Algebra Help Sheet: Similar (or Like) and Unlike Terms

Terms that do not differ at all or differ only in their numerical coefficients are similar or like terms. The numerical coefficient is the figure just before the letter or letters. In the term $12x^2$, 12 is the numerical coefficient; in $6a^2b$, 6 is the numerical coefficient.

Similar or like terms are **exactly alike as far as letters** are concerned. Similar terms have the same letters and, in each term, similar letters **have the same exponents**. For example, $2a^2x$, $6a^2x$, a^2x are similar terms; $3b^3$, $5b^3$, $8b^3$ are similar terms; $2b^3c^3$, $4b^3c^3$, $8b^3c^3$ are similar terms. But $6x^2y$ and $6xy$ are not similar terms because the exponent x in the first terms is not the same as the exponent x in the second term; $2a^3y^2$ and $2a^3y^3$ are not similar terms because the exponent y is not the same in both terms; a^2, a, and a^3 are all unlike terms.

Similar terms may be combined into one term by adding or subtracting or when separated by + or – signs by combining the coefficients. For example, $2ax + 3ax + 6ax = 11ax$. In mathematics, it is proper to associate the combination of similar terms with the application of the distributive law: $7a^2b^3 – 3a^2b^3 = (7 – 3)a^2b^3 = 4a^2b^3$. But unlike terms cannot be combined into one term when adding or subtracting or when they are separated by + or – signs; thus $2a^2x$, $5ax$, $6x$ are all unlike and cannot be combined into one term if we wish to add or subtract them. The only way their sum can be expressed is to connect them by + signs; thus: $2a^2x + 5ax + 6x$. If we wish to express the difference between $6b^3$ and $6ab^3$ (unlike terms) the only we can do it is to put a minus sign between them; thus: $6b^3 – 6ab^3$.

In multiplication and division of monomials, unlike terms can be combined into one term but in addition and subtraction they cannot be so combined. Therefore, if you wished to add the expressions $3a^2 – 5ab + b^2$, $2b^2 + 3ab$, $5ab – a^2 – b^2$, you would put the a^2 terms in one column, all the ab terms in another, and all the b terms in another:

Adding by columns:

$$\begin{array}{r} 3a^2 - 5ab + b^2 \\ + 3ab + 2b^2 \\ \underline{- a^2 + 5ab - b^2} \\ 2a^2 + 3ab + 2b^2 \end{array}$$

Adding by grouping like terms:

$$(3a^2 – 5ab + b^2) + (2b^2 + 3ab) + (5ab – a^2 – b^2)$$

$$= (3a^2 – a^2) + (–5ab + 3ab + 5ab) + (b^2 + 2b^2 – b^2)$$

$$= 2a^2 + 3ab + 2b^2$$