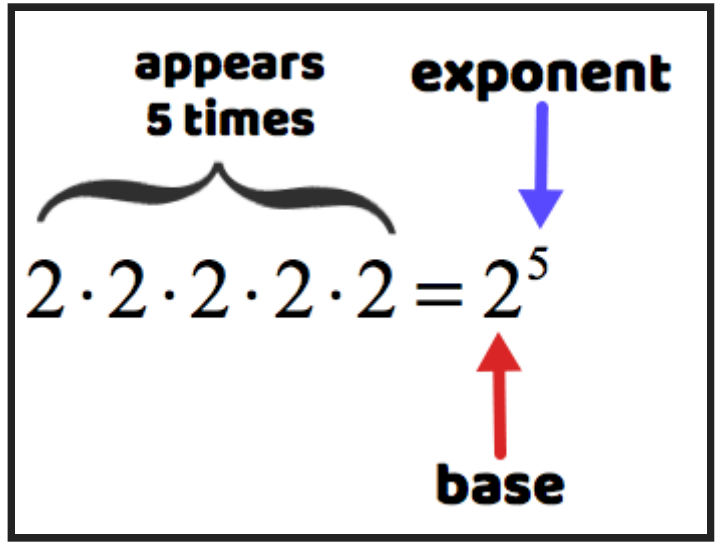
EXPONENTS: THE QUOTIENT RULE

LEARNING GOAL

1. I can divide exponential expressions using the **quotient rule.**


appears
5 times
exponent
$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^5$
base

Exponential Rules

Product Rule

$$a^x \times a^y = a^{x+y}$$

$$a^2 \times a^3 = a^5$$

Quotient Rule

$$a^x \div a^y = a^{x-y}$$

$$a^7 \div a^3 = a^4$$

Power Rule

$$\left(a^x\right)^y = a^{xy}$$

$$\left(a^7\right)^2 = a^{14}$$

Negative Rule

$$a^{-x} = \frac{1}{a^x}$$

$$a^{-4} = \frac{1}{a^4}$$

Zero Rule

$$a^0 = 1$$

Exponents Dividing Example One

$2^3 \div 2^2$ Rewrite as a Fraction

$= \frac{2^3}{2^2}$ Fully Expand the Powers out

$= \frac{2 \times \cancel{2} \times \cancel{2}}{\cancel{2} \times \cancel{2}}$ and then cancel all identical items in the top and bottom

$= 2$ ✓

Dividing Rule Example Two

$k^5 \div k^3$ Rewrite as a Fraction

$= \frac{k^5}{k^3}$ Use the Subtract Powers shortcut Rule

$= k^{5-3}$ If Bases are the same, then subtract the Powers, which is the Exponents Divide Rule.

$= k^2$ ✓

Dividing Rule Example Four

$12a^7b^5 \div 16a^2b^2$ Rewrite as a Fraction

$= \dfrac{12a^7b^5}{16a^2b^2}$ Separate Numbers & Letters

$= \dfrac{{}^{3}\cancel{12}}{{}_{4}\cancel{16}} \times \dfrac{a^7}{a^2} \times \dfrac{b^5}{b^2}$ Reduce down number Fraction and use Powers Subtract Rule

$= \dfrac{3}{4} \times a^{7-2} \times b^{5-2} = \dfrac{3}{4} \times a^5 \times b^3 = \dfrac{3a^5b^3}{4}$ ✓

Name:_____

Exponents
Worksheet 2

Directions: Complete the chart below.

		Expanded Form	Single Base and a Power
1.	$\frac{x^4}{x^3}$		
2.	$\frac{x^8}{x^5}$		
3.	$\frac{x^5}{x}$		
4.	$\frac{x^2}{x^8}$	$\frac{x \cdot x}{x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x}$	$\frac{1}{x^6}$
5.	$\frac{x}{x^5}$	$\frac{x}{x \cdot x \cdot x \cdot x \cdot x}$	$\frac{1}{x^4}$

6. Compare the 2nd and 4th columns in the table above. Describe, in words, what you notice about the relationship you see between them.

		Expanded Form	Single Base and a Power
7.	$\frac{x^3y^3}{x^3y}$		
8.	$\frac{x^2y^5}{x^3y^2}$		
9.	$\frac{6x^5}{8x^3}$	$\frac{2 \cdot 3 \cdot x \cdot x \cdot x \cdot x \cdot x}{2 \cdot 4 \cdot x \cdot x \cdot x}$	$\frac{3x^2}{4}$
10.	$\frac{12x^7y}{6x^3y^6}$		

Name:_____

Exponents
Worksheet 2

1) $\frac{b^6}{b^4}$

2) $\frac{8n^6z^3}{2n^5z^2}$

3) $\frac{5dk^3}{9d^4k^6}$

4) $\frac{kh}{7k^4h^5} = \frac{k \cdot h}{7k \cdot k \cdot k \cdot k \; h \cdot h \cdot h \cdot h \cdot h} = \frac{1}{7k^3h^4}$

5) $\frac{3w}{7w^6}$

6) $\frac{6^3}{6}$

7) $\frac{4k^3z^2}{3kz^4}$

8) $\frac{w}{w^3} = \frac{w^1}{w^3} = \frac{1}{w^2}$

9) $\frac{9g^4}{6g^6}$

10) $\frac{9^2}{9^4} = \frac{1}{9^2}$

11) $\frac{5h^4}{2h^3k^5} = \frac{5h^2}{2k^5}$

12) $\frac{2d^2}{6d}$