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Warmup 1/(\sqrt{289})

- ****Start your **WEEK TWO** Warmup Page****
- ****Make sure to keep it in a consistent spot where you won't lose it.****
- Evaluate each power.
 1. 4^4
 2. $(-4)^4$
 3. -4^4
 4. 4^{-4}
 5. $(-4)^{-4}$

QUIZ TOMORROW

- Multiplying Powers
- Dividing Powers
- Power to a Power
- Zero Exponents
- Negative Coefficients
- Make sure you can do them all **with** and **without** coefficients

p.26 (1-4); p.34 (2, 4, 6); p.47 (1-4, 11, 12)

p. 26

- 1) 4^8
- 2) $-6a^5$
- 3) y^3
- 4) $4k^3$

p. 34

- 2) h^{24}
- 4) $343w^{21}$
- 6) $36r^{10}s^{18}$

p. 47

- 1) $\frac{1}{7^{10}}$
- 2) $\frac{1}{(-5)^4}$
- 3) $\frac{1}{g^7}$
- 4) $\frac{1}{w^{13}}$

One way to think about positive/negative exponents...

- $3^4 = 1 \cdot 3 \cdot 3 \cdot 3 \cdot 3$
- $3^3 = 1 \cdot 3 \cdot 3 \cdot 3$
- $3^2 = 1 \cdot 3 \cdot 3$
- $3^1 = 1 \cdot 3$
- $3^0 = 1$
- $3^{-1} = \frac{1}{3}$
- $3^{-2} = \frac{1}{3 \cdot 3}$
- $3^{-3} = \frac{1}{3 \cdot 3 \cdot 3}$

Negative Exponents

Negative Exponents:

Rule: $x^{-n} = \frac{1}{x^n}$

- Negative exponent:
 - 1 over the same power with a positive exponent

Basically...

➡ **NEGATIVE
EXPONENTS =
DIVIDING!!!**

Negative Exponents

Examples

$$1) 3^{-2} = \frac{1}{3^2}$$

$$2) b^{-7} = \frac{1}{b^7}$$

$$\frac{1}{9}$$

$$3) x^3 \cdot x^{-5}$$

$$= x^{-2}$$

$$= \frac{1}{x^2}$$

$$4) \frac{g^4}{g^{10}} = g^{-6}$$

$$= \frac{1}{g^6}$$

Mathematicians say:

Never leave a zero or negative exponent in your answer.

(It is not necessarily incorrect, it just isn't **simplified**. Just like $\frac{12}{3}$ is not a simplified fraction.)

What about this?

$$\Rightarrow 4x^0 \longrightarrow \cancel{4}$$

■ The four is NOT connected to the exponent.

$$\Rightarrow 4 \cdot x^0$$

$$\Rightarrow 4 \cdot 1$$

$$\Rightarrow 4$$

What about this?

$$\Rightarrow 6x^{-4} \longrightarrow \cancel{\frac{1}{6x^4}}$$

■ The six is NOT connected to the exponent.

$$\Rightarrow 6 \cdot x^{-4}$$

$$\Rightarrow 6 \cdot \frac{1}{x^4}$$

$$\Rightarrow \frac{6}{1} \cdot \frac{1}{x^4}$$

$$\longrightarrow \frac{6}{x^4}$$

KNOW THE DIFFERENCE!

$$\Rightarrow (3x)^{-2} \longrightarrow \frac{1}{(3x)^2}$$

$$\Rightarrow 3x^{-2} \longrightarrow \frac{3}{x^2}$$

■ Write each using negative exponents:

$$\frac{1}{8^3}$$

$$\frac{1}{c^5}$$

$$\frac{1}{16}$$

$$\frac{1}{27}$$

What about:

$$\frac{1}{x^{-5}}$$

- If the negative exponent is already in the denominator, it moves back up to the numerator.

What about:

$$\frac{m^4}{m^{-2}}$$

2 Methods:

Shortcut

$$\begin{aligned} \frac{m^4}{m^{-2}} &= m^{4-(-2)} \\ &= m^6 \end{aligned}$$

Moving Neg. Exponent First

$$\begin{aligned} \frac{m^4}{m^{-2}} &= \frac{m^4 \cdot m^2}{m^2 \cdot m^{-2}} \\ &= \frac{m^6}{1} \\ &= m^6 \end{aligned}$$

- Simplify using the zero & negative exponent properties.

$$\begin{aligned} 3) \frac{q^3 q^2}{q^5} &= \frac{q^5}{q^5} \\ &= q^0 \\ &= 1 \end{aligned}$$

$$\begin{aligned} 4) \frac{n^{-3}}{n^5} &= n^{-3-5} \\ &= n^{-8} \\ &= \frac{1}{n^8} \end{aligned}$$

$$\begin{aligned} 5) a^4 b^4 \cdot a^6 b^{-6} &= a^{10} b^{-2} \\ &= a^{10} \cdot \frac{1}{b^2} \\ &= \frac{a^{10}}{b^2} \end{aligned}$$

$$\begin{aligned} 6) \frac{c^5 d^2}{c^2 d^5} &= \frac{\cancel{c}^4 \cdot \cancel{c}^1 \cdot \cancel{d}^3 \cdot \cancel{d}^1 \cdot \cancel{d}^1}{\cancel{c}^2 \cdot \cancel{d}^3 \cdot \cancel{d}^2 \cdot \cancel{d}^1 \cdot \cancel{d}^1} \\ &= \frac{c^3}{d^3} \end{aligned}$$

CHALLENGE!

Group Activity: Exponent Expressions Sorting

- There are 30 expressions
- Your group will sort them into groups of expressions that are all equivalent
- There are 7 groups – the groups do not all have the same number of expressions in them
- Each expression matches up with at least one other
- You may not have time to finish...try to get as many of them matched up as you can!!!

Homework: Studying Reflection

- Choose two of the methods of studying and write a reflection of how they were helpful for you.