PROPERTIES OF 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>.

Exponent

$$x^3 = x \cdot x \cdot x \qquad\qquad 5^3 = 5 \cdot 5 \cdot 5$$

Base

Download video from youtube

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

Download video from youtube

http://www.youtube.com/watch?v=QIZTruxt2rQ

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 **<u>zero</u>** is always…..

- Any base which has an exponent of one is always…..

1   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

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

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

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

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

$$\frac{\underline{x}^a}{x^b} = x^{a-b}$$

$$\frac{\underline{x}^8}{x^6} = x^{8-6} = x^2 \qquad \frac{\underline{2}^3}{2^1} = 2^{3-1} = 2^2$$

Simplify

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

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

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

Power to Power Rule

- To raise a power to a power , write the base and **MULTIPLY** the exponents

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

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

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

Simplify:

10. $(u^2)^3$

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

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

HOME

Negative Exponent Rule

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

$$x^{-6} = \frac{1}{x^6} \quad \text{OR} \quad \frac{1}{x^{-6}} = x^6$$

$$x^{-8} = \frac{1}{x^8} \qquad 2^{-3} = \frac{1}{x^3}$$

Simplify:

Answers must only have positive exponents

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

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

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

Fractional Exponent Rule

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

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

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

$$\left(\frac{5x^{\frac{9}{2}}y^7}{x^8 y^{\frac{-5}{2}}} \right)^{-2}$$

THE   END