Name:	Date:	Period:

Discovering Exponent Rules

Expand an exponential expression by rewriting it as factors
Example: $x^5 = x \cdot x \cdot x \cdot x \cdot x$

Expand each exponential expression, then **simplify**.

$(m^3)^2$	$(a^2)^5$	$(x^4)^3$	$(p^6)^2$	$(d^5)^2$
Expand $m^3 \cdot m^3$ $m \cdot m \cdot m \cdot m \cdot m \cdot m$	**Expand**	**Expand**	**Expand**	**Expand**
Simplify m^6	**Simplify**	**Simplify**	**Simplify**	**Simplify**

1. Do you notice a pattern? Find a relationship between the exponents in the original expression and the exponent in the final answer. Describe your observations.

2. To write a **general rule**, we use variables to mean that the pattern is true for any number. Use your observations to complete the general rule.

   For any exponents *m* and *n*, $(x^m)^n =$ This is known as the **Power of a Power Rule**.

3. Come up with one more example of your own like the ones above, and see if your rule holds.

Name:	Date:	Period:

Discovering Exponent Rules

Expand an exponential expression by rewriting it as factors
Example: $x^5 = x \cdot x \cdot x \cdot x \cdot x$

Expand each exponential expression, then **simplify**.

$d^3 \cdot d^4$	$x^2 \cdot x^4 \cdot x^3$	$y \cdot y^5$	$a^4 \cdot a^2$	$p^3 \cdot p^3$
Expand $(d \cdot d \cdot d) \cdot (d \cdot d \cdot d \cdot d)$	**Expand**	**Expand**	**Expand**	**Expand**
Simplify d^7	**Simplify**	**Simplify**	**Simplify**	**Simplify**

4. Do you notice a pattern? Find a relationship between the exponents in the original expression and the exponent in the final answer. Describe your observations.

5. To write a **general rule**, we use variables to mean that the pattern is true for any number. Use your observations to complete the general rule.

   For any exponents *m* and *n*, $x^m \cdot x^n =$ This is known as the **Product Rule**.

6. Come up with one more example of your own like the ones above, and see if your rule holds.

Name:	Date:	Period:

Discovering Exponent Rules

Expand an exponential expression by rewriting it as factors
Example: $x^5 = x \cdot x \cdot x \cdot x \cdot x$

Expand each exponential expression, then cancel out common factors in the numerator and denominator to **simplify**.

$\frac{m^7}{m^2}$	$\frac{k^8}{k^3}$	$\frac{b^3}{b^2}$	$\frac{j^5}{j}$	$\frac{x^9}{x^9}$
Expand $\frac{m \cdot m \cdot m \cdot m \cdot m \cdot m \cdot m}{m \cdot m}$	**Expand**	**Expand**	**Expand**	**Expand**
Simplify m^5	**Simplify**	**Simplify**	**Simplify**	**Simplify**

7. Do you notice a pattern? Find a relationship between the exponents in the original expression and the exponent in the final answer. Describe your observations.

8. To write a **general rule**, we use variables to mean that the pattern is true for any number. Use your observations to complete the general rule.

For any exponents *m* and *n*, $\frac{x^m}{x^n} =$ This is known as the **Quotient Rule**.

9. Come up with one more example of your own like the ones above, and see if your rule holds.

Other Exponent Rules

Expand an exponential expression by rewriting it as factors
Example: $x^5 = x \cdot x \cdot x \cdot x \cdot x$

Expand each exponential expression, then group each variable, and **simplify**

$(ab)^3$	$\left(\frac{a}{b}\right)^2$	$(xy)^4$	$\left(\frac{x}{y}\right)^3$
Expand $ab \cdot ab \cdot ab$	**Expand** $\frac{a}{b} \cdot \frac{a}{b}$	**Expand**	**Expand**
Group $a \cdot a \cdot a \cdot b \cdot b \cdot b$	**Group** $\frac{a \cdot a}{b \cdot b}$	**Group**	**Group**
Simplify $a^3 b^3$	**Simplify** $\frac{a^2}{b^2}$	**Simplify**	**Simplify**

10. Do you notice a pattern? Find a relationship between the original expression and the final answer. Describe your observations.

11. To write a **general rule**, we use variables to mean that the pattern is true for any number. Use your observations to complete the general rule.

For any exponent *m*, $(ab)^m =$ This is known as the **Power of a Product Rule**.

For any exponent *m*, $\left(\frac{a}{b}\right)^m =$ This is known as the **Power of a Quotient Rule**

12. Come up with two more examples (one for each rule) of your own like the ones above, and see if your rules holds.

Other Exponent Rules

Expand an exponential expression by rewriting it as factors
Example: $x^5 = x \cdot x \cdot x \cdot x \cdot x$

	Expand	Value
$2^{-3} =$		
$2^{-2} =$		
$2^{-1} =$		
$2^{0} =$		
$2^{1} =$		
$2^{2} =$		
$2^{3} =$		
$2^{4} =$	$2 \cdot 2 \cdot 2 \cdot 2$	=16

	Expand	Value

13. Starting with 2^1, **expand** each row to determine the value.

14. What is the pattern in the **value** column as the exponent *increases* by 1?

15. What is the pattern in the **value** column as the exponent *decreases* by 1?

16. Use the pattern in #3 to fill out the remaining boxes in the value column <u>in fraction form.</u>

17. Pick a positive number other than 1 or 2, and fill out the table just like the one above. <u>Use a different number than the people sitting near you.</u>

18. Look at both tables. What do you notice when the exponent is equal to 0? Check the tables of your other group members and compare.

19. Look at both tables. What do you notice when the exponent is negative? Check the tables of your other group members and compare.