

Math: Grade 7, Lesson 3, Generating Equivalent Expressions

Lesson Objective: Students will use the additive inverse to simplify equations with a focus on proving the expressions are equal by substitution.

Lesson Focus: In this lesson, students will generate equivalent expressions and explore using the additive inverse.

Practice Focus: Students will complete a set of problems by simplifying each expression and then substitute the number 5 in for each variable in order to make sure that the expressions are equal.

TN Standards: 7.EE.A.1 and 7.EE.A.2

Key Vocabulary: Additive inverse, Prove, Opposite, Sum, and Equal

Teacher Materials:

- Teacher will need the table that is referenced during instruction prepared on chart paper or a white board. Please see below.

Student Materials:

- Student practice pack for math, grade 7, lesson 3
- Paper and a pencil, and a surface to write on

Teacher Do	Student Do
<p>Opening (1 min)</p> <p>Hello! Welcome to Tennessee's At Home Learning Series for math! Today's lesson is for all our 7th graders out there, though all children are welcome to tune in. This lesson is the third in our series.</p> <p>My name is ____ and I'm a ____ grade teacher in Tennessee schools! I'm so excited to be your teacher for this lesson! Welcome to my virtual classroom!</p> <p>If you didn't see our previous lesson, you can find it at www.tn.gov/education. You can still tune in to today's lesson if you haven't see any of our others. But, it might be more fun if you first go back and watch our other lessons since we'll be talking about things we learned previously.</p> <p>Today we will be learning about the additive inverse and equivalent expressions in mathematics! Before we get started, to participate fully in our lesson today, you will need:</p> <ul style="list-style-type: none"> Paper and a pencil, and a surface to write on Student practice packet for math, grade 7, lesson 3, which is available at www.tn.gov/education <p>Ok, let's begin!</p>	<p>Students get materials ready for the lesson.</p>
<p>Intro (5 minutes)</p>	

<p>Today we will be talking about generating equivalent expressions.</p> <p>Remember that equivalent means “equal” or “same”. We will be using what we know about additive inverses and order of operations to generate the equivalent expressions.</p> <p>Additive inverses have a sum of zero. Fill in the center column of the table (see table below) with the opposite of the given number or expression, then show the proof that they are opposites. We will do the first one together.</p> <p>Please copy the table down as shown and fill out the opposite so it equals zero. [Table is included at the end of the script.]</p> <p>In the last two rows, explain how the given expression and its opposite compare.</p> <p><i>[Give students time to complete the table. Teacher will then complete table]</i></p> <p>Recall that the opposite of a number, say a, satisfies the equation $a + (-a) = 0$. We can use this equation to recognize when two expressions are opposites of each other.</p> <p>Since the opposite of x is $-x$ and the opposite of 3 is -3, what can we say about the opposite of the sum of x and 3? Pause.</p> <p>We can say that the opposite of the sum of $x+3$ is the sum of its opposites.</p>	<p>Student copies the table and fill out the opposite so that the numbers equal 0.</p> <p>Student fills out table. Please see table below.</p> <p>Students considers the opposite of the sum of $x + 3$.</p>
<p>Teacher Model (5 minutes)</p> <p>Example 1: Subtracting Expressions Subtract: $(40 + 9) - (30 + 2)$</p> <p>We can either use what we know about opposites: $40 + 9 + (-(30+2))$ $40 + 9 + (-30) + (-2)$ $49 + (-30) + (-2)$ $19 + (-2)$ 17 [Allow time to copy]</p> <p>Or we could use the order of operations: $(40 + 9) - (30 + 2)$</p>	<p>Students copy teachers work</p>

<p>(49) – (32) 17</p> <p>Which method is more efficient?</p> <p>[Allow think time]</p> <p>Now let's think about how we would simplify (3x + 5y -4) – (4x + 11).</p>	<p>Students answer question.</p>
<p>(3x + 5y -4) – (4x + 11) Since we cannot add or subtract unlike terms, we must use what we know about opposites.</p> <p><i>[Give students time to simplify the expression.]</i></p> <p>3x + 5y + (-4) + (-4x + 11) 3x + 5y + (-4) + (-4x) + (-11) Now let's add like terms: 3x + (-4x) + 5y + (-4) + (-11) -x + 5y + (-15) Or -x + 5y - 15</p> <p>How can we be sure that (3x + 5y -4) – (4x + 11) is really equivalent to -x + 5y – 15?</p> <p>[Allow for think time and ideas]</p> <p>Recall from Lesson 2 that we can choose numbers for x and y, and evaluate the expressions using those numbers. If we get the same results for each expression, they are equivalent. You choose numbers for x and y and evaluate.</p> <p><i>[Give students time to choose numbers and substitute]</i></p> <p>I'll choose x = 2 and y = 6. Do you have to choose these same values? Pause.</p> <p>NO! Any numbers should work!</p> <p>(3x + 5y -4) – (4x + 11) (3(2) + 5(6) – 4) – (4(2) + 11) (6 + 30 - 4) – (8 + 11) (36 – 4) – (19) 32 – 19</p>	<p>Students simplify expression.</p> <p>Students answer question.</p> <p>Students answer question.</p> <p>Students chose values for x and y and check for equivalence by solving both.</p>

<p>13</p> <p>$-x + 5y - 15$ $-(2) + 5(6) - 15$ $-2 + 30 + (-15)$ $28 + (-15)$ 13</p> <p>YES! Both expressions resulted in the same number, so they are equivalent!</p> <p>[Allow time for students to copy]</p>	
<p><u>Independent Practice</u> (remaining time)</p> <p>Great work, students! Today, we went over how to simplify expressions and proving they are equivalent. I hope you're seeing some connections between the two expressions! You sure did a great job! After the video, you will have some problems to practice on your own. Good luck and do your best!"</p>	
<p><u>Closing</u> (1 min)</p> <ul style="list-style-type: none"> • I enjoyed doing some mathematics with you today! Thank you for inviting me into your home. I look forward to seeing you in our next lesson in Tennessee's At Home Learning Series! • Bye! 	

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Table for Opening:

Expression	Opposite	Proof of Opposites
1	-1	$1 + (-1) = 0$
3		
-7		
$-\frac{1}{2}$		
x		
3x		
$x + 3$		
$3x - 7$		