Class X Maths Mock Test 05

Ch – Surface Area & Volume And Area Related To Circles

ANSWER KEY

1	(b)
2	(c)
3	(a)
4	(c)
5	(c)
6	(a)
7	(a)
8	(a)
9	(d)
10	(c)
11	Here $2\pi r = 22$ cm $2 \times \frac{22}{7} \times r = 22$ $\Rightarrow r = 22 \times \frac{7}{22} \times \frac{1}{2} = \frac{7}{2}$ cm $\therefore$ Area of quadrant of circle $= \frac{1}{4}\pi r^2$ $= \frac{1}{4} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$ $= \frac{77}{8}$ cm^2 **OR**

Given:

Length of the arc $= 8.8$ cm

And,

$\theta = 30°$

Now,

Length of the arc $= \frac{2\pi r\theta}{360}$

$\Rightarrow 8.8 = \frac{2 \times \frac{22}{7} \times r \times 360}{360}$

$\Rightarrow r = \frac{8.8 \times 360 \times 7}{44 \times 30}$

$\therefore r = 16.8$ cm

Length of the pendulum = 16.8 cm

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Formulate the Area Equation

The shaded region is the area of the large circle minus the area of the small circle.

- Area of large circle $= \pi R^2$
- Area of small circle $= \pi r^2$

$$A = \text{Area of large circle} - \text{Area of small circle}$$

$$A = \pi R^2 - \pi r^2$$

$$A = \pi(R^2 - r^2)$$

2. Apply the Difference of Squares Identity

The term $(R^2 - r^2)$ can be factored using the difference of squares identity, $a^2 - b^2 = (a - b)(a + b)$.

$$A = \pi(R - r)(R + r)$$

3. ➡️ Substitute Known Values

We know the value of A and $(R - r)$, and we can use $\pi = \frac{22}{7}$.

$$286 = \frac{22}{7} \times (7) \times (R + r)$$

4. ➗ Solve for the Sum of the Radii $(R + r)$

The 7 in the numerator and the 7 in the denominator cancel out:

$$286 = 22 \times (R + r)$$

Now, divide both sides by 22 to find the sum of the radii:

$$R + r = \frac{286}{22}$$

$$R + r = 13 \text{ cm}$$

OR

Diameter of the wheel = 60 cm

∴ Radius of the wheel = 30 cm

circumference of the wheel = $2\pi r$

$= 2 \times \frac{22}{7} \times 30$

$= \frac{1320}{7}$ cm

Distance covered by the wheel in 1 revolution $= \frac{1320}{7}$cm

∴ Distance covered by the wheel in 140 revolutions$= \left(\frac{1320}{7} \times 140 \times \frac{1}{100}\right)$ m

$= \left(\frac{1320 \times 140}{7 \times 1000} \times \frac{1}{100}\right)$ Km $= \frac{264}{1000}$ Km

Now,

Distance covered by the wheel in 1 minute = Distance covered by the wheel in 140 revolutions $= \frac{264}{1000}$km

∴ Distance covered by the wheel in 1 hour $= \frac{264}{1000} \times 60 = 15.84$ Km/h

Hence, the speed at which the boy is cycling is 15.84 km/h.

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Assumes the radius of the circle as r cm and writes the equation for the area as:

$120\pi = 300/360 \times \pi \times r^2$

$\Rightarrow r = 12$ cm

Finds the length of ribbon required as:

$(300/360 \times 2 \times \pi \times 12) + 24$ cm $= (20\pi + 24)$ cm

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Let r and R be the radii of inner and outer surface of a cylinder.

Given, height of cylinder (h) = 14 cm

Volume of cylinder (V) = 176 cm^3

and R – r = 1 cm ...(i)

$\because V = 176\ cm^2$

$\pi (R^2 - r^2) h = 176$

$\frac{22}{7}(R^2 - r^2) \times 14 = 176$

$R^2 - r^2 = \frac{176 \times 7}{22 \times 14} = 4$

$\Rightarrow (R - r)(R + r) = 4$

$\Rightarrow 1(R + r) = 4$

$\Rightarrow R + r = 4 \quad ...(ii)$

On solving eq. (i) and (ii), we get

$2R = 5$

$R = \frac{5}{2}$ cm

$= 2.5$ cm

From (i), $r = R - 1$

$r = \frac{5}{2} - 1 = \frac{3}{2} = 1.5$ cm

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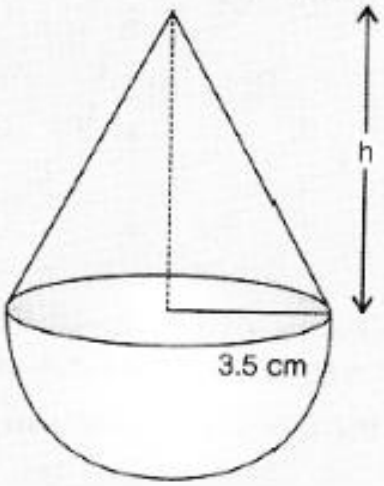
Given, radius of cone = radius of hemisphere = r

$r = 3.5$ cm.

Total volume, $V = 166\frac{5}{6}\text{ cm}^3 = \frac{1001}{6}\text{ cm}^3$

Let the height of cone be h.

Total volume = Volume of cone + Volume of hemisphere



$$\frac{1001}{6} = \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$$

or, $$\frac{1001}{6} = \frac{1}{3}\pi(3.5)^2 h + \frac{2}{3}\pi(3.5)^3$$

$$\text{or,} \quad \frac{1001}{6} = \frac{1}{3}\pi[12.25\,h + 2\times 42.875]$$

$$\text{or,} \quad \frac{1001\times 3\times 7}{6\times 22} = 12.25h + 85.75$$

$$\text{or,} \quad \frac{21021}{132} = 12.25h + 85.75$$

$$\text{or,} \quad 12.25\,h = 159.25 - 85.75$$

$$\text{or,} \quad h = \frac{73.5}{12.25} = 6$$

Height of the toy = 6 +3.5 = 9.5 cm.

$$\text{Surface area of hemisphere} = 2\pi r^2$$
$$= 2 \times \frac{22}{7}\times 3.5\times 3.5$$
$$= 77 \text{ cm}^2$$
$$\text{Cost of painting} = 10 \times 77$$
$$= ₹\ 770$$

OR

Total height of tent =27 m

Height of cylindrical part = 6 m

$$\therefore \text{ Height of conical part} = 27 - 6 = 21 \text{ m}$$

$$\text{Slant height of cone} = \frac{56}{2} = 28 \text{ m}$$

$$\text{Slant height of cone} = \sqrt{r^2 + h^2}$$
$$= \sqrt{28^2 + 21^2}$$
$$= \sqrt{784 + 441} = \sqrt{1225}$$
$$= 35 \text{ m}$$
$$\text{Area of canvas used} = 2\pi rh + \pi rl$$
$$= \pi r(2h + l)$$
$$= \frac{22}{7}\times 28(2\times 6 + 35)$$

= 22 x 4 x 47

= 4136 m^2

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: the diameter of the half cylinder is 7 m and its height is 15 m.

required volume = volume of the cuboid +1/2 volume of the cylinder
= 15×7×8+1/2×22/7×7/2×7/2×15=1128.75 ------ (2 m)
=1128.75m^3 -------- (½ m)

Amount of metal required = $\pi rh + \pi r^2 + 2h(l + b) + lb$
= 11 x 15 + 38.5 + 16 x 22 + 15 x 7
= 165 + 38.5 + 352 + 85 ------- (2m)
= 640.5 sq cm ------- (½ m)

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Convert the brick dimensions from centimeters (cm) to meters (m):

- **Length (l):** $25\ \text{cm} = 0.25\ \text{m}$
- **Width (w):** $12.5\ \text{cm} = 0.125\ \text{m}$
- **Height (h):** $7.5\ \text{cm} = 0.075\ \text{m}$

$$V_{\text{brick}} = l \times w \times h$$

$$V_{\text{brick}} = 0.25\ \text{m} \times 0.125\ \text{m} \times 0.075\ \text{m}$$

$$V_{\text{brick}} = 0.00234375\ \text{m}^3$$

$$\text{Number of Bricks}(N) = \frac{\text{Volume occupied by Bricks}}{\text{Volume of one Brick}}$$

$$N = \frac{V_{\text{bricks}}}{V_{\text{brick}}}$$

$$N = \frac{228\ \text{m}^3}{0.00234375\ \text{m}^3}$$

$$N = 97280$$

OR

Step 1: Convert all units to a consistent system and define variables

We will use meters (m) for length and minutes (min) for time

- Pipe internal diameter: $D_p = 20\ \text{cm} = 0.2\ \text{m}$. Radius: $r_p = 0.1\ \text{m}$.
- Water flow rate (speed): $v = 6\ \text{km/h} = \frac{6000\ \text{m}}{60\ \text{min}} = 100\ \text{m/min}$.
- Tank diameter: $D_T = 10\ \text{m}$. Radius: $R_T = 5\ \text{m}$.
- Tank depth (height): $H_T = 2\ \text{m}$.
- Let T be the time taken to fill the tank in minutes.

Step 2: Calculate the total volume of the cylindrical tank

The volume of a cylinder is given by the formula $V = \pi r^2 h$.

The volume of the tank (V_T) is:

$$V_T = \pi R_T^2 H_T$$

$$V_T = \pi(5\ \text{m})^2(2\ \text{m})$$

$$V_T = 50\pi\ \text{m}^3$$

Step 3: Calculate the volume of water flowing through the pipe per minute

The volume of water flowing through the pipe per unit time (volumetric flow rate, Q) can be calculated using the pipe's cross-sectional area and the flow speed.

The volume of water that flows in one minute is the volume of a cylinder with the pipe's radius (r_p) and a length equal to the distance the water travels in one minute ($v \times 1\ \text{min} = 100\ \text{m}$).

$$Q = \pi r_p^2 v$$

$$Q = \pi(0.1\ \text{m})^2(100\ \text{m/min})$$

$$Q = \pi(0.01\ \text{m}^2)(100\ \text{m/min})$$

$$Q = \pi\ \text{m}^3/\text{min}$$

Step 4: Determine the time required to fill the tank

The time (T) it takes to fill the tank is the total volume of the tank divided by the volumetric flow rate:

$$T = \frac{V_T}{Q}$$

$$T = \frac{50\pi\ \text{m}^3}{\pi\ \text{m}^3/\text{min}}$$

$$T = 50\ \text{min}$$

18	(i)r=10cm (ii)(a)16.2cm^2 **or** (b)157 (iv)31.4
19	(i)297/cm^2 (ii)22/15(84^o) (Iii)(a)66/7cm^2 **or** (b)396/7cm^2