



SSC FOUNDATION



सम्यान 1.0 बैच

MATHS

MENSURATION-3D

FRUSTUM & SPHERE

CONCEPT FORMULAS & TRICKS



«» LIVE 11:00 AM-BY SHASHI SIR

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Cone/शंकु

$$\text{Volume/आयतन} = \frac{1}{3} \times \text{base area} \times \text{height} = \frac{1}{3} \pi r^2 h$$

Curved surface area / वक्र पृष्ठ का क्षेत्रफल

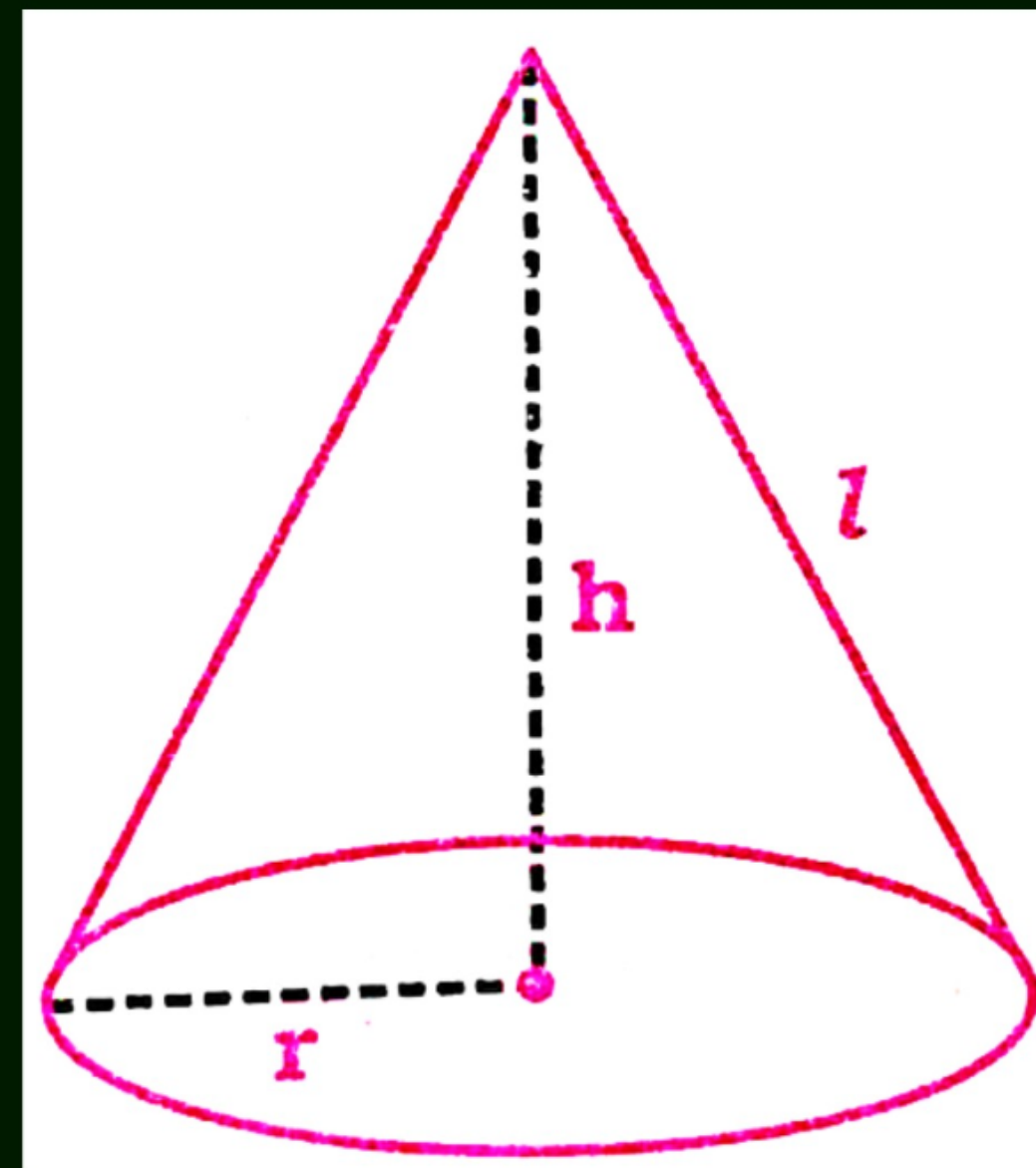
$$\text{C.S. A} = \frac{1}{2} \times \text{base perimeter} \times \text{slant height}$$

$$\text{C.S. A} = \frac{1}{2} \times 2\pi r l = \pi r l$$

Total surface area / कुल सतह का क्षेत्रफल

$$\text{T.S.A} = \text{CSA} + \text{base area}$$

$$\text{T.S. A} = \pi r l + \pi r^2 = \pi r (l + r)$$





$$R = \frac{105}{2}, l = 63\text{m}$$

$$C.S.A = 2\pi Rh + \pi Rl$$

$$= \pi R(2h + l)$$

$$= \frac{22}{7} \times \frac{105}{2} \times (6 + 63)$$

$$= 11 \times 15 \times 69$$

$$= 11385 \text{ cm}^2$$

1. A circular tent is cylindrical up to a height of 3m & conical above it. If its diameter is 105 m and the slant height of the conical part is 63 m, then the total area of the canvas re-quired to make the tent is.

एक वृत्ताकार टेन्ट 3m की ऊंचाई तक बेलनाकार है और उसके ऊपर शंकाकार है। यदि इसका व्यास 105 m और शंकाकार भाग की तिर्यक ऊंचाई 63m है तो टेन्ट को बनाने में लगे कैनवास का क्षेत्रफल क्या होगा।

(a) 10285 cm²

(b) 13465 cm²

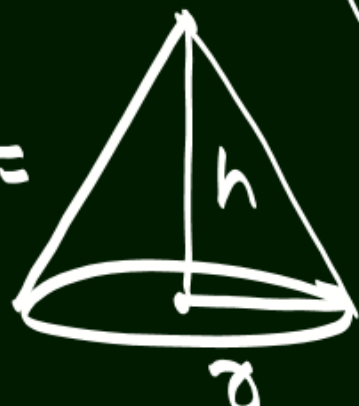
(c) 14370 cm²

(d) 11385 cm²

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



=



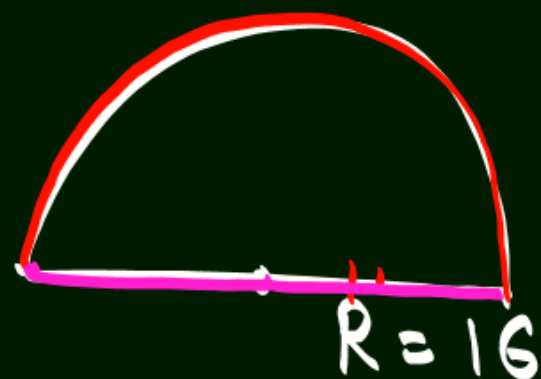
$$V = \frac{1}{3} \pi r^2 h$$

$$\frac{V_1}{V_2} = \frac{\pi r^2 h}{\frac{1}{3} \pi r^2 h} = 3:1$$

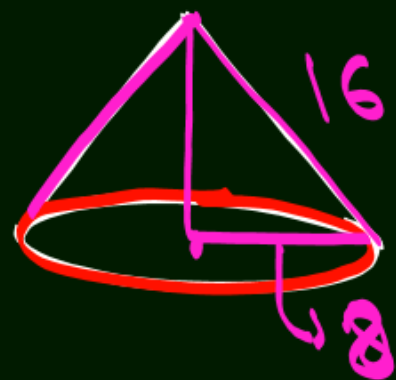
2. A cylinder and a cone have the same base and the same height. Find the ratio of the volume of the cylinder and the cone ?

एक बेलन और एक शंकु की आधार और ऊंचाई समान है। बेलन और शंकु के आयतन का अनुपात ज्ञात कीजिये ?

- (a) 2:3
- ☒ (b) 3:1
- (c) 1:3
- (d) 3:2



$$\pi R = \pi \times 16$$



$$2\pi r = \pi \times 16$$

$$r = 8$$

$$h = \sqrt{16^2 - 8^2} = \sqrt{256 - 64} = \sqrt{192} = \sqrt{64 \times 3} = 8\sqrt{3} \text{ cm}$$

3. A semicircular sheet of diameter 32 cm is bent into a conical cup. Find the depth of cup ?

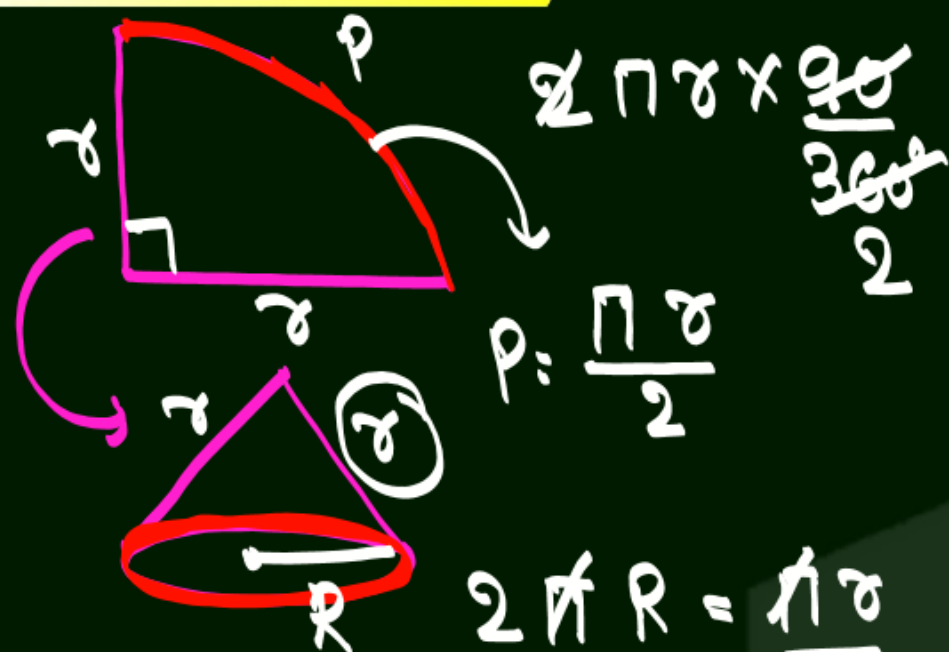
32 सेमी. व्यास वाले अर्धवृत्ताकार कागज को मोड़कर एक शंकु बनाया जाता है तब इस शंकु की गहराई क्या होगी?

(a) $8\sqrt{5}$ cm

✓ (b) $8\sqrt{3}$ cm

(c) $16\sqrt{2}$ cm

(d) $12\sqrt{3}$ cm



$$\frac{90}{360} \times 2\pi r$$

$$p = \frac{\pi r}{2}$$

$$2\pi R = \frac{\pi r}{2}$$

$$R = \frac{r}{4}$$

$$\begin{aligned} \text{C.S.A} &= \pi R l = \pi \frac{r}{4} \times r \\ &= \frac{\pi r^2}{4} \end{aligned}$$

4. A right angled sector of 90° 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.

r cm त्रिज्या वाले किसी एक 90° कोणीय भाग वृत्तखण्ड की दोनों त्रिज्याओं को मोड़कर एक शंकु बनाया गया। शंकु का वक्र पृष्ठीय क्षेत्रफल ज्ञात करो।

$$(a) \frac{1}{6} \pi r^2$$

$$(c) \frac{1}{8} \pi r^2$$

$$(b) \frac{1}{4} \pi r^2$$

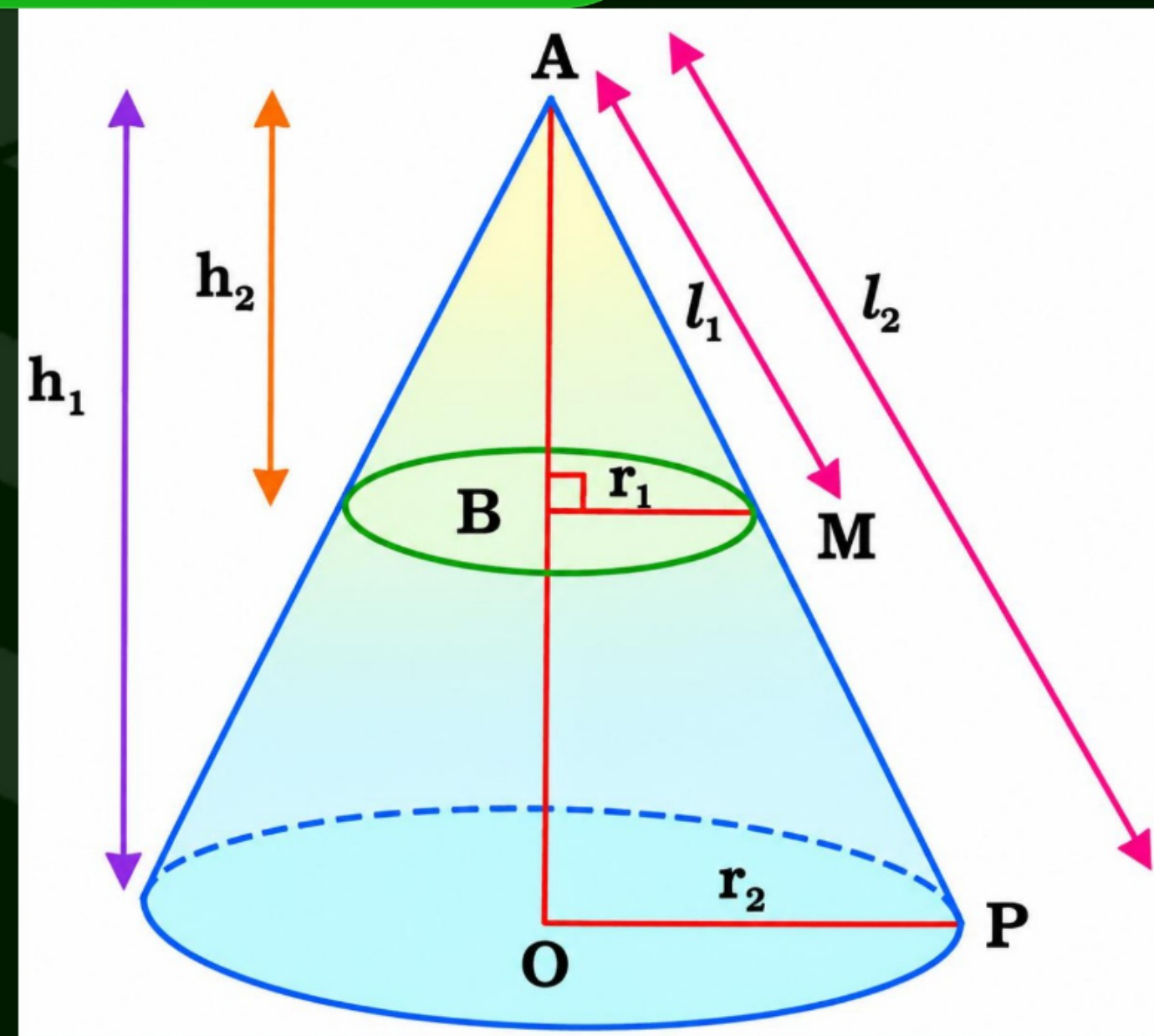
$$(d) \frac{1}{5} \pi r^2$$

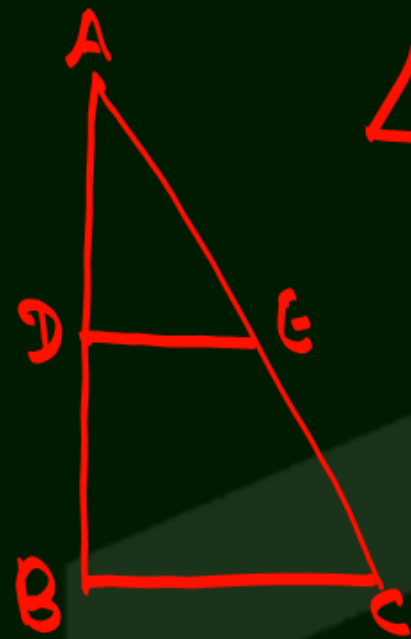
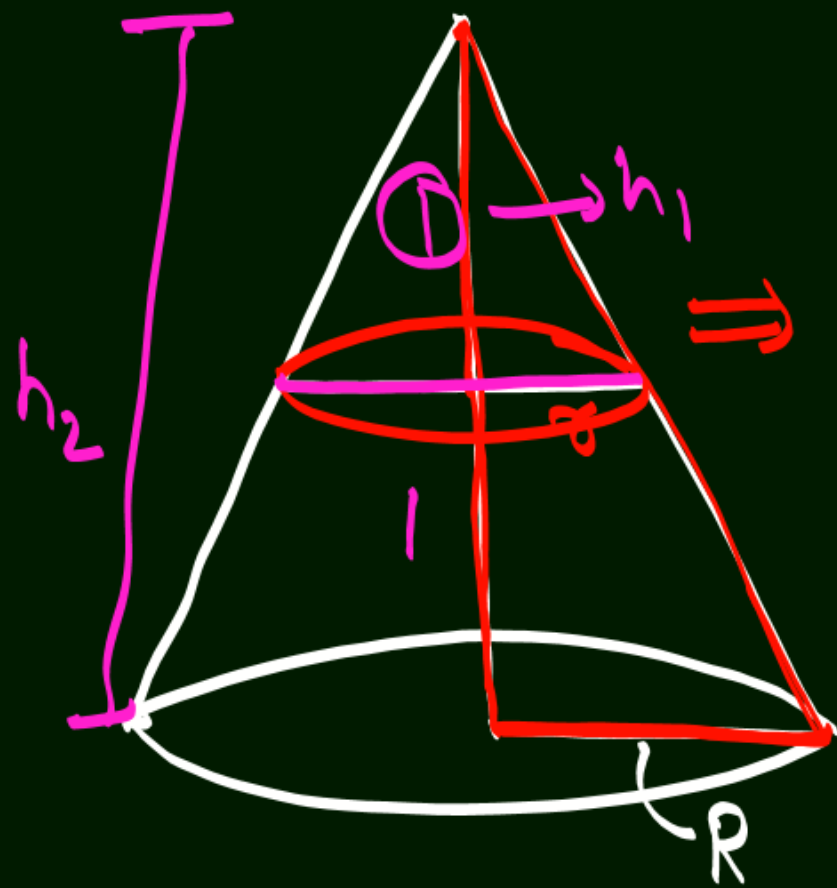
Cutting of a cone parallel to base किसी शंकु को उसके आधार के समानान्तर काटना

$$\Delta ABM \sim \Delta AOP$$

$$\frac{AB}{AO} = \frac{BM}{OP} = \frac{AM}{AP}$$

$$\frac{h_1}{h_2} = \frac{r_1}{r_2} = \frac{l_1}{l_2} = \sqrt[3]{\frac{V_1}{V_2}} = \sqrt{\frac{CSA_1}{CSA_2}}$$





$$\triangle ADE \sim \triangle ABC$$

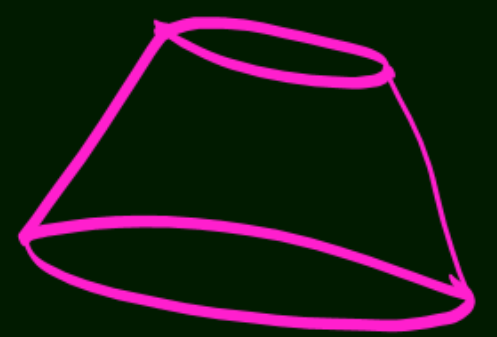
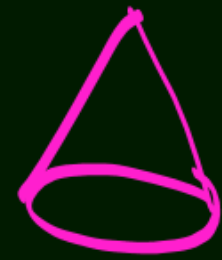
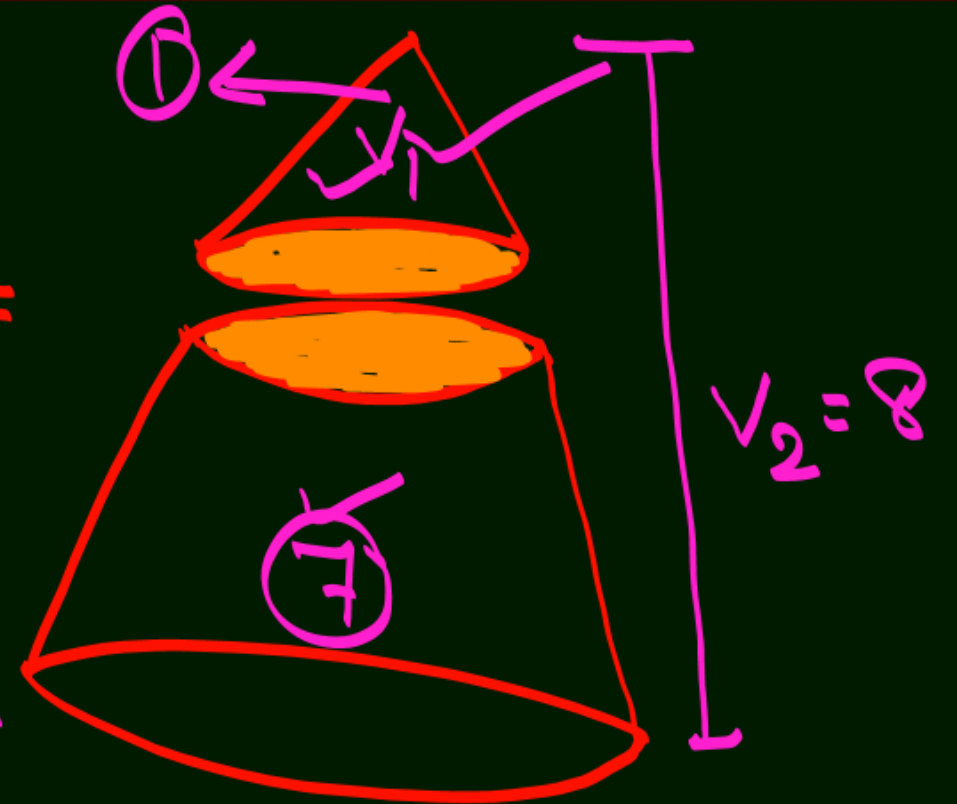
$$\frac{AD}{AB} = \frac{DE}{BC} = \frac{AE}{AC} = \frac{r}{R} =$$

$$= \sqrt[3]{\frac{V_1}{V_2}}$$

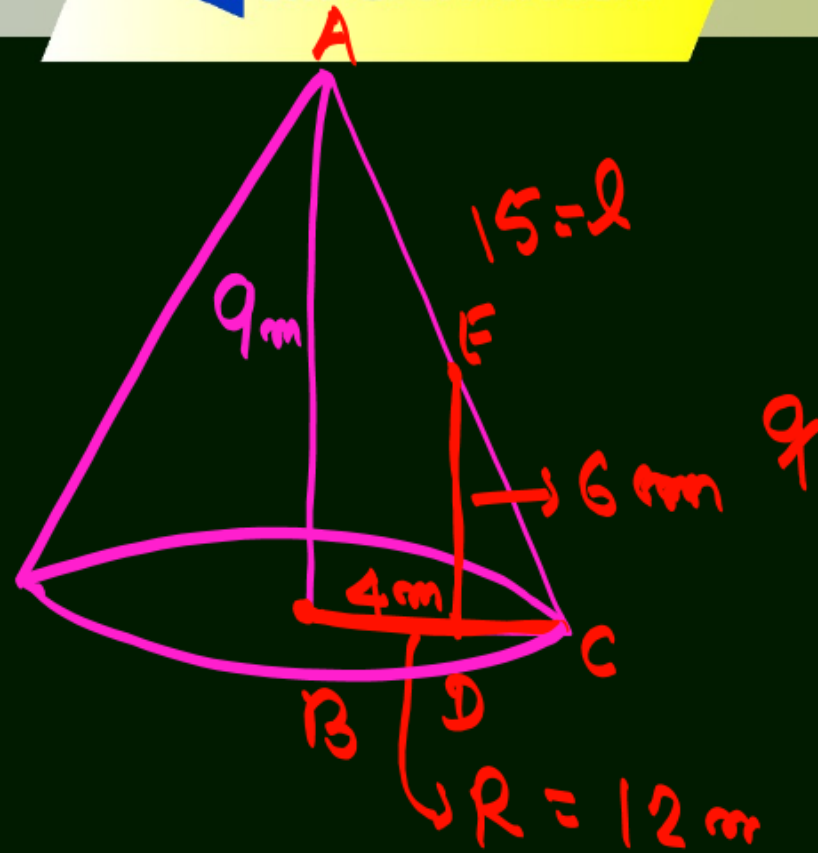
$$= \sqrt{\frac{C.S.A_1}{C.S.A_2}}$$

$$\frac{h_1}{h_2} = \frac{1}{2}$$

$$\frac{V_1}{V_2} = \frac{1}{8}$$

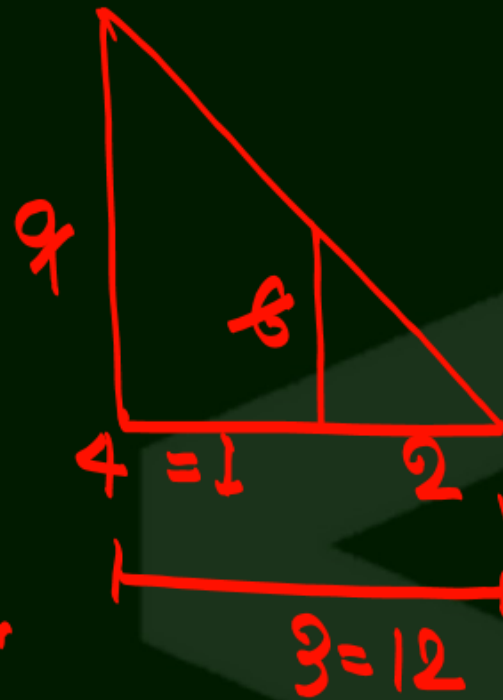


1 : 8 : 7



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

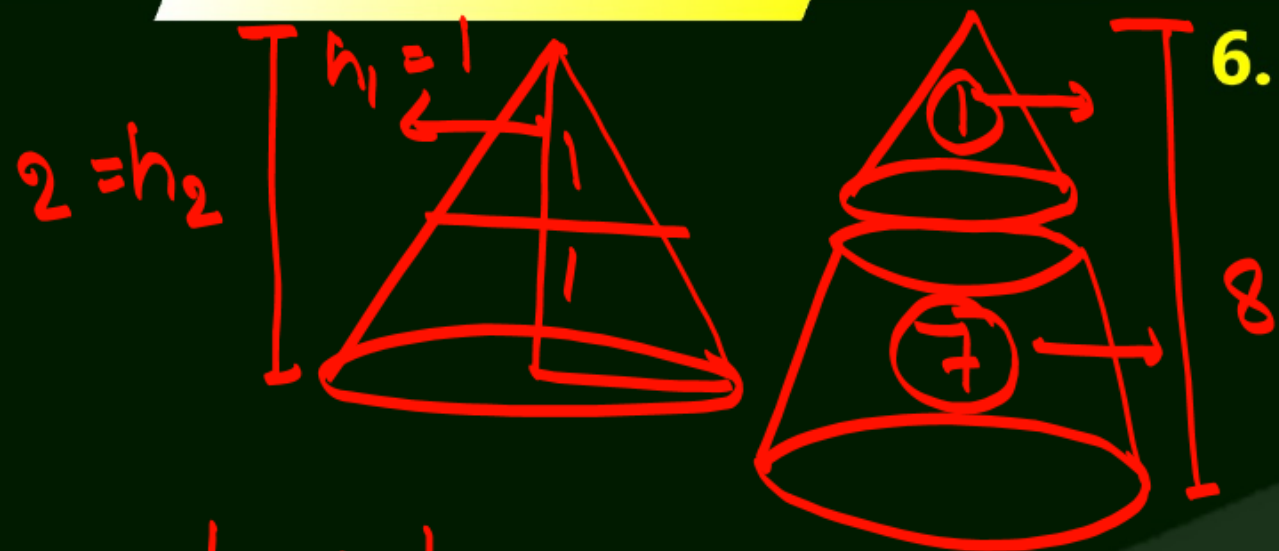
$$= \pi \times 12 \times 15 = 180\pi \text{ m}^2$$



5. The height of a conical tent is 9 m. A vertical pole of 6 m height is placed 4 meter away from its centre such that it touches its surface. Find the lateral surface area of the tent?

किसी शंकाकार टेंट की ऊंचाई 9m है। इसके केन्द्र से 4 m दूर, 6m ऊंचाई का एक खंभा रखा गया है जो इसकी सतह को स्पर्श करता है टेंट का वक्र पृष्ठीय क्षेत्रफल ज्ञात करो।

- (a) $180\pi \text{ m}^2$
 (b) $196\pi \text{ m}^2$
 (c) $226\pi \text{ m}^2$
 (d) $324\pi \text{ m}^2$



$$h_1 : h_2$$

$$1 : 2$$

$$V_1 : V_2$$

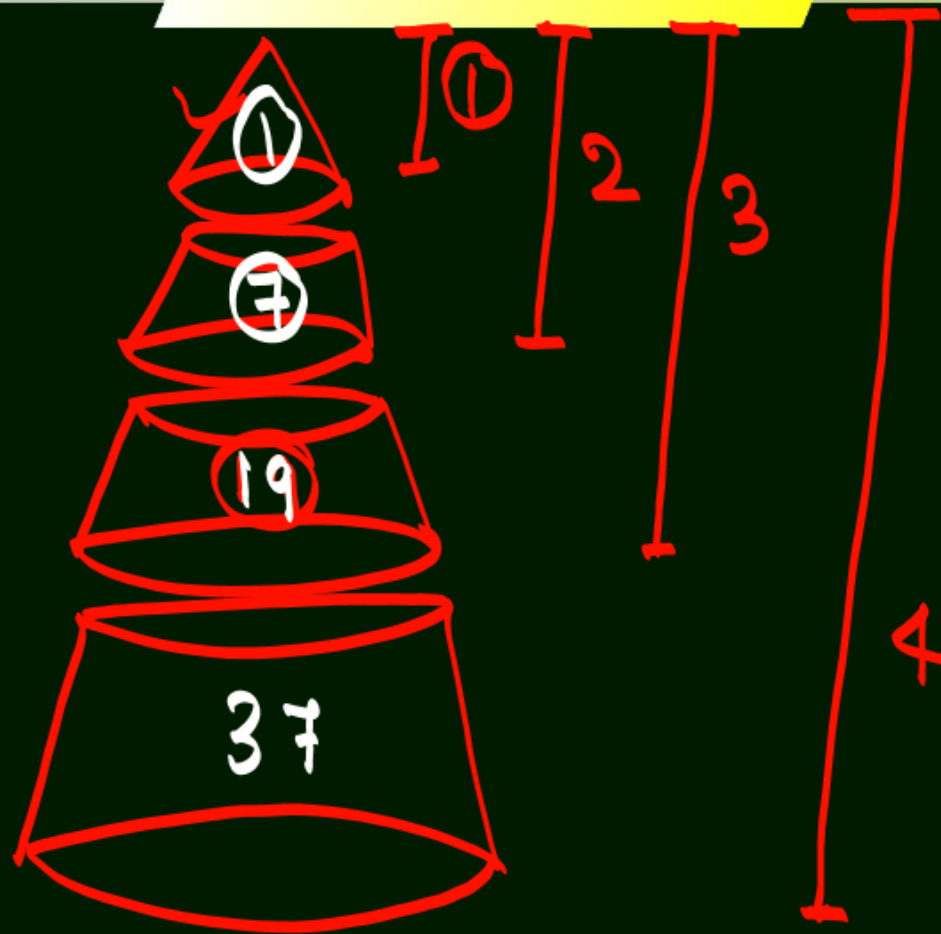
$$1^3 : 2^3 = 1 : 8$$

6.

A cone is cut parallel to its base in such a way that height of the two parts is same. Find the ratio of volume of two parts?

एक शंकु को उसके आधार के समानान्तर इस प्रकार काटा गया कि दोनों हिस्सों की ऊंचाई समान है। दोनों हिस्सों के आयतनों का अनुपात ज्ञात करो।

- (a) 1:7
(b) 1:10
(c) 1:8
(d) 1:9



7. A cone is cut into 4 parts by 3 cuts parallel to the base at equal height. What is the ratio of volume of 4 parts ?

एक लम्बवृत्तीय शंकु को इसके आधार पर समांतर 3 बार काटकर, बराबर ऊंचाई वाले 4 भागों में बांटा गया है, तब इन चारों भागों में आयतन का अनुपात क्या होगा?

- (a) 1:8:27:70
(b) 1:7:29:47
(c) 1:7:19:37
(d) 1:8:27:64

$$V_1 : V_2 : V_3 : V_4$$

$$1^3 : 2^3 : 3^3 : 4^3 = 1 : 8 : 27 : 64$$

(1+7) (1+8+19) (1+8+27+37)

$$\text{Total } V = 1 : 7 : 19 : 37$$

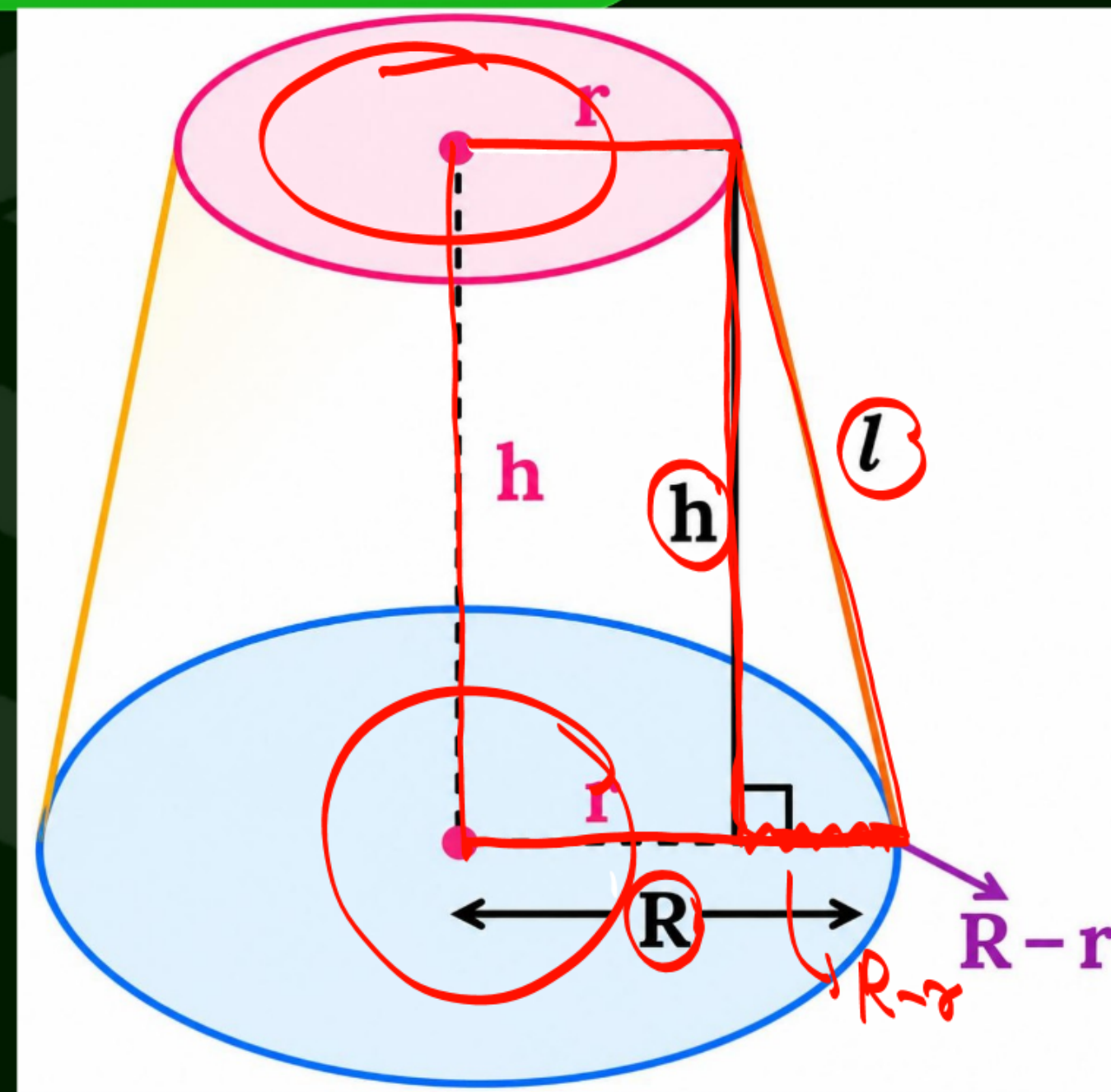
Frustum of cone / शंकु का छिन्नक

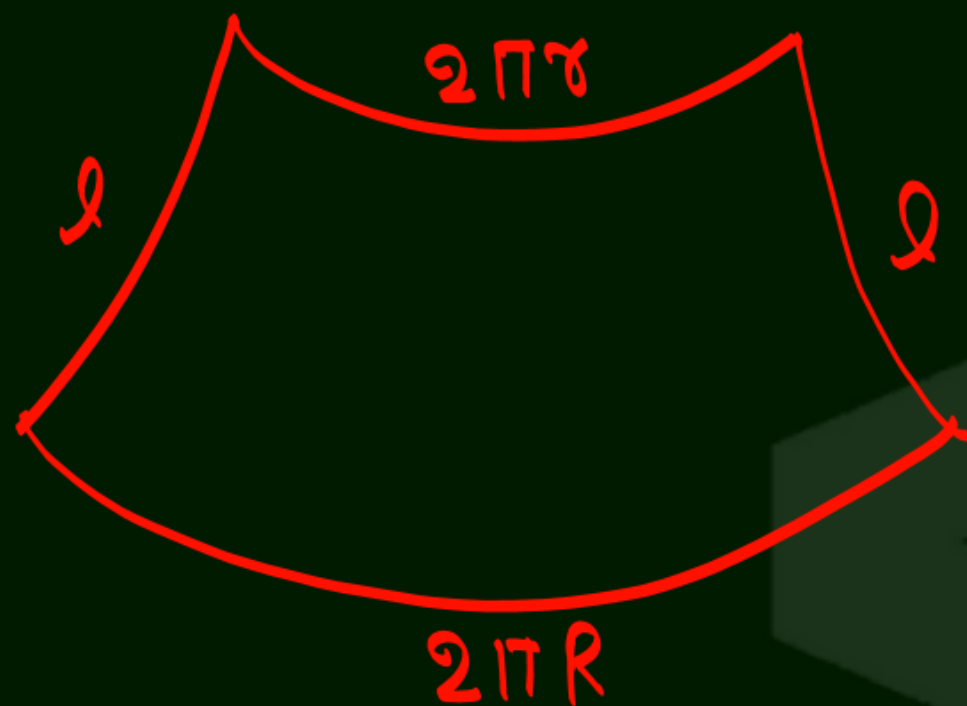
Volume = आयतन = $\left[\frac{1}{3} \pi h (R^2 + r^2 + Rr) \right]$

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

Curved surface area = $\pi(R + r) l$

Total surface area = $\pi(R + r) l + \pi r^2 + \pi R^2$





$$A = \frac{1}{2} \times (2\pi r + 2\pi R) \times l$$

$$= \frac{1}{2} \times 2\pi (R+r) \times l$$

$$C.S.A = \pi (R+r) \times l$$

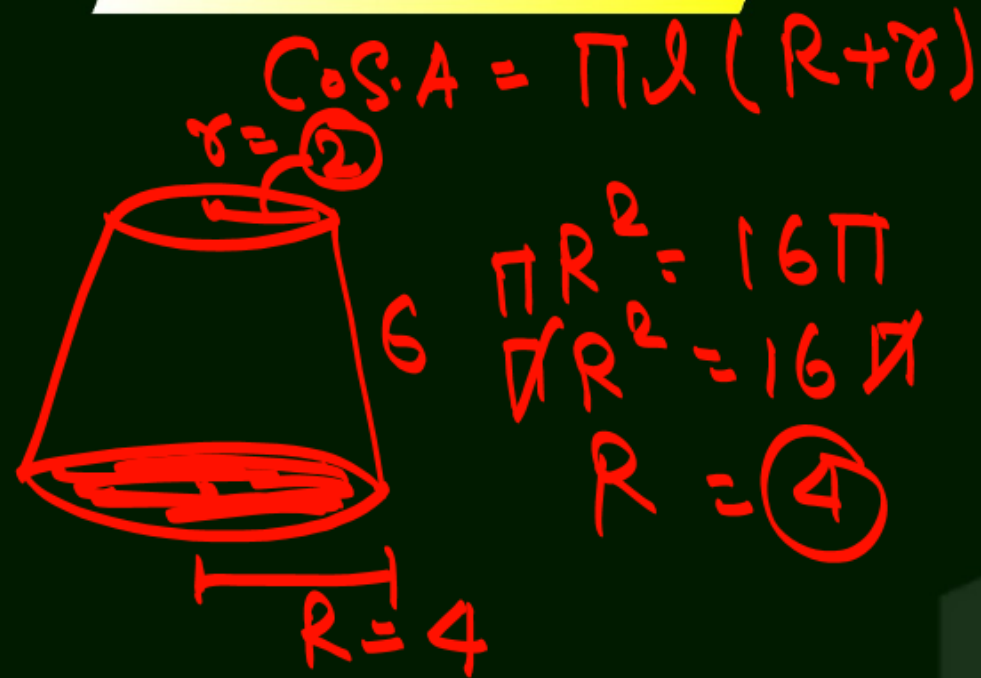
$$T.S.A = C.S.A + 2 \sqrt{r^2 + l^2}$$

$$\cancel{\pi} \pi (R+r)l + \pi r^2 + \pi R^2$$

$$\pi [(R+r)l + r^2 + R^2]$$

$$\begin{aligned}
 V &= \frac{1}{3} \pi h (R^2 + r^2 + Rr) \\
 &= \frac{1}{3} \times \frac{22}{7} \times 10.5 (25 + 9 + 15) \\
 &= 11 \times 49 = 539
 \end{aligned}$$

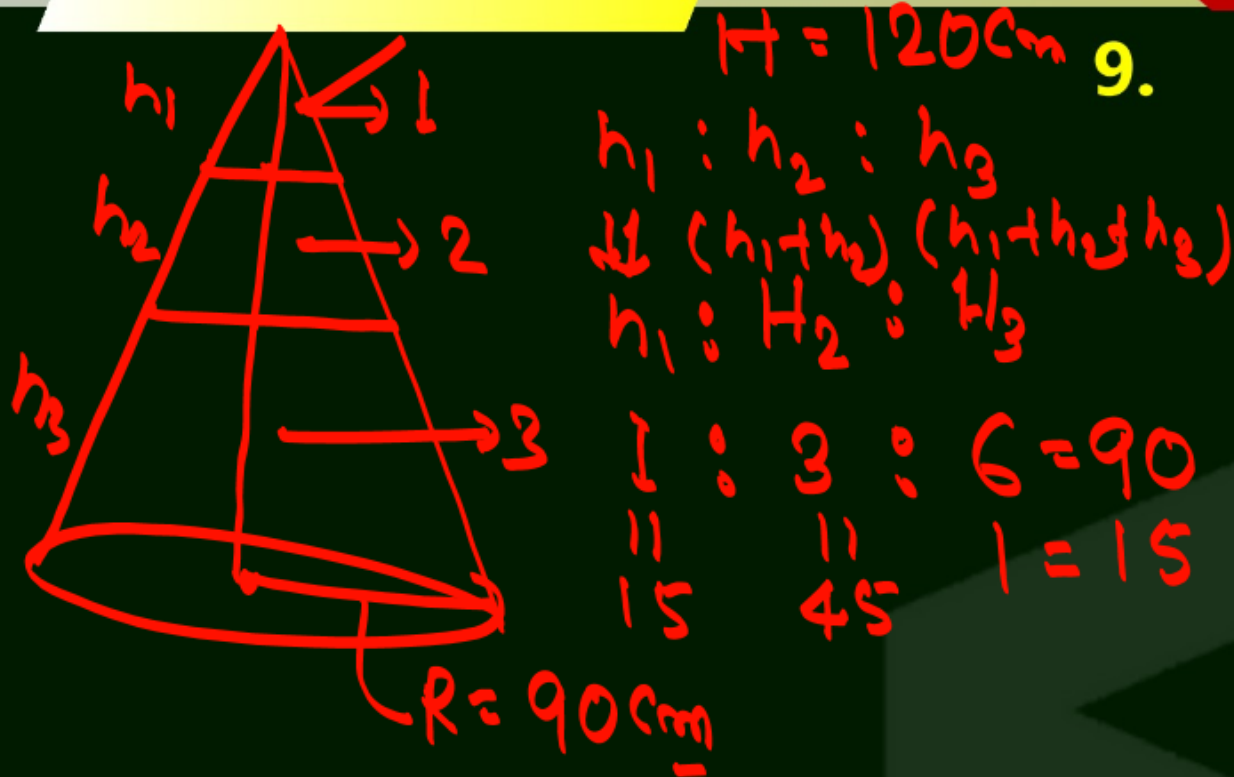
8. एक 10.5 cm ऊँचे शंकु के छिन्नक के दो वृत्ताकार फलकों की त्रिज्याएँ 5 cm और 3 cm हैं। cm^3 में इसका आयतन क्या है?
- The radii of the two circular faces of a frustum of a cone 10.5 cm high are 5 cm and 3 cm. What is its volume in cm^3 ?
- (a) 552
 - ✓ (b) 539
 - (c) 545
 - (d) 564



8. किसी लम्ब वृत्ताकार शंकु के छिन्नक के पार्श्व सतह का क्षेत्रफल क्या होगा, जिसके आधार का क्षेत्रफल $16\pi \text{ cm}^2$ है, वृत्ताकार ऊपरी सतह का व्यास 4 सेमी. है और तिरछी ऊँचाई 6 सेमी. है?

What is the lateral surface area of the frustum of a right circular cone, whose base area is $16\pi \text{ cm}^2$, the diameter of the circular upper surface is 4 cm, and the slant height is 6 cm?

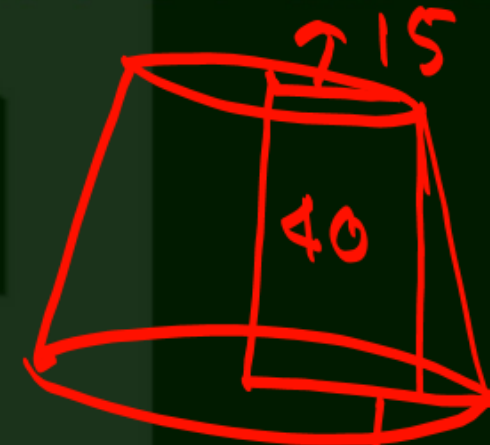
- (a) $30\pi \text{ cm}^2$
 (b) $48\pi \text{ cm}^2$
 (c) $36\pi \text{ cm}^2$
 (d) $60\pi \text{ cm}^2$



9. A cone of radius 90 cm and height 120 cm is cut into 3 parts by 2 cuts parallel to base, such that the height of 3 parts (from top to bottom) are in the ratio 1 : 2 : 3. What is the TSA of middle part?

एक शंकु जिसकी आधार त्रिज्या 90 सेमी. और ऊंचाई 120 सेमी. है को इसके आधार के समांतर समतल द्वारा 2 बार काटा गया है। जिससे तीन भाग बनते हैं जिनकी ऊंचाई का अनुपात 1 : 2 : 3 तब बीच वाले भाग का TSA ज्ञात करें?

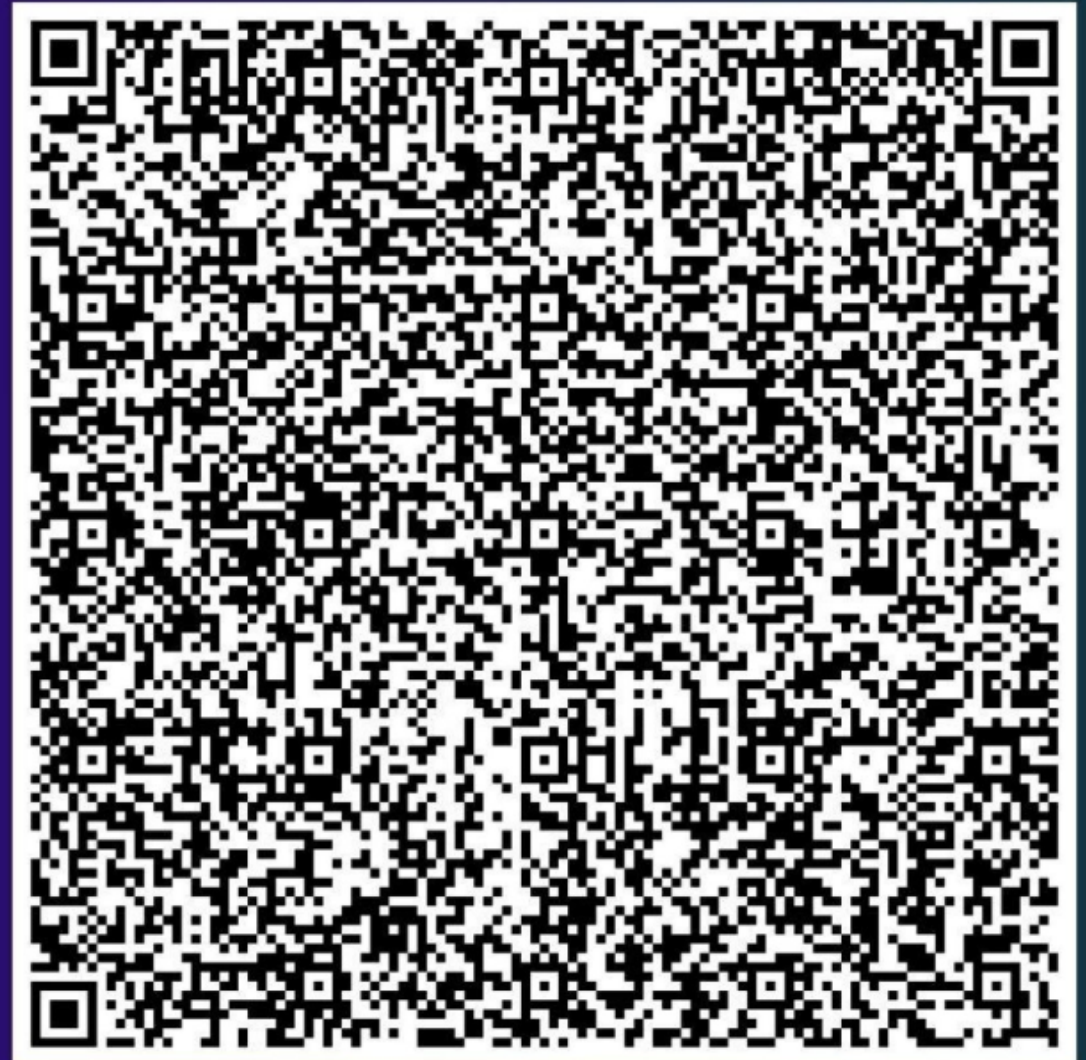
- (a) 13750 SKIP
- (b) 19250
- (c) 16500
- (d) 18500



$$\begin{aligned}
 l &= \sqrt{H^2 + (R-r)^2} \\
 &= \sqrt{45^2 + (90-30)^2} \\
 &= \sqrt{2025 + 3600} \\
 &= \sqrt{5625} \\
 &= 75
 \end{aligned}$$

$$\begin{aligned}
 \text{T.S.A} &= \pi(R+r)l + \pi r^2 + \pi R^2 \\
 &= \frac{22}{7} \times (30+60) \times 75 + \frac{22}{7} \times 30^2 + \frac{22}{7} \times 60^2 \\
 &= \frac{22}{7} \times 3000 + 2250 + 20250 \\
 &= 19250
 \end{aligned}$$

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