CHAPTER 19 – REPRESENTING 3-D IN 2-D

Question 1.

If a polyhedron has 8 faces and 8 vertices, find the number of edges in it.

Solution:

Faces $= 8$

Vertices $= 8$

Using Euler's formula,

$F + V - E = 2$

$8 + 8 - E = 2$

$-E = 2 - 16$

$E = 14$

Question 2.

If a polyhedron has 10 vertices and 7 faces, find the number of edges in it.

Solution:

Vertices $= 10$

Faces $= 7$

Using Euler's formula

$F + V - E = 2$

$7 + 10 - E = 2$

$-E = -15$

$E = 15$

Question 3.

State, the number of faces, number of vertices and number of edges of:

(i) a pentagonal pyramid

Solution:

(i) A pentagonal pyramid

Number of faces =6

Number of vertices =6

Number of edges =10

(ii) A hexagonal prism

Solution:

(ii) A hexagonal prism

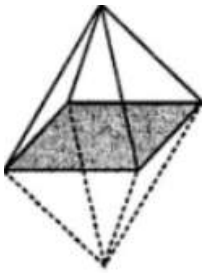
Number of faces = 8

Number of vertices =12

Number of edges =18

Question 4.

Verily Euler's formula for the following three dimensional figures:



Solution:

(i) Number of vertices = 6

Number of faces =8

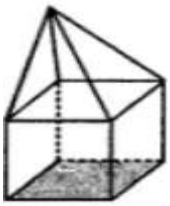
Number of edges =12

Using Euler formula

$F + V - E = 2$

$\mathrm{F} + \mathrm{V} - 12 = 2$

2=2 hence proved.



Solution:

(ii) Number of vertices =9

Number of faces =8

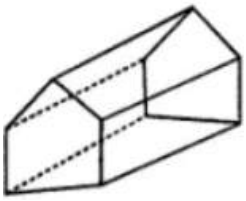
Number of edges =15

Using, Euler's formula,

$F + V - E = 2$

$9 + 8 - 15 = 2$

$2 = 2$ Hence proved.



Solution:

(iii) Number of vertices =9

Number of faces =5

Number of edges =12

Using, Euler's formula,

$F + V - E = 2$

$9 + 5 - 12 = 2$

2=2 hence proved.

Question 5.

Can a polyhedron have 8 faces, 26 edges and 16 vertices?

Solution:

Number of faces =8

Number of vertices =16

Number of edges =26

Using Euler's formula

$F + V - E$

$8 + 16 - 26 \neq -2$

$8 + 16 - 26 \neq -2$

$-2 \neq 2$

No, a polyhedron cannot have 8 faces, 26 edges and 16 vertices.

Question 6.

Can a polyhedron have?

(i) 3 triangles only?

Solution:

(i)No.

(ii) 4 triangles only?

Solution:

(ii) Yes.

(iii) A square and four triangles?

Solution:

(iii) Yes.

Question 7.

Using Euler's formula, find the values of x, y, z.

	Faces	Vertices	Edges
(i)	x	15	20
(ii)	6	Y	8
(iii)	14	26	z

Solution:

(i)$F + V - E = 2$

$x + 15 - 20 = 2$

$x - 5 = 2 \Rightarrow x = 2 + 5 = 7$

(ii)$F + V - E = 2$

$15 + y - 26 = 2$

$y - 11 = 2$

$y = 2 + 11 \Rightarrow y = 13$

(iii) $F + V - E = 2$

$14 + 26 - Z = 2$

$-Z = 2 - 40 \Rightarrow Z = 38$

Question 8.

What is the least number of planes that can enclose a solid? What is the name of the solid?

Solution:

The least number of planes that can enclose a solid is 4.

The name of the solid is Tetrahedron.

Question 9.

Is a square prism same as a cube?

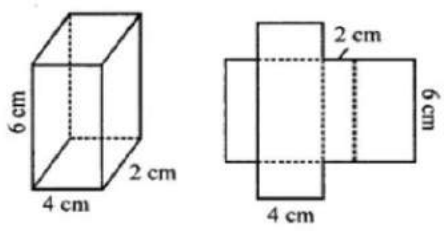
Solution:

Yes, a square prism is same as a cube.

Question 10.

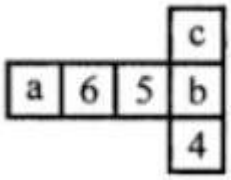
A cubical box is 6 cm× 4 cm ×2 cm. Draw two different nets of it.

Solution:

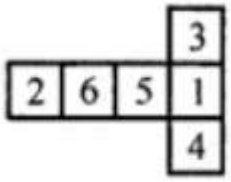


Question 11.

Dice are cubes where the sum of the numbers on the opposite faces is 7. Find the missing numbers a, b and c.



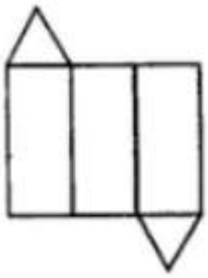
Solution:



Question 12.

Name the polyhedron that can be made by folding each of the following nets:

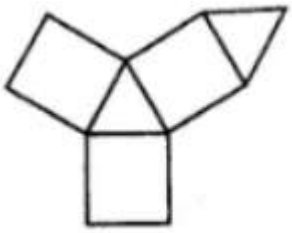
(i)



Solution:

(i) Triangular prism. It has 3 rectangles and 2 triangles.

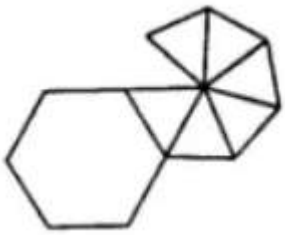
(ii)



Solution:

(ii) Triangular prism. It has 3 rectangles and 2 triangles.

(iii)

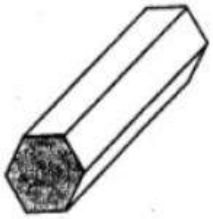


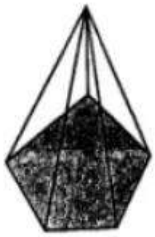
Solution:

(iii) Hexagonal pyramid as it has a hexagonal base and 6 triangles.

Question 13.

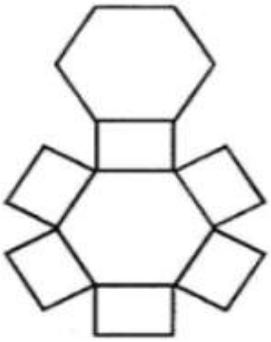
Draw nets for the following polyhedrons:





Solution:

Net of hexagonal prism:



Net of pentagonal pyramid: