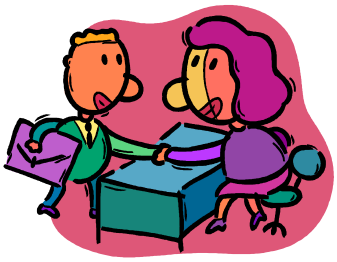
Algebra Connections

Mr. Breitsprecher's Edition | March 2, 2005 | Web: www.clubtnt.org/my_algebra



Meet, Polly Nomial

Polynomials are algebraic expressions. They can contain real numbers and variables. There cannot be any division and square roots that involve the variables. Only addition, subtraction and multiplication of variable terms are allowed.

Polynomials contain more than one term – that's the meaning of the root-word "poly" Think of polynomials as the sums of monomials.

A **monomial** has one term:

5y or $-8x^2$ or 3.

A **binomial** has two terms:

$-3x^2 + 2$, or $9y - 2y^2$

A **trinomial** has 3 terms:

$-3x^2 + 2 + 3x$, or $9y - 2y^2 + y$

The degree of the term is the exponent of the variable: $3x^2$ has a degree of 2.

When the variable does not have an exponent, it is assumed to be 1. (i.e. 1x has a degree of 1).

Polynomial Definitions of Terms:

- A monomial has one term: 5y or -8x2 or 3.
- A binomial has two terms: -3x2 + 2, or 9y - 2y2
- A trinomial has 3 terms: -3x2 + 2 +3x, or 9y - 2y2 + y
- The degree of the term is the exponent of the variable: 3x2 has a degree of 2.
- When the variable does not have an exponent -understand that there's a '1' e.g., 3x

Working With Polynomials: Just Collect Like Terms!

One thing you will do when solving polynomials is combine like terms. Understanding this is the key to adding and subtracting polynomials. Let's look at some examples:

- Like terms: 6x + 3x - 3x
- **NOT** like terms: 6xy + 2x - 4

The first two terms are like and they can be combined: $5x^2 + 2x^2 - 3$, combining like terms, we get: $7x^2 - 3$.

Adding and Subtracting Polynomials

Just like working with polynomials, they key is to identify like terms. To add polynomials, you must clear the parenthesis, combine and add the like terms. In some cases you will need to remember the order of operations. Remember, when adding and subtracting like parts, the variable never changes.

Example:

$x^2 - 7x - 6$

Each part, or "chunk" of mathematical information is a term and x^2 is referred to as the leading term.

Coefficients

A constant used to multiply another quantity or series is called a **coefficient**. Examples include 3x and ax. In these 2 cases, 3 and a are coefficients of x.

Examples:

Term	Coefficient
x^2	1
-7x	-7
-6	-6

Examples of Expressions and Polynomials

- $8x^2 + 3x - 2$ is a polynomial with three terms. It is a trinomial.
- $8x^{-3} + 7y - 2$ is **NOT** a Polynomial, because the exponent is negative.
- $9x^2 + 8x - 2/3$ is **NOT** a Polynomial; it cannot have division.
- 7xy is a Monomial. There is only 1 term.

Polynomials are usually written in decreasing order of terms. The largest term or the term with the highest exponent in the polynomial is usually written first. The first term in a polynomial is called a leading term. When a term contains an exponent, it tells you the degree of the term.

Degrees

Degree of a Term. Each term in a polynomial has a "degree," or the exponent of that term. A term written

Adding Polynomials (continued)

Here are a couple of examples of how to add polynomials:

(5x + 7y) + (2x - 1y)

= 5x + 7y + 2x - 1y (Clear the parenthesis)

=5x + 2x + 7y - 1y (Combine the like terms)

= 7x + 6y (Add like terms)

Another Example:

(y2 - 3y + 6) + (y - 3y 2 + y3)

y2 - 3y + 6+ y - 3y2 + y3 (Clear the parenthesis)

y3 + y2 - 3y2 - 3y + y + 6 (Combine the like terms)

y3 - 2y2 - 2y + 6 (Add like terms)

Subtracting Polynomials

To subtract polynomials, you must change the sign of terms being subtracted, clear the parenthesis, and combine the like terms. Here's an example:

(4x2 - 4) - (x2 + 4x - 4)

(4x2 - 4) + (-x2 - 4x + 4) (Change the signs)

4x2 - 4 + -x2 - 4x + 4 (Clear the parenthesis)

4x2 -x2 - 4x- 4 + 4 (Combine the like terms)

3x2 - 4x

Another Example:

(5x2 + 2x +1) - (3x2 – 4x –2)

5x2 + 2x +1 - 3x2 + 4x +2 (Change the signs and clear the parenthesis)

5x2 - 3x2 + 2x+ 4x+1 + 2 (Combine the like terms)

2x2+ 6x +3

Online Tools & Resources

Addition and Subtraction of Polynomials
http://www.mathnotes.com/Intro/Hchapter3/aw_InterActt3_4.html (requires plug-in)

Online Self-Check Quiz: Polynomial Basics
http://www.glencoe.com/sec/math/studytools/cgi-bin/msgQuiz.php4?isbn=0-02-825326-4&chapter=9&lesson=4

Online Self-Check Quiz: Adding and Subtracting Polynomials
http://www.glencoe.com/sec/math/studytools/cgi-bin/msgQuiz.php4?isbn=0-02-825326-4&chapter=9&lesson=5

Downloadable And On-Line Exercises And Review Material
http://www.mathmax.com/prealg/chapter/bk7c10.html

Adding and Subtracting Polynomials Tutorial
http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut27_addpoly.htm

Polynomial Basics (.pdf format – quiz with solutions)
http://www.clc.mnscu.edu/kschulte/online%20worksheet/Polynomial%20Basic.pdf

Adding and Subtracting Polynomials (.pdf format – quiz with solutions)
http://www.clc.mnscu.edu/kschulte/online%20worksheet/Polynomial%20Basic.pdf

without an exponent has a degree of 1 (assumed exponent of 1)

Degree of a Polynomial. Each polynomial also has a degree. The degree of a polynomial is the greatest degree of any term in a polynomial (largest exponent of any 1 term).

Example: Three Term Polynomial (Trinomial)

$6x^2 - 4xy + 2xy$ This three term polynomial has a leading term to the second degree. It is called a second degree polynomial and often referred to as a trinomial.

Example: Four Term Polynomial

$9x^5 - 2x + 3x^4 – 2$. This 4 term polynomial has a leading term to the fifth degree and a term to the fourth degree. It is called a fifth degree polynomial.

Evaluating Polynomials

The value of a polynomial depends on the replacement value that is used for each variable. When we evaluate a polynomial, we merely substitute the replacement value we are given for the variable(s) and determine a solution based on those values.

Notice that if we express polynomials in by writing them from their largest term to their smallest, and if we identify the degree of each term AND the degree of the polynomial (greatest degree of any term), then we can easily see if there are any like terms that should be combined.

Online Resources

Polynomial Basics
http://www.purplemath.com/modules/polydefs.htm

Like Terms
http://www.math.com/school/subject2/lessons/S2U2L4DP.html

Adding/Subtracting Polynomials
http://www.purplemath.com/modules/polyadd.htm

Exponents and Polynomials
http://www.mathnotes.com/Intro/aw_introchap3.html (interactive, requires plug-in - available at site)

More Polynomial Links
http://mathforum.org/library/topics/polynomials/