Parallel Lines Share a Slope

Students learn that parallel lines are lines with the same slope and different y-intercepts, connect that to sliding b in the family of lines, decide whether lines are parallel from equations and graphs, and write a parallel line through a point.

TIME	35 minutes (one student with a parent or tutor, or a small group)
WHO	Math 1 (algebra readiness), about age 12. Follows Unit 3 (Linear Functions), especially Lesson 3 (the family of lines) and Lesson 4 (writing the equation of a line).
MATERIALS	Student worksheet (PDF), the Deep Dive 5 interactive page for this lesson, pencil, graph paper, ruler
PRIOR KNOWLEDGE	Slope as rise over run; $y = mx + b$ and the jobs of m and b; put-the-point-in to find b; rewriting standard form into $y = mx + b$.
STANDARDS	NC Math 1 NC.M1.G-GPE.5 (use slope to determine whether lines are parallel; write the equation of a line parallel to a given line through a point).
KEEP OUT	Perpendicular lines are Lesson 2. Distance and midpoint are Unit 11.

Learning goals

1. Say what parallel means in words (never cross, same distance apart) and on a graph (same m, different b).
2. Decide whether two lines are parallel from their equations (rewriting when needed) and from their graphs, and tell parallel from the same line.
3. Write the equation of a line parallel to a given line through a given point: keep m, put the point in, solve for b.
4. State the special cases: vertical lines are parallel to each other by sight; horizontal lines share slope 0.

Vocabulary: say both, every time

The rule for the whole lesson: whenever the adult or the student says a math word, they follow it with the plain-English version. Proper term first, plain English second, until the student does it without being asked.

TERM	LOOKS LIKE	PLAIN ENGLISH
Parallel	same m, different b	Never cross, always the same distance apart.
Slope, m	rise over run	Steepness and direction. Parallel lines share it.
y-intercept, b	(0, b)	Where they differ.
Same line	same m and same b	One line written twice.
Vertical, horizontal	x = 3, y = 4	Vertical pairs and horizontal pairs are parallel.

> THE ONE SENTENCE TO SAY OUT LOUD
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> Parallel means the same slope and a different y-intercept: same m, different b. To write one through a point, keep m and use the point to find b.

Lesson timeline (35 minutes)

0:00 to 0:05	Warm-up: slide it. On the grid, draw y = 2/3 x. Ask the student to draw it slid up 3 and slid down 3 (Unit 3, Lesson 3). Ask what is the same (the tilt, m) and what changed (b). Ask whether the three lines will ever meet. Name it: parallel.
0:05 to 0:14	Mini-lesson: same m, different b. Say the definition both ways: in words (never cross, same distance apart) and on the graph (same slope, different y-intercept). Contrast with same b (same start, different tilt: they cross at (0, b)) and with same m and same b (the same line). Show the special cases: two vertical lines, two horizontal lines.
0:14 to 0:24	The skill. Parallel to y = 2x – 5 through (3, 4): keep m = 2, put the point in, solve for b, write it, check. Then one that needs a rewrite first. Use the See it on the grid widget so the student plots the point and draws the new line beside the old one.
0:24 to 0:32	Practice. The Read the slopes grids, then the practice problems or Worksheet Parts A to C. Same buttons: Hint, Show next step, Reveal answer, Hide help. Listen for same m, different b as the reason every time.
0:32 to 0:35	Exit ticket. Worksheet Part E or an index card. Success looks like: yes, same m = –2 and different b; y = 4x – 5.

Misconceptions to listen for

- **Same b means parallel.** Same b means they cross at the same point on the y-axis. Parallel is same m.
- **Comparing before rewriting.** Read m only from y = mx + b.
- **Changing m when writing the parallel line.** Keep it. Only b is new.
- **Close enough.** Slopes 1 and 5/4 look alike on a small grid, but the lines cross. Same means exactly the same.
- **Same line called parallel.** If m and b both match, it is one line.
- **Vertical lines are not parallel because they have no slope.** They are, by sight: both go straight up and down.

Support and stretch

Support

Use a ruler and slide it without turning to show parallel. Keep slopes whole numbers at first. Give the two moves as a card: keep m, use the point to find b.

Stretch

Ask for the parallel line through a point when the given line is in standard form with a fraction slope. Ask how many lines are parallel to a given line (infinitely many) and how many pass through a given point too (exactly one). Ask what parallel means for two vertical lines and why the slope rule cannot be used.

Where this goes next

Lesson 2: perpendicular lines and the negative reciprocal. The slope does its second new job, with the why: turn a line a quarter turn and the rise and run trade places.

> THE HABIT TO BUILD
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> Before saying parallel, compare m. Same m and different b, and only then.