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GCSE MATHS

Algebra

Edexcel 1MA1 | Subtopic collection Topic 23

Straight-line graphs

Higher tier

Answers and examiner comments

123	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 206. Use the original paper code, tier and question number shown above.

Original question 15

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

Original question 10

The full source mark scheme begins on page 260. Use the original paper code, tier and question number shown above.

Original question 11

The full source mark scheme begins on page 260. Use the original paper code, tier and question number shown above.

Original question 16

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

Original question 5

The full source mark scheme begins on page 311. Use the original paper code, tier and question number shown above.

Original question 17

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

19	(a)		56 Reason	2	B1 56° cao B1 sum of angles on a straight line is 180°
	(b)		22	1	B1 cao

1380/1F

Question		Working	Answer	Mark	Notes
23		Gradient = $\frac{10--2}{3-0}$	$y=4x-2$	3	M1 for gradient = $\frac{10--2}{3-0}$ oe or $(y=)\,4x+c$ or a right angle triangle with sides 12 and 3 shown M1 for (y =) mx - 2, $m \neq 0$ or $10 = 3m + c$ or - 2 = c (but not 'y-intercept = −2') A1 for $y=4x-2$ oe [the y must be included in the equation]

14	$\frac{2+12}{2}, \frac{3+7}{2}$	7, 5	2	M1 for $\frac{2+12}{2}$ oe or $\frac{3+7}{2}$ oe (may be implied by one correct co-ordinate) A1 cao (SC : B1 for 5, 7)

1380_3H

1380/3H

16	(a)		(0, 3, 2)	1	B1 cao
	(b)		(5, 3, 0)	1	B1 cao

8	(a)		– 4	2	M1 for 'difference in *y*' / 'difference in *x*' or 4 seen A1 for – 4 SC If no marks scored allow B1 for $y = 40 - 4x$, $y = -4x$, $40 - 4x$ or $-4x$
	(b)		Practical interpretation	1	B1 ft for depth decreases by "4" cm each hour oe or enables you to work out that the tank will be empty in 10 hours.

5MB1H_01
November 2010

5MB1H/01

5MB2H_01

Question	Working	Answer	Mark	Notes
10	(2, 5, 6) to (–1, – 4, 2) is (– 3, – 9, – 4) (–1 –3, –4 – 9, 2 – 4) or $\frac{2+x}{2} = -1$, $\frac{5+y}{2} = -4$, $\frac{6+z}{2} = 2$	(– 4, –13, – 2)	2	M1 for a complete correct method for at least 1 coordinate (could be implied by 2 out of 3 coordinates correct) A1 cao

13	(a)		$y = 5x + c$	1	B1 for $y = 5x + c$ oe $c \neq 6$
	(b)	gradient = $-\frac{1}{m} = -\frac{1}{5}$ $y = -\frac{1}{5} + c \quad x = -2, y = 5$ $5 = \frac{2}{5} + c$ $c = 5 - \frac{2}{5} = 4\frac{3}{5}$ $y = -\frac{1}{5}x + 4\frac{3}{5}$	$y = -\frac{1}{5}x + 4\frac{3}{5}$	3	M1 recognition that gradient = $-\frac{1}{m} = -\frac{1}{5}$ oe M1 substitution of $x = -2$, $y = 5$ in $y = mx + c$ where $m = -\frac{1}{5}$, $\frac{1}{5}$ or -5 A1 $y = -\frac{1}{5}x + 4\frac{3}{5}$ oe

5MB2H_01

21	(a)	e.g. $-\frac{2}{4}$	$-\frac{1}{2}$	2	M1 for attempt to find $\frac{\text{(difference in } y\text{)}}{\text{(difference in } x\text{)}}$ A1 for $-\frac{1}{2}$ oe SC B1 for $\frac{1}{2}$ or –2 seen with or without working or sight of $y = -½x + 2$ or $y = -½x$ or $-½x$
	(b)	$2 = -½ \times 6 + c$ $2 + 3 = c$ **Alternative** $y - 2 =$ "$-½$" $(x - 6)$ $y - 2 = -½x + 3$	$y = -\frac{1}{2}x + 5$	2	M1 for $y = '-\frac{1}{2}'x + c$ or $y = mx + 5$ A1 cao SC B1 for $-½x + 5$

1380_3H

Original question 9

The full source mark scheme begins on page 363. Use the original paper code, tier and question number shown above.

Original question 5

The full source mark scheme begins on page 377. Use the original paper code, tier and question number shown above.

Original question 7

The full source mark scheme begins on page 377. Use the original paper code, tier and question number shown above.

13	(a)		**6**, 4.5, 3, **1.5, 0**, –1.5	2	B2 for all 3 correct values of y [B1 for 1 or 2 correct values of y]
	(b)		Single straight line from (–2, 6) to (3, –1.5)	2	B2 for a straight line from (–2, 6) to (3, –1.5) [B1 for 5 of their points correctly plotted ±1 sq or a single line passing through (0, 3) or a single line of gradient –1.5]
	(c)		− 1.5 oe	2	M1 for a right-angled triangle drawn on their line graph with vertical and horizontal lengths correct for their triangle **or** sight of –1.5oe **or** 1.5oe or $\frac{2}{3}$ oe or $-\frac{2}{3}$ oe or $\frac{3}{2}$ or $-\frac{3}{2}$ A1 (ft their single line graph) for − 1.5 oe **or** M1 for a correct full method to rearrange the equation to make y the subject **or** sight of $y = k – 1.5x$ **or** $y = –1.5x$ **or** $–1.5x$ **or** $y + 1.5x = k$ A1 for –1.5oe

1380_4H

7	(a)	eg 60/30 =	2	2	M1 for method shown to work out the gradient for train A eg right-angled triangle drawn, 60÷30, etc. A1 cao Ignore units. SC B1 $y=2x+k$
	(b)	40÷30=1.3(3…..)	Train A and explanation	1	B1 Train A and slope is greater oe or accept a calculated speed, or distances for consistent time period or times for consistent distance
	(c)		15	1	B1 cao

Question		Working	Answer	Mark	Notes
8	(a)		3.5, 4.5, 5	2	B2 for 3.5, 4.5, 5 oe (B1 for 1 correct)
	(b)		Single line from (–2, 3) to (2, 5)	2	B2 cao for correct single line between $x = –2$ and $x = 2$ (B1 ft for plotting at least 4 points correctly or for a line with gradient ½ or for a single straight line passing through (0, 4))
	(c)(i)	(1, 2) to (0, 4)	Correct line	3	B1 ft for a perpendicular line through (0, 4) for at least x= -1 to x=1
	(ii)		$y = –2x + 4$		B2 correct answer or f.t. correct equation for their line (B1 $y = -2x + k$ or $-2x+4$ or ft correct expression for their line with no y=)

5MB2H_01

6	(a)	−14 ÷ 40	−0.35	2	M1 for method shown to work out the gradient, eg right-angled triangle drawn or 14÷40 or 0.35 or $\frac{14}{40}$ oe A1 for −0.35 or $-\frac{14}{40}$oe
	b(i)		*P* + reason	2	B1 for *P* with reason eg takes only 40 seconds or crosses time axis first, takes 10 second less oe
	(ii)		2		B1 cao

3		$\left(\frac{1+4}{2}, \frac{2+0}{2}\right)$	(2.5, 1)	2	M1 for $\frac{1+4}{2}$ and $\frac{2+0}{2}$ or for either the x coordinate correct or the y coordinate correct A1 for (2.5, 1) oe SC: B1for an answer of (1, 2.5) if M0 scored

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4*		500 × 1000 × 400 = 200 000 000 20 × 50 × 40 = 40 000 200 000 000 ÷ 40 000 = 5000 OR (500 ÷ 20) × (1000 ÷ 50) × (400 ÷ 40) = 25 × 20 × 10 = 5000	Proof	4	B1 for a correct unit conversion, could be seen on the diagram or in working M1 for 500 × 1000 × 400 or 200 000 000 or 20 × 50 × 40 or 40 000 or 5 × 10 × 4 or 200 or 0.2 × 0.5 × 0.4 or 0.04 M1(dep) for '200 000 000' ÷ '40 000' C1 for fully correct working leading to final answer of 5000 OR B1 for a correct unit conversion, could be seen on the diagram or in working M1 for (500 ÷ 20) or (1000 ÷ 50) or (400 ÷ 40) or at least two of 25, 20, 10 seen M1(dep) for '25' × '20' × '10' C1 for fully correct working leading to final answer of 5000

5MB2H_01

15		Grad = $\frac{1}{3}$ $3 = 6 \times \frac{1}{3} + c$ $c = 1$	$y = \frac{1}{3}x + 1$	3	M1 for $-3 \times m = -1$ oe or $\frac{1}{3}$ seen M1 for $3 = 6 \times$ '$\frac{1}{3}$' $+ c$ or $y - 3 =$ '$\frac{1}{3}$'$(x - 6)$ A1 for $y = \frac{1}{3}x + 1$ oe

5MB2H_01

Original question 1

The full source mark scheme begins on page 390. Use the original paper code, tier and question number shown above.

Original question 13

The full source mark scheme begins on page 390. Use the original paper code, tier and question number shown above.

Original question 17

The full source mark scheme begins on page 390. Use the original paper code, tier and question number shown above.

8	(a)	$\frac{y_2-y_1}{x_2-x_1}$ eg = $\frac{300-100}{7.5-2.5}$ oe eg = $\frac{400}{10} = \frac{200}{5}$	35 - 41	2	M1 for use of $\frac{y_2-y_1}{x_2-x_1}$ or drawing a right angled triangle against the line, or inverse expression of gradient eg 0.025, 1:40, $\frac{1}{40}$ or correct answer given as algebra (eg y=40, 40x) A1 for 35 – 41 (units not required)
	(b)		Interpretation	1	B1 ft from part (a) or equivalent written explanation placing the gradient into the correct context, linking rate eg distance per gallon, mpg, constant rate of use of petrol, constant rate.

17			(4,3), (4,4), (4,5), (5.4) marked	3	M2 for identifying the correct region or at least 3 correct points with no more than 3 incorrect points (M1 for drawing $x = 3$ (solid or dashed line) or at least 1 correct point with no more than 3 incorrect points) A1 cao

1MA0_1H

Question		Working	Answer	Mark	Notes
23			7.5	4	B1 for identifying A at 3 or D at 6 or A(3, 0) or D(0, 6) oe eg may be seen as labels on the diagram M1 for $0=\frac{-1}{-2}\times 3+c$ M1 (dep on previous M1) for 6 + '1.5' A1 cao **OR** B1 for identifying A at 3 or D at 6 or A(3, 0) or D(0, 6) oe eg may be seen as labels on the diagram M1 for 3/6 = *OP*/3 or 1.5 oe seen (from similar triangles) M1 for 6 + '1.5' A1 cao **OR** B1 for identifying A at 3 or D at 6 or A(3, 0) or D(0, 6) oe eg may be seen as labels on the diagram M1 for $(6+OP)^2 = (6^2+3^2) + (3^2+OP^2)$ oe (from Pythagoras) M1 for 6 + '1.5' A1 cao

12	(a)		Q marked and labelled	1	B1 for Q placed correctly (professional judgement if no cross)
	(b)		(3, 2, 4)	1	B1 cao

Question		Working	Answer	Mark	Notes
16		Gradient of $AB = 2$ Gradient of perpendicular line $= -\frac{1}{2}$ $y = -\frac{1}{2}x + c$ $-1 = -\frac{1}{2} \times 5 + c$ $c = \frac{3}{2}$	$y = -\frac{1}{2}x + \frac{3}{2}$	4	M1 for attempt to find gradient of AB M1 (dep) for attempt to find gradient of perpendicular line eg use of -1/m M1(dep on M2) for substitution of $x = 5$, $y = -1$ A1 for $y = -\frac{1}{2}x + \frac{3}{2}$ oe

13	(a) (b)		(8, 4, 0) (8, 2, $\frac{7}{2}$)	1 2	B1 cao M1 for mean of each pair of coordinates, $\frac{8+8}{2}$ (= 8), $\frac{4+0}{2}$ (= 2), $\frac{7+0}{2}$ (= $\frac{7}{2}$ oe), or 2 correct coordinates. A1 (8, 2, $\frac{7}{2}$) accept $3\frac{1}{2}$ or 3.5 for $\frac{7}{2}$

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

5MB2H_01

Question		Working	Answer	Mark	Notes
15	(a)		$y = 3x$	2	M1 for equation $y = 3x + k$ $(k \neq -4)$ A1 for $y = 3x$
	(b)		$y = -\frac{1}{3}x + 5$	2	M1 for gradient $-\frac{1}{3}$ A1 $y = -\frac{1}{3}x + 5$ oe

Original question 18

The full source mark scheme begins on page 409. Use the original paper code, tier and question number shown above.

28	(a)		(90, 0)	1	B1 for (90, 0) (condone $(\frac{\pi}{2}, 0)$)
	(b)		Correct graph	1	B1 for graph through (0, 2) (90, 0) (180, -2) (270, 0) (360, 2) professional judgement

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

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

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
3		Stem and leaf diagram: Additional horizontal line was inserted in the diagram.	Standard mark scheme
4	(b)	MLP only: *x* changed to *y*.	Standard mark scheme
7	(a)	2cm grid – shape P moved up two squares.	Note that the original shape **P** is in a different position
	(b)	2cm grid. No shading of shapes – x axis -2 and -4 removed as they would obscure shape	Standard mark scheme
10		Braille and MLP *x* changed to *y*.	Standard mark scheme
11		2 cm for 5 on both axes.	Change of scale
12		1.5 cm grid.	Standard mark scheme

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
13		N line increased to 9 cm. Shading removed. 'Land' and 'Sea' labelled. 037 degrees was changed to 040 degrees.	037° changed to 040°
14		2 cm spaces between numbers.	Standard mark scheme
17	(b)	Model as well as diagram provided. Braille only: 90 degrees written on diagram instead of the right angle sign.	Standard mark scheme
21		Frequency table: numbers changed to 5, 5, 10, 25, 10 and 5. Grid: 1.5 cm for 5 on both axes. Right axis labelled.	Frequency numbers changed to 5, 5, 10, 25, 10, 5 (a) Cumulative frequencies 5, 10, 20, 45, 55, 60 (b) Greater tolerance needed. Median and IQR will be different to those in standard scheme.
22	(b)	Models as well as diagram provided.	Standard mark scheme
24		2cm grid both axes. In the table, the number of calls is changed to 12 14 13 20 6	Number of calls changed to 12, 14, 13, 20, 6 So frequency density will be 1.2, 2.8, 2.6, 2, 0.4
27		vectors 'a' and 'b' in larger font size	Standard mark scheme
28		Size of diagram enlarged. Cross at A changed to a filled-in circle	Standard mark scheme

Original question 13

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

7			0.5	2	M1 for any suitable right angled triangle drawn against the given line with lengths indicated or used or for use of $\frac{y_2 - y_1}{x_2 - x_1}$ oe A1 for 0.5 oe SC B1 y=0.5x+1

14			2.5, 3, 1	2	M1 for $\frac{0+5}{2}$ or $\frac{3+3}{2}$ or $\frac{2+0}{2}$, can be implied by two correct coordinates in answer A1 cao

Question		Working	Answer	Mark	Notes
16	(a)		equation	1	B1 for $y = 3x + k$, $k \neq -5$ or any other equivalent form
	(b)		$y = -\frac{1}{3}x + 7$	3	B1 for $-\frac{1}{3}$ or $3m = -1$ oe M1 for $y = -\frac{1}{3}x + c$ or $5 = -\frac{1}{3} \times 6 + c$ or $\frac{y-5}{x-6} = -\frac{1}{3}$ A1 for $y = -\frac{1}{3}x + 7$ oe OR B1 for $x + 3y + k = 0$ or $x + 3y = k$ M1 for $6 + 3\times5 + k = 0$ A1 for $x + 3y - 21 = 0$ oe

17		(3,6,7) to (–2,2,5) (–5, –4, –2) (–2– 5, 2 – 4, 5 – 2)	(–7, –2, 3)	2	M1 for midpoint plus change or complete method for 2 out of 3 coordinates, can be implied by 2 correct values A1 cao

PAPER: 1MA0_1H

Original question 25

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

5MB1H_01

Question		Working	Answer	Mark	Notes
12	(a)		0.28	2	M1 for method shown to work out the gradient for car A A1 for 0.27 – 0.29
	(b)		35.5	1	B1 for 35.1 – 35.9

15	(a)		$y = 4x + 2$	2	B2 for $y = 4x + 2$ oe (B1 for $y = 4x + c$ or $4x + 2$ or $L = 4x + 2$)
	(b)		$y = 4x - 14$	3	B1 for gradient = 4 M1 for $-6 = '4' \times 2 + c$ or $y - -6 = '4'(x - 2)$ A1 for $y = 4x - 14$ oe

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

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

19			$y = \frac{1}{2}x - 5$	3	M1 for method to find gradient of L_1 e.g $\frac{6-3}{6-0}$ $\left(=\frac{1}{2}\right)$ M1 for $y =$ "$\frac{1}{2}$"$x + c$ or $y = mx - 5$ (c, m do not have to be numerical, or correct numerical values) or for $(L =)\frac{1}{2}x - 5$ A1 $y = \frac{1}{2}x - 5$ oe

PAPER: 1MA0_1H

PAPER: 1MA0_1H

Question		Working	Answer	Mark	Notes
26	(a)		180, 0	1	B1 for 180, 0 Accept π, 0
	(b)		270, –1	1	B1 for 270, –1 accept $\frac{3\pi}{2}$, –1
	(c)		$a = 2$ $b = 3$ $c = 1$	3	B1 cao B1 cao B1 cao

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PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
Q08		Diagram made x 2 size. 3 metres changed to 6 metres. 6 metres changed to 12 metres.	B1 for full line drawn 3 cm from edge of patio and parallel to it B1 for full arc of circle radius 6 cm centre the centre of the pond B1 ft for shading region to the right of their vertical line **and** outside the arc of their circle with correct centre
Q09	(a) (b)	2 cm grid. A cut-out shape is provided. Axis removed. 2 cm plain grid. L shape put on grid. 3 squares down and an extra square across. Total 4 squares. Candidates asked to enlarge the shape by SF3	B2 for shape with vertices at (0, –1), (–1, – 3), (–2, –3), (–2, –1) (B1 for rotation of 180° about the wrong centre) B2 for a correct enlargement (B1 for an enlargement with a SF other than 3 or for 3 sides correct)
Q10		No pictures	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.

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
Q14		No picture, just a box giving the distances	B1 for 5 miles = 8 km or equivalent statement or for $\frac{8}{5}$ or $\frac{5}{8}$ used correctly M1 for $50 \times r$ with $1.5 \leq r \leq 1.7$ oe or $480 \times s$ with $0.6 \leq s \leq 0.7$ oe M1 for 480 ÷ speed or distance ÷ 50 A1 oe
Q15		Grid x 2 – 2 cm squares. Top row removed.	B2 for all correct (B1 for 2 or 3 correct) M1 (dep on at least B1) for at least 6 points from their table plotted correctly A1 cao for fully correct graph M1 for line $y = x + 3$ drawn correctly or for reduction to correct 3 term quadratic (=0) and : $(x \pm 1)(x \pm 4)$ or formula using $a = 1$, $b = -3$ and $c = -4$, allow one sign error in the formula, or $\left(x - \frac{3}{2}\right)^2 = 4 + \left(\frac{3}{2}\right)^2$ A1 cao

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
Q16	(a)	Box plots: "first half" – relevant figures are 4.25, 4.75, 5.25, 5.5, 6.4.	M1 for "5.5" – "4.75" with at least one value correct A1 cao
	(c)	"Second half" figures are 3.6, 4.25, 4.75, 5, and 6. 2 cm squares	B1 ft from (a) for a correct comparison of a measure of spread B1 for a correct comparison of medians (accept averages) For the award of both marks at least one of the comparisons made must be in the context of the question.
Q19		2 cm grid	M1 for method to find gradient of L_1 e.g $\frac{6-3}{6-0}$ $\left(=\frac{1}{2}\right)$ M1 for $y =$ "$\frac{1}{2}$"$x + c$ or $y = mx - 5$ (c, m do not have to be numerical, or correct numerical values) or for $(L =)\frac{1}{2}x - 5$ A1 $y = \frac{1}{2}x - 5$ oe

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
Q20		Picture removed – box with the word "Photo inserted" Diagram labelled Diagram (i) and (ii)	M1 for $\frac{15}{10}$ (=1.5) or $\frac{10}{15}$ (=0.66..) or $\frac{16}{10}$(=1.6) or $\frac{10}{16}$(=0.625) M1 for $\frac{15}{10} \times 16$ (=24) oe A1 cao OR M1 for $\frac{15}{16}$(=0.9375) or $\frac{16}{15}$ (=1.066…) or $\frac{16}{10}$(=1.6) or $\frac{10}{16}$(=0.625) M1 for $\frac{15}{16} \times 10$ (=9.375) oe A1 20.625 oe
Q22	(b)	MLP only : x changed to y	M1 for $(y-3)(y+3)$ M1 for $(2y-1)(y+3)$ A1 for $\frac{y-3}{2y-1}$ cao
Q25		x 2 size, solid answer lines Braille only – Roman numerals inserted on the five answer lines	Standard mark scheme

PAPER: 1MA0_2H

Question		Working	Answer	Mark	Notes
1			(4, 5½)	2	M1 for $\frac{2+6}{2}$ or $\frac{3+8}{2}$ or 4, 5½ without brackets A1 for (4, 5½) oe NB: (4,5) gets 0 without working

19			(2, 1⅓, 1)	2	M1 for finding coordinates of P (6, 4, 3) or $OT = ⅓\ OP$ or 2 correct coordinate values A1 oe

17			$y = -\frac{1}{2}x + 2$	3	M1 for gradient = $-\frac{1}{m}$ or $-\frac{1}{2}$ M1 for substitution of $x = -2$, $y = 3$ into their $y = mx + c$ where c is a constant to be found A1 for $y = -\frac{1}{2}x + 2$ oe eg accept $2y + x = 4$

Paper: 5MB3H_01

Question		Working	Answer	Mark	Notes
11			16	3	M1 for a correct first step in a process to find q, eg. a right-angled triangle drawn with correct vertical and horizontal lengths shown or correctly finding the difference in x coordinates and the difference in y coordinates of any two of the three given points M1 for a complete method to find q A1 cao

Original question 24

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

9			(–3,–12,–1)	2	B2 cao B1 for two out of three coordinates correct

12			$y = \frac{10}{3}x + \frac{130}{3}$	5	B1 for stating B as (0, 5) or $OB = 5$ (could be written on the diagram) B1 for C as (10, 0) or $OC = 10$ (could be written on the diagram) or A is (-10, 10) or ft from their BC M1 gradient of $DA = \frac{10}{3}$ or $y = \frac{10}{3}x + c$ M1 for substitution of $x = -13$, $y = 0$ or $x = -10$, $y = 10$ in their equation A1 $y = \frac{10}{3}x + \frac{130}{3}$ oe

15	(a)		(3, 6.5)	2	M1 for a method to find either the x coordinate or the y coordinate of the midpoint or $x = 3$ or $y = 6.5$ oe A1 cao [SC: B1 for (6.5, 3)]
	*(b)		No and correct working	3	M1 for a method to work out a gradient between any relevant pair of points (ie 2 of points A, B, C or D), eg. $\frac{9-4}{8--2}\left(=\frac{5}{10}\right)$ M1(dep) for a method to work out the gradient between another pair of points which can be used for comparison; one gradient must be through D. C1 for "no" and a correct explanation based on two correct gradients OR M1 for a method to work out a gradient between any relevant pair of points (ie 2 of points A, B, C or D), eg. $\frac{9-4}{8--2}\left(=\frac{5}{10}\right)$ M1 (dep) for using their gradient to work out an equation of a straight line in the form $y = mx + c$ and substituting in an appropriate point C1 for "no" and a correct explanation based on correct working OR M2 for (100, 55) or (102, 56) C1 for "no" and a correct explanation based on correct coordinates.

PAPER: 1MA0_1H

12			$p = 8, q = 10$	3	M1 for finding the difference between the x or y coordinates eg $4 - 2$ (= 2) or $17 - 5$ (= 12) M1 for a complete method to find the value of p or the value of q A1 cao

17		Gradient of N = 3 Gradient of perpendicular to line N = $-\frac{1}{3}$	$y = -\frac{1}{3}x + 1$	3	M1 for complete method to find gradient of line N or for drawing a perpendicular line M1 for method to find the gradient of a perpendicular line A1 $y = -\frac{1}{3}x + 1$ oe

PAPER: 1MA0_2H

12	(a)		(5, 3, 4)	1	B1 cao
	(b)		point	1	B1 cao

5MB2H/01 June 2015

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

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

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

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

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

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

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

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

17			$y = 3x-5$	3	M1 for recognition that the gradient of $\mathbf{L_2}$ is 3 M1 for substitution of $x=3$ and $y=4$ into $y=$ "m"x+c A1 $y = 3x-5$ oe (SC B2 for '$3x-5$ ' or $L_2 = 3x-5$)

Original question 12

The full source mark scheme begins on page 488. Use the original paper code, tier and question number shown above.

Original question 15

The full source mark scheme begins on page 488. Use the original paper code, tier and question number shown above.

Question	Working	Answer	Mark	Notes
10		$-3, -2$	2	M1 for $x = -3$ or $y = -2$; for finding the difference between the x or y coordinates of M and P (eg ± 4 or ± 4.5); for $\frac{x+5}{2} = 1$ or for $\frac{y+7}{2} = 2.5$ A1 for $x = -3$, $y = -2$

12	(a)		0.27	2	M1 for method to work out the gradient for train A A1 for 0.26 – 0.28
	*(b)		Comparison	1	C1 for speed of train B is constant, speed of train A is increasing. oe

Question		Working	Answer	Mark	
9			142	3	M1 for 3 × 7 (=21) or 3 × 5 (=15) or 5 × 7 (=35) M1 (dep on M1) for 2 × (‘21’ + ‘15’ + ‘35’) A1 cao

Question		Working	Answer	Mark	
15			$y = -\frac{1}{2}x + \frac{17}{2}$	4	M1 for M = $\left(\frac{2+4}{2}, \frac{5+9}{2}\right)$ (= 3,7) M1 for gradient = $-\frac{1}{m}$ or $-\frac{1}{2}$ oe M1 (dep on 1st M1) for substitution of x = "3", y = "7" into their equation A1 for $y = -\frac{1}{2}x + \frac{17}{2}$ oe

15	(a)		–3, 8	2	M1 for 3 + (3 – 9) (= –3) oe or 5 + (5 – 2) (= 8) oe or $\frac{x+9}{2}=3$ or $\frac{y+2}{2}=5$ A1 cao
	(b)		$y = –0.5x + 6.5$	3	M1 for a correct method to find the gradient (= –0.5), ft the possible use of coordinates in part (a) M1 for method to find c eg substituting into $y =$ "–0.5"$x + c$ A1 for $y = –0.5x + 6.5$ oe

PAPER: 1MA0/1H

9	(a)		1.4	2	M1 for distance ÷ time, eg 14 ÷ 10 A1 for 1.3 – 1.5
	(b)		Lorry travels 1.4 kilometres each minute	1	B1 for (lorry travels) 1.4 kilometres each minute oe

13	(a) (b)		(5, 2, 2) (4, 2, 1)	1 2	B1 cao M1 for an answer of (a, 2, 1) or (4, b, 1) or (4, 2, c) or ft from (a) A1 (4, 2, 1) or ft from (a)	E E

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

17	$\frac{-2}{6} = \frac{-1}{3}$ $1 = 3 \times 3 + c$	$y = 3x - 8$	4	M1 for gradient $\frac{-2}{6}$ M1 for use of $\frac{-1}{m}$ for perpendicular line M1 for substitution of (3,1) into their equation A1 for $y = 3x - 8$ oe	E

11		(102, 104)	3	B1 for $(P=)$ (106, 107) M1 for a complete method eg [104 − ("106" − 104), 105.5 − ("107" − 105.5)] or $(A=)$ $(102, y)$ or $(A=)$ $(x, 104)$ A1 cao

Question	Working	Answer	Mark	Notes
24		$y = \frac{1}{4}x + 5$	4	B1 for $m = -4$ M1 (indep) for gradient of perpendicular $= -\frac{1}{"-4"}$ or $\frac{1}{4}$ M1 (dep on previous M1) for substituting $x = -8$, $y = 3$ into $y =$ "$\frac{1}{4}$"$x + c$ A1 for $y = \frac{1}{4}x + 5$ oe SC If M0 is scored then B2 for $y = -\frac{1}{4}x + 1$

Paper: 1MA0/2H

6		comparison	M1 A1	starts to manipulate expression e.g. $3y = 9x – 6$ or $3y = 9x – 5$ gives equation(s) which can be used to show that the gradients of the two lines are the same e.g. $y = 3x – 5/3$

Paper: 1MA1/1H

Question	Working	Answer	Mark	Notes
11 (a)		1, −3	B1	cao
(b)		−0.75, 2.75	B1	accept −0.7 to −0.8, 2.7 to 2.8
(c)		−2.8	B1	cao

18		$y = -2x + 21$	P1 P1 P1 A1	shows evidence of understanding that *AC* is perpendicular to *DB*, or states the gradient of *DB* as 0.5 oe shows a process to find the gradient of a perp. line e.g. use of $-\frac{1}{m}$ or states $y = -2x + c$ or states the gradient of AC as -2 (dep on P2) for sub. of $x = 5$, $y = 11$ into $y = mx + c$ where m is their found gradient for AC. oe

Question	Working	Answer	Mark	Notes
20 (a)		–0.4 to –0.2 and 3.2 to 3.4	M1 A1	for (y =) x + 4 for answers in the range –0.4 to –0.2 and 3.2 to 3.4
(b)		1.6 to 2.5	M1 M1 A1	for drawing a tangent to the curve at x = 2 for method to find gradient of their tangent for answer in the range 1.6 to 2.5

19		$y = 2x + 36$	P1	starts process, eg by rearranging to find gradient, eg $y = 6 - \frac{x}{2}$ **or** $\frac{-1}{2}$ **or** positions of B and E
			P1	complete process to find position of A **or** uses $\frac{-1}{m}$ to find the gradient of **M**
			P1	complete process to find equation of **M**
			A1	$y = 2x + 36$ oe

Question	Working	Answer	Mark	Notes
19		Proof (supported)	M1	for a method to find coordinates of $M(-1, -1)$ or $N(3, 1)$
			M1	for method to find gradient of MN or PR or for method to find column vector for MN or PR or for differences of x coordinates and differences of y coordinates for MN or PR
			A1	for gradients of MN and PR , ie ½ oe or for column vectors of MN and PR, $\overrightarrow{MN} = \begin{pmatrix}4\\2\end{pmatrix}$ and $\overrightarrow{PR} = \begin{pmatrix}8\\4\end{pmatrix}$ or for differences of x coordinates and of y coordinates for MN and PR
			C1	for conclusion from reasoning and correct working

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
6	(22, 20)	P1	for process to find width or height of diagram eg 38 − 6 (= 32) **or** 36 – 7 (= 29)	Figures may be shown on the diagram
		P1	for process to find length of side of square eg “32” ÷ 4 (= 8) **or** process to find half width of diagram eg “32” ÷ 2 (= 16)	
		P1	for process to find x coordinate eg 6 + 2 × “8” (= 22) **or** 6 + “16” (= 22) **or** (6 + 38) ÷ 2 (= 22)	If (6 + 38) ÷ 2 leads to an answer other than 22, award P2 only
		P1	for process to find y coordinate eg 36 – 2 × “8” (= 20) **or** 36 – “16” (= 20) **or** 7 + “8” + “29” – 3 × “8” (= 20)	
		A1	cao SC: award 4 marks for (20, 22)	Award for P3 for (22, y) or (x, 20) or x = 22 or y = 20

Question	Answer	Mark	Mark scheme	Additional guidance
19	$b = \frac{2}{3}a + 2$	P1	for process to rearrange the equation to give y in terms of x eg $y = \frac{7-3x}{2}$ **or** $y = -\frac{3}{2}x + \left(\frac{7}{2}\right)$ **or** $m = -\frac{3}{2}$	
		P1	for using their gradient in $mn = -1$	
		P1	for showing a process to find the gradient of PQ eg $\frac{b-4}{a-3}$ **OR** for substituting $x = 3$ and $y = 4$ in $y = \text{“}\frac{2}{3}\text{”}x + c$	
		P1	(dep P3) for forming an equation in a and b eg $\frac{b-4}{a-3} = \text{“}\frac{2}{3}\text{”}$ **or** $b = \text{“}\frac{2}{3}\text{”}a + \text{“2”}$ **OR** correct equation in terms of x and y eg $y = \frac{2}{3}x + 2$	$y - 4 = \frac{2}{3}(x-3)$ gets P4
		A1	for $b = \frac{2}{3}a + 2$ oe	Accept 0.66 or 0.67 oe for 2/3

Paper: 1MA1/1H

12	(a)	1.5	M1	for method to find the gradient of the line, eg $\frac{12}{8}$	Must see use of scales.
			A1	for 1.5 oe	
	(b)	Explanation	C1	Explanation relating to rate of change of volume with time, eg rate at which the container fills or change in number of litres per second or number of litres added per second	Ignore any quantities given. Award the mark for an explanation involving rate.
	(c)	Explanation	C1	Explanation relating to volume (amount) of liquid in the container at the start eg number of litres in the container when $t = 0$, amount of liquid in the container to start with	

17	(2, –9)	P1	substitutes $x = 0$, $y = –5$ into $y = x^2 + ax + b$ $(b = -5)$ **or** substitutes $x = 5$, $y = 0$ into $y = x^2 + ax + b$ $(0 = 25 + 5a + b)$ **or** starts process to find other intercept, eg writes $y = (x – 5)(x – k)$	
		P1	for complete process to find two intercepts, eg. substitutes the second point into $y = x^2 + ax + b$ and solves to find a $(= –4)$ and b $(= –5)$ **or** substitutes $x = 0$, $y = –5$ into $y = (x – 5)(x – k)$ and solves to find k $(= –1)$	
		P1	(dep on P2) for factorising or completing the square of $x^2 +$ "–4" $x +$ "–5" and identifying the x-coordinate of the turning point **or** for a complete process to find the x-coordinate of the turning point, eg $(5 +$ "–1"$)/2$	
		A1	cao	x-coordinate of 2 with no or incorrect working gets NO marks

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
6	7	P1	process to use gradient eg $y = 3x + c$ **or** $c = -6$ **or** $\frac{15-9}{d-5}$ **or** $(15 - 9) \div 3$ **or** (6, 12)	Condone use of a letter other than d, for d
		P1	(dep) full process to rearrange equation formed to isolate d eg rearrangement of $15 = 3d - 6$ or $3 = \frac{15-9}{d-5}$ **or** for $5 + \frac{15-9}{3}$	Must show processes to get as far as $d =$ Award P2 for an answer of (7, 15)
		A1	cao	

14	curve	C1	sketch of graph which starts above x-axis for negative x, and makes an increasing exponential rise into positive x	Condone graph "touching" the x axis. Do not award from a graph for positive x only.
	(0,1) labelled	C1	for showing a label of (0,1) on the y axis	Do not award if a point is given for crossing the x-axis. Accept the coordinates shown as a label of "1" written on the y axis at the intersection.

Question	Answer	Mark	Mark scheme	Additional guidance
18	$\left(\frac{-16}{5}, \frac{48}{5}\right)$	P1	for a method to find gradient of $\mathbf{L}_1$ eg $\frac{6-2}{4-12}$ $(= -\frac{1}{2})$ or states $\mathbf{L}_2$ as $y = -3x$	Ignore sketches.
		P1	(dep on P1) for a method to find equation of $\mathbf{L}_1$ eg subs into $y =$ "$-\frac{1}{2}$"$x+c$ OR states $\mathbf{L}_1$ as $y =$ "$-\frac{1}{2}$"$x + 8$	
		P1	(dep on P2) complete method to equate both lines eg "$-\frac{1}{2}$"$x + 8 = -3x$	
		A1	oe	Accept equivalents eg $(-3.2, 9.6)$

19	(i)	3, 8	M1	for $a = 3$, may be seen in working or as part of an expression, eg $(x - 3)^2 - 9$	9 does not have to be seen for this mark
			A1	for $a = 3$, $b = 8$	
	(ii)	3, –8	B1	for 3, –8 **or** ft (i)	

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
14 (a)(i)	0.83	B1	for a tangent drawn at $t = 15$	Working: $7.5 \div 9 = 0.83...$ No tangent scores 0 marks
		M1	full method to use the tangent to find the gradient (eg $7.5 \div 9$)	This mark can be awarded if the tangent is drawn at $t \neq 15$ Working may be seen on the diagram
		A1	for answer in the range 0.6 to 1.0	
(ii)	Statement	C1	statement **Acceptable examples** acceleration rate of change of speed increase in speed over time **Not acceptable examples** rate of change m/s/s increase in speed	
(b)	220	P1	for splitting the area into strips and correct process to find the area of one strip, eg $\frac{5\times4}{2}$ (=10) **or** $\frac{(4+12)}{2}\times5$ (=40) **or** $\frac{(12+18)}{2}\times5$ (=75) **or** $\frac{(18+20)}{2}\times5$ (=95)	Working 4, 12, 18, 20
		P1	for a complete process using at least 4 strips to find the area under the curve eg, "10" + "40" + "75" + "95"	Allow one error in the reading of speeds
		A1	for answer in the range 215 to 225 from correct working using at least 4 strips	

Paper: 1MA1/2H

16	$y = -\frac{3}{4}x - \frac{11}{4}$	M1	for identifying gradient of $\frac{4}{3}$	Ignore constant term
		M1	for beginning a method to find the gradient of the perpendicular line eg $\frac{4}{3} \times m = -1$ **or** identifies gradient of perpendicular line as $-\frac{3}{4}$	Can ft providing gradient is clearly stated
		A1	for $y = -\frac{3}{4}x - \frac{11}{4}$ or any equivalent equation	$4y + 3x = -11$ $y + 5 = -\frac{3}{4}(x - 3)$

Paper: 1MA1/2H

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

Paper: 1MA1/3H

21	Sketch graph with TP at (2, -13) and intercepts at (0, -5), $(2+\sqrt{\frac{13}{2}}, 0)$ and $(2-\sqrt{\frac{13}{2}}, 0)$	B1	for a parabola drawn with intercept at the point (0, – 5)	
		M1	for the start of a method to find the roots of $y = 0$, eg. $2(x-2)^2 - 13 (= 0)$ oe or $(x =) \frac{--8 \pm \sqrt{(-8)^2-4\times2\times-5}}{2\times2}$	
		M1	(dep) for method to find the roots, eg. $2 \pm \sqrt{\frac{13}{2}}$ oe	
		B1	for turning point at $(2, -13)$	Turning point may be just seen and labelled on the sketch
		C1	for a fully correct parabola drawn with turning point at $(2, -13)$ and intercepts at $(0, -5)$, $(2+\sqrt{\frac{13}{2}}, 0)$ oe and $(2-\sqrt{\frac{13}{2}}, 0)$ oe clearly shown	

Paper: 1MA1/1H

25	9.75	P1	process to find the gradient of **L** $\left(=-\frac{3}{2}\right)$	
		P1	process to find the gradient of the perpendicular line **M** eg use of $-\frac{1}{m}$ or states gradient as $\frac{2}{3}$ **or** $y=\frac{2}{3}x+c$	
		B1	(indep) gives y coordinate of $B = 8.5$ oe	Could be indicated other ways, eg 8.5 on the y axis of a diagram
		P1	(dep P2) process to find x coordinate of C (= 3) or y coordinate of C (= 4) eg the first stage of solving equations or using elimination by substitution, to find a coordinate of C.	ft their linear equation for M with L; allow some error in manipulation of these linear equations as long as the overall process is correct.
		A1	9.75 oe	Award 0 marks for a correct answer with no supportive working.

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

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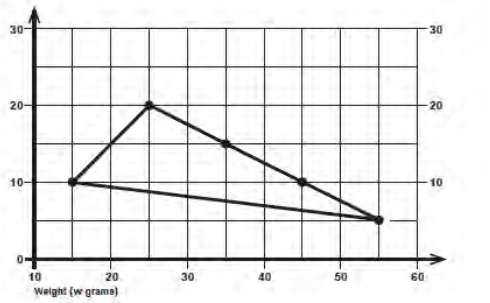
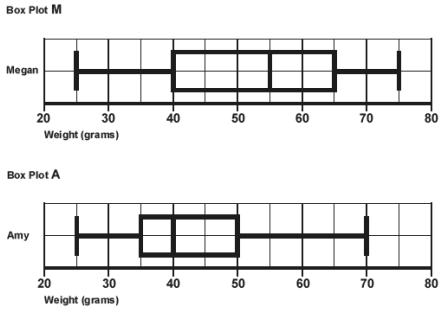
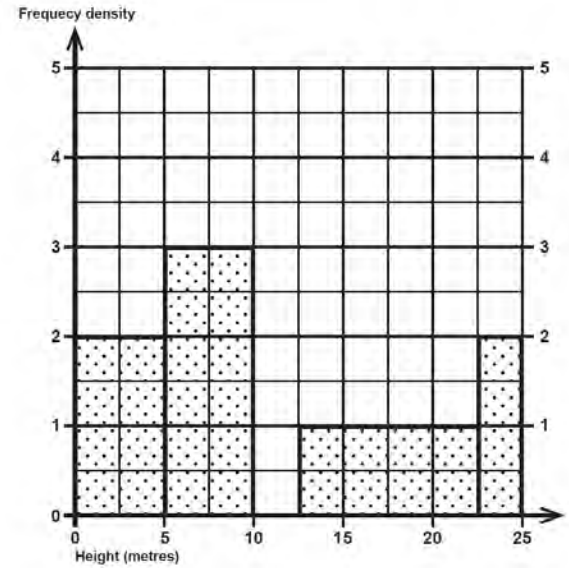
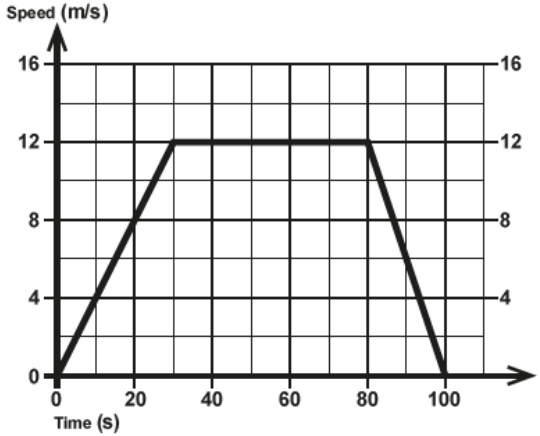
The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
1		Diagram enlarged and changed:  Crosses changed to solid circles. Axes label moved to the left of the horizontal axis. Frequency changed as follows: $10 < w \leq 20$ 5 $20 < w \leq 30$ 20 $30 < w \leq 40$ 15 $40 < w \leq 50$ 10 $50 < w \leq 60$ 5 Question wording changed from '50 potatoes' to '55 potatoes'.	Standard mark scheme, but reference to the first point is now "(15,5) has been incorrectly plotted at (15,10)"
3		Wording added 'Tom and Adam have some stamps.' Information moved to Diagram Book.	Standard mark scheme
5		Diagram enlarged. Graphs labelled as 'Graph A, graph B etc'.	Standard mark scheme
9		Diagrams enlarged; models should be provided for all candidates. Wording added 'The cuboid has length 18 cm, width 8 cm and height 6 cm.'	Standard mark scheme.

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
11		Box plots changed as shown.  Wording added 'They show box plot M and box plot A.' Megan's box plot labelled 'Box plot M' and Amy's box plot labelled 'Box plot A.' Horizontal axes labels moved to the left. Megan's box plot: Lowest 25, Highest 75, Median 55, IQR 40-65 (=25), range = 50 Amy's box plot: Lowest 25, Highest 70, Median 40, IQR 35-60 (=25), range = 45	Part (a): C1 explanation eg 'No' the median is 55 Part (b): C1: a correct comparison of medians eg the median weight for Megan was greater than the median weight for Amy C1: a correct comparison of a measure of spread eg the IQR of weights for Megan was the same as the IQR of weights for Amy For the award of both marks at least one of the comparisons must be in the context of the question Additional guidance: Simply quoting values for median, range and IQR is insufficient, they must be compared Figures given must be correct. Comparisons can relate to the range or the IQR
12		Diagram enlarged. Angle *EAD* marked with an angle arc. Angle moved outside of the angle arc and the angle arc made smaller.	Standard mark scheme
15		MLP only: *x* changed to *y*.	Standard mark scheme with letters changed as indicated.
16		Wording added 'Each card is numbered from 1-9.'	Standard mark scheme
17		Diagram enlarged. Angle moved outside of the angle arc and the angle arc made smaller.	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
18		Histogram changed as shown below.  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. Wording added 'It shows an incomplete histogram.' Grid extended to 5 on the vertical axis.	Mark scheme adjusted as follows: M1: method to find any frequency, eg 2 × 5 (= 10) **or** 3 × 5 (= 15) **or** 1 × 10 (= 10) **or** 2 × 2.5 (= 5) oe **or** method to use areas eg 2 × 4 (=8) or 2 × 6 (=12) or 4 × 2 (=8) or 1 × 4 (=4) oe complete method to find total frequency for the four intervals eg "10 + "15" + "10" + "5" (=40) **or** "8" + "12" + "8" + "4" (=32) C1: Bar of height 4 (8 squares high)
19		Diagram enlarged. Wording added for MLP only 'A hemisphere is half a sphere.' Formula placed above hemisphere. Wording for Braille only: 'The model represents a hemisphere with diameter 8.4cm.'	Standard mark scheme
20		Braille only- *c* changed to *r* and *d* changed to *s*	Standard mark scheme with the letters changed as indicated.

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
21		Diagram enlarged. Right axis labelled. Vertical axis marked in units of 4. Axes labels moved to the left of the horizontal axis and above the vertical axis.  	Standard mark scheme
23		Diagram enlarged. Angle moved outside of the angle arc and the angle arc made smaller. Wording added 'with sides $(2x - 1)$ cm and $(10 - x)$ cm. An angle of 150° is marked'	Standard mark scheme
24		Diagram enlarged. Shading changed to dotty shading. Wording added 'It shows square *ABCD* on a coordinate grid.' Shape provided for all candidates labelled *ABCD* on both sides. Wording added 'A cut out shape may be available if you wish to use it.'	Standard mark scheme

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
15	$y=-\frac{1}{3}x+8$	M1	for a method for finding the gradient of L_2 eg use of $-\frac{1}{m}$ **or** $-\frac{1}{3}$	
		M1	(dep) for substitution of (9, 5) into $y="-\frac{1}{3}"x+c$	
		A1	for $y=-\frac{1}{3}x+8$ oe	$y-5=-\frac{1}{3}(x-9)$ gets M2A1

12	(a)	–0.09	M1	for suitable method to find gradient, eg 27 ÷ 300	Any readings from the graph must be reasonable. Condone missing negative for M1
			A1	for answer in the range −0.1 to −0.08 oe	
	(b)		C1	for explanation **Acceptable examples** volume of petrol used each km litres/km Rate of fuel consumption For every 9 litres you can travel 100 km **Not acceptable examples** volume ÷ distance volume of petrol used per distance km/litre as distance increases volume decreases	Can ft explanation linked to incorrect gradient in part (a)

Paper: 1MA1/2H

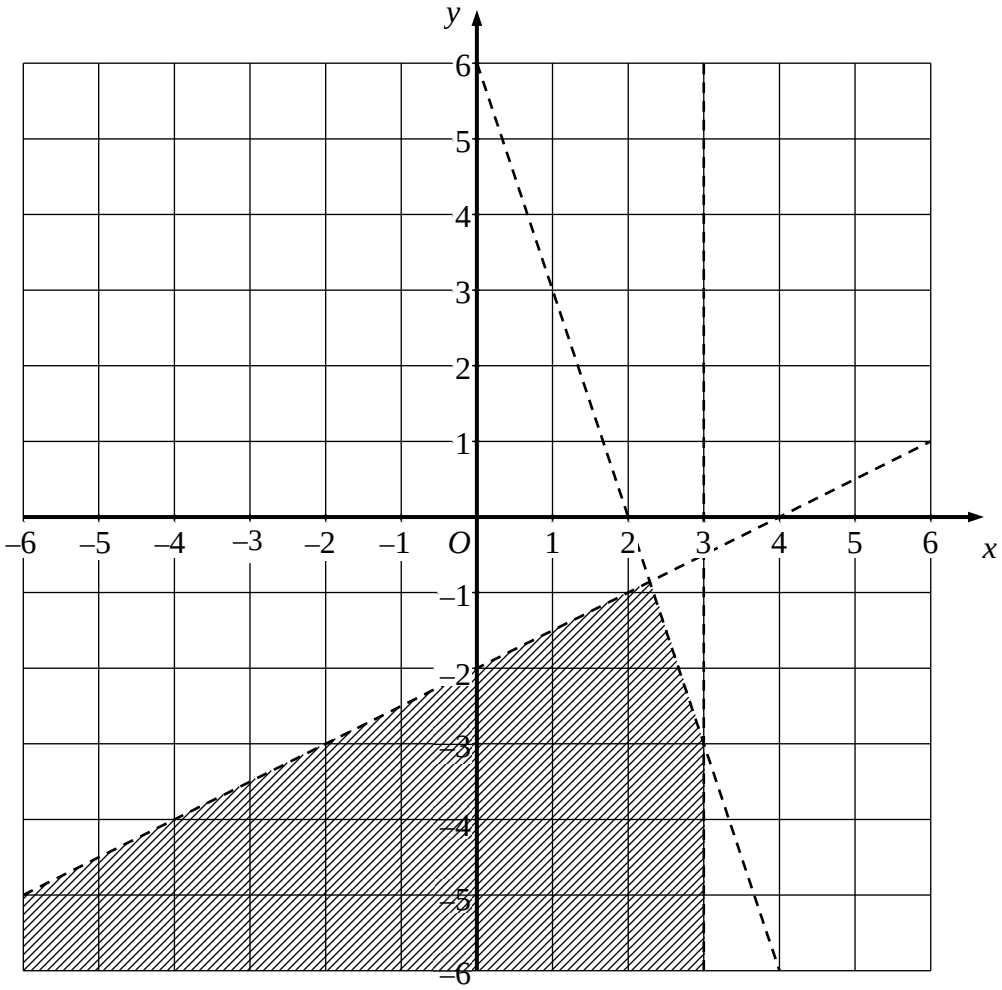
17	– 12, – 7	B1	cao	

13	(a)	region identified	M1	for 2 of lines $x = 2$, $y = x + 3$, $2x + 3y = 6$ correctly drawn	Accept use of full or broken lines for all marks
			M1	for all 3 lines $x = 2$, $y = x + 3$, $2x + 3y = 6$ correctly drawn	
			M1	for region which satisfies at least 2 of the inequalities $x \leq 2$, $y \leq x + 3$, $2x + 3y \geq 6$	Award for clear intention, shading not needed.
			A1	for correct region identified	Award for clear intention, shading not needed.
	(b)	no supported with reason	B1	for no and reason, eg (2, 4) does satisfy $x + y \leq 6$ or (2, 4) lies on the boundary of the region satisfying the equality sign.	

Paper: 1MA1/3H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**

22	(3, 36)	P1	for factorising –3 from the expression, eg $-3(x^2 - 6x - 3)$ **or** $-3(x^2 - 6x) + 9$	
		P1	for starting the process to complete the square, eg $(x - 3)^2 - 9$	ft from their factorising if only one error
		P1	for completing the process of completing the square, eg $-3[(x - 3)^2 - 12]$ **or** $-3(x - 3)^2 + 36$	
		A1	cao	An answer only and no working is 0 marks

Question 17



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

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

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

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
2		Wording added 'Look at the diagram for Question 2 in the Diagram Booklet. It shows an incomplete Venn diagram.' Wording added 'in the Diagram Booklet…'. Diagram enlarged. Labels 'Set *A*' and 'Set *B*' moved above the circles. Braille: In the diagram, add (i) for universal set, (ii) for Set *A*, (iii) for the overlap & (iv) for Set **B**. Then add 'Ans: (i) __ (ii) __ (iii) __ (iv) __'	Standard mark scheme
5		Wording added 'Look at the information for Question 5 in the Diagram Booklet.' Information enlarged.	Standard mark scheme

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
6		Wording 'Look at Diagram 1 and Diagram 2 for Question 6 in the Diagram Booklet. You may be provided with a model.' The triangle labelled *ABC*. Diagram 1 to show the 3D prism. Diagram 2 to show the cross-section *ABC*. Wording added 'Diagram 1 and the model show a prism'. Wording added 'The cross section of the prism shown in Diagram 2 is a right-angled triangle labelled *ABC*.' Wording added 'Angle *ABC* is a right angle. The base of the triangle, *BC* = 5 cm.' Diagram enlarged. Right angle made more obvious. Dashed lines made longer and thicker. Model could be provided candidates.	Standard mark scheme
7		Model of the cube and sphere provided for all candidates. Wording added 'Look at Diagram 1, Diagram 2 and the formula for Question 7 in the Diagram Booklet. You may be provided with two models.' Wording 'The diagram shows…' removed and replaced with 'Diagram 1 and Model A show a cube with edges of length *x* cm.' Wording added 'Diagram 2 and Model B show a sphere of radius 3 cm.' Diagrams enlarged and stacked vertically. Dashed lines made longer and thicker. The '3 cm' label and arrow moved to the left on the sphere diagram. Formula moved above the surface area diagram. Open headed arrows.	Standard mark scheme
8		Change *x* to *y*.	Standard mark scheme but note the changes to the letters.
10		Wording added 'Look at the diagram for Question 10 in the Diagram Booklet.' Wording 'The diagram shows…' removed and replaced with 'It shows…' Diagram enlarged.	Standard mark scheme

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
11		Wording added 'Look at the diagram for Question 11 in the Diagram Booklet.' Wording 'The diagram shows…' removed and replaced with 'It shows…' Diagrams enlarged. Labels moved to the left and above the diagrams. The rectangles labelled as 'rectangle **A**' and 'rectangle **B**'. Diagrams stacked vertically. Braille: Additional words: 'Rectangle **A** has a length of $2w + y$ and a width of 6. Rectangle **B** has a length of $3y + 6$ and a width of $7w$'	Standard mark scheme
12		Wording added 'Look at the diagram for Question 12 in the Diagram Booklet. It shows a grid.' Wording added 'The cumulative frequency table below gives…' Table enlarged. Cumulative frequency values modified: 4 changed to 5, 11 changed to 10, 24 changed to 25, 34 changed to 35 Wording added 'On the grid in the Diagram Booklet,..' Diagram enlarged. Open headed arrows. Axes labels moved to the left of the horizontal axis and above the vertical axis. Right axis has been labelled. Small squares removed. Braille: a spare diagram, 14 round bumpons and Wikki Stix.	Standard mark scheme but in (b) allow an answer in the range 12.6 to 14.5 (ft)
14		Wording added 'Look at the diagram for Question 14 in the Diagram Booklet. It shows the shape *ABCDEF*. All the measurements are in centimetres.' With the shape labelled *ABCDEF*. Wording added: '$AB = x + 1$, $BC = 4$, $EF = 2x + 6$, $AF = x + 11$' All the marked angles are right angles.' Wording 'Here is…' removed. Diagram enlarged. Right angles made more obvious.	Standard mark scheme
15		x changed to y.	Standard mark scheme but note the changes to the letters.

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
17		Wording added 'Look at the diagram for Question 17 in the Diagram Booklet. It shows a grid.' Diagram enlarged. Open headed arrows. The grid cut at $x = -4$. Axes labels moved to the right of the horizontal axis and above the vertical axis.	Standard mark scheme
18		Wording added 'Look at the diagram for Question 18 in the Diagram Booklet.' Wording 'Here is…' removed and replaced with 'It shows…' Wording added: '*AB* is parallel to *DC*. *BC* = 6 cm Angle *BCD* = 30°' Angle moved outside of the angle arc and the arc made smaller. Diagram enlarged.	Standard mark scheme
20		Wording added 'Look at the diagram for Question 20 in the Diagram Booklet.' Wording 'The diagram shows…' removed and replaced with 'It shows…' Diagram enlarged. Open headed arrows. Small squares removed. Axes labels moved to the right of the horizontal axis and above the vertical axis.	Standard mark scheme but for both A marks accept answers in the ranges $x = 2.0$ to 2.25, $y = 5.0$ to 5.25 $x = -2.5$ to -3.0, $y = -4.6$ to -4.9

11	(a)	(9, 7.5)	M1	for x coordinate = PO (6) $\times \frac{3}{2}$ (=9) **or** y coordinate = OQ (3) $\times \frac{5}{2}$ (= 7.5) **or** PO (6) $\times \frac{5}{2}$ (=15) **or** OQ (3) $\times \frac{3}{2}$ (= 4.5)	
			A1	cao	
	(b)	$y = -2x + 3$	P1	for process to find the gradient of the line, eg 3 ÷ 6 (=0.5) **or** $y = mx + 3$	Could use P and R or Q and R as ft from (a)
			P1	for process to find gradient of perpendicular eg $-1 \div$ [gradient of PQ] (= −2)	
			A1	for $y = -2x + 3$ oe	

Paper: 1MA1/2H

13	(9, 8)	P1 P1 P1 P1 A1	for setting up an equation for one dimension (width) of the pattern eg $2b - a = 8$ oe **or** $2x + y = 8$ oe for setting up an equation for the other dimension (height) of the pattern eg $2b + a = 16$ oe **or** $2x + 3y = 16$ oe (dep P2) for a full process to solve for both variables eg $4b = 24$, $b = 6$ and $12 - a = 8$, $a = 4$ **or** $8 = 2y$, $y = 4$ and $8 = 2x + y$, $x = 2$ (dep P3) for a full process to find one of the coordinates of C eg $3 + 6$ (= 9) or $4 + 4$ (= 8) **or** $3 + 2 + 4$ (= 9) or $4 + 4$ (= 8) cao	a and b are the width and length x is the difference between the length and width, y is the width of the rectangle Both values correct implies this mark Award 0 marks for a correct answer with no supportive working.

Paper: 1MA1/3H	

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
5	14.5, 21	P1	for process to work with coordinates, eg 4 – (−3) (= 7) **or** 9 – 1 (= 8)	Accept in reverse order eg −3 − 4 (= −7) and negative distances throughout
		P1	for process to use ratio, eg "7" ÷ 2 (= 3.5) **or** "8" ÷ 2 (= 4) **or** "7" × 3 (= 21) **or** "8" × 3 (= 24)	This mark is implied by 10.5 or 12 or 17.5 or 20
		P1	for complete process to find x or y coordinate of N, eg "3.5" × 3 + 4 **or** "4" × 3 + 9 **or** "3.5" × 5 –3 **or** "4" × 5 + 1 **OR** to find both the required distances eg "3.5" × 3 (= 10.5) **and** "4" ×3 (= 12) **or** "21" ÷ 2 (= 10.5) **and** "24" ÷ 2 (= 12) **or** "3.5" × 5 (= 17.5) **and** "4" × 5 (= 20)	
		A1	oe	

Paper: 1MA1/2H

12	comparison shown	M1 A1	for starting to manipulate equation, eg $5y = 10x + 15$ **or** $5y = 10x - 4$ **or** $y - 2x + \frac{4}{5} = 0$ **or** $y - 2x = 3$ for statement and equation(s) which can be used to show that the gradients of the two lines are the same, eg $5y = 10x + 15$ **and** $5y = 10x - 4$ **and** both have the same x coefficient **OR** $y = 2x - \frac{4}{5}$ **and** both have a gradient of 2	Ignore constant terms for both marks

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
8 (a)	0.14	M1	for a method to find the gradient, eg. 14 ÷ 100 using readings from the graph, at least one correct or for an answer of 0.14x	Must use the scales on the graph
		A1	for answer in the range 0.135 to 0.145 or ft correct readings from the graph	May be expressed as a fraction
(b)	Cost per unit of electricity	C1	for a correct explanation **Acceptable examples** eg cost of each unit (of electricity) rate of change of cost with units of electricity used cost per unit of electricity each unit costs 14p average cost charged for each unit of electricity used **Not acceptable examples** cost of how many units used costs in pounds per number of units used how much the cost of electricity goes up the relationship of cost and number of units used how steep it is	

Paper: 1MA1/3H

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
21	(180, –1)	B1 B1	for $180^{(o)}$ for –1 SC B1 if B0 scored for answer of (–1, 180)	

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
7 (a)	4	B1	for 4	Condone (0,4) or 0,4
(b)	(3, −5)	B1	cao	
(c)	5.1 to 5.3 and 0.7 to 0.9	M1	for a correct method, eg marking both intercepts with x-axis **or** one correct solution	**Accept** both solutions given as a coordinate for M1 eg (5.2, 0.8) **or** (0.8, 5.2) **or** (5.2, 0) **and** (0.8, 0)
		A1	for answers in the range 5.1 to 5.3 and 0.7 to 0.9	

9	Yes with comparisons shown	M1 A1	for starting to manipulate equation eg $y=\frac{3}{6}x+\frac{7}{6}$ or $y=\frac{1}{2}x+\frac{7}{6}$ or $3y=\frac{3}{2}x-6\times3$ or $6y=3x-36$ for statement and equation(s) which can be used to show that the gradients of the two lines are the same eg $y=\frac{1}{2}x+\frac{7}{6}$ **and** both have a gradient of $\frac{1}{2}$ or Yes, $6y=3x-36$ **and** both have the same x coefficients	Ignore constant terms for both marks

Paper: 1MA1/2H

21	(a)	1.06	M1	for tangent drawn at t =17.5	No tangent drawn at t=17.5 scores zero marks
			M1	for a complete method to find the gradient, eg tangent drawn at t = 17.5, and 18.5 ÷ 17.5	Use of change in y over change in x Working may be seen on the diagram
			A1	answer in the range 0.9 to 1.2	Answer of $\frac{10.5}{17.5}$ oe scores no marks Accept answers in the form a/b where a and b are integers
	(b)	Explanation	C1	suitable explanation, eg the rate of change of volume	If units are given they must be correct.

15	3	P1 P1 A1	for process to make the y term the subject of $6y + kx - 12 = 0$ eg $6y = 12 - kx$ or $y = 2 - \frac{k}{6}x$ for process to find gradient of line perpendicular to $\mathbf{L_1}$, eg $2 \times m = -1$ or $m = -\frac{1}{2}$ **or** for process to find k, eg $-\frac{k}{6} \times 2 = -1$ cao	A correct answer with no supportive working gets 0 marks

Paper: 1MA1/1H

7	(a)	(1, –3)	B1	cao	
	(b)	−0.7 or 2.7	B1	for an answer in the range –0.8 to –0.6 or 2.6 to 2.8	

17 (a)	16.5 to 19.5	M1 M1 A1	for tangent drawn at $t = 2.5$ dep (M1) for a complete method to find the gradient from tangent eg $(48 - 0) \div (4 - 1.4)$ (= 18.4...) for answer in the range 16.5 to 19.5 or ft acceptable tangent	The tangent must be seen to award any marks Award 0 marks for a correct answer (in the range) with no (or incorrect) supportive working
(b)	Description	C1	eg speed or velocity	"speed" may be expressed in a different way, eg distance per unit time (at that point) Award if extra information is given provided not contradictory.

Paper: 1MA1/3H

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	Graph drawn	B2	for a correct line drawn	
		(B1	for stating or plotting at least 2 points on the line eg (0, 0) and (4, 5) **or** (4, 5) and (8, 10) **or** giving the equation of the line eg $y = \frac{5}{4}x$)	
(b)(i)	1.25	B1	oe **or** ft their line in part (a)	Accept answers in the form $\frac{a}{b}$ where a and b are integers
(ii)	Explanation	C1	for explanation **Acceptable examples** the number of cups of water per cup of rice every cup of rice has 1.25 cups of water for every 4 cups of rice there are 5 cups of water **Not acceptable examples** cups of water ÷ cups of rice the gradient represents the steepness of the line the number of cups of rice for each cup of water	If figures are given as part of the answer they must be correct, but can allow ft

12	$y = -\frac{2}{3}x - 1$	M1	for a method to find gradient of perpendicular line, eg $y = \frac{3}{2}x(-\frac{7}{2})$ and $\frac{3}{2} \times m = -1$ **or** gradient of perpendicular shown as $-\frac{2}{3}$	
		M1	for a method to find the value of c, eg $-5 = \text{“}-\frac{2}{3}\text{”} \times 6 + c$ or $y - -5 = \text{"}-\frac{2}{3}\text{"}(x - 6)$ oe	
		A1	for $y = -\frac{2}{3}x - 1$ oe eg $2x + 3y + 3 = 0$ or $y + 5 = -\frac{2}{3}(x - 6)$ SC B1 for $y = -\frac{1}{3}x - 3$ oe if M0 scored	

Paper: 1MA1/1H

15	25	M1 M1 A1	for a tangent drawn at $t = 3$ for a complete method to find the gradient from tangent eg $50 \div (4 - 2)$ for answer in the range 22 to 28 or ft acceptable tangent	A tangent must be seen to award any marks This mark can be awarded if the tangent is drawn at $t \neq 3$ Award 0 marks for a correct answer (in the range) with no (or incorrect) supportive working

Paper: 1MA1/1H

12	6.4	P1	for a suitable start to the process, eg, $M = \left(\frac{7-3}{2}, \frac{13+21}{2}\right)$ (= (2, 17)) **or** $N = \left(\frac{15-3}{2}, \frac{23+21}{2}\right)$ (= (6, 22))	Condone missing brackets on coordinates Ignore units throughout
		P1	(dep on P1) for a correct first step using of Pythagoras, eg $\left(x_N - x_M\right)^2 + \left(y_N - y_M\right)^2$ eg (“6” – “2”)^2 + (“22” – “17”)^2 (= 41)	
		A1	for answer in the range 6.4 to 6.41	If an answer is given in the range in working and then rounded incorrectly award full marks.

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
6 (a)	$y = \frac{3}{2}x + 3$	M1	for a correct method to find the gradient of the line, eg $\frac{6-3}{2-0}$ $(= \frac{3}{2})$	
			or identifies 3 as the intercept in words or in a partial equation	Just circling 3 is insufficient
			or for $y = [\frac{3}{2}]x + c$	$[\frac{3}{2}]$ must be identifiable as their gradient
			or for $y - b = [\frac{3}{2}](x - a)$ where (a, b) is a correct coordinate	c must be seen either as a letter or a number
		M1	for $y = \frac{3}{2}x$ (+ c) oe **or** for $y =$ "$\frac{3}{2}$"$x + 3$, $m \neq 0$ **or** (**L** =) $\frac{3}{2}x + 3$ **or** $y - y_1 = \frac{3}{2}(x - x_1)$ **or** $y - b =$ "$\frac{3}{2}$"$(x - a)$ where (a, b) is a correct coordinate	Award of this mark implies the first M1
		A1	oe	Any correct equation gets 3 marks
(b)	Equation	B1	for $y = 5x + c$, $c \neq 0$ oe	May be in any equivalent form

Paper: 1MA1/1H

23	–5	P1	for $x^2 + y^2 = 125$ **or** $5^2 + 10^2 (= 125)$	
		P1	for process to find y coordinate of Q, eg $(\pm)\sqrt{125-(-2)^2}$	
		P1	for selecting $-\sqrt{125-(-2)^2}$ eg $y = -11$	
		P1	(dep P2) for process to find y intercept, eg $\frac{10-[y]}{5--2}$ $(= 3)$ **and** substitutes $x = 5$, $y = 10$ in $y =$ "3"$x + k$ or $\frac{10-[y]}{5--2}$ $(= 3)$ **and** $[y] + 2 \times$ "3" or $\frac{10-k}{5} = \frac{k-[y]}{2}$ or $[y] + \frac{2}{7} \times (10 - [y])$	Where $[y]$ is their y coordinate of Q
		A1	cao	

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

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

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

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
3		Diagram enlarged. Letters added to diagram (ABCDEF). Wording added: 'Look at the diagram for Question 3 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows a plan of a floor labelled ABCDEF. In the diagram: AB = 10 m BC = 5 m EF = 6 m FA = 8 m	Standard mark scheme
4		Diagram enlarged. Labels changed to 'Set P' and 'Set Q'. Wording added 'Look at the diagram for Question 4 in the separate Diagram Booklet. The diagram shows a Venn diagram with Set P and Set Q.'	Standard mark scheme
6		Diagram enlarged. Wording added 'Look at the diagram for Question 6 in the separate Diagram Booklet. The diagram shows a straight line L drawn on a coordinate grid.'	Standard mark scheme
11		Wording added 'Look at the diagram for Question 11 in the separate Diagram Booklet. The diagram shows triangle A on a coordinate grid. You may be given cut out shapes for this question.' Diagram enlarged. Triangle A moved one square lower on the grid. Centre of rotation for triangle B changed from (1, 2) to (1, 1)	M1 for triangle **B** drawn at (4, –1), (4, –3), (3, –3) **or** for triangle **C** drawn at (–3, –1), (–3, –2), (–1, –2) **or** for rotating their triangle **B** 90° clockwise about (1, 1) A2 for rotation 90° clockwise centre (–4, 0) (A1 for any 2 of the 3 aspects)
12		Wording added 'Look at the diagram for Question 12 in the separate Diagram Booklet. The diagram shows nine graphs labelled A, B, C, D, E, F, G, H, and J.'	Standard mark scheme

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
13		Word 'below' added 'The table below gives information …' In the table: frequency 22 changed to 20 frequency 8 changed to 10	
	(a)	Wording added 'Look at the diagram for Question 13(a) in the separate Diagram Booklet. The diagram shows a grid.' For Braille: sentence added 'A spare tactile diagram, drawing film, Wikki stix and sticky labels are available for this question.'	Standard mark scheme but note that relative heights are now 2, 3.5, **4**, 2, **1**
	(b)		M1 for a method to find number of people in interval eg $\frac{1}{2} \times 70 + 20 + \frac{1}{3} \times 30$ (= 65) **or** $150 - 20 - 10 - \frac{1}{2} \times 70 - \frac{2}{3} \times 30$ (= 65) A1 for $\frac{65}{150}$ oe fraction eg $\frac{13}{30}$
15		Diagram enlarged Wording added 'Look at the diagram for Question 15 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows a sector of a circle labelled OAB, with centre O and radius 6cm OA = 6 cm OB = 6 cm	Standard mark scheme

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
19		Diagram enlarged Wording added 'Look at the diagram for Question 19 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram shows two similar isosceles triangles, ABC and DAB. Sentence removed '*ABC* and *DAB* are similar isosceles triangles.'	Standard mark scheme
22	(a)	Diagram enlarged Wording amended 'Look at the diagram for Question 22 in the separate Diagram Booklet. The diagram shows two axes. On the axes, sketch the graph of $y = \sin x°$ for $0 \leq x \leq 360$' For Braille: sentence added 'A spare tactile diagram, Wikki stix and drawing film are available for this question.'	Standard mark scheme
	(b)	Word 'below' added 'Solve the equation below $2 \sin x° = -1$ for $0 \leq x \leq 360$'	Standard mark scheme

Question	Answer	Mark	Mark scheme	Additional guidance
20	3, – 11	P1	for start of a process to complete the square, eg $2\left(x^2-6x\right)...$ or $2\left(x^2-6x...\right)$ or $(x-3)^2$ … **or** an x coordinate of 3	… can be any constant term, but not a term in x
		P1	for completing the square $(y=)\ 2(x-3)^2-11$ or substitutes their value of x into the equation to find y	
		A1	cao	

7	Rate of change of volume	C1	for a correct explanation **Acceptable examples** The rate of water poured Speed of pouring water out from the tank How fast the water is being used (in the tank over time) Amount of water decreasing in the tank each second **Not acceptable examples** Negative correlation / negative gradient Amount of water decreasing in the tank in seconds As time increases the volume of water in the tank decreases It is negative, the volume of litres is going down It represents the deceleration or changing speed	Allow amount of water increasing in the tank each second

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
21	–6, 3.5	P1	for process to find gradient of PR or QR, eg $\frac{k+3-5}{k--4}\left(=\frac{k-2}{k+4}\right)$ **or** $\frac{k+3--6}{k-6}\left(=\frac{k+9}{k-6}\right)$ **or** $\frac{5-(k+3)}{-4-k}\left(=\frac{2-k}{-4-k}\right)$ **or** $\frac{-6-(k+3)}{6-k}\left(=\frac{-9-k}{6-k}\right)$ **OR** for start of process to use Pythagoras, eg $PR^2=(k--4)^2+(k+3-5)^2$ **or** $RP^2=(-4-k)^2+(-5-(k+3))^2$ **or** $QR^2=(k-6)^2+(k+3--6)^2$ **or** $RQ^2=(6-k)^2+(-6-(k+3))^2$	Condone missing bracket for first P1 only Stating eg Grad $PR=\frac{k--4}{k+3-5}$ Or grad $QR=\frac{k-6}{k+3--6}$ scores P0 but check SC
		P1	for forming a correct equation, eg $\frac{k+3-5}{k--4}\times\frac{k+3--6}{k-6}=-1$ **or** $\frac{k-2}{k+4}\times\frac{k+9}{k-6}=-1$ **or** $\frac{5-(k+3)}{-4-k}\times\frac{-6-(k+3)}{6-k}=-1$ **or** $\frac{2-k}{-4-k}\times\frac{-9-k}{6-k}=-1$ oe **OR** $(k--4)^2+(k+3-5)^2+(k-6)^2+(k+3--6)^2=(-6-5)^2+(6--4)^2$ **or** $(k+4)^2+(k-2)^2+(k-6)^2+(k+9)^2=(-11)^2+10^2$	
		P1	for writing in the form $ak^2+bk+c\ (=0)$, eg $2k^2+5k-42\ (=0)$ **or** $4k^2+10k-84\ (=0)$	
		P1	(dep P3) for factorising, eg $(k+6)(2k-7)\ (=0)$ **or** $(2k+12)(2k-7)$ **or** $(k+6)(4k-14)$ **OR** use of formula, eg $\frac{-5\pm\sqrt{5^2-4\times2\times-42}}{2\times2}$ **or** $\frac{-10\pm\sqrt{10^2-4\times4\times-84}}{2\times4}$	
		A1	cao SCB4 for correct answer coming from consistent use of reciprocals of gradients	

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
16	(7, 3.5)	P1	process to find the gradient of OB, eg $\frac{-4-0}{2-0}(=-2)$	
		P1	process to find the equation of DE, eg substitutes (12, −6.5) into $y =$ "−2"$x + c$ or $y = [-2]x + c$ or $y - -6.5 =$ "−2"$(x - 12)$ or $y - -6.5 = [-2](x - 12)$	Equation of DE is $y = -2x + 17.5$ Where [-2] can be $\frac{-1}{2}$ or 2 or $\frac{1}{2}$ and must be labelled as the gradient of OB
		P1	process to find the equation of OD, eg substitutes (0, 0) into $y = \frac{-1}{"-2"}x + c$ or $y = \frac{-1}{[-2]}x + c$ or $y - 0 = \frac{-1}{"-2"}(x - 0)$ or $y - 0 = \frac{-1}{[-2]}(x - 0)$	Equation of OD is $y = \frac{1}{2}x$ Where [-2] can be $\frac{-1}{2}$ or 2 or $\frac{1}{2}$ and must be labelled as the gradient of OB
		P1	(dep P3) forms an equation that can be solved to find x coordinate of D, eg "$-2x + 17.5$" = "$\frac{1}{2}x$"	
		A1	cao	A correct answer with no supportive working gets 0 marks

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
23	Sketch graph with minimum point at $(3p, -9p^2 - 7)$ in 4th quadrant and y intercept at $(0, -7)$	B1	for a curve drawn with intercept at the point $(0, -7)$	
		M1	for the start of a method to find the turning point, eg $(x - 3p)^2 \ldots$ **or** an x coordinate of $3p$ at the vertex	where … can be any constant term(s) but not term(s) in x
		M1	(dep) for a complete correct method to find the turning point, eg $(x - 3p)^2 - 9p^2 - 7$ **or** substitutes $x = 3p$ into the equation to find y	Allow $(3p)^2$ for $9p^2$ throughout
		B1	for turning point at $(3p, -9p^2 - 7)$	
		C1	for a sketch of a parabola drawn with intercept at $(0, -7)$ and minimum turning point clearly shown as being at $(3p, -9p^2 - 7)$ in the 4th quadrant.	A correct answer with no supportive working gets 0 marks

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

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

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

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
1		Wording added: 'Look at the diagram for Question 1 in the Diagram Booklet. It shows a grid.' Wording added: 'below' Value '100' changed to '90'. Table enlarged and left aligned. Frequency values in the table changed from 12, 28, 30, 22, 8 to 10, 25, 30, 20, 5 Wording changed from 'below' to 'in the Diagram Booklet'. For Braille: sentence added 'Bumpons and drawing film are provided if you wish to use them.' Diagram enlarged. Open headed arrows.	Standard mark scheme but points plotted at heights 10, 25, 30, 20, 5
3		Wording added: 'Look at the diagram for Question 3 in the Diagram Booklet. It shows angle ABC' Diagram enlarged. Diagram rotated so that BC is horizontal. For Braille: sentence added 'Drawing film is provided if you wish to use it.'	Standard mark scheme
4		Wording added: 'Look at the diagram for Question 4 in the Diagram Booklet. It shows an incomplete probability tree diagram.' For MLP: wording added 'in the Diagram Booklet. There are five spaces to fill.' For Braille: wording changed 'Complete the probability tree diagram by writing the missing values labelled (i) to (v).' Diagram enlarged.	Standard mark scheme
5		p changed to pence	Standard mark scheme
6		Wording changed: 'Look at the diagram for Question 6 in the Diagram Booklet. It is a stem and leaf diagram showing …' Diagram enlarged. Horizontal line added at the bottom of the diagram. Key moved above and left of the diagram.	Standard mark scheme

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
8		Wording changed: 'Look at the diagram for Question 8 in the Diagram Booklet. It shows a right-angled triangle ABC BC = 7.6 cm Angle ACB = 62° Angle ABC is a right angle.' Diagram enlarged. Right angle made more obvious. Angle moved outside of the angle arc and angle arc made smaller.	Standard mark scheme
11		Wording changed: 'Look at the diagram for Question 11 in the Diagram Booklet. It shows OAB, a sector of a circle with centre O and radius 4.7 metres.' Diagram enlarged. m changed to metres.	Standard mark scheme
13		Wording changed: 'Look at the diagram for Question 13 in the Diagram Booklet. It shows straight lines ABC and AED' Wording added: 'Angles ABE and ACD are right angles.' Diagram enlarged. Right angles made more obvious. Open headed arrows. Dimensions added to the diagram.	Standard mark scheme
16		Wording added: 'Look at the diagram for Question 16 in the Diagram Booklet. It shows OBCD and DCE on a set of axes.' Diagram enlarged. Open headed arrows. Coordinates added to the diagram.	Standard mark scheme
17		Wording changed: 'Look at the diagram for Question 17 in the Diagram Booklet. It shows triangle ABC AB = 14.6 cm BC = 18.2 cm CA = 7.9 cm' Diagram enlarged.	Standard mark scheme

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
19		Wording changed: Look at Diagram 1, Diagram 2, Diagram 3 and the formula for Question 19 in the Diagram Booklet. You may be provided with a model. The diagrams and model are NOT accurate. Diagram 1 and the model show a cone. Diagram 2 shows the base of the cone. Diagram 3 shows a side view of the cone. Model provided. Diagram enlarged. 2 additional 2D views added. Formula moved to the Diagram Booklet. Open headed arrows.	Standard mark scheme
21	(a)	Wording changed: 'Look at the diagram for Question 21(a) in the Diagram Booklet. It shows the graph of $y = f(x)$' Diagram enlarged. Grid cropped. Open headed arrows. For Braille: sentence added 'Bumpons and drawing film are provided if you wish to use them.'	Standard mark scheme
	(b)	Wording changed: 'Look at the diagram for Question 21(b) in the Diagram Booklet. It shows a sketch of the graph of $y = \sin x°$' Diagram enlarged. Cross changed to a dot. Open headed arrows.	Standard mark scheme
22		Wording changed: 'Look at the diagram for Question 22 in the Diagram Booklet. It shows a velocity–time graph for an aeroplane.' m changed to metres Diagram enlarged. Line changed to go through the points (0, 0), (10, 50), (20, 80) and (30, 90). Open headed arrows. s changed to seconds	M1 for starting to find the area under the curve, eg $0.5 \times 10 \times 50$ (= 250) M1 for a complete method to find the area under the curve, eg $0.5 \times 10 \times 50 + 0.5 \times 10 \times (50 + 80) + 0.5 \times 10 \times (80 + 90)$ A1 for 1750
23		Wording added: 'Look at the diagram for Question 23 in the Diagram Booklet. It shows blank axes. On the diagram,' Diagram enlarged. Open headed arrows. For Braille: sentence added 'Bumpons and drawing film are provided if you wish to use them.'	Standard mark scheme

Paper: 1MA1/1H

Question		Answer	Mark	Mark scheme	Additional guidance
3	(a)	(2),–2,(–4), –4, –2, 2	B2	for all 4 values correct	
			(B1	for 2 or 3 correct values)	
	(b)	Graph drawn	B2	for a fully correct graph	Accept a freehand curve drawn that is not made of line segments Curve must not have a horizontal segment between (–1, –4) and (0, –4) Ignore anything drawn outside the required range
			(B1	ft (dep on B1 in (a)) for plotting at least 5 of the points from their table correctly)	
	(c)	– 0.5, – 4.25	B1	ft their graph with a single turning point or for x coordinate = – 0.5 and y coordinate = – 4.25 oe	

Paper: 1MA1/1H

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
12 (a)(i)	10	M1	for a tangent drawn at $t = 3$	A tangent must be seen to award any marks
		M1	for a complete method to find the gradient from tangent, eg $\frac{30}{3}$	This mark can be awarded if the tangent is drawn at $t \neq 3$
		A1	for answer in the range 8.5 to 11.5 or ft acceptable tangent at $t = 3$	Accept answers in the form $\frac{a}{b}$ where a and b are integers Award 0 marks for a correct answer (in the range) with no (or incorrect) supportive working
(ii)	Acceleration or rate of change of velocity	C1	for a correct explanation **Acceptable examples** acceleration rate of change of velocity increase in velocity each second how quickly the velocity increases increase in velocity over time the rate at which the particle is accelerating **Not acceptable examples** rate of change increase in velocity the velocity per second velocity ÷ time as time increases so does the velocity how steep the line is the acceleration of the particle and how far it got	Award if extra information is given provided not contradictory or incorrect Accept ‘speed’ for ‘velocity’

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
12 (b)	220	M1	for a method to find an appropriate area, eg $\frac{1}{2}\times 30\times 2\,(=30)$ oe or $\frac{1}{2}(30+50)\times(4-2)\,(=80)$ oe or $\frac{1}{2}\times(50+60)\times(6-4)\,(=110)$ oe **or** for a method to find an estimate for the area of at least one rectangle with height at intersection of midpoint and curve, eg 2 × 16 (= 32) oe or 2 × 42 (= 84) oe or 2 × 56 (= 112) oe	Must have one correct expression for the award of this mark May be seen as a rectangle added to a triangle
		M1	for a complete method, eg $\frac{1}{2}\times 30\times 2+\frac{1}{2}(30+50)\times 2+\frac{1}{2}(50+60)\times 2$ or $\frac{1}{2}\times 2\times(0+60+2(30+50))$ **or** 2 × 16 + 2 × 42 + 2 × 56	Allow 1 error in *v* values used
		A1	for 220 or 228	Allow 228 only if it comes from rectangle/midpoint method

Paper: 1MA1/1H

17	$\frac{2}{3}$	M1 A1	for correct substitution, eg $1.5 = k^{-1}$ oe **or** $\frac{1}{1.5}$ oe but not $\frac{1}{1.5}$	Accept rounded or truncated to 2dp or better

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
20	Shown	M1	for the method to find a coordinate of the point D eg $\frac{1}{1+3}\times 16\ (=4)$ **or** $\frac{3}{1+3}\times 8\ (=6)$ **or** (4, 6) labelled	First two marks may be seen in either order Accept 4 or 6 stated or (6, 4)
		M1	for a correct form for **L**, eg $y=\sqrt{3}x+c$ **OR** a correct equation for the gradient of **L**, eg $\frac{[6]-f}{[4]--2}=\sqrt{3}$	Condone incorrect value for c when awarding this mark
		M1	for correct substitution to find c eg $[6]=\sqrt{3}\times[4]+c$ **or** $y-[6]=\sqrt{3}(x-[4])$ **or** $c=[6]-[4]\sqrt{3}\ (=-0.928...)$ **OR** starts to rearrange equation for gradient, eg $[6]-f=([4]--2)\sqrt{3}$	[4] must be clearly identified as the x-coordinate of D if incorrect Award of this mark implies the previous mark [6] must be clearly identified as the y-coordinate of D if incorrect
		M1	(dep on previous M1)for the method to substitute in –2, eg $\sqrt{3}\times(-2)+[6]-\sqrt{3}\times[4]$ **or** $\sqrt{3}\times(-2)+[c]$ **OR** a correct unevaluated expression for f, eg $f=[6]-([4]--2)\sqrt{3}$	[c] must be clearly what they have found to be the y-intercept of **L and** must have come from correct processes to evaluate
		C1	accurate figure eg $f=$ –4.39... **or** –4.39... < –4	–4.39... must come from correct working Accept −4.4 or better

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
7	(11, 14.5)	P1	for process to work with coordinates, eg 8 – 2 (= 6) **or** 12 – 7 (= 5) **or** eg (2 + 8) ÷ 2 (= 5) **or** (7 + 12) ÷ 2 (= 9.5)	Working may be seen on the diagram Allow alternative notation eg (6, 5) or (5, 6) or (5, 9.5) or (9.5, 5) Implied by $\frac{.....}{8-2}$ or $\frac{12-7}{.....}$ even if using $\frac{\text{diff in } x}{\text{diff in } y}$
		P1	for process to use proportion, eg "6" ÷ 2 (= 3) oe **or** "5" ÷ 2 (= 2.5) oe **or** 2 + "6" × 1.5 (= 11) **or** 2 + 9 (= 11) oe **or** 7 + "5" × 1.5 (= 14.5) **or** 7 + 7.5 (= 14.5) oe **or** "5" + "6" (= 11) **or** 8 + "5" – 2 (= 11) oe **or** "9.5" + "5" (= 14.5) **or** 12 + "9.5" – 7 (= 14.5) oe **or** (11, a) where $a \neq 14.5$ **or** (b, 14.5) where $b \neq 11$	Allow alternative notation eg (3, 2.5) or (2.5, 3) Implied by 8 + "3" (= 11) or 12 + "2.5" (= 14.5) Award P2 for (14.5, 11)
		A1	for (11, 14.5) oe	

Paper: 1MA1/3H

GCSE

Mark Scheme

Mathematics A (1387)

June 2003

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NOTES ON MARKING PRINCIPLES

NOTES ON MARKING PRINCIPLES

1 Three types of mark are available

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

2 Abbreviations

cao - correct answer only.
ft - follow through.
√ - 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.

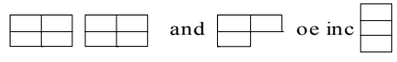
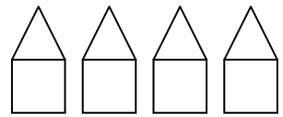
9 Parts of questions

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

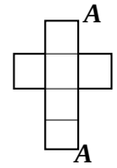
Paper 5501

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 $\frac{2}{3}$

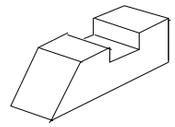
Paper 5501

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)

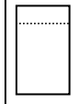
Paper 5503

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

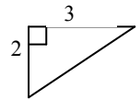
No	Working	Answer	Mark	Notes
11 (a)	Bryani was correct $4 \times 3^2 = 4 \times 9 = 36$	Bryani	2	M1 for 4×9 or $4 \times 3 \times 3$ or "square the three/x then multiply by four" A1 Bryani **SC** 4×3^2 with Bryani gets B2
(b)			1	B1 cao
12 (a)			3	B2 for rectangle height 4 squares, base 3 squares (B1 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.× 100 ×100 A1 cao
10 (a)	∑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 × 2 × 3 × 5	4	M1 for systematic method, eg division, factor trees (at least one prime) A1 cao
	2 × 48	$2^5 \times 3$		M1 for systematic method, eg division, factor trees (at least one prime) A1 cao
(b)		12	1	B1 cao
(c)	$2^5 \times 3 \times 5$	480	2	B2 cao B1 for $2^5 \times 3 \times 5$ or any correct common multiple

Paper 5504

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

Paper 5504

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

Paper 5504

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

Paper 5504

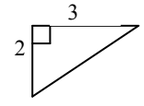
No	Working	Answer	Mark	Notes
22 (a)		No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice	1	B1 for a consistent answer
(b)	$\frac{1}{6}, \frac{5}{6}$ + labels		3	B1 for $\frac{5}{6}$ on the red dice, *not six* branch B1 for a fully complete tree diagram with all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

Paper 5505

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

Paper 5505

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



Paper 5505

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

Paper 5505

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

Paper 5505

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

Paper 5505

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

Paper 5505

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

Paper 5505

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506				
No	**Working**	**Answer**	**Mark**	**Notes**
9	$\frac{6\times10^{15}}{3.2\times10^{8}}$ 1.875×10^{7}	4.3×10^{3}	3	B3 for 4.3×10^{3} to 4.34×10^{3} (B2 for 1.875×10^{7} oe or 4300 to 4340, final answer of 1.9×10^{7} B1 for sight of 6×10^{15} oe or 3.2×10^{8} oe)
10	$8.5\times\tan38$ $=8.5\times0.7813$ $\frac{8.5}{\sin(90-38)}=\frac{AB}{\sin38}$ $AB=\frac{8.5\times\sin38}{\sin(90-38)}$ $=\frac{5.2331}{0.788}=6.64$	6.64	3	M1 for correct use of trig, eg $\tan 38=\frac{opp}{8.5}$ M1 for $8.5\times\tan38$ A1 6.64 – 6.641 OR M1 for correct substitution into the sine rule M1 (dep) for correct rearrangement for AB= A1 6.64 – 6.641
11 (a)		No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice	1	B1 for a consistent answer See additional sheet

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

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

Paper 5506

No	Working	Answer	Mark	Notes
15 (a)	$4a^2 - 4a + 1 - (4b^2 - 4b + 1) =$ $4(a^2 - b^2) - 4(a - b)$ $4(a - b)(a + b - 1)$ 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)	$\begin{array}{r} 1974 \\ \underline{6580} \\ 8554 \end{array}$	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)	$990 \div 69 = 14.3\ldots$ 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 $990 \div 69$ = integer answer between 12 and 19 inclusive and rem 30 seen (M1 for $990 \div 69$ 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]

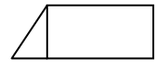
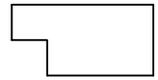
PAPER 5501				
No	**Working**	**Answer**	**Mark**	**Notes**
21	Vertices of new triangle at (2, −2) (2, 6) and (6, −2)	Correct triangle drawn	3	B3 cao (B2 for either correct triangle in wrong translated position or for 2 vertices correct) (B1 a right angled triangle with horizontal length 4 or vertical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

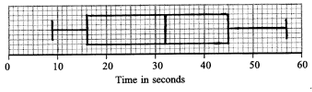
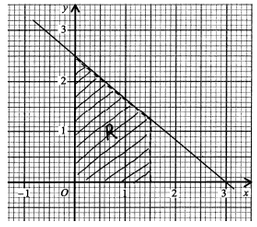
PAPER 5503				
No	**Working**	**Answer**	**Mark**	**Notes**
1		10.	1	B1 for 10
2 (a)(i)		$3e + 2f$	2	B1 for $3e + 2f$
(ii)		$3p^2$		B1 for $3p^2$
(b)	$5 \times -3 + 1$	-14	2	M1 for $5 \times -3 + 1$ A1 for -14
3	1974 6580 8554	855.4	3	M1 for complete correct method with relative place value correct,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

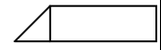
PAPER 5503					
No		**Working**	**Answer**	**Mark**	**Notes**
15			Tick boxes 1,3 & 6	3	B1 for $\frac{\pi abc}{2d}$; B1 for $2a^2$; B1 for $2\left(c^2+d^2\right)$ (−B1 for each additional expression ticked (>3) to a minimum of 0)
16		200×0.2	40	2	M1 for 200×0.2 or $\frac{40}{200}$ seen A1 for 40
17	(a)	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"
					B2
	(ii)		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
13	(a)	$20y - 18y = 16 - 9$ oe $2y = 7$	$3\frac{1}{2}$ oe	3	M1 $20y - 18y = 16 - 9$ oe M1 $2y = 7$ A1 cao
	(b)	$40 - x = 3(4 + x)$ $40 - x = 12 + 3x$ $40 - 12 = x + 3x$ $4x = 28$	7	3	M1 multiplying through by 3: $3 \times \frac{40 - x}{3} = 3 \times 4 + 3 \times x$ A1 $40 - 12 = x + 3x$ A1 cao
14	(a)		$12(x\text{-}4)$	1	B1 for $12(x - 4)$ or $12x - 48$ or $12 \times x - 48$ oe $x = 12\ (x - 4)$ gets B0
	(b)		$18x\text{-}48$	2	M1 $6x +$ "$12(x - 4)$" or $6x +$ "$12x - 48$" A1 ft a linear expression $18x - 48$, $2(9x - 24)$, $3(6x - 16)$, $6(3x - 8)$

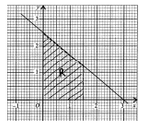
PAPER 5504					
No		**Working**	**Answer**	**Mark**	**Notes**
15		x $x^3 - 2x$ 4.1 60.7(21) 4.2 65.6(88) 4.3 70.9(07) Accept answer to 1 dp 4.22 66.7(114) or more 4.23 67.2(269) 4.24 67.7(45) 4.25 68.2(656)	4.2	4	B2 for trial $4.1 \leq x \leq 4.3$ evaluated (B1 for trial $4 < x < 5$ evaluated) B1 for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

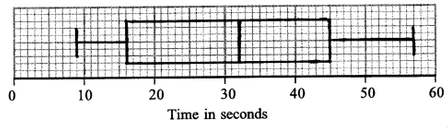
PAPER 5504					
	No	Working	Answer	Mark	Notes
20	(a)	$10^2 + 6^2$ or 136 $\sqrt{(100+36)}$ or $\sqrt{136} = 11.66\ldots$	11.7	3	M1 $10^2 + 6^2$ or 136 seen M1 (dep) $\sqrt{100+36}$ or $\sqrt{136}$ A1 11.66 – 11.7
	(b)	$\cos x = \frac{8}{10}$ or 0.8 $x = \cos^{-1} 0.8 = 36.869^\circ$	36.9	3	M1 for $\cos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

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

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

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

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

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

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

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

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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."

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

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

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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		$EB = 60 \times \tan 30°$ $BD = \sqrt{(60^2 + 60^2)}$ $\tan BDE = 34.64 \div 84.85$ $EB = 60 \times \tan 30°$ (= 34.64) $ED^2 = 60^2 + (\frac{60}{\cos 30})^2$ $ED = \sqrt{8400} = (91.65)$ $\text{Angle} = \sin^{-1}\left(\frac{EB}{\sqrt{8400}}\right) = 22.2$	22.2°	4	M1 for $EB = 60\times\tan30$ M1 for $BD = \sqrt{(60^2 + 60^2)}$ M1 for $\tan BDE$ = "34.64" ÷ "84.85" A1 22.17 – 22.21 M1 for $EB = 60 \times \tan 30°$ oe M1 for fully correct method for ED M1 for $\sin BDE = \left(\frac{'34.84'}{'\sqrt{8400}'}\right)$ (oe) A1 22.17 – 22.21

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

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

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

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Mark Scheme

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NOTES ON MARKING PRINCIPLES

1 **Types of mark**
M marks: method marks
A marks: accuracy marks
B marks: unconditional accuracy marks (independent of M marks)

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

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

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

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

6 Ignoring subsequent work

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

7 Probability

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

8 Linear equations

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

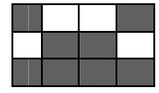
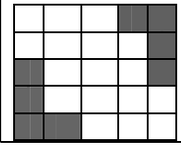
9 Parts of questions

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

Remember: if you are having difficulty making a decision on how you should mark a candidate response contact your Team Leader for advice, or send the item to review.

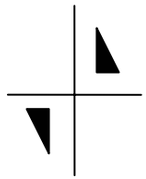
Paper 5521_01				
No	**Working**	**Answer**	**Mark**	**Notes**
1	Cat |||| /||| 8 Dog |||| | 6 Fish || 2 Hamster |||| 4	8, 6, 2, 4	3	M1 for attempt to tally or one frequency correct in either column A1 for 1 frequency correct or all tallies correct in correct column A1 for all frequencies correct (accept if /20)
2		27, 35, 42, 67, 118	1	B1 cao
3 (a)		Diameter drawn	1	B1 for a diameter
(b)		Right angle marked	1	B1 *R* marked correctly
(c)		Rectangle drawn	1	B1 for a rectangle
4 (a)		40	1	B1 cao
(b)		50	1	B1 cao
(c)		3 full loaves 4 full loaves + 1 half loaf	2	B1 for 3 full loaves B1 for 4 full loaves + 1 half loaf
5 (a)		7252	1	B1 cao
(b)		Three thousand and eighty six	1	B1 accept 3 thousand and eighty six (condone 0 hundred)
(c)		4600	1	B1 accept 4600
(d)		200	1	B1 for 200 or 2 hundred or 100 or hundred
6 (i)		Cube	2	B1 for 'cube' (accept 'cuboid') ignore spelling
(ii)		Cylinder		B1 for 'cylinder' ignore spelling
7	5×100	500	2	B2 for 490 or 500 or 510 (B1 for either 5 or 5.0 or 100 seen)

Paper 5521_01					
No		**Working**	**Answer**	**Mark**	**Notes**
8	(a)		8.4 cm or 84 mm	2	B2 allow ±2mm (B1 for 8.4 or 84, B1 for appropriate unit)
	(b)		37°	1	B1 allow ±2°
9	(a)		Carbon black	1	B1 accept 'black carbon' accept 26%
	(b)		0.1(0)	1	B1 cao
	(c)		0.04	1	B1 cao
	(d)	$\frac{26}{100}$	$\frac{13}{50}$	2	M1 for $\frac{26}{100}$ A1 cao
10	(a)		97	1	B1 cao
	(b)		London Reading	1	B1 cao
	(c)	41 + 57 + 58	156	3	M1 for two of 41, 57, 58 M1(dep) for '41' + '57' + '58' A1 cao
11	(a)		3	1	B1 cao allow ± 0.2
	(b)		–5	1	B1 cao allow ±0.2

Paper 5521_01					
No		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		Centimetres (cm) miles litres (*l*)	3	B3 (B1 for each correct answer) accept abbreviations
	(b)		300	1	B1 cao
	(c)	'1500>1400' or '1.5>1.4'	Reason	1	B1 for No and '1500>1400' or '1.5>1.4'
13	(a)	Height of bars 12, 8, 6 lines drawn between points	Bars drawn	2	B2 for 3 bars correctly drawn (B1 for 2 bars correct)
	(b)		July and August	1	B1 oe
	(c)	24 – 4	20	1	B1 (Accept '4 to 24' oe)
	(d)	The temperatures are rising	Temp's rising oe	1	B1 for reason
14	(a) (i)		$(-4, 3)$	2	B1 cao
	(ii)		$(2, -1)$		B1 cao
	(b) (i)	*D* marked at $(-4, -1)$	Point marked on grid	2	B1 for point marked at $(-4, -1)$ cao
	(ii)		$(-4, -1)$		B1 ft
15	(a)			1	B1 cao
	(b)			1	B1 cao

Paper 5521_01				
No	**Working**	**Answer**	**Mark**	**Notes**
16 (a)		(Pat +) reason	1	B1 correct comment (Pat may be implied)
(b)	21 ÷ 3	7	1	B1 cao
17 (i)		S marked at 1	3	B1 for S within ½ cm of 1
(ii)		P marked at 0		B1 for P marked at 0 cao
(iii)		Q marked at "1/3"		B1 for Q marked at 1/3 ± 1 cm use overlay
18	$6 + 6 + 3$ or $2\frac{1}{2} \times 6$	15	3	M1 for realizing 6 glasses in one bottle M1 for realizing 3 glasses in ½ a bottle A1 cao (M2 for attempt to find $2\frac{1}{2} \times 6$) oe
19	15 and 16 parts shaded Alternative 1 $\frac{3}{4} = 0.75$, $\frac{4}{5} = 0.8$ Alternative 2 $\frac{3}{4} = \frac{15}{20}$, $\frac{4}{5} = \frac{16}{20}$	$\frac{4}{5}$ + reason	3	M1 for correctly shading 15 parts for 3/4 M1 for correctly shading 16 parts for 4/5 A1 (dependent on M2) for selection of 4/5 Alternative 1 M1 for $\frac{3}{4} = 0.75$ M1 for $\frac{4}{5} = 0.8$ A1 (dep on M2) for selection of 0.8 or $\frac{4}{5}$ or $\frac{16}{20}$ Alternative 2 M1 for $\frac{3}{4} = \frac{15}{20}$ M1 for $\frac{4}{5} = \frac{16}{20}$ A1(dep on M2) for selection of $\frac{4}{5}$ or $\frac{16}{20}$

Paper 5521_01				
No	**Working**	**Answer**	**Mark**	**Notes**
20 (a)		−5 (−3) (−1) 1 3 5	2	B2 cao (B1 for any 2 or 3 correct)
(b)	Points plotted	Line	2	B2 for line from (−1, −5) to (4, 5) (B1 ft for plotting at least 5 "points")
21	Shapes shaded on grid	6 tessellating shapes	2	B2 for fully correct with 5 or more additional shapes, no gaps (B1 for 4 shapes tessellating with at least one shape inverted, with or without the given shape ignore extras)
22 (a)		$\frac{7}{20}$	1	B1 for $\frac{7}{20}$ oe
(b)	7 + 2 (or 20 – 11) are not lime flavour	$\frac{9}{20}$	1	B1 for $\frac{9}{20}$
(c)		0	1	B1 for 0, zero or nought ($\frac{0}{20}$ gets B0)
23 (a)		$4a$	1	B1 accept $4\times a$, $a \times 4$, $a4$
(b)		$12b$	1	B1 accept $12\times b$, $b \times 12$, $b12$
(c)		$2a + 6b$	2	B2 cao (B1 for $2a$ or $6b$ seen)
(d)		$x(x-6)$	2	B2 cao (B1 for $x(ax+b)$ where a, b are numbers not equal to 0 or $x - 6$ seen on its own, or as part of an expression)
24 (a)		40	1	B1 cao
(b)		45	1	B1 for 42 – 48 accept ¾ hour
(c)	40×2 or $\frac{40}{30}\times 60$ or $40\div\frac{1}{2}$	80	2	M1 for 40×2 or $\frac{40}{30}$ or $40\div\frac{1}{2}$ A1 cao NB $\frac{40}{45}\times 60$ gets M0 A0

Paper 5521_01				
No	**Working**	**Answer**	**Mark**	**Notes**
25 (a)		4560	1	B1 cao
(b)		45.6	1	B1 cao
(c)		2.4	1	B1 cao
26	$-7 - 3 = -10$ $2 \times -10 = -20$ $-20 \div 4$	-5	3	M1 for substitution of 2 and -7 into $p(q - 3)$ or sight of -20 or $-14 - 6$ M1dep for '-20' $\div 4$ A1 cao B1 SC for sight of -10 if M0 awarded
27 (a)		Reflection in y-axis	1	B1 cao
(b)		Rotation by half turn about (0,0)	2	B2 cao (B1 for half turn not about (0,0).)
(c)		Enlargement Scale factor 3 Centre (0,0)	3	B1 for 'enlargement' B1 for "scale factor 3" or 3 seen B1 for 'centre (0,0)
28 (a)		Reason	1	B1 for 'The frequencies are nearly equal' oe
(b)	$1\times26+2\times26+3\times23+4\times25 = 247$ 247/100	2.47	3	M1 for fx (attempting at least 2 relevant products) M1 for $\sum fx \div 100$ A1 2.47 cao

Paper 5521_01				
No	**Working**	**Answer**	**Mark**	**Notes**
29	5 × 5 × 6	150	4	M1 for attempt at 1 division (e.g. 40 ÷ 8), may be implied by marks or number on one edge of diagram or by 5 or 6 seen M1 for attempt at 3 divisions (40÷8, 40÷8, 60÷10), may be implied by marks or numbers on diagram or by 5,5 and 6 seen. M1 (dep on 1st M1) for "5" × "5" × "6" A1 cao Alternatively M1 for 40 × 40 × 60 **or** 8 × 8 × 10 **or** 96000 or 640 seen M1 for 40 × 40 × 60 **and** 8 × 8 × 10 or 96000 **and** 640 seen M1 (dep on 1st M1) for "(40 × 40 × 60)" ÷ "(8 × 8 × 10)" A1 cao SC:B1 for dividing area of one carton face by area of corresponding box face if M0

Paper 5521_02					
No		Working	Answer	Mark	Notes
1	(a)	Draw diagram.	Diagram	1	B1 cao
	(b)		13,16	1	B1 cao
	(c)		31	1	B1 cao
2	(a)		8	1	B1 cao
	(b)		14	2	B2 for 14 (B1 for 13 or 15)
	(c)		16	2	B2 for 16 (B1 for 15, 17 or 8)
3	(a)		4,7 drawn	2	B2 for car height 4 and bus height 7, (B1 for one correct)
	(b)		6	1	B1 cao
	(c)		Walk	1	B1
	(d)		27	1	B1 cao
4	(a)		40	1	B1 for 40–41 inclusive
	(b)		12	1	B1 for 11.5 – 12.5 inclusive
5	(a)		Row complete	2	B2 for 1+..+11; 36 (B1 for one of the 2 cells complete)
	(b)		Square	1	B1 "square"
6		One line of symmetry		1	B1 within 2mm of centre of base / 2mm of vertex

Paper 5521_02				
No	**Working**	**Answer**	**Mark**	**Notes**
7 (a) (i)		09 06	2	B1 (accept 9 06 oe)
(ii)		39		B1 cao
(b)		06 55	1	B1 (accept 6 55 oe)
(c)		2h 6min	1	B1 cao
(d)		15 min	2	M1 for 0906 – 0645 – "(c)" or 0906 – 0645 – 2hr 6min or 2hr 21min – "(c)" or 2hr 21min – 2hr 6 min or 141 – 126 or 20 – 5 A1 cao SC: B1 for 55 or 75 or 93 seen
8 (i)		8,10,12,20 or 30	3	B1 at least one of 8, 10, 12, 20, 30 (no extras)
(ii)		8,12 or 20		B1 at least one of 8,12, 20 (no extras)
(iii)		3 or 5		B1 3 or 5 or both (no extras)
9 (a)		C or G	1	B1 at least one of C or G (no extras)
(b)		A and F	1	B1 cao
(c)		2	1	B1 (accept –2)
10 (a)		$\frac{7}{10}$	1	B1 7/10 oe
(b)(i)		4 squares	2	B1 4 squares shaded
(ii)		80%		B1 80% or ft from unshaded part (no ft from 0% or 100%)
(c)(i)		2.5	2	B1 2.4–2.6 inclusive
(ii)		1.7		B1 1.6–1.8 inclusive
11 (a)		2	1	B1 for 2 or –2
(b)		14	1	B1 for 14 or –14

Paper 5521_02					
No		**Working**	**Answer**	**Mark**	**Notes**
12		$2 \times 8.50 = 17.00$ $3 \times 4.50 = 13.50$ Total = 30.50 50.00 – 30.50	19.5(0)(*p*)	3	M1 for adding 5 correct values or $2 \times 8.50 + 3 \times 4.50$ (ignore units) or 30.5(0) or 3050 seen M1 dep for 50 − "30.50" (ignore units) (OR M1for adding at least 1 adult ticket and at least 1 child ticket **and** subtracting from 50) A1 cao SC: B1 for 24 or 37 or 2400 or 3700 seen
13	(a)		Hexagon	1	B1
	(b)(i)		120	2	B1 cao
	(ii)		Str line		B1 reference to a (straight) line and 180°
	(c)		Obtuse	1	B1 Accept "interior"
14	(a)	2, 2, 3, 3, 3, 4, 4, 4, 5, 6	3.5	2	M1 ordering the numbers (condone 1 error or omission) A1 cao
	(b)	36 ÷ 10	3.6	2	M1 sum of numbers ÷ 10 A1 cao SC B1 for 3r 6
	(c)	6 – 2	4	1	B1 cao
15	(a)		Paul	1	B1 cao
	(b)	36 ÷ 2 oe	18	1	B1 cao
	(c)	60/360 =	1/6	2	M1 60/360 oe A1 cao

Paper 5521_02					
No		**Working**	**Answer**	**Mark**	**Notes**
16		4.7 ÷ 5.9 = 0.796610169	0.7966..	2	B2 for 0.7966 or better (B1 for 0.8, 0.80, 0.79, 0.796, 0.797 or digits 59 seen
17		$6x - 7 + 7 = 38 + 7$ $6x = 45$	7.5	2	M1 $6x = 45$ or +7 both sides A1 7.5 oe; accept 45/6 oe
18		**55** 61 74 **190** 33 **17** **10** 60 **88** **78** 84 250	**55** 61 74 **190** 33 **17** **10** 60 **88** **78** 84 250	3	B3 all six entries correct (B2 for 4 or 5 entries correct) (B1 for 2 or 3 entries correct)
19	(a)	900 × 1.70 =	1530	2	M1 900 × 1.7(0) or digits 153(0) seen A1 cao
	(b)	160 ÷ 1.70 =	£94.12 or £94.11	2	M1 160 ÷ 1.7(0) or digits 941(....) seen A1 cao
20	(a)(i)	180 – 54 (=126) "126" ÷ 2	63	3	M1 for (180–54) ÷ 2 A1 cao
	(ii)		Reason		B1 (indep) angles in triangle add to 180 OR equal angles in isosceles triangle OR equal angles and 2 sides the same (B0 if any incorrect reasoning given eg parallel, equilateral triangle)
	(b)	180 – "x"	117	1	B1 117 or ft 180 – "x" if $x < 90$
21	(a)	3 × 35 + 50	155	2	M1 for 3 × 35 + 50 or digits 155 seen A1 cao
	(b)	260 – 50 = 210 210 ÷ 35 =	6	3	M1 for 260–50 or 210 seen. M1 for "260-50" ÷ 35 or 210÷35 A1 cao SC B1 for starting at a number between 100 and 170 and adding at least two 35's and showing a total between 230 and 290 OR For adding at least three 35's, perhaps with other numbers, and showing a total between 180 and 240 (or between 230 and 290 if 50 is included in the sum)

Paper 5521_02				
No	**Working**	**Answer**	**Mark**	**Notes**
(c)		P=35h + 50	3	B3 for P=35h+50 or P=35×h+50 oe (B2 for correct RHS or P=h + 50 ×35 or P=35h+k where k is numerical oe) (B1 for P = some other linear expression in h, OR h + 50 ×35 OR 35h seen) NB: P=h scores no marks; ignore £ signs. SC B2 for $h = \frac{P-50}{35}$
22 (a)		Elevation	2	B2 for 4 vertical squares. Accept 4 by 1 rectangle. (B1 for 4 vertical squares with one square added or one parallelogram added at the top, or 3 vertical squares, or 4 horizontal squares)
(b)		Plan	2	B2 for 2 adjacent squares, vertical or horizontal. Accept 2 by 1 rectangle. (B1 for 3 adjacent horizontal or vertical squares or a rectangle with sides in the ratio 2:1)
23 (i)		5	3	B1 cao
(ii)		9		B1 cao
(iii)		6		B1 cao
24	$45.00 + 45.00 \times \frac{15}{100} =$ $45.00 + 6.75 =$	51.75	3	M2 for $45.00 + 45.00 \times \frac{15}{100}$ oe or 45.00×1.15 oe OR $45.00 + 6.75$ OR complete method or 5175 seen. (M1 for $45.00 \times \frac{15}{100}$ oe OR 6.75 seen OR 675 seen OR correct method for calculating 15% of 45) A1 cao SC Award B2 for an answer of 38.25

Paper 5521_02				
No	**Working**	**Answer**	**Mark**	**Notes**
25 (a)		Points	1	B1 all three points ±1 full square
(b)		Negative	1	B1 Negative (ignore additional descriptors unless contradictory)
(c)		lobf	1	B1 A single straight line drawn to cross between (5,30), (5,40) and (40,0), (40,15); accept freehand if considered to be straight.
(d)(i)		18–25	2	B1 18g–25g inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient.
(ii)		30–40		B1 30–40 min inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient
26		300 3 75 150	3	B3 for 4 correct answers (B2 for 2 or 3 correct answers) (B1 for 1 correct answer)
27	π × 0.65	2.04–2.05	2	M1 for π × 0.65 or 3.14 x 0.65 or 3.142 x 0.65 A1 for 2.04–2.05 SC Award B1 for 2.0 seen (not 2)
28	5 miles = 8 km 70mph÷5×8 = 112 km/h OR 120km/h ÷ 8 × 5 = 75 mph Faster than 70 mph	70mph (Great Britain) (112 km)	3	M1 5 miles = 8 km; OR 70 mph is about 100 km/h OR 1km=0.6(25) miles OR 1mile=1.6km oe M1 70 ÷ 5 × 8 (=112) or 120 ÷ 8 × 5 (=75) A1 (dep on at least M1) GB or 70 mph Refer to both answer line and working. NB GB or 70 mph without working scores 0 marks

Paper 5523_03				
No	**Working**	**Answer**	**Mark**	**Notes**
1		Cuboid drawn	2	B2 for correct isometric drawing in any orientation (ignore points 'behind', mark 7 vertices only); accept lines drawn near to dots as long as there is no ambiguity. (B1 for one of the three faces drawn correctly **or** for an isometric drawing of any cuboid)
2	Different makes of car Tally Frequency	Make of car Tally Frequency	3	B1 for make of car or list of at least 3 different makes B1 for tally or tally marks B1 for frequency or totals
3		6 tessellating shapes	2	B2 for fully correct with 5 or more additional shapes, no gaps (B1 for 4 or more shapes tessellating, with at least one shape inverted, with or without the given shape, ignore extras)
4	24.90 ÷ 3 or 8.30 24.90 – '8.30' or 2 × 8.30	16.6(0)	3	M1 for 24.90 ÷ 3 or 8.30 M1 (dep) for 24.90 – “8.30” or 2 × “8.30” A1 for 16.60 or 16.6

Paper 5523_03

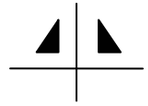
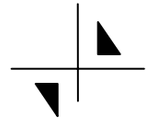
No	Working	Answer	Mark	Notes
5	315 × 24 24 × 315 1260 6300 7560 7200 7560 **3 1 5** 0 6 | 0 2 | 1 0 **2** 1 2 | 0 4 | 2 0 **4** 7 5 6 0 **300 10 5** 6000 200 100 **20** 1200 40 20 **4** 6000+200+100+1200+40+20 = 7560 **3 0.1 0.05** 60 2 1 **20** 12 0.4 0.2 **4** 60 + 2 + 1 + 12 + 0.4 + 0.2 = 75.6	75.6(0)	3	M1 for a complete method with relative place value correct. Condone 1 multiplication error, addition not necessary. **OR** M1 for a complete grid with not more than 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 7560 or digits 756(0) A1 (dep on M1, but not previous A1) for correct placement of decimal point.

Paper 5523_03				
No	**Working**	**Answer**	**Mark**	**Notes**
6	15 and 16 parts shaded Alternative 1 $\frac{3}{4} = 0.75$ or 75%, $\frac{4}{5} = 0.8$ or 80% Alternative 2 $\frac{3}{4} = \frac{15}{20}$, $\frac{4}{5} = \frac{16}{20}$	$\frac{4}{5}$ + reason	3	M1 for shading 15 parts for $\frac{3}{4}$ M1 for shading 16 parts for $\frac{4}{5}$ A1 (dep on M2) for selection of $\frac{4}{5}$ with correct shading Alternative 1 M1 for $\frac{3}{4} = 0.75$ or 75% M1 for $\frac{4}{5} = 0.8$ or 80% A1 (dep on M2) for selection of 0.8 or 80% or $\frac{4}{5}$ with correct decimals or percentages Alternative 2 M1 for $\frac{3}{4} = \frac{15}{20}$ oe M1 for $\frac{4}{5} = \frac{16}{20}$ oe A1 (dep on M2) for selection of $\frac{4}{5}$ or $\frac{16}{20}$ with equivalent fractions

Paper 5523_03					
No		**Working**	**Answer**	**Mark**	**Notes**
7		$5 \times 5 \times 6$	150	4	M1 for attempt at 1 division (e.g. $40 \div 8$), may be implied by marks or number on one edge of diagram or by 5 or 6 seen M1 for attempt at 3 divisions ($40 \div 8$, $40 \div 8$, $60 \div 10$), may be implied by marks or numbers on diagram or by 5,5 and 6 seen. M1 (dep on 1st M1) for "5" × "5" × "6" A1 cao Alternatively M1 for $40 \times 40 \times 60$ **or** $8 \times 8 \times 10$ **or** 96000 or 640 seen M1 for $40 \times 40 \times 60$ **and** $8 \times 8 \times 10$ or 96000 **and** 640 seen M1 (dep on 1st M1) for "$(40 \times 40 \times 60)$" ÷ "$(8 \times 8 \times 10)$" A1 cao SC:B1 for dividing area of one carton face by area of corresponding box face if M0
8	(a)		$\frac{7}{20}$	1	B1 for $\frac{7}{20}$ oe
	(b)	7 + 2 (or 20 – 11) are not lime flavour	$\frac{9}{20}$	1	B1 for $\frac{9}{20}$ oe
	(c)		0	1	B1 for 0, zero or nought ($\frac{0}{20}$ gets B0)
9	(a)		$80x$	1	B1 for $80x$ (accept $80 \times x$, $x80$, $x \times 80$) seen
	(b)		$95y$	1	B1 for $95y$ (accept $95 \times y$, $y95$, $y \times 95$) seen
	(c)		$80x + 95y$	2	M1ft for adding "$80x$" and "$95y$" (algebraic expressions only) A1 for $80x + 95y$

Paper 5523_03

No	Working	Answer	Mark	Notes
10 (a)		40	1	B1 cao
(b)		45	1	B1 for 42 to 48 (accept 3/4 hour)
(c)	40×2 or $\frac{40}{30}\times60$ or $40\div\frac{1}{2}$	80	2	M1 for 40×2 or $\frac{40}{30}$ or $40\div\frac{1}{2}$ A1 cao NB $\frac{40}{45}\times 60$ gets M0 A0
11 (a)	$3\times3-4\times2$ or $9-8$	1	2	M1 for substitution of 3 and 2 into expression or 9 and 8 seen A1 cao
(b)	$-7-3=-10$ $2\times-10=-20$ $-20\div4$	-5	3	M1 for substitution of 2 and –7 into p(q – 3) or sight of -20 or –14 – 6 M1 (dep) for "–20" ÷ 4 A1 cao SC: B1 for –10 seen if M0
12 (a)	6 | 8 9 7 7 | 8 5 9 6 3 8 | 1 3 1 7 1 9 | 0 1	6 | 7 8 9 7 | 3 5 6 8 9 8 | 1 1 1 3 7 9 | 0 1	3	M1 for unordered diagram (condone one error) A1 cao B1 for key (eg 6 | 7 = 67)
(b)(i)		Explanation	2	B1 for '(order numbers and) select middle value' oe
(ii)		79		B1 cao

Paper 5523_03					
No		**Working**	**Answer**	**Mark**	**Notes**
13	(a)		Reflection in y-axis	1	B1 for triangle with vertices at (-1, 1) (-3, 1) and (-1,4)
	(b)		Rotation by half turn about (0, 0)	2	B2 for triangle with vertices (-1, -1) (-3, -1) and (-1, -4) (B1 for half turn not about (0,0))
	(c)		Enlargement Scale factor 3 Centre (0, 0)	3	B1 for 'enlargement' B1 for 'scale factor 3' or 3 seen B1 for 'centre (0,0)' B0 for any combination of transformations
14	(a)		4560	1	B1 cao
	(b)		45.6	1	B1 cao
	(c)		2.4	1	B1 cao
15	(a)	$4a-2a+5b+b$	$2a+6b$	2	B2 cao (B1 for $2a$ or $6b$ seen)
	(b)		$x(x-6)$	2	B2 cao (B1 for $x(ax+b)$ where a, b are numbers not equal to zero or $x-6$ seen on its own, or part of an expression)
	(c)		$3x-2x^3$	2	B2 cao (B1 for $3x$ or $2x^3$)
	(d)		$4x(3y+x)$	2	B2 cao (B1 for $2(6xy+2x^2)$ or $4(3xy+x^2)$ or $x(12y+4x)$ or $2x(6y+2x)$ or $4x(\quad)$)

Paper 5523_03					
No		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$1 - (0.2 + 0.3 + 0.1)$	0.4	2	M1 for $1 - (0.2 + 0.3 + 0.1)$ A1 for 0.4 oe, accept $\frac{0.4}{1}$
	(b)	0.2×200	40	2	M1 for 0.2×200 A1 cao NB $\frac{40}{200}$ is M1 A0, 40 out of 200 is M1 A1
17	(a) (i)	$180 - 2 \times 25$	130	3	M1 for $180 - 2 \times 25$ A1 cao
	(ii)		Reason		B1 for mentioning isosceles and equal (or base) angles or equal sides and equal (or base) angles
	(b)	$180 - 95$	85	1	B1 cao
18	(a) (i)		7^5	3	B1 cao
	(ii)		7^4		B2 cao (B1 for sight of 7^5 or 7^{2+3} or 7×7^3 or $7^1 \times 7^3$ or $7^2 \times 7^2$ or 7^{2+3-1})
	(b)		$\frac{1}{2}$	1	B1 for $\frac{1}{2}$ or 0.5 or 2^{-1}
19	(a)		3×10^7	1	B1 cao
	(b)		0.002	1	B1 cao

Paper 5523_03				
No	**Working**	**Answer**	**Mark**	**Notes**
20		Box plot	2	3 aspects: 1st aspect – vertical line for median 2nd aspect – box using correct quartiles 3rd aspect – whiskers (could be single line) drawn with correct end points B2 for fully correct box plot (B1 for 1 aspect)
21 (a)	e.g. 2 | 126 3 | 63 3 | 21 7	$2\times3\times3\times7$	2	M1 for a systematic method of at least 2 correct divisions by a prime number oe factor trees; can be implied by digits 2, 3, 3, 7 on answer line. A1 for $2\times3^2\times7$ or $2\times3\times3\times7$
(b)	$2\times3\times7$	42	2	B2 cao (B1 for 6, 14, 21 or $2\times3\times7$)
22	$\frac{8}{3}\times\frac{5}{4}=\frac{8\times5}{3\times4}=\frac{40}{12}$	$3\frac{1}{3}$	3	B1 for $\frac{8}{3}$ oe improper fraction or $\frac{5}{4}$ oe improper fraction M1 (dep on B1) for multiplying numerator and denominator of "$\frac{8}{3}$" and "$\frac{5}{4}$" A1 for $3\frac{1}{3}$ oe mixed number or $\frac{10}{3}$ OR B1 for 1.25 and 2.67 or 2.66(…) M1 (dep on B1) for correct method of multiplication A1 for $3.\dot{3}$

Paper 5523_03				
No	**Working**	**Answer**	**Mark**	**Notes**
23			2	M1 for a relevant pair of intersecting arcs A1 for line drawn within guidelines, at least 3cm in length, accept broken line [SC: B1 for line drawn within guidelines if M0]
24 (a)		$-1, 0, 1, 2, 3$	2	B2 cao (-1 each error or omission)
(b)(i)		$x \geq \frac{7}{2}$	3	M1 for $2x \geq 7$, condone use of = sign or wrong equality A1 for $x \geq \frac{7}{2}$ oe as final answer
(ii)		4		SC:B1 for 3.5 or $\frac{7}{2}$ seen if M0 B1 ft from $x \geq$ "$\frac{7}{2}$"
25	$4x + 2y = 8$ $4x - 10y = 20$ $12y = -12$ $y = -1$ $4x + 2(-1) = 8$ $x = 2.5$	$x = 2.5$ $y = -1$	3	M1 for correct process to eliminate either x or y (condone one arithmetical error) M1 (dep) for substituting found value into either equation A1 for $x = 2.5$, $y = -1$ [SC: B1 for $x = 2.5$ or $y = -1$ if M0]

Paper 5523_03					
No		**Working**	**Answer**	**Mark**	**Notes**
26		Interior angle of hexagon = 180 – (360 ÷ 6) = 120 360 – (90 + 120)	150	4	Alternative 1 M1 for 360 ÷ 6 A1 for 60 M1 (dep on M1) for "60" + 90 A1 cao Alternative 2 M1 for 360 ÷ 6 A1 for 60 M1 (dep on M1) for 360 – (2 × "60" + 90) A1 cao Alternative 3 M1 for (6 – 2) × 180 ÷ 6 A1 for 120 M1 (dep on M1) for 360 – (90 + "120") A1 cao
27	(a)		(16), 50, 82, 96, 100	1	B1 cao
	(b)	Cumulative freq. diag. curve/ segments	Cum. freq graph	2	B1 for 4 or 5 points plotted correctly ± 1 full (2mm) square depending on sensible table (condone 1 addition error) B1 (dep) for points joined by curve or line segments provided no gradient is negative - ignore any part of graph outside range of their points. (SC:B1 if 4 or 5 points plotted not at end but consistent within each interval and joined)
	(c)	100 – 42	58	2	M1 (ft dep on graph being cf) for reading from graph at 18 or 19, can be implied by answer in range 40 to 46 A1 for answer in range 56 to 60 or ft for 100 – '42' ±1 full (2mm) square

Paper 5523_04					
No		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	900 × 1.70 =	1530	2	M1 900 × 1.7(0) or digits 153(0) seen A1 cao
	(b)	160 ÷ 1.70 =	£94.12 or £94.11	2	M1 160 ÷ 1.7(0) or digits 941(....) seen A1 cao
2	(a)	4.7 ÷ 5.9 = 0.796610169	0.7966..	2	B2 for 0.7966 or better (B1 for 0.8, 0.80, 0.79, 0.796, 0.797 or digits 59 seen)
	(b)	0.82, 0.8, 0.85, 0.66, 0.875 0.66, 0.8, 0.82, 0.85, 0.875 2/3, 4/5, 0.82, 85%, 7/8	2/3, 4/5, 0.82, 85%, 7/8	2	B2 correct order (oe decimals in order) (B1 correct order reversed, or one error in ordered listing) with or without decimal equivalents. NB Accept 0.67 or 0.66
3		**55** 61 74 **190** 33 **17** **10** 60 **88** **78** 84 250	**55** 61 74 **190** 33 **17** **10** 60 **88** **78** 84 250	3	B3 all 6 correct (B2 for 4 or 5 entries correct) (B1 for 2 or 3 entries correct)
4	(a)	–3 (–1) (1) 3 5 7	**–3**, 3, **5**, **7**	2	B2 all correct (B1 2,3 correct)
	(b)	(-2,-3),(-1,-1),(0,1),(1,3),(2,5),(3,7)	line	2	B2 cao for line from $x = -2$ to $x = 3$ (B1 plotting at least 5 points correctly or single line passing through (0, 1) or single line of gradient 2) The six possible points are: (-2,-3), (-1,-1), (0,1), (1,3), (2,5), (3,7)
	(c)(i)		–2	2	B1 $y = -2$ or ft from line segment
	(ii)		2.5		B1 $x = 2.5$ or ft from line segment

Paper 5523_04				
No	**Working**	**Answer**	**Mark**	**Notes**
5 (a) (i)	180 – 54 (=126) "126" ÷ 2	63	3	M1 for (180–54) ÷ 2 A1 cao
(ii)		Reason		B1 (indep) angles in triangle add to 180 OR equal angles in isosceles triangle OR equal angles and 2 sides the same (B0 if any incorrect reasoning given eg parallel, equilateral triangle)
(b)	180 – "x"	117	1	B1 117 or ft 180 – "x" if $x < 90$
6	15/120×360 = 45 Plain 40/120×360 = 120 Cheese & Onion 55/120×360 = 165 Salt & Vinegar 10/120 × 360 = 30 Beef	45°, 120°, 165°, 30°	4	M1 evidence of method for at least one angle (could be implied by one correct angle of four on pie chart or in the table) A2 All four angles drawn ±2° tolerance, any order (A1 at least 2 angles correctly drawn ±2°, or all 4 angles in the table) B1 (dep on at least 1 angle drawn correctly, and exactly 4 sectors) for labels (flavour or frequency; initials will do) NB: Ignore the table if the pie chart provides the marks.
7 (a)	260 – 50 = 210 210 ÷ 35 =	6	3	M1 for 260–50 or 210 seen. M1 for "260-50" ÷ 35 or 210÷35 A1 cao
(b)		P=35h + 50	3	B3 for P=35h+50 or P=35×h+50 oe (B2 for correct RHS or P=h + 50 ×35 or P=35h+k where k is numerical oe) (B1 for P = some other linear expression in h, OR h + 50 ×35 OR 35h seen) NB: P=h scores no marks; ignore £ signs. SC B2 for $h = \frac{P-50}{35}$
8 (a)		Elevation	2	B2 for 4 vertical squares. Accept 4 by 1 rectangle. (B1 for 4 vertical squares with one square added or one parallelogram added at the top, or 3 vertical squares, or 4 horizontal squares)

Paper 5523_04				
No	**Working**	**Answer**	**Mark**	**Notes**
(b)		Plan	2	B2 for 2 adjacent squares, vertical or horizontal. Accept 2 by 1 rectangle. (B1 for 3 adjacent horizontal or vertical squares or a rectangle with sides in the ratio 2:1)
9 (a)		Points	1	B1 all three points ±1 full square.
(b)		Negative	1	B1 Negative. Ignore other descriptors unless contradictory.
(c)		lobf	1	B1 A single straight line drawn to cross between (5,30), (5,40) and (40,0), (40,15); accept freehand if considered to be straight.
(d)(i) (ii)		18–25 30–40	2	B1 18g–25g inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient. B1 30–40 min inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient.
10		300, 3, 75, 150	3	B3 for 4 correct (B2 for 2 or 3 correct) (B1 for 1 correct)
11 (a)	$6x - 7 + 7 = 38 + 7$ $6x = 45$	7.5	2	M1 $6x = 45$ or +7 both sides A1 7.5 oe; accept 45/6
(b)	$5y - 2 = 10$ or $20y - 8 = 40$ $5y = 12$ $20y = 48$	$2\frac{2}{5}$	3	M1 $20y–8(=40)$ or $\frac{4(5y-2)}{4} = \frac{40}{4}$ or $5y–2=10$ M1 (indep) for correct rearrangement into the form $ay=b+c$ or better (eg $20y=40+8$ or $5y=10+2$, using own terms) A1 for $2\frac{2}{5}$, 2.4 oe
12	5 miles = 8 km 70mph÷5×8 = 122 km/h OR 120km/h ÷ 8 × 8 = 75 mph Faster than 70 mph	70mph (Great Britain) (112 km)	3	M1 5 miles = 8 km; OR 70 mph is about 100 km/h OR 1km=0.6(25) miles OR 1mile=1.6km oe M1 70 ÷ 5 × 8 (=112) or 120 ÷ 8 × 5 (=75) oe A1 (dep on at least M1) GB or 70 mph Refer to both answer line and working. NB GB or 70 mph without working scores 0 marks.

Paper 5523_04				
No	**Working**	**Answer**	**Mark**	**Notes**
13 (a)	$\pi \times 0.65$	2.04–2.05	2	M1 for $\pi \times 0.65$ or 3.14×0.65 or 3.142×0.65 oe A1 2.04–2.05 SC Award B1 for 2.0 seen (not 2)
(b)	1000 ÷ "(a)"	487–491	2	M1 for 1000 (or 100) ÷ "(a)" A1 for 487–491
14	$45.00 + 45.00 \times \frac{15}{100} =$ $45.00 + 6.75 =$	51.75	3	M2 for $45.00 + 45.00 \times \frac{15}{100}$ oe or 45.00×1.15 oe OR $45.00 + 6.75$ OR complete method or 5175 seen. (M1 for $45.00 \times \frac{15}{100}$ oe OR 6.75 seen OR 675 seen OR correct method for calculating 15% of 45) A1 cao SC Award B2 for an answer of 38.25
15		273	2	M1 for 728 ÷ 8 or 728 ÷ "3+5" or 91 A1 cao SC B1 for 455, or for 273:455
16	3 24 3.7 46.9(53) 4 60 3.8 51.0(72) 3.1 26.6(91) 3.9 55.4(19) 3.2 29.5(68) 3.21 29.8(66…) 3.3 32.6(37) 3.22 30.1(66…) 3.4 35.9(04) 3.23 30.4(68..) 3.5 39.3(75) 3.24 30.7(72...) 3.6 43.0(56) 3.25 31.0(78...) or 31	3.2	4	B2 for trial between 3.2 and 3.3 inclusive (B1 for trial between 3 and 4 inclusive) B1 for different trial between 3.21 and 3.25 inclusive B1 (dep on at least one previous B1) cao for 3.2 as final answer. NB: embedded answers: –B1; award Bs for evaluations rounded or truncated to at least 1 dp or for 31

Paper 5523_04				
No	**Working**	**Answer**	**Mark**	**Notes**
17	$45^2 + 34^2 =$ $2025 + 1156 = 3181$ $\sqrt{3181} = 56.4$	56	4	M1 for $45^2 + 34^2$ M1 (dep) for $\sqrt{(2025 + 1156)}$ A1 for 56.4 … B1 for rounding their diagonal to the nearest integer (dep on evidence from decimal) NB 56 as the final answer gets full marks. NB Scale drawings result in 0 marks.
18	$2000 \times (1.055)^3$ Interest = 2348.48 – 2000 =	348.48	3	M1 for 5.5/100 × 2000 (oe) or 330 or 2330 or 110 or 2110 M1 (dep) for 5.5/100 × (2000 + "110" + "116.05") or 122.4… seen A1 cao (accept only 348.48 or 348.49) **OR** M2 for $2000 \times (1.055)^3$ or 2348.48(…) or 2348.49 seen (M1 for $2000 \times (1.055)^n$, $n \neq 3$) A1 for 348.48 or 348.49 [SC: B2 for 2348.48 - 2348.49]
19		Line	2	B2 line fully within tramlines, crossing AB and CD (B1 a straight line which crosses AB within the tramline, and also crosses CD) NB: Accept dotted or dashed lines, but not curves; accept freehand if considered to be straight. SC B1 for a perpendicular bisector of AB that is at least half way from AB to CD within the tramlines
20 (a)		$90<t\leq100$	1	B1 for $90<t\leq100$; accept 90-100.
(b)	65×12=780 75×22=1650 85×23=1955 95×24=2280 105×19=1995 8660/100=	86.6	4	M1 for use of fx with x consistent within intervals (including end points). Allow one slip. M1 (dep) for use of midpoints M1 (dep on 1st M1) for use of $\sum fx/100$ or $\sum fx/\sum f$ A1 86.6

Paper 5523_04					
No		**Working**	**Answer**	**Mark**	**Notes**
21	(a)	$8 \times \frac{10}{4}$	20	2	M1 $\frac{10}{4}$ or $\frac{4}{10}$ or 0.4 or 2.5 oe seen A1 cao NB ratios get M0 unless of the form 1:*n* OR M1 $\frac{8}{4}, \frac{4}{8}$ oe seen A1 cao
	(b)	$15 \times \frac{4}{10}$	6	2	M1 $15 \times \frac{4}{10}$ oe A1 cao
22	(a)	$x^2 - 4x + 3x - 12 = x^2 - x - 12$	$x^2 - x - 12$	2	M1 for exactly 4 terms correct ignoring signs (eg x^2, 4*x*, 3*x*, 12) or 3 correct terms out of 4 terms with correct signs (eg 3 out of 4 of x^2, –4*x*, +3*x*,–12) A1 cao
	(b)	$(x+2)(x+5)$	$(x+2)(x+5)$	2	B2 cao (B1 for exactly one of $(x+2)$, $(x+5)$)
	(c)	$6=15+4q-20$ $6-15=4(q-5)$ $p-3t=4q-4t$ $6-3\times5=4(q-5)$	2 ¾	3	M1 for correct substitution of *p* and *t*. M1 for correct expansion of $4(q-t)$ oe (eg $4q-20$, $4q-4t$) A1 11/4 or 2 ¾ or 2.75 OR M1 for correct substitution of *p* and *t*. M1 for $\frac{p-3t}{4} = q - t$ oe A1 11/4 or 2 ¾ or 2.75

Paper 5523_04					
No		**Working**	**Answer**	**Mark**	**Notes**
23	(a)	$9.9\times10^8 - 6.0\times10^7$	9.3×10^8	2	M1 for $99\times10^7 - 6\times10^7$ or $9.9\times10^8 - 0.6\times10^8$ or conversion of either to an ordinary number, or 930000000 or 93×10^7 or 9.3×10^n where n is any positive integer A1 cao
	(b)	$\frac{6.0-4.5}{4.5}\times100 = \frac{1.5}{4.5}\times100 =$ or $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}\times100$	33.3%	3	M2 $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}\times100$ oe (M1 for $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}$ or $\frac{6.0\times10^7 - 4.5\times10^7}{6.0\times10^7}\times100$ oe A1 cao OR M2 $\frac{6.0\times10^7}{4.5\times10^7}\times100$ -100 = (M1 $\frac{6.0\times10^7}{4.5\times10^7}\times100$ or 133.33(%)) A1 cao NB Accept any of the above expressions without any reference to 10^7.
24		LCM (40,24) = 120 Bread buns 120÷40 Burgers 120÷24 OR Bread buns: 40 is $2\times2\times2$ (×5) Burgers: 24 is $2\times2\times2$ (×3)	Bread buns 3 Burgers 5	3	M1 attempt to find LCM by eg lists of multiples, or summing of 40 and 24. A1 identify 120 (as LCM) A1 cao (both) OR M1 expansion of either number into its prime factors in a factor tree or 8×5 or 8×3 A1 both expansions correct A1 cao (both) SC B2 if answers given the wrong way around

Paper 5523_04				
No	**Working**	**Answer**	**Mark**	**Notes**
25	8 × 41 = 328 2 × 29 = 58 328 – 58 = 270 270 ÷ 6 = 45	45	3	M1 for either 8 × 41 (=328) or 2 × 29 (=58) M1 (dep) “328” – “58” (=270) A1 cao NB 328 and/or 58 on the answer line gets M1 (implied); 270 on the answer line gets M2 (implied)

Paper 5525_05				
No	**Working**	**Answer**	**Mark**	**Notes**
1 (a)	$1 - (0.2 + 0.3 + 0.1)$	0.4	2	M1 for $1 - (0.2 + 0.3 + 0.1)$ A1 for 0.4 oe, accept $\frac{0.4}{1}$
(b)	0.2×200	40	2	M1 for 0.2×200 A1 cao NB $\frac{40}{200}$ is M1 A0, 40 out of 200 is M1 A1
2	$650 - 430 = 220$ 1 choc ice costs 110p $650 - 5 \times 110 = 100$p	50	3	M1 for $650 - 430$ or 220 or 110 oe seen M1 for $650 - 5 \times \frac{'220'}{2}$ or $430 - 3 \times \frac{'220'}{2}$ oe A1 for 50p or £0.50 or £0.5 *Alternative scheme* $2x + 5y = 650$ $2x + 3y = 430$ oe M1 for subtracting two simultaneous equations to eliminate x (lollies)(2 or 3 terms correct) M1 for $650 - 5 \times 'y'$ or $430 - 3 \times 'y'$ oe A1 for 50p or £0.50 or £0.5 *Alternative scheme* M1 for $3\times (2x + 5y = 650)$ evaluated and $5 \times (2x + 3y = 430)$ evaluated oe (5 or 6 terms correct) M1 for subtraction of equations to eliminate y (choc ices)(2 or 3 terms correct ft) A1 for 50p or £0.50 or £0.5

Paper 5525_05				
No	**Working**	**Answer**	**Mark**	**Notes**
3		question + response boxes oe	2	1st aspect: One question (eg 'how long does it take you to travel to school?' or 'What time did you leave home to get to school?'); ignore other questions. 2nd aspect: Response list (at least two), not overlapping. 3rd aspect: Some mention of units (eg minutes) in either question or responses B2 for all three aspects, or B1 for just one aspects.
4	2 [(3×1) + (4×1)] + (3×6) + (1×6) + (2×6) + (4×6) + (1×6) + (5×6)	110 cm^2	4	M1 for attempt to find the area of one face M1 for at least 6 faces with intention to add A1 cao B1 (indep) for cm^2 (with or without numerical answer)
5	$\left(\frac{-6+4}{2}\right), \left(\frac{5+3}{2}\right)$	(–1, 4)	2	B2 cao [B1 for (–1,*a*) or (b,4) or (4,-1)]
6		Box plot	2	3 aspects: 1st aspect – vertical line for median 2nd aspect – box using correct quartiles 3rd aspect – whiskers (could be single line) drawn with correct end points B2 for fully correct box plot (B1 for 1 aspect)
7			2	M1 for a relevant pair of intersecting arcs A1 for line drawn within guidelines, at least 3cm in length, accept broken line [SC: B1 for line drawn within guidelines if M0]

Paper 5525_05					
No		**Working**	**Answer**	**Mark**	**Notes**
8	(a)	e.g. 2 | 126 3 | 63 3 | 21 7	$2\times3\times3\times7$	2	M1 for a systematic method of at least 2 correct divisions by a prime number oe factor trees; can be implied by digits 2, 3, 3, 7 on answer line. A1 for $2\times3^2\times7$ or $2\times3\times3\times7$
	(b)	$2\times3\times7$	42	2	B2 cao (B1 for 6, 14, 21 or $2\times3\times7$)
9	(a)		$-1,0,1,2,3$	2	B2 cao (-1 each error or omission)
	(b)(i)		$x\geq\frac{7}{2}$	3	M1 for $2x\geq7$, condone use of = sign or wrong equality A1 for $x\geq\frac{7}{2}$ oe as final answer
	(ii)		4		SC:B1 for 3.5 or $\frac{7}{2}$ seen if M0 B1 ft from $x\geq$ "$\frac{7}{2}$" or $x>$"$\frac{7}{2}$"
10	(a)(i)		7^5	3	B1 cao
	(ii)		7^4		B2 cao (B1 for sight of 7^5 or 7^{2+3} or 7×7^3 or $7^1\times7^3$ or $7^2\times7^2$ or 7^{2+3-1})
	(b)		$\frac{1}{2}$	1	B1 for $\frac{1}{2}$ or 0.5 or 2^{-1}
11	(a)	$5n=m+21$	$n=\frac{m+21}{5}$	2	M1 for $5n=m+21$ or for attempt to divide three terms by 5 A1 $n=\frac{m+21}{5}$ oe

Paper 5525_05				
No	**Working**	**Answer**	**Mark**	**Notes**
(b)	$4p-8q=3p+2$ $p-8q=2$ $p=8q+2$	$p=8q+2$	3	M1 for $4p-aq$ or $\frac{3}{4}p+b$ where a is an integer and b is a number M1 (dep) for taking one term correctly to LHS or RHS of expression A1 $p=8q+2$ oe
12		$y=\frac{1}{2}x+3$	2	B2 for $y = ½x + 3$ oe (B1 for $y = ½x + c$, $c \neq 7$ or $y = mx + 3$ oe or $½x + 3$ or $M = ½x + 3$)
13	$\frac{8}{3}\times\frac{5}{4}=\frac{8\times5}{3\times4}=\frac{40}{12}$	$3\frac{1}{3}$	3	B1 for $\frac{8}{3}$ oe or $\frac{5}{4}$ oe M1 (dep on B1) for multiplying numerator and denominator of "$\frac{8}{3}$" and "$\frac{5}{4}$" A1 for $3\frac{1}{3}$ oe mixed number or $\frac{10}{3}$ *OR* B1 for 1.25 and 2.67 or 2.66(…) M1(dep on B1) for correct method of multiplication A1 for $3.\dot{3}$
14	$4x+2y=8$ $4x-10y=20$ $12y=-12$ $y=-1$ $4x+2(-1)=8$ $x=2.5$	$x=2.5$ $y=-1$	3	M1 for correct process to eliminate either x or y (condone one arithmetical error) M1 (dep) for substituting found value into either equation A1 for $x = 2.5$, $y = -1$ [SC: B1 for $x = 2.5$ or $y = -1$ if M0]

Paper 5525_05					
No		**Working**	**Answer**	**Mark**	**Notes**
15		Interior angle of hexagon = 180 – (360 ÷ 6) = 120 360 – (90 + 120)	150	4	Alternative 1 M1 for 360 ÷ 6 A1 for 60 M1 (dep on M1) for "60" + 90 A1 cao Alternative 2 M1 for 360 ÷ 6 A1 for 60 M1(dep on M1) for 360 – (2 × "60" + 90) A1 cao Alternative 3 M1 for (6 – 2) × 180 ÷ 6 A1 for 120 M1(dep on M1) for 360 – (90 + "120") A1 cao
16	(a)		(16), 50, 82, 96, 100	1	B1 cao
	(b)	Cumulative freq. diag. curve/ segments	Cum. freq graph	2	B1 ft for 4 or 5 points plotted correctly ± 1 full (2mm) square depending on sensible table (condone 1 addition error) B1 (dep) for points joined by curve or line segments provided no gradient is negative - ignore any part of graph outside range of their points. (SC:B1 if 4 or 5 points plotted not at end but consistent within each interval and joined)

Paper 5525_05				
No	**Working**	**Answer**	**Mark**	**Notes**
(c)	$100 - 42$	58	2	M1 (ft dep on graph being cf) for reading from graph at 18 or 19, can be implied by answer in range 40 to 46 A1 for answer in range 56 to 60 or ft for 100 –'42' ±1 full (2mm) square
17 (a)		0.6 and 0.7,0.3,0.7	2	B1 for 0.6 on LH branch B1 for 0.7, 0.3 and 0.7 on RH branches
(b)	0.4×0.3	0.12	2	M1 for 0.4×0.3 A1 0.12 oe
(c)	$0.4\times0.7+0.6\times0.3$	0.46	3	M1 for '0.4×0.7' or '0.6×0.3' M1 for addition of two products from correct branches A1 0.46 oe Alternative M2 for an attempt to evaluate 1-(0.3×0.4 +'0.6×0.7') A1 cao
18	$x = 0.4545...$ so $100x = 45.4545...$ $99x = 45$ $x = \frac{45}{99} = \frac{15}{33}$	proof	3	M1 for $100x = 45.45\ldots$ or $10000x = 4545.45\ldots$ M1 (dep) for subtraction of both sides A1 for $\frac{15}{33}$ from correct proof
19	$\left(\sqrt{3}\right)^2 + \sqrt{3}\sqrt{2} - \sqrt{3}\sqrt{2} - \left(\sqrt{2}\right)^2$ $= 3 - 2$	1	2	B2 cao (B1 for $\sqrt{3}\sqrt{3} + \sqrt{3}\sqrt{2} - \sqrt{3}\sqrt{2} - \sqrt{2}\sqrt{2}$ oe, $\sqrt{3}\sqrt{3} - \sqrt{2}\sqrt{2}$ oe, or for 2,3, $\sqrt{4}$ $\sqrt{6}$ $\sqrt{9}$ seen)
20 (a)	$\frac{96}{24}$ or 4 $\sqrt{4}$ or 2	8	3	M1 for $\frac{96}{24}$ or $\frac{24}{96}$ or 4 or $\frac{1}{4}$ oe M1 for $\sqrt{\frac{96}{24}}$ or $\sqrt{\frac{24}{96}}$ or $\sqrt{'4'}$ or $\frac{1}{\sqrt{'4'}}$ or 2 or $\frac{1}{2}$ oe A1 cao

Paper 5525_05					
No		**Working**	**Answer**	**Mark**	**Notes**
	(b)	12×2^3	96	2	M1 for '2'^{3} or 8 A1 cao
21	(a)	$x\times3-x\times2x^2$	$3x-2x^3$	2	B2 cao (B1 for a two term expression with either $3x$ or $2x^3$)
	(b)		$4x(3y+x)$	2	M1 for taking out a factor of x, $2x$, 2, 4 or $4x$ A1 cao
	(c)	$\frac{5a}{b^2}$	$\frac{5a}{b^2}$	2	B2 for $\frac{5a}{b^2}$ or $5ab^{-2}$ (accept $\frac{5a}{1b^2}$) (B1 for either dealing with the numbers or dealing with the powers of a)
	(d)	$\frac{\cancel{x-3}}{\cancel{(x-3)}(x+3)}$	$\frac{1}{x+3}$	2	M1 for $(x-3)(x+3)$ A1 cao
22	(a)		**a** + **b**	1	B1 **a** + **b** oe
	(b)	ED = **a** DX = –2**b** + 2 AC = 2**a** (So, DX = 2ED)	2**a**	3	M1 for (DX=) DA + AX A1 for (DX=) –2***b*** + 2 ("***a*** + ***b***") A1 2***a*** from fully correct proof
23		$\pi(2x)^2h=\frac{4}{3}\pi(3x)^3$ $h=\frac{\frac{4}{3}\pi(3x)^3}{\pi(2x)^2}$	$9x$	3	M1 for $\pi(2x)^2h=\frac{4}{3}\pi(3x)^3$ (condone absence of brackets) M1 (dep) for valid algebra that gets to $h=ax$ (condone one error in powers of numerical constants) A1 cao

Paper 5525_05					
No		**Working**	**Answer**	**Mark**	**Notes**
24	(i)	$n^2+(n+1)^2=2(n^2+n)+1$	$2n^2+2n+1$	4	M1 for at least 3 terms correct from $n^2+n+n+1$ A1 for $2n^2+2n+1$ oe
	(ii)		$2(n^2+n)$ is always even so $2(n^2+n)+1$ is always odd		M1 for recognizing $2n^2$ is always even A1ft complete proof for their quadratic *Alternative method* M1 for recognizing that if n^2 is odd then $(n+1)^2$ is even or vice versa A1 for complete proof
25			42 318	2	B1 for answer in range 36 – 48 B1 for answer in range 312 – 324
26	(a)	$(x-3)^2-3^2+15$	$p=3, q=6$	2	B2 for $p=3$ and $q=6$ (B1 for $p=3$ OR $q=6$) SC: award B2 for $(x-3)^2+6$ if p and q are not identified
	(b)		Sketch	2	B1 for U shaped curve B1 ft for TP in first quadrant (ft if TP not in first quadrant)
27	(a)	Graph translated 2 units upwards through points (–4, 2), (–2, 4), (0,2) and (3,5)	Sketch	2	M1 for a vertical translation A1 curve through points (–4, 2), (–2, 4), (0,2) and (3,5) ± ½ square
	(b)	Graph reflected in x-axis through points (–4,0), (–2, –2), (0, 0) and (3, -3)	Sketch	2	M1 for reflection in x-axis or y-axis A1 curve through points (–4,0), (–2, –2), (0, 0) and (3, -3) ± ½ square

Paper 5525_06				
No	**Working**	**Answer**	**Mark**	**Notes**
1		273	2	M1 for 728 ÷ 8 or 728 ÷ "3+5" or 91 A1 cao SC B1 for 455 or 273:455
2		$3n - 1$	2	B2 for $3n - 1$ oe (B1 for $3n + k$ where $k \neq -1$ but k could be 0)
3	3 24 3.7 46.9(53) 4 60 3.8 51.0(72) 3.1 26.6(91) 3.9 55.4(19) 3.2 29.5(68) 3.21 29.8(66…) 3.3 32.6(37) 3.22 30.1(66…) 3.4 35.9(04) 3.23 30.4(68..) 3.5 39.3(75) 3.24 30.7(72...) 3.6 43.0(56) 3.25 31.0(78...) or 31	3.2	4	B2 for trial between 3.2 and 3.3 inclusive (B1 for trial between 3 and 4 inclusive) B1 for different trial between 3.21 and 3.25 inclusive B1 (dep on at least one previous B1) cao for 3.2 NB: embedded answers: –B1; award Bs for evaluations rounded or truncated to at least 1 dp or for 31
4	2 is the only even prime number and the product of 2 odd numbers is odd	Yes	2	B2 for 'yes' and '2 is the only even prime number and the product of two odd numbers is odd' oe (B1 for 'yes' and either '2 is the only even prime number' oe **or** 'the product of two odd numbers is odd' oe)
5	$45^2 + 34^2 =$ $2025 + 1156 = 3181$ $\sqrt{3181} = 56.4$	56	4	M1 for $45^2 + 34^2$ M1 for $\sqrt{(2025 + 1156)}$ A1 for 56.4 … B1 for rounding their diagonal to the nearest integer (dep on evidence from decimal) NB 56 with no incorrect working as the final answer gets full marks. NB Scale drawings result in 0 marks.

Paper 5525_06				
No	**Working**	**Answer**	**Mark**	**Notes**
6	2000 × $(1.055)^3$ Interest = 2348.48 – 2000 =	£348.48	3	M1 for 5.5/100 × 2000 (oe) or 330 or 16.5/100×2000 or 2330 or 110 or 2110 M1 (dep) for 5.5/100 × (2000 + "110" + "116.05") or 122.4… seen A1 cao (accept only 348.48 or 348.49) **OR** M2 for 2000 × $(1.055)^3$ or 2348.48(…) or 2348.49 seen (M1 for 2000 × $(1.055)^n$, $n \neq 3$) A1 for 348.48 or 348.49 [SC: B2 for 2348.48 - 2348.49]
7 (a)		Line	2	B2 line fully within tramlines, crossing AB and CD (B1 a straight line which crosses AB within the tramline, and also crosses CD) NB: Accept dotted or dashed lines, but not curves; accept freehand if considered to be straight. SC B1 for the perpendicular bisector of *AB* reaching halfway or more from *AB*
(b)		Region		B2 correct arc ±2mm and shaded within. Allow dotty or continous arc. (B1 inaccurate arc and shaded or accurate arc unshaded)
8	65×12=780 75×22=1650 85×23=1955 95×24=2280 105×19=1995 8660/100=	86.6	4	M1 for use of fx with x consistent within intervals (including end points). Allow one slip even if outside interval M1 (dep) for use of midpoints M1 (dep on 1st M1) for use of $\sum fx/100$ or $\sum fx/\sum f$ A1 86.6

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
9		Distance ÷ time: 1400 ÷ 2 h 20 min 20 mins is $\frac{1}{3}$ hour 1400 × 3 ÷ 7 =	600 kph	3	B1 20 mins as $\frac{1}{3}$ hour or as 0.33……hour M1 for distance ÷ time eg 1400 ÷ "2h 20 min" A1 cao OR B1 2 hour 20min = 140 (min) M1 Speed = $\frac{1400}{140}$ = (10 km per minute) A1 cao
10	(a)	$(x+18)+2x+(2x+7)=180$	Equation	2	B2 for $(x+18)+2x+(2x+7)=180$ oe (B1 for $(x+18)+2x+(2x+7)$)
	(b)	$5x+25 = 180$ $5x = 155$	31	2	M1 for simplifying to at least $5x+25=180$ or 360 (may be earned in (a)) A1 for $x=31$
11	(a)	(–14) –4 (0) 4 14	–4, 4, 14	2	B2 for all 3 values correct (B1 for 1 or 2 values correct)
	(b)		curve	2	B1 for all 5 points plotted correctly ± ½ square (ft from table if at least B1 awarded in (a)) B1 (indep) ft for any smooth curve through their points

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
12	(a)	$8 \times \frac{10}{4}$	20	2	M1 $\frac{10}{4}$ or $\frac{4}{10}$ or 0.4 or 2.5 oe seen A1 cao NB ratios get M0 unless of the form 1:*n* OR M1 $\frac{8}{4}, \frac{4}{8}$ oe seen A1 cao
	(b)	$15 \times \frac{4}{10}$	6	2	M1 $15 \times \frac{4}{10}$ oe A1 cao
13	(a)	$9.9\times10^8 - 6.0\times10^7$	$\pm 9.3\times10^8$	2	M1 for $99\times10^7 - 6.0\times10^7$ or $9.9\times10^8 - 0.60\times10^8$ or correct conversion of either to an ordinary number or 930000000 or 9.3×10^n where *n* is any positive integer A1 cao
	(b)	$\frac{6.0-4.5}{4.5} \times 100 = \frac{1.5}{4.5} \times 100 =$ or $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7} \times 100$	33.3%	3	M2 $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7} \times 100$ oe (M1 for $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}$ or $\frac{6.0\times10^7 - 4.5\times10^7}{6.0\times10^7} \times 100$ oe A1 33.3 – 33.4 OR M2 $\frac{6.0\times10^7}{4.5\times10^7} \times 100$ -100 or 33.3% (M1 $\frac{6.0\times10^7}{4.5\times10^7} \times 100$ or 133.3%) A1 33.3-33.4 NB Accept any of the above expressions without any reference to 10^7.

Paper 5525_06				
No	**Working**	**Answer**	**Mark**	**Notes**
14	LCM (40,24) = 120 Bread buns 120÷40 Burgers 120÷24 OR Bread buns: 40 is 2 × 2 × 2 (×5) Burgers: 24 is 2 × 2 × 2 (×3)	Bread Buns 3 Burgers 5	3	M1 attempt to find LCM by eg lists of multiples, or summing of 40s and summing of 24s, with at least 3 numbers in each list A1 identify 120 as LCM A1 cao (both) **OR** M1 expansion of either number into its prime factors in a factor tree or 8×5 or 8×3 A1 both expansions correct A1 cao (both) SC B2 if answers given the wrong way around
15	$\sin 32 = \frac{AB}{12}$ $AB = 12 \times \sin 32$ $AB = 6.35903\ldots$	6.36	3	M1 $\sin 32 = \frac{AB}{12}$ (accept Sin $\frac{AB}{12}$) M1 $12 \times \sin 32$ or $12 \times 0.5299..$ A1 accept 6.359 – 6.360 SC Gradians 5.78(1…) Radians 6.62 Get M1M1A0 **OR** Use of Sine Rule $\frac{\sin 32}{AB} = \frac{\sin 90}{12}$ or $\frac{AB}{\sin 32} = \frac{12}{\sin 90}$ M1 $AB = \frac{12 \times \sin 32}{\sin 90}$ M1 AB = 6.359 – 6.36 A1 SC Gradians 5.85(…) Radians 7. 40(…) M1M1A0

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
16		$8 \times 41 = 328$ $2 \times 29 = 58$ $328 - 58 = 270$ $270 \div 6 = 45$	45	3	M1 for either 8×41 (=328) or 2×29 (=58) M1 (dep) "328" – "58" (=270) A1 cao NB 328 and /or 58 on the answer line gets M1 (implied); 270 on the answer line gets M2 (implied)
17	(a)	$x^2 - 4x + 3x - 12 = x^2 - x - 12$	$x^2 - x - 12$	2	M1 for exactly 4 terms correct ignoring signs (x^2, $4x$, $3x$, 12) or 3 out of 4 terms with correct signs (x^2, $-4x$, $+3x$, -12) A1 cao
	(b)	$6x^2 - 8x + 15x - 20 = 6x^2 + 7x - 20$	$6x^2 + 7x - 20$	2	M1 for exactly 4 terms correct ignoring signs ($6x^2$, $8x$, $15x$, 20) or 3 out of 4 terms with correct signs ($6x^2$, $-8x$, $+15x$, -20) A1 cao
	(c)	$(x+2)(x+5)$	$(x+2)(x+5)$	2	B2 cao (B1 for exactly one of $(x + 2)$, $(x + 5)$)
	(d)		$12p^8q^3$	2	B2 cao (B1 for any 2 out of 3 terms correct in a product or 3 terms correct in a sum or part product)
	(e)	$6 = 15 + 4(q - 5)$ $6 = 15 + 4q - 20$ $11 = 4q$	$2\frac{3}{4}$	3	M1 for correct substitution of p and t. M1 for correct expansion of $4(q-t)$ oe (eg $4q-20$, $4q-4t$) A1 11/4 or 2 ¾ or 2.75 OR M1 for correct substitution of p and t. M1 for $\frac{p-3t}{4} = q - t$ oe A1 11/4 or 2 ¾ or 2.75
18	(a)	$T=kx$; $150=6k$; $k=25$	$T=25x$	3	M1 for $T=kx$, k algebraic M1 subs $T=150$ and $x=6$ into $T = kx^n$ $(n \neq 0)$ A1 for $T=25x$ oe SC B1 $T \propto 25x$ oe

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
	(b)	$T = 25 \times 15 =$	375	1	B1 ft on k , $k \neq 1$
	(c)	$600 = 25x$; $x = 600 \div 25 =$	24	1	B1 ft on k , $k \neq 1$
19		$\frac{120}{570} \times 50 = 10.5263$ $\frac{250}{570} \times 50 = 21.9298$ $\frac{200}{570} \times 50 = 17.5438$	10 22 18	3	M1 method shown eg $\frac{120}{120+250+200} \times 50$ or one of 10.5(263) 21.9(298), 17.5(438) **OR** 570 ÷ 50 = 11.4 and one of 120 ÷ 11.4 =10.526…) , 270 ÷ 11.4 (=21.9298…) , 200 ÷ 11.4 (=17.5438…) A1 for 10.5(263), 21.9(298), 17.5(438) or 11, 22, 18 B1 correction to add to 50: 10, 22, 18 or 11, 22, 17
20		$x(x+1) + 4(2x–3) = (2x–3)(x+1)$ $x^2 + x + 8x – 12 = 2x^2 + 2x – 3x – 3$ $x^2 – 10x + 9 = 0$ $(x – 9)(x – 1) = 0$	$x = 1,9$	5	M1 for multiplying through by common denominator $(2x–3)(x+1)$ M1 (dep)for either $x^2 + x + 8x – 12$ or $2x^2 + 2x – 3x – 3$ oe A1 for correct quadratic (= 0) M1 for a correct method to solve 3 term quadratic A1 cao for both solutions
21		$AB^2 = 8^2 + 9^2 – 2\times8\times9\times\cos40$ $AB^2 = 64 + 81 – 144\times\cos40$ $AB^2 = 145 – 144 \times 0.766$ $AB^2 = 145 – 110.31… = 34.6896$ $AB = \sqrt{34.6796} = 5.8897877$	5.89	3	M1 Subs in Cos Rule: $8^2 + 9^2 – 2\times8\times9\times\cos40$ M1 correct order of evaluation of $8^2 + 9^2 – 2\times8\times9\times\cos40$ A1 cao 5.88 – 5.89 SC: Award B2 for one of $AB^2 = 241.03…$ or $AB = 15.525…$ (radians) $AB^2 = 28.50…$ or $AB = 5.33…$ (gradians)
22	(a)		24 30	2	B1 24 cao B1 30 cao
	(b)	Column $60 \leq w < 75$ at 10 Column $75 \leq w < 95$ at 4	10 4	2	B1 10 and correct width (tol $\pm\frac{1}{2}$ small square) B1 4 and correct width (tol $\pm\frac{1}{2}$ small square)

Paper 5525_06				
No	**Working**	**Answer**	**Mark**	**Notes**
23 (a)		100.5	1	B1 cao
(b)		10.515	1	B1 cao
(c)	$\frac{100.5}{10.515}$	9.5577746	2	M1 for greatest distance divided by least time Where 100 < greatest distance ≤ 100.5, 10.51 ≤ least time < 10.52 A1 for 9.555 – 9.56
(d)	$\frac{99.5}{10.525}$	9.45368..	2	M1 for least distance divided by greatest time Where 99.5 ≤ least distance < 100, 10.52 < greatest time ≤10.53 A1 for 9.45 – 9.455
24	$\frac{4}{7}\times\frac{4}{7}\times\frac{3}{7} + \frac{3}{7}\times\frac{3}{7}\times\frac{4}{7} =$ $\frac{48+36}{343} = \frac{84}{343}$ But there are three ways this can be achieved: BBG, BGB, GBB So the probability is $\frac{84}{343}\times 3$ OR $1-\frac{64}{343}-\frac{27}{343}$ NB: 84/343 = 0.244897; 252/343 = 0.73469 $\frac{4}{7} = 0.57(142...)$, $\frac{3}{7} = 0.42(857...)$	$\frac{252}{343}$	3	M1 for $\frac{4}{7}\times\frac{4}{7}\times\frac{3}{7}$ or $\frac{3}{7}\times\frac{3}{7}\times\frac{4}{7}$ oe or $\left(\frac{4}{7}\right)^3$ oe or $\left(\frac{3}{7}\right)^3$ oe or $\frac{91}{343}$ or 0.10(49…) or 0.13(99….) M1 (indep) for identification of all 6 outcomes (M2 for $1-\left[\left(\frac{4}{7}\right)^3+\left(\frac{3}{7}\right)^3\right]$) oe A1 $\frac{252}{343}$, $\frac{36}{49}$, 0.73(469…) oe

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
25	(a)	$\frac{1}{3} \times \pi \times 5^2 \times 8 = \pi \times 25 \times 8 \div 3 =$ 209.4395	209–210	2	M1 for $\frac{1}{3} \times \pi \times 5^2 \times 8$ A1 for 209–210
	(b)	Base radius = $\frac{216}{360} \times 15 = 9$ Height = $\sqrt{(15^2 - 9^2)} =$	12	4	M1 for 216 ÷ 360 A1 for 9 M1 for $\sqrt{(15^2 - \text{“9”}^2)}$, where “9” < 15 A1 cao

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Mark Scheme (Results)

June 2011

Modular Mathematics (GCSE)
Unit 1: 5MB1H_01 (Higher)

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NOTES ON MARKING PRINCIPLES

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

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

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

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

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

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

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

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

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

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.
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If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

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.

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

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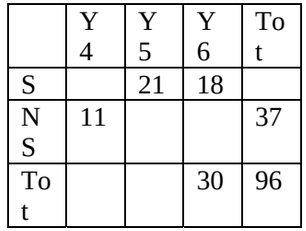
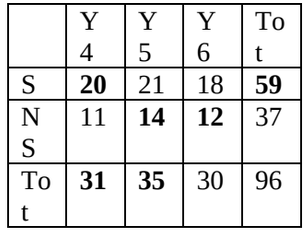
Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability 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

5MB1H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
1 (i)	 OR 96 – 37 = 59 children can swim 18 + 21 = 39 children in Y5 or Y6 can swim 59 – 39	20	4	M1 for including 4 of the 6 pieces of information given in a clearly labeled two-way table A1 for 20 or 20 out of 96 or 20/96 OR M1 for a correct method that leads to the number of children in year 4 that can swim eg 96 – 37 (= 59) children can swim 18 + 21 = (39) children in Y5 or Y6 can swim '59' – '39' A1 for 20 or 20 out of 96 or 20/96
(ii)	 OR 20 + 11 = 31children in Y4 30 + 31 = 61 children in Y4 or Y6 96 – 61	35		M1 for one correct calculation leading to a 'new', piece of information in a clearly labeled two-way table A1 for 35 or 35 out of 96 or $\frac{35}{96}$ OR M1 for a correct method that leads to the total number of children in year 5 eg '20' + 11 (= 31) children in Y4 30 + '31' (=61) children in Y4 or Y6 96 – '61' children in Y5 A1 for 35 or 35 out of 96 or $\frac{35}{96}$ SC If M1 not earned then award B1 if ans(ii) = 55 – ans (i)

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
2	(a)	See scatter graph	(12,14) and(17,20) plotted	1	B1 for correct plotting of both points
	(b)			1	B1 Positive (accept a correct relationship)
	(c)		16 to 18	2	B2 16 – 18 (M1 for a single line segment from m=11 to m = 16 within overlay or a vertical line drawn from m = 15 A1 for an answer in the range 16-18 or ft their line of best fit ± 2mm)

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)	$\frac{15}{100} \times 2400 = 360$ 2400 – 360 = 2040 2040 ÷ (1 + 2 + 5) = 255 255 × 1, 255 × 2, 255 × 5	Cement = 255 Sand = 510 Stone = 1275	4	M1 for $\frac{15}{100} \times 2400$ or $\frac{85}{100} \times 2400$ M1 for '2040' ÷ (1 + 2 + 5) M1 (dep on previous M1) for '255' × 1 or '255' × 2 or '255' × 5 either explicitly or with answer(s) on the answer line. A1 for all 3 correct masses
	(b)*	255 × 30 – 6500 = 1150 so not enough OR 6500 ÷ 255 = 25.5 m^3 worth of cement Which is less than 30 so not enough OR 6.5 tonnes of concrete gives 6.5 × 8 = 52 tonnes of dry mixture 30 m^3 of concrete requires 30 × 2400 × 0.85 kg of dry mixture = 61200kg of dry mixture (=61.2 tonnes)	No, with justification	3	B1 for a correct conversion between kg and tonnes e.g. 6.5 tonnes = 6500 kg (but not 1 tonne = 1000 kg) M1 for '255' × 30 C1(dep on M1) for an answer of No (Yes), supported by (ft) calculations. OR B1 for a correct conversion between kg and tonnes e.g. 6.5 tonnes = 6500 kg (but not 1 tonne = 1000 kg) M1 for 6500 ÷ '255' C1(dep on M1) for an answer of No (Yes), supported by (ft) calculations OR M1 for 6.5 × 8 and 30 × 2400 × 0.85 B1 for a correct between kg and tonnes e.g. 61200 kg = 61.2 kg (but not 1 tonne = 1000 kg) C1 (dep on M1) for an answer of No (Yes), supported by (ft) calculations.

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5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	(a)		14 | 8 15 | 2 4 16 | 0 2 4 4 8 17 | 0 3 4 9 14 | 8 = 148 cm	3	B2 for a fully correct ordered diagram (B1 for correct unordered diagram or ordered with at most two errors) B1 for a correct key eg 14 | 8 = 148 cm (cm not required)
	(b) *	Boy's Median = 170 Girl's Media = 164 Boy's Mean = 170(.38) Girl's Mean= 164 Boy's Range = 27 Girl's Range = 31 Boy's IQR = 14 Girl's IQR = 14.5 – 15.25 15 | 7 9 16 | 2 6 8 9 17 | 0 3 4 6 6 18 | 1 4	Compares: medians/means + Range + Spread	3	A maximum 2B marks from: B1 for a correct mean or median for either the boys or the girls. B1 for a correct measure of spread for either the boys or the girls. B1 for a correct stem and leaf diagram drawn for the boys (no need for a key) C1 for any correct comparison based on 2 medians(ft) or 2 means(ft) or 2 ranges(ft) or 2 IQRs (ft) or a correct statement following from comparing the correct stem and leaf diagrams. This comparison must be a general statement which compares the boys' heights with the girls' heights.
5	(a)	$1 - 0.3 - 0.1 - x$	$0.6 - x$	2	M1 for $0.3 + 0.1 + x + P(2) = 1$ oe A1 $0.6 - x$ or $\frac{6}{10} - x$ or $1 - (0.4 + x)$ or $1 - 0.3 - 0.1 - x$
	(b)	$0.3 + 0.1$	0.4	1	B1 cao
	(c)		$300x$	1	B1 for $300x$, $x \times 300$ oe

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5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		Overlapping response boxes Leading/biased question Age too personal Missing units	2	B2 for any two of: overlapping response boxes, too personal to ask person's age, a leading or biased question, no units (B1 – just one of the above).
	(b)		How many pieces of fruit do you eat each day? 0 to2, 3 to 4, over 4	2	B1 for a sensible question including a time period B1 for at least 3 response boxes. Any pairs of response boxes must not overlap
	(c)	$\frac{73}{536+384+48+73} \times 100$	7	2	M1 for $\frac{73}{536+384+48+73} \times 100$ Or $100 \div \left\langle \frac{536+384+48+73}{73} \right\rangle$ Or 7.01… A1 for 7
7		1200×1.035^3 Or 1200 × 1.035 = 1242 1242 × 1.035 = 1285.47 1285.47× 1.035 = 1330.46	1330.46	3	M2 for 1200×1.035^3 A1 1330.46 – 1330.47 Or M1 1200 × 1.035 M1(dep) for ' 1242'× 1.035 and '1285.47'× 1.035 A1 1330.46 – 1330.47 [SC: B1 for 42 or 84 or 126 or 1242 or 1284 or 1326 seen, if M0 scored]

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5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8	(a)		$25 \leq t < 30$	1	B1 for the interval $25 \leq t < 30$ described unambiguously
	(b)	12.5×6 + 17.5×4 + 22.5×24 + 27.5×44 + 32.5×10 + 37.5×4 =75+70+540+1210+325+150 = 2370 2370 ÷ 92	25.8	4	M1 for finding at least 4 products fx consistently within interval (including end points) M1 (dep) for use of at least 4 correct midpoints M1 (dep on first M) for $\frac{\Sigma fx}{\Sigma f}$ A1 25.76 – 25.8
	(c)	Cf table: 6, 10, 34, 78, 88, 92 Cf graph	Correct CF graph	3	B1 Correct cumulative frequencies (may be implied by correct heights on the grid) M1 for at least 5 of "6 points" plotted consistently within each interval A1 for a fully correct cf graph.
	(d)	Median at the (92+1)÷2 = 46.5 day temp IQR = UQ – LQ = 69.75th day temp – 23.25th day temp	Median = 25.4 IQR = 6.7	3	B1 for a median in the range 24.5−26.5 or B1 ft read off at CF = 46(.5) from a CF graph tol $\frac{1}{2}$ square M1 for reading off temps at CF= 69 or 69.75 (±0.5) and 23 or 23.25(±0.5) from a CF graph and subtracting A1 ft

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5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		Gradient $= \frac{68-32}{20}$	$m = 1.8$, $k = 32$	3	M1 for attempting to find the gradient of the line eg from height ÷ base of a triangle with the line as hypotenuse A1 for $m = 1.7 - 1.9$ B1 for $k = 31$ - 33
10	(a)		0.8 0.6 0.2 0.4 0.5 0.5	2	B2 for all 6 correct probabilities (B1 for two correct probabilities)
	(b)	0.6 × 0.8	0.48	2	M1 for '0.6' × '0.8' ft probability tree diagram A1 cao
	(c)	1 – (0.4 × 0.5) 1 – 0.2 OR 0.6 × 0.8 + 0.6 × 0.2 + 0.4 × 0.5	0.8	3	M2 for 1 – '0.4' × '0.5' ft probability tree diagram A1 cao OR M2 for '0.6' × '0.8' + '0.6' × '0.2' + '0.4' × '0.5' (M1 for any two of '0.6' × '0.8', '0.6' × '0.2', '0.4' × '0.5'added) A1 cao

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5MB1H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
11 (a)		Histogram Fd axis labelled say 0 to 8 5 – 10, fd = 1.6 10 – 12, fd = 7.5 12 – 16, fd = 6 16 – 20, fd = 4 20 – 25, fd = 2	3	M1 for fd axis labeled and 1 correct block or for one correct division eg 8 ÷ 5 or 1.6 A1 for at least 2 additional correct blocks or 2 additional frequency densities calculated A1 for completely correct histogram SC B2 for a fully correct but unlabeled histogram OR M1 for area key and 1 correct block A1 for at least 2 additional correct blocks A1 for completely correct histogram SC B2 for a fully correct but unlabeled histogram
(b)		32	2	M1 for 6 × 1 + 16 + 10 A1 cao

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Mark Scheme (Results)

June 2011

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

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NOTES ON MARKING PRINCIPLES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Mark Scheme (Results)

June 2012

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

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

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

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

5MB2H_01

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

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

	500	10	5
30	15000	300	150
5	2500	50	25

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

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

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5MB2H_01

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

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

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

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

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

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

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

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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)

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

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

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

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

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

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5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21		$1180.5 \div \frac{4}{3}\pi(6.15)^3$	1.21	4	M1 for 1180 ± 0.5 or 6.2 ± 0.05 M1 for 'max. mass' ÷ 'min. volume' where "min volume" is defined as any expression involving 6.15 M1 for $1180.5 \div \frac{4}{3}\pi(6.15)^3$ A1 for 1.21 – 1.22
22			proof	3	B1 for *AD* = *AB* and *AE* = *AG* B1 for angle *EAB* = angle *DAG* (= 90 + angle *DAE*) B1 (dep on previous B marks) for 2 sides and included angle (SAS) oe
23	(a)		$3\boldsymbol{a} + \boldsymbol{b}$	1	B1 oe
	(b)		$3\mathbf{c}$	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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NOTES ON MARKING PRINCIPLES

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

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

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

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

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

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

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

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

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

7 With working

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

8 Follow through marks

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

9 Ignoring subsequent work

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

10 Probability

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

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

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

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

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

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

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

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

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

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

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PAPER: 1MA0_2H

Question		Working	Answer	Mark	Notes
10		x | $x^3 + 2x$ 4 | 72 4.1 | 77.(121) 4.2 | 82.(488) 4.3 | 88.(107) 4.4 | 93.(984) 4.5 | 100.(125) 4.6 | 106.(536) 4.7 | 113.(223) 4.8 | 120.(192) 4.9 | 127.(449) 5 | 135 4.65 | 109.8(44625) 4.66 | 110.5(14696) 4.67 | 111.1(87563) 4.68 | 111.8(63232) 4.69 | 112.5(41709)	4.7	4	B2 for a trial $4.6 \leq x \leq 4.7$ evaluated correctly (B1 for a trial evaluated correctly for $4 \leq x \leq 5$) B1 for a different trial evaluated correctly for $4.65 \leq x < 4.7$ B1 (dep on at least one previous B1) for 4.7 [Note: Trials should be evaluated to at least accuracy shown in table, truncated or rounded] No working scores 0 marks
11			3.52	3	M1 for $1.35^2 + 3.25^2$ M1 (dep) for $\sqrt{(1.35^2 + 3.25^2)}$ $(= \sqrt{12.385})$ A1 for answer in the range 3.51 to 3.52

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

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

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

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

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

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

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

PMT

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

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

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

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

PMT

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

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Mark Scheme (Results)

November 2013

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

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NOTES ON MARKING PRINCIPLES

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

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

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

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

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

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

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

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

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

7 With working

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

8 Follow through marks

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

9 Ignoring subsequent work

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

10 Probability

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

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

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

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

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

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

PMT

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

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

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

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

PMT

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

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

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

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

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
22 (a)		'show'	2	M1 for $\frac{1}{2} \times (x - 4 + x + 5) \times 2$ **or** $2x \times (x - 4) + \frac{1}{2} \times 2x \times 9$ A1 for completion with correct processes seen
(b)		13	3	M1 for $\frac{-1 \pm \sqrt{1^2 - 4 \times 2 \times -351}}{2 \times 2}$ condone incorrect sign for 351 M1 for $\frac{-1 \pm \sqrt{2809}}{4}$ A1 for 13 NB for either M mark accept + only in place of ± **OR** M2 for $(2x + 27)(x - 13)$ (M1 for $(2x \pm 27)(x \pm 13)$) A1 for 13
23		15	2	M1 for $\frac{134}{1065} \times 120$ **or** 15.098... oe A1 cao

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
24		14.4	3	M1 for $\pi \times 6.5^2 \times 11.5$ (=1526.42...) M1 (dep) for $\frac{\text{'1526.42...'}}{\pi \times 5.8^2}$ A1 for 14.4 - 14.5 **OR** M1 for $\frac{5.8}{6.5}$ or $\frac{6.5}{5.8}$ or 0.89(23…) or 1.12(06896…) M1 for $11.5 \div \left(\frac{5.8}{6.5}\right)^2$ or $11.5 \div \left(\frac{6.5}{5.8}\right)^2$ A1 for 14.4 - 14.5
*25		Yes with explanation	3	M1 For **Line A**: writes equation as $y = 1.5x + 4$ or gives the gradient as 1.5 or constant term of 4 OR for **Line B**: shows a method which could lead to finding the gradient or gives the gradient as 2 or constant term of 4 or calculates a sequence of points including (0,4) or writes equation of line as $y = 2x + 4$ M1 Shows correct aspects relating to an aspect of Line A and an aspect of Line B that enables some comparison to be made eg gradients, equations or points. C1 for gradients 1.5 **and** 2 **and** Yes **with** explanation that the gradients are different or states the lines intersect at (0,4) or explanation that interprets common constant term (4) from equations OR M1 for a diagram that shows both lines drawn and intersecting at (0,4) M1 for a diagram that shows both lines and their intersection point identified as (0,4) C1 for Yes and states the intersection point as (0,4)

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

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

Question 6:

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

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

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

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

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

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

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Mark Scheme (Results)

November 2014

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

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NOTES ON MARKING PRINCIPLES

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

2 Mark schemes should be applied positively.

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

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

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

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

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

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

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

With working

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

8 Follow through marks

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

9 Ignoring subsequent work

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

10 Probability

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

Linear equations

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

12 Parts of questions

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

13 Range of answers

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

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

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

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(i)		3484	1	B1 cao
	(ii)		34.84	1	B1 cao
	(iii)		670	1	B1 cao
*2			Maths with correct comparative figure(s)	2	M1 for correct method to find figure(s) to compare, eg $\frac{32}{80}\times 100$ (=40) oe **or** 0.38×80 oe (=30.4) C1 for maths with 40% or 30.4 or $\frac{40}{100}$ and $\frac{38}{100}$ oe
3		8 | 4 8 9 9 | 0 0 1 1 2 3 5 7 8 10 | 2 3 6 8 11 | 0 5 8 | 4 represents 84(cm)	correct stem and leaf with key	3	B2 for a fully correct ordered diagram (B1 for a correct unordered diagram or ordered with at most two errors or omissions with stems 8, 9, 10 and 11 present) B1 for a correct key (units not necessary) Accept stem written as 80, 90, etc. but key only if consistent with this
4			$T = 6x + 8y$	3	M1 for $6x$ **or** $8y$ oe **or** $T=$ (a linear expression in x and y) M1 for $6x + 8y$ oe or $T = 6x$ $(+ay)$ oe or $T = 8y$ $(+bx)$ oe A1 for $T = 6x + 8y$ oe

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)		$y > 0.5$	2	M1 for clear intention to subtract 5 from both sides of inequality or equation **or** divide all terms of the inequality or equation by 6 **or** $6y > 3$ **or** 0.5 oe seen A1 for $y > 0.5$ oe as final answer
	(b)		$-3 < x \leq 4$	2	B2 for $-3 < x \leq 4$ oe (B1 for one correct inequality, eg $-3 < x$ **or** $x > -3$ **or** $x \leq 4$ **or** $4 \geq x$ **or** $-3 \leq x < 4$) NB Accept the use of any letter
*6		554 ×27 3878 11080 14958 1 0 1 0 0 8 3 5 3 5 2 8 1 4 9 5 8	Yes with correct working	4	M1 for a complete method with relative place value correct. Condone 1 multiplication error, addition not necessary. M1 (dep) for addition of all the appropriate elements of the calculation. A1 for £149.58 or 42p (spare) C1 ft (dep on M1) for correct decision for their total cost **OR** M1 for a complete grid with not more than 1 multiplication error, addition not necessary M1 (dep) for addition of all the appropriate elements of the calculation A1 for £149.58 or 42p (spare) C1 ft (dep on M1) for correct decision for their total cost **PTO**

		<table><tr><th>500</th><th>50</th><th>4</th><th>×</th></tr><tr><td>10 000</td><td>1000</td><td>80</td><td>20</td></tr><tr><td>3500</td><td>350</td><td>28</td><td>7</td></tr></table> 10000 1000 3500 350 80 28 14958			**OR** M1 for sight of a complete partitioning method, condone 1 multiplication error, addition not necessary. M1 (dep) for addition of all the appropriate elements of the calculation. A1 for £149.58 or 42p (spare) C1 ft (dep on M1) for correct decision for their total cost **OR** M1 for 150.0... ÷ 27 at least 5 seen and 15 carried or $\frac{50}{9}$ M1 (dep) for full correct process to divide 150 by 27 or $5\frac{5}{9}$ A1 for £5.55 or £5.56 o**r** £5.55... C1 ft (dep on M1) for correct decision for their plant cost **OR** M1 for 150.0…÷ 5.54 at least 2 seen and 392 carried M1 (dep) for full correct process to divide 150 by 5.54 A1 for 27 (.07…) C1 ft (dep on M1) for correct decision for their number of plants

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			9	4	M1 for method to find area of one rectangle, eg 15 × 8 (=120) or 15 × 11 (=165) M1 (dep) for subtracting from/by given area, eg (138 – "120") (=18) or "165" – 138 (=27) M1 for final step from complete method shown, eg 15 − "18"÷ 3 or "27" ÷ 3 A1 cao **OR** M1 for a correct expression for the area of one rectangle, eg (8 + 3) × (15 − x) or 8 × x M1 (dep) for a correct equation eg (8 + 3) × (15 − x) + 8 × x = 138 M1 for correct method to isolate x, eg 3x = 27 A1 cao
*8			x = 130 + correct reasons	4	M1 for angle BFG = 65 may be seen on diagram M1 (dep) for correct method to calculate x, eg (x=) 65 + 65 (=130) **or** (x=) 180 − (180 – 2 × 65) (=130) C2 for x = 130 **and** full appropriate reasons related to method shown (C1 (dep on M1) for any one appropriate reason related to method shown) eg alternate angles; base angles in an isosceles triangle are equal; angles in a triangle add up to 180°; angles on a straight line add up to 180°; exterior angle of triangle = sum of two interior opposite angles; co-interior angles add up to 180° (allied angles) NB Any reasons stated **must** be used

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
9	(a)		2 reasons	2	B2 for two different reasons (B1 for 1 reason) eg No units (of distance) eg Overlapping intervals or boxes or 2 and/or 3 in two boxes eg Missing box (no box for more than 6 (km/miles) or "other" or 4.5 (km/miles))
	(b)		question	2	B1 for a suitable question which includes a time frame (time frame could appear with response boxes) B1 for at least 3 relevant non-overlapping response boxes and exhaustive [Do not allow inequalities in response boxes]
10			construction	2	M1 for a pair of arcs or a single arc, centre C, that cut line AB **and** at least one pair of arcs not at C within guidelines A1 for perpendicular within guidelines with appropriate construction arcs **OR** M1 for an arc, centre A radius AC **and** an arc centre B radius BC. The two arcs must intersect below AB A1 for perpendicular within guidelines with appropriate construction arcs (SC If M0 scored, B1 for correct perpendicular line within guidelines)
11			900	4	M1 for 0.2×7000 (=1400) or 1.2×7000 (=8400) oe M1 for 7000 + "1400" − 3000 (=5400) oe M1 for "5400" ÷ 6 A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		$e(3e + 5)$	1	B1 for $e(3e + 5)$
	(b)		4	3	M1 for intention to expand brackets, eg $7k - 21$ or division of all terms on RHS by 7 as first step, eg $\frac{3}{7}k - \frac{5}{7}$ M1 for correct method to isolate terms in k in an equation A1 cao
	(c)		$2x^2 - 13x - 24$	2	M1 for 4 terms correct ignoring signs or 3 out of no more than 4 terms correct A1 cao
	(d)		$-\frac{1}{3}$	3	M1 for clear intention to multiply both sides by 4 or split into individual fractions on LHS M1 for correct method to isolate term in f in an equation, ft from equations of form $a + bf = c$, where $a, b, c \neq 0$ A1 cao
13	(a)		$2\times2\times3\times3\times5$	3	M1 for a continual prime factorisation (at least two consecutive steps correct) or at least two stages of a factor tree correct M1 for a fully correct factor tree or list 2,2,3,3,5 A1 for $2\times2\times3\times3\times5$ or $2^2\times3^2\times5$
	(b)		Eg 6, 30	2	M1 for two numbers with an HCF of 6 **or** for two numbers with a LCM a multiple of 15 A1 for two numbers with an HCF of 6 **and** a LCM a multiple of 15 (eg (6, 30), (12, 30), …) **OR** M1 for 2×3 **and** 3×5 **or** for $2\times3\times5$ A1 for two numbers with an HCF of 6 **and** a LCM a multiple of 15 eg (6, 30) (12, 30) …

<table>
<tr><th colspan="6">PAPER: 1MA0_1H</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>14</td><td></td><td></td><td>25</td><td>4</td><td>M1 for 600 ÷ 4 (=150)
M1 for 4500 ÷ “150” (=30)
M1 for 750 ÷ “30”
A1 for 25 with supporting working

OR
M1 for 4500 ÷ 750 (=6) or 750 ÷ 4500 (=$\frac{1}{6}$)
M1 for 600 ÷ 4 (=150) or 600 ÷ “6” (=100) or 600 × "$\frac{1}{6}$" (=100)
M1 for “150” ÷ “6” or “100” ÷ 4 or 150 × "$\frac{1}{6}$"
A1 for 25 with supporting working

OR
M1 for 4500 ÷ 750 (=6) or 750 ÷ 4500 (=$\frac{1}{6}$)
M1 for $\frac{1}{4} \times \frac{1}{\text{"6"}} \left(= \frac{1}{24}\right)$
M1 for "$\frac{1}{24}$" × 600
A1 for 25 with supporting working</td></tr>
<tr><td>15</td><td>(a)</td><td></td><td>correct box plot</td><td>2</td><td>M1 for a box drawn with at least 2 correct points from LQ, Median and UQ or with maximum value of 290 plotted
A1 for a fully correct box plot</td></tr>
<tr><td></td><td>*(b)</td><td><table><tr><td></td><td>girls</td><td>boys</td></tr><tr><td>Med</td><td>170</td><td>190</td></tr><tr><td>Range</td><td>230</td><td>210</td></tr><tr><td>IQR</td><td>120</td><td>100</td></tr></table></td><td>2 comparisons</td><td>2</td><td>C1 for a correct comparison of a measure of spread (using either range or IQR) or ft their box plot
C1 for a correct comparison of medians (accept averages)

For the award of both marks at least one of these comparisons must be in the context of the question.</td></tr>
</table>

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		correct graph	2	M1 for 5 or 6 or 7 points plotted correctly at the ends of the intervals (overlay) A1 cao for correct graph with points joined by curve or straight line segments [SC: B1 if the shape of the graph is correct and 5 or 6 or 7 of their points are **not** at the ends but are plotted consistently within (10,20) (20,30) (30,40) etc.]
	(b)		No with supporting figures	2	M1 for 0.1 × 200 (=20) **or** 0.9×200 (=180) **or** sight of 180 used on cf axis **or** 200 – 186 (=14) A1 ft for correct decision with 20 and "9" **or** 20 and 14 **or** "age" from reading graph at 180 **OR** M1 for method to find percentage of workers who are over 65, eg $\frac{200-"191"}{200} \times 100$ (=4.5%) **or** method to find percentage of workers who are over 60 (from table), eg $\frac{200-186}{200} \times 100$ (=7%) or $\frac{200-190}{200} \times 100$ (=5%) A1 ft for correct decision with "4.5"% or 7% or 5%

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
17			25	4	M1 for complete method to work out interior angle of a regular octagon **or** 135° identified as an interior angle of the octagon M1 for complete method to work out angle *KFG* or angle *KFG* identified as 110° M1 (dep on M2) for complete method to work out angle *KFE*, eg "135" − "110" or (8×"135" − 4×"135" − 4×"110") ÷ 4 or (3×180 − 2×"135" − 2×"110") ÷ 2 A1 for 25 with supporting working **OR** M1 for complete method to work out the exterior angle of a regular octagon **or** 45° identified as an exterior angle of the octagon M1 for complete method to work out angle *KFG* or angle *KFG* identified as 110° M1 (dep on M2) for complete method to work out angle *KFE*, eg 180 − "45" − "110" A1 for 25 with supporting working **OR** M1 for complete method to work out the exterior angle of a regular octagon **or** 45° identified as an exterior angle of the octagon M1 for complete method to work out angle *JKF* or angle *JKF* identified as 70° M1 (dep on M2) for complete method to work out angle *KFE*, eg "70" − "45" A1 for 25 with supporting working

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
18	(a)		7.5	2	M1 for $\frac{12}{18}$ oe **or** $\frac{18}{12}$ oe **or** $\frac{12}{5}$ oe **or** $\frac{5}{12}$ oe A1 cao
	(b)		45	3	M1 for $\left("\frac{3}{2}"\right)^2$ oe or $\left("\frac{2}{3}"\right)^2$ oe M1 for complete method to find area of shaded region, eg $36 \times "1.5"^2 - 36$ A1 cao (SC B2 for 81)
19	(a)		8, (4), (2), 1, 0.8, 0.5	2	B2 all 4 correct Accept $\frac{4}{5}$ in place of 0.8 and $\frac{1}{2}$ in place of 0.5 (B1 for 2 or 3 correct)
	(b)		correct graph	2	M1 (ft dep on B1) for 5 or 6 points plotted correctly from their table (overlay) A1 cao for correct curve drawn from (0.5,8) to (8, 0.5)
20			128π	5	M1 for $\frac{4\pi r^2}{2} = 32\pi$ oe A1 for (r =) 4 M1 for $2\times\pi\times"4"\times10$ (=80π) **or** $\pi\times"4"^2$ (=16π) or ft their r M1 for 32π + "80π" + "16π" oe or 402.1 −402.3 or ft their r A1 cao
21		$3 - \sqrt{2} + 3\sqrt{2} - \sqrt{2}\sqrt{2}$	$1 + 2\sqrt{2}$	2	M1 for 4 terms correct ignoring signs or 3 out of no more than 4 terms correct A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
22	(a)		1	1	B1 cao
	(b)		$\frac{5y}{8x^3}$	2	M1 for correct square root or correct use of reciprocal eg $\frac{8x^3}{5y}$ **or** $\frac{25y^2}{64x^6}$ A1 for $\frac{5y}{8x^3}$ **or** $\frac{5}{8}yx^{-3}$ oe
	(c)		$\frac{x+27}{(x-3)(x+3)}$	3	M1 for denominator $(x-3)(x+3)$ **or** x^2-9 M1 for $\frac{5(x+3)}{(x-3)(x+3)}$ oe **or** $\frac{4(x-3)}{(x-3)(x+3)}$ oe (NB The denominator must be $(x-3)(x+3)$ or x^2-9 **or** another suitable common denominator) A1 for $\frac{x+27}{(x-3)(x+3)}$ **or** $\frac{x+27}{x^2-9}$

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
23			$\frac{156}{336}$	4	**Method 1 (Combinations for odd T)** M1 for one probability for odd T, eg $P(2,3,4) = \frac{1}{8} \times \frac{2}{7} \times \frac{1}{6}$ or $P(2,4,5) = \frac{1}{8} \times \frac{1}{7} \times \frac{4}{6}$ or $P(3,3,5) = \frac{2}{8} \times \frac{1}{7} \times \frac{4}{6}$ or $P(3,5,5) = \frac{2}{8} \times \frac{4}{7} \times \frac{3}{6}$ or $P(5,5,5) = \frac{4}{8} \times \frac{3}{7} \times \frac{2}{6}$ M1 for adding at least two probabilities for odd T, eg $\frac{1}{8} \times \frac{2}{7} \times \frac{1}{6} + \frac{1}{8} \times \frac{1}{7} \times \frac{4}{6}$ or $3\left(\frac{2}{8} \times \frac{1}{7} \times \frac{4}{6}\right)$ M1 for completely correct method, ie $6\left(\frac{1}{8} \times \frac{2}{7} \times \frac{1}{6}\right) + 6\left(\frac{1}{8} \times \frac{1}{7} \times \frac{4}{6}\right) + 3\left(\frac{2}{8} \times \frac{1}{7} \times \frac{4}{6}\right) + 3\left(\frac{2}{8} \times \frac{4}{7} \times \frac{3}{6}\right) + \left(\frac{4}{8} \times \frac{3}{7} \times \frac{2}{6}\right)$ oe A1 for $\frac{156}{336}$ oe, eg $\frac{13}{28}$ or 0.46(4…) **OR** **Method 2 (Combinations for even T)** M1 for one probability for even T, eg $P(3,4,5) = \frac{2}{8} \times \frac{1}{7} \times \frac{4}{6}$ or $P(2,3,3) = \frac{1}{8} \times \frac{2}{7} \times \frac{1}{6}$ or $P(2,5,5) = \frac{1}{8} \times \frac{4}{7} \times \frac{3}{6}$ or $P(2,3,5) = \frac{1}{8} \times \frac{2}{7} \times \frac{4}{6}$ or $P(4,5,5) = \frac{1}{8} \times \frac{4}{7} \times \frac{3}{6}$ or $P(3,3,4) = \frac{2}{8} \times \frac{1}{7} \times \frac{1}{6}$ M1 for adding at least two probabilities for even T, eg $\frac{2}{8} \times \frac{1}{7} \times \frac{4}{6} + \frac{1}{8} \times \frac{2}{7} \times \frac{1}{6}$ or $3\left(\frac{1}{8} \times \frac{2}{7} \times \frac{1}{6}\right)$ M1 for completely correct method, ie $1 - [6\left(\frac{2}{8} \times \frac{1}{7} \times \frac{4}{6}\right) + 3\left(\frac{1}{8} \times \frac{2}{7} \times \frac{1}{6}\right) + 3\left(\frac{1}{8} \times \frac{4}{7} \times \frac{3}{6}\right) + 6\left(\frac{1}{8} \times \frac{2}{7} \times \frac{4}{6}\right) + 3\left(\frac{1}{8} \times \frac{4}{7} \times \frac{3}{6}\right) + 3\left(\frac{2}{8} \times \frac{1}{7} \times \frac{1}{6}\right)$ oe A1 for $\frac{156}{336}$ oe, eg $\frac{13}{28}$ or 0.46(4…) **PTO**

					Method 3 (Combinations of odd and even numbers- odd totals) M1 for one probability for odd T, eg P(E,E,O) =. $\frac{2}{8}\times\frac{1}{7}\times\frac{6}{6}$ or P(O,O,O) = $\frac{6}{8}\times\frac{5}{7}\times\frac{4}{6}$ M1for adding at least two probabilities for odd *T,* eg 3 $\left(\frac{2}{8}\times\frac{1}{7}\times\frac{6}{6}\right)$ or $\left(\frac{2}{8}\times\frac{1}{7}\times\frac{6}{6}\right)+\left(\frac{6}{8}\times\frac{5}{7}\times\frac{4}{6}\right)$ M1 for completely correct method, ie 3 $\left(\frac{2}{8}\times\frac{1}{7}\times\frac{6}{6}\right)+\left(\frac{6}{8}\times\frac{5}{7}\times\frac{4}{6}\right)$ A1 for $\frac{156}{336}$ oe, eg $\frac{13}{28}$ or 0.46(4…) **OR** **Method 4 (combinations of odd and even numbers- even totals)** M1 for probability for even T, ie = $\frac{2}{8}\times\frac{6}{7}\times\frac{5}{6}$ M1 for adding at least two probabilities for even *T,* eg 3 $\left(\frac{2}{8}\times\frac{6}{7}\times\frac{5}{6}\right)$ M1 for completely correct method, ie $1-3\left(\frac{2}{8}\times\frac{6}{7}\times\frac{5}{6}\right)$ A1 for $\frac{156}{336}$ oe, eg $\frac{13}{28}$ or 0.46(4…) **SC (with replacement)** For example, M0 M1 for adding at least two probabilities for odd or even *T,* eg P(E,E,O) = $\frac{2}{8}\times\frac{2}{8}\times\frac{6}{8}$ or P(O,O,O) = $\frac{6}{8}\times\frac{6}{8}\times\frac{6}{8}$ M1 for completely correct method, eg 3 $\left(\frac{2}{8}\times\frac{2}{8}\times\frac{6}{8}\right)+\left(\frac{6}{8}\times\frac{6}{8}\times\frac{6}{8}\right)$ or $\frac{288}{512}$ oe, eg $\frac{9}{16}$ or 0.56(25) A0

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*24		$2y = 3x - 4$ $y = \frac{3}{2}x - 2$; $m = \frac{3}{2}$ $\frac{3--1}{1-4} = -\frac{4}{3}$ $\frac{3}{2} \times -\frac{4}{3} = -2$	No with reason	4	M1 for $\frac{3}{2}$ oe or $y = \frac{3}{2}x\left(-\frac{4}{2}\right)$ oe M1 for method to find gradient of AB, eg $\frac{3--1}{1-4}$ **or** $\frac{-1-3}{4-1}$ **or** $-\frac{4}{3}$ oe A1 for identifying gradients as $\frac{3}{2}$ oe **and** $-\frac{4}{3}$ oe C1 (dep on M1) for a conclusion with a correct reason, eg No as product of $\frac{3}{2}$ and $-\frac{4}{3}$ is not −1, ft from their two gradients
25	(i)		(3, −1)	3	B1 cao
	(ii)		(1.5, −4)		B1 for (1.5, −4) accept 1.5 or $1\frac{1}{2}$ or $\frac{3}{2}$ for x coordinate
	(iii)		(−3, −4)		B1 cao

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

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

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

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
3		Stem and leaf diagram – extra line put in at the bottom	
5		Larger gaps between numbers	
10		Line AB put horizontal Small vertical line at either end of line AB	
12	(c)	*x* changed to *y*	
15	(b)	Table changed 50, 250, 175, 100, 225 Box plots labeled – Box plot (a) and Box plot (b) and both extended to 400 with a 2 cm grid Lines moved to 25, 125, 200, 225, 250	
16		Table changed to 20, 70, 140, 170, 185, 195, 200 Grid 1½ cm for 10 on y axis (this one gives 10 people over 60): x axis is 3cm for 10 years. Age (years) 90 column removed	
18		Shading reversed – AEFG is shaded Question wording altered to reflect this	

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Mark Scheme (Results)

November 2015

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

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NOTES ON MARKING PRINCIPLES

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

2 Mark schemes should be applied positively.

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

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

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

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

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

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

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

7 With working

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

8 Follow through marks

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

9 Ignoring subsequent work

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

10 Probability

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

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

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

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

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

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

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
1.			6 525 900 450	3	M1 for × 6 ÷ 4 oe or $\frac{6}{4}$ or 1.5 or 1 correct answer A2 for all correct (A1 for 2 or 3 correct)
2.			$8n + 24$	3	M1 for generating at least 3 terms of sequence 32, 40, 48 or sequence 4, 5, 6 M1 for $8n \pm k$ or $8(n \pm m)$ where $k \neq 24$, $m \neq 3$ A1 for $8n + 24$ or $8(n + 3)$ oe
3.			105 cm^3	4	M1 for writing factor pairs of 35, 21 or 15 M1 for "3" × "5" × "7" using their lengths dep on one at least one correct factor pair A1 ft for 105 (dep on one correct factor pair) B1 for cm^3

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
4.		$y = \frac{1}{2}x + 3$ x | −2 | −1 | 0 | 1 | 2 | 3 | 4 y | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5	Correct line from (−2, 2) to (4, 5)	3	**(Table of values / calculation of values)** M1 for at least 2 correct attempts to find points by substituting values of x. M1 ft for plotting at least 2 of their points (any points plotted from their table must be correctly plotted) A1 for correct line between $x = –2$ and $x = 4$ **(No table of values)** M1 for at least 2 correct points with no more than 2 incorrect points plotted M1 for at least 2 correct points (and no incorrect points) plotted **OR** line segment of $y = \frac{1}{2}x + 3$ drawn A1 for correct line between $x = –2$ and $x = 4$ **(Use of $y = mx + c$)** M1 for line drawn with gradient of $\frac{1}{2}$ **OR** line drawn with a y intercept of 3 M1 for line drawn with gradient of $\frac{1}{2}$ **AND** line drawn with a y intercept of 3 A1 for correct line between $x = –2$ and $x = 4$ **SC** : B2 for correct line from $x = 0$ to $x = 4$

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
5.			68	5	B1 for correct conversion of units M1 for 250 ÷ 25 (= 10) or 300 ÷ 20 (= 15) M1 for "10" × "15" M1 (dep on M2) for number of tiles ÷ 20, round up, × 8.5(0) A1 for 68 OR B1 for correct conversion of units M1 for 250 ÷ 20 (= 12.5) or 300 ÷ 25 (= 12) M1 for "12.5" × "12" M1 (dep on M2) for number of tiles ÷ 20, round up, × 8.5(0) A1 for 68 OR B1 for correct conversion of units M1 for 3 × 2.5 (= 7 .5) or 20 × 25 (= 500) M1 for "3 × 2.5" ÷ "0.2 × 0.25" or "300 × 250" ÷ "20 × 25" M1 (dep on M2) for number of tiles ÷ 20, round up, × 8.5(0) A1 for 68
*6		1, 4, 7, 10, 13 8, 6, 4, 2, 0	Explanation	2	M1 for listing at least 3 terms of both sequences C1 for Yes and explanation from fully correct working that 4 is in both sequences; numbers in A are increasing; numbers in B are decreasing

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5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			7.21 (am)	3	M1 for listing multiples 9,18,27,36 and 12,24,36 (condone 1 arithmetic error) or method to find LCM M1 for identifying 36 as LCM A1 cao OR M1 for listing times 6.54, 7.03, 7.12, 7.21 or for listing times 6.57, 7.09, 7.21 (condone one arithmetic error) M1 for listing times 6.54, 7.03, 7.12, 7.21 **and** 6.57, 7.09, 7.21 (condone one arithmetic error) A1 cao
8	(a)		4(3e +1)	1	B1 cao
	(b)		15c – 10d	1	B1 cao
	(c)		$28a^4b^3$	2	B2 for $28a^4b^3$ (B1 for two of 28, a^4 , b^3 as a product)
	(d)		$(x + 7)(x – 7)$	1	B1 cao
	(e)	$2y^2 – 6y + 7y – 21$	$2y^2 + y – 21$	2	M1 for 3 out of no more than 4 terms correct with correct signs or the 4 terms $2y^2$, $6y$, $7y$ and 21 seen, ignoring signs A1 cao

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		360 – 64 140 + 40 + 296 + 40 = 516 540 − 516 = 24	24°	4	M1 for 1 correct relevant angle calculation A1 for 24 cao C2 for all reasons (C1 (dep M1) for reason relating to parallel lines or parallelogram which is relevant to their chosen method) eg angles on a straight line add to 180° angles at a point add to 360° angles in a triangle add to 180° angles in a quadrilateral add to 360° alternate angles are equal corresponding angles are equal allied angles / co-interior angles add up to 180° opposite angles in a parallelogram are equal
10			$4\frac{8}{35}$	3	M1 for converting both fractions to get a common denominator of a multiple of 35 with at least one correctly converted. M1 (dep on M1) for $3+\frac{"28"}{35}+\frac{"15"}{35}(=3\frac{43}{35})$ oe A1 for $4\frac{8}{35}$ cao

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		7.8×10^{-3}	1	B1 cao
	(b)		6 710 000	1	B1 cao
	(c)	$-9,\ 0.9,\ 1,\ 3$	$-9,\ 0.9,\ 9^0,\ 9^{\frac{1}{2}}$	2	M1 for either $9^{\frac{1}{2}}$ or 9^0 evaluated correctly A1 for fully correct list from correct working, accept original numbers or evaluated. (SC: B1 for 1 error in position or a correct list in reverse order)
12.	(a)		(0, 5, 5)	1	B1 cao
	(b)		$(2\frac{1}{2}, 5, 2\frac{1}{2})$	1	B1 for $(2\frac{1}{2}, 5, 2\frac{1}{2})$ oe
13.			120	3	M1 for $80\% = 480$ or $\frac{480}{80}(=6)$ or $\frac{480}{80} \times 100\ (=600)$ oe M1 for $600 - 480$ or $\frac{480}{80} \times 20$ oe A1 cao
14.			$A = 9x^2 + 19x - 6$	4	B1 for one of $5x - 2$ or x found M1 for correct method to find area of one relevant rectangle. M1 for complete method to find whole area or simplified expression $9x^2 + 19x - 6$ or correct but not simplified formula A1 for correct, simplified formula $A = 9x^2 + 19x - 6$

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
15.			$y = \frac{3}{2}x - \frac{5}{2}$	4	M1 for attempt to find gradient of AB M1 (dep) for attempt to find gradient of perpendicular line eg use of $-\frac{1}{m}$ M1 for substituting $x = 3, y = 2$ into $y =$ "m" $x + c$ A1 for complete correct equation $y = \frac{3}{2}x - \frac{5}{2}$ oe
16.			$2\sqrt{7}$	3	M1 for multiplying numerator and denominator by $\sqrt{7}$ M1 for correct method to expand $(4+\sqrt{2})(4-\sqrt{2})$ with 3 out of no more than 4 terms correct with correct signs or the 4 terms seen, ignoring signs A1 for $2\sqrt{7}$ (accept $\sqrt{28}$)
17.		$\frac{(x-5)(x+3)}{(x+3)(2x+1)}$	$\frac{x-5}{2x+1}$	3	M1 for correct factorisation of numerator M1 for correct factorisation of denominator A1 for $\frac{x-5}{2x+1}$

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Question 19

A large number of students did not recognise this as a completing the square question or understand how to complete the square. Students who did tackle part (i) by completing the square were generally the most successful and many earned the method mark for getting as far as $(x – 3)^2$. A common mistake made by students who completed the square correctly to get $(x – 3)^2 – 8$ was writing $a = – 3$ and b = –8 on the answer lines. These students lost the accuracy mark. Those who started by expanding $(x – a)^2 – b$ were less successful. Errors were frequently made in the expansion but many of the students who did get to $x^2 – 6x + 1 = x^2 – 2ax + a^2 – b$ went on to rearrange the equation and did not identify $a = 3$.

Students who had found $(x – 3)^2 – 8$ in part (i) were often able to identify the coordinates of the turning point as (3, –8) in part (ii). It was not unusual to see students who had used an incorrect method in part (i) complete the square in this part to find the coordinates of the turning point.

Any working in part (ii) could not be credited in part (i). An answer of (–3, 8) was a common incorrect answer following a correct answer in part (i).

Question 14

This new topic was a challenge to many students. A large number failed to draw a tangent, often simply dividing the speed at $t = 15$ by 15, and so scored zero marks. Those who did draw a tangent then often scored all three marks. Some students took little care over the reading of the scales and therefore had an incorrect method for their gradient. It is important to realise that these questions need to have a tangent drawn. Several students gave an answer within the acceptable range, but they scored no marks as their answer clearly came from an incorrect method.

Part (ii) proved more challenging than the earlier one. This is a new topic and many students do not fully understand that gradients represent the instantaneous rate of change. In this context that being acceleration.

Part (b) brought in another new topic and students appeared better prepared than in previous series. However, the method for finding the area under the curve was often crude. Many students attempted to use rectangles, and whilst this does give an estimate, it is not a very good one. These students were able to score two marks typically for the processes, but their answer was usually outside the range given in the mark scheme. Students should be encouraged to use trapezia to find a better estimate. Many responses showed attempts to estimate distance using distance = speed × time. Many forgot to divide the triangle product for the first strip by two.

Question 16

It is evident that most students have some knowledge of $y = mx + c$ and the properties of the gradients of perpendicular lines, but many got into trouble because of the form in which line L was given. A good number of students failed to rearrange the given equation to find the gradient, often working with 4. These students were able to gain the second mark, provided they had clearly stated the gradient of L as being 4. Failing to do that meant they could gain no credit for their knowledge of the properties of the gradients of perpendicular lines. The students who knew the relevant property often scored the second mark, however, quite a number forgot either the negative or the reciprocal and only used one of these aspects, meaning the second mark was not awarded. There was no prerequisite in the question regarding the form of the final equation, and as such, any equivalent equation was accepted for the accuracy mark.

Question 22

Fully correct answers to this question were seen only rarely. It was found to be the most challenging question on the paper. Having said that, a significant proportion of students were able to score at least one mark for a successful start by identifying that angle OAB is a right angle or for a correct process to find the radius of the circle. Few students could see how to use the coordinates of P in order to derive an equation by either using the equation of the circle or by using Pythagoras's Theorem. The evidence from students' scripts showed that more students took the former approach, quoting $x^2 + y^2 = r^2$ and then substituting $x = 3p$, $y = p$, $r = 8$ to get an equation in p. Unfortunately, the lack of of use of correct notation, that is a pair of brackets, meant that many students wrote $3p^2 + p^2 = 8^2$ instead of $(3p)^2 + p^2 = 8^2$. These students usually went on to simplify their equation to $4p^2 = 8^2$.

Question 21

Again, only a very few students were able to make any headway in sketching a graph of the given quadratic. The *y*-intercept and the turning point were most often found by constructing tables of values. Some students did attempt to solve the quadratic, usually by completing the square, however this was often littered with mistakes. Many of the students who attempted this question drew a parabola which was symmetrical about the y-axis.

Question 25

It was clear that many students knew what to do but lacked the skills to do what they wanted. As a result this question was rarely attempted at all. Where the question was attempted and credit was achieved it was usually for finding the gradient of line L, although several forgot to divide the whole expression by 2. Once a gradient had been established, it was common for students to then use $-1/m$ to find the gradient of the perpendicular, although -2/3 was seen. It was common to see the correct equation here, but then students did not know how to progress further, although some then sketched

the equation identifying the y coordinate of B. Even in the rare cases when the coordinate of C was established forming the correct triangle and then successfully calculating the area was infrequent.

Summary

Based on their performance on this paper, students should:

- ensure that figures taken from the question, and from their own work, are transcribed accurately.
- avoid rounding or truncating answers part way through a solution and use the most accurate values where possible.
- ensure that calculators are used correctly.
- remember to include working out to support their answers.
- spend time on topics such as algebraic manipulation and proof, and application of ratios, bounds, iteration and histograms when preparing for future examinations.
- spend time on practicing response type questions where a written explanation is required.

Question 15

There was quite a good understanding that the gradient of the line L_2 is obtained by finding the negative reciprocal of 3. A common error was use 3 or -3 as the gradient of L_2. Having found the gradient

of $-\frac{1}{3}$ students often went on to substitute x = 9 and y = 5 in y = $-\frac{1}{3}$x + c to work out the value of c. Arithmetic slips were surprisingly common. Some of those who used y = mx + c did not substitute x = 9 and y = 5; instead they just wrote an answer such as y = $-\frac{1}{3}$x + 5. Substituting $-\frac{1}{3}$, 9 and 5 into $y - y_1 = m(x - x_1)$ gave some students a quick route to an answer. Some students found the gradient of $-\frac{1}{3}$ and made no further progress. Many, though, did not even get that far.

Question 12

Students were often able to gain one mark in part (a) for a suitable method to find the gradient, although too many students divided the change in x by the change in y rather than the other way round. Unfortunately, too many students, even after getting an answer in range, missed the negative sign from their gradient and therefore lost the second mark. Part (b) was less often awarded any credit. In many cases students talked about the relationship between variables, or correlation rather than the interpretation of the gradient as a rate of change.

Question 17

This question awarded a single mark for the student who understands the link between the completed square form of a quadratic and the turning point of its graph. Unfortunately, many students do not fully understand this, typically quoting the x coordinate as 12 not -12.

Question 13

This question was not generally well answered. However, there were a significant number of the more able students who were able to gain full marks.

In part (a) most students attempted to draw lines on the grid but only a minority of the scripts seen contained diagrams with at least two of the lines $x = 2$, $y = x + 3$, $2x + 3y = 6$ drawn correctly. This was the minimum requirement to gain any credit in this part of the question. The line $x = 2$ was often seen drawn incorrectly as $y = 2$. About one in ten of students obtained full marks in part (a).

Part (b) of the question attracted an encouraging number of responses which examiners could give credit for. To score the mark in part (b), students were expected to state that Geoffrey was not correct and give a reason for their response. Examiners accepted a range of possible reasons equivalent to stating that the point with coordinates (2, 4) was in fact in the region or that it satisfied the inequalities given. There were many excellent responses from students who clearly showed they had a very good understanding of the situation by referring to the equals signs in the inequalities or to the solid lines in the diagram.

Question 22

Very few students showed a full understanding of what was required to find the coordinates of the turning point on the curve. Some of those who realised that they needed to use completing the square tried to do this as the first step and invariably failed. Some students divided $9 + 18x - 3x^2$ by -3 and worked with $x^2 - 6x - 3$, often gaining one mark for starting the process to complete the square. Those who started by factorising often went on to give fully correct answers but sign errors and missing brackets prevented some students from achieving full marks.

In Summary

Based on their performance on this paper, students should:

- practise their arithmetic skills, particularly division and operations with mixed numbers
- consider whether or not an answer to a calculation is of a sensible size
- practise working out estimates by rounding numbers and develop an understanding of the purpose of rounding so that they can choose appropriate rounded values
- show their method when working out a percentage of an amount
- know and be able to use area formulae for triangles and trapezia
- practise answering questions involving algebraic fractions

Question 11

Part (a) was not well answered, with most students not understanding the ratio and how to apply it to the coordinates. It was rare to award both marks, with some students able to find one coordinate (typically the x value) or for getting as far as 4.5 when working with the y-coordinate.
Part (b) was a more common type of question and it showed that students have completed work on gradients and**,** compared to previous questions, a good number showed knowledge of gradients of perpendicular lines. The first mark was awarded in equal numbers for a correct process to find the gradient of **L** or for an equation in the form $y = mx + 3$. Those who correctly (or incorrectly) found a gradient for **L**, were still able to gain the second mark for a correct process to find the gradient of the perpendicular line, and this mark was awarded nearly as frequently as the first. Few gained full marks, either due to an error in finding the first gradient or for an incorrect y intercept, despite this being given in the question.

Question 13

This question was generally not well answered. Many students did not attempt the question and there were many attempts where students started by calculating the gradient of the line joining point *A* to point *B*. Where students were more successful, there were some well presented and clear solutions showing the derivation of two equations together with their solution, usually to find the length and width of each rectangle. These students usually completed the question and scored the full 5 marks.

Question 5

This problem required students to work with coordinates and a ratio to determine the coordinates of another point. A good number of students were able to gain credit on this question, with many gaining all 4 marks. Those who didn't score fully often only went as far as finding the vertical and horizontal distances, but then didn't add these onto the coordinates of L or M. Another common error was to use the ratio incorrectly, typically dividing by 3 and multiplying by 2, as was finding the equation of the line LMN, which could still gain P1 for the values of 8 and 7 within the gradient.

Question 12

This question was answered better than it has been on previous papers, with many students understanding the need to rearrange one of the equations, and in most cases being successful to some extent. The first mark could be gained by correctly moving one of the variables in either equation, or by correctly scaling one of the equations by multiplying or dividing by 5. To gain both marks the equations had to be manipulated enough for a comparison of coefficients to be possible, and for a comparison to be drawn – this was generally done well with the most common incorrect comparison being to state that the gradient was 10 when both equations were in the form $5y = 10x$ ...

Question 8

Many students found this question to be straightforward. They often used a triangle where readings were easy to take and gave a value for the gradient of the graph within the accepted range, more often than not 0.14. For some other students who drew a small triangle on the line getting an accurate answer was less likely. However, if the value given for the gradient was outside the range 0.135 to 0.145, examiners awarded both marks in part (a) provided a correct method was clearly shown. A small number of students used "increase in x ÷ increase in y" or counted squares rather than using the scales on the axes. These students could not be credited with any marks in part (a).

Part (b) was answered less well and many incorrect or ambiguous statements were seen. An answer equivalent to "cost per unit of electricity" was expected but many students merely described what the graph, not the gradient, showed and statements such as "cost of how many units used" were often seen.

Question 21

This question proved to be a good discriminator between the most able students. When only one of the two values was correct it tended to be the y coordinate and (90, – 1) was a common response that gained 1 mark. There were some students who gave the answer as (–1, 180) instead of (180, –1) and they gained 1 mark.

Question 7

This 3-part Quadratic Graph question was answered generally well on the higher paper. Almost all candidates scored full marks in part (a) and part (b) for reading off the *y*-intercept and turning point correctly. Many were then unsure as to what the roots were and didn't gain marks in part (c). Some did gain 1 mark for identifying the roots on the graph, but being unable to read off the values to gain both marks. Some candidates tried to solve algebraically despite being told to use the graph - this approach gained no credit.

Question 9

This question required candidates to rearrange one of the two equations, so that both were in the same form ($y = mx + c$ or $by = ax + c$) so that the gradient, or coefficients, can be compared. Most candidates attempted to manipulate one or the other of the equations, and mostly they were successful. Of those who successfully manipulated, most were able to draw a correct conclusion. A small number of candidates gained both marks by giving a full statement such as 3 divided by 6 is equal to ½ so both lines have the same gradient. Comparing the equations as they were given lead to incorrect conclusions that the gradients were different.

Question 21

Well into the Grade 8 questions on the paper and it is not surprising that fewer candidates are now scoring marks. For part (a), failure to draw a tangent at $t = 17.5$ meant that no marks could be scored at all. It was very common to just see $\frac{10.5}{17.5}$ which came from reading the volume at $t = 17.5$, and this scored zero. Those who drew a suitable tangent often then went on to score full marks for an answer in range. However, some were unable to use the scale correctly and then lost marks for their method to find the gradient. Part (b) showed improvements on previous series, and there were many suitable descriptions of what the gradient represented although students still relate this answer to a correlation type response. 'Acceleration' was a commonly seen incorrect answer.

Question 15

This question was not answered as well as might have been expected and a surprising number of students failed to gain any marks at all. After gaining the first mark for making the *y* term the subject of $6y + kx - 12 = 0$ or for finding that the gradient of a line perpendicular to $\mathbf{L_1}$ is $-\frac{1}{2}$ some students made no further progress. Many of those that did get both $y = -\frac{k}{6}x + 2$ and the gradient of $-\frac{1}{2}$ could not make the final step of equating the gradients to find the value of *k* and it was common to see an answer of $\frac{1}{12}$ from multiplying $-\frac{1}{2}$ by $-\frac{k}{6}$. The double minus of $-\frac{k}{6}$ and $-\frac{1}{2}$ caused lots of issues and a significant number of students gave the final answer as –3 instead of 3. An answer of 3 with no supportive working gained no marks because the question required students to show all their working. Common incorrect methods included trying to solve the equations simultaneously.

Question 7

Part (a) of this question attracted a high percentage of correct answers. The most common incorrect responses seen included (−3, 1), where the x and y coordinates were transposed, and answers where the roots of the equation $x^2 - 2x - 2 = 0$ were given on the answer line for this part of the question.
Part (b) was less well answered. Examiners asked for only one root so it was surprising to see so many students give both roots. A more serious error seen was for students to give an answer to the nearest integer not realising that the term "estimate" referred to the fact that using a graph could only provide an estimate for the roots. Many students took the request for an estimate as an instruction to round their answer. A further common error was for students to give both x and y values at the points where the graph crossed the x-axis when only the value of x was required. There were also a considerable number of students who gave the intercept of the graph with the y-axis (−2) as their root.

Question 17

In part (a) of this question, examiners saw many excellent answers with a clear and accurate tangent drawn at time 2.5 seconds followed by a clear method to work out the gradient of the tangent. Students who did not draw a tangent at the correct point were unable to access any marks here. An incorrect interpretation of the request to "estimate" resulted in some students prematurely rounding figures. Centres may like to remind students that the very nature of the process of drawing a tangent to estimate the gradient is in itself bound to give an estimate and that this is often the case when using readings from a graph. No further rounding is needed in the calculation. In this question, provided the student had drawn an acceptable tangent at time 2.5 seconds, examiners followed through their use of the graph and were able to award full marks for a correct method using figures correctly taken from their diagram together with an accurate evaluation of their numerical expression for the gradient. Some students did not use the scales on the axes correctly when calculating the gradient. It was encouraging that only a small proportion of students tried to find the gradient without drawing a tangent first and that few students used "increase in x ÷ increase in y" for the gradient or counted squares rather than using the scales on the axes.
Students usually quoted "speed", or the equivalent, in part (b) of the question to score the mark available. The most commonly seen incorrect answer was "acceleration".

Question 12

This problem was unfamiliar to most and there was very little success. A small number were able to find one or both midpoints of the given coordinates, but for almost all, that was all they could do. There was little evidence of students knowing to use Pythagoras to find the distance between two points, and so it was rare to see the award of more than a single mark.

Question 6

Part (a) was generally answered quite well. Many students were able to get one mark for being able to use $y = mx + c$. Some students drew an appropriate triangle on the diagram but did not know how to use it, others did use it and showed correct working or stated that the gradient is $\frac{3}{2}$. Incorrect gradients included $-\frac{3}{2}$ and $\frac{2}{3}$. Students should be encouraged to write down the formula for a gradient before applying it as this may minimise the use of

incorrect values. Many went on to use the gradient correctly in an equation but some students did not know what to do with it. When the gradient was used correctly a common wrong answer was $y = \frac{3}{2}x - 2$ where the x intercept was used rather than the y intercept and some gave the answer as $y = \frac{3}{2}x$. Answers such as these were awarded the two method marks.

A few students, who knew what they were doing, spoiled their final answers by using L instead of y in their equation, but were awarded two of the three marks. Students who did not know how to find the gradient could gain the first method mark for demonstrating understanding of the y-intercept.

A similar number of students were successful in part (b) when writing down the equation of a straight line parallel to $y = 5x$. It was clear that some students did not know that parallel lines have the same gradient. Common incorrect answers often included the digit 5, for example $y = -\frac{1}{5}x$, $y = \frac{1}{5}x$, $y = -5x$ and even $y = 5x$. Some students simply changed the 5 for a different digit and gave answers such as $y = 4x$ or $y = 2x$.

Question 23

It was pleasing to see some fully correct and well presented solutions to this grade 9 problem. Many students attempted to draw diagrams to help them structure their response. Some of those who did then started to solve the problem by using the equation of a circle and gained the first mark. Some made no further progress but a good number were able to show a correct process to find the y coordinate of Q which gained the second mark. Selecting the negative square root (because **L** has a positive gradient) gained the third mark. Students who used 11 rather than –11 were still able to gain the fourth mark for a process to find the y intercept. This process usually involved finding the gradient of **L** and if the gradient was incorrect then the mark could only be awarded if it could be seen that the gradient had come from a correct process. A significant number of students attempted to solve the problem by using only gradients and scored no marks.

Summary

Based on their performance on this paper, students should:

- communicate clearly when a decision and a reason are required
- develop an understanding of the purpose of rounding so that they can choose appropriate. rounded values when working out an estimate
- become more familiar with the set notation for the complement of a set
- practise applying the rules of indices in problems, including the use of negative and fractional indices
- practise solving problems involving similar triangles
- ensure that axes are correctly labelled on graphs and charts
- practise drawing and interpreting histograms

Question 20

Completing the square is always a topic that many struggle with, especially, if like here, the coefficient of x^2 is greater than 1. We saw a decent number gain a mark for taking out a factor of 2, and many were then able to find the $(x-3)^2$term, but very few were able to complete the process and gain the second. If they did, most gained the final mark, except for a few with the correct values but incorrect signs. Some were able to deduce the first coordinate of $x=3$, which gained them 1 mark, but were then unable to find the second coordinate.

Question 7

This question was not answered well with many learners unable to explain what the gradient of the graph represents. Correct explanations contained a reference to 'rate' or 'speed' or 'how fast' or 'each second', for example ‘the rate at which the tank is losing water’. Some of the incorrect explanations did refer to the volume of water and to time but described what the graph shows, not what the gradient represents. Explanations such as ‘the volume of water decreases as time increases’ and ‘the volume of water leaving the tank in 50 seconds’ were very common. There were also many incorrect explanations such as ‘negative correlation’ and ‘direct proportion’ that did not mention the context at all.

Question 21

Learners had two routes into the problem. They could work with gradients and the fact that perpendicular gradients have a product of -1 to form an equation to be solved. Alternatively, they could use Pythagoras to form an equation. This did lead to 4 expressions to each be squared, expanded and then summed leading to 12 terms. The sheer quantity of terms often leads to mistakes in manipulation and simplification. The presence of having to deal with multiple negative signs also proved a challenge.

Where learners did have some success it was normally for a single correct gradient. From there most learners didn't know how to proceed further.

Question 16

Few fully correct solutions were seen to this question. Those who attempted the question but gained no marks often found the gradient between the given points (2, -4) and (12, -6.5) which gained no credit. Several attempts at using Pythagoras' Theorem to find the lengths of sides were also seen. The most commonly, awarded mark was for finding the gradient of OB. Of those who realised that the gradient of OB was necessary to proceed, some of these were able to find the equation of DE and/or OD, with many correct equations leading to a correct solution. Those who just guessed at a co-ordinate gained no marks since the command that "you must show all your working" means that a correct answer with no supportive working gains 0 marks.

Question 23
A challenging question with the most common mark being awarded for drawing a curve with a y intercept at –7. Of those that recognised the need to complete the square, scores were higher; common mistakes in this being to not square the 3p. Most of those who correctly identified the turning point drew it in the correct quadrant but some did not gain full marks as they incorrectly identified roots at –1 and 7 or –p and 7p.

Summary

Based on their performance on this paper, learners are offered the following advice:

- Practise basic algebraic processes such as expanding a single bracket, factorising and collecting terms that can be used when changing the subject of a formula.
- When comparing distributions, ensure that comparative words are used such as "greater" or "higher"
- Ensure that recurring decimal notation, rather than terminating decimals are used when converting a recurring decimal to a fraction.
- Achieve a greater understanding of equivalent proportion in capture-recapture.
- Work on appropriate rounding, especially with monetary questions.

Question 3

This question was well answered by the majority of responses. The table in part (a) was often completed correctly. Some errors occurred with the substitution of $x = -2$ into the equation and the substitution of $x = 1$ sometimes resulted in $y = -3$.

When the 6 correct points were plotted in part (b) most responses realised that a curve was needed to join the points and it freehand curves drawn with an appropriate turning point. Many fully correct graphs were drawn. A significant number of responses drew an otherwise correct graph with a 'flat bottom' between $(-1, -4)$ and $(0, -4)$ and this meant that only one of the two marks was awarded. Graphs consisting solely of line segments could get at most one mark. Some responses plotted the six correct points but did not join the points to complete the graph. If a mark had been awarded in part (a) for finding two or three correct values, then at least one mark was usually earned in part (b) for plotting 5 of the points from their table correctly. Candidates should be reminded that curves must pass through all of the points and that quadratic graphs have a single turning point.

Responses that had drawn a graph with a single turning point were often able to gain the mark in part (c) for writing down the coordinates of the turning point. Some errors were made when reading the y coordinate from the graph and sometimes the x coordinate was given as 0.5 instead of –0.5. Some responses recognised that the turning point is at $x = -0.5$ and substituted into the equation to find that the y coordinate –4.25 and gained the mark. The coordinates of the turning point were often given as (–0.5, –4) even when the minimum point

on the curve was clearly below $y = -4$. Many responses used the points of intersection of the graph with the axes, leading to answers such as (0, –4) and (–2.6, 1.6).

Question 12

The tangents drawn in part (a)(i) were generally accurate and responses often went on to gain all three marks for working out an estimate of the gradient at $t = 3$. If a tangent was not drawn then no marks were awarded. When answers were given in the form a/b the final mark was not awarded unless a and b were integers. Errors were often the result of reading the scales incorrectly although some responses divided the change in x by the change in y. Some responses drew a tangent, thus gaining the first method mark, but did not then show a method to find the gradient. Many responses used the coordinates of the point on the curve at $t = 3$ and divided 42 by 3. Some of these responses had already drawn a tangent to the curve at $t = 3$.

In part (a)(ii), many responses showed that they knew the gradient represents the acceleration of the particle. Incorrect answers often referred to velocity or time or the distance travelled. Some answers referred to correlation.

In part (b), many responses demonstrated how to estimate the area under the curve using three strips of equal width. Often, they used one triangle and two trapeziums and usually made good use of the formula for the area of a trapezium although some incorrect substitution into the formula was seen. Some split each trapezium into a rectangle and a triangle which was perfectly acceptable. A method to find an appropriate area was needed to gain the first method mark and this could be implied by a single correct area for one strip. A complete method was needed for the second method mark. In some of the incomplete methods seen the responses had omitted one of the five areas when using a rectangle and triangle approach. When responses gained just one mark it was often for finding the area of the triangle in the first strip. Candidates should always show the method they use to work out each area as method marks can still be awarded for incorrect areas if examiners can see that the incorrect areas come from a correct method.

Question 17

This question, relating to an exponential graph, only carried 2 marks, but proved challenging. The first step, and indeed the first mark, was to substitute the given coordinates into the equation of the graph. This was a mark that was awarded to a pleasing number of responses given the grade of the question. However, only the stronger responses were able to rearrange to find k. This was in part because some did not recognise that $k^{-1} = \frac{1}{k}$. Those who did, normally gained both marks.

Question 20

This 5-mark problem required learners to work with ratio and coordinates to find point D, then a given gradient to find the equation of line $\mathbf{L}$ and finally use this to find the y value of a specific coordinate. The mark scheme basically followed this path. The first mark was for a method to find one of the coordinates of point D using the ratio. The second mark was for a correct form for line $\mathbf{L}$, with the third mark using the coordinate of D to find the y-intercept of $\mathbf{L}$.
The final method mark was for substituting the given x value into their equation to find the y value.
Learners were able to gain later marks within the question if they failed to correctly find the coordinates for D, providing it was clear that these incorrect coordinates were what they believed to be those of D. This meant that those who made an error in the ratio but knew how to work with the equation of a line, were able to gain up to 3 marks.
The final mark was for an accurate figure for f, and for stating that this is less than -4
There were some good responses seen, but not many fully correct ones. Many learners knew some of the skills required but struggled to pull them all together.
A commonly seen mistake seen was learners assuming that the 2 lines were perpendicular, learners should be reminded to not assume a 90-degree angle unless given in the question.

Question 7

Many responses followed a successful approach by calculating the difference between the coordinates and halving the values, recognising the need to work with horizontal and vertical distances. A common error was not adding the halved values to the relevant coordinate to complete the method, with some responses either adding to the coordinate of point A or leaving the intermediate values (e.g. 3 and 2.5) as the final answer. An alternative method involved finding the midpoint of the coordinates first. While this approach sometimes led to the correct answer, it was generally less successful, though often gained partial credit. Some responses gained one mark by identifying the differences of 6 and 5 but then attempted methods such as Pythagoras' Theorem or using the equation of a straight line, which did not lead to a correct solution. A common error in these methods involved calculating and halving the gradient, which prevented progress towards full marks.

Responses that included annotations on the diagram to show horizontal and vertical differences were more likely to reach the correct final answer. Arithmetic errors were also present in some cases, resulting in the loss of the accuracy mark and highlighting the importance of checking calculations carefully.