

10-23-17

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

HW: Packet Pg. 5

Do Now: Write your name on the Unit 3 Packet

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

Quick Review of Exponents

Base The factor used in repeated multiplication

Exponent Tells you how many times the base is used as a factor.

Power An expression consisting of a base and an exponent.

Standard Form The way of writing numbers easily.

$2^5$  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

$8^4$   $x^4$

Examples:

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

$2^4 = 2 \cdot 2 \cdot 2 \cdot 2$

$b^3 = b \cdot b \cdot b$

$(-1.5)^4 = (-1.5)(-1.5)(-1.5)(-1.5)$   
*\* neg. in parentheses*

Write each of the following using exponents.

$6 \cdot 6 = 6^2$

$y \cdot y \cdot y = y^3$

$-8 \cdot -8 \cdot -8 \cdot -8 = (-8)^4$   
*\* neg. in parentheses*

Solve each equation. Express your answer in standard form.

$x = 4^2$

1)  $y = 2^5$

2)  $z = 7^3$

\* 3)  $y = (-3)^4$

$x = 4 \cdot 4$

$y = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

$z = 7 \cdot 7 \cdot 7$

$y = (-3)(-3)(-3)(-3)$

$x = 16$

$y = 32$

$z = 343$

$y = 81$

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

$z = \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3}$

$z = \frac{8}{27}$

\* 5)  $x = (-5)^2$

$x = (-5)(-5)$

$x = 25$

~~\*\* 6)  $x = -5^2$~~   
*the opp. of  $5^2$*

~~$x = -(5 \cdot 5)$~~

~~$x = -25$~~

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

If  $n$  is a positive odd number, will  $(-3.5)^n$  be positive or 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:  $9^1 = 9$        $6.23^1 = 6.23$        $\left(\frac{3}{5}\right)^1 = \frac{3}{5}$

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

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  $x = -3$

$8 \cdot x^3$   
 $8 \cdot (-3)^3$

$8(-27)$   
 $-216$

8)  $3y^4$  if  $y = 10$

$3 \cdot y^4$   
 $3 \cdot 10^4$

$3 \cdot 10000$   
 $30000$

9)  $4x^2$  if  $x = \frac{1}{2}$

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

$4 \cdot \frac{1}{4}$   
 $1$

Evaluate each expression:

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

$$\left(-\frac{2}{5}\right)^4$$
$$\frac{16}{625}$$

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

$$2 \cdot x^3$$
$$2 \cdot (-3)^3$$
$$2 \cdot (-27)$$
$$-54$$

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

$$3 \cdot m^2 \cdot y^3$$
$$3 \cdot (5)^2 \cdot (3)^3$$
$$3 \cdot 25 \cdot 27$$
$$2025$$

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

$$(2 \cdot 6)^2$$
$$12^2$$
$$144$$

14) Rewrite 8 as a power of 2

$$2^3$$

15) Rewrite 9 as a power of 3

$$3^2$$

16) Rewrite 81 as a power of 3

$$3^4$$

HW: Using Exponents

Write each product using exponents:

1)  $4 \cdot 4 \cdot 4 \cdot 4$       2)  $t \cdot t \cdot t \cdot t \cdot t \cdot t \cdot t$       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)  $128$