MTH1W

Math 9 – Unit 2: Algebra One Name: Mr. Hagen

Lesson 2.4: More Distributive Property and Powers of Monomials Date: Sept 27, 2021

Learning Goal: We are learning to expand and simplify more complicated expressions.

Let's start off by continuing our lesson on the Distributive Property. Take a look at the following questions:

Expand AND simplify (put your answers in descending order):

a) $3x(4x^2-7x+2)+4x^2(2x-3)$

$= 12x^3 - 21x^2 + 6x + 8x^3 - 12x^2$

$= 20x^3 - 33x^2 + 6x$

b) $-4y^2(3y^2-5)-5y^3(6+y)$

$= -12y^4 + 20y^2 - 30y^3 - 5y^4$

$= -17y^4 - 30y^3 + 20y^2$

c) $3mn(2m-7n)-5m^2(4n+8)+6n^2(3m-n)$

$= 6m^2n - 21mn^2 - 20m^2n - 40m^2 + 18mn^2 - 6n^3$

$= -14m^2n - 3mn^2 - 40m^2 - 6n^3$

Now we are going to go back to discussing monomials. How do we simplify $(3x^2y^5)^3$? This is called a monomial raised to a power. How does the outside exponent affect the question? First, how does it work with just a number?

Simplify $(4^3)^2$ = $(4\times4\times4)^2$ = $(4\times4\times4)\times(4\times4\times4)$ = 4^{6}

The initial exponents were *3* and *2*, with the final exponent a 6. So, 3 x 2 = 6! This leads to our second exponent law. When raising a power to a power, multiply the exponents. Try it out!

Power Law

a) $(x^4)^5$ = x^{20}

b) $(y^2)^8$ = y^{16}

c) $(m^3n^6)^4$ = $m^{12}n^{24}$

That's all well and good (hopefully), but how do you handle a question with a coefficient?

Consider the expression from before, $(3x^2y^5)^3$. Expand it without using the laws.

$= (3x^2y^5)(3x^2y^5)(3x^2y^5) = 27x^6y^{15}$

multiply $3\times3\times3 = 3^3$

The coefficient was just raised to the power of 3! Awesome. Try out some more, this time following the laws.

a) $(2x^4y^2)^5$ = $32x^{20}y^{10}$

b) $(-3m^7n)^2$ = $9m^{14}n^2$

c) $(5a^2b^3c^4d^5)^6$ = $15625a^{12}b^{18}c^{24}d^{30}$

$-3^2 = -9$

$\rightarrow (-3)^2 = 9$

Exponents first

d) $(3x^2y^5)^2(2xy^3)$

$= (9x^4y^{10})(2x^1y^3)$

$= 18x^5y^{13}$

e) $(-4m^3n^2)^3(3m^4n^3)^2$

$= (-64m^9n^6)(9m^8n^6)$

$= -576m^{17}n^{12}$

f) $(5x^3y^6)^4(-8x^{10}y^{13})^0$

$= (625x^{12}y^{24})(1)$

$= 625x^{12}y^{24}$

$-[8]^0 = -1$

$\rightarrow (-8)^0 = 1$

g) $(3x^0y^2)(4x^2y^3)$

$= 12x^2y^5$

Success Criteria:

- I can use the distributive property to multiply a polynomial with a monomial
- I can use the distributive property to combine multiple variables into a single term
- I can simplify a monomial raised to a power by multiplying the exponents of each variable
- I can recognize that when a coefficient is raised to a power, it is NOT NOT NOT multiplied
- I can understand that raising to the power of zero equals one.