

Pre-Leaving Certificate Examination, 2017

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)

- Four questions are presented.

SECTION A

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

- Three questions are presented.

SECTION B

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

- Five questions are presented.

SECTION C

- 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:

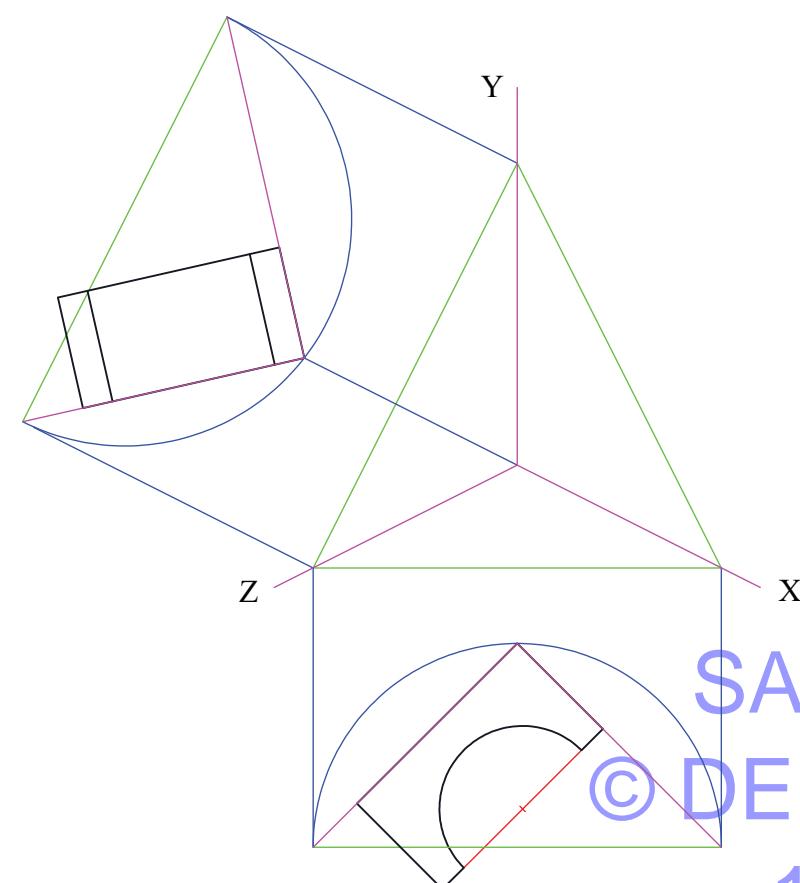
Teacher's Name:

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

- A-1.** The 3D graphic below shows a concrete structure housing an outdoor fire pit.

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

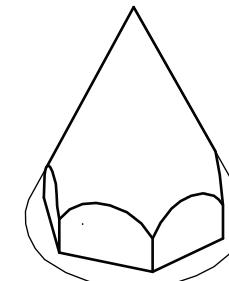
Draw the axonometric projection of the concrete structure.



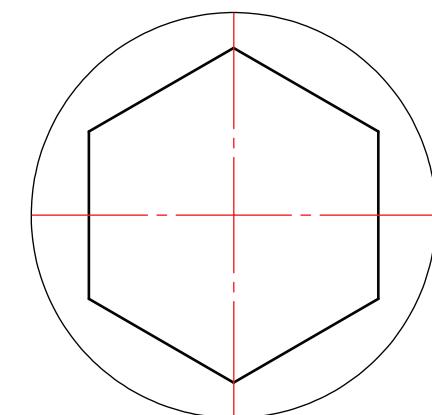
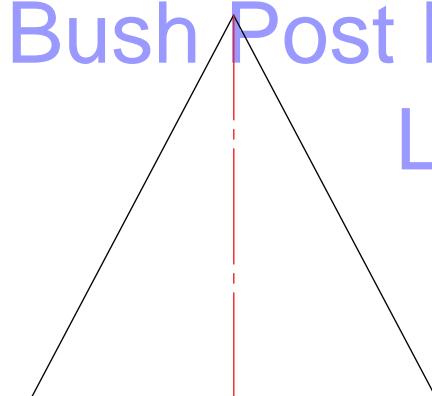
- A-2.** The 3D graphic below shows a storage container for pencils. A small 3D drawing, which is also given, shows that the lid is based on a cone which is cut by six vertical cutting planes resulting in a hexagonal base, six vertical surfaces and the conical surface.

The drawing on the right shows the plan and incomplete elevation of the lid.

- (a) Complete the elevation of the lid.
- (b) Determine and indicate the vertical and horizontal traces of any one of the six cutting planes which cut the cone to create the lid.

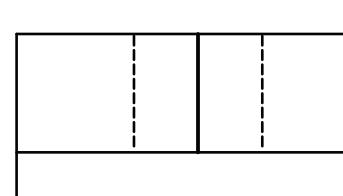


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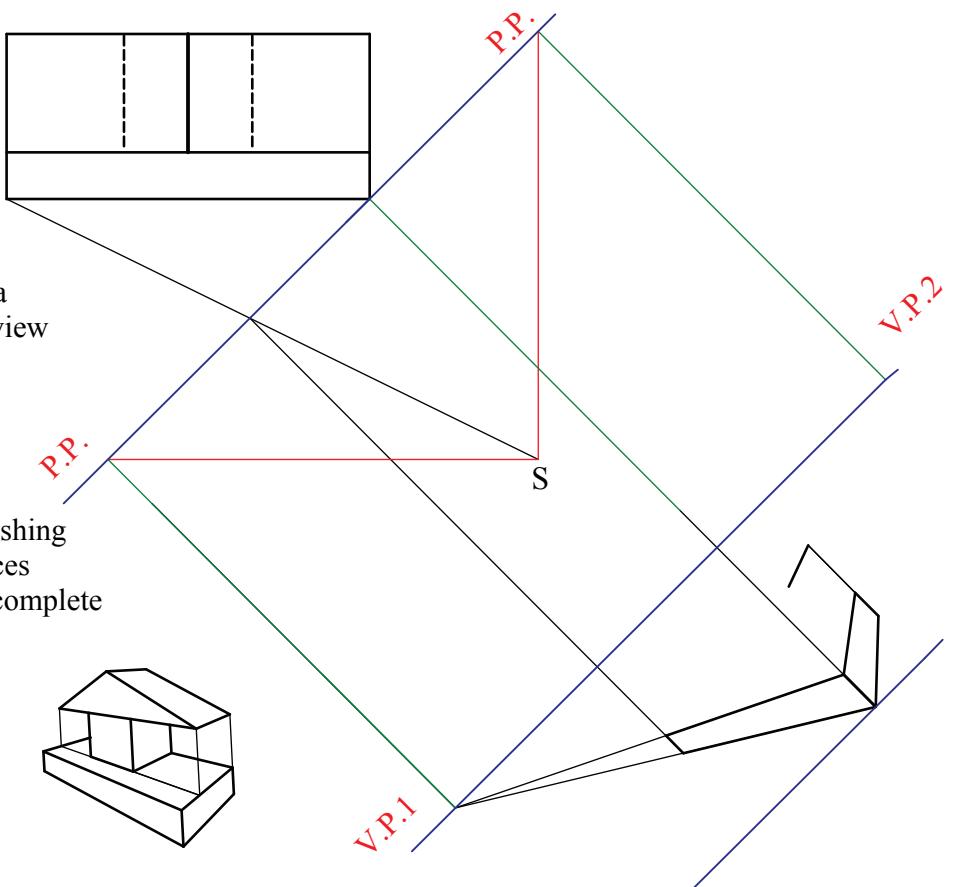
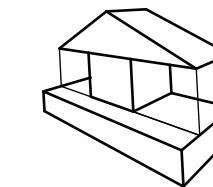
This examination paper must be returned at the end of the examination – You must include your Name, School Name and Teacher’s Name on the front cover.

- A-3.** The 3D graphic below shows children's playing blocks. A small 3D drawing, which is also given, shows an arrangement of three of the playing blocks.



The drawing on the right shows a partially completed perspective view of the arrangement of blocks.

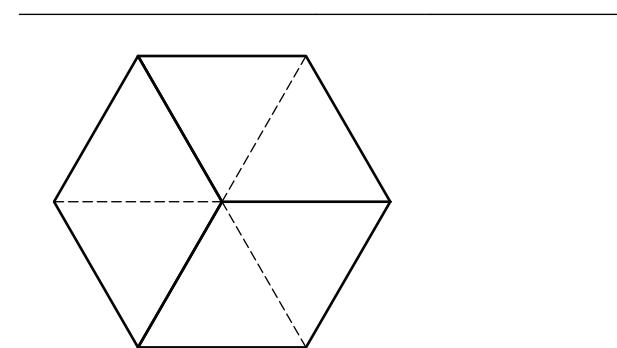
- (a) Complete the perspective drawing of the two cuboids.
- (b) Determine an auxiliary vanishing point for the 25° sloping faces of the triangular block and complete the drawing.



- A-4.** The 3D graphic below shows a sculpture based on a series of suspended cubes.

The drawing on the right shows the plan of a suspended cube which has one apex resting on the horizontal plane.

- (a) Determine the true shape of one of the surfaces of the cube.
- (b) Draw the elevation of the cube.



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Pre-Leaving Certificate Examination, 2017

***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)

- Four questions are presented.

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

- Three questions are presented.

SECTION B • Answer **any two** on drawing paper.
• All questions in Section B carry **45 marks** each.

- Five questions are presented.

SECTION C • 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.

SECTION B - Core

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

- B-1.** The image on the right shows the *Hearst Tower* located in New York City. The modern extension consists of a series of intersecting triangular glass surfaces.

Fig. B-1 shows the plan and elevation of three such intersecting planes.

Data relating to the horizontal and vertical co-ordinates for points **A**, **B**, **C**, **D** and **E**, defining the three planes, are also given.

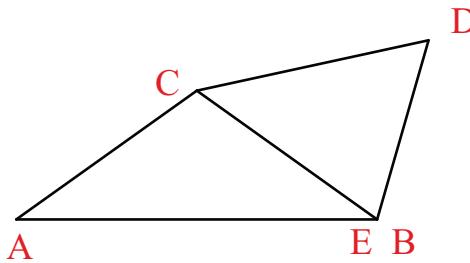
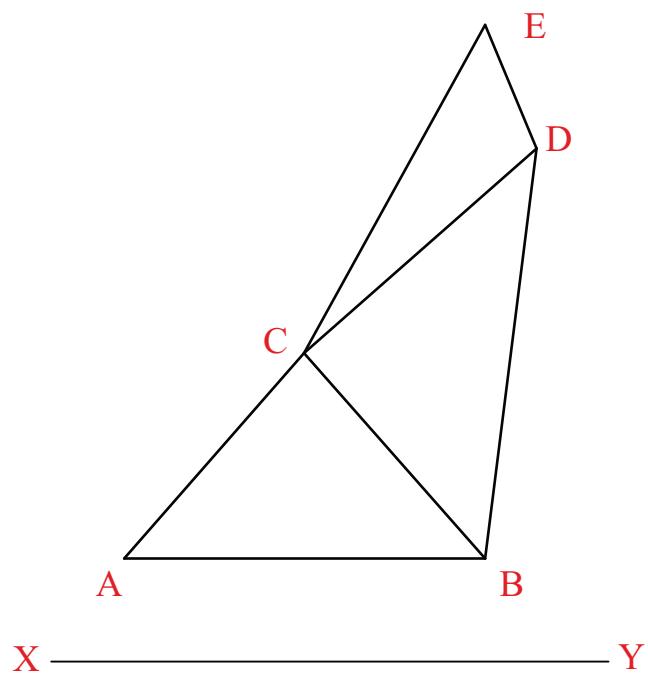


Fig. B-1



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- (a) Draw the given plan of the planes **ABC**, **BCD** and **CDE** and project the elevation of the planes **ABC** and **BCD**.

- (b) Determine the dihedral angle between the planes **ABC** and **BCD**.

- (c) Determine the vertical trace and the horizontal trace of the plane **ABC**.

- (d) The dihedral angle between the planes **BCD** and **CDE** is 105° .
Complete the projections of the surface **CDE**.

Scale 1:1

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- B-2.** The 3D graphic of a grandfather clock is shown on the right.

Fig. B-2 shows the plan and elevation of the clock.

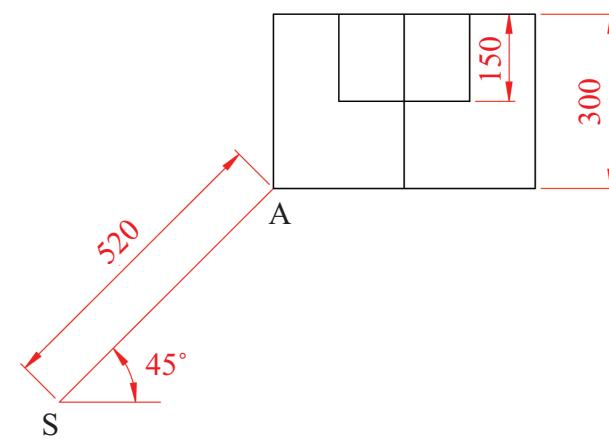
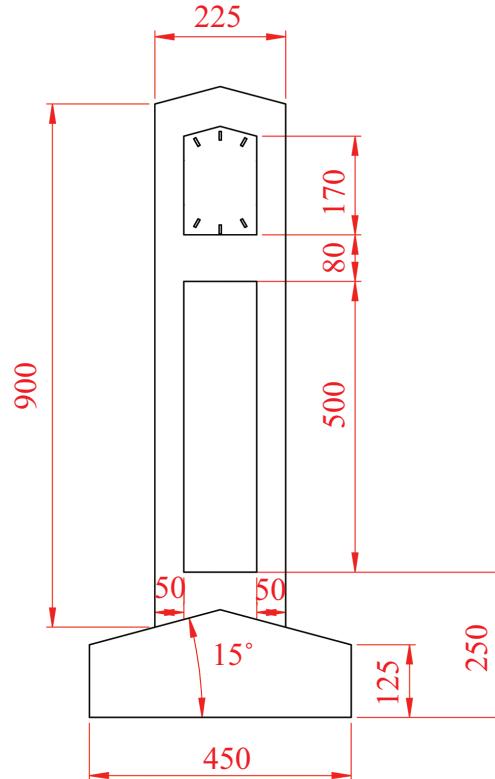
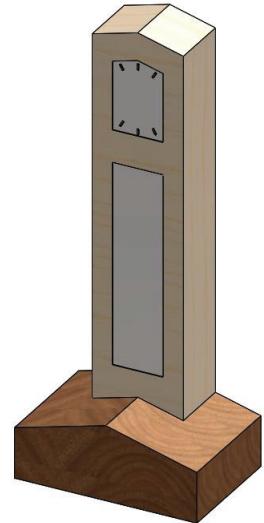
Draw the given plan and make a perspective drawing of the clock given the following:

- The spectator point S is 5.2m from corner A
- The picture plane passes through corner A
- The horizon line is 7.0m above the ground line.

Use auxiliary vanishing points where appropriate.

Note: It is not necessary to include details of the clock face.

Scale 1:5



S
A
45°
520

Fig. B-2

- B-3.** The image on the right shows the entrance to a building which consists of a conical portion which is intersected as shown.

Fig. B-3 shows the incomplete projections of a similar structure. A pictorial view is also shown.

In the elevation, A is the vertex of the parabola ABC.

- (a) Draw the elevation and end elevation of the building.

(The elevation of the curve may be ignored for this part of the question.)

- (b) Complete the drawing, showing all lines of interpenetration.

- (c) Surface S is extended to truncate the cone. Draw the true shape of surface S.

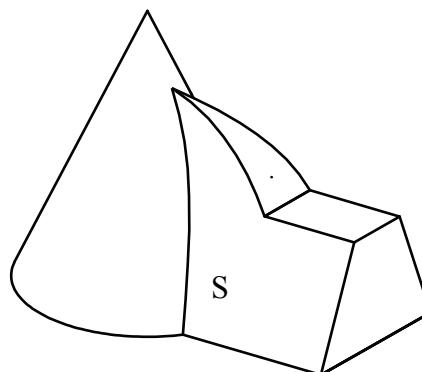
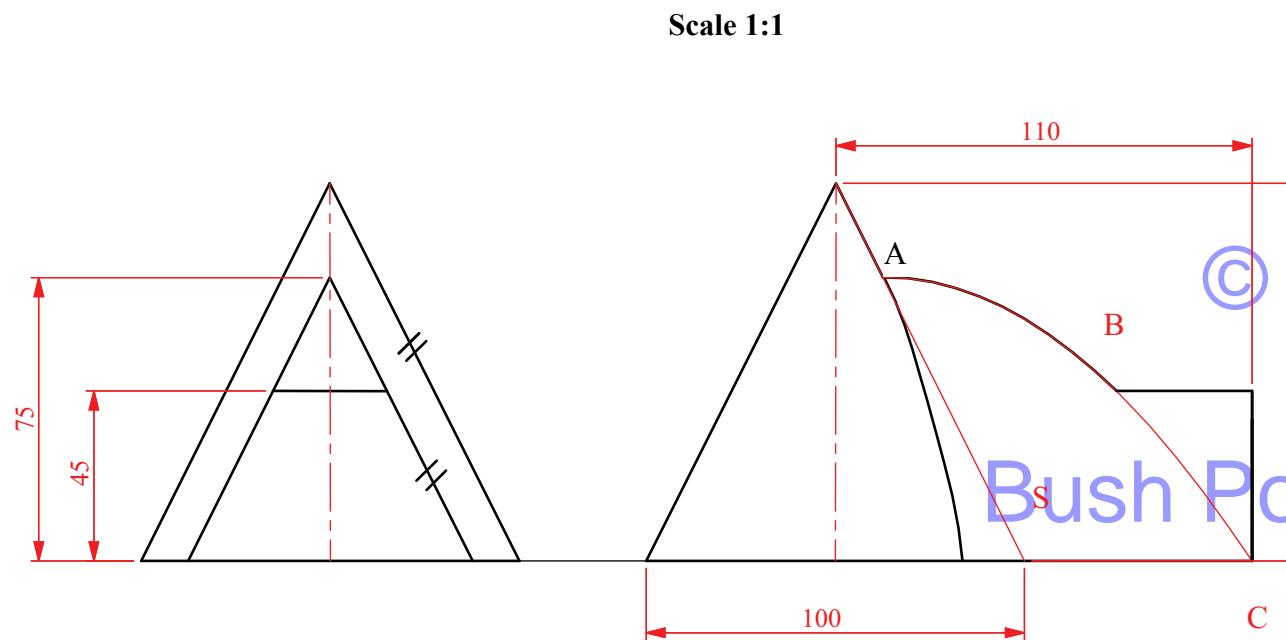


Fig. B-3

Assemblies

- C-5.** Details of a *Chip Cutter* are shown in Fig. C-5. The parts list is given below.

- (a) Draw a full-size sectional elevation on A-A₁, showing the parts fully assembled, with the cutter in a fully closed position.

(Unless otherwise stated all drilled holes are 5mm diameter. Unnecessary dimensions have been removed for clarity and any omitted dimensions may be estimated. The curve in 1 is parabolic with its vertex at A.)

- (b) Determine, and indicate on a separate line diagram, the position of the handle when the cutter is fully open.

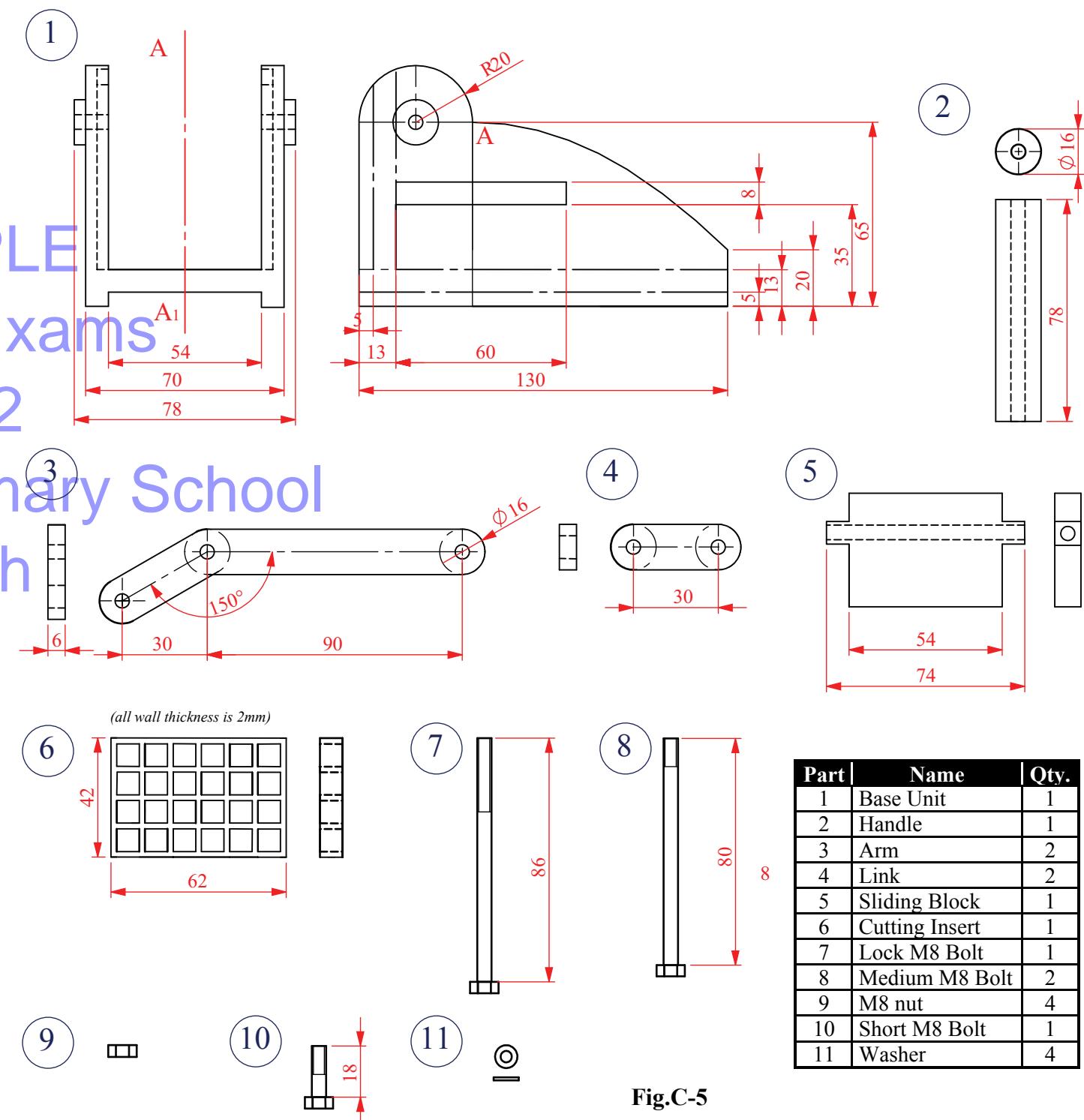


Fig.C-5

Dynamic Mechanisms

- C-4. (a) The 3D graphic on the right shows a window which is in an open position.

Fig. C-4(a) shows the crank **AP** which rotates about the stationary point **B**. The point **A** slides vertically along the line **L** and the mechanism is pin joined at **C**.

Plot the locus of point **P** as it moves to the line **L**.



Scale 1:1

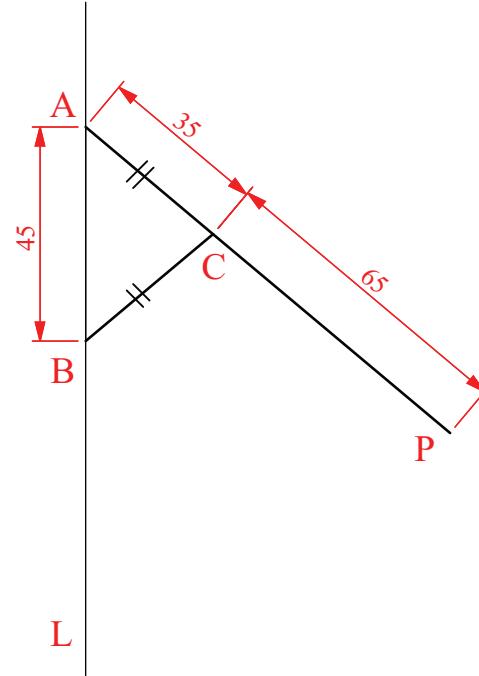


Fig. C-4(a)

- (b) The image on the right shows a spiral staircase. The handrail of the staircase is in the form of a helix.

Fig. C-4(b) shows the elevation of a cylinder with points **A** and **B** on the curved surface of the cylinder. These points represent the top and bottom point of the handrail of the staircase.



- Draw the given elevation and plan.
- Determine in the elevation the helical path between **A** and **B**.

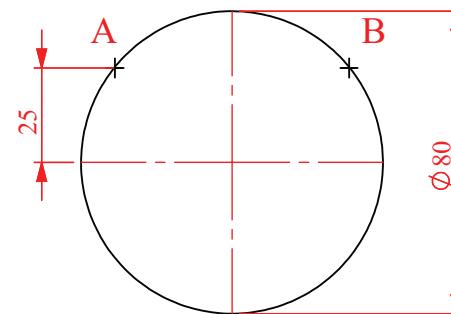


Fig. C-4(b)

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 5 metre vertical intervals.

ABC is the centreline of a proposed roadway.

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

- the section between **A** and **B** is level at an altitude of 90m;
- the section from **B** to **C** is falling uniformly to a level of 75m at **C**;
- the width of the road increases from **B** to **C**.

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 roadway.

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

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Scale 1:1000

- (b) On the map, points **D**, **E** and **F** are three points on top surface of a stratum of ore. Point **D** is at an altitude of 75m and point **E** is at an altitude of 65m. The strike of the stratum is north 60° east.

- Determine the dip of the stratum.
- Determine the altitude of point **F**.

Structural Forms

- C-2. The image on the right shows an observation tower. The base of the tower is in the form of a hyperboloid of revolution, with a shaped portion on the top.

Fig. C-2 shows the plan and elevation of a similar structure. The true length of the element of the hyperboloid of revolution is 18m.

- (a) Draw the given plan and elevation.
- (b) Draw the true shape of the section A-A₁ of the structure.

Scale 1:100

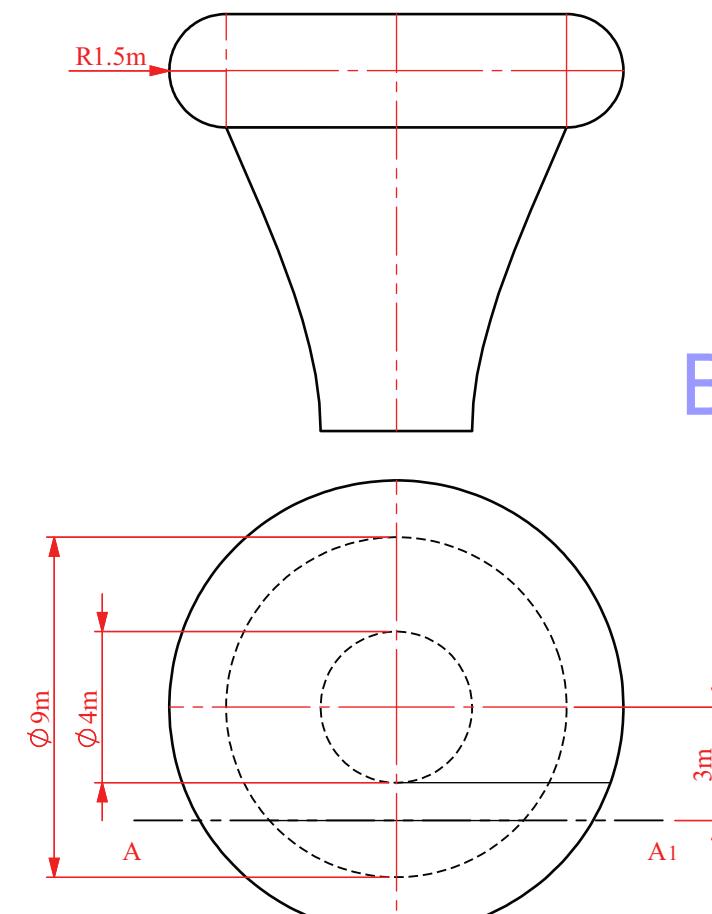


Fig. C-2

Surface Geometry

- C-3. The image on the right shows the Datong Art Museum.

Fig. C-3 shows the plan and elevation of a similar structure. It consists of two intersecting tetrahedrons which have been shaped as shown.

- (a) Draw the given plan and elevation.
- (b) Determine the dihedral angle between the surfaces A and D.
- (c) Draw the true shape of surface A and hence determine the radius of the largest circle that can be contained within the surface.



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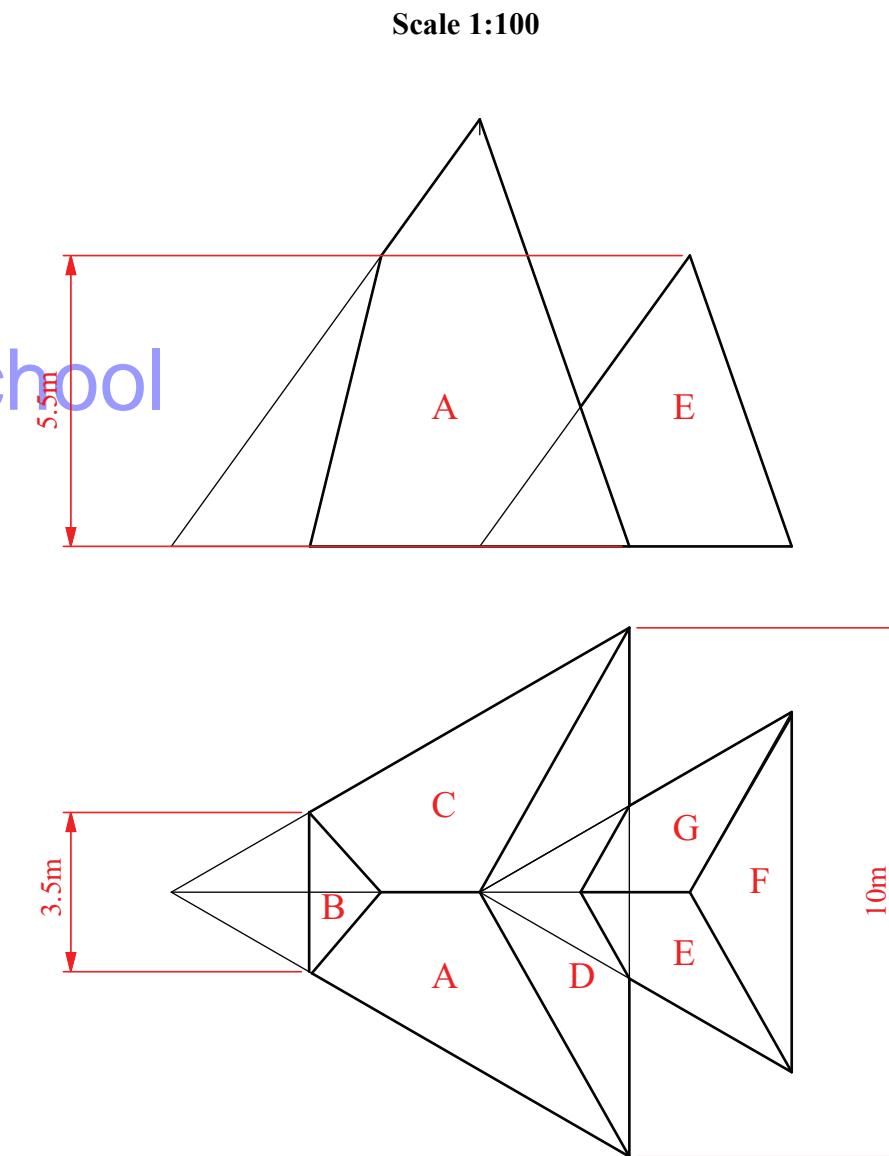


Fig. C-3