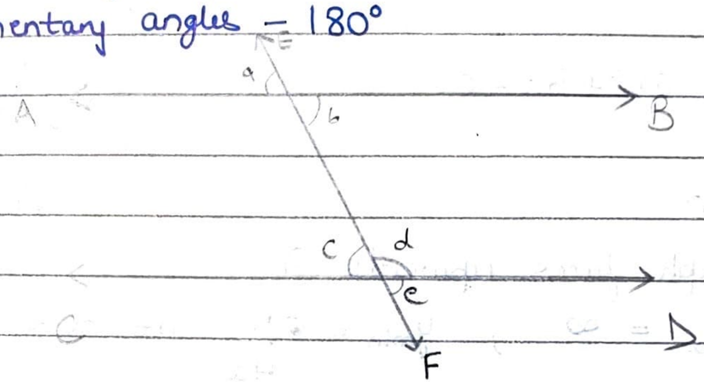
Lines & Angles

Complementary angles - 90°
Supplementary angles - 180°



If AB || CD & EF is a transversal

→ ∠a = ∠b (Vertically opposite angles)
→ ∠a = ∠c (corresponding angles)
→ ∠b = ∠c (Alternate Interior angles)
→ ∠a = ∠e (Alternate exterior angles)
→ ∠C + ∠D = 180° (collinear angles)
→ ∠B + ∠D = 180° (∠b = ∠c)

Triangles

Basis of angles
→ Acute
→ Right
→ Obtuse

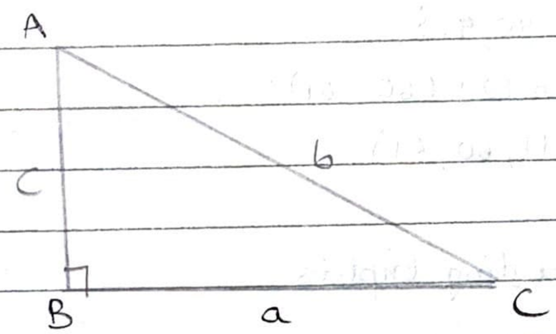
Basis of Sides
→ Equilateral
→ Isosceles
→ Scalene

Sides of a Triangle

Sum of 2 Sides > Third Side > Difference of 2 Sides

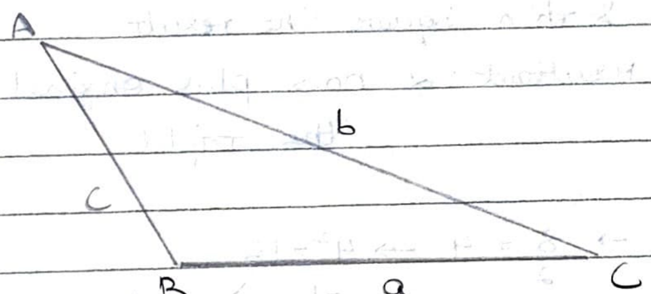
$a - b < c < a + b$ (a, b, c are sides of a triangle)

- Right Triangle



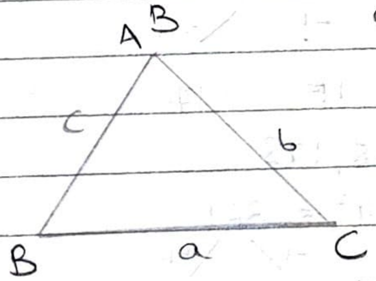
$b^2 = a^2 + c^2$

- Obtuse Triangle



$b^2 > a^2 + c^2$

- Acute Triangle



$b^2 < a^2 + c^2$

Pythagorean Triplet

For a right triangle, 3 +ive integral values that satisfy $c^2 = a^2 + b^2$ are pythagorean triplets ($c \rightarrow$ hypotenuse)

Eg)

3, 4, 5
5, 12, 13
7, 24, 25
8, 15, 17

* any natural no. will also be pythagorean triplets

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Odd numbers generating Triplets

→ Square the no.
→ Divide into 2 consecutive numbers (both no.s + actual no. will form triplet)

Eg - $9 \rightarrow 9^2 = 81\ (40 + 41)$

$\{9, 40, 41\}$

- $11 \rightarrow 11^2 = 121\ (60 + 61)$

$\{11, 60, 61)$

Even numbers generating triplets

→ Divide by 2 & then square the result
→ -1, +1 ; resultant 2 no.s plus original number form the triplet

Eg - $8 \rightarrow \frac{8}{2} = 4 \rightarrow 4^2 = 16$

-1 / \ +1

15 17

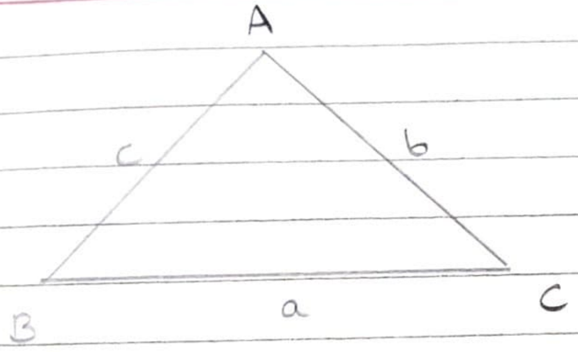
$\{8, 15, 17\}$

- $38 \rightarrow \frac{38}{2} = 19 \rightarrow 19^2 = 361$

-1 / \ +1

360 362

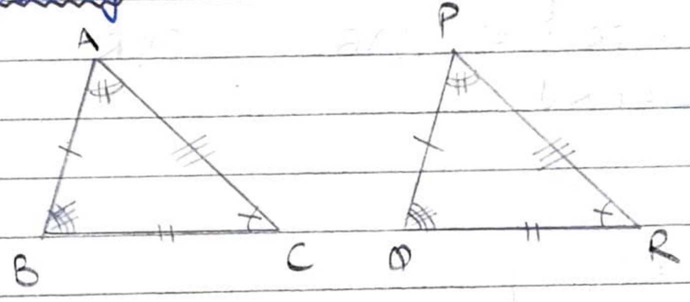
$\{38, 360, 362\}$



$$S\,(\text{Semi Perimeter}) = \frac{a+b+c}{2}$$

$$\text{Area}\,(\Delta ABC) = \sqrt{S(S-a)(S-b)(S-c)}$$

Congruency

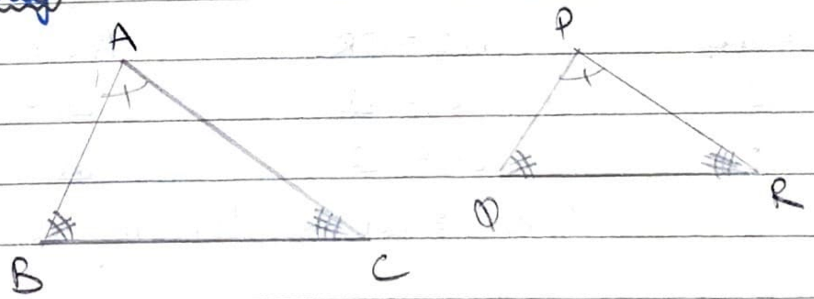


If $\Delta ABC \cong \Delta PQR$

$AB = PQ$, $BC = QR$, $AC = PR$

$\angle C = \angle R$, $\angle A = \angle P$, $\angle B = \angle Q$

Similarity

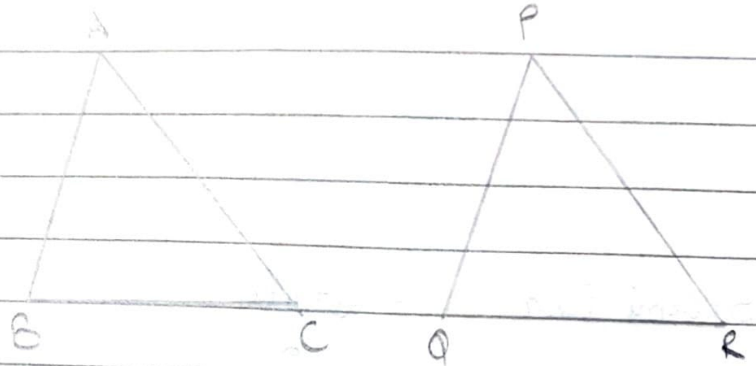


If $\Delta ABC \sim \Delta PQR$

$\angle A = \angle P$, $\angle Q = \angle B$, $\angle C = \angle R$

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR} = \frac{\sqrt{\text{Area. } \Delta ABC}}{\sqrt{\text{Area } \Delta PQR}}$$

Tests for Congruency



1) SSS Test

$$\left.\begin{aligned} AB &= PQ \\ BC &= QR \\ AC &= PR \end{aligned}\right\} \Rightarrow \Delta ABC \cong \Delta PQR$$

2) ASAS Test

$$\left.\begin{aligned} AB &= PQ \\ \angle B &= \angle Q \\ BC &= QR \end{aligned}\right\} \Rightarrow \Delta ABC \cong \Delta PQR$$

* The angle should be between the sides

3) 2Angles + 1Side (AAS, SAA, ASA)

$AB = PQ$	$BC = QR$	$AC = PR$
$\angle A = \angle P$	$\angle B = \angle Q$	$\angle C = \angle R$
$\angle B = \angle Q$	$\angle C = \angle R$	$\angle A = \angle P$

$\therefore$ $\Delta ABC \cong \Delta PQR$ for any of the above comb.

4) RHS Test

$$\left.\begin{aligned} &\angle B = \angle Q = 90^\circ \\ &AC = PR \text{ (Hypotinuse)} \\ &AB = PQ \text{ or } BC = QR \end{aligned}\right\} \Rightarrow \Delta ABC \cong \Delta PQR$$

Tests for Similarity

1) SSS Test

$$\left.\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}\right\} \Rightarrow \Delta ABC \sim \Delta PQR$$

2) SAS Test

$$\left.\begin{aligned}\frac{AB}{PQ} &= \frac{AC}{PR} \\ \angle A &= \angle P\end{aligned}\right\} \Rightarrow \Delta ABC \sim \Delta PQR$$

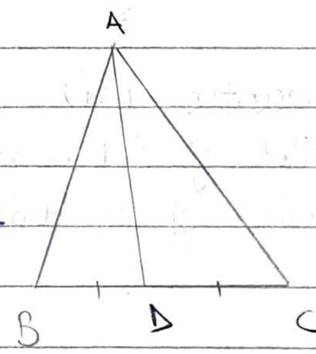
★ The angle should be b/w the sides

3) AA Test

$$\left.\begin{aligned}\angle A &= \angle P \\ \angle B &= \angle Q\end{aligned}\right\} \Rightarrow \Delta ABC \sim \Delta PQR$$

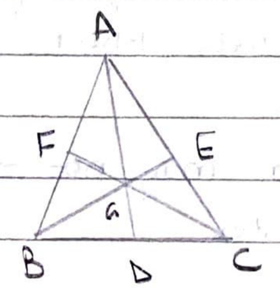
The 4 core lines

1) Median



→ Joins vertex to opposite side of a triangle and divides the side in 2 equal parts (BD = DC)

→ Also divides the triangle into 2 triangles of equal area
(Ar ΔABD = Ar. ΔADC)



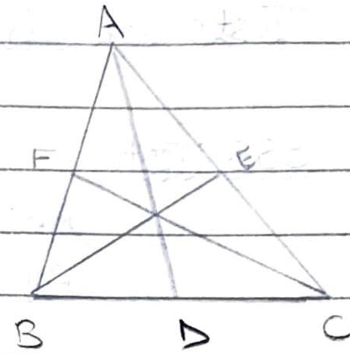
a) Centroid (G)

→ Intersection point of all 3 medians which divides the median in the ratio 2 : 1

$$\frac{AG}{GD} = \frac{BG}{GE} = \frac{CG}{GF} = \frac{2}{1}$$

→ It also divides the triangles in 6 triangles of equal areas

6) <u>Theorem of Apollonius</u>



When AD → Median

$$AB^2 + AC^2 = 2(AD^2 + \underbrace{BD^2}_{\text{or } DC^2})$$

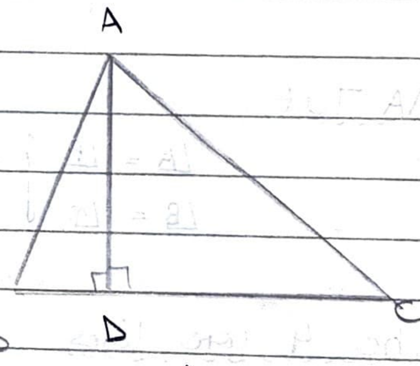
For BE → Median

$$AB^2 + BC^2 = 2(BE^2 + \underbrace{CE^2}_{\text{or } AE^2})$$

For CF → Median

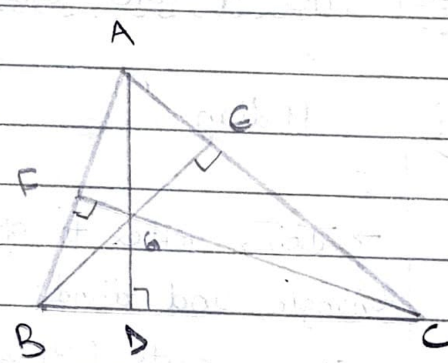
$$AC^2 + BC^2 = 2(CF^2 + \underbrace{AF^2}_{\text{or } BF^2})$$

2) <u>Altitude</u>



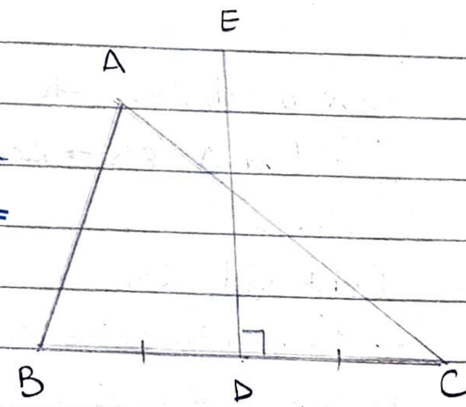
→ Draws a $\perp$ to the opposite side of the vertex ($\angle ADB = \angle ADC = 90°$)

a) <u>Orthocenter (G)</u>



→ Point of Intersection of all 3 altitudes of a triangle

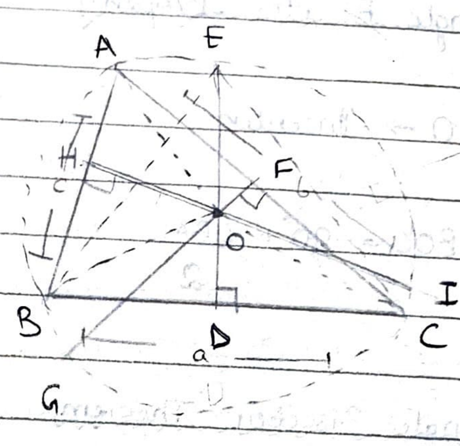
3) <u>Perpendicular Bisector</u>



→ Bisects the side equal forming a 90° angle as well ($BD = DC$ & $\angle EDC = \angle EDB = 90°$)

→ It may or may not touch the opposite vertex

a) Circumcenter



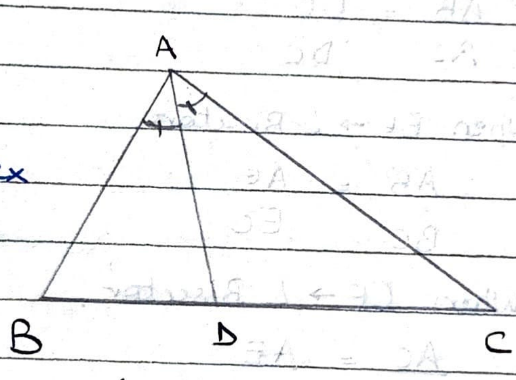
- $OA = OB = OC = R$
  Circumradius

- $Ar. \Delta ABC = \frac{abc}{4R}$

- $\angle BOC = 2\angle BEC$

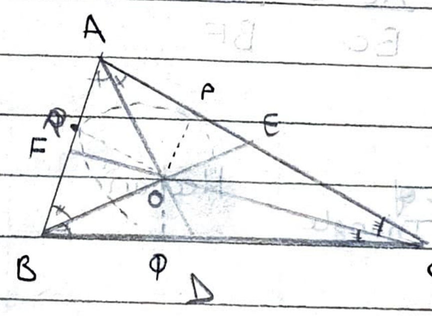
- In Right triangle, $R =$ Hypotenuse $/ 2$

4) Angle Bisector



→ Divides angle from the vertex into 2 equal angles ($\angle BAD = \angle DAC$) when AD is $\angle$ bisector

a) Incenter



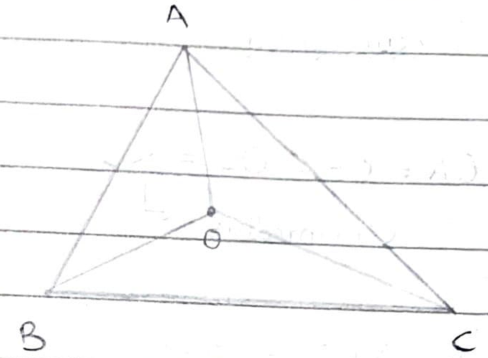
→ O is Incenter equidistant from 3 Sides of a triangle

→ $\perp$ from Incenter to any Side is inradius (r) (OP, OQ, OR)

→ $Ar. \Delta ABC = rS \rightarrow S = \frac{a+b+c}{2}$

Also, $r \perp$ tangent

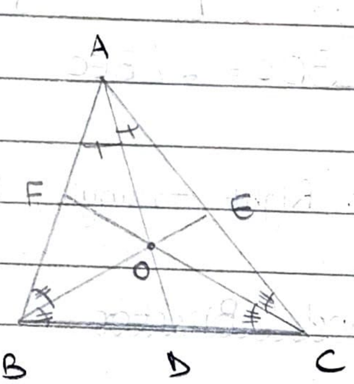
b) Angle Bisector Property



O → Incenter

$$\angle BOC = 90^\circ + \frac{\angle BAC}{2}$$

c) Angle Bisector Theorem



O → Incenter

When AD is ∠ Bisector,

$$\frac{AB}{AC} = \frac{BD}{DC}$$

When BE → ∠ Bisector,

$$\frac{AB}{BC} = \frac{AE}{EC}$$

When CF → ∠ Bisector,

$$\frac{AC}{BC} = \frac{AF}{BF}$$

Type of Triangle	Median	Orthocenter	Circumcenter	Incenter
Acute	Inside the Δ	Inside the Δ	Inside the Δ	Inside the Δ
Right	Inside the Δ	Vertex of Right ∠	On hypotenuse ~~Inside the Δ~~	Inside the Δ ~~On hypotenuse~~
Obtuse	Inside the Δ	Outside the Δ	Outside the Δ	Inside the Δ

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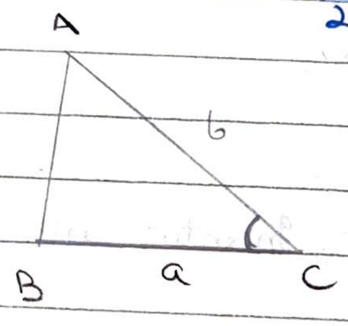
Area of a triangle

→ When base & altitude is known,

$$Area = \frac{1}{2} \times b \times h$$



→ When 2 sides & the angle b/w them is known,

$$Area = \frac{1}{2} ab \sin C$$

→ When all 3 sides are known,

$$S = \frac{a+b+c}{2} \qquad Area = \sqrt{S(S-a)(S-b)(S-c)}$$

→ When all 3 sides and Circumradius (R) is known,

$$Area = \frac{abc}{4R}$$

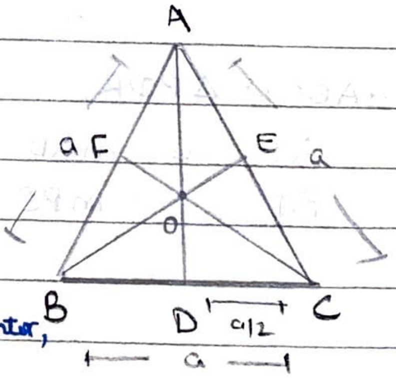
→ When all 3 sides & Inradius (r) is known,

$$Area = rS \quad \text{when } S = \frac{a+b+c}{2}$$

Special Cases

1) Equilateral Triangle

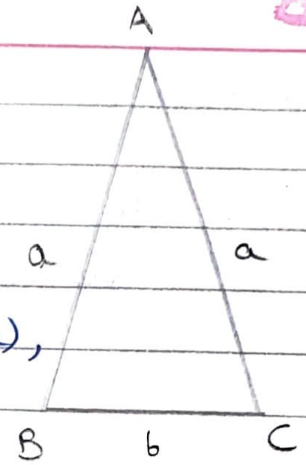
- AD, BE, CF → Median, ⊥ bisector, altitude, ∠ bisector
- O → Centroid, Ortrocenter, Circumcenter, Incenter.



$$h = \sqrt{a^2 - a^2/4}$$
$$= \frac{\sqrt{3}\,a}{2}$$

$$\therefore Ar = \frac{1}{2} \times a \times \frac{\sqrt{3}\,a}{2}$$
$$= \frac{\sqrt{3}\,a^2}{4}$$

2) Isosceles Triangle



$h = \frac{\sqrt{4a^2 - b^2}}{2}$

$Ar = \frac{1}{2} \times b \times \frac{\sqrt{4a^2-b^2}}{2}$

$= \frac{b}{4}\sqrt{4a^2-b^2}$

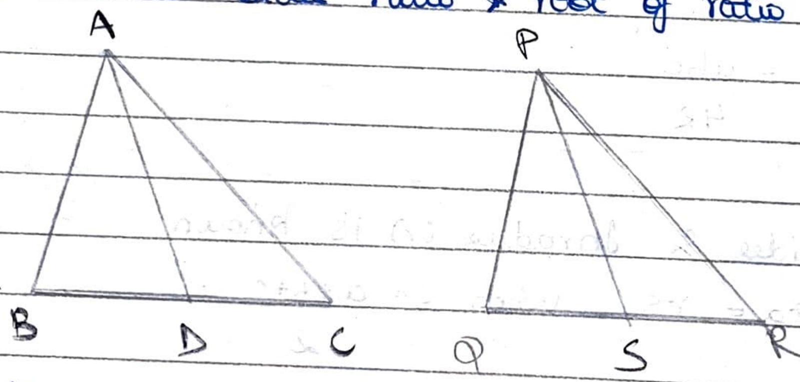
- 4 core lines will be same if drawn from the vertex common for the equal side (A in this case), otherwise they will be different.

- Centroid, Orthocenter, Circumcenter, Incenter will be collinear

Congruency & Similarity for 4 core lines

→ If 2 Δ's are congruent, then the core lines will be equal if drawn from the same vertex & the type of line is the same

→ If 2 Δ's are similar, then ratio of 2 core lines will be equal to 2 similar sides ratio & root of ratio of their areas.



- If $\Delta ABC \cong \Delta PQR$,
  then $AB = PQ$ & $m\,AD = m\,PS$

- If $\Delta ABC \sim \Delta PQR$,
  $\frac{AB}{PQ} = \frac{m\,AD}{m\,PS} = \sqrt{\frac{Ar\,\Delta ABC}{Ar\,\Delta PQR}}$

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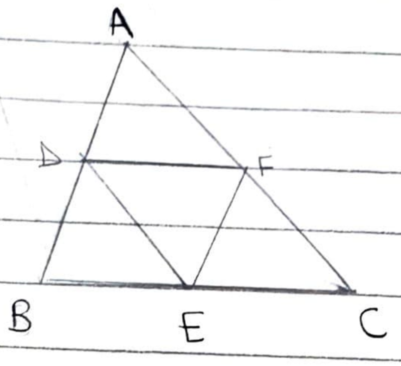
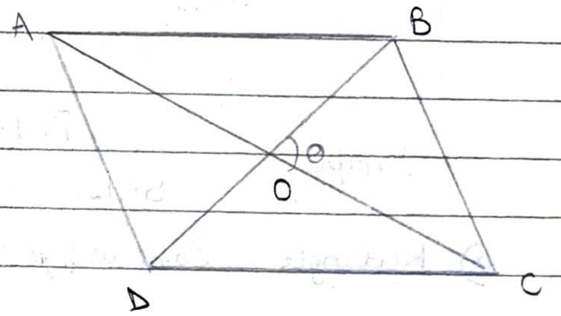
Mid Point Theorem



D, E & F are mid pts. of AB, BC & AC respectively

- DE || BC
- $DE = \frac{1}{2} BC$
- $Ar(\Delta ADF) = \frac{1}{4} Ar(\Delta ABC)$
- $Ar(\Delta ADF) = Ar(\Delta DEF) = Ar(\Delta DBE) = Ar(\Delta FEC)$

Parallelogram



ABCD is a ||gram

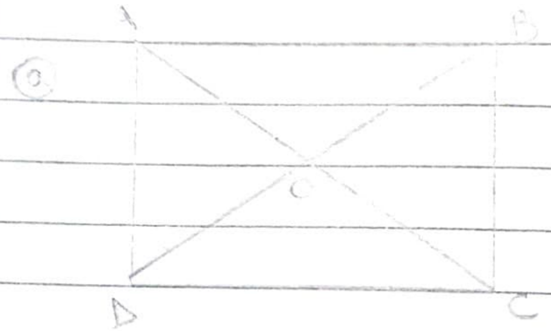
SIDES
- AB = CD , AD = BC
- AB || CD , AD || BC

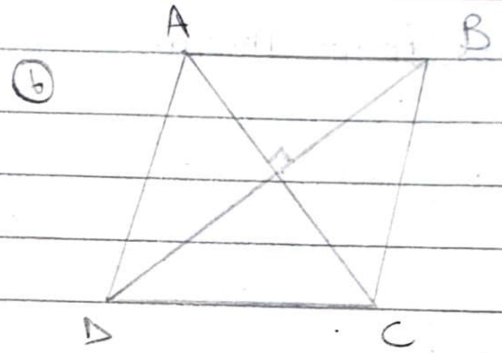
Angles
- $\angle A = \angle C$, $\angle B = \angle D$
- $\angle A + \angle D = \angle A + \angle B = \angle B + \angle C = \angle C + \angle D = 180°$

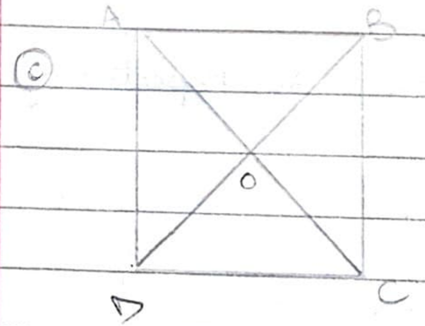
Diagonals
- AO = OC , BO = OD (Diagnols bisect each other)

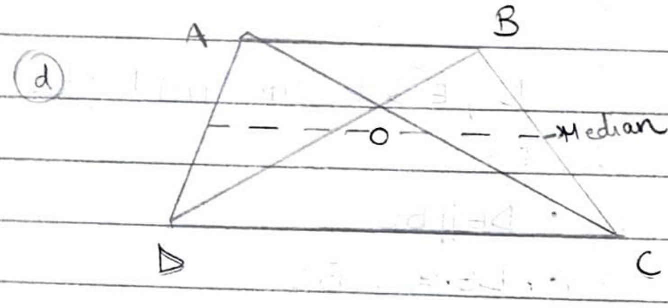
Area

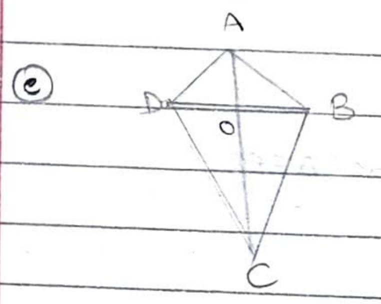
- AD × CD (b × h)
- $\frac{1}{2} \times AC \times BD \times \sin\theta$ $\left(\frac{1}{2} \times d_1 \times d_2 \times \sin\theta\right)$

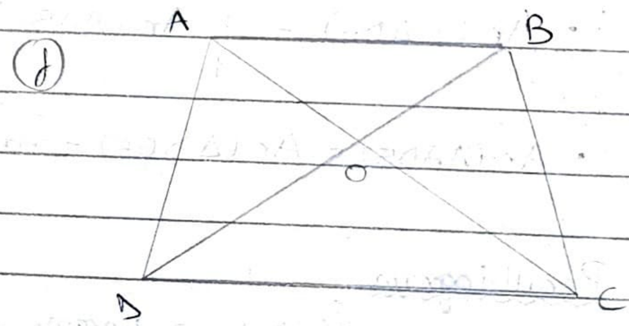










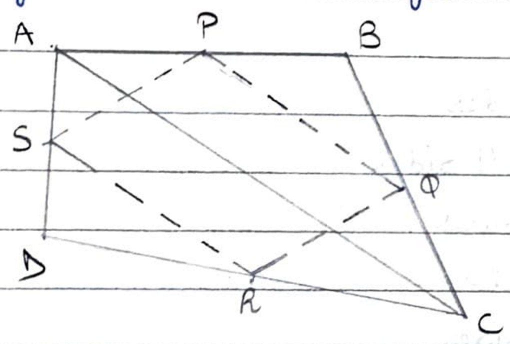


Shape	Properties apart from ∥gm			
	Sides	Angles	Diagonal	Area
a) Rectangle	Same as ∥gm	All ∠s = 90°	Diagonals are equal	Same as ∥gm (b×h)
b) Rhombus	All sides are equal	Same as ∥gm	Diagnols bis. at 90° & ∠ bis. at vertex	$\frac{1}{2} \times d_1 \times d_2$ $(\sin\theta = 1)$
c) Square	Same as ∥gm, rect, Rhombus	Same as rectangle	• ⊥ bis. of each other • Equal to each other • ∠ bis. of vetex	$(\text{Side})^2$
d) Trapezium	AB∥CD	∠A + ∠D = ∠B + ∠C = 180°	–	• $\frac{1}{2}(AB + CD)h$ • Median = $\frac{1}{2} \times (AB + CD)$

e)	Kite	AB = AD & BC = CD	-	AC is $\perp$ bisector of BD (AO = OB but AO $\neq$ OC)	-
f)	Isosceles Trapezium	AD = BC, AB $\parallel$ CD	$\angle C = \angle D$	-	-

Special Properties of Quadrilaterals

→ Joining mid points of all 4 sides of a Quadrilateral, we get a parallelogram or a member from $\parallel$gm family.



Acc. to mid pt. theorem,

- PQ $\parallel$ AC
- PQ = 1/2 AC

- RS $\parallel$ AC
- RS = 1/2 AC

from above,

PQ $\parallel$ RS & PQ = RS

$\therefore$ PQRS is a parallelogram

(Similarly, same can be done for QR & PS)

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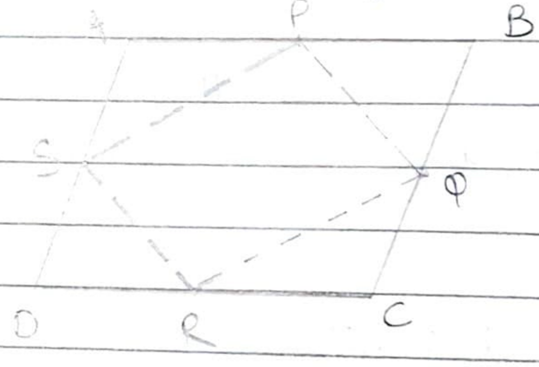
→ Joining mid points of all 4 sides of a ||gm, we get a ||gm or a member of ||gm family and area of the new ||gm will be 1/2 the area of original ||gm.



Area of PQRS = $\frac{1}{2}$ x Area of ABCD

Polygons

Triangle - 3 Sides
Quadrilateral - 4 Sides
Pentago - 5 Sides
Hexagon - 6 sides
Heptagon - 7 sides
Octagon - 8 Sides
Nonagon - 9 sides
Decagon - 10 Sides
Circle - ∞ sides

- Sum of Interior angles = $(n-2)180°$
- Sum of exterior angles = $360°$
- No. of diagnols = ${}^nC_2 - n$
  ($n \to$ no. of sides of the polygon)

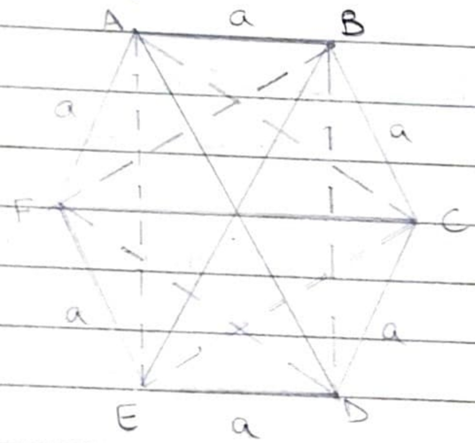
✱ no. of diagnols passing through the centre ~~= Total diagon~~
= $\frac{n}{2}$ ($n \to$ no. of sides of the polygon)

Regular Polygons

- All sides & angles are equal
- Sum of an Interior and exterior angle is 180°
- Each external angle = $\frac{360°}{n}$
- Each internal angle = $180° - \frac{360°}{n}$

($n \rightarrow$ no. of sides of a polygon)

Regular Hexagon



- Diagonals AD, BE, CF intersect each other to form 6 equalateral triangles

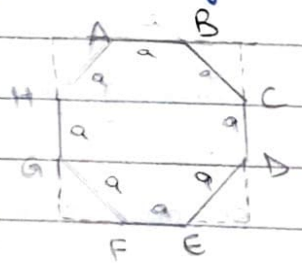
$\therefore$ Area of ⬡ ABCDEF $= \frac{\sqrt{3}}{4}a^2 \times 6$

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

Long diagonals $\Rightarrow$ AD, BE, CF = $2a$

Short diagonals $\Rightarrow$ AE, AC, BF, BD, CE, DF = $a\sqrt{3}$

Regular Octagon



Area = $2a^2(\sqrt{2}+1)$

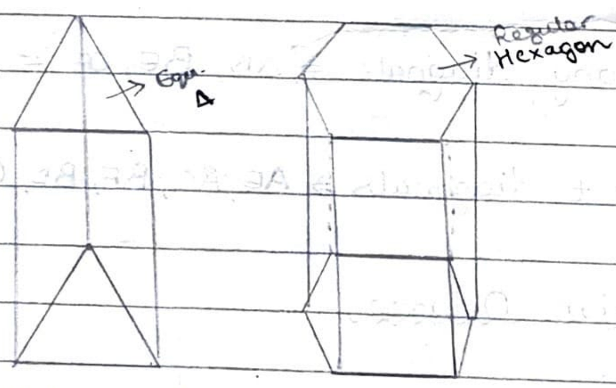
(Area of Square − Area of 4 small triangles)

Mensuration

3-D Shape	Volume	LSA or CSA	TSA
1) Cube Body diagnol = $a\sqrt{3}$	$V = a^3$	$LSA = 4a^2$	$TSA = 6a^2$
2) Cuboid Body diagonal = $\sqrt{l^2+b^2+h^2}$	$V = lbh$	$LSA = 2(l+b)h$	$TSA = 2(lb+bh+hl)$
3) Right Circular Cylinder	$V = \pi r^2 h$	$CSA = 2\pi rh$	$TSA = 2\pi r(r+h)$
4) Right Circular Cone	$V = \frac{1}{3}\pi r^2 h$	$CSA = \pi rl$ ($l \rightarrow$ Slant ht.)	$TSA = \pi r(l+r)$ ($l = \sqrt{h^2+r^2}$)
5) Sphere	$V = \frac{4\pi r^3}{3}$	$CSA = 4\pi r^2$	$TSA = 4\pi r^2$
6) Hemisphere	$V = \frac{2\pi r^3}{3}$	$CSA = 2\pi r^2$	$TSA = 3\pi r^2$

Prism

Base → Regular Polygon
joining adjacent vertices
to the top.



- Volume of cylinder $= (\pi r^2)h$ = Area of circle (base) $\times h$

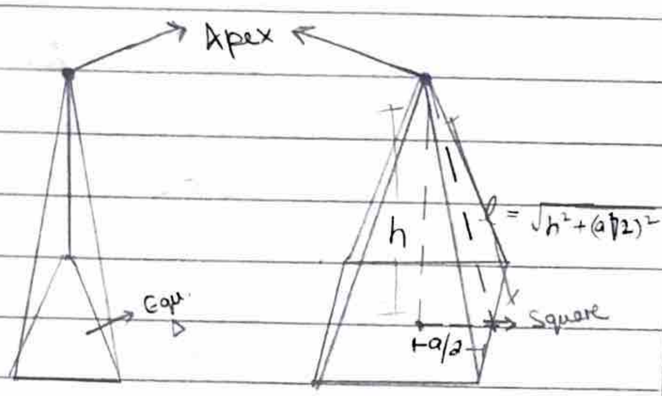
$\therefore$ Volume of Prism = Area of base $\times h$

- C.S.A of Cylinder $= (2\pi r)h$ = Perimeter of circle (base) $\times h$

  $\therefore$ CSA of Prism = Perimeter of base $\times h$

- $\therefore$ T.S.A of Prism = CSA of Prism + 2(Area of base)

Pyramid



Base → Regular polygon joining all vertices to a common pt. called Apex.

Volume of cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3}(\pi r^2)h$

$= \frac{1}{3} \times$ Area of circle (base) $\times h$

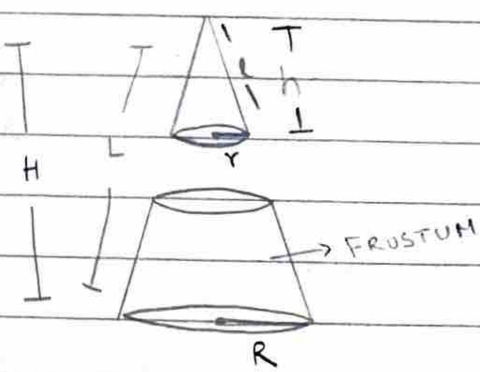
- $\therefore$ ~~Area~~ Volume of pyramid $= \frac{1}{3} \times$ Area of base $\times h$

C.S.A of cone $= \pi r l = (2\pi r) \times l/2$ = Perimeter $\times l/2$

- $\therefore$ CSA of pyramid = Perimeter of base $\times \frac{l}{2}$

- TSA of pyramid = CSA of pyramid + Area of base

Frustum



When a cone is cut from a point, it seperates into a smaller cone & frustum.

$V = \frac{1}{3}\pi R^2 H - \frac{1}{3}\pi r^2 h$

$\frac{H}{h} = \frac{L}{l} = \frac{R}{r} = \sqrt[3]{\frac{V_{\text{Bigger cone}}}{V_{\text{Small cone}}}}$

CSA $= \pi R L - \pi r l$

Trigonometry

30 - 60 - 90 triangle

Ratio → $(1 : \sqrt{3} : 2)$

45 - 45 - 90 triangle

Ratio → $(1 : 1 : \sqrt{2})$

	0°	30°	45°	60°	90°
Sine	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1

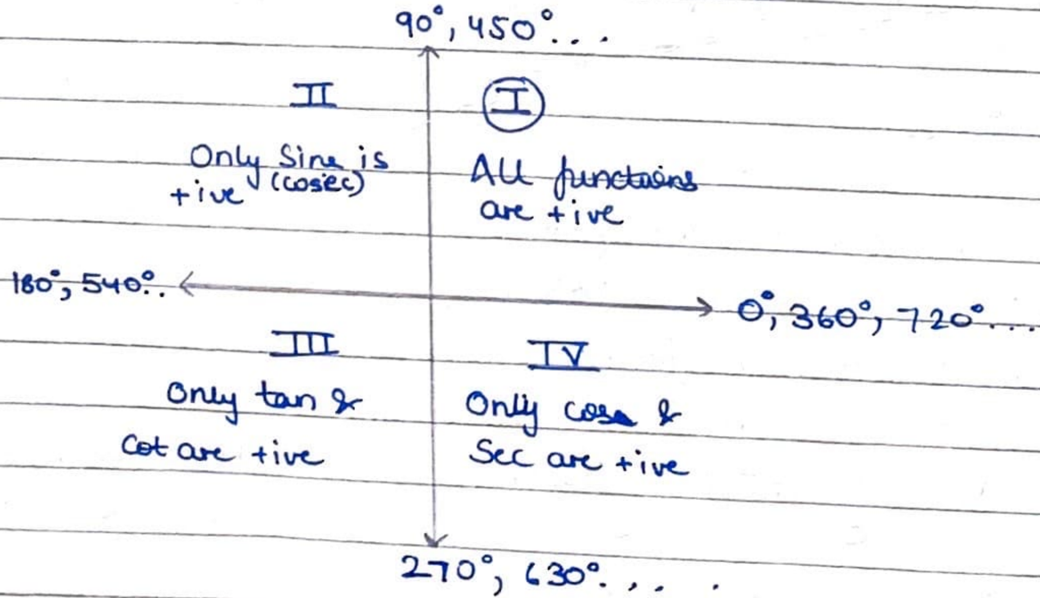
$\text{Cosec}\,\theta = \frac{1}{\sin\theta}$, $\cos\theta$ = Reverse the functions of $\sin\theta$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$, $\sec\theta = \frac{1}{\cos\theta}$, $\cot\theta = \frac{1}{\tan\theta}$

Pythagorean Formulae

$$\sin^2\theta + \cos^2\theta = 1$$
$$\sec^2\theta - \tan^2\theta = 1$$
$$\text{Cosec}^2\theta - \cot^2\theta = 1$$

Quadrants



Ratio Changes

Sin ↔ Cos
Sec ↔ Cosec
tan ↔ Cot

Sin, Cot, Cos, tan, Sec, cosec $(90 \times K \pm \theta)$

K = odd → The function will interchange ($\sin\theta \rightarrow \cos\theta$)

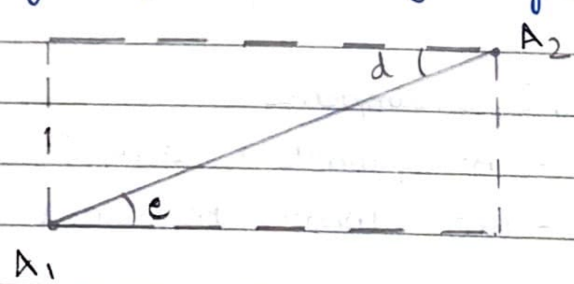
K = even → The function will remain the same ($\sin\theta \rightarrow \sin\theta$)

Eg) $\tan 480°$ (3 Steps to be remembered)

1) $\tan(90 \times 5 + 30)$ [Identify odd | even function]
   $\cot 30°$
2) $\tan(90 \times 5 + 30)$ [Check for Quadrant]
   2^{nd} Quadrant
3) $\cot 30° = \sqrt{3}$ (Check + or - Sign)
   $\therefore$ Final value $\Rightarrow -\sqrt{3}$

Heights & Distances

Angle of depression = Angle of elevation



Sine Rule

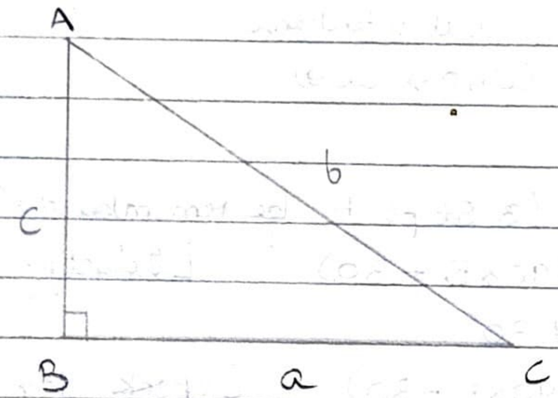
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$

→ Circumradius

Cosine Rule

$$\cos A = \frac{b^2+c^2-a^2}{2bc}, \quad \cos B = \frac{a^2+c^2-b^2}{2ac},$$

$$\cos C = \frac{a^2+b^2-c^2}{2ab}$$



CIRCLES

Definitions

→ Chord - Line Segment joining 2 points of a circle

→ Tangent - Line which touches only 1 point of a circle

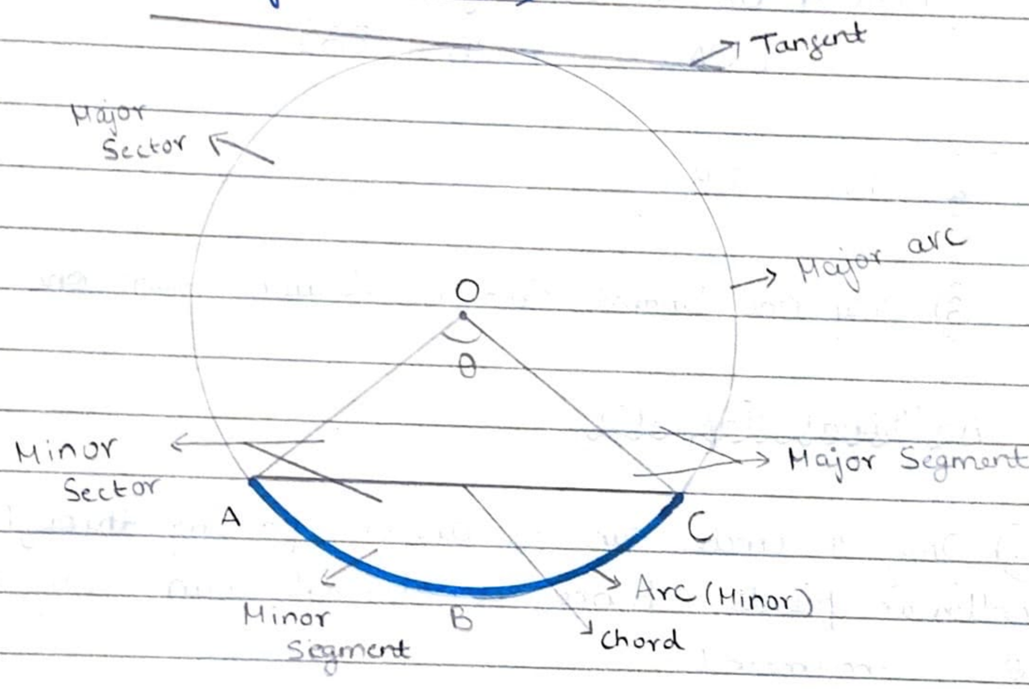
→ Arc - Part of the Circumference
- Major Arc - Arc, who's measure is more than 180°
- Minor Arc - Arc, who's measure is less than 180°

(*) m(Arc) = m∠ Subtended by the arc at the centre

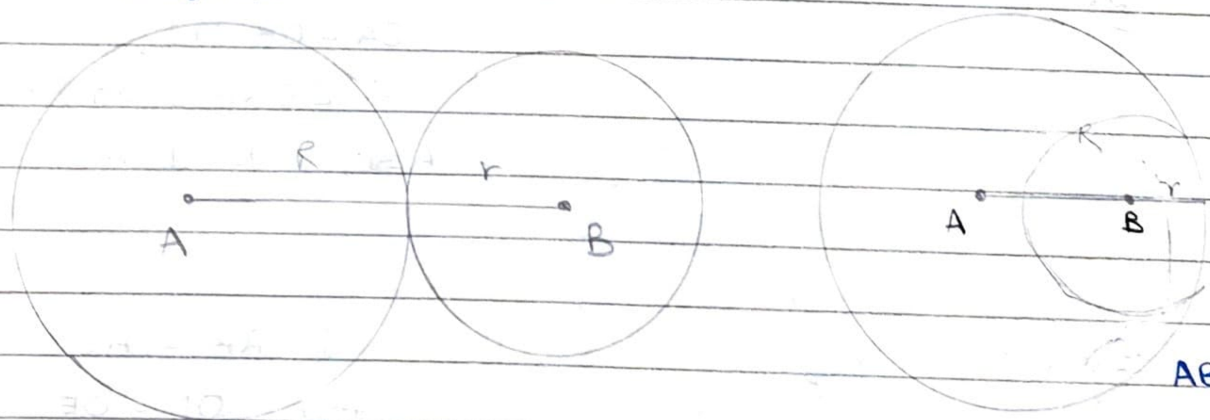
→ **Sector** - Part of area of Circle (Major & Minor)

- Area of Sector $= \frac{\theta}{360} \times \pi r^2$
- length of Arc $= \frac{\theta}{360} \times 2\pi r$

→ **Segment** - A chord dividing the circle in 2 parts. (Major & Minor)



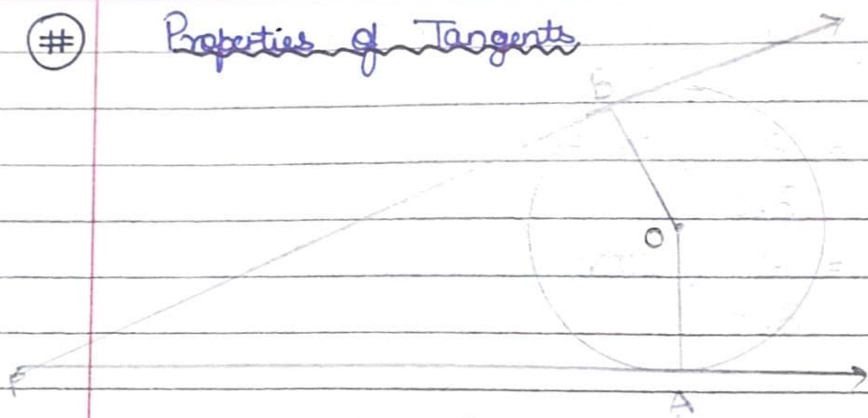
Tangents



$AB = R - r$

$AB = R + r$

Properties of Tangents



1) OA or OB (r) ⊥ Tangent (AP & BP)

[OA ⊥ PA & OB ⊥ PB]

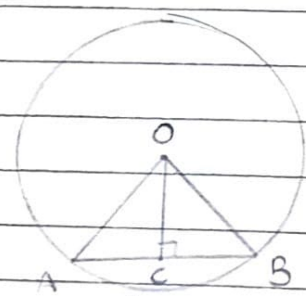
2) PA = PB

3) Only one tangent can be drawn from one point

Additional Properties

1) Only 1 circle can be drawn passing through 3 non-collinear points. Hence, a triangle can only have only one circumcircle.

2)

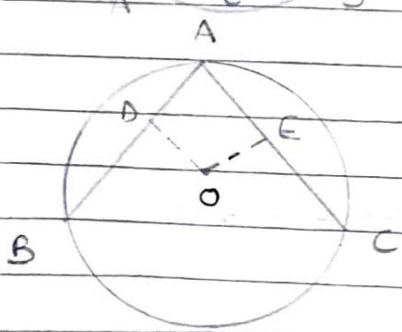


OA = OB (r)

∴ ΔOAB is an Isosceles triangle

Also, OC ⊥ AB

3)

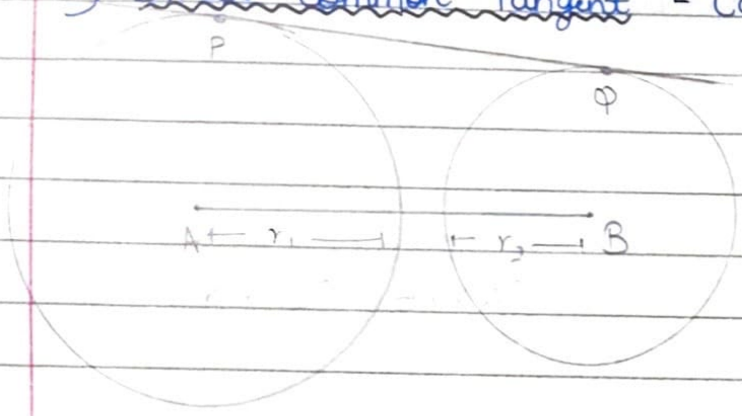


If AB = AC

then OD = OE

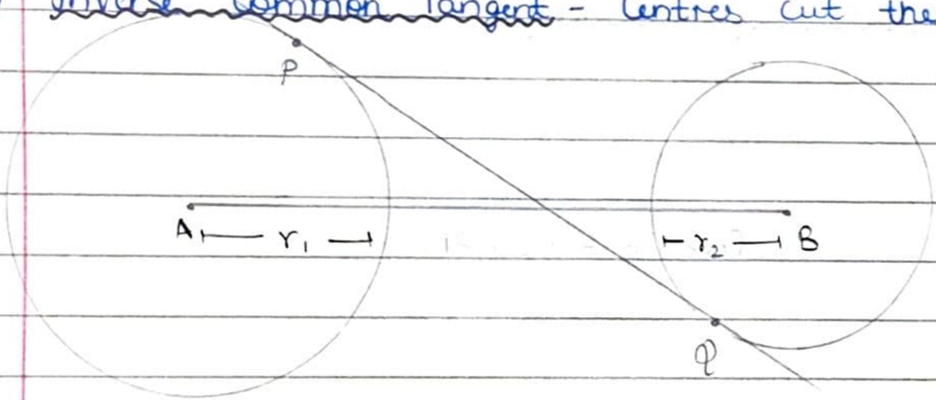
Common Tangents

1) Direct Common Tangent - Centers do not cut the tangent



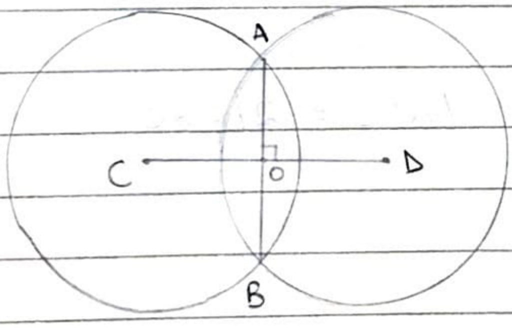
$PQ = \sqrt{(AB)^2 - (r_1 - r_2)^2}$

2) Inverse Common Tangent - Centres cut the tangent



$PQ = \sqrt{(AB)^2 - (r_1 + r_2)^2}$

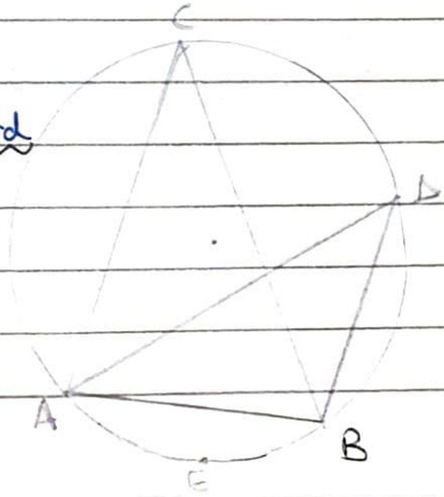
Common Chords



→ AB is bisected by CD but not Vice-Versa ($AO = OB$, $CO \neq OD$)

→ $AB \perp CD$

Inscribed angle by the Same Arc or Chord

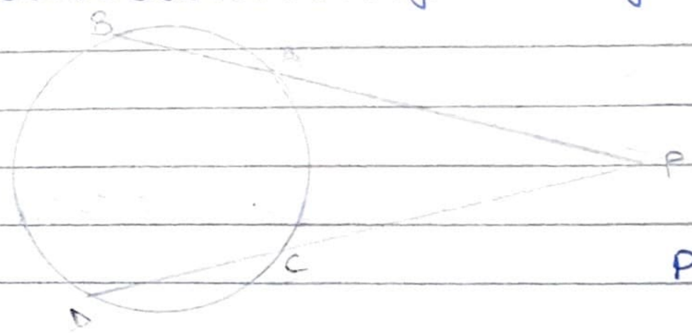


$\angle ACB = \angle ADB$

($\angle$s subtended by arc AEB or chord AB)

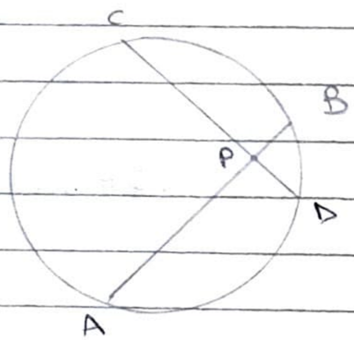
Secants

1) 2 Secants intersecting externally



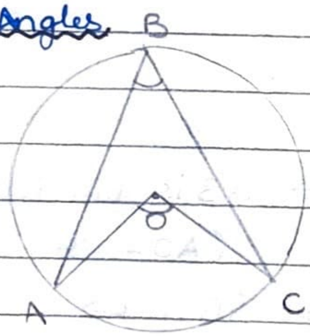
$PA \times PB = PC \times PD$

2) 2 Secants intersecting Internally



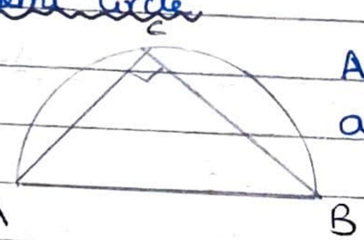
$PA \times PB = PC \times PD$

Central Angles



$\angle AOC = 2\angle ABC$

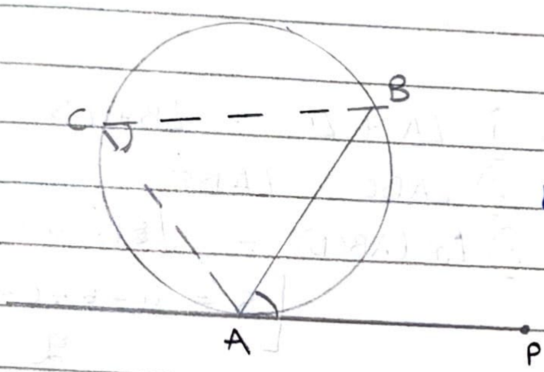
Angle subtended by Semi Circle



Any angle subtended by a semi circle will be 90°

$\angle ACB = 90°$

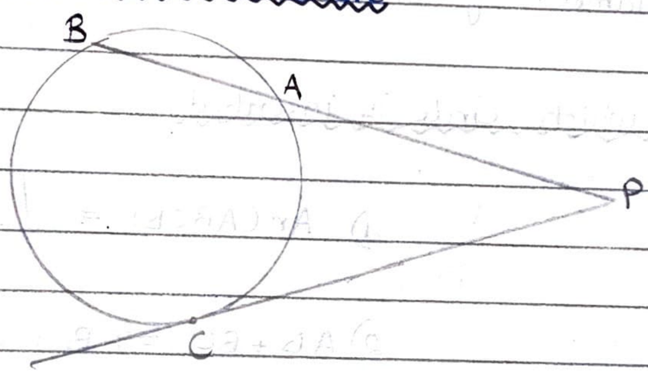
Alternate Segment Theorem



Angle made by tangent and a chord will be equal to any angle made by joining 2 chords to the ends of the original chord

$\angle BAP = \angle ACB$

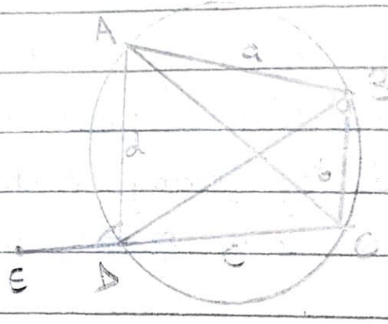
Tangent Secant Theorem



$PC^2 = PA \times PB$

OPTIONAL	IMPORTANT
1) Tangent Secant Theorem	1) Definitions
2) Secants Intersection (Int. & Ext.)	2) Tangents (3 properties)
3) Common Tangents (Direct & Inverse)	3) Chord & centre ($\perp$)
	4) Common Chord
	5) Central Angles (Semi Circle, Equal chords, Alternate Segment)

Cyclic Quadrilateral

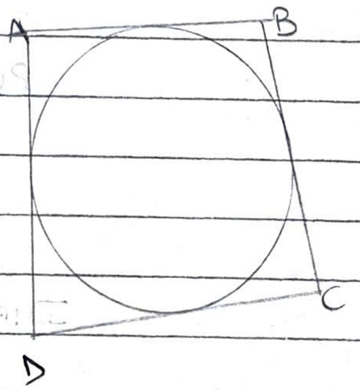


1) $\angle A + \angle C = \angle B + \angle D = 180^\circ$
2) $\angle ABC = \angle ADE$
3) $Ar(ABCD) = \sqrt{(s-a)(s-b)(s-c)(s-d)}$
$\left[s = \frac{a+b+c+d}{2} \right]$

4) $AC \times BD = AB \times CD + AD \times BC$ (Ptolemy's Theorem)
5) $AC = BD =$ Diameter of Circle

Quadrilateral in which Circle is inscribed

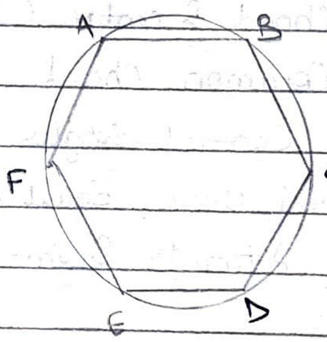
(Tangential quad.)



1) $Ar(ABCD) = \sqrt{(AB)^{\cdot} + BC + CD + DA}$

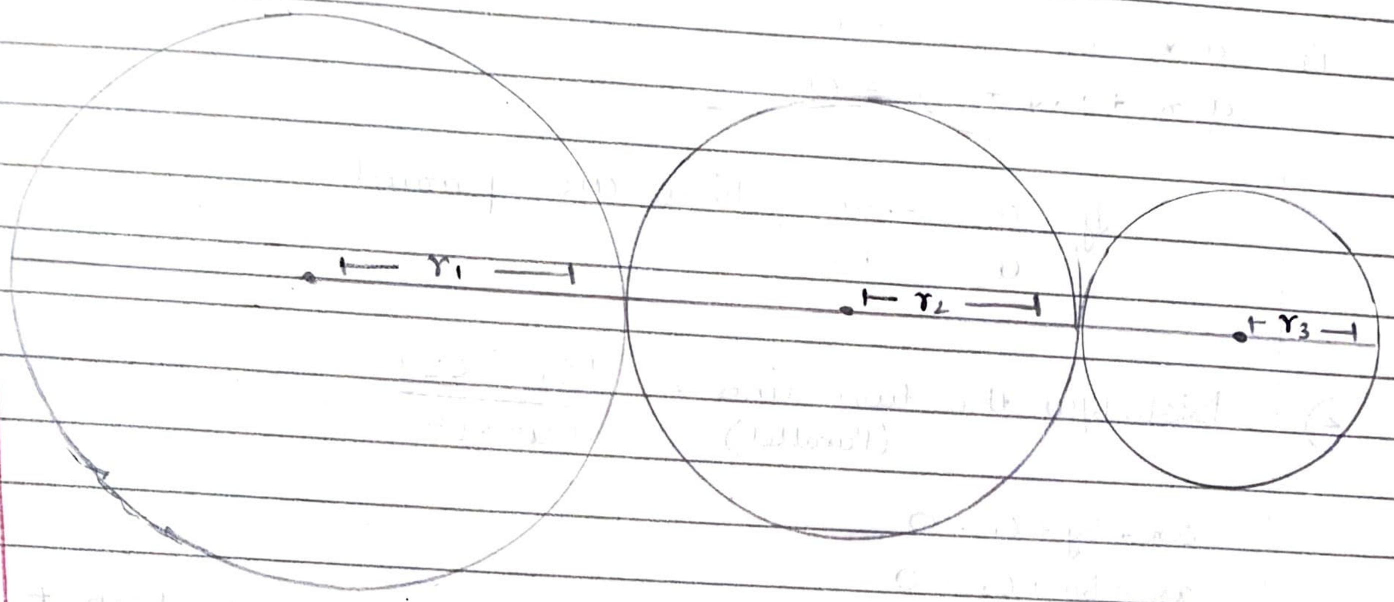
2) $AD + BC = AB + CD$

Cyclic Hexagon



Radius of Circle = Side of Hexagon

For circles drawn as below,



r_1, r_2, r_3 will be in a GP

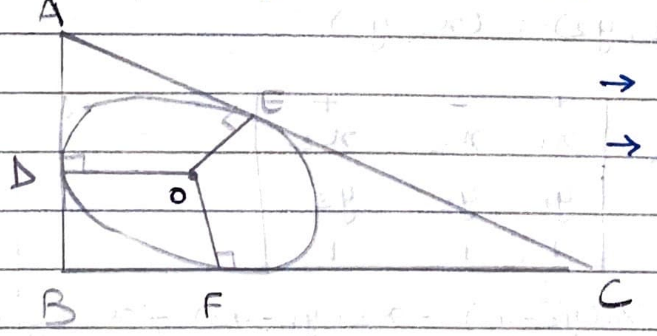
If $r_1 = 9$, $r_2 = 6$

$r_3 = ?$ C. ratio $= \frac{6}{9} = \frac{2}{3}$

$\frac{r_3}{r_2} = \frac{2}{3}$ $\frac{r_3}{\cancel{6}2} = \frac{2}{\cancel{3}}$

$r_3 = 4$

Incentre & Inradius of a right Triangle

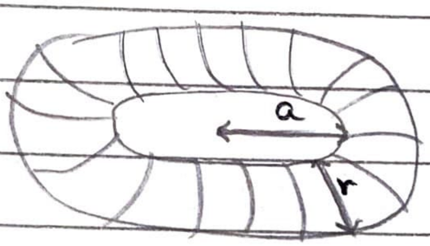


→ $r = S - \text{Hypotenuse}$

→ $R = \frac{\text{Hypotenuse}}{2}$

Mensuration (Extra)

1) TORUS



→ $TSA = 4\pi^2 ra$

→ $Volume = 2\pi^2 r^2 a$

(*) In centre of a Triangle

Vertices → (x_1, y_1) ; (x_2, y_2) ; (x_3, y_3)

lengths of sides → a, b, c

$$I(x, y) = \left(\frac{ax_1 + bx_2 + cx_3}{a+b+c} ; \frac{ay_1 + by_2 + cy_3}{a+b+c} \right)$$