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ST. LAWRENCE HIGH SCHOOL

A Jesuit Christian minority Institution

Subject: Mathematics **Class- X** **Date:07/05/2020**

Study material- 4

Chapter- Right Circular cylinder

Topic- Surface area, volume of right circular solid cylinder and hollow cylinder

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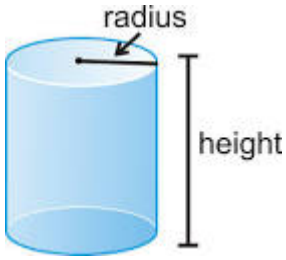
Right Circular Cylinder

A cylinder whose base is a circle is called circular cylinder. If the axis of the cylinder is perpendicular to its base then the cylinder is called a right circular cylinder.



Different formula related to a solid Right circular cylinder

Let radius of the base and height of a solid right circular cylinder be r unit and h unit respectively.

i)Lateral surface area= $2\Pi rh$ sq unit

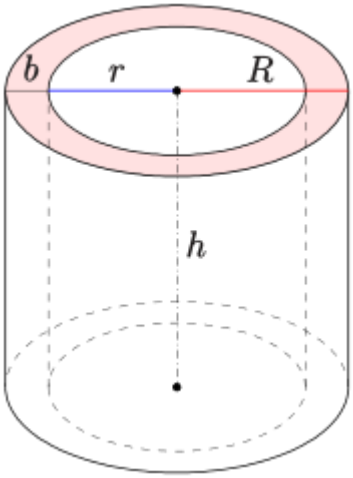
ii) Area of 2 bases= $2\Pi r^2$ sq unit

iii)Whole surface area = $(2\Pi rh+ 2\Pi r^2)$ sq unit

iv) Volume= Πr^2 h cubic unit

Right circular hollow cylinder

A right circular hollow cylinder (or cylindrical shell) is a three-dimensional region bounded by two right circular cylinders having the same axis and two parallel circular bases perpendicular to the cylinders' common axis, as in the diagram. Let the height be h, internal radius r, and external radius R.



Formula related to hollow right circular cylinder

i) **Volume(solid part) = volume of external cylinder – volume of internal radius= $\Pi h(R^2 - r^2)$ cubic unit**

ii) **Lateral surface area= External surface area + internal surface area= $2\Pi Rh + 2\Pi rh = 2\Pi h(R+r)$ sq unit**

iii) **Total surface area= Lateral surface area+ area of solid bases**

$$= [2\Pi h(R+r) + 2\Pi (R^2 - r^2)] \text{ sq unit}$$

SOLVED PROBLEMS

1) **A solid, metallic, right circular cylindrical block of radius 7 cm and height 8 cm is melted and small cubes of edge 2 cm are made from it. How many such cubes can be made from the block?**

Solution: For the right circular cylinder, we have radius (r) = 7 cm, height (h) = 8 cm.

Therefore, its volume = $\pi r^2 h$

= (22/7 × 7x7 × 8) cubic cm

= 1232 cm3

The volume of a cube = (edge) ^{3}

= 2^3 cubic cm

= 8 cubic cm

Therefore, the number of cubes that can be made = volume of the cylinder/volume of a cube = 1232/8= 154 cubes can be made (ans)

2) The height of a cylindrical pillar is 15 m. The diameter of its base is 350 cm. What will be the cost of painting the curved surface of the pillar at Rs 25 per sq m?

Solution: Here, radius = 175 cm = 1.75 m and height = 15 m

Therefore, the curved surface area of the pillar = 2πrh

= (2 × 22/7 × 1.75 × 15)sq m

= 165 sq m

Therefore, the cost of painting this area = Rs (25 × 165) = Rs 4125. (ans)

3)A hollow right circular cylinder has 5 cm external radius , 4 cm internal radius and 1188 sq cm total surface area. aehat is the height of the cylinder?

Solution: According to the problem

$2h\Pi$ (5+4) + 2Π (5^2-4^2)= 1188

Or, 22/7 (9h+9)=1188

Or, 9h +9 = 1188 x 7/22

Or, 9h= 189-9

Or, h = 180/9 =20 cm (ans)

4)A hollow right circular cylinder has 16 cm external diameter and 12 cm internal diameter. Height of the cylinder is 36 cm. After melting it few solid right circular cylinders with 2 cm diameter and 6 cm height are made. Find the numbers of solid cylinders can be made.

Solution: external radius= 8 cm , Internal radius= 6 cm, height= 36 cm

Volume of the hollow cylinder= Π(8^2 -6^2) 36= 1008 cubic cm

Radius of solid cylinder =1 cm , height= 6 cm

Volume of one solid cylinder= [Π $(1)^2$ x 6] cubic cm = 6Π cubic cm

Number of solid cylinders= 1008Π/ 6Π =168 (ans)

5)Height of a right circular cylinder is twice of its radius. If height was 6 times the radius then volume would heve been 539 cubic dcm more. Find height of the cylinder.

Solution: Let the original height is 2r dcm when radius is r dcm

Original volume= Π r^2 h= (Πr^2 X 2r) cubic dcm

New height is 6r dcm when radius is r dcm

New volume= (Πr^2 X 6r) cubic dcm

According to the problem

(Πr^2 X 6r)- (Πr^2 X 2r) =539

Or, r^3= 539 x 7/22 x ¼

Or, r^3 = $\frac{7x7x7}{2x2x2}$ therefore r= 7/2 cm =3.5 dcm

Height= (3.5x2) dcm = 7 d cm (ans)

6) Lateral surface area of a right circular cylindrical pillar is 264 sq m and volume is 924 cubic m. Find diameter and height of the pillar.

Solution: let radius and height of the pillar be r unit and h unit respectively

Volume =Πr^2h =924 cubic m ....i)

Lateral surface area = 2Πrh= 264 sq m....ii)

Dividing equation (i) by equation (ii) we get

Πr^2 h / 2Πrh=924/264

Or, r/2 = 924/ 264

Or, r= 7 cm therefore diameter is (7x2)=14m

putting r=7 in equation (ii) we get

2Π x 7x h= 264

Or, h= 6 m (ans)

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