

Exercise 10.3

1. Can a polyhedron have for its faces:

- (i) 3 Triangles?
- (ii) 4 triangles?
- (iii) A square and four triangles?

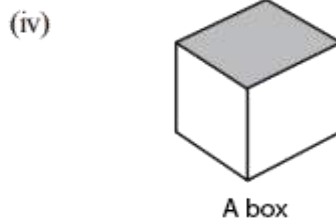
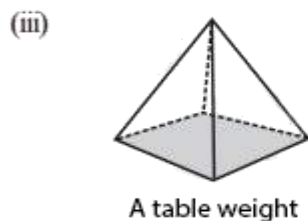
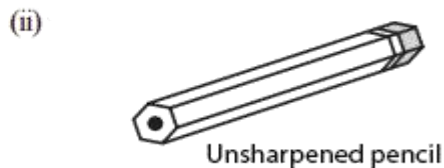
Solution:

- i) No, such polyhedrons are not possible. Such figures should have minimum 4 faces.
- ii) Yes, a triangular pyramid has 4 triangular faces.
- iii) Yes, as square pyramid has a square face and 4 triangular faces.

2. Is it possible to have a polyhedron with any given number of faces? (Hint : Think of a pyramid)

Solution: It is possible, only if the number of faces are greater than or equal to 4.

3. Which are prisms among the following:



- i) A nail: Not a polyhedron as it has a curved surface. This is not a prism.
- ii) Unsharpened Pencil: It is a prism.
- iii) A table Weight: It is not a prism.
- iv) A Box: It is a prism.

4. (i) How are prisms and cylinders alike ?
(ii) How are pyramids and cones alike ?

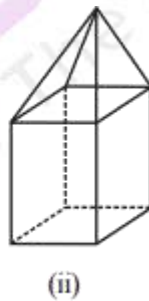
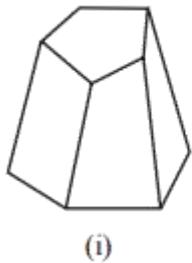
Solution:

- i) A cylinder can be look like circular prism, a prism with circular base.
- ii) A cone can be a circular pyramid, a pyramid with circular base.

5. Is a square prism same as a cube? Explain.

Solution: yes, a square prism can also be a cube. A square prism has a square as its base. However, its height is not necessarily same as the side of the square. Thus, a square prism can also be a cuboid.

6. Verify Euler's formula for these solids.



Solution:

- i) Number of faces, $F = 7$
Number of edges, $E = 15$
Number of vertices, $V = 10$
As per formula, $F + V - E = 2$
Substitute the values, we have
 $F + V - E = 7 + 10 - 15$
 $= 2$
Verified.

ii)

Here $F = 9$

$V = 9$

$E = 16$

Using formula, $F + V - E = 2$

$F + V - E = 9 + 9 - 16 = 2$

Hence, Euler's formula is verified.

7. Using Euler's formula, find the unknown:

Faces	?	5	20
Vertices	6	?	12
Edges	12	9	?

Solution:

Euler's formula: $F + V - E = 2$

Where, $F = \text{Faces}$, $V = \text{Vertices}$ and $E = \text{Edges}$

i) $F + 6 - 12 = 2$

$$F = 2 + 6$$

$$F = 8$$

ii) $5 + V - 9 = 2$

$$V - 4 = 2$$

$$V = 6$$

iii) $20 + 12 - E = 2$

$$32 - E = 2$$

$$E = 30$$

8. Can a polyhedron have 10 faces, 20 edges and 15 vertices?

Solution: From the given data, we have

$$F = 10$$

$$E = 20$$

$$V = 15$$

Every polyhedron satisfies Euler's formula, which is stated as, $F + V - E = 2$

For the given polygon, $F + V - E = 10 + 15 - 20 = 25 - 20 = 5$, which is not equal to 2

Therefore, A polyhedron is not possible as Euler's formula is not satisfied.