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)	$s = \dfrac{v^2 - u^2}{2a}$	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	$s = \dfrac{v^2 - u^2}{2a}$ oe	

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 $"1260" \div 7$ (= 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** $("\frac{2100}{10}" - "180") \div "180" \times 100$ (= 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** $("1470" - "1260") \div "1260" \times 100$ (= 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.

Question		Answer	Mark	Mark scheme	Additional guidance
4	(a)	200	M1	for $120 \times 5 \div 3$ oe	
			A1	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	for using time $= \dfrac{\text{distance}}{\text{speed}}$, eg $\dfrac{1}{200}$ or $\dfrac{1}{213}$ **or** for 1 hour $= 60 \times 60 \ (= 3600)$ seconds	
			P1	complete process, eg $\dfrac{1}{200} \times 60 \times 60$ oe or $\dfrac{1}{213} \times 60 \times 60$ oe	Calculation could be done in stages.
			A1	for answer in range 16 to 20	
	(b)	decision with reason	C1	(dep on correct use of time $= \dfrac{\text{distance}}{\text{speed}}$) for reason related to their response to part(a), eg overestimate as speed rounded down	

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 $\cos(60) = \dfrac{4}{x}$ or $0.5 = \dfrac{4}{x}$ oe or $\sin 30 = \dfrac{4}{x}$ or $\dfrac{\sin 30}{4} = \dfrac{\sin 90}{x}$ 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	

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)	$\dfrac{1}{5(x-1)}$	B1	for $\dfrac{1}{5(x-1)}$ or $\dfrac{1}{5x-5}$	
	(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 $-2(5+y)(y-5)$	

Question	Answer	Mark	Mark scheme	Additional guidance
11	20	P1	for start of process, eg $\frac{125}{100}$ oe or $\frac{100}{125}$ oe or $\frac{25}{125}$	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
		P1	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 $\frac{0.25p}{1.25m} = \frac{xp}{m}$	
		A1	cao	
12	21	C1	for angle $OAB = 90 - 56$ (= 34)	Throughout, angles may be written on the diagram; accept as evidence if correct. Ignore absence of degree sign Reasons need not be given.
		C1	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	
		C1	cao	
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	

Question	Answer	Mark	Mark scheme	Additional guidance
14 (a)	$\dfrac{8}{27}$	M1	for showing the 4th root of 16 as 2 **and** the 4th root of 81 as 3 **or** $\dfrac{8}{n}$ $(n \ne 27)$ **or** $\dfrac{n}{27}$ $(n \ne 8)$ **or** an intention to find the 4th root and cube, eg. $\sqrt[4]{\left(\dfrac{16}{81}\right)^3}$ or $\left(\sqrt[4]{\dfrac{16}{81}}\right)^3$ oe	
		A1	cao	
(b)	0	M1	for writing $\dfrac{1}{9} = 3^{-2}$, $9\sqrt{3} = 3^{2.5}$, $\dfrac{1}{\sqrt{3}} = 3^{-0.5}$ as powers of 3, with at least 2 correct **or** for working out $\dfrac{1}{9} \times 9\sqrt{3} \times \dfrac{1}{\sqrt{3}} = 1$	
		A1	cao	
15	3 : 10	P1	process to find ratio of lengths **A:B** $= \sqrt{4}:\sqrt{25}$ $(= 2:5$ or $\dfrac{2}{5}$ 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 $\dfrac{3}{4}$ 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	

Question	Answer	Mark	Mark scheme	Additional guidance
16	Proof with $\dfrac{127}{495}$	M1	$0.25656...$ **or** $0.2 + 0.05656..$ or $(10 \times 0.25\dot{6} =)$ $2.\dot{5}\dot{6}$ or $2.5656…$ or $(100 \times 0.25\dot{6} =)$ $25.\dot{6}\dot{5}$ or $25.6565…$ or $(1000 \times 0.25\dot{6} =)$ $256.\dot{5}\dot{6}$ 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 $25.\dot{6}\dot{5} – 0.25\dot{6}$ **or** for $\dfrac{254}{990}$ or $\dfrac{25.4}{99}$	
		C1	full proof seen with $\dfrac{127}{495}$	
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

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 $g^{-1}(x) = \dfrac{1}{2}x + 1$ **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	

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. $\dfrac{\text{"numerator"}}{\sqrt{8}-2} \times \dfrac{\sqrt{8}+2}{\sqrt{8}+2}$	
		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 $\overrightarrow{OM} = \mathbf{a} + \dfrac{1}{2}$ "$(\mathbf{b} - \mathbf{a})$"oe $(=\frac{1}{2}(\mathbf{a} + \mathbf{b}))$	
		P1	for process to find $\overrightarrow{AP} = -\mathbf{a} + \dfrac{3}{5}$ "$(\dfrac{1}{2}\mathbf{a} + \dfrac{1}{2}\mathbf{b})$" 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	
		P1 P1 P1 P1 A1	**ALTERNATIVE** for producing OM to C such that AC is parallel to OB for process to show that $MC = OM$, using congruent triangles ACM and BOM for process to find PC as a multiple of $OM/5$ $(= 7OM/5)$ for process to find ON as a multiple of $AC(OB)$ $(= 3OB/7)$ using similar triangles ACP and NOP cao	Formal geometric reasoning relating to congruent and similar triangles is not required

Question	Answer	Mark	Mark scheme	Additional guidance
22	21	P1	for a relevant probability, eg P(green) = $\dfrac{x}{2x+3}$ or P(blue) = $\dfrac{x+3}{2x+3}$	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. $"\dfrac{x}{2x+3}" \times "\dfrac{x-1}{2x+2}"$ or $"\dfrac{x+3}{2x+3}" \times "\dfrac{x+2}{2x+2}"$ **OR** $\left("\dfrac{x}{x+3}"\right)^2 + \left("\dfrac{x+3}{2x+3}"\right)^2 = \dfrac{27}{75}$	This is an exception using replacements. No further credit is available
		P1	forms an appropriate equation, eg. $"\dfrac{x}{2x+3} \times \dfrac{x-1}{2x+2}" + "\dfrac{x+3}{2x+3} \times \dfrac{x+2}{2x+2}" = \dfrac{27}{55}$	
		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.

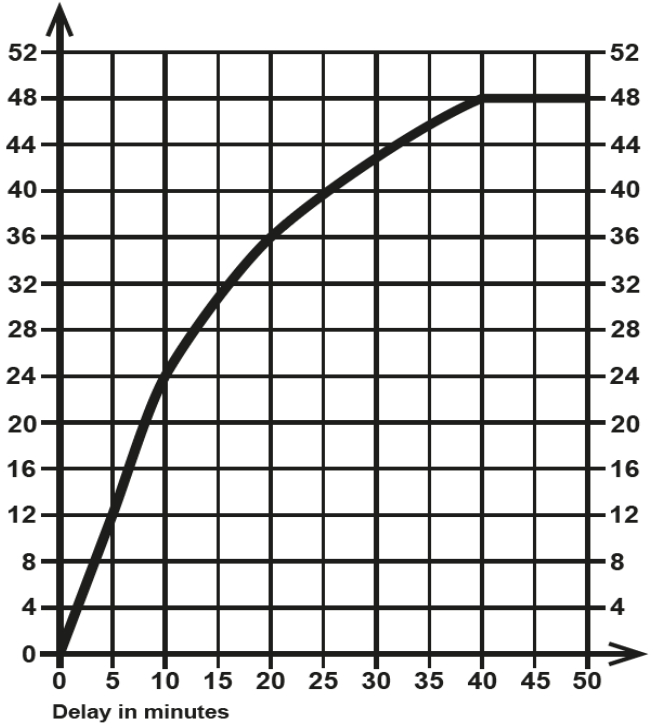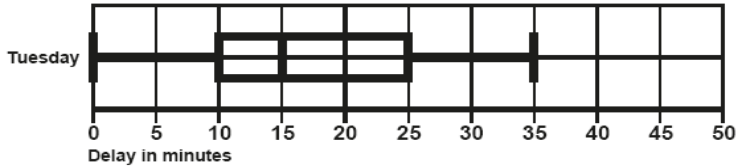The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

Angles: ±5°

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

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**
	Cumulative frequency graph with axes from 0 to 52 (Cumulative frequency) and 0 to 50 (Delay in minutes), with a curve rising from 0 to 48. Below, a box plot labelled "Tuesday" against a scale of Delay in minutes from 0 to 50.	

Cumulative frequency

Delay in minutes

Tuesday

Delay in minutes

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
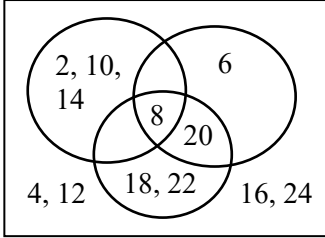
Mark Scheme (Results)

November 2018

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
1 (a)	Venn diagram	C4	fully correct Venn diagram	
		(C3	7 of the 8 regions correct **or** for a diagram with only one number incorrectly placed)	
		(C2	5 or 6 of the 8 regions correct)	
		(C1	3 or 4 of the 8 regions correct)	
(b)	$\dfrac{1}{12}$	M1	ft for identification of 1 or 12 eg from the diagram	Need not be written as a fraction or probability at this stage. eg could be a ratio 1:12
		A1	ft oe	Acceptable equivalents are (eg, could ft) any fraction equivalent to $\dfrac{1}{12}$, 0.08(33..) or 8(.33..)%

Question	Answer	Mark	Mark scheme	Additional guidance
2	statements	C1	for lobf incorrect **Acceptable examples** lobf lobf does not suit all points/not a lobf lobf wrong since hits x axis/is inaccurate/should be amongst the crosses lobf goes through the origin/through one point **Not acceptable examples** no correlation/there is no title	
		C1	for height scale not linear **Acceptable examples** 150 missing Height not linear / Height numbers going up wrong **Not acceptable examples** 150 graph does not start at 140/graph does not start at 0 height should start at 170	

Question	Answer	Mark	Mark scheme	Additional guidance
3	60	M1	use of parallel lines to find an angle eg *ABE*=70 **or** *EBG*=75 **or** *EBC* = 110 **or** shows parts of *x* as 35 or 25	Parts of *x* should be identified on the diagram by the insertion of a dividing line through angle *x* (need not be identified or drawn parallel).
		M1	for a complete method to find angle *x*; could be in working or on the diagram	Correct method can be implied from angles on the diagram if no ambiguity or contradiction.
		A1	for *x* = 60	
		C1	(dep on M1) for one reason linked to parallel lines and one other reason, supported by working taken from: alternate angles are equal, allied angles / co-interior angles add up to 180, angles on a straight line add up to 180, angles in a triangle add up to 180º	Underlined words need to be shown; reasons need to be linked to their method; any reasons not linked do not credit. There should be no incorrect reasons given.
4 (a)	Ben (supported)	P1	shows how to work interest out for one year eg 2000 × 0.025 (= 50) **or** 1600 × 0.035 (= 56) **or** 150 **or** 168 **or** 2000×1.025 (= 2050**)** or 1600 × 1.035 (= 1656)	Throughout accept figures ±1 pence which do not need to be presented in money notation (to 2dp) or with monetary symbols.
		P1	shows compound interest calculation for one account eg 2050→51.25 **or** 2101.25→52.53 or 1656→57.96 **or** 1713.96→59.99 eg 2000×1.025³ (= 2153.78**) or** 1600 × 1.035³ (= 1773.95)	Award mark for a correct process shown, for which these figures can be taken as implying the process.
		P1	shows complete compound interest calculation for both accounts eg 2000×1.025³ (= 2153.78**) and** 1600 × 1.035³ (= 1773.95) OR one interest stated correctly eg 153.78 **or** 173.95	As above, award mark for both correct processes shown for both accounts, which these figures can be taken as implying the process.
		C1	Ben (shares) supported by 153.78 **and** 173.95	Accept an answer of "shares".

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
4 (b)	conclusion	C1	conclusion (ft) eg no change, shares now 182.5… **Acceptable examples** no since shares/Ben now 182.5 Still Ben since 182.5 > Ali No; he only gets 8.57 more No; he gets 68.56 instead of 59.98 (3ʳᵈ yr) No; Ben already gets more interest, he would just get even more **Not acceptable examples** no shares now 182.5 Still Ben since less than Ali 182.5 > 153.78 no; he needs 20.17 more .	Conclusion needs to be supported. ft is from part (a); calculations carried out as part of (b) need to be correct for the comparison to be valid.
5	No (supported)	P1	calculates area of trapezium eg ½ × 7 × (10+16) (= 91)	
		P1	for division by coverage eg ÷2 or [area of trapezium] ÷ 2 (= 45.5) or process to find coverage per tin eg 5 × 2 (= 10) · for process to find number of tins bought eg 160 ÷ 16.99 = 9 tins	[area of trapezium] needs to be clearly stated if the process of finding the area is not clear
		P1	for division to find the number of tins eg ÷5 or "45.5" ÷ 5 (= 9.1) **or** [area of trapezium] ÷ "10" (= 9.1) · for using whole no. of tins to find total litres eg 9 × 5 (= 45)	
		P1	(dep on at least P2) for a process to multiply a whole number of tins (rounded up) by 16.99 · (dep on at least P2) for a process to find the total coverage eg "45" × 2 (= 90)	
		C1	for 'No' supported by correct figures eg 169.9 or 90 **and** 91	There must be a conclusion ("No" or equivalent wording) including the figure 169.9 and working showing processes followed.

Question		Answer	Mark	Mark scheme	Additional guidance
6		7	P1	process to use gradient eg $y=3x+c$ **or** c $= -6$ **or** $\dfrac{15-9}{d-5}$ **or** $(15-9) \div 3$ **or** $(6, 12)$	Condone use of a letter other than d, for d
			P1	(dep) full process to rearrange equation formed to isolate d eg rearrangement of $15 = 3d - 6$ or $3 = \dfrac{15-9}{d-5}$ **or** for $5 + \dfrac{15-9}{3}$	Must show processes to get as far as $d =$ Award P2 for an answer of $(7, 15)$
			A1	cao	
7	(a)	8.623×10^{-5}	B1	cao	
	(b)	7.44×10^6	M1	for $\dfrac{3200 + 0.051}{0.00043}$ or $\dfrac{3200.051}{0.00043}$ **or** performs an operation eg shows 163.2, 7441860.5, 118.6(…) **or** an answer or $7.44(….) \times 10^n$ where $n \neq 6$ or $7441979(….)$ **or** an answer of 7.4×10^6	7441979.0689…
			A1	for $7.44(1979…) \times 10^6$	If a correct answer is shown in working and then rounded incorrectly, award full marks. Answer need only be given correctly to 3 sig fig; if following digits are incorrect ignore them.
8		Rotation	M1	stating rotation **or** for showing **R** [(1,1), (1,−3), (3,−3)]	Award for a triangle in the correct position without the label R as long as this is the only triangle in lower right quadrant.
		90º anticlockwise	A1	for rotation of 90º anticlockwise	Accept rotation of 270° clockwise
		centre (−1,1)	A1	for centre (−1, 1) given as a coordinate.	Can be given as a coordinate alone. Do not award A marks if there is evidence of other transformations in the description, or other ambiguity in the answer given.

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
9	$7 \leq N < 8$	M1	for identifying the key numbers 7 and 8	Ignore any inequality symbols used at this stage Accept 7.9 (recurring) for 8 as shown by 7.999 or 7.9… or recurring notation (or words)
		A1	cao	
10	35	P1	use of ratio 2:3 and tin quantities to find overall ratio of litres eg 4:3 or 4 tins : 3 tins **or** 20 litres (Y) & 30 litres (B)	
		P1	calculates total cost of making paint eg 4 × 26 + 3 × 48 (50 litres) **or** 104+144 (=248)	Could be multiples 4 & 3 (for an amount which is a multiple of 50 litres). "248" is the total cost for making 50 litres
		A1	calculates comparable cost eg 10 litres (1 tin) green paint made as 49.6 **or** differences (profit) for 1 tin as 17.36 or 5 tins as 86.8 **or** total comparable costs for 50 litres as 334.8 **and** 248, for 25 litres as 167.4 **and** 124 or 1 litres as 33.48 **and** 24.8	"248" ÷ 5 = 49.6 for 10 litre (1 tin) green paint made Profit on 10 litres is 66.96 − 49.60 = 17.36 Profit on 50 litres is 304.8 − 248 = 86.8 334.8 comes from 5 × 66.96 and is the selling price for 50 litres green paint
		P1	for percentage calculation eg $\dfrac{1736}{4960} \times 100$, $\dfrac{"334.8"-"248"}{"248"} \times 100$	
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
11	1335	M1	for one correct procedure eg 9×15 (=135) **or** 15×8 (=120) **or** $9 \times 15 \times 8$ (=1080)	Ignore additional products.
		M1	for all three correct products eg "135", "120", "1080" **or** 9×15, 15×8, $9 \times 15 \times 8$ oe	Only these three products must be identified. There is no need to indicate summing at this stage.
		C1	for showing the three correct products added eg $135 + 120 + 1080$	There is no need to show the three products sum to 1335
12 (a)	$\dfrac{4x-6}{3x-9}$	M1	factorises numerator of $4x^2 - 9$ eg $(2x-3)(2x+3)$ oe	$\dfrac{2x(2x-3)(2x+3)}{3x(2x+3)(x-3)}$
		M1	factorises denominator eg $x(x{-}3)$ or $3(2x+3)$ or for $3x(2x^2 - 3x - 9)$	
		A1	cancels to give $\dfrac{4x-6}{3x-9}$	Accept $a = 4$, $b = -6$, $c = 3$, $d = -9$
(b)	$\dfrac{-x+8}{x(x+1)(x-2)}$	M1	method to use a common denominator eg $x(x{+}1)(x{-}2)$ by multiplying terms	Method must involve finding equivalents for all three separate terms; may be done in several stages.
		M1	deduce numerator eg $3x(x{-}2) + x(x{+}1) - 4(x{+}1)(x{-}2)$	
		A1	oe	Equivalents must be algebraically equivalent and must have involved full simplification.

Question	Answer	Mark	Mark scheme	Additional guidance
13	84.9	P1	shows a process to find the radius or diameter eg $44 = 2 \times \pi \times r$ **or** $r = \dfrac{22}{\pi}$ **or** $d = \dfrac{44}{\pi}$ **or** $r = 7.0028$ **or** $d = 14.0056..$	Allow r in the range 7 to 7.1 and d in the range 14 to 14.1 Could be shown on the diagram.
		P1	(dep on P1) complete method to find the area eg $\frac{1}{2} \times$ "d"$^2 \times$ Sin60 oe, $\frac{1}{2} \times 14 \times$ Tan60 oe, $\frac{1}{2} \times 14 \times \sqrt{14^2 - 7^2}$ oe	
		A1	for answer in the range 84.8 to 85	If the correct answer in the range is given in working and then rounded incorrectly award full marks.
14	curve	C1	sketch of graph which starts above x-axis for negative x, and makes an increasing exponential rise into positive x	Condone graph "touching" the x axis. Do not award from a graph for positive x only.
	(0,1) labelled	C1	for showing a label of (0,1) on the y axis	Do not award if a point is given for crossing the x-axis. Accept the coordinates shown as a label of "1" written on the y axis at the intersection.
15	6.5	B1	oe	Accept (eg) $6\dfrac{1}{2}$ and $\sqrt{42.25}$

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
16 (a)	0.455	M1	for $0.65 \times (1 - 0.65)$ or 0.65×0.35 $(=0.2275$ or $\frac{91}{400})$ or 2×0.2275 oe	Could be shown on a tree diagram but must show an intention to multiply
		A1	oe	Acceptable equivalents are 45.5% or $\frac{91}{200}$ oe
(b)	42	M1	for a start of the process eg $78 \div 0.65$ $(= 120)$ or 78×0.35 $(=27.3)$	$\frac{78 \times 0.35}{0.65}$, $\frac{78}{0.65} - 78$
		A1	cao	
17	4 : 1	P1	for associating algebraic expressions with the correct ratio eg $p - 5 : q - 5$ $(= 5 : 1)$ or $p + 20 : q + 20$ $(= 5 : 2)$	
		P1	for $\dfrac{p+20}{q+20} = \dfrac{5}{2}$ **or** $\dfrac{p-5}{q-5} = \dfrac{5}{1}$ oe **or** $p - 5 = 5(q - 5)$ **or** $2(p + 20) = 5(q + 20)$ oe	Award for one of the two simultaneous equations eg $5q - p = 20$, $5q - 2p = -60$ oe
		M1	for a complete method shown to find p **or** q	Award for a simultaneous equation method to eliminate one variable leading to either $p = 80$ or $q = 20$
		M1	for a complete method shown to find p **and** q **or** two values for p and q that are in the ratio 4 : 1 or an unsimplified ratio 4 : 1 (eg 80 : 20) or an answer of 1 : 4	Award for a simultaneous equation method to eliminate both variables leading to either $p = 80$ **and** $q = 20$
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
18	$\left(\dfrac{-16}{5}, \dfrac{48}{5}\right)$	P1	for a method to find gradient of **L**₁ eg $\dfrac{6-2}{4-12}$ $(=-½)$ or states **L**₂ as $y = -3x$	Ignore sketches.
		P1	(dep on P1) for a method to find equation of **L**₁ eg subs into $y=$ "$-½$"$x+c$ OR states **L**₁ as $y =$ "$-½$"$x + 8$	
		P1	(dep on P2) complete method to equate both lines eg "$-½$"$x + 8 = -3x$	
		A1	oe	Accept equivalents eg $(-3.2, 9.6)$
19	$9 < m < 11$ $-11 < m < -9$	M1	for a correct method to begin rearranging to solve for m^2 eg $88 < m^2 + 7$ or $m^2 + 7 < 128$ or $81 < m^2 < 121$	It is insufficient to just multiply all three elements by 4; some rearrangement must occur such as showing as two separate inequalities or isolating m^2
		M1	for a complete method to $m^2 = 81$ or $m^2 = 121$ or better	Accept an inequality used in place of "=". m^2 must be isolated at this stage.
		M1	for a set of critical values: at least two out of $9, 11, -9, -11$	Do not award if other values are also given eg 10
		M1	for selecting a correct inequality for one set of critical values eg $9 < m$ and $m < -9$ **or** $m < 11$ and $-11 < m$ **or** $9 < m$ and $m < 11$ or a set of inequalities with some error eg $9 ? m ? 11$ and $-11 ? m ? -9$ where ? is an incorrect inequality symbol like $9 < m \le 11$ or $9 \ge m \ge 11$ or answer given as $\pm 9 < m < \pm 11$	Could be shown as $9 < m < 11$ or $-11 < m < -9$ or $-11 < m < 11$
		A1	$9 < m < 11$ and $-11 < m < -9$ given as boundaries of m	Accept with an "and" or an "or" or neither

Question	Answer	Mark	Mark scheme	Additional guidance
20	3.75	P1	works to find vol of frustum eg $1/3\pi(3.6)^2 \times 6.4 - 1/3\pi(1.8)^2 \times 3.2$ or $86.858.. - 10.857\ldots$ (=24.192π or 76.00..)	
		P1	works to find vol of hemisphere eg $\frac{1}{2} \times \frac{4}{3}\pi \times 3.6^3$ (=31.104π or 97.7....)	781.7… by use of diameter does not get the mark
		P1	mass of frustum as [vol]×density eg "76.00" × 2.4 (=182.4..) **or** mass of hemisphere as [vol]×density eg "97.7...."×4.8 (=469.037...)	[vol] is their volume which could be ft using the radius, using the diameter, or could be another value as long as it is stated as being the volume, or clearly intended from working.
		P1	mean density as total mass ÷ total volume eg ("182.4.." + "469.037") ÷ ("76…" + "97.7..") or "651.4..". ÷ "173.7...."	All figures must come from correct method shown.
		A1	answer in the range 3.7 to 3.8	
21	proof	C1	uses cyclic quad eg if *CAB* = *x* then *CRO* = 180 – *x* (<u>Opposite angles</u> of a <u>cyclic quadrilateral</u> add up to 180º.)	Underlined words need to be shown; reasons need to be linked to their method; any reasons not linked do not credit.
		C1	establishes relationship outside a circle eg *ORB* = *x* (<u>Angles</u> on a straight <u>line</u> add up to 180)	Correct method can be implied from angles on the diagram if no ambiguity or contradiction.
		C1	uses properties of a circle eg *RO* = *OB* (both radii) so *ABC* = *x* (Base angles of an <u>isosceles triangle</u> are equal.)	
		C1	Complete proof and conclusion	Full reasons given without any redundant reasons and correct reasoning throughout.

Question 14: sketch of $y = 2^x$
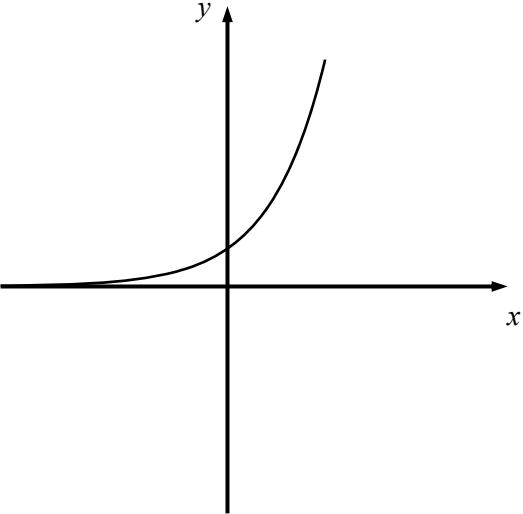
Modifications to the mark scheme for Modified Large Print (MLP) papers. Paper 2H.

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. Wording added 'It shows a Venn diagram.' Circles labelled 'set A', 'set B' and 'set C'. Braille only – sticky labels provided.	Standard mark scheme
2	Diagram enlarged. Crosses changed to solid dots. Axes labels moved to the left of the horizontal axis and above the vertical axis. Wording changed from 'Here is his answer.' to 'His answer is shown in the Diagram Book.'	Standard mark scheme
3	Diagram enlarged. Arrows moved further to the right and made bigger. Angles moved outside of the angle arcs and angle arcs made smaller. Wording added 'Angle CBG = 35°, Angle BED = 110°, Angle GEF = 25°, Angle BGE is marked x.' Wording changed from 'Work out the size of angle x.' to 'Work out the size of the angle marked x.	Standard mark scheme

Question	Modification	Mark scheme notes
5	Diagram enlarged and a model provided for all candidates. Wording added 'The diagrams show a floor in the shape of a trapezium and a tin of paint. The model represents the tin of paint.' Braille only – parallelogram labelled ABCD, added information about the shape.	Standard mark scheme
8	Diagram enlarged. Shading changed to dotty shading. Wording added 'It shows triangle P, triangle Q and triangle R on a grid.' Triangle P moved to (1,3), (5,3), (5,5). Triangle Q added at (-3,-1), (-3,-5), (-5,-5) and Triangle R added at (1,-1), (1,-5), (3,-5). Labels put above the shapes. Shape provided for all candidates. Wording added 'A cut out shape is available if you wish to use it.' Question wording changed: 8(a) Describe the single transformation that maps triangle P onto triangle Q.' (1 mark) 8(b) Describe the single transformation that maps triangle Q onto triangle R.' (1 mark) 8(c) Describe fully the single transformation that maps triangle R onto triangle P.' (1 mark)	(a) C1 for "reflection in the line $y = -x$ (b) C1 for "reflection in the line $x = -1$" (c) C1 for "rotation of 90° anticlockwise about the point $(-1,1)$" OR rotation of 270° clockwise about the point $(-1,1)$
12	In both parts x changed to y.	Standard mark scheme but x changed to y.
13	Diagram enlarged	Standard mark scheme
14	Diagram enlarged	Standard mark scheme

PAPER: 1MA1_2H		
Question	**Modification**	**Mark scheme notes**
20	Diagrams enlarged, simplified and made 2D. 2 models provided, Model 1 and Model 2. Wording changed to 'There are two models, Model 1 and Model 2.' Diagrams labelled Diagram 1 and Diagram Wording changed from 'Here is a frustum of a cone' to 'Diagram 1 and Model 1 show a frustum of a cone'. Wording changed from 'The frustum is'. to 'Diagram 2 and Model 2 show the frustum'. Wording 'shown below' removed	Standard mark scheme
21	Diagram enlarged	Standard mark scheme

Mark Scheme (Results)

November 2018

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

Question	Answer	Mark	Mark scheme	Additional guidance
1 (a)	7360	B1	cao	
(b)	0.1077981356	B2	for 0.1077(981…)	Answer must be given to at least 4 decimal places rounded or truncated
		(B1	for 5.74(45626…) **or** 53.29 **or** 0.11 **or** 0.107 **or** 0.108)	Accept a clear indication of the decimal point. Check first four decimal places only
2	260 to 260.5	M1	for 883 − 245 (=638) **or** 883 ÷ 245 (=3.60..) **or** 883 ÷ 245 × 100 (=360(.408...)) oe	
		M1	for a complete method to find the percentage increase eg "638" ÷ 245 × 100 (=260(.408..)) **or** 883 ÷ 245 × 100 − 100 (=260(.408..)) oe	
		A1	Accept answers in the range 260 to 260.5	

Question		Answer	Mark	Mark scheme	Additional guidance
3	(a)	2, −4, 2, 8	B2	all 4 values correct	
			(B1	for 2 or 3 correct values)	
	(b)	Graph	M1	(dep B1) for at least 5 points plotted correctly ft from part a	
			A1	for a fully correct curve drawn	Accept freehand curves drawn that are not line segments; there must be some attempt to draw the minimum point below $y = -4$
	(c)	−2.6 or 1.6	B1	for 1 correct value, ft a non linear graph	Award for −2.6 or 1.6 or both values but do not award the mark if a correct value is given with an incorrect value. Accept 1.56 or −2.56 Note for ft to be applied if the graph may be joined by line segments

Paper: 1MA1/3H					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
4 (a)		5	M1	"2" ÷ 40 × 100	"2" comes from their reading of the height of the 20 to 24 column
			A1	cao	
	(b)	9.5 shown	M1	for frequencies of 11, 8, 13, 6 and 2 (allow one error) **or** for midpoints 2, 7, 12, 17 and 22	May be seen on chart
			M1	for finding at least 4 products *fx* consistently within interval (including end points)	
			M1	for Σ"*fx*" ÷ ("11" + "8" + "13" + "6" + "2") **or** (11×2 + 8×7 + 13×12 + 6×17 + 2×22) ÷ 40 **or** Σ"*fx*" (=380) **and** 9.5 × ("11" + "8" + "13" + "6" + "2") (=380)	Evidence of two different calculations that should lead to 380 are required for this mark
			C1	for correct figures showing the answer or accurate figures to compare from correct working eg 380 from two calculations	

Question		Answer	Mark	Mark scheme	Additional guidance
5	(a)	2 mins 48 secs	P1	for an appropriate first step eg 700 ÷ 475 (=1.47..) **or** 475 ÷ [time] (= 4.16.. m/s) **or** [time] ÷ 475 (= 0.24 s/m)	[time] what candidate indicates as time of first race Units are not needed and can be ignored if given
			P1	for a complete method to find the required time eg 700 ÷ 475 × [time] (=168) **or** 700 ÷ (475 ÷ [time]) (=168) **or** [time] ÷ 475 ×700 (=168)	Allow calculation in stages and appropriate rounding.
			A1	cao	
	(b)	Statement	C1	eg takes less time **Acceptable examples** Quicker time Faster time Reduces my answer to part (a) **Not acceptable examples** It is an underestimate The amount of time could/may increase Laura goes faster	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
6	17.3	P1	for full process to find either angle eg (180 − 90) ÷ (2+3) ×2 (=36) **or** for 36 or 54 seen as an angle	May be seen on diagram Condone correct values if incorrectly placed.
		P1	for a correct equation using trigonometry eg cos [A] = 14÷ AB	This must be shown as an equation with all four elements (eg cos, [A], 14, AB) present. [A] could be 36 or any angle clearly and unambiguously identified as A. This also applies to [B] with Sine.
		P1	(dep previous P mark) for rearranging their trigonometry equation to make AB the subject eg (AB =) "14 ÷ cos 36"	
		A1	for an answer in the range 17.3 to 17.4	If an answer is shown in the range in working and then incorrectly rounded award full marks.

Question	Answer	Mark	Mark scheme	Additional guidance
7	Diagram drawn	B2	for correct frequency polygon	Plotting at (5,14), (15,18), (25,26), (35,12) Must use line segments for B2
		(B1	for points plotted at correct midpoints of intervals	
			or joining points at correct heights consistently within intervals including plotting at end values	Joining must be with line segments
			or correct frequency polygon with one point incorrect	NB ignore any histogram drawn and any part of frequency polygon outside range of first and last points plotted
			or correct frequency polygon with first and last points joined directly)	
8	8	P1	process to start the problem eg $xy = 45$ **and** $xz = 15$ **and** $yz = 27$ **or** 5×9 (=45) **and** 3×9 (=27) **and** 3×5 (=15) **or** 3, 5 and 9 stated	Maybe seen on diagram
		P1	for $3 \times 5 \times 9$ (=135) **or** 2 of "9" ÷ 2.5 (=3.6) **or** "5" ÷ 2.5 (=2) **or** "3" ÷ 2.5 (=1.2)	
		P1	for 2.5^3 (=15.625) **or** all of "9" ÷ 2.5 (=3.6) **and** "5" ÷ 2.5 (=2) **and** "3" ÷ 2.5 (=1.2)	
		P1	for a complete process to find the number of cubes possible eg [volume] ÷ "15.625" (=8.64) **or** "3.6" × "2" × "1.2" (=8.64)	[Volume] must come from multiplying together what they clearly indicate as the 3 dimensions of the cuboid. The three dimensions cannot be 45, 27 and 15
		A1	cao	

Question		Answer	Mark	Mark scheme	Additional guidance
9	(a)	$2x^3 + x^2 - 7x - 6$	M1	for a method to find the product of two linear expressions eg 3 correct terms out of 4 terms or 4 terms ignoring signs	Note that (eg) $-x - 6$ in expansion of $(x - 2)(2x + 3)$ is to be regarded as 3 correct terms.
			M1	for a complete method to obtain all terms, half of which are correct (ft their first product) eg $2x^3 - x^2 - 6x + 2x^2 - x - 6$	First product must be quadratic but need not be simplified or may be simplified incorrectly
			A1	cao	
	(b)	-5	M1	for beginning to combine indices eg 4+n or y^{-3+2}	
			A1	cao	
	(c)	1.27 and -0.472	M1	for substitution into the formula	Condone one sign error in the substitution Accept -4^2 or $(-4)^2$
			M1	for simplifying to the form $\frac{-b \pm \sqrt{N}}{k}$ eg $\frac{4 \pm \sqrt{76}}{10}$ **or** 1.27 to 1.28 **or** -0.48 to -0.47	
			A1	for 1.27 to 1.28 **and** -0.48 to -0.47	

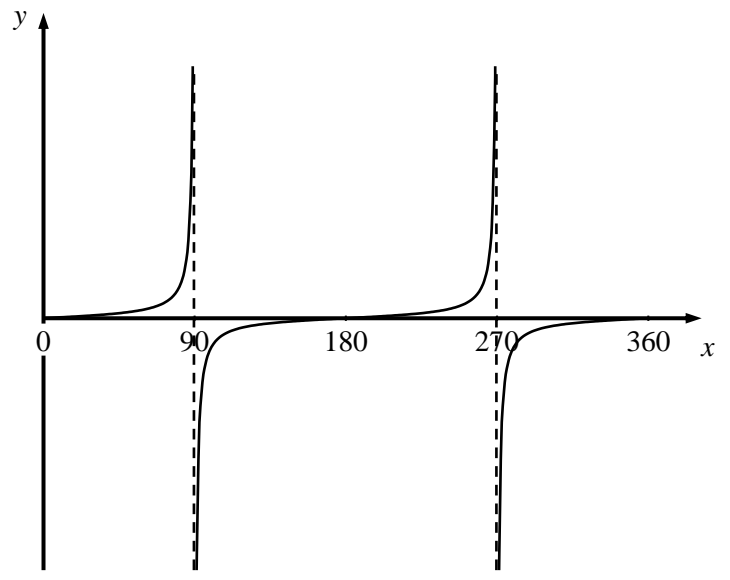| Question		Answer	Mark	Mark scheme	Additional guidance
10	(a)	1.56	B1	1.56 to 1.563	
	(b)	3.63	M1	for a complete method to find fg(34) eg 4 sin 65(=3.625..) **or** fg(x) eg 4 sin ($2x-3$)	
			A1	for answer in the range 3.6 to 3.63	If an answer in the range is seen in working and then incorrectly rounded award full marks.
	(c)	Statement	C1	for statement eg positive and negative square root required. **Acceptable examples** The other answer is −9 The quadratic should have 2 solutions. **Not acceptable examples** He has not expanded the brackets. He needed to (x+4) twice as there is a squared sign. (x+4)² is 16 not 25. Didn't expand the bracket.	
11		Graph drawn	C2	for fully correct sketch between 0° and 360°	
			(C1	for a graph with clear asymptotes at 90° and 270° only **or** the correct graph translated along the x-axis must have a period of 180)	

Question	Answer	Mark	Mark scheme	Additional guidance
12	73.6	P1	for correct initial use of Pythagoras eg $5^2 + 5^2$ (=50) **or** a trigonometric ratio in the form $\frac{5 \div 2}{0.5AC} = \sin 45$ oe	
		P1	for finding the length of half of the diagonal eg $\sqrt{"50"} \div 2$ (= 3.5...) **or** $0.5AC = \frac{5 \div 2}{\sin 45}$ (=3.5...) oe	do not accept $\sqrt{20} \div 2$
		P1	for process to use tan eg tan $TAC = (12 \div "3.5..")$ (=3.3..) **or** complete alternative method arriving at an equation with the subject as sin TAC or cos TAC	
		A1	for an answer in the range 73.58 to 74.1	
13	408	M1	for 1.01×400 (= 404) or 408.04 or 412.08	412(.08) on the answer line M1A0 1.01×400 may be seen as part of a calculation
		A1	cao	
14	Evidence of solution	M1	for constructing an equation eg $y \propto \frac{1}{x^3}$ or eg $y = \frac{k}{x^3}$ oe	
		M1	for substituting in the values a and 44 into $y = \frac{k}{x^3}$	
		C1	for a complete method to use the equation, the value of k and $x = 2a$ to show $y = 5.5$ eg $(2a)^3 y = 44a^3$ and $y = 44a^3 \div 8a^3 = 5.5$	Must show all steps clearly

Question	Answer	Mark	Mark scheme	Additional guidance
15	proof	C1	for writing an expression for an odd number, eg $2n + 1$ or $2n - 1$ (assuming n is any integer) **or** states n is even and eg $(n + 1)$ or $(n + 3)$ as odd numbers	
		C1	for a correct expression of the form $(2n + 1)^2 - (2n - 1)^2$ expanded eg $4n^2 + 12n + 9 - (4n^2 + 4n + 1)$ or $4n^2 + 4n + 1 - (4n^2 - 4n + 1)$ **or** $(2n + 1 + 2n - 1)(2n + 1 - (2n - 1))$ **or** when n is even and eg $(n^2 + 6n + 9) - (n^2 + 2n + 1)$ $(=4n + 8)$	Expansion of $(2n - 1)^2 - (2n + 1)^2$ oe is acceptable
		C1	for a correct simplified expression as a multiple of 8 eg $8n + 8$ or $8n$ **or** when n is even **and** eg $4n + 8$ **and** full explanation as to why $4(n+2)$ is always a multiple of 8	
16	39.9	P1	for finding the length of the minor or major arc eg $\frac{220}{360}\pi \times 12$ $(= 23(.03834..))$	Allow appropriate rounding if calculation seen in parts
		P1	for substituting into the sine or cosine rule to find OD eg $14 \div \sin 140 = OD \div \sin 24$ **or** $(OD^2 =)\ 6^2 + 14^2 - 2 \times 6 \times 14 \times \cos 24\ (=78.5....)$	Must involve OD in the relationship but may be implied
		P1	for a complete process to find the length OD eg $14 \div \sin 140 \times \sin 24$ $(=8.8(58778..))$	
		P1	for a complete process to find the perimeter eg "$23(.03834..)$" + 14+ "$8.8(58778..)$" $- 6$	May be seen in multiple calculations
		A1	for an answer in the range 39.8 to 40	If an answer in the range is seen in working and then incorrectly rounded award full marks.

Question		Answer	Mark	Mark scheme	Additional guidance
17	(a)	Histogram drawn	B3	for fully correct histogram eg relative heights 6, 3, 4, 2, 2	
			(B2	for 4 correct blocks **or** all 5 frequency ÷ class interval **and** 1 correct block)	
			(B1	for at least 2 correct blocks of different widths **or** for frequency ÷ class interval for at least 3 frequencies)	
	(b)	66 to 71	M1	indication of the median in the third interval **or** proportional method shown	Just stating the interval is sufficient for this mark May be implied by the number on the answer line
			A1	ft answer between 66 and 71	Median is at (approx.) 68.75 by a proportional method
18		2.7 with statement	B1	for 179.5 or 180.5 or 180.4999...	
			B1	for 486.5 or 487.5 or 487.4999...	
			P1	for a correct process to find a bound for average speed, eg [upper bound of distance] ÷ [lower bound of time] where 487 < [UB of distance] ≤ 487.5 and 179.5 ≤ [LB of time] < 180 **or** for [lower bound of distance] ÷ [upper bound of time] where 486.5 ≤ [LB of distance] < 487 and 180 < [UB of time] ≤ 180.5	
			A1	(dep on all previous marks) for 2.695(2…) **and** 2.715(8 …) with both values clearly coming from working with correct values	Accept bounds truncated or rounded to at least 4 sig fig
			C1	for 2.7 from 2.695… and 2.715… **and** statement that both LB and UB round to 2.7	

Question	Answer	Mark	Mark scheme	Additional guidance
19	$x = -\dfrac{23}{7}, y = \dfrac{15}{7}$	M1	for substitution of a rearrangement eg for $2(1 - 2y)^2 - y^2 = 17$ **or** $2x^2 - \left(\dfrac{1-x}{2}\right)^2 = 17$ **or** expansion of $(1 - 2y)^2 = 1 - 4y + 4y^2$ **or** $\left(\dfrac{1-x}{2}\right)^2 = \dfrac{1-2x+x^2}{4}$	
	$x = 3, y = -1$	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 $\dfrac{8 \pm \sqrt{64 + 420}}{14}$ or $\dfrac{-2 \pm \sqrt{4 + 1932}}{14}$ **or** completing the square	Can be implied by both x values correct or both y values correct.
		A1	$x = -\dfrac{23}{7}$ oe, $y = \dfrac{15}{7}$ 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
20	$(-3.5, 1)$	M1	for a complete method to show the transformations	Image at $(-4,1)$, $(-3,1)$ and $(-3.5, -2)$
		A1	cao	

Qu 11

Modifications to the mark scheme for Modified Large Print (MLP) papers. Paper 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: ±5º
Measurements of length: ±5 mm

PAPER: 1MA1_3H		
Question	**Modification**	**Mark scheme notes**
3	Wording added 'There are four spaces to fill.' Table turned to vertical format. Grid enlarged. Y axis changed to go up in units of 2 from -10 to10.	Standard mark scheme
4	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.	Standard mark scheme
6	Diagram enlarged.	Standard mark scheme
7	Diagram enlarged. Right axis labelled. Axes labels moved to the left of the horizontal axis and above the vertical axis. Frequency table changed to: 5, 20, 25, 10 and Frequency column widened. Question wording changed from 70 cars to 60 cars.	Standard mark scheme but plotting at (5,5), (15,20), (25,25), (35,10)
8	Diagram enlarged and model provided for all candidates. Wording added 'and on the model: 15 cm^2, 27cm^2, 45 cm^2'	Standard mark scheme

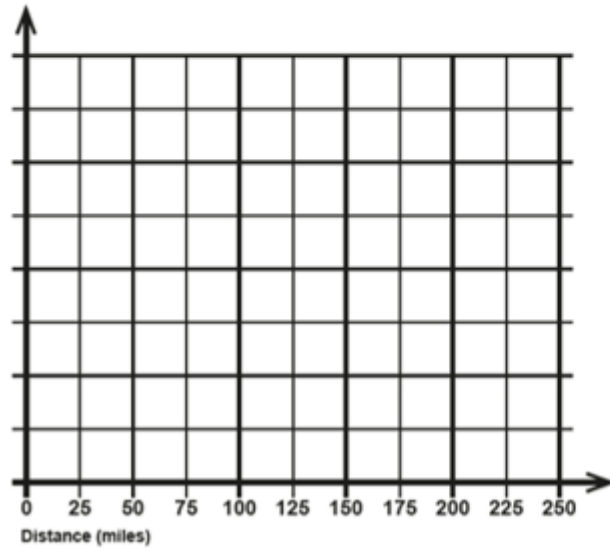| PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
9	(a)	MLP only – *x* changed to *y*.	Standard mark scheme with *x* changed to *y*.
9	(b)	Wording added, 'when'.	Standard mark scheme
11		Diagram enlarged.	Standard mark scheme
12		Diagram enlarged and model provided for all candidates. A dot added at the centre of square *ABCD*, labelled *M*. A line added joining *A* to *M* and another line added joining *M* to *T*. An angle arc added at *A*. Question wording changed to 'The vertex *T* is 12 metres vertically above the midpoint *M* of *AC*.'	Standard mark scheme
16		Diagram enlarged. Shading changed to dotty shading. *AD* labelled 14 cm. Question wording changed to 'The shape is made from the triangle *AOD* and a sector of a circle, centre *O* and radius 6 cm.'	Standard mark scheme
17		Diagram enlarged. *x* axis marked in units of 25 (as shown). Table changed as shown below. Number of students changed from 570 to 575	Standard mark scheme but histogram drawn at 7.5, 3.75, 5, 2.5, 2.5 Allow some tolerance on heights within gaps if intention is clear. Median at (approx.) 65.75 so allow within range 60 to 70.

17

Distance (d miles)	Frequency
$0 < d \leqslant 25$	150
$25 < d \leqslant 50$	75
$50 < d \leqslant 75$	100
$75 < d \leqslant 150$	150
$150 < d \leqslant 200$	100

Widen the frequency column to allow for working.

0   25   50   75   100   125   150   175   200   225   250

Distance (miles)

PAPER: 1MA1_3H		
Question	**Modification**	**Mark scheme notes**
20	Diagram enlarged and grid changed as shown below. Wording added, 'It shows triangle A, triangle B and triangle C on a grid. A cut out triangle is available if you wish to use it.' A cut out shape provided for all versions. Question wording changed as follows: (a) Describe the TWO transformations that map triangle A onto triangle B, then triangle B onto Triangle C. (1 mark). Three answer lines added for part (a). One point on triangle A is invariant under the combined transformation from triangle A to triangle C. (b) Find the coordinates of this point. (1 mark)	Part (a): award 1 mark for a full description of both transformations: A to B: a rotation of 180° about (−1,0) B to C: a translation of $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ Do **not** award the mark if there is any ambiguity or any reference to other forms of transformation. Part (b): award 1 mark for (−2.5, 1)

PAPER: 1MA1_3H		
Question	**Modification**	**Mark scheme notes**
20		