Class 10-Mathematics

Instructions for students: The notes provided must be copied to the Maths copy and then do the homework in the same copy.

Chapter 17

MENSURATION

Right Circular Cylinder: A solid obtained by revolving a rectangular lamina about one of its sides is called a **right circular cylinder.**

The cross-sections of a right circular cylinder are circles congruent to each other.

For a right circular cylinder with radius 'r' and height 'h',

1. **Curved Surface Area (Lateral Surface Area)** = $2\pi rh$
2. **Total Surface Area** = $2\pi r(h+r)$
3. **Volume** = $\pi r^2 h$

For a Hollow Cylinder with external radius 'R', internal radius 'r' and height 'h',

1. **Thickness** = $R - r$
2. **Area of cross section** = $\pi(R^2 - r^2)$
3. **External curved surface area** = $2\pi Rh$
4. **Internal curved surface area** = $2\pi rh$
5. **Total surface area** = $2\pi Rh + 2\pi rh + 2\pi(R^2 - r^2)$
6. **Volume of the material** = $\pi(R^2 - r^2)\,h$

Exercise 17.1

4. In this case,
   The circumference of the base of the cylinder
   $= 22\text{cm}$
   $\Rightarrow 2\pi r = 22\text{cm}$
   $\Rightarrow 2\times\frac{22}{7}\times r = 22\text{cm}$
   $\Rightarrow r = \frac{22\times7}{2\times22} = 3.5\text{ cm}$

   Height of the cylinder = 16 cm

   Volume = $\pi r^2 h$

$= \frac{22}{7} \times 3.5 \times 3.5 \times 16$

$= 616\ cm^3$

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9. Curved surface area $= 4400\ cm^2$

$\Rightarrow 2\pi rh = 4400\ cm^2$ ……..(1)

Circumference of base $= 110cm$

$\Rightarrow 2\pi r = 110\ cm$ ……,(2)

Dividing (1) by (2)

$$\frac{\cancel{2\pi r}h}{\cancel{2\pi r}} = \frac{4400}{110}$$

$\Rightarrow h = 40\ cm.$

$2\pi r = 110\ cm$

$\Rightarrow 2 \times \frac{22}{7} \times r = 110\ cm$

$\Rightarrow r = \frac{110 \times 7}{2 \times 22}$

$\Rightarrow r = 17.5\ cm$

Volume $= \pi r^2 h$

$= \frac{22}{7} \times 17.5 \times 17.5 \times 40$

$= 38{,}500 cm^3$

i) Height $= 40cm$

ii) Volume $= 38{,}500\ cm^3$

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15. Ratio between curved surface area and total surface area

$= 1:2$

$$\Rightarrow \frac{\cancel{2\pi r}h}{\cancel{2\pi r}(h+r)} = \frac{1}{2}$$

$$\Rightarrow \frac{h}{h+r} = \frac{1}{2}$$

$\Rightarrow 2h = h+r$

$\Rightarrow h = r$

Now, Total surface area $= 616\ cm^2$

$\Rightarrow 2\pi r(h + r)$ = 616 cm^2

$\Rightarrow 2\pi r(r + r)$ = 616 cm^2

$\Rightarrow 4\pi r^2$ = 616 cm^2

$\Rightarrow 4 \times \frac{22}{7} \times r^2$ = 616 cm^2

$\Rightarrow r^2 = \frac{616 \times 7}{4 \times 22}$

$\Rightarrow r^2$ = 49

$\Rightarrow$ r = 7 cm

$\Rightarrow$ h = 7 cm

Volume of the cylinder = $\pi r^2 h$

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

= 1078 cm^3

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16. Let the diameters of the Jars be 3x and 4x.

Their radii are $\frac{3x}{2}$ and $\frac{4x}{2}$ = 2x respectively.

Given that their volumes are equal.

Let their heights be h1 and h2 and volumes be V1 and V2 respectively.

Now, V1 = V2

$\Rightarrow \pi\left(\frac{3x}{2}\right)^2 h1 = \pi\ (2x)^2 h2$

$\Rightarrow \frac{9x^2}{4}\ h1 = 4x^2 h2$

$\Rightarrow \frac{h1}{h2} = \frac{4 \times 4}{9}$

$\Rightarrow \frac{h1}{h2} = \frac{16}{9}$

h1: h2 = 16: 9

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18. Internal diameter of the tube = 11.2 cm

Internal radius r = 5.6 cm

Thickness of the metal = 0.4 cm

External radius R = 5.6 + 0.4

= 6 cm

Height of the tube , h = 21 cm

Volume = $\pi(R^2 - r^2)h$

= $\frac{22}{7} \times (6^2 - (5.6)^2) \times 21$

= 306.24 cm^3

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17. Size of the rectangular sheet = 30cm×18 cm

When rolled along the length let the radius and height of the cylinder formed be r1 and h1.

Height of the cylinder formed h1 = 18 cm

Circumference of the base = 30 cm

$\Rightarrow$ $2\pi r$ = 30 cm

$\Rightarrow 2 \times \frac{22}{7} \times r1$ = 30cm

$\Rightarrow$ r1 = $\frac{30\times7}{2\times22}$

$\Rightarrow$ r1 = $\frac{105}{22}$ cm (Simplified)

Volume = $\pi r^2 h$

= $\frac{22}{7} \times \frac{105}{22} \times \frac{105}{22} \times 18$

V1 = $\frac{15\times105\times9}{11}$ cm^3 (not necessary to multiply)

When rolled along the breadth let the radius and height of the cylinder formed be r2 and h2.

Height of the cylinder formed h2 = 30 cm

Circumference of the base= 18 cm

$\Rightarrow$ $2\pi r$ = 18 cm

$\Rightarrow 2 \times \frac{22}{7} \times r2$ = 18cm

$\Rightarrow$ r2 = $\frac{18\times7}{2\times22}$

$\Rightarrow$ r2 = $\frac{63}{22}$ cm (Simplified)

Volume = $\pi r^2 h$

= $\frac{22}{7} \times \frac{63}{22} \times \frac{63}{22} \times 18$

V2 = $\frac{9 \times 63 \times 15}{11}$ cm^3 (not necessary to multiply)

V1:V2 = $\frac{\frac{15 \times 105 \times 9}{11}}{\frac{9 \times 63 \times 15}{11}}$

= $\frac{15 \times 105 \times 9}{11} \times \frac{11}{9 \times 63 \times 15}$

= $\frac{\cancel{15} \times 105 \times \cancel{9}}{\cancel{11}} \times \frac{\cancel{11}}{\cancel{9} \times 63 \times \cancel{15}}$

= $\frac{105}{63}$ = 5:3

Home Work: Complete **Exercise 17.1** in the Maths copy.

(Solve all the problems)