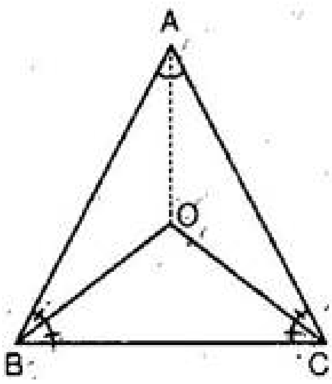
NCERT solutions for class 9 Maths Triangles Ex 7.2

Q1. In an isosceles triangle ABC, with AB = AC, the bisectors of $\angle$B and $\angle$C intersect each other at O. Join A to O. Show that:

(i) OB = OC

(ii) AO bisects $\angle$A.

Ans. (i) ABC is an isosceles triangle in which AB = AC.



$\therefore$ $\angle C = \angle B$ [Angles opposite to equal sides]

$\Rightarrow$ $\angle OCA + \angle OCB = \angle OBA + \angle OBC$

$\because$ OB bisects $\angle$B and OC bisects $\angle$C

$\therefore$ $\angle OBA = \angle OBC$ and $\angle OCA = \angle OCB$

$\Rightarrow$ $\angle OCB + \angle OCB = \angle OBC + \angle OBC$

$\Rightarrow$ $2\angle OCB = 2\angle OBC$

$\Rightarrow$ $\angle OCB = \angle OBC$

Now in ΔOBC,

$\angle OCB = \angle OBC$ [Prove above]

$\therefore$ OB = OC [Sides opposite to equal sides]

(ii) In ΔAOB and ΔAOC,

AB = AC [Given]

$\angle OBA = \angle OCA$ [Given]

And $\angle B = \angle C$

$\Rightarrow \frac{1}{2}\angle B = \frac{1}{2}\angle C$

$\Rightarrow \angle OBA = \angle OCA$

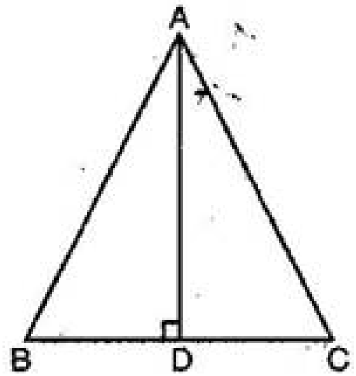
$\Rightarrow$ OB = OC [Prove above]

$\therefore \Delta AOB \cong \Delta AOC$ [By SAS congruency]

$\Rightarrow \angle OAB = \angle OAC$ [By C.P.C.T.]

Hence AO bisects $\angle A$.

Q2. In Δ ABC, AD is the perpendicular bisector of BC (See figure). Show that Δ ABC is an isosceles triangle in which AB = AC.



Ans. In Δ AOB and Δ AOC,

BD = CD [AD bisects BC]

$\angle ADB = \angle ADC = 90^\circ$ [AD $\perp$ BC]

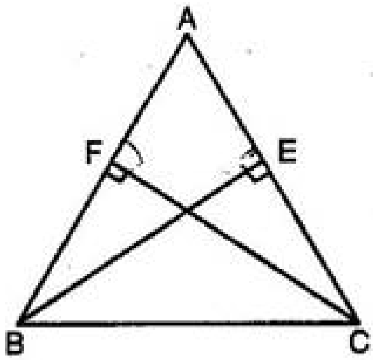
AD = AD [Common]

$\therefore \Delta ABD \cong \Delta ACD$ [By SAS congruency]

$\Rightarrow$ AB = AC [By C.P.C.T.]

Therefore, ABC is an isosceles triangle.

Q3. ABC is an isosceles triangle in which altitudes BE and CF are drawn to sides AC and AB respectively (See figure). Show that these altitudes are equal.



Ans. In ΔABE and ΔACF,

$\angle A = \angle A$ [Common]

$\angle AEB = \angle AFC = 90^\circ$ [Given]

AB = AC [Given]

$\therefore$ $\Delta ABE \cong \Delta ACF$ [By ASA congruency]

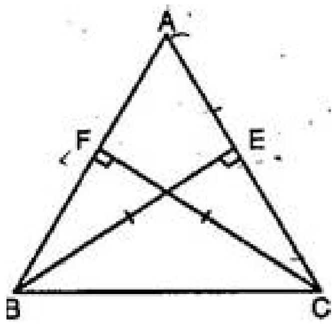
$\Rightarrow$ BE = CF [By C.P.C.T.]

$\Rightarrow$ Altitudes are equal.

Q4. ABC is a triangle in which altitudes BE and CF to sides AC and AB are equal (See figure). Show that:

(i) $\Delta ABE \cong \Delta ACF$

(ii) AB = AC or ΔABC is an isosceles triangle.



Ans. (i) In ΔABE and ΔACF,

$\angle A = \angle A$ [Common]

$\angle AEB = \angle AFC = 90^\circ$ [Given]

BE = CF [Given]

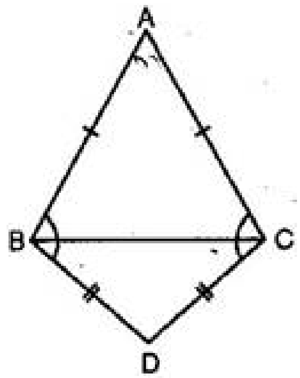
$\therefore$ $\Delta ABE \cong \Delta ACF$ [By ASA congruency]

(ii) Since $\Delta ABE \cong \Delta ACF$

$\Rightarrow$ BE = CF [By C.P.C.T.]

$\Rightarrow$ ABC is an isosceles triangle.

Q5. ABC and DBC are two isosceles triangles on the same base BC (See figure). Show that $\angle ABD = \angle ACD$.



Ans. In isosceles triangle ABC,

AB = AC [Given]

$\angle$ACB = $\angle$ABC ....(i) [Angles opposite to equal sides]

Also in Isosceles triangle BCD.

BD = DC

$\therefore$ $\angle$BCD = $\angle$CBD ....(ii) [Angles opposite to equal sides]

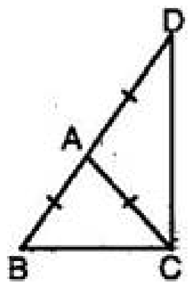
Adding eq. (i) and (ii),

$\angle$ACB + $\angle$BCD = $\angle$ABC + $\angle$CBD

$\Rightarrow$ $\angle$ACD = $\angle$ABD

Or $\angle$ABD = $\angle$ACD

Q6. ΔABC is an isosceles triangle in which AB = AC. Side BA is produced to D such that AD = AB. Show that $\angle$BCD is a right angle (See figure).



Ans. In isosceles triangle ABC,

AB = AC [Given]

$\angle$ACB = $\angle$ABC ....(i) [Angles opposite to equal sides]

Now AD = AB [By construction]

But AB = AC [Given]

$\therefore$ AD = AB = AC

$\Rightarrow$ AD = AC

Now in triangle ADC,

AD = AC

$\Rightarrow$ $\angle$ADC = $\angle$ACD ....(ii) [Angles opposite to equal sides]

Since $\angle$BAC + $\angle$CAD = 180° ....(iii) [Linear pair]

And Exterior angle of a triangle is equal to the sum of its interior opposite angles.

$\therefore$ In ΔABC,

$\angle$CAD = $\angle$ABC + $\angle$ACB = $\angle$ACB + $\angle$ACB [Using (i)]

$\Rightarrow$ $\angle$CAD = 2$\angle$ACB ....(iv)

Similarly, for ΔADC,

$\angle$BAC = $\angle$ACD + $\angle$ADC

= $\angle$ACD + $\angle$ACD = 2 $\angle$ACD ....(v)

From eq. (iii), (iv) and (v),

2$\angle$ACB + 2$\angle$ACD = 180°

$\Rightarrow$ 2($\angle$ACB + $\angle$ACD) = 180°

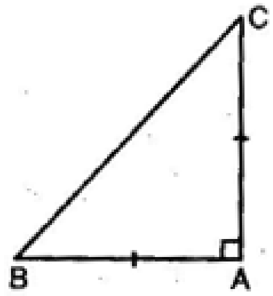
$\Rightarrow$ $\angle$ACB + $\angle$ACD = 90°

$\Rightarrow$ $\angle$BCD = 90°

Hence $\angle$BCD is a right angle.

Q7. ABC is a right angled triangle in which $\angle A = 90^\circ$ and AB = AC. Find $\angle B$ and $\angle C$.

Ans. ABC is a right triangle in which,



$\angle A = 90^\circ$ And AB = AC

In ΔABC,

AB = AC

$\Rightarrow \angle C = \angle B$ ....(i)

We know that, in Δ ABC,

$\angle A + \angle B + \angle C = 180^\circ$ [Angle sum property]

$\Rightarrow 90^\circ + \angle B + \angle B = 180^\circ$

[$\angle A = 90^\circ$ (given) and $\angle B = \angle C$ (from eq. (i)]

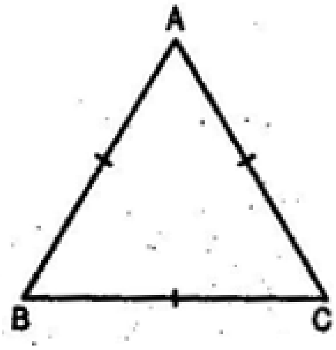
$\Rightarrow 2\angle B = 90^\circ$

$\Rightarrow \angle B = 45^\circ$

Also $\angle C = 45^\circ$ [$\angle B = \angle C$]

Q8. Show that the angles of an equilateral triangle are 60° each.

Ans. Let ABC be an equilateral triangle.



$\therefore$ AB = BC = AC

$\Rightarrow$ AB = BC

$\Rightarrow \angle C = \angle A$ ....(i)

Similarly, AB = AC

$\Rightarrow \angle C = \angle B$ ....(ii)

From eq. (i) and (ii),

$\angle A = \angle B = \angle C$ ....(iii)

Now in ΔABC

$\angle A + \angle B + \angle C = 180^\circ$ ....(iv)

$\Rightarrow \angle A + \angle A + \angle A = 180^\circ$

$\Rightarrow 3\angle A = 180^\circ$

$\Rightarrow \angle A = 60^\circ$

Since $\angle A = \angle B = \angle C$ [From eq. (iii)]

$\therefore \angle A = \angle B = \angle C = 60^\circ$

Hence each angle of equilateral triangle is 60°.

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