

Given the coordinates of two skew lines. To find the shortest distance between them at 30° to the HP. Fig. 9.93  
 A = 120 9 33 B = 48 60 69  
 C = 60 25 16 D = 96 65 65

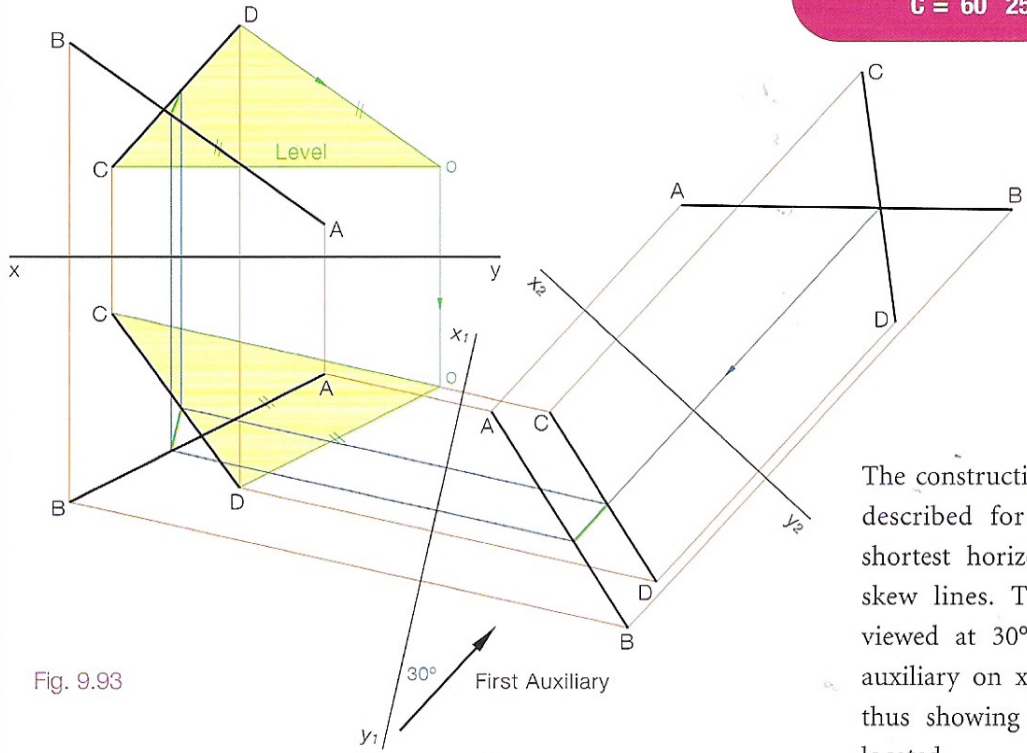


Fig. 9.93

The construction is nearly identical to that described for shortest perpendicular or shortest horizontal distance between two skew lines. The first auxiliary must be viewed at 30° to the  $x_1y_1$ . The resulting auxiliary on  $x_2y_2$  shows the lines crossing thus showing where the required line is located.

H I G H E R L E V E L

# Activities

## DIHEDRAL ANGLE

Q1. Given two planes VTH and  $V_1T_1H_1$ . Find the line of intersection between the planes. Determine the dihedral angle between the planes using the triangle method, Fig. 9.94.

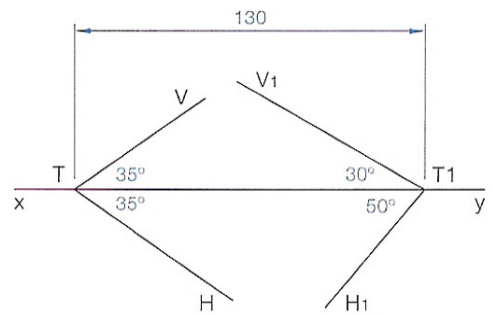


Fig. 9.94

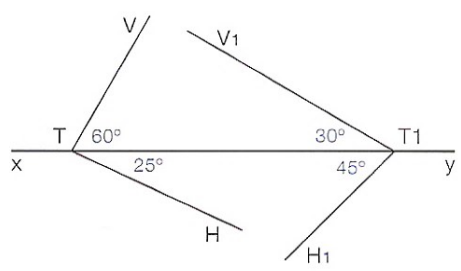


Fig. 9.95

Q2. Given two planes VTH and  $V_1T_1H_1$ . Find the line of intersection between the planes. Determine the dihedral angle between the planes using the point view method, Fig. 9.95.

PLANE INCLINATION

Q3. Draw the traces of a plane VTH given the inclination to the vertical plane as  $40^\circ$  and the inclination to the horizontal plane as  $70^\circ$ .

Q5. Given the plan and elevation of a point P as shown in Fig. 9.96. Find the traces of a plane that contains point P and is inclined at  $55^\circ$  and  $40^\circ$  to the HP and VP respectively.

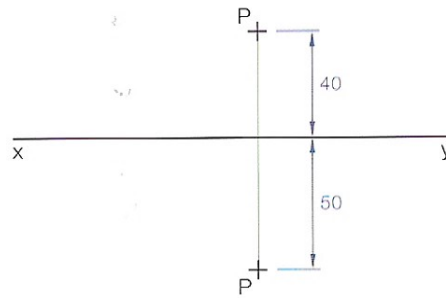


Fig. 9.96

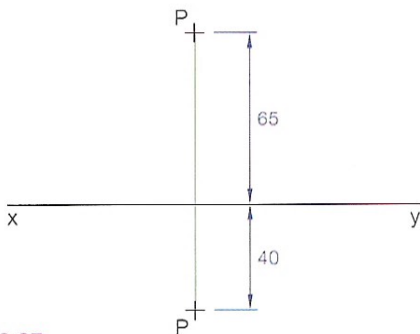


Fig. 9.97

Q6. Point P is to rest on an oblique plane which makes an angle of  $60^\circ$  to the HP and  $50^\circ$  with the VP, Fig. 9.97.

Q7. Given the projection of a line AB. Find the traces of the plane that contains line AB and is inclined at  $55^\circ$  to the HP, Fig. 9.98.

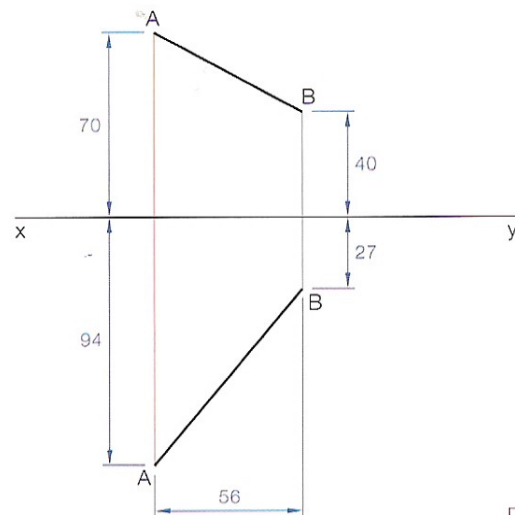


Fig. 9.98

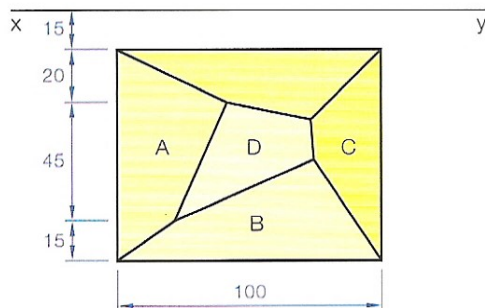


Fig. 9.99

Q8. Fig. 9.99 shows the plan of an oblique rectangular pyramid which has been cut by an oblique plane. Surfaces A, B, C and D are inclined at  $50^\circ$ ,  $60^\circ$ ,  $70^\circ$  and  $35^\circ$  respectively to the horizontal plane.

- (i) Draw the plan and elevation of the cut solid.
- (ii) Determine the inclination of the surface D to the vertical plan.

Q9. Fig. 9.100 shows the plan and elevation of a prism with a square base of 60 mm side which has been cut by an oblique plane. The cut surface  $abcd$  is inclined at  $45^\circ$  to the horizontal plane and the edge  $ab$  is inclined at  $20^\circ$  to the horizontal plane.

- (i) Draw the plan and elevation of the cut solid.
- (ii) Find the traces of the oblique plane.
- (iii) Determine the plane's inclination to the VP.
- (iv) Find the dihedral angle between surface  $S$  and the oblique plane.

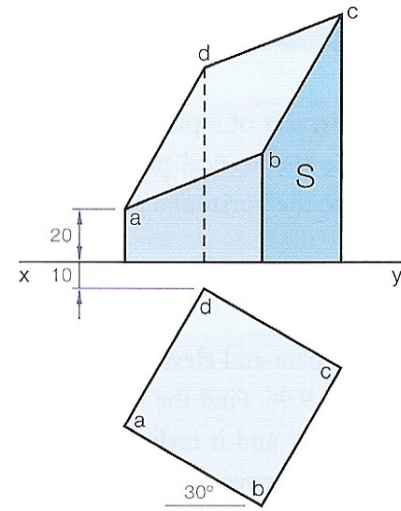


Fig. 9.100

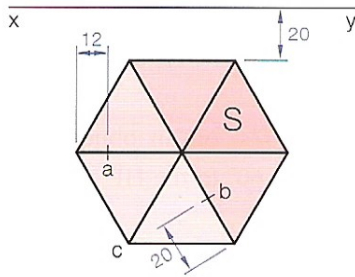


Fig. 9.101

Q10. The plan of a regular hexagonal pyramid of edge 40 mm and height 90 mm resting on the HP is shown. The solid is to be cut by an oblique plane which passes through points  $b$  and  $c$ , Fig. 9.101.

- (i) Find the traces of the oblique plane.
- (ii) Draw the plan and elevation of the cut solid.
- (iii) Find the dihedral angle between the cutting plane and surface  $S$ .

Q11. A regular pentagonal pyramid of altitude 105 mm is shown in Fig. 9.102. The pyramid is cut by an oblique plane that contains the points  $a$  and  $b$ . The oblique plane is inclined at  $55^\circ$  to the HP.

- (i) Draw the projections of the solid after it has been cut.
- (ii) Locate a point  $g$  on the horizontal trace of the plane so that  $bg$  makes an angle of  $35^\circ$  with the horizontal plane.

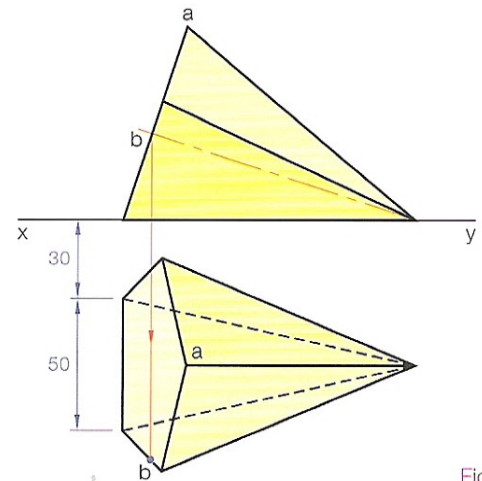


Fig. 9.102

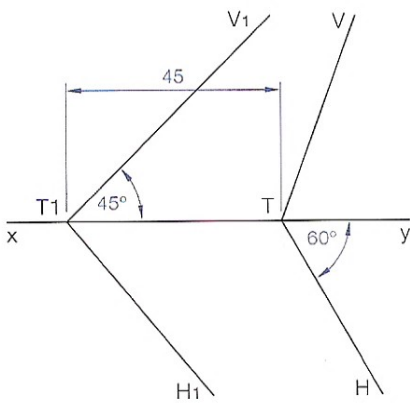


Fig. 9.103

Q12. The traces of two oblique planes are shown in Fig. 9.103. VTH makes an angle of  $70^\circ$  with the horizontal plane.  $V_1T_1H_1$  makes an angle of  $60^\circ$  with the vertical plane. A square-based pyramid of base 50 mm and altitude of 105 mm is placed on VTH. One edge of the pyramid's base lies on the HT and one corner touches the vertical plane.

- (i) Draw the given traces and the plan and elevation of the pyramid.
- (ii) The pyramid is cut by  $V_1T_1H_1$ . Draw the projections of the pyramid when it is cut by this plane.

Q13. The traces of two oblique planes are shown in Fig. 9.104. VTH makes an angle of  $50^\circ$  with the horizontal plane.  $V_1T_1H_1$  makes an angle of  $75^\circ$  with the vertical plane. A pentagonal-based pyramid of base 40 mm and altitude 95 mm is placed on VTH. One edge of the pyramid base lies on the VT and one corner touches the horizontal plane.

- (i) Draw the given traces and the plan and elevation of the pyramid.
- (ii) The pyramid is cut by  $V_1T_1H_1$ . Draw the projections of the pyramid when it is cut by this plane.

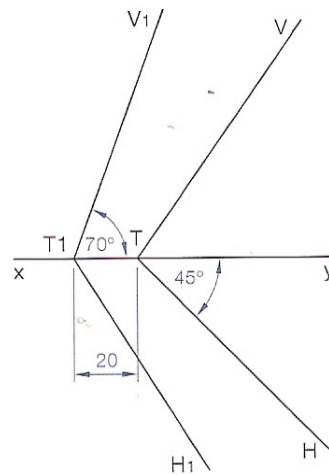


Fig. 9.104

H I G H E R L E V E L

LAMINAR SURFACES

Q14. Given the coordinates of two planes ABC and ABD.

$$A = 220 \ 15 \ 10 \quad B = 270 \ 35 \ 90$$

$$C = 260 \ 65 \ 15 \quad D = 230 \ 60 \ 75$$

- (i) Determine the dihedral angle between the planes.
- (ii) Determine the projections of a perpendicular from D to the plane ABC.

Q15. Given the horizontal and vertical projections of two planes ABC and ABD.

$$A = 130 \ 90 \ 10 \quad B = 215 \ 15 \ 95$$

$$C = 165 \ 100 \ 100 \quad D = 245 \ 70 \ 25$$

- (i) Determine the dihedral angle between the planes.
- (ii) Show the projections of a line drawn from C to the line AD and which shall be perpendicular to AD.

Q16. Given the horizontal and vertical projections of two planes ABC and ADE.

A = 125 85 30 B = 170 10 100 C = 80 75 65  
D = 180 70 70 E = 75 20 105

- (i) Determine the line of intersection between the planes.
- (ii) Determine the dihedral angle between the planes.
- (iii) Draw the projections of a line on the plane ABC, that passes through A and makes an angle of  $70^\circ$  with the edge BC.

Q18. Given the horizontal and vertical projections of two planes ABC and ADE.

A = 195 20 110 B = 175 105 55  
C = 130 65 20 D = 205 80 25 E = 120 55 50

- (i) Determine the line of intersection between the planes.
- (ii) Determine the dihedral angle between the planes.
- (iii) Determine the projections of a line drawn from E, which is inclined at  $30^\circ$  to the HP, is 45 mm long and touches the plane ABC.

Q17. Given the horizontal and vertical projections of two planes ABC and ADE.

A = 225 25 90 B = 220 95 50 C = 175 35 20  
D = 240 60 10 E = 140 60 15

- (i) Determine the line of intersection between the planes.
- (ii) Determine the dihedral angle between the planes.
- (iii) Determine the inclination of the line AD to the plane ABC.

Q19. Given the coordinates of two planes ABC and DEF.

A = 130 60 5 B = 210 10 90 C = 200 80 25  
D = 240 20 30 E = 155 85 5 F = 130 45 60

- (i) Determine the line of intersection between the planes.
- (ii) Determine the dihedral angle between the planes.
- (iii) Find the horizontal and vertical trace of DEF and find its true inclination to the vertical plane.

Q20. Given the coordinates of two planes ABC and DEF.

A = 185 25 15 B = 230 105 60 C = 120 45 75  
D = 240 90 10 E = 195 35 95 F = 130 65 30

- (i) Find the projections of the line of intersection between the planes.
- (ii) Determine the dihedral angle between the planes.
- (iii) Draw a line from E which is 35 mm long, is parallel to ABC and the vertical plane.

### SKIEW LINES

Q21. Given the coordinates of two skew lines AB and CD.

A = 125 85 30 B = 170 10 100  
C = 75 20 105 D = 180 70 70

Show the projections of the shortest distance between them using the point view method.

Q22. Given the coordinates of two skew lines AB and CD.

A = 195 20 110 B = 130 65 20  
C = 205 80 25 D = 120 55 50

Show the projections of the shortest distance between them using the plane method.