Name: Key
8A: Algebra 1

Date:_____
Period_____

Multiplying Monomials / Polynomials

Laws of Exponents Relating to Multiplication

When multiplying like bases, keep the base and add the exponents.

$x^a \bullet x^b =$ x^{a+b}

Examples:

1) $x^2 \bullet x^3 =$ x^5 2) $y^4 \bullet y^1 \bullet y^5 =$ y^{10} 3) $m^6 \bullet m^x =$ m^{x+6} 4) $k^{3y} \bullet k^{5y} =$ k^{8y}

Laws of Exponents Relating To Powers

When an exponent is applied to a power (a base with an exponent), the result is the same as if the exponents were multiplied.

$(x^a)^b =$ $x^{a \cdot b} = x^{ab}$

Examples:

1) $(x^2)^3 =$ x^6 2) $(y^5)^4 =$ y^{20} 3) $(m^{3x})^6 =$ m^{18x} 4) $(p^7)^x =$ p^{7x}

5) $(f^3)^2 \bullet (f^4)^2 =$ _____
$f^6 \cdot f^8 = f^{14}$

6) Find the volume of a rectangular prism whose length is x^2, whose width is x, and whose height is x^3.
$V = L \cdot W \cdot H$ $V = x^2 \cdot x \cdot x^3$ $V = x^6$

For all numbers x, y, and integers, n

$$(xy)^n = x^n y^n$$

"Notice: each factor of the product gets raised to the new power."

$(6x)^0$
$6^0 x^0$
$1 \cdot 1 = 1$

Examples:

1) $(-3x^2)^3 =$ _____
$(-3)^3 \cdot (x^2)^3$ or $(-3x^2)(-3x^2)(-3x^2)$
$-27x^6$ $-27x^6$

2) $(2x)^2 (-y^2)^3 =$ _____
$(2)^2 \cdot (x^1)^2 \cdot (-1)^3 (y^2)^3$ or $(2x)(2x)(-y^3)(-y^3) =$ $-4x^2y^6$
$4 \cdot x^2 \cdot -1 \cdot y^6$
$-4x^2y^6$

3) $(5x^2y^3)^4 =$ _____
$(5)^4 \cdot (x^{2 \cdot 4}) \cdot (y^3)^4$
$625 \cdot x^8 \cdot y^{12}$ or $(5x^2y^3)(5x^2y^3)(5x^2y^3)(5x^2y^3) =$ $625x^8y^{12}$
$625x^8y^{12}$

REMEMBER:

Rule: Anything to the 0 power always equals 1

Ex. $15^0 = 1$
$257^0 = 1$

Negative numbers as exponents have a special meaning. The rule is as follows:

$\text{Base}^{\text{negative exponent}} = \frac{1}{\text{base}^{\text{positive exponent}}}$ **Example:** $x^{-3} = \frac{1}{x^3}$ (Reciprocal of the base)

To Multiply Monomials

1. Multiply the numerical coefficients.
2. When variable factors are powers with the same base, multiply by adding exponents.
3. Multiply (combine) the products obtained in steps 2 and 3.

Examples:

1) $(8xy)(3z) = 24xyz$ 2) $(-4a^3)(-5a^5) = 20a^8$ 3) $(-6y^3)(y) = -6y^4$ 4) $(3a^2b^3)(4a^3b^4) = 12a^5b^7$

5) $(6c^2d^3)(-\frac{1}{2}d) = -3c^2d^4$

Multiplying a Polynomial by a Monomial

To multiply a polynomial by a monomial, use the distributive property: multiply each term of the polynomial by the monomial and write the result as the sum of these products.

Examples:

*multiply the coeff * Add the exponents

1) $3(6c + 3d) = 18c + 9d$

2) $4x(5x + 6) = 20x^2 + 24x$

3) $3xy(x^2 + xy + y^2) =$ $3x^3y + 3x^2y^2 + 3xy^3$

4) $5r^2s^2(-2r^2 + 3rs - 4s^2) =$ $-10r^4s^2 + 15r^3s^3 - 20r^2s^4$

☆ Monomials ☆ ☆ Don't Distribute ☆ Steps: (1) Multiply the coefficient (2) Add the exponents of the like bases

More Practice: Find the following products:

1) $(4x^2y^3)(2xy^5)$

$8x^3y^8$

2) $(5r^2s)(2rs^2)$

$10r^3s^3$

3) $(-3pt^3)(-6p^2t^2)$

$18p^3t^5$

4) $(3yt)(2y^3t)$

$6y^4t^2$

5) $(5ab^2c)(4a^3b^3c)$

$20a^4b^5c^2$

6) $(-2x^4y^3)(-xy^2)$

$2x^5y^5$

7) $(7p^3r^2t)(3pr^4t^2)$

$21p^4r^6t^3$

8) $(-4r^3x^2)(3r^4x)$

$-12r^7x^3$

☆ Distribute ☆ Steps: (1) Multiply the coefficients (2) Add the exponents of the like bases

9) $3x(2x + 9)$

$6x^2 + 27x$

10) $5ab(4a^2b + 2ab - 4a)$

$20a^3b^2 + 10a^2b^2 - 20a^2b$

11) $5x(3x - 2) - x(1-3x)$

$15x^2 - 10x - 1x + 3x^2$

$18x^2 - 11x$

12) $x(x + 5) - 2(x + 5)$

$x^2 + 5x - 2x - 10$

$x^2 + 3x - 10$

13) $x(x + y) - y(x + y)$

$x^2 + xy - xy - y^2$

$x^2 - y^2$

14) $2xy^3(3x^2 + 4xy - y^2)$

$6x^3y^3 + 8x^2y^4 - 2xy^5$