Name: _____ Date: Jan 30 Hour: 5th

Unit 5 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 (2^3) is the base & its a factor twice

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

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^6$

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

	Expanded Form	Expanded Expanded Form	Exponential Form
a. $(7^2)^3$			
b. $(5^3)^4$	$5^3 \cdot 5^3 \cdot 5^3 \cdot 5^3$	$5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5$	5^{12}
c. $(2^2)^4$	$2^2 \cdot 2^2 \cdot 2^2 \cdot 2^2$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$	2^8
d. $(x^2)^5$	$x^2 \cdot x^2 \cdot x^2 \cdot x^2 \cdot x^2$	$x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$	x^{10}
e. $(y^3)^3$	multiply the exponents		y^9

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

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

If you ever forget the shortcut…use expanded form.

B. Showing Work without writing expanded form.

Example	Work	Answer
$(4^5)^7$	$4^{5 \cdot 7}$	4^{35}
$(x^4)^{-2}$	$x^{4 \cdot -2}$	x^{-8} or $\frac{1}{x^8}$
$(k^{-8})^{-3}$	$k^{-8 \cdot -3}$	k^{24}
$(8^2)^9$	$8^{2 \cdot 9}$	8^{18}

C. What if there is more than 1 base?

1. Complete the table

Problem	Expanded	Re-written	Answer
$(4x)^2$	$4x \cdot 4x$	$4 \cdot 4 \cdot x \cdot x$	$4^2 \cdot x^2$ or $16x^2$
$(12m)^3$	$12m \cdot 12m \cdot 12m$	$12 \cdot 12 \cdot 12 \cdot m \cdot m \cdot m$	$12^3 m^3$ or $1728m^3$
$(xy)^4$	the exponent goes to both		$x^4 y^4$

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

D. Mixed Practice

Simplify each of the following or put numbers in the boxes to make the equation true.

1. $(b^{10})^8 = b^{10 \cdot 8} = \boxed{b^{80}}$

2. $(m^{\boxed{12}})^{\boxed{2}} = m^{24}$

3. $(f^3)^6$ $f^{3 \cdot 6} = \boxed{f^{18}}$

4. $(a^5)^{\boxed{2}} = a^{\boxed{10}}$

5. $(4x^3)^2$ $4^2(x^3)^2$ $16x^{3 \cdot 2}$ $\boxed{16x^6}$

6. $(2^3)^6 \cdot 2^7$ $2^{3 \cdot 6} \cdot 2^7 = 2^{18} \cdot 2^7 = 2^{18+7} = \boxed{2^{25}}$

7. $\dfrac{(a^2b)^3}{a^4}$ $\dfrac{(a^2)^3 \cdot b^3}{a^4} = \dfrac{a^{2 \cdot 3} b^3}{a^4}$ $\dfrac{a^6 b^3}{a^4} = a^{6-4} b^3 = \boxed{a^2 b^3}$

8. $(10^2)^{\boxed{12}} = \boxed{10}^{24}$

9. $(5h^7)^3$ $5^3(h^7)^3$ $5^3 h^{7 \cdot 3} = \boxed{125h^{21}}$

10. $(x^4)^{\boxed{7}} = x^{\boxed{28}}$