Lesson 1.3 – Numbers in Exponential Form Raised to a Power

Recall that when we combine bases that are being multiplied we _____ the exponents. When we combine bases that are being divided we _____ the exponents. At the beginning of the last lesson we reviewed the rule for multiplying like bases in depth, let's take a closer look at our rule for dividing like bases.

In general, if *y* is nonzero and *m, n* are positive integers, then

$$\frac{y^m}{y^n} = y^{m-n} \qquad \text{if } m > n$$

Questions for discussion

- Why did the rule mention that *y* is "nonzero"?
- Why did they state that $m > n$?

_____

Numbers in Exponential Form Raised to a Power

$$\left(7^4\right)^6$$

A number in exponential form raised to a power.

We will use the same strategy that we used in Lesson 1 and 2 to explore what occurs when a number in exponential form is raised to a power. We will expand our expression, condense it, then look for a pattern. However, we will not expand it completely. We will use the rule we discovered in lesson 1 to help save some time.

Complete the notes on the next page.

Class Notes – Expand the expression, then condense it.

LP#1 $\left(14^5\right)^3$	$\left(9^7\right)^4$
LP#2 $\left(4.3^3\right)^6$	$\left(1.7^6\right)^5$
LP#3 $\left((-7)^2\right)^5$ If we were to express our exponential expression in standard form, would our answer be negative or positive?	$\left((-2.3)^7\right)^3$ If we were to express our exponential expression in standard form, would our answer be negative or positive?

Use what you observe above to complete the following.

$$\left(x^a\right)^b =$$

When we raise a power to a power the exponent for the new expression is the (sum/difference/product/quotient) _____ of the original exponents.

Class Notes – Simplify the following expressions. Show your work by using one of the two methods below.

Examples of how to show your work.

Expanding and Condensing

$$\left(3^8\right)^4 = 3^8 \cdot 3^8 \cdot 3^8 \cdot 3^8$$
$$= 3^{8+8+8+8}$$
$$= 3^{32}$$

Using the algorithm

$$\left(3^8\right)^4 = 3^{8\bullet 4}$$
$$= 3^{32}$$

LP#4 $\left(8^{15}\right)^6$	$\left(15^9\right)^{11}$	$\left(8.2^5\right)^7$	$\left(0.25^{17}\right)^4$
LP#5 $\left((-7)^9\right)^{13}$ If we were to express our exponential expression in standard form, would our answer be negative or positive?	$\left((-19)^5\right)^{20}$ If we were to express our exponential expression in standard form, would our answer be negative or positive?	Kyle wrote $\left(5^4\right)^6 = 5^{10}$. Is he correct? If not, show work to correct his mistake.	

Review – Simplify the following expressions. Show work.

R#1 $\left(43^{11}\right)^{7}$	$\left(4.87^{2}\right)^{16}$	Alicia is confused on whether to add or multiply the exponents when simplifying the following expression. $6^{7} \cdot 6^{13}$ What does she need to do? What answer should she get?
R#2 $\left(62^{7}\right)^{7}$	$\left(0.125^{4}\right)^{12}$	Simplify the following expression. Express your answer using a base of 9. $\left(81^{3}\right)^{7}$
R#3 $\left((-17)^{8}\right)^{5}$	$\left(0.8^{6}\right)^{30}$	Simplify the following expression. Express your answer using a base of 2. $\left(16^{2}\right)^{5}$