

Warm-Up/Review:

1.  $\frac{18x^6y^{19}}{24xy^{10}}$

$$\boxed{\frac{3x^5y^9}{4y}}$$

2.  $(-2x^3y^4)(5y^7)$

$$\boxed{-10x^3y^{11}}$$

3.  $\frac{(x^2y^8z)(6x^5yz^9)}{20x^2y^3z^4}$

$$\frac{6x^7y^9z^{10}}{20x^2y^3z^4}$$

$$\boxed{\frac{3x^5y^6z^6}{10}}$$

Using the definition of exponents, what happens when bases are raised to another power...

Examples (Power to a Power):

$(2^3)^4$

$$2^3 \cdot 2^3 \cdot 2^3 \cdot 2^3$$

$$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$$

$$\boxed{2^{12}}$$

$(x^4)^2$

$$x^4 \cdot x^4$$

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

$$\boxed{x^8}$$

$(x^5y^2)^3$

$$x^5y^2 \cdot x^5y^2 \cdot x^5y^2$$

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

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

$$\boxed{x^{15}y^6}$$

Can you generalize what has happened?

When power is raised to another power  
mult. the exp.

Using what you just learned, what happens when different bases are being divided and raised to a power?

$\frac{a^3}{b^5} \cdot \frac{a^3}{b^5} \left(\frac{a^3}{b^5}\right)^2$

$$\frac{a \cdot a \cdot a \cdot a \cdot a \cdot a}{b \cdot b \cdot b \cdot b \cdot b \cdot b \cdot b \cdot b \cdot b}$$

$$= \boxed{\frac{a^6}{b^{10}}}$$

$\left(\frac{c^2}{d}\right)^9$

$$\frac{c^2 \cdot c^2 \cdot c^2 \cdot c^2 \cdot c^2 \cdot c^2 \cdot c^2 \cdot c^2 \cdot c^2}{d \cdot d \cdot d \cdot d \cdot d \cdot d \cdot d \cdot d \cdot d}$$

$$\boxed{\frac{c^{18}}{d^9}}$$

$\left(\frac{f^3g^2}{k^4}\right)^5$

$$\frac{f^3 \cdot f^3 \cdot f^3 \cdot f^3 \cdot f^3 \cdot g^2 \cdot g^2 \cdot g^2 \cdot g^2 \cdot g^2}{k^4 \cdot k^4 \cdot k^4 \cdot k^4 \cdot k^4}$$

$$\boxed{\frac{f^{15}g^{10}}{k^{20}}}$$

Does it change the rule?

Not really -- just use the  
rule for the num. + denom.

What about coefficients?! What do we do with those?!

\* coefficients get raised to the power outside the ( ) as well

$$(6x^4)^3$$

$$6x^4 \cdot 6x^4 \cdot 6x^4$$

$$6^3 x^{12}$$

$216x^{12}$

$$(9a^2b^4)^2$$

$$9a^2b^4 \cdot 9a^2b^4$$

$$9^2 a^4 b^8$$

$81a^4b^8$

$$(7cd^2)^3$$

$$7cd^2 \cdot 7cd^2 \cdot 7cd^2$$

$$7^3 c^3 d^6$$

$343c^3d^6$

$$\left(\frac{3n^4}{m^5}\right)^4$$

$$\frac{3n^4}{m^5} \cdot \frac{3n^4}{m^5} \cdot \frac{3n^4}{m^5} \cdot \frac{3n^4}{m^5}$$

$$\frac{3^4 n^{16}}{m^{20}} = \frac{81n^{16}}{m^{20}}$$

$\frac{81n^{16}}{m^{20}}$

$$\left(\frac{4x^3y^2}{z^8}\right)^3$$

$$\frac{4^3 x^9 y^6}{z^{24}}$$

$\frac{64x^9y^6}{z^{24}}$

$$\left(\frac{2f^3g^2}{5k^4}\right)^5$$

$$\frac{2^5 f^{15} g^{10}}{5^5 k^{20}}$$

$\frac{32f^{15}g^{10}}{3125k^{20}}$

Unit 2 4.3p Power to a Power

1.  $(3x^5yz^9)^5$

$$3^5 x^{25} y^5 z^{45}$$

$243x^{25}y^5z^{45}$

2.  $\left(\frac{b^3}{c^5}\right)^4$

$\frac{b^{12}}{c^{20}}$

3.  $(8j^3)^3$

$$8^3 j^9$$

$512j^9$

4.  $\left(\frac{2x}{3y^2}\right)^{12}$

$$\frac{2^{12} x^{12}}{3^{12} y^{24}} = \frac{4096x^{12}}{531,441y^{24}}$$

$\frac{4096x^{12}}{531,441y^{24}}$

5.  $(10w^4xyz^2)^2$

$$10^2 w^8 x^2 y^2 z^4$$

$100w^8x^2y^2z^4$

6. Challenge:  $\left(\frac{(-2x)^2}{3xy^2}\right)^3$

$$\left[\frac{(-2)^2 x^2}{3xy^2}\right]^3 = \left[\frac{4x^2}{3xy^2}\right]^3$$

$$\frac{4^3 x^6}{3^3 x^3 y^6} = \frac{64x^6}{27x^3y^6} = \frac{64x^3}{27y^6}$$

$\frac{64x^3}{27y^6}$