7 Triangles

Lesson at a Glance

1. Congruent figures are of same size and same shape.
2. When placing a figure of two congruent figures on the other one, they cover each other completely.
3. Two circles of the same radii are congruent.
4. Two squares of the same sides are congruent.
5. Two photographs of same sizes but different pictures are not congruent.
6. Types of triangles: Equilateral, isosceles, acute-angled, obtuse-angled, right-angle, scalene triangles.
7. If three sides of one triangle are equal to the three sides of another triangle, then the two triangles are congruent (SSS congruence rule).
8. If two sides and the included angle of one triangle are equal to the two sides and included angle of another triangle, then the two triangles are congruent (SAS congruence rule).
9. If two angles and the included side of one triangle are equal to two angles and the included side of another triangle, then the two triangles are congruent (ASA congruence rule).
10. If two angles and one side (other than included side) of one triangle are equal to two angles and one side (other than included side) of another triangle, then the two triangles are congruent (AAS congruence rule).
11. In two right-angled triangles, if hypotenuse and one side of one triangle are equal to the hypotenuse and one side of the other triangle, then the two triangles are congruent (RHS congruence rule).
12. Sum of angles of a triangle is 180°. This property is called *Angle Sum Property of a Triangle.*
13. A triangle in which all the three sides are equal is called an equilateral triangle.

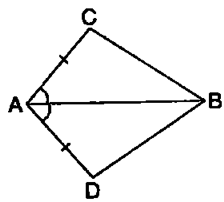
14. All the three angles of an equilateral triangle are equal, measuring 60° each.
15. A triangle in which two sides are equal is called an isosceles triangle.
16. Angles opposite to equal sides of a triangle are equal.
17. Sides opposite to equal angles of a triangle are equal.
18. The angle opposite to longer side of a triangle is larger.
19. The side opposite to the larger angle of a triangle is longer.
20. The sum of the two sides of a triangle is greater than the third side.
21. The difference of the two sides of a triangle is less than the third side.
22. All the three sides of a scalene triangle are of different lengths.

TEXTBOOK QUESTIONS SOLVED

Exercise 7.1 *(Pages – 118-120)*

1. *In quadrilateral ABCD, AC = AD and AB bisects ∠A (see figure). Show that ΔABC ≅ ΔABD.*

What can you say about BC and BD?



Sol. Consider triangles ABC and ABD,

We have AC = AD [Given]

AB = AB [Common]

and ∠CAB = ∠DAB [∵ AB bisects ∠CAD]

∴ Δ ABC ≅ Δ ABD [SAS rule]

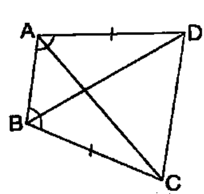
Therefore, BC = BD. [CPCT]

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.*



Sol. (i) Consider triangles ABD and ABC, We have AD = BC [Given]

AB = BA [Common]

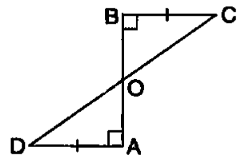
and ∠DAB = ∠CBA [Given]

∴ ΔABD ≅ ΔBAC [SAS rule]

(*ii*) BD = AC. [CPCT]

(*iii*) ∠ABD = ∠BAC. [CPCT]

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



Sol. AD and BC are perpendiculars to AB.

⇒ AD ∥ BC and CD is transversal.

∴ ∠BCD = ∠ADC, *i.e.*, ∠BCO = ∠ADO [Alternate angles]

Consider triangles BCO and ADO,

We have BC = AD [Given]

∠OBC = ∠OAD [90° each]

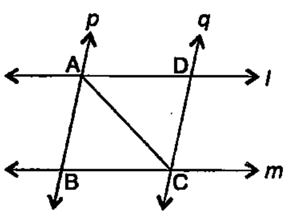
and ∠BCO = ∠ADO [Proved above]

∴ ΔOBC ≅ ΔOAD [ASA rule]

Therefore, OB = OA [CPCT]

Hence, CD bisects AB.

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



Sol. Since *l* ∥ *m* and AC is transversal.

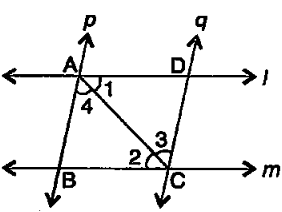
So, ∠1 = ∠2 ...(*i*)

[Alternate angles]

Again, *p* ∥ *q* and AC is transversal.

So, ∠3 = ∠4 ...(*ii*)

[Alternate angles]



Now, in Δ ADC and Δ ABC,

AC = CA [Common]

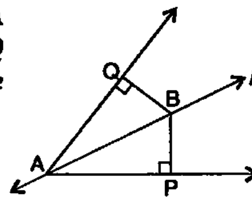
∠1 = ∠2 and ∠3 = ∠4 [From (*i*) and (*ii*)]

∴ Δ ABC ≅ Δ CDA. [ASA rule]

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) $\Delta APB \cong \Delta AQB$

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



Sol. ∵ Line l is the bisector of ∠QAP.

∴ ∠QAB = ∠PAB ...(i)

AB = BA ...(ii) [Common]

and ∠BQA = ∠BPA. ...(iii) [90° each]

(i) In triangles AQB and APB,

∠QAB = ∠PAB; AB = BA and ∠BQA = ∠BPA.

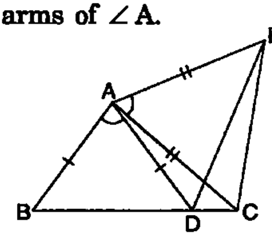
[From (i), (ii), (iii)]

∴ $\Delta APB \cong \Delta AQB$. [AAS rule]

(ii) Therefore, BP = BQ [CPCT]

i.e., B is equidistant from the arms of ∠A.

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



Sol. As ∠BAD = ∠CAE [Given]

⇒ ∠BAD + ∠DAC

= ∠DAC + ∠CAE

[∠DAC is added to both sides]

⇒ ∠BAC = ∠DAE ...(i)

Consider triangles BAC and DAE,

We have AB = AD [Given]

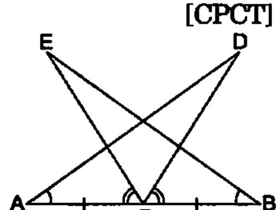
AC = AE [Given]

and ∠BAC = ∠DAE [From (i)]

∴ ΔBAC ≅ ΔDAC [SAS rule]

⇒ BC = DE. [CPCT]

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*) $\Delta DAP \cong \Delta EBP$

(*ii*) $AD = BE$.

Sol. Since $\angle EPA = \angle DPB$ [Given]

$\Rightarrow \angle EPA + \angle EPD = \angle EPD + \angle DPB$

[Adding $\angle EPD$ to both sides]

$\Rightarrow \angle APD = \angle BPE$ ...(*i*)

Also, $AP = BP$ ...(*ii*) [Given]

and $\angle DAP = \angle EBP$ ...(*iii*) [Given]

(*i*) Consider triangles DAP and EBP,

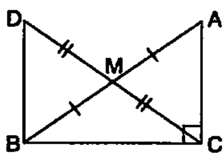
$\angle APD = \angle BPE$, $AP = BP$ and $\angle DAP = \angle EBP$.

[From (*i*), (*ii*), (*iii*)]

$\Delta DAP \cong \Delta EBP$. [SAS rule]

(*ii*) $AD = BE$. [CPCT]

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*) $\Delta AMC \cong \Delta BMD$

(*ii*) $\angle DBC$ *is a right angle.*

(*iii*) $\Delta DBC \cong \Delta ACB$

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

Sol. (*i*) Consider triangles AMC and DMB,

We have $AM = BM$ [Given]

$CM = DM$ [Given]

and $\angle AMC = \angle BMD$ [Vertically opposite angles]

$\therefore \Delta AMC \cong \Delta BMD$ [SAS rule]

(*ii*) As $\angle BAC = \angle DBA$ [CPCT, from part (*i*)]

and AB is the transversal.

So, DB ∥ AC ...(*i*)

We have AC ⊥ BC ...(*ii*) [Given]

So, DB ⊥ BC [From (*i*) and (*ii*)]

i.e., ∠DBC is a right angle, *i.e.*, ∠DBC = 90°.

(*iii*) Consider triangles ABC and DCB.

We have AC = DB [Since ΔAMC ≅ ΔBMD; result (*i*)]

BC = CB [Common]

and ∠ACB = ∠DBC [Each 90°]

∴ Δ DBC ≅ Δ ACB [SAS rule]

(*iv*) As DC = AB [CPCT from part (*iii*)]

⇒ 2CM = AB [∵ M is mid-point of DC]

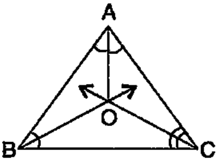
⇒ $CM = \frac{1}{2}AB.$

Exercise 7.2 *(Pages – 123-124)*

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.*

Sol. (*i*) In Δ ABC, AB = AC [Given]



⇒ ∠ABC = ∠ACB

[Angles opposite to equal sides are equal.]

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

⇒ ∠OBC = ∠OCB

[∵ OB and OC are bisectors of ∠ABC and ∠ACB respectively.]

⇒ OC = OB ...(*i*)

[Sides opposite to equal angles of a triangle are equal.]

(*ii*) Consider triangles AOB and AOC,

We have OC = OB [From (*i*)]

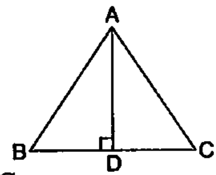
AO = OA [Common]

and $AB = AC$ [Given]

$\therefore$ $\Delta AOB \cong \Delta AOC$ [SSS rule]

$\Rightarrow$ $\angle OAB = \angle OAC$ [CPCT]

$\Rightarrow$ AO bisects $\angle BAC$.



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

Sol. Since AD is perpendicular bisector of BC.

$\therefore$ $BD = CD$ and $\angle ADB = \angle ADC = 90°$ ...(*i*)

Consider triangles ADB and ADC,

We have $BD = DC$

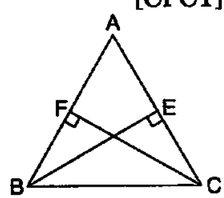
and $\angle ADB = \angle ADC$ [From (*i*)]

$AD = AD$ [Common]

$\therefore$ $\Delta ADB \cong \Delta ADC$ [SAS rule]

$\therefore$ $AB = AC$. [CPCT]

Therefore, ΔABC is an isosceles triangle with AB = AC.



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

Sol. In ΔABC, $AB = AC$ [Given]

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

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

Consider triangles BFC and BCE,

We have $\angle FBC = \angle ECB$ [From (*i*)]

$BC = CB$ [Common]

$\angle BFC = \angle CEB$ [90° each]

$\therefore$ $\Delta BCF \cong \Delta CBE$ [AAS rule]

$\Rightarrow$ $CF = BE$.

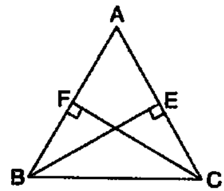
Hence, altitudes to the equal sides of a triangle are equal.

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

Sol. (*i*) Consider triangles ABE and ACF,



We have BE = CF [Given]

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

$\angle$AEB = $\angle$AFC [90° each]

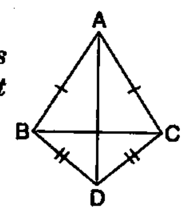
$\therefore$ Δ ABE $\cong$ Δ ACF [AAS rule]

(*ii*) Since Δ ABE $\cong$ Δ ACF [Proved above]

Hence, AB = AC [CPCT]

i.e., Δ ABC is isosceles.

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



Sol. Construction: Join A and D.

Proof: Consider triangles ABD and ACD,

We have AB = AC [Given]

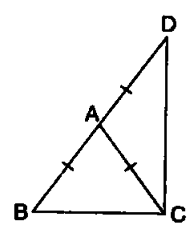
BD = CD [Given]

AD = AD [Common]

$\therefore$ Δ ABD $\cong$ Δ ACD [SSS rule]

$\therefore$ $\angle$ABD = $\angle$ACD. [CPCT]

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



Sol. As AB = AC [Given]

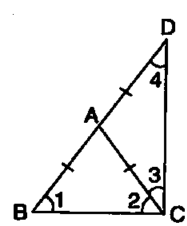
$\Rightarrow$ $\angle 1 = \angle 2$ ...(*i*)

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

and AC = AD ($\because$ AB = AD)[Given]

$\Rightarrow$ $\angle 3 = \angle 4$ ...(*ii*)

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



Also, in Δ DBC,

$\angle$DBC + $\angle$BCD + $\angle$CDB = 180°

[Sum of angles of a triangle is 180°.]

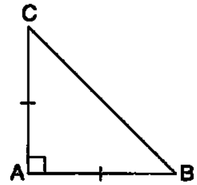
$\Rightarrow$ $\angle 1 + (\angle 2 + \angle 3) + \angle 4 = 180°$

$\Rightarrow \quad \angle 2 + \angle 2 + \angle 3 + \angle 3 = 180°$ [Using (*i*), (*ii*)]

$\Rightarrow \quad 2(\angle 2 + \angle 3) = 180°$

$\Rightarrow \quad \angle 2 + \angle 3 = 90° \Rightarrow \angle BCD = 90°.$

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



Sol. As $AB = AC$ [Given]

$\Rightarrow \angle B = \angle C$ ...(*i*) [Angles opposite to equal sides of a triangle are equal.]

In ΔABC, $\angle A + \angle B + \angle C = 180°$

[Sum of angles of a triangle is 180°.]

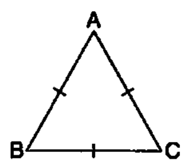
$\Rightarrow \quad 90° + \angle B + \angle B = 180°$

$\Rightarrow \quad 2\angle B = 90°$ [From (*i*)]

$\Rightarrow \quad \angle B = 45°$

$\therefore \quad \angle B = \angle C = 45°.$

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



Sol. As ΔABC is equilateral.

$\therefore \quad AB = BC = CA$

Now $\quad AB = BC \Rightarrow \angle C = \angle A$ ...(*i*)

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

Similarly, $BC = AC \Rightarrow \angle A = \angle B$ ...(*ii*)

[Reason same as above]

$\Rightarrow \quad \angle A = \angle B = \angle C$ ...(*iii*) [From (*i*) and (*ii*)]

In ΔABC, $\angle A + \angle B + \angle C = 180°$

[Sum of angles of a triangle is 180°.]

$\Rightarrow \quad \angle A + \angle A + \angle A = 180°$ [From (*iii*)]

$\Rightarrow \quad 3\angle A = 180°$

$\Rightarrow \quad \angle A = 60°$

$\therefore \quad \angle A = \angle B = \angle C = 60°.$

Exercise 7.3 *(Page – 128)*

1. *ΔABC and ΔDBC are two isosceles triangles on the same base BC and vertices A and D are on the same side of BC (see*

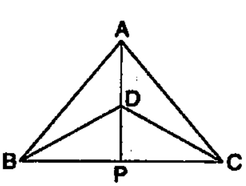


figure). If AD is extended to intersect BC at P, show that
(*i*) $\Delta ABD \cong \Delta ACD$
(*ii*) $\Delta ABP \cong \Delta ACP$
(*iii*) *AP bisects* $\angle A$ *as well as* $\angle D$.
(*iv*) *AP is the perpendicular bisector of BC.*

Sol. (*i*) Consider triangles ABD and ACD,

We have AB = AC [Given]
BD = CD [Given]
AD = DA [Common]
So, $\Delta ABD \cong \Delta ACD$ [SSS rule]
$\therefore$ $\angle BAD = \angle CAD$ and $\angle ABD = \angle ACD$ ...(*i*) [CPCT]

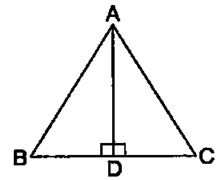
(*ii*) Consider triangles ABP and ACP,

We have AB = AC [Given]
AP = PA [Common]
and $\angle BAP = \angle CAP$ [From (*i*)]
$\therefore$ $\Delta ABP \cong \Delta ACP$ [SAS rule]
$\Rightarrow$ BP = PC, $\angle BPA = \angle CPA$

(*iii*) $\angle BAP = \angle CAP$ [From result (*ii*)]
$\Rightarrow$ AP bisects $\angle A$.
Also, $\angle BAD + \angle ABD = \angle CAD = \angle ACD$ [From (*i*)]
$\Rightarrow$ $\angle BDP = \angle CDP$ [Exterior angle property]
So, DP bisects $\angle D$.
Hence, AP bisects $\angle A$ as well as $\angle D$.

(*iv*) Also, $\angle BPA + \angle CPA = 180°$ [Linear pair]
$\Rightarrow$ $2\angle BPA = 180°$
$\Rightarrow$ $\angle BPA = 90°$ [From result (*ii*)]
As BP = CP [From result (*ii*)]
and $AP \perp BC$ [Proved above]
$\Rightarrow$ AP is perpendicular bisector of BC.

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. Consider triangles ABD and ACD,

We have AB = AC [Given]

AD = AD [Common]

∠ADB = ∠ADC [90° each]

∴ ΔABD ≅ ΔACD [RHS rule]

(*i*) ∴ BD = CD [CPCT]

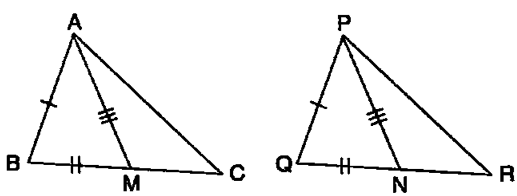
⇒ AD bisects BC.

(*ii*) and ∠BAD = ∠CAD [CPCT]

AD bisects ∠BAC, *i.e.*, ∠A.

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 ΔPQR (see figure). Show that:*

(*i*) Δ*ABM* ≅ Δ*PQN* (*ii*) Δ*ABC* ≅ Δ*PQR*.



Sol. (*i*) M and N are mid-points of BC and QR respectively, as AM and PN are medians.

∴ $BM = \frac{1}{2}BC$ and $QN = \frac{1}{2}QR$ ...(*i*)

Also, BC = QR [Given]

⇒ $\frac{1}{2}BC = \frac{1}{2}QR$ ⇒ BM = QN ...(*ii*) [From (*i*)]

Consider triangles ABM and PQN,

We have AB = PQ [Given]

AM = PN [Given]

and BM = QN [From (*ii*)]

∴ Δ ABM ≅ Δ PQN [SSS rule]

(*ii*) From result (*i*),

∠ABM = ∠PQN ⇒ ∠ABC = ∠PQR ...(*iii*)

Consider triangles ABC and PQR,

We have $AB = PQ$ [Given]

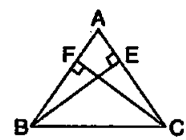
$BC = QR$ [Given]

and $\angle ABC = \angle PQR$ [From (*iii*)]

$\therefore$ $\Delta ABC \cong \Delta PQR$. [SAS rule]

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

Sol. Consider triangles BFC and CEB,



We have $BE = CF$ [Given]

$BC = CB$ [Common]

and $\angle BFC = \angle BEC$ [90° each]

$\therefore$ $\Delta BFC \cong \Delta CEB$ [RHS rule]

$\Rightarrow$ $\angle FBC = \angle ECB$ [CPCT]

i.e., $\angle ABC = \angle ACB$

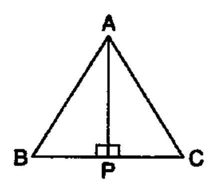
$\Rightarrow$ $AC = AB$

[Sides opposite to equal angles of a triangles are equal.]

$\Rightarrow$ ΔABC is an isosceles triangle.

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

Sol. Consider triangles APB and APC,



We have $AB = AC$ [Given]

$AP = PA$ [Common]

$\angle APB = \angle APC$ [90° each]

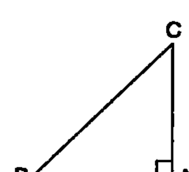
$\therefore$ $\Delta ABP \cong \Delta ACP$ [RHS rule]

$\Rightarrow$ $\angle B = \angle C$. [CPCT]

Exercise 7.4 *(Pages – 132-133)*

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

Sol. Triangle ABC is right angled at A.



$\therefore$ $\angle A > \angle B$ and $\angle A > \angle C$.

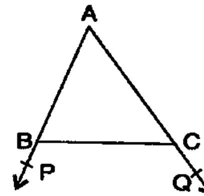
$\Rightarrow$ $BC > AC$ and $BC > AB$

[Because the side opposite to the greater angle is longer.]

$\Rightarrow$ BC is the longest side.

i.e., The hypotenuse is the longest side in an right angled triangle.

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



Sol. Given: $\angle PBC < \angle QCB$.

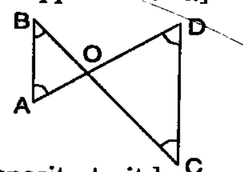
$\Rightarrow$ $180° - \angle ABC < 180° - \angle ACB$. [Linear pair]

$\Rightarrow$ $-\angle ABC < -\angle ACB$. [Multiplying by (– 1)]

$\Rightarrow$ $\angle ABC > \angle ACB$

$\Rightarrow$ $AC > AB$. [Greater angle has longer side opposite to it.]

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



Sol. As $\angle B < \angle A$ [Given]

$\Rightarrow$ $OA < OB$ ...(*i*)

[Greater angle has longer side opposite to it.]

$\angle C < \angle D$

$\Rightarrow$ $OD < OC$ ...(*ii*)

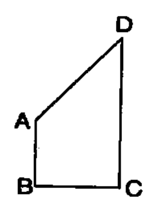
[Greater angle has longer side opposite to it.]

$\Rightarrow$ $OA + OD < OB + OC$

[Adding corresponding sides of (*i*) and (*ii*)]

$\Rightarrow$ $AD < BC$.

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



Sol. **Construction:** Join B and D.

In ΔABD, $AB < AD$ [Given]

$\Rightarrow$ $\angle ADB < \angle ABD$ ...(*i*)

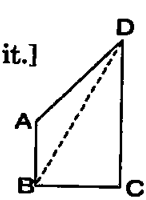
[Longer side has greater angle opposite to it.]

In ΔBCD,

$BC < CD$ [Given]

$\Rightarrow$ $\angle BDC < \angle DBC$ ...(*ii*)

[Longer side has greater angle opposite to it.]



Adding corresponding sides of (*i*) and (*ii*), we get

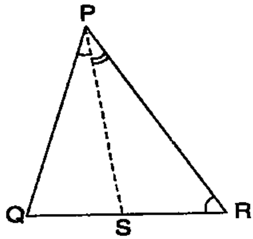
$\angle ADB + \angle BDC < \angle ABD + \angle DBC$

$\Rightarrow$ $\angle ADC < \angle ABC$ $\Rightarrow$ $\angle D < \angle B$

Similarly, by joining A and C, we can show $\angle A > \angle C$.

(Students try themselves)

5. *In figure, PR > PQ and PS bisects ∠QPR. Prove that ∠PSR > ∠PSQ.*



Sol. In ΔPQR, PR > PQ [Given]

⇒ ∠Q > ∠R ...(*i*)

[Angle opposite to longer side is greater.]

Also, ∠QPS = ∠RPS ...(*ii*)

[∵ PS is bisector of ∠QPR]

⇒ ∠Q + ∠QPS > ∠R < ∠RPS ...(*iii*) [Adding (*i*) and (*ii*)]

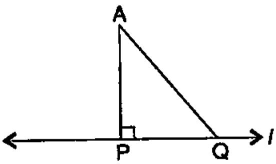
Also, ∠PSR = ∠Q + ∠QPS ...(*iv*) [Exterior angle is equal to sum of interior opposite angles.]

and ∠PSQ = ∠R + ∠RPS ...(*v*)

∴ ∠PSR > ∠PSQ. [From (*iii*), (*iv*) and (*v*)]

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

Sol. AP is perpendicular line segment on line l and AQ is any other line segment.



∠APQ > ∠AQP [In a triangle, if an angle is 90°, other two angles are less than 90°.]

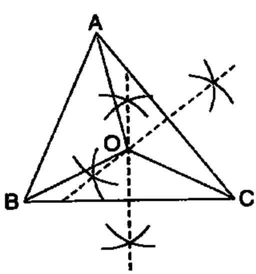
⇒ AQ > AP.

Hence, any line segment AQ, from point A to the line l, is greater than the perpendicular line segment AP, from point A to the line l.

Hence, AP is the shortest segment of all the segments.

Exercise 7.5 *(Page – 133)*

1. *ABC is a triangle. Locate a point in the interior of ΔABC which is equidistant from all the vertices of ΔABC.*



Sol. We know that any point on the perpendicular bisector of the line segment is equidistant from the end points of the line segment. Hence, (*i*) Draw the perpendicular bisector of line segment BC.

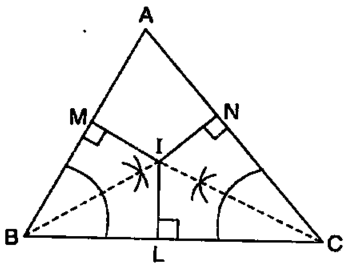
(*ii*) Draw the perpendicular bisector of line segment AC.

Let these perpendicular bisectors meet at O.

Then we have OB = OC = OA, *i.e.*, O is a point equidistant from the vertices of a triangle ABC.

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

Sol. We know that any point on the bisector of an angle is equidistant from the arms of an angle.



(*i*) Draw the bisector of ∠B.

(*ii*) Draw the bisector of ∠C.

Let these bisectors meet at I.

IL, IM and IN are perpendiculars drawn on the sides BC, AB and AC respectively.

As I lies on the bisector of ∠ABC ⇒ IL = IM

and I lies on the bisector of ∠ACB ⇒ IL = IN.

Then IL = IM = IN.

Hence, I is equidistant from BC, AC and AB.

3. *In a huge park, people are concentrated at three points (see figure):*

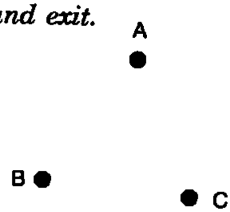
A: *where there are different slides and swings for children.*

B: *near which a man-made lake is situated.*

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

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

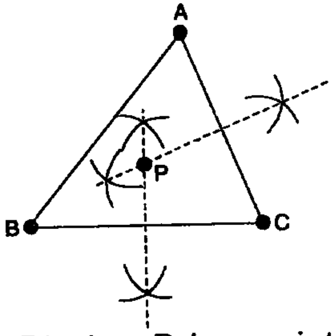
[**Hint:** *The parlour should be equidistant from A, B and C.*]



Sol. Position should be equidistant from A, B and C.

We know that any point on the perpendicular bisector of the line segment is equidistant from the end points of the line segment. Hence, (*i*) Draw the perpendicular bisector of line segment BC.

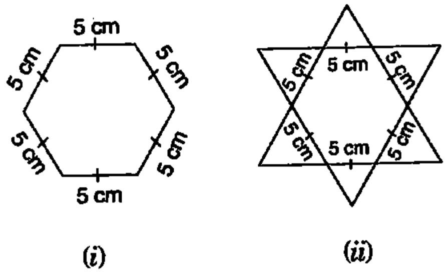
(*ii*) Draw the perpendicular bisector of line segment AC.



Let these perpendicular bisectors meet at P.

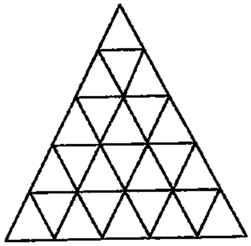
Then we have PB = PC = PA, *i.e.*, P is a point equidistant from the vertices of a triangle ABC. Hence parlour should be situated at P.

4. *Complete the hexagonal and star shaped Rangolies* [*see figure* (*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. Try yourself.

e.g.,



Side of bigger equilateral triangle is 5 cm and side of each smaller equilateral triangle is 1 cm.