10 Visualising Solid Shapes

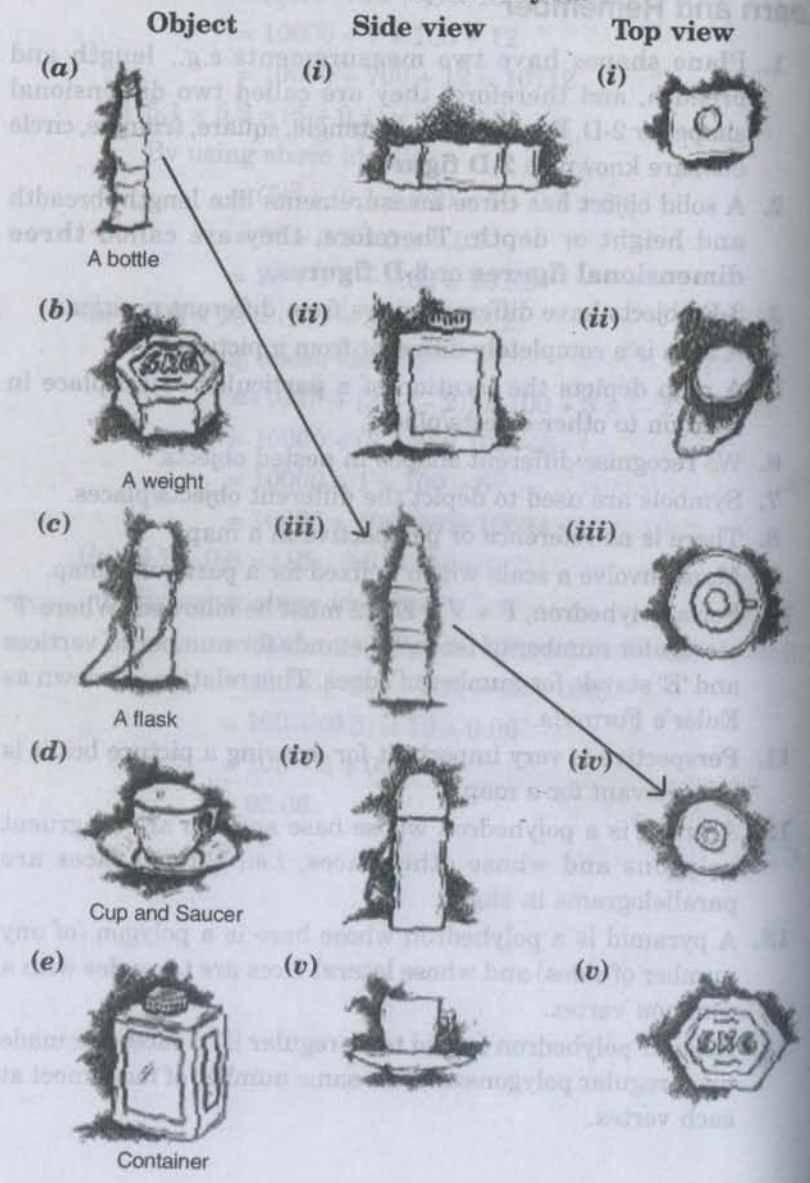
Learn and Remember

1. Plane shapes have two measurements *e.g.*, length and breadth, and therefore, they are called two dimensional shapes or 2-D. For example, rectangle, square, triangle, circle etc., are known as **2-D figures.**
2. A solid object has three measurements like length, breadth and height or depth. Therefore, they are called **three dimensional figures** or **3-D figures.**
3. 3-D objects have different views from different positions.
4. A map is a completely different from a picture.
5. A map depicts the location of a particular object/place in relation to other objects/places.
6. We recognise different shapes in nested objects.
7. Symbols are used to depict the different objects/places.
8. There is no reference or perspective in a map.
9. Maps involve a scale which is fixed for a particular map.
10. For a polyhedron, $F + V - E = 2$ must be followed. Where 'F' stands for number of faces, 'V' stands for number of vertices and 'E' stands for number of edges. This relation is known as Euler's Formula.
11. Perspective is very important for drawing a picture but it is not relevant for a map.
12. A prism is a polyhedron whose base and top are congruent polygons and whose other faces, *i.e.*, lateral faces are parallelograms in shape.
13. 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.
14. Regular polyhedron is said to be regular if its faces are made up of regular polygons and the same number of faces meet at each vertex.

TEXTBOOK QUESTIONS SOLVED

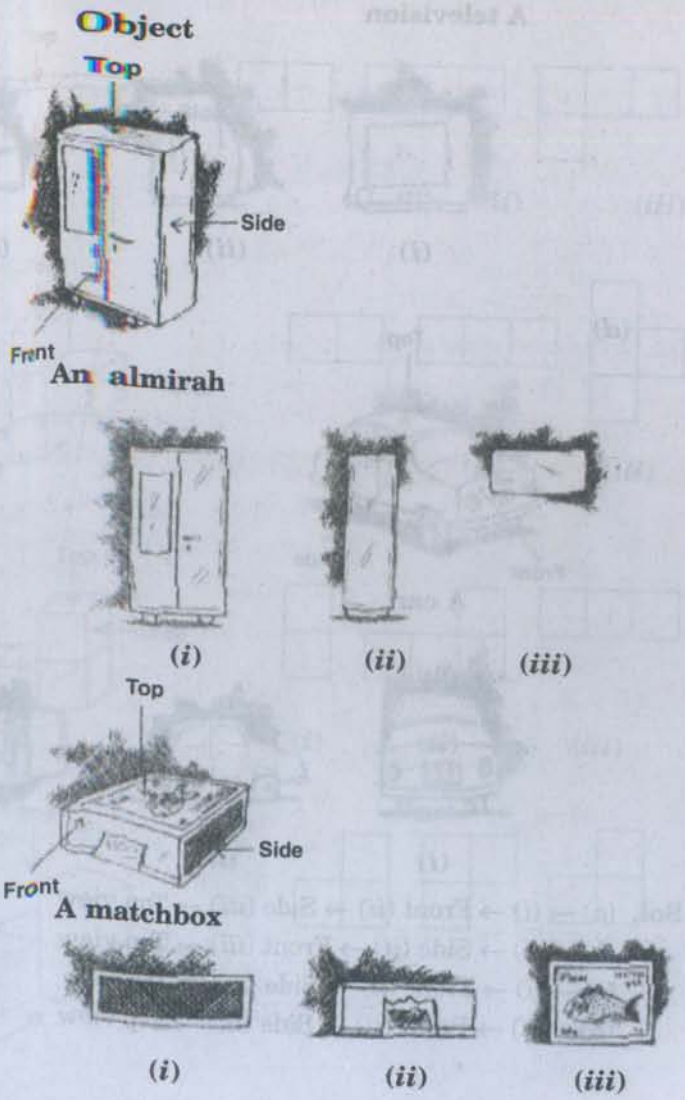
EXERCISE 10.1 (*Page –157*)

Q1. For each of the given solid, the two views are given. Match for each solid the corresponding top and front views. The first one is done for you.

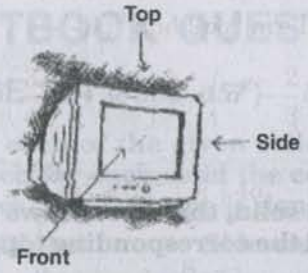


Sol. (*a*) → (*iii*) → (*iv*)
(*b*) → (*i*) → (*v*)
(*c*) → (*v*) → (*ii*)
(*d*) → (*v*) → (*iii*)
(*e*) → (*i*) → (*i*)

Q2. For each of the given solid, the three views are given. Identfy for each solid the corresponding top, front and side views.



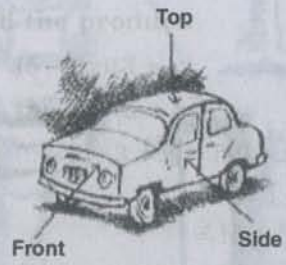
(c)



A television

(*i*) (*ii*) (*iii*)

(d)



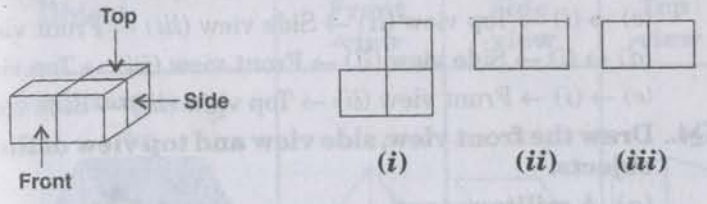
A car

(*i*) (*ii*) (*iii*)

Sol. (*a*) → (*i*) → Front (*ii*) → Side (*iii*) → Top view
(*b*) → (*i*) → Side (*ii*) → Front (*iii*) → Top view
(*c*) → (*i*) → Front (*ii*) → Side (*iii*) → Top view
(*d*) → (*i*) → Front (*ii*) → Side (*iii*) → Top view.

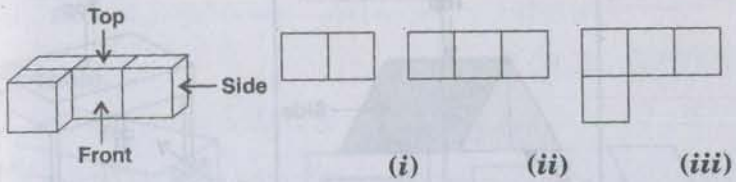
Q3. For each given solid, identify the top view, front view and side view.

(*a*)



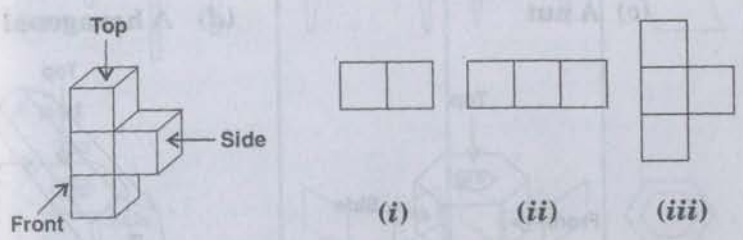
(*i*) (*ii*) (*iii*)

(*b*)



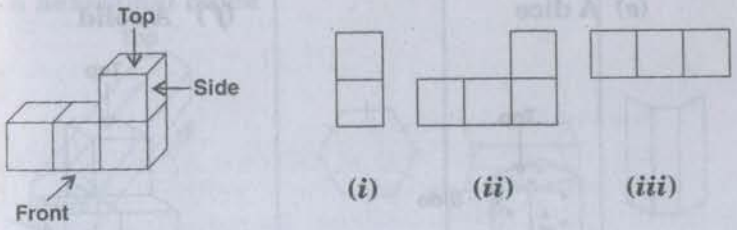
(*i*) (*ii*) (*iii*)

(*c*)



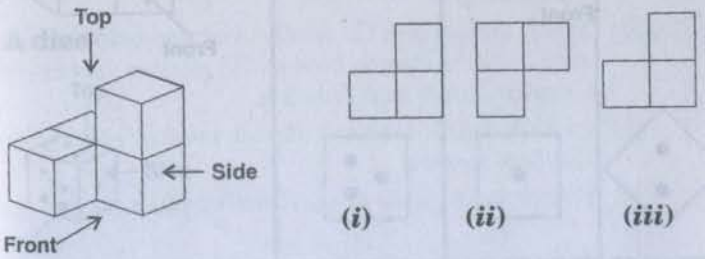
(*i*) (*ii*) (*iii*)

(*d*)



(*i*) (*ii*) (*iii*)

(*e*)

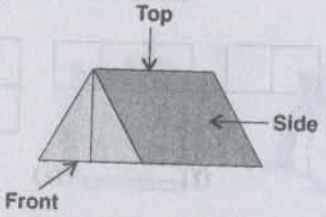


(*i*) (*ii*) (*iii*)

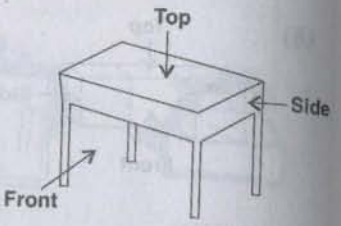
Sol. (*a*) → (*i*) → Top view (*ii*) → Front view (*iii*) → Side view
(*b*) → (*i*) → Side view (*ii*) → Front view (*iii*) → Top view
(*c*) → (*i*) → Top view (*ii*) → Side view (*iii*) → Front view
(*d*) → (*i*) → Side view (*ii*) → Front view (*iii*) → Top view
(*e*) → (*i*) → Front view (*ii*) → Top view (*iii*) → Side view.

Q4. Draw the front view, side view and top view of the given objects.

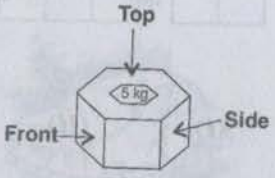
(*a*) A military tent



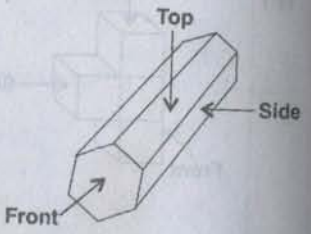
(*b*) A table



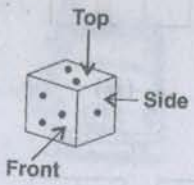
(*c*) A nut



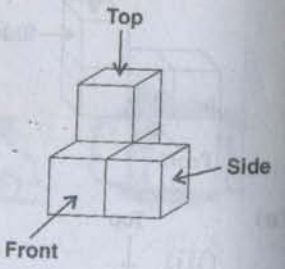
(*d*) A hexagonal block



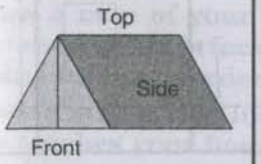
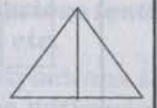
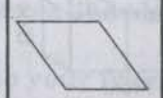
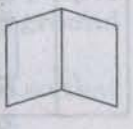
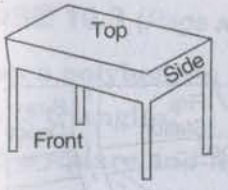
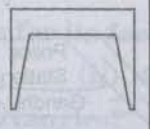
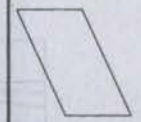
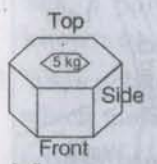
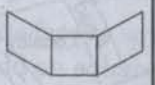
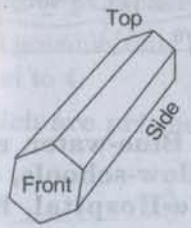
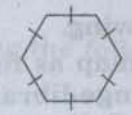
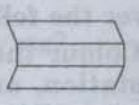
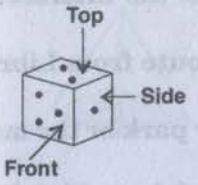
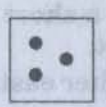
(*e*) A dice

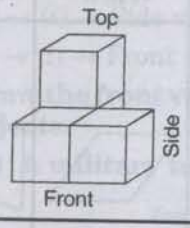
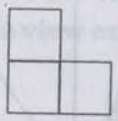
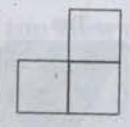
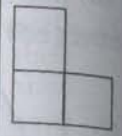


(*f*) A solid



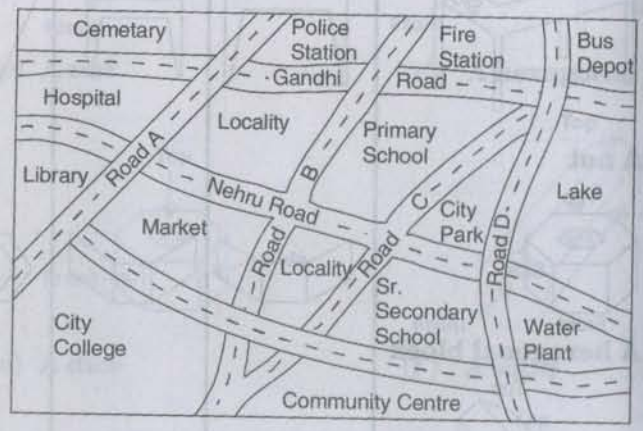
Sol.

S. No.	Object	Front -view	Side -view	Top -view
(*a*)	**A military tent** 			
(*b*)	**A table** 			
(*c*)	**A nut** 			
(*d*)	**A hexagonal block** 			
(*e*)	**A dice** 			

S. No.	Object	Front -view	Side -view	Top -view
(*f*)	A solid 			

EXERCISE 10.2 (*Page –163*)

Q1. Look at the given map of a city.



Answer the following.

(*a*) Colour the map as follows: Blue-water, red-fire station, orange-library, yellow-schools, Green-park, Pink-College, Purple-Hospital, Brown-Cemetary.

(*b*) Mark the green 'X' at the intersection of Road 'C' and Nehru Road, Green 'Y' at the intersection of Gandhi Road and Road A.

(*c*) In red, draw a short street route from Library to the bus depot.

(*d*) Which is further east, the city park or the market?

(*e*) Which is further south, the Primary School or the Sr. Secondary School.

Q2. Draw a map of your class room using proper scale and symbols for different objects.

Q3. Draw a map of your school compound using proper scale and symbols for various features like play ground main building, garden etc.

Q4. Draw a map giving instructions to your friend so that she reaches your house without any difficulty.

Sol. Do yourself Ex. 10.2.

EXERCISE 10.3 (*Page – 166-167*)

Q1. Can a polyhedron have for its faces

(*i*) 3 triangles? (*ii*) 4 triangles?

(*iii*) a square and four triangles?

Sol. (*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.

Q2. Is it possible to have a polyhedron with any given number of faces? (Hint: Think of a pyramid).

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

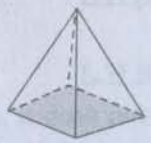
Q3. Which are prisms among the following?

(*i*) 

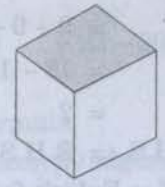
A nail

(*ii*) 

Unsharpened pencil

(*iii*) 

A table weight

(*iv*) 

A box

Sol. Fig. (*ii*) unsharpened pencil and fig. (*iv*) a box are prisms.

Q4. (*i*) How are prisms and cylinders alike?

(*ii*) How are pyramids and cones alike?

Sol. (*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.

Q5. Is a square prism same as a cube? Explain.

Sol. No, it can be a cuboid also.

Q6. Verify Euler's formula for these solids.

(*i*)

(*ii*)

Sol. (*i*) Fig. contains 7 faces, 10 vertices and 15 edges.

By using Euler's formula. We see F + V – E = 2.

Putting F = 7, V = 10 and E = 15

L.H.S. = F + V – E

= 7 + 10 – 5

= 17 – 15

= 2

L.H.S. = R.H.S.

It verifies Euler's formula.

For Fig. (*ii*)

In this figure, there are 9 faces, 9 vertices and 16 edges.

By using Euler's formula

F + V – E = 2

L.H.S. = F + V – E

= 9 + 9 – 16

= 18 – 16

= 2

L.H.S. = R.H.S.

It verifies Euler's formula.

Q7. Using Euler's formula find the unknown:

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

Sol. In first column

F = ?, V = 6 and E = 12

By using Euler's formula,

F + V – E = 2

$\Rightarrow$ F + 6 – 12 = 2

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

Hence, there are 8 faces.

In second column

F = 5, V = ? and E = 9

F + V – E = 2 By using Euler's Formula,

$\Rightarrow$ 5 + V – 9 = 2

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

Hence, there are 6 vertices.

In third column

F = 20, V = 12 and E = ?

By using Euler's formula,

F + V – E = 2

$\Rightarrow$ 20 + 12 – E = 2

$\Rightarrow$ 32 – 2 = E $\Rightarrow$ 30 = E $\Rightarrow$ E = 30.

Hence, required edges are 30.

Q8. Can a polyhedron have 10 faces, 20 edges and 15 vertices?

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

We know by Euler's formula F + V – E = 2

L.H.S. = F + V – E

= 10 + 15 – 20 = 25 – 20 = 5

L.H.S. $\neq$ R.H.S.

No, it does not follow Euler's formula.

So, polyhedron cannot have 10 faces, 20 edges and 15 vertices.