Lesson 18: Bases and Exponents

- Let's rewrite expressions using the property $(x^a)^b = x^{ab}$.

18.1: Math Talk: Different Bases

Decide if each expression is equal to 9^{16}.

$(9^8)^8$

$(9^4)^4$

$(3^2)^{16}$

3^{32}

18.2: What's the Factor?

1. Refer to the first table.

step	0	1	2	3	4	5	6
value	10	30	90	270			
expression	$10 \cdot 3^0$	$10 \cdot 3^1$	$10 \cdot 3^2$				

a. Predict the value in steps 4, 5, and 6.

b. By what factor does the value change . . .
   i. from step 1 to step 4?

   ii. from step 3 to step 6?

   iii. Conjecture about the factor from step 7 to step 10.

c. By what factor does the value change . . .
   i. from step 0 to step 5?

   ii. from step 1 to step 6?

   iii. Conjecture about the factor from step 10 to step 15.

2. Refer to the second table.

step	0	1	2	3	4	5	6
value	3	6	12	24			
expression	$3 \cdot 2^0$						

a. Predict the value in steps 4, 5, and 6.

b. By what factor does the value change . . .
i. from step 1 to step 3?

ii. from step 3 to step 5?

iii. Conjecture about the factor from step 10 to step 12.

c. By what factor does the value change . . .
i. from step 0 to step 3?

ii. from step 2 to step 5?

iii. Conjecture about the factor from step 10 to step 13.

3. Refer to the third table.

step	0	1	2	3	4	5	6
value	2,048	1,024	512				
expression							

a. Predict the value in steps 4, 5, and 6.

b. By what factor does the value change . . .
i. from step 1 to step 3?

ii. from step 3 to step 5?

iii. Conjecture about the factor from step 10 to step 12.

c. By what factor does the value change . . .

i. from step 0 to step 3?

ii. from step 2 to step 5?

iii. Conjecture about the factor from step 10 to step 13.

18.3: Rewriting Expressions

1. For each given expression, decide what to write in the box to create equal expressions.

given expression	equal expression 1	equal expression 2
$5 \cdot 10^8$	$5 \cdot 100^{\square}$	$5 \cdot \square^2$
$7 \cdot 16^9$	$7 \cdot \square^{4 \cdot 9}$	$7 \cdot 4^{\square}$
$(0.25)^3$	$(0.5)^{\square}$	$\square^1$
$3 \cdot (1.2)^6$	$3 \cdot 1.44^{\square}$	$3 \cdot 1.728^{\square}$
$6 \cdot 0.09^{10}$	$6 \cdot \square^5$	$6 \cdot 0.3^{\square}$

2. Write at least 3 new expressions that are equal to $4 \cdot 27^6$.