

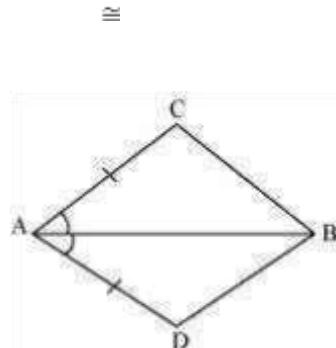
Class IX Chapter 7 – Triangles

Maths

Exercise 7.1 Question

1:

In quadrilateral ACBD, $AC = AD$ and AB bisects $\angle A$ (See the given figure). Show that



Answer: $\Delta ABC \cong \Delta ABD$. What can you say about BC and BD?

In ΔABC and ΔABD ,

$AC = AD$ (Given)

$\angle CAB = \angle DAB$ (AB bisects $\angle A$)

$AB = AB$ (Common)

$\therefore \Delta ABC \cong \Delta ABD$ (By SAS congruence rule)

$\therefore BC = BD$ (By CPCT)

Therefore, BC and BD are of equal lengths.

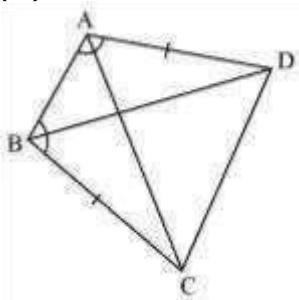
Question 2:

ABCD is a quadrilateral in which $AD = BC$ and $\angle DAB = \angle CBA$ (See the given figure).
Prove that

(i) $\Delta ABD \cong \Delta BAC$

(ii) $BD = AC$

(iii) $\angle ABD = \angle BAC$.



Answer:

In ΔABD and ΔBAC ,

$AD = BC$ (Given)

$\angle DAB = \angle CBA$ (Given)

$AB = BA$ (Common)

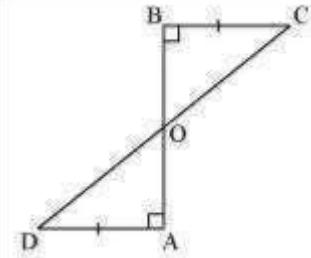
$\therefore \Delta ABD \cong \Delta BAC$ (By SAS congruence rule)

$\therefore BD = AC$ (By CPCT) And, $\angle ABD$
 $= \angle BAC$ (By CPCT)

Question 3:

AD and BC are equal perpendiculars to a line segment AB (See the given figure).

Show that CD bisects AB.



Answer:

In $\triangle BOC$ and $\triangle AOD$,

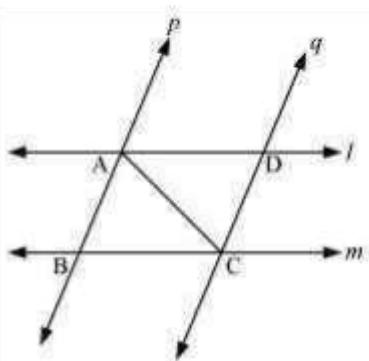
- $\angle BOC = \angle AOD$ (Vertically opposite angles)
- $\angle CBO = \angle DAO$ (Each 90°)

$BC = AD$ (Given)

- $\triangle BOC \cong \triangle AOD$ (AAS congruence rule)
- $BO = AO$ (By CPCT)
- \Rightarrow CD bisects AB.

Question 4: l and m are two parallel lines intersected by another pair of parallel lines p and q (see

the given figure). Show that $\triangle ABC \cong \triangle CDA$.



Answer:

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

$\angle BAC = \angle DCA$ (Alternate interior angles, as $p \parallel q$)

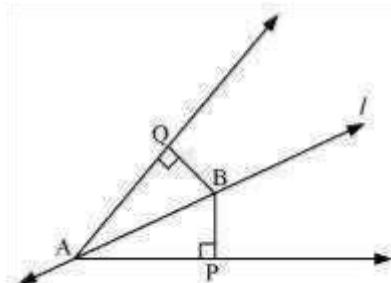
$AC = CA$ (Common)

$\angle BCA = \angle DAC$ (Alternate interior angles, as $l \parallel m$)

$\therefore \Delta ABC \cong \Delta CDA$ (By ASA congruence rule)

Question 5:

Line $l \angle A$ is the bisector of an angle and B is any point on l . BP and BQ are perpendiculars from B to the arms of $\angle A$ (see the given figure). Show that: i) $\Delta APB \cong \Delta AQB$ (ii) $BP = BQ$ or B is equidistant from the arms of $\angle A$.



Answer:

In ΔAPB and ΔAQB ,

$\angle APB = \angle AQB$ (Each 90°)

$\angle PAB = \angle QAB$ (l is the angle bisector of $\angle A$)

$AB = AB$ (Common)

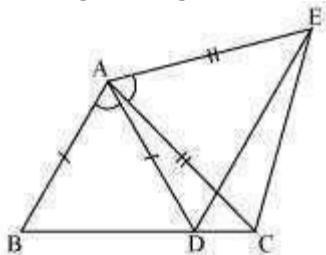
$\therefore \Delta APB \cong \Delta AQB$ (By AAS congruence rule) $\therefore BP =$

BQ (By CPCT)

It can be said that B is equidistant from the arms of $\angle A$. Or,

Question 6:

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



Answer:

It is given that $\angle BAD = \angle EAC$

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

$$\angle BAC = \angle DAE$$

In $\triangle BAC$ and $\triangle DAE$, $AB = AD$

(Given) $\angle BAC =$

$\angle DAE$ (Proved above)

$AC = AE$ (Given)

$\therefore \triangle BAC \cong \triangle DAE$ (By SAS congruence rule)

$\therefore BC = DE$ (By CPCT)

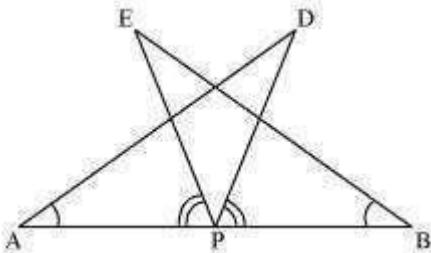
Question 7:

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 the given figure). Show that i)

$\triangle DAP \cong \triangle EBP$ (

(ii) $AD = BE$



Answer:

It is given that $\angle EPA = \angle DBP$

$$\therefore \angle EPA + \angle DPE = \angle DBP + \angle DPE$$

$$\therefore \angle DPA = \angle EPB$$

In $\triangle DAP$ and $\triangle EBP$,

$$\therefore \angle DAP = \angle EBP \text{ (Given)}$$

$AP = BP$ (P is mid-point of AB)

$$\therefore \angle DPA = \angle EPB \text{ (From above)}$$

$$\therefore \triangle DAP \cong \triangle EBP \text{ (ASA congruence rule)}$$

$$\therefore AD = BE \text{ (By CPCT)}$$

Question 8:

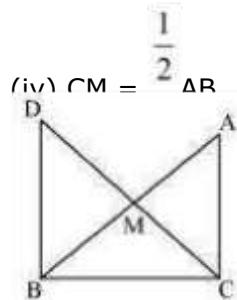
In right triangle ABC, right angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that $DM = CM$. Point D is joined to point

B (see the given figure). Show that: i)

$\Delta AMC \triangleq \Delta BMD$ (

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

$\Delta DBC \triangleq \Delta ACB$ (



Answer:

(i) In ΔAMC and ΔBMD ,
 $AM = BM$ (M is the mid-point of AB)

$\angle AMC = \angle BMD$ (Vertically opposite angles)

$CM = DM$ (Given)

$\therefore \Delta AMC \triangleq \Delta BMD$ (By SAS congruence rule)

$\therefore AC = BD$ (By CPCT) And,

$\therefore \angle ACM = \angle BDM$ (By CPCT) ii)

$\therefore \angle ACM = \angle BDM$ (

However, $\angle ACM$ and $\angle BDM$ are alternate interior angles.

Since alternate angles are equal,

It can be said that $DB \parallel AC$

$\therefore \angle DBC + \angle ACB = 180^\circ$ (Co-interior angles)

$\therefore \angle DBC + 90^\circ = 180^\circ$

$\therefore \angle DBC = 90^\circ$

(iii) In $\triangle DBC$ and $\triangle ACB$,
 $DB = AC$ (Already proved)

$\angle DBC = \angle ACB$ (Each 90°)

$BC = CB$ (Common)

$\therefore \triangle DBC \cong \triangle ACB$ (SAS congruence rule) iv)

$\triangle DBC \cong \triangle ACB$ (

$\therefore AB = DC$ (By CPCT)

$\therefore AB = 2 CM$

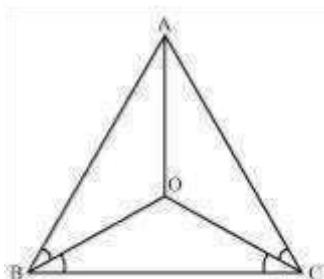
$$\therefore CM = \frac{1}{2} AB$$

Exercise 7.2 Question

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 $\angle A$ (Answer:



(i) It is given that in triangle ABC, $AB = AC$

$\angle A = \angle C$ $\angle B = \angle B$
 $\therefore \frac{1}{2} \angle A = \frac{1}{2} \angle C$ $\therefore \angle ACB = \angle ABC$
 $\therefore \angle OCB = \angle OBC$
 $\therefore OB = OC$ (Sides opposite to equal angles of a triangle are also equal)

(ii) In $\triangle OAB$ and $\triangle OAC$,
 $AO = AO$ (Common)

$AB = AC$ (Given)

$OB = OC$ (Proved above)

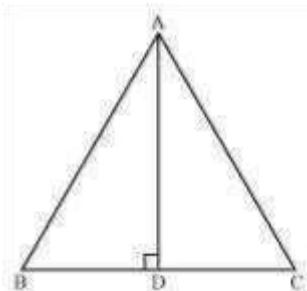
Therefore, $\triangle OAB \cong \triangle OAC$ (By SSS congruence rule)

$\therefore \angle BAO \cong \angle CAO$ (CPCT)

$\therefore AO$ bisects A .

Question 2:

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



Answer:

In $\triangle ADC$ and $\triangle ADB$,

$AD = AD$ (Common)

$\angle ADC = \angle ADB$ (Each 90°)

$CD = BD$ (AD is the perpendicular bisector of BC)

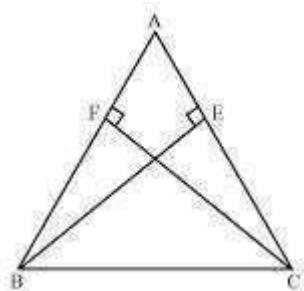
$\therefore \triangle ADC \cong \triangle ADB$ (By SAS congruence rule)

$\therefore AB = AC$ (By CPCT)

Therefore, ABC is an isosceles triangle in which $AB = AC$.

Question 3:

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



Answer:

In $\triangle AEB$ and $\triangle AFC$,

$\angle AEB$ and $\angle AFC$ (Each 90°) $A =$

$\angle A$ (Common angle)

$AB = AC$ (Given)

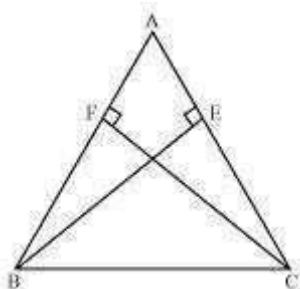
$\therefore \Delta AEB \cong \Delta AFC$ (By AAS congruence rule) $\therefore BE = CF$ (By CPCT)

Question 4:

ABC is a triangle in which altitudes BE and CF to sides AC and AB are equal (see the

given figure). Show that

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



Answer:

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

(i) In ΔABE and ΔACF ,

$\angle ABE$ and $\angle ACF$ (Each 90°)

$\angle A = \angle A$ (Common angle)

$BE = CF$ (Given)

$\therefore \Delta ABE \cong \Delta ACF$ (By AAS congruence rule)

(ii) It has already been proved that

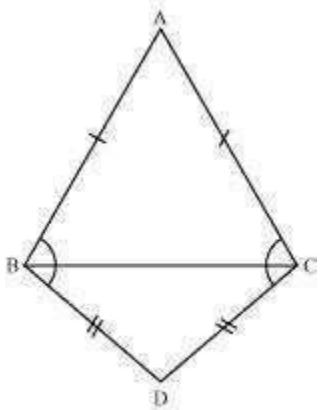
$\Delta ABE \cong \Delta ACF$

$\therefore AB = AC$ (By CPCT)

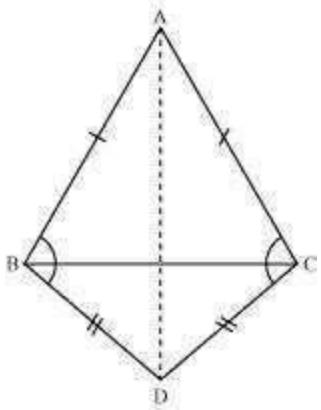
Question 5:

ABC and DBC are two isosceles triangles on the same base BC (see the given figure).

Show that $\angle ABD = \angle ACD$.



Answer:



Let us join AD.

In $\triangle ABD$ and $\triangle ACD$,

$AB = AC$ (Given)

$BD = CD$ (Given)

$AD = AD$ (Common side)

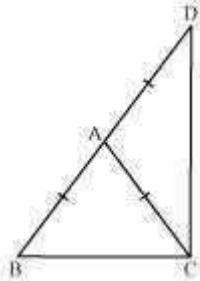
$\therefore \triangle ABD \cong \triangle ACD$ (By SSS congruence rule)

$\therefore \angle ABD = \angle ACD$ (By CPCT)

Question 6:

$\triangle ABC$ is an isosceles triangle in which $AB = AC$. Side BA is produced to D such that AD

$= AB$ (see the given figure). Show that $\angle BCD$ is a right angle.



Answer:

In $\triangle ABC$,

$AB = AC$ (Given)

$\therefore \angle ACB = \angle ABC$ (Angles opposite to equal sides of a triangle are also equal)

In $\triangle ACD$,

$AC = AD$

$\therefore \angle ADC = \angle ACD$ (Angles opposite to equal sides of a triangle are also equal)

In $\triangle BCD$,

$\angle ABC + \angle BCD + \angle ADC = 180^\circ$ (Angle sum property of a triangle)

$\angle ACB + \angle ACD + \angle ADC + \angle ACD = 180^\circ$

$\therefore \angle ACB + \angle ACD = 180^\circ$

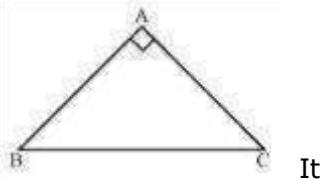
$\therefore \angle BCD = 180^\circ$

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

Question 7:

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

Answer:



It

is given that

$$AB = AC$$

$\therefore C = B$ (Angles opposite to equal sides are also equal)

In ΔABC ,

$$\hat{A} + \hat{B} + \hat{C} = 180^\circ \text{ (Angle sum property of a triangle)}$$

$$\overset{\wedge}{90^\circ} + \hat{B} + \hat{C} = 180^\circ$$

$$\overset{\wedge}{90^\circ} + \hat{B} + \hat{B} = 180^\circ$$

$$\overset{\wedge}{2B} = \overset{\wedge}{90^\circ}$$

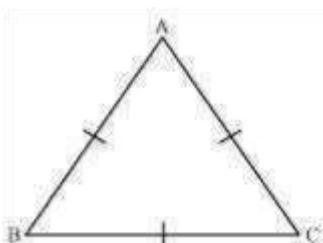
$$\hat{B} = \overset{\wedge}{45^\circ}$$

$$\hat{B} = \hat{C} = \overset{\wedge}{45^\circ}$$

Question 8:

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

Answer:



Let us consider that ABC is an equilateral triangle.

Therefore, $AB = BC = AC$

$$AB = AC$$

$\therefore C = B$ (Angles opposite to equal sides of a triangle are equal)

Also,

$$AC = BC$$

$\therefore \hat{B} = \hat{A}$ (Angles opposite to equal sides of a triangle are equal)

Therefore, we obtain $\hat{A} = \hat{B} = \hat{C}$

$$\text{In } \triangle ABC,$$

$$\hat{A} + \hat{B} + \hat{C} = 180^\circ$$

$$\therefore \hat{A} + \hat{A} + \hat{A} = 180^\circ$$

$$\therefore 3\hat{A} = 180^\circ$$

$$\therefore \hat{A} = 60^\circ$$

$\therefore \hat{A} = \hat{B} = \hat{C} = 60^\circ$ Hence, in an equilateral triangle, all interior angles are of measure 60° .

Exercise 7.3

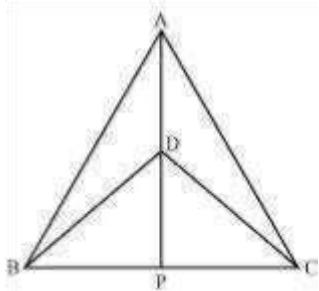
Question 1:

$\triangle ABC$ 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 the given figure). 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 \hat{A} as well as \hat{D} . (

(iv) AP is the perpendicular bisector of BC.



Answer:

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

$$AB = AC \text{ (Given)}$$

$$BD = CD \text{ (Given)}$$

$$AD = AD \text{ (Common)}$$

$\therefore \triangle ABD \cong \triangle ACD$ (By SSS congruence rule)

$\therefore \angle BAD = \angle CAD$ (By CPCT)

$\therefore \angle BAP = \angle CAP \dots (1)$

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

$$AB = AC \text{ (Given)}$$

$$\angle BAP = \angle CAP \text{ [From equation (1)]}$$

$$AP = AP \text{ (Common)}$$

$\therefore \triangle ABP \cong \triangle ACP$ (By SAS congruence rule)

$\therefore BP = CP$ (By CPCT) ... (2)

(iii) From equation (1),

$$\angle BAP = \angle CAP$$

Hence, AP bisects $\angle A$.

In $\triangle BDP$ and $\triangle CDP$,

$BD = CD$ (Given)

$DP = DP$ (Common)

$BP = CP$ [From equation (2)]

$\therefore \triangle ABD \cong \triangle CDP$ (By S.S.S. Congruence rule)

$\therefore \angle BDP = \angle CDP$ (By CPCT) ... (3) Hence,

AP bisects $\angle D$. iv) $\triangle ABD \cong \triangle CDP$...

$\triangle CDP$ (

$\therefore \angle BPD = \angle CPD$ (By CPCT) (4)

$\therefore \angle BPD + \angle CPD = 180^\circ$ (Linear pair angles)

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

$\therefore \angle BPD = 90^\circ$ [From equation (4)]

$\therefore \angle BPD = 90^\circ$... (5)

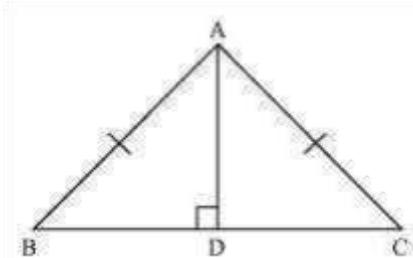
From equations (2) and (5), it can be said that AP is the perpendicular bisector of BC.

Question 2:

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

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

Answer:



(i) In $\triangle BAD$ and $\triangle CAD$,

$\angle ADB = \angle ADC$ (Each 90° as AD is an altitude)

$AB = AC$ (Given)

$AD = AD$ (Common)

$\therefore \triangle BAD \cong \triangle CAD$ (By RHS Congruence rule)

$\therefore BD = CD$ (By CPCT)

Hence, AD bisects BC.

(ii) Also, by CPCT,

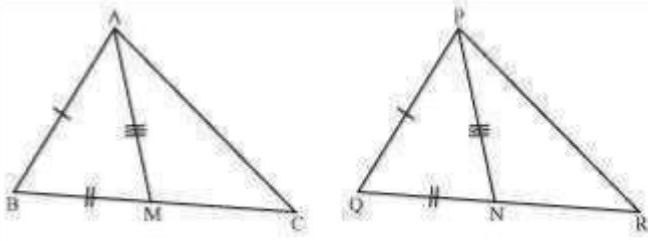
$\angle BAD = \angle CAD$ Hence, AD

bisects A. \therefore

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 $\triangle PQR$ (see the given figure). Show that: i) $\triangle ABM \cong \triangle PQN$ (ii) $\triangle ABC \cong \triangle PQR$ (

$\triangle PQN$ (ii) $\triangle ABC \cong \triangle PQR$ (



\therefore

Answer:

(i) In $\triangle ABC$, AM is the median to BC.

$$\therefore BM = \frac{1}{2} BC$$

$$\therefore QN = \frac{1}{2} QR$$

However, $BC = QR$

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

$$\therefore BM = QN \dots (1)$$

In $\triangle ABM$ and $\triangle PQN$, In $\triangle PQR$, PN is the median to QR.

$AB = PQ$ (Given)

$BM = QN$ [From equation (1)]

$AM = PN$ (Given)

$\therefore \triangle ABM \cong \triangle PQN$ (SSS congruence rule)

$\therefore ABM = PQN$ (By CPCT)

$\therefore ABC = PQR \dots (2)$

(ii) In $\triangle ABC$ and $\triangle PQR$,

$AB = PQ$ (Given)

$\angle ABC = \angle PQR$ [From equation (2)]

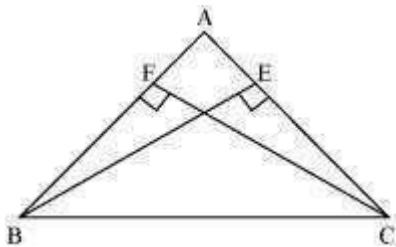
$BC = QR$ (Given)

$\therefore \triangle ABC \cong \triangle PQR$ (By SAS congruence rule)

Question 4:

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

Answer:



In $\triangle BEC$ and $\triangle CFB$,

$$\angle BEC = \angle CFB \text{ (Each } 90^\circ\text{)}$$

$$BC = CB \text{ (Common)}$$

$$BE = CF \text{ (Given)}$$

$$\therefore \triangle BEC \cong \triangle CFB \text{ (By RHS congruency)}$$

$$\therefore \angle BCE = \angle CBF \text{ (By CPCT)}$$

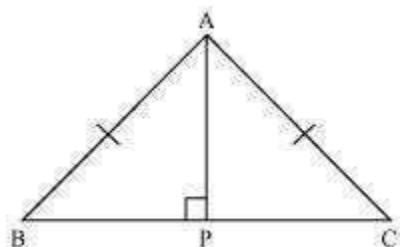
$$\therefore AB = AC \text{ (Sides opposite to equal angles of a triangle are equal)}$$

Hence, $\triangle ABC$ is isosceles.

Question 5:

Answer:

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



In $\triangle APB$ and $\triangle APC$,

$\angle APB = \angle APC$ (Each 90°)

$AB = AC$ (Given)

$AP = AP$ (Common)

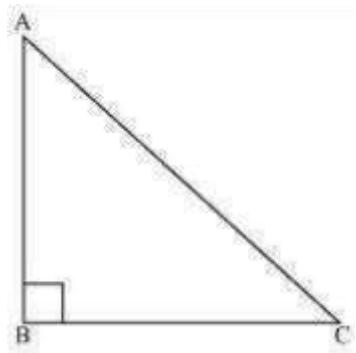
$\therefore \triangle APB \cong \triangle APC$ (Using RHS congruence rule)

$\therefore \angle B = \angle C$ (By using CPCT)

Exercise 7.4 Question 1:

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

Answer:



Let us consider a right-angled triangle ABC, right-angled at B.

In ΔABC ,

$$\angle A + \angle B + \angle C = 180^\circ \text{ (Angle sum property of a triangle)}$$

$$\angle A + 90^\circ + \angle C = 180^\circ$$

$$\therefore \angle A + \angle C = 90^\circ$$

Hence, the other two angles have to be acute (i.e., less than 90°).

$\therefore \angle B$ is the largest angle in $\triangle ABC$.

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

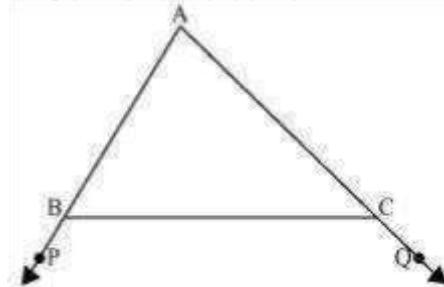
$\therefore AC > BC$ and $AC > AB$

[In any triangle, the side opposite to the larger (greater) angle is longer.] Therefore, AC is the largest side in $\triangle ABC$.

However, AC is the hypotenuse of $\triangle ABC$. Therefore, hypotenuse is the longest side in a right-angled triangle.

Question 2:

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



Answer:

In the given figure,

$$\angle ABC + \angle PBC = 180^\circ \text{ (Linear pair)}$$

$$\therefore \angle ABC = 180^\circ - \angle PBC \dots (1)$$

Also,

$$\angle ACB + \angle QCB = 180^\circ$$

\therefore

\therefore

$$\angle ACB = 180^\circ - \angle QCB \dots (2)$$

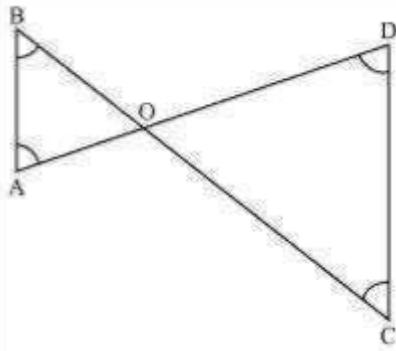
As $\angle PBC < \angle QCB$,

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

$\therefore \angle ABC > \angle ACB$ [From equations (1) and (2)] $\therefore AC >$

AB (Side opposite to the larger angle is larger.) Question 3:

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



Answer:

In $\triangle AOB$,

$\because \angle B < \angle A \quad AO < BO$ (Side opposite to smaller angle is smaller) ... (1)

In $\triangle COD$,

$\therefore \angle C < \angle D$

$\therefore OD < OC$ (Side opposite to smaller angle is smaller) ... (2)

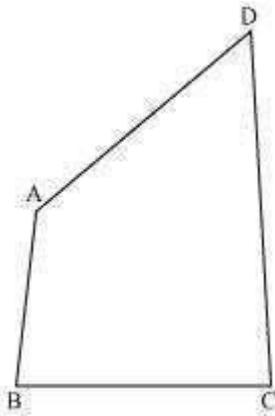
On adding equations (1) and (2), we obtain

$$AO + OD < BO + OC$$

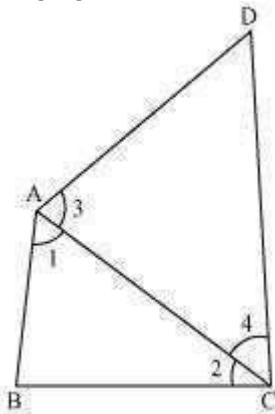
$$AD < BC$$

Question 4:

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



Answer:



Let us join AC.
In $\triangle ABC$,

$AB < BC$ (AB is the smallest side of quadrilateral ABCD)

$\therefore \angle 2 < \angle 1$ (Angle opposite to the smaller side is smaller) ... (1)

In $\triangle ADC$,

$AD < CD$ (CD is the largest side of quadrilateral ABCD)

$\therefore \angle 4 < \angle 3$ (Angle opposite to the smaller side is smaller) ... (2)

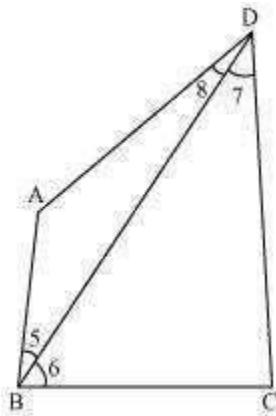
On adding equations (1) and (2), we obtain

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

$$\angle C < \angle A$$

$$\angle A > \angle C$$

Let us join BD.



In $\triangle ABD$,

$AB < AD$ (AB is the smallest side of quadrilateral ABCD)

$$\therefore \angle 8 < \angle 5 \text{ (Angle opposite to the smaller side is smaller) ... (3)}$$

In $\triangle BDC$,

$BC < CD$ (CD is the largest side of quadrilateral ABCD)

$$\therefore \angle 7 < \angle 6 \text{ (Angle opposite to the smaller side is smaller) ... (4)}$$

On adding equations (3) and (4), we obtain

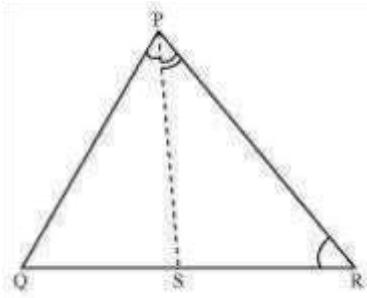
$$\angle 8 + \angle 7 < \angle 5 + \angle 6$$

$$\therefore \angle D < \angle B$$

$$\therefore \angle B > \angle D$$

Question 5:

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



Answer:

As $PR > PQ$,

$\therefore \angle PQR > \angle PRQ$ (Angle opposite to larger side is larger) ... (1)
 PS is the bisector of $\angle QPR$.

$\therefore \angle QPS = \angle RPS$... (2)

$\therefore PSR$ is the exterior angle of $\triangle PQS$.

$\therefore \angle PSR = \angle PQR + \angle QPS$... (3)

\therefore

$\therefore \angle PSQ$ is the exterior angle of $\triangle PRS$.

$$\angle PSQ = \angle PRQ + \angle RPS \dots (4)$$

Adding equations (1) and (2), we obtain

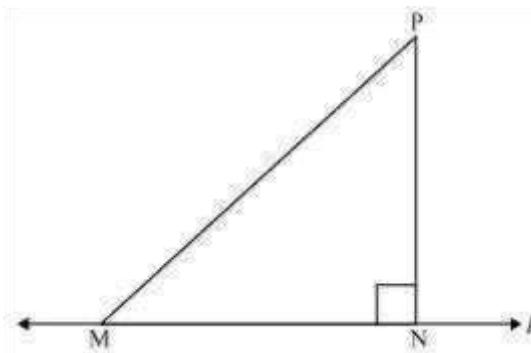
$$\angle PQR + \angle QPS > \angle PRQ + \angle RPS$$

$$\therefore \angle PSR > \angle PSQ [Using the values of equations (3) and (4)]$$

Question 6:

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

Answer:



Let us take a line l and from point P (i.e., not on line l), draw two line segments PN and PM . Let PN be perpendicular to line l and PM is drawn at some other angle.

In $\triangle PNM$,

$$\therefore N = 90^\circ$$

$$\therefore P + N + M \doteq 180^\circ \text{ (Angle sum property of a triangle)}$$

$$\therefore P + M = 90^\circ$$

Clearly, M is an acute angle.

$$\therefore M < N$$

$$\therefore PN < PM \text{ (Side opposite to the smaller angle is smaller)}$$

Similarly, by drawing different line segments from P to l , it can be proved that PN is smaller in comparison to them.

Therefore, it can be observed that of all line segments drawn from a given point not on it, the perpendicular line segment is the shortest.

Exercise 7.5 Question

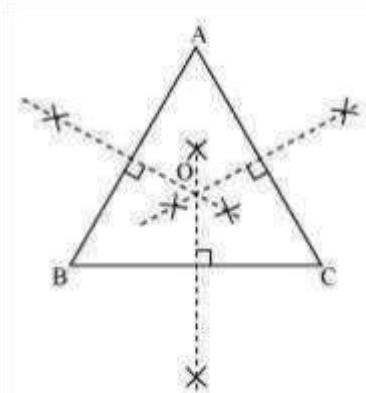
1:

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

Answer:

Circumcentre of a triangle is always equidistant from all the vertices of that triangle.

Circumcentre is the point where perpendicular bisectors of all the sides of the triangle meet together.



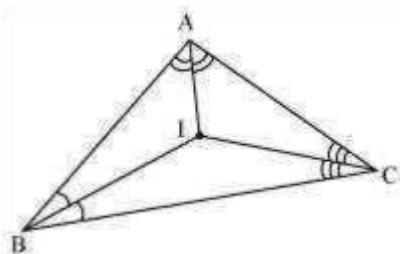
In ΔABC , we can find the circumcentre by drawing the perpendicular bisectors of sides AB , BC , and CA of this triangle. O is the point where these bisectors are meeting together. Therefore, O is the point which is equidistant from all the vertices of ΔABC .

Question 2:

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

Answer:

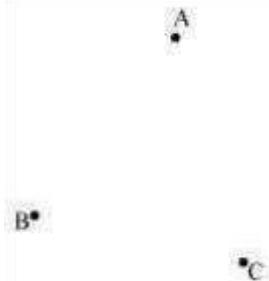
The point which is equidistant from all the sides of a triangle is called the incentre of the triangle. Incentre of a triangle is the intersection point of the angle bisectors of the interior angles of that triangle.



Here, in ΔABC , we can find the incentre of this triangle by drawing the angle bisectors of the interior angles of this triangle. I is the point where these angle bisectors are intersecting each other. Therefore, I is the point equidistant from all the sides of ΔABC .

Question 3:

In a huge park people are concentrated at three points (see the given figure)



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

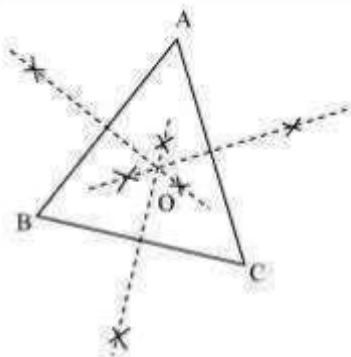
B: near which a man-made lake is situated,

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 parlor should be equidistant from A, B and C) Answer:

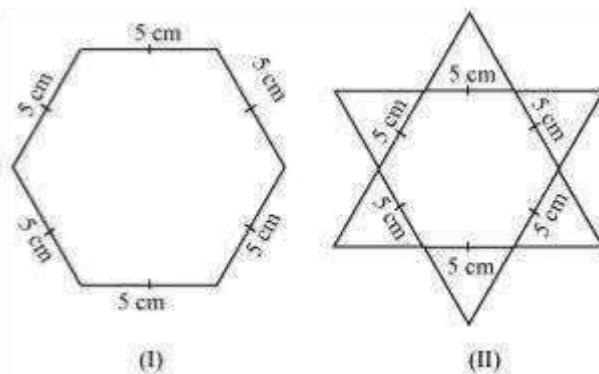
Maximum number of persons can approach the ice-cream parlour if it is equidistant from A, B and C. Now, A, B and C form a triangle. In a triangle, the circumcentre is the only point that is equidistant from its vertices. So, the ice-cream parlour should be set up at the circumcentre O of ΔABC .



In this situation, maximum number of persons can approach it. We can find circumcentre O of this triangle by drawing perpendicular bisectors of the sides of this triangle.

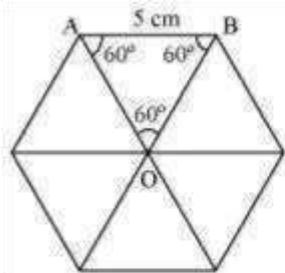
Question 4:

Complete the hexagonal and star shaped rangolies (see the given figures) 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?



Answer:

It can be observed that hexagonal-shaped rangoli has 6 equilateral triangles in it.



$$= \frac{\sqrt{3}}{4} (\text{side})^2 = \frac{\sqrt{3}}{4} (5)^2$$

Area of $\triangle OAB$

$$= \frac{\sqrt{3}}{4} (25) = \frac{25\sqrt{3}}{4} \text{ cm}^2$$

$$= 6 \times \frac{25\sqrt{3}}{4} = \frac{75\sqrt{3}}{2} \text{ cm}^2$$

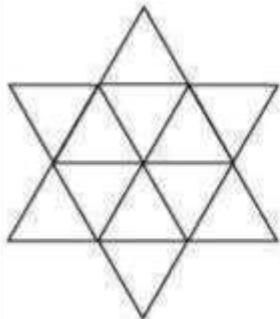
Area of hexagonal-shaped rangoli

$$\text{Area of equilateral triangle having its side as 1 cm} = \frac{\sqrt{3}}{4} (1)^2 = \frac{\sqrt{3}}{4} \text{ cm}^2$$

Number of equilateral triangles of 1 cm side that can be filled

$$\text{in this hexagonal-shaped rangoli} = \frac{\frac{75\sqrt{3}}{2}}{\frac{\sqrt{3}}{4}} = 150$$

Star-shaped rangoli has 12 equilateral triangles of side 5 cm in it.



$$\text{Area of star-shaped rangoli} = 12 \times \frac{\sqrt{3}}{4} \times (5)^2 = 75\sqrt{3}$$

Number of equilateral triangles of 1 cm side that can be filled

$$\text{in this star-shaped } rangoli = \frac{75\sqrt{3}}{\frac{\sqrt{3}}{4}} = 300$$

Therefore, star-shaped rangoli has more equilateral triangles in it.