

Dividing Monomials/Polynomials

Laws of Exponents Relating To Division

When dividing like bases, keep the base and **subtract** the exponents.

$$x^a \div x^b = x^{a-b}$$

Examples:

1) $x^9 \div x^5 = \boxed{x^4}$

2) $y^5 \div y^1 = \boxed{y^4}$

$\frac{c^5}{c^5} = c^0 = 1$

3) $c^5 \div c^5 = \boxed{1}$

4) $10^5 \div 10^3 = \boxed{10^2}$

5) $y^{6b} \div y^{4b} = \boxed{y^{2b}}$

Dividing a Monomial by a Monomial

PROCEDURE. To divide monomials:

1. **Divide their numerical coefficients.**
2. When variable factors are powers with the **same base**, divide by **subtracting exponents.**
3. Multiply (combine) the quotients obtained in steps 1 and 2.

Examples:

1) Divide $18x$ by 2
 $\frac{18x}{2} = \boxed{9x}$

2) Divide $14x^2y^2$ by -7
 $\frac{14x^2y^2}{-7} = \boxed{-2x^2y^2}$

3) $(8cd) \div (-4c)$
 $\frac{8cd}{-4c} = \boxed{-2d}$
 $\frac{c^1}{c^1} = c^0 = 1$

4) $\frac{15(c-d)}{-5(c-d)}$
 $\boxed{-3}$

5) $\frac{-27xyz}{-9xz}$
 $\boxed{3y}$

6) $15c^4d \div -5c^3d$
 $\frac{15c^4d}{-5c^3d} = \boxed{-3c}$

7) $\frac{10x^2y^{-5}}{5y^2}$ y^{-5-2}
 $\frac{2x^2y^{-7}}{1} = \boxed{\frac{2x^2}{y^7}}$

8) $\frac{4x^3y^{-2}}{6x^{-1}y^3}$ $x^{3-(-1)}$ y^{-2-3}
 $\frac{2}{3} \cdot x^4 \cdot y^{-5} = \boxed{\frac{2x^4}{3y^5}}$

9) $\frac{3x^3y^5z}{9x^4y^3}$ x^{3-4} y^{5-3}
 $\frac{1}{3} \cdot x^{-1} \cdot y^2 \cdot z = \boxed{\frac{y^2z}{3x}}$

Dividing a Polynomial by a Monomial

PROCEDURE. To divide a polynomial by a monomial, **divide each term of the polynomial by the monomial.**

Examples: Steps: (1) Divide the coefficients (2) subtract the exponents

1) $(8a^5 - 6a^4) \div 2a^2 =$

$$\frac{8a^5}{2a^2} - \frac{6a^4}{2a^2}$$

$$\boxed{4a^3 - 3a^2}$$

2) $\frac{21a^2b - 3ab}{3ab} =$

$$\frac{21a^2b}{3ab} - \frac{3ab}{3ab}$$

$$\boxed{7a - 1}$$

3) $\frac{24x^3y^4 - 18x^2y^2 - 6xy}{-6xy} =$

$$\frac{24x^3y^4}{-6xy} - \frac{18x^2y^2}{-6xy} - \frac{6xy}{-6xy}$$

$$\boxed{-4x^2y^3 + 3xy + 1}$$

4) $\frac{15y^4 - 12xy^3}{3y^2} =$

$$\frac{15y^4}{3y^2} - \frac{12xy^3}{3y^2}$$

$$5y^2 - 4xy$$

Extra Practice:

5) $\frac{4m^2n^2 + 6m^3n - 2m^2n^2}{2m^2n} =$

$$\frac{4m^2n^2}{2m^2n} + \frac{6m^3n}{2m^2n} - \frac{2m^2n^2}{2m^2n}$$

$$2n + 3m - 1n$$

$$\boxed{n + 3m}$$

1) $(12a^5 + 2a^3) \div 2a^2$

$$\frac{12a^5}{2a^2} + \frac{2a^3}{2a^2}$$

$$\boxed{6a^3 + a}$$

2) $\frac{-49c^4b^3}{7c^2b^2}$

$$\boxed{-7c^2b}$$

3) $\frac{mn - n}{n}$

$$\frac{mn}{n} - \frac{n}{n}$$

$$\boxed{m - 1}$$

4) $\frac{18d^3 + 12d^2}{6d}$

$$\frac{18d^3}{6d} + \frac{12d^2}{6d}$$

$$\boxed{3d^2 + 2d}$$

5) $\frac{25b^5 + 15b^4 - 5b^2}{5b^2}$

$$\frac{25b^5}{5b^2} + \frac{15b^4}{5b^2} - \frac{5b^2}{5b^2}$$

$$\boxed{5b^3 + 3b^2 - 1}$$

★ 6) $\frac{12x^4 + 15x^{-3} - 24x^{-1}}{3x^2}$

$$\frac{12x^4}{3x^2} + \frac{15x^{-3}}{3x^2} - \frac{24x^{-1}}{3x^2}$$

$$4x^2 + 5x^{-5} - 8x^{-3}$$

$$4x^2 + \frac{5}{x^5} - \frac{8}{x^3}$$

$$\begin{matrix} x^{-3 \cdot 2} \\ x^{-1 \cdot 2} \\ x \end{matrix}$$

$$\boxed{4x^2 + \frac{5}{x^5} - \frac{8}{x^3}}$$

7) $\frac{\pi r^2 + \pi r}{\pi r}$

$$\frac{\pi r^2}{\pi r} + \frac{\pi r}{\pi r}$$

8) $\frac{2.4y^5 + 1.2y^4 - 0.6y^3}{-0.6y^3}$

$$\frac{2.4y^5}{-0.6y^3} + \frac{1.2y^4}{-0.6y^3} - \frac{0.6y^3}{-0.6y^3}$$