In quadrilateral ACBD, AC = AD and AB bisects \( \angle A \) (See the given figure). Show that \( \triangle ABC \cong \triangle ABD \). What can you say about BC and BD?

Answer:
In \( \triangle ABC \) and \( \triangle ABD \),
AC = AD (Given)
\( \angle CAB = \angle DAB \) (AB bisects \( \angle A \))
AB = AB (Common)
\[ \therefore \triangle ABC \cong \triangle ABD \] (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) $\triangle ABD \cong \triangle BAC$
(ii) $BD = AC$
(iii) $\angle ABD = \angle BAC$.

Answer:
In $\triangle ABD$ and $\triangle BAC$,
$AD = BC$ (Given)
$\angle DAB = \angle CBA$ (Given)
$AB = BA$ (Common)
$\therefore \triangle ABD \cong \triangle BAC$ (By SAS congruence rule)
$BD = AC$ (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 ∆BOC and ∆AOD,

∠BOC = ∠AOD (Vertically opposite angles)

∠CBO = ∠DAO (Each 90°)

BC = AD (Given)

∴ ∆BOC ≅ ∆AOD (AAS congruence rule)

∴ BO = AO (By CPCT)

⇒ 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 ∆ABC ≅ ∆CDA.

Answer:

In ∆ABC and ∆CDA,
\( \angle BAC = \angle DCA \) (Alternate interior angles, as \( p \parallel q \))
\[ AC = CA \] (Common)
\[ \angle BCA = \angle DAC \] (Alternate interior angles, as \( l \parallel m \))
\[ \therefore \triangle ABC \cong \triangle CDA \] (By ASA congruence rule)

**Question 5:**
Line \( l \) \( \therefore \) \( A \) is the bisector of an angle and \( B \) is any point on \( l \). \( BP \) and \( BQ \) are perpendiculatrs from \( B \) to the arms of \( \angle A \) (see the given figure). Show that: i) \( \triangle APB \cong \triangle AQB \)  
ii) \( BP = BQ \) or \( B \) is equidistant from the arms of \( \angle A \).

**Answer:**
In \( \triangle APB \) and \( \triangle AQB \),
\[ \angle APB = \angle AQB \] (Each 90°)
\[ \angle PAB = \angle QAB \] (\( l \) is the angle bisector of \( \angle A \))
\[ AB = AB \] (Common)
\[ \therefore \triangle APB \cong \triangle AQB \] (By AAS congruence rule)
\[ BP = BQ \] (By CPCT)

**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 \( \angle EPA = \angle DPB \)

\( \therefore \angle EPA + \angle DPE = \angle DPB + \angle DPE \)

\( \therefore \angle DPA = \angle EPB \)

In \( \triangle DAP \) and \( \triangle EBP \),

\( \angle DAP = \angle EBP \) (Given)

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

\( \angle DPA = \angle EPB \) (From above)

\( \therefore \triangle DAP \cong \triangle EBP \) (ASA congruence rule)

\( \therefore AD = BE \) (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) \( \triangle AMC \cong \triangle BMD \) (iv) \( CM = \frac{1}{2} AB \)

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

\( \triangle DBC \cong \triangle ACB \) (ii)

Answer:

(i) In \( \triangle AMC \) and \( \triangle BMD \),
AM = BM (M is the mid-point of AB) 
\[\therefore \triangle AMC = \triangle BMD \text{ (Vertically opposite angles)}\]

CM = DM (Given) 
\[\therefore \triangle AMC \sim \triangle BMD \text{ (By SAS congruence rule)}\]

AC = BD (By CPCT) And, 
\[\therefore \triangle ACM = \triangle BDM \text{ (By CPCT)}\]

However, \triangle ACM and \triangle BDM are alternate interior angles. 

Since alternate angles are equal, 

It can be said that DB \parallel AC 
\[\therefore DBC + ACB = 180^\circ \text{ (Co-interior angles)}\]

\[\therefore DBC = 90^\circ\]

(iii) In \triangle DBC and \triangle ACB, 
DB = AC (Already proved) 
\[\therefore DBC = ACB \text{ (Each } 90^\circ)\]

BC = CB (Common) 
\[\therefore \triangle DBC \triangle ACB \text{ (SAS congruence rule)}\]

\[\therefore AB = DC \text{ (By CPCT)}\]

\[\therefore AB = 2 \text{ CM}\]

\[\therefore CM = \frac{1}{2} AB\]
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
\[ \therefore \angle ACB = \angle ABC \] (Angles opposite to equal sides of a triangle are equal)
\[ \therefore \frac{1}{2} \angle ACB = \frac{1}{2} \angle ABC \]
\[ \therefore \angle OCB = \angle OBC \]
\[ \therefore OB = OC \] (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, \( \triangle OAB \sim \triangle OAC \) (By SSS congruence rule)
\[ \therefore \angle BAO = \angle CAO \] (CPCT)
\[ \therefore AO \text{ bisects } \angle A. \]

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)
$\therefore ADC = \angle ADB$ (Each $90^\circ$)
$CD = BD$ (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 $\triangle AFC$,
$\therefore AEB$ and $\angle AFC$ (Each $90^\circ$)
$\therefore A = A$ (Common angle)
AB = AC (Given)

\therefore \triangle AEB \cong \triangle AFC \text{ (By AAS congruence rule)} \therefore BE = CF \text{ (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) \triangle ABE \cong \triangle ACF

Answer:

(ii) AB = AC, i.e., ABC is an isosceles triangle.
(i) In $\triangle ABE$ and $\triangle ACF$,

$\therefore \triangle ABE$ and $\triangle ACF$ (Each $90^\circ$)

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

BE = CF (Given)

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

(ii) It has already been proved that

$\triangle ABE \cong \triangle ACF$

$\therefore AB = AC$ (By CPCT)

Question 5:

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

Show that $\therefore \angle ABD = \angle ACD$. 
AB = AC (Given)
BD = CD (Given)
AD = AD (Common side)

\[ \triangle ABD \cong \triangle ACD \] (By SSS congruence rule)

\[ \angle ABD = \angle ACD \] (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 ∆ABC,
AB = AC (Given)
∴ ACB = ABC (Angles opposite to equal sides of a triangle are also equal)
In ∆ACD,
AC = AD
∴ ADC = ACD (Angles opposite to equal sides of a triangle are also equal)
In ∆BCD,
ABC + BCD + ADC = 180º (Angle sum property of a triangle)
∴ ACB + ACB + ACD + ACD = 180º
∴ 2(ACB + ACD) = 180º
∴ 2(BCD) = 180º
∴ BCD = 90º

Question 7:
ABC is a right angled triangle in which ∠A = 90º and AB = AC. Find ∠B and ∠C.
Answer:

is given that
AB = AC
∴ ∠C = ∠B (Angles opposite to equal sides are also equal)

In ΔABC,
∴ ∠A + ∠B + ∠C = 180° (Angle sum property of a triangle)
∴ 90° + ∠B + ∠C = 180°
∴ 90° + ∠B + ∠B = 180°
∴ 2 ∠B = 90°
∴ ∠B = 45°
∴ ∠B = ∠C = 45°

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
∴ ∠C = ∠B (Angles opposite to equal sides of a triangle are equal)
Also,
AC = BC
∴ ∠B = ∠A (Angles opposite to equal sides of a triangle are equal)
Therefore, we obtain ∠A
∴ ∠B = ∠C
In $\triangle ABC$,

$\therefore \angle A + \angle B + \angle C = 180^\circ$

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

$\therefore 3 \cdot \angle A = 180^\circ$

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

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

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) $\triangle ABD \sim \triangle ACD$

ii) $\triangle ABP \sim \triangle ACP$

(iii) $AP$ bisects $\angle A$ as well as $\angle D$.

(iv) $AP$ is the perpendicular bisector of $BC$.

\[\text{Diagram of } \triangle ABC \text{ and } \triangle DBC.\]
Answer:

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

$AB = AC$ (Given)
$BD = CD$ (Given)
$AD = AD$ (Common)

$\therefore \triangle ABD \cong \triangle ACD$ (By SSS congruence rule)
$\therefore \angle BAD = \angle CAD$ (By CPCT)
$\therefore \angle BAP = \angle CAP$ .... (1)

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

$AB = AC$ (Given)
$\angle BAP = \angle CAP$ [From equation (1)]
$AP = AP$ (Common)

$\therefore \triangle ABP \cong \triangle ACP$ (By SAS congruence rule)
$\therefore BP = CP$ (By CPCT) ... (2)

(iii) From equation (1),

$\therefore \angle BAP = \angle CAP$

Hence, $AP$ bisects $\angle A$.

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

$BD = CD$ (Given)
$DP = DP$ (Common)
$BP = CP$ [From equation (2)]

$\therefore \triangle BDP \cong \triangle CDP$ (By S.S.S. Congruence rule)
$\therefore \angle BDP = \angle CDP$ (By CPCT) ... (3) Hence,

$AP$ bisects $\angle D$.

iv) $\triangle BDP \cong \triangle CDP$ (}
\[ \therefore \angle BPD = \angle CPD \text{(By CPCT)} \quad \ldots \quad (4) \]
\[ \therefore \angle BPD + \angle CPD = 180 \text{ (Linear pair angles)} \]
\[ \therefore \angle BPD + \angle BPD = 180 \]
\[ \therefore \angle BPD = 180 \quad \text{[From equation (4)]} \]
\[ \therefore \angle BPD = 90 \quad \ldots \quad (5) \]
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 triangles ABC in which AB = AC. Show that
i) AD bisects BC (ii) AD bisects \( \angle A. \)

**Answer:**

![Diagram of triangle ABC with altitude AD](image)

(i) In \( \triangle BAD \) and \( \triangle CAD, \)
\[ \therefore \angle ADB = \angle ADC \text{ (Each 90\(^\circ\) as AD is an altitude)} \]
AB = AC \text{ (Given)}
AD = AD \text{ (Common)}
\[ \therefore \triangle BAD \cong \triangle CAD \text{ (By RHS Congruence rule)} \]
\[ \therefore BD = CD \text{ (By CPCT)} \]
Hence, AD bisects BC.
(ii) Also, by CPCT,
\[ \therefore \text{BAD} = \therefore \text{CAD} \quad \text{Hence,} \]
AD bisects \( \therefore \text{A}. \)

**Question 3:**

Two sides \( \text{AB} \) and \( \text{BC} \) and median \( \text{AM} \) of one triangle \( \text{ABC} \) are respectively equal to sides \( \text{PQ} \) and \( \text{QR} \) and median \( \text{PN} \) of \( \triangle \text{PQR} \) (see the given figure). Show that:  i) \( \triangle \text{ABM} \)

\[ \therefore \triangle \text{PQN} \quad (\text{ii}) \triangle \text{ABC} \therefore \triangle \text{PQR} \]

**Answer:**

(i) In \( \triangle \text{ABC} \), \( \text{AM} \) is the median to \( \text{BC} \).

\[ \therefore \text{BM} = \frac{1}{2} \text{BC} \]

\[ \therefore \text{QN} = \frac{1}{2} \text{QR} \]

However, \( \text{BC} = \text{QR} \)

\[ \therefore \frac{1}{2} \text{BC} = \frac{1}{2} \text{QR} \]

\[ \therefore \text{BM} = \text{QN} \quad (1) \]

In \( \triangle \text{ABM} \) and \( \triangle \text{PQN} \)

In \( \triangle \text{PQR} \), \( \text{PN} \) is the median to \( \text{QR} \).  

\[ \text{AB} = \text{PQ} \quad \text{(Given)} \]

\[ \text{BM} = \text{QN} \quad [\text{From equation (1)}] \]

\[ \text{AM} = \text{PN} \quad \text{(Given)} \]
\[ \triangle ABM \cong \triangle PQN \text{ (SSS congruence rule)} \]

\[ \therefore ABM = PQN \text{ (By CPCT)} \]

\[ \therefore ABC = PQR \ldots (2) \]

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

\[ AB = PQ \text{ (Given)} \]

\[ \therefore ABC = PQR \text{ [From equation (2)]} \]

\[ BC = QR \text{ (Given)} \]

\[ \therefore \triangle ABC \cong \triangle PQR \text{ (By SAS congruence rule)} \]

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 \( \triangle CFB \),

\[ \therefore BEC = CFB \text{ (Each 90°)} \]

BC = CB \text{ (Common)}
BE = CF (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:
ABC is an isosceles triangle with \( AB = AC \). Drawn \( AP \perp BC \) to show that \( \angle B = \angle C \).

Answer:

In \( \triangle APB \) and \( \triangle APC \),

\[ \therefore \angle APB = \angle APC \text{ (Each 90°)} \]

\[ AB = AC \text{ (Given)} \]

\[ AP = AP \text{ (Common)} \]

\[ \therefore \triangle APB \cong \triangle APC \text{ (Using RHS congruence rule)} \]

\[ \therefore \angle B = \angle C \text{ (By using CPCT)} \]

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,
\[ \therefore A + \angle B + \angle C = 180^\circ \text{ (Angle sum property of a triangle)} \]
\[ \therefore A + 90^\circ + \angle C = 180^\circ \]
\[ \therefore A + \angle C = 90^\circ \]
Hence, the other two angles have to be acute (i.e., less than 90º).

\[ \therefore \text{B is the largest angle in } \Delta ABC. \]

\[ \therefore \text{B > A and } \text{B > C} \]

\[ \therefore \text{AC > BC and AC > AB} \]

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

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

Question 2:

In the given figure sides AB and AC of \( \Delta ABC \) are extended to points P and Q respectively. Also, \( \angle PBC < \angle QCB \). Show that AC > AB.

Answer:

In the given figure,

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

\[ \therefore \angle ABC = 180^\circ - \angle PBC \ldots (1) \]

Also,

\[ \therefore \angle ACB + \angle QCB = 180^\circ \]

\[ \therefore \angle ACB = 180^\circ - \angle QCB \ldots (2) \]

As \( \angle PBC < \angle QCB \),
\[ \because 180^\circ - \angle PBC > 180^\circ - \angle QCB \]
\[ \because \angle ABC > \angle ACB \text{ [From equations (1) and (2)]} \because AC > AB \text{ (Side opposite to the larger angle is larger.)} \]

**Question 3:**
In the given figure, \( \angle B < \angle A \) and \( \angle C < \angle D \). Show that \( AD < BC \).

**Answer:**
In \( \triangle AOB \),
\[ \because B < A \therefore AO < BO \text{ (Side opposite to smaller angle is smaller)} \ldots (1) \]
In \( \triangle COD \),
\[ \because C < D \therefore OD < OC \text{ (Side opposite to smaller angle is smaller)} \ldots (2) \]
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 \( \angle B > \angle D \).
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
Let us join BD.

In \(\triangle ABD\),
\[ AB < AD \quad (AB \text{ is the smallest side of quadrilateral } ABCD) \]
\[ \therefore \angle 8 < \angle 5 \quad (\text{Angle opposite to the smaller side is smaller}) \quad \ldots (3) \]

In \(\triangle BDC\),
\[ BC < CD \quad (CD \text{ is the largest side of quadrilateral } ABCD) \]
\[ \therefore \angle 7 < \angle 6 \quad (\text{Angle opposite to the smaller side is smaller}) \quad \ldots (4) \]

On adding equations (3) and (4), we obtain
\[ \angle 8 + \angle 7 < \angle 5 + \angle 6 \]
\[ \therefore \angle D < \angle B \]
\[ \therefore \angle B > \angle D \quad \text{Question 5:} \]

In the given figure, PR > PQ and PS bisects \(\angle QPR\). Prove that \(\angle PSR > \angle PSQ\).
Answer:
As PR > PQ,
\[ \therefore \angle PQR > \angle PRQ \text{ (Angle opposite to larger side is larger)} \] ... (1)

PS is the bisector of \( \angle QPR \).
\[ \therefore \angle QPS = \angle RPS \] ... (2)

PSR is the exterior angle of \( \triangle PQS \).
\[ \therefore \angle PSR = \angle PQR + \angle QPS \] ... (3)

PSQ is the exterior angle of \( \triangle PRS \).
\[ \therefore \angle PSQ = \angle PRQ + \angle RPS \] ... (4)

Adding equations (1) and (2), we obtain
\[ \angle PQR + \angle QPS > \angle PRQ + \angle RPS \]
\[ \therefore \angle PSR > \angle PSQ \text{ [Using the values of equations (3) and (4)]} \]

Question 6:
Show that of all line segments drawn from a given point not on it, the perpendicular line segment is the shortest.
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 \( \triangle PNM \),
\[
N = 90^\circ
\]
\[
P + N + M = 180^\circ \quad \text{(Angle sum property of a triangle)}
\]
\[
P + M = 90^\circ
\]
Clearly, \( M \) is an acute angle.
\[
\therefore M < N
\]
\[
\therefore PN < PM \quad \text{(Side opposite to the smaller angle is smaller)}
\]
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 ∆ABC which is equidistant from all the vertices of ∆ABC.

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 \( \triangle ABC \), 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 \( \triangle ABC \).

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.

![Diagram of \( \triangle ABC \) with incentre \( I \)]

Here, in \( \triangle ABC \), 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 \( \triangle ABC \).

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

Area of hexagonal-shaped rangoli

Area of equilateral triangle having its side as 1 cm = \( \frac{\sqrt{3}}{4} \times (1)^2 = \frac{\sqrt{3}}{4} \) cm²

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

\[ \frac{75\sqrt{3}}{\sqrt{3}} = 25 \] in this hexagonal-shaped rangoli

Star-shaped rangoli has 12 equilateral triangles of side 5 cm in it.
Number of equilateral triangles of 1 cm side that can be filled

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

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