Properties of exponents are rules used to create equivalent expressions.

Properties of exponents can only be used when exponential expressions have the same base.

$\frac{Multiplying}{3^2 \times 3^5}$	Keep the <u>base</u> , add the <b>exponents</b> .	$3^2 \times 3^5 = 3^{2+5}$ = 3 <sup>7</sup> $3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^7$
Dividing 47 42	Keep the <u>base</u> , <b>subtract</b> the <b>exponents</b> .	$\frac{4^{7}}{4^{2}} = 4^{7-2}$ $= 4^{5}$ $\frac{4 \times 4 \times 4 \times 4 \times 4 \times 4}{4 \times 4} = 4^{5}$
•	CANNOT be used s are different:	$5^2 \times 4^3$ $\frac{3^4}{4^3}$

# 

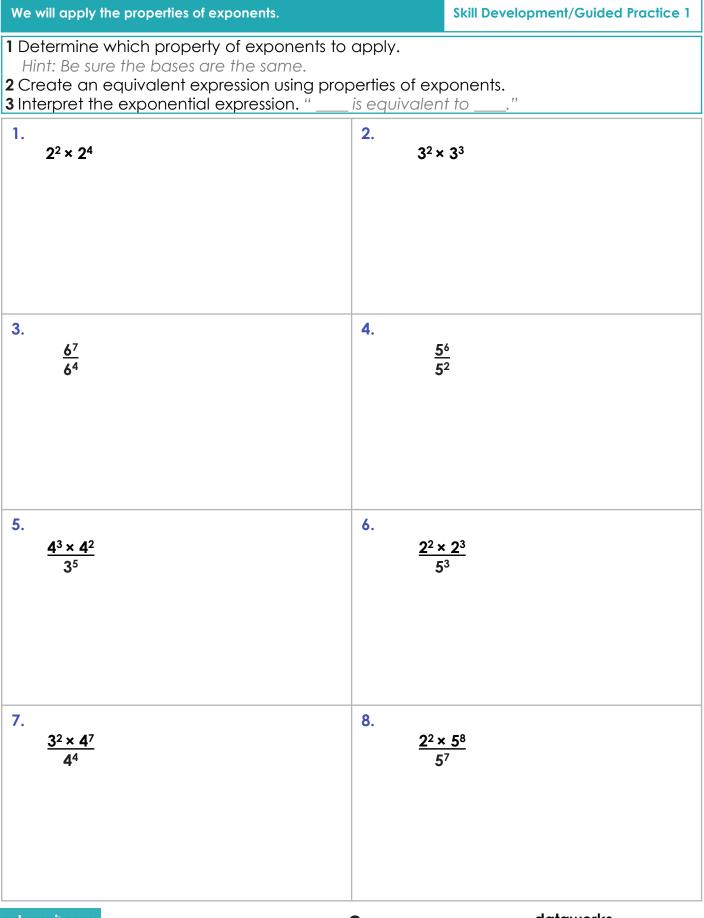
Which exponential expression can use an exponential rule? Explain.

- $3^4 \times 2^4$ Α
- $4^3 \times 4^2$ B

Which exponential expression can use an exponential rule? Explain.

- 7<sup>8</sup>
- . 75
- **9**<sup>2</sup> В
- <u>3</u>2





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Properties of exponents can only be used when exponential expressions have the same base.

$\frac{\text{Multiplying}}{3^2 \times 3^5}$	Keep the <u>base</u> , add the <b>exponents</b> .	$3^2 \times 3^5 = 3^{2+5}$ = 3 <sup>7</sup>
Dividing 47 42	Keep the <u>base</u> , <b>subtract</b> the <b>exponents</b> .	$\frac{4^{7}}{4^{2}} = 4^{7-2}$ $= 4^{5}$
<u>Raising to a power</u> (5 <sup>4</sup> ) <sup>3</sup>	Keep the <u>base</u> , <b>multiply</b> the <b>exponents</b> .	$(5^4)^3 = 5^4 \times 3$ = 5 <sup>12</sup> $5^4 \times 5^4 \times 5^4 = 5^{12}$

Exponent rules <u>CANNOT</u> be used	5 <sup>2</sup> × <b>4</b> <sup>3</sup>	<u>34</u>	5(4 <sup>3</sup> )
when the <b>bases are different</b> :	5- ~ 4°	<b>4</b> <sup>3</sup>	5(4°)

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Which exponential expression can use an exponential rule? Explain.

#### A 4<sup>3</sup> × 3<sup>4</sup>

**B** (4<sup>3</sup>)<sup>2</sup>



We will apply the properties of exponents.	Skill Development/Guided Practice 2			
<ol> <li>Determine which property of exponents to apply. Hint: Be sure the bases are the same.</li> <li>Create an equivalent expression using properties of exponents.</li> <li>Interpret the exponential expression. " is equivalent to"</li> </ol>				
9.	10.			
(3 <sup>3</sup> ) <sup>4</sup>	(5 <sup>2</sup> ) <sup>3</sup>			
11.	12.			
(2 <sup>4</sup> ) <sup>2</sup> × 2 <sup>2</sup>	(3 <sup>2</sup> ) <sup>4</sup> × 3 <sup>3</sup>			
13.	14.			
(5 <sup>3</sup> ) <sup>2</sup>	<u>(6<sup>5</sup>)<sup>2</sup></u>			
5 <sup>4</sup>	6 <sup>7</sup>			

Properties of exponents are rules used to create equivalent expressions.

Properties of exponents can only be used when exponential expressions have the same base.

<u>Any</u> base raised to a zero power is 1.	7 <sup>0</sup> = 1 15 <sup>0</sup> = 1	1 <i>,</i> 359 <sup>0</sup> = 1
Numbers with exponents can be moved between numerator and	$\frac{6^3}{1} = \frac{1}{6^{-3}}$	$\frac{1}{6^3} = 6^{-3}$
denominator by <u>reversing the sign of the</u> <u>exponent</u> .	$\frac{6^{-3}}{1} = \frac{1}{6^3}$	$\frac{1}{6^{-3}} = 6^3$

# 

Which expression is equivalent to the exponential expression **3**°? Explain.

- A 3
- B 1
- .
- **C** 0

Which expression is equivalent to the exponential expression **3**<sup>2</sup>? Explain.

A 
$$\frac{2^{3}}{1}$$
  
B  $\frac{1}{3^{2}}$   
C  $\frac{1}{3^{-2}}$ 

We will apply the properties of exponents.	Skill Development/Guided Practice 3			
<ol> <li>Determine which property of exponents to apply. Hint: Be sure the bases are the same.</li> <li>Create an equivalent expression using properties of exponents.</li> <li>Interpret the exponential expression. " is equivalent to"</li> </ol>				
15. 29 <sup>0</sup>	16. 16 <sup>0</sup>			
<b>17. 5</b> -3	18. 3 <sup>-2</sup>			
<b>19.</b> <del>1</del> <del>7</del> -2	20. 1 4 <sup>-3</sup>			
educeri.com	6 dataworks Educational Research ©2017 All rights reserved.			

We will apply the properties of expo	onents.	Closure
Skill Closure		
<ol> <li>Determine which property of Hint: Be sure the bases are t</li> <li>Create an equivalent exprese</li> <li>Interpret the exponential exponential exponential exponential</li> </ol>	he same. ssion using properties of exp	
1.	2.	3.
<b>4</b> <sup>3</sup> × <b>4</b> <sup>2</sup>	<b>(4</b> <sup>3</sup> ) <sup>2</sup>	<b>4</b> -3

#### **Concept Closure**

Caroline made a mistake applying the properties of exponents. Explain the error she made.

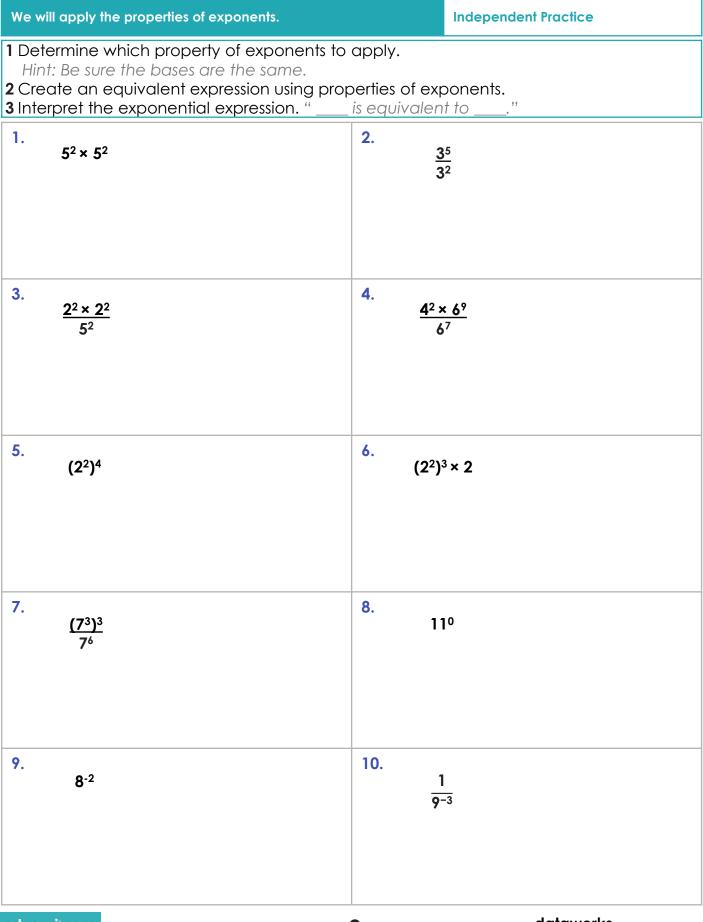
$$\frac{4^8}{2^5} = 2^{8-5} = 2^3$$

**Summary Closure** 

What did you learn today about applying properties of exponents?



negative



We will apply the properties of exponents.	Periodic Review 1
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## Create equivalent exponential expressions.

1.	<u>(94)3</u> 9 <sup>12</sup>	2. <u>6</u> <sup>4</sup>	<sup>5</sup> × 6 <sup>4</sup> 6 <sup>11</sup>
3.	(2 <sup>3</sup> ) <sup>2</sup> × 5 <sup>2</sup>	4.	<u>4</u> <sup>5</sup> <u>4</u> <sup>6</sup>
5.	(5 <sup>2</sup> ) <sup>2</sup> × 6 <sup>0</sup>	<b>6</b> . (5	<b>3</b> <sup>2</sup> ) <sup>-2</sup>

For each exponential expression, mark whether it is greater than or less than 3<sup>4</sup>.

	Greater than 3 <sup>4</sup>	Less than 3 <sup>4</sup>
7. 3 <sup>2</sup> × 3		
8. $\frac{(3^5)^2}{3^{10}}$		
9. $\frac{3^3}{3^{-4}}$		
10. (3 <sup>2</sup> ) <sup>1</sup>		
11. $\frac{3^2 \times 3^5}{3^{12}}$		
12. $\frac{1}{3^{-6}}$		





Create equivalent exponential expressions.

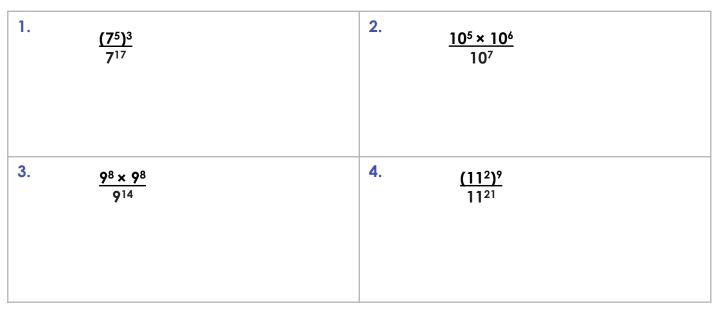


Describe the error made in applying the properties of exponents.

5. 
$$6^4 \times 6^5 = 6^{4 \times 5} = 6^{20}$$
  
 $7^3 \times 7^2 = 7^{3 \times 2} = 7^6$   
6.  $3^2 \times 2^3 = 6^{2+3} = 6^5$   
 $4^3 \times 3^1 = 12^{3+1} = 12^4$   
7.  $\frac{10^6}{5^3} = 2^{6-3} = 2^3$   
 $\frac{9^8}{3^6} = 3^{8-6} = 3^2$   
8.  $\frac{7^6}{7^3} = 7^{6+3} = 7^2$   
 $\frac{5^{10}}{5^2} = 5^{10+2} = 5^5$   
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We will apply the properties of exponents.	Periodic Review 3
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Create equivalent exponential expressions.



Select Yes or No to indicate whether the expression is equivalent to  $5^{-4}$ .

5.

A (5 <sup>-4</sup> ) <sup>2</sup> × 5 <sup>4</sup>	O Yes	O No
B $\frac{1}{5^{-3} \times 5^{-1}}$	O Yes	O No
C $5^2 \times 5^{-6}$	O Yes	O No
D $\frac{5^{-9}}{5^{5}}$	O Yes	O No

Select Yes or No to indicate whether the expression is equivalent to  $10^2$ .

6.

A $10^{1} \times 10^{1}$	O Yes	O No
B $\frac{10^2 \times 10^{-1}}{10^{-3} \times 10^{-2}}$	O Yes	O No
C $\frac{10^{-5}}{10^3}$	O Yes	O No
D (10 <sup>2</sup> ) <sup>2</sup> × 10 <sup>-2</sup>	O Yes	O No