Pre-Leaving Certificate Examination, 2020

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

Time: 3 Hours

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 Name, School's Name and Teacher's Name in the box below and on all other sheets used.*

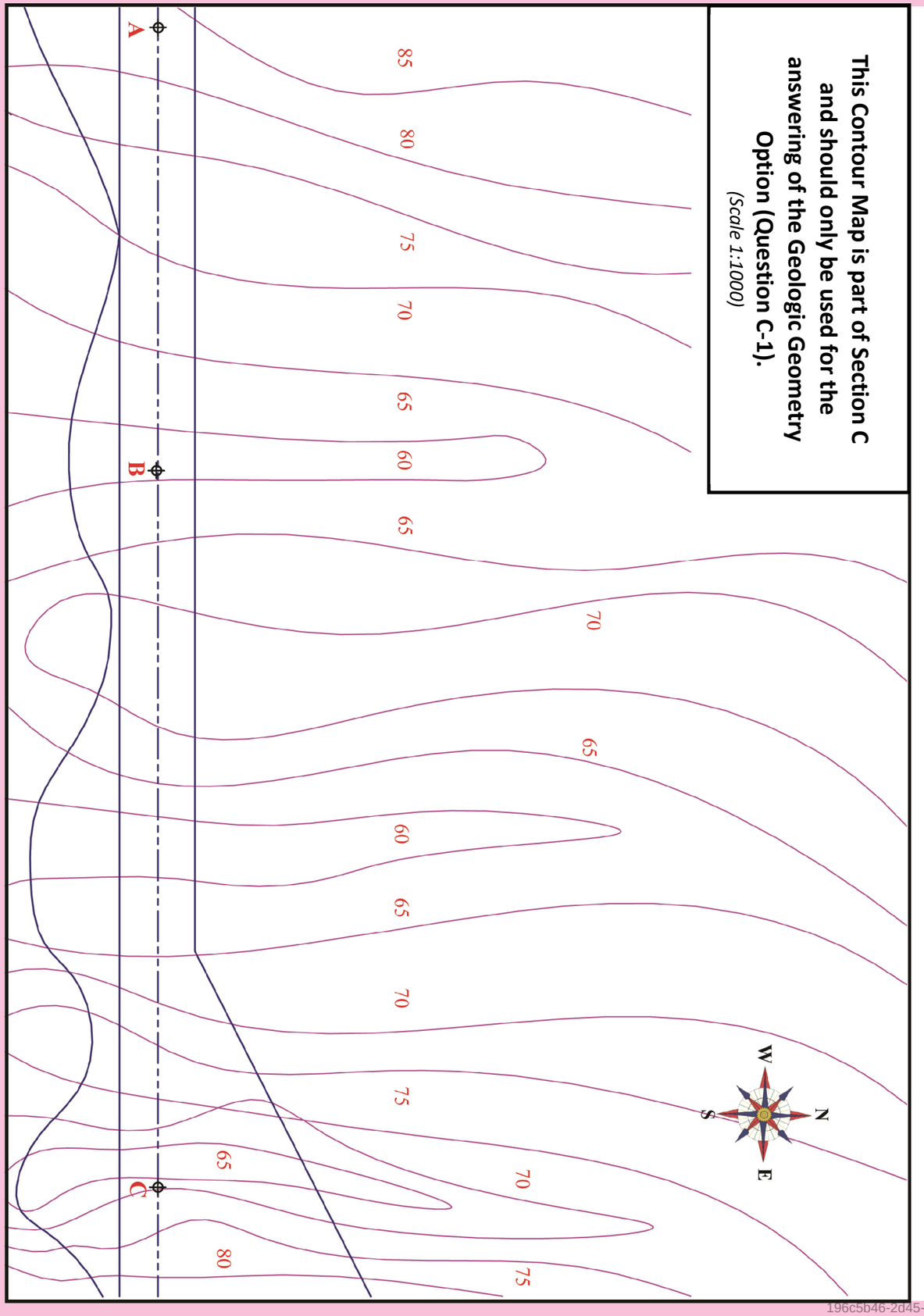
Name:

School's Name:

Teacher's Name:

This Contour Map is part of Section C and should only be used for the answering of the Geologic Geometry Option (Question C-1).

(Scale 1:1000)

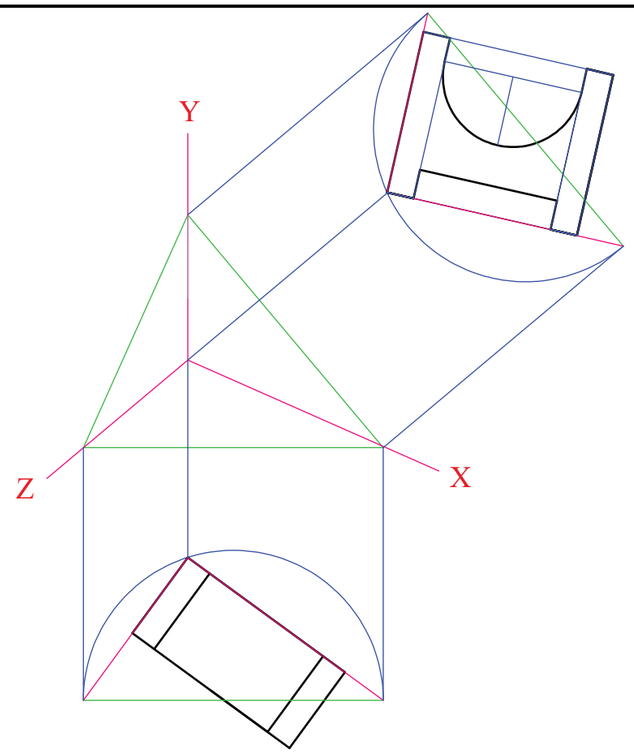


SECTION A - Core - Answer **any three** of the questions on this A3 sheet.

A-1. The 3D graphic shows a bridge which forms part of a train track.

A set of trimetric axes is shown on the right and the elevation and plan of a portion of a similar structure have been positioned as shown.

Draw the axonometric projection of the structure.

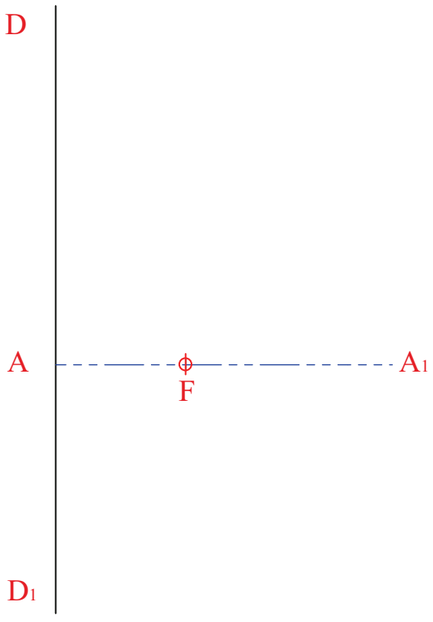


A-2. The image below shows the light cast on to a vertical wall from a spotlight in the ceiling. The outline of the light on the wall forms a hyperbola.

The drawing on the right shows the axis **A**-**A**$_1$, the directrix **D**-**D**$_1$ and the focus **F** of a similar hyperbola. The hyperbola has an eccentricity of 3:2.

(a) Locate the position of the vertex and draw a portion of the hyperbola.

(b) Locate a point **P** on the curve which is 35mm from the directrix and construct a tangent to the curve at point **P**.

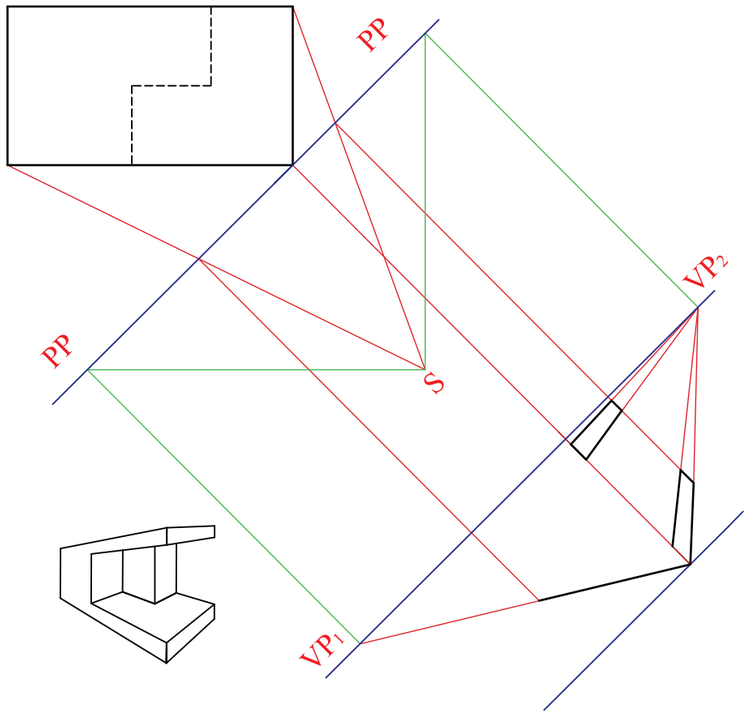


A-3. The 3D graphic shows a garden room.
The 3D sketch shows a similar structure composed of building blocks.

The drawing on the right is a partially completed perspective view of the structure.

(a) Complete the perspective drawing of the structure.

(b) Determine an auxiliary vanishing point for the 10° sloping faces of the triangular block and complete the drawing.

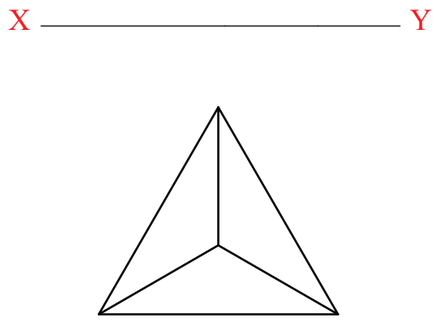


A-4. The image shows a handbag which is based on a tetrahedron.

The drawing on the right shows the plan of a similar tetrahedron.

(a) Draw an elevation of the tetrahedron.

(b) Find the dihedral angle between any two of the intersecting surfaces.



This examination paper must be returned at the end of the examination – You must include your Name, School's Name and Teacher's Name on the front cover.

There is no examination material on this page

Pre-Leaving Certificate Examination, 2020

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

Time: 3 Hours

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.*
- *The graphics presented are not necessarily drawn to scale and must not be used for scaling purposes.*
- *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 Name, School's Name and Teacher's Name in the box provided on section A and on all other sheets used.*

SECTION B - Core

Answer **any two** questions from this section on drawing paper.

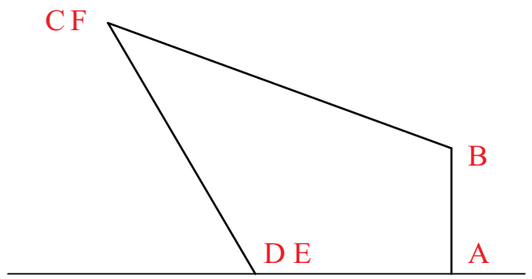
B-1. The image on the right shows the ***Glasshouse Hotel***, which consists of a series of intersecting triangular glass surfaces.

Fig. B-1 shows the plan and elevation of two similar intersecting planes.

Information relating to the horizontal and vertical co-ordinates for the points **A**, **B**, **C**, **D**, **E** and **F** are also given.

The plane **CDEF** is inclined at 60° to the horizontal plane.

Scale 1:1



A:	110	---	0	---	45
B:	110	---	?	---	65
C:	40	---	?	---	85
D:	70	---	0	---	45
E:	70	---	0	---	15
F:	40	---	?	---	15

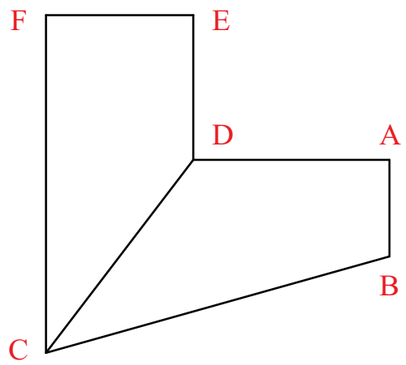


Fig. B-1

(a) Draw the plan and elevation of the surfaces **ABCD** and **CDEF** showing clearly how to find the altitude of points **B**, **C** and **F**.

(b) Determine the dihedral angle between the planes **ABCD** and **CDEF**.

(c) Show the traces of the plane which contains points **F**, **B** and **E**.

(d) Find the inclination of the surface **ABCD** to the vertical plane.

There is no examination material on this page

There is no examination material on this page

B-2. The image on the right shows the ***Peter Harrison Planetarium*** in London.

The structure is in the shape of a truncated cone.

The projection of a similar truncated cone is shown below, where the axis of the cone is inclined at 60° to the horizontal plane.

The elevation of the focal sphere is also shown.

(a) Draw the given elevation.

(b) Find the directrix, the focus and a vertex of the ellipse where the cone intersects the horizontal plane.

(c) Complete the plan of the truncated cone.

(d) Draw the true shape of the top cut surface of the truncated cone.

Scale 1:1

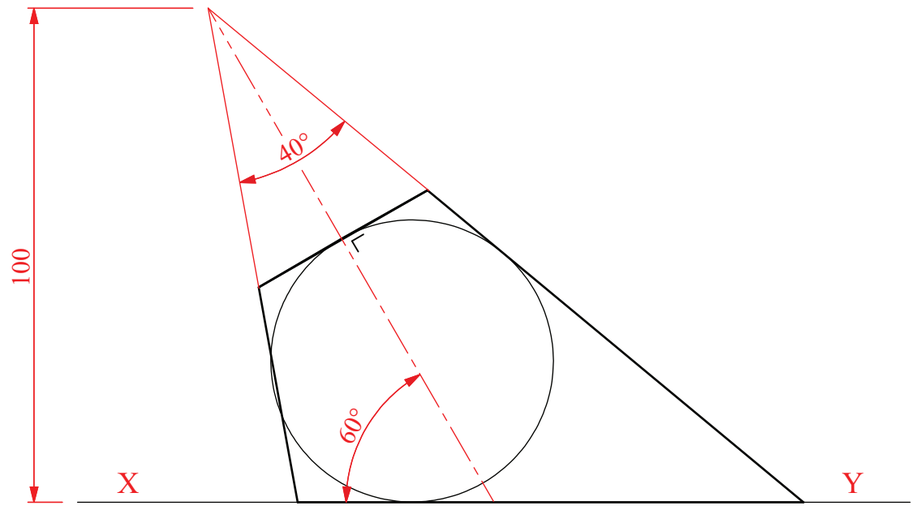


Fig. B-2

B-3. The image on the right shows a series of litter bins. The outline projections of the lid of a similar bin are shown below.

There is only one opening in the lid, which is on its front.

(a) Draw the given elevation and end view of the lid of the bin.

(b) Project a plan of the lid.

(c) Find the true shape of the opening in the lid.

Scale 1:1

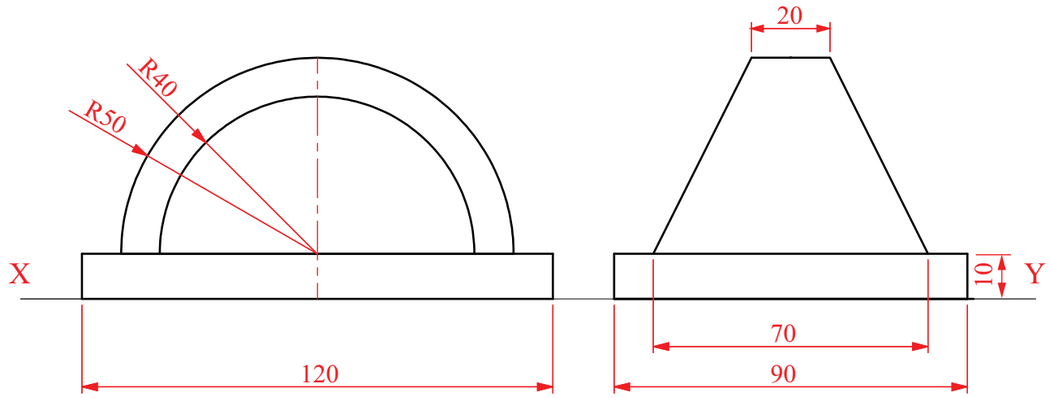


Fig. B-3

Assemblies

C-5. Details of a CCTV Camera and bracket are shown in Fig. C-5. The parts list is given on the right.

(a) Draw a full-size sectional elevation on **A-A$_1$** showing the parts fully assembled, with the central axis of the camera perpendicular to the wall on which it is mounted. *(All drilled holes are 8mm in diameter.)*

(b) Using a separate line diagram, establish the maximum angle that the camera can be rotated about a horizontal axis from its position in (a).

Part	Name	Qty.
1	Camera	1
2	Medium M8 bolt	1
3	Short M8 bolt	2
4	M8 nut	1
5	Plate	1
6	Swivel	1
7	Arm	1

Scale 1:1

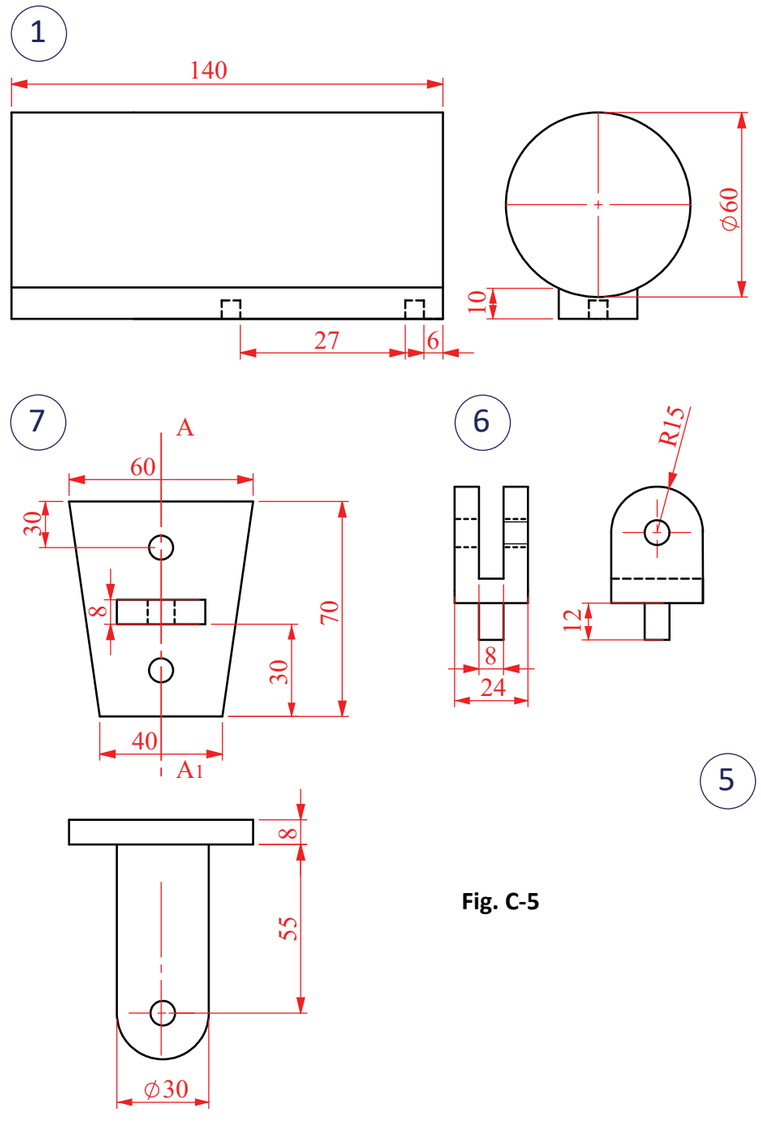


Fig. C-5

Dynamic Mechanisms

C-4. **(a)** The image on the right shows a lift barrier system.

A portion of the lift barrier system is shown in Fig. C-4(a).
It rotates clockwise about point **O** through an angle of 90° to move into an open position.
The system is pin jointed at points **A**, **B**, **C**, **D**, **E** and **F**.

Plot the locus of point **P** for this movement.

Scale 1:20

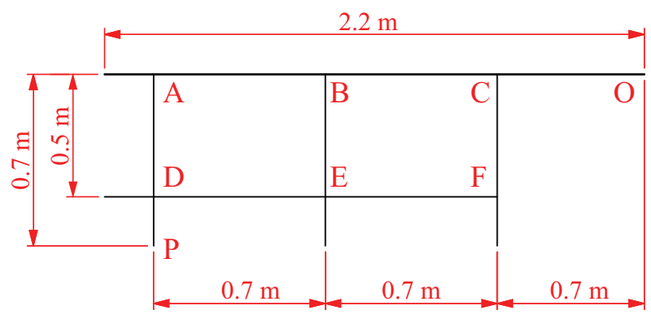


Fig. C-4(a)

(b) The image below shows the ***Evolution Tower*** in Moscow. It is based on a series of identical helical curves.

Fig. C-4(b) shows the elevation of a cylinder with points **A** and **B** on the front of the cylinder. These points represent the top and the bottom points of a similar helical curve.

(i) Draw the given elevation and project a plan.

(ii) Determine in elevation the helical path between **A** and **B**.

Scale 1:1

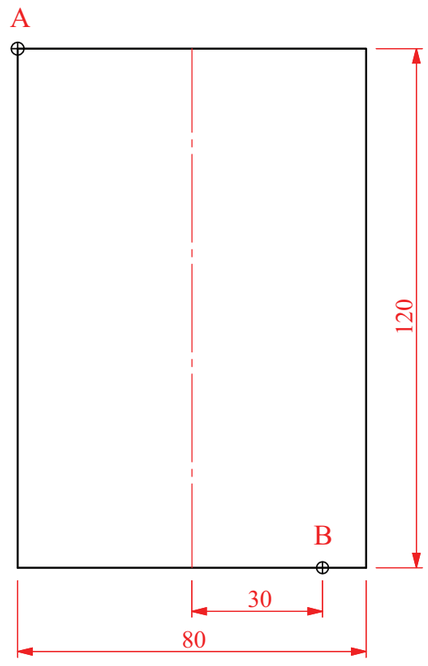


Fig. C-4(b)

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 roadway between **A** and **B** is level at an altitude of 70m. The section from **B** to **C** is rising uniformly to a level of 85m at **C**.

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

(*You may ignore the southern side.*)

(b) A borehole from **B** is drilled in a westerly direction in plan and is inclined at 65° to the horizontal plane. It reveals the top and bottom surfaces of the stratum at altitudes of 45m and 20m, respectively.

The strike of the stratum is north 50° east. The dip of the stratum is 45° bearing in a south-easterly direction.

Determine the thickness of the stratum.

Scale 1:1000

Structural Forms

C-2. The graphic on the right shows a jug.

The projections of the spout of the jug are shown in Fig. C-2.

The spout is created by translating the parabola **ABC** in a horizontal position along the parabola **BD**, which has its vertex at **D**.

(a) Draw the parabola **ABC**.

(b) Draw the elevation as shown.

(c) Project an end view of the spout as shown.

(b) Determine the true shape of the curve **EDF**.

Scale 2:1

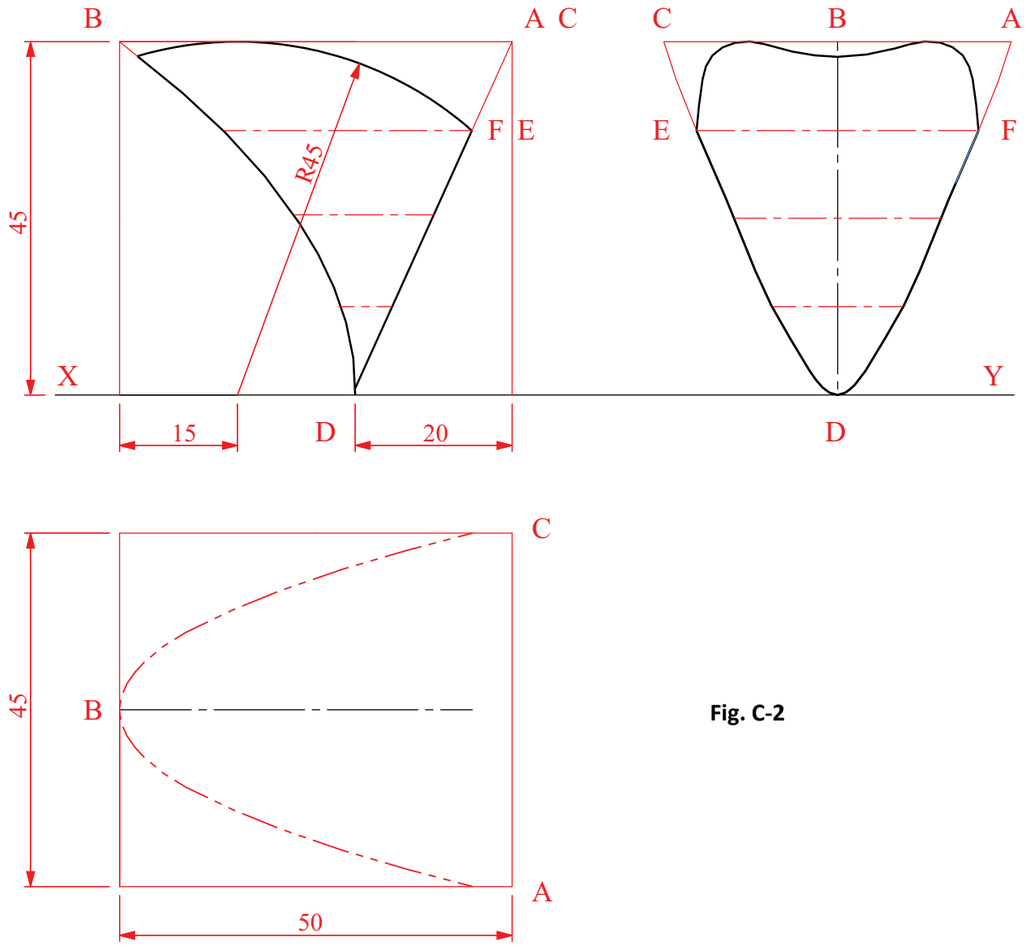


Fig. C-2

Surface Geometry

C-3. The image on the right shows a bottle of perfume.

Fig. C-3 shows the elevation and plan of a series of plane surfaces which form a portion of a similar bottle. These include a regular hexagon **A**, a pentagon **B** and a series of triangles **C**, **D** and **E**.

(a) Draw the projections of the inclined regular hexagon **A** and the regular pentagon **B**.

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

(c) Determine the horizontal trace and the vertical trace of the plane that contains the surface **E**.

(d) Determine the true inclination of surface **E** to the vertical plane.

Scale 1:1

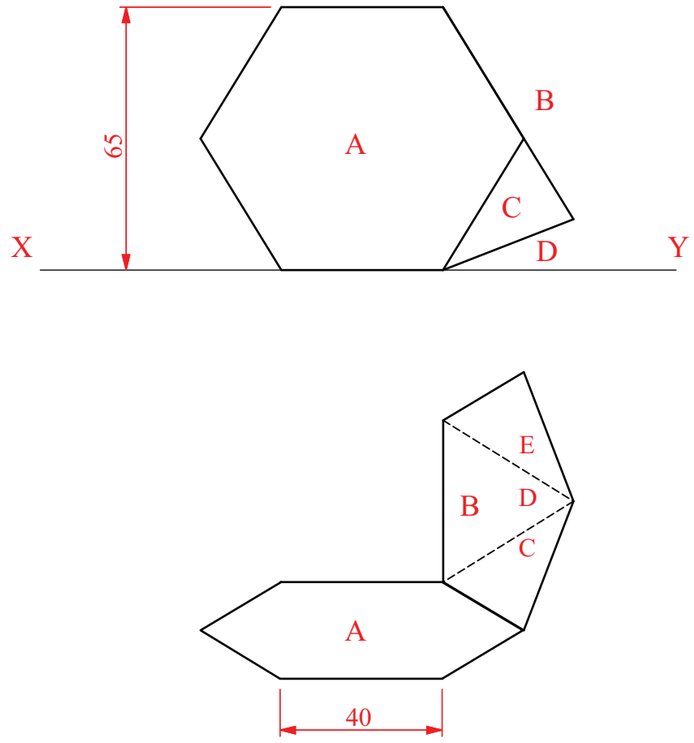


Fig. C-3