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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) ABC = ADC DAB = DCB(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 $\triangle ABD = A$ rea of $\triangle BCD$ Area of $\triangle ACD = A$ rea of $\triangle ABC$

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,

 $\hat{ADB} = C\hat{B}D$ (Alternate angles, AD //BC) $\hat{ABD} = B\hat{D}C$ (Alternate angles, AB //DC) BD is the common side.

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

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 $\triangle ABD = \text{Area of } \triangle BCD$ (Since $\triangle ABD \equiv \triangle BCD$)

 \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.