Name Key
Mrs. Roumbos

Date _____
8A Period _____

Zero & Negative Exponents

I. Exponents

In X^a : X is the base a is the exponent

II. Exponential vs. Expanded vs. Standard

$4^3 = 4 \cdot 4 \cdot 4 = 64$

III. Negative bases

*You have to be very careful when working with exponents whose bases are negative

* A negative base with an even exponent equals a positive number
$(-3)^2 = (-3) \cdot (-3) = 9$

* A negative base with an odd exponent equals a negative number
$(-3)^3 = (-3) \cdot (-3) \cdot (-3) = -27$

} with parentheses

* A base with a negative sign in front equals a negative number
$-3^3 = -(3 \cdot 3 \cdot 3) = -27$ $-3^2 = -(3 \cdot 3) = -9$ } NO parentheses

$-1 \cdot 3^2$
$-1 \cdot 9$
-9

Examples: Simplify the following

1) $-5^2 = -25$
$-1 \cdot 5^2$
$-1 \cdot 25$

2) $(-6)^2 = 36$
$(-6)(-6)$

3) $(-8)^3 = -512$
$(-8)(-8)(-8)$

4) $-2^4 = -16$
$-1 \cdot 2^4$
$-1 \cdot 16$

The Zero Power		
Words	Numbers	Algebra
The Zero power of any number (except 0) is 1.	$100^0 = 1$ $5^0 = 1$ $x^0 = 1$ $-5^0 = -1 \cdot (5)^0 = -1 \cdot 1 = -1$	$a^0 = 1$ if $a \neq 0$

Examples: Simplify the following

1) $7^0 = 1$

2) $15^0 = 1$

3) $8^0 = 1$

4) $x^0 = 1$

5) $(-10)^0 = (1^0)(10^0) = 1 \cdot 1 = 1$

6) $-10^0 = -1 \cdot 10^0 = -1 \cdot 1 = -1$

7) $\left(\frac{1}{3}\right)^0 = 1$

8) $(4x)^0 = (4^0)(x^0) = 1 \cdot 1 = 1$

9) $4x^0 = 4 \cdot x^0 = 4 \cdot 1 = 4$

Negative Exponents		
Words	Numbers	Algebra
Any non-zero number raised to a negative power equals 1, divided by that number raised to the positive power (reciprocal)	$5^{-3} = \frac{1}{5^3} = \frac{1}{125}$ $2^{-2} = \frac{1}{2^2} = \frac{1}{4}$ $x^{-4} = \frac{1}{x^4}$	$b^{-n} = \frac{1}{b^n}$ if $b \neq 0$

Examples: Simplify

1) $10^{-2} = \frac{1}{10^2} = \boxed{\frac{1}{100}}$

2) $x^{-7} = \boxed{\frac{1}{x^7}}$ if $x \neq 0$

3) $2^{-6} = \frac{1}{2^6} = \boxed{\frac{1}{64}}$

4) $(-3)^{-4} = \frac{1}{(-3)^4} = \boxed{\frac{1}{81}}$

5) $y^{-3} = \boxed{\frac{1}{y^3}}$, if $y \neq 0$

6) $(-2)^{-5} = \frac{1}{(-2)^5} = \boxed{\frac{1}{-32}}$

V. Mixed Examples

1) $6^{-4} = \frac{1}{6^4} = \boxed{\frac{1}{1296}}$

2) $12^0 = \boxed{1}$

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

4) $b^{-3} = \boxed{\frac{1}{b^3}}$ if $b \neq 0$

5) $347^0 = \boxed{1}$

6) $15^{-2} = \frac{1}{15^2} = \boxed{\frac{1}{225}}$

7) $20^{-2} = \frac{1}{20^2} = \boxed{\frac{1}{400}}$

8) $a^{-5} = \boxed{\frac{1}{a^5}}$, if $a \neq 0$

9) $0^1 = \boxed{0}$