Pre-Algebra

Essential Question: How can the laws (properties) of exponents help us simplify and evaluate exponential expressions?

Do Now: Evaluate each **exponential** expression.

a) 5^2_____ b) 2^4_____

c) $(-3)^3$_____ d) $(-1)^{10}$_____

Exponents

An exponent is a mathematical notation that implies the number of times a specific number is used as a factor in a multiplication expression.

Powers represent repeated multiplication of the same factor.

Example: (-15)(-15)(-15) *can be expressed as* $(-15)^3$

Power	Base	Exponent	Evaluate
7^2			
$(-4)^3$			
-6^2			

Zero Power

Look for a pattern.

Can we write a rule about the power of zero?

Rule (Law) #1:

2^4 = _____ 10^4 = _____

2^3 = _____ 10^3 = _____

2^2 = _____ 10^2 = _____

2^1 = _____ 10^1 = _____

2^0 = _____ 10^0 = _____

Evaluate (x *represents a nonzero number*).

1. 87^0 = 2. x^0 = 3. $(3x)^0$ = 4. $3x^0$ =

Negative Exponents

Powers of 2	Powers of 10
$2^4 = 2 \times 2 \times 2 \times 2 =$ **16**	$10^4 = 10 \times 10 \times 10 \times 10 =$ **10,000**
$2^3 = 2 \times 2 \times 2 =$ **8**	$10^3 = 10 \times 10 \times 10 =$ **1,000**
$2^2 = 2 \times 2 =$ **4**	$10^2 = 10 \times 10 =$ **100**
$2^1 =$ **2**	$10^1 =$ **10**
$2^0 =$ **1**	$10^0 =$ **1**
$2^{-1} =$	$10^{-1} =$
$2^{-2} =$	$10^{-2} =$
$2^{-3} =$	$10^{-3} =$

Rule (Law) #2:

Rewrite each expression using only positive exponents (*all variables represent nonzero numbers*).

5. 7^{-5}

6. 9^{-10}

7. $(-11)^{-8}$

8. a^{-7}

9. $(3a)^{-7}$

10. $3a^{-7}$

<u>Evaluate</u> each of the following expressions (*all variables represent nonzero numbers*).

11. 3^{-2}

12. 5^{-3}

13. $(-2)^{-5}$

14. $(-1)^{-4}$

15. x^{-6}

16. m^0n^{-7}

We learned two rules (laws) that help us simplify and evaluate exponential expressions.

Law #1: Any nonzero number raised to the zero power is always equal to _____.

Law #2: a^{-n} = and $a \neq 0$.

Order the following numbers from least to greatest.

4^2 4^{-2} 4^0 -4^2

HW #

Rewrite each exponential expression using positive exponents (*do not evaluate*).

1. 15^{-9}

2. $(-6)^{-7}$

3. b^{-25}

4. $(2x)^{-4}$

5. $2x^{-4}$

6. a^3b^{-4}

Evaluate each exponential expression (*all variables represent nonzero numbers*).

7. 5^3

8. 9^{-2}

9. 5^{-3}

10. $12x^0$

11. $(-2)^{-1}$

12. $(-2)^6$

13. Which expressions are equivalent to 64? **Select all that apply**.

- □ 2^6
- □ $(-8)^2$
- □ 4^3
- □ $(-4)^3$
- □ $(-2)^6$
- □ -2^6
- □ 64^1
- □ 8^{-2}
- □ 64^{-1}
- □ 8^2