Algebra 1 Bellwork

1. Write down your homework for the night
2. Take out the activity from yesterday
3. You will need your Algebra Nation book today
4. Answer the following question on the FRIDAY section of your bellwork:

$$a^{14}b^{6} \times a^{12}b^{2}$$

$a^{26}b^{8}$

Section 1 – Topic 5
Properties of Exponents

Let's review the properties of exponents.

$2^4 = 16$
$2^3 = 8$
$2^2 = 4$
$2^1 = 2$

What pattern do you notice?

dividing by 2

Continuing the pattern, what does the following term equal?

$2^0 = 1$

- This is the ***zero exponent property***: $a^0 = 1$.

$3^4 = 81$
$3^3 = 27$
$3^2 = 9$
$3^1 = 3$
$3^0 = 1$

$4^4 = 256$
$4^3 = 64$
$4^2 = 16$
$4^1 = 4$

x^4
x^3
x^2
x^1
$x^0 = 1$

Continuing the pattern, what do the following terms equal?

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

$2^{-2} = \frac{1}{4}$ 2^2

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

$2^{-4} = \frac{1}{16} \leftarrow 2^4$

$2^{-5} = \frac{1}{2^5} = 32$

- This is the ***negative exponent property***: $a^{-n} =$ $\frac{1}{a^n}$

  and $\frac{1}{a^{-n}} =$ a^n.

Let's explore multiplying terms with exponents and the same base.

$2^3 \cdot 2^4 =$ 2^7

$2^5 \cdot 2^{-3} =$ 2^2

$x^3 \cdot x^2 =$ x^5

- This is the ***product property***: $a^m \cdot a^n =$ a^{m+n}.

Let's explore dividing terms with exponents and the same base.

$\frac{4^5}{4^3} = 4^2$

$\frac{x^7}{x^8} = x^{-1} = \frac{1}{x^1}$

- This is the ***quotient property***: $\frac{a^m}{a^n} = a^{m-n}$.

x^{-6} $\frac{1}{x^6}$

5^{-3}

$\frac{1^3}{5^3}$

Let's explore raising powers to an exponent.

$(5^3)^2 =$ 5^6 $5^3 \cdot 5^3$

$(y^4)^3 =$ y^{12} $y^4 \, y^4 \, y^4$

- This is the ***power of a power property***: $(a^m)^n =$ $a^{m \cdot n}$.

Let's explore raising a product to an exponent.

$(2 \cdot 3)^2 = 2^2 \cdot 3^2$

$(4 \cdot x)^3 = 4^3 \cdot x^3$

- This is the ***power of a product property***: $(ab)^n = a^n b^n$.

Let's explore a quotient raised to an exponent.

$\left(\frac{20}{3}\right)^2 = \frac{20^2}{3^2}$

$\left(\frac{6}{y}\right)^3 = \frac{6^3}{y^3}$

- This is the ***power of a quotient property***: $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$.

Let's Practice!

1. Determine if the following equations are true or false. Justify your answers.

   a. $3^3 \cdot 3^4 = \frac{(3^9)}{(3^2)}$

   b. $(5 \cdot 4^2)^3 = 5^4 \cdot 5^0 \cdot \left(\frac{4^6}{5^{-1}}\right)^{-1}$

Try It!

2. Use the properties of exponents to match each of the following expressions with its equivalent expression.

A. $\left(\frac{7}{2}\right)^4$ $\frac{7^4}{2^4}$ II

B. $(7 \cdot 2^2)^3$ $7^3 \cdot 2^6$ I

C. $(7^2)(7^2)$ 7^4 IV

D. $(7^2)(7)^0$ V

E. $\left(\frac{7}{2}\right)^{-4}$ III

F. $\frac{(7^6)}{(7^3)}$ 7^3 VI

I. $7^3 \cdot 2^6$ B

II. $\frac{7^4}{2^4}$ A

III. $\frac{2^4}{7^4}$ E

IV. 7^4 C

V. 7^2 D

VI. 7^3 F

$$\frac{7^{-4}}{2^{-4}} = \frac{2^4}{7^4}$$

BEAT THE TEST!

1. Crosby and Adam are working with exponents.

   Part A: Crosby claims that $3^3 \cdot 3^2 = 3^5$. Adam argues that $3^3 \cdot 3^2 = 3^6$. Which one of them is correct? Use the properties of exponents to justify your answer.

   Part B: Crosby claims that $\frac{3^8}{3^2} = 3^4$. Adam argues that $\frac{3^8}{3^2} = 3^6$. Which one of them is correct? Use the properties of exponents to justify your answer.