

2-9: Rearranging Formulas

Example 1: Work with your partner to solve each equation for x. For part (c), remember a variable symbol, like a, b, and c, represents a number.

solve for x

a. $2x - 6 = 10$
 $\downarrow +6 \quad | +6$
 $\frac{2x}{2} = \frac{16}{2}$
 $x = 8 \rightarrow \frac{10+6}{2}$

b. $-3x - 6 = -12$
 $\downarrow +6 \quad | +6$
 $\frac{-3x}{-3} = \frac{-9}{-3}$
 $x = 3 \rightarrow \frac{-12+6}{-3}$

c. $ax - b = c$
 $\downarrow +b \quad | +b$
 $\frac{a \cdot x}{a} = \frac{c+b}{a}$
 $x = \frac{c+b}{a}$

Compare your work in parts (a) through (c) above. Did you have to do anything differently to solve for x in part (c)?
 NO.

Example 2:

Solve the equation $ax - b = c$ for a. The variable symbols x, b, and c represent numbers. Justify your steps using properties.

$ax - b = c$
 $\downarrow +b \quad | +b$
 $\frac{a \cdot x}{x} = \frac{c+b}{x}$
 $a = \frac{c+b}{x}$

original equation
 Addition Property
 Simplify
 Division Property
 Simplify

2-9

Example 3:

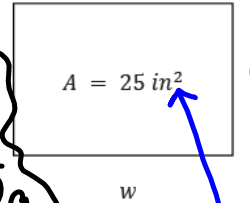
The area A of a rectangle is 25 in^2 . The formula for area is $A = lw$.

Area = length times width

(a) If the width w is 10 inches, what is the length l ?

$$A = l \cdot w \rightarrow \frac{25}{10} = \frac{l \cdot 10}{10} \rightarrow 2.5 = l$$

plug the values into the formula



Area is measured in square units.

(b) If the width w is 15 inches, what is the length l ?

$$\frac{25}{15} = \frac{l \cdot 15}{15} \rightarrow 1.\bar{6} \text{ in.} = l$$

(c) Rearrange the area formula to solve for l . $A = lw$

$$\frac{A}{w} = \frac{lw}{w}$$

$$\frac{A}{w} = l \text{ or } l = \frac{A}{w}$$

(d) Verify that the area formula, solved for l will give the same results for l as having solved for l in the original area formula.

(a) $A = 25, w = 10$

$$l = \frac{A}{w} = \frac{25}{10} = 2.5 \text{ in.}$$

(b) $A = 25, w = 15$

$$l = \frac{A}{w} = \frac{25}{15} = 1.\bar{6} \text{ in.}$$

✓ verified ☺

Example 4:

Solve each problem two ways. First, substitute the given values and solve for the given variable. Then, solve for the given variable and substitute the given values.

- a. The perimeter formula for a rectangle is $p = 2(l + w)$ where p represents the perimeter, l represents the length, and w represents the width. Calculate l when $p = 70$ and $w = 15$.

(Substitute in values for p and w)

(Plugin)

$$P = 2(l + w)$$

$$70 = 2(l + 15)$$

$$70 = 2l + 30$$

$$\begin{array}{r} 70 = 2l + 30 \\ -30 \quad | \quad \downarrow \quad -30 \\ \hline 40 = 2l \\ \frac{40}{2} = \frac{2l}{2} \rightarrow l = 20 \end{array}$$

(Solve the formula for l , then substitute values)

$$P = 2(l + w)$$

$$P = 2l + 2w$$

$$\begin{array}{r} P = 2l + 2w \\ -2w \quad | \quad \downarrow \quad -2w \\ \hline P - 2w = 2l \\ \frac{P - 2w}{2} = \frac{2l}{2} \end{array}$$

$$\frac{P - 2w}{2} = l$$

$$l = \frac{P - 2w}{2}$$

$$l = \frac{70 - 2 \cdot 15}{2}$$

$$l = \frac{70 - 30}{2} = \frac{40}{2} = 20$$

SAME

- b. The area formula for a triangle is $A = \frac{1}{2}bh$, where A represents the area; b represents the length of the base, and h represents the height. Calculate b when $A = 100$ and $h = 20$.

(Substitute in values for A and h)

$$A = \frac{1}{2}bh$$

$$100 = \frac{1}{2} \cdot b \cdot 20$$

$$100 = \frac{1}{2} \cdot 20 \cdot b$$

$$\frac{100}{10} = \frac{10b}{10}$$

$$10 = b$$

(Solve the formula for b , then substitute values)

$$A = \frac{1}{2}bh$$

$$2 \cdot A = 2 \cdot \frac{1}{2} \cdot b \cdot h$$

$$\frac{2A}{h} = \frac{b \cdot h}{h}$$

$$\frac{2A}{h} = b$$

$$b = \frac{2 \cdot 100}{20}$$

$$b = \frac{200}{20}$$

$$b = 10$$

Same