PERIMETER & AREA OF PLANE FIGURE

I.PLANE FIGURE

A figure enclosed by three or more sides or by a circular boundary is called a plane figure.

II. FOUR BASIC GEOMETRIC FIGURES

1.TRIANGLE

The figure having three sides is called a Triangle.

2. QUADRILATERAL

The figure having four sides is called a quadrilateral.

3. POLYGON

The figure having more than four sides is called polygon.

e.g. A pentagon have five sides.
A hexagon have six sides etc.

4. CIRCLE

Circle is a path traced by a point so that the distance from the point to the path is always remain the same. This point is known as center of the circle and distance from this point to the path traced is called radius of the circle.

III. PERIMETER

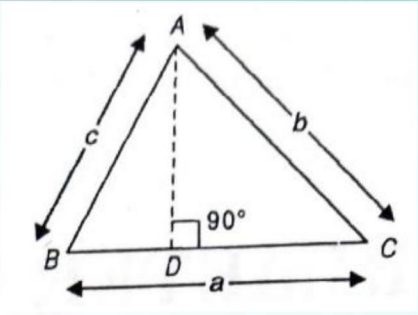
Perimeter of a plane figure is equal to the total length of the sides of that figure. The unit of perimeter is cm, m, km etc.

IV. AREA

Area of a plane figure is the measurement of space covered by the figure. It is measured in cm^2, m^2, km^2 etc.

V. PERIMETER AND AREA OF TRIANGLE

Triangle have three sides and three angles.



Here, ABC is a triangle with sides a, b and c where a is the base of the triangle and AD is the height (altitude) of the triangle.

Perimeter = a + b + c

Area $= \frac{Base \times Height}{2} = \frac{a \times AD}{2}$

Also, Area $= \sqrt{s(s-a)(s-b)(s-c)}$

Where semi-perimeter (s) $= \frac{a+b+c}{2}$

VI. SOME SPECIAL TYPES OF TRIANGLES

1.RIGHT- ANGLED TRIANGLE

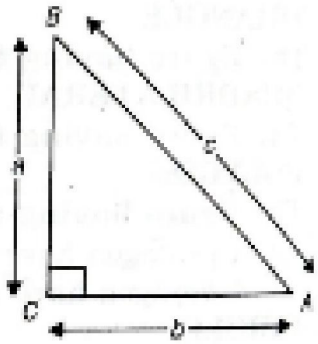
When one of the three angles of a triangle is equal to 90^0, then it is called right angled triangle.

Here, ABC is triangle with right – angl4ed at C.

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

$$C^2 = a^2 + b^2$$

According to Pythagoras theorem, the square of the side opposite to right angle (i.e. hypotenuse) is equal to the sum of squares of other two sides).



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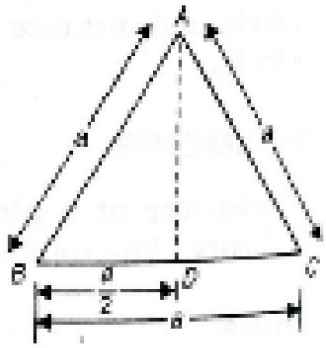
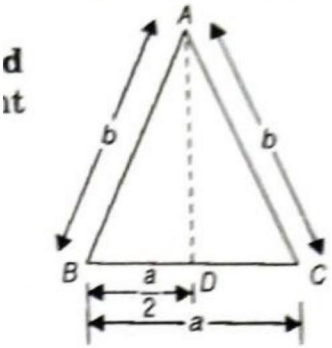
2. EQUILATERAL TRIANGLE



The triangle having all the three sides equal is called equilateral triangle.
In △ ABC, the sides AB = BC = CA, then D is the midpoint of AC.
Perimeter = 3a
Area = $\frac{\sqrt{3}}{4}$ a²
Height (AD) = $\frac{\sqrt{3}}{2}$ a

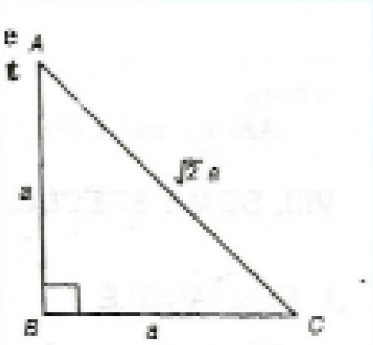
3. ISOSCELES TRIANGLE



The triangle having two of its sides equal is called isosceles triangle. In triangle ABC, AC = AC, then AD is height D is the mid – point of BC.
Perimeter = a + 2b
Height (AD) = $\frac{\sqrt{4b^2 - a^2}}{2}$
Area = $\frac{a}{4}\sqrt{4b^2 - a^2}$

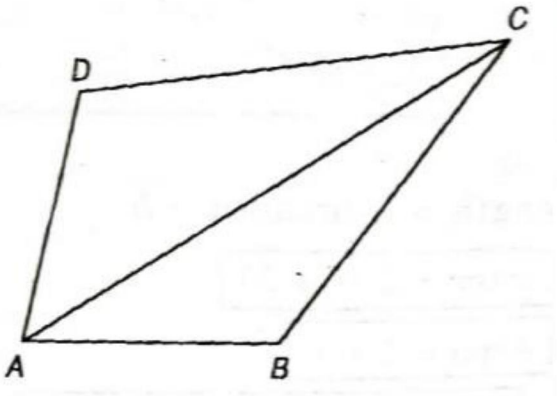
4. ISOSCELES – RIGHT TRIANGLE

The triangle having two of its sides equal and angle between them is equal to 90⁰ is called isosceles right triangle.
Perimeter = 2a + $\sqrt{2a}$
Area = $\frac{1}{a}$ a²
Hypotenuse = $\sqrt{2a}$



VII.AREA AND PERIMETER OF QUADRILATERAL

A plane figure bounded by four straight lines is called quadrilateral. Let ABCD be a quadrilateral and diagonal AC divides it into two triangles ACD and ABC



Area of quadrilateral ABCD = Area of triangle ABC + Area of triangle ACD
Perimeter = AB + BC + CD + DA

If one diagonal and two perpendiculars AE and CF from the opposite corner to the diagonal BD of a quadrilateral ABCD is given. Let h1, h2 be the

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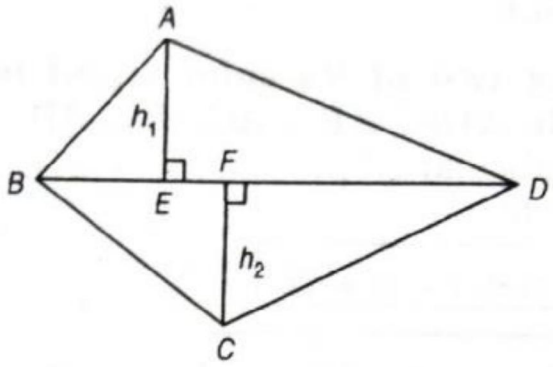
heights of perpendiculars drawn to diagonal from A and C respectively. Then



Area of quad. ABCD = Area of triangle ABD + Area of triangle BCD

$= \frac{1}{2}(BD \times AE) + \frac{1}{2} \times BD \times CF$

$=$ (i.e., Area of triangle ABC $= \frac{1}{2} \times base \times height$

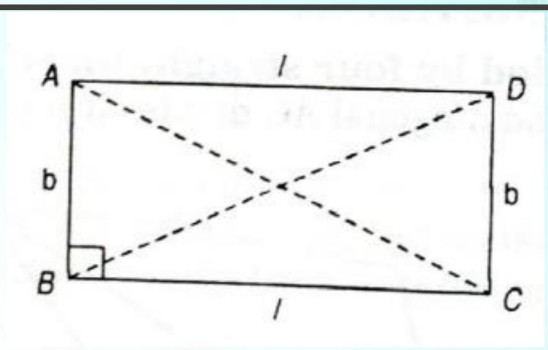
Area $= \frac{1}{2}$BD (h1 + h2)

Where:
BD = length of diagonal
AE(h1) and CF(h2) are perpendiculars from A and C to BD respectively.

VIII. SOME SPECIAL TYPES OF QUADRILATERALS

1.RECTANGLE

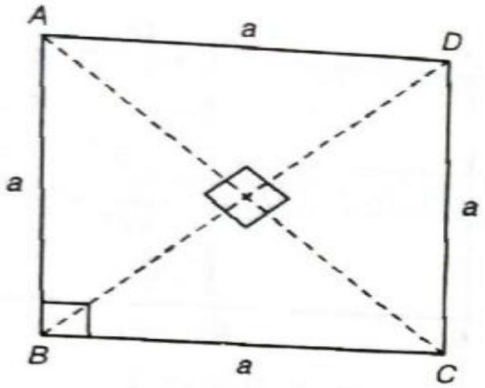
For a rectangle, opposite sides are equal and angle included b4etween aby two sides is equal to 90^0. Diagonal AC and BD are equal and bisect each other



Length = l, Breadth = b
Perimeter = 2(l + b)
Area = l × b
AC = BD (diagonal) = $\sqrt{l^2 + b^2}$

2. SQUARE

All the four sides of the square are equal. The angle between any two sides is equal to 900. Diagonals AC and BD are equal and bisect each other perpendicularly.



Let each side = a
Perimeter = 4a
Area = a^2
Diagonal = $\sqrt{2a}$
Also, Area = $\frac{1}{2}$ (diagonal)^2

Let l, b and h denote the length, breadth height of the room, then Area of four walls of the room = 2(l + b) × h

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Height of the room $= \frac{Area\ of\ four\ walls}{2(l+b)}$

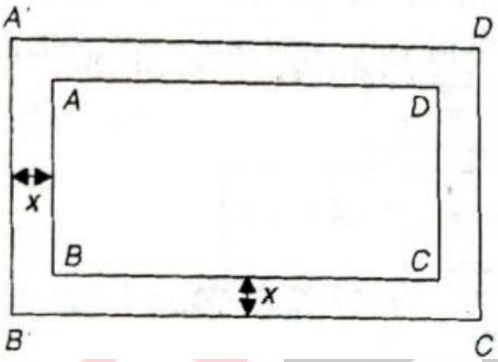
3. AREA OF PATH AND VERANDAHS

i) When the path surrounds the rectangle

Let ABCD is a rectangle park.

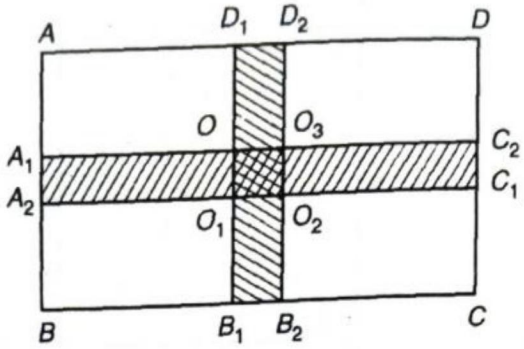
It is surrounded by a path of x m width.

Area of the path = Area of A'B'C'D – Area of ABCD



ii) When the path crosses each other in the midway of the rectangle.

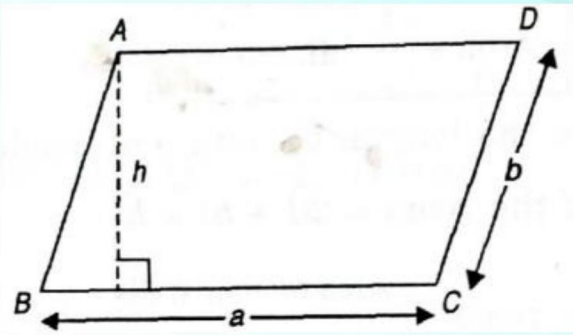
Area of the path = Area of ABCD – 4 (Area of AA_1OD_1)



∴ (Area of AA_1OD_1) = (Area of $A_2BB_1O_1$)
= (Area of $B_2CC_1O_2$) = (Area of $C_2DD_2O_3$)

4. PARALLELOGRAM

When opposite sides of a quadrilateral are equal and parallel to each other. The included angle need not be equal to 90^0. The diagonal of parallelogram bisects each other.



Let a, b be the adjacent sides of parallelogram, then

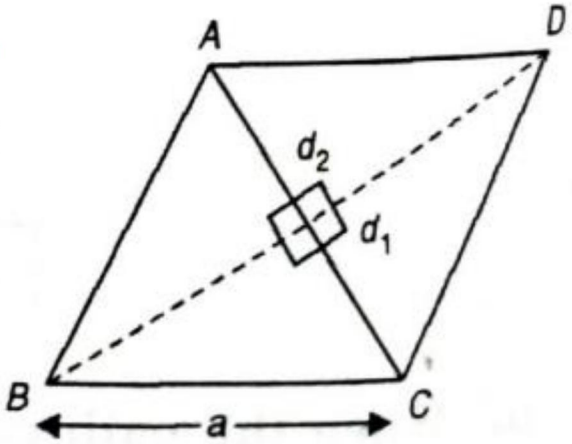
Perimeter = 2 (a + b)

Area = a × h = (base × height)

5.RHOMBUS

A special kind of parallelogram in which adjacent sides are equal. Diagonals bisect each other perpendicularly.

Let d1, d2 be the two diagonals and a be the one of the sides, then



Perimeter = 4a

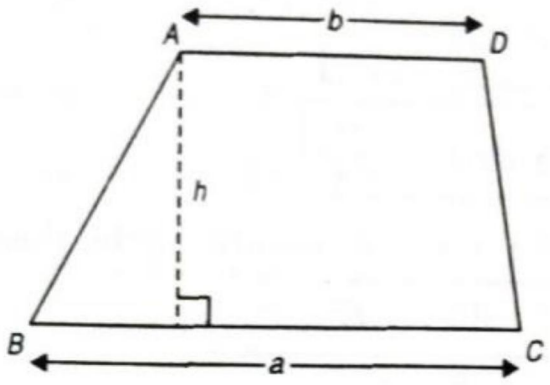
Area $= \frac{1}{2} \times (d1 \times d2)$

Perimeter $= 2\sqrt{d1^2 + d2^2}$

Side (a) $= \frac{1}{2}\sqrt{d1^2 + d2^2}$

6.TRAPEZIUM

A quadrilateral whose one pair of opposite sides are parallel, and another pair of opposite sides are non-parallel.



In quadrilateral ABCD, parallel sides are AD and BC. Let a, b be length of BC and AD respectively and h be the distance between them, then

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

Where a + b = sum of parallel sides
H = distance between them

IX. PERIMETER AND AREA OF REGULAR POLYGON

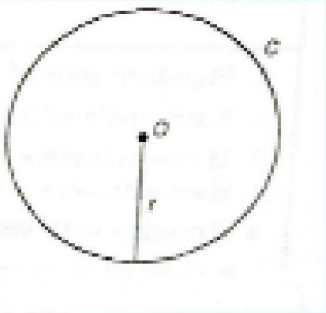
Polygon have more than four sides. A polygon is a regular polygon if it's all sides and all angles are equal. Hence are some polygons.

	Polygon	No. of Sides (n)	Internal Angle
1.	Pentagon	5	108°
2.	Hexagon	6	120°
3.	Septagon	7	128°6
4.	Octagon	8	135°
5.	Decagon	10	144°

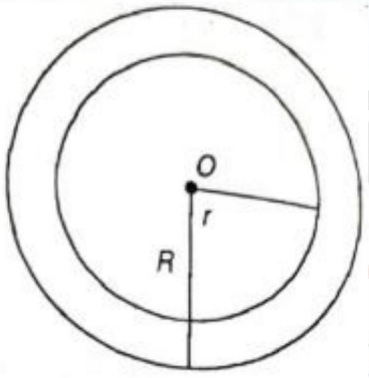
$$\text{Internal angle} = \left[\frac{(n-2)}{n} \times 180\right]^0$$

Perimeter = n × length of side
Where n = number of sides

X. PERIMETER AND AREA OF CIRCLE



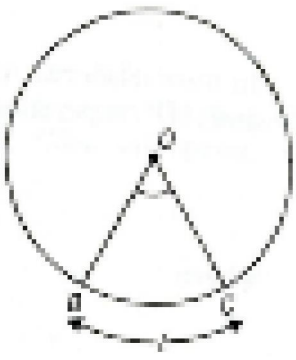
Perimeter of a circle is equal to its circumference.
Perimeter = $2\pi r$
Area = πr^2
D = 2r
Where r is radius of circle, d is diameter of circle r = 22/7 or 3.14 (constant)



Area of semicircle = $\frac{\pi r^2}{2}$

Area of quadrant of a circle = $\frac{\pi r^2}{4}$

If R and r be the radii of two concentric circle, then,
Area of circular path = $\pi(R^2 - r^2)$
Where: R > r



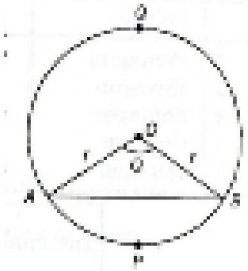
Area of sector $= \frac{\theta^0}{360^0} \times \pi r^2$

Length of arc (l) $= \frac{\theta}{180^0}\pi r$

Also, Area of sector $= \frac{1}{2} lr$

Where Boc represents a sector of circle l is the length of arc from B to C and θ^0 is angle subtends by the arc l.

XI. SEGMENT OF CIRCLE



Let OA be the radius of a circle and AB is the chord which divide the circle into two parts minor and major segment.

Here APB is the minor segment and AQB be the major segment

Area of segment APB = Area of sector OAPB – Area of triangle OAB

$= \frac{\theta}{360} \times \pi r^2 - \frac{1}{2} r^2 sin\theta$

Area of segment APB = $r^2(\frac{\pi\theta}{360} - \frac{sin\theta}{2})$

SURFACE AREA AND VOLUME OF SOLID

I.SOLID

A part of space enclosed by plane or curved surface is called solid. A solid has three dimensions length, breadth and height (thickness).

II. SURFACE AREA

The area covered by the outer surface of solid is called surface area.

III. VOLUME

The amount of space enclosed by the bounding surfaces of a solid is called its volume.

IV. CUBE

A solid bounded by six square surface is called a cube. A cube has 12 edges and 6 faces and 8 corners (vertices). Let length, breadth and height of a cube is denoted by l, b and h respectively.

In cube all the edges are equal i.e.

Let l = b= h = a

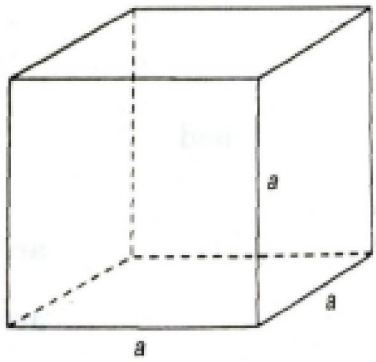
Surface area = $6a^2$

Lateral surface area = $4a^2$

Volume = a^2

Length of the diagonal = $\sqrt{3a}$

Edge of a cube = $\sqrt{Volume}$



V. CUBOID

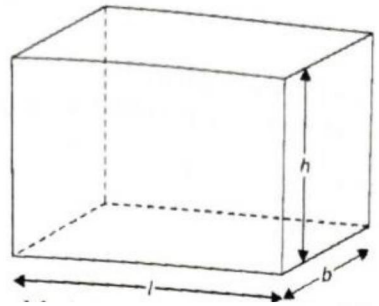
Let length, breadth and height of a cuboid is denoted by l, b and h respectively then

Surface area = 2(lb + bh + lh)

Lateral surface area = 2 (l + b) × h

Volume = $l \times b \times h$

Length of the diagonal = $\sqrt{l^2 + b^2 + h^2}$



VI. CYLINDER

If a rectangle is made to revolve about its one side as its axis, the solid thus formed is called a right circular cylinder.

If a circle of radius r is placed to a height h, then a right circular cylinder is formed.

Volume $= \pi r^2 h$

Curved surface area $= 2\pi rh$

Total surface area $= 2\pi r(r + h)$

Volume of material in a hollow pipe $= \pi(R^2 - r^2)l$

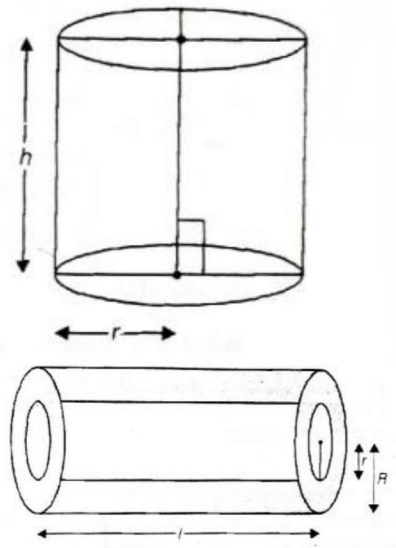
R= external radius

.r= internal radius

.l= length of the pipe

Total surface area of an open pipe $= 2\pi(Rh + rh + (R^2 - r^2)$

Radius of the base of cylinder $= \sqrt{\frac{Volume}{r \times h}}$



VII. CONE

If a right-angled triangle is revolved about one of the sides containing a right angle, the solid thus formed is called a right circular cone .

In volume, cone is $\frac{1}{3}$rd of the cylinder

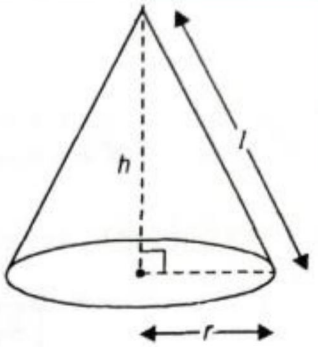
Volume $= 1/3\ \pi r^2 h$

Curved surface area $= \pi rl$

Where l= slant height

Total surface area $= \pi r(r + l)$

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



VIII. FRUSTUM OF THE CONE

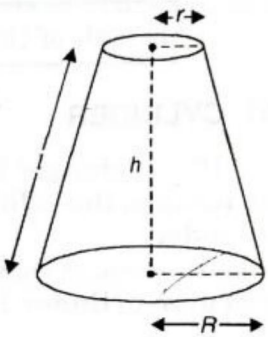
If the top of a cone is cut off by a plane parallel to the base, the remainder is called a frustum of the cone.

Slant height $l = \sqrt{h^2 + (R - r)^2}$

Curved surface area $= \pi\ (r + R)l$

Total surface area $= \pi((r + R)l + r^2 + R^2)$

Volume $= \frac{\pi h}{3}(r^2 + R^2 + rR)$



X. HEMISPHERE

A plan through the centre of the sphere divides it into two equal it into two equal part.
Each equal part is called hemisphere.

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

Curved surface area $= 2\pi r^2$

Total surface area $= 3\pi r^2$

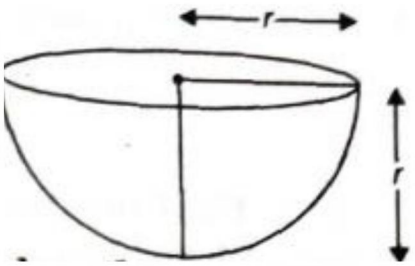
XI. CROSS SECTION

A cut, in a solid through perpendicular to its length, then it is called height is called uniform cross section. When a solid has uniform cross section then its

Volume = Area of cross section × length

Lateral surface area = Perimeter of cross section × length

Frustum of a cone and hemisphere are example of uniform cross section.



Practice Paper

1) If the length of a rectangle is 17 cm and its perimeter is 48 cm, then find the area of the rectangle.

a) 113 cm^2 b) 121 cm^2
c) 132 cm^2 d) 119 cm^2

2) The base of a parallelogram is twice its height. If the area of the Parallelogram is 72 Sq. cm, then find the height.

a) 4 cm b) 12 cm
c) 6 cm d) 8 cm

3) A rectangular piece of paper 22 x 7 cm is folded without overlapping to make a cylinder of height $\frac{7}{2}$ cm. Find the volume of the cylinder.

a) 133.50 cm^3 b) 134.50 cm^3
c) 134.75 cm^3 d) 135.70 cm^3

4) A rectangular box measures internally 1.6 m long, 1 m broad and 60 cm deep. The number of cubical blocks whose each of edge 20 cm that can be packed inside the box is.

a) 30 b) 60
c) 53 d) 120

5) The area of a trapezium shaped field is 360 m^2 , the distance between the parallel sides is 15 m and one of the parallel sides is 33 m. find the other parallel side.

a) 13 m b) 14 m
c) 16 m d) 15 m

6) A 7 m wide road runs outside around a circular park whose circumference is 176 m. Find the area of the road.

a) 1386 Sq. m b) 1472 Sq. m
c) 1512 Sq. m d) 1760 Sq. m

7) Area of a circular track having diameter 14 m is equal to.

a) 516 m^2 b) 154 m^2
c) 625 m^2 d) 308 m^2

8) The area of a △ ABC in the given figure.

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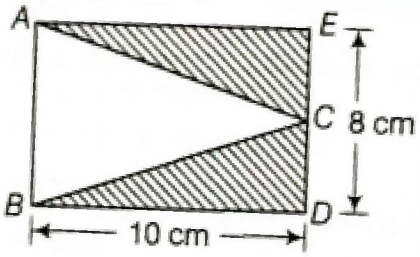


a) 50 cm^2
b) 45 cm^2
c) 55 cm^2
d) 40 cm^2

9) In the above figure, if some portion of the figure is shaded. Then, the area of shaded region is

a) 50 cm^2 b) 40 cm^2
c) 30 cm^2 d) 45 cm^2

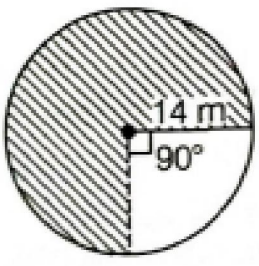
10) Area of rhombus whose one side measures 10 cm and one of the diagonals is equal to 12 cm.

a) 40 cm^2 b) 96 cm^2
c) 64 cm^2 d) 60 cm^2

11) If an edge of a cube is x cm, then its surface area is equal to.

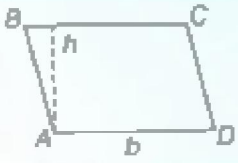
a) $7x^2$ b) $12x^2$
c) $6x^2$ d) $8x^2$

12) A framer grows crop in the shaded portion of a circular field as shown in the below figure. If radius of circular field is 14 m, then the area in which the farmer grows crop is.



a) 616 m^2
b) 462 m^2
c) 308 m^2
d) 412 m^2

13) A parallelogram is given in the figure, if DC = 10 cm and area of parallelogram is 35 cm^2 . Then, the value of h is equal to.



a) 7 cm
b) $\frac{7}{2}$ cm
c) 3 cm
d) 5 cm

14) If two circles have areas in the ratio 1 : 4 , then the ratio of their diameters will be.

a) 1 : 2 b) 2 : 1
c) 4 : 1 d) 1 : 4

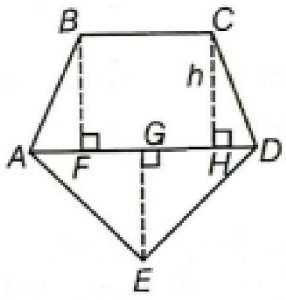
15) If area of a triangle whose all sides are equal, is $16\sqrt{3}$ cm. Then, the height of the perpendicular from the vertex to its base is.

a) $2\sqrt{3}$ cm b) $4\sqrt{3}$ cm
c) 2 cm d) 4 cm

16) Four cows are tethered with equal ropes at 4 corners of a square field of side 70 m, so that they can reach one another. Then, the area left ungrazed by cows is.

a) 1225 m^2 b) 1100 m^2
c) 1050 m^2 d) 4900 m^2

17) The area of the pentagon ABCDE, if AD = 8 cm, AH = 6 cm, AG = 4 cm, AF = 3 cm, BF = 3 cm, CH = 3 cm and EG = 2.5 cm, is.



a) 43.5 cm^2
b) 33.5 cm^2
c) 26.5 cm^2
d) 53.5 cm^2

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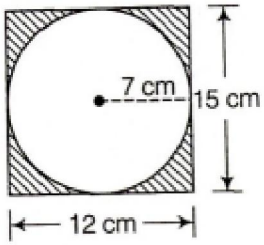
18) Assertion (A) If area of square is 64 cm^2 , then, its one side will be 4 cm.
Reason (R) Area of any square is side x side.
Which of the following statement is correct?
a) Both (A) and (R) are true and (R) is correct explanation of (A)
b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
c) (A) is true and (R) is false
d) (R) is true and (A) is false

19) Rakesh walks around a circular track of radius 7 m, with a speed of 4 km / h. If he takes 10 rounds of the track, then, how much time does he walk?
a) 6 min b) 7 min
c) 6 min 36 sec d) 6 min 30 sec

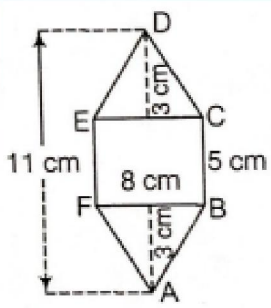
20) A field has a circular pond and a circular path along its boundary. A person walks around it exactly once keeping close to the edge. If his step is 132 cm long and he takes 400 steps to go around the field. Then, the diameter of the pond is.
a) 132 m b) 168 m
c) 154 m d) 200 m

21) in the given figure, radius of a circle is 7 cm and dimension of the ground is given in the figure. The ratio of the area of field to the area of shaded region is.



a) 90 : 13
b) 30 : 90
c) 13 : 90
d) 90 : 30

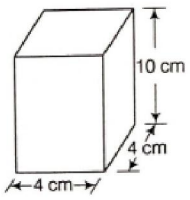
22) The area of the regular hexagon, shown in the figure,



a) 64 cm^2
b) 54 cm^2
c) 27 cm^2
d) 32 cm^2

23) A fountain pen with a cylindrical barrel of diameter 2 cm and height 10.5 cm, filled with ink can write 6600 words. How many words can be written with that pen using 200 ml of ink? (take, 1 cc = 1 ml)
a) 40000 b) 20000
c) 10000 d) 15000

24) total surface area of the given figure is .



a) 160 cm^2
b) 192 cm^2
c) 352 cm^2
d) 320 cm^2

25) The lateral surface area of a cylinder, if its total surface area is 1760 cm^2 and radius is 7 cm, is.
a) 880 cm^2 b) 1452 cm^2
c) 1840 cm^2 d) 900 cm^2

26) If we interchange the length of the base with the height of the cuboid to get another cuboid. Then, its lateral surface area will.
a) Change
b) Remain same
c) less than first cuboid
d) More than first cuboid

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27) Number of employees in an office room will be given by

a) $\frac{Perimeter}{Space\ occupied\ by\ a\ person}$

b) $\frac{volume\ of\ the\ room}{Space\ occupied\ by\ a\ person}$

c) $\frac{Surface\ of\ the\ room}{Volume}$

d) None of the above

28) The thickness of a hollow metallic cylinder is 2 cm. It is 70 cm along with outer radius of 14 cm. The volume of the metal used in making this cylinder assuming that, it is open at both ends.

a) 11440 cm^3 b) 10440 cm^3

c) 10500 cm^3 d) 9440 cm^3

29) A cuboidal tin box is opened at top, has dimensions 20 cm x 16 cm x 16 cm. The total area of metal sheet required to make such box.

a) 256 cm^2 b) 640 cm^2

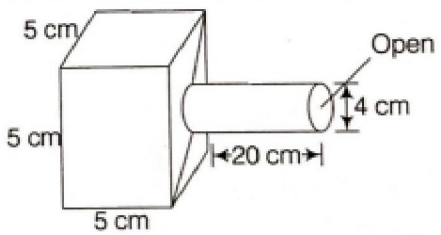
c) 1472 cm^2 d) 1792 cm^2

30) A cylindrical tank has a radius of 154 cm. It is filled with water to a height of 3 cm. If water to a height of 4.5 cm is poured into it. Then, the increase in the volume of water.
(in KL) ($1L^3 = 1KL$)

a) 1 KL b) 0.11 KL

c) 10 KL d) 2 KL

31) The surface area of the given figure,



a) 410.4 cm^2 b) 150 cm^2

c) 276.5 cm^2 d) None of these

32) The ratio between the curved surface area and the total surface area of a right circular cylinder is 1 : 2. The ratio between the height and radius of cylinder is.

a) 2 : 1 b) 1 : 2

c) 1 : 1 d) 1 : 3

33) Three cubes of side 3 cm, 4 cm and 5 cm are melted and a new cube if formed. The side of the new formed cube is.

a) 3 cm b) 4 cm

c) 6 cm d) 8 cm

34) How many soap cakes can be placed in a box of size 56 cm x 0.4 m x 0.25 m, if the size of a soap cake is 7 cm x 5 cm x 2.5 cm?

a) 200 b) 300

c) 400 d) 640

35) A metal sheet 27 cm long, 8 cm broad and 1 cm thick is melted to form a cube. The difference between the surface arears of two solids is.

a) 284 cm^2 b) 286 cm^2

c) 296 cm^2 d) 250 cm^2

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