

Solve & Discuss It!

Stella is making the United States flag. She has blue fabric, red fabric, and white fabric. Choose a length for the flag. What length of blue fabric would Stella need to make this flag? Explain your thinking.

Lesson 1-7

Multiply Rational Numbers

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I can...
multiply rational numbers.

Focus on math practices

Be Precise The blue region of the flag is $\frac{7}{13}$ the width and $\frac{2}{5}$ the length of the flag. What part of the total area is the blue region of the flag?

45

Essential Question

How is multiplying rational numbers like multiplying integers?

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EXAMPLE 1

Multiply a Negative Number by a Positive Rational Number

Two hikers descend from the summit of a mountain. What is Petra's change in elevation?

Petra's change in elevation is 3.5 times as great as Ben's change in elevation.

Use a number line to represent Petra's change in elevation.

Petra's change in elevation is -4.2 meters.

Use the rules for multiplying to find Petra's change in elevation.

Write an expression to represent the situation.

$$3.5 \cdot (-1.2)$$

$$= -4.2$$

Petra's change in elevation is -4.2 meters.

Generalize The rules for multiplying integers apply to all rational numbers.

positive \cdot negative = negative

Try It!

Meghan's bank account is charged \$9.95 per month for an online newspaper subscription. How could you represent the change in her account balance after three months of charges?

groups of

\cdot =

After three months, the change in her account balance is \$.

Convince Me! Meghan's bank account is charged 3 times. Without calculating, how can you determine whether this is a negative or positive change to her account? Explain.

46

EXAMPLE 2 Multiply a Positive Number by a Negative Rational Number

Find the product of $-\frac{5}{6}$ and $\frac{2}{5}$.

$$-\frac{5}{6} \cdot \frac{2}{5}$$

$$= \frac{-5 \cdot 2}{6 \cdot 5}$$

$$= \frac{-10}{30} = -\frac{1}{3}$$

So, $-\frac{5}{6} \cdot \frac{2}{5} = -\frac{1}{3}$.

Multiply the numerators and the denominators and then simplify.

Plot the negative value and then find $\frac{2}{5}$ of that length.

$$-\frac{5}{6} \cdot \frac{2}{5} = -\frac{2}{6} = -\frac{1}{3}$$

EXAMPLE 3 Multiply a Negative Number by a Negative Rational Number

Find the product of -0.3 and $-\frac{11}{30}$.

$$-0.30 \cdot \left(-\frac{11}{30}\right)$$

$$= -\frac{3}{10} \cdot \left(-\frac{11}{30}\right)$$

$$= \frac{-3 \cdot (-11)}{10 \cdot 30}$$

$$= \frac{33}{300} \text{ or } 0.11$$

So, $-0.3 \cdot \left(-\frac{11}{30}\right) = 0.11$ or $\frac{11}{100}$.

Convert one of the rational numbers so that they are both fractions or both decimals.

Generalize The rules for multiplying integers apply to all rational numbers.
 negative • negative = positive

Try It!

Find each product.

a. $-5.3 \cdot (-2.6)$ b. $\frac{3}{5} \cdot 4\frac{1}{6}$

c. $0.2 \cdot (-1.78)$ d. $-2.5 \cdot \left(-\frac{7}{10}\right)$

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KEY CONCEPT

The same rules for multiplying integers apply to multiplying all rational numbers.

When multiplying two rational numbers:

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

doesn't matter which number is bigger

Do You Understand?

1. **Essential Question** How is multiplying rational numbers like multiplying integers?

2. How do you multiply a decimal greater than 0 and a fraction less than 0?

3. **Model with Math** How does this number line represent multiplication of a negative number by a positive number? Explain.

4. **Do You Know How?** Use the number line to find the product $3 \cdot (-1\frac{1}{2})$.

Total = -4 1/2 or -4.5

5. Which of these products is positive? Select all that apply.

- $-0.2 \cdot (12.5)$
- $-\frac{1}{12} \cdot (-6\frac{1}{2})$
- $3.2 \cdot \left(-\frac{1}{900}\right)$
- $-3\frac{1}{2} \cdot 0$
- $-4.7 \cdot (-1)$

6. Find the product.

a. $-3.1 \cdot (-2.9)$

b. $1\frac{1}{2} \cdot \left(-\frac{5}{3}\right)$

c. $-3\frac{1}{2} \cdot 0.5$

d. $-\frac{4}{3} \cdot -\frac{1}{6}$

Handwritten notes:
 - Circled $\frac{1}{3}$ and $\frac{1}{3}$ with arrows pointing to $-\frac{1}{3}$ on the number line.
 - $7 \cdot \left(-\frac{1}{3}\right)$ written below.

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Name: _____

Practice & Problem Solving

In 7–14, multiply.

7. $(-2.655) \cdot (18.44)$ 8. $-1\frac{2}{3} \cdot 6\frac{1}{2}$

9. $-2\frac{1}{2} \cdot (-1\frac{2}{3})$ 10. $-3\frac{7}{8} \cdot (-5\frac{3}{4})$

11. $-7.5 \cdot -2\frac{3}{4}$ 12. $-0.6 \cdot (-0.62)$

13. $-0.2 \cdot -\frac{5}{8}$ 14. $\frac{5}{8} \cdot \frac{1}{8}$

15. At the beginning of the season, Jamie pays full price for a ticket to see the Panthers, her favorite baseball team. The Panthers currently have 33 wins and 31 losses.

- Represent the total change in the cost of a ticket given their losses.
- What is the cost of a ticket for the next game they play?

Ticket prices decrease \$0.41 for every game the Panthers lose this season!

Handwritten notes and calculations:

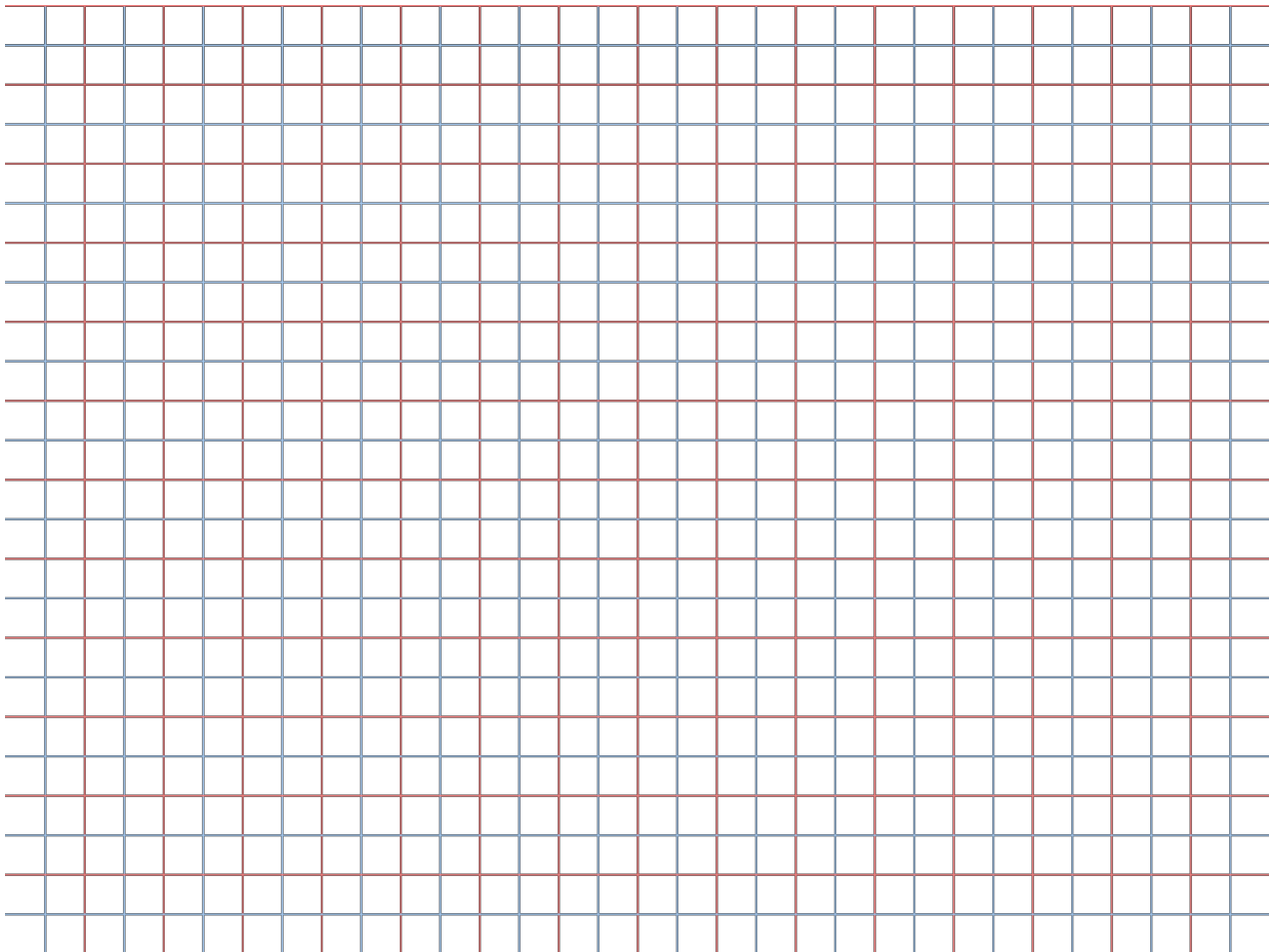
- 6.5
- $0.83333... = 0.8\bar{3}$
- Long division: $6 \overline{) 5.000000}$ with steps: -48 , -20 , -18 , -20 , -18 , -20 , -18 , -20 .
- -3.875
- $x - 5.75$
- $0.83333...$

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10)

$$-3\frac{7}{8} \cdot -5\frac{3}{4} = -\frac{23}{4}$$

$$\frac{-31}{8} \cdot \frac{-23}{4} = \frac{-31 \cdot (-23)}{32}$$



16. The price per share of ENVX stock is dropping at a rate of \$1.45 each hour.
- Write the rate as a negative number.
 - What rational number represents the change in the price per share after 5 hours?
 - What is the price per share after 5 hours?

UIA	1.32	3.95
ENVX	38.12	
CVPT	7.89	

17. Ming incorrectly says that this product is $\frac{4}{63}$.
- $$-\left(-\frac{4}{9}\right) \cdot \left(-\frac{1}{7}\right)$$
- What is the correct product?
 - What error could Ming have made?

18. Higher Order Thinking Place the products in order from least to greatest.
- $$4\frac{1}{2} \cdot 4\frac{1}{2}$$
- $$5\frac{1}{2} \cdot \left(-6\frac{1}{2}\right)$$
- $$-\frac{1}{2} \cdot \left(-2\frac{1}{2}\right)$$

Assessment Practice

19. Multiply $-2\frac{1}{2} \cdot (16.4)$.

20. Suppose there is a 1.3°F drop in temperature for every thousand feet that an airplane climbs into the sky. The temperature on the ground is -2.8°F.

PART A

Write a multiplication expression to represent the change in temperature after the plane ascends 10,000 feet.

PART B

What will the temperature be when the plane reaches an altitude of 10,000 feet?

