BYJU'S EXAM PREP

The Most Comprehensive
Preparation App For All Exams

MENSURATION-3D

Part-6

Agenda

+ Leftover Question (8-10) min

Prism (55-60) min

(Pyramid + Tetrahedron) → extra class

10. Base of a right prism is a rectangle with different integral (in cm) length and breadth. If the volume of the prism is numerically equal to the lateral surface area, which of the following can be the breadth of the rectangle?

(a) 2 cm
(b) 3 cm
(c) 4 cm
(d) 5 cm

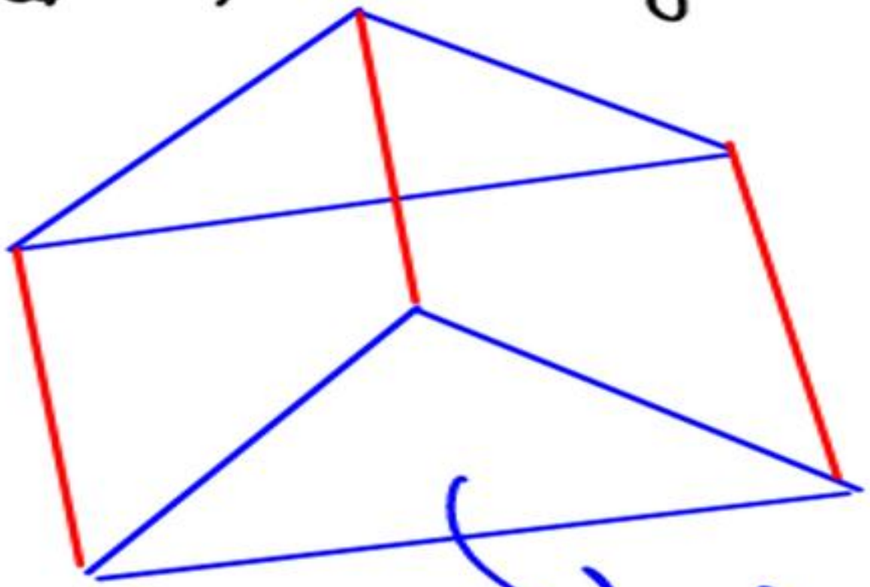
Ans. (b)

Right

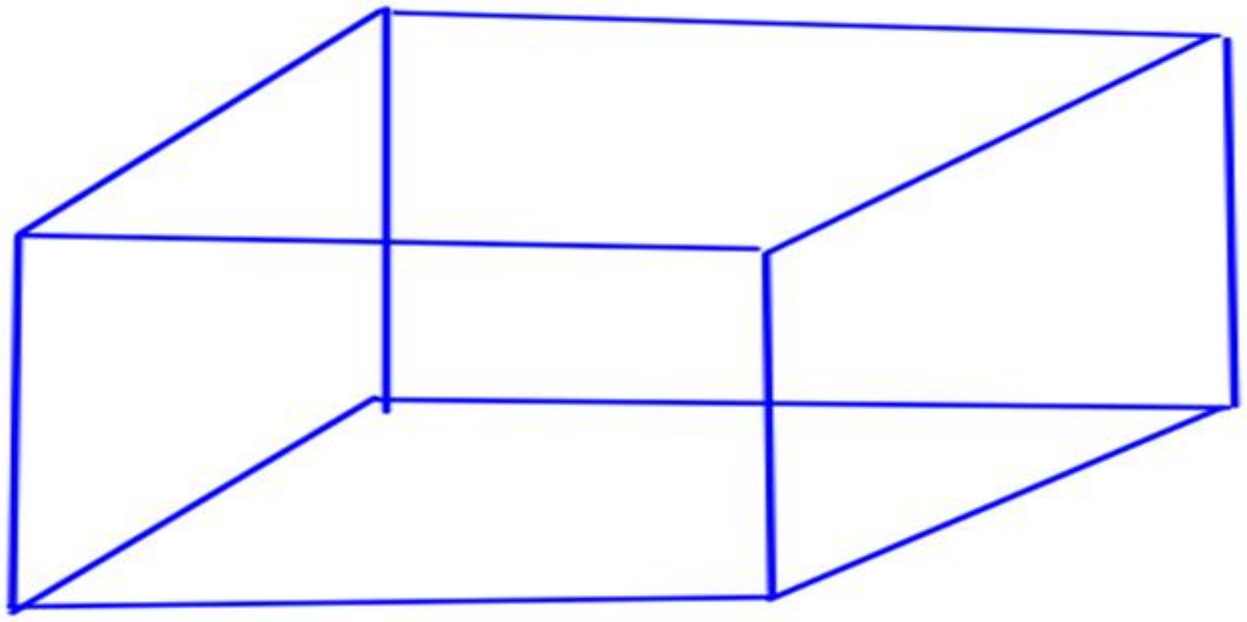
Prism

Base | Top → Polygon

lateral surface → Rectangle

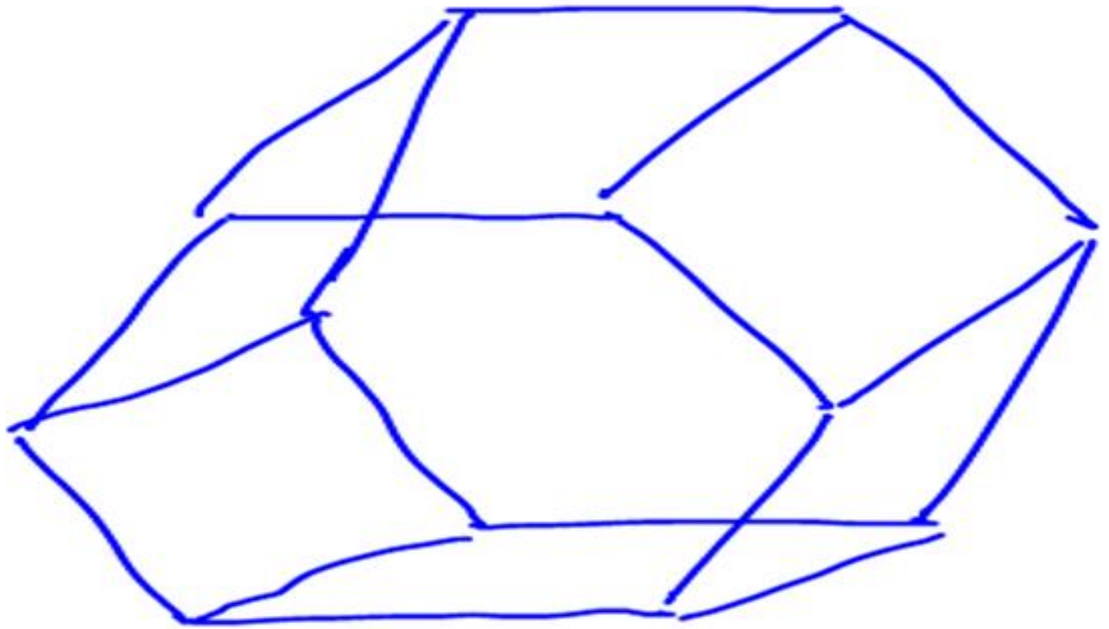


Base Triangle



Base / Top → Rectangle

Lateral Surface → Rectangle



Base → Hexagon

What is Prism ?

Base | Top → Polygons

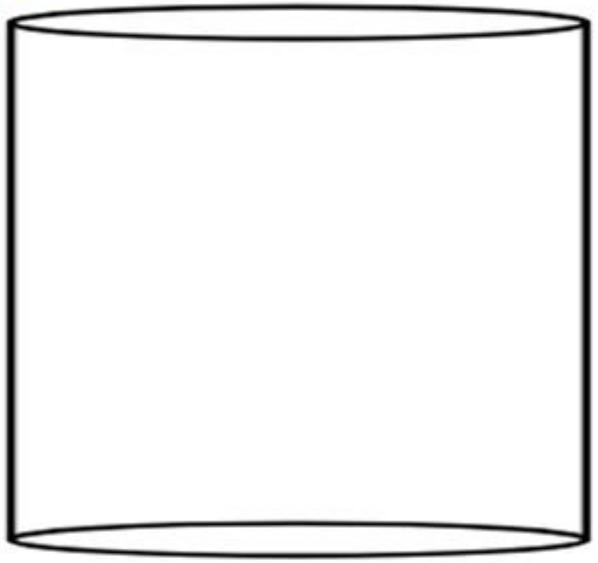
Lateral surfaces → Rectangle

Name of Prism ⟶ Base

Base	Name
Triangle	Triangular Prism
Rectangle	Rectangular Prism
Hexagon	Hexagonal Prism

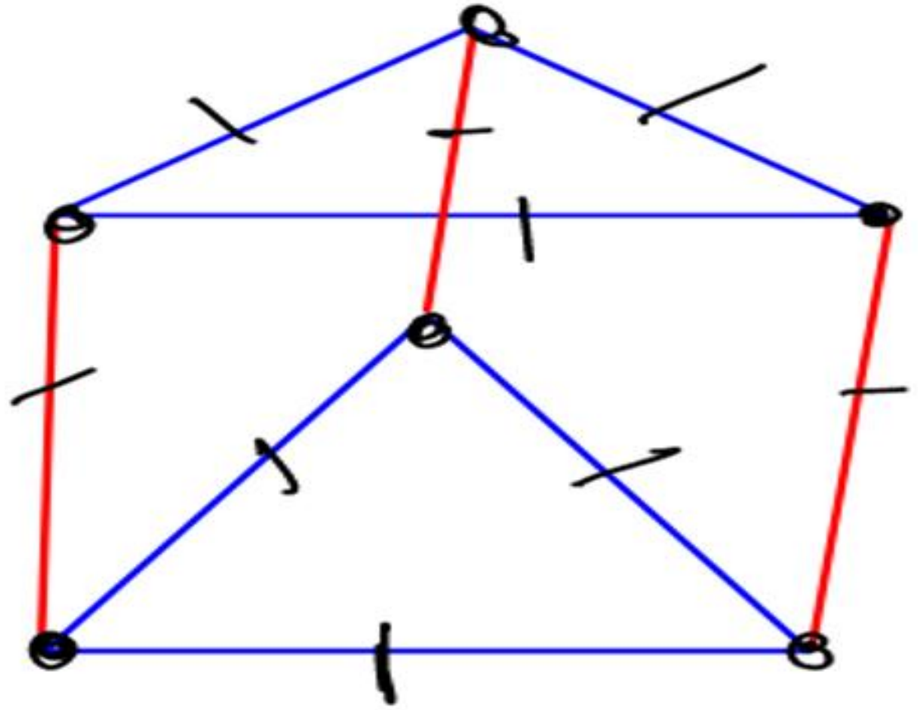
Is Right Circular Cylinder a Prism?

No



B/c Base/Top are not polygon

Faces, Vertices and Edges of Prism

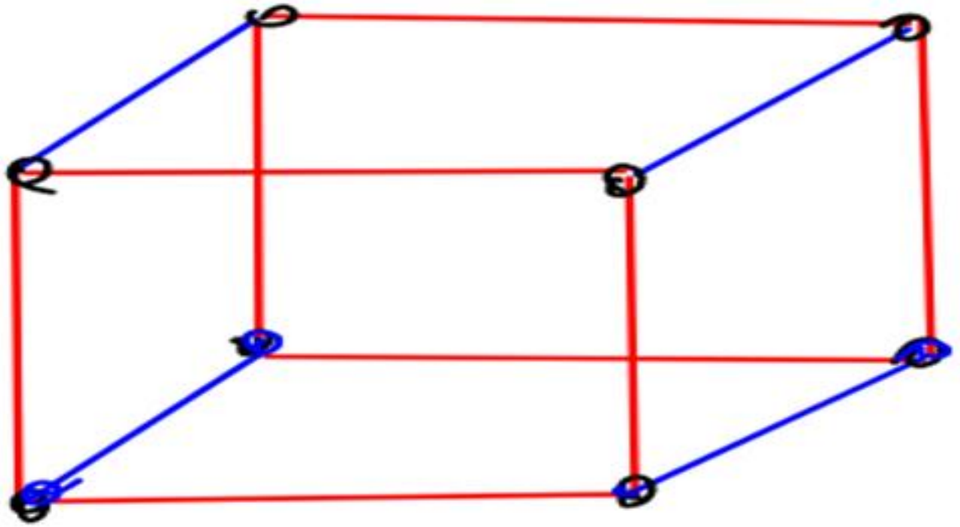


Faces → 5

vertices → 6

Edges → 9

$F + V - E = 2$



Faces → 6

Vertices → 8

Edges → 12

BYJU'S ExamPrep

For Any Prism where Base is a Polygon of n sides

Faces $\longrightarrow$ $n+2$

Vertices $\longrightarrow$ $2n$

Edges $\longrightarrow$ $3n$

BYJU'S ExamPrep

$n = 5$

Eg There is a pentagonal prism

Find the value $F + E - V$

F → Faces (7)

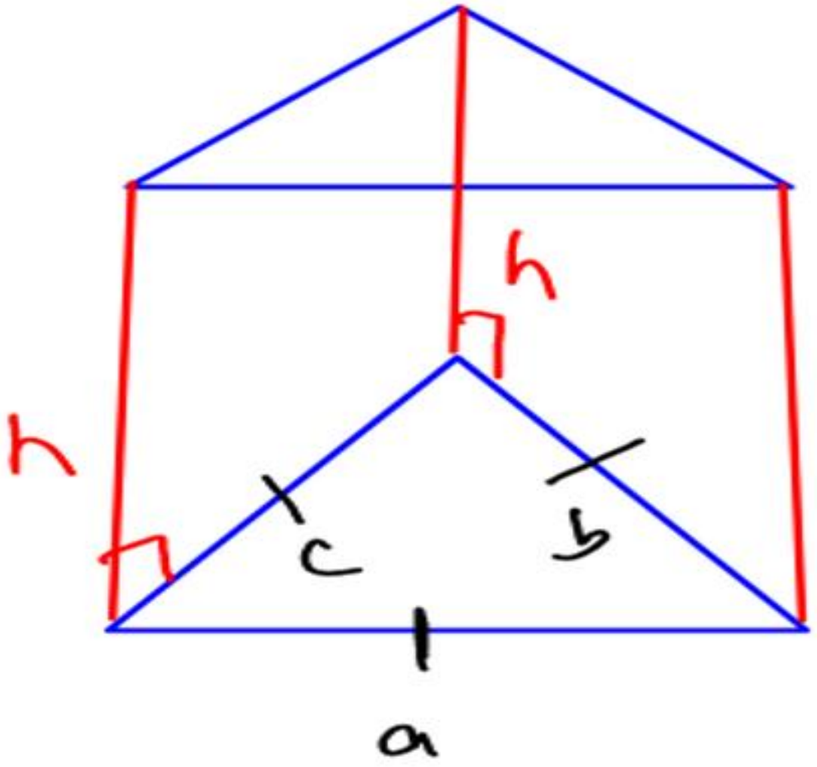
E → Edges (15)

V → Vertices (10)

$7 + 15 - 10$

$= 12$

LSA of Prism



let the side of the base are a, b & c & height of prism is h

→ $ah + bh + ch$

→ $h(a+b+c)$

→ perimeter of base × height

Formulae used in Prism

(i) Lateral surface area = Perimeter of the base × Height

(ii) Total surface area = Lateral surface area + 2 × area of the base

(iii) Volume = Area of the base × Height

1. The base of a right prism is an equilateral triangle. If the lateral surface area and the volume are 120 cm^2 and $40\sqrt{3}$ cm^3 respectively, then the side of base of the prism is:

(a) 4 cm (b) 5 cm
(c) 7 cm (d) 40 cm

Eq Δ

LSA = 120

Volume = $40\sqrt{3}$

(Perimeter of base) height = 120

(Area of base) × height = $40\sqrt{3}$

$3s \cdot h = 120$ — (1)

$\frac{\sqrt{3}s^2}{4} \cdot h = 40\sqrt{3}$ — (2)

(2) ÷ (1)

$\frac{\sqrt{3}s}{4 \cdot 3s} = \frac{1}{\sqrt{3}}$

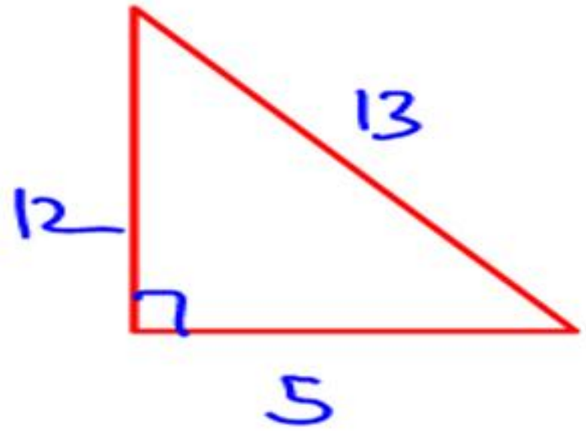
$s = 4$

Ans. (a)

2. The base of a right prism is a right-angled triangle whose sides are 5 cm, 12 cm and 13 cm. If the area of the total surface of the prism is 360 cm^2, then its height (in cm) is

(a) 10 (b) 12 (c) 9 (d) 11

Base



$TSA = 360\ cm^2$

$h = ??$

$TSA = LSA + 2(\text{Area of Base})$

$(5+12+13)h + 2 \times \frac{1}{2} \cdot 5 \cdot 12 = 360$

$30h = 300$

$h = 10$

Ans. (a)

3. The total surface area of a right triangular prism of height 6 cm is $162\sqrt{3}$ cm². If the base of the prism is an equilateral triangle, what is the volume of the prism?

(a) $162\sqrt{3}$ cm³
(b) $105\sqrt{3}$ cm³
(c) $201\sqrt{3}$ cm³
(d) 243 cm³

Eq Triangle

TSA = $162\sqrt{3}$

h = 6cm

Volume = ??

$3S \cdot 6 + 2 \cdot \frac{\sqrt{3}}{4} \cdot S^2 = 162\sqrt{3}$

$\sqrt{3}S^2 + 36S - 324\sqrt{3} = 0$

$S^2 + 12\sqrt{3} - 324 = 0$

$S = -18\sqrt{3}$ or $6\sqrt{3}$

$\frac{\sqrt{3}}{4} \cdot 6\sqrt{3} \cdot 6\sqrt{3} \cdot 6 = 162\sqrt{3}\ cm^2$

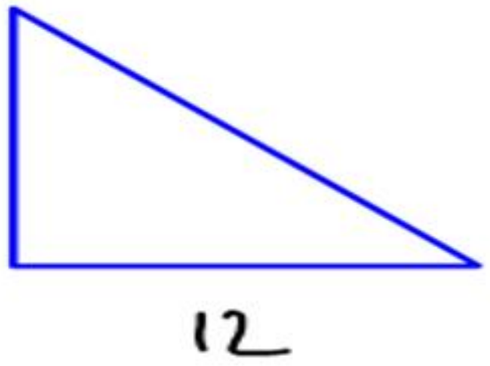
Ans. (a)

4. A prism has as the base a right angled triangle whose sides adjacent to the right angles are 10 cm and 12 cm long. The height of the prism is 20 cm. The density of the material of the prism is 6 gm/cubic cm. The weight of the prism is

(a) 6.4 kg (b) 7.2 kg

(c) 3.4 kg (d) 4.8 kg

Right angle Δ



6 gm/cm³

Weight = ??

h = 20 cm

Volume = (Area)(height)

$\frac{1}{2} \cdot 12 \cdot 10 \cdot 20$

$1200\ cm^3 \times 6\ gm/cm^3$

7200 gm

7.2 Kg

Ans. (b)

5. The perimeter of the triangular base of a right prism is 15 cm and the radius of the incircle of the triangular base is 3 cm. If the volume of the prism be 270 cm^3, then the height of the prism is:

(a) 6 cm (b) 7.5 cm

(c) 10 cm (d) 12 cm

$r = 3cm$

$p = 15cm$

Volume = 270

$h = ?$

Volume of prism = (Area)(height)

$\Rightarrow (r \cdot s) \cdot h$

$3 \cdot \frac{15}{2} \cdot h = 270$ (6)

$h = 12cm$

Ans. (d)

6. The base of a right prism is a rectangle, the ratio of whose length and breadth is 3:2. If the height of the prism be 12 cm and the total surface area is 288 sq. cm, the volume of the prism is:

(a) 291 cm^3 (b) 288 cm^3

(c) 290 cm^3 (d) 286 cm^3

$l = 6 \quad b = 4$

Volume $= 6 \cdot 4 \cdot 12 = 288$

$TSA = 288$

$p \cdot h + 2A = 288$

$2(3x+2x) \cdot 12 + 2 \cdot (6x^2) = 288$

$x^2 + 10x - 24 = 0$

$x = -12, 2$

x

Ans. (b)

7. The height of a right prism with a square base is 15 cm. If the area of the total surface of the prism is 608 sq. cm, its volume is:

(a) 910 cm^3 (b) 920 cm^3

(c) 960 cm^3 (d) 980 cm^3

BYJU'S EXAM PREP

$h = 15cm$

Base → Square

$TSA = 608$

Volume = ??

$p \cdot h + 2(A) = 608$

$4s \cdot 15 + 2s^2 = 608$

$s^2 + 30s - 304 = 0$

$s = -38, 8$

s

Volume $= 8^2 \cdot 15 = 960 cm^3$

Ans. (c)

8. The lateral surface area is $8\sqrt{3}\ cm^2$ more than the area of the base of a prism, whose base is an equilateral triangle. If the height of the prism is $\sqrt{3}\ cm$, then the volume of the prism is

(a) 12 cm^3
(b) 18 cm^3
(c) 48 cm^3
(d) Either (a) or (c)

Base → eq Δ

LSA = Area + $8\sqrt{3}$

$h = \sqrt{3}$

Volume = ??

$3S \cdot \sqrt{3} = \frac{\sqrt{3}}{4}S^2 + 8\sqrt{3}$

$12S = S^2 + 32$

$S^2 - 12S + 32 = 0$

$S = 4, 8$

$V = (\text{Area}) \text{ height}$

$\frac{\sqrt{3}}{4} \cdot 4^2 \cdot \sqrt{3} \Rightarrow (12)$

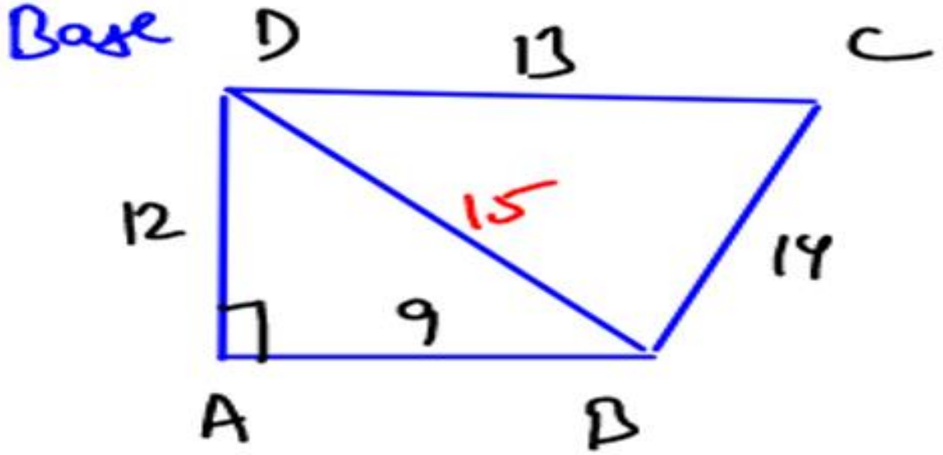
Ans. (d)

9. The base of a right prism is a quadrilateral ABCD. Given that AB = 9 cm, BC = 14 cm, CD = 13 cm, DA = 12 cm and $\angle DAB = 90°$. If the volume of the prism be 2070 cm^3, then the area of the lateral surface is –

(a) 720 cm^2 (b) 810 cm^2

(c) 1260 cm^2 (d) 2070 cm^2

$A \cdot h = 2070$



Area of Quad ABCD

= Area of $\Delta ABD + \Delta BCD$

$\frac{1}{2} \cdot 9 \cdot 12 + \sqrt{21 \cdot 8 \cdot 7 \cdot 6}$

$54 + 84 = 138\ cm^2$

Volume = 2070

$138 \cdot h = 2070$

$h = 15\ cm$

LSA = ??

$(12+9+14+13) \cdot 15$

Ans. (a)

V. Imp

10. Base of a right prism is a rectangle with different integral (in cm) length and breadth. If the volume of the prism is numerically equal to the lateral surface area, which of the following can be the breadth of the rectangle?

(a) 2 cm
(b) 3 cm
(c) 4 cm
(d) 5 cm

$(lb)k = 2(l+b)\cdot k$

$lb - 2l - 2b = 0$

$l(b-2) - 2(b-2) = 4$

$(l-2)(b-2) = 4$

$l \neq b$

$b-2 = 1$

$b = 3$

4 . 1

Ans. (b)

Pyramid

What is Pyramid ?