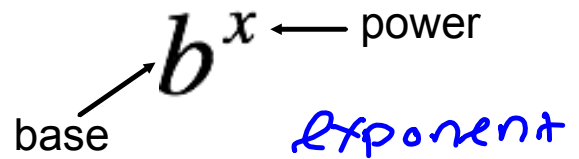


Unit 6: Exponential Functions

6-1: Exponent Rules

Objectives: I can simplify exponents

Vocab:



- Base

big #, what you multiply

- Power

how many times
multiply it

- Exponent

$$2^3 = 2 \cdot 2 \cdot 2$$

Like-terms review

Group the like terms and then

combine

x^3 (blue circle), x (green triangle), $-5x$ (green triangle), $-x^2$ (red square)
 $2x^3$ (blue circle), x^2 (red square), $-6x^3$ (blue circle), $3x$ (green triangle), $7x^2$ (red square)

- Same exponent
- Same variable

$$\text{Blue circle} = 1x^3 + 2x^3 - 6x^3 = -3x^3$$

$$\text{Red square} = -x^2 + x^2 + 7x^2 = 7x^2$$

$$\text{Green triangle} = x - 5x + 3x = -1x$$

What's the difference between:

$$1x + 1x + 1x = 3x$$

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

$$2x + 2x + 2x = 6x$$

$$2x \cdot 2x \cdot 2x = \begin{array}{l} 2x^3 \\ 6x^3 \\ \cancel{8x^3} \end{array} \quad 8x^3$$

\swarrow
 $4 \cdot 2$

Practice Expanding and Simplifying:

$$x^4 = x \cdot x \cdot x \cdot x$$

$$x^2 = x \cdot x$$

$$2^4 = 2 \cdot 2 \cdot 2 \cdot 2$$

$$y^5 = y \cdot y \cdot y \cdot y \cdot y$$

$$(2a)^3 = 2a \cdot 2a \cdot 2a$$

$$(jk)^5 = jk \cdot jk \cdot jk \cdot jk \cdot jk$$

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

$$x \cdot x \cdot x \cdot x \cdot x = x^5$$

$$5 \cdot 5 \cdot 5 \cdot 5 = 5^4$$

$$z \cdot z \cdot z \cdot z \cdot z \cdot z = z^6$$

$$(4y)(4y)(4y) = (4y)^3$$

$$(ab)(ab)(ab)(ab)(ab) = (ab)^5$$

MULTIPLY

Expression	Write it Out	Simplified
$x^2 \cdot x^3$	$x \cdot x \cdot x \cdot x \cdot x$	x^5
$y^5 \cdot y^2$	$y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y$	y^7
$a^4 \cdot a$	$a \cdot a \cdot a \cdot a \cdot a$	a^5
$3^4 \cdot 3^2$	$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$	$3^6 = 729$ <small>Use your calculator for the final answer</small>
$4^3 \cdot 4^3$	$4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$	$4^6 = 4096$ <small>Use your calculator for the final answer</small>

What's the pattern?

add exponents

Try simplifying without writing it out!

$$x^5 \cdot x^{12} = x^{17} \quad w^{14} \cdot w^{20} = w^{34} \quad 2^4 \cdot 2^5 = 2^9$$

Will this work for $x^2 \cdot y^3$? same base

Expression	Write it Out	Simplified
$(xy)^2$	$(xy) \cdot (xy) = (xx)(yy)$	$x^2 \cdot y^2$
$(ab)^4$	$a \cdot a \cdot a \cdot a \cdot b \cdot b \cdot b \cdot b$	$a^4 b^4$
$(xyz)^3$	$xxx yyy zzz$	$x^3 y^3 z^3$
$(2x)^4$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot x$	$2^4 x^4 = 16x^4$ <small>Use your calculator for the final answer</small>
$(3j)^3$	$3 \cdot 3 \cdot 3 \cdot j \cdot j \cdot j$	$3^3 j^3 = 27j^3$ <small>Use your calculator for the final answer</small>

What's the pattern?

dISTRIBUTE the exponent

Try simplifying without writing it out!

$$(pq)^{12} =$$

$$p^{12} q^{12}$$

$$(cde)^8 =$$

$$c^8 d^8 e^8$$

$$(4x)^3 =$$

$$4^3 x^3 = 64x^3$$

Expression	Write it Out	Simplified
$\left(\frac{x}{y}\right)^3$	$\left(\frac{x}{y}\right)\left(\frac{x}{y}\right)\left(\frac{x}{y}\right) = \frac{x \cdot x \cdot x}{y \cdot y \cdot y}$	$\frac{x^3}{y^3}$
$\left(\frac{a}{b}\right)^6$		
$\left(\frac{2}{x}\right)^4$	$\frac{2 \cdot 2 \cdot 2 \cdot 2}{x \cdot x \cdot x \cdot x}$	$\frac{2^4}{x^4} = \frac{16}{x^4}$ Use your calculator for the final answer
$\left(\frac{1}{3}\right)^4$		Use your calculator for the final answer
$*\left(\frac{2x}{y}\right)^2$		Use your calculator for the final answer

What's the pattern?

DISTRIBUTE TO DENOMINATOR

Try simplifying without writing it out!

$$\left(\frac{w}{z}\right)^9 = \frac{w^9}{z^9}$$

$$\left(\frac{a}{4}\right)^5 = \frac{a^5}{4^5}$$

$$\left(\frac{2}{3}\right)^4 = \frac{2^4}{3^4}$$

EVD-V-D

Expression	Write it Out	Simplified
$\frac{x^5}{x^2}$	$\frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x} = \frac{x \cdot x \cdot x}{1}$	x^3
$\frac{x^4}{x^6}$	$\frac{x \cdot x \cdot x \cdot x}{x \cdot x \cdot x \cdot x \cdot x \cdot x} = \frac{1}{x \cdot x}$	$\frac{1}{x^2}$
$\frac{y^6}{y^2}$	$y \cdot y \cdot y \cdot y \cdot y \cdot y$	y^4
$\frac{a^5}{a^3}$	$a \cdot a \cdot a \cdot a \cdot a$	$\frac{1}{a^2}$
$\frac{3^5}{3^3}$	$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$	$3^2 = 9$

Use your calculator for the final answer

What's the pattern $3 \cdot 3 \cdot 3$

SUBTRACT exponents, negative exponent go in bottom

Try simplifying without writing it out!

$$\frac{x^{20}}{x^{10}} = x^{10}$$

$$\frac{m^6}{m^{11}} = \frac{1}{m^5}$$

$$\frac{4^9}{4^7} = 4^2 = 16$$

Use your calculator to simplify each of the following:

$$5^0 = 1$$

$$0.25^0 = 1$$

$$100^0 = 1$$

$$\left(\frac{1}{17}\right)^0 = 1$$

$$123456789^0 = 1$$

What's the pattern?

power of 0 = 1

Try simplifying without using a calculator:

$$187^0 = 1$$

$$x^0 = 1$$

$$\left(\frac{x}{z}\right)^0 = 1$$

$$\left(\frac{\partial\Omega\beta}{\delta\sigma\xi}\right)^0 = 1$$

Simplify each of the following:

$$x \cdot x \cdot x \cdot x \cdot x =$$

$$x^4 \cdot x^9 =$$

$$(ab)^{14} =$$

$$\left(\frac{a}{2}\right)^4 =$$

$$\frac{k^{12}}{k^5} =$$

$$\left(\frac{1}{4}\right)^0 =$$