Exercise 13.3

6. How many silver coins, 1.75 cm in diameter and of thickness 2 mm, must be melted to form a cuboid of dimensions $5.5\text{ cm} \times 10\text{ cm} \times 3.5\text{ cm}$?

Ans. For silver coin, Diameter = 1.75 cm

$\therefore$ Radius $(r) = \frac{1.75}{2} = \frac{7}{8}$ cm and Thickness $(h) = 2$ mm $= \frac{1}{5}$ cm

For cuboid, Length $(l) = 5.5$ cm, Breadth $(b) = 10$ cm and Height $(h') = 3.5$ cm

Let n coins be melted.

Then, According to question,

Volume of n coins = Volume of cuboid

$$\Rightarrow n \times \pi r^2 h = l \times b \times h'$$

$$\Rightarrow n \times \pi \left(\frac{7}{8}\right)^2 \times \left(\frac{1}{5}\right) = 5.5 \times 10 \times 3.5$$

$$\Rightarrow n \times \frac{22}{7} \times \frac{49}{64} \times \frac{1}{5} = 5.5 \times 10 \times 3.5$$

$$\Rightarrow n = \frac{5.5 \times 10 \times 3.5 \times 7 \times 64 \times 5}{22 \times 49}$$

$$\Rightarrow n = 400$$

7. A cylindrical bucket, 32 cm and high and with radius of base 18 cm, is filled with sand. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm, find the radius and slant height of the heap.

Ans. For cylindrical bucket, Radius of the base (r) = 18 cm and height (h) = 32 cm

$\therefore$ Volume = $\pi r^2 h = \pi(18)^2 \times 32$

$= 10368\pi \ cm^3$

For conical heap, Height (h') = 24 cm

Let the radius be r_1 cm.

Then, Volume = $\frac{1}{3}\pi r_1^2 h'$

$= \frac{1}{3} \times \pi \times r_1^2 \times 24 = 8\pi r_1^2 \ cm^3$

According to question, Volume of bucket = Volume of conical heap

$\Rightarrow 10368\pi = 8\pi r_1^2$

$\Rightarrow r_1^2 = \frac{10368\pi}{8\pi} = 1296$

$\Rightarrow r_1 = 36$ cm

Now, Slant height $(l) = \sqrt{(r_1)^2 + (h')^2}$

$= \sqrt{(36)^2 + (24)^2} = \sqrt{1296 + 576}$

$= \sqrt{1872} = 12\sqrt{13}$ cm

8. Water in a canal 6 m wide and 1.5 m deep is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed?

Ans. For canal, Width = 6 m and Depth

$= 1.5 \text{ m} = \frac{3}{2} \text{ m}$

Speed of flow of water = 10 km/h

$= 10 \times 1000 \ m/h = 10000 \text{ m/h}$

$= \frac{10000}{60} \text{ m/min} = \frac{500}{3} \text{ m/min}$

$\therefore$ Speed of flow of water in 30 minutes

$= \frac{500 \times 30}{3} \text{ m/min}$

$\therefore$ Volume of water that flows in 30 minutes

$= 6 \times \frac{3}{2} \times 5000 = 45000 \ m^3$

$\therefore$ The area it will irrigate $= \frac{45000}{\left(\frac{8}{100}\right)} = \frac{4500000}{8}$

$= 562500 \ m^2$

$= \frac{562500}{10000} \text{ hectares} = 56.25 \text{ hectares}$

9. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in her field, which is 10 m in diameter and 2 m deep. If water flows through the pipe at the rate of 3 km/h, in how much time will the tank be filled?

Ans. For cylindrical tank, Diameter = 10 m

$\therefore$ Radius $(r) = \frac{10}{2}$ = 5 m and Depth (h) = 2 m

$\therefore$ Volume = $\pi r^2 h = \pi(5)^2 \times 2 = 50\pi m^3$

Rate of flow of water (h') = 3 km/h = 3000 m/h = $\frac{3000}{60}$ m/min = 50 m/min

For pipe, Internal diameter = 20 cm, therefore radius (r_1) = 10 cm = 0.1 m

$\therefore$ Volume of water that flows per minute = $\pi(r_1)^2 h'$

$= \pi(0.1)^2 \times 50 = \frac{\pi}{2} m^3$

$\therefore$ Required time = $\frac{50\pi}{\pi/2}$ = 100 minutes

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