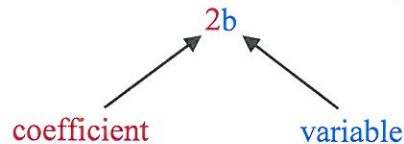## Polynomials

Monomials: single term expression that can be a
- number
- variable
- a product of a number and one or more variables

<u>e.g.</u>   2, a, 3b, $4a^3b^2$

Note: When there are numbers and variables, the number is referred to as the coefficient
e.g.   2b

coefficient   variable

Question: What are the coefficients of the following?
        (a)   3ab
        (b)   4c
        (c)   z

Like-Terms: When there are identical exponents assigned to identical variables

e.g.   (1)   2a and 4a

                (2) $-3b^2$ and $7b^2$

What about….

                (3)   5 and 7 ?
                      Yes! $5a^0$ and $7a^0$
                                          5(1)   7(1)
                                          5   7

                (4) $3a^3b^2$ and $9a^7b^2$
                      No! $3a^3b^2$ does <u>not</u> have the same exponents as $9a^7b^2$

                (5) $8y^2z^3$ and $15y^2z^3$
                      Yes! $8y^2z^3$ and $15y^2z^3$ have the same variables with the same exponents associated with them

What about….is it a monomial?
    (a)   5x + 6

        No! There are 2 terms

Binomial: a polynomial with two terms

e.g. $3a^2 + b$, $4a - c$, $16z - 5c$

Note: We can see there are two terms in the expression ($3a^2 + b$) because there is an addition sign between the two terms.

Is the following a monomial or a binomial?
  a) $-3x$ → monomial
  b) $4ab$ → monomial
  c) $4b + c$ → binomial
  d) $7b^2$ → monomial
  e) $c + 4d^2$ → binomial

What about …..?
  $4a^2b + 2a^2 + 5b^2$
  It is a trinomial

How many terms are there in the following statement?
  $4a^2b + 2a + 5b^2$
  There are three monomials = trinomial

Trinomial: a polynomial with 3 terms

e.g. $4a^2 + 2b + 4a^2b$
       $6a^3b + 6b^2 - 7c$
       $7ca + 2b^2 + 4$

Question: Can we put any of them together?

→ Can you add a^2 and a?
No, because they both have different exponents – they are two different terms.

→ $2a^3 + 6a^3$
Yes! We can add them because they have the same base and exponent.

→ Can you add a and b?
No, because they both have different bases

Always reduce the algebraic expression before deciding if it is a monomial, binomial or a trinomial.

How many terms are there in the following statement?

$4a^2b + 2ab + 5ab$ ⟵ NOT a Trinomial!

Once it is reduced we find there are only two terms
$4a^2b + 7ab$
it is a binomial!

Degree of a Polynomial: is the highest value of the exponents in a polynomial once it has been reduced.

e.g. (1) $4a^5 + 2a^3 + 7a^2 \rightarrow$ degree: 5

(2) $7c$ $\rightarrow$ degree: 1 because $c = c^1$

(3) $\dfrac{6b^9 - 4b^3}{6b^2}$ $\rightarrow$ degree: 7 because $6b^9 \div 6b^2 = b^7$

When there is more than one variable we add the exponents in each term to find the highest degree.

e.g. (1) $4a^5 b^3 + 2a^3b^1 + 7a^2$
       5+3   3+1   2
        8   4   2 $\rightarrow$ degree: 8

(2) $12a^8 b^2 + 2a^4b^5$
     8+2   4+5
     10   9 $\rightarrow$ degree: 10

(3) $\dfrac{6a^7b^9}{6a^3b^2} = a^4b^7$
           4+7
           11   $\rightarrow$ degree: 11