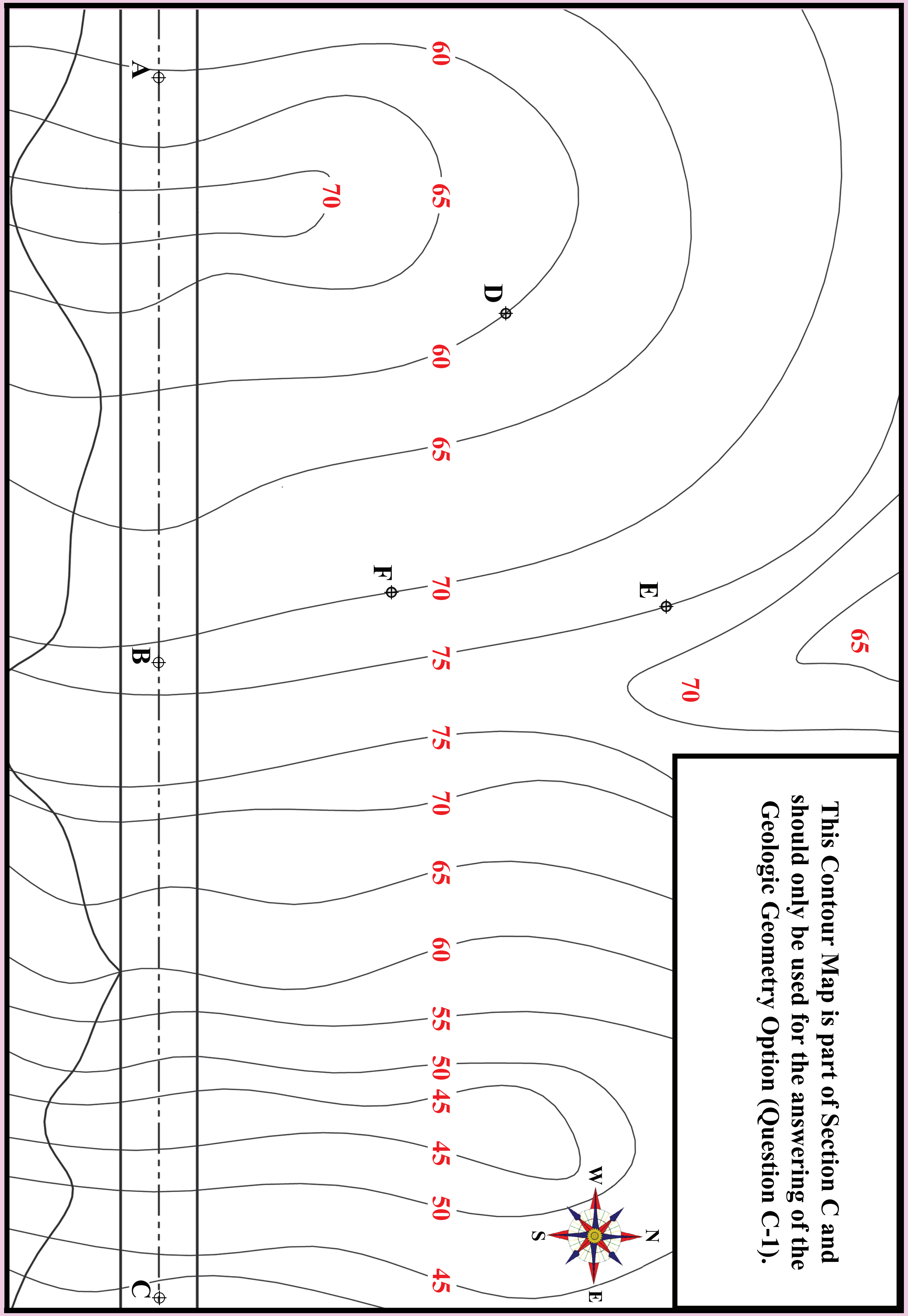


Pre-Leaving Certificate Examination, 2013

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 name in the box below and on all other sheets used.*

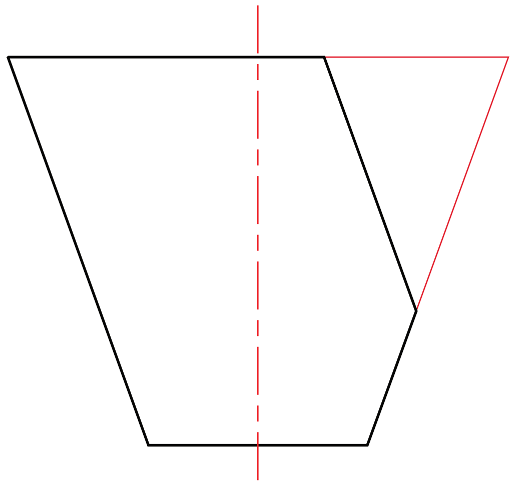
Name:	
School Name:	
Teacher Name:	

SECTION A - Core - Answer **Any Three** of the questions on this A3 sheet

A-1. The 3D graphic below shows a helmet from a set of armour used by a local drama group. It consists of two truncated cones. The drawing on the right shows the elevation of the top truncated cone. The true shape of the cut surface is a parabola.

(a) Use a focal sphere to find the directrix and the focal point of the parabola.

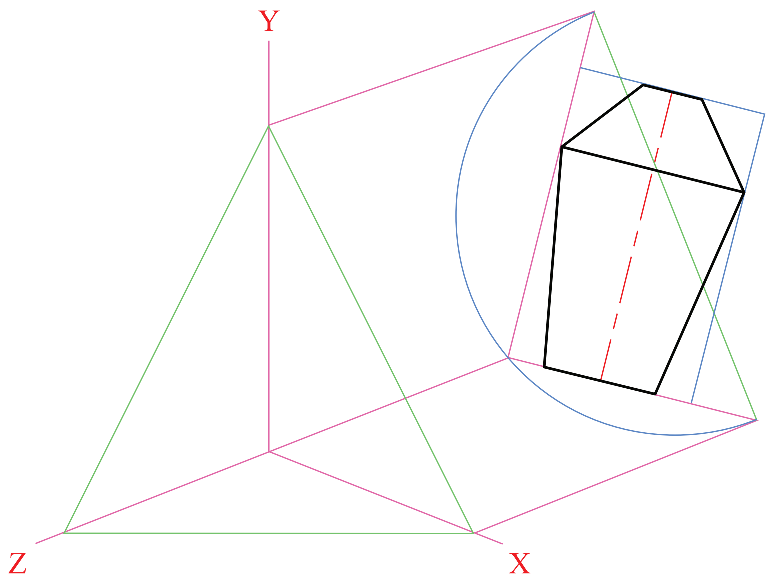
(b) Draw a portion of the curve.



A-2. The 3D graphic below shows a pair of garden lights. The head of the light consists of two square-based truncated pyramids.

The drawing on the right shows a set of dimetrix axes. The elevation of a similar lamp head has been positioned relative to the axes as shown.

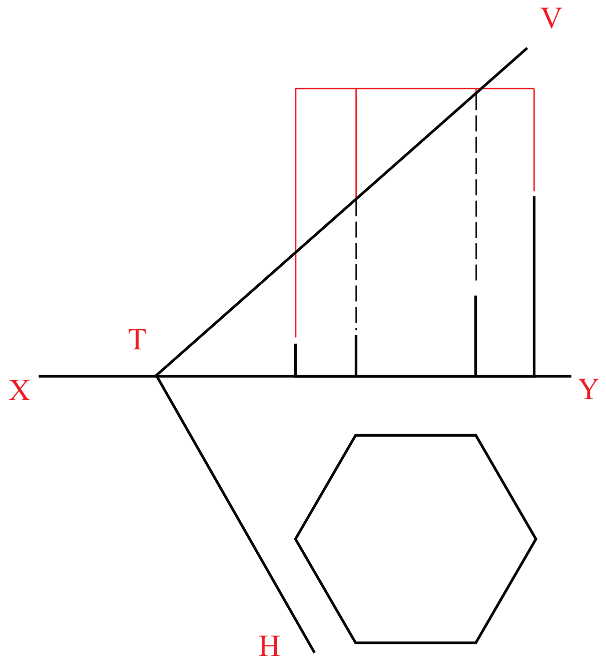
Draw the plan in its correct position and complete the axonometric projection.



A-3. The 3D graphic below shows an office building. It is based on truncated hexagonal prisms. The drawing on the right shows how a prism is truncated.

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

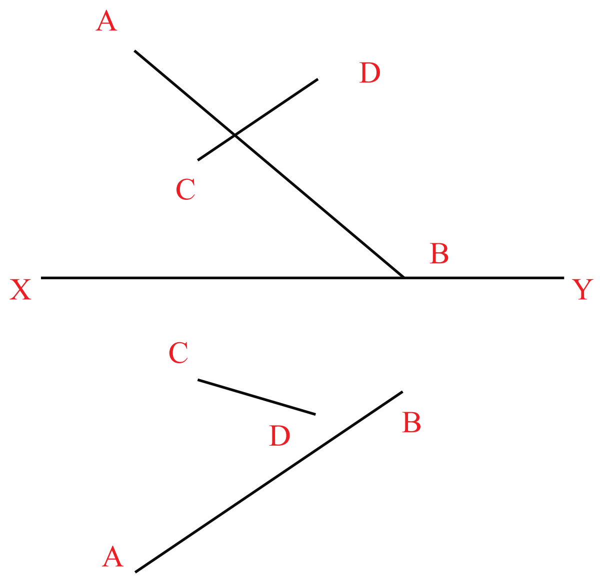
(b) Determine, and indicate in degrees, the inclination of the cut surface to the vertical plane.



A-4. The graphic below shows a miner in a borehole. The positions of two boreholes are represented by the projections of two skew lines **AB** and **CD** as shown.
To facilitate access between the boreholes a horizontal borehole is required.

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

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



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

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Pre-Leaving Certificate Examination, 2013

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 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 a sculpture which is located in Massachusetts, USA. It is formed by a series of intersecting planes.

The horizontal and vertical coordinates for two of the planes **ABC** and **DEF** are given below.

A	=	45	---	95	---	80
B	=	20	---	10	---	20
C	=	95	---	25	---	50
D	=	95	---	70	---	25
E	=	15	---	95	---	55
F	=	60	---	5	---	75

(a) Draw the plan and elevation of the planes.
(Use a horizontal orientation for the A3 sheet to maximise space.)

(b) Determine the line of intersection between the planes.

(c) Determine the dihedral angle between the planes.

(d) Determine the inclination between the line **AB** and the horizontal plane.

Scale 1:1

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B-2. The image on the right shows the Citigroup Centre, one of the ten tallest skyscrapers in New York City.

Fig. B-2 shows the plan and elevation of a portion of a model of the building.

(a) Draw the given plan.

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

- The picture plane passes through the corner **A**
- The spectator **S** is 250mm from the corner **A**
- The horizon line is 120mm above the ground line.

Use an auxiliary vanishing point to locate the sloping edges of the building.

Scale 1:20

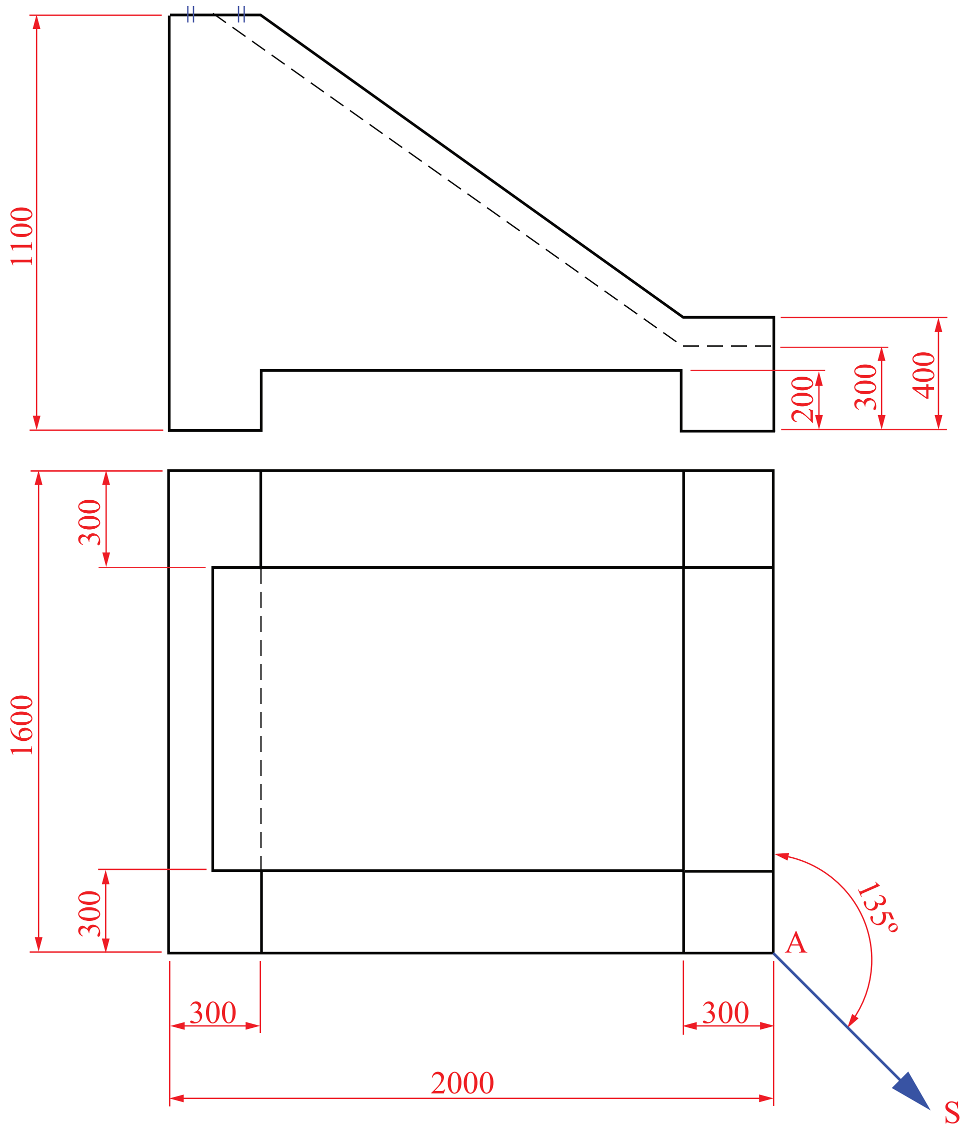


Fig. B-2

B-3. The image on the right shows a tent.

Fig. B-3 below shows the elevation and partially completed plan of a similar tent with an opening as shown in the elevation. The design is based on a square-based pyramid sitting on a square-based pyramid. The opening is an isosceles triangle as shown.

(a) Draw an elevation and plan of the tent without the opening with the edge **AB** inclined at 60º to the vertical plane and with the apex 60mm from the vertical plane.

(b) Show the projections of the opening in both views.

(c) Draw the traces of the oblique plane which will contain surface **P**.

Scale 1:40

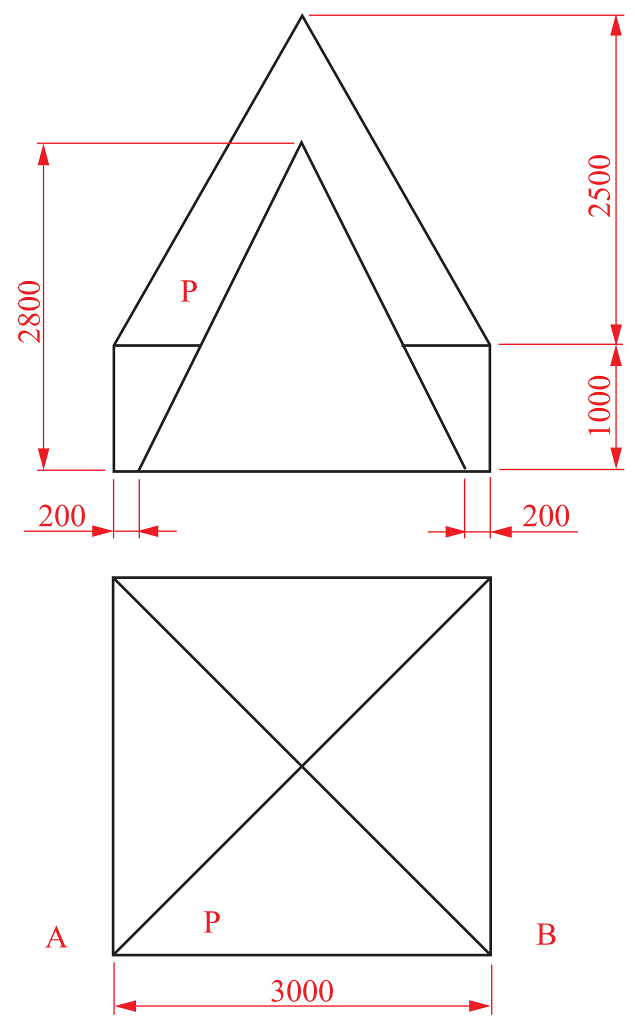


Fig. B-3

Assemblies

C-5. **(a)** Details of a **Magazine Rack** are shown in Fig. C-5. The parts list is given on the right. Draw the sectional elevation A-A and end elevation of the magazine rack. *(Any omitted dimensions may be estimated.)*

(b) To facilitate the assembly of the piece, which part number would be last to be put in place?

Part	Name	Qty.
1	Sides	2
2	Rails	4
3	Base	1
4	Dowels	14
5	Handle	1

Scale 1:2

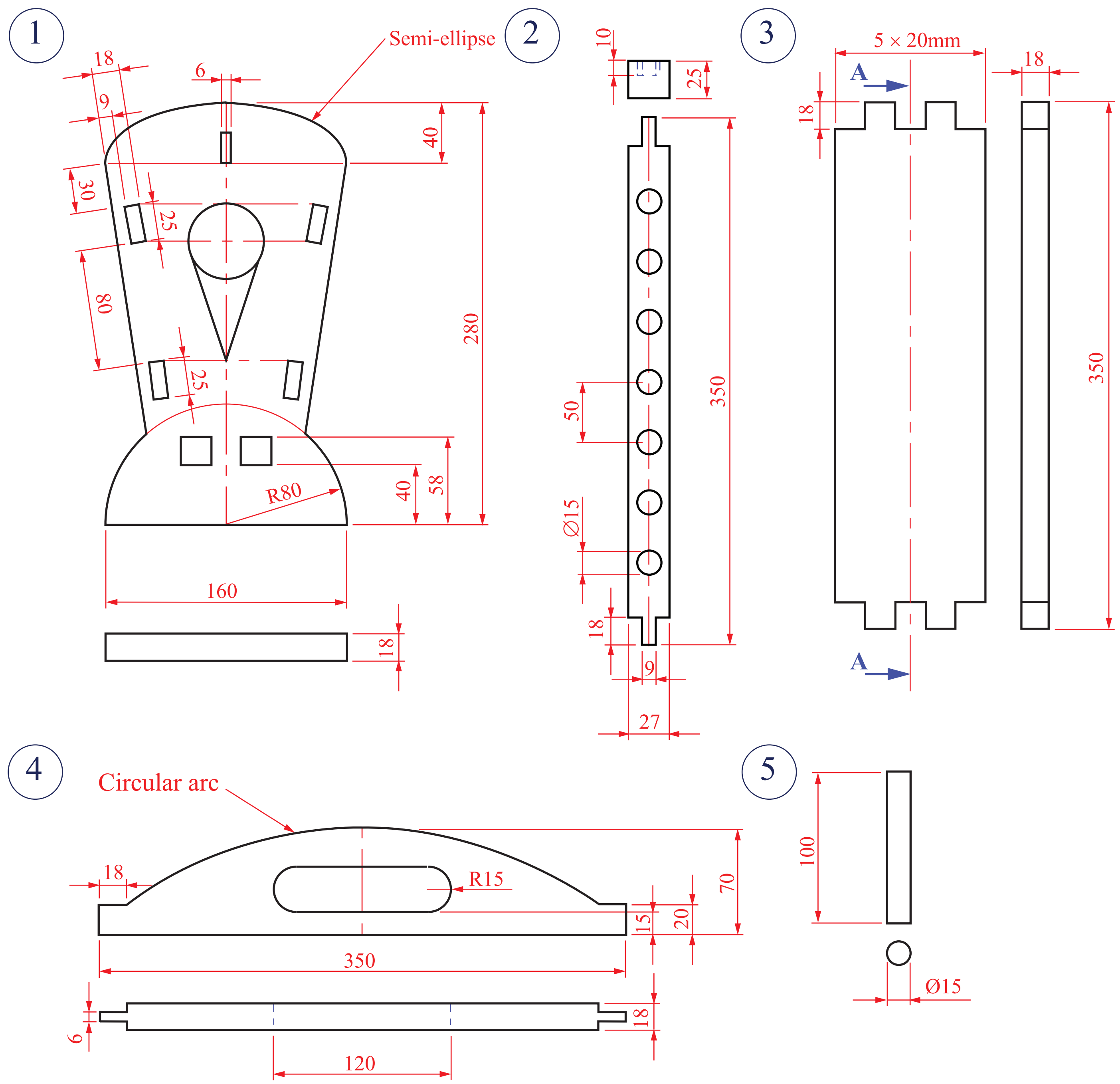


Fig. C-5

Dynamic Mechanisms

C-4. (a) The 3D graphic below shows a toy train.

A cam on the axle of the train causes the chimney to go up and down as the train rolls.

Fig. C-4(a) on the right shows the details of the cam.

(i) Draw the given cam.

(ii) Draw the displacement diagram which results from a clockwise rotation.

Scale 5:1 (Enlarged Scale)

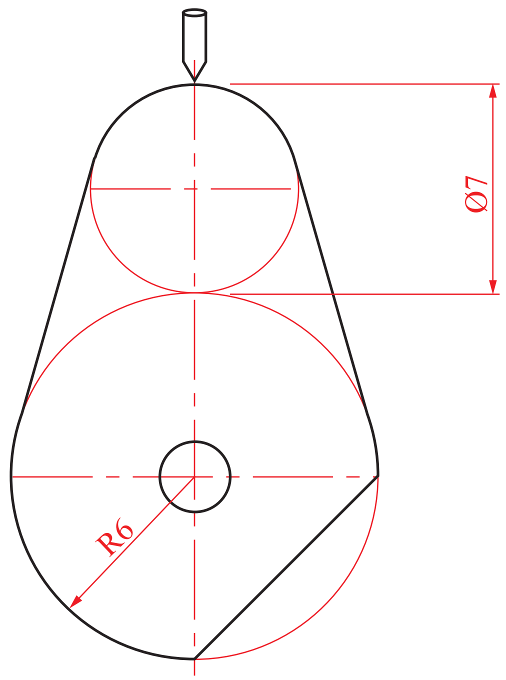


Fig. C-4(a)

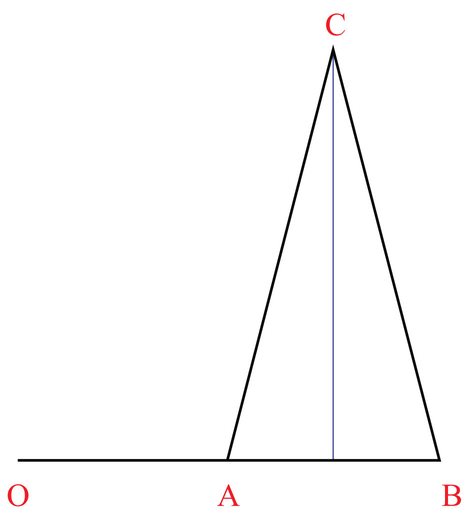
(b) The 3D graphic on the right shows a door closing mechanism. The mechanism is similar to the one shown in Fig. C-4(b) below.

Crank **OB** rotates anti-clockwise about **O** through an angle of 90º. **B** and **C** are pin-jointed and **A** is fixed.

(i) Draw the line diagram.

(ii) Plot the locus of point **C** for the 90º rotation.

Scale 1:1



Arm Lengths

OA = 40
OB = 80
AC = 80
BC = 80

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 roadway has the following specification:

(i) the section of the roadway between **C** and **B** is level at an altitude of 60m

(ii) the section from **B** to **A** has a gradient of 1 in 20 falling.

Using side slopes of 1 in 1 for the embankments and 1 in 1.5 for the cuttings, 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.

(i) Determine the dip and strike of the stratum.

A skew borehole at **E** is drilled in an easterly direction in plan and has an actual inclination of 45º to the horizontal plane. It reveals the bottom surface of the stratum at a distance of 25m for **E**.

(ii) Determine the thickness of the stratum.

Scale 1:1000

Structural Forms

C-2. The 3D graphic on the right shows a building. The roof of the building is in the shape of a hyperbolic paraboloid.

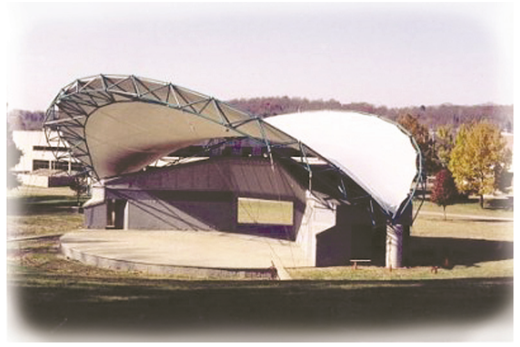


Fig. C-2 below shows the projections of the building. The perimeter is an ellipse in plan and the outline shape of the building is formed by extending the hyperbolic paraboloid surface **ABCD**. The main body of the building is cylindrical as shown.

(a) Draw the plan and elevation of the roof of the building.

(b) Draw the projections of the main body of the building. *(Show all hidden detail.)*

(c) A plane director for the elements **AD** and **BC** is positioned so that it contains the point **A**. Draw the traces of this plane director.

Scale 1:100

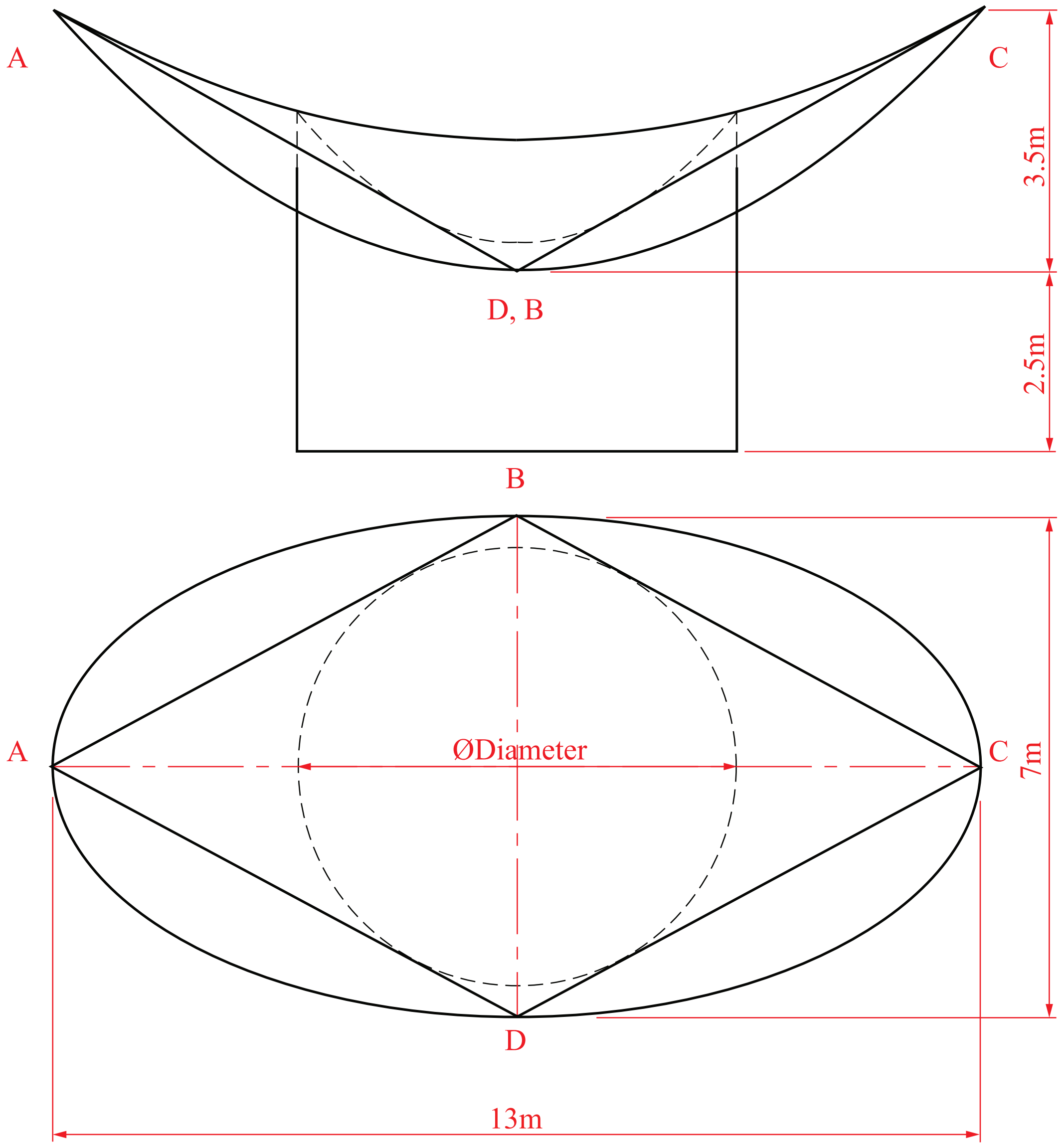


Fig. C-2

Surface Geometry

C-3. The 3D graphic on the right shows a coal bucket. It is based on two truncated cones.

Fig. C-3 below shows the plan and elevation of the coal bucket without the handles.

(a) Draw the given views.

(b) Draw the development of the lower portion of the bucket. Determine the smallest rectangular piece of sheet material which could be used to make this portion of the bucket.

(c) Use a focal sphere to find the directrix, the vertex and the focus of the elliptical portion on the top of the bucket.

Scale 1:5

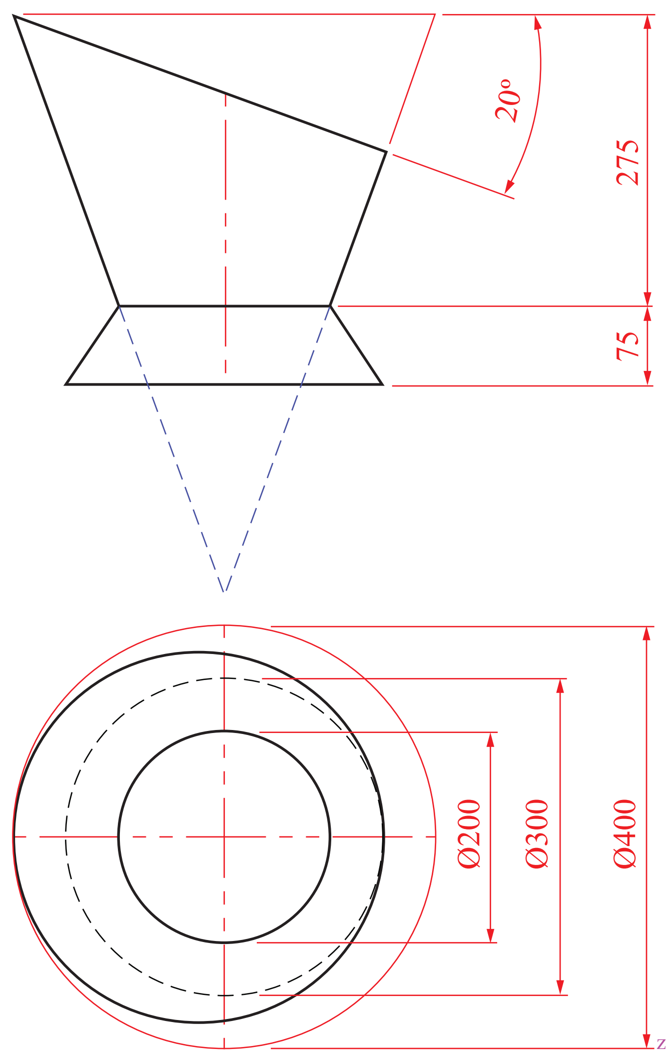


Fig. C-3