VIDYA BHAWAN BALIKA VIDYA PITH

शक्तिउत्थानआश्रमलखीसरायबिहार

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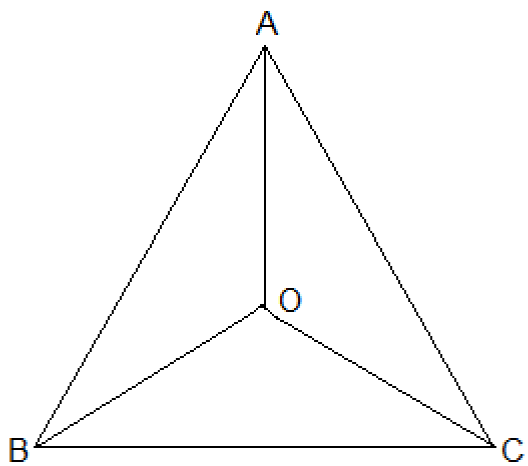
Teacher Name –Krishna Kanhaiya

1. In an isosceles triangle ABC, with AB = AC, the bisectors of B and C intersect each other at O. Join A to O. Show that:

(i) OB = OC (ii) AO bisects A



Solution:

Given:

AB = AC and

the bisectors of B and C intersect each other at O

(i) Since ABC is an isosceles with AB = AC,

B = C

½ B = ½ C

⇒ OBC = OCB (Angle bisectors)

∴ OB = OC (Side opposite to the equal angles are equal.)

(ii) In ΔAOB and ΔAOC,

AB = AC (Given in the question)

AO = AO (Common arm)

OB = OC (As Proved Already)

So, ΔAOB ΔAOC by SSS congruence condition.

BAO = CAO (by CPCT)

Thus, AO bisects A.

2. In ΔABC, AD is the perpendicular bisector of BC (see Fig. 7.30). Show that ΔABC is an isosceles triangle in which AB = AC.

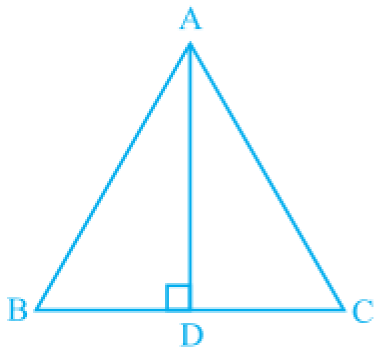


Fig. 7.30

Solution:

It is given that AD is the perpendicular bisector of BC

To prove:

AB = AC

Proof:

In ΔADB and ΔADC,

AD = AD (It is the Common arm)

ADB = ADC

BD = CD (Since AD is the perpendicular bisector)

So, ΔADB ΔADC by **SAS congruency criterion**.

Thus,

AB = AC (by CPCT)

3. ABC is an isosceles triangle in which altitudes BE and CF are drawn to equal sides AC and AB respectively (see Fig. 7.31). Show that these altitudes are equal.

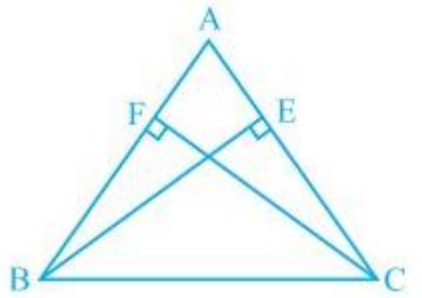


Fig. 7.31

Solution:

Given:

(i) BE and CF are altitudes.

(ii) AC = AB

To prove:

BE = CF

Proof:

Triangles ΔAEB and ΔAFC are similar by AAS congruency since

A = A (It is the common arm)

AEB = AFC (They are right angles)

AB = AC (Given in the question)

∴ ΔAEB ΔAFC and so, BE = CF (by CPCT).

4. ABC is a triangle in which altitudes BE and CF to sides AC and AB are equal (see Fig. 7.32). Show that

(i) ΔABE ΔACF

(ii) AB = AC, i.e., ABC is an isosceles triangle.

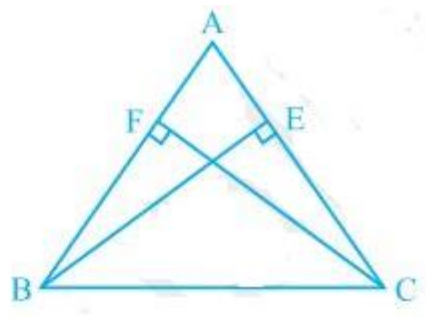


Fig. 7.32

Solution:

It is given that BE = CF

(i) In ΔABE and ΔACF,

A = A (It is the common angle)

AEB = AFC (They are right angles)

BE = CF (Given in the question)

∴ ΔABE ΔACF by **AAS congruency condition**.

(ii) AB = AC by CPCT and so, ABC is an isosceles triangle.