



# Mark Scheme (Results)

November 2019

Pearson Edexcel GCSE (9 – 1)

In Mathematics (1MA1)

Higher (Non-Calculator) Paper 1H

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## General marking guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

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

Where some judgement is required, mark schemes will provide the principles by which marks will be awarded; exemplification/indicative content will not be exhaustive. When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the response should be sent to review.

- 2 All the marks on the mark scheme are designed to be awarded; mark schemes should be applied positively. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme. If there is a wrong answer (or no 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.

**Questions where working is not required:** In general, the correct answer should be given full marks.

**Questions that specifically require working:** In general, candidates who do not show working on this type of question will get no marks – full details will be given in the mark scheme for each individual question.

- 3 **Crossed out work**

This should be marked **unless** the candidate has replaced it with an alternative response.

- 4 **Choice of method**

If there is a choice of methods shown, mark the method that leads to the answer given on the answer line.

If no answer appears on the answer line, mark both methods **then award the lower number of marks.**

- 5 **Incorrect method**

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 for your Team Leader to check.

- 6 **Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working as you can check the answer, 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.

**7 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 or its context. (eg. an incorrectly cancelled fraction when the unsimplified fraction would gain full marks).

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect (eg. incorrect algebraic simplification).

**8 Probability**

Probability answers must be given as a fraction, percentage or decimal. 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 fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

**9 Linear equations**

Unless indicated otherwise in the mark scheme, full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously identified 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).

**10 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 all numbers within the range.

**11 Number in brackets after a calculation**

Where there is a number in brackets after a calculation E.g.  $2 \times 6 (=12)$  then the mark can be awarded **either** for the correct method, implied by the calculation **or** for the correct answer to the calculation.

**12 Use of inverted commas**

Some numbers in the mark scheme will appear inside inverted commas E.g. "12"  $\times$  50 ; the number in inverted commas cannot be any number – it must come from a correct method or process but the candidate may make an arithmetic error in their working.

**13 Word in square brackets**

Where a word is used in square brackets E.g. [area]  $\times$  1.5 : the value used for [area] does **not** have to come from a correct method or process but is the value that the candidate believes is the area. If there are any constraints on the value that can be used, details will be given in the mark scheme.

**14 Misread**

If a candidate misreads a number from the question. Eg. uses 252 instead of 255; method or process marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review.

### Guidance on the use of abbreviations within this mark scheme

<b>M</b>	method mark awarded for a correct method or partial method
<b>P</b>	process mark awarded for a correct process as part of a problem solving question
<b>A</b>	accuracy mark (awarded after a correct method or process; if no method or process is seen then full marks for the question are implied but see individual mark schemes for more details)
<b>C</b>	communication mark awarded for a fully correct statement(s) with no contradiction or ambiguity
<b>B</b>	unconditional accuracy mark (no method needed)
<b>oe</b>	or equivalent
<b>cao</b>	correct answer only
<b>ft</b>	follow through (when appropriate as per mark scheme)
<b>sc</b>	special case
<b>dep</b>	dependent (on a previous mark)
<b>indep</b>	independent
<b>awrt</b>	answer which rounds to
<b>isw</b>	ignore subsequent working

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	1080	M1	for method to write one number as a product of prime factors (condone one division error in method chosen), eg. one complete factor tree or 2, 2, 3, 3, 3 or 2, 2, 2, 3, 5 or for listing at least 5 multiples of either number (condone one error) or for any common multiple ( $\neq 1080$ ), eg. 12960 ( $= 108 \times 120$ )	Accept first 5 multiples if all correct or one error in the first 6 multiples
		M1	for method to write both numbers as a product of prime factors (condone a total of one division error) eg. two complete factor trees or 2, 2, 3, 3, 3 <b>and</b> 2, 2, 2, 3, 5 or lists of multiples of the two numbers, at least 5 of each, one of which includes 1080	For the list not containing 1080, accept first 5 correct multiples or one error in the first 6 multiples
		A1	cao  SC: B2 for any product that would lead to 1080, eg. $2^3 \times 3^3 \times 5$ or $12 \times 9 \times 10$	



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
5	93	M1  M1  M1  A1	for method to find angle $ACB$ , eg. $180 - 75 - 51 (= 54)$  (dep M1) for method to use the ratio, eg. $"54" \div (2 + 1) (= 18)$  for complete method, eg. $180 - 51 - "18" \times 2$ or $75 + "18"$ oe  cao	Angles may be shown on diagram but must not be ambiguous eg. M0 for angle of $54^\circ$ shown in the wrong place
6	No (supported)	P1  P1  C1	for process to find total weight of the 4 red bricks, eg. $5 \times 4 (= 20)$ <b>or</b> for process to find total weight of the 5 blue bricks eg. $9 \times 5 (= 45)$  for process to find total weight of all 10 bricks, eg. $"20" + "45" + 6 (= 71)$  No with correct supporting evidence <b>Acceptable examples</b> No, it is 7.1 She is wrong, it is 0.1 more No, (the total weight is) 71 not 70 <b>Not acceptable examples</b> Yes .... No, it is 71	May be seen next to statements 20 must be clearly referenced to the red bricks. $5 + 9 + 6 = 20$ gets no marks       Candidates working in grams will need to give 7100 and 7000 for example as comparable figures



Paper: 1MA1/1H					
Question		Answer	Mark	Mark scheme	Additional guidance
7	(a)	$p^{10}$	B1	cao	
	(b)	$2x^4y^2$	M1	for any two of $12 \div 6 (= 2)$ , $x^{7-3} (= x^4)$ , $y^{3-1} (= y^2)$ in a single product or written as a fraction with complete and correct cancelling of at least two terms	
			A1	cao	
8	(i)	Distance in the range 20 to 23	P1	for a process to draw a bearing of $070^\circ$ , eg. a line drawn $70^\circ$ from the North line at $P$	Accept a line of any length as long as the intention is clear.
	(ii)	Bearing in the range 317 to 330	P1	for a process to work out the distance $PQ$ , eg. $12 \times 1.5 (= 18)$	Award P3 for Q shown in the correct place on the diagram. 4.5 scores 2 marks provided there is a link to $12 \times 1.5 (= 18)$  Award no marks if no supportive processes  Award no marks if no supportive processes  Award A0A0 if $Q$ is not in the correct place
			P1	(dep previous P1) for the process to use the given scale, eg. “18” $\div 4 (= 4.5 \text{ cm})$	
			A1	(dep P3) for distance in the range 20 to 23	
			A1	(dep P3) for bearing in the range 317 to 330	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	21.6	M1	for a method using distance = speed $\times$ time, eg. $72 \times \frac{18}{60}$ or 7.2 km in 6 minutes, so $7.2 \times 3$ oe partitioning method	Accept $72 \times 18$
		A1	for 21.6 oe	
		M1	for a method to convert 20 m/s to km/h or 72 km/h to m/s, eg. $20 \times \frac{3600}{1000}$ (= 72) or $72 \times \frac{1000}{3600}$ (= 20)	
(b)	No (supported)	C1	for No since 72 km/h = 20 m/s oe	Accept methods to convert <b>both</b> speeds to km/s or m/h
10 (a)	cf graph through (40, 5), (60, 25), (80, 35), (100, 38) and (120, 40)	C2	for a complete and accurate cf graph	May be a cumulative frequency curve or a cumulative frequency polygon Ignore any graph drawn to the left of the first point If histograms drawn, plots must be identified
		(C1	for at least 4 or 5 cf values plotted correctly)	
			SC: B1 for 4 or 5 points plotted not at end but consistently within each interval and joined provided no gradient is negative	
		M1	for UQ in the range 66 to 70 or LQ in the range 42 to 46	
		A1	or ft their cf graph	
			for answer in range 21 to 28 or ft their cf graph	
(b)	answer in range 21 to 28	M1	for UQ in the range 66 to 70 or LQ in the range 42 to 46	Their graph must be a cf graph
		A1	or ft their cf graph	
(c)	answer in the range $\frac{19}{40}$ to $\frac{24}{40}$	M1	for finding the difference between readings taken from the cf axis at points from a mark of 50 and a mark of 90 or ft their graph (if possible)	Accept any equivalent fraction, decimal from 0.475 to 0.6 or percentage from 47.5% – 60%
		A1	for an answer in the range $\frac{19}{40}$ to $\frac{24}{40}$ or ft their cf graph	



**Paper: 1MA1/1H**

Question	Answer	Mark	Mark scheme	Additional guidance
14	5	P1	for process to find the area of the triangle, eg. $0.5 \times (x + 4)(x - 2)$ oe OR for process to find the area of rectangle and $27.5 \times 2$ , eg. $(x + 4)(x - 2)$ and 55	Trial and improvement methods must be fully correct identifying the value of x as 7 (3 marks) or the shortest side as 5 (4 marks)
		P1	(dep P1) for process to expand the brackets and derive a quadratic equation, eg. $x^2 + 4x - 2x - 8 = 55$ or $0.5(x^2 + 4x - 2x - 8) = 27.5$ oe	
		P1	(dep P2) for complete process to solve the quadratic equation $x^2 + 2x - 63 = 0$ eg $(x - 7)(x + 9) (= 0)$ or $\frac{-2 \pm \sqrt{2^2 - 4 \times 1 \times -63}}{2 \times 1}$ or $(x + 1)^2 - 1 - 63 (= 0)$	
		A1	cao  SC: B1 for $x^2 + 4x - 2x - 8 = 27.5$	

An answer of 5 with no supportive working gets no marks

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
15	$\frac{414}{990}$	M1  M1  A1	for $(x =) 0.41818\ldots$ or $(10x =) 4.\dot{1}\dot{8}$ or $4.1818\ldots$ or $(100x =) 41.\dot{8}\dot{1}$ or $41.818\ldots$ or $(1000x =) 418.\dot{1}\dot{8}$ or $418.18\ldots$  for using two recurring decimals with a terminating decimal difference, eg. $(1000x - 10x =) 418.\dot{1}\dot{8} - 4.\dot{1}\dot{8}$ or $418.18\ldots - 4.1818\ldots (= 414)$  for $\frac{414}{990}$ oe, eg $\frac{23}{55}$	Accept $(100x - x =) 41.\dot{8}\dot{1} - 0.\dot{4}\dot{1}\dot{8}$ or $41.818\ldots - 0.41818\ldots (= 41.4)$  $\frac{41.4}{99}$ must be simplified to gain the accuracy mark
16 (a)	$2\sqrt{11}$	M1  A1	for method to multiply numerator and denominator by $\sqrt{11}$ or a multiple of $\sqrt{11}$ , eg $\frac{22}{\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}}$  for $2\sqrt{11}$	
(b)	$\frac{6 + \sqrt{3}}{11}$	M1  M1  A1	for method to multiply numerator and denominator by $2\sqrt{3} + 1$ or a multiple of $2\sqrt{3} + 1$ , eg $\frac{\sqrt{3}}{2\sqrt{3} - 1} \times \frac{2\sqrt{3} + 1}{2\sqrt{3} + 1}$  (dep) for $\sqrt{3} \times 2\sqrt{3} = 6$ or $2\sqrt{3} \times 2\sqrt{3} = 12$  for $\frac{6 + \sqrt{3}}{11}$ (accept $a = 6$ and $b = 11$ )	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	4	P1	for process to find ratio of corresponding lengths, eg. $\sqrt{4}:\sqrt{9}$ (= 2 : 3)	This may be seen by checking their volume, eg. "8" $\times$ 4 (= 32) and "8" $\times$ 3 (= 24)  An answer of 4 with no supportive working gets no marks
		P1	for process to find ratio of volumes, eg "2" <sup>3</sup> : "3" <sup>3</sup> (= 8 : 27)	
		P1	for "27" $\div$ "8" (= 3.375)	
		A1	for rounding to give an answer of 4 from correct working	

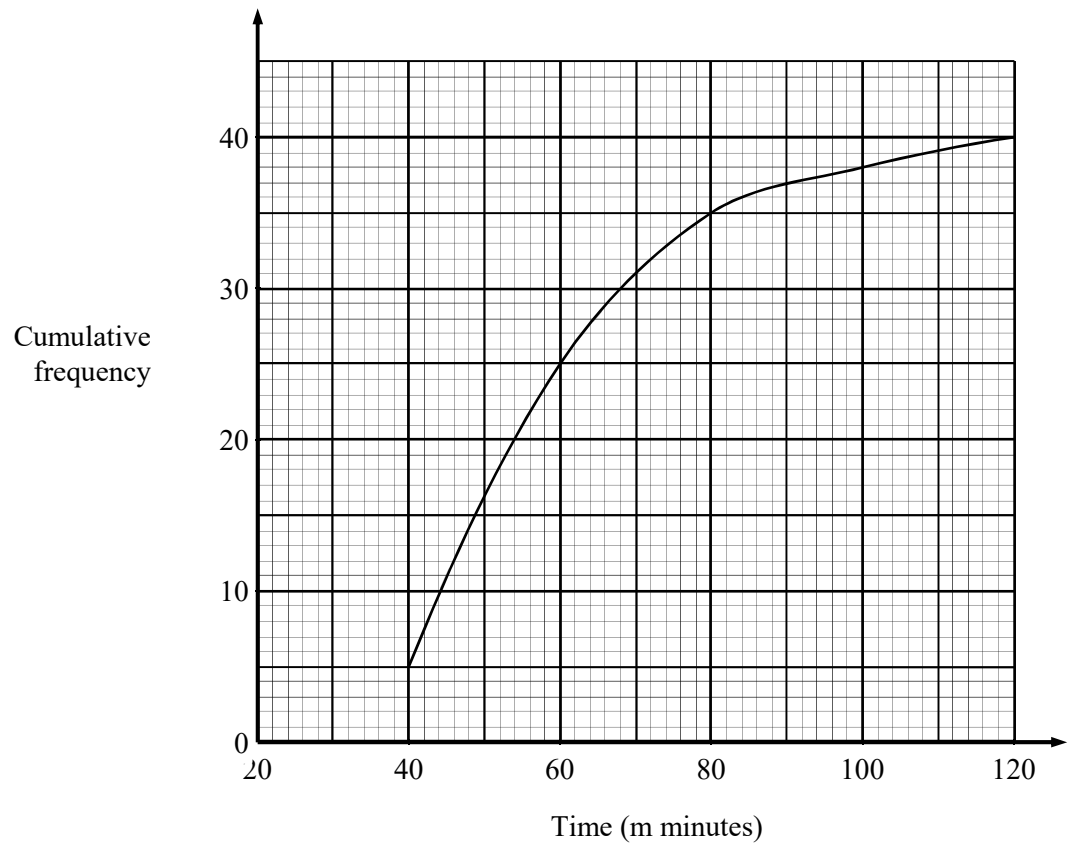
Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
18 (a)	Shown	C1	for $f^{-1}(x) = \sqrt[3]{\frac{x+4}{2}}$ OR for $2x^3 - 4 = 50$ OR for substituting $x = 3$ to find $f(3)$	
		C1	for substituting $x = 50$ to show the result giving $f^{-1}(50) = 3$ OR solving for $x$ to give $x = 3$ OR for showing that $f(3) = 50$	
(b)	$x = -1$ and $x = 2.5$	P1	for $hg(x) = (x + 2)^2$	
		P1	(dep) for start to a process to derive a quadratic equation eg. $x^2 + 4x + 4 = 3x^2 + x - 1$	$(x + 2)^2$ must be correctly expanded
		P1	for a process to solve the quadratic equation $2x^2 - 3x - 5 = 0$ eg $(2x - 5)(x + 1) (= 0)$ or $\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 2 \times -5}}{2 \times 2}$ or $2\left[\left(x - \frac{3}{4}\right)^2 - \frac{9}{16} - \frac{5}{2}\right] (= 0)$	
		A1	for $x = -1$ and $x = 2.5$	2.5 or $2\frac{1}{2}$ or $\frac{5}{2}$ acceptable
19	$\frac{3}{4}$ oe	P1	for a first step to converting to a common base with one correct conversion, eg. $9^{-\frac{1}{2}} = 3^{-1}$ or $\frac{1}{3}$ or $27^{\frac{1}{4}} = 3^{\frac{3}{4}}$ oe	$9^{-\frac{1}{2}} = 3^{-1}$ (or $\frac{1}{3}$ ) oe or $27^{\frac{1}{4}} = 3^{\frac{3}{4}}$ oe seen alone gets the P1
		P1	(dep) for $3^{-1} = 3^{\frac{3}{4}} \div 3^{x+1}$ oe	
		A1	cao	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
20 (a)	graph	C2	for a translation of the graph by the vector $\begin{pmatrix} -1 \\ -3 \end{pmatrix}$	Condone graph of $y = f(-x)$ also being drawn on the grid
		(C1	for a translation of the graph by the vector $\begin{pmatrix} -1 \\ b \end{pmatrix}$ where $b \neq -3$ or $\begin{pmatrix} a \\ -3 \end{pmatrix}$ where $a \neq -1$  or for a translation by the vector $\begin{pmatrix} -1 \\ -3 \end{pmatrix}$ of 3 or 4 critical points)	Correct vector gets 1 mark
(b)	2, 1	B1	cao	
21	Sketch graph with TP at (2, -13) and intercepts at (0, -5), $(2 + \sqrt{\frac{13}{2}}, 0)$ and $(2 - \sqrt{\frac{13}{2}}, 0)$	B1	for a parabola drawn with intercept at the point (0, -5)	Turning point may be just seen and labelled on the sketch
		M1	for the start of a method to find the roots of $y = 0$ , eg. $2(x - 2)^2 - 13 (= 0)$ oe or $(x = ) \frac{- -8 \pm \sqrt{(-8)^2 - 4 \times 2 \times -5}}{2 \times 2}$	
		M1	(dep) for method to find the roots, eg. $2 \pm \sqrt{\frac{13}{2}}$ oe	
		B1	for turning point at (2, -13)	
		C1	for a fully correct parabola drawn with turning point at (2, -13) and intercepts at (0, -5), $(2 + \sqrt{\frac{13}{2}}, 0)$ oe and $(2 - \sqrt{\frac{13}{2}}, 0)$ oe clearly shown	



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	Proof	C1	<p>for <b>one</b> correct pair of equal angles with correct reason from:  angle <math>ACB = \text{angle } ADB</math>, (<u>angles</u> in the <u>same segment</u> are equal)  angle <math>DBC = \text{angle } DAC</math>, (<u>angles</u> in the <u>same segment</u> are equal)  angle <math>ABD = \text{angle } ACD</math>, (<u>angles</u> in the <u>same segment</u> are equal)</p> <p><b>or</b> for recognising all angles of 60 in triangle <math>AED</math> <b>and</b> in triangle <math>CEB</math> )</p>	Underlined words need to be shown; reasons need to be linked to their statement(s)
		C1	<p>for <b>one</b> identity, with reason(s), from the following list of alternatives:  <b>Alternatives:</b>  a complete method to show that angle <math>ACB = \text{angle } DBC (= 60)</math>,  <b>or</b>  <math>BC</math> being common to both triangles  <b>or</b>  <math>DB = DE + EB = AE + EC = AC</math> (sides of an <u>equilateral triangle</u> are equal)  <b>or</b>  angle <math>ABC = 60 + \text{angle } ABD = 60 + \text{angle } ACD = \text{angle } DCB</math>  (<u>angles</u> in the <u>same segment</u> are equal)  <b>or</b>  angle <math>BDC = \text{angle } CAB</math> (<u>angles</u> in the <u>same segment</u> are equal)</p>	Pairs of equal angles may be just shown on the diagram
		C1	for a <b>second</b> identity, with reason(s), from the alternatives above	
		C1	for concluding the proof with a <b>third</b> identity, with reason(s), from the alternatives above, together with the condition for congruency, ASA or SAS or AAS	

Q10(a)



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

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

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

Angles:  $\pm 5^\circ$

Measurements of length:  $\pm 5$  mm

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PAPER: 1MA1_1H			
Question		Modification	Mark scheme notes
2		Wording changed to 'Using the information work out the value of n.'	Standard mark scheme
4		P moved 1 cm to the left.	Standard mark scheme
5		Diagram enlarged. Wording added 'Angle BAC = 75° Angle ABC = 51°.' Angles moved outside of the angle arcs and angle arcs made smaller.	Standard mark scheme
8		North lines made 9 cm. Scale moved above the diagram. Changed the scale from '1 cm represents 4km' to '1 cm represents 2 km.'	Standard mark scheme but note the scale change P1 for a process to work out the distance $PQ$ , eg. $12 \times 1.5 (= 18)$ P1 for the process to use the given scale eg. " $18 \div 2 (= 9 \text{ cm})$ " Award P3 for $Q$ shown in the correct place on the diagram. A1 for distance in the range 20 to 23 A1 for bearing in the range 317 to 330

10	<p>Table left aligned. Diagram enlarged. Right axis labelled.</p> <p>Axes labels moved to the left of the horizontal axis and above the vertical axis.</p> <p>Frequency table:</p> <table><tr><td><math>20 &lt; m \leq 40</math></td><td>5</td></tr><tr><td><math>20 &lt; m \leq 60</math></td><td>10</td></tr><tr><td><math>20 &lt; m \leq 80</math></td><td>25</td></tr><tr><td><math>20 &lt; m \leq 100</math></td><td>35</td></tr><tr><td><math>20 &lt; m \leq 120</math></td><td>40</td></tr></table>	$20 < m \leq 40$	5	$20 < m \leq 60$	10	$20 < m \leq 80$	25	$20 < m \leq 100$	35	$20 < m \leq 120$	40	<p>Part (a) Standard mark scheme but plots at values shown.</p> <p>Part (b):</p> <p>M1 for <math>UQ = 90 (\pm 2)</math> or <math>LQ = 60 (\pm 2)</math> or fit their cf graph</p> <p>A1 answer in the range 36 to 44</p> <p>Part (c):</p> <p>M1 for finding the difference between readings taken from the cf axis at points from a mark of 50 and a mark of 90</p> <p>eg <math>30 - 7.5</math></p> <p>A1 answer in the range 19/40 to 26/40</p>
$20 < m \leq 40$	5											
$20 < m \leq 60$	10											
$20 < m \leq 80$	25											
$20 < m \leq 100$	35											
$20 < m \leq 120$	40											

PAPER: IMA1_1H			
Question		Modification	Mark scheme notes
12		MLP only- $q$ changed to $m$ .	Standard mark scheme
13	(a)	MLP only – $x$ changed to $y$ .	Standard mark scheme with letters changed as indicated.
13	(b)	MLP only – $x$ and $y$ changed to $e$ and $f$ .	Standard mark scheme with change of letters as indicated.
14		Diagram enlarged. Triangle vertices labelled $ABC$ . Wording ' $ABC$ ' added. Wording ' $BC = (y+4)$ cm' and ' $BA = (y-2)$ cm' added. MLP only – $x$ changed to $y$	Standard mark scheme with change of letters as indicated.
17		Diagram enlarged; model may be provided. Labels removed from inside the shapes and above the containers labelled 'container A' and 'container B'. Wording changed to 'They show two similar cylindrical containers, container A and container B' ; Container A is smaller than container B.'	Standard mark scheme
20		Diagram enlarged. In part (a) the wording changed from ' $y = f(x+1) - 3$ ' to ' $y = f(x+1) - 5$ '. Braille only – only point A on the diagram and wording 'Point A $(-2,1)$ ' added above the diagram.	Standard mark scheme, but note the graph required to be drawn in part (a) is now 2 squares below that normally expected, so in the standard mark scheme replace -3 by -5
21		A pair of axes provided.	Standard mark scheme
22		Diagram enlarged.	Standard mark scheme



