Mark Scheme (Results)

Summer 2017

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

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Summer 2017
Publications Code 1MA1_1H_1706_MS

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. (e.g.. 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 (e.g.. 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.

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
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	**Working**	**Answer**	**Mark**	**Notes**
1 (a)		10,19	B1	cao
(b)		positive	C1	positive (correlation)
(c)		12 to 13	M1	for an appropriate line of best fit drawn, or a point marked at (x, 16.4) or a horizontal line drawn from 16.4 across to (x, 16.4) where x is in the range 12 to 13
			A1	hours given in the range 12 to 13
(d)		explanation	C1	(yes) e.g. as the majority of points for high temperature appear when there are more hours of sunshine (positive correlation)
2		2×2×2×7	M1	for complete method to find prime factors; could be shown on a complete factor tree with no more than 1 arithmetic error
			A1	accept $2^3 \times 7$
3	21840 1638 23478 **5 4 6** 2 | 20 | 16 | 24 | **4** 3 | 15 | 12 | 18 | **3** 4 7 8 | | 500 | 40 | 6 | | 40 | 20000 | 1600 | 240 | | 3 | 1500 | 120 | 18 | 20000 + 1600 + 240 + 1500 + 120 + 18 = 23478	234.78	M1	for complete method with relative place value correct including addition of all the appropriate elements of the calculation e.g. two lines of 1st method, internal numbers of grids, or complete structure shown of partitioning methods
			A1	for digits 23478
			A1	(ft dep M1) for correct placement of the decimal point into their final answer
4		$x^2 + 6x = 1$	M1	writes the area using algebraic terms e.g. $(x + 3) \times (x + 3)$ or at least two correct area expressions which may be written on the diagram or x given as $\sqrt{10} - 3$
			M1	expands and includes the given 10 e.g. $x^2 + 3x + 3x + 9 = 10$; condone one error in the four terms when expanding or $10 - 3\sqrt{10} - 3\sqrt{10} + 9 + 6\sqrt{10} - 18$ (=1) condone 1 error in the 6 terms
			A1	rearranges to give the given equation or shows surd expression simplifies to 1

Paper: 1MA1/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
5		70.5	P1	starts process of Pythagoras e.g. $5^2 + 12^2$
			P1	complete process for Pythagoras e.g. $\sqrt{5^2+12^2}$ or $\sqrt{25+144}$ or $\sqrt{169}$ (=13)
			P1	(dep P1 for Pythagoras) process of adding all the lengths e.g. 5 + 5 + 12 + 12 + "13" (=47)
			P1	(indep) process of multiplying at least 2 lengths by 1.5
			A1	cao SC: any evidence of working with Pythagoras award the P1 or P2
6		comparison	M1	starts to manipulate expression e.g. $3y = 9x - 6$ or $3y = 9x - 5$
			A1	gives equation(s) which can be used to show that the gradients of the two lines are the same e.g. $y = 3x - 5/3$
7		72	P1	for showing the process of 30 × 60 (=1800) or 20 × 54 (=1080)
			P1	(dep P1) for showing the complete process e.g. ("1800" – "1080") ÷ 10
			A1	concluding the answer is 72 (and not 66)
8 (a)		0.00000797	B1	cao
(b)		6.3×10^7	M1	for partial calculation involving powers of 10 e.g. $0.63 \times 10^{5--3}$ or 6.3×10^n where $n \neq 7$ or for $n \times 10^8$ or for 63000000
			A1	cao
9		500	M1	recognition of 1.2 or 120% oe eg 600 ÷ 1.2 oe or $x \times 1.2 = 600$ oe or 120%=600
			A1	cao
10		$x^3+6x^2+11x+6$	M1	for method to find the product of any two linear expressions (3 correct terms) e.g. $x^2+x+2x+2$ or $x^2+2x+3x+6$ or $x^2+x+3x+3$
			M1	for method of multiplying out remaining products, half of which are correct (ft their first product) e.g. $x^3+x^2+2x^2+3x^2+2x+3x+6x+6$
			A1	cao

Paper: 1MA1/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
11 (a)		1, −3	B1	cao
(b)		−0.75, 2.75	B1	accept −0.7 to −0.8, 2.7 to 2.8
(c)		−2.8	B1	cao
12 (a)		$\frac{1}{9}$	M1	for showing a method using either reciprocal or square root e.g. $\frac{1}{n}$ or 9 seen
			A1	cao Accept $\pm\frac{1}{9}$ or 0.1 recurring
(b)		$\frac{16}{25}$	M1	for showing cube root of 64 as 4 and the cube root of 125 as 5 or $\frac{16}{n}$ ($n \neq 25$) or $\frac{n}{25}$ ($n \neq 16$) or an intention to find the cube root and square.
			A1	cao Accept 0.64
13 (a)		$y = \frac{9}{x^2}$	M1	begins to work with $y = \frac{k}{x^2}$ oe e.g. subs of a pair of numbers into $y = \frac{k}{x^2}$ or states k=9
			A1	for $y = \frac{9}{x^2}$ Accept $y = 9x^{-2}$
(b)		$\frac{3}{4}$	M1	ft (dep on previous M1) subs y = 16 into proportional formula of the form $y = \frac{k}{x^2}$ oe
			A1	oe

Paper: 1MA1/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
14		$\frac{1}{3}$	P1	process to solve the problem e.g. $\frac{3}{10}\times\frac{4}{9}(=\frac{12}{90}=\frac{2}{15})$ OR finds the number of white circles for their chosen number OR for 9 : 21 (or a multiple of 9 : 21)
			P1	second step of the process e.g. $\frac{7}{10}\times\frac{2}{7}(=\frac{14}{70}=\frac{2}{10}=\frac{1}{5})$ OR finds the number of black circles for their chosen number OR for a multiple of 2 : 5 where the ratio parts sum to "21"
			P1	for complete process e.g. $"\frac{2}{15}"+"\frac{1}{5}"\left(=\frac{4}{30}+\frac{6}{30}\right)$ OR finds the total number of circles for their chosen number OR for 3 ratios that could be used to solve the problem eg 9 : 21 with 4 : 5 with 6 : 15
			A1	for $\frac{1}{3}$ oe
15 (a)		3.5 to 4.5	M1	substitution into formula $\frac{1}{3}\pi r^2 h$ of chosen values for r and V (accept $r = 5.13$ and $V = 98$) and starts rearrangement e.g. multiplies by 3, divides by π or divides by r^2 (both sides)
			M1	uses estimates in calculation e.g. $\frac{3\times100}{3\times25}$ (or in rearranged formula) or $\frac{12}{\pi}$
			A1	arrives at a single value from estimate in the range 3.5 to 4.5
(b)		more	C1	ft e.g. more since number in numerator goes up; numbers in denominator go down.
16		$2(2n-3)$	C1	correct expansion of brackets to give at least 3 terms from $n^2-2n-2n+4$
		even	C1	arrives at n^2-2-n^2+4n-4 oe
			C1	reduces to $2(2n-3)$ or $4n-6$
			C1	for conclusion e.g. $2(2n-3)$ always even, $4n-6$ is always even since both are even numbers, they are multiples of 2.

Paper: 1MA1/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
17		$\frac{28}{72}$	P1	for $\frac{6}{8}$ or $\frac{2}{8}$ or $\frac{7}{8}$ or $\frac{1}{8}$ oe seen on diagram or in a calculation
			P1	for $\frac{7}{9} \times \frac{2}{8}$ or $\frac{2}{9} \times \frac{7}{8}$ or $\frac{14}{72}$ oe for $\frac{7}{9} \times \frac{6}{8}$ or $\frac{2}{9} \times \frac{1}{8}$ or $\frac{42}{72}$ or $\frac{2}{72}$ or $\frac{44}{72}$ oe
			P1	for $\frac{7}{9} \times \frac{2}{8} + \frac{2}{9} \times \frac{7}{8}$ for $1 - (\frac{7}{9} \times \frac{6}{8} + \frac{2}{9} \times \frac{1}{8})$ or $1 - (\text{"}\frac{42}{72}\text{"} + \text{"}\frac{2}{72}\text{"})$
				or $\text{"}\frac{14}{72}\text{"} + \text{"}\frac{14}{72}\text{"}$ oe or $1 - \text{"}\frac{44}{72}\text{"}$ oe
			A1	oe SC B1 for $\frac{14}{81}$ B2 for $\frac{28}{81}$
18		$y = -2x + 21$	P1	shows evidence of understanding that *AC* is perpendicular to *DB*, or states the gradient of *DB* as 0.5 oe
			P1	shows a process to find the gradient of a perp. line e.g. use of $-\frac{1}{m}$ or states $y = -2x + c$ or states the gradient of AC as -2
			P1	(dep on P2) for sub. of $x = 5$, $y = 11$ into $y = mx + c$ where m is their found gradient for AC.
			A1	oe

Paper: 1MA1/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
19		$\frac{2}{5}$	P1	for first step to solve the problem e.g. $\overrightarrow{AC} = -\mathbf{a} + \mathbf{c}$ or $\overrightarrow{OX} = \frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{c}$ or demonstrates the location of D and X on the diagram
			P1	for a correct vector statement using $\overrightarrow{CD}$ eg $\overrightarrow{CD} = \overrightarrow{CX} + \overrightarrow{XD}$ or $\overrightarrow{CD} = \overrightarrow{OD} - \overrightarrow{OC}$ or $\overrightarrow{OD} = \frac{7}{2}\mathbf{c}$ or $\overrightarrow{CD} = 2.5\mathbf{c}$ oe
			P1	for a correct equation or ratio using k eg equating $\overrightarrow{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a} = \frac{1}{2}(-\mathbf{a} + \mathbf{c}) + \frac{1}{k}\mathbf{c}$ or $\frac{\overrightarrow{OD}}{\overrightarrow{OC}} = \frac{k+1}{k}$ or $k = \frac{1}{2.5}$ or using a ratio approach eg $(\overrightarrow{OC} : \overrightarrow{CD}) = k : 1 = 1 : 2.5$
			A1	cao
20		$x = -\frac{24}{5}$ $y = -\frac{7}{5}$ $x = -3$, $y = 4$	M1	for substitution of a rearrangement of $y - 3x = 13$ e.g. $(3x + 13)^2 + x^2 = 25$
			M1	(dep M1) for expansion of bracket after substitution (at least 3 terms correct out of the 4 terms) e.g. $9x^2 + 39x + 39x + 169$
			M1	for forming quadratic ready for solving e.g. $10x^2 + 78x + 144$ (= 0)
			M1	for factorising e.g. $(5x + 24)(x + 3)$ (= 0) oe
			A1	$x = -\frac{24}{5}$, $y = -\frac{7}{5}$ and $x = -3$, $y = 4$ SC: B1 (if M0) for all 4 values mis-associated or one correct pair of values or values given as coordinates.

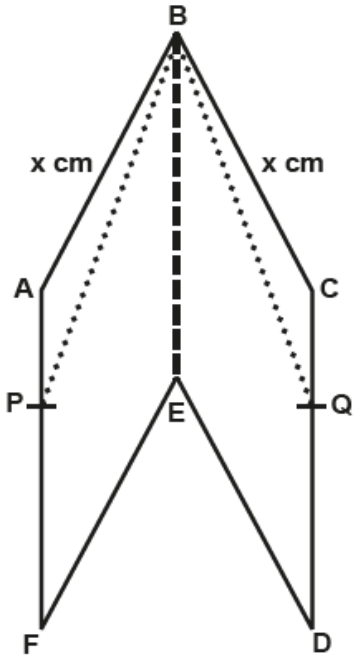
Paper: 1MA1/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
21			C1	states (angle) *ABC* = (angle) *BCD*
			C1	states 2nd link *AB* = *CD*
			C1	states 3rd link with reason: *BC* = *BC* (common)
			C1	concludes proof by stating (triangle) *ABC* ≡ (triangle) *DCB* with reason SAS and *AC* = *BD*
22		Proof	B1	(indep) for stating cos 30 = $\frac{\sqrt{3}}{2}$
			M1	for $PQ^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos PBQ$ **or** $AC^2 = x^2 + x^2 - 2 \times x \times x \times \cos 30$ $(=x^2(2-\sqrt{3}))$ oe
			M1	for $\cos PBQ = \frac{10^2 + 10^2 - PQ^2}{2 \times 10 \times 10}$ (implies previous M1)
	cos PBQ= $\frac{10^2 + 10^2 - x^2(2-\sqrt{3})}{200}$ = $\frac{200 - x^2(2-\sqrt{3})}{200}$		M1	for $\cos PBQ = \frac{10^2 + 10^2 - (x^2 + x^2 - 2 \times x \times x \times \cos 30)}{2 \times 10 \times 10}$
			A1	conclusion of proof with all working seen

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

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**
1		Diagram enlarged. Right axis has been labelled. Crosses have been changed to solid circles.	Standard mark scheme but in (c) accept 12 to 14
4		Diagram enlarged. Arrows removed. Dashed lines at the top and left of the square extended. Dashes made longer and thicker.	Standard mark scheme
5		Diagram enlarged. Left hand side and top of shape labelled as well. Wording added 'The marked angles are right angles.' Braille only: will add labels *A B C D* etc. and information about the diagrams.	Standard mark scheme
10		*x* has been changed to *y*	Standard mark scheme with *x* replaced by *y*
11		Diagram enlarged.	Standard mark scheme if on 2mm grid, otherwise apply greater tolerance.
13		Table turned to vertical format.	Standard mark scheme
15		Only changes are to the formula box for a cone: diagram enlarged, dashes made longer and thicker, arrow heads changed to open headed arrows.	Standard mark scheme
18		Diagram enlarged. Dashed line added from *B* to *D*	Standard mark scheme
19		Diagram enlarged. Diagonal line added from *A* to *C* and *X* has been marked on the line as the midpoint.	Standard mark scheme
21		Diagram enlarged. Angle arcs made smaller.	Standard mark scheme

PAPER: 1MA1_1F			
Question		**Modification**	**Mark scheme notes**
22		Diagram enlarged. Labels '*x* cm' added to the left and right side of the diagram. Dotted lines added between *B P* and *B Q*.  	Standard mark scheme

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