Math 3

2·1 Exponent Properties

Unit 2 Day 1

OBJ: simplify exponents using the properties of exponents.

Properties: Zero and Negative Exponents		
Zero as an Exponent	For every nonzero number a, $a^0 = 1$	Examples:
Negative Exponent	For every nonzero number *a* and integer *n*, $a^{-1} = \frac{1}{a^n}$	Examples:

What is the simplified form of each expression?

a) $x^{-9} =$ b) $\frac{1}{n^{-3}} =$ c) $4c^{-3}b =$ d) $\frac{2}{a^{-3}} =$

Multiplying Powers with the Same Base		
To multiply powers with the same base, add the exponents.	$a^m \cdot a^n =$	Examples: $4^2 \cdot 4^6 =$

What is the simplified form of each expression in the following parts?

a) $5x^4 \cdot x^9 \cdot 3x =$ b) $-4c^3 \cdot 7d^2 \cdot 2c^{-2} =$ c) $j^2 \cdot k^{-2} \cdot 12j =$

Dividing Powers with the Same Base		
To divide powers with the same base, subtract the exponents.	$\frac{a^m}{a^n} =$	Examples: $\frac{x^4}{x^7} =$

What is each expression written using each base only once?

a) $\frac{4x^8}{2x^3} =$ b) $\frac{9m^2n^4}{-12m^5n^3} =$

c) $\frac{-9k^6j^2}{36kj^5} =$ d) $\frac{5^{-2}a^{-3}b^7}{2a^5b^2} =$

Raising a Product to a Power		
To raise a product to a power, raise each factor to the power and multiply.	$(ab)^n =$	Examples: $(3x)^4 =$

What is the simplified form of each expression?

a) $(x^{-2})^2(3xy^5)^4$ b) $(3c^5)^4(c^2)^3$ c) $(6ab)^3(5a^{-3})^2$

Raising a Quotient to a Power		
To raise a quotient to a power, raise the numerator and the denominator to the power and simplify.	$\left(\frac{a}{b}\right)^n =$	Examples: $\left(\frac{3}{5}\right)^3 =$
To raise a quotient to a negative power, raise the numerator and the denominator to the power and simplify.	$\left(\frac{a}{b}\right)^{-n} =$	Examples: $\left(\frac{h}{g}\right)^{-3} =$

a) What is the simplified form of $\left(\frac{4}{x^3}\right)^2$?

b) What is the simplified form of $\left(\frac{2x^6}{y^4}\right)^{-3}$?

Rational Exponents

Rational Exponent: _____

- We can rewrite expressions with rational exponents as radical expressions to help us evaluate them more easily
- The denominator of the fraction is the index (root) of your radical and the numerator is the power of the base inside the radical
- **Example:** $x^{\frac{a}{b}} = \sqrt[b]{x^a}$

Example 1: Simplify each expression

*Turn it into a radical. The numerator is the power of the base, and the denominator is the number in the corner of the radical!

a) $27^{\frac{1}{3}}$

b) $64^{\frac{1}{2}}$

c) $8^{\frac{2}{3}}$

d) $12^{\frac{2}{3}}$

a) $a^{\frac{1}{6}}$

b) $m^{\frac{1}{2}}$

c) $x^{\frac{3}{4}}$

d) $y^{\frac{7}{2}}$

Example 2: Write each expression as a Rational Exponent

*The numerator is the power of the base, and the denominator is the number in the corner of the square root sign!

a) $\sqrt{x^3}$

b) $\sqrt{5y}$

c) $(\sqrt[4]{b})^3$

d) $\sqrt{a^3x^2y}$

a) $\sqrt[3]{m}$

b) $\sqrt[3]{2y^2}$

c) $\sqrt{-6}$

d) $\sqrt[3]{16a^2b^5}$