

GCSE Mathematics (1MA1)

Aiming for Grade 7 practice papers – Paper 3 – Calculator

Compiled from student-friendly mark schemes

Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn't show follow-through marks (marks that are awarded despite errors being made) or special cases.

It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme.

NOTES ON MARKING PRINCIPLES

Guidance on the use of codes within this mark scheme
M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect. P1 – process mark. This mark is generally given for setting up an appropriate process to find a solution in the context of the question. A1 – accuracy mark. This mark is generally given for a correct answer following correct working. B1 – working mark. This mark is usually given when working and the answer cannot easily be separated. C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working. Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

Question 1 (Total 6 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$(2x + 1)(x + 3) = 2x^2 + 7x + 3$ or $(x + 3)(3x + 7) = 3x^2 + 16x + 21$	M1	This mark is given for a method to find the product of any two linear expressions
	$(2x^2 + 7x + 3)(3x + 7) =$ $(2x + 1)(3x^2 + 16x + 21) =$	M1	This mark is given for a method to multiply out two products with at least half the terms correct
	$6x^3 + 35x^2 + 58x + 21$	A1	This mark is given for the correct answer only
(b)	$1 - x < \pm \frac{3}{5}$	M1	This mark is given for a finding the square root of both sides of the inequality
	$1 - x < -\frac{3}{5}$ then $x < 1\frac{3}{5}$ $1 - x < \frac{2}{5}$ then $x > \frac{2}{5}$	M1	This mark is given for critical values $\frac{2}{5}$ and $1\frac{3}{5}$ seen
	$\frac{2}{5} < x < 1\frac{3}{5}$	A1	This mark is given for the correct answer only

Question 2 (Total 2 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{3.42}{7.5} \times \frac{10^{-7}}{10^{-6}} = 0.456 \times 10^{-1}$	M1	This mark is given for a method to find an answer in standard form
	4.56×10^{-2}	A1	This mark is given for the correct answer only

Question 3 (Total 2 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	For example: Sarah should have calculated $AC^2 - AB^2$ Sarah should have calculated $8^2 - 6^2$	C1	This mark is given for a correct statement describing Sarah's mistake
(b)	For example: The scale factor in the diagram is 2.5 $5 \div 2$ is not $1\frac{1}{2}$	C1	This mark is given for the correct statement to say why Roy's diagram is not correct

Question 4 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{16-4}{8-0} = \frac{12}{8}$	M1	This mark is given for a method to find the gradient of the line
	1.5	A1	This mark is given for the correct answer only
(b)	The rate of change of the volume of the container with time	C1	This mark is given for a correct explanation
(c)	The number of litres in the container to start with (when $t = 0$)	C1	This mark is given for a correct explanation

Question 5 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$x_1 = \sqrt[3]{7-2} = \sqrt[3]{5} = 1.70997$	M1	This mark is given for a substitution of 2 into the equation to find x_1
	$x_2 = \sqrt[3]{7-1.70997} = \sqrt[3]{5.29003} = 1.74241$	M1	This mark is given for a substitution of x_1 into the equation to find x_2
	$x_3 = \sqrt[3]{7-1.74241} = \sqrt[3]{5.25759} = 1.73885$	A1	This mark is given for a substitution of x_2 into the equation to find x_3

Question 6 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\begin{array}{ccccc} 6 & 10 & 14 & 18 & 22 \\ & 4 & 4 & 4 & 4 \end{array}$	M1	This mark is given for a method to find the second differences
	$2n^2$	M1	This mark is given for a method to recognise that a second difference of 4 means a $2n^2$ term will be used
	$2n^2 - 3$	A1	This mark is given for the correct answer only

Question 7 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$78 \div 0.65 = 120$	M1	This mark is given for a method to find the total number of counters
	$120 - 78 = 42$	A1	This mark is given for a correct answer only

Question 8 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	The denominator for the 2nd student is incorrect (it should be 29) or The probabilities for the 2nd student do not add up to 1 (they add to $\frac{29}{30}$)	C1	This mark is given for a correct comment
(b)	No, the probabilities should be multiplied together rather than added	C1	This mark is given for a correct conclusion with a supporting comment

Question 9 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$12336 \div 12000 = 1.028$	P1	This mark is given for the start of a process to find interest rate for year 1
	$1.028 - 1 \times 100 = 2.8\%$	P1	This mark is given for a complete process to find the interest rate for year 1
	$\frac{2.8}{2} \div 100 \times 12336 = 172.70$	P1	This mark is given for a complete process to find the value of the interest in year 2
	$12336 + 172.70 = 12.508.70$	A1	This mark is given for the correct answer only

Question 10 (Total 6 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$2x^2 - 5x - 12 = (2x + 3)(x - 4)$	M1	This mark is given for factorising the denominator
	$x^2 - 16 = (x + 4)(x - 4)$	M1	This mark is given for factorising the numerator
	$\frac{x + 4}{2x + 3}$	A1	This mark is given for the correct answer only
(b)	$15(t - 2v) = 15t - 30v$	M1	This mark is given for a correct step towards solution
	$wv = 15t - 30v$ $wv + 30v = 15t$ $v(w + 30) = 15t$	M1	This mark is given for a method to rearrange the formula to isolate terms in v
	$v = \frac{15t}{w + 30}$	A1	This mark is given for the correct answer only

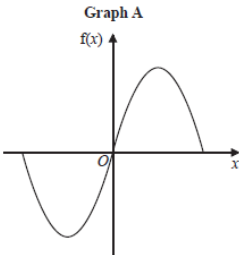
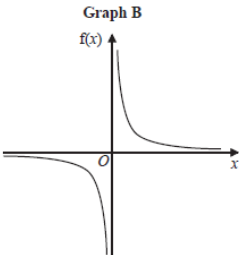
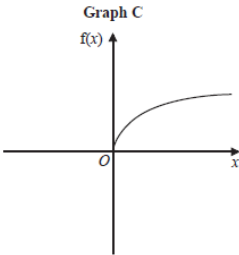
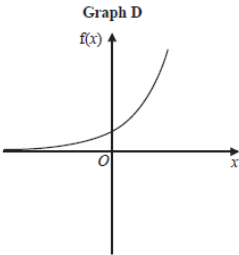
Question 11 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2 \times \pi \times 0.8^2 = 4.021$	P1	This mark is given for a process to find the area of the top and bottom of the tank
	$2\pi \times 0.8 \times 1.8 = 9.047$	P1	This mark is given for a process to find the curved surface area of the tank
	$4.021 + 9.047... = 13.069$	P1	This mark is given for a process to find the total surface area of the tank
	$3 \times 13.068 = 39.204$	P1	This mark is given for a process to find the total surface area of three tanks
	Jeremy only has enough paint to cover 35 m^2 so Jeremy does not enough paint to completely cover 3 tanks	C1	This mark is given for a correct conclusion supported by correct working

Question 12 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\left(\frac{1}{2} \times 5 \times (0 + 22)\right) + \left(\frac{1}{2} \times 5 \times (22 + 28)\right) +$ $\left(\frac{1}{2} \times 5 \times (28 + 32)\right) + \left(\frac{1}{2} \times 5 \times (32 + 35)\right)$ $= 55 + 125 + 150 + 167.5$	M1	This mark is given for a method to find the area of one strip using a trapezium (or a triangle)
		M1	This mark is given for a method to find the area under the curve using four trapeziums
	497.5	A1	This mark is given for the correct answer only
(b)	This is an underestimate since there are small areas under the graph not included	C1	This mark is given for a correct statement supported by working

Question 13 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes										
	Graph A  Graph B  Graph C  Graph D  <table><tr><th>Description of function</th><th>Graph</th></tr><tr><td>$f(x)$ is inversely proportional to x</td><td>B</td></tr><tr><td>$f(x)$ is a trigonometrical function</td><td>A</td></tr><tr><td>$f(x)$ is an exponential function</td><td>D</td></tr><tr><td>$f(x)$ is directly proportional to $\sqrt{x}$</td><td>C</td></tr></table>	Description of function	Graph	$f(x)$ is inversely proportional to x	B	$f(x)$ is a trigonometrical function	A	$f(x)$ is an exponential function	D	$f(x)$ is directly proportional to $\sqrt{x}$	C	B2	These marks are given for all four graphs labelled correctly (B1 is given for two graphs labelled correctly)
Description of function	Graph												
$f(x)$ is inversely proportional to x	B												
$f(x)$ is a trigonometrical function	A												
$f(x)$ is an exponential function	D												
$f(x)$ is directly proportional to $\sqrt{x}$	C												

Question 14 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$AOB = 60^\circ$	B1	This mark is given for recognising an angle of 60 at AOB
	$\pi r^2 \times \frac{60}{360} = \frac{121\pi}{6} = 63.3\dots$	P1	This mark is given for a process to find the area of the sector NOQ
	$\frac{1}{2}ab \sin C = \frac{1}{2} \times 7^2 \times \sin 60$ $= 24.5 \times \frac{\sqrt{3}}{2} = 21.2\dots$	P1	This mark is given for a process to find the area of the triangle AOB
	$\frac{63.3 - 21.2}{63.3} \times 100$	P1	This mark is given for a process to find the percentage of the sector which is shaded
	66.5	A1	This mark is given for the correct answer only (in the range 66.5 to 66.6)

Question 15 (Total 3 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
		B3	These marks are given for a fully correct histogram (B2 is given for all four blocks correct or all six frequencies) (B1 is given for at least 2 blocks of different widths or at least three correct frequencies)

Question 16 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$P_2 = 1.01 \times 400 = 404$ $P_3 = 1.01 \times 404 = 408.04$	M1	This mark is given for correctly substituting 400 into the iterative formula
	408 animals	A1	This mark is given for the correct answer only

Question 17 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)(i)		B1	This mark is given for a tangent drawn at $t = 15$
	$7.5 \div 9$	M1	This mark is given for a method to use the tangent to find the gradient
	0.83	A1	This mark is given for a correct answer in the range 0.6 – 1
(a)(ii)	Acceleration of the car (the change of speed with respect to time)	C1	This mark is given for a correct description

Question 18 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y \geq -2, y \leq -2$ or $y = -2$	M1	This mark is given for y and -2 indicated in an equality or inequality
	$y \geq x, y \leq x$ or $y = x,$	M1	This mark is given for y and x indicated in an equality or inequality
	$y \leq \frac{1}{2}x + 1, y \geq \frac{1}{2}x + 1$ or $y = \frac{1}{2}x + 1,$	M1	$y = \frac{1}{2}x + 1$ indicated in an equality or inequality
	$y \geq -2, y \geq x$ and $y \leq \frac{1}{2}x + 1$	A1	This mark is given for three correct inequalities

Question 19 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$50\,000 \times 1.02^8$	1	The mark is given for a method to find the increase in value after 8 years
	58 600	1	This mark is given for the correct answer only
(b)	$325\,000 \div 250\,000 = 1.3$	1	This mark is given for finding a multiplier
	$(1.3)^{\frac{1}{6}} = 1.0447\dots$	1	This mark is given for a method to find the percentage increase each year
	4.5	1	This mark is given in the range 4.4 – 4.5

Question 20 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y = \frac{4}{3}x + \frac{7}{3}$	M1	This mark is given for a method to rearrange the equation and identify the gradient
	$\frac{4}{3} \times m = -1$, so perpendicular $= -\frac{3}{4}$	M1	This mark is given for a method to find the gradient of the line perpendicular to L
	$y = -\frac{3}{4}x + c$ $-5 = -\frac{3}{4}x + c$ so $c = -\frac{11}{4}$ $y = -\frac{3}{4}x - \frac{11}{4}$ Rearranging, $4y + 3x = -11$	A1	This mark is given for a correct equation (or any equivalent)

Question 21 (Total 4 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$6 + \left[(x+5) \div \frac{(x+5)(x-2)}{x-1} \right]$	B1	This mark is given for factorising $x^2 + 3x - 10$
	$= 6 + \left[(x+5) \times \frac{x-1}{(x+5)(x-2)} \right]$ $= 6 + \frac{x-1}{x-2}$	M1	This mark is given for a method to rearrange the fraction in brackets and cancel through by $(x-5)$
	$= \frac{6(x-2)}{x-2} + \frac{x-1}{x-2}$ $= \frac{6(x-2) + (x-1)}{x-2}$	M1	This mark is given for putting the two terms of the expression over the same common denominator
	$\frac{7x-13}{x-2}$	A1	This mark is given for a correct answer only

Question 22 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\overrightarrow{OP} = \frac{1}{3} \overrightarrow{OX} = \frac{1}{3} \mathbf{a}$ $\overrightarrow{OR} = \frac{1}{4} \overrightarrow{OY} = \frac{1}{4} \mathbf{b}$	P1	This mark is given a process to find $\overrightarrow{OP}$ and $\overrightarrow{OR}$
	$\overrightarrow{ZO} = \frac{1}{3} \overrightarrow{YX} = \mathbf{a} - \mathbf{b}$ $\overrightarrow{ZY} = \mathbf{a}$	P1	This mark is given for a process to use vector equivalence of opposite sides of a parallelogram to find vector expressions for $\overrightarrow{ZO}$ and $\overrightarrow{ZY}$
	$\overrightarrow{ZP} = \mathbf{a} - \mathbf{b} + \frac{1}{3} \mathbf{a}$ $\overrightarrow{ZR} = \mathbf{a} - \mathbf{b} + \frac{1}{4} \mathbf{b}$	P1	This mark is given for a process to find $\overrightarrow{ZP}$ and $\overrightarrow{ZR}$ in terms of $\mathbf{a}$ and $\mathbf{b}$
	$12 \overrightarrow{ZP} = 12\mathbf{a} - 12\mathbf{b} + 4\mathbf{a} = 16\mathbf{a} - 12\mathbf{b}$ $12 \overrightarrow{ZR} = 12\mathbf{a} - 12\mathbf{b} + 3\mathbf{b} = 12\mathbf{a} - 9\mathbf{b}$ $16\mathbf{a} - 12\mathbf{b} = \frac{4}{3}(12\mathbf{a} - 9\mathbf{b}) \text{ so } \overrightarrow{ZP} = \frac{4}{3} \overrightarrow{ZR}$	P1	This mark is given for a process to write $\overrightarrow{ZP}$ and $\overrightarrow{ZR}$ as multiples of the same vector
	4 : 3	A1	This mark is given for the correct answer only (or an equivalent ratio)

Suggested Grade Boundaries for Aiming for 7, Calculator: Paper 3

Grade	7	6	5	4
Mark	51	39	26	15

For example:

A student aiming for Grade 7 would be expected to score at least 51 marks on this practice paper.

Question	Taken from Paper/Q			Number of Marks	Edexcel averages: scores of candidates who achieved grade 7	%
1a	3H	June 19 - 3H	18a	3	2.74	91
1b	3H	June 19 - 3H	18b	3	0.75	25
2	2H	Nov 19 2H	7	2	1.75	88
3a	3H	June 19 3H	8a	1	0.89	89
3b	3H	June 19 3H	8b	1	0.74	74
4a	3H	June 18 - 3H	12a	2	1.65	83
4b	3H	June 18 - 3H	12b	1	0.56	56
4c	3H	June 18 - 3H	12c	1	0.78	78
5	3H	June 18 - 3H	18c	3	2.57	86
6	3H	June 19 - 3H	16	3	2.48	83
7	2H	Nov 18 -2H	16b	2	1.61	81
8a	2H	June 17 - 2H	12a	1	0.84	84
8b	2H	June 17 - 2H	12b	1	0.76	76
9	2H	June 18 2H	9	4	3.08	77
10a	3H	June 17 - 3H	14a	3	2.12	71
10b	3H	June 17 - 3H	14b	3	2.11	70
11	3H	June 19 3H	6	5	3.34	67
12a	3H	June 18 - 3H	15a	3	2.22	74
12b	3H	June 18 - 3H	15b	1	0.67	67
13	3H	June 19 - 3H	17	2	1.28	64
14	2H	June 17 - 2H	17	5	2.89	58
15	3H	Nov 18 -3H	17a	3	1.72	57
16	3H	Nov 18 -3H	13	2	1.11	56
17	2H	June 19 - 2H	14a	4	2.73	68
18	3H	June 17 - 3H	13.00	4	1.98	50
19	2H	Nov 17 2H	13a	2	1.66	83
20	2H	Nov 17 2H	13b	3	1.46	49
21	2H	June 19 - 2H	16	3	1.42	47
22	2H	June 19 2H	13	4	1.71	43