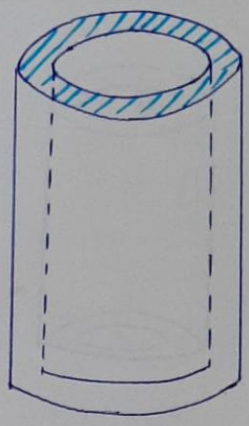
The length of inner and outer diameter of a right circular cylindrical pipe open at two ends are 30cm and 26 cm, respectively and length of pipe is 14.7 m. Calculate the cost of painting its all surfaces with coaltar at ₹2.25 per sqdcm.

13. The outer diameter of the pipe

$= 30\text{cm} = 3\text{dcm}$

So outer radius $= r_1 = \frac{3}{2}$ dcm

height of the pipe $= h$
$= 14.7\text{m}$
$= 147$ dcm



→ Right circular pipe.

So area of outer curved surface

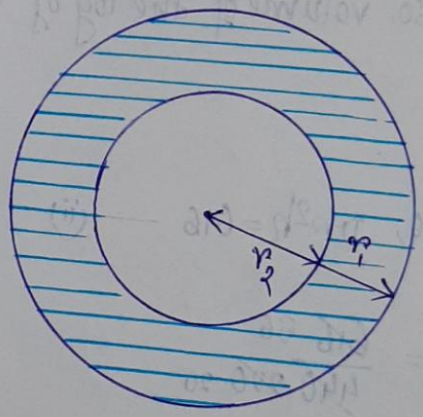
$= 2\pi r_1 h$

$= \left(2 \times \frac{22}{7} \times \frac{3}{2} \times 147\right)$ sq dcm

$= 1386$ sqdcm

The inner diameter $= 26\text{ cm} = 2.6$ dcm

inner radius $= \frac{2.6}{2} = r_2$ dcm.



→ Top view

So, inner curved surface area

$= 2\pi r_2 h$

$= \left(2 \times \frac{22}{7} \times \frac{2.6}{2} \times 147\right)$ sqdcm.

$= 1201.2$ sqdcm

Area of total plane surfaces

$= 2\pi(r_1^2 - r_2^2)$

$= 2 \times \frac{22}{7} \times \left\{\left(\frac{3}{2}\right)^2 - \left(\frac{2.6}{2}\right)^2\right\}$ sq. dcm

$= \left(2 \times \frac{22}{7} \times \frac{9 - 6.76}{4}\right)$ sqdcm

$= \left(\frac{2 \times 22}{7} \times 2.24\right)$

$= 3.52$ sqdcm

Total surface area of the pipe $= (1386 + 1201.2 + 3.52)$ sq dcm $= 2590.72$ sqdcm

Total cost of painting

$= ₹(2590.72 \times 2.25) = ₹5829.12$.

If a pump set with a pipe of 14cm diameter can drain 2500m water per minute. Let, us write by calculating, how much kilolitre water will that pump drain per hour.

8. The radius of the pipe = $r = \frac{\text{diameter}}{2} = \frac{14}{2} = 7\text{cm} = \frac{7}{10}\text{dcm}$

per minute the water it can drain is = $h = 2500\text{ m} = 25000\text{ dcm}$.

So, amount of water it drains in one minute

$$= \pi r^2 h$$

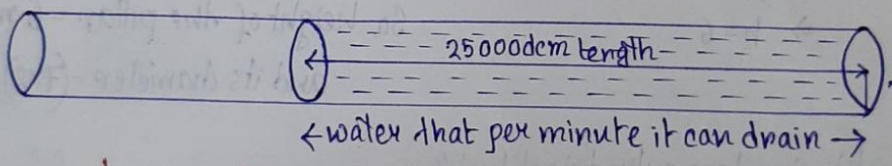
$$= \left(\frac{22}{7} \times \frac{7}{10} \times \frac{7}{10} \times 25000\right) \text{dcm}^3.$$

per hour = 60 minutes it drains

$$= \left(\frac{22}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{10}} \times \frac{7}{\cancel{10}} \times 2500\cancel{0} \times 60\right) \text{dcm}^3 \text{ water}.$$

$$= 2310{,}000\ \text{dcm}^3 \text{ water} = 2310{,}000\,\text{l} \quad (\text{since } 1\,\text{l} = 1\,\text{dcm}^3)$$

$$= 2310 \text{ Kilo litre water}.$$



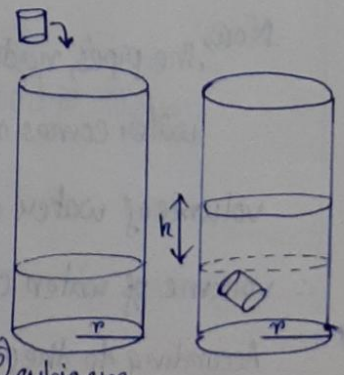
9. There are some water in a jar of 7cm diameter. If a solid right circular cylindrical pipe having 5cm length and 5.6cm diameter be immersed completely in that water, then calculate, how much the level of water will rise.

The long gas jar's radius = $r_1 = \frac{7}{2}$ cm

Let after immersing cylindrical pipe in jar water level will increase = $h_1 = x$ cm.

The change in volume of water in long jar

$$= \pi r_1^2 h_1 = \left(\frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times x\right) \text{ cubic cm}.$$



And solid right circular cylindrical pipes,

radius = $r_2 = \frac{5.6}{2} = 2.8$ cm

length = $h_2 = 5$ cm

its volume = $\pi r_2^2 h_2 = \left(\frac{22}{7} \times \frac{28}{10} \times \frac{28}{10} \times 5\right)$ cubic cm

According to the prob,

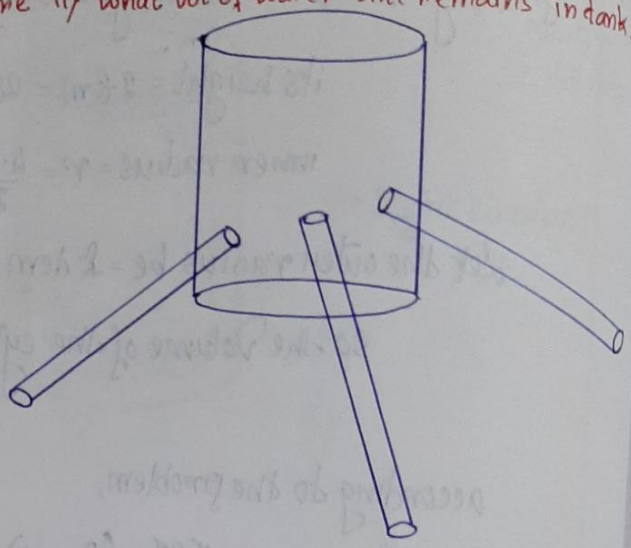
$$\cancel{\frac{22}{7}} \times \frac{\cancel{7}}{\cancel{2}} \times \frac{\cancel{7}}{\cancel{2}} \times x = \cancel{\frac{22}{7}} \times \frac{\overset{4}{\cancel{28}}}{10} \times \frac{\overset{4}{\cancel{28}}}{10} \times 5$$

$$\Rightarrow x = \frac{\cancel{2}\times\cancel{2}\times 4\times 4\times\cancel{5}}{\cancel{5}\times\cancel{10}\times\cancel{10}} = \frac{16}{5} = 3.2$$

So water level will rise 3.2cm.

A group of firebrigade personnel carried a right circular cylindrical tank filled with water and pumped out water at a speed of 420 m. per minute to put out the fire in 40 mins by 3 pipes of 2cm diameter each. If the diameter of tank is 2.8m and its length is 6m then calculate— i) what vol of water has been spent in putting out the fire ii) what vol of water still remains in tank.

16. The right circular cylinder's,



$$\text{radius} = R = \frac{2.8}{2} = 1.4\text{ m}$$

$$\text{height} = H = 6\text{m}$$

volume of water contained in tank

$$= \pi R^2 H$$

$$= \left(\frac{22}{7} \times 1.4 \times 1.4 \times 6\right) m^3$$

$$= 36.96\ m^3$$

$$= (36.96 \times 1000)\ dcm^3$$

$$= 36960\ dcm^3$$

$$= 36960 \text{ litre.}$$

now, each of the pipes,

$$\text{radius} = r = \frac{2}{2}\text{cm} = 1\text{cm} = \frac{1}{100}\text{m.}$$

per minute water pumped out from each pipe = $h = 420$ m

So, volume of water that each pipe pumped out per minute

$$= \pi r^2 h$$

$$= \left(\frac{22}{7} \times \frac{1}{100} \times \frac{1}{100} \times 420\right) m^3.$$

So, In 40 minutes, water pumpep out by 3 pipes

$$= \left(40 \times 3 \times \frac{22}{7} \times \frac{1}{100} \times \frac{1}{100} \times 420\right) m^3$$

$$= \frac{1584}{100}\ m^3$$

$$= \left(\frac{1584}{100} \times 1000\right) dcm^3 = 15840\ dcm^3 = 15840\ l.$$

So, 15840 l water has been spent in putting out the fire (i) (Ans).

volume of water still remains in tank

$$= (36960 - 15840)\ l$$

$$= 21120\ l \quad \text{(ii) (Ans).}$$