Math 9 – Unit 2: Algebra One

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Lesson 2.3: Multiplying Monomials

Date: Sep 23, 2025

Learning Goal: We are learning to multiply with monomials.

Now that we know how to add and subtract like terms, let's look at how to multiply terms together (whether they are like terms or not!). Today, we will focus our attention on multiplying monomials.

How would you simplify $(3x^2y)(5x^3y^2)$? Let's break it down and first look at something more familiar.

How would you evaluate 3^4? $3\times3\times3\times3 = 81$

In the same way, $5\times5\times5\times5\times5\times5\times5$ can be simplified as 5^7

$(3x^2y)(5x^3y^2) = (3)(x)(x)(y)(5)(x)(x)(x)(y)(y) = 15x^5y^3$

Therefore, since variables are just numbers disguising themselves as letters, we can apply the exact same math to them.

If we had to simplify $(n^3)(n^2)$, we can rewrite each bracket as $(n)(n)(n)(n)(n)$, then we can simplify it to n^5. Notice that we started with the exponents of *3* and *2*, and we ended with an exponent of 5. This leads to the first rule of exponents:

When multiplying the same variables together, ADD the exponents.

Try out these examples:

a) $(x^5)(x^{10})$

$= x^{15}$

b) $(a^2b^3)(a^4b^8)$

$= a^6b^{11}$

c) $(2w^3x^1y^7)(5w^2x^9y^2)$ *WHOAH! 2 and 5 aren't variables!*

$= 10w^5x^{10}y^9$

d) $(-4abc)(6b^4c^3)(-3c^2b^8a^3)$

$= 72a^4b^{13}c^6$

Now that we can multiply a monomial by a monomial, how would we multiply a monomial by a polynomial, such as $3x^2(2x^3+5x-4)$? To multiply, you need to use DISTRIBUTIVE PROPERTY. In a nutshell, you "distribute" the monomial to each term via multiplication.

Example: Simplify $3(4+5)$ first with BEDMAS, then by using the distributive property.

DISTRIBUTIVE

$3(4+5)$

$= 12+15$

$= 27$

BEDMAS

$3(4+5)$

$= 3(9)$

$= 27$

Again, if it works with numbers, it has to work with variables!

Examples: Expand (that's the word we use to mean to "grow" the expression and to get rid of the brackets):

a) $2x(3x-7)$ $(2x)(3x)$ $(2x)(-7)$

$= 6x^2-14x$

b) $3x^2(2x^3+5x-4)$

$= 6x^5+15x^3-12x^2$

c) $-5m^4n^3\left(2mn^1+3m^3n^6-1m^2n^{10}\right)$

$= -10m^5n^4 - 15m^7n^9 + 5m^6n^{13}$

d) $\frac{2}{5}x^3\left(\frac{3}{2}x^4-\frac{2}{7}x^2+\frac{1}{3}\right)$

$= \frac{3}{5}x^7 - \frac{4}{35}x^5 + \frac{2}{15}x^3$

WORKING

① $\left(\frac{2}{5}x^3\right)\left(\frac{3}{2}x^4\right) = \frac{6}{10}x^7 = \frac{3}{5}x^7$

② $\left(\frac{2}{5}x^3\right)\left(-\frac{2}{7}x^2\right)$

③ $\frac{2}{5}x^3\left(\frac{1}{3}\right)$

Success Criteria:

- I can multiply like variables by adding the exponents
- I understand the difference between multiplying coefficients and multiplying variables
- I can use the distributive property to multiply a polynomial with a monomial