Mark Scheme (Results)

November 2018

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 × 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" × 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] × 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: 1MA1/1H					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
1		9	M1	for a correct first step, using the laws of indices to simplify eg. 3^2 or 3^{7+-2} or 3^{7-3} or 3^{-2-3} OR for using exact values, eg. $2187 \times \frac{1}{9}$ (= 243) or $2187 \div 27$ (= 81) or $\frac{1}{27\times9}$ $(=\frac{1}{243})$	
			A1	cao	
2	(a)	6 or –6	M1	for $12^2 + 2 \times -3 \times 18$ (= 36)	Terms may be partially evaluated.
			A1	for 6 or –6, accept ±6	Only one value is required for full marks
	(b)	$s = \frac{v^2 - u^2}{2a}$	M1	for subtracting u^2 from both sides or dividing all terms by $2a$ as the first step	Must see this step carried out, not just the intention shown
			A1	$s = \frac{v^2 - u^2}{2a}$ oe	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
3	No (supported)	P1	for start to process, eg. $2100 \times \frac{40}{100}$ (= 840) **or** 100 – 40 (= 60)	May compare bonus shares of a single salesman or total bonus share for all 7 salesmen.
		P1	for process to find the 7 salesmen's share of bonus, eg 2100 – "840" (= 1260) **or** $2100 \times \frac{"60"}{100}$ (= 1260)	
		P1	for process to find bonus amount each salesman gets eg "1260" ÷ 7 (= 180) **OR** process to find the total bonus for all salesmen if shared equally, eg $\frac{2100}{10} \times 7$ (= 1470)	
		P1	for process to compare what a single salesman gets under each scheme, eg $"180" \times \frac{25}{100}$ (= 45) and "$\frac{2100}{10}$" – "180" (= 30) **or** $"180" \times \frac{25}{100}$ (= 45) and "180" + "45" (= 225) oe and $\frac{2100}{10}$ (= 210) **or** ("$\frac{2100}{10}$" – "180") ÷ "180" × 100 (= 16.6...) **OR** process to compare what all salesmen gets under each scheme, eg $"1260" \times \frac{25}{100}$ (= 315) and "1470" – "1260" (= 210) **or** $"1260" \times \frac{25}{100}$ (= 315) and "1260" + "315" (= 1575) oe and "1470" **or** ("1470" – "1260") ÷ "1260" × 100 (= 16.6...)	
		A1	'No' supported by correct figures, eg 45 and 30, 225 and 210, 315 and 210 **or** 1575 and 1470 **or** 16.(6...)(% and 25%)	Do not award unless correct figures have been shown to support a statement made that the salesman was not correct.

Paper: 1MA1/1H					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
4	(a)	200	M1 A1	for $120 \times 5 \div 3$ oe cao	
	(b)	statement	C1	Statement that each tap fills at the same rate or that the rate does not change over time Examples **Acceptable responses:** Taps are running at the same speed They (clearly referring to taps) all fill the pool with the same volume of water The amount of water is the same in the same time (again referring to taps) Each tap is doing a fifth of the filling That all taps take equal time to fill the pool All taps produce the same amount of water That the water flow stays at the same rate over the whole time. **Non acceptable responses** It will take more time because there are less taps The less taps used the longer it takes to fill the pool That 1 tap can take up to 24 mins each 3 taps will take longer to fill the pool	Any statement referring to the same amount of water flowing from each tap is acceptable.
5	(a)	16 to 20	P1 P1 A1	for using time = $\frac{\text{distance}}{\text{speed}}$, eg $\frac{1}{200}$ or $\frac{1}{213}$ **or** for 1 hour = 60×60 (= 3600) seconds complete process, eg $\frac{1}{200} \times 60 \times 60$ oe or $\frac{1}{213} \times 60 \times 60$ oe for answer in range 16 to 20	Calculation could be done in stages.
	(b)	decision with reason	C1	(dep on correct use of time = $\frac{\text{distance}}{\text{speed}}$) for reason related to their response to part(a), eg overestimate as speed rounded down	

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
7	shown	C1	for method to find area of semicircle, eg $\pi \times 10^2 \div 2$ $(= 50\pi)$	Can award first 3 marks if a value for π is used
		C1	for method to find area of quarter circle, for $\pi \times 20^2 \div 4$ $(= 100\pi)$	
		C1	for a complete method to find area shaded **and** area of square, eg $\pi \times 20^2 \div 4 - \pi \times 10^2 \div 2$ **and** 20×20	Working out to find the area of the shaded region **must** be shown
		C1	fully correct working leading to $\frac{\pi}{8}$	
8 (a)	1	B1	cao	
(b)	8	M1	starts process, eg $\cos(60) = \frac{4}{x}$ or $0.5 = \frac{4}{x}$ oe or $\sin 30 = \frac{4}{x}$ or $\frac{\sin 30}{4} = \frac{\sin 90}{x}$ oe	All three elements of cos, 4, x must be present in an equation. eg $\cos = 4/x$ is acceptable but $\cos(4/x)$ is insufficient
		A1	cao	

Paper: 1MA1/1H					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
9	(a)	box plot drawn	B1	ends of whiskers at 0 and 42 with a box	The box can be of any height. Accept ends that are marked (eg line, cross, dot) or defined by the end of the whiskers if clear.
			B1	median at 10 inside a box	Has to be inside a box; whiskers not required
			B1	for ends of box at 4 and 20	An independent mark that can be awarded for just a box; do not need whiskers for this mark.
	(b)	Comparison	C1	for a correct comparison of medians, eg. the median delay time on Mon was greater than the median delay time on Tues. or ft (a)	Simply quoting values for median, range and IQR is insufficient, they must be compared
			C1	for a correct comparison of a measure of spread, eg. the interquartile range (range) of delay times on Mon was greater than the interquartile range (range) of delay times on Tues. or ft (a) For the award of both marks at least one of the comparisons must be in context	Comparisons can relate to the median, and then either the range or the IQR.
	(c)	statement	C1	'No' with statement explaining that there might not be any delays between 25 minutes and 30 minutes as in the upper 25% (12 trains) the delays may all be between 17 and 25 or 30 and 33	The 'No' may be implied from their wording, and could be written next to the "?" The statement must mention (or imply) values above the UQ of 17
10	(a)	$\frac{1}{5(x-1)}$	B1	for $\frac{1}{5(x-1)}$ or $\frac{1}{5x-5}$	
	(b)	$2(5+y)(5-y)$	M1	for partial factorisation, eg $2(25-y^2)$ oe or $(10+2y)(5-y)$ oe or $(5+y)(10-2y)$ oe or $-2(y^2-25)$ oe	
			A1	for $2(5+y)(5-y)$ or $-2(5+y)(y-5)$	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
11	20	P1 P1 A1	for start of process, eg $\frac{125}{100}$ oe or $\frac{100}{125}$ oe or $\frac{25}{125}$ for a suitable process to develop a percentage, either 80% or 20% eg. $\frac{100}{125} = \frac{x}{100}$ or $\frac{125-100}{125} = \frac{x}{100}$ **or** $\frac{p}{1.25m} = \frac{xp}{m}$ or $\frac{0.25p}{1.25m} = \frac{xp}{m}$ cao	Values of amount of cereal and cost may be used, eg. 100g of cereal costing £10 An acceptable start of a process would then be: 125g of cereal costing £10 using Jack's idea
12	21	C1 C1 C1	for angle $OAB = 90 - 56$ (= 34) for process to find angle CAD (= 69) or angle BCA (= 56) or angle COA (= 138) , eg use of alternate segment theorem or angle at centre is twice the angle at the circumference cao	Throughout, angles may be written on the diagram; accept as evidence if correct. Ignore absence of degree sign Reasons need not be given.
13	enlargement scale factor $-\frac{1}{3}$ centre (2, 2)	C2 (C1	for **all** of: enlargement, (scale factor =) $-\frac{1}{3}$ oe, (centre =) (2, 2) for **two** of: enlargement, (scale factor =) $-\frac{1}{3}$ oe, (centre =) (2, 2)) Note: award no marks if more than one transformation is given	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
14 (a)	$\frac{8}{27}$	M1	for showing the 4th root of 16 as 2 **and** the 4th root of 81 as 3 **or** $\frac{8}{n}$ $(n \neq 27)$ **or** $\frac{n}{27}$ $(n \neq 8)$ **or** an intention to find the 4th root and cube, eg. $\sqrt[4]{\left(\frac{16}{81}\right)^3}$ or $\left(\sqrt[4]{\frac{16}{81}}\right)^3$ oe	
		A1	cao	
(b)	0	M1	for writing $\frac{1}{9} = 3^{-2}$, $9\sqrt{3} = 3^{2.5}$, $\frac{1}{\sqrt{3}} = 3^{-0.5}$ as powers of 3, with at least 2 correct **or** for working out $\frac{1}{9} \times 9\sqrt{3} \times \frac{1}{\sqrt{3}} = 1$	
		A1	cao	
15	3 : 10	P1	process to find ratio of lengths **A**:**B** = $\sqrt{4}$:$\sqrt{25}$ (= 2:5 or $\frac{2}{5}$ or 2, 5)	Accept working in fractions for the award of process marks but the final answer must be in correct simplified ratio notation
		P1	for process to find ratio of lengths **B**:**C** = $\sqrt[3]{27}$: $\sqrt[3]{64}$ (= 3:4 or $\frac{3}{4}$ or 3, 4)	
		P1	for process to write as one ratio eg. finding a common multiple of 3 and 5 **or** 6 : 15 : 20 oe	
		A1	cao	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
16	Proof with $\frac{127}{495}$	M1	0.25656... **or** 0.2 + 0.05656.. or $(10 \times 0.2\dot{5}\dot{6} =)\ 2.\dot{5}\dot{6}$ or 2.5656… or $(100 \times 0.2\dot{5}\dot{6} =)\ 25.\dot{6}\dot{5}$ or 25.6565…or $(1000 \times 0.2\dot{5}\dot{6} =)\ 256.\dot{5}\dot{6}$ or 256.5656…	
		M1	for finding two correct recurring decimals that when subtracted would result in a terminating decimal or integer, eg. 256.5656….. – 2.5656….. or 25.6565….. – 0.25656….. or $256.\dot{5}\dot{6} - 2.\dot{5}\dot{6}$ or $25.\dot{6}\dot{5} - 0.2\dot{5}\dot{6}$ **or** for $\frac{254}{990}$ or $\frac{25.4}{99}$	
		C1	full proof seen with $\frac{127}{495}$	
17	(2, –9)	P1	substitutes $x = 0$, $y = -5$ into $y = x^2 + ax + b$ ($b = -5$) **or** substitutes $x = 5$, $y = 0$ into $y = x^2 + ax + b$ ($0 = 25 + 5a + b$) **or** starts process to find other intercept, eg writes $y = (x - 5)(x - k)$	
		P1	for complete process to find two intercepts, eg. substitutes the second point into $y = x^2 + ax + b$ and solves to find a ($= -4$) and b ($= -5$) **or** substitutes $x = 0$, $y = -5$ into $y = (x - 5)(x - k)$ and solves to find k ($= -1$)	
		P1	(dep on P2) for factorising or completing the square of x^2 + "–4" x + "–5" and identifying the x-coordinate of the turning point **or** for a complete process to find the x-coordinate of the turning point, eg (5 + "–1")/2	
		A1	cao	x-coordinate of 2 with no or incorrect working gets NO marks

Paper: 1MA1/1H					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
18	(a)	sketch	B1	for appropriate sketch which crosses the x axis at (2,0) and (4,0), minimum point at (3,−1) and end points at (1,3) and (5,3)	Allow some tolerance on the points if the intention is clear.
	(b)	$y = g(-x)$	B1	cao	
19	(a)	shown	C1	for first step, eg $2((x + 1)^2 - 1)$ or $2(x^2 + 2x + 1 - 1)$ oe	
			C1	for fully correct chain of reasoning	It is insufficient to state $gf(x) = 2x(x + 2)$ without showing the first step, and the following sequence of algebraic steps leading to it.
	(b)	4.5	M1	process to find inverse of g, eg $g^{-1}(x) = \frac{1}{2}x + 1$ **or** for $2(x - 1) = 7$	Could be shown in the form of a flowchart, which must show inverse operations.
			A1	for 4.5 oe	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
20	fully correct working leading to $16\left(1+\sqrt{2}\right)$	C1	for expanding the numerator, eg $18 + 2\sqrt{2}\sqrt{18} + 2$ or $\sqrt{324} + \sqrt{36} + \sqrt{36} + \sqrt{4}$ (= 32) **or** for simplifying $\sqrt{18}$, eg. $\sqrt{18} = 3\sqrt{2}$ or $\sqrt{18} + \sqrt{2} = 4\sqrt{2}$	Expanded terms need not be simplified
		C1	(indep) for method to rationalise the denominator, eg. $\frac{\text{"numerator"}}{\sqrt{8}-2} \times \frac{\sqrt{8}+2}{\sqrt{8}+2}$	
		C1	for fully correct working leading to $16\left(1+\sqrt{2}\right)$	Accept $a = 16$, $b = 1$
21	3 : 4	P1	starts process eg $\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$ oe	
		P1	for process to find $\overrightarrow{OM} = \mathbf{a} + \frac{1}{2}$ "($\mathbf{b} - \mathbf{a}$)"oe ($= \frac{1}{2}(\mathbf{a} + \mathbf{b})$)	
		P1	for process to find $\overrightarrow{AP} = -\mathbf{a} + \frac{3}{5}$ "$(\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b})$" oe **or** (indep) for $\overrightarrow{AN} = -\mathbf{a} +$ "k"$\mathbf{b}$	
		P1	process to find "k" using $\overrightarrow{AN} = -\mathbf{a} +$ "k"$\mathbf{b}$ as a multiple of $\overrightarrow{AP}$	
		A1	cao	
			ALTERNATIVE	
		P1	for producing OM to C such that AC is parallel to OB	Formal geometric reasoning relating to congruent and similar triangles is not required
		P1	for process to show that $MC = OM$, using congruent triangles ACM and BOM for process to find PC as a multiple of OM/5 (= 7OM/5)	
		P1	for process to find ON as a multiple of AC(OB) (= 3OB/7) using similar	
		P1	triangles ACP and NOP	
		A1	cao	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
22	21	P1	for a relevant probability, eg P(green) = $\frac{x}{2x+3}$ or P(blue) = $\frac{x+3}{2x+3}$	the number of green and blue pens could be $x - 3$ and x or equivalent probabilities must be in an algebraic form in a single variable
		P1	for a relevant product, eg. $"\frac{x}{2x+3}" \times "\frac{x-1}{2x+2}"$ or $"\frac{x+3}{2x+3}" \times "\frac{x+2}{2x+2}"$ **OR** $\left("\frac{x}{x+3}"\right)^2 + \left("\frac{x+3}{2x+3}"\right)^2 = \frac{27}{75}$	This is an exception using replacements. No further credit is available
		P1	forms an appropriate equation, eg. $"\frac{x}{2x+3} \times \frac{x-1}{2x+2}" + "\frac{x+3}{2x+3} \times \frac{x+2}{2x+2}" = \frac{27}{55}$	
		P1	(dep P3) process to reduce equation to $ax^2 + bx + c = 0$ eg. $x^2 - 25x + 84 = 0$	
		P1	process to solve quadratic equation eg. $(x - 21)(x - 4) = 0$	
		A1	cao	

Modifications to the mark scheme for Modified Large Print (MLP) papers. Paper 1H.

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

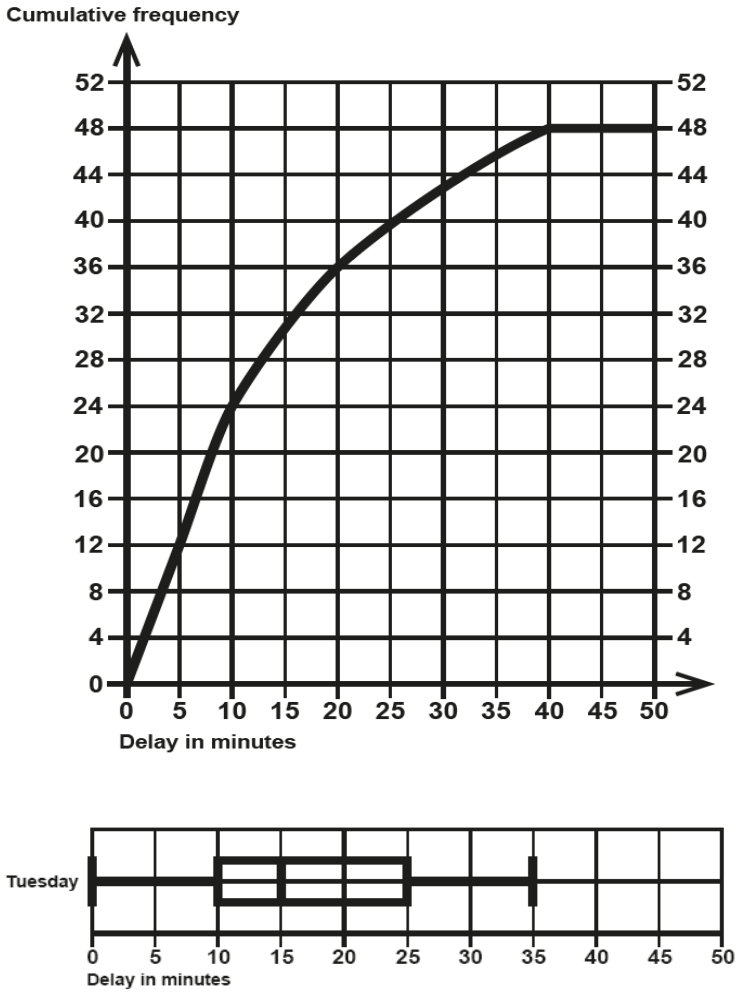
The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

Angles: ±5º

Measurements of length: ±5 mm

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
7		Diagram enlarged. Shading has been changed to dotty shading. *DC* labelled 20 cm.	Standard mark scheme
8	(b)	Diagram enlarged. Angle moved outside of angle arc and angle arc made smaller. Wording changed to 'It shows a right-angled triangle *ABC*. *AB* = 4 cm *AC* = *x* cm Angle *ABC* is a right angle Angle *BAC* = 60°'.	Standard mark scheme

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
9		Diagram enlarged. Right axis labelled. Axes labels moved to the left of the horizontal axis and above the vertical axis. Horizontal axis marked in units of 5 from 0 to 50. Vertical axis marked in units of 4 from 0 to 52. Graph lines changed to go through the following points: (5, 12), (10, 24), (20, 36), (40, 48) Graph line to finish at 48. Wording changed from 'The longest delay was 42 minutes.' To 'The longest delay was 40 minutes.'	
9	(a)	Diagram enlarged. Wording 'below' removed. Horizontal axis label moved to the left of the axis and marked in units of 5 from 0 to 50.	Standard mark scheme for the box plot drawing, but note that the box is drawn to the following points: Min LQ Median UQ Max 0 5 10 20 40
9	(b)	Horizontal axis label moved to the left of the axis and marked in units of 5 from 0 to 50. Wording 'below' removed. The box plot has been drawn as follows: Min LQ Median UQ Max 0 10 15 25 35	Standard mark scheme but note the comparisons could use the revised numbers quoted herein.
9	(c)	Question wording changed to 'The longest delay on Tuesday was 35 minutes. This means that there must be some delays of between 27 and 32 minutes.	Standard mark scheme but answers could use the revised numbers quoted herein.

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
			

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
11		Frames removed from information.	Standard mark scheme
12		Diagram enlarged. Angles moved outside of angle arcs and angle arcs made smaller. *DAE* line made slightly shorter.	Standard mark scheme
13		Diagram enlarged. Letters deleted from inside the shapes but shapes labelled as 'triangle A' and 'triangle B'. Shading changed to dotty shading. Grid cut to (-5,5). Wording added 'It shows triangle A and triangle B on a grid.'	Standard mark scheme
14	(b)	For Braille only: *a* changed to *w*, *b* changed to *x* and *c* changed to *y*	Standard mark scheme but note letter changes for braille.
17		Diagram enlarged.	Standard mark scheme
18	(a)	Diagram enlarged.	Standard mark scheme
18	(b)	Diagram enlarged. Wording 'On the grid' removed. Wording 'It shows a grid' added.	Standard mark scheme
21		Diagram enlarged.	Standard mark scheme

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