Given the plan and elevation of a tetrahedron. Show the projections of the smallest cube that this solid would fit into. Draw the circumscribing sphere for both solids.

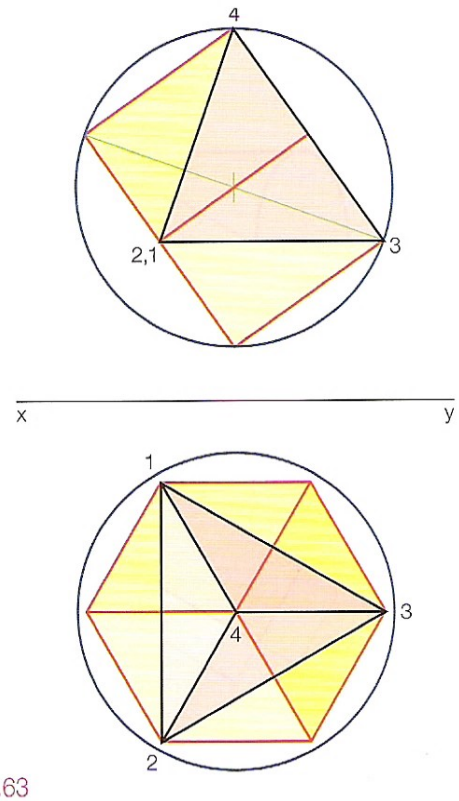

Fig. 3.63

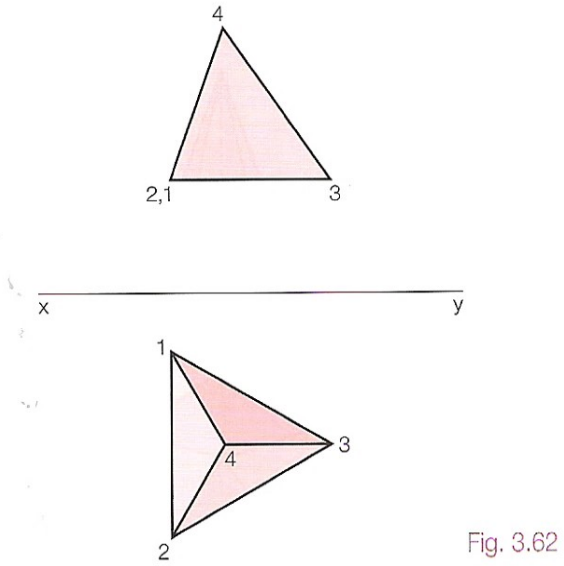

Fig. 3.62

Each edge will form the diagonal of a face of the cube. Edge 3,4 is a true length in elevation and edge 1,2 is seen as a point view in elevation. Two opposite faces of the cube will contain these two lines and will be seen as edge views in elevation. The construction is evident from the diagram.

Activities

SECTION PLANE TYPES

Q1. Make neat freehand sketches of the horizontal and vertical projection planes showing the following plane types:

- Horizontal section plane,
- Vertical section plane,
- Simply inclined section plane,
- Oblique section plane.

Draw a separate diagram for each plane type.

Q2. Explain the terms, horizontal trace and vertical trace of a plane using neat pictorial sketches accompanied by brief notes.

USING HORIZONTAL SECTION PLANES

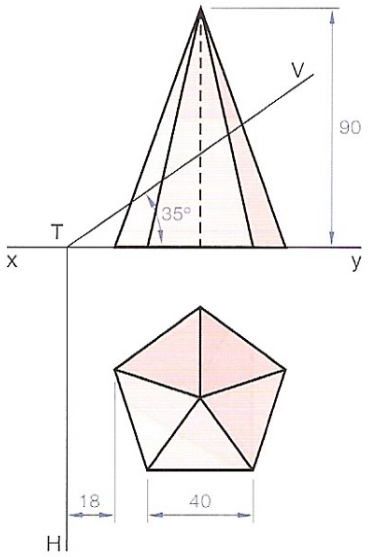

Fig. 3.64

Q3. The pentagonal right pyramid, shown in Fig. 3.64, is cut by the simply inclined plane VTH. Find the cut surface with the aid of horizontal section planes.

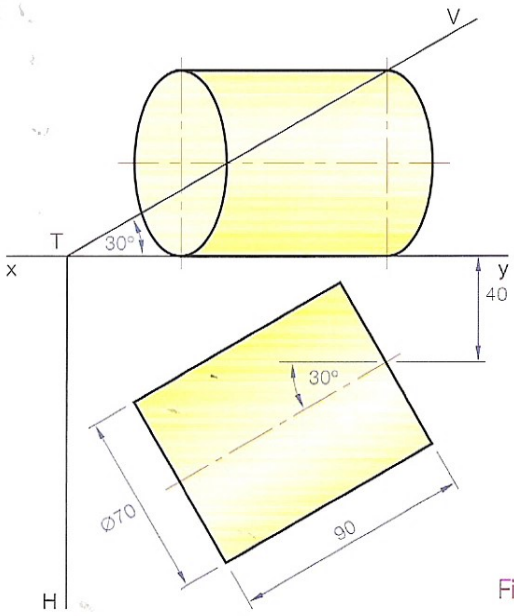

Fig. 3.65

Q4. A cylinder resting on its side is shown in Fig. 3.65. This cylinder is to be cut by the simply inclined plane VTH. Find the cut surface using horizontal section planes.

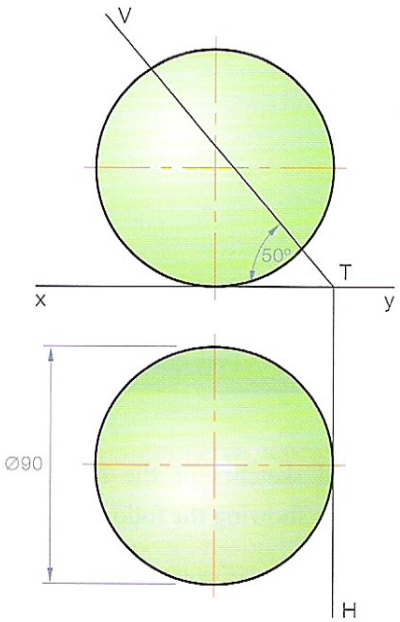

Fig. 3.66

Q5. A sphere resting on the horizontal plane is to be cut by the simply inclined plane VTH, Fig. 3.66. Find the cut surface using horizontal section planes.

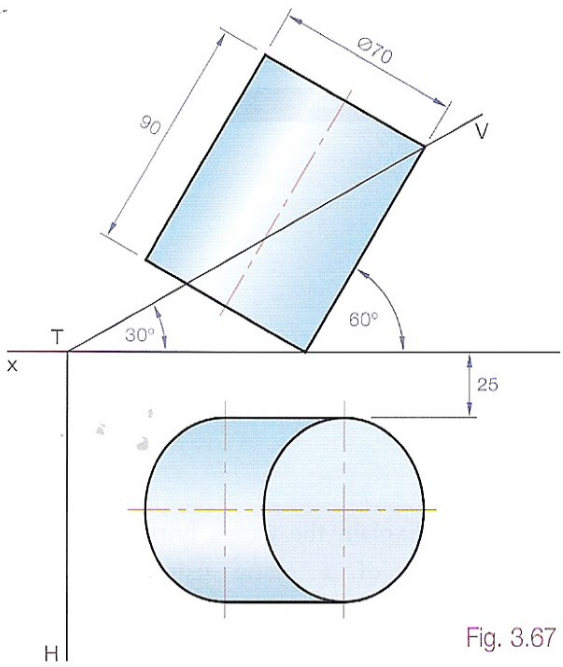

Fig. 3.67

USING VERTICAL SECTION PLANES

Q6. A right cylinder whose base is inclined to the HP is shown in Fig. 3.67. This cylinder is to be cut by the simply inclined plane VTH. Using vertical section planes find the cut surface.

Q7. The projections of a right cone are shown in Fig. 3.68. The cone is to be cut by the simply inclined plane VTH. Find the cut surface of the cone using vertical section planes.

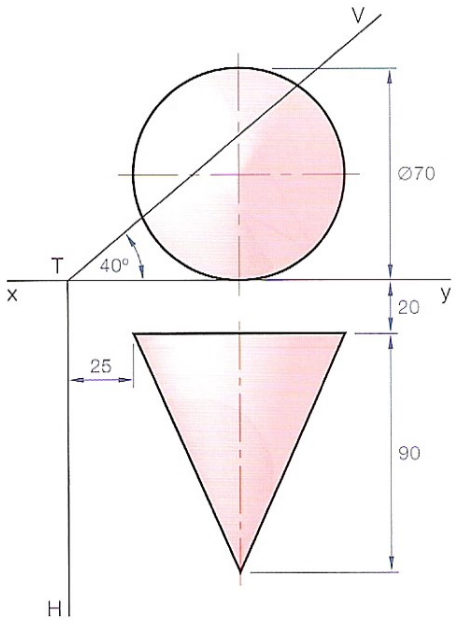

Fig. 3.68

SOLVING PROBLEMS OF SOLIDS CUT BY OBLIQUE PLANES USING HORIZONTAL AND VERTICAL SECTION PLANES

Q8. Using horizontal or vertical section planes find the cut surface of the hexagonal prism shown in Fig. 3.69.

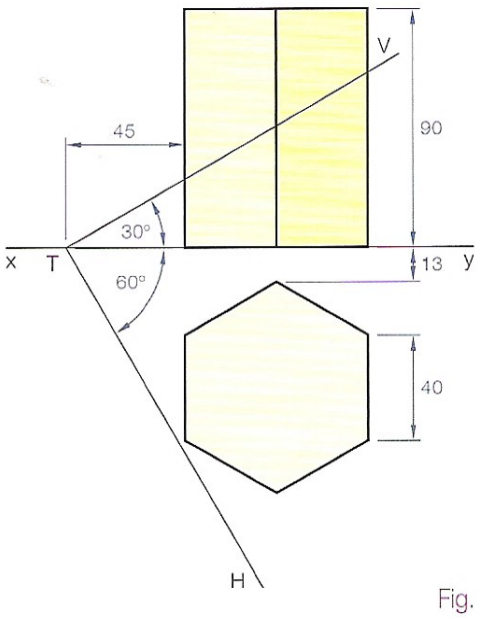

Fig. 3.69

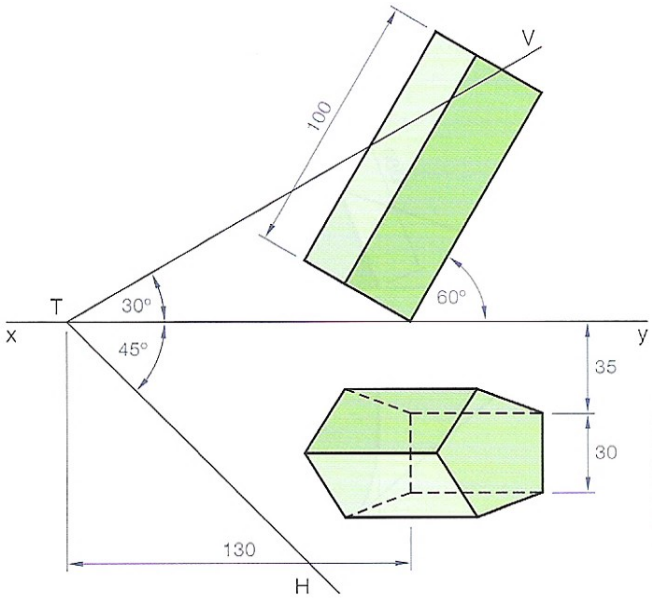

Fig. 3.70

Q9. A regular, right, pentagonal prism has been tilted onto one edge as shown in Fig. 3.70. The prism is to be cut by the oblique plane VTH. Using vertical section planes find the cut surface of the solid.

Q10. A right cylinder has been tilted to the horizontal plane as shown in Fig. 3.71. This cylinder is to be cut by the oblique plane VTH. Using vertical section planes find the cut surface of the cylinder.

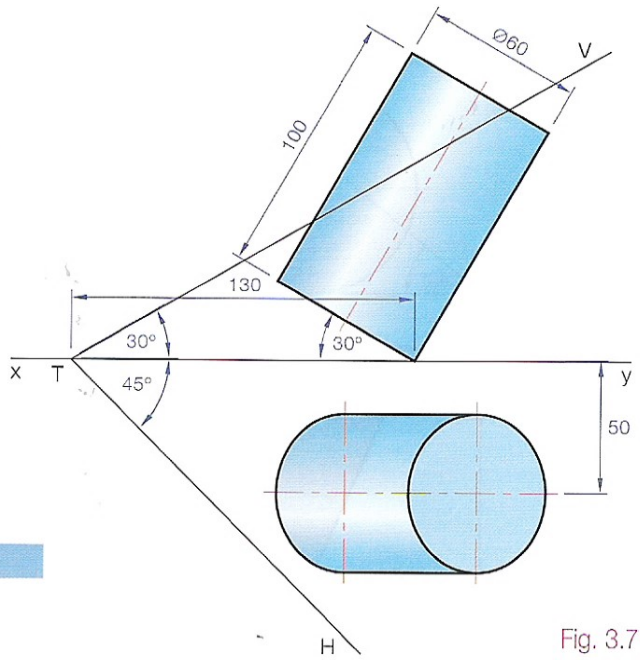

Fig. 3.71

USING SIMPLY INCLINED SECTION PLANES

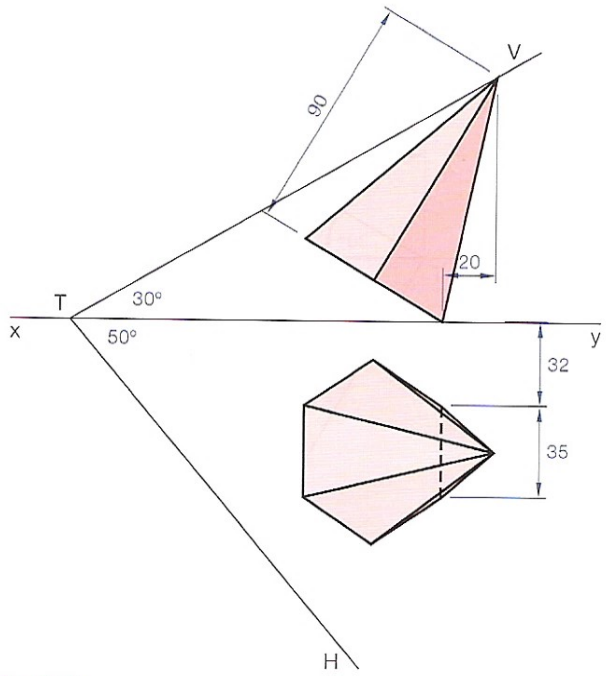

Fig. 3.72

Q11. A right hexagonal-based pyramid has been tilted at an angle to the HP as shown in Fig. 3.72. This pyramid is to be cut by the oblique plane VTH. Using simply inclined planes find the cut surface.

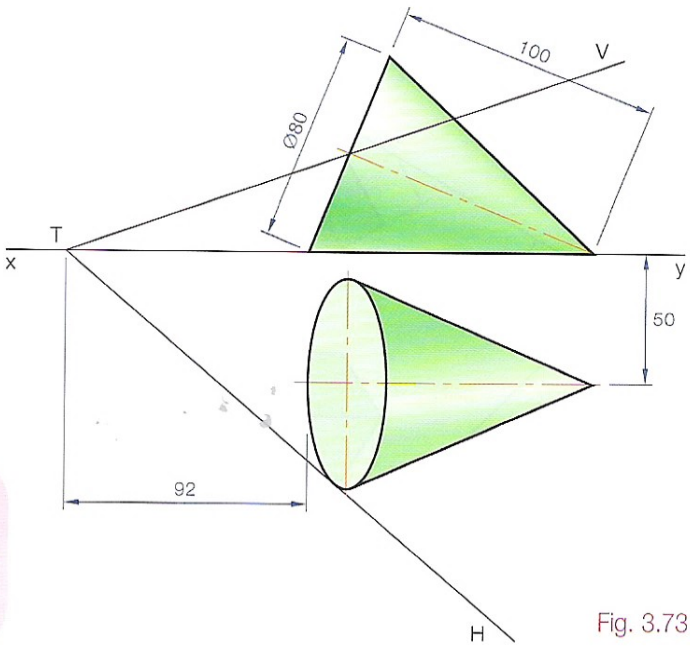

Fig. 3.73

Q12. A right cone rests on its side as shown in Fig. 3.73. The cone is to be cut by the oblique plane VTH. Using simply inclined planes find the cut surface of the solid.

CUBE AND TETRAHEDRON

Q13. Make a neat pictorial diagram of a cube with its dual solid, the octahedron, inside it.

Q14. Make a neat pictorial diagram of an octahedron showing its dual, the cube, inside it.

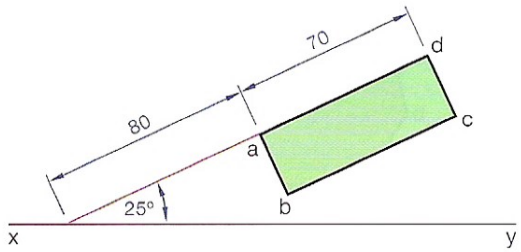

Fig. 3.74

Q15. The elevation of one face of a cube, abcd is shown in Fig. 3.74. Edge ad rests against the vertical plane and the surface abcd makes an angle of 70° to the vertical plane. Draw the plan and elevation of the cube.

Q16. One face of a cube, seen as an edge view, is shown in Fig. 3.75. This cube has edges of length 76 mm and has one edge resting on the horizontal plane. Draw the plan and elevation of the cube.

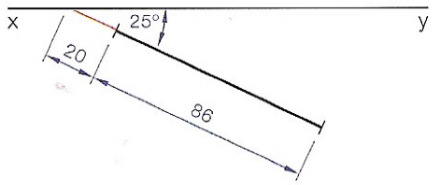

Fig. 3.75

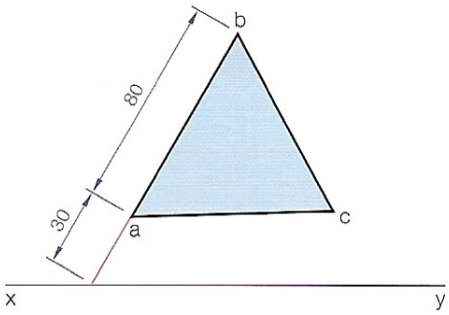

Fig. 3.76

Q17. The elevation of an equilateral triangle inclined at 20° to the VP and having edge ab in the vertical plan is shown in Fig. 3.76. The triangle is one face of a tetrahedron. Draw the plan and elevation of the solid.

Q18. The plan of a tetrahedron is shown in Fig. 3.77. Corner a rests on the horizontal plan and corner b is 14 mm above the horizontal plane. The tetrahedron has sides 70 mm long and edge bc is parallel to the xy line in plan. Draw the tetrahedron in plan and elevation.

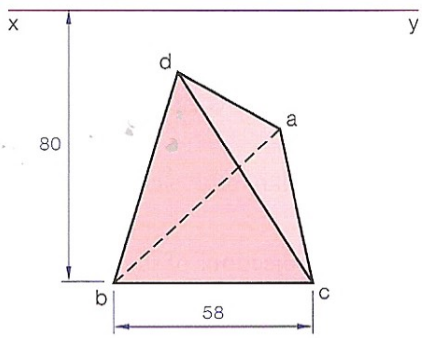

Fig. 3.77

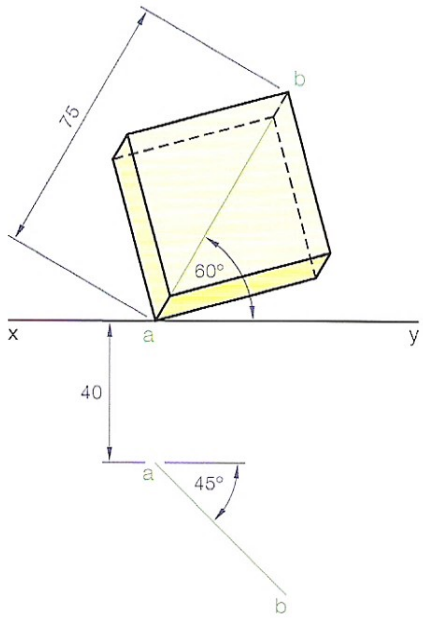

Fig. 3.78

Q19. Given the elevation of a cube in Fig. 3.78. The long diagonal ab is shown in plan and elevation.

(i) Find the size of the cube and draw its plan and elevation.

(ii) Inscribe a sphere.

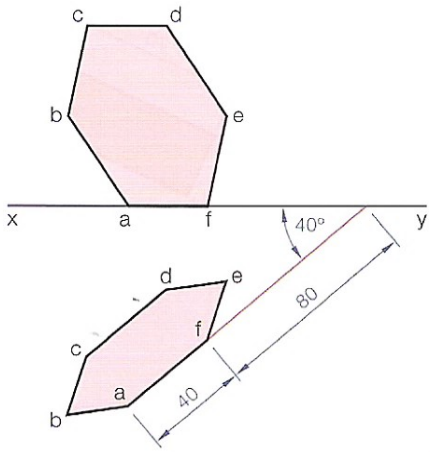

Fig. 3.79

Q20. Shown in Fig. 3.79 is the plan and elevation of a regular hexagon which is inclined at 75° to the HP.

(i) This hexagon is the section of a cube. Draw the plan and elevation of the cube.

(ii) Draw the circumscribing sphere.

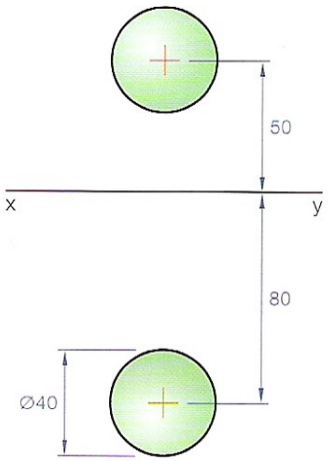

Fig. 3.80

Q21. The plan and elevation of a sphere is shown in Fig. 3.80. The sphere is inscribed in a tetrahedron. The base of the tetrahedron makes an angle of 20° with the HP. Draw the plan and elevation of the tetrahedron.

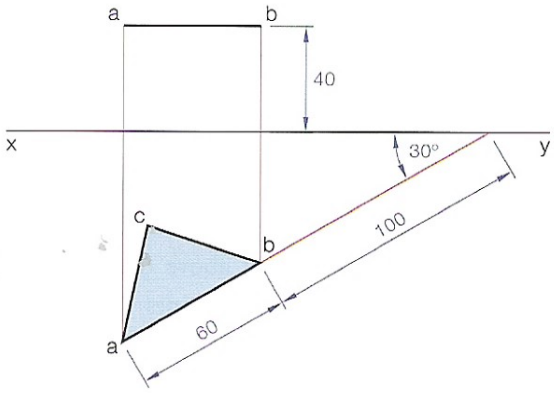

Fig. 3.81

Q22. The plan of the base of a tetrahedron, which is inclined at 50° to the HP, is shown in Fig. 3.81. The edge ab of this face is horizontal and is shown in elevation.

(i) Draw the plan and elevation of the complete tetrahedron.

(ii) Show the projections of the smallest cube that will contain this solid.

(iii) Draw the circumscribing sphere for both sides.