

## Representing 3-D in 2-D

- We see a few shapes in our day- to-day life which are not flat. Some of these shapes are solids.



(Cricket ball : a sphere)



(Brick : a cuboid)



(Ice cream : a cone)



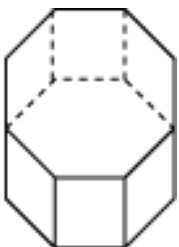
(Battery : a cylinder)



(Die : a cube)

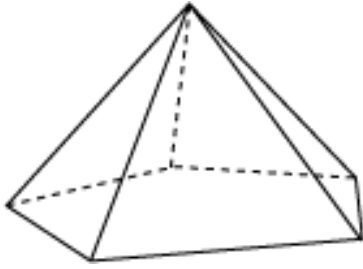
- A prism is a polyhedron whose base and top are congruent polygons and whose lateral faces are parallelograms in shape.

For example:



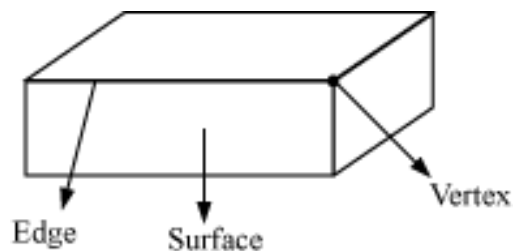
- A pyramid is a polyhedron whose base is a polygon (of any number of sides) and whose lateral faces are triangles with a common vertex.

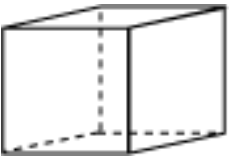
For example:

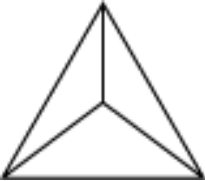
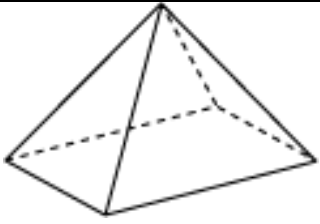
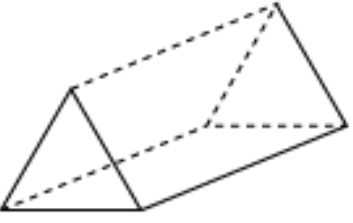


**Note:** A prism or a pyramid is named subsequent to the shape of its base. For instance, pentagonal prism and pentagonal pyramid are named after their base, pentagon.

- Each side of a cuboid is flat, called a **flat surface** (or surface). Two faces meet at a line segment called an **edge**. Three edges meet at a point called the **vertex**.



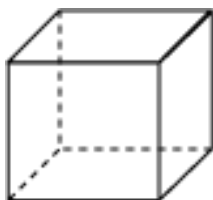
| Solid    | Figure                                                                              | Properties                                  |
|----------|-------------------------------------------------------------------------------------|---------------------------------------------|
| Cube     |  | 6 faces<br>12 edges<br>8 vertices (corners) |
| Cuboid   |  | 6 faces<br>12 edges<br>8 vertices           |
| Cylinder |                                                                                     | 2 flat faces (circles)                      |

|                    |                                                                                     |                                                |
|--------------------|-------------------------------------------------------------------------------------|------------------------------------------------|
|                    |     | 1 curved face                                  |
| Cone               |    | 1 flat surface<br>1 curved surface<br>1 vertex |
| Triangular Pyramid |    | 4 faces<br>6 edges<br>4 vertices               |
| Square pyramid     |    | 5 faces<br>8 edges<br>5 vertices               |
| Triangular prism   |  | 5 faces<br>9 edges<br>6 vertices               |

- For any polyhedron,  $F + V - E = 2$ , where F is the number of faces, V is the number of vertices and E is the number of edges.

This relationship is called Euler's formula.

**Example:** Verify Euler's formula for the given solid.



**Solution:**

The given figure is a cube.

We have

Number of vertices,  $V = 8$

Number of edges,  $E = 12$

Number of faces,  $F = 6$

Thus,  $F + V - E = 6 + 8 - 12 = 14 - 12 = 2$

Hence, Euler's formula is verified.