Carnegie Learning Family Guide — Grade 7

Module 1: Thinking Proportionally

TOPIC 2: FRACTIONAL RATES

In this topic, students extend their work with rates to include rates with fractional values. To begin the topic, students write, analyze, and use unit rates with whole numbers and fractions to solve problems. Next, students calculate and use unit rates from ratios of fractions. They use unit rates and proportions to convert between measurement systems. Finally, students review strategies for solving problems involving equivalent ratios and proportions.

Where have we been?

In grade 6, students learned about ratios, rates, unit rates, and proportions, and they represented ratios and unit rates with tables and graphs. Students used a variety of informal strategies to compare ratios, determine equivalent ratios, and solve simple proportions (e.g., double number lines, scaling up and down by a scale factor, conversion factors).

Where are we going?

This topic broadens students' range of numbers and strategies for solving ratio and proportion problems, preparing them to dig deeper into representations of proportional relationships in the next topic and solving multistep ratio and percent problems in future lessons.

Using Means and Extremes to Solve Proportions

In the proportion $\frac{a}{b} = \frac{c}{d}$, the terms *b* and *c* are called the *means*, and the terms *a* and *d* are called the *extremes*.

extremes

3 : 4 = 9 : 12

means

(4)(9) = (3)(12)

or

$\frac{3}{4} = \frac{9}{12}$

means extremes

(4)(9) = (3)(12)

You can solve a proportion for an unknown variable using this method. First, identify the means and extremes. Then, set the product of the means equal to the product of the extremes. Finally, isolate the variable to solve for the unknown quantity.

Myth: "If I can get the right answer, then I should not have to explain why."

Sometimes you get the right answer for the wrong reasons. Suppose a student is asked, "What is 4 divided by 2?" and she confidently answers "2!" If she does not explain any further, then it might be assumed that she understands how to divide whole numbers. But, what if she used the following rule to solve that problem? "Subtract 2 from 4 one time." Even though she gave the right answer, she has an incomplete understanding of division.

However, if she is asked to explain her reasoning, either by drawing a picture, creating a model, or giving a different example, the teacher has a chance to remediate her flawed understanding. If teachers aren't exposed to their students' reasoning for both right and wrong answers, then they won't know about or be able to address misconceptions. This is important, because mathematics is cumulative in the sense that new lessons build upon previous understandings.

You should ask your student to explain their thinking, when possible, even if you don't know whether the explanation is correct. When children (and adults!) explain something to someone else, it helps them learn. Just the process of trying to explain is helpful.

#mathmythbusted

Talking Points

You can further support your student's learning by asking questions about the work they do in class or at home. Your student is learning to reason using fractional rates.

Questions to Ask

- How does this problem look like something you did in class?
- Can you show me the strategy you used to solve this problem? Do you know another way to solve it?
- Does your answer make sense? How do you know?

Key Terms

complex ratio

A complex ratio is a ratio in which the numerator, denominator, or both are fractions.

proportion

A proportion is an equation that states that two ratios are equal. To *solve a proportion* means to determine all the values of the variables that make the equation true.

inverse operations

Inverse operations are operations that "undo" each other. Multiplication and division are inverse operations.