

## Section 1.2

### Fractions in Algebra

#### Making a List and Trimming it Twice!



The average number of holiday presents bought by U.S. shoppers is decreasing each year by

about  $2\frac{1}{5}$  presents per shopper.



While completing one of the application exercises in this section of your textbook, you will utilize a formula that will help you to analyze this trend.

#### First Steps:

- Take comprehensive notes** from your instructor's lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 1.2 of your textbook which begins on page 14.
- Complete the *Concept and Vocabulary Check* on page 28 of the textbook.

#### Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

**Objective #1:** Convert between mixed numbers and improper fractions.

#### ✓ *Solved Problem #1*

1a. Convert  $2\frac{5}{8}$  to an improper fraction.

$$\begin{aligned} 2\frac{5}{8} &= \frac{2 \cdot 8 + 5}{8} \\ &= \frac{16 + 5}{8} \\ &= \frac{21}{8} \end{aligned}$$

1b. Convert  $\frac{5}{3}$  to a mixed number.

5 divided by 3 is 1 with a remainder of 2,  
so  $\frac{5}{3} = 1\frac{2}{3}$ .

#### *Pencil Problem #1*

1a. Convert  $7\frac{3}{5}$  to an improper fraction.

1b. Convert  $\frac{76}{9}$  to a mixed number.

**Objective #2:** Write the prime factorization of a composite number.

 **Solved Problem #2**

2. Find the prime factorization of 36.

Begin by selecting any two numbers whose product is 36.

Here is one possibility:  $36 = 4 \cdot 9$

Because the factors 4 and 9 are not prime, factor each of these composite numbers.

$$36 = 4 \cdot 9$$

$$= 2 \cdot 2 \cdot 3 \cdot 3$$

Notice that 2 and 3 are both prime.

The prime factorization of 36 is  $2 \cdot 2 \cdot 3 \cdot 3$ .

 **Pencil Problem #2** 

2. Find the prime factorization of 240.

**Objective #3:** Reduce or simplify fractions.

 **Solved Problem #3**

3a. Reduce  $\frac{10}{15}$  to its lowest terms.

$$\frac{10}{15} = \frac{2 \cdot \cancel{5}}{3 \cdot \cancel{5}} = \frac{2}{3}$$

 **Pencil Problem #3** 

3a. Reduce  $\frac{35}{50}$  to its lowest terms.

3b. Reduce  $\frac{13}{15}$  to its lowest terms.

13 and 15 share no common factors (other than 1).

Therefore,  $\frac{13}{15}$  is already reduced to its lowest terms.

3b. Reduce  $\frac{120}{86}$  to its lowest terms.

**Objective #4:** Multiply fractions.

 **Solved Problem #4**

4a. Multiply  $\frac{4}{11} \cdot \frac{2}{3}$ .

If possible, reduce the product to its lowest terms.

$$\begin{aligned} \frac{4}{11} \cdot \frac{2}{3} &= \frac{4 \cdot 2}{11 \cdot 3} \\ &= \frac{8}{33} \end{aligned}$$

 **Pencil Problem #4** 

4a. Multiply  $\frac{3}{8} \cdot \frac{7}{11}$ .

If possible, reduce the product to its lowest terms.

4b. Multiply  $\left(3\frac{2}{5}\right)\left(1\frac{1}{2}\right)$ .

If possible, reduce the product to its lowest terms.

$$\begin{aligned}\left(3\frac{2}{5}\right)\left(1\frac{1}{2}\right) &= \frac{17}{5} \cdot \frac{3}{2} \\ &= \frac{51}{10} \\ &= 5\frac{1}{10}\end{aligned}$$

4b. Multiply  $\left(3\frac{3}{4}\right)\left(1\frac{3}{5}\right)$ .

If possible, reduce the product to its lowest terms.

**Objective #5:** Divide fractions.

 **Solved Problem #5**

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

$$\begin{aligned}\frac{5}{4} \div \frac{3}{8} &= \frac{5}{4} \cdot \frac{8}{3} \\ &= \frac{5}{\cancel{4}} \cdot \frac{\cancel{4} \cdot 2}{3} \\ &= \frac{10}{3} \\ &= 3\frac{1}{3}\end{aligned}$$

 **Pencil Problem #5** 

5a. Divide  $\frac{7}{6} \div \frac{5}{3}$ .

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

$$\begin{aligned}3\frac{3}{8} \div 2\frac{1}{4} &= \frac{27}{8} \div \frac{9}{4} \\ &= \frac{27}{8} \cdot \frac{4}{9} \\ &= \frac{\cancel{9} \cdot 3 \cdot \cancel{4}}{\cancel{4} \cdot 2 \cdot \cancel{9}} \\ &= \frac{3}{2} \\ &= 1\frac{1}{2}\end{aligned}$$

5b. Divide  $6\frac{3}{5} \div 1\frac{1}{10}$ .

**Objective #6:** Add and subtract fractions with identical denominators. **Solved Problem #6****6a.** Perform the indicated operation:  $\frac{2}{11} + \frac{3}{11}$ 

$$\begin{aligned}\frac{2}{11} + \frac{3}{11} &= \frac{2+3}{11} \\ &= \frac{5}{11}\end{aligned}$$

 **Pencil Problem #6** **6a.** Perform the indicated operation:  $\frac{7}{12} + \frac{1}{12}$ **6b.** Perform the indicated operation:  $\frac{5}{6} - \frac{1}{6}$ 

$$\begin{aligned}\frac{5}{6} - \frac{1}{6} &= \frac{4}{6} \\ &= \frac{2}{3}\end{aligned}$$

**6b.** Perform the indicated operation:  $\frac{11}{18} - \frac{4}{18}$ **Objective #7:** Add and subtract fractions with unlike denominators. **Solved Problem #7****7a.** Perform the indicated operation:  $\frac{1}{2} + \frac{3}{5}$ 

$$\begin{aligned}\frac{1}{2} + \frac{3}{5} &= \frac{1 \cdot 5}{2 \cdot 5} + \frac{3 \cdot 2}{5 \cdot 2} \\ &= \frac{5}{10} + \frac{6}{10} \\ &= \frac{5+6}{10} \\ &= \frac{11}{10}\end{aligned}$$

 **Pencil Problem #7** **7a.** Perform the indicated operation:  $\frac{3}{8} + \frac{5}{12}$

7b. Perform the indicated operation:  $3\frac{1}{6} - 1\frac{11}{12}$

$$\begin{aligned} 3\frac{1}{6} - 1\frac{11}{12} &= \frac{19}{6} - \frac{23}{12} \\ &= \frac{19 \cdot 2}{6 \cdot 2} - \frac{23}{12} \\ &= \frac{38}{12} - \frac{23}{12} \\ &= \frac{15}{12} \\ &= \frac{5}{4} \\ &= 1\frac{1}{4} \end{aligned}$$

7b. Perform the indicated operation:  $3\frac{3}{4} - 2\frac{1}{3}$

**Objective #8:** Solve problems involving fractions in algebra.

 **Solved Problem #8**

8a. Determine whether the given number is a solution of the equation.

$$x - \frac{2}{9}x = 1; \quad 1\frac{2}{7}$$

$$\begin{aligned} x - \frac{2}{9}x &= 1 \\ 1\frac{2}{7} - \frac{2}{9}\left(1\frac{2}{7}\right) &= 1 \\ \frac{9}{7} - \frac{2}{9}\left(\frac{9}{7}\right) &= 1 \\ \frac{9}{7} - \frac{2}{7} &= 1 \\ \frac{7}{7} &= 1 \\ 1 &= 1, \text{ true} \end{aligned}$$

The given fraction is a solution.

 **Pencil Problem #8**

8a. Determine whether the given number is a solution of the equation.

$$\frac{2}{9}y + \frac{1}{3}y = \frac{3}{7}; \quad \frac{27}{35}$$

**8b.** Translate from English to an algebraic expression or equation, whichever is appropriate. Let the variable  $x$  represent the number.

$\frac{2}{3}$  of a number decreased by 6.

$$\frac{2}{3}(x-6)$$

**8b.** Translate from English to an algebraic expression or equation, whichever is appropriate. Let the variable  $x$  represent the number.

A number decreased by  $\frac{1}{4}$  of itself.

**8c.** The temperature on a warm spring day is  $77^\circ\text{F}$ .

Use the formula  $C = \frac{5}{9}(F - 32)$  to find the equivalent temperature on the Celsius scale.

$$C = \frac{5}{9}(F - 32)$$

$$C = \frac{5}{9}(77 - 32)$$

$$= \frac{5}{9}(45)$$

$$= 25$$

$77^\circ\text{F}$  is equivalent to  $25^\circ\text{C}$ .

**8c.** The temperature on a cool fall day is  $68^\circ\text{F}$ .

Use the formula  $C = \frac{5}{9}(F - 32)$  to find the equivalent temperature on the Celsius scale.

**Answers for Pencil Problems (Textbook Exercise references in parentheses):**

**1a.**  $\frac{38}{5}$  (1.2 #3)    **1b.**  $8\frac{4}{9}$  (1.2 #9)    **2.**  $2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5$  (1.2 #27)    **3a.**  $\frac{7}{10}$  (1.2 #33)    **3b.**  $\frac{60}{43}$  (1.2 #39)

**4a.**  $\frac{21}{88}$  (1.2 #43)    **4b.** 6 (1.2 #51)    **5a.**  $\frac{7}{10}$  (1.2 #61)    **5b.** 6 (1.2 #65)

**6a.**  $\frac{2}{3}$  (1.2 #69)    **6b.**  $\frac{7}{18}$  (1.2 #83)    **7a.**  $\frac{19}{24}$  (1.2 #81)    **7b.**  $\frac{17}{12}$  or  $1\frac{5}{12}$  (1.2 #89)

**8a.** solution (1.2 #97)    **8b.**  $x - \frac{1}{4}x$  (1.2 #105)    **8c.**  $20^\circ\text{C}$  (1.2 #123)

**Homework:**

- Review the Section 1.2 summary** that begins on page 103 of the textbook.
- Insert your homework** into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.