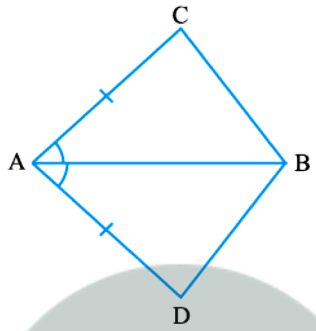
NCERT Solutions for Class 9 Maths Chapter 7 Triangles Ex 7.1

Question 1.

In quadrilateral ACBD,

AC = AD and AB bisects ∠ A (see figure). Show that Δ ABC ≅Δ ABD.

What can you say about BC and BD?



Solution.

It is given in the question that:

AC = AD and,

AB bisects ∠A

To prove: $\Delta ABC \cong \Delta ABD$

Proof: In $\Delta ABC \text{ and } \Delta ABD$,

AB = AB (Common)

AC = AD (Given)

∠CAB = ∠DAB (AB is bisector)

Therefore,

By SAS congruence,

$\Delta ABC \cong \Delta ABD$

BC and BD are of equal length

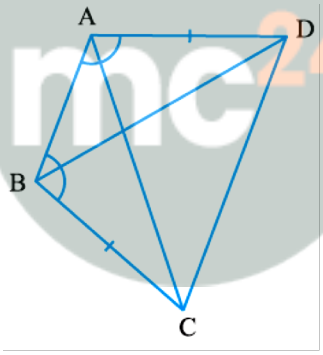
Question 2.

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

(i) Δ ABD ≅Δ BAC

(ii) BD = AC

(iii) ∠ ABD = ∠ BAC.



Solution.

It is given in the question that:

AD = BC and

∠DAB = ∠CBA

(i) In $\Delta ABD \text{ and } \Delta BAC$,

AB = BA (Common)

∠DAB = ∠CBA (Given)

AD = BC (Given)

Therefore,

By SAS congruence,

$\Delta ABD \cong \Delta BAC$

(ii) Since,

$\Delta ABD \cong \Delta BAC$

Therefore,

BD = AC (By c.p.c.t)

(iii) Since,

$\Delta ABD \cong \Delta BAC$

Therefore,

∠ABD = ∠BAC (By c.p.c.t)

Question 3.

AD and BC are equal perpendiculars to a line segment AB (see Fig. 7.18). Show that CD bisects AB.

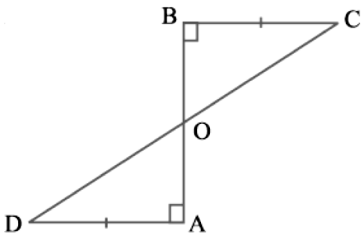


Fig. 7.18

Solution.

It is given in the question that:

AD and BC are equal perpendiculars to AB

To prove: CD bisects AB

Proof: In $\Delta AOD \ and \ \Delta BOC$,

∠A = ∠B (Perpendicular)

∠AOD = ∠BOC (Vertically opposite angle)

AD = BC (Given)

Therefore,

By AAS congruence,

$\Delta AOD \cong \Delta BOC$

Now,

AO = OB (By c.p.c.t)

CD bisects AB

Question 4.

l and m are two parallel lines intersected by another pair of parallel lines p and q(see Fig. 7.19). Show that Δ ABC ≅Δ CDA.

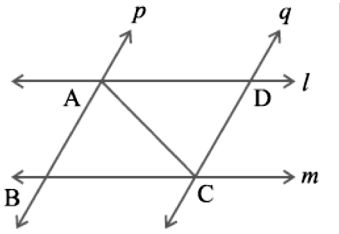


Fig. 7.19

Solution.

It is given in the question that:

l parallel to m

And,

p parallel to q

To prove: $\Delta ABC \cong \Delta CDA$

∠BCA = ∠DAC (Alternate interior angles)

Therefore,

By ASA congruence,

$\Delta ABC \cong \Delta CDA$

Question 5.

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 figure). Show that:

(i) Δ APB ≅Δ AQB

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

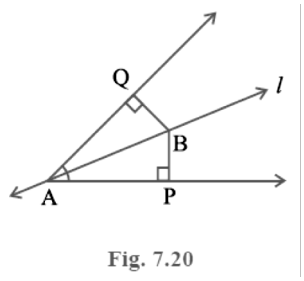


Fig. 7.20

Solution.

It is given in the question that:

l is the bisector of an ∠A

BP and BQ are perpendiculars

(i) In $\Delta APB \; and \; \Delta AQB$

∠P = ∠Q (Right angles)

∠BAP = ∠BAQ (l is the bisector)

AB = AB (Common)

Therefore,

By AAS congruence,

$\Delta APB \cong \Delta AQB$

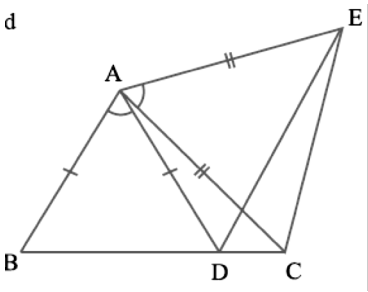
(ii) BP = BQ (By c.p.c.t)

Therefore,

B is equidistant from the arms of ∠A

Question 6.

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



Solution.

It is given in the question that:

AC = AE

AB = AD and,

∠BAD = ∠EAC

To show: BC = DE

Proof:

∠BAD = ∠EAC (Adding ∠DAC both sides)

∠BAD + ∠DAC = ∠EAC + ∠DAC

∠BAC = ∠EAD

In $\Delta ABC \; and \; \Delta ADE$,

AC = AE (Given)

∠BAC = ∠EAD

AB = AD (Given)

Therefore,

By SAS congruence,

$\Delta ABC \cong \Delta ADE$

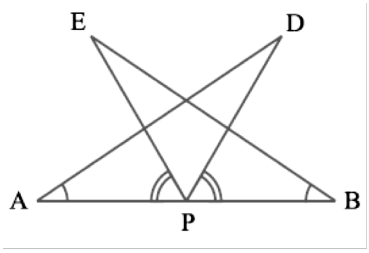
BC = DE (By c.p.c.t)

Question 7.

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 figure). Show that

(i) Δ DAP ≅Δ EBP

(ii) AD = BE



Solution.

It is given in the question that:

P is the mid-point of AB

∠BAD = ∠ABE and,

∠EPA = ∠DPB

(i) ∠EPA = ∠DPB (Adding ∠DPE both sides)

∠EPA + ∠DPE = ∠DPB + ∠DPE

∠DPA = ∠EPB

In $\Delta DAP \; and \; \Delta EBP$

∠DPA = ∠EPB

AP = BP (P is the mid-point of AB)

∠BAD = ∠ABE (Given)

Therefore,

By ASA congruence,

$\Delta DAP \cong \Delta EBP$

(ii) AD = BE (By c.p.c.t)

Question 8.

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 figure). Show that:

(i) Δ AMC ≅Δ BMD

(ii) ∠DBC is a right angle.

(iii) Δ DBC ≅Δ ACB

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

Solution.

It is given in the question that:

∠C = 90°,

M is the mid-point of AB and DM = CM

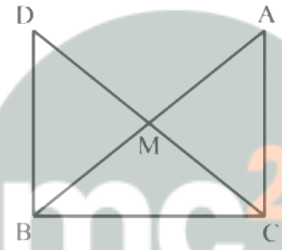


Fig. 7.23

(i) In $\Delta AMC \text{ and } \Delta BMD$,

AM = BM (M is the mid-point)

∠CMA = ∠DMB (Vertically opposite angle)

CM = DM (Given)

Therefore,

By SAS congruence,

$\Delta AMC \cong \Delta BMD$

(ii) ∠ACM = ∠BDM (By c.p.c.t)

Therefore,

AC parallel to BD as alternate interior angles are equal

Now,

$\angle ACB + \angle DBC = 180^o$ (Co-interior angles)

$90^o + \angle B = 180^o$

$\angle DBC = 90^o$

(iii) In $\Delta DBC \text{ and } \Delta ACB$,

BC = CB (Common)

$\angle ACB = \angle DBC$ (Right angles)

DB = AC (By c.p.c.t already proved)

Therefore,

By SAS congruence rule,

$\Delta DBC \cong \Delta ACB$

(iv) DC = AB ($\Delta DBC \cong \Delta ACB$)

DM = CM = AM = BM (M is the mid-point)

DM + CM = AM + BM

CM + CM = AB

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