

Exploring Laws of Exponents

Name _____

What does an exponent tell you about the number?

Product of Powers Property

Complete the table below.

Expression	E·X·P·A·N·D·E·D Form	Exponential Form
$3^2 \cdot 3^5$		
$2 \cdot 2^6$		
$b^5 \cdot b^8$		

1. Look at the table above. Compare the first and third column. Describe, using words, the relationship that you see between them.

2. Use your observations from above to fill in a generalized form:

$a^m \cdot a^n =$

3. The rule you discovered is called the “**product of powers.**” Use it to simplify the expressions below.

a. $2^6 \cdot 2^8$

b. $(-7)^3 \cdot (-7) \cdot (-7)^5$

c. $m^7 \cdot m^4 \cdot m^6$

Power of a Power Property

Complete the table below.

Expression	E·X·P·A·N·D·E·D Form	Exponential Form
$(5^2)^3$		
$(8^5)^2$		
$(x^3)^4$		

4. Look at the table above. Compare the first and third column. Describe, using words, the relationship that you see between them.

5. Use your observations from above to fill in a generalized form:

$(a^m)^n =$

6. The rule you discovered is called the “**power of a power.**” Use it to simplify the expressions below.

a. $(7^4)^9$

b. $(k^{17})^2$

c. $(w^{100})^5$

Quotient of Powers Property

Complete the table below.

Expression	E·X·P·A·N·D·E·D Form	Exponential Form
$\frac{6^9}{6^4}$		
$\frac{100^5}{100^2}$		
$\frac{t^{15}}{t^8}$		

7. Look at the table above. Compare the first and third column. Describe, using words, the relationship that you see between them.

8. Use your observations from above to fill in a generalized form:

$$\frac{a^m}{a^n} =$$

9. The rule you discovered is called the “**quotient of powers.**” Use it to simplify the expressions below.

a. $\frac{16^7}{16^3}$

b. $\frac{w^{25}}{w^{10}}$

c. $\frac{4^3 \cdot 4^7}{4^5}$

Zero Powers Property

Complete the table below.

Expression	E·X·P·A·N·D·E·D Form	Answer
5^4		625
5^3		
5^2		
5^1		
5^0		

10. Look at the table above. What is the pattern in the third column? Describe, using words, how that pattern helps you find 5^0 ?

Expression	E·X·P·A·N·D·E·D Form	Answer
3^4		
3^3		
3^2		
3^1		
3^0		

11. Use your observations from above to fill in a generalized form:

$$a^0 =$$

12. The rule you discovered is called the “**zero power property.**” Use it to simplify the expressions below.

a. $(x \cdot x^2 \cdot x^9)^0$

b. $\left(\frac{3^4}{3^0}\right)^2$

c. $(128,917,654^5)^0$

Negative Powers Property

Complete the table below.

Expression	E·X·P·A·N·D·E·D Form	Answer
4^2		
4^1		
4^0		
4^{-1}		
4^{-2}		

13. In order to work up in exponents, you are increasing the number of times that you are _____ the number (or variable).

If you are decreasing the exponent (the exponent is getting more negative) then you are _____ by the number (or variable).

14. Use your observations from above to fill in a generalized form:

$$a^{-m} =$$

$$\frac{1}{a^{-m}} =$$

15. The rule you discovered is called the “**negative power property.**” Use it to simplify the expressions below.

a. y^{-5}

b. $(x^2)^{-5}$

c. $\left(\frac{z^0}{z^2 \cdot z^4}\right)^{-2}$

Day 1: Properties of Exponents

- 1) An _____ is a quantity that shows the number of times a given number is being _____ by _____.

Examples: $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 =$

$$3 \cdot 3 \cdot 3x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot z =$$

- 2) An exponential term contains a _____ and a _____ (also known as an exponent).

Example: a^n : a is the base, n is the power

x^{17} : _____ is the base, _____ is the power.

Let's put it all together!

Simplify. Your answer should contain only positive exponents.

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

4) $(m^2 m^7)^2$

5) $a^2 \cdot (a^2)^2$

6) $n^{-2} n^2$

7) $x^{-3} \cdot (x^2)^0$

8) $(n^{-2})^{-2} \cdot n^{-5}$

$$9) \frac{b^2}{(b^2)^2 \cdot b^2}$$

$$10) \frac{(m^2 m^{-1})^{-1}}{(m^2)^0}$$

$$11) \frac{(b^2)^2}{bb^{-2}b^{-1}}$$

$$12) \frac{(2k^2)^2}{k^{-2} \cdot k}$$

$$13) \frac{(aa^0)^{-2}}{a}$$

$$14) \frac{b^0 \cdot (b^{-2})^2}{b^{-2}}$$

$$15) \left(\frac{x^6}{x^{-2}x^5} \right)^{-2}$$

$$16) \left(\frac{m}{m^{-1}m^2} \right)^3$$