NCERT Solutions for Class 9 Maths Chapter 7 Triangles Ex 7.3

Question 1.

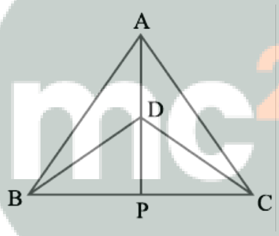
Δ ABC and Δ DBC are two isosceles triangles on the same base BC and vertices A and D are on the same side of BC (see Fig. 7.39). If AD is extended to intersect BC at P, show that

(i) Δ ABD ≅Δ ACD

(ii) Δ ABP ≅Δ ACP

(iii) AP bisects ∠ A as well as ∠ D.

(iv) AP is the perpendicular bisector of BC.



Solution.

It is given in the question that:

$\Delta ABC\ and\ \Delta DBC$ are two isosceles triangles

(i) In $\Delta ABD\ and\ \Delta ACD$,

AD = AD (Common)

AB = AC (Triangle ABC is isosceles)

BD = CD (Triangle DBC is isosceles)

Therefore,

By SSS axiom,

$\Delta ABD \cong \Delta ACD$

(ii) In $\Delta ABP \ and \ \Delta ACP$,

AP = AP (Common)

∠PAB = ∠PAC (By c.p.c.t)

AB = AC (Triangle ABC is isosceles)

Therefore,

By SAS axiom,

$\Delta ABP \cong \Delta ACP$

(iii) ∠PAB = ∠PAC (By c.p.c.t)

AP bisects ∠A (i)

Also,

In $\Delta BPD \ and \ \Delta CPD$,

PD = PD (Common)

BD = CD (Triangle DBC is isosceles)

BP = CP ($\Delta ABP \cong \Delta ACP$ so by c.p.c.t)

Therefore,

By SSS axiom,

$\Delta BPD \cong \Delta CPD$

$Thus,$

∠BDP = ∠CDP (By c.p.c.t) (ii)

By (i) and (ii), we can say that AP bisects ∠A as well as ∠D

(iv) ∠BPD = ∠CPD (By c.p.c.t)

And,

BP = CP (i)

Also,

∠BPD + ∠CPD = 180° (BC is a straight line)

2∠BPD = 180°

∠BPD = 90° (ii)

From (i) and (ii), we get

AP is the perpendicular bisector of BC

Question 2.

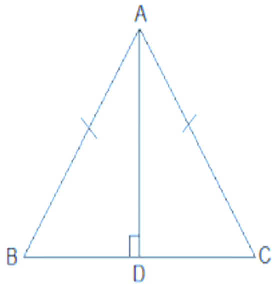
AD is an altitude of an isosceles triangle ABC in which AB = AC. Show that

(i) AD bisects BC

(ii) AD bisects ∠ A

Solution. It is given in the question that:

AD is an altitude and AB = AC



(i) In $\Delta ABD \ and \ \Delta ACD,$

∠ADB = ∠ADC = 90°

AB = AC (Given)

AD = AD (Common)

Therefore,

By RHS axiom,

$\Delta ABD \ \cong \ \Delta ACD$

$Now,$

$BD = CD$ (By c.p.c.t)

$Thus,$

$AD \ bisects \ BC$

(ii) ∠BAD = ∠CAD (By c.p.c.t)

Thus,

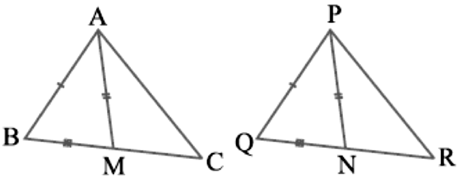
Ad bisects ∠A

Question 3.

Two sides AB and BC and median AM of one triangle ABC are respectively equal to sides PQ and QR and median PN of Δ PQR (see Fig. 7.40). Show that:

(i) Δ ABM ≅Δ PQN

(ii) Δ ABC ≅Δ PQR



Solution.

It is given in the question that:

AB = PQ

BC = QR

And,

AM = PN

(i) $\frac{1}{2}$BC = BM

And,

$\frac{1}{2}$ QR = QN (Am and PN are medians)

Also,

BC = QR

$\frac{1}{2}$BC = $\frac{1}{2}$QR

$BM = QN$

In ΔABM and ΔPQN,

AM = PN (Given)

AB = PQ (Given)

BM = QN (Proved above)

Therefore,

By SSS axiom,

$\Delta ABM \cong \Delta PQN$

(ii) In ΔABC and ΔPQR,

AB = PQ (Given)

∠ABC = ∠PQR (By c.p.c.t)

BC = QR (Given)

Therefore,

By SAS axiom,

$\Delta ABC \cong \Delta PQR$

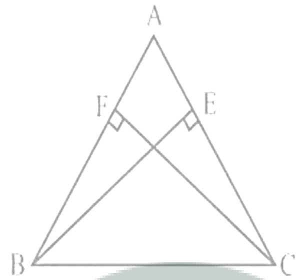
Question 4.

BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule, prove that the triangle ABC is isosceles.

Solution.

It is given in the question that:

BE and CF are two equal altitudes



In $\Delta BEC\ and\ \Delta CFB$,

$\angle$BEC = $\angle$CFB = 90° (Altitudes)

BC = CB (Common)

BE = CF (Common)

Therefore,

By RHS axiom,

$\Delta BEC \cong CFB$

Now,

$\angle$C = $\angle$B (By c.p.c.t)

Thus,

AB = AC as sides opposite to the equal angles are equal

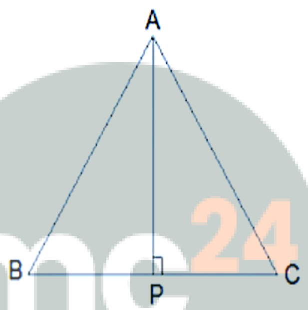
Question 5.

ABC is an isosceles triangle with AB = AC. Draw AP ⊥ BC to show that ∠ B = ∠ C.

Solution.

It is given in the question that:

AB = AC



In ΔABP and ΔACP,

∠APB = ∠APC = 90° (AP is altitude)

AB = AC (Given)

AP = AP (Common)

Therefore,

By RHS axiom,

$\Delta ABP \cong \Delta ACP$

Thus, ∠B = ∠C (By c.p.c.t)