



Mark Scheme (Results)

November 2021

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

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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 (eg 3.5 – 4.2) then this is inclusive of the end points (eg 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 eg $2 \times 6 (=12)$ 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 eg "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 eg [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

M method mark awarded for a correct method or partial method

P process mark awarded for a correct process as part of a problem solving question

A 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)

C communication mark awarded for a fully correct statement(s) with no contradiction or ambiguity

B unconditional accuracy mark (no method needed)

oe or equivalent

cao correct answer only

ft follow through (when appropriate as per mark scheme)

sc special case

dep dependent (on a previous mark)

indep independent

awrt answer which rounds to

isw ignore subsequent working

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
1 (a) (b) (c)	(100,18) 12.8 to 14.8 Decision and statement	B1 M1 A1 C1	<p>cao</p> <p>for a method to read off eg line of best fit or line up from 370 or for a point on the grid at $(370, y)$ where y lies between 12.8 and 14.8</p> <p>for an answer in the range 12.8 to 14.8</p> <p>for decision and statement</p> <p>Acceptable examples</p> <p>No, as this point can be disregarded from the general trend</p> <p>No, ignore this point</p> <p>No, the correlation is positive</p> <p>No, because even with an outlier you can still have a negative or positive correlation.</p> <p>No, there is still a correlation.</p> <p>No, as you can use the rest of the data to determine a correlation.</p> <p>No, as outlier does not affect the majority</p> <p>No as a line of best fit can still be drawn</p> <p>No, it is an anomaly</p> <p>Not acceptable examples</p> <p>Yes,</p> <p>Outliers can be ignored [no decision]</p> <p>No, the outlier can be ignored so the correlation is negative</p> <p>No there are other things that can affect the test</p>	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
2	12.85 or 12.86 or 13.5(0)	P1 P1 P1 A1	for $9 + 2 + 1 (= 12)$ for working out how many lots of 175g are needed eg $6000 \div "12" \times 2 \div 175 (= 5.71\dots)$ for a complete process eg “5.71...” $\times 2.25 (= 12.857\dots)$ for 12.85 or 12.86 or 13.5(0)	Award this mark for sight of 4500, 1000 or 500 Process may lead to 5 or 6 instead of 5.71... “5.71...” (ft) may be rounded or truncated.e.g “6”
3 (a) (b) (c)	450 000 7×10^{-3} 4.73×10^3	B1 B1 M1 A1	cao cao for 4730 oe or for 4.73×10^n where $n \neq 3$ cao	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
4	260	P1 P1 P1 A1	<p>conversion to common units of capacity eg $2.2 \times 4.54 (= 9.988)$ or $8 \div 4.54 (= 1.76\dots)$</p> <p>OR for Company A $2400 \div 4.54 (= 528.63\dots)$</p> <p>OR $2400 \div 8 (= 300)$</p> <p>OR a rate per minute $8 \div [\text{time for Company A}] (= 4.8\dots)$ oe</p> <p>for a complete process to find the time for company A or company B in minutes. eg in litres Company A $2400 \div "4.8\dots" (= 500)$ or "$300" \times [1 \text{ min } 40 \text{ sec}] (= 500)$ or Company B $2400 \div "9.988" (= 240.28\dots)$</p> <p>OR eg in gallons Company A "$528.63\dots \div ("1.76\dots" \div [1 \text{ min } 40 \text{ sec}]) (= 500)$" or Company B "$528.63\dots \div 2.2 (= 240.28\dots)$"</p> <p>for complete processes to find the times for both company A and company B in minutes.</p> <p>Company A eg in litres $2400 \div "4.8\dots" (= 500)$ or "$300" \times [1 \text{ min } 40 \text{ sec}] (= 500)$ or in gallons "$528.63\dots \div ("1.76\dots" \div [1 \text{ min } 40 \text{ sec}]) (= 500)$"</p> <p>AND Company B eg in litres $2400 \div "9.988" (= 240.28\dots)$ or in gallons "$528.63\dots \div 2.2 (= 240.28\dots)$"</p> <p>for an answer in the range 259 to 260</p>	<p>Results of calculations may be truncated or rounded.</p> <p>[time for Company A] could be 1 min 40 sec or 1.66... or 1.6 or 1.40 etc as long as it is clear it relates to 1 min 40 sec</p> <p>If the answer is given within the range but then rounded incorrectly award full marks.</p>

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
5	12	P1 P1 A1	for a process to find the fifth term, eg $3a + 5a (= 8a)$ for setting up the equation eg $a + 2a + 3a + 5a + [8a] = 228$ cao	[8a] allow use of what is clearly indicated as the missing term $\frac{228}{19}$ or $\frac{228}{1+2+3+5+8}$ scores P1 P1 $\frac{228}{1+2+3+5+[8]}$ scores P0P1
6 (a) (b)	0.5, 0.3 120	P1 A1 M1 A1	for $1 - 0.05 - 0.15 (= 0.8)$ oe 18 ÷ 0.15 oe or $6 + 18 + a + b$ where $a + b = 96$ cao	Award this mark for any two probabilities that sum to 0.8
7	18.3	P1 P1 P1 A1	for finding the area of the triangle eg $0.5 \times 8 \times 8 (= 32)$ for finding the area of the circle $\pi \times 8 \times 8 (= 201.06..)$ for finding the area of the sector eg $\frac{1}{4} \times \pi \times 8^2$ or “201.06..” ÷ 4 (= 50.26...) for an answer in the range 18.2 to 18.3	Accept rounded or truncated figures If the answer is given within the range but then rounded incorrectly award full marks.
8 (a) (b)	Graph sketched Graph sketched	C1 C1	Sketch Sketch	Accept freehand provided intention is clear

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	4	P1 A1	$12 \times 5 \div 15$ cao	
(b)	Statement	C1	<p>Acceptable examples</p> <p>it could take more time it could take less time it could take more or less time it would take longer if they worked at a slower rate</p> <p>Not acceptable examples</p> <p>the time will be less as there are more people if the rate at which the 15 people work changes it would have taken longer it would take less time</p>	
10	14.14	P1	<p>works out scale factor eg $(9 + 6) \div 6 (= 2.5)$ OR for start of process to find angle DBE eg $\sin B = \frac{2}{6}$ oe</p>	Note method can be carried out in either order
		P1	<p>uses Pythagoras eg $6^2 - 2^2 (= 32)$ or $\sqrt{32} (= 5.6\dots)$ OR calculates AC eg $2 \times "2.5" (= 5)$ OR for complete process to find angle DBE eg $\sin^{-1} \left(\frac{2}{6} \right) (= 19.4\dots)$</p>	May be seen on diagram
		P1	<p>complete process to find CB eg "2.5" \times "$\sqrt{32}$" ($= 10\sqrt{2}$) or $\sqrt{(9+6)^2 - "5"^2} (= 10\sqrt{2})$ OR uses trigonometry, eg $15 \times \cos "19.4\dots"$</p>	
		A1	14.1 to 14.15	If the answer is given within the range but then rounded incorrectly award full marks.

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
11	6.35, 6.45	B1 B1	for 6.35 in the correct position for 6.45 in the correct position	Accept 6.449 oe or 6.4499... oe
12	49, 2	P1 A1	for setting up $6 \div n = 3$ oe or $7^n = a$ oe or one correct answer cao	Accept the figures written as a complete statement eg $(49x^6)^{\frac{1}{2}}$
13	(9, 8)	P1 P1 P1 P1 A1	for setting up an equation for one dimension (width) of the pattern eg $2b - a = 8$ oe or $2x + y = 8$ oe for setting up an equation for the other dimension (height) of the pattern eg $2b + a = 16$ oe or $2x + 3y = 16$ oe (dep P2) for a full process to solve for both variables eg $4b = 24$, $b = 6$ and $12 - a = 8$, $a = 4$ or $8 = 2y$, $y = 4$ and $8 = 2x + y$, $x = 2$ (dep P3) for a full process to find one of the coordinates of C eg $3 + 6 (= 9)$ or $4 + 4 (= 8)$ or $3 + 2 + 4 (= 9)$ or $4 + 4 (= 8)$ cao	a and b are the width and length x is the difference between the length and width, y is the width of the rectangle Both values correct implies this mark Award 0 marks for a correct answer with no supportive working.

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
14	8 : 12 : 9 : 1	P1 P1 P1 A1	<p>for $2 + 3 (= 5)$ and $9 + 1 (= 10)$</p> <p>OR</p> <p>for assigning a total number of sweets for F + G and O + J eg $F + G = 100$, $O + J = 50$</p> <p>for finding correct multiplier for relationship between totals for F + G and O + J eg $\times 4$ to get from 5, 10 to 20, 10</p> <p>OR</p> <p>for working out the number of sweets from their totals for F, G eg 40, 60 or for O, J, eg 45, 5</p> <p>for $2 \times 4 (= 8)$ and $3 \times 4 (= 12)$</p> <p>OR</p> <p>for ratio in unsimplified form, eg 40 : 60 : 45 : 5</p> <p>cao</p>	<p>May be in algebraic form, eg $2a + 3a (= 5a)$ and $9a + 1a (= 10a)$</p> <p>May be in algebraic form, eg $F + G = 5a$, $O + J = 2.5a$</p>
15	0.7 to 1.1	M1 M1 A1	<p>for tangent to the curve drawn at $t = 12$</p> <p>for method to find the gradient of their tangent, eg $28 \div 30$</p> <p>for answer in the range 0.7 to 1.1 dependent upon tangent drawn</p>	<p>Working may be seen on the diagram</p> <p>Ignore negative signs</p>

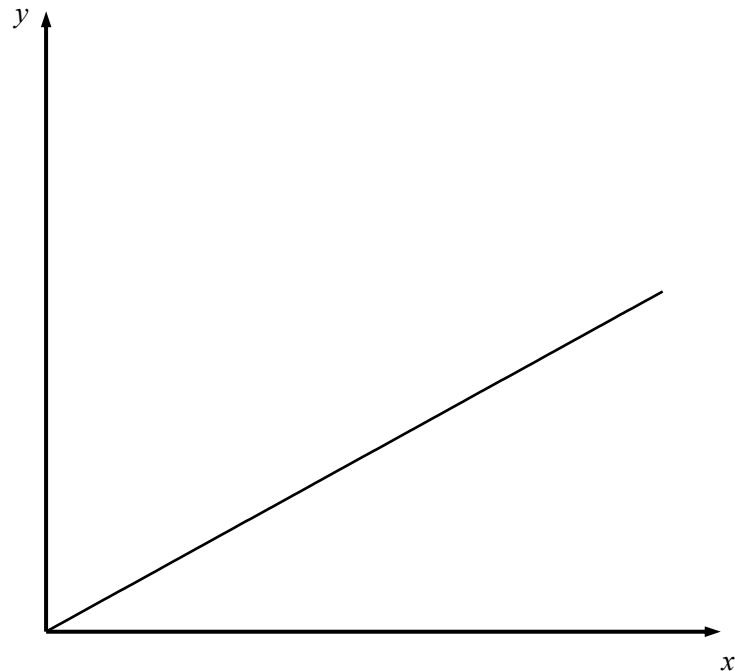
Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
16	Shown (supported)	M1 M1 M1 C1	for eliminating y or x , eg $x^2 + 3x - 3 = 5x - 4$ for rearranging, collecting terms and setting to 0 eg $x^2 - 2x + 1 (= 0)$ for factorising or solving eg $(x - 1)^2 (= 0)$ for statement confirming 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
17	$x = \frac{1}{2}z^6$	M1 M1 M1 A1	for setting up an equation eg $x = ky^2$ oe or $y = cz^3$ oe for eliminating y eg $x = k(cz^3)^2$ oe OR substitutes values in both equations, eg $32 = ky^2$ and $y = c2^3$ for substituting in 32 and 2 to find the constant, eg $32 = m2^6$ OR combines equations, eg $32 = k c^2 2^6$ oe	Accept use of proportionality sign, eg $x \propto y^2$ or $y \propto z^3$ or $x \propto ky^2$ or $y \propto cz^3$ Accept use of proportionality sign, eg $32 \propto ky^2$ and $y \propto c2^3$

Paper: 1MA1/3H					
Question	Answer	Mark	Mark scheme	Additional guidance	
18	$\frac{2}{5}\mathbf{a} + \mathbf{b}$	P1 P1 P1 A1	<p>for relationship involving D eg $\overrightarrow{OD} = \frac{2}{5}\overrightarrow{OB}$ or $\overrightarrow{DB} = \frac{3}{5}\overrightarrow{OB}$</p> <p>or</p> <p>for relationship involving E eg $\overrightarrow{BE} = \frac{1}{5}\overrightarrow{BC}$ or $\overrightarrow{EC} = \frac{4}{5}\overrightarrow{BC}$</p> <p>for relationship involving D in terms of \mathbf{a} and \mathbf{b} eg $\overrightarrow{OD} = \frac{2}{5}(\mathbf{a} + \mathbf{b})$ or $\overrightarrow{DB} = \frac{3}{5}(\mathbf{a} + \mathbf{b})$</p> <p>or</p> <p>for relationship involving E in terms of \mathbf{a} and \mathbf{b} eg $\overrightarrow{BE} = \frac{1}{5}(-\mathbf{b} - \mathbf{a} + 3\mathbf{b})$ oe or $\overrightarrow{EC} = \frac{4}{5}(-\mathbf{b} - \mathbf{a} + 3\mathbf{b})$ oe</p> <p>$\overrightarrow{BC} = 2\mathbf{b} - \mathbf{a}$ oe or $\overrightarrow{CB} = \mathbf{a} - 2\mathbf{b}$ oe</p> <p>(dep P2) for expression for \overrightarrow{DE} in terms of \mathbf{a} and \mathbf{b} eg $\overrightarrow{DE} = \frac{3}{5}(\mathbf{a} + \mathbf{b}) + \frac{1}{5}(-\mathbf{b} - \mathbf{a} + 3\mathbf{b})$</p> <p>for $\frac{2}{5}\mathbf{a} + (1)\mathbf{b}$ or $\frac{1}{5}(2\mathbf{a} + 5\mathbf{b})$</p>		
19	0.95	P1 P1 A1	<p>for initial use of the formula eg $3610 = kP_n$ or $P_{n+1} = 4000k$ or for $P_{n+2} = k^2P_n$ or for $3610 = k^2 \times 4000$</p> <p>for a complete method to find k eg $\sqrt{\frac{3610}{4000}}$ or ± 0.95</p> <p>oe</p>	<p>Accept n or any integer replacement for n</p> <p>This may be seen in steps</p>	

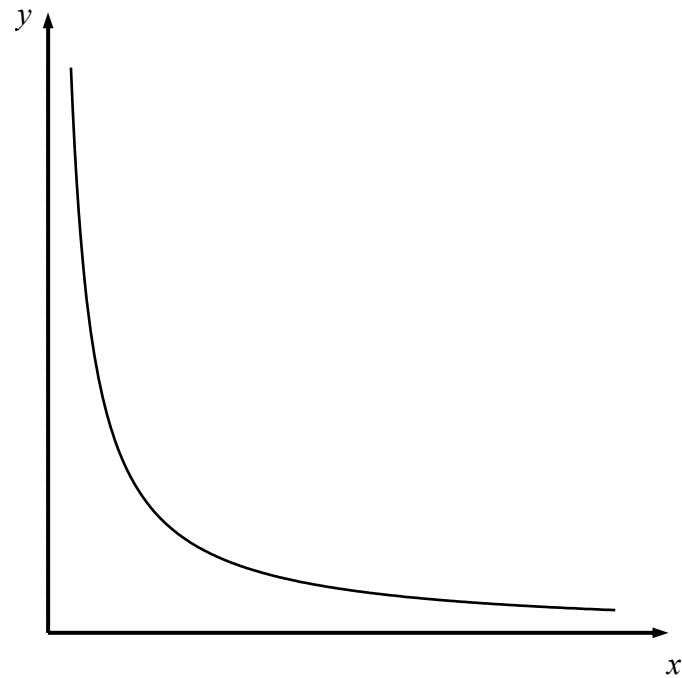
Paper: 1MA1/3H					
Question	Answer	Mark	Mark scheme		Additional guidance
20	$1 - \left(\frac{1}{2}\right)^n - \left(\frac{1}{2}\right)^n$	M1 A1	for $\left(\frac{1}{2}\right)^n$ oe oe eg $1 - \left(\frac{1}{2}\right)^{n-1}$		
21 (a)	19.1	M1 M1 A1	for a method to find an estimate for the area of at least 1 trapezium under the curve eg $0.5 \times 1 \times (4 + 6)$ or $0.5 \times 1 \times (6 + 7.2)$ or $0.5 \times 1 \times (7.2 + 7.8)$ for a complete method eg $0.5 \times 1 \times (4 + 6) + 0.5 \times 1 \times (6 + 7.2) + 0.5 \times 1 \times (7.2 + 7.8)$ or $0.5 \{(4 + 7.8) + 2(6 + 7.2)\}$ cao		Allow a maximum of 2 errors in y values used Ignore any reference to units If units are given they must be correct
(b)	Statement	C1	eg distance (travelled)		
22	$\frac{1}{x(x+4)}$	M1 M1 A1	inverting the fraction and multiplying eg $\frac{6x^3}{(9x^2-144)} \times \frac{3(x-4)}{2x^4}$ for factorising $9x^2 - 144$, eg $(3x - 12)(3x + 12)$ cao		

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
23	Proof (supported)	M1	<p>for using the sine rule on triangle ABD or on triangle ADC, to involve sides AB, BD, AC, or DC eg $\frac{AB}{\sin ADB} = \frac{BD}{\sin x}$ oe or $\frac{AC}{\sin ADC} = \frac{DC}{\sin x}$ oe</p> <p>OR</p> <p>for an expression for the area of triangle ABD or for the area of triangle ADC eg $\frac{1}{2} AB AD \sin x$ or $\frac{1}{2} AD AC \sin x$ or $\frac{1}{2} h BD$ or $\frac{1}{2} h DC$</p>	Accept extra letters eg y shown on diagram for any angle used

Question 8(a)



Question 8(b)



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.

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 is a scatter graph which shows...’ Diagram enlarged. Open headed arrows. Right axis has been labelled. Axes labels moved to the left of the horizontal axis and above the vertical axis. Crosses changed to solid dots. Small squares removed. Braille: There will be a spare diagram and Wikki Stix	Standard mark scheme but in part (b) use a range of 12.5 to 15
5	Change a to n .	Standard mark scheme but note the change in letter.
6	Wording added ‘Look at the table for Question 6 in the Diagram Booklet.’ Wording added ‘The table in the Diagram Booklet...’; Table enlarged and turned vertical. In part (a) Wording added ‘in the Diagram Booklet.’; Wording added ‘There are two spaces to fill.’ Braille: In the table letters (i) & (ii) placed in the blank spaces with an answer line: ‘Ans: (i) __ (ii) __’	Standard mark scheme
7	Wording added ‘Look at the diagram for Question 7 in the Diagram Booklet.’ Wording ‘The diagram shows...’ removed and replaced with ‘It shows...’ Wording added ‘ $OP = OR = 8$ cm.’ Wording added ‘The marked angle is a right angle.’ Diagram enlarged. Right angle made more obvious. Shading changed.	Standard mark scheme

PAPER: 1MA1_3H				
Question		Modification	Mark scheme notes	
8	(a)	Wording added ‘Look at the diagram for Question 8(a) in the Diagram Booklet.’ Wording ‘below’ removed and replaced with ‘in the Diagram Booklet,..’ Diagram enlarged. Open headed arrows. Axes labels moved to the right of the horizontal axis and above the vertical axis. Braille: also provided with a spare diagram, Wikki Stix and drawing film		
8	(b)	Wording added ‘Look at the diagram for Question 8(b) in the Diagram Booklet.’ Wording ‘below’ removed and replaced with ‘in the Diagram Booklet,..’ Diagram enlarged. Open headed arrows. Axes labels moved to the right of the horizontal axis and above the vertical axis. Braille: also provided with a spare diagram, Wikki Stix and drawing film		
10		Wording added ‘Look at the diagram for Question 10 in the Diagram Booklet.’ Wording added ‘Triangle DEB is smaller than triangle ACB .’ Wording added ‘Both the marked angles are right angles.’ The measurements 9 cm, 2 cm and 6 cm added to the diagram. Diagram enlarged. Right angles made more obvious. Braille alternative wording to that shown above: ‘Triangle DEB is shaded and is smaller than triangle ACB .’		
12		Change a to m .		Standard mark scheme but note letter change.
13		Wording added ‘Look at the diagram for Question 13 in the Diagram Booklet.’ Wording ‘A pattern is made from four identical rectangles’ removed and replaced with ‘It shows a pattern made from four identical rectangles within a set of axes.’ Diagram enlarged. Open headed arrows. Axes labels moved to the right of the horizontal axis and above the vertical axis. Crosses changed to solid dots. Wording added ‘Point C is marked on the diagram in the Diagram Booklet.’		Standard mark scheme

PAPER: 1MA1_3H		
Question	Modification	Mark scheme notes
15	<p>Wording added ‘Look at the diagram for Question 15 in the Diagram Booklet. It shows a graph...’</p> <p>Diagram enlarged. Open headed arrows. Right axis labelled. Small squares removed.</p> <p>Axes labels moved to the left of the horizontal axis and above the vertical axis.</p>	Standard mark scheme
18	<p>Wording added ‘Look at the diagram for Question 18 in the Diagram Booklet.’</p> <p>Wording ‘$OABC$ is a trapezium’ removed and replaced with ‘It shows a trapezium $OABC$.’</p> <p>Wording added ‘A straight line inside the trapezium joins point O and point B.’ Diagram enlarged.</p>	Standard mark scheme
21	<p>Wording added ‘Look at the diagram for Question 21 in the Diagram Booklet. It is a...’</p> <p>Diagram enlarged. Open headed arrows.</p> <p>Axes labels moved to the left of the horizontal axis and above the vertical axis.</p> <p>Right axis has been labelled. Small squares removed.</p> <p>Braille: also provided with a spare diagram and Wikki Stix.</p>	Standard mark scheme, but some leeway needs to be given with regard to reading off the values, and therefore also in the answer.
22	Change x to y .	Standard mark scheme but note letter change.
23	<p>Wording added ‘Look at the diagram for Question 23 in the Diagram Booklet.’</p> <p>Wording ‘ABC is a triangle’ removed and replaced with ‘It shows triangle ABC.’</p> <p>Diagram enlarged. Angles moved outside of the angle arcs and the arcs made smaller.</p>	Standard mark scheme

