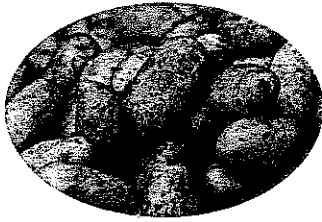


# OPERATIONS WITH MIXED NUMBERS

## LESSON 1.5



Add, subtract, multiply or divide mixed numbers.



**M**ixed numbers are the sum of a whole number and a fraction less than 1. Mixed numbers are used in many situations. You may need  $2\frac{1}{4}$  cups of flour when making cookies. You may run  $3\frac{1}{2}$  miles. You might buy  $1\frac{1}{8}$  pounds of potatoes. Finding sums, differences, products and quotients with mixed numbers can be done by changing each number into an improper fraction before following the procedures you learned in previous lessons.

### OPERATIONS WITH MIXED NUMBERS

1. Write each mixed number as an improper fraction.
2. Follow the procedures for adding, subtracting, multiplying or dividing fractions.
3. Write the answer in simplest form. Convert the answer to a mixed number, if needed.

#### EXAMPLE 1

Find the value of  $2\frac{1}{4} + 1\frac{7}{8}$ .

#### SOLUTION

Change each mixed number to an improper fraction.

$$2\frac{1}{4} = \frac{9}{4} \quad 1\frac{7}{8} = \frac{15}{8}$$

Write equivalent fractions with the least common denominator, 8.

$$\frac{9}{4} \xrightarrow{\times 2} \frac{18}{8} \quad \text{and} \quad \frac{15}{8}$$

Add the numerators.

$$\frac{18}{8} + \frac{15}{8} = \frac{33}{8}$$

Write as a mixed number.

$$\frac{33}{8} = 4\frac{1}{8}$$

$$2\frac{1}{4} + 1\frac{7}{8} = 4\frac{1}{8}$$

Whole numbers can be turned into improper fractions by writing the whole number with 1 in the denominator. For example:  $5 = \frac{5}{1}$ .

#### EXAMPLE 2

Madison had a rope that was 8 feet long. She cut off a piece for a friend that was  $5\frac{3}{4}$  feet long. How much rope does she have left?

#### SOLUTION

Write the problem.

$$8 - 5\frac{3}{4}$$

Change each mixed or whole number to an improper fraction.

$$8 = \frac{8}{1} \quad 5\frac{3}{4} = \frac{23}{4}$$

Write equivalent fractions with the least common denominator, 4.

$$\frac{8}{1} \xrightarrow{\times 4} \frac{32}{4} \quad \text{and} \quad \frac{23}{4}$$

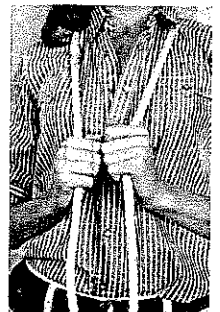
Subtract the numerators.

$$\frac{32}{4} - \frac{23}{4} = \frac{9}{4}$$

Write as a mixed number.

$$\frac{9}{4} = 2\frac{1}{4}$$

Madison has  $2\frac{1}{4}$  feet of rope left.



**EXAMPLE 3**Find the value of  $(2\frac{1}{6})(\frac{3}{10})$ .**SOLUTION**

Write each mixed number as an improper fraction.

$$2\frac{1}{6} = \frac{13}{6} \qquad \frac{3}{10} = \frac{3}{10}$$

Multiply the numerators and denominators.

$$\frac{13}{6} \cdot \frac{3}{10} = \frac{13 \cdot 3}{6 \cdot 10} = \frac{39}{60}$$

Simplify the fraction.

$$\frac{39}{60} = \frac{13}{20}$$

(Diagram showing 39/60 = 13/20 with arrows and ÷3 indicating simplification)

$$2\frac{1}{6}(\frac{3}{10}) = \frac{13}{20}$$

When finding the reciprocal of a whole number, write the whole number as a fraction over 1 and then “flip” the fraction.

$$3 = \frac{3}{1} \xrightarrow{\text{Reciprocal}} \frac{1}{3}$$

**EXAMPLE 4**Iona runs six days each week. Each of her runs is equal in length. If her total mileage for the week is  $12\frac{3}{4}$  miles, how long was each run?**SOLUTION**

Write the problem.

$$12\frac{3}{4} \div 6$$

Write each whole and mixed number as an improper fraction.

$$12\frac{3}{4} = \frac{51}{4} \qquad 6 = \frac{6}{1}$$

Multiply by the reciprocal of the divisor.

$$\frac{51}{4} \div \frac{6}{1} = \frac{51}{4} \cdot \frac{1}{6} = \frac{51}{24}$$

Simplify the fraction.

$$\frac{51}{24} = \frac{17}{8}$$

(Diagram showing 51/24 = 17/8 with arrows and ÷3 indicating simplification)

Change into a mixed number.

$$\frac{17}{8} = 2\frac{1}{8}$$

Iona runs  $2\frac{1}{8}$  miles each day.

You can also cross reduce before multiplying.

$$\frac{\overset{17}{\cancel{51}}}{4} \cdot \frac{1}{\underset{2}{\cancel{6}}} = \frac{17}{8} = 2\frac{1}{8}$$