

Write Equations with Variables on Both Sides

Scenario	Define Variable	Write Equation
A t-shirt company's costs include a fixed overhead charge of \$300 plus \$2 for every t-shirt they sell. Their sales are \$8 per t-shirt. How many t-shirts must they sell in order for their costs to equal their revenue?	t : t-shirts	Cost = sales. $2t + 300 = 8t$
Sam's gym has a registration fee of \$10, plus he pays \$3 for every visit. Ciara's gym has a registration fee of \$14, but she only pays \$1 for every visit. After how many visits would Sam and Ciara have spent the same amount on their gym memberships?	v : visits	Sam's Cost = Ciara's Cost $3v + 10 = 1v + 14$
Trey has \$50 in his bank account and earns \$10 per hour at his job. Briana has \$80 in her bank account and earns \$7 per hour at her job. If they both deposit all their earnings into their bank accounts, after how many hours of work do they have the same amount of money saved up?	h : hours	Trey amount = Briana amount $50h + 10 = 80h + 7$

Model Equations with Algebra Tiles

Model	Algebra	Words
	$2x - 5 = x + 1$ $\begin{array}{r} -x \\ \hline x - 5 = 1 \\ +5 \quad +5 \\ \hline x = 6 \end{array}$	<ul style="list-style-type: none"> * get rid of the variable on one side. * isolate the remaining variables
	$2x - 8 = 4x + 2$ $\begin{array}{r} -2x \\ \hline -8 = 2x + 2 \\ -2 \quad -2 \\ \hline -10 = 2x \\ \frac{-10}{2} = \frac{2x}{2} \\ -5 = x \end{array}$	<p>It doesn't matter what side you take the variable from.</p>

Example	Make Note!	You Try
$\begin{array}{r} -3x + 7 = 2x - 3 \\ -7x \quad -5x \\ \hline 7 = 5x - 3 \\ +3 \quad +3 \\ \hline 10 = 5x \\ \frac{10}{5} = \frac{5x}{5} \\ \boxed{2 = x} \end{array}$	<ul style="list-style-type: none"> • Add variables if you want to get rid of negative variables 	$\begin{array}{r} 5x - 4 = -4x + 14 \\ +4x \quad +4x \\ \hline 9x - 4 = 14 \\ +4 \quad +4 \\ \hline 9x = 18 \\ \frac{9x}{9} = \frac{18}{9} \\ \boxed{2 = x} \end{array}$
$\begin{array}{r} 3x - 2(5x - 1) = x - 6 \\ \boxed{3x} - \boxed{10x} + 2 = x - 6 \\ -7x + 2 = x - 6 \\ -x \quad -x \\ \hline -8x + 2 = -6 \\ -2 \quad -2 \\ \hline -8x = -8 \\ \frac{-8x}{-8} = \frac{-8}{-8} \\ \boxed{x = 1} \end{array}$	<p>Simplify one side @ a time (you cannot combine like terms across the = sign)</p>	$\begin{array}{r} -4x - 3(-3x + 4) = -2x + 2 \\ -4x + 9x - 12 = -2x + 2 \\ -5x - 12 = -2x + 2 \\ +2x \quad +2x \\ \hline -7x - 12 = 2 \\ +12 \quad +12 \\ \hline -7x = 14 \\ \frac{-7x}{-7} = \frac{14}{-7} \\ \boxed{x = 2} \end{array}$

Find the Mistake - Two Errors in Each Incorrect Solution

Solution with Errors	What did they do?	Correct Solution
$\begin{array}{r} 5x + 3 = 2x - 9 \\ \boxed{+2x} \quad \boxed{+2x} \\ \hline 7x + 3 = -9 \\ -3 \quad -3 \\ \hline 7x = -6 \\ \frac{7x}{7} = \frac{-6}{7} \\ x = -\frac{6}{7} \end{array}$	<ul style="list-style-type: none"> • should -2x on both sides • $9 - 3 = -12$ 	$5x + 3 = 2x - 9$
$\begin{array}{r} 2x - 8 = -3(4x - 1) + 3x \\ 2x - 8 = -12x - 3 + 3x \\ 2x - 8 = -9x - 3 \\ +9x \quad +9x \\ \hline 11x - 8 = -3 \\ \boxed{+3} \quad \boxed{+3} \\ \hline 11x = -5 \\ \frac{11x}{11} = \frac{-5}{11} \\ x = -\frac{5}{11} \end{array}$	<ul style="list-style-type: none"> • should distribute the (-) • isolate the variable 	$2x - 8 = -3(4x - 1) + 3x$