Do Now:

1.) 12 - 7

2.) 4 + 7

3.) 3^2

4.) 3^3

Do Now: Copy and complete the table.

Expression	Expanded Expression	Number of Factors	Product as a Power
$2^2 * 2^4$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$	6	2^6
$3^3 * 3^1$	$3 \cdot 3 \cdot 3 \cdot 3$	4	3^4
$7^2 * 7^3$	$7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$	5	7^5

1. How are the exponents in the first and last column related? Add exponents

2. Write the product $a^{13} * a^{21}$ as a single power.

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

4.6 Rules of Exponents

7.NS
8.EE

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

- Calculators: No

base$^{\text{exponent}}$

7^6 ← 6 ← exponent

7 ← base

Product of Powers Property

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

$a^m * a^n = a^{m+n}$

same same same

Tell whether the product of powers can be used to simplify the expression.

1. $14^5 * 14^8$ Same — Yes
2. $6^2 * 5^2$ Different — No
3. $w^4 * r^9$ Different — No
4. $f^1 * f^7$ Same — Yes

$14^5 \cdot 14^8 = 14^{5+8} = 14^{13}$

$f^1 \cdot f^7 = f^{1+7} = f^8$

Simplify:

$x^4 * x^7 = x^{4+7} = x^{11}$

Simplify:

$a^5 * a^8 = a^{13}$

Simplify. Write your answer as a power.

$5^3b^2 * 5^2b^4 = (5^3 \cdot 5^2)(b^2 \cdot b^4) = 5^5 b^6$

Simplify.

$5^3b^2 * 5^2b^4 = 5^5b^6 = 3{,}125\,b^6$

$5 \cdot 5 \cdot 5 \cdot 5 \cdot 5$

$25 \cdot 25 \cdot 5$

$625 \cdot 5$

$3{,}125$

625 × 5 = 3125

Simplify. Write your answer as a power.

$3^2x^2 * 3x^3$

Simplify.

$3^2x^2 * 3x^3$

How can we divide exponents?

$\frac{a^5}{a^3} = \frac{1a \cdot 1a \cdot 1a \cdot a \cdot a}{1a \cdot 1a \cdot 1a} = \frac{a \cdot a}{1} = \frac{a^2}{1} = a^2$

Top - Bottom

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

Subtract exponents

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

b.) $\frac{4x^8}{10x^3}$ Reduce $= \frac{4^1 \cdot x^{(8)}}{10^1 \cdot x^{(3)}}$ Subtract $\frac{4 \div 2}{10 \div 2} = \frac{2}{5}$

$x^{8-3} = x^5$

$= \frac{2x^5}{5}$

Simplify. Write your answer as a power.

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

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

Simplify: $(3 \cdot 1)(m^5 \cdot m^2) = 3m^{5+2} = 3m^7$

$\frac{3m^5 * 1m^2}{6m^4} = \frac{3m^7}{6m^4}$ $m^{7-4} = m^3$ $\frac{3 \div 3}{6 \div 3} = \frac{1}{2}$

$= \frac{1 \cdot m^3}{2} = \frac{m^3}{2}$

Simplify:

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

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

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 4.6

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

$2^5 * 2^4 = (2*2)^{5+4}$

Base needs to stay the same!

$= 4^9$

Wrong!

$2^5 \cdot 2^4 = 2^{5+4}$

$= 2^9$

Right!

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

Working individually or with a partner, complete the workbook.

Workbook pg.

Reflections of Today's Lesson

4.6 Rules of Exponents

7.NS
8.EE

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

- Calculators: No

Homework

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