

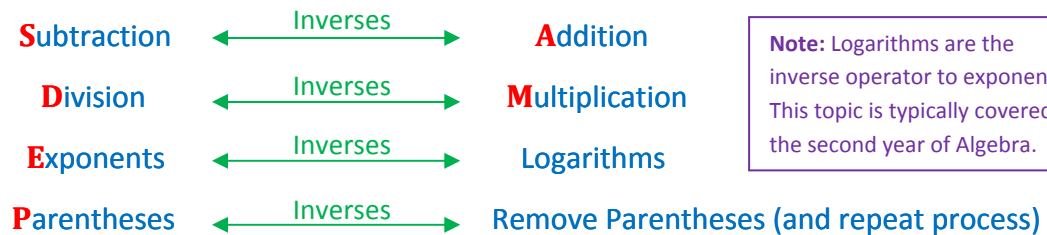
Pre-Algebra Solving Multi-Step Equations

Reverse PEMDAS

One systematic way to approach multi-step equations is Reverse PEMDAS. PEMDAS describes the order of operations used to evaluate an expression. Solving an equation is the opposite of evaluating it, so reversing the PEMDAS order of operations seems appropriate.

The **guiding principles** in the process are:

- Each step works toward isolating the variable for which you are trying to solve.
- Each step “un-does” an operation in **Reverse PEMDAS** order:



The list above shows inverse operation relationships. **In order to undo an operation, you perform its inverse operation.** For example, to undo addition, you subtract; to undo division, you multiply. Here are a couple of examples:

Example 1

Solve: $3x - 4 = 14$

Step 1: **Add 4**

$$\begin{array}{r} 3x - 4 = 14 \\ +4 \quad +4 \\ \hline \end{array}$$

Result: $3x = 18$

Step 2: **Divide by 3**

$$\begin{array}{r} 3x = 18 \\ \div 3 \quad \div 3 \\ \hline \end{array}$$

Result: $x = 6$

Notice that we add and subtract before we multiply and divide. **Reverse PEMDAS.**

Example 2

Solve: $2 \cdot (2x + 5) - 3 = -5$

Step 1: **Add 3**

$$\begin{array}{r} 2 \cdot (2x + 5) - 3 = -5 \\ +3 \quad +3 \\ \hline \end{array}$$

Result: $2 \cdot (2x + 5) = -2$

Step 2: **Divide by 2**

$$\begin{array}{r} 2 \cdot (2x + 5) = -2 \\ \div 2 \quad \div 2 \\ \hline \end{array}$$

Result: $(2x + 5) = -1$

Step 3: **Remove parentheses**

Result: $2x + 5 = -1$

Step 4: **Subtract 5**

$$\begin{array}{r} 2x + 5 = -1 \\ -5 \quad -5 \\ \hline \end{array}$$

Result: $2x = -6$

Step 5: **Divide by 2**

$$\begin{array}{r} 2x = -6 \\ \div 2 \quad \div 2 \\ \hline \end{array}$$

Result: $x = -3$

With this approach, you will be able to solve almost any multi-step equation. As you get better at it, you will be able to use some shortcuts to solve the problem faster.

Since speed is important in mathematics, learning a few tips and tricks with regard to solving equations is likely to be worth your time.