

Lesson 5-4

Example 1 Find Multiplicative Inverses

Find the multiplicative inverse of each number.

a. $\frac{4}{9}$

$$\frac{4}{9} \cdot \frac{9}{4} = 1 \quad \text{The product is 1.}$$

The multiplicative inverse or reciprocal of $\frac{4}{9}$ is $\frac{9}{4}$.

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

$$-3\frac{2}{5} = -\frac{17}{5} \quad \text{Write as an improper fraction.}$$

$$-\frac{17}{5} \cdot \left(-\frac{5}{17}\right) = 1 \quad \text{The product is 1.}$$

The multiplicative inverse of $-3\frac{2}{5}$ is $-\frac{5}{17}$.

Example 2 Divide by a Fraction

Find $\frac{3}{8} \div \frac{1}{4}$. Write the quotient in simplest form.

$$\frac{3}{8} \div \frac{1}{4} = \frac{3}{8} \cdot \frac{4}{1} \quad \text{Multiply by the multiplicative inverse of } \frac{1}{4}.$$

$$= \frac{3}{\cancel{8}^1} \cdot \frac{\cancel{4}_1}{1} \quad \text{Divide 4 and 8 by their GCF, 4.}$$

$$= \frac{3}{2} \text{ or } 1\frac{1}{2} \quad \text{Simplify.}$$

Example 3 Divide by a Whole Number

Find $\frac{2}{5} \div 3$. Write the quotient in simplest form.

$$\frac{2}{5} \div 3 = \frac{2}{5} \div \frac{3}{1} \quad \text{Write 3 as } \frac{3}{1}.$$

$$= \frac{2}{5} \cdot \frac{1}{3} \quad \text{Multiply by the multiplicative inverse of } \frac{3}{1}, \frac{1}{3}.$$

$$= \frac{2}{15} \quad \text{Multiply the numerators and multiply the denominators.}$$

Example 4 Divide by a Mixed Number

Find $-4\frac{2}{3} \div 1\frac{5}{8}$. Write the quotient in simplest form.

$$\begin{aligned}
 -4\frac{2}{3} \div 1\frac{5}{8} &= -\frac{14}{3} \div \frac{13}{8} && \text{Rename the mixed numbers as improper fractions.} \\
 &= -\frac{14}{3} \cdot \frac{8}{13} && \text{Multiply by the multiplicative inverse of } \frac{13}{8}, \frac{8}{13}. \\
 &= -\frac{112}{39} \text{ or } -2\frac{34}{39} && \text{Simplify.}
 \end{aligned}$$

Example 5 Divide by an Algebraic Fraction

Find $\frac{5ab}{8} \div \frac{b}{2}$. Write the quotient in simplest form.

$$\begin{aligned}
 \frac{5ab}{8} \div \frac{b}{2} &= \frac{5ab}{8} \cdot \frac{2}{b} && \text{Multiply by the multiplicative inverse of } \frac{b}{2}, \frac{2}{b}. \\
 &= \frac{5a\cancel{b}^1}{\cancel{8}_4} \cdot \frac{\cancel{2}^1}{\cancel{b}_1} && \text{Divide out common factors.} \\
 &= \frac{5a}{4} && \text{Simplify.}
 \end{aligned}$$

Example 6 Use Dimensional Analysis to Solve a Problem

BAKING How many cakes can be made out of $33\frac{1}{4}$ cups of flour if the recipe requires $2\frac{3}{8}$ cups for each cake?

To find how many cakes, divide $33\frac{1}{4}$ by $2\frac{3}{8}$.

$$\begin{aligned}
 33\frac{1}{4} \div 2\frac{3}{8} &= \frac{133}{4} \div \frac{19}{8} && \text{Rename } 33\frac{1}{4} \text{ and } 2\frac{3}{8} \text{ as improper fractions.} \\
 &= \frac{\cancel{133}^7}{\cancel{4}_1} \cdot \frac{\cancel{8}^2}{\cancel{19}_1} && \text{Multiply by the reciprocal of } \frac{19}{8}, \frac{8}{19}. \\
 &= 14 && \text{Simplify.}
 \end{aligned}$$

So, 14 cakes can be made.