

Modeling and Solving Real-World Problems Using Multi-Step Equations

Steps to Writing and Solving an Equation

- Read the problem and underline or **highlight** the key pieces of information
- Choose a variable to represent the unknown you know the least information about
- Write an expression to represent any other unknowns using the variable you chose
- Write an equation using your chosen variable
- Solve the equation
- Reread the problem and answer the question being asked

Example One

The length of a rectangular field is 6 m less than twice the width. The perimeter is 312 m. Find the width and length of the field.

Let w = width

Let $2w - 6$ = length

$$\text{Perimeter} = 2 \cdot \text{width} + 2 \cdot \text{length}$$

$$312 = 2w + 2(2w - 6)$$

$$312 = 2w + 4w - 12$$

$$312 = 6w - 12$$

$$324 = 6w$$

$$54 = w$$

$$w = 54$$

The problem is asking for the width and the length. The length is defined as $2w - 6$.

Substitute 54 in for w to find the length. The length = $2(54) - 6 = 102$

Solution: The width is 54 m and the length is 102 m.

Example Two

The second side of a triangle is 9 m shorter than the first side. The third side is 3 times as long as the second side. The perimeter is 39 m. Find the length of the longest side.

Let x = length of the first side

Let $x - 9$ = length of the second side

Let $3(x - 9)$ = length of the third side

$$\text{Perimeter} = \text{first side} + \text{second side} + \text{third side}$$

$$39 = x + (x - 9) + 3(x - 9)$$

$$39 = x + x - 9 + 3x - 27$$

$$39 = 5x - 36$$

$$75 = 5x$$

$$15 = x$$

$$x = 15$$

The problem is asking for the longest side. The first side is 15 m. The second side is defined as

$x - 9$ so the second side is $15 - 9 = 6$ m. The third side is defined as $3(x - 9) = 3(15 - 9) = 18$ m.

Solution: The longest side is 18 m.

Try These

Answer the following by writing and solving an equation.

1. A DVD cost \$3 more than a CD. Raymond bought five DVDs and two CDs. The total cost was \$120. What was the price of a DVD?
2. A triangular pennant has two sides the same length. The third side is 9 in. shorter than either of the equal sides. The perimeter of the pennant is 57 in. How long is the shortest side?
3. Acme car rental agency charges a fee of \$29 per day plus \$0.15 per mile. Travel Ease car rental agency charges \$20 per day plus \$0.25 per mile. For a one day trip, at what mileage would the two rates be equal?
4. The length of a rectangle is 2 cm more than 5 times the width. The perimeter is 196 cm. Find the width and length.
5. Cindy wants an average of 80% in American History. Her current test grades are 74%, 83%, 78% and an 81%. What must she score on her fifth test so that she earns the grade she wants?
6. Together a computer, monitor and printer cost \$1775. The monitor cost \$300 less than the computer and the printer cost \$50 more than the monitor. Find the cost of the printer.