Definition: A term is a number, a variable, the product or quotient of a number and one or more variables (possibly raised to powers). Below are examples of terms.

Terms: $-5$, $x$, $3n$, $a^3$, $5x^2y^2$, $\frac{3}{4}mn^4r$ (or $\frac{3mn^4r}{4}$), $\frac{3}{xy^2}$, $-\frac{18z^5}{5x^2y}$

If a term has a number factor, that number is called the coefficient of the term.

For the terms listed above, $-5$ has a coefficient of $-5$; $x$ has a coefficient of $1$, $3n$ has a coefficient of $3$, $\frac{3mn^4r}{4}$ has a coefficient of $\frac{3}{4}$, and $-\frac{18z^5}{5x^2y}$ has a coefficient of $-\frac{18}{5}$.

(Note: The term $\frac{3}{xy^2}$ could be written as $3x^{-1}y^{-2}$; the term $-5$ could be written as $-5x^0$; and the term $-\frac{18z^5}{5x^2y}$ could be written as $-\frac{18}{5}x^{-2}y^{-1}z^5$.)

Definition
Any combination of variables or constants (numbers) joined by the operations of addition, subtraction, multiplication, division (except division by 0), powers, or roots is called an algebraic expression.

A specific type of algebraic expression is a polynomial.

Definition
A polynomial of 1 variable is a term or a finite sum of terms in which all variables have whole number exponents and no variables appear in denominators.

The degree of the polynomial is the greatest exponent in the polynomial and the coefficient of the term with the greatest exponent is called the leading coefficient. Any number term (no variables) is called the constant term or simply a constant.

A polynomial of 1 variable that is written in order of descending powers of the variable is said to be in standard form. A polynomial with only one term is a monomial. A polynomial with two unlike terms is called a binomial. One with three unlike terms is a trinomial.

(See the table on the text page.)
<table>
<thead>
<tr>
<th>Polynomial</th>
<th>Standard Form</th>
<th>Degree</th>
<th>Leading Term &amp; Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4x - 3x^2 + 2 + x^4$</td>
<td>$x^4 - 3x^2 + 4x + 2$</td>
<td>4</td>
<td>$x^4, 1$</td>
</tr>
<tr>
<td>$\frac{1}{3}n - 3n^3$</td>
<td>$-3n^3 + \frac{1}{3}n$</td>
<td>3</td>
<td>$-3n^3, -3$</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>$4a - 12a^5 + 2a^3 - 6$</td>
<td>$-12a^5 + 2a^3 + 4a - 6$</td>
<td>5</td>
<td>$-12a^2, -12$</td>
</tr>
</tbody>
</table>

**Example A:** $2x^4 - 3x^5 + 5x - 9 - 5x^3$

a) Write the polynomial above in descending order.

b) What is the degree of the polynomial?

c) Evaluate, if $x = -2$.

**Example B:** What type of polynomial is each below (monomial, binomial, trinomial, polynomial)?

a) $-3x - x^3$

b) $5n^4 - n^3 + 2n - 7$

c) $3y^2 - 2y + 1$

d) $4a^2bc^8xy^3$
Example C: Combine terms to simplify.

a) \(4a^4 + 2a^2 - 3a^3 + 7a^2 + a^3 - 8a^4\)

b) \(6 + 3c - (4c + 1) - (2c - 8)\)

(lesson 1b or part 2 of lesson 1)

To add two or more polynomials, remove any grouping and combine ‘like’ terms. To subtract a polynomial, add the opposite (distribute the negative sign). Polynomials may be added or subtracted in a horizontal format or a vertical format. It is important to remember to distribute the negative (minus) to each term of the polynomial that is subtracted.

Example 1: Add or subtract (combine) where possible in each polynomial expression.

a) \((3x^2 - 2x + 9) - (5x - 2x^2 + 10)\)

b) \((4x + 2) - (12x - 9) - 3x + (5 - 7x)\)

c) \((2a^2 - 4a + 1) - [(3a^2 - a + 3) - (4a - 9a^2 + 7)]\)

d) \[ -(b^2 - b + 7) - (2b^2 + 3b - 5) ] + (2b^2 - 7b - 5)\)
e) \[-5(8a^2 - 2a + 5) - 6(-a^2 + 2a - 11)\]

\[\begin{align*}
\text{f) Add} & \quad \text{g) Add} \\
-13q^2 - 15q + 3 & \quad 6x^3 + 5x^2 + 7x \\
-5q^2 + 11q - 8 & \quad -2x^3 - 3x^2 + x \\
\hline 
\end{align*}\]

\[\begin{align*}
\text{h) Subtract} & \\
2m^3 - 7m^2 + 4m \\
5m^3 - m^2 + 9 \\
\hline 
\end{align*}\]

\[\begin{align*}
i) \text{ Subtract} & \\
-4y^2 - 7y + 2 \\
-(-2y^2 + 5y + 3) \\
\hline 
\end{align*}\]

**Important Note:**
The textbook will not have a minus sign before the polynomial to be subtracted, such as \(h\) at the left (when aligned vertically).

In MyMathLab, there may be a minus sign before the polynomial to be subtracted, such as \(i\) at the left. (As a reminder to distribute the negative to each term).
Example 2:
The four sides of a quadrilateral can be represented by the expressions
\((2a + 5), (3a - 1), (5a - 6),\) and \((4a - 3)\). Find a polynomial that represents the perimeter of the quadrilateral. Perimeter is the distance around a figure.

If \(a = 12\), what is that perimeter?

Example 3: Add or subtract the following polynomials. (Hint: Find a LCD.)

\[a) \quad \left(\frac{2}{3} y^3 - \frac{3}{2} y^2 + \frac{3}{4}\right) + \left(\frac{1}{6} y^2 - \frac{1}{2} y - \frac{2}{3}\right)\]

\[b) \quad (0.614 r^2 - 0.25 r + 1.05) - (0.83 r^2 - 0.235 r + 2.3)\]