

7 TRIANGLES

EXERCISE 7.1

Q.1. In quadrilateral $ACBD$,
 $AC = AD$ and AB bisects $\angle A$
 (see Fig.). Show that $\triangle ABC \cong \triangle ABD$. What can
 you say about BC and BD ?

Sol. In $\triangle ABC$ and $\triangle ABD$, we have
 $AC = AD$ [Given]
 $\angle CAB = \angle DAB$
 $AB = AB$ [Common]
 $\therefore \triangle ABC \cong \triangle ABD$ [By SAS congruence] **Proved.**
 Therefore, $BC = BD$. (CPCT). **Ans.**

Q.2. $ABCD$ is a quadrilateral in which $AD = BC$
 and $\angle DAB = \angle CBA$ (see Fig.). Prove that
 (i) $\triangle ABD \cong \triangle BAC$
 (ii) $BD = AC$
 (iii) $\angle ABD = \angle BAC$

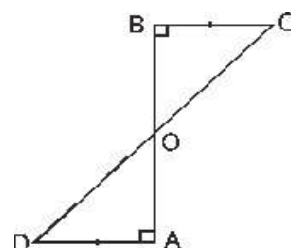
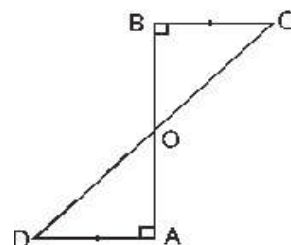
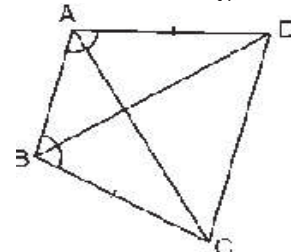
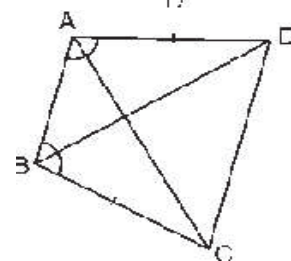
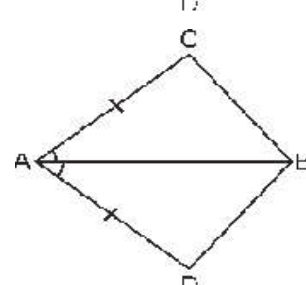
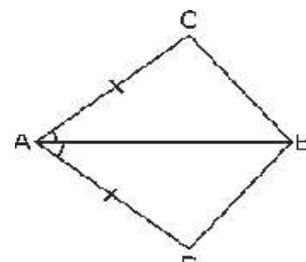
Sol. In the given figure, $ABCD$ is a quadrilateral in
 which $AD = BC$ and $\angle DAB = \angle CBA$.

In $\triangle ABD$ and $\triangle BAC$, we have
 $AD = BC$ [Given]
 $\angle DAB = \angle CBA$ [Given]
 $AB = AB$ [Common]
 $\therefore \triangle ABD \cong \triangle BAC$ [By SAS congruence]
 $\therefore BD = AC$ [CPCT]
 and $\angle ABD = \angle BAC$ [CPCT]

Proved

Q.3. AD and BC are equal perpendiculars to
 a line segment AB (see Fig.). Show that
 CD bisects AB .

Sol. In $\triangle AOD$ and $\triangle BOC$, we have,
 $\angle AOD = \angle BOC$ [Vertically opposite angles]
 $\angle CBO = \angle DAO$ [Each = 90°]
 and $AD = BC$ [Given]
 $\therefore \triangle AOD \cong \triangle BOC$ [By AAS congruence]
 Also, $AO = BO$ [CPCT]
 Hence, CD bisects AB **Proved.**



Q.4. l and m are two parallel lines intersected by another pair of parallel lines p and q (see Fig.). Show that $\triangle ABC \cong \triangle CDA$.

Sol. In the given figure, ABCD is a parallelogram in which AC is a diagonal, i.e., $AB \parallel DC$ and $BC \parallel AD$.

In $\triangle ABC$ and $\triangle CDA$, we have,

$$\angle BAC = \angle DCA \quad [\text{Alternate angles}]$$

$$\angle BCA = \angle DAC$$

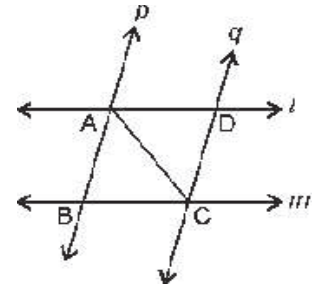
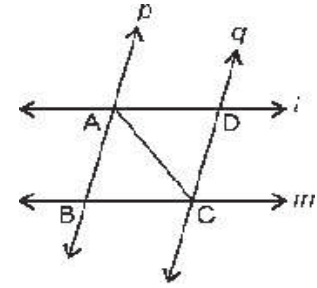
[Alternate angles]

$$AC = AC$$

[Common]

$$\therefore \triangle ABC \cong \triangle CDA \quad [\text{By ASA congruence}]$$

Proved.



Q.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 $\angle A$ (see Fig.). Show that :

(i) $\triangle APB \cong \triangle AQB$

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

Sol. In $\triangle APB$ and $\triangle AQB$, we have

$$\angle PAB = \angle QAB$$

[l is the bisector of $\angle A$]

$$\angle APB = \angle AQB$$

[Each = 90°]

$$AB = AB$$

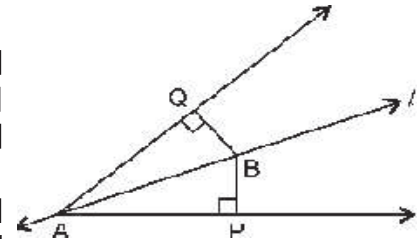
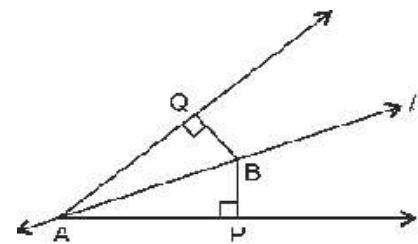
[Common]

$$\therefore \triangle APB \cong \triangle AQB \quad [\text{By AAS congruence}]$$

$$\text{Also, } BP = BQ$$

[By CPCT]

i.e., B is equidistant from the arms of $\angle A$. **Proved**



Q.6. In the figure, $AC = AE$, $AB = AD$ and $\angle BAD = \angle EAC$. Show that $BC = DE$.

Sol. $\angle BAD = \angle EAC$ [Given]

$$\Rightarrow \angle BAD + \angle DAC = \angle EAC + \angle DAC$$

[Adding $\angle DAC$ to both sides]

$$\Rightarrow \angle BAC = \angle EAD \quad \dots (i)$$

Now, in $\triangle ABC$ and $\triangle ADE$, we have

$$AB = AD \quad [\text{Given}]$$

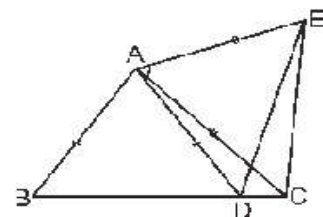
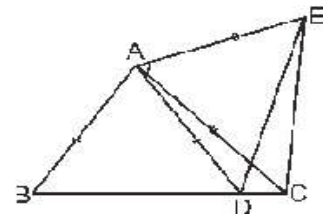
$$AC = AE \quad [\text{Given}]$$

$$\Rightarrow \angle BAC = \angle DAE \quad [\text{From (i)}]$$

$$\therefore \triangle ABC \cong \triangle ADE \quad [\text{By SAS congruence}]$$

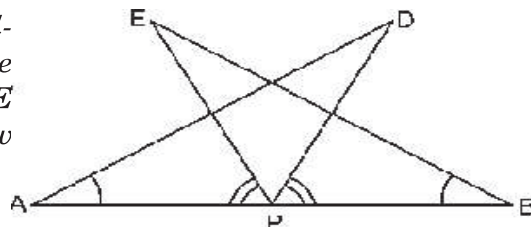
$$\Rightarrow BC = DE.$$

[CPCT] **Proved.**



Q.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 $\angle BAD = \angle ABE$ and $\angle EPA = \angle DPB$ (see Fig.). Show that

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



Sol. In $\triangle DAP$ and $\triangle EBP$, we have

$AP = BP$ [Q P is the mid-point of line segment AB]

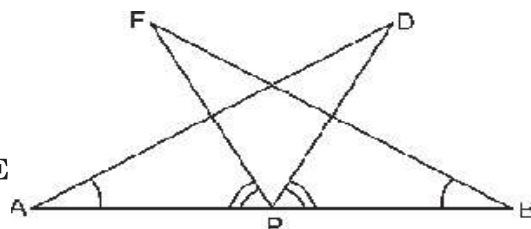
$\angle BAD = \angle ABE$ [Given]

$\angle EPB = \angle DPA$

[Q $\angle EPA = \angle DPB \Rightarrow \angle EPA + \angle DPE = \angle DPB + \angle DPE$]

$\therefore \triangle DPA \cong \triangle EPB$ [ASA]

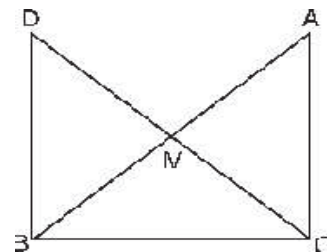
$\Rightarrow AD = BE$ [By CPCT] **Proved.**



Q.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 Fig.). Show that :

- (i) $\triangle AMC \cong \triangle BMD$
(ii) $\angle DBC$ is a right angle.
(iii) $\triangle DBC \cong \triangle ACB$

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



Sol. In $\triangle BMC$ and $\triangle DMC$, we have

- (i) $DM = CM$ [Given]

$BM = AM$

[Q M is the mid-point of AB]

$\angle DMB = \angle AMC$

[Vertically opposite angles]

$\therefore \triangle AMC \cong \triangle BMD$ [By SAS]

Proved.

- (ii) $AC \parallel BD$ [Q $\angle DBM$ and $\angle CAM$ are alternate angles]

$\Rightarrow \angle DBC + \angle ACB = 180^\circ$ [Sum of co-interior angles]

[Q $\angle ACB = 90^\circ$] **Proved.**

$\Rightarrow \angle DBC = 90^\circ$ **Proved.**

- (iii) In $\triangle DBC$ and $\triangle ACB$, we have

$DB = AC$

[CPCT]

$BC = BC$

[Common]

$\angle DBC = \angle ACB$

[Each = 90°]

$\therefore \triangle DBC \cong \triangle ACB$

[By SAS] **Proved.**

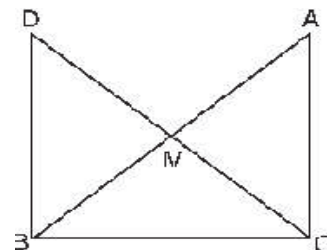
- (iv) $\therefore AB = CD$

[CPCT]

$\Rightarrow \frac{1}{2}AB = \frac{1}{2}CD$

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

[$CM = \frac{1}{2}CD$] **Proved.**



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EXERCISE 7.2

Q.1. 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 $\angle A$.

Sol. (i) $AB = AC \Rightarrow \angle ABC = \angle ACB$

[Angles opposite to equal sides are equal]

$$\frac{1}{2} \angle ABC = \frac{1}{2} \angle ACB$$

$$\Rightarrow \angle CBO = \angle BCO$$

[OB and OC are bisectors of $\angle B$ and $\angle C$ respectively]

$$\Rightarrow OB = OC \quad [\text{Sides opposite to equal angles are equal}]$$

$$\text{Again, } \angle \frac{1}{2} ABC = \frac{1}{2} \angle ACB$$

$$\Rightarrow \angle ABO = \angle ACO \quad [\because OB \text{ and } OC \text{ are bisectors of } \angle B \text{ and } \angle C \text{ respectively}]$$

In $\triangle ABO$ and $\triangle ACO$, we have

$$AB = AC$$

[Given]

$$OB = OC$$

[Proved above]

$$\angle ABO = \angle ACO$$

[Proved above]

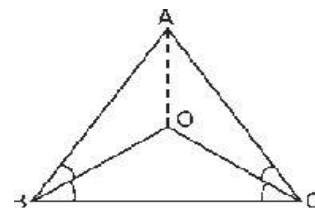
$$\therefore \triangle ABO \cong \triangle ACO$$

[SAS congruence]

$$\Rightarrow \angle BAO = \angle CAO$$

[CPCT]

$\Rightarrow AO$ bisects $\angle A$ **Proved.**



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

Sol. In $\triangle ABD$ and $\triangle ACD$, we have

$$\angle ADB = \angle ADC \quad [\text{Each} = 90^\circ]$$

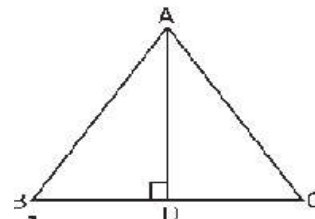
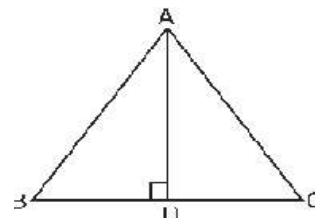
$$BD = CD \quad [Q \text{ } AD \text{ bisects } BC]$$

$$AD = AD \quad [\text{Common}]$$

$$\therefore \triangle ABD \cong \triangle ACD \quad [\text{SAS}]$$

$$\therefore AB = AC \quad [\text{CPCT}]$$

Hence, $\triangle ABC$ is an isosceles triangle. **Proved.**



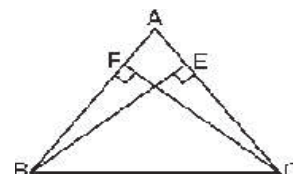
Q.3. ABC is an isosceles triangle in which altitudes BE and CF are drawn to equal sides AC and AB respectively (see Fig.). Show that these altitudes are equal.

Sol. In $\triangle ABC$,

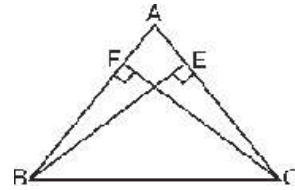
$$AB = AC \quad [\text{Given}]$$

$$\Rightarrow \angle B = \angle C \quad [\text{Angles opposite to equal sides of a triangle are equal}]$$

Now, in right triangles BFC and CEB ,



$\angle BFC = \angle CEB$ [Each = 90°]
 $\angle FBC = \angle ECB$ [Proved above]
 $BC = BC$ [Common]
 $\therefore \triangle BFC \cong \triangle CEB$ [AAS]
 Hence, $BE = CF$ [CPCT] **Proved.**



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

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

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

Sol. (i) In $\triangle ABE$ and $\triangle ACF$, we have

$BE = CF$ [Given]

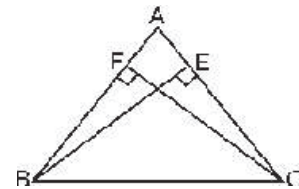
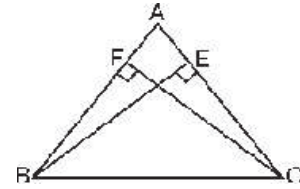
$\angle BAE = \angle CAF$ [Common]

$\angle BEA = \angle CFA$ [Each = 90°]

So, $\triangle ABE \cong \triangle ACF$ [AAS] **Proved.**

(ii) Also, $AB = AC$ [CPCT]

i.e., ABC is an isosceles triangle **Proved.**



Q.5. ABC and DBC are two isosceles triangles on the same base BC (see Fig.). Show that $\angle ABD = \angle ACD$.

Sol. In isosceles $\triangle ABC$, we have

$AB = AC$

$\angle ABC = \angle ACB$... (i)

[Angles opposite to equal sides are equal]

Now, in isosceles $\triangle DCB$, we have

$BD = CD$

$\angle DBC = \angle DCB$... (ii)

[Angles opposite to equal sides are equal]

Adding (i) and (ii), we have

$\angle ABC + \angle DBC = \angle ACB + \angle DCB$

$\Rightarrow \angle ABD = \angle ACD$ **Proved.**

Q.6. $\triangle ABC$ is an isosceles triangle in which $AB = AC$. Side BA is produced to D such that $AD = AB$ (see Fig.). Show that $\angle BCD$ is a right angle.

Sol. $AB = AC$ [Given]

$\angle ACB = \angle ABC$... (i)

[Angles opposite to equal sides are equal]

$AB = AD$ [Given]

$\therefore AD = AC$ [Q $AB = AC$]

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

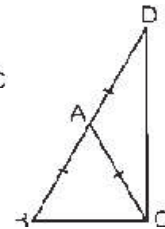
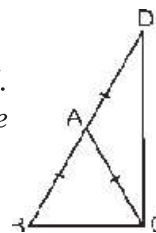
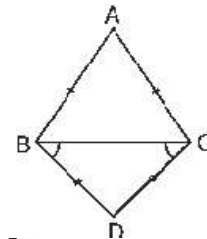
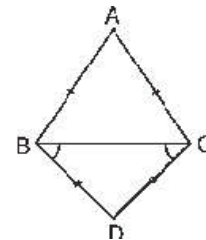
Adding (i) and (ii)

$\angle ACB + \angle ACD = \angle ABC + \angle ADC$

$\Rightarrow \angle BCD = \angle ABC + \angle ADC$... (iii)

Now, in $\triangle BCD$, we have

$\angle BCD + \angle DBC + \angle BDC = 180^\circ$ [Angle sum property of a triangle]



$$\therefore \angle BCD + \angle BCD = 180^\circ$$

$$\Rightarrow 2\angle BCD = 180^\circ$$

$$\Rightarrow \angle BCD = 90^\circ$$

Hence, $\angle BCD = 90^\circ$ or a right angle **Proved.**

Q.7. *ABC is a right angled triangle in which $\angle A = 90^\circ$ and $AB = AC$. Find $\angle B$ and $\angle C$.*

Sol. In $\triangle ABC$, we have

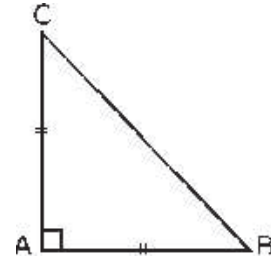
$$\left. \begin{array}{l} \angle A = 90^\circ \\ \text{and } AB = AC \end{array} \right\} \text{ [Given]}$$

We know that angles opposite to equal sides of an isosceles triangle are equal.

So, $\angle B = \angle C$

Since, $\angle A = 90^\circ$, therefore sum of remaining two angles = 90° .

Hence, $\angle B = \angle C = 45^\circ$ **Answer.**



Q.8. *Show that the angles of an equilateral triangle are 60° each.*

Sol. As $\triangle ABC$ is an equilateral.

So, $AB = BC = AC$

Now, $AB = AC$

$$\Rightarrow \angle ACB = \angle ABC \quad \dots(i)$$

[Angles opposite to equal sides of a triangle are equal]

Again, $BC = AC$

$$\Rightarrow \angle BAC = \angle ABC \quad \dots(ii) \quad \text{[same reason]}$$

Now, in $\triangle ABC$,

$$\angle ABC + \angle ACB + \angle BAC = 180^\circ \quad \text{[Angle sum property of a triangle]}$$

$$\Rightarrow \angle ABC + \angle ABC + \angle ABC = 180^\circ \quad \text{[From (i) and (ii)]}$$

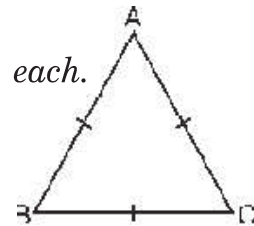
$$\Rightarrow 3 \angle ABC = 180^\circ$$

$$\Rightarrow \angle ABC = \frac{180^\circ}{3} = 60^\circ$$

Also, from (i) and (ii)

$$\angle ACB = 60^\circ \text{ and } \angle BAC = 60^\circ$$

Hence, each angle of an equilateral triangle is 60° **Proved.**

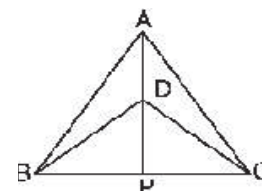


7 TRIANGLES

EXERCISE 7.3

Q.1. $\triangle ABC$ and $\triangle DBC$ are two isosceles triangles on the same base BC and vertices A and D are on the same side of BC (see Fig.). If AD is extended to intersect BC at P , show that

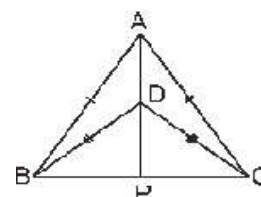
- (i) $\triangle ABD \cong \triangle ACD$
- (ii) $\triangle ABP \cong \triangle ACP$
- (iii) AP bisects $\angle A$ as well as $\angle D$.
- (iv) AP is the perpendicular bisector of BC .



Sol. (i) In $\triangle ABD$ and $\triangle ACD$, we have

$$\begin{array}{ll}
 AB = AC & \text{[Given]} \\
 BD = CD & \text{[Given]} \\
 AD = AD & \text{[Common]} \\
 \therefore \triangle ABD \cong \triangle ACD & \text{[SSS congruence]}
 \end{array}$$

Proved.



(ii) In $\triangle ABP$ and $\triangle ACP$, we have

$$\begin{array}{ll}
 AB = AC & \text{[Given]} \\
 \angle BAP = \angle CAP & \text{[Q } \angle BAD = \angle CAD, \text{ by CPCT]} \\
 AP = AP & \text{[Common]} \\
 \therefore \triangle ABP \cong \triangle ACP & \text{[SAS congruence]}
 \end{array}$$

Proved.

(iii) $\triangle ABD \cong \triangle ADC$ [From part (i)]

$$\Rightarrow \angle ADB = \angle ADC \quad \text{(CPCT)}$$

$$\Rightarrow 180^\circ - \angle ADB = 180^\circ - \angle ADC$$

$$\Rightarrow \text{Also, from part (ii), } \angle BAPD = \angle CAP \quad \text{[CPCT]}$$

$\therefore AP$ bisects $\angle A$ as well as $\angle D$. **Proved.**

(iv) Now, $BP = CP$

$$\text{and } \angle BPA = \angle CPA \quad \text{[By CPCT]}$$

$$\text{But } \angle BPA + \angle CPA = 180^\circ \quad \text{[Linear pair]}$$

$$\text{So, } 2\angle BPA = 180^\circ$$

$$\text{Or, } \angle BPA = 90^\circ$$

Since $BP = CP$, therefore AP is perpendicular bisector of BC .

Proved.

Q.2. *AD is an altitude of an isosceles triangle ABC in which AB = AC. Show that*

- (i) *AD bisects BC* (ii) *AD bisects $\angle A$.*

Sol. (i) In $\triangle ABD$ and $\triangle ACD$, we have

$$\angle ADB = \angle ADC \quad [\text{Each} = 90^\circ]$$

$$AB = AC \quad [\text{Given}]$$

$$AD = AD \quad [\text{Common}]$$

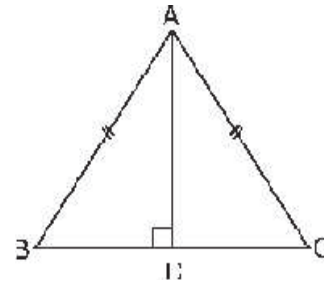
$$\therefore \triangle ABD \cong \triangle ACD \quad [\text{RHS congruence}]$$

$$\therefore BD = CD \quad [\text{CPCT}]$$

Hence, AD bisects BC.

- (ii) Also, $\angle BAD = \angle CAD$

Hence AD bisects $\angle A$ **Proved**



Q.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 $\triangle PQR$ (see Fig.). Show that :*

- (i) $\triangle ABM \cong \triangle PQN$ (ii) $\triangle ABC \cong \triangle PQR$

Sol. (i) In $\triangle ABM$ and $\triangle PQN$,
we have

$$BM = QN$$

$$[BC = QR]$$

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

$$AB = PQ \quad [\text{Given}]$$

$$AM = PN \quad [\text{Given}]$$

$$\therefore \triangle ABM \cong \triangle PQN \quad [\text{SSS congruence}]$$

$$\Rightarrow \angle ABM = \angle PQN \quad [\text{CPCT}]$$

Proved.

- (ii) Now, in $\triangle ABC$ and $\triangle PQR$, we have

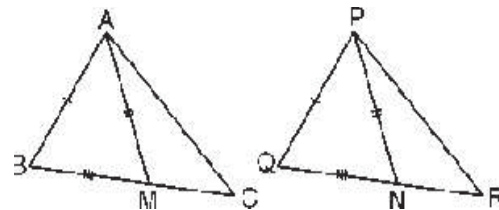
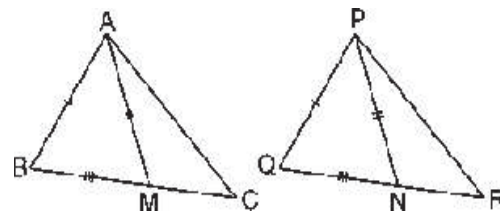
$$AB = PQ \quad [\text{Given}]$$

$$\angle ABC = \angle PQR \quad [\text{Proved above}]$$

$$BC = QR \quad [\text{Given}]$$

$$\therefore \triangle ABC \cong \triangle PQR \quad [\text{SAS congruence}]$$

Proved.



Q.4. *BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule, prove that the triangle ABC is isosceles.*

Sol. BE and CF are altitudes of a $\triangle ABC$.

$$\therefore \angle BEC = \angle CFB = 90^\circ$$

Now, in right triangles BEC and CFB, we have

$$\text{Hyp. BC} = \text{Hyp. BC} \quad [\text{Common}]$$

$$\text{Side BE} = \text{Side CF} \quad [\text{Given}]$$

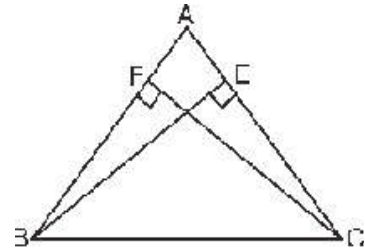
$$\therefore \triangle BEC \cong \triangle CFB \quad [\text{By RHS congruence rule}]$$

$$\therefore \angle BCE = \angle CBF \quad [\text{CPCT}]$$

Now, in $\triangle ABC$, $\angle B = \angle C$

$$\therefore AB = AC \quad [\text{Sides opposite to equal angles are equal}]$$

Hence, $\triangle ABC$ is an isosceles triangle. **Proved.**



Q.5. *ABC is an isosceles triangle with $AB = AC$. Draw $AP \perp BC$ to show that $\angle B = \angle C$.*

Sol. Draw $AP \perp BC$.

In $\triangle ABP$ and $\triangle ACP$, we have

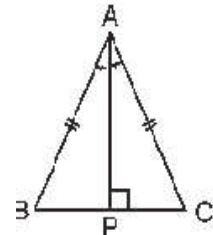
$$AB = AC \quad [\text{Given}]$$

$$\angle APB = \angle APC \quad [\text{Each} = 90^\circ]$$

$$AP = AP \quad [\text{Common}]$$

$$\therefore \triangle ABP \cong \triangle ACP \quad [\text{By RHS congruence rule}]$$

Also, $\angle B = \angle C$ **Proved.** [CPCT]



7 TRIANGLES

EXERCISE 7.4

Q.1. Show that in a right angled triangle, the hypotenuse is the longest side.

Sol. ABC is a right triangle, right angled at B.

Now, $\angle A + \angle C = 90^\circ$

$\Rightarrow$ Angles A and C are each less than 90° .

Now, $\angle B > \angle A$

$\Rightarrow AC > BC$... (i)

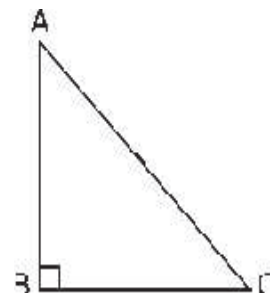
[Side opposite to greater angle is longer]

Again, $\angle B > \angle C$

$\Rightarrow AC > AB$... (ii)

[Side opposite to greater angle is longer]

Hence, from (i) and (ii), we can say that AC (Hypotenuse) is the longest side. **Proved**

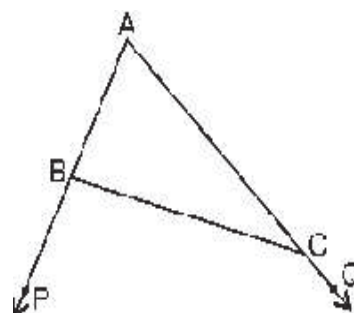


Q.2. In the figure, sides AB and AC of $\triangle ABC$ are extended to points P and Q respectively. Also, $\angle PBC < \angle QCB$. Show that $AC > AB$.

Sol. $\angle ABC + \angle PBC = 180^\circ$ [Linear pair]

$\Rightarrow \angle ABC = 180^\circ - \angle PBC$... (i)

Similarly, $\angle ACB = 180^\circ - \angle QCB$... (ii)



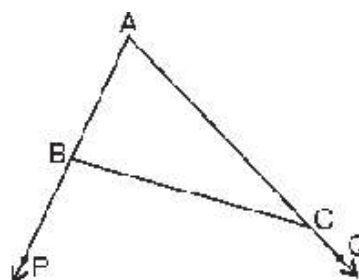
It is given that $\angle PBC < \angle QCB$

$\therefore 180^\circ - \angle QCB < 180^\circ - \angle PBC$

Or $\angle ACB < \angle ABC$ [From (i) and (ii)]

$\Rightarrow AB < AC$

$\Rightarrow AC > AB$ **Proved.**



Q.3. In the figure, $\angle B < \angle A$ and $\angle C < \angle D$. Show that $AD < BC$.

Sol. $\angle B < \angle A$ [Given]
 $BO > AO$... (i)
 [Side opposite to greater angle is longer]
 $\angle C < \angle D$ [Given]
 $\Rightarrow CO > DO$... (ii)
 [Same reason]
 Adding (i) and (ii)
 $BO + CO > AO + DO$
 $\Rightarrow BC > AD$
 $AD < BC$ **Proved.**

Q.4. AB and CD are respectively the smallest and longest sides of a quadrilateral $ABCD$ (see Fig.). Show that $\angle A > \angle C$ and $\angle B > \angle D$.

Sol. Join AC .

Mark the angles as shown in the figure.

In $\triangle ABC$,

$BC > AB$ [AB is the shortest side]

$\Rightarrow \angle 2 > \angle 4$... (i)

[Angle opposite to longer side is greater]

In $\triangle ADC$,

$CD > AD$ [CD is the longest side]

$\angle 1 > \angle 3$... (ii)

[Angle opposite to longer side is greater]

Adding (i) and (ii), we have

$$\angle 2 + \angle 1 > \angle 4 + \angle 3$$

$\Rightarrow \angle A > \angle C$ **Proved.**

Similarly, by joining BD , we can prove that

$$\angle B > \angle D.$$

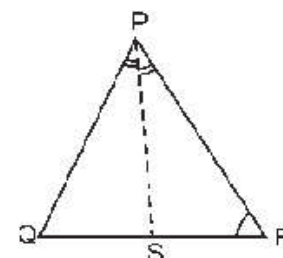
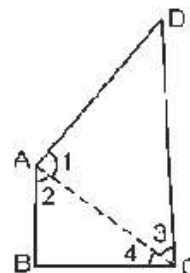
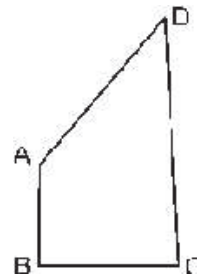
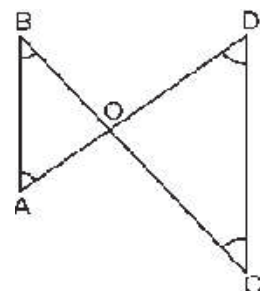
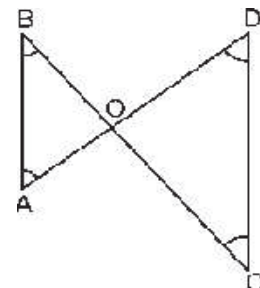
Q.5. In the figure, $PR > PQ$ and PS bisects $\angle QPR$. Prove that $\angle PSR > \angle PSQ$.

Sol. $PR > PQ$

$\angle PQR > \angle PRQ$... (i)

[Angle opposite to longer side is greater]

$\angle QPS > \angle RPS$ [$\because PS$ bisects $\angle QPR$] ... (ii)



In $\triangle PQS$, $\angle PQS + \angle QPS + \angle PSQ = 180^\circ$

$$\Rightarrow \angle PSQ = 180^\circ - (\angle PQS + \angle QPS) \quad \dots(iii)$$

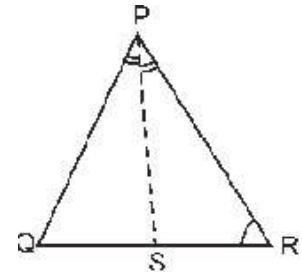
Similarly in $\triangle PRS$, $\angle PRS + \angle RPS + \angle PSR = 180^\circ$

$$\Rightarrow \angle PSR = 180^\circ - (\angle PRS + \angle RPS) \quad \text{[from (ii) ... (iv)]}$$

From (i), we know that $\angle PQS < \angle PRS$

So from (iii) and (iv), $\angle PSQ < \angle PSR$

$$\Rightarrow \angle PSR > \angle PSQ \quad \textbf{Proved}$$



Q.6. Show that of all the segments drawn from a given point not on it, the perpendicular line segment is the shortest.

Sol. We have A line $\leftrightarrow l$ and O is a point not on $\leftrightarrow l$.

$$OP \perp \leftrightarrow l.$$

We have to prove that $OP < OQ$, $OP < OR$ and $OP < OS$.

In $\triangle OPQ$, $\angle P = 90^\circ$

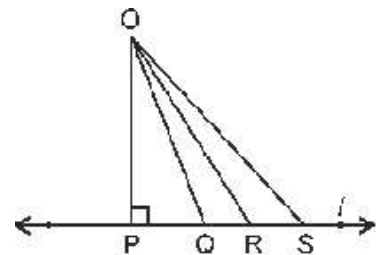
$\therefore \angle Q$ is an acute angle (i.e., $\angle Q < 90^\circ$)

$\therefore \angle Q < \angle P$

Hence, $OP < OQ$

[Side opposite to greater angle is longer]

Similarly, we can prove that OP is shorter than OR , OS etc. **Proved.**

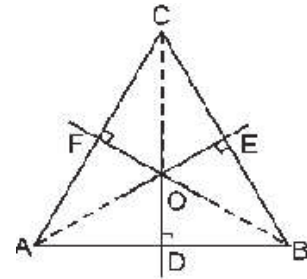


7 TRIANGLES

EXERCISE 7.5 (OPTIONAL)

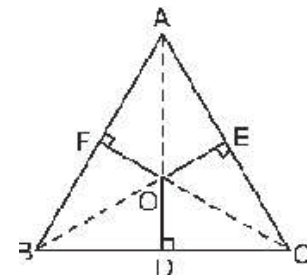
Q.1. ABC is a triangle. Locate a point in the interior of $\triangle ABC$ which is equidistant from all the vertices of $\triangle ABC$.

Sol. Draw perpendicular bisectors of sides AB , BC and CA , which meets at O .
Hence, O is the required point.



Q.2. In a triangle locate a point in its interior which is equidistant from all the sides of the triangle.

Sol.



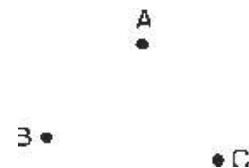
Q.3. In a huge park, people are concentrated at three points (see Fig.).

A : where there are different slides and swings for children,

B : near which a man-made lake is situated,

C : which is near to a large parking and exit.

Where should an icecream parlour be set up so that maximum number of persons can approach it?

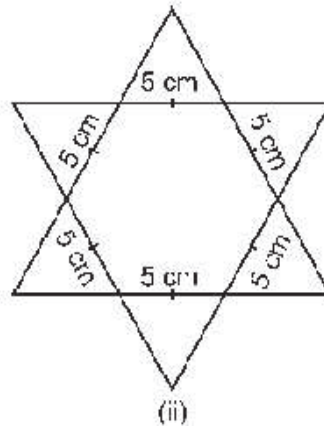
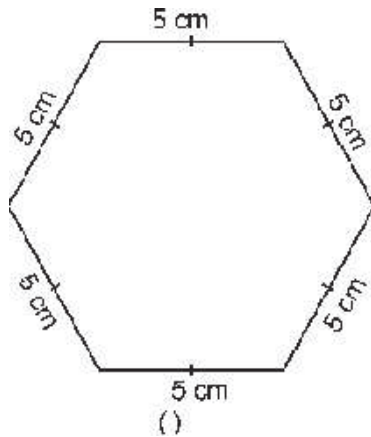


Draw bisectors $\angle A$, $\angle B$ and $\angle C$ of $\triangle ABC$. Let these angle bisectors meet at O .

O is the required point.

Sol. Join AB , BC and CA to get a triangle ABC . Draw the perpendicular bisector of AB and BC . Let them meet at O . Then O is equidistant from A , B and C . Hence, the icecream parlour should be set up at point O .

Q.4. Complete the hexagonal and star shaped Rangolies [see Fig. (i) and (ii)] by filling them with as many equilateral triangles of side 1 cm as you can. Count the number of triangles in each case. Which has more triangles?



Sol.

