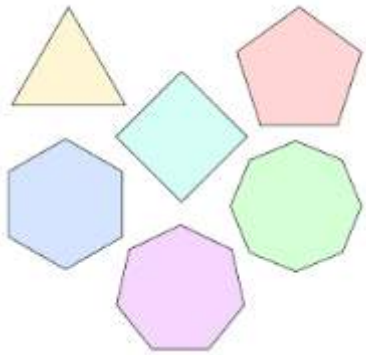
Areas of Triangles and Parallelograms

Introduction to Areas of Triangles and Parallelograms

Introduction

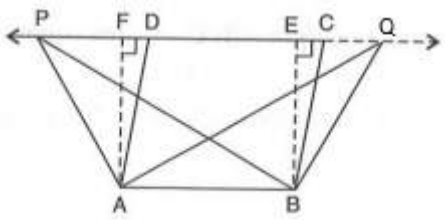
The **area** represents the amount of **planar surface** being covered by **a closed geometric figure**.



Areas of closed figures

Figures on the Same Base and Between the Same Parallels

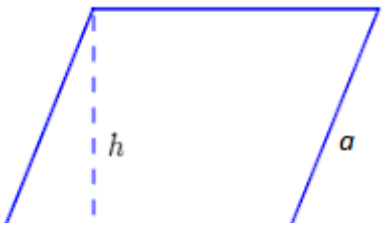
Two figures are said to be on the same base and between the same parallels if:
a) They have a **common side**.
b) The sides parallel to the common base and vertices opposite the common side **lie on the same straight line parallel to the base**.

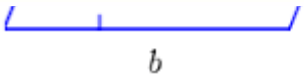


Figures on same base AB and between same parallels AB and PQ

For example : Parallelogram ABCD, Rectangle ABEF and Triangles ABP and ABQ

Area of a parallelogram



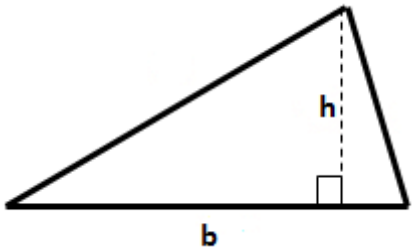


Parallelogram

Area of a parallelogram = $b \times h$

Where 'b' is the **base** and 'h' is the corresponding **altitude**(Height).

Area of a triangle



Area of triangle

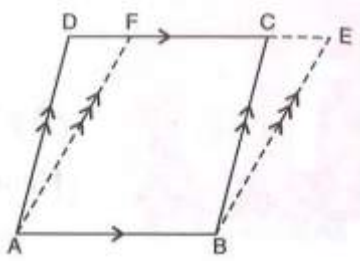
Area of a triangle = $\frac{1}{2} \times b \times h$

Where \('b'\) is the **base** and \('h'\) is the corresponding **altitude**.

Theorems

Parallelograms on the same Base and Between the same Parallels

Two parallelograms are said to be on the same base and between the same parallels if
a) They have a **common side.**
b) The sides parallel to the common side **lie on the same straight line**.

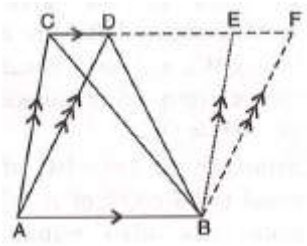


Parallelogram ABCD and ABEF

Theorem : Parallelograms that lie on the **same base** and **between the same parallels** are **equal in area**.
Here, $ar(parallelogram\ ABCD) = ar(parallelogram\ ABEF)$

Triangles on the same Base and between the same Parallels

Two triangles are said to be on the same base and between the same parallels if
a) They have a **common side**.
b) The vertices opposite the common side **lie on a straight line parallel to the common side**.

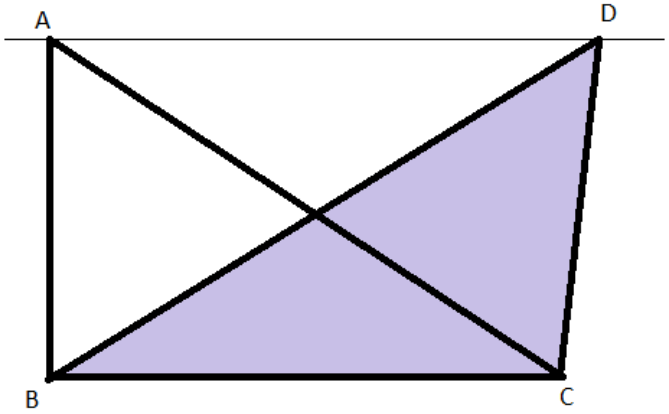


Triangles ABC and ABD

Theorem : Triangles that lie on the same base and between the same parallels are equal in area.
Here, $ar(\Delta ABC) = ar(\Delta ABD)$

Two triangles having the same base & equal areas

If two triangles have the same base and are equal in area, then, their corresponding altitudes are equal.

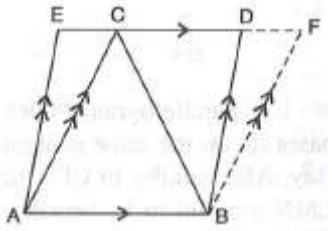


-If **two triangles** have **equal bases** and are **equal in area**, then their corresponding **altitudes are equal**.

A Parallelogram and a triangle between the same parallels

A triangle and a parallelogarm are said to be on the same base and between the same parallels if
a) They have a **common side.**

b) The vertices opposite the common side **lie on a straight line parallel to the common side**.



A triangle ABC and a parallelogram ABDE

Theorem : If a **triangle** and a **parallelogram** are on the same base and between the same parallels, then the **area of the triangle is equal to half the area of the parallelogram.**
Here $ar(\Delta ABC) = \frac{1}{2} ar(parallelogarm\ ABDE)$