

0.2 Solve Linear Equations

Equation: a statement saying that two expressions are equal.

* **General Rule:** What you do to one side of the equation, you must do to the other side!

To Solve an Equation:

1. Apply Distributive Property or Fraction Bust
2. Clean up- combine like terms on either side of the equal sign
3. Isolate the variable- get it alone on one side
4. Undo the Order of Operations
5. Check your answer! Substitute into the **Original Equation**.

Examples:

<p>1. $2c + 14 = 6 - 4c$</p> $\begin{array}{r} 2c + 14 = 6 - 4c \\ +4c \qquad \qquad +4c \\ \hline 6c + 14 = 6 \\ -14 \quad -14 \\ \hline 6c = -8 \\ c = -8/6 = -4/3 \end{array}$	<p>2. $12(r + 3) = 2(r + 5) - 3r$</p> $\begin{array}{l} 12r + 36 = 2r + 10 - 3r \\ 12r + 36 = -r + 10 \\ +r \qquad \qquad +r \\ 13r + 36 = 10 \\ -36 \qquad -36 \\ 13r = -26 \\ \boxed{r = -2} \end{array}$
<p>3. $\frac{1}{2}y + \frac{1}{3}y = 10 \quad \cdot (6)$</p> $\begin{array}{l} \frac{6}{2}y + \frac{6}{3}y = 60 \\ 3y + 2y = 60 \\ 5y = 60 \\ \boxed{y = 12} \end{array}$	<p>4. $\frac{2}{5}k + \frac{1}{6} = \frac{3}{10}k + \frac{1}{3} \quad (\cdot 30)$</p> $\begin{array}{l} \frac{60}{5}k + \frac{30}{6} = \frac{90}{10}k + \frac{30}{3} \\ 12k + 5 = 9k + 10 \\ -9k \qquad -9k \\ 3k + 5 = 10 \\ -5 \qquad -5 \qquad \rightarrow \quad \boxed{k = 5/3} \end{array}$

*Special Cases:

<p>5. $5(x - 4) = 5x + 12$</p> $\begin{array}{l} 5x - 20 = 5x + 12 \quad \text{same} \\ -5x \qquad \qquad -5x \\ 0x \quad -20 = 12 \quad \text{no solution} \\ \text{False} \qquad \qquad \quad \phi \end{array}$	<p>6. $5(2 - x) = 3 - 2x + 7 - 3x$</p> $\begin{array}{l} 10 - 5x = 10 - 5x \\ \text{same on both sides} \\ \text{true} \\ \text{all real } \boxed{\mathbb{R}} \end{array}$
<p>7. $2(x + 4) = -3x + 8$</p> $\begin{array}{l} 2x + 8 = -3x + 8 \\ +3x \qquad \qquad +3x \\ \hline 5x + 8 = 8 \end{array}$	$\begin{array}{l} 5x + 8 = 8 \\ -8 \quad -8 \\ \hline 5x = 0 \\ \frac{5x}{5} = \frac{0}{5} \\ \boxed{x = 0} \end{array}$ <p>only if variable is 0x is there ϕ or \mathbb{R}</p>

0.2 Rewrite Formulas & Equations

Formula: an equation that relates two or more quantities:

Examples:

$$D = R \cdot T \quad r = D/T$$

$$l = \frac{A}{w} \quad A_{\text{rectangle}} = lw$$

$$A_{\text{circle}} = \pi r^2 \quad \frac{A}{\pi} = r^2 \quad \sqrt{\frac{A}{\pi}} = r$$

$$F = \frac{9}{5}C + 32 \quad \frac{5}{9}F - \frac{160}{9} = C$$

$$A_{\text{triangle}} = \frac{1}{2}bh \quad \frac{2A}{b} = h$$

$$A_{\text{trapezoid}} = \frac{1}{2}h(b_1 + b_2) \quad \frac{2A}{h} - b_1 = b_2$$

To Solve for a Variable:

This means to rewrite the equation with a specific variable on one side of the equation.

Examples:

<p>1. $3y + 4x = 24$ Solve for x.</p> $\begin{aligned} -3y & & -3y \\ \hline 4x & = & -3y + 24 \\ \frac{4x}{4} & = & \frac{-3y}{4} + \frac{24}{4} \\ \hline x & = & -\frac{3}{4}y + 6 \end{aligned}$	<p>2. $3y + 4x = 24$ Solve for y.</p> $\begin{aligned} -4x & & -4x \\ \hline 3y & = & -4x + 24 \\ \frac{3y}{3} & = & \frac{-4x}{3} + \frac{24}{3} \\ \hline y & = & -\frac{4}{3}x + 8 \end{aligned}$
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Use Slope-Intercept Form:

$$y = mx + b$$

solve for y

<p>3. $6x + 5y = 30$ Solve for y.</p> $\begin{aligned} -6x & & -6x \\ \hline 5y & = & -6x + 30 \\ \frac{5y}{5} & = & \frac{-6x}{5} + \frac{30}{5} \\ \hline y & = & -\frac{6}{5}x + 6 \end{aligned}$ <p>Find y if $x = -10$.</p> $y = \left(-\frac{6}{5}\right)(-10) + 6 = \frac{60}{5} + 6 = \boxed{18}$	<p>4. $9x - 6y = 63$ Solve for y.</p> $\begin{aligned} -9x & & -9x \\ \hline -6y & = & -9x + 63 \\ \frac{-6y}{-6} & = & \frac{-9x}{-6} + \frac{63}{-6} \\ \hline y & = & \frac{3}{2}x - \frac{21}{2} \end{aligned}$ <p>Find y if $x = -10$.</p> $y = \frac{3}{2}(-10) - \frac{21}{2} = \frac{-30}{2} - \frac{21}{2} = \boxed{-\frac{51}{2}}$
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If the variable shows up in **more than 1 term**, you must apply the **distributive property** (factor). *in reverse*

<p>5. $4y - xy = 9$ Solve for y.</p> $y \frac{(4-x)}{4-x} = \frac{9}{4-x} \leftarrow \text{undistribute } y$ $y = \frac{9}{4-x}$ <p>Find y if $x = 4$.</p> $y = \frac{9}{4-4} = \phi \text{ no solution}$ <p>\leftarrow can't be 0</p>	<p>6. $xy - x = 40$ Solve for y.</p> $x \frac{(y-1)}{x} = \frac{40+x}{x}$ $y = \frac{40}{x} + 1$ <p>Find y if $x = 5$.</p> $y = \frac{40}{5} + 1 = \boxed{9}$
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