

C3.5 Equations of linear graphs

Name: _____ Class: _____ Date: _____

Total: 20 marks

KEY WORDS gradient 斜率 • intercept 截距 • vertical 竖直 • horizontal 水平

Objective

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

You must be able to:

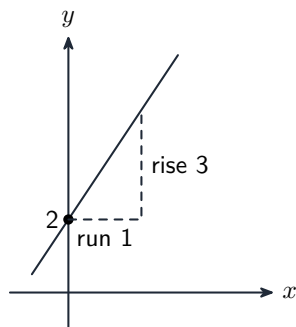
- Read gradient and intercept from a line equation or graph
- Write fully simplified equations of straight lines
- Recognise vertical lines in the form $x = k$

1 Key knowledge and worked examples

■ Key knowledge: Equations of linear graphs

In $y = mx + c$, m is gradient and c is the y -intercept. To find a line equation from a graph, read the intercept and calculate the gradient from a slope triangle. Simplify the equation fully. A horizontal line is $y = k$; a vertical line is $x = k$, not $y = k$.

■ Worked example: Equations of linear graphs



A graph crosses the y -axis at 2 and rises 3 units for a run of 1.

- $m = 3/1 = 3$ and $c = 2$.
- Using $y = mx + c$, its equation is $y = 3x + 2$.
- For $y = -4x + 7$, the gradient is -4 and the intercept is $(0, 7)$.
- A vertical line through $(-2, 5)$ has equation $x = -2$.

■ **Method check**

In $y = mx + c$, c is a y -value where $x = 0$. A vertical line uses $x = k$ and cannot be given a finite gradient.

2 Practice

2.1 State the gradient and y -intercept of $y = 5x - 3$. [2]

2.2 A line has gradient -2 and y -intercept 6 . Give its equation. [2]

2.3 Give the equation of the vertical line through $(4, -1)$. [2]

2.4 Give the equation of the horizontal line through $(2, -5)$. [2]

3 Exam-style questions

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

- (a) On graph paper, draw the line through $(0, -2)$, $(2, 2)$, $(4, 6)$. Read its y -intercept. [2]

- (b) Find the gradient from a slope triangle. [2]

- (c) Write its equation and check it using $(4, 6)$. [2]

3.2 On graph paper draw the line through $(0, 4)$, $(2, 1)$ and $(4, -2)$.

- (a) Read its vertical intercept and find its gradient using a grid slope triangle. Write its equation. [3]

- (b) Write the equation of the vertical line through $(-3, 2)$. Explain why $y = -3$ is a different line. [3]

Solutions

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

2.1

- Compare with $y = mx + c$: $m = 5$, intercept $(0, -3)$.

2.2

- $y = mx + c$ gives $y = -2x + 6$.

2.3

- Every point has the same x : $x = 4$.

2.4

- Every point has the same y : $y = -5$.

3.1

(a)

- The y -axis crossing is $(0, -2)$, so $c = -2$.

(b)

- Run 2 and rise 4 give $m = 4/2 = \mathbf{2}$.

(c)

- $y = 2x - 2$. Check: $y = 2(4) - 2 = 6$.

3.2

(a)

- Intercept **4**.
- A grid triangle gives $m = (1 - 4)/(2 - 0) = \mathbf{-3/2}$.
- Thus $y = \mathbf{-1.5x + 4}$.

(b)

- The vertical line is $\mathbf{x = -3}$: every point has x-coordinate -3 .
- The equation $y = -3$ instead describes a horizontal line with constant y .