IGCSE MATHEMATICS • EXERCISE SHEET

E3.6 Parallel lines

Name: _____ Class: _____ Date: _____ **Total: 14 marks**

KEY WORDS parallel 平行 • gradient 斜率 • y-intercept 纵截距 • rearrange 变形 • substitute 代入

Objective

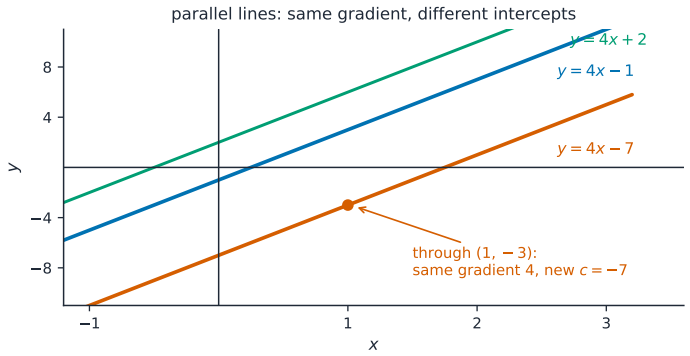
Build the skills to answer Extended exam questions on **parallel lines** 平行线 — recognising that parallel lines have **equal gradients** 斜率相等, finding the equation of a line parallel to a given one, and deciding whether two equations describe parallel lines.

You must be able to:

- write down the gradient of a line parallel to a given line
- find the equation of the line parallel to a given line through a given point
- decide whether two equations are parallel by rearranging both into $y = mx + c$

1 Worked examples

Same gradient, different intercept



$y - y_1 = m(x - x_1)$ (same m)

Changing c slides the line up or down; only m changes its direction

- **Rule:** parallel $\Rightarrow m_1 = m_2$. The y-intercepts must be **different**, or the two are the same line.
- **Rearrange before comparing.** $4y = 8x - 3$ is $y = 2x - 0.75$, so it IS parallel to $y = 2x + 1$.
- **Through a point:** keep m, then substitute the point to find the new c. Parallel to $y = 3x + 1$ through $(2, 9)$: $9 = 3(2) + c$, so $c = 3$ and $y = 3x + 3$.
- A question asking you to *show* two lines are parallel wants both gradients stated and compared.

Answer shapes (marked by **method marks** — M1 for a correct method, A1 for the correct answer): the rearranged equation, and the substitution that finds c, are the method marks.

2 Practice

2.1 Write down the gradient of any line parallel to $y = 5x - 2$. [1]

2.2 Find the equation of the line parallel to $y = 3x + 1$ that passes through $(2, 9)$. [3]

2.3 Show that $y = 2x + 1$ and $4y = 8x - 3$ are parallel. [2]

3 Exam-style questions

3.1 The line L has equation $3y = 12x - 9$.

(a) Find the gradient of L. [2]

(b) Find the equation of the line parallel to L that passes through $(-1, 2)$. [3]

3.2 Find the equation of the line parallel to $y = -\frac{1}{2}x + 4$ that passes through $(6, 5)$. [3]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

Each answer shows the steps, then the **result**.

2.1

- parallel lines share a gradient

$$= \mathbf{5}$$

2.2

- the gradient is still 3, so $y = 3x + c$
- substitute $(2, 9)$: $9 = 6 + c$, so $c = 3$

$$\mathbf{y = 3x + 3}$$

2.3

- divide the second equation by 4: $y = 2x - \frac{3}{4}$
- both gradients are 2, and the intercepts differ, so the lines are parallel

3.1

(a)

- divide by 3: $y = 4x - 3$

$$m = \mathbf{4}$$

(b)

- the parallel line is $y = 4x + c$
- substitute $(-1, 2)$: $2 = -4 + c$, so $c = 6$

$$\mathbf{y = 4x + 6}$$

3.2

- the gradient stays $-\frac{1}{2}$, so $y = -\frac{1}{2}x + c$
- substitute $(6, 5)$: $5 = -3 + c$, so $c = 8$

$$\mathbf{y = -\tfrac{1}{2}x + 8}$$