Solving Equations—Explanation

The Goal: To get the equation in the form of: variable = constant

STEPS	TOOLS
1. **Simplify** the expressions on each side of the equation	**Order of Operations**
2. **Isolate** the **variable term** on one side of the equation.	**Addition Property of Equations**

To remove an unwanted variable term…….Add the opposite of the variable term to both sides.
To remove an unwanted constant term……Add the opposite of the constant term to both sides.

3. **Isolate** the **variable** itself — **Division Property of Equations**

To remove the coefficient……Divide both sides by the coefficient.

Example:

$2(5x - 1) = 4x + 13 + 3$

$10x - 2 = 4x + 16$ — Simplify the expressions

$10x - 2 + (-4x) = 4x + 16 + (-4x)$ — Get variable term on one side only by adding to both sides of the equation the opposite of the unwanted variable term $4x$.

$6x - 2 = 16$

$6x - 2 + (+2) = 16 + (+2)$ — Isolate the variable term by adding to both sides of the equation the opposite of the unwanted constant term –2.

$6x = 18$

$\frac{6x}{6} = \frac{18}{6}$ — Isolate the variable itself by dividing by the coefficient of the variable.

$x = 3$ — variable = constant… Done!

Steps for Solving Equations
(All steps may not be necessary for every problem)

Step	Tool	Example
		Given: $\frac{5x-2}{3}-\frac{3}{5}x=\frac{4x+16}{5}+\frac{2}{15}$
1. Clear Fractions	Multiply each term by LCD	$\frac{15}{1}\left(\frac{5x-2}{3}\right)-\frac{15}{1}\left(\frac{3}{5}x\right)=\frac{15}{1}\left(\frac{4x+16}{5}\right)+\frac{15}{1}\left(\frac{2}{15}\right)$ $5(5x-2)-3(3x)=3(4x+16)+(2)$
2. Clear Parentheses	Distributive Property	$25x - 10 - 9x = 12x + 48 + 2$
3. Combine like terms on each side of the equation.	Rules for Adding/Subtracting like terms	$16x - 10 = 12x + 50$
4. Gather all variable terms on one side of the equation **And** all constant terms on the other side.	Addition Property of Equality (Add or subtract the same term from both sides of the equation)	$16x - 10 - 12x = 12x + 50 - 12x$ $4x - 10 = 50$ $4x - 10 + 10 = 50 + 10$ $4x = 60$
5. Isolate the variable	Multiplication Property of Equality (Divide both sides of equation by the numerical coefficient of the variable.)	$\frac{4x}{4}=\frac{60}{4}$ $x=15$