Unit Rate Problems

Students put the unit together on real problems: the unit rate way and the scale factor way, better buys, and a multi-step travel problem, and they review the whole unit through its study guide.

TIME	25 minutes (one student with a parent or tutor)
WHO	7th grade, about age 12. Follows Lesson 7, Converting Rates. Closes Unit 1.
MATERIALS	Student worksheet (PDF), the Unit 1 study guide (this lesson's), the Deep Dive 5 page for this lesson, pencil, calculator for decimals.
PRIOR KNOWLEDGE	All of Unit 1: unit rates with fractions, the table and graph tests, y = rx, reading points, converting.
STANDARDS	NC.7.RP.1, NC.7.RP.2, NC.7.RP.3.
KEEP OUT	Percent (Unit 2 starts there). Cross multiplying as a trick; keep it unit rate and scale factor.

Learning goals

1. Solve a problem the unit rate way and the scale factor way, and show they agree.
2. Find a better buy by comparing unit rates in the same units.
3. Solve a multi-step story problem, choosing the unit rate that answers the question.
4. Say the unit's sentence from memory and name the four places to find the unit rate.

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
Scale factor	30 ÷ 12 = 2.5	How many times bigger.
Better buy	$0.22 an ounce beats $0.25	The lower price for one.
Unit rate	6 minutes per mile	How much for one.

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

Lesson timeline (25 minutes)

0:00 to 0:03	Warm-up. The student says the unit's sentence from memory. If it comes out word for word, the unit worked.
0:03 to 0:10	Cookies, both ways. Unit rate way, scale factor way, same answer. Ask which numbers were friendlier.
0:10 to 0:15	Better buy. Chips, then the cereal and juice questions. Same units before comparing.
0:15 to 0:21	Emily. Which unit rate, and why. Four steps to the bell.
0:21 to 0:25	Review and exit ticket. Worksheet Parts D and E with the study guide open. Success looks like 45 points found two ways.

Misconceptions to listen for

- **The bigger package is always the better buy.** The 24-ounce cereal box is not.
- **Only one way is right.** Both ways always agree; use the other to check.
- **Any unit rate will do.** Emily knows the miles, so she wants minutes per mile.
- **Adding the scale factor instead of multiplying.** 30 cookies is 2.5 times 12, so 2.5 times the flour.

Support and stretch

Support

Keep the two ways as two columns on paper and fill both for every problem until the student chooses one on purpose. For Emily, write the four steps as a checklist.

Stretch

Ask for a problem where the scale factor way is clearly friendlier, and one where the unit rate way is. Ask what Emily's equation t = 6d means and what (1, 6) means on its graph.

Where this goes next

Unit 2, Lesson 1: percent. A percent is a rate out of 100, so every percent problem is a proportional relationship that always multiplies by the same number.

> THE HABIT TO BUILD
>
> Find how much for one. Then multiply. Check with the other way.