Pre-Leaving Certificate Examination, 2015

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.

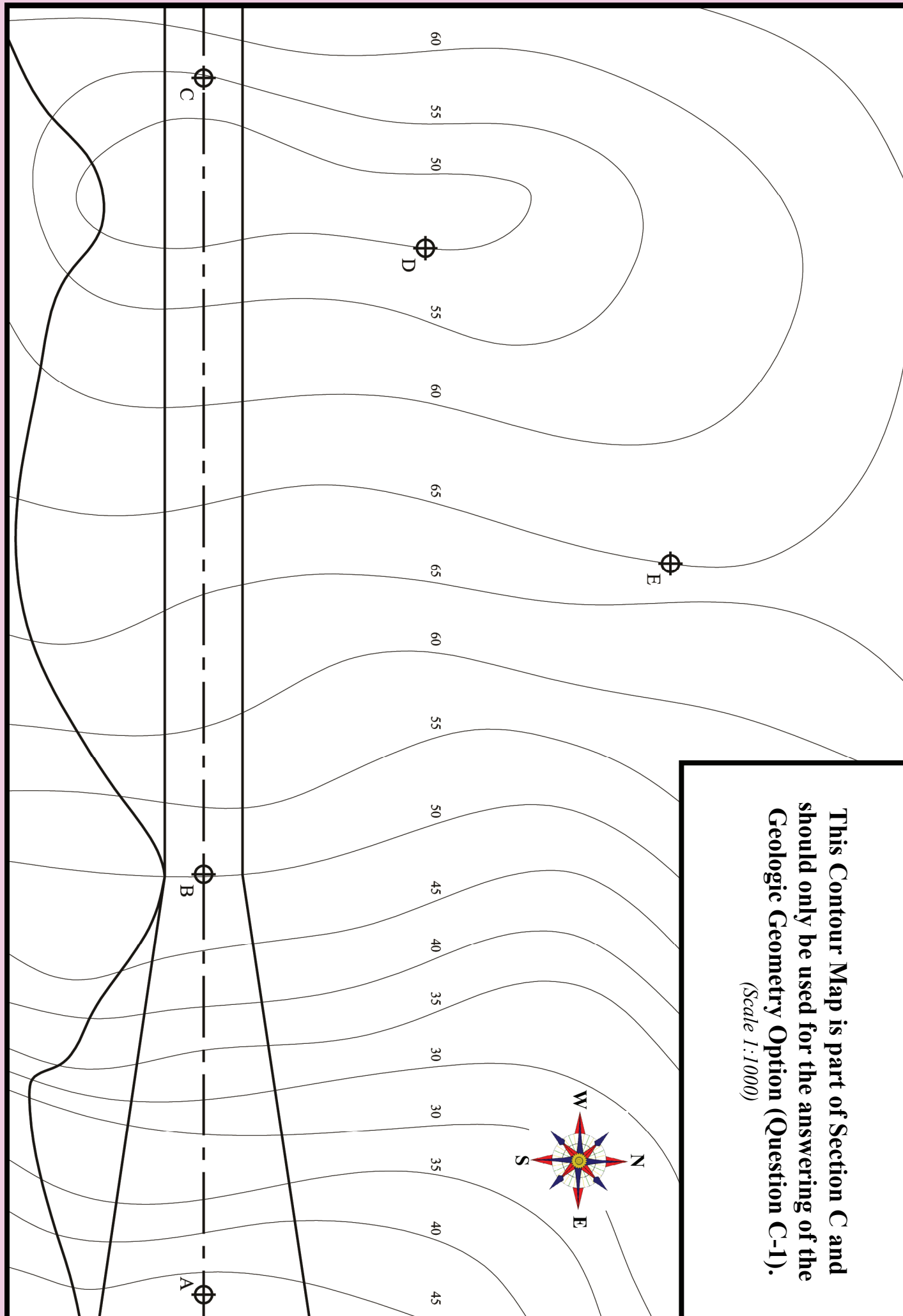| **SECTION C**	• Five questions are presented. • Answer **any two** (i.e. the options you have studied) on drawing paper. • All questions in Section C carry **45 marks** each.

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.*
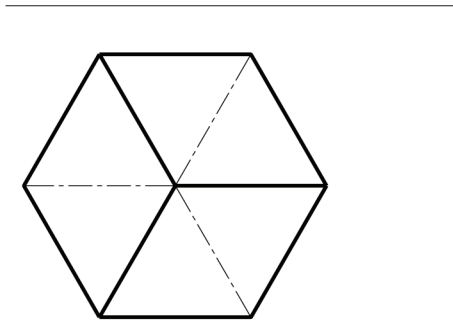
Name:

School Name:

Teacher's Name:

Page 1 of 3

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)

60
55
50
D
55
60
65
E
65
60
55
50
45
40
35
30
30
35
40
45

C
B
A

W
S
N
E

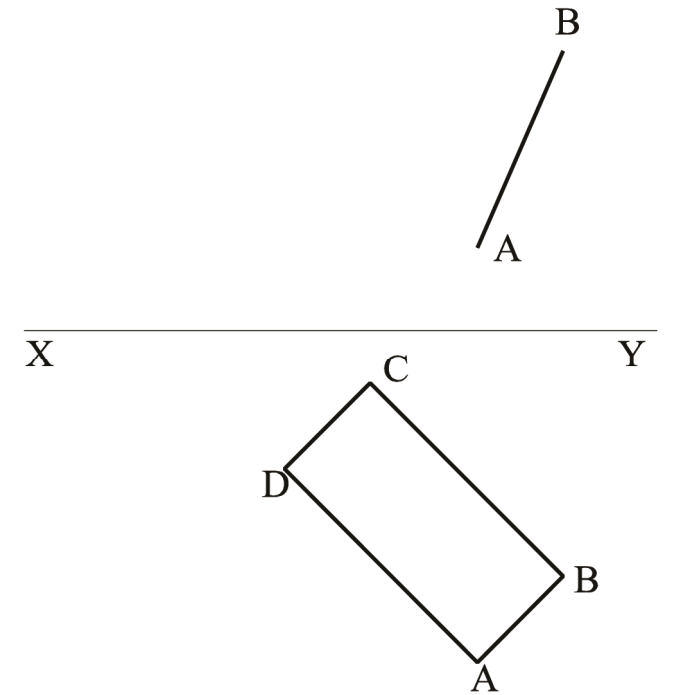**A-1.** The 3D graphic below shows a set of trophies both of which are based on a cube.

The drawing on the right shows the plan of a similar cube which is oriented as shown.

(a) Find the true shape of any square surface of the cube.

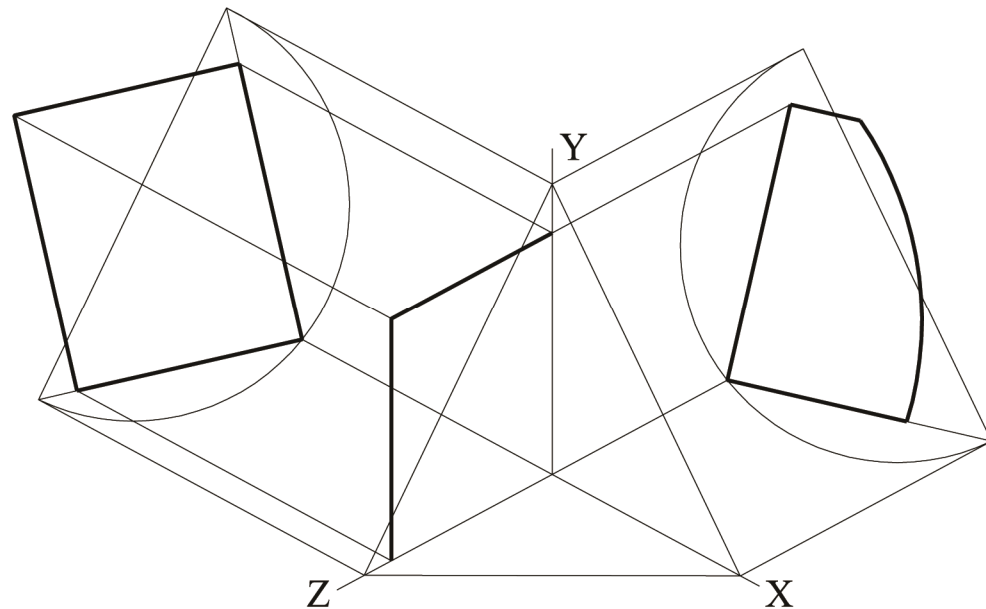(b) Project an elevation of the cube which shows the cube in contact with the horizontal plane.

A-2. The 3D graphic below shows a litter bin. The drawing below shows an incomplete trimetric projection of a similar litter bin using the axonometric axes method.

(a) Complete the axonometric of the litter bin.

(b) Determine the true shape of the rectangular top surface of the litter bin.

A-3. The 3D graphic below shows a mirror which has a rectangular sloping face as shown. The drawing on the right shows the plan of the sloping rectangular surface **ABCD** and the elevation of the line **AB** of the rectangle **ABCD**.

(a) Complete the elevation of the rectangle **ABCD**.

(b) Draw the traces of the oblique plane which contains the surface **ABCD**.

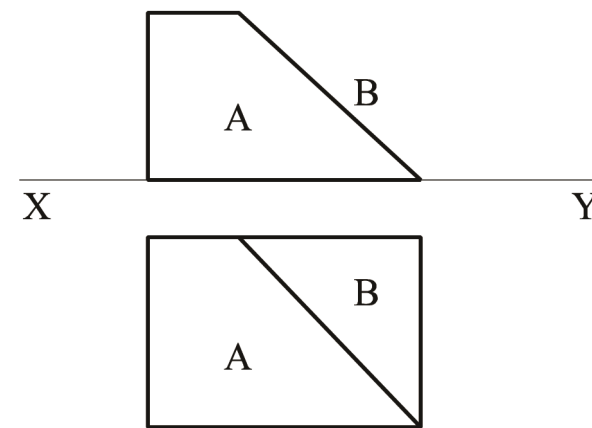(c) Find the inclination of this oblique plane to the vertical plane.

A-4. The 3D graphic on the right shows a number of roof surfaces on a residential house. The drawing below shows two intersecting roof surfaces **A** and **B**.

(a) Determine the true length of the line of intersection between the surfaces **A** and **B**.

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

Pre-Leaving Certificate Examination, 2015

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.*

B-1. The 3D graphic on the right shows a building which is based on a number of intersecting solids.

Fig. B-1 shows the plan and elevation of a similar set of solids which penetrate each other.

(a) In the diagram an irregular shaped prism rests on the horizontal plane. Draw the plan and elevation of this prism.

(b) A pentagonal based prism, of 40mm side, penetrates the prism as shown. Draw the outline plan and elevation of this prism.

(c) Complete the drawing, showing all lines of interpenetration.
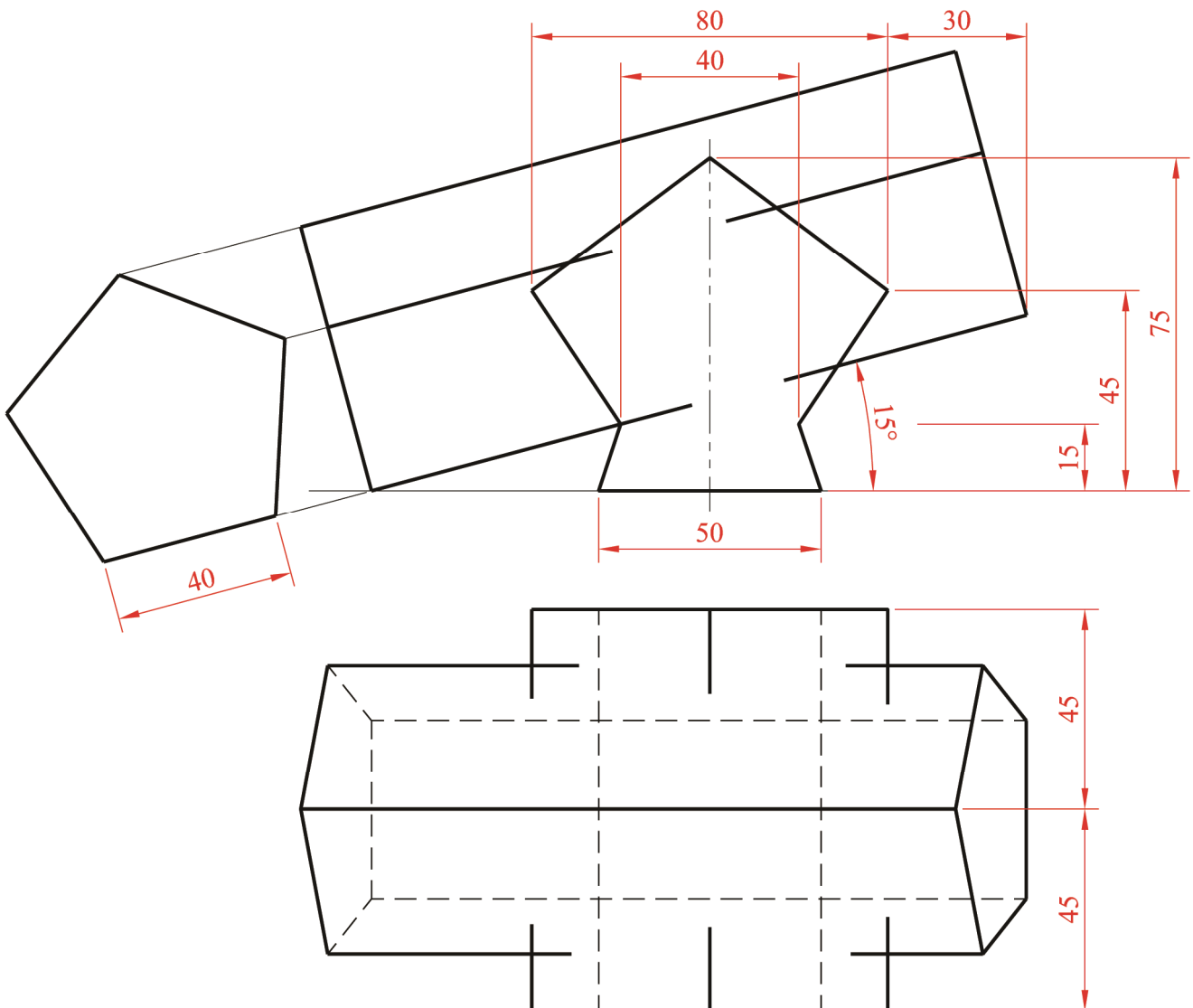
Scale 1:1

Fig. B-1

B-2. The 3D graphic on the right shows a jug. The base of the jug is based on a truncated cone while the top portion of the jug is based on an inverted truncated cone.

Fig. B-2 shows the plan and elevation of a conical surface which is truncated in a similar fashion to the top portion of the jug.

(a) Draw the given elevation and plan and project an end view in the direction of arrow **A**.

(b) Draw the true shape of the elliptical section.

(c) Draw the elevation of a focal sphere and establish the position of one focal point and the directrix for the elliptical cut surface **S**.
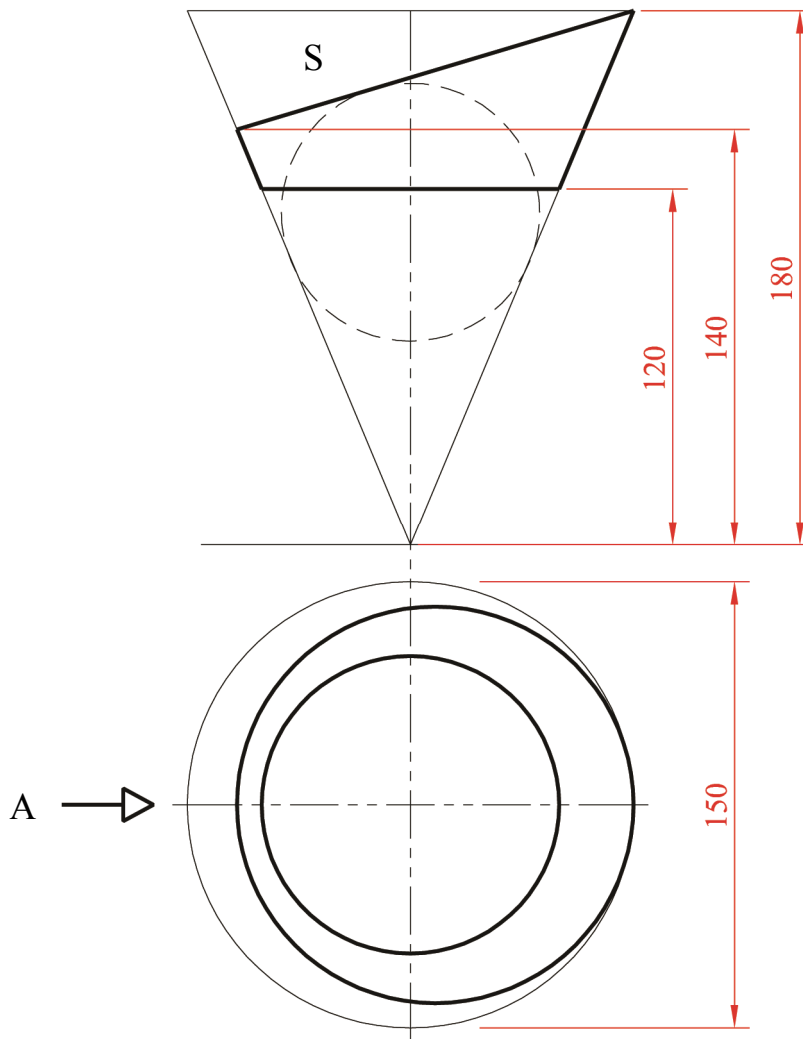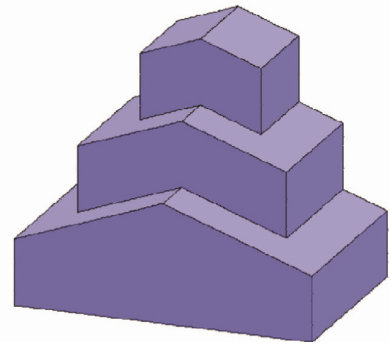
Scale 1:2

S

A

120
140
180

150

Fig. B-2

B-3. The projections of a model building are shown in Fig. B-3. A 3D graphic of the building is shown on the right.

Draw a perspective view of the building given the following:

- The picture plane passes through corner **A**
- The spectator **S** is 400mm from corner **A**
- The horizon line is 480mm above the ground line.

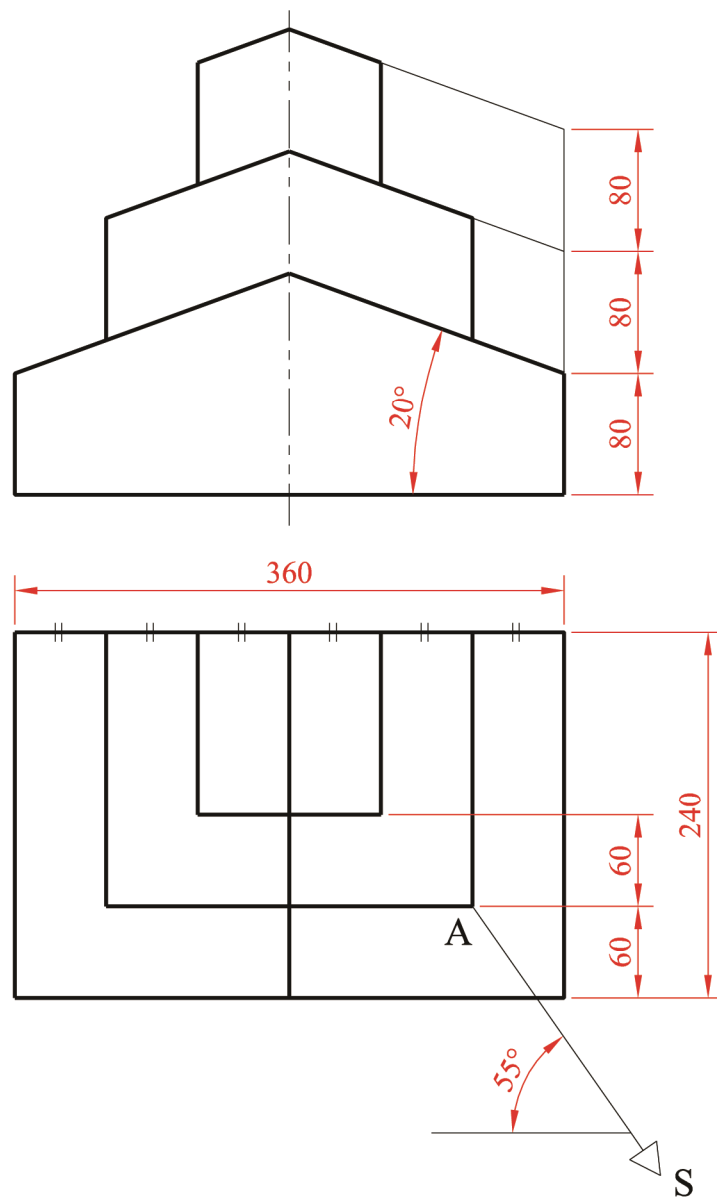*Use auxiliary vanishing points where appropriate.*

Scale 1:4

Fig. B-3

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 5 metre vertical intervals.

ABC is the centreline of a proposed roadway.

The roadway **ABC** has the following specifications:

- the section of the roadway between **A** and **B** is level at an altitude of 50m;

- the section of the roadway from **C** to **B** has a gradient of 1 in 15 rising;

- the width of the roadway increases from **B** to **A**.

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 on its northern side.

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

(b) On the map, points **D** and **E** are outcrop points on the top surface of the stratum of ore. The strike of the stratum is N60W.

(i) Determine the dip of the stratum.

A vertical borehole at **E** reveals a vertical depth of stratum of 25m.

(ii) Determine the actual thickness of the stratum.

Scale 1:1000

Structural Forms

C-2. The graphic on the right shows a woman's shoe.

Fig. C-2 below shows projections of the shoe. The heel 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.

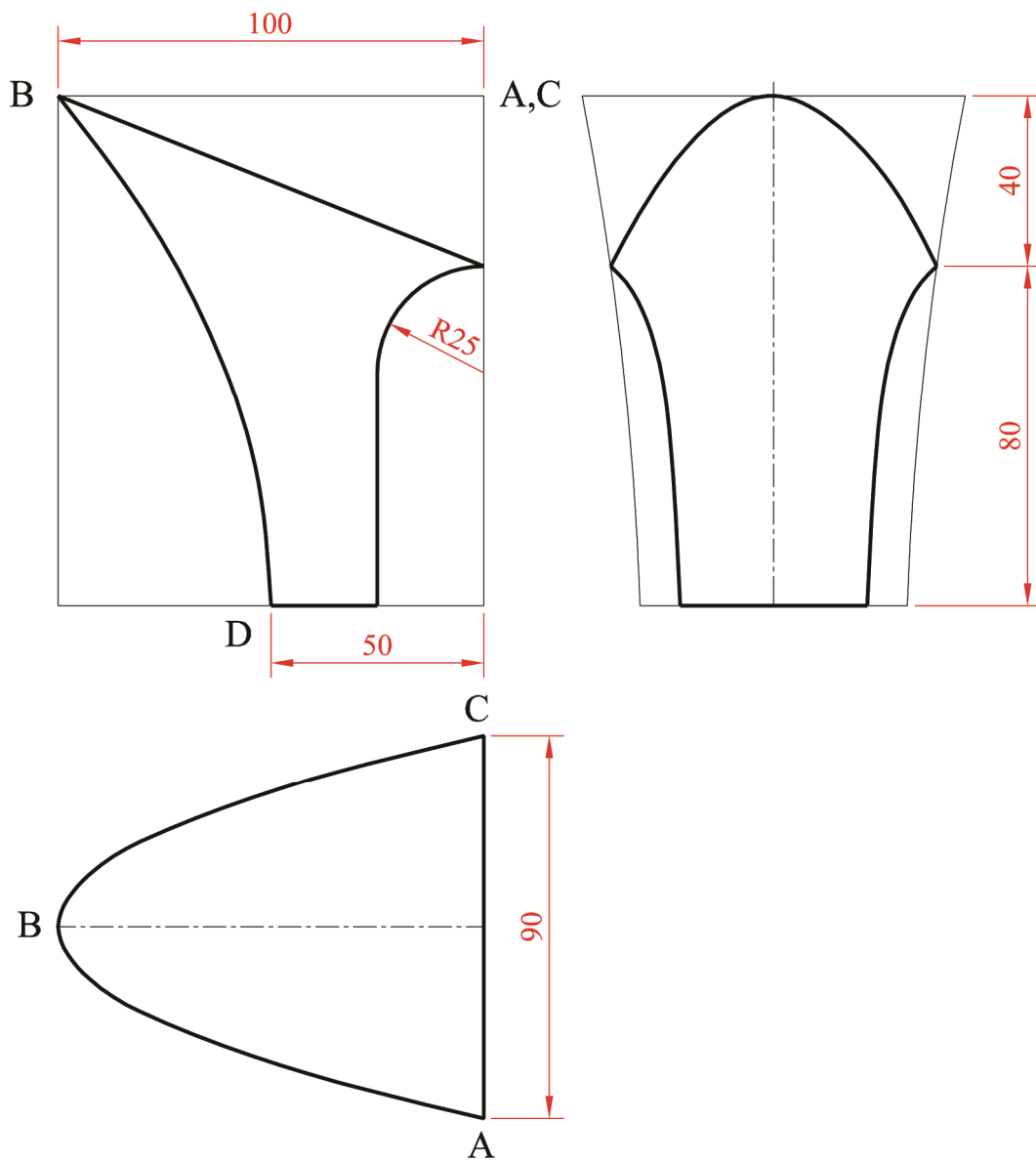**(c)** Project an end elevation of the shoe as shown.

Scale 1:1

Fig. C-2

Surface Geometry

C-3. The graphic on the right shows a residential house.

Fig. C-3 below shows the plan and elevation of a similar building. The surfaces **A** and **C** have a pitch of 45º and the surface **B** has a pitch of 35º.

(a) Draw the elevation and plan of the surfaces **A**, **B** and **C**.

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

(c) The true length of the line of intersection between the roof surfaces **D** and **E** is 3.25m. Draw the elevation and plan of surfaces **D**, **E** and **F**.

(d) Complete the drawing and develop the surface **S**.

Scale 1:50
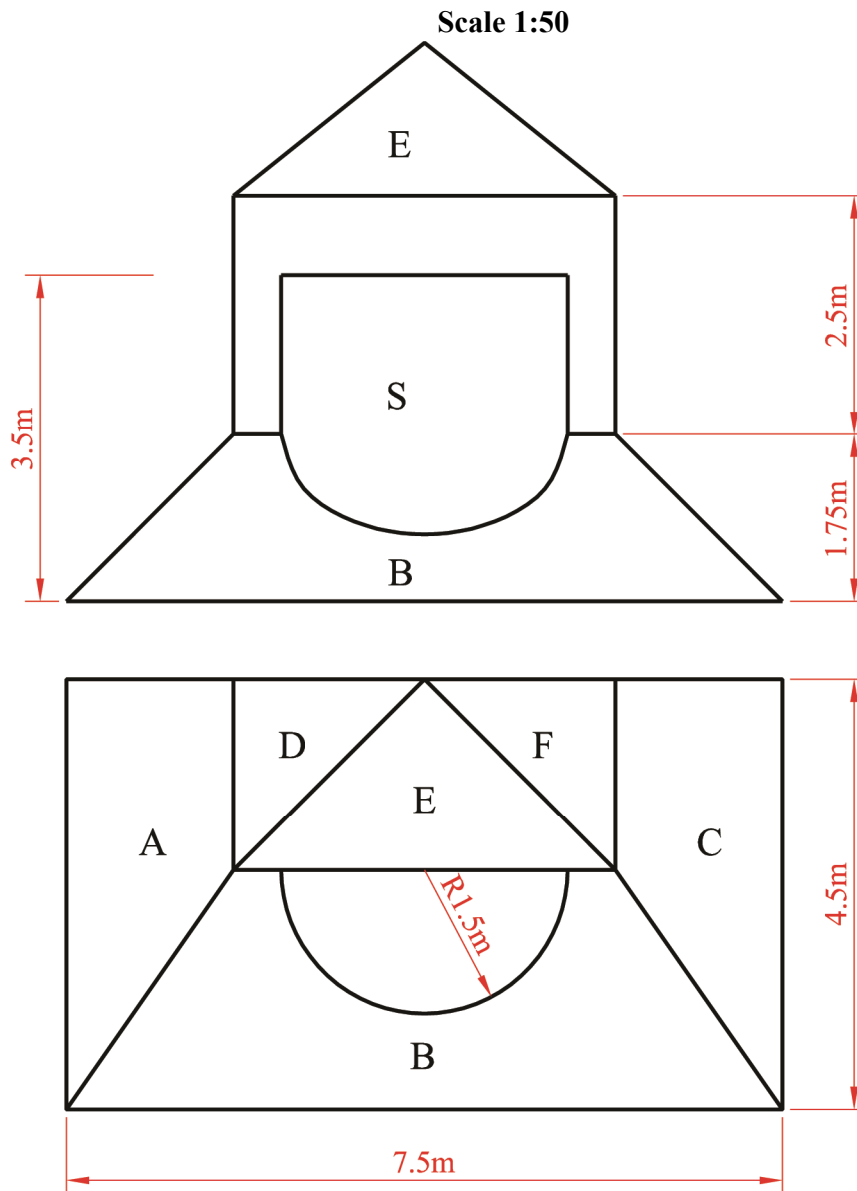
Fig. C-3

Dynamic Mechanisms

C-4. **(a)** The graphic on the right shows a camshaft from a go-kart.

Details of a similar camshaft are given below.

Draw the profile and displacement diagram for the cam rotating in a clockwise direction and imparting the following motion to an in-line flat follower that extends 6mm to either side of the centre line. The centre of the cam is 18mm below the nearest approach of the follower and the camshaft diameter is 12mm.

- 0° to 180° Rise 45mm with uniform velocity
- 180° to 240° Dwell
- 240° to 360° Fall 45mm with simple harmonic motion.

Scale 1:1

(b) A photograph of a child on a swing is shown on the right.

A line diagram showing the movement of the ropes of the swing is shown in Fig. C-4(b) below.

Point **P** shows the position of the child's hands as the swing is in its present position.

As the child swings to the left through an angle of 90° and back to its original position she moves her hands along the rope from **P** to **P$_1$**.

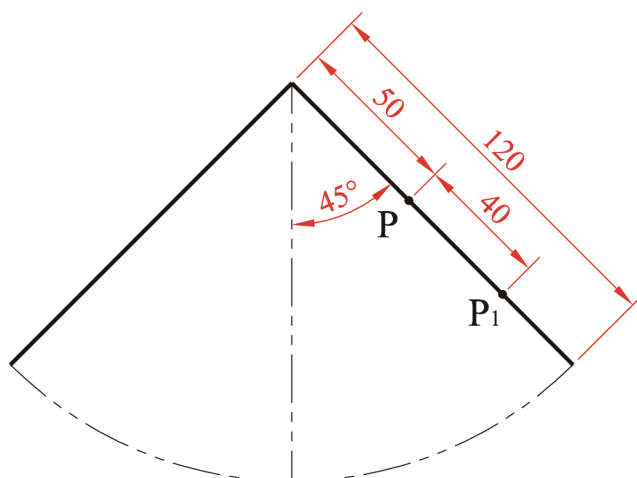Plot the locus of point **P** for the combined movement.

Scale 1:1

Fig. C-4(b)

Assemblies

C-5. **(a)** Details of a *Can Crusher* which was bought in a pre-assembled format are shown in Fig. C-5. A parts list and a 3D graphic of a similar can crusher are also given. Draw a full-size sectional elevation, on A-A, showing the parts fully assembled, with the line **CD** in a vertical position. *(All drilled holes are 8mm diameter.)*

(b) Using a separate line diagram establish the change in altitude of the moving head, when the arm is rotated while crushing a can from its initial position until the line **DE** is in a vertical position.

Scale 1:2
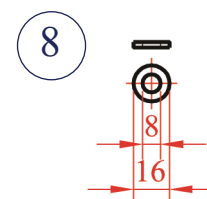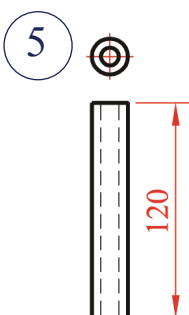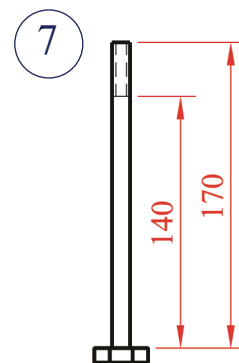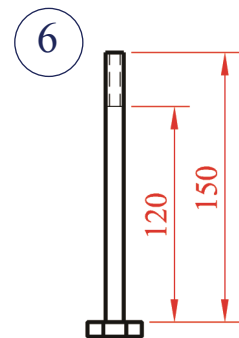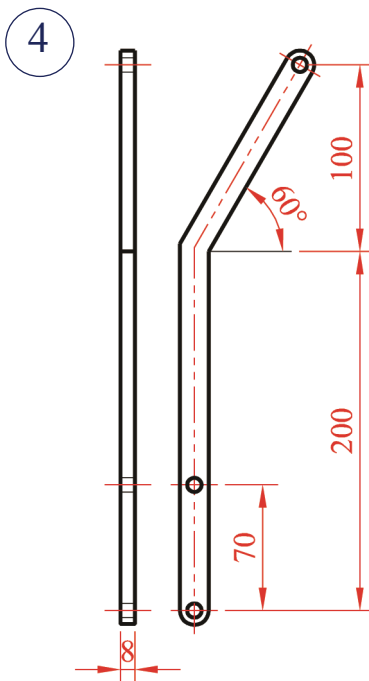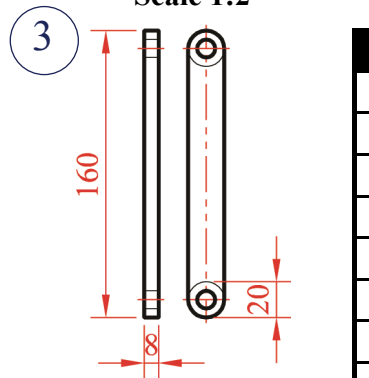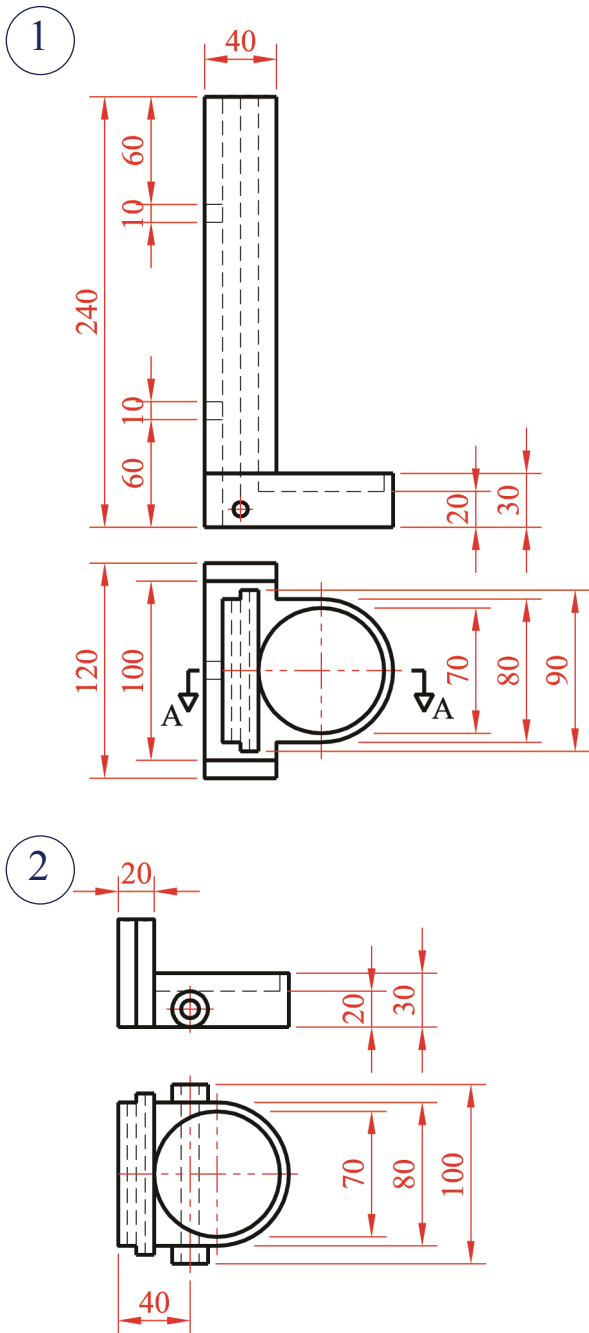
Part	Name	Qty.
1	Wall plate	1
2	Moving head	1
3	Link	2
4	Arm	2
5	Handle	1
6	Short M8 bolt	1
7	Long M8 bolt	1
8	M8 washer	2
9	M8 nut	2

Fig. C-5

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