SpeedLabs

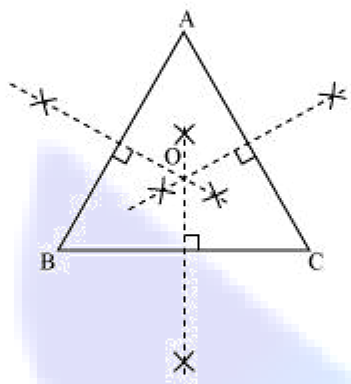
MATHS

CBSE 9th

TEEVRA EDUTECH PVT. LTD.

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

Ans. Let ABC be a triangle.



Draw perpendicular bisectors PQ and RS of sides AB and BC respectively of triangle ABC.

Let PQ bisects AB at M and RS bisects BC at point N.

Let PQ and RS intersect at point O.

Join OA, OB and OC.

Now in Δ AOM and Δ BOM,

AM = MB [By construction]

∠ AMO = ∠ BMO = [By construction]

OM = OM [Common]

∴ Δ AOM ≅ Δ BOM [By SAS congruency]

⇒ OA = OB [By C.P.C.T.] .... (i)

Similarly, BON CON

⇒ OB = OC [By C.P.C.T.] ......(ii)

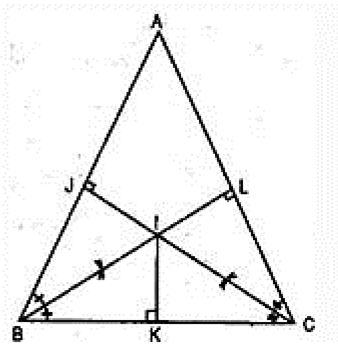
From eq. (i) and (ii),

OA = OB = OC

Hence O, the point of intersection of perpendicular bisectors of any two sides of Δ ABC equidistant from its vertices.

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

Ans. Let ABC be a triangle.



Draw bisectors of ∠ B and ∠ C.

Let these angle bisectors intersect each other at point I.

Draw IK ⊥ BC

Also draw IJ ⊥ AB and IL ⊥ AC.

Join AI.

In Δ BIK and Δ BIJ,

∠ IKB = ∠ IJB = 90° [By construction]

∠ IBK = ∠ IBJ

[∴ BI is the bisector of ∠ B (By construction)]

BI = BI [Common]

∴ Δ BIK ≅ Δ BIJ [ASA criteria of congruency]

IK = IJ [By C.P.C.T.] ………. (i)

Similarly, Δ CIK ≅ CIL

∴ IK = IL [By C.P.C.T.] ………. (ii)

From eq (i) and (ii),

IK = IJ = IL

Hence, I is the point of intersection of angle bisectors of any two angles of ABC equidistant from its sides.

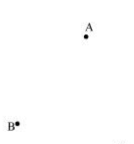
Q.3 In a huge park, people are concentrated at three points (See figure).

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

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

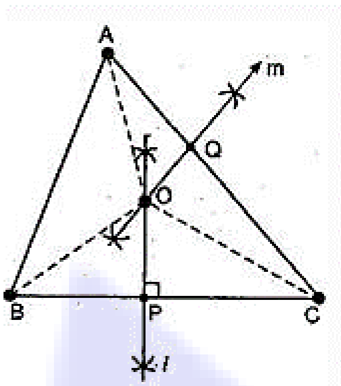
C: which is near to a large parking and exit.

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



Ans. The parlor should be equidistant from A, B and C.

For this let we draw perpendicular bisector say l of line joining points B and C also draw perpendicular bisector say m of line joining points A and C.



Let l and m intersect each other at point O.

Now point O is equidistant from points A, B and C.

Join OA, OB and OC.

Proof: In BOP and COP,

OP = OP [Common]

$\angle$ OPB = $\angle$ OPC = 90°

BP = PC [P is the mid-point of BC]

$\therefore$ Δ BOP $\cong$ Δ COP [By SAS congruency]

$\Rightarrow$ OB = OC [By C.P.C.T.] .....(i)

Similarly, Δ AOQ $\cong$ Δ COQ

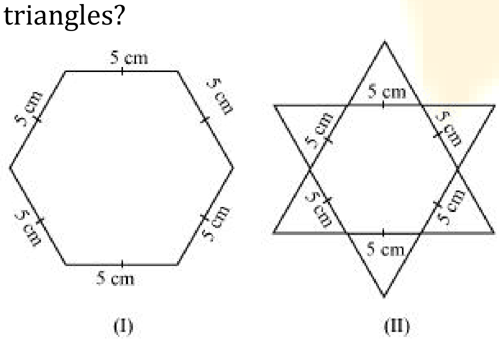
$\Rightarrow$ OA = OC [By C.P.C.T.] .....(ii)

From eq. (i) and (ii),

OA = OB = OC

Therefore, ice cream parlour should be set up at point O, the point of intersection of perpendicular bisectors of any two sides out of three formed by joining these points.

Q.4 Complete the hexagonal Rangoli and the star rangolies (See figure) but 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?



Ans. In hexagonal Rangoli, Number of equilateral triangles each of side 5 cm are 6.

Area of equilateral triangle $= \frac{\sqrt{3}}{4}(\text{side})^2 = \frac{\sqrt{3}}{4}(5)^2 = \frac{\sqrt{3}}{4} \times 25$ sq. cm

Area of hexagonal rangoli = 6 x Area of an equilateral triangle

$= 6 \times \frac{\sqrt{3}}{4} \times 25 = 150 \times \frac{\sqrt{3}}{4}$ sq. cm .... (i)

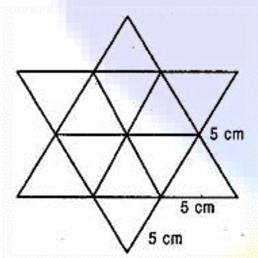
Now area of equilateral triangle of side 1 cm = $= \frac{\sqrt{3}}{4}(\text{side})^2 = \frac{\sqrt{3}}{4}(1)^2 = \frac{\sqrt{3}}{4}$ sq. cm .....(ii)

Number of equilateral triangles each of side 1 cm in hexagonal rangoli

$= 150 \times \frac{\sqrt{3}}{4} \div \frac{\sqrt{3}}{4} = 150 \times \frac{\sqrt{3}}{4} = 150 =$.........(iii)

Now in Star rangoli,

Number of equilateral triangles each of side 5 cm = 12



Therefore, total area of star rangoli = 12 $\times$ Area of an equilateral triangle of side 5 cm

$= 12 \times \left(\frac{\sqrt{3}}{4}(5)^2\right)$

$= 12 \times \left(\frac{\sqrt{3}}{4} 25\right)$

$= 300 \frac{\sqrt{3}}{4}$ sq. cm ....(iv)

Number of equilateral triangles each of side 1 cm in star rangoli

$= 300 \frac{\sqrt{3}}{4} \div \frac{\sqrt{3}}{4}$

$= 300 \frac{\sqrt{3}}{4} \times \frac{\sqrt{3}}{4}$

$= 300$................v

From eq. (iii) and (v), we observe that star rangoli has more equilateral triangles each of side 1 cm.