Module 2: Operating with Signed Numbers

TOPIC 2: MULTIPLYING AND DIVIDING RATIONAL NUMBERS

In this topic, students use number lines and two-color counters to model the multiplication of integers before developing rules for determining the product of signed numbers. Students use patterns and multiplication fact families to develop the rules for the quotient of signed numbers, namely that the same rules apply to quotients as products. After students understand multiplying and dividing integers, they apply the rules to the set of rational numbers in the context of problem solving.

Where have we been?

Students have learned to use number lines and two-color counters to represent and model operations with integers. Even earlier, in elementary school, students learned that multiplication can be viewed as repeated addition and as equal groups of objects. Fact families, a familiar concept from elementary school, are used to help students generalize the rules for the signs of the products and quotients.

Where are we going?

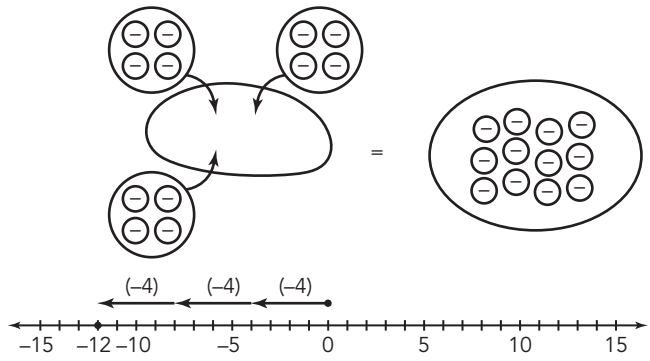
It is essential that students develop a strong conceptual foundation for multiplying and dividing with rational numbers, as a basis for manipulating and representing increasingly complex numeric and algebraic expressions. In high school, students will focus more on expressions and equations than on numbers, including rational expressions, equations, and functions.

Modeling Integer Products with Two-Color Counters and Number Lines

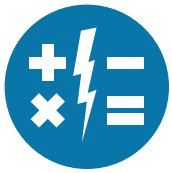
Both the number line and counter models represent the product $3 \times (-4)$, or 3 groups of -4.

Consider the expression $3 \times (-4)$. As repeated addition, it is represented as $(-4) + (-4) + (-4)$.

You can think of $3 \times (-4)$ as three groups of (-4).



Myth: Just watch a video, and you will understand it.



Has this ever happened to you? Someone explains something, and it all makes sense at the time. You feel like you get it. But then, a day later when you try to do it on your own, you suddenly feel like something's missing? If that feeling is familiar, don't worry. It happens to us all. It's called the illusion of explanatory depth, and it frequently happens after watching a video.

How do you break this illusion? The first step is to try to make the video interactive. Don't treat it like a TV show. Instead, pause the video and try to explain it to yourself or to a friend. Alternatively, attempt the steps in the video on your own and rewatch it if you hit a wall. Remember, it's easy to confuse familiarity with understanding.

#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 multiply and divide with negative integers and rational numbers.

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?
- Is there anything you don't understand? How can you use today's lesson to help?

Key Terms

terminating decimals

A terminating decimal has a finite number of digits, meaning that after a finite number of decimal places, all following decimal places have a value of 0.

repeating decimals

A repeating decimal is a decimal in which a digit or a group of digits repeat infinitely.

bar notation

Bar notation is used to indicate the digits that repeat in a repeating decimal. In the quotient of 1 and 7, the sequence 142857 repeats. The digits that lie underneath the bar are the digits that repeat.

$\frac{1}{7} = 0.142857142857... = 0.\overline{142857}$