3-4 Study Guide and Intervention
Systems of Equations in Three Variables

Real-World Problems
Example: The Laredo Sports Shop sold 10 balls, 3 bats, and 2 bases for $99 on Monday. On Tuesday they sold 4 balls, 8 bats, and 2 bases for $78. On Wednesday they sold 2 balls, 3 bats, and 1 base for $33.60. What are the prices of 1 ball, 1 bat, and 1 base?

First define the variables.
\( x = \) price of 1 ball
\( y = \) price of 1 bat
\( z = \) price of 1 base

Translate the information in the problem into three equations.

\[ 10x + 3y + 2z = 99 \]
\[ 4x + 8y + 2z = 78 \]
\[ 2x + 3y + z = 33.60 \]

Subtract the second equation from the first equation to eliminate \( z \).

\[ 10x + 3y + 2z = 99 \]
\[ (-) \ 4x + 8y + 2z = 78 \]
\[ 6x - 5y = 21 \]

Multiply the third equation by 2 and subtract from the second equation.

\[ 4x + 8y + 2z = 78 \]
\[ (-) \ 4x + 6y + 2z = 67.20 \]
\[ 2y = 10.80 \]
\[ y = 5.40 \]

Substitute 5.40 for \( y \) in the equation
\[ 6x - 5y = 21 \]
\[ 6x - 5(5.40) = 21 \]
\[ 6x = 48 \]
\[ x = 8 \]

Substitute 8 for \( x \) and 5.40 for \( y \) in one of the original equations to solve for \( z \).

\[ 10x + 3y + 2z = 99 \]
\[ 10(8) + 3(5.40) + 2z = 99 \]
\[ 80 + 16.20 + 2z = 99 \]
\[ 2z = 2.80 \]
\[ z = 1.40 \]

So a ball costs $8, a bat $5.40, and a base $1.40.

Exercises

1. FITNESS TRAINING Carly is training for a triathlon. In her training routine each week, she runs 7 times as far as she swims, and she bikes 3 times as far as she runs. One week she trained a total of 232 miles. How far did she run that week?

2. The sum of three numbers is 6. The third number is the sum of the first and second numbers. The first number is one more than the third number. Find the numbers.
3. **FOOD** A natural food store makes its own brand of trail mix out of dried apples, raisins, and peanuts. One pound of the mixture costs $3.18. It contains twice as much peanuts by weight as apples. One pound of dried apples costs $4.48, a pound of raisins $2.40, and a pound of peanuts $3.44. How many ounces of each ingredient are contained in 1 pound of the trail mix?

4. **ENTERTAINMENT** At the arcade, Ryan, Sara, and Tim played video racing games, pinball, and air hockey. Ryan spent $6 for 6 racing games, 2 pinball games, and 1 game of air hockey. Sara spent $12 for 3 racing games, 4 pinball games, and 5 games of air hockey. Tim spent $12.25 for 2 racing games, 7 pinball games, and 4 games of air hockey. How much did each of the games cost?

5. The sum of three numbers is –4. The second number decreased by the third is equal to the first. The sum of the first and second numbers is –5. Find the numbers.

6. **SPORTS** Alexandria High School scored 37 points in a football game. Six points are awarded for each touchdown. After each touchdown, the team can earn one point for the extra kick or two points for a 2-point conversion. The team scored one fewer 2-point conversions than extra kicks. The team scored 10 times during the game. How many touchdowns were made during the game?