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GCSE MATHS

Algebra

Edexcel 1MA1 | Subtopic collection Topic 20

Simultaneous equations

Higher tier

Answers and examiner comments

51	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 11

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

Original question 20

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

Original question 11

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

Original question 23

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

Original question 14

The full source mark scheme begins on page 88. Use the original paper code, tier and question number shown above.

Original question 8

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

20		$4x + y = -1$ $12x+3y = -3$ $\underline{4x - 3y = 7}$ $\underline{4x - 3y = 7}$ $4y = -8$ $16x = 4$ $y = -2$ $x = 1/4$	$x = \frac{1}{4}$ $y = -2$	3	M1 for correct process to eliminate either x or y (condone one arithmetic error) M1 (dep on previous M1) for substituting found value into an appropriate equation, or further elimination A1 cao

1380 3H

1380/3H

21		$6x+4y=16$ $6x+15y=-6$ $-11y=22$ $6x+4\times-2=16$ **Alternative method** $x=\frac{8-2y}{3}$ $2\left(\frac{8-2y}{3}\right)+5y=-2$ 16 – 4y + 15y = −6 11y = −22 $x=\frac{8-2\times-2}{3}$	x = 4, y = -2	4	M1 for correct process to eliminate either x or y (condone one arithmetic error) A1 for either x = 4 or y = -2 M1 (dep on 1st M1) for correct substitution of their found variable OR M1 (indep of 1st M1 for a correct process to eliminate the other variable (condone one arithmetic error) A1 cao for both x = 4 and y = -2 [SC: B1 for x =4 or y =-2 if M0 scored]

1380_3H
Summer 2010

21	Equation (1) × 3 then add equation (2) × 2 leads to $26x = 13$ $3 + 2y = -3$	$x = \frac{1}{2}$ $y = -3$	4	M1 for coefficients of x or y the same followed by correct operation, condone one arithmetic error A1 for one correct answer M1 (dep) for substituting found value in one equation A1 cao for other correct answer (SC: B2 for one correct answer only if M's not awarded)

19		$4x + y = 10$ $4x - 6y = 38$ – $7y = -28$, $y = -4$ $4x - 4 = 10$, $x = 3.5$ **or** $12x + 3y = 30$ $2x - 3y = 19$ + $14x = 49$, $x = 3.5$ $7 - 3y = 19$, $y = -4$ **Alternative** $y = 10 - 4x$ $2x - 3(10 - 4x) = 19$ $14x - 30 = 19$; $x = 3.5$ $4 \times 35 + y = 10$; $y = 4$	$x = 3.5$ $y = -4$	3	M1 for full method to eliminate x or y, allow one error in calculation M1(dep) for substitution of one variable into one of the equations, or by appropriate method after starting again A1 3.5 and –4 **Alternative** M1 for full method to rearrange and substitute to eliminate x or y, allow one error in calculation M1 (dep) for substitution of one variable into one of the equations, or by appropriate method after starting again A1 for 3.5 and –4

1380_3H

12		$9x + 12y = 600$ $8x + 12y = 576$ $x = 24$ $3 \times 24 + 4y = 200$ $6x + 8y = 400$ $6x + 9y = 432$ $y = 32$ $3x + 4 \times 32 = 200$	$x = 24$ $y = 32$	4	M1 correct process to eliminate either x or y (allow one arithmetical error) A1 either $x = 24$ or $y = 32$ M1 (dep on 1st M1) correct substitution of their value of x or y into one of the equations OR M1 (indep of 1st M1) correct process to eliminate the other variable (allow one arithmetical error) A1 cao for both $x = 24$ and $y = 32$

Question		Working	Answer	Mark	Notes
14	(a) (i)		– 0.6 to – 0.5 5.5 to 5.6	3	B1 for both, accept – 0.6 to – 0.5 and 5.5 to 5.6
	(ii)		–1.4, 6.4		M1 draw $y = 6$ or one value correct A1 –1.4, 6.4 ± 0.2
	(b)	Draw $y = x - 4$	$x = 0.2$, $y = -3.8$ $x = 5.8$, $y = 1.8$	3	B1 draw $y = x - 4$ M1 use the points of intersection, can be implied by one value ft their line A1 $x = 0.2$, $y = -3.8$ and $x = 5.8$, $y = 1.8$ ± 1 sq [SC: B2 for $x = 3 \pm \sqrt{8}$, $y = -3 \pm \sqrt{8}$ if B0 A0 scored]

Original question 20

The full source mark scheme begins on page 140. Use the original paper code, tier and question number shown above.

Question		Working	Answer	Mark	Notes
16	(a)	$2a + 2t = 5t + 7$ $2a = 3t + 7$ $2a - 7 = 3t$	$\frac{2a-7}{3}$	3	M1 for expansion of bracket eg $2\times a+2\times t$ or divide all terms by 2 M1 for attempt at rearrangement of t term eg $-2t$ each side; $2a = 3t+?$ but with separate terms. A1 $\frac{2a-7}{3}$ oe but must have one term in t. NB: for $\frac{2}{3}$ accept working to 2 dp: 0.67, 0.66, 2.33 or better
	(b)		$x = \frac{2}{3}$ $y = -1\frac{1}{2}$	3	M1 for correct process to eliminate either x or y (condone one arithmetic error) M1 (dep on 1st M1) for correct substitution of their found variable or other acceptable method A1 cao for both $x = \frac{2}{3}$ and $y = -1\frac{1}{2}$ oe SC: B1 for $x = \frac{2}{3}$ or $y = -1\frac{1}{2}$ oe NB: for $\frac{2}{3}$ accept working to 2 dp: 0.67 or 0.66 or better

5MB3H_01

Question		Working	Answer	Mark	Notes
22		$12x+8y=16$ $12x+15y=51$ $7y=35$ $3x+2\times5=6$ Alternative method $x=\frac{4-2y}{3}$ $4\left(\frac{4-2y}{3}\right)+5y=17$ $16-8y+15y=51$ $7y=35$ $x=\frac{4-2\times5}{3}$	$x=-2$ $y=5$	4	M1 for a correct process to eliminate either x or y or leading to substitution (condone one arithmetic error) A1 for either $x=-2$ or $y=5$ M1 (dep) for correct substitution of their found value A1 cao SC If M0 scored B1 for $y=-2$ and $x=5$

1MA0_1H

21		$x^2 + (2x + 5)^2 = 25$ $x^2 + 4x^2 + 20x + 25 = 25$ $5x^2 + 20x = 0$ $5x (x + 4) = 0$ $x = 0,\ x = –4$ $y = 2 \times 0 + 5$ $y = 2 \times –4 + 5$	$x = 0,$ $y = 5$ or $x = –4,$ $y = –3$	6	M1 $x^2 + (2x + 5)^2$ (= 25) A1 $x^2 + 4x^2 + 10x + 10x + 25$ (= 25) M1 Use of factorisation or correct substitution into quadratic formula or completing the square to solve an equation of the form $ax^2 + bx + c = 0, a \neq 0$ A1 $x = 0, x = –4$ M1 substitution of an x value into an original equation A1 $y = 5,\ y = –3$ correctly matched to x values SC (If M0M0M0 then B1 for one pair (x, y) of correct answers)

Original question 14

The full source mark scheme begins on page 160. Use the original paper code, tier and question number shown above.

Original question 18

The full source mark scheme begins on page 175. Use the original paper code, tier and question number shown above.

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.

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

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

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

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

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

Question		Working	Answer	Mark	Notes
13		$3x + 10y = 7$ $3x - 12y = 18$ $22y = -11$ $y = -0.5$ $3x + 10 \times -0.5 = 7$ $x = 4$	$x = 4$, $y = -0.5$	3	M1 for a full method to eliminate x or y, allow one error in calculation M1 (dep) for substitution of one variable into one of the equations, or by appropriate method after starting again A1 for 4 and –0.5

PAPER: 1MA0_1H

Question		Working	Answer	Mark	Notes
15		$6x + 8y = 10$ $6x - 9y = 27$ $y = -1$ $3x - 4 = 5$ $3x = 9$ $x = 3$ OR $9x + 12y = 15$ $8x - 12y = 36$ $x = 3$ $9 + 4y = 5$ $4y = -4$ $y = -1$	$x = 3$, $y = -1$	4	M1 for a correct process to eliminate either variable (condone one arithmetic error) A1 cao for either x or y M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again (condone one arithmetic error) A1 cao OR M1 for full method to rearrange and substitute to eliminate either variable (condone one arithmetic error) A1 cao for either x or y M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again (condone one arithmetic error) A1 cao Trial and improvement scores 0 marks unless both x and y are correct

Question	Working	Answer	Mark	Notes
14	$4x - 5y = 33$ $\underline{15x + 5y = 5}$ $19x \quad = 38$ $x = 2, \quad 3\times2 + y = 1$ $y = -5$ $12x - 15y = 99$ $\underline{12x + 4y = 4}$ $-19y = 95$ $y = -5, \quad 3x - 5 = 1$ $x = 2$ OR $4x - 5(1 - 3x) = 33$ $x = 2, \quad 3\times2 + y = 1$ $y = -5$	$x = 2, y = -5$	3	M1 for a fully correct process to eliminate one variable (condone one arithmetical error) M1 (dep on M1) for a correct substitution of their value (of x or y) into one of the equations, or for starting again with a fully correct process to eliminate the second variable A1 for $x = 2$ and $y = -5$ OR M1 for a correct rearrangement of one of the equations to make either x or y the subject and a correct method of substitution into the other equation. (condone one arithmetical error) M1 (dep on M1) for the substitution of their value (of x or y) into one of the equations. A1 for $x = 2$ and $y = -5$ [Note: No marks for trial and improvement methods unless a fully correct solution is found]

Question	Working	Answer	Mark	Notes
14	$4x - 5y = 33$ $15x + 5y = 5$ $19x = 38$ $x = 2$, $3\times2 + y = 1$ $y = -5$ $12x - 15y = 99$ $12x + 4y = 4$ $-19y = 95$ $y = -5$, $3x - 5 = 1$ $x = 2$ OR $4x - 5(1 - 3x) = 33$ $x = 2$, $3\times2 + y = 1$ $y = -5$	$x = 2$, $y = -5$	3	M1 for a fully correct process to eliminate one variable (condone one arithmetical error) M1 (dep on M1) for a correct substitution of their value (of x or y) into one of the equations, or for starting again with a fully correct process to eliminate the second variable A1 for $x = 2$ and $y = -5$ OR M1 for a correct rearrangement of one of the equations to make either x or y the subject and a correct method of substitution into the other equation. (condone one arithmetical error) M1 (dep on M1) for the substitution of their value (of x or y) into one of the equations. A1 for $x = 2$ and $y = -5$ [Note: No marks for trial and improvement methods unless a fully correct solution is found]

18			$x = 7$ $y = -3$	3	M1 for correct process to eliminate one variable (condone one arithmetic error) M1 (dep) for substituting found value in one of the equations or appropriate method after starting again (condone one arithmetic error) A1 for $x = 7$ and $y = -3$

Original question 17

The full source mark scheme begins on page 197. Use the original paper code, tier and question number shown above.

PAPER: 1MA0_2H

Question		Working	Answer	Mark	Notes
28	(a)		Circle drawn	2	B2 fully correct circle drawn (B1 for circle drawn with centre (0,0) or circle drawn with radius 4) OR M1 at least 5 correct points calculated and plotted A1 fully correct circle drawn
	(b)		$x = 1.4, \quad y = 3.8$ $x = -2.2, y = -3.4$	3	M1 for $y = 2x + 1$ drawn or for elimination of one variable A1 for one correct pair of values given or for $x = 1.4, -2.2$ (± 0.2) or ft from graph provided 2 marks in (a) A1 for second correct pair of values given (± 0.2) or ft from graph provided 2 marks in (a)

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

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Measurements of length: ±5 mm

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q4		Grid is enlarged. 2 rows at the top and 2 columns on the right are removed. The enlargement is drawn on the diagram and the question is reversed. 'Describe fully the single transformation that maps shape P onto shape Q.'	B2 for enlargement, scale factor 2, centre A (B1 for enlargement, or scale factor 2)

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q6		Diagrams removed.	M1 for a complete method to find the cost per sachet or the number of sachets per £1 for one size of box M1 for a complete method to find all three comparable figures A1 for 0.47(08. .), 0.46, 0.45 or 2.12(3...), 2.17(..), 2.22 (2..) oe C1(dep on M2) for a comparison of their answers leading to a correct deduction **OR** M1 for 3 multiples of each of 12, 20 and 35 or a common multiple of 12, 20 and 35, eg 420 or multipliers to compare the same number of sachets from each box, eg $\times\frac{35}{12}$ and $\times\frac{35}{20}$ M1 for a complete method to find three comparable costs A1 for three correct costs, eg 197.75 and 193.20 and 189.00 C1(dep on M2) for a comparison of their answers leading to a correct deduction
Q7	(a)	MLP only: x changed to p.	B1 cao

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q9	(a)	In text 51 is changed to 55. Frequencies changed to : 5, 20, 15, 10, 5. Grid is simplified and enlarged. Both axes – 3cm grid with an intermediate line. Label for horizontal axis left aligned. Label for vertical axis placed above the axis.	B2 for correct plotting of 5 points and joining with line segments (B1 for points plotted correctly at midpoints of intervals **OR** joining points with line segments at the correct heights and consistent within the class interval (including end values) **OR** correct frequency polygon with one point incorrect **OR** correct frequency polygon with first and last point joined) NB Ignore any histogram drawn and any part of frequency polygon outside range of first and last points plotted
Q9	(b)	In text 51 is changed to 55. Frequencies changed to : 5, 20, 15, 10, 5. Grid is simplified and enlarged. Both axes – 3cm grid with an intermediate line. Label for horizontal axis left aligned. Label for vertical axis placed above the axis.	M1 for finding a quarter of 55 and for finding how many teachers sent more than 30 emails C1 for 13.75 or 14 compared to 15 and yes she is correct **OR** M1 for finding how many teachers sent more than 30 emails and '15'× 4 C1 for comparing 60 with 55 and yes she is correct **OR** M1 for 15 ÷ 55 (= 0.27...) or $\frac{15}{55}$ × 100 (= 27…%) C1 for comparing 0.27.. with $\frac{1}{4}$ or 0.25 OR 27….% with 25% and yes she is correct
Q10		Rectangle has been widened so that AD and BC are 12 cm. In text, 8 metres has been changed to 10 metres.	B1 for line parallel to *BC* and 3 cm from *BC* B1 for arc drawn, centre *C*, with radius 5 cm B1 ft for shading a region below their horizontal line **and** inside their arc

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q11		Diagram is enlarged.	M1 for $\pi \times 7$ (= 21.9 to 22) or $\pi \times 7 \times 2.54$ = (55.5 to 56) M1 (dep) for a complete method that could lead to two figures that are comparable eg $\pi \times 7 \times 2.54$; $\pi \times 7$ and $50 \div 2.54$ A1 for correct comparable figures eg 55.5 to 56 (cm); 21.9 to 22 (in) and 19.6 to 19.7 (in) C1 (dep M2) for a correct conclusion based on their comparable figures **OR** M1 for eg $50 \div \pi$ (= 15.9 to 15.92) or $50 \div 2.54\pi$ (=6.26 to 6.27) M1 (dep) for a complete method that could lead to two figures that are comparable eg $(50 \div \pi) \div 2.54$; $50 \div \pi$ and 7×2.54 A1 for correct comparable figures eg 6.26 to 6.27 (in); 15.9 to 15.92 (cm) and 17.7 to 17.8 (cm) C1 (dep M2) for a correct conclusion based on their comparable figures
Q14		Frequency column has been widened to allow for working.	M1 for finding at least 4 products *ft* consistently within interval (including end points) M1 (dep) for use of at least 4 correct midpoints. M1 (dep on 1st M) for 'Σft' ÷ 40 A1 for 116.25
Q17		Diagram is enlarged.	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
Q19		Diagram is enlarged. Angle arc put inside the angle size.	M1 for a method to find BC or AC or AD B1 for angle EAD = 30° or AED = 60° or ACD = 30° or CAD = 60° M1 for a method to find CE A1 for 15.9-16.1 with supporting working

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q23		Diagram is enlarged. Angle arc put inside the angle size.	M1 for $\frac{1}{2} \times 7 \times 5 \times \sin 40$ or $\frac{1}{2} \times 7 \times 5 \times \sin(180 - 40)$ M1 (dep M1) for doubling the area of the triangle A1 for 22.4 – 22.5 **OR** M1 for complete method to find height of parallelogram, eg 5 sin40° M1 (dep M1) for complete method to find the area of the parallelogram, eg 7 × 5sin40° A1 for 22.4 – 22.5
Q26	(a)	Braille only: (i) to(iv) put in the spaces in the frequency table. Diagram enlarged. Label for horizontal axis left aligned. Label for vertical axis placed above the axis. Top row of grid removed.	M1 for correct calculation to find one frequency e.g. 0.9 × 10 or 1.6 × 5 or 1 × 10 or 0.8 × 15 or for one frequency correct or shows that 1 cm^2 = 1 A1 for all frequencies correct
Q26	(b)	Diagram enlarged. Label for horizontal axis left aligned. Label for vertical axis placed above the axis. Top row of grid removed.	M1 for 8 (people) or $\frac{2}{3}$ of "12" A1ft for 8 out of 43 stated as a percentage or fraction or decimal
Q26	(c)	Diagram enlarged. Label for horizontal axis left aligned. Label for vertical axis placed above the axis. Top row of grid removed.	M1 ft for finding the interval in which the "21.5th" or "22nd" value lies or 26 or 25.5 A1 for 26000 or 25500

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
Q27		Diagram enlarged. Lowercase vectors are increased further in size for emphasis.	M1 for $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$ $(= -(2\mathbf{a} + \mathbf{b}) + (3\boldsymbol{a} + 2\boldsymbol{b}))$ or $\mathbf{a} + \mathbf{b}$ M1 for $\overrightarrow{AC} = \frac{7}{2}\overrightarrow{AB}$ or $\overrightarrow{BC} = \frac{5}{2}\overrightarrow{AB}$, may be in terms of **a** and **b** M1 (dep M2) for complete method to find $\overrightarrow{OC}$ in terms of **a** and **b** A1 for $\frac{11}{2}\mathbf{a} + \frac{9}{2}\mathbf{b}$ or equivalent simplest form (SCB2 for $\frac{11}{2}\mathbf{a} + \frac{23}{2}\mathbf{b}$ or $\frac{11}{2}\mathbf{a} + \frac{19}{2}\mathbf{b}$)
Q28	(a)	Grid enlarged and simplified.	B2 fully correct circle drawn (B1 for circle drawn with centre (0,0) or circle drawn with radius 4) **OR** M1 at least 5 correct points calculated and plotted A1 fully correct circle drawn
Q28	(b)	Grid enlarged and simplified.	M1 for $y = 2x + 1$ drawn or for elimination of one variable A1 for one correct pair of values given or for $x = 1.4, -2.2$ (± 0.2) or ft from graph provided 2 marks in (a) A1 for second correct pair of values given (±0.2) or ft from graph provided 2 marks in (a)

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

PAPER: 1MA0_1H

Original question 15

The full source mark scheme begins on page 211. Use the original paper code, tier and question number shown above.

Question	Working	Answer	Mark	Notes
19	$4x - 2y = 26$ $x - 2y = 11$ $3x = 15$ $2x - y = 13$ $2x - 4y = 22$ $3y = -9$	$x = 5$ $y = -3$	3	M1 for correct process to eliminate one variable (condone one arithmetic error) M1 (dep) for substituting found value in one of the equations or appropriate method after starting again (condone one arithmetic error) A1 for $x = 5$ and $y = -3$

14		$x = 0.4, y = -2$	4	M1 for a correct method leading to either x or y (condone one error) A1 for $x = 0.4$ or $y = -2$ M1 for a correct substitution into one of the equation or a correct method leading to the second value A1 cao

20		$x=-\frac{24}{5}$	M1	for substitution of a rearrangement of $y - 3x = 13$ e.g. $(3x + 13)^2 + x^2 = 25$
		$y=-\frac{7}{5}$	M1	(dep M1) for expansion of bracket after substitution (at least 3 terms correct out of the 4 terms) e.g. $9x^2 + 39x + 39x + 169$
		$x = -3,$	M1	for forming quadratic ready for solving e.g. $10x^2 + 78x + 144$ (= 0)
		$y = 4$	M1	for factorising e.g. $(5x + 24)(x + 3)$ (= 0) oe
			A1	$x = -\frac{24}{5}, y = -\frac{7}{5}$ and $x = -3, y = 4$ SC: B1 (if M0) for all 4 values mis-associated or one correct pair of values or values given as coordinates.

2		$x = -\frac{2}{3}$	M1	for a method to eliminate one variable (condone one arithmetic error)
		$y = -2$	M1	(dep) for substituting found value in one of the equations or appropriate method after starting again (condone one arithmetic error)
			A1	$x = -\frac{2}{3}$ oe and $y = -2$

16	(a)	Correct graph	B2 (B1	for a circle radius 3.5, centre (0, 0) for a circle centre (0, 0) of a different radius, **or** for a circle drawn of radius 3.5 centre not (0, 0) **or** incomplete correct circle)	Circle could be drawn freehand as long as it approximates to a circle
	(b)	$x = 2.0$, $y = -2.9$ $x = -1.2$, $y = 3.3$	M1 A1 A1	for $2x + y = 1$ drawn, **or** for correctly eliminating one variable, eg $x^2 + 1 - 4x + 4x^2 = 12.25$ or $x^2 + (1 - 2x)^2 = 12.25$ for the pair of x values, **or** the correct pair of y values, **or** one correct pair of x/y values ft from (a) (dep on B1) for both correct pair of x/y values, unambiguously matched ft from (a) (dep on B1)	$2x + y = 1$ does not have to be shown Use professional judgment Accept values given as coordinates. Check graph for answers

Paper: 1MA1/2H

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
6	$x = 4.5, y = -1.5$	M1	correct process to eliminate one variable (condone one arithmetic error)	
		M1	(dep) for substituting found value in one of the equations **OR** correct process after starting again (condone one arithmetic error)	
		A1	for $x = 4.5, y = -1.5$ oe	Fractions do not need to be in simplest form

Question	Answer	Mark	Mark scheme	Additional guidance
19	$x= -\frac{23}{7}, y = \frac{15}{7}$	M1	for substitution of a rearrangement eg for $2(1 – 2y)^2 – y^2 = 17$ **or** $2x^2 - \left(\frac{1-x}{2}\right)^2 = 17$ **or** expansion of $(1 – 2y)^2 = 1 – 4y + 4y^2$ **or** $\left(\frac{1-x}{2}\right)^2 = \frac{1-2x+x^2}{4}$	
	$x = 3, y = -1$	M1	for expansion of bracket **and** substitution eg $2(1 – 4y + 4y^2) – y^2 (= 17)$ **or** $8x^2 – (1 – 2x + x^2) (= 68)$	
		A1	for forming quadratic ready for solving eg $7y^2 – 8y – 15 (= 0)$ **or** $7x^2 + 2x – 69 (= 0)$	
		M1	ft a 3 term quadratic, factorising eg $(7y – 15)(y + 1) (= 0)$ **or** $(7x + 23)(x – 3) (= 0)$ **or** correct use of formula eg $\frac{8 \pm \sqrt{64+420}}{14}$ or $\frac{-2 \pm \sqrt{4+1932}}{14}$ **or** completing the square	Can be implied by both x values correct or both y values correct.
		A1	$x = -\frac{23}{7}$ oe, $y = \frac{15}{7}$ oe **and** $x = 3, y = -1$	Answers must be correctly paired. (Maybe in the body of the working) Accept for x between -3.29 and -3.28 and for y between 2.14 and 2.15 Answers only award 0 marks

10	$x = 2.2$ to 2.3 $y = -1.3$ to -1.4	M1 A1	for recognition of use of intersection point, one of the solutions given, solutions reversed or solutions given as a coordinate. x given in the range 2.2 to 2.3, y given in the range -1.3 to -1.4	

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
20	$x = 3\frac{2}{5}, y = -\frac{4}{5}$	M1	for substitution of a rearrangement eg $x = \frac{7-4y}{3}$ or $y = \frac{7-3x}{4}$ into $x^2 - 4y^2 = 9$ **or** expansion of $\left(\frac{7-4y}{3}\right)^2 = \frac{49-56y+16y^2}{9}$ or $\left(\frac{7-3x}{4}\right)^2 = \frac{49-42x+9x^2}{16}$	Expansion may not be in simplest form but must be correct
	$x = 5, y = -2$	M1	for correct expansion **and** substitution eg $\frac{49-56y+16y^2}{9} - 4y^2 = 9$ **or** $x^2 - 4\left(\frac{49-42x+9x^2}{16}\right) = 9$	
		A1	for forming quadratic ready for solving eg $-20y^2 - 56y - 32 (= 0)$ or $5y^2 + 14y + 8 (= 0)$ oe **or** $5x^2 - 42x + 85 (= 0)$ oe	Note we do not need to see "= 0"; just the LHS is sufficient.
		M1	ft a 3 term quadratic , factorising eg $(5y + 4)(y + 2) (= 0)$ **or** $(5x - 17)(x - 5) (= 0)$ or correct use of formula eg $(y =) \frac{-14 \pm \sqrt{14^2 - 4\times5\times8}}{2\times5}$ **or** $(x =) \frac{--42 \pm \sqrt{42^2 - 4\times5\times85}}{2\times5}$ **or** completing the square, eg $(y + \frac{7}{5})^2 - \frac{9}{25} (= 0)$ or $(x - \frac{21}{5})^2 - \frac{16}{25} (= 0)$	Can be implied by both x values correct or both y values correct.
		A1	correctly pairs x and y values: $x = 3\frac{2}{5}, y = -\frac{4}{5}$ oe , $x = 5, y = -2$	Answers must be correctly paired. Accept coordinate pairs

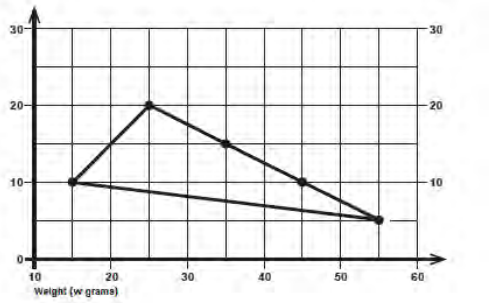
Paper: 1MA1/3H

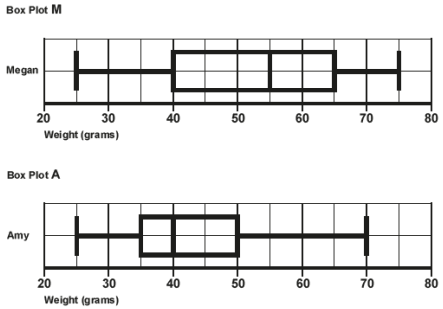
25	9.75	P1	process to find the gradient of **L** $\left(=-\frac{3}{2}\right)$	
		P1	process to find the gradient of the perpendicular line **M** eg use of $-\frac{1}{m}$ or states gradient as $\frac{2}{3}$ **or** $y=\frac{2}{3}x+c$	
		B1	(indep) gives y coordinate of $B = 8.5$ oe	Could be indicated other 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.

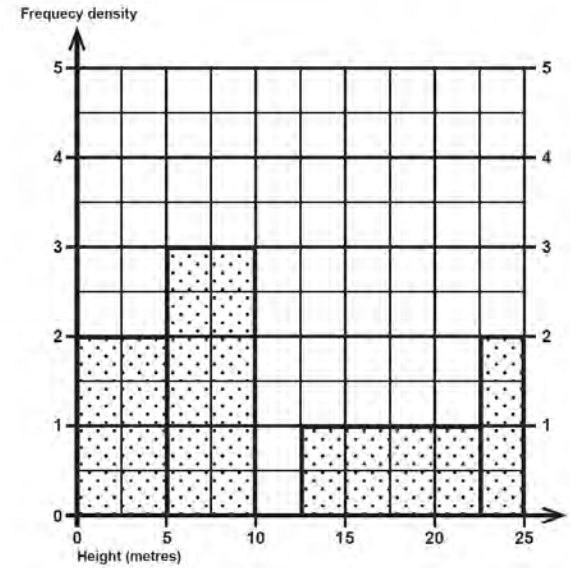
Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 2H

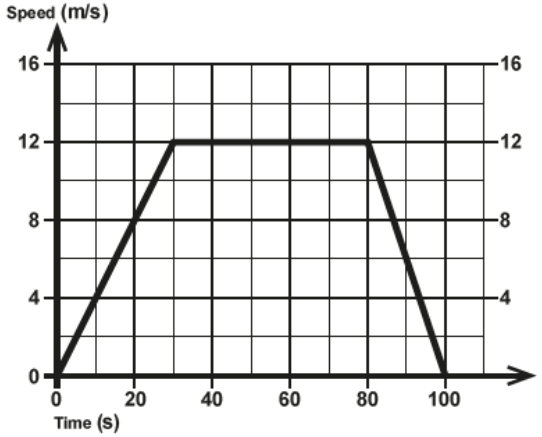
Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

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

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
1		Diagram enlarged 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

6	(a)	−2, 4	B1	cao	
	(b)	0.55 to 0.65, 3.35 to 3.45	M1	for correct method, eg marking intercepts with *x*-axis or one correct answer or both solutions given as a coordinate eg (0.6, 3.4) or (0.6, 0) (3.4, 0)	If answers are stated as coordinates, award M1 for both coordinates and M0 for one coordinate.
			A1	for answers in the ranges 0.55 to 0.65 and 3.35 to 3.45	With no extras

20	$x = 2.1$, $y = 5.1$ $x = -2.9$, $y = -4.7$	M1 A1 A1	for drawing the graph of $y - 2x = 1$ for one correct pair of values **or** for both correct x values, **or** for both correct y values for both correct pairs, correctly matched	For both A marks accept answers in the ranges $x = 2.0$ to 2.2, $y = 5.0$ to 5.2 $x = -2.8$ to -3.0, $y = -4.6$ to -4.8 Accept values given as coordinates

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
16	Shown (supported)	M1	for eliminating y or x, eg $x^2 + 3x - 3 = 5x - 4$	
		M1	for rearranging, collecting terms and setting to 0 eg $x^2 - 2x + 1 (= 0)$	
		M1	for factorising or solving eg $(x - 1)^2 (= 0)$	
		C1	for statement confirming only 1 point in common eg only 1 root **or** only 1 value of x so only 1 set of coordinates	There must be a statement in words for the award of this mark

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
22	(– 3 , – 11) and (5.5, 6)	M1	for method to eliminate one variable, eg $(2x – 5)^2 = 6x^2 – 25x – 8$ or $y^2 = 6\left(\frac{y+5}{2}\right)^2 – 25\left(\frac{y+5}{2}\right) – 8$	
		M1	for expanding the square to give, eg. $4x^2 – 20x + 25 = 6x^2 – 25x – 8$ or $y^2 = 6\left(\frac{y^2+10y+25}{4}\right) – 25\left(\frac{y+5}{2}\right) – 8$	
		M1	for method to solve equation $2x^2 – 5x – 33 (= 0)$, eg $(2x – 11)(x + 3) (= 0)$ or $x = \frac{--5\pm\sqrt{(-5)^2-4\times2\times-33}}{2\times2}$ or –3, 5.5 oe or for method to solve equation $2y^2 + 10y – 132 (= 0)$, eg. $(2y + 22)(y – 6) (= 0)$ or $y = \frac{-10\pm\sqrt{10^2-4\times2\times-132}}{2\times2}$ or –11, 6	
		A1	for (– 3, – 11)	
		A1	for (5.5, 6) oe	

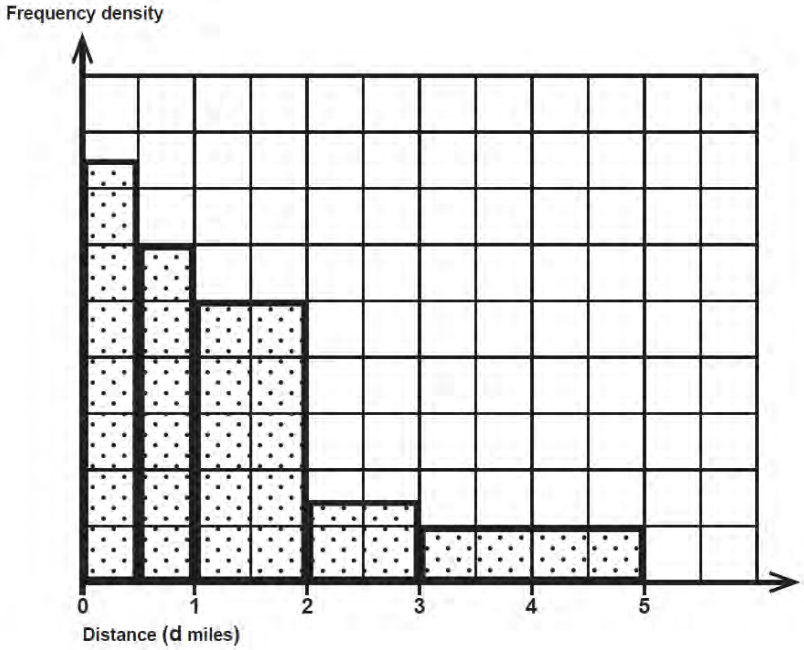
Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 3H

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

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

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
1		Wording added 'Look at the diagram for Question 1 in the Diagram Booklet. It shows a right-angled triangle, ABC.' Diagram enlarged. The diagram labelled ABC. Wording added: 'AB = 4 cm AC = 8.5 cm BC = x cm'. Wording added 'Angle ABC is a right angle.' The right angle made more obvious.	Standard mark scheme
2	(b)	The letter 'd' changed to 'n'	Standard mark scheme but note the change of letter
3		Wording added 'Look at the information for Question 3 in the Diagram Booklet.' Wording added 'as shown in the ratio.'	Standard mark scheme
4		Wording added 'Look at the information for Question 4 in the Diagram Booklet.' Wording added 'The information in the Diagram Booklet shows the cost…'. Diagram enlarged. The information stacked vertically.	Standard mark scheme
5		Wording added 'Look at the diagram for Question 5 in the Diagram Booklet. It shows a frequency polygon.' Wording added 'The table below…'. Wording added 'Amos draws the frequency polygon in the Diagram Booklet…'. Diagram enlarged. Open headed arrows. Change the crosses to dots. The axes labels moved to the top of the vertical axis and to the left of the horizontal axis.	Standard mark scheme
7		The letter x changed to y. Wording added 'Look at the diagram for Question 7 in the Diagram Booklet. It shows…'. Wording added: 'TQ = 2y cm, TS = 4y cm, SR = 3y cm, RV = 5 cm' Wording added 'The trapezium QUVR is shaded.' Diagram enlarged. Open headed arrows. The text moved out of the arrows. Shading changed.	Standard mark scheme
8		Wording added 'Look at the diagram for Question 8 in the Diagram Booklet. It shows a graph.' Wording added 'David uses the graph in the Diagram Booklet…'. Diagram enlarged. Right axes labelled. Open headed arrows. Remove the small squares. The axes labels moved to the top of the vertical axis and to the left of the horizontal axis.	Standard mark scheme

12		Wording added 'Look at the diagram for Question 12 in the Diagram Booklet.' Wording added '…are right-angled triangles with a common side AC.' Wording added 'Angle ACD and angle ACB are right-angles.' Diagram enlarged. The angles moved outside of the angle arcs and the angle arcs made smaller.	Standard mark scheme
15		Wording added 'Look at the diagram for Question 15 in the Diagram Booklet.' Diagram enlarged.	Standard mark scheme
16		Letter 'e' changed to 't'. Letter 'f' changed to 'u'.	Standard mark scheme but note change of letters.
17	(a)	The values changed: 48 changed to 50. 22 changed to 30. 8 changed to 20. 12 changed to 20. Wording added 'Look at the diagram for Question 17(a) in the Diagram Booklet. It shows a grid.' Wording added 'The table below…'. 'On the grid in the Diagram Booklet…'. Diagram enlarged. Small squares removed. Open headed arrows. Grid reduced in size. Axes labels moved to the top of the vertical axis and to the left of the horizontal axis.	Standard mark scheme but note change in values: relative heights: 90, 100, 60, 20, 10

17	(b)	Wording added 'Look at the diagram for Question 17(b) in the Diagram Booklet. It is a histogram which shows…'. The values changed: 0.5 – 1 moved up to 30 small squares (6 squares high); 1– 2 moved up to 25 small squares (5 squares high); 3 – 5 moved up to 5 small squares (1 square high) Diagram enlarged. Small squares removed. Open headed arrows. Shading changed. The axes labels moved to the top of the vertical axis and to the left of the horizontal axis. Question 17(b)  	**M1** for comparing the heights of the bars of the two intervals, showing them in the ratio 5 : 2, eg. height of 1 - 2 = 5 units and height of 3 - 5 = 1 unit or compares areas of bars, eg 10 and 4 **A1** for $0.4n$ oe

18		Open-fronted model provided with a dowel from S to T and D to T. A wedge placed at DTS. DC is labelled with 14 cm. Wording added 'Look at Diagram 1 and Diagram 2 for Question 18 in the Diagram Booklet. You may be provided with a model.' Wording added 'Diagram 1 and the model show a prism ABCDSPQR.' '…a trapezium of area 147 cm^2 as shown in Diagram 2'; 'CD = 14cm.' Diagram 1 to show the original diagram. The line 'DT' joined with a dotted line and an angle arc added. Diagram 2 to show SRCD with 12 cm, 14 cm and two right angles marked. Diagrams enlarged. The dashed lines made longer and thicker. Braille: For **ALL** candidates, provide a **simplified 2D diagram** of the cross section SRCD. Wording added: "Look at the diagram for Question 18 in the separate Diagram Booklet. The diagram is NOT accurately drawn. The diagram is a simplified 2D diagram of the cross section of the prism."	Standard mark scheme
20		Wording added 'Look at the table for Question 20 in the Diagram Booklet.' Wording added 'The table in the Diagram Booklet…'. Table turned vertical.	Standard mark scheme
21		Wording added 'Look at the diagram for Question 21 in the Diagram Booklet. It shows Ray's nine cards numbered 1 to 9.' Diagram enlarged. Braille: Text frames removed and the numbers listed. Words changed to "Ray has nine cards numbered 1 to 9, as listed below."	Standard mark scheme

12	$x = 3, y = -2$	M1 A1 M1 A1	for a correct method to eliminate either variable or rearrangement of one equation leading to substitution (condone one arithmetic error) for either correct value of x or correct value of y (dep M1) for a correct substitution of found value into one of the equations or a correct method leading to the second value (condone one arithmetic error) $x = 3, y = -2$	Trial and improvement methods score 0 marks unless both x and y are correct

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
9	$x = 6$ $y = -2$	B1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
11	$x = -2$, $y = 1.5$	M1	for a correct process to eliminate one variable (condone one arithmetic error)	
		A1	for either $x = -2$ or $y = 1.5$ oe	Fractions do not need to be in simplest form
		M1	(dep M1) for substituting found value in one of the equations **or** correct process after starting again (condone one arithmetic error)	
		A1	for $x = -2$, $y = 1.5$ oe SCB2 for both correct answers if no more than 1 mark awarded SCB1 for one correct answer if no marks awarded	Fractions do not need to be in simplest form

21	(a)	Circle drawn	B2 (B1	for drawing a circle centre (0,0) and radius 13 for drawing a circle centre (0,0) with radius ≠ 13 or a circle of radius 13 with a centre not (0,0) or an incomplete correct circle drawn)	Circle could be drawn freehand as long as it closely approximates to a circle
	(b)	$x = 7.2$, $y = 10.8$ and $x = -7.2$, $y = -10.8$	M1 A1	for drawing the line $2y = 3x$ for both x values correct or both y values correct or one pair of x and y values correct ft from (a) dep on B1	For both A marks accept answers in the ranges $x = 7.0$ to 7.4, $y = 10.6$ to 11.0 $x = -7.0$ to -7.4, $y = -10.6$ to -11.0
			A1	for both correct pairs of values correctly matched ft from (a) dep on B1	Accept values given as coordinates Check graph for answers

Paper: 1MA1/1H

10	$x = 3$ $y = -4$	M1 A1 M1 A1	for a correct method to eliminate either variable or rearrangement of one equation leading to substitution (condone one arithmetic error) for either $x = 3$ **or** $y = -4$ (dep M1) for a correct substitution of found value into one of the equations or a correct method leading to the second value (condone one arithmetic error) for $x = 3$ and $y = -4$ NB Trial and improvement methods score 0 marks unless both x and y are correct	

Paper: 1MA1/1H

10	$x = -2.5, y = -6$	M1	for a correct method to eliminate one variable (condone one arithmetic error)	
		A1	for either $x = -2.5$ **or** $y = -6$ oe	Fractions do not need to be in simplest form
		M1	(dep M1) for substituting found value into one of the equations **or** correct method after starting again (condone one arithmetic error)	
		A1	for either $x = -2.5$ **and** $y = -6$ oe SCB2 for both correct answers if no more than 1 mark awarded SCB1 for one correct answer if no marks awarded	Fractions do not need to be in simplest form

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
20	$x = 26.3\ldots$, $y = -45.6\ldots$ and $x = 1.71\ldots$, $y = 3.57\ldots$	M1	for correct substitution for y^2 or x^2, eg $(7 - 2x)^2 = 3x^2 + 4$ **OR** for correct rearrangement and expansion of $(7-2x)^2$ to obtain 4 terms with all correct without considering signs or for 3 terms out of 4 correct with correct signs **and** substitution eg $(7-2x)^2 = 49-14x-14x+4x^2$ **and** $49-14x-14x+4x^2 = 3x^2+4$	NB $49-28x$ or $-28x+4x^2$ can be considered 3 terms out of 4 correct with correct signs
		M1	for method to write a correct simplified equation eg $x^2 - 28x + 45$ (=0)	The quadratic does not have to equal 0, ie accept $x^2 - 28x = -45$
		M1	for a method to solve a correct quadratic eg $\frac{28 \pm \sqrt{(-28)^2 - 4\times1\times45}}{2\times1}$ or $\frac{28 \pm \sqrt{604}}{2}$ or $14 \pm \sqrt{151}$ **or** $(x-14)^2 - 14^2 + 45 = 0$ oe	Can be implied by both x values correct or both y values correct
		A1	$x = 26.2$ to 26.3, $y = -45.6$ to -45.5 **and** $x = 1.7$ to 1.712, $y = 3.5$ to 3.6	Answers must be correctly paired (Maybe in the body of the working) If answers are given in the range in working and then rounded incorrectly award full marks

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
21	$x = -\frac{6}{7}, y = \frac{32}{7}$ $x = 2, y = -4$	M1	for substitution of a rearranged equation into a correct equation to form an equation in one variable. eg $3x^2 + 2(2 - 3x)^2 = 44$ **or** $3\left(\frac{2-y}{3}\right)^2 + 2y^2 = 44$	Allow $(\pm 2 \pm 3x)$ for $(2 - 3x)$ (or $\left(\frac{\pm 2 \pm y}{3}\right)$ for $\left(\frac{2-y}{3}\right)$) Implied by a correct equation (simplified or unsimplified) in terms of x or y eg $3x^2 + 2(4 - 12x + 9x^2) = 44$ or $3x^2 + 8 - 24x + 18x^2 = 44$ or $21x^2 - 24x = 36$
		M1	(dep on first M1) for multiplying out all brackets and collecting terms to form a simplified three term quadratic in any form of $ax^2 + bx + c\ (= 0)$ where at least 2 coefficients (a, b, c) are correct eg $21x^2 - 24x - 36\ (= 0)$ **or** $7x^2 - 8x - 12\ (= 0)$ **or** $7y^2 - 4y - 128\ (= 0)$	Look out for signs reversed The quadratic does not have to equal 0, ie accept $21x^2 - 24x = 36$
		M1	(dep on first M1) for a suitable method to solve **their** 3 term quadratic using any correct method, for factorising, eg $(7x + 6)(x - 2)$ or $(7x + 6)(3x - 6)$ or $(21x + 18)(x - 2)$ or $(7y - 32)(y + 4)$ or correct use of formula, eg $\frac{8 \pm \sqrt{(-8)^2 - 4 \times 7 \times -12}}{2 \times 7}$ or $\frac{4 \pm \sqrt{(-4)^2 - 4 \times 7 \times -128}}{2 \times 7}$ or completing the square	Can be implied by both x values **or** both y values correct (condone incorrect labelling) if the quadratic is correct If using the quadratic formula (condone one sign error, omission of brackets around the b in the $b^2 - 4ac$ and the fraction line not being under the – in the $-b$. Allow some simplification – as far as eg $\frac{8 \pm \sqrt{64 + 336}}{14}$ **or** if factorising allow brackets which expand to give 2 out of 3 terms correct for their quadratic

Paper: 1MA1/3H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
		M1	(dep on first M1) for substituting their 2 found values of x or y in a suitable equation or (dep on first M1) for one correct pair of values following from a correct quadratic	Condone substitution into their $(\pm 2 \pm 3x)$ or $\left(\frac{\pm 2 \pm y}{3}\right)$ Allow – 0.85(7…) or – 0.86 for $-\frac{6}{7}$ Allow 4.57(1…) for $\frac{32}{7}$ If values of x or y are incorrect then working must be shown
		A1	for $x = -\frac{6}{7}$ oe, $y = \frac{32}{7}$ oe **and** $x = 2$, $y = -4$	Accept as coordinates Assume correct pairing unless clearly incorrect eg $\left(-\frac{6}{7}, -4\right)$, $\left(2, \frac{32}{7}\right)$ Allow – 0.85(7…) or – 0.86 for $-\frac{6}{7}$ Allow 4.57(1…) for $\frac{32}{7}$ If an answer is shown in the range in working and then incorrectly rounded award full marks A correct answer with no supportive working gets 0 marks

Paper: 1MA1/3H

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June 2007

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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.

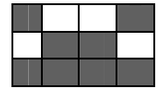
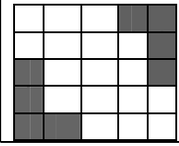
9 Parts of questions

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.

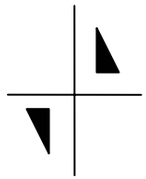
Paper 5521_01					
No		Working	Answer	Mark	Notes
1		Cat |||| /||| 8 Dog |||| | 6 Fish || 2 Hamster |||| 4	8, 6, 2, 4	3	M1 for attempt to tally or one frequency correct in either column A1 for 1 frequency correct or all tallies correct in correct column A1 for all frequencies correct (accept if /20)
2			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 × 8.50 = 17.00 3 × 4.50 = 13.50 Total = 30.50 50.00 – 30.50	19.5(0)(*p*)	3	M1 for adding 5 correct values or 2 × 8.50 + 3 × 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

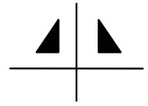
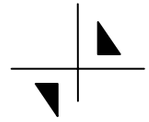
No	Working	Answer	Mark	Notes
5	315 × 24 24 × 315 1260 6300 7560 7200 7560 **3 1 5** 0 6 | 0 2 | 1 0 — **2** 1 2 | 0 4 | 2 0 — **4** 7 5 6 0 **300 10 5** 6000 | 200 | 100 — **20** 1200 | 40 | 20 — **4** 6000+200+100+1200+40+20 = 7560 **3 0.1 0.05** 60 | 2 | 1 — **20** 12 | 0.4 | 0.2 — **4** 60 + 2 + 1 + 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" $\div 4$ 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)		$\mathbf{a}+\mathbf{b}$	1	B1 $\mathbf{a}+\mathbf{b}$ oe
	(b)	$ED=\mathbf{a}$ $DX=-2\mathbf{b}+2\ AC=2\mathbf{a}$ (So, $DX=2ED$)	$2\mathbf{a}$	3	M1 for $(DX=)\ DA+AX$ A1 for $(DX=)\ -2\boldsymbol{b}+2$ ("$\boldsymbol{a}+\boldsymbol{b}$") A1 $2\boldsymbol{a}$ 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	$2000 \times (1.055)^3$ 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 $2000 \times (1.055)^3$ 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]
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 $2 \times 2 \times 2$ (×5) Burgers: 24 is $2 \times 2 \times 2$ (×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 $4(q\text{-}t)$ 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		$AB^2 = 8^2 + 9^2 – 2×8×9×\cos40$ $AB^2 = 64 + 81 – 144×\cos40$ $AB^2 = 145 – 144 × 0.766$ $AB^2 = 145 – 110.31… = 34.6896$ $AB = \sqrt{34.6796} = 5.8897877$	5.89	3	M1 Subs in Cos Rule: $8^2 + 9^2 – 2×8×9×\cos40$ M1 correct order of evaluation of $8^2 + 9^2 – 2×8×9×\cos40$ 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)

Summer 2012

GCSE Mathematics (Linear) 1MA0
Foundation (Non-Calculator) Paper 1F

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NOTES ON MARKING PRINCIPLES

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

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

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

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

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

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

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

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

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

7 With working

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

8 Follow through marks

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

9 Ignoring subsequent work

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

10 Probability

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

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

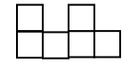
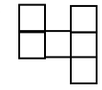
12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

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

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

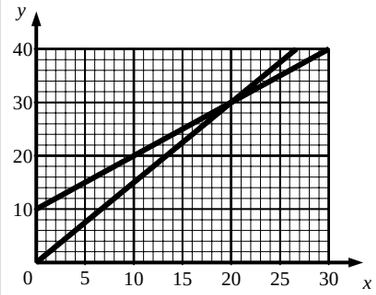
1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		380	1	B1 cao
	(b)		6.2	1	B1 cao
	(c)		Arrow at 34	1	B1 cao
2	(a)		8	1	B1 for 8 ± 0.2
	(b)		35	1	B1 for 35 ± 2°
	(c)		Circle drawn	1	B1 for all parts within ± 2mm, (use overlay)
3	(a)		4, 7, 4, 3, 2	2	M1 for at least 3 correct tallies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

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

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

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

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

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

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

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

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

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

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

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

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

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

PMT

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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.

PMT

10 Probability

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

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.

PMT

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

PMT

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

PMT

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

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

PMT

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

PMT

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

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

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NOTES ON MARKING PRINCIPLES

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

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

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

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

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

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

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

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

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

7 With working

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

8 Follow through marks

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

9 Ignoring subsequent work

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

10 Probability

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

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

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

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

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

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		331.705	1	B1 cao
	(b)		179300	1	B1 cao
2			24	4	M1 for 0.15 × 240 (= 36) oe M1 for $\frac{3}{4}$ × 240 (= 180) oe M1 (dep on both prev M1) for 240 – "180" – "36" A1 cao **OR** M1 for 15(%) + 75(%) (= 90(%)) M1 for 100(%) – "90(%)" (= 10(%)) M1 (dep on both prev M1) for " $\frac{10}{100}$ " × 240 oe A1 cao **OR** M1 for 0.15 + 0.75(= 0.9) oe M1 for "0.9" × 240(= 216) oe M1 (dep on both prev M1) for 240 "216" A1 cao **OR** M1 for 0.15 + 0.75(= 0.9) oe M1 for 1 – "0.9"(= 0.1) oe M1 (dep on both prev M1) for "0.1" × 240 oe A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
3			2| 4 7 8 3| 0 3 3 5 7 8 8 4| 1 1 2 4 4 5 Key,eg 4|1 is 4.1(kg)	3	B2 for correct ordered stem and leaf (B1 for fully correct unordered or ordered with one error or omission) B1 (indep) for key (units not required)
4	(a)		$6 + 3t$	1	B1 for $6 + 3t$
	(b)		$6x^2 + 15x$	2	B2 for $6x^2 + 15x$ (B1 for $6x^2$ or $15x$)
	(c)	$m^2 + 10m + 3m + 30$	$m^2 + 13m + 30$	2	M1 for all 4 terms (and no additional terms) correct with or without signs or 3 out of no more than four terms correct with signs A1 for $m^2 + 13m + 30$
5		5|525 5|105 3|21 7	$3 \times 5 \times 5 \times 7$	3	M1 for continual prime factorisation (at least first 2 steps correct) or first two stages of a factor tree correct M1 for fully correct factor tree or list 3, 5, 5, 7 A1 $3 \times 5 \times 5 \times 7$ or $3 \times 5^2 \times 7$

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PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
6			7	3	M1 for 4 ×10 or 40 or $\frac{12+6+15+x}{4}$ or a correct equation M1 for a complete and correct method A1 cao
7	(a)	(4,0) (3, 0) (3, -1) (2, -1) (2, 2) (4, 2)	Correct position	2	B2 for correct shape in correct position (B1 for any incorrect translation of correct shape)
	(b)		Rotation 180° (0,1)	3	B1 for rotation B1 for 180° (ignore direction) B1 for (0, 1) **OR** B1 for enlargement B1 for scale factor -1 B1 for (0, 1) (NB: a combination of transformations gets B0)

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		$\frac{20 \times 300}{0.5}$	12000	3	B1 for 20 or 300 used M1 for "20" × "300" or $\frac{"20"}{0.5}$ or $\frac{"300"}{0.5}$, values do not need to be rounded A1 for answer in the range 11200 –13200 SC B3 for 12000 with or without working
9		LCM (80, 50) = 400 Matt 400 ÷ 50 = 8 Dan 400 ÷80 = 5 **OR** 50 = 2 × 5 (× 5) 80 = 2 × 5 (× 2 × 2 × 2)	Matt 8 Dan 5	3	M1 lists multiples of both 80 (seconds) and 50 (seconds) (at least 3 of each but condone errors if intention is clear, can be in minutes and seconds) or use of 400 seconds oe. M1 (dep on M1) for a division of "LCM" by 80 or 50 or counts up "multiples" (implied if one answer is correct or answers reversed) A1 Matt 8 and Dan 5 SC B1 for Matt 7, Dan 4 **OR** M1 for expansion of both 80 and 50 into prime factors. M1 demonstrates that both expansions include 10 oe A1 Matt 8 and Dan 5 SC B1 for Matt 7, Dan 4

PMT

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
10			1.5	4	M1 for correct expression for perimeter eg. $4 + 3x + x + 6 + 4 + 3x + x + 6$ oe M1 for forming a correct equation eg. $4 + 3x + x + 6 + 4 + 3x + x + 6 = 32$ oe M1 for $8x = 12$ or $12 \div 8$ A1 for 1.5 oe **OR** M1 for correct expression for semi-perimeter eg. $4 + 3x + x + 6$ oe M1 for forming a correct equation eg. $4 + 3x + x + 6 = 16$ oe M1 for $4x = 6$ or $6 \div 4$ A1 for 1.5 oe

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
***11 QWC**		$\frac{30}{24} \times 60 = 75$	Debbie + explanation	4	M1 for reading 24 (mins) and 30 (km) or a pair of other values for Debbie M1 for correct method to calculate speed eg. 30 ÷ 24 oe A1 for 74 – 76 or for 1.2 – 1.3 and 1.1 C1 (dep on M2) for correct conclusion, eg Debbie is fastest from comparison of "74 – 76" with 66 (kph) or "1.2 – 1.3" and 1.1 (km per minute) **OR** M1 for using an appropriate pair of values for Ian's speed eg 66 and 60, 33 and 30, 11 and 10 M1 for pair of values plotted on graph A1 for correct line drawn C1 (dep on M2) for Debbie is fastest from comparison of gradients. **OR** M1 for reading 24 (mins) and 30 (km) or a pair other values for Debbie M1 for Ian's time for same distance or Ian's distance for same time. A1 for a pair of comparable values. C1 (dep on M2) for Debbie is fastest from comparison of comparable values.

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12		x – 2 -1 0 1 2 3 4 y 4 4.5 5 5.5 6 6.5 7	$y = ½ x + 5$ drawn	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 plotted correctly) 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 M1 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = ½ x + 5$ drawn A1 for correct line between $x =$ -2 and $x = 4$ **(Use of y=mx+c)** M1 for line drawn with gradient 0.5 **OR** line drawn with y intercept at 5 M1 for line drawn with gradient 0.5 **AND** line drawn with y intercept at 5 A1 For correct line between $x =$ -2 and $x = 4$ SC B2 for a correct line from $x = 0$ to $x = 4$
*13 QWC			Yes with explanation	3	M1 for bearing ± 2 ° within overlay M1 for use of scale to show arc within overlay or line drawn from C to ship's course with measurement C1(dep M1) for comparison leading to a suitable conclusion from a correct method

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)	Line joins an empty circle at -2 to a solid circle at 3	diagram	2	B2 cao (B1 for line from -2 to 3)
	(b)	$2x \geq 7$	$x \geq 3.5$	2	M1 for correct method to isolate variable and number terms (condone use of =, >, ≤, or <) or (x =) 3.5 A1 for $x \geq 3.5$ oe as final answer
*Q15 QWC			No + explanation	3	M1 for $500 \times 9 \times 10^{-3}$ oe A1 for 4.5 C1 (dep M1) for correct decision based on comparison of their paper height with 4 **OR** M1 for $4 \div 500$ oe A1 for 0.008 C1 (dep M1) for correct decision based on comparison of their paper thickness with 0.009 **OR** M1 for $4 \div (9 \times 10^{-3})$ oe A1 for 444(.4...) C1 (dep M1) for correct decision based on comparison of their number of sheets of paper with 500
16			£500	3	M1 for 70% = 350 or $\frac{350}{70}$ M1 for $\frac{350}{70} \times 100$ oe A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
17			1 hour 45 mins	6	M1 for method to find volume of pond, eg $\frac{1}{2}(1.3 + 0.5) \times 2 \times 1$ (= 1.8) M1 for method to find the volume of water emptied in 30 minutes, eg $1 \times 2 \times 0.2$ (= 0.4), $100 \times 200 \times 20$ (= 400000) A1 for correct rate, eg 0.8 m³/hr, 0.4 m³ in 30 minutes M1 for correct method to find total time taken to empty the pond, eg "1.8" ÷ "0.8" M1 for method to find extra time, eg 2 hrs 15 minutes − 30 minutes A1 for 1.75 hours, $1\frac{3}{4}$ hours, 1 hour 45 mins or 105 mins **OR** M1 for method to find volume of water emptied in 30 minutes,.eg. $1 \times 2 \times 0.2$ (= 0.4), $100 \times 200 \times 20$ (= 400000) M1 for method to work out rate of water loss eg. "0.4" × 2 A1 for correct rate, eg 0.8 m³/hr M1 for correct method to work out remaining volume of water eg. $\frac{1}{2}(1.1 + 0.3) \times 2 \times 1$ (= 1.4) M1 for method to work out time, eg "1.4" ÷ "0.8" A1 for 1.75 hours, $1\frac{3}{4}$ hours, 1 hour 45 mins or 105 mins NB working could be in 3D or in 2D and in metres or cm throughout

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PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
18		$12x + 21y = 3$ $12x + 40y = 60$ $19y = 57$ $y = 3$ $3x + 10\times 3 = 15$ $3x = -15$ Alternative method $x = \left(\frac{1-7y}{4}\right)$ $3\left(\frac{1-7y}{4}\right) + 10y = 15$ $3 - 21y + 40y = 60$ $19y = 57$ $x = \left(\frac{1-7\times 3}{4}\right)$	$x = -5$, $y = 3$	4	M1 for a correct process to eliminate either x or y or rearrangement of one equation leading to substitution (condone one arithmetic error) A1 for either $x = -5$ or $y = 3$ M1 (dep) for correct substitution of their found value A1 cao
19		$-5, 0.2, 0.5, 1$	$-5, 5^{-1}, 0.5, 5^{0}$	2	M1 for either 5^{-1} or 5^{0} evaluated correctly A1 for a fully correct list from correct working, accept original numbers or evaluated (SC B1 for one error in position or correct list in reverse order)

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
20			$5x^2$	4	M1 for $4x \times 4x$ M1 for $(2x \times 4x)/2$ or $(2x \times x)/2$ or $(3x \times 4x)/2$ M1(dep M2) for "16 x^2" – "4 x^2" – "x^2" – "6 x^2" A1 for $5x^2$ **OR** M1 for $\sqrt{(2x)^2 + (4x)^2}$ $(= \sqrt{20x^2} = \sqrt{20}\,x)$ M1 for $\sqrt{(x)^2 + (2x)^2}$ $(= \sqrt{5x^2} = \sqrt{5}\,x)$ M1(dep M2) for $\frac{"\sqrt{5}\,x" \times "\sqrt{20}\,x"}{2}$ $(= \frac{\sqrt{100}}{2}\,x^2)$ A1 for $5x^2$
21	(a)	Cf table: 4, 9, 25, 52, 57,60 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
	(b)(i)		172	3	B1 for 172 or read off at cf = 30 or 30.5 from a cf graph, ft provided M1 is awarded in (a)
	(ii)	IQR = UQ – LQ	12 - 14		M1 for readings from graph at cf = 15 or 15.25 and cf = 45or 45.75 from a cf graph with at least one of LQ or UQ correct from graph (± ½ square). A1ft provided M1 is awarded in (a)

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
22			1200 cm^3	4	M1 for 10 × 2 × 2 and 15 × 2 M1 for "40" × "30" A1 for 1200 B1 (indep) for cm^3 OR M1 for 10 × 15 or 2^3 or 8 indicated as scale factor M1 for 10 × 15 × 2 × 2 × 2 A1 for 1200 B1 (indep) for cm^3 SC B2 for 600 cm^3 (B1 for 600)
23		$\frac{4(x+5)}{(x+5)(x-3)}$	$\frac{4}{x-3}$	2	M1 for $(x \pm 5)(x \pm 3)$ A1 for $\frac{4}{x-3}$
24		12 ÷ 10 = 1.2 15 ÷ 5 = 3 13 ÷ 5 = 2.6 18 ÷ 10 = 1.8 3 ÷ 15 = 0.2	Histogram	3	B3 for fully correct histogram (B2 for 4 correct blocks) (B1 for 3 correct blocks) (If B0, SC B1 for correct key eg $1cm^2$ = 2 (calls) Or frequency ÷ class interval for at least 3 frequencies) **NB** Apply the same mark scheme if a different frequency density is used.

PMT

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
25	(a)		$a = 4, b = 5$	3	M1 for sight of $(x-4)^2$ M1 for $(x-4)^2 - 16 + 21$ A1 for $a = 4, b = 5$ OR M1 for $x^2 - 2ax + a^2 + b$ M1 for $-2a = -8$ and $a^2 + b = 21$ A1 for $a = 4, b = 5$
	(b)		(4, 5)	1	B1 ft
26		50 1 1 1 50 1 1 1 50	$\frac{126}{720}$	4	M1 for 3 fractions $\frac{a}{10}, \frac{b}{9}, \frac{c}{8}$ where a < 10, b < 9 and c < 8 M1 for $\frac{7}{10}\times\frac{3}{9}\times\frac{2}{8}$ or $\frac{3}{10}\times\frac{7}{9}\times\frac{2}{8}$ or $\frac{3}{10}\times\frac{2}{9}\times\frac{7}{8}$ $(=\frac{42}{720})$ M1 for $\frac{7}{10}\times\frac{3}{9}\times\frac{2}{8} + \frac{3}{10}\times\frac{7}{9}\times\frac{2}{8} + \frac{3}{10}\times\frac{2}{9}\times\frac{7}{8}$ or $3\times\frac{3}{10}\times\frac{2}{9}\times\frac{7}{8}$ A1 for $\frac{126}{720}$ oe. eg. $\frac{7}{40}$ **Alternative Scheme for With Replacement** M1 for $\frac{7}{10}\times\frac{3}{10}\times\frac{3}{10}$ $(=\frac{63}{1000})$ M1 for $\frac{7}{10}\times\frac{3}{10}\times\frac{3}{10}\times 3$ $(=\frac{189}{1000})$ M0 A0 No further marks

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
27	(a)		**a - b**	1	B1 for **a - b** oe
	(b)		$\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b}$	3	M1 for a correct vector statement for $\overrightarrow{NR}$ eg. ($\overrightarrow{NR}$ =) $\overrightarrow{NQ} + \overrightarrow{QR}$ or ($\overrightarrow{NR}$ =) $\overrightarrow{NS} + \overrightarrow{SR}$ M1 for $\frac{2}{5}SQ$ (+ QR) or $\frac{3}{5}QS$ (+ SR) (SQ, QR, QS, SR may be written in terms of **a** and **b)** A1 for $\frac{2}{5}(\mathbf{a} - \mathbf{b}) + \mathbf{b}$ oe or $\frac{3}{5}(\mathbf{b} - \mathbf{a}) + \mathbf{a}$ oe
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

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: ±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) (b)	2cm grid – shape P moved up two squares. 2cm grid. No shading of shapes – x axis -2 and -4 removed as they would obscure shape	Note that the original shape **P** is in a different position 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

PMT

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

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Mark Scheme (Results)

Summer 2014

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

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

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.

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

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

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

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

PMT

Paper: 5MB3H_01					
Question		Working	Answer	Mark	Notes
1			226.80	3	M1 for method to find 5% of 54 (= 2.7) or 5% of "54×4" (=10.8) or 105% of 54 (= 56.7) M1 for a complete method to find the total amount A1 for 226.8(0)
2			7.4	3	M1 for a correct method to find the weight of 1 metre of hosepipe, eg. (1 ÷ 0.5) × 150 (= 300) M1 (dep) for a correct method to find the weight of the hosepipe alone, eg. "300" × 20 (= 6000) A1 for 7.4 (accept 7400 g)
3			enlargement scale factor 3 centre *O*	3	B1 for enlargement B1 for scale factor 3 B1 for (centre) *O* oe NB: B0 for any combination of transformations
*4		**Examples** **£ per bag** 2.15÷50 = 0.043 (4.3) 3.29÷80 = 0.0411.. (4.11..) 5.17÷125 = 0.0413..(4.13..) **Bags per £ (or pence)** 50÷2.15 = 23.2(5...) 80÷3.29 = 24. 3(1...) 125÷5.17 = 24.1(7...) **Price per 400 bags** S: 2.15×8 = 17.2 M: 3.29×5 = 16.45 **Price per 1000 bags** M: 3.29×12.5=41.125 L: 5.17×8=41.36	Medium	4	M1 for division of price by quantity for at least two boxes or division of quantity by price for at least two boxes or a complete method to find price of same quantity for at least two boxes or to find quantity of same price applied to at least two boxes M1 for a complete method to give values that can be used for comparison of all 3 boxes. A1 for correct values that can be used for comparison for all 3 boxes C1 ft (dep on M2) for comparison of their values with a correct conclusion.

PMT

Paper: 5MB3H_01					
Question		Working	Answer	Mark	Notes
5			41.1 to 41.2	3	M1 for a method to find the circumference of the circle, eg. $\pi \times 16$ (= 50.265..) M1 for a method to find the length of the semicircle, eg. "50.265.." ÷ 2 (= 25.132..) A1 for answer in the range 41.1 to 41.2
6	(a)		$5x - 3 = 52$	3	M1 for $2x$ or $2x - 3$ seen M1 for x and $2x$ and $2x - 3$ A1 for $5x - 3 = 52$ from correct working
	(b)		11	2	M1 for intention to either add 3 to both sides or to divide all terms by 5 as a first step A1 cao
7			77 to 77.2	4	M1 for $\pi \times 40^2 \times 90$ (= 452389. ..) M1 for "452389. .." – 65000 (= 387389. …) M1 (dep on at least M1) for "387389. .." ÷ ($\pi \times 40^2$) A1 for answer in the range 77 to 77.2 OR M1 for $\pi \times 40^2$ (= 5026. ...) M1 for 65000 ÷ "5026. ...." (= 12.93...) M1 (dep on at least M1) for 90 − "12.93..." A1 for answer in the range 77 to 77.2

Paper: 5MB3H_01					
Question		Working	Answer	Mark	Notes
8		x=2 gives 20 x=2.1 gives 21(.86...) x=2.2 gives 23(.84...) x=2.3 gives 25(.96...) x=2.4 gives 28(.22...) x=2.5 gives 30(.62...) x=2.6 gives 33(.17...) x=2.7 gives 35(.88...) x=2.8 gives 38(.75...) x=2.9 gives 41(.78...) x=3 gives 45 x=2.35 gives 27.0(7...) x=2.36 gives 27.3(0...) x=2.37 gives 27.5(3...)	2.3	4	B2 for a correct trial $2.3 \leq x \leq 2.4$ evaluated (B1 for a correct trial $2 \leq x \leq 3$ evaluated) B1 for a different correct trial $2.3 < x < 2.4$ evaluated B1 (dep on at least one previous B1) for 2.3 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but correct to 1 dp (rounded or truncated) if the value of x is to 2 dp NB: no working scores no marks even if answer is correct
9			shaded region	3	B1 for arc of circle centre A radius 2 cm B1 for arc of circle centre B radius 4 cm B1 ft for correct region shaded
10	(a)		2, −1, 2	2	B2 for all correct (B1 for two correct)
	(b)		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 graph
	(c)		−0.4, 2.4	2	B1 for an answer in the range 2.3 to 2.5 or ft their graph B1 for an answer in the range −0.3 to −0.5 or ft their graph

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
12	(a)		$e > \frac{9}{4}$	2	M1 for correct process to isolate terms in e from other terms A1 for $e > \frac{9}{4}$ oe
	(b)		shaded region	2	M1 for $x + y = 1$ drawn or for a region shaded above their line with negative gradient A1 for region shaded above line
13	(a)		5.0	3	M1 for $2.1^2 + 4.5^2$ or 4.41+20.25 or 24.66 M1 for $\sqrt{(2.1^2 + 4.5^2)}$ or $\sqrt{24.66}$ A1 for answer in the range 4.9 to 5.0
	(b)		115	4	M1 for a correct method to find the angle at the tower (A) or the angle at the tree (B), eg. $\tan(A) = \frac{4.5}{2.1}$ (= 2.14…) or $\tan(B) = \frac{2.1}{4.5}$ (= 0.46…) M1 for $\tan^{-1}\left(\frac{4.5}{2.1}\right)$ (= 64.98..) or $\tan^{-1}\left(\frac{2.1}{4.5}\right)$ (= 25.01…) A1 for 64.9(8...) or 25.0(1...) A1 for 115 or ft 180 – "64.98..." or 90 + "25.01"

Paper: 5MB3H_01					
Question		Working	Answer	Mark	Notes
14			2700	3	M1 for a correct method to find 25% of 4800 (= 1200) M1 for a fully complete and correct method to find the value of the car at the end of 2015 A1 cao OR M2 for $4800 \times (0.75)^2$ A1 cao
15			57.6	2	M1 for $\frac{D}{8} = \frac{36}{5}$ oe A1 for 57.6 oe
16	(a)		0.0045	1	B1 cao
	(b)		6.58×10^{-6}	2	M1 for $(2.5 \div 3.8) \times 10^{(-2-3)}$ or $0.657...\times10^{-5}$ or 0.00000657.. A1 for an answer in the range 6.57×10^{-6} to 6.58×10^{-6}

Paper: 5MB3H_01					
Question		Working	Answer	Mark	Notes
*17		Example: 4a+5b=1115 3a+2b=530 12a+15b=3345 12a+ 8b = 760 7b=1225 b=175 a=(1115 − 5×175)÷4 (= 60) OR 8a+10b=2230 15a+10b=2650 7a = 420 a=60 b=(1115 −4×60)÷5 (=175)	Small = 60 Large = 175	5	M1 for two correct equations expressed in terms of two variables M1 (dep) for correct process to eliminate either variable (condone one arithmetic error) A1 for 60 or 175 M1 (dep) for correct substitution of their found variable or M1 (indep) for correct process to eliminate the other variable (condone one arithmetic error) C1 (dep on M3) for a statement giving small = 60 **and** large = 175
*18			No with reason	4	M1 for $\frac{4}{3} \times \pi \times 2^3$ (=33.51...) M1 for 45 ÷ "volume" A1 for 1.3 – 1.4 C1 (dep on M1) for No and eg. 1.34 > 1.24 OR M1 for (volume =) 45 ÷ 1.24 (= 36.29...) oe M1 for (r^3 =) "36.29..."÷ ($\frac{4}{3} \times \pi$) oe A1 for 8.6 − 8.7 C1 (dep on M1) for No and eg. 8.6... > 8

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Paper: 5MB3H_01					
Question		Working	Answer	Mark	Notes
19			proof	4	B1 for $\overrightarrow{AM}$ = 0.5**b** or $\overrightarrow{MC}$ = 0.5**b** or $\overrightarrow{BC}$ = **a** or $\overrightarrow{CX}$ = **a** or $\overrightarrow{BX}$ = 2**a** Note: This could be shown on the diagram or in a correct vector expression M1 for a correct relevant vector expression for $\overrightarrow{OM}$ or $\overrightarrow{MX}$ or $\overrightarrow{OX}$ eg $\overrightarrow{OM}$=$\overrightarrow{OA}$ + $\overrightarrow{AM}$ or $\overrightarrow{OX}$= **b** + 2**a** A1 for any two from $\left(\overrightarrow{OM}\right)$ = **a** + 0.5**b**, $\left(\overrightarrow{MX}\right)$ = **a** + 0.5**b** and $\left(\overrightarrow{OX}\right)$ = **b** + 2**a** B1 for a fully correct proof, eg." $\overrightarrow{OX}$ = 2$\overrightarrow{OM}$ so the vectors are parallel and have a common point *O* " OR (geometric proof) M1 for <OAM = <MCX or OA = CX and AM = CM A1 for <OAM = <MCX with reason (alternate angles) and OA = CX and AM = CM B1 for ΔOAM ≡ ΔXCM with reason, eg SAS B1 for correct proof, eg <AMO = <CMX with reason (vertically opposite angles)
20			15500 to 15600	3	B1 for 50.5 (accept 50.4$\dot{9}$) or 227.5 (accept 227.4$\dot{9}$) or 177.5 (accept 177.4$\dot{9}$) M1 for 0.5 × “227.5” × “177.5” ×sin“50.5” A1 for an answer in the range 15575 to 15580 from using three **correct** upper bounds
21			−4, 1	4	M1 for method to clear the fraction., eg $4 - 2x = x(x + 1)$ oe M1 for rearranging to the form $ax^2 + bx + c = 0$ condone one error M1 (dep on previous M1) for a method to solve their quadratic equation A1 for −4 and 1

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Question		**Modification**	**Notes**
Q03		1.5cm grid	
Q04		No pictures	
Q07		model provided as well as diagram	
Q09		diagram size X2 10km and 20km changed to 20km and 40 km	
Q10		grid x 2 2cm squares	
Q12		2 cm grid Q13 On the diagram crosses at tower and tree changed to filled in circles	

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Mark Scheme (Results)

Summer 2016

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

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If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 **Follow through marks**

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

9 **Ignoring subsequent work**

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

10 **Probability**

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

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

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

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

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

PMT

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

PMT

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

PMT

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

PMT

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

PMT

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

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

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

PMT

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

PMT

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

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

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

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

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

PMT

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

PMT

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

PMT

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

PMT

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Question 10

Fewer students than expected realised that the estimates of the solutions of the simultaneous equations could be found from the point of intersection of the two straight lines. Many attempts at solving the equations algebraically were seen even though the question instructed students to use the graphs. Those students that did focus on the point of intersection of the two straight lines did not always score both marks. Errors were frequently made in reading the required values from the graph ($x = 2.5$ was a common error) and some students transposed the x and y values or omitted the minus sign from the y value. Surprisingly few students marked the graph to help them estimate the values. A common mistake was to use the points of intersection of the line $3y + 2x = 1/2$ with the x-axis and y-axis instead of the point of intersection of the two straight lines. Some students gave a correct value for x using the point of intersection but then used the y-intercept as the value for y.

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 6

There were a good number of totally correct responses to this question. However, in part (a) some students attempted to solve the equations algebraically usually without success.

Part (b) was not answered well and a significant number of students did not attempt the question. Students who included correct solutions in an incorrect format, such as (0.6, 0) and (3.4, 0) or $0.6 < x < 3.4$ were given one mark on the basis that they had clearly used the intercepts of the x axis. One mark was also available to students who marked the two intercepts of the x axis on the diagram but not to those students who also marked extra intercepts, for example at (0, 2).

Question 20

This question was poorly answered with relatively few students achieving any marks. For those who drew the graph of $y - 2x = 1$ it was common to see at least two marks awarded if not all three. When one of the accuracy marks was lost this was usually due to the values not being given as pairs or an error being made when reading from the graph. Not all attempts at drawing the graph of $y - 2x = 1$ were successful. Some students attempted an algebraic approach despite the question directing them to use the graph but these attempts were doomed to failure on this non-calculator paper and gained no marks.

Question 16

Many students gave a concise, clear and accurate algebraic argument to score full marks for their answers to this question. Lower attaining students often made errors in the

manipulation of the equations involved. It was common for examiners to award 3 marks for students completing the algebra correctly but not the fourth communication mark because the student had not made a statement to conclude their findings.

Question 22

This question was accessible to and discriminated well between the most high attaining students sitting this paper. These students often gave a complete and fully correct solution and scored full marks. They usually used the approach of eliminating y to get an equation in x. This was more straightforward to deal with than the corresponding equation in y. The most common errors made by students included expanding $(2x - 5)^2$ incorrectly, often as $4x^2 + 25$, and making errors when re-arranging their quadratic equation to get all terms on one side of the equation. Some students who did get the correct quadratic equation to solve, made errors when trying to factorise and so restricted themselves to the award of 2 marks.

Summary

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

- make sure you put negative numbers in brackets when substituting them into algebraic expressions or when using a calculator.
- check all your working for careless errors and to make sure you have not miscopied numbers or algebraic expressions either given in the question or in a previous line of your working.
- practise the addition and subtraction of algebraic fractions.
- check your working when expanding brackets and collecting terms, especially when finding the product of three linear expressions or when removing brackets after a subtraction of one expression from another.
- ensure you have a good understanding of how to use multipliers in problems concerning reverse percentages.
- practise drawing histograms and using them to solve problems.

Question 12

Many of the students appeared familiar with simultaneous equations and started by multiplying both equations to make the coefficients of x or y the same. Most then subtracted one equation from the other to eliminate one of the variables and gained the first method mark. Accuracy was sometimes lost through arithmetic errors in the multiplying or subtracting. Some students got to $7y = -14$ or $-7y = 14$ and then wrote $y = 2$. Students who used a correct method to find one value usually went on to substitute this value into an equation in order to find the other value and gained the second method mark. Eliminating one variable by rearranging one equation and substituting into the other equation was attempted by a few students but this method rarely led to a fully correct answer. Responses which scored no marks tended to involve an immediate addition or subtraction of the equations before balancing coefficients.

Question 9

Students who realised that the solutions of the simultaneous equations could be found from the point of intersection of the two straight lines usually gave the correct answer. Errors were sometimes made in reading the y value from the graph and some students omitted the minus sign from the y value. Occasionally the x and y values were reversed. Incorrect answers often came from using the points of intersection of the lines with the x-axis and y-axis instead of the point of intersection of the two straight lines. Many attempts at solving the equations algebraically were seen even though the question instructed students to use the graphs. These attempts were usually unsuccessful.

Question 11

This is a question often seen on paper 1, but it was answered quite well by many, with it not being uncommon to award 4 marks. With it appearing on a calculator paper though, it meant some candidates used their scientific calculators to solve. Unfortunately, these candidates had not paid attention to the demand of the question which asked for algebra. Without supporting algebra, the correct answers were awarded a Special case B2. It is vital that candidates read the demand carefully to ensure they are answering the questions as they are intended to.
Of those who did use algebra, it was typical to award at least 2 marks, for a correct method to eliminate (often condoning a single arithmetic error) and for substituting correctly to find the second value. The main issue with the substitution method was subtracting a negative e.g. $18y - (-8y) = 10y$ was a very common error.

Question 10

Many of the students appeared familiar with simultaneous equations and started by multiplying both equations to make the coefficients of x or y the same. Most then subtracted one equation from the other to eliminate one of the variables and gained the first method mark. Accuracy was sometimes lost through arithmetic errors in the multiplying or subtracting. The most successful students were those who eliminated y first as this made the arithmetic easier. Eliminating x using $10x - 4y = 46$ and $10x - 15y = 90$ tended to lead to more subtraction errors than using $15x - 6y = 69$ and $4x - 6y = 36$ to eliminate y. Having carried out the necessary multiplications some students added the two equations and gained no marks. Students who used a correct method to find one value usually went on to substitute this value into an equation in order to find the other value and so gained the second method mark. A number of students who substituted $x = 3$ into the second equation to get $15 - 2y = 23$ could not solve the equation correctly, often arriving at $y = 4$. Eliminating one variable by rearranging one equation and substituting into the other equation was attempted by a few students but this method rarely led to a fully correct answer. There were many responses in which students had made multiple attempts to find a solution and the working was often difficult for examiners to follow.

Question 10

A standard simultaneous equation question and one that learners are familiar with. Centres, and therefore learners, have learned from previous series that clear algebraic working is required for full credit here and it was rare to award the SCB1 or SCB2 for correct answers without working.
Although we saw the full range of marks scored, those who gained M1 for a method to isolate normally got the second M1 for substitution at the least. Those who gained the first M1A1 for full method to find one value also then normally went on to gain full marks. There were exceptions to this, but not many.
As is ever the case with solving linear simultaneous equations, the major misconception comes in knowing whether to add or subtract the equations to eliminate, and a significant number of learners made the same mistake in this series.

Question 20

Most of those who obtained marks on this question had correctly recognised that making y, rather than x, the subject would be the most sensible approach. Of those who made a correct substitution for y^2, it was invariably sign errors that cost them the most marks. Use of the quadratic formula was seen more often than use of completing the square and again it was sign errors that led to incorrect solutions. Reasons for a learner obtaining 3 rather than 4 marks was for failing to find the y values, not clearly identifying the final pairs of values (good practice being x_1, y_1, x_2, y_2) or leaving answers in surd form despite the question instructing that answers should be given to 3 significant figures.

Question 21

This question assessed the ability to solve a pair of simultaneous equations, one linear and one quadratic. The most effective approach involved using the equation $y = 2 - 3x$ as the basis for substitution. Responses that began this way generally showed greater confidence and accuracy in subsequent steps. In contrast, those that attempted to rearrange the linear equation into an alternative form often introduced errors during the rearrangement process.

Many responses that formed a three-term quadratic, whether correct or not, were able to access the method mark for attempting to solve the equation, with the quadratic formula being used more frequently than factorisation. In these cases, it was important to show the substitution of values for *a*, *b*, and *c* into the formula, rather than relying solely on calculator functions. More successful responses continued by finding the corresponding values of the second variable. Some responses missed a method mark by not explicitly showing the substitution of their solutions into the original linear equation. This mark was available even if the values were incorrect, provided the substitution was clearly shown.



Examiners' Report
Principal Examiner Feedback

Summer 2019

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)
Higher (Calculator) Paper 3H

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GCSE (9 – 1) Mathematics – 1MA1
Principal Examiner Feedback – Higher Paper 3

Introduction

Most students entered for this examination presented their working in a clear and logical way and worked accurately to demonstrate a good performance overall. Questions where this was not quite so evident included Q6 (surface area) and Q20 (simultaneous equations). Only a small proportion of students presented weak scripts, suggesting that most students who sat this paper were entered appropriately for the higher tier.

The paper gave the opportunity for students of all abilities to demonstrate positive achievement. All questions were accessible to some students but as you would expect there were relatively few students able to work confidently on all questions.
In particular, Q1 (Venn diagram), Q7 (use of a calculator), Q8a (Pythagoras's Theorem), Q11 (speed, distance, time) and Q18a (cubic expansion) were answered well by a large majority of students whereas Q14 (using areas and ratio), Q18b (solution of a quadratic inequality), Q20 (simultaneous equations), Q22 (circle problem) and
Q23 (trigonometry) proved more of a challenge to students.

The time allowed for the examination appears to have been sufficient for most students to complete the paper.

Report on Individual Questions.

Question 1

This question provided a good start to the paper. Nearly all students gained some credit for their answers with most students scoring at least four of the five marks available. Part (a) of this question requiring students to complete the Venn diagram was generally well done though some students did make careless errors when placing the numbers within set A and/or set B. A significant number of students wrote all of the numbers 1
to 9 in the region $(A \cup B)'$.
Part (b) of the question was answered quite well and many students benefited from the mark scheme which allowed a follow through from part (a). It was not unusual for students to gain part marks in part (a) followed by full marks in part (b). Some students reverted to using the sets listed rather than their Venn diagram to answer part (b). A common error was for students to give $\frac{6}{9}$ as their answer to this part presumably because students had confused intersection with union.

Question 2

This question was a good discriminator. About one third of students entered for the examination scored full marks for their responses to this question testing compound interest. Students generally used a multiplier approach though students frequently used an incorrect multiplier, for example 1.15 A very common error was for students to give 212272.71 as their answer, the total value of the savings after 4 years and not the interest earned over the period. This answer was awarded two of the three marks available. A great majority of students got at least one mark for

the interest earned in the first year. Very few students lost the accuracy mark for not using correct money notation, that is for giving an answer to more than 2 decimal places.

Question 3

A majority of students scored full marks on this question. The most common error seen in part (a) was to give $30 < h \leq 40$ as the class in which the median lies. Common errors in drawing the frequency polygon included plotting points at the upper or lower boundary of each interval instead of the midpoint and joining the points with a curve, not straight lines. Points were generally carefully plotted at the correct heights.

Question 4

This question was quite well answered and descriptions of the things wrong with the time series graph were generally well described. There were a variety of possible acceptable answers but students needed to state them clearly and unambiguously. For example, “the axis does not start at 0” would not be worthy of any credit but “the y axis does not start at 0” would score a mark. Similarly, “the scale on the x axis” would not be enough but “it is not clear what the 2, 3, 4 on the x axis means” would get a mark. A number of students stated there should be a line of best fit drawn. This was not an acceptable response.

Question5

A good discriminator, this question attracted many concise and fully correct solutions. Despite there being a number of possible routes that students could take, there were also many incorrect or incomplete solutions. The most common approach was to use the total of the angles in a hexagon together with the relationship between angles BCE and CDE to work out the size of angle AFE. The most commonly seen alternative route was to use the symmetry of the hexagon to form two pentagons and work from there. A minority of students joined the points F and C and found the size of angle BCE. These students did not usually make significant further progress beyond labelling angles BCD and CDE as $2x$ and x respectively. A surprising number of students marked angles BCD and CDE as x and $2x$ respectively. In most cases, however, labelling of the diagram proved to be a help to students and is to be encouraged. About two in every five of students obtained full marks for their solution to this question.

Question 6

This question was also a good discrminator. Unfortunately, a significant proportion of students calculated the volume of the cylinder rather than the surface area and so could not be awarded much credit for their responses. However, there were many fully correct and complete solutions usually comparing the total surface area of the 3 tanks with the total surface area which could be covered with 7 tins of paint but sometimes comparing the number of tins of paint needed to paint the three tanks with the 7 tins of paint available to Jeremy. A good proprtion of students calculated the surface area of only one end of the cylinder or tried to combine the area of one or two ends with a volume or with an incorrect “area” found by calculating 1.6 by 1.8. It was pleasing to see that students often worked with exact expressions in terms of π, thus avoiding the need to round values in intermediate working and minimizing the risk of errors when calculating and writing down decimal values from calculators.

Question 7

This question was done well by the great majority of students who were awarded both marks. Some students gave an answer of 0.32 believing this was correct to 3 significant figures. These students were given full marks provided they had shown a more accurate version of the answer in the working space. The request to give the answer correct to 3 significant figures served as a guide to students and correct answers given to more than 3 significant figures gained full credit. Students are therefore advised to write down their full calculator display before rounding.

Question 8

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

Question 9

This question was not well answered in general though there were many clear and concise responses which earned full marks. Many students were able to make a start by stating that 54 (6×9) machine days were needed to make all the boxes. A much smaller proportion of students could make further progress. The most common strategy used by students who successfully solved the problem was to identify that 42 machine days were needed in addition to the first 3 days and then that 42 machine days is equivalent to 7 days with all the machines working. A small number of students who used this approach gave 7 as their final answer instead of the correct 10 days (3 + 7). The most able students were able to identify that 6 machine days were lost in the first 3 days so one extra day in addition to the 9 days would be needed to make all the boxes.

Question 10

Examiners were able to award full marks to about a half of students for their answer to this question involving percentages. Most students showed a good understanding of the problem and calculated that the total interest added to Marie's account was £144. Not all of these students could express this as a percentage interest rate. The most common error was for students to express £144 as a percentage of £8144 instead of £8000. It was noticeable that a large number of students used a multiplier approach, interpreting 0.018 or 1.018 as a 1.8% increase. The most common errors seen were working out 20% of 8000, or using an incorrect reverse percentage process.

Question 11

Questions involving standard form are often well answered and this question was no exception. Students usually expressed their answer to part (a) as an ordinary number (130) with a small minority of students giving their answer in standard form (1.3×10^2). Most students worked in standard form and did not convert the distance and speed to ordinary numbers before dividing one by the other. The most common error seen in the method was for students to multiply the distance by the speed but this was not commonplace. However, there were a significant number of students who identified the correct calculation $(3.9 \times 10^7) \div (1.3 \times 10^5)$ but who expressed it without the brackets. This usually led to the incorrect answer 1.3×10^{12} because students were not careful about the order of operations when they used their calculator to evaluate their answer. These students could usually be awarded one of the two marks available.

Most students were able to gain the mark in part (b) for stating that their answer to part (a) would be increased or equivalent, for example that the signal will take longer to get to Mars.

Question 12

About two thirds of students were able to give an acceptable reason why $64^{\frac{1}{4}}$ is not equal to $\frac{1}{4}$ of 64, usually by explaining that $64^{\frac{1}{4}}$ can be interpreted as the fourth root of 64 or $\sqrt[4]{64}$ or by evaluating the value of $\sqrt[4]{64}$ as 2.828. The reason "$\frac{1}{4}$ of 64 is not the same as 64 to the power $\frac{1}{4}$" was not deemed sufficient to score the mark because it is the same as merely rephrasing the statement in the question.

Question 13

This question was successfully answered by about a half of all students. About two thirds of all students realised the need to multiply the measures of density and volume of both ethanol and propylene and so accessed the first two marks for these processes. Some students changed litres to millilitres before doing this. About a half of all students were able to move on from there to complete the calculation of the density of the antifreeze. The most common error seen by examiners was for students to use division rather than multiplication to work out $188 \div \left(\frac{60}{1.09} + \frac{128}{0.97}\right)$ or equivalent. The answer given, 1.005, was in the range of acceptable values but could not be awarded any credit.

Question 14

A small minority of students scored full marks for their responses to this question. Weaker students often showed little or no working and if they did show working, it was often characterised by assuming that the triangles were right angled and using trigonometry to fit such a situation. More able students often did realise that references to area in the question together with the diagram showing non right angled triangles suggested use of the formula $\frac{1}{2}ab\sin C$. However, some of these students tried to find the length of AE instead of using the ratio $AB : AE$ to express AE as an unknown variable, for example $3x$. Students who used $AB = x$ and $AE = 3x$ scored at least one mark and often went on to write down and solve an equation using the given fact that the sum of the areas of the triangles was equal to the area of the rectangle. Examiners were surprised at the number of students who equated the area of one triangle to the area of the rectangle which led to the incorrect final answer of 18.

Question15

Some students appeared to have little knowledge about the content covered in this question and either did not attempt the question or revealed little understanding through their responses to the question. In general, little working was seen and students may have benefited from writing down the transformations represented by the equations $y = f(-x)$ and $y = f(x) - 3$.
Very few students did this and so some denied themselves the award of a mark for showing an understanding of the types of transformation involved in the question. However, examiners were able to award a good number of students at least one mark for getting an x coordinate as -7 or a y coordinate as -1. Students who gave a final answer of $(-10, -5)$ following on from an intermediate stage of $(-7, -2)$ could not be awarded any marks because they had not discriminated between which coordinates were changed by which transformation. Some students attempted to substitute values for x and y, often 7 and 2 respectively. The best students did show a good understanding of the notation and transformations involved and gave a fully correct answer.

Question 16

This question discriminated well with many students being awarded each of the 0, 1, 2 or 3 marks available. Most students followed the strategy of finding second differences to help them find the term in n^2 and realised that the common differences of 4 meant they should write an expression for the nth term which included the term $2n^2$. Many students went on to give a fully correct expression but a significant minority of students gave $2n^2 - 3n$ as their answer. Students would be wise to check their answers to questions of this type by substitution.

Question 17

Matching the functions to the graphs in this question produced a good spread of marks with about a third of all students scoring each of the marks available. The graph of a trigonometrical function was identified correctly more frequently than the other graphs and the graphs showing one form of proportionality or another were the least well known.

Question 18

Students usually scored well on part (a) of this question requiring the expansion of a product of three linear expressions to give a fully simplified cubic expression. Errors were usually restricted to incorrect terms rather than a flawed strategy although some students omitted terms from their expansion. It was usual for students to earn two or three of the available marks. Less able students lacked a clear strategy and sometimes tried the multiply all three brackets together at once.

Part (b) of the question proved to be more challenging than part (a) and it was relatively rare for examiners to award full marks. Credit awarded to students was often restricted to the mark gained for taking the square root of each side of the inequality or, in the case of students who started by expanding the left hand side, for getting a quadratic equation or inequality with all the terms on one side. Very few students used the expected method of taking the square root of both sides, taking into account both square roots of $\frac{9}{25}$. Students who expanded $(1 - x)^2$ were more likely to gain two or three marks for their responses but only about a third of all students earned one or more marks. The best answers demonstrated a very good understanding of the topic together with the good practice of including a graph sketch with the rest of their working.

Question 19

Part (a) of this question discriminated well between more able students sitting this paper. Some students did not attempt the question and many weaker students restricted their answer to working out the value of D by substituting $u = 26.2$ and $a = 4.3$ This gained no credit. Of those students who did score marks, many of them scored just one mark for writing down at least one of the bounds for u or a. Students who substituted bounds for u and a into the expression for D were split between those who calculated [UB of u]^2 ÷ [2 × LB of a], the correct expression, those who calculated
[UB of u]^2 ÷ [LB of a] and those who calculated [UB of u]^2 ÷ [2 × UB of a].

Part (b) was not answered well and only a small proportion of students gave the correct answer of 80. Even fewer students were able to say why. The most common incorrect approach by far was to add their answer to part (a) to 78.6003 and then divide by 2, accompanied by an explanation of this being the mid-point or the average. Centres may wish to highlight this misconception.

Question20

This question also proved to be a good discriminator between the most able students. Many of the more able students were able to make a good start, realizing the need to make a substitution, usually using $x = \frac{7-4y}{3}$ from the second equation, to eliminate x from the first equation. Fewer students could carry out the substitution and expand $\left(\frac{7-4y}{3}\right)^2$ correctly to score the second method mark. Often the denominator of the fraction was ignored in this process. Students who rearranged $3x + 4y = 7$ often stopped at $4y = 7 – 3x$, then substituted this into $x^2 – 4y^2 = 9$ to give the incorrect equation
$x^2 – (7 – 3x)(7 – 3x) = 9$. A further error seen quite commonly occurred when students multiplied through their equation by 9 but forgot to multiply all the terms by 9.
Only the most able students could obtain a correct quadratic equation in the form $ay^2 + by + c = 0$ (or $ax^2 + bx + c = 0$ in the cases where y had been eliminated). Some students who did not get a correct quadratic equation were able to score a further mark which was given independently for solving a three term quadratic equation. Full marks were scored in this question by only a very small proportion of all students who were entered for the examination. Some students who arrived at the correct 4 values were not awarded the final accuracy mark as the values were not clearly paired.

Question 21

Though a significant number of students did not attempt this question, a good proportion of those students who did attempt it scored full marks for a complete and correct solution. The most common errors made by those students who followed a correct method, that of finding the total number of onions weighing less than 60g or more than 120g, usually involved obtaining an incorrect frequency for the number of onions weighing between 120g and 135g or for the number of onions weighing between 135g and 180g, or both. This usually arose because of using an incorrect class interval . Students who used the strategy of finding that there were 420 onions weighing between 60g and 120g were generally more successful. Some students opted to work with percentages, either giving their final answer as a percentage, or rounding a recurring decimal to 1decimal place and hence introducing a rounding error. In these cases the final accuracy mark was usually lost. There were a significant number of students who used the heights of the bars to represent frequencies. This approach could not be awarded any credit.

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 23

This question was accessible to and discriminated well between the most able students sitting this paper. Students who had a good understanding of bearings together with applications of the sine rule and cosine rule were able to produce an accurate and concise solution to the problem. Of those students who gained partial credit for their attempts, many were only able to score either one mark for a correct process to find the size of angle ABC or two marks for getting as far as finding the length of AC. Some students who got as far as finding the size of angle BAC successfully gave this as their final answer. Finding the bearing of A from C instead of the bearing from C from A was also seen quite frequently.

Summary

Based on their performance on this paper, students should:

- check working for careless errors and to see that the answer given was specifically required by the question.
- practise problems involving the surface areas of solids.
- practise expanding brackets and collecting terms especially with quadratic functions involving fractions.
- ensure a good understanding of multipliers in problems concerning percentages
- practise solving quadratic inequalities.

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