

**Do Now:**

Expression	Expanded Expression	Number of Factors	Product as a Power
$2^6$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$	6	$2^6$
$3^4$	$3 \cdot 3 \cdot 3 \cdot 3$	4	$3^4$
$7^5$	$7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$	5	$7^5$

- How are the exponents in the first and last column related?  
*Add exponents in first column together to get the last column*
- Write the product  $a^{13} \cdot a^{21}$  as a single power.

$$a^{13} \cdot a^{21} = a^{13+21} = a^{34}$$

**4.5 Rules of Exponents**

7.NS  
7.EE

- SWBAT multiply and divide expressions with exponents.
- SWBAT understand patterns.

- Calculators: No

**Product of Powers Property**

To multiply exponents with the **same base**, add their exponents.

$$a^m \cdot a^n = a^{m+n}$$

Simplify:

$$a.) \underline{x^6} \cdot \underline{x^9} = x^{6+9} = x^{15}$$

$$b.) 3x \cdot 5x^5 = (3 \cdot 5)(x \cdot x^5)$$

$$\searrow = 15x^6$$

Simplify:

$$a.) b^{10} \cdot b^8 = b^{18}$$

$$b.) 5m^2 \cdot 6m^4 = 30m^6$$

Simplify. Write your answer as a power.

$$5^3 b^2 \cdot 5^2 b^4 = (5^3 \cdot 5^2)(b^2 \cdot b^4) \\ = 5^{3+2} b^{2+4} = 5^5 b^6$$

Simplify.

$$5^3 b^2 \cdot 5^2 b^4 = 5^5 \cdot b^6 = 3,125 b^6$$

Simplify. Write your answer as a power.

$$3^2 x^2 \cdot 3^3 x^3 = 3^5 x^5$$

Simplify.

$$3^2 x^2 \cdot 3^3 x^3 = 3^5 x^5 = 27x^5$$

How can we divide exponents?

$$\frac{a^5}{a^3} = a^{5-3} = a^2$$

$$\hookrightarrow \frac{\overset{1}{\cancel{a}} \cdot \overset{1}{\cancel{a}} \cdot \overset{1}{\cancel{a}} \cdot \overset{1}{\cancel{a}} \cdot \overset{1}{\cancel{a}} \cdot a \cdot a}{\underset{1}{\cancel{a}} \cdot \underset{1}{\cancel{a}} \cdot \underset{1}{\cancel{a}}} = a^2$$

Quotient of Powers Property

To divide powers with the same base, subtract their exponents.

$$\frac{a^m}{a^n} = a^{m-n}$$

Simplify. Write your answer as a power.

$$a.) \frac{7^6}{7^2} = 7^{6-2} = 7^4$$

Reduce

$$b.) \frac{4x^8}{10x^3} = \frac{2x^5}{5}$$

Simplify. Write your answer as a power.

$$a.) \frac{5^6}{5^1} = 5^{6-1} = 5^5$$

$$b.) \frac{7c^9}{21c^6} = \frac{1 \cdot c^3}{3} = \frac{c^3}{3}$$

Simplify.

Add

$$\frac{(3m^5) \cdot (1m^2)}{6m^4} = \frac{3m^7}{6m^4} = \frac{1 \cdot m^3}{2} = \frac{m^3}{2}$$

Reduce

Simplify:

$$\text{a.) } \frac{5x^4 * 6x^6}{10x^5} = 3x^5$$

$$\text{b.) } \frac{f^3 g^4}{fg^2} = f^2 g^2$$

$$f^{3-1} g^{4-2} = f^2 g^2$$

Evaluate the expression.

$$(2 * 2^3)^2$$

Evaluate the expression.

$$\left(\frac{3^8}{3^6}\right)^3$$

Evaluate the expression.

$$1. (4^0 * 4^2)^2$$

$$2. \left(\frac{2^9}{2^8}\right)^5$$

**Exit Pass 4.5**

Describe and correct the error in simplifying  $2^5 * 2^4$ .

$$\begin{aligned} 2^5 * 2^4 &= (2*2)^{5+4} \\ &= 4^9 \end{aligned}$$

"Don't blame the sea if you cannot catch a fish."

Working individually or with a partner, complete the workbook.

**Workbook pg.**

**Reflection of Today's Lesson****4.5 Rules of Exponents**

7.NS  
7.EE

- SWBAT multiply and divide expressions with exponents.
- SWBAT understand patterns.

• Calculators: No

**Homework**

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