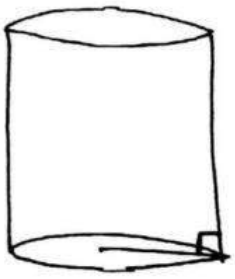
CLASS 60

3D-MENSURATION

Prism

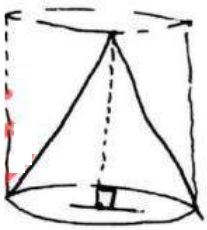


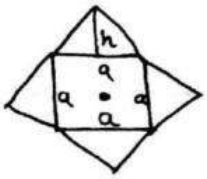
vol. = Base Area × Height

L.S.A = Base Perimeter × H

T.S.A = L.S.A + 2 · Base Area

Pyramid





vol. = $\frac{1}{3}$ × Base Area × Height

L.S.A = $\frac{1}{2}$ × Base Perimeter × slant Height

T.S.A = L.S.A + Base Area

① find the vol of a prism w/c is based on regular octagon of side 10 cm and height of the prism is 63 cm.

vol. of prism = Base Area × H.

$$2 \times 10 \times 10 \left(\sqrt{2}+1\right) \times 63.$$

② The base of a right prism is a Δ of side 5, 12, 13 cm and its vol. is 450 cm^3. find its Total surface area.

$450 = 30 \times H$

$H = 15$ cm

$T.S.A = \underbrace{30 \times 15}_{\text{L.S.A}} + \underbrace{2 \times 30}_{\text{2. Base Area.}}$

$= 510\ cm^2$

③ The base of a right prism is a Δ of perimeter 45 cm and its incircle radius is 9 cm. find its T.S.A if its vol. is 810 cm^3.

$r = \frac{A}{s}$, $9 = \frac{A}{\frac{45}{2}}$, Area of $\Delta = 9 \times \frac{45}{2}$

Vol. = B.A × H

$2\cancel{90}$

$\cancel{810} = 9 \times \frac{45}{2} \times H$

$H = 4$

T.S.A = 45 × 4 = 180

T.S.A = L.S.A + 2(9 × 45/2)

= 180 + 405

= 585 cm^2

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④ The base of a right prism is a quadrilateral ABCD. and the vol. of the prism is 2070 cm^3. find its L.S.A.

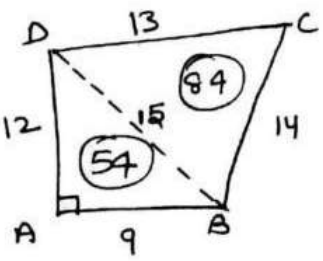
AB = 9

BC = 14

CD = 13

AD = 12

∠A = 90°



$\frac{1}{2} \times 9 \times 12^{C}$

= 54.

Vol. = B.A × H.

B.A = 54 + 84 = 138

⇒ 2070 = 138 × H

H = 15

L.S.A = Base Perimeter × Height

= 48 × 15 = 720 cm^2

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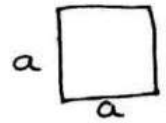
⑤ The height of a right prism is 15 cm w/c is based on a square. If its total surface area is 608 cm^2. find its volume.



T.S.A = 608

$4a \times 15 + 2a^2 = 608$

$30a + a^2 = 304$

$a(30 + a) = 304$

$\cancel{8}$ $\cancel{8}$ ↓ ↳ By unit digit concept)

a = 8

Vol. = 64 × 15 = 960 cm^3

---

⑥ find the vol. of a right prism w/c is based on a regular hexagon of Height 10 cm. If its T.S.A is $156\sqrt{3}$ cm.

$$6a \times 10 + 2 \times \frac{3\sqrt{3}}{2} a^2 = 156\sqrt{3}$$

$$20a + \sqrt{3}a^2 = 52\sqrt{3}$$

$$a(20 + \sqrt{3}a) = 52\sqrt{3}$$

$$2\sqrt{3}(20 + \sqrt{3} \times 2\sqrt{3}) = 52\sqrt{3}$$

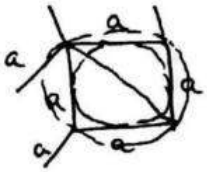
$$2\sqrt{3} \times 26 = 52\sqrt{3}$$

so: $a = 2\sqrt{3}$

put value of a = $\sqrt{3}, 2\sqrt{3}, 3\sqrt{3}, 4\sqrt{3}$.
∵ $\sqrt{3}$ a का root खत्म करना है otherwise वो 20 में add नहीं होगा

Vol. = $\frac{3\sqrt{3}}{2} \times (2\sqrt{3})^2 \times 10$

① **Cube**



Vol. = a^3

L.S.A = $4a^2$

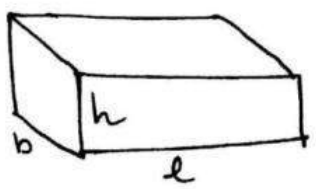
T.S.A = $6a^2$

D = $\sqrt{3}a$

$r = \frac{a}{2}$

$R = \frac{\sqrt{3}}{2}a$

② **Cuboid**



V = lbh

L.S.A = $2(l+b)h$

T.S.A = $2(lb+bh+hl)$

Diagonal (D) = $\sqrt{l^2+b^2+h^2}$

(#) A cuboid can be put in hemisphere. and the radius of hemisphere is =

$$R = \frac{1}{2}\sqrt{4h^2+l^2+b^2}$$

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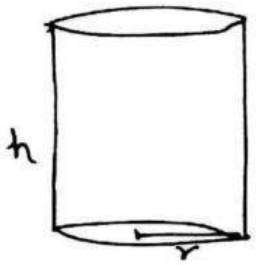
(3) **Cylinder**.



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

$$L.S.A = 2\pi r h$$

$$T.S.A = L.S.A + 2\pi r^2$$

$$= 2\pi r(r+h)$$

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(7) find the vol. of a pyramid w/c is based on a regular Hexagon of side $2\sqrt{3}$ cm and Height of pyramid is 15 cm.

$$\text{vol.} = \frac{1}{3} \times \frac{3\sqrt{3}}{2} \times 6 \times 15 = 90\sqrt{3} \text{ Ans}$$

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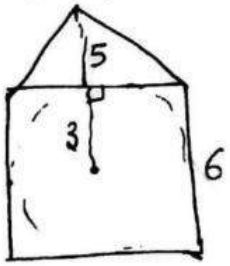
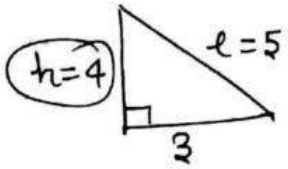
(8) find the vol. of a pyramid w/c is based on a square of side 6 cm and its slant height is 5 cm.





$$\text{vol.} = \frac{1}{3} \times 36 \times 4 = 48 \text{ cm}^3$$

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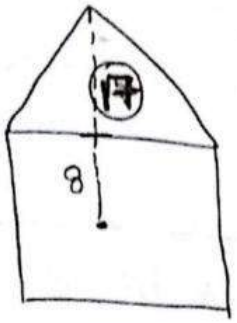
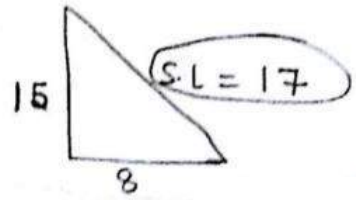
(9) find the T.S.A of a pyramid of height 15 cm w/c is based on a square of side 16 cm.





T.S.A = L.S.A + B.A

$\frac{1}{2} \times 64 \times 17 + 256$

$800\ cm^2$

(*) Radius of incircle in the square = $\frac{a}{2}$

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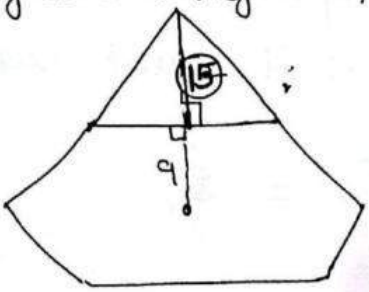
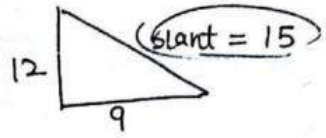
(10) find the T.S.A of a pyramid w/c is based on a regular hexagon of side $6\sqrt{3}$ cm and height 12 cm.



$r = \frac{\sqrt{3}}{2} \times 6\sqrt{3} = 9$



Base Area = $\frac{\sqrt{3}}{4} \times (6\sqrt{3})^2 \times 6 = 162\sqrt{3}$

C.S.A = $\frac{1}{2} \times 6 \times 6\sqrt{3} \times 15 = 270\sqrt{3}$

T.S.A = $270\sqrt{3} + 162\sqrt{3} = 432\sqrt{3}$

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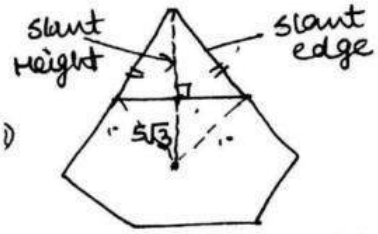
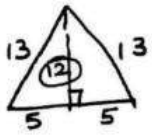
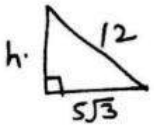
(11) find the vol. of a pyramid w/c is based on regular hexagon of side 10 cm. and having slant edge 13 cm



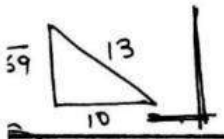


slant Height = 12

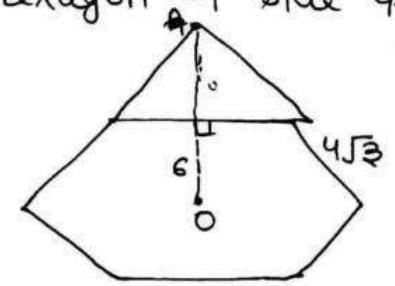


$h = \sqrt{144-75} = \sqrt{69}$

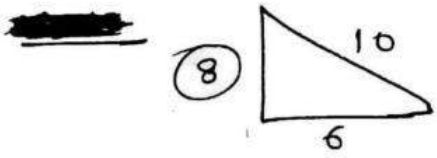
Vol. $= \frac{1}{3} \times \frac{3\sqrt{3}}{2} \times 5 \times 10 \times \sqrt{69} = 50\sqrt{207}$



(2) find the vol. of a pyramid w/c is based on hexagon of side $4\sqrt{3}$ and having slant ~~edge~~ height 10 cm.



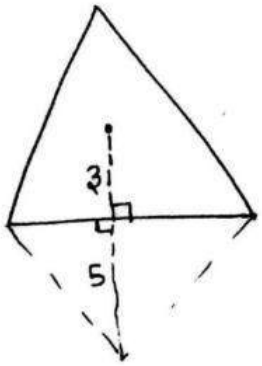
$r = \frac{\sqrt{3}}{2} \times 4\sqrt{3} = 6$

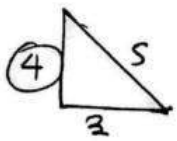


Vol. $= \frac{1}{3} \times \frac{3\sqrt{3}}{2} \times \frac{24}{48} \times 8 = 192\sqrt{3}$

(13) find the vol. of a pyramid w/c is based on a equilateral Δ of side $6\sqrt{3}$ cm if its slant Height is 5 cm.

$r = \frac{6\sqrt{3}}{2\sqrt{3}} = 3$

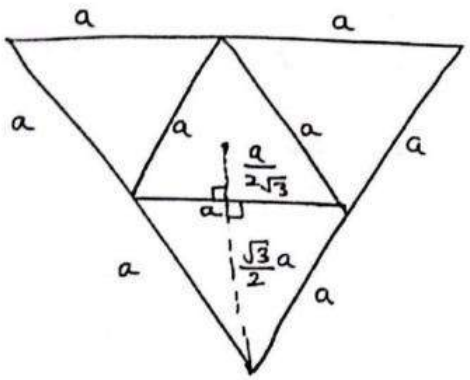




Vol. $= \frac{1}{2} \times \frac{\sqrt{3}}{4} \times \frac{36}{108} \times 4 = 36\sqrt{3}$

CLASS 61

(4) Tetrahedron



$$\text{Height} = \frac{\sqrt{2}}{\sqrt{3}}a$$

$$\text{Vol.} = \frac{\sqrt{2}}{12}a^3$$

$$\text{L.S.A} = \frac{3\sqrt{3}}{4}a^2$$

$$\text{T.S.A} = \sqrt{3}a^2$$

$$\text{Slant Height} = \frac{\sqrt{3}}{2}a$$

$$\text{Slant edge} = a$$

(14) find the vol. of a tetrahedron whose height is $2\sqrt{3}$

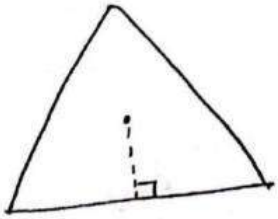
$$\frac{\sqrt{2}}{\sqrt{3}}a = 2\sqrt{3}$$

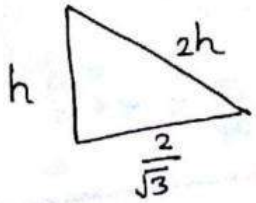
$$a = \frac{6}{\sqrt{2}}$$

$$\text{vol.} = \frac{\sqrt{2}}{12} \times \frac{6 \times 6 \times 6}{\sqrt{2} \times \sqrt{2} \times \sqrt{2}} = \frac{18}{2} = 9\ cm^3$$

(15) find the vol. of a pyramid w|c is based on an equilateral Δ of side 4 cm. If its slant height is 2 times of its height

$$r = \frac{4}{2\sqrt{3}} = \frac{2}{\sqrt{3}} \quad (\text{Base length})$$





$$h^2 + \frac{4}{3} = 4h^2$$

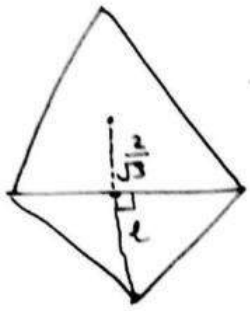
$$3h^2 = \frac{4}{3}$$

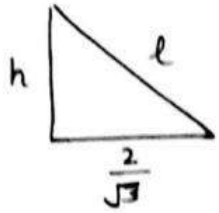
$$h^2 = \frac{4}{9}$$

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

$$\text{vol.} = \frac{1}{3} \times \frac{\sqrt{3}}{4} \times 4 \times 4 \times \frac{2}{3} = \frac{8}{9}\sqrt{3}$$

(16) The base of a pyramid is equilateral Δ of side 4 cm. if its total surface area is 3 times its volume. find the vol. of pyramid.





$l^2 = h^2 + \frac{4}{3}$

T.S.A = 3 × V

$\frac{1}{2} \times 12 \times l + \frac{\sqrt{3}}{4} \times 4 \times 4 = 3 \times \frac{1}{3} \times \frac{\sqrt{3}}{4} \times 4 \times 4 \times h$

$6l + 4\sqrt{3} = 4\sqrt{3}\,h$

$3l + 2\sqrt{3} = 2\sqrt{3}\,h$

$3l = 2\sqrt{3}(h-1)$

square

$9l^2 = 12(h^2+1-2h)$

$9\left(h^2+\frac{4}{3}\right) = 12(h^2+1-2h)$

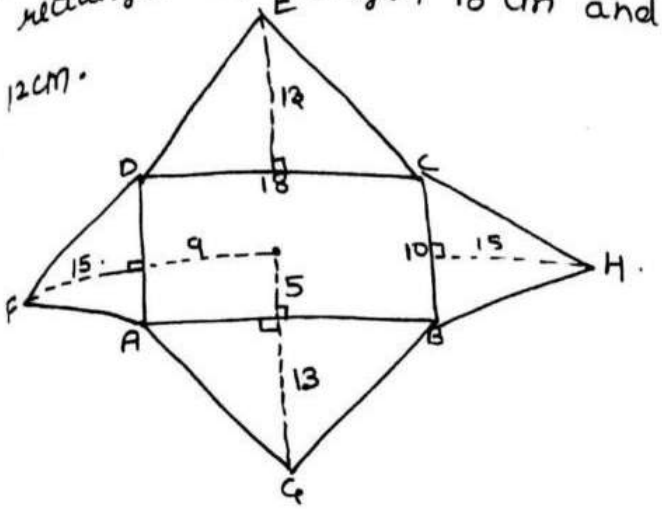
$9h^2 + 12 = 12h^2 + 12 - 24h$

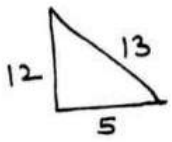
$3h^2 = 24h$

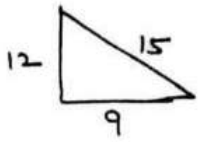
$\boxed{h = 8}$

Vol. $= \frac{1}{3} \times \frac{\sqrt{3}}{4} \times 4 \times 4 \times 8 = \frac{32\sqrt{3}}{3}$ Ans.

(7) find the T.S.A of a pyramid w/c is based on rectangle of length 18 cm and breadth 10 cm. & height 12cm.







$\frac{1}{2} \times 18 \times 12 + \frac{1}{2} \times 10 \times 15$

Ar. Δ DEC & Ar Δ ABG

Ar Δ FDA & Ar Δ BCH.

$\Rightarrow 234 + 150 = 384 = L.S.A$

T.S.A = L.S.A + 18×10

= 384 + 180 = 564 cm^2

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(8) The height of a conical tank is 9 m. A vertical pole of 6 m height is placed 4 m away from its centre such that it touches its surface. ~~vertical~~ find the L.S.A of the tent.

(9) A cone is cut parallel to its base in such a way that height of the two parts is same. find the ratio of vol. of these two parts.

(20) A cone is cut parallel to its base in such a way that the height of each part is same. find the ratio of vol. of these parts.

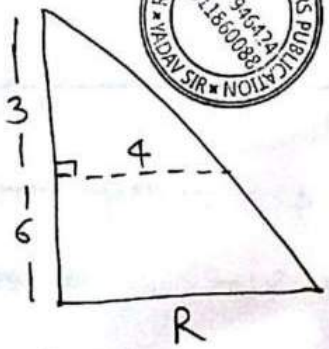
(21) A cone is cut parallel to its base in such a way that the volume of the smaller cone is $1/729$ times of bigger cone. find the height of the smaller cone if the cone is cut 40 cm above the base.

(22) The base radius and height of a cone are 5 cm and 25 cm. if the cone is cut parallel to its base at a height of h from the base. If the vol. of frustum is 110 cm3. find the ~~vol~~ radius of the smaller cone.

~~(23) The side of a right angle is 15,~~

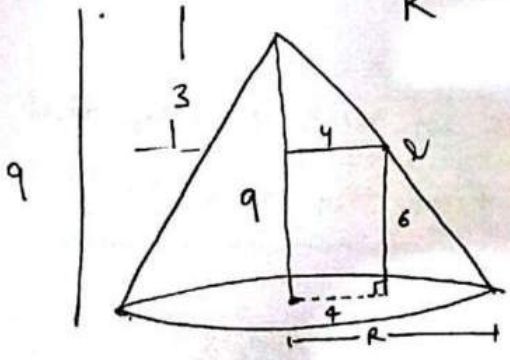
Soln

(18)

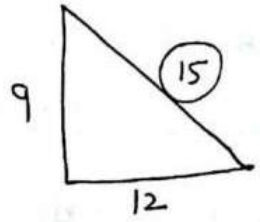


$$\frac{3}{9} = \frac{4}{R}$$

$$R = 12$$



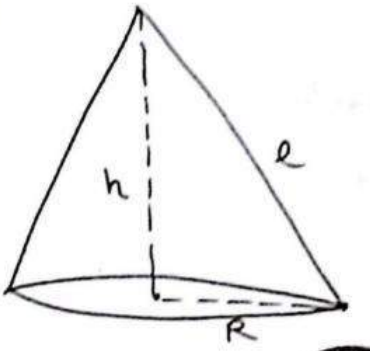
R=12



vol. $= \frac{1}{3} \times \frac{22}{7} \times 12 \times 12 \times 9 = 432\pi$

L.S.A $= \frac{22}{7} \times 12 \times 15 = 180\pi$

(#) **CONE**

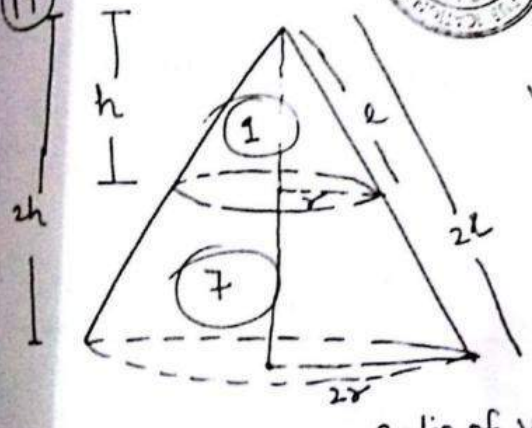


$V = \frac{1}{3}\pi r^2 h$

L.S.A $= \pi r l$

T.S.A $= \pi r(r+l)$

(19)



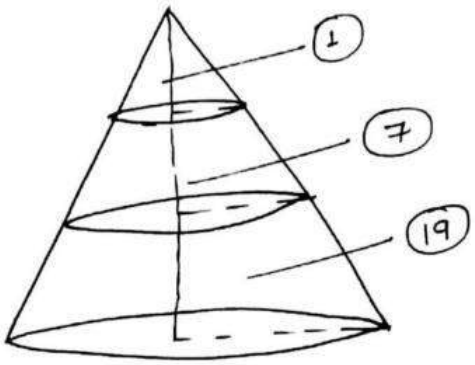
	small cone	larger cone
$V =$	$\frac{1}{3} \times \pi r^2 h$	$\frac{1}{3}\pi (2r)^2 \times 2h$
	r^2	$4r^2 \times 2$
	1 :	8

Ratio of vol. of two parts $= \frac{1}{7}$

(#) if a cone is cut parallel to its base then

	smaller cone		larger cone
Height / slant Height / radius →	x	:	y
volume →	x^3	:	y^3.

(20)

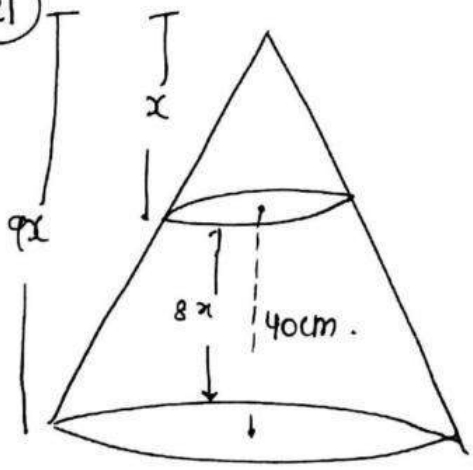


	smaller	Medium	larger
Height →	1	: 2	: 3
Vol. →	1	: 8	: 27

Vol. of three parts = 1, 7, 19 Ans:

---

(21)



	small	larger
Vol.	1	729
H/radius	1	: 9

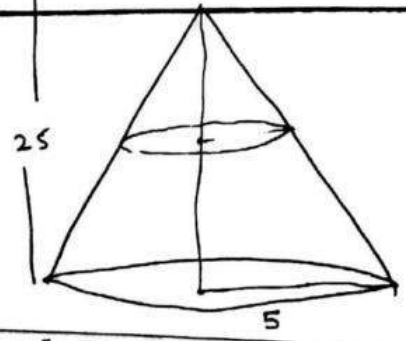
$8x = 40$

$\boxed{x = 5}$

Height of smaller cone = 5 cm.

---

(22)



$$\frac{V_{cone}}{V_{frustum}} = \frac{\frac{1}{3} \times \frac{22}{7} \times 25 \times 25}{110}$$

$$\frac{V_{cone}}{V_{frustum}} = \frac{125}{21}$$

Vol. larger cone

125

Vol. smaller cone

104

Height | slant Height | radius.

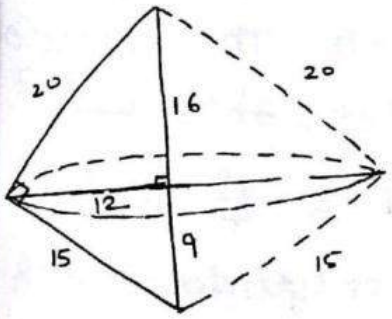
5 — ×1 — 5

$\sqrt[3]{104}$

∴ Radius of smaller cone = $\sqrt[3]{104}$ Ans.

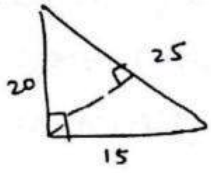
---

(23) The side of a right angle Δ are 15, 20 & 25 cm. if the Δ is revolve around its hypotenuse, then find the vol. and T.S.A of the formed figure.



Vol. of such figure = $\frac{1}{3}\pi\left[\frac{P\times B}{H}\right]^2 \times H$

H → Hypotenuse.



$\frac{20\times15}{25} = 12$

$\frac{1}{3}\times\frac{22}{7}\times\frac{4}{12}\times12\times25 = 1200\pi$

T.S.A = $\pi r l_1 + \pi r l_2 \Rightarrow \pi r(l_1+l_2) \Rightarrow \pi\times12(20+15) = 420\pi$

---

(24) → If the length of each side of regular tetrahedron is 12 cms, find the vol. ?

$a = 12$

$V = \frac{\sqrt{2}}{12}\times12\times12\times12 = 144\sqrt{2}$ Ans

---

(25) The length of diagonal of a cube with volume 729 cm^3 is →

$a^3 = 729$

$a = 9$

$D = \sqrt{3}\,a = 9\sqrt{3}$ Ans

⑥ The ratio of radii of two right circular cylinders is 2:3 and their heights are in the ratio 5:4. Then ratio of their curved surface area is →

$2\pi(2)\times 5 : 2\pi(3)\times 4$

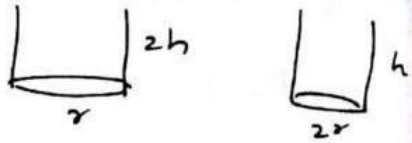
$5 : 6$

---

⑦ If the radius of right circular cylinder is doubled and the height is halved, then the ratio b/w the new volume and the previous volume of the cylinder is →

$\pi r^2 \times 2h : \pi 4r^2 \times h$

$1 : 2$



---

⑧ A solid cylinder has total surface area of 462 sq. cm. curved surface area is 1/3rd of its T.S.A. The volume of the cylinder is –

$2\pi r h \times 3 = 2\pi r(r+h)$

$3h = r+h$

$2h = r$

$2\pi r(h+r) = 462$

$2\pi \times 2h(h+2h) = 462$

$4 \times \frac{22}{7} \times 3h^2 = 462$

$h^2 = \frac{49}{4} \Rightarrow h = \frac{7}{2}$

Vol. of cylinder $= \pi r^2 h$

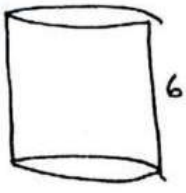
$\Rightarrow \frac{22}{7} \times 4h^2 \times h$

$= \frac{22}{7} \times 4 \times \frac{49}{4} \times \frac{7}{2}$

$= 539\ cm^3$ Ans

---

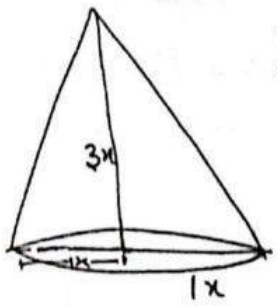
⑨ The height of a right circular cylinder is 6 m and three times the sum of the areas of its two end faces is equal to twice the area of its curved surface. The radius of its base, in metre is ?



$2\pi r^2 \times 3 = (2\pi r \times 6)2$

$r = 4$

(30) The ratio of height and dimeter of a right circular cone is 3:2 and its vol. is 1078 cc, then its height is



$\frac{1}{3} \times \frac{22}{7} \times x^2 \times 3x = 1078$

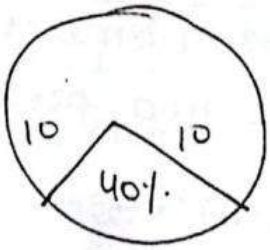
$x^3 = 49 \times 7$

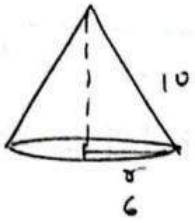
$\boxed{x = 7}$

Height $= 3x \Rightarrow 3 \times 7 = 21$ cm Ans.

---

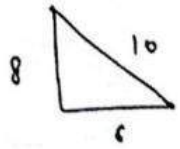
(31) In a circular sheet of paper of radius 10 cm, a sector of 40% area is removed and the remaining part is used to make a conical surface. find the volume of the conical surface.





$\frac{60}{100} \times \pi \times 10 \times 10 = \pi r (6)$

$\boxed{r = 6}$



Height = 8.

Vol. $= \frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 8 = 96\pi$

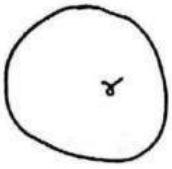
---

(32) A right angled sector of radius r cm is rolled up into a cone in a way that two binding radii are joined together. find the C.S.A of the cone →

C.S.A $= \frac{90}{360} \times \pi r^2 = \frac{\pi}{4} r^2$

CLASS
62

(#) **Sphere**

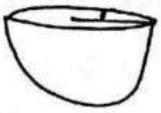


$V = \frac{4}{3}\pi r^3$

$L.S.A = 4\pi r^2$

$T.S.A = 4\pi r^2$

(#) **Hemisphere**

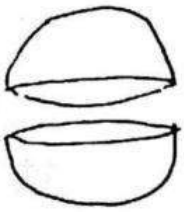


$V = \frac{2}{3}\pi r^3$

$L.S.A = 2\pi r^2$

$T.S.A = 3\pi r^2$

(33) A sphere is cut in two parts along its diameter. find the total surface area of these two parts



$4\pi r^2 + \pi r^2 + \pi r^2 = 6\pi r^2$

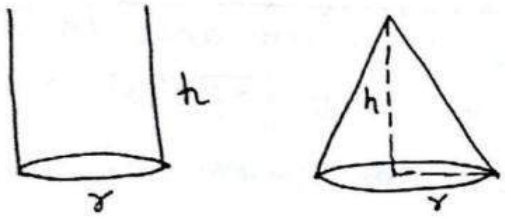
if sphere is cut into n parts, then
T.S.A of n parts = $4\pi r^2 + n\pi r^2$

(34) The T.S.A of a solid hemisphere is 1848 sq. cm. then the diameter of the same is —

$3 \times \frac{22}{7} \times r^2 = 1848$ | $r = 7 \times 2 = 14$

$r^2 = 7 \times 7 \times 4$ | $D = 28$ cm.

(35) A cyclinder and a cone have equal radii of their bases and equal heights. If their curved surface area are in the ratio 8:5, the ratio of their radius & height is →

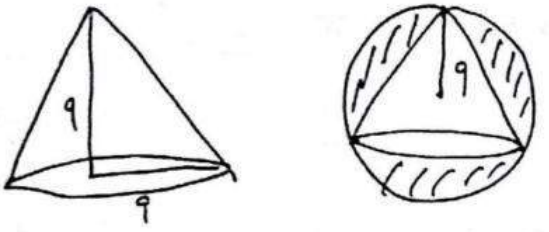


$$\frac{2\pi rh}{\pi r\sqrt{h^2+r^2}} = \frac{8}{5}$$

$$\frac{4h^2}{h^2+r^2} = \frac{64}{25}$$

$$\frac{h}{r} = \frac{8}{6} = \frac{4}{3}$$

(36) A solid cone of height 9 cm with diameter of its base 18 cm is cut from a wooden solid sphere of radius 9 cm. The percentage of wood wasted is :



$$\frac{\frac{4}{3}\pi(9)^3 \times 9}{\frac{4}{3}\pi(9)^3}$$

$= \frac{1}{4}$ — cone volume / sphere vol.

$\therefore \frac{3}{4} \times 100 = 75\%$ wasted.

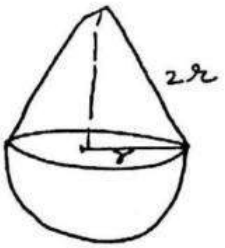
(37) From a solid cylinder of height 10 cm and radius of the base 6 cm, a cone of same height and same base is removed. Volume of the remaining solid is –:

$$2\pi\left(\frac{105}{2}\right)\times 3 + \pi\left(\frac{105}{2}\right)\times 63$$

$$\frac{22}{7}\left(\frac{105}{2}\right)[6+63]$$

$$\frac{22}{7}\times\frac{15}{\frac{105}{2}}\times 69 = 11385 \text{ वर्ग मी.}$$

(41) A solid is hemispherical at the bottom and conical above if the surface areas of the two parts are equal then the ratio of radius and height of its conical part is :-



$$\pi r l = 2\pi r^2$$

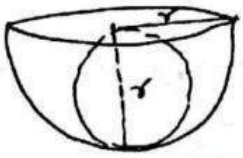
$$l = 2r$$

$$h = \sqrt{(2r)^2 - r^2} = \sqrt{3}\,r$$

$$r : \sqrt{3}\,r$$

$$1 : \sqrt{3}$$

(42) A maximum size sphere is cut from a hemi-sphere of radius r. Find the ratio of volumes of hemisphere to sphere :-

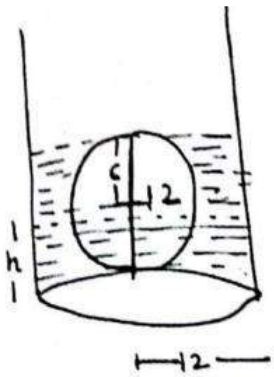


$$\frac{2}{3}\pi r^3 : \frac{4}{3}\pi\left(\frac{r}{2}\right)^3$$

$$1 : \frac{1}{4}$$

$$4 : 1$$

(43) In a cylindrical vessel of diameter 24 m filled up with sufficient quantity of water, a solid spherical ball of radius 6 cm is completely immersed. Then the increases in height of water level is :-



$$\cancel{\pi}(12)^2 \times 12 - \frac{4}{3}\cancel{\pi}(6)^3 = \cancel{\pi}(12)^2 \times h$$

$$12^2 \times 12 - \frac{4}{3} \times 6 \times 6 \times 6 = (12)^2 \times h$$

$$12 - 2 = h$$

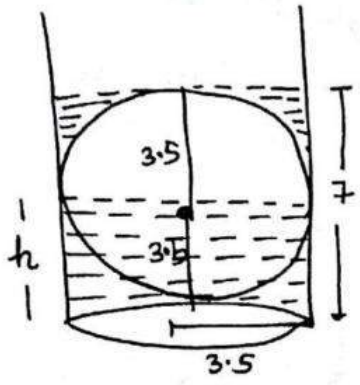
$$\boxed{h = 10 \text{ cm}}$$

$\therefore$ ↑ in water level $= 12 - 10 = 2$ cm.

---

(44) ~~A cone, a hemisphere~~

A cylindrical cane whose base is horizontal is of internal radius 3.5 cm contain sufficient water so that when a solid sphere of max. size is placed, water just immersed it. Calculate the depth of water in the cane before the sphere was put.



$$\cancel{\pi}(3.5)^2 \times 7 - \frac{4}{3}\cancel{\pi}(3.5)^3 = \cancel{\pi}(3.5)^2 \times h$$

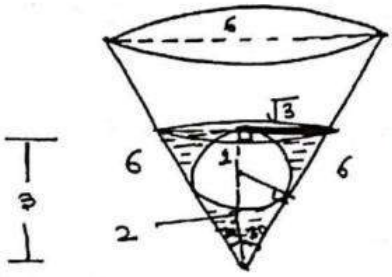
$$7 - \frac{4}{3} \times \frac{7}{2} = h$$

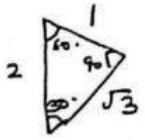
$$7 - \frac{14}{3} = h$$

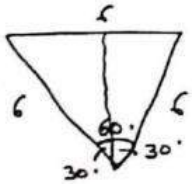
$$h = \frac{7}{3} \quad \text{Ans.}$$

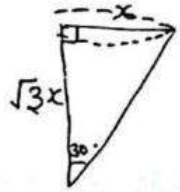
---

(45) The base radius and slant height of a conical vessel is 3cm and 6cm respectively. find the volume of sufficient water in the vessel such that when a sphere of radius 1 cm is placed into it, water just immersed it.









$\sqrt{3}x \rightarrow 3$

$x \rightarrow \frac{3}{\sqrt{3}} = \sqrt{3}$

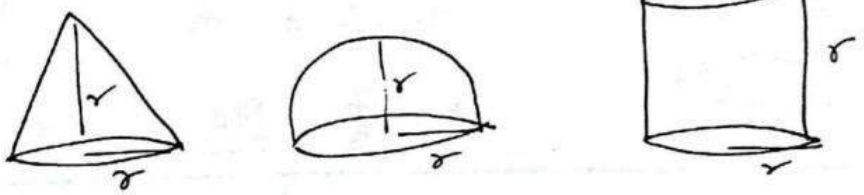
$\frac{1}{3}\pi(\sqrt{3})^2 \times 3 - \frac{4}{3}\pi(1)^3$

$3\pi - \frac{4}{3}\pi$

$\frac{5}{3}\pi$ Ans.

---

(46) A cone, a hemisphere and a cylinder stand on equal base and have the same height. Their vol. are in the ratio -



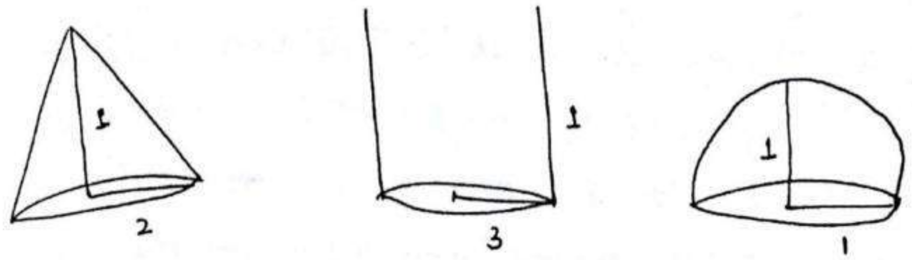
$\frac{1}{3}\pi r^2 \cdot r : \frac{2}{3}\pi r^3 : \pi r^2 \cdot r$

$\frac{1}{3} : \frac{2}{3} : 1$

$1 : 2 : 3$ Ans

---

(47) The height of a cone, cylinder and hemi-sphere are equal. if their radii are in the ratio 2:3:1, then the ratio of their volumes is :-



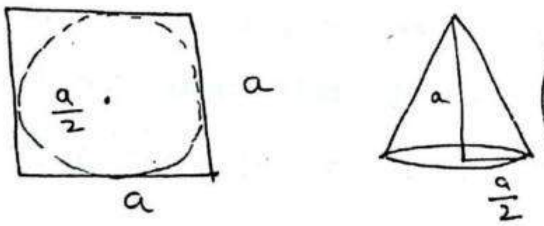
$\frac{1}{3} \times \pi \times 2^2 \times 1 \quad : \quad \pi (3)^2 \times 1 \quad : \quad \frac{2}{3} \pi (1)^2 \times 1$

$\frac{4}{3} \quad : \quad 9 \quad : \quad \frac{2}{3}$

$4 \quad : \quad 27 \quad : \quad 2$ Ans.

---

(48) A cylinder is kept inside the cube in such a way that it touches all side of the cube and a cone is further placed inside the cylinder and the base & height of all the three are same. find the ratio of their volumes.



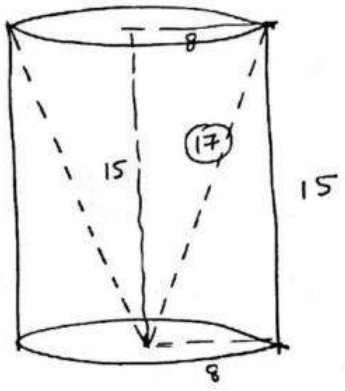
$a^3 \quad : \quad \pi \left(\frac{a}{2}\right)^2 \times a \quad : \quad \frac{1}{3} \pi \left(\frac{a}{2}\right)^2 \times a$

$12 \quad : \quad 3\pi \quad : \quad \pi$

$\overset{6}{\cancel{12}} \quad : \quad 3 \times \frac{\cancel{22}^{11}}{7} \quad : \quad \frac{\cancel{22}^{11}}{7}$

$42 \quad : \quad 33 \quad : \quad 11$ Ans

(49) if a conical cavity is drilled out into a circular cylinder of height 15 cm and base radius 8 cm. the hight and base radius of conical cavity is same. find the volume and T.S.A of the remaining solid.



vol. of remaining solid =

$\frac{2}{3} \times \frac{22}{7} \times 8 \times 8 \times 15$

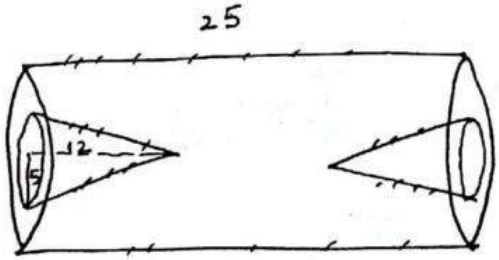
$640\pi \text{ cm}^3$

T.S.A of Remaining solid = $2\pi(8) \times 15 + \pi(8)^2 + \pi(8) \times$

$= 440\pi$

---

(50) The base radius and height of a cylinder are 7 cm & 25 cm. 2 conical cavity of radius 5 cm and height 12 cm are drilled out on the both ends of the cylinder find the volume and T.S.A of the Remaining solid.



vol. of Remaining solid =

$\pi(7)^2 \times 25 - 2 \times \frac{1}{3}\pi(5)^2 \times$

$\pi(1225 - 200) = 1025\pi$

T.S.A = $\underbrace{2\pi(7) \times 25}_{\text{cylinder}} + \underbrace{2\pi(5) \times 13}_{\text{2 cavity}} + \underbrace{\left[2\pi[7^2 - 5^2]\right]}_{= 2 \times 24\pi}$

↓ दोनों ends पर बना हुआ area.

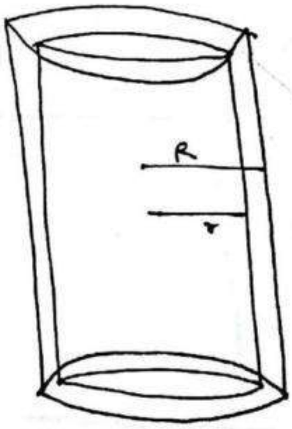
$= 528\pi$ Ans

1) The height of a metallic hollow cylinder is 14 cm and the diff b/w its inner curved surface area & outer C.S.A is 44 cm^2. if the cylinder is made up of volume 99 cm^3 metal. find its inner & outer radius.

2) outer diameter of a 20 cm long pipe is 25 cm. if the thickness of the metal in the pipe is 1 cm. find the T.S.A of the pipe.

---

1)



$\Rightarrow \quad 2\pi R \times 14 - 2\pi r \times 14 = 44$

$2 \times \frac{22}{7} \times 14 \, [R - r] = 44$

$[R - r] = \frac{1}{2}$

$\Rightarrow \quad \pi R^2 14 - \pi r^2 14 = 99$

$\frac{22}{7} \times 14 \, (R^2 - r^2) = 99$

$44 (R - r)(R + r) = 99$

$4 \times \frac{1}{2} (R + r) = 9$

$(R + r) = \frac{9}{2}$

$\Rightarrow$

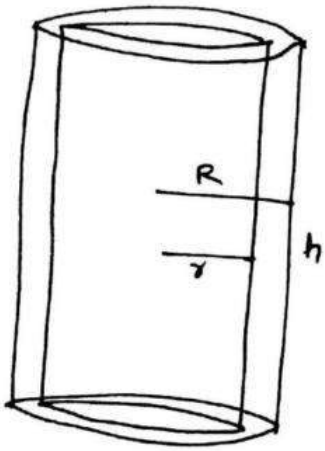
$R - r = \frac{1}{2}$

$R + r = \frac{9}{2}$

$2R = 5$

$\boxed{R = \frac{5}{2}}$ $\quad$ $\boxed{r = 2}$

(52)



$2\pi Rh + 2\pi rh + 2\pi [R^2 -$

$2\pi h [R+r] + 2\pi [(R+r)(R-r)]$

$2\pi [R+r][h+R-r]$

$2\pi (R+r)(h+t)$

$2 \times \frac{22}{7} (12.5 + 11.5)(20+1)$

$2 \times \frac{22}{7} \times 24 \times 3 = 44 \times 72 = 3168$

(54)

(54)

T.S.A of the Hollow cylider =

$2\pi (R+r)(h+t)$

CLASS 63

(53) A room 8m long, 6m broad and 3m high have 2 windows of $1\frac{1}{2}$ m x 1m and a door of 2m x $1\frac{1}{2}$ m. find the cost of papering the 4 walls with paper 50cm wide at the rate of 25 paise per metre.

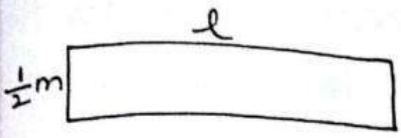
(54) find the length of wire of radius 0.25 cm w/c can completely cover the surface of a cylinder whose height is 1.2 m and base radius 14 cm.

OR

Area of 4 walls to be papered $= 2(l+b)h$

$= 2\times14\times3 = 84 - \underbrace{2\times\left[\frac{3}{2}\times1\right]}_{\text{windows Area}} - \underbrace{2\times\frac{3}{2}}_{\text{door Area.}}$

$84-6 = 78\ m^2$



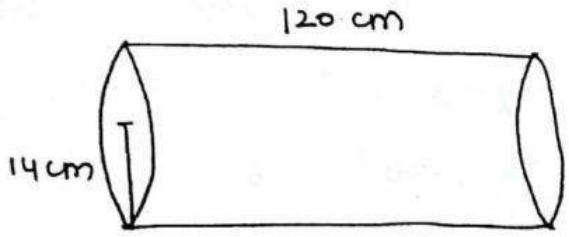
$78\ m^2 = l \times \frac{1}{2}$

length of paper = 156 metre

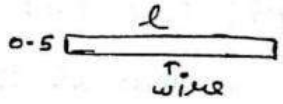
cost of papering the wall $= \cancel{156}^{39} \times \frac{25}{\cancel{100}\ 4} = 39$ Rs.

---

(54)



$\underbrace{2\times\frac{22}{7}\times\cancel{14}^{2}\times120}_{\text{surface area of cylinder}} = \underbrace{l\times\frac{0.5}{10}}_{\text{area of wire}}$



(*) wire radius = 0.25

∴ width of wire = diameter of wire = $0.25\times2 = 0.5$

$\Rightarrow 88\times120\times2 = l$

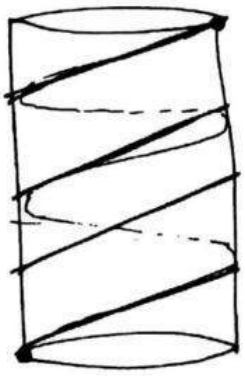
$l = 21120$ cm. Ans.

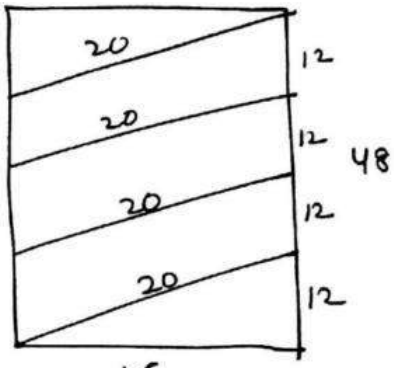
OR

$\frac{120}{0.5} = 240$ rounds of wire

$\Rightarrow 2\times\frac{22}{7}\times\cancel{14}^{2}\times240 = 21120$ cm.

(55) find the length of the string wound on a cylindrical tank whose base diameter and height are $5\frac{1}{11}$ cm and 48 cm. The string makes exactly 4 complete turns around the cylinder while its two ends touch the top and bottom of the tank.





$d = \frac{56}{11}$

16

$2\pi r$

$^{8}\frac{\cancel{56}}{\cancel{11}} \times \frac{\cancel{22}^{2}}{\cancel{7}} = 16$

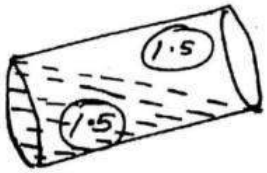
Length of string = 20+20+20+20 = 80. (approx.)

---

(56) Two-third part of an aquarium is full of water. when we tilt the aquarium in such a way that the water becomes diagonal shape, in this process 93.5 L of water is flown out. find the capacity of the aquarium?

Let capacity = 3 L

filled = $\frac{2}{3} \times 3$ = 2 L



$2 - 0.5 = 0.5 \rightarrow 93.5$

$1 \rightarrow \frac{935}{05} = 187$

Capacity = 3×187 L

(57) water flowing at the rate of 5Km/Hr through a pipe of radius 7cm into a rectangular tank w/c is 100 m long and 44 m wide. In what time the water level will rise by 14 cm.

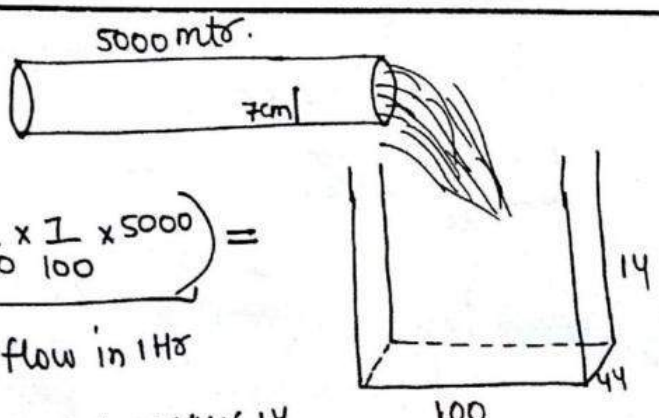
(58) The water in a rectangular reserveir having 80m x 60m x 6.5 m dimension. In what time can the water be emptied by a pipe of w/c the cross-section is a square of side 20 cm. If the water run through the pipe at the rate of 15 Km/Hr.

(59) A rectangular tank of dimension 225 m x 162 m at the base, with what speed must water flow into it through a rectangular 11 piped of base 40m x 60 m so that the water level may be ↑ by 20 cm in 5 hours

(60) if the length of a rectangular 11piped is 3 times of its breadth and 5 times of its height. If its Vol. is 14400 cm^3, find its T.S.A ?

---

(57)



$\eta\left(\frac{22}{7} \times \frac{1}{100} \times \frac{1}{100} \times 5000\right) =$

↑ water flow in 1Hr

$100 \times 44 \times \frac{14}{100}$

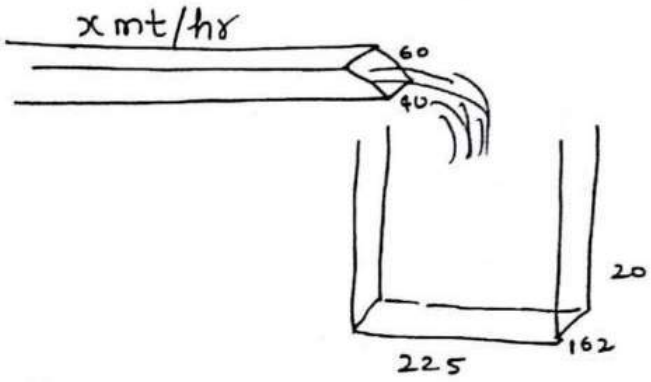
↓ Vol. of 11piped.

$$n\left(\frac{22}{7}\times\frac{7}{10\cancel{0}}\times\frac{7}{100}\times 5000\right) = 100\times 44\times\frac{44}{100}$$

$n = 8$ Hours.

---

(59)



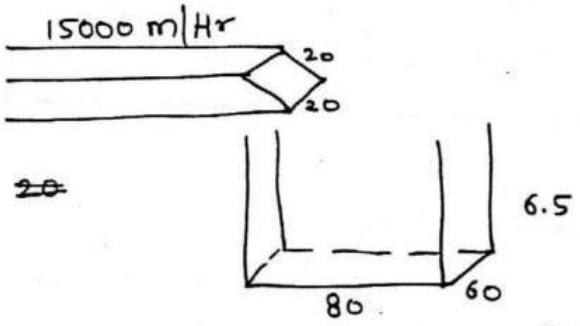
$$5\times\left[\underbrace{\frac{60}{100}\times\frac{40}{100}\times x}_{25}\right] = 225\times 162\times\frac{20}{100}$$

↑ 1 Hr vol.

$$x = 25\times 9\times 27 = 6075 \text{ m}.$$

---

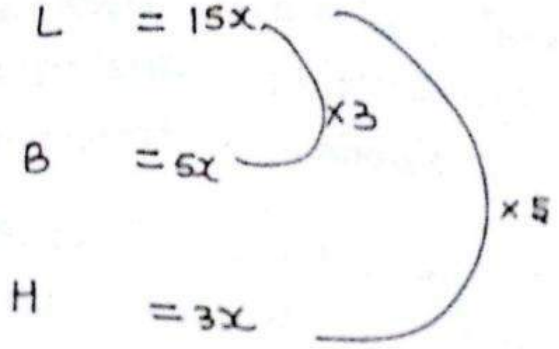
(58)



$$\left[\frac{20}{100}\times\frac{20}{100}\times 15000\right]\times n = 80\times 60\times\frac{65}{10}$$

$n = 52$ Hours.

(60)



$15x \times 5x \times 3x = 14400$

4800

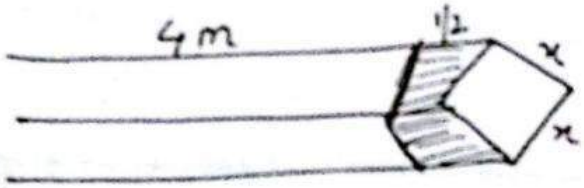
$\boxed{x = 4}$

Surface Area = $2(L+B) \times h$.

$2(60+20) \times 12 = 1920$

---

(61) The weight of a cubic metre metal is 480 kg. It is melted and cast into a square rod of 4m length. A solid cube of maximum size is taken out from one end. find the weight of the solid cube ?



$x \times x \times 4 = \frac{1}{2}$

$x^2 = \frac{1}{4}$

$\boxed{x = \frac{1}{2}}$

(Vol. of square rod = Vol. of metal)

Vol. of cube = $\left(\frac{1}{2}\right)^3 = \frac{1}{8} m^3$

weight = $\frac{1}{8} \times 480 = 60$ kg

(62) A well of 14 m base radius is digged upto a depth of 10m & A 7 m wide plateform was made around the well. find the height of plateform?

(63) In the middle of a rectangular field of length 35m and breadth 15.4 m, a bit of length 5.5 m, breadth 4 m and depth 2.5 m was dug. and the earth taken out was spread over rest of the ground. How much the level of the ground will be increased?

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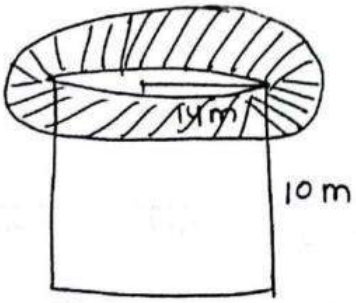
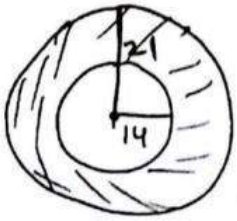
(62)



Vol. of earth $= \frac{22}{7} \times 14 \times 14 \times 10$.



→ It would be prism like

$$\frac{22}{7} \times 14 \times 14 \times 10 = \pi [21^2 - 14^2] \times h$$

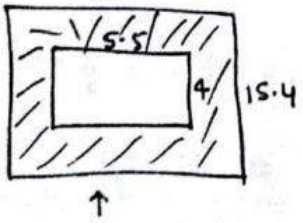
$$14 \times 14 \times 10 = (21+14)(21-14) \times h$$

$$2 \times 14 \times 14 \times 10 = 35 \times 7 \times h$$

$$h = 8$$

---

(63)



↑ would be prism

Vol. of earth $= 5.5 \times 4 \times 2.5$

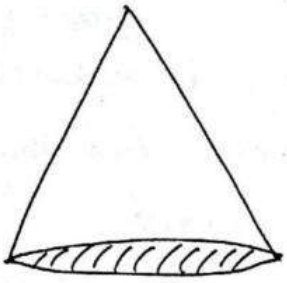
$$(35 \times 15.4 - 5.5 \times 4) \times h = 5.5 \times 4 \times 2.5$$

$$(539 - 22) \times h = 55$$

$$517\,h = 55$$

$$h = 9.4 \text{ m}$$

(64) A conical tent is required to accomodate 5 people and each person needs 16 m square of space on the ground and 100 m^3 air to breath. find the height of the conical tent ?



Base Area $= \pi r^2 = 5 \times 16$

$\frac{1}{3}\pi r^2 h = 5 \times 100$

$\frac{1}{3} \times \frac{5 \times 16}{\pi} \times h = 500$

$\frac{1}{3} \times \frac{4}{\cancel{80}} \times h = \frac{25}{\cancel{500}}$

$h = \frac{75}{4}$

(65) What is the semi-vertical angle of the cone whose L.S.A is double of the base area.

(66) find the no. of cones of semi-vertical angle α and having r as the radius of the mid section w/c can be molded out of the cylinder of base radius r and height $2r\cot\alpha$.

(67) find the radius of maximum size sphere w/c can be inscribed in a cone whose base radius and height are 6 cm and 8 cm.

(68) The base ~~area~~ radius and height of a rod roller are 0.7 cm and 10 cm respectively. When it revolves 1200 times then it levels only 88% area. find the cost of leveling the whole ground at the rate of 6.75 Rs per cm^2.

CLASS
64

(69) The height of a cylinder is 2 cm, find its base radius if 6 cm is added either in radius or height gives same change in the volume.

(घटकर $\frac{1}{9}$ हो गया)

(70) A cylinder whose area of the base is reduced to 1/9 and its height is increased to 6 times. find the increase or decrease in the C.S.A of the cylinder.

(71) The radius of a cylinder is 10 cm and its height is 4 cm. How much cm does we add either in radius or in height to get the same change in the vol.

(72) Rs 1000 is spent on the maintenance of a rectangul ground. When the cost per metre is 25 paise. The width of the ground is 50m. if the length of the ground is increased by 20 m, then find the new cost of the maintenance.

(73) 2 cm of rain has fallen on a square Km of length 50% of the water was stored in a tank of dimensi 100m × 10m. Find the ↑ in the water level in tank

(74) if P is the height of a tetrahedron and length of each side is ~~2P~~ 2A. find the value of $3P^2$

(75) A prism based on a traperium with parallel sides of length 8 cm and 14 cm have a distance of 14 cm between its two parallel lines. find the hei

(76) if h, c and v are the height, C.S.A, and vol respectively of a cone. find

$3\pi v h^3 - c^2 h^2 + 9v^2$

(77) A person requires 4 m^2 of space on the ground and 20 m^3 vol. to breath. What is the height of a conical tent if 11 person has to be accomodated in the tent.

(78) How many smaller cylinder of height & radius 3.5 cm can be made from a larger cylinder of height 14 cm and radius 7 cm

(79) The length of a rectangular metallic sheet is 20m and width is 14 cm. A water tank of maximum vol. possible is made from the sheet of height 2 cm. find the vol. of the tank.

(80) Few people dive in a swimming pool of dimension 20m x 10m. Due to this the water level rises by 2m. If one person displace 1 cubic m of water find the no. of people who are diving.

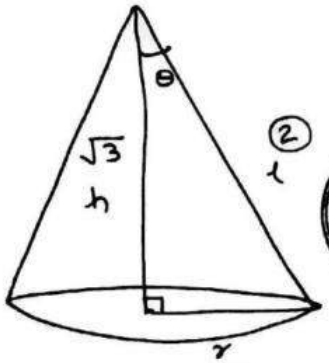
(81) A rectangular sheet of length 44 cm and breadth 18 cm was rolled along its length (length को मोड़ना है) to form a cylinder. find the vol. of the formed cylinder.

(82) The capacity of two hemispherical bowls is 6.4 l and 21.6 l. find the ratio of their C.S.A.

(63) The length of a swimming pool is 20 m and width 10 m. Its depth in starting is 4.5 m w|c reaches upto 7.5 m in the other end. find the vol. of the pool.

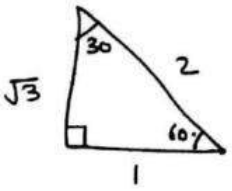
Solutions

(65)



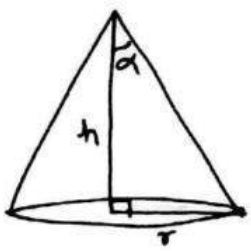
$\pi r l = 2\pi r^2$

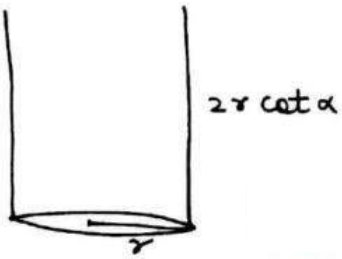
$\frac{1}{r} = \frac{2}{1}$



$\therefore \boxed{\theta = 30^\circ}$ Ans.

(66)





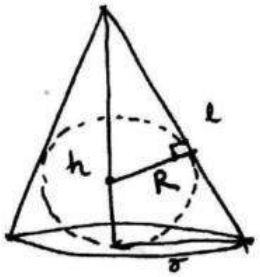
$\frac{h}{r} = \cot\alpha$

$h = r\cot\alpha$

$\pi r^2 \times 2r\cot\alpha = n \times \frac{1}{3}\pi r^2 \times r\cot\alpha$

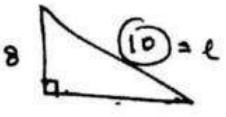
$\boxed{n = 6}$ Ans.

(67)

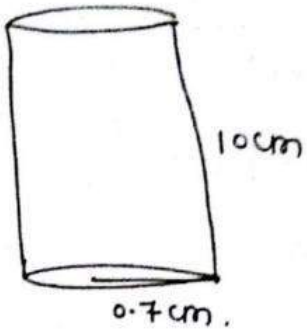


Radius of sphere $= \frac{h \times r}{l + r}$

$= \frac{8 \times 6}{10+6} = \frac{48}{16} = 3$ cm. Ans



(68)



एक बार में roller घुमेगा तो वो अपने surface Area जितना area cover करेगा।

$$2 \times \frac{22}{7} \times 0.7 \times 10 \times 1200 = A \times \frac{\cancel{88}^{2}}{100}$$

$$A = 60{,}000 \text{ cm}^2$$

$$\text{cost} = 60{,}000 \times 6.75 = 405{,}000 \text{ Rs.}$$

---

(70)

$\pi R^2 = 9$ $(R=3)$

$\pi r^2 = 1$ $(r=1)$

Surface Area

$2\pi R H = 3 \times 1 = 3$ (1 = height)

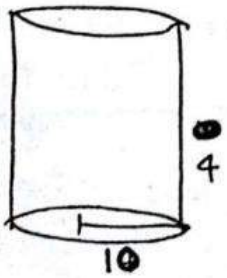
$2\pi r h = 1 \times 6 = 6$ (6 = height)

(x 2 times)

S.A. becomes 2 times.

---

(71)



$\text{Vol.} = \pi (10)^2 \times 4$

$= 400\pi$

if Add 5 in radius then.

$\text{Vol} = \pi \times 15^2 \times 4 = 900\pi$

if Add 5 in height then

$\text{Vol} = \pi \times 10^2 \times 9 = 900\pi$.

$\therefore$ The no. is 5. Ans

options are -

A) 5

B) 16

C) 25

D) 36.

OR

$\pi(10+x)^2 \times 4 = \pi(10)^2(4+x)$

$(100+x^2+20x)4 = 100(4+x)$

$400 + 4x^2 + 80x = 400 + 100x$

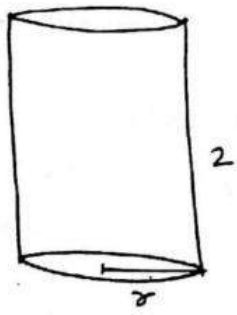
$4x^2 = 20x$

$4x = 20$

$\boxed{x = 5}$ Ans.

---

(69)



$\pi(r+6)^2 \times 2 = \pi r^2(6+2)$

$(r+6)^2 \times 2 = r^2(8)$

squaring

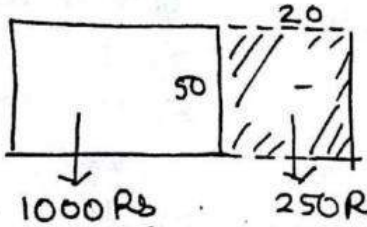
$\sqrt{(r+6)^2 \times 2} = \sqrt{r^2(4)}$

$r+6 = 2r$

$\boxed{r=6}$

---

(72)



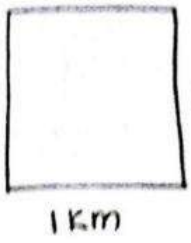
$50 \times 20 = 1000\ m^2$ (Area increase due to ↑ in length)

increase in cost = $1000 \times \frac{25}{100} = 250$ Rs

Now cost = $1000 + 250 = 1250$ Rs.

---

(13)



Area = 1000×1000

$\underbrace{1000 \times 1000 \times \frac{2}{100}}_{\text{इतना पानी गिरा है}} \times \underbrace{\frac{5}{10}}_{\downarrow \text{इतना store किया है}} = \underbrace{100 \times 10 \times h}_{\text{tank area}}$

$\boxed{h = 10m}$ Ans.

---

(14)

$\frac{\sqrt{2}}{\sqrt{3}} \times 2A = P$

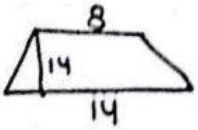
$\frac{2}{3} \times 4 \times A^2 = P^2$

$8A^2 = 3P^2$ Ans.

∴ Height of tetrahedron = $\frac{\sqrt{2}}{\sqrt{3}} a$

---

(15)



$\underbrace{\frac{1}{2} \times (8+14) \times 14}_{\text{Base Area}} \times h = 1056$

$\text{Base Area} \times h = \text{Vol.}$

$\Rightarrow \frac{1}{2} \times 22 \times 7 \times h = 1056$ (48)

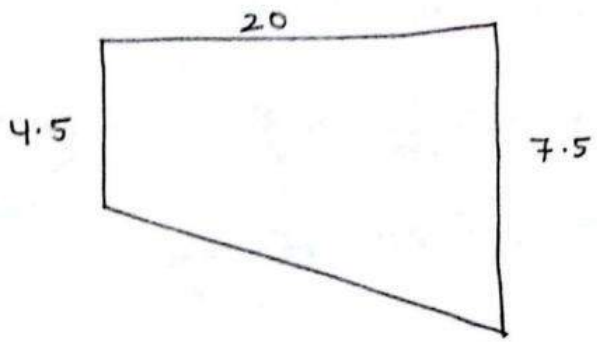
$\boxed{h = \frac{48}{7}}$ Ans.

---

(16)

Vol. of swimming pool $= \frac{1}{2}$ [sum of depth of Both end] x length x Breadth

(83)



Trapezium like

$$\text{Vol.} = \frac{1}{2}(4.5+7.5) \times 20 \times 10$$

$$= \frac{1}{2} \times 12 \times 20 \times 10 = 1200\ m^3.$$

---

(76) $v = \frac{1}{3}\pi r^2 h$, $c = \pi r l$, $l^2 = r^2 + h^2$

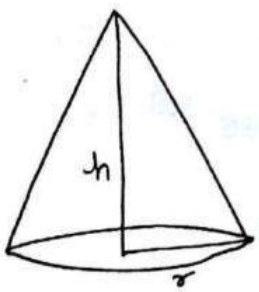
$$3\pi v h^3 - c^2 h^2 + 9v^2$$

$$\Rightarrow 3\pi \times \frac{1}{3}\pi r^2 h \times h^3 - \pi^2 r^2 (r^2+h^2) h^2 + 9 \times \frac{1}{9}\pi^2 r^4 h^2$$

$$\Rightarrow \pi^2 r^2 h^4 - \pi^2 r^4 h^2 - \pi^2 r^2 h^4 + \pi^2 r^4 h^2 = 0$$ Ans.

---

(77)



$$\pi r^2 = 4 \times 11 \quad \text{(Area)}$$

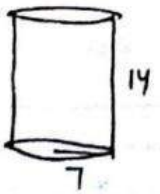
$$\frac{1}{3}\pi r^2 h = 20 \times 11 \quad \text{(Vol.)}$$

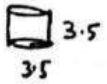
$$\frac{1}{3}(4 \times 11)\, h = 20 \times 11$$

$$\boxed{h = 15}$$ Ans.

---

(78)



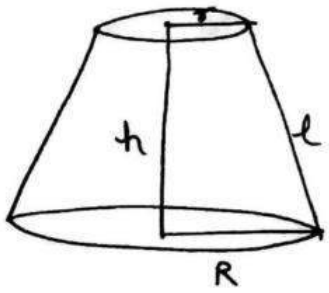


$$\pi(7^2) \times 4 = n \times \pi\,(3.5)^2 \times 3.5$$

$$\boxed{n = 16}$$ Ans

(#) Frustum of a cone

$$\text{Vol.} = \frac{1}{3}\pi\left[R^2 + r^2 + Rr\right]h$$



$$\text{Surface Area} = \pi(R+r)l$$

$$\text{T.S.A} = \pi[R+r]l + \pi r^2 + \pi R^2$$

$$l = \sqrt{h^2 + (R-r)^2}$$