# PROPERTIES EXPONENTS

# Exponents

- An exponent tells how many times a number, the base, is used as a factor.
- Has two parts, a <u>base</u> and an <u>exponent</u>.



#### Download video from youtube

http://www.youtube.com/watch?v=dQ9A-o3dUIM

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### Properties of Exponents



Zero /One Exponent Rule



Product Rule



Quotient Rule



Power to Power Rule



Negative Exponent Rule



Fractional Exponent Rule



#### Zero Exponent Rule

#### One Exponent Rule

 Any base which has an exponent of zero is always..... Any base which has an exponent of one is always.....

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BASE

## Simplify:

Answers must only have positive exponents

1. 
$$x^0$$

2. 
$$(3a^4b^3)^1$$

3. 
$$(2x^3y^{-2})^0$$

#### Product Rule

To multiply when two bases are the same,
 write the base and ADD the exponents

$$x^a \cdot x^b = x^{a+b}$$

$$x^5 \cdot x^2 = x^{5+2} = x^7$$

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

# Simplify

4.  $x^2y^4 \cdot x^3y^6$ 

5.  $m^{-4}n^{-2} \cdot m^{-10}n^2$ 

6.  $2y^4x^{-2} \cdot -3x^6y$ 

#### Quotient Rule

 To divide when two bases are the same, write the base and <u>SUBTRACT</u> the exponents

$$x^a = x^{a-b}$$
 $x^b$ 

$$x^8 = x^{8-6} = x^2$$
  $2^3 = 2^{3-1} = 2^2$   
 $x^6$   $2^1$ 

Simplify 7.

7. 
$$\frac{m^{7}p^{9}}{m^{3}p^{2}}$$

8.  $\frac{h^4j^4k^9}{j^{-3}k^4}$ 

9.  $-12yx^2z^3$  $-3x^2y^3z^{-4}$ 

#### Power to Power Rule

 To raise a power to a power, write the base and <u>MULTIPLY</u> the exponents

$$(x^a)^b = x^{a \cdot b}$$

$$(x^4)^3 = x^{4 \cdot 3} = x^{12}$$

$$(7^7)^4 = x^{7^4} = x^{28}$$

# Simplify:

10.  $(u^2)^3$ 

11.  $(p^5r^3)^2$ 

12.  $(4y^4x^{-2})^3$ 

#### Negative Exponent Rule

 If a factor in the numerator or denominator is moved across the fraction bar, the <u>sign of the</u> <u>exponent is changed.</u>

$$x^{-6} = 1$$
 OR  $\frac{1}{x^{-6}} = x^{0}$   
 $x^{-8} = 1$   $2^{-3} = 1$   
 $x^{-8} = x^{-6}$ 

3.

## Simplify:

Answers must only have positive exponents

13. 
$$x^0y^{-2} \cdot -x^3y^{-3}$$

14. 
$$(3a^4b^3)^{-3}$$

15. 
$$(2x^3y^{-2})^4$$

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#### Fractional Exponent Rule

$$X^{1/2} = \sqrt{X}$$

$$X^{1/2} = \sqrt{X}$$
  $X^{1/3} = \sqrt[3]{X}$ 

$$100^{1/2} = \sqrt{100} = 10$$
  $8^{1/3} = \sqrt[3]{8} = 2$ 

$$8^{1/3} = \sqrt[3]{8} = 2$$

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# Simplify:

16.  $(81)^{1/2}$ 

17.  $(27)^{1/3}$ 

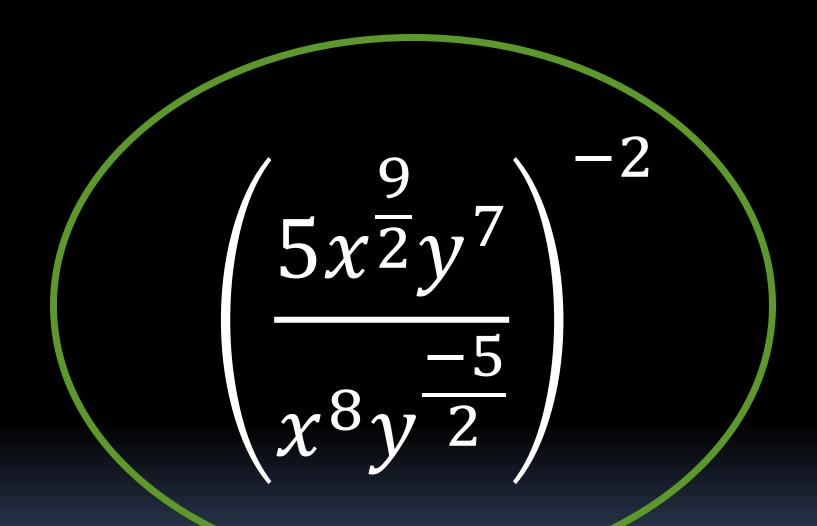
18.  $(x^2)^{1/2}$ 

Answers must only have positive exponents Simplify:

19.  $2x^4y^{-2} \cdot 4yx^2$ 

20.  $-a^{-1}b^2 \cdot 2ab^{-3}$ 

21.  $2x^{-2}y^{-3} \cdot -2y^{-4}$ 



# THE END

