

Mathematics

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(Chapter – 10) (Visualising Solid Shapes)

(Class – VIII)

Exercise 10.3

Question 1:

Can a polygon have for its faces:

- (i) 3 triangles (ii) 4 triangles (iii) a square and four triangles

Answer 1:

- (i) No, a polyhedron cannot have 3 triangles for its faces.
(ii) Yes, a polyhedron can have four triangles which is known as pyramid on triangular base.
(iii) Yes, a polyhedron has its faces a square and four triangles which makes a pyramid on square base.

Question 2:

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

Answer 2:

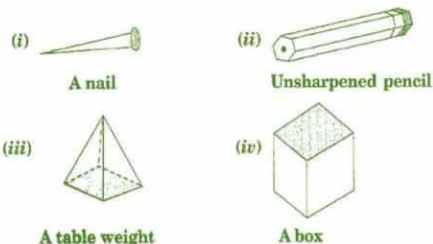
It is possible, only if the number of faces are greater than or equal to 4.

Question 3:

Which are prisms among the following:

Answer 3:

Figure (ii) unsharpened pencil and figure (iv) a box are prisms.



Question 4:

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

Answer 4:

- (i) A prism becomes a cylinder as the number of sides of its base becomes larger and larger.
(ii) A pyramid becomes a cone as the number of sides of its base becomes larger and larger.

Question 5:

Is a square prism same as a cube? Explain.

Answer 5:

No, it can be a cuboid also.

Question 6:

Verify Euler's formula for these solids.

Answer 6:

- (i) Here, figure (i) contains 7 faces, 10 vertices and 15 edges.
Using Euler's formula, we see $F + V - E = 2$
Putting $F = 7$, $V = 10$ and $E = 15$,
 $F + V - E = 2 \Rightarrow 7 + 10 - 15 = 2$
 $\Rightarrow 17 - 15 = 2 \Rightarrow 2 = 2$
 $\Rightarrow \text{L.H.S.} = \text{R.H.S.}$



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(ii) Here, figure (ii) contains 9 faces, 9 vertices and 16 edges.

Using Euler's formula, we see $F + V - E = 2$

$$F + V - E = 2 \quad \Rightarrow \quad 9 + 9 - 16 = 2$$

$$\Rightarrow \quad 18 - 16 = 2 \quad \Rightarrow \quad 2 = 2$$

$$\Rightarrow \quad \text{L.H.S.} = \text{R.H.S.}$$

Question 7:

Using Euler's formula, find the unknown:

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

Answer 7:

In first column, $F = ?$, $V = 6$ and $E = 12$

Using Euler's formula, we see $F + V - E = 2$

$$F + V - E = 2$$

$$\Rightarrow \quad F + 6 - 12 = 2$$

$$\Rightarrow \quad F - 6 = 2$$

$$\Rightarrow \quad F = 2 + 6 = 8$$

Hence there are 8 faces.

In second column, $F = 5$, $V = ?$ and $E = 9$

Using Euler's formula, we see $F + V - E = 2$

$$F + V - E = 2$$

$$\Rightarrow \quad 5 + V - 9 = 2$$

$$\Rightarrow \quad V - 4 = 2$$

$$\Rightarrow \quad V = 2 + 4 = 6$$

Hence there are 6 vertices.

In third column, $F = 20$, $V = 12$ and $E = ?$

Using Euler's formula, we see $F + V - E = 2$

$$F + V - E = 2$$

$$\Rightarrow \quad 20 + 12 - E = 2$$

$$\Rightarrow \quad 32 - E = 2$$

$$\Rightarrow \quad E = 32 - 2 = 30$$

Hence there are 30 edges.

Question 8:

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

Answer 8:

If $F = 10$, $V = 15$ and $E = 20$.

Then, we know Using Euler's formula, $F + V - E = 2$

$$\text{L.H.S.} = F + V - E$$

$$= 10 + 15 - 20$$

$$= 25 - 20$$

$$= 5$$

$$\text{R.H.S.} = 2$$

$$\therefore \quad \text{L.H.S.} \neq \text{R.H.S.}$$

Therefore, it does not follow Euler's formula.

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