

TOPIC 6

# Multiplying and Dividing Rational Numbers

**Lesson 6.1a/b**

Equal Groups  
Multiplying and Dividing Integers

**Lesson 6.2**

Be Rational!  
Quotients of Integers

**Lesson 6.3a/b**

Building a Wright Brothers' Flyer  
Simplifying Expressions to Solve Problems

**Lesson 6.4**

Properties Schmoperties  
Using Number Properties to Interpret Expressions with Signed Numbers





LESSON 6.1a  
Equal Groups

Objective Using Multiplying and Dividing Integers

Warm-Up



Determine each sum.

1.  $-2\frac{3}{4} + (-2\frac{3}{4})$

2.  $-9.502 - 4.239$

## GETTING STARTED

Addition or Multiplication?

Consider the addition problem  $(-8) + (-8) + (-8) + (-8)$ .

1. Rewrite the addition problem as a multiplication problem.

2. Is the product from Question 1 positive or negative?  
Explain your reasoning.

Consider the addition problem  $(-1) + (-1) + (-1) + (-1) + (-1)$ .

3. Rewrite the addition problem as a multiplication problem.

4. Is the product from Question 3 positive or negative?  
Explain your reasoning.

5. What relationship helped you answer Questions 2 and 4?



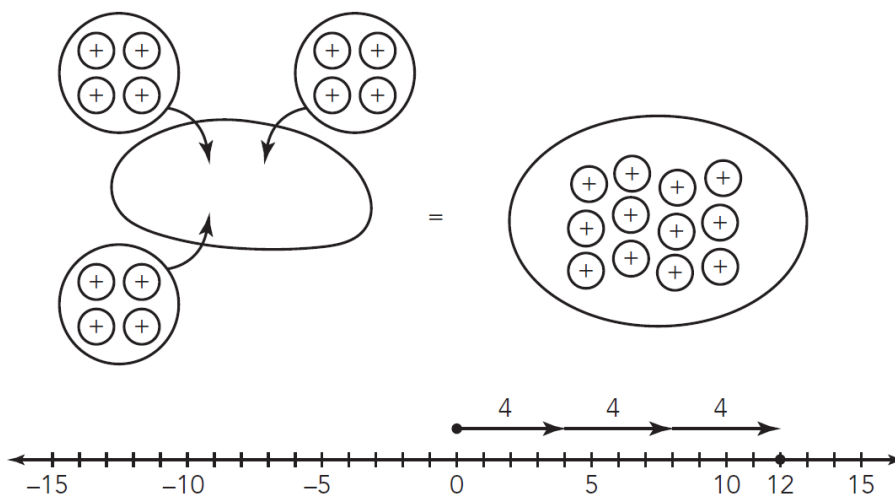
When thinking about multiplying integers, remember that multiplication can be represented as repeated addition.

## WORKED EXAMPLE

Consider the expression  $3 \times 4$ .

As repeated addition, it is represented as  $4 + 4 + 4$ .

You can think of  $3 \times 4$  as three groups of 4.

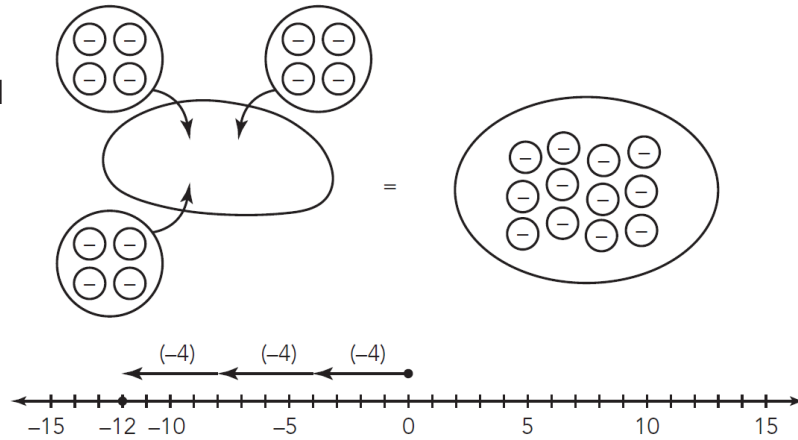


1. Explain how the number line in Worked Example 1 illustrates  $3 \times 4$ .

### WORKED EXAMPLE

Consider the expression  $3 \times (-4)$ . As repeated addition, it is represented as  $(-4) + (-4) + (-4)$ .

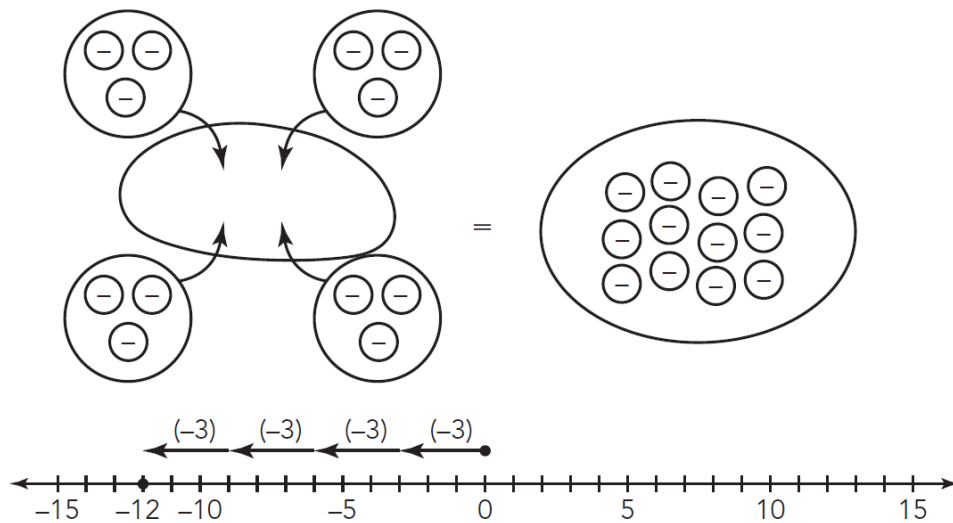
You can think of  $3 \times (-4)$  as three groups of  $(-4)$ .



2. Explain how each model in Worked Example 2 can be interpreted as three groups of the opposite of 4.

### WORKED EXAMPLE

Consider the expression  $4 \times (-3)$ .

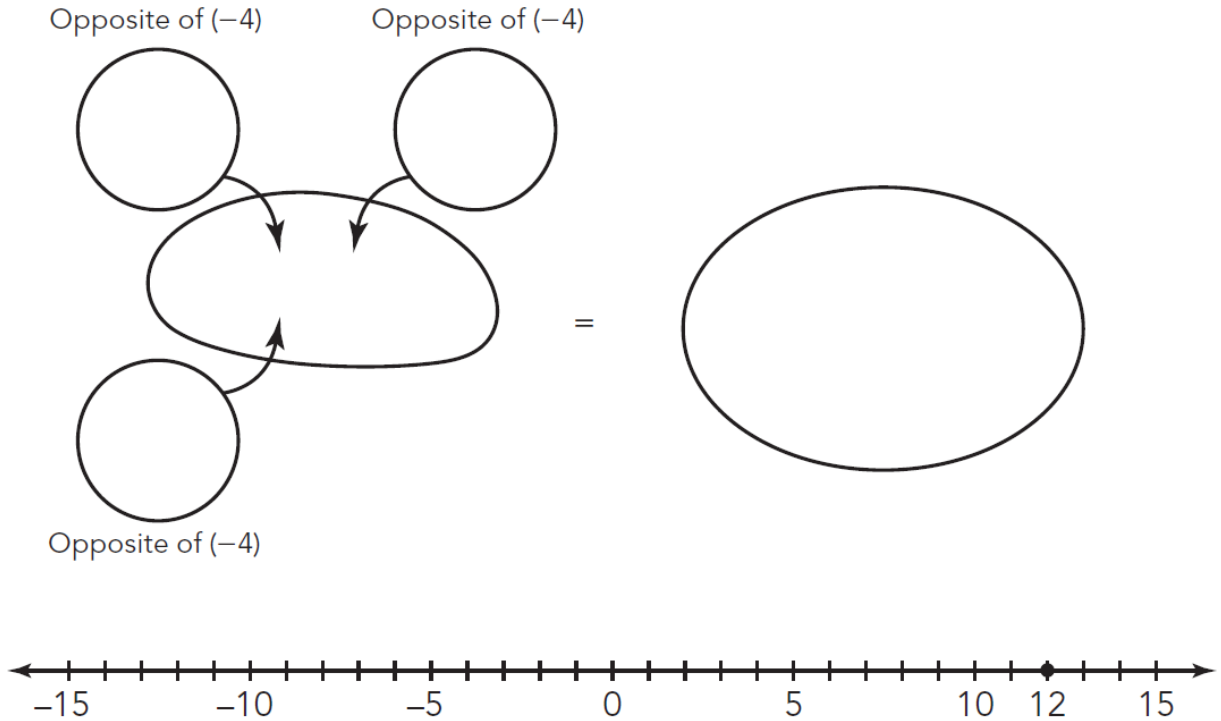


3. Interpret each model in Worked Example 3.

**WORKED EXAMPLE**

Consider the expression  $(-3) \times (-4)$ .

You know that  $3 \times (-4)$  means "three groups of  $(-4)$ " and that  $-3$  means "the opposite of 3." So,  $(-3) \times (-4)$  means "the opposite of 3 groups of  $(-4)$ ."



4. Complete the model by drawing in the appropriate counters and the appropriate rays in Worked Example 4.

a. Determine the product and explain how your models illustrate this product.

b. This expression can be written as  $-((-4) + (-4) + (-4))$ .  
 Rewrite the expression as the opposite of a number:  $-(\quad)$ .

c. How does the expression you wrote in part (b) relate to the product? Explain why this makes sense.

5. Draw either a number line or two-color counter model to determine each product. Describe the expression in words.

a.  $2 \times 3$

b.  $2 \times (-3)$

c.  $(-2) \times 3$

d.  $(-2) \times (-3)$

6. Complete the table.

Expression	Description	Addition Sentence	Product
$3 \times 5$	Three groups of 5	$5 + 5 + 5 = 15$	15
$(-3) \times 5$			
$3 \times (-5)$			
$(-3) \times (-5)$			

7. What do you notice about the products and their signs across the problems in this activity?



**LESSON 6.1a**  
**Equal Groups****Objective****Using Multiplying and Dividing Integers****Review**

1. The Baby Shop sells baby supplies for new families. They offer different brands of the same items. James and his mom are shopping for his new baby brother. It is James' job to make sure that his mom is making wise purchases. Their first item to purchase is diapers. There are 3 different options for newborn-sized diapers.

Stay-Dry: 108 diapers for \$25.18

UberSoft: 180 diapers for \$39.14

Cuddlies: 160 diapers for \$38.77

- What is a unit rate for the Stay-Dry diapers?
  - What is a unit rate for the UberSoft diapers?
  - What is a unit rate for the Cuddlies diapers?
  - Which kind of diapers should James advise his mom to purchase?
2. Calculate each sum.
- $2\frac{1}{2} + (-3\frac{3}{4}) + 5\frac{2}{5}$
  - $5\frac{1}{3} + (-4\frac{1}{6}) + (-2\frac{1}{2})$
3. Determine each unit rate.
- $1\frac{1}{4}$  teaspoons baking powder per  $\frac{3}{8}$  cup flour
  - $2\frac{2}{5}$  parts ammonia per  $1\frac{1}{3}$  parts vinegar

