Chhetri Academy

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GCSE MATHS

Geometry and measures

Edexcel 1MA1 | Subtopic collection Topic 48

Transformations

Higher tier

Answers and examiner comments

80	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 6

The full source mark scheme begins on page 124. Use the original paper code, tier and question number shown above.

Original question 21

The full source mark scheme begins on page 124. Use the original paper code, tier and question number shown above.

Original question 12

The full source mark scheme begins on page 178. Use the original paper code, tier and question number shown above.

Original question 6

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

Original question 4

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

5	(a)		116	1	B1 for 116 [accept 114 if 116 seen on the dotted line in the sequence]
	(b)		112	1	B1 cao
	(c)		it is odd (and all the terms are even)	1	B1 for a correct reason

2		$30-(16+9)$	5	2	M1 30 - "(16 + 9)" or "30 − 16" − 9 or "30 − 9" − 16 A1 cao

4	(a)		Enlarged P	2	B2 any correct enlargement (B1 at least one side drawn to a sf of 3) tol $\frac{1}{2}$ sq (B1 correct enlargement by SF $\neq$ 3)
	(b)	Triangle at (2,–1),(3,–1),(2,–3)	Rotated Q	3	B3 fully correct (B2 correct orientation in correct quadrant or 90° anticlockwise about *O*) (B1 any rotation about *O* OR correct orientation in incorrect quadrant). SC B1 If Q is plotted correctly in all 4 quadrants then award

1380 3H

1380/3H

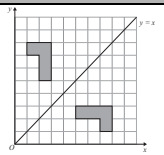
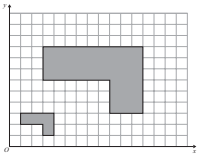
Question		Working	Answer	Mark	Notes
9			Rotation 180° Centre (0, 1)	3	B1 for rotation B1 for 180 (or half turn) B1 for (0, 1) OR B1 for enlargement B1 for scale factor −1 B1 for (0, 1) (B0 for any combination of transformations)

5			Triangle at (1,-2), (-1,-2), (1,-5)	2	B2 for triangle at (1,-2), (-1,-2), (1,-5) (B1 for rotation of 180° about the wrong centre or for a rotation of $90°$, centre (1,0) clockwise or anticlockwise)

6			Enlargement scale factor 2 centre (1,0)	3	B1 for enlargement B1 for scale factor 2 oe (eg 'x2',' by 2',' of 2') B1 for (1,0) [condone omission of brackets and/or the word 'centre'; do not accept a vector] Note: A combination of transformations gets NO marks

1380_3H
Summer 2010

12	(a)		Correct description	3	B1 for rotation B1 for about (0,0) B1 for 180° (accept half turn) NB: If more than one transformation seen then B0
	(b)		triangle with vertices (6, 1) (6, 4) (5, 4)	1	B1 cao

Question	Working	Answer	Mark	Notes
5 (a)			2	B2 cao (B1 for shape in the correct orientation above the line y = *x* or for shape elongated or shortened by one square but with either top or bottom in the correct position and in the correct orientation)
(b)			3	B3 for correct enlargement in correct position (B2 for enlargement SF 3 in incorrect position or enlargement, centre *O*, but different scale factor) (B1 for 4 lines enlarged by SF 3 or enlargement, not from *O*, different scale factor)

7	(a)		Reflection	2	B2 for vertices of shape plotted at (-3, 2), (-3, 3), (-5, 3), (-6, 2.5), (-5, 2) (B1 for a reflection in any vertical or horizontal line)
	(b)		Translation; $\begin{pmatrix}-6\\-1\end{pmatrix}$	2	B1 for translation B1 (indep.) for 6 left and 1 down OR $\begin{pmatrix}-6\\-1\end{pmatrix}$ Note B0 if more than one transfomation given

1380_3H

2			Correct enlargement s.f. $\frac{1}{2}$, centre P	3	B3 for correct enlargement s.f. $\frac{1}{2}$ centre P (B2 for correct enlargement s.f. $\frac{1}{2}$, incorrect centre or correct enlargement P, s.f $\neq \frac{1}{2}, 1$, centre P) (B1 for correct enlargement s.f $\neq \frac{1}{2}, 1$,, incorrect centre or for 2 sides correctly enlarged, s.f. $\frac{1}{2}$)

8			draw rotation	2	B2 for correct rotation, correct centre (B1 for correct orientation or 90° anticlockwise about O)

1380_4H

Question		Working	Answer	Mark	Notes
5	(a)	Vertices at (–4, 2), (–4, 0), (0, 0) and (–2, 2)	Correct translation	2	M1 for any translation A1 cao
	(b)	Vertices at (4, 4), (2, 4) and (2, 8)	Correct reflection	2	M1 Line $y = x$ drawn or correct reflection in $y = -x$ A1 cao

Original question 9

The full source mark scheme begins on page 229. Use the original paper code, tier and question number shown above.

Original question 18

The full source mark scheme begins on page 229. Use the original paper code, tier and question number shown above.

8	(a)		Triangle with vertices (2,–1) (4, –1) (4, –4)	2	B2 for triangle with vertices (2,–1) (4, –1) (4, –4) (B1 for triangle in correct orientation **or** rotated 90° anticlockwise centre *O*
	(b)		Triangle with vertices (7, 2) (13, 2) (7, 11)	3	B3 for triangle with vertices (7, 2) (13, 2) (7, 11) (B2 for 2 vertices correct or enlargement scale factor 3 in wrong position or enlargement, centre (1,2), with different scale factor) (B1 for 1 vertex correct or enlargement, not from (1,2), different scale factor)

Question		Working	Answer	Mark	Notes
1		15 ÷ 3 × 4 =	20 cm	3	M1 for 4 × 5 or 3 × 5 or $\frac{3}{15}$, $\frac{15}{3}$, $\frac{3}{4}$, $\frac{4}{3}$, or equivalent values, or 4:20 oe, or identification of 5 as the scale factor of enlargement. A1 cao C1 (indep) for units: cm stated on answer line or with "20" in the working space if not given on answer line.

6			Rotation 90° clockwise centre (1,1)	3	B1 for rotation B1 for 90° clockwise or 270° anticlockwise B1 for (1,1) (B0 for any combination of transformations)

5MB3H_01

6			Enlargement, scale factor 2.5, centre (0,0)	3	B1 for enlargement B1 for scale factor 2.5 oe B1 for (0,0); accept origin or *O* NB: if two different transformations are stated then 0 marks.

2	(a)		Triangle with vertices (1, 5) (4, 5) (4,7)	2	B2 correct reflection (B1 a translation of the correct answer with the final shape above $y = x$ **or** any two correct vertices) SC : B1 for a triangle with vertices at (2, 5) (4, 5) (4, 8)
	(b)		Translation by $\begin{pmatrix} -2 \\ -4 \end{pmatrix}$	2	B1 Translation B1 $\begin{pmatrix} -2 \\ -4 \end{pmatrix}$ NB. Award no marks for a combination of transformations

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*3		3× £193.86 = £581.58 £581.58 ×0.85=£494.343	£494.34	5	M1 3 × 193.86 (= 581.58) B1 ft correct discount % identified or used in working (may be identified in table) M1 '581.58'× '0.15' (=87.23(7)) M1 (dep on the previous M1) '581.58' − '87.23(7)' (= 494.34(3) **or** 494.35) C1 (dep on all method marks) for £494.34 **or** £494.35 identified as final answer with correct money notation **OR** M1 3 × 193.86 (= 581.58) B1 ft correct discount % identified or used in working (may be identified in table) M2 '581.58'× '0.85' **(=** 494.34(3)) (M1 '581.58' × '1.15' (=668.81(7)) C1 (dep on all method marks) for £494.34 **or** £494.35 identified as final answer with correct money notation **NB. Throughout, values may be rounded or truncated to 2 decimal places**

1MA0_2H

Question		Working	Answer	Mark	Notes
10	(a)		reflected shape	2	B2 correct triangle drawn with vertices (4,4), (5,4) and (5,6) (B1 for a correct reflection in $x = a$)
	(b)		rotation centre (0,1) 90° anti-clockwise or 270° clockwise	3	B1 rotation B1 about the centre (0,1) B1 90° anticlockwise or 270° clockwise **NB** If more than one transformation seen then B0

Question		Working	Answer	Mark	Notes
18		**Q** at (– 3, 1), (– 6, 1) (–5, 3) (– 3, 3) **R** at (–3, – 1), (–6, – 1), (–5, – 3) (–3, –3)	Rotation 180° about (–1, 0)	3	M1 for showing **R** correctly on the grid without showing **Q or** for showing **Q and R** correctly on the grid A1 for rotation of 180° A1 for (centre) (–1, 0) **Or** M1 for showing **R** correctly on the grid without showing **Q or** for showing **Q and R** correctly on the grid A1 for Enlargement Scale Factor –1 A1 for centre (–1, 0) **NB** Award no marks for any correct answer from an incorrect diagram or any Accuracy marks if more than one transformation is given

22		Vertices at (–2, –4), (–4, –4), (–4, –6), (–2, –5)	Correct diagram	3	M1 for a similar shape in the correct orientation in the third quadrant M1 for an image in the correct orientation of the correct size A1 cao

1MA0_1H

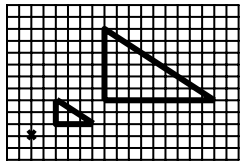
10			Translation; $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$	2	B1 for translation B1 for $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$ NB: B0 if more than one transformation given

Original question 7

The full source mark scheme begins on page 249. Use the original paper code, tier and question number shown above.

7	(a)	(4,0) (3, 0) (3, -1) (2, -1) (2, 2) (4, 2)	Correct position	2	B2 for correct shape in correct position (B1 for any incorrect translation of correct shape)
	(b)		Rotation 180° (0,1)	3	B1 for rotation B1 for 180° (ignore direction) B1 for (0, 1) **OR** B1 for enlargement B1 for scale factor -1 B1 for (0, 1) (NB: a combination of transformations gets B0)

PAPER: 1MA0_1H

2				3	B3 for fully correct triangle (B2 for 2 vertices correct or enlargement scale factor 3 in wrong position or enlargement, centre *A*, with different scale factor) (B1 for 1 vertex correct or enlargement, not from *A*, different scale factor)

14		**B** at (3, –1), (5, –1), (5, –4) **C** at (–1, –1), (–3, –1), (–3, –4)	Rotation of 180° about (1,0)	3	M1 for showing **C** correctly on the grid without showing **B** or for showing **B** and **C** correctly on the grid A1 for rotation of 180° A1 for (centre) (1,0) OR M1 for showing **C** correctly on the grid without showing **B** or for showing **B** and **C** correctly on the grid A1 for enlargement scale factor –1 A1 for (centre) (1,0) **NB** Award no marks for any correct answer from an incorrect diagram and no A marks if more than one transformation is given

PAPER: 5MB3H_01

6	(a)		Shape with vertices at (–1, 3), (0, 6), (2, 6), (1, 3)	1	B1 for correct shape in correct position
	(b)		Rotation centre (0,0) 90° anticlockwise	3	B1 rotation B1 (centre) (0,0) B1 90° anticlockwise or 270° clockwise Note: award no marks if more than one transformation is given

PAPER: 1MA0_1H

23			Triangle with vertices at (–1,–4), (–1,–5), (–3,–4.5)	2	M1 for correct shape and size and the correct orientation in the wrong position or two vertices correct A1 cao

PAPER: 1MA0_1H

Question	Working	Answer	Mark	Notes
1 (a)		Reflection in $x = 0$ or y-axis	2	B1 for reflection B1 for $x = 0$ or y-axis (NB: a combination of transformations gets B0)
(b)		Triangle (1, 0)(4, 0)(1, –2)	2	M1 for any correct rotation of 90° clockwise OR for any correct rotation about the point (0, 2) A1 for a triangle with vertices at (1, 0), (4, 0) and (1, –2)

Question	Working	Answer	Mark	Notes
1 (a)		Reflection in $x = 0$ or y-axis	2	B1 for reflection B1 for $x = 0$ or y-axis (NB: a combination of transformations gets B0)
(b)		Triangle (1, 0)(4, 0)(1, –2)	2	M1 for any correct rotation of 90° clockwise OR for any correct rotation about the point (0, 2) A1 for a triangle with vertices at (1, 0), (4, 0) and (1, –2)

PAPER: 1MA0_1H

Question		Working	Answer	Mark	Notes
9	(a)		Shape drawn	2	B2 for shape with vertices at (0, –1), (–1, – 3), (–2, –3), (–2, –1) (B1 for rotation of 180° about the wrong centre)
	(b)		Triangle drawn	2	B2 for triangle with vertices at (6, 9), (9, 9), (9, 3) (B1 for 2 vertices correct or enlargement sf 3 in wrong position or enlargement, centre (0, 0), but sf >1, ≠ 3)
*10		1.18 ÷ 4 = 0.295 (118 ÷ 4 = 29.5) 1.74 ÷ 6 = 0.29 (174 ÷ 6 = 29) 1.18 ÷ 2 = 0.59 1.74 ÷ 3 = 0.58 1.74 × 4 = 6.96 1.18 × 6 = 7.08 1.74 × 2 = 3.48 1.18 × 3 = 3.54 1.18÷2×3=1.77 1.74÷3×2=1.16 4÷1.18=3.3(…) 6÷1.74=3.4(…)	6 pints	3	M1 for division of price by quantity for both bottles or division of quantity by price for both bottles or complete method to find price of same quantity of milk A1 for two correct values that could be used for a comparison C1 ft (dep on M1) for comparison of their values with a correct conclusion.

5			Translation $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$	2	B1 for translation B1 for $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$ NB No marks if more than one transformation given.

3			enlargement scale factor 3 centre *O*	3	B1 for enlargement B1 for scale factor 3 B1 for (centre) *O* oe NB: B0 for any combination of transformations
*4		**Examples** **£ per bag** 2.15÷50 = 0.043 (4.3) 3.29÷80 = 0.0411.. (4.11..) 5.17÷125 = 0.0413..(4.13..) **Bags per £ (or pence)** 50÷2.15 = 23.2(5...) 80÷3.29 = 24. 3(1...) 125÷5.17 = 24.1(7...) **Price per 400 bags** S: 2.15×8 = 17.2 M: 3.29×5 = 16.45 **Price per 1000 bags** M: 3.29×12.5=41.125 L: 5.17×8=41.36	Medium	4	M1 for division of price by quantity for at least two boxes or division of quantity by price for at least two boxes or a complete method to find price of same quantity for at least two boxes or to find quantity of same price applied to at least two boxes M1 for a complete method to give values that can be used for comparison of all 3 boxes. A1 for correct values that can be used for comparison for all 3 boxes C1 ft (dep on M2) for comparison of their values with a correct conclusion.

Paper: 5MB3H_01

PAPER: 1MA0_2H

Question		Working	Answer	Mark	Notes
4	(a)		Correct shape	2	B2 cao (B1 for shape in the correct orientation below the line $y = x$ or for 2 vertices correct) with vertices at (2, 1), (4, 1), (4, 0), (3, 0)
	(b)		Translation by $\begin{pmatrix} 4 \\ -1 \end{pmatrix}$	2	B1 for translation B1 for $\begin{pmatrix} 4 \\ -1 \end{pmatrix}$ NB: B0 if more than one transformation given

7	(a) (b)		reflection enlargement sf 2 centre (−6,2)	2 3	B2 cao (B1 for reflection in vertical line) B1 for enlargement B1 for (scale) factor 2 or ×2 B1 for (−6, 2) (NB B0 if not single transformation)
*8		1.2 × (550 ÷ 50) × £4.15 = £54.78 4 × £2.95 × 4 + 2 × £2.95 =£53.10	Hammer company	5	M1 for 20% of a cost in Nail Company, eg 4.15 × 0.2 (= 0.83) oe M1(dep) for adding their 20% to their cost, eg 4.15 × 1.2 (= 4.98) oe M1 for using special offer in Hammer Company M1 for 4 × 125 and 2 × 25 in Hammer Company C1 for Hammer Company and figures 54.78 [Nail Company] and 53.1(0) [Hammer Company]

PAPER: 5MB3H_01

10			43	3	M1 for $\pi \times 40$ or $2 \times \pi \times 20$ M1 for $34 \times 2 \times \pi \times 20$ A1 for 42.7 – 43

7	(a)		Triangle with vertices at (–3, 3), (–3, 4) and (–1, 4)	2	B2 for a triangle with vertices at (–3, 3), (–3, 4), (–1, 4) (B1 for triangle in correct orientation and size or rotated 90° clockwise about centre *O* or three correct vertices without joining)
	(b)		Reflection in line $y = x$	2	B1 for reflection B1 for (in the line) $y = x$ Note: award no marks if more than one transformation is given

PAPER: 1MA0_1H

4			Enlargement	2	B2 for fully correct triangle (B1 for 2 vertices correct or enlargement scale factor 2 in the wrong position or enlargement, centre *A*, with a different scale factor)
*5		1155 ÷ 15 = 77 $x + 2x + x - 7 = 77$ $4x - 7 = 77$ $4x = 84$; $x = 21$ OR $15x + (15 \times 2x) + 15(x - 7) = 1155$ $60x - 105 = 1155$ $60x = 1260$ $x = 21$	Redlands 21 St Samuels 42 Francis Long 14	5	M1 for $2x$ or $x-7$ M1 for 1155 ÷ 15 (= 77) M1 (dep M2) for equation summing their three expressions to "77" A1 for 21, 42 and 14 C1 for fully correct answer with correct labels OR M1 for an expression for the cost of the pupils from Redlands M1 for expression for the cost of the pupils from either St Samuels or Francis Long M1 (dep M2) for equation summing their three expressions to 1155 A1 for 21, 42, and 14 C1 for fully correct answer with correct labels

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*6			Large box	4	M1 for a complete method to find the cost per sachet or the number of sachets per £1 for one size of box M1 for a complete method to find all three comparable figures A1 for 0.47(08. .), 0.46, 0.45 or 2.12(3...), 2.17(..), 2.22 (2..) oe C1(dep on M2) for a comparison of their answers leading to a correct deduction OR M1 for 3 multiples of each of 12, 20 and 35 or a common multiple of 12, 20 and 35, eg 420 or multipliers to compare the same number of sachets from each box, eg $\times\frac{35}{12}$ and $\times\frac{35}{20}$ M1 for a complete method to find three comparable costs A1 for three correct costs, eg 197.75 and 193.20 and 189.00 C1(dep on M2) for a comparison of their answers leading to a correct deduction

10		Rotation, 90° clockwise centre (1,4)	3	B1 for rotation B1 for 90° clockwise or 270° anticlockwise B1 for (1,4) NB Award B0 if more than one transformation given

5MB3H/01 June 2015

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 .

4	(a)		translation $\begin{pmatrix} 3 \\ -3 \end{pmatrix}$	2	B1 for translation B1 for $\begin{pmatrix} 3 \\ -3 \end{pmatrix}$ (B0 if not single transformation)
	(b)		Triangle	2	B2 cao (B1 for rotation a 180 degrees about any point or for a rotation about (0, 1))

5MB3H_01 November 2015

2	(a)		Correct shape	2	B2 for correct reflection with vertices (–4, 2) (–6, 3) (–6, 7) (–4, 6) (B1 for reflection in a vertical or horizontal line)
	(b)		Correct shape	2	B2 for correct rotation with vertices (–1, 3) (–5, 3) (–6, 5) (–2, 5) (B1 for rotation of 90(°) clockwise about (0,1) **or** correct orientation fully in top left quadrant)

Original question 2

The full source mark scheme begins on page 264. Use the original paper code, tier and question number shown above.

Question	Working	Answer	Mark	Notes
1		Diagram drawn	3	B3 for fully correct shape (B2 for 3 or 4 vertices correct or enlargement scale factor 3 in wrong position or enlargement, centre *A*, with different scale factor) (B1 for 2 vertices correct or enlargement, not from *A*, with different scale factor)

14	**B** at (1, 0), (1, –1), (3, –2) **C** at (–2, –1), (–2, –2), (0, –3) Rotation 90° clockwise (or 270° anti-clockwise) about (–2, 2)	Rotation 90° clockwise centre (–2, 2)	3	M2 for stating rotation 90° clockwise (or 270° anti-clockwise) or centre (–2, 2) (M1 for showing **B** and **C** correctly on the grid) A1 for a fully correct description NB Award a maximum of M1 if more than one transformation is given

6	(a)		Triangle	2	B1 for triangle translated B1 for triangle at (−2,2), (−2,0), (−1,0)
	(b)		Rotation 90° anticlockwise centre (0,0)	3	B1 Rotation B1 90° anticlockwise oe B1 centre (0,0) Note Award no marks if more than one transformation is given

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

8	(a)		Transformation	2	B2 for a triangle with vertices at (−1, 1), (−2, 3) and (−2, 1) (B1 for a triangle in correct orientation or rotated 90° clockwise centre the origin)
	(b)		Description	3	B1 Enlargement B1 Scale factor 3 (accept × 3) B1 Centre (1,0) NB: More than one transformation is B0

Paper: 1MA0/1H

9		No (supported)	M2 [M1 C1 M2 C1	for the correct position of C or E for a correct position of B or D] for No with correct supporting evidence, eg. showing C and E in the correct positions OR for C is a rotation of 90° anticlockwise about *O* **or** E is a rotation of 90° clockwise about *O* for No with supporting evidence, eg. C is a rotation of 90° anticlockwise about *O* **and** E is a rotation of 90° clockwise about *O*.

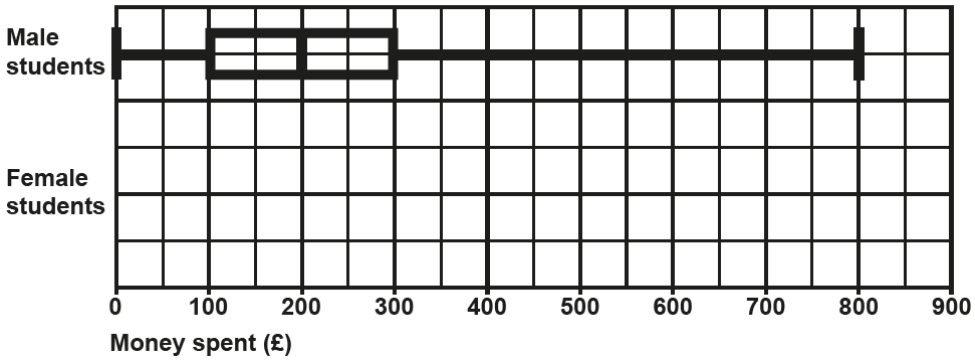
Paper: 1MA1/2H

20	(a)		(0,1)	B1	(0,1)
	(b)		Circle radius 4 Centre (3,0) and (−1,0) and (7,0) labelled	M1	For centre (3,0) implied by drawing or label or a circle of radius 4 or intersections on the x-axis at −1or 7 implied by drawing or labels
				M1	for 2 of centre (3,0) implied by drawing or label intersections on the x-axis at −1 and 7 implied by drawing or label circle drawn with radius 4
				A1	for a fully correct answer

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

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

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

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
1		Diagram enlarged. Braille only: will label the circles 'Set A' and 'Set B' and will label all the places which need to be answered (i) to (iv).	Standard mark scheme accept for Braille award C2 for a fully correct diagram.
5		Diagram enlarged.	Standard mark scheme
7		Diagrams enlarged. The smaller triangle on the right has been rotated so it is facing the opposite triangle. Braille only: will give information about the triangles in written form.	Standard mark scheme
9	(a)	Diagram enlarged. Points on the Male box plot changed to: 0, 100, 200, 300 and 800. Horizontal axis label has been moved to the left of the horizontal axis. Label 'Female students' added to the left of the grid below 'Male students'. Axis has been cut so the horizontal axis finishes at 900.  	Amend mark scheme to read: M1 "for evidence of taking & using readings at LQ and UQ eg 300 – 100" A1 for 200 [as the answer to (a)] Median 200, IQR 200

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
9	(b)	Numbers on the table changed to: 50, 150, 300, 350 and 650. Wording changed to: 'On the grid for Question 9, draw a box plot for the information in the table. Draw this below the box plot for the Male students.'	Standard mark scheme Median 300, IQR 200
13		Diagram enlarged. Shading changed to dotty shading.	Standard mark scheme
15		Diagram enlarged. Angle size moved outside of the angle arc and the arc has been made smaller. MLP only: x changed to y.	Standard mark scheme except using y instead of x.
18		Diagram enlarged.	Standard mark scheme
20	(b)	A blank set of x and y axes have been provided.	Standard mark scheme

Question	Working	Answer	Mark	Notes
18		Correct enlargement	B2 (B1	Correct enlargement (-1,-1.5), (-1,-3.5) (-2,-1.5) correct size, correct orientation in incorrect position **or** 2 out of 3 vertices correctly placed)

5 (a)		(−2, 1) (−4, 1) (−2, 2) (−5, 2)	B1	Shape labelled **A**
(b)		(1, −4) (3, −4) (1, −5) (4, −5)	B1	Shape labelled **B**

Paper: 1MA1/2H

7	rotation 180° about (−1, −2) **or** enlargement sf −1 centre (−1, −2)	B2 (B1	rotation 180° about (−1, −2) **or** enlargement sf −1 centre (−1, −2) rotation 180° **or** rotation about (−1, −2) **OR** enlargement sf −1 **or** enlargement centre (−1, −2)) Award no marks for the description if more than one transformation is given SC B1 for fully correct diagram if B0 scored	Condone missing brackets but do not accept centre written as a vector Do not accept ‘half turn’ for ‘rotation 180°’ Ignore references to clockwise and anticlockwise Triangles at (−3, 1), (−5, 1), (−4, 3) and (−3, −5), (−5, −5), (−4, −7)

Paper: 1MA1/1H

7	Enlargement	B2 (B1	for correct enlargement at (1,2) (2,3) (2,4) (1,4) for correct size **and** orientation in the wrong position **OR** 3 of 4 vertices correct and joined **OR** 4 correct vertices not joined)	

Paper: 1MA1/2H

13	enlargement scale factor $-\frac{1}{3}$ centre (2, 2)	C2 (C1	for **all** of: enlargement, (scale factor =) $-\frac{1}{3}$ oe, (centre =) (2, 2) for **two** of: enlargement, (scale factor =) $-\frac{1}{3}$ oe, (centre =) (2, 2)) Note: award no marks if more than one transformation is given	

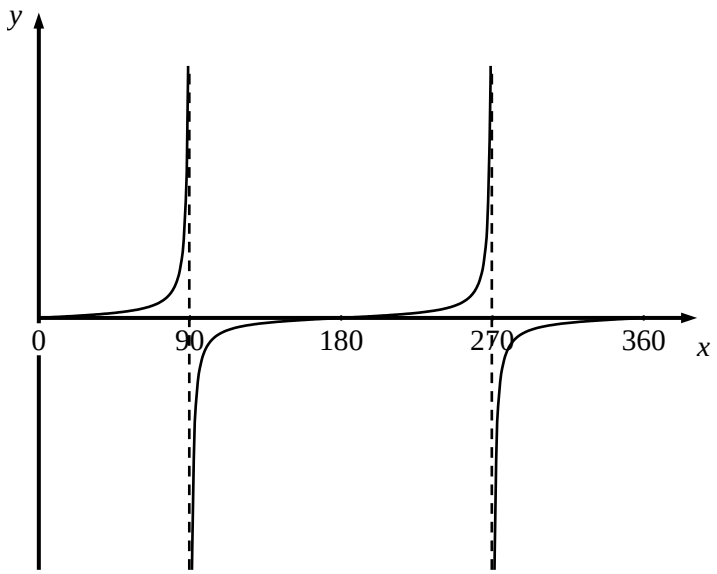
Paper: 1MA1/1H

8	Rotation	M1	stating rotation **or** for showing **R** [(1,1), (1,−3), (3,−3)]	Award for a triangle in the correct position without the label R as long as this is the only triangle in lower right quadrant.
	90º anticlockwise	A1	for rotation of 90º anticlockwise	Accept rotation of 270° clockwise
	centre (−1,1)	A1	for centre (−1, 1) given as a coordinate.	Can be given as a coordinate alone. Do not award A marks if there is evidence of other transformations in the description, or other ambiguity in the answer given.

Paper: 1MA1/2H

20	(−3.5, 1)	M1 A1	for a complete method to show the transformations cao	Image at (−4,1), (−3,1) and (−3.5, −2)

Qu 11



Modifications to the mark scheme for Modified Large Print (MLP) papers. Paper 3H.

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

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

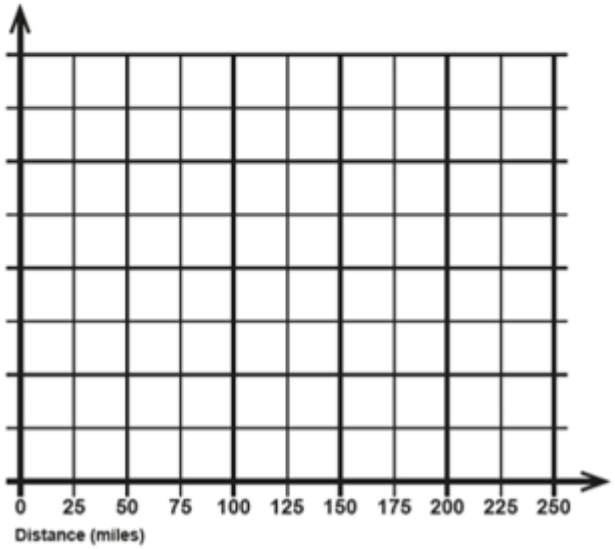
PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
3		Wording added 'There are four spaces to fill.' Table turned to vertical format. Grid enlarged. Y axis changed to go up in units of 2 from -10 to10.	Standard mark scheme
4		Diagram enlarged. Right axis labelled. Shading changed to dotty shading. Axes labels moved to the left of the horizontal axis and above the vertical axis.	Standard mark scheme
6		Diagram enlarged.	Standard mark scheme
7		Diagram enlarged. Right axis labelled. Axes labels moved to the left of the horizontal axis and above the vertical axis. Frequency table changed to: 5, 20, 25, 10 and Frequency column widened. Question wording changed from 70 cars to 60 cars.	Standard mark scheme but plotting at (5,5), (15,20), (25,25), (35,10)
8		Diagram enlarged and model provided for all candidates. Wording added 'and on the model: 15 cm^2, 27cm^2, 45 cm^2'	Standard mark scheme

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
9	(a)	MLP only – x changed to y.	Standard mark scheme with x changed to y.
9	(b)	Wording added, 'when'.	Standard mark scheme
11		Diagram enlarged.	Standard mark scheme
12		Diagram enlarged and model provided for all candidates. A dot added at the centre of square $ABCD$, labelled M. A line added joining A to M and another line added joining M to T. An angle arc added at A. Question wording changed to 'The vertex T is 12 metres vertically above the midpoint M of AC.'	Standard mark scheme
16		Diagram enlarged. Shading changed to dotty shading. AD labelled 14 cm. Question wording changed to 'The shape is made from the triangle AOD and a sector of a circle, centre O and radius 6 cm.'	Standard mark scheme
17		Diagram enlarged. x axis marked in units of 25 (as shown). Table changed as shown below. Number of students changed from 570 to 575	Standard mark scheme but histogram drawn at 7.5, 3.75, 5, 2.5, 2.5 Allow some tolerance on heights within gaps if intention is clear. Median at (approx.) 65.75 so allow within range 60 to 70.

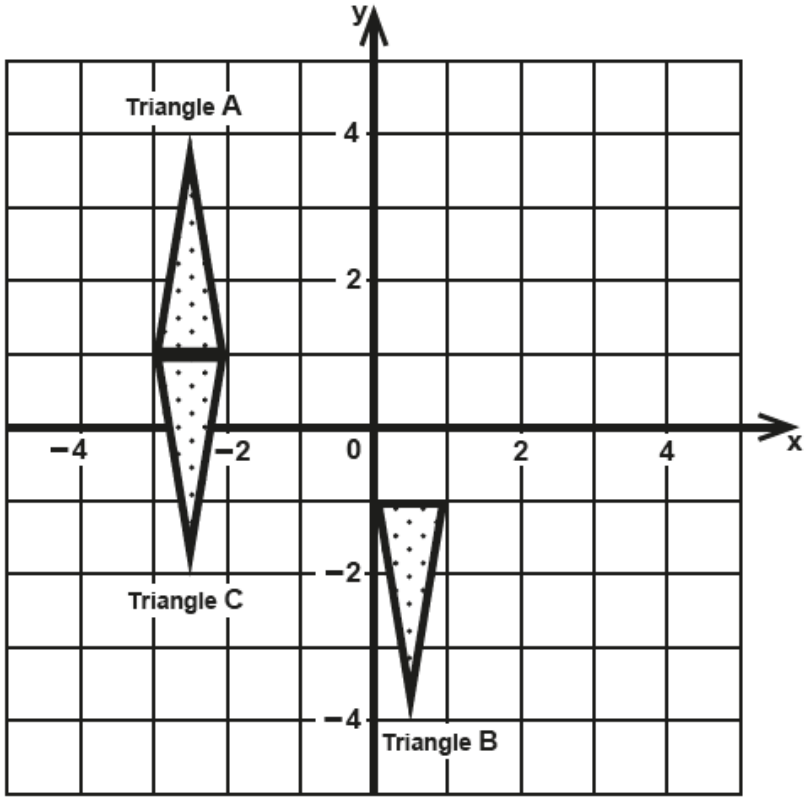
PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
17			

Distance (d miles)	Frequency
$0 < d \leqslant 25$	150
$25 < d \leqslant 50$	75
$50 < d \leqslant 75$	100
$75 < d \leqslant 150$	150
$150 < d \leqslant 200$	100

Widen the frequency column to allow for working.



PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
20		Diagram enlarged and grid changed as shown below. Wording added, 'It shows triangle A, triangle B and triangle C on a grid. A cut out triangle is available if you wish to use it.' A cut out shape provided for all versions. Question wording changed as follows: (a) Describe the TWO transformations that map triangle A onto triangle B, then triangle B onto Triangle C. (1 mark). Three answer lines added for part (a). One point on triangle A is invariant under the combined transformation from triangle A to triangle C. (b) Find the coordinates of this point. (1 mark)	Part (a): award 1 mark for a full description of both transformations: A to B: a rotation of 180° about $(-1,0)$ B to C: a translation of $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ Do **not** award the mark if there is any ambiguity or any reference to other forms of transformation. Part (b): award 1 mark for $(-2.5, 1)$

PAPER: 1MA1_3H			
Question		Modification	Mark scheme notes
20			

5	$c = -6$ $d = -1$	M1 A1 A1	for reflection in x-axis shown on diagram for $c = -6$ or $d = -1$ for both $c = -6$ and $d = -1$ SCB2 for $c = -1$ and $d = -6$	Vertices (3, −2), (5, −2), (3, −5) One correct value is M1A1 regardless of second value or diagram

Paper: 1MA1/1H

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

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance

24	Description	C2
		
		(C1
			for (rotation) 90º clockwise about (–1, 0)
			or (rotation) 90º anticlockwise about (–1, 6)
			or (rotation) 180º about (–1, 2)
			or (rotation) 180º about (–1, 4)
			
			for (–1, 0) or (–1, 6) or (–1, 2) or (–1, 4))
				Award 0 marks if there is reference to other transformations eg coordinates given as vectors (which is a translation)

9	Enlargement	B2 (B1	vertices at (2.5, 1) (2.5, 6) (5, 6) for triangle of the correct size and orientation in the wrong position **or** a correct enlargement of a different scale factor centre (0, 1) **or** correct orientation with 2 of 3 vertices correct)	

15	Enlargement sf –1.5 centre (1, 1)	B2 (B1	for enlargement scale factor –1.5 **and** centre (1, 1) for enlargement scale factor –1.5 **or** enlargement centre (1, 1))	Award no marks if more than one transformation is given

Paper: 1MA1/2H

11 (a)	rotation of 180° about (2.5, −1)	M1	for method to find position of **Q**, eg shape drawn at **(**−1, −2), (−1, −5) and (−2, −5) **or** for method to find position of **R**, eg shape drawn at **(**4, −4), (4, −7) and (3, −7) **or** for method to translate their **Q** correctly	The method mark is awarded if no working is shown but at least 2 of the 3 aspects are correct in the description
		A2	for rotation of 180° about (2.5, −1) or enlargement by scale factor −1, centre (2.5, −1)	Cannot award A marks for a combination of transformations With no extra incorrect aspects
		(A1	for any 2 of the 3 aspects)	
(b)	(2.5, −1)	B1	for (2.5, −1) ft from rotation or enlargement in (a)	No follow through from a combined transformation in part (a)

Paper: 1MA1/3H

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
19	Proof	P1	for start to process to find area of *ABCDEF*, eg area of equilateral triangle $= \frac{1}{2} \times x \times x \times \sin 60$ $\left(= \frac{\sqrt{3}}{4}x^2\right)$ **OR** for start to process to find area of *FGHIJK*, eg area of equilateral triangle $= \frac{1}{2} \times px \times px \times \sin 60$ $\left(= \frac{\sqrt{3}}{4}p^2x^2\right)$	Any correct process to find the area of part of the hexagon is acceptable for this mark, eg $\frac{1}{2} \times x \times x \times \sin 120$ or $\frac{1}{2} \times (x + 2x) \times \frac{\sqrt{3}}{2}x$ Allow sin 60 left in expressions for the first 3 marks.
		P1	for complete process of finding area of *ABCDEF*, eg $6 \times \frac{1}{2} \times x \times x \times \sin 60$ or $6 \times \frac{1}{2} \times x \times x \times \frac{\sqrt{3}}{2}$ $\left(= \frac{3\sqrt{3}}{2}x^2\right)$ oe **OR** for complete process of finding area of *FGHIJK*, eg $6 \times \frac{1}{2} \times px \times px \times \frac{\sqrt{3}}{2}$ $\left(= \frac{3\sqrt{3}}{2}p^2x^2\right)$ oe	
		P1	for process of finding area of *ABCDEF* eg $\frac{3\sqrt{3}}{2}x^2$ oe **AND** for process of finding area of *FGHIJK*, eg $p^2 \times \frac{3\sqrt{3}}{2}x^2$ oe	
		C1	correct algebra leading to given result, $\frac{3\sqrt{3}}{2}(p^2 - 1)x^2$	Accept $\frac{3\sqrt{3}}{2}x^2(p^2 - 1)$ as final result.

Paper: 1MA1/3H

2	translation $\begin{pmatrix} -5 \\ 6 \end{pmatrix}$	B1 B1	for translation for vector $\begin{pmatrix} -5 \\ 6 \end{pmatrix}$	Award no marks if more than one transformation is given Do not accept as a coordinate $(-5, 6)$

13	enlargement	B2 (B1	for correct enlargement at (4, 8) (6, 4) (10, 4) (12, 8) for correct size **and** orientation in the wrong position **OR** 3 of 4 vertices correct)	

Paper: 1MA1/2H

11	Enlargement scale factor $\frac{1}{3}$ centre (0, 2)	B2 (B1	for enlargement scale factor $\frac{1}{3}$ centre (0, 2) for any 2 aspects)	No marks if more than one transformation is given

Question	Answer	Mark	Mark scheme	Additional guidance
18	Description	C1 C1	for translation for $\begin{pmatrix} 8 \\ 0 \end{pmatrix}$	Award no marks if more than one transformation May be described as, for example "by 8 units in the direction of the x axis"

16	Triangle at (6, –2) (4, 4) (8, 4)	M1 A1	for the correct shape in the correct orientation in the wrong position or for two correct points cao	

Question	Answer	Mark	Mark scheme	Additional guidance
18 (a)	Triangle drawn	B2 (B1	for correct enlargement at (7, −10) (4, −4) (7, −4) for triangle of correct size and orientation in the wrong position **or** for 2 vertices correct)	Label not necessary provided intention is clear
(b)	Correct vector	C1	for $\begin{pmatrix}-5\\7\end{pmatrix}$ or $\begin{pmatrix}-7\\9\end{pmatrix}$ or $\begin{pmatrix}-3\\13\end{pmatrix}$	

Question	Answer	Mark	Mark scheme	Additional guidance
11	Rotation 90º clockwise centre (–4, 1)	M1	for triangle **B** drawn at (4, 0), (4, –2), (3, –2) **or** for triangle **C** drawn at (–3, 0), (–3, –1), (–1, –1) **or** for rotating their **B** 90º clockwise about (1, 2)	Award for a triangle in the correct position without the label **B** or **C** as long as this is the only triangle in the quadrant. Accept just the vertices marked.
		A2	for rotation 90º clockwise centre (–4, 1)	Accept 270º (anticlockwise)
		(A1	for any 2 of the 3 aspects)	Do not award A1 for 'rotation 90º clockwise' if triangle **C** is shown not in the correct orientation Do not award A marks if there is evidence of other transformations in the description or other ambiguity in the answer given

12	Correct enlargement	B2 (B1	for correct enlargement (–2, –4), (–2, –6), (–6, –4) for correct size and orientation but incorrect position **or** 2 out of 3 vertices correctly placed)	Award for clear intention, shading not needed.

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
11	enlargement scale factor $\frac{2}{3}$ centre (–4, –2)	C2 (C1	for enlargement, scale factor $\frac{2}{3}$ oe , centre (–4, –2) for 2 of the 3 aspects)	Award no marks if more than one transformation is given

9	(a)	Rotation 90° (anticlockwise) about (– 1, 0)	B2 (B1	for rotation 90° (anticlockwise) about (– 1, 0) for any 2 of the 3 aspects)	Accept 270° clockwise Award no marks if more than one transformation is given
	(b)	Enlargement	B2 (B1	for correct enlargement with vertices at (1,0), (3,0), (1,2) for correct size and orientation but incorrect position **or** 2 out of 3 vertices correctly placed)	Award for clear intention, shading not needed

Paper: 1MA1/1H

22	Circle radius 5 centre (0, –2) and (0, 3) and (0, –7) labelled	B3 (B2 (B1	for a correct sketch of a circle with centre (0, –2) **and** intercepts (0, 3) and (0, –7) labelled for a sketch of a circle with two of the 3 points indicated, or for a sketch of a circle with correct centre **and** radius of 5 labelled or stated) for a sketch of a circle with the correct centre **or** states correct centre **and** radius, but does not sketch)	See diagram at end of scheme Allow freehand circles Ignore intersections with x axis for all marks Accepts points marked with correct y-coordinate, eg -2 on y-axis for centre

Paper: 1MA1/2H

GCSE

Mark Scheme

Mathematics A (1387)

June 2003

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June 2003

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NOTES ON MARKING PRINCIPLES

NOTES ON MARKING PRINCIPLES

1 Three types of mark are available

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

2 Abbreviations

cao - correct answer only.
ft - follow through.
√ - Denotes a "follow through" answer.

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

3 If no working shown, then

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

4 Marking instructions

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

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

5 Style of marking

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

6 Follow Through Marks

Follow throughs are guided by two principles:

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

7 Probability

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

8 Linear Equations

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

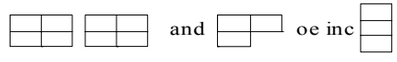
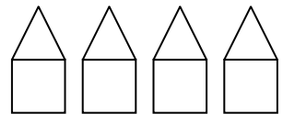
9 Parts of questions

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

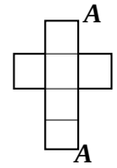
Paper 5501

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

Paper 5501

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

Paper 5501

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

Paper 5501

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

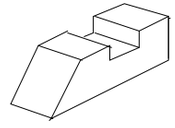
Paper 5501

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

Paper 5501

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

Paper 5501

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

Paper 5502

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

Paper 5502

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

Paper 5502

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

Paper 5502

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

Paper 5502

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

Paper 5502

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

Paper 5503

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

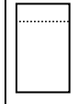
Paper 5503

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

Paper 5503

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

Paper 5503

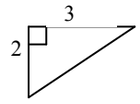
No	Working	Answer	Mark	Notes
11 (a)	Bryani was correct $4 \times 3^2 = 4 \times 9 = 36$	Bryani	2	M1 for 4×9 or $4 \times 3 \times 3$ or "square the three/x then multiply by four" A1 Bryani **SC** 4×3^2 with Bryani gets B2
(b)			1	B1 cao
12 (a)			3	B2 for rectangle height 4 squares, base 3 squares (B1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

Paper 5503

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

Paper 5503

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



Paper 5503

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

Paper 5504

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

Paper 5504

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

Paper 5504

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

Paper 5504

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

Paper 5504

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

Paper 5504

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

Paper 5504

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

Paper 5504

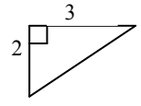
No	Working	Answer	Mark	Notes
22 (a)		No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice	1	B1 for a consistent answer
(b)	$\frac{1}{6}, \frac{5}{6}$ + labels		3	B1 for $\frac{5}{6}$ on the red dice, *not six* branch B1 for a fully complete tree diagram with all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

Paper 5505

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

Paper 5505

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



Paper 5505

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

Paper 5505

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

Paper 5505

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

Paper 5505

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

Paper 5505

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

Paper 5505

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

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

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NOTES ON MARKING PRINCIPLES

NOTES ON MARKING PRINCIPLES

1 Three types of mark are available

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

2 Abbreviations

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

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

3 If no working shown, then

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

4 Marking instructions

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

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

5 Style of marking

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

6 Follow Through Marks

Follow throughs are guided by two principles:

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

7 Probability

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

6 Linear Equations

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

8 Parts of questions

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

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

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

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

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

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

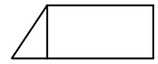
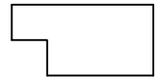
PAPER 5501				
No	**Working**	**Answer**	**Mark**	**Notes**
21	Vertices of new triangle at (2, −2) (2, 6) and (6, −2)	Correct triangle drawn	3	B3 cao (B2 for either correct triangle in wrong translated position or for 2 vertices correct) (B1 a right angled triangle with horizontal length 4 or vertical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

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

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

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

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

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

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

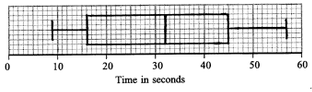
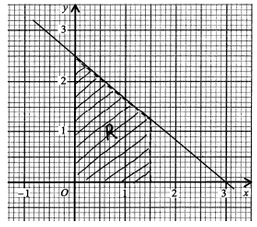
PAPER 5503					
No		**Working**	**Answer**	**Mark**	**Notes**
1			10.	1	B1 for 10
2	(a)(i)		$3e + 2f$	2	B1 for $3e + 2f$
	(ii)		$3p^2$		B1 for $3p^2$
	(b)	$5 \times -3 + 1$	-14	2	M1 for $5 \times -3 + 1$ A1 for -14
3		1974 6580 8554	855.4	3	M1 for complete correct method with relative place value correct,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

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

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

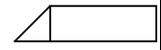
PAPER 5503				
No	**Working**	**Answer**	**Mark**	**Notes**
15		Tick boxes 1,3 & 6	3	B1 for $\frac{\pi abc}{2d}$; B1 for $2a^2$; B1 for $2\left(c^2+d^2\right)$ (−B1 for each additional expression ticked (>3) to a minimum of 0)
16	200×0.2	40	2	M1 for 200×0.2 or $\frac{40}{200}$ seen A1 for 40
17 (a)	eg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

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

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

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

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

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

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

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

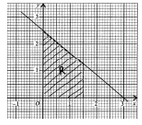
PAPER 5504					
No		**Working**	**Answer**	**Mark**	**Notes**
15		x $x^3 - 2x$ 4.1 60.7(21) 4.2 65.6(88) 4.3 70.9(07) Accept answer to 1 dp 4.22 66.7(114) or more 4.23 67.2(269) 4.24 67.7(45) 4.25 68.2(656)	4.2	4	B2 for trial $4.1 \leq x \leq 4.3$ evaluated (B1 for trial $4 < x < 5$ evaluated) B1 for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

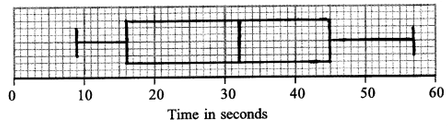
PAPER 5504					
	No	Working	Answer	Mark	Notes
20	(a)	$10^2 + 6^2$ or 136 $\sqrt{(100+36)}$ or $\sqrt{136} = 11.66\ldots$	11.7	3	M1 $10^2 + 6^2$ or 136 seen M1 (dep) $\sqrt{100+36}$ or $\sqrt{136}$ A1 11.66 – 11.7
	(b)	$\cos x = \frac{8}{10}$ or 0.8 $x = \cos^{-1} 0.8 = 36.869^\circ$	36.9	3	M1 for $\cos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

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

PAPER 5505					
	No	Working	Answer	Mark	Notes
1	(a)(i)		2.21	2	B1 for 2.21
	(ii)		0.013		B1 for 0.013
	(b)	LCM = 3 × 13 × 17 = 3 × 221	663	2	M1 for 3 × 13 × 17 oe A1 for 663
2			Tick boxes 1,3 & 6	3	B1 for $\frac{\pi abc}{2d}$; B1 for $2a^2$; B1 for $2(c^2 + d^2)$ (−B1 for each additional expression ticked (>3) to a minimum of 0)
3	(a)	200 × 0.2	40	2	M1 for 200 × 0.2 or $\frac{40}{200}$ seen A1 for 40
	(b)	0.2 + 0.4	0.6	2	M1 for 0.2 + 0.4 A1 for 0.6
4	(a)	eg 2 | 108 2 | 54 3 | 27 3 | 9 3	$2^2 \times 3^3$	3	M2 for full systematic method of at least 4 divisions by prime numbers oe factor trees; condone 1 calculation error (M1 for 108 written as a correct product with only one non-prime or equivalent division or a full process with 2 calculation errors.) A1 for $2^2 \times 3^3$ (accept 2 × 2 × 3 × 3 × 3)
	(b)		12	1	B1 for 12
5		Perpendicular from P to intersecting arcs (within tramlines); perpendicular at least 2 cm long		2	M1 relevant pair of arcs crossing within tramlines A1 SC M1A0 for full construction of a line perpendicular to AB not through P
6		15 × 10	150 cm^3.	3	M1 for 15 × 10 A1 for 150 B1 for cm^3

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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NOTES ON MARKING PRINCIPLES

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

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

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

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

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

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

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

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

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

7 With working

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

8 Follow through marks

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

9 Ignoring subsequent work

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

10 Probability

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

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

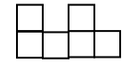
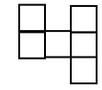
12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

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

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

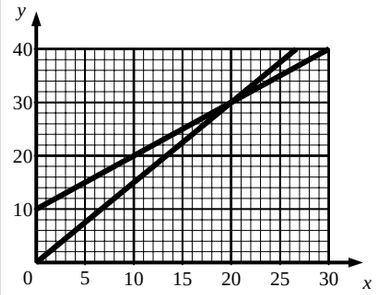
1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		380	1	B1 cao
	(b)		6.2	1	B1 cao
	(c)		Arrow at 34	1	B1 cao
2	(a)		8	1	B1 for 8 ± 0.2
	(b)		35	1	B1 for 35 ± 2°
	(c)		Circle drawn	1	B1 for all parts within ± 2mm, (use overlay)
3	(a)		4, 7, 4, 3, 2	2	M1 for at least 3 correct tallies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

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

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

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

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

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

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

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

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

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

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

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

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

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

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7 With working

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

8 Follow through marks

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

9 Ignoring subsequent work

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

PMT

10 Probability

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

11 Linear equations

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

12 Parts of questions

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

13 Range of answers

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

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

PMT

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

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

PMT

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 $\frac{7}{9}$ × 10800 or 8400 or $\frac{2}{9}$ × 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

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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.

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)		$3\mathbf{c}$	4	M1 for writing *QB* as a combination of vectors eg $\frac{1}{2}$ ('3**a** + **b**') + **b** or 3**a** + 2**b** – $\frac{1}{2}$ ('3**a** + **b**') or 2**a** + 2**b** − **c** oe M1 for equating **a** + **b** = 2**c** or writing *PQ* in terms of vectors **a** and **b** eg −**a** + $\frac{1}{2}$ ('3**a** + **b**') or 2**a** + **b** – $\frac{1}{2}$ ('3**a** + **b**') A1 for (*PQ*=) $\frac{1}{2}$**a** + $\frac{1}{2}$**b** **or** (*QB*=) $\frac{3}{2}$**a** + $\frac{3}{2}$**b** or (*QB*=) 2**c**−**a** + **a** + **c** A1 cao NB: accept equivalent expressions throughout

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Mark Scheme (Results)

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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

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* =) $\frac{6}{\sin 25} \times \sin 120$ (= 12.2(951…)) or (*BC* =) $\frac{6}{\sin 25} \times \sin 35$ (= 8.1(431…) M1(dep M2) for method to find area, eg 0.5 × 6 × "*AB*" sin35 or 0.5 × 6 × "*BC*" sin 120 A1 for answer in the range 21.1 – 21.2 OR (with perpendicular from *A* meeting *BC* extended at a point *X*) M1 for method to find *AX* M1 for method to find *BX* M1(dep M2) for 0.5 × "*AX*" × "*BC*" A1 for answer in the range 21.1 – 21.2
*19			0.38 because the LB and UB agree to that number of figures	5	B1 for 10.75 or 10.85 or 10.84999… B1 for 75.055 or 75.065 or 75.064999… M1 for $\sqrt{\frac{10.85}{75.055}}$ as UB **OR** $\sqrt{\frac{10.75}{75.065}}$ as LB A1 (dep on all previous marks) for both 0.3802… and 0.3784 must clearly come from working with correct values C1 for 0.38 from 0.3784… and 0.3802 … **and** "both LB and UB round to 0.38" **NB** An answer of 038(932….) without working scores no marks

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

PMT

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

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

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

PAPER: 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

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

PMT

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

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

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Question 5

Most of the students who gave the correct values of c and d had first drawn the reflection of shape **A** in the x-axis. Those who did not give two correct values often gained two of the three marks for either $c = -6$ or $d = -1$ or for transposing the two correct values. One correct value, either $c = -6$ or $d = -1$, scored two marks regardless of the second value or the diagram. A surprising number of students with neither value correct spurned the opportunity of scoring a relatively easy mark by failing to draw the reflection of shape **A** in the x-axis, sometimes drawing the reflection in the y-axis or the reflection of shape **B** in the x-axis but often drawing no reflection at all. Some students drew lines between the corresponding vertices of the two triangles, clearly confused with which type of transformation they were dealing with.

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 24

A very challenging question for the vast majority. Many were able to gain one mark for stating a correct co-ordinate, the most popular of which were (-1,0) or (-1,2). There were many who left out the direction in their description and some confused their description by using enlargement, translation and vectors instead of co-ordinates.

Question 9

This question was almost always attempted but the marks were reasonably evenly spread over the three options.

The most common incorrect responses seen were the incorrect placing of an image of correct size and orientation. A few students drew an enlargement using a different scale factor. The most common incorrect scale factor used was 3.5.

Question 15

Many students struggled to score with this question, due to stating multiple transformations, and centres should remind students that these questions always ask students to describe a single transformation. The nature of the negative enlargement, caused many students to get confused and quote rotations of 180 degrees. It was also common to see translations combined with enlargements. It is worth noting for centres that students needed to quote the correct type of transformation with either the centre or scale factor to score one mark.

Question 11

This question proved to be a good discriminator. A high percentage of students were able to score at least one mark by correctly carrying out one or both of the two transformations and

showing their results on the grid provided. About a third of students were able to describe the single equivalent transformation as a rotation of 180° with about a third of these students also able to give the correct centre of rotation. It was encouraging to see very few students describing more than one transformation. About half of the students who scored all three marks in part(a) understood the meaning of the term "invariant point" and were able to write down the coordinates of their centre of rotation as their response in part (b).

Question 19

There were some excellent responses to this question from the most able students taking this paper but these were few and far between. Able students who were unable to get as far as the given result were sometimes able to score some marks for successfully finding expressions for the area of part of a hexagon or for a whole hexagon, whether it be *ABCDEF* or *FGHIJK*. Where this applied, students usually used trigonometry to find the height of a constituent triangle and then its area by using $\frac{1}{2} \times$ base $\times$ height or they found an area using the formula $\frac{1}{2}ab\sin C$.

Some weaker students used the given result and tried to justify it by using substitution or by algebraic manipulation whilst other students seemed to think that the question revolved around finding angles of a polygon. No marks could be awarded for these approaches.

Question 2

This description of a translation was, unfortunately, not answered as well as would be expected. Many students did not properly read the question and assumed the transformation was going from left to right, and hence had the wrong vector of $\begin{pmatrix} 5 \\ -6 \end{pmatrix}$. It was also disappointing to see how many students were unable to give the correct transformation of translation.

Question 13

A higher tier enlargement, and one generally completed well. Many were able to deal with the negative scale factor and correctly complete the transformation. There were a significant number of students who were unable to and either mistook the negative for a fractional enlargement and made the shape smaller or ignored the negative altogether and enlarged the shape by a scale factor of 2.

Question 11

Descriptions of the transformation were generally very poor and surprisingly few students gained full marks for giving all three aspects of the description. Stating an incorrect scale factor of 3 or –3 was a common error and the centre of enlargement was often incorrect or not given. Many of the students who stated that the transformation was an enlargement did not get a mark because they failed to give either a correct scale factor or a correct centre of enlargement. Two of the three aspects of the description were needed for 1 mark. Some students tried to describe a combination of transformations – it was common to see translations combined with enlargements – and this gained no credit.

Question 18

It is unfortunate that very few candidates used the working space for this question to draw a diagram to help them. Consequently, only a small number could identify the correct single transformation. Instead, many candidates suggested that the single transformation equivalent to two reflections would be another reflection or, bizarrely an enlargement, scale factor 3. Of those candidates who did identify the transformation as a translation, some gave the vector $\begin{pmatrix}4\\0\end{pmatrix}$ to describe the translation instead of $\begin{pmatrix}8\\0\end{pmatrix}$.

Question 16

This question discriminated well between more able students sitting this paper but students generally scored 0 or 2 marks. Some carelessness was seen in some student responses where vertices were plotted at (4, 5) and (8, 5) instead of at (4, 4) and (8, 4). Students who scored full marks tended to use construction lines though some used vectors from the centre of enlargement to each vertex and multiplied them by −2. Common errors seen included triangles drawn by using a scale factor of $\frac{1}{2}$ or $-\frac{1}{2}$ or 2.

Question 18

It is disappointing to report that students were generally unable to enlarge the given triangle to the prescribed requirements in part (a) of the question and it was unusual for examiners to be able to award 1 mark for a triangle of the correct size and orientation drawn in the wrong position or for 2 correct vertices. It was not unusual to see the triangle enlarged by scale factor $\frac{1}{2}$ and/or the origin used as the centre of enlargement. Only a very small number of students were able to give a correct vector in part (b) of the question. A significant number of students were able to rotate and translate triangle

P but seemed not to be familiar with the term "invariant". Of those students who showed some understanding of the demand, a significant number gave the vector $\begin{pmatrix} 5 \\ -7 \end{pmatrix}$ instead of the vector $\begin{pmatrix} -5 \\ 7 \end{pmatrix}$.

Question 11

Most students attempted to draw triangle **B** and triangle **C** on the grid and many gained the first mark for showing at least one of the triangles in the correct position or for rotating their incorrectly positioned triangle **B** by 90° clockwise about the point (1, 2). Often both triangles were correctly positioned. Students who drew triangle **B** and triangle **C** in the correct positions were often able to recognise that the single transformation that will map shape **A** to shape **C** is a rotation. Descriptions of the transformation were generally good although sometimes when the angle of rotation was given as 90° the direction of 'clockwise' was missing or given as 'anticlockwise'. The centre of rotation was sometimes missing or incorrect. It was apparent that some students had used tracing paper when answering this question and this was generally a successful strategy for determining the centre of rotation. Many students gave more than one transformation, often using a rotation and a translation, and therefore got neither of the two marks available for the description as the question asked for a single transformation. Quite a few students simply restated the transformations given in the question.

Question 12

Some students were able to pick up one of the two marks for having a triangle of the correct size and orientation but in the wrong position or for 2 out of 3 vertices correctly placed.

However, there were a significant number of students who either misinterpreted the negative for a fractional enlargement or ignored the negative altogether and completed an enlargement of scale factor 2 or –1 or ½ or –½. Others misinterpreted the centre of enlargement and drew their triangle so that it touched the origin and others seemed to draw a triangle that was not similar in a random position on the grid. Many students attempted drawing the projection lines first and trying to fit a triangle within these lines – they knew the orientation and quadrant the triangle should end up in but often did not place the vertices correctly or check that it was the correct size. A few students wrote calculations at the side to work out the directions or new coordinates, this was often successful. Many students used little jumps drawn on the squares to help them count, which was often successful and helped them place the triangle in the correct position.

Question 11

This enlargement question was a challenging one, and as a result many did not gain full marks. Those who achieved 1 mark typically did so for stating ‘enlargement’ along with a correct centre, using ‘ray lines’. The scale factor proved a real challenge to many, and if stated, was often given as 1.5. It is important that learners read the question carefully and realise which shape is the ‘object’ and which is the ‘image’. They must not assume that an enlargement is always increasing in size. The other error seen with the scale factor was to give an answer of -1.5.
We did see some cases of learners using ‘ray lines’ inaccurately and giving a centre that had decimal coordinates. This is an error that has not been evident much in the past.

Question 9

In part (a), a correct description of the single transformation that maps shape **A** onto shape **B** gained two marks. The description needed to include three aspects: (1) rotation or rotate; (2) an angle of 90° (since positive angle measures represent an anticlockwise rotation) or 90° anticlockwise or 270° clockwise; and (3) the correct centre of rotation (–1, 0). A description with two of the three aspects was awarded one mark. Many responses that did not achieve full marks described the rotation as 90° clockwise, which maps shape **B** onto shape **A** and not shape **A** onto shape **B**. The centre of rotation, (–1, 0), was often missing or incorrect. It was sometimes given in the reverse order (0, –1). Omission of the brackets from the coordinates was condoned but use of vector notation was not condoned. Descriptions using more than one transformation, for example a rotation and a translation, were awarded no marks as the question asked for a single transformation.

In part (b), many responses were able to score two marks for drawing a correct enlargement of the triangle. Those who drew lines from the vertices of the triangle to the centre of enlargement were often successful. One mark was awarded for a triangle with two out of three vertices correctly placed or, more commonly, for a triangle of the correct size and

orientation in an incorrect position. Some triangles were drawn with one vertex touching the centre of enlargement. Triangles of the correct size that were drawn in an incorrect orientation gained no marks and sometimes these were the result of using a negative scale factor. Some of the triangles drawn were larger than the original triangle.

Question 22

This question looked to combine the understanding of the equation of a circle along with a translation of a graph. The strongest responses showed a circle of radius 5 and a centre at $(0, -2)$, showing the two intercepts on the y-axis at 3 and -7. If the drawn circle was not fully correct, 2 marks could be awarded if two of the correct points were indicated on the sketch, or we had a sketch with the correct centre and radius stated. Finally, a single mark could be awarded for a sketch with the correct centre, or no sketch but the correct centre and radius stated. For all the marks, the intersections did not need to be given as coordinates. Performance was mixed, as would be expected on a question of this grade, but it was pleasing to see so many responses gaining at least some marks and having some idea of the nature of the graph and the transformation.