TOPIC: RULES OF EXPONENTS

EXPONENT RULES			
Name	Example	Rule	Description
Base 1	1^4 = _____ = _____	$1^n = 1$	1 to *any* power equals _____
Neg to Even Power	$(-3)^2$ = _____ = _____ $(-3)^4$ = _____ = _____	$(-a)^{even} = a^{even}$	**[CANCEL | KEEP]** negative sign
Neg to Odd Power	$(-2)^3$ = _____ = _____	$(-a)^{odd} = -a^{odd}$	**[CANCEL | KEEP]** negative sign
Product Rule	$4^2 \times 4^1$ = $= 4^{\_\_} = 4^{\_\_\_\_}$ $y^{30} \times y^{70}$ $= y^{\_\_} = y^{\_\_\_\_}$	$a^m \times a^n = a^{m+n}$	*Multiply* terms w/ ***same base*** ⇒ **[ADD | SUBTRACT]** exponents
Quotient Rule	$\frac{4^3}{4^1}$ = $= 4^{\_\_} = 4^{\_\_\_\_}$	$\frac{a^m}{a^n} = a^{m-n}$	*Divide* terms w/ ***same base*** ⇒ **[ADD | SUBTRACT]** exponents ALWAYS _____ – _____
Zero Exp. Rule	$\frac{2^4}{2^4}$	$a^0 = 1$	*ANYTHING* (except 0) raised to ____ exponent = ____
Neg. Exp. Rule	$\frac{2^2}{2^5}$	$a^{-n} = \frac{1}{a^n}$ $\frac{1}{a^{-n}} = a^n$	Neg exp in ***top*** ⇒ flip to **[BOTTOM | TOP]** with pos exp Neg exp in ***bottom*** ⇒ flip to **[BOTTOM | TOP]** with pos exp
Power Rule	$(4^3)^2$ ( )( )	$(a^m)^n = a^{m \cdot n}$	*Power* to another power ⇒ _____ exponents
Power of a Product	$(3 \cdot 4)^2$	$(a \cdot b)^m = a^m \cdot b^m$	***Distribute*** exponent to each _____ in parentheses
Power of a Quotient	$\left(\frac{12}{4}\right)^2$	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$	***Distribute*** exponent to

Note: This table will span multiple videos.

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- When you can't combine "like terms", you'll need new rules to simplify/manipulate exponents in expressions.

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

$$\frac{(-2)^3(x^4y^2)}{-8yx^3}$$

Here are some rules to help!

EXAMPLE: Simplify the expressions using the exponent rules above.

$(\boldsymbol{A})$ $\dfrac{(-5)^9}{(-5)^6}$

$(\boldsymbol{B})$ $\dfrac{(2x^4)(7x^2)}{x^5}$

$(\boldsymbol{C})$ $(6x^3y^2)(4x^2y^5)$

PRACTICE: Simplify the expression using exponent rules.

$(-5a^2)(3a^8)$

PRACTICE: Simplify the expression using exponent rules.

$$\frac{-12b^{11}}{4b^7}$$

TOPIC: RULES OF EXPONENTS
ZERO & NEGATIVE EXPONENTS

- In some problems, using the Quotient Rule results in zero or negative exponents.

EXAMPLE: Simplify the expressions using the rules above.

$(\boldsymbol{A})$ $(xy)^{-3}$

$(\boldsymbol{B})$ xy^{-3}

$(\boldsymbol{C})$ $\dfrac{9^0}{9^{-4}}$

POWER RULES

- When you see powers (exponents) or products _____ other powers, use the **Power Rules.**

EXAMPLE: Simplify the exponential expressions using the power rules.

$(\boldsymbol{A})$ $(m^{-2})^{-5}$

$(\boldsymbol{B})$ $(xy^3)^4$

$(\boldsymbol{C})$ $\left(\dfrac{5}{x}\right)^{-3}$

PRACTICE: Rewrite the expression using exponent rules.

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

PRACTICE: Rewrite the expression using exponent rules.

$$\left(\frac{3x^4}{y^{-2}}\right)^3$$

TOPIC: RULES OF EXPONENTS
SIMPLIFYING EXPRESSIONS WITH EXPONENTS

- You'll often have to use multiple exponent rules to fully simplify expressions. Use this checklist!
  - There's no "correct" order in using rules but *usually* it's easiest to simplify from inner-most expression outward.

EXAMPLE: Simplify the expressions.

(A) $(3x^{-5})^2 \cdot (-2x^4)^3$

(B) $\left(\frac{x^2y^7}{x^5y^4}\right)^{-1}$

Expressions are ***fully simplified*** when:	Name	Rule
✓ No powers raised to other powers	Power Rules	$(a^m)^n = a^{m \cdot n}$
		$(a \cdot b)^m = a^m \cdot b^m$
✓ No parentheses		$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$
✓ No same bases multiplied or divided (e.g. $x^2 \cdot x^4$, $\frac{y^7}{y^4}$)	Product & Quotient Rules	$a^m \times a^n = a^{m+n}$
		$\frac{a^m}{a^n} = a^{m-n}$
✓ No zero exponents	Zero Exp. Rule	$a^0 = 1$
✓ No negative exponents	Negative Exp. Rule	$a^{-n} = \frac{1}{a^n}$
✓ All numbers with exponents evaluated	Base 1	$1^n = 1$
	Neg to Even Power	$(-a)^{even} = a^{even}$
	Neg to Odd Power	$(-a)^{odd} = -a^{odd}$
✓ All operations $(\times, \div, +, -)$ performed		