UDAAN 2024

– FOR CLASS 10th STUDENTS

Lecture No.- 04

- Subject Name- Mathematics
- Chapter Name- Surface Area and Volume

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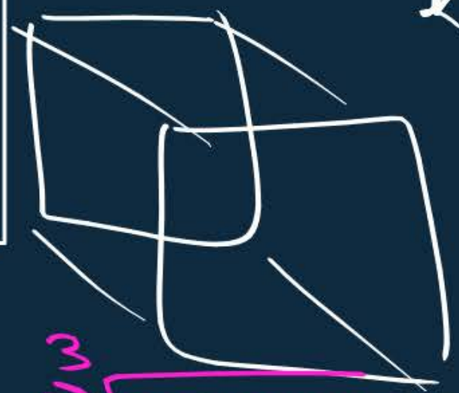
Topic to be Covered

Topic Conversion of solids

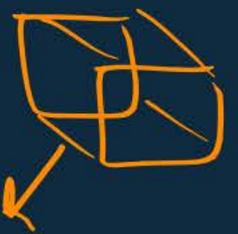
#Q. Three metallic solid cubes whose edges are 3 cm, 4 cm and 5 cm, are melted and formed into a single cube. Find the edge of cube so formed.

[NCERT Exemplar]

Volume of three small cubes = volume of big cube



Melt



$a_1 = 3cm$

$a_2 = 4cm$

$a_3 = 5cm$

$a = ?$

$(a_1)^3 + (a_2)^3 + (a_3)^3 = (a)^3$

$(3)^3 + (4)^3 + (5)^3 = (a)^3$

$27 + 64 + 125 = (a)^3$

$216 = a^3$

$\sqrt[3]{216} = a$

$\sqrt[3]{2\times2\times2\times3\times3\times3} = (a)$

$a = 6cm$

Topic : Conversion of solids

cuboid

#Q. A solid iron rectangular block of dimensions 4.4 m, 2.6 m and 1 m is cast into a hollow cylindrical pipe of internal radius 30 cm and thickness 5 cm. Find the length of the pipe.

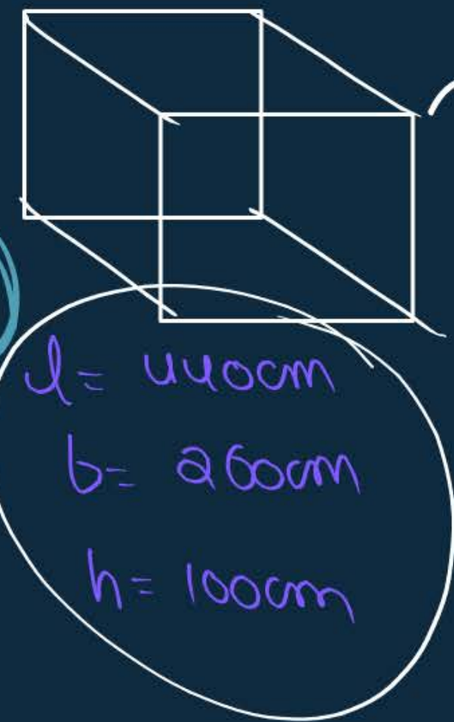
[NCERT Exemplar]

Volume of cuboid = Volume of hollow cylinder

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

$$440 \times 260 \times 100 = \frac{22}{7}\left[(35)^2 - (30)^2\right]h$$

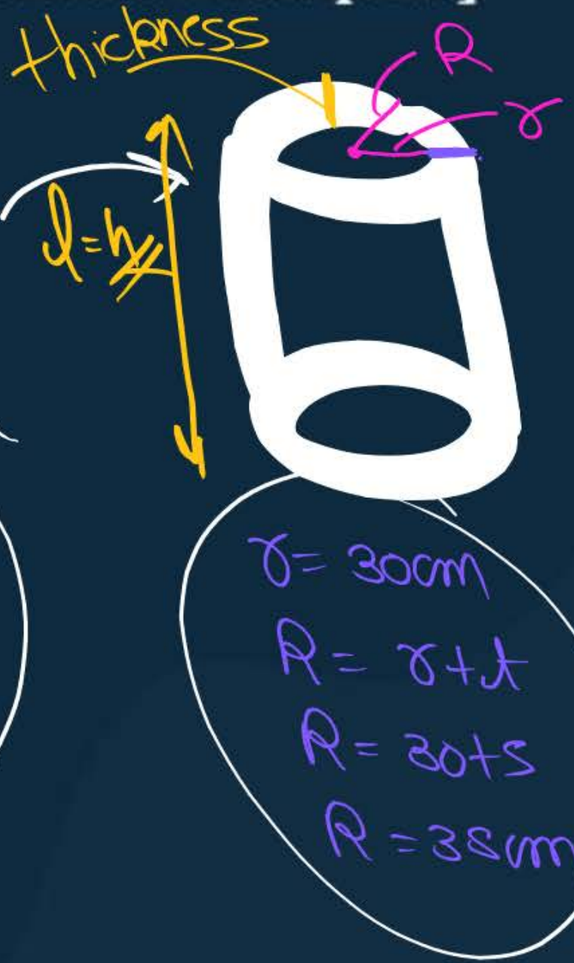
$$\frac{440 \times 260 \times 100 \times 7}{22} = (35+30)(35-30) \times h$$



$l = 440cm$

$b = 260cm$

$h = 100cm$



$r = 30cm$

$R = r + t$

$R = 30 + 5$

$R = 35cm$

$$\frac{20 \times 52 \times 20 \times 7}{22 \times 65 \times 8} = h$$

$$11200\,cm = h$$

$1\,m = 100\,cm$

$112\,m = 112 \times 100\,cm$

Ans //

Topic : Conversion of solids

#Q. The diameter of a metallic sphere is 6 cm. The sphere is melted and drawn into a wire of uniform cross-section. If the length of the wire is 36 m, find its radius. **[CBSE 2013]**

A) 0.2cm

B) 0.02cm

C) 0.1cm

D) NOT

$V_S = V_C$

$\frac{4}{3}\pi(r_1)^3 = \pi(r_2)^2 h$

$\frac{4}{3} \times 3 \times 3 \times 3 = (r_2)^2 \times 3600$

$\frac{4 \times 3 \times 3}{3600} = (r_2)^2$

$\frac{1}{100} = (r_2)^2$

$\frac{1}{10}\,cm = r_2$

Topic : Conversion of solids

#Q. A right circular cone is of height 8.4 cm and the radius of its base is 2.1 cm. It is melted and recast into a sphere. Find the radius of the sphere.

A) 2.1 cm
B) 2.2 cm
C) 3.1 cm
D) N.O.T

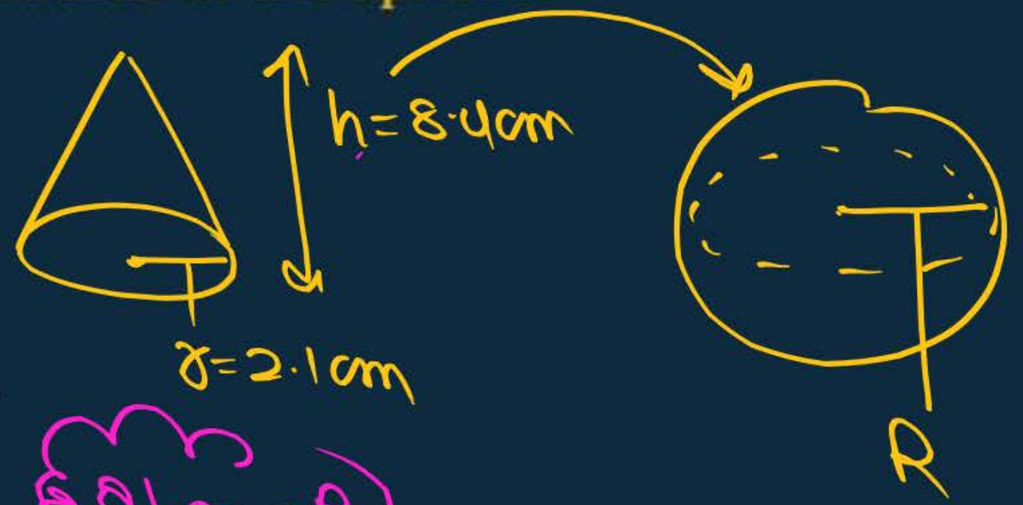
$\frac{1}{3}\pi r^2 h = \frac{4}{3}\pi (R)^3$

$r^2 h = 4 \times R^3$

$\frac{21}{10} \times \frac{21}{10} \times \frac{21}{10} = 4 \times R^3$

$\frac{21 \times 21 \times 21}{10 \times 10 \times 10} = R^3$

$\sqrt[3]{\frac{21 \times 21 \times 21}{10 \times 10 \times 10}} = R$



$\frac{21}{10}$ cm = R

Topic : Conversion of solids

sphere

#Q. How many shots each having diameter 3 cm can be made from a cuboidal lead solid of dimensions 9 cm × 11 cm × 12 cm? [NCERT Exemplar]

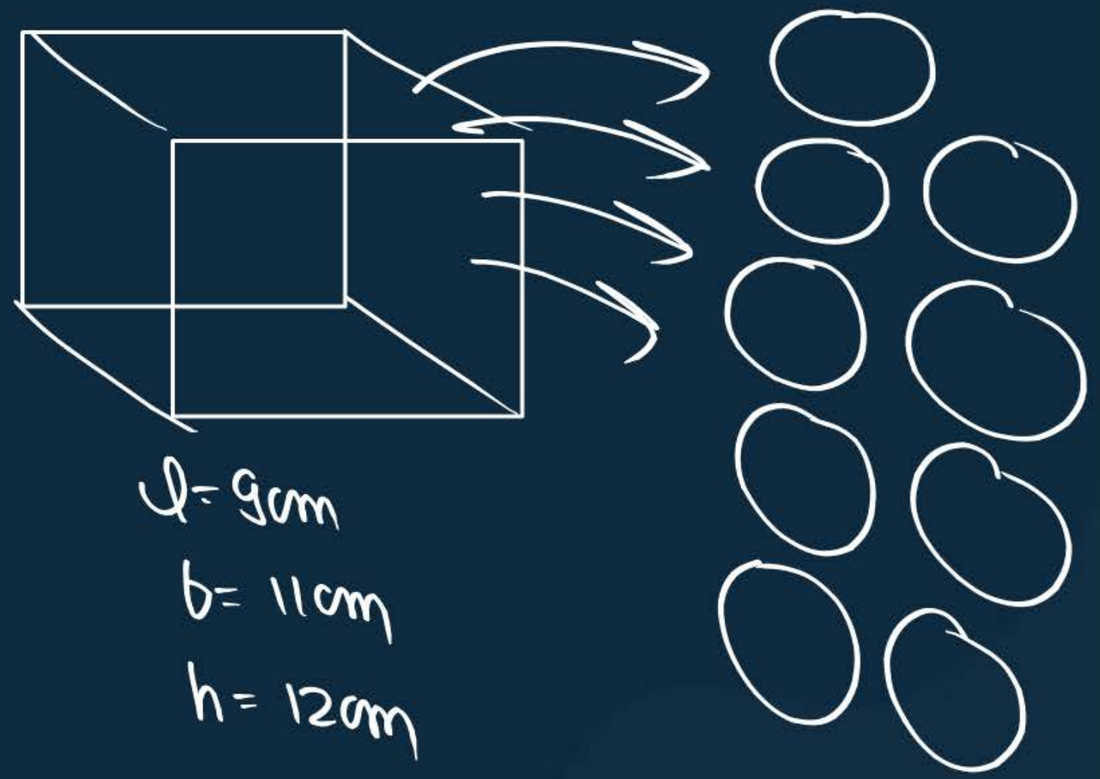
let 'n' no. of shots can be made.

Volume of 'n' shots = V. of cuboid

$$n\left(\frac{4}{3}\pi r^3\right) = lbh$$

$$n\left(\frac{4}{3}\times\frac{22}{7}\times\frac{3}{2}\times\frac{3}{2}\times\frac{3}{2}\right) = 9\times11\times12$$

n = 84 shots



l = 9cm

b = 11cm

h = 12cm

Topic : Conversion of solids

#Q. Find the number of coins 1.5 cm. in diameter and 0.2 cm thick, to be melted to form a right circular cylinder of height 10 cm and diameter 4.5 cm.

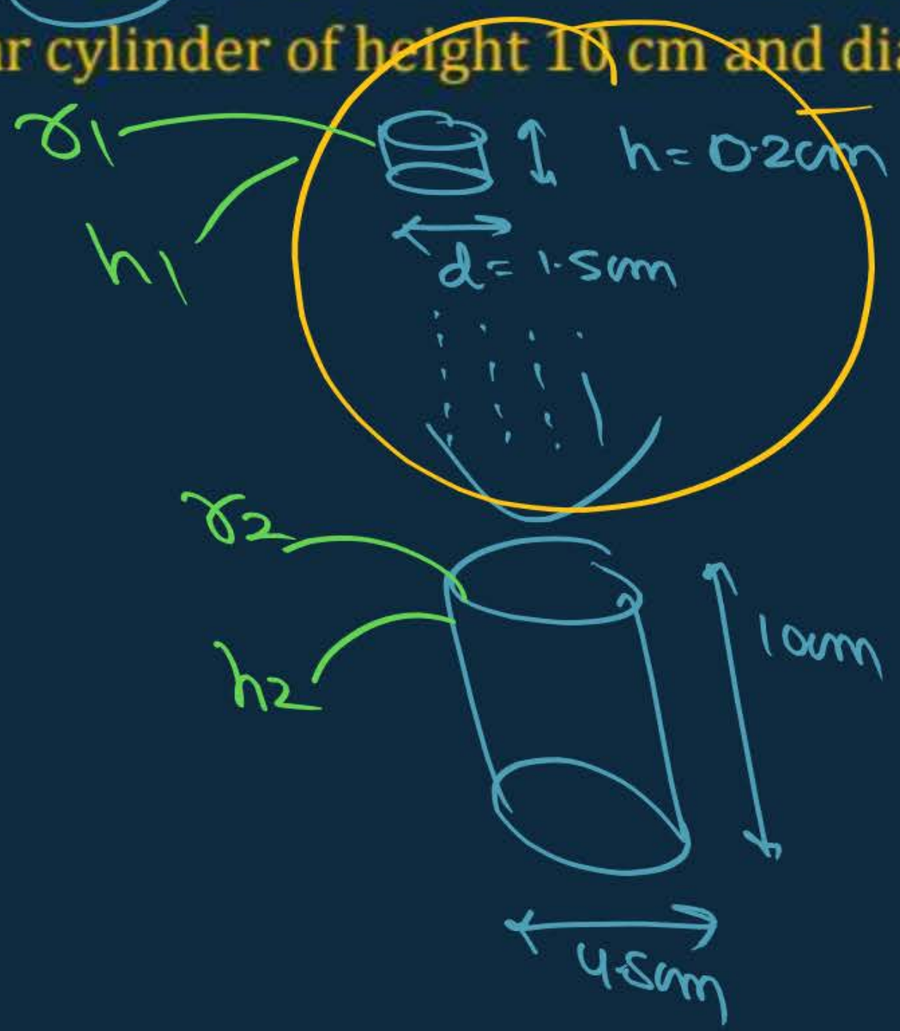
A) 400

B) 450

C) 500

D) N.O.T

cylinder



let 'n' coins

V. of 'n' coins = V. of cylinder

$$n \times \pi r_1^2 h_1 = \pi r_2^2 h_2$$

$$n \times \frac{1}{\cancel{15}} \times \frac{1}{\cancel{15}} \times \frac{\cancel{2}}{10} = \frac{3}{\cancel{45}} \times \frac{\cancel{45}}{\cancel{20}} \times \frac{5}{\cancel{10}}$$

$n = 450$ coins

Topic : Conversion of solids

#Q. A solid metallic sphere of radius 5.6 cm is melted and solid cones each of radius 2.8 cm and height 3.2 cm are made. Find the number of such cones formed. **[CBSE 2014, 2017]**

H.W

A) 26

B) 24

C) 25

D) 28

Topic : Conversion of solids

#Q. A 20 m deep well with diameter 7 m is dug and the earth form digging is evenly spread out to form a platform 22 m by 14 m. Find the height of the platform. [NCERT, CBSE 2015]

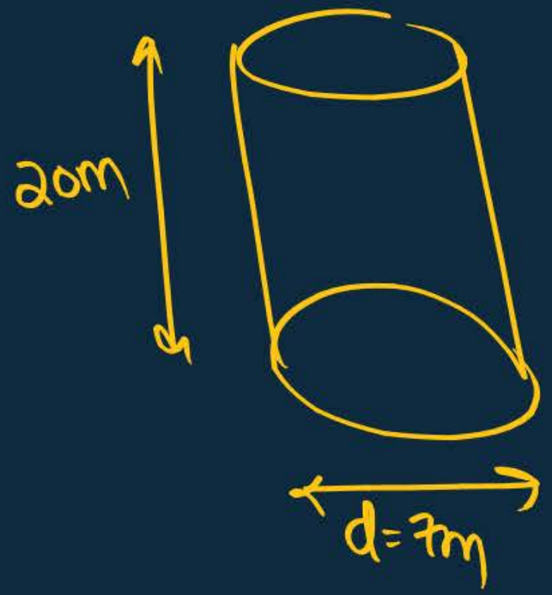
V. of earth dug out = V of platform

$\pi r^2 h = lbh$

$\frac{22}{7} \times \frac{1}{2} \times \frac{1}{2} \times 20 = 22 \times 14 \times h$

$\frac{10}{4} = h$

2.5m = h



l = 22m
b = 14m
h = ?

Topic : Conversion of solids

#Q. The $3/4^{th}$ part of a conical vessel of internal radius 5 cm and height 24 cm is full of water. The water is emptied into a cylindrical vessel with internal radius 10 cm. Find the height of water in cylindrical vessel. **[CBSE 2017]**

V of water in the cone $= \frac{1}{3}\pi r^2 h$

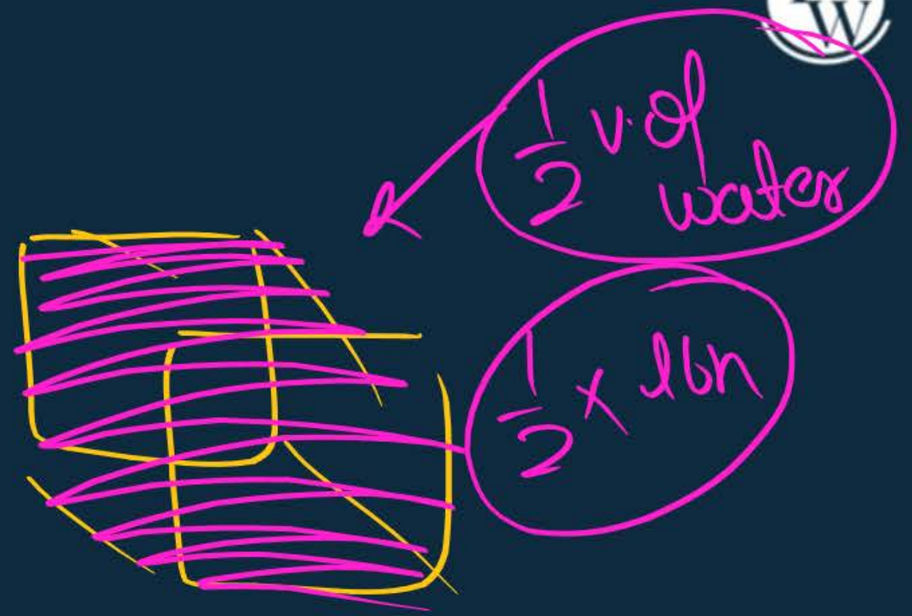
$\frac{3}{4}^{th}$ water in the cone = V of water in the cylinder

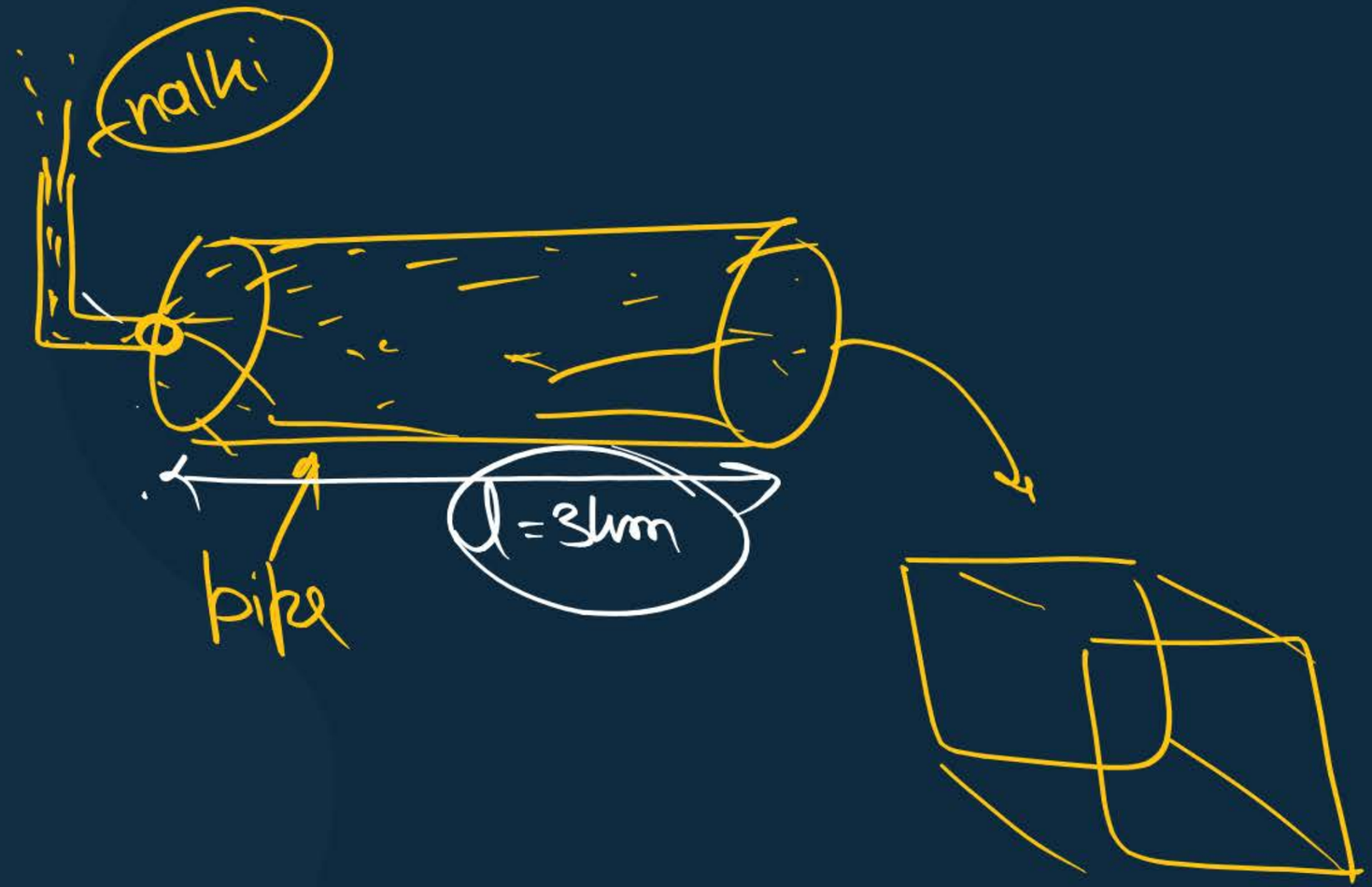
$\frac{3}{4} \times \frac{1}{3} \times \pi r^2 h = \pi R^2 H$

$\frac{1}{4} \times 5 \times 5 \times 24 = 10 \times 10 \times H$

$\frac{3}{2} = H$

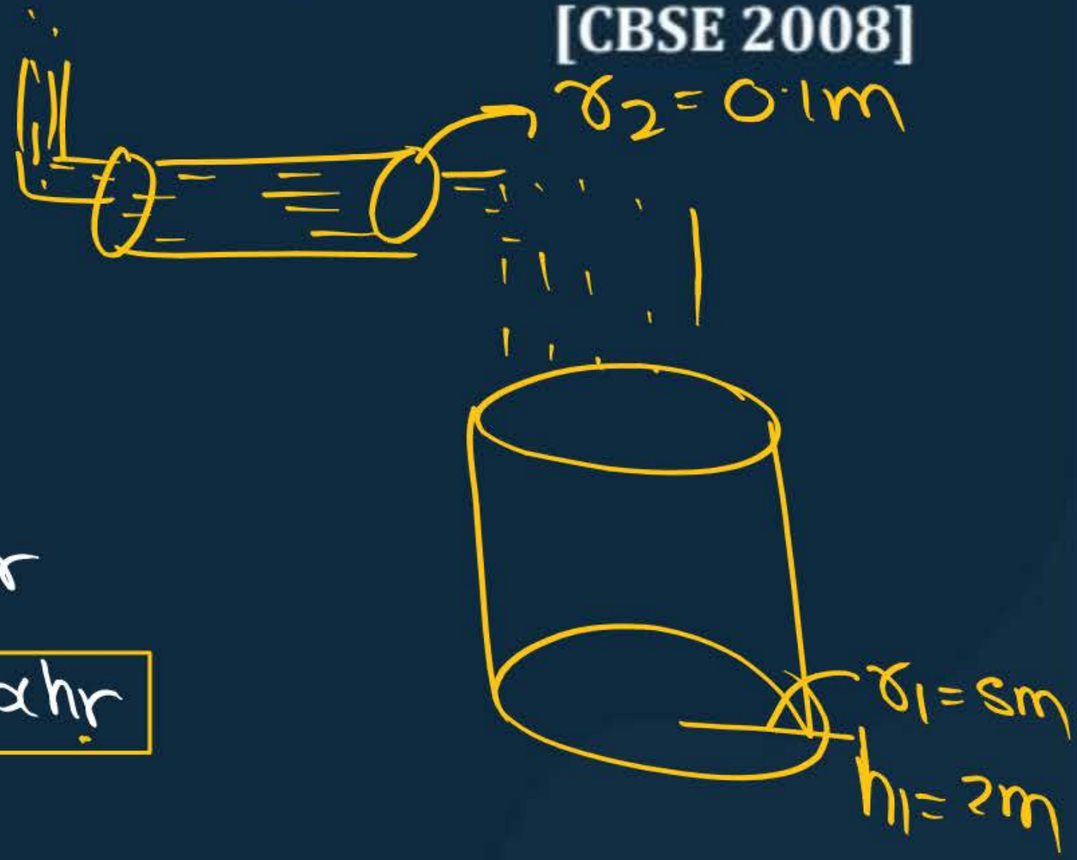
$H = 1.5\,cm$


$\frac{1}{2}$ v. of water
$\frac{1}{2}$ x 16h


nalki
l = 3km
bike

Topic : Conversion of solids

#Q. Water is flowing at the rate of 3 km/hr through a circular pipe of 20 cm internal diameter into a circular cistern of diameter 10 m and depth 2 m. In how much time will the cistern be filled? [CBSE 2008]



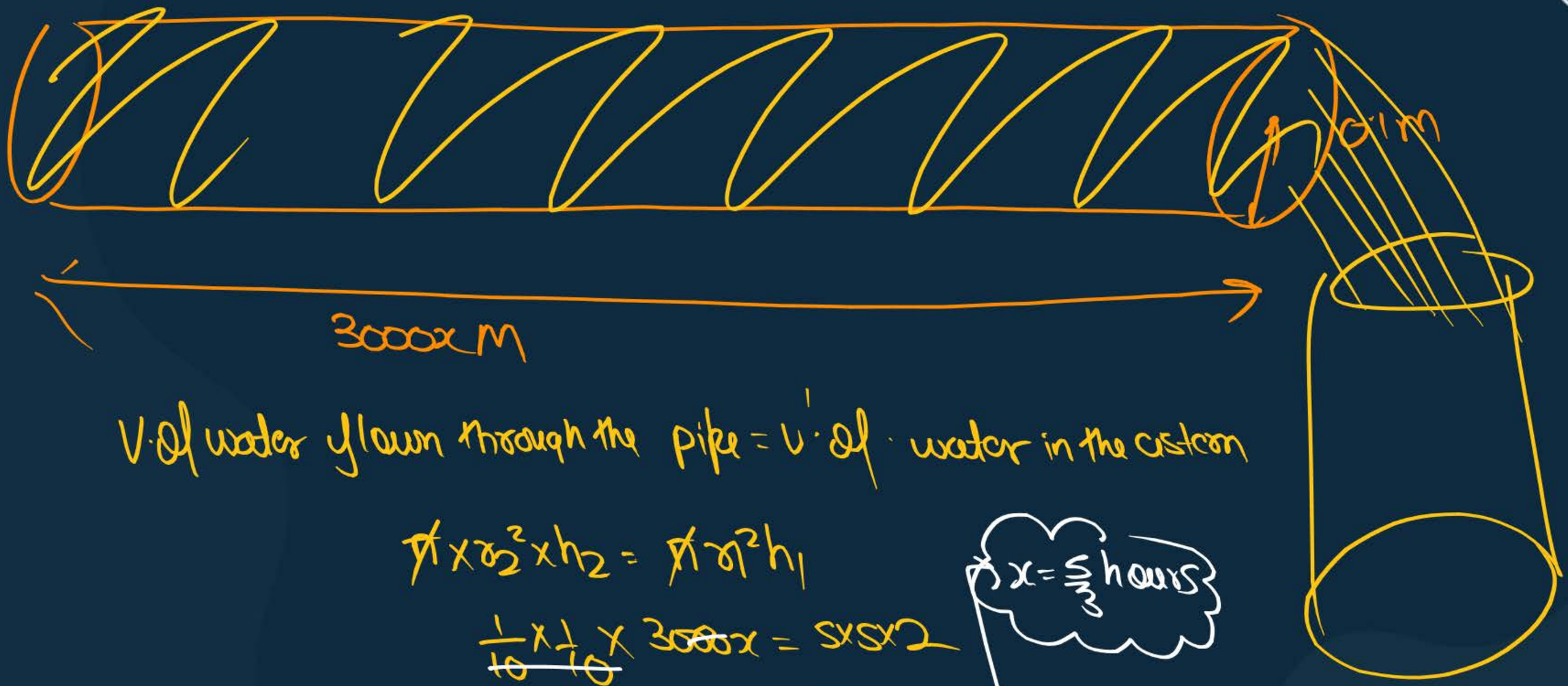
Rate of flow of water = 3km/hr

3km = 1hr

Let cistern gets filled in 'x' hours -

$3x^{km} = x\,hr$

$3000x\,m = x\,hr$



V. of water flown through the pipe = V. of water in the custom

$$\pi \times r_2^2 \times h_2 = \pi r^2 h_1$$

$$\frac{1}{10} \times \frac{1}{10} \times 3000x = 5 \times 5 \times 2$$

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

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

$1\ hr = 60 min$

$\frac{5}{3} hr = \left(\frac{5}{3} \times 60\right) min$

$= 100 min$

$= 60 min + 40 min$

$= 1\ hour + 40 min$

20cm → m

1 m = 100cm

$\frac{1}{100}$ m = 1cm

$\frac{20}{100}$ m = 20cm

0.2m = 20cm

Topic : Conversion of solids

#Q. Water is flowing at the rate of 5 km/hr through a pipe of diameter 14 cm into a rectangular tank which is 50 m long and 44 m wide. Determine the time in which the level of the water in the tank will rise by 7 cm. **[CBSE 2017]**

A) 2h

B) 3h

c) 4h

D) N.O.T

5km = 1hr

5000m = 1hr

(2 × 5000)m = 2hr

$5000x_m$ = xhr

r = 7cm

r = 0.07m

l = 50m

b = 44m

h = 7cm

V. of water through the pipe = V of water in the Cuboidal tank

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

$$\frac{22}{7} \times \frac{7}{100} \times \frac{7}{100} \times 5000x = 50 \times 44 \times \frac{7}{100}$$

$$x = \frac{50 \times 44}{50 \times 22}$$

$x = 2$ hours

Topic : Conversion of solids

#Q. Water is flowing at the rate of 7 meter per second through a circular pipe whose internal diameter is 2 cm into a cylindrical tank the radius of whose base is 10 cm. Determine the increase in the water level 1/2 hour.

[CBSE 2006 C, 2013]

7 m = 1 sec

420 m = 60 sec

4200 cm = 1 min

$30 \times 42 \times 1000$ cm = 30 min

V of water through the pipe = V of water in the tank

$\pi r_1^2 h_1 = \pi r_2^2 h_2$

$1 \times 1 \times 30 \times 42 \times 1000 = 10 \times 10 \times h_2$

$12600_{cm} = h_2$

$126m = h_2$

Topic : Conversion of solids

#Q. A hemispherical tank full of water is emptied by a pipe at the rate of $3\frac{4}{7}$ litres per second. How much time will it take to make the tank half- empty, if the tank is 3 m in diameter? [CBSE 2016]

H.W

$1m^3 = 1000$ litres

Topic : Conversion of solids

#Q. A cylindrical bucket, 32 cm high and with radius (base 18 cm, is filled with sand. This bucket is emptied out 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. **[CBSE 2012, 2014]**


7-8 hr
daily
NCERT
Refer one
Notes
Sample Paper
THANK YOU