# Unit I Notes

# Exponents



Tentative Schedule

Day	Date	Class Work	Assignment	
1	Wed. 9/3 Thurs. 9/4	Problem Solving Group Work	Watch Video #1.1 – Exponential Notation, the Product of Powers and the Quotient of Powers	
2	Fri. 9/5	P.S. #1.1	Watch Video #1.2 – The Power of a Power	
3	Mon. 9/8 Tues. 9/9	P.S. #1.2	Watch Video #1.3 – Zero and Negative Exponents	
4	Wed. 9/10	<b>Quiz #1.1</b> P.S. #1.3	Finish P.S. #1.3	
5	Thurs. 9/11 Fri. 9/12	Activity	Review for Test #1	
6	Mon. 9/15	<b>Quiz #1.2</b> Review for Test #1	Study	
7	Tues. 9/16 Wed. 9/17	Test #1	Watch Video #2.1	
Name:				

## Notes II - Exponential Notation and Product/Quotient of Powers

Examples involving exponential notation. Also, identify the base and exponent in each expression.

## 1.) $5 \times 5 \times 5 \times 5 \times 5 \times 5 =$



Base: \_\_\_\_\_ Exponent: \_\_\_\_\_



Try these exercises on your own. Then, compare with your partner.

#### Exercise 1

 $\underbrace{4 \times \cdots \times 4}_{7 \text{ times}} =$ 

#### Exercise 2

 $\underbrace{3.6 \times \cdots \times 3.6}_{times} = 3.6^{47}$ 

#### Exercise 3

$$\underbrace{(-11.63)\times\cdots\times(-11.63)}_{34\ times}=$$

#### Exercise 4

 $\underbrace{12 \times \cdots \times 12}_{times} = 12^{15}$ 

#### Exercise 5

 $\underbrace{(-5)\times\cdots\times(-5)}_{10 \ times} =$ 

#### Exercise 11

Will these products be positive or negative? How do you know?

$$\underbrace{(-1) \times (-1) \times \dots \times (-1)}_{12 \ times} = (-1)^{12}$$



$$\underbrace{(-1) \times (-1) \times \dots \times (-1)}_{13 \ times} = (-1)^{13}$$

#### Exercise 6

$$\frac{\frac{7}{2} \times \cdots \times \frac{7}{2}}{\frac{21 \text{ times}}{2}} =$$

## Exercise 7 -13) × ··· × (–13)

$$\underbrace{(-13)\times\cdots\times(-13)}_{6 \ times} =$$

# $\underbrace{\left(-\frac{1}{14}\right)\times\cdots\times\left(-\frac{1}{14}\right)}_{=}=$

Exercise 9

Exercise 8

 $\underbrace{x \cdot x \cdots x}_{185 \ times} =$ 

Exercise 10

 $\underbrace{x \cdot x \cdots x}_{times} = x^n$ 

## Exercise 12

Is it necessary to do all of the calculations to determine the sign of the product? Why or why not?

$$\underbrace{(-5) \times (-5) \times \cdots \times (-5)}_{95 \ times} = (-5)^{95}$$

$$\underbrace{(-1.8) \times (-1.8) \times \dots \times (-1.8)}_{122 \ times} = (-1.8)^{122}$$



### Exercise 13

Fill in the blanks about whether the number is positive or negative.

If *n* is a positive even number, then (–55)<sup>*n*</sup> is \_\_\_\_\_\_

If *n* is a positive odd number, then  $(-55)^n$  is \_\_\_\_\_.

### Exercise 14

Josie says that  $(-15) \times (-15) \times (-15) \times (-15) \times (-15) = -15^6$ . Is she correct? How do you know?

### **Exercise 15**

Expand and evaluate  $\left(-\frac{3}{4}\right)^3$ .

- 1.) Expand  $10^6$ .
- 2.) Expand  $10^3$ .
- 3.) Expand  $10^6 \cdot 10^3$ . What do you notice?
- 4.) Expand  $a^4$ .
- 5.) Expand  $a^5$ .
- 6.) Expand  $a^4 \cdot a^5$ . What do you notice?

When you find the product of two algebraic expressions with the same base, you can \_\_\_\_\_\_ their exponents and use this exponent with the \_\_\_\_\_\_ base. $a^m \bullet a^n = \_____$ 

Simplify each expression. Write your answer in exponential notation.

7.)  $(-4)^2 \cdot (-4)^3 = 8.$   $3^6 \cdot 3 = 9.$   $a^{23} \cdot a^9 = 9.$ 



11.) Expand 5<sup>2</sup>.

12.) Expand  $5^6 \div 5^2$ . What do you notice?



14.) Expand  $y^4$ .

15.) Expand  $y^7 \div y^4$ . What do you notice?

When you find the quotient of two algebraic expressions with the					
same base, you can t	heir exponents and use this				
exponent with the ba	se.				
$a^m \div a^n =$					

Simplify each expression. Write your answer in exponential notation.

16.)  $2^9 \div 2^6 =$  17.)  $(-7)^5 \div (-7) =$  18.)  $\frac{35x^4y^7}{5x^2y^3}$ 



## Notes 1.2 - Power of a Power

Simplify each expression. Write your answer in exponential notation.

1.) 
$$\frac{4^2 \cdot 4^7 \cdot 4}{4^3 \cdot 4 \cdot 4^4}$$
  
2.)  $\frac{\left(\frac{1}{4}\right)^3 \cdot \left(\frac{1}{4}\right) \cdot \left(\frac{1}{4}\right)^2}{\left(\frac{1}{4}\right) \cdot \left(\frac{1}{4}\right)}$   
3.)  $\frac{3x^4 \cdot 5y^3 \cdot 6x^6}{2y \cdot 3x^2 \cdot 5y^3}$   
4.)  $\frac{6^7 \cdot 6^3 \cdot 6^2}{6 \cdot 6^4 \cdot 6^5}$   
5.)  $\frac{b^5 \cdot 4a^4 \cdot 9a^3}{2a^2 \cdot b^2 \cdot 6a^2}$ 

- 6.) What does  $(2^4)^3$  mean?
- 7.) What does  $(n^2)^5$  mean?
- 8.) What do you notice?

When you raise a power to a power, keep the base and multiply			
the exponents.			
$(a^m)^n =$			

Simplify each expression. Write your answer in exponential notation.

9.)  $(15^3)^9$  10.)  $((-2)^5)^8$  11.)  $(a^{17})^4$ 



## Notes I.3 - Zero and Negative Exponents

1.) Use the power of a quotient property to simplify each expression. Write the quotient as an exponent.

Expression	Exponent
$\frac{3^5}{3^2}$	3 <sup>3</sup>
$\frac{3^5}{3^3}$	
$\frac{3^5}{3^4}$	
$\frac{3^5}{3^5}$	

What expression did you write for  $\frac{3^5}{3^5}$ ? What exponent did you use?

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- 2.) Using factored form, find the value of  $\frac{3^5}{3^5}$ .
- 3.) Based on your findings, what can you conclude about the value of  $3^{\circ}$ ?
- 4.) Make a prediction about the value of any number raised to the zero power.
- 5.) Use a calculator to check your prediction for several numbers. Is your prediction right?

	A nonzero number raised to the zero power is equal to $a^0 = \$	
Simplify		each

expression and evaluate where applicable.

6.)  $7^3 \cdot 7^0$  7.)  $3 \cdot 10^2 + 2 \cdot 10^1 + 8 \cdot 10^0$ 

8.) 
$$\frac{4^2 \cdot 4^6}{4^8}$$
 9.)  $(a^4 \div a^0) \cdot a^3$ 

10.) Use the quotient of powers property to simplify each expression. Write the quotient in exponential notation.

Expression	Exponent
$\frac{4^5}{4^3}$	4 <sup>2</sup>
$\frac{4^5}{4^4}$	
$\frac{4^5}{4^5}$	
$\frac{4^5}{4^6}$	
$\frac{4^5}{4^7}$	

What expression did you write for  $\frac{4^5}{4^6}$ ? What exponent did you use?

- 11.) Using factored form, find the value of  $\frac{4^5}{4^6}$ .
- 12.) Using factored form, find the value of  $\frac{4^{\scriptscriptstyle 5}}{4^{\scriptscriptstyle 7}}.$

 $a^{-n} =$ \_\_\_\_\_

16.)  $4^8 \cdot 4^{-10}$ 

13.) How would you write  $a^{-3}$  using a positive exponent?

Simplify each expression. Write your answer using a positive exponent.

15.)  $\frac{x^{-7}}{x^4}$ 

14.)  $13^{-4} \cdot 13^{7}$ 

17.) 
$$x^{-7} \div x^{-4}$$



18.) 
$$\left(\frac{8n^5}{32n^0}\right)^{-1}$$
 19.)  $14a^{-5} \div (7a \cdot 2a^{-4})$ 

Simplify each expression and evaluate where applicable.

20.) 
$$\frac{(-6)^3}{(-6)^4}$$
 21.)  $\frac{3^{-5} \cdot 3}{5^3 \cdot 5^{-8}}$