Polynomials

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Monomials

A *monomial* is a product of one or more numbers and/or letters raised to positive integer exponents. The following are all monomials.

$$8x, \quad -3x^2y, \quad \frac{5}{7}xy^3z^5$$

Monomials can be multiplied and/or divided using the commutative and associate properties of multiplication along with the familiar rules of exponents.

Practice multiplying monomials

1. $(4x^3y^2)(-6xy^4)$
2. $(-\frac{2}{3}xy^2)(-\frac{9}{8}yz^3)$
3. $(3r^3s^7t^4)(-4r^2s^3t)(-4r^2s^6t^3)^2$

Practice dividing monomials

1. $\dfrac{8x^7y^6}{2xy^4}$
2. $\dfrac{-54xy^5z^6}{(3y^2z^3)^2}$
3. $\left(\dfrac{(2a^{-1}b^2c^{-3})^{-4}}{(4a^4b^{-5}c^6)^2}\right)^{-1}$
4. $\left(\dfrac{(\frac{1}{3}p^5q^2r^{-3})^{-2}}{(\frac{3}{4}pqr^{-2})^3}\right)^{-2}$

Polynomials

A *polynomial* is a sum of monomials. In this context, the monomials that make up a polynomial are called *terms* of a polynomial. Polynomials can be multiplied together using the distributive rule along with the familiar rules of exponents.

Practice multiplying polynomials

1. $-3x^2(-4x^2+5x-1)$
2. $36x^4yz^2\left(\frac{5}{6}y^3-\frac{1}{3}xz^4+\frac{7}{12}\right)$
3. $(3x+4x^2)(2y-3y^2)$

Remark. When multiplying a polynomial with m terms by a polynomial with n terms, mn multiplications are involved. When multiplying a binomial by a binomial, the acronym F.O.I.L. may help you remember the four multiplications involved (First Outer Inner Last).

A polynomial can be divided by a monomial simply by breaking up the fraction into a sum of monomials divided by the same monomial.

Practice dividing polynomials by monomials

1. $\dfrac{6a^3b^4x^2+10a^3b^4x-4a^3b^4}{2a^3b^4}$
2. $\dfrac{7x^8y^7-7x^7y^8-42x^6y^9}{7x^6y^7}$
3. $\dfrac{2b^{-1}d^{-1}-2b^{-1}c^{-1}+3a^{-1}d^{-1}-3a^{-1}c^{-1}}{a^{-1}b^{-1}c^{-1}d^{-1}}$
4. $\dfrac{\frac{2}{3}xyz+5x^5y^4z^3-\frac{1}{4}xyz}{5xyz}$