

Fig. 4.27 shows the elevation of a cone A and a sphere B resting on the horizontal plane and in contact with each other.

- (i) Draw the elevation and plan of the two solids.
- (ii) Draw the projections of another sphere C, of 40 mm diameter, which is in contact with the sphere and cone in position S. The centre of the sphere is to be 50 mm above the horizontal plane.
- (iii) Show all points of contact.

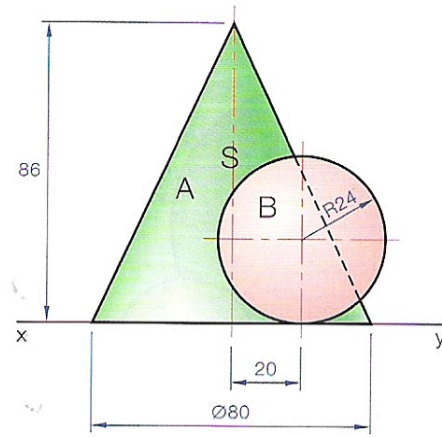


Fig. 4.27

- (1) Draw the given elevation and project the plan of the cone.
- (2) Sphere B must be drawn to the side of the cone, touching it, projected to plan and rolled into position, Fig. 4.28.

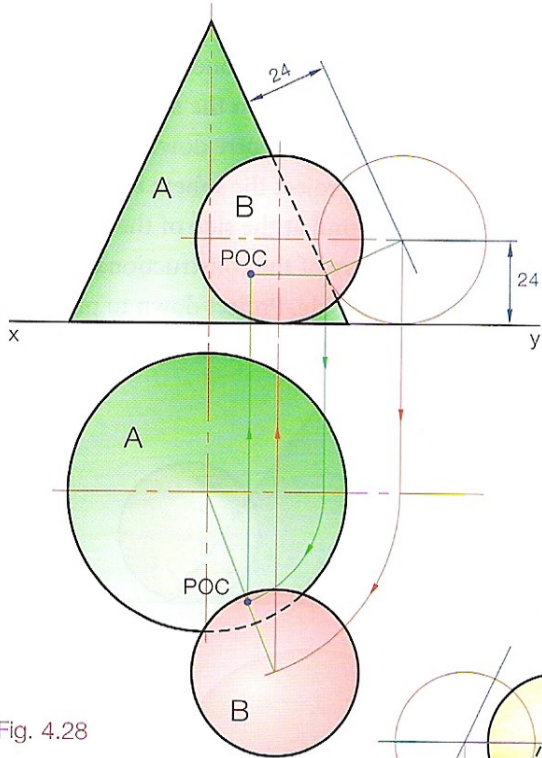


Fig. 4.28

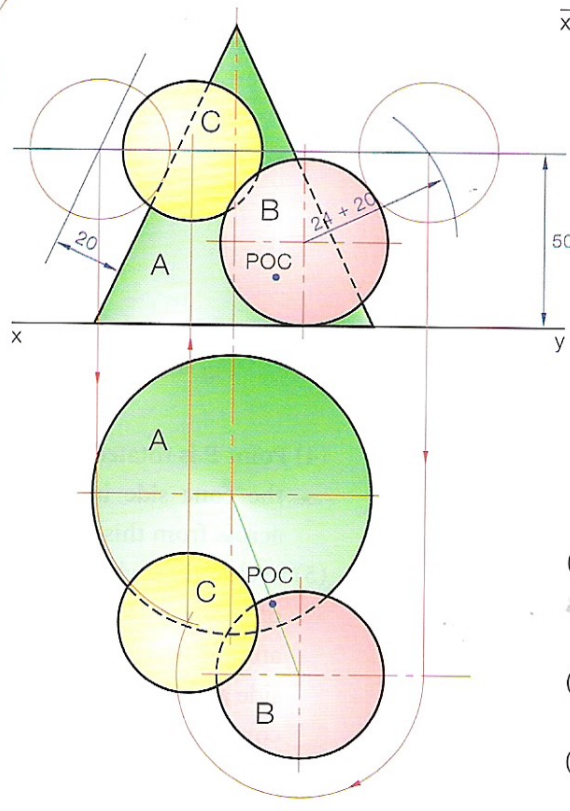


Fig. 4.29

- (3) The point of contact is found at the side of the elevation, projected to plan and rotated until it hits the line joining the centres. Project to elevation.
- (4) Sphere C has its centre 50 mm above the horizontal plane, Fig. 4.29. Draw the sphere to the side of, and touching, the cone A. Project to plan and rotate about the cone.

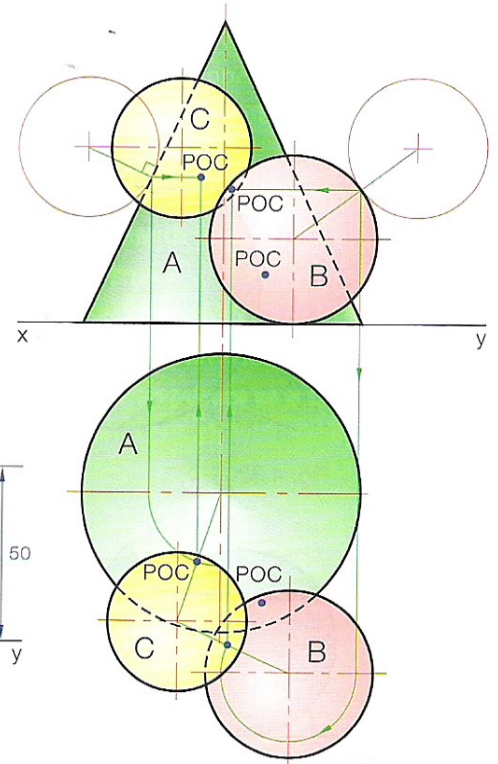


Fig. 4.30

- (5) Draw the sphere C to the side of, and touching, sphere B. Project to plan and rotate about sphere B.
- (6) Draw the sphere C on its correct position in both views.
- (7) The points of contact between the solids are found in the usual way as can be seen in Fig. 4.30.

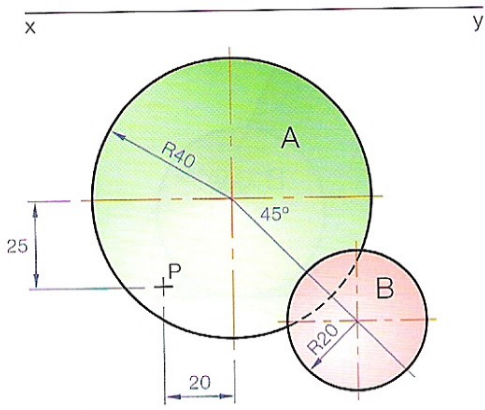


Fig. 4.31

Fig. 4.31 shows the plan of a right cone A in contact with a sphere B. The cone's altitude is 55 mm. Both solids rest on the horizontal plane. The position of a point P on the cone's surface is also given.

(i) Draw the cone A and sphere B in plan and elevation showing the point of contact.

(ii) Locate point P in elevation.

(iii) Another sphere C is placed on the horizontal plane and is in contact with cone A at the point P. Draw this sphere in plan and elevation.

- (1) Draw the plan and elevation of the cone.
- (2) Construct a 20 mm radius sphere to the side of the cone and in contact with it. Drop the centre down and rotate it onto the 45° line in plan. Project the sphere to elevation.
- (3) The point of contact is found at the side of the elevation. Draw a line from the centre of the constructional sphere, perpendicular to the cone side. Project down to plan and rotate onto the line joining the centres, Fig. 4.32.

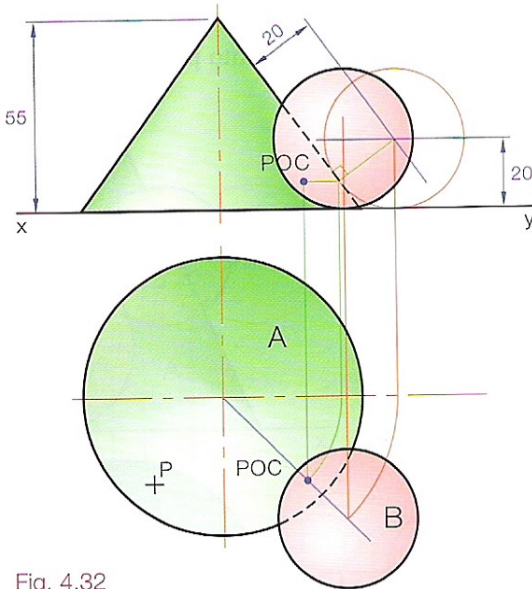


Fig. 4.32

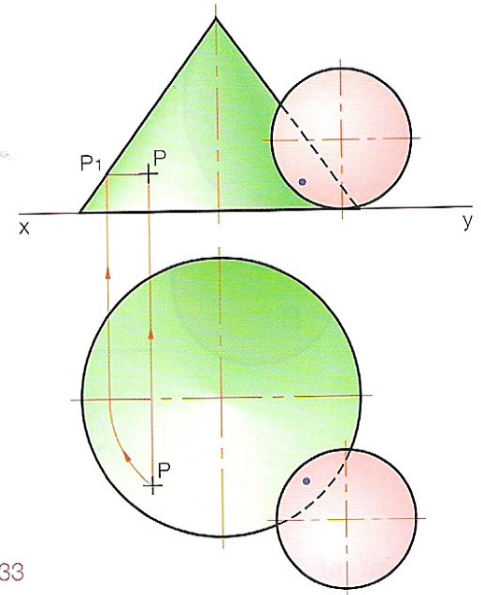


Fig. 4.33

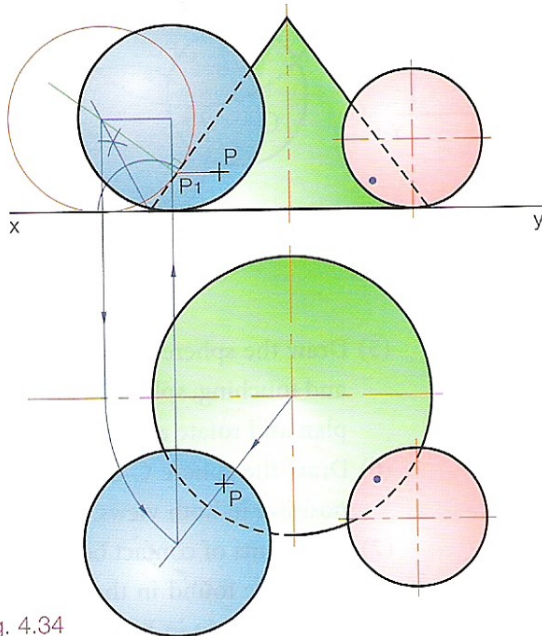


Fig. 4.34

- (4) Point P is rotated to the side of the cone, then projected to the cone side in elevation, P₁. A horizontal is brought across from this point. Point P is on this line, Fig. 4.33.
- (5) In elevation, where the horizontal from point P hits the side of the cone, P₁, construct a sphere that will touch this point and the horizontal plane. Bisect the angle between the cone side and the horizontal plane. Draw a perpendicular to the cone side from point P₁. The perpendicular and the bisector cross giving the sphere centre.
- (6) Find the final position of this sphere in the usual way, Fig. 4.34.

Fig. 4.35 shows the plan of a rectangular-based pyramid of 55 mm height. A sphere of 20 mm radius is in contact with the horizontal plane and the pyramid. Also shown is a point P on the surface of the pyramid.

- (i) Draw the elevation and plan of the two solids showing the point of contact.
- (ii) Show the plan and elevation of a sphere that rests on the horizontal plan and is in contact with the pyramid at point P.

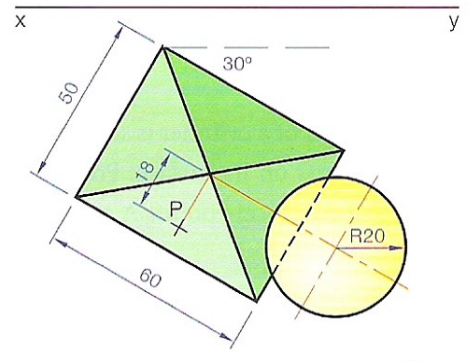


Fig. 4.35

- (1) Draw the plan and elevation of the pyramid.
- (2) Project an auxiliary elevation that will show the surface in contact with the sphere as an edge view.
- (3) Construct the sphere in the auxiliary. Bisect the angle between the pyramid face and the xy line. Draw a horizontal line 20 mm above the xy line. These two lines cross giving the required sphere's centre point. Draw the sphere.
- (4) Find the point of contact and project both centre and POC back to plan and elevation, Fig. 4.36.

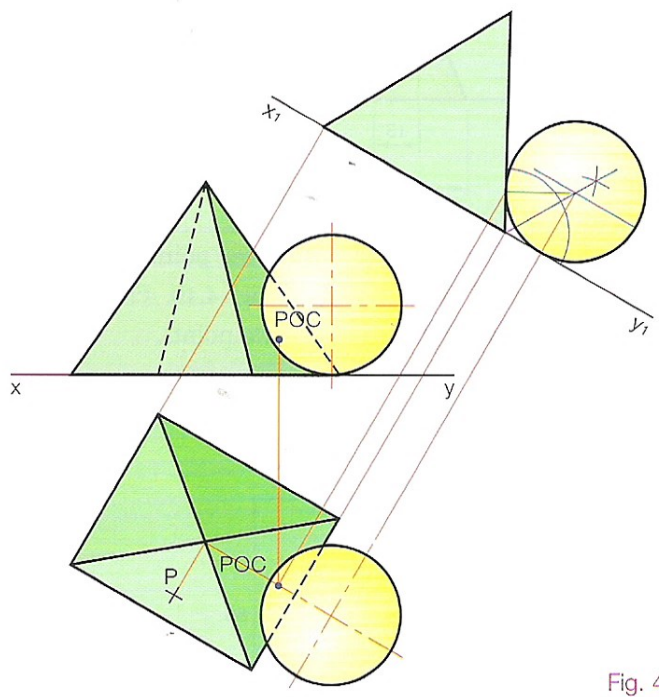


Fig. 4.36

- (5) To find the sphere that touches point P. Project an auxiliary that will show the surface containing point P as an edge view. Find the sphere centre in the auxiliary by drawing a perpendicular to the pyramid side from point P and bisecting the angle the pyramid surface makes with the xy line, Fig. 4.37.

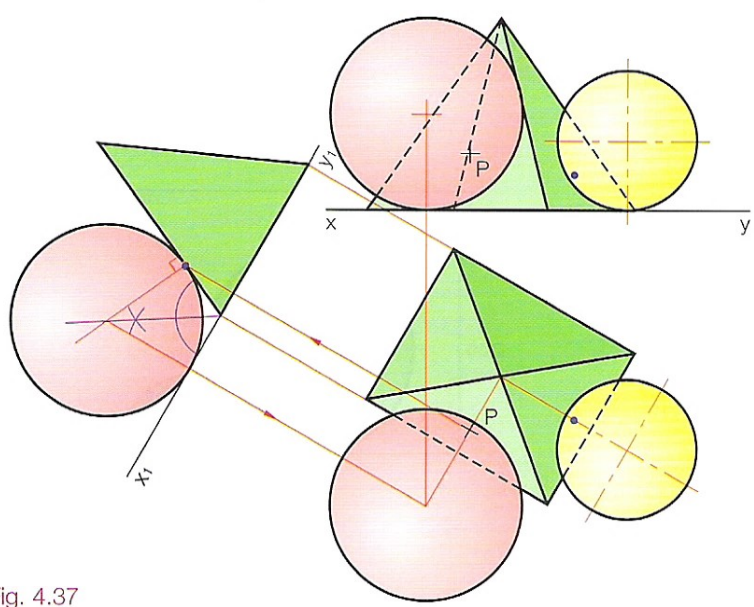


Fig. 4.37