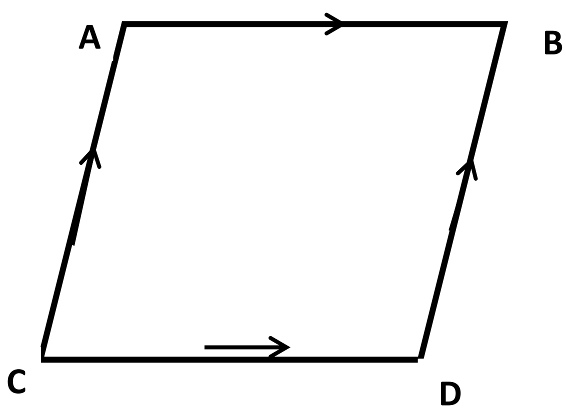
16. Parallelogram.

A quadrilateral with both pairs of opposite sides parallel is defined as a **parallelogram**.

In a parallelogram,

(i) Opposite sides are equal.
(ii) Opposite angles are equal.
(iii) The area of the parallelogram is bisected by each diagonal.
(iv) The diagonals bisect each other.



$(i)\ AB = CD$

$AD = BC$

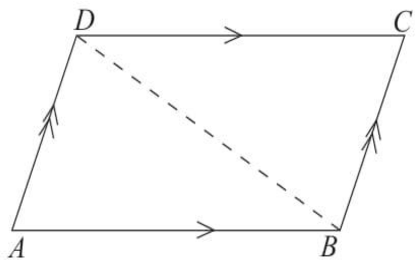
$(ii)\ A\hat{B}C = A\hat{D}C$

$D\hat{A}B = D\hat{C}B$

(iii) Area of $ABD\Delta$ = Area of $CBD\Delta$

Area of $ABC\Delta$ = Area of $ADC\Delta$

Solve all the questions in **Exercise 16.1** in your text book page numbers 163 and 164.



Data: $ABCD$ is a parallelogram.

To be proved: (i) $AB = DC$ and $AD = BC$

(ii) $B\hat{A}D = B\hat{C}D$ and $A\hat{D}C = A\hat{B}C$

(iii) Area of ΔABD = Area of ΔBCD

Area of ΔACD = Area of ΔABC

Construction: Join BD

We can obtain the three results by showing that the triangles ABD and BCD are congruent. Let us prove that the two triangles are congruent under the case AAS as follows.

Proof: In the triangles ABD and BCD,

$A\hat{D}B = C\hat{B}D$ (Alternate angles, $AD // BC$)

$A\hat{B}D = B\hat{D}C$ (Alternate angles, $AB // DC$)

BD is the common side.

$\therefore \Delta ABD \equiv \Delta BCD$ (AAS)

Since the corresponding elements of congruent triangles are equal,

$AB = DC$ and $AD = BC$.

Also $B\hat{A}D = B\hat{C}D$.

Area of ΔABD = Area of ΔBCD (Since $\Delta ABD \equiv \Delta BCD$)

$\therefore$ The area of the parallelogram $ABCD$ is bisected by the diagonal BD.

The above facts can also be proved by using the diagonal AC.

Solve all the questions in **Exercise 16.2** in your text book page numbers 167 and 168.