

Study Guide and Intervention

7NSI.2, 7MGI.3

Multiplying Positive and Negative Fractions

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

Example 1 Find $\frac{3}{8} \cdot \frac{4}{11}$. Write in simplest form.

$$\begin{aligned}\frac{3}{8} \cdot \frac{4}{11} &= \frac{3}{\cancel{8}^2} \cdot \frac{\cancel{4}_2}{11} \\ &= \frac{3 \cdot 1}{2 \cdot 11} \\ &= \frac{3}{22}\end{aligned}$$

Divide 8 and 4 by their GCF, 4.

Multiply the numerators and denominators.

Simplify.

To multiply mixed numbers, first rewrite them as improper fractions.

Example 2 Find $-2\frac{1}{3} \cdot 3\frac{3}{5}$. Write in simplest form.

$$\begin{aligned}-2\frac{1}{3} \cdot 3\frac{3}{5} &= -\frac{7}{3} \cdot \frac{18}{5} \\ &= -\frac{7}{\cancel{3}^1} \cdot \frac{\cancel{18}^6}{5} \\ &= -\frac{7 \cdot 6}{1 \cdot 5} \\ &= -\frac{42}{5} \\ &= -8\frac{2}{5}\end{aligned}$$

$$-2\frac{1}{3} = -\frac{7}{3}, 3\frac{3}{5} = \frac{18}{5}$$

Divide 18 and 3 by their GCF, 3.

Multiply the numerators and denominators.

Simplify.

Write the result as a mixed number.

Exercises**Multiply. Write in simplest form.**

1. $\frac{2}{3} \cdot \frac{3}{5}$

2. $\frac{4}{7} \cdot \frac{3}{4}$

3. $-\frac{1}{2} \cdot \frac{7}{9}$

4. $\frac{9}{10} \cdot \frac{2}{3}$

5. $\frac{5}{8} \cdot \left(-\frac{4}{9}\right)$

6. $-\frac{4}{7} \cdot \left(-\frac{2}{3}\right)$

7. $2\frac{2}{5} \cdot \frac{1}{6}$

8. $-3\frac{1}{3} \cdot 1\frac{1}{2}$

9. $3\frac{3}{7} \cdot 2\frac{5}{8}$

10. $-1\frac{7}{8} \cdot \left(-2\frac{2}{5}\right)$

11. $-1\frac{3}{4} \cdot 2\frac{1}{5}$

12. $2\frac{2}{3} \cdot 2\frac{3}{7}$

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Dividing Positive and Negative Fractions

Two numbers whose product is 1 are **multiplicative inverses**, or **reciprocals**, of each other.

Example 1 Write the multiplicative inverse of $-2\frac{3}{4}$.

$$-2\frac{3}{4} = -\frac{11}{4} \quad \text{Write } -2\frac{3}{4} \text{ as an improper fraction.}$$

$$\text{Since } -\frac{11}{4} \left(-\frac{4}{11}\right) = 1, \text{ the multiplicative inverse of } -2\frac{3}{4} \text{ is } -\frac{4}{11}.$$

To divide by a fraction or mixed number, multiply by its multiplicative inverse.

Example 2 Find $\frac{3}{8} \div \frac{6}{7}$. Write in simplest form.

$$\frac{3}{8} \div \frac{6}{7} = \frac{3}{8} \cdot \frac{7}{6} \quad \text{Multiply by the multiplicative inverse of } \frac{6}{7}, \text{ which is } \frac{7}{6}.$$

$$= \frac{\overset{1}{\cancel{3}}}{8} \cdot \frac{7}{\underset{2}{\cancel{6}}} \quad \text{Divide 6 and 3 by their GCF, 3.}$$

$$= \frac{7}{16} \quad \text{Simplify.}$$

Exercises

Write the multiplicative inverse of each number.

1. $\frac{3}{5}$

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

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

4. $-\frac{1}{6}$

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

6. $-1\frac{2}{3}$

7. $-5\frac{2}{5}$

8. $7\frac{1}{4}$

Divide. Write in simplest form.

9. $\frac{1}{3} \div \frac{1}{6}$

10. $\frac{2}{5} \div \frac{4}{7}$

11. $-\frac{5}{6} \div \frac{3}{4}$

12. $1\frac{1}{5} \div 2\frac{1}{4}$

13. $3\frac{1}{7} \div \left(-3\frac{2}{3}\right)$

14. $-\frac{4}{9} \div 2$

15. $\frac{6}{11} \div (-4)$

16. $5 \div 2\frac{1}{3}$

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Ratios and Rates

A **ratio** is a comparison of two numbers by quantities. Since a ratio can be written as a fraction, it can be simplified.

Example 1 Express 35 wins to 42 losses in simplest form.

$$\frac{35}{42} = \frac{5}{6}$$

Divide the numerator and denominator by the greatest common factor, 7.

The ratio in simplest form is $\frac{5}{6}$ or 5:6.

Example 2 Express 1 foot to 3 inches in simplest form.

To simplify a ratio involving measurements, both quantities must have the same unit of measure.

$$\frac{1 \text{ foot}}{3 \text{ inches}} = \frac{12 \text{ inches}}{3 \text{ inches}}$$

Convert 1 foot to 12 inches.

$$= \frac{4 \text{ inches}}{1 \text{ inch}}$$

Divide the numerator and denominator by 3.

The ratio in simplest form is $\frac{4}{1}$ or 4:1.

A **rate** is a ratio that compares two quantities with different types of units. A unit rate is a rate with a denominator of 1.

Example 3 Express 309 miles in 6 hours as a unit rate.

$$\frac{309 \text{ miles}}{6 \text{ hours}} = \frac{51.5 \text{ miles}}{1 \text{ hour}}$$

Divide the numerator and denominator by 6 to get a denominator of 1.

The unit rate is 51.5 miles per hour.

Exercises

Express each ratio in simplest form.

- | | |
|-------------------------------------|------------------------------|
| 1. 3 out of 9 students | 2. 8 passengers:2 cars |
| 3. 5 out of 10 dentists | 4. 35 boys:60 girls |
| 5. 18 red apples to 42 green apples | 6. 50 millimeters to 1 meter |

Express each rate as a unit rate.

- | | |
|------------------------------|---------------------------|
| 7. 12 waves in 2 hours | 8. 200 miles in 4 hours |
| 9. 21 gallons in 2.4 minutes | 10. \$12 for 4.8 pounds |
| 11. \$49,500 in 12 months | 12. 112 feet in 5 seconds |