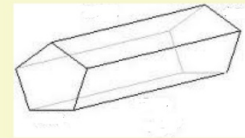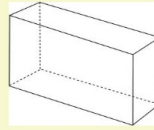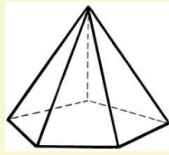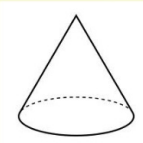## L49 : Introduction to Solids (aka 3D Figures)

Polyhedron closed 3D figure formed by four or more polygons that intersect only at their edges
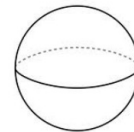
Cone 3D figure with a circular base and a curved lateral surface that comes to a point
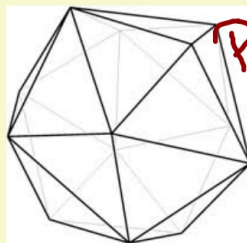
Cylinder 3D figure with two parallel circular bases a curved lateral surface that connects the bases

Sphere set of points in a space that are a fixed distance from a given pt (center)
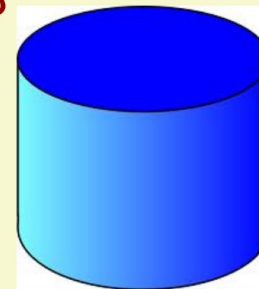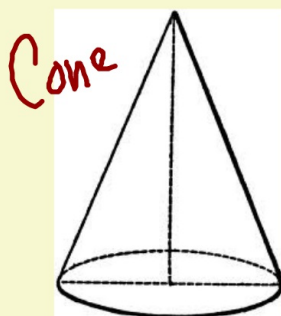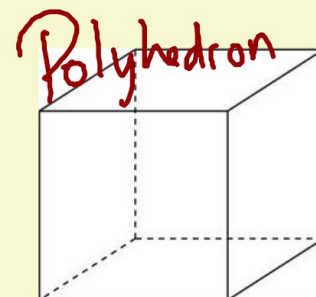

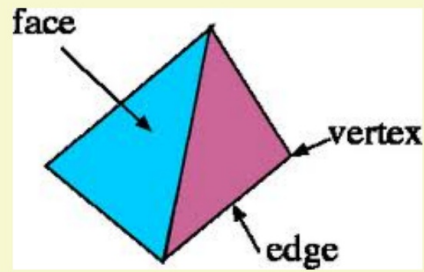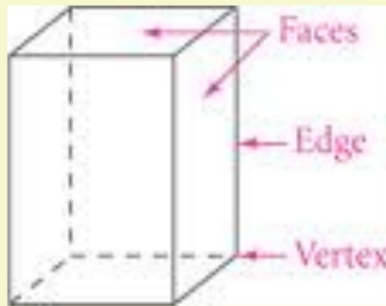**Ex A : Classify each solid.**
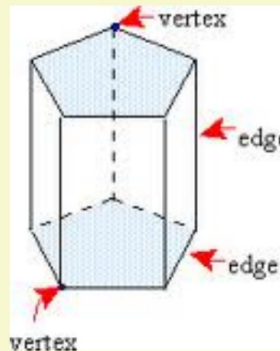
Polyhedron

Cylinder

Sphere

Cone

Polyhedron

Face: each flat surface of a polyhedron
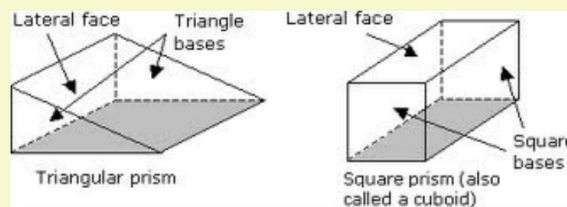

Vertex
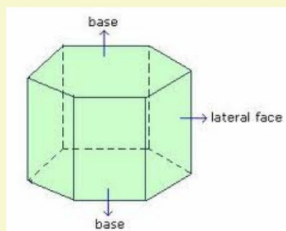intersection of three or more faces of a figure

Edge
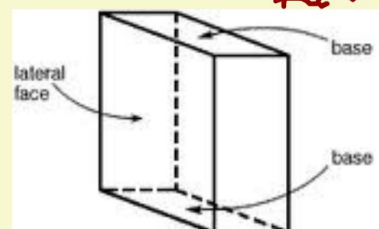segment that is the intersection of two faces of a solid

Prism : polyhedron formed by two parallel congruent polygonal bases connected by lateral faces that are parallelograms
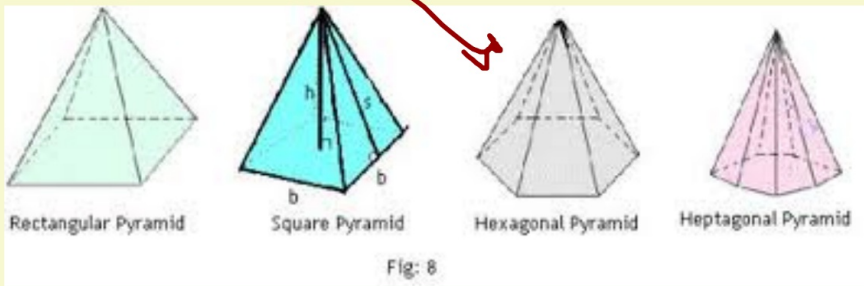

Hexagonal Prism

Rectangular Prism

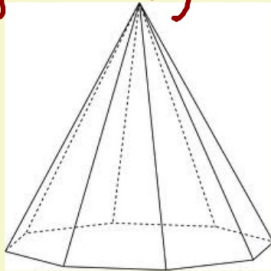**Pyramid** : polyhedron formed by a polygonal base and triangular lateral faces that meet at a common vertex

vertex

lateral edge

lateral face

base

Lateral Face

Base

Rectangular Pyramid

Square Pyramid

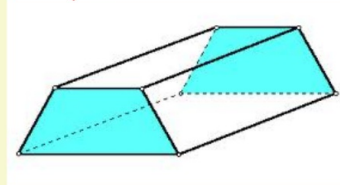Hexagonal Pyramid

Heptagonal Pyramid

Fig: 8
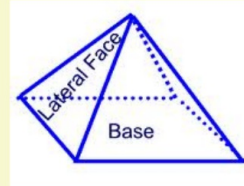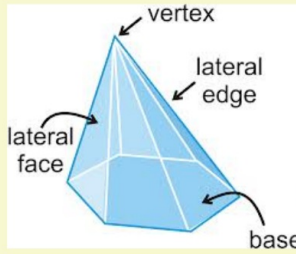
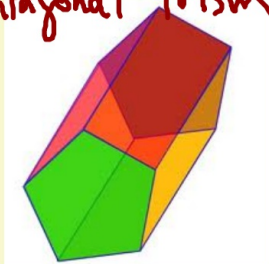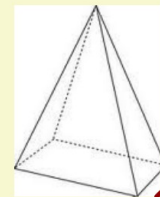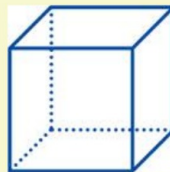Ex B : Classify the following Polyhedra.

Octagonal Pyramid

Trapezoidal Prism
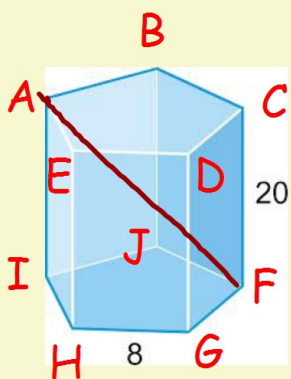
Pentagonal Prism

Cube (Square Prism)

Rectangular Pyramid

Regular Solids...

* **Polyhedron:** regular if all of its faces are congruent, regular polygons

* **Pyramid:** regular if its base is a regular polygon and its lateral faces are congruent isosceles Δ's

* **Prism:** regular if its base is regular and its faces are rectangles

Diagonal of a polyhedron:

segment whose endpoints are the vertices of two different faces of the polyhedron

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Ex C : Classify the polyhedron below, assuming all of the angles of the base are congruent. Is the figure regular? How many edges, vertices, and faces does it have? If the polyhedron has diagonal segments, name one of them.

B
A   C
E   D   20
I   J   F
H   8   G

* Pentagonal Prism
* Regular
* E = 15   V = 10   F = 7

* Diagonals: $\overline{AF}, \overline{AG}$, etc

Euler's Formula:

$$\overset{10 - 15 + 7}{V - E + F = 2}$$

Vertices   Edges   Faces

Ex D : How many edges does a polyhedron with 16 vertices and 10 faces have?

$$16 - E + 10 = 2$$

$$26 - E = 2$$

$$+E = +24$$