Lesson 3-1 (PART 1)

Exponents and Order of Operations

Warm-Up: Simplify.

$25 - (7 \cdot 2) =$

$14 \div 2 \cdot (4 - 1) =$

Exponent	Tells you how many times a number (base) is used as a factor (multiplied by itself).	Example: 2^4 x^{10} $(-3)^3$ y^2

exponent ↓

$5^3 = 5 \cdot 5 \cdot 5 = 125$

↑ base

How do we read these?

7^4 seven to the 4th power

8^{10} eight to the tenth power

4^2 four squared OR four to the 2nd power

x^3 x cubed OR x to the 3rd power

Write using an exponent.

$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 =$ 3^5

9 27 81 243

81 × 3 = 243

$11 \cdot 11 \cdot 11 =$ 11^3

121 121 1331

121 × 11: 121, 1210, 1331

$a \cdot a \cdot a =$ a^3

What if a number is raised to the power of 1? $x^1 =$ x **or** $2^1 =$ 2

What if a number is raised to the power of 0? $x^0 =$ 1 **or** $2^0 =$ 1

Practice. You may use a calculator.

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

$16 \cdot 4 = 64$

$10^2 =$ $10 \cdot 10 = 100$

$(2+3)^2 =$ $5^2 = 5 \cdot 5 = 25$

$14^0 =$ 1

$2^4 =$ $2 \cdot 2 \cdot 2 \cdot 2$

$4 \cdot 2 = 8 \cdot 2 = 16$

Evaluate each expression for *m*=3, *n*=2 and *r*=4.

$m^2 + n^2$

$3^2 + 2^2$

$9 + 4 = 13$

$(m+n)^2$

$(3+2)^2$

$5^2 = 25$

$n^2(m+r)$

$2^2(3+4)$

$2^2(7)$

$4(7) = 28$

Exponents with Negative Numbers

Are these the same thing?

-3^2

↓

$-1 \cdot 3^2$

$-1 \cdot 9$

$\boxed{-9}$

$(-3)^2$

$-3 \cdot -3$

$\boxed{9}$

When an exponent is present with a negative symbol WITHOUT parentheses, the answer is always NEGATIVE.

Is there a pattern?

$(-2)^1 = \boxed{-2}$ −

$(-2)^2 = -2 \cdot -2 = \boxed{4}$ +

$(-2)^3 = -2 \cdot -2 \cdot -2 = \boxed{-8}$ −

$(-2)^4 = -2 \cdot -2 \cdot -2 \cdot -2 = \boxed{16}$ +

$-8 \cdot -2$

When an exponent is present with a negative symbol <u>INSIDE</u> parentheses, the answer is:

NEGATIVE when exponent is ODD

POSITIVE when exponent is EVEN

You Try! Decide whether the ~~answer~~ exponent is EVEN or ODD, then simplify.

$(-2)^6$ (EVEN) or ODD $(-2)^6 = +64$

$(-3)^3$ EVEN or (ODD) $(-3)^3 = -27$

$(-1)^{97}$ EVEN or (ODD) $(-1)^{97} = -1$

Evaluate each expression for *m*=3, *n*=2 and *r*=4.

$-m^2$

$-3^2 = \boxed{-9}$

$(-r)^3$

$(-4)^3 = \boxed{-64}$

$(n-r)^5$

$(2-4)^5$

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

Solve.

$-6^1 = -6$

$(-2)^4 = 16$

$(-3)^2 = 9$

$-4^3 = -64$

$(-5)^0 = 1$