

**3-4 Study Guide and Intervention****Dividing Rational Numbers**

**Divide Fractions** Two numbers whose product is 1 are called multiplicative inverses or reciprocals. For any fraction  $\frac{a}{b}$ , where  $a, b \neq 0$ ,  $\frac{b}{a}$  is the multiplicative inverse and  $\frac{a}{b} \cdot \frac{b}{a} = 1$ . This means that  $\frac{2}{3}$  and  $\frac{3}{2}$  are multiplicative inverses because  $\frac{2}{3} \cdot \frac{3}{2} = 1$ .

To divide by a fraction, multiply by its multiplicative inverse:  $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} = \frac{ad}{bc}$ , where  $b, c, d \neq 0$ .

**Example** Find each quotient. Write in simplest form.

a.  $\frac{3}{4} \div \frac{5}{8} = \frac{3}{4} \cdot \frac{8}{5}$

Multiply by the multiplicative inverse of  $\frac{5}{8}$ ,  $\frac{8}{5}$ .

$$= \frac{3}{\cancel{4}^2} \cdot \frac{\cancel{8}_1}{5}$$

Divide 4 and 8 by their GCF, 4.

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

Simplify.

b.  $-6\frac{2}{5} \div 2\frac{1}{5} = \frac{-32}{5} \div \frac{11}{5}$

Rename mixed numbers as improper fractions.

$$= \frac{-32}{5} \cdot \frac{5}{11}$$

Multiply by the multiplicative inverse of  $\frac{11}{5}$ ,  $\frac{5}{11}$ .

$$= \frac{-32}{\cancel{5}^1} \cdot \frac{\cancel{5}_1}{11}$$

Divide out common factors.

$$= \frac{-32}{11} \text{ or } -2\frac{10}{11}$$

Simplify.

**Exercises**

Find each quotient. Write in simplest form.

1.  $\frac{5}{16} \div \frac{5}{8}$

2.  $\frac{7}{9} \div \frac{2}{3}$

3.  $\frac{16}{21} \div \left(-\frac{2}{7}\right)$

4.  $-\frac{4}{5} \div \frac{3}{10}$

5.  $1\frac{1}{4} \div 2\frac{3}{8}$

6.  $-8\frac{4}{7} \div 2\frac{1}{7}$

7.  $\frac{18}{21} \div 3$

8.  $-4\frac{5}{8} \div \left(-3\frac{1}{3}\right)$

**3-4 Study Guide and Intervention** *(continued)***Dividing Rational Numbers**

**Divide Algebraic Fractions** Algebraic fractions are fractions which contain one or more variables. You can divide algebraic fractions just as you would divide numerical fractions.

**Example** Find  $\frac{4}{qrs} \div \frac{10}{qs}$ . Write the quotient in simplest form.

$$\begin{aligned} \frac{4}{qrs} \div \frac{10}{qs} &= \frac{4}{qrs} \cdot \frac{qs}{10} && \text{Multiply by the reciprocal of } \frac{10}{qs}, \frac{qs}{10}. \\ &= \frac{4}{\cancel{qr}^2 \cancel{rs}^1} \cdot \frac{\cancel{qs}^1}{\cancel{qs}^1} && \text{Divide out common factors.} \\ &= \frac{2}{5r} && \text{Simplify.} \end{aligned}$$

**Exercises**

Find each quotient. Write in simplest form.

1.  $\frac{2x}{y} \div \frac{3}{y}$

2.  $\frac{c}{4d} \div \frac{3}{8d}$

3.  $\frac{4a}{b} \div \frac{2ac}{b}$

4.  $\frac{m}{9} \div \frac{mn^2}{3}$

5.  $\frac{ab}{9} \div \frac{bc}{12}$

6.  $\frac{2st}{q} \div \frac{4t}{q}$

7.  $\frac{10z}{xy} \div \frac{2}{5xyz}$

8.  $\frac{8g}{3hi} \div \frac{4g}{15i}$

9.  $\frac{7p}{9qr} \div \frac{3p}{18q}$

10.  $\frac{x}{yz} \div \frac{4x}{11z}$

11.  $\frac{2d}{3ef} \div \frac{5}{6ef}$

12.  $\frac{3x}{5wy} \div \frac{6x}{20yz}$

13.  $\frac{4ab}{3c} \div \frac{6b}{4c}$

14.  $\frac{14jk}{3l} \div \frac{4j}{9l}$

15.  $\frac{6a}{11bc} \div \frac{a}{44b}$

16.  $\frac{15yz}{6x} \div \frac{10z}{3x}$

17.  $\frac{de}{20f} \div \frac{e}{2f}$

18.  $\frac{6i}{5gh} \div \frac{8i}{3h}$