

Exercise walk-through

C3.3

Gradient of linear graphs

IGCSE Mathematics

You must be able to

- Draw a large slope triangle on a straight-line graph
- Calculate signed rise divided by horizontal run
- Interpret zero and negative gradients

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The method

Method — Key knowledge: Gradient of linear graphs

Gradient is vertical change divided by horizontal change on a straight-line graph. Choose two clear grid intersections far apart, draw a slope triangle, and count using axis units rather than squares alone. Moving right, rising gives positive gradient and falling gives negative gradient. A horizontal line has gradient 0; a vertical line has no defined gradient.

Exercises 2.1·2.3

2.1 On graph paper, draw a line through $(0, 0)$, $(4, 8)$. Use a slope triangle to find its gradient. [2]

2.2 Draw a line through $(0, 6)$, $(3, 0)$. Read its gradient from the grid. [2]

2.3 A graph line rises 5 vertical units over 10 horizontal units. Find its gradient. [2]

Exercises 2.1·2.3

2.1 On graph paper, draw a line through $(0, 0)$, $(4, 8)$. Use a slope triangle to find its gradient. [2]

2.1

- Run 4, rise 8: $m = 8/4 = \mathbf{2}$.

2.2 Draw a line through $(0, 6)$, $(3, 0)$. Read its gradient from the grid. [2]

2.2

- Run 3, fall 6: $m = -6/3 = \mathbf{-2}$.

2.3 A graph line rises 5 vertical units over 10 horizontal units. Find its gradient. [2]

2.3

- $m = 5/10 = \mathbf{0.5}$.

Exercise 2.4

2.4 State the gradient of a horizontal line, and explain.

[2]

3 Exam-style questions

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[2]

3 Exam-style questions

2.4

- The rise is zero for any nonzero run: **0**.

Exercise 3.1 (a)

3.1 Apply the gradient of linear graphs methods below. Show working and include units where appropriate.

(a) On graph paper plot $A = (-2, -1)$ and $B = (4, 2)$ and draw the line through them.[2]

Exercise 3.1 (a)

3.1 Apply the gradient of linear graphs methods below. Show working and include units where appropriate.

(a) On graph paper plot $A = (-2, -1)$ and $B = (4, 2)$ and draw the line through them.[2]

(a)

- **Ruled line through A and B**, extended over the plotted grid.

Exercise 3.1 (b)

3.1 Apply the gradient of linear graphs methods below. Show working and include units where appropriate.

(b) Draw a slope triangle and read the run and rise.

[2]

Exercise 3.1 (b)

3.1 Apply the gradient of linear graphs methods below. Show working and include units where appropriate.

(b) Draw a slope triangle and read the run and rise.

[2]

(b)

- From A to B, **run 6, rise 3** units.

Exercise 3.1 (c)

3.1 Apply the gradient of linear graphs methods below. Show working and include units where appropriate.

(c) Find the gradient and explain its sign.

[2]

Exercise 3.1 (c)

3.1 Apply the gradient of linear graphs methods below. Show working and include units where appropriate.

(c) Find the gradient and explain its sign.

[2]

(c)

- $m = 3/6 = \mathbf{0.5}$; positive because the line rises to the right.

Exercise 3.2 (a)

3.2 On a square grid plot $A = (-3,5)$, $B = (1,3)$ and $C = (5,1)$. Draw the line through them.

(a) Draw a slope triangle from A to C. Read its rise and run and calculate the gradient.[3]

Exercise 3.2 (a)

3.2 On a square grid plot $A = (-3,5)$, $B = (1,3)$ and $C = (5,1)$. Draw the line through them.

(a) Draw a slope triangle from A to C. Read its rise and run and calculate the gradient.[3]

(a)

- From the grid, run is **8** and signed rise **-4** .
- Use $m = \text{rise/run}$, so $m = -4/8 = -\mathbf{1/2}$.

Exercise 3.2 (b)

3.2 On a square grid plot $A = (-3,5)$, $B = (1,3)$ and $C = (5,1)$. Draw the line through them.

(b) Repeat using A to B and explain why the gradient agrees. State the gradient of the horizontal line $y = 3$. [3]

Exercise 3.2 (b)

3.2 On a square grid plot $A = (-3,5)$, $B = (1,3)$ and $C = (5,1)$. Draw the line through them.

(b) Repeat using A to B and explain why the gradient agrees. State the gradient of the horizontal line $y = 3$. [3]

(b)

- From A to B, run 4 and rise -2 give $m = -2/4 = -1/2$.
- Both triangles lie on the same straight line, whose gradient is constant.
- A horizontal line has gradient **0**.