Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2010

Design & Communication Graphics
Higher Level
Section A *(60 marks)*

Friday, 18 June
Afternoon, 2:00 - 5:00

This examination is divided into three sections:

SECTION A   (Core - Short Questions)
SECTION B   (Core - Long Questions)
SECTION C   (Applied Graphics - Long Questions)

SECTION A
- Four questions are presented.
- Answer **any three** on the A3 sheet overleaf.
- All questions in Section A carry **20 marks** each.

SECTION B
- Three questions are presented.
- Answer **any two** on drawing paper.
- All questions in Section B carry **45 marks** each.

SECTION C
- Five questions are presented.
- Answer **any two** (i.e. the options you have studied) on drawing paper.
- All questions in Section C carry **45 marks** each.

General Instructions:
- *Construction lines must be shown on all solutions.*
- *Write the question number distinctly on the answer paper in Sections B and C.*
- *Work on one side of the drawing paper only.*
- *All dimensions are given in metres or millimetres.*
- *Write your Examination number in the box below and on all other sheets used.*
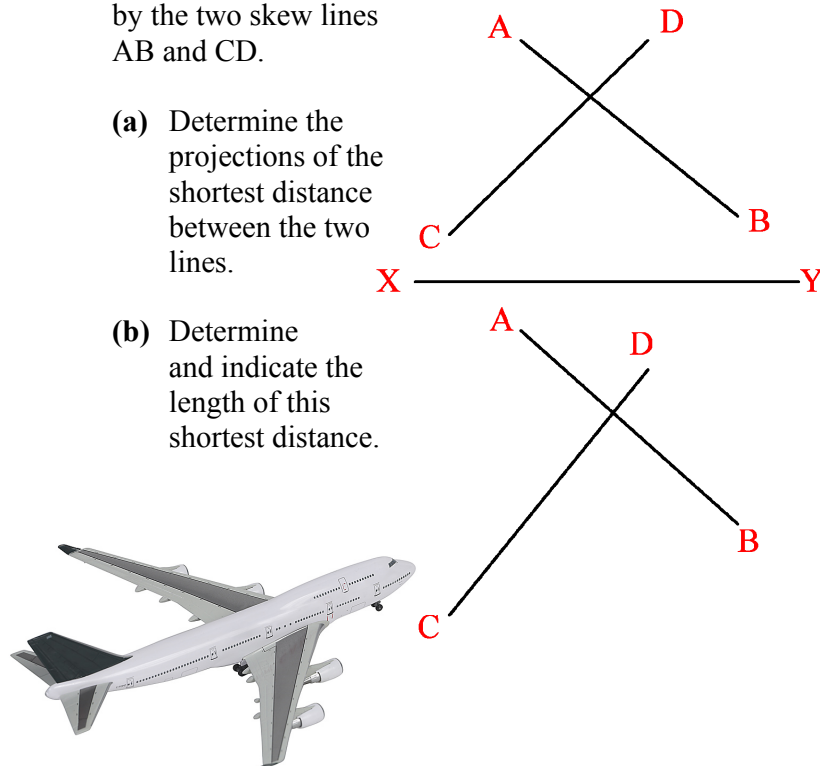
Examination Number:

A-1. The flight paths of two aircraft are represented by the two skew lines AB and CD.

(a) Determine the projections of the shortest distance between the two lines.

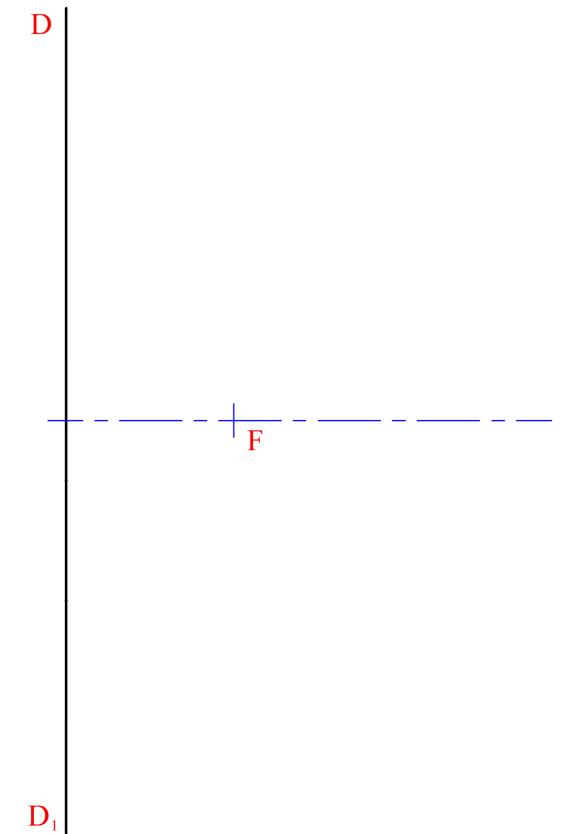(b) Determine and indicate the length of this shortest distance.

A-3. A parabolic curve is often used in the design of racing tracks.

The drawing on the right shows the axis, directrix and focus of a parabola.

(a) Locate the vertex and draw a portion of the curve.

(b) Draw a tangent to the curve at a point 45mm from the focus.

A-2. A pair of bookends, each of which incorporates a globe, and some books are shown in the 3D graphic below.

A set of isometric axes is shown on the right and the elevation and plan of a bookend, which incorporates a globe, have been positioned as shown.

Draw the axonometric projection of the bookend.
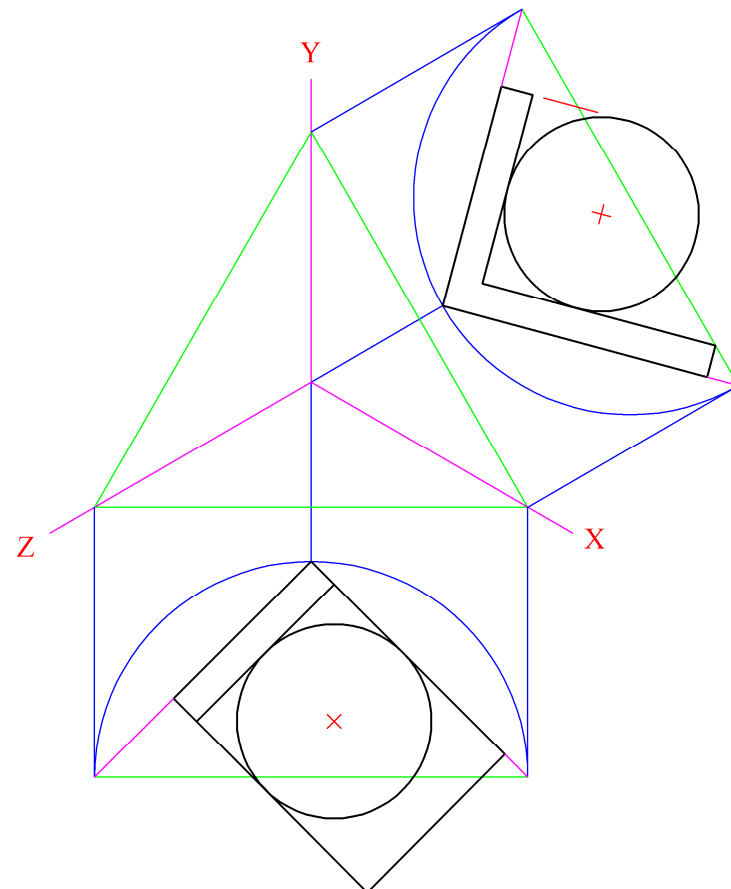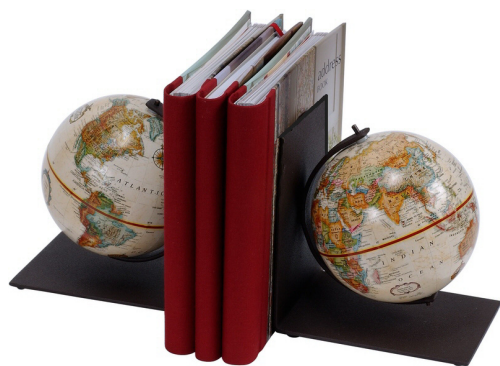
A-4. The 3D graphic below shows a design of a display box for fruit. The box consists of a regular hexagonal prism which has been cut as shown.
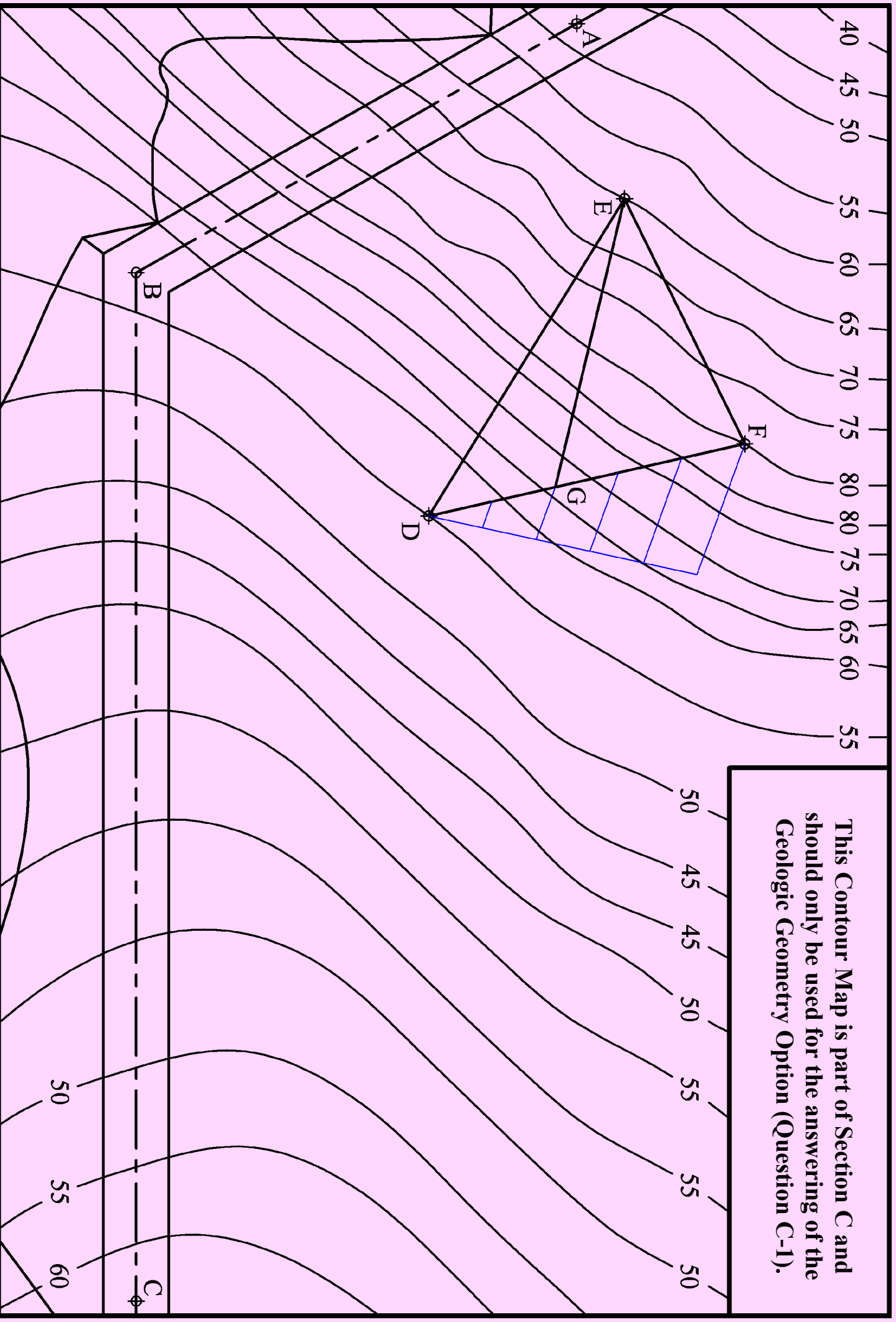
The drawing on the right shows how the prism is cut to form the sloping surface.

(a) Draw the elevation of the prism when cut by the oblique plane VTH.

(b) Determine, and indicate in degrees, the inclination of the cut surface to the horizontal plane.
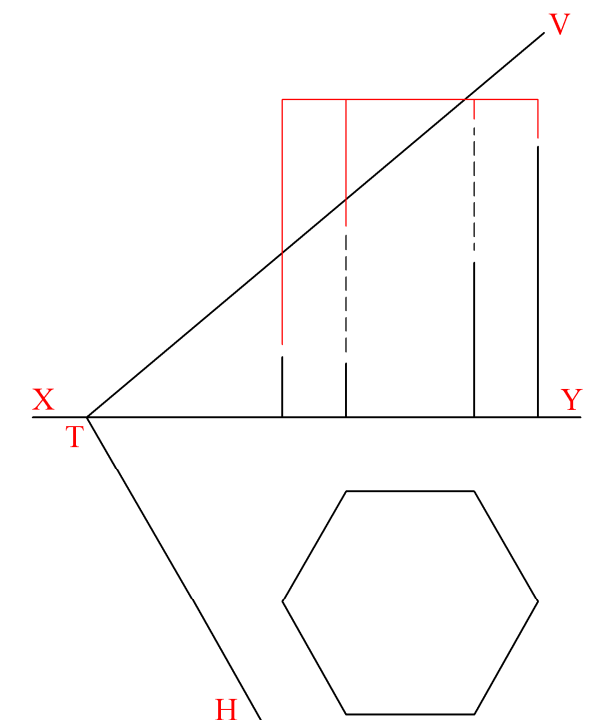
Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2010

Design & Communication Graphics
Higher Level
Sections B and C (180 marks)

Friday, 18 June
Afternoon, 2:00 - 5:00

This examination is divided into three sections:
SECTION A   (Core - Short Questions)
SECTION B   (Core - Long Questions)
SECTION C   (Applied Graphics - Long Questions)

SECTION A
- Four questions are presented.
- Answer **any three** on the accompanying A3 examination paper.
- All questions in Section A carry **20 marks** each.

SECTION B
- Three questions are presented.
- Answer **any two** on drawing paper.
- All questions in Section B carry **45 marks** each.

SECTION C
- Five questions are presented.
- Answer **any two** (i.e. the options you have studied) on drawing paper.
- All questions in Section C carry **45 marks** each.

General Instructions:
- *Construction lines must be shown on all solutions.*
- *Write the question number distinctly on the answer paper in Sections B and C.*
- *Work on one side of the drawing paper only.*
- *All dimensions are given in metres or millimetres.*
- *Write your Examination number in the box provided on section A and on all other sheets used.*

B-1. The graphic on the right shows Dublin's new rugby and soccer Stadium. The modern design is lower in height at one end, in order to minimise the impact on local residents.

Fig. B-1 below shows the plan and elevation of a portion of a model of the stand at the lower end.

A pictorial view of the structure is also shown.

(a) Draw the given plan.

(b) Make a perspective drawing of the structure given the following:

- The spectator point is 1.8m from the corner A
- The picture plane is touching the corner A
- The horizon line is 2m above the ground line.

Use an auxiliary vanishing point to locate the sloping edges of the roof.
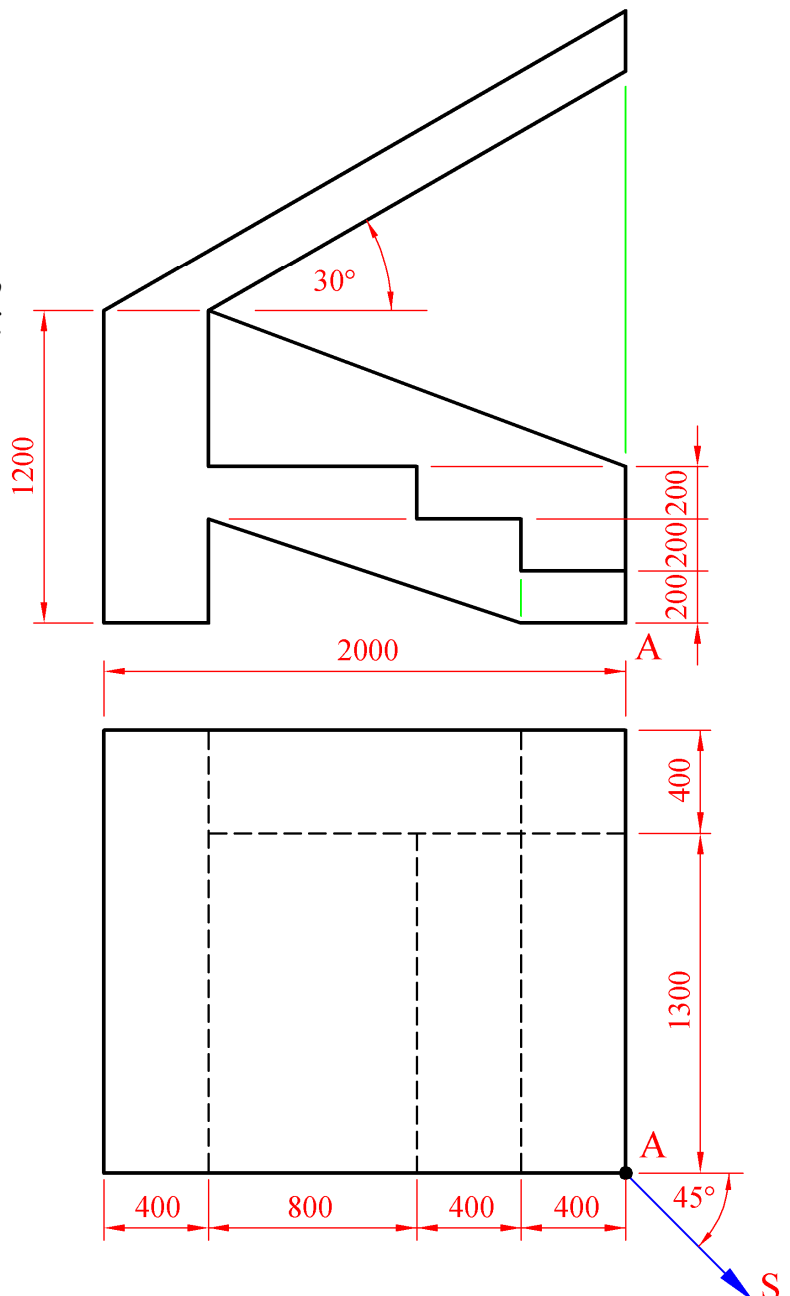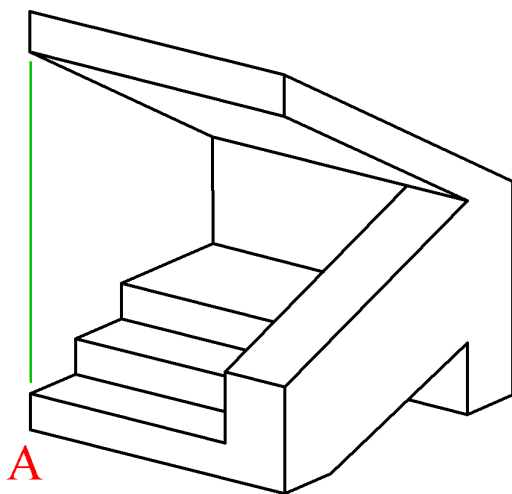
Scale 1:20

Fig. B-1

B-2. The graphic on the right shows a skyscraper which is located in Miami, Florida.

The front face of the building contains a curved recess as shown.

Fig. B-2 shows the outline plan and elevation of the building.

(a) Draw the given plan and elevation of the building.
(The elevation of the curve may be ignored for this part of the question.)

(b) Complete the elevation by drawing the curve on the front face of the building.

(c) Determine the horizontal and vertical traces of the oblique plane that contains the front face of the building.

(d) Determine the true angle between the traces.
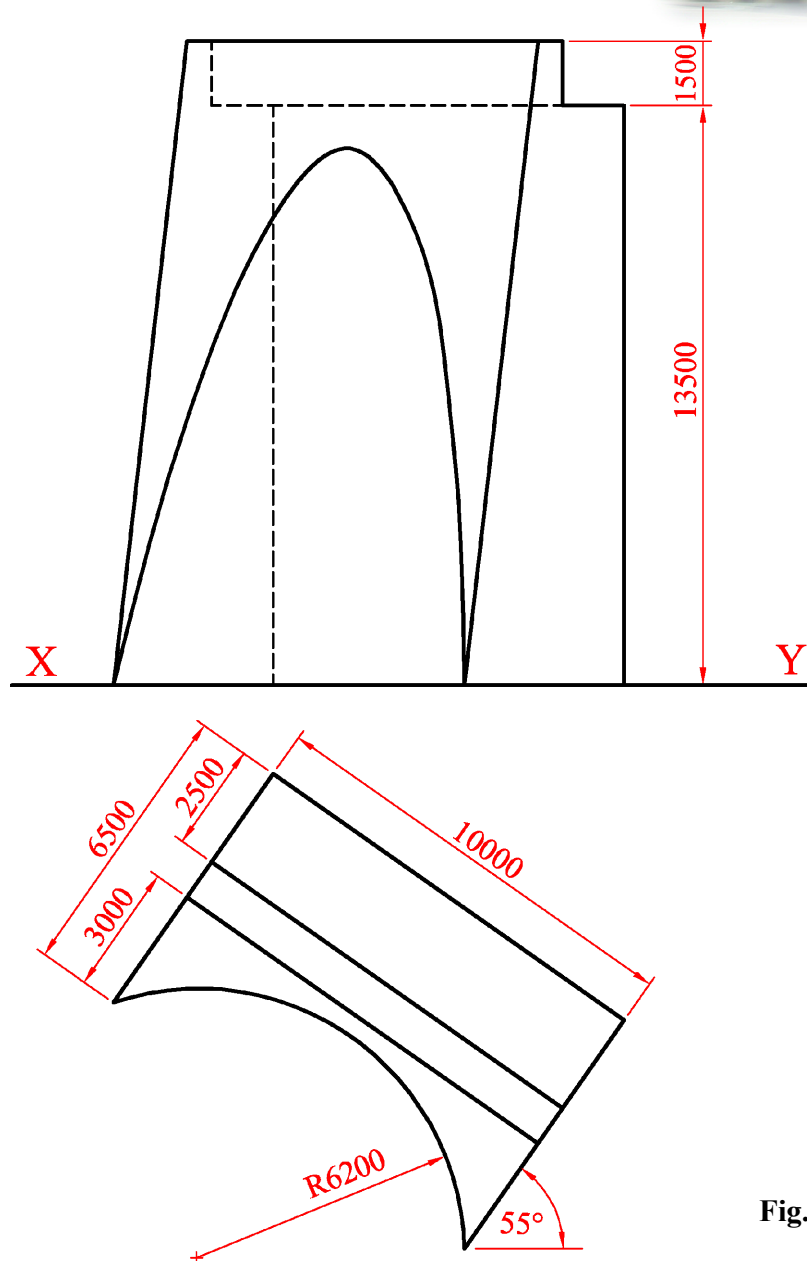
Scale 1:100

Fig. B-2

B-3. The 3D graphic on the right shows a metal geometric sculpture made up of a series of intersecting triangles.

The horizontal and vertical coordinates for the outer points of two of the intersecting triangular planes **ABC** and **ABD** are given below.

A	=	60	---	20	---	70
B	=	90	---	60	---	40
C	=	120	---	20	---	70
D	=	30	---	70	---	15

(a) Draw the plan and elevation of the intersecting planes.

(b) Determine the dihedral angle between the planes.

(c) Determine the true shape of the triangle ABC.

(d) Determine the traces of the plane that contains the triangle ABC.

Scale 1:1

SECTION C - Applied Graphics
Answer **Any Two** questions (i.e. the options you have studied)
from this section on drawing paper.

Geologic Geometry

C-1. **(a)** The accompanying map, located on the back page of Section A, shows ground contours at five metre vertical intervals.

ABC is the centreline of a proposed roadway. The section of the roadway between A and B is level at an altitude of 60m. The section from B to C has a gradient of 1 in 30 rising.

Using side slopes of 1 in 1.5 for the cuttings and 1 in 2 for the embankments, complete the earthworks necessary to accommodate the roadway on its northern side.

Note: The earthworks on the southern side of the roadway have already been completed.

(b) On the map, D, E and F are outcrop points on the top surface of a stratum of ore.
The line from E to G is the strike line for the stratum and has been constructed as shown.

(i) Determine the dip of the stratum.

A vertical bore-hole at F reveals a vertical depth of stratum of 25m.

(ii) Determine the actual thickness of the stratum.

Scale 1:1000

C-2. The 3D graphic on the right shows a ladies hat, which is in the form of a hyperbolic paraboloid.

The projections of the hat are shown in Fig. C-2 below. The perimeter is an ellipse in plan and the outline shape of the hat is formed by extending the hyperbolic paraboloid surface ABCD.

(a) Draw the outline plan and elevation of the hat.

(The hole, which is circular in plan, may be ignored for this part of the question.)

(b) Draw the plan and elevation of the hole.

(c) A plane director for the elements AD and BC is positioned so that it contains the point B. Draw the traces for this plane director.
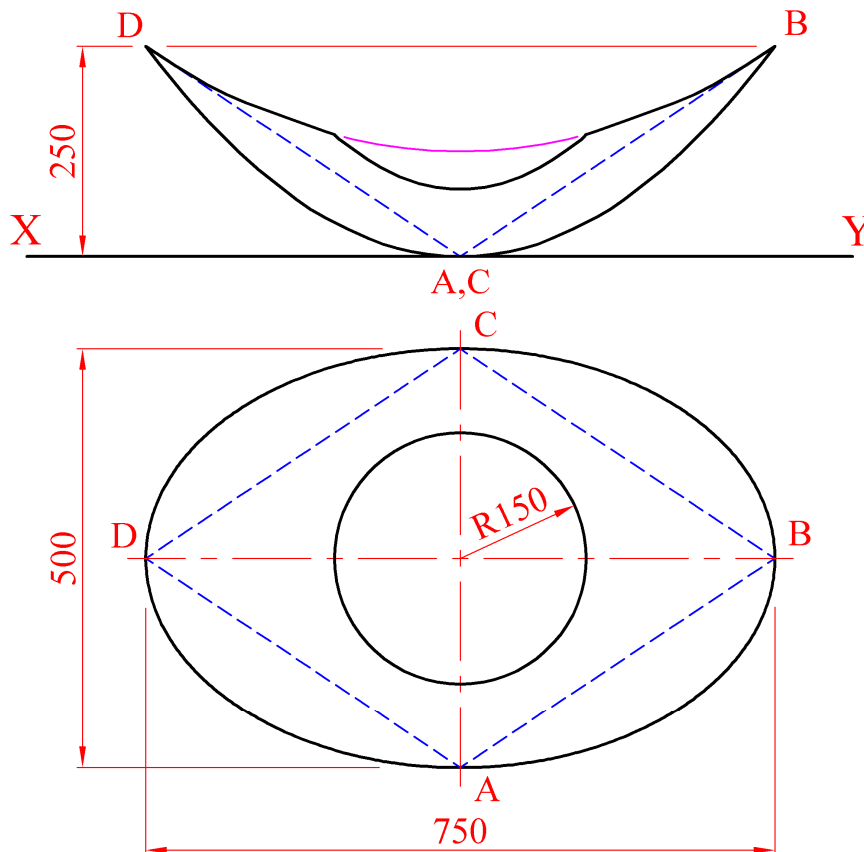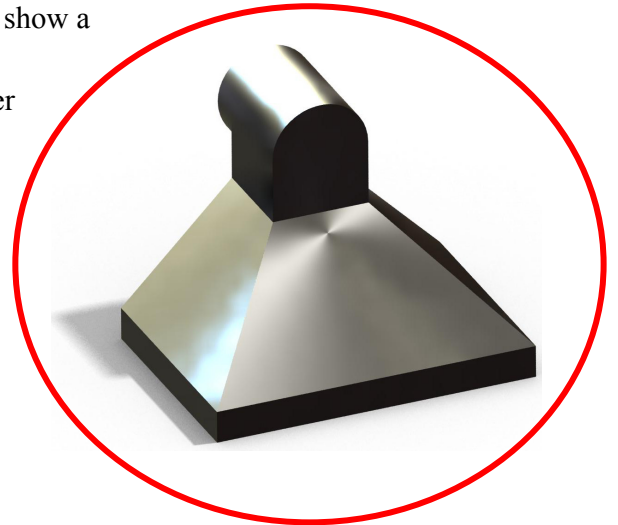
Scale 1:5

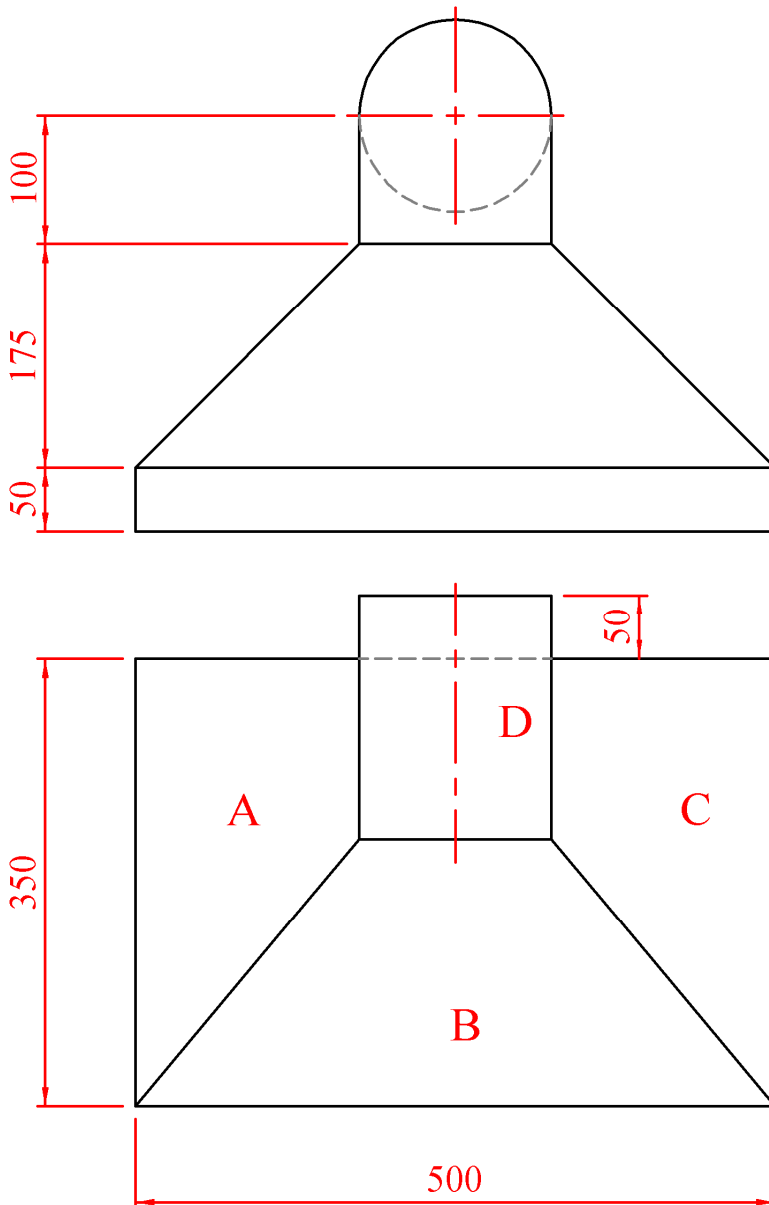**Fig. C-2**

Surface Geometry

C-3. The 3D graphic, and enlarged balloon detail on the right, show a cooker hood in a kitchen.

Fig. C-3 below shows the plan and elevation of the cooker hood. Surfaces A and C are sloped at 45° and surface B is sloped at 40°. Surface D is cylindrical.

(a) Draw the given plan and elevation.

(b) Find the dihedral angle between surfaces A and B.

(c) The cooker hood is to be manufactured from stainless steel.

    (i) Draw a one-piece surface development of surfaces B and C.

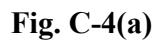   (ii) Draw the development of the curved surface of the cylinder D.
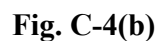
Scale 1:5

Fig. C-3

Dynamic Mechanisms

C-4. **(a)** The 3D graphic on the right shows part of an automated packaging machine. The mechanism is shown in line-diagram format in Fig. C-4(a) below. In the diagram, crank OA rotates clockwise about point O. An arm AB is pin-jointed at A and is constrained to move tangentially to the circle R as shown.

Plot the locus of point B for one revolution of the crank OA.

Scale 1:1

130

A

B

O

R

40   15   35

Fig. C-4(a)

(b) The 3D graphic on the right shows a caterpillar toy which uses a series of cams and followers to create movement.

Fig C-4(b) below shows the details of one of the cams. The nearest approach of the in-line follower to the cam centre is 40mm. The cam rotates in an anti-clockwise direction as shown.

Draw the cam profile and the displacement diagram given the following data:

0°	to	180°	Rise 40mm with simple harmonic motion;
180°	to	270°	Dwell;
270°	to	360°	Return to initial position as shown in the diagram.

Scale 1:1

0°

R40

270°   Ø20   90°

180°

Fig. C-4(b)

Assemblies

C-5. **(a)** Details of a Clamp for securing a Camera to a circular bar are shown in Fig. C-5. The **Camera Clamp** has been disassembled. The parts list is given on the right and a 3D Graphic of the individual parts is also shown.

Draw a full size sectional elevation on A-A showing the parts fully assembled. The Clamp should have a 24mm diameter bar between the fixed jaw and the adjustable jaw in the assembly.

(All fillets are 3mm and any omitted dimensions may be estimated).

(b) Determine and indicate on your drawing the maximum rotation of the swivel mount from the extreme left to the extreme right position.

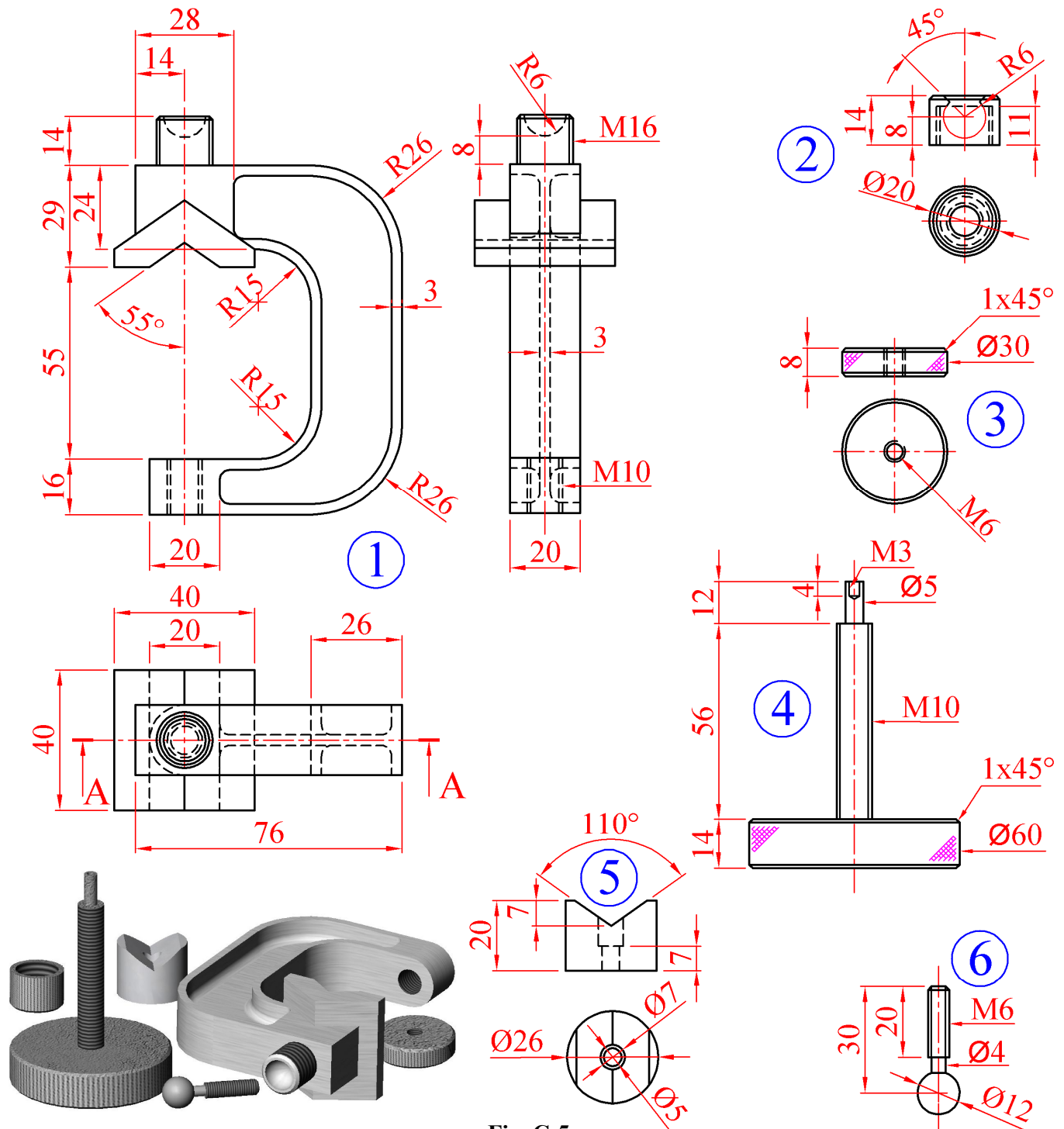| Part	Name	Qty.
1	Frame	1
2	Swivel Clamp	1
3	Locknut	1
4	Clamp Screw	1
5	Moving Jaw	1
6	Swivel Mount	1

Fig. C-5

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