

Additive Inverse

Student Probe

What is $-3 + 3$?

Answer: 0

A common misconception would be that the students would just add the 2 terms and answer 6 or -6.

Lesson Description

This lesson is intended to help students develop an understanding of the additive inverse. The lesson will focus on using the two-color counter model as a tool for developing the conceptual foundation.

Rationale

Integers are arguably the most important subset of the number system. The understanding of integers is essential for entry into higher level mathematics. The main confusion of the additive inverse is that students would add the numbers because of their limited understanding of what the sign represents.

Preparation

Provide a set of two-color counters for each student.

At a Glance

What: Additive inverse of integers

Common Core State Standard:

CC.7.NS.1a. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. (a) Describe situations in which opposite quantities combine to make 0.

Mathematical Practices:

Model with mathematics.

Attend to precision.

Look for and make use of structure.

Use appropriate tools strategically.

Who: Students who have difficulty with adding integers

Grade Level: 7

Prerequisite Vocabulary: positive, negative, additive inverse, sum, set, expression, value

Prerequisite Skills: addition of whole numbers

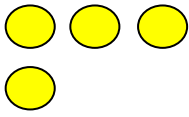
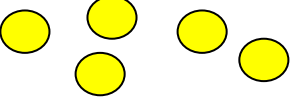

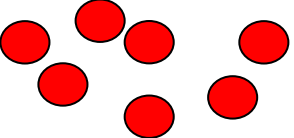



Delivery Format: Individual, small group



Lesson Length: 15 to 20 minutes

Materials, Resources, Technology: Visual display (white board, chalk board, chart

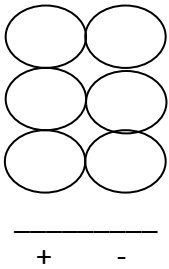
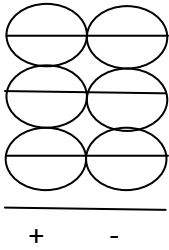
Lesson

The teacher says or does...	Expect students to say or do...	If students do not, then the teacher says or does...
1. I borrowed 5 dollars from a friend and I paid her back the 5 dollars. How much do I owe her?	0	

The teacher says or does...	Expect students to say or do...	If students do not, then the teacher says or does...
<p>2. Today we are going to experience and study the additive inverse property. Distribute two-color counters to students. Explain that yellow is the positive side and red is the negative side.</p>		
<p>3. What does this represent:</p> 	4	<p>What kind of 4? What does the yellow represent?</p>
<p>4. Can you represent a positive 5?</p>		<p>What color should you use?</p>
<p>5. What does this represent</p> 	-3	<p>Is it positive or negative? How many are there?</p>
<p>6. Represent -7.</p>		<p>What color should you use?</p>
<p>7. What is the opposite of positive?</p>	negative	
<p>8. Can everyone give me the opposite of this representation</p> 		<p>Is it positive or negative? What color should you use? How many are there?</p>
<p>9. What would we call this representation?</p> 	-2	<p>Is it positive or negative? How many are there?</p>

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10. What would we call this representation? 	Positive 2 or 2	Is it positive or negative? How many are there?
11. How could I represent 1 +1? 		Is it positive or negative? How many are there?
12. Can you use the two-color counters to represent "Add 1 and its opposite together?"	Student should have a yellow counter and a red counter showing.	Show me 1. Show me -1 .
13. What would the expression be?	Student should write $1 + -1$ or $-1 + 1$	Student might write 1-1. Help students to see that the red color means negative, not subtraction. The correct initial expression would be the plus sign for addition.
14. What is the value of this expression?	0	If I owed a friend a dollar than I gave her a dollar what has occurred? Students should recognize that there is no money owed or a value of 0. Share with them that opposites cancel the positive and negative charge and the charge would be neutral or there would be no charge.
15. Can you represent with the two-color counters "Add 3 and its opposite together?"	Student should have 3 yellow counters and 3 red counters showing.	Help students pair the opposite colors.
16. What would the expression be?	Student should write $3 + -3$	Same as above. Help students differentiate the operation of subtraction and the negative sign .
17. What is the value of this expression?	0	Same as previous

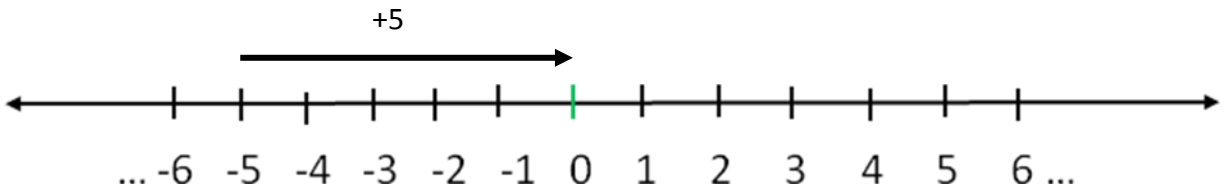
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		teacher says or does...
<p>18. We just showed examples that the sum of a number and its opposite is zero. This is called the additive inverse.</p> <p>For any real number a, $a + -a = -a + a = 0$.</p>		
Steps 19 -21 are a lesson extension using drawings, rather than two-color counters.		
<p>19. What would this model represent?</p> <p>(Draw this representation on the board.)</p> 	$3 + (-3)$	<p>Help students to see that there are 2 columns, a positive column and a negative column.</p>
<p>20. How many zero pairs are there?</p>	3	Help students line up their columns.
<p>21. (Draw this representation on the board. Cross out the pairs horizontally to model the practice for the students.)</p> 		

Variations

Use the number line to help connect the concrete to the semi-abstract.

$-5 + 5$ is represented on the number-line:



$$5 + (-5) = 0.$$

Formative Assessment

Create opposite expressions and have students model concretely and write and simplify expressions.

Examples:

$$4 + -4$$

$$-9 + 9$$

$$-7 + 7$$

$$a + -a$$

References

Slidshare. (n.d.). Retrieved 12 9, 2010, from

Mathematics Preparation for Algebra. (n.d.). Retrieved 12 9, 2010, from Doing What Works: