

DIVISION BY FRACTIONS

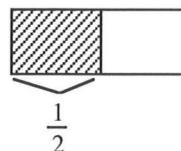
Division by fractions introduces three methods to help students understand how dividing by fractions works. In general, think of division for a problem like $8 \div 2$ as, "In 8, how many groups of 2 are there?" Similarly, $\frac{1}{2} \div \frac{1}{4}$ means, "In $\frac{1}{2}$, how many fourths are there?"

For more information, see the Math Notes box in Lesson 3.3.1 of the *Core Connections, Course 2* text. The first two examples show how to divide fractions using a diagram.

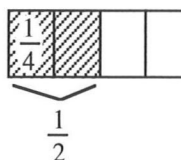
Example 1

Use the rectangular model to divide: $\frac{1}{2} \div \frac{1}{4}$.

Step 1: Using the rectangle, we first divide it into 2 equal pieces. Each piece represents $\frac{1}{2}$. Shade $\frac{1}{2}$ of it.



Step 2: Then divide the *original* rectangle into four equal pieces. Each section represents $\frac{1}{4}$. In the shaded section, $\frac{1}{2}$, there are 2 fourths.



Step 3: Write the equation.

$$\frac{1}{2} \div \frac{1}{4} = 2$$

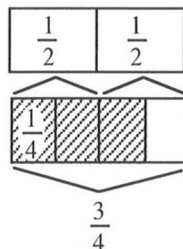
Example 2

In $\frac{3}{4}$, how many $\frac{1}{2}$ s are there?

That is, $\frac{3}{4} \div \frac{1}{2} = ?$



Start with $\frac{3}{4}$.



In $\frac{3}{4}$ there is one full $\frac{1}{2}$ shaded and half of another one (that is half of one-half).

So: $\frac{3}{4} \div \frac{1}{2} = 1\frac{1}{2}$
(one and one-half halves)

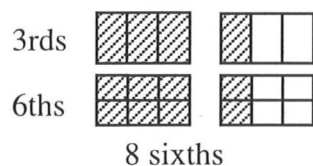
Problems

Use the rectangular model to divide.

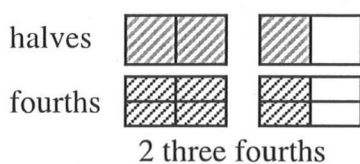
1. $1\frac{1}{3} \div \frac{1}{6}$ 2. $\frac{3}{2} \div \frac{3}{4}$ 3. $1 \div \frac{1}{4}$ 4. $1\frac{1}{4} \div \frac{1}{2}$ 5. $2\frac{2}{3} \div \frac{1}{9}$

Answers

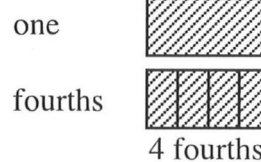
1. 8



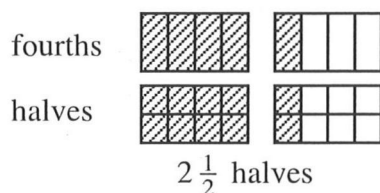
2. 2



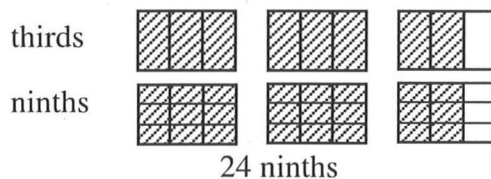
3. 4



4. $2\frac{1}{2}$



5. 24



The next two examples use common denominators to divide by a fraction. Express both fractions with a common denominator, then divide the first numerator by the second.

Example 3

$$\frac{4}{5} \div \frac{2}{3} =$$

$$\frac{12}{15} \div \frac{10}{15} =$$

$$\frac{12}{10} = \frac{6}{5} \text{ or } 1\frac{1}{5}$$

Example 4

$$1\frac{1}{3} \div \frac{1}{6} =$$

$$\frac{4}{3} \div \frac{1}{6} =$$

$$\frac{8}{6} \div \frac{1}{6} = \frac{8}{1} \text{ or } 8$$

One more way to divide fractions is to use the Giant One from previous work with fractions to create a “Super Giant One.” To use a Super Giant One, write the division problem in fraction form, with a fraction in both the numerator and the denominator. Use the reciprocal of the denominator for the numerator and the denominator in the Super Giant One, multiply the fractions as usual, and simplify the resulting fraction when possible.

Example 5

$$\frac{\frac{1}{2}}{\frac{1}{4}} = \frac{\frac{4}{1}}{\frac{1}{4}} = \frac{4}{1} = 4 = 2$$

Example 6

$$\frac{\frac{3}{4}}{\frac{1}{6}} = \frac{\frac{6}{1}}{\frac{1}{6}} = \frac{18}{1} = \frac{9}{2} = 4 \frac{1}{2}$$

Example 7

$$1 \frac{1}{3} = \frac{4}{3} \cdot \frac{\frac{2}{3}}{\frac{2}{3}} = \frac{8}{9} = \frac{8}{9}$$

Example 8

$$\frac{2}{3} \div \frac{3}{5} \Rightarrow \frac{10}{15} \div \frac{9}{15} \Rightarrow \frac{10}{9}$$

Compared to:

$$\frac{\frac{2}{3}}{\frac{3}{5}} = \frac{\frac{5}{3}}{\frac{3}{5}} = \frac{10}{9} = 1 \frac{1}{9}$$

Problems

Complete the division problems below. Use any method.

1. $\frac{3}{7} \div \frac{1}{8}$
2. $1 \frac{3}{7} \div \frac{1}{2}$
3. $\frac{4}{7} \div \frac{1}{3}$
4. $1 \frac{4}{7} \div \frac{1}{3}$
5. $\frac{6}{7} \div \frac{5}{8}$
6. $\frac{3}{10} \div \frac{5}{7}$
7. $2 \frac{1}{3} \div \frac{5}{8}$
8. $7 \div \frac{1}{3}$
9. $1 \frac{1}{3} \div \frac{2}{5}$
10. $2 \frac{2}{3} \div \frac{3}{4}$
11. $3 \frac{1}{3} \div \frac{5}{6}$
12. $1 \frac{1}{2} \div \frac{1}{2}$
13. $\frac{5}{8} \div 1 \frac{1}{4}$
14. $10 \frac{1}{3} \div \frac{1}{6}$
15. $\frac{3}{5} \div 6$

Answers

1. $3 \frac{3}{7}$
2. $2 \frac{6}{7}$
3. $1 \frac{5}{7}$
4. $4 \frac{5}{7}$
5. $1 \frac{13}{35}$
6. $\frac{21}{50}$
7. $3 \frac{11}{15}$
8. 21
9. $3 \frac{1}{3}$
10. $3 \frac{5}{9}$
11. 4
12. 3
13. $\frac{1}{2}$
14. 62
15. $\frac{1}{10}$