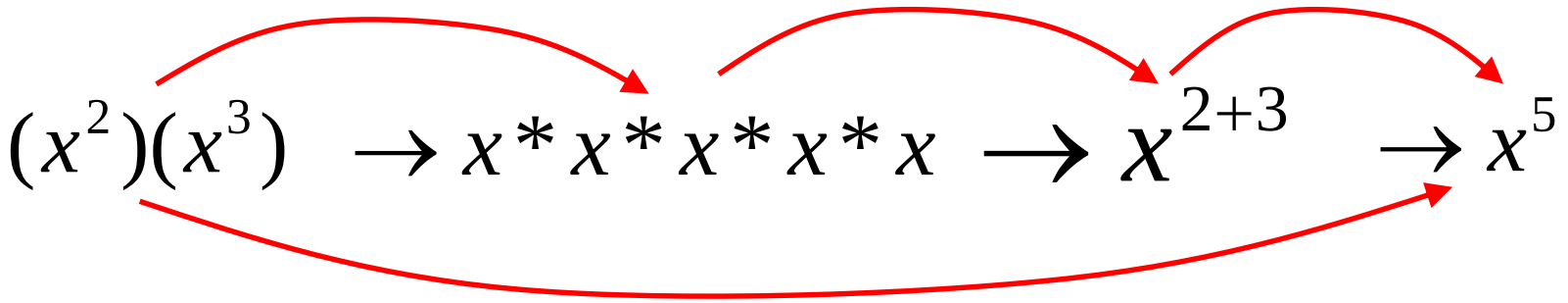
Math-2A

Lesson 2-5: Powers (part 2)

1) Multiply Powers Property of Exponents: when you multiply "same based powers" you just add the exponents.

Properties are "short-cuts" that give you an equivalent expression (or equation)



Simplify

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

You can re-arrange the order of multiplication (Commutative Property)

$\rightarrow 3*4*x^2*x^3$

$\rightarrow 12x^5$

Coefficients of the powers are handled separately from the base and the exponent.

$-2x^3(3x^5) \rightarrow -2*3*x^3*x^5 \rightarrow -6x^8$

$-m^2(-4m^6)(5m^3) \rightarrow -1*(-4)*5*m^2*m^6*m^3$

$\rightarrow 20m^{11}$

Simplify

$$(5x^2)(2x^3) \rightarrow 10x^5$$

$$2x^3 * \frac{1}{2}x^2 \rightarrow x^5$$

Exponent of a Power Property of Exponents $(x^2)^3$

What is the "base" for the exponent 3? (x^2)

How many times is x^2 used as a factor?

$$(x^2)^3 \rightarrow x^2 * x^2 * x^2 \rightarrow x*x*x*x*x*x$$

$(x^2)^3 =$ **'x' used as a factor six times** $= x^6$

$$(x^2)^3 = x^{2*3} = x^6$$

When you raise a power to another power
("power of a power")
you multiply the exponents.

Exponent of a Product Property of Exponents $(xy)^2$

What is the "base" for the exponent 2?

Base '(xy)' used as a factor 2 times

$\rightarrow (xy)(xy) \quad \rightarrow x*y*x*y \quad \rightarrow x*x*y*y$

$\rightarrow x^2y^2 \qquad (xy)^m = x^m y^m$

This makes it seem like you can "distribute" in the exponent. This only works with the power of a product!!

$$(x-y)^2 \neq x^2 - y^2$$

You must use the distribute property (twice) for a suml!!

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

$$\rightarrow x^2 - 2xy + y^2$$

Simplify

$$(3x^3y^4)^2 \quad \rightarrow (3^1x^3y^4)^2$$

Constants (integer, etc.) have an exponent of ‘1’.

$$\rightarrow 3^2x^6y^8$$

$$(3^a x^b y^c)^m = 3^{am}x^{bm}y^{cm}$$

What is the difference between?

$(x)^4 \; and \; \mathrm{x}^4$

$(x^2)^3 \text{ and } (x^3)^2$

$x^4 x^3 \text{ and } x^3 x^4$

$(x+1)^2 \text{ and } (x+1)(x+1)$

Simplify

$(x^2)^5 \rightarrow x^{10}$

$5(x)^3 x^4 \rightarrow 5x^7$

$3(2y^5)^3 \rightarrow 3^1 * 2^3 * y^{15} \rightarrow 24y^{15}$

Watch the negatives! $(-x^3y^4)^2$

$= ((-1)^1 x^3 y^4)^2$ Turn negative signs into multiplication by -1.

$= (-1)^2 x^6 y^8$ This way you will be able to tell if the simplified version is positive or negative.

$= x^6 y^8$

$(-2x^2y^6)^3$ Negative coefficients have an exponent of '1'.

$= ((-2)^1 x^2 y^6)^3$

$= (-2)^3 x^6 y^{18}$

$= -8x^6 y^{18}$

A negative number raised to an odd exponent remains negative.

Simplify

$(-3x^2)^3 \rightarrow -27x^6$

$(-wx^3)^5 \rightarrow -w^5x^{15}$

$(-2x^3)^4 \rightarrow 16x^{12}$

$(-2x^2y^4z)^3 \rightarrow -8x^6y^{12}z^3$

$2(-m^4x^3)^5 \rightarrow -2w^{20}x^{15}$

$-3(-2x^2yz^3)^4 \rightarrow -48x^{12}$