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GCSE MATHS

Geometry and measures

Edexcel 1MA1 | Subtopic collection Topic 47

Congruence and geometric proof

Higher tier

Answers and examiner comments

16	2003-2024	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 14

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

Original question 16

The full source mark scheme begins on page 38. Use the original paper code, tier and question number shown above.

Original question 15

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

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 $\frac{13}{2}$)

Question		Working	Answer	Mark	Notes
22		*AM* = *MC* (given *M* is midpoint) *AL* = *LB* (given *L* is midpoint) *LB* = *MN* (opp sides of a parallogram) So *AL* = *MN* *BN* = *NC* (given *N* is midpoint) *BN* = *LM* (opp sides of a parallogram) So *LM* = *NC* triangles are congruent SSS OR *AM* = *MC* (given *M* is midpoint) Angle *ALM* = angle *ABN* = angle *MNC* (corresponding angles) Angle *AML* = angle *MCN* (corresponding angles) triangles are congruent ASA OR Angles CNM = Angles NML (alternate angles) Angle NML = Angle MLA (alternate angles) Therefore Angle MLA = Angle CNM [Then lines 2 to 7 of the first method] triangles are congruent SAS	Proof	3	M1 for either *AM* = *MC* or *AL* = *LB* or *BN* = *NC* M1 for either *LB* = *MN* or *BN* = *LM* A1 for conclusion of congruency (eg SSS) with all three sides shown as equal OR M1 for *AM* = *MC* M1 for either Angle *ALM* = angle *MNC* or Angle *AML* = angle *MCN* or Angle *MAL* = angle *CMN* A1 for conclusion of congruency (eg ASA) with two angles and one side shown to be equal OR M1 for either Angle MLA = Angle CNM or AL = LB or BN = NC M1 for either LB = MN or BN = LM A1 for conclusion of congruency (e.g. SAS) with two sides and one angle shown to be equal SC : Include appropriate pair of sides (eg. LM = NC) with justification of mid-point rule in any of above

1380_4H

Original question 22

The full source mark scheme begins on page 89. Use the original paper code, tier and question number shown above.

Original question 28

The full source mark scheme begins on page 104. Use the original paper code, tier and question number shown above.

13			48	5	M1 for 8 – 2 (= 6) M1 (indep) for $x^2 + 8^2$ (provided $x \leq 8$) M1 (dep on previous M1) fo $\sqrt{"x"^2 + 8^2}$ or $\sqrt{"100"}$ M1 (dep on M2) for 4 × 2 + 4 × "10" A1 cao

PAPER: 1MA0_1H

Question	Working	Answer	Mark	Notes
21			C1	states (angle) ABC = (angle) BCD
			C1	states 2nd link $AB = CD$
			C1	states 3rd link with reason: $BC = BC$ (common)
			C1	concludes proof by stating (triangle) $ABC \equiv$ (triangle) DCB with reason SAS and $AC = BD$

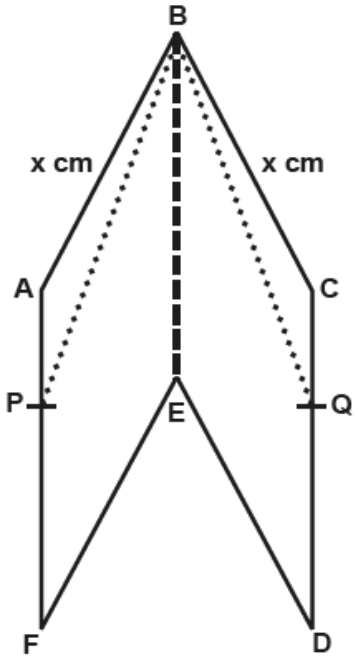
22	cos PBQ= $\frac{10^2+10^2-x^2(2-\sqrt{3})}{200}$ $= \frac{200-x^2(2-\sqrt{3})}{200}$	Proof	B1 M1 M1 M1 A1	(indep) for stating $\cos 30 = \frac{\sqrt{3}}{2}$ for $PQ^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos PBQ$ **or** $AC^2 = x^2 + x^2 - 2 \times x \times x \times \cos 30$ $(=x^2(2-\sqrt{3}))$ oe for $\cos PBQ = \frac{10^2+10^2-PQ^2}{2\times10\times10}$ (implies previous M1) for $\cos PBQ = \frac{10^2+10^2-(x^2+x^2-2\times x\times x\times\cos 30)}{2\times10\times10}$ conclusion of proof with all working seen

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.

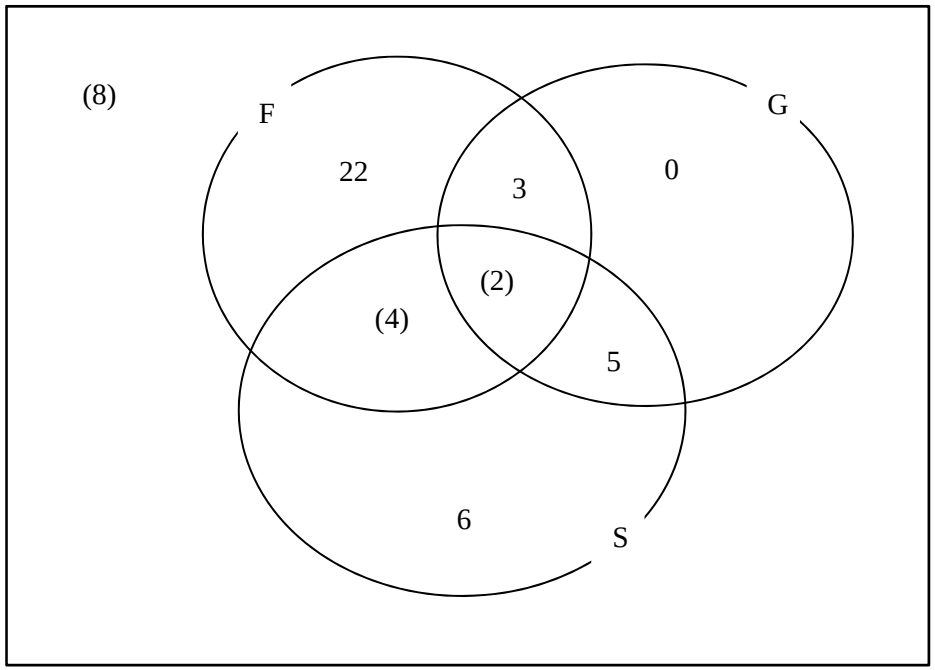
The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
1		Diagram enlarged. Right axis has been labelled. Crosses have been changed to solid circles.	Standard mark scheme but in (c) accept 12 to 14
4		Diagram enlarged. Arrows removed. Dashed lines at the top and left of the square extended. Dashes made longer and thicker.	Standard mark scheme
5		Diagram enlarged. Left hand side and top of shape labelled as well. Wording added 'The marked angles are right angles.' Braille only: will add labels *A B C D* etc. and information about the diagrams.	Standard mark scheme
10		*x* has been changed to *y*	Standard mark scheme with *x* replaced by *y*
11		Diagram enlarged.	Standard mark scheme if on 2mm grid, otherwise apply greater tolerance.
13		Table turned to vertical format.	Standard mark scheme
15		Only changes are to the formula box for a cone: diagram enlarged, dashes made longer and thicker, arrow heads changed to open headed arrows.	Standard mark scheme
18		Diagram enlarged. Dashed line added from *B* to *D*	Standard mark scheme
19		Diagram enlarged. Diagonal line added from *A* to *C* and *X* has been marked on the line as the midpoint.	Standard mark scheme
21		Diagram enlarged. Angle arcs made smaller.	Standard mark scheme

Question		Modification	Mark scheme notes
22		Diagram enlarged. Labels '*x* cm' added to the left and right side of the diagram. Dotted lines added between *B P* and *B Q*.  	Standard mark scheme

Question	Answer	Mark	Mark scheme	Additional guidance
21 (a)	Proof	C1	for starting the proof, identifying a pair of relevant equal sides or angles with reasons from $AD = BC$ (opposite sides of a parallelogram are equal) angle PAD = angle QCB (opposite angles of a parallelogram are equal) angle ADP = angle CBQ (given or both 90^o)	
		C1	(dep C1) for complete identification of all three equal aspects with reasons	
		C1	(dep C2) for conclusion of congruency proof	Congruency conclusion must include a reference to ASA
(b)	Explanation	C1	for identifying a pair of equal sides or angles in $APCQ$, with reason, eg $AP = QC$ since triangle ADP is congruent to triangle CBQ	
		C1	(dep C1) for reasoning that $APCQ$ is a parallelogram so opposite sides of a parallelogram are parallel	

Q20

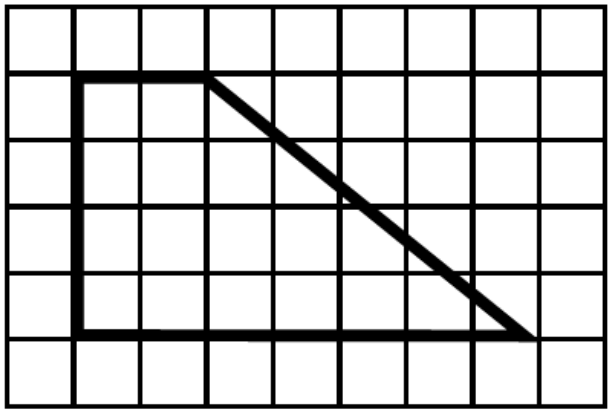


Modifications to the mark scheme for Modified Large Print (MLP) papers.

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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**
1		Diagram enlarged. Axes labels moved to the left of the horizontal axis and above the vertical axis. Crosses changed to solid dots. Right axis has been labelled.	Standard mark scheme

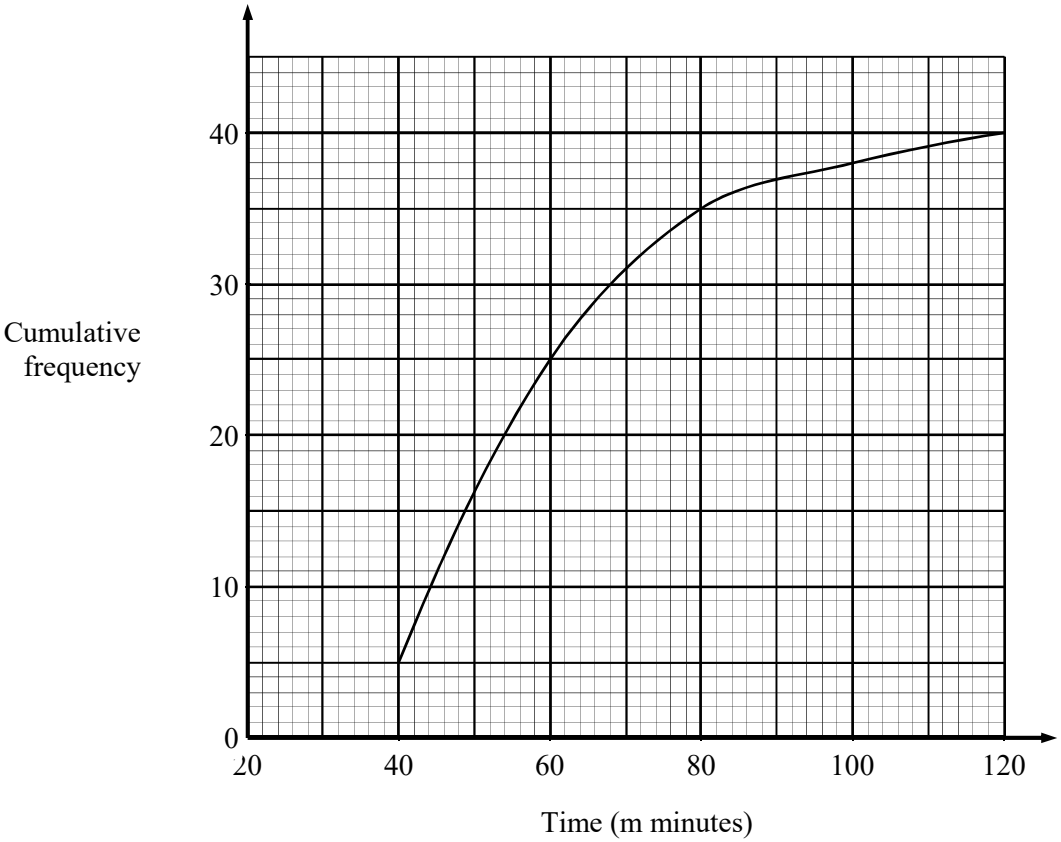
Paper: 1MA1/3H			
Question		**Modification**	**Mark scheme notes**
3		Shape changed but the area is still the same. Wording changed to 'Look at the diagram for Question 21 in the Diagram Book. It shows a trapezium drawn on a grid of squares. Each square on the grid represents a 1 cm square. A triangle is going to be drawn that is equal in area to the trapezium. Write down the length of the base and the vertical height of a triangle that is equal in area to the trapezium.' Two answer lines have been provided. Each square on the grid represents a 1 cm square. 	M1 for a method to find area of trapezium, eg. $\frac{1}{2}(2+7)\times 4$ (=18) or $(2\times 4)+(0.5\times 5\times 4)$ or $8+10$ (=18) or for two answers that would give a triangle of area ft their area of trapezium (if not 18) or for two answers that would give a triangle of area 36 A1 for two answers given that would give a triangle of area 18, eg. base = 6, height = 6 or base = 9, height = 4 oe NB: answers need not be whole numbers.
4		Diagram enlarged. Wording added 'It shows a probability tree diagram	Standard mark scheme

Paper: 1MA1/3H			
Question		**Modification**	**Mark scheme notes**
5		Diagram enlarged. Wording added 'AB = 11cm CB = 7cm Angle ACB is a right angle. Angle ABC is marked.'	Standard mark scheme
6		Table has been turned to vertical format. Order of the table changed round so it reads: blue, yellow, red and white.	Standard mark scheme
8		Diagram enlarged. Angles moved outside of the angle arcs, with smaller arcs. Wording added 'Angle EAB = 125° Angle AED = 115° Angle EDC is a right angle.'	Standard mark scheme
10		Pictures removed. Wording changed to 'There are three lamps, lamp A, lamp B and lamp C.'	Standard mark scheme
12		Diagram enlarged. Right axis has been labelled. Axes labels moved to the left of the horizontal axis and above the vertical axis.	Standard mark scheme
13		Pictures removed. Wording added 'shape A and shape B.'	Standard mark scheme
15		Diagram enlarged. Right axis has been labelled. Axes labels moved to the left of the horizontal axis and above the vertical axis.	Standard mark scheme, but apply MLP tolerances when reading figures from the graph (extra tolerance needed).
17		Diagram enlarged. Angles moved outside of the angle arcs, and the arcs have been made smaller. Wording added 'The diagram shows a shape labelled ABCD. AB = 11.4 cm, CD = 12.5 cm, Angle ABD = 86°, Angle DBC = 109°, Angle BCD = 34°.'	Standard mark scheme

Paper: 1MA1/3H			
Question		**Modification**	**Mark scheme notes**
19		Diagrams enlarged. Angles moved outside of the angle arcs, and the arcs have been made smaller. Braille will label the triangles and add information about the measurements of the triangles.	Standard mark scheme
21		Diagram enlarged. Arrows made longer. Wording added 'ABP and QDC are straight lines and parallel.', 'AD is parallel to BC.'	Standard mark scheme

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

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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

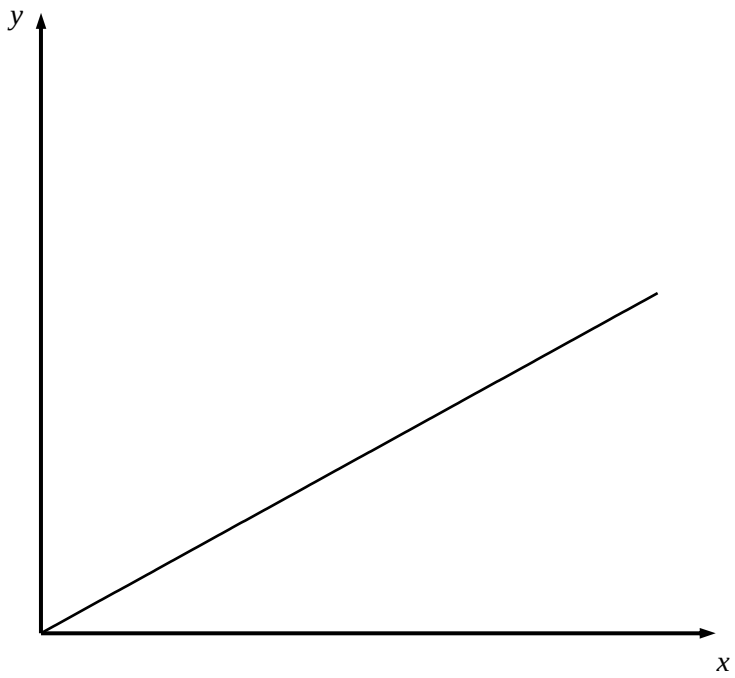
10		Table left aligned. Diagram enlarged. Right axis labelled. Axes labels moved to the left of the horizontal axis and above the vertical axis. Frequency table: $20 < m \leq 40$ 5 $20 < m \leq 60$ 10 $20 < m \leq 80$ 25 $20 < m \leq 100$ 35 $20 < m \leq 120$ 40	Part (a) Standard mark scheme but plots 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

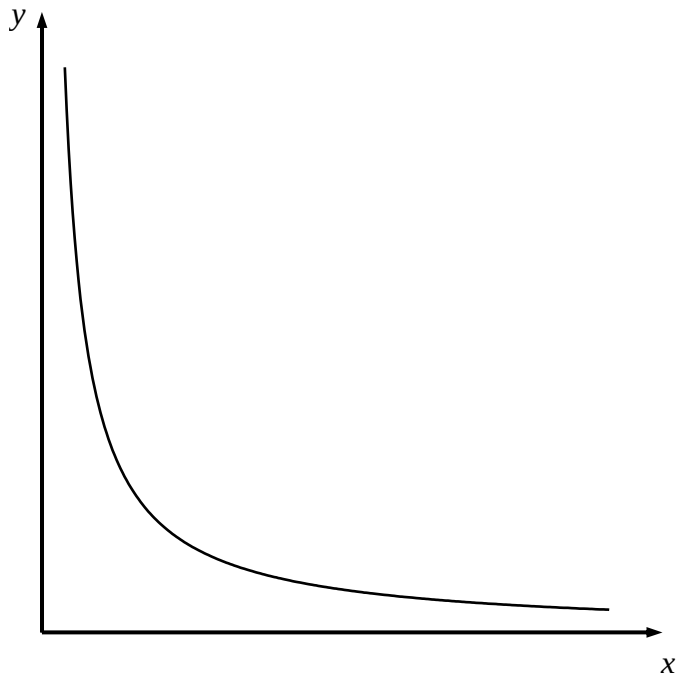
Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
23	Proof (supported)	M1	for using the sine rule on triangle *ABD* or on triangle *ADC*, to involve sides *AB*, *BD*, *AC*, or *DC* eg $\frac{AB}{\sin ADB} = \frac{BD}{\sin x}$ oe or $\frac{AC}{\sin ADC} = \frac{DC}{\sin x}$ oe **OR** for an expression for the area of triangle *ABD* or for the area of triangle *ADC* eg $\frac{1}{2} AB\ AD \sin x$ or $\frac{1}{2} AD\ AC \sin x$ or $\frac{1}{2} h\ BD$ or $\frac{1}{2} h\ DC$	Accept extra letters eg *y* shown on diagram for any angle used
		M1	for using the sine rule on both triangle *ABD* and on triangle *ADC*, to involve sides *AB*, *BD*, *AC*, or *DC* eg $\frac{AB}{\sin ADB} = \frac{BD}{\sin x}$ oe and $\frac{AC}{\sin ADC} = \frac{DC}{\sin x}$ oe **OR** for two expressions for the area of either triangle *ABD* or for triangle *ADC* eg $\frac{1}{2} AB\ AD \sin x$ and $\frac{1}{2} h\ BD$ **or** $\frac{1}{2} AD\ AC \sin x$ and $\frac{1}{2} h\ DC$	
		M1	for stating or showing sin *ADB* = sin *ADC*, eg sin *y* = sin (180 − *y*) **OR** for using two expressions to form an equation eg $\frac{\frac{1}{2} AB\ AD \sin x}{\frac{1}{2} AD\ AC \sin x} = \frac{\frac{1}{2} h\ BD}{\frac{1}{2} h\ DC}$ oe	
		C1	for a full method to arrive at the given answer	

Question 8(a)



Question 8(b)



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

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Measurements of length: ±5 mm

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
1		Wording added 'Look at the diagram for Question 1 in the Diagram Booklet. It is a scatter graph which shows…' Diagram enlarged. Open headed arrows. Right axis has been labelled. Axes labels moved to the left of the horizontal axis and above the vertical axis. Crosses changed to solid dots. Small squares removed. Braille: There will be a spare diagram and Wikki Stix	Standard mark scheme but in part (b) use a range of 12.5 to 15
5		Change *a* to *n*.	Standard mark scheme but note the change in letter.
6		Wording added 'Look at the table for Question 6 in the Diagram Booklet.' Wording added 'The table in the Diagram Booklet…'; Table enlarged and turned vertical. In part (a) Wording added 'in the Diagram Booklet.'; Wording added 'There are two spaces to fill.' Braille: In the table letters (i) & (ii) placed in the blank spaces with an answer line: 'Ans: (i) __ (ii) __'	Standard mark scheme
7		Wording added 'Look at the diagram for Question 7 in the Diagram Booklet.' Wording 'The diagram shows…' removed and replaced with 'It shows…' Wording added '$OP = OR = 8$ cm.' Wording added 'The marked angle is a right angle.' Diagram enlarged. Right angle made more obvious. Shading changed.	Standard mark scheme

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
8	(a)	Wording added 'Look at the diagram for Question 8(a) in the Diagram Booklet.' Wording 'below' removed and replaced with 'in the Diagram Booklet,..' Diagram enlarged. Open headed arrows. Axes labels moved to the right of the horizontal axis and above the vertical axis. Braille: also provided with a spare diagram, Wikki Stix and drawing film	
8	(b)	Wording added 'Look at the diagram for Question 8(b) in the Diagram Booklet.' Wording 'below' removed and replaced with 'in the Diagram Booklet,..' Diagram enlarged. Open headed arrows. Axes labels moved to the right of the horizontal axis and above the vertical axis. Braille: also provided with a spare diagram, Wikki Stix and drawing film	
10		Wording added 'Look at the diagram for Question 10 in the Diagram Booklet.' Wording added 'Triangle *DEB* is smaller than triangle *ACB*.' Wording added 'Both the marked angles are right angles.' The measurements 9 cm, 2 cm and 6 cm added to the diagram. Diagram enlarged. Right angles made more obvious. Braille alternative wording to that shown above: 'Triangle *DEB* is shaded and is smaller than triangle *ACB*.'	
12		Change *a* to *m*.	Standard mark scheme but note letter change.
13		Wording added 'Look at the diagram for Question 13 in the Diagram Booklet.' Wording 'A pattern is made from four identical rectangles' removed and replaced with 'It shows a pattern made from four identical rectangles within a set of axes.' Diagram enlarged. Open headed arrows. Axes labels moved to the right of the horizontal axis and above the vertical axis. Crosses changed to solid dots. Wording added 'Point C is marked on the diagram in the Diagram Booklet.'	Standard mark scheme

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
15		Wording added 'Look at the diagram for Question 15 in the Diagram Booklet. It shows a graph…' Diagram enlarged. Open headed arrows. Right axis labelled. Small squares removed. Axes labels moved to the left of the horizontal axis and above the vertical axis.	Standard mark scheme
18		Wording added 'Look at the diagram for Question 18 in the Diagram Booklet.' Wording '*OABC* is a trapezium' removed and replaced with 'It shows a trapezium *OABC*.' Wording added 'A straight line inside the trapezium joins point *O* and point *B*.' Diagram enlarged.	Standard mark scheme
21		Wording added 'Look at the diagram for Question 21 in the Diagram Booklet. It is a…' Diagram enlarged. Open headed arrows. Axes labels moved to the left of the horizontal axis and above the vertical axis. Right axis has been labelled. Small squares removed. Braille: also provided with a spare diagram and Wikki Stix.	Standard mark scheme, but some leeway needs to be given with regard to reading off the vales, and therefore also in the answer.
22		Change *x* to *y*.	Standard mark scheme but note letter change.
23		Wording added 'Look at the diagram for Question 23 in the Diagram Booklet.' Wording '*ABC* is a triangle' removed and replaced with 'It shows triangle *ABC*.' Diagram enlarged. Angles moved outside of the angle arcs and the arcs made smaller.	Standard mark scheme

20	Proof	C1 C1 C1	for angle *EAC* = angle *EDB* (Base angles of an isosceles triangle are equal) **or** for explanation that *AB* + *BC* = *BC* + *CD* using ratio so *AC* = *DB* oe **or** *AE*=*DE* (given) for at least 2 correct pairings with reasons for a complete proof including all reasons given and SAS	Reasons must be linked to their method.

Paper: 1MA1/3H

9	shown	M1	for method to find the interior angle eg $(9 – 2) \times 180 \div 9$ (= 140) **or** exterior angle eg $360 \div 9$ (= 40) of a regular nonagon	Angles may be shown on the diagram Any angle labelled correctly as 140 or 40 and not contradicted scores this mark
		M1	for a complete method to find the interior angle *ABC*, eg 360 – "140" – "140" (= 80) **or** "40" × 2 (= 80) or finds the angle sum assuming a square, eg $90+"140"+"140"\ (=370)$	
		A1	for complete solution with correct conclusion, eg interior angle of a square is 90, not 80 or angles around a point sum to 360 not 370	

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Mark Scheme

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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]

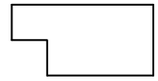
PAPER 5501				
No	**Working**	**Answer**	**Mark**	**Notes**
21	Vertices of new triangle at (2, −2) (2, 6) and (6, −2)	Correct triangle drawn	3	B3 cao (B2 for either correct triangle in wrong translated position or for 2 vertices correct) (B1 a right angled triangle with horizontal length 4 or vertical 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"

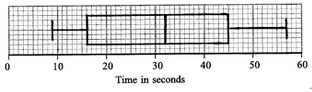
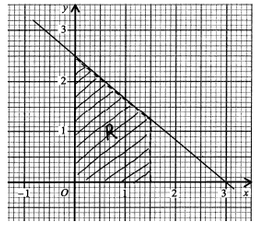
PAPER 5503					
No		**Working**	**Answer**	**Mark**	**Notes**
1			10.	1	B1 for 10
2	(a)(i)		$3e + 2f$	2	B1 for $3e + 2f$
	(ii)		$3p^2$		B1 for $3p^2$
	(b)	$5 \times -3 + 1$	-14	2	M1 for $5 \times -3 + 1$ A1 for -14
3		1974 $\frac{6580}{8554}$	855.4	3	M1 for complete correct method with relative place 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

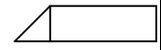
PAPER 5503				
No	**Working**	**Answer**	**Mark**	**Notes**
15		Tick boxes 1,3 & 6	3	B1 for $\frac{\pi abc}{2d}$; B1 for $2a^2$; B1 for $2\left(c^2+d^2\right)$ (−B1 for each additional expression ticked (>3) to a minimum of 0)
16	200×0.2	40	2	M1 for 200×0.2 or $\frac{40}{200}$ seen A1 for 40
17 (a)	eg 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) (ii)		0.4 1.2	2	B1 0.4 or ft single straight line with positive gradient 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 $18x - 48$, $2(9x - 24)$, $3(6x - 16)$, $6(3x - 8)$

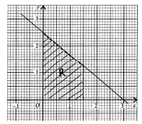
PAPER 5504					
No		**Working**	**Answer**	**Mark**	**Notes**
15		x $x^3 - 2x$ 4.1 60.7(21) 4.2 65.6(88) 4.3 70.9(07) Accept answer to 1 dp 4.22 66.7(114) or more 4.23 67.2(269) 4.24 67.7(45) 4.25 68.2(656)	4.2	4	B2 for trial $4.1 \leq x \leq 4.3$ evaluated (B1 for trial $4 < x < 5$ evaluated) B1 for 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

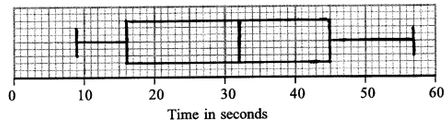
PAPER 5504					
	No	Working	Answer	Mark	Notes
20	(a)	$10^2 + 6^2$ or 136 $\sqrt{(100+36)}$ or $\sqrt{136} = 11.66\ldots$	11.7	3	M1 $10^2 + 6^2$ or 136 seen M1 (dep) $\sqrt{100+36}$ or $\sqrt{136}$ A1 11.66 – 11.7
	(b)	$\cos x = \frac{8}{10}$ or 0.8 $x = \cos^{-1} 0.8 = 36.869^\circ$	36.9	3	M1 for $\cos = \frac{8}{10}$, 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

PAPER 5505					
	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

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	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		$18x - 6y = 99$ $\quad 12x - 4y = 66$ $8x + 6y = 18$ $\quad 12x + 9y = 27$ $26x = 117$ $\quad -13y = 39$	$x = 4\ ½$ $y = –3$	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)

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	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

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	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

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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

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	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

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	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.

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	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

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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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Mark Scheme (Results)

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GCSE Mathematics (2MB01) Higher
5MB3H (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.

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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

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*1			small and correct answers	3	M1 for 4.2 ÷ 1.75 (=2.4(0)) **or** 8.68 ÷ 3.5 (=2.48) M1 for 4.2 ÷ 1.75 (=2.4(0)) **and** 8.68 ÷ 3.5 (=2.48) C1 (dep on at least M1) for small and (£)2.4(0) and (£)2.48 **OR** M1 for 1.75 ÷ 4.2 (=0.41(6)) **or** 3.5 ÷ 8.68 (=0.40(3)) M1 for 1.75 ÷ 4.2 (=0.41(6)) **and** 3.5 ÷ 8.68 (=0.40(3)) C1 (dep on at least M1) for small and 0.41(6)(kg) and 0.40(3)(kg) **OR** M1 for 4.2 ÷ 1.75 (=2.4(0)) **or** 8.68 ÷ 3.5 (=2.48) M1 for (4.2 ÷ 1.75) × 3.5 (=8.4(0)) or (8.68 ÷ 3.5) × 1.75 (=4.34) C1 (dep on at least M1) for small and (£)8.4(0) or for small and (£)4.34 **OR** M1 for 1.75 ÷ 4.2 (=0.41(6)) or 3.5 ÷ 8.68 (=0.40(3)) M1 for (1.75 ÷ 4.2) × 8.68 (=3.61(6)) or (3.5 ÷ 8.68) × 4.2 (=1.69(3)) C1 (dep on at least M1) for small and 3.61(6)(kg) or 1.69(3)(kg) **OR** M2 for 8.68 ÷ 2 (=4.34) or 4.20 × 2 (=8.40) C1 (dep on at least M1) for small and (£)4.34 or (£8.40) **OR** Any other method considered equivalent. Figures may be truncated or rounded as long as their method is clear.

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
2		$7 \times 8^2 + 320 = 448 + 320$ 768p = 7.68	£7.68	3	M1 for 7×8^2 or 448 seen A1 for 768 B1 for correct monetary answer written correctly eg £7.68 or 768p
3			correct shaded region	2	B1 for arc of circle, centre oak tree, radius 4cm(±2mm) B1 for shaded region where the tree can be planted, bounded by sides of garden and arc of circle centre oak tree
4	(a)		−3, −2, −1,0,1	2	B2 for all 5 values and no others (B1 for 4 correct values and no others or -4,-3,-2,-1,0,1 or -3,-2,-1,0,1,2
	(b)		$-2 \leq x < 4$	2	B2 for $-2 \leq x < 4$ (B1 for $-2 \leq x$ or $x < 4$ or $-2 < x \leq 4$) [Note: accept the use of any letter other than x throughout and ignore any attempt to list integer values]
5			25.1-25.2	2	M1 for $2 \times 3.142 \times 4$ or 8π oe A1 for 25.1 – 25. 2
6	(a)		5, −4, −3	2	B2 for 5, −4 and −3 (B1 for 5 or −4 or −3)
	(b)		correct curve	2	B2 for fully correct curve (B1 ft for at least 5 points plotted correctly)

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5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			enlargement, scale factor 2, centre (6, −5)	3	B1 for enlargement B1 for (scale) factor 2 or ×2 or sf 2 B1 for (6, −5) NB: award 0 marks for an explanation that includes reference to more than one transformation.
*8		Cost of wages, rent and other expenses last year 92 000+10 800+7000=109 800 Cost of wages, rent and other expenses this year $1.075\times92\,000 + \frac{7}{9} \times 10\,800 + 7000\div2 = 98\,900+8400+3500 = 110\,800$ Costs are more this year, so she cannot increase the amount she spends on goods	no, with working and reason	4	M1 for an attempt to calculate using 7.5% and 92000 (eg 7.5% of 92000 or increase of 7.5%) eg 92000 + 6900 or 98900 M1 for an attempt to find a fractional amount of 10800 (eg $\frac{7}{9} \times 10800$ or 8400 or $\frac{2}{9} \times 10800$ or 2400) M1 for complete method of increasing 92000 by 7.5%, finding $\frac{7}{9}$ of 10800, and halving 7000, with at least all of these three added together. C1 for statement eg "no" with both 110800 & 109800 seen, OR "no" with "1000 more" OR "no" and compares 181800 with 182800, oe.
9	(a)	$\sqrt{30} = 5.4772255\ldots$ $2.5^2 = 6.25$ $5.4772255\ldots\div 6.25 =$	0.876	2	M1 for $\sqrt{30} \div 6.25$ or $5.4(7\ldots) \div 2.5^2$ A1 for any answer in the range 0.876 to 0.877
	(b)	$4.5 \times 1000 \times 1000$	4 500 000	2	M1 for complete method equivalent to $4.5 \times 1000 \times 1000$ A1 for 4 500 000 oe

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10		3 → 21 4 → 56 3.1 → 23.5(9) 3.2 → 26.3(6) 3.3 → 29.3(3) 3.4 → 32.5(0) 3.5 → 35.8(7) 3.6 → 39.4(5) 3.7 → 43.2(5) 3.8 → 47.2(7) 3.9 → 51.(5) 3.35 → 30.8(9)	3.3	4	B2 for a trial between 3.3 and 3.4 inclusive (B1 for a trial between 3 and 4 inclusive) B1 for a 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 1dp truncated or rounded
11			45	3	M1 for 60000 × 0.75 or ÷1000 or digits 45 or the numbers 60 or 0.00075) M1 for the complete method 60 000 × 0.75 ÷ 1000 oe A1 cao
12	(a)		−7	2	M1 for an attempt to get *x*s on one side or number terms on one side A1 cao
	(b)		8.5	2	M1 for an attempt to divide each side by 4 or an attempt to expand the bracket eg $4 \times x - 4 \times 5$ A1 for 8.5 oe

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*13		2500×0.04×2 =£200 2500×$(1.039)^2$ = £2698.80 £2698.80 – £2500 = £198.80 Scheme A gives £1.20 more	statement	4	M1 for a correct method to find 4% of 2500 or 3.9% of 2500 A1 for a correctly calculated amount 2700 or 2698.8(0) or 200 or 198.8(0); or percentage rate calculated over the 2 years for comparison: 3.93% or 3.976% oe M1 for a correct compound interest method using 3.9% and 2500 over 2 years C1 for statement of scheme A, with two correct comparable figures.
14		$3x - 2y = 7$ $7x + 2y = 13$ $10x = 20$ $x = 2$ $3\times2 - 2y = 7$ $-2y = 1$ $y = -0.5$	2, −0.5	3	M1 for a correct process to eliminate either x or y (allow one arithmetic error) M1 (dep) for correct substitution of their found variable or an otherwise correct method to eliminate the other variable A1 for 2 and −0.5 oe
15	(a)		3.7×10^{-3}	1	B1 cao
	(b)		49 000	1	B1 cao
	(c)	500 ÷ 250 000 [= 0.002] OR $(5 \times 10^2) \div (2.5 \times 10^5)$ [= $(5\div2.5)\times10^{2-5}$] OR $\frac{500}{250} \times \frac{1}{10^3}$ [= 2×10^{-3}] OR $\frac{500\div100}{250000\div100} = \frac{5}{2500}$ [= 0.002]	2×10^{-3}	2	M1 for an attempt to divide using two numbers that are in consistent form eg following an attempt to convert to ordinary numbers, or standard form numbers. A1 for 2×10^{-3}

PMT

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16			12.7	3	M1 for 3.142 × 5 × 5 oe or 3.142 × 5 × 5 × '*h*' (=78.5 – 78.55) M1 for 1000 ÷ (3.142 × 5 × 5) A1 for 12.7 – 12.8 NB: multiples of π acceptable for M marks
17		$4x - 3 = 2x + 2y$ $2x - 3 = 2y$ $2x = 2y + 3$ $x = y + 1.5$	$x = y + 1.5$	3	M1 for attempt to expand brackets eg $2\times x+2\times y$ or divide through by 2 (each term). M1 for attempt to get x on one side of equation. A1 for $(x =) y + 1.5$, $\frac{2y + 3}{2}$, oe
18			(11, 21)	3	M1 for 5 – 2 or 9 – 3 OR 3 or 6 as long as these are not related to the 3 from *A* or multiple 3 or 9,18 M1 for 2 + 3 × "3" and 3 + 3 × "6" OR for 5 + 2 × "3" and 9 + 2 × "6" OR for 2 + 3 × "3" (=11) and (y=) 2 × '11' – 1 A1 cao SC: B1 if no method shown and answer shows x coordinate as 11 or y coordinate as 21.

PMT

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19			4.6	5	M1 for $AC = \sqrt{(3^2+4^2)}$ (=5) or $DA = \sqrt{(5^2+2^2)}$ M1 for tan BAC = 0.75 oe or (BAC=) 36.8(6) or 36.9 M1 for tan DAC = 0.4 oe or (DAC=) 21.8(0) M1 for $\sqrt{'5'^2+2^2}$ × sin("36.8(6)"+"21.8(0)") or 5.385 × sin 58.7 A1 for 4.59 – 4.61 OR M1 for $AC = \sqrt{3^2+4^2}(=5)$ or $DP = \sqrt{(29 - AP^2)}$ M1 for cos BAC = 0.8 oe or (BAC=) 36.8(6) oe M1 for angle CDP = angle BAC M1 for (DP=) 3 + 2×cos CDP or (AP=) 4 – 2×sin CDP A1 for 4.59 – 4.61
20			0.5, −3	3	M1 for $(2x \pm 1)(x \pm 3)$ M1 for $(2x - 1)(x + 3)$ A1 cao OR M1 for $\frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times -3}}{2 \times 2}$ allow sub. of $c = \pm 3$ M1 for $\frac{-5 \pm \sqrt{49}}{4}$ A1 cao NB: any other method put in review.

PMT

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21		$1180.5 \div \frac{4}{3}\pi(6.15)^3$	1.21	4	M1 for 1180 ± 0.5 or 6.2 ± 0.05 M1 for 'max. mass' ÷ 'min. volume' where "min volume" is defined as any expression involving 6.15 M1 for $1180.5 \div \frac{4}{3}\pi(6.15)^3$ A1 for 1.21 – 1.22
22			proof	3	B1 for *AD* = *AB* and *AE* = *AG* B1 for angle *EAB* = angle *DAG* (= 90 + angle *DAE*) B1 (dep on previous B marks) for 2 sides and included angle (SAS) oe
23	(a)		$3\boldsymbol{a} + \boldsymbol{b}$	1	B1 oe
	(b)		$3\mathbf{c}$	4	M1 for writing *QB* as a combination of vectors eg $\frac{1}{2}$ ('3**a** + **b**') + **b** or 3**a** + 2**b** – $\frac{1}{2}$ ('3**a** + **b**') or 2**a** + 2**b** − **c** oe M1 for equating **a** + **b** = 2**c** or writing *PQ* in terms of vectors **a** and **b** eg −**a** + $\frac{1}{2}$ ('3**a** + **b**') or 2**a** + **b** – $\frac{1}{2}$ ('3**a** + **b**') A1 for (*PQ*=) $\frac{1}{2}$**a** + $\frac{1}{2}$**b or** (*QB*=) $\frac{3}{2}$**a** + $\frac{3}{2}$**b** or (*QB*=) 2**c**−**a** + **a** + **c** A1 cao NB: accept equivalent expressions throughout

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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

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_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** $(360 - 2\times$ '65') ÷ 2 A1 for 115 with working **OR** M1 for 360÷4 (=90) M1 (dep) for '90' − 25 (=65) M1 for $180 -$ '65' **or** $(360 - 2\times$'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

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 $(AC =) \frac{12}{\sin 72}$ × sin54 (=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** $m = \frac{5-g}{-a-3}$

PAPER: 1MA0_2H				
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

PAPER: 1MA0_2H				
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^{o}) 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^{o}.) *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

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

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**
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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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 4

This question was answered quite well with many students able to identify A and D as the congruent triangles. The most common error was to choose triangles B and C, the two triangles with sides marked as 8 cm and 10 cm.

Question 23

There were a small number of excellent answers to this question which was aimed at the best students taking this paper. These students invariably use the sine rule together with the result that $\sin y = \sin(180 - y)$ to prove the given result and examiners rarely saw the alternative approach using areas of triangles.
An error seen in many responses was to treat the triangles *ADB* and *ADC* as similar or congruent triangles. This is clearly not the case. Many other students tried to use the sine rule on two different triangles and wrote down incorrect statements such as
$\frac{BD}{\sin x} = \frac{DC}{\sin x}$

In Summary

Based on their performance on this paper, students should:

- carry out a common sense check on the answers to calculations, so for example in question 12 you should expect 15 people to take less time than 12 people to clean the same number of cars.
- practise less straightforward problems which involve working with ratio
- read questions very carefully in order to fully understand what is being asked for
- improve your skills in dealing with units of time and conversion between these units
- take care in interpreting the scales used on the axes in questions which involve the use and interpretation of graphs, for example question 21(a) on this paper

Question 20

This question was not well done and there were few full proofs seen. Many candidates who attempted the question realised that they needed to consider the case of "SAS". However, they more often than not failed to give sufficient justification to accompany the pairings of two sides or two angles. In particular, examiners could not accept "*AE* = *DE*" without any justification as this was merely writing a detail from the question. Instead, they needed to see "*AE* = *DE* (given)" or equivalent. The pairing *AC* with *DB* needed to be accompanied by some justification related to the ratio 1:2:1 given in the question and the pairing of angle *EAC* with angle *EDB* needed to be accompanied with a justification related to the base angles of isosceles triangle *ADE*. A substantial number of candidates made progress with reasons but failed to explicitly say that this led to the equality of the lengths or angles involved. For example, it was not uncommon to see part of an explanation as to why the ratio lead to the fact that the lengths of *AC* and *DE* were the same without actually stating that *AC* = *DE*.

Question 9

This question required learners to show that a shape is not a square using geometrical reasoning. The first mark was for finding the interior or exterior angle of the regular nonagon. It was pleasing to see so many learners being able to do this. The second mark was then for a method to find the angle at ABC, or to find the angle sum around the point B assuming the shape was a square. The final mark required a correct method and conclusion. This was typically of the form of showing angle $ABC = 80$ and that it is not 90.
Those who were less successful often assumed there was another nonagon above the diagram and adjoining the side AD. This was incorrect and normally resulted in 0 marks.