



Unit 9: Lesson 06

Solving for two variables in word problems

When working word problems involving two unknowns,

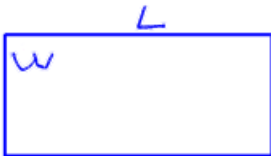
- draw a picture if possible,
- create two variables and define them (or label them in the picture),
- create two equations using the two variables, and
- solve for the variables using either substitution or elimination.

Example 1: A pile of coins consists of dimes and quarters. If the total number of coins is 40 and their total value is \$4.75, how many of each type coin is there?

d = number of dimes; q = number of quarters

$$\begin{array}{l}
 d + q = 40 \xrightarrow{-10(d+q)} -10(d+q) = 40(-10) \rightarrow -10d - 10q = -400 \\
 kd(.10d + .25q) = 4.75(100) \rightarrow 10d + 25q = 475 \xrightarrow{-10d} \underline{10d + 25q = 475} \\
 \rightarrow -10d - 10q = -400 \\
 15q = 75 \\
 q = 5 \text{ quarters} \\
 d + q = 40 \\
 d + 5 = 40 \\
 d = 40 - 5 = \boxed{35 \text{ dimes}}
 \end{array}$$

Example 2: A rectangular garden has a perimeter of 76 meters. If the width is 12 meters less than the length, what are the dimensions of the garden?



$$\begin{array}{l}
 \rightarrow 2L + 2W = 76 \quad W = L - 12 \\
 \text{Per } 2L + 2(L - 12) = 76 \\
 2L + 2L - 24 = 76 \\
 4L - 24 = 76 \\
 4L = 76 + 24 = 100 \\
 L = \frac{100}{4} = \boxed{25 \text{ m}} \\
 \\
 W = L - 12 \\
 W = 25 - 12 \\
 W = \boxed{13 \text{ m}}
 \end{array}$$

Example 3: One number is 8 more than 11 times another number. When added, their total is 92. What are the numbers?

$x = \text{the first number}$; $y = \text{the second number}$

$$\begin{array}{l}
 x = 11y + 8 \\
 x + y = 92 \\
 \downarrow \\
 (11y + 8) + y = 92 \\
 12y + 8 = 92 \\
 12y = 92 - 8 = 84 \\
 y = \frac{84}{12} = 7 \\
 x = 11(7) + 8 \\
 x = 77 + 8 \\
 x = 85
 \end{array}$$

Assignment: Work these problems by creating two equations with two variables.

1. Tickets for a small private concert sell for \$30 for seats near the stage. All other tickets sell for \$25. If a total of 52 tickets are sold totaling \$1360, how many tickets were sold for seats near the stage?

2. If the width of a rectangle is 4 ft less than its length and the perimeter is 68 ft, what are the dimensions of the rectangle?

3. Bill has coins worth \$5.15 in his pocket. If he has only dimes and quarters and there are 8 more quarters than dimes, how many quarters does Bill have?

4. On an archeological field trip, Lucy and Chuck found a total of 92 arrowheads. If Lucy found 6 more than Chuck, how many did Chuck find?

5. A certain rectangle having a perimeter of 84 inches has a length that is 2 inches more than its width. What is the length of the rectangle?

6. If a triangle's base is 10 ft and its height is 8 less than the area, what is the area of the triangle?

7. A total of 50 coins is worth \$4.15. If only nickels and dimes are present, how many of each is there?

8. The Imperial Fruit Stand only sells very high quality, expensive fruit. Three pears and two apples cost \$8.25 while two pears and three apples would cost \$8.00. How much would 4 pears and one apple cost?

9. The length of a rectangle of perimeter 130 meters is 5 meters more than twice its width. What are the dimensions of the rectangle?