Solving an Algebraic Equation

Algebraic equations are made from a series of operations. To solve an equation, use the inverse of each operation.

<table>
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<th>Operation</th>
<th>Inverse operation used to solve the equation</th>
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<tbody>
<tr>
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<td>Subtraction</td>
</tr>
<tr>
<td>Subtraction</td>
<td>Addition</td>
</tr>
<tr>
<td>Multiplication</td>
<td>Division</td>
</tr>
<tr>
<td>Division</td>
<td>Multiplication</td>
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</tbody>
</table>

Examples:

- \( X + 4 = 11 \)
  - \( X + 4 - 4 = 11 - 4 \)
  - \( X = 7 \)

- \( X - 4 = 11 \)
  - \( X - 4 + 4 = 11 + 4 \)
  - \( X = 15 \)

- \( 3x = 6 \)
  - \( \frac{3x}{3} = \frac{6}{3} \)
  - \( x = 2 \)

- \( \frac{x}{6} = 2 \)
  - \( 6 \cdot \frac{x}{6} = 6 \cdot 2 \)
  - \( x = 12 \)

**Rule 1:** Any inverse operation performed one side of the “=” must be performed on the other side.

**Equations with more than one operation**

Examples:

- \( 2x - 7 = 19 \)
  - \( 2x - 7 + 7 = 19 + 7 \)
  - \( 2x = 26 \)
  - \( \frac{2x}{2} = \frac{26}{2} \)
  - \( x = 13 \)

- \( 4x - x + 2 = 17 \)
  - \( 3x + 2 = 17 \)
  - \( 3x + 2 - 2 = 17 - 2 \)
  - \( 3x = 15 \)

**Rule 2:** Do addition or subtraction first

**Rule 3:** Do division or multiplication second
Equations with parenthesis

Examples:

\[
\begin{align*}
4(x + 3) &= 20 \\
4x + 4 \cdot 3 &= 20 \\
4x + 12 &= 20 \\
4x + 12 - 12 &= 20 - 12 \\
4x &= 8 \\
\frac{4x}{4} &= \frac{8}{4} \\
X &= 2
\end{align*}
\]

1. Remove parenthesis
2. Combine like terms
3. Use the inverse of each operation
4. Do addition and subtraction
5. Do multiplication and division

\[
\begin{align*}
5(x - 1) &= 4(x + 4) \\
5x - 5 \cdot 1 &= 4x + 4 \cdot 4 \\
5x - 5 &= 4x + 16 \\
5x - 5 + 5 &= 4x + 16 + 5 \\
5x &= 4x + 21 \\
5x - 4x &= 4x + 21 - 4x \\
X &= 21
\end{align*}
\]