

C3.6 Parallel lines

Name: _____ Class: _____ Date: _____

Total: 20 marks

KEY WORDS parallel • gradient • intercept • vertical

Objective

Use parallel lines to solve Core IGCSE Mathematics problems.

You must be able to:

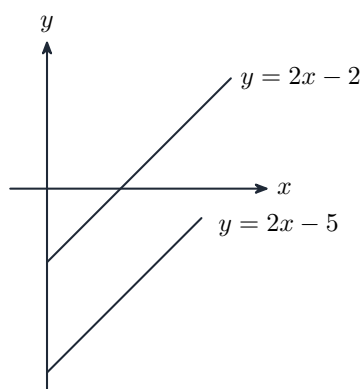
- Recognise parallel lines by their gradients
- Find a parallel line through a stated point
- Distinguish coincident lines from distinct parallel lines

1 Key knowledge and worked examples

■ Key knowledge: Parallel lines

Parallel nonvertical straight lines have the same gradient. Their intercepts differ unless they are the same line. To find a parallel line through a point, copy the gradient into $y = mx + c$, substitute the point, and solve for c . Vertical lines $x = k$ are parallel to one another.

■ Worked example: Parallel lines

Find the line parallel to $y = 2x - 5$ through $(3, 4)$.

- Copy the gradient: $m = 2$.
- Write $y = 2x + c$ and substitute: $4 = 2(3) + c$.
- Subtract 6 to get $c = -2$, so $y = 2x - 2$.
- Check: at $x = 3$, $y = 4$, and both lines have gradient 2.

■ Method check

Equal gradients do not by themselves make two lines distinct: equal intercepts give the same line. Substitute the given point to determine a new intercept.

2 Practice

2.1 Give the gradient of a line parallel to $y = -3x + 8$. [2]

2.2 Which is parallel to $y = 4x - 1$: $y = 4x + 7$ or $y = -4x + 7$? Explain. [2]

2.3 Find the line of gradient 5 through $(0, 2)$. [2]

2.4 Find the line parallel to $y = x - 4$ through $(2, 7)$. [2]

3 Exam-style questions

3.1 Apply the parallel lines methods below. Show working and include units where appropriate.

- (a) A line L has equation $y = -2x + 9$. State the gradient of a parallel line. [2]

- (b) Find the equation of the parallel line through $(4, -1)$. [2]

- (c) Find where your line crosses the y -axis, and verify that $(4, -1)$ lies on it. [2]

3.2 Line L is $y = 3x - 4$. Line M is parallel to L and passes through $(-2, 5)$.

- (a) Find the equation of M , showing how you obtain its intercept. [3]

- (b) Line N is $2y = 6x - 8$. Decide whether N is a distinct parallel line or the same line as L . Explain, and give one example of a distinct parallel line. [3]

Solutions

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

2.1

- Parallel gradients match: -3 .

2.2

- $y = 4x + 7$, because its gradient is also 4.

2.3

- The point is the intercept: $y = 5x + 2$.

2.4

- $7 = 2 + c$, so $c = 5$ and $y = x + 5$.

3.1

(a)

- $m = -2$.

(b)

- $-1 = -2(4) + c$ gives $c = 7$, so $y = -2x + 7$.

(c)

- Crossing: $(0, 7)$. Substitution gives $y = -8 + 7 = -1$, as required.

3.2

(a)

- Parallel lines have equal gradient, so $m = 3$.
- In $y = 3x + c$, substitute $5 = 3(-2) + c$, giving $c = 11$ and $y = \mathbf{3x + 11}$.

(b)

- Divide N's equation by 2 to obtain $y = 3x - 4$, so N is **the same line** as L.
- An example of a distinct parallel line is $\mathbf{y = 3x + 1}$, with a different intercept.