

Objective Fractions by Fractions Division

Warm-Up



Use **benchmark** fractions to estimate each product.

1. $5\frac{2}{5} \times 2\frac{7}{10}$

Sample worked out



$$\begin{array}{ccc}
 5\frac{2}{5} & \times & 2\frac{7}{10} \\
 \downarrow & & \downarrow \\
 \text{Closest} & & \text{Closest} \\
 \text{value} & & \text{value} \\
 \downarrow & & \downarrow \\
 6 & \times & 3 = 18
 \end{array}$$

2. $3\frac{8}{9} \times 2\frac{7}{15}$

3. $7\frac{5}{7} \times 4\frac{1}{5}$

4. $6\frac{4}{7} \times 2\frac{1}{9}$



In the same way that you can “multiply across,” or multiply the numerators and multiply the denominators, to determine the product of two fractions, you can also “divide across” to determine the quotient of two fractions.

WORKED EXAMPLE

Determine the quotient: $\frac{7}{8} \div \frac{1}{2} = ?$

Divide the numerators. Then divide the denominators.

$$\begin{aligned}\frac{7}{8} \div \frac{1}{2} &= \frac{7 \div 1}{8 \div 2} \\ &= \frac{7}{4}\end{aligned}$$

Amy and Sandy used different ways to calculate the quotient $\frac{3}{4} \div \frac{1}{3}$.

Amy



$$\frac{3}{4} \div \frac{1}{3}$$

$$\frac{3}{4} = \frac{9}{12} \quad \frac{1}{3} = \frac{4}{12}$$

$$\begin{aligned}\frac{9}{12} \div \frac{4}{12} &= \frac{9 \div 4}{12 \div 12} \\ &= \frac{9 \div 4}{1} \\ &= \frac{9}{4}\end{aligned}$$

I can determine equivalent fractions and then divide across.

Sandy



$$\frac{3}{4} \div \frac{1}{3}$$

$$\frac{3}{4} \div \frac{1}{3} = \frac{3}{\frac{4}{3}}$$

$$= \frac{\frac{3}{1} \times \frac{3}{4}}{\frac{4}{3} \times \frac{3}{4}}$$

$$= \frac{9}{4}$$

$$= \frac{9}{4}$$

I just divide across. If I get a fraction over a fraction, I can make the resulting denominator a 1.

A complex fraction is a fraction that has a fraction in either the numerator, the denominator, or both the numerator and denominator.

1. Study Sandy's and Amy's methods.

a. Which student wrote complex fractions?

b. How are the methods different? How are they alike?

**2. Calculate each quotient by dividing across.
Rewrite any improper fractions as mixed numbers.**

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

b. $\frac{3}{8} \div \frac{1}{4}$

c. $\frac{5}{6} \div \frac{2}{3}$

d. $\frac{7}{4} \div \frac{3}{4}$



When you reverse the numbers in the numerator and denominator of a fraction, you form a new fraction called the reciprocal of the original fraction.

1. Which number is its own reciprocal?

2. Which number has no reciprocal? Explain your reasoning.

3. Alexa wrote the reciprocal of the mixed number incorrectly. Explain why she is incorrect and provide the correct reciprocal.

Alexa

Given $3\frac{8}{5}$

The reciprocal is $3\frac{5}{8}$.



Karen said, "I wish everything could be as easy as dividing by 1." She tried her "dividing by 1" method to determine the quotient $\frac{5}{8} \div \frac{3}{4}$.

"If I can turn the divisor of $\frac{3}{4}$ into 1, then the problem can be solved. I can multiply both fractions by the reciprocal of $\frac{3}{4}$, which is $\frac{4}{3}$, to create 1."

4. Analyze Karen's method for dividing fractions. Describe the steps in the dashed circles

$$\begin{aligned} \frac{5}{8} \div \frac{3}{4} &= \frac{\frac{5}{8}}{\frac{3}{4}} \\ &= \frac{\frac{5}{8}}{\frac{3}{4}} \times \frac{\frac{4}{3}}{\frac{4}{3}} \\ &= \frac{\frac{5}{8} \times \frac{4}{3}}{\frac{3}{4} \times \frac{4}{3}} = \frac{\frac{5}{8} \times \frac{4}{3}}{1} \\ &= \frac{5}{8} \times \frac{4}{3} \\ &= \frac{20}{24} \\ &= \frac{5}{6} \end{aligned}$$

Division is rewritten as a fraction

5. Write a rule based on Karen's method that you can use to calculate the quotient in a fraction division problem.

6. Calculate each quotient.

6. Calculate each quotient.

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

b. $\frac{4}{5} \div \frac{1}{3}$

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

b. $\frac{3}{10} \div \frac{1}{3}$


LESSON 2.3b
Yours Is to Reason Why!

Objective Fractions by Fractions Division

Find the reciprocal. Show that the product of the mixed number and its reciprocal is 1.

1. $10\frac{1}{2}$

2. $6\frac{3}{7}$

3. $2\frac{8}{9}$

4. $15\frac{1}{4}$

5. $9\frac{2}{3}$

6. $7\frac{5}{8}$

Divide. Write each answer in simplest form.

7. $\frac{8}{10} \div 1\frac{5}{6}$

8. $2 \div 1\frac{6}{7}$

9. $3\frac{3}{5} \div 2\frac{1}{4}$

10. $4\frac{1}{2} \div 2\frac{3}{8}$

11. $5\frac{5}{6} \div 3\frac{1}{6}$

12. $\frac{11}{12} \div 2\frac{5}{8}$

13. $1\frac{9}{13} \div \frac{3}{8}$

14. $6\frac{4}{5} \div 3\frac{2}{9}$

15. $9\frac{2}{3} \div 6\frac{8}{9}$
