

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) $(-3)^3$ _____

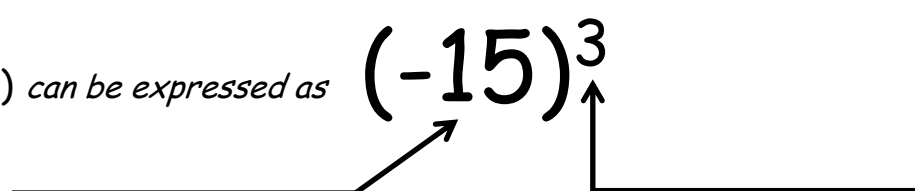
d) $(-1)^{10}$ _____

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

$2^4 =$ _____

$10^4 =$ _____

$2^3 =$ _____

$10^3 =$ _____

$2^2 =$ _____

$10^2 =$ _____

$2^1 =$ _____

$10^1 =$ _____

$2^0 =$ _____

$10^0 =$ _____

Look for a pattern.



Can we write a rule about the power of zero?

Rule (Law) #1:

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. $3a^{-7}$

Evaluate 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}

The
TAKEAWAY

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

-2^6

$(-8)^2$

64^1

4^3

8^{-2}

$(-4)^3$

64^{-1}

$(-2)^6$

8^2