GENERAL APTITUDE

4 lectures

GEOMETRY AND MENSURATION -I

2-D → Area, Perimeter

- Rectangle
- Square
- Parallelogram
- Trapzeium
- Rhombus
- Triangle
- Circle

3-D → Volume, TSA (Total surface area), CSA (curved surface area)

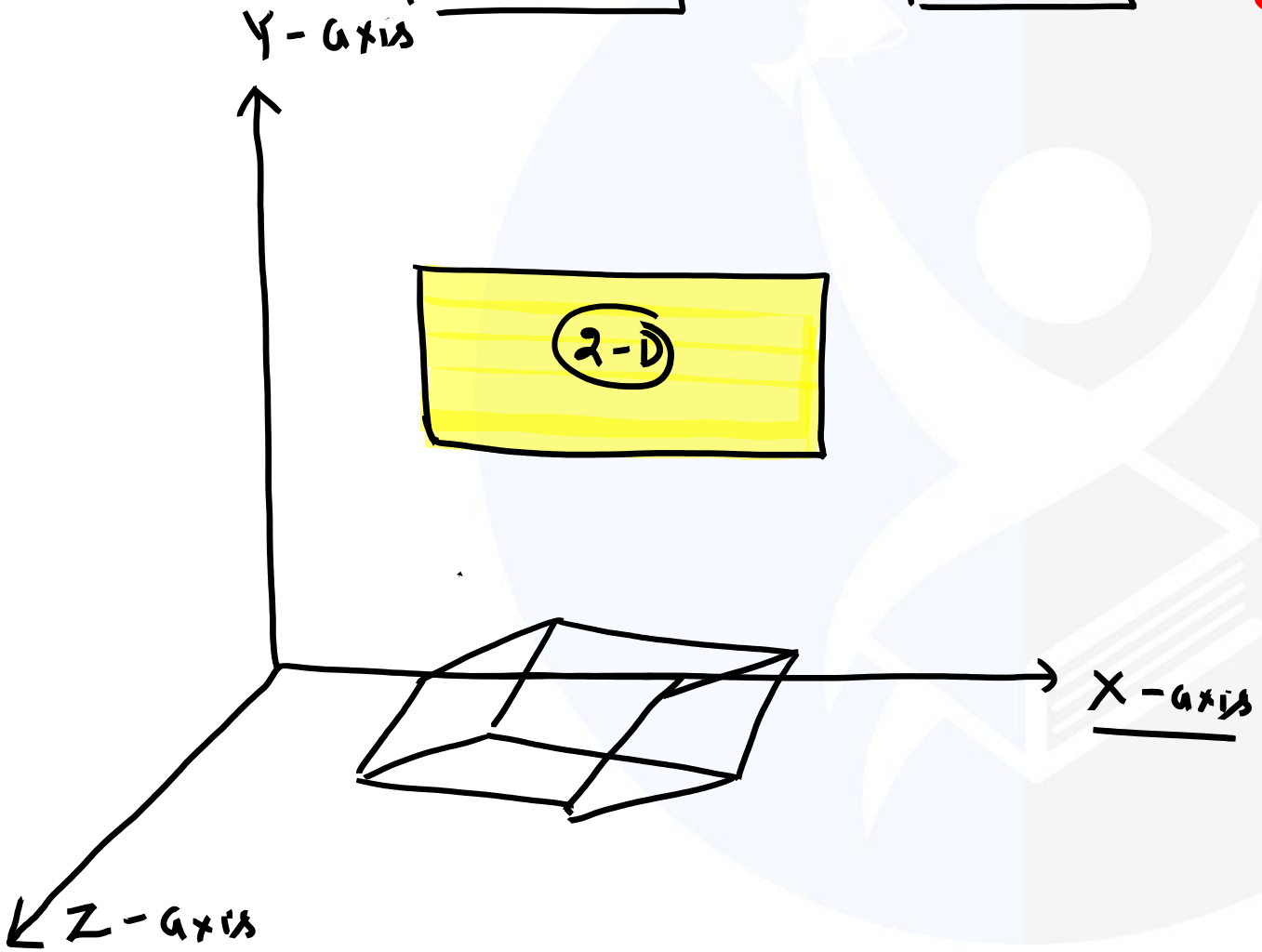
- Cube
- Cuboid
- Cylinder
- Cone
- Hemisphere
- sphere

1-D (Measurement of length)
Unit → cm, metres, km

2-D (Area)
cm^2, m^2, km^2

3-D (Volume)
cm^3, m^3, km^3

2-D and 3-D Figures



2-D

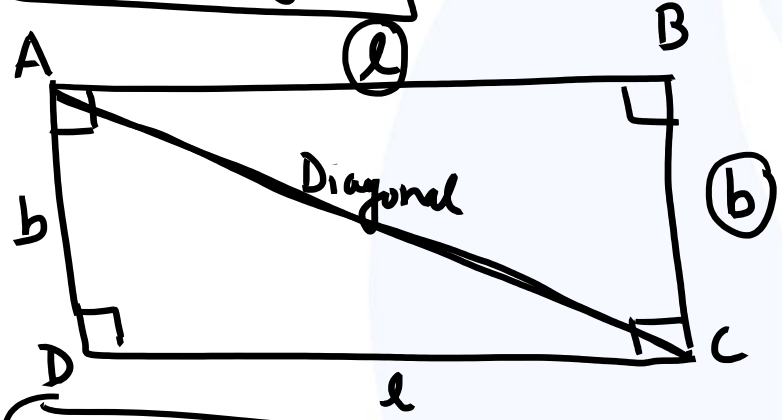
$H^2 = P^2 + B^2$

ΔABC Pythagoras

$AC^2 = AB^2 + BC^2$

$AC = \sqrt{AB^2 + BC^2}$

① Rectangle

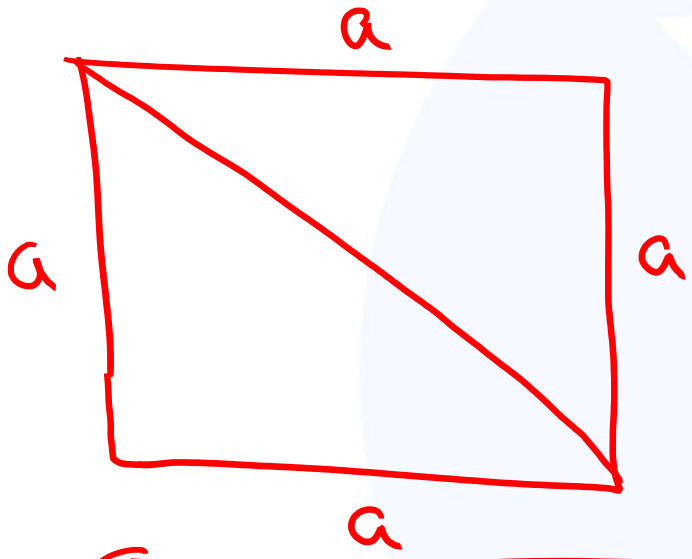


Area = $l \times b$

Perimeter = $2(l+b)$

Diagonal = $\sqrt{l^2 + b^2}$

② Square



Area = a^2 $(\text{Side})^2$

Perimeter = $4a$

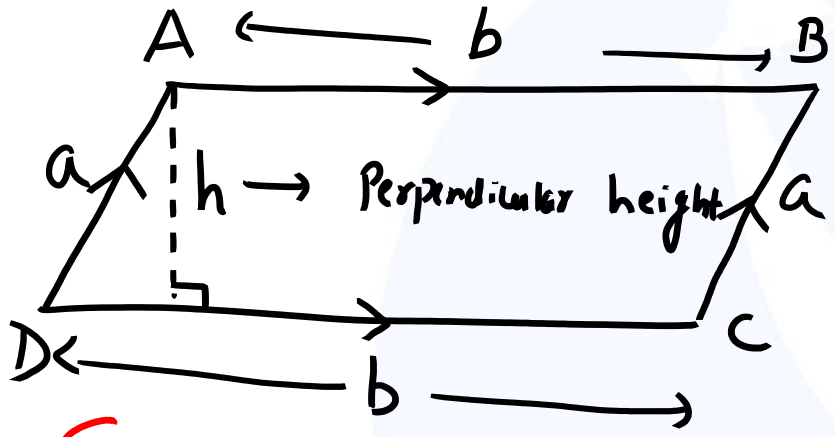
Diagonal = $\sqrt{2}\,a$

$\sqrt{l^2+b^2}$

$\sqrt{a^2+a^2} = \sqrt{2a^2}$

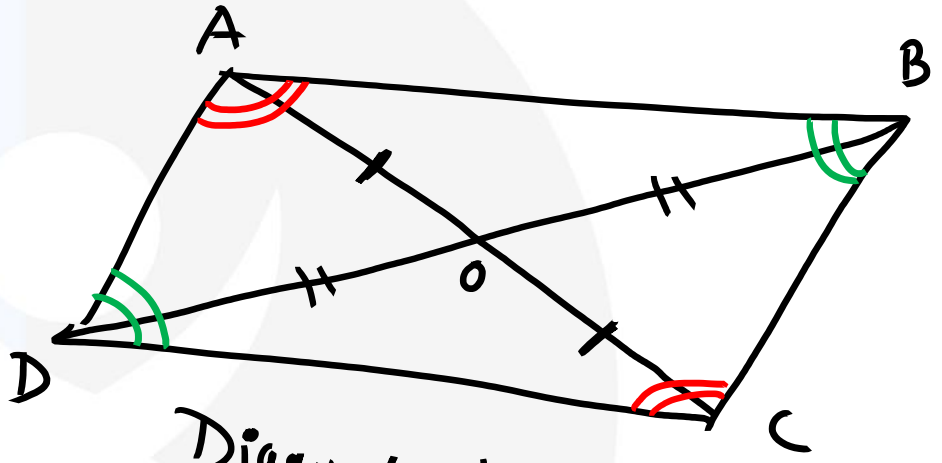
$\sqrt{2}a$

③ Parallelogram



Area = $b \times h$

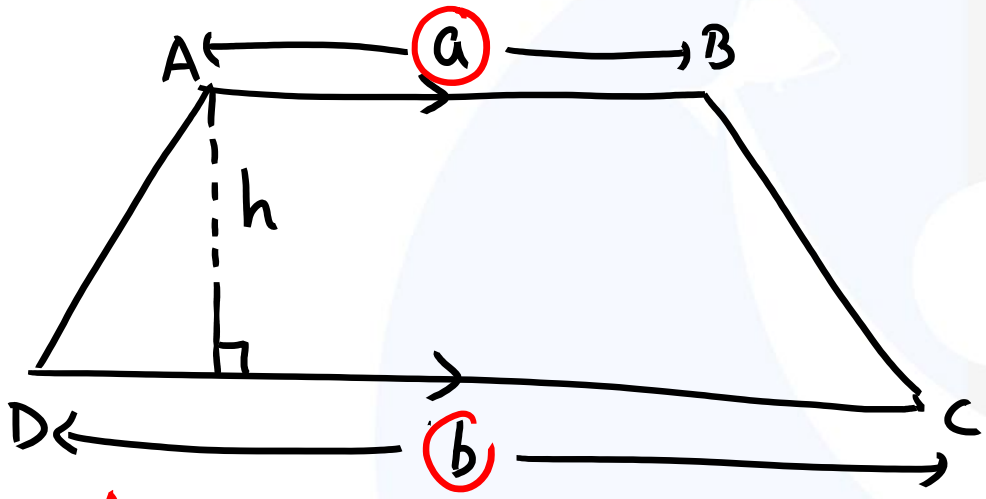
Perimeter = $2(a+b)$



Diagonals bi-sects each other

Opposite angles are Equal

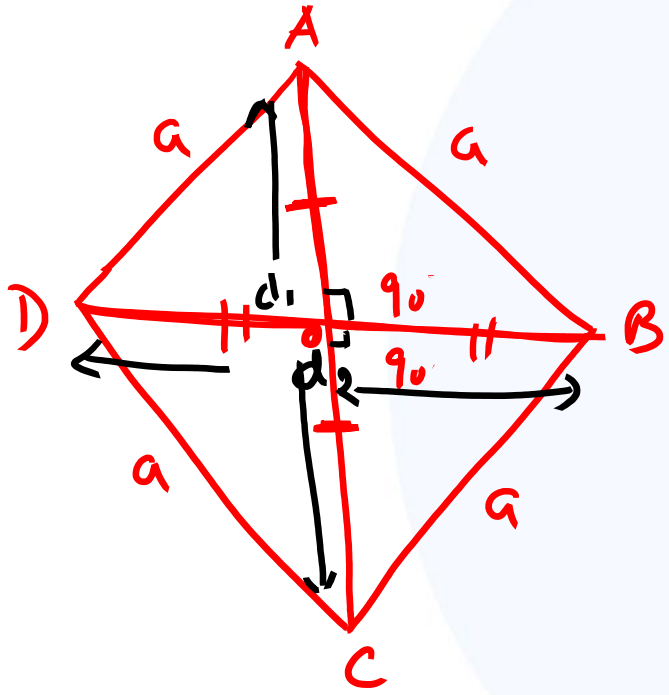
(4) Trapezium

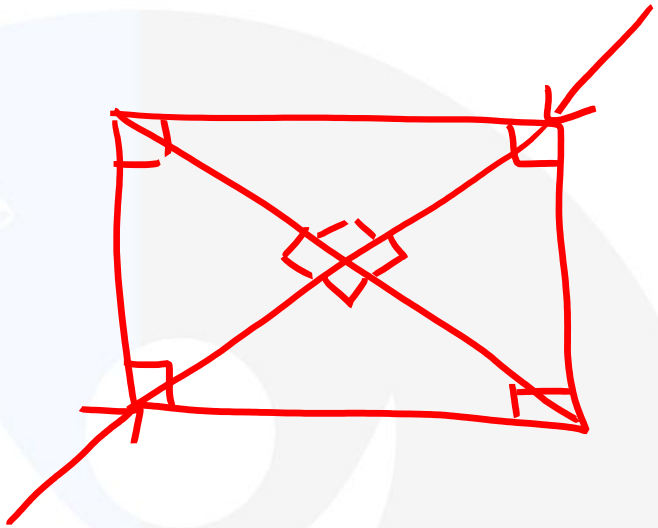


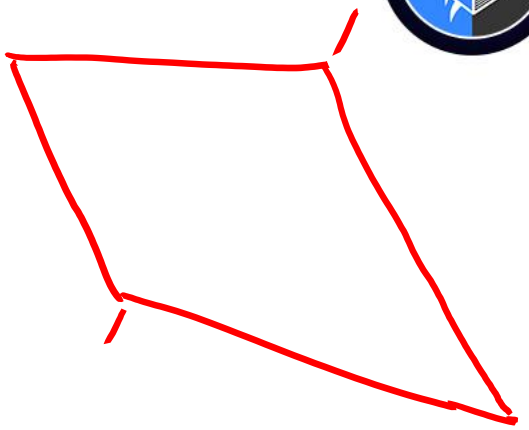
Area = $\frac{1}{2}$ [Sum of Parallel side] × distance between them

$$\text{Area} = \frac{1}{2}[a+b] \times h$$

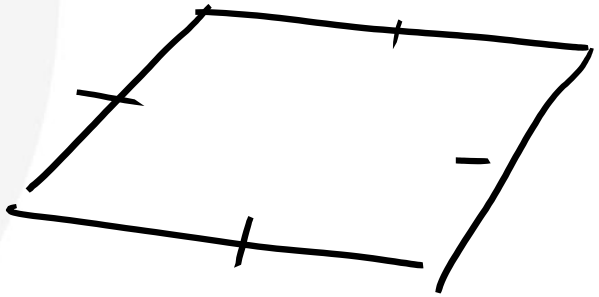
(5) Rhombus







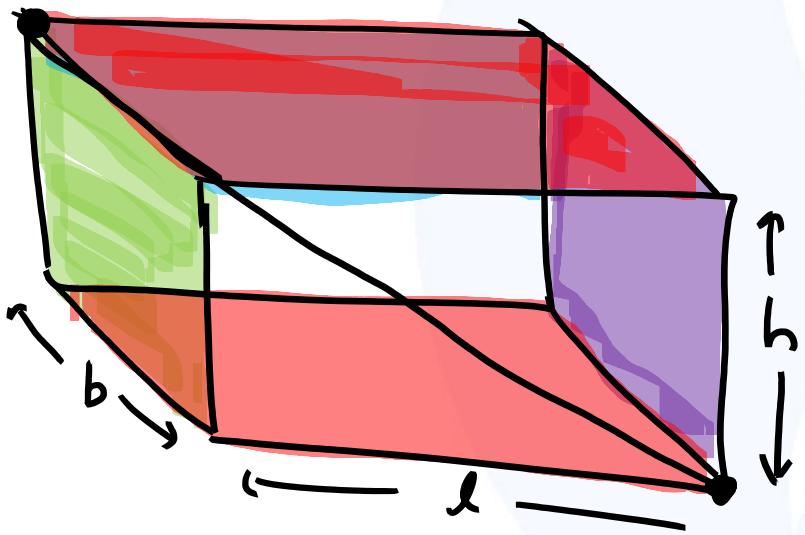
Area =



$$\text{Area} = \frac{1}{2}\left[d_1 \times d_2\right]$$

3-D

① Cuboid

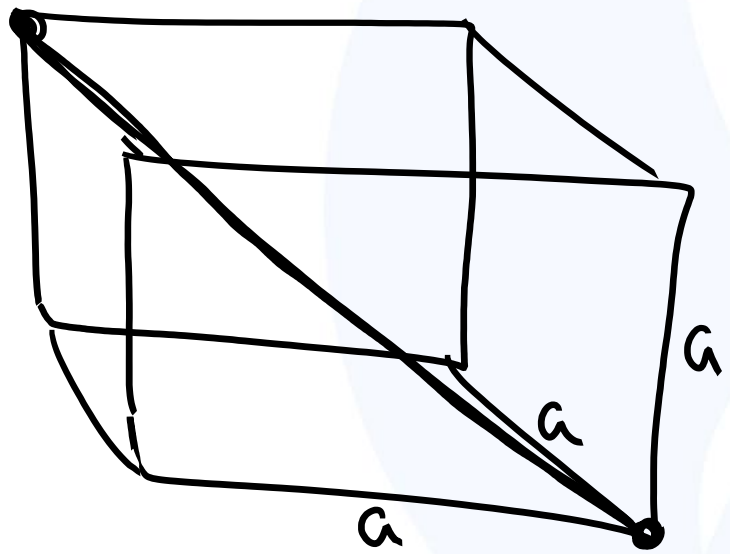


- Volume = $l \cdot b \cdot h$
- CSA = $2[l+b] \times h$
- TSA = $2[lb+bh+hl]$
- Diagonal = $\sqrt{l^2+b^2+h^2}$

$\sqrt{3a^2}$

$\sqrt{3}\,a$

② Cube

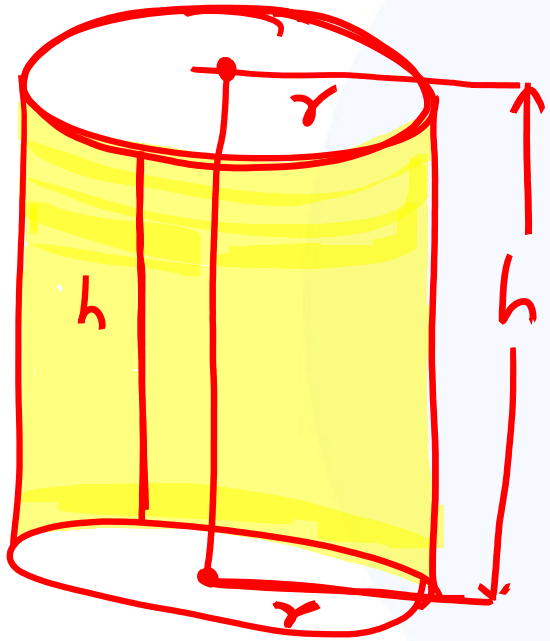


- Volume = a^3
- C.S.A = $4a^2$
- T.S.A = $6a^2$
- Diagonal = $\sqrt{3}a$

③ Cylinder

$\pi = 3.141\ldots$

$\pi = \frac{22}{7}$



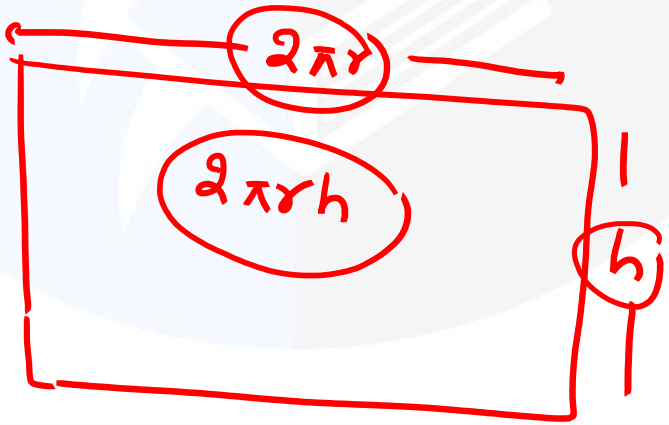
Volume = $\pi r^2 h$

C.S.A = $2\pi rh$

T.S.A = $2\pi r[r+h]$

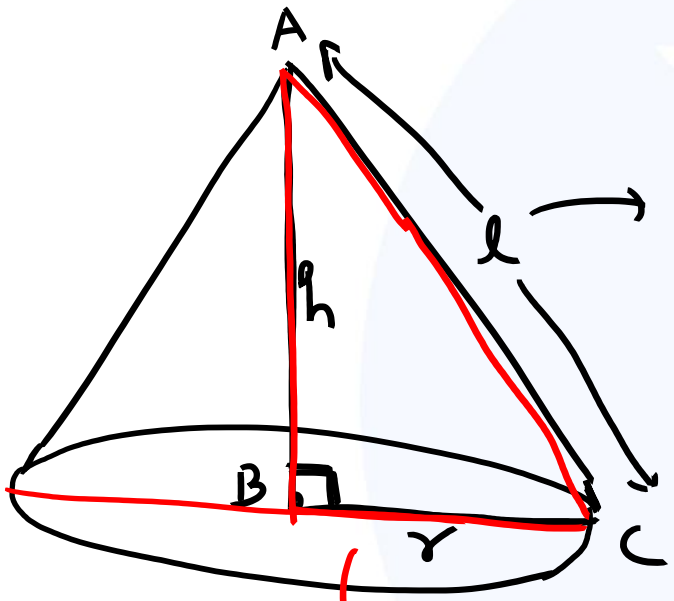
$2\pi rh + 2\pi r^2$

$2\pi r[h+r]$



(9)

Cone



l → Slant height

$$l^2 = h^2 + r^2$$

$$\text{Volume} = \frac{1}{3}\pi r^2 h$$

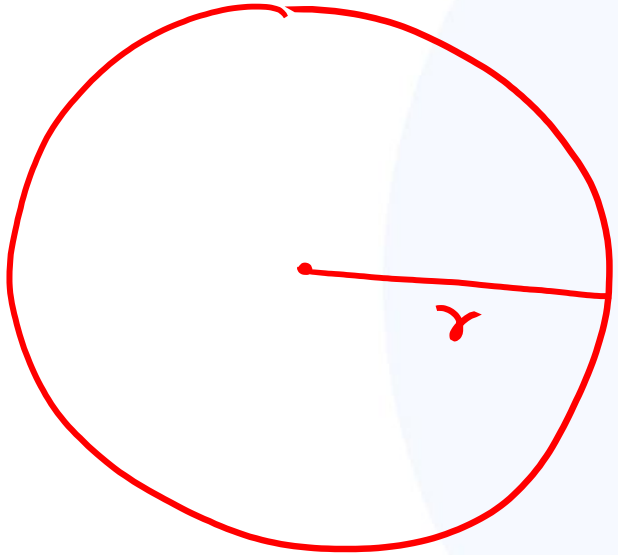
$$\text{CSA} = \pi r l$$

$$\text{TSA} = \pi r[l + r]$$

$\pi r^2 + \pi r l$

$\pi r [r + l]$

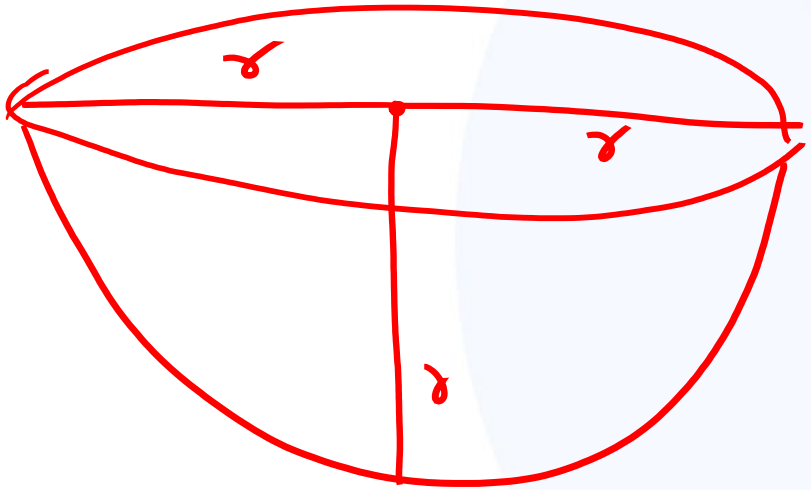
(5) **Sphere**

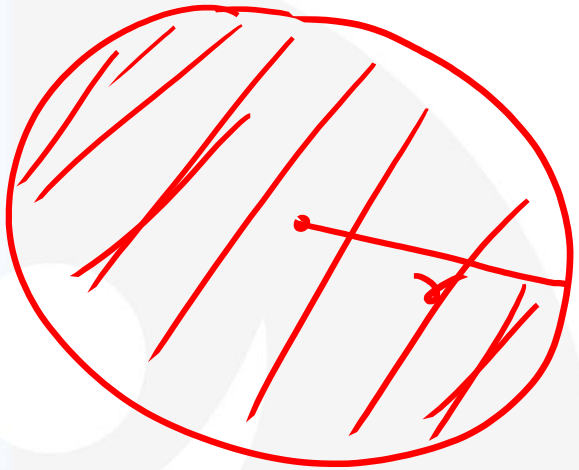


$$\text{Volume} = \frac{4}{3}\pi r^3$$

$$\text{C.S.A/T.S.A} = 4\pi r^2$$

(6) Hemisphere





Volume = $\frac{2}{3}\pi r^3$

C.S.A = $2\pi r^2$

T.S.A = $3\pi r^2$

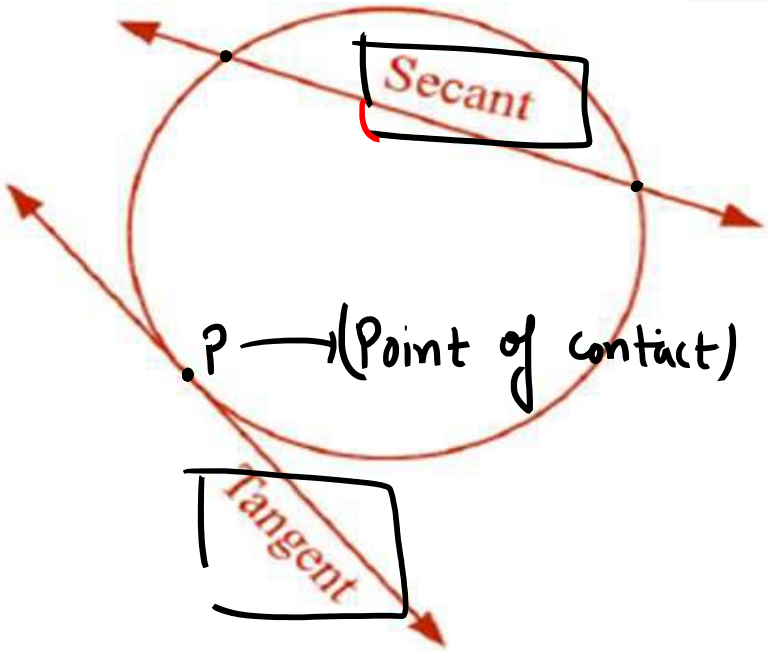
Important theorems of quadrilateral:

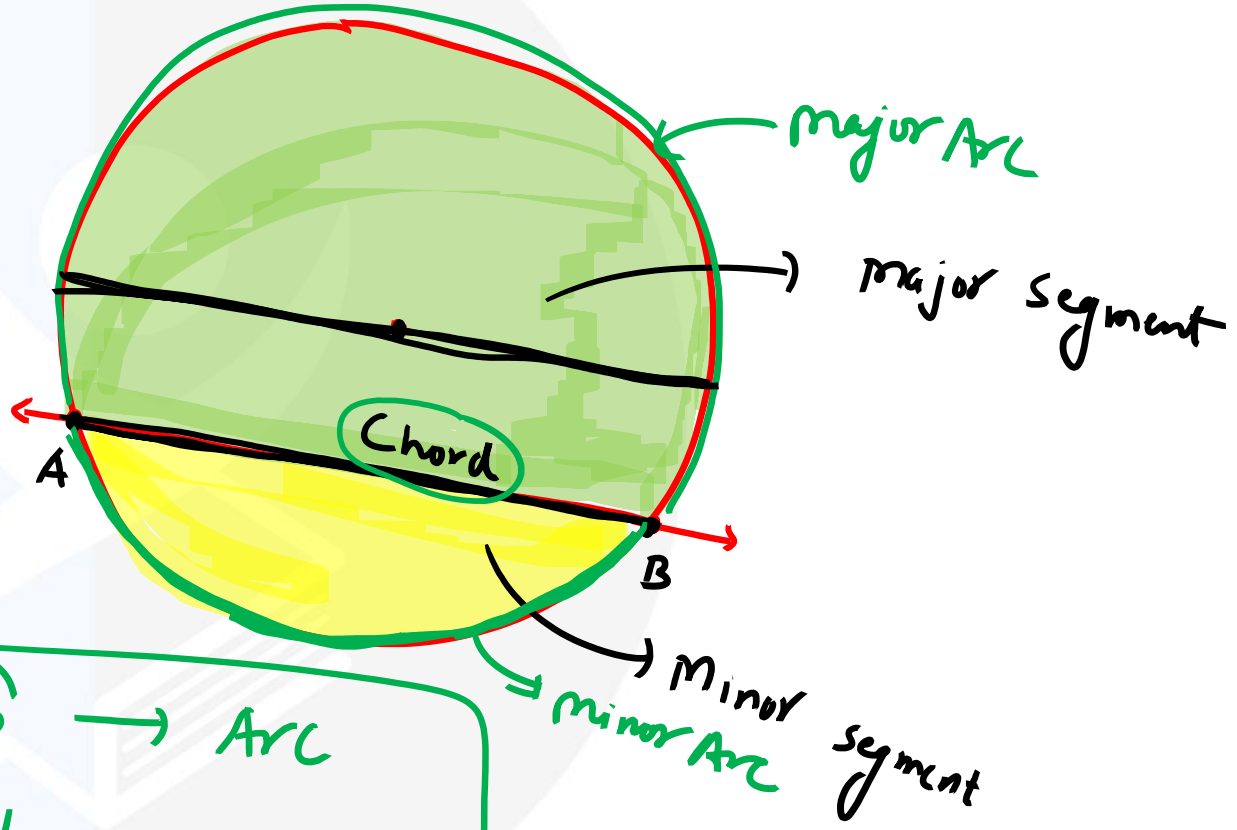
1. Opposite angles of a cyclic quadrilateral are supplementary.
2. Each diagonal of a parallelogram divides it into triangles of the same area.
3 The diagonals of a rectangle are equal and bisect each other.
4. The diagonals of a square are equal and bisect each other at right angles.

5. The diagonals of a rhombus are unequal and bisect each other at right angles.
6. A parallelogram and a rectangle on the same base and between the same parallels are equal in area.
7. Of all the parallelogram of given sides, the parallelogram which is a rectangle has the greatest area.

Circle:

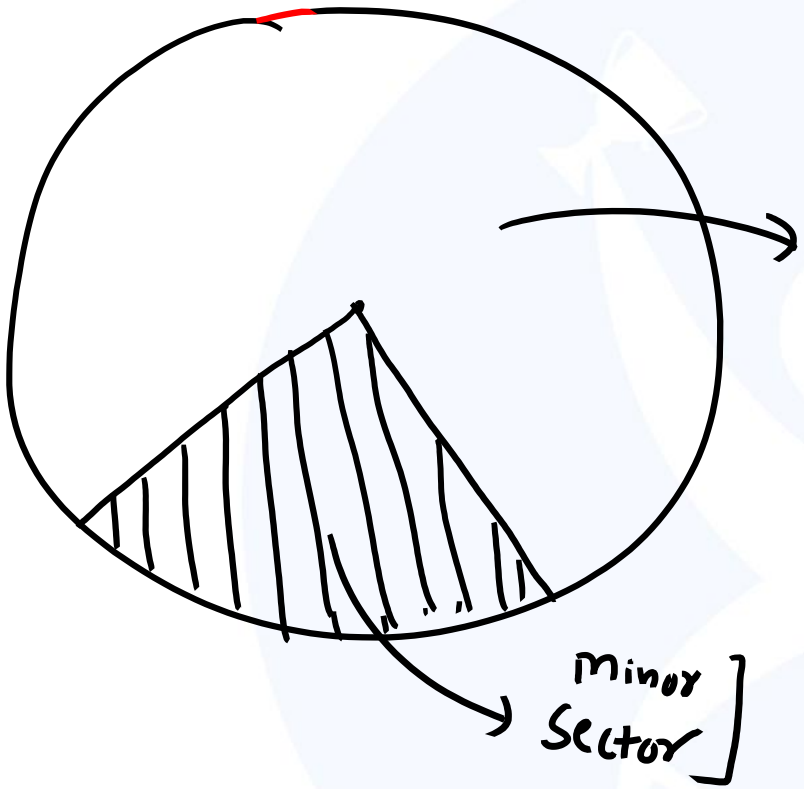
Secant vs tangent

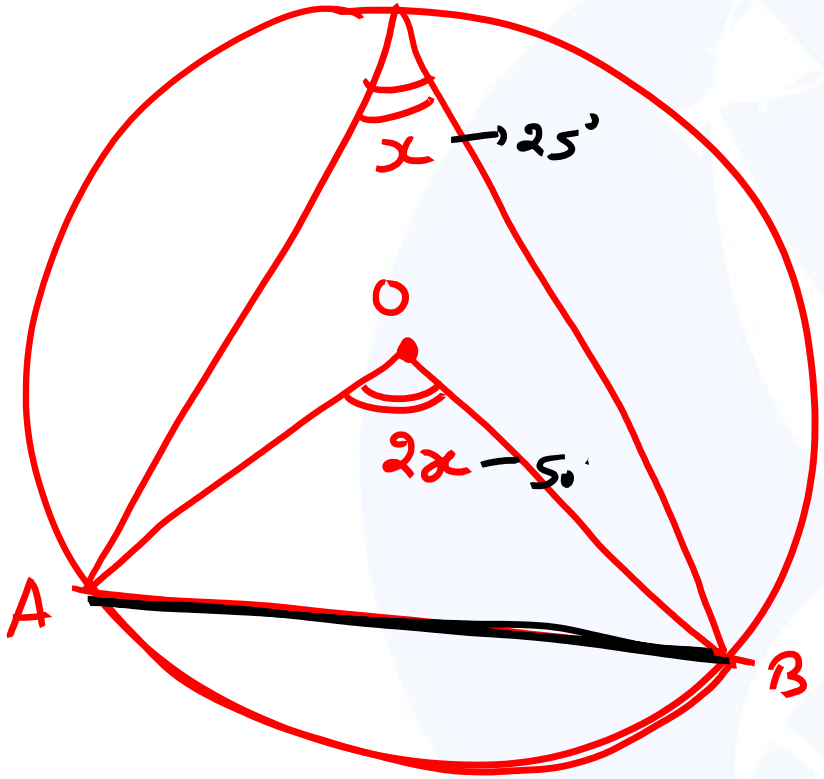


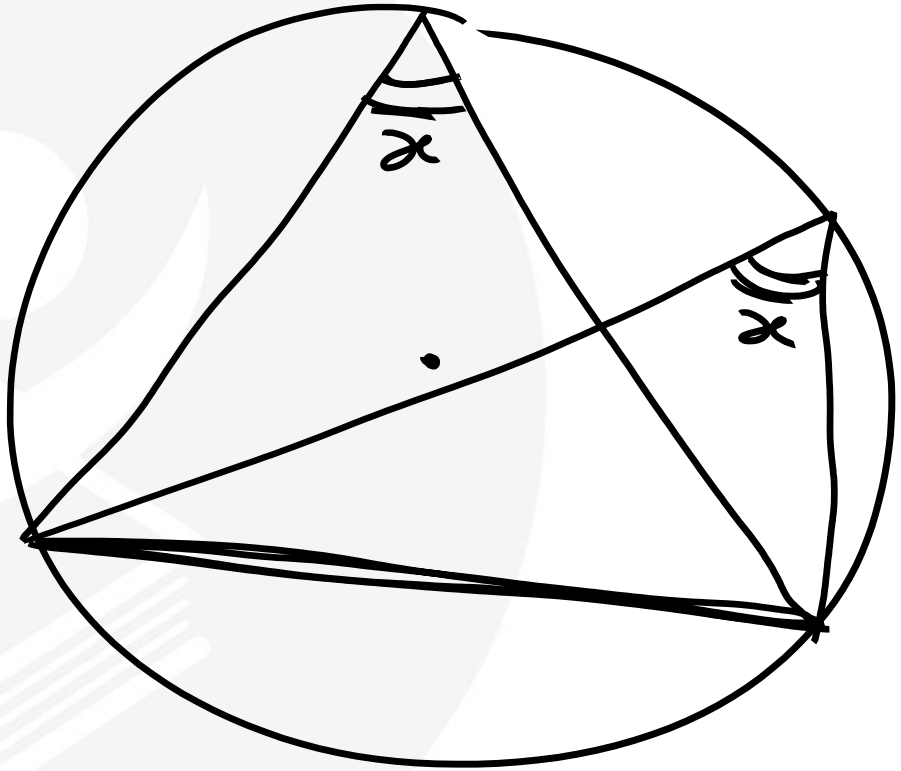


$\overset{\frown}{AB}$ → Arc

$AB / \overline{AB}$ → Chord

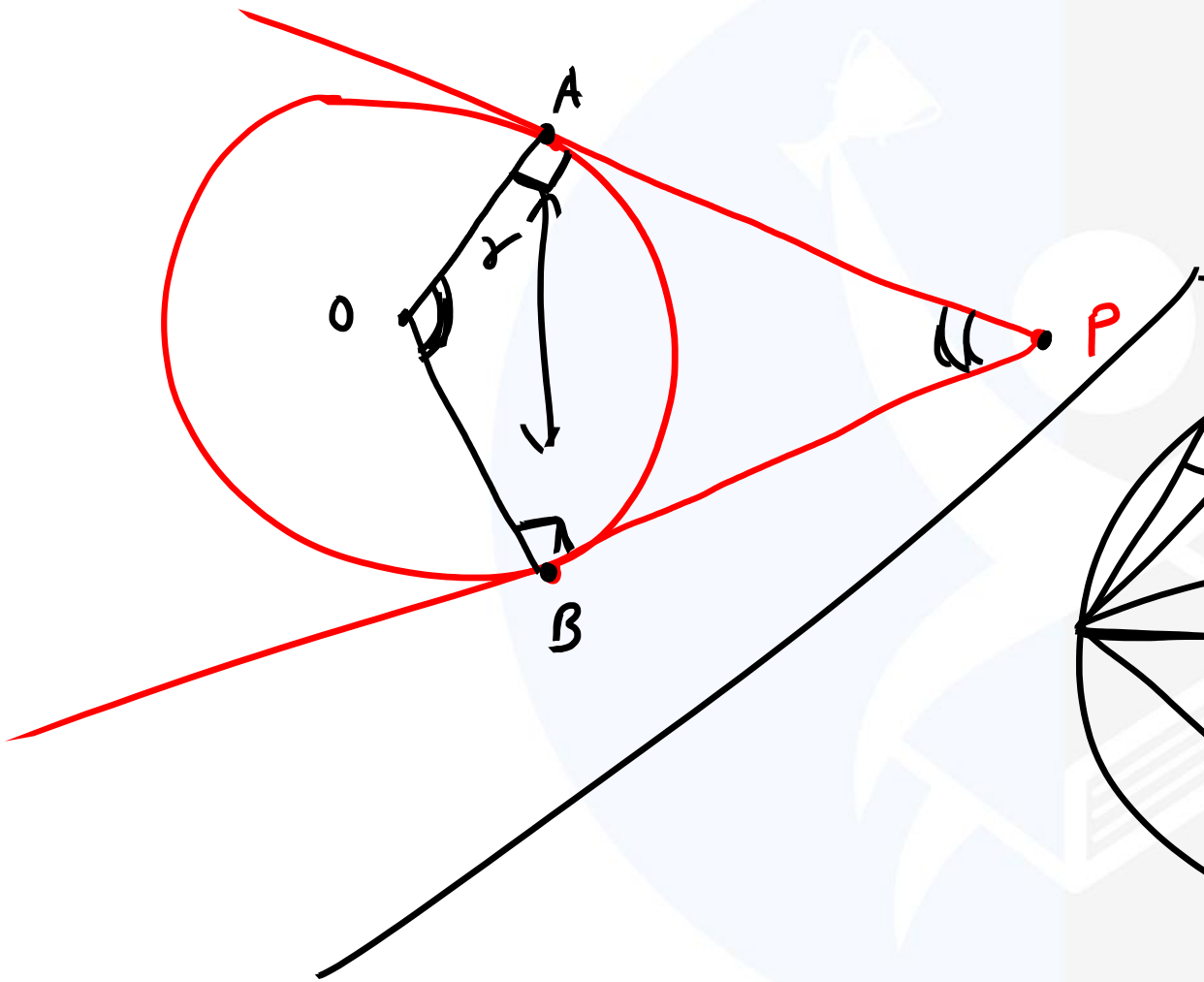

Major Sector
Minor
Sector

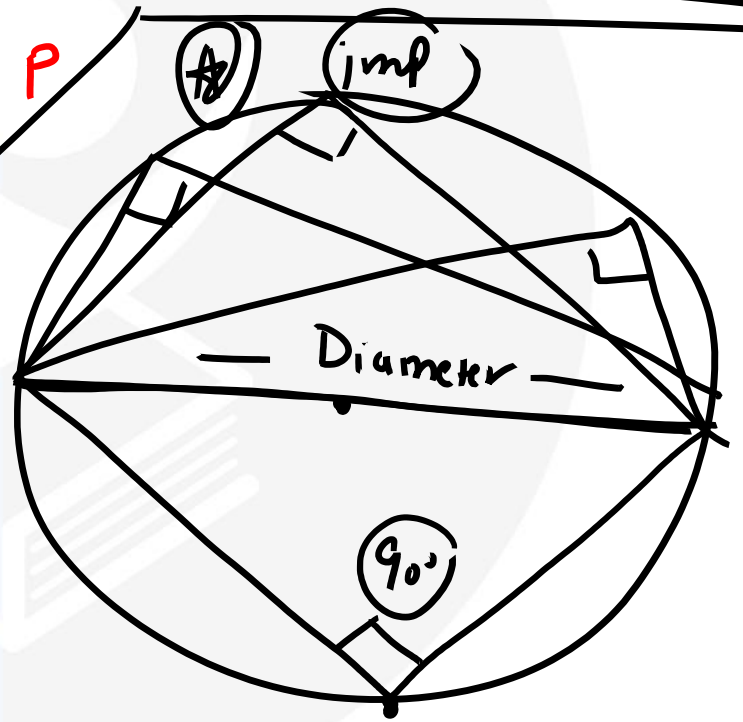

x → 25°
O
2x → 50°
A
B

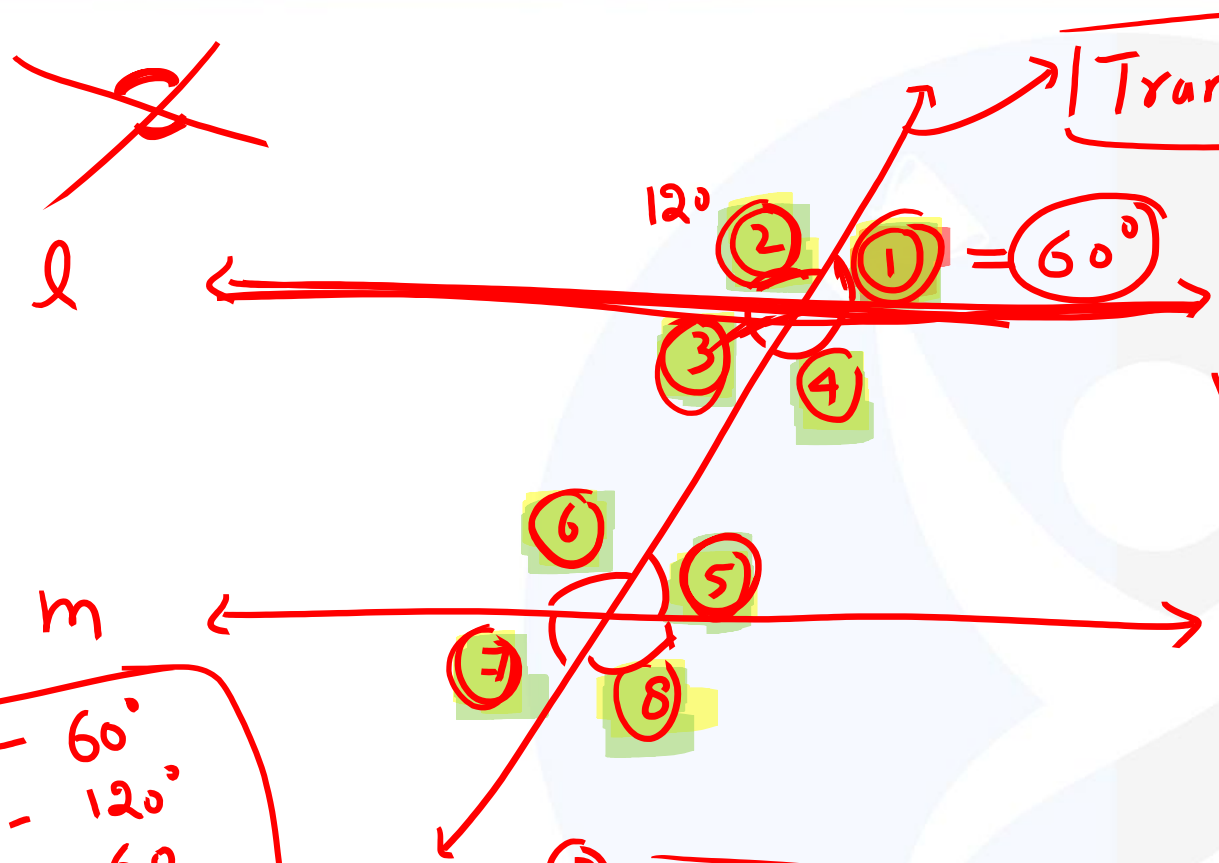

x
x

A P B O

$\angle AOB + \angle APB = 180^\circ$







1 - 60°
2 - 120°
3 - 60
4 - 120
5 - 60
6 - 120
7 - 60
8 - 120

① Vertically opposite Angles

(1-3) (2-4) (5-7) (6-8)

V.O.A are Always equal

② Alt. interior Angles

(3-5) (4-6)

Alt. Ext. Angles

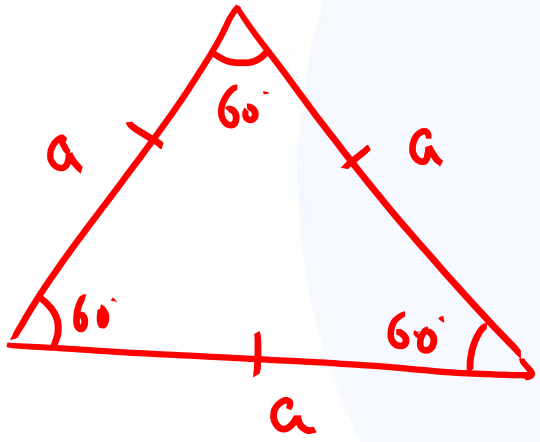
(1-7) (2-8)

③ Corresponding Angles

(2-6) (1-5) (3-7) (4-8)

Triangle → Type

① Equilateral triangle



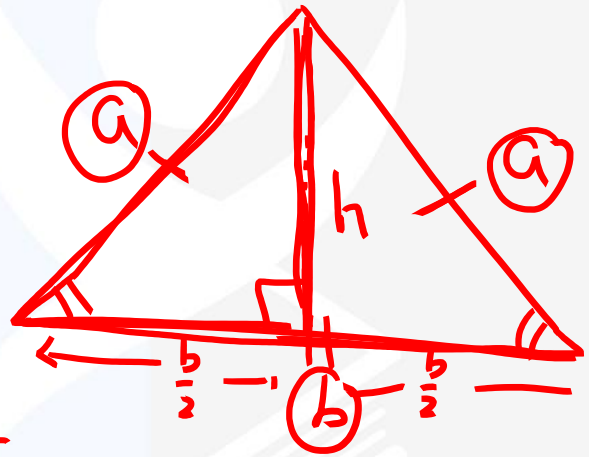
$$\text{Area} = \frac{\sqrt{3}}{4} a^2$$

$$\text{Perimeter} = 3a$$

② Isosceles triangle

$$a^2 - \left(\frac{b}{2}\right)^2 = h^2$$

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



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

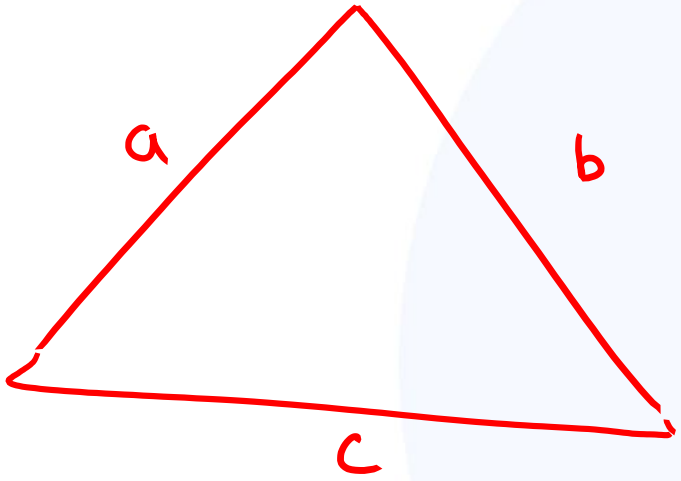
$$\frac{1}{2} \times b \times \frac{\sqrt{4a^2-b^2}}{2}$$

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

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

(3) Scalene triangle

Heron's Formula

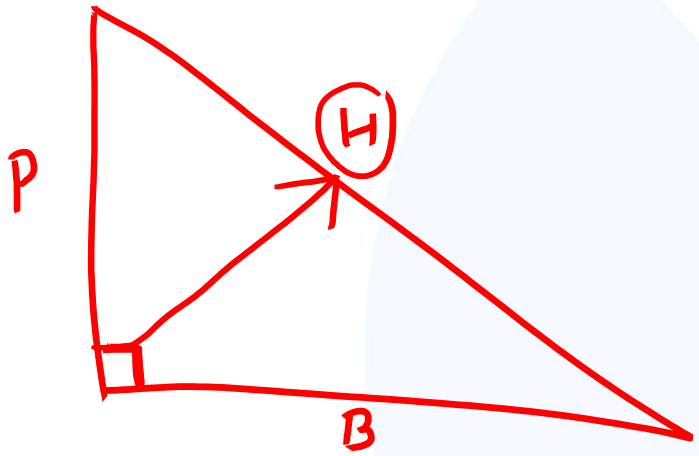


$S \rightarrow$ Semiperimeter

$$S = \frac{a+b+c}{2}$$

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

④ Right Triangle



$$\text{Area} = \frac{1}{2} \times B \times P$$

$$H^2 = P^2 + B^2$$

Polygons:

A closed plane figure bounded by line segments is called a polygon.

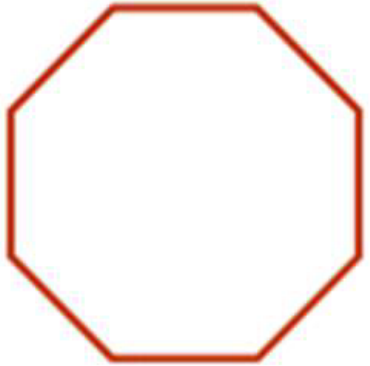
Trapezium

Hexagon

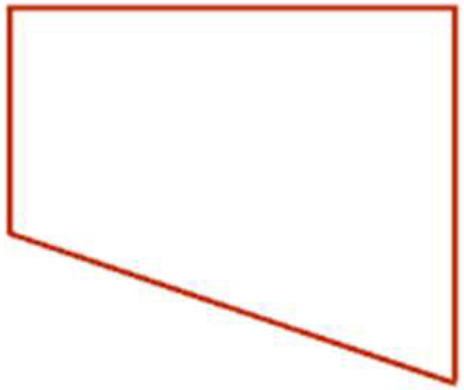
Pentagon

Heptagon

Octagon:



Irregular Polygon:



Sum of interior angles of a polygon:

Sum of interior angles = (n-2)180°

Where n is the number of sides of the polygon.

Polygon	No of Sides	Sum of Interior Angles
Triangle	3	180^0
Square	4	360^0
Rectangle	4	360^0
Rhombus	4	360^0
Trapezium	4	360^0
Parallelogram	4	360^0
Pentagon	5	540^0
Hexagon	6	720^0
Heptagon	7	900^0
Octagon	8	1080^0
Decagon	10	1440^0

(*) The area of an equilateral triangle is $\sqrt{3}$. What is the perimeter of the triangle?

(A) 2 (B) 4 (C) 6 (D) 8

Ans

$$\frac{\sqrt{3}}{4} a^2 = \sqrt{3}$$

$$a^2 = 4$$

$$a = 2$$

Perimeter $= 3a$

$= 3 \times 2 = 6$

The perimeters of a circle, a square and an equilateral triangle are equal. Which one of the following statement is true?

(A) The circle has the largest area

(B) The square has the largest area.

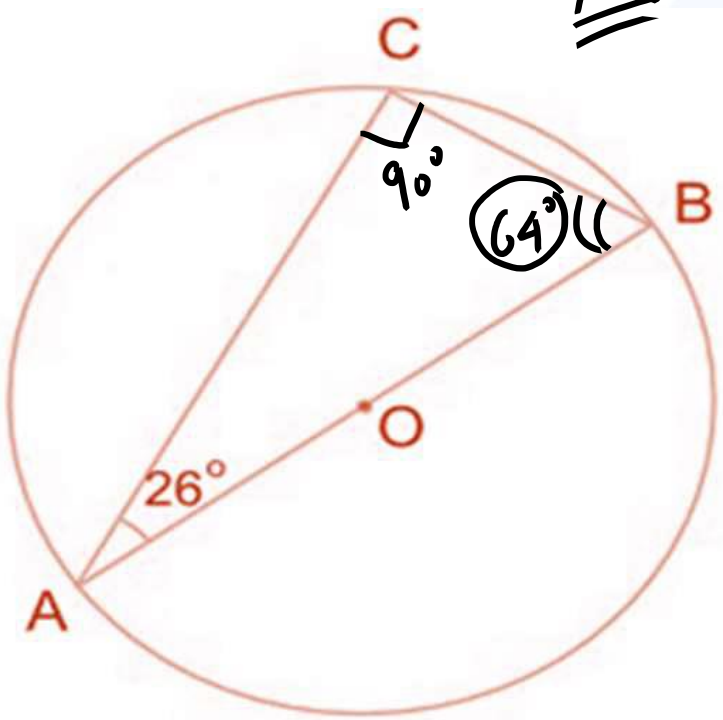
(C) The equilateral triangle has the largest area

(D) All the three shapes have the same area

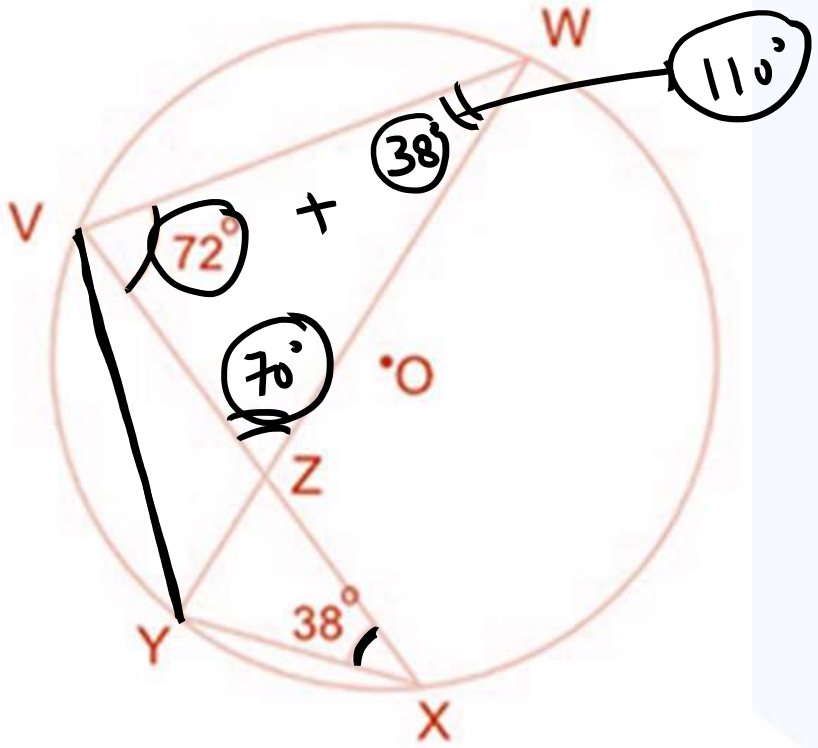
AB is a diameter of a circle, centre O. C is a point on the circumference of the circle, such that ∠CAB = 26°. What is the size of ∠CBA?

(1) 26° (2) 45° (3) 64° (4) 74°

Ans



V, W, X and Y are points on the circumference of a circle, centre O. Chords VX and WY intersect at the point Z.
∠XVW = 72° and ∠VXY = 38° What is the size of ∠VZW?
(1) 38° (2) 60° (3) 70° (4) 72°



THANKYOU

GENERAL APTITUDE

GEOMETRY AND MENSURATION -II

Rectangle
Square
Parallelogram
Trapzeium
Rhombus
Triangle

Cube
Cuboid
Cylinder
Cone
Hemisphere
sphere

2-D and 3-D Figures

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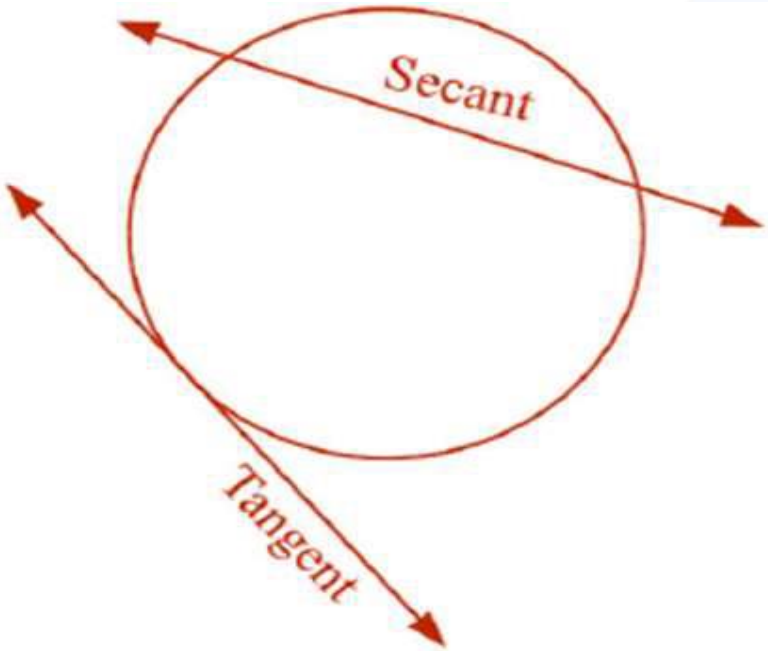
Circle:

Secant vs tangent



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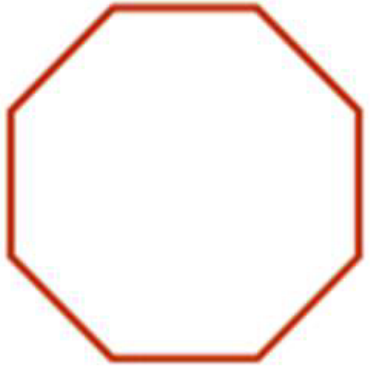
Octagon:



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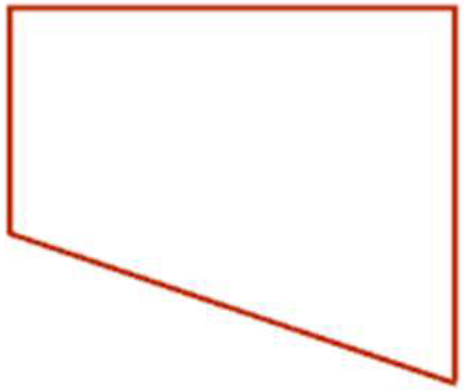

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The area of an equilateral triangle is $\sqrt{3}$. What is the perimeter of the triangle?

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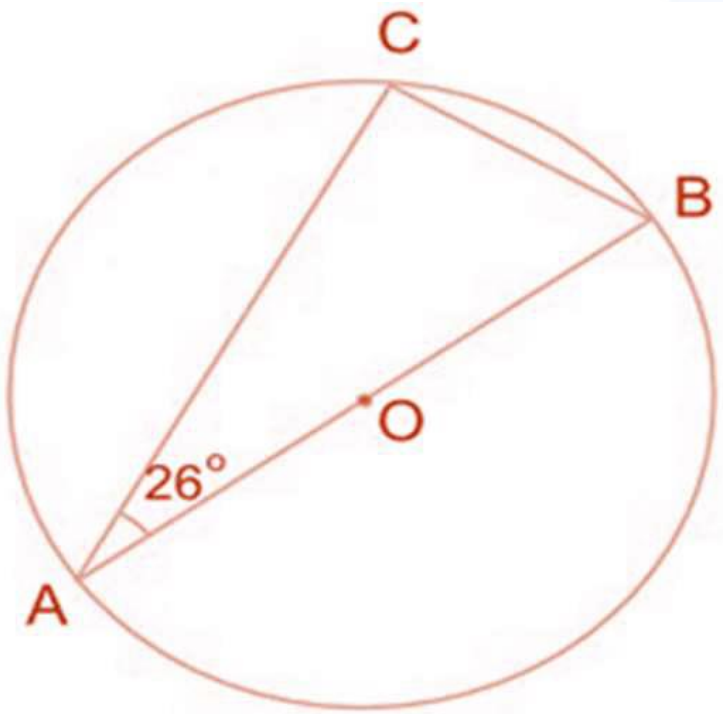

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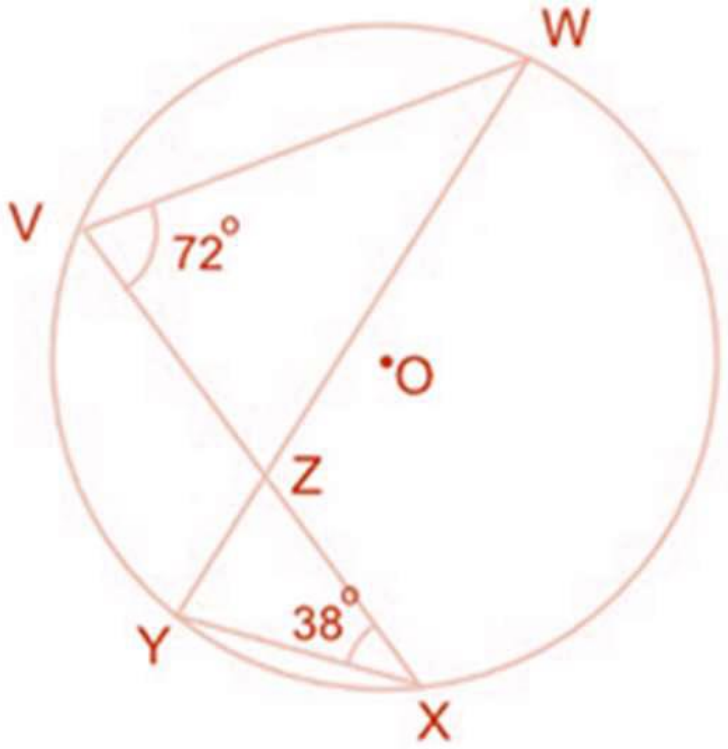
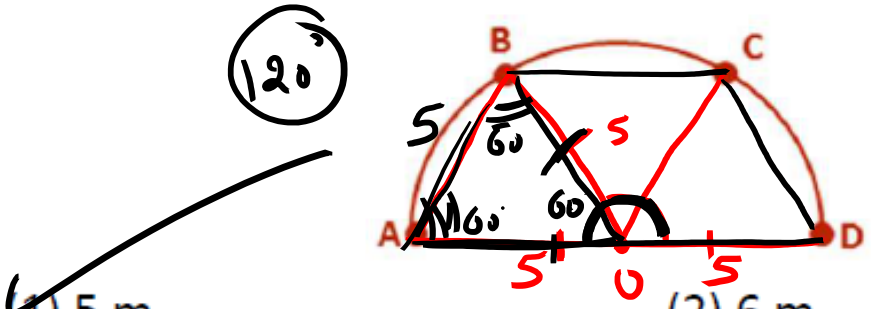


(CSIR NET/JRF JUNE 2014)

On a semi-circle of diameter 10 m drawn on a horizontal ground are standing 4 boys A, B, C and D with distances AB = BC = CD. The length of the line segment joining A and B is:



(1) 5 m

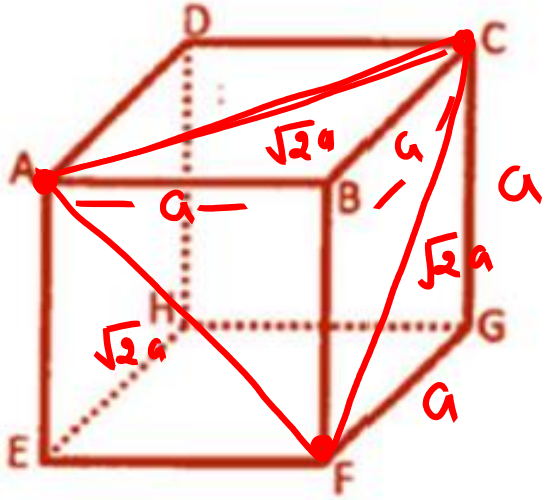
(2) 6 m

(3) 7 m

(4) $\frac{5\pi}{3}$ m

(CSIR NET/JRF DEC 2012)

The cube ABCDEFGH in the figure has each edge equal to a. The area of the triangle with vertices A, C and F is:



(1) $\frac{\sqrt{3}}{4}a^2$

(2) $\frac{\sqrt{3}}{2}a^2$

(3) $\sqrt{3}\,a^2$

(4) $2\sqrt{3}\,a^2$

Ans

Diag $= \sqrt{2}\,a$

Area $= \frac{\sqrt{3}}{4}\,\text{Side}^2$

$= \frac{\sqrt{3}}{4}(\sqrt{2}\,a)^2$

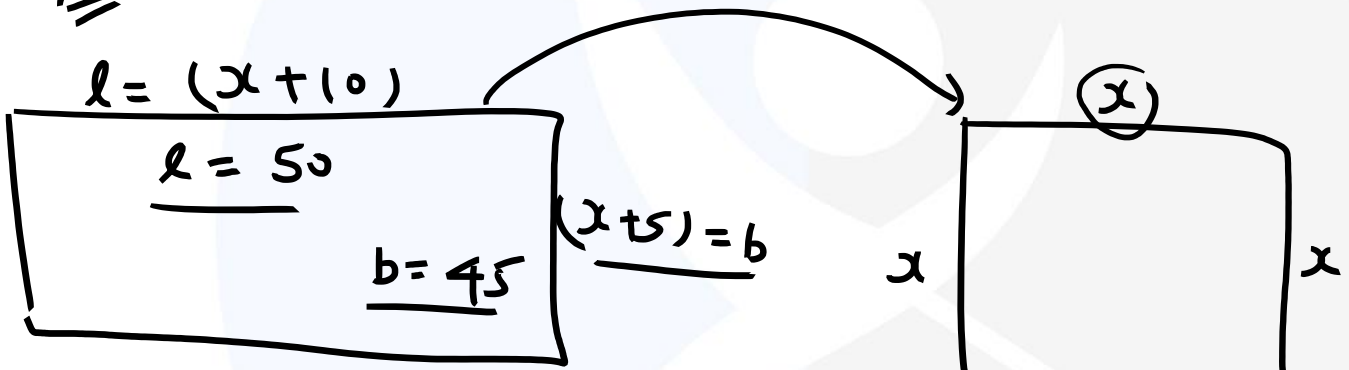
$= \frac{\sqrt{3}}{4_2} \times a^2 = \frac{\sqrt{3}}{2}a^2$

A rectangle becomes a square when its length and breadth are reduced by 10m and 5 m respectively. During this process, the rectangle losses 650 m area. What is the area of the original rectangle in square meters?

(A) 1125 (B) 2250 (C) 2924 (D) 4500

Ans

2 min



Area = 50 × 45

= 2250 m^2

$(x+10)(x+5) - x^2 = 650$

$x^2 + 5x + 10x + 50 - x^2 = 650$

$15x = 600$

$x = 40$

Suresh wanted to lay a new carpet in his new mansion with an area of 70 × 55 sq. mts. However an area of 550 sq. mts. had to be left out for flower pots. If the cost of carpet is Rs.50 per sq. mts., how much money (in Rs.) will be spent by Suresh for the carpet now?

(A) Rs.1,65,000 (B) Rs.2,75,000

(C) Rs.1,92,500 (D) Rs.1,27,500

Required Area = $(70 \times 55) - 550$

$= 3850 - 550$

$= 3300$ sqm ✓

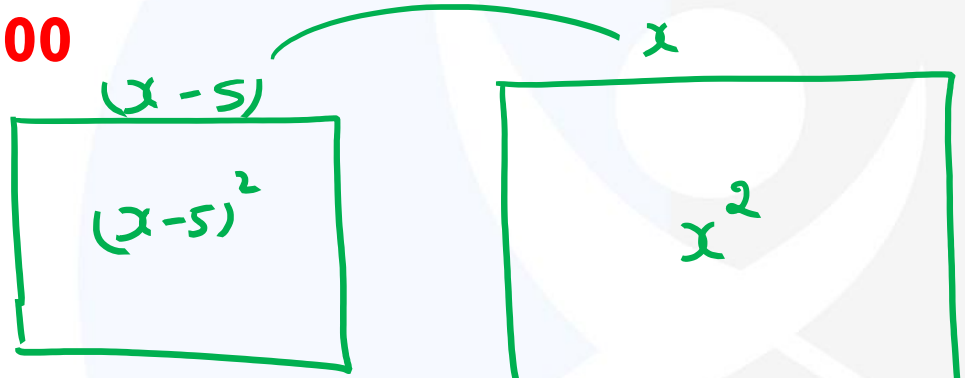
Total cost = $3300 \times 50 = 1,65,000$ ₹

A square has sides 5 cm smaller than the sides of a second square. The area of the larger square is four times the area of the smaller square. The side of the larger square is 10 cm.

(A) 15.10 (B) 8.50

(C) 18.50 (D) 10.00

Ans



$x^2 = 4$

$x^2 = 4(x-5)^2$

$\sqrt{x^2} = \sqrt{[2(x-5)]^2}$

$x = 2(x-5)$

$x = 2x - 10$

$x = 10$ cm

For a regular polygon having 10 sides, the interior angle between the sides of the polygon, in degree is

(A) 324 (B) 216

(C) 144 (D) 396

A retaining wall with measurements 30m × 12m × 6m was constructed with bricks of dimensions 8cm × 6cm × 6cm. If 60% of the wall consists of bricks, the number of bricks used for the construction is lakhs.

(A) 30 (B) 40

(C) 75 (D) 45

Ans

No. of bricks = $\frac{\text{Volume of bricks}}{\text{Volume of 1 - brick}}$

$= \frac{1000 \times 30 \times 12 \times 6 \times \frac{60}{100}}{8 \times 6 \times 6}$

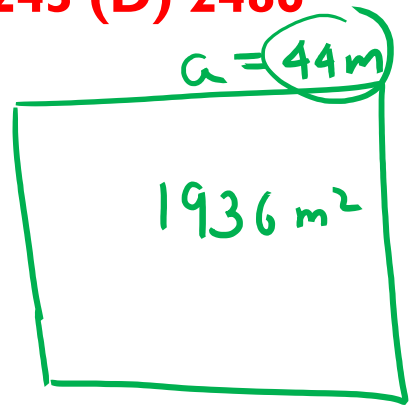
$= 45,00000$

45 Lac

A wire would enclose an area of 1936 m^2, if it is bent into a square. The wire is cut into two pieces. The longer piece is thrice as long as the shorter piece. The long and the short pieces are bent into a square and a circle, respectively. Which of the following choices is closest to the sum of the areas enclosed by the two pieces in square meters?

(A) 1096 (B) 1111

(C) 1243 (D) 2486



$a^2 = 1936$

$a = \sqrt{2 \times 2 \times 2 \times 2 \times 11 \times 11}$

$a = 2 \times 2 \times 11$

$a = 44$

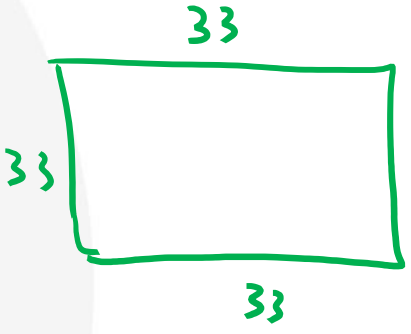
Length = $4 \times 44 = 176$ m

1 : 3

44 , 132

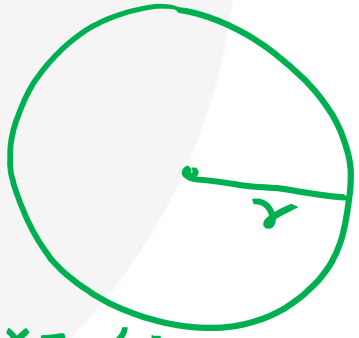
484 — 4

121



$\frac{132}{4} = 33$

Area = $(33)^2 = 1089$ m^2



$2 \times \frac{22}{7} \times r = 44$

$r = 7$

Area = $\frac{22}{7} \times 7 \times 7$

154 m^2

1089

154

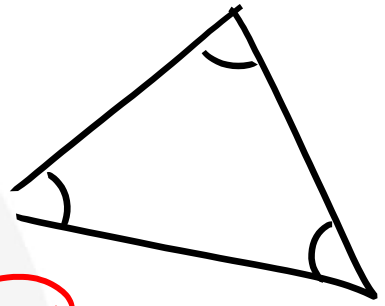
1243 m^2 Ans

Sum of interior angles of a polygon:

Sum of interior angles = (n-2)180°

Where n is the number of sides of the polygon.

Polygon	No of Sides	Sum of Interior Angles
Triangle	3	180^0
Square	4	360^0
Rectangle	4	360^0
Rhombus	4	360^0
Trapezium	4	360^0
Parallelogram	4	360^0
Pentagon	5	540^0
Hexagon	6	720^0
Heptagon	7	900^0
Octagon	8	1080^0
Decagon	10	1440^0



10

$= (n-2)180$

$(10-2)180$

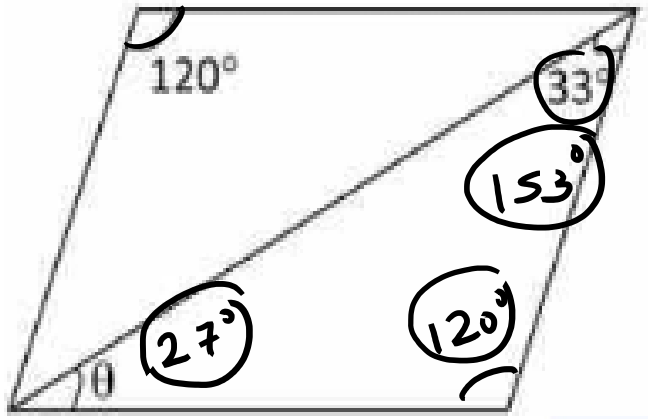
8×180

$= 1440$

The area of an equilateral triangle is $\sqrt{3}$. What is the perimeter of the triangle?

(A) 2 (B) 4 (C) 6 (D) 8

Angle θ in the following parallelogram is:(JUNE 2022)



1. 17
2. 19
3. 27
4. 29

Ans

If the length of the smallest side of a triangle is 5 units, and the sides are in arithmetic progression with integer difference, the number of such possible triangles is:(JUNE 2022)

1. 3
2. 4
3. 5
4. Infinite

Ans

1) 5, 6, 7 ✓

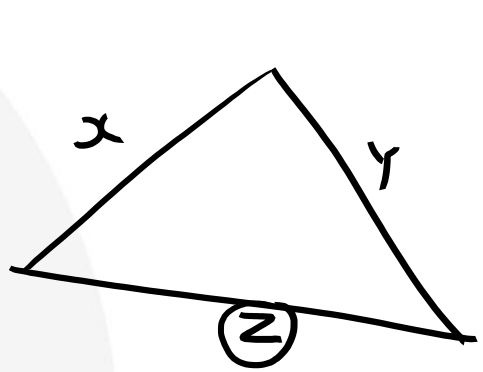
2) 5, 7, 9 ✓

3) 5, 8, 11 ✓

4) 5, 9, 13 ✓

5) 5, 10, 15 ✗

5, 11, 17 ✗



$x + y > z$

$x + z > y$

$y + z > x$

The perimeters of a circle, a square and an equilateral triangle are equal. Which one of the following statement is true?

(A) The circle has the largest area

(B) The square has the largest area.

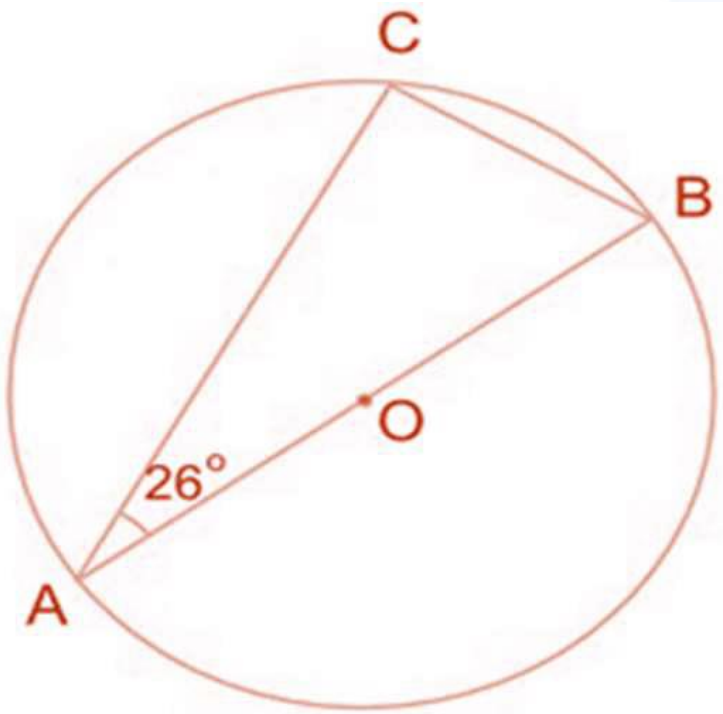
(C) The equilateral triangle has the largest area

(D) All the three shapes have the same area ×

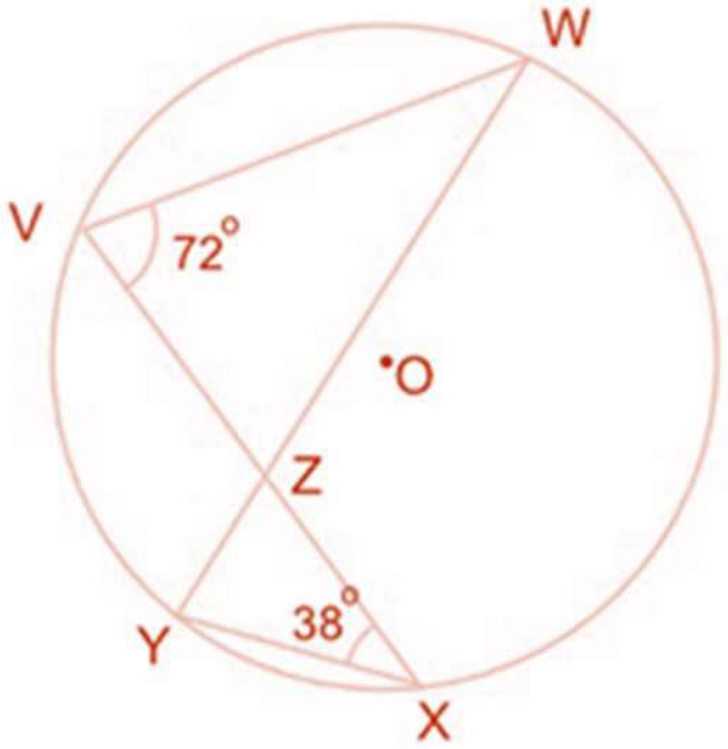
$$2\pi r = 4a = 3x$$

AB is a diameter of a circle, centre O. C is a point on the circumference of the circle, such that ∠CAB = 26°. What is the size of ∠CBA?

(1) 26° (2) 45° (3) 64° (4) 74°



V, W, X and Y are points on the circumference of a circle, centre O. Chords VX and WY intersect at the point Z.
∠XVW = 72° and ∠VXY = 38° What is the size of ∠VZW?
(1) 38° (2) 60° (3) 70° (4) 72°



(CSIR NET/JRF JUNE 2014)

On a semi-circle of diameter 10 m drawn on a horizontal ground are standing 4 boys A,B, C and D with distances AB = BC = CD. The length of the line segment joining A and B is:

(1) 5 m

(2) 6 m

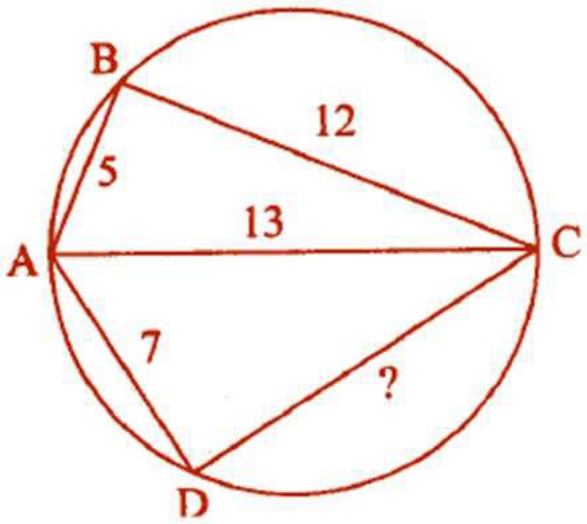
(3) 7 m

(4) $\frac{5\pi}{3}$ m

(CSIR NET/JRF JUNE 2016)

A, B, C, D are points on a circle with AB= 5 cm, BC= 12 cm, AC= 13 cm and AD= 7 cm. Then, the closest approximation of CD is:

(1) 9 cm (2) 10 cm (3) 11 cm (4) 14cm



M and N are the midpoints of AB and CD, respectively, of a square ABCD whose side is 12 cm. Take a point P on MN and let AP = r cm and PC = s cm. The area of the triangle whose sides are r, s, 12 cm is: (JUNE 2022)

1. 36 cm^2
2. 72 cm^2
3. rs cm^2
4. 2 rs cm^2

An aircraft is approaching the airport from a line of sight distance of 10 km to the landing point and is currently at a height of 5 km. What is the angle of elevation? :(JUNE 2022)

1. 15°
2. 30°
3. 45°
4. 60°

(CSIR NET/JRF DEC 2012)

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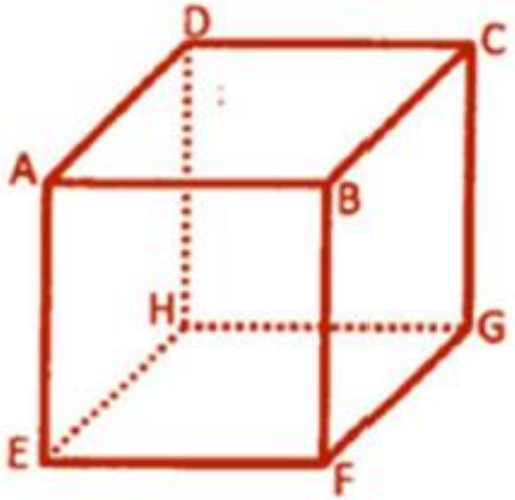

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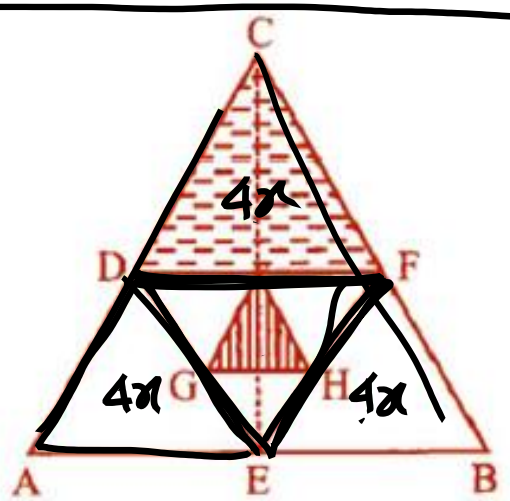
(CSIR NET/JRF JUNE 2016)

2 min

Equilateral triangles are drawn one inside the other as shown. What is the ratio of the two shaded areas?



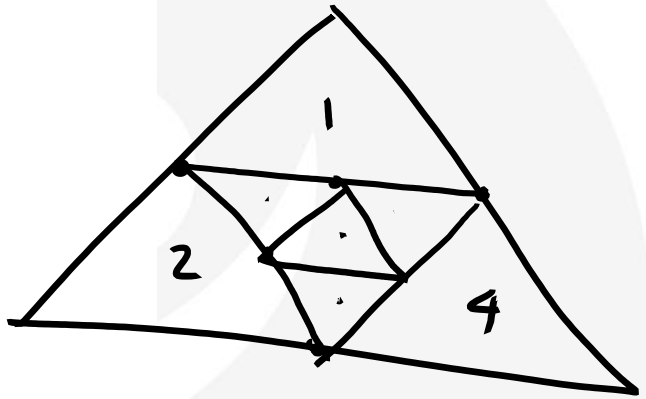
(1) 2: 1

(2) $\sqrt{3}$: 4

(3) 4: 1

(4) 8: 1

Ans



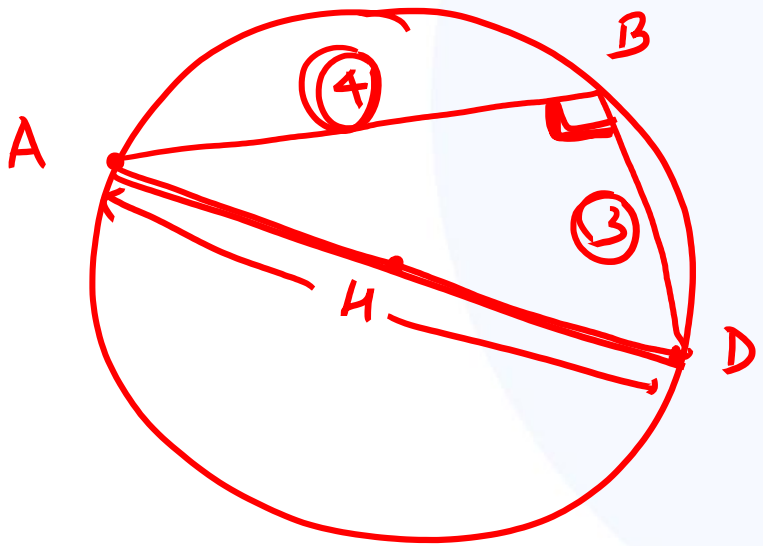
x : 4x

1 : 4

(CSIR NET/JRF DEC 2015)

A turtle starts swimming from a point A located on the circumference of a circular pond. After swimming for 4 meters in a straight line it hits point B on the circumference of the pond. From there it changes direction and swims for 3 meters in a straight line and arrives at point D diametrically opposite to point A. How far is point D from A?

(1) 3m (2) 4 m (3) 7 m (4) 5 m



$$H = \sqrt{4^2 + 3^2} = \sqrt{16+9} = \sqrt{25} = 5\ m$$

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$$\text{Interior angle b/w sides} = \frac{(n-2)\,180}{n} = \frac{8 \times 180}{10} = 144^\circ$$

Sum of angles $= (n-2)180^\circ$

8 Side

$$\frac{6 \times 180}{8} = 135^\circ$$

THANKYOU

THANKYOU