ETHNUS ™

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MENSURATION

- Mensuration is a topic in Geometry which is a branch of mathematics. deals with length, area and volume of different kinds of shape- both 2D and 3D.

- A 2D shapes have no depth or height; they have two dimensions- length and breadth. For 2D shapes, we measure area (A) and perimeter (P).

- A 3D shape have three dimensions- length, breadth and height/depth.

- For 3D shapes we measure Volume (V), Curved Surface Area (CSA), Lateral Surface Area (LSA) and Total Surface Area (TSA).

Area (A) – The surface occupied by a given closed shape is called its area. It is represented A and is measured in unit square- m2/ cm2. One square unit is actually the area occupied by a square of side one unit.

Perimeter (P) – The length of the boundary of a figure is called its perimeter. It is represented by P and is measures in cm/ m.

Volume (V) – The space that is contained in a three-dimensional shape is called its volume. It is represented by V and is measured in cm3/ m3. One cubic unit is the volume occupied by a cube of side one unit.

Curved Surface Area (CSA) – In solid shapes where there is a curved surface, like a sphere or cylinder, the total area of these curved surfaces is the Curved Surface Area.It is measured in m2 or cm2.

Lateral Surface Area (LSA) – The total area of all the lateral surfaces of a given figure is called its Lateral Surface Area. Lateral Surfaces are those surfaces that surround the object. It is measured in m2 or cm2.
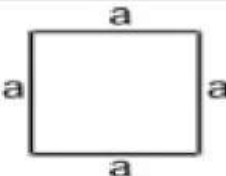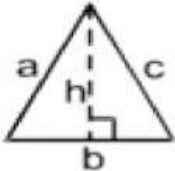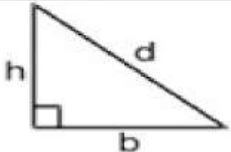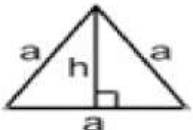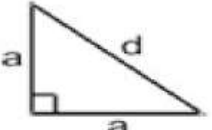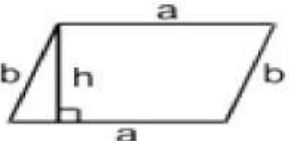
Total Surface Area (TSA) – The sum of the total area of all the surfaces in a closed shape is called its Total Surface Area. For example, in a cuboid when we add the area of all the six surfaces we get its Total Surface Area.It is measured in m2 or cm2.

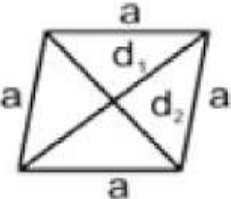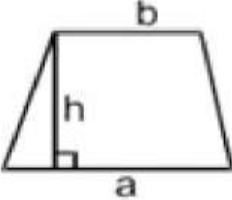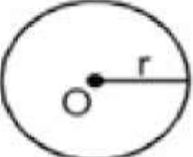| Name	Figure	Perimeter	Area
Rectangle	b a	$2(a + b)$	ab
Square	a a a a	$4a$	a^2
Triangle	a h c b	$a + b + c = 2s$	$1 = \frac{1}{2} \times b \times h$ $2 = \sqrt{s(s-a)(s-b)(s-c)}$
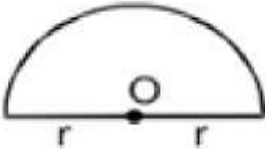
Right triangle		$b + h + d$	$\frac{1}{2}\,bh$
Equilateral triangle		$3a$	1. $\frac{1}{2}\,ah$ 2. $\frac{\sqrt{3}}{4}\,a^2$
Isosceles right triangle		$2a + d$	$\frac{1}{2}\,a^2$
Parallelogram		$2\,(a + b)$	ah
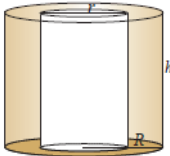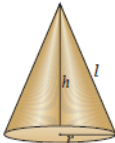
Rhombus		$4a$	$\frac{1}{2}\,d_1 d_2$
Trapezium		Sum of its four sides	$\frac{1}{2}\,h\,(a+b)$
Circle		$2\pi r$	πr^2
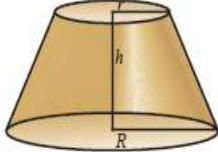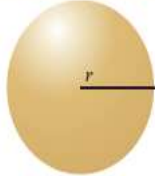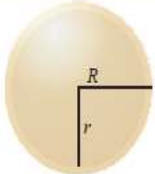
Formulae:

Semicircle		$\pi r + 2r$	$\frac{1}{2}\pi r^2$
Ring (shaded region)		----	$\pi (R^2 - r^2)$
Sector of a circle		$l + 2r$ where $l = (\theta/360) \times 2\pi r$	$\theta/360° \times \pi r^2$
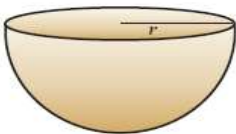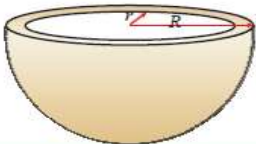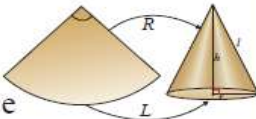
Formulae:

Sl. No	Name	Figure	Lateral or Curved Surface Area (sq.units)	Total Surface Area (sq.units)	Volume (cu.units)
1	**Right circular cylinder**		$2\pi r h$	$2\pi r(h + r)$	$\pi r^2 h$
2	**Right circular hollow cylinder**		$2\pi h(R + r)$	$2\pi(R + r)(R - r + h)$	$\pi R^2 h - \pi r^2 h$ $\pi h(R^2 - r^2)$ $\pi h(R + r)(R - r)$
3	**Right circular cone**		$\pi r l$	$\pi r(l + r)$	$\frac{1}{3}\pi r^2 h$

4	Frustum		- - - - - - -	- - - - - - - - - - - - - -	$\frac{1}{3}\pi h(R^2 + r^2 + Rr)$
5	Sphere		$4\pi r^2$	- - -	$\frac{4}{3}\pi r^3$
6	Hollow sphere		- - -	- - -	$\frac{4}{3}\pi(R^3 - r^3)$

Hemisphere		$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$
Hollow Hemisphere		$2\pi(R^2 + r^2)$	$2\pi(R^2 + r^2) + \pi(R^2 - r^2)$	$\frac{2}{3}\pi(R^3 - r^3)$

Cone

$$l = \sqrt{h^2 + r^2}$$
$$h = \sqrt{l^2 - r^2}$$
$$r = \sqrt{l^2 - h^2}$$

CSA of a cone = Area of the sector

$$\pi r l \quad = \frac{\theta}{360} \times \pi r^2$$

Length of the sector = Base circumference of the cone

10. Volume of water flows out through a pipe
= {Cross section area × Speed × Time }

11. No. of new solids obtained by recasting
$$= \frac{\text{Volume of the solid which is melted}}{\text{volume of one solid which is made}}$$

Conversions $1 \text{ m}^3 = 1000 \text{ litres}$, $1 \text{ d.m}^3 = 1 \text{ litre}$, $1000 \text{ cm}^3 = 1 \text{ litre}$, $1000 \text{ litres} = 1 \, kl$

Find the area of trapezium whose parallel sides are 20 cm and 18 cm long, and the distance between them is 15 cm.

A. 225 cm^2

B. 275 cm^2

C. 285 cm^2

D. 315 cm^2

E. None of these

Answer: C

Find the area of a parallelogram with base 24 cm and height 16 cm.

A. 262 cm^2

B. 384 cm^2

C. 192 cm^2

D. 131 cm^2

E. None of these

Answer: B

A horse is tethered by a rope 10 m long at a point. Find the area of the region

where it can graze ($\pi = 3.14$)

A. 314 cm²

B. 31.4 cm²

C. 314 m²

D. 31.4 m²

Answer: A

The length of a room exceeds the breadth by 22 metres. If both the length and the breadth are increased by 1 meter, then the area of the room is increased by 11 sq. m. Find the length and the breadth of the room.

A. 3m and 2 m

B. 2m and 7m

C. 7m and 9m

D. 6m and 4m

Answer: D

The length of a rectangular plot is thrice its breadth. If the area of the rectangular plot is 867 sq m, then what is the breadth of the rectangular plot?

A. 8.5 m

B. 17 m

C. 34 m

D. 51 m

E. None of these

Answer: B

The area of a square is equal to five times the area of a rectangle of dimensions 125 cm * 64 cm. What is the perimeter of the square?

A. 600 m

B. 800 m

C. 400 m

D. 1000 m

E. None of these

Answer: B

A wire in the form of a circle of radius 3.5 m is bent in the form of a rectangule, whose length and breadth are in the ratio of 6 : 5. What is the area of the rectangle?

A. 60 cm^2

B. 40 cm^2

C. 30 cm^2

D. 15 cm^2

E. None of these

Answer: C

The area of a square is 4096 sq cm. Find the ratio of the breadth and the length of a rectangle whose length is twice the side of the square and breadth is 24 cm less than the side of the square.

A. 18 : 5

B. 7 : 16

C. 5 : 14

D. 5 : 16

Answer: D

The parameter of a square is double the perimeter of a rectangle. The area of the rectangle is 480 sq cm. Find the area of the square.

A. 200 sq cm

B. 72 sq cm

C. 162 sq cm

D. Cannot be determined

E. None of these

Answer: D

The dimensions of a room are 25 feet * 15 feet * 12 feet. What is the cost of white washing the four walls of the room at Rs. 5 per square feet if there is one door of dimensions 6 feet * 3 feet and three windows of dimensions 4 feet * 3 feet each?

A. Rs. 4800

B. Rs. 3600

C. Rs. 4530

D. Rs. 3560

Answer: C

Find the total surface area of a container in cylindrical shape whose diameter is 28cm and height is 15cm.

A. 2552

B. 3644

C. 4536

D. 3562

E. None of these

Answer: A

Calculate the cost required to paint a container which is in shape of a right circular cylinder having a base radius of 7 m and height 13 m. If the painting cost of the container is INR 2.5/m². (Take π = 22/7)

A. Rs. 4800

B. Rs. 2200

C. Rs. 2530

D. Rs. 3560

Answer: B

The radius of hemispherical balloon increase from 7 cm to 14 cm as air is being pumped into it. Find the ratios of the surface areas of the balloon in two cases.

A. 1:5

B. 1:6

C. 1:4

D. 1:3

E. None of these

Answer: C

A toy is in the shape of a cylinder surmounted by a hemisphere. The height of the toy is 25 cm. Find the total surface area of the toy if its common diameter is 12 cm.

A. 1800

B. 1056

C. 1230

D. 1560

Answer: B

A funnel consists of a frustum of a cone attached to a cylindrical portion 12 cm long attached at the bottom. If the total height be 20 cm, diameter of the cylindrical portion be 12 cm and the diameter of the top of the funnel be 24 cm. Find the outer surface area of the funnel.

A. Rs. 4800

B. Rs. 3600

C. Rs. 4530

Answer: C