Lesson 1-3: The Distributive Property (of multiplication over addition)

When multiplying a factor and the sum of two or more addends, the factor can be distributed to each of the addends.

$2(x + 4) \rightarrow 2x + 2(4) \rightarrow 2x + 8$

Factor Addends

Your Turn: Use the distributive property to simplify the expression

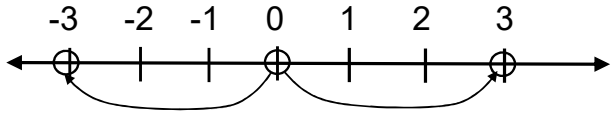
$4(x + 5)$

$-3(x - 4)$

$5(3x - 2)$

Negative Number

A number that is the same distance from zero on the number line as the positive number, but is on the opposite side of zero.



3 And -3 are the same distance from zero.

-3 is the "opposite" of 3

Multiplication by (-1) will change any number to its "opposite" (sign)

$-1(3) =$ ___ $-2(-3)(-4) =$ ___ $-1(x + 3) =$ _____

$-1(-2) =$ ___ $-5 = (-1)*$___ $-(x - 4) =$ _____

Order of Operations!!

$5 + 2(x + 4) \rightarrow$ _____

$\rightarrow 5 + 2x + 8$

$\rightarrow 2x + 13$

$2x - 3(x - 1) \rightarrow$ _____

$\rightarrow 2x - 3x + 3$

$\rightarrow -x + 3$

$3 - 2(x + 5) \rightarrow$ _____

$\rightarrow 3 - 2x - 10$

$\rightarrow -2x - 7$

$4 - 3x - (-5x - 2) \rightarrow$ _____

$\rightarrow 4 - 3x + 5x + 2$

$\rightarrow 2x + 6$

Solving Equations using the Distributive Property

$3(5x - 6) = 12$

Can we use the addition property of equality to add '6' (left/right)?

$3(5x - 6) = 12$

$+6 \quad +6$

$3(5x) = 18$

Why not?

PEMDAS: you must multiply (to remove the parentheses) before you can subtract from the parentheses.

$\rightarrow 15x - 18 = 12$

$+18 \quad +18$

$15x = 30$

$\div 15 \quad \div 15$

$x = 2$

Your turn: Solve the following equations

(Get rid of parentheses 1st using the distributive property.)

$$4(5-4m)=-12$$

$$-6(-6+4x)=12$$

Another example

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

$$\rightarrow 3x-6=4(-x+1)$$

$$\rightarrow 3x-6=-4x+4$$

$+4x \quad +4x$

$$7x-6=4$$

$+6 \quad +6$

$$7x=10$$

$$7x=10$$

$\div 7 \quad \div 7$

$$x=\frac{10}{7}$$

Your Turn: Solve using the Distributive Property

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

$$-5(x+2)=(2x-7)$$

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

Your turn: Solve the following equations

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

$$2(2x+4)=5-(2x-5)$$

$$3x-(2x-3)=5(2x-3)-3x$$

Checking the solution of a multi-variable equation

$$3x+4y+2z=12$$

x = 0
y = 2
z = 2

$3(0)+4(2)+2(2)=12$

There are infinitely many combinations.

x = 4
y = 0
z = 0

$3(4)+4(0)+2(0)=12$

x = 2
y = 1
z = 2

$3(2)+4(1)+2(2)\neq 12$

Solving a multi-variable equation

$$3x+4y+2z=12$$

Could you find the value of 'x' if I gave you the values of 'y' and 'z' ?

x = ___
y = 1
z = 2

$$3x+4y+2z=12$$
$$3x+4(\ )+2(\ )=12$$
$$3x+4(1)+2(2)=12$$
$$3x+4+4=12$$
$$3x+8=12$$
$$3x=4$$
$$x=\frac{3}{4}$$

Your Turn: Solve for x

y = 2, z = 1, x = ___ $x=2y+3z$

x = 1, y = 3, z = ___ $3x-2y+3z=6$

Vocabulary

Solve the single unknown equation: Use properties of equality to rewrite the equation as an equivalent equation with the unknown value on one side of the equal sign and a number on the other side.

Solve for a variable (more then one variable in the equation): Use properties of equality to rewrite the equation as an equivalent equation with the specified variable on one side of the equal sign and all other terms on the other side.

Solve for "x"

$x + 1 = 5$

$-1 \quad -1$

$x = 4$

Solve a single unknown equation: Use properties of equality to rewrite the equation as an equivalent equation with the unknown value on one side of the equal sign and a number on the other side.

Solve for 'x'

$4 + 2x + 4y = 6$

$-4 \qquad -4$

$2x + 4y = 2$

$-4y \quad -4y$

$2x = 2 - 4y$

$\div 2 \quad \div 2$

$x = \frac{2-4y}{2}$

$x = \frac{2}{2} - \frac{4y}{2}$

$x = 1 - 2y$

Solve for the specified variable: Use properties of equality to rewrite the equation as an equivalent equation with the specified variable on one side of the equal sign and all other terms on the other side.

Another way to Solve for 'x'

$4 + 2x + 4y = 6$

$\div 2 \quad \div 2$

$2 + x + 2y = 3$

$-2y \quad -2y$

$2 + x = 3 - 2y$

$-2 \quad -2$

$x = 1 - 2y$

'2' is a common factor of each term

Solve for the variable: Use properties of equality to rewrite the equation as an equivalent equation with the specified variable on one side of the equal sign and all other terms on the other side.

Solve for "x"

$yx - 2 = 4$

$+2 \quad +2$

$yx = 6$

$\div y \quad \div y$

$x = \frac{6}{y}$

Your turn: Solve for 'k'

$2k - 3m = 5$

$\frac{7k - 3y}{2} = 4x$

$4m - 3ky = 7$