



Study Prep
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TOPIC: RULES OF EXPONENTS**EXPONENT RULES**

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

Note: This table will span multiple videos.

TOPIC: RULES OF EXPONENTS

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

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

Here are some rules to help!

EXAMPLE: Simplify the expressions using the exponent rules above.

(A)

$$\frac{(-5)^9}{(-5)^6}$$

(B)

$$\frac{(2x^4)(7x^2)}{x^5}$$

(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.

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

(B) xy^{-3}

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

POWER RULES

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

EXAMPLE: Simplify the exponential expressions using the power rules.

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

(B) $(xy^3)^4$

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

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 <u>powers</u> raised to other <u>powers</u>	Power Rules	$(a^m)^n = a^{m \cdot n}$
		$(a \cdot b)^m = a^m \cdot b^m$
✓ No <u>parentheses</u>		$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$
✓ No <u>same bases</u> 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 <u>zero</u> exponents	Zero Exp. Rule	$a^0 = 1$
✓ No <u>negative</u> exponents	Negative Exp. Rule	$a^{-n} = \frac{1}{a^n}$
✓ All numbers with exponents <u>evaluated</u>	Base 1	$1^n = 1$
	Neg to Even Power	$(-a)^{\text{even}} = a^{\text{even}}$
	Neg to Odd Power	$(-a)^{\text{odd}} = -a^{\text{odd}}$
✓ All operations ($\times, \div, +, -$) performed		