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Changing your Tomorrow

PERIOD 2

MATHEMATICS

CHAPTER NUMBER :~ 8
CHAPTER NAME :~QUADRILATERALS

PREVIOUS KNOWLEDGE TEST

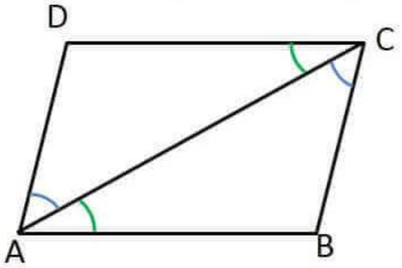
1. Prove that the sum of all angles of a quadrilateral is 360°.

LEARNING OUTCOME:~

1.Students will be able to learn the properties of parallelogram.

Theorem 8.1:

A diagonal of a parallelogram divides it into two congruent triangles



Given: A parallelogram ABCD

with AC as its diagonal

To prove: ΔABC ≅ ΔADC

Proof:

Opposite sides of parallelogram is parallel

So, AB ∥ DC and AD ∥ BC

Since **AB ∥ DC**

& AC is the transversal

∠ BAC = ∠ DCA *(Alternate angles)* ...(1)

Since **AD ∥ BC**

& AC is the transversal

∠ DAC = ∠ BCA *(Alternate angles)* ...(2)

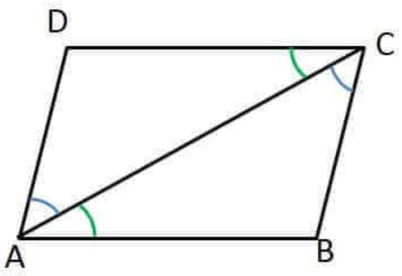
In Δ ABC & Δ ADC

$\angle$ BAC = $\angle$ DCA *(From (1))*

AC = AC *(Common)*

$\angle$ DAC = $\angle$ BCA *(From (2))*

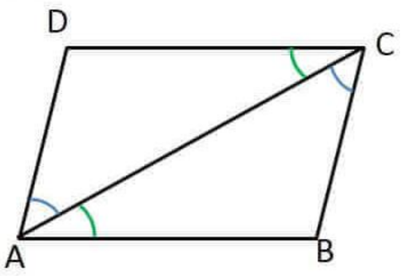
$\therefore$ $\Delta ABC \cong \Delta ADC$ *(ASA congruency)*



Hence proved

Theorem 8.2:

In a parallelogram, opposite sides are equal.



Given: A parallelogram ABCD

with AC as its diagonal

To prove: ΔABC ≅ ΔADC

Proof:

Opposite sides of parallelogram is parallel

So, AB ∥ DC and AD ∥ BC

Since **AB ∥ DC**

& AC is the transversal

∠ BAC = ∠ DCA *(Alternate angles)* ...(1)

Since **AD ∥ BC**

& AC is the transversal

∠ DAC = ∠ BCA *(Alternate angles)* ...(2)

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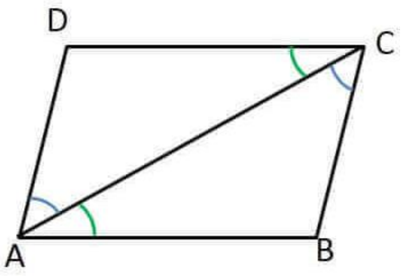
In Δ ABC & Δ ADC

$\angle BAC = \angle DCA$ *(From (1))*

$AC = AC$ *(Common)*

$\angle DAC = \angle BCA$ *(From (2))*

$\therefore \Delta ABC \cong \Delta ADC$ *(ASA congruency)*



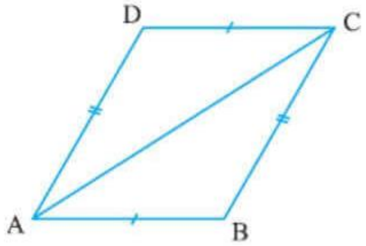
Hence,

$AB = CD$ & $AD = BC$ *(CPCT)*

Hence proved

Theorem 8.3

If each pair of opposite sides of a quadrilateral is equal, then it is a parallelogram.



Given : ABCD is a quadrilateral,

where AB = CD & AD = BC

To Prove : ABCD is a Parallelogram.

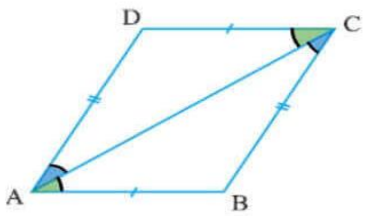
Construction : Join AC, AC is the diagonal

Proof:

In Δ ABC & Δ CDA

AB = CD	(Given)
BC = DA	(Given)
AC = CA	(Common)
∴ Δ ABC ≅ Δ CDA	(SSS congruency)

∴ Δ ABC ≅ Δ CDA



Hence,

∠ BAC = ∠DCA (CPCT) ...(1)

∠ BCA = ∠DAC (CPCT) ...(2)

For lines **AB and CD**

with transversal AC,

∠ BAC & ∠DCA are alternate angles and are equal.

∴ Lines are parallel i.e. AB ∥ CD

For lines **AD and BC**

with transversal AC,

∠ BCA & ∠DAC are alternate angles and are equal.

∴ Lines are parallel i.e. AD ∥ BC

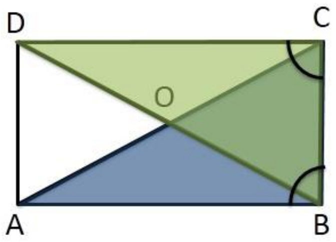
Thus, In ABCD,

Both pairs of opposite sides are parallel,

∴ ABCD is a parallelogram

Ex 8.1, 2

If the diagonals of a parallelogram are equal, then show that it is a rectangle.



Given: Let ABCD be a parallelogram

where AC = BD

To prove: ABCD is a rectangle

Proof: Rectangle is a parallelogram with one angle 90°

We prove that one of its interior angles is 90°.

In ΔABC and ΔDCB,

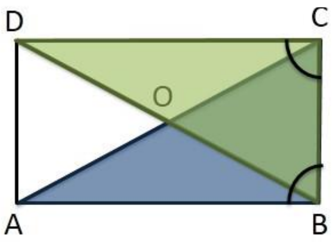
AB = DC (Opposite sides of parallelogram are equal)

BC = BC (Common)

AC = DB (Given)

∴ ΔABC ≅ ΔDCB (SSS congruence rule)

⇒ ∠ABC = ∠DCB (CPCT) ...(1)



Now,

AB || DC *(Opposite sides of parallelogram are parallel)*

& BC is a transversal

$\therefore \angle B + \angle C = 180°$ *(Interior angles on the same side of transversal are supplementary)*

$\angle B + \angle B = 180°$ (From (1): $\angle B = \angle C$)

$2\angle B = 180°$

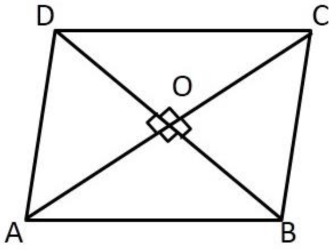
$$\angle B = \frac{180°}{2} = 90°$$

So, ABCD is a parallelogram with one angle 90°

$\therefore$ ABCD is a rectangle

Ex .8.1,3 (Method 1)

Show that if the diagonals of a quadrilateral bisect each other at right angles, then it is a rhombus.



Given: Let ABCD be a quadrilateral,

where diagonals bisect each other

∴ OA = OC, ...(1)

and

OB = OD, ...(2)

And they bisect at right angles

So, ∠AOB = ∠BOC = ∠COD = ∠AOD = 90° ...(3)

To prove :ABCD a rhombus,

Proof : Rhombus is a parallelogram with all sides equal

We will first prove ABCD is a parallelogram

and then prove all the sides of ABCD are equal.

In ΔAOD and ΔCOB,

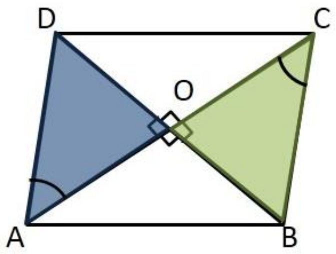
OA = OC (From (1))

∠AOD = ∠COB (From (3))

OD = OB (From (2))

∴ ΔAOD ≅ ΔCOB (SAS congruence rule)

⇒ ∠OAD = ∠ OCB (CPCT)



For sides AD & BC

with transversal AC,

∠OAD & ∠ OCB are alternate angles, and they are equal,

So, AD ∥ BC

Similarly, AB ∥ DC

Now, In ABCD, AD ∥ BC & AB ∥ DC

Since opposites sides of ABCD are parallel,

⇒ ABCD is a parallelogram

HOMEWORK ASSIGNMENT

Exercise 8.1
Question number 2,3

AHA

1.Show that the bisectors of angles of a parallelogram form a rectangle.

THANKING YOU

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