

2.8 Rewrite Equations & Formulas

The equation $ax + b = c$ is called a **literal equation** because the coefficients & constants have been replaced by letters.

When you solve a literal equation, you can use the result to solve any equation that has the same form.

1. a) Solve $ax + b = c$ for x .

$$\begin{array}{r} \frac{ax}{a} = \frac{c-b}{a} \\ \boxed{x = \frac{c-b}{a}} \end{array}$$

b) Use the solution to solve $ax + b = c$
 $2x + 5 = 11$.
 $a=2$ $b=5$ $c=11$

$$x = \frac{11 - 5}{2}$$

$$x = \frac{6}{2}$$

$$\boxed{x = 3}$$

2. a) Solve $a - bx = c$ for x .

$$\begin{array}{r|l} -a & -a \\ \hline -bx = c - a & \\ \hline -b & -b \\ \hline x = \frac{c-a}{-b} & \end{array}$$

b) Use the solution to solve $12 - 5x = -3$.

$$a - bx = c$$

$$a = 12 \quad b = 5 \quad c = -3$$

$$x = \frac{c-a}{-b}$$

$$x = \frac{-3 - 12}{-5}$$

$$x = \frac{-15}{-5}$$

$$x = 3$$

3. a) Solve $ax = bx + c$ for x .

$$\begin{array}{r|l} -bx & -bx \\ \hline ax - bx = c & \\ \hline x(a-b) = \frac{c}{a-b} & \\ \hline x = \frac{c}{a-b} & \end{array}$$

$$ax = bx + c$$

b) Use the solution to solve $11x = 6x + 20$.

$$a = 11 \quad b = 6 \quad c = 20$$

$$x = \frac{c}{a-b}$$

$$x = \frac{20}{11-6}$$

$$x = \frac{20}{5}$$

$$x = 4$$

An equation in two variables...

$$-5a + 3b = -35$$

$$4x + 3y = 12$$

$$-7m - 3n = 8$$

or a formula in two or more variables...

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

$$C = \frac{5}{9}(F - 32)$$

$$d = rt$$

can be rewritten so that one variable is a function of the other variable(s).

4. Write $3x + 2y = 8$ so that y is a function of x .

In other words...

solve for y

$$\begin{array}{r} 3x + 2y = 8 \\ -3x \quad -3x \\ \hline 2y = 8 - 3x \\ \frac{2y}{2} = \frac{8 - 3x}{2} \\ y = 4 - \frac{3}{2}x \end{array}$$

5. Write $-2x + 3y = 6$ so that y is a function of x .

$$\begin{array}{r} -2x + 3y = 6 \\ +2x \quad +2x \\ \hline 3y = 6 + 2x \\ \frac{3y}{3} = \frac{6 + 2x}{3} \\ y = 2 + \frac{2}{3}x \end{array}$$

Solve for x.

$$6. \quad \frac{8x}{8} = \frac{y}{8}$$

$$\boxed{x = \frac{y}{8}}$$

$$7. \quad \frac{(x-c)}{8} = d \cdot -6$$

$$x-c = -6d$$

$$\begin{array}{r} +c \\ \hline \end{array} \quad \begin{array}{r} +c \\ \hline \end{array}$$

$$\boxed{x = -6d + c}$$

Solve for w.

$$8. \quad \frac{bw + c}{-c} = \frac{d}{-c}$$

$$\frac{bw}{b} = \frac{d-c}{b}$$

$$\boxed{w = \frac{d-c}{b}}$$

$$\frac{bw}{b} = \frac{d-c}{b}$$

$$w = \frac{d}{b} - \frac{c}{b}$$

same

$$\star 9. \quad \frac{mw - n}{-kw} = \frac{ad + kw}{-kw}$$

$$\frac{mw - n - kw}{+n} = \frac{ad}{+n}$$

$$\frac{mw - kw}{m-k} = \frac{ad + n}{m-k}$$

$$\boxed{w = \frac{ad + n}{m-k}}$$

10.a) Solve the formula of the area of a triangle for the height (h).

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

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

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

b) Use the rewritten formula to find the height of a triangle with a base of 12 m and an area of 48 m².

$$\frac{2 \cdot 48}{12} = h$$

$$\boxed{8 \text{ m} = h}$$

11.a) Solve the formula of the area of a rectangle for the length (l).

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

$$\boxed{\frac{A}{w} = l}$$

b) Use the rewritten formula to find the length of a rectangle with a width of 13 cm and an area of 351 cm².

$$\frac{351}{13} = l$$

$$\boxed{27 \text{ cm} = l}$$

12.a) What is the formula for the perimeter of a **rectangle**? $2l + 2w = P$

b) Solve the formula for the **width** (w).

$$\begin{array}{r}
 \cancel{2l} + 2w = P \\
 \underline{-\cancel{2l}} \qquad \qquad \underline{-\cancel{2l}} \\
 2w = P - 2l \\
 \underline{\quad 2} \qquad \qquad \underline{\quad 2} \\
 w = \frac{P - 2l}{2}
 \end{array}$$

13.a) Rewrite the formula for temperature by solving for **F**.

$$\begin{array}{r}
 \frac{9}{5} \cdot C = \frac{5}{9} (F - 32) \cdot \frac{9}{5} \\
 \frac{9}{5} C = F - 32 \\
 \underline{+32} \qquad \qquad \underline{+32} \\
 \frac{9}{5} C + 32 = F
 \end{array}$$

b) Find the temperature for Saturday in degrees Fahrenheit if it's **14°C**.

$$\begin{array}{r}
 \frac{9}{5} \cdot 14 + 32 = F \\
 \boxed{57.2^\circ F}
 \end{array}$$