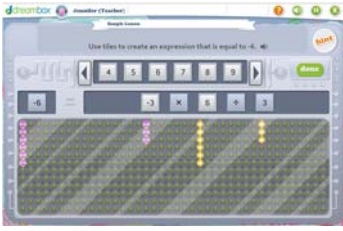


Integer Operations



The interactive white board Teacher Tool for this lesson is available on our website under Resources www.dreambox.com/teachertools. Students use substitution to create equations involving multiplication and division with integers. The DreamBox lesson visually represents the order and the results of the operations.

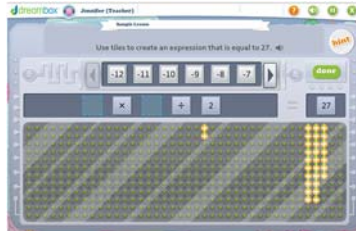
Sample Lesson

Objective: When given an equation involving multiplication, division, and two unknown values, students use integers to create an expression that is equal to a target value.

Background: Prior to this lesson, students should understand how multiplication and division are represented by arrays and be fluent with integer products and quotients such as $(-3) \times 2 = (-6)$ and $(-10) \div (-2) = 5$.

Instruction:

1. Bring up the DreamBox interactive white board lesson.



2. Begin by stating, "We need to choose two integers to substitute into this equation to make it true. How could we figure this out? Take a moment to create an expression on your own and then discuss it with your partner and explain why you think it's true." Once students have discussed their ideas in pairs, ask a volunteer to provide her solution. Possible student responses for $__ \times __ \div 2 = 27$
 - "In order to get 27, we need to create a multiplication problem that can be divided by 2. If we work backward, we can multiply 27×2 to get 54. The rest is easy because $6 \times 9 = 54$. We can plug that into the equation and it works."
 - "In order to get 27, we need to create a division problem that equals 3 such as $6 \div 2$ because $3 \times 9 = 27$. Then we can multiply 3×9 to get 27."
 - "We can use -6 and -9 because when you multiply the two negative numbers you get a positive 54 that can be divided by 2 to get a positive 27."
3. Select the done button to confirm the class's answer. For incorrect responses, discuss why they are incorrect. One possible error is using an invalid order of operations. If students rely too heavily on acronyms such as PEMDAS to determine the order of operations, they will have difficulty with an equation such as $__ \div __ \times 6 = 24$ because the division operation is executed before the multiplication operation.
4. For correct solutions, require students to next list all of the other valid expressions that would have worked. In this example, the only valid solution pairs of numbers are 6 and 9 or -6 and -9 because no other combination of available number tiles results in a product of 54. Once students agree that there aren't any other valid expressions that generate a true equation, ask them to construct an argument that proves why there are definitely no other solutions.

Common Core State Standards

| Grade | ID | Domain | Cluster | Standard |
|-------|----------|-------------------------------------|--|---|
| 7 | NS.A.2b | The Number System | Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. | Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts. |
| 6 | EE.A.2.c | Expressions and Equations | Apply and extend previous understandings of arithmetic to algebraic expressions. | Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). |
| 6 | EE.B.5 | Expressions and Equations | Reason about and solve one-variable equations and inequalities. | Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. |
| 7 | SMP.1 | Standards for Mathematical Practice | | Make sense of problems and persevere in solving them. |
| 7 | SMP.2 | Standards for Mathematical Practice | | Reason abstractly and quantitatively. |