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GCSE MATHS

Geometry and measures

Edexcel 1MA1 | Subtopic collection Topic 38

Pythagoras' theorem (incl. 3D)

Higher tier

Answers and examiner comments

57	2003-2025	Higher
question groups	available papers	tier

Using this booklet

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

Name _____ **Date** _____

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

Original question 3

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

Original question 4

The full source mark scheme begins on page 100. Use the original paper code, tier and question number shown above.

Question		Working	Answer	Mark	Notes
17		$20 \times 36 = 720$ $4 \times 36 = 144$ **30** **6** **20** 600 120 720 **4** 120 24 144 720 144 3 6 0 1 2 6 2 8 1 2 4 2 4 6 4	864	3	M1 for a complete method with relative place value correct. Condone 1 multiplication error, addition not necessary. M1 (dep) for addition of the appropriate elements of the calculation. [Note: Repeated addition of 24 lots of 36 (36 lots of 24) gets M1 only] A1 cao

16		$14^2 + 12^2$ $= 196 + 144 = 340$ $\sqrt{340} = 18.4\ldots$	18.4	3	M1 for $14^2 + 12^2$ M1 (dep) for $\sqrt{14^2 + 12^2}$ A1 for 18.4 to 18.44

Question		Working	Answer	Mark	Notes
25	(a)	$x^2+(x+2)^2=(x+4)^2$ $x^2+x^2+4x+4=x^2+8x+16$ $x^2+4x-8x+4-16=0$	Proof	3	M1 for $x^2 + (x + 2)^2 = (x + 4)^2$ oe A1 for $x^2+x^2+4x+4 = x^2+8x+16$ A1 for completing the proof
	b)(i)	$(x-6)(x+2)=0$ $x-6=0$ or $x+2=0$ or $x=\frac{--4\pm\sqrt{(-4)^2-4\times1\times-12}}{2\times1}$ $x=\frac{4\pm\sqrt{64}}{2}$ $(x - 2)^2 - 16 = 0$ $x - 2 = \pm\sqrt{16}$ $x = 2 \pm\sqrt{16}$	6, -2	4	M1 for $(x \pm 6)(x \pm 2)$ (= 0) OR $\frac{--4\pm\sqrt{(-4)^2-4\times1\times-12}}{2\times1}$ allow ±4 for b and ±12 for c OR $(x - 2)^2 - 16 = 0$ A1 $x = 6$ cao A1 $x = -2$ cao [SC: B1 for 1 correct solution if MO scored]
	(ii)		10		B1 ft from (b)(i), provided x is a positive value [Note: an answer of 10 and 2 gets B0]

1380_3H
Summer 2010

12	(a)	$0.5\times6\times14$	42	2	M1 for $0.5\times6\times14$ oe A1 cao
	(b)	$\sqrt{6^2+14^2} = \sqrt{232}$	15.23	3	M1 for 6^2+14^2 or 36+196 or 232 M1 for $\sqrt{36+196}$ or $\sqrt{232}$ A1 for answer in the range 15.2 to 15.3

Question	Working	Answer	Mark	Notes
19 (a)	15 ÷ 10 8 × 1.5	12	2	M1 for 15 ÷ 10 or 1.5 or $\frac{3}{2}$ or $\frac{2}{3}$ A1 cao
(b)	½ × (8 +"a") × 5	50	2	NB : ft from (a) provided '*DC*' > 8 M1 for $\frac{(8+"a")\times 5}{2}$ A1 ft **or** M1 for (8× 5) + ½("*DC*" − 8) × 5 A1 ft **or** M1 for ½ × "*DC*" × 15 − ½ × 8 × 10 A1 ft **or** M1 for ½ × 8 × 10 × "1.5^2" − ½ × 8 × 10 A1 ft

1380_3H

1380/3H

Question		Working	Answer	Mark	Notes
25		$\pi x l = 2\pi x^2$ $h^2 + x^2 = 4x^2$ $h^2 = 3x^2$ **Alternative** $\pi x\sqrt{h^2 + x^2} = 2\pi x^2$ $\sqrt{h^2 + x^2} = 2x$ $h^2 + x^2 = 4x^2$ $h^2 = 3x^2$	$\sqrt{3}x$	4	B1 for curved surface area of one of the shapes e.g. $\pi x l$ or $2\pi x^2$ M1 for for attempt to equate surface areas e.g $\pi x l = 2\pi x^2$ or $l = 2x$ M1 for attempt to connect h and x using Pythagoras's theorem e.g. $h^2 + x^2 = 4x^2$ A1 for $\sqrt{3}x$ or $\sqrt{3x^2}$ **Alternative** B1 for $h^2 + x^2 = l^2$ oe M1 for attempt to equate surface areas e.g. $\pi x\sqrt{h^2 + x^2} = 2\pi x^2$ oe M1 (dep) for attempt to square both sides of their formula e.g. $h^2 + x^2 = 4x^2$ A1 for $\sqrt{3}x$ or $\sqrt{3x^2}$ SC B1 for attempt to equate surface areas in terms of r, rather than x

Question		Working	Answer	Mark	Notes
25	(a)	$BC = \sqrt{8^2 - 3^2} = \sqrt{55} =$ 7.416198... CD = 7.416… ÷ sin 50° = 9.6811….	9.68	4	M1 for $8^2 - 3^2$ oe M1(dep) for $\sqrt{8^2 - 3^2}$ or 7.41… or 7.42 seen Or M1 for $A = \cos^{-1}\left(\frac{3}{8}\right)$ (=67.98°) M1(dep) for $3 \times \tan' 67.98'$ or 7.41… or 7.42 seen M1 for '7.4……' ÷ sin 50 A1 for 9.67 – 9.69 SC B3 for -28.2 to -28.3 using rad or 10.4 – 10.5 using grad
	(b)	CE^2 =19^2+9.68^2 –2(19)(9.68) cos 40 = 361+93.7024–367.84(0.766) = 172.920612 CE = 13.1499…	13.1	3	M1 for (CE^2 =) 19^2 + '$(9.68)^2$' – 2 (19) '(9.68)' cos 40 M1(dep) for correct order of evaluation to reach $\sqrt{'172.920612'}$ A1 for 13.1– 13.15 SC B2 26.4(5805…) or 26.5 used radians or 12.5(3449…) used gradians

Question		Working	Answer	Mark	Notes
21		$6^2-(2\sqrt{3})^2=36-12=24$ Area $=\frac{1}{2}\times 2\sqrt{3}\times\sqrt{24}=\sqrt{72}$ $=\sqrt{36\times 2}=6\sqrt{2}$	proof	5	M1 $6^2-(2\sqrt{3})^2$ or $\sqrt{48}$ seen or $(2\sqrt{3})^2+x^2=6^2$ oe A1 $\sqrt{24}$ oe M1(dep on M1) $\frac{1}{2}\times 2\sqrt{3}\times$ '$\sqrt{24}$' A1 $\sqrt{72}$ oe A1 $6\sqrt{2}$ or $(k)=6$

Question		Working	Answer	Mark	Notes
18		$BD^2 + 12^2 = 16^2$ oe BD= $\sqrt{256-144}$ (=10.58...) sin 40 = $\frac{'10.58'}{CD}$ $CD = \frac{'10.58'}{\sin 40}$	16.5	5	M1 for $BD^2 + 12^2 = 16^2$ oe or $16^2 - 12^2$ or 112 seen M1 for $\sqrt{256-144}$ or $\sqrt{112}$ (=10.58...) M1 for sin 40 = $\frac{'10.58'}{CD}$ or cos 50 = $\frac{'10.58'}{CD}$ M1 for (CD =) $\frac{'10.58'}{\sin 40}$ or $\frac{'10.58'}{\cos 50}$ A1 for 16.4 – 16.5 **OR** M1 for $BD^2 + 12^2 = 16^2$ oe or $16^2 - 12^2$ or 112 seen M1 for $\sqrt{256-144}$ or $\sqrt{112}$ (=10.58..) M1 for (BC =) '10.58'× tan 50 or $\frac{'10.58'}{\tan 40}$ (=12.6…) M1 for $\sqrt{'12.6'^2+'10.58...'^2}$ A1 for 16.4 – 16.5

1MA0_2H

Original question 10

The full source mark scheme begins on page 161. Use the original paper code, tier and question number shown above.

9		$\sqrt{39^2 + 52^2} = \sqrt{4225}$ = 65 2×65 + 2×39 + 2×52 = 156×2 = $\sqrt{39^2 + 52^2} = \sqrt{4225}$	312	5	M1 for $39^2 + 52^2$ or 1521 + 2704 or 4225 M1 for $\sqrt{39\times39+52\times52}$ or $\sqrt{1521 + 2704}$ or $\sqrt{4225}$ A1 for 65 seen or diagonal length of 65 (oe) indicated on diagram, or other Pythagorean length justified. M1 for 2 × "65" + 2 × 39 + 2 × 52 (= 156 × 2) or 130 + 182 A1 cao

5MB3H_01

15		$9 - 3 = 6$ $10^2 - 6^2 = 64$ $BC = 8$ $AC^2 = 9^2 + 8^2 = 145$	12.0	5	M2 $10^2 - (9-3)^2$ (=64) **or** $BC = 8$ (M1 $9 - 3$ (= 6) may be seen on diagram) M1 (indep) $9^2 + 'BC'^2$ where BC is a numerical value M1 (dep on previous M1) $\sqrt{81 + '64'}$ A1 12.0 – 12.042

1MA0_2H

3		Work with whole shape: 12 − 9 4 × (3 + 15) Work with 4 triangles: 15 + 12 + 9 = 36 4×36=144 144 – (9×8) = Work with single triangles: 15 + 12 + 9 = 36 4×(36-18) =	72	3	M1 12 – 9 (=3) M1 for 4 × (“3” + 15) oe A1 cao OR M1 for 4×(15 + 12 + 9) (=144) M1 for ‘144’-9×8 oe A1 cao OR M1 (15 + 12 + 9) – (2 × 9) (=18) oe M1 for 4× “18” oe A1 cao

5MB2H_01

7		$9^2 + 14^2 = 81 + 196 = 277$ $AB = \sqrt{277}$	16.6	3	M1 $9^2 + 14^2$ or 81 + 196 or 277 M1 $\sqrt{277}$ or $\sqrt{81+196}$ or A1 16.6 -16.644

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8*		Paint for You 7.5 ÷ 2.5 = 3 tins 3 × 8.35 = £25.05 25.05 × 1.20 = £30.06 Paul's paints 7.5 ÷ 0.75 = 10 tins 10 × 3.15 = £31.50 OR Paint for You 8.35× 1.20 = £10.02 10.02 ÷ 2.5 = £4.008 per litre Paul's Paints 3.15 ÷ 0.75 = £4.20 per litre There is no wastage	Paint for You (2.5 litre tins)	4	M1 7.5 ÷ 2.5 or 3 seen or 7.5 ÷ 0.75 or 10 seen M1 8.35× 1.2(0) oe or 10.02 or "25.05" × 1.2(0)oe M1 "3" × 8.35 or "3" × "10.02" **and** "10" × 3.15 C1 for both 30.06 and 31.5(0) and correct conclusion OR M1 7.5 ÷ 2.5 or 3 seen or 7.5 ÷ 0.75 or 10 seen M1 8.35× 1.2(0) oe or 10.02 or 8.35÷2.5 × 1.2(0)oe or 3.34 × 1.2(0) oe M1 "10.02" ÷ 2.5 or 4.008 or 4.01 **and** 3.15 ÷ 0.75 or 4.20 C1 for both 4.008 (or 4.01) and 4.2(0) and correct conclusion OR M1 7.5 ÷ 2.5 or 3 seen or 7.5 ÷ 0.75 or 10 seen M1 8.35× 1.2(0) oe or 10.02 M1 2.5 ÷ 0.75 **and** "10.02" ÷ 3.15 C1 for both 3.3(3.. and 3.1(8...) and correct conclusion OR any equivalent process using correct methods which leads to two values that can be compared

5MB3H_01

13	(a)		11.5	3	M1 for $13^2 - 6^2$ or $169 - 36$ or 133 M1 (dep on M1) for $\sqrt{"13^2 - 6^2"}$ **or** $\sqrt{133}$ A1 for answer in the range 11.5 − 11.6
	(b)		47.2	3	M1 for cos (*RPQ*)= $\frac{17}{25}$ oe **OR** sin *PQR* = $\frac{17}{25}$with *PQR* clearly identified M1 for (*RPQ* =+) $\cos^{-1}\frac{17}{25}$oe **OR** *PQR* = $\sin^{-1}\frac{17}{25}$with *PQR* clearly identified A1 for answer in the range 47.1 − 47.2 SC : B2 for an answer of 0.823(033...) **or** 52.3(95...) **or** 52.4

1MA0_2H

Original question 19

The full source mark scheme begins on page 180. Use the original paper code, tier and question number shown above.

Original question 22

The full source mark scheme begins on page 180. Use the original paper code, tier and question number shown above.

Question		Working	Answer	Mark	Notes
20			$5x^2$	4	M1 for $4x \times 4x$ M1 for $(2x \times 4x)/2$ or $(2x \times x)/2$ or $(3x \times 4x)/2$ M1(dep M2) for "$16x^2$" – "$4x^2$" – "x^2" – "$6x^2$" A1 for $5x^2$ **OR** M1 for $\sqrt{(2x)^2 + (4x)^2}$ $(= \sqrt{20x^2} = \sqrt{20}\,x)$ M1 for $\sqrt{(x)^2 + (2x)^2}$ $(= \sqrt{5x^2} = \sqrt{5}\,x)$ M1(dep M2) for $\frac{\text{"}\sqrt{5}\,x\text{"} \times \text{"}\sqrt{20}\,x\text{"}}{2}$ $(= \frac{\sqrt{100}}{2}\,x^2)$ A1 for $5x^2$

11			3.52	3	M1 for $1.35^2 + 3.25^2$ M1 (dep) for $\sqrt{(1.35^2 + 3.25^2)}$ $(= \sqrt{12.385})$ A1 for answer in the range 3.51 to 3.52

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

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

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

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

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

PAPER: 1MA0_2H

Question		Working	Answer	Mark	Notes
10	(a)	$24.5^2 + 10.6^2$ (= 712.61) $\sqrt{712.61}$	26.7	3	M1 for (GJ^2 =) $24.5^2 + 10.6^2$ or 600.25 + 112.36 or 712.61 M1 for $\sqrt{24.5^2 + 10.6^2}$ or $\sqrt{712.61}$ A1 for answer in the range 26.69 – 26.7
	(b)	$\cos x = \frac{7}{18}$ $x = \cos^{-1}\left(\frac{7}{18}\right)$	67.1	3	M1 for $\cos(x) = \frac{7}{18}$ oe M1 for $(x =) \cos^{-1}\left(\frac{7}{18}\right)$ or $\cos^{-1}(0.388...)$ or $\cos^{-1}(0.38)$ A1 for answer in the range 67.1 – 67.17 SC: B2 for an answer of 1.1(713...) or 1.2 or 74.5(717...) or 74.6

PAPER: 5MB3H_01

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

PAPER: 5MB3H_01

Question		Working	Answer	Mark	Notes
16	(a)	$\frac{1}{2} \times 5 \times 5 \times \sin 60^o$ or $\sqrt{5^2 - 2.5^2} = 4.330.....$ $\frac{1}{2} \times 5 \times 4.33$	10.8	3	M1 for using a triangle of sides 5 cm and angle 60^o or a right-angled triangle of sides 5 cm and 2.5 cm M1 for a complete correct method to find the area of the triangle A1 for answer in the range 10.8 to 10.9
	(b)		7	4	M1 for $\frac{4}{3} \times \pi \times 17.5^3$ (= 22449.29...) or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 35^3$ (= 89797.19...) M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times 17.5^3$ (= 11224.6) M1 (dep on M1) for 80 × 1000 ÷ '11224.6' oe A1 for 7 or (dep on M2) ft rounded down.

Question		Working	Answer	Mark	Notes
16	(a)	$\frac{1}{2} \times 5 \times 5 \times \sin 60^o$ or $\sqrt{5^2 - 2.5^2} = 4.330.....$ $\frac{1}{2} \times 5 \times 4.33$	10.8	3	M1 for using a triangle of sides 5 cm and angle 60^o or a right-angled triangle of sides 5 cm and 2.5 cm M1 for a complete correct method to find the area of the triangle A1 for answer in the range 10.8 to 10.9
	(b)		7	4	M1 for $\frac{4}{3} \times \pi \times 17.5^3$ (= 22449.29...) or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 35^3$ (= 89797.19...) M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times 17.5^3$ (= 11224.6) M1 (dep on M1) for 80 × 1000 ÷ '11224.6' oe A1 for 7 or (dep on M2) ft rounded down.

16		$AC^2 = 5^2 + 3^2$ $AC = \sqrt{25+9}$ (=5.83) $\frac{5}{5.83} = \frac{DB}{3}$ $DB = \frac{5}{5.83} \times 3$ (= 2.57) 5 + 3 + 5.83 + 2.57 = **OR** $AC = \sqrt{25+9}$ (=5.83) $\tan A = \frac{3}{5}$ $A = 30.96$ $\sin 30.96 = \frac{DB}{5}$ $DB = 5 \times \sin 30.96$ (= 2.57) 5 + 3 + 5.83 + 2.57 =	16.4	5	M1 for $(AC^2) = 5^2 + 3^2$ =34) M1 for $\sqrt{25+9}$ or $\sqrt{34}$ (=5.83) M1 for $\frac{5}{'5.83'} = \frac{DB}{3}$ or $DB \times AC = 5 \times 3$ M1 for $(DB =) \frac{5}{'5.83'} \times 3$ A1 for 16.4 to 16.41 **OR** M1 for $(AC^2) = 5^2 + 3^2$ (=34) M1 for $\sqrt{25+9}$ or $\sqrt{34}$ (=5.83) M1 for using a correct trig ratio in an attempt to find angle A or angle C, e.g. $\tan A = \frac{3}{5}$, $\sin A = \frac{3}{'5.83'}$, $\cos C = \frac{3}{'5.83'}$ M1 for using DB in a a correct trig ratio, e.g. sin'30.96' = $\frac{DB}{5}$ A1 for 16.4 to 16.41

PAPER: 1MA0_2H

11			9.54	4	M1 for $10^2 - 5^2$ (= 75) or (*BD* =) 10 × cos 30 (= 8.66...) M1 for "75" + 4^2 (= 91) or "8.66..."^{2} + 4^2 (= 91) M1 for $\sqrt{(10^2 - 5^2 + 4^2)}$ or $\sqrt{(\text{"8.66..."}^2 + 4^2)}$ A1 for 9.53 − 9.54

PAPER: 5MB3H_01

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

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

5MB3H/01 June 2015

Original question 7

The full source mark scheme begins on page 195. Use the original paper code, tier and question number shown above.

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

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

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

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

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

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

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

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

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

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

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

Original question 10

The full source mark scheme begins on page 214. Use the original paper code, tier and question number shown above.

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

PAPER: 1MA0/2H

Question	Working	Answer	Mark	Notes
11	$\pi \times 6^2 - 2 \times 6 \times 6$	41.1	4	M1 for correct method to work out the area of the circle or quarter circle or semi-circle eg $\pi \times 6^2$ (=113(.09..)); $\pi \times 6^2 \div 2 = 56.5(4..)$; $\pi \times 6^2 \div 4 = 28.2(7\ldots)$) M1 for method to work out the area of the square (=72) oe or a triangle eg ½×6×6 (=18) M1 for complete method to find shaded area. A1 for value in the range 41.04 - 41.112

11		8.56	3	M1 for $5.2^2 + 6.8^2$ (= 73.28) M1 for $\sqrt{(5.2^2 + 6.8^2)}$ or $\sqrt{73.28}$ A1 for 8.5 – 8.6

PAPER: 5MB3H_01

Question	Working	Answer	Mark	Notes
15		18	4	M1 for correct initial use of Pythagoras eg $(AB^2 =)\ 10^2 - 6^2$ (= 64) or $AB = 8$ M1 (dep M1) for "$\sqrt{64}$" ÷ 2 (= 4) M1 for method to find area of trapezium eg $\frac{1}{2} \times$ "4" $\times (6 \div 2 + 6)$ A1 cao OR M1 for correct initial use of Pythagoras eg $(AB^2 =)\ 10^2 - 6^2$ (= 64) or $AB = 8$ M1 (dep M1) for method to find area of ΔABC eg $\frac{1}{2} \times$ "$\sqrt{64}$" $\times 6$ (= 24) or area of ΔAED $\frac{1}{2} \times 6 \div 2 \times$ "4" (= 6) or $24 \times (\frac{1}{2})^2$ (= 6) M1 for a complete method to find area of $EDBC$ e.g $\frac{3}{4} \times$ "24" eg "24" − "6" A1 cao

8		5.59	M1	For use of $\pi r^2 = 49$, where r is the radius or $r = 3.9(49\ldots)$ or diameter $= 7.8(9865\ldots)$	
			M1	For use of Pythagoras to set up an equation in x^2 e.g. $x^2 + x^2 = (d)^2$ or $x^2 = r^2 + r^2$	For use of trigonometry to set up an equation in x eg $\sin 45 = x \div d$
			M1	(dep on M2) Rearrange to $(x^2 =)$ 2× "3.949.." ^{2}	Rearrange to $(x=)$ "7.898.." × sin 45 oe
			A1	5.5 to 5.6	

Question	Working	Answer	Mark	Notes
7		32.3	P1	for using Pythagoras to find length of third side of triangle, eg $7.5^2 - 6^2$ or $6^2 + x^2 = 7.5^2$ or uses trigonometry to find angle in triangle, eg $\sin A = \frac{6}{7.5}$ or $\cos B = \frac{6}{7.5}$
			P1	(dep P1) for complete process to find length of third side of triangle eg $\sqrt{7.5^2 - 6^2}$ or $\sqrt{56.25 - 36}$ or $\sqrt{20.25}$ (= 4.5) or uses trigonometry to find base length of triangle, eg 7.5 × cos "A" or 7.5 × sin "B" or $\frac{6}{\tan "A"}$
			P1	(dep P2) for 24 – 10 – "4.5" (= 9.5)
			P1	(indep) for process to find angle CDA, eg $\tan CDA = \frac{6}{\text{base}}$ from right- angled triangle
			A1	for answer in the range 32.2 to 32.3

Question	Answer	Mark	Mark scheme	Additional guidance
12	73.6	P1	for correct initial use of Pythagoras eg $5^2 + 5^2$ (=50) **or** a trigonometric ratio in the form $\frac{5 \div 2}{0.5AC}$ = sin 45 oe	
		P1	for finding the length of half of the diagonal eg $\sqrt{"50"} \div 2$ (= 3.5...) **or** $0.5AC = \frac{5 \div 2}{\sin 45}$ (=3.5...) oe	do not accept $\sqrt{20} \div 2$
		P1	for process to use tan eg tan *TAC* = (12 ÷ "3.5..") (=3.3..) **or** complete alternative method arriving at an equation with the subject as sin *TAC* or cos *TAC*	
		A1	for an answer in the range 73.58 to 74.1	

8	(a)	Mistake described	C1	for statement describing a mistake **Acceptable** eg should be $AC^2 - AB^2$ she should do $8^2 - 6^2$ she should be subtracting not adding the numbers she thought that BC was the hypoteneuse when it was actually AC should be $BC^2 + AB^2 = AC^2$ .....should be $8^2 = 6^2 + BC^2$ **Not acceptable** eg she has not used Pythagoras correctly $6^2 + 8^2$ is 120 the answer should be $\sqrt{28}$ or 5 or 5.3 or 5.2915 $BC + AB = AC$	
	(b)	Explanation	C1	for explanation **Acceptable examples** the scale factor used is 2.5 5 ÷ 2 is not 1.5 10 ÷ 4 is more than 1.5 the scale factor is not 1.5 he has not used the correct scale factor has enlarged it by too much ZY should be 6 **Not acceptable examples** the grid is not large enough	Note that a diagram alone is insufficient.

Paper: 1MA1/3H

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

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
6	12	P1	for a process to find the area of cross section, eg $750 \div 25$ (= 30) oe **or** $\frac{1}{2} \times 5 \times h$ oe	May use any letter for h or may use ?
		P1	for a correct equation in h, eg $750 \div 25 = \frac{1}{2} \times 5 \times h$ oe **or** $\frac{1}{2} \times 5 \times h \times 25 = 750$ oe **or** for a complete process to find h, eg $\frac{750}{25} \times \frac{2}{5}$ oe **or** "30" $\times 2 \div 5$	
		A1	cao SC B1 for answer of 6 if P0 scored	

Question	Answer	Mark	Mark scheme	Additional guidance
5	41.6	P1	for start of process to find the length of the hypotenuse, eg (hyp^2 =) $8^2 + 10^2$ (= 164)	Note lengths may be seen on the diagram
		P1	for complete process to find hypotenuse, eg $\sqrt{8^2+10^2}$ **or** $\sqrt{64+100}$ **or** $\sqrt{164}$ (= 12.8…)	
		P1	(dep P2) for complete process to find the required perimeter, eg 8 + 8 + 10 + "12.8" + "12.8 – 10" **or** $16 + 4\sqrt{41}$	8 + 8+ "12.8" + "12.8" oe is acceptable for this mark
		A1	for answer in the range 41 to 42	If an answer in the range 41 to 42 is given in the working space then incorrectly rounded, award full marks.

10	14.14	P1	works out scale factor eg (9 + 6) ÷ 6 (= 2.5) **OR** for start of process to find angle *DBE* eg sin $B = \frac{2}{6}$ oe	Note method can be carried out in either order
		P1	uses Pythagoras eg $6^2 - 2^2$ (= 32) or $\sqrt{32}$ (= 5.6...) **OR** calculates *AC* eg 2 × "2.5" (= 5) **OR** for complete process to find angle *DBE* eg $\sin^{-1}\left(\frac{2}{6}\right)$ (= 19.4...)	May be seen on diagram
		P1	complete process to find *CB* eg "2.5" × "√32" (= 10√2) **or** $\sqrt{(9+6)^2 - "5"^2}$ (= 10√2) **OR** uses trigonometry, eg 15 × cos "19.4..."	
		A1	14.1 to 14.15	If the answer is given within the range but then rounded incorrectly award full marks.

Paper: 1MA1/3H	

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
13	Relationship shown	M1	for use of Pythagoras' theorem, eg $d_A^2 = d_B^2 + d_C^2$ **or** $a^2 = b^2 + c^2$ **or** $(2x)^2 = (2y)^2 + (2z)^2$ **or** $a = \sqrt{b^2 + c^2}$ **or** uses a 3, 4, 5 triangle	May be seen at any stage Where d_A, a, $2x$, etc are their diameters Could be any Pythagorean triple
		M1	for forming correct expressions for the areas of at least 2 of the 3 semicircles, eg at least two of $\frac{1}{2}\pi\left(\frac{a}{2}\right)^2$, $\frac{1}{2}\pi\left(\frac{b}{2}\right)^2$, $\frac{1}{2}\pi\left(\frac{c}{2}\right)^2$ or at least two of $\frac{1}{2}\pi x^2$, $\frac{1}{2}\pi y^2$, $\frac{1}{2}\pi z^2$ or at least two of $\frac{1}{2}\pi\left(\frac{5}{2}\right)^2$, $\frac{1}{2}\pi\left(\frac{3}{2}\right)^2$, $\frac{1}{2}\pi\left(\frac{4}{2}\right)^2$	Where a, b, c are their diameters Where $2x$, $2y$, $2z$ are their diameters Where 3, 4, 5 are their diameters
		C1	for a fully correct and convincing chain of reasoning, eg showing that eg $\frac{1}{2}\pi\left(\frac{a}{2}\right)^2 = \frac{1}{2}\pi\left(\frac{b}{2}\right)^2 + \frac{1}{2}\pi\left(\frac{c}{2}\right)^2$ can be reduced to $a^2 = b^2 + c^2$ **or** that $(2x)^2 = (2y)^2 + (2z)^2$ is the same as $\frac{1}{2}\pi x^2 = \frac{1}{2}\pi y^2 + \frac{1}{2}\pi z^2$	

Paper: 1MA1/3H

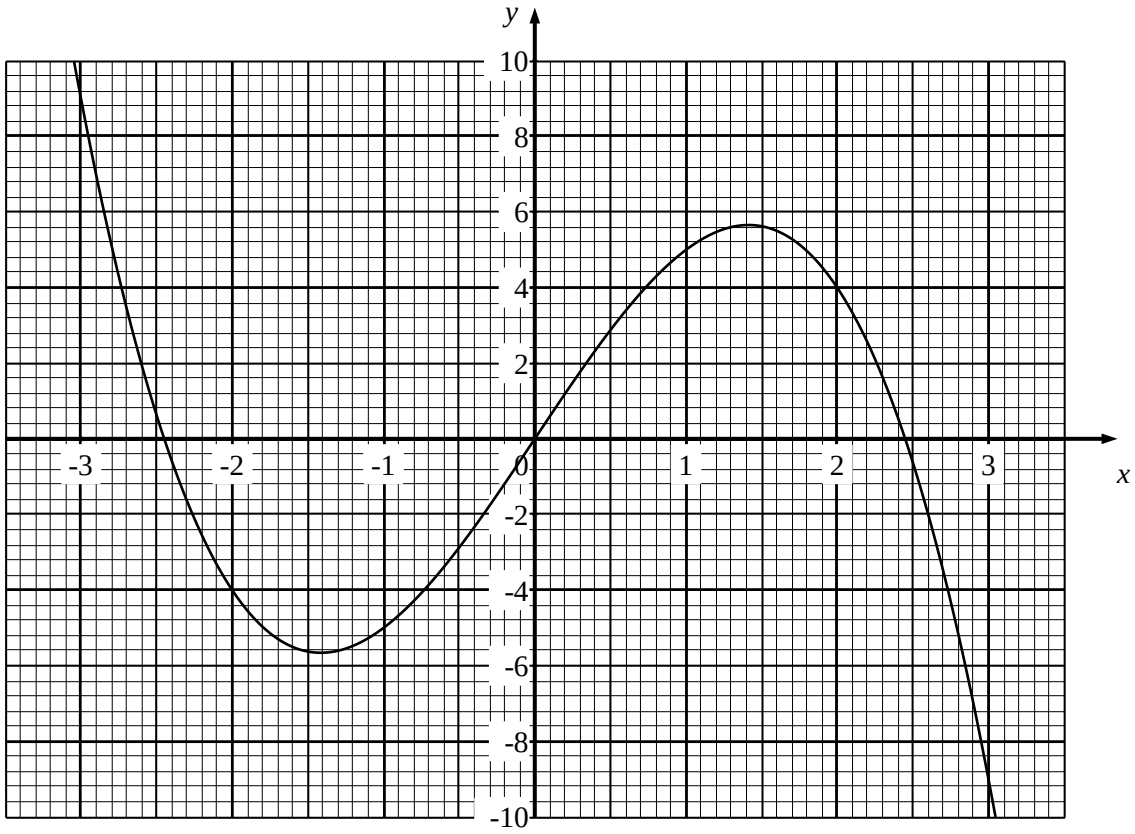
Question	Answer	Mark	Mark scheme	Additional guidance
1	7.5	M1	for correct use of Pythagoras, eg. $8.5^2 - 4^2$ (= 56.25) or $4^2 + x^2 = 8.5^2$	Must have values substituted Trigonometry may be used but M1 only awarded when complete method shown.
		A1	for 7.5 or $7\frac{1}{2}$ or $\frac{15}{2}$	

18	30.6	P1	for process to find *TC*, eg. (*TC* =) $14 \times \frac{3}{3+4}$ (= 6)	Lengths of *TC*, *TD*, *SD* may be seen on the diagram
		P1	for process to find *TD*, eg. (*TD* =) $\sqrt{14^2 + "6"^2}$ or $\sqrt{232}$ or $2\sqrt{58}$ (= 15.2…)	
		P1	for process to find *SD,* using area of a trapezium, 147 = 0.5 × (*SD* + 12) × 14, or *SD*= 9	
		P1	for $\tan^{-1}\left(\frac{"9"}{"15.2..."}\right)$	A complete set of processes to find the angle is needed where an alternative route is involved with more than one stage in the working
		A1	for answer in the range 30.4 to 30.7	If an answer is given in the range in working and then rounded incorrectly award full marks.

Paper: 1MA1/3H

24	(a)	1 : 4	P1	for process to equate the two volumes, $\frac{4}{3}\pi r^3 = \frac{1}{3}\pi r^2 h$	
			A1	cao	
	(b)	$1 : \sqrt{8}$	P1	for process to equate surface areas, eg $4\pi r^2 = \pi r^2 + \pi r l$	Can be implied by $3r = l$
			P1	for process to substitute $l = \sqrt{h^2 + r^2}$, eg $4\pi r^2 = \pi r^2 + \pi r\sqrt{h^2 + r^2}$	
			P1	for process to isolate term in r^2 after substituting for l, eg $8r^2 = h^2$	
			A1	for $1 : \sqrt{8}$	

Question 9(b)



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

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

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

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
5		Wording added 'Look at the table for Question 5 in the Diagram Booklet.' Wording added 'in the Diagram Booklet'. Table enlarged.	Standard mark scheme
6	(a)	Text left aligned. Values changed: *a* to *p*; *b* to *q*; *c* to *r*	Standard mark scheme but note change of letter
6	(b)	Text left aligned. Values changed: *m* to *w*; *n* to *x*; *p* to *y*	Standard mark scheme but note change of letter
7		Wording added 'Look at Diagram 1 and Diagram 2 for Question 7 in the Diagram Booklet. You may be provided with a model. It is not accurate.' Wording added 'Diagram 1 and the model show'. Wording added 'that'. Diagram enlarged. Base view added with measurements. Wording added 'Diagram 2 shows the base view.' Frame removed from formula and moved above the diagram to the left	Standard mark scheme
9	(a)	Wording added 'below'. Wording added 'There are four spaces to fill.' Table turned vertical and enlarged.	Standard mark scheme
9	(b)	Wording added 'Look at the diagram for Question 9(b) in the Diagram Booklet.' Wording added 'in the Diagram Booklet'. Diagram enlarged. Axes labels moved above the vertical axis and right on the horizontal axis. Open headed arrows. Black grid lines. Small squares removed.	Standard mark scheme
10		Wording added 'Look at the diagram and table for Question 10 in the Diagram Booklet.' The word 'a' removed and replaced with 'the'. Wording added 'in the Diagram Booklet'. Diagram enlarged. Spinner straightened and spike removed. Dot added to the centre. Table turned vertical and enlarged. The wording 'Here are her results' removed and replaced with 'Her results are shown in the table in the Diagram Booklet.'	Standard mark scheme
11		Wording added 'Look at the diagram for Question 11 in the Diagram Booklet. It shows Shape P and Shape Q.' Labels moved above the shapes. Shapes relabelled as 'Shape P' and 'Shape Q'. Wording added 'in the Diagram Booklet'. Diagram enlarged. Shading changed. Axes labels moved above the vertical axis and right on the horizontal axis. Open headed arrows. Black grid lines.	Standard mark scheme
13		Wording added 'Look at the table for Question 13 in the Diagram Booklet.' Wording added 'There are three spaces to fill.' Table turned vertical and enlarged.	Standard mark scheme

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
14		Wording added ‘Look at the diagram for Question 14 in the Diagram Booklet. It shows a grid.’ Wording added ‘in the Diagram Booklet’. Diagram enlarged. Axes labels moved above the vertical axis and left on the horizontal axis.	Standard mark scheme
15		Wording added ‘Look at the diagram for Question 15 in the Diagram Booklet.’ Diagram enlarged. Angle moved outside the angle arc. Angle arc made smaller.	Standard mark scheme
18		Wording added ‘Look at the diagram for Question 18 in the Diagram Booklet. It shows a circle with centre O’ Diagram enlarged. Angle moved outside the angle arc. Angle arc made smaller. The wording ‘a circle, centre O.’ removed and replaced with ‘the circle.’ Wording added ‘The lines AB, OB and OA form the triangle AOB.’ The word ‘point’ added. Dot at O enlarged.	Standard mark scheme
21		Wording added ‘Look at the diagram for Question 21 in the Diagram Booklet. It shows’ The wording ‘The diagram’ removed. Diagram enlarged. Axes labels moved above the vertical axis and right on the horizontal axis. Open headed arrows. Change cross to solid dot.	Standard mark scheme
22		Wording added ‘Look at the diagram for Question 22 in the Diagram Booklet.’ The wording ‘Here is’ removed and replaced with ‘It shows’. Diagram enlarged. Angle moved outside the angle arc. Angle arc made smaller. Wording added: ‘AC = 6.5cm’; ‘BC = 10.7 cm’; ‘Angle BAC = 30º'	Standard mark scheme

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
24	(a)	Wording added 'Look at Diagram 1, Diagram 2, Diagram 3, Diagram 4 and Diagram 5 for Question 24(a) in the Diagram Booklet. You may be provided with models. They are not accurate.' Diagrams enlarged and added for 2D representation of sphere, cone side and cone base. The wording 'Here is a solid sphere and a solid cone' removed and replaced with 'Diagram 1 and model 1 show a solid sphere. Diagram 2 shows a 2D representation of the sphere. Diagram 3 and Model 2 show a solid cone. Diagram 4 shows a 2D representation of the cone. Diagram 5 shows the base of the cone.' Wording added 'radius of the sphere = radius of the base of the cone = r'. Wording added 'vertical height of the cone = h'; Wording added 'Volume of sphere = $\frac{4}{3}\Pi r^3$' Wording added 'Volume of cone = $\frac{1}{3}\Pi r^2 h$' Dashed lines made longer and thicker. Diagram headings moved above the diagrams. Labels moved to the left side. Models provided.	Standard mark scheme
24	(b)	Wording added 'Look at Diagram 1, Diagram 2, Diagram 3, Diagram 4 and Diagram 5 for Question 24(b) in the Diagram Booklet. You may be provided with models. They are not accurate. They show a different solid sphere and solid cone.' The wording 'Here is a different solid sphere and a different solid cone.' Removed. Diagrams enlarged and added for 2D representation of sphere, cone side view and cone base' Wording added 'Diagram 1 and model 1 show a solid sphere. Diagram 2 shows a 2D representation of the sphere. Diagram 3 and Model 2 show a solid cone. Diagram 4 shows a 2D representation of the cone. Diagram 5 shows the base of the cone.' Wording added 'radius of the sphere = radius of the base of the cone = r'. Wording added 'slant height of the cone = l'; 'Surface area of sphere = $4\Pi r^2$' Wording added 'Curved area of cone = Πrl' Dashed lines made longer and thicker. Diagram headings moved above the diagrams. Labels moved to the left side. Models provided.	Standard mark scheme

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

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
13	18.6	M1	for use of Pythagoras eg, $(-5 - 6)^2 + (8 - -7)^2$ or $121 + 225$ or 346 or $\sqrt{346}$	
		A1	answer in the range 18.6 to 18.61	If a correct answer within the range is shown in working but incorrectly rounded award full marks

Question	Answer	Mark	Mark scheme	Additional guidance
24	$4\left(2+\sqrt{2}\right)a^2$	P1	for process to find area required and identifying 135° or 45° or 90° angle(s), eg splitting shape into square and 4 triangles and an angle relevant to the triangle clearly identified.	90° must be in a triangle to gain credit. May be seen on diagram.
		P1	for process to find the area of a relevant triangle using 45°, eg $\frac{1}{2}\times a\times\left(2\times\frac{a}{\sqrt{2}}\right)\times\frac{1}{\sqrt{2}}\left(=\frac{a^2}{2}\right)$ or using 90°, eg $\frac{1}{2}\times a\times a\left(=\frac{a^2}{2}\right)$ or process to find the area of a square made from 2 small triangles, eg $a\times a\left(=a^2\right)$	Accept $0.49...a^2$ May be seen as the area of 2 squares (from 4 small triangles)
		P1	for process to find the length of the square, eg $a+a+\sqrt{a^2+a^2}\left(=2a+a\sqrt{2}\right)$	Accept $3.41a$
		P1	for process to find the total area, eg $\left("2a+a\sqrt{2}"\right)^2+4\times"\frac{a^2}{2}"$	Accept $(11.655+4\times0.49)\,a^2$
		A1	(dep on P3) for $4\left(2+\sqrt{2}\right)a^2$	Answer only award no marks. If working in decimals accept $\frac{13.656}{2+\sqrt{2}}$ leading to 4 Accept $p=4$ if supported by correct working

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

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

		Modification	Mark scheme notes
4	(b)	Wording added 'Look at the diagram for Question 4(b) in the Diagram Booklet. It shows a number line'. Wording removed 'below'. Diagram enlarged. Open headed arrow. Axis label moved to the right of the horizontal axis.	Standard mark scheme
4	(c)	Letter 'g' changed to 't'.	Standard mark scheme but note letter change.
5		Wording added 'Look at the diagram for Question 5 in the Diagram Booklet. It shows a triangle ABC and a rectangle PQRS.' Wording removed 'Here is a triangle and a rectangle.' Triangle labelled ABC. Rectangle labelled PQRS. Diagram enlarged. Diagrams stacked vertically. Right angle made more obvious. Shape labels moved to the left and to above the rectangle. Wording added 'In triangle ABC: AB is marked $6x$; BC is marked 8; Angle ABC is a right angle. In rectangle PQRS: PQ is marked 5; PS is marked $4x - 1$'	Standard mark scheme
7		Letter 'd' changed to 'n'.	Standard mark scheme but note letter change.
9		Wording added 'Look at the diagram for Question 9 in the Diagram Booklet. It shows a grid.' Wording added 'below' Table enlarged and left aligned. Letter 'a' changed to 'A'. Values changed in the table: 48 changed to 50; 64 changed to 65 Wording removed 'opposite' and replaced with 'in the Diagram Booklet.' Grid enlarged. No small squares. Black grid lines added. Open headed arrows. Right axis labelled. Axes labels moved to the top of the vertical axis and to the left of the horizontal axis	(a) Standard mark scheme using the amended numbers n in the table. (b) B1 for answer in the range 32.5 to 38.5 or ft their cf graph with a tolerance of ±2.5 (5 mm)
10		Wording added 'Look at the table for Question 10 in the Diagram Booklet.' Table enlarged and turned vertical.	Standard mark scheme
12		Wording added 'Look at the diagram for Question 12 in the Diagram Booklet. It shows the'. Wording removed 'The'; Wording removed 'lie'; Wording added 'the circumference of'. Diagram enlarged. Cross changed to a solid dot. Wording 'BC' removed and replaced with 'AD'. Labels moved to the left of the rectangle and inside the rectangle.	Standard mark scheme

		Modification	Mark scheme notes
13		Wording added 'Look at the diagram for Question 13 in the Diagram Booklet. It shows triangle ABC.'; Wording removed 'ABC is a triangle.' Diagram enlarged and rotated so AC is horizontal. Angle moved outside angle arc and angle arc made smaller. Wording added 'AB = 15 cm; AC = 18 cm; Angle ABC = 70°'	Standard mark scheme
16		Wording added 'Look at the diagram for Question 16 in the Diagram Booklet. It shows an incomplete histogram.' Diagram enlarged. Small squares removed. Bar heights changed: 0-20 is now 3 cm high, 20-30 is now 7 cm high, 30-40 is now 6 cm high. Open headed arrows. Shading changed. Right axis labelled. Axes labels moved to the top of the vertical axis and to the left of the horizontal axis. Value 28 changed to 30 and value 24 changed to 20. (a) Wording added 'in the Diagram Booklet'.	(a) M1 for using area to represent frequency eg 12 (cm^2) represents 30 (students) or showing a correct scale on fd axis A1 Bar of height 2 cm drawn for interval 40 – 60 hours (b) M1 for method to find total area under the histogram, eg $(4 \times 3) + (2 \times 7) + (2 \times 6) + (4 \times 2)$ (= 46) oe **or** for method to find total frequency, eg 30 + 35 + 30 + 20 oe A1 for 115 cao
18		Letter '*a*' changed to '*p*'; Letter '*b*' changed to '*q*'; Letter '*c*' changed to '*r*'.	Standard mark scheme but note change of letters.
19		Wording added 'Look at the diagram for Question 19 in the Diagram Booklet. It shows a right-angled triangle ABC.' Wording removed 'ABC is a right-angled triangle.' Diagram enlarged. Right angle made more obvious. Angle label moved outside angle arc and angle arc made smaller. Wording added 'Angle ABC is a right angle. Angle ACB is marked *x*.'	Standard mark scheme

		Modification	Mark scheme notes
20		Wording added 'Look at the diagram for Question 20 in the Diagram Booklet. It shows a triangle ORT.' Wording removed 'ORT is a triangle.' Diagram enlarged. Open headed arrows. Arrow heads enlarged. Line at M changed to a solid circle. Dashed line added for MT.	Standard mark scheme
21	(a)	Wording removed 'Here is the graph of $y = f(x)$'. Diagram removed. Wording added 'Look at the diagram for Question 21(a) in the Diagram Booklet. It shows the graph of $y = f(x)$' Wording 'grid below' removed and replaced with 'diagram'. Axes labels moved to the top of the vertical axis and to the right of the horizontal axis. Grid enlarged. $y = f(x)$ graph line added.	Standard mark scheme
21	(b)	Wording added 'Look at the diagram for Question 21(b) in the Diagram Booklet. It shows the graph of $y = f(x)$' Wording 'grid below' removed and replaced with 'diagram'. Axes labels moved to the top of the vertical axis and to the right of the horizontal axis. Grid enlarged. $y = f(x)$ graph line added.	Standard mark scheme
23		Wording added 'Look at the diagram for Question 23 in the Diagram Booklet. It shows'. Wording removed 'Here are'. Diagram enlarged. Arrow heads enlarged.	Standard mark scheme
24		Wording added 'Look at the diagram for Question 24 in the Diagram Booklet. It'. Wording removed 'The diagram'. Diagram enlarged. Shading changed. Letter 'a' changed to 't'.	Standard mark scheme but note change of letters.

Question	Answer	Mark	Mark scheme	Additional guidance
1	16.2	M1	for a correct first step to find *BC*, eg $19^2 = 10^2 + BC^2$ or $19^2 - 10^2$ $(= 261)$ or $\sqrt{19^2 - 10^2}$ or $\sqrt{261}$ or $3\sqrt{29}$	Can use alternative letter for *BC* provided intention is clear If using an alternative method using trigonometry must have *BC* as the only unknown
		A1	for answer in the range 16.1 to 16.2	ISW incorrect rounding if answer given in range

Question	Answer	Mark	Mark scheme	Additional guidance
8	35	P1	for one correct use of the given scale, eg $40 \div 5$ (= 8) **or** 28×5^2 (= 700)	Can award these marks in either order
		P1	for process to use area of triangle, eg $28 = \frac{1}{2} \times PQ \times [QR]$ **or** $[\text{area}] = \frac{1}{2} \times PQ \times 40$	[*QR*] must be clearly identified as the drawing length, and cannot be 40 [area] must be clearly identified as the real area, and cannot be 28
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
7	240	P1	for forming an appropriate equation, eg $2x + 11 = 4x - 4$ **or** $2x + 11 + 4x - 4 + 2x + 5 = 72$ **or** $8x + 12 = 72$	
		P1	(dep P1) for process to isolate terms in x for their equation, eg $4x - 2x = 11 + 4$ **or** $2x + 4x + 2x = 72 - 11 + 4 - 5$ **or** $x = 7.5$ oe	$8x = 60$ **or** $2x = 15$ implies P2 A correct length stated or shown on diagram implies P2 Eg $AB = 20$, $AC = 26$, $CB = 26$ [AC] [BC] [AB] [ACB] [CAB] and [BAC] must be clearly identified if incorrect. May be on diagram.
		P1	for correct application of Pythagoras, eg $("26")^2 - \left(\frac{"20"}{2}\right)^2$ **or** $[AC]^2 - \left(\frac{[AB]}{2}\right)^2$ **or** height = 24 **or** a complete method to find the height for a correct trig statement to find CAB or CBA or ACB, eg $\cos CAB = \cos CBA = \frac{"20" \div 2}{"26"}$ **or** $\cos CAB = \cos CBA = \frac{20^2 + 26^2 - 26^2}{2 \times 20 \times 26}$ **or** $\cos ACB = \frac{26^2 + 26^2 - 20^2}{2 \times 26 \times 26}$ **or** $CAB = 67.3\ldots$ **or** $CBA = 67.3\ldots$ **or** $ACB = 45.2\ldots$	$AB = 2 \times "7.5" + 5\ (= 20)$ $AC = 2 \times "7.5" + 11\ (= 26)$ $CB = 4 \times "7.5" - 4\ (= 26)$ Alternative scheme not expected on Foundation tier but may be seen.
		P1	for process to find area of triangle, eg "20" × "24" ÷ 2 **or** $[AB] \times [\text{height}] \div 2$ for process to find area of triangle, eg $\frac{1}{2} \times "26" \times "20" \times \sin "67.3..."$ **or** $\frac{1}{2} \times "26" \times "26" \times \sin "45.2..."$ **or** $\frac{1}{2} \times [AB] \times [AC] \times \sin [BAC]$ **or** $\frac{1}{2} \times [BC] \times [AC] \times \sin [ACB]$	ft incorrect figures providing at least one previous P1 awarded. [height] is what they clearly think is the height of the triangle but not 26 or 20 or 10
		A1	cao	

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
20	10.8	P1	for process to find FC, eg $\tan 52 = \frac{8}{FC}$ $(FC = 6.25(028..))$	
		P1	for process that will lead to side length of ABC, eg $\sin 60 = \frac{"6.25" \times 1.5}{BC}$ **or** $\cos 30 = \frac{"6.25" \times 1.5}{BC}$ **or** $("6.25" \times 1.5)^2 + (0.5x)^2 = x^2$ oe	
		A1	for answer in range 10.8 to 10.83	

Paper: 1MA1/2H

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
8 (a)	Proof	M1	for identifying angle *A* as common **or** for angle *AED* = angle *ACB* or angle *ADE* = angle *ABC* with appropriate reason(s) eg corresponding angles are equal or co-interior angles add up to 180 and angles on a straight line add up to 180	
		C1	for completing the proof by identifying a second pair of equal angles with appropriate reason(s) **and** a statement that the angles in each triangle are the same	Statement can be implied by identifying a third pair of equal angles (no reason needed)
(b)	6	P1	for a scale factor of 1.5 or $\frac{2}{3}$ oe **or** for $\frac{AE}{20}=\frac{18}{30}$ oe	
		P1	for a process to find the length of *AE*, eg 18 ÷ 1.5 (= 12) oe **or** $(AE =)\frac{20\times18}{30}$ oe **or** for a complete process to find the length of *EC*, eg $18\times(1-\frac{2}{3})$ oe	
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
8	44.9	P1	for process to find an expression for the area of the trapezium, eg ½(12 + *CD*) 8 or 8 × 12 + ½ × 8 × *x* **or** for process to find the area of the triangle, eg 112 – 8 × 12 (= 16)	*x* is the length of the line from *C* to where perpendicular from *B* meets *CD* Allow use of other letters in place of *CD* and *x* (do not have to be defined unless otherwise stated) Award P1 for 112 – 8 × 12 (= 16) even if not used
		P1	for forming an equation and isolating terms in the unknown length, eg 4*CD* = 112 – 48 **or** ½ × 8 × *x* = 112 – 8 × 12 **or** ½ × 8 × *x* = "16" **or** *CD* = 16 **or** *x* = 4	Award P2 for *CD* = 16 or *x* = 4 even if not used unless clearly from incorrect working eg 12 – 8 (= 4) Only award P2 for 16 if it is clearly identified as *CD*
		P1	for start of process to find length of *BC*, eg $8^2 + \text{"4"}^2$ (= 80) **or** $8^2 + [\text{their } x]^2$ **or** $\tan^{-1}\left(\frac{\text{"4"}}{8}\right)$ (= 26.5…) oe **or** $\tan^{-1}\left(\frac{8}{\text{"4"}}\right)$ (= 63.4…) where "4" can be [their *x*]	[their *x*] can be any value less than 12 or clearly identified as the length of the line from *C* to where perpendicular from *B* meets *CD* (may be seen on the diagram)
		P1	for $\sqrt{8^2 + \text{"4"}^2}$ or $\sqrt{64 + \text{"16"}}$ or $\sqrt{80}$ or $4\sqrt{5}$ (= 8.9…) oe or $\sqrt{8^2 + [\text{their } x]^2}$ **or** $\frac{\text{"4"}}{\sin\text{"26.5..."}}$ or $\frac{8}{\cos\text{"26.5..."}}$ or $\frac{8}{\sin\text{"63.4..."}}$ or $\frac{\text{"4"}}{\cos\text{"63.4..."}}$ where "4" can be [their *x*]	Award P4 for (*BC* =) $\sqrt{80}$ or $4\sqrt{5}$ or 8.9... unless *x* = 4 is clearly from incorrect working
		A1	for answer in the range 44.9 to 44.95	If an answer is shown in the range in working and then incorrectly rounded award full marks

Paper: 1MA1/3H

GCSE

Edexcel GCSE

Mathematics A 1387

Summer 2005
Mark scheme

Edexcel GCSE
Mathematics A 1387

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CONTENTS

Notes on Marking Principles 1

Paper 5521/01 3

Paper 5521/02 12

Paper 5523/03 18

Paper 5523/04 27

Paper 5525/05 37

Paper 5525/06 45

NOTES ON MARKING PRINCIPLES

1 Types of mark

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

2 Abbreviations

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

3 No working

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

4 With working

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

5 Follow through marks

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

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

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

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

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

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

Paper 5521/01

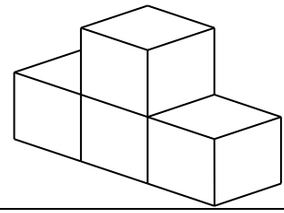
No	Working	Answer	Mark	Notes
4	286 × 43 = 858, 11440, 12298 43 × 286 = 258, 3440, 8600, 12298 286×40 = 1140 286×3 = 858 1140+858=12298 x | 40 | 3 | 200 | 8000 | 600 | 8600 80 | 3200 | 240 | 3440 6 | 240 | 18 | 258 | | | 12298 2 8 6 1 | 0 8 | 3 2 | 2 4 | 4 2 | 0 6 | 2 4 | 1 8 | 3 2 9 8	12298	3	M2 for complete correct method (condone one computational error) (M1 for complete correct method with two computational errors) A1 cao OR B2 inside of grid completed (condone missing zeros and one error) (B1 2 or 3 errors) B1 cao
5 (a)		18, 69	1	B1
(b)(i)		18 or 36	1	B1
(ii)		16 or 36	1	B1
(c)		factor	1	B1
(d)(i)		18	3	B1 cao
(ii)		11 or 88		B1
(iii)		69		B1 cao

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

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

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

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

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

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

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

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

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

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

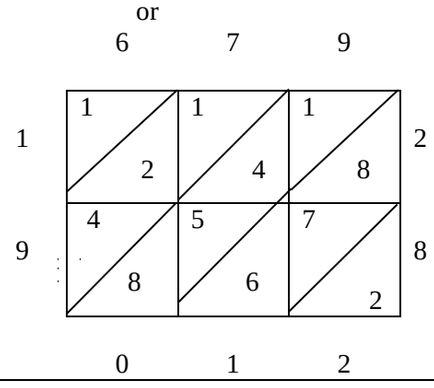
Paper 5521/02					
No		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		1.5 – 2.0	1	B1 for height between 1.5m – 2.0m inclusive
	(b)	Height of man × "2.5"	3 – 6	3	B3 for height between 3m – 6m inclusive (B2 for multiplying (a) by a number between 2 and 3 inclusive) (B1 for multiplying (a) by a number)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

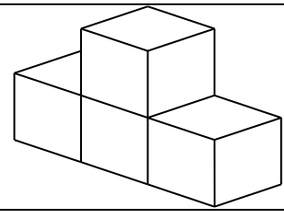
Paper 5521/02					
No		Working	Answer	Mark	Notes
19	(a)		Correct plane	2	B2 for a correct plane defined by showing at least 2 lines. (B1 for a line of symmetry on one face)
	(b)		Correct net	2	B2 cao (B1 for 2 equilateral triangles joined appropriately to at least one rectangle or for 1 equilateral triangle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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

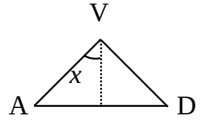
Paper 5525/06					
No		Working	Answer	Mark	Notes
12	(a)	$84 = 6.7\pi + 2 \times 6.7 + 2a$ $2a + 13.4 = 62.95\ldots$ or $2a + 34.44 = 84$	24.8	3	M1 for substituting correctly, π may be left M1 for correct rearrangement as far as $\pm 2a$ A1 for $24.7 - 24.8$
	(b)	$P = \pi r + 2r + 2a$ $P - 2a = \pi r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

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

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

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

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

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

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

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

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Mark Scheme (Results)

June 2012

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

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

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

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*1		Angle *BED* = 68° 180 – (68 + 68) OR Angle *BEF* = 180 – 68 = 112 Angle *BED* = 180= 112 = 68 180 – (68 + 68)	x = 44°	4	M1 for Angle *BED* = 68° seen in the diagram or correctly used in the working space M1 for 180 – 2 × "68" A1 for x = 44° (accept angle *BDE* = 44°) [Note: 44° only seen in the body of the script without the "x =" gets M1M1A0] C1 (dep on at least M1) for alternate angles are equal (or equivalent) and one other reason; either angles in a triangle add to 180° or base angles of an isosceles triangle are equal OR for allied angles (or equivalent, eg co-interior) add up to 180° and angles on a straight line add up to 180° and one other reason; either angles in a triangle add to 180° or base angles of an isosceles triangle are equal
2			4n + 2	2	B2 for 4n + 2 oe (eg 4×n + 2 or n4 + 2, …) or nth = 4n + 2 (B1 for a linear expression in 4n e.g. 4n + a ($a \neq 2$) or n = 4n + 2) (B0 for n = 4n and n + 4)

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

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

5MB2H_01

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

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

	500	10	5
30	15000	300	150
5	2500	50	25

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

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

5MB2H_01

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

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

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

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

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

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

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

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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

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.

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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÷2 = 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...÷ 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 × 1000 × 1000	4 500 000	2	M1 for complete method equivalent to 4.5 × 1000 × 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}

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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.

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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.

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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**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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NOTES ON MARKING PRINCIPLES

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

2 Mark schemes should be applied positively.

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

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

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

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

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

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

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

7 With working

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

8 Follow through marks

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

9 Ignoring subsequent work

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

10 Probability

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

PMT

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

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

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

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Mark Scheme (Results)

Summer 2016

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

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NOTES ON MARKING PRINCIPLES

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

2 Mark schemes should be applied positively.

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

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

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

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

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

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

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

7 **With working**

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

8 **Follow through marks**

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

9 **Ignoring subsequent work**

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

10 **Probability**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

PMT

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

PMT

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

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Question 8

A large proportion of students were able to score at least one mark for their responses to this question. Responses were usually clearly expressed.
Part (a) was answered well. The most common description of the mistake that Sarah made was to state that the first line should read $BC^2 = AC^2 - AB^2$ or equivalent, for example that she should be subtracting not adding the numbers. A common but unacceptable response was that the mistake was not to show the square root sign over the 100.
Part (b) was also answered well with most students stating that the scale factor is 2.5 and not 1.5 as required and many other students who explained that the length of one side of the enlarged triangle was incorrect together with a statement of what the length should be. The most common unacceptable response referred to C being the wrong centre of enlargement.

Question 7

The last of the common questions found most students being able to gain some credit. A good proportion of students realised that the first step was to use Pythagoras' Theorem to find the missing length of the right-angled triangle. However, to this end there were many students who used Pythagoras' Theorem incorrectly, adding rather than subtracting. The third process mark was available then for any student, even those unable to find the missing length, and it was good to see many examples of good exam technique to access this mark. Stating or using the correct formula for the area of a quadrant was all that was required and it was awarded to many students. The demand in the question asked for students to show all of their working and it was pleasing to see this instruction followed by this cohort.

Question 6

Many of the attempts to work out the height of the triangular prism failed because students treated the shape as a cuboid and worked with length × width × height. This meant that 6 was a very common incorrect answer. Some of the students who gained the first mark for dividing 750 by 25 to find the area of the cross section made no further progress but most went on to make an attempt at finding the height of the triangle. These attempts were often not successful because students failed to take into account the fact that the cross section was a triangle. Some students wrote an equation such as $\frac{1}{2} \times 5 \times h \times 25 = 750$ and were awarded the first two marks but they were not always able to solve their equation correctly. For those students who had gained no process marks yet had only omitted division by 2 there was a special case mark for a final answer of 6.

Question 5

The first real problem question on the paper and it was good to see the majority of students were able to spot the need to use Pythagoras' Theorem to find the length of the hypotenuse. It was also really pleasing to see that once that had been identified, most were then able to score 2 marks for completing the process to find the missing length of the triangle. At this stage many understood the need to add the sides to find the perimeter, but a significant number were unable to complete this process successfully. A common misconception was to find the perimeter of one triangle and then double it, thus not dealing with the overlapping sides.

Question 10

This question involving similar right-angled triangles was well answered by a minority of students. There were two main routes used by students who scored full marks. Some students used a scale factor together with Pythagoras' rule while other students used trigonometry to find the size of angle *B* then went on to use trigonometry again to find the length of side *CB*. Of those students who could only be awarded partial credit for their attempts, most scored the mark for using Pythagoras' rule correctly to find the length of *EB*. Unfortunately, they often then used a scale factor of 1.5 instead of 2.5 or failed to make any further progress.

Question 13

This was an unfamiliar type of question but even so it was not answered as well as might have been expected. Many students recognised that the question required the use of Pythagoras and wrote down Pythagoras' theorem, often as it appears on the formula sheet. This alone was not sufficient for the first mark – the statement of Pythagoras needed to be linked in some way to the question. Many students did this by labelling the sides of the

triangle in the diagram and using these letters in Pythagoras' theorem, some students explained what the letters they used represented. Some students labelled the sides as a^2, b^2 and c^2 and used these incorrectly or used the labels from the diagram to form their Pythagoras equation which was not worthy of any marks unless A, B and C were either clearly linked to the diagram or clearly defined as being the diameters of the semi-circles. It was very disappointing that relatively few students scored the second mark for writing correct expressions for the areas of at least two of the three semicircles. It was very common to see the diameters being used instead of the radii in πr^2 and for expressions to be given for the areas of circles instead of semicircles. Students who labelled the sides $2a$, $2b$ and $2c$ found it easier to write correct expressions for the areas but harder to write a Pythagoras statement. Those who did write correct expressions for the areas were then often not able to complete the chain of reasoning to give a fully correct answer. Students should be encouraged to use brackets correctly. The omission of brackets was rarely recovered and resulted in a loss of marks. Students who used numerical values for the sides of the triangle were still able to access the first two marks but a surprising number of these students were unable to write correct expressions for the areas and gained the first mark only.

Question 1

This question provided a good start to the paper. Most students gained the full 2 marks. However, a significant number of students did not apply Pythagoras' rule correctly and instead added 4^2 and 8.5^2. These students could not be awarded any marks. It was surprising to see many students forget to take a square root and give the answer 56.25. A brief recap of the diagram might have alerted some students to there being an error in their working. In a small number of cases, trigonometry was attempted but the method was often incomplete and so no marks could be awarded.

Question 18

It is encouraging to report that the majority of students gained some credit for their attempt at this question. The length of *TC* was often found successfully and a good proportion of students were also able to find the length of at least one of *SD* and *TD*. Only the higher attaining students were able to identify the angle which was required and put everything together in order to find the size of this angle, that is the size of angle *DTS*. Errors commonly seen included, substituting 12 and 14 incorrectly into the formula for the area of the cross section and making an error in the use of Pythagoras' rule to find the length of *DT*.

Question 24

In part (a) many of the students who gained the first mark for equating the two volumes were not able to go on and find the correct ratio. Those that got as far as writing $4r = h$ often gave the ratio $r : h$ as 4 : 1 instead of 1 : 4.

The majority of students made no attempt at part (b) and very few managed to gain more than one mark. The first mark was awarded for equating the surface area of the sphere with the

surface area of the cone but a common error here was to omit the area of the base of the cone and write $4\pi r^2 = \pi rl$. Students making this error could still be awarded the next two process marks if they went on to substitute for l and isolate the terms in r^2.

Summary

Based on their performance on this paper, students should:

- practise their arithmetic skills, particularly division and operations with decimals
- take care when carrying out arithmetic operations and check their working to avoid careless errors
- read each question carefully and ensure that their final answer matches the question asked
- practise subtracting one algebraic expression from another, especially expressions with negative terms, and use brackets more efficiently
- practise finding angles using the circle theorems and stating the circle theorems used

Question 4

This is the first AO3 question on the paper and required 3 main processes. The first of which was to find the total area, and there were two marks assigned to this, the first for correctly finding 3 areas and the second for finding all 4. The second process was to find the number of bags of grass seed that is needed. This could be gained for finding this for a single area or a combination. Finally, the candidates had to round the number of bags up to gain the number needed to buy, and multiply by £10.95 to find the total cost.

Almost all candidates were able to gain some marks, even if just for correct areas. This was as often seen for 2 rectangles and the quadrant, as it was for 2 rectangles and the triangle. Most were then able to gain the mark for dividing by 14. The two major causes of errors were learners not having all four areas correct, as this was needed to gain the 3rd mark. The other common error was for candidates to not round the number of bags up to the nearest integer and so found a cost that was inaccurate.

Question 13

This is a topic that has not been assessed regularly, and it showed in the quality of candidates' responses. Very few candidates realised this required the use of Pythagoras. The most common incorrect response seen was to find the gradient of the line *AB*. It is evident that centres have not spent much time on the topic and further work is needed.

Question 24

The final question on the paper was a challenging shape problem requiring candidates to find an expression for the area of an unfamiliar shape. The most common approach was to split the shape into a square and 4 identical triangles. By doing this and correctly identifying an angle inside or outside of the triangle, candidates were able to gain the first mark. To gain the second and third they needed an expression for the area of one of the triangles, or the length of the side of the square. The former was awarded more regularly, as many spotted that the triangles were right-angles and isosceles. The length of the square proved more challenging as it involved using Pythagoras and surds. The final process mark was to put it altogether to form an expression for the total area, before simplifying it to the given form. Although there were some excellent responses, some candidates were let down by the accuracy of their algebra, and we also saw candidates guessing the value of p, but without supporting algebra, this gained no credit. A successful method seen, other than the square and four triangles split, was to split the shape into 8 triangles, 2 trapezia and 1 rectangle. Several responses started with finding the hypotenuse of the small triangle or the area but did not get beyond this. There was evidence that candidates were not very confident at manipulating numbers inside a square root. Some had trouble with

simplifying $\sqrt{2a^2}$ to $a\sqrt{2}$ after using Pythagoras theorem to find the length of the hypotenuse of the small triangle.
If candidates did correctly expand the expression for the area of the square and added on the triangle areas, they were usually able to work backwards from the final answer to rearrange their expression correctly.

Summary

Based on the performance on this paper, students should:

- ensure they are using efficient calculator methods
- take extra care when working in algebra and show each step carefully, and remember the importance of brackets and the length of the lid on root signs
- spend more time interpreting statistical diagrams such as cumulative frequency curves and histograms with unequal class intervals
- read the demand of questions carefully so as to fully understand what the question expects in terms of approach for answering, and also the form in which the answer is expected
- remember that trial and improvement methods should be discouraged
- work on geometrical topics such as the sine rule and ensure that angles are labelled correctly, either using 3 letter notation or on the diagram if introducing a new variable such as x
- ensure candidates are fully prepared for the planned withdrawal of the exam aid for future series

Question 1

This question was a straightforward Pythagoras theorem application and was a positive start for most students, with them gaining the two marks available. A small proportion of students, as is expected, mixed up the formula and worked as if they were finding the hypotenuse rather than one of the shorter sides. This typically resulted in no marks. Some knew to square and subtract but forgot to take the square root. These students were able to gain the first mark. Some attempted to use trigonometry but tended to get no further than trying to find a missing angle.

Question 8

There were two processes in this question, a use of scale and a use of the formula for the area of a triangle. The more successful students used the scale first on *RQ* to get a drawing length of 8 cm. This was then used correctly with the area of the scale drawing to find *PQ*, which was then scaled back up to get the real length.
The other method was to scale up the area first, and then use the real length of *RQ* to find the real length of *PQ*. This method was the better of the two as it seems to have less steps.

However, most who attempted this method only multiplied the area by the length scale factor of 5, not the area scale factor of 5^2, and as a result could only gain the one mark. It was common to see a correct scaling of 8 for the length together with an incorrect scaling of 140 for the area, and this was considered to be a choice of methods.

Question 7

Another problem-solving question, and this one worth five marks. The first is for forming an appropriate equation using the information on the diagram. Either summing all sides to 72, or for equating the two equal sides. The second for the process to isolate the terms in x.
Many learners were able to gain both marks. It was more common to see the longer equation set to 72, but most were able to then manipulate the algebra and typically solve to find the value of x.
The next two marks were then for a process to find the area of the triangle. This could be done in two main ways. The first, and most common, was to use Pythagoras' theorem to find the perpendicular height of the triangle and then use the standard formula for the area of a triangle. The second method was to use either standard trigonometry or the cosine rule to find one of the angles in the triangle and then $\frac{1}{2}ab\sin C$ to find the area. These marks were less commonly earned than the previous two. Of those who attempted Pythagoras, many forgot to halve the base of the large triangle when finding the height. Even if was the case, the final mark could still be awarded if what they believed to be the height was clearly stated, and not one of the other lengths in the question. Those who attempted some forms of trigonometry were often the more accomplished mathematicians and as such typically went on to complete the question successfully.
Overall, the full range of marks was awarded and the majority scored at least 2.

Question 20

Although there were not as many steps as we often see on a 3D trigonometry problem here, many candidates struggled to make a start to the question. The first step to find FC proved conceptually too difficult and many either didn't attempt, or used a method that would lead to VC not FC. This could then lead to FC with a second step using Pythagoras, but this was normally missing.
If learners did find FC, they then had to use the ratio to find MC along with Pythagoras to form an equation for the side length. Alternatively, they could use MC along with either the $60°$ or $30°$ angle and trigonometry. Neither were seen often, but those who got this far generally gained the accuracy mark.

Question 8

In part (a), a proof that triangle *ABC* is similar to triangle *ADE* was required and this appeared to be particularly challenging with many responses unsure of what was required. Those responses that showed some understanding of what they needed to do often gained the first mark for identifying angle *A* as common or for stating that angle *AED* = angle *ACB* or angle *ADE* = angle *ABC* and giving an appropriate reason. This mark could not be awarded when reasons were incomplete or poorly expressed. Reasons given to explain why angle *ADE* = angle *ABC*, for example, often referred only to parallel lines and did not mention corresponding angles. Equal pairs of angles were often identified with no reasons given and so no marks could be awarded. To complete the proof, it was necessary to identify a second pair of equal angles with an appropriate reason and give a statement that the angles in each triangle are the same. Many responses tried to prove that the two triangles are similar by using the conditions for congruency and it was common to see working that ended with SAS or ASA or RHS. These responses could gain at most one mark. Many responses contained only numerical work, often involving the scale factor, and these gained no marks.

In part (b), many responses were able to score all three marks for working out the length of *EC* as 6 cm. Finding the scale factor earned the first mark and a process to find the length of *AE*, such as 18 ÷ 1.5, earned the second mark. Some responses did not gain the final mark because 12 was given as the final answer. Giving the scale factor in ratio form earned the first mark but a common mistake was to then divide 18 in the ratio 2 : 3 which resulted in answers of 7.2 or 10.8. A common incorrect approach that gained no marks was 30 – 20 = 10 followed by 18 – 10 = 8. There were many incorrect attempts that involved Pythagoras' rule or areas of triangles and trapeziums.

Question 8

Most responses began by either applying the formula for the area of a trapezium or by dividing the shape into a rectangle and a triangle to calculate the area. Both methods were generally successful in gaining the first two marks, either for identifying the length of *CD* or the length from point *C* to the point where the perpendicular from *B* meets *CD*. The trapezium formula route was more complex and occasionally led to errors, such as using 12 and 8 as the parallel sides or incorrect rearrangement of the formula, resulting in an inaccurate value for *CD*. Some responses used an incorrect triangle area formula, often omitting the division by 2 after multiplying the base and height.

Where the initial steps were not completed accurately, many responses still gained marks through correct use of Pythagoras' Theorem. While this was generally applied correctly, some responses involved subtracting rather than adding the squares of the sides, which prevented progress. A small number attempted trigonometry to find the length of *BC,* but this method was rarely successful. A few responses began by forming a right-angled triangle *DAB* and used Pythagoras' Theorem to calculate *BD*, which did not lead to further progress.

Some responses could not gain the final accuracy mark due to incorrectly including the internal length of 8 cm in the total or by leaving the correct answer in surd form. Use of the formula sheet and practice with substituting values and rearranging formulae would support improved accuracy. Arithmetic errors were also noted and often affected the final mark, highlighting the importance of checking calculations carefully.