INSTRUCTIONS

(a) Answer four questions.
(b) All questions carry equal marks.
(c) Construction lines must be shown on all solutions.
(d) Write the number of the question distinctly on the answer paper.
(e) All dimensions on the question paper are given in millimetres.
(f) First or third angle projection may be used.
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1. Given the horizontal and vertical projections of two planes ABC and ADE.

    A = 185 – 85 – 10
    B = 135 – 20 – 90
    C = 235 – 35 – 40
    D = 170 – 50 – 80
    E = 220 – 5 – 20

(a) Determine the line of intersection between the planes.
(b) Determine the dihedral angle between the planes.
(c) Show the projections of a straight line drawn from E which shall touch the plane
     ABC at a distance of 60 mm from E and which shall be inclined at an angle of 45°
     to the horizontal plane.
(d) On a separate diagram show the projections of the skew lines BC and AE and show
     the projections of the shortest distance between them.

2. In Fig. I the triangle ABC has a perimeter of 456 mm. The inscribed triangle DEF
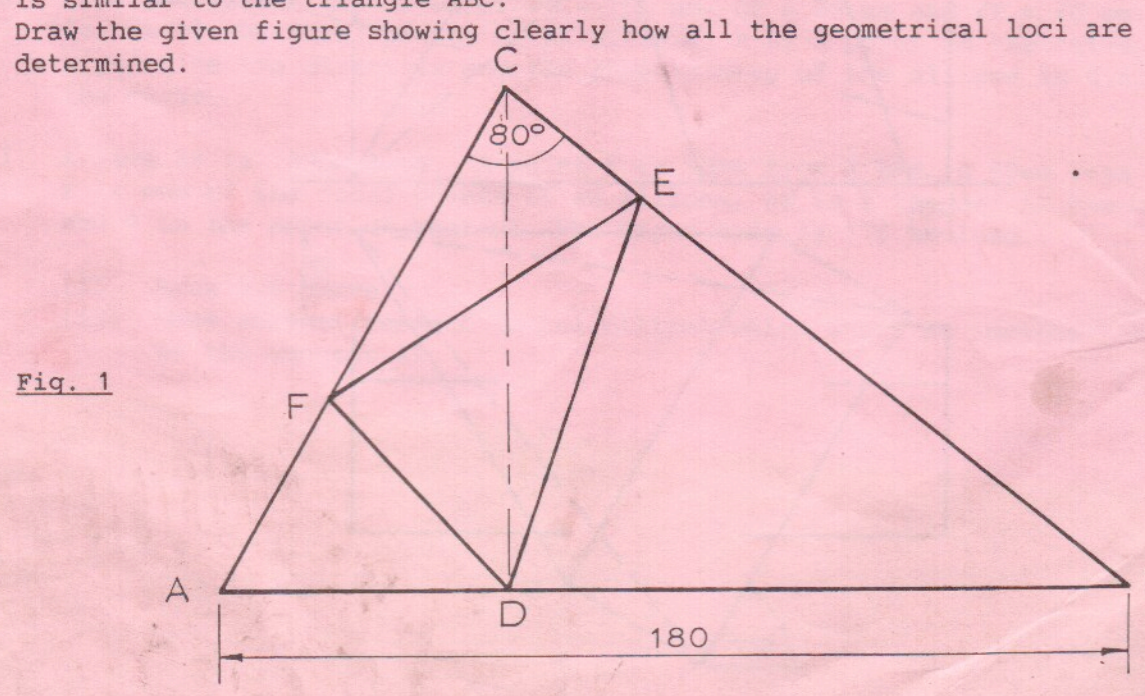   is similar to the triangle ABC.
    Draw the given figure showing clearly how all the geometrical loci are
    determined.

Fig. 1

X ———————————————————————————————————— Y

3. Fig. 2 shows the plan of a
right cone which has a
diameter of 90 mm and
altitude 100 mm standing on the
horizontal plane. Also shown
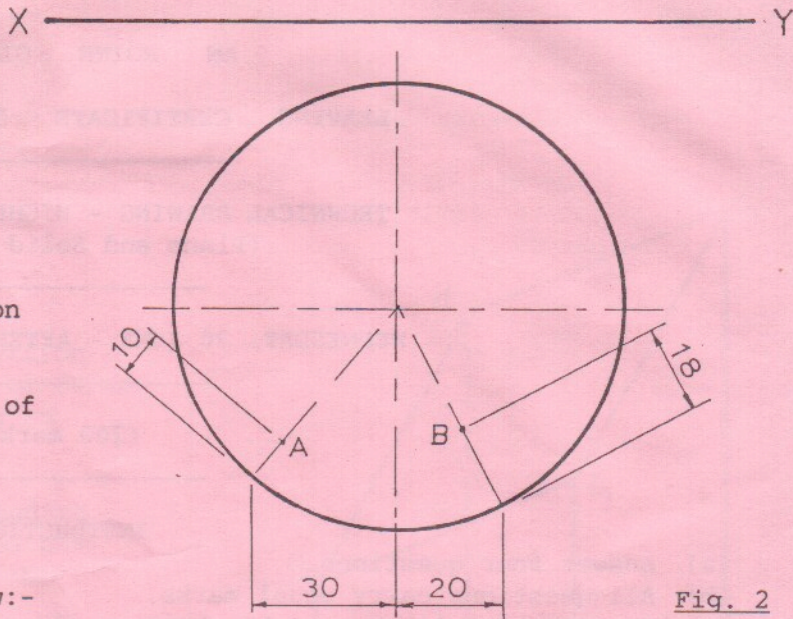are two points A and B on the
surface of the cone.

(a) Draw the plan and elevation
of the cone and show the
projections of a spiral
which moves from the base of
the cone to the apex and
which passes through the
points A and B.

(b) On a separate diagram show:-

(i) the projections of a sphere S which rests on the horizontal plane
and touches the cone at the point A.

(ii) the projections of another sphere which touches the cone at
the point B and is in contact with sphere S.

Fig. 2

4. A square-based right pyramid has a side of base 90mm and an altitude of 105mm
and it rests on one of its triangular faces on the horizontal plane as shown in
plan and elevation in FIG. 3.

Also shown are the projections of an equilateral triangular prism of 50 mm side
which penetrates the pyramid.

Draw the projections of the solids showing all lines of interpenetration.
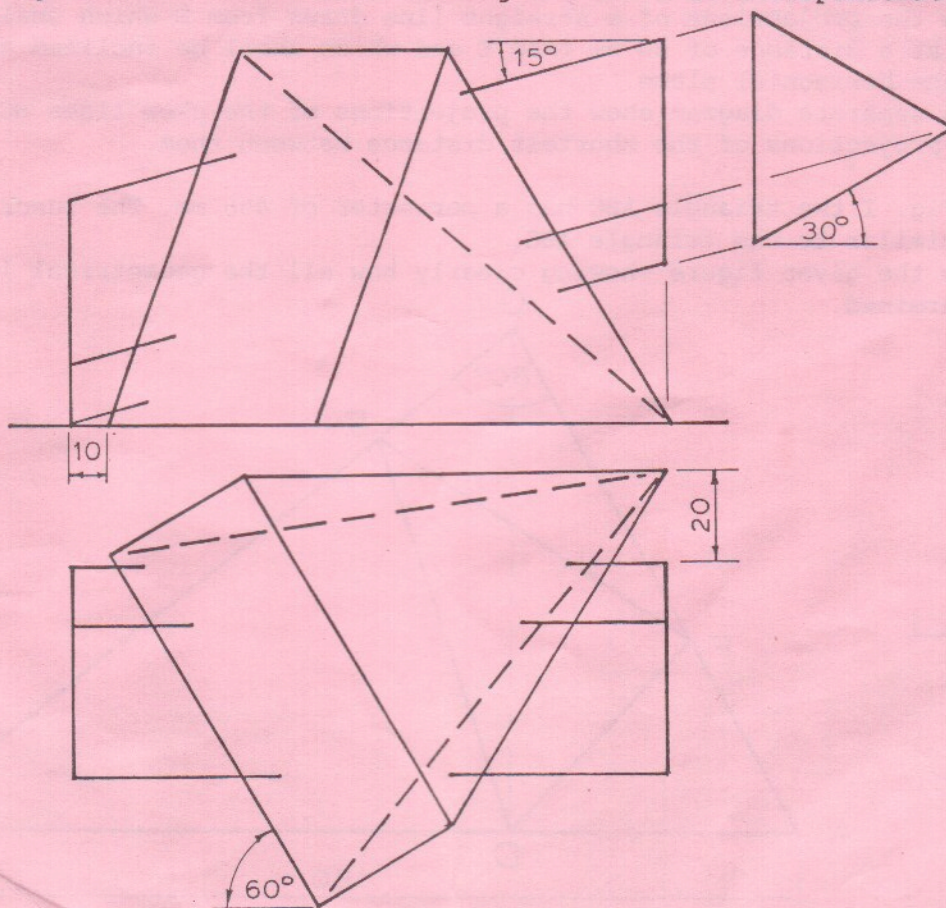
Fig. 3

5.   Fig. 4 shows two circles, A and B in contact.

   (a)   Determine the radius of circle B and draw the given figure.

   (b)   The circle A rolls clockwise along the circumference of the circle B until
         the point P touches the line CD. Draw the locus of the point P for this
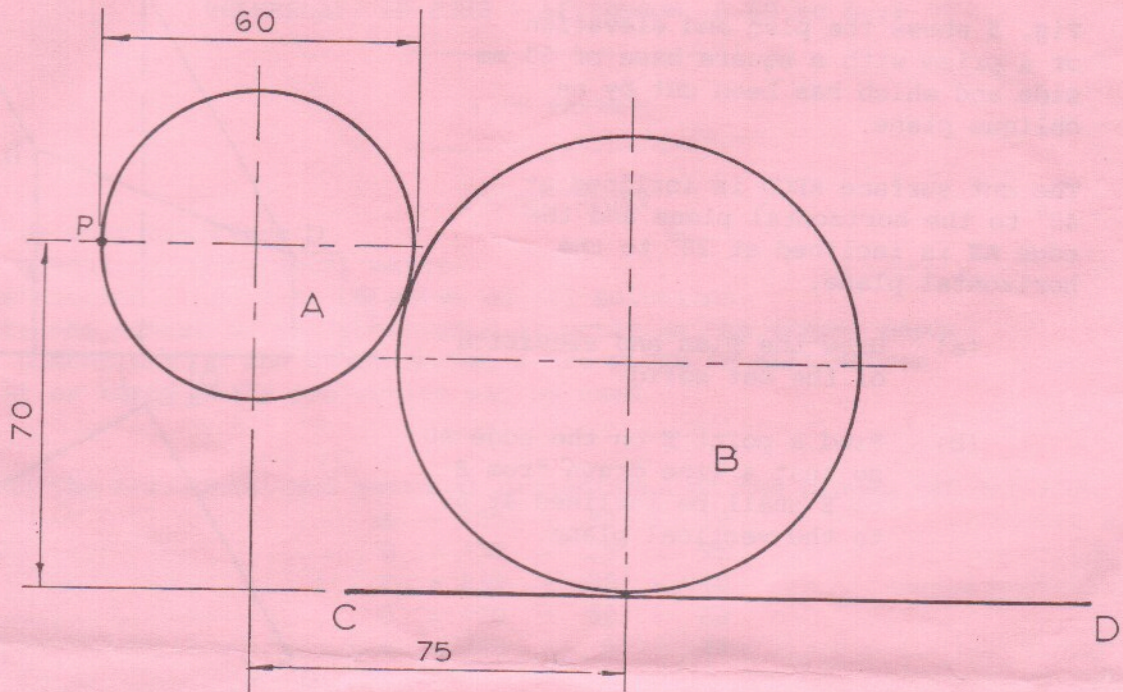   movement.

Fig. 4

6.   (a)   Draw a triangle DFP in which DP = 100 mm, DF = 85 mm and FP = 40 mm. If F
           is one of the focal points of an ellipse, P is a point on the curve, D is
           a point on the directrix and the eccentricity of the ellipse is 0.6, draw
           the curve.

     (b)   A line AP is 120mm long. A point F is 90mm from A and is 60mm from P.
           F is one of the focal points of an ellipse, AP is a tangent to the curve
           and P is the point of contact. The major axis is 170 mm long.

           (i)   Draw the curve.
           (ii)   Draw another tangent to the ellipse which shall be inclined at 120°
                  to the tangent AP.

7. Fig. 5 shows the plan and elevation
   of a prism with a square base of 60 mm
   side and which has been cut by an
   oblique plane.

   The cut surface ABCD is inclined at
   45° to the horizontal plane and the
   edge AB is inclined at 20° to the
   horizontal plane.

   (a)   Draw the plan and elevation
         of the cut solid.

   (b)   Find a point E on the edge AD
         so that a line drawn from B
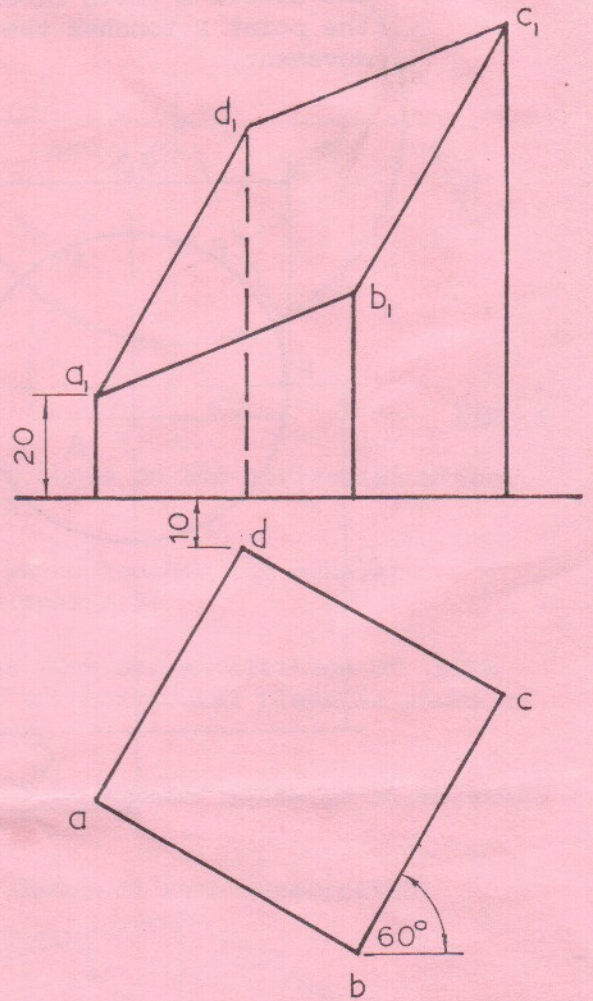   to E shall be inclined at 60°
         to the vertical plane.

Fig. 5