

1-8

Dividing Rational Numbers

What You'll Learn

To use the rules for dividing integers to divide rational numbers and to solve problems by dividing rational numbers

CONTENT STANDARDS

7.NS.2, 7.NS.2.b,
7.NS.2.c, 7.NS.3

Why Learn This?

In many places, a well is the source of water. Many wells today are drilled deep underground. Rational numbers can be used to show depths of wells.



Suppose some drillers want to drill a water well 212.5 m deep. If they plan to work for 5 days, they can divide the rational number -212.5 by 5 to determine the depth they need to drill each day.

KEY CONCEPTS

Dividing Rational Numbers

You already know how to divide integers.

Two Numbers	Sign of Quotient	Examples
Same Sign	Quotient is positive.	$16 \div 2 = 8$ $-16 \div (-2) = 8$
Opposite Signs	Quotient is negative.	$-16 \div 2 = (-8)$ $16 \div (-2) = (-8)$

EXAMPLE

Dividing Rational Numbers: Same Sign

- 1 a. Find $2.064 \div 0.24$.

$$0.24 \overline{)2.064}$$
 →

↑
Multiply the divisor and the dividend by 100 to make the divisor a whole number.

$$\begin{array}{r}
 8.6 \\
 24 \overline{)206.4} \\
 \underline{192} \\
 144 \\
 \underline{144} \\
 0
 \end{array}$$

← Place the decimal point in the quotient above the decimal point in the dividend.

Vocabulary Tip

The quotient is the result of dividing a dividend by a divisor. Remember that a divisor can never be zero.

Example**1 Dividing Rational Numbers: Same Sign**a. Find $7.055 \div 0.85$.

$$\begin{array}{r}
 0.85 \overline{)7.055} \quad \rightarrow \quad 85 \overline{)705.5} \\
 \underline{680} \\
 255 \\
 \underline{255} \\
 0
 \end{array}$$

Place the decimal point in the quotient above the decimal point in the dividend.

Multiply the divisor and the dividend by \square to make the divisor a whole number.

b. Find $-\frac{5}{6} \div -\frac{2}{3}$.

$$\begin{aligned}
 -\frac{5}{6} \div -\frac{2}{3} &= -\frac{5}{6} \times -\frac{3}{2} && \leftarrow \text{Multiply by the reciprocal of the divisor.} \\
 &= -1 \left(\frac{5}{6} \right) \times -1 \left(\frac{3}{2} \right) && \leftarrow \text{Write the rational numbers as products with } -1. \\
 &= -1 \times \left(\frac{5}{6} \times -1 \right) \times \left(\frac{3}{2} \right) && \leftarrow \text{Use the Associative Property.} \\
 &= -1 \times \left(-1 \times \frac{5}{6} \right) \times \left(\frac{3}{2} \right) && \leftarrow \text{Use the Commutative Property.} \\
 &= (-1 \times -1) \times \left(\frac{5}{6} \times \frac{3}{2} \right) && \leftarrow \text{Use the Associative Property.} \\
 &= 1 \times \left(\frac{5}{6} \times \frac{3}{2} \right) && \leftarrow -1 \times -1 = 1 \\
 &= \frac{5}{6} \times \frac{3}{2} && \leftarrow \text{Multiply and simplify.} \\
 &= \frac{15}{12} \text{ or } 1\frac{1}{4}
 \end{aligned}$$

b. Find $\left(\frac{-2}{3}\right) \div \left(\frac{-1}{2}\right)$.

$$\begin{aligned}
 \left(\frac{-2}{3}\right) \div \left(\frac{-1}{2}\right) &= \frac{-2}{3} \times \frac{-2}{1} && \leftarrow \text{Multiply by the } \square \text{ of the divisor.} \\
 &= (-1) \left(\frac{2}{3}\right) (-1) \left(\frac{2}{1}\right) && \leftarrow \text{Write } -1 \text{ as a factor.} \\
 &= (-1)(-1) \left(\frac{2}{3}\right) \left(\frac{2}{1}\right) && \leftarrow \text{Use the } \square \text{ Property to rearrange.} \\
 &= \square \left(\frac{2}{3}\right) \left(\frac{2}{1}\right) && \leftarrow \text{Multiply.} \\
 &= \square \text{ or } 1\frac{1}{3} && \leftarrow \text{Simplify if you are asked to.}
 \end{aligned}$$

Quick Check

1. Find each quotient.

a. $-16.9 \div -1.3$

b. $-\frac{2}{3} \div \frac{1}{6}$

EXAMPLE Application: Meal Planning

- 2 How many $1\frac{1}{2}$ -oz servings of cereal are in the larger cereal box at the right?

To find how many $1\frac{1}{2}$ -oz servings are in $19\frac{1}{2}$ oz, divide $19\frac{1}{2}$ by $1\frac{1}{2}$.

$$\begin{aligned}
 19\frac{1}{2} \div 1\frac{1}{2} &= \frac{39}{2} \div \frac{3}{2} && \leftarrow \text{Write the mixed numbers as improper fractions.} \\
 &= \frac{39}{2} \cdot \frac{2}{3} && \leftarrow \text{Multiply by } \frac{2}{3}, \text{ the reciprocal of } \frac{3}{2}. \\
 &= \frac{\cancel{39}^{\cancel{13}} \cdot \cancel{2}^1}{\cancel{2}^1 \cdot 3} && \leftarrow \text{Divide 39 and 3 by their GCF. Divide 2 by itself.} \\
 &= \frac{13}{1} = 13 && \leftarrow \text{Simplify.}
 \end{aligned}$$



There are thirteen $1\frac{1}{2}$ -oz servings in the larger cereal box.

Example

- 2 Dividing Rational Numbers: Different Sign

Find $-5\frac{1}{4} \div 2\frac{1}{2}$.

$$\begin{aligned}
 -5\frac{1}{4} \div 2\frac{1}{2} &= \boxed{} \div \boxed{} && \leftarrow \text{Write both mixed numbers as fractions.} \\
 &= (-1 \cdot \frac{21}{4}) \div \frac{5}{2} && \leftarrow \text{Write the negative number as a product with } -1. \\
 &= (-1 \cdot \frac{21}{4}) \times \frac{2}{5} && \leftarrow \boxed{} \text{ by the } \boxed{} \text{ of the divisor.} \\
 &= (-1) \left(\frac{21}{4} \times \frac{2}{5} \right) && \leftarrow \text{Use the } \boxed{} \text{ Property.} \\
 &= (-1) \left(\frac{21}{10} \right) && \leftarrow \text{Multiply.} \\
 &= -\frac{21}{10} \text{ or } \boxed{} && \leftarrow \text{Simplify if you are asked to.}
 \end{aligned}$$

Quick Check

2. Find each quotient.

a. $-\frac{3}{4} \div \frac{1}{8}$

b. $5\frac{4}{9} \div -\frac{7}{10}$

c. $-43.68 \div 5.6$

EXAMPLE**Dividing Rational Numbers:
Different Sign**3 Find $-3\frac{5}{6} \div 2\frac{1}{3}$.

$$-3\frac{5}{6} \div 2\frac{1}{3} = -\frac{23}{6} \div \frac{7}{3}$$

← Write both mixed numbers as fractions.

$$= \left(-1 \times \frac{23}{6}\right) \div \frac{7}{3}$$

← Write the negative number as a product with -1 .

$$= \left(-1 \times \frac{23}{6}\right) \times \frac{3}{7}$$

← Multiply by the reciprocal of the divisor.

$$= -1 \times \left(\frac{23}{6} \times \frac{3}{7}\right)$$

← Use the Associative Property.

$$= -1 \times \left(\frac{23}{14}\right)$$

← Multiply.

$$= -\frac{23}{14} \text{ or } -1\frac{9}{14}$$

← Simplify.

A Find each product.

7. $13.65 \div 2.1$

8. $-8\frac{2}{3} \div -2\frac{2}{3}$

9. $-3.9 \div -1.5$

10. $-9\frac{9}{10} \div \left(-2\frac{3}{4}\right)$

11. $-27.9 \div (-6.2)$

12. $8\frac{1}{2} \div 1\frac{1}{2}$

13. $\left(-5\frac{1}{3}\right) \div \left(\frac{2}{3}\right)$

14. $3.7 \div (-3.7)$

15. $\left(-\frac{5}{6}\right) \div \left(\frac{5}{7}\right)$

16. $-\frac{4}{5} \div \left(\frac{8}{11}\right)$

17. $-20.4 \div 1.2$

18. $3 \div (-0.375)$

19. $1\frac{4}{5} \div \frac{5}{6}$

20. $-15.64 \div 2.3$

21. $\left(6\frac{2}{5}\right) \div \left(-1\frac{3}{5}\right)$