



# SSC FOUNDATION



सम्यान 1.0 बैच

# MATHS

## MENSURATION-3D

## PRISM & PYRAMID

## CONCEPT FORMULAS & TRICKS



**LIVE 11:00 AM-BY SHASHI SIR**



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PRISM →  $\begin{cases} \text{what about?} \\ \text{formula} \\ \text{p.q} \end{cases}$

Pyramid →  $\begin{cases} \text{what about?} \\ \text{formula} \\ \text{p.q} \end{cases}$

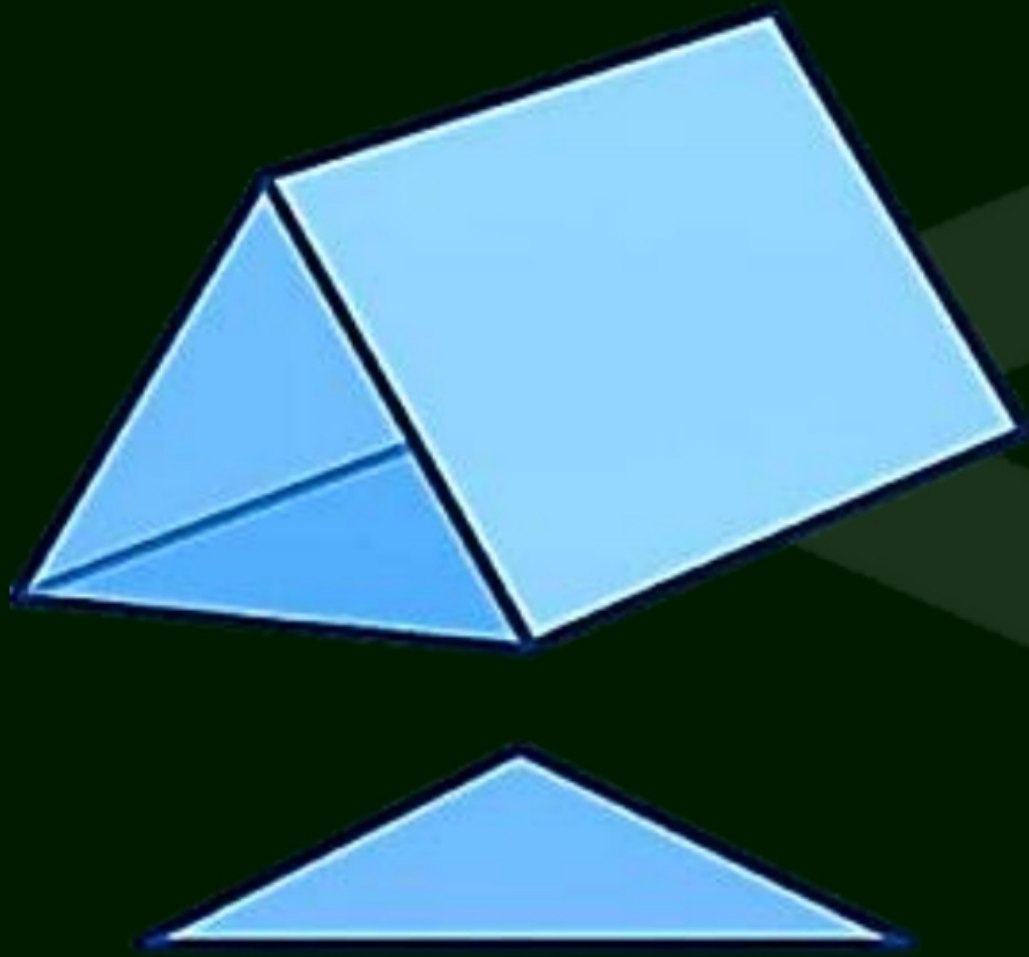




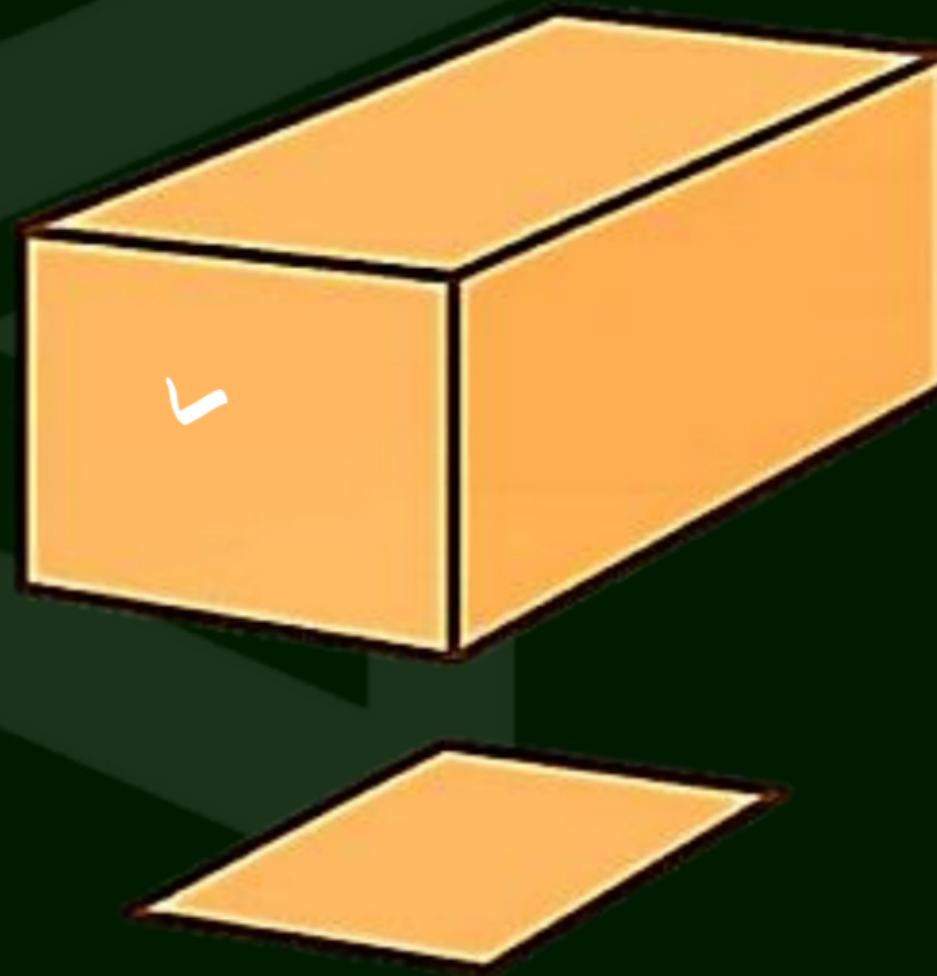
**PRISM**



# Prism Shape



**Base Prism**

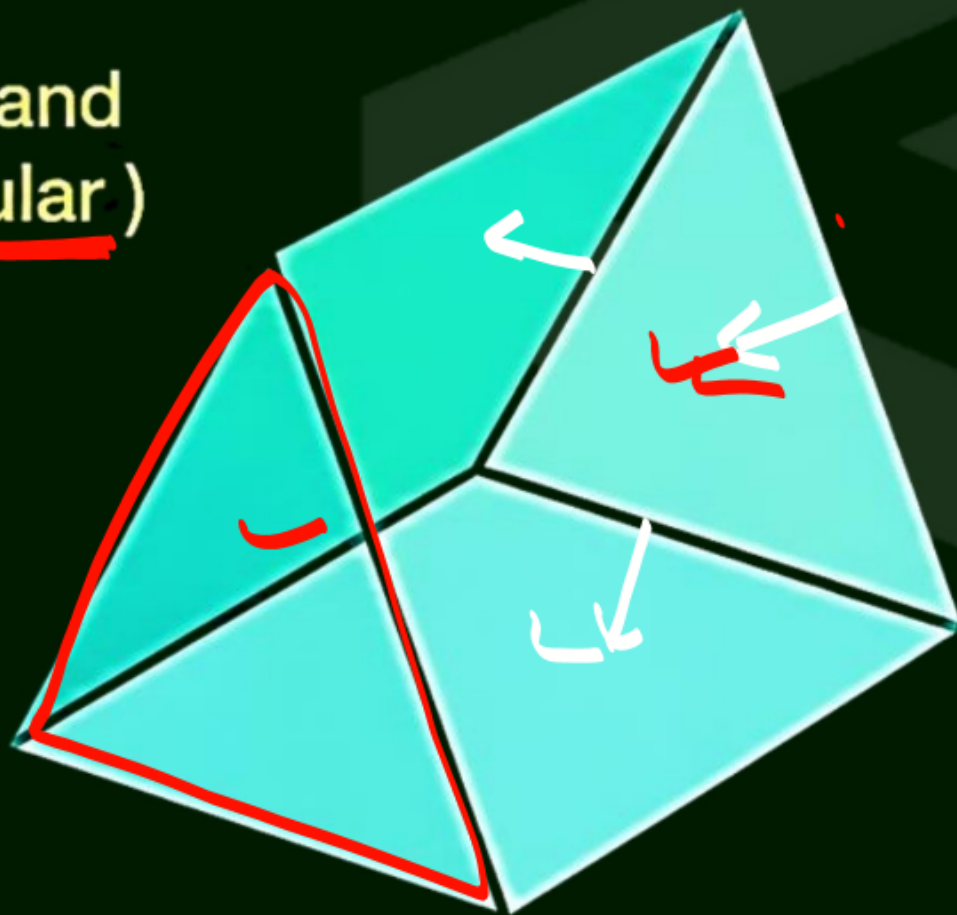


**Base Rectangular**

# Prism Shape

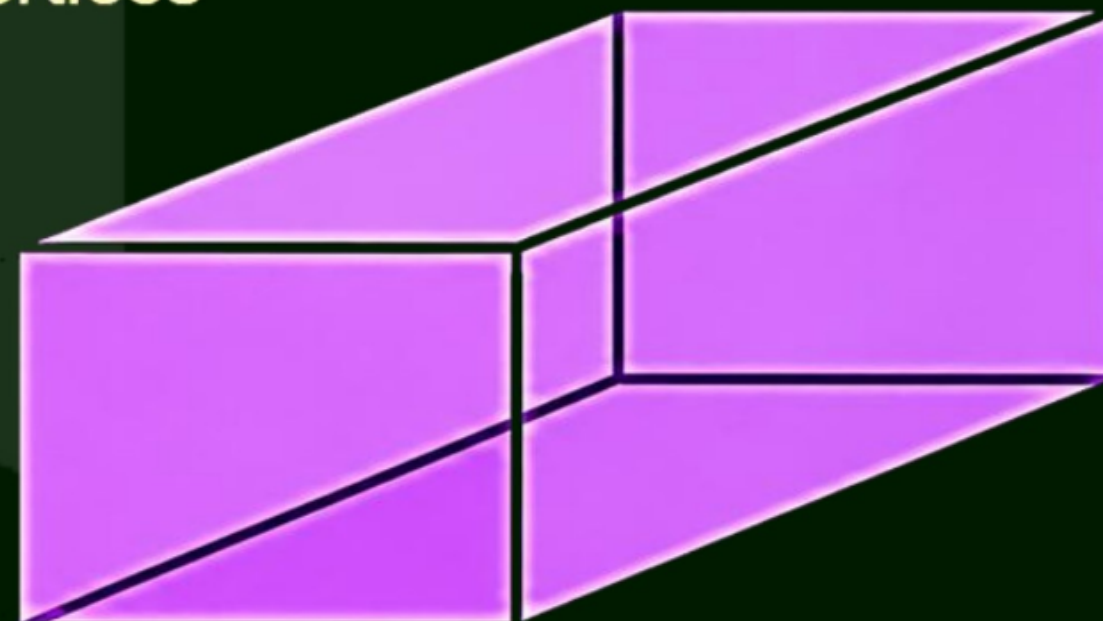
## Triangular

- 5 faces (2 triangular and 3 rectangular)
- 9 edges
- 6 vertices



## Rectangular

- 6 faces (all rectangular)
- 12 edges
- 8 vertices



$$V = 2 \times b \times h$$

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

$$T.S.A = 2(2+b) \times h + 2 \times b$$



# Prism Shape

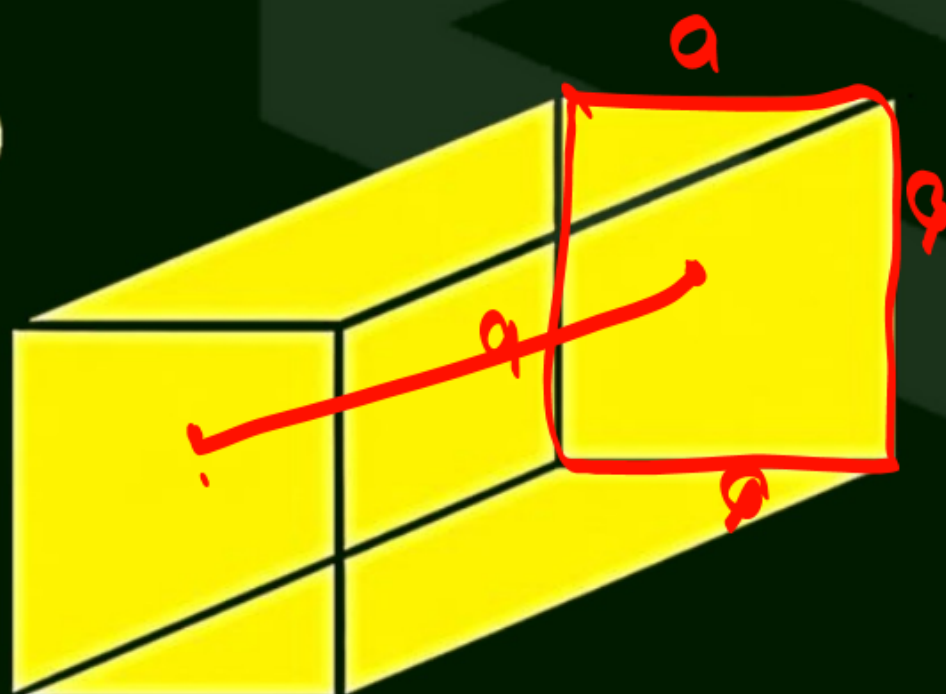
## Square

- 6 faces (2 squares and 4 rectangular)
- 12 edges
- 8 vertices

$$V = Q^2 \times h$$

$$L.S.A = 4Q \times h$$

$$T.S.A = 4Qh + 2Q^2$$



## Pentagonal

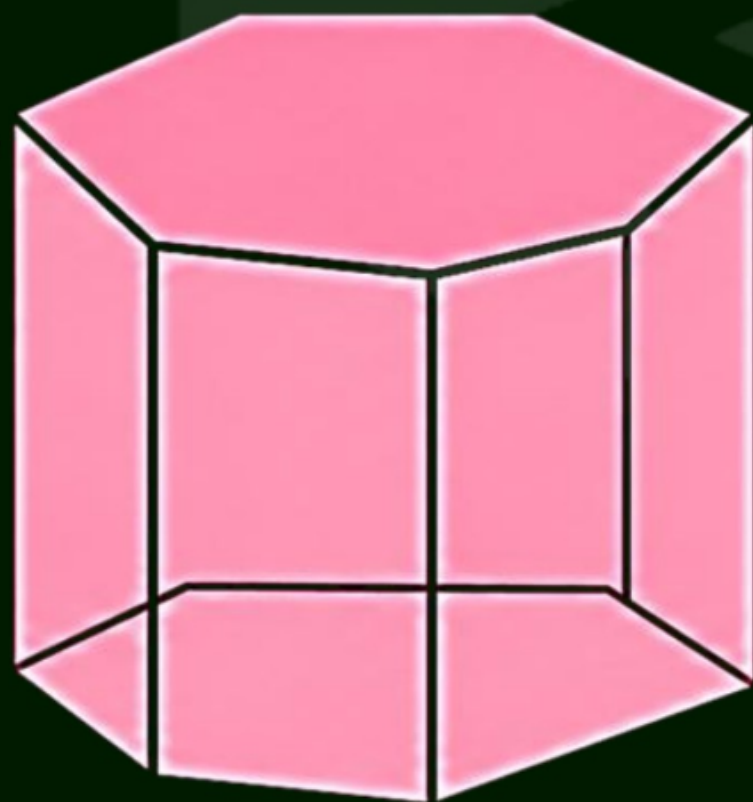
- 7 faces (2 pentagonal and 5 rectangular)
- 15 edges
- 10 vertices



# Prism Shape

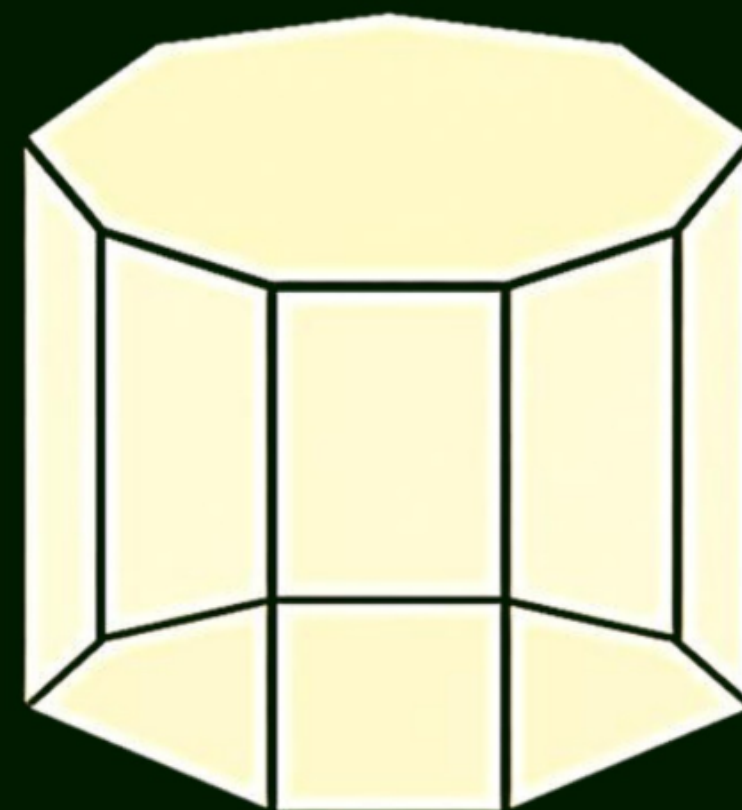
## Hexagonal

- 8 faces  
(2 hexagonal and 6 rectangular)
- 18 edges
- 12 vertices



## Heptagonal

- 9 faces  
(2 heptagonal and 7 rectangular)
- 21 edges
- 14 vertices

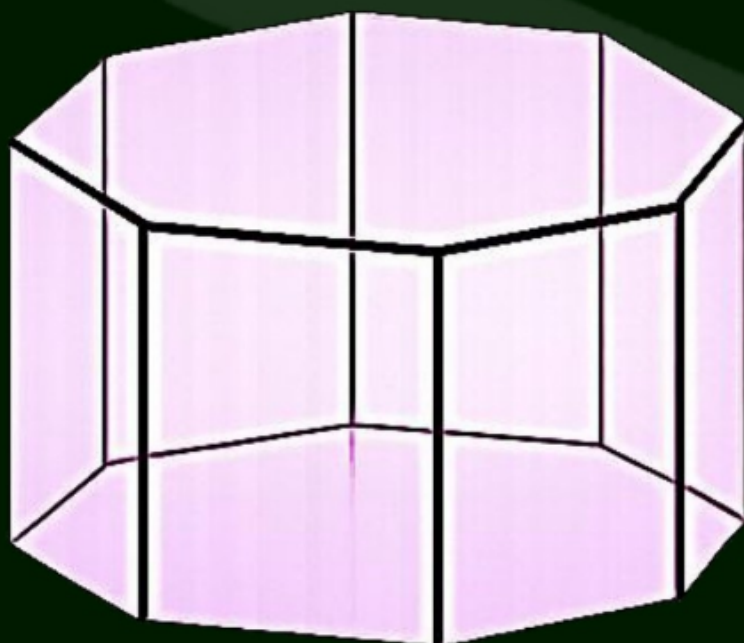




# Prism Shape

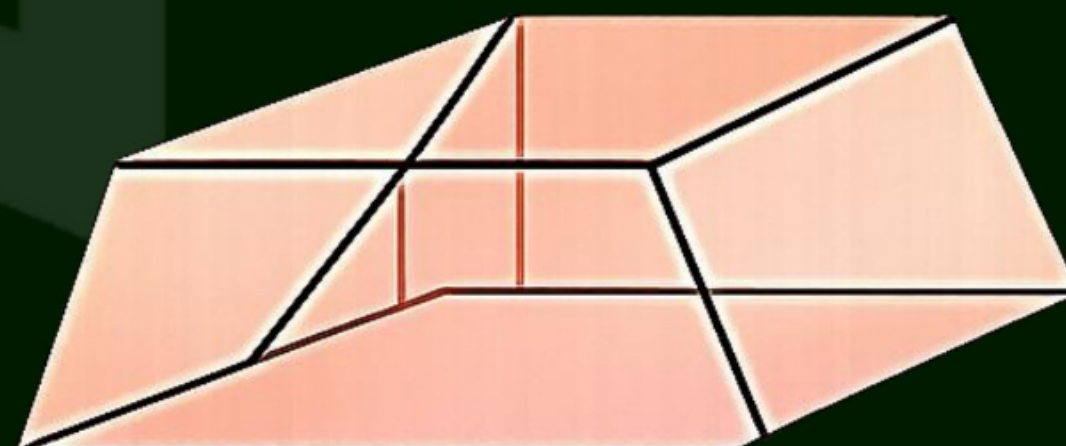
## Octagonal

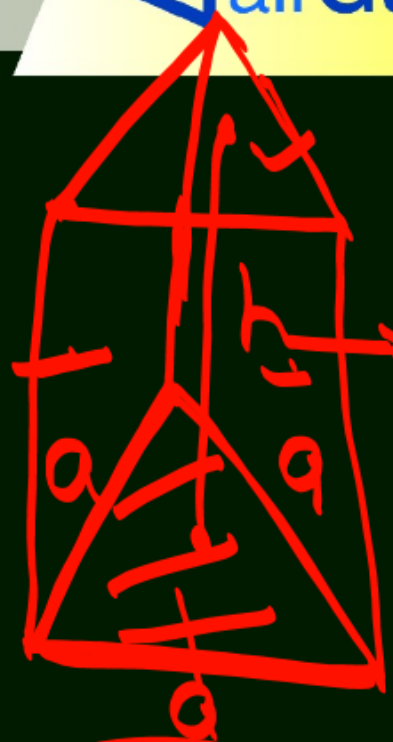
- 10 faces (2 octagonal and 8 rectangular)
- 24 edges
- 18 vertices



## Trapezoidal

- 6 faces (2 trapezoidal and 4 rectangular)
- 12 edges
- 8 vertices





□ volume (आयतन) = Area of base × height  
आधार का श्रे. × ऊँचाई ✓

□ L.S.A. (पार्श्व पृष्ठ का श्रे.) = आधार का परिमाप × ऊँचाई  
Perimeter of base × height ✓

□ T.S.A. (संपूर्ण पृष्ठ का श्रे.) = L.S.A + 2 ढक्कन ✓

$$3ah + 2 \times \frac{\sqrt{3}}{4} \times a^2$$

T.S.A.  
Hex



$$V = \text{Area of base} \times h$$

$$\frac{\sqrt{3}}{4} \times a^2 \times h = \frac{\sqrt{3}}{4} \times 8^2 \times 10$$

$$= 160\sqrt{3} \text{ cm}^3$$

1. The base of a prism is an equilateral triangle of side 8 cm and height of the prism is 10 cm. Then the volume of the prism is:

प्रिज्म का आधार भुजा 8 सेमी. का एक समबाहु त्रिभुज है और प्रिज्म की ऊँचाई 10 सेमी. है। तब प्रिज्म आयतन होती है।

(a)  $320\sqrt{3} \text{ cm}^3$

☒ (b)  $160\sqrt{3} \text{ cm}^3$

(c)  $150\sqrt{3} \text{ cm}^3$

(d)  $3000\sqrt{3} \text{ cm}^3$

Base  $\rightarrow$  Equilateral Triangle<sup>2</sup>

$$T.S.A = E.S.A + 2 \times \text{Area of base}$$

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

$$= 3 \times 12 \times 10 + \frac{\sqrt{3}}{2} \times 12 \times 12$$

$$= 72(5 + \sqrt{3})$$

If the altitude of a right prism is 10 cm and its base is an equilateral triangle of side 12 cm, then its total surface area (in sq. cm) is:

यदि एक प्रिज्म की ऊँचाई 10 सेमी. है और इसका आधार भुजा 12 सेमी. का एक समबाहु त्रिभुज है, तो इसका कुल सतह क्षेत्र (वर्ग सेमी. में) है।

(a)  $(5 + 3\sqrt{3})$

(b)  $36\sqrt{3}$

(c) 360

☒ (d)  $72(5 + \sqrt{3})$



T.S.A  $\rightarrow$  Side  $\rightarrow$  Volume

$\downarrow$

$$3a \times 6 + \frac{\sqrt{3}}{2} \times a^2 = 18(6 + \sqrt{3})$$

$$36a + \sqrt{3}a^2 = 36(6 + \sqrt{3})$$

$$36a + \sqrt{3}a^2 = 36 \times 6 + 36 \times \sqrt{3}$$

$$a = 6$$

$$V = \frac{\sqrt{3}}{2} \times a^2 \times 6 = 54\sqrt{3} \text{ cm}^3$$

3.

The total surface area of a right triangular prism of the height 6 cm is  $18(6 + \sqrt{3}) \text{ cm}^2$ . If the base of the prism is an equilateral tri-angle, find volume.

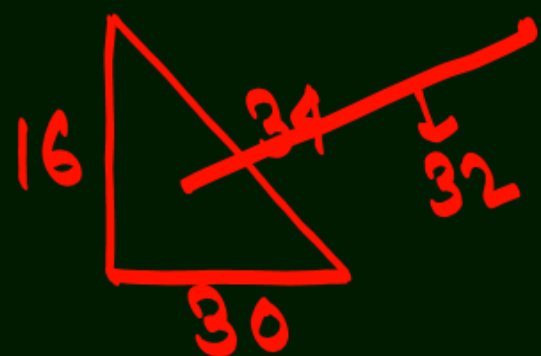
एक समत्रिभुजाकार प्रिज्म का संपूर्ण पृष्ठीय क्षेत्रफल  $18(6 + \sqrt{3}) \text{ cm}^2$  है, तथा उस की ऊँचाई 6 सेमी. है। यदि प्रिज्म का आधार एक समबाहु त्रिभुज हो, तो - उसका आयतन ज्ञात करो ?

(a)  $108\sqrt{3} \text{ cm}^3$

☒ (b)  $54\sqrt{3} \text{ cm}^3$

(c)  $36\sqrt{3} \text{ cm}^3$

(d)  $72\sqrt{3} \text{ cm}^3$



$$L.S.A = P \times h = (16 + 30 + 34) \times 32$$

$$= 80 \times 32$$

$$= 2560$$

$$V = \frac{1}{2} \times 30 \times 32$$

$$= 240 \times 32 = 7680$$

4. The base of a right prism is a triangle with sides 16 cm, 30 cm and 34 cm. Its height is 32 cm. The lateral surface area (in  $\text{cm}^2$ ) and the volume (in  $\text{cm}^3$ ) are, respectively:

एक समकोण प्रिज्म का आधार एक त्रिभुज है जिसकी भुजाएं 16 सेमी. 30 सेमी. और 34 सेमी. हैं। इसकी ऊँचाई 32 सेमी. है। पार्श्व सतह क्षेत्र (सेमी.<sup>2</sup> में) और आयतन (सेमी.<sup>3</sup> में) क्रमशः हैं:

(a) 2560 and 6400

~~(b) 2560 and 7680~~

~~(c) 2688 and 7680~~

~~(d) 2624 and 7040~~





$$P = 15, r = 3$$

$$r = \frac{\Delta}{S}, \Delta = (r \times S)$$

$$V = \frac{1}{2} \times 15 \times h = 270$$

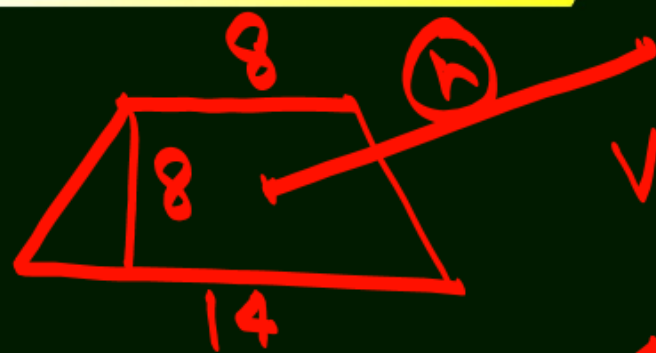
$$h = 12 \text{ cm}$$

5.

The perimeter of the triangular base of a right prism is 15 cm and radius of the incircle of the triangular base is 3 cm. If the volume of the prism be  $270 \text{ cm}^3$  then the height of the prism is:

किसी 15 सेमी परिमाण वाले त्रिभुज जिसकी अन्तः वृत्त की त्रिज्या 3 सेमी. है, को आधार मानते हुए एक प्रिज्म हैं। यदि प्रिज्म का आयतन 270 सेमी है, तब प्रिज्म की ऊँचाई ज्ञात करें?

- (a) 6 cm
- (b) 7.5 cm
- (c) 10 cm
- ✓ (d) 12 cm



$$V = 1056 \text{ cm}^3$$

$$V = \frac{1}{2} (14 + 8) \times 8 \times h = 1056$$

$$21 \times h = 264$$

$$h = 12 \text{ cm}$$

6.

The base of a prism is a trapezium. The length of the parallel sides are 8 cm and 14 cm and the distance between the parallel side is 8 cm. If the volume of the prism is 1056 cm. then the height of prism is

एक प्रिज्म का आधार एक ट्रेपेजियम है। समानांतर भुजाओं की लंबाई 8 सेमी. और 14 सेमी. है और समानांतर भुजाओं के बीच की दूरी 8 सेमी. है। यदि प्रिज्म का आयतन 1056 घन सेमी. है, तो प्रिज्म की लम्बाई है।

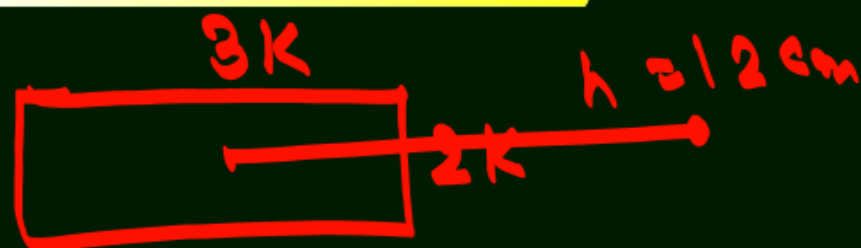
(a) 44 cm

(b) 16.5 cm

(c) 12 cm

(d) 10.56 cm





$$T.S.A = L.S.A + 2ab$$

$$2(3K + 2K) \times 12 + 2 \times 3K \times 2K = 288$$

$$10K + K^2 = 24$$

Divisibility

$$K(10 + K) = 24$$

$$(10 + 2) = 24$$

7. Base of a right prism is a rectangle, the ratio of whose length and breadth is 3: 2. If the height of the prism is 12 cm and total surface area is  $288\text{cm}^2$  find the volume of the prism?

एक लंब प्रिज्म का आधार एक आयत है जिसकी लम्बाई और चौड़ाई का अनुपात 3 : 2 है। यदि प्रिज्म की ऊँचाई 12 सेमी. है और कुल पृष्ठीय क्षेत्रफल 288 वर्ग सेमी. है, तो प्रिज्म का आयतन ज्ञात करें? (12)

(a)  $288\text{ cm}^3$

(b)  $290\text{ cm}^3$

(c)  $286\text{ cm}^3$

(d)  $291\text{ cm}^3$

$$V = (2 \times 5 \times 4) = 6 \times 4 \times 12 = 288\text{ cm}^3$$



$$L.S.A = 6a \times 10$$

$$A = \frac{3\sqrt{3}}{2} \times a^2 \times 2$$

$$60a + 3\sqrt{3}a^2 = 156\sqrt{3}$$

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

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

↓

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

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

$$V = \frac{3\sqrt{3}}{2} \times (2\sqrt{3})^2 \times 10 = 180\sqrt{3} \text{ cm}^3$$

8. Find the volume of a right prism which is based on a regular hexagon of height 10 cm. If its total surface area is  $156\sqrt{3} \text{ cm}^2$ ?

एक समप्रिज्म का आयतन ज्ञात करें जो कि 10 सेमी. ऊँचाई के एक नियमित षट्भुज पर आधारित है। यदि इसका संपूर्ण पृष्ठ क्षेत्रफल  $156\sqrt{3} \text{ cm}^2$  है?

(a)  $180 \text{ cm}^3$

(b)  $216 \text{ cm}^3$  X

(c)  $216\sqrt{3} \text{ cm}^3$  X

✓ (d)  $180\sqrt{3} \text{ cm}^3$

$$V = \text{Area} \times h$$

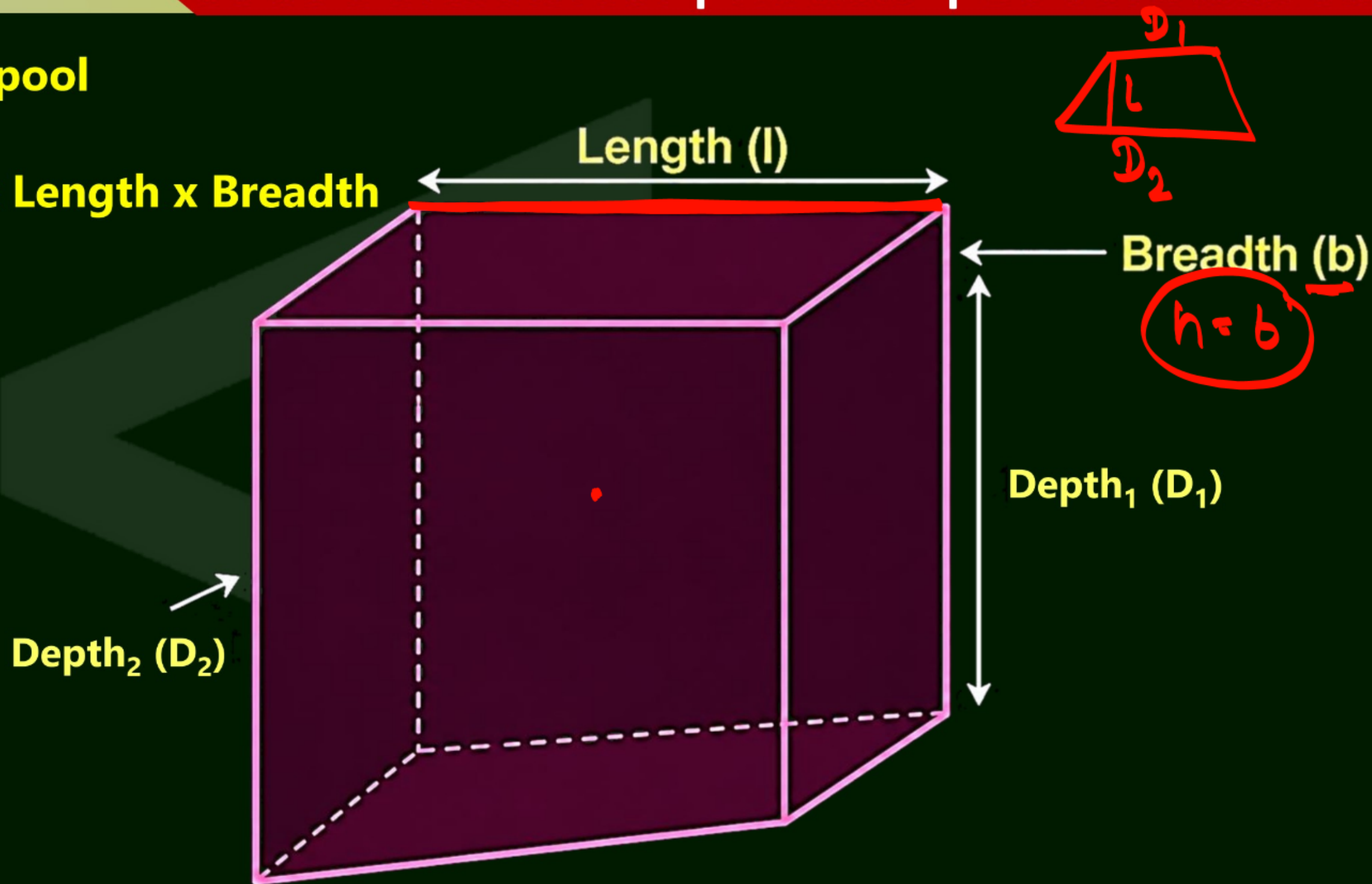
10

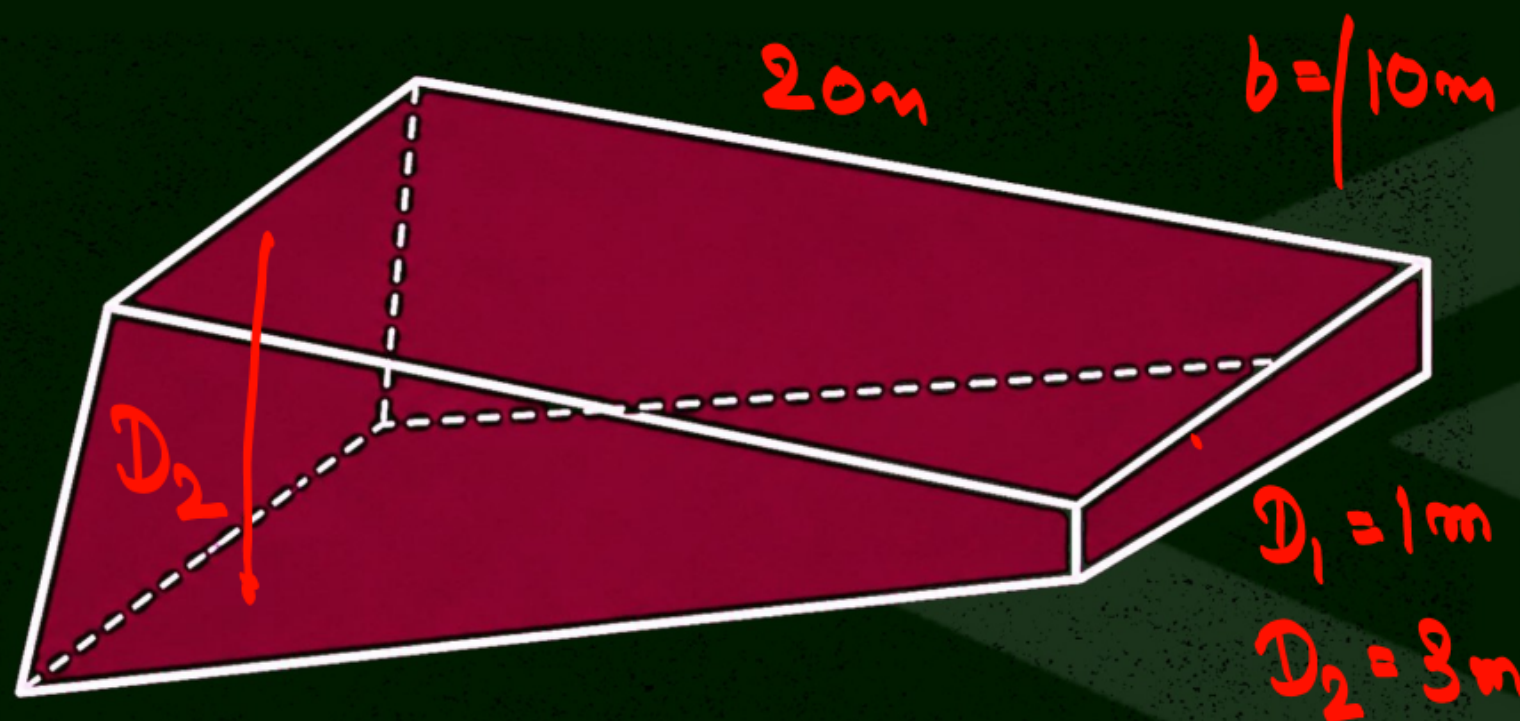


# Volume of a Rectangular pool

$$= \frac{1}{2} \times (\text{Depth}_1 + \text{Depth}_2) \times \text{Length} \times \text{Breadth}$$

$$V = \left[ \frac{1}{2} \times (D_1 + D_2) \times l \right] \times b$$





$$V = \frac{1}{2} (1 + 3) \times 20 \times 10$$

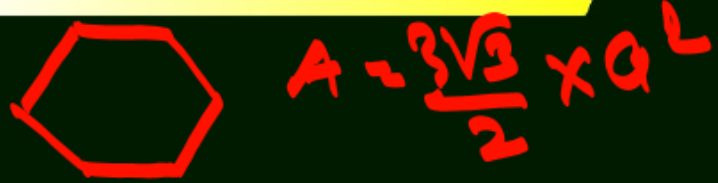
$$= \frac{1}{2} \times 4 \times 200 = 400 \text{ m}^3$$

9. A rectangular swimming pool of length 20 m and breadth 10 m has a uniformly sloping floor. It is 1 m in depth on one end of its length and 3 m at the other. How much water is needed to completely fill this pool?

20 मी. की लंबाई और 10 मी. की चौड़ाई वाले एक आयताकार स्विमिंग पूल में एक सामन रूप से झुका हुआ फर्श है। इसकी लंबाई के एक छोर की गहराई 1 मी. और दूसरे छोर की गहराई 3 मी. है। इस पूल की पूरी तरह से भरने के लिए कितने पानी की जरूरत होगी? ( $\pi = \frac{22}{7}$  लीजिए)

- (a) 800 cu. m  
(b) 300 cu. m  
(c) 480 cu. m  
(d) 400 cu. m





$$V = \frac{3\sqrt{3}}{2} \times 1^2 \times 1 = \frac{3\sqrt{3}}{2} \text{ cu m}$$

10. The base of a prism is a regular hexagon. If every edge of the prism measures 1 metre and height is 1 metre, then the volume of the prism is.

एक प्रिज्म का आधार एक समषट्भुज है यदि समषट्भुज की भुजा 1 मी है और प्रिज्म की ऊँचाई भी 1 मी. है तो प्रिज्म का आयतन क्या होगा?

(a)  $\frac{3\sqrt{2}}{2} \text{ cu m}$

☒ (b)  $\frac{3\sqrt{3}}{2} \text{ cu m}$

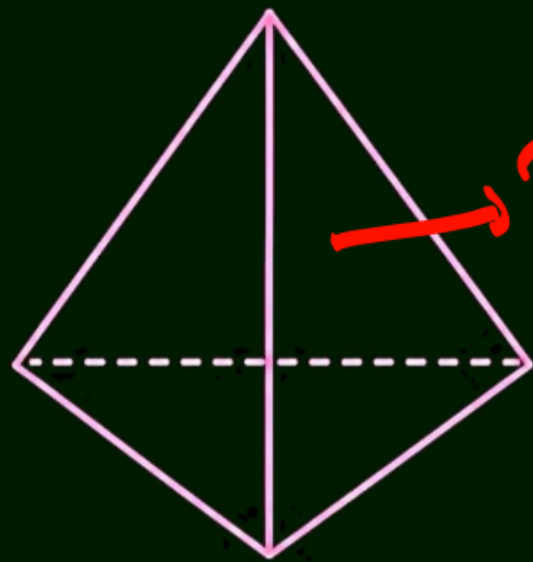
(c)  $\frac{6\sqrt{3}}{5} \text{ cu m}$

(d)  $\frac{5\sqrt{2}}{2} \text{ cu m}$

## Pyramid / पिरामिड

A pyramid is a 3D figure built with a base of a polygon and triangular faces all connected together.

पिरामिड एक 3D आकृति है जो एक बहुभुज के आधार और सभी त्रिकोणीय फलकों को एक साथ जोड़कर बनाई जाती है।

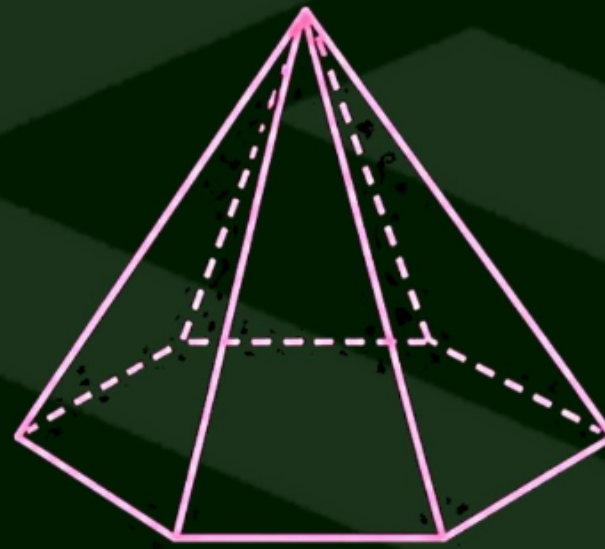


Triangular  
Pyramid

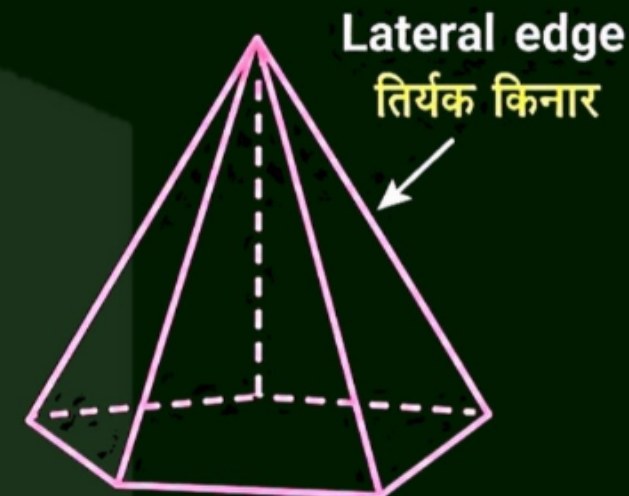
→ Triangle



Square  
Pyramid

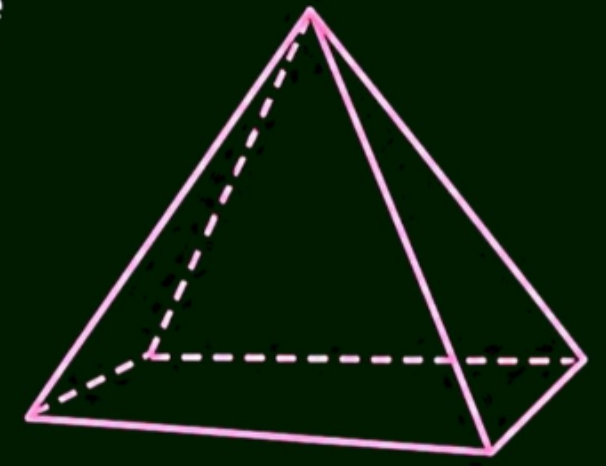


Hexagonal  
Pyramid



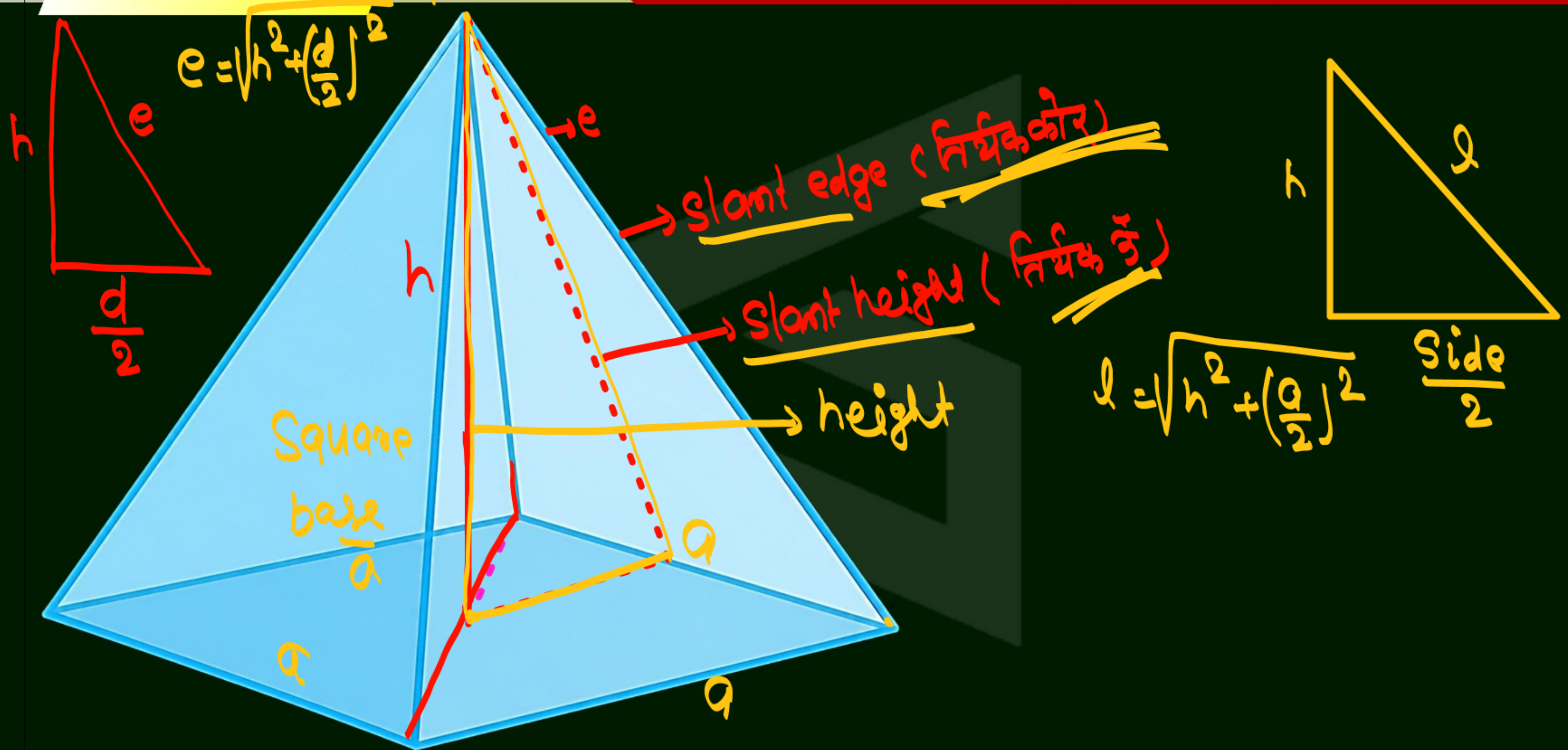
Rectangular  
Pyramid

Lateral edge  
तिर्यक किनार



Pentagonal  
Pyramid





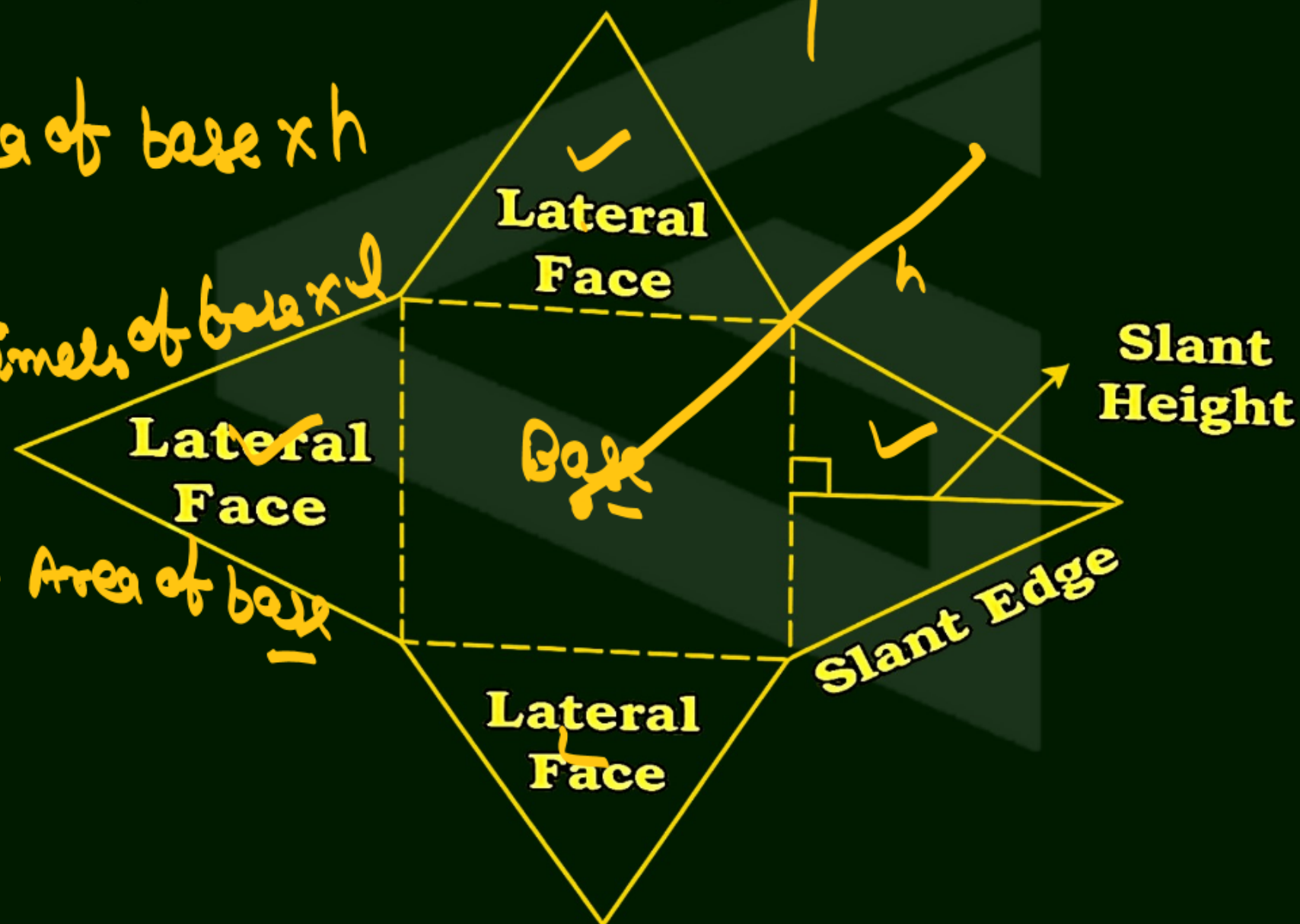
$$\text{Volume} = \frac{1}{3} \times \text{Base Area} \times \text{height}$$

$$\text{CSA/LSA} = \frac{1}{2} \times \text{Base perimeter} \times \text{Slant height} \quad \text{TSA} = \text{LSA} + \text{Base Area}$$

$$V = \frac{1}{3} \times \text{Area of base} \times h$$

$$\text{L.S.A} = \frac{1}{2} \times \text{Perimeter of base} \times l$$

$$\text{T.S.A} = \text{L.S.A} + \text{Area of base}$$







a

$$V = \frac{1}{3} \times \text{Area of base} \times h$$

a

$$V = \text{Area of base} \times h$$

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

$$3 : 1$$

12. A prism and a pyramid have the same base and the same height. Find the ratio of the volume of the prism and the pyramid?

एक प्रिज्म और एक पिरामिड का आधार समान और ऊंचाई समान है। प्रिज्म और पिरामिड के आयतन का अनुपात ज्ञात कीजिये ?

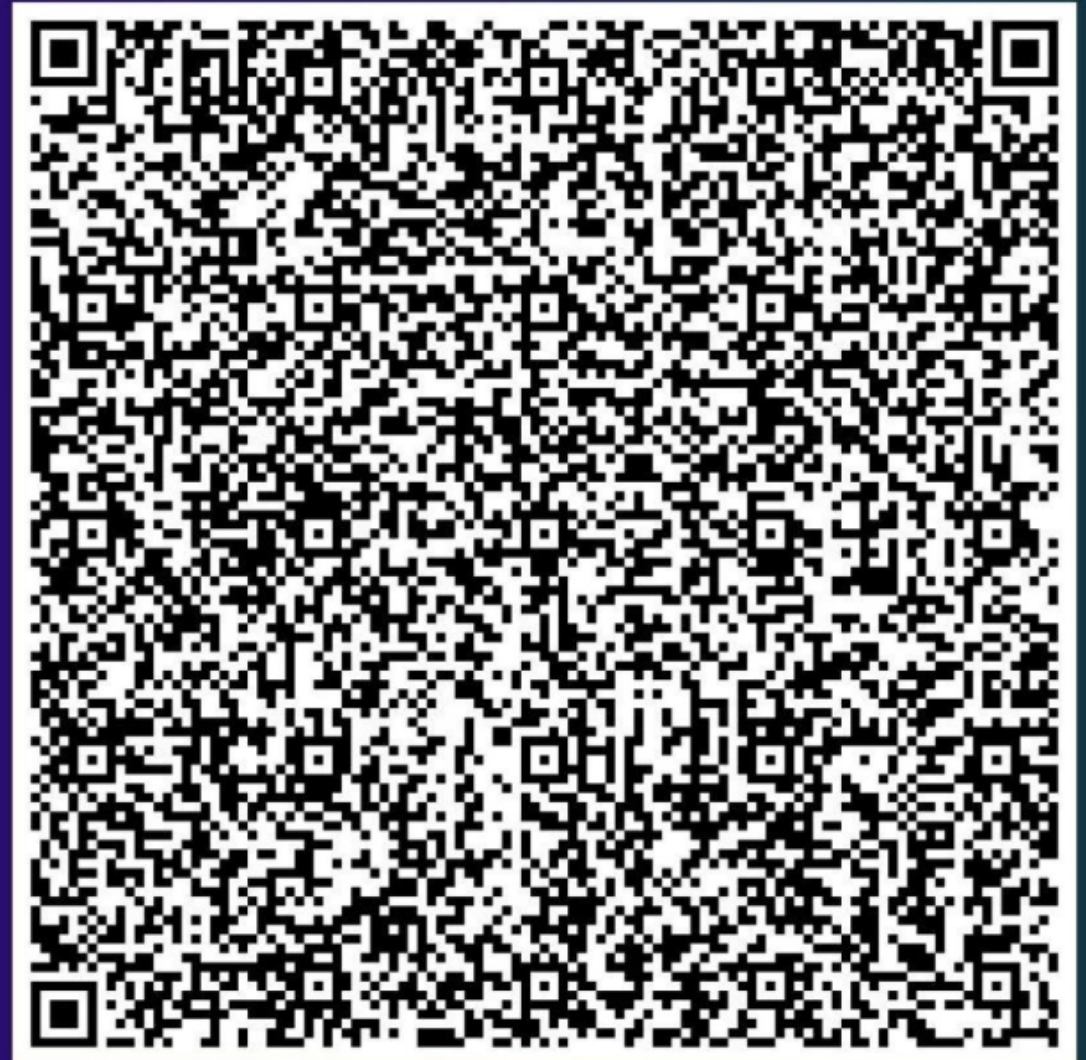
(a) 2:3

(b) 3:1

(c) 1:3

(d) 3:2

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