To Solve Linear Equations
with the Variable on BOTH sides of the Equal Sign

1) If there are fractions, multiply both sides by the LCD.

2) Distribute to remove parentheses, then combine like terms on each side of the equal sign.

3) Use the addition property of equality to get all terms with the variable on one side of the equal sign, and all other terms on the other side of the equal sign. Combine like terms on each side of the equal sign.

4) Use the multiplication property of equality to isolate the variable.

5) Check the solution in the original equation.

EXAMPLES:

A) \[ 5x - 3 = 11 - 2x \]
\[ +2x + 2x \]
\[ 7x - 3 = 11 + 3 \]
\[ +3 + 3 \]
\[ 7x = 14 \]
\[ \frac{7x}{7} = \frac{14}{7} \]
\[ x = 2 \]

B) \[ -4x + 8 = x + 23 \]
\[ -4x - x \]
\[ -5x + 8 = 23 \]
\[ -8 - 8 \]
\[ -5x = 15 \]
\[ -5 \]
\[ x = -3 \]

C) \[ 7x - 2 = 7 - 2x + 10x \]
\[ 7x - 2 = 7 + 8x \]
\[ 3x + 8x \]
\[ -8x + 8x \]
\[ -11x - 2 = 7 \]
\[ +2 + 2 \]
\[ -11x = 9 \]
\[ -1 \]
\[ x = -9 \]

D) \[ -2(x - 5) = 8x \]
\[ -2x + 10 = 8x \]
\[ +2x + 2x \]
\[ 10 = 10x \]
\[ \frac{10}{10} = \frac{10x}{10} \]
\[ 1 = x \]
\[ x = 1 \]
Solving Identities

Solve:

\[ 3 + 6x - 5 = 2(3x - 1) \]
\[ 6x - 2 = 6x - 2 \]
\[ -2 = -2 \]

If variables are gone and you have a true statement,

Solution: Any real number \( \text{IR} \)

If both sides of the equation are identical, the equation is true for any real number, so the solution is "any real number."

Solving Contradictions

Solve:

\[ 10(x-10) + 5 = 5(2x-20) \]
\[ 10x - 100 + 5 = 10x - 100 \]
\[ 10x - 95 = 10x - 100 \]
\[ -95 = -100 \]

No solution