NAME:_____ Math _____, Period_____

Mr. Rogove Date:_____

LEARNING OBJECTIVE: We will simplify expressions that contain negative exponents. (G8M1L5)

CONCEPT DEVELOPMENT:

Recall the following exponent rules:

$x^m \cdot x^n = x^{m+n}$ multiplying

$(x^m)^n$ powers of powers

$(xy)^n = x^n y^n$ product of powers

$x^0 = 1$ zero exponent.

$8^{-3} = \frac{1}{8^3}$

Question: What should 7^{-2} mean? $\frac{1}{7^2}$

Definitions: $x^{-n} = \frac{1}{x^n}$ $8^{-3} = \frac{1}{8^3}$

$\frac{1}{x^{-n}} = \frac{1}{\frac{1}{x^n}} = \frac{1}{1} \div \frac{1}{x^n} = \frac{1}{1} \cdot \frac{x^n}{1} = x^n$

Examples: $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$ $13^{-2} = \frac{1}{169}$ $2^{-4} = \frac{1}{2^4} = \frac{1}{16}$

Rewriting Numbers Using Negative Powers of 10

$10^0 = 1$

$\frac{1}{10^1}$ $10^{-1} = 0.1$

$\frac{1}{10^2}$ $10^{-2} = 0.01$

$10^{-3} = 0.001$

$10^{-4} = 0.0001$

$10^{-4} \cdot 10^x = 1$

Example: $328.54 = (3\times10^2) + (2\times10^1) + (8\times10^0) + (5\times10^{-1}) + (4\times10^{-2})$

3 2 8 . 5 4

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Guided Practice:

Write a simplified expression that is equivalent to the given one.

3×10^{-2} $3\times\frac{1}{10^2}$ $3\times\frac{1}{100}=\frac{3}{100}=0.03$	2×10^{-4} $2\times\frac{1}{10^4}=\frac{2}{10^4}$ $\frac{2}{10000}=\frac{1}{5000}=0.0002$
Write the expanded form in exponential notation: 12:345 $(1\times10^{1})+(2\times10^{0})+(3\times10^{-1})+(4\times10^{-2})+(5\times10^{-3})$	Write the expanded form in exponential notation: 4.728
x^1y^{-4} $x\cdot y^{-4}$ $x\cdot\frac{1}{y^4}=\frac{x}{y^4}$	$3\cdot4^{-7}$ $\frac{3}{4^7}$
$\frac{19^2}{19^5}$	$\frac{17^6}{17^{-3}}$ $\frac{17^6}{1}\cdot\frac{17^3}{1}=17^9$ $\frac{17^6}{17^{-3}}=17^{6-(-3)}=17^9$

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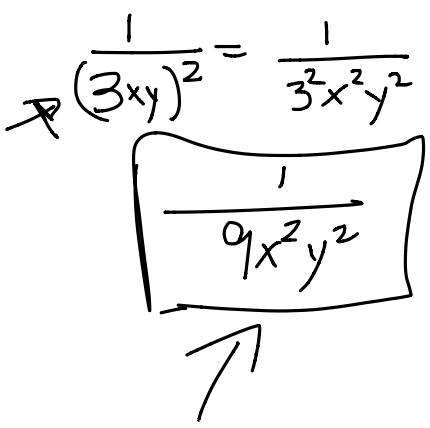
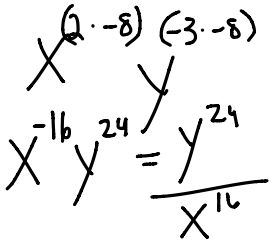
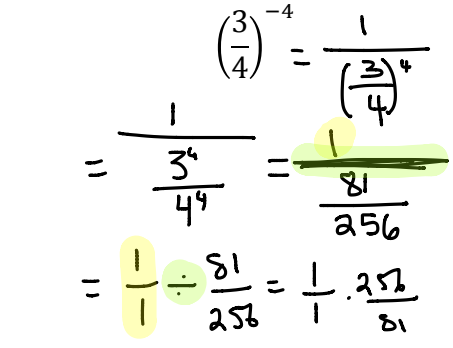
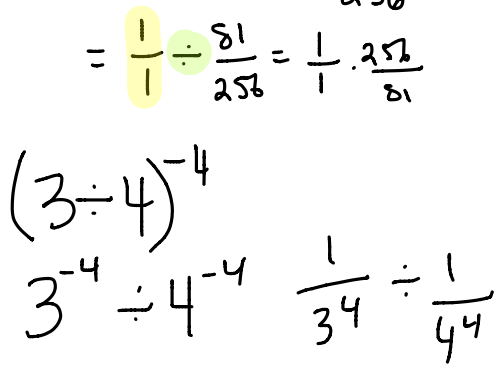
$(3xy)^{-2}$ 	$(4g)^{-5}$
$(4x^3)^{-4}$	$(x^2y^{-3})^{-8}$ 
$\left(\frac{3}{4}\right)^{-4}$  	$\left(\frac{78}{5}\right)^{-5}$

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Independent Practice:

ab^{-1}	$\frac{4^0}{w^{-4}}$
$\frac{3x^{-4}}{y}$	$\frac{n^{-5}}{n^{-8}v^2}$
$\frac{6x^{-4}y^{-4}}{4x^{-7}}$	$\frac{8a^{-1}}{2c^{-3}}$
$(4s^3t^{-3}v^0)^{-6}$	$(2^{-3}d^{-3}f^4)^{-7}$

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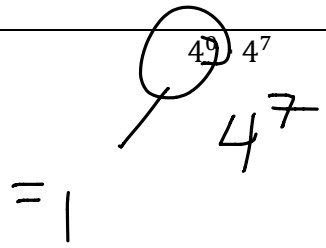
Activating Prior Knowledge:

We know how to multiply and divide exponents in the context of having zero exponents

$4^0 \cdot 4^7$  $= 1$	$\frac{5^8}{5^8}$ $5^{8-8} = 5^0 = 1$

Closure:

Identify each of the following as either negative, between 0 and 1, or more than 1.

A. $-2^2 = -4$

B. $(-2)^2 = 4$

C. $2^{-2} = \frac{1}{4}$

D. $-2^3 = -8$

E. $(-2)^{-3} = \frac{1}{(-2)^3} = -\frac{1}{8}$

Teacher Notes:

Yummy Math: Negative Exponents-Ugh!