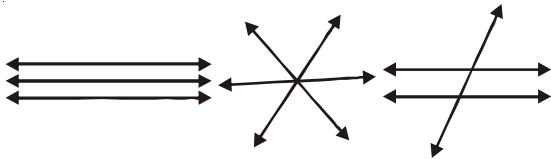


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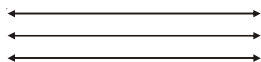
CONCURRENT LINES

- Two lines in a plane can either be parallel or intersecting.

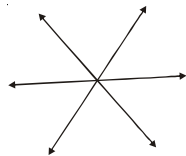


Three lines in a plane may:

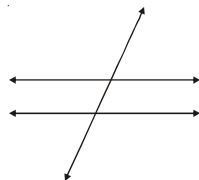
(i) be parallel to each other



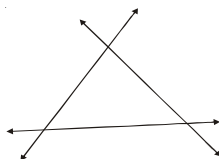
(ii) intersect each other in exactly one point



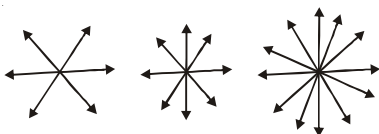
(iii) intersect each other in two points



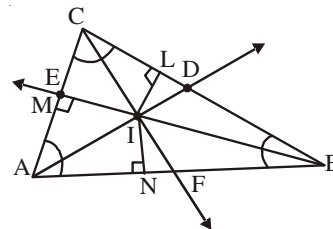
(iv) intersect each other at most in three points



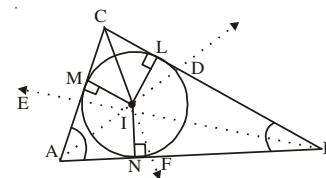
- Three or more lines in a plane which intersect each other in exactly one point or pass through the same point are called concurrent lines and the common point is called the point of concurrency.



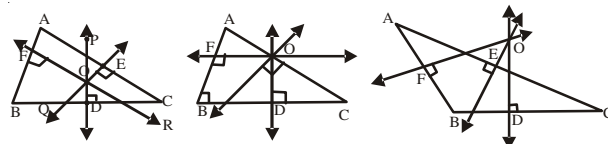
- A line which bisects an angle of a triangle is called an angle bisector of the triangle.
- A triangle has three angle bisectors in it.
- Angle bisectors of a triangle pass through the same point.
- AD, BE and CF are three angle bisectors of $\triangle ABC$ which pass through same point I. I is called incentre of the triangle.



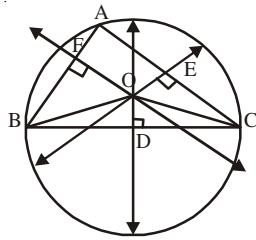
- Incentre always lies in the interior of the triangle and at the same distance from the three sides of the triangle i.e. $IL = IM = IN$
- If we take I as centre and IL or IM or IN as radius and draw a circle then the circle is called "incircle" of the triangle.



- A line which bisects a side of a triangle at right angle is called the perpendicular bisector of the side.
- The three perpendicular bisectors of the sides of a triangle pass through the same point. The point of concurrency O is called the 'circumcentre' of the triangle.

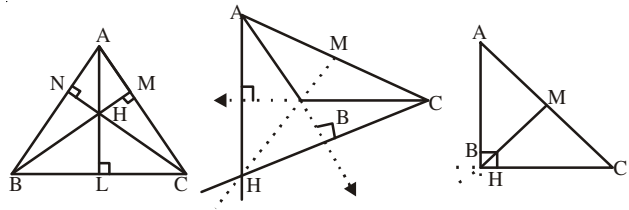


- **Circumcentre will be**
 - (i) In the interior of the triangle for an acute triangle.
 - (ii) On the hypotensue of a right angle.
 - (iii) in the exterior of the triangle for an obtuse triangle.
- All the three perpendicular bisectors of a triangle pass through O and it is called circumcentre which is equidistant from vertices A, B and C.
- If we mark O as centre and OA or OB or OC as radius and draw a circle. The circle passes through A, B and C of the triangle called 'circumcircle' of the triangle.

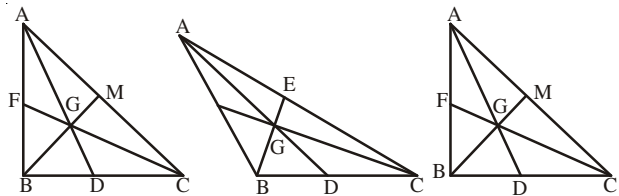


- Perpendicular drawn from a vertex of a triangle on the opposite side is called its altitude.
- In a triangle the three altitudes pass through the same point and the point of concurrency is called the 'orthocentre' of the triangle.
- **Orthocentre will be**
 - (i) In the interior of the triangle for an acute

- (ii) At the vertex containing the right angle for a right triangle.
- (iii) In the exterior of the triangle for an obtuse triangle.



- A line joining a vertex to the mid point of the opposite side of a triangle is called its median.
- All the three medians pass through the same point. The point of concurrency 'G' is called the centroid of the triangle.

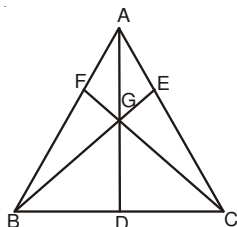


- Centroid divides each of the medians in the ratio 2:1.
- In an isosceles triangle, bisector of the angle formed by the equal sides is also a perpendicular bisector, an altitude and a median of the triangle.
- In an equilateral triangle the angle bisectors are also the perpendicular bisectors of the sides, altitudes and medians of the triangle.

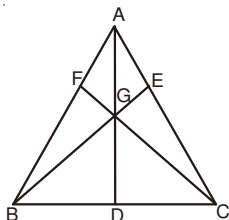
CHECK YOUR PROGRESS:

- In a plane the point equidistant from vertices of a triangle is called its-
 A. Centroid B. Incentre C. Circumcentre D. Orthocentre
- In a plane the point equidistant from the sides of the triangle is called its-
 A. Centroid B. Incentre C. Circumcentre D. Orthocentre
- Centroid of a triangle divides median in the ratio-
 A. 2 : 1 B. 1 : 2 C. 1:1 D. None of these
- The incentre of the triangle always lies in the
 A. Exterior of the triangle B. On the triangle
 C. Interior of the triangle D. None of these

5. Three or more lines in a plane which intersect each other in exactly one point or which pass through the same point are called:
- A. Parallel lines
B. Concurrent lines
C. Congruent lines
D. Bisectors
6. In an equilateral $\triangle ABC$, G is the centroid, If AG is 7.2cm, find AD and BE.



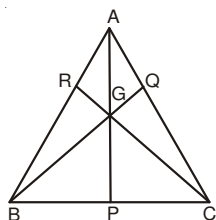
7. In figure if AD = 4.8 cm, D is the mid point of BC. Find AG.



8. In an equilateral triangle show that the incentre, the circumcentre, the orthocentre and the centroid are the same point.
9. ABC is an equilateral triangle of side 24cm. If G be its centroid. Find AG.
10. ABC is an isosceles triangle such that $AB = AC = 10\text{cm}$ and base $BC = 8\text{cm}$. If G is the centroid of $\triangle ABC$, find AG.

STRETCH YOURSELF

- Find the circumradius of circumcircle and inradius of incircle of an equilateral triangle of side $2a$.
- In an equilateral $\triangle ABC$, if G is centroid and $AG = 6\text{cm}$ find the side of the triangle.
- In an isosceles triangle, show that the bisector of the angle formed by the equal sides is also a perpendicular bisector, altitude and a median of the triangle.
- In figure P, Q and R are the mid-points of the sides of $\triangle ABC$. Show that



$$BQ - CR > \frac{3}{2} BC.$$

5. If O is the orthocentre of $\triangle PQR$, then show that P is the orthocentre of the $\triangle OQR$.

ANSWER:

CHECK YOUR PROGRESS :

- C
- B
- A
- C
- B
- $AD = 10.8\text{cm}$, $BE = 10.8\text{cm}$
- $AG = 3.2\text{cm}$
- $8\sqrt{3}\text{ cm}$
- $AG = 4\text{cm}$

STRETCH YOURSELF :

- Circumradius = $\frac{2a}{\sqrt{3}}$, inradius = $\frac{a}{\sqrt{3}}$
- $6\sqrt{3}\text{ cm}$