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GCSE MATHS

Geometry and measures

Edexcel 1MA1 | Subtopic collection Topic 41

Circle theorems

Higher tier

Answers and examiner comments

91	2001-2025	Higher
question groups	available papers	tier

Using this booklet

1. Answer numbers match the companion question booklet.
2. Follow the original question number on marking tables.
3. Examiner comments are included where available.

Name _____ **Date** _____

Some entries use full source marking material in an appendix. Any unavailable mark schemes are identified beside the relevant answer.

Original question 17

No matching mark scheme was available in the supplied archive for this question.

Original question 12

The full source mark scheme begins on page 136. Use the original paper code, tier and question number shown above.

Original question 15

The full source mark scheme begins on page 136. Use the original paper code, tier and question number shown above.

Original question 10

No matching mark scheme was available in the supplied archive for this question.

Original question 18

No matching mark scheme was available in the supplied archive for this question.

Original question 11

The full source mark scheme begins on page 190. Use the original paper code, tier and question number shown above.

Original question 16

The full source mark scheme begins on page 190. Use the original paper code, tier and question number shown above.

Original question 13

No matching mark scheme was available in the supplied archive for this question.

Original question 15

No matching mark scheme was available in the supplied archive for this question.

Original question 4

The full source mark scheme begins on page 241. Use the original paper code, tier and question number shown above.

Original question 13

No matching mark scheme was available in the supplied archive for this question.

Original question 18

No matching mark scheme was available in the supplied archive for this question.

18			Ben with a valid reason	2	B2 for Ben and a valid reason, eg 'it should be 180' or 'they are not supplementary (allied, co-interior)' oe This could be implied by 184 or 84 or 92 seen [B1 for Ben and 88+96 or 180 – 88 or 180 – 96 seen or for just a valid reason given (eg without Ben or with James)]

Question		Working	Answer	Mark	Notes
24	(a)	$4x = 9-1$ $\frac{4x}{4}+\frac{1}{4}=\frac{9}{4}$	2	2	M1 for $4x = 9-1$ or $\frac{4x}{4}+\frac{1}{4}=\frac{9}{4}$ or a clear intention to either subtract 1 from both sides of the equation or to divide each term by 4 A1 for 2 (accept $\frac{8}{4}$)
	(b)	$2y = 12+1$ $\frac{2y}{2}-\frac{1}{2}=\frac{12}{2}$	6.5	2	M1 $2y = 12+1$ or $\frac{2y}{2}-\frac{1}{2}=\frac{12}{2}$ or a clear intention to either add 1 to both sides of the equation or divide each term by 2 A1 6.5 oe (accept $\frac{13}{2}$)

18	(a)		55° Reason	2	B1 cao B1 Angle between tangent & radius, diameter (is 90°) OR alternate segment theorem
	(b)		55° Reason	2	B1 cao or ft (a) providing the answer is $< 90^o$ B1 Angle in a semicircle or angle subtended by a diameter (is 90°) OR alternate segment theorem

1380 3H

1380/3H

Question	Working	Answer	Mark	Notes
27	$PQT = 58^o$ (Alternate segment theorem) $QTP = (180 - 58)/2$ $(= 61^o)$ (Isosceles triangle) $OTQ = 61 - (90-58)$ (Angle between tangent and radius) Alternative: $OTP = 90 - 58$ $(=32^o)$ (angle between radius and tangent) $OTP = OPT = 32^o$ (isosceles triangle) $POT = 180 - 32 - 32 = 116^o$ (angles in a triangle) $PQT = 116 \div 2 = 58^o$ (angle at centre = 2 × angle at circumference) $QTP = QPT = (180 - 58)/2$ $(= 61^o)$ (Isosceles triangle) $OTQ = 61 - 32$	29	5	M1 for $PQT = 58^o$ or ½ (180 – 2(90 – 58)) M1 (dep) for QPT or QTP = (180 – "58")/2 A1 for $OTQ = 29^o$ B2 for fully correct reasons (B1 for alternate segment theorem or equivalent circle theorems leading to PQT)

1380_3H
Summer 2010

26	$\frac{40}{360}\times\pi\times8^2 - \frac{1}{2}\times8^2\times\sin 40^o$ = 22.34.... – 20.569... OR $\frac{40}{360}\times\pi\times8^2 -$ $8\times\sin 20^o\times8\times\cos 20^o$ = 22.34.... – 20.569...	1.77	5	M1 for $\frac{40}{360}$ oe seen or $0.1\dot{1}$ seen or ÷9 M1 for $\frac{40}{360}\times\pi\times8^2$ oe or sight of 22.3-22.35 M1 for $\frac{1}{2}\times8^2\times\sin 40^o$ or $8\times\sin\ 20\times8\times\cos 20$ or sight of 20.56-20.57 M1 (dep on at least one M1 scored) for the intention to find the difference between the area of triangle *OPS* and the area of sector *OPRS* A1 for 1.74 -1.78 [B3: RAD: ±1.50(340...) or GRAD: 3.53(108...)]

22	(a)		Reason	1	B1 for angle between a **tangent** and a **radius** is a right angle (or 90°)
	(b)	$8^2 + 6^2$ $\sqrt{100}$ 10 – 6	4	3	M1 for $\sqrt{(8^2 + 6^2)}$ A1 for 10 A1 cao

1380_3H

1380/3H

Question	Working	Answer	Mark	Notes
23	Angle ADC = 180 − 128 = 52° x = 2 × 52° or Reflex angle AOC = 256° x = 360 − 256	104	2	M1 for valid method to get angle ADC or 128 × 2 or 256° seen … can be on the diagram A1 cao

Original question 16

The full source mark scheme begins on page 302. Use the original paper code, tier and question number shown above.

Question	Working	Answer	Mark	Notes
16	*DE* = *AE*, and *AE* = *EB* (tangents from an external point are equal in length) so *DE* = *EB* *AE* = *EC* (given) Therefore *AE* = *DE* = *EB* = *EC* So *DB* = *AC* If the diagonals are equal and bisect each other then the quadrilateral is a rectangle. OR If *AE* = *DE* = *EB* = *EC* then there are four isosceles triangles *ADE*, *AEB*, *BEC*, *DEC* in which the angles *DAB*, *ABC*, *BCD*, *CDA* are all the same. Since *ABCD* is a quadrilateral this makes all four angles 90°, and *ABCD* must therefore be a rectangle.	Proof	4	B1 for *DE* = *AE* or *AE* = *EB* (can be implied by triangle *AED* is isosceles or triangle *AEB* is isosceles or indication on the diagram) OR tangents from an external point are equal in length B1 for *AE* = *DE* = *EB* = *EC* B1 for *DB* = *AC*, (dep on B2) OR consideration of 4 isosceles triangles in *ABCD* C1 fully correct proof. Proof should be clearly laid out with technical language correct and fully correct reasons

21	(i)		54	1	B1 cao
	(ii)		reason	1	B1 for angles in the same segment (are equal), or angles subtended at the circumference by the same chord (are equal) or angles subtended at the circumference by the same arc (are equal)

Original question 13

The full source mark scheme begins on page 321. Use the original paper code, tier and question number shown above.

Question		Working	Answer	Mark	Notes
19		$ACB = 90^o$ angle in a semi circle $CBD = 180 - ACB$ co-interior angles add to 180° $CBD = 90°$ $DCB = CDB = (180^o - 90^o) \div 2$ base angles of an isosceles triangles	45	4	B1 $ACB = 90$ (could be on the diagram) or 45 seen in a correct position on the diagram B1 answer of 45 B1 angle in a semicircle = 90 B1 base angles isosceles triangle are equal or alternate angles are equal

14		Angle *ORT* = 90° Angle between the tangent and the radius is 90° Angle *AST* = 90° Corresponding angles with angle *ORT* as *AS* is parallel to *OR*	Proof	3	B1 for angle *ORT* (or angle *ORS*) = 90° C1 for angle between the tangent and the radius is 90°/right angle C1 for angle *AST* = 90° and angle *AST* = angle *ORT* because corresponding angles are equal oe or for angle *ASR*= 90° because of allied /co-interior angles, so angle *AST* = 90° because angles on a straight line add up to 180°

5MB2H_01

12		Angle *PTO* = angle *PSO* = 90 Angle *TPS* = 24 × 2 = 48 360 – 90 – 90 – 48 OR Angle *PTO* = 90 Angle *TOP* = 180 – 90 – 24 = 66 66 × 2	132	3	M1 for angle *PTO* = 90 or angle *PSO* = 90, could be marked on the diagram M1 for 360 – 90 – 90 – (24 × 2) A1 cao OR M1 for angle *PTO* = 90 or angle *PSO* = 90, could be marked on the diagram M1 for 2 × (180 – 90 – 24) A1 cao

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13*		Rectangle – unshaded triangle $(x + 6)(3x – 5) – ½×2x(3x – 5)$ $=3x^2 + 18x – 5x – 30 – (3x^2 – 5x)$ $=3x^2 + 18x – 5x – 30 – 3x^2 + 5x$ QED OR $(x + 6)(3x – 5) – ½×2x(3x – 5)$ $= (x + 6)(3x – 5) – x(3x – 5)$ $= (3x – 5)(x + 6 – x)$ $= 6(3x – 5) = 18x – 30$ QED OR Shaded trapezium + shaded triangle $½(x + 6 – 2x + x + 6)(3x – 5)$ $=6(3x – 5) = 18x – 30$ QED	Proof	4	M1 for using two lengths to find an area M1(dep) for '$(x + 6)(3x – 5)$' – '$½ × 2x(3x – 5)$' M1 for $3x^2 + 18x – 5x – 30$ or $½×(6x^2 – 10x)$ or $3x^2 – 5x$ C1 for a correct completion of the proof resulting in $18x – 30$ from fully correct working OR M1 for using two lengths to find an area M1(dep) for '$(x + 6)(3x – 5)$' – '$½ × 2x(3x – 5)$' M1 for factorising process with $(3x – 5)$ as the common factor C1 for a correct completion of the proof resulting in $18x – 30$ from fully correct working OR M1 for $x + 6 – 2x$ $(= 6 – x)$ M2 for $½(x + 6 – 2x + x + 6)(3x – 5)$ C1 for a correct completion of the proof resulting in $18x – 30$ from fully correct working

5MB2H_01

Original question 21

The full source mark scheme begins on page 334. Use the original paper code, tier and question number shown above.

Original question 15

The full source mark scheme begins on page 354. Use the original paper code, tier and question number shown above.

Original question 15

The full source mark scheme begins on page 373. Use the original paper code, tier and question number shown above.

19			68	3	M1 for angle *OBC* = 90° or angle *OAC* = 90° (may be marked on the diagram or used in subsequent working) M1 for correct method to find angle *BOC* or *AOC* or *AOB* e.g. angle *BOC* = 180 – 90 – 34 (= 56) or angle *AOC* = 180 – 90 – 34 (=56) or angle *AOB* = 180 – 2 × 34 (= 112) A1 cao **NB** (68 must be clearly stated as an answer and not just seen on diagram)

1MA0_1H

Original question 14

The full source mark scheme begins on page 388. Use the original paper code, tier and question number shown above.

Original question 16

The full source mark scheme begins on page 403. Use the original paper code, tier and question number shown above.

Question		Working	Answer	Mark	Notes
13		*OAC* = *OBC* = 90 (tangent is perpendicular to the radius) *AOB* = 360 – 90 – 90 – 36 = 144 (angles in a quadrilateral add up to 360°) *OBA* = (180 – 144) ÷ 2 = 18 (angles in a triangle add up to 180° and base angles of isosceles triangle are equal) **OR** *CAB* = *CBA* = (180 – 36)÷2 =72 (angles in a triangle add up to 180° and base angles of isosceles triangle are equal) *OBA* = 90 – 72 = 18 (tangent is perpendicular to the radius)	18	4	M1 for angle *OAC* or angle *OBC* = 90° or angle *AOB* = 144° or both angles *CAB* and *CBA* = 72° or angle *BCO* or angle *ACO* = 18° and angle *BOC* or angle *AOC* = 72° (these could be marked on the diagram or implied by calculation) M1 for a complete correct method e.g. $90 - \frac{180 - 36}{2}$ or $\frac{1}{2}(180 - (360 - 90 - 90 - 36))$ C1 for one reason (dep on M1) C1for 18 with full reasons QWC: Reasons clearly laid out with correct geometrical language used

Original question 22

The full source mark scheme begins on page 424. Use the original paper code, tier and question number shown above.

Original question 28

The full source mark scheme begins on page 445. Use the original paper code, tier and question number shown above.

Original question 14

The full source mark scheme begins on page 467. Use the original paper code, tier and question number shown above.

Original question 18

The full source mark scheme begins on page 481. Use the original paper code, tier and question number shown above.

Original question 18

The full source mark scheme begins on page 481. Use the original paper code, tier and question number shown above.

21			55	3	M1 for angle ABO = 90 or angle ADO = 90, or angle OBC = 15 or angle FDO = 90 or angle EBO = 90 (could be marked on the diagram) M1 for reflex angle BOD = 360 – (360 – 90 – 90 – 40) (= 220) or angle BCD = (360 – 90 – 90 – 40) ÷ 2 (= 70) or angle BDO or angle DBO = 90 – (180 – 40)/2 (= 20) or angle BOC = 180 – (15 + 15) (=150) A1 cao

12			20	3	M1 for indication that angle between a tangent and radius is 90 (could be seen on the diagram) M1 for OAC = 20 or AOC = 70 or BOC = 140 or ABC = ACB or BCA = $\frac{180-40}{2}$ (= 70) A1 cao

PAPER: 1MA0_2H

Question		Working	Answer	Mark	Notes
17			35°	4	M1 for *ABC* = 90 M1 for (*ACB* =) 180 – 90 – 25 (= 65) M1 for (*DBC* =) 180 – '65' – 80 (=35) A1 cao supported by working OR M1 for (*AOB* =) 180 – 2 × 25 (= 130) M1 for (*ADB* =) 130 ÷ 2 (=65) M1 for (*DAC* =) 180 – 65 – 80 A1 cao supported by working.

Original question 14

The full source mark scheme begins on page 499. Use the original paper code, tier and question number shown above.

Original question 17

The full source mark scheme begins on page 512. Use the original paper code, tier and question number shown above.

13		29.6	4	M1 for $8^2 + 5^2$ or 64 + 25 or 89 M1 (dep) $\sqrt{"8^2"+"5^2"}$ (=9.4) M1 for "9.4..." × π A1 for 29.5 – 29.65
*14		49	3	M1 for 180 - 56 - 75 A1 for 49 C1 for alternate segment theorem and angles on a straight line add up to 180° OR alternate segment theorem and angles in a triangle add up to 180° Appropriate to methods shown

5MB3H/01 June 2015

Original question 14

The full source mark scheme begins on page 528. Use the original paper code, tier and question number shown above.

Original question 22

The full source mark scheme begins on page 547. Use the original paper code, tier and question number shown above.

Original question 15

The full source mark scheme begins on page 563. Use the original paper code, tier and question number shown above.

Original question 17

The full source mark scheme begins on page 582. Use the original paper code, tier and question number shown above.

Original question 20

The full source mark scheme begins on page 596. Use the original paper code, tier and question number shown above.

PAPER: 1MA0_2H

Question		Working	Answer	Mark	Notes
22			28.9	3	M2 for $\frac{75}{360} \times 2 \times \pi \times 6$ oe + $\frac{75}{360} \times 2 \times \pi \times 10$ oe (= 7.85... + 13.08... = 20.94..) (M1 for $\frac{75}{360} \times 2 \times \pi \times 6$ oe or $\frac{75}{360} \times 2 \times \pi \times 10$ oe) A1 for 28.9 to 28.95

Question		Working	Answer	Mark	
14			$\frac{2x+y}{2}$ (with reasons)	5	M1 for (POS =) $360-(90+90+2x)$ $(=180-2x)$ ie using angles around O or (QOR =) $360-(90+90+y)$ $(=180-y)$ M1 (dep) for (POQ =) $\frac{1}{2}$ [360 − ("POS" + "QOR")] A1 for (POQ =) $x+\frac{y}{2}$ oe C1 (dep M1 and supported) for circle theorem angle between tangent and radius is 90 C1 for full reasons and supported eg sum of angles in a quadrilateral is 360 and sum of angles at a point is 360 OR M1 for (POA=) $180-90-x$ $(=90-x)$ ie after having drawn line AOC or (QOC=) $180-90-\frac{y}{2}$ $(=90-\frac{y}{2})$ M1 (dep and supported) for (POQ =) 180 − "POA" − "QOC" A1 for (POQ =) $x+\frac{y}{2}$ oe C1 (dep M1 and supported) for circle theorem for angle between tangent and radius is 90 C1 for full reasons and supported eg sum of angles in a triangle is 180 and sum of angles on straight line is 180 OR M1 for (ABC or ADC =) $\frac{1}{2}(360-2x-y)$ ie using similar triangles M1 (dep)for (POQ =) $360-90-90-$ "ABC" A1 for (POQ =) $x+\frac{y}{2}$ oe C1 (dep M1 and supported) for circle theorem for angle between tangent and radius is 90 C1 for full reasons and supported eg sum of angles in a quadrilateral is 360 and eg ΔABC similar to ΔADC

PAPER: 5MB2H/01

Original question 16

The full source mark scheme begins on page 615. Use the original paper code, tier and question number shown above.

Original question 18

The full source mark scheme begins on page 634. Use the original paper code, tier and question number shown above.

Original question 14

The full source mark scheme begins on page 656. Use the original paper code, tier and question number shown above.

Original question 16

The full source mark scheme begins on page 667. Use the original paper code, tier and question number shown above.

Original question 22

The full source mark scheme begins on page 680. Use the original paper code, tier and question number shown above.

Question	Working	Answer	Mark	Notes
15		Proof	C1	for identifying one pair of equal angles with a correct reason, e.g. (angle) *BAE* = (angle) *CDE*; angles in the same segment are equal or angles at the circumference subtended on the same arc are equal or for identifying two pairs of equal angles with no correct reasons given (angles must be within the appropriate triangles)
			C1	for identifying a second pair of equal angles with a correct reason, e.g. (angle) *AEB* = (angle) *DEC*; opposite angles or vertically opposite angles are equal or for identifying the three pairs of equal angles with no correct reasons given
			C1	for stating the three pairs of equal angles of the two triangles e.g. *ABE* = *DCE*, *BEA* = *CED*, *EAB* = *EDC* with fully correct reasons

Question	Working	Answer	Mark	Notes
18	Note *DOC*=*DOA*, *ADO*=*CDO*	21.6	P1 P1 P1 P1 A1	Recognises that *OAD* or *OCD* is 90° or right angle for using trigonometry to set up an equation in *DOA* or *ADO* eg Cos *DOA* = $\frac{5}{9}$ for using inverse trigonometry to find *DOA* or *ADO* eg *DOA* = $\text{Cos}^{-1}\frac{5}{9}$ (= 56.25…) for a complete process to find arc length *ABC* or *AC* eg $\frac{360-2\times"56.25.."}{360}\times2\times\pi\times5$ (=21.598..) or $\frac{2\times"56.25.."}{360}\times2\times\pi\times5$ (=9.8174..) for answer in the range 21.5 to 21.65

Question	Working	Answer	Mark	Notes
3 (a)		31.4	P1	for working with circumference formula, eg $\pi \times 80$ (=251. …) oe
			A1	for answer in the range 31.4 to 31.5 accept 10π
(b)		No (supported)	C1	Mean distance stays the same with reason, eg total distance remains unchanged or same number of points

Question	Working	Answer	Mark	Notes
20		68.5	B1	for angle $OAB = 90°$ or angle $OCB = 90°$, may be seen on diagram
			P1	for a process to find the length of AB or the length of CB ($= 10\sqrt{3}$ oe) eg $10 \times \tan 60°$ ($= 17.3...$) or the length of OB ($= 20$), eg $10 \div \cos 60°$
			P1	for a process (dep previous P1) to find the area of the triangle OAB ($= 50\sqrt{3}$ oe) or area of triangle OCB ($= 50\sqrt{3}$ oe) or area of kite $OABC$ ($= 100\sqrt{3}$ oe)
			P1	for a process to find the area of the sector OAC e.g. $\frac{1}{3} \times \pi \times 10^2$ ($= 104.7...$),accept rounded or truncated to 3 significant figures or more
			A1	for 68.4 − 68.6

Paper: 1MA1/2H

19		Proof (supported)	M1 M1 M1 M1 C1	starts process to find point of intersection by substituting, eg $(10 + 2y)^2 + y^2$ (= 20) for expanding, eg $4y^2 + 20y + 20y + 100$ (3 out of 4 terms correct) (dep M2) for 3-term quadratic equation ready for solving, eg $5y^2 + 40y + 80 = 0$ (dep on previous M1) for method to solve an equation of the form $ay^2 + by + c = 0$, eg by factorising or correct substitution into quadratic formula fully correct method leading to $y = –4$ or $x = 2$ or $(y + 4)^2 = 0$ or $(x – 2)^2 = 0$ and statement, eg only one point of intersection so the line is a tangent to the circle

20		Proof	C1	draws OC and considers angles in an isosceles triangle (algebraic notation may be used, eg two angles labelled x)
			C1	finds sum of angles in triangle ABC, eg $x + x + y + y = 180$, or sum of angles at O, eg $180 – 2x + 180 – 2y$
			C1	complete method leading to $ACB = 90$
			C1	complete proof with all reasons given, eg base angles of an isosceles triangle are equal, angles in a triangle add up to 180º, angles on a straight line add up to 180º

Paper: 1MA1/3H

11	90 – 2*x*	M1	for identifying an unknown angle eg *BAO* = *x* , *AOB* = 180 – 2*x*, *OBC* = 90, *ABC* = 90 + *x*	Could be shown on the diagram alone
		M1	full method to find the required angle eg a method leading to 180 – *x* – *x* − 90	Needs to be an algebraic method Accept *x* + *x* + 90 + *y* = 180 for M2
		A1	for 90 – 2*x*	
		C2	(dep M2) full reasons for their method, from base angles in an isosceles triangle are equal angles in a triangle add up to 180° a tangent to a circle is perpendicular to the radius (diameter) angles on a straight line equal 180° the exterior angle of a triangle is equal to the sum of the interior opposite angles	Underlined words need to be shown; reasons need to be linked to their method; any reasons not linked do not credit.
		(C1	(dep M1) for a tangent to a circle is perpendicular to the radius (diameter))	Apply the above criteria

Paper: 1MA1/1H

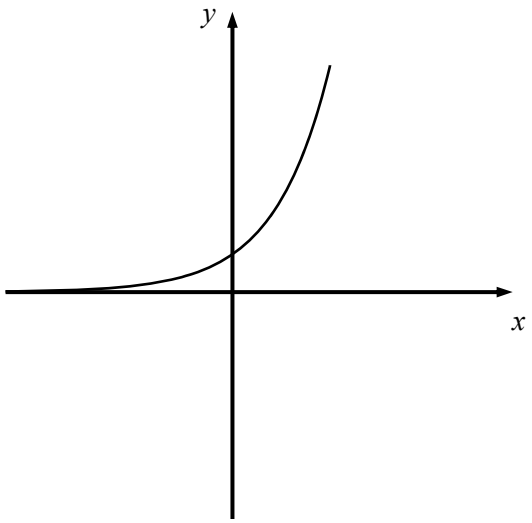
Question	Answer	Mark	Mark scheme	Additional guidance
13 (a)	Shown	M1	for finding one missing angle eg *BDE* = *y* **or** *ODE* = 90 **or** *ODF* = 90 **or** *DBO* = *x* **or** *BCD* = 180 – *y* **or** (reflex) *BOD* = 2*y*	Could be shown on the diagram or in working
		A1	for a complete correct method leading to $y - x = 90$	
		C1	(dep on A1) for all correct circle theorems given appropriate for their working eg The tangent to a circle is perpendicular (90°) to the radius (diameter) Alternate segment theorem **OR** Angle at the centre is twice the angle at the circumference Opposite angles in a cyclic quadrilateral sum to 180°	
(b)	Explanation	C1	for explanation eg No as *y* must be less than 180 as it is an angle in a triangle	

12	21	C1 C1 C1	for angle $OAB = 90 - 56$ (= 34) for process to find angle CAD (= 69) or angle BCA (= 56) or angle COA (= 138) , eg use of alternate segment theorem or angle at centre is twice the angle at the circumference cao	Throughout, angles may be written on the diagram; accept as evidence if correct. Ignore absence of degree sign Reasons need not be given.

Question	Answer	Mark	Mark scheme	Additional guidance
13	84.9	P1	shows a process to find the radius or diameter eg $44 = 2 \times \pi \times r$ **or** $r = \frac{22}{\pi}$ **or** $d = \frac{44}{\pi}$ **or** $r = 7.0028$ **or** $d = 14.0056..$	Allow r in the range 7 to 7.1 and d in the range 14 to 14.1 Could be shown on the diagram.
		P1	(dep on P1) complete method to find the area eg ½ × "d" ^{2} × Sin60 oe, ½ × 14 × Tan60 oe, ½ × 14 × $\sqrt{14^2 - 7^2}$ oe	
		A1	for answer in the range 84.8 to 85	If the correct answer in the range is given in working and then rounded incorrectly award full marks.

21	proof	C1	uses cyclic quad eg if $CAB = x$ then $CRO = 180 - x$ (Opposite angles of a cyclic quadrilateral add up to 180°.)	Underlined words need to be shown; reasons need to be linked to their method; any reasons not linked do not credit.
		C1	establishes relationship outside a circle eg $ORB = x$ (Angles on a straight line add up to 180)	Correct method can be implied from angles on the diagram if no ambiguity or contradiction.
		C1	uses properties of a circle eg $RO = OB$ (both radii) so $ABC = x$ (Base angles of an isosceles triangle are equal.)	
		C1	Complete proof and conclusion	Full reasons given without any redundant reasons and correct reasoning throughout.

Question 14: sketch of $y = 2^x$



Modifications to the mark scheme for Modified Large Print (MLP) papers. Paper 2H.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

Angles: ±5°

Measurements of length: ±5 mm

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
1		Diagram enlarged. Wording added 'It shows a Venn diagram.' Circles labelled 'set A', 'set B' and 'set C'. Braille only – sticky labels provided.	Standard mark scheme
2		Diagram enlarged. Crosses changed to solid dots. Axes labels moved to the left of the horizontal axis and above the vertical axis. Wording changed from 'Here is his answer.' to 'His answer is shown in the Diagram Book.'	Standard mark scheme
3		Diagram enlarged. Arrows moved further to the right and made bigger. Angles moved outside of the angle arcs and angle arcs made smaller. Wording added 'Angle CBG = 35°, Angle BED = 110°, Angle GEF = 25°, Angle BGE is marked x.' Wording changed from 'Work out the size of angle x.' to 'Work out the size of the angle marked x.	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
5		Diagram enlarged and a model provided for all candidates. Wording added 'The diagrams show a floor in the shape of a trapezium and a tin of paint. The model represents the tin of paint.' Braille only – parallelogram labelled ABCD, added information about the shape.	Standard mark scheme
8		Diagram enlarged. Shading changed to dotty shading. Wording added 'It shows triangle P, triangle Q and triangle R on a grid.' Triangle P moved to (1,3), (5,3), (5,5). Triangle Q added at (-3,-1), (-3,-5), (-5,-5) and Triangle R added at (1,-1), (1,-5), (3,-5). Labels put above the shapes. Shape provided for all candidates. Wording added 'A cut out shape is available if you wish to use it.' Question wording changed: 8(a) Describe the single transformation that maps triangle P onto triangle Q.' (1 mark) 8(b) Describe the single transformation that maps triangle Q onto triangle R.' (1 mark) 8(c) Describe fully the single transformation that maps triangle R onto triangle P.' (1 mark)	(a) C1 for "reflection in the line $y = -x$ (b) C1 for "reflection in the line $x = -1$" (c) C1 for "rotation of 90° anticlockwise about the point $(-1,1)$" OR rotation of 270° clockwise about the point $(-1,1)$
12		In both parts x changed to y.	Standard mark scheme but x changed to y.
13		Diagram enlarged	Standard mark scheme
14		Diagram enlarged	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
20		Diagrams enlarged, simplified and made 2D. 2 models provided, Model 1 and Model 2. Wording changed to 'There are two models, Model 1 and Model 2.' Diagrams labelled Diagram 1 and Diagram Wording changed from 'Here is a frustum of a cone' to 'Diagram 1 and Model 1 show a frustum of a cone'. Wording changed from 'The frustum is'. to 'Diagram 2 and Model 2 show the frustum'. Wording 'shown below' removed	Standard mark scheme
21		Diagram enlarged	Standard mark scheme

16	39.9	P1 P1 P1 P1 A1	for finding the length of the minor or major arc eg $\frac{220}{360}\pi\times12$ (= 23(.03834..)) for substituting into the sine or cosine rule to find *OD* eg 14 ÷ sin140 = *OD* ÷ sin 24 **or** (OD^2=) $6^2+14^2-2\times6\times14\times\cos24$ (=78.5....) for a complete process to find the length *OD* eg 14 ÷ sin140 × sin24 (=8.8(58778..)) for a complete process to find the perimeter eg "23(.03834..)" + 14+ "8.8(58778..)" – 6 for an answer in the range 39.8 to 40	Allow appropriate rounding if calculation seen in parts Must involve *OD* in the relationship but may be implied May be seen in multiple calculations If an answer in the range is seen in working and then incorrectly rounded award full marks.

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
18	75° with reasons	M1	for finding angle $BAD = \frac{180-40}{2}$ (= 70) **or** angle $BDA = \frac{180-40}{2}$ (= 70)	Could be shown on the diagram or in working
		M1	for finding angle *BCD* = 180 – "70" (=110) or 40 + *x* + 70 + *x* = 180	
		A1	for finding angle *ADE* = 75	
		C2	(dep M2) for Opposite angles of a cyclic quadrilateral add up to 180 **and** one other reason; all reasons given must be appropriate for their working Base angles of an isosceles triangle are equal Angles in a triangle add up to 180, Angles on a straight line add up to 180 [**or** exterior angle of a cyclic quadrilateral is equal to the interior opposite angle]	Underlined words need to be shown; reasons need to be linked to their method
		(C1	(dep M2) for Opposite angles of a cyclic quadrilateral add up to 180, **or** all other reasons given appropriate for their working)	Apply the above criteria

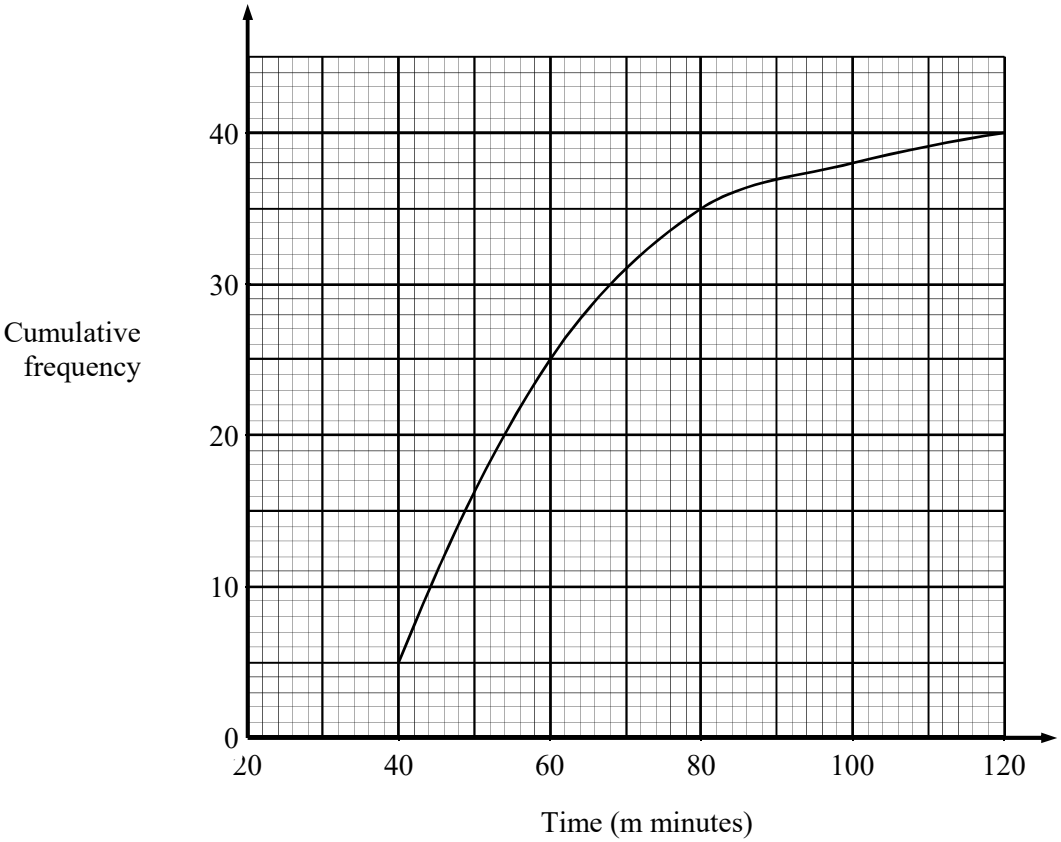
Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
22	2.5	P1	use of $\sin 30 = \frac{1}{2}$ to find OA (= 8) or $OAB = 90°$ eg $OA = 16\sin 30°$ or right angle marked on diagram	
		P1	recognition that equation of circle is $x^2 + y^2 = r^2$	Accept $3p^2 + p^2 = r^2$ for the award of this mark
		P1	Correct substitution of p, $3p$ and r in $x^2 + y^2 = r^2$ eg $9p^2 + p^2 = OA^2$ or $(3p)^2 + p^2 =$ "8^2"	Do not accept $3p^2 + p^2 = 8^2$ for the award of this mark
		A1	for answer in the range 2.5 to 2.53	Accept $\sqrt{6.4}$ or $\frac{4\sqrt{10}}{5}$ If an answer within the given range is seen in working and rounded incorrectly award full marks. Award 0 marks for the answer without supportive working.

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
22	Proof	C1	for **one** correct pair of equal angles with correct reason from: angle *ACB* = angle *ADB*, (angles in the same segment are equal) angle *DBC* = angle *DAC*, (angles in the same segment are equal) angle *ABD* = angle *ACD*, (angles in the same segment are equal) **or** for recognising all angles of 60 in triangle *AED* **and** in triangle *CEB*)	Underlined words need to be shown; reasons need to be linked to their statement(s) Pairs of equal angles may be just shown on the diagram
		C1	for **one** identity, with reason(s), from the following list of alternatives: **Alternatives:** a complete method to show that angle *ACB* = angle *DBC* (= 60), **or** *BC* being common to both triangles **or** *DB* = *DE*+*EB* = *AE*+*EC* = *AC* (sides of an equilateral triangle are equal) **or** angle *ABC* = 60 + angle *ABD* = 60 + angle *ACD* = angle *DCB* (angles in the same segment are equal) **or** angle *BDC* = angle *CAB* (angles in the same segment are equal)	
		C1	for a **second** identity, with reason(s), from the alternatives above	
		C1	for concluding the proof with a **third** identity, with reason(s), from the alternatives above, together with the condition for congruency, ASA or SAS or AAS	

Q10(a)


Cumulative frequency
0
10
20
30
40
20
40
60
80
100
120
Time (m minutes)

Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 1H

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5º
Measurements of length: ±5 mm

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
2		Wording changed to 'Using the information work out the value of n.'	Standard mark scheme
4		P moved 1 cm to the left.	Standard mark scheme
5		Diagram enlarged. Wording added 'Angle BAC = 75° Angle ABC =51°.' Angles moved outside of the angle arcs and angle arcs made smaller.	Standard mark scheme
8		North lines made 9 cm. Scale moved above the diagram. Changed the scale from '1 cm represents 4km' to '1 cm represents 2 km.'	Standard mark scheme but note the scale change P1 for a process to work out the distance PQ, eg. 12×1.5 (= 18) P1 for the process to use the given scale eg. "18" ÷ 2 (= 9 cm) Award P3 for Q shown in the correct place on the diagram. A1 for distance in the range 20 to 23 A1 for bearing in the range 317 to 330

10		Table left aligned. Diagram enlarged. Right axis labelled. Axes labels moved to the left of the horizontal axis and above the vertical axis. Frequency table: $20 < m \leq 40$ 5 $20 < m \leq 60$ 10 $20 < m \leq 80$ 25 $20 < m \leq 100$ 35 $20 < m \leq 120$ 40	Part (a) Standard mark scheme but plots at values shown. Part (b): M1 for UQ = 90 (±2) or LQ = 60 (±2) or ft their cf graph A1 answer in the range 36 to 44 Part (c): M1 for finding the difference between readings taken from the cf axis at points from a mark of 50 and a mark of 90 eg 30 – 7.5 A1 answer in the range 19/40 to 26/40

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
12		MLP only- q changed to m.	Standard mark scheme
13	(a)	MLP only – x changed to y.	Standard mark scheme with letters changed as indicated.
13	(b)	MLP only – x and y changed to e and f.	Standard mark scheme with change of letters as indicated.
14		Diagram enlarged. Triangle vertices labelled ABC. Wording 'ABC' added. Wording 'BC = (y+4) cm' and 'BA = (y-2) cm' added. MLP only – x changed to y	Standard mark scheme with change of letters as indicated.
17		Diagram enlarged; model may be provided. Labels removed from inside the shapes and above the containers labelled 'container A' and 'container B'. Wording changed to 'They show two similar cylindrical containers, container A and container B' ; Container A is smaller than container B.'	Standard mark scheme
20		Diagram enlarged. In part (a) the wording changed from 'y =f(x+1) -3' to 'y =f(x+1) -5'.Braille only – only point A on the diagram and wording 'Point A (-2,1)' added above the diagram.	Standard mark scheme, but note the graph required to be drawn in part (a) is now 2 squares below that normally expected, so in the standard mark scheme replace -3 by -5
21		A pair of axes provided.	Standard mark scheme
22		Diagram enlarged.	Standard mark scheme

17	61	B1 M1 A1	angle *OAD* = 90, may be marked on diagram method to work out angle *OAB* (=29) cao	Angle could be shown by a right-angle symbol Correct method can be implied from angles on the diagram if no ambiguity or contradiction. Reasons need not be given. Award 0 marks for an answer of 61 with no other working.

7	35.3	P1 P1 P1 A1	for starting the process to find length of third side of triangle, eg $9^2 - 6^2$ (= 45) **or** $6^2 + x^2 = 9^2$ for $\sqrt{9^2 - 6^2}$ or $\sqrt{81 - 36}$ or $\sqrt{45}$ or $3\sqrt{5}$ (= 6.7..) **or** $r^2 = 45$ for stating or using $\pi \times$ [radius]$^2 \div 4$ for answer in range 35.2 to 35.4	 [radius] is any value If an answer in the range 35.2 to 35.4 is given in the working space then incorrectly rounded, award full marks No working, answer only, no marks

Paper: 1MA1/2H

14	60 (supported)	M1 M1 A1 C1	for angle *DBF*, eg 180 – 100 (= 80) for angle *BFD*, eg 180 – "80" – 40 (= 60) or for angle *CBF* = 40 for angle *ABD* = 60 (dep M2) for at least 2 reasons from Opposite angles of a cyclic quadrilateral add up to 180 Angles in a triangle add up to 180 Alternate segment theorem **OR** Opposite angles of a cyclic quadrilateral add up to 180 Alternate segment theorem Angles on a straight line add up to 180	Angles may be shown on the diagram or in working Underlined words need to be shown; reasons need to be linked to their method

14	25 with reasons	M1 M1 C2 (C1	for method to find angle *BCD* eg 180 ÷ (3 + 1) (= 45) **or** *BAD* = 180 ÷ (3 + 1) × 3 (=135) for method to find angle *BDA* eg 180 – 20 – (180 – "45") (=25) **or** method to find angle *SBD* eg *SBD* = *BCD* (=45) for finding *SBA* (=25) and both reasons given, eg Opposite angles of a cyclic quadrilateral add up to 180 for angle *SBD* = 45 because alternate segment theorem (dep M1) for one reason given Opposite angles of a cyclic quadrilateral add up to 180 for angle *SBD* = 45 because alternate segment theorem)	Could be shown on the diagram or in working Do not award if it ambiguous as to which angle is being found Underlined words need to be shown; reasons need to be linked to their method

Paper: 1MA1/2H

7	18.3	P1	for finding the area of the triangle eg $0.5 \times 8 \times 8$ (= 32)	Accept rounded or truncated figures
		P1	for finding the area of the circle $\pi \times 8 \times 8$ (= 201.06..)	
		P1	for finding the area of the sector eg $\frac{1}{4} \times \pi \times 8^2$ **or** "201.06.." ÷ 4 (= 50.26...)	
		A1	for an answer in the range 18.2 to 18.3	If the answer is given within the range but then rounded incorrectly award full marks.

20	98	M1	for $BAD = 132 \div 2$ (= 66)		Angles may be seen on diagram
		M1	eg $BCD = 180 - $ "66" (= 114) **or** $ABE = 180 - $ "66" $- 16$ (= 98)	M2 for reflex $BOD = 360 - 132$ (= 228) **and** $BCD =$ "228" $\div 2$ (= 114)	
		A1	for finding $CDE = 98$		
		C1	(dep on at least M2) for one circle theorem relevant to their method eg The angle at the centre of a circle is twice the angle at the circumference **or** Opposite angles of a cyclic quadrilateral add up to 180		Underlined words need to be shown; reasons need to be linked to their method.

Paper: 1MA1/2H

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
15	Proof	C1	for angle PQX = angle SRX as angles in the same segment are equal (or angles at the circumference subtended from the same arc/chord of a circle are equal)	Underlined words need to be shown; reasons need to be linked to their method.
			or angle QPX = angle RSX as angles in the same segment are equal (or angles at the circumference subtended from the same arc/chord of a circle are equal)	
			or angle PXQ = angle SXR as vertically opposite angles/ vertically opposite angles are equal	Could be shown on the diagram
			or for identifying two pairs of corresponding equal angles with no reason given	
		C1	for identifying two pairs of corresponding equal angles with correct reasons given	
		C1	for stating that the triangles are similar because all three pairs of corresponding angles are equal with complete reasons given.	Note that the students third/final reason may be: Angles in a triangle add up to 180

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
18	Result shown	M1	for angle $OBC = 90$ **or** for method to find angle OBA or angle OAB, eg $\frac{180 - x}{2}$ oe **or** for angle ABC = 90 – angle OBA, eg angle $ABC = 90 - y$ **or** marks point on circumference and draws triangle using A and B and point marked	Angles must be clearly labelled on the diagram or otherwise identified. Correct method can be implied from angles on the diagram if no ambiguity or contradiction.
		M1	for method to find angle ABC, eg $90 - \text{“}\frac{180 - x}{2}\text{”}$ oe **or** for $x = 180 - 2 \times$ angle OBA, eg $x = 180 - 2y$ **or** for angle at circumference = $\frac{1}{2}x$	
		C1	for correct algebra leading to angle $ABC = \frac{1}{2}x$ **and** one circle theorem relevant to their method, eg The <u>tangent</u> to a circle is perpendicular to the <u>radius</u> **OR** for $x = 180 - 2y$ and angle $ABC = 90 - y$ **and** one circle theorem relevant to their method, eg The <u>tangent</u> to a circle is perpendicular to the <u>radius</u> **OR** for angle $ABC = \frac{1}{2}x$ **and** one circle theorem relevant to their method, eg The <u>angle</u> at the <u>centre</u> of a circle is <u>twice</u> the <u>angle</u> at the <u>circumference</u> or <u>Alternate segment</u> theorem	Underlined words need to be shown; reasons need to be linked to their method.

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
4	186.15	P1	for correctly finding the area of at least three sections, eg 3 of 11×7 (= 77), **or** 9×7 (= 63), **or** $\frac{1}{2} \times 11 \times 9$ (= 49.5), **or** $\frac{1}{4} \times \pi \times 7^2$ (= 38.4845..)	Note a trapezium for the rectangle and triangle should be classed as two areas. Accept figures rounded or truncated to 1 dp or better throughout.
		P1	for a method to find the number of bags required for one area or a combination of areas eg "77" ÷ 14 (= 5.5) **or** "227.9845.." ÷ 14 (= 16.2846…)	
		P1	for method to work out the total area for all four sections eg "77" + "63" + "49.5" + "38.4845…" (= 227.9845…) or adding the exact number of bags per section for all four sections eg "5.5" + "4.5" + "3.53.." + "2.74.." (= 16.28...)	This mark is dependent upon correct processes seen for all four sections.
		P1	for method to find the cost, eg integer number of bags × 10.95	integer number of bags must come from area ÷ 14 rounded up
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
16	40	M1	for $ABD = 120$ and $AED = 60$ **or** for using the properties of a cyclic quadrilateral eg $EAB + BDE = 180$	Angles may be shown on the diagram
		M1	for using the ratio of 2 : 1 eg showing sizes of angles such that $EAB : BCD = 2 : 1$	May be expressed using algebra eg $EAB = 2x$ and $BCD = x$
		M1	(dep on M1) for linking an angle from the cyclic quadrilateral with angle(s) in the triangle (other than $EAB : BCD = 2 : 1$) eg $BDE = BCD + 60$ or $BDE = 180 - BDC$ or $EAB + BCD + AEC = 180$	Could be expressed using algebra eg $x + 60 = 180 - 2x$
		A1	for $BCD = 40$ from correct working	

Question	Answer	Mark	Mark scheme	Additional guidance
21	71	M1	for method to find angle *BAD* or angle *OAB* or angle *OBD*, eg angle *BAD* = 64 ÷ 2 (= 32) or angle *OAB* = 51 or angle *OBD* = (180 – 64) ÷ 2 (= 58)	Angles may be seen on the diagram
		M1	for method to find angle *ADO* or angle *AXD* (where *X* is a point on the major arc *AD*) eg *ADO* = 180 – 64 – (180 – 51 – "32") (= 19) or *ADO* = (180 – 64 – (180 – 2 × "51")) ÷ 2 (= 19) or angle *AXD* = 180 – "58" – 51 (= 71)	
		A1	for angle *ADC* = 71	
		C1	(dep on M1) for one circle theorem relevant to their method, eg The angle at the centre of a circle is twice the angle at the circumference or The tangent to a circle is perpendicular to the radius (diameter) or Opposite angles of a cyclic quadrilateral add up to 180 or Alternate segment theorem	Underlined words need to be shown; reasons need to be linked to their method

12	40.2	P1 P1 P1 A1	for start of process to find the diameter or the radius of the circle, eg $8^2+10^2(=d^2)$ oe or $4^2+5^2\ (=r^2)$ oe for complete process to find diameter, eg $\sqrt{8^2+10^2}$ (= 12.8...) or complete process to find radius, eg $\sqrt{4^2+5^2}$ (= 6.40...) for process to find circumference, eg $\pi \times$ "12.8..." or $2\times\pi\times$ " 6.40..." answer in the range 40.2 to 40.24	 Accept $\sqrt{164}$ or $2\sqrt{41}$ or $\sqrt{41}$ If an answer is given in the range in working and then rounded incorrectly award full marks.

Paper: 1MA1/2H

14	19.9	P1	for substituting into the cosine rule to find *OB*, eg $(OB^2) = 9^2 + 6^2 - 2 \times 9 \times 6 \times \cos 35$	
		P1	for using correct order of operations eg 81 + 36 – 88.46... (= 28.5...)	May be implied by *OB* = 5.34.... Values may be rounded or truncated.
		P1	for process to find the area of the sector, eg $\frac{80}{360} \times \pi \times$ "$5.34...^2$"	
		A1	for answer in the range 19.8 to 20	If a correct answer within the range is shown in working but incorrectly rounded award full marks.

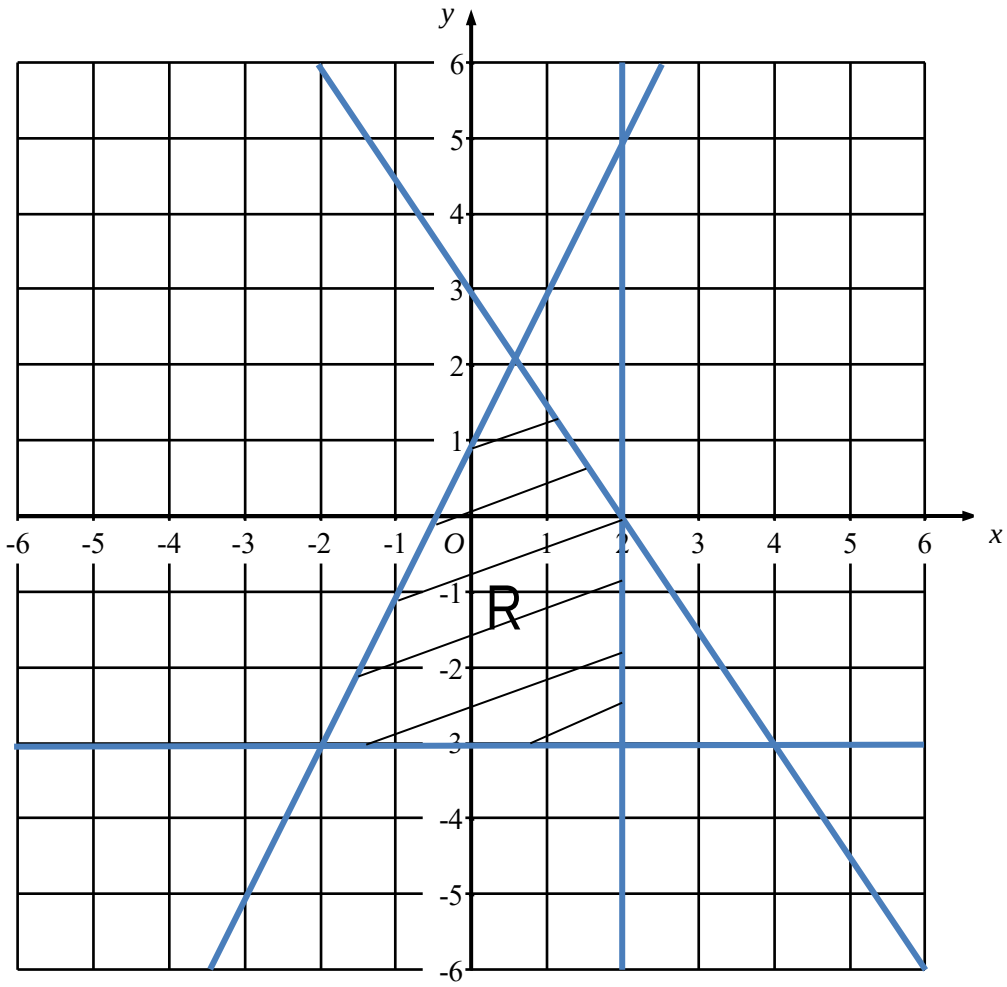
Paper: 1MA1/3H

21	27	M1 M1 A1 C1	for start by finding one missing angle, eg angle *CBD* = 35 or angle *ADC* = 90 or angle *ACE* = 117 for making progress by finding a second angle, eg angle *BDE* = 117 or angle *DCE* = 62 or angle *BCA* = 63 for angle *BDC* = 27 (dep on M1) for stating one correct circle theorem used eg Angles in a semicircle are 90 **or** Angles in the same segment are equal **or** Angles at the circumference subtended from the same arc of a circle are equal **or** The angle at the centre of a circle is twice the angle at the circumference	Angles clearly identified on the diagram or in the working space may be awarded marks provided there is no ambiguity or contradiction. Underlined words need to be shown; circle theorems stated need to be linked to their method, which can be implied from correctly identified angles (stated or written on the diagram).

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
22	Proof	C1 C1 C1 C1	for angle OAP = angle OBP = 90 angle between radius and tangent is 90° for $OA = OB$ both radii OP is common (dep on C3) for a complete proof with all reasons given, eg triangles OAP and OBP are congruent RHS so $AP = BP$ or $AP = \sqrt{OP^2 - OA^2}$ and $BP = \sqrt{OP^2 - OB^2}$ and $OA = OB$ so $AP = BP$	May be seen as 2 separate diagrams All reasons given must be clearly linked to the appropriate statement Underlined words need to be shown
22 **ALT**	Proof	C1 C1 C1 C1	for $\cos AOP = \frac{AO}{OP} = \frac{r}{OP}$ or $\cos BOP = \frac{BO}{OP} = \frac{r}{OP}$ angle between radius and tangent is 90° for $\cos AOP = \frac{AO}{OP} = \frac{r}{OP}$ **and** $\cos BOP = \frac{BO}{OP} = \frac{r}{OP}$ **and** $AOP = BOP$ both radii OP is common (dep on C3) for a complete proof with all reasons given, eg triangles OAP and OBP are congruent SAS so $AP = BP$	May be seen as 2 separate diagrams Underlined words need to be shown

13



Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 2H

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme. Notes apply to both MLP papers and Braille papers unless otherwise stated.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
1		Diagram enlarged. Wording added 'Look at the diagram for Question 1 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows a right-angled triangle labelled ABC. In the diagram: AB = 10 cm AC = 19 cm'	Standard mark scheme
2	(b)	Word 'When' added Letters changed: A changed to T and B changed to U	Standard mark scheme
5	(a)	Word 'below' added to the sentence 'Complete the table below of values for …' For Braille: answer lines added Ans: (i) _____ (ii) _____ (iii) _____	Standard mark scheme
	(b)	Diagram enlarged. Wording added 'Look at the diagram for Question 5 (b) in the separate Diagram Booklet. The diagram shows a grid.' For Braille sentence added 'A spare tactile diagram and bumpons are provided for this question.'	Standard mark scheme
7		Diagram enlarged. Labelling of trapezium changed from ABCD to DABC. Top left now A – top right now B – bottom right now C and bottom left now D. Letter changed: x changed to y Wording added 'Look at the diagram for Question 7 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows a quadrilateral labelled ABCD. In the diagram: All angles are measured in degrees. Angle ABC = 4y + 8 Angle BCD = 3y – 3 Angle CDA = 2y + 15 Angle DAB = 4y + 15'	Standard mark scheme but note the changes in the vertices and the change from x to y

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
8		Diagram enlarged. Labelling of the triangle changed – Now P at the top, Q same at bottom right, R now at bottom left. Wording added 'Look at the diagram for Question 8 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows a playground in the shape of a right-angled triangle labelled PQR.' Wording changed 'The real length of PQ is 40 m. (changed from QR) Work out the real length of RQ.' (changed from PQ)	Standard mark scheme but note the changes in the vertices
10		Diagram enlarged. Letter changed: x changed to y Wording added 'Look at the diagram for Question 10 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows two right-angled triangles labelled PQR and STU. In the diagram: All lengths are measured in centimetres. In triangle PQR: PR = 8 cm RQ = (7 – 2y) cm Angle RPQ is marked a In triangle STU: SU = (1 + y) cm UT = 4 cm Angle STU is marked b'	Standard mark scheme but note the change of letter from x to y

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
11		Wording changed 'Look at the frequency table for Question 11 in the separate Diagram Booklet. It gives information about the weights of **60** parcels.' Word 'below' added 'The frequency table below gives…' Frequency values in the table changed from 7, 21, 15, 11, 6 to 5, 25, 15, 10, 5.	B1 for 5, 30, 45, 55, 60
	(b)	Wording changed 'Look at the grid for Question 11 (b) in the separate Diagram Booklet. On the grid, draw a cumulative frequency graph for your table.' For Braille: sentence added 'A spare tactile diagram, bumpons and Wikki Stix are provided for this question.'	Standard mark scheme but points plotted at heights 5, 30, 45, 55, 60
	(c)		M1 for at least one correct quartile, eg (UQ =) 6 or (LQ =) value in the range 2.5 to 3 **or** ft their cf graph A1 for answer in the range 3.4 to 3.8
	(d)	Value changed: 7.4 kg changed to 7 kg	M1 for cf reading at weight = 7 in the range 47 to 53 **or** ft their cf graph A1 for answer in the range 7 to 13
13		Diagram enlarged. Wording added 'Look at the diagram for Question 13 in the separate Diagram Booklet. The diagram shows a coordinate grid.' For Braille: sentence added 'A spare tactile diagram, Wikki Stix, drawing film and sticky label R are available for this question.'	Standard mark scheme
14	(a)	Diagram enlarged. Wording added 'Look at the diagram for Question 14 (a) in the separate Diagram Booklet. The diagram is a graph.' For Braille: sentence added 'A spare tactile diagram, Wikki Stix are available for this question.'	Standard mark scheme
	(b)	For Braille: sentence added 'A spare tactile diagram, Wikki Stix are available for this question.'	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
15		Letter changed: a changed to p	Standard mark scheme but note the change of letter from a to p
16		Letter changed: x changed to y	Standard mark scheme but note the change of letter from x to y
17		Wording changed to 'Look at the diagrams for Question 17 in the separate Diagram Booklet. The diagrams are NOT accurately drawn. The diagrams show three similar solid cylinders made from the same material. The cylinders are labelled cylinder L, cylinder M and cylinder P. You may also be given three models.' For Braille: wording changed to 'Ask for the models for Question 17. The models are NOT accurately made. The models represent three similar solid cylinders made from the same material. The models are labelled Cylinder L, Cylinder M and Cylinder P. Cylinder L has a mass of 64 g. Cylinder M has a mass of 125 g. Cylinder M has a total surface area of 144 cm^2 Cylinder P has a total surface area of 16 cm^2'	Standard mark scheme
19		Diagram enlarged. Wording added 'Look at the diagram for Question 19 in the separate Diagram Booklet. The diagram is NOT accurate. The diagram shows a quadrilateral labelled OACB. In the diagram:'	Standard mark scheme
21		Diagram enlarged. Sentence added 'Look at the diagram for Question 21 in the separate Diagram Booklet.' For Braille: sentence added 'A spare tactile diagram, Wikki Stix and drawing film are available for this question.'	Standard mark scheme
22		Diagram enlarged. Sentence added 'Look at the diagram for Question 22 in the separate Diagram Booklet. The diagram is NOT accurately drawn. In the diagram:'	Standard mark scheme

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
21	Result shown	P1	for process to find the length of half a side or a side or the perimeter of the smaller hexagon *PQRSTU*, eg $r\sin 30 \left(=\frac{r}{2}\right)$ oe or $2r\sin 30 \ (=r)$ oe or $6 \times 2r\sin 30 \ (=6r)$ oe	May use Sine Rule or cos60 instead of sin30
		P1	for process to find the length of half a side or a side or the perimeter of the larger hexagon *ABCDEF* eg Length of half side = r tan 30 or $\frac{r}{\tan 60} \left(=\frac{\sqrt{3}r}{3}\right)$ oe or Length of side = $2r$ tan 30 or $\frac{2r}{\tan 60}$ or $\frac{r}{\sin 60}$ or $\frac{r}{\cos 30} \left(=\frac{2\sqrt{3}r}{3}\right)$ oe or Length of perimeter = $6 \times 2r$ tan 30 or $6 \times \frac{2r}{\tan 60}$ oe	May use Sine Rule Note this mark is not for just the sight of $\frac{\sqrt{3}r}{3}$ or $\frac{2\sqrt{3}r}{3}$ or $\frac{12\sqrt{3}r}{3}$ oe, they need to be associated with the correct length Perimeter $= 4\sqrt{3}r$ alone does not get this mark
		P1	(dep P2) for process of forming a correct inequality, eg using half lengths eg $\frac{r}{2} < \frac{2\pi r}{12} < r$ tan 30 oe or using lengths eg $r < \frac{2\pi r}{6} < 2r$ tan 30 oe or using perimeters eg $6 \times r < 2\pi r < 6 \times 2r$ tan 30 oe	
		C1	(dep P2) correct algebra leading to given result, $3 < \pi < 2\sqrt{3}$	

Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 3H

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.
Notes apply to both MLP papers and Braille papers unless otherwise stated.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
3		For MLP: wording added 'Look at the diagram for Question 3 in the separate Diagram Booklet. It shows a solid triangular prism. The diagram is NOT accurately drawn. You may also be given a model.' For Braille: wording added 'Ask for the model for Question 3. The model IS accurately made. The model is a solid triangular prism.'	
	(a)	Wording added 'Look at the diagram for Question 3 (a) in the separate Diagram Booklet. The diagram shows a square grid. Each square on the grid represents a 1 cm square.' Sentence changed to 'Her answer is shown on the grid.'	Standard mark scheme
	(b)	Diagram Booklet has four shapes labelled shape A, shape B, shape C and shape D. Wording added 'Look at the diagram for Question 3 (b) in the separate Diagram Booklet. The diagram shows shape A, shape B, shape C and shape D drawn on a square grid. Each square on the grid represents a 1 cm square.' Demand changed to 'Which shape A, B, C or D is the plan view of the solid prism?'	B2 for C (B1 for B or D)
6	(a)	Diagram enlarged. Wording added 'Look at the diagram for Question 6 (a) in the separate Diagram Booklet. The diagram shows an incomplete probability tree diagram.'	Standard mark scheme
7		For MLP: wording added 'Look at the diagram for Question 7 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows a paddling pool in the shape of a cylinder. You may also be given a model.' For Braille: sentence added 'Ask for the model for Question 7. The model is NOT accurately made. The model represents a paddling pool in the shape of a cylinder.'	Standard mark scheme

<table>
<tr><td>8</td><td></td><td>Wording added ‘Look at the diagram for Question 8 in the separate Diagram Booklet.
The diagram is a grid.’
Demand now ‘On the grid, draw and label the vector 2a + b when a = $\begin{pmatrix}3\\2\end{pmatrix}$ and b = $\begin{pmatrix}-1\\4\end{pmatrix}$,
For Braille: sentence added ‘A spare tactile diagram, Wikki Stix, drawing film, vector arrows and sticky labels are available for this question.’</td><td>Standard mark scheme</td></tr>
<tr><td>9</td><td></td><td>For MLP: diagram enlarged. Wording added ‘Look at the diagram for Question 9 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows a cube with sides 6 cm and a square-based pyramid with an 8 cm square base and perpendicular height h cm. You may also be given two models.’
For Braille: sentence added ‘Ask for the models for Question 9. The models are NOT accurately made. Model A is a cube with sides 6 cm. Model B is a square – based pyramid with an 8 cm square base and a perpendicular height h cm.</td><td>Standard mark scheme</td></tr>
<tr><td>11</td><td>(a)

(b)</td><td>Sentence changed to ‘She uses her results to work out the information in the table below.’
Values in the table changed: Interquartile range from 12 to 10, Range from 37 to 35
Wording added ‘On the grid provided for Question 11 (a) in the separate Diagram Booklet, draw a box plot to show the information in the table.’
For Braille: sentence added ‘A spare tactile diagram and drawing film are available for this question.’

Wording added ‘Look at the diagram for Question 11 (b) in the separate Diagram Booklet.
The diagram shows a box plot.’

Box plot data changed from 22, 33, 42, 48, 66 to 20, 30, 45, 50, 65</td><td>M1 for method to find UQ (45) or greatest value (60) from the table
M1 for showing a box and at least 3 correctly plotted values from 25, 35, 40, 45, 60
A1 for a fully correct box plot

Standard mark scheme but note change in values
<table><tr><td></td><td>Median</td><td>Range</td><td>IQR</td></tr><tr><td>Friday</td><td>40</td><td>35</td><td>10</td></tr><tr><td>Sunday</td><td>45</td><td>45</td><td>20</td></tr></table></td></tr>
<tr><td>12</td><td></td><td>Diagram enlarged. Triangle T with vertices at (–2, –4), (–2, –6), (–6, –4) added to grid.
Wording added ‘Look at the diagram for Question 12 in the separate Diagram Booklet.
The diagram shows triangle T and triangle S on a coordinate grid.’
Demand changed to ‘Describe fully the single transformation that maps triangle T onto triangle S.
You may be given a cut-out shape for this question.’</td><td>B2 for enlargement, scale factor –2, centre (0, 0)
(B1 for any 2 aspects)</td></tr>
</table>

15	(a) (c)	Letter changed: a changed to p Letter changed: x changed to y	Standard mark scheme but note the change of letter Standard mark scheme but note the change of letter
18		Diagram enlarged. Labels changed on the diagram (B changed to D and D changed to B) Wording added 'Look at the diagram for Question 18 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows a quadrilateral labelled ABCD.' 'In the diagram: AD = 17 cm Angle ABC = 57° Angle ACB = 48° Angle CAD = 35°' Demand amended 'The area of triangle ACD is 54 cm^2 Calculate the area of triangle ABC.'	Standard mark scheme but note the changes in the vertices
21		Diagram enlarged. Dashed line with label 'r cm' drawn from centre to midpoint of EF. Wording added 'Look at the diagram for Question 21 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows a circle, radius r cm and two regular hexagons.'	Standard mark scheme

Question	Answer	Mark	Mark scheme	Additional guidance
17	100	M1	for angle *BAC* = 40	
		M1	for angle *OAC* or angle *OCA* = 10 **or** angle *OAB* or angle *OBA*= 30	angle *AOB* = 120 gets M1M1
		M1	for angle *ACB* = (180 – 30 – 30) ÷ 2 (= 60) **or** angle *OCD* = 90 or angle *OCB* = 50	Award M3C0 for answer of 100 with no correct appropriate circle theorem
		C1	for angle *ACD* = 100 **and one** correct appropriate circle theorem from alternate segment theorem angle at the centre is twice the angle at the circumference the tangent to a circle is perpendicular to the radius	Underlined words need to be shown Reason needs to be linked to their method, which can be implied from correctly identified angles (stated or written on the diagram)

Question	Answer	Mark	Mark scheme	Additional guidance
18	Proof	M1	begins proof to show that triangles *ABO* and *CBO* or triangles *ABD* and *CBD* are congruent by giving one pair of equal sides or equal angles with reason	Where *D* is point such that *BOD* is diameter
		M1	for different pair of equal sides or angles with reason	
		C1	for full proof that triangles *ABO* and *CBO* are congruent, SSS, or triangles *ABD* and *CBD* are congruent, RHS, and therefore angle *ABO* = angle *CBO* *AB* = *CB* (given) *BO* (or *BD*) is common *AO* = *CO* radii of circle angle *BAD* = angle *BCD* angles in a semicircle are 90 (*BO* = *AO* = *CO* radii of circle) counts as two sides with reasons **OR**	
		M1	draws *OA*, *OC* and *AC* and labels angle *OAC* = *x* and angle *OCA* = *x* with reason given, *AO* = *CO* radii of circle and base angles of an isosceles triangle are equal **or** *BAC* = *BCA* since *ABC* is isosceles	
		M1	shows *OAC* = *OCA* **and** shows *BAC* = *BCA* **and** uses these to show *OAB* = *OCB* with all reasons given	
		C1	for full proof concluding with angle *ABO* = *y* **and** angle *CBO* = *y* with reason given, eg *OA* = *OB* = *OC* radii of circle and *OBC* and *OAC* are isosceles	

Paper: 1MA1/2H

11	304	P1 P1 A1	for start of process to find the arc length eg $34.3 - 2 \times 4.7$ (= 24.9) **or** for forming a suitable equation eg $\frac{\angle AOB}{360} \times \pi \times 2 \times 4.7 + 2 \times 4.7 = 34.3$ for process to isolate the arc length in an equation eg $\frac{\angle AOB}{360} \times \pi \times 2 \times 4.7 = "24.9"$ **or** for complete process to find AOB eg $\angle AOB = \frac{"24.9" \times 360}{\pi \times 2 \times 4.7}$ answer in the range 303 to 304	Condone omission of the addition of 2 radii in the equation for this mark only eg $\frac{\angle AOB}{360} \times \pi \times 2 \times 4.7 = 34.3$ If an answer is given in the range in working and then rounded incorrectly award full marks

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
20	57	M1 M1 A1 C1	for method to find angle *BCD* eg *BCD* = 180 – 80 (= 100) for method to find angle *DOB* eg *DOB* = 80 × 2 (= 160) for *OBC* = 57 (dep on M1) for one correct circle theorem appropriate to their method eg The angle at the centre of a circle is twice the angle at the circumference **or** The angle at the circumference of a circle is half the angle at the centre **or** Opposite angles of a cyclic quadrilateral add up to 180	Angles may be seen on diagram Method marks can be awarded in either order Correct method can be implied from angles on the diagram if no ambiguity or contradiction. eg Angle *O* = 160 is too ambiguous accept angle *C* = 100 Underlined words need to be shown; reasons need to be linked to their method. Accept "∠" for "angle" and "∠*s*" for "angles" Accept "4-sided shape" for "quadrilateral"

Paper: 1MA1/3H

GCSE

Mark Scheme

Mathematics A (1387)

June 2003

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NOTES ON MARKING PRINCIPLES

NOTES ON MARKING PRINCIPLES

1 Three types of mark are available

M marks - awarded for correct working seen or implied.
A marks - conditional accuracy marks which are awarded for accurate working following the award of M marks.
B marks - unconditional accuracy marks (independent of M).

2 Abbreviations

cao - correct answer only.
ft - follow through.
$\surd$ - Denotes a "follow through" answer.

SC - special case.
isw - ignore subsequent working.
oe - or equivalent (and appropriate).
NB: a candidate cannot benefit from both isw and ft.

3 If no working shown, then

correct answers normally score full marks
incorrect (even though nearly correct) answers score no marks.

4 Marking instructions

Misread loses A marks (and sometimes B marks) on that part but ft can be allowed on subsequent parts. M marks can still be earned. If in doubt contact your team leader.
If there is a wrong answer in the answer space DO CHECK the working in the body of the script.

- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.
- If there is a wrong answer in the answer space DO CHECK the working in the body of the script.
- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.

5 Style of marking

Answer correct: tick and write part mark in margin NEXT TO BRACKETED MARK.
Answer incorrect: cross, but show M, A or B marks if any earned in body of script and transfer the total of these to the margin next to the bracket mark.
Total for each double page at bottom right page (except for back if used), FINAL TOTAL IN RELEVANT BOX ON FRONT COVER.
Nought in margin for fully incorrect question or page AND FOR NO ATTEMPT.
Where no attempt has been made a line should be put in the answer space and zero in the margin next to the bracketed mark
CHOICE OF METHOD – No marks unless one answer is in answer space – then mark that.
CROSSED OUT WORK - if not replaced this should be marked (if legible).
There must always be a mark next to bracketed mark in the margin/

6 Follow Through Marks

Follow throughs are guided by two principles:

(a) Follow throughs which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous, do not award.
(b) Follow throughs which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

7 Probability

Probability answers must be given as fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least two decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

8 Linear Equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

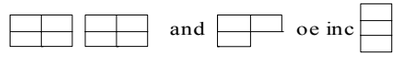
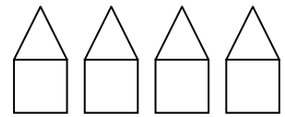
9 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

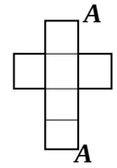
Paper 5501

No	Working	Answer	Mark	Notes
1 (a)		46	1	B1 cao
(b)		3.4	1	B1 oe
(c)		Arrow at 430	1	B1 allow ± half graduation
(d)		Arrow at 3.7	1	B1 allow ± half graduation Accept indications other than arrows as long as they are clear
2		1.60 2.05	2	B1) Condone B1) reversal
3 (a)	$\frac{18}{24}$ or $\frac{9}{12}$ or $\frac{6}{8}$	$\frac{3}{4}$	2	B2 for $\frac{3}{4}$ cao (B1 for $\frac{18}{24}$ or $\frac{9}{12}$ or $\frac{6}{8}$) SC B1 for $\frac{1}{4}$ only
(b)		16 squares shaded	1	B1 cao
4 (a)		line	1	B1 within overlay tolerance
(b)		midpoint	1	B1 within overlay tolerance ft from (a) ± 0.2cm
(c)		rectangle	1	B1 for rectangle 6 cm ± 0.2cm by 4 cm ± 0.2cm
5		kilograms, kg litre, *l* or cubic metres, m^3 inches, in	3	B1 B1 B1
6 (a)		parallel lines marked	1	B1
(b)		right angle marked	1	B1
(c)(i)		acute	1	B1
(ii)		reflex	1	B1

Paper 5501

No	Working	Answer	Mark	Notes
7 (i)		sphere	1	B1
(ii)		cylinder	1	B1 Accept circular prism
(iii)		pyramid	1	B1 Condone omission of "triangular" Accept tetrahedron
8 (a)(i)		40	2	B1 cao
(ii)		50		B1 cao
(b)		5 complete symbols	1	B1 cao
(c)		 and oe inc	1	B1
9 (i)		9, 37, 56, 59, 75	5	B1 cao
(ii)		0.067, 0.56, 0.6, 0.605, 0.65		B1 cao Ignore trailing zeros
(iii)		–10, –6, –4, 2, 5		B1 cao
(iv)		$\frac{2}{5}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$		B2 for all 4 correct (B1 for any 3 in correct order) SC B1 for all 4 in reverse order (applies to(iv) only)
10 (a)			1	B1
(b)		Plotting (4, 24)	1	B1 ft from their matchsticks
(c)		60	1	B1 cao
(d)		$m = 6n$	2	B2 for $m = 6n$ oe (B1 for $6n$ oe or m = multiple of n except $m = n$)
11 (i)		6, 12	4	B1 cao
(ii)		4, 16		B1 cao
(iii)		3, 4, 6 or 3, 4, 6, 12		B1 Condone omission of 12
(iv)		8, 27		B1 cao

Paper 5501

No	Working	Answer	Mark	Notes
12		2.43	4	B1 for 36 or 0.36 B1 for 96 or 0.96 B1 for 125 or 1.25 If none of first 3 B1s awarded then SC B1 for four 24s and five 25s seen OR 4 × 24 and 5 × 25 seen B1 for 2.43 cao
13 (a)(i)		Edinburgh and Plymouth	3	B1 for Edinburgh or −7 B1 for Plymouth or 5
(ii)		12		B1ft from (i) if one positive and one negative
(b)		Cardiff and Belfast London and Plymouth	2	B1 for Cardiff and Belfast OR −6 and −4 B1 for London and Plymouth OR 3 and 5
14		5 9 8	3	B1 cao B1 cao B1 cao
15 (a)			2	✓ / × / 2 / 0 / B2 1 / 0 / B1 1 / 1 / B1 2 / 1 / B1
(b)	$2 \times 2 \times 2$	8	2	M1 for $2 \times 2 \times 2$ A1 for 8 cao
16 (a)		30	1	B1 cao
(b)		3	1	B1 cao
(c)	$2 \times 29 = 58$ $5 \times 30 = 150$ $2 \times 31 = 62$ $1 \times 32 = 32$ $\frac{302}{10} = 30.2$	30.2	3	M1 for freq × no pins M1 (dep on 1st M1) for totalling and ÷ 10 A1 for 30.2 cao

Paper 5501

No	Working	Answer	Mark	Notes
17		7 5 5 13 33 52 23	3	B3 all correct (B2 for 4, 5 or 6 correct B1 for 2 or 3 correct)
18 (a)(i) (ii) (iii) (iv) (b)		$4c$ p^4 $8g$ $10pr$ OR $10rp$ $10y - 15$	4 1	B1 oe B1 cao B1 oe B1 B1 cao Accept $10y + - 15$
19		$\frac{2}{3}$	3	M1 for 3 rows (9 squares) shaded M1 for 2 columns (10 squares) shaded A1 for $\frac{2}{3}$
	$\frac{3}{5} = \frac{9}{15}$ $\frac{2}{3} = \frac{10}{15}$	$\frac{2}{3}$	3	M1 for $\frac{3}{5} = \frac{9}{15}$ M1 for $\frac{2}{3} = \frac{10}{15}$ A1 for $\frac{2}{3}$
	$\frac{3}{5} = 0.6$ $\frac{2}{3} = 0.66$ or 0.67 or better	$\frac{2}{3}$	3	M1 for $\frac{3}{5} = 0.6$) Accept M1 for $\frac{2}{3} = 0.66$ or 0.67 or better) percentages A1 for $\frac{2}{3}$

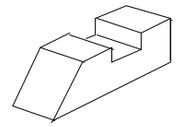
Paper 5501

No	Working	Answer	Mark	Notes
20 (a)	955 × 48 7640 38200 45840 OR 48 × 955 240 2400 43200 45840	458.40	3	M1 for complete correct method (condone one computational error) A2 for 458.40 cao (A1 for digits 4584 OR ft if M1 awarded)
(b)	14. 5 48 | 696. 0 48 216 192 24 0 24 0	14.50	3	M1 for 1 as first digit in answer and remainder 21 M1 (dep) 4 as second digit in answer A1 for 14.50 (Accept 14.5)
21 (a)		$12x$	1	B1 oe
(b)		$12x + 10y$	2	B2 oe ft from (a) (B1 $12x$ + multiple of y or $10y$ seen) SC B1 for $x = 12x + 10y$ OR $y = 12x + 10y$

Paper 5501

No	Working	Answer	Mark	Notes
22	$\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$ $1-\frac{7}{12}=\frac{5}{12}$	$\frac{5}{12}$	3	M1 for $\frac{4}{12}$ **and** $\frac{3}{12}$ oe A2 for $\frac{5}{12}$ oe (A1 for $\frac{7}{12}$) B1 for 1–"$\left(\frac{1}{3}+\frac{1}{4}\right)$" correctly evaluated
	$1-\frac{1}{3}=\frac{2}{3}$, $1-\frac{1}{4}=\frac{3}{4}$ $\frac{8}{12}-\frac{3}{12}=\frac{5}{12}$ or $\frac{9}{12}-\frac{4}{12}=\frac{5}{12}$	$\frac{5}{12}$	3	B1 for $\frac{2}{3}$ or $\frac{3}{4}$ seen M1 for $\frac{8}{12}-\frac{3}{12}=\frac{5}{12}$ or $\frac{9}{12}-\frac{4}{12}=\frac{5}{12}$ A1 for $\frac{5}{12}$ oe
		$\frac{5}{12}$	3	M1 for 0.25 and 0.33 or better A1 for 0.58 or better A1 for $0.41\dot{6}$ or recurring
23 (a) (b)(i) (ii)	 180 – (54 + 54)	54 72 Reason	1 3	B1 cao M1 for 180 – (54 + 54) A1 ft from (a) if $x < 90$ B1 for mentioning isosceles and equal or base angles or equal sides and equal or base angles

Paper 5501

No	Working	Answer	Mark	Notes
24 (a)		Bryani	2	M1 for 4×9 or $4 \times 3 \times 3$ or $4 \times x \times x$ or square x first or square 3 first A1 SC 4×3^2 with Bryani scores B2
(b)		64	1	B1 cao
25 (a)		 dotted line may be solid	3	B2 for rectangle base 3 squares and height 4 squares (B1 for rectangle with one correct dimension) B1 for horizontal line 1 cm from top) SC B2 for completely correct elevation on its side
(b)			2	B2 for perspective drawing showing slant face and cutout B1 for perspective drawing with either slant face cutout omitted
26 (a)	20×2 or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$	40	2	M1 for 20×2 or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$ A1 cao
(b)	$\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes	line from (45, 20) to (65, 0)	2	M1 for $\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes seen A1 for correct line SC If M0, B1 for line from (45, 20) to (t, 0) where $t > 45$ or B1 for a line of the correct gradient.

Paper 5502

No		Working	Answer	Mark	Notes
1	(a)		$\frac{7}{100}$	1	B1 cao accept 0.07
	(b)		0.18	1	B1 cao
	(c)	20 in 100 oe	40	2	M1 for sight of 20 in 100 or 20 × 2 A1 cao
2	(a)		6cm	2	B1 for 6 ± 0.2 or 60 ± 2 B1 indep for cm or mm consistent with 1st B1
	(b)		At centre	1	B1 within overlay
	(c)		Circle drawn	1	B1 all within overlay
3			See diagram	3	B3 all correct – see separate sheet (B2 for 3 correct B1 for 2 correct)
4	(a)		$\frac{1}{4}$ oe	1	B1 cao
	(b)		0.75	1	B1 cao
	(c)		75%	1	B1 cao
	(d)(i)		9	2	B1 accept answer in range 9 - 9.2
	(ii)		15 - 16		B1 accept answers in range15 - 16
5	(a)		9:30	1	B1 cao
	(b)		2hrs 45 min	2	B2 for 2hr 45 min or 2 $\frac{3}{4}$ hr or 165 minutes B1 2:45 or 2.45 or 165 or 45min + 1hr + 1hr oe
	(c)		17	1	B1 cao
6	(a)	96 × 4	3.84	2	M1 for 96 × 4 or digits 384 A1 cao
	(b)	3 × 96 + 40 = 328	(0).56	2	M1 for 3 × 96 + 40 or digits 328 or digits 56 A1 cao accept 56p

Paper 5502

No	Working	Answer	Mark	Notes
7 (a)		54 000	1	B1 cao accept 54 thousand
(b)		50 000	1	B1 (accept ten thousand or 10 000) oe
8 (a)		14	1	B1 cao
(b)		6	1	B1 cao
(c)		Correct reflection	2	B2 fully correct (B1 correct reflection in a line parallel to the mirror line or condoning 1 block error in shape or position of shape)
9 (a)		Missing horiz label 1 (and 6) missing on vertical scale	2	B1 B1
(b)		Correct graph	2	B1 for bar up to 4 for yellow B1 for bar up to 2 for green
(c)		Blue	1	B1 cao
(d)	3 + 5 + 4 + 2	14	1	B1 ft from (b)
(e)		$\frac{3}{14}$	1	B1 ft on '14'
10	Barry (8) because you double Kath (7) because you add, 1,2,3		2	B1 oe B1 oe SC: B1 for correct rules only
11 (a)		$2n$	1	B1 for $2n$ or $n + n$ OR $2 \times n$ OR $n \times 2$ OR $n2$
(b)		$2n + 15$	1	B1 for "$2n$" + 15 oe
(c)		20q	1	B1 cao
12 (a)	1 + 3 + 5 + 8 + 5	22	2	M1 add frequencies A1 cao
(b)		No, is>no of cups of coffee in the table	1	B1 'average cannot be bigger than 6' oe OR 'Average must be less than 6 oe'
13 (a)		Trapezium	1	B1 cao ignore spelling
(b)		(2, 3)	1	B1 cao
(c)		Isosceles	1	B1 cao ignore spelling
(d)		Q correct	1	B1 cao

Paper 5502

No	Working	Answer	Mark	Notes
14 (a)		250 000	1	B1 cao
(b)	$\frac{28}{4}$	7	2	M1 for $\frac{28}{4}$ oe or "250000" × 28 A1 cao **SC** B1 for 7 000 000
15 (a)		10	1	B1 cao
(b)		5.5	1	B1 ±0.3 pounds
(c)	$\frac{110}{22}$	50	3	M1 for use of graph at 11 or $\frac{110}{22}$ A1 for 5 A1 cao **SC** B2 for 49.5 – 50.6

Paper 5502

No	Working	Answer	Mark	Notes
16 (a)	$269.30 - 56.80 = 212.50$ $\frac{212.50}{42.50}$	6	2	M1 for $\frac{269.30 - 56.80}{42.50}$ or 5 seen A1 cao
(b)	5% of £269.30 £269.30 – "£13.465" OR $\frac{95}{100} \times 269.30$	255.83 or 255.84	3	M1 for $(5 \div 100) \times 269.30$ M1 for $269.30 - $ "13.465" A1 cao OR M2 for $\frac{95}{100} \times 269.30$ A1 cao **Alternative Method:** M1 for $\frac{5}{100} \times 56.80$ $(= 2.84)$ and $\frac{5}{100} \times 42.50$ (=2.12(5)) (OR 53.96 AND 40.38 (40.375) seen M1 for $56.80 -$ "2.84" (= 53.96) $42.50 -$ "2.12(5)" (= 40.375 or 40.38) "5" × "40.375" + "53.96" A1 cao
17	$4.1^2 \times 1.07 = 16.81 \times 1.07$	17.9867	2	M1 for ("4.1") followed by squaring, or sight of 16.81 A1 cao SC: *B1 for 18 or better with no working*
18 (a)		60	1	B1 cao
(b)	$360 - 60 - 90 - 90$	120	2	M1 for $360 -$ " 60 " $- 90 - 90$ or $180 -$ "60" A1 cao
(c)	6×2	12	2	M1 for 6×2 A1 cao for 12

Paper 5502

No	Working	Answer	Mark	Notes
19 (a)(i)	$240 \times 5 = 1200$	1250	3	B1 cao 1250
(ii)	$\frac{50}{'1250'}$	$\frac{1}{25}$		M1 cao $\frac{50}{'1250'}$ A1 for $\frac{1}{25}$ in its simplest form
(b)	$\frac{60}{100} \times 1000 = 600$	12:5	3	M1 for $\frac{60}{100} \times 1000$ oe A1 for 600 A1 cao
20 (a)		$x + 2$	1	B1 accept $2 + x$ but not $x = x + 2$
(b)	$x + 5 + x + 5 + x + 2 + x + 2$	$4x + 14$	2	M1 adding 4 sides, two of which are '$x + 2$' (all sides to be linear expressions in x) **SC** $x + 5 + x + 2 \times 2$ gets M1 A1 for correct simplified answer or $(20 - 14) \div 4$ oe gets M1
(c)	'$4x + 14$' = 20	1.5 oe	2	M1 for equation A1 cao
21	$\sum f = 90$	Angles drawn, labelled	3	M1 for 1 person = 4°or one angle correct in table or pie chart A1 any 2 correctly drawn angles in pie chart A1 fully correct chart labelled
22 (a)		$2p - q$	2	B1 cao for $2p$ B1 cao for $-q$ accept $(-q + 2p)$, $2p - 1q$ and $2p + -q$
(b)	$5x = 3 + 4$	1.4	2	M1 for either (+3 or sight of 7) or (÷ 5 or sight of 0.8 and 0.6) A1 cao accept $\frac{7}{5}$ or $1\frac{2}{5}$

Paper 5502

No	Working	Answer	Mark	Notes
23 (a)		$\frac{4\times5}{2}$	1	B1 cao
(b)	$1+2+3+4+5+6+7+8$	$\frac{8\times9}{2}$	1	B1 cao
(c)	$\frac{100\times101}{2}$	5050	1	B1 cao
24	0 | 5 7 8 8 1 | 0 0 0 0 2 5 5 5 6 2 | 0 0 0 4 5 3 | 3 5 Key 1 | 2 = 12 (min)	See working	3	B1 for stem 0, 1, 2, 3 or 0, 10, 20, 30 B1 for accurate unordered leaves condone 1 error or omission B1 for key and ordered leaves all correct
25	$3.2\times2.8=8.96$ $2\times4.5\times2.8=25.2$ $2\times4.5\times28.8=28.8$ $\frac{62.96}{2.5}\times2.99$	£75.30	5	M1 for area of any face found correctly M1 for 2 areas found correctly A1 for 62.96 or 54 M1 for $\frac{'62.96'}{2.5}\times2.99$ Al cao Alternate method for candidates who round up $\frac{"62.92"}{2.5}$ M1 for "26" × 2.99 A1 for £77.74 cao **SC**: *for top included B2 for 71.92 m^2 seen or* B3 for £86.02 seen **SC** B4 for £64.58 or £65.78 seen
26	$2.5\times10\,000$	25 000	2	M1 for $2.5\times100\times100$ A1 cao

Paper 5503

No	Working	Answer	Mark	Notes
1 (a)(i)		$8g$	2	B1 oe
(ii)		$10rp$		B1 for $10pr$ or $10\ rp$
(b)		$10y - 15$	1	B1 cao accept $10y$ - + 15
(c)	$6x + 8 - 12x + 15$	$-6x + 23$	2	M1 for 3 correct terms out of 4 A1 cao
2		$m = 6n$	2	B2 for $m = 6n$ oe accept $6 \times n$, n 6 (B1 for $6n$ alone, or $6n$ +1 oe OR m = multiple of n except $m = n$)
3 (i)		0.067, 0.56, 0.6, 0.605, 0.65	1	B1 cao Ignore trailing zeros
(ii)		−10, −6, −4, 2, 5	1	B1 cao
(iii)		$\frac{2}{5}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$	2	B2 all four correct (B1 any three in correct order) SC: B1 all 4 in reverse order
4		7 5 5 13 33 52 23	3	B3 all correct (B2 for 4, 5 or 6 correct entries) (B1 for 2, 3 correct entries)

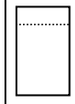
Paper 5503

No	Working	Answer	Mark	Notes
5		$\frac{2}{3}$	3	M1 for 3 rows (9 squares) shaded M1 for 2 columns (10 squares) shaded A1
	OR $\frac{3}{5} = \frac{9}{15}$ $\frac{2}{3} = \frac{10}{15}$ Therefore $\frac{2}{3} > \frac{3}{5}$	$\frac{2}{3}$		M1 for $\frac{3}{5} = \frac{9}{15}$ M1 for $\frac{2}{3} = \frac{10}{15}$ A1
	OR $\frac{3}{5} = 0.6$ or percent $\frac{2}{3} = 0.66$ or 0.67 or better Therefore $\frac{2}{3} > \frac{3}{5}$	$\frac{2}{3}$		M1 for $\frac{3}{5} = 0.6$ or percent M1 for $\frac{2}{3} = 0.66$ or 0.67 or better A1
6	$2 \times 29 = 58$ $5 \times 30 = 150$ $2 \times 31 = 62$ $1 \times 32 = 32$ $\frac{302}{10} = 30.2$	30.2	3	M1 for freq × no. pins (at least 3) M1 for totalling and for ÷ 10 (dep on 1st M1) A1 cao
7 (a)			2	B1 for 180° rotation (wrong centre) B1 cao
(b)			3	B1 for any enlargement sf other than 1 B1 for all sides halved B1 for position

Paper 5503

No	Working	Answer	Mark	Notes
8 (a)		$12x$	1	B1 oe
(b)		$12x + 10y$	2	B2 oe or ft from (a) (B1 for $12x$ + a multiple of y or $10y$ seen) **SC** B1 for $x = 12x + 10y$ or $y = 12x + 10y$
9	$\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$ $1-\frac{7}{12}=\frac{5}{12}$ OR $1-\frac{1}{3}=\frac{2}{3}, 1-\frac{1}{4}=\frac{3}{4}$ $\frac{9}{12}-\frac{4}{12}=\frac{5}{12}, \frac{8}{12}-\frac{3}{12}=\frac{5}{12}$	$\frac{5}{12}$	3	M1 for $\frac{4}{12}$ and $\frac{3}{12}$ oe A2 for $\frac{5}{12}$ oe (A1 for getting $\frac{7}{12}$) (B1 for $1 - \frac{"1"}{3} + \frac{1"}{4}$ correctly evaluated) OR B1 for $\frac{2}{3}$ or $\frac{3}{4}$ seen M1 for $\frac{3}{4}-\frac{1}{3}=\frac{9}{12}-\frac{4}{12}$ or $\frac{2}{3}-\frac{1}{4}=\frac{8}{12}-\frac{3}{12}$ A1 for $\frac{5}{12}$ oe OR M1 0.25 and 0.33 or better A1 for 0.58 or better A1 for 0.416 *recurring*
10 (a)		54	1	B1 cao
(b)(i)	180 – (54 +54)	72	3	M1 for 180 – (“54” + “54”) A1 for 72° ft from (a) if $x < 90°$
(ii)				B1 for mentioning isosceles and equal or base angles or equal sides and equal or base angles

Paper 5503

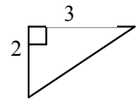
No	Working	Answer	Mark	Notes
11 (a)	Bryani was correct $4 \times 3^2 = 4 \times 9 = 36$	Bryani	2	M1 for 4×9 or $4 \times 3 \times 3$ or "square the three/x then multiply by four" A1 Bryani **SC** 4×3^2 with Bryani gets B2
(b)			1	B1 cao
12 (a)			3	B2 for rectangle height 4 squares, base 3 squares (B1 for rectangle with one correct dimension) B1for line 1 square from the top **SC** B2 for completely correct elevation on its side
(b)			2	B2 for perspective drawing showing slant face and cut out (B1 for perspective drawing with either slant face or cut out omitted or one aspect incorrect)
13 (a)	20×2 or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$	40	2	M1 for 20×2 or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$ A1 cao
(b)	$\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes seen	Line from (45, 20) to (65, 0)	2	M1 for $\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes seen A1 for correct line **SC** If M0, B1 for line from (45, 20) to (t, 0) where $t > 45$ or a line of the correct gradient
14 (i)		119.31	3	B1 cao
(ii)		119 310		B1 cao
(iii)		1.23		B1 cao

Paper 5503

No	Working	Answer	Mark	Notes
15	$\frac{10}{100}\times 12000$ 12 000 – 1200 = 10 800 $\frac{10800}{10}=1080$ 10 800 – 1080 = £9720	£9720	3	M1 for $\frac{10}{100}\times 12000$ or sight of 1200 or 2400 or 10 800 or 9600 M1 (dep) for $\frac{10}{100}\times(12\,000-\frac{10}{100}\times 12000)$ or sight of 1080 A1 cao Alternative mark scheme M2 for $12000\times(1-\frac{10}{100})^2$ (M1 for $12000\times(1-\frac{10}{100})$ A1 cao
16 (a)	$2p = 6$	$p = 3$	2	M1 for $7p – 5p = 8 – 2$ or $2p$ or 6 A1 cao
(b)	$7r – 5r = – 20 –2$	–11	2	M1 for $7r + 2 = 5r – 20$ or $\frac{7r}{5}+\frac{2}{5}=r-4$ or $7r – 5r = 20 – 2$ or $\frac{7r}{5}-r=-4-\frac{2}{5}$ A1 cao
17		$5n + 1$	2	B2 oe (B1 for $5n$ seen) NB: n = gets B1 max

Paper 5503

No	Working	Answer	Mark	Notes
18 (a)	–1, 0, 1		2	B2 for –1, 0, 1 (B1 for –1, 0 or 0,1 or –1,1 or –2, -1, 0, 1 only)
(b)	(–1, –1), (0, –1), (1, –1), (0, 0), (1, 0), (1, 1)		3	B3 for 6 points correct B2 for 3 points correct B1 for 1 point correct **NB** –B1 each additional point over six
19 (a)	Triangle with vertices at (0,0) (0,–2) and (3,0)		2	M1 for correct orientation A1 cao
(b)	Rotation, 180°, centre (0,1) Enlargement sf - 1 centre (0,1)		2	B2 for 180° 'rotation' centre (0, 1) B2 for Enlargement sf - 1 centre (0,1) (B1 for any two of the three parts) NB: B0 if additional transformation is included
20	Bisector of $\angle BAC$ Arc around A Region		3	B3 cao (B2 for either two correct boundaries, no shading/ wrong shading or one correct boundary, one incorrect boundary with valid shading) (B1 for either two incorrect boundaries but one drawn from A and one intersection, with valid shading or one correct boundary) Ignore shading outside the triangle
21		Length Volume Area	3	B1 for Length B1 for Volume B1 for Area
22 (a)	Unbiased question with choices		2	B1 for unbiased question B1 for at least 2 choices
(b)			2	Classification 1: A biased question Classification 2: A restricted sample of people Classification 3: Not specifying a range of foods Classification 4: Nothing to do with eating habits B2 reasons which satisfy 2 different classifications (B1 a reason which satisfies one classification)



Paper 5503

No	Working	Answer	Mark	Notes
23 (a)	$6 \times 10^2 \times 8 \times 10^4$ 48×10^6	4.8×10^7	3	M1 for $6 \times 10^a \times 8 \times 10^b$ oe, a and b integers including 0 A1 for 48×10^6 oe A1 cao
(b)	200 000 + 30 000	230000	2	B2 cao (B1 for sight of 200 000 or 30 000 or 2.3×10^5 or 23×10^4)
24 (i)		64	4	B1 cao
(ii)		3		B1 cao
(iii)	$\sqrt{16 \times 9} = \sqrt{144}$	12		B2 cao (B1 for sight of $\sqrt{2^4} \times \sqrt{9}$ or better, or 144 seen)
25 (i)	Tangent 90° to diameter /radius/ line from (through) centre	27°	4	B1 for 27° cao B1 for reason
(ii)	180 –(90+ "27") angle in semicircle (is 90°)/Alternate segments /angle at centre twice at circumference	63°		B1 ft for 90–"27" if not 63° B1 for reason
26 (a)(i)		152	2	B1 cao
(ii)		177		B1 cao
(b)			3	B1 for median marked at 167 B1 ft for postion of box with its ends at "152" and "177" B1 for position of whiskers with ends at 132 and 182 NB: For any points plotted between 141 and 149 give a tolerance of an extra ± 1 square
27	$x^2 + xy + xy + y^2$	$x^2 + 2xy + y^2$	2	M1 for at least 3 of the 4 terms correct A1 cao
		25	2	M1 for recognising 3.47 + 1.53 (= 5) A1 cao

Paper 5504

No	Working	Answer	Mark	Notes
1 (a)	$4.1^2 \times 1.07 = 16.81 \times 1.07$	17.9867	2	M1 for (4.1) followed by squaring, or sight of 16.81 A1 cao SC: B1 for 18 or better with no working
(b)		$(1.6 + 3.8 \times 2.4) \times 4.2$	1	B1 cao Allow additional brackets if they give an expression with value 45.024
2 (a)	269.30 – 56.80 = 212.50	6	2	M1 for $\frac{269.30 - 56.80}{42.50}$ or 5 seen A1 cao
(b)	5% of £269.30 £269.30 – "£13.465" OR $\frac{95}{100} \times 269.30$	255.83 or 255.84	3	M1 for (5 ÷ 100) × 269.30 M1 (dep) for 269.30 – "13.465" A1 cao OR M2 for $\frac{95}{100} \times 269.30$ A1 cao **Alternative Method:** M1 for $\frac{5}{100} \times 56.80$ (= 2.84) and $\frac{5}{100} \times 42.50$ (=2.12(5)) (OR 53.96 AND 40.38 (40.375) seen M1 for 56.80 – "2.84" (= 53.96) 42.50 – "2.12(5)" (= 40.375 or 40.38) "5" × "40.375" + "53.96" A1 cao

Paper 5504

No	Working	Answer	Mark	Notes
3 (a)		60	1	B1 cao
(b)	360 – 60 – 90 – 90	120	2	M1 for 360 – "60" – 90 – 90 or 180 – "60" A1 cao
(c)	6 × 2	12	2	M1 for 6 × 2 A1 cao 12
(d)		Correct drawing	2	B2 for triangle and construction lines (see overlay) (B1 for 1 line of length 4cm and correct arcs crossing OR for correct triangle with either no arcs or incorrect arcs) SC: B1 similar triangle drawn with construction lines
4 a(i)	240 × 5 = 1200	1250	3	B1 cao 1250
(ii)	$\frac{50}{1250}$	$\frac{1}{25}$		M1 $\frac{50}{"1250"}$ A1 oe in its simplest form
(b)	$\frac{60}{100} \times 1000 = 600$ 600: 250	12:5	3	M1 for $\frac{60}{100} \times 1000$ oe A1 for 600 A1 cao
5 (a)		$x + 2$	1	B1
(b)	$x + 5 + x + 5 + x + 2 + x + 2$	$4x + 14$	2	M1 adding 4 sides, two of which must be '$x + 2$' (all sides to be linear expressions in x) A1 for correct simplified answer
(c)	"$4x + 14$" = 20	1.5	2	M1 for equation "$4x + 14$" = 20 OR $\frac{20-14}{4}$ oe A1 cao

Paper 5504

No	Working	Answer	Mark	Notes
6 (a)		$2p - q$	2	B1 cao for $2p$ B1 cao for $-q$ accept $-q + 2p$ and $2p - 1q$
(b)	$5x = 3 + 4$	1.4	2	M1 for either (+3 or sight of 7) or (÷ 5 or sight of 0.8 and 0.6) A1 cao accept $\frac{7}{5}$ or $1\frac{2}{5}$
7 (a)		$\frac{4\times5}{2}$	1	B1 cao
(b)	$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8$	$\frac{8\times9}{2}$	1	B1 cao
(c)	$\frac{100\times101}{2}$	5050	1	B1 cao
(d)		$\frac{n(n+1)}{2}$	2	B2 cao (B1 for any quadratic in n)
8	$3.2 \times 2.8 = 8.96$ $2 \times 4.5 \times 2.8 = 25.2$ $2 \times 4.5 \times 3.2 = 28.8$ $\frac{62.96}{2.5} \times 2.99$	75.30	5	M1 for area of any face found correctly M1 for 2 areas seen A1 for 62.96 or 54 M1 for $\frac{'62.96'}{2.5} \times 2.99$ A1 cao Alternate method for candidates who round up $\frac{"62.96"}{2.5}$ M1 for "26" x 2.99 A1 for £77.74 cao SC: for top included B2 for 71.92 m^2 seen or B3 for £86.02 or £86.71 SC: B4 for £64.58 or £65.78 seen

Paper 5504

No	Working	Answer	Mark	Notes
9	2.5×10000	25000	2	M1 for 2.5×10000 or $2.5 \times 100 \times 100$ A1 cao
10 (a)	$\sum f = 90$ (88), 144, 32, 96	Angles drawn, labelled	3	M1 for 1 person = 4° or one angle correct in table or pie chart A1 any 2 angles correctly drawn in pie chart A1 fully correct chart labelled
(b)	$0.38 + 0.27 + 0.15$	0.20	2	M1 1 – sum A1 cao
11	0 | 5 7 8 8 1 | 0 0 0 0 2 5 5 5 6 2 | 0 0 0 4 5 3 | 3 5 Key 1 | 3 = 13 (min)	See working column	3	B1 for stem 0, 1, 2, 3 or 0, 10, 20, 30 B1 for accurate unordered leaves condone 1 error or omission B1 for key and ordered leaves all correct
12 (a)	$V = \pi \times 4^2 \times 10$	502 – 503	2	M1 for $\pi \times 4^2 \times 10$ A1 502 – 503
(b)	$P^2 = 10^2 + 8^2$ $P = \sqrt{164}$	$\sqrt{164} < 13$	3	M1 for sight of a correct right-angled triangle M1 for $10^2 + 8^2$ A1 for conclusion based on a correct calculation or 12.8 seen
13 (a)	2×30	$2 \times 2 \times 3 \times 5$	4	M1 for systematic method, eg division, factor trees (at least one prime) A1 cao
	2×48	$2^5 \times 3$		M1 for systematic method, eg division, factor trees (at least one prime) A1 cao
(b)		12	1	B1 cao
(c)	$2^5 \times 3 \times 5$	480	2	B2 cao B1 for $2^5 \times 3 \times 5$ or any correct common multiple

Paper 5504

No	Working	Answer	Mark	Notes
14 (a)		$150 < C \leq 200$	2	M1 use of cum freq to find the cost of the 20th or 20.5^{th} car OR $\frac{1}{2}\Sigma f$ or $\frac{1}{2}(\Sigma f + 1)$ A1 eg 150 to 200
(b)		No, because the 21st value is in the same interval	1	B1 20.5^{th} or 21st in same interval or an alternative correct explanation
(c)	80% = 5200 $\frac{5200}{80} \times 100$	6500	3	M1 for (100 – 20) % = 5200 M1 for $\frac{5200}{"80"} \times 100$ A1 cao
15 (a)	$x^2(x + 1) = 230$	AG	2	M1 for $x \times x \times (x+1)$ or $x \times x \times x + 1$ oe A1 cao from $x \times x \times (x+1)$
(b)	‘5 – 150 5.1 – 158.7 5.2 – 167.6 5.3 – 177.0 5.4 – 186.6 5.5 – 196.6 5.6 – 207.0 5.7 – 217.7 5.8 – 228.8 5.9 –240.2 5.85 – 234.4	5.8	4	B 2 for trial between 5.8 and 5.9 inclusive (B1 for different trial between 5 and 6 inclusive) B1 for different trial between 5.8 and 5.85 (not including 5.8) B1 (dep on at least one previous B1) cao for 5.8, 5.81, 5.811

Paper 5504

No	Working	Answer	Mark	Notes
16	$\pi \times \left(\frac{15}{2}\right)^2 = 176.715$	88.4cm^2	3	M1 for $\pi \times \left(\frac{15}{2}\right)^2$ A1 88.3 – 88.4 B1(ind) for cm²
17 (a)	$5 = 0.5x + 1$	8	2	M1 for $5 = 0.5x + 1$ A1 cao
(b)		$y = \frac{1}{2}x + c$	1	B1 $y = \frac{1}{2}x + c$, c ≠ 1, oe
(c)		$x = 2y - 2$ OR $x = 2(y - 1)$	2	M1 for correctly multiplying both sides by 2 or correctly isolating $\frac{x}{2}$ A1 for $x = 2(y - 1)$, $x = \frac{y-1}{0.5}$, $x = \frac{y-1}{\frac{1}{2}}$ oe SC: B1 for $x = 2y - 1$
18	$4x - 6y = 22$ $15x + 6y = 54$ $19x = 76$	$x = 4,\ y = -1$	4	M1 for coefficients of x or y the same followed by correct operation , one arithmetical error A1 cao M1(dep on previous M mark) for sub for other variable A1 cao Trial and improvement –0 unless both x and y correct values found

Paper 5504

No	Working	Answer	Mark	Notes
19 (a)	$SF = \frac{10}{6}$ $\frac{10}{6} \times 4.8 = 8$	8	2	M1 for sight of $\frac{10}{6}$ or $\frac{6}{10}$ or 1.67 or better or $\frac{CD}{10} = \frac{4.8}{6}$ A1 cao
(b)	$\frac{10}{6} \times 4.5 - 4.5 = 3$	19.8	2	M1 for use of SF from (a) to find *BC* or *AC* and adding 4 sides A1 cao
20	$\frac{6 \times 10^{15}}{3.2 \times 10^{8}}$ 1.875×10^{7}	4.3×10^{3}	3	B3 for 4.3×10^{3} to 4.34×10^{3} (B2 for 1.875×10^{7} oe or 4300 to 4340 or final answer of 1.9×10^{7}) (B1 for sight of 6×10^{15} oe or 3.2×10^{8} oe)
21	$8.5 \times \tan 38 = 8.5 \times 0.7813$	6.64	3	M1 for correct use of trig, eg $\tan 38 = \frac{opp}{8.5}$ M1 for 8.5 × tan38 A1 6.64 – 6.641

Paper 5504

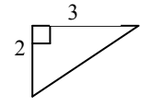
No	Working	Answer	Mark	Notes
22 (a)		No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice	1	B1 for a consistent answer
(b)	$\frac{1}{6}, \frac{5}{6}$ + labels		3	B1 for $\frac{5}{6}$ on the red dice, *not six* branch B1 for a fully complete tree diagram with all branches labelled B1 for $\frac{1}{6}$, $\frac{5}{6}$ on all remaining branches as appropriate

Paper 5505

No	Working	Answer	Mark	Notes
1 (i) (ii) (iii)		119.31 119310 1.23	3	B1 cao B1 cao B1 cao
2	$\frac{10}{100}\times 12000 = 1200$ 12 000 – 1200 = 10 800 10 800 ÷ 10 =1080 10 800 – 1080 = £9720	9720	3	M1 for $\frac{10}{100}\times 12\,000$ or sight of 1200 or 2400 or 10 800 or 9600 M1 (dep) for $\frac{10}{100}\times(12\,000 - \frac{10}{100}\times 12\,000)$ or sight of 1080 A1 cao Alternative markscheme M2 for $12000\times\left(1-\frac{10}{100}\right)^2$ (M1 for $12000\times\left(1-\frac{10}{100}\right)$) A1 cao
3	$7r - 5r = -20 - 2$	–11	2	M1 for $7r + 2 = 5r - 20$ or $\frac{7r}{5} + \frac{2}{5} = r - 4$ or $7r - 5r = -20 - 2$ or $\frac{7r}{5} - r = -4 - \frac{2}{5}$ A1 cao

Paper 5505

No	Working	Answer	Mark	Notes
4 (a)		–1, 0, 1	2	B2 for –1, 0, 1 only (B1 for –1, 0 or 0,1 or –1, 1 or –2, -1, 0, 1 only)
(b)		(–1,–1)(0,–1) (1,–1) (0, 0) (1, 0) (1, 1)	3	B3 for 6 points correct (B2 for 3 points correct) (B1 for 1 point correct) *NB: –B1 for each additional point over six*
5		$5n + 1$	2	B2 oe (B1 for $5n$ seen) NB: n = gets B1 max
6 (a)	Triangle with vertices at (0,0) (0,–2) and (3,0)		2	M1 for correct orientation A1 cao
(b)	Rotation, 180°, centre (0,1) Enlargement sf –1 centre (0,1)		2	B2 for 180° 'rotation' centre (0, 1) or for Enlargement sf - 1 centre (0,1) (B1 for any two of the three parts) NB: B0 if additional transformation is included
7	Bisector of $\angle BAC$ Arc around A Region	See overlay	3	B3 cao (B2 for either two correct boundaries, no shading/ wrong shading or one correct boundary, one incorrect boundary with valid shading) (B1 for either two incorrect boundaries but one drawn from A and one intersection, with valid shading or one correct boundary) Ignore shading outside the triangle
8		Length Volume Area	3	B1 for Length B1 for Volume B1 for Area



Paper 5505

No		Working	Answer	Mark	Notes
9	(a)	Unbiased question with choices		2	B1 for unbiased question B1 for at least 2 choices
	(b)	Leading question and a restricted sample		2	Classification 1: A biased question Classification 2: A restricted sample of people Classification 3: Not specifying a range of foods Classification 4: Nothing to do with eating habits B2 reasons which satisfy 2 different classifications (B1 a reason which satisfies one classification)
10	(a)	$6 \times 10^2 \times 8 \times 10^4$ $48 \times 10^6 = 4.8 \times 10^7$	4.8×10^7	3	M1 for $6 \times 10^a \times 8 \times 10^b$ oe, a and b integers including 0 A1 for 48×10^6 oe A1 cao
	(b)	200 000 + 30 000 = 230 000	230 000	2	B2 cao (B1 for sight of 200 000 or 30 000 or 2.3×10^5 or 23×10^4)
11	(a)	$x^2 + xy + xy + y^2$	$x^2 + 2xy + y^2$	2	M1 for at least 3 of the 4 terms correct A1 cao
	(b)		25	2	M1 for recognising 3.47 + 1.53 (= 5) A1 cao
12	(i)	Tangent 90° to diameter /radius/ line from (through) centre	27°	4	B1 for 27° cao B1 for reason
	(ii)	180 –(90+ "27") angle in semicircle (is 90°)/Alternate segments /angle at centre twice at circumference	63°		B1 ft for 90–"27" if not 63° B1 for reason
13	(i)		p^9	1	B1 cao
	(ii)		$6q^6$	2	B2 for $6q^6$ (B1 for sight of $\frac{6q^9}{q^3}$ or $3q \times 2q^5$ or $3q^4 \times 2q^2$ or $6 \times q \times q \times q \times q \times q \times q$ or final answer of the form kq^6, $k > 0$)

Paper 5505

No	Working	Answer	Mark	Notes
14 (a)(i)		152	2	B1 cao
(ii)		177		B1 cao
(b)			3	B1 for median marked at 167 B1 ft for postion of box with its ends at "152" and "177" B1 for position of whiskers with ends at 132 and 182 NB: For any points plotted between 141 and 149 give a tolerance of an extra ± 1 square
15	(arc =) $\frac{40}{360} \times 2\pi \times 9$ $= 2\pi$	$2\pi + 18$	4	M1 for $\frac{40}{360} \times$ M1 for $2\pi \times 9$ M1 (dep) for $\frac{40}{360} \times 2\pi \times 9$ oe A1 for $\frac{18 \times \pi}{9} + 18$ oe exact form
16 (i)		1	1	B1 cao
(ii)		$\frac{1}{16}$	1	B1 cao accept 0.0625
(iii)		64	1	B1 cao condone ± 64

Paper 5505

No	Working	Answer	Mark	Notes
17 (a)	$F \propto 1/x^2$ $F = k/x^2$ $4 = k / 3^2$ $F = 36/x^2$	$F = \frac{36}{x^2}$	3	M1 for $F = k/x^2$ seen or implied. ($k \neq 1$) M1 (dep) for subst. or sight of $k = 36$ A1 for $F = 36/x^2$
(b)		9	1	B1 ft for 9 (ft on $F = kx^n$, $n \neq 0$)
(c)	$64 = \frac{36}{x^2}$ $x^2 = \frac{36}{64}$ $x = \pm\frac{3}{4}$	$\frac{6}{8}$	2	M1 for $x^2 = \frac{"36"}{64}$ A1 for $\frac{6}{8}$ oe (condone $\pm$) *SC: Use of $F = kx^2$ max M1 M1 A0 B1 ft M0 A0* *SC: Use of* $F = \frac{k}{\sqrt{x}}$ *max M1 M1 A0 B0 M1* ($\sqrt{x} = \frac{4\sqrt{3}}{64}$) *A0*
18	$(5+\sqrt{3})(5-\sqrt{3}) = 5\times5 - 5\sqrt{3} + 5\sqrt{3} - \sqrt{3}\sqrt{3}$ $= 5\times5 - 3$ $\frac{22}{\sqrt{22}} = \frac{22\sqrt{22}}{22}$	$\sqrt{22}$	3	B1 for correct expansion 25 - $5\sqrt{3}$ + $5\sqrt{3}$ - $\sqrt{3}$ $\sqrt{3}$ with 1st three terms reducing to 25 **without** any errors seen B1 (indep) for $\sqrt{3}$ $\sqrt{3}$ = 3 B1 for $\sqrt{22}$ coming from $\frac{22}{\sqrt{22}}$ (S.C $\frac{(5+\sqrt{3})(5-\sqrt{3})\sqrt{22}}{22}$ gets B1)

Paper 5505

No	Working	Answer	Mark	Notes
19 (a)		60 40	2	B1 cao B1 cao
(b)		correct bars	2	B1 for $30 < x \leq 40$ with an area of 2½ squares B1 for $40 < x \leq 70$ with an area of 3 squares *SC:* $\frac{0}{4}$ *give M1 if clearly using area or frequency density*
20 (a)	$6x + 8 - 12x + 15$	$-6x + 23$	2	M1 for 3 of the 4 terms $6x$, $+8$, $-12x$, $+15$ correct A1 cao
(b)		$32x^5y^{15}$	2	B2 cao (B1 for two of 32, x^5, y^{15})
(c)	$\frac{(n+1)(n-1)}{n+1} \times \frac{2}{n-2}$ $\frac{2(n-1)}{n-2}$	$\frac{2(n-1)}{n-2}$	3	M1 for $k(n + 1)(n - 1)$ M1 dep for $\frac{(n+1)(n-1)}{(n+1)} = n - 1$ A1 for $\frac{2(n-1)}{n-2}$
21	Vertices at $(-3, -1\frac{1}{2}), (-4\frac{1}{2}, -1\frac{1}{2}), (-3, -4\frac{1}{2})$		3	B1 for all sides $\times 1\frac{1}{2}$ B1 for correct orientation with 2 vertices almost correct B1 cao

Paper 5505				
No	**Working**	**Answer**	**Mark**	**Notes**
22	Total = 3 + 5 + 2 (=10) $\frac{3}{10}\times\frac{3}{10}\times\frac{5}{10}\left(=\frac{45}{1000}\right), \frac{3}{10}\times\frac{3}{10}\times\frac{2}{10}\left(=\frac{18}{1000}\right)$ $\frac{5}{10}\times\frac{5}{10}\times\frac{3}{10}\left(=\frac{75}{1000}\right), \frac{5}{10}\times\frac{5}{10}\times\frac{2}{10}\left(=\frac{50}{1000}\right)$ $\frac{2}{10}\times\frac{2}{10}\times\frac{3}{10}\left(=\frac{12}{1000}\right), \frac{2}{10}\times\frac{2}{10}\times\frac{5}{10}\left(=\frac{20}{1000}\right)$ $3\times\left(\frac{"45"}{1000}+\frac{"18"}{1000}+\frac{"75"}{1000}+\frac{"50"}{1000}+\frac{"12"}{1000}+\frac{"20"}{1000}\right)$ $\frac{660}{1000}$	$\frac{660}{1000}$ oe	5	M3 for all six expressions seen OR their combined equivalents (M2 for four expressions seen OR their combined equivalents) (M1 for two expressions seen OR their combined equivalents) M1 sum of 18 relevant products condone 1 slip A1 for $\frac{660}{1000}$ oe *SC: without replacement maximum M4 A0* SC: Just 2 beads: Answer either $\frac{38}{100}$ oe OR $\frac{28}{90}$ oe B1

Paper 5505

No	Working	Answer	Mark	Notes
23 (a)(i)		$6\mathbf{b} - 6\mathbf{a}$	2	B1 for $6\mathbf{b} - 6\mathbf{a}$ oe
(ii)		$6\mathbf{a}$		B1 for $6\mathbf{a}$ oe
(b)	$\overrightarrow{EX} = \overrightarrow{EB} + \overrightarrow{BX}$ $= 12\mathbf{b} + \frac{1}{2}\overrightarrow{BC}$	$12\mathbf{b} - 3\mathbf{a}$	2	M1 for $\overrightarrow{EX} = \overrightarrow{EB} + \overrightarrow{BX}$ oe vector journey in a form ready for straightforward substitution A1 for $12\mathbf{b} - 3\mathbf{a}$ oe
(c)	$\overrightarrow{AY} = \frac{5}{3}\overrightarrow{AB}$ or $\overrightarrow{BY} = \frac{2}{3}\overrightarrow{AB}$ $\overrightarrow{EY} = 16\mathbf{b} - 4\mathbf{a}$ or $\overrightarrow{XY} = 4\mathbf{b} - \mathbf{a}$ $\overrightarrow{EY} = 4\overrightarrow{XY}$ or $\overrightarrow{EX} = 3\overrightarrow{XY}$ or $\overrightarrow{EY} = \frac{4}{3}\overrightarrow{EX}$	Printer Answer	3	B1 for either $\overrightarrow{AY} = \frac{5}{3}\overrightarrow{AB}$ or $\overrightarrow{BY} = \frac{2}{3}\overrightarrow{AB}$ oe B1 ft for either $\overrightarrow{EY} = 16\mathbf{b} - 4\mathbf{a}$ or $\overrightarrow{XY} = 4\mathbf{b} - \mathbf{a}$ ft only on parts (*a*) and (*b*) B1 for either $\overrightarrow{EY} = 4\overrightarrow{XY}$ or $\overrightarrow{EX} = 3\overrightarrow{XY}$ or $\overrightarrow{EY} = \frac{4}{3}\overrightarrow{EX}$ oe **plus** conclusion of *E*, *X*, *Y* on the same straight line
24 (a)(i)		$(5, -4)$	4	B1 cao
(ii)		$(2, -9)$		B1 cao
(iii)		$(2, 4)$		B1 cao
(iv)		$(1, -4)$		B1 cao
(b)		$(x-2)^2 - 4$	4	B4 for $(x-2)^2 - 4$ oe eg. $x^2 - 4x$ (B3 for $(x+2)^2 - 4$ or $(x-2)^2 + 4$) (B2 for $x^2 - 4$ or $(x-2)^2$ OR $x^2 + bx$, $b \neq 0$ OR $(x+2)^2 + 4$ OR $f(x-2) - 4$) (B1 for $x^2 + 4$ or $(x+2)^2$ or $ax^2 + bx$ or $x^2 + bx + c$ OR $x - 2 - 4$ or $x^2 - 2 - 4$, $a, b, c \neq 0$)

Paper 5506

No	Working	Answer	Mark	Notes
1 (a)	$V = \pi \times 4^2 \times 10$	502 – 503 cm^3	2	M1 for $\pi \times 4^2 \times 10$ A1 502 – 503
(b)	$P^2 = 10^2 + 8^2$ $P = \sqrt{164}$	$\sqrt{164} < 13$	3	M1 for sight of correct right angled triangle M1 for $10^2 + 8^2$ A1 for conclusion based on a correct calculation Or 12.8 seen
2 (a)(i)	2×30	$2 \times 2 \times 3 \times 5$	4	M1 for systematic method, eg division, factor trees (at least one prime) A1 cao
(ii)	2×48	$2^5 \times 3$		M1 for systematic method, division, factor trees (at least one prime) A1 cao
(b)		12	1	B1 cao
(c)	$2^5 \times 3 \times 5$	480	2	B2 cao B1 for $2^5 \times 3 \times 5$ or any correct common multiple

Paper 5506

No	Working	Answer	Mark	Notes
3 (a)		$150 < C \leq 200$	2	M1 use of cum freq to find the cost of the 20th or 20.5^{th} car OR $\frac{1}{2}\Sigma f$ th or $\frac{1}{2}(\Sigma f + 1)$ th car. A1 eg 150 to 200, 150 – 200
(b)		No, because the 21st value is in the same interval	1	B1 for 20.5^{th} or 21st value in the same internal consistent with 'a' OR Refers to the median value being low in the interval (statement to be mathematically correct) See additional sheet
(c)	80% = 5200 $\frac{5200}{80} \times 100$	6500	3	M1 for (100 – 20)% = 5200 M1 for $\frac{5200}{"80"} \times 100$ A1 cao

Paper 5506

No	Working	Answer	Mark	Notes
4 (a)	$x^2(x + 1) = 230$	AG	2	M1 for $x \times x \times (x+1)$ or $x \times x \times x + 1$ oe, $x^2(x+1)$, $x^2 \times x + 1$ A1 cao from $x \times x \times (x+1)$, no need to see 230
(b)	5 – 150 6 – 252 5.1 – 158.7 5.2 – 167.6 5.3 – 177.0 5.4 – 186.6 5.5 – 196.6 5.6 – 207.0 5.7 – 217.7 5.8 – 228.8 5.9 –240.2 5.85 – 234.4	5.8	4	B2 for trial between 5.8 and 5.9 inclusive evaluated (B1 for trial between 5 and 6 inclusive evaluated) B1 for different trial between 5.8 and 5.85 (not including 5.8) B1 dep on at least are previous B1 5.8, 5.81, 5.811
5	$\pi \times \left(\frac{15}{2}\right)^2 = 176.715$	88.4 cm^2	3	M1 for $\pi \times \left(\frac{15}{2}\right)^2$ seen A1 88.3 – 88.4 B1 for cm² (independent)

Paper 5506

No	Working	Answer	Mark	Notes
6 (a)	$5 = 0.5x + 1$	8	2	M1 for $5 = 0.5x + 1$ A1 cao
(b)		$y = \frac{1}{2}x + c$	1	B1for $y = \frac{1}{2}x + c$, $c \neq 1$, oe
(c)		$x = 2y - 2$ OR $x = 2(y - 1)$	2	M1for correctly multiplying both sides by 2 or correctly isolating $\frac{x}{2}$ A1 for $x = 2(y - 1)$, $x = \frac{y-1}{0.5}$, $\frac{y-1}{\frac{1}{2}}$ oe SC B1 for x= 2y -1
7	$4x - 6y = 22$ $15x + 6y = 54$ $19x = 76$	$x = 4$, $y = -1$	4	M1 for coefficients of x or y the same followed by correct operation, allow one arithmetical error A1 cao M1 (dep) for correct sub for other variable A1 cao Trial and improvement 0 marks unless both correct values of x and y found
8 (a)	SF = $\frac{10}{6}$ $\frac{10}{6} \times 4.8 = 8$	8	2	M1 for sight of $\frac{10}{6}$ or $\frac{6}{10}$ or 1.67 or better or $\frac{CD}{10} = \frac{4.8}{6}$ A1 cao
(b)	$\frac{10}{6} \times 4.5 - 4.5 = 3$	19.8	2	M1 for use of SF from "a" to find AC or BC or $\frac{BC}{4.5} = \frac{4}{6}$ and adding 4 sides A1 cao

Paper 5506

No	Working	Answer	Mark	Notes
9	$\frac{6\times10^{15}}{3.2\times10^{8}}$ 1.875×10^{7}	4.3×10^{3}	3	B3 for 4.3×10^{3} to 4.34×10^{3} (B2 for 1.875×10^{7} oe or 4300 to 4340, final answer of 1.9×10^{7} B1 for sight of 6×10^{15} oe or 3.2×10^{8} oe)
10	$8.5\times\tan38$ $=8.5\times0.7813$ $\frac{8.5}{\sin(90-38)}=\frac{AB}{\sin38}$ $AB=\frac{8.5\times\sin38}{\sin(90-38)}$ $=\frac{5.2331}{0.788}=6.64$	6.64	3	M1 for correct use of trig, eg $\tan 38=\frac{opp}{8.5}$ M1 for $8.5\times\tan38$ A1 6.64 – 6.641 OR M1 for correct substitution into the sine rule M1 (dep) for correct rearrangement for AB= A1 6.64 – 6.641
11 (a)		No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice	1	B1 for a consistent answer See additional sheet

Paper 5506

No	Working	Answer	Mark	Notes
(b)	$\frac{1}{6}, \frac{5}{6}$ + labels		3	B1 for $\frac{5}{6}$ on the red dice, *not six* branch B1 for a fully complete tree diagram with all branches labelled B1 for $\frac{1}{6}$ and $\frac{5}{6}$ on all remaining branches as appropriate
(c)(i)	$\left(\frac{1}{6}\right)^2$	$\frac{1}{36}$	2	M1 $\left(\frac{1}{6}\right)^2$ or $\frac{1}{6}\times\frac{1}{6}$ only or 0.28 A1 $\frac{1}{36}$ or 0.03 or better
(ii)	$1-\left(\frac{5}{6}\right)^2$ OR $\frac{1}{6}\times\frac{5}{6}+\frac{5}{6}\times\frac{1}{6}+\frac{1}{6}\times\frac{1}{6}$	$\frac{11}{36}$	3	M2 for $1-\left(\frac{5}{6}\right)^2$ or $1-\frac{5}{6}\times\frac{5}{6}$ A1 cao OR M1 for $\frac{1}{6}\times\frac{5}{6}$ oe M1 for 2 or 3 only of $\frac{1}{6}\times\frac{5}{6}, \frac{5}{6}\times\frac{1}{6}$, "a" A1 for $\frac{11}{36}$ or 0.31 or better

Paper 5506

No	Working	Answer	Mark	Notes
12 (a)	$\pi \times 30 \times \frac{7.5^2}{3} - \pi \times 10 \times \frac{2.5^2}{3} = 1767 - 65$	1700	3	M1 for either $\pi \times 30 \times \frac{7.5^2}{3}$ or $\pi \times 10 \times \frac{2.5^2}{3}$ M1 (dep) for difference A1 1700 – 1702 **SC** B1 Using d instead of r, 6800 – 6808
(b)	$\frac{S}{2\pi d} = \sqrt{h^2 + d^2}$ $\left(\frac{S}{2\pi d}\right)^2 = h^2 + d^2$	$h = \sqrt{\frac{S^2 - 4\pi^2 d}{4\pi^2 d^2}}$	3	M1 for correctly isolating $\sqrt{h^2 + d^2}$ or $h^2 + d^2$ or $h + d$ or kh^2 or kh M1(indep) squaring both sides A1 $h = \sqrt{\frac{S^2 - 4\pi^2 d^4}{4\pi^2 d^2}}$, $h = \frac{\sqrt{S^2 - 4\pi^2 d^4}}{2\pi d}$ $h = \sqrt{\left(\frac{S}{2\pi d}\right)^2 - d^2}$
(c)	$\left(\frac{30}{20}\right)^2 \times 450$ or $450 \div \left(\frac{20}{30}\right)^2$	1012.5	2	M1 for sight of correct SF^2 including 4:9 A1 1010 to 1013

Paper 5506

No	Working	Answer	Mark	Notes
13 (a)	$\frac{2x(x+20)}{2} = 400$	As given	2	M1 $\frac{2x(x+20)}{2}$ or $\frac{2x \times x + 20}{2}$ or $2x(x + 20) = 800$ A1 cao following correct working, no need for = 400 *SC B1* $2x \times x + \frac{1}{2} \times 2x(10 - \frac{x}{2}) \times 2$
(b)	$\frac{-20 \pm \sqrt{20^2 - 4 \times 1 \times (-400)}}{2}$ $= \frac{-20 \pm 44.721}{2}$	12.361	3	M1 for correct sub, up to signs, in the quad formula A1 for 44.7 or $\sqrt{2000}$ A1 for 12.3606 – 12.361, ignore negative solution T.I B3 for 12.361 OR Completing the square M1 for $(x+10)^2$ seen A1 for $-10 \pm \sqrt{500}$ A1 for 12.3606 – 12.361 ignore negative solution

Paper 5506

No	Working	Answer	Mark	Notes
14 (a)	$0.5\times 8\times 15\times \sin 70^0$	56.4	2	M1 for correct sub into area formula A1 56.38 – 56.4
(b)	$AB^2 = 8^2 + 15^2 - 2\times 8\times 15\times \cos 70^0 = 206.9$ EITHER $0.5\times AB\times CX$ ='56.38' OR $\frac{\sin B}{8} = \frac{\sin 70}{\sqrt{'206.9'}}$ $B = 31.5$ 15 sin '31.5'	7.84	4	M1 for correct sub into cos rule A1 for 206.9 - 207 or 14.38 – 14.4 EITHER M1 for use of area rule to find CX A1 7.83 – 7.84 OR M1 for correct use of sine rule to find sin B or sin A and then sight of 15sin B *or* 8 sin A A1 7.83 – 7.84

Paper 5506

No	Working	Answer	Mark	Notes
15 (a)	$4a^2 - 4a + 1 - (4b^2 - 4b + 1) =$	AG	3	Expansion Method M1 for a correct expansion of any one of the three terms M1(dep) on an attempt to expand all 3 terms and show LHS = RHS A1 fully correct algebra RHS exp is $4\left(a^2 + ab - a - ba - b^2 + b\right)$
	$4(a^2 - b^2) - 4(a - b)$ $4(a - b)(a + b - 1)$			
	OR $((2a - 1) - (2b - 1))((2a - 1) + (2b - 1))$ $(2a - 2b)(2a + 2b - 2)$			OR Factorisation Method M1 for attempt to use difference of 2 squares on LHS M1 for one bracket correctly simplified A1 fully correct
(b)	Any 2 odd square numbers have the above form If a and b are both even or odd then $a - b$ is even, so $4(a - b)$ is a multiple of 8 If one of a,b is odd, then $a + b - 1$ is even, so $4(a + b - 1)$ is a multiple of 8		3	B1 'any 2 square nos have the above form' (may be implied by sight of $(2a - 1)^2 - (2b - 1)^2$ in part (b)) B1 first reason B1 second reason SC B1 for $(2r + 1)^2 - (2r - 1)^2$ B1 for 8r
16 (a)	$g_L = \frac{2 \times 4.495}{1.35^2 \times \sin 30.5}$	9.719	4	B2 for any 4 of 4.505, 1.25, 29.5, 4.495, 1.35, 30.5 seen (B1 for any two or three seen) B1 for 11.710 – 11.7103
	$g_u = \frac{2 \times 4.505}{1.25^2 \times \sin 29.5}$	11.710		B1 cao 9.719 – 9.71904
(b)	Round, until lower and upper bounds agree	10	1	B1 for 10 + reason " they agree to this level of accuracy"

Paper 5506

No	Working	Answer	Mark	Notes
17 (a)(i)		xy	3	B1 cao
(ii)		y^2		B1 for y^2 or $y \times y$
(iii)		$\frac{x}{2}$		B1 for $\frac{x}{2}$ or $0.5x$ or $2^{-1}x$
(b)	Divide to get $2y = 1$	$q = -1$	2	M1 for $2y = 1$ or $\frac{x}{2} = 32$ or $p + q = 5$ or $1 + p + 2q = 5$
		$p = 6$		A1 cao
18 (a)	$x^2 - 2mx + m^2 - k$	$k = m^2$	2	M1 for correct exp of $(x - m)^2$ or correct completion of the square eg $\left(x - \frac{2m}{2}\right)^2 - \left(\frac{2m}{2}\right)^2$
				A1 cao
				SC B1 for $k = -m^2$
(b)(i)	Min value is $-m^2$	$-m^2$	3	M1 for recognition that min value occurs when $(x - m)^2 = 0$ (either (b)(i) or (b)(ii) correct implies this M1)
(ii)	$x = m$	m		A1 ft on 'k', " $-k$" gets M1 A0
				A1 cao
19	$0.06 \times 0.05 = 0.003$	No	2	M1 for 0.06×0.05
				A1 correct conclusion based on 0.003 or 0.06 x 0.05 stated as $\neq 0.0011$
				OR M1 for statement that for the two events to be independent P (BL and CL) = P(BL) × P(CL)

Paper 5506				
No	**Working**	**Answer**	**Mark**	**Notes**
20		50 50 4	3	B1 50 or $\frac{100}{2}$ B1 for 50 or "a" B1 4 or $\frac{360}{90}$ oe

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GCSE
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Mathematics A 1387

July 2004

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NOTES ON MARKING PRINCIPLES

NOTES ON MARKING PRINCIPLES

1 Three types of mark are available

M marks - awarded for correct working seen or implied.
A marks - conditional accuracy marks which are awarded for accurate working following the award of M marks.
B marks - unconditional accuracy marks (independent of M).

2 Abbreviations

cao - correct answer only.
ft - follow through.
$\surd$ - Denotes a "follow through" answer.

SC - special case.
isw - ignore subsequent working.
oe - or equivalent (and appropriate).
NB: a candidate cannot benefit from both isw and ft.

3 If no working shown, then

correct answers normally score full marks
incorrect (even though nearly correct) answers score no marks.

4 Marking instructions

Misread loses A marks (and sometimes B marks) on that part but ft can be allowed on subsequent parts. M marks can still be earned. If in doubt contact your team leader.
If there is a wrong answer in the answer space DO CHECK the working in the body of the script.

- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.
- If there is a wrong answer in the answer space DO CHECK the working in the body of the script.
- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.

5 Style of marking

Answer correct: tick and write part mark in margin NEXT TO BRACKETED MARK.
Answer incorrect: cross, but show M, A or B marks if any earned in body of script and transfer the total of these to the margin next to the bracket mark.
Total for each double page at bottom right page (except for back if used), FINAL TOTAL IN RELEVANT BOX ON FRONT COVER.
Nought in margin for fully incorrect question or page AND FOR NO ATTEMPT.
Where no attempt has been made a line should be put in the answer space and zero in the margin next to the bracketed mark
CHOICE OF METHOD – No marks unless one answer is in answer space – then mark that.
CROSSED OUT WORK - if not replaced this should be marked (if legible).
There must always be a mark next to bracketed mark in the margin/

6 Follow Through Marks

Follow throughs are guided by two principles:

(a) Follow throughs which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous, do not award.
(b) Follow throughs which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

7 Probability

Probability answers must be given as fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least two decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

6 Linear Equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

8 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

PAPER 5501					
No		**Working**	**Answer**	**Mark**	**Notes**
1			K: 1020 L: 8.06	2	B1 for 1020 or 1,020 B1 for 8.06 Accept £8.06p and £8,06
2	(a)		28, 33	2	B1, B1 (B1 ft for "28" + 5 if both numbers >25)
	(b)			1	B1 for add 5, +5, for going up in 5's the difference is 5 oe
	(c)			1	B1 for they end in 3 and 8, it ends in 7; or refers to 383 and 388 are in sequence
3	(a)(i)		$\frac{1}{2}$	2	B2 for ½ accept half (B1 for an equivalent unsimplified fraction eg 4/8 or 50% or 0.5)
	(ii)		2 rectangles shaded	1	B1 for correct shading (any 2 rectangles)
	(b)(i)		40	4	B1 for 40 cao
	(ii)		150 000		B1 for 150 000 cao (accept 150,000 not 150.000)
	(iii)		6.55		B1 for 6.55 cao not $6.5^{½}$
	(iv)		$\frac{3}{8}$		B1 for $\frac{3}{8}$ oe accept 0.375
	(c)		Cross 3cm from *A*	1	B1 mark a cross 3 cm (±2 mm) from *A*
4	(a)(i)		metres	2	B1 for metres (m)
	(ii)		grams		B1 for grams (g)
	(b)		miles	1	B1 for miles
5	(a)		(3, 2)	1	B1 for (3, 2)
	(b)(i)		*Q* at (0, 3)	1	B1 for *Q* plotted correctly on *y*-axis at (0, 3) ±2mm
	(ii)		*R* at (−2, −3)	1	B1 for *R* plotted correctly at (−2, −3) ±2mm
6	(a)(i)		30	2	B1 for 30
	(ii)		25		B1 for 25
	(b)(i)		4 shapes	2	B1 for drawing 4 shapes
	(ii)		1½ shapes		B1 for drawing 1½ shapes

PAPER 5501					
	No	Working	Answer	Mark	Notes
7	(a)		30	1	B1 for 30
	(b)	$20 \times 3 + 5$	65	2	M1 for $20 \times 3 + 5$ oe A1 for 65
8	(a)		Draws perp.	1	B1 for correctly drawing perp must touch line or cut line *AB* ± 2mm
	(b)		Sketches a cylinder	1	B1 for sketching cylinder
9	(a)	1974 6580 8554	855.4	3	M1 for complete method with relative place value correct, condone 1 error in multiplication A2 cao (A1 for digits 8554 seen or A1 for "855.4" dependent on 1 arithmetic error)
	(b)	990 ÷ 69 = 14.3…. or 14 rem 24	14	4	Method 1 - Everything excluding long division M2 for a valid method with no errors …need to see 966 or 1035 (M1 for a valid method, including estimation, that reaches an answer between 901 and 1099 inclusive. Ignore errors.) A2 for 14 with a fully correct method (A1 (dep on 1st M1) for an answer between 14 and 15 inclusive. Ignore errors. Cannot have used estimation.) Note: Estimation can only score a maximum of M1 unless accompanied by another method or 966 or 1035 see (award M2) Method 2 – long division method M2 for 990 ÷ 69 = integer answer between 12 and 19 inclusive and rem 30 seen (M1 for 990 ÷ 69 with 1 in tens column.) A2 for 14 with fully correct method (A1 (dep on 1st M1) for an answer between 14 and 15 inclusive.)

PAPER 5501					
	No	**Working**	**Answer**	**Mark**	**Notes**
10	(a)(i)		7	2	B1 for 7
	(ii)		−10		B1 for −10
	(b)(i)		6	2	B1 for 6 (accept −6)
	(ii)		8		B1 for 8 (accept −8)
	(c)		−7	1	B1 for −7 cao
11	(a)		B and D	2	B1, B1 (–1 each extra)
	(b)(i)		A	2	B1 for A
	(ii)		3		B1 for 3
12	(a)	800 − 144	656	2	M1 for at least 1 digit correct and in correct position needs to be 3 digit number A1 for 656
	(b)	144 is less than 200 so Trudy is wrong		2	B1 for 200 B1ft for 'correct' explanation based on cand's "200"
	(c)	$\frac{45\times800}{100}$	360	2	M1 for 45 × 800 ÷ 100 oe A1 for 360
	(d)	$\frac{176}{800}\times100$	22	2	M1 for $\frac{176}{800}\times100$ oe A1 for 22
13	(a)(i)		25	4	B1 for 25
	(ii)		28		B1 for 28
	(iii)		5 and 20		B1 for 5 and 20
	(iv)		26 and 33		B1 for 26 and 33
	(b)	$2^3 = 8$ or $2^3 = 2 \times 2 \times 2$ (which is not 6)		1	B1 for valid 'explanation'
14			10 m^2	2	B1 for 10 B1 indep for m^2.

PAPER 5501					
No		**Working**	**Answer**	**Mark**	**Notes**
15	(a)	$\frac{11}{12}-\frac{10}{12}$	$\frac{1}{12}$	2	M1 for correctly writing both fractions to a common denominator A1 for $\frac{1}{12}$ oe
	(b)	$\frac{70\times400}{200}$	140	2	B2 for 140 (accept 136) (B1 for sight of any two of 70, 400 or 200)
16	(a)		$2y$	1	B1 for $2y$ or $2\times y$, $y2$, $y\times2$
	(b)		$3p^2$.	1	B1 for $3p^2$ or $3\times p^2$ or $p^2\times3$ or $p^2 3$
	(c)		$x(x-3)$	2	B2 for $x(x-3)$ (B1 for x (x…….)) $\frac{25}{60}$ wrongly cancelled gets B1 ISW
17	(a)		2 23 9 34 15 2 9 26 17 25 18 60	3	B3 for all correct (B2 for 4 or 5 entries correct) (B1 for 2 or 3 entries correct)
	(b)		$\frac{25}{60}$	1	B1 for $\frac{25}{60}$ or $\frac{5}{12}$ oe $\frac{25}{60}$ wrongly cancelled gets B1 ISW

PAPER 5501					
	No	**Working**	**Answer**	**Mark**	**Notes**
18	(a)(i)		60	2	B1 for 60
	(ii)				B1 for all **angles equal** so equilateral triangle oe
	(b)(i)		130	3	B1 for 130
	(ii)				B1 for isosceles triangle oe or 2 angles equal accept $\angle Q = \angle R$ B1 for angles on a straight **line** add up to **180°**oe (180° could be in working)
	(c)		64	1	B1 for 64
19	(a)		1	1	B1 for 1
	(b)		3	1	B1 for 3
	(c)	$9\times1+3\times2+5\times3+3\times4$ (= 42) "42" ÷ 20	2.1	3	M1 for 9×1, 3×2, 5×3, 3×4 or for 42 seen M1 (dep) for "42" ÷ 20 A1 for 2.1 or $2\frac{1}{10}$ or $2\frac{2}{20}$
20	(a)		09 05	1	B1 for 09 05 oe
	(b)		7	1	B1 for 7
	(c)		10	1	B1 for 10
	(d)	7km in 20 mins	21	3	B1 for 20 (minutes) oe or $\times3$ seen M1 for $\frac{"7"}{"20"}$ A1 cao [SC: "7" × 3 seen gets B1 M1]

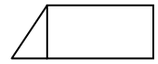
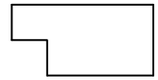
PAPER 5501				
No	**Working**	**Answer**	**Mark**	**Notes**
21	Vertices of new triangle at (2, −2) (2, 6) and (6, −2)	Correct triangle drawn	3	B3 cao (B2 for either correct triangle in wrong translated position or for 2 vertices correct) (B1 a right angled triangle with horizontal length 4 or vertical length 8 in the same orientation as the shaded triangle) SC B2 for s + 3 totally correct
22 (a) (b) (c)	 8560 ÷ (10 × 10)	8 Pentagon 85.6	1 1 2	B1 for 8 B1 for pentagon M1 for 8560 ÷ (10 × 10) oe A1 for 85.6
23	$2x + x + 100 + 47 = 360$ $2x + x = 360 - 100 - 47$ $x = 71$ Largest angle = $2x$ =	142	4	M1 for $2x + x + 100 + 47 = 360$ or 360 – 147 or 213 seen M1 dep for correctly separating x-terms and non x terms or "360 – 147" ÷ 3 A1 for $x = 71$provided M2 awarded A1 ft for 142

PAPER 5502					
	No	Working	Answer	Mark	Notes
1	(a)		Diagram	1	B1 cao
	(b)		22, 26	1	B1 cao
	(c)		46	1	B1 cao
2	(a)	£5.95 + £1.62 + 25p + 2 × 48p = £8.78	1.22	3	M1 for 3 of £5.95, £1.62, 25p, 48p seen with intention to add or 170 seen A1 for £8.78 A1 ft from " 8.78"
	(b)	160 ÷ 12 = 13.(333…)	14	2	M1 for 160 ÷ 12, or 13 or better or 12 × 13 or 12 × 14 A1 14 cao
	(c)	"14" × £12.20 = £170.8**0**	170.80	2	M1 for "14" × 12.20 A1 for 170.8**0** or 158.6**0** if 13 in (b) NB: 170.8 or 158.6 gets M1 A0
3	(a)(i)		1459	1	B1 cao
	(ii)		9541	1	B1 cao
	(b)		9 + 5 = 14	1	B1 cao
	(c)		0	1	B1 cao
4	(a)		1123	1	B1 cao
	(b)		1125	1	B1 cao
	(c)		43	1	B1 cao
	(d)	67 – "43"	24	2	M1 for 67 – "43" A1 ft from "43"
	(e)(i)		80	2	B1 cao
	(ii)		56 – 58		B1 answer in range 56 to 58 inc
	(f)		Completes graph	2	B2 for (Apr , 70) and (May , 60 < p < 65) plotted and joined (B1 for one point plotted)

PAPER 5502					
	No	Working	Answer	Mark	Notes
5	(a)(i)		4	1	B1 cao
	(ii)		10	1	B1 cao
	(b)		28	2	B2 for 28 (B1 for 29 or 14×2)
6	(a)		$\frac{3}{4}$	1	B1 accept 0.75, 75%
	(b)	$\frac{3}{4} \times 28 = 21$	15.54	3	M1 for $\frac{3}{4} \times 28$ or 21 seen M1 for "21" $\times$ 74 or 28×74 or 7×74 A1 cao
	(c)(i)		44 – 46	2	B1 44 – 46 inc
	(ii)		5.2 – 5.4		B1 5.2 – 5.4 inc
7	(a)		Correct shape	1	B1
	(b)		Correct shape	1	B1
8	(a)		Hexagon	1	B1
	(b)		Right	1	B1 cao
	(c)		Drawing	2	B2 for 7 additional hexagons with at least 2 points at which 3 hexagons meet (B1 for one point at which 3 hexagons meet)
9	(a)		$\frac{3}{4}$	2	M1 $\frac{80-20}{80}$ or $\frac{60}{80}$ or 0.75 (oe) A1 cao Do not accept equivalents
	(b)		15	1	B1 cao
	(c)		Iron and Cook set	1	B1 for both Accept mixer and fryer
	(d)		Microwave	1	B1 cao
	(e)		Bar chart	2	B1 one column (mixer): 70, 90 B1 second column (fryer): 70, 85 [SC: B1 columns correct but reversed]

PAPER 5502					
No		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		Acute	1	B1
	(b)		Reflex	1	B1
	(c)		reason	1	B1 reason eg 120 + 230 = 350 ≠ 360
11	(a)		$\frac{1}{2}$	1	B1 for $\frac{1}{2}$ oe
	(b)		reason	1	B1 for reason e.g could get 30 heads
12	(a)	7.5×4	30	2	M1 for 7.5×4 or $7\frac{1}{2} \times 4$ A1 cao
	(b)	$\sqrt{(42.25)}$	6.5	2	B2 for 6.5 (B1 for 42.25)
13	(a)		$6x$	1	B1 accept $6 \times x$, $x6$ oe
	(b)		$x - 4$	1	B1 cao
	(c)		$12(x - 4)$	1	B1 for $12(x - 4)$ or $12x - 48$ or $12 \times x - 48$ oe
	(d)		$18x - 48$	2	M1 for "$6x$" + "$12(x-4)$" or "$6x$" + "$12x - 48$" oe A1 ft $18x - 48$, $2(9x - 24)$, $3(6x - 16)$, $6(3x - 8)$
14	(a)		90	2	B2 for 90 ± 2 (B1 for 9 ± 0.2)
	(b)		317	1	B1 for 317 ± 4
15	(a)	Accurate drawing of triangle		2	B1 cao for 38° (±2°) B1 cao (indep) for BC drawn 7.3 cm (±2mm) and completing the triangle.
	(b)	Measure angle A	63°	1	B1 for 63° (±2°) or ft their diagram (±2°)

PAPER 5502					
	No	Working	Answer	Mark	Notes
16	(a)	0 × 1 = 0 1 × 1 = 1 2 × 4 = 8 3 × 8 = 24 4 × 8 = 32 5 × 7 = 35	100	3	M1 col 1 × col 2 (at least 3 shown) M1 (dep) sum of totals A1 cao SC: M1 M1 A0 for 101
	(b)	Either 35.50 ÷ 1.42 = 25; 26.99 – 25 = 1.99 Cheaper in the USA Or 26.99 × 1.42 = 38.33; 38.33 – 35.50 = 2.83 Cheaper in the USA		3	M1 35.50 ÷ 1.42 A1 25 seen B1 ft (dep on M1) £1.99 with conclusion (must have units) **OR** M1 26.99 × 1.42 A1 38.32 or 38.33… seen B1 ft (dep on M1) $2.83 or $2.82 with conclusion (must have units) must be to 2dp
17	(a)		-1, (1), (3), 5, 7, 9	2	B2 cao (B1 for 2 values)
	(b)		Graph	2	B1 ft for plotting points ±1/2 square B1 cao for line between $x = -2$ and $x = 3$
	(c)(i)		0.4	2	B1 for 0.4 or ft from single straight line with positive gradient
	(ii)		1.2		B1 for 1.2 or ft from single straight line with positive gradient

PAPER 5502					
	No	Working	Answer	Mark	Notes
18	(a)		Plots	1	B1 cao
	(b)		description	1	B1 dynamic relationship or "positive" (correlation)
	(c)		line of best fit	1	Line within overlay region, and to the extent of.
	(d)(i)	280 g →	reading	2	B1 ft from single straight line of positive gradient (±1/2 square)
	(ii)	120 pages →	reading		B1 ft from single straight line of positive gradient (±1/2 square)
19			200 150 225 150 10	3	B3 cao (B2 for three correct, or B1 for one correct)
20	(a)			2	B1 B1 for correct sketch – ignore additional internal lines B1 B0 for rectangle or right-angled triangle or correct shape without line NB 3-D sketch gets B0 B0
	(b)			2	B1 B1 for correct plan – ignore internal lines – accept a rotated plan, not reflected B1 B0 for a single rectangle drawn NB 3-D sketch gets B0 B0
21	(a)	163.25 – 35.50 = 127.75 127.75 ÷ 18.25 = 7	8	3	M1 163.25 – 35.50 (or sight of 127.75) M1 (dep) "127.75" ÷ 18.25 A1 cao SC: M2 for 7 days
	(b)	1.175 × £64 or $\frac{17.5}{100}$ × 64 or £11.20 seen	75.20	2	M1 1.175 × 64, 0.175 × 64 oe or 11.20 or 75.2 seen or 6.40, 3.20 and 1.60 seen A1 cao

PAPER 5502					
	No	Working	Answer	Mark	Notes
22	(a)		6	1	B1 cao
	(b)		$t^2 - 2t$	1	B1 oe
	(c)		$3(y - 4)$	1	B1 Accept $3 \times (y - 4)$ or $3(y - 4$
23	(a)		Reason	1	B1 Makes some mention of bias either directly or making reference to an insufficient or biased range of responses
	(b)		Reason	1	B1 (a) an insufficient range of responses (b) No mention of money (c) No time frame in the question (d) Misunderstanding of "A lot" and "Not much"

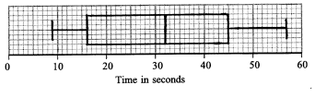
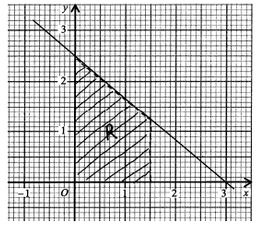
PAPER 5503				
No	**Working**	**Answer**	**Mark**	**Notes**
1		10.	1	B1 for 10
2 (a)(i)		$3e + 2f$	2	B1 for $3e + 2f$
(ii)		$3p^2$		B1 for $3p^2$
(b)	$5 \times -3 + 1$	-14	2	M1 for $5 \times -3 + 1$ A1 for -14
3	1974 6580 8554	855.4	3	M1 for complete correct method with relative place value correct, condone 1 error in multiplication. A2 cao (A1 for digits 8554 seen or A1 ft for "855.4" dependent on one arithmetic error only)
4 (a)		2 23 9 34 15 2 9 26 17 25 18 60	3	B3 all correct (B2 for 4 or 5 entries correct) (B1 for 2 or 3 entries correct)
(b)		$\frac{25}{60}$	1	B1 for $\frac{25}{60}$ or $\frac{5}{12}$ oe
5 (a)	$\frac{45}{100} \times 800$	360	2	M1 for $\frac{45}{100} \times 800$ oe A1 for 360
(b)	$\frac{176}{800} \times 100$	22	2	M1 for $\frac{176}{800} \times 100$ oe A1 for 22

PAPER 5503					
	No	Working	Answer	Mark	Notes
6	(a)	$\frac{11}{12}-\frac{10}{12}$	$\frac{1}{12}$	2	M1 for correctly writing both fractions to a common denominator A1 for $\frac{1}{12}$ oe
	(b)	$\frac{70\times400}{200}$	140	2	B2 for 140 (accept 136) (B1 for sight of any two of 70, 400 or 200)
7	(a)(i)		60	2	B1 for 60
	(ii)				B1 for all angles equal so equilateral triangle oe
	(b)(i)		130	3	B1 for 130
	(ii)				B1 for isosceles triangle oe B1 for angles on a straight line add up to 180°oe
	(c)		64	1	B1 for 64
8		$9\times1+3\times2+5\times3+3\times4$ (=42) "42" ÷ 20	2.1	3	M1 for 9×1, 3×2, 5×3, 3×4 or for 42 seen M1 (dep) "42" ÷ 20 A1 for 2.1 or $2\frac{1}{10}$ or $2\frac{2}{20}$
9	(a)		09 05	1	B1 for 09 05 oe
	(b)		7	1	B1 for 7
	(c)		10	1	B1 for 10
	(d)	7 km in 20 minutes	21	3	B1 for 20 (minutes) oe or $\times3$ seen M1 for $\frac{"7"}{"20"}$ A1 cao SC: "7" $\times3$ gets B1 M1

PAPER 5503					
No		**Working**	**Answer**	**Mark**	**Notes**
10		Vertices of new triangle at (2, −2) (2, 6) and (6, −2)	Correct triangle drawn	3	B3 cao (B2 for either correct triangle in wrong translated position or for 2 vertices correct) (B1 for a right-angled triangle with horizontal length 4 or vertical length 8 in the same orientation as shaded triangle) SC B2 for scale factor 3, totally correct
11		$2^2 + 3 =$	7 which is not even	2	B2 (B1 for correctly evaluating $n^2 + 3$ with a prime number value for n.)
12	(a)	360 ÷ 5	72	2	M1 for 360 ÷ 5 oe A1 for 72
	(b)	8560 ÷ (10 × 10)	85.6	2	M1 for 8560 ÷ (10 × 10) oe A1 for 85.6
	(c)(i)	Least length = 100.5	100.5	2	B1 for 100.5
	(ii)	Greatest length = 101.5	101.5		B1 for 101.5 or 101.499 or better
13		$2x + x + 100 + 47 = 360$ $2x + x = 360 - 100 - 47$ $x = 71$ Largest angle = $2x$ =	142	4	M1 for $2x + x + 100 + 47 = 360$ or 360 – 147 or 213 seen M1 (dep) for correctly separating x-terms and non x terms or $\frac{"360-147"}{3}$ A1 for $x = 71$ A1 ft (provided M2 awarded) for "142"
14	(a)(i)		2.21	2	B1 for 2.21
	(ii)		0.013		B1 for 0.013
	(b)	LCM = 3 × 13 × 17 = 3 × 221	663	2	M1 for 3 × 13 × 17 oe A1 for 663

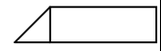
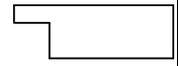
PAPER 5503				
No	**Working**	**Answer**	**Mark**	**Notes**
15		Tick boxes 1,3 & 6	3	B1 for $\frac{\pi abc}{2d}$; B1 for $2a^2$; B1 for $2\left(c^2+d^2\right)$ (−B1 for each additional expression ticked (>3) to a minimum of 0)
16	200×0.2	40	2	M1 for 200×0.2 or $\frac{40}{200}$ seen A1 for 40
17 (a)	eg 2 | 108 2 | 54 3 | 27 3 | 9 3	$2^2 \times 3^3$	3	M2 for full systematic method of at least 4 divisions by prime numbers oe factor trees; condone 1 calculation error (M1 for 108 written as a correct product(s) with only one non-prime or equivalent division or a full process with 2 calculation errors.) A1 for $2^2 \times 3^3$ (accept $2 \times 2 \times 3 \times 3 \times 3$)
(b)		12	1	B1 for 12
18	Perpendicular from P to intersecting arcs (within tramlines); perpendicular at least 2cm long		2	M1 relevant pair of arcs crossing within tramlines A1 SC M1 AO for a full construction of a perpendicular to AB not passing through P.
19	15×10	150 cm^3.	3	M1 for 15×10 A1 for 150 B1 for cm^3.

PAPER 5503					
No		**Working**	**Answer**	**Mark**	**Notes**
20			$y = 2x + 6$	2	B2 for $y = 2x + 6$ (B1 for $y = 2x + k$, $k \neq 1$ or for $y = mx + 6$, m $\neq 0$ or for $2x + 6$)
21		$6\frac{2}{5} = \frac{32}{5}$ Area of triangle = $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ (=2) Length of a side of sq. = $\sqrt{18 \times "2"}$ (=6) Perimeter of square = 4 × 6	24	5	B1 for $6\frac{2}{5} = \frac{32}{5}$ oe or $3\frac{1}{5} = \frac{16}{5}$ or $\frac{30}{8} + \frac{2}{8}$ oe (or implied by area of triangle=2) M1 for $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ oe M1 for area of square = 18 × product of two lengths A1 for $\sqrt{18 \times "2"}$ A1 for 24
22	(a)		$x(x-3)$	2	B2 for $x(x-3)$ (B1 for x (…….))
	(b)		k^3.	1	B1 for k^3.
	(c)(i)	$4x + 20 + 3x - 21$	$7x - 1$	4	M1 for **three** of 4 terms $4x + 20 + 3x - 21$ (or better) A1 for $7x - 1$
	(ii)	$x^2 + 3yx + 2xy + 6y^2$	$x^2 + 5xy + 6y^2$		M1 for **three** of 4 terms $x^2 + 3yx + 2xy + 6y^2$ A1 for $x^2 + 5xy + 6y^2$
	(d)		$(p+q)(p+q+5)$	1	B1 for $(p+q)(p+q+5)$

PAPER 5503					
	No	Working	Answer	Mark	Notes
23	(a)		32	1	B1 for 32 (accept 31.5 to 33.5 inclusive)
	(b)			3	B1 for ends of whiskers at 9 and 57, (with a box) B1 for ends of box at 16 and 45 (± 0.5) B1 for median marked at 32 or a complete box and whisker diagram drawn with a median inside the box
	(c)	Median(B)>Median(G); on average boys take longer IQR(B)>IQR(G); times for boys have a greater spread		2	B1 eg for comparison of medians B1 eg for comparison of (interquartile) ranges
24	(a)	$6y = 15 - 5x$	$y = \frac{15-5x}{6}$	2	M1 for either $6y = 15 - 5x$ or -6 $y = 5x - 15$ or for $\frac{5x}{6} + y = \frac{15}{6}$ or a correct ft on sign error to $y=$ A1 for $y = \frac{15-5x}{6}$ oe
	(b)	$6k + 5(-21) = 15$	20	2	M1 for substitution of $x = -21$ (or $x = 21$) into given equation or candidate's answer to (a) A1 for $k = 20$
	(c)(i)		Region R indicated	3	B2 correct region shaded (accept unshaded if R clear) (B1 shaded or R region satisfies 3 of the 4 given inequalities with same boundaries)
	(ii)		(1,1)		B1 for (1,1)

PAPER 5503					
	No	Working	Answer	Mark	Notes
25	(a)		60	1	B1 for 60 B1 for *BDC* = 25
	(b)	eg Angle *BDC* = 25 *ADB* = 60 − 25	35	2	[Award the mark for equivalent approaches] B1 ft for (a) − 25
	(c)	Ben is correct; angle *DAB* = 65 + 25 = 90 and since angle in a semi-circle is 90°, *BD* must be a diameter		1	B1 for full valid justification

PAPER 5504					
	No	Working	Answer	Mark	Notes
1	(a)	Accurate drawing of triangle		2	B1 cao for 38º (±2º) B1 cao (indep) for BC drawn 7.3 cm (±2mm) and completing the triangle.
	(b)	Measure angle A	63º	1	B1 for 63º (±2º) or ft their diagram (±2º)
2	(a)	0 × 1 = 0 1 × 1 = 1 2 × 4 = 8 3 × 8 = 24 4 × 8 = 32 5 × 7 = 35	100	3	M1 col 1 × col 2 (at least 3 shown) could be implied by answers. M1 (dep) sum of totals A1 cao SC: M1 M1 A0 for 101
	(b)	Either $35.50 ÷ 1.42 = £25; £26.99 - £25 = £1.99 Cheaper in the USA Or £26.99 × 1.42= $38.33; $38.33 - $35.50 = $2.83 Cheaper in the USA		3	M1 35.50 ÷ 1.42 A1 25 seen B1 ft (dep on M1) £1.99 with conclusion; units needed OR: M1 26.99 × 1.42 A1 38.33 or 38.32…seen B1 ft (dep on M1) $2.83 or $2.82 with conclusion; units needed
3	(a)		-1, (1), (3), 5, 7, 9	2	B2 cao (B1 for 2 values)
	(b)		Graph	2	B1 ft for plotting points ±1/2 square B1 cao for line between $x = -2$ and $x = 3$
	(c)(i)		0.4	2	B1 0.4 or ft single straight line with positive gradient
	(ii)		1.2		B1 1.2 or ft single straight line with positive gradient

PAPER 5504					
	No	Working	Answer	Mark	Notes
4	(a)			2	B1 Rectangle drawn B1 Triangle attached Ignore additional internal lines; 3D sketch gets B0
	(b)			2	B1 single Rectangle drawn B1 Attached smaller rectangle drawn Accept rotated plan, Ignore internal lines down; Nets get B0
5	(a)	£163.25 - £35.50 = £127.75 £127.75 ÷ £18.25 = 7	8	3	M1 163.25 – £35.50 (or sight of £127.75) M1 (dep) "127.75" ÷ 18.25 A1 cao SC: M2 for 7 days
	(b)	1.175 × £64 or $\frac{17.5}{100}$ × 64 or £11.20 seen	75.20	2	M1 1.175 × 64.00 0.175 × 64 oe or 11.20 or 75.2 seen OR 6.40, 3.20, and 1.60 seen A1 cao
	(c)	54 × £2.38 =	128.52	2	M1 54 × £2.38 A1 cao
6		Tessellation	Drawing	2	B2 seven additional hexagons, with at least 2 points at which 3 hexagons meet (B1 one point at which 3 hexagons meet).
7			200 150 225 150 10	3	B3 cao (B2 for three correct, or B1 for one correct)
8	(a)(i)	Bearing measured	70	2	B1 70 ± 4
	(ii)	Bearing measured	317		B1 317 ± 4
	(b)	Locus (circle) drawn & shaded		2	B1 circle ±2 mm centre Manchester B1 shading with accurate or approximate circle within tolerance

PAPER 5504					
	No	Working	Answer	Mark	Notes
9	(a)		Plots	1	B1 cao
	(b)		Description	1	B1 dynamic relationship or "positive" (correlation)
	(c)		Line of best fit	1	Line within overlay region, and to the extent of.
	(d)(i)	280 g →	Reading	2	B1 ft from single straight line of positive gradient (±1/2 square) B1 ft from single straight line of positive gradient (±1/2 square)
	(ii)	120 pages →	Reading		
10	(a)	$\frac{1}{6}, \frac{3}{8}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$		2	B2 for all correct (B1 for 1 error or all correct but wrong order, or use of a common denominator decimals).
	(b)	3/5, 65%, 2/3, 0.72, 3/4		2	B2 for all correct (B1 for 1 error or all correct but wrong order or conversions to decimals oe)
11	(a)		182, 178, 180, 184	2	M1 mean of any three consecutive months, eg (147 + 161 + 238) ÷ 3 oe A1 cao
	(b)	Sale price = 80% Fun Friday price = 70% of 80% = 56% (oe)		2	B1 B1 for a fully correct explanation involving a worked example (oe) B1 a partially complete explanation

PAPER 5504					
	No	Working	Answer	Mark	Notes
12	(a)		Reason	1	B1 makes a mention of bias, either directly, or making reference to an insufficient or biased range of responses.
	(b)(i)		Reason	1	B1 make some mention of any one of (a) an insufficient range of responses (b) no mention of money (c) no time frame in the question (d) misunderstanding of "a lot" or "not much"
	(ii)		Question	2	B2 B1 for each of the following upto B2 (a) an improved question eg time frame made clear (b) response boxes (imperfect) (c) response boxes no errors OR For suggesting a generally improved question (a) a question clearly in the context of changes to the canteen (b) at least 3 boxes showing a full range of responses
13	(a)	$20y - 18y = 16 - 9$ oe $2y = 7$	$3\frac{1}{2}$ oe	3	M1 $20y - 18y = 16 - 9$ oe M1 $2y = 7$ A1 cao
	(b)	$40 - x = 3(4 + x)$ $40 - x = 12 + 3x$ $40 - 12 = x + 3x$ $4x = 28$	7	3	M1 multiplying through by 3: $3 \times \frac{40 - x}{3} = 3 \times 4 + 3 \times x$ A1 $40 - 12 = x + 3x$ A1 cao
14	(a)		$12(x\text{-}4)$	1	B1 for $12(x - 4)$ or $12x - 48$ or $12 \times x - 48$ oe $x = 12(x - 4)$ gets B0
	(b)		$18x\text{-}48$	2	M1 $6x +$ "$12(x - 4)$" or $6x +$ "$12x - 48$" A1 ft a linear expression $18x - 48$, $2(9x - 24)$, $3(6x - 16)$, $6(3x - 8)$

PAPER 5504					
No		**Working**	**Answer**	**Mark**	**Notes**
15		x $x^3 - 2x$ 4.1 60.7(21) 4.2 65.6(88) 4.3 70.9(07) Accept answer to 1 dp 4.22 66.7(114) or more 4.23 67.2(269) 4.24 67.7(45) 4.25 68.2(656)	4.2	4	B2 for trial $4.1 \leq x \leq 4.3$ evaluated (B1 for trial $4 < x < 5$ evaluated) B1 for different trial $4.225 \leq x \leq 4.25$ evaluated B1 (dep on at least one previous B1) for 4.2 cao
16	(a)		1.0×10^{-9}	1	B1 accept 1×10^{-9} or just 10^{-9}
	(b)	$1 \div 5 \times 10^{-9}$	2×10^{8}	2	M1 for $1 \div$ ("5×10^{-9}") or digit 2 with zeros only seen Condone omission of bracket for M1. A1 cao
17	(a)	$\frac{6.27 \times 4.52}{4.81 + 9.63} = \frac{28.3404}{14.44} = 1.962631579$	1.9626…	2	B2 for 1.9626… (B1 for 28.34 or 14.44)
	(b)		1.96	1	B1 ft from (a) as rounded to 1dp or 2dp. Do not accept 2, 2.00, but accept 2.0
18			$d = 4n + 6$	2	B2 $d = 4n + 6$ oe (B1 $d = 4n + k$, k an integer or 0, $4n + 6$, $n = 4n + 6$)
19		Vol = $\pi \times 3.8^2 \times 2.5 = \pi \times 14.44 \times 2.5$ = 45.36… × 2.5 = 113.411 Mass = "113" × 1.5 = 170.1165	170	4	M1 for $\pi \times r^2 \times 2.5$ where r = is 3.8 or 7.6 A1 if $r = 3.8$ M1 for "113" × 1.5 A1 for 169.5 – 170.3 cao

PAPER 5504					
	No	Working	Answer	Mark	Notes
20	(a)	$10^2 + 6^2$ or 136 $\sqrt{(100+36)}$ or $\sqrt{136} = 11.66\ldots$	11.7	3	M1 $10^2 + 6^2$ or 136 seen M1 (dep) $\sqrt{100+36}$ or $\sqrt{136}$ A1 11.66 – 11.7
	(b)	$\cos x = \frac{8}{10}$ or 0.8 $x = \cos^{-1} 0.8 = 36.869^\circ$	36.9	3	M1 for $\cos = \frac{8}{10}$, cos = 0.8 (oe) M1 (dep) for $\cos^{-1}$ (oe) A1 for 36.86 – 36.9
21		$18x - 6y = 99$ $\quad 12x - 4y = 66$ $8x + 6y = 18$ $\quad 12x + 9y = 27$ $26x = 117$ $\quad -13y = 39$	$x = 4\frac{1}{2}$ $y = -3$	4	M1 correct process to eliminate either x or y (condone one error) A1 cao for non – eliminated one. M1 (dep on 1st M1) for correct substitution of their found value. A1 cao (need both)
22		$\frac{133}{72} = 1.8472, \frac{160}{82} = 1.9512$ OR $\frac{72}{133} = 0.54135, \frac{82}{160} = 0.5125$ OR $\frac{160}{133} = 1.203...., \frac{82}{72} = 1.1388....$ OR $\frac{133}{160} = 0.83125...., \frac{72}{82} = 0.878$	1.84..≠ 1.95.. 1.20..≠ 1.13..	3	M1 for $\frac{133}{72}$ (= 1.8472…) oe Accept 1.8, 1.85 M1 for $\frac{160}{82}$ (=1.9512…) oe consistent pairing Accept 2.0, 1.9 **OR** M1 for $\frac{160}{133}$ (= 1.203…) oe M1 for $\frac{82}{72}$ (=1.1388) oe A1 for enough decimal places to show that the ratios are not equal; since the scale factors are different the shapes cannot be similar. NB Do Not need conclusion

PAPER 5504					
	No	Working	Answer	Mark	Notes
23	(a)		0.4, 0.6 0.4, 0.6, 0.4	2	B1 for LHS: (0.6), 0.4 B1 for RHS: 0.6, 0.4, 0.6, 0.4
	(b)	(30 × 42) – (25 × 42.8) = 1260 – 1070 = 190 190 ÷ 5 =	38	3	M1 for (30 × 42) – (25 × 42.8) or 1260 – 1070 or 190 seen M1 (dep) for "190" ÷ 5 A1 cao
24	(a)	£12000 × 0.25 = £3000; £12000 – £3000 = £9000 £9000 × 0.25 = £2250; £9000 – £2250 = £6750 £6750 × 0.25 = £1687.50; £6750 – £1687.50 =	£5062.50	3	M1 for 12000 × 0.75 (=9000) oe or £3000 or £23437.50 seen M1 (dep) for at least two further depreciation calculations (complete steps) A1 cao **OR** M2 for $12000 \times (0.75)^3$ or 5062.50 seen (M1 for $12000 \times (0.75)^n$, $n = 2$ or 4)
	(b)	0.8 × 0.8 × 0.8 × 0.8 (oe)	0.4096	2	M1 0.8^4 (oe) A1 cao

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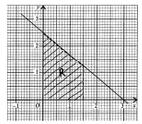
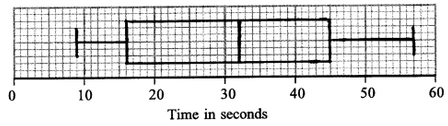
	No	Working	Answer	Mark	Notes
1	(a)(i) (ii) (b)	 LCM = 3 × 13 × 17 = 3 × 221	2.21 0.013 663	2 2	B1 for 2.21 B1 for 0.013 M1 for 3 × 13 × 17 oe A1 for 663
2			Tick boxes 1,3 & 6	3	B1 for $\frac{\pi abc}{2d}$; B1 for $2a^2$; B1 for $2(c^2 + d^2)$ (−B1 for each additional expression ticked (>3) to a minimum of 0)
3	(a) (b)	200 × 0.2 0.2 + 0.4	40 0.6	2 2	M1 for 200 × 0.2 or $\frac{40}{200}$ seen A1 for 40 M1 for 0.2 + 0.4 A1 for 0.6
4	(a) (b)	eg 2 | 108 2 | 54 3 | 27 3 | 9 3 12	$2^2 \times 3^3$ 12	3 1	M2 for full systematic method of at least 4 divisions by prime numbers oe factor trees; condone 1 calculation error (M1 for 108 written as a correct product with only one non-prime or equivalent division or a full process with 2 calculation errors.) A1 for $2^2 \times 3^3$ (accept 2 × 2 × 3 × 3 × 3) B1 for 12
5		Perpendicular from P to intersecting arcs (within tramlines); perpendicular at least 2 cm long		2	M1 relevant pair of arcs crossing within tramlines A1 SC M1A0 for full construction of a line perpendicular to AB not through P
6		15 × 10	150 cm^3.	3	M1 for 15 × 10 A1 for 150 B1 for cm^3

PAPER 5505					
	No	Working	Answer	Mark	Notes
7	(a)		k^3.	1	B1 for k^3.
	(b)(i)	$4x + 20 + 3x - 21$	$7x - 1$	4	M1 for **three** of 4 terms $4x + 20 + 3x - 21$ (or better) A1 for $7x - 1$
	(ii)	$x^2 + 3yx + 2xy + 6y^2$	$x^2 + 5xy + 6y^2$		M1 for **three** of 4 terms $x^2 + 3yx + 2xy + 6y^2$ A1 for $x^2 + 5xy + 6y^2$
	(c)		$(p+q)(p+q+5)$	1	B1 for $(p+q)(p+q+5)$
	(d)		m^8	1	B1 for m^8.
	(e)		$6r^3t^6$	2	B2 for $6r^3t^6$ (B1 for $.....r^3t^6$ or for $6....t^6$)
8	(i)	Least length = 100.5	100.5	2	B1 for 100.5
	(ii)	Greatest length = 101.5	101.5		B1 for 101.5; ACCEPT 101.499 or better
9		$6\frac{2}{5} = \frac{32}{5}$ Area of triangle = $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ (= 2) Length of a side of sq. = $\sqrt{18 \times "2"}$ (=6) Perimeter of square = 4 × 6	24	5	B1 for $6\frac{2}{5} = \frac{32}{5}$ oe or $3\frac{1}{5} = \frac{16}{5}$ oe or $\frac{30}{8} + \frac{2}{8}$ oe (or implied by area of triangle=2) M1 for $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ oe M1 for (area of square) = 18 × product of two lengths A1 = $\sqrt{18 \times "2"}$ A1 for 24

PAPER 5505					
	No	Working	Answer	Mark	Notes
10	(a)	$6y = 15 - 5x$	$y = \frac{15-5x}{6}$	2	M1 for either $6y = 15 - 5x$ or for $\frac{5x}{6} + y = \frac{15}{6}$ or $-6y = 5x - 15$ or a correct ft on sign error to $y =$ A1 for $y = \frac{15-5x}{6}$ oe
	(b)	$6k + 5(-21) = 15$	20	2	M1 for subst. of $x = -21$ (or $x = 21$) into given eq^n or answer to (a) A1 for $k = 20$
	(c)(i)		Region R indicated	3	B2 correct region shaded (accept unshaded if R clear) (B1 shaded (R) region satisfies 3 of the 4 given inequalities with same boundaries)
	(ii)		(1,1)		B1 for (1,1)
11	(a)		$y = 2x + 6$	2	B2 for $y = 2x + 6$ (B1 for $y = 2x + k$, $k \neq 1$ or for $y = mx + 6$, $m \neq 0$ or for $2x+6$)
	(b)	Grad of $AB = 2$; Grad of $BC = \frac{-1}{"2"}$	$y = -\frac{1}{2}x + 6$	2	M1 for Grad of $BC = \frac{-1}{"2"}, -\frac{1}{2}$ or grad of $BC = -\frac{1}{\text{grad of AB}}$ A1 ft for $y = -\frac{1}{2}x + 6$ oe ft on wrong coeff. of x in (a)
	(c)	Eg A rectangle is always a cyclic quadrilateral because the opposite angles of a rectangle always add up to 180° (90+90)		1	B1 for valid explanation. (eg lines from the pt of int. of diagonals of rect to all 4 vertices are equal(radii))
12		Vertices of new triangle at $(-1, -4)$ $(-4, 2)$ and $(2, 2)$	Correct triangle drawn	3	B3 cao (B2 for 3 correct vertices no triangle or triangle with 2 correct vertices (B1 for triangle with two of six co-ordinates correct from using P as centre or any isosceles triangle with base 6 and height 6)

PAPER 5505					
	No	Working	Answer	Mark	Notes
13	(a)		32	1	B1 for 32 (accept 31.5 to 33.5 inclusive)
	(b)			3	B1 for ends of whiskers at 9 and 57 (with a box) B1 for ends of box at 16 and 45/46 ($\pm$ 0.5) B1for median marked at "32"or complete box and whisker diagram drawn with a median inside the box
	(c)	Median(B)>Median(G); on average boys take longer IQR(B)>IQR(G); times for boys have a greater spread		2	B1 eg for comparison of medians (ft on diagrams) B1 eg for comparison of (interquartile) ranges (ft on diagram)
14		Reading top to bottom frequencies are 20; 18; 45; 52		2	B2 all correct (B1 for one frequency correct)
15	(a)	$1600 = p\,q^0$.; $400 = pq^2$ $q^2 = 0.25$	$p = 1600$ $q = 0.5$	3	M1 for either $400 = pq^2$ or $1600 = pq^0$ B1 for $p = 1600$ A1 for $q = 0.5$
	(b)	$V = pq^{-2}$	6400	2	M1 for recognition that t = –2 A1 for 6 400

PAPER 5505					
No		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	(I) $AB = AC$ (triangle ABC is isosceles) (II) PB = PC tangents (from a point to a circle are) equal (III) AP = AP (common side) so the 2 triangles are congruent ,SSS.		3	B3 for I, II, III with congruency reason (B2 for any two of I, II or III) (B1 for any one of the I, II or III)
	(b)	$BPC = 20°$ PBC (or PCB) = 90-1/2 "20" (= 80°) $BAC = PBC$ = "80"	50°	4	B4 for 50° (B3 for $BAC = 80°$) (B2 for $PBC = 80°$ or $PCB = 80°$) (B1 for $APC = 10°$ or $BPC = 20°$ or a middle angle = 90°) SC if clear numerical slip seen eg "PBC = 180 – 90 – 10 = 70" then goes on to get correct ft angle $ABC = 55$ deduct 1 from total so this cand would get B4–1 = B3
17	(a)	$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ $= \overrightarrow{OA} + \frac{2}{3}(6\mathbf{c} - 6\mathbf{a})$ $= 6\mathbf{a} + 4\mathbf{c} - 4\mathbf{a}$	$2\mathbf{a} + 4\mathbf{c}$	3	M1 for $\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ or any correct vector journey involving $\overrightarrow{OP}$ M1 for $\overrightarrow{AP} = \frac{2}{3}(6\mathbf{c} - 6\mathbf{a})$ oe or $\overrightarrow{CP} = \frac{1}{3}(-6\mathbf{c} + 6\mathbf{a})$ oe or reverse vectors A1 for $2\mathbf{a} + 4\mathbf{c}$ oe (accept unsimplified)
	(b)	Eg $\overrightarrow{OM} = \overrightarrow{OC} + \overrightarrow{CM} = 6\mathbf{c} + 3\mathbf{a}$ $\overrightarrow{OM} = 1.5\overrightarrow{OP}$	$\overrightarrow{OM} = 1.5\overrightarrow{OP}$ so OPM is a straight line	2	B1 for $\overrightarrow{OM} = 6\mathbf{c} + \frac{1}{2}(6\mathbf{a})$ or $\overrightarrow{PM} = 2\mathbf{c} + \mathbf{a}$ unsimplified or reverse vectors B1 for a fully correct proof.

PAPER 5505					
	No	Working	Answer	Mark	Notes
18	(a)		4	1	B1 for 4 condone $\pm$ 4
	(b)		2	1	B1 for 2 condone ± 2
	(c)	$\sqrt{160} = 4\sqrt{10}$; $\left[\frac{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)-\sqrt{2}\times\sqrt{5}}{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)}\right]\times 100$ $\left[\frac{6\sqrt{10}-\sqrt{10}}{6\sqrt{10}}\right]\times 100$	$\frac{500}{6}$	4	B1 for **either** $\sqrt{160} = 4\sqrt{10}$ or $\sqrt{8} = 2\sqrt{2}$ **or** $\sqrt{20} = 2\sqrt{5}$ M1 for $\left[\frac{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)-\sqrt{2}\times\sqrt{5}}{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)}\right]$ oe $(\times 100)$ B1 for either $6\sqrt{10} - \sqrt{10}$ or $6\sqrt{10}$ A1 for $\frac{500}{6}$ (accept 83.3 if no obvious earlier error)

PAPER 5505					
	No	Working	Answer	Mark	Notes
19	(a)(i)		$(2x-7)(x-14)$	3	M1 x^2 term and constant term (± 98) obtained or $2x(x-14) - 7(x-14)$ or $x(2x-7) - 14(2x-7)$ A1 for $(2x-7)(x-14)$
	(ii)		$x = \frac{7}{2}$; $x = 14$		B1ft ft (i) provided of form $(2x\pm a)(x\pm b)$
	(b)(i)		$\frac{7}{n+7}$	3	B1 for $\frac{7}{n+7}$ oe
	(ii)	$\frac{7}{n+7} = \frac{2}{5} \Rightarrow 2(n+7) = 5 \times 7$ $2n = 21$	$n=10.5$ is not possible since n has to be an integer		M1 for $2(n+7) = 5\times 7$ or $n+7=5\times 3.5$ (can be implied) ft (b)(i) fractional in terms of n and < 1 A1 ft for $n=10.5$ not possible (since n not integer) oe
	(c)	$2\times\left(\frac{n}{n+7}\right)\times\left(\frac{7}{n+7}\right) = \frac{4}{9}$ $14n\times 9 = 4(n+7)^2$ $14n\times 9 = 4(n^2+14n+49)$ $4n^2+56n+196-126n = 0$	$2n^2 - 35n + 98 = 0$	5	M1 for $\left(\frac{n}{n+7}\right)\times\left(\frac{7}{n+7}\right)$ seen M1 for $2\times\left(\frac{n}{n+7}\right)\times\left(\frac{7}{n+7}\right)$ oe $(=\frac{4}{9})$ M1(dep on 1st M) elimination of fractions within an equation B1 3 terms correct in expansion of $(n+7)^2 = n^2 + 7n + 7n + 49$ A1 full valid completion to printed answer

PAPER 5505					
	No	Working	Answer	Mark	Notes
	(d)	$\frac{7}{n+7}\times\frac{7}{n+7}=\frac{7}{21}\times\frac{7}{21}=$	$\frac{1}{9}$	2	M1 for $\frac{7}{n+7}\times\frac{7}{n+7}$ or better or ft [answer (b)(i)]^2 or $1-\frac{4}{9}-(\frac{n}{n+7})^2$ A1 for $\frac{1}{9}$ oe cao
20	(a)(i)		$y=1+\sin x$	2	B1 for $y=1+\sin x$
	(ii)		$y=2\sin x$		B1 for $y=2\sin x$ SC both (i) f(x) + 1, (ii) 2f(x) B1
	(b)	Stretch parallel to y-axis scale factor 3 Stretch parallel to x-axis scale factor $\frac{1}{2}$		3	M1 for 'stretch' A1 for Stretch parallel to y-axis scale factor 3 oe A1 for Stretch parallel to x-axis scale factor $\frac{1}{2}$ oe SC if M0 award BI for "sf 3 vertically" **and** "sf $\frac{1}{2}$ horizon."

PAPER 5506					
No		**Working**	**Answer**	**Mark**	**Notes**
1			Question	2	B1 for each of the following upto B2 (a) an improved question eg time frame made clear (b) response boxes (imperfect) (c) response boxes no errors OR For suggesting a generally improved question (a) a question clearly in the context of changes to the canteen (b) at least 3 boxes showing a full range of responses
2		Locus (circle) drawn & shaded		2	B1 circle centre Manchester ±2mm B1 shading with accurate or approximate circle within tolerance
3	(a)		182, 178, 180, 184	2	M1 mean of any three consecutive months, eg (147 + 161 + 238) ÷ 3 oe A1 cao
	(b)	Sale price = 80% Fun Friday price = 70% of 80% = 56% (oe)		2	B1 B1 for a fully correct explanation involving a worked example (oe) B1 a partially complete explanation
4		x $x^3 - 2x$ 4.1 60.7(21) 4.2 65.6(88) 4.3 70.9(07) 4.22 66.7(114) 4.23 67.2(269) 4.24 67.7(45) 4.25 68.2(656)	4.2	4	B2 for trial $4.1 \leq x \leq 4.3$ evaluated (B1 for trial $4 < x < 5$ evaluated) B1 for different trial $4.225 \leq x \leq 4.25$ evaluated B1 (dep on at least one previous B1) for 4.2 cao

PAPER 5506					
	No	Working	Answer	Mark	Notes
5	(a)		1.0×10^{-9}	1	B1 accept 1×10^{-9} or just 10^{-9}
	(b)	$1 \div (5 \times 10^{-9})$	2×10^{8}	2	M1 for $1 \div$ ("5×10^{-9}") or digit 2 with zeros only seen Condone omission of bracket for M1. A1 cao
6	(a)	$\frac{6.27 \times 4.52}{4.81 + 9.63} = \frac{28.3404}{14.44} = 1.962631579$	1.9626…	2	B2 for 1.9626… (B1 for 28.34… or 14.44)
	(b)		1.96	1	B1 ft from (a) as rounded to 1dp or 2dp. Do not accept 2, 2.00, but accept 2.0
7			$d = 4n + 6$	2	B2 $d = 4n + 6$ oe (B1 $d = 4n + k$, k an integer $\neq 6$, $4n + 6$, $n = 4n + 6$)
8		Vol = $\pi \times 3.8^2 \times 2.5 = \pi \times 14.44 \times 2.5$ $= 45.36\ldots \times 2.5 = 113.411$ Mass = "113" × 1.5 = 170.1165	170	4	M1 for $\pi \times r^2 \times 2.5$ where r = is 3.8 or 7.6 A1 if $r = 3.8$ M1 for "113" × 1.5 A1 for 169.5 – 170.3 cao

PAPER 5506					
	No	Working	Answer	Mark	Notes
9	(a)	$10^2 + 6^2$ or 136 $\sqrt{}(100 + 36)$ or $\sqrt{}136 = 11.66\ldots$	11.7	3	M1 for $10^2 + 6^2$ or 136 seen M1 (dep) $\sqrt{100+36}$ or $\sqrt{136}$ A1 11.66 – 11.7
	(b)	Cos x = 8/10 or 0.8 $x = \cos^{-1} 0.8 = 36.869^o$	36.9	3	M1 for cos = $\frac{8}{10}$, cos = 0.8(oe) M1 (dep) for $\cos^{-1}$ (oe) A1 for 36.86 – 36.9 M1 Use of sine rule and x found M1 for $x = 90 - \sin^{-1}$("0.8") A1 for 36.86 – 36.9
10		$18x - 6y = 99$ $12x - 4y = 66$ $8x + 6y = 18$ $12x + 9y = 27$ $26x = 117$ $-13y = 39$	$x = 4\frac{1}{2}$ $y = -3$	4	M1 correct process to eliminate either x or y (condone one error) A1 cao for non – eliminated one. M1 (dep on 1st M1) for correct substitution of their found value. A1 cao (need both)

PAPER 5506					
	No	Working	Answer	Mark	Notes
11		$\frac{133}{72} = 1.8472\,,\ \frac{160}{82} = 1.9512$ OR $\frac{72}{133} = 0.54135, \frac{82}{160} = 0.5125$ OR $\frac{160}{133} = 1.203...., \frac{82}{72} = 1.1388....$ OR $\frac{133}{160} = 0.83125...., \frac{72}{82} = 0.878$	1.84..≠ 1.95.. 1.20..≠ 1.13..	3	M1 for $\frac{133}{72}$ (= 1.8472…) oe Accept 1.8, 1.85 M1 for $\frac{160}{82}$ (=1.9512…) oe consistent pairing Accept 2.0, 1.9 **OR** M1 for $\frac{160}{133}$ (= 1.203…) oe M1 for $\frac{82}{72}$ (=1.1388) oe A1 for enough decimal places to show that the ratios are not equal; since the scale factors are different the shapes cannot be similar. NB Do Not need conclusion
12	(a)	£12000 × 0.25 = £3000; £12000 – £3000 = £9000 £9000 × 0.25 = £2250; £9000 – £2250 = £6750 £6750 × 0.25 = £1687.50; £6750 – £1687.50 =	£5062.50	3	M1 for 12000 × 0.75 (=9000) oe or £3000 or £23437.50 seen M1 (dep) for at least two further depreciation calculations (complete steps) A1 cao **OR** M2 for 12000 × $(0.75)^3$ or 5062.50 seen (M1 for 12000 × $(0.75)^n$, $n = 2$ or 4)
	(b)	0.8 × 0.8 × 0.8 × 0.8 (oe)	0.4096	2	M1 0.8^4 (oe) A1 cao

PAPER 5506					
No		**Working**	**Answer**	**Mark**	**Notes**
13		$r^2 = \frac{3\times10}{\pi h} = \frac{3\times10}{\pi 1.5} = \frac{3\times10}{4.712..} = 6.36, 6.37$ $r = \sqrt{6.366\ldots}$	2.52-2.54	3	M1 for correct rearrangement to give $r^2 = \frac{3V}{\pi h}$ or $30 \div 4.712..$ or $6.36 - 6.37$ *Allow 0.3, 0.33 for* $\frac{1}{3}$ M1 (dep) for $\sqrt{}$ A1 cao 2.52 – 2.54
14	(a)		0.4 0.6,0.4, 0.6,0.4	2	B1 for LHS: (0.6), 0.4 B1 for RHS: 0.6, 0.4, 0.6, 0.4
	(b)	0.6×0.6	0.36	2	M1 $0.6 \times$ "0.6" [0 < "0.6" < 1] A1 cao
	(c)	$(30 \times 42) - (25 \times 42.8) = (1260 - 1070 = 190$ $190 \div 5 =$	38	3	M1 for $(30 \times 42) - (25 \times 42.8)$ or $1260 - 1070$ or 190 seen M1(dep) for "190" ÷ 5 A1 cao 38

PAPER 5506					
	No	Working	Answer	Mark	Notes
15	(a)	$S = \frac{k}{f^2};\ 125 = \frac{k}{8^2};\ k = 8000$	$S = \frac{8000}{f^2}$	3	M1 for $S = \frac{k}{f^2}$ M1 for $125 = \frac{k}{8^2}$ A1 cao These marks can be awarded if the full formula appears in part (b), rather than in part (a). [SC: $S = \frac{125}{64} f^2$ M1 M0 A0, $S = 1.95(3125) f^2$ M1 M0 A0 $S = \frac{1000}{f}$ M1 M0 A0]
	(b)		500	1	B1 cao

PAPER 5506				
No	**Working**	**Answer**	**Mark**	**Notes**
16	$0.5 \times 3.2 \times 8.4 \times \text{Sin } B = 10$ $\sin B = 0.74404\ldots$ 48.077 $AC^2 = 3.2^2 + 8.4^2 - 2 \times 3.2 \times 8.4 \times \cos B$ $AC^2 = 44.8815\ldots..$ $AC = 6.69\ (936\ldots)$ Perimeter = 18.3 Use the altitude AD, $\frac{h \times 8.4}{2} = 10 \Rightarrow h = (2.381)$ $BD = \sqrt{3.2^2 - h^2} = 2.139$ $DC = 6.261$ $AC = \sqrt{2.38^2 + '6.261'^2} = 6.69(936)$ Perimeter = 18.3	18.3	6	M1 for $0.5 \times 3.2 \times 8.4 \times \sin B$ (= 10) A1 for sin B = 0.74(404…) or B = 47.7 – 48.1 M1 for $3.2^2 + 8.4^2 - 2 \times 3.2 \times 8.4 \times \cos$ "48.077" M1(dep) for AC^2 = "44.8(815)"….. with correct order of evaluation A1 AC = 6.69 – 6.7 A1 18.29 – 18.3 **for** $\frac{h \times 8.4}{2} = 10 \Rightarrow h = (2.381)$ M1 for $BD^2 = 3.2^2 - "2.381"^2$ A1 BD = 2.1 – 2.2 M1 (dep) $AC^2 = "2.381"^2 + "6.261"^2$ A1 AC = 6.69 – 6.7 A1 18.29 – 18.3

PAPER 5506					
	No	Working	Answer	Mark	Notes
17	(a)	$(x + 8)^2 = x^2 + (x + 5)^2$ $x^2 + 16x + 64 = 2x^2 + 10x + 25$		4	B1 for angle $OTA = 90°$ (implied by use of Pythagoras with OA as hypotenuse) M1 $(x + 8)^2 = x^2 + (x + 5)^2$ oe M1 for correct squaring of x+8 or x+5 A1 for completion following correct working
	(b)	$(+6 + \sqrt{(6^2 - - 4\times39)})/2$ $= (6 \pm \sqrt{(36 + 156)})/2$ $= (6 \pm \sqrt{192})/2 = (6 + 13.856)/2$	9.93	3	M1 for substitution into quadratic formula, allow sign errors in b and c M1 for $x = (6 \pm \sqrt{192})/2$ [+ alone will do] A1 for 9.92 – 9.93 M1 for $(x-3)^2-9-39$ M1 for $x = 3 \pm \sqrt{48}$ [+ alone will do it] A1 for 9.92 – 9.93 T&I= 9.93 gets M1,M0,A0
18		$EB = 60 \times \tan 30°$ $BD = \sqrt{(60^2 + 60^2)}$ $\tan BDE = 34.64 \div 84.85$ $EB = 60 \times \tan 30°$ (= 34.64) $ED^2 = 60^2 + (\frac{60}{\cos 30})^2$ $ED = \sqrt{8400} = (91.65)$ $\text{Angle} = \sin^{-1}\left(\frac{EB}{\sqrt{8400}}\right) = 22.2$	22.2°	4	M1 for $EB = 60\times\tan30$ M1 for $BD = \sqrt{(60^2 + 60^2)}$ M1 for $\tan BDE$ = "34.64" ÷ "84.85" A1 22.17 – 22.21 M1 for $EB = 60 \times \tan 30°$ oe M1 for fully correct method for ED M1 for $\sin BDE = \left(\frac{'34.84'}{'\sqrt{8400}'}\right)$(oe) A1 22.17 – 22.21

PAPER 5506					
	No	Working	Answer	Mark	Notes
19	(a)	$x^2 + 6^2 = 25$ $x^2 = -11$		2	M1 substitutes y=6 to get x^2+36 = 25 A1 deduces x^2=25-36<0; impossible, (so line does not intersect curve)
	(b)	$y^2 = (2x - 2)^2$ $x^2 + (2x - 2)^2 = 25$ $x^2 + 4x^2 - 8x + 4 = 25$ $5x^2 - 8x + 4 - 25 = 0$ $5x^2 - 8x - 21 = 0$ $(5x + 7)(x - 3) = 0$ or $x = \frac{--8 \pm \sqrt{(-8)^2 - 4 \times 5 \times (-21)}}{10} = \frac{8 \pm \sqrt{484}}{10}$ So $x = 3$, or $x = -1.4$ Subs into either equation gives: $y = 4$, or $y = -4.8$	$x = 3$ $y = 4$ $x = -1.4$ $y = -4.8$	6	M1 $y^2=(2x-2)^2$ seen or implied A1 $x^2 + 4x^2 - 8x + 4 = 25$ (oe expanded form) M1 correct attempt to solve 3 term quadratic equation A1 $x = 3$, $x = -1.4$ M1 (dep on previous Ms) Sub one value of x into either equation gives: A1 $y = 4$, $y = -4.8$ NB: incorrectly matched pairs loses the final A1.

PAPER 5506					
	No	Working	Answer	Mark	Notes
20	(a)	400.005 ÷ 59.95 = 6.672310 6.672310 ÷ 1000 × 3600 = 24.02032 399.995 ÷ 60.05 = 6.661032 6.661032 ÷ 1000 × 3600 = 23.97972	24.020 23.980	5	B1 for 400.005 or 59.95 seen oe M1 for "400.005" ÷ "59.95" where "400.005" ∈ [400.005,400.5] and "59.95" ∈ [59.5,59.95] oe B1 for 399.995 or 60.05 seen oe M1 for "399.995" ÷ "60.05" where "399.995" ∈ [399.5,399.95] and "60.05" ∈ [60.05,60.5] oe A1 23.979-23.980 and 24.020-24.0204
	(b)	24.0 because to 1dp the answers are the same		1	B1cao for 24.0 with reason
	(c)	177 × 50/477 = 18.553 → 19 → 18 111 × 50/477 = 11.635 → 12 86 × 50/477 = 9.0147 → 9 82 × 50/477 = 8.595 → 9 21 × 50/477 = 2.201 → 2	18 12 9 9 2	3	M1 for $\frac{50}{"477"} \times 177$ or 111 or 86 or 82 or 21 A1 for all integers or better answers, at least 3 correct A1 cao
21	(a)	$40 - x = 3(4 + x)$ $40 - x = 12 + 3x$ $40 - 12 = x + 3x$ $4x = 28$	7	3	M1 multiplying through by 3: $3 \times \frac{40 - x}{3} = 3 \times 4 + 3 \times x$ A1 $40 - 12 = x + 3x$ A1 cao
	(b)	$\frac{2x(2x - 3)}{(2x - 3)(2x + 3)} = \frac{2x}{2x + 3}$	$\frac{2x}{2x + 3}$	3	B1 for $(2x-3)(2x+3)$ B1 for $2x(2x-3)$ or $(2x + 0)(2x + 3)$ B1 cao

PAPER 5506				
No	**Working**	**Answer**	**Mark**	**Notes**
22	Distance from x axis is y. Distance from (0, 2) is $\sqrt{(x^2+(y-2)^2)}$ $y^2 = x^2 + (y-2)^2$ $y^2 = x^2 + y^2 - 4y + 4$ $0 = x^2 - 4y + 4$ $4y = x^2 + 4$ and finish		4	B1 for $(x-0)^2 + (y-2)^2$ or $\sqrt{((x-0)^2+(y-2)^2)}$ oe seen B1 for $y = \sqrt{(x-0)^2+(y-2)^2}$ or $y^2 = (x-0)^2 + (y-2)^2$ oe B1 $(y-2)^2 = y^2 - 4y + 4$ seen B1 for $4y = x^2 + 4$ and finish

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NOTES ON MARKING PRINCIPLES

1 Types of mark

- M marks: method marks
- A marks: accuracy marks
- B marks: unconditional accuracy marks (independent of M marks)

2 Abbreviations

cao – correct answer only
ft – follow through
isw – ignore subsequent working
SC: special case
oe – or equivalent (and appropriate)
dep – dependent
indep - independent

3 No working

If no working is shown then correct answers normally score full marks
If no working is shown then incorrect (even though nearly correct) answers score no marks.

4 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.
If there is no answer on the answer line then check the working for an obvious answer.

5 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

6 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

7 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

8 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

9 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		17252	1	B1 cao
	(b)		5400	1	B1 cao
	(c)		thousands, 1000, 4000	1	B1
2	(a)		grams, g	3	B1 oe spelling
			centimetres, cm		B1 oe spelling
			millilitres, m*l*, cm^3		B1 oe spelling
	(b)		5	1	B1 cao
3	(a)		106, 102	1	B1 cao ignore extras
	(b)		eg take away 4	1	B1 could be indicated on the diagram
	(c)		46	1	B1 cao

Paper 5521/01

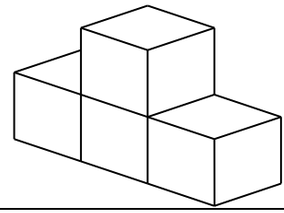
No	Working	Answer	Mark	Notes
4	286 × 43 = 858 + 11440 = 12298 43 × 286 = 258 + 3440 + 8600 = 12298 286×40 = 1140 286×3 = 858 1140+858=12298 x | 40 | 3 | 200 | 8000 | 600 | 8600 80 | 3200 | 240 | 3440 6 | 240 | 18 | 258 | | | 12298 2 8 6 1 | 08 | 32 | 24 | 4 2 | 06 | 24 | 18 | 3 2 9 8	12298	3	M2 for complete correct method (condone one computational error) (M1 for complete correct method with two computational errors) A1 cao OR B2 inside of grid completed (condone missing zeros and one error) (B1 2 or 3 errors) B1 cao
5 (a)		18, 69	1	B1
(b)(i)		18 or 36	1	B1
(ii)		16 or 36	1	B1
(c)		factor	1	B1
(d)(i)		18	3	B1 cao
(ii)		11 or 88		B1
(iii)		69		B1 cao

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		April & May	1	B1 for both
	(b)		Daffodil	1	B1
	(c)		Feb	1	B1
	(d)		Crocus	1	B1
	(e)(i)		$\frac{1}{5}$	2	B1 for $\frac{1}{5}$ oe
	(ii)		× from 56 mm to 64 mm from 0		B1 A single mark on the line, between 56 mm and 64 mm measured from end 0
7	(a)	$\frac{40}{100}$	$\frac{2}{5}$	2	B2 for $\frac{2}{5}$ B1 for $\frac{40}{100}$ or $\frac{4}{10}$ or $\frac{20}{50}$ or $\frac{8}{20}$
	(b)		0.98	1	B1 cao
	(c)		7 500 000	1	B1 cao
	(d)		25	1	B1 cao
	(e)		60	1	B1 cao

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
8	(a)(i)		(0, 2)	2	B1 cao
	(ii)		(4, 1)		B1 cao
	(b)		$(2, 1\frac{1}{2})$ marked	1	B1 Allow 2mm tolerance from $(2, 1\frac{1}{2})$
9	(a)		2.40	1	B1 cao could be indicated on the diagram
	(b)	1.60 + 0.40	2.00	2	M1 for appropriate sum or product in £ or p or 200 seen eg 1.60 + 0.40, 160 + 40, 0.80 + 0.80 + 0.40, 80 + 80 + 40, 0.08×25, 0.80×2.5, 200 A1 cao
	(c)	$1\div0.8$ or $2.50\div2$	1.25	2	M1 for $1.00\div0.8$ or $2.50\div2$ or 125 or appropriate combination eg $1+\frac{1}{2}\times0.50$ A1 cao
10	(a)		hexagon	1	B1 Condone spelling error
	(b)		Sum of angles at a point is 360°	2	B1 for 360 seen B1 for "point", "complete turn" or "a circle" or similar unless accompanied by an incorrect angle SC If neither B1 scored, award B1 for a clear indication that the size of an angle, other than *x*, is 90° or a right angle (may be on diagram)
	(c)	$30\times4+8\times2$	136	2	M1 $30\times4+8\times2$ or attempt to sum 5 or 6 lengths A1 cao

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		13, 67, 76, 103, 130	5	B1 cao
	(b)		$-7, -3, -1, 0, 5$		B1 cao
	(c)		0.07, 0.072,0.7, 0.702, 0.72		B1 cao
	(d)		0.6, $\frac{2}{3}$, 70%, $\frac{3}{4}$		B2 (B1 for any 3 in correct order)
12	(a)		16 30	1	B1 Accept 4 30 pm Do not accept 4 30
	(b)(i)	$33.56 \div 4$ oe	8.39	3	M1 for $33.56 \div 4$ oe eg $3356 \div 4$, division by 2 twice A1 cao
	(ii)		9		B1 ft from "8.39" unless whole number of pounds
13	(a)		6 cm^2	3	B2 for 6 cao for numerical answer (B1 for $5.5 < \text{Area} \leq 7$) then B1 (indep) for cm^2 with or without numerical answer
	(b)	See diagram	Correct shape	2	B2 (B1 for any 2 sides correct or a correct enlargement scale factor $\neq 1$ or 2)

Paper 5521/01				
No	**Working**	**Answer**	**Mark**	**Notes**
14 (a)	$(4+3)\times10$	70	2	M1 for (4 + 3) × 10 A1 cao
(b)	$120\div10-3$	9	2	M1 for $\frac{120}{10}$ or 12 seen eg $12\times10=120$ A1 cao
(c)		$C=10(n+3)$	3	B3 for $C=10(n+3)$ oe such as $C=(n+3)\times10$ (B2 for correct RHS or $C=n+3\times10$, $C=10n+3$ oe B1 for C = some other linear expression in n or for $n+3\times10$, $10n+3$ etc) Note: $C = n$ scores no marks
15		11 13 16 8 21	2	B2 all correct (B1 for 2 correct)

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		$2p + 4q$	2	B2 for $2p + 4q$ (accept $2 \times p$ etc) (B1 for $2p$ or $4q$)
	(b)		$2y^2$	1	B1 accept $2 \times y^2$ oe inc $2 \times y \times y$
	(c)		$3c + 4d$	2	B2 for $3c + 4d$ (accept $3 \times c$ etc) (B1 for $3c$ or $4d$)
	(d)		$8pq$	1	B1 accept in any order but must not include $\times$ sign
17	(a)(i)		60	2	B1 cao
	(ii)		eg top triangle is equilateral		B1 for reason
	(b)		150	2	M1 for $\frac{180 - "60"}{2} + 90$ A1 ft from (a)(i) if $x < 90$ SC B1 for "60" + 90 if $x < 90$
18			40	2	M1 for 60×2 or 120 or $60 \div 3$ or 20 or $\frac{120}{180}$ A1 cao
19			correct drawing	2	B2 Condone hidden detail shown with solid lines and missing lines on front face (B1 for a correct sketch with other incorrect sketch(es) or for prism with correct cross section >1 cube wide or for attempt to draw prism with correct cross section or prism with correct plan and side elevation)

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
20		$\frac{600}{3\times10}$ or $\frac{640}{3.2\times10}$	$20\text{-}21\frac{1}{3}$	2	M1 for rounding at least two of the numbers to 1 sf or for sight of 640, 3.2 or 640, 32 or 600, 32 or 30 seen A1 for $20\text{-}21\frac{1}{3}$ Note: 20.3125 scores M0 A0
21	(a)		Points plotted	1	B1 $\pm$ 1 full (2 mm) square
	(b)		positive	1	B1 cao
	(c)		Line of best fit	1	B1 Must pass through (42.5, 1.45), (42.5, 1.55) AND (67.5, 1.75), (67.5, 1.85)
	(d)		~ 1.65	1	B1 ft from single line segment with positive gradient $\pm$ 1 full (2 mm) square
22	(a)	eg $50\times\frac{2000}{500}$	200	2	M1 for $\frac{2000}{500}$ or 4 seen A1 cao
	(b)	eg $400\times\frac{750}{500}$	600	2	M1 for $\frac{750}{500}$ or 1.5 seen or 400 + 200 A1 cao

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
23	(a)	$4\times3-2\times1$ $12-2$	10	3	M1 for 3×4 (=12) or 1×2 or attempt to divide diagram up into rectangles M1 "12"– "2" or sum of areas of rectangles A1 cao
	(b)(i)	$\frac{10}{100}\times680$ or $680\div10$ 680 + 68	748	5	M1 $\frac{10}{100}\times680$ or 680÷10 or 68 seen M1 (dep) 680 + "68" or M2 for 680×1.10 A1 cao
	(ii)	"748"÷50 or 14.96	15		M1 For "748"÷50 or 14.96 Accept "748" rounded up or down to next 50 followed by $\div50$ A1 ft from (b)(i) rounded up SC B1 for 680 (seen) leading to 14

Paper 5521/02					
No		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	Plain llll lll 8 Chicken lll 3 Bovril llll 5 S & Vin llll 4		3	M1 for attempt to tally A1 for 1 frequency correct or all tallies correct A1 for all frequencies correct (accept for /20)
	(b)		4	1	B1 ft
	(c)		Plain or 8	1	B1 ft
2	(a)(i)		11	2	B1 cao
	(ii)		16		B1 cao
	(b)	See diagram	Correct lines	2	B2 cao for both lines correct (B1 for one line correct)
	(c)		12	2	B2 cao (B1 for 11 or 13)
3	(a)		580	1	B1 for 580 (± 2) could be written on line
	(b)		7.2	1	B1 for 7.2 ± 0.02 could be written on line
	(c)		Arrow at 48	1	B1 allow ± half graduation
	(d)		Arrow at 6.7	1	B1 allow ± half graduation
4	(i)		Cylinder	2	B1 ignore spelling
	(ii)		Cuboid		B1 ignore spelling
5	(a)	£10 – (£2.15 + £2.30)	5.55	4	M1 £2.15 + £2.30 A1 for 4.45 M1 £10 – "4.45" A1 cao
	(b)	£60 ÷ £2.80 = 21.42857	21	2	M1 for £60 ÷ 2.80 or sight of digits 214… A1 for 21
	(c)	$120 \times 25 \div 100$	30	2	M1 ¼ of £120 (oe) A1 cao SC B2 for £90

Paper 5521/02					
No		Working	Answer	Mark	Notes
6	(a)(i)		143^0	2	B1 for 143 ($\pm 2^0$)
	(ii)		Obtuse		B1 for obtuse (ignore spelling)
	(b)	See diagram	Accurate drawing	1	B1 for accurate drawing ± 2mm
7	(a)(i)		5	2	B1 cao
	(ii)		23		B1 cao
	(b)	$\times 2 - 1$		1	B1 for explaining a suitable method
	(c)	See their diagram		1	B1 for a correct diagram
	(d)		14, 17	2	B2 cao for both (B1 for one only ft from their 14)
8	(a)		90	1	B1 accept –90
	(b)		540	1	B1 accept –540
	(c)		Jupiter	1	B1 accept –150
	(d)		- 230	1	B1 cao

Paper 5521/02					
No		Working	Answer	Mark	Notes
9	(a)	2658 – 2430 = 228 "228" × 32	72.96	4	M1 2658 – 2430 A1 228 M1 "228" × 32 or "228" × 0.32 or digits 7296 seen A1 cao **Or** M1 for 2430 × 32 (or digits 77760 seen) or 2658 × 32 (or digits 85056 seen) A1 if 1 correct M1 for "85056" – "77760" or 7296 seen A1 cao
	(b)	$\frac{2}{5} \times 145 = 58$ 145 – "58"	87	3	M1 $\frac{2}{5} \times 145$ (or M1 $\frac{3}{5}$ seen) A1 58 (or M1 $\frac{3}{5} \times 145$) A1 for 87 ft
	(c)(i) (ii)		80 125	2	B1 for 80 (± 1) B1 125 (± 3)

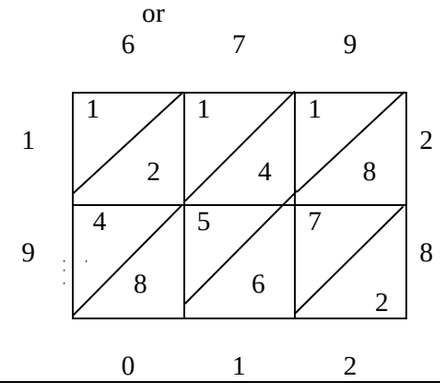
Paper 5521/02					
No		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		1.5 – 2.0	1	B1 for height between 1.5m – 2.0m inclusive
	(b)	Height of man × "2.5"	3 – 6	3	B3 for height between 3m – 6m inclusive (B2 for multiplying (a) by a number between 2 and 3 inclusive) (B1 for multiplying (a) by a number)
11		61 – 19 = 42 42 ÷ 3 = 14	14	2	M1 for – 19 or 42 seen A1 cao
12	(a)		5	1	B1
	(b)	4+5+5+5+4+3+2+1+4+5 = 38 mean = 38 ÷ 10 = 3.8	3.8	2	M1 for attempt to add and ÷ 10 or 3.7 or 3.9 seen A1 for 3.8 SC B1 for 33.5 seen
13	(a)		$3x$	1	B1 cao Accept $3 \times x$, $x3$, $x \times 3$, $x + x + x$
	(b)		x - 9	1	B1 for x – 9 cao
14	(a)	14.44 – 8.660254038	5.77974(…)	2	M1 for 14.44 seen or 8.66(…) or 5.7 or 5.8 or better rounded or truncated
	(b)		6	1	A1 cao B1 ft
15		15 ÷ 24	62.5	2	M1 for 15 ÷ 24 or 1500 ÷ 24 or sight of digits 625 A1 cao
16		2.10 × 450	945	2	M1 for digits 210 × 450 or sight of digits 945 A1 cao
17		See diagram	$2(y + y)$ $2y + 2y$	2	B1 for $2(y + y)$ B1 for $2y + 2y$ (Deduct B1 for each additional tick (>2) to min 0)
18		360° ÷ 18 (=20) Sector angles: G= 60; S= 80; B=220; Correct sectors labelled correctly Use angle measurer	Angles drawn, labelled	4	B4 for fully correct and labelled pie chart (B3 for all angles correct or for a labelled pie chart with 2 correct angles) (B2 for labelled pie chart with 1 correct angle drawn) (B1 for 360° ÷ 18 or 20 seen or implied)

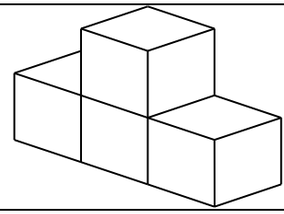
Paper 5521/02					
No		Working	Answer	Mark	Notes
19	(a)		Correct plane	2	B2 for a correct plane defined by showing at least 2 lines. (B1 for a line of symmetry on one face)
	(b)		Correct net	2	B2 cao (B1 for 2 equilateral triangles joined appropriately to at least one rectangle or for 1 equilateral triangle joined appropriately to one of 3 rectangles)
	(c)		Correct drawing	2	B1 for two extra sides of length 6cm (± 2mm) B1 for construction arcs 6cm from each of the ends of the given line.
20	(a)		15	1	B1 for 15 (± 1)
	(b)		15	1	B1 for 15 (± 0.4)
	(c)			2	B1 horiz. line from (2, 20) to (3, 20) B1 line from (3, 20) to (5,0) or horizontal translation of it SC B1 for any journey ending at (5,0)
21	(a)	$x+4+x+x+4+x$	$4x+8$	2	M1 for attempting to add x, $x + 4$, x, $x + 4$ may be implied by $4x + a$ ($a > 0$) A1 for $4x + 8$ or $4(x + 2)$
	(b)	$4x + 8 = 54$ $4x = 46$ $x = 11.5$ Length = "11.5" + 4	15.5	3	M1 for "$4x + 8$" = 54 A1 cao for 11.5 seen B1 ft for "11.5" + 4
22		0.4 + 0.15 1 – "0.55"	0.45	2	M1 for 1 – sum A1 for 0.45 o.e. SC B1 for 0.81
23	(a)		3:1	1	B1 cao
	(b)	$\pi \times 2.45$	7.7	2	M1 for $\pi \times 2.45$ (accept π as 3.1 or better) A1 for 7.59 to 7.70

Paper 5521/02					
No		**Working**	**Answer**	**Mark**	**Notes**
24		7×10000	70 000	2	M1 for 7 X 10 000 or 7 X 100 X 100 A1 cao
25		5.40 ÷ 3 × 7	12.60	3	M1 for 5.40 ÷ 3 or sight of 1.8 M1 dep for "1.80" × 7 A1 for 12.6 or equivalent
26		7.60 x $\frac{17.5}{100}$ = 1.33 7.60 + 1.33 = 8.93 1650 x "8.93"	£14 734.50	4	M1 for 7.60 x $\frac{17.5}{100}$ or 1.33 seen or 7.60 x 1.175 (oe) (Award M1 for 10%, 5% and 2½% correctly calculated) A1 for 8.93 or 893 M1 for 1650 x "8.93" or digits 147345 seen A1 cao Accept 14734.5 **Alternative** M1 for 1650 × 7.6(0) or 12540 seen M1 for "12540" × $\frac{17.5}{100}$ or 2194.5 seen or "12540"× 1.175 (oe) (Award M1 for 10%, 5% and 2½% correctly calculated) M1 for "12540" + "2194.5" (dep on both previous method marks) or digits 147345 seen A1 cao accept 14 734.5

Paper 5523/03				
No	**Working**	**Answer**	**Mark**	**Notes**
1		Correct shape	2	B2 B1 for any 2 sides correct, or a correct enlargement scale factor ≠1 or 2.
2 (a)		11 13 16 8 21	2	B2 all correct (B1 for 2 correct) sign
(b)		$\frac{31}{80}$	1	B1 oe
3 (a)		$2p+3q$	2	B2 for $2p+3q$ (accept $2\times p$ etc) (B1 for $2p$ or $3q$ or $2p3q$)
(b)		$2y^2$	1	B1 accept $2\times y^2$ or $2\times y\times y$
(c)		$3c+4d$	2	B2 for $3c+4d$ (accept $3\times c$ etc) (B1 for $3c$ or $4d$ or $3c4d$)
(d)		$8pq$	1	B1 accept in any order but must not include ×
4 (a)(i)		60	2	B1 cao
(ii)		eg top triangle is equilateral		B1 for reason
(b)		150	2	M1 $\frac{(180-"60")}{2}+90$ A1 ft from (a)(i) if $x < 90°$ SC:B1 for answer from "60" + 90 if $x < 90°$

Paper 5523/03					
No		Working	Answer	Mark	Notes
5	(a)	$4\times3-2\times1$ $12-2$	10	3	M1 for 3×4 (=12) or 1×2 or attempt to divide diagram up into rectangles M1 "12" – "2" A1 cao
	(b)(i)	$\frac{10}{100}\times680$ or $680\div10$ 680 + 68	748	5	M1 $\frac{10}{100}\times680$ or $680\div10$ or 68 seen M1 (dep) 680 +"68" (or M2 for 680×1.10) A1 cao
	(ii)	"748" ÷ 50 or 14.96	15		M1 for "748" $\div50$ or 14.96; accept "748" rounded up or down to next 50 followed by $\div50$ A1 ft from (b)(i) rounded up SC B1 for 680 (seen) leading to 14
6	(a)	$2\times5+5\times-3=10-15=$	-5	2	M1 substitute e.g 2×5 and 5×-3 or 10 and -15 A1 cao
	(b)	5×4^2 - 7 5×16 - 7	73	3	M1 substitution e.g 5×4^2 -7; do not accept 54^2-7 M1 $5\times16-7$ or $5\times4\times4$-7 or 80 – 7 (NB 4^2 as 4×4) A1 cao

Paper 5523/03					
No		**Working**	**Answer**	**Mark**	**Notes**
7		679 × 28 = 5432 + 13580 = 19012 or 28 × 679 = 252 + 1960 + 16800 = 19012 or  	190.12	3	M1 for an attempt to multiply the units and tens, or correct partitioning M1 complete correct method (condone one arithmetic error) A1 for 190.12 cao OR M1 for putting the numbers in a grid M1 for multiplying out and addition (condone one error) A1 answer shown with point OR M1 for correct partitioning M1 679×20 and 679×8 calculated oe (condone one error) A1 cao
8	(a)		Points plotted	1	B1 ±1 full (2mm) square
	(b)		positive	1	B1 cao
	(c)		Line of best fit	1	B1 must pass through (42.5, 1.45), (42.5, 1.55) AND (67.5, 1.75), (67.5, 1.85)
	(d)		approx 1.65	1	B1 ft from single line segment with positive gradient ± 1 full (2mm) square

Paper 5523/03					
No		**Working**	**Answer**	**Mark**	**Notes**
9	(a)	eg $50 \times \frac{2000}{500}$	200	2	M1 $2000 \div 500$ or 4 seen A1 cao
	(b)	eg $400 \times \frac{750}{500}$	600	2	M1 $750 \div 500$ or 1.5 seen or 400 + 200 A1 cao
10			$C = 10(n+3)$	3	B3 for $C = 10(n+3)$ oe such as $C = (n+3) \times 10$ (B2 for correct RHS or $C = n + 3 \times 10$, $C = 10n + 3$ etc B1 for C = some other linear expression in n or $n + 3 \times 10$, $10n + 3$ etc) NB: C=n scores no marks
11	(a)		$p(p+6)$	2	B2 for $p(p+6)$ or $p \times (p+6)$ (B1 for $p(ap+b)$ where a,b are numbers or $p+6$ seen on it's own, or part of an expression)
	(b)	$x^2 - 4x + 7x - 28$	$x^2 + 3x - 28$	2	M1 for 4 terms correct ignoring signs (e.g $x^2, 4x, 7x, 28$) or 3 terms with correct signs (e.g $x^2, -4x, 7x, -28$) A1 cao
12			correct drawing	2	B2. Condone hidden detail shown with solid lines, or missing lines on front face. (B1 for : one sketch correct with other sketches incorrect cross-section correct with depth > 1 cube, correct plan and side elevation)

Paper 5523/03					
No		**Working**	**Answer**	**Mark**	**Notes**
13		$\frac{600}{3\times10}$ or $\frac{640}{3.2\times10}$	20 to 21 $\frac{1}{3}$	2	M1 For rounding at least two of the numbers to 1 sf, or for sight of 640, 3.2 or 640, 32 or 600, 32 or 30 seen A1 for 20 to 21 $\frac{1}{3}$ NB: 20.3125 scores M0 A0
14	(a)		correct reflection	2	B2 (B1 reflection in line other than x=3)
	(b)		reflection in $y = x$	2	B2 cao Accept the word "reflected" (B1 any statement including the word "reflection")
15	(a)(i)		5^6	1	B1 accept 15125, 5^{4+2}
	(ii)		5^3	1	B1 accept 125, 5^{9-6}
	(b)	$x + y = 10$ and $x - y = 4$	$x = 7$ $y = 3$	3	M1 for either $x + y = 10$ or $x - y = 4$ A2 for both values correct [(A1 for one value correct) If M0, award B3 for both values correct or B2 for one value correct, otherwise B0] SC B2 for $x = 3$ and $y = 7$

Paper 5523/03				
No	**Working**	**Answer**	**Mark**	**Notes**
16 (a)	$5-3x=2x+2$ $5-2=2x+3x$	$\frac{3}{5}$	3	B1 for $2x+2$ seen OR $2.5-1.5x=x+1$ M1 for correct rearrangement of 4 terms A1 for $\frac{3}{5}$ oe
(b)		$-3,-2,-1,0,1,2$	2	B2 (B1 for 5 correct and not more than one incorrect integers)
17		question + response boxes oe	2	1st aspect: One question with time period (eg each night); ignore other questions. 2nd aspect: Response list (at least two), not overlapping.* 3rd aspect: Some mention of units (eg hours) in either question or responses Award B2 for all three aspects, or B1 for just two aspects. * 0-1, 2-3, 4-5 is OK, but 0-1, 1-2, 2-3 is not OK.

Paper 5523/03				
No	**Working**	**Answer**	**Mark**	**Notes**
18 (a)	$\frac{2}{3}\times\frac{3}{4}=\frac{6}{12}$	$\frac{1}{2}$	2	M1 for $\frac{6}{12}$ or $\frac{3}{6}$ or $\frac{2\times3}{3\times4}$ A1 accept 0.5
(b)	$1+2+\frac{8}{12}+\frac{9}{12}$	$4\frac{5}{12}$	3	M1 for attempt to convert to fractions with common denominator e.g two fractions, denominator of 12 A1 correct conversion : $\frac{8}{12}$ and $\frac{9}{12}$, or $\frac{20}{12}$ and $\frac{33}{12}$ seen (oe) A1 cao for $4\frac{5}{12}$ OR attempts to convert to decimals: must use at least 2dp M1 0.66+0.75 (or 1.66+2.75) or 0.67+0.75 etc A1 4.41, 4.417, 4.416 A1 4.416 (*recurring*)
19	$2\times\frac{1}{2}\times6\times8$ or 48 $8\times9+6\times9+10\times9$ or 72 +54 + 90	264 cm^2	4	M1 attempt to find the area of one face; $\frac{1}{2}\times6\times8$ or (8×9) or (6×9) or (10×9) or 72 or 54 or 90 or 24 M1 all five faces with an intention to add A1 cao numerical answer of 264 B1 (indep) cm^2 with or without numerical answer

Paper 5523/03					
No		**Working**	**Answer**	**Mark**	**Notes**
20			$\frac{\pi ab^3}{3d}$ $3(c+d)^3$ $3\pi bc^2$	3	B3 (B1 for each one correct) Nb –B1 for each of the 4th,5th,6th tick
21	(a)	$x+0.3+0.2+x=1$	0.25	2	M1 for $x+0.3+0.2+x=1$ oe, or $0.5\div 2$ A1 oe
	(b)	0.3×200	60	2	M1 0.3×200 A1 cao Accept 60 out of 200 (in words) SC B1 for $\frac{60}{200}$
22	(a)		$(-12)-4$ -2 $(0)8$	3	B3 for all correct [(B1 for each one correct)
	(b)		points plotted accurately points joined with smooth curve	2	B1 ± 1 full (2mm) square ft table if at least B1 awarded (all 5 points plotted) B1 ft for any smooth curve if previous B1 gained NB: curve must pass within 1 full square of the points
23			$\frac{1}{4}$ on LH branch $\frac{2}{3}$ & $\frac{1}{3}$ & $\frac{2}{3}$ on RH branches	2	B1 B1
24			m=3 n=5	2	B1 for 3 B1 for 5 (B2 for $2^3\times 5$ or $2\times 2\times 2\times 5$) SC: award B1 only if m=5, n=3 or for 8×5 seen

Paper 5523/03					
No		Working	Answer	Mark	Notes
25		$\frac{5--1}{-1-2} = -2$	$y = -2x + 5$	4	M1 for clear attempt to find gradient eg fraction with -1,5 in numerator, 2,-1 in denominator A1 for -2 B2 ft for $y =$"-2"$x + 5$ oe (eg $y = \frac{-6}{3}x + 5$) (B1 for $y = mx + 5$ or , $-2x+5$ or $y =$"-2"$x + c$)
26	(a)(i)		150	2	B1 accept 150 or 210
	(ii)				B1 for angle at the centre is twice the angle at the circumference
	(b)	$360 - 90 - 90 -$"150"	30	3	B1 identifies angle between radius and tangent as $90°$ (may be in working or on diagram) M1 $360° - 90 - 90 -$"150" A1 ft from (a)(i) excluding a negative answer OR B1 for 90 M1 for $2 \times (180 - 90 -$"$\frac{150}{2}$"$)$ A1 ft from (a)(i) excluding a negative answer OR B3 for $180 -$(a)

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	14.44 – 8.660254038	5.77974(….)	2	M1 for 14.44 seen or 8.66(……) seen or 5.7 or 5.8 or better, rounded or truncated A1 cao
	(b)		6	1	B1 ft
2		15 ÷ 24	62.5	2	M1 for 15 ÷ 24 or 1500 ÷ 24 or sight of digits 625 A1 cao
3	(a)	2.10 × 450	945	2	M1 for digits 210 × 450 or sight of digits 945 A1 cao
	(b)	63÷2.10	30	2	M1 for 63 ÷ digits 210 A1 cao
4		See diagram	$2(y + y)$ $2y + 2y$	2	B1 for $2(y + y)$ B1 for $2y + 2y$ (Deduct B1 for each additional tick (>2) to min 0)
5		$360^o \div 18$ (=20) Sector angles: G= 60; S= 80; B=220; Correct sectors labelled correctly Use angle measurer	Angles drawn, labelled	4	B4 for fully correct and labelled pie chart (B3 for all angles correct or for a labelled pie chart with two angles correct) (B2 for labelled pie chart with one correct angle drawn) (B1 for $360 \div 18$ or 20 seen or implied)
6	(a)		Correct plane	2	B2 for a correct plane defined by showing at least 2 lines. (B1 for a line of symmetry on one face)
	(b)		Correct net	2	B2 cao (B1 for 2 equilateral triangles joined appropriately to at least one rectangle or for 1 equilateral triangle joined appropriately to one of the three rectangles)
	(c)		Correct drawing	2	B1 for two extra sides of length 6 cm (± 2mm) B1 for construction arcs 6cm from each of the ends of the given line
7		61 – 19 = 42 42 ÷ 3 = 14	14	2	M1 for –19 or 42 seen or $3x + 19$ A1 cao

Paper 5523/04					
No		Working	Answer	Mark	Notes
8	(a) (b) (c)		15 15	1 1 2	B1 cao for 15(±1) B1 cao for 15(±0.4) B1 horiz. line from (2,20) to (3,20) B1 line from (3,20) to (5,0) or horiz. translation of it SC: B1 for any journey ending at (5,0)
9	(a)	$x+4+x+x+4+x$	$4x+8$	2	M1 for attempting to add $x+4, x, x+4, x$ may be implied by $4x+a$, $a>0$ A1 for $4x+8$ or $4(x+2)$
	(b)	$4x + 8 = 54$ $4x = 46$ $x = 11.5$ Length = "11.5" + 4	15.5	3	M1 for "$4x + 8$" = 54 A1 cao for 11.5 seen B1 ft for "11.5"+ 4
10		0.4 + 0.15 1 – 0.55	0.45	2	M1 for 1 – sum A1 for 0.45 oe SC: B1 for 0.81
11	(a) (b)	 $\pi \times 2.45$	3:1 7.7	1 2	B1 cao M1 for $\pi \times 2.45$ (accept π as 3.1 or better) A1 for 7.59 to 7.70
12		7×10000	70000	2	M1 for 7×10000 or $7 \times 100 \times 100$ A1 cao
13		$5.40 \div 3 \times 7$	12.60	3	M1 for $5.40 \div 3$ or sight of 1.8 M1 (dep) for "1.80" × 7 A1 for 12.6 or equivalent

Paper 5523/04				
No	**Working**	**Answer**	**Mark**	**Notes**
14	$7.60 \times \frac{17.5}{100} = 1.33$ 7.60 + 1.33 = 8.93 1650 × "8.93"	£14734.50	4	M1 for $7.60 \times \frac{17.5}{100}$ or 1.33 seen or 7.60 ×1.175 (oe) (Award M1 for 10%, 5% and 2½% correctly calculated) A1 for 8.93 or 893 M1 for 1650 × "8.93" or digits 147345 seen A1 cao Accept 14734.5 OR M1 for 1650×7.6 or 12540 seen M1 for "12540" $\times \frac{17.5}{100}$ or 2194.5 seen or "12540"×1.175 (oe) (Award M1 for 10%, 5%, and 2½% correctly calculated) M1 for "12540" + "2194.5" (dep on both previous M marks) or digits 147345 seen A1 cao accept 14734.5

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
15		$285 \times 1000/(60 \times 60) = 79.1\dot{6}$		3	M2 for $285 \times 1000 \div 60 \div 60$ or $80 \times 60 \times 60 \div 1000$ or for a correct method to obtain two comparable values e.g $80 \times 60 \times 60$ and 285×1000 (M1 for $285 \div 60 \div 60$ or 0.079(….) seen or $80 \times 60 \times 60$ or 288000 seen or for 285×1000 or 285000 seen or $80 \div 1000$ or 0.08 seen) A1 for 288 or 79.(….) or for two correctly calculated comparable values e.g 288000 and 285000
16	(a)	$4x + 12 = 6$ $4x = -6$	-1.5	3	B1 for $4x + 12$ or $x + 3 = \frac{6}{4}$ M1 for a correct re-arrangement of their 3 terms to isolate $4x$ or x A1 for -1.5 oe
	(b)	$v - u = 5t$	$\frac{v-u}{5}$	2	M1 for isolating $\pm 5t$ or $\pm t$ or for dividing through by 5 A1 oe

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
17		3→15 4→48 3.1→17.3(91) 3.2→19.9(68) 3.3→22.7(37) 3.4→25.7(04) 3.5→28.8(75) 3.4→25.7(04) 3.3→22.7(37) 3.35→24.1(95375)	3.3	4	B2 for trial between 3.3 and 3.4 inclusive (B1 for trial between 3 and 4 inclusive) B1 for different trial between 3.3 and 3.4 exclusive B1 (dep on at least one previous B1) for 3.3 NB trials should be evaluated to at least 1 dp truncated or rounded
18	(a)	36 ÷ (7+3+2) "3" × 7	21	3	M1 for 36 ÷ (7+3+2) M1 (dep) for "3" × 7 or 3 or 2 A1 cao
	(b)	$51.5 \times \frac{8.5}{100} = 4.3775$ 51.5 – 4.3775 = 47.1225	47 or 47.1 or 47.12	4	M1 for $51.5 \times \frac{8.5}{100}$ or 4.37(75) seen M1 (dep) for 51.5 – "4.37(75)" A1 for 47 or better B1 (indep) for rounding their answer correctly to the nearest whole number or 1 or 2 d.p OR M1 for $51.5 \times \frac{100-8.5}{100}$ M1 for $51.5 \times$"0.915" or 0.515 × "91.5" A1 for 47 or better B1 (indep) for rounding their answer correct to the nearest whole number or 1 or 2 d.p

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
19	(a)		Angle in a semicircle	1	B1 oe
	(b)	$12^2 + 16^2 = 400$ $\sqrt{400} = 20$	20	3	M1 for $12^2 + 16^2$ M1 for $\sqrt{144+256}$ A1 cao
	(c)	$\pi \times 10^2$	314	3	M1 for $\pi \times \left(\frac{"20"}{2}\right)^2$ M1 (indep) for correct order of evaluation of $\pi \times r^2$ for any r A1 for 314 – 315 inclusive

Paper 5523/04					
No		Working	Answer	Mark	Notes
20	(a)	$(1 \times 10)+(3 \times 15)+(5 \times 30)+(7 \times 35)+$ $(9 \times 25)+(11 \times 5) = 730$ "730" ÷ 120 = 6.08333	6.08	4	M1 for use of *fx* with *x* consistent within intervals (including end points) M1 (dep) for use of midpoints M1 (dep on 1st M1) for use of $\frac{\sum fx}{\sum f}$ A1 6.08 to 6.085
	(b)		(10),25,55,90,115, 120	1	B1 for all correct
	(c)		graph	2	B1 ft for 5 or 6 points plotted correctly ± 1 full (2mm) square at the end of interval dep on sensible table (condone 1 addition error) B1(dep) for points joined by curve or line segments provided no gradient is negative – ignore any part of graph outside range of their points. (SC: B1 if 5 or 6 points plotted not at end but consistent within each interval and joined)

Paper 5523/04				
No	**Working**	**Answer**	**Mark**	**Notes**
(d)		72–74	2	M1 (ft dep on graph being cf) for reading from graph at 7 A1 ft ±1 full (2 mm) square Or B2 for $72-74$
21 (a) (b) (c) (d)		a^7 $15x^3y^4$ $x-1$ $(x+3)(x-3)$	1 2 1 1	B1 accept a^{4+3} B2 cao (B1 for two of 15, x^3, y^4 in a product) B1 cao B1 cao
22	80% = 220 $220 \div 80 \times 100$	275	3	M1 for recognising that 80% is equivalent to 220 M1 for $220 \div 80 \times 100$ oe A1 cao

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
23			$x = 3$ $y = 0.5$	3	M1 for coefficients of x or y the same followed by correct operation, condone one arithmetical error M1 (dep) for substituting found value in one equation A1 cao SC: B1 for one correct answer only if M's not awarded
24			1.4×10^{10}	2	B2 for 1.4×10^{10} or 1.44×10^{10} (B1 for 14.4×10^{9} or 14400,000,000 or 14000,000,000 or 14×10^{9})
25	(a)	$\tan x = \frac{1.9}{3.2}$ $x = \tan^{-1}\left(\frac{1.9}{3.2}\right) = 30.7$	30.7	3	M1 for $\tan x = \frac{1.9}{3.2}$ or $\tan \frac{1.9}{3.2}$ M1 for $\tan^{-1}\left(\frac{1.9}{3.2}\right)$ A1 for 30.6 – 30.7
	(b)	90 + "30.7"	121	1	B1 (indep) ft for 90 + "30.7" rounded to 3 or 4 s.f

Paper 5523/04				
No	**Working**	**Answer**	**Mark**	**Notes**
26	SF$=\frac{12}{9}$ $\frac{12}{9}\times 6=8$	2	2	M1 for $\frac{12}{9}$ or $\frac{9}{12}$ or 1.33… seen or 0.75 seen or 8 seen or $\frac{6}{9}$ or $\frac{9}{6}$ or 0.66… or 1.5 or $\frac{1}{3}$ or 3 oe seen A1 cao

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	$x^2-4x+7x-28$	$x^2+3x-28$	2	M1 for 4 terms correct ignoring signs (e.g $x^2,4x,7x,28$) or 3 terms with correct signs (e.g $x^2,-4x,7x,-28$) A1 cao
	(b)		y^4+2y^2	2	B2 cao B1 for y^4 or $2y^2$
	(c)		$p(p+6)$	2	B2 for $p(p+6)$ or $p\times(p+6)$ (B1 for $p(ap+b)$ where a,b are numbers or $p+6$ seen on it's own, or part of an expression)
	(d)		$3x(2x-3y)$	2	B2 (B1 for $3(2x^2-3xy)$ or $x(6x-9y)$ or $3x(...)$)
2			question + response boxes oe	2	1st aspect: One question with time period (eg each night); ignore other questions. 2nd aspect: Response list (at least two), not overlapping.* 3rd aspect: Some mention of units (eg hours) in either question or responses Award B2 for all three aspects, or B1 for just two aspects. * 0-1, 2-3, 4-5 is OK, but 0-1, 1-2, 2-3 is not OK.
3	(b)		reflection in $y=x$	2	B2 cao accept the word "reflected" (B1 any statement including the word "reflection")
4	(a)	$5-3x=2x+2$ $5-2=2x+3x$	$\frac{3}{5}$	3	B1 for $2x+2$ seen OR $2.5-1.5x=x+1$ M1 for correct rearrangement of 4 terms A1 for $\frac{3}{5}$ oe
	(b)		$-3,-2,-1,0,1,2$	2	B2 (B1 for 5 correct and not more than one incorrect integers)

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
5	(a)	$\frac{2}{3}\times\frac{3}{4}=\frac{6}{12}$	$\frac{1}{2}$	2	M1 for $\frac{6}{12}$ or $\frac{3}{6}$ or $\frac{2\times3}{3\times4}$ A1 accept 0.5
	(b)	$1+2+\frac{8}{12}+\frac{9}{12}$	$4\frac{5}{12}$	2	M1 for attempt to convert to fractions with common denominator e.g two fractions, denominator of 12 A1 correct conversion : $\frac{8}{12}$ and $\frac{9}{12}$, or $\frac{20}{12}$ and $\frac{33}{12}$ seen (oe) A1 cao for $4\frac{5}{12}$ OR attempts to convert to decimals: must use at least 2dp M1 0.66+0.75 (or 1.66+2.75) or 0.67+0.75 etc A1 4.41, 4.417, 4.416 or 0.41, 0.417, 0.416 or 0.42, 4.42 A1 4.416 (*recurring*)
6	(a)(i)		5^6	1	B1 accept 15625, 5^{4+2}
	(ii)		5^3	1	B1 accept 125, 5^{9-6}
	(b)	$x+y=10$ and $x-y=4$	$x = 7$ $y = 3$	3	M1 for either $x + y = 10$ or $x-y=4$ A2 for both values correct [(A1 for one value correct) If M0, award B3 for both values correct or B2 for one value correct, otherwise B0] SC B2 for $x = 3$ or $y = 7$

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
7		$2\times\frac{1}{2}\times6\times8$ or 48 $8\times9+6\times9+10\times9$ or 72 +54 + 90	264 cm^2	4	M1 attempt to find the area of one face; $\frac{1}{2}\times6\times8$ or (8×9) or (6×9) or (10×9) or 72 or 54 or 90 or 24 or 48 M1 all five faces with an intention to add A1 cao numerical answer of 264 B1 (indep) cm^2 with or without numerical answer
8			$\frac{\pi ab^3}{3d}$ $3(c+d)^3$ $3\pi bc^2$	3	B3 (B1 for each one correct) Nb –B1 for each of the 4th,5th,6th tick
9	(a)	$x+0.3+0.2+x=1$	0.25	2	M1 for $x+0.3+0.2+x=1$ oe, or 0.5 ÷ 2 A1 oe
	(b)	0.3×200	60	2	M1 0.3×200 A1 cao Accept 60 out of 200 (in words) SC B1 for $\frac{60}{200}$
10	(a)		$(-12)-4\quad-2\quad(0)8$	3	B3 for all correct [(B1 for each one correct)
	(b)		5 points plotted accurately points joined with smooth curve	2	B1 ±1 full (2mm) square ft table if at least B1 awarded (all 5 points plotted) B1 ft for any smooth curve if previous B1 gained NB: curve must pass within 1 full square of the points
11			m=3 n=5	2	B1 for 3 B1 for 5 (B2 for $2^3\times5$ or $2\times2\times2\times5$) SC: award B1 only if m=3, n=3, for 8×5 seen

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
12		$\frac{5--1}{-1-2} = -2$	$y = -2x + 5$	4	M1 for clear attempt to find gradient eg fraction with -1,5 in numerator, 2,-1 in denominator A1 for -2 cao B2 ft for $y =$"-2"$x + 5$ oe (eg $y = \frac{-6}{3}x + 5$) (B1 for $y = mx + 5$ or , $-2x+5$ or $y =$"-2"$x + c$)
13	(a)		$\frac{1}{4}$ on LH branch $\frac{2}{3}$ & $\frac{1}{3}$ & $\frac{2}{3}$ on RH branches	2	B1 cao B1
	(b)	$\frac{3}{4} \times \frac{2}{3} + \frac{1}{4} \times \frac{1}{3} = \frac{6}{12} + \frac{1}{12}$	$\frac{7}{12}$	3	M1 for $\frac{3}{4} \times \frac{2}{3}$ or $\frac{1}{4} \times \frac{1}{3}$ from their tree diagram M1 for sum of two products A1 for $\frac{7}{12}$ oe
	(c)	$n = 21 \times 4$ or $\frac{1}{6} : \frac{1}{4}$ oe $\frac{1}{6} \times 84$ or $21 \times \frac{2}{3}$	14	3	M1 for either $\frac{1}{3} \times \frac{3}{4} \left(= \frac{1}{4}\right)$ or $\frac{2}{3} \times \frac{1}{4} \left(= \frac{1}{6}\right)$ from their tree diagram M1 for 21×4 (=84) or $\frac{21}{3} \times 2$ A1 for 14 cao SC: B2 for 63 seen in fraction or ratio

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
14	(a)(i)		150	2	B1 accept 150 or 210
	(ii)				B1 for angle at the centre is twice the angle at the circumference
	(b)		30	3	B1 identifies angle between radius and tangent as $90°$ (may be in working or on diagram)
		$360 - 90 - 90 - "150"$ or $180 - "150"$			M1 $360° - 90 - 90 - "150"$ A1 ft from (a)(i) excluding a negative answer Or B1 for 90 M1 for $2 \times (180 - 90 - "\frac{150}{2}")$ A1 ft from (a)(i) excluding a negative answer Or B3 for $180 - (a)$ SC: 180 – "210" can get B1 for $90°$ and/or B1 for "cyclic quadrilateral"
15	(a)		0.2727…	1	B1 for 2.27 recurring or 0.2727…. oe or 0.273
	(b)	eg $x = 0.3939…$ so $100x = 39.3939…$ $99x = 39$ so $x = \frac{39}{99} = \frac{13}{33}$		3	M1 for $100x = 39.39…$ M1 dep for subtraction of both sides A1 for $\frac{13}{33}$ from correct proof **Alternative method** M1 for $13.000 \div 33$ M1 for remainders 31 and 13 A1 for 0.39 recurring SC:B1 for $\frac{39}{99}$

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$d = kt^2$ $80 = k \times 4^2$	$d = 5t^2$	3	M1 for $d = kt^2$ or $d \propto t^2$ M1 sub d=80 and t=4 into their equation A1 for $d = 5t^2$ oe (cao)
	(b)		245	1	B1 ft from (a) using "k"
	(c)	$45 = 5t^2$	3	2	M1 ft from (a) for substituting d=45 into their equation A1 for 3 cao (condone inclusion of -3)
17	(a)(i) (ii)		(0, 9) (8, 25)	3	B1 cao B1 for $x = 8$ cao B1 for $y = 25$ cao SC: B1 for (25, 8)
	(b)	LHS = $\left(\frac{100-(x^2-16x+64)}{4}\right)$ $= \left(\frac{36+16x-x^2}{4}\right)$ RHS = $\left(\frac{36-2x+18x-x^2}{4}\right)$ = LHS		3	M1 for expansion of either set of brackets with at least 3 of 4 terms correct M1 for common denominator of 4 or multiplying through by 4 or reducing each numerator to a single term A1 for fully correct solution **Alternative method** M1 for $(5-\frac{(x-8)}{2})(5+\frac{(x-8)}{2})$ M1 for $(\frac{2\times5-(x-8)}{2})(\frac{2\times5+(x-8)}{2})$ A1 for $\frac{(18-x)(x+2)}{4}$

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
18	(a)	$\frac{810\pi}{90\pi}$ or 9 $\sqrt{9}$ or 3	12	3	M1 for $\frac{810\pi}{90\pi}$ or 9 or $\frac{1}{9}$ or 1:9 oe M1 for $\sqrt{\frac{810\pi}{90\pi}}$ or $\sqrt{9}$ or 3 or $\frac{1}{3}$ or $\sqrt{9}:\sqrt{1}$ oe A1 cao SC:B1 for answer of 36
	(b)	3^3 or 27 or 2700	2700π	2	M1 for "3"^{3} or 27 or $\left(\sqrt{9}\right)^3 : (\sqrt{81})^3$ oe or 9^3 or 2700– A1 cao
19	(a)(i)		1	1	B1 cao
	(ii)		8	1	B1 cao
	(iii)	$64^{-\frac{2}{3}} = \frac{1}{64^{\frac{2}{3}}}$ or $64^{-\frac{2}{3}} = (4^2)^{-1}$	$\frac{1}{16}$	2	M1 for knowing negative power is a reciprocal or power of $\frac{1}{3}$ root is a cube root A1 cao for $\frac{1}{16}$
	(b)	$\sqrt{27} = \sqrt{9\times3}$ or $\sqrt{27} = 3\sqrt{3}$ or $\sqrt{27} = 3^{3/2}$	$\frac{5}{2}$ oe	2	M1 for $\sqrt{27} = \sqrt{9\times3}$ or $\sqrt{27} = 3^{3/2}$ A1 for $\frac{5}{2}$ oe (cao) **Alternative method** M1 for $9\times27 = 3^{2n}$ A1 for $\frac{5}{2}$ oe (cao)

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
20	(a)(i) (ii) (b)(i) (ii)		(90, 1) (180, 0) (45, 0) (90, -3)	2 2 	B1 cao could be indicated on diagram B1 cao could be indicated on diagram B1 cao could be indicated on diagram B1 cao could be indicated on diagram
21		$\frac{1}{3}\pi x^2 h = \frac{4}{3}\pi(2x)^3$ $x^2 h = 4\times 8x^3$	$32x$	3	M1 for substitution in correct formulae M1 (dep.) for correct unsimplified expression eg $h = \frac{\frac{4}{3}\pi(2x)^3}{\frac{1}{3}\pi x^2}$ oe or $h = 8x$ oe A1 for $32x$ cao
22	(a)	$\left(\overline{OM} =\right)\ \boldsymbol{a} + 2\boldsymbol{b}$ $\left(\overline{ON} =\right) 3\boldsymbol{a}$ or $\frac{6}{2}\boldsymbol{a}$ $\left(\overline{MN} =\right)\ -\boldsymbol{a} - 2\boldsymbol{b} + 3\boldsymbol{a}$	$2\boldsymbol{a} - 2\boldsymbol{b}$	2	B2 (B1 for either $\overline{OM}$ or $\overline{ON}$ or $-\boldsymbol{a} - 2\boldsymbol{b} + 3\boldsymbol{a}$ SC: B1 for $2\boldsymbol{b} - 2\boldsymbol{a}$
	(b)	$\left(\overline{OX} =\right)\ 2\boldsymbol{a} + \boldsymbol{b}$ $\left(\overline{OY} =\right) \boldsymbol{b} + 4\boldsymbol{a}$ (½ $\overline{QR}$ =) $2\mathbf{a} - \boldsymbol{b}$ or (½ $\overline{RQ}$ =) $\boldsymbol{b} - 2\boldsymbol{a}$	$\overline{XY} = 2\boldsymbol{a}$ (hence parallel)	2	B1 for either $\overline{OX}$ or $\overline{OY}$ or (½ $\overline{QR}$) B1 for $\overline{XY} = 2\boldsymbol{a}$ or $\overline{YX} = -2\boldsymbol{a}$

Paper 5525/06					
No		Working	Answer	Mark	Notes
1	(a)	$v - u = 5t$	$\frac{v-u}{5}$	2	M1 for isolating $\pm 5t$ or $\pm t$ or for dividing through by 5 A1 oe
	(b)	$x - 3 = 5x - 25$ $22 = 4x$	$5\frac{1}{2}$	3	M1 for $x - 3 = 5(x-5)$ or $\frac{x}{5} - \frac{3}{5} = x - 5$ M1 for isolating terms in x correctly from $ax + b = cx + d$ A1 cao accept $5\frac{1}{2}$, $\frac{11}{2}$, 5.5
2	(a)	$36 \div (7+3+2)$ "3" $\times 7$	21	3	M1 for $36 \div (7+3+2)$ M1 (dep) for "3" $\times 7$ or 3 or 2 A1 cao
	(b)	$51.5 \times \frac{8.5}{100} = 4.3775$ $51.5 - 4.3775 = 47.1225$	47 or 47.1 or 47.12	4	M1 for $51.5 \times \frac{8.5}{100}$ or 4.37(75) seen M1 (dep) for 51.5 – "4.37(75)" A1 for 47 or better B1 (indep) for rounding their answer correctly to the nearest whole number or 1 or 2 d.p OR M1 for $51.5 \times \frac{100 - 8.5}{100}$ M1 for $51.5 \times$"0.915" or 0.515 ×"91.5" A1 for 47 or better B1 (indep) for rounding their answer correct to the nearest whole number or 1 or 2 d.p

Paper 5525/06					
No		**Working**	**Answer**	**Mark**	**Notes**
3		3→15 4→48 3.1→17.3(91) 3.2→19.9(68) 3.3→22.7(37) 3.4→25.7(04) 3.5→28.8(75) 3.4→25.7(04) 3.3→22.7(37) 3.35→24.1(95375)	3.3	4	B2 for trial between 3.3 and 3.4 inclusive (B1 for trial between 3 and 4 inclusive) B1 for different trial between 3.3 and 3.4 exclusive B1 (dep on at least one previous B1) for 3.3 NB trials should be evaluated to at least 1 dp truncated or rounded
4	(a)		Angle in a semicircle	1	B1 oe
	(b)	$12^2 + 16^2 = 400$ $\sqrt{400} = 20$	20	3	M1 for $12^2 + 16^2$ M1 for $\sqrt{144+256}$ A1 cao
	(c)	$\pi \times 10^2$	314	3	M1 for $\pi \times \left(\frac{"20"}{2}\right)^2$ M1 (indep) for correct order of evaluation of $\pi \times r^2$ for any r A1 for 314 – 315 inclusive

Paper 5525/06					
No		Working	Answer	Mark	Notes
5	(a)	$(1 \times 10)+(3 \times 15)+(5 \times 30)+(7 \times 35)+$ $(9 \times 25)+(11 \times 5) = 730$ "730" ÷ 120 = 6.08333	6.08	4	M1 for use of *fx* with *x* consistent within intervals (including end points) M1 (dep) for use of midpoints M1 (dep on 1st M1) for use of $\frac{\sum fx}{\sum f}$ A1 6.08 to 6.085
	(b)		(10),25,55,90, 115,120	1	B1 for all correct
	(c)		graph	2	B1 ft for 5 or 6 points plotted correctly ± 1 full (2mm) square at the end of interval dep on sensible table (condone 1 addition error) B1(dep) for points joined by curve or line segments provided no gradient is negative – ignore any part of graph outside range of their points. (SC: B1 if 5 or 6 points plotted not at end but consistent within each interval and joined)
	(d)		72 – 74	2	M1 (ft dep on graph being cf) for reading from graph at 7 A1 ft ±1 full (2 mm) square Or B2 for $72 - 74$

Paper 5525/06				
No	**Working**	**Answer**	**Mark**	**Notes**
6 (a)		a^7	1	B1 accept a^{4+3}
(b)		$15x^3y^4$	2	B2 cao (B1 for two of 15, x^3, y^4 in a product)
(c)		$x-1$	1	B1 cao
(d)		$(a + 3b)(a - 3b)$	2	B2 for $(a + 3b)(a - 3b)$ (B1 for $(a \pm 3b)(a \pm 3b)$
7	80% = 220 $220 \div 80 \times 100$	275	3	M1 for recognising that 80% is equivalent to 220 M1 for $220 \div 80 \times 100$ oe A1 cao
8		$x = 3$ $y = 0.5$	3	M1 for coefficients of x or y the same followed by correct operation, condone one arithmetical error M1 (dep) for substituting found value in one equation A1 cao SC: B1 for one correct answer only if Ms not awarded
9		1.4×10^{10}	2	B2 for 1.4×10^{10} or 1.44×10^{10} (B1 for 14.4×10^9 or 14400,000,000 or 14000,000,000 or 14×10^9)

Paper 5525/06					
No		Working	Answer	Mark	Notes
10	(a)	$\tan x = \frac{1.9}{3.2}$ $x = \tan^{-1}\left(\frac{1.9}{3.2}\right) = 30.7$	30.7	3	M1 for $\tan x = \frac{1.9}{3.2}$ or $\tan \frac{1.9}{3.2}$ M1 for $\tan^{-1}\left(\frac{1.9}{3.2}\right)$ A1 for 30.6 – 30.7
	(b)	90 + "30.7"	121	1	B1 (indep) ft for 90 + "30.7" rounded to 3 or 4 s.f
11	(a)	$SF = \frac{12}{9}$ $\frac{12}{9} \times 6 = 8$	2	2	M1 for $\frac{12}{9}$ or $\frac{9}{12}$ or 1.33… seen or 0.75 seen or 8 seen or $\frac{6}{9}$ or $\frac{9}{6}$ or 0.66… or 1.5 or $\frac{1}{3}$ or 3 oe seen A1 cao
	(b)	$SF = \frac{9}{12}, \frac{9}{12} \times 7 = 5.25$	5.25	2	M1 for $\frac{BE}{7} = \frac{9}{12}$ oe A1 cao

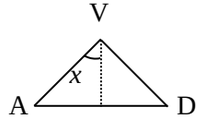
Paper 5525/06					
No		**Working**	**Answer**	**Mark**	**Notes**
12	(a)	$84 = 6.7\pi + 2 \times 6.7 + 2a$ $2a + 13.4 = 62.95\ldots$ or $2a + 34.44 = 84$	24.8	3	M1 for substituting correctly, π may be left M1 for correct rearrangement as far as $\pm 2a$ A1 for $24.7 - 24.8$
	(b)	$P = \pi r + 2r + 2a$ $P - 2a = \pi r + 2r$ $P - 2a = (\pi + 2)r$	$\frac{P-2a}{\pi+2}$	3	M1 subtracting $2a$ from each side M1 for factorising to get $(\pi+2)r$ A1 for $\frac{P-2a}{\pi+2}$ oe S.C $\frac{p-2a}{5.14}$ oe is M1 M1 A0
13		Area $\Delta ABC = \frac{1}{2} \times 14 \times 8 \times \sin 106$ (= 53.8)	53.8	3	M1 for $\frac{1}{2} \times 14 \times 8 \times \sin 106$ M1 (dep) for $56 \times 0.961(26..)$ or $107.6\ldots$ A1 $53.8 - 53.9$ SC 107.6 is B2
14	(a)		4.5	1	B1 cao
	(b)	$500 \times 1.045^{20} = 1205.857\ldots\ldots$	1205.86	2	M1 for 500×1.045^{20} A1 for $1205.85 - 1206$ (SC:B1 for $705.85 - 706$ no working)

Paper 5525/06				
No	**Working**	**Answer**	**Mark**	**Notes**
15 (a)	$6x^2 + 11x - 10 + 6x - 4 = 25$ $6x^2 + 17x - 39 = 0$		3	M1 for an expression for the area involving either $(3x-2)(2x+5)+2(3x-2)$ or $3x(3x-2)+(3x-2)(7-x)$ or $3x(2x+5)-2(7-x)$ or $(3x-2)^2 + 2(3x-2) + (3x-2)(7-x)$ where in each case at least one of 2 or 3 product terms must be correct M1 (indep) for one correct expansion involving x^2 A1 for simplification to final answer

Paper 5525/06					
No		Working	Answer	Mark	Notes
15	(b)(i)	$x = \frac{-17 \pm \sqrt{17^2 - 4\times 6\times(-39)}}{2\times 6}$ $= \frac{-17 \pm \sqrt{289+936}}{12}$ $x = +\frac{18}{12}$ or -4.33	$1.5, -\frac{13}{3}$	4	M1 for $x = \frac{-17 \pm \sqrt{17^2 - 4\times 6\times(-39)}}{2\times 6}$ up to signs in b & c M1 for $x = \frac{-17 \pm \sqrt{1225}}{12}$ A1 $x = 1.5$ or -4.33, or better OR M2 for $(3x+13)(2x-3)$ (M1 for $(3x \pm a)(2x \pm b)$ with ab = ±39 A1 x = 1.5 or – 4.33, or better OR M1 for $\left(x+\frac{17}{12}\right)^2$ *seen* M1 $\left(x+\frac{17}{12}\right)^2 = \left(\frac{17}{12}\right)^2 + \frac{39}{6}$ A1 x = 1.5 or – 4.33, or better SC:M1 for answer "1.5" with no working or T & I
		$x^2 + \frac{17}{6}x - \frac{39}{6} = 0$ $\left(x+\frac{17}{12}\right)^2 - \left(\frac{17}{12}\right)^2 - \frac{39}{6} = 0$ $\left(x+\frac{17}{12}\right)^2 = \left(\frac{17}{12}\right)^2 + \frac{39}{6}$			
	(ii)		8		B1 cao length = 8

Paper 5525/06					
No		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	P(win) = $\frac{2}{5}\times\frac{3}{5}+\frac{2}{5}\times\frac{1}{5}(=\frac{8}{25})$	$\frac{8}{25}$	3	M1 for $\frac{2}{5}\times\frac{3}{5}$ or $\frac{2}{5}\times\frac{1}{5}$ or for clearly identifying in P(R) $\times$P(R) + P(B) $\times$ P(B) M1 for P(win) = " $\frac{2}{5}$ " $\times$ " $\frac{3}{5}$ " + " $\frac{2}{5}$ " $\times$ " $\frac{1}{5}$ " A1 for $\frac{8}{25}$, oe
	(b)	$\frac{8}{25}$ $\times$ 100 (=32) 100 $\times$ 20 – "32" $\times$ 50	£4	2	M1 for (" $\frac{8}{25}$ " $\times$100)$\times$50 or $\times$ 0.5 A1 cao

Paper 5525/06					
No		**Working**	**Answer**	**Mark**	**Notes**
17		Lower bound of 1200 is 1150 Upper bound of 60 is 65 $1150 \div 65$	17	4	B1 for 1150 or 1250 seen B1 for 65 or 55 seen M1 (Lower bound of load) ÷ (Upper bound of weight) Where 1150 ≤ LB load < 1200 and 60 < UB Weight ≤ 65 A1 for 17 requires fully correct working OR B1 for 1150 or 1250 seen B1 for 65 or 55 seen M1 (upper bound of load) ÷(lower bound of weight) Where 1200 ‹ UB load ≤ 1250 and 55 ≤ LB weight < 60 A1 for 22 requires fully correct working OR M2 $1200 \div 55$ A1 21.8 A1 21 requires fully correct working OR M2 $1200 \div 65$ A1 18.4(6) A1 18 requires fully correct working
18	(a)	$3^4 x^4 y^8$	$81x^4y^8$	2	B2 for $81x^4y^8$ (B1 for 2 of 81, x^4, y^8)
	(b)	$\frac{x(x-3)}{(x-5)(x-3)}$	$\frac{x}{x-5}$	3	B1 for $x(x-3)$ B1 for $(x-5)(x-3)$ B1 cao

Paper 5525/06					
No		Working	Answer	Mark	Notes
19	(a)	$6^2 - 2^2 = 32$	5.66	2	M1 for $6^2 - 2^2$ (= 32) A1 5.65 – 5.66
	(b)	V  $DVA = 2 \times \sin^{-1}(\frac{2}{6})$ OR $\cos DVA = \frac{6^2 + 6^2 - 16}{2 \times 6 \times 6}$ $= \frac{56}{72}$ $DVA = \cos^{-1}\left(\frac{56}{72}\right) = 38.94$	38.9	3	M1 $\sin x = \frac{2}{6}$ oe M1 for $DVA = 2 \times \sin^{-1}(\frac{2}{6})$ A1 38.9 – 38.95 OR M1 for $(\cos DVA =) \frac{6^2 + 6^2 - 4^2}{2 \times 6 \times 6}$ M1 for $DVA = \cos^{-1}\left(\frac{56}{72}\right)$ A1 38.9 – 38.95

Paper 5525/06				
No	**Working**	**Answer**	**Mark**	**Notes**
19 (c)	$AC^2 = 2^2 + 2^2 - 2 \times 2 \times 2 \times \cos 120^o$ $AC = \sqrt{12}$ **OR** $AN = 2 \times \sin 60 = \sqrt{3}$ **OR** VN = $\sqrt{"32"+1} = \sqrt{33}$ $\cos AVC = \frac{6^2 + 6^2 - 12}{2 \times 6 \times 6}$ $\cos AVC = \frac{60}{72}$ **OR** $AVC = 2 \times \sin^{-1}\frac{\sqrt{3}}{6}$, using AN **OR** $AVC = 2 \times \cos^{-1}\frac{\sqrt{33}}{6}$, using VN	33.6	4	M1 for any valid method for AC or AN or VN where N is the midpoint of AC A1 for $AC^2 = 12$ or $AC = \sqrt{12}$ (= 3.46…) or $AN = \sqrt{3}$ (=1.73…)or $VN = \sqrt{33}$ (=5.74…) M1 (indep) for correct method to find angle AVC A1 33.55 – 33.6

Paper 5525/06					
No		**Working**	**Answer**	**Mark**	**Notes**
20	(a)	Graph translated 1 unit to the right passing through the points (-1,0), (1,2) and (2,0)		2	M1 for translation of $\begin{pmatrix}1\\0\end{pmatrix}$ or $\begin{pmatrix}-1\\0\end{pmatrix}$ A1 for right through the 3 points, $\pm\frac{1}{4}$ sq
	(b)	Graph stretched 2 units parallel to y-axis; passing through the points (-2,0), (0,4) and (1,0)		2	M1 for graph stretched parallel to the y-axis by scale factor 2 A1 through all 3 points; $\pm\frac{1}{4}$ sq not on grid at $x = 2$

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Mark Scheme (Results)

November 2010

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GCSE Mathematics (Modular) 5MB2H
Unit 2 - Higher

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

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7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

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5MB2H_01					
Question		Working	Answer	Mark	Notes
1		$140 \div (3+4) (= 20)$ "20"×4	80	2	M1 for $140 \div (3+4)$ or 20 or $\frac{4}{7} \times 140$ A1 cao
2	(a)		$8bc$	1	B1 cao
	(b)		$6w - 15t$	2	M1 for $3 \times 2w - 3 \times 5t$ or 6w or -15t A1 cao
	(c)	$x^2 + -2x + 7x - 14$	$x^2 + 5x - 14$	2	M1 for all 4 terms correct with or without signs **or** 3 out of no more than four terms correct with signs **or** $x(x-2)+7(x-2)$ *or* $x(x+7)-2(x+7)$ A1 cao
3		$80 \div 100 \times 15$	12	2	M1 for $80 \div 100 \times 15$ **or** 8 and 4 seen **or** correct method to find 10% and 5% of 80 eg $80 \div 100 \times 10$ and $80 \div 100 \times 5$ oe A1 cao

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Question	**Working**	**Answer**	**Mark**	**Notes**
4	$BFD = 42°$ *HFB* = 110° $110 - 42$	68	3	M1 for $EDC = 42$ or $DHF = 180 - 110$ M1 for $180 - 42 - 70$ A1 cao **or** M1 for $BFD = 42°$ or $HFB = 110°$ M1 for $110 - 42$ A1 cao **or** M1 for $AFH = 180 - 110 = 70$ M1 for $180 - 70 - 42 = 68$ A1 cao
5		24	2	M1 for list of at least 3 multiples of 8 **and** 2 multiples of 12 **or** correct method to write **either** 8 **or** 12 as product of prime factors A1 cao
6	$180 - 140 (= 40)$ $360 \div "40"$	9	3	M1 for $180 - 140 (= 40)$ M1 (dep) for $360 \div "40"$ A1 cao

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Question	**Working**	**Answer**	**Mark**	**Notes**
7 (a)		68	2	M1 for $\frac{9}{5}\times 20+32$ A1 cao
(b)	Table of values 10 20 30 40 50 50 68 86 104 122 **or** Use $y=mx+c$ With $m=\frac{9}{5}$, $c=32$	Single line from (0, 32) to (50, 122)	3	B3 for correct single straight line from (0, 32) to (50, 122) [B2 for at least 3 points correctly plotted (ft from (a)) and joined with line segments **or** 3 correct points plotted two of which must be the extremes with no joining **or** a single line of gradient $\frac{9}{5}$ passing through (0,32) B1 for 2 correctly plotted points ft from (a) **or** a single line of gradient $\frac{9}{5}$ **or** a single line with positive gradient passing through (0,32) **or** 2 correct pairs of values, may include (20,68) from (a) if correct]
(c)		37.8	1	B1 for answer in range 36 - 39 **or** ft from line drawn (± 2mm) *NB : Whole question needs to be clipped together*

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Question	**Working**	**Answer**	**Mark**	**Notes**
8	$12\times 7=84$ $84-\frac{1}{2}(3\times 6)$ $75\div 32$	3	4	M1 for $12\times 7\,(=84)$ M1 for $"84"-\frac{1}{2}(3\times 6)\ \ (=75)$ M1 for "area" $\div 32$ or (32, 64,) 96 seen with "area" calculated. A1 cao (dep on all M marks) **or** M1 for $12\times 4\ \ (=48)$ M1 for $"48"+\frac{1}{2}(12+6)\times 3$ M1 for "area" $\div 32$ or (32, 64,) 96 seen with "area" calculated. A1 cao (dep on all M marks) M1 for $6\times 3+\frac{1}{2}(3\times 6)\ (=27)$ M1 for $"27"+12\times 4$ M1 for "area" $\div 32$ or (32, 64,) 96 seen with "area" calculated. A1 cao (dep on all M marks)

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Question	**Working**	**Answer**	**Mark**	**Notes**
9	$3600\times 4=14400$ $\frac{2}{5}=40\%$ $\frac{1}{4}=25$ $30+40+25=95\%$ Saved 5% 10% of $14400=1440$ 5% 0f $14400=1440\div 2$	£720	5	M1 3600×4 $(=14400)$ B1 for $\frac{2}{5}=40\%$ **or** $\frac{1}{4}=25$ M1 for $30+40+25$ or 95 or 5 M1 for complete method to find 5% of 14400 A1 cao **or** M1 for 3600×4 $(=14400)$ B1 for $30\%=\frac{3}{10}$ oe M1 $\frac{3}{10}+\frac{2}{5}+\frac{1}{4}$ or $\frac{19}{20}$ or $\frac{1}{20}$ M1 for complete method to find $\frac{1}{20}$ of 14400 A1 cao **or** M1 3600×4 $(=14400)$ M1 for 0.3×14400 oe $(=4320)$ M1 for $\frac{2}{5}\times 14400$ oe $(=5760)$ M1 $14400-3600-4320-5760$ A1 cao SC if no other marks awarded M1 for 0.3×3600 $(=1080)$ M1 for $\frac{2}{5}\times 3600$ $(=14400)$

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Question		Working	Answer	Mark	Notes
10	(a)		$4wy(5w+6y^2)$	2	M1 for a correct factor taken outside the brackets Or 4*wy*(a 2 term expression in w and y, with just one error) A1 cao
	(b)		$(m + 8)(m - 5)$	2	M1 for $(m \pm 8)(m \pm 5)$ A1 cao
11		45	200 minutes	6	M1 for $120\times20\times30(=72000)$ M1 for $"72000"\div120$ A1 for $600\,\text{cm}^3$ min oe M1 for $\frac{1}{2}\times(120+80)\times40\times30\,(=120000)$ M1 for $"120000"\div"600"$ A1 for 200 minutes or 3 hours 20 mins oe SC B1 for 4 hours
12	(a)		1	1	B1 cao
	(b)		$8x^{18}y^{-3}$	2	M1 for $2^3x^{3\times6}y^{3\times-1}$ **or** $8x^{18}y^k$ (k ≠ 0) **Or** $8x^ky^{-3}$ (k ≠ 0) **or** $kx^{18}y^{-3}$ (k ≠ 0, k ≠ 1) **or** $2x^6y^{-1} \times 2x^6y^{-1} \times 2x^6y^{-1}$ A1 cao

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Question	**Working**	**Answer**	**Mark**	**Notes**
13	0.5×10^6	5×10^5	2	M1 for 0.5×10^6 or 500000 or $2.5\div0.5\times10^6$ or $0.5\times10^{9-3}$ Or $2500000000\div5000$ A1 cao
14*	$(2x-2)(2x+1)$ $+\frac{1}{2}(2x-2)((3x+5)-(2x+1))$ $4x^2 - 2x - 2$ $+ x^2 + 4x - x - 4$ $= 5x^2 + x - 6$ Or $(2x-2)(3x+5)$ $-\frac{1}{2}(2x-2)((3x+5)-(2x+1))$ $= 6x^2 - 6x + 10x - 10$ $- x^2 - 4x + x + 4$ $= 5x^2 + x - 6$	Show	4	M1 for correct expression for a single rectangle area $(2x-2)(2x+1)$ or $(2x-2)(3x+5)$ M1 for correct expression for triangle area $\frac{1}{2}(2x-2)((3x+5)-(2x+1))$ M1 for all 4 terms correct with or without signs or 3 out of no more than four terms correct with signs in expansion of any two linear expressions. C1 for $5x^2+x-6$ and all steps clearly shown in a logical progression **QWC: All steps need to be clearly laid out showing a logical progression**

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5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
15	$\frac{2x}{x-1}-\frac{7x-3}{x^2-1}$ $=\frac{2x(x+1)}{x^2-1}-\frac{7x-3}{x^2-1}$ $=\frac{2x^2+2x-7x+3}{x^2-1}$ $=\frac{2x^2-5x+3}{x^2-1}$ $=\frac{(2x-3)(x-1)}{(x+1)(x-1)}$ $=\frac{2x-3}{x+1}$	$\frac{2x-3}{x+1}$	4	B1 for $x^2-1=(x+1)(x-1)$ M1 for correct process to obtain any common denominator M1 for correct expansion and simplification of numerator A1 cao

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Question	**Working**	**Answer**	**Mark**	**Notes**
15	Alternative method $\frac{2x}{x-1} - \frac{7x-3}{x^2-1}$ $= \frac{2x(x^2-1)}{(x-1)(x^2-1)} - \frac{(7x-3)(x-1)}{(x-1)(x^2-1)}$ $= \frac{2x(x^2-1)-(7x+3)(x-1)}{(x-1)(x^2-1)}$ $= \frac{2x^3-2x-7x^2+7+3x-3}{(x-1)(x^2-1)}$ $= \frac{2x^3-7x^2+8x-3}{(x-1)(x^2-1)}$ $= \frac{(2x-3)(x-1)^2}{(x+1)(x-1)^2}$ $= \frac{2x-3}{x+1}$	$\frac{2x-3}{x+1}$	4	Alternative Method M1 for correct process to obtain any common denominator B1 for $2x^3-2x-7x^2+7+3x-3$ M1 (dep on first M1) for correct expansion and simplification of numerator A1 cao

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GCSE MATHEMATICS 2MB01

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
16*	$AOT = 90 - x$ (Angle between tangent and radius is 90°) $AOC = 90 + x$ (Tangents from an external point are equal) $ACB = 2(180 - (90 + x)) \div 2 = 90 - x$ Or Obtuse angle $BOA = 180 - 2x$ (Angle between tangent and radius is 90°) Reflex angle $BOA = 180 + 2x$ (Tangents from an external point are equal) $ACB = (360 - (180 + 2x)) \div 2 - 90 - x$		5	B1 for $AOT = 90 - x$ or OAT = 90° or OBT= 90° (may be shown on diagram) B1 for $AOC = 90 + x$ B1 for completing the proof C2 for 2 reasons: Angle between tangent and radius is 90° **and** Tangents from an external point are equal. **QWC: proof should be clearly laid out with technical language correct** [C1 for 1 of: Angle between tangent and radius is 90° **or** Tangents from an external point are equal, **QWC: proof should be clearly laid out with technical language correct**] **OR** B1 for obtuse angle $BOA = 180 - 2x$ or OAT = 90° or OBT= 90° (may be shown on diagram) B1 for reflex angle $BOA = 180 + 2x$ B1 for completing the proof C2 for 2 reasons: Angle between tangent and radius is 90° **and** Tangents from an external point are equal. **QWC: proof should be clearly laid out with technical language correct** [C1 for 1 of: Angle between tangent and radius is 90° **or** Tangents from an external point are equal, **QWC: proof should be clearly laid out with technical language correct**]

GCSE MATHEMATICS 2MB01

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
16*	Alternative method $AOB = 360 - 2x - 90 - 90 = 180 - 2x$ (Angle between tangent and radius is 90°) $ACB = (180 - 2x)/2$ (Angle at the circumference is half angle at the centre)			Alternative method B1 for $AOB = 360 - 2x - 90 - 90$ B1 for $ACB = (180 - 2x)/2$ B1 for completing the proof C2 for 2 reasons: Angle between tangent and radius is 90° **and** Angle at the circumference is half angle at the centre **QWC: proof should be clearly laid out with technical language correct** [C1 for 1 of: Angle between tangent and radius is 90° **or** Angle at the circumference is half angle at the centre **QWC: proof should be clearly laid out with technical language correct**] B3 maybe awarded for a fully correct alternative method.

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Mark Scheme (Results)

June 2011

Modular Mathematics (GCSE)
Unit 2: 5MB2H_01 (Higher)

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M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		$5 \times 6 \div 2$	15cm^2	3	M1 $5 \times 6 \div 2$ oe seen A1 15 B1 cm^2
2	(a)		$3y + 7x + 3$	1	B1 cao
	(b)		$2x(x - 2)$	2	B2 for $2x(x - 2)$. Accept $2x(x + -2)$. (B1 for $x(2x - 4)$ or $2(x^2 - 2x)$ or $2x$(linear expression in x) or $(x - 2)$(linear expression in x)
	(c)	$11-3x - 6$	$5-3x$	2	M1 for expansion of $-3(x + 2)$ A1 cao
	(d)	$3x^2+7x-18x-42$	$3x^2- 11x - 42$	2	M1 for 4 terms correct with or without signs or 3 out of exactly 4 terms correct (the terms may be in an expression or table) **OR** $x(3x+7)-6(3x+7)$ or $3x(x - 6) + 7(x - 6)$ A1 cao

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5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
3 (a)	48=2 × 24 = 2 × 2 × 12 = 2 × 2 × 2 × 6 =2 × 2 × 2× 2 × 3 **OR** Use of factor trees	2 × 2 × 2 × 2 × 3	2	M1 for a systematic method that isolates 2 correct prime numbers correct divisions by a prime number **OR** an equivalent factor tree A1 for 2 × 2 × 2 × 2 × 3 or $2^4 \times 3$
(b)	Exeter coach after 20, 40, 60, 80, 100… Plymouth coach after 16, 32, 48, 64, 80, 96, … **OR** Timetable schedule for the coaches Exeter coach at 8.00, 8.20, 8.40, 9.00, 9.20… Plymouth coach at 8.00, 8.16, 8.32, 8.48, 9.04, 9.20… **OR** LCM of 16 and 20 is 80	9:20(am)	3	M1 for attempt to list multiples of 16 and 20 (at least first 3 of each, condone 1 addition error) M1(dep) for identifying their LCM A1 9:20 am (accept 9:20) **OR** M1 for attempt to draw up a timetable showing when the coaches will run (at least 3 extra times for each, condone 1 addition error) M1(dep) for identifying the first time common to both timetables A1 9:20 oe (do not accept 9:20pm) **OR** M1 attempt to find the LCM M1 for 2 × 2 × 2 × 2 × 5 oe seen A1 9:20 oe (do not accept 9:20pm)
4	10% = 6 6 × 4 = 24	24	2	M1 40 ÷ 100 × 60 oe or any complete method, eg 10% = 6, 6 × 4 A1 cao SC B1 for 36 or 84

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
5 (a)	Table of values x = -1 0 1 2 3 y = 2 2 6 10 14 OR Using $y = mx + c$, gradient = 4, y intercept = 2	Line from (1, 2) to (3,14)	3	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x. M1 ft for plotting at least 2 of their points (any points plotted from their table must be correct) A1 for correct line between 1 and 3 **(No table of values)** M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = 4x + 2$ drawn (ignore any additional incorrect segments) (M1 for at least 3 correct points with no more than 2 incorrect points) A1 for correct line between -1 and 3 **(Use of $y = mx + c$)** M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = 4x + 2$ drawn (ignore any additional incorrect segments) (M1 for line drawn with gradient 4 OR line drawn with a y intercept of 2) A1 for correct line between 1 and 3
(b)(i)		$y = 4x + c$, $c \neq 2$	1	B1 Correct equation given.
(ii)		– 0.25	1	B1 Correct gradient given. Note – 0.25 could be written as $-\frac{1}{4}$ oe

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
6	$6 \times 2 + 3 \times 2 = 12 + 6 = 18$ or $2 \times 5 + 4 \times 2 = 18$ $18 \div 2.5 = 7.2$ or $2.5 \times 7 = 17.5$ or $2.5 \times 8 = 20$ OR $6 \times 5 - 4 \times 3 = 18$ $18 \div 2.5 = 7.2$ or $2.5 \times 7 = 17.5$ or $2.5 \times 8 = 20$	8 packs	4	M2 for a complete method for finding the total area (can be implied by 18) (M1 for attempt to calculate at least one area, 6×2(=12) or 3×2 or 2×5(=10) or 4×2(=8) or 2×2 or 6×5 (=30) or 3×4(=12)) M1 for their area $\div 2.5$ or repeated addition of 2.5 to within 2.5 of their area C1 for clear communication that 8 full packs are required supported by their calculations, provided at least one of the first two method marks awarded SC B3 for 8 identified as the answer to the problem.
7	$\frac{3+7}{2}, \frac{8+5}{2}$	$(5, 6\frac{1}{2})$	2	M1 for either x or y coordinate correct or $\frac{3+7}{2}, \frac{8+5}{2}$, both seen but not correctly evaluated Al for $(5, 6\frac{1}{2})$ oe
8 (a) (b) (c)		p^8 h^5 x^6	3	B1 for p^8 B1 for h^5 B1 for x^6

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		24 × 2 = 48 56 ÷ 8 × 5 = 35 or 24 × 2 = 48 48 ÷ 5 × 8 = 76.8	Monday	4	M1 for a correct method to obtain two comparable time periods or speeds. eg 24 × 2 (= 48 miles), 56 ÷ 2 (= 28 km) M1 for a correct method to convert between miles and km or mph and km/h eg –, – – – A1 for two correct values (using same units) for comparison C1 for day identified from a clear attempt to use comparable time periods and speeds/distances Note: day alone scores zero
10	(a)		$4n + 2$	2	B2 for oe (B1 for $4n+k$ where $k \neq 2$)
	(b)	$2 \times 3^2 - 4$ 18 - 4	14	2	M1 for $2 \times 3^2 - 4$ A1 cao
11		360 ÷ 10 36 ÷ 2	18°	4	M1 for correct method to find the size of an exterior angle eg 360 ÷ 10 A1 for 36 M1 for '36' ÷ 2 or (180 – (180 – 36)) ÷ 2 A1 cao OR M1 for correct method to find the size of an interior angle eg(180 × 8) ÷ 10 A1 144 M1 (180 '144') ÷ 2 A1 cao

5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
12	$n^2 - 2n + 1 + n^2 + n^2 + 2n + 1 \equiv 3n^2 + 2$	Proof	2	M1 for correct expansion of either $(n - 1)^2$ or $(n + 1)^2$ or $n^2 - 2n + 1$ or $n^2 + 2n + 1$ seen A1 for $3n^2 + 2$ from correct working
13	$42 \div 2 = 21$ $180 - 90 - 21 = 69$ $69 \times 2 = 138$	138°	3	M1 for 90 seen. A1 for 138 (accept 222) C1 for The tangent to a circle is perpendicular (90°) to the radius (diameter) and Angles in a triangle add up to 180° **OR** The tangent to a circle is perpendicular (90°) to the radius (diameter) and Angles in a quadrilateral (4 sided shape) add up to 360°
14 (a)	$5\sqrt{9\times3}$	$15\sqrt{3}$	2	M1 for sight of $\sqrt{9\times3}$ or $\sqrt{9}\ \sqrt{3}$ or $3\sqrt{3}$ A1 for $15\sqrt{3}$ (accept $n = 15$)
(b)		$7\sqrt{3}$	2	M1 for $\frac{21\sqrt{3}}{\sqrt{3}\sqrt{3}}$ A1 for $7\sqrt{3}$ (accept $\frac{21\sqrt{3}}{3}$)

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5MB2H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
15 (a)		3	1	B1 cao
(b)		$\frac{1}{5}$	2	M1 $\frac{1}{25^{\frac{1}{2}}}$ or $\sqrt{25} = 5$ A1 $\frac{1}{5}$ or 5^{-1} or 0.2
16 (a)	$\frac{2(y-6)}{(y-6)(y-2)}$	$\frac{2}{y-2}$	3	M1 $2(y-6)$ M1 $(y-6)(y-2)$ A1 cao
(b)	$\frac{3(x+5)-(x-4)}{(x-4)(x+5)}$	$\frac{3(x+5)-(x-4)}{(x-4)(x+5)}$	2	M1 for $3(x+5)$ or $3x+15$ or $3x+5$ or $-(x-4)$ or $-x+4$ or $-x-4$ or $(x-4)(x+5)$ A1 for $\frac{3(x+5)-(x-4)}{(x-4)(x+5)}$ oe

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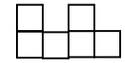
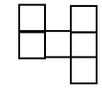
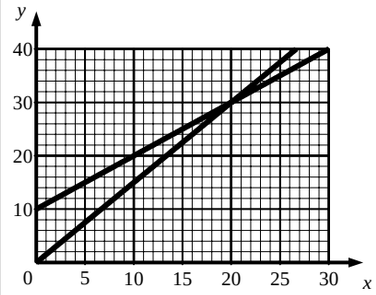
1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		380	1	B1 cao
	(b)		6.2	1	B1 cao
	(c)		Arrow at 34	1	B1 cao
2	(a)		8	1	B1 for 8 ± 0.2
	(b)		35	1	B1 for 35 ± 2°
	(c)		Circle drawn	1	B1 for all parts within ± 2mm, (use overlay)
3	(a)		4, 7, 4, 3, 2	2	M1 for at least 3 correct tallies **or** at least 3 correct frequencies A1 for all frequencies correct
	(b)		7	1	B1 for 7 **or** ft from frequencies in (a) or tallies if no frequencies
	(c)		Diagram drawn	3	M1 for bar chart or other suitable chart with at least 3 correct heights for their scale (can f.t.) A1 for all 5 bars correctly labelled and vertical axis correctly scaled A1 for fully correct **or** ft frequencies in (a) **OR** M1 for pictogram with at least 3 correct rows (can f.t.) A1 for correct labels on all 5 rows and correctly key A1 for fully correct **or** ft frequencies in (a) **OR** M1 for pie chart with at least 3 correct sectors ± 2° (can f.t.) A1 for all 5 sectors correctly labelled A1 for fully correct **or** ft frequencies in (a)

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		£1.18 + 94p = £2.12 £5 – £2.12 – 30p = £2.58 £2.58 ÷ 2 =	1.29	3	M2 for (5 – 1.18 – 0.94 – 0.30) ÷ 2 oe **or** digits 129 (M1 for 1.18 + 0.94 **or** 2.12 seen **or** 1.18 + 0.94 + 0.30 oe **or** 2.42 seen **or** 5 – 1.18 – 0.94 oe **or** 2.88 seen **or** (5 – 1.18 – 0.94) ÷ 2 **or** 1.44 seen **or** 5 – 1.18 – 0.94 – 0.30 oe **or** 2.58 seen) A1 cao **NOTE**: Accept working in £ or pence
5	(a)(i)		(2, 3)	2	B1 cao
	(ii)		(–3, 1)		B1 cao
	(b)		Point plotted at (3, –4)	1	B1 cao
6	(a)		– 5	1	B1 cao
	(b)		6	1	B1 for 6 or – 6
	(c)		3	1	B1 cao
7			(P, B), (P, S), (P, L) (M, B), (M, S), (M, L) (H, B), (H, S), (H, L)	2	M1 for any 3 combinations with no incorrect combinations A1 for all 9 combinations with no duplicates or extras
8	(a)		Walk	1	B1 cao
	(b)	24 ÷ 4 =	6	2	M1 for 24 ÷ 4 oe or ¼ oe seen A1 cao

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
9	(a)		Isosceles triangle	1	B1 for isosceles triangle
	(b)		Rectangle with area 12 cm^2	2	M1 for rectangle drawn A1 cao
10	(a)		A marked at 0	1	B1 for A marked at 0 (within overlay)
	(b)		B marked at 1/4	1	B1 for B marked at 1/4 (within overlay)
11	(a)		9	1	B1 cao
	(b)		33	2	M1 for 5 × 5 **or** 25 seen in the working **or** 2 × 2 × 2 **or** 8 seen in the working A1 cao
12	(a)		20	2	M1 3 × 3 × 3 oe seen or drawn or 27 seen or use of 3 layers A1 cao
	(b)			2	B2 for correct view (B1 for  or )
13	(a)(i)		07 29	2	B1 for 07 29
	(ii)		36		B1 for 36 or ft difference between (i) and 06 53
	(b)		07 51	1	B1 cao
	(c)		09 55	1	B1 for 09 55 or 9 55 or five to ten

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
14		2 + 8 + 2 + 8 = 20 20 ÷ 4 =	5	4	M2 for 2 + 8 + 2 + 8 oe **or** 20 seen **or** (2 + 8) ÷ 2 oe (M1 for the sum of 3 sides of the rectangle) M1 (dep) for the sum of 3 or 4 sides of the rectangle ÷ 4 **or** an attempt to evaluate (2 + 8) ÷ 2 oe to get the length of one side A1 cao **SC**: B1 for an answer of 4 coming from $\sqrt{2\times 8}$ oe
15	(a)		4	1	B1 cao
	(b)	9.5 – 4.75 = **OR** 9.5 ÷ 2 =	4.75	2	M1 for 9.5 – 4.75 **or** 9.5 ÷ 2 **or** 4.75 – 9.5 A1 cao
	(c)		6	1	B1 cao
	(d)	12 × 4 =	48	2	M1 for × 4 seen **or** identifying + 0.5 for every 2 inches **or** 12 + 12 + 12 + 12 oe **or** build up method eg 12, 24, 36, 48 allow one error A1 cao
16	(a)		trapezium	1	B1 for trapezium or isosceles trapezium
	(b)			2	B2 for correct tessellation (at least 5 more shapes) (B1 for at least 4 shapes (including initial shape) correctly tessellating)

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
17*		S: 35 ÷ 100 × 40 = 14 W: 40 ÷ 8 × 3 = 15 **OR** D: 16 ÷ 40 (× 100) = 0.4 (40%) W: 3 ÷ 8 (× 100) = 0.375 (37.5%) **OR** D: $\frac{16}{40} = \frac{80}{200}$ S: $\frac{35}{100} = \frac{70}{200}$ W: $\frac{3}{8} = \frac{75}{200}$	Debbie and correct calculations	4	**Compares Marks out of 40 or fractions with denominator of 40** M1 for 35 ÷ 100 × 40 oe **or** 14 seen (or 14/40 seen) M1 for 40 ÷ 8 × 3 **or** 15 seen (or 15/40 seen) A1 for 14 and 15 **or** $\frac{14}{40}$ and $\frac{15}{40}$ C1 (dep on M1) for correct conclusion for their working QWC with 3 comparable marks: Decision and justification should be clear with working clearly presented and attributable. **OR Decimals (or Percentages)** M1 for 16 ÷ 40 (× 100) oe **or** 0.4 (or 40) seen M1 for 3 ÷ 8 (× 100) oe **or** 0.375 (or 37.5) seen A1 for 0.4 and 0.375 (**or** 40 and 37.5) C1 (dep on M1) for correct conclusion for their working QWC: with 3 comparable decimals (or percentages: Decision and justification should be clear with working clearly presented and attributable. **OR Compares Fractions with denominator other than 40** M1 for attempt to convert all to fractions with a common denominator other than 40 M1 for at least 1 correct A1 for $\frac{80}{200}$ and $\frac{70}{200}$ and $\frac{75}{200}$ oe C1 (dep on M1) for correct conclusion for their working QWC with 3 comparable fractions: Decision and justification should be clear with working clearly presented and attributable.

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
18*	(a)		10	1	B1 cao
	(b)	 **Miles** 0 10 20 30 40 50 **Ed** 0 15 30 45 60 75 **Bill** 10 20 30 40 50 60	Ed is cheaper up to 20 miles, Bill is cheaper for more than 20 miles	3	M1 for correct line for Ed intersecting at (20,30) ±1 sq tolerance **or** $10 + x = 1.5x$ oe C2 (dep on M1) for a correct full statement ft from graph eg. Ed cheaper up to 20 miles **and** Bill cheaper for more than 20 miles (C1 (dep on M1) for a correct conclusion ft from graph eg. cheaper at 10 miles with Ed ; eg. cheaper at 50 miles with Bill eg. same cost at 20 miles; eg for £5 go further with Bill **or** A general statement covering short **and** long distances eg. Ed is cheaper for shorter distances **and** Bill is cheaper for long distances) **OR** (continued on next page)

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
18 (contd)					**OR** M1 for correct method to work out Ed's delivery cost for at least 2 values of n miles where $0 < n \leq 50$ **or** for correct method to work out Ed and Bill's delivery cost for n miles where $0 < n \leq 50$ C2 (dep on M1) for 20 miles linked with £30 for Ed and Bill with correct full statement eg. Ed cheaper up to 20 miles **and** Bill cheaper for more than 20 miles (C1 (dep on M1) for a correct conclusion eg. cheaper at 10 miles with Ed; eg. cheaper at 50 miles with Bill eg. same cost at 20 miles; eg for £5 go further with Bill **or** A general statement covering short **and** long distances eg. Ed is cheaper for shorter distances **and** Bill is cheaper for long distances) SC: B1 for correct full statement seen with no working eg. Ed cheaper up to 20 miles **and** Bill cheaper for more than 20 miles QWC Decision and justification should be clear with working clearly presented and attributable

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
19		1,96 × 2.25 = 4.41 **OR** 4.23 ÷ 9 = 0.47 1.96 ÷ 4 = 0.49 **OR** 4.23 × 4 = 16.92 1.96 × 9 = 17.64 **OR** 4.23 ÷ 9 = 0.47 0.47 × 4 = 1.88 **OR** 1.96 ÷ 4 = 0.49 0.49 × 9 = 4.41 **OR** 9 ÷ 4.23 = 2.12 4 ÷ 1.96 = 2.04	Pack of 9	3	M2 for a fully correct method to enable a conclusion eg 1.96 × 2¼ **OR** M1 for 4.23 ÷ 9 or 423 ÷ 9 **or** 0.47 seen **or** 47 seen M1 for 1.96 ÷ 4 or 196 ÷ 4 or 0.49 seen or 49 seen **OR** M1 for 4.23 × 4 **or** 423 × 4 **or** 16.92 seen **or** 1692 seen M1 for 1.96 × 9 **or** 196 × 9 **or** 17.64 seen **or** 1764 seen **OR** M1 for 4.23 ÷ 9 **or** 423 ÷ 9 **or** 0.47 seen **or** 47 seen M1 for 0.47 × 4 **or** 47 × 4 **or** 1.88 seen **or** 188 seen **OR** M1 for 1.96 ÷ 4 **or** 196 ÷ 4 **or** 0.49 seen **or** 49 seen M1 for 0.49 × 9 **or** 49 × 9 **or** 4.41 seen **or** 441 seen **OR** M1 for 9 ÷ 4.23 **or** 2.12(...) seen **or** 2.13 seen M1 for 4 ÷ 1.96 **or** 2.04(...) seen A1 for Pack of 9 and fully correct calculations **NOTE:** B0 for an answer of 9 not supported by working.
20	(a)		6	1	B1 cao
	(b)		44	1	B1 cao
	(c)		31	2	M1 for 60 – 29 **or** 29 – 60 **or** any correct method that is attempting to find the difference between 29 and 60 (allow 1 arithmetic error) A1 cao

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
21*		Angle *DBC* = (180 – 50) ÷ 2 Base angles of isosceles triangle are equal Angle *ABD* = 180 – 65 Angles on a straight line add up to 180 *x* = 180 – 20 – 115 Angles in a triangle add up to 180 **OR** Angle *DBC* = (180 – 50) ÷ 2 Base angles of isosceles triangle are equal *x* = 65 – 20 Exterior angle of triangle is equal to sum of interior opposite angles **OR** Angle *DCB* = (180 – 50) ÷ 2 Base angles of isosceles triangle are equal *x* = 180 – 50 – 20 – 65 Angles in a triangle add up to 180	45 with reasons	4	M1 for (180 – 50) ÷ 2 oe **or** 65 seen M1 for 180 – 20 – (180 – "65") **or** "65" – 20 or 180 – 50 – 20 –'65' oe C2 for *x* identified as 45 with full reasons QWC: Reasons clearly laid out with correct geometrical language used (C1 (dep on M1) for one reason QWC: Reasons clearly laid out with correct geometrical language used) NOTE: *x* = 45 with no working or without any correct angles marked on the diagram cannot score.

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
22	(a)	360 ÷ 60 = 6 300 ÷ 60 = 5 6 × 5 =	Yes and 30	3	M1 for dividing side of patio by side of paving slab eg 360 ÷ 60 **or** 300 ÷ 60 **or** 3.6 ÷ 0.6 **or** 3 ÷ 0.6 **or** 6 and 5 seen **or** 6 divisions seen on length of diagram **or** 5 divisions seen on width of diagram M1 for correct method to find number of paving slabs eg (360 ÷ 60) × (300 ÷ 60) oe **or** 6 × 5 **or** 30 squares seen on diagram (units may not be consistent) A1 for Yes **and** 30 (or 2 extra) with correct calculations **OR** M1 for correct method to find area of patio **or** paving slab eg 360 × 300 **or** 108000 seen **or** 60 × 60 **or** 3600 seen **or** 3.6 × 3 **or** 10.8 seen **or** 0.6 × 0.6 **or** 0.36 seen M1 for dividing area of patio by area of a paving slab eg. (3.6 × 3) ÷ (0.6 × 0.6) oe (units may not be consistent) A1 for Yes **and** 30 (or 2 extra) with correct calculations **OR** M1 for method to find area of patio and area of 32 slabs eg. 60 × 60 × 32 **or** 360 × 300 M1 for method to find both areas eg. 60 × 60 × 32 **and** 360 × 300 (units may not be consistent) A1 for Yes **and** 115200 **and** 108000 **OR** Yes **and** 11.52 **and** 10.8 **NB :** Throughout the question, candidates could be working in metres or centimetres

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
22	(b)	1726 25890 27616 **8 6 3** **2** 2 4 1 8 9 **3** **7** 1 6 1 2 6 **2** 6 1 6 800 60 3 30 24000 1800 90 2 1600 120 6 24000 + 1800 + 90 + 1600 + 120 + 6 = 27616	276.16	3	M1 for complete correct method with relative place value correct. Condone 1 multiplication error, addition not necessary. **OR** M1 for a complete grid. Condone 1 multiplication error, addition not necessary. **OR** M1 for sight of a complete partitioning method, condone 1 multiplication error. Final addition not necessary. A1 for digits 27616 A1 ft (dep on M1) for correct placement of decimal point after addition (of appropriate values) (SC: B1 for attempting to add 32 lots of 8.63)
23	(a)		30	2	M1 for 25 ÷ 10 **or** 2.5 seen **or** 10 ÷ 25 **or** 0.4 seen **or** 12+12+6 oe **or** a complete method eg. 25×12÷10 oe A1 cao
	(b)	1000 ÷ 200 × 12	60	2	M1 for 500 ÷ 50 **or** 1000 ÷ 200 **or** 500 ÷ 10 **or** correct scale factor clearly linked with one ingredient eg 10 with sugar or 5 with butter or flour or 50 with milk **or** an answer of 120 or 600 A1 cao

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
24		Acton after 24, 48, 72, 96, .. Barton after 20, 40, 60, 80, .. LCM of 20 and 24 is 120 9:00 am + 120 minutes **OR** Acton after 24, 48, 1h 12 min... Barton after 20, 40, 1 h LCM is 2 hours 9:00 am + 2 hours **OR** Times from 9:00 am when each service leaves the bus station Acton at 9:24, 9:48, 10:12.. Barton at 9:20, 9:40, 10:00.. **OR** 20 = 2 × 2 × 5 24 = 2 × 2 × 2 × 3 2 × 2 × 2 × 3 × 5 = 120	11:00 am	3	M1 for listing multiples of 20 and 24 with at least 3 numbers in each list ; multiples could be given in minutes or in hours and minutes (condone one addition error in total in first 3 numbers in lists) A1 identify 120 (mins) **or** 2 (hours) as LCM A1 for 11:00 (am) **or** 11(am) **or** 11 o'clock **OR** M1 for listing times after 9am when each bus leaves the bus station, with at least 3 times in each list (condone one addition error in total in first 3 times after 9am in lists) A1 for correct times in each list up to and including 11:00 A1 for 11:00 (am) **or** 11(am) **or** 11 o'clock **OR** M1 for correct method to write 20 and 24 in terms of their prime factors 2, 2, 5 and 2, 2, 2, 3 (condone one error) A1 identify 120 as LCM A1 for 11:00 (am) **or** 11(am) **or** 11 o'clock

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
25	(a)		$6y - 15$	1	B1 cao
	(b)		$4x(2x + y)$	2	B2 cao (B1 for $x(8x + 4y)$ **or** $2x(4x + 2y)$ **or** $4(2x^2 + xy)$ **or** $4x(ax + by)$ where a, b are positive integers **or** $ax(2x + y)$ where a is a positive integer **or** $4x(2x \quad y)$)
	(c)	$10t = gh$ $h = \frac{10t}{g}$	$\frac{10t}{g}$	2	M1 for clear intention to multiply both sides of the equation by 10 (eg. ×10 seen on both sides of equation) **or** clear intention to divide both sides of the equation by g (eg. ÷ g seen on both sides of equation) **or** $10t = gh$ **or** $\frac{t}{g} = \frac{h}{10}$ **or** fully correct reverse flow diagram eg. ← ×10 ← ÷g ← A1 for $\frac{10t}{g}$ oe

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
26	(a)	$2 \times 5 \times 2 = 20$ $300 \div 20 =$	15	3	M2 for $300 \div (2 \times 5 \times 2)$ oe (M1 for $2 \times 5 \times 2$ **or** 20 seen **or** $300 \div (2 \times 5)$ **or** 30 seen A1 cao
	(b)	$c = \frac{30 \times 40}{150}$ =	8	2	M1 for $\frac{30 \times 40}{150}$ **or** 1200 seen A1 cao
27		$3x - 15 = 2x + 24$ $x = 39$ **OR** $2x + 3x - 15 + 2x + 2x + 24 = 360$ $9x + 9 = 360$ $9x = 351$ $x = 39$ **OR** $2x + 2x + 24 = 180$ $4x + 24 = 180$ $4x = 156$ $x = 39$ **OR** $2x + 3x - 15 = 180$ $5x - 15 = 180$ $5x = 195$ $x = 39$	39	3	M1 for forming an appropriate equation eg $3x - 15 = 2x + 24$ **or** $2x + 3x - 15 + 2x + 2x + 24 = 360$ oe **or** $2x + 2x + 24 = 180$ oe **or** $2x + 3x - 15 = 180$ oe **or** $2x + 3x - 15 = 2x + 2x + 24$ M1 (dep) for correct operation(s) to isolate x and non-x terms in an equation to get $ax = b$ A1 cao **OR** M2 for $\frac{351}{9}$ **or** $\frac{195}{5}$ **or** $\frac{156}{4}$ oe A1 cao

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GCSE Mathematics (2MB01) Higher
5MB2H (Non-Calculator) Paper 01

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*1		Angle *BED* = 68° 180 – (68 + 68) OR Angle *BEF* = 180 – 68 = 112 Angle *BED* = 180= 112 = 68 180 – (68 + 68)	*x* = 44°	4	M1 for Angle *BED* = 68° seen in the diagram or correctly used in the working space M1 for 180 – 2 × "68" A1 for *x* = 44° (accept angle *BDE* = 44°) [Note: 44° only seen in the body of the script without the "*x* =" gets M1M1A0] C1 (dep on at least M1) for alternate angles are equal (or equivalent) and one other reason; either angles in a triangle add to 180° or base angles of an isosceles triangle are equal OR for allied angles (or equivalent, eg co-interior) add up to 180° and angles on a straight line add up to 180° and one other reason; either angles in a triangle add to 180° or base angles of an isosceles triangle are equal
2			4*n* + 2	2	B2 for 4*n* + 2 oe (eg 4×*n* + 2 or *n*4 + 2, …) or *n*th = 4*n* + 2 (B1 for a linear expression in 4*n* e.g. 4*n* + a ($a \neq 2$) or *n* = 4*n* + 2) (B0 for *n* = 4*n* and *n* + 4)

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3		35 ÷ (5 + 2) = 5 5 × 5 OR 5 2 10 4 15 6 20 8 25 10	25	2	M1 for 35 ÷ (5 + 2) or 35 ÷ 7 or 35 × $\frac{5}{7}$ A1 for 25 cao OR M1 for listing 5, 10, 15, ….. and 2, 4, 6, ….. to at least 15 and 6 A1 for 25 cao [SC: B1 for an answer of 25:10 if M0 scored]
4		$\frac{16}{40} + \frac{15}{40} = \frac{31}{40}$ OR | | 2 | 5 | | 3 | | 15 | | 8 | 16 | 40 | OR 0.4 + 0.375	$\frac{31}{40}$ or 0.775	2	M1 for attempt to write both fractions with a common denominator (a multiple of 40) with at least one of them correct A1 for $\frac{31}{40}$ oe OR M1 for 40 in the correct cell and 15 or 16 in the correct cell A1 for $\frac{31}{40}$ oe OR M1 for changing both fractions to decimals with both 0.4 and 0.375 seen A1 for 0.775

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5		$\frac{15}{100} \times 400 = 60$ $400 - 60 =$ OR $\frac{85}{100} \times 400$	340	3	M1 for $\frac{15}{100} \times 400$ (= 60) oe or 40 + 20 or 400 × 0.15 M1 (dep) for 400 – "60" A1 for 340 cao OR M1 for 100–15 (=85) M1 (dep) for $\frac{'85'}{100} \times 400$ or '0.85' × 400 A1 for 340 [SC: B1 for an answer of 460 if M0 scored]
6	(a)		$5(2a + 1)$	1	B1 for $5(2a + 1)$ or $5\times(2a + 1)$ or $(2a + 1)5$ or $5(1 + 2a)$, etc
	(b)	$5x + 35 + 3x - 6$	$8x + 29$	2	M1 for $5x + 35$ or $3x - 6$ or $8x$ or 29 A1 for $8x + 29$
	(c)		$3ab(a + 2b)$	2	B2 for $3ab(a + 2b)$ (B1 for correct partial factorisation $a(3ab + 6b^2)$ or $b(3a^2 + 6ab)$ or $3a(ab + 2b^2)$ or $3b(a^2 + 2ab)$ or $ab(3a + 6b)$ OR $3ab(ma + 2b)$ or $3ab(a + nb)$ where $m \neq 1$, $n \neq 2$) [B0 for partial factorisation using only an integer e.g. $3(a^2b + 2ab^2)$]

5MB2H_01

Question		Working	Answer	Mark	Notes
7		515 × 35 2575 15450 18025 10 × 515 = 5150 10 × 515 = 5150 10 × 515 = 5150 5 × 515 = 2575 18025 15000 + 2500 + 300 + 50 + 150 + 25 =18025	£180.25	4	M1 for 515 × 0.35 or 515 × 35 This may be implied from an incomplete method of multiplication M1 for a complete method with relative place value correct. Condone one multiplication error, addition not necessary Or for a complete grid, condone one multiplication error, addition not necessary Or for sight of a complete partitioning method. Condone one multiplication error final addition not necessary M1 (dep on the previous M1) for addition of appropriate elements of the calculation A1 for £180.25(p) or 18025p (with '£' sign deleted)

	5	1	5	×
	1 / 5	0 / 3	1 / 5	3
1	2 / 5	0 / 5	2 / 5	5
8	0	2	5	

	500	10	5
30	15000	300	150
5	2500	50	25

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
		OR 3307 × 35 = 115 745 2792 × 35 = 97720 115745 – 97720			OR M1 for 3307 × 0.35 − 2792 × 0.35 or 3307 × 35 − 2792 × 35 M1 for a correct method of multiplication of at least one product, using digits 3307 and 35 or 2792 and 35 Condone one multiplication error, addition not necessary M1 (dep on the previous M1) for addition of appropriate elements of the calculation A1 for £180.25 or 18025p (with '£' sign deleted)

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		**Triangular ends** $\frac{1}{2} \times 5 \times 12 = 30$ $\frac{1}{2} \times 5 \times 12 = 30$ **Base** $20 \times 5 = 100$ **Vertical face** $20 \times 12 = 240$ **Slant face** $20 \times 13 = 260$ **Total area** $= 30 + 30 + 100 + 240 + 260$ OR $(5 + 12 + 13) \times 20 + 2 \times \frac{1}{2} \times 5 \times 12$	660	3	M1 for $\frac{1}{2} \times 5 \times 12$ (= 30) or 20×5 (= 100) or 20×12 (= 240) or 20×13 (= 260) M1 (dep) for adding at least 3 areas found from correct methods (of no more than 5 faces) A1 cao OR M1 for $(5 + 12 + 13) \times 20$ or $\frac{1}{2} \times 5 \times 12$ (= 30) M1 (dep) for adding "$(5 + 12 + 13) \times 20$" to at least "$1 \times \frac{1}{2} \times 5 \times 12$" A1 cao Note: Sight of $\frac{1}{2} \times 5 \times 12 \times 20$ or 600 (ie a volume calculation) scores no marks

5MB2H_01

Question		Working	Answer	Mark	Notes
9		Table of values x : –2, –1, 0, 1, 2 y : –7, –5, –3, –1, 1 OR Using $y = mx + c$ Gradient 2 intercept –3	Single line drawn from (–2, –7) to (2, 1)	3	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x. M1 (dep) ft for correctly plotting at least 2 of their points (any points plotted from their table must be plotted correctly) A1 for the correct line from (-2, -7) to (2, 1) OR **(No table of values)** M2 for at least 2 correct points (and no incorrect points) correctly plotted or for a line segment of the graph of $y = 2x – 3$ drawn (ignore any additional incorrect line segments) [M1 for at least 3 correct points plotted with no more than 2 incorrect points] A1 for the correct line from (-2, -7) to (2, 1) OR **(Use of $y = mx + c$)** M2 for a single straight line of gradient 2, passing through (0, -3) [M1 for a single straight line of gradient 2 or for a single straight line passing through (0, -3)] A1 for the correct line from (-2, -7) to (2, 1)

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10		$\frac{1}{2}$ (6 + 4) × 3 OR 6 × 3 – $\frac{1}{2}$ × 2 × 3 OR 4 × 3 + $\frac{1}{2}$ × 2 × 3	15 cm²	4	M2 for $\frac{1}{2}$ (6 + 4) × 3 oe A1 for 15 cao B1 for cm² OR M1 for 6 × 3 (=18) or $\frac{1}{2}$ × 2 × 3 (=3) M1 (dep on "6 × 3" and "$\frac{1}{2}$ × 2 × 3") for "18" – "3" from correct methods A1 for 15 cao B1 for cm² OR M1 for 4×3 (=12) or $\frac{1}{2}$ × 2 × 3 (=3) M1 (dep on "4×3" and "$\frac{1}{2}$ × 2 × 3") for "12" + "3" from correct methods A1 for 15 cao B1 for cm²

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		10 000 × 0.8 8000 × 0.9 = 7200 OR 10 000 – $\frac{20}{100}$ × 10 000 = 8000 8000 – $\frac{10}{100}$ × 8 000 OR 10 000 × 0.8 × 0.9	7200	3	M1 for 10 000 × 0.8 (= 8000) M1 (dep) for "8000" × 0.9 (= 7200) A1 for £7200 cao OR M1 for 10 000 – $\frac{20}{100}$ × 10 000 oe M1 (dep) for "8000" – $\frac{10}{100}$ × "8 000" oe A1 7200 cao OR M1 for 0.8 × 0.9 (=0.72) M1 (dep)for 10 000 × "0.72" A1 for 7200 cao [SC: B1 for an answer of 7000 if M0 scored]
12	(a)		$x^2 - 3x - 40$	2	M1 for 3 terms correct (out of no more than 4 terms) from x^2, $5x$, $-8x$ and -40 or 4 terms x^2, $5x$, $8x$ and 40 (ignoring signs) A1 for $x^2 - 3x - 40$ [Note: $x^2 - 3x + 40$ and $x^2 + 3x - 40$ with no working get M0A0]
	(b)		$(x + 4)(x – 4)$	1	B1 for $(x + 4)(x – 4)$ oe
13	(a)		(0, 2, 4)	1	B1 cao
	(b)	$\left(\frac{0+6}{2}, \frac{2+2}{2}, \frac{4+4}{2}\right)$	(3, 2, 4)	2	M1 for an answer of (a, 2, 4) or (3, b, 4) or (3, 2, c) or for[("0" + 6) ÷2, ("2" + 2) ÷2, ("4" + 4) ÷2] This may be implied by their answer with no working seen A1 for (3, 2, 4) cao

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)	$x = 0.25555\ldots$ $10x = 2.555\ldots$ $100x = 25.5555\ldots$ $90x = 25 - 2 = 23$ OR $x = 0.25555\ldots$ $10x = 2.555\ldots$ $100x = 25.5555\ldots$ $9x = 2.3$ OR $0.2 + (x = 0.0555\ldots.)$ $10x = 0.555\ldots$ $100x = 5.5555\ldots$ $0.2 + 5/90$	$\frac{23}{90}$	3	M1 for $0.255(5\ldots.)$ or $0.2 + 0.055(5\ldots)$ This can be implied in subsequent working M1 for 2 correct recurring decimals which when subtracted will leave an integer or a terminating decimal number A1 for $\frac{23}{90}$ [Note: $\frac{2.3}{9}$ gets A0] [SC: B1 for an answer of $\frac{25}{99}$ oe $(= 0.\dot{2}\dot{5})$, with or without working if M0 scored]
	(b)	$\frac{12}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{12\sqrt{6}}{6}$	$2\sqrt{6}$	2	M1 for multiplying numerator and denominator by $\sqrt{6}$ A1 for $2\sqrt{6}$ (accept $\frac{2\sqrt{6}}{1}$)

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*15		180 –(90 + 20) = 70 2 × 70 = 140	Angle *TOR* =140º	4	M1 for angle *PTO* (*PRO*) = 90º or seeing it marked on the diagram with a right angle or as 90° M1 (dep) for 180 –(90 + 20) (=70°) or for 360 – (90 + 90 + 40) (=140) A1 for (angle) *TOR* = 140º or for 140º seen in the correct place in the diagram [140º alone without the '*TOR* =' gets A0] C1 (dep on at least M1) for angle between a tangent and a radius = 90° plus at least one other correct reason from: Sum of angles in a triangle is 180º Sum of angles in a quadrilateral is 360º Triangles *PTO* and *PRO* are congruent Tangents from a point are equal in length OR
		(180 – 40)÷2 =70 180 – 2×(90 –70) = 140			M1 for angle *PTO* (*PRO*) = 90º or seeing it marked on the diagram with a right angle or as 90° M1 for (180 – 40)÷2 (=70) and [180 – 2×(90 –"70")] (=140) A1 for (angle) *TOR* = 140º or for 140º seen in the correct place in the diagram [140º alone without the '*TOR* =' gets A0] C1 (dep on at least M1) for angle between a tangent and a radius = 90° plus at least one other correct reason from: Sum of angles in a triangle is 180º Base angles of an isosceles triangle are equal Triangles *PTO* and *PRO* are congruent Tangents from a point are equal in length

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16		$80 \times \frac{5}{8} = 50$ 50×2.75 OR $80 \times 2.75 = 220$ $220 \times \frac{5}{8}$	136 to 138 inc.	3	M1 for $80 \times \frac{5}{8}$ or $80 \div 1.6$ oe (= 50) M1 (indep) for "50" × 2.75 [accept "50"× 165 (=8250)] or "50" + "50" + "50"÷2 (=25) + "25" ÷2 (=12.5) Note: "50" is what is considered to be their speed in miles per hour calculated using an explicitly stated conversion factor A1 for an answer in the range 136 to 138 inc. OR M1 for 80 × 2.75 (=220) [accept 80 × 165 (=13200)] or 80 + 80 + 80÷2 (=40) + "40"÷2 (=20) M1 (indep) for "220" × $\frac{5}{8}$ Note: "220" is what is considered to be their distance in kilometres calculated using an explicitly stated conversion factor A1 for an answer in the range 136 to 138 inc.
17		$y = -\frac{1}{2}x + 2.5$ *mm'* = –1 shows gradient is 2 $y = 2x + c$ goes through (3, 7) $7 = 2 \times 3 + c$	$y = 2x + 1$	4	M1 for establishing gradient of original line is $-\frac{1}{2}$ or sight of $y = -\frac{1}{2}x + c$ M1 (indep) for (gradient of perpendicular) × "$-\frac{1}{2}$" = –1 This can be implied by a gradient of 2 or ft on "$-\frac{1}{2}$" M1 (dep on the previous M1) for substituting (3, 7) into y = "2"x + c A1 for $y = 2x + 1$ (or equivalent algebraic equation)

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18		$\frac{2x^2-9x-5}{4x^3+2x^2}$ $\frac{(2x+1)(x-5)}{2x^2(2x+1)}$	$\frac{x-5}{2x^2}$	3	M1 for factorising the numerator correctly M1 for fully factorising the denominator correctly A1 for $\frac{x-5}{2x^2}$ oe eg. $\frac{-5+x}{2x^2}$

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November 2012

GCSE Mathematics (2MB01) Higher
5MB2H (Non-Calculator) Paper 01

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Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			39.00	3	M1 for 240 ÷ 8 or 30 seen, or 240 × 1.3(0) or 312 seen, or 1.3 ÷ 8 or 0.1625 seen M1 (dep) for 240 × 1.3 ÷ 8 or "30" × 1.3(0) or "312"÷ 8 or "0.1625"×240 A1 for 39.00 or 39 NB: M marks for use of 130 in place of 1.30
2	(a)	5 ÷ 2 2.5 × 4 10 × 28	280	3	M2 for 4 × 28 × 5 ÷ 2 oe (M1 for 5 ÷ 2 × 4 (=10) or 4 × 28 (=112) or 4 ÷ 2 × 28 (=56) oe or 560 seen) A1 cao
	(b)	140 ÷ 28 5 × 2	10	2	M1 for 140 ÷ 28 × 2 or 140 ÷ 14 oe A1 cao
3		Work with whole shape: 12 − 9 4 × (3 + 15) Work with 4 triangles: 15 + 12 + 9 = 36 4×36=144 144 – (9×8) = Work with single triangles: 15 + 12 + 9 = 36 4×(36-18) =	72	3	M1 12 − 9 (=3) M1 for 4 × ("3" + 15) oe A1 cao OR M1 for 4×(15 + 12 + 9) (=144) M1 for '144'-9×8 oe A1 cao OR M1 (15 + 12 + 9) − (2 × 9) (=18) oe M1 for 4× "18" oe A1 cao

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	(a)	54 ÷ 2 = 27 27 ÷ 3 = 9 9 ÷ 3 = 3 3 ÷ 3 = 1	2 × 3 × 3 × 3	2	M1 for attempt at prime factorization (at least two correct divisions): could be shown as a factor tree OR sight of at least one of each of 2, 3 as factors of 54 A1 for 2 × 3 × 3 × 3 or 2 × 3^3
	(b)	45, 90, 135, 180, 225, 270,.. 54, 108, 162, 216, 270, ..	270	2	M1 for at least 3 multiples of 45 and 54 (can include 45, 54) or a correct method to write 45 as 3×3×5 or 3^2×5 A1 cao
5		25 + 2 × 40	105	3	M2 for a complete method that uses both rates (M1 for method to find cost of first 100 units or £25 seen or £10 per 100 units for 2nd rate or for complete method to find the cost of 800 extra units) A1 cao

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6			120	4	M1 for method to find remaining area of wall eg (3 × 2.4) – (2 × 0.9) or 7.2 – 1.8 (= 5.4) oe M1 for remaining area of wall ÷ area of tile using changed units, eg, "5.4" ÷ "0.12" (= 45) or (7.2 ÷ 0.12) – (1.8 ÷ 0.12) oe or 60 – 15 or 45 seen M1 (dep on at least M1) finding the number of boxes (eg ÷6 and round up oe) A1 for 120 cao OR M1 for attempt to find how many rows of tiles eg 300 ÷ 30 and 240 ÷ 40 or 200 ÷ 40 and 90 ÷ 30 using changed units or 10 & 6 or 5 & 3 seen. M1 for complete method to find the number of tiles needed by tessellation method eg ("10"×"6")-("5"×"3") or 60-15 or 45 seen M1 (dep on at least M1) finding the number of boxes (eg ÷6 and round up oe) A1 for 120 cao
7	(a)		370	1	B1 cao
	(b)		0.37	1	B1 cao
	(c)		17.02	1	B1 cao
8	(a)		$7n - 3$	2	B2 for $7n - 3$ oe (B1 for $7n + d$, $d \neq -3$ or absent)
	(b)		47	2	M1 for $3 \times 4^2 - 1$ A1 cao

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9			$112\frac{1}{2}$	4	M1 for exterior angle = 360 ÷ 8 (=45) M1 for interior angle = 180 − "45" (=135) M1 (dep on at least M1) for $\frac{1}{2}$ (360 – "135") or 180 - $\frac{1}{2}$ ("135") A1 for $112\frac{1}{2}$ oe OR M1 for 360 ÷ 8 (=45) M1 for 180 + "45" (=225) or 180 – "45" M1 (dep on at least M1) for "225" ÷ 2 or for $\frac{1}{2}$ (360 – "135") or 180 - $\frac{1}{2}$ ("135") A1 for $112\frac{1}{2}$ oe OR M1 for Sum of interior angles = 180×(8-2) (=1080) M1 for interior angle = "1080" ÷8 (=135) M1 (dep on at least M1) for $\frac{1}{2}$ (360 – "135") or 180 - $\frac{1}{2}$ ("135") A1 for 112.5 oe NB do not award marks for angles that are stated in working but contradicted by their position on the diagram.

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		1.25×10^5	1	B1 cao
	(b)		0.0008	1	B1 cao
11		$\frac{1}{2} \times 2x \times x \times (x + 10)$	$V = x^3 + 10x^2$	3	M1 for $\frac{1}{2} \times 2x \times x \times (x + 10)$ A1 for $x^3 + 10x^2$ or $x^2(x + 10)$ B1 for V = cubic expression in x
12	(a)		Q marked and labelled	1	B1 for Q placed correctly (professional judgement if no cross)
	(b)		(3, 2, 4)	1	B1 cao
13	(i)		$\frac{1}{16}$	2	B1 for $\frac{1}{16}$ or 0.0625
	(ii)		4		B1 cao

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)		$(x + 1)(\boldsymbol{x} + 4)$	2	B2 for $(x + 1)(\boldsymbol{x} + 4)$ (B1 for $(x + a)(\boldsymbol{x} + b)$ with one factor correct or $(x - 1)(\boldsymbol{x} - 4)$ or $x(\boldsymbol{x} + 4)+1(\boldsymbol{x} + 4)$ or $x(\boldsymbol{x} + 1)+4(\boldsymbol{x} + 1)$)
	(b)	$3x(2x + 5) - 1(2x + 5)$ $6x^2 + 15x - 2x - 5$	$6x^2 + 13x - 5$	2	B2 for fully correct (B1 for 3 out of not more than 4 terms including signs or 4 terms correct ignoring signs)
	(c)	$\frac{15}{30x} + \frac{6}{30x} - \frac{10}{30x}$	$\frac{11}{30x}$	2	M1 for attempt to use a correct common denominator with at least 2 correct equivalent fractions A1 for $\frac{11}{30x}$ oe

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*15			Proof	5	B1 for $OM = ON$ or (OMN is) isosceles triangle or OMB = 90° or AMO = 90° B1 for $OMN = ONM$ or either = $\frac{1}{2}(180 - y)$ oe B1 for (Angle) $BMN = 90 - "\frac{1}{2}(180 - y)"$ [if algebraic in y] C1 for statement angle between tangent and radius = 90° (or perpendicular or right angle) C1 for correct conclusion with BMN stated, accompanied by correct working clearly laid out and in a logical sequence with correct calculations Acceptable alternative: B1 for angle at circumference = $\frac{1}{2}y$ B1 for 'angle at centre is twice the angle at the circumference' oe B1 for angle $BMN = \frac{1}{2}y$ C1 for statement 'alternate segment theorem' C1 for correct conclusion with BMN stated, accompanied by correct working clearly laid out and in a logical sequence with correct calculations

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16		Gradient of $AB = 2$ Gradient of perpendicular line $= -\frac{1}{2}$ $y = -\frac{1}{2}x + c$ $-1 = -\frac{1}{2} \times 5 + c$ $c = \frac{3}{2}$	$y = -\frac{1}{2}x + \frac{3}{2}$	4	M1 for attempt to find gradient of AB M1 (dep) for attempt to find gradient of perpendicular line eg use of -1/m M1(dep on M2) for substitution of $x = 5$, $y = -1$ A1 for $y = -\frac{1}{2}x + \frac{3}{2}$ oe
17		$6 \times 6 + 6 \times \sqrt{5} - 6 \times \sqrt{5} - \sqrt{5} \times \sqrt{5}$ $\frac{31}{\sqrt{31}} \times \frac{\sqrt{31}}{\sqrt{31}}$	$\sqrt{31}$	3	M1 for $6 \times 6 + 6 \times \sqrt{5} - 6 \times \sqrt{5} - \sqrt{5} \times \sqrt{5}$ or $6^2 - \left(\sqrt{5}\right)^2$ (for 3 out of not more than 4 terms including signs or 4 terms correct ignoring signs) M1 $\frac{"31"}{\sqrt{31}} \times \frac{\sqrt{31}}{\sqrt{31}}$ or for $\frac{\text{[expression in surd form]}}{\sqrt{31}} \times \frac{\sqrt{31}}{\sqrt{31}}$ A1 cao

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Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5MB2H_01

Question		Working	Answer	Mark	Notes
1	(a)		x: −2, −1, 0, 1, 2, 3, 4 y: -2, **0**, **2**, **4**, 6, **8**, **10**	2	B2 cao (B1 for any 2 correct values)
	(b)		Correct graph	2	B2 correct line through at least 2 correct points (B1 for correct points plotted or ft from their table if at least B1 earned in part (a))
2			60	3	M1 for 200 ÷ 5 (=40) M1(dep) for '40' × 1.50 or '40' × 150 A1 cao OR M1 150 ÷ 5 (= 30) or 1.5(0) ÷ 5 (=0.3(0)) M1(dep) for 200 × '30' or 200 × '0.3(0)' A1 cao (If no marks scored, SC B1 for 120)
3		$\frac{9}{24} + \frac{8}{24}$	$\frac{17}{24}$	2	M1 for converting to two fractions with a correct common denominator, at least one fraction correct. A1 $\frac{17}{24}$ oe

PMT

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4			150	3	M1 300 ÷ 20 (= 15) or 200 ÷ 20 (=10) or 3 ÷ 0.2 (= 15) or 2 ÷ 0.2 (=10) M1(dep) '15' × '10' A1 cao OR M1 300 × 200 (= 60000) or 20 × 20 (=400) or 3 × 2 (= 6) or 0.2 × 0.2 (=0.04) M1 (dep) '60000' ÷ '400' or '6' ÷ '0.04' A1 cao
5	(a)		$3x - y$	2	M1 for $3x$ or $-y$ A1 for $3x - y$ or $-y + 3x$
	(b)		$2 - 3x$	1	B1 for $2 - 3x$ or $-3x + 2$
	(c)		t^{11}	1	B1 cao
	(d)		y^4	1	B1 cao
	(e)		c^{12}	1	B1 cao
6			6400	4	M1 for correct method to work out 20% M1 for correct method to divide in the ratio 2:3 M1for complete and correct method A1 cao

PMT

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)		$4n - 2$	2	B2 $4n - 2$ or $2 + (n - 1) \times 4$ oe (B1 for $4n + k$, $k \neq -2$, or $4n$)
	(b)		−30	2	M1 $20-5 \times 10$ A1 cao
8			48	4	M1 for $360 \div 5$ (=72) M1 for 180 – '72' (= 108) M1 (dep M2) for '108' – 60 A1 cao OR M1 for $(5 - 2) \times 180$ (=540) M1 for '540' ÷ 5 (= 108) M1 (dep M2) for '108' - 60 A1 cao
9	(a)		$3(t + 4)$	1	B1 for $3(t + 4)$ or $3 \times (t + 4)$ oe
	(b)(i)		$20x + 25$	3	M1 for $7 \times 2x + 7 \times 1$ or $14x + 7$ or $6 \times x + 6 \times 3$ or $6x + 18$ A1 for $20x + 25$ (accept $5(4x+5)$)
	(ii)		Shown		B1 for $5(4x+5)$ or describes how the coefficient of x and the constant term are both multiples of 5
10			Correct elevation	2	M1 for a side elevation which shows 2 vertical, 2 horizontal and 1 sloping line in the correct order. A1 fully correct

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		$8\times10+\frac{4+10}{2}\times6=122$ 80+42 = 122 122 × 30 OR $(8+6)\times10-2\times\frac{1}{2}\times\frac{10-4}{2}\times6=$ $140-18=122$ 122 × 30 OR 8 × 10 × 30 = 2400 $\frac{4+10}{2}\times6\times30=1260$ 2400 + 1260 OR (8 + 6) × 10 × 30 = 4200 $2\times\frac{1}{2}\times\frac{10-4}{2}\times6\times30=540$ 4200-540	3660	4	M1 for correct method to find one correct area eg 8 × 10 (= 80) or $\frac{4+10}{2}\times6\ (=42)$ or (8 + 6) × 10 (=140) or $\frac{1}{2}\times\frac{10-4}{2}\times6\ (=9)$ M1 for correct method to find one correct volume eg 8 × 10 × 30 (= 2400) or $\frac{4+10}{2}\times6\times30\ (=1260)$ or 9 ×30 M1 for correct and complete method to find the total volume A1 cao

PMT

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12		4.2×10^5 1.3×10^5 3.0×10^{-5} -2.5×10^{-4} 5.2×10^3 OR 420000 130000 0.00003 −0.00025 5200	-2.5×10^{-4} 30×10^{-6} 0.0052×10^6 13×10^4 4.2×10^5	3	M1 for intention to reduce numbers to standard form A1 at least two numbers correctly changed into standard form A1 correct order (any form) OR M1 for intention to reduce numbers to ordinary form A1 at least two numbers correctly changed into ordinary form A1 correct order (any form) (SC B2 for correct ordering largest to smallest)
13	(a)		(8, 4, 0)	1	B1 cao
	(b)		(8, 2, $\frac{7}{2}$)	2	M1 for mean of each pair of coordinates, $\frac{8+8}{2}$ (= 8), $\frac{4+0}{2}$ (= 2), $\frac{7+0}{2}$ (= $\frac{7}{2}$ oe), or 2 correct coordinates. A1 (8, 2, $\frac{7}{2}$) accept $3\frac{1}{2}$ or 3.5 for $\frac{7}{2}$

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*14		Angle *BCD* = 27° Angle *CBD* = 90° Angle *CDB* = $180^o - 90^o - 27^o = 63^o$ Alternate angles are equal The tangent to a circle is perpendicular (or 90°) to the radius (or diameter) Angles in a triangle add up to 180° OR Angle *CBE* = 90°, Angle *ABE* = $90^o - 27^o = 63^o$ Angle *CDB* = 63° The tangent to a circle is perpendicular (or 90°) to the radius (or diameter) Corresponding angles are equal OR Angle *CBD* = 90° Angle *ABD* = $90^o + 27^o = 117^o$ Angle *CDB* = $180^o - 117^o = 63^o$ The tangent to a circle is perpendicular (or 90°) to the radius (or diameter) Allied angles/Co-interior angles add up to 180°	63°	4	B1 for Angle CBD = 90° or Angle CBE = 90° B1 for Angle BCD = 27° or Angle ABE = 63° C1 for Angle CDB = 63° and one correct reason C1 for complete and correct reasons. OR B1 for Angle CBD = 90° B1 for Angle ABD = 117° C1 for Angle CDB = 63° and one correct reason C1 for complete and correct reasons. Alternate angles are equal Corresponding angles are equal The tangent to a circle is perpendicular (or 90°) to the radius (or diameter) Angles in a triangle add up to 180° Angles on a straight line add up to 180° The exterior angle of a triangle is equal to the sum of the interior opposite angles. Allied angles/Co-interior angles add up to 180°

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)		$y = 3x$	2	M1 for equation $y = 3x + k$ $(k \neq -4)$ A1 for $y = 3x$
	(b)		$y = -\frac{1}{3}x + 5$	2	M1 for gradient $-\frac{1}{3}$ A1 $y = -\frac{1}{3}x + 5$ oe
16			1	3	M1 $(\sqrt{5})^2 - 1$ or $\sqrt{25} - 1$ or $\sqrt{5} \times \sqrt{5} - \sqrt{5} + \sqrt{5} - 1$ or $\sqrt{25} - \sqrt{5} + \sqrt{5} - 1$ M1 (indep) use of $(\sqrt{5})^2 = 5$ or $\sqrt{5} \times \sqrt{5} = 5$ A1 cao
17			$\frac{x}{2x+1}$	3	B1 for $x(x - 3)$ B1 for $(2x + 1)(x - 3)$ B1 for $\frac{x}{2x+1}$

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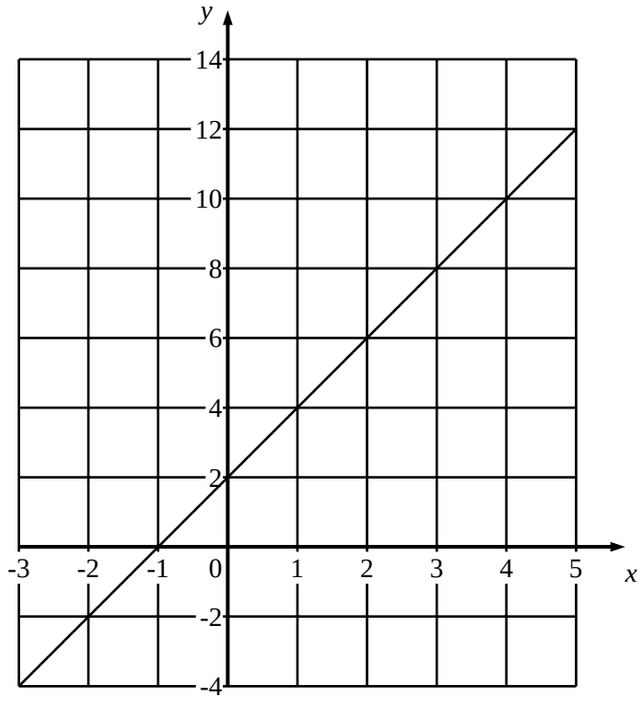
1.



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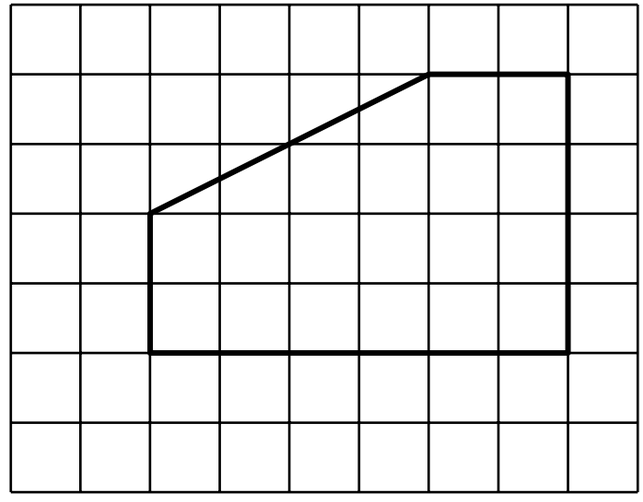

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PMT

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			40.5	3	M1 for 1.5×6 or 1.5 ×1.5 M1 for adding area of 5 or 6 faces provided at least 3 are the correct area A1 cao NB: anything that leads to a volume calculation 0 marks.
*2			Not enough mincemeat since 600<700 OR Only able to make 38 mince pies since insufficient mincemeat	4	M1 for 45 ÷ 18 (= 2.5) M1 for 2.5 used as factor or divisor A1 for ingredients as 562.5 and 875 and 250 and 700 and 2.5 (accept 2 or 3) OR for availables as 400, 400, 200 240, 2.4 (accept 2 or 3) C1 ft (dep on at least M1) for identifying and stating which ingredient is insufficient for the recipe (with some supportive evidence) OR M1 for a correct method to determine the number of pies one ingredient could produce M1 for a correct method to determine the number of pies **all** ingredient could produce A1 for 80 and 51 and 90 and 38 and 108 C1 ft (dep on at least M1) for identifying and stating which ingredient is insufficient for the recipe. (with some supportive evidence)

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)		Points plotted at (1,8200) and (3.5,5000)	1	B1 for points accurately plotted ±1/2 square tolerance
	(b)		'the older the car the lower the value' 'the greater the value the newer the car'	1	B1 for an acceptable relationship eg. 'the older the car the lower the value' (accept 'negative correlation' but not just 'negative')
	(c)		5200 to 6600	2	M1 for a single line segment with negative gradient that could be used as a line of best fit or a vertical line from 2.5 or a point at (2.5,*y*) where *y* is from 5200 to 6600 A1 for given answer in the range 5200 − 6600
4			126	3	M1 for 1 – 0.05 – 0.32 (= 0.63) M1 for '0.63' × 200 A1 cao OR M1 for 0.05 × 200 (= 10) or 0.32 × 200 (= 64) or 0.37 × 200 (=74) M1 for 200 – '10' – '64' A1 cao OR M1 for 100 – 5 – 32 (= 63) M1 for $\frac{"63"}{100} \times 200$ A1 cao SC: B2 for $\frac{126}{200}$ as the answer.

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)		Response boxes overlap and are not exhaustive	2	B2 for **TWO** aspects from: No time frame given Non-exhaustive responses Response boxes over-lapping (B1 for ONE correct aspect)
	(b)		How many magazines do you buy each month? 0-4 5-8 over 8	2	B1 for a question with a time frame B1 for at least 3 correctly labelled response boxes (non-overlapping, need not be exhaustive) **or** for a set of response boxes that are exhaustive (could be overlapping) [Do not allow inequalities in response boxes]
	(c)		One reason	1	B1 for ONE reason Eg. All the same age, may all be males, may all like same types of magazines, sample too small, biased
6			4.8	4	M1 for 60 × 60 (=3600) M1 for 15000÷ 20 (=750) or 20÷15000 (=0.00133..) or "3600"÷15000 (=0.24) or 15000÷"3600" (=4.16..) M1 for "3600" ÷ (15000÷20) or "3600"×20÷15000 oe A1 cao

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PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			28% or $\frac{14}{50}$	4	M1 for 100 30 (= 70) or $1 - \frac{3}{10}$ $(= \frac{7}{10})$ M1 for "70" ÷ (3 + 2) (= 14) or $"\frac{7}{10}" \div (3+2)$ $(= \frac{7}{50})$ M1 for "14" × 2 or $\frac{7}{50} \times 2$ A1 for 28% or $\frac{14}{50}$ oe **OR** M1 for a correct method to find (100-30)% of any actual sum of money M1 for "350" ÷ (3 + 2) (= 70) M1 for "70" × 2 A1 for 28% or $\frac{14}{50}$ oe **OR** M1 for starting with two numbers in ratio 3:2, eg 21 and 14 M1 for equating sum of their numbers to 100 – 30 (=70%), eg '21' + '14' (=35) M1 for scaling sum of their numbers to 100%, eg '35'÷70×100 (=50) A1 for 28% or $\frac{14}{50}$ oe SC: award B3 for oe answers expressed in an incorrect form eg $\frac{2.8}{10}$

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PAPER: 1MA0_2H					
Question		Working	Answer	Mark	Notes
8			10752	4	M1 for splitting the pentagon (or show the recognition of the "absent" triangle) and using a correct method to find the area of one shape M1 for a complete and correct method to find the total area M1 (dep on at least one prev M1) for multiplying their total area by 2.56 (where total area is a calculation involving at least two areas) A1 cao
9			55	4	M1 for a correct method to find a different angle using 35° M1 for setting up a complete process to calculate angle *x* A1 cao B1 states one of the following reasons relating to their chosen method: Alternate angles are equal; Corresponding angles are equal; Allied angles / Co-interior angles add up to 180; the exterior angle of a triangle is equal to the sum of the interior opposite angles.

<table>
<tr><th colspan="5">PAPER: 1MA0_2H</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>10</td><td></td><td><table><tr><th>x</th><th>$x^3 + 2x$</th></tr><tr><td>4</td><td>72</td></tr><tr><td>4.1</td><td>77.(121)</td></tr><tr><td>4.2</td><td>82.(488)</td></tr><tr><td>4.3</td><td>88.(107)</td></tr><tr><td>4.4</td><td>93.(984)</td></tr><tr><td>4.5</td><td>100.(125)</td></tr><tr><td>4.6</td><td>106.(536)</td></tr><tr><td>4.7</td><td>113.(223)</td></tr><tr><td>4.8</td><td>120.(192)</td></tr><tr><td>4.9</td><td>127.(449)</td></tr><tr><td>5</td><td>135</td></tr><tr><td></td><td></td></tr><tr><td>4.65</td><td>109.8(44625)</td></tr><tr><td>4.66</td><td>110.5(14696)</td></tr><tr><td>4.67</td><td>111.1(87563)</td></tr><tr><td>4.68</td><td>111.8(63232)</td></tr><tr><td>4.69</td><td>112.5(41709)</td></tr></table></td><td>4.7</td><td>4</td><td>B2 for a trial $4.6 \leq x \leq 4.7$ evaluated correctly
(B1 for a trial evaluated correctly for $4 \leq x \leq 5$)
B1 for a different trial evaluated correctly for $4.65 \leq x < 4.7$
B1 (dep on at least one previous B1) for 4.7

[Note: Trials should be evaluated to at least accuracy shown in table, truncated or rounded]

No working scores 0 marks</td></tr>
<tr><td>11</td><td></td><td></td><td>3.52</td><td>3</td><td>M1 for $1.35^2 + 3.25^2$
M1 (dep) for $\sqrt{(1.35^2 + 3.25^2)}$ $(= \sqrt{12.385})$
A1 for answer in the range 3.51 to 3.52</td></tr>
</table>

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PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)	$3x - 6 = x + 7$ $2x = 13$	6.5	3	M1 for $3\times x - 3\times 2$ ($=3x - 6$) or $\frac{x}{3} + \frac{7}{3}$ seen M1 for correct method to isolate the terms in x or the number terms on opposite sides of an equation A1 for 6.5 oe
	(b)	$2 - y = 1 \times 5$	-3	2	M1 for intention to multiply both sides by 5 (to give $2 - y = 1 \times 5$) A1 cao
13	(a)		(3, 3.5) oe	2	M1 for a correct method to find the value of either the x coordinate or the y coordinate of the midpoint **or** $x = 3$ **or** $y = 3.5$ A1 cao
	(b)		-1.8 oe	2	M1 for correct method to find the gradient OR (+)1.8 A1 for -1.8 oe

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*14			The Friendly Bank	4	M1 for a correct method to find interest for the first year for either bank **OR** correct method to find the value of investment after one year for either bank **OR** use of the multiplier 1.04 or 1.05 M1 for a correct full method to find the value of the investment (or the value of the total interest) at the end of 2 years in either bank A1 for 2100.8(0) and 2110.5(0) (accept 100.8(0) and 110.5(0)) C1 (dep on M1) ft for a correct comparison of *their* total amounts, identifying the bank from their calculations **OR** M1 for either 1.04 × 1.01 or 1.05 × 1.005 M1 for 1.04 × 1.01 and 1.05 × 1.005 A1 for 1.0504 and 1.05525 C1 (dep on M1) ft for a correct comparison of *their* total multiplying factors identifying the bank from their calculations

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PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)		-2 -1 0 1 2 3 4 **8** 3 0 **-1** **0** 3 **8**	2	B2 for 8, -1, 0, 8 (B1 for at least two of 8, -1, 0, 8)
	(b)		Correct curve	2	M1 (ft) for at least 5 points plotted correctly A1 for a fully correct curve
	(c)	$x^2 - 2x - 3 = 0$ OR $(x - 3)(x + 1) = 0$	3 and −1	2	M1 for the straight line $y = 3$ drawn to intersect the "graph" from (a) A1 for both solutions **OR** M1 for identifying $y = 3$ from the table A1 for both solutions **OR** M1 for $(x \pm 3)(x \pm 1)$ A1 for both solutions

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*16		Angle *POT* = 180 – 90 – 32 = 58 (angle between radius and tangent = 90° and sum of angles in a triangle = 180°) Angle *OST* =angle *OTS* = 58÷2 (ext angle of a triangle equal to sum of int opp angles and base angles of an isos triangle are equal) or (angle at centre = 2x angle at circumference) OR Angle *SOT* = 90 + 32 = 122 (ext angle of a triangle equal to sum of int opp angles) (180 – 122) ÷ 2 (base angles of an isos triangle are equal)	29	5	B1 for angle OTP = 90°, quoted or shown on the diagram M1 for a method that leads to 180 – (90 + 32) or 58 shown at *TOP* M1 for completing the method leading to "58"÷2 or 29 shown at *TSP* A1 cao C1 for "angle between radius and tangent = 90°" **and** one other correct reason given from theory used NB: C0 if inappropriate rules listed OR B1 for angle OTP = 90°, quoted or shown on the diagram M1 for a method that leads to 122 shown at *SOT* M1 for (180 – "122") ÷ 2 or 29 shown at *TSP* A1 cao C1 for "angle between radius and tangent = 90°" **and** one other correct reason given from theory used NB: C0 if inappropriate rules listed

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
17	(a)		Box plot overlay	2	M1 for a box drawn with at least 2 correct points from LQ, Med and UQ A1 for a fully correct box plot
	(b)		Comparison of a measure of spread plus a comparison of medians (in context)	2	B1 for a correct comparison of a measure of spread (using either range or iqr) B1 for a correct comparison of medians For the award of both marks at least one of the comparisons made must be in the context of the question.
18		$3p^2 = y + 4$ $p^2 = \frac{y+4}{3}$	$p = \sqrt{\frac{y+4}{3}}$	3	M1 for clear intention to add 4 to both sides or divide all terms by 3(with at least 3 terms) M1 for clear intention to find the square root from p^2 = (expression in y) A1 for $p = \sqrt{\frac{y+4}{3}}$ oe (accept ± a correct root)
19	(a)		$3(2 + 3x)$	1	B1 for $3(2 + 3x)$
	(b)		$(y + 4)(y – 4)$	1	B1 for $(y + 4)(y – 4)$
	(c)		$(2p − 5)(p + 2)$	2	M1 for $(2p \pm 5)(p \pm 2)$ A1 for $(2p − 5)(p + 2)$

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
20		cos y = 2.25 ÷ 6 y = cos^{-1} (2.25 ÷ 6) OR 6cos 75 = 1.55…	The ladder is not safe because y is not near to 75	3	M1 for cos y = 2.25 ÷ 6 oe M1 for cos^{-1} (2.25 ÷ 6) C1 for sight of 67-68 and a statement eg this angle is NOT (near to) 75° and so the ladder is not steep enough and so not safe. OR M1 for cos 75 = x ÷ 6 M1 for 6cos 75 C1 for sight of 1.55(29…) and a statement eg that 2.25 NOT (near to) 1.55 and so the ladder is not steep enough and so not safe.
21			48 or 49	2	M1 for $\frac{460}{460+320+165}\times 100$ (=48.67 ….) or $\frac{460}{9.5}$ or $\frac{460}{9.45}$ A1 for 48 or 49
22			1.33	3	M1 for $3.4 = \frac{k}{5^2}$ oe or 3.4×5^2 (=85) M1 for '3.4×5^2' ÷ 8^2 A1 for answer in range 1.32 to 1.33 or $\frac{85}{64}$
23		d: UB = 54.5 (or 54.499), LB = 53.5 C: UB = 170.5 (or 170.499), LB = 169.5 170.5 ÷ 53.5 169.5 ÷ 54.5	3.19 3.11..	4	B1 for any one correct bound quoted M1 for 170.5 ÷ 53.5 or 169.5 ÷ 54.5 A1 for UB = answer in range 3.18 to 3.19 from correct working A1 for LB = 3.11.. from correct working

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PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
24	(a)		18.2	2	M1 for ½ × 6 × 7 × sin60 A1 for answer in range 18.1 to 18.2
	(b)		6.56	3	M1 for $6^2 + 7^2 - 2 \times 6 \times 7 \times \cos 60$ M1 for correct order of operation eg 36 + 49 – 42 (=43) A1 for answer in range 6.55 to 6.56
25			$x = 2.87$, $y = -0.87$ and $x = -0.87$, $y = 2.87$	6	M1 for $x^2 + (2 - x)^2 = 9$ M1 for $4 - 4x + x^2$ A1 for $2x^2 - 4x - 5 = 0$ oe 3 term simplified quadratic M1 for a correct method to solve their quadratic Eg $x = \frac{4 \pm \sqrt{(16 - 4 \times 2 \times -5)}}{4}$ A1 for $x = 2.87$, $y = -0.87$ or better A1 for $x = -0.87$, $y = 2.87$ or better Award marks for equivalent algebraic expressions. Apply the same scheme as above for y first.

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Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
1		Model as well as diagram provided	Standard mark scheme
3	(a)	*y*-axis 2 cm for 1000. *x*-axis 2 cm for ½ Table: 8200 changed to 8000	Points plotted at (1,8000) and (3.5,5000
8		Braille diagram labelled A B E D C	Standard mark scheme
12	(a)	MLP only: *x* changed to *y*.	Standard mark scheme
13		Crosses at A and B changed to a filled-in circle. Braille: AB is joined with a line.	Standard mark scheme

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
15		Table: wording added "There are four spaces to fill." *x*-axis 2 cm for ½. *y*-axis 2 cm for 1. Labelling remains same as on standard paper.	Standard mark scheme
17		Both box plots put on one page and labelled 'Girls' and 'Boys' Girls: LQ changed to 15, UQ changed to 40 Boys: figures changed to 5 20 35 40 50 2 cm grids.	Standard mark scheme
20		'horizontal ground' and 'vertical wall' labelled.	Standard mark scheme
24		Braille: Information about measurements given	Standard mark scheme

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Mark Scheme (Results)

November 2013

Pearson Edexcel GCSE
in Mathematics Linear (1MA0)
Higher (Non-Calculator) Paper 1H

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			90 450 225 1.5 960	3	M1 for 6 ÷ 4 (= 1.5) or 4 ÷ 6 (= 0.66..) or ÷4 × 6 oe or sight of any one of the correct answers A1 for three correct A1 for all correct
2	(a)		Plot (90,17)	1	B1 cao
	(b)		Positive	1	B1 Positive
	(c)		In range 16 to 20	2	M1 for a single straight line segment with positive gradient that could be used as a line of best fit or a vertical line from 110 or a point plotted at (110, *y*) where *y* is in the range 16 to 20 A1 for an answer in the range 16 to 20 inclusive
3			120 cm^3	4	M1 for $\frac{1}{2} \times 3 \times 4$ M1 (dep) for '$\frac{1}{2} \times 3 \times 4$' × 20 A1 for 120 B1 (indep) for cm^3

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	(a)		$4y + 5x + 5$	2	M1 $5x$ or 5 seen A1 cao
	(b)		$3x(3x - 2y)$	2	B2 for $3x(3x - 2y)$ (B1 for $x(9x - 6y)$ or $3(3x^2 - 2xy)$ or $3x(ax - by)$ where a and b are integers not equal to zero)
	(c)		$4x + 8$	1	B1 cao
	(d)		$x^2 - 2x - 15$	2	M1 for 4 terms correct with or without signs or 3 out of no more than 4 terms correct with correct signs A1 cao
5	(a)		0.25	1	B1 oe
	(b)		150	2	M1 for 0.75×200 oe A1 cao
6	(a)		Shape with vertices at (–1, 3), (0, 6), (2, 6), (1, 3)	1	B1 for correct shape in correct position
	(b)		Rotation centre (0,0) 90° anticlockwise	3	B1 rotation B1 (centre) (0,0) B1 90° anticlockwise or 270° clockwise Note: award no marks if more than one transformation is given

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(i)	20, 40, 60 12, 24, 36, 48, 60	3 and 5 or any multiple of 3, 5	4	M1 attempts multiples of both 20 and 12 (at least 3 of each shown but condone errors if intention is clear) or identifies 60 or a multiple of 60 M1 (dep on M1) for a division by 20 or 12 or counts up 'multiples' or identifies a common multiple (implied if one answer is correct or answers reversed) A1 cheese slices (packets) 3, burgers (boxes) 5 or any multiple of 3, 5 OR M1 for expansion of either 20 or 12 into factors M1 for demonstration that both expansions include 4 (or 2 × 2) A1 cao for cheese slices (packets) 3, burgers (boxes) 5
		20 = 4×5 = 2×2×5 12 = 4×3 = 2×2×3			
	(ii)		60		B1 for 60 or ft from their correct answer in (i) or ft 'common multiple'
8			38	5	M1 $3x - 5 = 19 - x$ M1 for a correct operation to collect the x terms or the number terms on one side of an equation of the form $ax + b = cx + d$ A1 for $x = 6$ M1 for substituting their value of x in the three expressions and adding **or** substituting their value of x after adding the three expressions A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
9	(a)		Criticisms	2	B1 Qu 1 Overlapping boxes, no units B1 Qu 2 e.g. no time frame, non-specific responses, no number quantities, open to interpretation, no option for those who do not exercise
	(b)		Question given	2	B1 for a correct question with a time frame B1 for at least 3 correctly labelled non-overlapping response boxes (need not be exhaustive) or at least 3 response boxes that are exhaustive for all integer values of their time unit (could be overlapping) NB Units must be included in either question or response boxes to score full marks [Do not allow inequalities in response boxes]

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*10			Not enough, needs £133	5	M1 for splitting the shape (or showing recognition of the "absent" rectangle) and using a correct method to find the area of one shape M1 for a complete and correct method to find the total area M1 for a complete method to find 70% of 19 (= 13.3) or 70% of their total cost or 70% of their area A1 114(m^2) and (£)133 **or** 114(m^2) and (£)13.3(0) and 108(m^2) C1 (dep on M2) for a conclusion supported by their calculations OR M1 for a complete method for the number of tins required for one section of the area of the floor M1 for a complete method to find the number of tins for the whole floor M1 for a complete method to find 70% of their total number of tins and multiply by 19 A1 (£)133 C1 (dep on M2) for a conclusion supported by their calculations
11			164	5	M1 200 ÷ (3+2) (= 40) or an equivalent ratio seen M1 (dep) 3 ×'40' (= 120) or 2 ×'40' (= 80) or 120: 80 or 80:120 M1 a complete method to find 70% of their total number of large letters e.g. 0.7 × '80' (=56) M1 multiplies their three totals by the correct unit price and adds, e.g. 60(p) × '120' + (£)1 × '56' + (£)1.50 × '24' A1 164

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12		<table><tr><td>x</td><td>–2</td><td>–1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>y</td><td>–4</td><td>–1</td><td>2</td><td>5</td><td>8</td></tr></table>	$y = 3x + 2$ drawn	4	B1 for axes scaled and labelled **(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x M1 ft for plotting at least 2 of their points (any points from their table must be correctly plotted) A1 for correct line between $x = –2$ and $x = 2$ **(No table of values)** M1 for at least 2 correct points with no more than 2 incorrect points M1 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = 3x + 2$ drawn A1 for correct line between $x = –2$ and $x = 2$ **(Use of $y = mx + c$)** M1 for line drawn with gradient of 3 **OR** line drawn with y intercept at 2 M1 for line drawn with gradient of 3 **AND** with y intercept at 2 A1 for correct line between $x = –2$ and $x = 2$ SC B2 (indep of B1) for correct line segment between $x = 0$ and $x = 2$ (ignore any additional incorrect line segment(s))

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
13		35 × 10 = 350 33 × 11 = 363 363 – 350 = 13 OR 10×(35–33) =20 33 – 20 = 13	13	3	M1 35 × 10 (= 350) or 33 × 11 (= 363) M1 (dep) finding the difference in their totals e.g. '363' – '350' A1 cao OR M1 10×(35 – 33) (=20) or 11×(35 – 33) (=22) M1 (dep) 33 – '20' or 35 – '22' A1 cao
14	(a)		$\frac{1}{5}$	1	B1 oe
	(b)		$\frac{1}{9}$	1	B1 cao
	(c)	$9\times10^4\times3\times10^3$	2.7×10^8	2	M1 27×10^7 oe or $9\times3\times10^{4+3}$ A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
15		$6x + 8y = 10$ $6x - 9y = 27$ $y = -1$ $3x - 4 = 5$ $3x = 9$ $x = 3$ OR $9x + 12y = 15$ $8x - 12y = 36$ $x = 3$ $9 + 4y = 5$ $4y = -4$ $y = -1$	$x = 3$, $y = -1$	4	M1 for a correct process to eliminate either variable (condone one arithmetic error) A1 cao for either x or y M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again (condone one arithmetic error) A1 cao OR M1 for full method to rearrange and substitute to eliminate either variable (condone one arithmetic error) A1 cao for either x or y M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again (condone one arithmetic error) A1 cao Trial and improvement scores 0 marks unless both x and y are correct
16		$120 \div 20 = 6$ $6^2 = 36$ $36 \times 300 = 10\,800$	10 800	3	M1 $120 \div 20$ (= 6) oe, can be implied by $120^2 \div 20^2$ M1 '$6'^2 \times 300$ A1 cao
17		(3,6,7) to (–2,2,5) (–5, –4, –2) (–2– 5, 2 – 4, 5 – 2)	(–7, –2, 3)	2	M1 for midpoint plus change or complete method for 2 out of 3 coordinates, can be implied by 2 correct values A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
18	(a)		68	1	B1 cao
	*(b)		Yes as 28 > 20 or 35% > 25% or 53 < 60	3	M1 for reading a value from graph at time = 60 (=28, accept 27 to 28) M1 for '28' ÷ 80 × 100 (= 35) or 25 ÷ 100 × 80 (= 20) C1 (dep on M2) for correct decision based on their figures OR M1 for 25 ÷ 100 × 80 (= 20) M1 for reading a value from graph at cf = 20 (=53, accept 52 to 54) C1 (dep on M2) for correct decision based on their figures
	(c)	28, 53, 68, 76, 96	Box plot plotted	3	B1 for ends of whiskers at 28 and 96 with a box B1 ft for median at '68' inside a box B1 for ends of box at 53 (accept 52 to 54) and 76
19			0.82	3	M1 for 1 – 0.7 (= 0.3) or 1 – 0.4 (= 0.6) M1for 1– '0.3'×'0.6' A1 for 0.82 oe OR M1 for 1 – 0.7 (= 0.3) or 1 – 0.4 (= 0.6) M1 (0.7 × 0.4) + (0.7 × '0.6') + ('0.3'× 0.4) A1 for 0.82 oe

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
20	(a)		4	3	M1 for correct expansion to $32x - 8$ or multiplying both sides by $3x$ or dividing both sides by 4 M1 for a compete and correct method to isolate the x terms and the number terms (condone one arithmetic error in multiplying out the bracket) A1 cao
	(b)	$\frac{2(y-6)-(y+3)}{(y+3)(y-6)}$	$\frac{y-15}{(y+3)(y-6)}$	3	M1 for common denominator of $(y+3)(y-6)$ M1 for $\frac{2(y-6)}{(y+3)(y-6)} - \frac{y+3}{(y+3)(y-6)}$ oe or $\frac{2(y-6)-(y+3)}{(y+3)(y-6)}$ oe A1 for $\frac{y-15}{(y+3)(y-6)}$ or $\frac{y-15}{y^2-3y-18}$
21			100	4	M1 $y = kx^2$ oe or $36 = k \times 3^2$ A1 $k = 4$ M1 (dep on M1) $(y =)$ '4' $\times 5^2$ A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*22		$360 - y$	$180 - \frac{y}{2}$	4	M1 $ADC = \frac{y}{2}$ A1 $180 - \frac{y}{2}$ C2 (dep on M1) for both reasons Angle at centre is twice the angle at the circumference Opposite angles in cyclic quadrilateral add to 180° (C1 (dep on M1) for one appropriate circle theorem reason) OR M1 reflex $AOC = 360 - y$ A1 $\frac{360 - y}{2}$ oe C2 (dep on M1) for both reasons Angles around a point add up to 360° Angle at centre is twice the angle at the circumference (C1 (dep on M1) for one appropriate circle theorem reason)
23			Triangle with vertices at (–1,–4), (–1,–5), (–3,–4.5)	2	M1 for correct shape and size and the correct orientation in the wrong position or two vertices correct A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
24	(a)	$\overrightarrow{AB} = -\mathbf{a} + \mathbf{b}$ $\overrightarrow{ON} = \overrightarrow{OA} + \frac{2}{3}\overrightarrow{AB}$ $\overrightarrow{ON} = \mathbf{a} + \frac{2}{3}(-\mathbf{a} + \mathbf{b})$ $= \frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ OR $\overrightarrow{ON} = \overrightarrow{OB} + \frac{1}{3}\overrightarrow{BA}$ $\overrightarrow{ON} = \mathbf{b} + \frac{1}{3}(-\mathbf{b} + \mathbf{a})$ $= \frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$	$\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$	3	M1 for correct vector equation involving $\overrightarrow{ON}$, eg. $\overrightarrow{ON} = \overrightarrow{OA} + \overrightarrow{AN}$, may be written, partially or fully, in terms of **a** and **b**, e.g. $(\overrightarrow{ON} =)$ $\mathbf{a} + \frac{2}{3}\overrightarrow{AB}$ M1 for showing answer requires $\overrightarrow{AN} = \frac{2}{3}\overrightarrow{AB}$ or $\overrightarrow{BN} = \frac{1}{3}\overrightarrow{BA}$ A1 $\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ oe
	(b)	$\overrightarrow{OD} = \overrightarrow{OA} + \overrightarrow{AC} + \overrightarrow{CD}$ $= \mathbf{a} + \mathbf{b} + \mathbf{b}$ $= \mathbf{a} + 2\mathbf{b}$ $\overrightarrow{OD} = 3(\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b})$ $\overrightarrow{OD} = 3\overrightarrow{ON}$	Proof	3	M1 for a correct vector statement for $\overrightarrow{OD}$ or $\overrightarrow{ND}$ in terms of **a** and **b**, e.g. $\overrightarrow{OD} = \mathbf{a} + \mathbf{b} + \mathbf{b}$ oe or $\overrightarrow{ND} = \frac{2}{3}(-\mathbf{b} + \mathbf{a}) + \mathbf{b} + \mathbf{b}$ oe A1 for correct and fully simplified vectors for $\overrightarrow{ON}$ (may be seen in (a)) **and** for $\overrightarrow{OD}$ $(= \mathbf{a} + 2\mathbf{b})$ or $\overrightarrow{ND}$ $(= \frac{2}{3}\mathbf{a} + \frac{4}{3}\mathbf{b})$ C1 (dep on A1) for statement that $\overrightarrow{OD}$ or $\overrightarrow{ND}$ is a multiple of $\overrightarrow{ON}$ (+ common point)

Modifications to the mark scheme for Modified Large Print (MLP) papers.

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Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
2		*x* axis 2cm for 10,*y* axis 2cm for 2 ½ . Crosses changed to filled in circles. Right axis labelled.	Standard mark scheme
3		Model as well as diagram	Standard mark scheme
4	(a)	*x* changed to *e*. *y* changed to *f*.	M1 5*e* or 5 seen A1 cao
	(c)	*x* changed to *y*	Standard mark scheme
	(d)	*x* changed to *y*	Standard mark scheme

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PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
6	(a)	Move shape A two squares to the right. Cut left axis at -5. 2cm grid.	B1 for correct shape in correct position
	(b)	2cm grid. *x* axis -6 to +7. *y* axis -3 to +7.	Standard mark scheme
Q11		Remove 501 – 750g row. .	Standard mark scheme
Q12		2 cm grid. Axes drawn but not labelled	Standard mark scheme
Q18		Change line so it goes through (20, 0) (50, 20) (60, 30) (70, 40) (80,60) (100, 80). *x* axis 2cm for 10, *y* axis 2cm for 5.	B1 for 70 (accept 68 to 72) M1 for reading a value from graph at time = 60 (=30, accept 28 to 32) M1 for '30' ÷ 80 × 100 (= 37.5) or 25 ÷ 100 × 80 (= 20) C1 (dep on M2) for correct decision based on their figures OR M1 for 25 ÷ 100 × 80 (= 20) M1 for reading a value from graph at cf = 20 (=50, accept 48 to 52) C1 (dep on M2) for correct decision based on their figures
	(c)	28 seconds changed to 30 seconds. 96 seconds changed to 100 seconds. Boxplot *x* axis 3cm for 10 in an intermediate line.	B1 for ends of whiskers at 30 and 100 with a box B1 ft for median at '70' inside a box B1 for ends of box at 50 (accept 52 to 54) and 80 (accept 78 to 82)

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
Q23		Triangle A (the image) moved down 1 square. Triangle B (the enlargement) given scale factor $-\frac{1}{2}$ centre (0, -1). Wording: 'Describe fully the single transformation that will map Triangle A onto Triangle B'.	B1 for enlargement scale factor $-\frac{1}{2}$ B1 for (centre) (0, –1)
Q24		Vectors increased in size.	Standard mark scheme

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Mark Scheme (Results)

November 2013

Pearson Edexcel GCSE
In Mathematics Linear (1MA0)
Higher (Calculator) Paper 2H

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NOTES ON MARKING PRINCIPLES

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If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
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Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
1 (a)		18.75	2	M1 for 84 **or** 4.48 **or** $\frac{112}{25}$ **or** 18.7 **or** 18.8 **or** 19 **or** 20 **or** $\frac{75}{4}$ A1 cao
(b)		20	1	B1 for 20 **or** ft from their answer to (a) provided (a) is written to 2 or more significant figures
2 (a)		12	2	M1 for 32÷8 (=4) **or** $\frac{3}{8} \times 32$ oe A1 for 12
(b)		36	2	M1 for correct method to find 45% of 80 A1 cao
3		4	2	M1 for 14 **or** $\frac{3+7}{n} = \frac{5}{7}$ **or** any fraction equivalent to $\frac{2}{7}$ or $\frac{5}{7}$ A1 cao
4			2	M1 for a 5cm by 5 cm square **or** a 5cm by 3 cm rectangle **or** a 5 cm by 2 cm rectangle A1 for correct elevation with dividing line NB: diagrams which appear to have a 3D element get 0 marks

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PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
5		£26.50 **or** HK$325.95	3	M1 for 3179.55 ÷ 12.3 (=258.5) M1 (dep) for 285 - '258.5' A1 for £26.50 (correctly stated with currency) **OR** M1 for 285 × 12.3 (=3505.5) M1 (dep) for '3505.5' - 3179.55 (=325.95) A1 for HK$325.95 (correctly stated with currency)
6		19	4	M1 for 130 − 96 (=34) M1 for 73 − 55 (=18) M1 for '34' − 9 − '18' + 12 A1 cao **OR** M1 for 96 − 55 − 12 (=29) M1 for 9 + '29' (=38) M1 for 130 − 73 − '38' A1 cao

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
*7		Small with correct figures for comparison	4	M1 for one calculation eg 6.5 ÷ 30 (=0.216...) **or** 8.95 ÷ 40 (=0.22375) **or** 10.99 ÷ 50 (=0.2198) M1 for all three calculations eg 6.5 ÷ 30 (=0.216...) **and** 8.95 ÷ 40 (=0.22375) **and** 10.99 ÷ 50 (=0.2198) A1 for 0.216(6...) **and** 0.223(75) **and** 0.219(8...); can be rounded or truncated as long as they remain different C1 (dep on M1) for conclusion ft from three comparable figures [could use different figures relating to 30, 40, 50] **OR** M1 for one calculation eg 6.5 × 20 (=130) **or** 8.95 × 15 (=134.25) **or** 10.99 × 12 (=131.88) M1 for three calculations eg 6.5 × 20 (=130) **and** 8.95 × 15 (=134.25) **and** 10.99 × 12 (=131.88) A1 for 130 **and** 134(.25) **and** 131(.88); can be rounded or truncated as long as they remain different C1 (dep on M1) for conclusion ft from three comparable figures eg cost of 600 plants or comparing small and medium and small and large e.g. 120 plants and 150 plants separately] **OR** M1 for one calculation e.g 30 ÷ 6.5 (= 4.615…) **or** 40 ÷ 8.95 (= 4.469…) **or** 50 ÷ 10.99 (= 4.549…) M1 for three calculations e.g. 30 ÷ 6.5 (= 4.615…) **and** 40 ÷ 8.95 (= 4.469…) **and** 50 ÷ 10.99 (= 4.549…) A1 for 4.6(15…) **and** 4.4(69…) **and** 4.5(49…) can be rounded or truncated as long as they remain different C1 (dep on M1) for conclusion ft from three comparable figures [or any other calculations leading to comparable figures]

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
8 (a)		$7n - 4$	2	B2 for $7n - 4$ (B1 for $7n + d$ where d is an integer)
(b)		explanation	2	M1 for '$7n - 4$' = 150 **or** any other valid method, eg. counting on 7s (to get 150) A1 for a complete explanation eg. the 22nd term is 150 or $n = 22$ from solution of equation or a clear demonstration based on 22 or complete sequence
9		115	4	M1 for $360 - 4 \times 25$ (=260) M1 (dep) for '260'÷4 (=65) M1 for 180 − '65' **or** (360 −2× '65') ÷ 2 A1 for 115 with working **OR** M1 for 360÷4 (=90) M1 (dep) for '90' − 25 (=65) M1 for 180 − '65' **or** (360 − 2×'65') ÷ 2 A1 for 115 with working
10		Merit	3	M1 for $\frac{62}{80} \times 100$ (=77.5) A1 for 77.5% **or** 78% B1 ft (dep on M1) for 'Merit' **OR** M1 for calculating a percentage between 70 and 85% of 80 eg 0.7×80 (=56) **or** 0.84 × 80 (=67.2) **or** 0.85 × 80 (=68) A1 for 56 **and** 67(.2) or 68 or for two appropriate values which can be compared with 62 B1 ft (dep on M1) for 'Merit'

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
11 (a)		x^{10}	1	B1 cao
(b)		m^{12}	1	B1 cao
(c)		$3a^{-4}f^{6}$	2	B2 for $3a^{-4}f^{6}$ **or** $\frac{3f^{6}}{a^{4}}$ (B1 for any two from 3, a^{-4} or $\frac{1}{a^{4}}$, f^{6} in a product)
12		440	2	M1 for 140 × π oe or 439 A1 for 439.6 – 440
*13	Distance ÷ speed: 30 ÷ 70 (= 0.42-0.43); Distance ÷ time: 30 ÷ 26 (=1.15…); Speed × time: = 70 × 26 (=1820 mins); mph to miles/min =70÷ 60 (=1.16-1.17); Minutes to hours is 26 ÷ 60 (=0.43…)	No with correct figure	3	M1 for a calculation which uses the Time × Speed = Distance relationship **OR** a conversion of units eg between hours & minutes or between mph & miles per min M1 for a calculation involving both of the above C1 for "no" with a correct calculation, with units, from working: 25.2-25.8 minutes, 30.1-30.8 miles, 69-69.3 mph NB: 70 ÷ 26 × 30 as a single stage calculation gets 0 marks

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)		$20 < T \leq 24$	1	B1 for $20 < T \leq 24$
	(b)	$6\times10 + 8\times14 + 13\times18 + 21\times22 + 2\times26 = 920$ $920 \div 50$	18.4	4	M1 for finding fx with x consistent within intervals (including the end points) allow 1 error; implied by 820, 1020 M1 (dep) for use of all correct mid-interval values eg 920 M1 (dep on 1st M1) for $\sum fx \div \sum f$ A1 for 18.4 oe
	(c)		correct frequency polygon	2	B2 for fully correct frequency polygon - points plotted at the midpoint (B1 for all points plotted accurately but not joined with straight line segments) **or** all points plotted accurately and joined with last joined to first to make a polygon **or** all points at the correct heights and consistently within or at the ends of the intervals and joined (can include joining last to first to make a polygon) NB: ignore parts of graph drawn to the left of the 1st point or the right of the last point
15			80.1	3	M1 for $39^2 + 70^2$ M1 for $\sqrt{"1521" + "4900"}$ or $\sqrt{"6421"}$ A1 for 80.1 - 80.2

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		6.25	3	M1 for clear intention to expand bracket **or** divide both sides of the equation by 5 as first step M1 for correct method to isolate terms in *f* A1 for 6.25 oe
	(b)		−0.75	4	M1 for correct method to clear fractions eg. multiply all terms by 6 M1 for expansion of brackets oe M1 (dep on M1) for isolating the terms in *h* **and** the constant terms A1 for −0.75 oe
17	(a)		**-15, 0**, 3, 0 ,**-3**, **0**, 15	2	B2 for all correct (B1 for any 2 or 3 correct)
	(b)		Correct graph	2	M1 for at least 5 points plotted correctly (ft from table if at least B1 awarded in (a)) A1 for a fully correct curve

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PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
18		49.5	4	M1 for $\tan 54 = \frac{\text{height}}{6}$ M1 for (height =) 6 × tan54 (=8.2-8.3) M1 for $\frac{1}{2}$ × '8.258..' × 12 A1 for 49.2 - 50 **OR** M1 for $\cos 54 = \frac{6}{AC}$ M1 for $(AC =) \frac{6}{\cos 54}$ (=10.2(07...)) M1 for $\frac{1}{2}$ × 12 × '10.207' × sin54 A1 for 49.2 - 50 **OR** M1 for $\frac{AC}{\sin 54} = \frac{12}{\sin 72}$ M1 for $(AC =) \frac{12}{\sin 72} \times \sin 54$ (=10.2(07...)) M1 for $\frac{1}{2}$ × 12 × '10.207' × sin54 A1 for 49.2 – 50

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
19	(a)		0.00078	1	B1 cao
	(b)		9.56×10^7	1	B1 cao
20			116	3	M1 for 80% or 0.8 seen oe or $\frac{464}{0.8}$ (=580) M1 for $\frac{464}{0.8} - 464$ A1 cao **OR** M1 for 80% or 0.8 seen oe M1 for 464 ÷ 4 **or** 464 ÷ (80÷20) A1 cao
21	(a)		$(2x + 3)(2x - 3)$	1	B1 cao
	(b)		$m = \frac{g-5}{a+3}$	3	M1 for correct processes to isolate terms in m from other terms M1 for taking m out as a common factor A1 for $m = \frac{g-5}{a+3}$ **or** $m = \frac{5-g}{-a-3}$

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Question	**Working**	**Answer**	**Mark**	**Notes**
22 (a)		'show'	2	M1 for $\frac{1}{2} \times (x - 4 + x + 5) \times 2$ **or** $2x \times (x - 4) + \frac{1}{2} \times 2x \times 9$ A1 for completion with correct processes seen
(b)		13	3	M1 for $\frac{-1 \pm \sqrt{1^2 - 4 \times 2 \times -351}}{2 \times 2}$ condone incorrect sign for 351 M1 for $\frac{-1 \pm \sqrt{2809}}{4}$ A1 for 13 NB for either M mark accept + only in place of ± **OR** M2 for $(2x + 27)(x - 13)$ (M1 for $(2x \pm 27)(x \pm 13)$) A1 for 13
23		15	2	M1 for $\frac{134}{1065} \times 120$ **or** 15.098... oe A1 cao

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Question	**Working**	**Answer**	**Mark**	**Notes**
24		14.4	3	M1 for $\pi \times 6.5^2 \times 11.5$ (=1526.42...) M1 (dep) for $\frac{\text{'1526.42...'}}{\pi \times 5.8^2}$ A1 for 14.4 - 14.5 **OR** M1 for $\frac{5.8}{6.5}$ or $\frac{6.5}{5.8}$ or 0.89(23…) or 1.12(06896…) M1 for $11.5 \div \left(\frac{5.8}{6.5}\right)^2$ or $11.5 \div \left(\frac{6.5}{5.8}\right)^2$ A1 for 14.4 - 14.5
*25		Yes with explanation	3	M1 For **Line A**: writes equation as $y = 1.5x + 4$ or gives the gradient as 1.5 or constant term of 4 OR for **Line B**: shows a method which could lead to finding the gradient or gives the gradient as 2 or constant term of 4 or calculates a sequence of points including (0,4) or writes equation of line as $y = 2x + 4$ M1 Shows correct aspects relating to an aspect of Line A and an aspect of Line B that enables some comparison to be made eg gradients, equations or points. C1 for gradients 1.5 **and** 2 **and** Yes **with** explanation that the gradients are different or states the lines intersect at (0,4) or explanation that interprets common constant term (4) from equations OR M1 for a diagram that shows both lines drawn and intersecting at (0,4) M1 for a diagram that shows both lines and their intersection point identified as (0,4) C1 for Yes and states the intersection point as (0,4)

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
26	180-136-"34.4" =9.504	3.73	5	M1 for $\frac{\sin L}{12.8} = \frac{\sin 136}{15.7}$ M1 for $L = \sin^{-1}\left(\frac{\sin 136}{15.7} \times 12.8\right)$ or **or** $\sin^{-1}0.566...$ A1 for 34.4 - 34.5 M1 for $\frac{LN}{\sin(180-136-'34.4')} = \frac{15.7}{\sin 136}$ or $\frac{LN}{\sin(180-136-'34.4')} = \frac{12.8}{\sin'34.4'}$ or $(LN^2 =)\ 15.7^2 + 12.8^2 - 2\times15.7\times12.8\times\cos(180 - 136 - '34.4')$ A1 for 3.73 - 3.74
27	$12\times20 + 10.8\times10 + 7\times15 + 5\times15 + 1.8\times30 + 0.6\times30$ $=240+108+105+75+54+18$ $=528+72=600$	12%	3	M1 for attempt to work out total area (eg =600) or area greater than 60 (eg =72) by using fd or counting squares M1 (dep) for $\frac{'72'}{'600'}\times100$ oe (=12) A1 cao (must have % otherwise 2 marks)

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
*28		Proof	3	M1 for one pair of equal angles or sides with reason M1 for second pair of equal angles or sides with reason C1 for proof completed correctly with full reasons and reason for congruence Acceptable reasons: *AD* common (oe eg both same) Angle *BAD* = angle *CDA* (angles in a semicircle are 90°) Angle *ABO* = angle *DCA* (angles in the same segment are equal) Triangle *ABD* and triangle *DCA* are congruent - ASA **OR** *BD* = *CA* (diameters of the circle) Angle *BAD* = angle *CDA* (angles in a semicircle are 90°.) *AD* common Triangle *ABD* and triangle *DCA* are congruent - RHS **OR** *BD* = *CA* (diameters of the circle) *AD* is common Angle *ADB* = angle *CAD* (base angles of an isosceles triangle are equal.) Triangle *ABD* and triangle *DCA* are congruent - SAS

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Question 6:

	F	S	G	
W	12	55		96
M	**7**	**18**	9	**34**
	19	73		130

	F	S	G	
W	12	55	**29**	96
M			9	
	19	73	**38**	130

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q4		Model as well as diagram of prism provided. Question reversed.	Standard mark scheme
Q9		MLP – *a* changed to *x*	Standard mark scheme
Q11	(a) (c)	MLP – *x* changed to *y* MLP - *a* changed to *e*	 B2 for $3e^{-4}f^6$ **or** $\frac{3f^6}{e^4}$ (B1 for any two from 3, e^{-4} or $\frac{1}{e^4}$, f^6 in a product)
Q14	 (c)	Some frequencies changed: 6, 8, 14, 20, 2 Grid – *y* axis labelled in 4s up to 24. 2cm for 2. *x*- axis 2cm for 2	Standard mark scheme Standard mark scheme

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q15		Braille – information given about the diagram.	Standard mark scheme
Q17		Grid x 1.5 with 1.5 cm squares. For 36pt, squares will be close to 2cm.	Standard mark scheme
Q18		Braille – information given about the diagram.	Standard mark scheme
Q21	(b)	a changed to f	M1 for correct processes to isolate terms in m from other terms M1 for taking m out as a common factor A1 for $m = \frac{g-5}{f+3}$ **or** $m = \frac{5-g}{-f-3}$
Q22		MLP and Braille – diagram labelled clockwise from the top left. ABCD. x changed to y. Information given about the diagram.	Standard mark scheme
Q24		Model as well as diagram provided.	Standard mark scheme
Q26		MLP and Braille information given about the diagram.	Standard mark scheme
Q27		Diagram: 20-30 bar brought down to 9. 60-90 bar brought up to 2. 90-120 bar brought up to 1. 2cm grid.	Standard mark scheme

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In Mathematics Modular (2MB01)
Unit 2: (5MB2H_01) Higher (Non-Calculator)

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PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		11	2	M1 for 20 ÷ 2 or 10 or list/table with 4 pairs of at least 5 pairs correct A1 cao
	(b)		$3n + 1$	2	B2 for $3n + 1$ oe (B1 for $3n + k$, $k \neq 1$ or absent)
2	(a)		5^{10}	1	B1 cao
	(b)		7^3	1	B1 cao
3			16	2	M1 for correct substitution of values eg $6^2 - 5\times4$ A1 cao
4	(i)		126	2	B1 cao
	(ii)		Reason		B1 for reason relating to geometrical property & parallel lines which is not contradicted by method shown elsewhere eg alternate angles are equal, corresponding angles are equal, allied angles / co-interior angles add up to 180°

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PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)		400	2	M1 for the correct scale factor 2.5 oe eg $\frac{20}{8}$, $\frac{8}{20}$, 160+160+80 or 160÷8×20 oe A1 cao
	*(b)		12	3	M1 for number of scones for limiting ingredients, eg 2×6 (=16) or 8+4 (=12) A1 for 12 cao C1 ft (dep on M1) for displaying both limiting calculations and reaching correct conclusion for their working OR M1 for proportion of limiting ingredient e.g. 80 ÷ 40 (=2) or 300 ÷ 200 (=1.5) A1 for 12 cao C1 ft (dep on M1) for displaying both limiting calculations and reaching correct conclusion for their working OR M1 for relating proportion in list to proportion Sophie has. e.g. 200 ÷ 40 or 300 ÷ 80 or 5 or 3.75 or 3.8 oe A1 for 12 cao C1 ft (dep on M1) for displaying both limiting calculations and reaching correct conclusion for their working
6	(a)		Correct diagram	2	B2 (B1 any isometric face correct)
	(b)		6	2	M1 for (1) × 2 × 3 or 2 × 4 × 6 ÷ (2 × 2 × 2) A1 cao

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PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)		$e + 7f$	2	B2 for $e + 7f$ (B1 for e or $7f$)
	(b)		$10c + 15d$	1	B1 cao
	(c)		$2x - 7$	4	M1 for $x + x + 3 + 2x$ ($= 4x + 3$) M1 for $2(3x - 2)$ ($= 6x - 4$) M1 for '$6x$' –'$4x$' – '4' ± '3' oe A1 cao OR M1 for $2(3x - 2)$ ($= 6x - 4$) M1 for '$6x$'$- x - x - 2x$ ($=2x$) oe M1 for '−4' ± 3 A1 cao
8		$\frac{90 \times 0.5}{5} = \frac{45}{5}$	8.9 – 9.5	2	M1 for at least two of 90, 0.5 and 5 A1 for 8.9 – 9.5
9	(a)		1.52×10^8	2	M1 for 1.52×10^n or 1.5×10^n or 152×10^6 A1 cao
	(b)		0.0024	1	B1 cao

PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10			126	3	M1 for (angle *BCD* =) $\frac{180\times(10-2)}{10}$ (= 144) M1 (dep) for (angle *DCX* =) 360 – '144' – 90 oe A1 cao OR M1 for (exterior angle =) $\frac{360}{10}$ (= 36) M1 (dep) for (angle *DCX* =) 90 + '36' oe, eg 180 – (90 – 36) A1 cao
11			66400	5	M1 for explicit area of a trapezium eg (3+4) ÷2 × 14 (=49) or (60+62) ÷2 ×14 (=854) OR M1 for implicit area of trapezium eg 3×14 (=42) and 0.5×14×1 (=7) or 3×14×4 (=168) and 0.5×14×1×4 (=28) M1 for area of a rectangle using correct dimensions eg 68 × 2 (=136), 30 × 68 (=2040) M1 for a complete and correct method to find the total area M1 (dep on at least one previous M1) for multiplying their total area by 200 (where total area is a calculation involving at least two areas) A1 cao

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PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		$2a(3b + 5c)$	2	B2 cao (B1 for $a(6b + 10c)$ or $2(3ab + 5ac)$ or $2a$(linear term in b and c))
	(b)		$x^2 + 2x - 35$	2	M1 for 3 terms out of 4 correct including signs or all 4 terms correct ignoring signs A1 cao
	(c)		$\frac{2t^4}{m^2}$	2	B2 for $2m^{-2}t^4$ oe (B1 $\frac{2t^4}{m^n}, n \neq 2$ oe or $\frac{2t^k}{m^2}, k \neq 4$ oe or $m^{-2}t^4$ oe)
	(d)		$(y-4)(y+4)$	1	B1 cao
	(e)		h^{-6}	1	B1 for h^{-6} or $\frac{1}{h^6}$
13			7.5	3	B1 for length given as $\frac{\sqrt{120}}{4}$ oe M1 for squaring $\frac{\sqrt{120}}{4}$ or $\frac{120}{4\times4}$ oe A1 for $\frac{120}{16}$ oe or $7\frac{1}{2}$ or 7.5 oe SC B1 for $\sqrt{30} \times \sqrt{30}$

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PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*14			113	5	B1 for stating angle *TAO* = 90 M1 for stating angle *OBA* or angle *OAB* = 90 – 58 (=32) M1 for stating angle *ABT* = 180 − 58 – 41 (=81) or angle *AOB* = 180 – 64 (=116) A1 for 113 clearly identified as the answer C1 (dep on M1) for correct statements for method used: angle between tangent and radius = 90° AND at least one of base angles of an isosceles triangle are equal sum of angles in a triangle is 180 sum of angles in a quadrilateral is 360 NB angles may be seen in diagram
15	(a)		$y = 4x + 2$	2	B2 for $y = 4x + 2$ oe (B1 for $y = 4x + c$ or $4x + 2$ or $L = 4x + 2$)
	(b)		$y = 4x - 14$	3	B1 for gradient = 4 M1 for $-6 = '4' \times 2 + c$ or $y - -6 = '4'(x - 2)$ A1 for $y = 4x - 14$ oe

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 5MB2H_01			
Question		**Modification**	**Notes**
Q1		2cm squares. Shading is dotty. 'Grey' changed to 'shaded'. 'Centimetre' removed throughout the question.	Standard mark scheme
Q4		Parallel lines labelled AB and CD. Extra wording inserted 'AB is parallel to CD'.	Standard mark scheme
Q6		Models for part (b) – dimensions of 2 × 4 × 6 given. Wording given below	
Q6	(a)	Look at the model or at the diagram for Question 6(a). They show a cuboid. For the cuboid (i) write down the number of faces, (ii) write down the number of edges, (iii) write down the number of vertices.	
Q6	(b)	Look at the two models or at the diagram for Question 6(b). They are NOT accurate. A different box has been made to hold cubes. This box is in the shape of a cuboid. A cube is also shown. Each cube has edges of length 2 cm Work out the largest number of cubes that can fit into the box.	

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PAPER: 5MB2H_01			
Question		**Modification**	**Notes**
Q7	(c)	MLP only: *x* changed to *y*. Information given about the diagram.	Standard mark scheme
Q11		Shape rotated 90° clockwise to fit measurement more easily. On diagram 'cm' removed. Wording inserted 'All measurements are in centimetres.'	Standard mark scheme
Q12	(a)	*a* changed to *e*, *b* changed to *f*, *c* changed to *g*.	B2 cao (B1 for $e(6f + 10g)$ or $2(3ef + 5eg)$ or $2e$(linear term in *f* and g))
Q12	(b)	*x* changed to *y*.	Standard mark scheme

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Mark Scheme (Results)

November 2013

Pearson Edexcel GCSE
In Mathematics Modular (2MB01)
Unit 3: (5MB3H_01) Higher (Calculator)

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
1 (a)		Reflection in $x = 0$ or y-axis	2	B1 for reflection B1 for $x = 0$ or y-axis (NB: a combination of transformations gets B0)
(b)		Triangle (1, 0)(4, 0)(1, –2)	2	M1 for any correct rotation of 90° clockwise OR for any correct rotation about the point (0, 2) A1 for a triangle with vertices at (1, 0), (4, 0) and (1, –2)
2		1263	4	M1 for a correct method to find 65% (= 5473) of the customers M1 for a correct method to find $\frac{1}{5}$ (= 1684) of the customers M1 (dep on M2) for a correct method to find the remaining number of customers A1 cao OR M1 for a correct method of adding 65% and $\frac{1}{5}$ when both correctly written as percentages (= 85%) or decimals (= 0.85) or fractions (= $\frac{85}{100}$ oe) M1 ft for a correct method to find the percentage or decimal or fraction of the customers (= 7157) M1 (dep on M2) for a correct method to find the remaining number of customers A1 cao OR M1 for a correct method of adding 65% and $\frac{1}{5}$ when both correctly percentages (= 85%) or decimals (= 0.85) or fractions (= $\frac{85}{100}$ oe) M1 ft for a correct method to find the remaining percentage (= 15%) or

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
				decimal (= 0.15) or fraction ($\frac{15}{100}$ oe) of the customers M1 (dep on M2) for a correct method to find the remaining number of customers A1 cao
3	$x = 3$ gives 39 $x = 4$ gives 80 $x = 3.1$ gives 42.(191) $x = 3.2$ gives 45.(568) $x = 3.3$ gives 49.(137) $x = 3.4$ gives 52.(904) $x = 3.5$ gives 56.(875) $x = 3.6$ gives 61.(056) $x = 3.7$ gives 65.(453) $x = 3.8$ gives 70.(072) $x = 3.9$ gives 74.(919) $x = 3.55$ gives 58.9(38875) $x = 3.56$ gives 59.3(58016) $x = 3.57$ gives 59.7(79293)	3.6	4	B2 for a correct trial in the range $3.5 \leq x \leq 3.6$ evaluated (B1 for a correct trial in the range $3 \leq x \leq 4$ evaluated) B1 for a different correct trial in the range $3.55 \leq x < 3.58$ evaluated B1 (dep on at least one previous B1) for 3.6 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but to 1 dp (rounded or truncated) if the value of x is to 2 dp NB: If no working shown, no marks can be awarded, even if the answer is correct.
4		480	2	M1 for using a correct ratio of $\frac{800}{150}$ oe or $\frac{150}{800}$ oe or $\frac{90}{150}$ oe or $\frac{150}{90}$ oe A1 cao [SC: B1 for 477 ≤ answer < 480 if no working and M0 scored]

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
*5	Key ring: 1.6 × 9 = 14.4 Purse : 3.2 × 8 = 25.6	Key ring £1.60 Purse £3.20	4	M1 for $9x$ or $8 \times 2x$ (where x is the price of a key ring) M1 for equation $9x + 8 \times 2x = 40$ oe A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation OR M1 for $(8\times2) : 9$ (= 16 : 9) M1 for $40 \div (16 + 9)$ A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation OR M2 for trial with attempt to evaluate $9x$ and $8 \times 2x$ with £1 < x < £2 (M1 for trial with attempt to evaluate $9x$ and $8 \times 2x$ with £1 ≤ x ≤ £4) A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation [SC: B2 for both £1.60 cao and £3.20 cao clearly identified for correct items with correct money notation if no working shown]

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PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
6		58.05	4	B1 for identifying 19.5(0) and 15(.00) M1 for a correct method to find the total cost of their identified tickets for the family, or for a correct method to find the discounted cost of at least one of the identified tickets M1 for a correct method to find the total discounted cost of their identified tickets A1 cao
7		Correct region shaded	3	B1 for perpendicular bisector within guidelines B1 for arc of circle, centre A, within guidelines B1 ft for a correct region shaded or otherwise indicated from their perpendicular bisector of AB and their arc drawn, centre A

PAPER: 5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*8		179 ÷ 70 = 2.5(571.....) 275 ÷ 100 = 2.7(5) 399 ÷150 = 2.6(66....) 70 ÷ 179 = 0.39(11....) 100 ÷ 275 = 0.36(36...) 150 ÷399 = 0.37(59....)	70 m*l* tube with reason	4	**Using pence per m*l*** M1 for a correct method of finding the cost per millilitre (or cost/10 m*l* etc) for one of the sizes M1 for a correct method of finding the cost per millilitre (or cost/10 m*l* etc. must be consistent) for each of the sizes A1 for 2.5(571.....) (70 m*l*) and 2.7(5) (100 m*l*) and 2.6(66....) (150 m*l*) or equivalent depending upon units used. These values can be rounded or truncated as long as they remain different C1 (dep on M1) for selecting the tube with the best value for money based upon a comparison of their 3 values. OR **Using m*l* per 1p** M1 for a correct method of finding the volume per pence (or £) for one of the sizes M1 for a correct method of finding the volume per pence (or £) for each of the sizes, with consistent units A1 for 0.39(11....) (70 m*l*) and 0.36(36...) (100 m*l*) and 0.37(59....) (150 m*l*) or equivalent depending upon units used. These values can be rounded or truncated as long as they remain different C1 (dep on M1) for selecting the tube with the best value for money based upon a comparison of their 3 values.
9	(a)	*x* –1 0 1 2 3 4 5 *y* **9** 3 –1 **–3** –3 **–1** 3	9, –3, –1	2	B2 for a fully correct table of values (B1 for at least one correct extra entry)
	(b)		Correct graph	2	B1 (dep on at least B1 in (a)) for all of their points correctly plotted B1 (dep on previous B1) for smooth curve through all 7 of their points
	(c)		0.7, 4.3	2	B1 for an answer rounding to 0.7 or ft their graph B1 for an answer rounding to 4.3 or ft their graph

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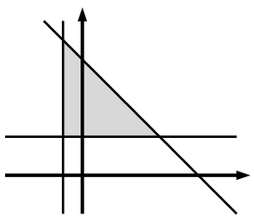
PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
10 (a)		10.25	2	M1 for an attempt to expand the bracket or divide both sides by 4 as a first step. A1 for 10.25 oe
(b)		$t = \frac{P+3}{4}$	2	M1 for a correct first step of either adding 3 to both sides or dividing both sides by 4 A1 for $t = \frac{P+3}{4}$ oe [SC: B1 for $P + 3 \div 4$ if M0 scored]
11		66.7	3	M1 for tan (y =) $\frac{86}{37}$ (= 2.3243..) M1 (dep) for $\tan^{-1}$ "2.32(43..)" = or $\tan^{-1}(\frac{86}{37})$ (accept 'shift tan' or 'inv tan' for $\tan^{-1}$) A1 for answer in the range 66.6° to 66.8° [SC: B1 for an answer in the range 23.2 to 23.3 if M0 scored]
12		Region identified	4	B1 for $x + y = 6$ or $x = -1$ or $y = 2$ drawn B1 for $x + y = 6$ and $x = -1$ and $y = 2$ drawn M1 for consistent shading (in or out) for any two of the lines $x + y = 6$, $x = -1$, $y = 2$ A1 lines drawn, and correct region identified by either shading in, or shading out; the letter R is not required, but necessary if no shading. Note: Lines may be solid or dotted/dashed etc

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PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
13		32.2	4	M1 for $BC = \frac{10}{4} \times 5$ (= 12.5) M1 for $EC = \frac{10}{4} \times 5.8 - 5.8$ (=8.7) M1(dep on at least M1) for '12.5' + '8.7' + 5 + 6 A1 cao OR M1 for $BC = \frac{5}{4} \times 10$ (= 12.5) M1 for $EC = \frac{5.8}{5} \times$ '12.5' – 5.8 (= 8.7) M1 (dep on at least M1) for '12.5' + '8.7' + 5 + 6 A1 cao OR M1 for $BC = \frac{5}{4} \times 10$ (= 12.5) M1 for $EC = \frac{6}{4} \times 5.8$ (= 8.7) M1 (dep on at least M1) for '12.5' + '8.7' + 5 + 6 A1 cao OR M1 for 4 + 5 + 5.8 (= 14.8) M1 for $\frac{10}{4} \times$ '14.8' (= 37) M1 (dep on at least M1) for '37' – 4 – 5.8 + 5 A1 cao

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PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
14	$4x - 5y = 33$ $\underline{15x + 5y = 5}$ $19x = 38$ $x = 2$, $3\times2 + y = 1$ $y = -5$ $12x - 15y = 99$ $\underline{12x + 4y = 4}$ $-19y = 95$ $y = -5$, $3x - 5 = 1$ $x = 2$ OR $4x - 5(1 - 3x) = 33$ $x = 2$, $3\times2 + y = 1$ $y = -5$	$x = 2$, $y = -5$	3	M1 for a fully correct process to eliminate one variable (condone one arithmetical error) M1 (dep on M1) for a correct substitution of their value (of x or y) into one of the equations, or for starting again with a fully correct process to eliminate the second variable A1 for $x = 2$ and $y = -5$ OR M1 for a correct rearrangement of one of the equations to make either x or y the subject and a correct method of substitution into the other equation. (condone one arithmetical error) M1 (dep on M1) for the substitution of their value (of x or y) into one of the equations. A1 for $x = 2$ and $y = -5$ [Note: No marks for trial and improvement methods unless a fully correct solution is found]
15 (a)(i)		3.202(17….)	3	B2 for for 3.202(17.....) (B1 for 5.357 .. or 1.673... seen)
(a)(ii)		3.20		B1 for 3.20 or ft from "(a)" [Note: 3.2 only gets B0]
(b)		1.17×10^{10}	2	M1 for $2.34 \times 5 \times 10^{(5+4)}$ or $11.7 \times 10^{(5+4)}$ or 234000 × 50000 (= 11700000000) A1 for 1.17×10^{10}

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PAPER: 5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$\frac{1}{2} \times 5 \times 5 \times \sin 60^o$ or $\sqrt{5^2 - 2.5^2} = 4.330.....$ $\frac{1}{2} \times 5 \times 4.33 \ldots \ldots$	10.8	3	M1 for using a triangle of sides 5 cm and angle 60° or a right-angled triangle of sides 5 cm and 2.5 cm M1 for a complete correct method to find the area of the triangle A1 for answer in the range 10.8 to 10.9
	(b)		7	4	M1 for $\frac{4}{3} \times \pi \times 17.5^3$ (= 22449.29...) or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 35^3$ (= 89797.19...) M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times 17.5^3$ (= 11224.6) M1 (dep on M1) for 80 × 1000 ÷ '11224.6' oe A1 for 7 or (dep on M2) ft rounded down.
17		$(x^2 - 7)y = (x^2 + 9)$ $x^2y - 7y = x^2 + 9$ $x^2y - x^2 = 9 + 7y$ $x^2(y - 1) = 9 + 7y$	$x = (\pm)\sqrt{\frac{7y+9}{y-1}}$ oe	4	M1 for correctly removing the fraction or $(x^2 - 7)y$ oe seen M1 for a correct rearrangement, isolating terms in x^2 on one side of an equation M1 for the fully correct factorisation of their $x^2y - x^2$ oe A1 for $x = (\pm)\sqrt{\frac{7y+9}{y-1}}$ or $x = (\pm)\sqrt{\frac{-7y-9}{1-y}}$ oe

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PAPER: 5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*18			128°	4	M1 for 180 – 116 (= 64), when clearly attempting to find angle *ADC* M1 (indep) for their angle *ADC* × 2 C2 (dep on M2) for $x = 128(^o)$ and fully correct reasons supported by method: eg. "opposite angles of a cyclic quadrilateral add up to 180°" and "the angle at the centre of a circle is twice the angle at the circumference" [C1 (dep on the relevant M1) for one correct reason] OR M1 for 116 × 2 (= 232), when clearly attempting to find reflex angle *AOC* M1 (dep) for 360 – '232' C2 (dep on M2) for $x = 128(^o)$ and fully correct reasons: eg. "the angle at the centre of a circle is twice the angle at the circumference" and "angles at a point add up to 360°" [C1 (dep on the relevant M1) for one correct reason] [SC: B2 for 128 seen identified as angle *x*, if M0 scored]
19	(a)		**b** – **a**	1	B1 for **b** – **a** oe
	(b)		$\frac{4}{5}\mathbf{a} + \frac{1}{5}\mathbf{b}$ oe	3	M1 for a fully correct vector statement for $\overrightarrow{OX}$ eg.($\overrightarrow{OX}$ =) $\overrightarrow{OA}$ (or **a**) + $\overrightarrow{AX}$ (or $\frac{1}{5}\overrightarrow{AB}$) or ($\overrightarrow{OX}$ =) $\overrightarrow{OB}$ (or **b**) + $\overrightarrow{BX}$ (or $\frac{4}{5}\overrightarrow{BA}$ or $-\frac{4}{5}\overrightarrow{AB}$) M1 (indep) for $\pm\frac{1}{5}$(**b** – **a**) or $\pm\frac{4}{5}$(**a** – **b**), ft their (a) A1 for **a** + $\frac{1}{5}$(**b** – **a**) or **b** + $\frac{4}{5}$(**a** – **b**) oe

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PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
20		4.5, –0.75 oe	3	M2 for $(2x – 9)(4x + 3)$ oe (M1 for $(2x \pm 9)(4x \pm 3)$) oe A1 for 4.5, –0.75 oe [SC: B1 for 4.5 and –0.75 oe, found by any other method]

Modifications to the mark scheme for Modified Large Print (MLP) papers.

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Angles: ±5°
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PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q1	(a) (b)	2cm grid 2cm grid. Triangle A to be rotated about the point (0,1).	
Q6		July peak / off peak in a different format. Information the same.	Standard mark scheme
Q7		Dashed line to join Alford and Bancroft. A to B – 7.5cm.	Standard mark scheme
Q9		1 ½ cm grid.	Standard mark scheme
Q12		2cm grid.	Standard mark scheme
Q13		Measurement arrows taken out.	Standard mark scheme
Q16		Model and diagram	Standard mark scheme

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Mark Scheme (Results)

November 2014

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Non-Calculator) Unit 2

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5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

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The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
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If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

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Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

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PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		$7n - 2$	2	M1 for $7n + k$ where $k \neq -2$ or absent A1 cao
	(b)		31	2	M1 for correct substitution $4\times3^2 - 5$ oe A1 cao
2			108	5	M1 for a method for finding the dimensions eg length & width = 12 or 2 × length + width = 21 A1 for length = 9 (could be shown on diagram) A1 for width = 3 (could be shown on diagram) M1 for area = "9" × "3" × 4 A1 cao
3			50	3	M1 for 625 ÷ 250 (= 2.5) or 360 ÷ 120 (= 3) or 1000 ÷ 300 (=3⅓) M1 for correct method to calculate the number of cookies for one ingredient e.g. 625 ÷ 250 or 2.5 oe **and** 20 × "2.5" A1 cao OR M1 for multiples of 250 : 120 : 30 e.g. for 40 cookies 500, 240, 600 M1 for multiples linked with the weight of ingredients available e.g. (625, 2½) or (360, 3) or (1000. 3⅓) A1 cao

PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		x -2 -1 0 1 2 3 y -7 -5 -3 -1 1 3	correct line	3	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x. M1 ft for plotting at least 2 of their points (any points plotted from their table must be correctly plotted) A1 for correct line between -2 and 3 **(No table of values)** M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $2x$-3 drawn (ignore any additional incorrect segments) (M1 for at least 3 correct points with no more than 2 incorrect points) A1 for correct line between -2 and 3 **(Use of y=mx+c)** M2 line segment of $2x$-3 drawn (ignore any additional incorrect segments) (M1 for line drawn with gradient of 2 OR line drawn with a y intercept of -3 and a positive gradient) A1 for correct line between -2 and 3

PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(i)		candles 3 holders 5	5	M1 for listing multiples of either 30 or 18 (at least 3 but condone errors if intention is clear) M1 for listing multiples of both 30 and 18 (at least 3 but condone errors if intention is clear) M1 (dep on M1) for division by 30 or 18 or counts up multiples (implied if one answer is correct or answers are reversed) A1 candles (packs) 3, holders (packs) 5 or any same multiple of 3,5 OR M1 expansion of either number in factors M1 demonstrates one of the expansions that includes 6 oe M1 demonstrates second expansion that includes 6 oe A1 candles (packs) 3, holders (packs) 5 or any same multiple of 3,5
	(ii)		90		B1 for 90 or ft on both their packs or ft "common multiple" NB: accept consistent multiples of the given answer
*6			NO figures and comparisons	5	M1 for 100 × 40 × 60 (= 240 000) M1 for "240 000" ÷ 8000 (= 30) M1 for "30"× 2.50 (= 75) A1 for 240 000 and 75 C1 (dep on M1) for comparing the cost of grit with £70 ft from their working OR M1 for 70 ÷ 2.50 (= 28) M1 for "28"× 8000 (= 224 000) M1 for 100 × 40 × 60 (= 240 000) A1 for 240 000 and 224 000 C1 (dep on M1) for comparing values of grit needed with that which can be bought for £70 ft from their working

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PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*7			broke the record	5	M1 conversion between km and miles M1 for a first step to find comparable figures M1 for a complete method to find comparable figures A1 for correct comparable figures C1 (dep on first 2 M marks) for statement e.g broke the record with comparison of their figures
8			$14\frac{2}{3}$	3	M1 for method to write fractions as improper fractions with one correct M1 (dep on M1) for multiplying numerators and denominators A1 cao SC: B2 for $\frac{220}{15}$ oe
9			(–3,–12,–1)	2	B2 cao B1 for two out of three coordinates correct
10	(a)		1	1	B1
	(b)		$\frac{1}{16}$	1	B1
	(c)		$2\sqrt{7}$	2	M1 for multiplying numerator and denominator by $\sqrt{7}$ A1 for $2\sqrt{7}$

PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		$6x^5y^8$	2	M1 for any two of 6, x^5, y^8 A1 cao
	(b)		$6x^2-11x+3$	2	M1 for 3 out of 4 correct terms with correct signs, or all 4 terms correct ignoring signs A1 cao
	(c)		$4x^3y^2(2y^3-3x)$	2	M1 for $4x^3y^2$ (two terms involving x and/or y) or correct partial factorising taking out two from 4 or x or y A1 cao
	(d)		$(2+x)(e-2f)$	2	M1 for partial factorising of at least two terms eg $2(e-2f)$ or $x(e-2f)$ or $e(2+x)$ or $2f(2+x)$ oe A1 cao
12			$y=\frac{10}{3}x+\frac{130}{3}$	5	B1 for stating B as (0, 5) or $OB = 5$ (could be written on the diagram) B1 for C as (10, 0) or $OC = 10$ (could be written on the diagram) or A is (-10, 10) or ft from their BC M1 gradient of $DA = \frac{10}{3}$ or $y=\frac{10}{3}x+c$ M1 for substitution of $x=-13$, $y=0$ or $x=-10$, $y=10$ in their equation A1 $y=\frac{10}{3}x+\frac{130}{3}$ oe
13			$\frac{7x-6}{x(2-x)}$	3	M1 for intention to use $x(2-x)$ as the denominator M1 for $\frac{4x-3(2-x)}{x(2-x)}$ oe A1 cao allow $2x-x^2$ as a denominator

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
*14			Proof	5	B1 for matching two lines of the same length with reasons B1 for matching two sides of the kite with reasons B1 for showing $AD = AB$ and $DC = CB$ with reasons C1 for "Tangents from an external point are equal in length." C1 for a complete proof

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PAPER: 5MB2H_01			
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4		2 cm grid – inside spaces will be slightly less but equal Q5. Picture removed	
6		Model given – MLP also have diagram Wording inserted: The box is 100 cm long, 40 cm wide and 60 cm high	
11	(a)	x changed to e y changed to f	
	(d)	x changed to y	
14		AC joined with a dotted line	

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5MB2H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
1 (a)		$5^1/_4$	1	B1 for $5^1/_4$ oe
(b)		12	2	M1 for (28 ÷ 7) × 3 oe A1 cao
(c)		4000	2	M1 for 20 or 200 A1 for 4000 – 4040
2	−2 −1 0 1 2 3 7 5 3 1 −1 −3	Correct graph	3	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x M1 (dep) for plotting at least 2 of their points (any points plotted from their table must be correctly plotted) A1 for correct line between $x = -2$ and $x = 3$ **(No table of values)** M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = 3 - 2x$ drawn (ignore any additional incorrect segments) (M1 for at least 3 correct points with no more than 2 incorrect points) A1 for correct line between $x = -2$ and $x = 3$ **(Use of $y = mx + c$)** M2 line segment of $y = 3 - 2x$ drawn (ignore any additional incorrect segments) (M1 for line drawn with gradient of –2 OR line drawn with y intercept of 3 and a negative gradient) A1 for correct line between $x = -2$ and $x = 3$

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5MB2H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
3		270	3	M1 for 9÷0.1 (=90) or 4.5÷1.5 (=3) oe M1 for "3" × "90" oe (=270) A1 cao OR M1 for 4.5÷0.1 (=45) or 9÷1.5 (=6) oe M1 for "6" × "45" oe (=270) A1 cao OR M1 for 9×4.5 (=40.5) or 1.5×0.1(=0.15) oe M1 for "40.5" ÷ "0.15" (=270) oe A1 cao
4		3, 5, 7	2	M1 for at least two consecutive numbers substituted into $2n+1$ or at least two of 3, 5 ,7 A1 cao
5		150 cm^3	3	M1 for a complete method to find the volume A1 for 150 B1 (indep) for cm^3
6	3000 ÷ 20=150 150 ÷ (14+1) = 10 10 × 0.5 = 20 20 × 3.99	79.80	4	M1 for amount of petrol or oil or mixture M1 for use of ratio M1(dep on M1, M1) for total cost of bottles A1 for 79.8(0)

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5MB2H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
7 (a)		$5y + 4$	2	M1 for $3\times y-3\times 2$ or $2\times y+2\times 5$ A1 cao
(b)		w^2	1	B1 cao
(c)		$5(x + 4)$	1	B1 cao
8	1.15 × 2000 (=2300) 1.10 × 2300	2530	3	M1 for a correct method to find the amount at the end of the first year M1(dep) for a correct method to find the amount at the end of the second year A1 cao
9		Italy with reason	3	B1 for 5 miles = 8km oe M1 for change to consistent units from $70\times r$ with $1.5 \le r \le 1.7$ or $130 \times s$ with $0.6 \le s \le 0.7$ C1 for Italy identified and 112 kph stated or Italy identified and 81.(25) mph stated oe

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5MB2H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
*10		27	4	M1 for 360÷5 (=72) or 360÷8 (=45) M1 for '72' – '45' A1 for $x = 27$ C1 (dep on M1) for sum of exterior angles of polygon is 360 degrees oe OR M1 for 3×180÷5 (=108) or 6×180÷8 (=135) M1 for '135' – '108' A1 for $x = 27$ C1 (dep on M1) for sum of interior angles of polygon is $180(n - 2)$ oe degrees or angles in a triangle sum to 180 degrees OR M1 for 360÷8 (=45) or 3×180÷5 (=108) M1 for 180 – ('108'+'45') A1 for $x = 27$ C1 (dep on M1) for sum of exterior angles of polygon is 360 degrees oe and angles on a straight line sum to 180 degrees
11		0.0025 2.5×10^{-2} 2.5×10^{2} 2500	2	M1 for converting all numbers to same form with at least one conversion correct A1 for fully correct order with correct numbers in any correct form (SC B1 if one number incorrectly placed or all 4 numbers listed in reverse order)
12 (a)		(5, 3, 4)	1	B1 cao
(b)		point	1	B1 cao

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5MB2H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
13		$x^2+10x+22$	4	M1 for $(x+8) - (x+5)$ (=3) or $(x+4) - (x+2)$ (=2) M1 for area of one rectangle eg $(x+2)(x+5)$ (= $x^2+7x+10$) M1 for complete method to find area e.g. $(x+2)(x+5) + 3(x+4)$ (= $x^2+7x+10 + 3x+12$) A1 cao
14 (a)		1	1	B1 cao
(b)		$\frac{1}{16}$	2	M1 for two of cube root, square, reciprocal A1 cao
15 (a)		$(y-7)(y+2)$	2	B2 cao (B1 for $(y \pm 7)(y \pm 2)$)
(b)		$\sqrt{5}+29$	2	M1 expand brackets, with at least 3 correct terms including signs or 4 correct terms ignoring signs eg $2\sqrt{5}\times3\sqrt{5}-2\sqrt{5}+3\sqrt{5}-1\times1$ A1 for $\sqrt{5}+29$ or $29+\sqrt{5}$
(c)		$\sqrt{3}$	2	M1 for $\frac{6}{\sqrt{12}}\times\frac{\sqrt{12}}{\sqrt{12}}$ oe or $\sqrt{12}=2\sqrt{3}$ A1 cao

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5MB2H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
16		$y = 2x - 1$	4	M1 for $\left(\frac{6+-2}{2}, \frac{1+5}{2}\right)$ oe M1 for $\frac{-1}{-0.5}$ oe (=2) M1(dep on previous M1) for using $y =$ '2'$x + c$ with their coordinates for the midpoint used correctly to find c A1 for $y = 2x - 1$ oe
*17		proof with reasons	5	M1 for using x oe for AOB or CPB or consistent use of three letter notation M1 for correct use of at least one circle theorem or for extending PR and CA to meet at 'X' and using triangles OBX and PCX A1 for correct proof C2 for fully correct reasons for each stage of proof (C1 for any relevant circle theorem reason) Possible reasons: Angles in a triangle add up to 180° Angles in a quadrilateral (4 sided shape) add up to 360° Angles on a straight line add up to 180° The tangent to a circle is perpendicular (90°) to the radius (diameter) Tangents from an external point are equal in length. Reasons must be relevant for method shown.

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PAPER: 5MB2H_01			
Question		**Modification**	**Notes**
Q2		Grid has been enlarged.	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x M1 (dep) for plotting at least 2 of their points (any points plotted from their table must be correctly plotted) A1 for correct line between $x = -2$ and $x = 3$ **(No table of values)** M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = 3 - 2x$ drawn (ignore any additional incorrect segments) (M1 for at least 3 correct points with no more than 2 incorrect points) A1 for correct line between $x = -2$ and $x = 3$ **(Use of $y = mx + c$)** M2 line segment of $y = 3 - 2x$ drawn (ignore any additional incorrect segments) (M1 for line drawn with gradient of -2 OR line drawn with y intercept of 3 and a negative gradient) A1 for correct line between $x = -2$ and $x = 3$

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PAPER: 5MB2H_01			
Question		**Modification**	**Notes**
Q3		Diagram has been enlarged. 9 metres moved to top of diagram 4.5 metres moved to the left of diagram.	M1 for 9÷0.1 (=90) or 4.5÷1.5 (=3) oe M1 for "3" × "90" oe (=270) A1 cao OR M1 for 4.5÷0.1 (=45) or 9÷1.5 (=6) oe M1 for "6" × "45" oe (=270) A1 cao OR M1 for 9×4.5 (=40.5) or 1.5×0.1(=0.15) oe M1 for "40.5" ÷ "0.15" (=270) oe A1 cao
Q5		Model provided for all candidates. Also a diagram is provided for MLP. Wording added: right-angled before triangular prism.	M1 for a complete method to find the volume A1 for 150 B1 (indep) for cm^3

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PAPER: 5MB2H_01			
Question		**Modification**	**Notes**
Q7	(c)	MLP *x* changed to y.	B1 cao
Q10		Diagram has been enlarged.	M1 for 360÷5 (=72) or 360÷8 (=45) M1 for '72' – '45' A1 for *x* = 27 C1 (dep on M1) for sum of exterior angles of polygon is 360 degrees oe OR M1 for 3×180÷5 (=108) or 6×180÷8 (=135) M1 for '135' – '108' A1 for *x* = 27 C1 (dep on M1) for sum of interior angles of polygon is 180(*n* - 2) oe degrees or angles in a triangle sum to 180 degrees OR M1 for 360÷8 (=45) or 3×180÷5 (=108) M1 for 180 – ('108'+'45') A1 for *x* = 27 C1 (dep on M1) for sum of exterior angles of polygon is 360 degrees oe and angles on a straight line sum to 180 degrees
Q12	(a)	Model provided for all candidates. Also enlarged diagram provided for MLP. On the model and diagram the point C is marked in the correct place, with an additional mark either side of the C	B1 cao
Q12	(b)	Question has been changed: "The point C has been marked on the cuboid. Write down the co-ordinates of point C". (1 mark) (_____, _____, _____)	B1 cao

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PAPER: 5MB2H_01			
Question		**Modification**	**Notes**
Q13		Diagram has been enlarged. MLP *x* changed to y.	M1 for $(x+8) - (x+5)$ (=3) or $(x+4) - (x+2)$ (=2) M1 for area of one rectangle eg $(x+2)(x+5)$ $(= x^2+7x+10)$ M1 for complete method to find area e.g. $(x+2)(x+5) + 3(x+4)$ $(= x^2+7x+10 + 3x+12)$ A1 cao
Q17		Diagram has been enlarged.	M1 for using *x* oe for *AOB* or *CPB* or consistent use of three letter notation M1 for correct use of at least one circle theorem or for extending *PR* and *CA* to meet at '*X*' and using triangles *OBX* and *PCX* A1 for correct proof C2 for fully correct reasons for each stage of proof (C1 for any relevant circle theorem reason) Possible reasons: Angles in a triangle add up to 180° Angles in a quadrilateral (4 sided shape) add up to 360° Angles on a straight line add up to 180° The tangent to a circle is perpendicular (90°) to the radius (diameter) Tangents from an external point are equal in length. Reasons must be relevant for method shown.

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Mark Scheme (Results)

Summer 2015

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Calculator) Unit 3

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NOTES ON MARKING PRINCIPLES

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i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

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The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

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If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
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Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

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It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

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5MB3H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
1		71.40	2	M1 for 41.65÷7 A1 for 71.4(0)
2		4	3	M1 $\frac{4.5}{100} \times 300$ (=13.5) or $\frac{104.5}{100} \times 300$ (=313.5) oe M1 50 ÷ "13.5" (=3.7) or at least 3 repeated addition of "13.5" A1 cao SC B1 for $1.045^n \times 300$

5MB3H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
3 (a)		1.75	2	M1 for intention to multiply brackets or for intention to divide all terms by 4 as the first step A1 for 1.75 oe
(b)		p > 7.5	2	M1 for correct method to isolate *p* or intention to divide all terms by 2 as the first step (condone the use of '=' in method) A1 for *p* > 7.5 oe
(c)		3, -5	3	M2 for $(x - 3)(x + 5)$ (M1 for $(x \pm 3)(x \pm 5)$) A1 cao 3 and –5 OR M1 for $\frac{-2 \pm \sqrt{2^2 - 4 \times 1 \times -15}}{2 \times 1}$ M1 for $\frac{-2 \pm \sqrt{64}}{2}$ A1 for 3 and – 5 cao

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5MB3H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
*4		275g (£7.95) pack with reason	4	M1 for one of 439 ÷ 150 (= 2.92), 639 ÷ 200 (= 3.19), 795 ÷ 275 (= 2.89) OR one of 150 ÷ 439 (= 0.341), 200 ÷ 639 (= 0.31), 275 ÷ 795 (= 0.345) OR any other calculation that could lead to a comparative figure M1 for calculations that could lead to comparative figures for 2 jars M1 for calculations that could lead to comparative figures for 3 jars eg all 3 from the above lists C1 for correct comparative figures for all 3 jars leading to a correctly stated comparison: 275g best value
5 (a)		7, -2, -1	2	B2 for all three correct values 7, -2, -1 (B1 for two correct values 7, -2 or -1)
(b)		Correct curve	2	B2 for fully correct curve (B1 ft for at least 5 points plotted correctly)
6		6	4	M1 for $7x + 22$ or $(5x+2)$ or $7b + 22p$ or $5b + 2p$ M1 for forming equation $7x + 22 = 2(5x + 2)$ M1 for correct intent to isolate x on one side A1 cao

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5MB3H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
7		28	3	M1 for 240 × 1.2 (=288) M1 for "288" ÷ 10 (=28.8) A1 cao OR M1 for 10 ÷ 1.2 (=8.33) M1 240 ÷ "8.33" (=28.8) A1 cao
8		Correct position marked	3	M1 for perpendicular bisector of the line AC M1 for arc of circle centre D radius 7cm A1 for correct point
*9		No with comparison of correct figures.	3	M1 for correct method to find frame dimensions 15+5+5 (=25) and 10+5+5 (=20) M1 for finding relationship between length and width for both eg 15 ÷ 10 (=1.5) and 25 ÷ 20 (= 1.25) or for correct use of a scale factor to find a comparable length C1 for correct conclusion following comparison of 2 correct comparable figures
10		Rotation, 90° clockwise centre (1,4)	3	B1 for rotation B1 for 90° clockwise or 270° anticlockwise B1 for (1,4) NB Award B0 if more than one transformation given

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5MB3H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
11		3.4	3	M1 for $\pi \times 3.5^2 \times 10$ (=384.85 or =122.5π) or $\pi \times 6^2$ (=113.1 or =36π) M1 (dep) for "384.85" ÷ "113.1" or 122.5(π) ÷ 36(π) A1 for 3.4 – 3.5 OR M1 for $\left(\frac{12}{7}\right)^2$ (=2.9) or $\left(\frac{7}{12}\right)^2$ (=0.34) M1 for $10 \div "\left(\frac{12}{7}\right)^2"$ or $10 \times "\left(\frac{7}{12}\right)^2"$ A1 for 3.4 – 3.5
12		7.5×10^9	2	M1 for 2.1×10^7 or 21000000 or sight of figures 75 A1 for 7.5×10^9
13		29.6	4	M1 for $8^2 + 5^2$ or 64 + 25 or 89 M1 (dep) $\sqrt{"8^2"+"5^2"}$ (=9.4) M1 for "9.4..." × π A1 for 29.5 – 29.65
*14		49	3	M1 for 180 - 56 - 75 A1 for 49 C1 for alternate segment theorem and angles on a straight line add up to 180° OR alternate segment theorem and angles in a triangle add up to 180° Appropriate to methods shown

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5MB3H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
15		0.84	3	M2 for 2×0.75^3 (M1 for 2×0.75 (=1.5) or 2×0.25 (=0.5) and 2 – "0.5") A1 for 0.84 − 0.844
16	$y(x+5) = 3x$ $yx+5y = 3x$ $5y = 3x - yx$ $5y = x(3 - y)$	$x = \frac{5y}{3-y}$	3	M1 for intention to multiply by $x + 5$ M1 for intention to isolate yx and $3x$ on one side to get $3x - xy$ oe A1 for $x = \frac{5y}{3-y}$ or $\frac{-5y}{y-3}$
17		85.6	4	M1 for 360 ÷ 5 (=72) M1 (dep) for $\frac{1}{2} \times 6^2 \times$ sin"72" (=17.12) M1 for completing full method to find total area of pentagon A1 for 85.5 − 85.6 OR M1 for 360 ÷ 10 (=36) or $\frac{1}{2}$(180 − 360÷5) (=54) M1(dep) for eg 6 × sin"36" × 6 × cos"36" (=17.12) or $\frac{1}{2}$ 6 × sin"54" × 6 × cos"54" (=8.55) M1 for completing full method to find total area of pentagon A1 for 85.5 − 85.6

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5MB3H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
18		$y = \frac{375}{x^2}$	3	M1 for $y \propto \frac{1}{x^2}$ or $y = \frac{k}{x^2}$ or $k = yx^2$ M1 for $5^2 \times 15$ (=375) A1 for $y = \frac{375}{x^2}$ or $y = \frac{k}{x^2}$ and $k = 375$
19		300	3	B1 for 45 or 0.15 M1 for 45 ÷ 0.15 A1 for 300 cao
20 (a)		$p = 4$, $q = -10$	3	M1 for sight of $(x - 4)^2$ or $p = 4$ M1 for $(x - 4)^2 - 16 + 6$ A1 for $p = 4$, $q = -10$ OR M1 for $x^2 - 2px + p^2 + q$ or $-2p = -8$ or $p^2 + q = 6$ M1 for $-2p = -8$ and $p^2 + q = 6$ A1 for $p = 4$, $q = -10$
(b)		(4, -10)	1	B1 ft
21 (a)		Correct graph	2	M1 for any translation along x axis A1 correct position
(b)		$y = -g(x)$	1	B1 for $y = -g(x)$ oe from correct interpretation of diagram

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5MB3H/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
22		6.2	5	M1 for a method to find an angle *RAB* = 70, *ABR* = 50, *BRA* = 60 or *TAR* = 20 M1 for substitution into sine formula $\frac{AR}{\sin"50"} = \frac{12}{\sin"60"}$ M1 for use of sine rule to find *AR*, *AR* = $\frac{12}{\sin"60"} \times \sin"50"$ (=10.61) M1 for substitution into cosine formula $TR^2 = 5^2 + "10.61"^2 - 2 \times 5 \times "10.61" \times \cos 20$ (=37.92) A1 for 6.15 - 6.2
23		$\frac{3}{4}(\mathbf{b} + \mathbf{a})$	4	B1 for $\mathbf{b} - \mathbf{a}$ or $\frac{1}{2}(\mathbf{b} - \mathbf{a})$ or $\mathbf{a} - \mathbf{b}$ or $\frac{1}{2}(\mathbf{a} - \mathbf{b})$ M1 for $\overrightarrow{OM} = \mathbf{a} + \frac{1}{2}(\mathbf{b} - \mathbf{a})$ or $\mathbf{b} + \frac{1}{2}(\mathbf{a} - \mathbf{b})$ oe M1 for $\overrightarrow{ON} = \frac{3}{2}(\mathbf{a} + \frac{1}{2}(\mathbf{b} - \mathbf{a}))$ or $\frac{3}{2}(\mathbf{b} + \frac{1}{2}(\mathbf{a} - \mathbf{b}))$ A1 for $\frac{3}{4}(\mathbf{b} + \mathbf{a})$ oe (simplified)

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Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q4		Diagrams have been removed.	M1 for one of 439 ÷ 150 (= 2.92), 639 ÷ 200 (= 3.19), 795 ÷ 275 (= 2.89) OR one of 150 ÷ 439 (= 0.341), 200 ÷ 639 (= 0.31), 275 ÷ 795 (= 0.345) OR any other calculation that could lead to a comparative figure M1 for calculations that could lead to comparative figures for 2 jars M1 for calculations that could lead to comparative figures for 3 jars eg all 3 from the above lists C1 for correct comparative figures for all 3 jars leading to a correctly stated comparison: 275g best value
Q5	(a)	Wording added: 'There are three spaces to fill.' Table produced in vertical format.	B2 for all three correct values 7, -2, -1 (B1 for two correct values 7, -2 or -1)
Q5	(b)	1½ cm grid provided.	B2 for fully correct curve (B1 ft for at least 5 points plotted correctly)

PMT

PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q8		Size of diagram kept as original. Scale put on diagram as well as in text.	M1 for perpendicular bisector of the line AC M1 for arc of circle centre D radius 7cm A1 for correct point
Q9		Diagram has been enlarged. Dotty shading. Measurement labels moved to be more accessible for candidates.	M1 for correct method to find frame dimensions 15+5+5 (=25) and 10+5+5 (=20) M1 for finding relationship between length and width for both eg 15 ÷ 10 (=1.5) and 25 ÷ 20 (= 1.25) or for correct use of a scale factor to find a comparable length C1 for correct conclusion following comparison of 2 correct comparable figures
Q10		The grid has been enlarged. Shapes are labelled triangle A and triangle B. Wording added: 'It shows two triangles on the grid, triangle A and triangle B.' Dotty shading	B1 for rotation B1 for 90° clockwise or 270° anticlockwise B1 for (1,4) NB Award B0 if more than one transformation given

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PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q11		The diagram has been enlarged. 2 models provided for all candidates. A diagram is also provided for MLP.	M1 for $\pi \times 3.5^2 \times 10$ (=384.85 or =122.5π) or $\pi \times 6^2$ (=113.1 or =36π) M1 (dep) for "384.85" ÷ "113.1" or 122.5(π) ÷ 36(π) A1 for 3.4 – 3.5 OR M1 for $\left(\frac{12}{7}\right)^2$ (=2.9) or $\left(\frac{7}{12}\right)^2$ (=0.34) M1 for 10 ÷ "$\left(\frac{12}{7}\right)^2$" or 10 × "$\left(\frac{7}{12}\right)^2$" A1 for 3.4 – 3.5
Q13		The diagram has been enlarged.	M1 for $8^2 + 5^2$ or 64 + 25 or 89 M1 (dep) $\sqrt{"8^2"+"5^2"}$ (=9.4) M1 for "9.4..." × π A1 for 29.5 – 29.65
Q14		The diagram has been enlarged. Wording added: 'Angle CAB is marked x'.	M1 for 180 - 56 - 75 A1 for 49 C1 for alternate segment theorem and angles on a straight line add up to 180° OR alternate segment theorem and angles in a triangle add up to 180° Appropriate to methods shown

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PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q16		MLP: *x* changed to *e*. *y* changed to *f*.	M1 for intention to multiply by $e + 5$ M1 for intention to isolate yx and $3x$ on one side to get $3e - ef$ oe A1 for $x = \frac{5f}{3-f}$ or $\frac{-5f}{f-3}$
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Q19		MLP and braille: a changed to x. b changed to f.	B1 for 45 or 0.15 M1 for $45 \div 0.15$ A1 for 300 cao

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PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q21	(a)	The grid has been enlarged.	M1 for any translation along x axis A1 correct position
Q21	(b)	The grid has been enlarged.	B1 for $y = -g(x)$ oe from correct interpretation of diagram
Q22		The diagram has been enlarged. TR is joined by a dashed line.	M1 for a method to find an angle, $RAB = 70$, $ABR = 50$, $BRA = 60$ or $TAR = 20$ M1 for substitution into sine formula $\frac{AR}{\sin"50"} = \frac{12}{\sin"60"}$ M1 for use of sine rule to find AR, $AR = \frac{12}{\sin"60"} \times \sin"50"$ (=10.61) M1 for substitution into cosine formula $TR^2 = 5^2 + "10.61"^2 - 2 \times 5 \times "10.61" \times \cos 20$ (=37.92) A1 for 6.15 - 6.2
Q23		The diagram has been enlarged. OM is joined by a dashed line.	B1 for $\mathbf{b} - \mathbf{a}$ or $\frac{1}{2}(\mathbf{b} - \mathbf{a})$ or $\mathbf{a} - \mathbf{b}$ or $\frac{1}{2}(\mathbf{a} - \mathbf{b})$ M1 for $\overrightarrow{OM} = \mathbf{a} + \frac{1}{2}(\mathbf{b} - \mathbf{a})$ or $\mathbf{b} + \frac{1}{2}(\mathbf{a} - \mathbf{b})$ oe M1 for $\overrightarrow{ON} = \frac{3}{2}(\mathbf{a} + \frac{1}{2}(\mathbf{b} - \mathbf{a}))$ or $\frac{3}{2}(\mathbf{b} + \frac{1}{2}(\mathbf{a} - \mathbf{b}))$ A1 for $\frac{3}{4}(\mathbf{b} + \mathbf{a})$ oe (simplified)

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Mark Scheme (Results)

November 2015

Pearson Edexcel GCSE
In Mathematics A (1MA0)
Higher (Non-Calculator) Paper 1H

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Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			69	4	M1 for finding 15% of £720 (=108) M1 (dep) for finding total of £720 plus interest (or 115% etc) (=828) M1 (dep on previous M1) dividing by 12 A1 cao OR M1 finding 720 ÷ 12 (=60) M1 (dep) finding 15% of "60" (=9) M1 (dep on previous M1) for adding, e.g. 60 + 9 A1 cao
2	(i)		19.44	2	B1 cao
	(ii)		19 440		B1 cao
3	(a)		$6n + 5$	2	B2 for $6n + 5$ (B1 for $6n + k$ where k is an integer or absent)
	(b)		No with explanation	2	M1 for "$6n + 5$" = 121 or any other valid method, e.g. counting on 6s (to get to 119 or more) A1 for No with complete explanation, e.g. $6n$=116 will not give a whole number
4	(a)		60	2	M1 for 200 × 0.3 oe A1 cao
	(b)		0.1	2	M1 subtracting sum of probabilities from 1, e.g. 1−(0.3+0.2+0.4) A1 cao

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
5			20	3	M1 for 330÷120 (=2.75) or 200÷60 (=3 1/3) or 450 ÷180 (=2.5) M1 for 450÷180 (=2.5) AND 8×"2.5" A1 cao OR M1 for 120÷8 (=15) or 60÷8 (=7.5) or 180÷8 (=22.5) M1 for 330÷(120÷8) [=22] or 200÷(60÷8) [=26.6..] or 450÷(180÷8) A1 cao OR M1 for multiples of 120:60:180 M1 for multiplication linked to 450 and 8+8+4 A1 cao
6			40°	4	M1 for angle FBC=70 or CFG = x or ABF = 110 may be seen in diagram M1 for angle CBF = BFC =70 or 90 – ½ x A1 for 40 supported by working C1 (dep on M2) for all reasons and linked to appropriate working, e.g. Alternate angles are equal; Allied angles / Co-interior angles add up to 180°; Base angles of an isosceles triangle are equal; angles in a triangle add to 180°, angles on a straight line equals 180°
7	(a)		explanations	2	B2 for two aspects from: no time frame; responses vague; no "never" box (B1 for one correct aspect)
	(b)		question response boxes+	2	B1 for a question with a time frame (may appear with response boxes) B1 for at least 3 correctly labelled response boxes (non-overlapping and exhaustive) Do not accept inequality symbols.

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		2p 1p ½ p Tot Sat 7 16 (31) 54 Sun (15) 14 17 (46) Tot (22)(30) 48 (100)	14	4	M1 for total Sat bottles 100 – 46 (=54) or for total ½ pint bottles 100 – 22 – 30 (=48) or (total 2 pint bottles on Sat) 22 – 15 (=7) M1 for total Sun bottles of ½ pint "48" – 31 (=17) or for total Sat bottles of 1 pint: "54" – 31 – (22 −15) (=16) M1 for 46 – 15 – "17" or for 30 – "16" A1 cao NB: any of the above figures could be shown in a 2-way table
*9			NO with evidence	4	M1 for 50 × 40 × 30 (=60000) M1 for "60000" ÷ 3000 (=20) M1 for "20" × £3.50 C1 eg for 70 and comparison resulting in NO OR M1 for £60 ÷ 3.50 (=17 bottles) M1 for "17" × 3000 (=51000) M1 for 50 × 40 × 30 (=60000) C1 eg for 51000 and 60000 and comparison resulting in NO

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		$x^2 + 2x$	1	B1 cao
	(b)		$3y + 4x + 2$	2	M1 for a method to expand a bracket, e.g. $3y + 6$ or $4x - 4$ A1 cao
	(c)	$2t^2 + 10t - 3t - 15$	$2t^2 + 7t - 15$	2	M1 for 4 terms correct ignoring signs or 3 out of no more than 4 terms with signs correct unless ambiguous A1 cao
	(d)		$4a(2a + 3)$	2	M1 for $4a(na+c)$ or $2a(4a+6)$ or $a(8a+12)$ [n,c integers, $c \neq 0$] A1 cao
	(e)		$(y + 1)(y - 2)$	2	M1 for $(y \pm 1)(y \pm 2)$ unless ambiguous A1 cao
11	(a)		150	2	M1 for $180 - (360 - 330)$ or $180 - 30$ or $330 - 180$ or a complete diagram showing the bearing of 330° A1 cao
	(b)		11 40	4	M1 for $200 \div 120$ (=1 2/3 h) M1 for conversion between hours and minutes A1 for 1 h 40 min or 100 minutes B1 (ft dep on M1) for 11 40

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		2, 0, 0, 6	2	B2 for 2, 0, 0, 6 (B1 for at least two of 2, 0, 0, 6); could be taken from graph
	(b)		Correct curve	2	M1 (ft) for at least 5 points plotted correctly A1 for a fully correct curve
	(c)		−0.6, 3.6	2	M1 (ft if M1 awarded in (b) and at least B1 in (a)) for indicating a point or line drawn at $y=4$, or one solution given A1 (ft) for both solutions
13			20	3	M1 for 30 × 14 (=420) or 18×10 (=180) M1 for 30 × 14 – 18 × 10 or "420" – "180" (=240) A1 cao
14			126	4	M1 for method to find exterior or interior angle of octagon M1 for method to find exterior or interior angle of pentagon M1 for complete method A1 cao

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)		19, 36, 51, 63, 73, 80	1	B1 cao
	(b)		cf graph	2	M1 for at least 5 of the 6 points plotted at each upper end of the interval (not joined) or 5 of the 6 points plotted consistently within interval (not upper end) and joined (dep on a cf table with no more than one arithmetic error) A1 correct graph
	*(c)		comparable value and conclusion	3	M1 for indication of a reading taken from a cf graph using weight = 3.4 kg or find UQ from 60 A1 for value given between 55 & 57 or 3.6 & 3.8 C1 (dep on at least M1) for conclusion (justified)
16			13.75	5	M1 for finding perimeter of rectangle e.g. $5x + 5 + 5x + 5 + 4x + 4x$ $(= 18x + 10)$ M1 for finding perimeter of trapezium e.g. $9x - 2 + 7x - 2 + 10x$ $(=26x - 4)$ M1 for equation e.g. $26x - 4 = 18x + 10$ (or $8x = 14$) A1 for finding the value of x as 1.75 B1 ft for subs of x into $5x + 5$ and evaluated (=13.75)
17			$x = 3\frac{1}{3}$ $y = -2$	4	M1 for a correct process to eliminate either variable (condone one arithmetic error) or to rearrange and substitute for elimination A1 cao for either x or y M1 (dep on M1) for correct substitution of found value into one of the equation or appropriate method after starting again (condone one arithmetic error) A1 cao

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
18			$2\sqrt{5}$	2	M1 for multiplication of denominator and numerator by $\sqrt{5}$ A1 cao
19			756π	5	M1 for $\frac{1}{3}\pi r^2 \times 10$ $(=270\pi)$ A1 for $r = 9$ M1 (dep on M1) for $\frac{1}{2} \times \frac{4}{3}\pi \times "9"^3$ $(= 486\pi)$ M1 for 270π + "486π" oe A1 cao
*20			Proof	5	M1for finding one other vector expressed as **a** and/or **b** M1 for method to find one of $\overrightarrow{DM}$, $\overrightarrow{MA}$ or $\overrightarrow{DA}$ eg $\overrightarrow{DM} = -\mathbf{b} + \frac{1}{2}(3\mathbf{b} + \mathbf{a})$ oe, $\overrightarrow{MA} = \frac{1}{2}(3\mathbf{b} + \mathbf{a}) + \mathbf{a}$ oe or $\overrightarrow{DA} = 2\mathbf{b} + 2\mathbf{a}$ oe M1 for method to find two of $\overrightarrow{DM}$, $\overrightarrow{MA}$ or $\overrightarrow{DA}$ A1 for two of $\overrightarrow{DM} = \frac{1}{2}(\mathbf{a} + \mathbf{b})$, $\overrightarrow{MA} = 1.5(\mathbf{a} + \mathbf{b})$, $\overrightarrow{DA} = 2(\mathbf{a} + \mathbf{b})$ ie simplified but oe C1 (dep on working shown) for conclusion relating to correct working

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
21	(a)		$\frac{9x-8}{x(2-x)}$	3	M1 for method to use a common denominator, e.g. $\frac{5(x)-4(2-x)}{x(2-x)}$ M1 (dep on M1) for correct expansion of brackets and combination of numerators e.g. $5x-8+4x$ $(=9x-8)$ A1 for $\frac{9x-8}{x(2-x)}$ or $\frac{9x-8}{2x-x^2}$
	(b)		$y=\frac{2-2t}{t+3}$	4	M1 for intention to multiply both sides by $y+2$ as a first step e.g. $t \times y+2=2-3y$ M1 for intention to correctly isolate their y terms on one side and the other terms on the other side, e.g. $ty+3y=2-2t$ M1 for intention to factorise, e.g. $y(t+3)$ $(=2-2t)$ A1 for $y=\frac{2-2t}{t+3}$ oe
*22			Similarity and proof	5	B1 for method matching a pair of opposite angles, e.g. if $EAB=x$, $BDE=180-x$, $EAB+BDE=180$ B1 for linking angles between quad and triangle, e.g. if $BDE=180-x$ then $BDC=x$ B1 for stating or implying $ACE=BCD$ (same angle) C1 for Opposite angles of a cyclic quadrilateral add up to 180° or statement linking three angles for similarity C1 for complete proof

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
Q06		Diagram is enlarged.	Standard mark scheme
Q09		Model is provided for all candidates. Diagram also provided for MLP.	Standard mark scheme
Q10	(a)	MLP only: x changed to y Diagram is enlarged.	Standard mark scheme
Q12	(a) (b)	Wording added “There are four spaces to fill.” 1.5 cm grid..Small squares removed.	Standard mark scheme
Q14		Diagram enlarged.	Standard mark scheme
Q15	(c)	Frequencies changed to 25, 20, 15, 10, 5, 5. Grid: 1.5 cm 3.4 kg changed to 3.5 kg.	Standard mark scheme
Q16		“trapezium” and “rectangle” put inside the shapes. MLP only: x changed to y.	Standard mark scheme
Q19		Model provided for all candidates. Diagram also provided for MLP.	Standard mark scheme

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PAPER: 1MA0_1H			
Question		Modification	Notes
Q20		Diagram is enlarged. Lower case vectors enlarged.	Standard mark scheme
Q22		Diagram is enlarged.	Standard mark scheme

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Mark Scheme (Results)

November 2015

Pearson Edexcel GCSE
In Mathematics A (1MA0)
Higher (Calculator) Paper 2H

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will award marks for the quality of written communication (QWC).
The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

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7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

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11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

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Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

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PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		2 3 5 8 9 3 2 5 7 8 9 4 1 2 4 5 1 6 1 3	Stem and leaf with key	3	B2 for a fully correct ordered stem and leaf (B1 for a correct unordered stem and leaf or for an ordered stem and leaf with at most 1 error or omission) B1 (indep) for a correct key (units not required)
2	(a)		Point plotted	1	B1 cao
	(b)		positive	1	B1 cao
	(c)		18 - 22	2	M1 for a single line segment with a positive gradient that could be used as a line of best fit or a vertical line from 10 or a point plotted at (10, y) where y is in the range 18 - 22 A1 18 - 22
	(d)		45	1	B1 cao
3			32 64 29	4	M1 for $2y$ or $y - 3$ M1 for adding their three expressions and setting equal to 125 M1 for correct method to solve $ay + b = 125$ A1 Ali 32, Bhavara 64 and Ceris 29
4			49	3	M1 for converting calculations to common units (either system is acceptable) M1 for dividing their total capacity by the refuelling rate A1 48.9 - 49.1

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
5		0.65×80 = 52 $\frac{5}{8}$×80 = 50 52 - 50 Or $\frac{5}{8}$=0.625 0.65 − 0.625=0.025 0.025×80	2	4	M1 for method to calculate the time Celina sings M1 for method to calculate the time Zoe sings M1(dep on at least M1) for finding the difference between two times A1 cao Or M1 for a conversion to a common representation M1 (dep on M1) for finding the difference in their chosen representation M1 for using their proportional difference multiplied by 80 A1 cao
6			40 000	2	M1 for 100 × 100 isolated or 4 × 100 × 100 A1 cao
*7			No not enough	5	M1 for substituting into Pythagoras' theorem M1 for complete correct use of Pythagoras' theorem M1 for a complete method to find the perimeter of their trapezium A1 51.(20655..) C1 (dep on correct first 2 M marks) for correct conclusion dependent upon supporting calculations
*8			125m*l*	4	M1 for a complete method to find the cost per m*l* or the number of m*l* per £1 for one tube or for a method that results in at least 2 values that can be used to compare 2 tubes M1 for a complete method to find all three equivalent figures A1 3 correct figures suitable for comparison C1(dep on M2) for stating the correct tube size from their calculations

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
9			Correct line drawn	2	M1 for two pairs of relevant arcs drawn A1 correct line drawn (with arcs) SC B1 Correct line no arcs visible
10	(a)	9×6	54	2	M1 for a method to find the speed e.g 9 ÷ 10, 9 ÷ 0.16 A1 cao
	(b)		Graph completed	3	B1 horizontal line from (30,21) to (45,21) M1 for a complete method to show the return journey is 30 mins or ½ hour evidenced by the line on the graph or by calculation A1 Correct line drawn from Luscoe (x,21) to (x + 30,0)
11	(a)		±7	2	M1 for intent to divide both sides by 3 as a first step or answer of 7 or -7 A1 ±7
	(b)		0.125 or $\frac{1}{8}$	1	B1 cao
	(c)		$27x^6$	2	M1 for either 27 or x^6 in a two term product A1 cao
	(d)		$p = \frac{w + 16}{4}$	2	M1 for ÷ 4 throughout or adding 16 to both sides as a first step A1 $p = \frac{w+16}{4}$ oe

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PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12			Rotation about (2,1) through 180˚	3	B1 rotation B1 about (2,1) B1 through 180˚ Or B2 enlargement scale factor −1 B1 about (2,1) Note Award no marks if more than one transformation is given .
13	(a)		5 and 6	2	M1 for evidence that (x =) 4, 5, 6 or evidence that (y =) 5,6,7, 8 A1 cao
	(b)		Region identified	4	M1 for two of the lines $y = -1$,$y = 3x - 1$ and $y = 4 - x$ drawn M1 for three of the lines $y = -1$, $y = 3x - 1$ and $y = 4 - x$ drawn M1 any correct shading(in or out) satisfying at least two of the inequalities where the shading must extend from the appropriate line A1 Fully correct region shown by either shading in, shading out or the use of R Accept lines that are solid or dashed
14	(a)		76	3	M1 for 89% = 68 M1 for 68 ÷ 0.89 oe A1 for 76 – 76.41
	(b)		11.8	2	M1 for (68 − 60) ÷ 68 × 100 oe A1for 11.7 - 12

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PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*15	(a)			1	C1 for a complete reason eg Angles in a semicircle are 90°, alternate segment theorem
	(b)		2.75	4	M1 for $7 \times \sin 35$ M1 for $7 \times \sin 35 \times 2$ M1 (indep) for "*DB*"$\times \cos 70$ A1 2.74 - 2.75
16	(a)		6.4×10^8	1	B1 cao
	(b)		5×10^2	2	M1 for $3 \div 6 \times 10^{7-4}$ or 0.5×10^3 or 500 or 30 000 000÷60 000 A1 cao
17			$y = 3x-5$	3	M1 for recognition that the gradient of $\mathbf{L_2}$ is 3 M1 for substitution of x=3 and y=4 into y= "m"x+c A1 $y = 3x-5$ oe (SC B2 for '$3x-5$ ' or $L_2 = 3x-5$)
18	(a)		37	1	B1 cao
	(b)		36	2	M1 for identifying LQ and UQ e.g 35 – 71 A1 cao
	*(c)			2	C1 for a correct comparison of medians ft (a) C1 for a correct comparison of a measure of spread with correct figures ft (b) For the award of both marks at least one of the comparisons must be interpretative

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
19	(a)		4.25	1	B1 cao
	(b)		7.20-7.21	3	B1 4.35 or 0.35 M1 for $4.35+\frac{1}{0.35}$ A1 7.2(0)-7.21 or $\frac{1009}{140}$ from a correct method seen
20		$\pi 2^2\times 2=8\pi$ $\pi 2^2\times\frac{20}{360}\times 3+\pi 2^2\times\frac{340}{360}\times 2$ $8\pi : \frac{74}{9}\pi$: 72 : 74 Or $\frac{20}{360}\times 3+\frac{340}{360}\times 2=\frac{37}{18}$ 2: $\frac{37}{18}$ 36:37	36:37	4	M1 method to find relative cost of design A e.g. $\pi 2^2$, $k\times\pi 2^2$ M1 for a complete method to find the relative cost of the watch face for design B e.g. $\pi 2^2\times\frac{20}{360}\times\frac{3}{5}+\pi 2^2\times\frac{340}{360}\times\frac{2}{5}$ M1 (dep on M1, M1) for the cost of design A: cost of design B A1 cao Or M1 for method to find fraction of the sectors in design B $\frac{20}{360}, \frac{340}{360}$ M1 for complete method to find the relative cost of the watch face for design B M1 (dep on M1,M1) for the cost of design A: cost of design B A1 cao

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PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
21			9 or 10	2	M1 for 35÷148×40 A1 9 or 10
22			$2x^2 + 7x + 4 = 0$	3	M1 for finding a correct coefficient M1 for a method to find a and c or b and c A1 $2x^2 + 7x + 4 = 0$ or $a = 2$, $b = 7$, $c = 4$
23	(a)		Graph drawn	2	B2 correct graph drawn (B1 for a graph translated up/down)
	(b)		Graph drawn	2	B2 for correct graph drawn (B1 for a graph reflected in the x axis or stretched by sf 2 parallel to the y axis)
24			31.1	5	M1 for $\frac{1}{2} \times 8.4 \times x \times \sin 40 = 100$ M1 for 100÷(0.5×8.4×sin 40) (= 37.(041...)) M1 (dep on 1st M1) for substituting the appropriate figures into the cosine rule eg $8.4^2+'37.041'^2-2\times8.4\times'37.041'\cos40^\circ$ M1 (dep on previous M1) for correct order of evaluation or (c^2=) 965.(897...) A1 31.07 - 31.1

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
25		$\frac{18}{30}\times\frac{12}{29}+\frac{7}{30}\times\frac{23}{29}+\frac{5}{30}\times\frac{25}{29}$ or $1-(\frac{18}{30}\times\frac{17}{29}+\frac{7}{30}\times\frac{6}{29}+\frac{5}{30}\times\frac{4}{29})$ or $\frac{18}{30}\times\frac{7}{29}+\frac{18}{30}\times\frac{5}{29}+\frac{7}{30}\times\frac{18}{29}$ $+\frac{7}{30}\times\frac{5}{29}+\frac{5}{30}\times\frac{18}{29}+\frac{5}{30}\times\frac{7}{29}$	$\frac{502}{870}$	4	B1 for a second 'branch' probability seen (could be seen in a tree) M1 for a product of any first and second stage correct probabilities M1 for a complete method to find the required probability A1 for $\frac{502}{870}$ oe Note if decimals used they must be correct to 2 decimal places SC with replacement B2 for $\frac{502}{900}$ oe B0 M1 $\frac{18}{30}\times\frac{12}{30}$ or $\frac{7}{30}\times\frac{23}{30}$ or $\frac{5}{30}\times\frac{25}{30}$ M1 $\frac{18}{30}\times\frac{12}{30}+\frac{7}{30}\times\frac{23}{30}+\frac{5}{30}\times\frac{25}{30}$ A0

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Q8	**Per 25ml**	**Per ml**	**Per £**
50ml	54.5	2.18	45.87155…
75ml	56	2.24	44.64285..
125ml	53.8	2.152	46.46840..

PMT

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q01		MLP only: basis given for stem and leaf diagram.	B2 for a fully correct ordered stem and leaf (B1 for a correct unordered stem and leaf or for an ordered stem and leaf with at most 1 error or omission) B1 (indep) for a correct key (units not required)
Q02		Grid enlarged. Crosses changed to filled in circles. Right axis labelled	B1 cao B1 cao M1 for a single line segment with a positive gradient that could be used as a line of best fit or a vertical line from 10 or a point plotted at (10, *y*) where *y* is in the range 18 - 22 A1 18 - 22 B1 cao

PMT

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q07		Diagram enlarged and labelled ABCD clockwise from the top right. Measurement lines removed. Information about the length of lines given in the text.	M1 for substituting into Pythagoras' theorem M1 for complete correct use of Pythagoras' theorem M1 for a complete method to find the perimeter of their trapezium A1 51.(20655..) C1 (dep on correct first 2 M marks) for correct conclusion dependent upon supporting calculations
Q08		Diagram removed.	M1 for a complete method to find the cost per m*l* or the number of m*l* per £1 for one tube or for a method that results in at least 2 values that can be used to compare 2 tubes M1 for a complete method to find all three equivalent figures A1 3 correct figures suitable for comparison C1(dep on M2) for stating the correct tube size from their calculations
Q09		AB = 9 cm.	M1 for two pairs of relevant arcs drawn A1 correct line drawn (with arcs) SC B1 Correct line no arcs visible
Q15		Diagram enlarged. Measurement line remove – MLP. 7 cm and measurement line removed – Braille only.	C1 for a complete reason eg Angles in a semicircle are 90°, alternate segment theorem M1 for 7 × sin 35 M1 for 7 × sin 35 × 2 M1 (indep) for "*DB*"× cos 70 A1 2.74 - 2.75

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q18		Diagrams enlarged Dotty shading added	B1 40 cao M1 for identifying LQ and UQ e.g 35 – 70 A1 35 cao C1 for a correct comparison of medians ft (a) C1 for a correct comparison of a measure of spread with correct figures ft (b) For the award of both marks at least one of the comparisons must be interpretative
Q20		Diagrams enlarged.	M1 method to find relative cost of design A e.g. $\pi 2^2$, $k \times \pi 2^2$ M1 for a complete method to find the relative cost of the watch face for design B e.g. $\pi 2^2 \times \frac{20}{360} \times \frac{3}{5} + \pi 2^2 \times \frac{340}{360} \times \frac{2}{5}$ M1 (dep on M1, M1) for the cost of design A: cost of design B A1 cao Or M1 for method to find fraction of the sectors in design B $\frac{20}{360}, \frac{340}{360}$ M1 for complete method to find the relative cost of the watch face for design B M1 (dep on M1,M1) for the cost of design A: cost of design B A1 cao

PMT

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q23		Diagrams enlarged.	B2 correct graph drawn (B1 for a graph translated up/down) B2 for correct graph drawn (B1 for a graph reflected in the *x* axis or stretched by sf 2 parallel to the *y* axis)
Q24		Diagrams enlarged.	M1 for $\frac{1}{2}\times 8.4\times x\times \sin 40 = 100$ M1 for 100÷(0.5×8.4×sin 40) (= 37.(041...)) M1 (dep on 1st M1) for substituting the appropriate figures into the cosine rule eg $8.4^2+'37.041'^2-2\times 8.4\times '37.041'\cos 40^\circ$ M1 (dep on previous M1) for correct order of evaluation or (c^2=) 965.(897...) A1 31.07 - 31.1

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Mark Scheme (Results)

November 2015

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Calculator) Unit 3

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3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

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The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
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Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

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Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5MB3H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		2.47	2	M1 for 7.66… A1 for 2.47 – 2.48
	(b)		400	1	B1 for 400 or 4×10^2
2	(a)		Correct point marked	3	M1 for line bearing 300° M1 for line bearing 40° A1 cao
	(b)		4.15	2	M1 for "8.3" × 50 000 (=415 000) A1 for 4.10 – 4.25
*3			Bottle with reason	5	**Cans** M1 for 30×0.28 – 10×0.25 (=5.9) oe **Bottles** M1 0.15 × 1.60 (=£0.24) oe or 0.15 × 6.40 (=0.96) oe M1 (dep) for 1.60 – 0.24 (=£1.36 per bottle, or £5.44 for 4 bottles) oe **Best value** M1 for "1.36" ÷ 2.5 (=0.544 £/litre) and "5.9" ÷ 9.9 (=0.595…£/litre) oe C1 (dep on M1) for 0.544 and 0.595… and bottle identified OR M1 for 2.5 ÷ "1.36 (=1.83… litres/£) and 9.9 ÷"5.9" (=1.67… litres/£) C1 (dep on M1) for 1.67... and 1.83… and bottle identified
4	(a)		translation $\begin{pmatrix} 3 \\ -3 \end{pmatrix}$	2	B1 for translation B1 for $\begin{pmatrix} 3 \\ -3 \end{pmatrix}$ (B0 if not single transformation)
	(b)		Triangle	2	B2 cao (B1 for rotation a 180 degrees about any point or for a rotation about (0, 1))

<table>
<tr><th colspan="5">5MB3H_01 November 2015</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>5</td><td></td><td></td><td>17.6</td><td>3</td><td>M1 for 8 ÷ 5 (=1.6) or 5÷8 (=0.625)
M1 for (16 – 5) × “1.6” or for (16 – 5) ÷ “0.625” oe
A1 cao</td></tr>
<tr><td>6</td><td></td><td></td><td>bisector</td><td>2</td><td>M1 for an appropriate pair of arcs or correct line drawn without construction arcs
A1 for perpendicular bisector of AB drawn with a pair of construction arcs</td></tr>
<tr><td>7</td><td></td><td>
<table>
<tr><th>x</th><th>$x^3 - 9x$</th></tr>
<tr><td>4</td><td>28</td></tr>
<tr><td>4.1</td><td>32.(021)</td></tr>
<tr><td>4.2</td><td>36.(288)</td></tr>
<tr><td>4.3</td><td>40.(807)</td></tr>
<tr><td>4.4</td><td>45.(584)</td></tr>
<tr><td>4.5</td><td>50.(625)</td></tr>
<tr><td>4.6</td><td>55.(936)</td></tr>
<tr><td>4.7</td><td>61,(523)</td></tr>
<tr><td>4.8</td><td>67.(392)</td></tr>
<tr><td>4.9</td><td>73.(549)</td></tr>
<tr><td>5</td><td>80</td></tr>
<tr><td>4.41</td><td>46.0(7612)</td></tr>
<tr><td>4.42</td><td>46.5(7089)</td></tr>
<tr><td>4.43</td><td>47.0(6831)</td></tr>
<tr><td>4.44</td><td>47.5(6838)</td></tr>
<tr><td>4.45</td><td>48.0(7113)</td></tr>
</table>
</td><td>4.4</td><td>4</td><td>B2 for a trial $4.4 \le x \le 4.5$
(B1 for a trial evaluated correctly for $4 \le x \le 5$)
B1 for a different trial evaluated correctly for $4.41 \le x \le 4.5$
B1 (dep on at least one previous B1) for 4.4

[Note trials should be evaluated to at least accuracy indicated in the table, truncated or rounded]

[NB B0 No working scores 0 marks]</td></tr>
</table>

5MB3H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
8			180	3	M1 for area of cross section, eg 3×2 + 3×4 + 3×6 (=36) or 9×6 − 3×3×2 (=36) M1 for "36" ×5 A1 cao OR M1 for area of one cuboid eg 3 × 2 × 5 (=30) M1 for 6 × "30" A1 cao OR M1 for 4.5 × 8 (=36) M1 for "36" × 5 A1 cao
9	(a)		0, 4, 3, −5	2	M1 for one correct value, could be taken from graph A1 cao
	(b)		correct curve	2	M1 for at least 4 points plotted correctly from table A1 for correct curve drawn
10			11	4	M1 for introducing variable eg x or $x+3$ or $2x+6$ M1 (dep) for "x" + "$(x+3)$" + "$(2x+)$" = 53 M1 for complete method to isolate x A1 cao
11	(a)		$x > -4$	1	B1 cao
	(b)		$y \leq 3$	2	M1 for intention to isolate y or for $y = 3$ or $y < 3$ A1 cao
	(c)		−1,0,1	2	M1 for listing −3, −2, −1,0,1 or −1, 0,1,2,3 or for $-2 < ? < 2$ A1 for −1,0,1
12			1.01	3	M1 for 1.2 × 15 (= 18) or 1 × 250 clearly defined as mass M1 for $\frac{"18" + "250"}{15+250}$ A1 for 1.01(1…)

5MB3H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
*13			36% depreciation	3	M1 for 0.8 × 0.8 (=0.64) M1 for 1 – "0.64" (=0.36) C1 for 36% (depreciation) oe or compares cost with 40% reduction OR (uses a trial value, eg 1000) M1 for $1000\times(0.8)^2$ (=640) M1 for (1000 – 640) ÷ 1000 (=0.36) C1 for 36% (depreciation) oe or compares cost with 40% reduction OR M1 for 0.2 × 0.2 (=0.04) M1 for 0.2 + 0.2 – "0.04" (=0.36) C1 for 36% (depreciation) oe or compares cost with 40% reduction OR C1 only for identifying the 2nd 20% reduction is off the reduced amount at the end of the first year
14			$t = \frac{ap^2}{3}$	3	M1 for squaring both sides of the equation as the first step M1 (dep) for isolating the *t* term A1 for $t = \frac{ap^2}{3}$ oe
15			20.94	5	M1 for method to find circumference of circle, eg. $2\times\pi\times2.45$ or $\pi\times4.9$ (= 15.393....) M1 (dep) for $\frac{105}{360}\times$ "15.393 ... (= 4.4898...) M1 for "4.4898.." ÷ 1.75 (= 2.565...) or "4.9" ÷ 1.75 (= 2.8) oe or "9.3898…" ÷ 1.75 (=5.3656…) M1 for total cost = "6" × 3.49 (=20.94) or cost of arc or straight edges = "3" × 3.49 (=10.47) A1 cao

5MB3H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
16			$\frac{4}{7}$	4	M1 for multiplication of all terms by a multiple of 6 eg $3(x+1) + 2(2x-1) = 5$ M1 for $3\times x+3\times 1 (=3x+3) + 2\times 2x -2\times 1 (=4x-2)$ oe or $3x+3+4x-2=5$ M1 (dep) for collecting like terms on each side of the equation eg $3x+4x = 5 -3 +2$ or $7x + 1 = 5$ or $7x = 4$ A1 for $\frac{4}{7}$ or 0.57…
*17			56 supported	3	M1 for 180 – 85 (=95) A1 for 56 C1 for opposite angles of a cyclic quadrilateral add up to 180
18			$-\frac{3}{2}, \frac{5}{3}$	3	M1 for $(2x \pm 3)(3x \pm 5)$ M1 for $(2x + 3)(3x - 5)$ A1 for $-\frac{3}{2}$ and $\frac{5}{3}$ oe accept 1.66 – 1.67 OR M1 for $\frac{-(-1)\pm\sqrt{(-1)^2-4\times 6\times -15}}{2\times 6}$, condone one sign error M1 for $\frac{1\pm\sqrt{361}}{12}$ A1 for $-\frac{3}{2}$ and $\frac{5}{3}$ oe accept 1.66 – 1.67 OR M1 for $\left(x-\frac{1}{12}\right)^2 \pm \left(\frac{1}{12}\right)^2 \pm a = 0$ M1 for $\left(x-\frac{1}{12}\right)^2 = b$ A1 for $-\frac{3}{2}$ and $\frac{5}{3}$ oe accept 1.66 – 1.67
19			36	3	M1 for $100 = k \times 5^2$ oe or $(k=)$ 4 M1 for $(y =) \frac{100}{5^2} \times 3^2$ or "4" $\times 3^2$ A1 cao

5MB3H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
20			0.063	3	B1 for 252.5 or 247.5 or 3950 or 3850 M1 for 247.5 ÷ 3950 or ft "lower bound for 250" ÷ "upper bound for 3900" A1 for 0.062−0.063 (from correct working)
21		Eg $BQ=\sqrt{(5^2+6^2)}=\sqrt{61}$ Angle $ABQ=\tan^{-1}(6\div5)=50.194^o$ $BP=\sqrt{61}\div\cos30=9.018$ cm Angle $PBC=90–30–50.194^o=9.806^o$ $BC=9.018\times\cos9.806=8.886...$ **OR** $BQ=\sqrt{(5^2+6^2)}=\sqrt{61}$ $PQ=\sqrt{61}\tan30=4.509$ Angle $BQA=\tan^{-1}(5\div6)=39.806$ Angle $PQD=180–90–39.806=50.194^o$ $QD=4.509\times\cos50.194=2.886...$	8.89	5	M1 for correct use of Pythagoras M1 for correct use of appropriate trig ratio M1 for correct use of appropriate inverse trig ratio M1 for correct method to calculate angle *CBP* or *PQD* A1 for 8.88 – 8.89
22	(a)		(0, 1)	1	B1 cao
	(b)	P(−1, 0), Q(1, 0)	2	2	M1 for "a" – "$-a$" or (x =) –1 or (x =) 1 or "8" ÷ 4 A1 cao

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PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q02		Harbour to Lighthouse = 10 cm. Harbour and Lighthouse are joined with a dashed line. North line extended.	
Q04	(a)	Grid enlarged.	
Q04	(b)	Question reversed. Triangle W given on grid. Candidates asked to describe the transformation of triangle T to triangle W.	
Q06		AB = 8 cm.	
Q08		Model provided for all candidates. MLP also given an enlarged diagram.	
Q09	(a)	Wording added above the table. There are four spaces to fill.	
Q09	(b)	Grid enlarged.	
Q11	(a)	Diagram enlarged.	

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PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q14		All candidates, a changed to n.	
Q15		Diagram enlarged.	
Q16		MLP only: x changed to y.	
Q17		Diagram enlarged. Wording added: “Angle BAP is marked x.”	
Q21		Diagram enlarged. Wording added: “BA = 5 cm. AQ = 6 cm. Angle PBQ = $30°$.	
Q22		Diagram enlarged.	

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Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCSE
In Mathematic A (1MA0)
Higher (Non-Calculator) Paper 1H

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Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
1			750 cm^3	3	M1 for 30×25 A1 for 750 B1 (indep) for cm^3
2	(a)		Correct shape	2	B2 for correct reflection with vertices (–4, 2) (–6, 3) (–6, 7) (–4, 6) (B1 for reflection in a vertical or horizontal line)
	(b)		Correct shape	2	B2 for correct rotation with vertices (–1, 3) (–5, 3) (–6, 5) (–2, 5) (B1 for rotation of 90(°) clockwise about (0,1) **or** correct orientation fully in top left quadrant)
3	(a)		Reasons	2	B2 for 2 reasons from no time frame, vague response boxes, not exhaustive eg "no always" (B1 for 1 reason)
	(b)		Question written	2	B1 for a suitable question which includes a time frame (the time frame could appear with the response boxes) B1 for at least 3 non-overlapping exhaustive response boxes with no use of inequality symbols
	(c)		Reason	1	B1 for reason why the sample is biased eg all the same age, they are friends, too small a sample. NB: "biased" alone is insufficient.

PAPER: 1MA0_1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
4 (a)		p^7	1	B1 cao
(b)		g^2	1	B1 cao
(c)		k^6	1	B1 cao
(d)		$-5m + 10$	2	M1 for $3m + 12$ or $-8m - 2$ or $8m + 2$ A1 for $-5m + 10$ or $10 - 5m$ or $-5(m - 2)$ or $5(2 - m)$ oe
(e)		$n(n - 7)$	1	B1 cao
5		44 - 56	2	B2 for 44 - 56 (B1 for 1000 or 900 or 20 or 18 or 19, unless it is clear these have not come from estimation)
6		90	3	M1 for $1-\frac{3}{5}$ (=$\frac{2}{5}$ or 40%) oe M1 for a complete method to find the number of female teachers (54) eg $36 \div 2 \times 3$ or determines $\frac{3}{5}$(60%) is 54, or 10% is 9 A1 cao **OR** M1 for F : M = 3 : 2 M1 for a complete method to find the number of female teachers (54) eg $\frac{3}{2} \times 36$ oe A1 cao

PAPER: 1MA0_1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
*7		Conclusion (supported)	5	M1 for finding the area of one rectangle which is not 6 × 10 eg 2×2.5 (=5) or 4×10 (=40) or 2.5×6 or 5×2 M1 for a complete method to find the total area eg 5+5+40 or 60−10 (=50) M1 for a complete method to find the number of tins needed eg "50" ÷ 5 ÷ 2.5 (=4) OR for a complete method to find the number of litres needed. eg "50" ÷ 5 (=10) OR for a complete method to find the area covered by 3 tins eg 3×2.5×5 (=37.5) A1 for 50 (m^2) **and** 4 (tins needed) **or** for 10 (litres) **and** 7.5 (litres) **or** for 50(m^2) **and** 37.5(m^2) C1 (dep M2) for a conclusion supported by their calculations
8		60	3	M1 for $\frac{16}{80}$ or $\frac{300}{80}$ oe M1 (dep) for $"\frac{16}{80}"\times 300$ or $"\frac{300}{80}"\times 16$ A1 cao
9		$T = 5x + 20y$	3	B3 for $T = 5x + 20y$ oe (B2 for $5x + 20y$ or $T = 5x + y$ or $T = x + 20y$ or $T = 20x + 5y$) (B1 for T = a two term linear expression in x and y, or $5x + y$ or $x + 20y$)

<table>
<tr><th colspan="5">PAPER: 1MA0_1H</th></tr>
<tr><th>Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>10</td><td></td><td>−3, −2</td><td>2</td><td>M1 for $x = -3$ or $y = -2$; for finding the difference between the x or y coordinates of M and P (eg ±4 or ±4.5); for $\frac{x+5}{2} = 1$ or for $\frac{y+7}{2} = 2.5$
A1 for $x = -3$, $y = -2$</td></tr>
<tr><td>11</td><td><table><tr><td></td><td>S</td><td>A</td><td>B</td><td></td></tr><tr><td>M</td><td>4</td><td>9</td><td>10</td><td>23</td></tr><tr><td>F</td><td>6</td><td>11</td><td>26</td><td>43</td></tr><tr><td></td><td>10</td><td>20</td><td>36</td><td>66</td></tr></table></td><td>11</td><td>4</td><td>M1 for a correct first step which results in a value that could be in the table: ie. 66 – 10 – 20 (= 36) or 66 – 43 (= 23) or 10 – 4 (= 6)
M1 for correct method to find a second value that could be in the table using their first value eg “23” – 4 - 10 (= 9) or “36” - 10 (= 26)
M1 for a fully correct and complete method.
A1 cao</td></tr>
<tr><td>12</td><td></td><td>100 – 25π</td><td>3</td><td>M1 for π×5×5 or 25π
M1 for (10×10 –“π×5×5”)
A1 for 100 – 25π oe
NB: ignore the inclusion of any units.</td></tr>
<tr><td>13</td><td></td><td>36</td><td>3</td><td>M1 for correct method to work out 20% of 30% (=6%)
M1 for 30% + “6%”
A1cao

OR
M1 for complete and correct method to find amount of money spent on rent eg 800 × 0.3 (=240) oe
M1 for correct method to find rent next month (288) eg “240” × 1.2 (=288) oe or $\frac{"288"}{800} \times 100$ oe or 30 × 1.2
A1 cao</td></tr>
</table>

PAPER: 1MA0_1H

Question	Working	Answer	Mark	Notes
14 (a)		Correct construction	2	M1 for correct construction arcs or bisector within guidelines but no (or incorrect) construction arcs A1 for bisector within guidelines with correct arcs shown
(b)		Correct construction	2	M1 for correct construction arcs or perpendicular within guidelines but no (or incorrect) construction arcs A1 for perpendicular within guidelines with correct arcs shown
*15 (a)	<table><tr><td></td><td>Age 16</td><td></td><td>Age 18</td></tr><tr><td>HV</td><td>310</td><td><</td><td>380</td></tr><tr><td>LV</td><td>80</td><td><</td><td>130</td></tr><tr><td>Median</td><td>180</td><td><</td><td>240</td></tr><tr><td>Range</td><td>230</td><td><</td><td>250</td></tr><tr><td>IQR</td><td>80</td><td>></td><td>70</td></tr></table>	Compares: medians and spread	3	C1 for any correct comparison of the medians C1 for any correct comparison of the IQRs or the ranges C1 (dep on one C1) for either statement written in context
(b)		150	2	M1 for $\frac{3}{4} \times 200$ oe A1 cao
16		7×10^8	2	M1 for 7×10^n, $n \neq 8$ or $a \times 10^8$, $a \neq 7$ or $700\,000\,000$ or 0.7×10^9 A1 cao

PAPER: 1MA0_1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
17 (a)		$x < 7$	2	M1 for isolating term in x eg $3x < 16 + 5$ or $3x < 21$ or for $(x =) 7$ or $x > 7$ etc A1 cao
(b)		$\frac{7}{5}$	3	M1 for multiplying by 4 or adding $\frac{w}{4}$ or subtracting $\frac{11}{4}$ or subtracting 1 [all applied to both sides and as a first step] M1 for isolating terms in w on one side and number terms on the other side of the equation A1 for $\frac{7}{5}$ oe
18 (a)		$2\frac{4}{5}$	3	M1 for writing as improper fractions eg $\frac{6}{5}$ or $\frac{7}{3}$ M1 (dep) for multiplying improper fractions eg $\frac{6\times7}{5\times3}$ or $\frac{14}{5}$ oe A1 cao
(b)		$\frac{4}{5}$	3	M1 for finding two correct fractions with a common denominator eg $\frac{7}{15}-\frac{10}{15}$ or $\frac{21-30}{45}$ M1 (dep) for complete and correct method eg $1-\frac{3}{15}$ or $\frac{37}{15}-\frac{25}{15}$ or $\frac{111-75}{45}$ oe A1 for $\frac{4}{5}$ oe

PAPER: 1MA0_1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
19 (a)(i)		–0.4 to –0.5 4.4 to 4.5	3	B1 for value in range –0.4 to –0.5 and value in range 4.4 to 4.5 NB: condone values given as part of coordinates.
(ii)		–1.0 to –1.2 5.0 to 5.2		M1 for $x^2 - 4x - 2 = 4$ or line $y = 4$ drawn on graph or points marked with a y coord. of 4 or a value in range –1.0 to –1.2 or a value in range 5.0 to 5.2 A1 for value in range –1.0 to –1.2 and value in range 5.0 to 5.2; do not accept coordinates.
(b)		–1.6 to –1.8 4.6 to 4.8	3	M1 for $x + y = 6$ drawn on graph A2 for value in range –1.6 to –1.8 and value in range 4.6 to 4.8 (A1 for one correct value or both values given as coordinates)
*20		69° (supported)	5	M1 for method to find angle PSR eg 90 – 48 (= 42) or method in triangle POS to find angle POS (= 84) M1 for method to find angle PMS (= 42) A1 cao C2 (dep on at least M1) for correct and complete set of appropriate reasons (C1 for one correct reason involving a circle theorem supported by working) eg The tangent to a circle is perpendicular (90) to the radius (diameter) Alternate segment theorem. Angles in a triangle add up to 180 Base angles of an isosceles triangle are equal. The angle at the centre of a circle is twice the angle at the circumference.

PAPER: 1MA0_1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
21 (a)		0.7 0.2 0.3 0.8 0.05 0.95	3	B1 for 0.2, 0.8 oe B1 for 0.7, 0.3 oe B1 for 0.05, 0.95 oe
(b)		0.04	2	M1 for "0.8" × "0.05" A1 oe
22		2, 6	3	M1 for $(x^2 =)\ \ 4(x^2 - 6x + 9)$ or $4x^2 - 24x + 36$ oe or for $\frac{x^2}{4} = x^2 - 6x + 9$ M1 (dep) for $3x^2 - 24x + 36 = 0$ or $3(x^2 - 8x + 12) = 0$ or $(x - 2)(x - 6) = 0$ or $(3x - 6)(x - 6) = 0$ oe A1 cao OR M1 for $x = (\pm)2(x - 3)$ or $\frac{x}{2} = (\pm)(x - 3)$ M1(dep) for correct solution of one equation A1 cao

PAPER: 1MA0_1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
23 (a)(i)		$\mathbf{a} + \mathbf{b}$	2	B1 for $\mathbf{a} + \mathbf{b}$ oe
(ii)		$-\mathbf{a} + 3\mathbf{b}$		B1 for $-\mathbf{a} + 3\mathbf{b}$ oe
(b)		$\frac{3}{4}\mathbf{a} + \frac{3}{4}\mathbf{b}$	2	M1 for $\overrightarrow{OP} + \frac{1}{4}\overrightarrow{PR}$ or $\overrightarrow{OR} + \frac{3}{4}\overrightarrow{RP}$ (may be in terms of **a** and **b)** A1 for $\frac{3}{4}\mathbf{a} + \frac{3}{4}\mathbf{b}$ or $\frac{3}{4}(\mathbf{a} + \mathbf{b})$
*(c)		$OS = \frac{3}{4}OT$	2	C2 (dep A1) for S divides OT in the ratio 3:1 oe or $OS = \frac{3}{4}OT$ oe (C1 (dep A1) for S lies on OT or that OT and PR intersect at S oe)
24		100, 25, 4	4	M1 for $y = \frac{k}{x^2}$ oe or $1 = \frac{k}{10^2}$ M1 for complete method to find k or $y = \frac{100}{x^2}$ oe OR (dep on M1) for $k = 100$ A1 for one entry correct A1 for other two entries correct

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PAPER: 1MA0_1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
25		$\frac{1}{4}-\frac{\sqrt{6}}{12}$	3	M1 for $\frac{1}{2}\times\frac{\sqrt{2}}{2}\times\frac{\sqrt{2}}{2}$ or $\frac{1}{2}\times\frac{\sqrt{2}}{2}\times\frac{\sqrt{3}}{3}$ M1 for $\frac{1}{2}\times\frac{\sqrt{2}}{2}\times\frac{\sqrt{2}}{2}-\frac{1}{2}\times\frac{\sqrt{2}}{2}\times\frac{\sqrt{3}}{3}$ A1 for $\frac{1}{4}-\frac{\sqrt{6}}{12}$ oe OR M1 for (BC =) $\frac{\sqrt{2}}{2}-\frac{\sqrt{3}}{3}$ M1 for $\frac{1}{2}\times\left\{\frac{\sqrt{2}}{2}-\frac{\sqrt{3}}{3}\right\}\times\frac{\sqrt{2}}{2}$ A1 for $\frac{1}{4}-\frac{\sqrt{6}}{12}$ oe

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
1		Model provided for all candidates. Diagram enlarged and also provided for MLP.	Standard mark scheme
2	(a)	Reflection drawn on the diagram. Shading changed to dotty shading. Wording changed 'It shows shape P and shape Q given on a grid. Describe fully the single transformation that maps shape P onto shape Q.' Grid enlarged. y axis is cut at -4. 3 answer lines given.	Marked scheme changed to: B1 Reflection B1 in the line $x = -1$
	(b)	Rotation drawn on the diagram. Wording changed 'It shows shape P and shape S given on a grid.' Describe fully the single transformation that maps shape P onto shape S.' 3 answer lines given.	Mark scheme changed to: B1 Rotation or rotate B1 90° anticlockwise B1 about (0, 1)
7		Diagram enlarged. Braille only: Plan of floor labelled ABCDEFGH as 1F Q24.	Standard mark scheme
10		Diagram enlarged. Crosses changed to filled in circles. Arrows heads changed to open headed arrows.	Standard mark scheme
12		Diagram enlarged. Shading changed to dotty shading. Braille only: Diagram turned into horizontal position (circle inside square).	Standard mark scheme

<table>
<tr><th colspan="4">PAPER: 1MA0_1H</th></tr>
<tr><th colspan="2">Question</th><th>Modification</th><th>Notes</th></tr>
<tr><td>14</td><td>(a)

(b)</td><td>Diagram lines made longer and thicker
Braille only: Angle A 75° exactly for bisection.
Diagram kept the same size. Point P has been moved to the left.</td><td>Standard mark scheme</td></tr>
<tr><td>15</td><td>(a)

(b)</td><td>Grid enlarged. Small squares removed. Lines of the box plot have been moved.
‘16 year old workers’ lines are at ‘75,125,175,200 and 300’.
‘18 year old workers’ lines are at ‘125, 200, 225, 275 and 375’.

‘£130’ changed to ‘£125’</td><td>Standard mark scheme with these following values

<table><tr><td></td><td>Age 16</td><td></td><td>Age 18</td></tr><tr><td>HV</td><td>300</td><td><</td><td>375</td></tr><tr><td>LV</td><td>75</td><td><</td><td>125</td></tr><tr><td>Median</td><td>175</td><td><</td><td>225</td></tr><tr><td>Range</td><td>225</td><td><</td><td>250</td></tr><tr><td>IQR</td><td>75</td><td>=</td><td>75</td></tr></table></td></tr>
<tr><td>14</td><td></td><td>Grid enlarged. Small squares removed. [Leeway needed for answering the question.]</td><td>Standard mark scheme</td></tr>
<tr><td>17</td><td>(a)
(b)</td><td>Wording added above the table ‘There are four spaces to fill.’
Grid enlarged. Right axis labelled.</td><td>Standard mark scheme</td></tr>
<tr><td>18</td><td></td><td>Diagram enlarged.</td><td>Standard mark scheme</td></tr>
</table>

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
19		Grid enlarged. [Leeway need for answering the question.]	Standard mark scheme
20		Diagram enlarged. Cross changed to filled in circle.	Standard mark scheme
21		Diagram enlarged. Wording added ‘There are six spaces to fill.’	Standard mark scheme
23		Diagram enlarged	Standard mark scheme

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Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Calculator) Unit 3

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will award marks for the quality of written communication (QWC).
The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PMT

PAPER: 5MB3H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1*			Decision (supported)	3	M1 for correct first step e.g. 15 ÷ 3 M1 for complete method C1 for correct decision with accurate figures
2	(a)		Correct diagram	2	B2 cao (B1 for correct orientation)
	(b)		Enlargement, sf 4, centre (0, 1)	3	B1 for enlargement B1 for scale factor 4 B1 for centre (0, 1)
3			$w = \frac{d+5}{2}$	2	M1 for attempt to add 5 to both sides or divide both sides by 2 as a first step, eg $d + 5 = 2w$ oe or $\frac{d}{2} = w - \frac{5}{2}$ oe A1 for $w = \frac{d+5}{2}$ oe

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PAPER: 5MB3H/01					
Question		Working	Answer	Mark	Notes
4			22.5	4	M1 for $4(x - 8) = 2x + 13$ M1 for expansion of bracket or division of all terms by 4, eg $4x - 32 = 2x + 13$, or $x - 8 = \frac{2x}{4} + \frac{13}{4}$ M1 for isolating x and number terms eg $2x = 45$, $\frac{x}{2} = \frac{45}{4}$ A1 for $\frac{45}{2}$ or 22.5 OR M1 for $(180 - 64) \div 2$ (= 58) M1 for $4(x - 8)$ = "58" or $2x + 13$ = "58" or "58" – 13 (= 45) M1 for isolating x and number terms eg $4x = 90$, $2x = 45$ or "45" ÷ 2 A1 for $\frac{45}{2}$ or 22.5 OR M1 for $64 + 4(x - 8) + 2x + 13$ M1 for $64 + 4(x - 8) + 2x + 13 = 180$ M1 for isolating x and number terms eg $6x = 135$ A1 for $\frac{45}{2}$ or 22.5
5			Correct region shaded	3	M1 for a circle centre M or N (accept arc of sufficient length to define the region) M1 for circle centre M radius 5 cm **and** circle centre N radius 3 cm (accept arc of sufficient length to define the region) A1 for correct region shaded

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PAPER: 5MB3H/01					
Question		Working	Answer	Mark	Notes
*6			Conclusion (supported)	4	M1 for $\pi \times 120^2$ (= 45 216 – 45 249) M1 for "$\pi \times 120^2$" ÷ 1800 A1 for 25 – 25.2 C1 ft (dep on M2) for appropriate conclusion from their figures OR M1 for $\pi \times 120^2$ (= 45 216 – 45 249) M1 for 20 × 1800 A1 for 36 000 and 45 216 – 45 249 C1 ft (dep on M2) for appropriate conclusion from their figures OR M1 for $\pi \times 120^2$ (= 45 216 – 45 249) M1 for "$\pi \times 120^2$" ÷ 20 A1 for 2260 – 2263 C1 ft (dep on M2) for appropriate conclusion from their figures OR M1 for 1800 × 20 M1 for 36 000 ÷ π (=11 457 – 11 465) A1 for 107(.0…) C1 ft (dep on M2) for appropriate conclusion from their figures
7			161.50	5	M2 for a correct method to decrease 6720 by 20%, eg 6720 × 0.8 (= 5376) or 6720 × 0.2 (= 1344 and 6720 – 1344 (= 5376)) (M1 for a correct method to find 20% of 6720 eg 6720 × 0.2 or $\frac{20}{100} \times 6720$ (= 1344)) M1 for subtracting 1500 (= 3876) after a percentage calculation M1 "3876" ÷ 24 after the subtraction of 1500 A1 for 161.5(0)

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PAPER: 5MB3H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		3 42 3.1 45.(291) 3.2 48.(768) 3.3 52.(437) 3.4 56.(304) 3.5 60.(375) 3.6 64.(656) 3.7 69.(153) 3.8 73.(872) 3.9 78.(819) 4 84 3.71 69.6(14811) 3.72 70.(078848) 3.73 70.5(45117) 3.74 71.(013624) 3.75 71.4(84375)	3.7	4	B2 for a trial between 3 and 4 exclusive (B1 for a trial at 3 or 4) B1 for a different trial of $3.7 < x \leq 3.75$ B1 (dep on at least one previous B1) for 3.7 NB. Trials should be evaluated to at least 2 sf truncated or rounded for values of x correct to 1 decimal place. Trials should be evaluated to at least 1 dp truncated or rounded for values of x correct to 2dp. **NB** No working scores 0 marks even if answer is correct
9			618	4	M1 for a method to find an area which is part of the cross section M1 (dep) for a complete method to find the total area of the cross section M1 (dep M1) for their cross sectional area × 12 A1 cao **OR** M1 for a method to find the volume of cuboid, 8 × 8 × 12 (= 768) M1 for a method to find the volume of the triangular prism, ½ ×5 × 5 × 12(= 150) M1 (dep M2) for a complete method for the volume of the prism A1 cao

5MB3H_01					
Question		Working	Answer	Mark	Notes
10	(a)		15.2	3	M1 for $12.7^2 + 8.3^2$ or 161.29 + 68.89 or 230.18 M1 for √"$(12.7^2 + 8.3^2)$" or √"161.29 + 68.89" or $\sqrt{230.18}$ A1 for 15.2 or 15.17(168…)
	(b)		16.1	3	M1 for $\sin 40° = \frac{DE}{25}$ oe or $\frac{DE}{\sin 40} = \frac{25}{\sin 90}$ oe M1 for 25 sin 40° A1 for 16.1 or 16.06(969…)
11	(a)		4.081	2	M1 for 8.875 or $\frac{71}{8}$ or 2.979…or 4.08 A1 for 4.081 or 4.0809(5…)…
	(b)		4×10^{-3}	2	M1 for 4×10^n, $n \neq -3$ or $a \times 10^{-3}$, $a \neq 4$ or 0.004 or 0.4×10^{-2} or 1/250 A1 cao
12			$x < 2$	2	M1 for an attempt to isolate x and number terms or multiply all terms by 2, or for $\frac{3}{2}x < 3$ or $-\frac{3}{2}x < -3$ or $x = 2$ A1 cao
13	(a)		0, 6, 4, –6	2	B2 for all values correct (B1 for any one value correct)
	(b)		Graph drawn	2	M1 ft (provided B1 in (a) for at least 6 points plotted correctly from their table A1 cao for correct curve drawn from (–4, –6) to (3, –6)
	(c)		1.5 to 1.6 and –2.5 to –2.6	2	M1 for correct use $y = 2$ (may be implied by one correct estimate) or correct use of formula. A1 for 1.5 to 1.6 and –2.5 to –2.6

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14*		Sher Yas **Old 19300 12560** New 20265 13502 **Inc 965 942**	Correct comparison (supported)	3	M1 for a correct method to calculate the population at the beginning of the 10 year period for at least one place. eg $\frac{20265}{1.05}$ (= 19 300) oe or $\frac{13502}{1.075}$ (= 12 560) oe A1 for 965 (Sherbury) **and** 942(Yaston) C1 (dep on M1) ft for statement comparing increases leading to conclusion based on two comparable amounts eg increase in Sherbury is greater than increase in Yaston
15		$20x + 10y = 35$ $6x - 10y = -48$ $x = -\frac{1}{2}$ $y = \frac{9}{2}$ OR $12x + 6y = 21$ $12x - 20y = -96$ $26y = 117$ $y = \frac{9}{2}$ $x = -\frac{1}{2}$	$-\frac{1}{2}, \frac{9}{2}$	4	M1 for a correct process to eliminate either variable (condone one arithmetic error) A1 cao for either x or y M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again (condone one arithmetic error) A1 cao OR M1 for full method to rearrange and substitute to eliminate either variable (condone one arithmetic error) A1 cao for either x or y M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again (condone one arithmetic error) A1 cao **NB** Trial and improvement methods score 0 marks unless both x and y are correct
16			226	2	M1 for angle $ABC = 180 - 67$ (= 113) A1 cao OR M1 for obtuse angle $AOC = 2 \times 67$ (= 134) A1 cao

5MB3H_01					
Question		Working	**Answer**	**Mark**	**Notes**
17			– 2.82, 19.82	3	M1 for $\frac{--17 \pm \sqrt{(-17)^2 - 4\times1\times-56}}{2\times1}$ (condone one sign error) or $\left(x - \frac{17}{2}\right)^2$ oe M1 for $\frac{17 \pm \sqrt{513}}{2}$ or for method leading to $\frac{17}{2} \pm \sqrt{\frac{513}{4}}$ oe A1 for answers in the range 19.82 to 19.825; – 2.82 to –2.825
18			21.2	4	M1 for correct use of sine rule to find *AB* or *BC*, eg $\frac{6}{\sin 25} = \frac{AB}{\sin 120}$ or $\frac{6}{\sin 25} = \frac{BC}{\sin(180-120-25)}$ M1 for (*AB* =) $\frac{6}{\sin 25} \times \sin 120$ (= 12.2(951…)) or (*BC* =) $\frac{6}{\sin 25} \times \sin 35$ (= 8.1(431…) M1(dep M2) for method to find area, eg 0.5 × 6 × "*AB*" sin35 or 0.5 × 6 × "*BC*" sin 120 A1 for answer in the range 21.1 – 21.2 OR (with perpendicular from *A* meeting *BC* extended at a point *X*) M1 for method to find *AX* M1 for method to find *BX* M1(dep M2) for 0.5 × "*AX*" × "*BC*" A1 for answer in the range 21.1 – 21.2
*19			0.38 because the LB and UB agree to that number of figures	5	B1 for 10.75 or 10.85 or 10.84999… B1 for 75.055 or 75.065 or 75.064999… M1 for $\sqrt{\frac{10.85}{75.055}}$ as UB **OR** $\sqrt{\frac{10.75}{75.065}}$ as LB A1 (dep on all previous marks) for both 0.3802… and 0.3784 must clearly come from working with correct values C1 for 0.38 from 0.3784… and 0.3802 … **and** "both LB and UB round to 0.38" **NB** An answer of 038(932….) without working scores no marks

5MB3H_01					
Question		Working	**Answer**	**Mark**	**Notes**
20			7.35	3	M1 for $y \propto \frac{1}{\sqrt{x}}$ or $y = \frac{k}{\sqrt{x}}$ or $9 = \frac{k}{\sqrt{4}}$ M1 for $k = 9\sqrt{4}$ (=18) A1 for 7.35 or 7.348…
*21			$\frac{2}{3}$ (7**a** + 3**b**) and correct conclusion	4	M1 for correct vector for $\overrightarrow{OY}$, or $\overrightarrow{AP}$ eg $(\overrightarrow{OY}) = \overrightarrow{OA} + \overrightarrow{AY}$, or $\overrightarrow{OY} = \overrightarrow{OA} + \frac{2}{3}\overrightarrow{AP}$ may include terms in **a** and **b,** eg. 6**a** + $\overrightarrow{AY}$, 4**b** + 4**a** – **b** + $\overrightarrow{PY}$ or $\overrightarrow{AP} = \overrightarrow{AO} + \overrightarrow{OB} + \overrightarrow{BP}$ or –6**a** + 4**b** + 4**a** – **b** or – 2**a** + 3**b** M1 for $(\overrightarrow{AY}) = \frac{2}{3}\overrightarrow{AP}$ or ⅔(–6**a** + 4**b** + 4**a** – **b**) or ⅔(–2**a** + 3**b**) or $(\overrightarrow{PY} = \frac{1}{3}\overrightarrow{PA}$ or ⅓(– 4**a** + **b** – 4**b** + 6**a**) or ⅓(2**a** – 3**b**) M1 for correct expression for $\overrightarrow{OY}$ in terms of **a** and **b,** eg $\frac{14}{3}$ **a** + 2**b** C1 for $\frac{2}{3}$ (7**a** + 3**b**) and "$\overrightarrow{OY}$ is parallel to the vector 7**a** +3**b**" **oe**

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q2	(a)	Grid enlarged. Shading changed to dotty shading. Labels added to shapes. Image labelled shape A. Rotation given and labelled shape B. Question changed to 'Describe fully the single transformation which maps shape A to shape B. One row top and bottom, one column left and right has been removed. Three answer lines given.	2 cao (B1 for correct orientation in third quadrant or correct quarter turn)
Q2	(b)	Grid enlarged. Shading changed to dotty shading. Labels added next to the triangles 'triangle P' and 'triangle Q'. One column removed from the left.	B1 for enlargement B1 for scale factor 4 B1 for centre (0, 1)

PMT

PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q4		Diagram enlarged. MLP only – x changed to y. Braille only – measurements given in the text.	M1 for $4(x - 8) = 2x + 13$ M1 for expansion of bracket or division of all terms by 4, eg $4x - 32 = 2x + 13$, $x - 8 = 2x/4 + 13/4$ M1 for isolating x and number terms eg $2x = 45$, $x/2 = 45/4$ A1 for 45/2 or 22.5 OR M1 for $(180 - 64) \div 2$ (= 58) M1 for $4(x - 8) = 58$ or $2x + 13 = 58$ M1 for isolating x and number terms eg $4x = 90$, $2x = 45$ A1 for 45/2 or 22.5 OR M1 for $64 + 4(x - 8) + 2x + 13$ M1 for $64 + 4(x - 8) + 2x + 13 = 180$ M1 for isolating x and number terms eg $6x = 135$ A1 for 45/2 or 22.5
Q5		Diagram kept the same size as original. Scale moved above the diagram and also put in the question paper.	B1 for circle centre M radius 5 cm B1 for circle centre N radius 3 cm B1 for correct region shaded

PMT

PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q6		Diagram enlarged. Cross changed to a filled in circle. Arrow heads removed.	M1 for $\pi \times 120^2$ (= 45238….) M1 for "$\pi \times 120^2$" ÷ 1800 A1 for 25.0 – 25.2 C1 for "surface is large enough as 25 > 20" oe OR M1 for $\pi \times 120^2$ (= 45238….) M1 for 20 × 1800 A1 for 36000 C1 for "surface is large enough as 36000 < 45238..." oe OR M1 for $\pi \times r^2 = 1800 \times 20$ M1 for 36000 ÷ π (=11459..) A1 for 107.0… C1 for "surface is large enough as 107…< 120" oe
Q9		Model provided for all candidates. Diagram enlarged and provided for MLP.	M1 for a method to find an area which is part of the cross section M1 (dep) for a complete method to find the total area of the cross section M1 (dep M2) for a complete method for the volume of the prism A1 cao OR M1 for a method to find the volume of cuboid, 8 × 8 × 12 M1 for a method to find the volume of the triangular prism M1 (depM2) for a complete method for the volume of the prism A1 cao

PMT

PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q10	(a)	Diagram enlarged. Braille only: measurements given in the text.	M1 for $12.7^2 + 8.3^2$ or $161.29 + 68.89$ or 230.18 M1 for $\sqrt{161.29 + 68.89}$ or $\sqrt{230.18}$ A1 for 15.2 or 15.17(168…)
Q10	(b)	Diagram enlarged. Braille only – measurements given in the text.	M1 for $\sin 40° = \frac{DE}{25}$ oe M1 for $25 \sin 40°$ A1 for 16.1 or 16.06(969…)
Q13	(a)	Wording added 'There are four spaces to fill.'	B2 for all values correct (B1 for any one value correct)
Q13	(b)	Grid enlarged.	M1 ft for at least 6 points plotted correctly from their table A1 cao for correct curve drawn from (–4, –6) to (3, –6)
Q16		Diagram enlarged. Dot added at centre.	M1 for angle ABC = 180 – 67 (= 113) A1 cao OR M1 for obtuse angle AOC = 2 × 67 (= 134) A1 cao

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PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q18		Diagram enlarged.	M1 for correct use of sine rule to find *AB* or *BC*, eg $\frac{6}{\sin 25} = \frac{AB}{\sin 120}$ M1 for (*AB* =) $\frac{6}{\sin 25} \times \sin 120$ or (*BC* =) $\frac{6}{\sin 25} \times \sin 35$ M1(dep M2) for method to find area, eg 0.5×6×*AB*sin35 or 0.5×6×*BC* sin 120 A1 for answer in the range 21.1 – 21.2 OR (with perpendicular from *A* meeting *BC* extended at a point *X*) M1 for method to find *AX* M1 for method to find *BX* M1(dep M2) for 0.5 × "*AX*" × "*BC*" A1 for answer in the range 21.1 – 21.2
Q21		Diagram enlarged.	M1 for correct vector for $\overrightarrow{OY}$, eg $(\overrightarrow{OY}) = \overrightarrow{OA} + \overrightarrow{AY}$, may include terms in **a** and **b,** eg. 6**a** + $\overrightarrow{AY}$, 4**b** + 4**a** – **b** + $\overrightarrow{PY}$ M1 for $(\overrightarrow{AY} =) \frac{2}{3}\vec{A}P$ or $(\overrightarrow{PY} =) \frac{1}{3}\overrightarrow{PA}$ M1 for correct expression for $\overrightarrow{OY}$ in terms of **a** and **b,** eg $\frac{14}{3}$**a** + 2**b** C1 for $\frac{2}{3}$(7**a** + 3**b)** and "$\overrightarrow{OY}$ is parallel to the vector 7**a** +3**b" oe**

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Mark Scheme (Results)

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Pearson Edexcel GCSE
In Mathematics A (1MA0)
Higher (Calculator) Paper 2H

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will award marks for the quality of written communication (QWC).
The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
1	3 | 1 3 7 4 | 1 4 4 7 8 8 5 | 1 2 3 5 6 6 6 6 | 0 1 3 4	Diagram and key	3	B2 for fully correct diagram (accept a stem of 30, 40, 50, 60, the order of the numbers in the stem may be reversed) (B1 for one error or omission or unordered diagram with no errors) B1 for a correct key (units may be omitted but must be correct if stated) eg 3 | 1 = 31 (mm)
2 (a)		225 : 475	2	M1 for 700 ÷ 2 + 125 (= 475) **or** 700 ÷ 2 – 125 (= 225) A1 for 225 : 475 oe, eg 9:19
(b)		175, 455	3	M1 for 630 ÷ (5 + 13) (= 35) M1 for "35" × 5 (= 175) **or** "35" × 13 (= 455) A1 cao
3		26	3	M1 for (360 − 90) ÷ 2 (= 135) M1 for $4x + 31$ = "135" or $6x - 21$ = "135" A1 cao OR M1 for forming an appropriate equation eg $4x + 31 = 6x - 21$ or $6x - 21 + 4x + 31 + 90 = 360$ oe M1 (dep) for isolating terms in x and number terms A1 cao

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
4 (a)		0.3	2	M1 for 1 − (0.25 + 0.10 + 0.20 + 0.15) oe A1 for 0.3 oe
(b)		21	3	M1 for 0.25 + 0.10 (= 0.35) or 0.25 × 60 (= 15) or 0.10 × 60 (= 6) M1(dep) for 60 × "0.35" or "15" + "6" A1 cao
5		1.4091(…)	2	B2 for 1.4091(…) (B1 for 2.1025 or 1.492 or 2.397…or 2.398)
6		180	3	M1 for a correct start to the process, eg 300 ÷ 5 (= 60) or 300 ÷ (5 × 1.5) (= 40) or 8 ÷ 5 (= 1.6) or 5 ÷ 8 (= 0.625) M1 for a complete method that will lead to the number of bricks needed to build the wall (= 480) or for a complete method that will lead to the number of extra bricks needed to build the wall, eg 300 ÷ 5 × 3 A1 cao

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
7	x -1 0 1 2 3 4 y 10 8 6 4 2 0	$y = 8 - 2x$ drawn	3	B3 for a correct line between $x = -1$ and $x = 4$ OR B2 for a correct straight line segment through at least 3 of $(-1, 10)$, $(0, 8)$, $(1, 6)$, $(2, 4)$, $(3, 2)$, $(4, 0)$ **or** for all of these points plotted but not joined **or** for a line drawn with a negative gradient through $(0, 8)$ **and** clear intention to use of a gradient of -2, eg line through (0,8) and (0.5, 6) OR B1 for at least 2 correct points stated or plotted **or** for a line drawn with a negative gradient through $(0, 8)$ **or** a line with gradient -2
*8		Comparison	3	M1 for 23.50×1.34 A1 for 31.49 C1 (dep M1) for 'euros' stated and a comparison ft their "31.49" OR M1 for $31 \div 1.34$ A1 for 23.13(43...) C1 (dep M1) for '£' stated and a comparison ft their "23.13" OR M1 for $31 \div 23.50$ A1 for 1.31(91...) C1 (dep M1) for comparison ft their "1.31(91...)" and explanation linked to conversion rate.

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
9		6.56	4	M1 for $200^2 + 60^2$ (= 43600) M1 for $\sqrt{40000+3600}$ or $\sqrt{43600}$ (= 208.8…) M1 for a complete method eg ("208.8" + 2 × 200 + 2 × 60) ÷ 100 × 0.9 oe A1 for 6.55 – 6.561
*10		large carton with correct calculations	3	M1 for 1.60 ÷ 125 (= 0.0128) or 2.8 ÷ 225 (= 0.0124(4…)) or 125 ÷ 1.60 (= 78(.125(g)) or 225 ÷ 2.80 (= 80(.35…g)) or any other calculation that could lead to a comparative figure M1 for 1.60 ÷ 125 (= 0.0128) **and** 2.8 ÷ 225 (= 0.0124(4…)) or for 125 ÷ 1.60 (= 78(.125(g)) **and** 225 ÷ 2.80 (= 80(.35…g)) or for calculations that could lead to comparative figures for the cartons 2 C1 for correct comparative figures for both cartons leading to a correctly stated comparison. Accept any other method considered equivalent. Figures may be truncated or rounded as long as their method is clear.

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
11	$\pi \times 6^2 - 2 \times 6 \times 6$	41.1	4	M1 for correct method to work out the area of the circle or quarter circle or semi-circle eg $\pi \times 6^2$ (=113(.09..)); $\pi \times 6^2 \div 2 = 56.5(4..)$; $\pi \times 6^2 \div 4 = 28.2(7\ldots)$) M1 for method to work out the area of the square (=72) oe or a triangle eg ½×6×6 (=18) M1 for complete method to find shaded area. A1 for value in the range 41.04 - 41.112
12 (a)		n^4	2	M1 for $\frac{n^{10}}{n^6}$ oe or $\frac{n^7}{n^3}$ oe or $n \times n^3$ oe A1 cao
(b)		$3x^2 + 4x$	2	B2 for $3x^2 + 4x$ or $x(3x + 4)$ (B1 for $x^2 - 2x$ or $2x^2 + 6x$ or $3x^2 + nx$ or $px^2 + 4x$)
(c)		$5(y - 3)$	1	B1 cao
(d)		$9ab(2 + 3b)$	2	B2 for $9ab(2 + 3b)$ (B1 for $9a(2b + 3b^2)$ or $9b(2a + 3ab)$ or $ab(18 + 27b)$ or $3ab(6 + 9b)$ or $3a(6b + 9b^2)$ or $3b(6a + 9ab)$ or $9ab$(a two term algebraic expression))

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
13 (a)		5, 30, 60, 75, 80	1	B1 for correct cumulative frequencies (may be implied by correct heights on the grid)
(b)		cf graph	2	M1 for at least 4 of the 5 points plotted correctly at the ends of the intervals or 4 of the 5 points plotted not at the ends but consistently within each interval and joined (dep on a cf table with no more than one arithmetic error) A1 for a fully correct cf graph (points may be joined by a curve or straight line segments)
(c)	IQR = UQ – LQ	26-28	2	M1 for reading values from their cf graph at cf = 20 or 20.25 **and** cf = 60 or 60.75 A1ft provided M1 is awarded in (b)
(d)		55-59	3	M1 for reading a value from their cf graph at weight 150 grams M1 for $\frac{"45"}{"80"} \times 100$ A1ft provided M1 is awarded in (b)
14		126	3	M1 for 180 – (360 ÷ 5) (= 108) or (5 – 2) × 180 ÷ 5 (= 108) M1 for a complete method eg $\frac{360-"108"}{2}$ or $180-\frac{"108"}{2}$ A1 cao

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
15		28.9	5	M1 for $\sin 62 = \frac{BD}{15}$ **or** $\frac{BD}{\sin 62} = \frac{15}{\sin 90}$ oe M1 for (BD =) $15 \times \sin 62$ **or** $\frac{15}{\sin 90} \times \sin 62$ oe (= 13.24...) M1 for $\tan BCD = \frac{"13.24"}{24}$ oe **or** $\tan BDC = \frac{24}{"13.24"}$ with BDC clearly identified M1 for $BCD = \tan^{-1}\frac{"13.24"}{24}$ oe **or** $BDC = \tan^{-1}\frac{24}{"13.24"}$ with BDC clearly identified A1 for 28.8 – 28.9 **OR** M1 for $\cos(90 - 62) = \frac{BD}{15}$ M1 for (BD =) $15 \times \cos(90 - 62)$ (= 13.24...) M1 for $\tan BCD = \frac{"13.24"}{24}$ oe **or** $\tan BDC = \frac{24}{"13.24"}$ with BDC clearly identified M1 for $BCD = \tan^{-1}\frac{"13.24"}{24}$ oe **or** $BDC = \tan^{-1}\frac{24}{"13.24"}$ with BDC clearly identified A1 for 28.8 – 28.9

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
16		$\frac{8}{17}$	5	M1 for $5x + 4$ or $10 - x$ M1 (dep) for "$5x + 4$" = $\frac{2}{3}$ "$(10 - x)$" M1 for expanding the bracket or multiplying both sides by 3 in an equation of the form $(ax + b) = \frac{2}{3}(cx + d)$ A1 for correct equation with terms in x and number terms isolated, eg $15x + 2x = 20 - 12$ or $5x + \frac{2x}{3} = \frac{20}{3} - 4$ A1 for $\frac{8}{17}$ oe accept 0.47(0588...)
17 (a)		Question and responses	2	B1 for a suitable question which includes a time frame (the time frame could appear with the response boxes) B1 for at least 3 non-overlapping response boxes which are exhaustive for their question NB Do not accept inequality signs
(b)		53 or 54	2	M1 for $\frac{460}{1709} \times 200$ (= 53.8...) oe A1 for 53 or 54

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
*18		28°	4	M1 for angle $ABD = 62°$ M1 for angle $BAD = 90°$ C2 for angle $ADB = 28^{\circ}$ with full, appropriate reasons given angles in the same segment are equal; angles in a semicircle are 90°; angles in a triangle add up to 180° (C1 (dep on relevant M1) for one correct and appropriate reason relating to a circle theorem) OR M1 for angle $AOD = 62° \times 2$ (= 124°) M1 for $(180° - 124°) \div 2$ C2 for angle $ADB = 28°$ with full, appropriate reasons given the angle at the centre of a circle is twice the angle at the circumference; base angles of an isosceles triangle are equal; angles in a triangle add up to 180° (C1 (dep on relevant M1) for one correct and appropriate reason relating to a circle theorem)

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
19 (a)		$y^2 + 7y + 10$	2	M1 for all 4 terms (and no additional terms) correct ignoring signs **or** 3 terms correct A1 for $y^2 + 7y + 10$
(b)		$(e - 3)(e + 4)$	2	M1 for $(e \pm 3)(e \pm 4)$ A1 for $(e - 3)(e + 4)$
(c)		0.77, –0.43	3	M1 for $\frac{--1 \pm \sqrt{(-1)^2 - 4 \times 3 \times -1}}{2 \times 3}$ (condone one sign error) M1 for $\frac{1 \pm \sqrt{13}}{6}$ A1 for one answer in the range 0.767 to 0.77 and one answer in the range –0.43 to –0.4343
20		17.7(014…)	3	B1 for 7.75 or7.85 or 5.15 or 5.25 or 62.5 or 63.5 M1 for $\frac{1}{2} \times 7.75 \times 5.15 \times \sin 62.5$ A1 for 17.7(0140994…)

PAPER: 1MA0/2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*21			No with explanation and supportive working	4	M1 for method to find the volume of compost needed to fill one or more baskets eg $\frac{2}{3} \times \pi \times 20^3$ (= 16755(.16…)) Or $\frac{4}{3} \times \pi \times 20^3$ (= 33510(.32…)) M1 for appropriate use of 1 litre = 1000 cm^3, eg $4 \times 50 \times 1000$ (= 200000) or "16755" ÷ 1000 M1 for complete method to find values needed to make decision C1 for conclusion supported by correct values, eg 200000 and 201061(.92...) (accept 201000 to 201120) or 16666(.66...) and 16755(.16…) or 11.9(36...) NB Calculations can be in litres or cm^3
22	(a)	$2 = k^{-1}$	½	2	M1 for reading off and substituting a pair of values from the graph (excluding 0, 1) into the equation, eg $x = -1$, $y = 2$ A1 for ½ oe
	(b)		correct graph	2	B2 cao (B1 for correct general shape, eg $y = -\sin x°$)

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
23		Correct conclusion from correct working	4	B1 for $\overrightarrow{AB} = -5\mathbf{a} + 2\mathbf{b}$ or $\overrightarrow{BA} = 5\mathbf{a} - 2\mathbf{b}$ M1 for a correct vector statement for $\overrightarrow{OT}$ eg $\overrightarrow{OA} + \overrightarrow{AT}$ or $\overrightarrow{OB} + \overrightarrow{BT}$ or $\overrightarrow{OA} + \frac{5}{6}\overrightarrow{AB}$ or $\overrightarrow{OB} + \frac{1}{6}\overrightarrow{BA}$, may be written partially or fully in terms of **a** and **b** M1 for $5\mathbf{a} + \frac{5}{6}(-5\mathbf{a} + 2\mathbf{b})$ oe or $2\mathbf{b} + \frac{1}{6}(5\mathbf{a} - 2\mathbf{b})$ oe A1 for $\frac{5}{6}(\mathbf{a} + 2\mathbf{b})$ is parallel to $\mathbf{a} + 2\mathbf{b}$

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
*24	$(n^2 + 4n + 4) - (n^2 + 2n + 1)$ $\frac{2n+3}{2n^2+3n}$ $\frac{2n+3}{n(2n+3)}$	Proof	4	M1 for correct method to expand $(n + 2)^2$ or $(n + 1)^2$ M1 for correct simplification of numerator M1 for factorisation of $2n^2 + 3n$ **or** for clearing the fractions on both sides correctly C1 for complete and correct proof OR M1 for $\{(n+2)-(n+1)\}\{(n+2)+(n+1)\}$ M1 for $1 \times (2n+3)$ M1 for factorisation of $2n^2 + 3n$ **or** for clearing the fractions on both sides correctly C1 for complete and correct proof OR M1 for $n\{(n+2)^2-(n+1)^2\} = (2n^2 + 3n) \times 1$ M1 for $n(n+2)^2 - n(n+1)^2$ or for correct expansion of $(n+2)^2-(n+1)^2$ M1 for correct expansion of $n\{(n+2)^2-(n+1)^2\}$ C1 for complete and correct proof (must include statement recognising the equality of LHS and RHS)

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
1		Diagram enlarged. 4th horizontal line added to the bottom of the stem and leaf diagram. Key moved above and to the left of the diagram. Wording added 'It shows the basis of a stem and leaf diagram.	Standard mark scheme
3		Diagram enlarged. Wording added 'Angle $B\,O\,C = 4\,x + 31$'. Wording added 'Angle $A\,O\,C = 6\,x - 21$'.	Standard mark scheme
4		Diagram enlarged. Spike removed from the spinner and the spinner has been straightened.	Standard mark scheme
7		Grid enlarged.	Standard mark scheme
9		Diagram enlarged. Wording added '$CB = 200$ cm'. Wording added '$DC = 60$ cm'.	Standard mark scheme

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
10		Pictures have been removed.	Standard mark scheme
11		Diagram enlarged.	Standard mark scheme
12	(b)	MLP only: x changed to y.	B2 for $3y^2 + 4y$ or $y(3y + 4)$ (B1 for $y^2 - 2y$ or $2y^2 + 6y$ or $3y^2 + ny$ or $py^2 + 4y$)
	(d)	'a' changed to 's' and 'b' changed to 't' for all candidates.	B2 for $9st(2 + 3t)$ (B1 for $9s\,(2t + 3t^2)$ or $9t(2s + 3st)$ or $st(18 + 27t)$ or $3st(6 + 9t)$ or $3s(6t + 9t^2)$ or $3t(6s + 9st)$ or $9st$(a two term algebraic expression))
13	(a)	Wording added 'There are five spaces to fill.'	Standard mark scheme
	(b) to (d)	Diagram enlarged. Axes labels have been moved to the top of the vertical axis and to the left of the horizontal axis. Right axis has been labelled.	Standard mark scheme
14		Diagram enlarged.	Standard mark scheme
15		Diagram enlarged. Wording 'AB = 15 m' changed to 'BA = 15 metres'. Wording 'BC = 24 m' changed to 'CB = 24 metres'. Wording added 'Angle CBD = angle BDA = 90°.'	Standard mark scheme

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
18		Diagram enlarged.	Standard mark scheme
19	(b)	Braille only: e changed to m.	M1 for $(m \pm 3)(m \pm 4)$ A1 for $(m - 3)(m + 4)$
21		Simplified diagram provided for MLP candidates.	Standard mark scheme
22	(a) (b)	Grid enlarged. Grid enlarged.	Standard mark scheme Standard mark scheme
23		Diagram enlarged. Cross at T changed to a solid dot.	Standard mark scheme

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Mark Scheme (Results)

November 2016

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Non-Calculator) Unit 2

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4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will award marks for the quality of written communication (QWC).
The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

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Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

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11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 − 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 − method mark for appropriate method in the context of the question A1 − accuracy mark B1 − Working mark C1 − communication mark QWC − quality of written communication oe − or equivalent cao − correct answer only ft − follow through sc − special case dep − dependent (on a previous mark or conclusion) indep − independent isw − ignore subsequent working

5MB2H November 2016						
Question		**Working**	**Answer**	**Mark**	**Notes**	**Type**
1	(a)		$7n - 4$	2	B2 for $7n - 4$ (B1 for $7n + k$, $k \neq -4$	G
	(b)	$3 \times 4^2 + 5$	53	2	M1 for $3 \times 4^2 + 5$ A1 cao	G
2	(a)	$7a + 4a - 8b$	$11a - 8b$	2	M1 for $4a - 8b$ A1 for $11a - 8b$	G
	(b)		n^{11}	1	B1 cao	C
	(c)		$5(x + 2)$	1	B1 cao	G
3			74	4	M1 for $200 - \frac{10}{100} \times 200$ (=180) M1 for "180" ÷ (1 + 2 + 7) (= 18) M1 for "18" × (1 + 2) + 20 A1 cao OR M1 for $200 - \frac{1}{10} \times 200$ (=180) M1 for $\frac{7}{10} \times 180$ (=126) M1 for 200 – "126" + 20 A1 cao	E
4			Plan 	2	M1 for 7 × 4 rectangle A1 for correct plan with dividing line	G

5MB2H November 2016					
Question	**Working**	**Answer**	**Mark**	**Notes**	**Type**
*5	(180 – 120) ÷ 2 = 30 (180 – 30) ÷ 2	75°	4	M1 for method to find angle *ADB* (or angle *ABD*) (180 – 120) ÷ 2 A1 for 75 C1 (dep on M1) for Alternate angles are equal **or** co-interior (allied) angles add up to 180° C1 (dep on M1) for Base angles of an isosceles triangle are equal **and** Angles in a triangle add up to 180°	E
6	30 ÷ 15 = 2 48 ÷ (6 – 2)	12	3	M1 for 30 ÷ 15 = 2 M1 for 48 ÷ (6 – "2") A1 cao	E
*7	120 ÷ 8 × 5 80 + 75 = 155 155 > 150 150 – 80 = 70 70 ÷ 5 × 8 112 < 120	No with reason	3	M1 for method to convert 120 km to miles 120 ÷ 8 × 5 (=75) M1 for 80 + '75' (=155) C1 for No with correct total distances in miles OR M1 for 150 – 80 = 70 M1 for complete method to convert 70 miles to km 70 ÷ 5 × 8 (=112) C1 for No with correct values for distance driven in France and mileage remaining.	E

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5MB2H November 2016					
Question	**Working**	**Answer**	**Mark**	**Notes**	**Type**
8	$4 \times 3 = 12$ $2 \times 10 = 20$ $(12 + 20 + 20) \times 1.5$ $8 \times 10 \times 1.5 = 120$ $\frac{1}{2} \times 4 \times 7 \times 1.5 = 21$ $120 - 21 - 21$	78	4	M1 for method to find area of parallelogram or 2 triangles M1 for method to find whole cross sectional area M1 for complete method to find volume A1 cao OR M1 for method to find volume of enclosing cuboid or volume of a single cuboid. M1 for method to find volume of triangular prism(s) or for method to find volume of parallelogram prism(s) M1 for complete method to find volume of prism. A1 cao	E
9	$10 \times 4^2 - 4 - 21 = 135$ $2 \times 4 - 3 = 5$ $135 \div 5 = 27$ $10x^2 - x - 21$ $= (2x - 3)(5x + 7)$ $5 \times 4 + 7$	27	3	M1 for $10 \times 4^2 - 4 - 21$ (= 135) M1 for $135 \div (2 \times 4 - 3)$ A1 cao OR M1 for factorising to give $5x + 7$ or $5x + n$, $n \neq 7$ or $mx + 7$, $m \neq 5$) M1 (dep) for substitution of $x = 4$ into expression for length of rectangle A1 cao	E

5MB2H November 2016					
Question	**Working**	**Answer**	**Mark**	**Notes**	**Type**
10 (a)(i)		1	3	B1 cao	C
(ii)		$\frac{1}{25}$		B1 for $\frac{1}{25}$ or 0.04	C
(iii)		4		B1 cao	C
(b)		$5a^4b^3$	2	B2 for $5a^4b^3$ (B1 for any two of 5, a^4, b^3 in a product)	E
11		$\frac{29}{35}$	4	M1 for writing both $4\frac{3}{5}$ and $2\frac{2}{3}$ or both $\frac{3}{5}$ and $\frac{2}{3}$, with a common denominator (a multiple of 15) with at least one correct numerator M1 for $4 - 2 + \frac{9}{15} - \frac{10}{15}$ $(= \frac{29}{15})$ or $\frac{69}{15} - \frac{40}{15}$ M1 for "$\frac{29}{15}$" $\times \frac{3}{7}$ A1 for $\frac{29}{35}$ oe single fraction	E
12 (a)		0.00023	1	B1 cao	C
(b)	$5.86 \times 10^6 = 5\,860\,000$ $4\,200\,000 = 4.2 \times 10^6$ 5.3 million $= 5\,300\,000 = 5.3 \times 10^6$	A C B	2	M1 for one correct conversion to or from standard form or answer reversed. A1 for A C B or numbers in correct order	G
13 (a)		(5, 2, 2)	1	B1 cao	E
(b)		(4, 2, 1)	2	M1 for an answer of (a, 2, 1) or (4, b, 1) or (4, 2, c) or ft from (a) A1 (4, 2, 1) or ft from (a)	E

5MB2H November 2016					
Question	**Working**	**Answer**	**Mark**	**Notes**	**Type**
*14	360 – 90 – 90 – 110 = 70 180 – 60 – 70 360 – 90 – 90 – 60 = 120 360 – 110 – 120 = 130 360 – 90 – 90 − 130	50°	4	B1 for identifying 90 ° (may be on diagram) M1 for beginning method using *MON* = 110 eg 360 – 90 – 90 – 110 (= 70) M1 for completing method to find *BAC* eg 180 – 60 – 70 (=50) C1 for (angle *BAC* =) 50 and all reasons relevant to method used: Angle between tangent and radius is 90 Sum of angles in a quadrilateral is 360 Angles in a triangle add up to 180 OR B1 for identifying 90 ° (may be on diagram) M1 for beginning method using *NCP* = 60 eg 360 – 90 – 90 – 60 (= 120) M1 for completing method to find *BAC*, e.g. 360 – 110 – 120 = 130 360 – 90 – 90 – 130 (=50) C1 for (angle *BAC* =) 50 and all reasons relevant to method used: Angle between tangent and radius is 90 Sum of angles in a quadrilateral is 360 Angles around a point equal 360	E
15		$\frac{7x}{x+5}$	3	M1 for $7x(x-3)$ M1 for $(x-3)(x+5)$ A1 for $\frac{7x}{x+5}$	E

5MB2H November 2016					
Question	**Working**	**Answer**	**Mark**	**Notes**	**Type**
16	$\frac{(\sqrt{5}+\sqrt{5}+6)}{2} \times (\sqrt{5}-2)$ $(\sqrt{5}+3)(\sqrt{5}-2)$ $5+3\sqrt{5}-2\sqrt{5}-6$ $\sqrt{5}(\sqrt{5}-2)+\frac{6(\sqrt{5}-2)}{2}$ $5-2\sqrt{5}+3\sqrt{5}-6$	$\sqrt{5}-1$	3	M1 for $\frac{(\sqrt{5}+\sqrt{5}+6)}{2} \times (\sqrt{5}-2)$ M1 for expansion $5+3\sqrt{5}-2\sqrt{5}-6$ with 3 terms out of 4 correct including signs or all 4 terms correct ignoring signs A1 cao OR M1 for $\sqrt{5}(\sqrt{5}-2)+\frac{6(\sqrt{5}-2)}{2}$ M1 for expansion $5-2\sqrt{5}+3\sqrt{5}-6$ with 3 terms out of 4 correct including signs or all 4 terms correct ignoring signs A1 cao	E
17	$\frac{-2}{6}=\frac{-1}{3}$ $1=3\times 3+c$	$y=3x-8$	4	M1 for gradient $\frac{-2}{6}$ M1 for use of $\frac{-1}{m}$ for perpendicular line M1 for substitution of (3,1) into their equation A1 for $y=3x-8$ oe	E

3

Mark Scheme (Results)

November 2016

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Calculator) Unit 3

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PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
1		67200	2	M1 for 0.12 × 60000 (= 7200) oe A1 cao
2		40	2	M1 for 32 ÷ 20 (= 1.6) or 32 × 25 (= 800) or 20:25 (or use of) A1 cao
3		105.7	2	M1 for π × 5.8 × 5.8 oe A1 for 105.6 to 105.8
4		Perpendicular bisector	2	M1 for accurate line drawn without arcs, or appropriate arcs A1 accurate line and appropriate arcs drawn
5 (a)		Inequality drawn	2	B2 for all three features of −2, O and right arrow (B1 for two of these features)
(b)		2	3	M1 for isolating the y terms A1 for $3y < 8$ or $3y = 8$ or better B1 ft
6 (a)		Triangle	2	B1 for triangle translated B1 for triangle at (−2,2), (−2,0), (−1,0)
(b)		Rotation 90° anticlockwise centre (0,0)	3	B1 Rotation B1 90° anticlockwise oe B1 centre (0,0) Note Award no marks if more than one transformation is given

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
*7		Flow pumps	5	M1 for a correct first step, eg 4 × 35 (= 140 galls in 1 min or 8400 galls in 1 hour) or 1000000 ÷ 2100 (= 476 hours for 1 speedy pump) or 35 × 60 (= 2100 gallons in 1 hour) M1 for a correct method to find a time taken for one type of pump, eg 1000000 ÷ 8400 (= 119 hours) M1 for a correct method to find a time taken for the other type of pump (consistent), eg 500 ÷ 5 (= 100 hours) A1 for two correct comparable values, eg 119 (hours) and 100 (hours) C1 ft (dep M3) for conclusion of Flow pumps with correct figures for comparison OR M1 for a correct first step, eg 4 × 35 (= 140 galls in 1 min) M1 for a correct method to find the number of gallons pumped out by one type of pump in a certain time period, eg 1000000 ÷ 100 (= 10000 gall in 1 hour) M1 for a correct method to find the number of gallons pumped out by the other type of pump in a certain time period (consistent), eg for two correct comparable values, eg 10000 ÷ 60 (= 166 gallons in 1 min) A1 for 140 (galls in 1 min) and 166 (galls in 1 min) oe C1 ft (dep M3) for conclusion of Flow pumps with correct figures for comparison
8		2 000 000	2	M1 for 2 × 100 × 100 × 100 A1 oe

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PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
*9		Tymes shop	3	M1 for 80 – 18 (= 62) or for method to reduce 80 by 20% oe (= 80 − 16 = 64) A1 for 62 and 64 C1 for comparison using 62 and 64 OR M1 for method to find 20% of 80 (=16) A1 for 16 C1 for comparison using 16 and given 18 OR M1 for writing £18 as a % of £80 (= 22.5%) A1 for 22.5% C1 for comparison using 22.5% and 20%
10		C shown	3	M1 for correct angle of 70° M1 for correct angle of 320° A1 C marked unambiguously in the correct position
11		8.56	3	M1 for $5.2^2 + 6.8^2$ (= 73.28) M1 for $\sqrt{(5.2^2 + 6.8^2)}$ or $\sqrt{73.28}$ A1 for 8.5 – 8.6

PAPER: 5MB3H_01

Question	Working	Answer	Mark	Notes
12 (a)		Equation	2	M1 for $2x \times x \times (x + 4)$ A1 for clear working leading to $x^3 + 4x^2 = 90$
(b)	3 63 4 128 3.1 68.231 3.2 73.728 3.3 79.497 3.4 85.544 3.5 91.875 3.45 88.67363 3.46 89.30814 3.47 89.94552 3.48 90.58579	3.5	4	B2 for trial evaluated using $3 < x < 4$ (B1 for trial evaluated using $3 \leq x \leq 4$) B1 for a different trial evaluated using $3.4 \leq x \leq 3.5$ B1 (dep on at least one previous B1) for 3.5 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but correct to 1dp (rounded or truncated) if the value of x is to 2 dp. NB: no working scores no marks even if the answer is correct.
13 (a)		−3 −2 −1 0 1 2 3 −5 **8** 9 **4** **−1** 0 13	2	B2 for all 3 correct values (B1 for 2 correct values)
(b)			2	M1 (dep on B1) for plotting at least 6 values from their table A1 for a correct graph
14		$x = 0.4$, $y = -2$	4	M1 for a correct method leading to either x or y (condone one error) A1 for $x = 0.4$ or $y = -2$ M1 for a correct substitution into one of the equation or a correct method leading to the second value A1 cao
15		$d = ep - ef$	2	M1 for isolating the term in d or multiplication of all terms by e as the first step A1 oe

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
*16			4	M1 for showing that *OAB* and *ODA* are isosceles (*OA*, *OB*, *OD* radii) or shows that *OD* bisects *AOB*. M1 for recognising that *AOB* = 120° (from *ACB* = 60°) A1 for identifying angles of ODA as 60° C1 (dep on M1) for conclusion that ODA is equilateral, and appropriate reason linked to shown method eg The angle at the centre of a circle is twice the angle at the circumference. OR M1 for showing that triangles *OAM* and *OBM* are congruent (*OM* common, *AM* = *MB* given, and *OA* = *OB* radii) M1 for showing *AOM* = 60° and *AO* = *OD* (radii) A1 for identifying angles of *ODA* as 60° C1 (dep on M1) for conclusion that *ODA* is equilateral, and appropriate reason linked to shown method eg The angle at the centre of a circle is twice the angle at the circumference.
17		16	2	M1 for 18 ÷ 24 (= 0.75) or 24 ÷ 18 (= 1.333) A1 cao
18		199 - 201	3	M1 for a correct first step, eg changes km/s to mph 13 × 2250 (= 29250 mph) M1 for finding time eg $\frac{1.4\times10^8}{"29250"}$ (= 4786 hours) A1 199 to 201 days OR M1 for a correct first step, eg changes km to miles $1.4 \times 10^8 \times 1.6$ ($= 2.24 \times 10^8$) M1 for finding time eg $\frac{"2.24\times10^8"}{13}$ (= 17230769 seconds) A1 199 to 201 days

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
19 (a)		5 and −7	3	M1 for $(x \pm 5)(x \pm 7)$ M1 for $(x - 5)(x + 7)$ A1 cao OR M1 for correct substitution into formula M1 for reduction to $\frac{-2 \pm \sqrt{144}}{2}$ A1 cao
(b)		$\pm\sqrt{3}$	4	M1 for multiplying through by a common denominator eg by $(x + 1)(2x + 3)$ M1 (dep) for reduction eg to $4x + 6 + x^2 + x$ or $2x^2 + 3x + 2x + 3$ M1 for $x^2 - 3$ (= 0) A1 cao for both answers; accept decimals to at least 2 dp
20		$\frac{59}{330}$	3	M1 for $100x = 17.87878787\ldots$ or $1000x = 178.7878787\ldots$ **and** $10x = 1.7878787$ M1 (dep) for subtraction, $100x - x$ or $1000x - 10x$ or $\frac{17.7}{99}$ or $\frac{177}{990}$ seen A1 working leading to given fraction
21		7	2	M1 for $6000 \times (1.03)^n$ for $n > 2$ OR M1 for $7379.24 \div 6000$ (= 1.2298733) A1 cao

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
22		8.64	5	M1 for $0.5 \times 9.3 \times 8 \times \sin BAC$ A1 for $BAC = 59.34°$ M1 for substitution into the cosine rule eg $9.3^2 + 8^2 - 2\times9.3\times8\times\cos$"59.34" M1 for correct order of calculation and $\sqrt{}$ eg $86.49 + 64 - 75.8777$ leading to $\sqrt{74.6123}$ A1 8.6 to 8.7 with supporting working
23 (a)		199.75	1	B1 cao
*(b)		Yes	3	B1 for ub = 24.5 or 175.5 M1 ft for "24.5" + "175.5" (= 200) C1 (dep M1) for 200 and statement based on their working as to whether the cup will overflow (ie comparison with (a)).

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Mark Scheme (Results)

Summer 2017

Pearson Edexcel GCSE
In Mathematics A (1MA0)
Higher (Non-Calculator) Paper 1H



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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
1 (a)		x^{12}	1	B1 cao
(b)		2	1	B1 cao
(c)		18	1	B1 cao
(d)		example given	1	B1 for stating a value of n for which $6n + 1$ is not prime eg 4, 8, 9, 14, 19, ... ,1000 etc

Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
*2		Yes (supported)	5	M1 for method to calculate profit on one laptop e.g. 400 × 0.3 oe (= 120) **or** 400 × 0.15 oe (= 60) M1 for method to calculate selling price of one of the two deals e.g. 400 × 1.3 oe (= 520) **or** 400 × 1.15 oe (= 460) M1 for method to calculate the total selling price of one laptop e.g. 40 × 400 × 1.3 oe (= 20 800) **or** 10 × 400 × 1.15 oe (= 4600) M1 for total income e.g. “20 800” + “4600” C1 for Yes **and** (£)25 400 **or** Yes with £400 more **OR** M1 for a method for the profit on one laptop e.g. 400 × 0.3 oe (=120) **or** 400 × 0.15 oe (= 60) M1 for a method for the total profit for one of the two deals e.g. 40 × “120” (= 4800) **or** 10 × “60” (= 600) M1 for a method for total profit “4800” + “600” (= 5400) M1 for a method for target profit e.g. 25 000 − 400 × 50 (= 5000) C1 for Yes with (£)5400 **and** (£)5000 **or** Yes with £400 more **OR** M1 for a method for the profit on one laptop e.g. 400 × 0.3 oe (= 120) **or** 400 × 0.15 oe (= 60) M1 for a method for the total profit for one of the two deals e.g. 40 × “120” oe (= 4800) **or** 10 × “60” (= 600) M1 for 50 × 400 + “4800” or 50 × 400 + “600” M1 for 50 × 400 + “4800” + “600” (= 25400) C1 for Yes **and** (£)25 400 **or** Yes with £400 more

Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
3 (a)		Frequency polygon	2	B2 correct frequency polygon (B1 for points plotted correctly but not joined OR for points plotted at the correct heights, consistently placed within the class intervals (including ends) and joined OR for an otherwise correct frequency polygon with one point incorrect OR correct frequency polygon with first and last points joined directly) NB: ignore parts of graph drawn to the left of the 1st point or the right of the last point; ignore any histograms drawn.
(b)		$60 < A \leq 80$	1	B1 ft frequency polygon
4		−2	3	M1 for expanding brackets eg $4x + 12$ $(= 2x + 8)$ or dividing by 4 as a first step eg $x + 3 = \frac{2x}{4} + \frac{8}{4}$ M1 ft their equation of the form $ax + b = 2x + 8$ or $x + 3 = ax + b$ for isolating terms in x and numbers e.g. $4x - 2x = 8 - 12$ seen as part of their solution oe A1 cao
5		42	3	M1 for a method to find angle ABD eg $ABD = 360 - 130 - 130 - 40$ $(= 60)$ or angle DBC eg $DBC = 180 - 2 \times 72$ $(= 36)$ (may be on the diagram) M1 for a complete method eg (180 – "60" − "36") ÷ 2 A1 cao OR M1 for a method to find angle ABC eg $ABC = 540 - 130 - 40 - 130 - 72 - 72$ $(= 96)$ M1 for a complete method eg (180 − "96") ÷ 2 A1 cao

Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
6 (a)		40 100	3	M1 for method to find unit weight eg 60 ÷ 3 (= 20) M1 for complete method to find weight of one of the other ingredients eg "20" × 2 (= 40) or "20" × 5 (= 100) A1 cao
(b)		1.44	3	M1 for a complete method to work out the weight of nuts needed eg 300 ÷ (3 + 2 + 5) × 3 (= 90) or 300 ÷ (60 + "40" + "100") × 60 (= 90) M1 for a complete method to work out the cost eg (800 ÷ 500) × "90" (= 144) A1 cao
7		15 200	3	M1 for a method to obtain at least 2 different areas from 50×80 (= 4000), $\frac{1}{2} \times 40 \times 60$ (= 1200), 60×80 (= 4800) M1 (dep on M1) for adding at least 4 correct face areas A1 cao
8 (a)		Transformation	2	B2 for a triangle with vertices at (−1, 1), (−2, 3) and (−2, 1) (B1 for a triangle in correct orientation or rotated 90° clockwise centre the origin)
(b)		Description	3	B1 Enlargement B1 Scale factor 3 (accept × 3) B1 Centre (1,0) NB: More than one transformation is B0

Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
9		$\frac{4}{15}$	3	M1 for a method to find the total number of people eg 3×5 (= 15) or $\frac{5}{15} = \frac{1}{3}$ M1 (dep) for "15" – 5 – 6 (= 4) A1 oe OR M1 for a method to find prob (boy) eg $\frac{6}{5} \times \frac{1}{3}$ (= $\frac{6}{15}$) M1 (dep) for $1 - \text{“}\frac{6}{15}\text{”} - \frac{1}{3}$ A1 oe OR M1 for an expression for the number of adults eg $\frac{5}{5+6+x}$ M1 (dep) for $\text{“}\frac{5}{5+6+x}\text{”} = \frac{1}{3}$ or $x = 4$ A1 oe **SC:** B2 for $\frac{4}{n}$ where $n > 4$, $n \neq 15$

Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
10 (a)		$3n - 1$	2	B2 for $3n - 1$ oe (B1 for $3n + k$, k an integer $\neq -1$ or absent)
(b)		Yes	2	M1 for $3n - 1 = 299$ ft if B1 earned in (a) A1 for eg Yes and $n = 100$ oe
(c)		$3(n+1)-1$	1	B1 oe eg $3n + 2$ or ft (a) providing at least B1 earned
11		(102, 104)	3	B1 for (P=) (106, 107) M1 for a complete method eg [104 − ("106" − 104), 105.5 − ("107" − 105.5)] or (A=) (102, y) or (A=) (x, 104) A1 cao
12		270	3	M1 for correct use of formula for volume of a cylinder using exact or (some) approximate figures eg $\pi \times 31^2 \times 97.5$ or $\pi \times 31^2 \times 100$ or using an estimate of π eg $\pi = 3$ in the volume formula M1 for a complete method to find an estimate for the volume in cm^3 with at least 2 values rounded eg $\pi \times 30^2 \times 100$ (= 270 000) eg $3.1 \times 30^2 \times 100$ eg $3 \times 31^2 \times 100$ A1 accept answer in the range 270 − 300 from a method using estimates

Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
13 (a)		5, −1, 5	2	B2 for all 3 correct (B1 for 1 or 2 correct)
(b)		Correct graph	2	M1 ft for 5, 6 or 7 points plotted correctly, provided at least B1 awarded in (a) A1 for a fully correct graph (no line segments)
(c)		−0.6, 3.6	2	M1 for use of $y = 3$ A1 for −0.5 to −0.7, 3.5 to 3.7 (ft quadratic graph)
14		130	4	M1 for setting up two correct equations eg 3p + 4c = 440 4p + 3c = 470 M1 for adding the two equations eg 7p + 7c = 910 or for a correct method to eliminate one variable (allow one error) M1 for a method to find p + c eg 910 ÷ 7 or for a complete method to find both p and c (p = 80, c = 50) A1 for 130 or £1.30(p) **NB:** Allow any letters for variables. Allow a non-algebraic approach eg 7 kg potatoes and 7 kg carrots costs a total of 910

Paper: 1MA0/1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
15			18	4	M1 for correct initial use of Pythagoras eg $(AB^2 =)\ 10^2 - 6^2$ (= 64) or $AB = 8$ M1 (dep M1) for "$\sqrt{64}$" ÷ 2 (= 4) M1 for method to find area of trapezium eg $\frac{1}{2} \times$ "4" × (6 ÷ 2 + 6) A1 cao OR M1 for correct initial use of Pythagoras eg $(AB^2 =)\ 10^2 - 6^2$ (= 64) or $AB = 8$ M1 (dep M1) for method to find area of ΔABC eg $\frac{1}{2} \times$ "$\sqrt{64}$" × 6 (= 24) or area of ΔAED $\frac{1}{2} \times 6 \div 2 \times$ "4" (= 6) or $24 \times (\frac{1}{2})^2$ (= 6) M1 for a complete method to find area of $EDBC$ e.g $\frac{3}{4} \times$ "24" eg "24" − "6" A1 cao
16	(a)	40, 110, 170, 185, 195, 200	Table	1	B1
	(b)		Cumulative frequency diagram	2	M1 ft their cumulative frequency table for at least 5 points plotted correctly at the ends of the intervals provided tables values are cumulative, condoning one arithmetical error, **or** if the shape of the graph is correct for 5 or 6 points plotted not at the ends but consistently within each interval and joined. A1 for a correct graph (allow curve or line segments)
	(c)		40 to 48	2	M1 for reading their cumulative frequency graph from mark of 54 (= 152 to 160) where the points are plotted consistently within each interval and joined. A1 for answer in the range 40 to 48 or ft from their cumulative frequency graph

Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
17		0.5	4	M1 for identifying a common denominator in a correct expression or equation eg $\frac{4(x+1)}{12}+\frac{3(2x+5)}{12}$ (= 2) M1 (dep on M1) for expanding both brackets in an equation eg $\frac{4x+4}{12}+\frac{6x+15}{12}$ = 2 eg $4x + 4 + 6x + 15 = 12\times 2$ M1 (dep on M1) for isolating "like terms" on each side of an equation eg $4x + 6x = 24 - 15 - 4$ A1 for 0.5 oe
18 (a)		5.4×10^6	1	B1 cao
(b)		0.00032	1	B1 cao
(c)		6.3×10^{32}	2	M1 for 630×10^{30} oe or figures 63 **with** $\times 10^n$ A1 for 6.3×10^{32} or 6.30×10^{32}
*19	<table><tr><td></td><td>M</td><td>F</td></tr><tr><td>Median</td><td>40</td><td>40</td></tr><tr><td>Range</td><td>90</td><td>106</td></tr><tr><td>IQR</td><td>31</td><td>42</td></tr></table>	Compare: medians and spread	3	C1 for any correct comparison of the medians C1 for any correct comparison of the IQRs or range C1 for a comparison of medians, IQRs or ranges written in context

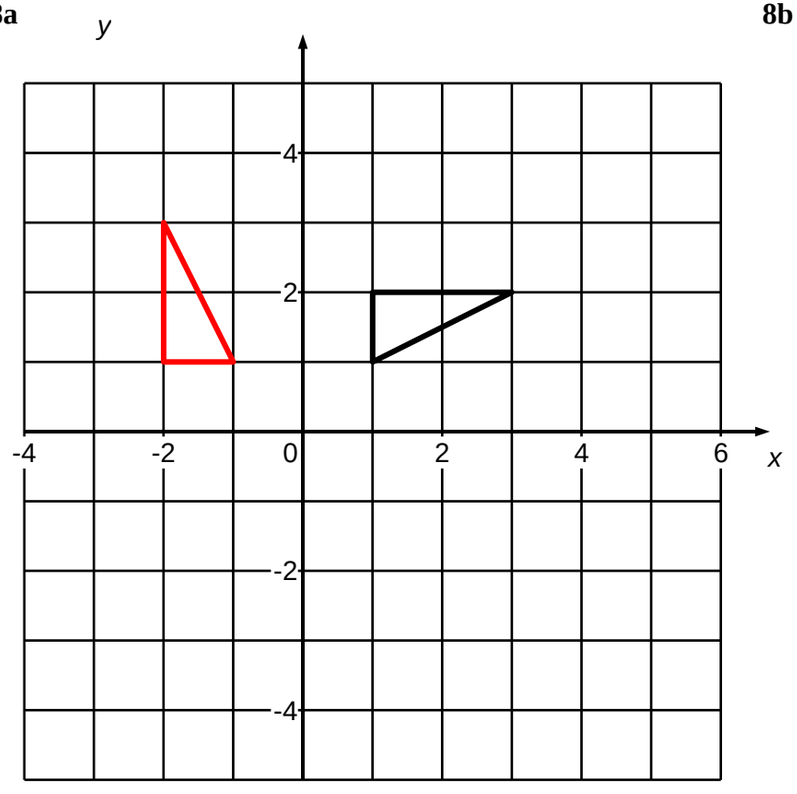
Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
20 (a)		x^6	1	B1 cao
(b)		$(2y + 1)(y - 3)$	2	M1 for $(2y \pm 1)(y \pm 3)$ or $(2y \pm 3)(y \pm 1)$ A1 cao
21		$16\sqrt{2}$	4	M1 for method to expand $(\sqrt{8} + 2)^2$ with at least 3 correct terms out of 4 terms M1 for method to expand $(\sqrt{8} - 2)^2$ with at least 3 correct terms out of 4 terms M1 (dep on M2) for a method to subtract the two expressions and use of $\sqrt{8} = 2\sqrt{2}$ A1 cao OR M1 for factorising $a^2 - b^2 = (a + b)(a - b)$ M1 for substituting for a and b with simplification (at least 1 of the two terms correct) M1 (dep on M2) for multiplying the 2 terms together and use of $\sqrt{8} = 2\sqrt{2}$ A1 cao

Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
*22		155°	5	M1 for a method to find angle *AOD* e.g 90 − 40 (= 50) M1 for a complete method to find angle *BCD* eg 360 − '50' (= 310) and '310' ÷ 2 (= 155) A1 for 155 C2 for complete reasons for their method Angle between tangent and radius = 90 Angle at the centre is twice the angle at the circumference oe Angle sum of a triangle = 180 Sum of angles round a point = 360 (C1 for at least two reasons, one of which must be a circle theorem) OR M1 for a method to find angle *AOD* eg 90 − 40 (= 50) M1 for a complete method to find angle *BCD* eg 50 ÷ 2 (= 25) and 180 − '25' (= 155) A1 for 155 C2 for complete reasons for their method Angle between tangent and radius = 90 Angle at the centre is twice the angle at the circumference oe Opposite angles of a cyclic quadrilateral add up to 180 Angle sum of a triangle = 180 (C1 for at least two reasons, one of which must be a circle theorem)

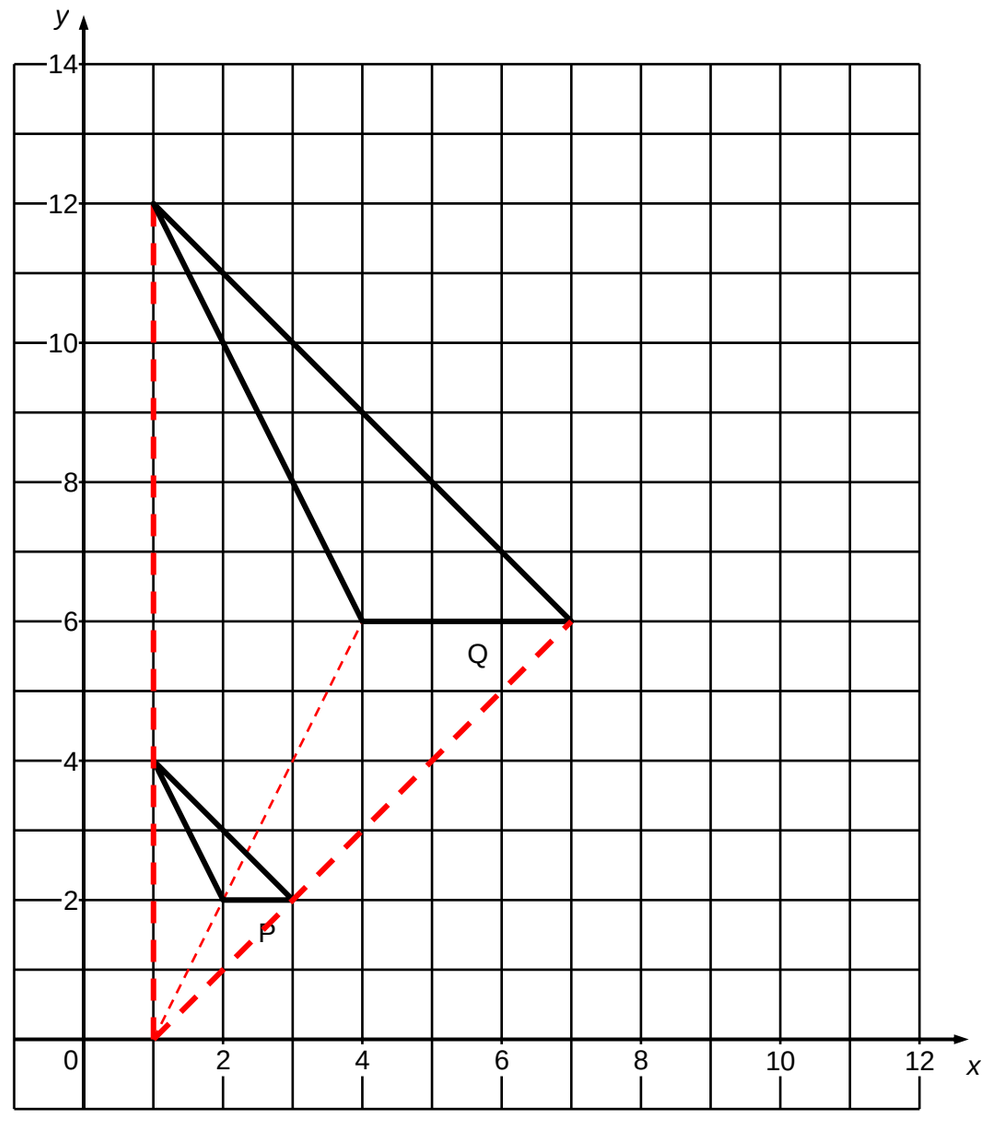
Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
23 (a)		$\frac{42}{110}$	3	M1 for use of 11 and 10 in the denominators M1 for $\frac{7}{11} \times \frac{6}{10}$ oe A1 for $\frac{42}{110}$ oe **SC for replacement**: B1 for $\frac{7}{11} \times \frac{7}{11}$ $(= \frac{49}{121})$
(b)		$\frac{62}{110}$	3	M1 for correct method for GG $\frac{3}{11} \times \frac{2}{10}$ $(= \frac{6}{110})$ M1 (dep) $1 - (BB + GG)$ $= 1 - (\text{“}\frac{42}{110}\text{”} + \text{“}\frac{6}{110}\text{”})$ A1 for $\frac{62}{110}$ oe OR M1 for at least two of $\frac{7}{11} \times \frac{3}{10}$, $\frac{7}{11} \times \frac{1}{10}$, $\frac{3}{11} \times \frac{1}{10}$ oe M1 for a complete method eg $2 \times (\frac{7}{11} \times \frac{3}{10} + \frac{7}{11} \times \frac{1}{10} + \frac{3}{11} \times \frac{1}{10})$ oe A1 for $\frac{62}{110}$ oe **SC for replacement**: B2 for $2 \times (\frac{7}{11} \times \frac{3}{11} + \frac{7}{11} \times \frac{1}{11} + \frac{3}{11} \times \frac{1}{11})$ oe $(= \frac{62}{121})$ or $(\frac{7}{11} \times \frac{4}{11} + \frac{3}{11} \times \frac{8}{11} + \frac{10}{11} \times \frac{1}{11})$ oe $(= \frac{62}{121})$ or $1 - (\text{“}\frac{49}{121}\text{”} + \frac{9}{121} + \frac{1}{121})$ oe $(= \frac{62}{121})$ (B1 for at least two of $\frac{7}{11} \times \frac{3}{11}$, $\frac{7}{11} \times \frac{1}{11}$, $\frac{3}{11} \times \frac{1}{11}$ oe)

Paper: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
24 (a)		3**a** + 3**b**	2	M1 for $\vec{AB} = 6\mathbf{b} - 6\mathbf{a}$ oe or $\vec{BA} = 6\mathbf{a} - 6\mathbf{b}$ oe or $(\vec{OM}) = \frac{1}{2}(6\mathbf{a} + 6\mathbf{b})$ oe A1 cao
*(b)	Method 1 Show that $\vec{AG}$ is parallel to $\vec{AN}$	Shown	4	M1 for a method to find $\vec{OG}$ or $\vec{GM}$ in terms of **a** and **b** eg $\vec{OG} = \frac{2}{3}$ "(3**a** + 3**b**)" (= 2**a** + 2**b**) eg $\vec{GM} = \frac{1}{3}$ "(3**a** + 3**b**)" (= **a** + **b**) M1 for a method to find $\vec{AN}$ in terms of **a** and **b** eg −6**a** + 6**b** ÷ 2 (= 3**b** − 6**a**) M1 for a method to find $\vec{AG}$ in terms of **a** and **b** eg −6**a** + "2**a** + 2**b**" (= 2**b** − 4**a**) C1 for correct simplified expressions in terms of **a** and **b** for $\vec{AG}$ and $\vec{AN}$ followed by conclusion OR
	Method 2 Show that $\vec{AG}$ is parallel to $\vec{GN}$			M1 for a method to find $\vec{OG}$ in terms of **a** and **b** eg $\frac{2}{3}$ "(3**a** + 3**b**)" (= 2**a** + 2**b**) M1 for a method to find $\vec{GN}$ in terms of **a** and **b** eg −"(2**a** + 2**b**)" + 6**b** ÷ 2 (= **b** − 2**a**) M1 for a method to find $\vec{AG}$ in terms of **a** and **b** eg $\frac{1}{2}(6\mathbf{b} - 6\mathbf{a}) - \frac{1}{3}$ "(3**a** + 3**b**)" (=2**b** − 4**a**) C1 for correct simplified expressions in terms of **a** and **b** for $\vec{AG}$ and $\vec{GN}$ followed by conclusion

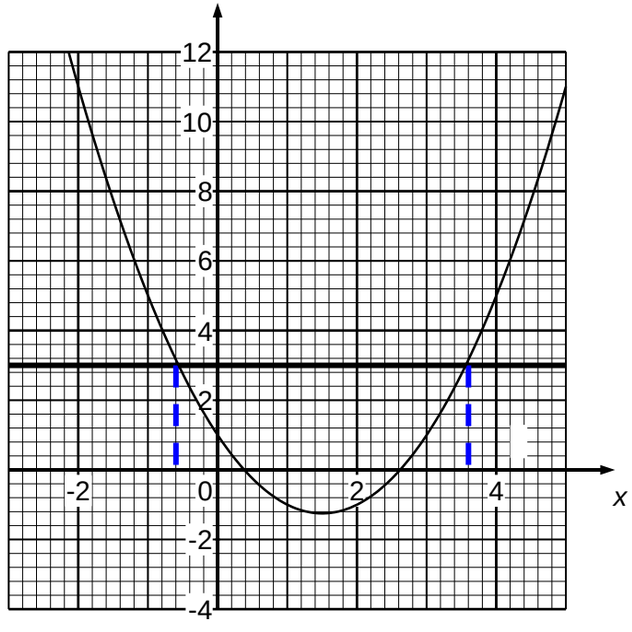
8a



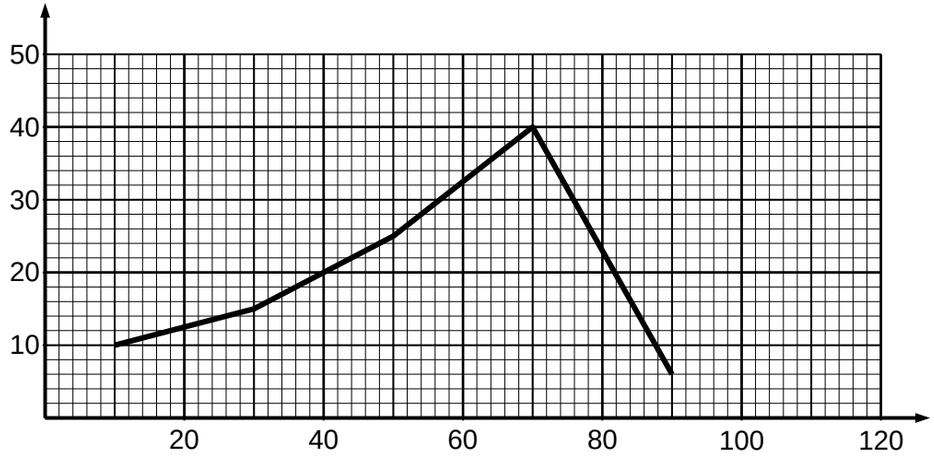
8b



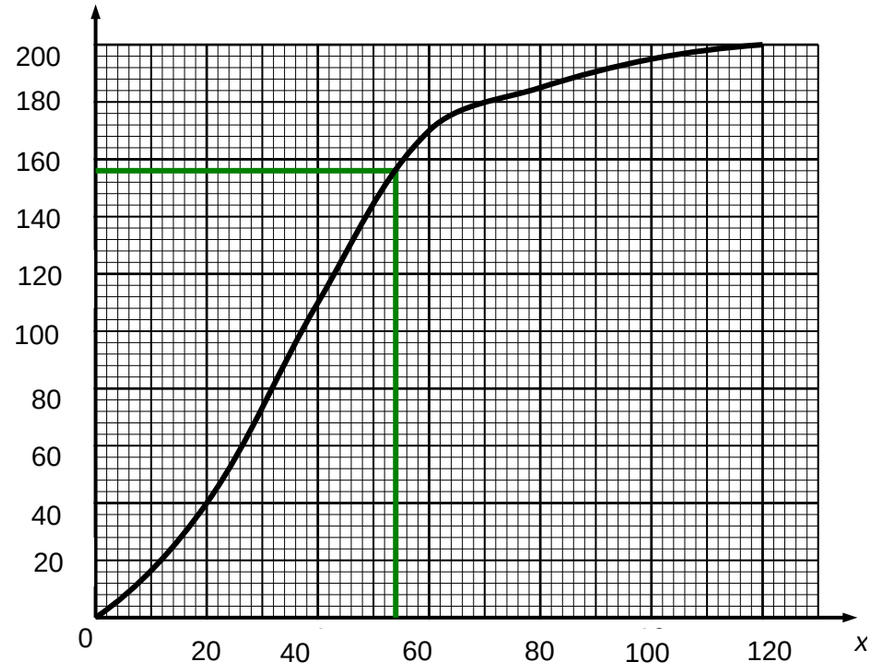
13a



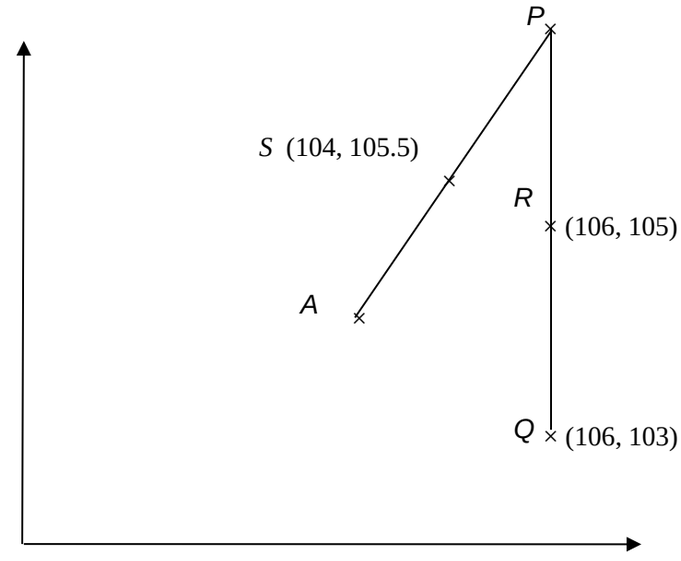
3a



16


200
180
160
140
120
100
80
60
40
20
0
20
40
60
80
100
120
x

11

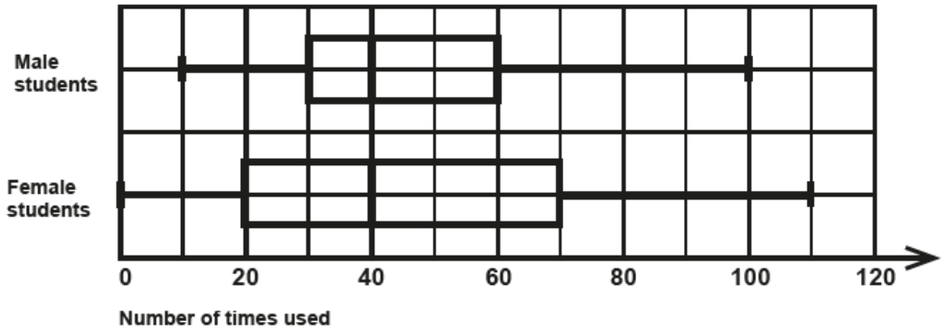

P
S (104, 105.5)
R
(106, 105)
A
Q
(106, 103)

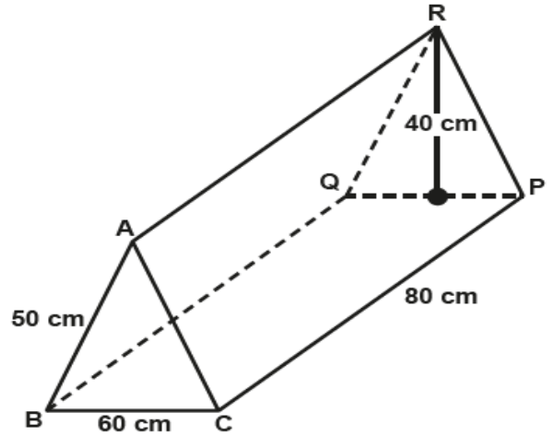
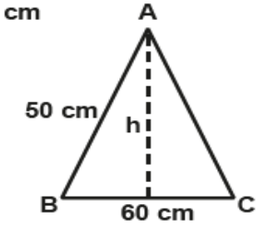
Modifications to the mark scheme for Modified Large Print (MLP) papers.

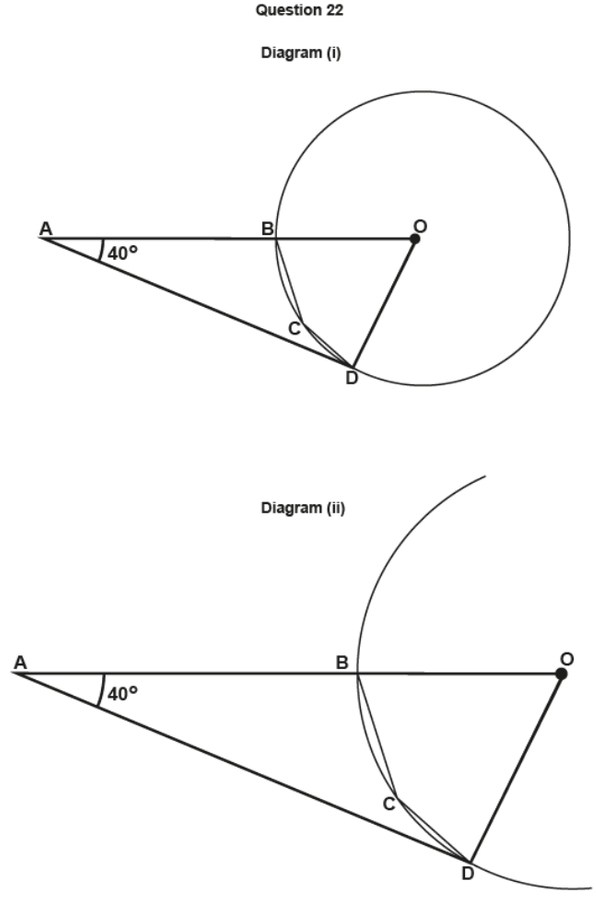
Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5º
Measurements of length: ±5 mm

PAPER: 1MA0_1H			
Question		**Modification**	**Mark scheme notes**
1	(a)	MLP only: *x* changed to *e*.	Standard mark scheme but *x* changed to *e* for MLP
3		Number 6 on the frequency column of the table changed to number 5. Diagram enlarged. Right axis has been labelled. Axes labels have been moved to the left of the horizontal axis and above the vertical axis.	Standard mark scheme
4		MLP only: *x* changed to *y*.	Standard mark scheme but *x* changed to *y* for MLP
5		Diagram enlarged. Angle sizes moved outside of the angle arcs; arcs have been made smaller.	Standard mark scheme
7		See below	
8	(a)	Question reversed. Triangle S has been rotated by anticlockwise 90° at the origin and has been labelled triangle T. Question wording changed to 'It shows triangle S and triangle T given on a grid. Describe fully the single transformation that maps triangle S onto triangle T.' 3 answer lines have been provided. Dotty shading has been used.	New mark scheme: B1 for Rotation B1 for 90° anticlockwise about origin [(0,0)]
8	(b)	Diagram enlarged. Shading has changed to dotty shading. Shapes labelled 'triangle Q' and 'triangle P'. Wording added 'It shows triangle Q and triangle P given on a grid.' Question wording 'shape' changed to 'triangle'. *x* axis cut so it finishes at 10. The grid to the left and below the axis is removed.	Standard mark scheme
12		Model provided for all candidates. Diagram enlarged and also provided for MLP. Arrow heads removed and a dot has been added to the centre.	Standard mark scheme
13		In (a) Table has been turned to vertical format and left aligned. Wording added 'There are three spaces to fill.'. In (b) Diagram enlarged.	Standard mark scheme
15		Diagram enlarged. Arrow removed from 6 cm. Arrow and line for 10 cm now a dashed line.	Standard mark scheme

<table>
<tr><th colspan="3">PAPER: 1MA0_1H</th></tr>
<tr><th colspan="2">Question</th><th>Modification</th><th>Mark scheme notes</th></tr>
<tr><td>16</td><td>(a)</td><td>Numbers on the frequency table changed to: 40, 70, 50, 20, 10, 10.</td><td>(a) award B1 for 40, 110, 160, 180, 190, 200
In (b) standard mark scheme (with the above figures) but apply extended tolerance to the plotting of their points.</td></tr>
<tr><td>16</td><td>(c)</td><td>Diagram enlarged. Right axis has been labelled. Axes labels have been moved to the left of the horizontal axis and above the vertical axis.
On larger print versions the horizontal axis is labelled 0, 20, 40, etc. due to lack of space
The number 54 has been changed to 50.</td><td>For (c): M1 indicates using diagram with a mark of 50 eg draws line from 50 to their cumulative frequency graph, or sght of 160 eg 200 − 160
A1 for 40 or ft on a cumulative frequency graph</td></tr>
<tr><td>17</td><td></td><td>MLP only: x changed to y.</td><td>Standard mark scheme with x replaced with y</td></tr>
<tr><td>19</td><td></td><td>Diagram enlarged. Points on the Male box plot moved to: 10, 30, 40, 60, 100. Points on the Female box plot moved to: 0, 20, 40, 70, 110. Horizontal axis label moved to the left of the axis.

</td><td>Standard mark scheme for the award of marks, but not the different figures they might use as shown below.
<table><tr><td></td><td>Male</td><td>Female</td></tr><tr><td>Median</td><td>40</td><td>40</td></tr><tr><td>Range</td><td>90</td><td>110</td></tr><tr><td>IQR</td><td>30</td><td>50</td></tr></table></td></tr>
<tr><td>22</td><td></td><td>See below</td><td></td></tr>
<tr><td>24</td><td></td><td>Diagram enlarged. Crosses at G and N changed to a solid dots.</td><td>Standard mark scheme.</td></tr>
</table>

PAPER: 1MA0_1H			
Question		**Modification**	**Mark scheme notes**
7		 Cross section of prism h = height 40 cm 	Diagram changed as shown. Model provided for all candidates. Diagram also enlarged and provided for MLP. Cross section of the prism also provided. Key provided for the cross section of the prism. Braille only: will label the cross section R P Q.	Standard mark scheme

2		Diagram enlarged and labelled ‘Diagram (i)’. Angle size moved outside of the angle arc and the arc has been made smaller. An enlarged part of the diagram has also been provided and labelled ‘Diagram (ii)’. Wording added ‘Diagram (ii) shows an enlarged section of part of the diagram.’ 	Standard mark scheme.

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Question 18

This circle theorem problem primarily required the knowledge of only one circle theorem that opposite angles in a cyclic quadrilateral add up to 180° – alongside some of the general geometric properties. It was split into two method marks, one accuracy mark and two communication marks. Most students gained the first mark for using the isosceles triangle to find either *BAD* or *BDA*. The second mark was for using cyclic quadrilaterals to find *BCD* or setting up an equation for *ABC* and *ADC,* also using cyclic quadrilaterals. The accuracy mark was then for the final two steps of method and getting to the correct value for *ADE*.
To gain all communication marks, students had to correctly state the circle theorem as well as one other correct property used. Alongside this, any other reasons stated need not be complete in terms of their wording, but must have been appropriate for the method that the individual used. If the award of both communication marks could not be made then one mark was available for either stating "opposite angles in a cyclic quadrilateral…", or for correctly giving all other reasons appropriate for their method. A common mistake in this question was to use a wrong circle theorem.

Question 22

Fully correct answers to this question were seen only rarely. It was found to be the most challenging question on the paper. Having said that, a significant proportion of students were able to score at least one mark for a successful start by identifying that angle OAB is a right angle or for a correct process to find the radius of the circle. Few students could see how to use the coordinates of P in order to derive an equation by either using the equation of the circle or by using Pythagoras's Theorem. The evidence from students' scripts showed that more students took the former approach, quoting $x^2 + y^2 = r^2$ and then substituting $x = 3p$, $y = p$, $r = 8$ to get an equation in p. Unfortunately, the lack of of use of correct notation, that is a pair of brackets, meant that many students wrote $3p^2 + p^2 = 8^2$ instead of $(3p)^2 + p^2 = 8^2$. These students usually went on to simplify their equation to $4p^2 = 8^2$.

Question 22

Fully correct solutions were very rare indeed. Equal pairs of angles were sometimes identified but often with no reasons given. The most common award of one mark was for showing triangles *AED* and *EBC* to be equilateral with all angles of 60° shown. One mark for BC being common to both triangles was also awarded on a number of occasions.

Summary

Based on their performance on this paper, students should:

- read questions carefully.
- ensure that they know the difference between factors and multiples.
- re-visit the four rules of fractions.
- understand that constructions and scale drawings require accuracy of measurement.
- take care in interpreting the scale on the axes in graphical questions.
- ensure that specific questions posed in problems are answered, eg. “Is Donna correct” requires an answer of “yes” or “no” together with full explanation.

Question 17

Students should be encouraged to mark the angles on the diagram. Many got one mark for identifying the 90˚ angle. It was disappointing to find errors were then made with basic geometry to find the angle *OAB*. Some students found the angle 58˚ at the top of the triangle, but failed to recognise the other triangle was isosceles, or incorrectly tried to apply the alternate segment theorem and made one of the angles in the triangle 32˚, which then led to an incorrect final answer.

Question 7

The last of the common questions found most students being able to gain some credit. A good proportion of students realised that the first step was to use Pythagoras' Theorem to find the missing length of the right-angled triangle. However, to this end there were many students who used Pythagoras' Theorem incorrectly, adding rather than subtracting. The third process mark was available then for any student, even those unable to find the missing length, and it was good to see many examples of good exam technique to access this mark. Stating or using the correct formula for the area of a quadrant was all that was required and it was awarded to many students. The demand in the question asked for students to show all of their working and it was pleasing to see this instruction followed by this cohort.

Question 14

This question was answered well by a significant proportion of students who produced a logically written and accurate solution, accompanied by clear reasons. Just under a half of all students scored some marks for their answers. However, many students either did not attempt the question or used incorrect assumptions or results. Most common among these were assuming that angle *BDE* and angle *BFE* were right angles or that "opposite angles of a cyclic quadrilateral are equal" leading to the belief that angle *DBF* was 100°. There were two possible routes to a correct solution and both were used by a good number of students. Students who scored part marks usually either failed to give adequate reasons for their working or could not complete the last stage in their reasoning to find the size of angle *ABD* successfully. A typical example of this was where a student successfully found the size of angles *DBF* and *BFD* but could not recall or use the alternate segment theorem.

Question15

About a quarter of students provided a clear proof in answer to this question. Sometimes the lack of any indication that values used were recurring decimals spoiled a student's working. Examiners accepted a dot above a 3 (eg $73.\dot{3}$) or dots at the end of a number (eg 73.3…) to signify a recurring decimal. Terminating decimals such as 73.33 were not accepted as part of a proof. A small number of students resorted to a purely numerical approach dividing 11 by 15 to show this gave $0.7\dot{3}$. This approach could not, of course, be given any credit and students are advised to follow the request to "prove algebraically" in similar questions set in the future.

Question 14

To access any marks on this question students had to understand the ratio and be able to use this with a circle theorem to find *BCD* or *BAD*. Unfortunately, many were not able to do this and thus scored no marks. Those who did, typically scored at least two marks as they normally stated the correct circle theorem. As is often the case, many students struggled to apply (or name) the 'alternate segment theorem' and therefore struggled to find the correct value for *SBA*. Some gained the second method mark for using angles in a triangle to find *BDA* or a small number recognised the relationship between *BCD* and *SBD* but this was rare. Very few were able to correctly find the required angle and provide both correct circle theorems.

Question 7

This question was done well by a majority of students who were awarded all 4 marks. Some students found the area of the triangle and/or the area of the quadrant but could not complete the solution to get full marks. It was encouraging to see that nearly all students could recall how to find the area of a circle.

Question 20

This circle theorem question proved to be challenging to many. There were 3 routes through this problem. The most common start was to find *BAD* and then *BCD* before moving into triangle *CDE*. Alternatively, a number of students found *BAD* and then *ABE* using angles in a triangle before finding *ADC*. The third method was to find the reflex *BOD* before moving to *BCD*. All of these methods were seen regularly, and successfully. However, many students struggled with remembering their circle theorems and either thought opposite angles in a cyclic quadrilateral are equal, or incorrectly thought that *OBCD* was a cyclic quadrilateral. Reasons were frequently not accurately stated; correct geometric terms must be used.

Question 18

This question was answered very poorly. Some students scored the first mark for angle *OBC* = 90º which was often marked on the diagram but could then make no further meaningful progress. Many could not even get that far. Some students correctly identified an isosceles triangle, but used arbitrary numerical values, e.g. 45, instead of an algebraic approach. Those with some idea usually found expressions for angles in terms of *x* although other approaches were occasionally seen. Some students labelled angle *OBA* or angle *ABC* as *y* and used the relationship between *x* and *y* to show the required result and a few students marked a point on the circle and formed a triangle with *AB* as the base. Full marks were awarded surprisingly rarely. Some answers were let down by poor algebra but some students who did show correct working leading to the required result then failed to correctly state the one circle theorem that was needed for the final mark. Some gave no reason, others gave a description which did not include the required key words.

Question 4

This is the first AO3 question on the paper and required 3 main processes. The first of which was to find the total area, and there were two marks assigned to this, the first for correctly finding 3 areas and the second for finding all 4. The second process was to find the number of bags of grass seed that is needed. This could be gained for finding this for a single area or a combination. Finally, the candidates had to round the number of bags up to gain the number needed to buy, and multiply by £10.95 to find the total cost.

Almost all candidates were able to gain some marks, even if just for correct areas. This was as often seen for 2 rectangles and the quadrant, as it was for 2 rectangles and the triangle. Most were then able to gain the mark for dividing by 14. The two major causes of errors were learners not having all four areas correct, as this was needed to gain the 3rd mark. The other common error was for candidates to not round the number of bags up to the nearest integer and so found a cost that was inaccurate.

Question 16

The majority of candidates achieved some credit for their answers to this question by showing they could interpret the ratio given or by showing they understood that opposite angles in a cyclic quadrilateral sum to 180°. Many candidates showed they understood the ratio by marking the angles *EAC* and *ACE* as $2x$ and x respectively on the diagram. Examiners also accepted values for the size of these two angles, in the given ratio, to award this mark. Similarly, values for the opposite angles in quadrilateral *ABDE* which added to 180 were accepted as evidence for the use of the result that opposite angles of a cyclic quadrilateral add up to 180. A relatively small proportion of candidates could find a further connection between the angles in the quadrilateral and the angles in the triangle and so score more than 2 marks. Despite the guidance that all working needed to be shown, a number of candidates wrote down 40 as their answer but with a lack of supportive and persuasive working. These candidates could not be given full credit. In particular, examiners were concerned to see some candidates using results incorrectly, for example "angles on a straight line sum to 180°" to state that angles *EAB* and *DBC* sum to 180 or that angles *ABD* and *BDC* were alternate angles.

Question 21

This question was answered very poorly and full marks were awarded far less often than might have been expected. Many students struggled to make a correct first step with relatively few scoring the first mark for a method to find angle *BAD* or angle *OAB* or angle *OBD*. Some of those who did find angle *BAD* = 32º were not able to show a complete method, often incorrectly assuming that angle *ADO* = 32º. Some students marked angle *CDO* as 90º on the diagram but could make no meaningful progress. Misconceptions abounded, it was common to see angle *BAD* = 64º and angle *ADO* = 51º because students misidentified when to use the circle theorem that angles in the same segment are equal. Many students assumed that *AD* is perpendicular to *BO* and worked with right angled triangles and some incorrectly assumed that they were dealing with parallel lines and attempted to use alternate angles. After scoring the first M mark students were often able to correctly state one circle theorem relevant to their method and gain the C mark. This was mainly awarded for the

theorem that the tangent is perpendicular to the radius. Some, however, gave no reason, others gave descriptions which did not include the required key words.

Question 12

This problem-solving question was answered really well, with a good proportion getting 2 or even all 4 marks. Many spotted the need for Pythagoras and typically gained the 2 marks for a full process. There were a number then that used the formula for the circumference incorrectly and used the wrong value of radius or diameter and gained no further credit. Some candidates also calculated area instead of circumference, particularly disappointing given the formula are on the Exam Aid given to candidates for this series. Those who did not spot the need for Pythagoras unfortunately scored no marks unless they applied trigonometry correctly.

Question 14

Just under a half of students scored full marks for their responses to this question. However, many other students were able to gain some marks and the question was a good discriminator between students who could show a good understanding of the cosine rule and those who had little understanding of the application of trigonometry to non right-angled triangles. There were a significant proportion of students who could correctly write down an expression for OB^2 by using the cosine rule but then did not observe the correct order of operations and calculated $9\cos 35°$ instead of $117 - 108\cos 35^\circ$. Students who made a good start to the problem were often able to complete it successfully, but some students used OB^2 rather than OB as the radius when finding the area of the sector. Other errors seen included using $\frac{1}{4}$ rather than $\frac{80}{360}$ when finding the area of the sector and assuming that the radius of the circle was 6 cm.

Question 21

Faced with quite a complex diagram, nearly a half of students achieved some credit for their answers to this question by getting at least one, and often two of the missing angles correct. Angles *ACE* and *ACB* were often found first and examiners were also encouraged to see that a good proportion of students could use the "Angles in the same segment are equal" theorem to state or show on the diagram that angle *CBD* was 35°. Only a small number of these students could accurately quote the theorem to justify their reasoning. A significant number of students stated "alternate segment theorem" but did not state what the theorem is. An error seen commonly in responses from lower attaining students was that of assuming that triangle *CDE* was isosceles, whereas it was in fact right-angled. Students are advised not to jump to conclusions without evidence from the question or diagram to support their assumptions.

Question 22

The final question required students to prove that two tangents from a fixed point are equal in length. Most attempted this using congruency, with varying degrees of success. As it was a proof, it required reasons to be given at each stage, and although a good number knew the facts, they did not give correct, or complete reasons and struggled to gain any credit. It is important again that students practise stating the geometric properties and reasons.
There was an alternative method seen using isosceles triangles, and this too was able to gain credit when complete reasons were given. When this method was used it was common for the marks to be lost for writing only isosceles rather than isosceles triangle.
Alternate segment theorem was also a possible approach and was an efficient method. Other errors include claiming that OP bisected the angle with no justification for this, describing the relationship without actually stating that, e.g. $OA = OB$.

Summary

Based on the performance on this paper, students should:

- Ensure they know how and when to use a calculator efficiently, but not to forget manual methods. Use of brackets and edit function will help with substitution on a calculator.
- Practise articulating their mathematics in verbal discussions to aid them in written responses.
- Use tables and diagrams to extract information from a question so they can better navigate through the problem.
- Know the relationships between volume, area and length scale factors.
- Provide unambiguous explanation whenever required by the question.
- Cross out any work they do not wish the examiners to mark, leaving one clear solution.
- Whenever possible use accurate figures without prematurely rounding or truncating in presenting work.

Question 21

A challenging question, as intended, at the end of the paper. When students were awarded one mark, it was usually for identifying that a side of the smaller hexagon was equal to the radius of the circle or for Perimeter of $PQRSTU = 6r$. Some students arrived at this result by using trigonometry whereas others used their knowledge of equilateral triangles. Students found the work required to gain the second mark much more challenging, with most trying to go down the route of finding the length of half of a side of the larger hexagon with various levels of success. A few students attempted to work the question backwards to appear as though they were finding the correct perimeter for the larger hexagon. This was a question where clear layout was essential. Those students that took care to present their work in a logical way were often successful but where working was muddled, students often lost their way and had marks deducted they might otherwise have gained. Many students had marked deducted because their diagrams were not properly labelled or it was unclear what length they were trying to find an expression for. There was also a tendency to calculate areas instead of perimeters. The students that were able to gain the first two marks, often went on to gain all the marks; scores of 2 and 3 were few and far between. The main reason for a student to score 3 rather than the 4 marks was because they had made a slip within their working, usually dropping an r or for giving a final answer of $3 : \pi : 2\sqrt{3}$ instead of $3 < \pi < 2\sqrt{3}$. It is worth reminding students that in questions in which the answer is given to them in the form of a 'show that' then examiners are expecting to see sufficient working to prove that the result has been derived accurately (and not just stated after only a line or two of either correct or incorrect working).

Summary

Based on their performance on this paper, students are offered the following advice:

- Write down all steps in your working, ensuring work is structured and easy to follow to have access to as many marks as possible. This can partly be done by annotating given diagrams eg labelling sides and angles.
- Check all your working for any errors and to make sure you have not miscopied numbers or algebraic expressions either given in the question or in a previous line of your working. Along with this check that you have answered the question fully eg giving the answer in the required form.
- Practice factorising quadratics, particularly those where $a \neq 1$ or $b = 0$ and check this by expanding the brackets.
- Take care with algebraic notation and ensure that brackets are used when necessary.
- Learn all the necessary formulae eg the formula for the volume of a pyramid, the Sine Rule and the formula for the area of a triangle.
- Only round your answer at the final stage to avoid losing out on the final accuracy mark.
- Be concise when answering questions that require an explanation and don't add in unnecessary calculations that risk the addition of an incorrect statement and the mark(s) being deducted.

Question 17

Most of the learners who earned the first method mark for finding that angle $CAB = 40^\circ$ did so by using the alternate segment theorem. A few found angle $COB = 80^\circ$ and then used the angle at the centre is twice the angle at the circumference to find the size of angle CAB. Many of those who found angle $CAB = 40^\circ$ went on to earn the second method mark for using it to find either angle $OAC = 10^\circ$ or angle $OAB = 30^\circ$. The third method mark could be awarded for angle $OCD = 90^\circ$ which was often marked on the diagram or for angle $OCB = 50^\circ$ and for some learners this was the only mark they got. Complete methods to find angle ACD were quite rare. Some that showed a correct method leading to angle $ACD = 100^\circ$ and earned the three method marks then failed to correctly state the one circle theorem that was needed for the final mark. Some gave no reason, others gave a description which did not include the required key words. Many learners had no idea how to proceed in this question and misconceptions such as angle $OBC = 40^\circ$ and angle $ACD = 90^\circ$ were very common. Learners should ensure that they clearly identify which angles they are working with by marking any found angles on the diagram and by using the correct three letter angle notation.

Question 18

There were two main methods to approach this proof, and we saw a few fully successful attempts. The first method was to prove congruence of triangles AOB and COB, using SSS, and therefore prove that angles CBO and ABO are equal. Or they could extend BO to a point on the circumference, D, forming a diameter. This allowed proof on congruence of triangles ABD and CBD using RHS. In either case we rarely saw more than one mark being awarded for stating a single pair of equal sides.
The second approach was longer, and even less successful. This method used a series of isosceles triangles and matching base angles. First recognising ABC is an isosceles triangle and so BAC and ACB are equal. The next step was to recognise AOC as isosceles due to the two radii and therefore OCA and OAC are equal. Next, learners had to use these two found angles to show that OCB and OAB are equal. The final step being to recognise that AOB and COB are isosceles and as OCA and OAC are equal then so are OBC and OBA. Much like the first method, it was rare to see more than a single mark awarded.

Question 11

Responses on this question showed quite a lot of confusion between area and perimeter as it was not uncommon for learners to equate the area of the sector to 34.3 or even 24.9. Of the learners that were most successful in answering this question, most started with a complete equation.

Question 20

Many responses demonstrated a good understanding of circle theorems. The diagram was used effectively, with angles such as 160° and 100° often placed correctly on the diagram rather than written in the answer space. It was more common for responses to correctly identify angle *BOD* than angle *BCD*, partly due to some interpreting *DOBC* instead of *ABCD* as a cyclic quadrilateral, which led to incorrect calculations such as angle *DCB* being given as 20°. Some responses applied the theorem that the angle at the centre is twice the angle at the circumference but used the reflex angle *DOB* instead of the obtuse angle, resulting in errors. A number of responses divided the quadrilateral *DOBC* into an isosceles triangle, with varying success, some calculated missing angles accurately, while others made incorrect assumptions.

Where full marks were not achieved, the correct theorems were often applied, but explanations lacked precision or key terminology. Centres may wish to reinforce the importance of using accurate mathematical language in justifications. Abbreviations such as “opp” for opposite or “circ” for circumference should be avoided. In particular, terms like “circumference” should be used instead of “perimeter” or “edge of the circle,” and “centre” should be preferred over “origin” or “middle of the circle.”

Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2022

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)
Higher (Calculator) Paper 3H

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GCSE Mathematics (1MA1/3H)
Principal Examiner Feedback – Higher Paper 3

Introduction

The time allowed for the examination appears to have been sufficient for most students to complete this paper. The great majority of students seemed well suited to entry at the higher tier.

Most students entered for this examination presented their working in a clear and logical way. This helped examiners to award any credit due where final answers were not correct. Only a very small proportion of low attaining students presented weak scripts. Questions where working was often not so well organized included question 7 (algebraic expression for an area) and question 13 (manipulation of column vectors).

The paper gave the opportunity for students of all abilities to demonstrate positive achievement. All questions were accessible to some students but, as you would expect, there were relatively few students able to work confidently on all questions. In particular, questions 1 (Pythagoras' rule), 2 (formulae), 3 (ratio), 4 (best buy) and 11 (product rule for counting) were answered well by a large majority of students whereas questions, 10 (reverse percentage), 13 (column vectors), 14(a) (factorisation) and 15 (circle theorems) proved more of a challenge to the students in the attainment range they were aimed at.

REPORT ON INDIVIDUAL QUESTIONS

Question 1

This question provided a good start to the paper. Most students gained the full 2 marks. However, a significant number of students did not apply Pythagoras' rule correctly and instead added 4^2 and 8.5^2. These students could not be awarded any marks. It was surprising to see many students forget to take a square root and give the answer 56.25. A brief recap of the diagram might have alerted some students to there being an error in their working. In a small number of cases, trigonometry was attempted but the method was often incomplete and so no marks could be awarded.

Question 2

There was a disappointing proportion of fully correct answers to part (a) of this question. It has to be said that there was a great deal of sloppiness in students' notation when making the substitution and far too many students failed to write the −3 in brackets. They very often wrote $4 \times -3^2 - 11$, with most of these students then going on to use their calculators with little understanding of how to deal with the square of –3. This resulted in many answers of −47 instead of the correct 25. Students are advised to put brackets round any negative numbers when working with algebraic expressions

involving substitution both when writing down their working and when inputting any expression into their calculator.
Part (b) of the question was done quite well. Students usually changed the subject by subtracting 4 from both sides first and then dividing by 3. Only a small minority of students divided by 3 as their first step. Students who did do this often forgot to divide the 4 by 3. Students are reminded that they should give a complete answer on the answer line, including the "$p =$". A number of students just wrote "$\frac{d-4}{3}$" on the answer line.

Question 3

A majority of students scored full marks on this question. Many students in this higher tier paper used an algebraic approach, formulating and solving an equation, then using the solution to find a ratio and the value of p. Students usually worked accurately, but there were a number of students who wrote down a correct equation but collected terms in x to get $4x$ instead of the correct $5x$. Other students, having got the correct equation, $5x - 6 = 54$, then made an error in the first step to solve it, writing $5x = 48$.

A significant proportion of students adopted a purely numerical approach, finding, by trial and improvement, three numbers which satisfied the criteria given in the question, then using them to form a ratio. Some students found the number of counters for Rick and for Tony but did not form a ratio. There were also some other students who did form a ratio but did not write it in the ratio $1 : p$.

Question 4

A good discriminator between lower attaining students, this question attracted many fully correct solutions. Despite there being a number of possible routes that students could take, there were also many incorrect or incomplete solutions. The most common approach was to find the cost of 15 rolls of wallpaper at each of the shops, though credit was given for comparing any number of rolls, for example 1 roll or 5 rolls. A high proportion of students compared £180 with £184.80 and reached a correct conclusion to score all 4 marks. However, some students worked out the discount and took that to be the cost of the wallpaper at Style Papers.

A common error seen was, for students who did not appear to have access to a calculator, to use a build-up method to find 12%, for example by writing down 10%, 1% and 1%. Students who did this often made an error with the arithmetic and lost marks because they did not show the calculation, for example the addition of the three percentages or how they worked out the 10% or 1%. Students are reminded that when showing their calculation of a percentage, they should show a full method, so for example instead of writing 12% of £70 = £8.40, they should write $\frac{12}{100} \times 70 = 8.40$ or $0.12 \times 70 = 8.40$. This is so that in the event of an incorrect answer, marks for a correct method can be awarded.

Question 5

This question was quite well answered and descriptions of the mistakes made when the frequency polygon was drawn were generally clearly described. There were two mistakes to identify and students needed to describe them both to score the full 2 marks. Examiners were surprised that more students gained the mark for stating that the point plotted at (50, 5) should have been plotted at (45, 5) than gained the mark for stating that 40 had been omitted from the scale on the frequency axis. Any statement equivalent to one of these, and which was unambiguously stated, earned a mark. The most commonly seen unacceptable statements included not joining the polygon to (0, 0) and not joining the ends of the polygon.

Question 6

The majority of students made a good attempt at this problem on distance, time and average speed. Many students produced a concise, accurate and complete solution. Lower attaining students sometimes lost accuracy in their working because they used 0.6, 0.66 or another decimal approximation when coverting 40 minutes to hours. These students were still able to be given 3 of the 4 marks available if they had used and shown correct processes in their solutions. A significant number of students appeared to ignore the units in the question and were very fortunate to get a correct answer because the nature of the problem depended on the ratio of the times taken, rather than the times themselves. Of those students who answered the question incorrectly, many did so because they did not know the formula and divided the speed by the time, instead of multiplying them.

Question 7

This question was a good discrminator. There were a number of routes which could be followed in order to show the given result. The most popular method was to use the formula for the area of the trapezium *QUVR*. Once a student had found the length of *QU* (= $x + 5$), they could make substitutions into the formula then simplify it to show $A = 2x^2 + 20x$. Many students found this to be quite straightforward.

A second commonly seen and generally successful method was to use
Area of trapezium *QUVR* = Area of rectangle *TUVS* − Area of trapezium *TQRS*.
Perhaps the most straightforward way was to find the area of the rectangle with length and width $4x$ and 5 then add the area of a triangle of base x and height $4x$. It was surprising how few students took this approach.

The presentation of students answers was often not very clear with examiners having to search the working space for relevant working. However, many students did use algebra in a confident way to show the given result. The absence of brackets to make working clear sometimes led to a student losing marks but examiners were sympathetic where intentions were clear.

Question 8

Many students found this question to be straightforward. They often used a triangle where readings were easy to take and gave a value for the gradient of the graph within the accepted range, more often than not 0.14. For some other students who drew a small triangle on the line getting an accurate answer was less likely. However, if the value given for the gradient was outside the range 0.135 to 0.145, examiners awarded both marks in part (a) provided a correct method was clearly shown. A small number of students used "increase in x ÷ increase in y" or counted squares rather than using the scales on the axes. These students could not be credited with any marks in part (a).

Part (b) was answered less well and many incorrect or ambiguous statements were seen. An answer equivalent to "cost per unit of electricity" was expected but many students merely described what the graph, not the gradient, showed and statements such as "cost of how many units used" were often seen.

Question 9

Just over a quarter of all students completed part (a) of this question successfully to gain all 3 marks. A commonly seen final answer was 10^{120}. This could only score 1 mark. However, about two thirds of all students got as far as simplifying the expression to $\sqrt{10^{120}}$. Some of these students left this as their answer while other students went on to evaluate it incorrectly.

Answers to part (b) were often marred by a lack of clarity. Answers such as "Liam should have multiplied the numbers inside and outside the brackets" were commonplace but could not usually be rewarded with the mark available. Another common incorrect response was for a student to state that the 12 should be squared. More successful responses usually referred to the answer Liam should get, that is 12^{100} or that Liam should have multiplied 50 and 2, not worked out 50^2.

Question 10

This question was not well done. Too many students showed the misunderstanding that, to reverse a 10% decrease, they had to increase the value of the car by 10%, so they multiplied by 1.1 rather than using the correct method of dividing by 0.9. It was relatively unusual to award 1 or 2 marks for responses. Students usually either showed a good understanding or no understanding of the processes required to solve the problem.

Question 11

This question was generally well answered with most students scoring the full 2 marks. Where examiners saw errors, most either involved adding 16, 5 and 3 instead of multiplying, or multiplying the 16, 5 and 3 but then adjusting their answer by, for

example dividing by 3 or dividing by 2, as they mistakenly believed that the 240 included repeats. This latter approach was given some credit for the 16 × 5 × 3.

Question 12

In answering this question, most students showed a good understanding of how to apply trigonometrical ratios to this 2 stage problem. However, a significant proportion of them made errors in manipulating the ratio used in the second stage of the problem.

It was envisaged that students would use the trigonometry of right angled triangles to solve this problem and most did. However, a large number of students used the sine rule to get their answer. Examiners were surprised how few students realised that triangle *ACD* was isosceles and so they were not able to write down the length of AC without further calculation. However, they usually used tan 45 = $\frac{AC}{8}$ correctly to get 8 cm for the length of *AC*. Most students were then able to write down a relationship which would enable them to find the length of *AB*, and this was awarded some credit. However, too many of these students did not rearrange their equation correctly and instead of getting *AB* = $\frac{8}{\sin 20}$, wrote down *AB* = 8 × sin20, leading to an incorrect answer.

Question 13

This question was successfully answered by just under a half of all students who took this paper. Nearly all students scored a mark for finding 3**a** as a column vector. However, students often failed to write their responses in a clear, logical manner. Few students manipulated the equation to get $-2\mathbf{b} = \begin{pmatrix} 8 \\ 17 \end{pmatrix} - 3\mathbf{a}$ or $2\mathbf{b} = 3\mathbf{a} - \begin{pmatrix} 8 \\ 17 \end{pmatrix}$ before substituting for **a**. This might have led to a clearer approach and the avoidance of errors with signs. As it was, examiners were often left not knowing whether the student was trying to find the value of −2**b** or 2**b** with a consequent loss of marks for those students who did not get a fully correct final answer. Students who got one correct component of **b** were given the benefit of the doubt and rewarded with two of the three marks available.

Question 14

A minority of students scored full marks for their responses to this question. However, most students were able to gain some marks and the question was a good discriminator between students who could manipulate algebraic expressions with accuracy and those who made, sometimes unnecessary, errors.

A fully factorised expression was asked for in answering part (a) of this question. It was disappointing to see so few students factorise the expression fully and it was much more usual for students to gain just one of the two marks available for getting as far as, for example, $4(p^2 - 9)$ or $(2p - 6)(2p + 6)$.

Students usually scored well in part (b) which required the expansion of a product of three linear expressions to give a fully simplified cubic expression. Students generally showed their working in an organized way or used a grid to show terms in their products. Errors were usually restricted to incorrect terms or difficulties in dealing with the signs when collecting terms together, rather than a flawed strategy although some students omitted terms from their expansion. For students who did not give a fully correct answer, it was commonplace for them to earn 2 or 3 of the available marks in part (b).

Question15

There were some excellent complete, concise and clear proofs to this question involving the application of circle theorems. However, these were only seen in a minority of cases and students need to be aware of the need to state results clearly using the statements indicated on the mark scheme as guidance. There were many students who could not give reasons or who gave them with a lack of clarity. These students often gained some credit for matching up at least two pairs of equal angles. A clear indication of this on the diagram was accepted by examiners.

Of students who completed the proof successfully, most used statements of the same segment theorem together with a pair of vertically opposite angles. Students should note it was not enough to state "same segment theorem" – they needed to say what the theorem states, for example "angles in the same segment are equal". Some students used the result that angles in a triangle sum to 180° as a reason to support the equality of their third pair of angles. This was, of course, acceptable. A small number of students used the result that the angle at the centre of a circle is twice the angle at the circumference to show that angle PQX = angle PRS and that angle QPR = angle QSR, another acceptable approach.

About one in ten students obtained full marks for their proof.

Question 16

This question discriminated well between more able students sitting this paper with many students being awarded each of the 0, 1, 2 or 3 marks available. Some students did not attempt the question and many lower attaining students restricted their answer to working out the value of p by substituting $e = 6.8$ and $f = 0.05$. This gained no credit. Of those students who did score marks, many of them scored just one mark for writing down at least one of the bounds for e or f. Students who substituted bounds for e and f into the expression for p were split between those who calculated
$2[\text{UB of } e] \div [\text{LB of } f]$, the correct expression and those who calculated
$2[\text{UB of } e] \div [\text{UB of } f]$. Some students who had the correct fraction, failed to take the square root or made an error in taking the square root and so lost the final accuracy mark.

There was a significant number of students who calculated [UB of $2e$] ÷ [LB of f], that is $\frac{13.65}{0.045}$ instead of $\frac{13.7}{0.045}$. These students could not be awarded full marks even though their final answer worked out to be in the range 17.4 to 17.5

Question 17

In part (a) of this question, lower attaining students often drew a bar chart and did not recognise the need to find and use frequency densities. Some students used the midpoints of the class intervals erroneously together with the frequencies to get values which they then used to draw a diagram. Having said that, there was a good proportion of students who did successfully calculate frequency densities and use these to draw a histogram. It was interesting to note that a significant number of students drew the first four bars correctly but then made an error drawing the bar representing the interval $3.0 < d \leq 5.0$

Part (b) of the question was less well done with only a small proportion of students able to use the ratio of the areas of the two bars concerned to find a correct expression. Examiners did award one mark to a significant number of students who showed that they needed to compare the heights, widths and areas of the two bars concerned.

Question 18

It is encouraging to report that the majority of students gained some credit for their attempt at this question. The length of *TC* was often found successfully and a good proportion of students were also able to find the length of at least one of *SD* and *TD*. Only the higher attaining students were able to identify the angle which was required and put everything together in order to find the size of this angle, that is the size of angle *DTS*. Errors commonly seen included, substituting 12 and 14 incorrectly into the formula for the area of the cross section and making an error in the use of Pythagoras' rule to find the length of *DT*.

Question 19

Fully correct answers to this question were seen infrequently. However, a significant proportion of students taking this paper were able to score at least one mark for using a correct common denominator and writing at least one of the three terms with that common denominator, usually the first fraction as $\frac{3x(x-2)}{x^2-4}$. Only the best students were able to work accurately in order to gain more credit for their responses. The question discriminated well between high ability students aiming to get one of the two top grades. For many students, this question proved to be the most challenging question on the paper. In particular mistakes were often made with signs when the fraction $\frac{(x+2)(2x+1)}{x^2-4}$ was subtracted from the fraction $\frac{3x(x-2)}{x^2-4}$ or in writing $-(x^2 - 4)$ as $-x^2 - 4$.

Question 20

Though a significant number of students did not attempt this question, many of those students who did attempt it scored full marks for a complete and correct solution. The most common error seen was for students to write down a correct equation, $29\,600 = 24\,000a + 800$ but then make an error in solving the equation. It was not unusual for students to divide 29600 by 24800 as a first step, then subtract 800. Some students who found a correct value for "a" went on to use the iterative relationship correctly but only went as far as finding the profit made by the shop in the year 2020.

Question 21

Higher attaining students usually made a good start on this question on probability and identified the non-replacement nature of this problem. They usually presented at least one correct product of three fractions with denominators 9, 8 and 7 respectively. Only a small proportion of students gave all four possible ways of getting an even sum with the resultant correct answer, $\frac{11}{21}$. Students who drew a tree diagram were generally more successful at finding all 4 correct combinations.

Very few students approached the problem by finding the probability that the result was an odd number then subtracted from 1. Those students who did do this were rewarded appropriately.

Question 22

This question was accessible to and discriminated well between the most high attaining students sitting this paper. These students often gave a complete and fully correct solution and scored full marks. They usually used the approach of eliminating y to get an equation in x. This was more straightforward to deal with than the corresponding equation in y. The most common errors made by students included expanding $(2x - 5)^2$ incorrectly, often as $4x^2 + 25$, and making errors when re-arranging their quadratic equation to get all terms on one side of the equation. Some students who did get the correct quadratic equation to solve, made errors when trying to factorise and so restricted themselves to the award of 2 marks.

Summary

Based on their performance on this paper, students are offered the following advice:

- make sure you put negative numbers in brackets when substituting them into algebraic expressions or when using a calculator.
- check all your working for careless errors and to make sure you have not miscopied numbers or algebraic expressions either given in the question or in a previous line of your working.
- practise the addition and subtraction of algebraic fractions.
- check your working when expanding brackets and collecting terms, especially when finding the product of three linear expressions or when removing brackets after a subtraction of one expression from another.
- ensure you have a good understanding of how to use multipliers in problems concerning reverse percentages.
- practise drawing histograms and using them to solve problems.

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