



*Leaving Certificate Examination 2007*

***Technical Drawing***  
***Paper 1 - Higher Level***  
***(Plane and Solid Geometry)***

*(200 Marks)*

***Thursday 14 June***  
***Morning, 9.30 – 12.30***

***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)*** Work on one side of the paper only.
- (f)*** All dimensions on the question paper are given in metres or millimetres.
- (g)*** First or third angle projection may be used.

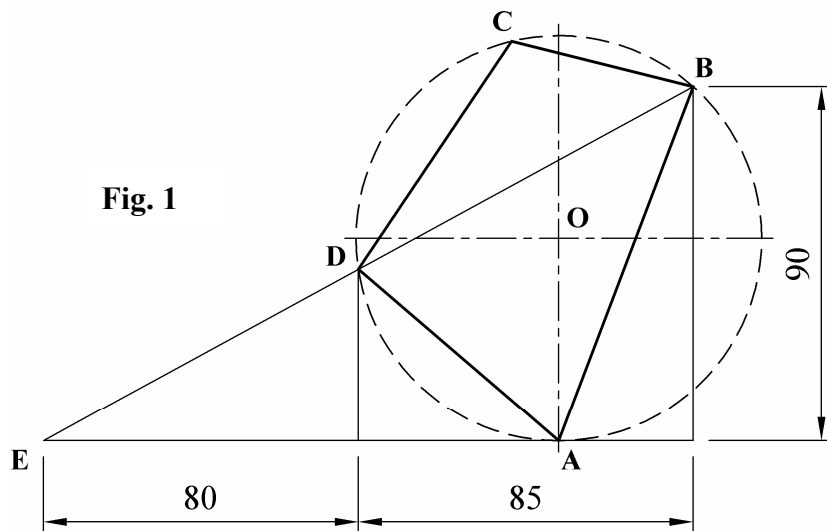
1. Given the horizontal and vertical projections of two planes ABC and ADE.

A	=	150	---	100	---	20
B	=	130	---	10	---	80
C	=	230	---	55	---	60
D	=	200	---	25	---	90
E	=	110	---	15	---	45

- Determine the line of intersection between the planes.
- Determine the dihedral angle between the planes.
- Determine the projections of a straight line drawn from B, which is 60mm long, is inclined at  $40^\circ$  to the plane ABC and is inclined at  $45^\circ$  to the horizontal plane.
- On a separate diagram, draw the projections of the skew lines AD and BC and show the projections of the shortest line between them. Determine and indicate, in millimetres, the true length of this line.

2. Fig. 1 shows a quadrilateral ABCD inscribed in a circle with centre O. In the given figure, the triangle BCD is equal in area to an equilateral triangle of 60mm side.

- Draw the given figure, showing clearly how the points A, O and C are obtained.
- Draw two straight lines from A, which shall divide the area of the quadrilateral ABCD into three equal parts.
- On a separate diagram redraw the circle and the line BE. Construct a square having one vertex at O, two vertices on the circumference of the circle and the fourth vertex on the line BE.



3. Fig. 2 shows the elevation of a right cone A and a hemisphere B which are in contact with each other. Also shown is the position of a point P on the *front* of the cone.

(a) Draw the elevation and plan of the solids in contact.

(b) Draw the projections of another right cone C, standing on the horizontal plane, so that it is in contact with the base of the cone A at the point P. This cone C should also touch the hemisphere B at a point 20mm above the horizontal plane.

(c) Draw the traces of a plane which is tangential to the cone C and to the hemisphere B.

Determine the projections of the point of contact between the hemisphere B and the tangent plane.

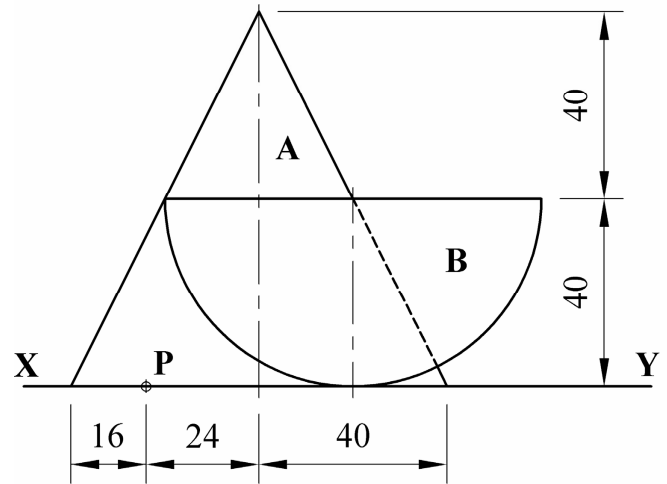


Fig. 2

4. Fig. 3 shows the projections of an equilateral triangular prism of 95mm side, which has been cut as shown. Also shown are the incomplete projections of a square based prism of 45mm side which penetrates the cut triangular prism.

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

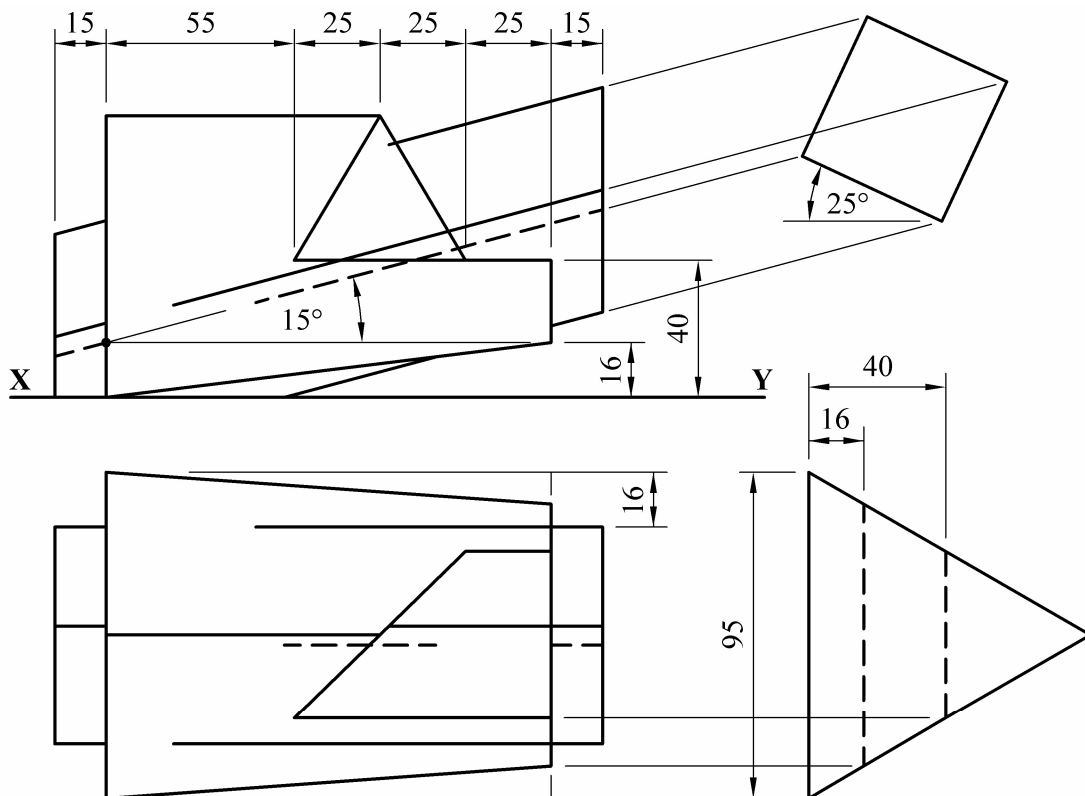


Fig. 3

5. Fig. 4 shows a circle C, which rolls clockwise along the line AB for three-quarters of a revolution. Also shown is a line MP. During the rolling of the circle, the line MP rotates about the point M in an anti-clockwise direction through an angle of  $180^\circ$ .

- (a) Draw the locus of point P for the combined movement.

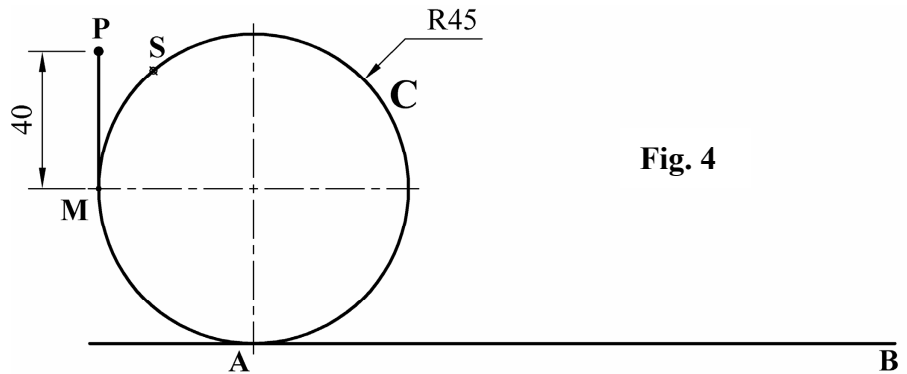


Fig. 4

- (b) On a separate diagram redraw the circle C and the line MP as given. P is a point on an involute which is unwound in an anti-clockwise direction from S to A. Draw the locus of this involute clearly showing how the starting position S is located.

6. (a) Draw a triangle PFA, where PF is 47mm long, FA is 20mm long and the angle PFA is  $90^\circ$ . F is one of the focal points of an ellipse, P is a point on the curve and A is a point on the major axis. The eccentricity of the ellipse is 0.6

- (i) Determine the directrix and the major axis, and draw half of the curve.  
 (ii) Draw a tangent to the curve, which shall be perpendicular to the line AP. Show clearly how the point of contact is obtained.

- (b) Two lines AF and AB meet at an angle of  $30^\circ$ . AF is 90mm long. F is the focus of a parabola, A is a point on the axis and AB is a tangent to the curve.

- (i) Locate the point of contact P between the parabola and the tangent and draw a portion of the curve to include the point P.  
 (ii) Draw a circle which is tangential to the axis and which touches the curve at point P.

7. Fig. 5 shows the traces of two oblique planes VTH and  $V_1T_1H_1$ . A square based right pyramid with a side of base 60mm and an altitude of 80mm rests with one of its triangular faces on the horizontal plane as shown. The point A lies in the oblique plane  $V_1T_1H_1$ .

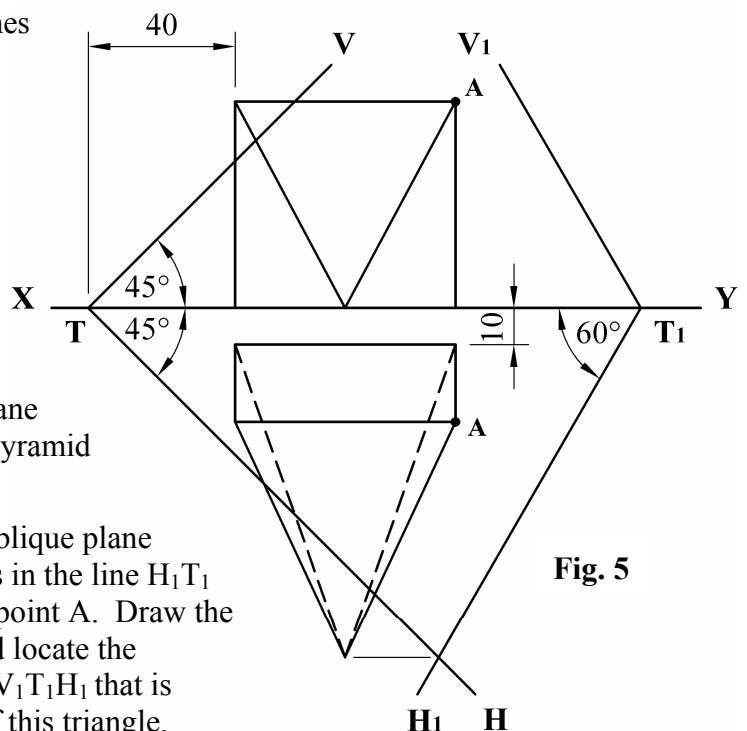


Fig. 5

- (a) Draw the plan and elevation of the pyramid and the given traces.  
 (b) The pyramid is cut by the oblique plane VTH. Draw the projections of the pyramid when it has been cut by this plane.  
 (c) An equilateral triangle rests on the oblique plane  $V_1T_1H_1$ . One side of the triangle lies in the line  $H_1T_1$  and the third vertex is located at the point A. Draw the plan and elevation of the triangle and locate the projections of the point in the plane  $V_1T_1H_1$  that is equidistant from the three vertices of this triangle.

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