▶ 3.5 Skill Builder

Dividing Fractions

Here are two ways to divide $2 \div \frac{2}{3}$.

- Use a number line.

$$\begin{array}{cccccccc} & \frac{2}{3} & & \frac{2}{3} & & \frac{2}{3} & & \\ 0 & \frac{1}{3} & \frac{2}{3} & 1 & \frac{4}{3} & \frac{5}{3} & 2 \end{array}$$

How many groups of two-thirds are there in 2?

There are 3 groups of two-thirds in 2. So, $2 \div \frac{2}{3} = 3$

- Multiply by the reciprocal of $\frac{2}{3}$.

$2 \div \frac{2}{3}$ The reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$.

$= 2 \times \frac{3}{2}$

$= \frac{2}{1} \times \frac{3}{2}$

$= \frac{2^1 \times 3}{1 \times 2^1}$ Look for common factors.

$= 3$

Check

1. Find each quotient. Use any method.

a) $2 \div \frac{1}{6} =$ _____

b) $\frac{1}{3} \div 2 =$ _____

c) $\frac{1}{3} \div \frac{5}{3} = \frac{1}{3} \times$ _____

$=$ _____

$=$ _____

d) $4 \div \frac{2}{3} = 4 \times$ _____

$=$ _____

$=$ _____

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3.5 Dividing Rational Numbers

FOCUS Divide rational numbers.

Division is the opposite of multiplication.
So, the sign rules for dividing rational numbers
are the same as those for multiplying rational numbers.

÷	(−)	(+)
(−)	(+)	(−)
(+)	(−)	(+)

Example 1 | **Dividing Rational Numbers in Fraction Form**

Divide: $\dfrac{3}{4} \div \left(-\dfrac{9}{8}\right)$

Solution

$\dfrac{3}{4} \div \left(-\dfrac{9}{8}\right)$

The fractions have different signs, so the quotient is negative.

$\dfrac{3}{4} \div \left(-\dfrac{9}{8}\right) = \dfrac{3}{4} \times \left(-\dfrac{8}{9}\right)$ Multiply by the reciprocal.

$= \dfrac{\cancel{3}^1 \times (-\cancel{8})^{-2}}{\cancel{4}^1 \times \cancel{9}^3}$ Look for common factors.

$= \dfrac{1 \times (-2)}{1 \times 3}$

$= -\dfrac{2}{3}$

So, $\dfrac{3}{4} \div \left(-\dfrac{9}{8}\right) = -\dfrac{2}{3}$

Dividing by $-\dfrac{9}{8}$ is the same as multiplying by $-\dfrac{8}{9}$.

Check

1. Divide.

Think: Is the quotient positive or negative?

a) $\dfrac{2}{5} \div \left(-\dfrac{3}{4}\right)$

$= \dfrac{2}{5} \times \underline{\qquad}$
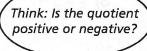
$= \dfrac{2 \times \underline{\qquad}}{5 \times \underline{\qquad}}$

$= \underline{\qquad}$

b) $\left(-\dfrac{2}{9}\right) \div \left(-\dfrac{4}{7}\right)$

$= \underline{\qquad} \times \underline{\qquad}$

$= \dfrac{\underline{\qquad} \times \underline{\qquad}}{\underline{\qquad} \times \underline{\qquad}}$

$= \underline{\qquad}$

Example 2 | Dividing Rational Numbers in Decimal Form

Divide:

$(-5.1) \div 3$

Solution

$(-5.1) \div 3$

Since the signs are different, the quotient is negative.

Divide integers: $(-51) \div 3 = -17$

Estimate to place the decimal point.
-5.1 is close to -6, so $(-5.1) \div 3$ is close to $(-6) \div 3 = -2$
So, $(-5.1) \div 3 = -1.7$

Check

1. Divide: $(-7.5) \div 5$

$(-7.5) \div 5$

Divide integers: _____ ÷ ___ = _____

Estimate to place the decimal point.

$(-7.5) \div 5$ is about _____ ÷ ___ = _____

So, $-7.5 \div 5 =$ _____

Think: Is the quotient positive or negative?

Practice

1. Is the quotient positive or negative?

a) $(-7.5) \div (-3)$ Same sign; the quotient is _____.

b) $8.42 \div (-2)$ _____; the quotient is _____.

c) $\left(-\dfrac{9}{10}\right) \div \dfrac{3}{5}$ _____; the quotient is _____.

d) $(-16) \div \left(-\dfrac{4}{5}\right)$ _____; the quotient is _____.

2. Which of these expressions have the same answer as $\left(-\frac{3}{10}\right) \div \frac{2}{5}$?

a) $-\frac{3}{10} \times \frac{5}{2}$

_____ , since _____

_____

b) $-\frac{3}{10} \div \left(-\frac{2}{5}\right)$

_____ , since _____

_____

c) $\frac{2}{5} \div \left(-\frac{3}{10}\right)$

_____ , since _____

_____

d) $\frac{3}{10} \div \left(-\frac{2}{5}\right)$

_____ , since _____

_____

3. Find each quotient.

a) $\left(-\frac{2}{3}\right) \div \frac{7}{6}$

$= \left(-\frac{2}{3}\right) \times$ _____

$= \dfrac{\rule{1cm}{0.4pt} \times \rule{1cm}{0.4pt}}{\rule{1cm}{0.4pt} \times \rule{1cm}{0.4pt}}$

$= \dfrac{\rule{1cm}{0.4pt} \times \rule{1cm}{0.4pt}}{\rule{1cm}{0.4pt} \times \rule{1cm}{0.4pt}}$

$= \dfrac{\rule{1cm}{0.4pt}}{\rule{1cm}{0.4pt}}$

b) $\left(-\frac{15}{16}\right) \div \left(-\frac{5}{8}\right)$

$= \left(-\frac{15}{16}\right) \times$ _____

$= \dfrac{\rule{1cm}{0.4pt} \times \rule{1cm}{0.4pt}}{\rule{1cm}{0.4pt} \times \rule{1cm}{0.4pt}}$

$= \dfrac{\rule{1cm}{0.4pt} \times \rule{1cm}{0.4pt}}{\rule{1cm}{0.4pt} \times \rule{1cm}{0.4pt}}$

$= \dfrac{\rule{1cm}{0.4pt}}{\rule{1cm}{0.4pt}}$

4. Divide.

a) $\left(-\dfrac{8}{9}\right) \div \dfrac{1}{3}$

$= \left(-\dfrac{8}{9}\right) \times \underline{}$

$= \dfrac{\underline{} \times \underline{}}{\underline{} \times \underline{}}$

$= \dfrac{\underline{} \times \underline{}}{\underline{} \times \underline{}}$

$= \dfrac{}{}$

Think: Is the quotient positive or negative?

b) $\left(-\dfrac{2}{5}\right) \div \left(-\dfrac{3}{7}\right)$

$= \dfrac{}{} \times \dfrac{}{}$

$= \dfrac{\underline{} \times \underline{}}{\underline{} \times \underline{}}$

$= \dfrac{}{}$

5. Use integers to determine each quotient.
Estimate to place the decimal point in the answer.

a) $(-2.94) \div 0.7$

$(-2.94) \div 0.7$
The quotient is _____.
To find $(-2.94) \div 0.7$, divide: _____ $\div$ ____ = _____
$(-2.94) \div 0.7$ is about _____ $\div$ ____ = _____.
So, $(-2.94) \div 0.7 =$ _____

b) $(-5.52) \div (-0.8)$

$(-5.52) \div (-0.8)$
The quotient is _____.
To find $(-5.52) \div (-0.8)$, divide: _____ $\div$ ____ = ____
$(-5.52) \div (-0.8)$ is about _____ $\div$ _____ = ___.
So, $(-5.52) \div (-0.8) =$ _____