Name: _____ Date: Aug 27 Hour: ___Alg 1____

Unit 1A Day 7: The Power Rule

Focus Question: How do I simplify a power to a power?

A. Mary says she can expand $(2^3)^2$ as shown at right.

I know that $(2^3)^2 = (2^3) \cdot (2^3)$.

1. Do you agree with Mary? Explain. Yes b/c 2^3 is the base & is a factor twice

2. Now expand $2^3 \cdot 2^3$ and write your answer in exponential form with a single base and power.

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$ or 2^6

3. Use that example to fill in the following table.

Problem	Expanded Form	Expanded Expanded Form	Exponential Form
a. $(5^3)^4$	$5^3 \cdot 5^3 \cdot 5^3 \cdot 5^3$	$5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5$	5^{12}
b. $(x^2)^5$	$x^2 \cdot x^2 \cdot x^2 \cdot x^2 \cdot x^2$	$x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$	x^{10}
c. $(y^3)^3$	~~~	$y^{3 \cdot 3}$	y^9

4. What do you notice when you raise a power to a power?

multiplied the two exponents

5. Finish the following equation to express **The Power Rule**.

$(a^m)^n = a^{m \cdot n}$

the base is a power

B. What if there is more than 1 base?

1. Complete the table

Problem	Expanded	Re-written	Answer
$(4x)^2$	$4x \cdot 4x$	$4 \cdot 4 \cdot x \cdot x$	4^2x^2 or $16x^2$
$\left(\frac{x^2}{y}\right)^3$	$\frac{x^2}{y^1} \cdot \frac{x^2}{y^1} \cdot \frac{x^2}{y^1}$	$\frac{x^{2+2+2}}{y^{1+1+1}}$	$\frac{x^6}{y^3}$
$(xy^3)^4$	$xy^3 \cdot xy^3 \cdot xy^3 \cdot xy^3$	$x^{1+1+1+1} y^{3+3+3+3}$	$x^4 y^{12}$

2. Complete the rule $(ab)^m =$ $a^m b^m$

Note: This is very different from $(3 + x)^2$. If you "distribute" the exponent on this one you are WRONG! Distributing the exponent only works when the terms in the base are being multiplied. We will learn how to do the problem $(3 + x)^2$ in our quadratics unit.

$(3x)^2$ $(3+x)^2$

C. What if the base isn't the same?!?!?!

1. How are the following two problems different? $4^3 \cdot 4^2$ and $3^4 \cdot 2^4$

4^{3+2} or 4^5

same base

same exp.

2. Write $3^4 \cdot 2^4$ in expanded form.

$3 \cdot 3 \cdot 3 \cdot 3 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

3. Because it is all multiplication, you can multiply in any order. How could your re-write #2 but keep it in expanded form?

$3 \cdot 2 \cdot 3 \cdot 2 \cdot 3 \cdot 2 \cdot 3 \cdot 2$

$7^1 \cdot 2^1$

14^1

4. How could you rewrite #3 in exponential form?

$6 \cdot 6 \cdot 6 \cdot 6 = 6^4$

5. Complete the table.

Problem	Re-Write	Exponential form
$2^3 \cdot 5^3$	$(2 \cdot 5)^3$	10^3
$5^2 \cdot 6^2$	$(5 \cdot 6)^2$	30^2
$x^6 \cdot y^6$	$(x \cdot y)^6$	$(xy)^6$
$\frac{8^2}{2^2}$	$\left(\frac{8}{2}\right)^2$	4^2
$\frac{10^5}{5^5}$	$\left(\frac{10}{5}\right)^5$	2^5

6. Finish the following equations to express what you have learned when there are **two powers with the same exponent.**

$a^m \cdot b^m = (ab)^m$

$\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$

You secretly already knew this because you could do the problem $5 \cdot 3 = 15$ which could be seen as $5^1 \cdot 3^1 = 15^1$

D. Practice problems are the circled problems on your homework paper.

e: _____ Date: _____ **HW #6 All rules of exponents**

nplify each expression below using exponent rules. Your final answer should not lude any negative exponents. You MUST show work in order to receive credit.

$x^5 \bullet x^2$	2. $y^3 \bullet y \bullet y^4$	3. $b^4 \bullet b^{-4}$
$7x^3y^2 \bullet 5xy^9$	5. $a^{10} \bullet a^2 \bullet a^{-6}$	6. $\left(z^5\right)^5$
$\left(b^7\right)^2$	8. $\left(m^{-8}\right)^{-3}$ $m^{-8 \circ -3}$ m^{24}	9. $\left(x^2y^4m^3\right)^8$
. $\left(3x^2\right)^4$	11. $\frac{2x^6y}{(3x^2y^2)^3} = \frac{2}{27y^5}$ $\frac{2x^6y^1}{3^3x^6y^6} \Rightarrow \frac{2}{27}x^{6-6}y^{1-6}$ $\frac{2}{27}x^0y^{-5}$	12. $\left(2x^3y\right)^6$ $2^6 \; 3^{\circ 6} \; 6$ $2^6 x \; y$ $64x^{18}y^6$
. $\left(m^7\right)^4 \bullet m^3$	14. $p^2 \bullet \left(p^5\right)^2$	15. $\frac{x^5}{x^2}$
6. $\frac{c^4}{c^8}$	17. $\frac{5x^{-4}}{x^{-9}}$	18. $\frac{x^3 \bullet x^4}{x^2}$

$\left(\frac{6}{x^4}\right)^3$

20. $\left(\frac{xy^2}{xy^3}\right)^{-2}$

$\left(\frac{xy^3}{xy^2}\right)^2$

$(y^{3-2})^2$

$(y^1)^2$

y^2

21. $\left(\frac{3x^4}{y^6}\right)^5$

$\left(\frac{m^4}{5n^9}\right)^3$

23. $\left(\frac{3x^7}{2y^{12}}\right)^4$

24. $(8m)^0$

$5x^0y^5$

26. $2x^{-2}$

27. $5m^{-3}n^4$

$3x^{-2}y^{-5}$

29. $(x^{-2}y^2)^{-3}$

30. $(4x^4y^{-3})^{-2}$