## Lesson 2: Simplifying Expressions with Integer Exponents

## Recall:

Rule	Numeric Example	Algebraic Example
Product	$2^3 \times 2^4 = 2^7$	$a^m \times a^n = a^{m+n}$
Quotient	$5^6 \div 5^2 = 5^4$	$a^m \div a^n = a^{m-n}$
Power of a power	$(3^3)^2 = 3^6$	$(a^m)^n = a^{mn}$
Power of a product	$(2 \times 3)^4 = 2^4 \times 3^4$	$(xy)^m = x^m y^m$
Power of a quotient	$\left(\frac{3}{5}\right)^2 = \frac{3^2}{5^2}$	$\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}, y \neq 0$

Test yourself: True or False? Circle the correct choice. (Pull tab for answers)

 $(-6)^2 = -36$ 

$$x^9 \div x^{-9} = x^0$$
 true false  
 $(2y^3)^4 = 2y^{12}$  true false  
 $(5^2)(5^2) = 25^4$  true false  
 $(-1)^6 = 1$  true false

$$(3a^{2})^{2} = 9a^{4}$$
 true false  
 $(x^{5})(x^{4}) = x^{20}$  true false  
 $(4a^{2})^{0} = 1$  true false

true (false)

$$-6^2 = -36$$
 true false  
 $(x^7)(x^5) = x^1$  true false  
 $(a^4b^{-3})^{-3} = a^{-12}b$  true false

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Zero Exponent Rule

 $a^0 = 1, a \neq 0$ 

Test yourself: Is the answer equal to one, or not equal to one? Circle the correct choice. (Pull tab for answers)

$$-(-x)^0$$
  
2000 $x^0$   
 $5x^0$ 

$$\begin{array}{ccc}
=1 & \neq 1 \\
=1 & \neq 1 \\
=1 & \neq 1
\end{array}$$







**≠1** 

**(**≠1**)** 

-1<sup>50</sup>

## **Negative Exponents**

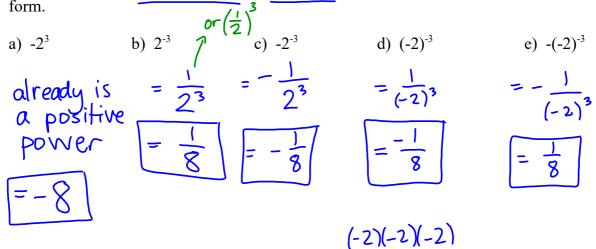
Any base raised to a **negative exponent** equals the **reciprocal of the base** to the positive exponent!

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

Ex: Ex:

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Ex 1) Rewrite as a positive power then evaluate and express in rational (fractional) form.



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Ex 2) Simplify, then evaluate each expression. Express answers in rational form.

a) 
$$(5^{-2})^3(5^3)$$
  
b)  $(6^{-2})^5(6^7)$   
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c) 
$$3^{-5} \div \left(\frac{3^{1}}{3^{5}}\right)$$

$$= 3^{-5} \div 3^{-4}$$

$$= 3^{-5 - (4)}$$

$$= 3^{-1}$$

$$= \frac{1}{3}$$

$$= \frac{2^{-24} \times 2^{3}}{2^{3}}$$

$$= 2^{-21 - (-18)}$$

$$= 2^{-3}$$

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

$$= \frac{1}{8}$$

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Ex 3) Simplify 
$$(12)^{-5}(3^{-2})^{-3}$$
 using the power of a product rule. Then evaluate.

$$2^{1} \times 3 = (2^{4})^{-2} \qquad \text{using the power of a product rule. Then evaluate.}$$

$$= (2^{2} \cdot 3)^{-5}(3^{6})$$

$$= (3^{-8})^{-8} = (3^{-8})^{-5} \times 3^{-5} \times 3^{-$$

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Ex 4) Evaluate 
$$(x^{n} - y^{n})^{n}$$
 where  $x = -1, y = -2, \text{ and } n = -3$ 

$$= \left( (-1)^{3} - (-2)^{3} \right)^{-3}$$

$$= \left( -1 - \left( \frac{1}{(-2)^{3}} \right) \right)^{-3}$$

$$= \left( -1 - \left( \frac{1}{8} \right)^{-3} \right)^{-3}$$

$$= \left( -1 + \frac{1}{8} \right)^{-3}$$

$$= \frac{-512}{343}$$

Do ALL homework questions without a calculator, unless specified otherwise.

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## HW U2L2:

1. p. 221 #4-7ace, 8,9ace,11acd, 13-14ace,15 (calculator permitted for 7,11)

2. Correct and sign unit 1 test