Name: Key Class: _____

M8-U6: Notes #2 – Exponent Operations: division, negative exponents, and zero exponent

Date: _____

Dividing Powers with the Same Bases:

You can use repeated multiplication to simplify fractions. Expand the numerator and the denominator using repeated multiplication. Then cancel like terms. Note the example below.

$$\frac{5^6}{5^2} = \frac{5\cdot5\cdot5\cdot5\cdot\cancel{5\cdot5}}{\cancel{5\cdot5}} = 5^4$$

1. Complete the following: $\frac{3^7}{3^2} = \frac{\cancel{3}\cdot\cancel{3}\cdot3\cdot3\cdot3\cdot3\cdot3}{\cancel{3}\cdot\cancel{3}} = 3^{5}$

2. Determine the relationship between the exponents on the two original exponents and the exponent on the final answer.

Rule: $\frac{a^x}{a^y} = a^{x-y}$ when dividing with like bases, keep the base and subtract the exponents

ex: $\frac{5^{10}}{5^2} = 5^8$

3. Using this relationship that you defined above, complete the following

$$\frac{x^{12}}{x^4} = x^{8}$$

Try Its: **Rewrite each item as an equivalent expression in exponential notation.**

a) $\frac{5^9}{5^6} = 5^3$

b) $\frac{(-8)^5}{(-8)^3} = (-8)^2$

c) $\frac{(6)^8}{(3)^8} = 2^8$ $2 \cdot 2 \cdot 2 \cdot 2 \cdots$

d) $\frac{x^7}{x^3} = x^4$

e) $\frac{5^9}{5^9} = 5^0$

f) $\frac{4^7}{4^7} = 4^0$ $4^{7-7} = 4^0$ $\frac{4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4}{4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4} = 1$

a number ÷ by itself = 1

$a^0 = 1$ any non-zero base raised to the zero power = 1
ex $5^0 = 1$

g) $\frac{5^6}{5^{12}} = 5^{-6}$

h) $\frac{6^7}{6^{10}} = 6^{-3}$

Tell whether each statement is correct. Show work to support your answer.

i) $7^3 \cdot 7^0 = 7^3$ true

$7^3 \cdot 1 = 7^3$

or $7^{3+0} = 7^3$

j) $2 \cdot 10^2 + 3 \cdot 10^0 = 203$ true

$2 \cdot 100 + 3$

$200 + 3$

203

k) $7^{-4} = \frac{7^0}{7^4}$ true

7^{0-4}

$= 7^{-4}$

l) $8^5 \cdot 8^{-2} = 8^{-10}$ false $8^3 \neq 10^{-10}$

8^3 b/c $5 + -2 = 3$

m) $\frac{6^7}{6^{-10}} = 6^{17}$ true

b/c $6^{7--10} = 6^{17}$

n) $(6^{-4})^5 = \frac{6^0}{6^{20}}$ true

$6^{-20} = 6^{0-20}$

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

A base w/ negative exponent is equivalent to a fraction w/ same base and a positive exponent.

ex $5^{-2} = \frac{1}{5^2}$

Try Its: **Rewrite each item as an equivalent expression in exponential notation. Answers should only have positive exponents.**

a) $4^{-5} = \frac{1}{4^5}$

b) $(-2)^{-4} = \frac{1}{(-2)^4}$

c) $\frac{3^7}{3^9} = 3^{-2} = \frac{1}{3^2}$

d) $\frac{6^0}{6^{20}} = 6^{-20} = \frac{1}{6^{20}}$

Property of Exponents Summary:

Exponential Notation	Expanded Notation	Evaluate
2^4	$2 \cdot 2 \cdot 2 \cdot 2$	16
2^3	$2 \cdot 2 \cdot 2$	8
2^2	$2 \cdot 2$	4
2^1	2	2
2^0	1	1
2^{-1}	$\frac{1}{2}$	$1/2$
2^{-2}	$\frac{1}{2 \cdot 2}$	$\frac{1}{2^2} = 1/4$
2^{-3}	$\frac{1}{2 \cdot 2 \cdot 2}$	$\frac{1}{2^3} = \frac{1}{8}$
2^{-4}	$\frac{1}{2 \cdot 2 \cdot 2 \cdot 2}$	$1/2^4 = \frac{1}{16}$

note: $2^4 \cdot 2^{-4} = 1$

or $2^0 = 1$

or $16 \cdot \frac{1}{16} = 1$

or $2^4 \cdot \frac{1}{2^4}$

$\frac{2^4}{2^4} = 1$