What a Point Means

Students read points on a proportional graph with a sentence frame, learn what the origin and the point (1, r) mean, read the unit rate off the graph, and interpret a point between grid lines and a point off the line.

TIME	25 minutes (one student with a parent or tutor)
WHO	7th grade, about age 12. Follows Lesson 5, Writing y = rx.
MATERIALS	Student worksheet (PDF), the Deep Dive 5 page for this lesson (tap-a-point graph, graph reading), pencil.
PRIOR KNOWLEDGE	The graph test and the equation y = rx (Lessons 4 and 5).
STANDARDS	NC.7.RP.2.
KEEP OUT	Slope. Say unit rate and the point (1, r).

Learning goals

1. Read any point with the frame: in x input units, you get y output units.
2. Explain the origin: zero in gives zero out, on every proportional graph.
3. Explain (1, r) and read the unit rate off a graph.
4. Decide whether a point is on the line, and say what an off-line point means.

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
Ordered pair (x, y)	(3, 24)	Input first, then output.
Origin	(0, 0)	Zero in gives zero out.
(1, r)	(1, 8)	The point that shows the unit rate.

> THE ONE SENTENCE TO SAY OUT LOUD
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> In x, you get y. The origin is zero for zero, and (1, r) is the unit rate.

Lesson timeline (25 minutes)

0:00 to 0:05	Warm-up. Jordan's line on the page. Point to (3, 24) and ask what it means. Teach the frame.
0:05 to 0:12	The two special points. (0, 0) and (1, 8). Then (2.5, 20) and the red point (4, 30). Tap each one on the page and check the sentence.
0:12 to 0:17	Another graph. The car at 28 miles per gallon. The four reading questions.
0:17 to 0:22	Practice. The practice problems or Worksheet Parts A and B.
0:22 to 0:25	Exit ticket. Worksheet Part C. Success looks like (1, 28) read with units and named as the unit rate.

Misconceptions to listen for

- **(3, 24) means 24 hours.** Input first, then output.
- **The origin is just where the axes meet.** It is a point of the story: zero in, zero out.
- **r can be read anywhere.** Read it at x = 1, or divide y by x.
- **A point off the line is a graphing error.** It is a pair the relationship does not make.

Support and stretch

Support

Say the frame aloud with every point, pointing at x on the bottom axis and y on the side axis. For on-or-off, multiply x by r every time.

Stretch

Give a graph with no numbers on the line and only (1, r) marked, and ask for three more points and the equation. Ask what (1, r) looks like when r is a fraction.

Where this goes next

Lesson 7: converting rates. Both units of a rate change, one at a time, and it is still multiplying by the same number.

> THE HABIT TO BUILD
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> Input first, then output, then the units. Every point, every time.