

Solving Linear Equations

Definition of an Equation

An equation is a statement telling us that two expressions are equal.

Examples:

$$7x + 5 = 2$$

$$3(4x - 9) = 2x + 1$$

Addition Property of Equality		Multiplication Property of Equality	
<p>If a, b, and c are real numbers, then</p> $a = b$ <p>is equivalent to</p> $a + c = b + c$	<p>If a, b, and c are real numbers, then</p> $a = b$ <p>is equivalent to</p> $a - c = b - c$	<p>If a, b, and c are real numbers, and $c \neq 0$ then</p> $a = b$ <p>is equivalent to</p> $a \cdot c = b \cdot c$	<p>If a, b, and c are real numbers, and $c \neq 0$ then</p> $a = b$ <p>is equivalent to</p> $\frac{a}{c} = \frac{b}{c}$
<p>Example:</p> $x - 7 = 3$ $+7 \quad +7$ $x = 10$	<p>Example:</p> $x + 5 = -2$ $-5 \quad -5$ $x = -7$	<p>Example:</p> $\frac{x}{7} = 4$ $\frac{x}{7} \cdot 7 = 4 \cdot 7$ $x = 28$	<p>Example:</p> $6x = -12$ $\frac{6x}{6} = \frac{-12}{6}$ $x = -2$

Examples of Solving Linear Equations:

Examples:	Explanation:
<p>Solve the linear equation:</p> $3x + 5 = -7$ $\quad -5 \quad -5$ $3x = -12$ $\frac{3x}{3} = \frac{-12}{3}$ $x = -4$	<p>Subtract 5 from both sides. 5 and -5 cancels.</p> <p>Divide both sides by 3. 3 and 3 cancels.</p>
<p>Solve the linear equation:</p> $9x + 2 = 3x - 4$ $\quad -2 \quad -2$ $9x = 3x - 6$ $-3x \quad -3x$ $6x = -6$ $\frac{6x}{6} = \frac{-6}{6}$ $x = -1$	<p>Isolate x on the left side, and the numbers on the right side.</p> <p>Subtract 2 from both sides.</p> <p>Subtract $3x$ from both sides.</p> <p>Divide both sides by 6.</p>
<p>Solve the linear equation:</p> $5(2x - 3) = 25$ $10x - 15 = 25$ $\quad +15 \quad +15$ $10x = 40$ $\frac{10x}{10} = \frac{40}{10}$ $x = 4$	<p>Use the distributive property to remove the parentheses.</p> <p>Isolate x on the left side, and the numbers on the right side.</p> <p>Add 15 to both sides.</p> <p>Divide both sides by 10.</p>

<p>Solve the linear equation:</p> $4x + 7x - 3 = 4(2x + 3)$ $11x - 3 = 8x + 12$ $\begin{array}{r} -8x \\ -8x \end{array}$ $3x - 3 = 12$ $\begin{array}{r} +3 \\ +3 \end{array}$ $\frac{3x}{3} = \frac{15}{3}$ $x = 5$	<p>Combine $4x$ and $7x$ on the left side. Use the distributive property to remove the parentheses on the right side.</p> <p>Subtract $8x$ from both sides.</p> <p>Add 3 to both sides.</p> <p>Divide both sides by 3.</p>
<p>Solve the linear equation:</p> $\frac{x}{4} + 6 = 10$ $\begin{array}{r} -6 \\ -6 \end{array}$ $\frac{x}{4} = 4$ $\frac{x}{4} \cdot 4 = 4 \cdot 4$ $x = 16$	<p>Subtract 6 from both sides.</p> <p>Multiply both sides by 4.</p> <p>On the left side, 4 and 4 cancels.</p>
<p>Solve the linear equation:</p> $2x + x = 5 - (-1)$ $3x = 6$ $\frac{3x}{3} = \frac{6}{3}$ $x = 2$	<p>Combine the like terms on each side.</p> <p>Divide both sides by 3.</p>