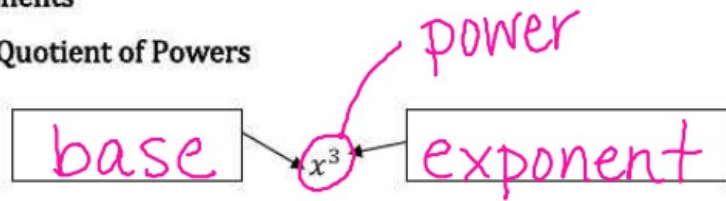


Algebra 1

Date: \_\_\_\_\_

Unit 8 - Laws of Exponents

Product of Powers & Quotient of Powers



What does  $x$  mean? a variable; represents a number

How many do I have in the example above?  $x \cdot x \cdot x$  3

What about  $x^2$ ? 2  $x^5$ ? 5

So what is another way to write  $x$  using exponents?  $x^1$

What does the exponent belong to?

Power	Exponent goes with	Factors
$2x^2$	<u><math>x</math></u>	<u><math>2 \cdot x \cdot x</math></u>
$-m^3$	<u><math>m</math></u>	<u><math>-1 \cdot m \cdot m \cdot m</math></u>
$h^4$	<u><math>h</math></u>	<u><math>h \cdot h \cdot h \cdot h</math></u>
$-3^2$	<u>3</u>	<u><math>-1 \cdot 3 \cdot 3</math></u>
$(-k)^4$	<u><math>(-k)</math></u>	<u><math>(-k)(-k)(-k)(-k)</math></u>

Write in factored form.

1)  $3x^4$ :  $3 \cdot x \cdot x \cdot x \cdot x$

2)  $-5y^2$ :  $-1 \cdot 5 \cdot y \cdot y$

3)  $-a^5$ :  $-1 \cdot a \cdot a \cdot a \cdot a \cdot a$

Write using exponents.

4)  $(-b)(-b)(-b)(-b)$ :  $(-b)^4$

5)  $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$ :  $3^7$

6)  $m \cdot m \cdot m \cdot m$ :  $m^4$

<b>Product of Powers</b>	When multiplying powers with like bases, <b>ADD</b> the exponents.	<b>Example</b> $x^4 \cdot x^3 = x^7$
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Write  $x^4$  in factored form:  $x \cdot x \cdot x \cdot x$

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

Write  $x^3$  in factored form:  $x \cdot x \cdot x$

How do you think you could write  $x^4 \cdot x^3$  using exponents?  $x^7$

Practice

$$2^2 \cdot 2^4 = \underline{2^{2+4} = 2^6 = 64}$$

$$(-7)^1 (-7)^3 = \underline{(-7)^{1+3} = (-7)^4 = 2401}$$

$$k^1 \cdot k^5 \cdot k^6 = \underline{k^{1+5+6} = k^{12}}$$

You try:

$$(-5)(-5)^6 = \underline{(-5)^7}$$

$$m^3 \cdot m^4 = \underline{m^7}$$

$$3^2 \cdot 3^4 = \underline{3^6}$$

$$y \cdot y^3 \cdot y^5 = \underline{y^9}$$

Practice

$$2n^5 \cdot n^2 = \underline{2n^{5+2} = 2n^7}$$

$$2b^3 \cdot 5b^3 = \underline{10b^{3+3} = 10b^6}$$

$$2x^3 \cdot y^2 = \underline{2x^3y^2}$$

$$(ab^3)(a^2b^2) = \underline{a^{1+2}b^{3+2} = a^3b^5}$$

You try:

$$10q^3 \cdot q^8 = \underline{10q^{11}}$$

$$9a^8 \cdot 4a^7 = \underline{36a^{15}}$$

$$3w \cdot 8w^3 = \underline{24w^4}$$

$$(2pq)(3pq^5) = \underline{6p^2q^6}$$

<b>Quotient of Powers</b>	When dividing powers with like bases, <b>SUBTRACT</b> the exponents.	<b>Example</b> $\frac{x^5}{x^3} = x^2$
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Write  $\frac{x^5}{x^3}$  in factored form:  $\frac{\cancel{x \cdot x \cdot x \cdot x \cdot x}}{\cancel{x \cdot x \cdot x}}$

Eliminate any factors that equal 1. (Remember  $\frac{x}{x} = 1$ )

Write the remaining factors in power/exponent form:  $x \cdot x = x^2$

### Practice

- Write each quotient in factored form.
- Eliminate any factors that equal 1.
- Write the remaining factors in power/exponent form.

$$\frac{3^4}{3^2} = 3^{4-2} = 3^2 \quad (9)$$

$$\frac{3 \cdot 3 \cdot 3 \cdot 3}{3 \cdot 3} = 3^2$$

$$\frac{8k^7}{12k^3} = \frac{1}{4} k^{7-3} = \frac{1}{4} k^4$$

$$\frac{\cancel{K \cdot K \cdot K \cdot K \cdot K \cdot K \cdot K}}{\cancel{K \cdot K \cdot K}} = \frac{K^4}{4}$$

$$\frac{a^4 b^3}{a^1 b^2} = a^{4-1} b^{3-2} = a^3 b^1 = a^3 b$$

### You try

$$\frac{x^6}{x^4} = \frac{x^{6-4}}{x^0} = x^2$$

$$\frac{4^6}{4^4} = 4^{6-4} = 4^2 = 16$$

$$\frac{c^7 d^4}{c^6 d^2} = c^{7-6} d^{4-2} = c^1 d^2 = cd^2$$