ODM EDUCATIONAL GROUP
Changing your Tomorrow

PERIOD 4

MATHEMATICS

CHAPTER NUMBER :~ 8
CHAPTER NAME :~QUADRILATERALS

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PREVIOUS KNOWLEDGE TEST

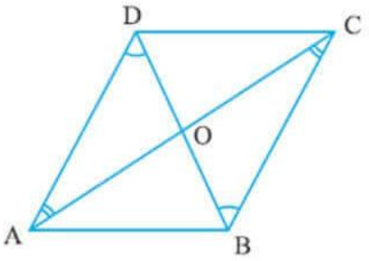
1. ABCD is a parallelogram in which P and Q are the midpoints of opposite sides AB and CD. If AQ intersects DP at S and BQ intersects CP at R, show that APCQ is a parallelogram.

LEARNING OUTCOME:~

1.Students will be able to learn some more properties of parallelogram.
2.Students will be able to solve application sums on parallelogram.

Theorem 8.6

The diagonals of a parallelogram bisect each other



Given : ABCD is a Parallelogram with

AC and BD diagonals & O is the

point of intersection of AC and BD

To Prove : OA = OC & OB = OD

Proof : Since, opposite sides of Parallelogram are parallel.

AD ‖ BC	**AD ‖ BC**
with transversal BD	with transversal AC
∠ODA = ∠OBC *(Alternate interior angles)*	∠OAD = ∠OCB *(Alternate interior angles)*

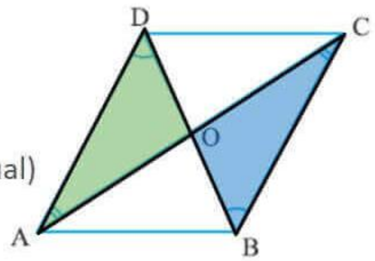
In △ AOD and △BOC

$\angle OAD = \angle OCB$ (From (1))

AD = CB (Opposite side of Parallelogram are equal)

$\angle ODA = \angle OBC$ (From (2))

$\triangle AOD \cong \triangle BOC$ (ASA rule)



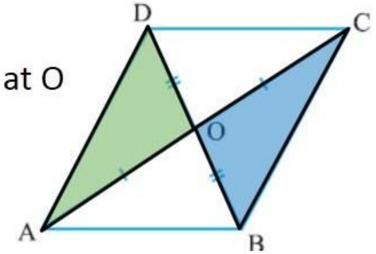
So,

OA = OC & OB = OD (CPCT)

Hence Proved

Theorem 8.7

If the diagonals of a quadrilateral bisect each other, then it is a parallelogram.



Given: ABCD is a quadrilateral with

AC and BD are diagonals intersecting at O

Diagonals bisect each other

i.e. OA = OC & OB = OD

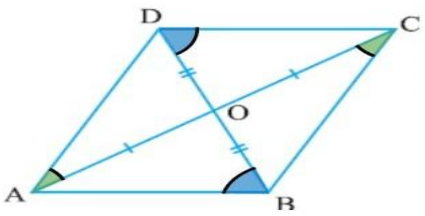
To Prove: ABCD is a parallelogram

Proof : In ΔAOD and ΔCOB

OA = OC	*(Given)*
∠AOD = ∠COB	*(Vertically opposite angles)*
OD = OB	*(Given)*
△ AOD ≅ △COB	*(SAS congruency)*

△ AOD ≅ △COB

∴ ∠OAD = ∠OCB (CPCT) ...(1)



Similarly, we can prove

△ AOB ≅ △COD

∴ ∠ABO = ∠CDO (CPCT) ...(2)

For lines **AB and CD**

with transversal BD,

∠ ABO & ∠CDO are alternate angles and are equal.

∴ Lines are parallel i.e. AB || CD

For lines **AD and BC**

with transversal AC,

∠ OAD & ∠OCB are alternate angles and are equal.

∴ Lines are parallel i.e. AD || BC

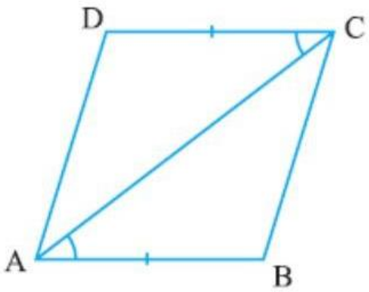
Thus, In ABCD,

Both pairs of opposite sides are parallel,

∴ ABCD is a parallelogram

Theorem 8.8

A quadrilateral is a parallelogram if a pair of opposite sides is equal and parallel.



Given : ABCD is a quadrilateral

where AB ∥ CD & AB = CD

To Prove : ABCD is a Parallelogram

Proof :

Given AB ∥ CD

with transversal AC.

$\angle BAC = \angle DCA$ *(Alternate angles)* ...(1)

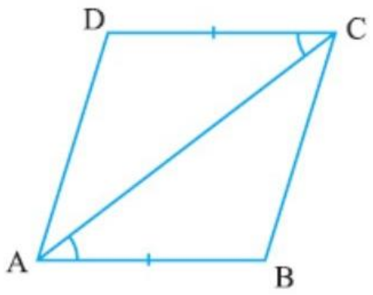
In Δ ADC & Δ CBA

AB = CD (Given)

∠BAC = ∠DCA (From (1))

AC = CA (Common)

∴ Δ ADC ≅ Δ CBA (SAS Rule)



Hence, DA = BC (CPCT)

Thus, In ABCD,

Both pairs of opposite sides are equal

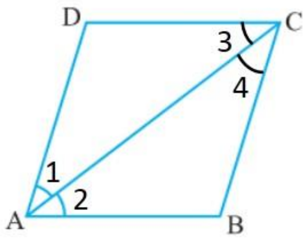
∴ ABCD is a Parallelogram.

Hence proved

Ex 8.1, 6

Diagonal AC of a parallelogram ABCD bisects ∠ A. Show that

(i) it bisects ∠ C also,



Given: Parallelogram ABCD

where ∠ 1= ∠ 2 ...(1)

To prove: AC bisects ∠ C

i.e. ∠ 3 = ∠ 4

Proof:

Now,

∠ 1 = ∠ 2 (Given)

∠ 2 = ∠ 3 — AB || DC & AC as traversal, Alternate angles equal

∠1 = ∠4 — AD || BC & AC as traversal, Alternate angles equal

Hence, we can say that

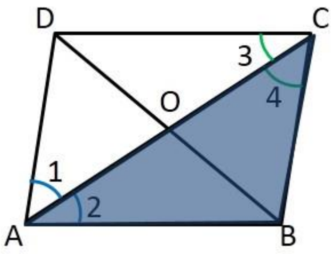
∠ 1 = ∠ 2 = ∠ 3 = ∠4

So, ∠ 3 = ∠ 4

Hence proved

Ex 8.1, 7

ABCD is a rhombus. Show that diagonal AC bisects ∠ A as well as ∠ C and diagonal BD bisects ∠ B as well as ∠ D.



Given:

Rhombus ABCD

To prove:

(i) AC bisects ∠ A, i.e. ∠ 1 = ∠ 2 & bisects ∠ C, i.e. ∠ 3 = ∠ 4

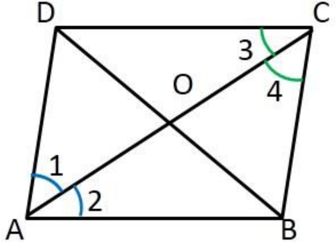
(ii) BD bisects ∠ D & ∠ B

Proof:

In ΔABC,

AB = BC (Sides of rhombus are equal)

So, ∠4 = ∠2 (Angles opposite to equal sides are equal) ...(1)



Now, AD ∥ BC *(Opposite sides of rhombus are parallel)*

and transversal AC.

∠1 = ∠4 (Alternate angles) ...(2)

From (1) & (2)

∠1 = ∠2

⇒ AC bisects ∠ A

Now, AB ∥ DC *(Opposite sides of rhombus are paralle*

and transversal AC.

∠2 = ∠3 (Alternate angles)..(3)

From (1) & (3)

∠4 = ∠3

⇒ AC bisects ∠ C

Hence,

AC bisects ∠ C & ∠ A

Similarly we can prove that BD bisects ∠ B & ∠ D

Hence proved

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HOMEWORK ASSIGNMENT

Exercise 8.1
Question number 6,7

AHA

1.A diagonal of a parallelogram bisects one of its angles. Prove that it's a rhombus.

THANKING YOU

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