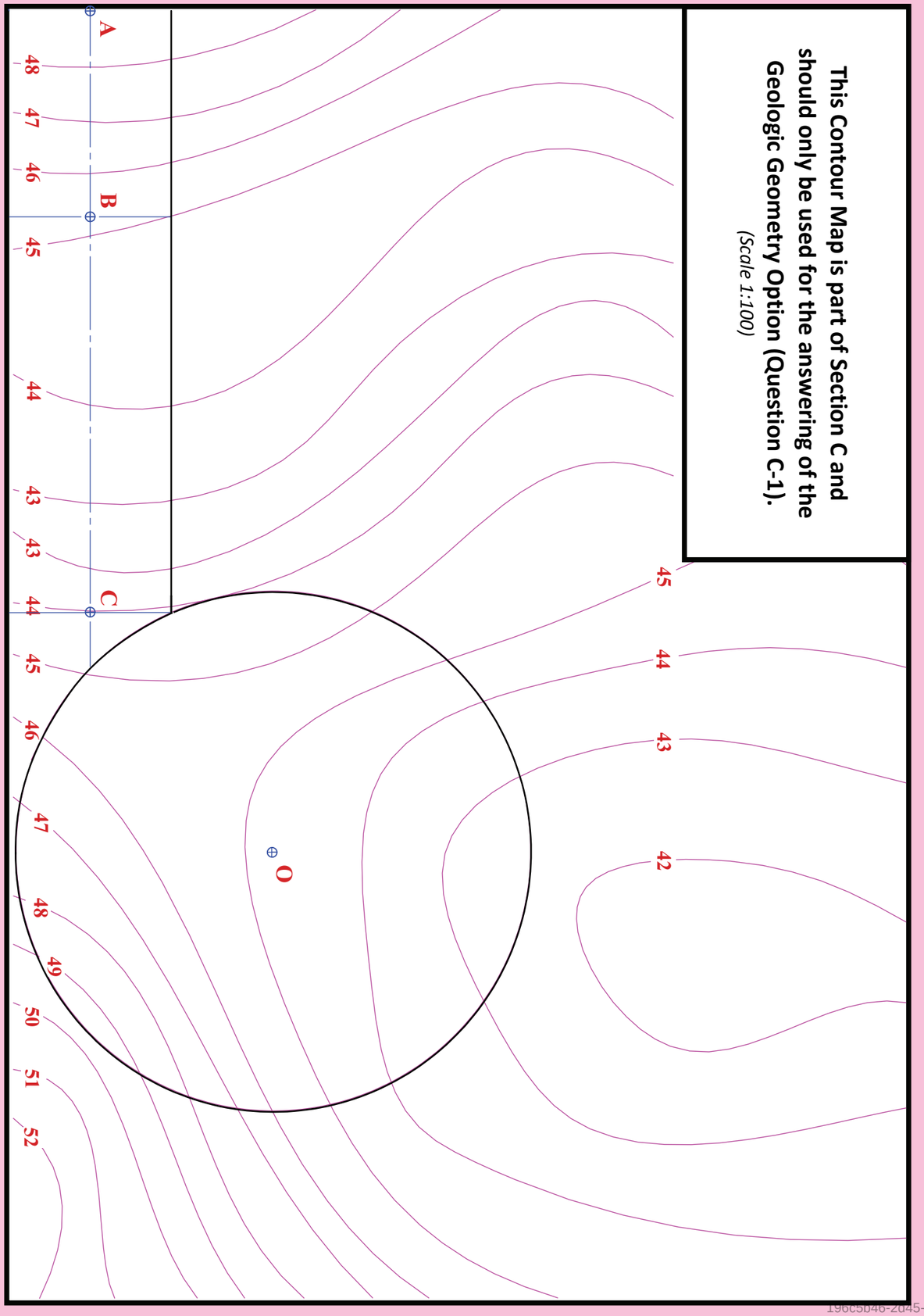


This Contour Map is part of Section C and should only be used for the answering of the Geologic Geometry Option (Question C-1).

(Scale 1:100)

L.85A

Pre-Leaving Certificate Examination, 2018

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

Name:

School Name:

Teacher's Name:

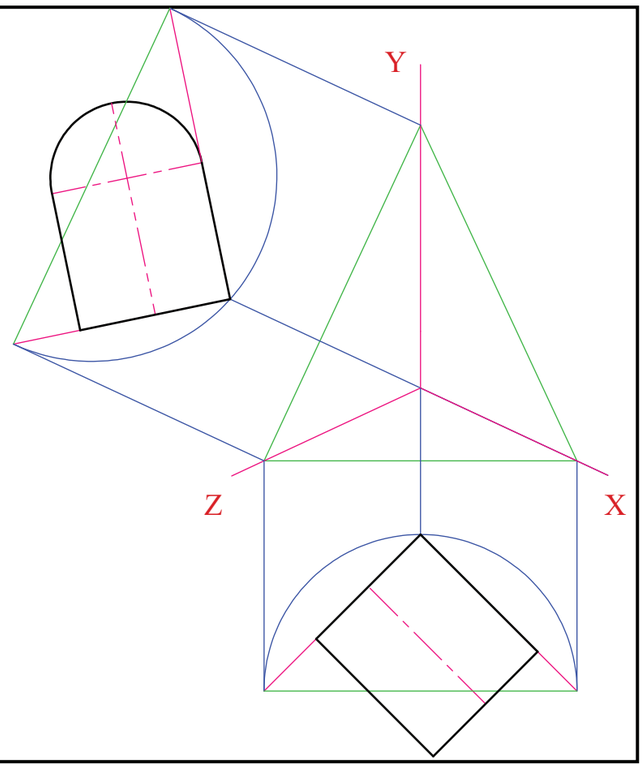
SECTION A - Core - Answer **any three** of the questions on this A3 sheet.

A-1. The image below shows a post box.

A set of dimetric axes is shown on the right and the elevation and plan of the post box have been positioned as shown.

(a) Draw the axonometric projection of the post box.

(b) Determine the true shape of the curved surface of the post box.

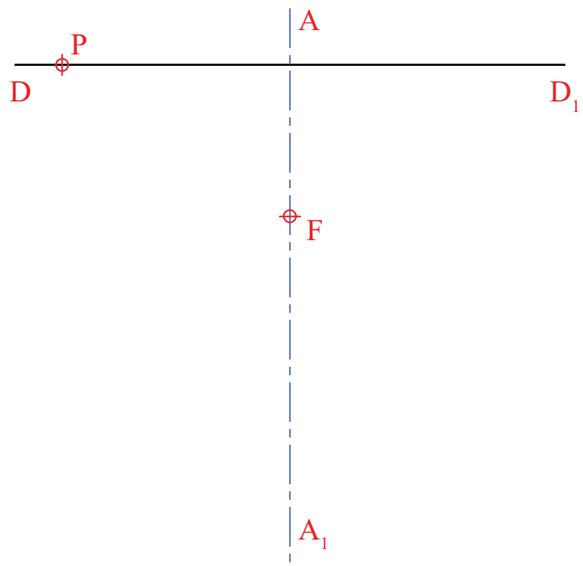


A-2. The graphic below shows a modern house. The main roof is based on a parabola.

The drawing on the right shows the axis $\mathbf{AA_1}$, the directrix $\mathbf{DD_1}$ and the focus **F**, of a similar parabola. **P** is a point on the directrix.

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

(b) Draw a tangent to the curve at the point **P**.

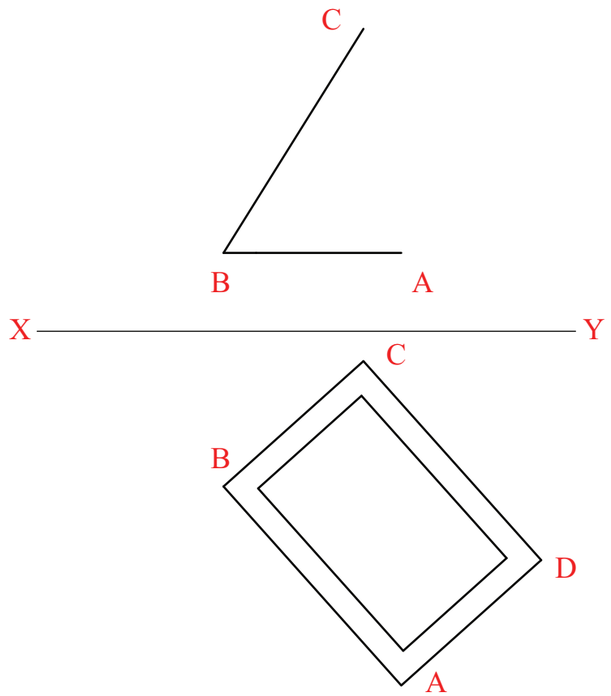


A-3. The graphic below shows a tablet and stand.

The drawing on the right shows the plan and partially completed elevation of a similar tablet.

(a) Complete the elevation of the sloping surface **ABCD**.

(b) Determine the vertical and horizontal traces of the oblique plane which contains the surface **ABCD**.

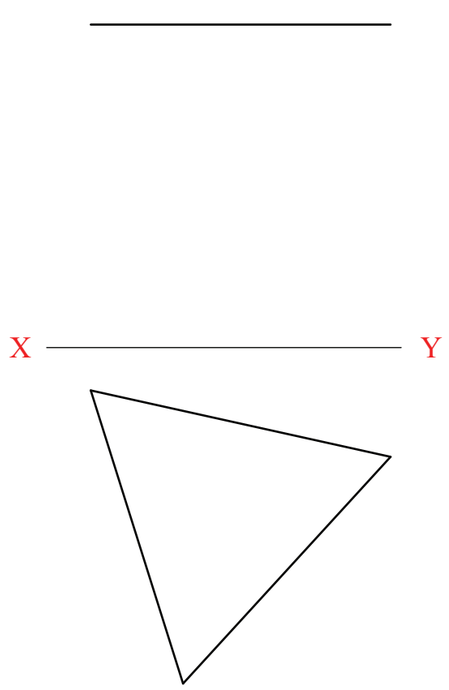


A-4. The graphic below shows a table which is based on an inverted tetrahedron.

The drawing on the right shows the incomplete plan and elevation of a similar inverted tetrahedron.

(a) Complete the plan and elevation of the tetrahedron.

(b) Draw the plan and elevation of the largest possible sphere that could be contained inside the tetrahedron.



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

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Pre-Leaving Certificate Examination, 2018

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.*
- *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 Name and Teacher's Name in the box provided on section A and on all other sheets used.*

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SECTION B - Core

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

B-1. The image on the right shows a concrete garden table.

The table comprises regular pentagons for the top and base.
These pentagons are connected by a series of ten identical triangles.
The height of the table is 900mm.

Fig. B-1 shows the plan of the table.

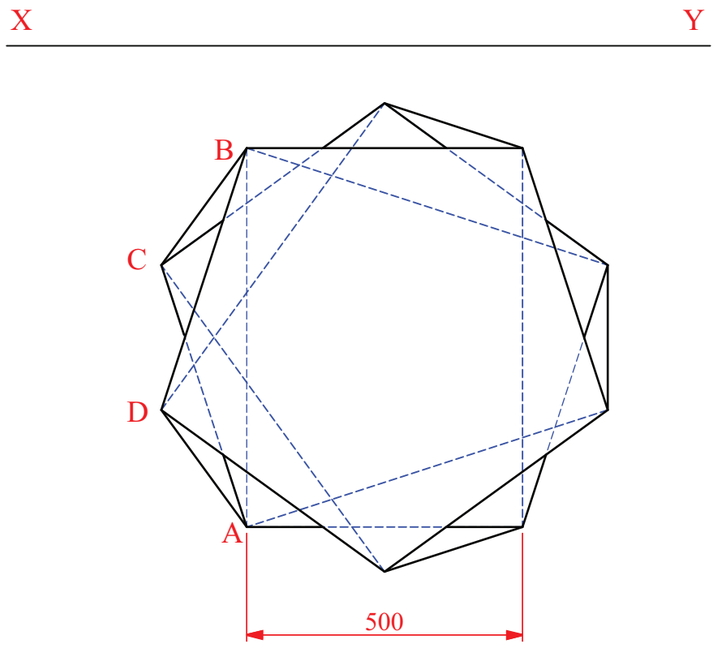

Fig. B-1

(a) Draw the given plan of the pentagons and of the surfaces **ABC** and **ABD**.

(b) Draw an elevation of the surfaces **ABC** and **ABD**.
Determine the dihedral angle between these two surfaces.

(c) Determine the traces of the surface **ABC** and then determine the inclination of the surface **ABC** to the vertical plane.

Scale 1:10

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B-2. The image on the right shows a display stand used for necklaces in a jewellery shop.

Fig. B-2 below shows the elevation and plan of a similar display stand. The curve **AB** is parabolic, with its vertex at **A**. A truncated cylinder penetrates the shaped base as shown.

(a) Draw the given plan and elevation of the display stand.

(b) Project an end view in the direction of arrow **A**.

Scale 1:4

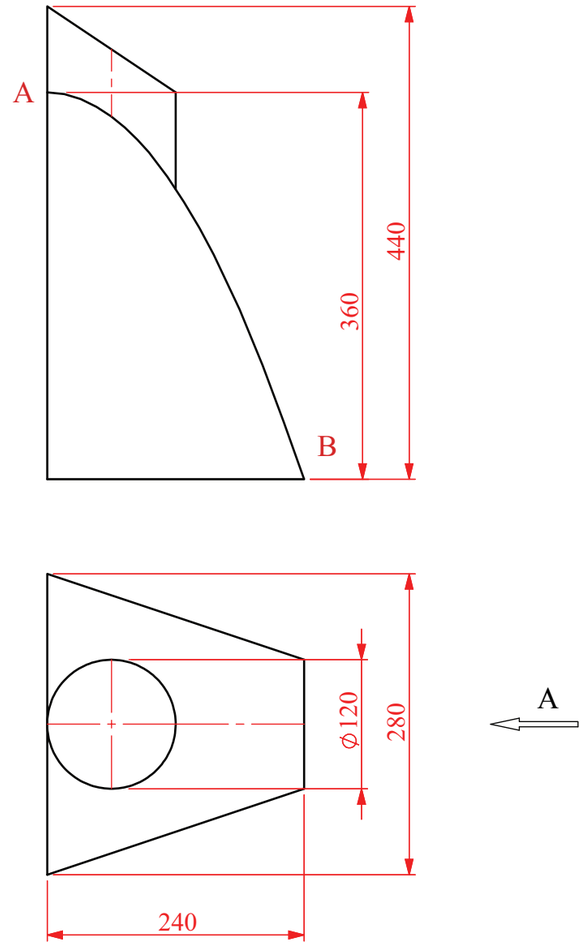


Fig. B-2

B-3. Fig. B-3 shows the plan and elevation of a speaker, similar to the one shown in the image on the right.

Draw the given plan and make a perspective drawing of the structure, given the following:

- The spectator point, **S**, is 375mm from corner **A**
- The picture plane is touching corner **A**
- The horizon line is 200mm above the ground line.

Use an auxiliary vanishing point to determine the sloping surface of the speaker in the perspective drawing.

Scale 1:5

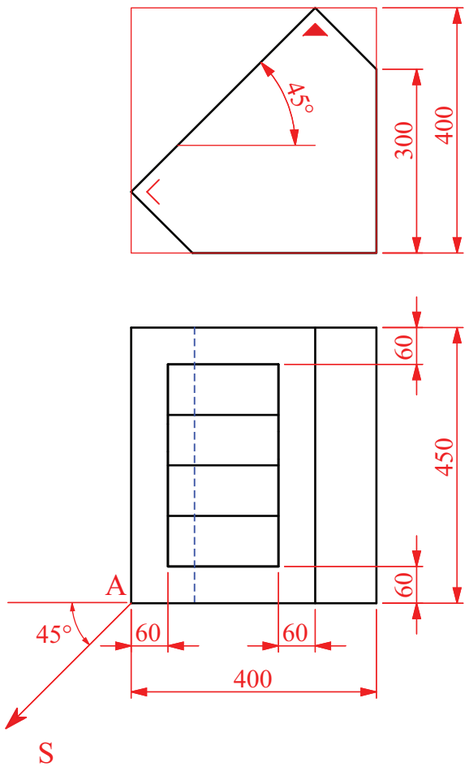
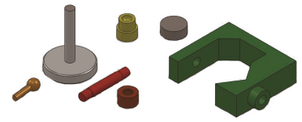


Fig. B-3

Assemblies

C-5. Details of a ***camera clamp*** are shown in Fig. C-5. The clamp can be fixed to cylindrical bars of various radii. The parts list given on the right together with a partially exploded 3D graphic of the camera clamp and its constituent parts.



Part	Name	Qty.
1	Plate	1
2	Fixing clamp	1
3	Moving plate	1
4	Socket piece	1
5	Swivel bolt	1
6	Adjustable clamp	1
7	Extending arm	1

(a) Draw a full-size sectional elevation on **A-A**, showing the parts fully assembled and fixed to a cylindrical bar with a radius of 10mm. *(Unless otherwise stated, fillets are 6mm and chamfers 1×1mm. Some dimensions have been removed for clarity and any omitted dimensions may be estimated.)*

(b) Determine, and indicate on your drawing, the maximum radius of a cylindrical bar that the camera clamp can be fixed to.

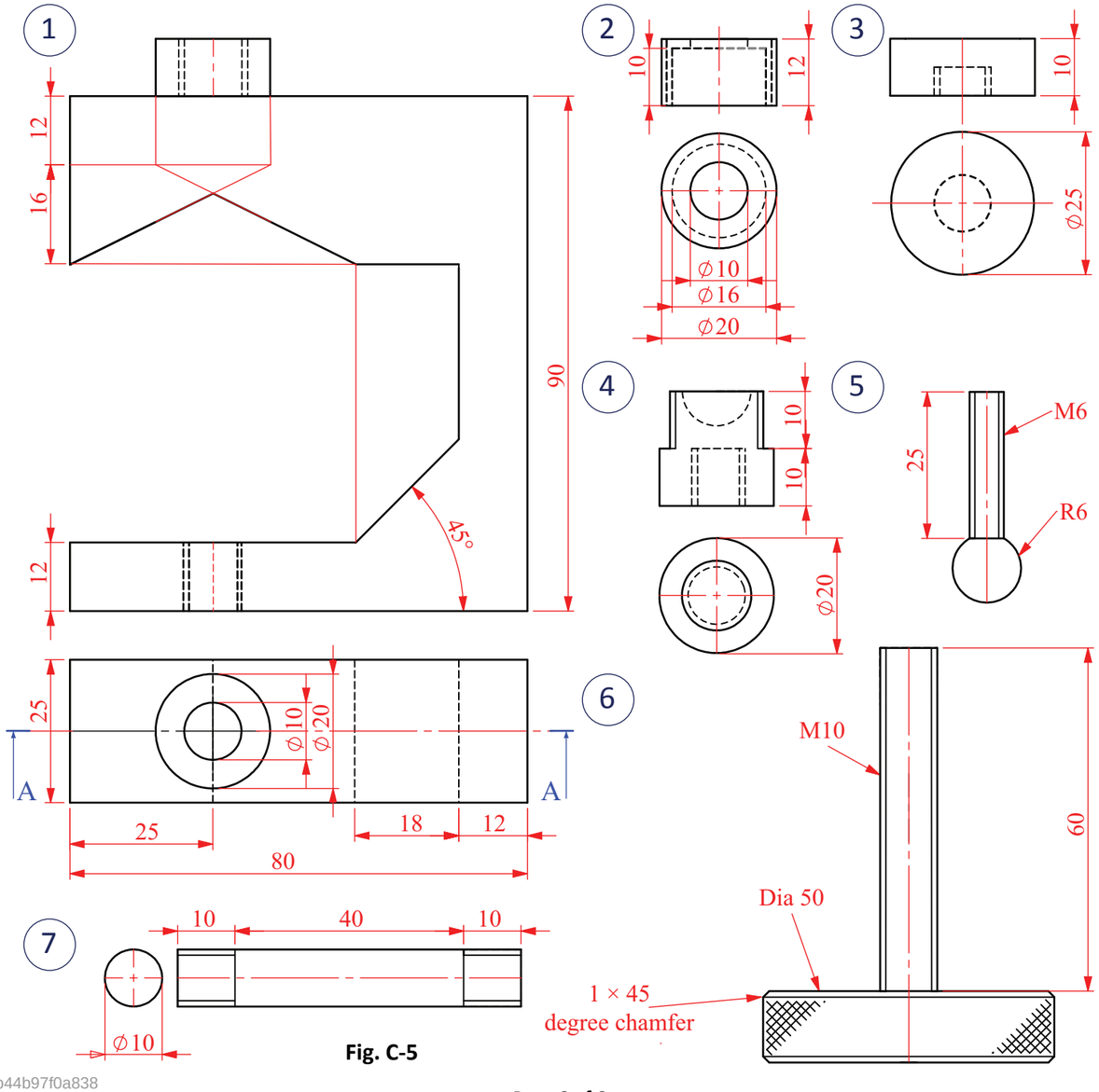


Fig. C-5

Dynamic Mechanisms

C-4. **(a)** The image on the right shows a spiral staircase.
The design is based on a Logarithmic spiral.

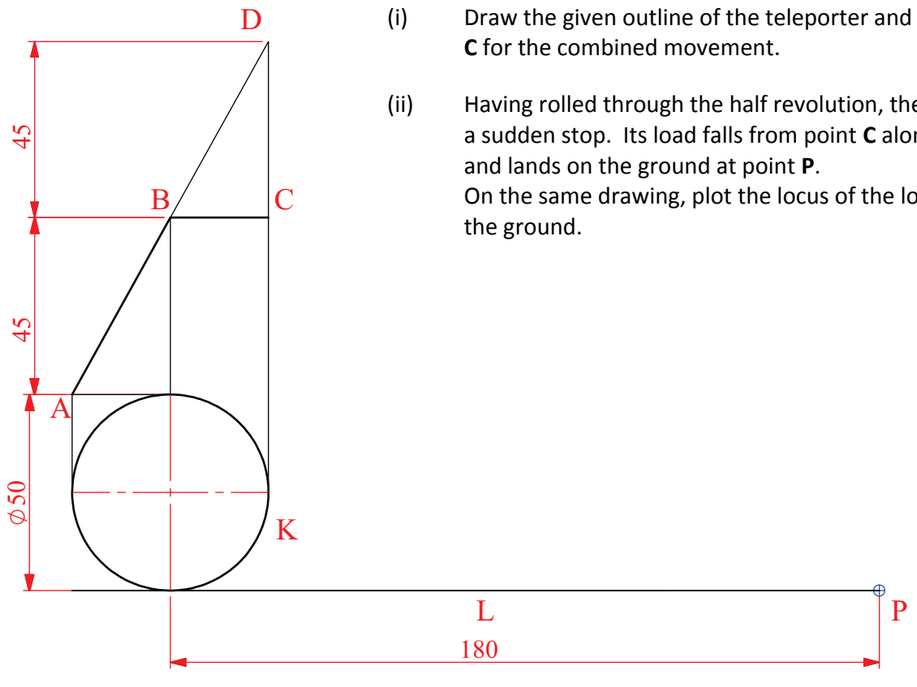
Draw a Logarithmic spiral. The spiral has an initial radius of 80mm with each successive radius reducing in a ratio of 8:7 over 30°.

Scale 1:1

(b) The graphic on the right shows a teleporter.
Details of the teleporter are given in Fig. C-4(b) below.

Along with the ability to rotate, the main arm of the teleporter is telescopic and extends if required.

The telescopic arm extends from **AB** to **AD** while the platform **BC** remains **horizontal**. At the same time, the teleporter moves forward, with the wheel **K** rolling clockwise for **half** of one revolution.



(i) Draw the given outline of the teleporter and plot the locus of point **C** for the combined movement.

(ii) Having rolled through the half revolution, the teleporter comes to a sudden stop. Its load falls from point **C** along a parabolic path and lands on the ground at point **P**.
On the same drawing, plot the locus of the load as it falls to the ground.

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 one metre vertical intervals on a proposed path to a circular tee area at a golf course.

On the map, **ABC** is the centreline of the path and **O** is the centre of the circular tee area.
The path has the following specifications:

- the portion of the path between **A** and **B** is level at an altitude of 45m
- the portion of the path from **B** to **C** is rising uniformly to a level of 46m at **C**
- the circular tee area is level at an altitude of 46m.

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

(b) The designer of the golf course is considering elevating the tee area to an altitude of 47m.
On the same contour map, show the earthworks necessary to accommodate the higher tee area.
Points **A**, **B** and **C** in the elevated tee area are at 45m, 45m and 47m, respectively.

Scale 1:100

Structural Forms

C-2. The image on the right shows the *L'Oceanographic*, an oceanarium in Valencia, Spain. The roof structure is based on a hyperbolic paraboloid.

Fig. C-2 shows the plan and elevation of the roof structure which is sectioned as shown.

The generating parabola **ABC** is represented by a dotted line in the outline end view and it moves in a vertical position along the parabola **BD**.

B is the vertex of the parabola **ABC** and **D** is the vertex of the parabola **BD**.

(a) Draw the given elevation of the structure.

(b) Draw the end view of the generating parabola **ABC**.

(c) Project the plan of the structure.

(d) Determine the true shape of the surface **EBF**.

Scale 1:200

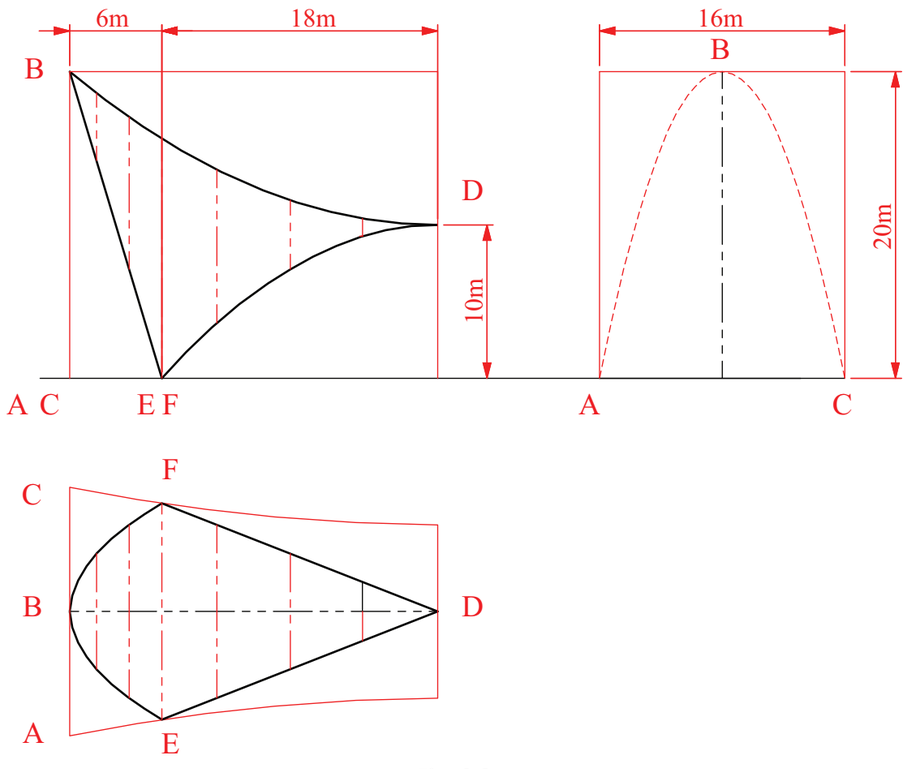


Fig. C-2

Surface Geometry

C-3. The image on the right shows *Áras Chill Dara* in Naas, Co. Kildare. Its architectural design includes several intersecting sloping glass surfaces.

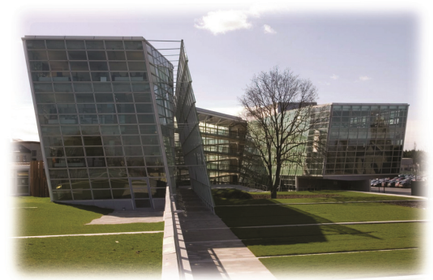


Fig. C-3 below shows the outline plan and elevation of a similar structure.

(a) Surface **A** has a pitch of 65°. Draw the plan and elevation of surface **A**.

(b) Surface **B** has a pitch of 75°. Draw the plan and elevation of surface **B**.

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

(d) The dihedral angle between surfaces **C** and **D** is 140°. Complete the projections of surfaces **C** and **D**.

Scale 1:100

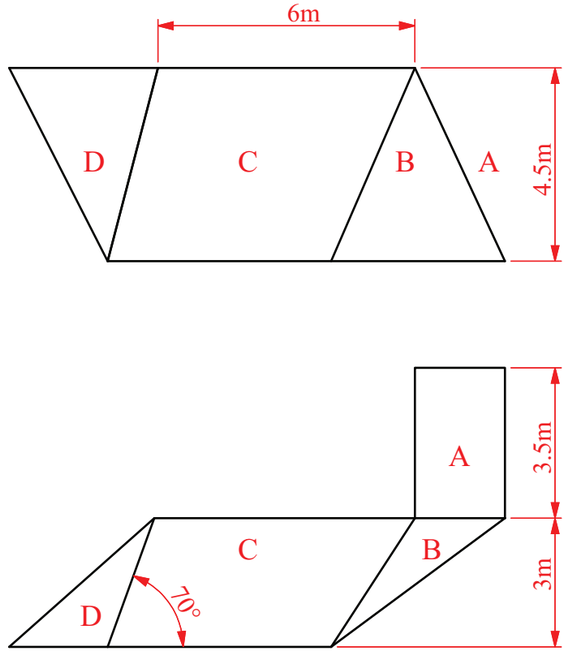


Fig. C-3