GCSE Mathematics (1MA1)

Themed papers – Coordinate Geometry: Linear Graphs

Compiled from student-friendly mark schemes

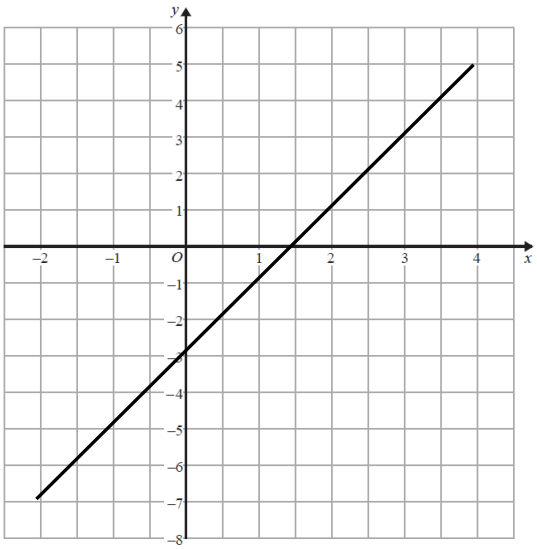
Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn't show follow-through marks (marks that are awarded despite errors being made) or special cases.

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 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		B3	These marks are given for a correct straight line between the points (–2, –7) and (4, 5) (B2 is given for a straight line segment through at least three of the points (–2, –7), (–1, 5), (0, –3), (1, –1) (2, 1), (3, 3) and (4, 5)) (B1 is give for at least two correct points stated or plotted or for a line drawn with gradient 2)

Question 2 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$m = \frac{6}{2} = 3$	M1	This mark is given for a correct method to find the gradient of the line
	Reading from the graph $c = -6$	M1	This mark is given for finding –6 from the graph **or** $y = 3x + c$ **or** $3x - 6$
	$y = 3x - 6$	A1	This mark is given for the correct answer only

Question 3 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		M1	This mark is given for a method to find the gradient
		M1	This mark is given for a method to find the c in y=mx + c
	$y = 2x + 1$		This mark is given for the correct answer or equivalent

Question 4 (Total 1 mark)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Shona's line should have a positive *y*-intercept rather than the negative one shown	C1	This mark is given for a correct explanation

Question 5 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)(i)	The starting price **or** a fixed charge	C1	This communication mark is given for correct interpretation
(a)(ii)	The cost per minute **or** how much the price increases every minute	C1	This communication mark is given for correct interpretation
(b)	7.5 ÷ 5 **or** the *y*-intercept = 0.5	M1	This method mark is given for an attempt to calculate the gradient, with 2 correct values used or for finding the *y*-intercept
	1.5x + 0.5	M1	This method mark is given for a gradient given as a coefficient of x in an equation
	y = 1.5x + 0.5	A1	This accuracy mark is given for the fully correct equation for the gradient

Question 6 (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 7 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	210 ÷ 140	M1	This mark is given for a method to find the gradient
	–1.5	A1	This mark is given for a correct interpretation of the negative gradient
(b)	"rate of change of depth of water in tank"	C1	This mark is given for a valid explanation

Question 8 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y = 3x - 2$ so $3y = 9x - 6$ $3y - 9x + 5 = 0$ so $3y = 9x - 5$	M1	This mark is given for a method to start to form expressions which can be compared
	Dividing rearranged equations by 3 gives $y = 3x - 2$ and $y = 3x - \frac{5}{3}$ Gradient = 3 for both lines	A1	This mark is given for comparing two equations and deducing that the gradients of the two lines are the same

Question 9 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{d-10}{5-2}=4$	P1	This mark is given for a process to process to use the gradient
	$\frac{d-10}{3}=4$ so $d-10=12$	P1	This mark is given for a process to for a complete process to rearrange equation formed to isolate d
	$d=22$	A1	This mark is given for the correct answer only

Question 10 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	width: $38-6=32$ height: $36-7=29$	P1	This mark is given for a process to find the width and height of the diagram
	$32\div 4=8$	P1	This mark is given for a process to find the length of a side of a square
	$6+8+8=22$	P1	This mark is given for a process to find the x-coordinate
	$36-8-8=20$	P1	This mark is given for a process to find the y-coordinate
	(22, 20)	A1	This mark is given for the correct answer only

Question 11 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$x = 2.2$, $y = -1.3$	M1	This mark is given for use of the intersection point (evidenced by one solution given, solution reversed or solutions given as a coordinate)
		A1	This mark is given for x given in the range 2.2 to 2.3 and y given in the range -1.3 to -1.4

Question 12 (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 13 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Gradient of $DB = \frac{1}{2}$	P1	This mark is given for finding the gradient of the line *DB*
	Gradient of $AC = -\frac{1}{\frac{1}{2}} = -2$, so equation for *AC* is $y = -2x + c$	P1	This mark is given for understanding that the line *AC* is perpendicular to *DB* and using $-\frac{1}{m}$ to find its gradient
	$11 = -10 + c$ $c = 21$	P1	This mark is given for substituting the values for the coordinates of *A* ($x = 5$ and $y = 11$) into $y = -2x + c$ to find the value of *c*
	$y = -2x + 21$	A1	This mark is given for the correct answer only

Question 14 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y = 3x + c$ Using the coordinates for point A, $9 = (3 \times 5) + c \quad c = -6$	P1	This mark is given for a process to use the gradient given
	$y = 3x - 6$ Using the coordinates for point B, $15 = (3 \times d) - 6$ $3d = 21$	P1	This mark is given for a process to find a value for d
	$d = 7$	A1	This mark is given for the correct answer only

Question 15 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y = -\frac{3}{2}x + \frac{7}{2}$	P1	This mark is given for a process to rearrange to give the equation of the line perpendicular to PQ in terms of x
	Gradient of $PQ = \frac{2}{3}$	P1	This mark is given for a process to find the gradient of PQ using $mn = -1$
	Equation for PQ is $y = \frac{2}{3}x + c$	P1	This mark is given for a process to find an equation for PQ
	$y = \frac{2}{3}x + c$ at (3, 4) $4 = 2 + c$ $c = 2$	P1	This mark is given for finding the value of c
	$b = \frac{2}{3}a + 2$	A1	This mark is given for a correct answer only

Question 16 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{6-2}{4-12} = -\frac{1}{2}$	P1	This mark is given for a process to find a gradient of the line $\mathbf{L}_1$
	$\mathbf{L}_1 = -\frac{1}{2}x + c$ When $x = 4$, $y = 6$ and when $x = 12$, $y = 2$ so $\mathbf{L}_1 = -\frac{1}{2}x + 8$ $\mathbf{L}_2 = -3x$	P1	This mark is given for a process to find equations for the lines $\mathbf{L}_1$ and $\mathbf{L}_2$
	When $-\frac{1}{2}x + 8 = -3x$, $x = -\frac{16}{5}$ $y = -3x = \frac{48}{5}$	P1	This mark is given for a process to find the x- and y-coordinates common to both lines
	$\left(-\frac{16}{5}, \frac{48}{5}\right)$	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
		P1	Tis mark is given for a process to find the gradient of the line AB
	use of $-1/m$	P1	This mark is given for a process to find the gradient of a perpendicular line
		P1	This mark is given for substitution of x=5, y=−1
	$y = -\frac{1}{2}x + \frac{3}{2}$	A1	This mark is given for the correct equation stated or a correct equivalent

Question 18 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$B = (12, 0)$, $E = (0, 6)$ Gradient of **L** $= -\frac{1}{2}$	1	This mark is given for rearranging to find a gradient or positions of B and E
	$A = (–12, 12)$	1	This mark is given for finding the position of A
	Gradient of **M** = 2	1	This mark is given for a finding the gradient of **M**
	Equation of **M** is $y = 2x + 36$	1	This mark is given for the correct answer only

Question 19 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{12-7}{11--9}$ $(=\frac{1}{4})$	P1	This mark is given for a process to find the gradient of the line PQ
	$x = -9 + (\frac{2}{5} \times 20)$ $(= -1)$ $y = 7 + (\frac{2}{5} \times 5)$ $(= 9)$ Coordinates of M are (–1, 9)	P1	This mark is given for a process to process to find the x or y coordinate of the point M
	gradient of line **L** $= \frac{-1}{\frac{1}{4}}$ $(= -4)$	P1	This mark is given for a process to method to find gradient of line **L**
	$y = -4x + c$ when $x = –1$ and $y = 9$, $c = 5$	M1	This mark is given for a method to substitution of found values for x, y and M into equation for straight line
	$y = -4x + 5$	A1	This mark is given for the correct answer only

Mark scheme for 1MA1 Higher themed papers: Coordinate Geometry: Linear Graphs

Performance data:

Q	Taken from			Total Marks available	TOPIC	Spec Ref	AO	% Mean marks	Edexcel mean averages Marks of candidates who achieved grade:										
	Q	Series	Paper						ALL	9	8	7	6	5	4	3	2	1	U
1	2	June 2019	2H	3	Algebra	A10	2	89	2.68	2.96	2.93	2.89	2.80	2.59	2.16	1.54	-	-	0.96
2	3	June 2018	2H	3	tbc	tbc	tbc	64	1.92	2.95	2.84	2.61	2.19	1.49	0.71	0.25	-	-	0.08
3	3	Spec Set 1	3H	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	5c	Mock Set 3	3H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5a	2a	Mock Set 1	1H	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b	2b	Mock Set 1	1H	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6a	12a	June 2018	3H	2	Ratio	R14	1	62	1.24	1.92	1.81	1.65	1.39	0.99	0.51	0.17	-	-	0.05
6b	12b	June 2018	3H	1	Ratio	R14	2	42	0.42	0.86	0.72	0.56	0.41	0.27	0.16	0.08	-	-	0.05
6c	12c	June 2018	3H	1	Algebra	A15	2	64	0.64	0.96	0.89	0.78	0.66	0.53	0.39	0.28	-	-	0.18
7a	10a	Spec Set 1	2H	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7b	10b	Spec Set 1	2H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	6	June 2017	1H	2	Algebra	A9	2	60	1.20	1.98	1.92	1.74	1.33	0.79	0.35	0.12	-	-	0.05
9	1	Mock Set 2	3H	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	6	June 2018	1H	5	Geometry	G11, A8, A21	3	51	2.55	4.58	3.82	3.11	2.51	1.97	1.45	0.93	-	-	0.54
11	10	June 2019	1H	2	Algebra	A19	2	48	0.95	1.91	1.69	1.28	0.85	0.52	0.30	0.18	-	-	0.13
12	16	June 2019	2H	3	Algebra	A9	3	31	0.93	2.81	2.37	1.42	0.54	0.13	0.03	0.01	-	-	0.00
13	18	June 2017	1H	4	Algebra	A9G4	3	31	1.23	3.82	3.33	2.00	0.71	0.18	0.04	0.01	-	-	0.00
14	6	Nov 2018	2H	3	Algebra	A8A10, A17	3	28	0.83	3.00	2.82	2.54	1.99	1.27	0.38	0.16	-	-	0.04
15	19	June 2018	1H	5	Algebra	A22, A1	3	24	1.18	4.57	3.37	1.67	0.61	0.16	0.04	0.01	-	-	0.00
16	18	Nov 2018	2H	4	Algebra	A9	3	9	0.37	3.40	3.29	2.01	0.85	0.36	0.07	0.01	-	-	0.00
17	23	Spec Set 1	1H	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

18	19	Nov 2017	1H	4	Geometry	A9, G11	3	3	0.11	3.62	2.38	1.21	0.40	0.12	0.02	0.00			0.00
19	19	Mock Set 1	2H	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				66					**16.25**	**39.34**	**34.18**	**25.47**	**17.24**	**11.37**	**6.61**	**3.75**	**-**	**-**	**2.08**