Pre-Algebra
Tips and Tricks in Solving Multi-Step Equations

Fractional Coefficients

Fractions present a stumbling block to many students in solving multi-step equations. When stumbling blocks occur, it is a good time to develop a trick to help with the process. The trick shown below involves using the reciprocal of a fractional coefficient as a multiplier in the solution process. (Remember that a coefficient is a number that is multiplied by a variable.)

Example 1

Solve: $\qquad \frac{2}{3}x = 8$

Multiply by $\frac{3}{2}$: $\qquad \cdot \frac{3}{2} \qquad \cdot \frac{3}{2}$

Result: $\qquad x = \frac{3}{2} \cdot 8 = \frac{24}{2} = 12$

Explanation: Since $\frac{3}{2}$ is the reciprocal of $\frac{2}{3}$, when we multiply them, we get 1, and $1 \cdot x = x$. Using this approach, we can avoid dividing by a fraction, which is more difficult.

Example 2

Solve: $\qquad -\frac{1}{4}x = -2$

Multiply by -4: $\qquad \cdot(-4) \quad \cdot(-4)$

Result: $\qquad x = (-2) \cdot (-4) = 8$

Explanation: -4 is the reciprocal of $-\frac{1}{4}$, so when we multiply them, we get 1. Notice the use of parentheses around the negative number to make it clear we are multiplying and not subtracting.

Another Approach to Parentheses

In the Reverse PEMDAS method, parentheses are handled after all other operations. Sometimes, it is easier to operate on the parentheses first. In this way, you may be able to re-state the problem in an easier form before solving it.

Example 3, at right, is another look at the problem in Example 2 on the previous page.

Use whichever approach you find most to your liking. They are both correct.

Example 3

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

Step 1: Eliminate parentheses

Result: $\qquad 4x + 10 - 3 = -5$

Step 2: Combine constants

Result: $\qquad 4x + 7 = -5$

Step 3: Subtract 7 $\qquad -7 \qquad -7$

Result: $\qquad 4x = -12$

Step 4: Divide by 4 $\qquad \div 4 \qquad \div 4$

Result: $\qquad x = -3$