Teacher guidance

Key focus

Gradient measures how **steep** a line is. It tells you how much the line goes up or down for every unit you move sideways. Gradient = $\frac{\text{rise}}{\text{run}}$

How to calculate gradient

1. Find the vertical distance (**rise**): the difference in y-values.
2. Find the horizontal distance (**run**): the difference in x-values.
3. Divide: gradient $= \frac{\text{rise}}{\text{run}}$.

Quick interpretation guide

- Positive gradient: line goes **up** left to right
- Negative gradient: line goes **down** left to right
- Large positive (e.g. 3): steep upward
- Small positive (e.g. $\frac{1}{4}$): gentle upward
- Large negative (e.g. -5): steep downward
- Zero: horizontal line
- Undefined: vertical line

Example 1: rise over run

A line rises 3 units for every 2 units it runs. Gradient = $\frac{3}{2} = 1.5$.

Example 2: from two points

Find gradient from $(1, 2)$ to $(5, 4)$.
Rise = $4 - 2 = 2$, Run = $5 - 1 = 4$. Gradient = $\frac{2}{4} = \frac{1}{2}$.

Example 3: negative gradient

From $(0, 1)$ to $(2, -3)$.
Rise = $-3 - 1 = -4$, Run = $2 - 0 = 2$. Gradient = $\frac{-4}{2} = -2$.

Example 4: from a table

Table: $(0, 2), (1, 4), (2, 6), (3, 8)$.
Change in y: always $+2$. Change in x: always $+1$. Gradient = $\frac{2}{1} = 2$.

Try these

1. Find gradient from $(-1, 3)$ to $(1, 7)$.
2. A line falls 5 when it runs 2. What is the gradient?
3. For the sequence $10, 7, 4, 1, \ldots$, what is the rate of change?
4. Which is steeper: gradient $\frac{2}{3}$ or gradient $\frac{4}{5}$?

Watch for

Do not mix up rise and run. $\frac{\text{rise}}{\text{run}} \neq \frac{\text{run}}{\text{rise}}$. Always put the change in y on top and change in x on the bottom.

Watch for

When going from point (x_1, y_1) to (x_2, y_2), both differences must use the same direction order: $\frac{y_2 - y_1}{x_2 - x_1}$, not $\frac{y_1 - y_2}{x_2 - x_1}$.