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Study Guide and Intervention

7NS1.2, 7MG1.3

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.**

$$\frac{3}{8} \cdot \frac{4}{11} = \frac{3}{\cancel{8}_{2}} \cdot \frac{\cancel{4}^{1}}{11}$$ Divide 8 and 4 by their GCF, 4.

$$= \frac{3 \cdot 1}{2 \cdot 11}$$ Multiply the numerators and denominators.

$$= \frac{3}{22}$$ 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.**

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

$$= -\frac{7}{\cancel{3}_{1}} \cdot \frac{\cancel{18}^{6}}{5}$$ Divide 18 and 3 by their GCF, 3.

$$= -\frac{7 \cdot 6}{1 \cdot 5}$$ Multiply the numerators and denominators.

$$= -\frac{42}{5}$$ Simplify.

$$= -8\frac{2}{5}$$ Write the result as a mixed number.

Exercises

Multiply. Write in simplest form.

1. $\frac{2}{3} \cdot \frac{3}{5}$ $\frac{2}{5}$
2. $\frac{4}{7} \cdot \frac{3}{4}$ $\frac{3}{7}$
3. $-\frac{1}{2} \cdot \frac{7}{9}$ $-\frac{7}{18}$
4. $\frac{9}{10} \cdot \frac{2}{3}$ $\frac{3}{5}$
5. $\frac{5}{8} \cdot \left(-\frac{4}{9}\right)$ $-\frac{5}{18}$
6. $-\frac{4}{7} \cdot \left(-\frac{2}{3}\right)$ $\frac{8}{21}$
7. $2\frac{2}{5} \cdot \frac{1}{6}$ $\frac{2}{5}$
8. $-3\frac{1}{3} \cdot 1\frac{1}{2}$ -5
9. $3\frac{3}{7} \cdot 2\frac{5}{8}$ 9
10. $-1\frac{7}{8} \cdot \left(-2\frac{2}{5}\right)$ $4\frac{1}{2}$
11. $-1\frac{3}{4} \cdot 2\frac{1}{5}$ $-3\frac{17}{20}$
12. $2\frac{2}{3} \cdot 2\frac{3}{7}$ $6\frac{10}{21}$

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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 $-2\frac{3}{4}$.**

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

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

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

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

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

Exercises

Write the multiplicative inverse of each number.

1. $\frac{3}{5}$ $\frac{5}{3}$
2. $-\frac{8}{9}$ $-\frac{9}{8}$
3. $\frac{1}{10}$ 10
4. $-\frac{1}{6}$ -6
5. $2\frac{3}{5}$ $\frac{5}{13}$
6. $-1\frac{2}{3}$ $-\frac{3}{5}$
7. $-5\frac{2}{5}$ $-\frac{5}{27}$
8. $7\frac{1}{4}$ $\frac{4}{29}$

Divide. Write in simplest form.

9. $\frac{1}{3} \div \frac{1}{6}$ 2
10. $\frac{2}{5} \div \frac{4}{7}$ $\frac{7}{10}$
11. $-\frac{5}{6} \div \frac{3}{4}$ $-1\frac{1}{9}$
12. $1\frac{1}{5} \div 2\frac{1}{4}$ $\frac{8}{15}$
13. $3\frac{1}{7} \div \left(-3\frac{2}{3}\right)$ $-\frac{6}{7}$
14. $-\frac{4}{9} \div 2$ $-\frac{2}{9}$
15. $\frac{6}{11} \div (-4)$ $-\frac{3}{22}$
16. $5 \div 2\frac{1}{3}$ $2\frac{1}{7}$

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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 quanitities 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 $\frac{1}{3}$
2. 8 passengers:2 cars $\frac{4}{1}$
3. 5 out of 10 dentists $\frac{1}{2}$
4. 35 boys:60 girls $\frac{7}{12}$
5. 18 red apples to 42 green apples $\frac{3}{7}$
6. 50 millimeters to 1 meter $\frac{1}{20}$

Express each rate as a unit rate.

7. 12 waves in 2 hours
   6 waves/h
8. 200 miles in 4 hours
   50 mi/h
9. 21 gallons in 2.4 minutes
   8.75 gal/min
10. $12 for 4.8 pounds
    $2.50/lb