



# Bases and Exponents

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

## 21.1 Math Talk: Different Bases

Mentally decide if each expression is equal to  $9^{16}$ .

- $(9^8)^8$

- $(9^4)^4$

- $(3^2)^{16}$

- $3^{32}$



## 21.2 What's the Factor?

1. Refer to the first table.

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

- Predict the value in Steps 4, 5, and 6.
- By what factor does the value change between each of these steps?
  - from Step 1 to Step 4
  - from Step 3 to Step 6
  - Conjecture about the factor from Step 7 to Step 10.
- By what factor does the value change between each of these steps?
  - from Step 0 to Step 5
  - from Step 1 to Step 6
  - 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	$3 \cdot 2^0$						

- Predict the value in Steps 4, 5, and 6.
- By what factor does the value change between each of these steps?
  - from Step 1 to Step 3
  - from Step 3 to Step 5
  - Conjecture about the factor from Step 10 to Step 12.
- By what factor does the value change between each of these steps?
  - from Step 0 to Step 3
  - from Step 2 to Step 5
  - 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							

- Predict the value in Steps 4, 5, and 6.
- By what factor does the value change between each of these steps?
  - from Step 1 to Step 3
  - from Step 3 to Step 5
  - Conjecture about the factor from Step 10 to Step 12.
- By what factor does the value change between each of these steps?
  - from Step 0 to Step 3
  - from Step 2 to Step 5
  - Conjecture about the factor from Step 10 to Step 13.



## 21.3 Rewriting Expressions

1. For each given expression, decide what to write in the boxes 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  $4 \cdot 27^6$ .