Solving Problems with Formulas

Fill in the guided notes as you watch the video in the Digital Toolbox.

- When solving problems with formulas, start by **reading** the problem carefully.
  - Name the **formula** that contains both the value that you are solving for and the values that you already know.
- Once you have written down a formula and defined the **variables** in the problem:
  - **Substitute** the values that you already know into the formula.
  - **Solve** for the remaining variable in the formula.
- Remember to label your final answer with the correct **units**. If no units of measurements are specified, simply use "units."

Example 1

Complete the example as you watch the video in the Digital Toolbox.

Determine the formula needed to solve.

Triangle: $P = a + b + c$ **Rectangle:** $P = 2l + 2w$

The perimeter of a rectangle is 48 units. The length is twice the width plus 3. What are the dimensions?

Implement

$P = 2l + 2w$

$P = 48$

$l = 2w + 3$

$48 = 2(2w + 3) + 2w$

$48 = 4w + 6 + 2w$

$48 = 6w + 6$

$-6 \quad -6$

$42 = 6w$

$w = 7$

$l = 2(7) + 3 = 17$

Check

$48 = 2(17) + 2(7)$

$48 = 34 + 14$ ✓

Explain

Name the formula
Identify the key information
Determine the equation for length using mathematical vocabulary

Substitute values into the formula

Solve for the variable, w

Substitute to find the length, l

The dimensions of the rectangle are 17 units by 7 units.

Example 2

Complete the example as you watch the video in the Digital Toolbox.

Determine the formula needed to solve.

Triangle: $P = a + b + c$ **Rectangle:** $P = 2l + 2w$

The perimeter of a triangle is 30 inches. Side b is twice the length of side a, and side c is three times the length of side a. Find the dimensions of the triangle.

Implement

$P = a + b + c$

$P = 30,\ b = 2a,\ c = 3a$

$30 = a + (2a) + (3a)$

$30 = 6a$

$a = 5$

$b = 2(5) = 10$

$c = 3(5) = 15$

Explain

Name the formula
Identify the key information
Determine the equations for b and c

Solve for a, b, and c

Check

$30 = 5 + 10 + 15$

$30 = 15 + 15$ ✓

The dimensions of the triangle are 5 inches, 10 inches, and 15 inches.

Practice

Determine the formula needed to solve. Show your work.

Rectangle	Triangle	Rectangular Prism	Rectangular Pyramid
$A = lw$ or $A = bh$ $P = 2(l + w)$ or $P = 2l + 2w$	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$ $P = a + b + c$	$V = lwh$	$V = \frac{1}{3}lwh$

1) The perimeter of a rectangle is 36 inches. The length is two more than the width. Find the dimensions of the rectangle.

$P = 2l + 2w;\ P = 36;\ l = w + 2$

$36 = 2(w + 2) + 2w$

$36 = 2w + 4 + 2w$

$36 = 4w + 4$

$-4 \quad -4$

$\left(\frac{1}{4}\right)32 = 4w\left(\frac{1}{4}\right)$

$w = 8$

$l = (8) + 2 = 10$

Check

$36 = 2(10) + 2(8)$ ✓

The dimensions of the rectangle are 10 inches by 8 inches.

2) The perimeter of a triangle is 19 cm. The largest side is twice the smallest side plus one. The middle side is two more than the smallest side. Find the dimensions of the triangle.

$P = a + b + c$

a: shortest $\quad b$: middle $\quad c$: longest

$P = 19; \quad b = a + 2; \quad c = 2a + 1$

$19 = a + (a + 2) + (2a + 1)$

$19 = 4a + 3$

$-3 \quad -3$

$\left(\frac{1}{4}\right)16 = 4a\left(\frac{1}{4}\right)$

$a = 4 \quad b = (4) + 2 \quad c = 2(4) + 1$

$b = 6 \quad c = 9$

Check

$19 = 4 + 6 + 9$ ✓

The dimensions of the triangle are 4 cm, 6 cm, and 9 cm.

Rectangle	Triangle	Rectangular Prism	Rectangular Pyramid
$A = lw$ or $A = bh$ $P = 2(l + w)$ or $P = 2l + 2w$	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$ $P = a + b + c$	$V = lwh$	$V = \frac{1}{3}lwh$

Determine the formula needed to solve. Show your work.

3) Find the height of a pyramid if the volume is 35 cm^3, the length of the base is 3 cm and the width of the base is 5 cm.

$V = \frac{1}{3}lwh$

$V = 35;\ l = 3;\ h = 5$

$35 = \frac{1}{\cancel{3}}(\cancel{3})(5)h$

$\left(\frac{1}{5}\right)35 = 5h\left(\frac{1}{5}\right)$

$h = 7$

Check

$35 = \frac{1}{3}(3)(5)(7)$ ✓

The height of the pyramid is 7 cm.

4) Find the length of a rectangular prism if the height is 12 inches, the width is 4 inches, and the volume is 72 cubic inches.

$V = lwh$

$V = 72;\ h = 12;\ w = 4$

$72 = l(4)(12)$

$\left(\frac{1}{48}\right)72 = 48l\left(\frac{1}{48}\right)$

$l = \frac{72}{48} = \frac{3}{2}$

$l = 1.5$

Check

$72 = (1.5)(4)(12)$ ✓

The length of the rectangular prism is 1.5 inches.