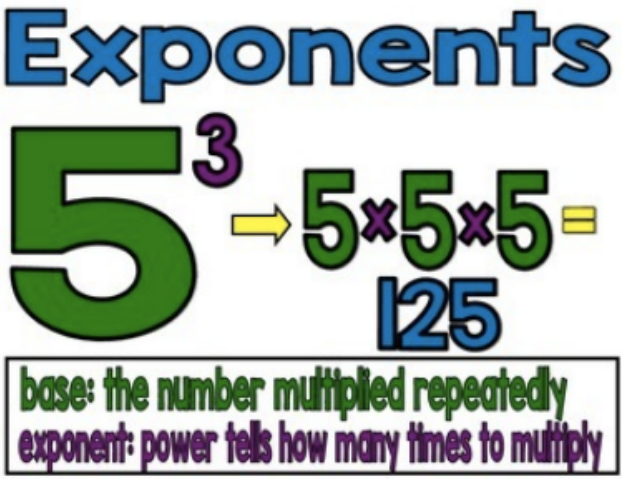


SEMINAR NOTES

Learning Guide 3

$10^0 = 1$

$10^1 = 10$

$10^2 = 10 \times 10 = 100$

$10^3 = 10 \times 10 \times 10 = 1{,}000$

$10^4 = 10 \times 10 \times 10 \times 10 = 10{,}000$

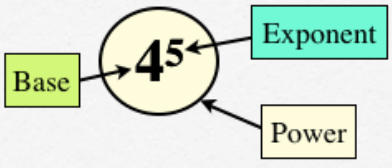
SEMINAR NOTES for LG 3

Exponents

What is a Power?

When an integer can be written as a product of equal factors, we can write the integer as a power.

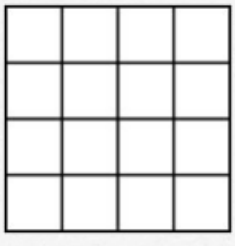
Ex. Name the parts of the following power.



Writing square and cube numbers

Square numbers have an integer base with an exponent of two.
Cube numbers have an integer base with an exponent of three.

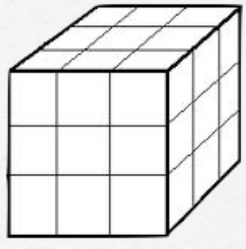
Ex. Write the following figure as a square number.



Repeated Multiplication: $4 \times 4 = 4^2$ (As a Power)

$= 16$ (Standard Form)

Ex. Write the following figure as a cube number.



Repeated Multiplication: $3 \times 3 \times 3 = 3^3$ (As a Power)

$= 27$ (Standard Form)

Try See next page for questions.

Try

1. Identify the base and exponent of each power:

3^2 7^5 2^6 9^4

2. Write each of the following as a repeated multiplication:

$7^6 =$ $3^5 =$ $(-9)^7 =$ $\left(\frac{1}{2}\right)^4 =$

3. Write each of the following as a powers:

$8\times8\times8\times8 =$ $1\times1\times1\times1\times1\times1 =$ $2\times2\times2\times2\times2 =$ $6\times6\times6 =$

4. Evaluate the following:

$3^5 =$ $5^{10} =$ $-(-3)^7 =$ $2^{20} =$

Is it Positive or Negative?

The exponent only applies to the sign if the negative sign is inside parentheses.

Count the number of negative signs to determine the sign of the answer in standard form. (Odd #: Negative Even #: Positive)

Ex. Predict the sign of the answer.

$-3^6 =$

Ex. Predict the sign of the answer.

$(-3)^6 =$

Try

4. Is the answer positive or negative?

$(-2)^3$ $\quad -(-3)^3$ $\quad -(-9^3)$ $\quad (-1)^{2011}$

Powers of Ten

When the base is a 10 there is a direct relation between the exponent and the number of zeros in the standard form number.

Ex. Fill in the following table.

Exponent	Power	Standard Form	
5	10^5	100000	Exp = 5 5 zeros
4			
3			
2			
1			
0			

Ex. Write the following number as a power of 10.

1000000 =

There are 6 zeros.

The Zero Exponent

Any integer to the zero exponent equals 1.

Ex. $4^0 =$

Ex. $-4^0 =$

Remember, the zero exponent belongs only to the base which is 4.

Ex. $(-4)^0 =$

Try Evaluate each power.

$3^0 =$ $17^0 =$ $(-3)^0 =$ $-2^0 =$

Writing Numbers Using Powers of Ten

To write numbers using powers of ten, use place values to separate the standard form number into ones, tens, hundreds, etc.

Ex. Write 2438 using powers of ten.

$2438 = 2000 + 400 + 30 + 8$ — Change standard form number into separate place values.

$= 2 \times 1000 + 4 \times 100 + 3 \times 10 + 8 \times 1$ — Separate the place values by writing a number x 1, 10, 100..

$= 2 \times 10^3 + 4 \times 10^2 + 3 \times 10^1 + 8 \times 1^0$ — Write 1, 10, 100, ... as powers of 10.

Try Write using powers of ten.

3200 =

9163 =

605875 =

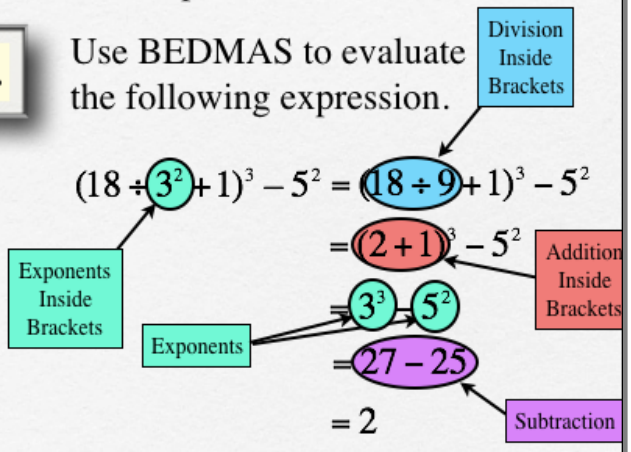
Order of Operations With Powers

You must know in which order you need to evaluate each expression.
Use the mnemonic BEDMAS to decide the order of operations.

Ex. What does the mnemonic BEDMAS stand for?

- **B**rackets
- **E**xponents
- **D**ivision } done from Left to Right
- **M**ultiplication
- **A**ddition } done from Left to Right
- **S**ubtraction

Ex. Use BEDMAS to evaluate the following expression.



Try Use BEDMAS to evaluate.

$(3+2)^2 - (5-3)^3 =$

$\left(9^2 + 4^2\right)^0 + \left(2^3 - 2^2\right)^2 =$

$(2 \times 4^5 + 8)^0 + 4 \div 2 - 1$

Order of Operations With Powers

Adding brackets (or parentheses) will change the value of an expression.

Ex. Match the expression on the right to the correct answer.

$8+2\times3^2-5=85$	$8+2\times(3^2-5)$
$8+2\times3^2-5=16$	$(8+2\times3)^2-5$
$8+2\times3^2-5=191$	$(8+2)\times3^2-5$

- $3^2-5=4$
- $2 \times 4=8$
- $8+8=16$

- $8+2 \times 3=14$
- $14^2=196$
- $196-5=191$

- $8+2=10$
- $10 \times 3^2=90$
- $90-5=85$

Try Add parentheses to find the desired answer.

$3+5\times2-2^3+4^2=1$

$3+5\times2-2^3+4^2=24$

$3+5\times2-2^3+4^2=81$