

### 1.9 Division of Algebraic Expressions

To find the quotient of one monomial divided by another monomial remember the laws of exponents. **\*\*quotient of powers property\*\***

Examples (a monomial divided by monomial "of same base")

divide coefficients : subtract exponents

$$\frac{8x^3y^2}{-2xy}$$

$$\frac{4 \cdot x^2}{2 \cdot x}$$

Divide  $25a^4$  by  $5a^2$

$$\left( \frac{2a^2b^3}{14a^4c} \right)^2$$

$$\left( \frac{5a^{-3}b^2}{10ab^{-4}} \right)$$

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Examples (a multinomial ( polynomial ) divided by monomial "of same base")

divide each term by the binomial

$$\frac{8x^2y^3 - 28x^3y^2}{4xy^2}$$

$$\frac{4x^2y^3 + 2x^4y^2 - 3x}{2x^4}$$

$$\frac{2x^2y + 4x^3y^2}{6xy} = \frac{2x^2y}{6xy} + \frac{4x^3y^2}{6xy}$$

$$\frac{x}{3} + \frac{2x^2y}{3}$$

$$\frac{(2x^2y * 4x^3y^2)}{6xy}$$

$$\frac{8x^5y^2}{6xy}$$

$$\frac{4x^4y^2}{3}$$

$$\frac{2x^2y * 4x^3y^2}{6xy}$$

$$\frac{1x \cdot 4x^3y^2}{3} = \frac{4x^4y^2}{3}$$

**Degree of a Term**

For a term with one variable, the degree is the variable's exponent.  
 With more than one variable, the degree is the sum of the exponents of the variables.

term	degree
$(2x^2)^4$	8
$2x^2y^1$	3
$186x^5y^2z^1$	8

**Degree of a Polynomial**

Degree of the monomial with the greatest degree.

Polynomial	degree
$x^2 + 2x - 15$	2
$2x^1y^3 + 5x^1y^2 - 4$	4

**Decreasing order of powers**

setting the dividend and divisor in order by variable powers from greatest to least.

$$4x^3 - 5x^4 + 6x - 2x^2 - 5$$

$$-5x^4 + 4x^3 - 2x^2 + 6x - 5$$

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Procedure for dividing a polynomial by a polynomial:

(think long division)

1. Write both the dividend and the divisor in decreasing order of powers.
2. For missing terms write a coefficient of 0.
3. Set up the problem as long division.
4. Divide the first term in the dividend by the first term in the divisor.
5. Multiply the divisor by this first term of the quotient. Write the product below the dividend with like terms under like terms. Subtract the product from the dividend.
6. Repeat the last two steps until the power of the new dividend is less than the power of the divisor.

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$(6x^3 - 3)$        $6x^3 + 0x^2 + 0x - 3$        $6x^2 - 3$   
 $6x^2 + 0x - 3$

$$(6x^2 + x - 2) \div (2x - 1)$$

$2 \overline{) 10 \frac{1}{2}}$   
 $2x - 1$

$2x^2 + 4x + 2 \left( \frac{3}{2x-1} \right)$   
 $4x^3 + 6x^2 + 0x + 1$   
 $- 4x^3 + 2x^2$   
 $8x^2 + 0x$   
 $- 8x^2 + 4x$   
 $4x + 1$   
 $- 4x + 2$   
 $3$

