

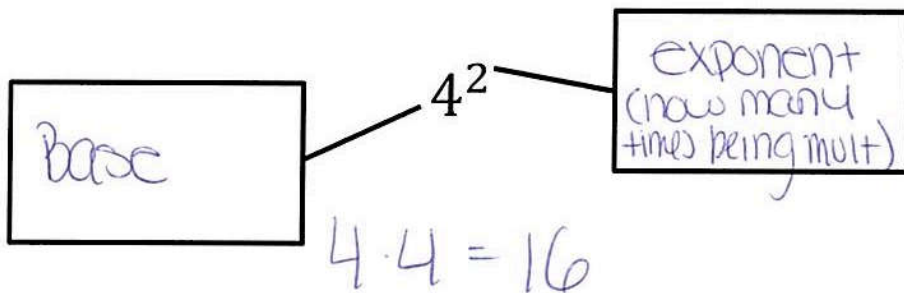
Day 1- Laws of Exponents

Do Now:

Solve the following exponents.

1. $2^3$ $2 \cdot 2 \cdot 2 = 8$	2. $5^2$ $5 \cdot 5 = 25$	3. $6^8$ 1679616	4. $15^0$ 1 Anything raised to the power of 0 is 1.
-------------------------------------	------------------------------	---------------------	---

Vocabulary: Base, exponent



Negative Exponents

Example:  $x^{-2} =$

When there is a negative exponent, the base and exponent go in the denominator of a fraction.

Practice:

1. $x^{-3}$ $\frac{1}{x^3}$	2. $4^{-2}$ $\frac{1}{4^2} = \frac{1}{16}$	3. $4x^{-4}$ $4 \frac{1}{x^4}$ or $\frac{4}{x^4}$	4. $(2x)^{-3}$ $\frac{1}{(2x)^3} = \frac{1}{2^3 x^3}$ $\left(\frac{1}{8x^3}\right)$
--------------------------------	---	--	---

\*\*\*All of the rules can ONLY be used if the exponentials have the SAME base.\*\*\*

### Multiplication Rule

$$x^4 * x^2$$

a. Expand the expression above.

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

b. Solve. Simplify.  
 $x^6$

c. Multiplication rule:

Keep the base, add the exponent

1. $2^3 \cdot 2^4$ $2^7$	2. $8^1 \cdot 8^3$ $8^4$	3. $t^4 \cdot t^4$ $t^8$
4. $x^5 \cdot x^9$ $x^{14}$	5. $y^{10}(y^2)$ $y^{12}$	6. $3^2(3^4)$ $3^6$

### Division Rule

$$\frac{x^{10}}{x^2}$$

a. Write the expression above in expanded form.

$$\frac{\cancel{x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x}}{\cancel{x \cdot x}}$$

b. Simplify the expression.

$$x^8$$

c. Division Rule:

Keep the base, subtract the exponents (top-bottom)

$$(3x^6)^3$$

c. Write the expression above in expanded form and simplify.

$$(3x^6)(3x^6)(3x^6)$$

$$27x^{18}$$

d. Power to Power Rule:

1. $(p^2)^5$ $p^{10}$	2. $(x^m)^2$ $x^{2m}$	3. $(10^2)^3$ $10^6$
4. $(5t^{10})^9$ $5^9 t^{90}$ $1953125 t^{90}$	5. $\left(\frac{a}{6}\right)^2$ $\frac{a^2}{6^2} = \frac{a^2}{36}$	6. $(2r^4)^2$ $2^2 r^8$ $4r^8$

1. $\frac{a^8}{a^3}$ $a^5$	2. $\frac{7^{11}}{7^8}$ $7^3$	3. $\frac{x^{10}}{x^4}$ $x^6$
4. $\frac{2^6}{2^{10}}$ $6-10=-4$ $2^{-4}$	5. $\frac{x^{15}}{x^{15}}$ $x^0=1$	6. $\frac{x^2}{x^1}$ $2-1=1$ $x$

### Power to Power Rule

$$(x^3)^2$$

a. Write the expression above in expanded form and simplify.

$$(x \cdot x \cdot x)(x \cdot x \cdot x)$$

b. Power to Power Rule:

$$x^6 \text{ multiply exponents}$$

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

a. Write the expression above in expanded form and simplify.

$$\frac{x}{y} \cdot \frac{x}{y} = \frac{x^2}{y^2}$$

b. Power to Power Rule:

multiply the exponent with each exponent inside.

1. $\frac{a^8}{a^3}$ $a^5$	2. $\frac{7^{11}}{7^8}$ $7^3$	3. $\frac{x^{10}}{x^4}$ $x^6$
4. $\frac{2^6}{2^{10}}$ $2^{-4} = \frac{1}{2^4}$	5. $\frac{x^{15}}{x^{15}}$ $x^0 = 1$	6. $\frac{x^2}{x^1}$ $x$

### Power to Power Rule

$$(x^3)^2$$

a. Write the expression above in expanded form.

$$(x \cdot x \cdot x)^2 = (x \cdot x \cdot x)(x \cdot x \cdot x)$$

b. Simplify the expression.

$$x^6$$

c. Power to Power Rule:

Keep the base, multiply the exponents

1. $(p^2)^5$ $p^{10}$	2. $(x^m)^2$ $x^{2m}$	3. $(10^2)^3$ $10^6$
4. $(t^{10})^9$ $t^{90}$	5. $\left(\frac{a}{6}\right)^2$ $\frac{a^2}{6^2} = \frac{a^2}{36}$	6. $(r^4)^2$ $r^8$