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**Lesson #5: Dividing Monomials**

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**Learning Goal**: We are learning to divide by monomials.

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 $\dfrac{4^5}{4^3}$ = $\dfrac{4 \times 4 \times 4 \times 4 \times 4}{4 \times 4 \times 4}$ = $4^2$

This leads to our 4$^{th}$ exponent law. When dividing, ___Subtract___ the exponents. Time to put it into practice!

a) $\dfrac{x^8}{x^5}$

$= x^3$

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

$= y^{26}$

c) $\dfrac{m^5 n^3}{m^2 n^1}$

$= m^3 n^2$

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

$= 6 p^5 q^7$

The final step is to divide a monomial into a polynomial, such as $\dfrac{4x^5 - 2x^3 + 6x^2}{2x^2}$. However, first let's look back

at adding fractions so we can see an integral step that we will need to use:

$\dfrac{1}{2} + \dfrac{3}{4} + \dfrac{5}{8}$ $= \dfrac{4}{8} + \dfrac{6}{8} + \dfrac{5}{8}$ $= \dfrac{4 + 6 + 5}{8}$ $= \dfrac{15}{8}$

**Keep in mind when doing the following questions that the denominator gets applied to all the terms in the numerator.**

a) $\dfrac{4x^5 - 2x^3 + 6x^2}{2x^2}$

$= \dfrac{4x^5}{2x^2} - \dfrac{2x^3}{2x^2} + \dfrac{6x^2}{2x^2}$    $= x^0 = 1$

$= 2x^3 - x + 3$

b) $\dfrac{16x^3 y^5 + 8x^2 y^4}{4x^2 y}$

$= 4x y^4 + 2y^3$

c) $\dfrac{40a^3b^6 - 50a^2b^3 + 10ab}{10ab}$

$= 4a^2b^5 - 5ab^2 + 1$

d) $\dfrac{9x^7 + 27x^5 - 15x^4}{-3x^3}$

$= -3x^4 - 9x^2 + 5x$

e) $\dfrac{192r^{78}s^{34} - 144r^{65}s^{53} - 256r^{98}s^{23} + 80r^{88}s^{45}}{16r^{33}s^{21}}$

$= 12r^{45}s^{13} - 9r^{32}s^{32} - 16r^{65}s^{2} + 5r^{55}s^{24}$

**Success Criteria**:
- I can divide like variables by subtracting their exponents
- I can understand the difference between dividing coefficients and dividing variables
- I can divide the monomial into each term of a polynomial separately
- I can recognize that when you divide two identical monomials, the result is one.