

C3.3 Gradient of linear graphs

Name: _____ Class: _____ Date: _____

Total: 20 marks

KEY WORDS gradient 斜率 • horizontal 水平 • vertical 竖直

Objective

Use gradient of linear graphs to solve Core IGCSE Mathematics problems.

You must be able to:

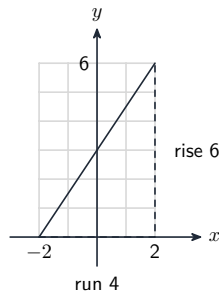
- Draw a large slope triangle on a straight-line graph
- Calculate signed rise divided by horizontal run
- Interpret zero and negative gradients

1 Key knowledge and worked examples

■ 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.

■ Worked example: Gradient of linear graphs

On the grid shown, a line goes from $(-2, 0)$ to $(2, 6)$.

- The slope triangle has run 4 units and rise 6 units.
- $m = \text{rise/run} = 6/4 = 1.5$.
- A fall of 3 units over a run of 2 gives $m = -3/2 = -1.5$.

- Use one consistent direction for both changes.

■ Method check

Take rise and run in the same direction. Reading a slope triangle from a grid is the Core method; a negative rise over a positive run gives a negative gradient.

2 Practice

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]

2.4 State the gradient of a horizontal line, and explain. [2]

3 Exam-style questions

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]

(b) Draw a slope triangle and read the run and rise. [2]

(c) Find the gradient and explain its sign. [2]

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]

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

Solutions

Award method and answer marks as indicated; accept equivalent correct methods.

2.1

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

2.2

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

2.3

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

2.4

- The rise is zero for any nonzero run: $\mathbf{0}$.

3.1

(a)

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

(b)

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

(c)

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

3.2

(a)

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

(b)

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