PERIOD 2

MATHEMATICS

CHAPTER NUMBER :~ 7
CHAPTER NAME :~ TRIANGLES

PREVIOUS KNOWLEDGE TEST

1. What is the difference between similar figures and congruent figures.
2. What do you mean by corresponding parts of congruent figures.

LEARNING OUTCOME:~

1.Students will be able to learn ASA congruence rule.
2.Students will be able to prove ASA congruence rule.

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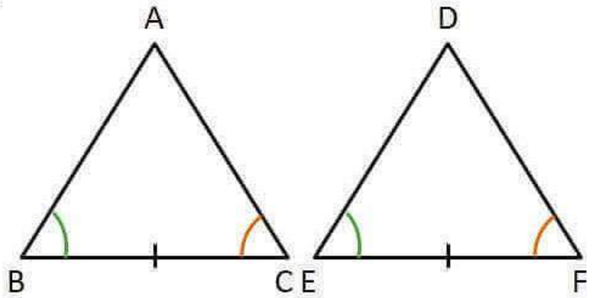
Two triangles are congruent if two angles and the included side of one triangle are equal to two angles and the included side of other triangle.

Given :- Δ ABC and Δ DEF such that

$\angle B = \angle E$ & $\angle C = \angle F$

and BC = EF



To Prove :- $\Delta ABC \cong \Delta DEF$

Proof:- We will prove by considering the following cases :-

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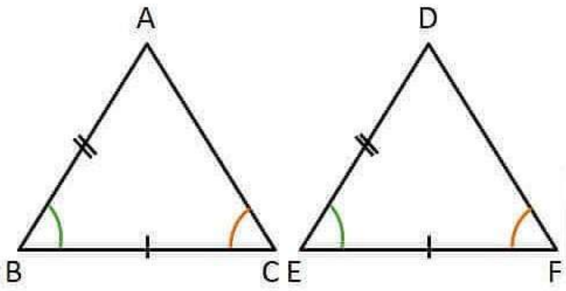
Case 1: Let AB = DE



In ΔABC and ΔDEF

AB = DE (Assumed)

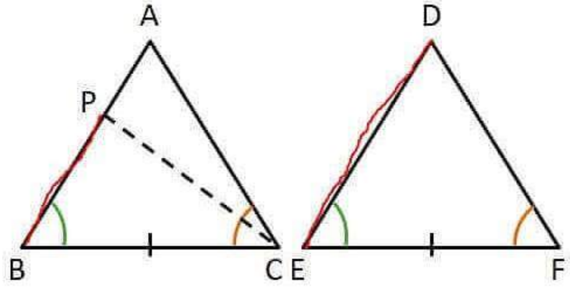
∠B = ∠E (Given)

BC = EF (Given)

⇒ ΔABC ≅ ΔDEF (SAS congruence rule)

Case 2: AB > DE

Construction :- Take a point P on AB such that PB = DE



In ΔPBC and ΔDEF

PB = DE (Assumed)

∠B = ∠E (Given)

BC = EF (Given)

⇒ ΔPBC ≅ ΔDEF (SAS congruence rule)

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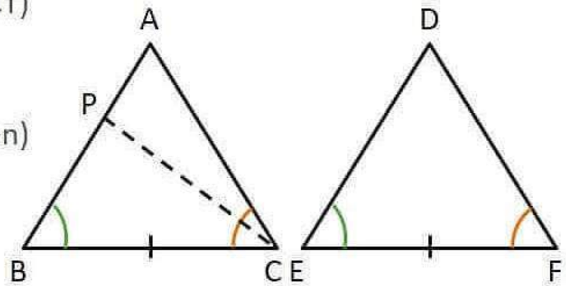
⇒ ∠PCB = ∠DFE (CPCT)

But ∠ACB = ∠DFE (Given)

Thus, ∠ACB = ∠PCB

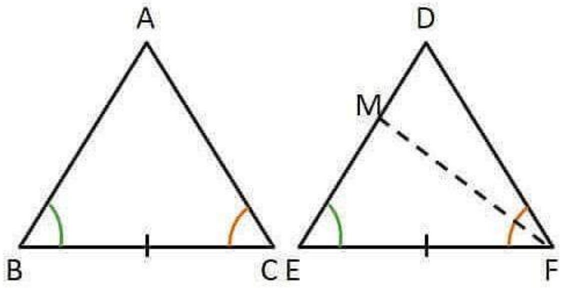


This is possible only if P is coincides with A

⇒ AB = DE

∴ By Case 1

ΔABC ≅ ΔDEF



Case 3: If AB < DE

If AB < DE, then by choosing a point M on DE such that

AB = ME and repeating the argument in Case (2).

We get ΔABC ≅ ΔDEF

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AAS CONGRUENCE RULE

Two triangles are congruent if any two pairs of angles and one pair of corresponding sides are equal.

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EVALUATION QUESTIONS

In quadrilateral ACBD, AC = AD and AB bisects $\angle A$ (See the given fig.) Show that $\Delta ABC \cong \Delta ABD$. What can you say about BC and BD?

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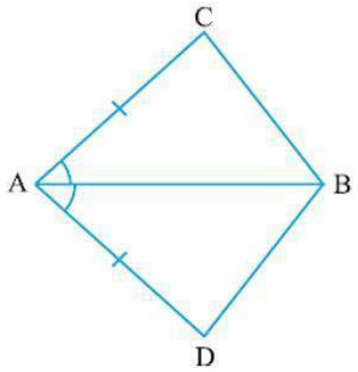
In quadrilateral ACBD, AC = AD and AB bisects ∠A (See the given fig.) Show that ΔABC ≅ ΔABD. What can you say about BC and BD?

Given: AC = AD ...(1)

AB bisects ∠ A

i.e. ∠ ∠CAB = ∠DAB ...(2)



To prove: ΔABC ≅ ΔABD

Proof:

In ΔABC and ΔABD,

AB = AB *(Common)*

∠CAB = ∠DAB *(From (2))*

AC = AD *(From (1))*

∴ ΔABC ≅ ΔABD *(SAS congruence rule)*

∴ BC = BD *(CPCT)*

Therefore, BC and BD are of equal length.

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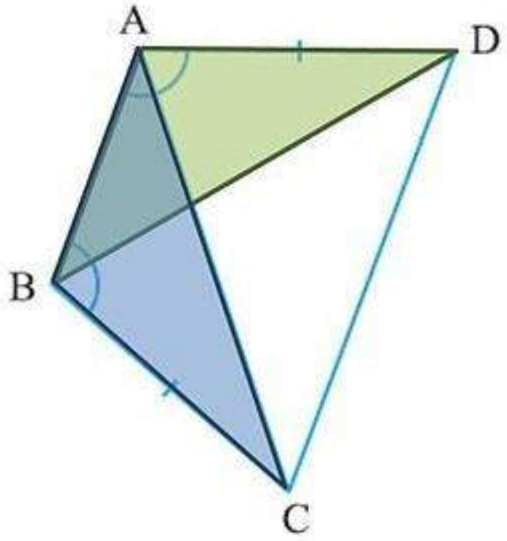
ABCD is a quadrilateral in which AD = BC and ∠DAB = ∠CBA (See the given figure). Prove that

(i) ΔABD ≅ ΔBAC

(ii) BD = AC

(iii) ∠ABD = ∠BAC.



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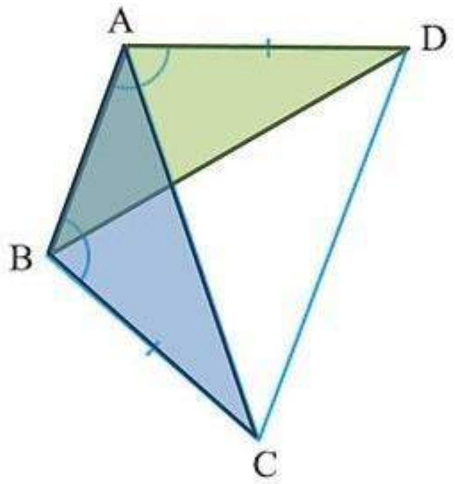

Given:

AD = BC ...(1)

and ∠ DAB = ∠CBA ...(2)

To prove: (i) ΔABD ≅ ΔBAC , (ii) BD = AC , (iii) ∠ ABD = ∠ BAC

Proof:

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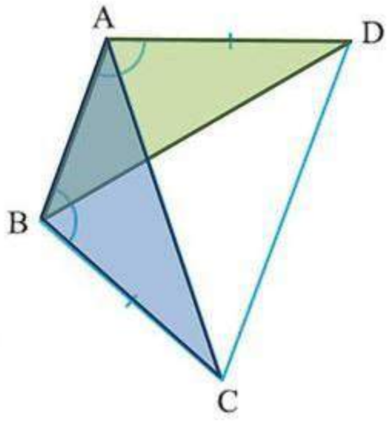
In ΔABD and ΔBAC,

AD = BC *(Given)*

∠ DAB = ∠ CBA *(Given)*

AB = BA *(Common)*

Δ ABD ≅ Δ BAC *(SAS congruence rule)*



∴ BD = AC *(CPCT)*

And, ∠ABD = ∠BAC *(CPCT)*

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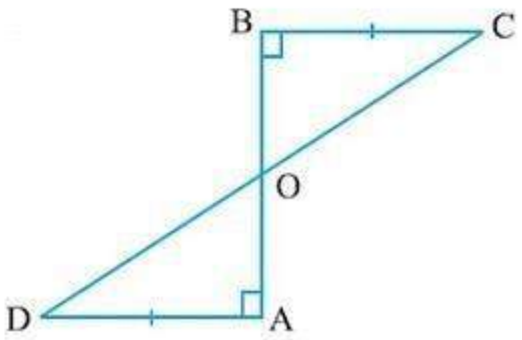
AD and BC are equal perpendiculars to a line segment AB (See the given figure). Show that CD bisects AB.



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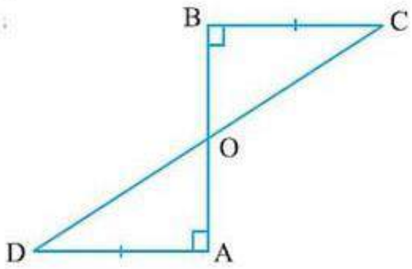

Given:

AD = BC ...(1)

AD ⊥ AB , i.e. ∠ OAD = 90°

BC ⊥ AB , i.e. ∠ OBC = 90°

To prove: CD bisects AB i.e. OA = OB

Proof:

Since

Line CD & AB intersect.

∠ AOD = ∠ BOC *(Vertically opposite angles)* ...(2)

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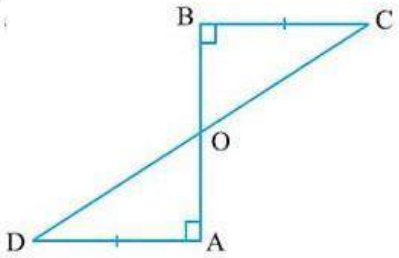

In ΔBOC and ΔAOD,

$\angle BOC = \angle AOD$ *(From (2))*

$\angle CBO = \angle DAO$ *(Both angles 90°)*

$BC = AD$ *(From (1))*

$\therefore \Delta BOC \cong \Delta AOD$ *(AAS congruence rule)*

$\therefore BO = AO$ *(CPCT)*

Hence proved

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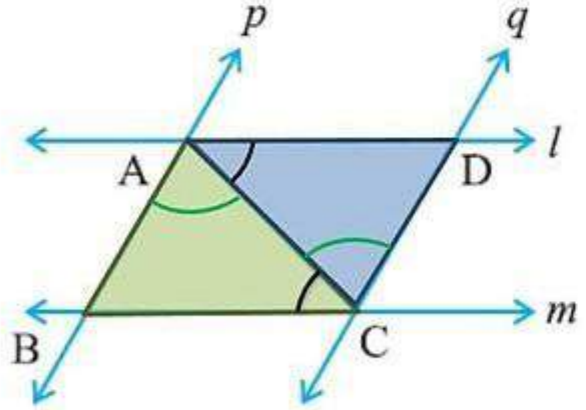
l and *m* are two parallel lines intersected by another pair of parallel lines *p* and *q* (see the given figure). Show that ΔABC ≅ ΔCDA.

Given:

$l \parallel m$

& $p \parallel q$



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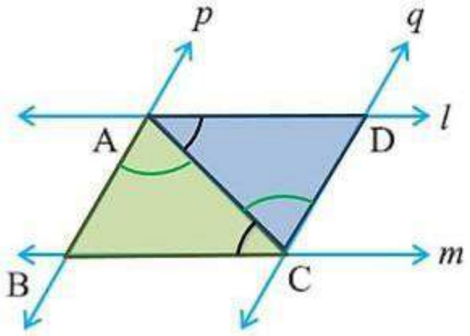

Given:

$l \parallel m$

& $p \parallel q$

To prove: ΔABC ≅ ΔCDA

Proof:

Taking $l \parallel m$ and AC is the transversal,

∠ACB = ∠ CAD *(Alternate angles)* ...(1)

Considering $p \parallel q$ and AC is the transversal,

∠BAC = ∠DCA *(Alternate angles)* ...(2)

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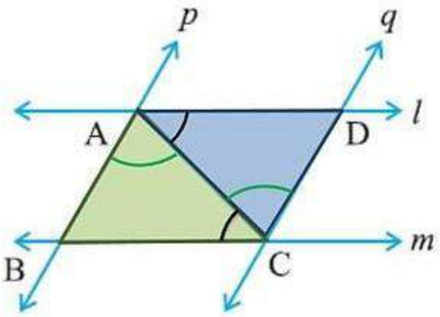
In ΔABC and ΔCDA,

∠ACB = ∠CAD (*From (1)*)

AC = CA (*Common*)

∠BCA = ∠DAC (*From (2)*)

∴ ΔABC ≅ ΔCDA (*ASA congruence rule*)



Hence proved

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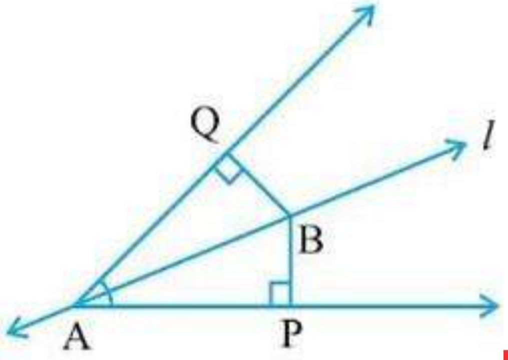
Line l is the bisector of an angle ∠A and B is any point on l. BP and BQ are perpendiculars from B to the arms of ∠A (see the given figure). Show that:

(i) ΔAPB ≅ ΔAQB

(ii) BP = BQ or B is equidistant from the arms of ∠A.



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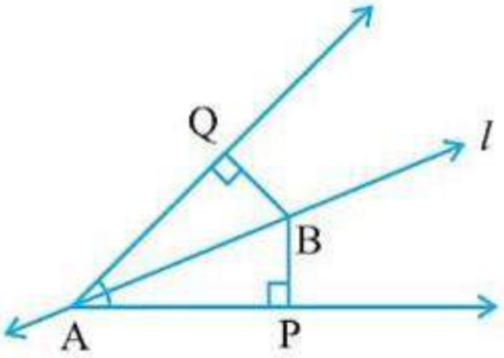
Given:

l is the bisector of ∠ A

So, ∠PAB = ∠QAB ...(1)



BP & BQ are perpendiculars from B,

So, ∠APB = ∠AQB = 90° ...(2)

To prove: (i) ΔAPB ≅ ΔAQB (ii) BP = BQ

Proof:

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In ΔAPB and ΔAQB,

∠APB = ∠AQB (From (2))

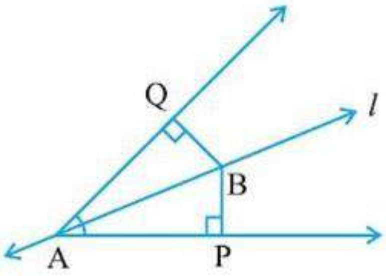
∠PAB = ∠QAB (From (1))

AB = AB (Common)

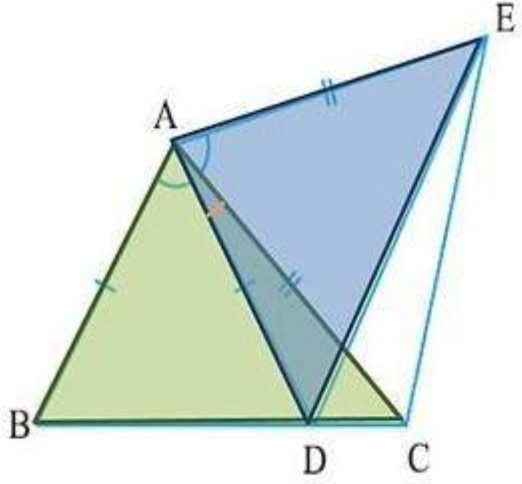
∴ ΔAPB ≅ ΔAQB (AAS congruence rule)

∴ BP = BQ (CPCT)

Hence proved



In the given figure, AC = AE, AB = AD and ∠BAD = ∠EAC. Show that BC = DE.



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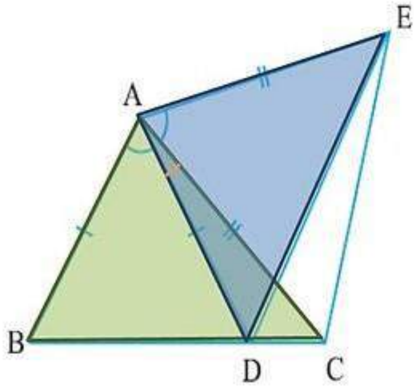

Given:

AC = AE ...(1)

AB = AD ...(2)

∠ BAD = ∠ EAC

To prove: BC = DE

Proof:

Given that

∠BAD = ∠EAC

∠BAD + ∠DAC = ∠EAC + ∠DAC

∠BAC = ∠DAE ...(3)

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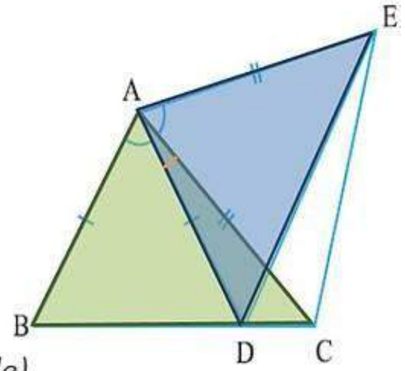
In ΔABC and ΔADE,

$AB = AD$ *(From (2))*

$\angle BAC = \angle DAE$ *(From (3))*

$AC = AE$ *(From (1))*

$\therefore \Delta ABC \cong \Delta ADE$ *(SAS congruence rule)*

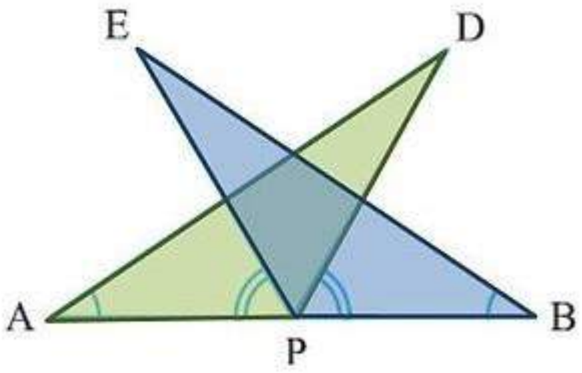


$\therefore BC = DE$ *(CPCT)*

Hence proved

AB is a line segment and P is its mid-point. D and E are points on the same side of AB such that ∠BAD = ∠ABE and ∠EPA = ∠DPB (See the given figure). Show that

(i) $\Delta DAP \cong \Delta EBP$ (ii) AD = BE



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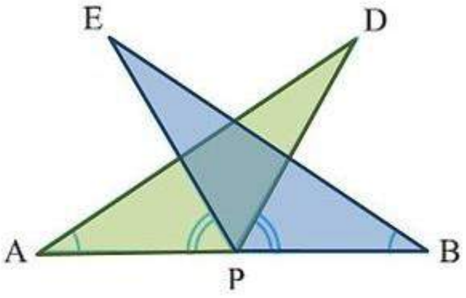
AB is a line segment and P is its mid-point. D and E are points on the same side of AB such that ∠BAD = ∠ABE and ∠EPA = ∠DPB (See the given figure). Show that

(i) ΔDAP ≅ ΔEBP (ii) AD = BE

Given:



P is the mid point of AB,

So, AP = BP ...(1)

∠BAD = ∠ABE ...(2)

∠EPA = ∠DPB ...(3)

To prove: (i) ΔDAP ≅ ΔEBP (ii) AD = BE

Proof:

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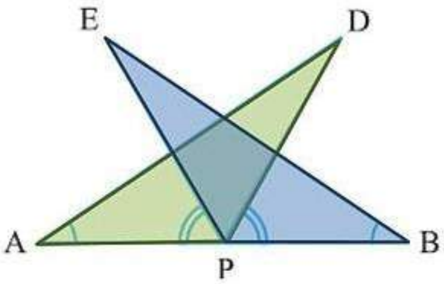
Since

$\angle EPA = \angle DPB$

We add $\angle DPE$ both sides

$\angle EPA + \angle DPE = \angle DPB + \angle DPE$

$\angle DPA = \angle EPB$ ...(4)



In ΔDAP and ΔEBP,

$\angle DAP = \angle EBP$ *(From (2))*

$AP = BP$ *(From (1))*

$\angle DPA = \angle EPB$ *(From (4))*

$\therefore \Delta DAP \cong \Delta EBP$ *(ASA congruence rule)*

$\therefore AD = BE$ *(CPCT)*

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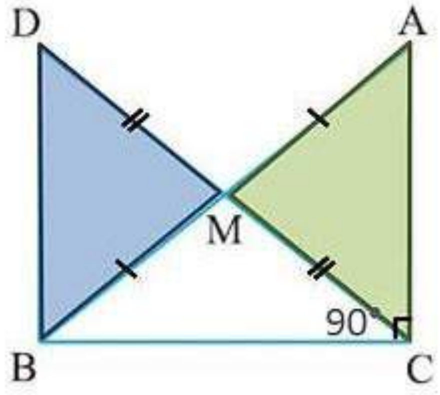
In right triangle ABC, right angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that DM = CM. Point D is joined to point B (see the given figure). Show that:

(i) $\Delta AMC \cong \Delta BMD$



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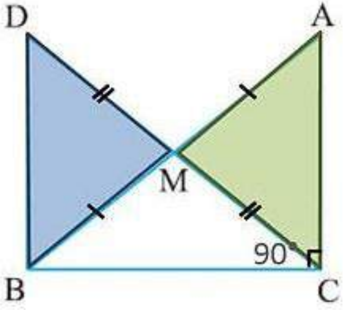

Given:

$\angle ACB = 90°$

M is the mid-point of AB

So, AM = BM ...(1)

Also, DM = CM ...(2)

To prove: $\Delta AMC \cong \Delta BMD$

Proof:

Lines CD & AB intersect...

So, $\angle AMC = \angle BMD$ *(Vertically opposite angles)* ...(3)

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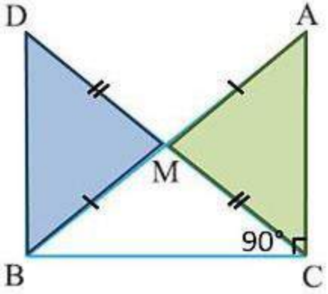
In ΔAMC and ΔBMD,

AM = BM *(From (1))*

∠AMC = ∠BMD *(From (3))*

CM = DM *(From (2))*

∴ ΔAMC ≅ ΔBMD *(SAS congruence rule)*



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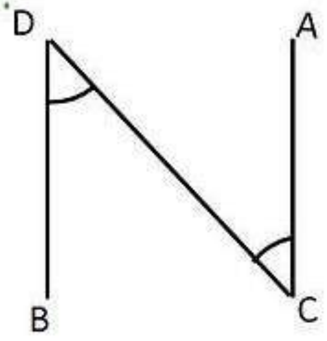
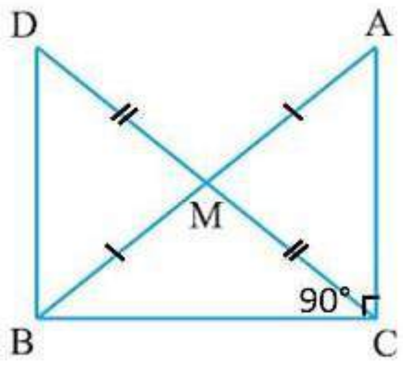
Show that:

(ii) ∠DBC is a right angle.





From part 1,

ΔAMC ≅ ΔBMD

∴ ∠ACM = ∠BDM   (CPCT)

But ∠ACM and ∠BDM are alternate interior angles

for lines AC & BD

If a transversal intersects two lines such that pair of alternate interior angles is equal, then lines are parallel.

So, BD || AC

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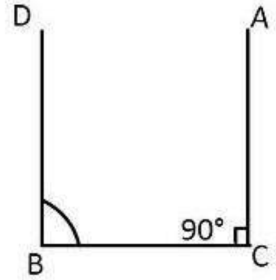

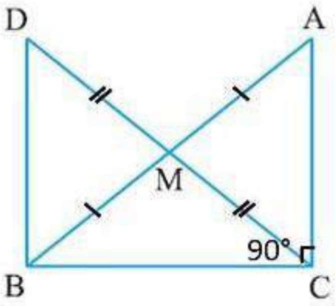

Now, Since

DB || AC and Considering BC as transversal

, ⇒ ∠DBC + ∠ACB = 180° *(Interior angles on the same side of transversal are supplementary)*

⇒ ∠DBC + 90° = 180°

⇒ ∠DBC = 180° – 90°

⇒ ∠DBC = 90°

Hence, ∠ DBC is a right angle

Hence proved

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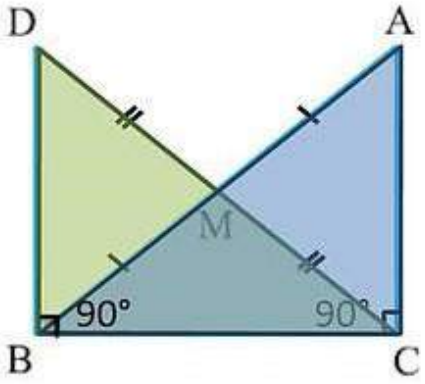
(iii) ΔDBC ≅ ΔACB



From part 1,

ΔAMC ≅ ΔBMD

AC = BD *(CPCT)* ...(1)

In ΔDBC and ΔACB,

DB = AC *(From (1))*

∠DBC = ∠ACB *(Both 90°)*

BC = CB *(Common)*

∴ ΔDBC ≅ ΔACB *(SAS congruence rule)*

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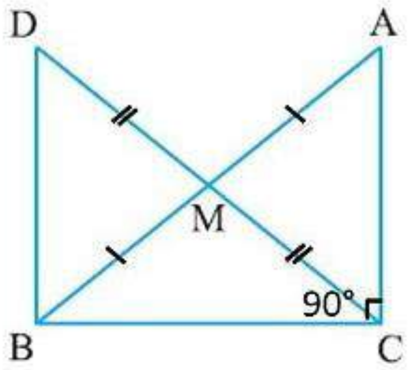
Show that:

(iv) $CM = \frac{1}{2} AB$



From part 3,

$\Delta DBC \cong \Delta ACB$

$\therefore DC = AB$ (CPCT)

$\frac{1}{2} DC = \frac{1}{2} AB$

As DM = CM
$\therefore DM = CM = \frac{1}{2} DC$

$CM = \frac{1}{2} AB$

Hence proved

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HOMEWORK ASSIGNMENT

Exercise 7.1 Qno 5,6,7,8

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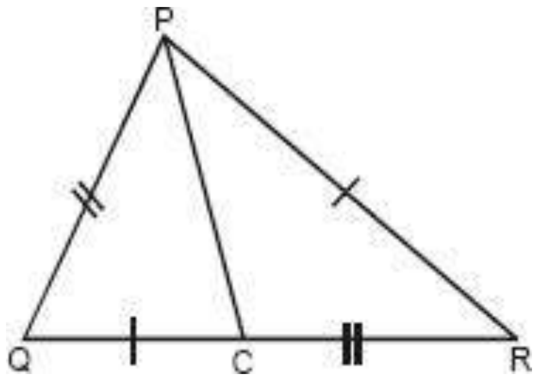
AHA

1.In the given figure, triangles PQC and PRC are such that QC = PR and PQ = CR. Prove that ∠PCQ = ∠CPR



THANKING YOU

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