

LESSON 7 | MEET THE IDEA

Slope, rate of change and proportional relationships

Tuesday, November 3, 2026 . 6:00–7:00 PM Central

By the end, I can...

Find slope from points, a table, a graph or an equation, and explain what its sign and units mean.

Slope compares the vertical change with the horizontal change. For a straight, nonvertical line, that rate stays constant.

The slope rule

$m = (y_2 - y_1) / (x_2 - x_1)$
 Think: **change in output / change in input**. Use the same point order on the top and bottom. The denominator cannot be zero.

Example 1 | Use the points (1, 3) and (4, 9)

$m = (9 - 3) / (4 - 1)$

 $m = 6 / 3 = 2$

Subtract second-point values minus first-point values in both places.

The output increases by 2 for each increase of 1 in the input.

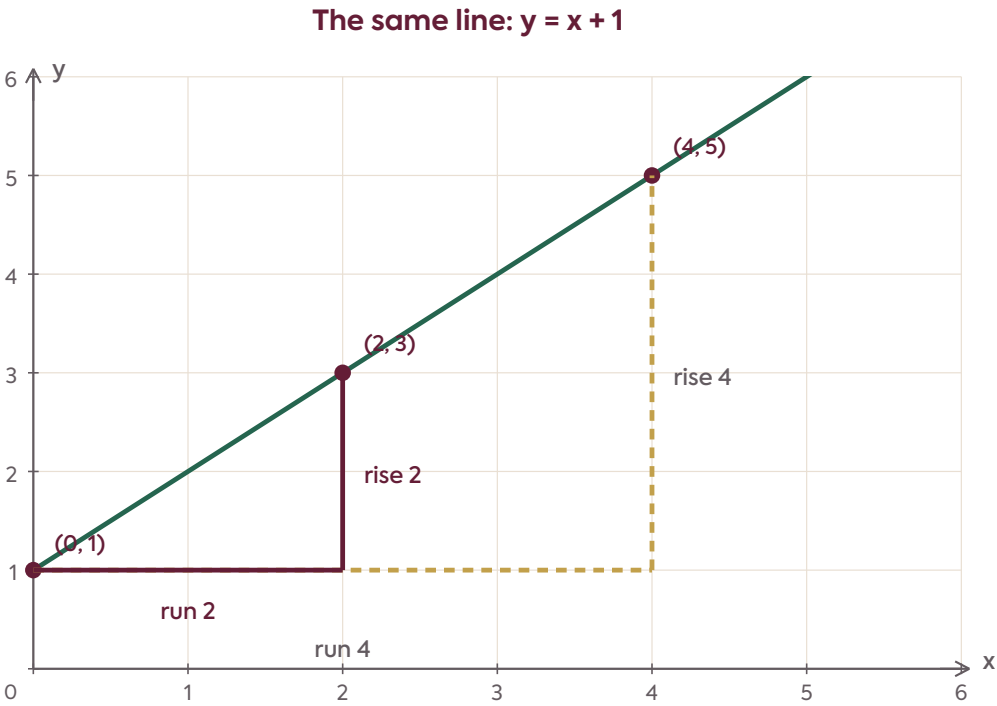
x	1	4	6
y	3	9	13

The table also has slope 2: from x = 4 to x = 6, $(13 - 9)/(6 - 4) = 4/2 = 2$. Unequal input gaps are fine; compare **ratios**, not just output differences.

LESSON 7 | A VISUAL EXPLANATION

Why the slope stays the same

Draw two right triangles along one straight line. Both have a right angle and the same angle where the line meets a horizontal side, so the triangles are **similar**.



Triangle	Rise / run	Slope
Small, solid sides	2 / 2	1
Large, dashed sides	4 / 4	1

The larger triangle doubles **both** matching side lengths. Its ratio stays 1. Similar triangles explain why choosing different pairs of points on a nonvertical line gives the same slope.

Keep the direction consistent

Going backward changes both signs: $(-2)/(-2) = 1$. Changing the order in only the numerator would give the wrong sign.

LESSON 7 | CONTEXT AND EQUATION FORMS

Give the rate a meaning

Example 2 | A tank holds 18 L at 2 min and 10 L at 6 min

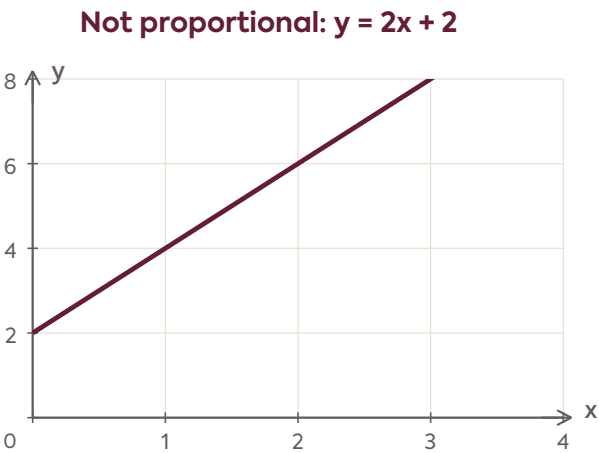
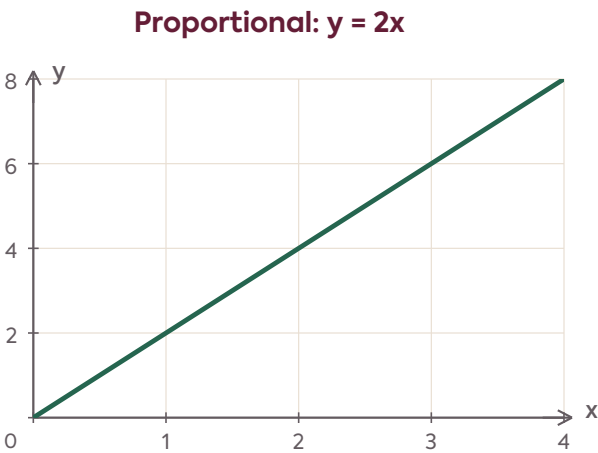
$$m = (10 - 18) / (6 - 2)$$
$$m = -8 / 4 = -2$$

Compare liters with minutes, in the same point order.

The tank loses 2 liters per minute during this constant-rate period.

Equation	Find the slope
$y = 3x + 4$	$m = 3$: the coefficient of x after y is isolated.
$2x + y = 6$	Rewrite as $y = -2x + 6$, so $m = -2$.
$y - 5 = (1/2)(x - 2)$	$m = 1/2$. This point-slope form is developed in Class 9.

A **proportional relationship** has the form $y = kx$ and passes through $(0, 0)$. Its slope k is the unit rate. A fixed starting fee would change the model to $y = mx + b$ with $b \neq 0$.



Horizontal line: slope 0. Vertical line: undefined slope, because the horizontal change is 0. Class 10 explores both cases.

LESSON 7 | SHORT CHECKS

Your turn

Try these before reading the worked answers. Your main homework is in digital practice.

1. Find the slope through (2, 5) and (6, 13).

2. A table pairs $x = 0, 2, 5$ with $y = 7, 3, -3$. Show that both successive intervals have the same slope.

3. Two right triangles along a line have rise/run $3/2$ and $9/6$. Explain why the slopes agree.

4. A tank contains 40 liters at 0 minutes and 28 liters at 3 minutes. Find and interpret the constant rate.

5. For $y = 3x$, list three points including the origin. Is it proportional? What is its slope?

Before you move on

Have you kept the point order consistent? Have you divided by the change in x ? If the quantities have units, have you included them?

LESSON 7 | WORKED ANSWERS AND RECAP

Check your thinking

1. $m = (13 - 5)/(6 - 2) = 8/4 = 2$.
2. First interval: $(3 - 7)/(2 - 0) = -4/2 = -2$. Second: $(-3 - 3)/(5 - 2) = -6/3 = -2$. Both rates match.
3. $9/6 = 3/2$. The larger triangle multiplies both matching sides by 3, so the ratio is unchanged. Both slopes are **1.5**.
4. $(28 - 40)/(3 - 0) = -12/3 = -4$ **liters per minute**. The tank loses 4 liters each minute over this period.
5. Possible points: **(0, 0), (1, 3), (2, 6)**. Yes: it has the form $y = kx$, with **$k = m = 3$** . Its graph is a line through the origin.

Slope describes a change

Positive: y increases as x increases. Negative: y decreases. Zero: y stays constant. Undefined: the line is vertical, so there is no nonzero horizontal change.

I can...

- ☐ Calculate slope from different representations.
- ☐ Explain constant slope using similar triangles.
- ☐ Interpret a rate and recognize a proportional model.

Next class: graph a line and interpret its intercepts. Curriculum focus: A.3A, A.3B, A.2D.