Algebra 1 Notes...

Date: _____

8.1 Using the "Product Rule" for Exponents

LIKE TERMS have the same variables raised to the same exponents
EX $5x + 2x = 7x$

VOCABULARY

Terms are seperated by Addition + Subtraction

EXAMPLE (3 terms): $3x - 4y + 10$

Factors are seperated by multiplication SIGNS

EXAMPLEs: (a) 4 Numeric Factors: $3 \cdot 3 \cdot 3 \cdot 3$

(b) 4 Factors with Variables $4 \cdot x \cdot y \cdot z$

FACTORS ARE USED WITH EXPONENTS

EX $3 \cdot 3 \cdot 3 \cdot 3 \rightarrow 3^4$

Expression: are Combination of operations $(+, -, \times, \div)$, numbers, variables and symbols of inclusion $( ), [ ]$

EXAMPLE: $2(3+5) = 2(8) = 16$ (EVALUATE)

To find the answer to an expression problem (Fill in).... "EVALUATE" **an expression**

Expressions with exponents

1) Label the Base, Exponent

2^5 — Exponent, Base

2^5 is called the power

1) **Expand** Power to a product of Factors

$2^5 \rightarrow 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

2) **Evaluate** the Power 32

3) **Calculator Command to Evaluate the Power**

$2^5 \rightarrow 2 \wedge 5 = 32$

mentally: 2·2, 4·2, 8·2, 16·2, 32

EXAMPLE 1: Write in words, expand to a product of factors, and evaluate. (FIND THE VALUE)

	Power (implied 1)	Words	Expand to a product of factors	Evaluate
a.	10^1	10 TO THE 1 ST	10	$10^1 = 10$
b.	12^2	12 SQUARED	$12 \cdot 12$	$12^2 = 144$
c.	5^3	5 CUBED	$5 \cdot 5 \cdot 5$	$5^3 = 125$

EXAMPLE 2: Evaluate powers with negative numbers. (MUST USE ( )'s when substituting)

a) Evaluate X^4 when X = -2...

$X^4 = (-2)^4$ — Show substitution.

$(-2) \cdot (-2) \cdot (-2) \cdot (-2)$ — Expand to a product of factors

16 — Evaluate and circle answer

b) Evaluate X^3 when X = -2...

$X^3 = (-2)^3$ — Show substitution.

$(-2) \cdot (-2) \cdot (-2)$ — Expand to a product of factors

-8 — Evaluate and circle answer

Rules:

1. Neg # raised to a EVEN exponent is Positive
   $(-2)^4 \rightarrow +\#$
2. Neg # raised to an ODD exponent is Negative
   $(-2)^3 \rightarrow -\#$

Algebra 1 Notes...

Using the "Product Rule"

EXPLORATION:

a) **Expand both numeric powers:** $4^3 \cdot 4^2 = (\underline{4 \cdot 4 \cdot 4}) \cdot (\underline{4 \cdot 4})$

b) **Then rewrite as a single power:** $= \underline{4^5}$ Simplify. Base = 4

THE PRODUCT RULE FOR POSITIVE NUMERIC EXPONENTS:

Words: To multiply powers having the same base, ADD EXPONENTS.

Example 1: **Simplify(SHOW WORK):** $2^2 \cdot 2^3 = \underline{2^{2+3}} = \underline{2^5}$ ← Exponential form

Base = 2

Then Evaluate: $= \underline{32}$ ← EVALUATE

Example 2: **Simplify(SHOW WORK):** $2^1 \cdot 2^3 = \underline{2^{1+3}} = \underline{2^4}$ (implied 1)

BASE = 2

Then Evaluate: $= \underline{16}$

THE PRODUCT RULE FOR POSITIVE NUMERIC EXPONENTS:

Words: To multiply powers having the same base, ADD EXPONENTS

Example 3: **Simplify(SHOW WORK):** $(-2)^2 \cdot (-2)^4 = \underline{(-2)^{2+4}} = \underline{(-2)^6}$ Answer is Pos (+)

BASE: −2

Then Evaluate: $= \underline{64}$

Example 4: **Simplify(SHOW WORK):** $(-5)^1 \cdot (-5)^2 = \underline{(-5)^{1+2}} = \underline{(-5)^3}$

BASE: −5

Then Evaluate: $= \underline{-125}$ Answer is Neg (−)

THE PRODUCT RULE FOR VARIABLE EXPONENTS:

Words: To multiply powers having the same base, ADD THE EXPONENTS. (MULT. NUMBERS)

Example 5: **Simplify(SHOW WORK):** $x^4 \cdot x^6 = \underline{x^{4+6}} = \underline{x^{10}}$

Base = x

Example 6: **Simplify(SHOW WORK):** $5y^1 \cdot 8y^5 = \underline{5 \cdot 8\, y^{1+5}} = \underline{40y^6}$ (implied 1)

Base = y

Example 7: **Simplify(SHOW WORK):** $3x \cdot y^5 \cdot 5x^2 = \underline{3 \cdot 1 \cdot 5 \cdot x^{1+2} y^5} = \underline{15x^3y^5}$

Bases = x and y