

10-05-18

Aim: SWBAT identify exponents, powers, and bases AND evaluate expressions using exponents.

HW: Packet Page 4

Do Now: Read Packet Page 1

AIM: SWBAT identify exponents, powers and bases, and evaluate expressions using exponents.

Quick Review of Exponents

Base - The base is the number being multiplied. It is the factor.

Exponent - The exponent tells you how many times to multiply the base by itself.

Power - The **number** that can be written using an exponent.

Standard Form - is the "normal" way we see numbers.

2^5 The base is 2 The exponent is 5 The power is 2^5

2^5 expressed in standard form is 32

The powers 5^2 , 9^3 , and 8^4 are read as follows.

5^2 "five to the second power" or "five squared"

9^3 "nine to the third power" or "nine cubed"

8^4 "eight to the fourth power"

Examples:

Write each of the following as a **product of the same factor**.

$2^4 = 2 \cdot 2 \cdot 2 \cdot 2$ $b^3 = \underline{b \cdot b \cdot b}$ $(-1.5)^4 = \underline{(-1.5)(-1.5)(-1.5)(-1.5)}$

Write each of the following using **exponents**.

$6 \cdot 6 = 6^2$ $y \cdot y \cdot y = \underline{y^3}$ $-8 \cdot -8 \cdot -8 \cdot -8 = \underline{(-8)^4}$

Solve each equation. Express your answer in **standard form**.

$x = 4^2$ 1) $z = \left(\frac{2}{3}\right)^3$ 2) $x = (-5)^2$ 3) $x = -5^2$

$x = 4 \cdot 4$
 $x = 16$

$z = \left(\frac{2}{3}\right)\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)$
 $z = \frac{8}{27}$

"-5 squared"
 $x = (-5)(-5)$
 $x = 25$

"the opp. of 5 squared"
 $x = -(5 \cdot 5)$
 $x = -25$

If n is a positive even number, will $(-55)^n$ be positive or negative? positive
 If n is a positive odd number, will $(-3.5)^n$ be positive or negative? negative *

**Any number to the zero power (except 0) is one.

Examples: $9^0 = 1$ $1.2^0 = 1$ $(-110)^0 = 1$ $0^0 = \text{undefined}$

**Any number to the first power is equal to itself.

Examples: $9^1 = 9$ $6.23^1 = 6.23$ $\left(\frac{3}{5}\right)^1 = \frac{3}{5}$
 $\frac{3}{5}$

Classwork.

Write each product using exponents:

1) $x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$
 x^8

2) $y \cdot y \cdot y \cdot x \cdot y \cdot x \cdot y$
 $x^2 y^5$

3) $-4 \cdot -4 \cdot n \cdot n$
 $(-4)^2 n^2$

* 4) $\frac{11}{5} \cdot \frac{11}{5} \cdot \frac{11}{5} \cdot \frac{11}{5} \cdot \frac{11}{5} \cdot \frac{11}{5} \cdot \frac{11}{5} \cdot \frac{11}{5} \cdot \frac{11}{5}$
 $\left(\frac{11}{5}\right)^9$

Write each power as a product of the same factor:

5) 3^5
 $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$

6) $(-6)^4$
 $(-6)(-6)(-6)(-6)$

Evaluate each expression. When you replace a variable that has an exponent put it in parenthesis.

n^2 if $n = 5$
 $(5)^2$
 $5 \cdot 5$
 25

7) $8x^3$ if $x = -3$
 $8 \cdot (-3)^3$
 $8 \cdot (-27)$
 -216

8) $3y^4$ if $y = 10$
 $3 \cdot 10^4$
 $3 \cdot 10,000$
 $30,000$
 $(3y)^4$
 $(3 \cdot 10)^4$
 30^4
 $810,000$

9) $4x^2$ if $x = \frac{1}{2}$
 $4 \cdot \left(\frac{1}{2}\right)^2$
 $4 \cdot \frac{1}{4}$
 1

Evaluate each expression:

* 10) x^4 if $x = -\frac{2}{5}$

$$\left(-\frac{2}{5}\right)^4$$

$$\frac{16}{625}$$

11) $2x^3$ if $x = -3$

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

$$2 \cdot -27$$

$$-54$$

12) $3m^2y^3$ if $m = 5$ and $y = 3$

$$3 \cdot 5^2 \cdot 3^3$$

13) $(rm)^2$ if $r = 2$ and $m = 6$

$$(2 \cdot 6)^2$$

* 14) Rewrite 8 as a power of 2

$$8$$

$$\begin{array}{c} \textcircled{2} \quad \textcircled{4} \\ \quad \quad \quad \textcircled{2} \quad \textcircled{2} \end{array}$$

$$2^3$$

* 15) Rewrite 9 as a power of 3

$$9$$

$$\begin{array}{c} \textcircled{3} \quad \textcircled{3} \end{array}$$

$$3^2$$

16) Rewrite 81 as a power of 3

$$81$$

$$\begin{array}{c} \textcircled{3} \quad \textcircled{27} \\ \quad \quad \quad \textcircled{3} \quad \textcircled{9} \\ \quad \quad \quad \quad \quad \textcircled{3} \quad \textcircled{3} \end{array}$$

$$3^4$$

HW: Using Exponents

Write each product using exponents:

1) $4 \cdot 4 \cdot 4 \cdot 4$ 2) $t \cdot t \cdot t \cdot t \cdot t \cdot t \cdot t \cdot t$ 3) $4.3 \cdot 4.3 \cdot 4.3$ 4) $-5 \cdot -5$

Express each of the following as a standard numeral:

5) 3^5 6) $(-4)^3$ 7) $(1.5)^2$ 8) $\left(\frac{1}{5}\right)^3$ 9) 125^0

Determine whether each sentence is true or false.

10) $2^{10} > 10^2$ 11) $9^8 > 8^9$ 12) $2^4 = 4^2$ 13) $2^3 \neq 3^2$

Evaluate each expression:

14) x^3 if $x = -6$ 15) $4r^3$ if $r = 3$ 16) $(xy)^3$ if $x = \frac{1}{5}$ and $y = 10$

17) Write an expression with (-1) as its base that will produce a positive product. _____

18) Write an expression with (-1) as its base that will produce a negative product. _____

19) Tim wrote 16 as $(-2)^4$. Is he correct? Explain why or why not.

Rewrite each of the following numbers in exponential notation using a base of 2.

20) 8

21) 32

22) 128