You will need your clickers for today's lesson. We will start with the warm-up skills check questions.

# Multiplying and **Dividing Integers**



1. Vocabulary Review Two numbers that are additive inverses always have a sum of <u>?</u>.

Find each sum.

**2.** 7 + (-3)

**3.** −4 + 9

**4.** -22 + (-13)

**5.** -17 + 17



### What You'll Learn

To multiply and divide integers and to solve problems involving integers

### Why Learn This?

Balloonists watch their altitude when they fly. You can multiply integers to find change in altitude.

A balloon descends at a rate of 4 ft/min for 3 min. To multiply integers, think of multiplication as repeated addition.

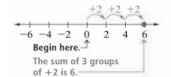




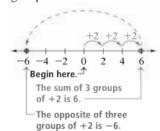
You can use number lines to multiply integers.

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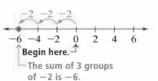
3(2) means three groups of 2.



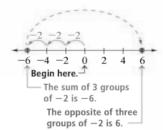
-3(2) is the opposite of three groups of 2.



3(-2) means three groups of -2.



-3(-2) is the opposite of three groups of -2.



This pattern suggests the rules for multiplying integers.

## Copy this in your notes:

## KEY CONCEPTS

## **Multiplying Integers**

The product of two integers with the same sign is positive. The product of two integers with different signs is negative.

$$-3(-2) = 6$$

$$3(-2) = -6$$

Find each product.

a. 
$$5(3) = 15$$
  $\leftarrow$  same signs;  $\rightarrow$  b.  $-5(-3) = 15$ 

c. 
$$5(-3) = -15$$
  $\leftarrow \frac{\text{different signs;}}{\text{negative product}} \rightarrow \text{d. } -5(3) = -15$ 

1 EXAMPLE Find each product.



Solve: -4(-7)



28



-28





Since -2(5) = -10, you know that  $-10 \div (-2) = 5$ . The rules for dividing integers are similar to the rules for multiplying.

## **KEY CONCEPTS** Dividing Integers

The quotient of two integers with the same sign is positive. The quotient of two integers with different signs is negative.

$$-10 \div (-2) = 5$$

$$10 \div (-2) = -5$$

Copy this in your notes too.



## EXAMPLE Dividing Integers

A rock climber is at an elevation of 10,100 feet. Five hours later, she is at 7,340 feet. Use the formula below to find the climber's vertical speed.

$$\begin{array}{lll} \text{vertical speed} &=& \frac{\text{final elevation} - \text{initial elevation}}{\text{time}} \\ &=& \frac{7,340 - 10,100}{5} & \leftarrow \begin{array}{ll} \text{Substitute 7,340 for final elevation,} \\ 10,100 \text{ for initial elevation, and 5 for time.} \\ &=& \frac{-2.760}{5} = -552 & \leftarrow \begin{array}{ll} \text{Simplify. The negative sign means the} \\ \text{climber is descending.} \end{array}$$

The climber's vertical speed is -552 feet per hour.

2 EXAMPLE You are riding your bicycle at a speed of 12 ft/s. Four seconds later, you come to a complete stop. Find the acceleration of your bicycle by using the formula:

acceleration = 
$$\frac{\text{final velocity} - \text{initial velocity}}{\text{time}}$$
= 
$$\frac{0-12}{4} \leftarrow \frac{\text{Substitute 0 for final velocity, 12}}{\text{for initial velocity, and 4 for time.}}$$
= 
$$\frac{-12}{4} = -3 \leftarrow \frac{\text{Simplify. The negative sign means}}{\text{the bicycle is slowing.}}$$

The bicycle's acceleration is -3 ft/s per second.



A cave explorer descends at a rate of 6 meters a minute. Which expression CANNOT be used to find the explorer's depth after 4 minutes?



B -6/4

**(C)** -6(4)

(-6) + (-6) + (-6) + (-6)



The product of two integers is zero. What do you know about the value of at least one of the integers?

At least one number has to be zero because of the Distributive Property

At least one number has to be zero because of the Zero Property of Multiplication

At least one number has to be one becase of the Identity Property of Multiplication

At least one number has to be one because of the Zero Property of Multiplication



Solve -7 x ? = -28

**(A)** 11

B -11

(C) 4

**D** -4



# Solve $-48 \div ? = 6$



**B** 8

© 9

**D** -8



Solve: ?/-4 = -20

**A** 100

**D** -80

**B** 80

5

**©** -100

**F** -5



Solve: -2(-13)

**A** 15

B -15

**©** 26

**D** -26



# Solve 22 ÷ (-11)

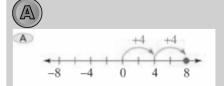


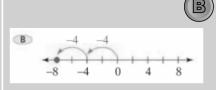
33

-33

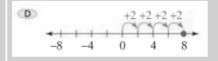


## Which model best represents the expression $2 \times (-4)$ ?











## Here are some problems for additional practice.

## Find each product.

**10.**  $-5 \times 4$ 

**11**. 12(3)

**12.** 6(-6)

**13.**  $-7 \cdot (-3)$  **14.**  $-21 \times (-4)$ 

**15**. 3(-33)

**16**. -12(-17)

**17**. −35 • 24

**18**. -102(6)

Problems for additional practice.

Find each quotient.

**19**. 
$$\frac{36}{12}$$

**20.** 
$$\frac{14}{-2}$$

19. 
$$\frac{36}{12}$$
 20.  $\frac{14}{-2}$ 
 21.  $-42 \div 20$ 

 22.  $-80 \div -20$ 
 23.  $-8)64$ 
 24.  $\frac{-27}{-9}$ 

 25.  $96 \div (-12)$ 
 26.  $\frac{-195}{13}$ 
 27.  $\frac{-242}{-1}$ 

23. 
$$-8)64$$

**24.** 
$$\frac{-27}{-9}$$

**26.** 
$$\frac{-195}{13}$$

27. 
$$\frac{-9}{-242}$$

You can power down your clickers and put them away now.

