



Leaving Certificate Examination

*Design & Communication Graphics
Higher Level*

Sections B and C (180 Marks)

Sample Examination Paper
3 Hours Duration

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**

- SECTION B**
- Three questions are presented
 - Answer **any two** on A3 drawing paper
 - All questions in Section B carry **45 marks**

- SECTION C**
- Five questions are presented
 - Answer **any two** (i.e. the options you have studied) on A3 drawing paper
 - All questions in Section C carry **45 marks**

General Instructions:

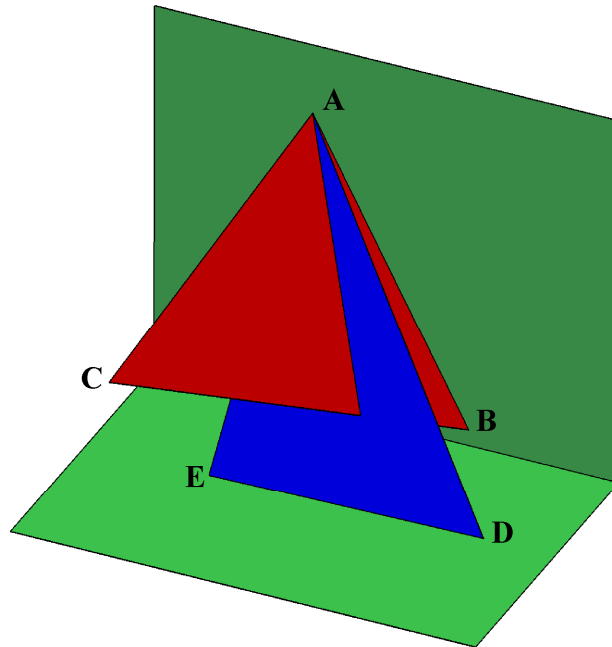
- *Construction lines must be shown on all solutions*
- *Write the question number distinctly on the answer paper in Sections B and C*
- *Work on one side of the drawing paper only*
- *All dimensions are given in metres or millimetres*
- *Write your Examination number in the box provided on section A and on all other sheets used*

SECTION B - Core

Answer **Any Two** questions from this section on A3 drawing paper

B-1. The 3D graphic in Fig. B-1 shows two intersecting planes, ABC and ADE. The horizontal and vertical planes of reference are also shown.

Fig. B-1



The horizontal and vertical coordinates for the intersecting planes are given below.

A	=	170	---	95	---	20
B	=	215	---	25	---	30
C	=	150	---	55	---	90
D	=	235	---	20	---	65
E	=	155	---	5	---	45

- (a) Draw the plan and elevation of the intersecting planes.
(Use a vertical orientation for the A3 sheet to maximise space)
- (b) Determine the line of intersection between the planes.
- (c) Determine the angle of inclination of the line of intersection to the vertical plane.
- (d) Determine the dihedral angle between the planes.

Scale 1:1

B-2. Fig. B-2 shows the projections of a square based prism of 64mm side, which has been cut as shown. Also shown are the incomplete projections of a equilateral triangular based prism, of 44mm side, which penetrates the square based prism.

A 3D graphic of the interpenetrating solids is also shown.

Draw the projections of the solids showing all lines of interpenetration.

Scale 1:1

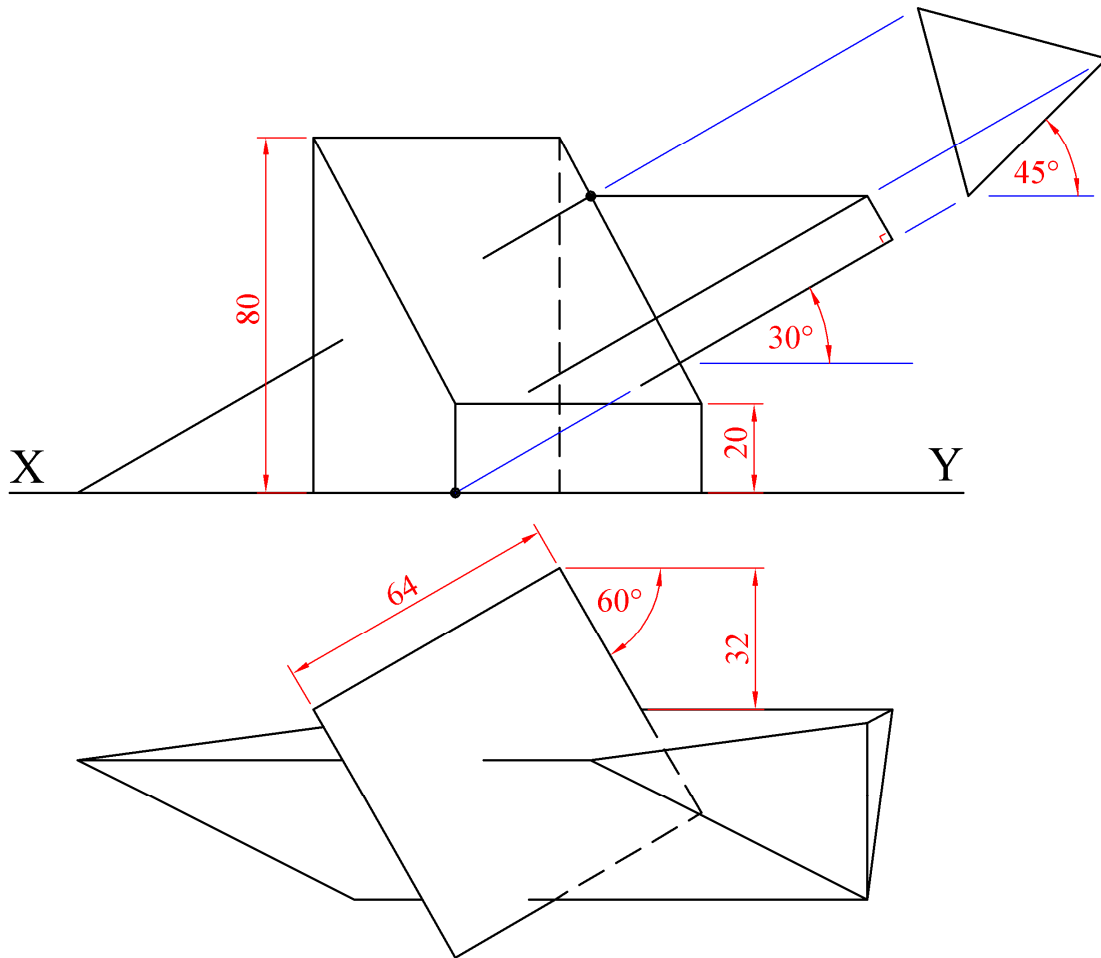
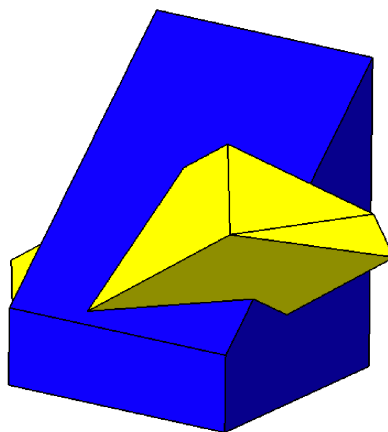


Fig. B-2



B-3. Fig. B-3 shows the plan and elevation of a trophy which was commissioned for a golfing competition. A 3D graphic of the trophy is also given. The main body of the trophy is made from hollow glass with a golf ball inside as shown.

The base is elliptical and the upper portion is part of a cone which has been shaped as shown in the elevation.

Note: The pictorial view shows material thickness, fillets and text which may be ignored for the purpose of your drawing.

- (a) Draw the given elevation and plan of the trophy.
- (b) Draw the development of the cut surface.
- (c) Determine the position of the focus for the parabolic portion of the cut surface.

Scale 1:2

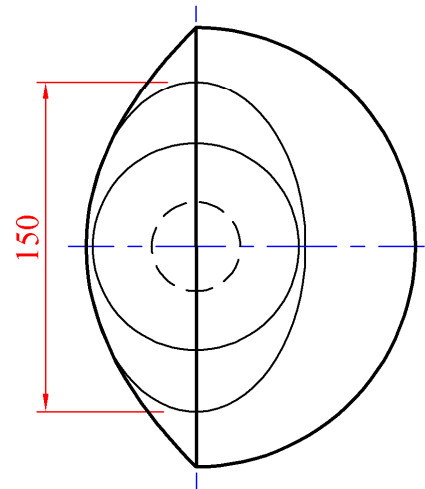
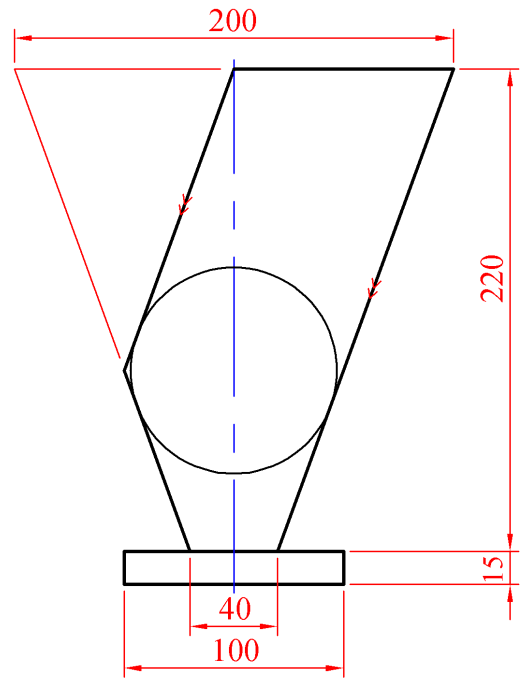


Fig. B-3

SECTION C - Applied Graphics

Answer **Any Two** questions (i.e. the options you have studied)
from this section on A3 drawing paper

Dynamic Mechanisms

- C-1. (a)** Fig. C-1(a) shows a link mechanism. The crank OC rotates clockwise about the fixed point O as shown. Crank AD pivots about the fixed point D. A and C are pin joints.

Draw the locus of point B for one complete revolution of the crank OC.

Scale 1:1

OC = 25
AB = 130
BC = 65
AD = 65

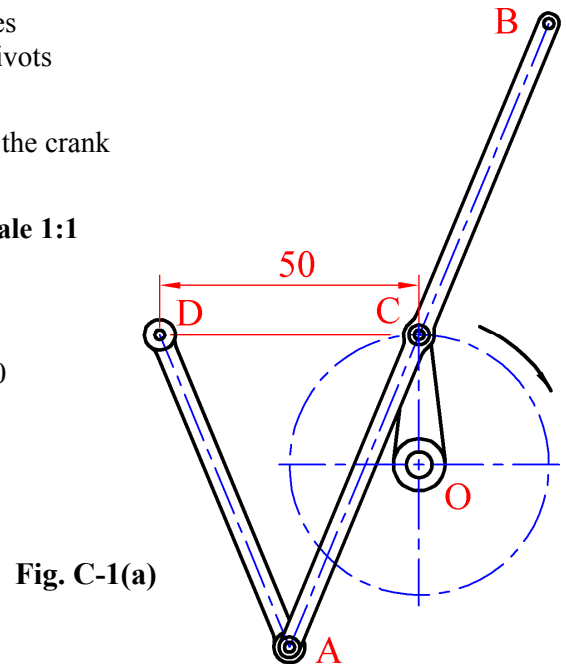
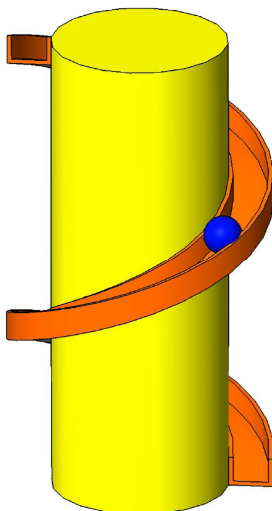


Fig. C-1(a)

- (b)** The 3D graphic below shows a helical marble chute from a child's toy. The relative positions of the rectangular ends of the chute are shown in fig C-1(b). The helix rotates about the central support column through an angle of 540° as shown.

Draw the plan and elevation of the column and chute showing all helical curves.

(Hidden detail need not be shown and the wall thickness of the chute should be ignored).



Scale 1:1

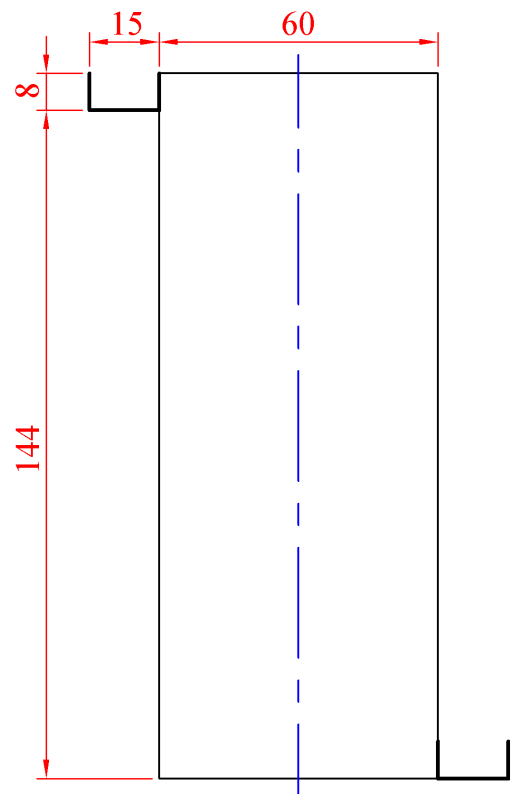


Fig. C-1(b)

Structural Forms

C-2. (a) Fig. C-2(a) shows the elevation of a structure which is inspired by Sydney Opera House. A 3D graphic of the structure is shown on the right.

The curved surface is generated by translating the parabola ABC in a vertical position along the parabola BD. B is the vertex for parabola BD. The generating parabola ABC is represented by a dotted line in the end view.

Draw the given elevation and project a plan of the structure.

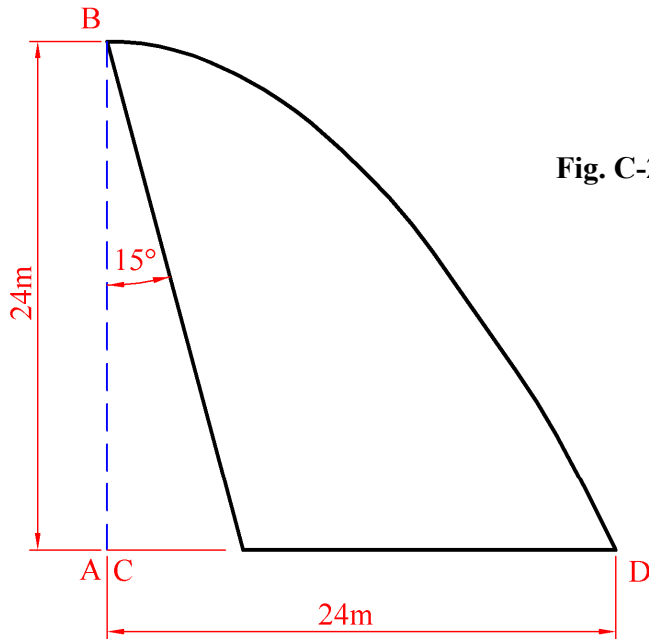
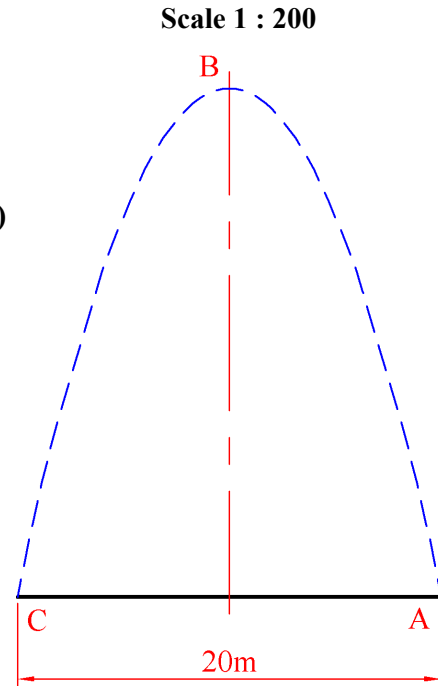
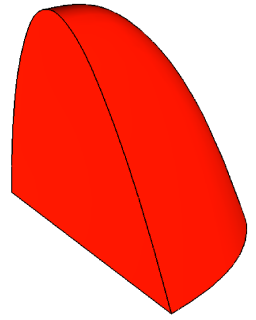


Fig. C-2(a)



Scale 1 : 200



(b) The projections of a lightweight structure for an open air exhibition are shown in Fig. C-2(b). A 3D graphic is also given. The structure consists of four adjoining hyperbolic paraboloid surfaces.

- Using six elements in each direction, draw the plan and elevation of the hyperbolic paraboloid surface ABCD, orientated as shown.
- Determine the traces of the plane director for the edges AB and DC of the surface.

Scale 1:200

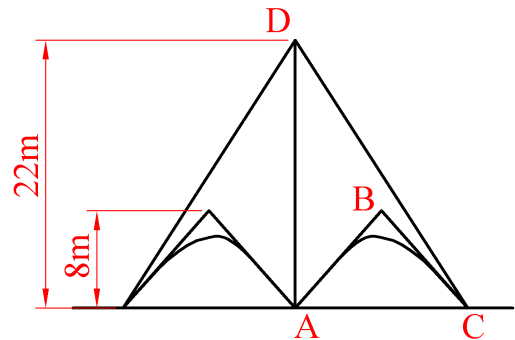
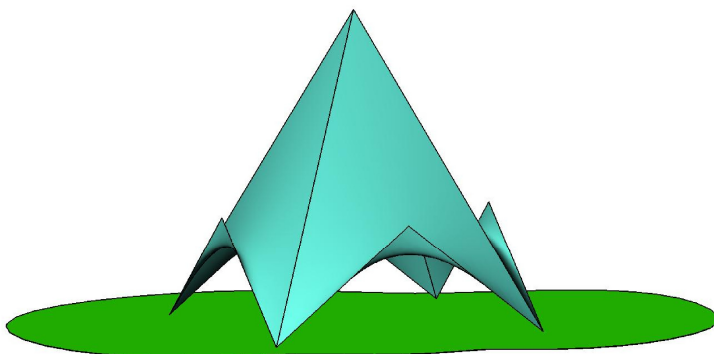
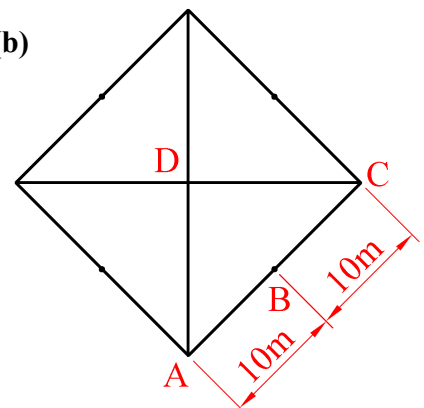


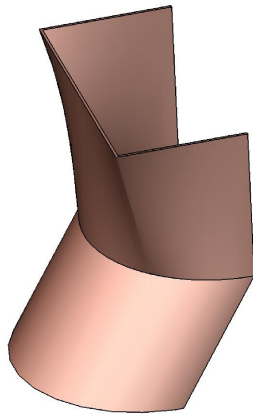
Fig. C-2(b)



Surface Geometry

- C-3. (a)** Fig. C-3(a) shows the projections of part of a copper ducting from an air-conditioning system in a hotel. A 3D graphic is also shown. The ducting consists of half of an oblique cylinder and a transition piece to a rectangular top as shown.

Draw a one-piece surface development of the cylindrical portion of the ducting.



Scale 1:5

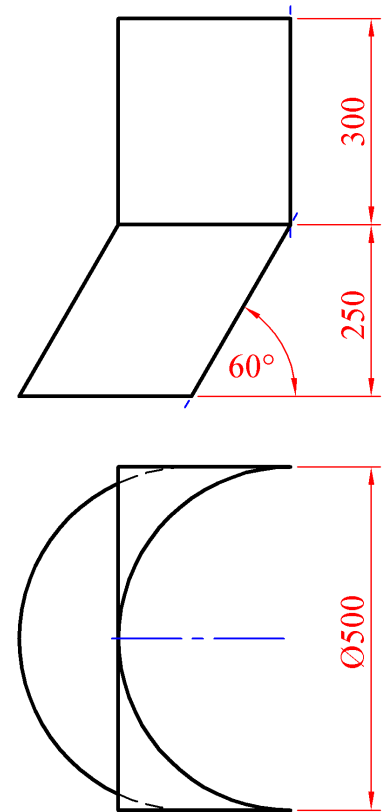


Fig. C-3(a)

- (b)** Fig. C-3(b) shows the plan and elevation of a climbing apparatus for an outdoor activity centre. A 3D graphic is also shown. The structure has surfaces which are sloped at different angles to accommodate climbers of differing ability levels.

- Draw the plan and elevation of the surfaces A and B and find the dihedral angle between them.
- Surface C is sloped at 75° . Determine the baseline (horizontal trace) for this surface.
- The dihedral angle between surfaces B and D is 70° . Complete the plan and elevation of the structure.

Scale 1:50

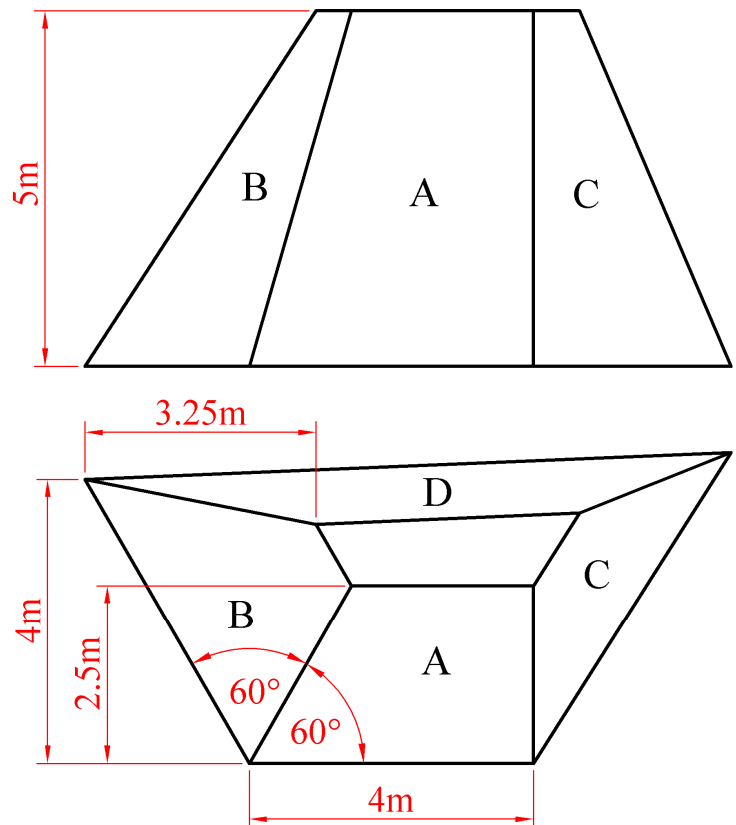
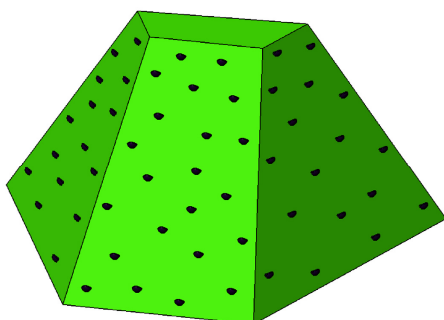


Fig. C-3(b)

Geologic Geometry

- C-4. (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 the roadway between A and B is level at an altitude of 55m. The section from B to C has a gradient of 1 in 20 falling.

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

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

- (b)** On the map, D and E indicate the location of two points on the ground.

A vertical borehole is drilled at D and it reveals the top and bottom surfaces of a stratum of ore at distances of 35m and 60m from D respectively.

A skew borehole at E is drilled as shown and has an actual inclination of 60° to the horizontal plane. It reveals the top and bottom surfaces of the stratum at distances of 10m and 30m from E respectively.

- (i) Determine the dip, strike and thickness of the stratum.
- (ii) Determine the apparent dip of the stratum in a South-Easterly direction.

Scale 1:1000

Assemblies

C-5. (a) Details of a skateboard axle assembly are given in Fig. C-5(a) with the parts list tabulated on the right. A 3D graphic of the parts is also given.

Draw a full size sectional elevation A-A showing the parts fully assembled.

Note: All external fillets are 3mm.
Internal fillets may be estimated.

PART	NAME	REQUIRED
1	Base Plate	1
2	Hanging Axle	1
3	King Pin	1
4	Rubber Bush	2
5	Washer	1
6	M12 Nut	1

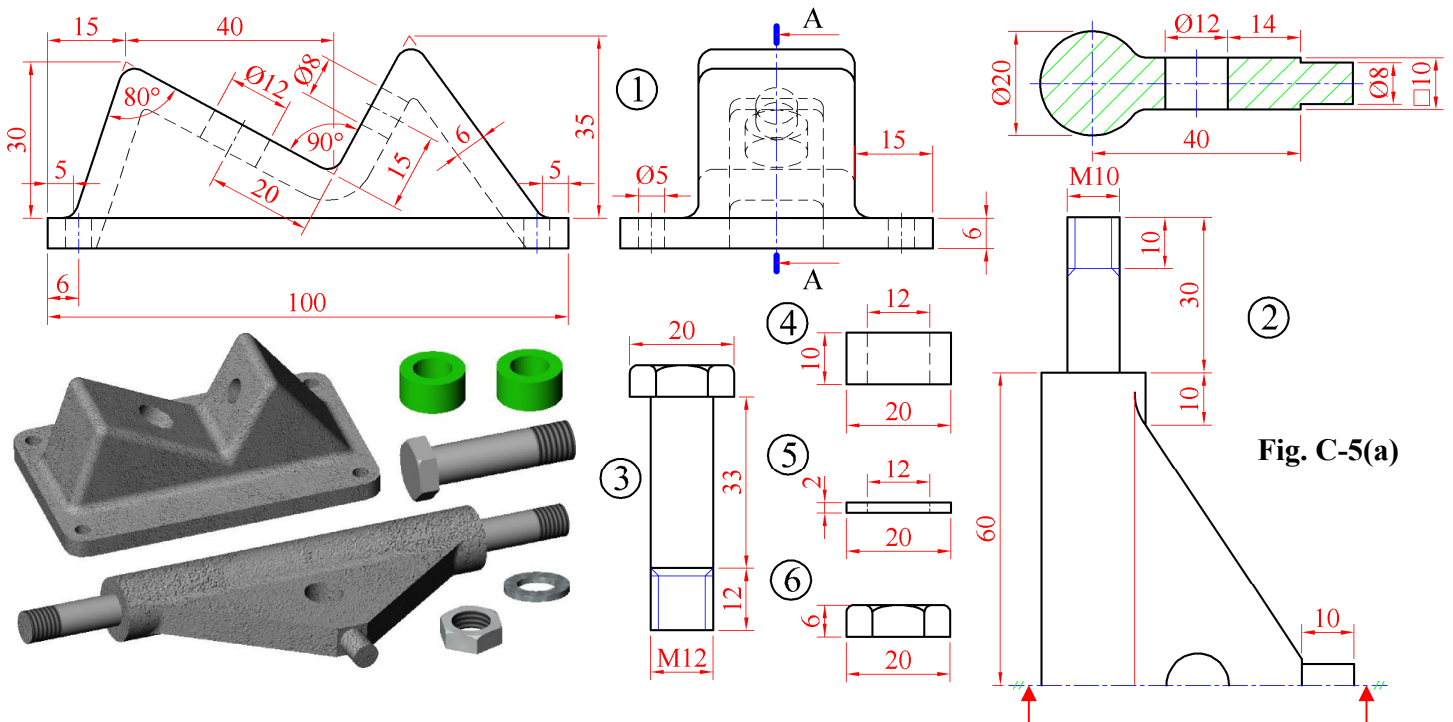


Fig. C-5(a)

(b) A global manufacturer wishes to distribute skateboards in flat-pack form for assembly by the customer. The accompanying assembly instructions must be text free to allow for distribution worldwide.

Prepare the necessary drawings to convey the following information:

- Two preassembled axles, from part (a), are to be fixed to the underside of a pre-drilled wooden skate deck, using 5mm Hex Socket Bolts and M5 nuts.
- The wheels, with bearings, are to be held in place using washers and M10 nuts.

You may use either 3D freehand sketches or 2D drawings to indicate the methods of assembly. You may estimate all dimensions and your assembly drawings should be appropriately rendered.

The various assembly components as well as the completed skateboard are shown in fig.C-5(b) below.

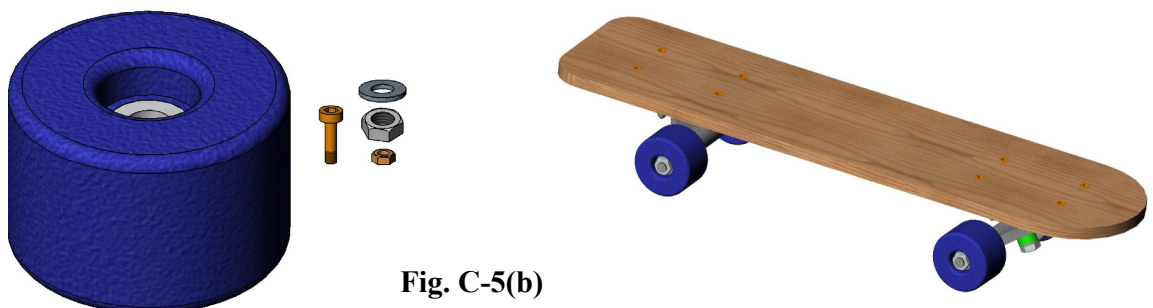


Fig. C-5(b)

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