

Activity 3

Multiplication of Integers— Repeated Addition and Subtraction

Objective

- ♦ To explore skip counting to complete patterns
- ♦ To develop multiplication

Materials

- ♦ TI-73 Calculator
- ♦ Red & Blue Chips



Teacher Notes

Introduction

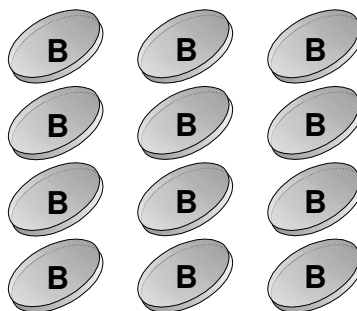
Repeated addition and subtraction can lead to ideas about multiplication. This activity provides students the opportunity to create expressions with repeated addition or subtraction using the Number Line application.

Procedure

1. Demonstrate how to use red and blue chips to multiply integers. Let the blue chips stand for positive integers and the red chips stand for negative integers. When the number of red and blue chips are equal then we have zero.

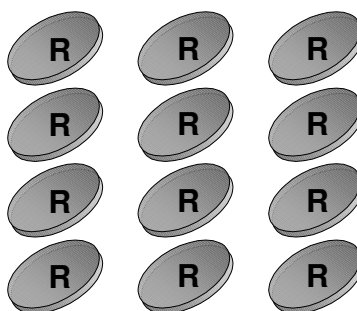
To show 3×4 use three groups of four blue chips.

- ♦ Start with no chips on the overhead.
- ♦ The positive three means you “put in” three groups.
- ♦ The positive four tells you that each group put in will contain four blue.



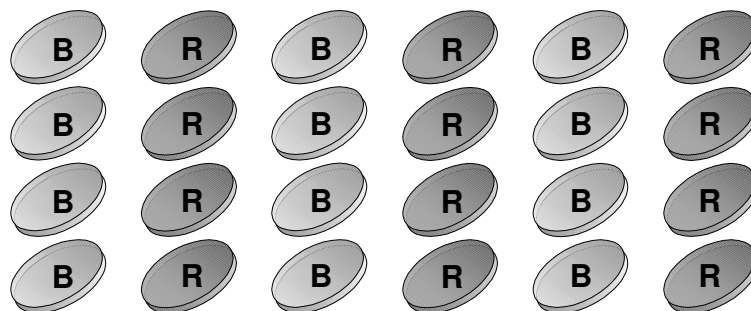
To show 3×-4 , use three groups of four red chips.

- ◆ Start with no chips on the overhead.
- ◆ The positive three means you “put in” three groups.
- ◆ The negative four tells you to use four red chips in each group.

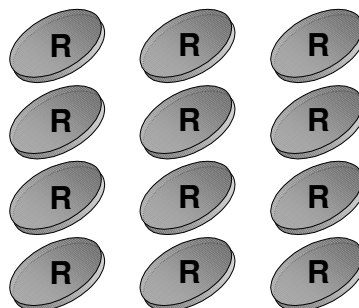


To show -3×4 , use three groups of four blue chips and three groups of four red chips.

- ◆ Start with no chips on the overhead.
- ◆ The negative three means you “take away” three groups. Since there are no chips to take away we add enough zeroes so that there are enough blue chips to take away.
- ◆ The positive four tells you the groups being removed will each contain four blue chips.

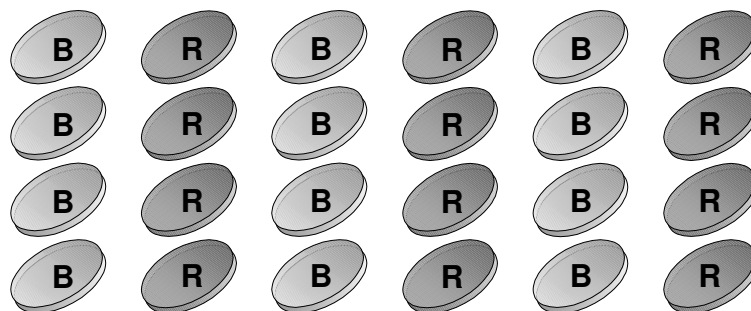


- ◆ Once the three groups of four blue chips are taken away, 12 red chips will remain.

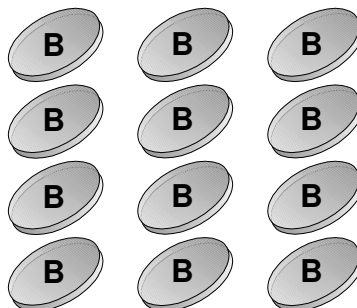


To show -3×-4 use three groups of four blue chips and three groups of four red chips.

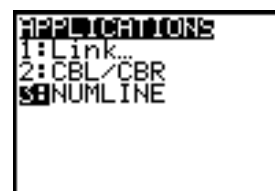
- ◆ Start with no chips on the overhead.
- ◆ The negative three means you “take away” three groups. Since there are no chips to take away we add enough zeroes so that there are enough red chips to take away.
- ◆ The negative four tells you the groups being removed will each contain four red chips.



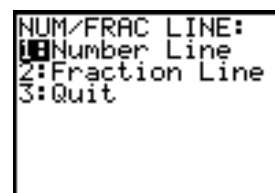
- ◆ Once the three groups of four red chips are taken away, 12 blue chips will remain.



2. Start the Number Line application by pressing the **APPS** key and selecting the NUMLINE application.



3. Once the App has started, select 1: Number Line.
 4. Distribute the Student Activity pages and have students work in pairs using the Number Line application.
 5. Discuss the answers for items 5 through 10.



Answer Key

4. -8. Answers will vary.
5. The expression $0 - 2 - 2 - 2 - 2$ is equivalent to 8.
This expression is equivalent to -4×2 .

6.

	Expression	Equivalent
a.	$0 + 3 + 3 + 3 + 3 = 12$	4×3
b.	$0 + -3 + -3 + -3 + -3 = -12$	4×-3
c.	$0 - 3 - 3 - 3 - 3 = -12$	-4×3
d.	$0 - -3 - -3 - -3 - -3 = 12$	-4×-3

7.

	Addition/Subtraction Expression	Multiplication Equivalent
a.	$0 + -8 + -8 + -8 + -8$	4×-8
b.	$0 + -9 + -9 + -9$	3×-9
c.	$0 - -7 - -7 - -7 - -7 - -7 - -7 - -7$	-6×-7
d.	$0 - 6 - 6 - 6 - 6 - 6$	-5×6



Name _____

Date _____

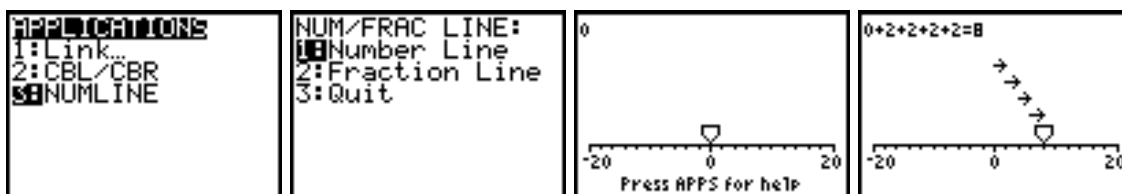
Activity 3

Multiplication of Integers—Repeated Addition and Subtraction

Objective: In this activity, you will investigate how repeated addition or subtraction is related to multiplication. You will use the Number Line application on the TI-73 calculator.

We have seen how red and blue chips can be used to model multiplication of integers. Are there other models? One that has been used extensively in the past uses the number line.

1. Access the Number Line application by pressing **APPS** and pressing **▼** to select the NUMLINE application. Press **ENTER** twice to get to the NUM/FRAC LINE menu and select 1: Number Line.



2. Now, press **+** **2** **+** **2** **+** **2** **+** **2** **+** **2** **ENTER**. Above you see the expression $0 + 2 + 2 + 2 + 2 + 2$ is equivalent to 8. We could also write $2 + 2 + 2 + 2$ or 4×2 .

3. Now, press **CLEAR** 1 to clear the expression. Then enter $0 - 2 - 2 - 2 - 2$ **ENTER**.

As you see, the expression $0 - 2 - 2 - 2 - 2$ is equivalent to -8. This expression has the opposite value of the first one computed.

4. Compare this to the expression $0 + -2 + -2 + -2 + -2$.

Press **CLEAR** then $0 + (-) 2 + (-) 2 + (-) 2 + (-) 2$ **ENTER**. What is the value of the expression?

Which of the expressions is it equivalent to? Explain.

5. Now press **CLEAR** 1, then press $0 - (-) 2 - (-) 2 - (-) 2 - (-) 2$ **ENTER**.

The expression $0 - -2 - -2 - -2 - -2$ has a value of:

Write an expression using multiplication:

6. Use the application to compute each of these expressions:

	Expression	Equivalent
a.	$0 + 3 + 3 + 3 + 3 =$	This is equivalent to $\underline{\quad} \times 3$
b.	$0 + -3 + -3 + -3 + -3 =$	This is equivalent to $\underline{\quad} \times -3$
c.	$0 - 3 - 3 - 3 - 3 =$	This is equivalent to $\underline{\quad} \times 3$
d.	$0 - -3 - -3 - -3 - -3 =$	This is equivalent to $\underline{\quad} \times -3$

7. Compute the values of these expressions using the Number Line application. Then write equivalent multiplication problems.

	Addition/Subtraction Expression	Multiplication Equivalent
a.	$0 + -8 + -8 + -8 + -8$	
b.	$0 + -9 + -9 + -9$	
c.	$0 - -7 - -7 - -7 - -7 - -7 - -7 - -7$	
d.	$0 - 6 - 6 - 6 - 6 - 6$	

8. Explain the relationship between repeated addition and multiplication.

9. Explain the relationship between repeated subtraction and multiplication.

10. Explain the relationship between repeated addition and repeated subtraction using chips and the number line.