SSBCrack EXAMS

CDS 1 2025

MATHS

LIVE

GEOMETRY

CLASS 4

NAVJYOTI SIR

8 Nov 2024 Live Classes Schedule

8:00AM	08 NOVEMBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	08 NOVEMBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:30AM	OVERVIEW OF TAT & WAT	ANURADHA MA'AM

NDA 1 2025 LIVE CLASSES

11:30AM	GK - MODERN HISTORY - CLASS 1	RUBY MA'AM
4:00PM	MATHS - PERMUTATION & COMBINATION - CLASS 3	NAVJYOTI SIR
5:30PM	ENGLISH - COMPREHENSION - CLASS 1	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

11:30AM	GK - MODERN HISTORY - CLASS 1	RUBY MA'AM
5:30PM	ENGLISH - COMPREHENSION - CLASS 1	ANURADHA MA'AM
7:00PM	MATHS - GEOMETRY - CLASS 4	NAVJYOTI SIR

AFCAT 1 2025 LIVE CLASSES

5:30PM	ENGLISH - COMPREHENSION - CLASS 1	ANURADHA MA'AM

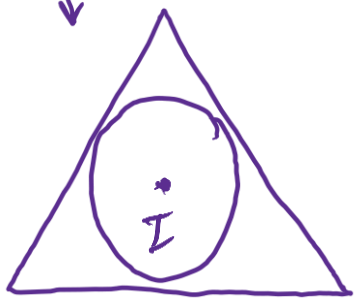
CENTRES OF TRIANGLE

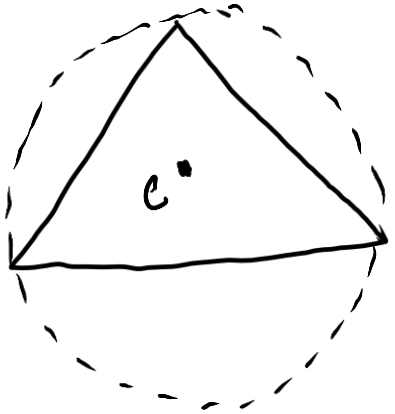
Incentre
(I)

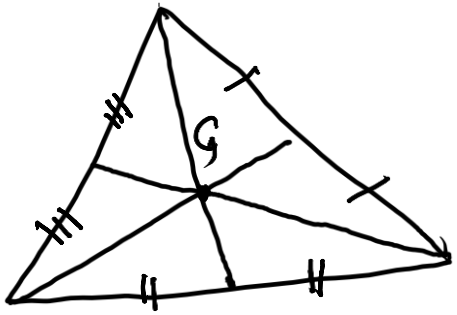
Circumcentre
(C)

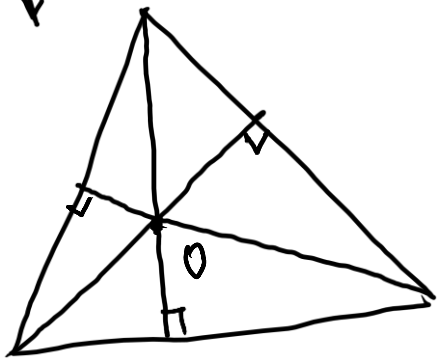
Centroid
(G)

Orthocentre
(H)

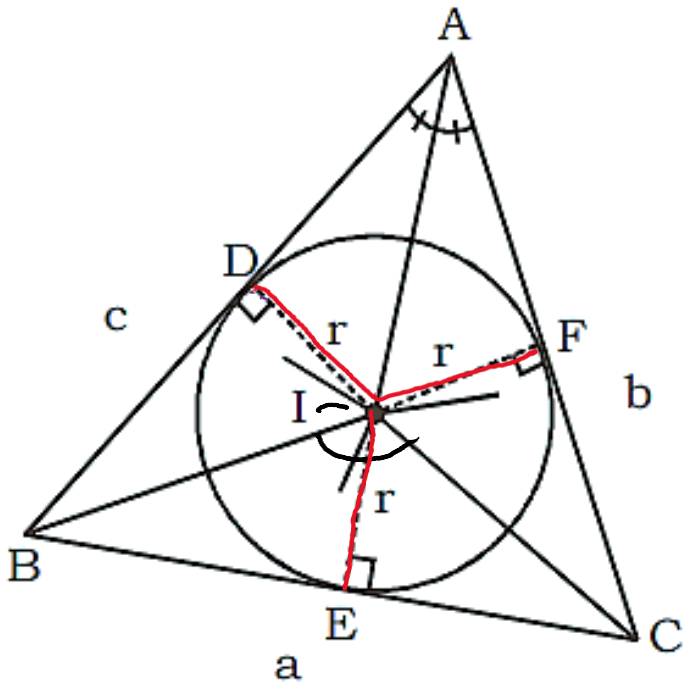








INCENTRE



point of intersection of angle bisectors.

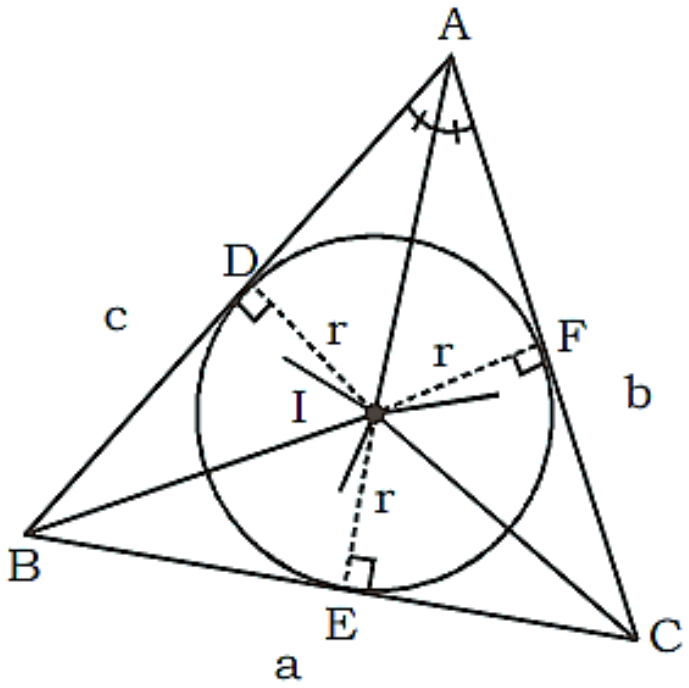
$$\angle BIC = 90^\circ + \frac{\angle A}{2}$$

$$\angle AIC = 90^\circ + \frac{\angle B}{2}$$

$$\angle AIB = 90^\circ + \frac{\angle C}{2}$$

I is equidistant from each side.

INCENTRE



$AE = h_1$

$BF = h_2$

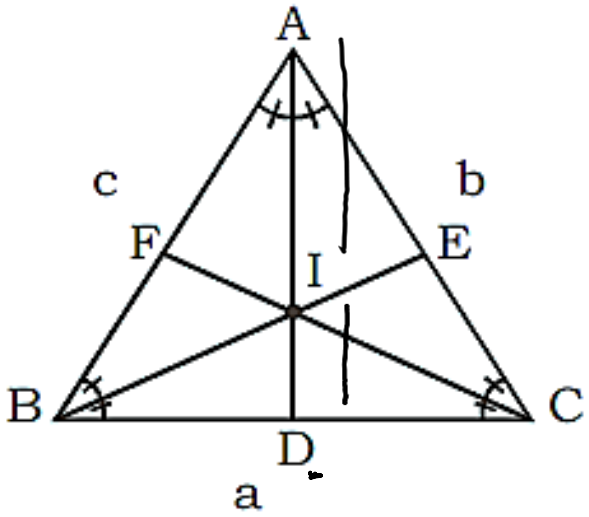
$CD = h_3$

If altitudes h_1, h_2, h_3 are given

$$\frac{1}{r} = \frac{1}{h_1} + \frac{1}{h_2} + \frac{1}{h_3}$$

radius of incircle ('in-radius')

INCENTRE

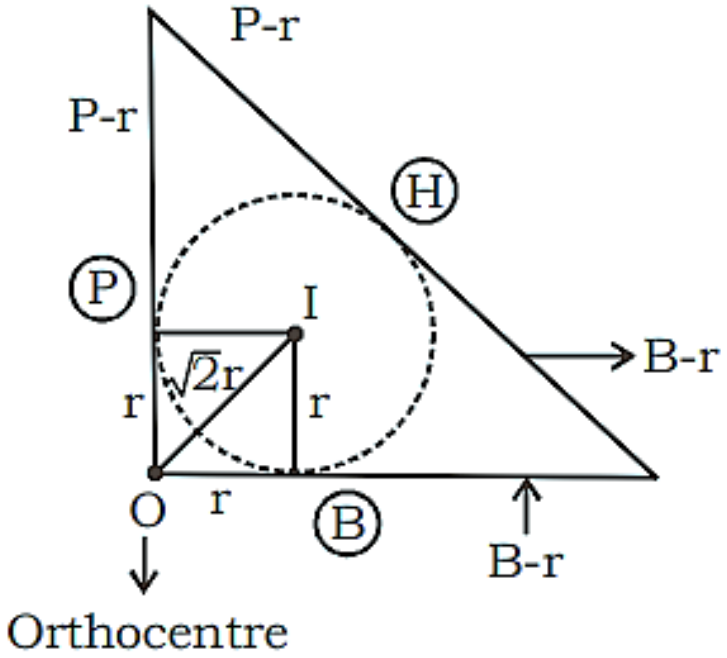


$$\frac{AI}{ID} = \frac{b+c}{a}$$

$$\frac{BI}{IE} = \frac{c+a}{b}$$

$$\frac{CI}{IF} = \frac{a+b}{c}$$

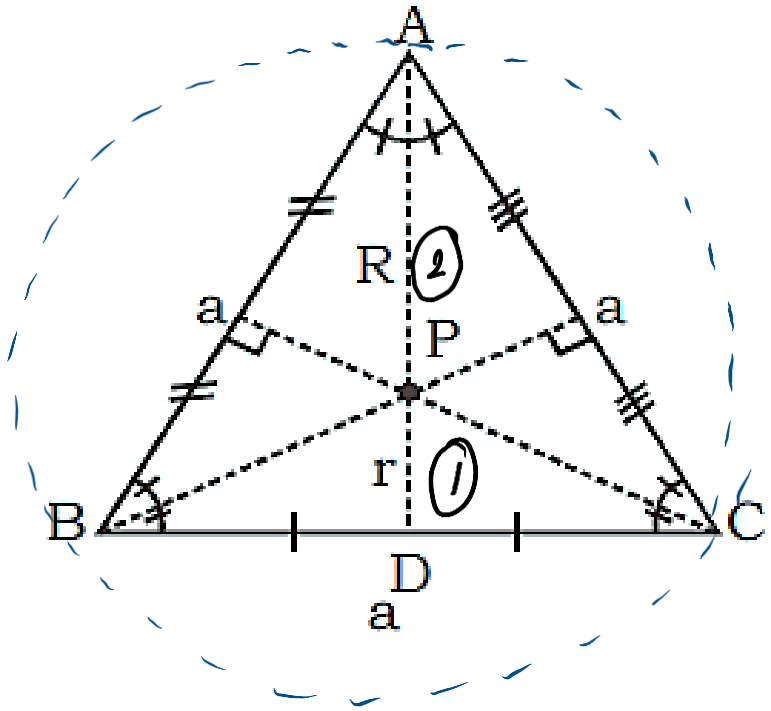
INCENTRE – RIGHT ANGLE TRIANGLE



Distance between in-centre and orthocentre = $\sqrt{2}r$

SSBCrack EXAMS

INCENTRE – EQUILATERAL TRIANGLE



I, C, O, G (point P)

(Incentre, circumcentre, orthocentre, centroid)

all are the same point.

$R = 2r$

$AD = \frac{\sqrt{3}}{2}a$

$R = \frac{2}{3}(AD)$

$r = \frac{1}{3}(AD)$

$R = \frac{a}{\sqrt{3}}$

$r = \frac{a}{2\sqrt{3}}$

QUESTION

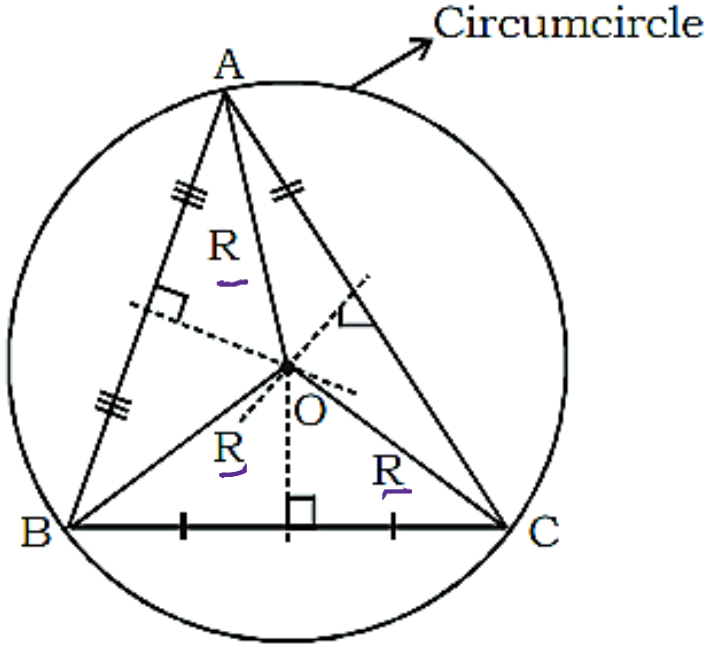
What is the ratio between the area of incircle and circumcircle for a given equilateral triangle ?

$$\frac{\pi r^2}{\pi R^2} = \left(\frac{r}{R}\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4} \Rightarrow 1:4$$

$R = 2r$

$$\frac{r}{r} = \frac{1}{2}$$

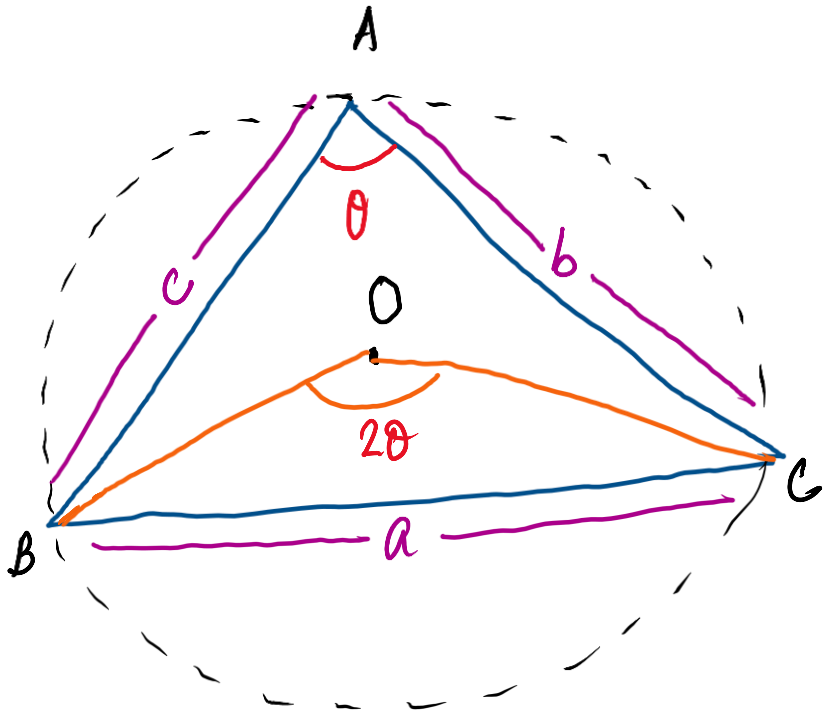
CIRCUMCENTRE



- **Intersection of all 3 perpendicular bisectors.**
- **It may lie inside, outside or on the triangle.**

equidistant from vertices of triangle — A, B and C.

CIRCUMCENTRE



$\angle BOC = 2\angle A;\ \angle AOB = 2\angle C;\ \angle AOC = 2\angle B$

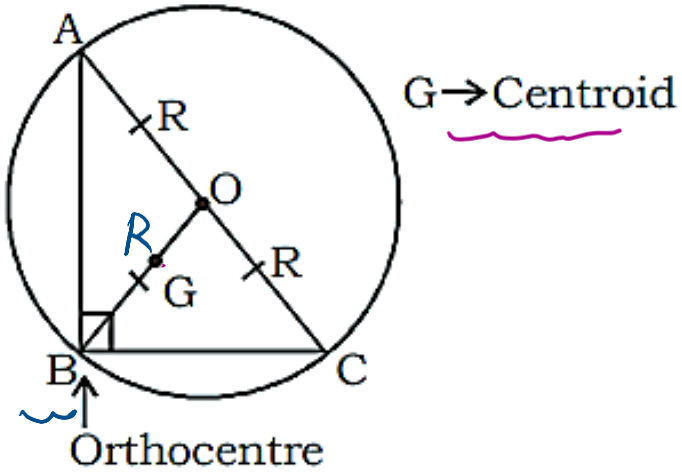
CIRCUMCENTRE

$$R = \frac{a}{2\sin A} = \frac{b}{2\sin B} = \frac{c}{2\sin C}$$

$$\therefore \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$

sine - formula

CIRCUMCENTRE – RIGHT ANGLED TRIANGLE



G→Centroid

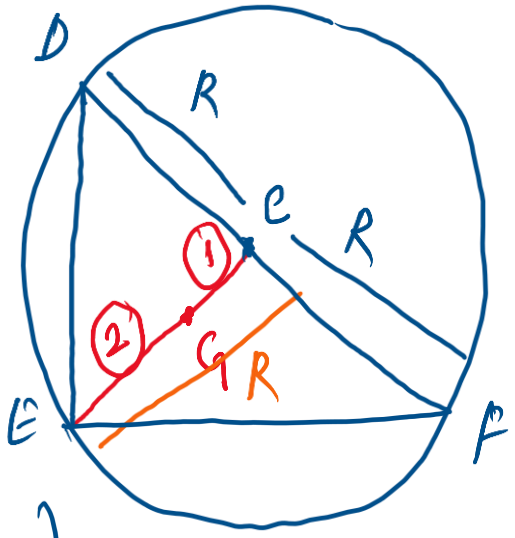
BO = R = distance between orthocentre and circumcentre = median of hypotenuse =

$$\textbf{shortest median} = \frac{H}{2}$$

SSBCrack EXAMS

QUESTION

What is the distance between centroid and circumcentre of a right triangle ?



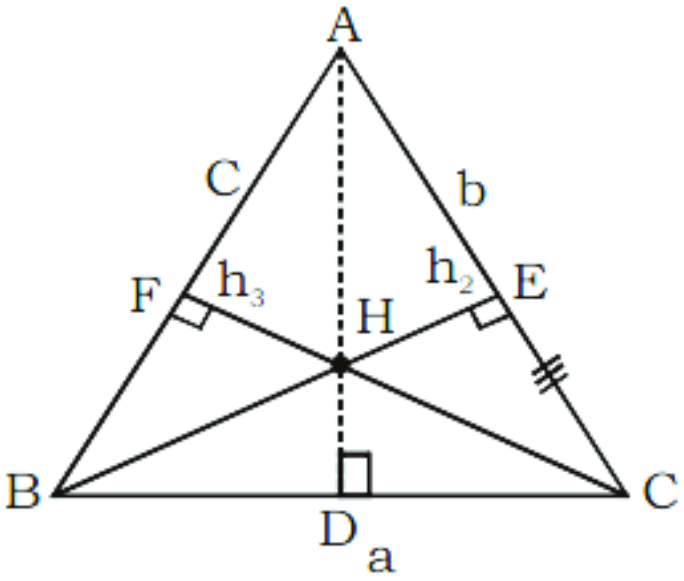
EC is median at hypotenuse, DF.

$EC = R$

$GC = \frac{1}{3}R = \frac{1}{3}\left(\frac{H}{2}\right) = \frac{H}{6}$

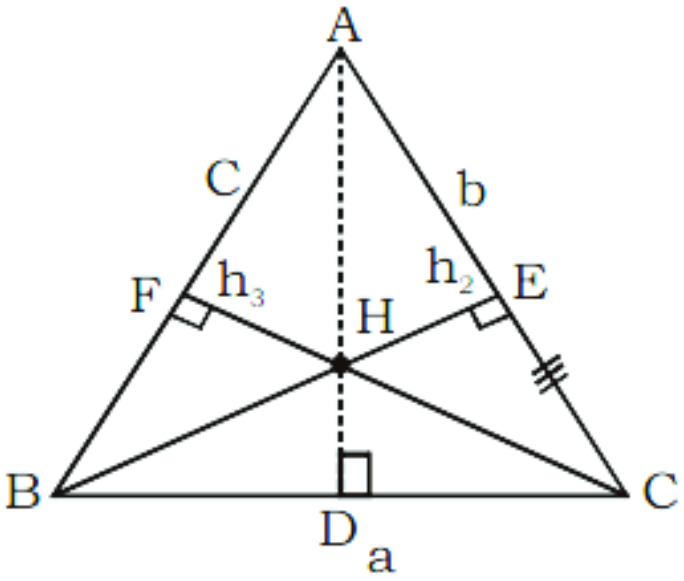
$\frac{R}{3}$ | $\frac{H}{6}$

ORTHOCENTRE



- **Intersection of all 3 altitudes.**
- **It may lie inside, outside or on the triangle.**

ORTHOCENTRE



$$\text{Area} = \frac{1}{2}\,ah_1 = \frac{1}{2}\,bh_2 = \frac{1}{2}\,ch_3$$

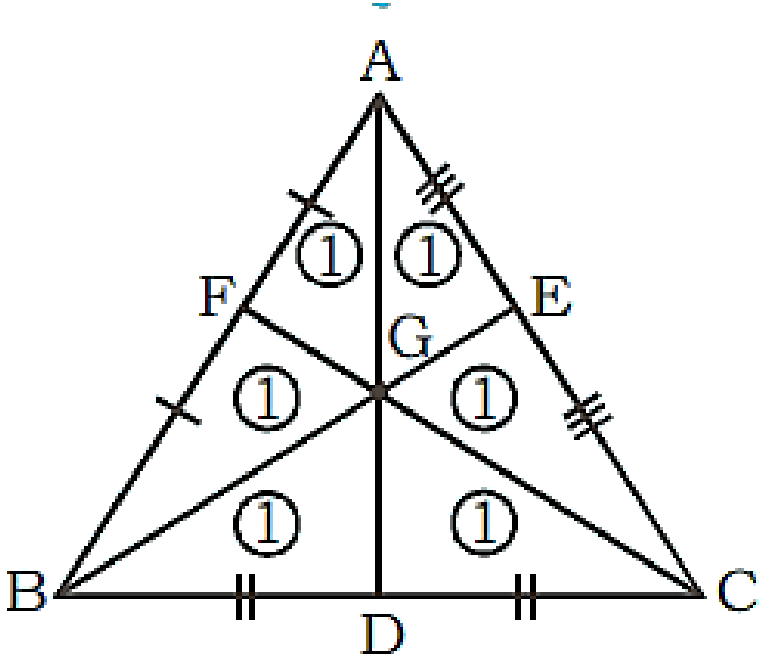
$$ah_1 = bh_2 = ch_3 = 2 \times \text{Area}$$

$$\mathbf{h_1 : h_2 : h_3 = \frac{1}{a} : \frac{1}{b} : \frac{1}{c}}$$

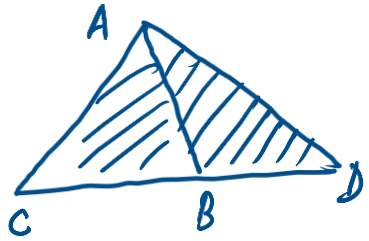
CENTROID

- Intersection of all 3 medians.
- It lies always inside the triangle.

CENTROID



- **Median divides the triangle into two equal areas.**



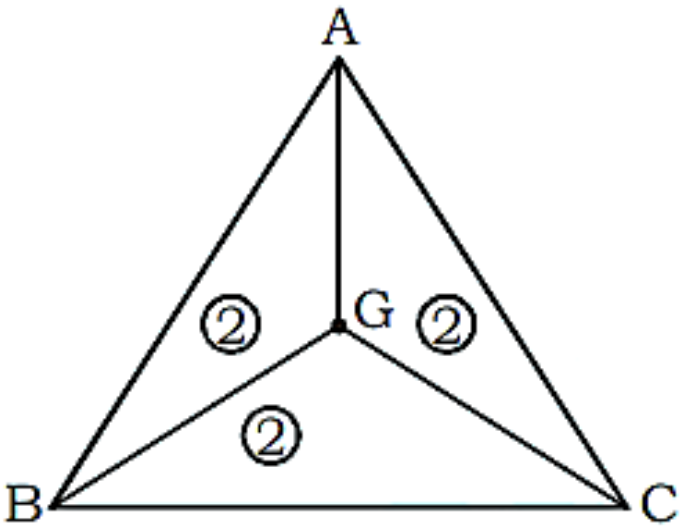
AB is median

$ar(\triangle ABC) = ar(\triangle ADB)$

6 triangle made by 3 medians have equal area.

$$\text{Area of each triangle} = \frac{1}{6} \text{ Area of } \Delta ABC$$

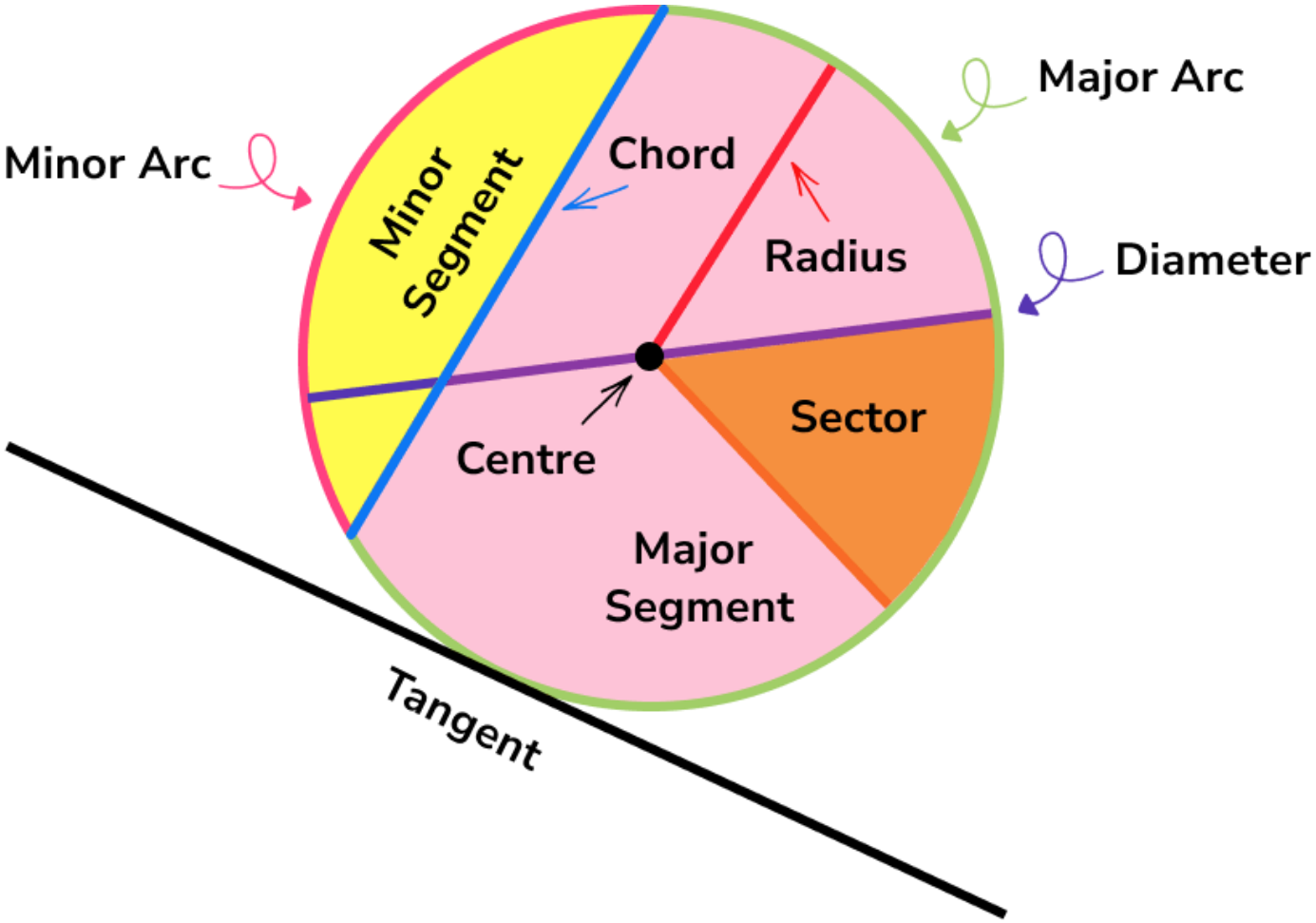
CENTROID



$ar(\triangle AGB) = ar(\triangle AGC) = ar(\triangle BGC)$

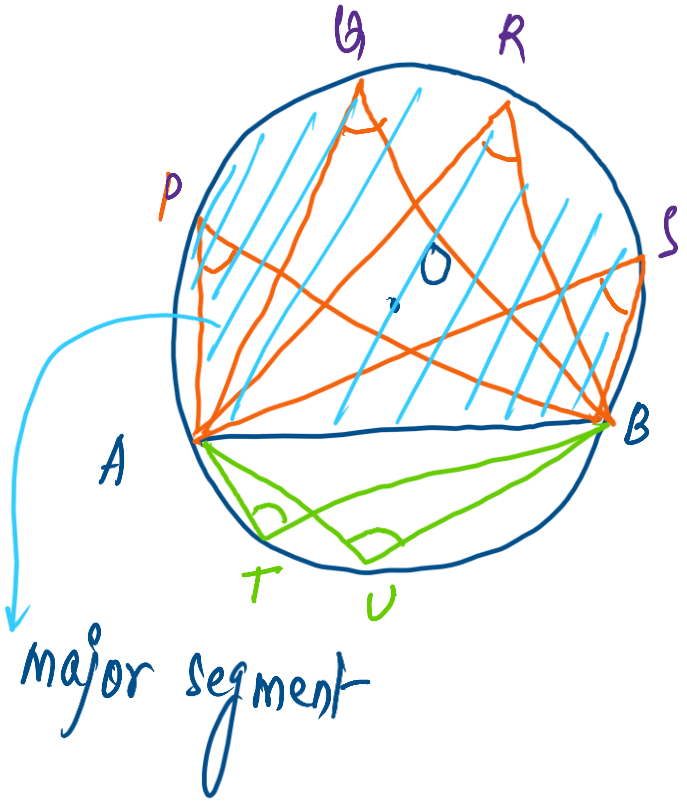
(joining vertex to centroid)

CIRCLE


Minor Arc
Minor Segment
Chord
Major Arc
Radius
Diameter
Centre
Sector
Major Segment
Tangent

ANGLE IN SEGMENT

- **Angle formed in the major segment of the circle is acute.**
- **Angle formed in the minor segment of the circle is obtuse.**



$\angle P, \angle Q, \angle R, \angle S \longrightarrow$ acute

$\angle T, \angle U \longrightarrow$ obtuse

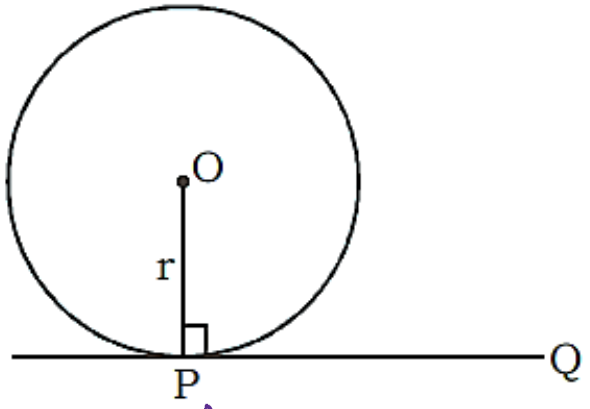
CIRCLE – PROPERTIES

- Two circles are congruent only when they have equal radii.
- All circles are similar to each other.
- Radius drawn perpendicular to chord bisects the chord.
- Equal chords of circle subtend equal angles at the centre.

CIRCLE – PROPERTIES

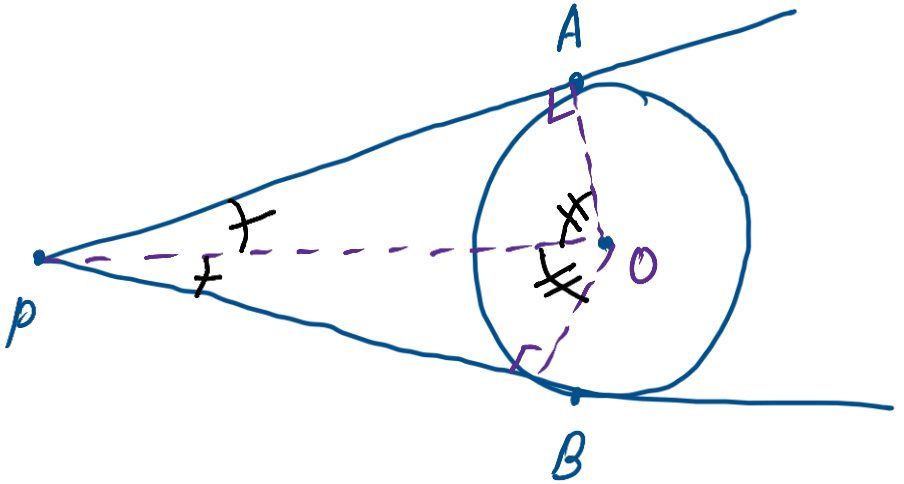
- A circle can only circumscribe a rectangle, trapezium, triangle, square and kite.
- Chords equidistant from centre are equal in length.
- Diameters are the only chords that bisect each other.

TANGENT



(point of contact)

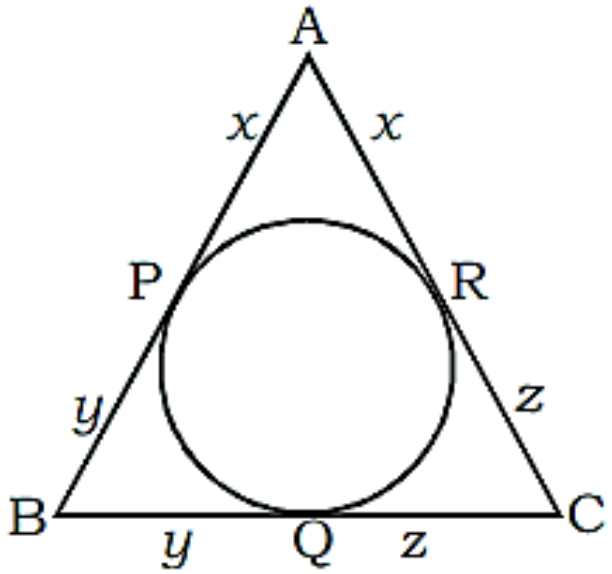
- **OP perpendicular to PQ.** (radius ⊥ Tangent)
- **Tangents drawn from an external point to a circle are equal.**



(PA = PB)

$\triangle OPA \cong \triangle OBP$

TANGENTS AND INCENTRE



$$S = x + y + z$$

Area of $(\Delta)\ \Delta ABC = \sqrt{(x+y+z)\cdot xyz}$

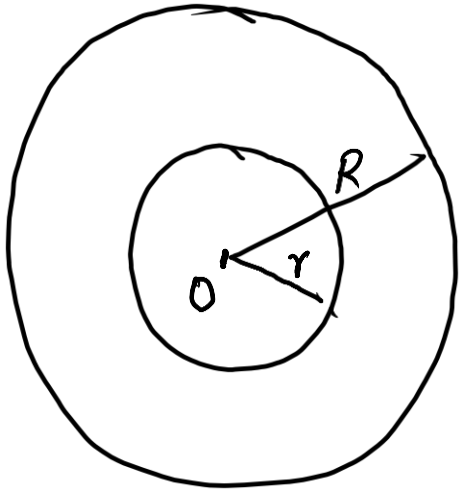
Semi-perimeter

Heron's formula

$$r = \frac{\Delta}{s} = \sqrt{\frac{xyz\,(x+y+z)}{x+y+z}}$$

$$\mathbf{r = \sqrt{\frac{xyz}{x+y+z}}}$$

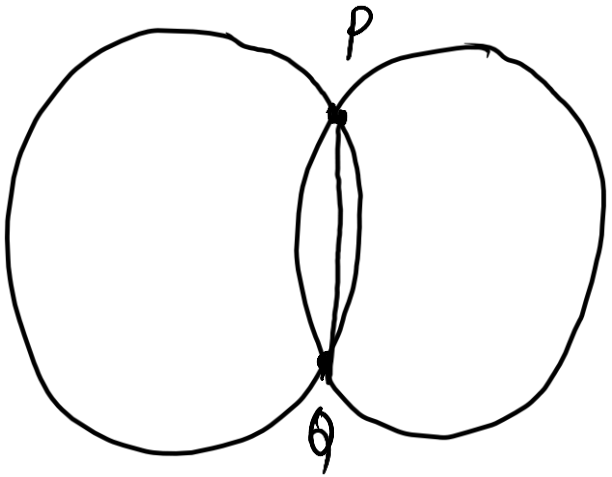
CONCENTRIC CIRCLES



circles having same centre.

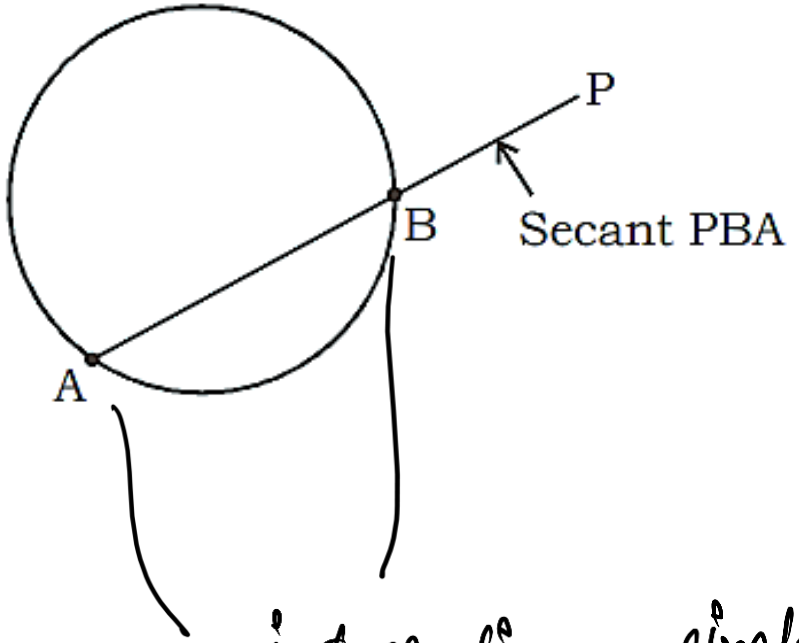
COMMON CHORD

When a point of intersection of two given circles is joined, this is the common chord.



PQ — comm chord

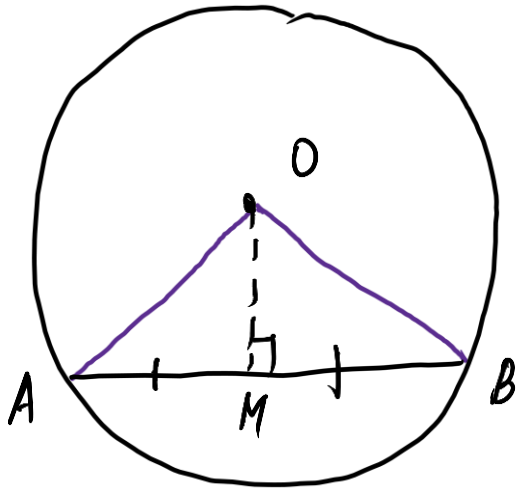
SECANT



intersecting circle at 2 points.

THEOREM

- **A perpendicular drawn from the centre of a circle to a chord bisects the chord.**

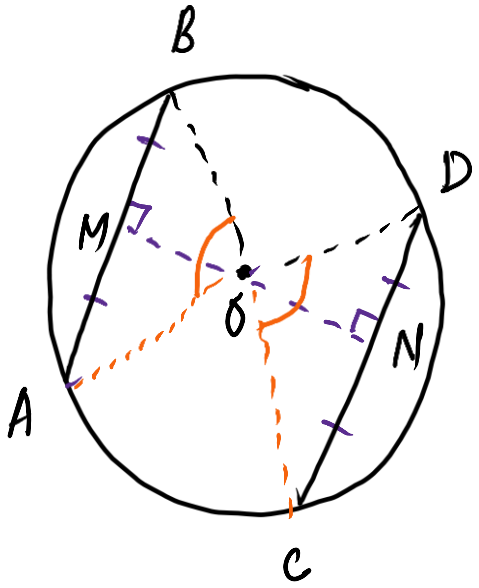


$\triangle OMA \cong \triangle OMB$

$AM = BM$

THEOREM

- **Equal chords are equidistant from the centre.**
- **Equal chords make equal angle at the centre.**

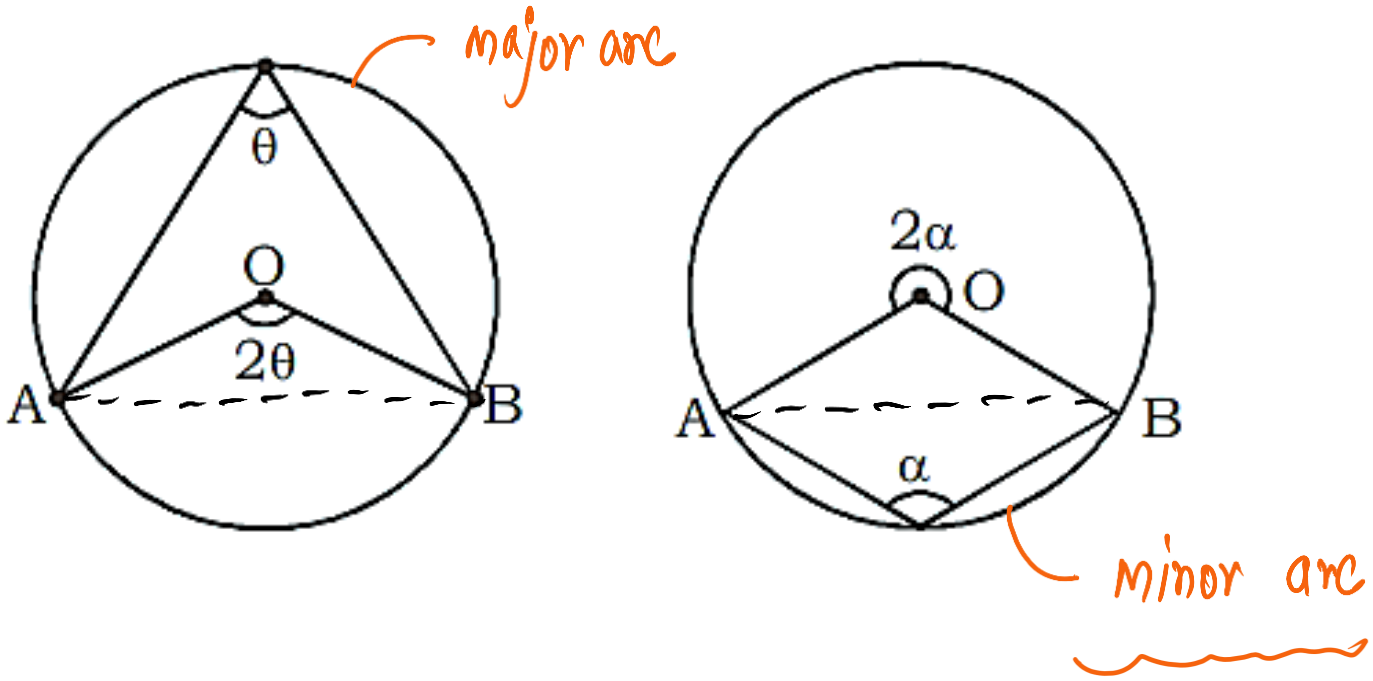


$\triangle OMB \cong \triangle OND$,

$OM = ON$

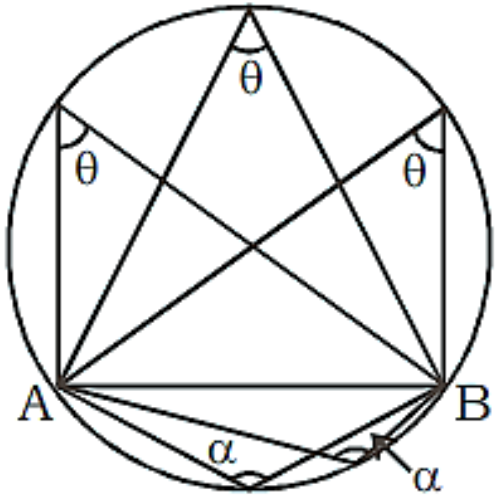
THEOREM

- **Angle made by an arc on centre is double the angle made by the same arc on the circumference of centre.**



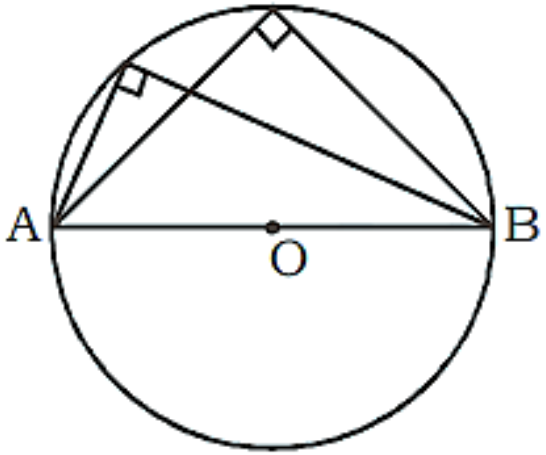
THEOREM

- **Angle made by an arc on same side of circle are equal.**



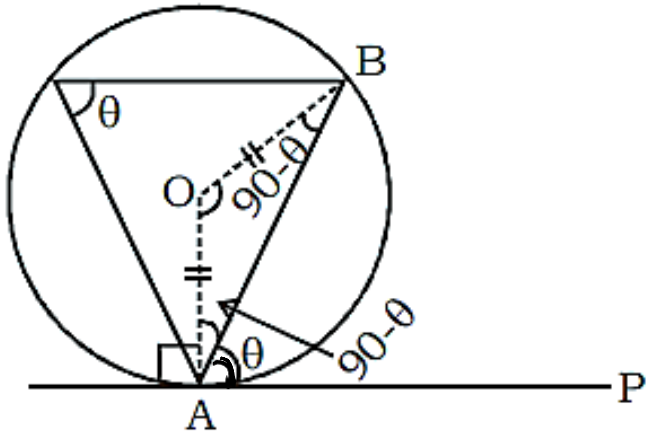
THEOREM

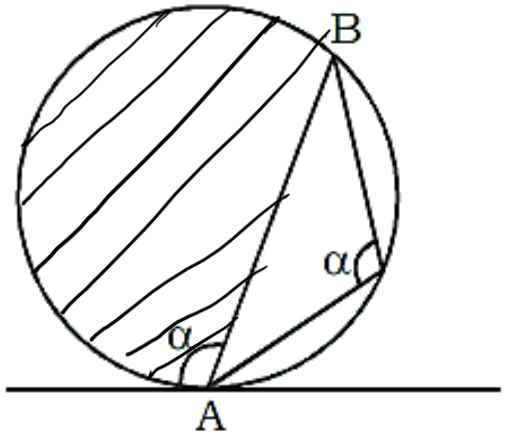
Angle made in semi-circle is right angle.

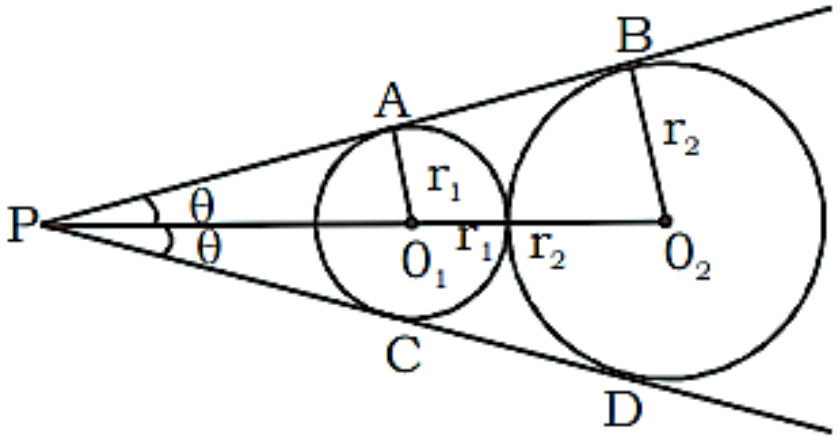


ALTERNATE SEGMENT THEOREM

- **Angle made by a chord and tangent is equal to the angle made by the chord in other segment of the circle**







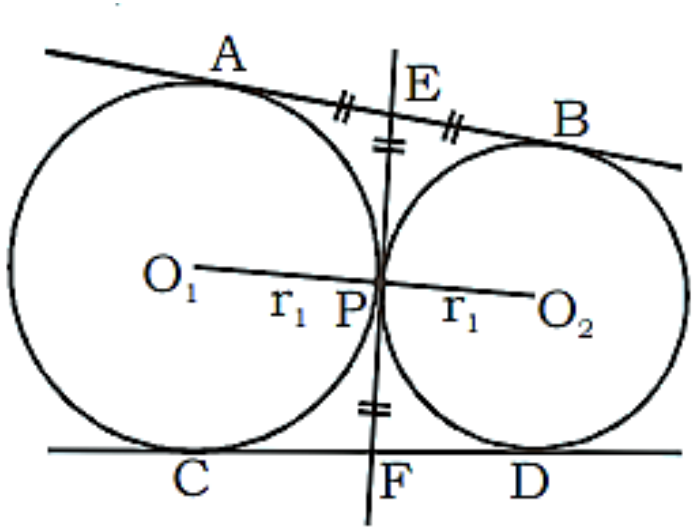
circles are externally touching

$$O_1O_2 = r_1 + r_2$$

$$\left(\frac{r_1}{r_2}\right) = \frac{1-\sin\theta}{1+\sin\theta}$$

COMMON TANGENTS – EXTERNAL TOUCHING

- **When two circles touch each other externally. Then distance between their centres is sum of their radii.**

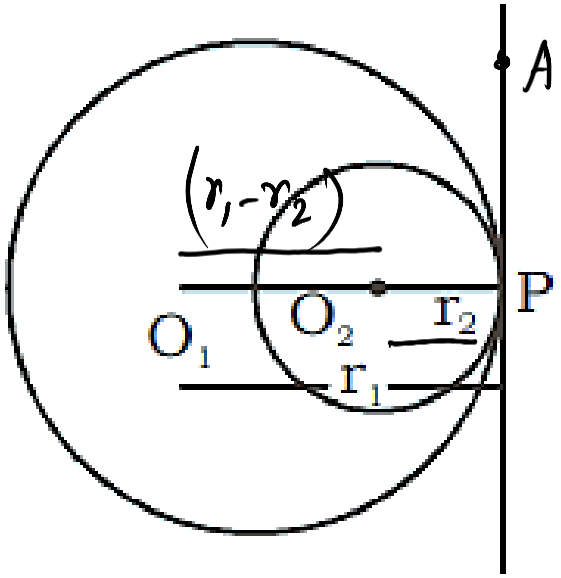


$O_1O_2 = r_1 + r_2$

Common tangents — AB, CD, EF

3

COMMON TANGENTS – INTERNAL TOUCHING

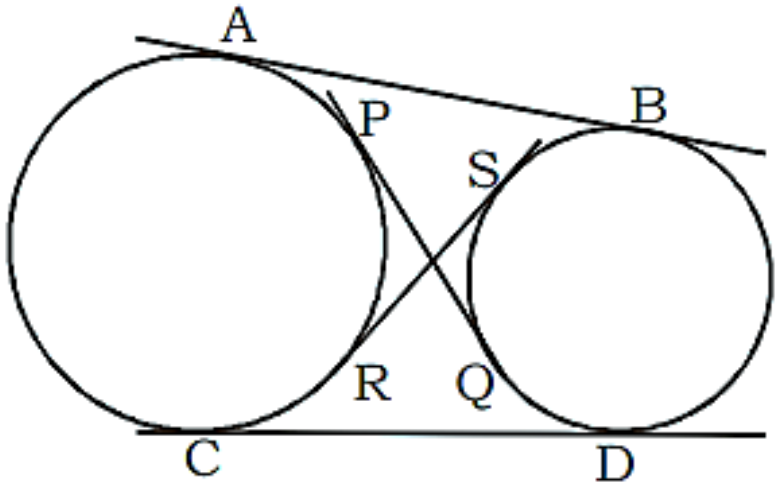


common tangent — AP — (1)

distance between centres = diff. of radii

$= r_1 - r_2$

COMMON TANGENTS – NOT INTERSECTING

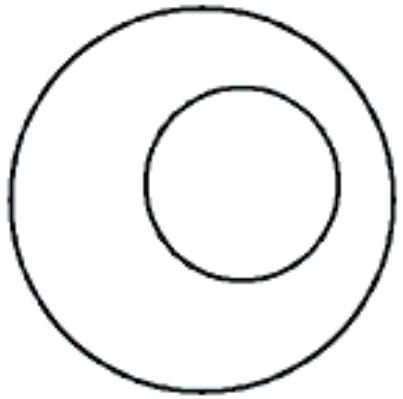


4 common tangents

AB, CD — direct common tangents

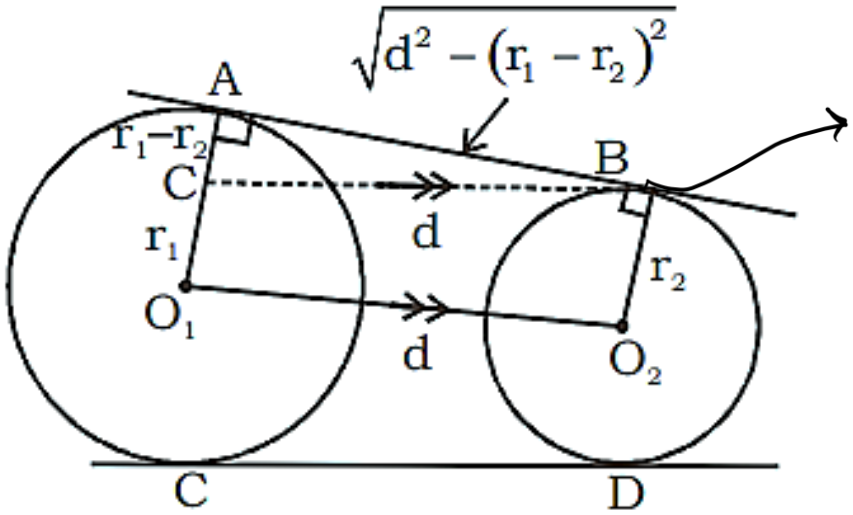
PQ, SR — transverse common tangents

COMMON TANGENTS – NOT INTERSECTING



No common tangent

LENGTH OF DIRECT COMMON TANGENT



In right $\triangle ACB$,

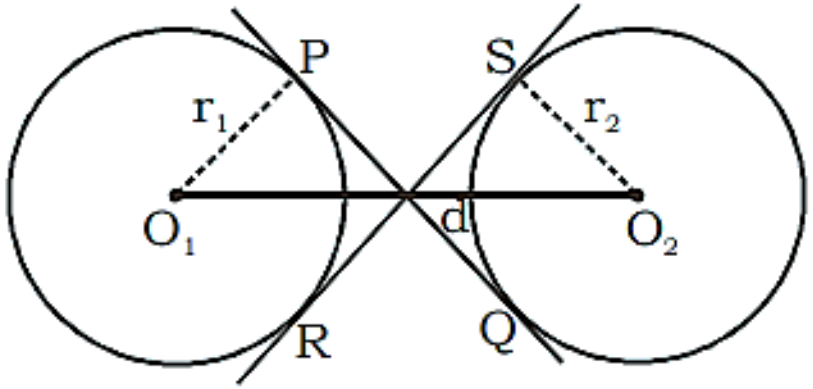
$$d^2 - (r_1 - r_2)^2 = AB^2$$

$CB \parallel O_1O_2$

DCT = AB = CD = $\sqrt{d^2-(r_1-r_2)^2}$

d - distance between centres

LENGTH OF TRANSVERSE COMMON TANGENT



$$TCT = PQ = RS = \sqrt{d^2 - (r_1 + r_2)^2}$$

distance between centres

Sum of radii

DCT > TCT

CDS 1 2025

LIVE

MATHS

GEOMETRY

CLASS 5

NAVJYOTI SIR

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EXAMS