What Makes It Proportional

Students learn what proportional means, test tables by dividing each output by its input, see why a fee breaks the pattern, meet the word proportion, and get a first look at the graph test.

TIME	25 minutes (one student with a parent or tutor)
WHO	7th grade, about age 12. Follows Lesson 1, Rates with Fractions.
MATERIALS	Student worksheet (PDF), the Deep Dive 5 page for this lesson (table checker and sorter), pencil.
PRIOR KNOWLEDGE	Unit rates (Lesson 1); ratio tables from 6th grade (NC.6.RP.3).
STANDARDS	NC.7.RP.2.
KEEP OUT	The name constant of proportionality (Lesson 3). The full graph test and the word steeper (Lesson 4). Cross multiplying.

Learning goals

1. Say what proportional means: always multiplies by the same number.
2. Test a table by dividing each output by its input, every row.
3. Explain why a starting fee makes a relationship not proportional.
4. Write a proportion from two rows of a proportional table.

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
Proportional	0.75, 0.75, 0.75	Always multiplies by the same number.
Proportion	$\frac{1.50}{2} = \frac{3.00}{4}$	Two ratios that are equal.
Input, output	cups, cost	What you start with, what you get.

> THE ONE SENTENCE TO SAY OUT LOUD
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> A proportional relationship always multiplies by the same number, the unit rate.

Lesson timeline (25 minutes)

0:00 to 0:04	Warm-up: portion. Cut a paper pizza into equal slices. Every slice is the same share. Say the thread sentence together.
0:04 to 0:12	Mini-lesson: two tables. Lemonade and bowling side by side. Divide every row out loud. Ask what zero games would cost, and why that matters.
0:12 to 0:18	Checker and sorter. The three table checkers, then the sorting activity. Each wrong sort gets a reason.
0:18 to 0:22	Proportion. Two equal ratios from the lemonade table. A glance at the points lining up through (0, 0).
0:22 to 0:25	Exit ticket. Worksheet Part C. Success looks like all three rows divided and the 16 spotted.

Misconceptions to listen for

- **Going up by the same amount means proportional.** Bowling goes up by $5 each game and is not. The test is dividing, not subtracting.
- **Two rows are enough.** The exit ticket table passes on two rows and fails on the third.
- **Dividing the wrong way.** Output divided by input, the same way every row.
- **A proportion is a table.** A proportion is two equal ratios.

Support and stretch

Support

Keep a third column on every table for output divided by input, and fill it in together before deciding. Ask the zero question every time: what would zero cost?

Stretch

Give a table with a fraction unit rate (3 cups for 2 batches) and ask the student to test it. Ask them to invent a story that looks proportional but hides a fee.

Where this goes next

Lesson 3: the number every row divides to gets its names, the unit rate and the constant of proportionality, and students compare two proportional relationships.

> THE HABIT TO BUILD
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> Divide every row. Then ask: what does zero cost?