

GCSE MATHEMATICS

Gradient and Intercept

OCR-style Topic Practice

Based on OCR GCSE (9–1) Mathematics (J560)

Tier: Foundation and Higher

Name _____

Date _____

You may use:

- geometrical instruments
- tracing paper

INSTRUCTIONS

- Use black ink. You may use an HB pencil for graphs and diagrams.
- Answer all the questions.
- Read each question carefully before you start to write your answer.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided.
- Section A: you must not use a calculator.
- Section B: you may use a scientific or graphical calculator.

INFORMATION

- The total mark for this paper is **42**.
- The marks for each question are shown in brackets [].
- The questions suit both Foundation and Higher tier students.
- Diagrams are not drawn accurately unless the question says they are.
- Graphs drawn on a grid are accurate.

These are original, independent practice questions written in the style of OCR GCSE Mathematics. They are not official OCR examination questions and are not endorsed by OCR.

Section A

You must not use a calculator in this section.

- 1 A straight line has equation $y = 9 - 5x$

(a) Write down the gradient of the line.

..... [1]

(b) Write down the coordinates of the point where the line crosses the y-axis.

..... [1]

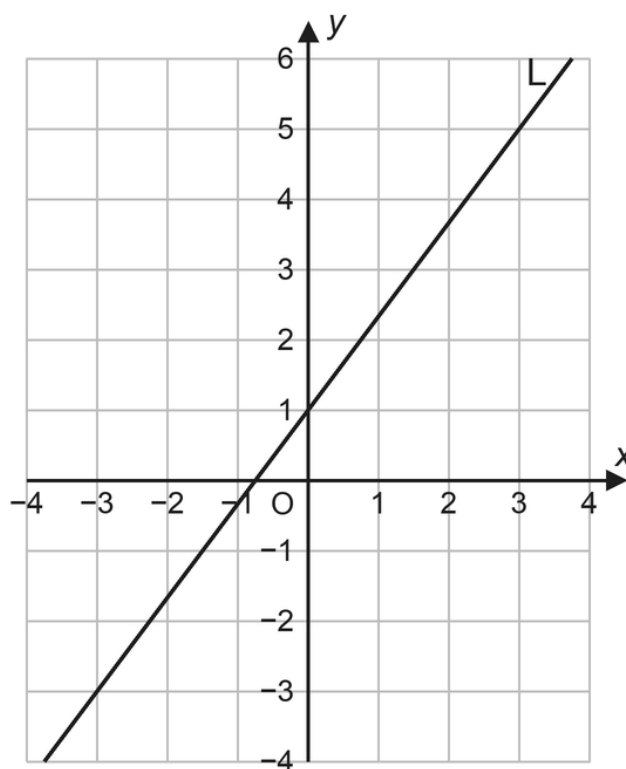
(c) Here are the equations of four more straight lines.

Line	Equation
A	$y = 5x + 9$
B	$y = 2 - 5x$
C	$y = 9x - 5$
D	$5y = x + 9$

Which line is parallel to $y = 9 - 5x$? Give a reason for your answer.

..... [2]
.....

- 2 The grid shows a straight line, L.



- (a) Find the equation of line L.

..... [3]

- (b) Does the point (9, 13) lie on line L? Show how you decide.

..... [2]

- 3 Kofi says that the lines $5y + 2x = 15$ and $y = 4 - 0.4x$ are parallel.

Is Kofi correct? Show how you decide.

.....

.....

.....

.....

[3]

- 4 Mia is finding the equation of the line that passes through the point (1, 3) and has gradient 2.

Here is her working.

$$y = 2x + c$$

$$1 = 2 \times 3 + c$$

$$c = -5$$

$$y = 2x - 5$$

- (a) Explain the mistake Mia has made.

[1]

- (b) Find the correct equation of the line.

[2]

- 5 Find the equation of the line that passes through the points $(-2, 8)$ and $(2, -2)$.

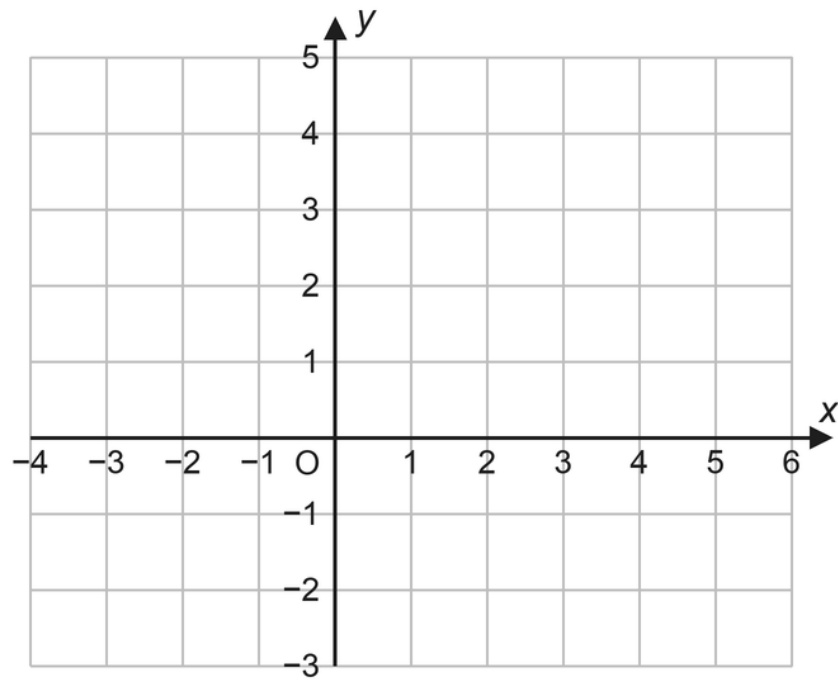
- 6 (a) Write down the equation of the y-axis. [3]

- (b) A straight line passes through the points $(3, -1)$ and $(3, 5)$.
Write down the equation of this line. [1]

- (c) Explain why the line in part (b) cannot be written in the form $y = mx + c$ [1]

..... [1]

- 7 On the grid, draw the line $y = -\frac{1}{2}x + 2$



[2]

Section B

You may use a scientific or graphical calculator in this section.

- 8 An energy company charges a fixed amount each day plus an amount for each unit of electricity used.

The table shows the total cost, C pence, of using u units of electricity in one day.

Table 8.1

Units used, u	4	10	16
Total cost, C (pence)	150	297	444

The graph of C against u is a straight line.

- (a) Work out the gradient of the line.

[2]

- (b) Find the value of C when $u = 0$. Explain what this value represents.

[2]

- (c) Write down a formula for C in terms of u .

[1]

- (d) On one day the total cost was £5.42. How many units of electricity were used?

[2]

- 9 Line L passes through the points A(−1.5, 7.2) and B(2.5, −2.4).

(a) Work out the gradient of line L.

..... [2]

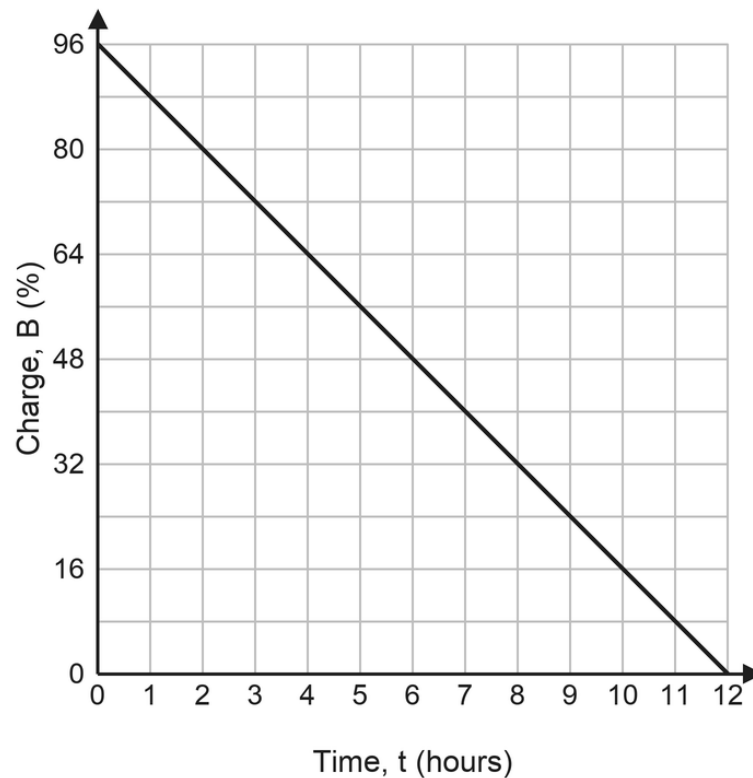
(b) Find the equation of line L. Give your answer in the form $y = mx + c$.

..... [2]

(c) Line M is parallel to line L and passes through the point (5, 1). Find the equation of line M.

..... [2]

- 10 The graph shows the charge left in a phone battery, $B\%$, t hours after the phone is taken off charge.



- (a) Write down the charge in the battery when the phone is taken off charge.

..... % [1]

- (b) Work out the gradient of the line.

..... [2]

- (c) Explain what the gradient tells you about the battery.

..... [1]

- (d) The phone switches itself off when the charge falls to 4%. Work out how long after being taken off charge the phone switches off.

..... hours [2]

END OF QUESTION PAPER

Mark scheme

Subject-Specific Marking Instructions

- M marks are for a correct method.
- A marks are for an accurate answer and depend on preceding M marks, so M0 A1 cannot be awarded.
- B marks are independent of method. SC marks are for special cases worthy of some credit.
- FT means follow through; oe means or equivalent; soi means seen or implied; isw means ignore subsequent working; nfwv means not from wrong working; dep means dependent on the marks indicated; cao means correct answer only.
- For methods not specifically provided for in the mark scheme, including valid visual representations, give as far as possible equivalent marks for equivalent correct work.

Question	Answer	Marks	Part marks and guidance	
1(a)	-5	1		Do not accept 5 or 9
1(b)	(0, 9)	1		Accept $x = 0$, $y = 9$
1(c)	B and a reason that refers to both gradients being -5	2	B1 for B B1 for a correct reason, e.g. "B is $y = -5x + 2$, so it has gradient -5, the same as $y = 9 - 5x$ "	The reason must refer to the gradient (or the coefficient of x), not just "they both have $5x$ " The second B1 is dependent on B

Question	Answer	Marks	Part marks and guidance	
2(a)	$y = \frac{4}{3}x + 1$ oe	3	M1 for a correct method for the gradient, e.g. $(5 - 1) \div (3 - 0)$ or a triangle showing 4 up and 3 across A1 for $\frac{4}{3}$ soi B1 for $c = 1$ soi	If 0 scored, SC1 for $y = mx + 1$ with $m \neq \frac{4}{3}$ Answer must be an equation for 3 marks Accept $y = 1 + \frac{4}{3}x$, $3y = 4x + 3$
2(b)	Yes, with $\frac{4}{3} \times 9 + 1 = 13$ shown	2	M1 for substituting $x = 9$ into their equation, e.g. $\frac{4}{3} \times 9 + 1$, or $12 + 1$ A1 for 13 and "yes"	FT their equation from (a) for M1 only "Yes" with no working scores 0

Question	Answer	Marks	Part marks and guidance	
3	Yes, both lines have gradient -0.4 oe	3	M1 for rearranging $5y + 2x = 15$ to make y the subject, e.g. $5y = -2x + 15$ or $y = -\frac{2}{5}x + 3$ A1 for gradient $-\frac{2}{5}$ or -0.4 identified A1 for "yes" with both gradients stated as equal ($-\frac{2}{5} = -0.4$)	The final A1 requires a comparison of the two gradients, not just two values stated Do not accept "yes" based on comparing the numbers 2 and 0.4 without rearranging

Question	Answer	Marks	Part marks and guidance	
4(a)	She has substituted $x = 3$ and $y = 1$; the point (1, 3) has $x = 1$ and $y = 3$	1	B1 for identifying that the coordinates have been substituted the wrong way round	Accept "she swapped x and y " or "3 is the y -coordinate, not the x -coordinate" oe Do not accept "c should be positive" or "the answer is wrong" on its own
4(b)	$y = 2x + 1$	2	M1 for $3 = 2 \times 1 + c$ A1 cao	

Question	Answer	Marks	Part marks and guidance	
5	$y = -\frac{5}{2}x + 3$ oe	3	M1 for a correct method for the gradient, e.g. $(-2 - 8) \div (2 - (-2))$ or $-10 \div 4$ M1dep for substituting either point into $y = \text{their } m x + c$, e.g. $8 = -\frac{5}{2} \times (-2) + c$ A1 for $y = -\frac{5}{2}x + 3$ oe	Accept $y = -2.5x + 3$, $2y = -5x + 6$, $y = 3 - 2.5x$

Question	Answer	Marks	Part marks and guidance	
6(a)	$x = 0$	1		Do not accept $y = 0$
6(b)	$x = 3$	1		Do not accept $y = 3$
6(c)	It is a vertical line, so its gradient is undefined because the change in x is 0	1	B1 for a correct explanation	Accept equivalent explanations, e.g. " x is always 3, whatever y is"; "the change in x is 0, so calculating the gradient would require division by zero"; "a vertical line does not have a finite gradient m that can be used in $y = mx + c$ " Do not accept "it is parallel to the y -axis" or "it has no y " on its own, unless the explanation also refers to the gradient or to x being fixed

Question	Answer	Marks	Part marks and guidance	
7	A ruled straight line through (0, 2) and, e.g., (-4, 4), (2, 1), (4, 0) and (6, -1)	2	B2 for a correct line across the grid B1 for a line through (0, 2) with a different negative gradient, or a line with gradient $-\frac{1}{2}$ not through (0, 2)	The line must be ruled and cover at least from $x = -2$ to $x = 4$

Question	Answer	Marks	Part marks and guidance	
8(a)	24.5	2	M1 for $(297 - 150) \div (10 - 4)$ or $147 \div 6$ oe A1 cao	Accept any correct pair of points from the table for M1
8(b)	$C = 52$, the fixed daily charge (52p a day)	2	B1 for 52 B1 for "the fixed (daily) charge" or "the cost when no electricity is used" oe	FT their gradient for the first B1 from $150 - 4 \times$ their (a) The explanation must refer to the charge made even when no units are used
8(c)	$C = 24.5u + 52$	1		FT their (a) and their (b) Must be a formula with C as the subject
8(d)	20	2	M1 for $(542 - 52) \div 24.5$ or $24.5u + 52 = 542$ oe A1 cao	M1 requires the cost in pence (542), or both the cost and the formula in pounds FT their formula from (c) for M1 only

Question	Answer	Marks	Part marks and guidance	
9(a)	-2.4	2	M1 for $(-2.4 - 7.2) \div (2.5 - (-1.5))$ or $-9.6 \div 4$ A1 cao	Do not accept 2.4
9(b)	$y = -2.4x + 3.6$	2	M1 for substituting A or B into $y = \text{their } m x + c$, e.g. $7.2 = -2.4 \times (-1.5) + c$ A1 cao	FT their gradient from (a) for M1 only
9(c)	$y = -2.4x + 13$	2	M1 for $1 = \text{their } (a) \times 5 + c$ A1 for $y = -2.4x + 13$ oe	The M1 requires the gradient from (a) to be used unchanged

Question	Answer	Marks	Part marks and guidance	
10(a)	96(%)	1		
10(b)	-8	2	M1 for $(16 - 96) \div (10 - 0)$ or $-80 \div 10$ oe A1 cao	Accept any correct pair of points read from the graph for M1 Do not accept 8 for A1
10(c)	The charge goes down by 8% every hour	1	B1 FT their gradient	Must refer to the charge (or %) and to time (each hour, per hour) Do not accept "the gradient is -8" or "the line goes down" on its own
10(d)	11.5 (hours)	2	M1 for $(96 - 4) \div 8$ or $96 - 8t = 4$ oe A1 cao	Accept 11 hours 30 minutes A correct answer with no working scores 2 marks

Elite Learners Specification & Assessment Objectives Summary

For teachers: this section maps the paper to OCR GCSE (9–1) Mathematics J560 content and assessment objectives. It is an Elite Learners teacher resource and is not part of the OCR-style mark scheme.

Question	OCR J560 content	AO	Marks
1(a)	7.02a Straight line graphs	AO1	1
1(b)	7.02a Straight line graphs	AO1	1
1(c)	7.02b Parallel lines (the parallel-line component only)	AO1, AO2	2
Question 1 total			4
2(a)	7.02a Straight line graphs	AO1 ×3	3
2(b)	7.02a Straight line graphs	AO1, AO2	2
Question 2 total			5
3	7.02b Parallel lines (the parallel-line component only)	AO1 ×2, AO2	3
Question 3 total			3
4(a)	7.02a Straight line graphs	AO2	1
4(b)	7.02a Straight line graphs	AO1 ×2	2
Question 4 total			3
5	7.02a Straight line graphs	AO1 ×3	3
Question 5 total			3
6(a)	7.02a Straight line graphs	AO1	1
6(b)	7.02a Straight line graphs	AO1	1
6(c)	7.02a Straight line graphs	AO2	1
Question 6 total			3
7	7.02a Straight line graphs	AO1 ×2	2
Question 7 total			2
8(a)	7.04b Gradients as rates of change	AO1, AO3	2
8(b)	7.04b Gradients as rates of change	AO2, AO3	2
8(c)	7.02a Straight line graphs	AO2	1
8(d)	7.04b Gradients as rates of change	AO3 ×2	2
Question 8 total			7
9(a)	7.02a Straight line graphs	AO1 ×2	2
9(b)	7.02a Straight line graphs	AO1 ×2	2
9(c)	7.02b Parallel lines (the parallel-line component only)	AO1, AO3	2
Question 9 total			6
10(a)	7.02a Straight line graphs	AO2	1
10(b)	7.02a Straight line graphs	AO1 ×2	2

Question	OCR J560 content	AO	Marks
10(c)	7.04b Gradients as rates of change	AO2	1
10(d)	7.04b Gradients as rates of change	AO3 ×2	2
Question 10 total			6
Paper total			42

Assessment objectives

Assessment objective	Marks
AO1 use and apply standard techniques	26 (62%)
AO2 reason, interpret and communicate mathematically	9 (21%)
AO3 solve problems within mathematics and in other contexts	7 (17%)
Total	42