# VIII – Mathematics Assignment – Basics – Mensuration.

Firstly let us talk about the rectilinear figures.

A figure made up of some line segments is called a rectilinear figure. The line segments forming the figure are known as the sides of the figure. Thus, a rectangle, a square, a triangle, a quadrilateral, a parallelogram, a rhombus and a trapezium are comes under rectilinear figures.

The part of the plane enclosed by a simple closed figure is called a region.

The magnitute of a plane region enclosed by a simple closed figure is called its area.

A square centimetre is the area of the region formed by a square of side 1 Cm.

Cont-Pg-2

A Square Centimetre is a standard Unit of area. It is written as

$Cm^2$ or Square Cm.

## Relations

$1\ Cm^2 = 100\ mm^2$

$100\ Cm^2 = 1\ dm^2$

$100\ dm^2 = 1\ m^2$

$10,000\ Cm^2 = 1\ m^2$

$1\ are = 100\ m^2$

$1\ hectare = 100 \times 100\ m^2$

$1\ hectare = 100\ ares$

$1\ Km^2 = 100\ hectares.$

## Area and Perimeter

(a) **Rectangle**: Let $l$ be the length and 'b' be the width of the rectangle

then Area $= l \times b$ Square Units

Perimeter $= 2(l+b)$ Units

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

length $= \frac{\text{Area}}{\text{Width}}$ "

Width $= \frac{\text{Area}}{\text{length}}$ "



Cont-Pg-3

(b) **Area of four walls**

Let l be length of a room, b be its width and 'h' be the height then

ar. of four walls = $2(l+b)h$ sq. units

Diagonal of the room = $\sqrt{l^2+b^2+h^2}$ units.

area of floor or Roof = $l \times b$ sq. units.

(c) **Area and Perimeter of Square-**

Let each side of the square be 'a' units. Then

(i) Area of square = $a^2$ sq. units.

(ii) Perimeter of square = $4a$ units

(iii) Diagonal of square = $\sqrt{2}\,a$ units.

(d) **Rhombus :-**

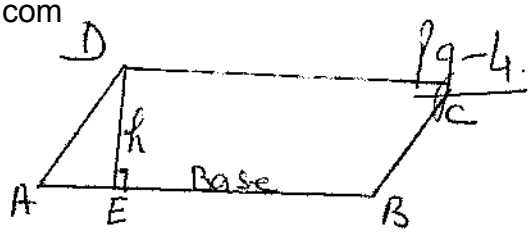
(i) Area of rhombus = $\frac{1}{2} \times d_1 d_2$ sq. units
where $d_1, d_2$ are diagonals.

(ii) Side of rhombus = $\frac{1}{2}\sqrt{d_1^2+d_2^2}$ units

(iii) Perimeter of rhombus = $4 \times$ Side units

Cont. – Pg-4

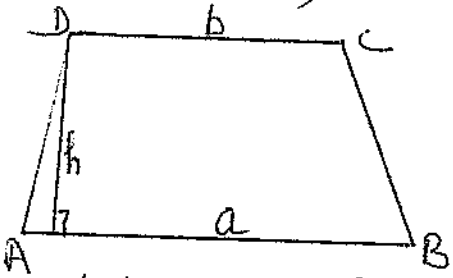
(e) Parallelogram –




(i) Area of parallelogram = Base x height Sq. Unit

(ii) Perimeter of " " = 2(l+b) Units

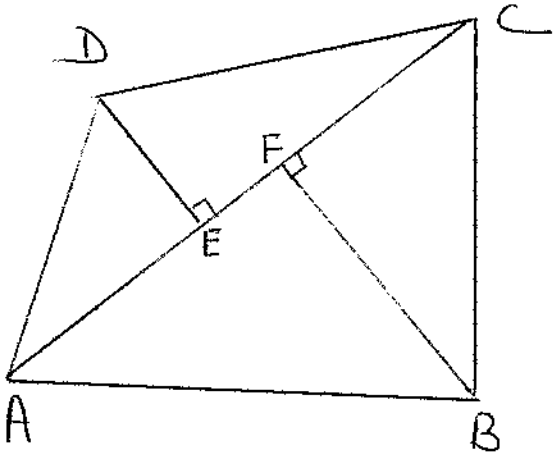
(f) Trapezium –




(i) Area of trapezium = $\frac{1}{2}(a+b) \times h$ Sq. Unit

Where a, b are parallel sides and h is the distance between parallel sides.

(g) Quadrilateral –




Area of quadrilateral

$= \frac{1}{2}$ AC x (DE + BF)

$= \frac{1}{2}$ one diagonal x (Sum of offsets)

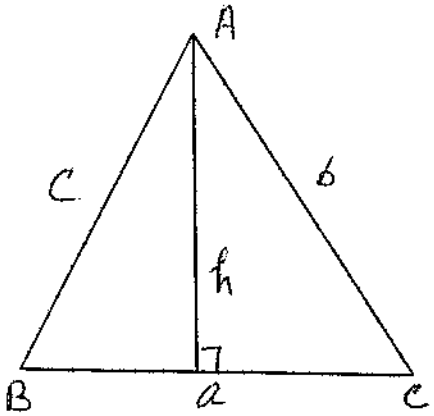
(h) Area of Triangle

$= \frac{1}{2}$ Base x height

Hero'n Formula

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

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



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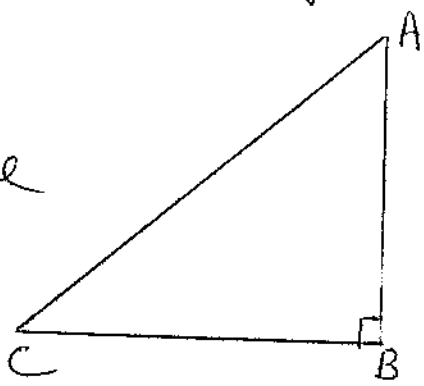
(i) Right angled triangle –



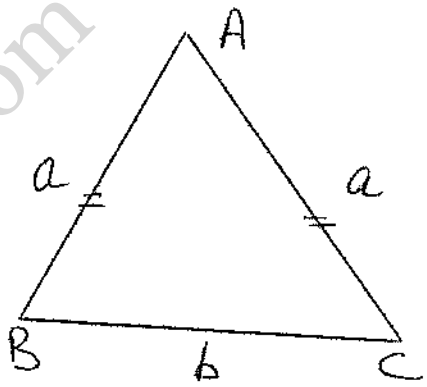

Area of right angled triangle

$= \frac{1}{2}$ BC x BA

OR $= \frac{1}{2}$ Product of legs

OR $= \frac{1}{2}$ Product of Base and perpendicular

(j) Isosceles triangle –




Area of isosceles triangle

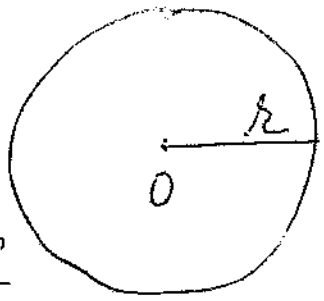
$= \frac{b}{4}\sqrt{4a^2 - b^2}$

$= \frac{\text{Base}}{4}\sqrt{4(\text{Congruent side})^2 - (\text{Base})^2}$

(K) Circle

(i) Area of Circle $= \pi r^2$

Where $\pi = \frac{22}{7} = 3.14 = \frac{355}{113}$




(ii) Circumference of circle $= 2\pi r$

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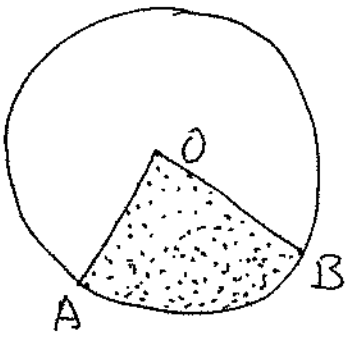
(L) **Area of sector OAB**




Sector is a part of a circle

$$\text{Area} = \frac{\angle AOB}{360} \times \pi r^2$$

(M) **length of minor arc $\overset{\frown}{AB}$:**

$$\overset{\frown}{AB} = \frac{\angle AOB}{360} \times 2\pi r.$$

Now **area of sector** in terms of arc length.

$$= \frac{1}{2} \overset{\frown}{AB} \times r.$$

Note: The circumference of a circle bears a constant ratio with its diameter. This constant ratio is denoted by $\pi$ whose approximate value is $\frac{22}{7}$ or 3.14.

Segment of a circle is the region enclosed by an arc of the circle and its chord.

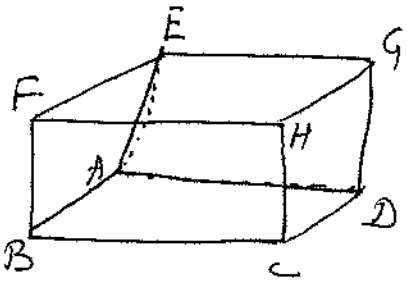
Now we shall discuss about volume

Cont- Pg-7 →

# Volume

1. **Cuboid**: A Solid bounded by six rectangular plane faces is called a Cuboid.

let $l$ = length
$b$ = Width
$h$ = Height




Then

Volume of Cuboid = $l \times b \times h$ Cu. Units

length of Cuboid = $\frac{V}{b \times h}$ Units

Width of Cuboid = $\frac{V}{l \times h}$ "

Height of Cuboid = $\frac{V}{l \times b}$ "

**Note**: To find the length of the longest rod that can be kept inside the room (Cuboid shape) is

Diagonal of the Cuboid = $\sqrt{l^2 + b^2 + h^2}$ Unit

2. **Cube**: A Solid bounded by six Equal Square faces is called a Cube. It has 12 edges, 6 faces, 8 vertices.

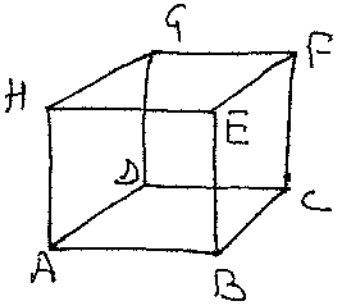
let $s$ be the length of one edge →

Cont-Pg-8

Then Volume of Cube = $s^3$

length of edge of Cube = $\sqrt[3]{V}$

Diagonal of Cube = $\sqrt{3}\,s$

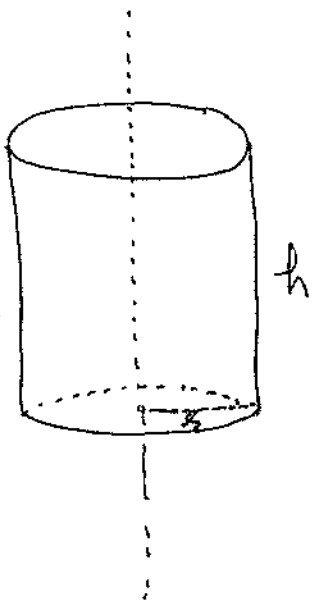



3. Cylinder :-

Volume of Cylinder = $\pi r^2 h$

Height of Cylinder = $\frac{V}{\pi r^2}$

Radius of Cylinder = $\pm\sqrt{\frac{V}{\pi h}}$




## Surface Area – (S.A)

1. Cuboid – S.A of a Solid is Equal to the Sum of the areas of its faces. Some of the surfaces are planes While Others are Curves. In order to get the total S.A. we shall Calculate the area of each face (plane or Curved) and add them up.

A Solid bounded by Six rectangula plane faces is Called a Cuboid.

Cont-Pg-9

A Cuboid has 6 rectangular faces, 12 edges and 8 vertices.

Any face of a Cuboid may be called its base.

The four faces which meet the base are called the lateral faces of the Cuboid.

(a) Lateral S.A of Cuboid $= 2h(l+b)$ sq. units

(b) Total S.A. of Cuboid $= 2(lb+bh+hl)$ sq. units.

(c) Diagonal of a Cuboid $= \sqrt{l^2+b^2+h^2}$ units

(d) Area of four walls $= 2h(l+b)$ sq. units

2. Cube — A Cuboid whose length breadth and height are all equal is called a Cube. Each edge of a Cube is called its side. It has 6 square faces, 12 edges and 8 vertices. Any face of the Cube is its base. The four faces which meet its base are called its lateral faces

Cont-Pg-10

**Standard Unit of Volume:-** The volume of the space region formed by a cube, each of whose edges is 1 cm long is called 1 cubic cm., written as 1 cubic cm or $1\ cm^3$. This is a standard unit of volume.

**Other Standard Units of Volume** and their relations are

$$1000\ mm^3 = 1\ cm^3$$
$$1000\ cm^3 = 1\ dm^3$$
$$1000\ dm^3 = 1\ m^3$$
$$10^9\ m^3 = 1\ Km^3.$$

Capacity (i.e Volume) of a vessel is expressed in litres

$$1 \text{ litre} = 1\ dm^3 = 1000\ cm^3$$
$$1 \text{ ml} = (0.001) \text{ litre} = 1\ cm^3$$
$$1 \text{ kl} = (1000) \text{ litre} = 1\ m^3$$

(i) Volume of Cube = $(edge)^3$

(ii) Diagonal of Cube = $\sqrt{3}$ (edge)

(iii) Total S.A. of Cube = $6\ (edge)^2$

(iv) Lateral S.A. of Cube = $4\ (edge)^2$



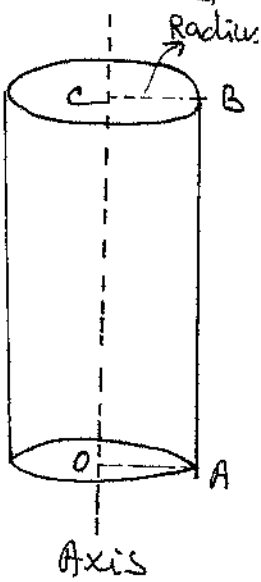
Cont-Pg-11

## 3. Cylinder:-

**General Introduction:-** Students, you must have seen road roller, a gas cylinder, circular water tank, circular pencil etc are the examples of cylinder, so

A solid having a curved surface as a lateral surface and a uniform circular cross-section, is known as a cylinder. Brief explanation of it is,

(i) The radius of the cross-section is called the radius of the cylinder e.g. CB




(ii) The line joining the centres of these cross-sections is called the axis of the cylinder. eg. OC

(iii) The circular end of cylinder is called base.

(iv) The length between the two ends is called the length or height of the cylinder

In general, cylinder always mean right circular cylinder

Cont-Pg-12

(i) Volume of Cylinder $= \pi r^2 h$

Where 'r' is the radius and 'h' is the height.

(ii) S.A | Lateral S.A | Curved S.A of Cylinder

$= 2\pi rh$

(iii) Total S.A. of Cylinder

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

OR $2\pi r(r+h)$

Note :—

(i) Units of area are Square Units

(ii) Units of Volume are Cubic Units