

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	Points plotted at (130, 12) (150, 28) (170, 30) (190, 22) (210, 8) and joined with line segments	B2 (B1	for correct plotting of 5 points and joining with line segments for points plotted correctly at midpoints or for a frequency polygon with one point incorrect or for a frequency polygon with first and last point joined directly or for joining the points with line segments at the correct heights consistent within intervals (including end points))	Ignore any histogram drawn Ignore any part of the frequency polygon outside of the range of the first and last point plotted. for example, at 120, 140, 160, 180, 200 or at 140, 160, 180, 200, 220
2	(a) 340 200 (b) 8.026×10^{-1}	B1 B1	cao cao	
3	Drawn	B2 (B1	for a correct construction with all relevant arcs drawn for all relevant arcs drawn or for a bisector within guidelines but with no or insufficient arcs)	
4	(a) (0.3) 0.7 0.3 0.7 0.3 0.7 (b) 0.49	B2 (B1 M1 A1	all probabilities correctly placed for 0.7 correctly placed for Game 1) for a correct method, ft their tree diagram eg 0.7×0.7 only oe, ft their tree diagram	Accept equivalent fractions or percentages for probabilities ft their diagram provided probabilities are less than 1 An answer of $\frac{0.49}{1}$ scores M1A0 unless 0.49 seen

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5	45.6	P1	for a process to start to work with the ratio, eg $240 \div (3 + 5) (= 30)$ or pens = $3n$ and pencils = $5n$ where n is a positive integer	Can work in £ or pence but must be consistent, 90 or 150 imply P1 This mark can be awarded at any stage
		P1	for a complete process to find the number of pens and pencils, eg “30” $\times 3 (= 90)$ and “30” $\times 5 (= 150)$ OR for process to find one cost or amount to sell for one item eg [pens] $\times 9 (= 810)$ or [pens] $\times 11 (= 990)$ or [pencils] $\times 6 (= 900)$ or [pencils] $\times 10 (= 1500)$ OR process to find the profit for one pen or one pencil eg $11 - 9 (= 2)$ or $10 - 6 (= 4)$	[pens] could be “30” $\times 3$ or their number of pens [pencils] could be “30” $\times 5$ or their number of pencils [pens] , [pencils] $\neq 1$
		P1	for a process to find the total cost to buy or the total amount to sell for both, eg [pens] $\times 9$ + [pencils] $\times 6 (= 1710)$ or [pens] $\times 11$ + [pencils] $\times 10 (= 2490)$ OR process to find the profit for one item eg [pens] $\times 11 - [pens] \times 9 (= 180)$ or [pens] $\times (11 - 9) (= 180)$ or [pencils] $\times 10 - [pencils] \times 6 (= 600)$ or [pencils] $\times (10 - 6) (= 600)$	180 or 600 or 780 implies P3 [pens] could be “30” $\times 3$ or their number of pens [pencils] could be “30” $\times 5$ or their number of pencils [pens] , [pencils] $\neq 1$
		P1	for a complete process to find the profit as a percentage or a decimal, eg $\frac{[2490] - [1710]}{[1710]} \times 100$ or $\frac{[2490] - [1710]}{[1710]} (= 0.456...)$ or for a process to find the amount to sell as a percentage of the cost eg $\frac{[2490]}{[1710]} \times 100 (= 145.6...)$	[2490] is their amount to sell for both pens and pencils [1710] is their cost of pens and pencils [2490] – [1710] may be [180] + [600]
		A1	answer in the range 45.6 to 45.62	If an answer is given in the range in working and then rounded incorrectly award full marks. A correct answer with no supportive working gets 0 marks

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6	Comparison	B1	for correctly identifying the median of (School) A as 57	If median for school B is stated in the comparison it must be correct
		C1	(ft, dep on value for the median being stated) for making a correct comparison of <u>median</u> eg ‘the median of (School) A is higher than the median of (School) B’	
		B1	for correctly identifying the range of (School) A as 49	
		C1	(ft, dep on value for the range being stated) for making a correct comparison of <u>range</u> eg ‘the range of (School) A is higher than the range of (School) B’	
7	10.2 and 10.3	B1	for 10.2 in the correct place	Accept 10.2 ⁹ or 10.299(99...)
		B1	for 10.3 in the correct place	
8	14.3	M1	for a correct statement for AB using trigonometry, eg $\tan 62 = \frac{AB}{7.6}$ or $(AB =) 7.6 \times \tan 62$	If an answer is given in the range in working and then rounded incorrectly award full marks
		A1	answer in the range 14.28 to 14.3	
9	$14x^5y^6$	B2	cao	Where a, x^b, y^c can be made up of two products Condone inclusion of multiplication signs for B1
		(B1)	for correct simplification of two terms ax^5y^6 or $14x^by^6$ or $14x^5y^c$ where $a \neq 14, b \neq 5, c \neq 6$	
(b)	m^{-6}	B1	for m^{-6} or $\frac{1}{m^6}$	

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10	55	M1 A1	for a complete method eg $46.75 \div 0.85$ oe or for a correct equation eg $0.85x = 46.75$ oe or 55 seen, then used as part of an extended method eg 8.75 or 101.75 accept trailing zeros eg 55.00	
11	304	P1 P1 A1	for start of process to find the arc length eg $34.3 - 2 \times 4.7 (= 24.9)$ or for forming a suitable equation eg $\frac{\angle AOB}{360} \times \pi \times 2 \times 4.7 + 2 \times 4.7 = 34.3$ for process to isolate the arc length in an equation eg $\frac{\angle AOB}{360} \times \pi \times 2 \times 4.7 = "24.9"$ or for complete process to find AOB eg $\angle AOB = \frac{"24.9" \times 360}{\pi \times 2 \times 4.7}$ answer in the range 303 to 304	Condone omission of the addition of 2 radii in the equation for this mark only eg $\frac{\angle AOB}{360} \times \pi \times 2 \times 4.7 = 34.3$ If an answer is given in the range in working and then rounded incorrectly award full marks

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12 (a)	4775.38	M1	for a method to find the value after 1 year, eg $4500 \times 1.024 (= 4608)$ oe	Award of this mark implies the first M1 May be seen in more than 1 calculation M2A0 is implied by 275.37 or 275.38 Correct answer not rounded to 2dp gains M2A0
		M1	for a complete method to find the value after 3 years, eg $"4608" \times 1.018^2$ or $"4608" \times 1.018 (= 4690.944)$ and $"4690.944" \times 1.018$ oe	
		A1	accept 4775.37 SCB1 for 4770 or 4824 if M0 scored	
	26	P1	for a start to the process, eg $4107 \div 7500 (= 0.5476)$	0.74 implies P1
		P1	for a process to find percentage change eg $\sqrt{"0.5476"} \times 100 (= 74)$ or $(\sqrt{"0.5476"} - 1) \times 100 (= -26)$ or $1 - \sqrt{"0.5476"} (= 0.26)$	
		A1	cao	
(b)				

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Question	Answer	Mark	Mark scheme	Additional guidance
13	18.9	P1 P1 A1	for using length scale factor to find AB, eg $(AB =) 10.8 \div \left(\frac{3}{2}\right)$ or $(AB =) 10.8 \times \left(\frac{2}{3}\right)$ ($= 7.2$) for using length scale factor to find BC, eg $(BC =) 10.8 \div \frac{6.3}{6.3 - 4.2}$ or $(BC =) 10.8 \times \frac{6.3 - 4.2}{6.3}$ ($= 3.6$) or finds area scale factor, eg $\left(\frac{3}{2}\right)^2$ or $\left(\frac{2}{3}\right)^2$ for a complete process to find the area of trapezium, eg $\frac{6.3 + 4.2}{2} \times (10.8 - "7.2")$ or $\frac{(6.3 - 4.2) \times "3.6"}{2} + "3.6" \times 4.2$ or $\frac{10.8 \times 6.3}{2} - \frac{7.2 \times 4.2}{2}$ or $\frac{10.8 \times 6.3}{2} - \frac{10.8 \times 6.3}{2} \div \left(" \frac{3}{2} " \right)^2$ or $\frac{10.8 \times 6.3}{2} - \frac{10.8 \times 6.3}{2} \times \left(" \frac{2}{3} " \right)^2$ accept trailing zeros eg 18.90	Can use a combination of skills but must have a complete process to find AB or BC to score this mark

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

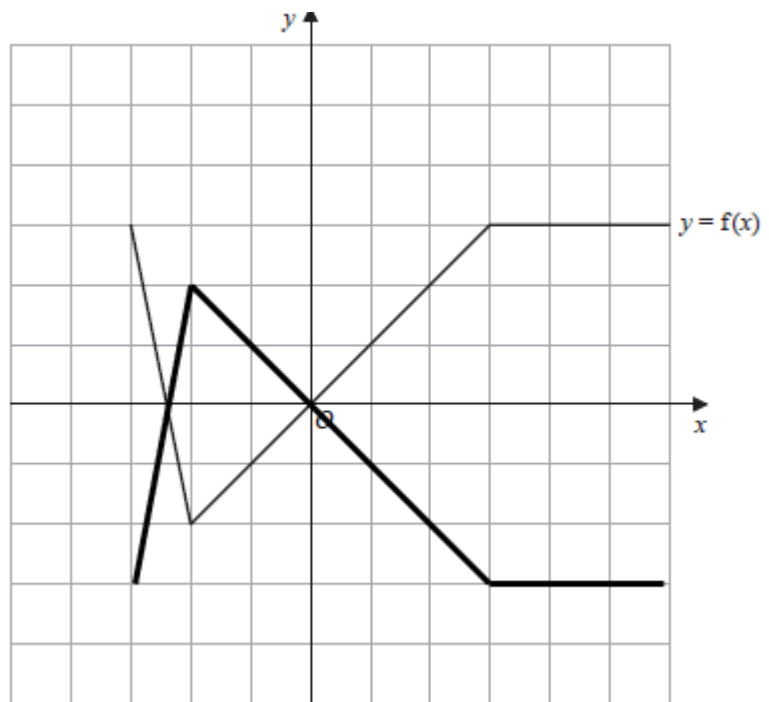
Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	56.0	P1	for a start to the process by correctly substituting into the cosine rule to find an angle eg, $18.2^2 = 14.6^2 + 7.9^2 - 2 \times 14.6 \times 7.9 \times \cos A$	
		P1	for rearranging to find $\cos A$, eg $\cos A = \frac{14.6^2 + 7.9^2 - 18.2^2}{2 \times 14.6 \times 7.9} \quad (= -0.2413\dots)$ or $A = 103.965\dots$	$\cos B = 0.9069\dots$ $B = 24.912\dots$ $\cos C = 0.6276\dots$ $C = 51.1222\dots$
		P1	for process to find the area of triangle ABC eg $\text{Area} = \frac{1}{2} \times 7.9 \times 14.6 \times \sin ("103.965\dots")$ or $\text{Area} = \frac{1}{2} \times 7.9 \times 14.6 \times \sin [A]$ $\text{Area} = \frac{1}{2} \times 14.6 \times 18.2 \times \sin ("24.912\dots")$ or $\text{Area} = \frac{1}{2} \times 14.6 \times 18.2 \times \sin [B]$ $\text{Area} = \frac{1}{2} \times 7.9 \times 18.2 \times \sin ("51.1222\dots")$ or $\text{Area} = \frac{1}{2} \times 7.9 \times 18.2 \times \sin [C]$	[A], [B], [C] must be a numerical value and clearly identified by labelling or on the diagram with no contradiction
		A1	for answer in the range 55.96 to 56.0	If an answer is given in the range in working and then rounded incorrectly award full marks

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
18 (a)	200	P1	for $\frac{55}{11} (= 5)$ or $\frac{11}{55} (= 0.2)$ or $\frac{40}{11} (= 3.63..)$ or $\frac{11}{40} (= 0.275)$ or for starting to use ratio eg tagged : untagged = 11 : 44 oe	Allow decimal values truncated or rounded to at least 2dp
		P1	for $\frac{11}{55} = \frac{40}{n}$ or $\frac{11}{40} = \frac{55}{n}$ or $\frac{55 \times 40}{11}$ oe or for process to find the number of untagged frogs eg $\frac{55 - 11}{11} \times 40 (= 160)$	May be seen in ratio eg 40 : 160
		A1	cao	A correct answer with no supportive working gets 0 marks.
(b)	Assumption	C1	for a suitable assumption, Acceptable examples no frogs have left/arrived at the lake no tags have fallen off / no lost tags sample of frogs taken was a random sample / this is a representative sample tagged frogs are distributed around the lake no baby frogs / no frogs have died There are (still) 4 untagged for every tagged frog. The tagged frogs had time to blend into the population. It is a closed environment There aren't any more frogs in the lake No other frogs in the lake Not acceptable examples She has caught all the frogs There are lots of frogs. This is the same lake	

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19	6	P1	for starting process, by defining height, radius and using Pythagoras to form an equation for the slant height l eg height = h, radius = $\frac{3}{4}h$ and $l^2 = h^2 + \left(\frac{3h}{4}\right)^2 \left(= \frac{25}{16}h^2\right) \text{ or } (l =) \sqrt{h^2 + \left(\frac{3h}{4}\right)^2} \left(= \frac{5}{4}h\right) \text{ oe}$ eg $r = 3x$ and $h = 4x$ and $l^2 = (3x)^2 + (4x)^2$	Can use any other letter than h provided it is defined eg height = x
		P1	(dep P1) for process to form a correct expression for the curved surface area in terms of a single variable, eg $\pi \times \frac{3}{4}h \times \frac{5}{4}h \left(= \frac{15}{16}\pi h^2\right)$ or $\pi \times 3x \times 5x$ where $h = 4x$	May include area of circle eg $\pi \times \left(\frac{3}{4}h\right)^2 + \pi \times \frac{3}{4}h \times \frac{5}{4}h \left(= \frac{24}{16}\pi h^2\right)$
		P1	for forming and simplifying a correct equation to find height, eg $\frac{24\pi}{16}h^2 = 54\pi$	
		A1	cao	

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21 (a)	Sketch	B1	for an appropriate sketch, ie reflection in x axis	Allow some tolerance on the points and in drawing the function if the intention is clear
(b)	(90, 3)	M1	for coordinates of $p = (270, -1)$	May see 270 and -1 marked in the correct positions on the axes
		M1	for describing part of the translation, eg “270” $- 180$, or “ -1 ” $+ 4$ or $[x_p] - 180$, or $[y_p] + 4$ or for an answer of $(90, b)$ or an answer of $(a, 3)$	$[x_p]$, $[y_p]$ must be a numerical value and clearly identified as point P by labelling or on the diagram with no contradiction
		A1	cao	
22	1760	M1	for starting to find the area under the curve, eg $0.5 \times 10 \times 54 (= 270)$ oe or $0.5 \times 10 \times (54 + 76) (= 650)$ oe or $0.5 \times 10 \times (76 + 92) (= 840)$ or for a method to find an estimate for the area of at least 1 strip with heights at intersection of midpoint and curve eg $10 \times [39]$ oe or $10 \times [67]$ oe or $10 \times [86]$ oe	Must have one correct expression for the award of this mark May be seen as a rectangle added to a triangle Where $38 \leq [39] \leq 40$ Where $66 \leq [67] \leq 68$ Where $85 \leq [86] \leq 87$
		M1	for a complete method to find the area under the curve, eg $0.5 \times 10 \times 54 + 0.5 \times 10 \times (54 + 76) + 0.5 \times 10 \times (76 + 92)$ oe eg $0.5 \times 10 (92 + 2(54 + 76))$ or $10 \times [39] + 10 \times [67] + 10 \times [86]$ oe	Allow 1 error in y values used
		A1	for 1760 or 1890 to 1950 SCB2 for an answer in the range 1815 – 1855	Allow 1890 to 1950 only if it comes from midpoint method

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



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

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

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

Angles: $\pm 5^\circ$

Measurements of length: ± 5 mm

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

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

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