TOPIC

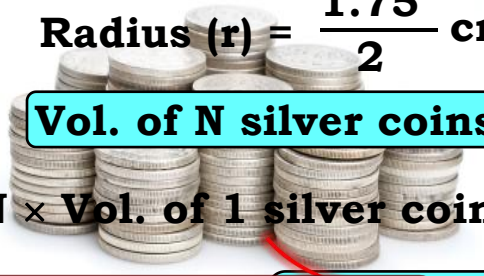
- Sum based on Cylinder
- Sum based on Cylinder and Cuboid

SURFACE AREAS AND VOLUMES

- **Sum based on Cylinder and Cuboid**

Q. How many silver coins, 1.75 cm in diameter and of thickness 2mm, must be melted to form a cuboid of dimensions 5.5 cm × 10 cm × 3.5 cm?

Sol. Radius (r) = $\frac{1.75}{2}$ cm



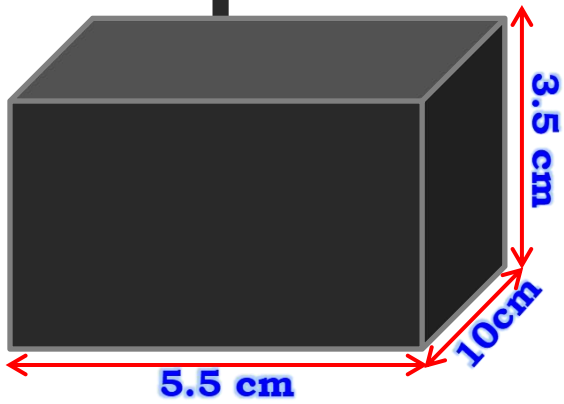
Vol. of N silver coins = Vol. of Cuboid

N × Vol. of 1 silver coin = Vol. of Cuboid

$N = \frac{\text{Vol. of cuboid}}{\text{Vol. of 1 silver coin}}$

Silver coins are melted to form a cuboid

1.75 cm



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$$N = \frac{\text{Vol. of cuboid}}{\text{Vol. of 1 silver coin}}$$

Sol. Radius (r) = $\frac{1.75}{2}$ cm

W What is the shape of silver coins?

Cylinder

Vol. of cuboid = $l \times b \times h_1$

$= 5.5 \times 10 \times 3.5$

$\therefore$ Vol. of cuboid = $\frac{55}{10} \times 10 \times \frac{35}{10}$ cm^3

Vol. of 1 silver coin = $\pi r^2 h_2$

$\therefore$ Vol. of 1 silver coin = $\frac{22}{7} \times \frac{1.75}{2} \times \frac{1.75}{2} \times \frac{2}{10}$

Q. How many silver coins, 1.75 cm in diameter and of thickness 2mm, must be melted to form a cuboid of dimensions 5.5 cm × 10 cm × 3.5 cm?

$$N = \frac{\text{Vol. of cuboid}}{\text{Vol. of 1 silver coin}}$$

Sol. $\text{Vol. of 1 silver coin} = \frac{22}{7} \times \frac{1.75}{2} \times \frac{1.75}{2} \times \frac{2}{10}$

$$\therefore \text{Vol. of 1 silver coin} = \frac{22}{7} \times \frac{175}{200} \times \frac{175}{200} \times \frac{2}{10}$$

$$N = \frac{\text{Vol. of cuboid } (V_1)}{\text{Vol. of 1 silver coin } (V_2)}$$

$$\therefore \quad N = \frac{\frac{55}{10} \times 10 \times \frac{35}{10}}{\frac{22}{7} \times \frac{175}{200} \times \frac{175}{200} \times \frac{2}{10}}$$

$$\text{Vol. of cuboid} = \frac{55}{10} \times 10 \times \frac{35}{10}\ \text{cm}^3$$

Q. How many silver coins, 1.75 cm in diameter and of thickness 2mm, must be melted to form a cuboid of dimensions 5.5 cm × 10 cm × 3.5 cm?

$$N = \frac{\text{Vol. of cuboid}}{\text{Vol. of 1 silver coin}}$$

Sol.

$$N = \frac{\frac{55}{10} \times 10 \times \frac{35}{10}}{\frac{22}{7} \times \frac{175}{200} \times \frac{175}{200} \times \frac{2}{10}}$$

$$= \frac{\cancel{55}^{5}}{\cancel{10}} \times \cancel{10} \times \frac{\cancel{35}}{\cancel{10}} \times \frac{\cancel{7}}{\cancel{22}_{11}} \times \frac{\cancel{200}^{\cancel{40}^{20}}}{\cancel{175}_{\cancel{35}}} \times \frac{\cancel{200}^{\cancel{40}^{\cancel{8}^{4}}}}{\cancel{175}_{\cancel{35}_{\cancel{5}}}} \times \frac{\cancel{10}}{\cancel{2}}$$

$$= 5 \times 20 \times 4$$

$$= 400$$

$\therefore$ **400 coins must be melted.**

SURFACE AREAS AND VOLUMES

- **Sum based on Cylinder and Cone**

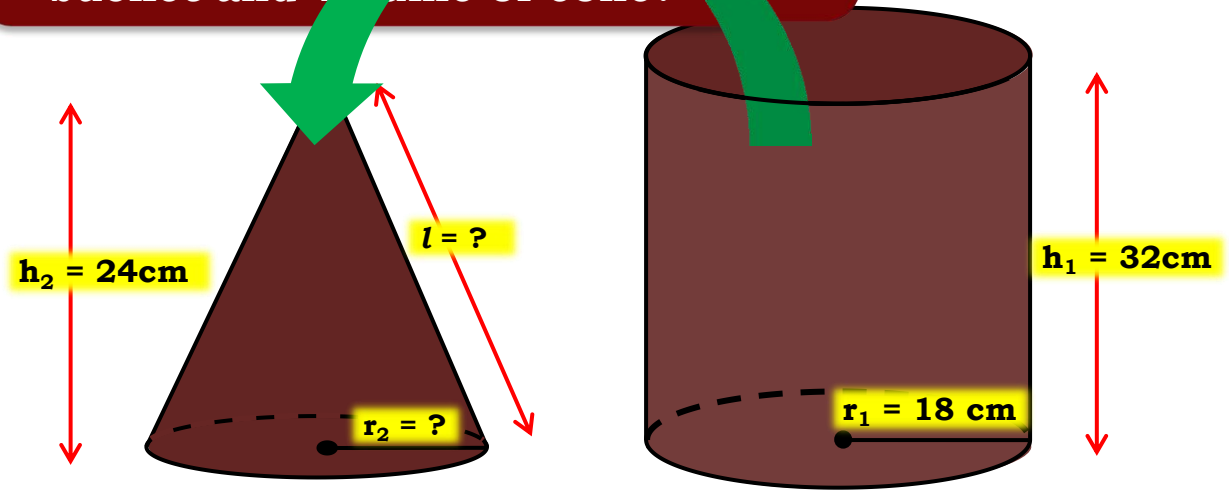
Q. A cylindrical bucket, 32 cm high and with radius of base 18 cm, is filled with sand. This bucket is emptied on the ground and a conical h[illegible]nd is fo[illegible] height of the conical heap is 24 cm, [illegible] the radius and slan[illegible]eight of the heap.

$\pi r_1^2 h_1$ ✓ ✓ $\quad \frac{1}{3} \times \pi r_2^2 h_2$? ✓

Vol. of cylindrical bucket (V_1)	=	Vol. of cone (V_2)

What is the relation between the volume of the cylindrical bucket and volume of cone?

They are equal



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$\pi r_1^2 h_1$ $\frac{1}{3} \times \pi r_2^2 h_2$?

Vol. of cylindrical bucket (V_1) = Vol. of cone (V_2)

Sol.

Vol. of cylindrical bucket = Vol. of the cone

$$\therefore \quad \pi \times r_1^2 \times h_1 = \frac{1}{3} \times \pi \times r_2^2 \times h_2$$

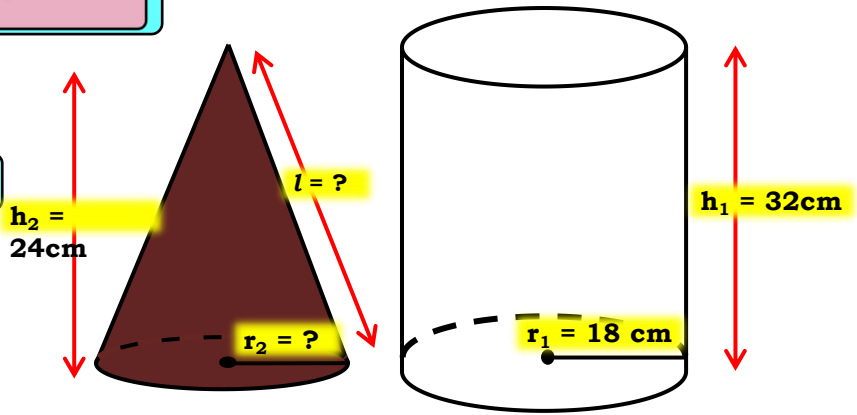
$$\therefore \quad 18 \times 18 \times 32 = \frac{1}{3} \times r_2^2 \times 24$$

$$\therefore \quad \frac{18 \times 18 \times 32 \times 3}{24} = r_2^2$$

$$\therefore \quad r_2^2 = 3 \times 18 \times 8 \times 3$$

$$\therefore \quad r_2^2 = 3 \times 3 \times 3 \times 2 \times 2 \times 2 \times 2 \times 3$$

$$\therefore \quad r_2 = 3 \times 3 \times 2 \times 2$$



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

$\pi r_1^2 h_1$ | $\frac{1}{3} \times \pi r_2^2 h_2$

Vol. of cylindrical bucket (V_1) = Vol. of cone (V_2)

Sol.

$$r_2 = 3 \times 3 \times 2 \times 2$$

$$\therefore \quad r_2 = 36 \text{ cm}$$

$\therefore$ Radius of the heap is 36 cm

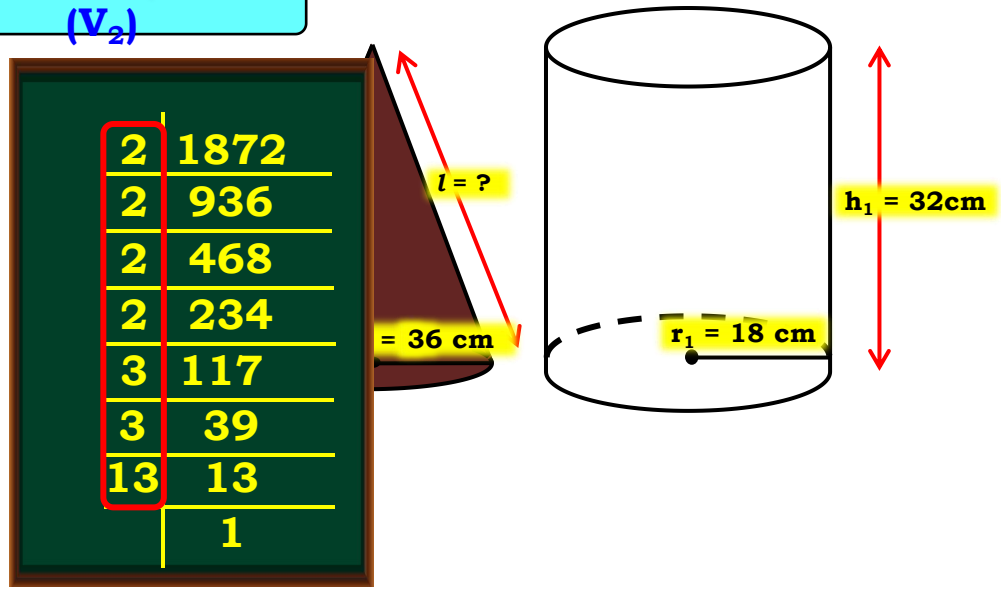
Now, let us find slant height of the cone

What is the formula to find slant height (l) ? $l^2 = r^2 + h^2$

$$\therefore \quad l = \sqrt{1872}$$

$$\therefore \quad l = \sqrt{2\times2\times2\times2\times3\times3\times13}$$

2	1872
2	936
2	468
2	234
3	117
3	39
13	13
	1



Q. A cylindrical bucket, 32 cm 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.

Vol. of cylindrical bucket (V_1) = Vol. of cone (V_2)

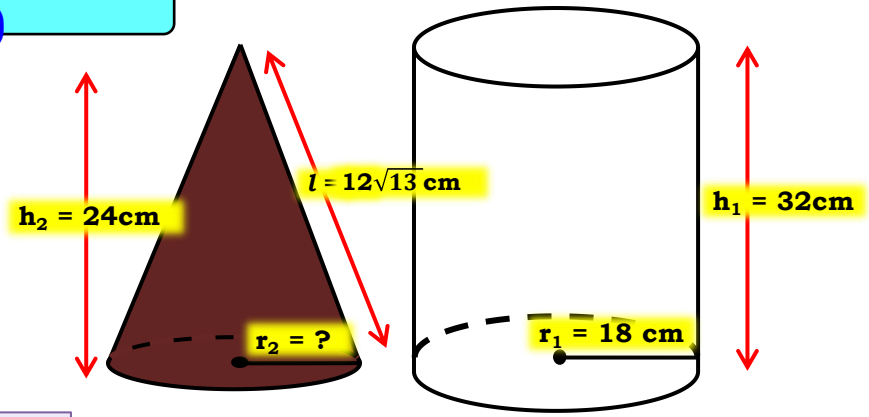
Sol.

$$l = \sqrt{2\times2\times2\times2\times3\times3\times13}$$

$$\therefore \quad l = 2 \times 2 \times 3\sqrt{13}$$

$$\therefore \quad l = 12\sqrt{13}$$

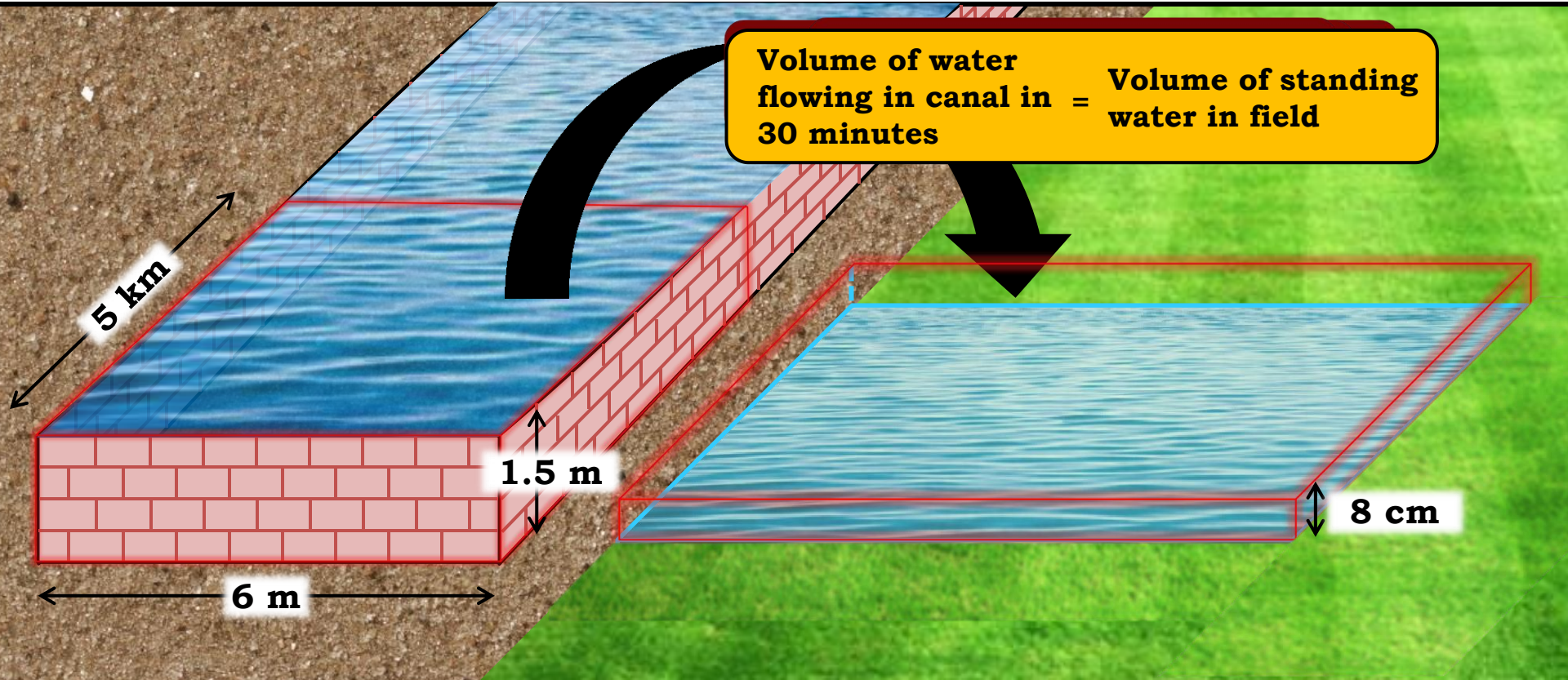
$\therefore$ **Slant height of the heap is $12\sqrt{13}$ cm.**



SURFACE AREAS AND VOLUMES

- **Sum based on Cuboid**

Q. 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?



Q. W… canal, 6 m wide and 1.5 m deep, is flowing with a sp… 0 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed?

$\frac{8}{100}$ m

W… We know that, Area = $l \times b$ …a to find …oid?

Sol. Length of the water flowing in 1 hour = 1…

∴ Length of the water flowing in 30 minutes (l) = $\frac{\quad}{2}$

= 5 km

= 5 × 1000 m

∴ Length of the water flowing in 30 minutes (l) = 5000 m

Volume of water flowing in canal in 30 minutes = Volume of standing water in field

∴ $l \times b \times h = l_1 \times b_1 \times h_1$

∴ Volume of water flowing in canal in 30 minutes = Volume of standing water in field

∴ $5000 \times 6 \times 1.5 = \text{Area} \times \frac{\quad}{100}$

Q. 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?

1 hectare = 10,000 m²

Sol. $5000 \times 6 \times 1.5 = \text{Area} \times \frac{8}{100}$

$\therefore \quad \text{Area} = (5000 \times 6 \times 1.5) \div \frac{8}{100}$

$= \frac{\overset{2500}{\cancel{5000}}}{} \times \overset{3}{\cancel{6}} \times \frac{15}{\cancel{10}} \times \overset{5}{\frac{\cancel{100}}{\cancel{8}_{\cancel{4}\,\cancel{2}}}}$

$= 2500 \times 3 \times 75$

$\therefore \quad \text{Area} = 562500 \text{ m}^2$

$= \frac{562\cancel{500}}{1000\cancel{0}}$

$= \frac{5625}{100}$

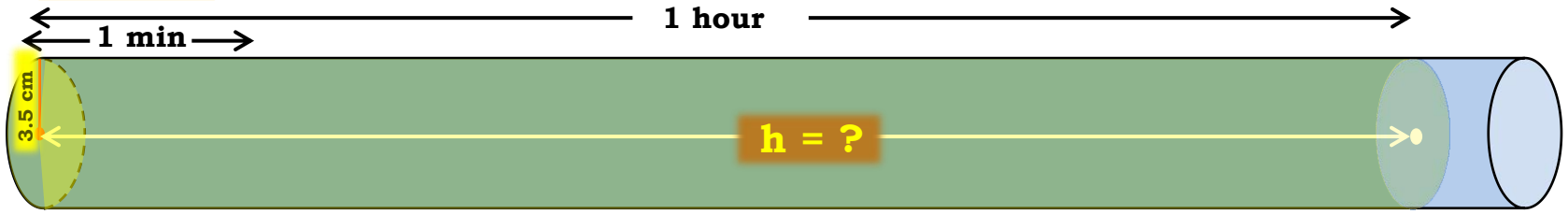
$= 56.25 \text{ hectares}$

$\therefore$ **Area irrigated will be 562500 m² or 56.25 hectares.**

SURFACE AREAS AND VOLUMES

- **Sum based on Cylinder**

Q. A cylindrical pipe has inner diameter of 7 cm and water flows through it at 192.5 litres per minute. Find the rate of flow in kilometers per hour.



Sol. Radius = $\frac{7}{2}$ = 3.5 cm

Vo…in = 192.5 litres

What is formula to find volume of cylinder ?

$\pi r^2 h$

V…our = 192.5 × 60 litres

= 11550 × 1000 cm^3

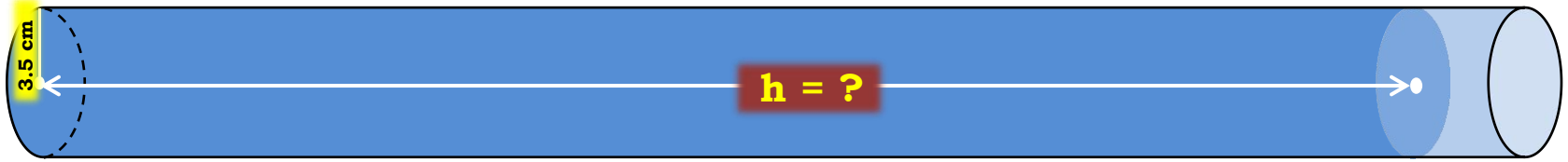
Volume of water flowing in 1 hour = 11550000 cm^3

Volume of water flowing 1 hour = **Vol. of cylinder**

11550000 = $\pi r^2 h$

Q. A cylindrical pipe has inner diameter of 7 cm and water flows through it at 192.5 litres per minute. Find the rate of flow in kilometers per hour.

$$\text{Radius} = \frac{7}{2} = 3.5 \text{ cm}$$



Sol.

$$11550000 = \pi r^2 h$$

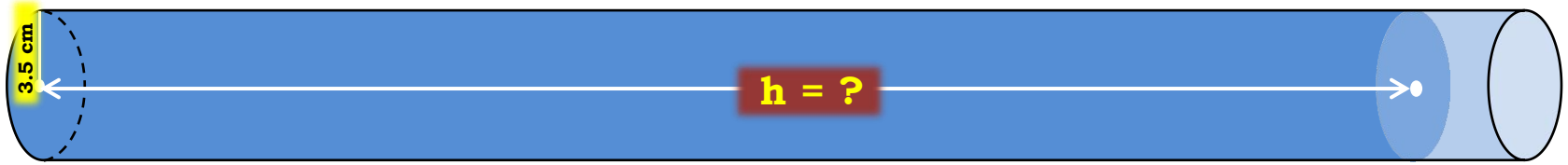
$$\therefore \quad 11550000 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times h$$

$$\therefore \quad h = \frac{11550000 \times 7 \times 2 \times 2}{22 \times 7 \times 7}$$

$$\therefore \quad h = \frac{\overset{15}{\cancel{105}}\cancel{1155} \times 10000 \times \cancel{7} \times \cancel{2} \times 2}{\cancel{22}\,\cancel{2} \times \cancel{7} \times \cancel{7}}$$

$$\therefore \quad h = 15 \times 10000 \times 2$$

Q. A cylindrical pipe has inner diameter of 7 cm and water flows through it at 192.5 litres per minute. Find the rate of flow in kilometers per hour.



Sol. $h = 15 \times 10000 \times 2$

$\therefore \quad h = 300000 \text{ cm}$

1 km = 100000 cm

$h = \frac{300000}{100000}$

$\therefore \quad h = 3 \text{ km}$

$\therefore$ **The rate of flow of water is 3 km per hour.**

SURFACE AREAS AND VOLUMES

- **Sum based on Cylinder and Cuboid**

Q. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in his 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?

Sol.

Radius of pipe (r) = 10 cm = $\frac{1}{10}$ m

If the volume of cylindrical tank is 5000 litres

Height of tank (H) = 2 m

Length of water flowing in 1 hour = 3000 m

Then, what will be the time taken ?

If the volume of water flowing in tank in 1hr is 1000 litres

Time = 5

5000 litres

1000 litres/hr

2 m

10 m

Q. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in his 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?

$$\text{Time taken} = \frac{\text{Vol. of cylindrical tank}}{\text{Vol. of water flowing in 1hr}}$$

What is the formula to find Volume of cylinder? $\pi R^2 h$

Sol. $r = \frac{1}{10}$ m, $R = 5$ m, $H = 2$ m, $h = 3000$ m

$$\text{Vol. of cylindrical tank} = \pi R^2 H$$
$$= \pi \times 25 \times 2$$
$$\therefore \text{Vol. of cylindrical tank} = 50\pi \text{ m}^3$$

$$\text{Vol. of water flowing in 1hr} = \pi r^2 h$$
$$= \pi \times \frac{1}{10} \times \frac{1}{10} \times 3000$$
$$\therefore \text{Vol. of water flowing in 1hr} = (30\pi) \text{ m}^3$$

Q. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in his 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?

$$\text{Time taken} = \frac{\text{Vol. of cylindrical tank}}{\text{Vol. of water flowing in 1hr}}$$

Sol. $$\text{Time taken} = \frac{\text{Vol. of cylindrical tank}}{\text{Vol. of water flowing in 1hr}}$$

$$= \frac{50\pi}{30\pi}$$

$$= \frac{5}{3}$$

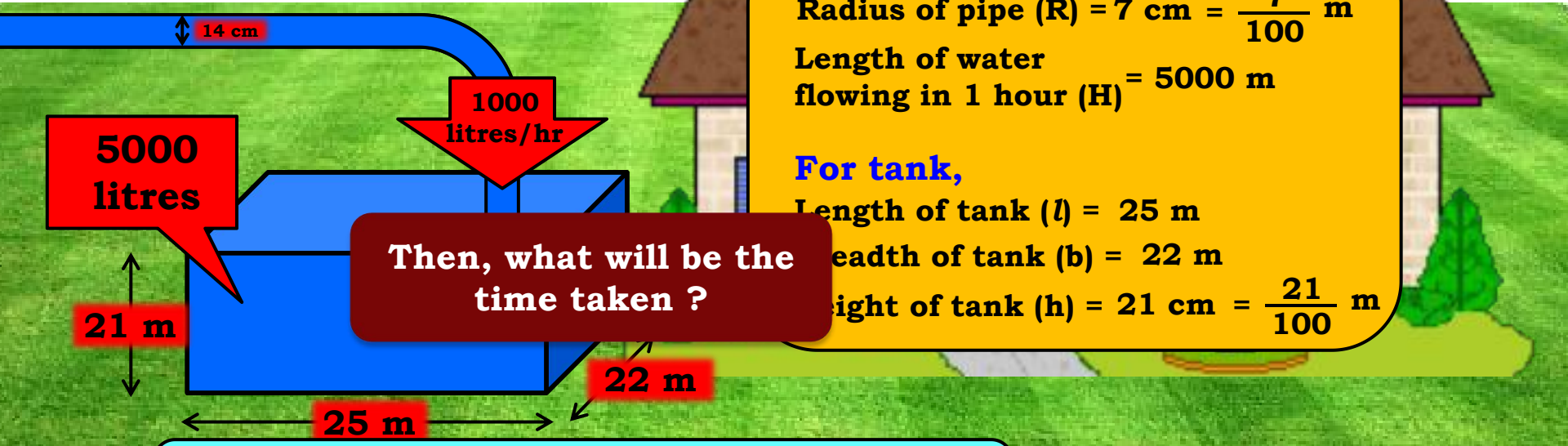
$$5$$

Vol. of water in tank = 50 π m³

Vol. of water flowing in 1hr = 30 π m³

∴ **Time taken to fill the tank is 100 minutes.**

Q. Water is flowing at the rate of 5 km per hour through a pipe of diameter 14 cm into a rectangular tank which is 25 m long and 22 m wide. Determine the time in which the level of water in the tank will rise by 21 cm. (Take = 22/7)



For pipe,

Radius of pipe (R) = 7 cm = $\frac{7}{100}$ m

Length of water flowing in 1 hour (H) = 5000 m

For tank,

Length of tank (l) = 25 m

Breadth of tank (b) = 22 m

Height of tank (h) = 21 cm = $\frac{21}{100}$ m

Then, what will be the time taken ?

i.e. Vol. of rectangular tank = 5000/100 Vol. of water flowing in 1hr (H)

$$\text{Time taken} = \frac{\text{Vol. of rectangular tank}}{\text{Vol. of water flowing in 1hr}} = \frac{5000}{1000} = 5$$

Q. Water is flowing at the rate of 5 km per hour through a pipe of diameter 14 cm into a rectangular tank which is 25 m long and 22 m wide. Determine the time in which the level of water in the tank will rise by 21 cm. (Take = 22/7)

$$\text{Time taken} = \frac{\text{Vol. of rectangular tank}}{\text{Vol. of water flowing in 1hr}}$$

What is the formula to find Volume of cylinder?

$\pi R^2 H$

Sol. For pipe, $R = \frac{7}{100}$ m, $H = 5000$ m.

For tank, $l = 25$m, $b = 22$m, $h = \frac{21}{100}$ m

Vol. of rectangular tank $= l \times b \times h$

Vol. of rectangular tank $= 25 \times 22 \times \frac{21}{100}$ m^3

Vol. of water flowing in 1hr $= \pi R^2 H$

$= \pi \times \frac{7}{\cancel{100}_{2}} \times \frac{7}{\cancel{100}} \times \cancel{5000}$

$\therefore$ Vol. of water flowing in 1hr $= \frac{4}{2}\pi$ m^3

Q. Water is flowing at the rate of 5 km per hour through a pipe of diameter 14 cm into a rectangular tank which is 25 m long and 22 m wide. Determine the time in which the level of water in the tank will rise by 21 cm. (Take π = 22/7)

$$\text{Time taken} = \frac{\text{Vol. of rectangular tank}}{\text{Vol. of water flowing in 1hr}}$$

Sol. Time taken $= \dfrac{\text{Vol. of rectangular tank}}{\text{Vol. of water flowing in 1hr}}$

$$= 25 \times 22 \times \frac{21}{100} \div \frac{4}{2}\pi$$

$$= 25 \times 22 \times \frac{21}{100} \div \frac{4}{2} \times \frac{2}{7}$$

$$\text{Vol. of water in tank} = 25 \times 22 \times \frac{2}{100}\ m^3$$

$$\text{Vol. of water flowing in 1hr} = \frac{4}{2}\pi\ m^3$$

$\therefore$ **The time in which the level of water in the tank will rise by 21 cm is 1.5 hours**

Thank You