

Math 9 – Unit 2: Algebra One

Lesson 2.4: Powers of Monomials and Dividing Monomials

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Learning Goal: We are learning to do powers of monomials and divide 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?

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

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

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

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

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

Powers of monomials
 - rule.
 ex:

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

Consider the expression from before, $(3x^2y^5)^3$. That big three is just a regular number, and regular numbers use regular math.

$$3^3 = 27 \\ = 27x^6y^{15}$$

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

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

$$\text{b) } (-3m^7n)^2 \quad \begin{array}{l} -3^2 = -9 \\ (-3)^2 = (-3) \times (-3) \\ = 9 \end{array} \\ = 9m^{14}n^2$$

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

We've added, subtracted, multiplied, and even raised monomials to powers. All that is left is dividing by monomials. First, let's develop a rule with numbers.

Simplify $\frac{4^5}{4^3} = \frac{\cancel{4} \times \cancel{4} \times \cancel{4} \times 4 \times 4}{\cancel{4} \times \cancel{4} \times \cancel{4}} = 4^2$ $5 - 3 = 2$

This leads to our 3rd exponent law. When dividing, subtract the exponents. Time to put it into practice! *from the same variable*

a) $\frac{x^8}{x^5}$ subtract

$= x^3$

b) $\frac{y^{72}}{y^{46}}$

$= y^{26}$

c) $\frac{m^5 n^3}{m^2 n}$

$= m^3 n^2$

d) $\frac{18p^7 q^9}{3p^2 q^2}$ $18 \div 3$

$= 6p^5 q^7$

Dividing Monomials
-rule
ex!

Success Criteria:

- 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 divide like variables by subtracting their exponents
- I can understand the difference between dividing coefficients and dividing variables