

# Inquiry Lab

## Equations with Variables on Each Side



**HOW** do you use the Properties of Equality when solving an equation using algebra tiles?



**Content Standards**  
8.EE.7, 8.EE.7a



**Mathematical Practices**  
1, 3, 5

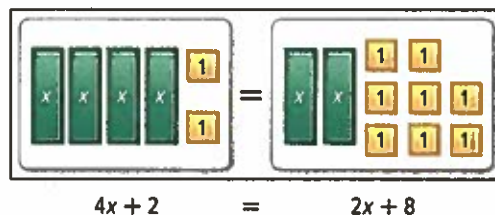
Leah bought 4 pens and a bottle of nail color. Her sister bought 2 of the same pens and 4 bottles of nail color, and spent the same amount as Leah. The nail color cost \$2. Use algebra tiles to find the cost of each pen.

### Hands-On Activity 1

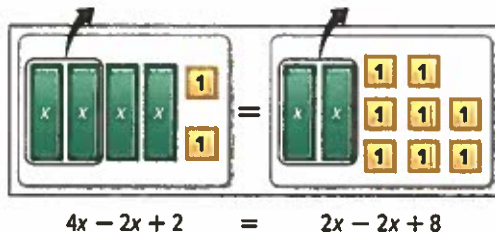


The equation  $4x + 2 = 2x + 8$  represents the real-world situation above. Use algebra tiles to model and solve the equation.

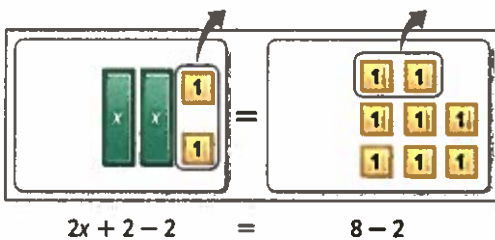
**Step 1** Model the equation.



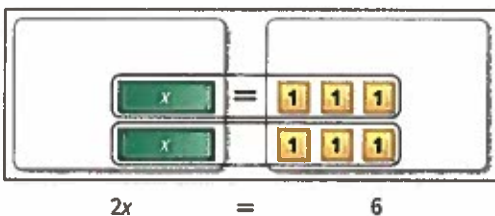
**Step 2** Remove  x-tiles from each side of the mat until there are x-tiles on only one side.



**Step 3** Remove  1-tiles from each side of the mat until the x-tiles are by themselves on one side.



**Step 4** Separate the tiles in  equal groups.



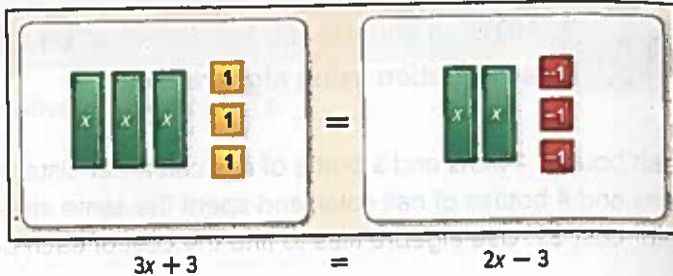
Check  $4 \cdot \square + 2 \stackrel{?}{=} 2 \cdot \square + 8$   
 $14 = 14 \checkmark$

So, each pen costs \$ .

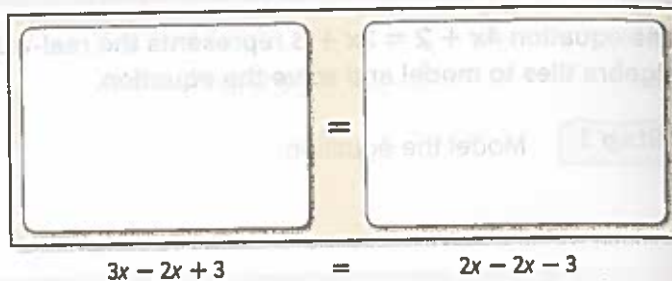
## Hands-On Activity 2

Use algebra tiles to model and solve  $3x + 3 = 2x - 3$ . Draw the tiles in the blank mats shown. The first step is done for you.

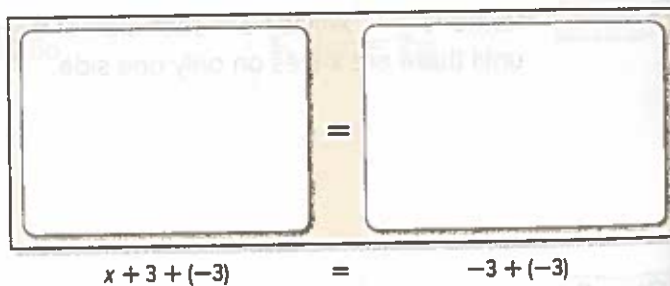
**Step 1** Model the equation.



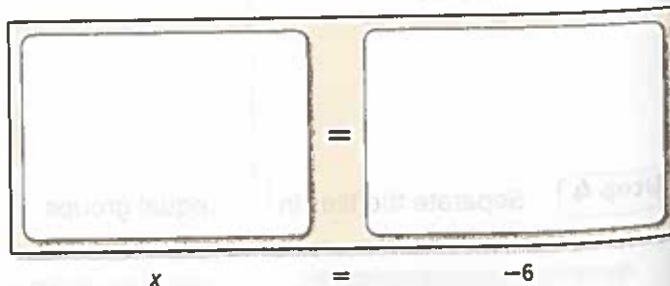
**Step 2** Remove 2  $x$ -tiles from each side of the mat in Step 1 so that there is an  $x$ -tile by itself on the left side. Draw the tiles that remain.



**Step 3** To isolate the  $x$ -tile, it is not possible to remove the same number of 1-tiles from each side of the mat. Add three  $-1$ -tiles to each side of the mat. Draw the tiles.



**Step 4** Remove the zero pairs from the left side. There are six  $-1$ -tiles on the right side of the mat. The  $x$ -tile is isolated on the left side of the mat. Draw the tiles that remain.



So,  $x = \boxed{\phantom{00}}$ .

Check  $3(\boxed{\phantom{00}}) + 3 \stackrel{?}{=} 2(\boxed{\phantom{00}}) - 3$

$-15 = -15$  ✓ The solution is correct.



# Investigate

**MP Use Math Tools** Work with a partner. Model and solve each equation. Show your work using drawings. Write the solution below the mat.

1.  $x + 2 = 2x + 1$

Show your work.

	=	
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$x =$  \_\_\_\_\_

2.  $2x + 7 = 3x + 4$

	=	
--	---	--

$x =$  \_\_\_\_\_

3.  $2x - 5 = x - 7$

	=	
--	---	--

$x =$  \_\_\_\_\_

4.  $x + 6 = 3x - 2$

	=	
--	---	--

$x =$  \_\_\_\_\_

5.  $8 + x = 3x$

	=	
--	---	--

$x =$  \_\_\_\_\_

6.  $3x + 6 = 6x$

	=	
--	---	--

$x =$  \_\_\_\_\_

7.  $3x + 3 = x - 5$

	=	
--	---	--

$x =$  \_\_\_\_\_

8.  $2x + 5 = 4x - 1$

	=	
--	---	--

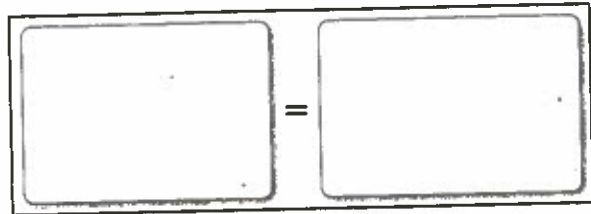
$x =$  \_\_\_\_\_



## Analyze and Reflect

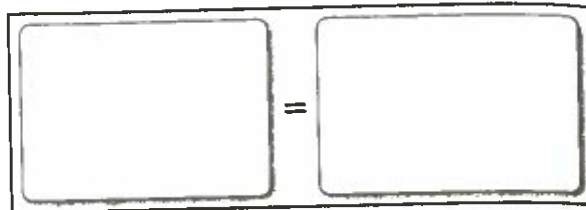
Work with a partner. One of you should solve the following equations by removing 1-tiles first. The other one should solve the equations by removing x-tiles first. Compare your answers.

9.  $x + 4 = 3x - 4$



$x =$  \_\_\_\_\_

10.  $4x + 2 = x - 4$



$x =$  \_\_\_\_\_

11. **MP Reason Inductively** Does it matter whether you remove x-tiles or 1-tiles

first? Is one way more convenient? Explain. \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

12. **MP Use Math Tools** Explain why you can remove an x-tile from each side of the mat. \_\_\_\_\_



## Create

13. **MP Identify Structure** Write a real-world problem that could be represented by the equation  $x + 4 = 3x - 4$ . Then use algebra tiles to find a solution to your problem. \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

14. **MP Identify Structure** Pizza Shack charges \$8 per pizza with a \$4 delivery fee. Pizza on the Plaza charges \$10 per pizza, but does not charge a delivery fee. Write an equation that could be used to find the number of pizzas for which the cost, including delivery, will be the same. Then use algebra tiles to find the solution. \_\_\_\_\_

15. **Inquiry** HOW do you use the Properties of Equality to solve an equation using algebra tiles? \_\_\_\_\_

\_\_\_\_\_