CHAPTER - 19
REPRESENTING 3-D IN 2-D

EXERCISE 19

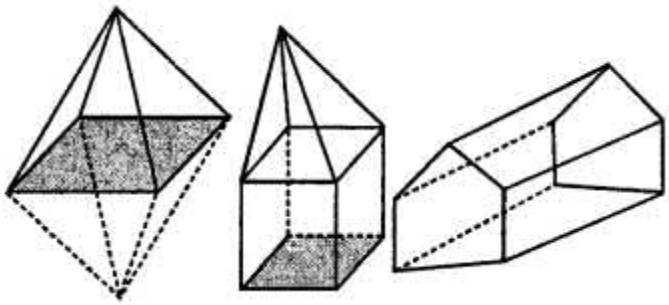
Question 1.
If a polyhedron has 8 faces and 8 vertices, find the number of edges in it.
Solution:
Faces = 8
Vertices = 8
using Eulers formula,
F + V – E = 2
8 + 8 – E = 2
-E = 2 – 16
E= 14

Question 2.
If a polyhedron has 10 vertices and 7 faces, find the number of edges in it.
Solution:
Vertices = 10
Faces = 7
Using Eulers 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
(ii) a hexagonal prism
Solution:
(i) A pentagonal pyramid
Number of faces = 6
Number of vertices = 6
Number of edges = 10

(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
8 + 6 – 12 = 2
2 = 2 Hence proved.

(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.

(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
$\Rightarrow$ 8 + 16 – 26 $\neq$ -2
$\Rightarrow$ -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 ?
(ii) 4 triangles only ?
(iii) a square and four triangles ?
Solution:
(i) No.
(ii) Yes.
(iii) Yes.

Question 7.
Using Euler's formula, find the values of x, y, z.

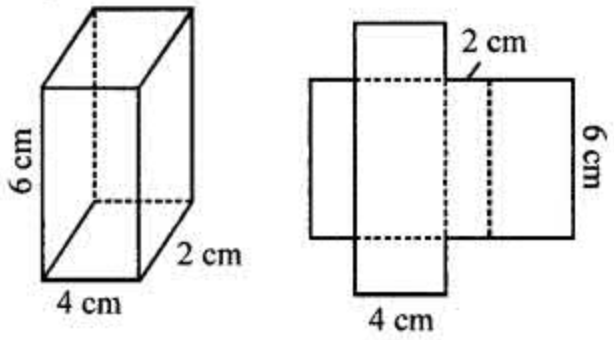
	Faces	Vertices	Edges
(*i*)	x	15	20
(*ii*)	6	y	8
(*iii*)	14	26	z

Solution:
(*i*) $F + V - E = 2$
$\Rightarrow x + 15 - 20 = 2$
$\Rightarrow x - 5 = 2 \Rightarrow x = 2 + 5 = 7$
(*ii*) $F + V - E = 2$
$\Rightarrow 15 + y - 26 = 2$
$\Rightarrow y - 11 = 2$
$\Rightarrow y = 2 + 11 \Rightarrow y = 13$
(*iii*) $F + V - E = 2$
$\Rightarrow 14 + 26 - Z = 2$
$\Rightarrow -Z = 2 - 40 \Rightarrow Z = 38$

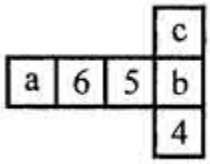
Question 8.
What is the least number of planes that can enclose a solid? What is the name of the solid.
Solution:
The least number of planes that can enclose a solid is 4.
The name of the solid is Tetrahedron.

Question 9.
Is a square prism same as a cube?
Solution:
Yes, a square prism is same as a cube.

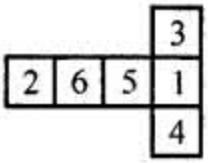
Question 10.
A cubical box is 6 cm x 4 cm x 2 cm. Draw two different nets of it.
Solution:



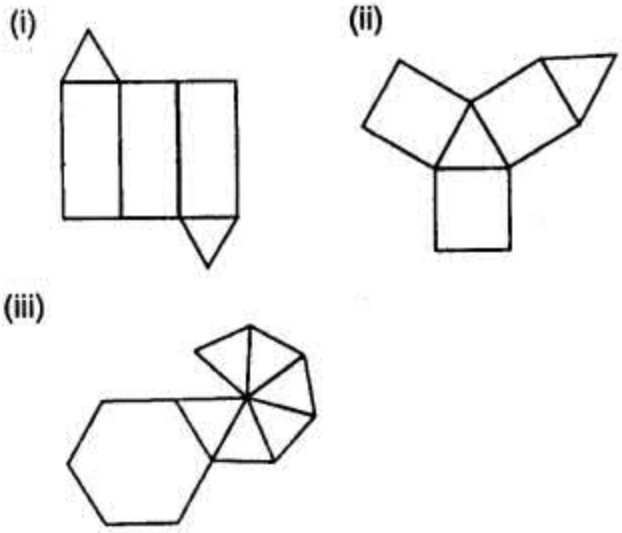
Question 11.
Dice are cubes where the sum of the numbers on the opposite faces is 7. Find the missing numbers a, b and c.



Solution:

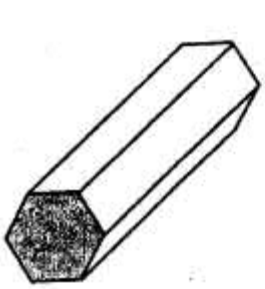


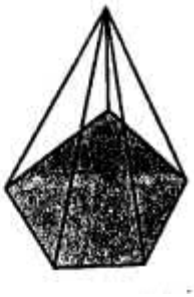
Question 12.
Name the polyhedron that can be made by folding each of the following nets:



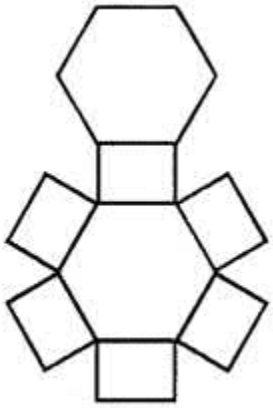
Solution:
(i) Triangular prism. It has 3 rectangles and 2 triangles.
(ii) Triangular prism. It has 3 rectangles and 2 triangles.
(iii) Hexagonal pyramid as it has a hexagonal base and 6 triangles.

Question 13.
Draw nets for the following polyhedrons:





Solution:
Net of hexagonal prism:



Net of pentagonal pyramid: