

Section 1.5

Problem Solving and Using Formulas

The COST to Cross



Visitors to the world's great bridges are frequently inspired by their beauty. This feeling is not always shared by daily commuters dealing with escalating toll costs and peak-hour congestion. For these frequent users, most bridge authorities provide the option of a fixed cost that reduces the toll. In this section, you will see how toll options in these situations can be modeled and compared using linear equations.



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 1.5 of your textbook which begins on page 54.
- Complete the *Concept and Vocabulary Check* on page 65 of the textbook.

Guided Practice:

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

Objective #1: Solve algebraic word problems using linear equations.

✓ *Solved Problem #1*

- 1a.** The average yearly salary of a woman with an associate degree exceeds that of a woman with some college by \$4 thousand. The average yearly salary of a woman with a bachelor's degree or more exceeds that of a woman with some college by \$21 thousand. Combined, three women with each of these educational attainments earn \$136 thousand. Find the average yearly salary of women with each of these levels of education.

Let x = the average yearly salary, in thousands, of women with some college.

Let $x + 4$ = the average yearly salary, in thousands, of women with an associate degree.

Let $x + 21$ = the average yearly salary, in thousands, of women with a bachelor's degree or more.

$$x + (x + 4) + (x + 21) = 136$$

(continued on next page)

Pencil Problem #1

- 1a.** In a triangle, the measures of the three angles are consecutive integers. What is the measure of each angle?

$$x + (x + 4) + (x + 21) = 136$$

$$x + x + 4 + x + 21 = 136$$

$$3x + 25 = 136$$

$$3x = 111$$

$$x = 37$$

$x = 37$, some college: \$37,000

$x + 4 = 41$, associate degree: \$41,000

$x + 21 = 58$, bachelor's degree: \$58,000

1b. You are choosing between two texting plans. Plan A has a monthly fee of \$15 with a charge of \$0.08 per text. Plan B has a monthly fee of \$3 with a charge of \$0.12 per text. For how many text messages will the costs for the two plans be the same?

Let x = the number of text messages for which the two plans cost the same.

$$15 + 0.08x = 3 + 0.12x$$

$$0.08x - 0.12x = 3 - 15$$

$$-0.04x = -12$$

$$\frac{-0.04x}{-0.04} = \frac{-12}{-0.04}$$

$$x = 300$$

The two plans cost the same for 300 text messages.

1b. The bus fare in a city is \$1.25. People who use the bus have the option of purchasing a monthly discount pass for \$15.00. With the discount pass, the fare is reduced to \$0.75. Determine the number of times in a month the bus must be used so that the total monthly cost without the discount pass is the same as the total monthly cost with the discount pass.

- 1c.** After a 30% price reduction, you purchase a new computer for \$840. What was the computer's price before the reduction?

Let x = the original price of the new computer.

$$x - 0.30x = 840$$

$$0.70x = 840$$

$$\frac{0.70x}{0.70} = \frac{840}{0.70}$$

$$x = 1200$$

The original price of the new computer was \$1200.

- 1c.** The selling price of a refrigerator is \$584. If the markup is 25% of the dealer's cost, what is the dealer's cost of the refrigerator?

- 1d.** The length of a rectangular basketball court is 44 feet more than the width. If the perimeter of the basketball court is 288 feet, what are its dimensions?

Let x = the width of the basketball court.

Let $x + 44$ = length of the basketball court.

$$P = 2l + 2w$$

$$288 = 2(x + 44) + 2x$$

$$288 = 2x + 88 + 2x$$

$$288 = 4x + 88$$

$$-4x = -200$$

$$x = 50$$

$$x + 44 = 94$$

The dimensions of the basketball court are 50 feet by 94 feet.

- 1d.** A rectangular soccer field is twice as long as it is wide. If the perimeter of the soccer field is 300 yards, what are its dimensions?

Objective #2: Solve a formula for a variable. **Solved Problem #2****2a.** Solve the formula $2l + 2w = P$ for w .

$$\begin{aligned}
 2l + 2w &= P \\
 2w &= P - 2l \\
 \frac{2w}{2} &= \frac{P - 2l}{2} \\
 w &= \frac{P - 2l}{2}
 \end{aligned}$$

 **Pencil Problem #2** **2a.** Solve the formula $T = D + pm$ for p .**2b.** Solve the formula $P = C + MC$ for C .

$$\begin{aligned}
 P &= C + MC \\
 P &= C(1 + M) \\
 \frac{P}{1 + M} &= \frac{C(1 + M)}{1 + M} \\
 \frac{P}{1 + M} &= C \\
 C &= \frac{P}{1 + M}
 \end{aligned}$$

2b. Solve the formula $IR + Ir = E$ for I .**Answers for Pencil Problems (Textbook Exercise references in parentheses):****1a.** $59^\circ, 60^\circ, 61^\circ$ (1.5 #21) **1b.** 30 times (1.5 #31) **1c.** \$467.20 (1.5 #39)**1d.** 50 yards by 100 yards (1.5 #41) **2a.** $p = \frac{T - D}{m}$ (1.5 #55) **2b.** $I = \frac{E}{R + r}$ (1.5 #73)**Homework:**

- Review the Section 1.5 summary** on page 96 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.