Math: Pre-Algebra Session #3

A variable is a letter used to represent an unknown number.
We use letters like x, y, a, b, r, n… to represent a quantity we want to find.

Example: x – 3 = 0
Do you notice how x = 3 in order for the above statement to be true?

The sum of a number and ten.	**She made three times more cookies this time.**
Today is ten degrees warmer than yesterday.	**Three plus twice a number.**
Twice the difference of a number and four.	**I had a hundred dollars, so I bought seven pizzas.**

Evaluate an expression: substitute the value in for the variable.

Evaluate the expression $2x + 3$ when $x = 4$.
(This means we should substitute 4 for x in the expression.)

$2(4) + 3 = 8 + 3 = 11$

Evaluate an expression: substitute the value in for each variable.
If there's more than one variable, be careful to substitute the right one!

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

x	y	5x - 2y
-3	1	5(-3) – 2(1) = -17

Distributive Property

Distributive Property

$$a \cdot (b + c) = a \cdot b + a \cdot c$$

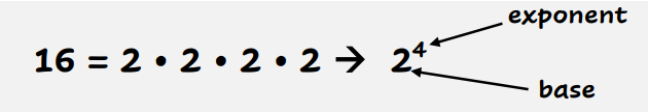
OR

$$(b + c) \cdot a = b \cdot a + c \cdot a$$

where a, b, and c are integers

The distributive property tells us that distributing the multiplier (a) to each addend (b & c) produces the same result as adding the addends first and then multiplying by the multiplier.

Exponents are a math tool used to represent repeated multiplication.



The exponent of 4 means to multiply the base 2 together 4 times.

Exponents work with variables also!

$$2y^3(x+1)^6 = 2yyy(x+1)(x+1)(x+1)(x+1)(x+1)(x+1)$$

Simplify the expressions:

Combine LIKE terms (same variable *and* same exponent) only!

$4x^2 + 3x^2 + 3x = 7x^2 + 3x$

$5x^2 + 12x - 4x = 5x^2 + 8x$

Calculator Power:

Example: Calculate 2^5

1. **Enter the base: 2**
2. **Now use the "exp" or "^" button**
3. **Enter the exponent: 5 (Did you get 32?)**

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A variable is a letter used to represent an unknown number.
We use letters like x, y, a, b, r, n... to represent a quantity we want to find.

Example: x – 3 = 0
Do you notice how x = 3 in order for the above statement to be true?

~~Let's simply the following expressions:~~

Get it to zero:

$3 + x = 0 \quad x = -3$

$4 + x = 0 \quad x = -4$

$-4 + x = 0 \quad x = 4$

$3x = 0 \quad x = 0$

$4x = 0 \quad x = 0$

Get it to 1:

$3x = 1 \quad x = \frac{1}{3}$

$4x = 1 \quad x = \frac{1}{4}$

$8x = 1 \quad x = \frac{1}{8}$

$\frac{x}{5} = 1 \quad x = 5$

$\frac{1}{9}x = 1 \quad x = 9$

The sum of a number and ten. $x + 10$	**She made three times more cookies this time.** $3x$
Today is ten degrees warmer than yesterday. $x + 10$	**Three plus twice a number.** $3 + 2x$
Twice the difference of a number and four. $2(x - 4)$	**I had a hundred dollars, so I bought seven pizzas.** $100 - 7p$

Evaluate an expression: substitute the value in for the variable.

Evaluate the expression $2x + 3$ when $x = 4$.
(This means we should substitute 4 for x in the expression.)

$2(4) + 3 = 8 + 3 = 11$

$3(x-2)$ $\quad x = 5 \quad$ $3(\underbrace{5-2}_{3}) = 9$

$4x+7$ $\quad x = 1 \quad$ $4(1) + 7 = 11$

$10y - 2$ $\quad y = \frac{1}{2} \quad$ $\underbrace{10(\frac{1}{2})}_{5} - 2 = 3$

$6 + 3x$ $\quad x = 11 \quad$ $6 + \underbrace{3(11)}_{33} = 39$

$-2(x-2)$ $\quad x = 9 \quad$ $-2(\underbrace{9-2}_{7}) = -14$

Evaluate an expression: substitute the value in for each variable.
If there's more than one variable, be careful to substitute the right one!

	x	y	2x + 3y
①	-2	1	2(-2) + 3(1) = -1

	x	y	5x - 2y
②	-3	1	5(-3) - 2(1) = -17

① $x = 0$
$y = -1$

$2x + 3y \rightarrow 2(0) + 3(-1) = \underline{-3}$

① $x = -3, \quad y = 2$

$2x + 3y \rightarrow \underbrace{2(-3)}_{-6} + \underbrace{3(2)}_{6} = \underline{0}$

② $5x - 2y \quad x = 1 \quad y = -2$

$5(1) - \underbrace{2(-2)}_{+4} = \underline{9}$

② $5x - 2y \quad x = -3 \quad y = -7$

$5(-3) - 2(-7) = -15 + 14 = \underline{-1}$

Distributive Property

Distributive Property

$a \cdot (b + c) = a \cdot b + a \cdot c$

OR

$(b + c) \cdot a = b \cdot a + c \cdot a$

where a, b, and c are integers

The distributive property tells us that distributing the multiplier (a) to each addend (b & c) produces the same result as adding the addends first and then multiplying by the multiplier.

$3(-7+2) = 3(-5) = -15$

$12(6 + -7) = 12(-1) = -12$

$4(x+3) = 4x+12$

$-12(x-7) = -12x+84$

$-3(x-2) = -3x+6$

$-2(x+7) = -2x-14$

Exponents are a math tool used to represent repeated multiplication.

$16 = 2 \cdot 2 \cdot 2 \cdot 2 \rightarrow 2^4$ (4: exponent, 2: base)

The exponent of 4 means to multiply the base 2 together 4 times.

$5^2 = 5 \times 5 = 25$

$5^3 = 5 \times 5 \times 5 = 125$

$5^4 = 5 \times 5 \times 5 \times 5 = 625$

$5^7 \Rightarrow$ Calculator $\Rightarrow 78,125$

$x^2 = x \cdot x$

$x^3 = x \cdot x \cdot x$

$x^2 x^3 = (x \cdot x)(x \cdot x \cdot x) = x^5$

add exponents

$(x^2)^3 = (x \cdot x)(x \cdot x)(x \cdot x) = x^6$

multiply exponents

Exponents work with variables also!

$2y^3(x+1)^6 = 2yyy(x+1)(x+1)(x+1)(x+1)(x+1)(x+1)$

$x \cdot y \cdot 2x \cdot y \cdot y = 2x^2y^3$

$x \cdot x \cdot y \cdot 4x^2 = 4x^4y$

$(3x^2)^3 = (3x^2)(3x^2)(3x^2)$

$= 27x^6$

$(-6xy^2)^2 = (-6xy^2)(-6xy^2)$

$= +36x^2y^4$

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

$= -8x^3(3x)$

$= -24x^4$

Simplify the expressions:

Combine LIKE terms (same variable *and* same exponent) only!

$4x^2 + 3x^2 + 3x = 7x^2 + 3x$ **$5x^2 + 12x - 4x = 5x^2 + 8x$**

$2x + 4x - x = \boxed{5x}$

$x^4 + 3x \Rightarrow \boxed{x^4 + 3x}$ (already simplified!)

$7x^2 - x + 3x^2 - 1$

$= \boxed{4x^2 - x - 1}$

$4x^2 - 2x + 1 - x^2 + 3x + 5$

$= \boxed{3x^2 + x + 6}$

$5(4x^2 + 3x^2) + 3x$

$20x^2 + 15x^2 + 3x$

$\boxed{35x^2 + 3x}$ ← same!

OR

$5(\underbrace{4x^2 + 3x^2}_{7x^2}) + 3x$

$5(7x^2) + 3x = \boxed{35x^2 + 3x}$

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$$9x^5 + 3x^5 + 2x - 1$$

$$= \boxed{12x^5 + 2x - 1}$$

$$-9x^5 + 3x^5 + 3x - 6 + 2x$$

$$-6x^5 \quad + 5x \quad - 6$$

$$= \boxed{-6x^5 + 5x - 6}$$

$$-y + -6xy + 2y + 3x$$

$$= \boxed{y - 6xy + 3x}$$

$$y^2 - -y^2 + 6x^2$$

$$= \boxed{2y^2 + 6x^2}$$

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$5(5x) - 4(3x) = 25x - 12x = \underline{13x}$

$5 - (x + 2x) = 5 - (3x) = \underline{5 - 3x}$

$5 - (x^2 + 2x) = \underline{5 - x^2 - 2x}$

$7(\underbrace{-y + 8y}_{7y}) = 7(7y) = \underline{49y}$

Calculator Power:

Example: Calculate 2^5

1. Enter the base: 2
2. Now use the "exp" or "^" button
3. Enter the exponent: 5 (Did you get 32?)

$2^3 = 8$	$2^8 = 256$	$3^6 = 729$
$7^4 = 2401$	$2^0 = 1$	$3^9 = 19,683$
$10^6 = 1,000,000$	$4^5 = 1024$	$6^5 = 7,776$