3-Dimensional Shapes

Grade 4: Geometry

Three Dimensional Shapes (3D shapes)

a.k.a. Solids

Solids

→ An object that has a fixed shape and size is called a solid.

→ A solid occupies fixed space (fixed volume)

→ Solid occurs in different shapes:

↓

k/a 3D shapes

k/a → known as

a.k.a. → also known as

Mathmetical Definition :

1D shape : Shapes that has only length. Example: Line or Line segment

2D shapes : Shapes that has length and breadth (width) only.
e.g.
Example: rectangle, square, triangle, etc.

0D shape : Shapes that has no length and no breadth.
Example: point (·)

3D shapes : Shapes / figures that has height (or depth) in addition to width and length.

Examples : [cube, cuboid, cone, cylinder, sphere, prism, pyramid]

3D shapes

[Faces, Edges and Vertices]

Face : The flat surface of 3-D figure is called face.

Edges: Two face meets to form a line segment called edge of the shape.

Vertex: Two or more edges meet in a point called vertex.

12 x 1, 12

12 x 2 24 +12

12 x 3 36 +12

12 x 4 48 +12

12 x 5 60

12 x 6 72

12 x 7 84

12 x 8 96 +12

12 x 9 108

12 x 10 120

$12\overline{)3499}$

Qu. = 291

Re. = 7

$13 \times 4 = \underbrace{(10+3) \times 4 = 40 + 12}_{\text{[in your head/brain]}} = 52$

$12 \times 9 = \underbrace{(10+2)\ 9 = 90 + \overbrace{18}^{10+8}}_{\text{in your head.}} = 108$

$$
\begin{array}{r}
528 \\
14 \overline{)7398} \\
-70 \\
\hline
39 \\
-28 \\
\hline
118 \\
-112 \\
\hline
6
\end{array}
$$

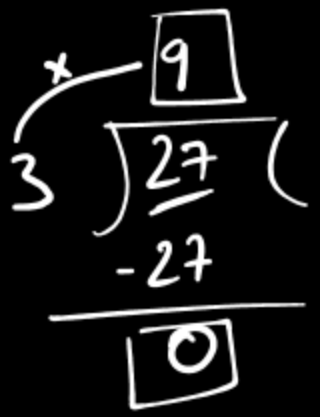
$14 \times 5 = \underbrace{(10+4)5 = 50+20}_{} = \underline{70}$

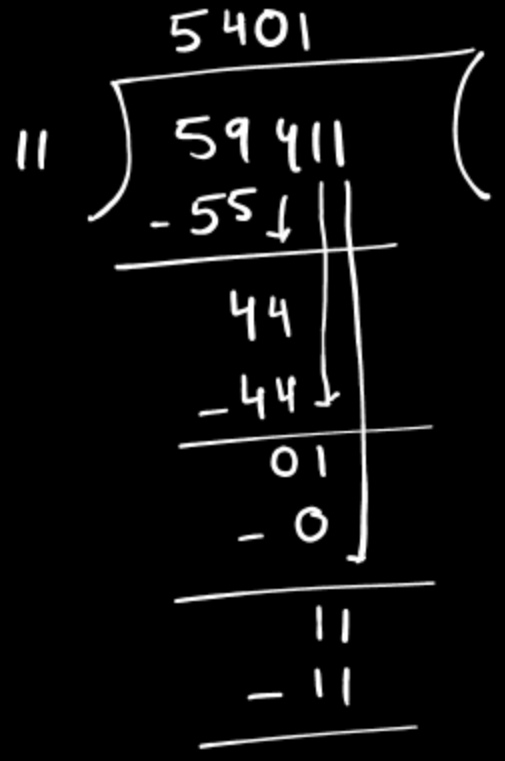
$$
\begin{array}{r}
14 \\
14 \\
\hline
\end{array}
$$

14×3

$14 \times 8 = 80 + 32 = \underline{\underline{112}}$ (20 ten, $\boxed{30}+2$)

$14 \times 9 =$



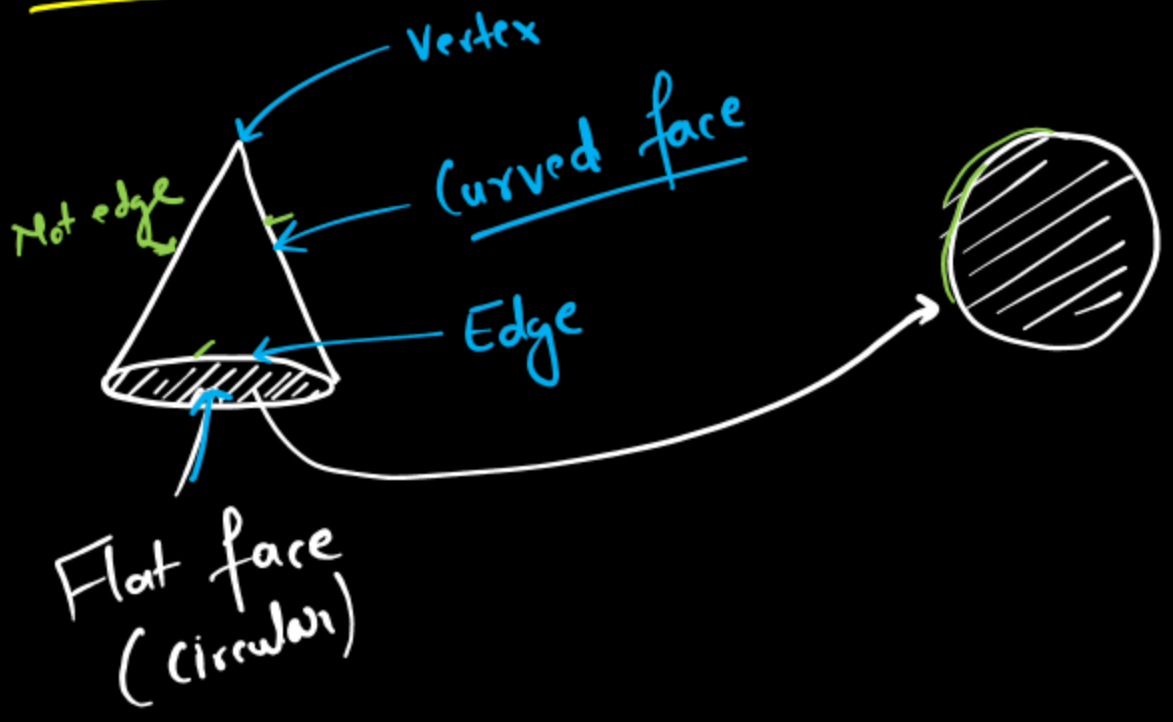


Q = 541

R = 0

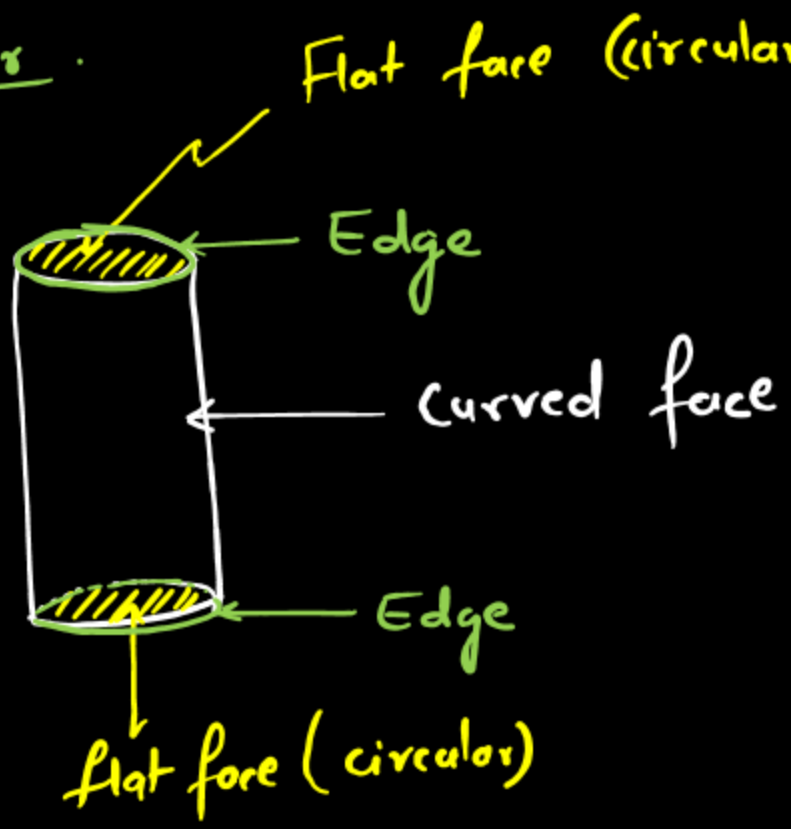
541 x 11

3-D shapes



(Cone)

Cylinder



→ 3 face (

Sphere

→ Only 1 curved face., no edge, no vertex.

→ It has length, breadth and height.

Cylinder:

It has → 3 faces (2 flat and 1 curve)

→ 2 edges

→ no vertex (zero vertex)

Cone :→

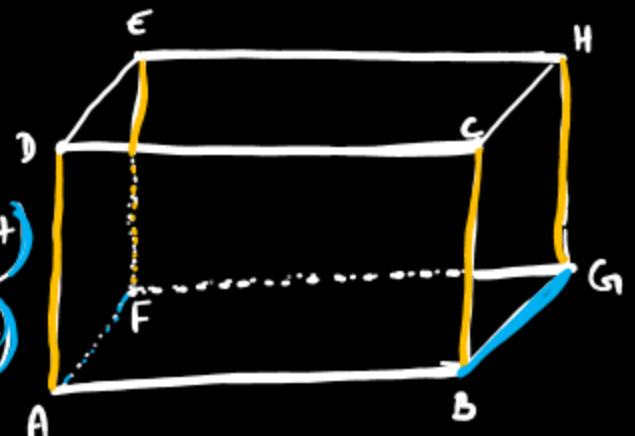
It has → 2 face (1 flat + 1 curved)

→ 1 edge

→ 1 vertex

face ≡ surface

⇒ Cuboid



① Face : 6 faces

- rectangle ABCD (front)
- rect. BCHG (Right)
- rect. DEHC (top)
- rect. ABGF (Bottom)
- rect. DEFA (Left)
- rect. EFGH (Back)

② Edges : 12 edges

↳ AB, CD, EH, FG
BG, AF, DE, CH
DA, CB, HG, EF

- AB = DC = EH = FG } ⇒ length
- AD = BC = GH = EF } height / Depth
- BG = AF = CH = DE } Breadth

③ Vertices : 8 vertices

↳ A, B, C, D, E, F, G, and H.

- ABCD and EFGH are opposite faces
- BCHG and DEFA are opposite faces
- DEHC and ABGH are opposite faces

} 3 pair of opposite faces

$9\overline{)2194}$

$7\overline{)843}$

$11\overline{)4321}$

$12\overline{)3491}$

$16\overline{)432}$

$18\overline{)9412}$

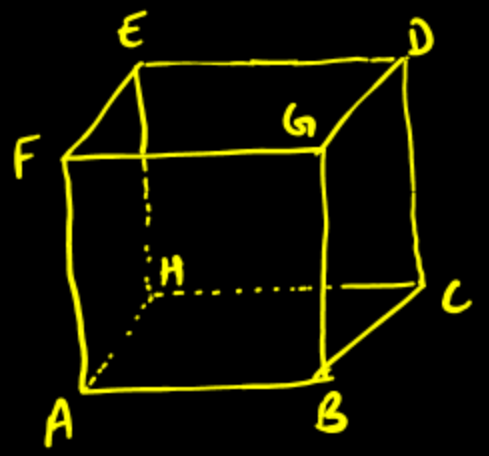
(H.W.)

[* A cuboid has 6 rectangular faces, 12 edges and 8 vertices]

Cube: 6 Faces (Square)

8 vertices

12 Edges.



⇒ A cuboid in which length, breadth and height are equal.

12 edges [AB = BC = CD = GD = AH = AF = FG = EF = HC = EH = ED = GB

eg: Dice, Sugar cube, rubics cube, ~~box~~ cubical box.

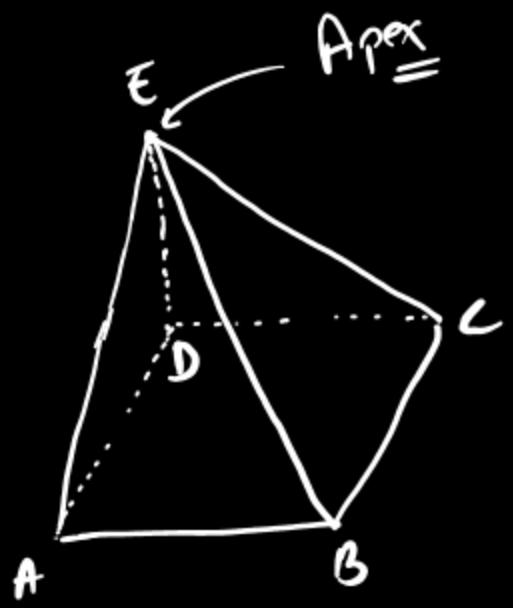
⇒ [A cube has 6 square faces, 12 edges (equal) and 8 vertices]

Pyramid

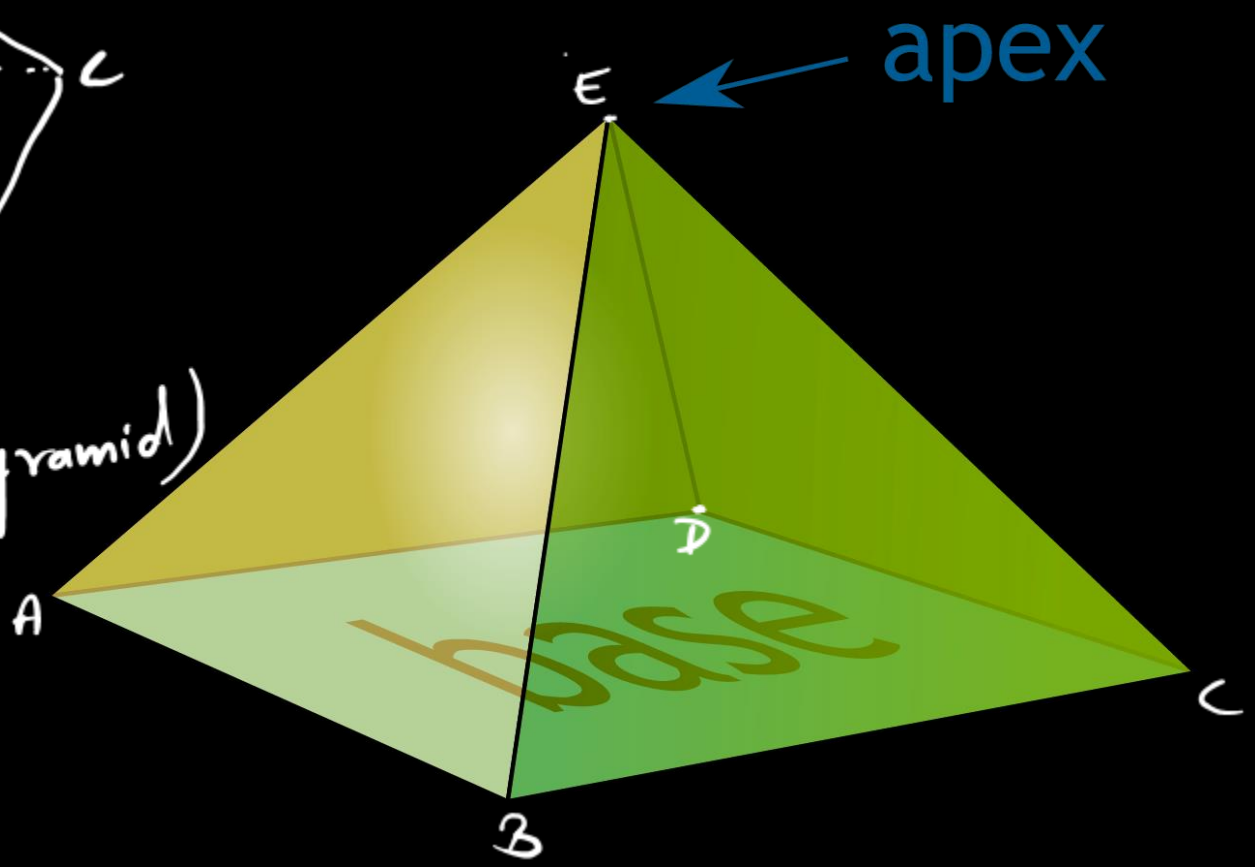
→ Square base

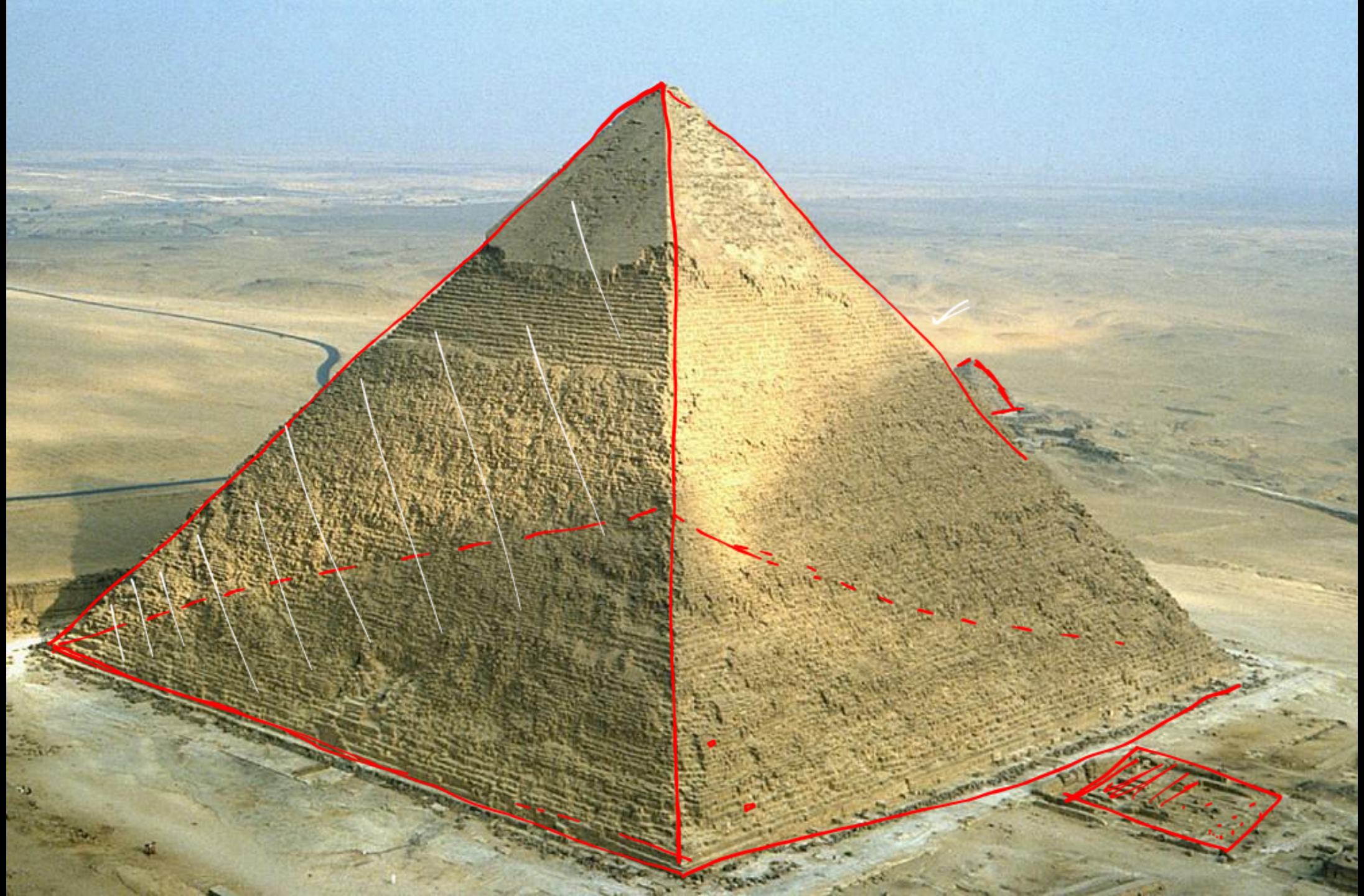
→ Triangular face

→ Apex → is the point where vertices of all the triangular face meet.



(Square Pyramid)

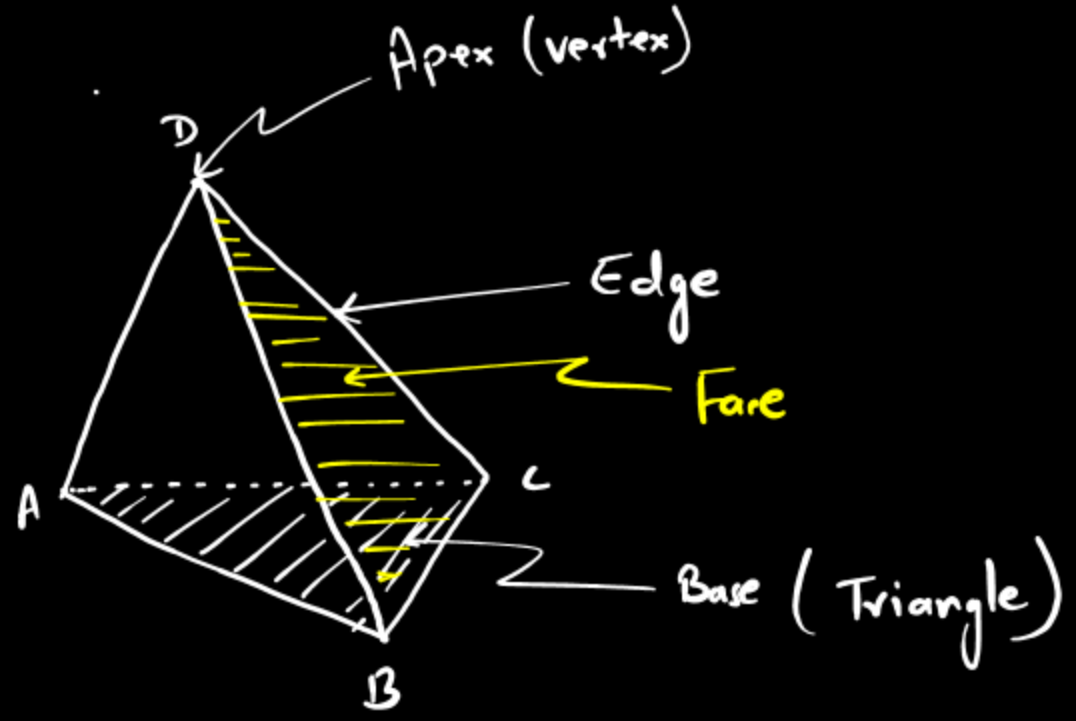




→ A pyramid is a solid (3-D) shape whose base is a plane rectilinear figure whose side faces are triangles having a common vertex (apex).

→ If base of pyramid is square, it is called square pyramid.

→ If base of pyramid is triangle, it is called triangular pyramid.



(Triangular pyramid)

Square pyramid:

Faces : 5 faces [4 triangular + 1 square face]

Vertices: 5 vertices [4 base vertex + 1 apex]

Edges : 8 edges [4 base edges + 4 side edges]

Triangular Pyramid

Faces : 4 faces (3 side faces + 1 base)

Vertices: 4 vertices (3 base vertex + 1 apex)

Edges : 6 edges. (3 base edges + 3 side edges)

A pyramid should have:

→ triangular side faces, and

→ an Apex.

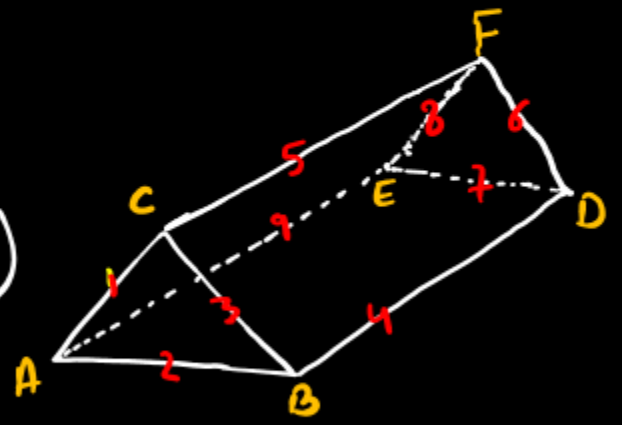
Prism:

→ It is made up of Two triangular face (top and bottom) and three rectangular face, connecting the triangles

Edges: 9

faces: 5 (3 rectangular + 2 triangular)

Vertices: 6

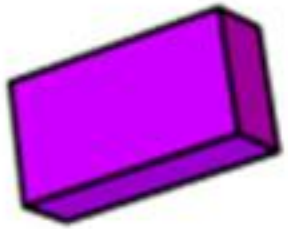


[Triangular Prism]

triangular prism

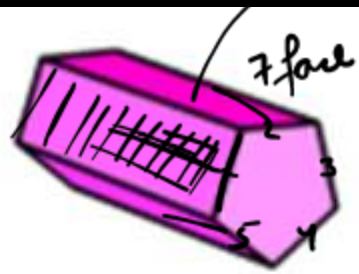
square prism

(cuboid)



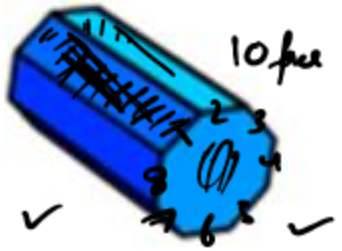
rectangular prism

(cuboid)



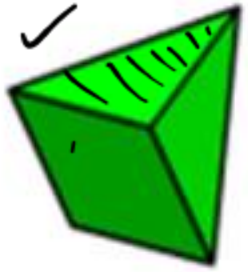
pentagonal prism

hexagonal prism



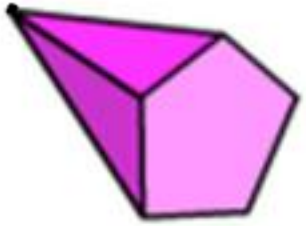
octagonal prism

triangular pyramid

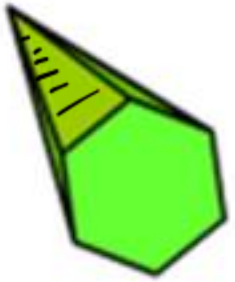


square pyramid

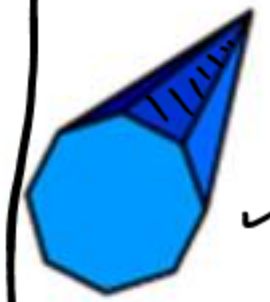
rectangular pyramid



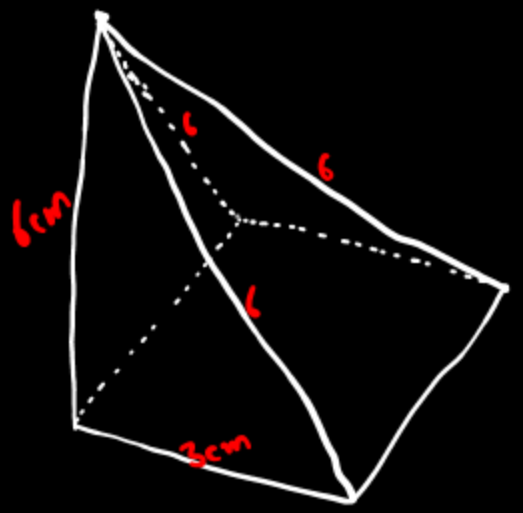
pentagonal pyramid

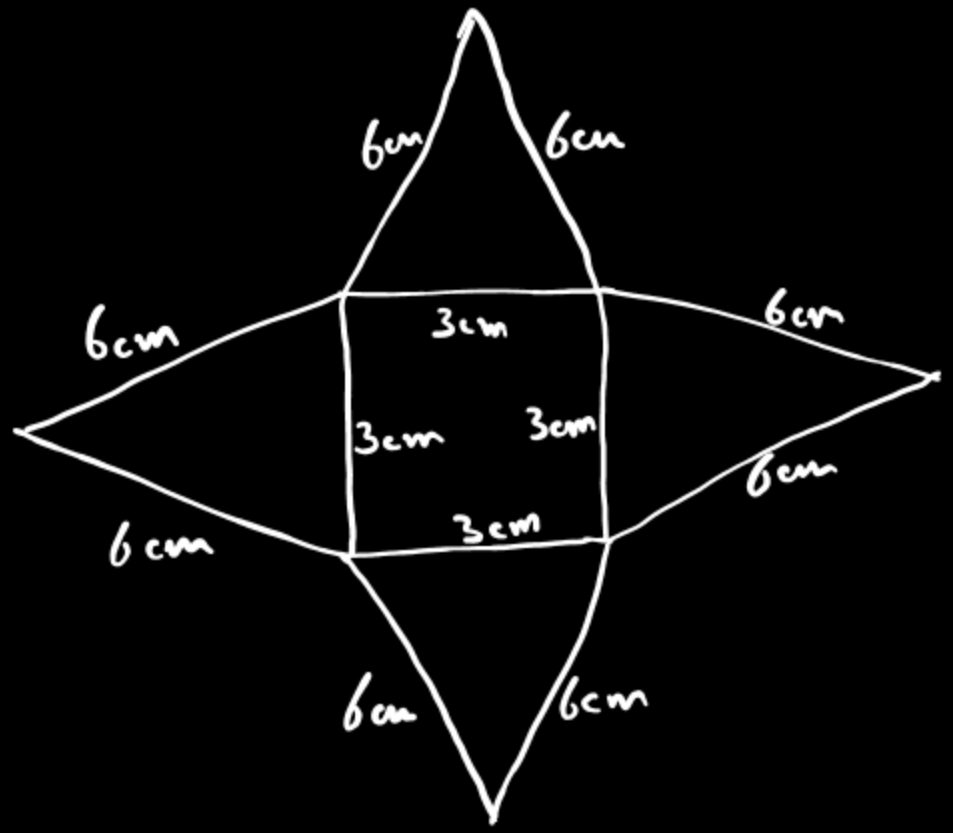


hexagonal pyramid



octagonal pyramid

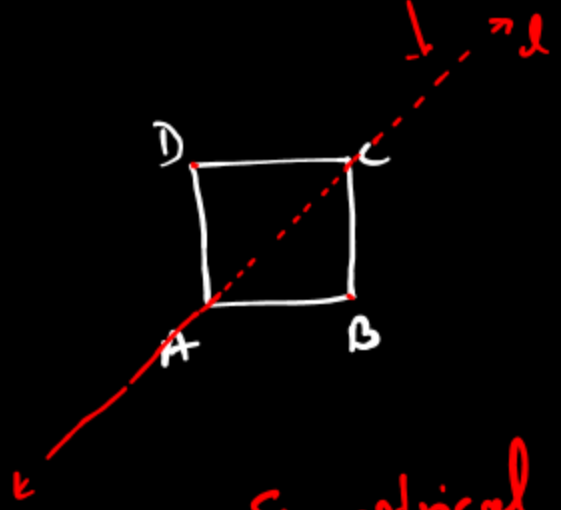




Cut out figure of a pyramid (Square pyramid)

Symmetry

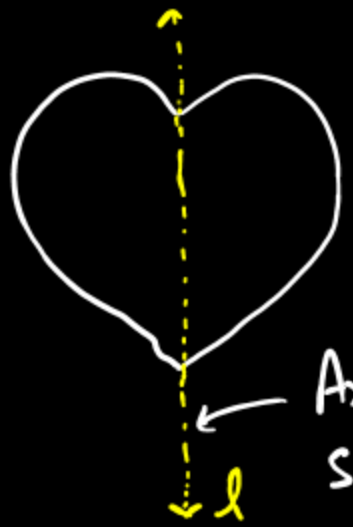
axis of symmetry (imaginary line)



Symmetrical figure

"Some object/shapes are symmetrical and some are not symmetrical (asymmetrical)

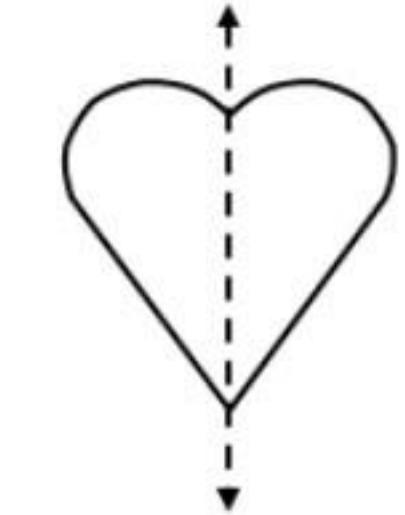
eg. This heart is a symmetrical



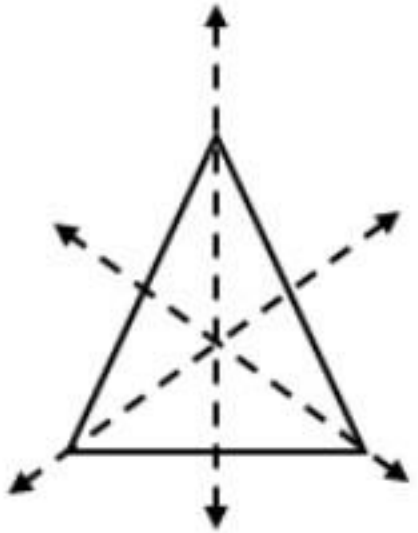
(Symmetrical)

(Asymmetrical)

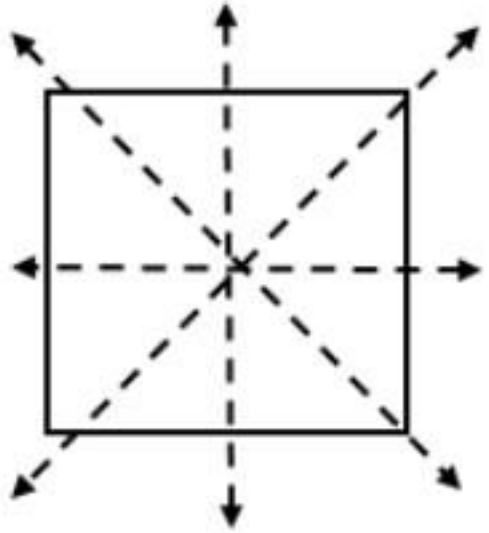
⇒ If a figure is identical on either side of a line 'l', it is said to be symmetrical about line l. and the line l is known as axis of symmetry.



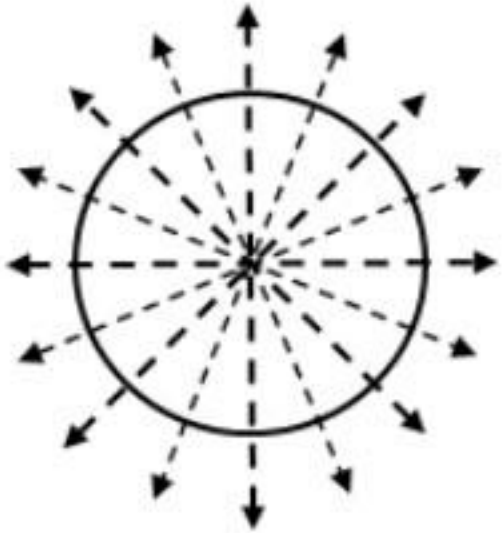
1 line of symmetry



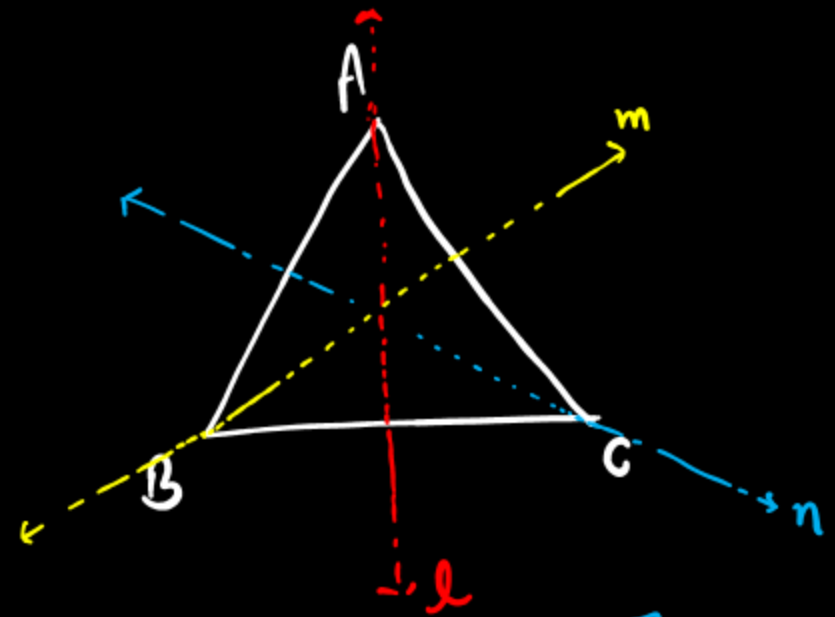
3 lines of symmetry



4 lines of symmetry



infinite number of lines of symmetry



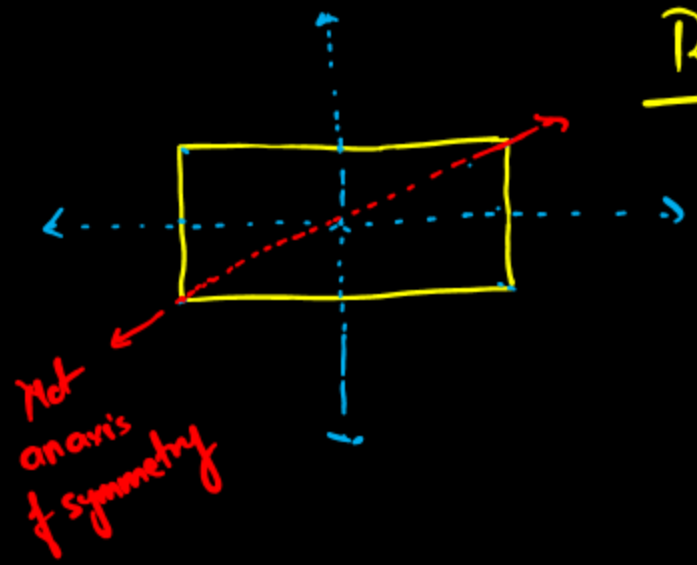
3 axis of symmetry

Cloud

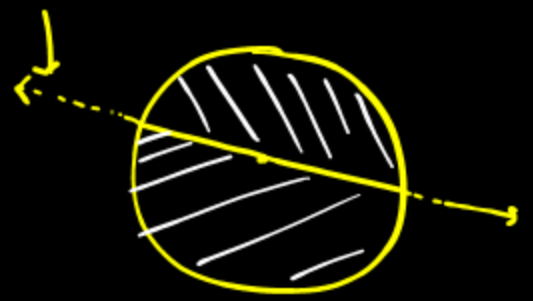
(Assymetrical)

Symmetrical

Rectangle

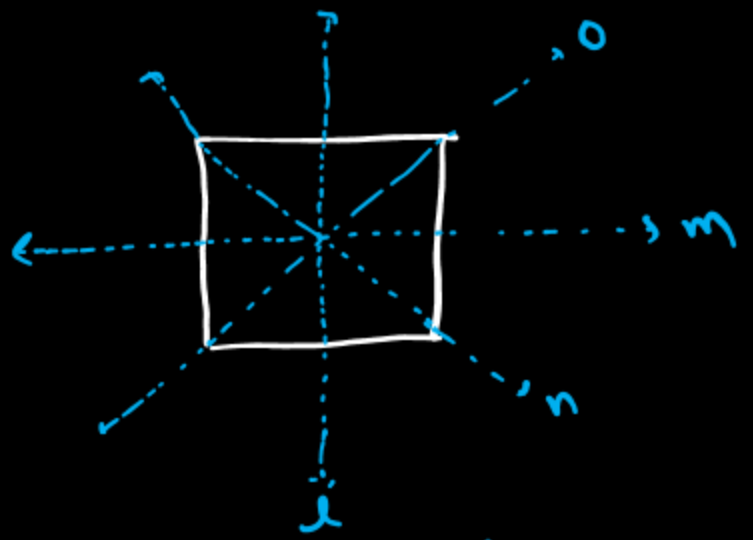


Not an axis of symmetry



2 axis of symmetry

Square



4 axis of symmetry.

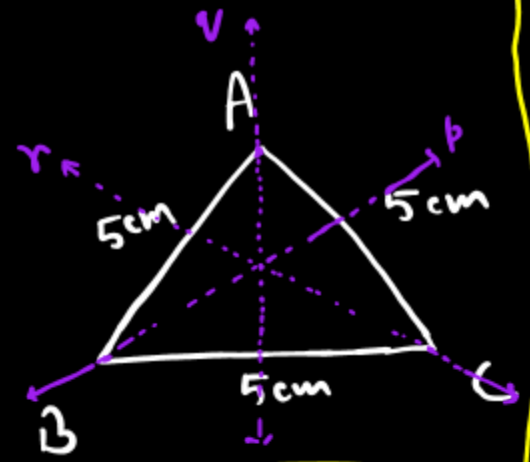
$\Rightarrow$ 1 half exactly overlaps the other half about 4 lines (l, m, n, o)

1 axis of symmetry

(3)

Triangle

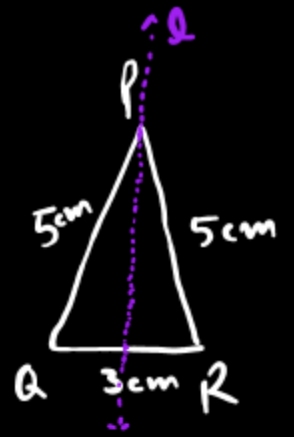
3



All sides are equal

(Equilateral Triangle)

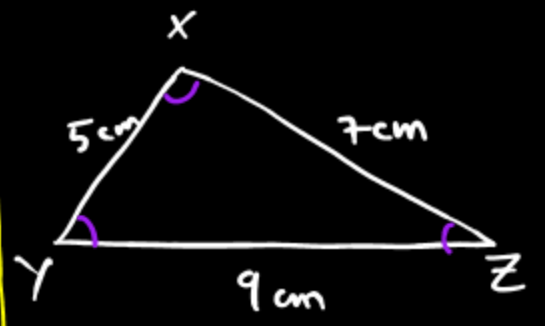
⇒ 3 axis of symmetry



Two sides are equal

(Isosceles Triangle)

⇒ 1 axis of symmetry



All sides are not equal.

(Scalene triangle)

⇒ No axis of symmetry.

④ Circle

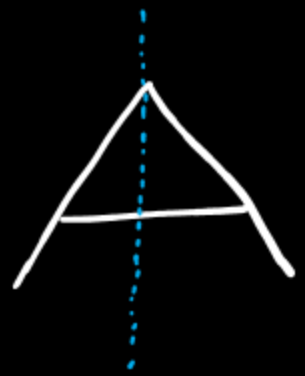
⇒ Circle is symmetrical about its diameter.

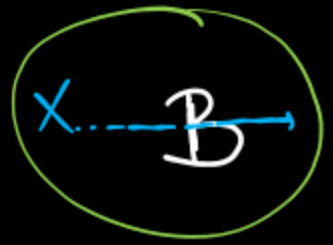
⇒ Diameter is ~~an~~ the axis of symmetry.

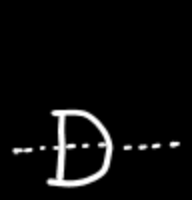
Axis of symmetry

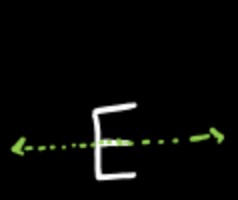
~~or~~ a.k.a

Line of symmetry

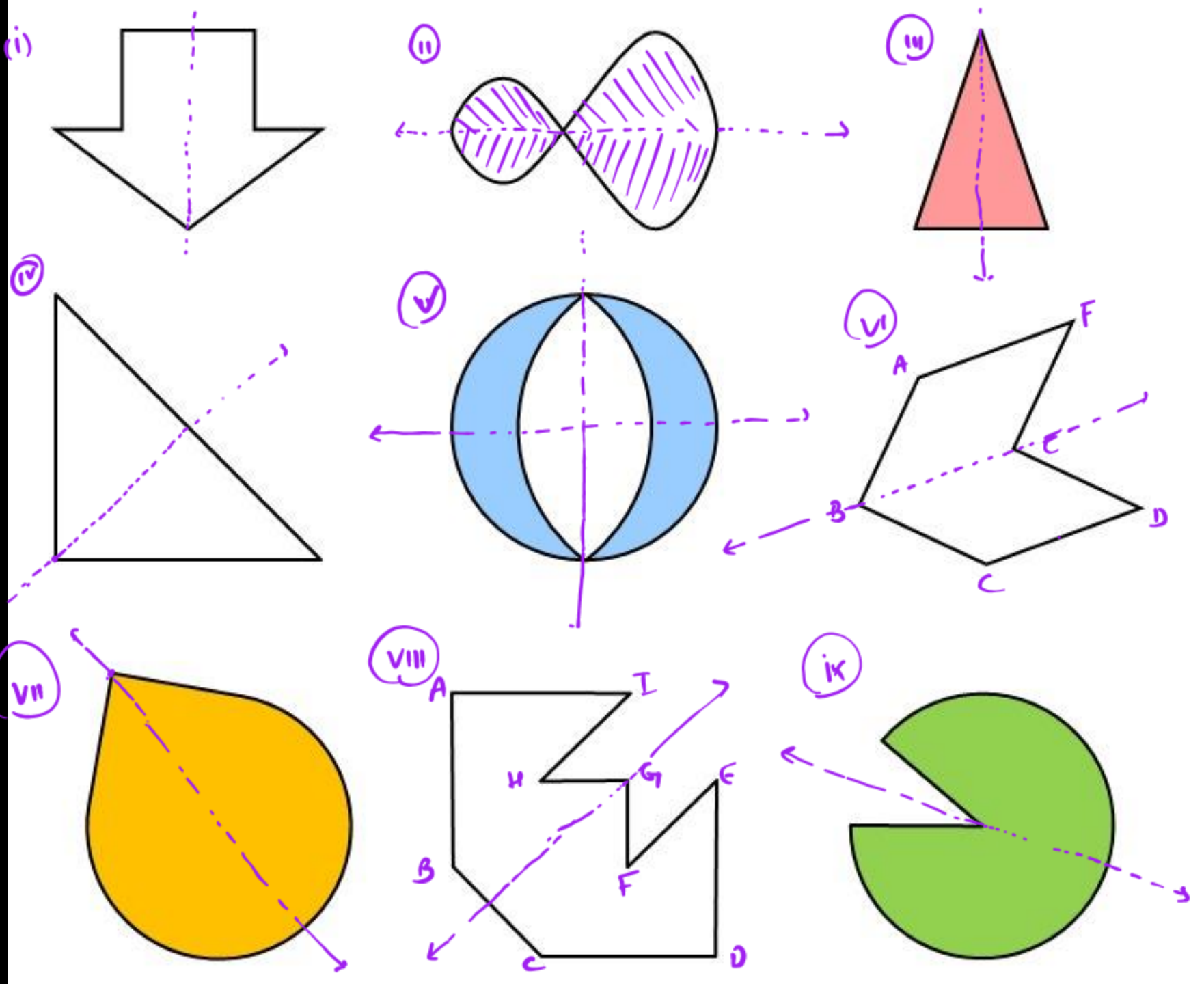








H.W. [Look for axis of symmetry in remaining alphabets]


(i)
(ii)
(iii)
(iv)
(v)
(vi)
A
F
E
B
D
C
(vii)
(viii)
A
I
H
G
E
B
F
C
D
(ix)

End of the chapter