
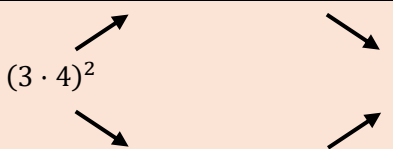
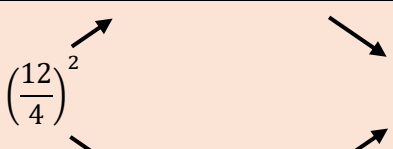



## TOPIC: RULES OF EXPONENTS

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	$(-3)^2 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $(-3)^4 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$	$(-a)^{\text{even}} = a^{\text{even}}$	<b>[CANCEL   KEEP]</b> negative sign
Neg to Odd Power	$(-2)^3 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$	$(-a)^{\text{odd}} = -a^{\text{odd}}$	<b>[CANCEL   KEEP]</b> 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/ <b>same base</b> $\Rightarrow$ <b>[ADD   SUBTRACT]</b> 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/ <b>same base</b> $\Rightarrow$ <b>[ADD   SUBTRACT]</b> 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 <b>top</b> $\Rightarrow$ flip to <b>[BOTTOM   TOP]</b> with pos exp Neg exp in <b>bottom</b> $\Rightarrow$ flip to <b>[BOTTOM   TOP]</b> 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 <b>each</b> $\underline{\hspace{2cm}}$ 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.

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

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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.

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

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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 <b>fully simplified</b> 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 <b>Even</b> Power	$(-a)^{\text{even}} = a^{\text{even}}$
	Neg to <b>Odd</b> Power	$(-a)^{\text{odd}} = -a^{\text{odd}}$
✓ All operations ( $\times, \div, +, -$ ) performed		