

**PROJECTION OF POINTS**

1. A point P is 30 mm in front of VP, 40 mm above HP and 50 mm from RPP. Draw its projections.
2. A point is 30 mm in front of VP, 20 mm above HP and 25 mm in front / behind / from LPP. Draw its projections and name the side view.
3. A point P is 45 mm above HP, 60 mm behind VP and 30 mm from RPP. Draw the three principal views of the point. Also state the quadrant in which it lies.
4. A point is 40 mm behind VP, 15 mm above HP and 25 mm in front / behind / from LPP. Draw its projections and name the side view.
5. A point is 40 mm behind VP, 20 mm above HP and 30 mm in front / behind / from LPP. Draw its projections and name the side view.
6. A point is 35 mm below HP, 20 mm behind VP and 25 mm behind / in front / from RPP. Draw its projections and name the side view.
7. A point is 35 mm below HP, 15 mm behind VP and 25 mm behind / in front / from RPP. Draw its projections and name the side view.
8. Draw all the three views of a point P lying 60mm below HP, 70 mm in front of VP and 40mm from RPP. Also state the quadrant in which it lies.
9. A point is 30 mm behind VP, 30 mm above HP and 25 mm in front / behind / from LPP. Draw its projections and name the side view.
10. A point is 30 mm behind VP, 30 mm above HP and 20 mm in front / behind / from RPP. Draw its projections and name the side view.
11. A point is lying on HP, 20 mm behind VP and 25 mm behind / in front / from RPP. Draw its projections and name the side view.
12. A point is lying on HP, 20 mm behind VP and 35 mm behind / in front / from RPP. Draw its projections and name the side view.
13. A point is lying on VP, 20 mm below HP and 30 mm behind / in front / from LPP. Draw its projections and name the side view.

14. A point is lying on VP, 10 mm below HP and 30 mm behind / in front / from LPP. Draw its projections and name the side view.
15. Point A is 20 mm above HP and in the 1st quadrant. Its shortest distances from the XY line is 40 mm. Draw the projections determine its distance from VP.
16. Draw the projections of a point A lying 30 mm above HP and in first quadrant. If its shortest distance from the line of intersection of HP and VP is 50 mm. Also find the distance of the point from VP.
17. A point G is 25 mm below HP and is situated in the third quadrant. Its shortest distance from the intersection of XY and  $X_1Y_1$  is 45 mm. Draw its projection and find its distance from VP.
18. A point A is 40 mm in front of VP and is situated in the fourth quadrant. Its shortest distance from the intersection of XY and  $X_1Y_1$ , is 45 mm. Draw its projections. Also find distance from VP.
19. Draw the projections of point G which is in 1st Quadrant such that it is equidistant from HP and VP. The point is 25 mm from RPP. Determine its distance from HP and VP.
20. A point 30 mm above XY line is the front view of two points A and B. The top view of A is 40 mm behind VP and the top view of B is 45 mm in front of VP. Draw the projections of the points and state the quadrants in which the points are situated.
21. Draw and state the quadrants in which the following points are located. Assume any distances.
  - A - front view below XY line and Top view above XY line
  - B - Front and Top views below XY line.
  - C - Front and Top views are above XY line.
  - D - Front view above XY line and Top view below XY line.
22. Draw the projections of the following points on the same XY line, keeping convenient distance between each projectors. Name the quadrants in which they lie.
  - E - 30 mm below HP and 25 mm behind VP.
  - F - 35 mm above HP and 40 mm behind VP.
  - G - on HP and 30 mm in front of VP.
  - H - on HP and 35 mm behind VP.

23. Draw the projections of the following points on the same XY line, keeping convenient distance between each projectors. Name the quadrants in which they lie.
- A - 30 mm above HP and 35 mm in front of VP.
  - B - 35 mm below HP and 30 mm in front of VP.
  - C - 40 mm above HP and on VP.
24. Draw the projections of the following points on the same XY line, keeping convenient distance between each projectors and state the quadrants in which they lie.
- R - 25 mm below HP and in VP.
  - S - 40 mm above HP and in VP.
  - E - 35 mm above HP and on VP.
  - F - 30 mm below HP and on VP.
25. A point 30 mm above XY line is the front view of 3 points P,Q and R. The top view of R is 40 mm behind VP, the top view Q is on XY line and top view of point P is 45 mm in front of VP. Draw the projections of the points and state the quadrants in which the points are situated.
26. A point 20 mm below the reference XY line is the top view of three points P,Q and R. P is 20 mm below HP, Q is 35 mm above HP and R is on HP. Draw the projections of the three points and state their positions and quadrants in which they are situated.
27. A point A is 20 mm above HP and 25 mm in front of VP. Another point B is 25 mm behind VP and 40 mm below HP. Draw their projections when the distance between their projectors parallel to XY line is zero mm. Add the right side view only to point B.
28. A point P is 15 mm above HP and 25 mm in front of VP. Another point Q is 25 mm behind VP and 40 mm below HP. Draw their projections when the distance between their projectors parallel to XY line is zero mm. Add the right side view only to point Q.
29. The common point 40 mm below XY line represents not only the front views of three points A,B and C but also the top view of point C. The top view of point B is lies on XY line and top view of point A lies 50 mm above it. Draw the projections of the points and add the right side view to the point A only. Also state in which the quadrants the points lie.

30. A point P is on HP and 35 mm in front of VP. Another point Q is on VP and below HP. The line joining their front views makes an angle of 30 deg. to XY line, while the line joining their top views makes an angle of 45 deg. with XY line. Find the distance of the point Q from HP.
31. A point R is 25 mm above HP and 20 mm in front of VP. Another point S is on HP and 30 mm behind VP. The distance between their projectors measured parallel to the line of intersection VP and HP is 50 mm. Find the distance between top views of points R and S.
32. A point M is on HP and 30 mm in front of VP. Another point N is 20 mm below HP and 20 mm in front of VP. The distance between their projectors measured parallel to XY line is 50 mm. Find the distance between front views of the point M and N.
33. A point P is on HP and 30 mm in front of VP. Another point Q is on VP and 40 mm above HP. The distance between their projectors parallel to XY line is 50 mm. Find the distance between their front and top views of the points P and Q.
34. Two points R and S are on HP. The point R is 35 mm in front of VP, while S is 50 mm behind VP. The line joining their top views makes an angle of 40 deg. with XY. Find the horizontal distance between the two projectors.
35. Two points P and Q are on HP. The point P is 30 mm behind VP, while Q is 50 mm in front of VP. The line joining their top views makes an angle of 40 deg. with XY. Find the horizontal distance between their projectors parallel to XY line.
36. A point M is 30 mm in front of VP and 20 mm above HP, another point N is 15 mm behind VP and 25 mm below HP. The horizontal distance between the points parallel to XY line is 50 mm. Draw the projections of the points M and N and join their front and top views. Draw the right side view for the point N only.
37. A point A is 30 mm in front of VP and 40 mm above HP. Another point B is 20 mm behind VP and 35 mm below HP. The horizontal distance between the points measured parallel to XY line is 60 mm. Draw the three projections of the points. Join their front and top views.
38. A point S is in first quadrant and equidistant of 50 mm from all the three principal planes. Draw the projections of the point. Draw all the three views of the point.

**PROJECTION OF LINES**

1. A line AB 80 mm long has its end A 20 mm above HP and 30 mm in front of VP. It is inclined at 30 deg. to HP and 45 deg. to VP. Draw the projections of the line and find apparent lengths and apparent inclinations.
2. A line A 80 mm long is inclined to HP at 30 deg. and inclined to VP at 45 deg. Draw front and top views of line and determine their lengths. Also measure the perpendicular distance of end B from both HP and VP
3. A line AB 60 mm long has one of its extremities 20 mm in front of VP and 15 mm above HP. The line is inclined at 25 deg. to HP and 40 deg. to VP. Draw its top and front views.
4. A line AB 100 mm long is inclined to HP at 45 deg. and inclined to VP at 30 deg. Draw front and top views of line and determine their lengths. Also determine the perpendicular distance of end B from both HP and VP.
5. Draw the projections of a line AB 100 mm long inclined at  $45^\circ$  to VP and  $30^\circ$  to HP. One end of the line is 20 mm above HP and in VP. Determine apparent lengths and inclinations.
6. A straight line PQ, 65 mm long, is inclined at 45 deg. to HP and 30 deg. to VP. The point P is 70 mm from both the reference planes and point Q is towards the reference planes. Draw the projections.
7. A line AB measuring 70 mm has its end A 15 mm in front of VP and 20 mm above HP and the other end B 60 mm in front of VP and 50 mm above HP. Draw the projections of the line and find the inclinations of the line with the both the reference planes of projection.
8. A line AB 65 mm long, has its end A 20 mm above HP and 25 mm in front of VP. The end B is 40 mm above HP and 65 mm in front of VP. Draw the projections of AB and show its inclination with HP and VP.
9. A line AB 65 mm long, has its end A 25 mm above HP and 30 mm in front of VP. The other end B is 45 mm above HP and 50 mm in front of VP. Draw the projections and determine its inclinations.
10. A line AB has its end A 20 mm above HP and 30 mm in front of VP. The other end B is 60 mm above HP and 45 mm in front of VP. The distance between end projectors is 70 mm. Draw its projections. Determine the true length and apparent inclinations.
11. A line AB has its end A 20 mm above HP and 15 mm in front of VP. The other end B is 60 mm above HP and 45 mm in front of VP. The distance between end projectors is 70 mm. Draw its projections. Determine the apparent lengths and true inclinations.

12. The end A of a line AB is on HP and 25 mm in front of VP. The end B is on VP and 50 mm above HP. The distance between the end projectors when measured parallel to the line of intersection of HP and VP is 65 mm. Draw the projections of the line AB and determine its true length and true inclinations with HP and VP.
13. The end A of a line AB is in HP and 25 mm in front of VP. The end B is 10 mm in front of VP and 50 mm above HP. The distance between the end projectors when measured parallel to the line of intersection of HP and VP is 80 mm. Draw the projections of the line AB and determine its true length and true inclinations with HP and VP.
14. A line PQ 85 mm long has its end P 10 mm above HP and 15 mm in front of VP. The top view and front view of line PQ are 75 mm and 80 mm respectively. Draw its projections. Also determine the true and apparent inclinations of the line.
15. The top view of a line AB, 80 mm long measures 65 mm and the length of the front view is 50 mm. The end A is in HP and 15 mm in front of VP. Draw its projections.
16. The top view of a 75 mm long line AB measures 65 mm, while the front view is 50 mm. Its one end A is in the HP and 12 mm in front of VP. Draw the projections of AB and determine its inclinations with HP and VP.
17. The top view of a line PQ 75 mm long measures 50 mm and the front view measures 60 mm. The end P is 30 mm above HP and 15 mm in front of VP. Draw the projections of the line and find its true inclinations with HP and VP. Find the length of front view and distance between the end projectors.
18. A line has its end A 10 mm above HP and 15 mm in front of VP. The end B is 55 mm above HP and line is inclined at 30 deg. to HP. The distance between the end projectors is 50 mm. Draw the projections of the line. Determine the true length of the line and its inclination with VP.
19. A line has its end A 15 mm above HP and 10 mm in front of VP. The end B is 55 mm above HP and the line is inclined at 30 deg. to HP. The distance between the end projectors is 50 mm. Draw the projections of the line and determine the true length of the line and its inclination with VP.
20. Draw the projections of a line PQ and find its apparent lengths, true length and true inclinations with HP. When the line PQ has its end P 25 mm above HP and 20 mm in front of VP. The distance between the end projectors of the line when measured parallel to the line of intersection of the HP and VP is 60 mm. The end Q is 50 mm above HP and the line is inclined at 30 deg. to the VP.

21. The distance between the end projectors through the end points of a line AB is 60 mm. The end A 10 mm above HP and 15 mm in front of VP. The end B is 35 mm in front of VP. The line AB appears 70 mm long in the front view. Complete the projections. Find the true length of the line and its inclination with HP and VP.
22. The distance between the end projectors through the end points of a line AB is 40 mm. The end A is 20 mm above HP and 15 mm in front of VP. The end B is 45 mm in front of VP. The line AB appears 50 mm long in the front view. Complete the projections. Find the true length of the line and its inclinations with HP and VP.
23. A line PQ measures 80 mm in length. The point P is above HP and in front of VP by 20 mm and 30 mm respectively. The distance between the end projectors is 50 mm. The line is inclined to VP by 30 deg. Draw the projections of the line and specify its true inclination with HP.
24. The top view of a line PQ is 70 mm and front view is 60 mm long. The end Q is nearer to both HP and VP than the end P and is 15 mm above HP and 20 mm in front of VP. Draw the projections of the line if the distance between projectors is 50 mm.
25. The top view of the line PQ 75 mm long measures 50 mm. The end P is 30 mm in front of VP and 15 mm above HP. The end Q is 15 mm in front of VP and above HP. Draw the projections of the line and find its inclinations with HP and VP. Find the length of front view and distance between the end projectors.
26. A line has one end 30 mm in front of VP and 15 mm above HP and the other end is 15 mm in front of VP and is above HP. Length of the line is 60 mm. Top view of the line is 40 mm long. Draw the two views of the line and obtain the inclination of the line with HP and VP.
27. The top view of line 75 mm long measures 50 mm. The end P is 30 mm in front of VP and 15 mm above HP. The end Q is 15 mm in front of VP and above HP. Draw the projections of the line and find its true inclinations with HP and VP.
28. The point B of a line AB is on the horizontal plane, the top view of the line makes an angle of 30 deg. with XY line, being 80 mm. The point A is on the vertical plane and 50 mm above the horizontal plane. Draw the top and front views of the line and obtain the true length of the line. Also find the inclinations of the line with the two planes.

29. The top view  $ab$  of a straight line  $AB$  is 60 mm long and makes an angle of 30 deg. with the  $XY$  line. The end  $A$  is in  $VP$  and 30 mm above  $HP$ . The end  $B$  is 65 mm above  $HP$ . Draw the projections of the line  $AB$  and determine i) length of the front view. ii) its true length and true inclinations with the reference planes.
30. The top view  $PQ$  of a straight line is 70 mm and makes an angle of 60 deg. with  $XY$  line. The end  $Q$  is 10 mm in front of  $VP$  and 30 mm above  $HP$ . The difference between the distances of  $P$  and  $Q$  above  $HP$  is 45 mm. Draw the projections. Determine its true length and true inclinations with  $HP$  and  $VP$ .
31. A point  $P$  is 40 mm above  $HP$  and 20 mm in front of  $VP$  another point  $Q$  is 20 mm above  $HP$  and 50 mm in front of  $VP$ . The top view of line  $PQ$  is inclined at 30 deg. to  $XY$ . Draw the projections.
32. A straight line  $PQ$  is inclined at 45 deg. to  $HP$  and 30 deg. to  $VP$ . The point  $P$  is in  $HP$  and the point  $Q$  is in  $VP$ . The length of the straight line is 65 mm. Draw the projections of the straight line  $PQ$ .
33. Draw the projections of a straight line  $AB$ , 100 mm long, inclined at 45 deg. to  $HP$  and 30 deg. to  $VP$ . The end  $A$  is in  $HP$  and the end  $B$  is in  $VP$ . Find the shortest distance between the straight line  $AB$  and the line of intersection of planes of projection.
34. The front view of a 90 mm long line which is inclined at 45 deg. to the  $XY$  line, measures 65 mm. End  $A$  is 15 mm above the  $XY$  line and is in  $VP$ . Draw the projections of the line and find its inclinations with  $HP$  and  $VP$ .
35. The top view of the line  $AB$  80 mm long measures 65 mm. The midpoint of the line is 40 mm above  $HP$  and 30 mm in front of  $VP$ . The point  $A$  is in  $VP$ . Draw its projections and find its inclinations.
36. Draw the projections of a line  $AB$  90 mm long and find its true and apparent inclinations with  $HP$  and  $VP$ , when its end  $A$  is on  $HP$  and 20 mm in front of  $VP$ . Its midpoint  $M$  is 20 mm above  $HP$  & 40 mm in front of  $VP$ .
37. A straight line  $AB$  measuring 80 mm long has the end  $A$  in the  $HP$  and 25 mm in front of  $VP$ . Its midpoint  $M$  is 25 mm above  $HP$  and 40 mm in front of  $VP$ . Draw the views of the line and determine the inclination of the line with  $HP$  and  $VP$ . Also find the distance between end projectors.
38. A straight line  $AB$  measuring 80 mm long has the end  $A$  in the  $HP$  and 25 mm in front of  $VP$ . Its midpoint  $M$  is 25 mm above  $HP$  and 40 mm in front of  $VP$ . Draw the projections of the line and determine the inclination of the line with  $HP$  and  $VP$ .
39. A line  $AB$  100 mm long measures 80 mm in front view and 70 mm in top view the midpoint  $M$  of the line is 40 mm from both  $HP$  and  $VP$ . Draw the projections. Find its inclinations.



40. A straight line PQ inclined at 40 deg. to VP has  $pq = 60$  mm and  $p'q' = 50$  mm. The end P is in both HP and VP, and 40 mm to the right of left profile plane.
- Draw the projections of the straight line PQ.
  - Find the true length and true inclination with HP.
  - Draw the profile view of the straight line.
  - Find the position of the end Q with HP and VP.
41. The front view of the line PQ 80 mm long measures 50 mm and it is inclined to XY at 50 deg. One end of the line P is 20 mm above HP and 25 mm in front of VP. Draw the front view and top view of the line and find the inclinations of the line with HP and VP.
42. One end of a line is 30 mm in front of VP and 30 mm above HP. The line is inclined at 40 deg. to HP and its top view measuring 60 mm, is inclined at 50 deg. to XY. Draw the projections of the line and determine true length and inclination with VP.
43. The elevation of a line AB 90 mm long, is inclined at 30 deg. to HP and measures 70 mm. The end A is 20 mm above HP and is in VP. Draw the projections of the line and find its inclination with VP.
44. A line MN 90 mm long has a point P on it which divides the line in the ratio 2:1 i.e., MP:PN is 2:1 this point P is 50 mm above HP and 60 mm in front of VP. The line is inclined at 30 deg. to HP and 40 deg. to VP. Draw the projection of the line. Find the distance between the end projector and the position of the ends of the line with HP and VP.
45. Two lines AB and AC make an angle of 120 deg. between them in their front view and top view. AB is parallel to both the HP and the VP. Determine the real angle between AB and AC.
46. A straight line PQ 80 mm long appears to a length of 50 mm and inclined at 30 deg. to XY line in its profile view. Draw its projections when its end point P is 15 mm above HP and 60 mm in front of VP. Point Q is nearer to VP than P.
47. Find the true length and true inclination of a line AB with HP having one of its ends 20 mm in front of VP and 30 mm above HP. The line is inclined at 40 deg. to VP and the right side view of the line is 60 mm long and inclined at 60 deg. to the X1Y1 line. Draw all the three views of the line.

48. Draw the projections of a line PQ and find its true length and inclinations when the line is inclined at 30 deg. to the HP and 45 deg. to the VP. The line is having one of its ends 15 mm above HP and 20 mm in front of VP. The distance between the end projectors on the XY line is 60 mm.
49. A line PQ is inclined to both HP and VP by 30 deg. and 45 deg. respectively. One of its end P is at a distance of 10 mm from HP and 15 mm from VP. The distance between the end projectors is 45 mm. Draw the top, front and right side views of the line. Determine the true length of the line and the distance of end Q from VP and HP.

**Projection of Planes**

1. An equilateral triangular lamina of 25 mm sides lies with one of its edges on HP such that the surface of the lamina is inclined to HP at 60 deg. The edge on which it rests is inclined to VP at 60 deg. Draw its projections.
2. A Triangular plane figure of sides 25 mm is resting on HP with one of its corners, such that the surface of the lamina makes an angle of 60 deg. with HP. If the side opposite to the corner on which the lamina rests makes an angle of 30 deg. with VP. Draw the top and front views in this position.
3. A 30 - 60 deg. set square of 60 mm longest side is so kept such that the longest side is in HP making an angle of 30 deg. with VP. The set square itself is inclined at 45 deg. to HP. Draw the projections of the set square
4. A square lamina of 40 mm side rests on one of its sides on HP. The lamina makes 30 deg. to HP and the side on which it rests makes 45 deg. to VP. Draw its projections.
5. A rectangular lamina of sides 20 mm X 30 mm rests on HP on one of its longer edges. The lamina is tilted about the edge on which it rests till its plane surface is inclined to HP at 45 deg. The edge on which it rests is inclined at 30 deg. to VP. Draw its projections of the lamina.
6. A pentagonal lamina of edges 25 mm is resting on HP with one of its sides such that the surface makes an angle of 60 deg. with HP. The edge on which it rests is inclined at 45 deg. to VP. Draw its projections.
7. Pentagonal lamina of edges 25 mm is resting on HP with one of its corners such that the plane surface makes an angle of 60 deg. with HP. The two of the edges containing the corner on which the lamina rests make equal inclinations with HP. When the edge opposite to the corner makes an angle of 45 deg. with VP and nearer to the observer. Draw the top and front views of the plane lamina in this position.
8. A pentagonal lamina of edges 25 mm resting on VP with one of its sides such that the surface makes an angle of 60 deg. with VP. The edge on which it rests is in inclined at 45 deg. to HP. Draw its projections.
9. A hexagonal lamina of sides 25 mm rests on one of its sides on VP. The lamina makes 45 deg. to VP and the side on which it rests 45 deg. to HP. Draw its projections.
10. An equilateral triangular lamina of 25 mm sides lies on one of its sides on HP. The lamina makes 45 deg. with HP and one of its medians is inclined at 40 deg. to VP. Draw the projections.

11. A square plate of 30 mm sides rests on HP such that one of the diagonals is inclined at 30 deg. to HP and 45 deg. to VP. Draw its projections.
12. A pentagonal lamina having edges 25 mm is placed on one of its corners on HP such that the perpendicular bisector of the edge passing through the corners on which the lamina rests is inclined at 30 deg. to HP and 45 deg. to VP. Draw the top and front views of the lamina.
13. A hexagonal lamina of sides 25 mm rests on one of its corners on HP. The lamina makes 45 deg. to HP and the diagonal passing through the corner on which it rests is inclined at 30 deg. to VP. Draw its projections.
14. A circular lamina of 50 mm diameter rests on HP such that one of its diameter is inclined at 30 deg. to VP and 45 deg. to HP. Draw its top and front views in this position.
15. A circular lamina of 30 mm diameter rests on VP such that one of its diameters is inclined at 30 deg. to VP and 45 deg. to HP. Draw its top and front views in this position.
16. A triangular lamina of 25 mm sides rests on one of its corners on VP such that the median passing through the corner on which it rests is inclined at 30 deg. to HP and 45 deg. to VP. Draw its projections.
17. A pentagonal lamina having edges 25 mm is placed on one of its corners on VP such that the surface makes an angle 30 deg. with VP and perpendicular bisector of the edge passing through the corner on which the lamina rests is inclined at 45 deg. to HP. Draw the top and front views of the lamina.
18. A hexagonal lamina of sides 30 mm is resting on HP with one of its corners in VP and its surface inclined at an angle of 30 deg. with VP. The diagonal passing through that corner which is in VP is inclined at an angle of 45 deg. to HP. Draw the projections.
19. A square lamina ABCD of 40 mm side rests on corner C such that diagonal AC appears to be at 45 deg. to VP. The two sides BC and CD containing that corner C make equal inclination with HP. The surface of the lamina makes 30 deg. with HP. Draw its top and front views.
20. A pentagonal lamina having edges 25 mm is placed on one of its corners on HP such that the surface makes an angle 30 deg. with HP and perpendicular bisector of the edge passing through the corner on which the lamina rests appears to be inclined at 30 deg. to VP. Draw the top and front views of the lamina.

21. A hexagonal lamina of sides 25 mm rests on one of its corners on HP. The lamina makes 45 deg. to HP and the diagonal passing through the corner on which it rests appears to be inclined at 30 deg. to VP. Draw its projections.
22. Draw the projections of a circular plate of negligible thickness of 50 mm diameter resting on HP on a point A on the circumference, with its plane inclined at 45 deg. to HP and the top view of the diameter passing through the resting point makes 60 deg. with VP.
23. A pentagonal lamina having edges 25 mm is placed on one of its corners on VP such that the surface makes an angle of 30 deg. with VP and perpendicular bisector of the edge passing through the corner on which the lamina rests appears to be inclined at 30 deg. to HP. Draw the top and front views of the lamina.
24. A hexagonal lamina of sides 30 mm is resting on HP with one of its corners in VP and its surface inclined at an angle of 30 deg. with VP. The diagonal passing through that corner which is in VP appears to be inclined at 40 deg. to HP. Draw the projections of the lamina.
25. A triangular plane lamina of sides 25 mm is resting on HP with one of its corners touching it, such that the side opposite to the corner on which it rests is 15 mm above HP and make an angle of 30 deg. with VP. Draw the top and front views in this position. Also determine the inclination of the lamina to the reference plane.
26. A pentagonal lamina of edges 25 mm is resting on HP with one of its corner such that the edge opposite to this corner is 20 mm above HP and makes an angle of 45 deg. with VP. Draw the top and front views of the plane lamina in this position. Determine the inclination of the lamina with HP.
27. A hexagonal lamina of sides 25 mm rests on one of its corners on HP. The corner opposite to the corner on which it rests is 35 mm above HP and the diagonal passing through the corner on which it rests is inclined at 30 deg. to VP. Draw its projections. Find the inclination of the surface with HP.
28. A hexagonal lamina of sides 25 mm rests on one of its sides on VP. The side opposite to the side on which it rests is 30 mm in front of VP and the side on which it rests makes 45 deg. to HP. Draw its projections. Also determine the inclination of the lamina with the reference plane.

29. A rectangular lamina of 35 mm X 20 mm rests on HP one of its shorter edges. The lamina is rotated about the edge on which it rests till it appears as a square in the top view. The edge on which the lamina rests is inclined at 30 deg. to VP. Draw its projections and find its inclination to HP.
30. A rectangular lamina of 35 X 20 mm rests on HP on one of its shorter edges. The lamina is rotated about the edge on which it rests till it appears as a square in the top view. The edge on which the lamina rests being parallel to both HP and VP. Draw its projections and find its inclinations to HP and VP.
31. A rectangular plate of negligible thickness of size 35 X 20 mm has one of its shorter edges in VP with that edge inclined at 40 deg. to HP. Draw the top view if its front view is a square of side 20 mm.
32. The front view of a rectangular lamina of sides 30 mm X 20 mm is a square of 20 mm sides. Draw the projections and determine the inclination of the surface of the lamina with HP and VP.
33. The top view of a square lamina of side 30 mm is a rectangle of sides 30 mm X 20 mm with a longer side of the rectangle being parallel to both HP and VP. Draw the top and front views of the square lamina. What is the inclination of the lamina with HP and VP.
34. A pentagonal lamina of sides 25 mm is resting on one of its edges on HP with the corner opposite to that edge touching VP. This edge is parallel to VP and the corner, which touches VP is at a height of 15 mm above HP. Draw the projections of the lamina and determine the inclination of the lamina with HP and VP and the distance at which the parallel edge lies from VP.
35. A pentagonal lamina of sides 25 mm is having a side both on HP and VP. The corner opposite to the side on which it rests is 15 mm above HP. Draw the top and front views of the lamina.
36. A regular hexagonal lamina of side 30 mm is lying in such a way that one of its sides touches both the reference planes. If the side opposite to the side on which it rests is 45 mm above HP. Draw the projections of the lamina.
37. A pentagonal lamina of sides 25 mm is having a side on both HP and VP. The surface of the lamina is inclined at an angle of 60 deg. with HP. Draw the top and front views of the lamina.
38. A regular pentagonal lamina of 25 mm side is resting on one of its corner on HP while the side opposite to this corner touches VP. If the lamina makes an angle of 60 deg. with HP and 30 deg. with VP. Draw the projections of the lamina.

39. A regular pentagonal lamina of 25 mm side is resting on one of its sides on HP while the corner opposite to this side touches VP. If the lamina makes an angle of 60 deg. with HP and 30 deg. with VP. Draw the projections of the lamina.
40. A regular hexagonal lamina of 30 mm sides lying in such a way that one of its sides touches both the reference planes. If the lamina makes 60 deg. with HP. Draw the projections of the lamina.
41. A regular hexagonal lamina of sides 25 mm is lying in such a way that one of its sides on HP while the side opposite to the side on which it rests on VP. If the lamina makes 60 deg. to HP. Draw the projections of the lamina.
42. A regular hexagonal lamina of side 25 mm is lying in such a way that one of its corners on HP while the corner opposite to the corner on which it rests on VP. If the lamina makes 60 deg. to HP. Draw the projections of the lamina.
43. Draw the top and front views of a hexagonal lamina of 30 mm sides having two of its edges parallel to both HP and VP and one of its edges 10 mm from each of the planes of projection. The surface of the lamina is inclined at an angle of 60 deg. to the HP.
44. A circular lamina of 50 mm diameter is standing with one of its points on the rim on HP and the lamina inclined at 45 deg. to HP. The diameter at right angle to the diameter which is passing through the point on which the lamina rests is parallel to VP. Draw its projections.
45. An isosceles triangular plate of negligible thickness has base 25 mm long and altitude 35 mm it is placed on HP such that in the front view is seen as an equilateral triangle of 25 mm sides with the side that is parallel to VP is inclined at 45 deg. to HP. Draw its top and front views. Also determine the inclination of the plate with the reference plane.
46. A rectangular lamina of sides 20 mm X 25 mm has an edge in HP and adjoining edge in VP, is tilted such that the front view appears as a rectangle of 20 mm X 15 mm. The edge which is in VP is 30 mm from the right profile plane.
- Draw the top view, front view and the left profile view in this position.
  - Find its inclinations with the corresponding principal planes.

47. A mirror 30 mm X 40 mm is inclined to the wall such that its front view is a square of 30 mm side. The longer side of the mirror appear perpendicular to both HP and VP. Find the inclination of the mirror with the wall.
48. A hexagonal lamina of 30 mm sides rests on HP with one of its corners touching VP and the surface inclined at 45 deg. to it. One of its edges inclined to HP at 30 deg. Draw the top and front views of the lamina in its final position.
49. A circular lamina inclined to the VP appears in the front view as an ellipse of major axis 30 mm and minor axis 15 mm. The major axis is parallel to both HP and VP. One end of the minor axis is in both the HP and VP. Draw the projections of the lamina and determine the inclination of the lamina with the VP.



**PYRAMIDS**

1. A square pyramid 35mm sides of base and 65mm axis length rest on HP on one of its edges of the base which is inclined to VP at  $30^\circ$ . Draw the projections of the pyramid when the axis is inclined to HP at  $45^\circ$ .
2. A pentagonal pyramid 25mm sides of base and 60mm axis length rest on HP on one of its edges of the base which is inclined to VP at  $30^\circ$ . Draw the projections of the pyramid when the axis is inclined to HP at  $40^\circ$ .
3. A hexagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its edges of the base which is inclined to VP at  $30^\circ$ . Draw the projections of the pyramid when the axis is inclined to HP at  $45^\circ$ .
4. A hexagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its edges of the base. Draw the projections of the pyramid when the axis is inclined to HP at  $45^\circ$  and VP at  $30^\circ$ .
5. A square pyramid 35mm sides of base and 65mm axis length rest on HP on one of its edges of the base. Draw the projections of the pyramid when the axis is inclined to HP at  $45^\circ$  and VP at  $30^\circ$ .
6. A pentagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its edges of the base. Draw the projections of the pyramid when the axis is inclined to HP at  $45^\circ$  and VP at  $30^\circ$ .
7. A square pyramid 35mm sides of base and 60mm axis length rest on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the pyramid when the axis of the pyramid is inclined to HP at  $40^\circ$  and appears to be inclined to VP at  $45^\circ$ .
8. A square pyramid 35mm sides of base and 60mm axis length rest on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the pyramid when the axis of the pyramid is inclined to HP at  $40^\circ$  and appears to be inclined to VP at  $30^\circ$ .
9. A pentagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the pyramid when the axis of the pyramid is inclined to HP at  $40^\circ$  and appears to be inclined to VP at  $45^\circ$ .

10. A pentagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the pyramid when the axis of the pyramid is inclined to HP at  $40^\circ$  and appears to be inclined to VP at  $30^\circ$ .
11. A hexagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its edges of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the pyramid when the axis of the pyramid is inclined to HP at  $40^\circ$  and appears to be inclined to VP at  $45^\circ$ .
12. A hexagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the pyramid when the axis of the pyramid is inclined to HP at  $40^\circ$  and appears to be inclined to VP at  $30^\circ$ .
13. A square pyramid 35mm sides of base and 60mm axis length is suspended freely from a corner of its base. Draw the projection of the pyramid when the axis appears to be inclined to VP at  $45^\circ$ .
14. A pentagonal pyramid 25mm sides of base and 50mm axis length is suspended freely from a corner of its base. Draw the projection of the pyramid when the axis appears to be inclined to VP at  $45^\circ$ .
15. A hexagonal pyramid 25mm sides of base and 50mm axis length is suspended freely from a corner of its base. Draw the projection of the pyramid when the axis appears to be inclined to VP at  $45^\circ$ .
16. A square pyramid of base side 30mm and height 60mm is suspended by a thread tied to one of the corner of its base. It is then tilted such the axis makes an angle of  $45^\circ$  with respect to VP. Considering the apex of the solid to be nearer to the observer, draw the projections of the solid.
17. A square pyramid 35mm sides of base and 60mm axis length rest on HP on one of its slant edges. Draw the projection of the pyramid when the axis appears to be inclined to VP at  $45^\circ$ .
18. A pentagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its slant edges. Draw the projection of the pyramid when the axis appears to be inclined to VP at  $45^\circ$ .
19. A hexagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its slant edges. Draw the projection of the pyramid when the axis appears to be inclined to VP at  $45^\circ$ .

20. A square pyramid 35mm sides of base and 60mm axis length rest on HP on one of its slant triangular faces.

Draw the projection of the pyramid when the axis appears to be inclined to VP at  $45^\circ$ .

21. A pentagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its slant triangular faces. Draw the projection of the pyramid when the axis appears to be inclined to VP at  $45^\circ$ .

22. A hexagonal pyramid 25mm sides of base and 50mm axis length rest on HP on one of its slant triangular faces. Draw the projection of the pyramid when the axis appears to be inclined to VP at  $45^\circ$ .

### **PRISMS**

23. A square prism 35mm sides of base and 65mm axis length rests on HP on one of its edges of the base which is inclined to VP at  $30^\circ$ . Draw the projections of the prism when the axis is inclined to HP at  $45^\circ$ .

24. A pentagonal prism 25mm sides of base and 60mm axis length rests on HP on one of its edges of the base which is inclined to VP at  $30^\circ$ . Draw the projections of the prism when the axis is inclined to HP at  $40^\circ$ .

25. A pentagonal prism 25mm sides of base and 60mm axis length rests on HP on one of its edges of the base. Draw the projections of the prism when the axis is inclined to HP at  $40^\circ$  and VP at  $30^\circ$ .

26. A square prism 35mm sides of base and 60mm axis length rests on HP on one of its corner of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at  $40^\circ$  and to VP at  $30^\circ$ .

27. A pentagonal prism of base side 25mm and height 50mm is resting on HP on one of its base corners such that the topmost edge is at a distance of 60mm above HP. Draw its projections, when its top view of the axis is inclined at  $45^\circ$  to VP. Also determine the inclination of the longer edge of the prism to HP which contains the resting corner.

28. A square prism is 35mm sides of base and 60mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at  $40^\circ$  and appears to be inclined to VP at  $45^\circ$ .

29. A pentagonal prism 25mm sides of base and 60mm axis length rests on HP on one of its corner of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw

the projections of the prism when the axis of the prism is inclined to HP at  $40^\circ$  and appears to be inclined to VP at  $45^\circ$ .

30. A hexagonal prism 25mm sides of base and 50mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at  $40^\circ$  and appears to be inclined to VP at  $45^\circ$ .

31. A square prism 35mm sides of base and 60mm axis length rests on HP on one of its edges of the base. Draw the projections of the prism when the axis of the prism is inclined to HP at  $45^\circ$  and to VP at  $30^\circ$ .

32. A hexagonal prism 25mm sides of base and 50mm axis length is suspended freely from a corner of its base. Draw the projection of the prism when the axis appears to be inclined to VP at  $45^\circ$ .

33. A square prism 35mm sides of base and 60mm axis length is suspended freely from a corner of its base. Draw the projection of the prism when the axis appears to be inclined to VP at  $45^\circ$ .

34. A pentagonal prism 25mm sides of base and 50mm axis length is suspended freely from a corner of its base. Draw the projection of the prism when the axis appears to be inclined to VP at  $45^\circ$ .

### **CUBE**

35. A cube of 40mm sides rest on HP on an edge which is inclined to VP at  $30^\circ$ . Draw the projections when the lateral square face containing the edge on which it rests makes an angle of  $50^\circ$  to HP.

36. A hexahedron of 30mm sides is resting on one of its corners on HP such that one of its solid diagonals is perpendicular to VP. draw the projections of the solid.

### **CONE**

37. A cone of 50mm base diameter and 60mm axis length rest on HP on one of its generators. Draw its projections when the axis is inclined to VP at  $30^\circ$ .

38. A cone of base dia. 40mm and axis length 50mm is resting on HP on a point on the circumference of its base such that its apex is at 40mm above HP and its top view of the axis is inclined at  $60^\circ$  to VP. Draw the top and front views of the solid. Also determine the inclinations of the axis when the base is nearer to the observer.

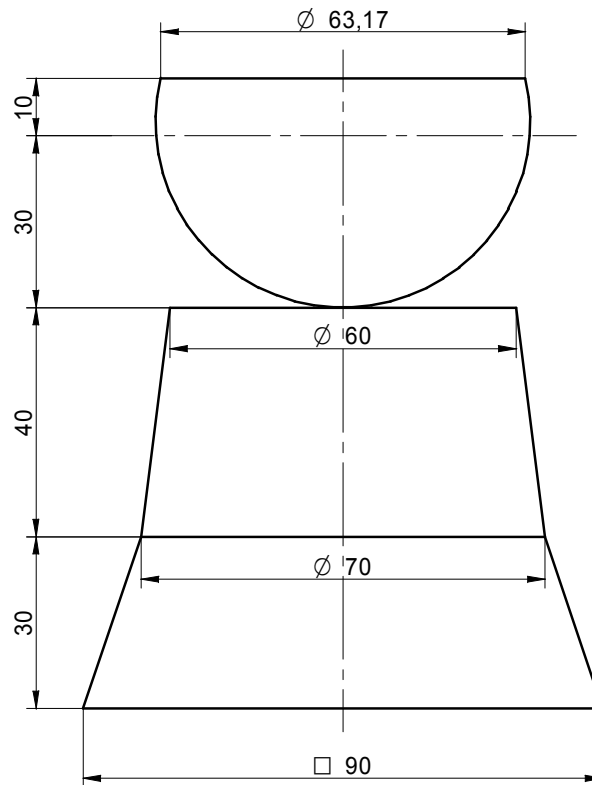
**TETRAHEDRON**

39. A tetrahedron of 55mm sides rest on one of its corners such that an edge containing that corner is inclined to HP at  $50^{\circ}$  and VP at  $30^{\circ}$ . draw its projections.
40. A tetrahedron of sides 40mm is resting on one of its sides on HP. This side is parallel to VP and 40mm away from it. It is tilted about resting side such that the base containing this edge is inclined at  $30^{\circ}$  to HP. Draw the projections of the solid.

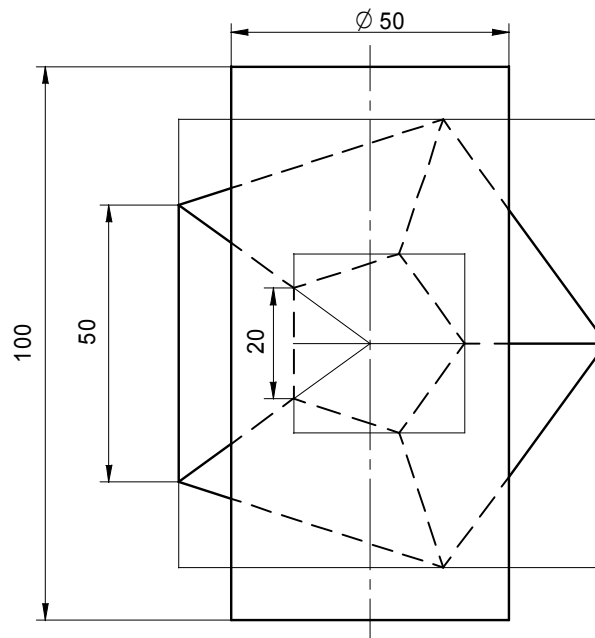
**ISOMETRIC PROJECTIONS**

1. A sphere of diameter 50 mm rests centrally on top of a cube of sides 50 mm. Draw the Isometric projections of the combination of solids.
2. A sphere of diameter 30 mm rests on the frustum of a hexagonal pyramid base 30 mm, top face 18 mm side and height 50 mm, such that their axes coincide. Draw the isometric projection of the combined solids.
3. A sphere of diameter 45 mm rests centrally over a frustum of cone of base diameter 60 mm, top diameter 40 mm and height 60 mm. Draw its isometric projections.
4. A sphere diameter 60 mm is placed centrally on the top face of a square prism side - 60 mm and height 70 mm. Draw the isometric projection of the combination.
5. A sphere of 60 mm is placed centrally on the top face of a hexagonal prism side - 35 mm and height 50 mm. Draw the isometric projection of the combination.
6. A sphere diameter 40 mm is placed centrally on the flat face of a hemisphere diameter 60 mm. Draw the isometric projection of the combination.
7. A hemisphere of 40 mm diameter is supported co-axially on the vertex of a cone of base diameter 60 mm and axis length 50 mm. The flat circular face of the hemisphere is facing upside. Draw the isometric projection of the combination of solids.
8. A hemisphere of diameter 50 mm is centrally resting on top of a square prism of base side 60 mm and height 30 mm such that the curved surface of hemisphere is touching top face of the prism. Draw its isometric projections.
9. A hemisphere diameter 50 mm is resting on its curved surface centrally on the top face of frustum of a rectangular pyramid base - 80 mm X 60 mm and top - 60 mm X 40 mm, height 55 mm. Draw the isometric projection of the combination.
10. A hemisphere diameter 70 mm is placed on the ground on its curved surface. A cone base diameter 70 mm and height 70 mm is placed centrally on it. Draw the isometric projection of the combination.
11. Draw isometric projection of a hexagonal prism of side of base 40 mm and height 60 mm with a right circular cone of base 40 mm as diameter altitude 50 mm, resting on its top such that the axes of both the solids are collinear.

12. A cone of base diameter 30 mm and height 40 mm rests centrally over a cube of side 50 mm. Draw the isometric projection of the combination of solids.
13. A cone of base diameter 40 mm and height 50 mm rests centrally over a frustum of a pentagonal pyramid of base side 45 mm and top side 35 mm and height 55 mm. Draw the isometric projections of the solids.
14. Draw the isometric projection of the combination of solids formed by a frustum of cone and co-axial frustum of pentagonal pyramid. The lower frustum of cone is 80 mm base diameter, 60 mm top diameter and height 25 mm. The upper frustum of pyramid is of 30 mm side of base, 20 mm side of top face and height 40 mm.
15. A cone of base diameter 50 mm and height 40 mm is placed centrally on the top face of a square slab side - 80 mm and height 20 mm. Draw the isometric projection of the combination.
16. A frustum of cone base diameter 50 mm, top diameter 25 mm and height 50 mm is placed centrally on a cylindrical slab of diameter 100 mm and thickness - 30 mm. Draw the isometric projection of the combination.
17. A frustum of cone base diameter 50 mm, top diameter 25 mm and height 50 mm is placed centrally on a square slab side - 80 mm and thickness 30 mm. Draw the isometric projection of the combination.
18. A frustum of cone base diameter 50 mm, top diameter 25 mm and height 50 mm is placed centrally on the top face of a cylinder diameter 60 mm and height 60 mm. Draw the isometric projection of the combination.
19. A cone base diameter 45 mm and height 65 mm is placed centrally on the top face of a pentagonal prism side - 45 mm and height 35 mm. Draw the isometric projection of the combination.
20. A cone of base diameter 60 mm, top diameter 40 mm and height 50 mm is placed centrally on frustum of a square pyramid base side - 100mm top face side - 60 mm and height 20 mm. Draw the isometric projection of the combination.
21. A cone of base diameter 50 mm and height 60 mm is placed centrally on an equilateral triangular prism of side - 100 mm and 20 mm thick. Draw the isometric projection of the combination.
22. A pentagonal pyramid of base side 30 mm and axis length 60 mm is resting on HP on its base with a side of base perpendicular to VP. Draw its isometric projections.
23. Following figure shows the front view of combination of solids consisting a cut sphere and frustum of a cone and a square pyramid. Draw the isometric projection of the combination of solids.



24. Following figure shows the top view of a cylinder which is centrally mounted on a frustum of a pentagonal pyramid of 60 mm height. Draw the Isometric projection of the combination of solids.

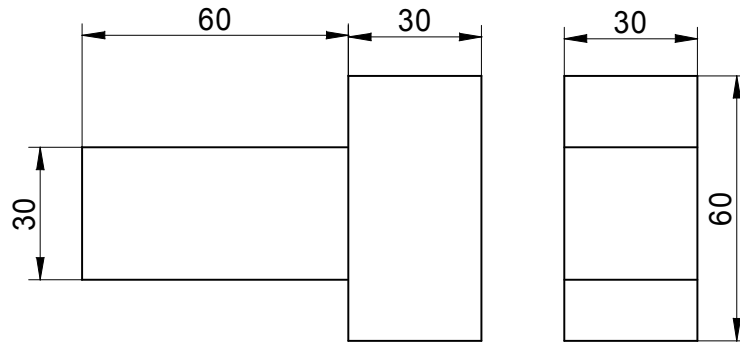




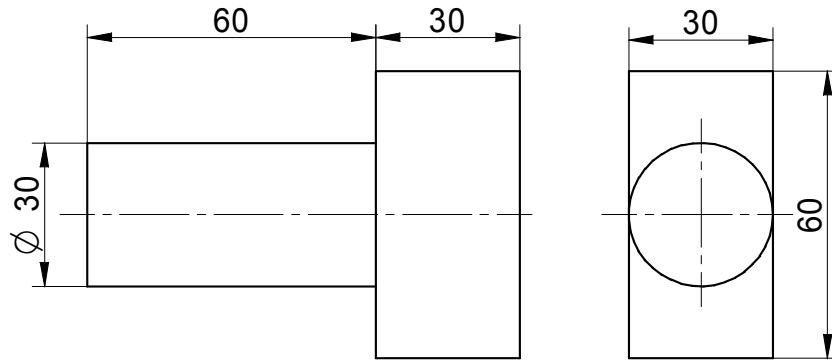
25. A pentagonal pyramid base side - 25 mm and height 65 mm is placed centrally on a rectangular slab 100 mm X 60 mm and 20 mm - thick. Draw the isometric projection of the combination.
26. A frustum of a square pyramid base side - 40 mm, top face side - 20 mm and height 40 mm is placed centrally on frustum of a cone base diameter 80 mm, top diameter 60 mm and height 20 mm. Draw the isometric projection of the combination.
27. The frustum of a square pyramid of base 40 mm, top face 20 mm and height 60 mm rest on the centre of the top of a square block of sides 60 mm and height 20 mm. The base edges of the pyramid are parallel to the top edges of the square block. Draw the isometric projection of the combination of the solids.
28. A square pyramid of base side 40 mm and height 70 mm rests symmetrically on a cube of edge 50 mm, which itself is placed on a cylinder of diameter 80 mm and thickness 30 mm. Draw the isometric projection of the solids, if the axes of the three solids are in common line.
29. A rectangular pyramid of base - 40 mm X 25 mm and height 50 mm is placed centrally on a cylindrical slab of diameter 100 mm and thickness - 30 mm. Draw the isometric projection of the combination.
30. A rectangular pyramid of base - 40 mm X 25 mm and height 50 mm is placed centrally on a rectangular slab sides - 100 mm X 60 mm and thickness 20 mm. draw the isometric projections of the combination.
31. A triangular pyramid base side - 40 mm and height 50 mm is placed centrally on a square slab side - 80 mm and 20 mm - thick. Draw the isometric projection of the combination.
32. Draw the Isometric projection of a rectangular prism of 60 X 80 X 20mm thick surmounting a tetrahedron of sides 45 mm such that the axis of the solids are collinear and at least one of the edges of both the solids are parallel to VP.
33. A square prism base side - 40 mm, height 50 mm is placed centrally on a cylindrical slab of diameter 100 mm and thickness 30 mm. Draw the isometric projection of the combination.
34. A square prism base side - 40 mm, height 50 mm is placed centrally on a rectangular slab sides - 100 mm X 60 mm and thickness 20 mm. Draw the isometric projection of the combination.
35. A square prism of base side - 30 mm and length - 70 mm is resting on its rectangular face on top of a square slab side - 70 mm and 25 mm thick. Draw the isometric projection of the combination.

36. A square prism side - 40 mm and height 70 mm has a full depth co-axial square hole side - 20 mm, such that edges of both the squares are parallel. Draw the isometric projection of the combination.
37. A cube of side - 25 mm is resting centrally on a rectangular slab 100 mm X 40 mm and 30 mm thick. Draw the isometric projection of the combination.
38. Two rectangular plats are placed centrally with dimensions ( l x b x h ) 100 mm X 60 mm X 20 mm and 100 mm X 40 mm X 20 mm such that longer edges are parallel. Draw the isometric projection of the combination.
39. Three rectangular slabs (lxbxh) 100 mm X 60 mm X 20 mm, 100 mm X 40 mm X 20 mm and 100 mm X 20 mm X 20 mm are placed one above the other in the ascending order of their width - b, such that their longer axes are co-planar. Draw the isometric projection of the combination.
40. Three cubes of sides 60 mm, 40 mm, and 20 mm are placed centrally one above the other in the ascending order of their side. Draw the isometric projection of the combination.
41. A rectangular slab base - 100 mm X 80 mm and height 30 mm has a full depth co-axial square hole side - 40 mm, such that one of the sides of the square is parallel to one of the sides of the rectangle. Draw the isometric projection of the combination.
42. A cube of side - 40 mm is resting centrally on a hexagonal prism base side - 40 mm and height 50 mm, such that one of the base sides of the cube is parallel to one of the side of the top face of the prism. Draw the isometric projection of the combination.
43. A regular pentagonal prism of base edge 30 mm and axis 60 mm is mounted centrally over a cylindrical block of 80 mm diameter and 25 mm thick. Draw Isometric projection of the combined solids.
44. A triangular prism base side 30 mm and length - 70 mm is resting on its rectangular face on top of a square slab side - 70 mm and 25 mm thick. Draw the isometric projection of the combination.
45. Following figures shows the front and side views of solid. Draw the isometric projection of the solid.

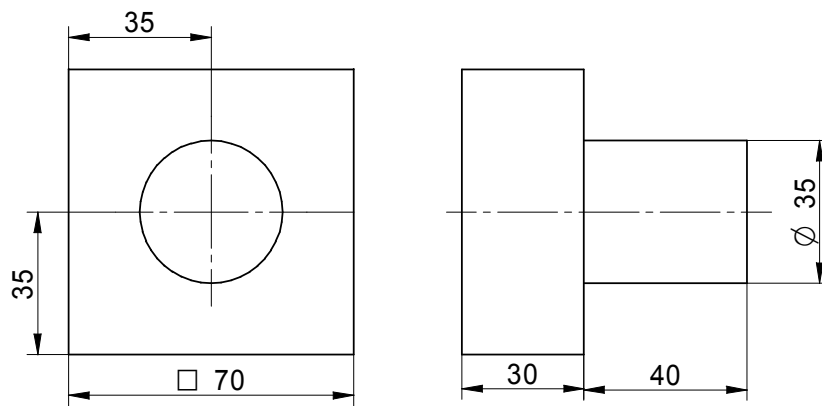
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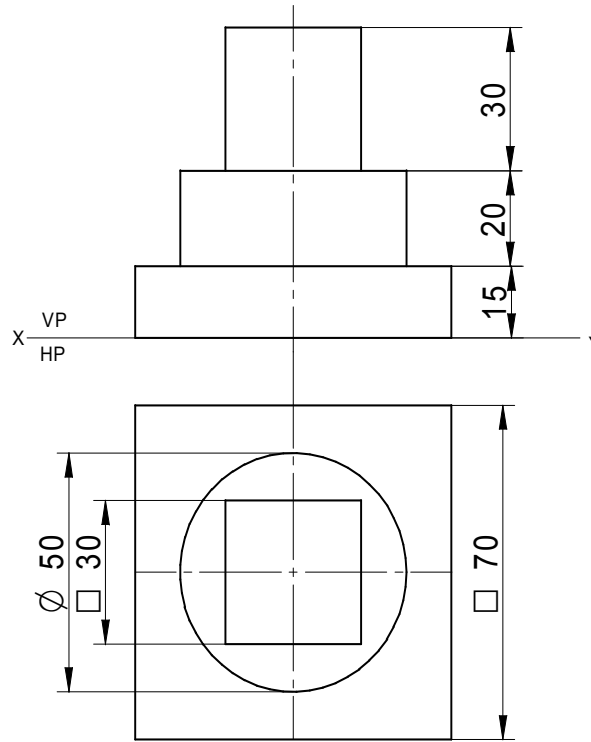
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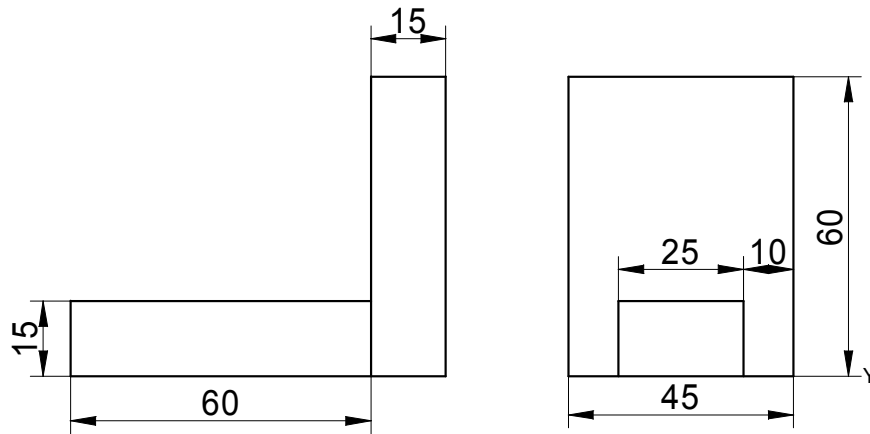
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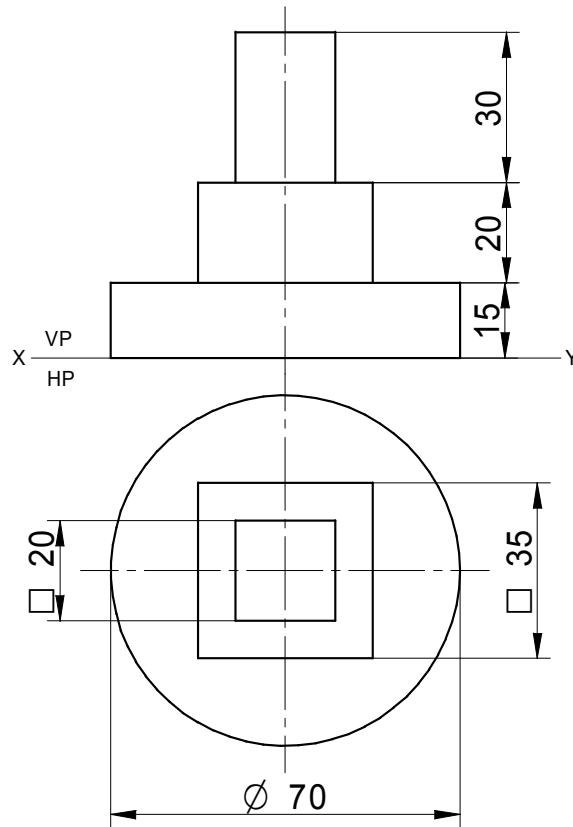
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5



6



**SECTIONS AND DEVELOPMENTS OF LATERAL SURFACES OF SOLIDS**

1. A triangular prism with one of its rectangular faces parallel to VP and nearer to it is cut as shown in fig.1. Draw the development of the retained portion of the prism which are shown in dark lines.
2. A square prism of 30 mm side of the base and height 50 mm is resting with its base on HP such that one of its vertical faces is inclined at 40 deg. to VP. It is cut as shown in the following front view figure 2. Draw the development of the lateral surface of the prism.

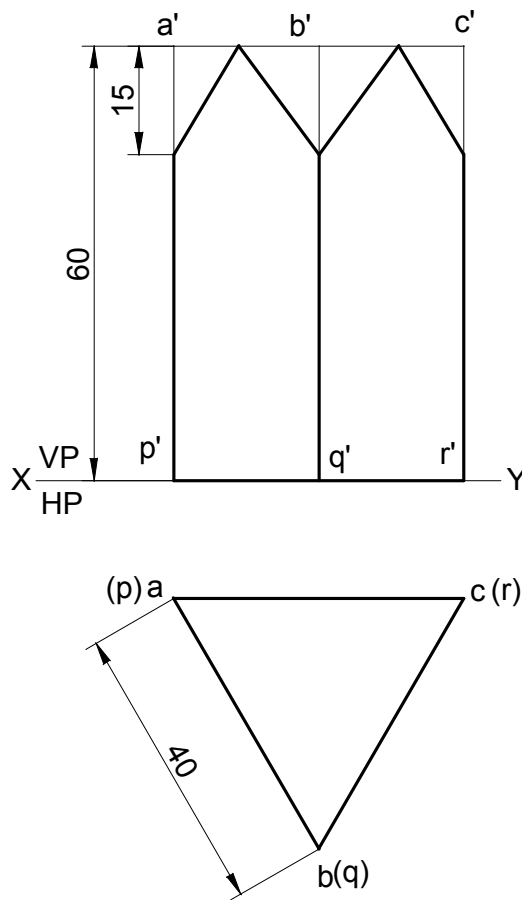


Fig (1)

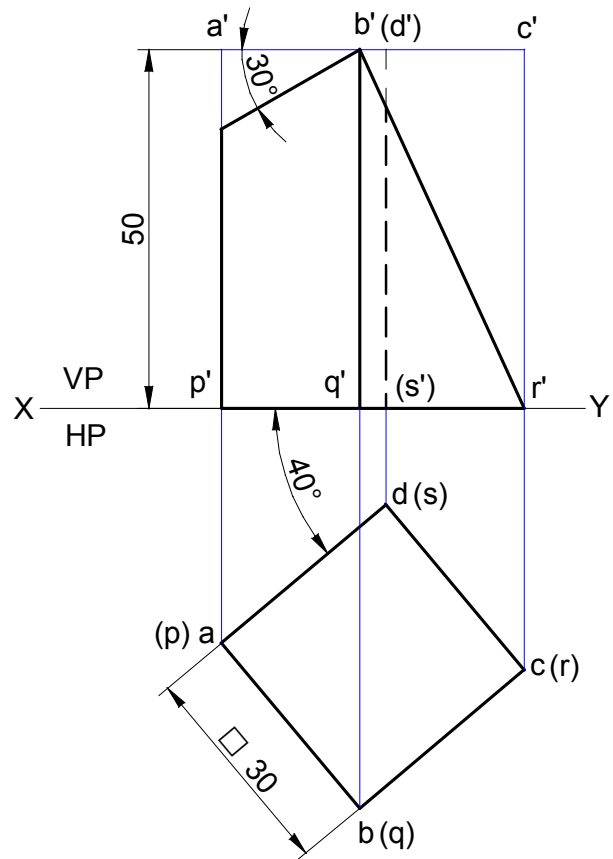


Fig (2)

3. A square prism of base side 30 mm and axis length 60 mm is resting on HP on its base with all the vertical faces being equally inclined to VP. It is cut by an inclined plane 60 deg. to HP and perpendicular to VP and is passing through a point on the axis at a distance 50 mm from the base. Draw the development of the lower portion of the prism.
4. A Square prism of base side 40 mm and axis length 65 mm is resting on HP on its base with all the vertical faces being equally inclined to VP. It is cut by an inclined plane 60 deg. to HP and perpendicular to VP and is passing through a point on the axis at a distance of 15 mm from the top face. Draw the development of the lower portion of the prism.
5. A cube of side 40 mm is resting on HP with its base on HP such that one of its vertical faces is inclined at 30 deg. to the VP. It is cut by a section plane perpendicular to VP, inclined to HP at an angle 45 deg. and passes through the mid point of the axis. Draw the development of the lower lateral surface of the cube.

6. A rectangular prism of base 40 mm X 25 mm and height 65 mm rests on HP on its base with the longest base side inclined at 30 deg. to VP. It is cut by a plane inclined at 40 deg. to HP, perpendicular to VP cuts the axis at its mid height. Draw the development of the remaining portion of the prism.
7. A rectangular prism of base 30 mm X 20 mm and height 60 mm rests on HP on its base with the longer base side inclined at 40 deg. to VP. It is cut by a plane inclined at 45 deg. to HP, perpendicular to VP and bisects the axis. Draw the development of the lateral surface of the prism.
8. A rectangular prism of base size 25 mm X 40 mm and axis length 65 mm is resting on HP on its base with the longer side of base inclined at 30 deg. to VP. It is cut by a plane inclined at 40 deg. to HP and perpendicular to VP and passes through the extreme left corner of base. Draw the development of the lateral surface of the remaining portion of the prism.
9. A square prism of base side 35 mm rests with its base on HP and two faces equally inclined to VP. Draw the development of the lateral surfaces of the retained portions of the cut prism shown by dark lines in the fig 3.
10. A pentagonal prism of base sides 20 mm and height 40 mm is resting with its base on HP and base edge is parallel to the VP. The prism is cut as shown in the following front view of Fig 4. Draw the development of the lateral surface of the prism.

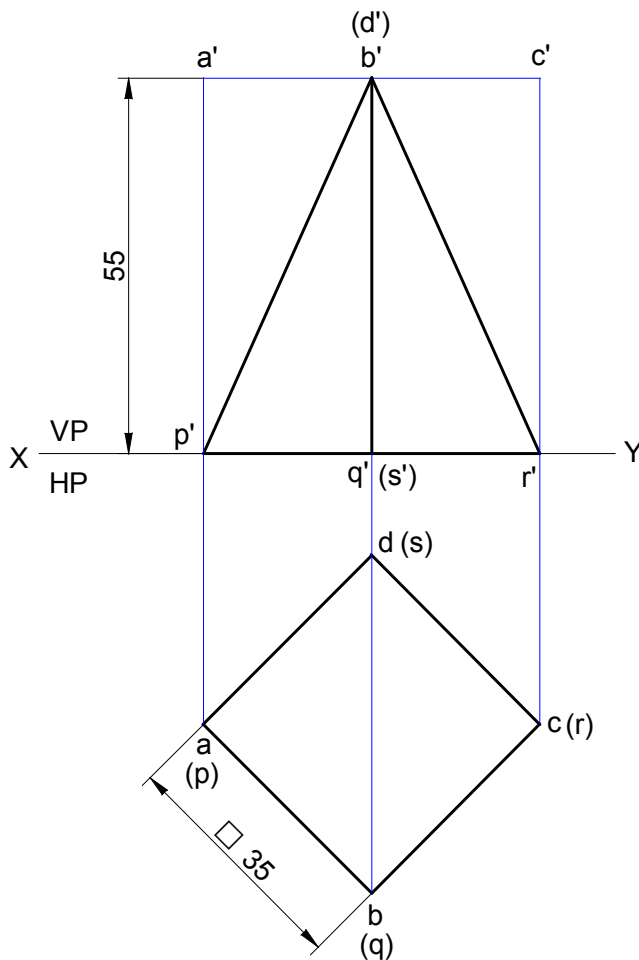


Fig (3)

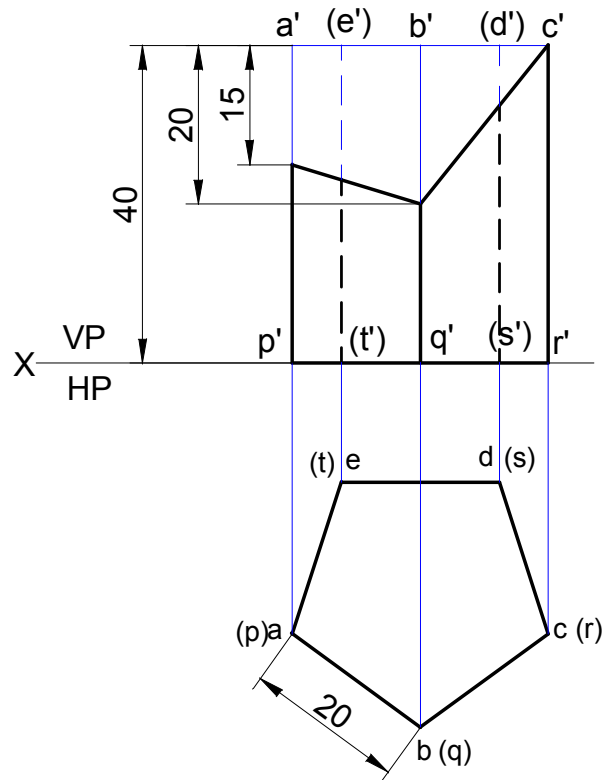


Fig (4)

11. Draw the development of the truncated portion of the lateral faces of a pentagonal prism of 20 mm sides of base and 50 mm height standing vertically with one of its rectangular faces parallel to VP and nearer to

it so as to produce a one piece development. The inclined face of the truncated prism is 30 deg. to its axis and passes through the right extreme corner of the top face of the prism.

12. A regular pentagonal prism of height 60 mm and base edge 30 mm rests with its base on HP. The vertical face closest to VP is 30 deg. to it. Draw the development of the truncated prism with its truncated surface inclined at 60 deg. to its axis and bisecting it.
13. A pentagonal prism of 30 mm side of base and height 50 mm lies with its base on HP such that one of the rectangular faces is inclined at 40 deg. to VP. It is cut to the shape of truncated pyramid with the truncated surface inclined at 30 deg. to the axis so as to pass through a point on it 30 mm above the base. Develop the truncated portion of the prism so as to produce a one piece development.
14. A hexagonal prism of base side 20 mm and height 50 mm is resting on HP on its base, such that one of its base edge is parallel to VP. The prism is cut in this position as shown in the following front view (Fig 5). Draw the development of the lateral surface of the prism.
15. A hexagonal prism of base side 25 mm and height 55 mm is resting on HP on its base, such that one of its base edges is parallel to VP. The prism is cut in this position as shown in the following front view (fig 6). Draw the development of the lateral surface of the prism.

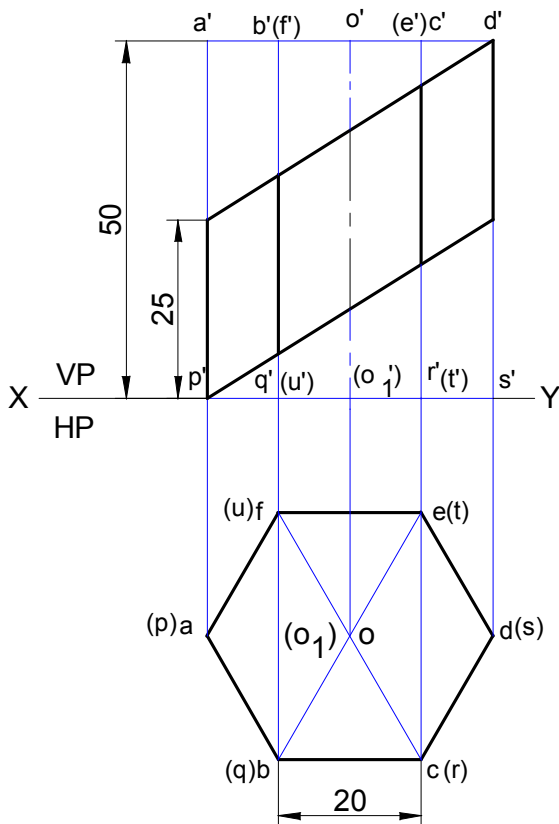


Fig (5)

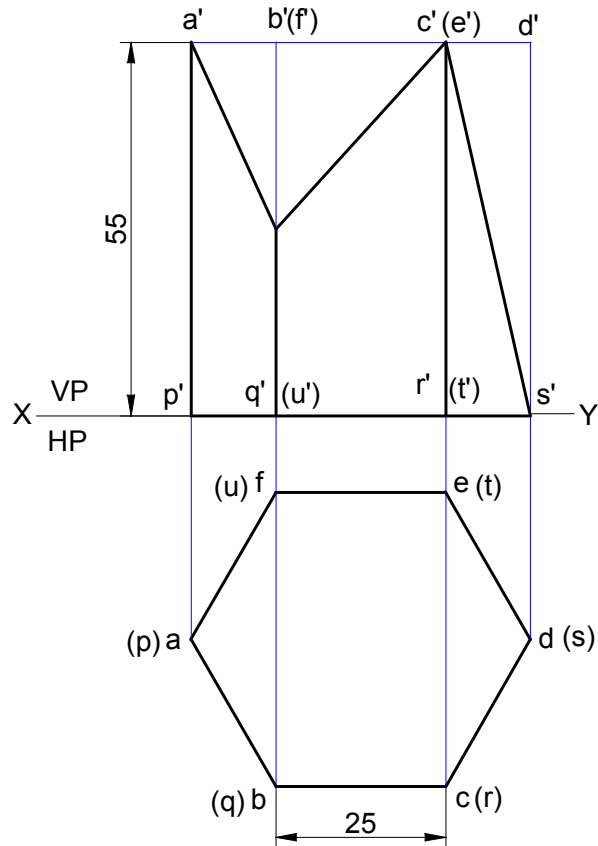


Fig (6)

16. A pentagonal prism of base sides 30 mm and axis length 60 mm rests with its base on HP and an edge of the base inclined at 45 deg. to VP. It is cut by a plane perpendicular to VP, inclined at 40 deg. to HP and passing through a point on the axis, at a distance of 30 mm from the base. Develop the remaining surfaces of the truncated prism.



17. A square pyramid of side of base 45 mm, altitude 70 mm is resting with its base on HP with two sides of the base parallel to VP. The pyramid is cut by a section plane which is perpendicular to the VP and inclined at 40 deg. to the HP. The cutting plane bisects the axis of the pyramid. Obtain the development of the lateral surfaces the truncated pyramid.
18. A square pyramid base 40 mm side and axis 65 mm long has its base on HP and all the edges of the base are equally inclined to VP. It is cut to with an inclined section plane so as the truncated surface at 45 deg. to its axis, bisecting it. Draw the development of the truncated pyramid.
19. A frustum of a square pyramid has its base 40 mm sides, top 16 mm sides and height 60 mm, its axis is vertical and a side of its base is parallel to VP. Draw the projections of the frustum and show the development of the lateral surfaces of it.
20. A rectangular pyramid, side of base 25 mm x 40 mm and height 50 mm has one of the sides of the base is inclined at 30 deg. to the VP. Draw the development of the lateral surface of the cut pyramid, whose front view is shown below Fig (7).
21. A pentagonal pyramid of 30 mm edges of base and 50 mm height rests vertically with one of its base edges parallel to VP and nearer to it. It is cut as shown in following figure 8. Draw the development of the lateral surfaces of the upper portion of the pyramid.

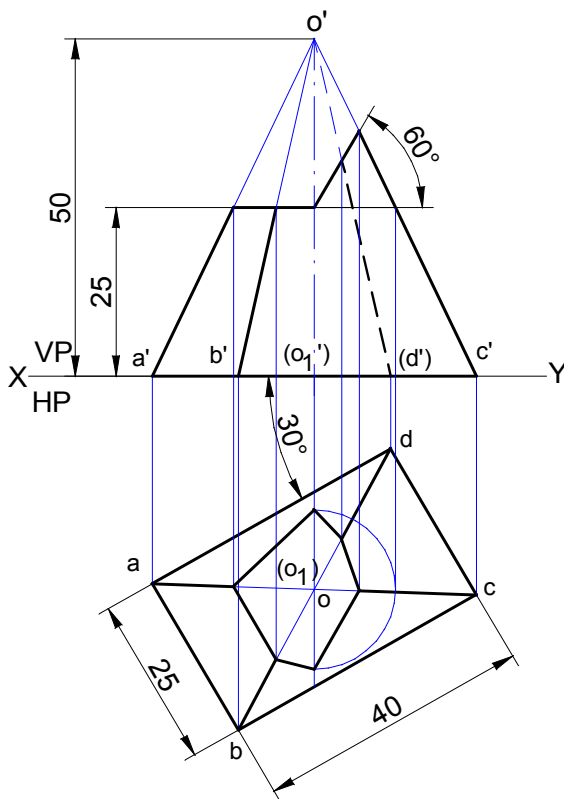


Fig (7)

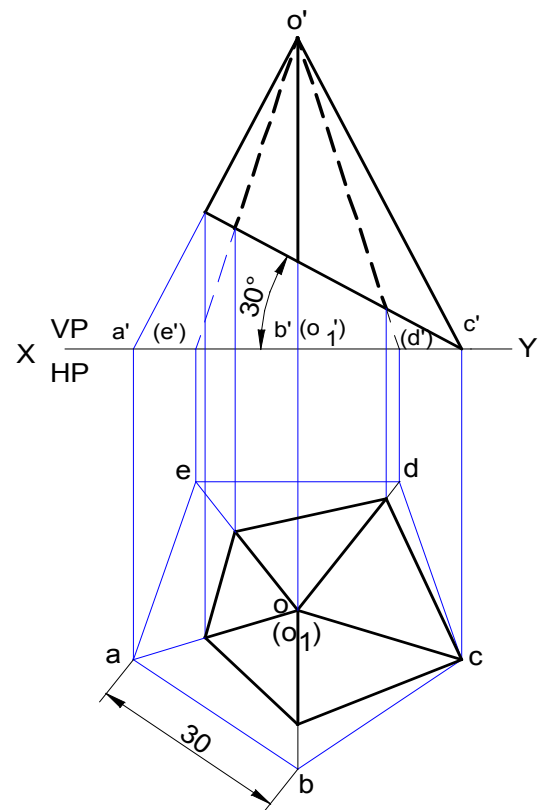
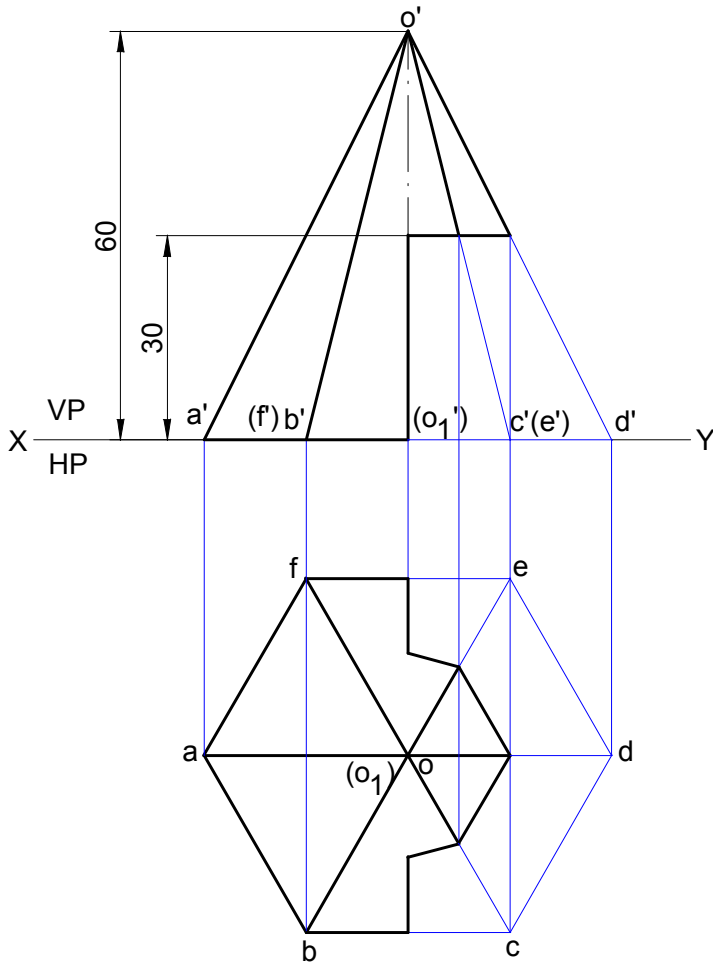


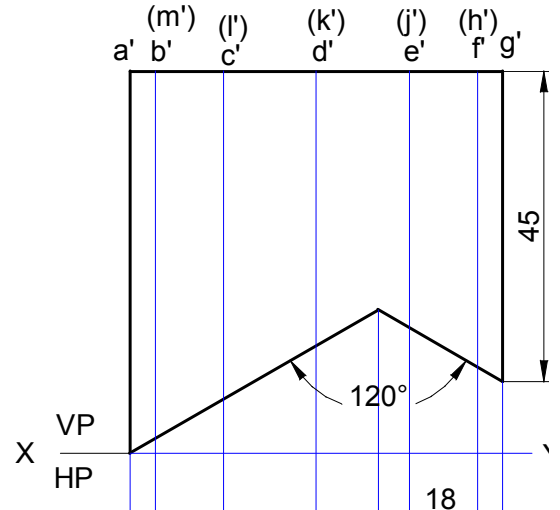
Fig (8)

22. A square pyramid of 25 mm base edge and 50 mm height rests with its base on HP with all of its base edges equally inclined to VP. It is cut by a plane perpendicular to VP and inclined to HP at 60 deg., passing through the extreme right corner of base. Draw the development of the lateral surface of the pyramid.
23. A frustum of a pentagonal pyramid, smaller base sides 16 mm and bigger top face sides 32 mm and height 40 mm is resting on the HP on its smaller base, with one of its base side parallel to the VP. Draw the projection of the frustum and develop the lateral surface.

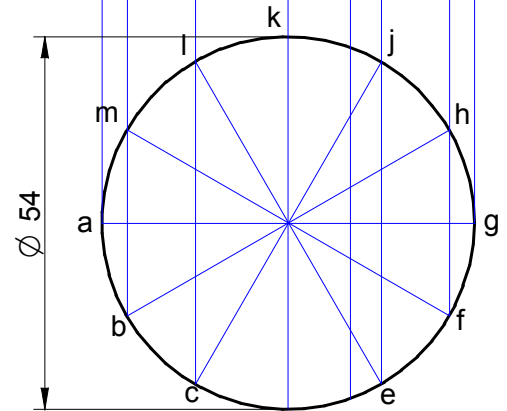
24. A regular pentagonal pyramid of side of base 35 mm and altitude 65 mm has its base on HP with a side of base perpendicular to VP. The pyramid is cut by a section plane which is perpendicular to the VP and inclined at 30 deg. to HP. The cutting plane meets the axis of the pyramid at a point 30 mm below the vertex. Obtain the development of the remaining part of the pyramid.
25. A hexagonal pyramid, base sides 25 mm and height 60 mm, is resting with its base on HP and an edge of base inclined at 40 deg. to VP. It is cut to the shape of a truncated pyramid with the truncated surface indicated in the front view at a point on the axis 20 mm from the apex and inclined at 40deg. to XY. Draw the projections and show the development of the the lateral surface of the remaining portion of the pyramid.
26. A hexagonal pyramid of sides 35 mm and altitude 65 mm is resting on HP on its base with two of the base sides perpendicular to VP. The pyramid is cut by a plane inclined at 30 deg. to HP and perpendicular to VP and is intersecting the axis at 30 mm above the base. Draw the development of the remaining portion of the pyramid.
27. A hexagonal pyramid 25 mm side of base and axis 65 mm long is resting on its base on HP with one of the edges of the base parallel to VP. It is cut by a vertical section plane at a distance of 8 mm from the axis towards right side. Develop the lateral surface of the left part of the pyramid.
28. The inside of a hopper of a flour mill is to be lined with thin sheet. The top and bottom of the hopper are regular pentagons with each side equal to 30 mm and 22.5 mm respectively. The height of the hopper is 30 mm. Draw the shape of the sheet to which it is to be cut so as to fit into the hopper.
29. A vertical cylinder of base diameter 45 mm and axis length 60 mm is cut by a plane perpendicular to VP and inclined at 50 deg. to HP, is passing through the centre point of the top face. Draw the development of the lateral surface of the cylinder.
30. A vertical cylinder of base diameter 50 mm and axis length 60 mm is cut by two planes which are perpendicular to VP and inclined at 45 deg. to HP and passing through either side of the centre point of the top face. Draw the development of the lateral surface of the cylinder.
31. A right cone of 55 mm diameter of base and 75 mm height stands on its base on HP. It is cut to the shape of truncated cone with its truncated surface inclined at 45 deg. to the axis lying at a distance of 40 mm from the apex of the cone. Obtain the development of the lateral surface of the truncated cone.
32. A funnel is to be made of sheet metal. The funnel t appears from 40 mm to 20 mm diameter to a height of 20mm and from 20mm to 15mm diameter, for next 20 mm height. The bottom of the funnel is beveled off to a plane inclined at 45 deg. to the axis. Draw the development of the funnel
33. A funnel is made of sheet metal. The funnel tapers from 60 mm to 30 mm diameters to a height of 25 mm and then forms a cylinder with a height of 50 mm. Bottom of funnel is beveled off completely at an angle of 45 deg. to axis. Draw the development of funnel.
34. A hexagonal pyramid of 30 mm base sides with a side of base parallel to VP. Draw the development of the lateral surfaces of the retained portion of the pyramid cut by two perpendicular planes shown by dark lines in the fig 9.
35. Fig.10 shows the front view of a model of a steel chimney of diameter 54 mm made from a flat thins sheet metal fitted over an inclined plane roof. Develop the portion of the chimney.



**Fig (9)**



**FIG 10**



36. A pipe made of using a half tubular (circular) with a half square in shape is cut as shown in the following fig.11. Draw the development of the lateral surface of the object.
37. A cone of base diameter 60 mm and height 70 mm is resting on its base on HP. It is cut as shown in the following fig.12. Draw the development of the lateral surface of the remaining portion of the cone.
38. Develop the lateral surface of the cylinder of 40 mm diameter and height 60 mm which is cut in the following way as shown in fig.13
39. Develop the lateral surface of the cylinder of 40 mm diameter and height 60 mm cut in the following way as shown in fig.14.

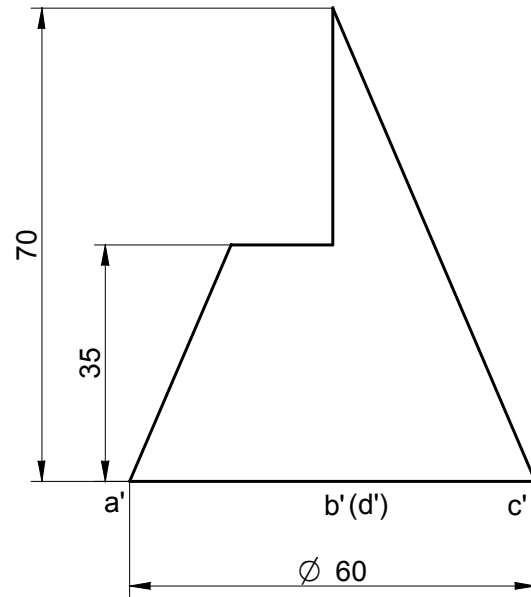
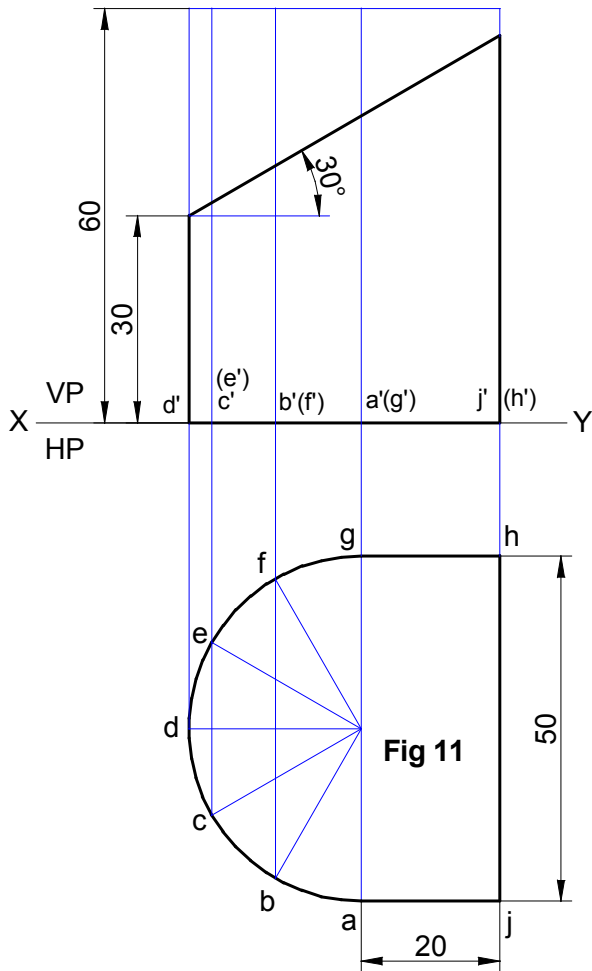


Fig 12

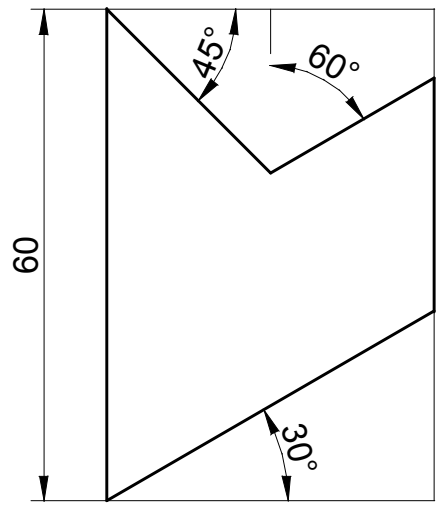


Fig (13)

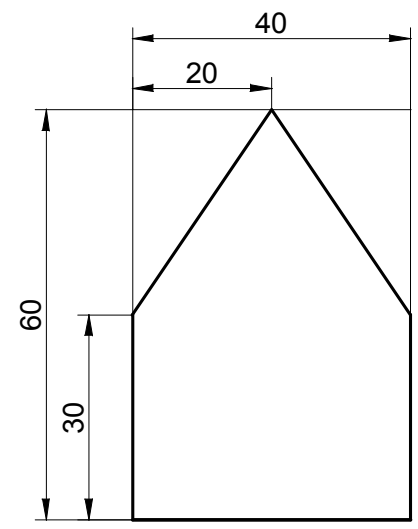
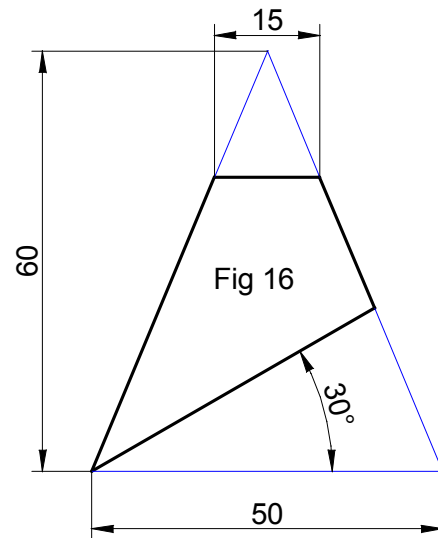
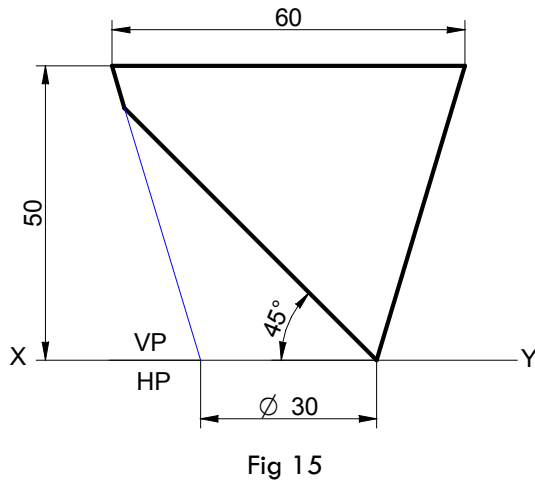
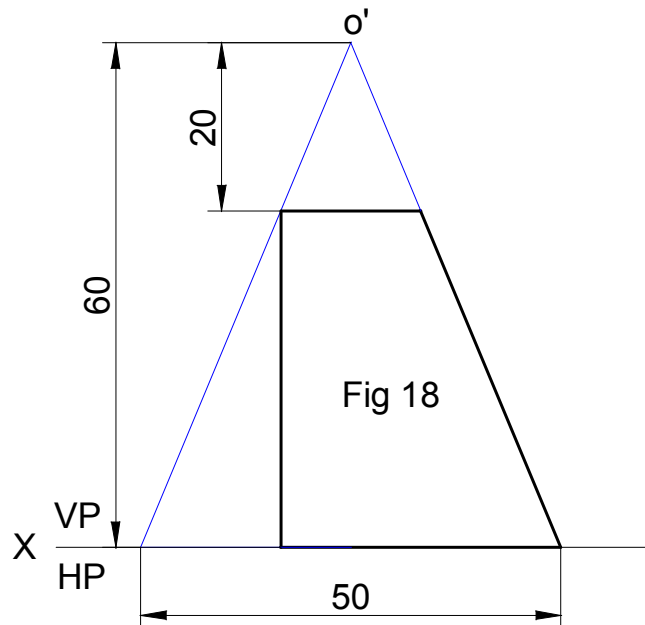
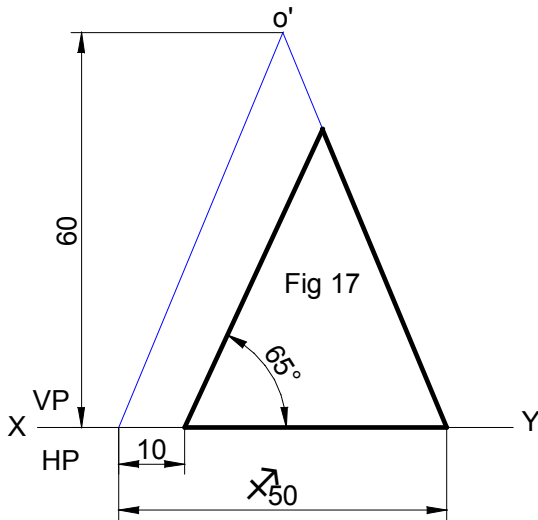


Fig (14)

40. Draw the development of the following truncated cone. Fig 15 & Fig.16



41. A cone of base diameter 50 mm and height 60 mm is resting with its base on HP. It is cut, as shown in the following front view of which is as shown in fig.17 & Fig 18. Draw the development of the lateral surface of it.



42. Draw the development of the lateral surface of a funnel consisting of a cylinder and a frustum of a cone. The diameter of the cylinder is 20 mm and top face diameter of the funnel is 80 mm. The height of frustum and cylinder are equal to 60 mm and 40 mm respectively.

43. A funnel is to be made of sheet metal. The funnel tapers from 40 mm to 20 mm diameter to a height of 20 mm and from 20 mm to 15 mm diameter, for next 20 mm height. The bottom of the funnel is beveled off to a plane inclined at 45 deg. to the axis. Draw the development of the funnel.

44. A funnel is made of sheet metal. The funnel tapers from 60 mm to 30 mm diameters to a height of 25 mm and then forms a cylinder with a height of 50 mm. Bottom of funnel is beveled off completely at an angle of 45 deg. to axis. Draw the development of funnel.
45. Develop the lateral surface of the cylinder of 40 mm diameter and height 60 mm cut in the following way. (Fig 19 & 20)

