


Explore It!

A popular beach erodes 4 inches per year on average.



Lesson 1-6


Multiply Integers

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I can...
multiply integers.

A. How many years will it take for the coastline to erode one foot?

B. The number line below shows the expected change in the coastline as years pass. How could you use the number line to show the erosion after 10 years?



Focus on math practices

Be Precise What expression could you use to represent the change in the coastline in 5 years?

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Essential Question

How do the signs of factors affect their product?

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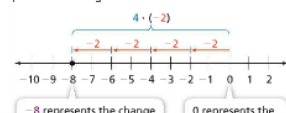
EXAMPLE 1 **Multiply a Negative Integer by a Positive Integer**

While playing a board game, unlucky Lawrence had to move back 2 spaces for 4 turns in a row. What integer represents his change in position?

Model with Math What integer can you use to represent the number of spaces Lawrence had to move back each turn?



Use a number line to represent the change in position on the game board.



The total change in position on the board is **-8**. Lawrence had to move **back 8 spaces**.

Use multiplication and properties of operations to show why $4 \cdot (-2) = -8$.

$4 \cdot (-2 + 2) = 0$

$4 \cdot (-2) + 4 \cdot 2 = 0$

$4 \cdot (-2) + 8 = 0$

$7 + 8 = 0$

You know that opposites add to 0, so $-8 + 8 = 0$.

So, $4 \cdot (-2) = -8$.

Generalize A rule for multiplication of integers is: **positive · negative = negative**.

Try It!

A race car game takes 6 points from a player each time the player hits a cone. What integer represents the change in total points if the player hits 10 cones?

$10 \cdot \square = \square$

The change in total points is \square .

Convince Me! Could the product of a positive integer and a negative integer be positive? Explain.

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EXAMPLE 2 Multiply a Positive Integer by a Negative Integer

What is the balloon's change in elevation in 3 minutes?
 Write an expression to represent the change in elevation.
 $-500 \cdot 3$
 $-3 \cdot (-500)$
 $= -1,500$

The change in elevation for the balloon is $-1,500$ feet.

Generalize A rule for multiplication of integers is: **negative** \cdot **positive** = **negative**.

EXAMPLE 3 Multiply a Negative Integer by a Negative Integer

a. Use a number line to represent $-3 \cdot (-10)$.

$3 \cdot (-10) = -30$
 $-(3 \cdot (-10))$ is the opposite of $3 \cdot (-10)$.
 So, $-3 \cdot (-10) = 30$.

Opposites are the same distance from 0, but on opposite sides of 0.

b. Use multiplication and properties of operations to show why $-3 \cdot (-10) = 30$.

$-3 \cdot (-10 + 10) = 0$
 Use additive inverses and the Zero Property of Multiplication to write a multiplication problem.

$-3 \cdot (-10) + -3 \cdot 10 = 0$

$-3 \cdot (-10) + (-30) = 0$
 You know that opposites add to 0, so $30 + (-30) = 0$.

So, $-3 \cdot (-10) = 30$.

Generalize A rule for multiplication of integers is: **negative** \cdot **negative** = **positive**.

Try It!
 Find each product.
 a. $-7 \cdot (-2)$ b. $7 \cdot (-13)$ c. $-6 \cdot 8$ d. $(-1) \cdot (-1)$

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KEY CONCEPT

When multiplying two integers, the sign of the product depends on the sign of the factors.

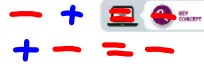
If the signs of the factors are the **same**, the product is **positive**.

$7 \cdot 3 = 21$ $-7 \cdot (-3) = 21$



If the signs of the factors are **different**, the product is **negative**.

$-4 \cdot 5 = -20$ $4 \cdot (-5) = -20$



** does not matter which number is bigger*

Do You Understand?

- Essential Question** How do the signs of factors affect their product?
- Construct Arguments** What is the sign of the product if you multiplied three negative integers? Explain your answer.
- Reasoning** Explain why the product of two negative integers is not negative. Use $(-1)(-1)$ as an example.
- Use Structure** Is the product the same when multiplying $22 \times (-5)$ and multiplying $(-5) \times 22$? Explain.

Do You Know How?

- Represent $2 \cdot (-3)$ on the number line.
- Which of these products is negative? Select all that apply.
 $-8 \cdot (-3)$ **+**
 $-2 \cdot 8$ **-**
 $0 \cdot (-2)$ **→ 0***
 $15 \cdot (-5)$ **-**
 $-8 \cdot (-9)$ **+**
- Find each product.
 a. $-9 \cdot (-4)$ b. $-7 \cdot 12$
 c. $8 \cdot (-8)$ d. $9 \cdot 15$
- A game show contestant starts a game by answering two questions incorrectly. Each incorrect answer costs the contestant \$600. Use a product of two integers to show the point total that would appear for the contestant.

Name: _____

Practice & Problem Solving

In 9–14, multiply.

9. $(-6) \cdot (-2)$

10. $4 \cdot (-8)$

11. $7 \cdot (-5)$

12. $-5 \cdot 2$

13. $-1 \cdot (-24)$

14. $(5) \cdot (-9) \cdot (-2)$

15. A football team **lost** the same number of yards on each of 3 consecutive plays. What is the total change in yards from where the team started?

16. a. Find the product.
 $-41 \cdot (-1)$

b. **Construct Arguments** Describe how you use the properties of multiplication to find the product.

17. Alex is working to simplify $5 \cdot (-8) \cdot 2$.

a. What is the product?

b. Suppose Alex found the opposite of the correct product. Describe an error he could have made that resulted in that product.

$(-7)(5) = -35$
 -35

$or (-5)(2) or 2(-5)$
 -10

$+3 \cdot (-6) \rightarrow -18$

The football team **lost** a total of 18 yards after the 3 plays. Total = ?

18. Which product is greater, $(-4) \cdot (-6)$ or $(-7) \cdot (-8)$? Explain.

19. **Make Sense and Persevere** While playing a board game, Cecilia had to move back 6 spaces 9 times. What integer represents Cecilia's movement on the board for those 9 turns?



20. Anya makes withdrawals from and deposits into her bank account.

- a. What integer represents the change in the amount in her account if Anya withdraws \$12 once each day for four days?
- b. What integer represents the change in the amount in her account if Anya deposits \$12 once each day for four days?
- c. **Look for Relationships** Explain the difference between the integer for the withdrawals and the integer for the deposits.

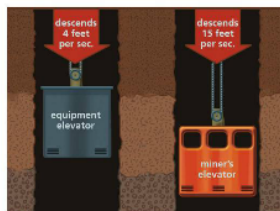
9 times

$9 \cdot (-6)$

-54

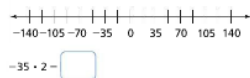
Cecilia moves back a total of 54 spaces during the board game.

21. **Higher Order Thinking** A gold mine has two elevators, one for equipment and one for miners. One day, the equipment elevator begins to descend. After 28 seconds, the elevator for the miners begins to descend. What is the position of each elevator relative to the surface after another 14 seconds? At that time, how much deeper is the elevator for the miners?



Assessment Practice

22. Use the number line to find $-35 \cdot 2$.



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23. Which of these expressions has the same product as $(-6) \cdot 7$? Select all that apply.

- $(-3) \cdot 14$
- $16 \cdot (-3)$
- $(-6) \cdot 7$
- $7 \cdot (-6)$
- $14 \cdot (-3)$

<p>21) <u>Equipment</u></p> <p>after 28sec $\begin{array}{r} 3 \ 28 \\ \times 4 \\ \hline 112 \text{ ft} \end{array}$</p> <p>after an extra 14sec $\begin{array}{r} 14 \\ \times 4 \\ \hline 56 \text{ ft} \end{array}$</p> <p>total drop = $\begin{array}{r} 112 \\ + 56 \\ \hline 168 \text{ ft} \end{array}$</p>	<p><u>Miners</u></p> <p>0 ft</p> <p>$\begin{array}{r} 2 \ 15 \\ \times 14 \\ \hline 60 \\ + 150 \\ \hline 210 \text{ ft} \end{array}$</p> <p>subtract \rightarrow 210 ft</p> <p>$\begin{array}{r} 1 \ 210 \\ - 168 \\ \hline 42 \text{ ft} \end{array}$</p>
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The miners were 42 feet deeper inside the mine than their equipment.

