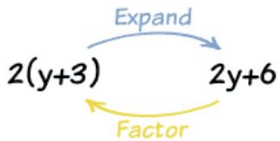
Factorization



When two or more algebraic expressions are multiplied, the result is called product and each expression is called the factor of the product.

The process of finding out factors of an algebraic expression is known as factorisation.

For example:

If we factorise (bc + cd), you get c (b + d).

Factorizing the difference of two squares

Let's multiply (a + b) and (a - b)

(a + b) (a - b)

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

$= a^2 - b^2$ (This expression is called a difference of two squares)

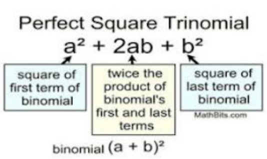
Therefore, the factors of $a^2 - b^2$ are (a + b) and (a - b)

Examples:

1. $x^2 - 49$
   Solution:
   $x^2 - 49$, this expression is the difference of two squares.
   $= x^2 - 7^2$, which is in the form of $a^2 - b^2$
   $= (x+7)(x-7)$

2. $4y^2 - 36y^6$
   Solution:
   In $4y^2 - 36y^6$, there is a common factor of $4y^2$ that can be factored out first in this problem, to make the problem easier.
   $= 4y^2 - 36y^6$
   $= 4y^2(1 - 9y^4)$
   $= 4y^2\{(1)^2 - (3y^2)^2\}$
   $= 4y^2(1+3y^2)(1-3y^2)$

Factoring perfect square trinomials



Factoring perfect square trinomials

Let's multiply (a+b) and (a+b)

(a+b) (a+b)

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

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

Thus, $a^2 + 2ab + b^2 = (a + b)^2$ and $(a + b)^2$ is the factorisation form of $a^2 + 2ab + b^2$

Similarly, $a^2 - 2ab + b^2 = (a - b)^2$ and $(a - b)^2$ is the factorisation form of $a^2 - 2ab + b^2 = (a - b)^2$ and $(a - b)^2$ is the factorisation form of $a^2 - 2ab + b^2$

Geometrical meaning

If we consider (a+ b) as one of the side of the square then the product of the expression will form two squares namely a^2 and b^2 and two congruent rectangles with each having an area of ab.

a^2 ab
ab b^2

Area of the entire square = $(a + b)^2$

Area of two squares and two rectangles

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

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

Thus, $a^2 + 2ab + b^2 = (a+b)^2$