

Operations with Fractions: Multiplying and Dividing

To multiply fractions, multiply the numerators and multiply the denominators.

EXAMPLE

1 Find each product.

a. $\frac{2}{5} \cdot \frac{1}{3}$
 $\frac{2}{5} \cdot \frac{1}{3} = \frac{2 \cdot 1}{5 \cdot 3}$ Multiply the numerators.
Multiply the denominators.
 $= \frac{2}{15}$ Simplify.

b. $\frac{7}{3} \cdot \frac{1}{11}$
 $\frac{7}{3} \cdot \frac{1}{11} = \frac{7 \cdot 1}{3 \cdot 11}$ Multiply the numerators.
Multiply the denominators.
 $= \frac{7}{33}$ Simplify.

If the fractions have common factors in the numerators and denominators, you can simplify before you multiply by canceling.

EXAMPLE

2 Find each product. Simplify before multiplying.

a. $\frac{3}{4} \cdot \frac{4}{7}$
 $\frac{3}{4} \cdot \frac{4}{7} = \frac{3}{\cancel{4}} \cdot \frac{\cancel{4}^1}{7}$ Divide by the GCF, 4.
 $= \frac{3}{7}$ Multiply.

b. $\frac{4}{9} \cdot \frac{45}{49}$
 $\frac{4}{9} \cdot \frac{45}{49} = \frac{4}{\cancel{9}^5} \cdot \frac{\cancel{45}_5}{49}$ Divide by the GCF, 9.
 $= \frac{20}{49}$ Multiply.

Two numbers whose product is 1 are called **multiplicative inverses** or **reciprocals**.

EXAMPLE

3 Name the reciprocal of each number.

a. $\frac{3}{8}$ b. $\frac{1}{6}$
 $\frac{3}{8} \cdot \frac{8}{3} = 1$ The product is 1. $\frac{1}{6} \cdot \frac{6}{1} = 1$ The product is 1.
The reciprocal of $\frac{3}{8}$ is $\frac{8}{3}$. The reciprocal of $\frac{1}{6}$ is 6.

c. $2\frac{4}{5}$
 $2\frac{4}{5} = \frac{14}{5}$ Write $2\frac{4}{5}$ as an improper fraction.
 $\frac{14}{5} \cdot \frac{5}{14} = 1$ The product is 1.
The reciprocal of $2\frac{4}{5}$ is $\frac{5}{14}$.

To divide one fraction by another fraction, multiply the dividend by the multiplicative inverse of the divisor.

EXAMPLE

4 Find each quotient.

a. $\frac{1}{3} \div \frac{1}{2}$
 $\frac{1}{3} \div \frac{1}{2} = \frac{1}{3} \cdot \frac{2}{1}$ Multiply $\frac{1}{3}$ by $\frac{2}{1}$, the reciprocal of $\frac{1}{2}$.
 $= \frac{2}{3}$ Simplify.

b. $\frac{3}{8} \div \frac{2}{3}$
 $\frac{3}{8} \div \frac{2}{3} = \frac{3}{8} \cdot \frac{3}{2}$ Multiply $\frac{3}{8}$ by $\frac{3}{2}$, the reciprocal of $\frac{2}{3}$.
 $= \frac{9}{16}$ Simplify.

c. $4 \div \frac{5}{6}$
 $4 \div \frac{5}{6} = \frac{4}{1} \cdot \frac{6}{5}$ Multiply 4 by $\frac{6}{5}$, the reciprocal of $\frac{5}{6}$.
 $= \frac{24}{5}$ or $4\frac{4}{5}$ Simplify.

d. $\frac{3}{4} \div 2\frac{1}{2}$
 $\frac{3}{4} \div 2\frac{1}{2} = \frac{3}{4} \cdot \frac{2}{5}$ Multiply $\frac{3}{4}$ by $\frac{2}{5}$, the reciprocal of $2\frac{1}{2}$.
 $= \frac{6}{20}$ or $\frac{3}{10}$ Simplify.