Math 9 – Exponent Laws **Name:** Key.

N1- demonstrate an understanding of powers of integral bases and whole numbers by representing repeated multiplication of powers, using patterns to show that a power with an exponent of zero is equal to one and solving problems involving powers.

- I can represent powers as repeated multiplication and vice versa
- I can represent a power in standard form
- I can evaluate a whole number base to a power of zero
- I can predict if the answer of a power will be positive or negative
- I can solve problems involving powers

Outcome Score:____/4 Comments:

1. Complete the table below

Power	Base	Exponent	Repeated Multiplication	Standard Form (Evaluate)
10^4	10	4	10 x 10 x 10 x 10	10000
2^3	2	3	2 x 2 x 2	8
$(-2)^2$	-2	2	(-2) x (-2)	4
-7^2	7	2	- (7 x 7)	-49
$-(-2)^3$	-2	3	- (-2)(-2)(-2)	+8
9^0	9	0		1
$-(4)^0$	4	0		-1
-2^0	2	0		-1

2. Predict whether the following will be a positive answer or negative answer and provide reasoning.

(-8)² __+__ **why?** Even ~~odd~~ # of (-) factors = +

(-8)⁵ __−__ **why?** odd # of (-) factors = −

-8² __−__ **why?** The neg. is separate from the power and is added to the answer.

-(-8)² __−__ **why?** $(-8)^2$ is + but the extra neg in front makes it (-).

3. Evaluate the following using BEDMAS. THESE CANNOT BE SIMPLIFIED USING EXPONENT LAWS. Please show your work (step by step).

a. $(6^2 + 2^3) \div 2$

$(36 + 8) \div 2$

$44 \div 2$

22

b. $2 \times (5^3 - 37)^0$

$2 \times (1)$

2

c. $(3 - 5)^2 - (-3)^2$

$(-2)^2 - 9$

$4 - 9$

-5

N2- demonstrate an understanding of powers of integral bases and whole numbers
- I can evaluate powers using power of a product (various complexities and variables)
- I can evaluate powers using power of a quotient (various complexities and variables)
- I can evaluate powers using power of a product of a power (various complexities and variables)
- I can evaluate powers using power of a power (various complexities and variables)
- I can evaluate powers using quotient of a power (various complexities and variables)
- I can evaluate powers using the combined exponent laws

Outcome Score:_____/4 Comments:

1. **Simplify using the product of powers law (Law #1):**

   a) $2^3 \times 2^4$ 2^7 b) $(-3) \times (-3)^2 \times (-3)^3$ $(-3)^6$

2. **Simplify using the quotient of powers law (Law #2):**

   a) $(-4)^5 \div (-4)^3$ $(-4)^2$ b) $-2^{12} \div 2^7$ -2^5

3. **Simplify using the power of a power law (Law #3):**

   a) $-(5^4)^3$ -5^{12} b) $[(-2)^0]^7$ $(-2)^0$

4. **Simplify using the power of a product law (Law #4):**

   a) $[(-3) \times (-2)]^4$ $(-3)^4 \times (-2)^4$ b) $[4^2 \times 5^3]^3$ $4^6 \times 5^9$

5. **Simplify using the power of a quotient law (Law #5):**

   a) $\left(\frac{9}{2}\right)^3$ $\frac{9^3}{2^3}$ b) $\left(\frac{16^2}{25^4}\right)^2$ $\frac{16^4}{25^8}$

6. **Combined exponent laws:**
   <u>Simplify using the laws as much as possible first</u>, and <u>then</u> evaluate:

$(-3)^4 \times (-3)^6 \div (-3)^8$ $(-3)^{10} \div (-3)^8$ $(-3)^2$ $= 9$	$(-2)^2 \times (-2) + (-2)^3 \times (-2)$ $(-2)^3 + (-2)^4$ $-8 + 16$ $= +8$
$\frac{(2^4)^3 \times (2^2)^4}{(2^4 \times 2^5)^2}$ $\frac{2^{12} \times 2^8}{(2^9)^2}$ $= \frac{2^{20}}{2^{18}}$ $= 2^2 = 4$	$\frac{(-9)^0 \times 5^3 \times 6^2 \times 6}{(4)^0 \times 5^4 \div 5^2 \times 6^3}$ $\frac{1 \times 5^3 \times 6^3}{1 \times 5^2 \times 6^3}$ $1 \times 5^1 \times 6^0$ $1 \times 5 \times 1 = 5$

7. Explain or show two ways that $(3 \times 2)^2$ can be evaluated.

$(3\times2)^2$ OR $3^2 \times 2^2$

$(6)^2$ 9×4

36 36

(BEDMAS) (Laws)

8. Identify and correct any errors in these answers. Explain how you think the errors occurred.

a) $2^3 \times 4^2 = 8^5$

Mult. bases and Added exp. Can only add exp. if bases are the same.

b) $1^2 \times 1^4 - 1^3 = 1^3$

Added exp but then Subtracted the 3 exp. Can only do that for ÷ questions, not subtraction.

c) $\frac{4^2 \times 4^4}{4^2 \times 4^1} = 4^2$ $\frac{4^6}{4^3}$

Added exp on top + bottom, but then ÷ exp. instead of (−) them. Should be.

4^3

9. If you're done early, tell me one thing you have learned about exponents that you didn't get a chance to show me on this test.