Day 11 – Isolating a Variable

Isolating a variable simply means to solve for that variable or get the variable "by itself" on one side of the equal sign (usually on the left). Sometimes we may have more than one variable in our equations; these type of equations are called **literal equations**. We solve literal equations the same way we solve "regular" equations.

Steps for Isolating Variables

1. Locate the variable you are trying to isolate.
2. Follow the rules for solving equations to get that variable by itself.

Solving an Equation You're Familiar with	Solving a Literal Equation
$\frac{2x}{2} = \frac{10}{2}$ $x = 5$	$\frac{gh}{g} = \frac{m}{g}$ solve for h $h = \frac{m}{g}$
$2x + 6 = 11$ $-6 \quad -5$ $\frac{2x}{2} = \frac{6}{2}$ $x = 3$	$ax + b = c$ solve for x $-b \quad -b$ $\frac{ax}{a} = \frac{c-b}{a}$ $x = \frac{c-b}{a}$

Practice:

1. Solve the equation for b: $a = bh$

$\frac{a}{h} = \frac{bh}{h}$

$b = \frac{a}{h}$

2. Solve the equation for b: $y = mx + b$

$y = mx + b$
$-mx \quad -mx$
$y - mx = b$

$b = y - mx$

3. Solve the equation for x: $2x + 4y = 10$

$2x + 4y = 10$
$-4y \quad -4y$
$\frac{2x}{2} = \frac{10 - 4y}{2} = \frac{10}{2} - \frac{4y}{2}$

$x = 5 - 2y$

4. Solve the equation for m: $y = mx + b$

$y = mx + b$
$-b \quad -b$
$\frac{y-b}{x} = \frac{mx}{x}$

$m = \frac{y-b}{x}$ OR $\frac{y}{x} - \frac{b}{x}$

5. Solve the equation for w: $p = 2l + 2w$

$p = 2l + 2w$
$-2l \quad -2l$
$\frac{p-2l}{2} = \frac{2w}{2}$

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

6. Solve the equation for a: $\frac{a}{2} - 1 = b$

$\frac{a}{2} - 1 = b$
$+1 \quad +1$
$2 \cdot \frac{a}{2} = (b+1) \cdot 2$

$a = 2(b+1)$

$a = 2b + 2$

7. Solve the equation for y: $6x - 3y = 15$

$6x - 3y = 15$
$-6x \quad -6x$
$\frac{-3y}{-3} = \frac{15 - 6x}{-3}$

$y = \frac{15}{-3} - \frac{6x}{-3} = -5 - (-2x)$
$= \boxed{-5 + 2x}$

8. Solve the equation for h: $V = \frac{1}{3}Bh$

$\frac{3}{1} \cdot V = \frac{1}{3}Bh \cdot \frac{3}{1}$

$\frac{3V}{B} = \frac{Bh}{B}$

$\boxed{h = \frac{3V}{B}}$

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1. You are visiting a foreign county over the weekend. The forecast is predicted to be 30 degrees Celsius. Are you going to pack warm or cold clothes? Use Celsius = $\frac{5}{9}(F - 32)$

$C = 30$

$C = \frac{5}{9}(F - 32)$
$30 = \frac{5}{9}(F - 32)$

$30 = \frac{5}{9}F - \frac{160}{9}$
$+\frac{160}{9} \quad +\frac{160}{9}$

$\frac{9}{5} \cdot \frac{430}{9} = \frac{5}{9}F \cdot \frac{9}{5}$

$86 = F$

2. The area of a triangle is given by the formula $A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$, where b is the base and h is the height.

a. Use the formula given to find the height of the triangle that has a base of 5 cm and an area of 50 cm.

$A = \frac{bh}{2} \quad \frac{2}{5} \cdot 50 = \frac{5h}{2} \cdot \frac{2}{5}$

$\frac{100}{5} = h$

~~b. Solve the formula for the height.~~

~~c. Use the formula from part b to find the height of a triangle that has a base of 5 cm and an area of 50 cm.~~

$\frac{9}{5} \cdot 30 = \frac{5}{9}(F - 32) \cdot \frac{9}{5}$

$\frac{9 \cdot 30}{5} = F - 32$

$\frac{270}{5} = F - 32$

$54 = F - 32$
$+32 \quad +32$

$86° = F \Longrightarrow$ warm