

# Study Guide

## Equations Order of Operations 03/01/2012

### Equations: Order of Operations

An equation is a statement in which two numbers or two expressions are set equal to each other. For example,  $5 + 3 = 8$  and  $16 = 3c + 4$  are equations.

When solving equations, find the value of the variable by getting the variable alone on one side of the equal sign. To do this, undo any operations on the variable by using the inverse operation. Any operation done on one side of the equal sign must be done on the other side of the equal sign in order to keep the statement true.

If a number has been added to the variable, subtract the number from both sides of the equation.

$$\begin{array}{r} m + 3 = 5 \\ - 3 \quad - 3 \\ \hline m = 2 \end{array}$$

If a number has been subtracted from the variable, add the number to both sides of the equation.

$$\begin{array}{r} b - 7 = 9 \\ + 7 \quad + 7 \\ \hline b = 16 \end{array}$$

If a variable has been multiplied by a nonzero number, divide both sides by the number.

$$\begin{array}{l} 6c = 12 \\ \frac{6c}{6} = \frac{12}{6} \\ c = 2 \end{array}$$

If a variable has been divided by a number, multiply both sides by the number.

$$\begin{array}{l} \frac{c}{2} = 6 \\ \frac{c}{2} \times 2 = 6 \times 2 \\ c = 12 \end{array}$$

When solving 2-step equations, we must first undo the addition or subtraction using the inverse operation, then undo the multiplication or division:

$$\begin{array}{l} 2n - 6 = 8 \\ 2n - 6 = 8 \\ + 6 \quad + 6 \\ \hline \frac{2n}{2} = \frac{14}{2} \\ n = 7 \end{array}$$

**Example 1:** Solve the equation for t.

$$5(t - 4) = t + 12$$

$$\begin{array}{l} 5(t - 4) = t + 12 \\ 5t - 20 = t + 12 \end{array}$$

Step 1: Multiply 5 times the terms inside the parenthesis.

$$\begin{array}{l} 5t - 20 = t + 12 \\ + 20 \quad + 20 \\ \hline 5t = t + 32 \end{array}$$

Step 2: Add 20 to both sides of the equation

$$\begin{array}{r} 5t = t + 32 \\ -t \quad -t \\ \hline 4t = 32 \end{array}$$

Step 3: Subtract t from both sides of the equation

$$\begin{array}{r} \frac{4t}{4} = \frac{32}{4} \\ t = 8 \end{array}$$

Step 4: Divide both sides of the equation by 4.

Answer:  $t = 8$

**Example 2:** Evaluate the expression for  $c = 3$ :

$$2(c + 4) + 2(15)$$

$$(1) 2(3 + 4) + 2(15)$$

$$(2) 2(7) + 2(15)$$

$$(3) 14 + 30$$

$$(4) 44$$

Step 1: Substitute 3 in place of 'c' in the expression.

Step 2: Add the numbers in parentheses.

Step 3: Rewrite the equation after performing all multiplications in order from left to right.

Step 4: Add 14 and 30 to get 44.

Answer: 44