7.2
APPLY EXPONENT PROPERTIES INVOLVING QUOTIENTS

1) Quotient of Powers Property

- When ___dividing powers___ with ___like bases___, ___subtract___ the ___exponents___.

- EX:

$$\frac{4^7}{4^2} = 4^{7-2} = 4^5 \qquad * \text{Like base is 4.}$$

$$\frac{x^{10}}{x^7} = x^{10-7} = x^3 \qquad * \text{Like base is x.}$$

EX:

- Simplify the expression. <u>Write your answer using</u> <u>exponents.</u> → Don't multiply out numbers.

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

  $(-4)^{9-2}$

  $\boxed{(-4)^7}$

- $$\frac{9^4 \cdot 9^3}{9^2}$$

  $$\frac{9^7}{9^2}$$

  9^{7-2}

  $\boxed{9^5}$

2) Power of a Quotient Property

☐ When a ___quotient___ is ___raised___ ___to a power___, raise ___both___ the ___numerator___ and the ___denominator___ to the power and ___Cancel___ if possible.

☐ EX:

$$\left(\frac{3}{2}\right)^{7} = \frac{3^{7}}{2^{7}}$$

* $\frac{3}{2}$ is the quotient

* 3 is the Numerator
  2 is the denominator

* Raise both to the 7th power

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

* $\frac{x}{y}$ is the quotient

* x is the numerator
  y is the denominator

* Raise both to the 2nd power

EX: Simplify the Expression. → As much as possible. Multiply out all numbers.

- $(-7/x)^2$

$$\frac{(-7)^2}{x^2}$$

$$\boxed{\frac{49}{x^2}}$$

- $(x^2/4y)^2$

$$\frac{(x^2)^2}{(4y)^2}$$

$$\boxed{\frac{x^4}{16y^2}}$$

- $(-5/y)^3$

$$\frac{(-5)^3}{y^3}$$

$$\boxed{\frac{-125}{y^3}}$$

$(2s/3t)^3 \cdot (t^5/16)$

$$\frac{(2s)^3}{(3t)^3} \cdot \frac{t^5}{16}$$

$$\frac{\cancel{8}^{1}s^3}{27t^3} \cdot \frac{t^5}{\cancel{16}\,2}$$

$$\frac{s^3}{27\cancel{t^3}} \cdot \frac{t^{\cancel{5}\,2}}{2}$$

$$\frac{s^3}{27} \cdot \frac{t^2}{2}$$

$$\boxed{\frac{s^3 t^2}{54}}$$

$(3x^2/3y^3)^2$

$$\frac{(3x^2)^2}{(3y^3)^2}$$

$$\frac{\cancel{9}^{1}x^4}{\cancel{9}^{1}y^6}$$

$$\boxed{\frac{x^4}{y^6}}$$

EX:

- The order of magnitude of the brightness of the Milky Way is 10^{36} watts. The order of magnitude of the brightness of a gamma ray burster is 10^{45} watts. How many times brighter is the gamma ray burster than the Milky Way?

- http://www.youtube.com/watch?v=P2ESs1rPO_A

$$\frac{10^{45}}{10^{36}}$$

$$10^{45-36}$$

$\boxed{10^{9} \text{ times brighter}}$

* Divide to figure out how many times brighter