Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2009

Design & Communication Graphics
Higher Level
Sections B and C (180 Marks)

Friday, 12 June
Afternoon, 2.00 - 5.00

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 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 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 drawing paper

B-1. The 3D graphic on the right shows a string of pearls hanging on a necklace easel. The easel consists of a front stand and a rear support as shown.

The projections of the easel are shown in Fig. B-1 below. The plan, which is constructed on a square grid, includes the outline of the necklace which hangs in a parabolic curve as shown.

(a) Draw the given plan and elevation of the easel.

(b) Draw the outline of the necklace in plan and in elevation.

(c) Determine the traces of the oblique plane that contains:

(i) The Front stand;

(ii) The Rear support.

Scale 1:2

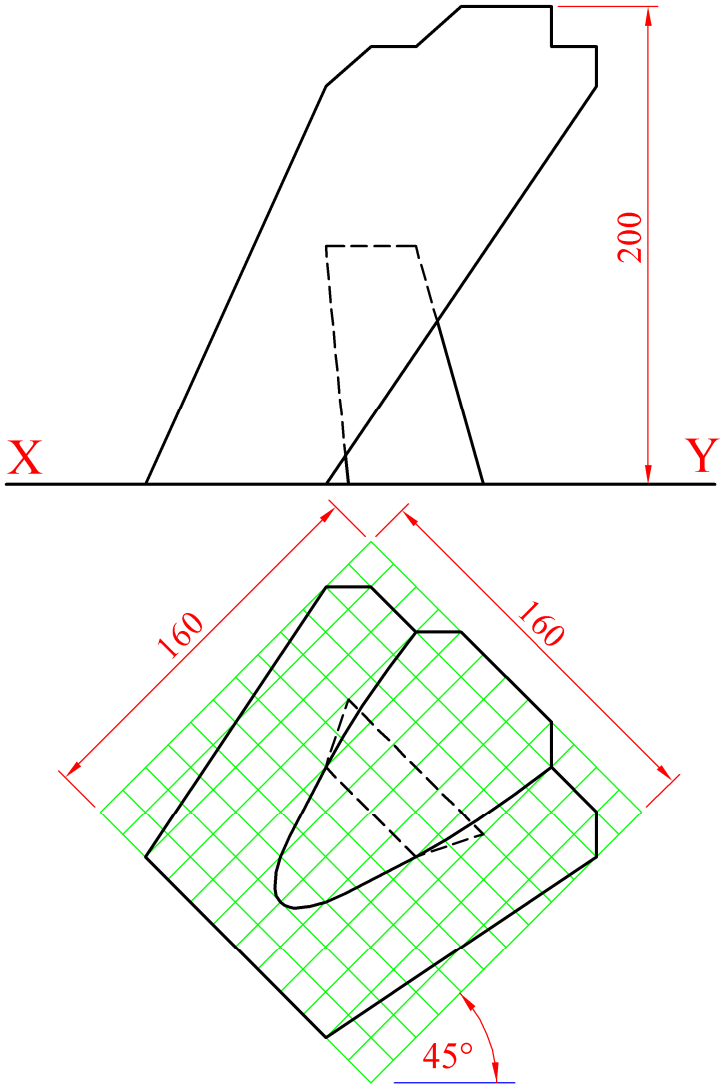
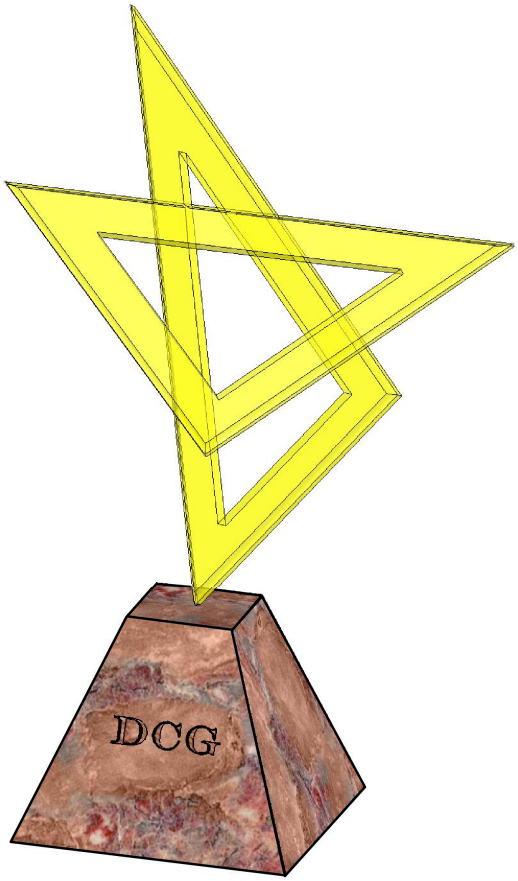


Fig. B-1

B-2. The 3D graphic shows a trophy which is to be awarded to the best student in a DCG class.

The trophy consists of two interlocking coloured glass set squares.

(The marble base, which is shown in the 3D Graphic, should be ignored for the purposes of your drawing).



The horizontal and vertical coordinates for the outer points of the intersecting triangular planes ABC and DEF are given below.

A	=	145	---	80	---	30
B	=	205	---	35	---	70
C	=	265	---	80	---	30
D	=	170	---	105	---	5
E	=	205	---	0	---	75
F	=	250	---	55	---	70

(a) Draw the plan and elevation of the intersecting planes.

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

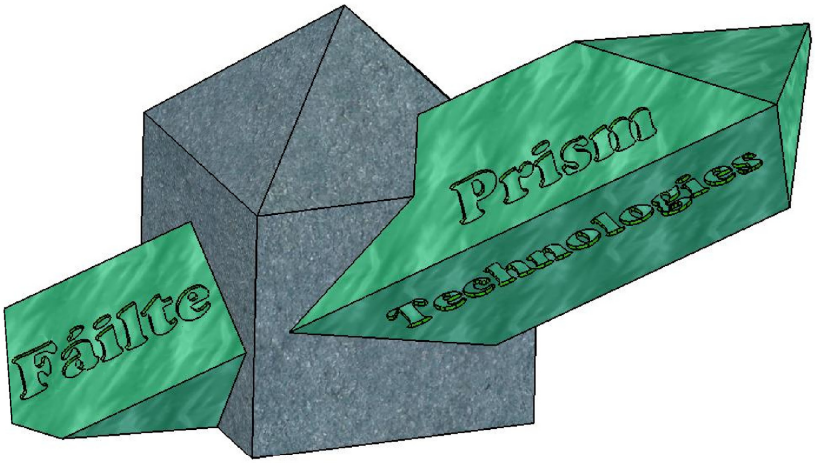
(c) Determine the dihedral angle between the planes.

(d) The inner triangle in the 45° set square (triangle ABC) is offset 10mm from the outer triangle. Draw the plan and elevation of the inner triangle.

(It is not necessary to draw the inner triangle on the other set square).

Scale 1:1

B-3. The 3D graphic on the right shows a piece of sculpture from the entrance lobby of an Irish company, ***Prism Technologies***.



The projections of the sculpture are shown in Fig. B-3 below.

The sculpture consists of a square based shaped solid which stands upright on the floor. This solid is penetrated by a square based prism of 350mm side as shown.

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

(The 3D graphic shows engraved text, which should be ignored for the purpose of your drawing).

Scale 1:10

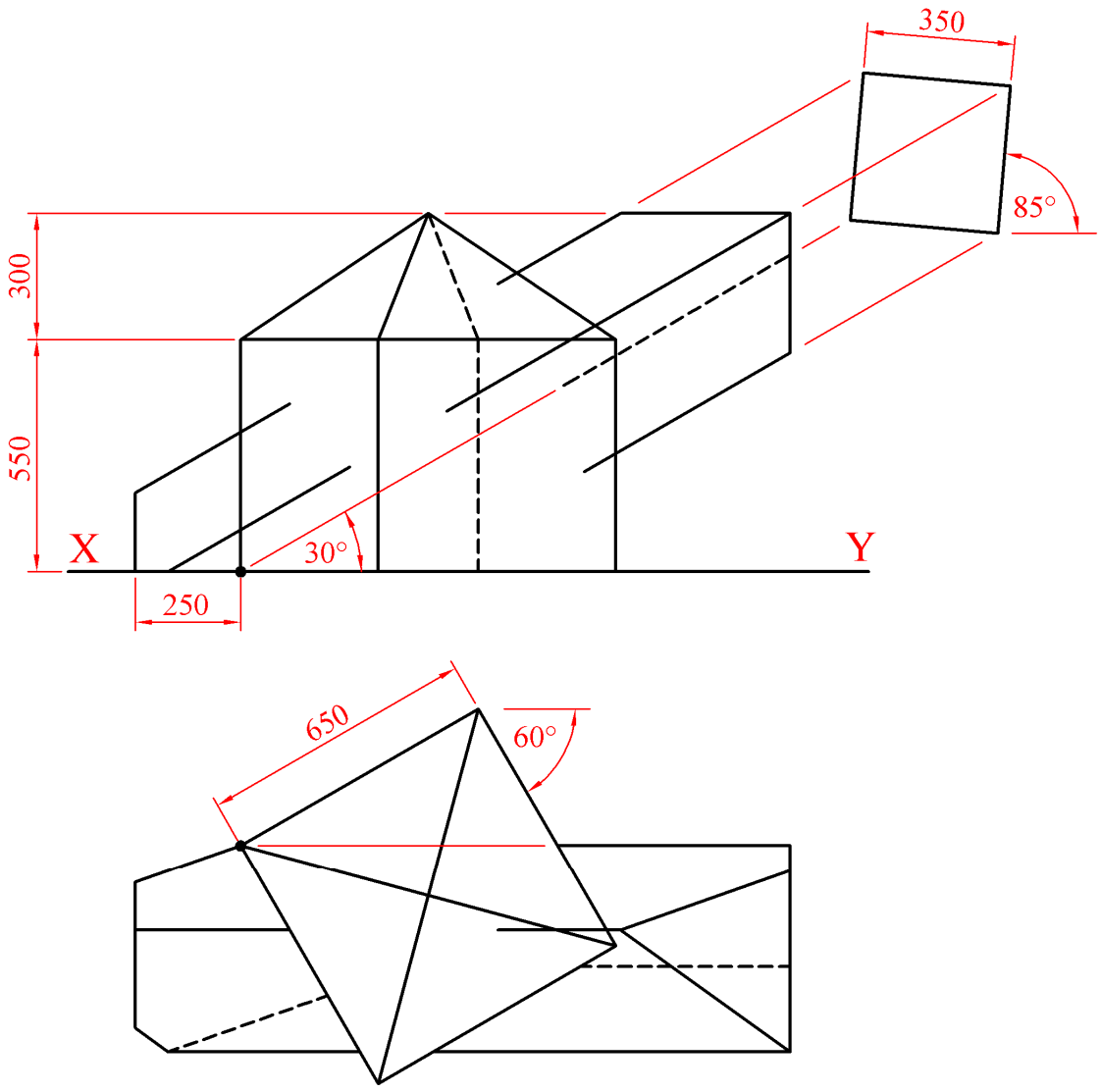


Fig. B-3

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 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 40m. The section from B to C has a gradient of 1 in 15 rising.

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 in 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 strike and dip of the stratum.

A skew bore-hole at D is drilled in a northerly direction in plan and has an actual inclination of 45° to the horizontal plane. It reveals the bottom surface of the stratum at a distance of 20 m from D.

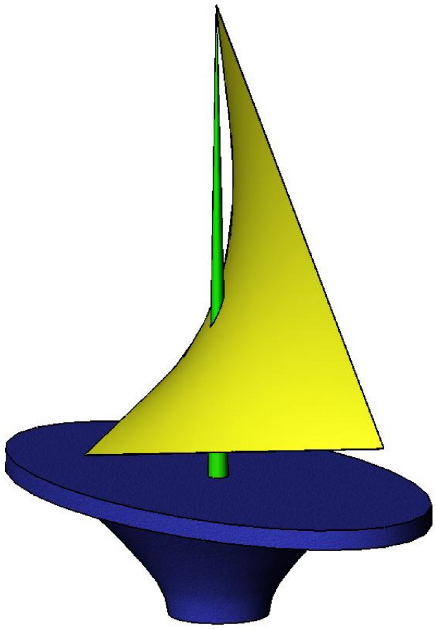
(ii) Determine the thickness of the stratum.

Scale 1:1000

Structural Forms

C-2. The 3D graphic on the right shows a trophy for a sailing competition which is in the form of a yacht. The projections of the trophy are shown in Fig. C-2.

The stand is a semi hyperboloid of revolution and the deck is elliptical. The sail, ABCD, is in the form of a hyperbolic paraboloid.



(a) Draw the given plan and elevation.

(The supporting mast, which is shown in the 3D Graphic, should be ignored for the purposes of your drawing).

(b) A plane director for the elements AB and DC is positioned so that it contains the point B. Draw the traces for this plane director.

Scale 1:1

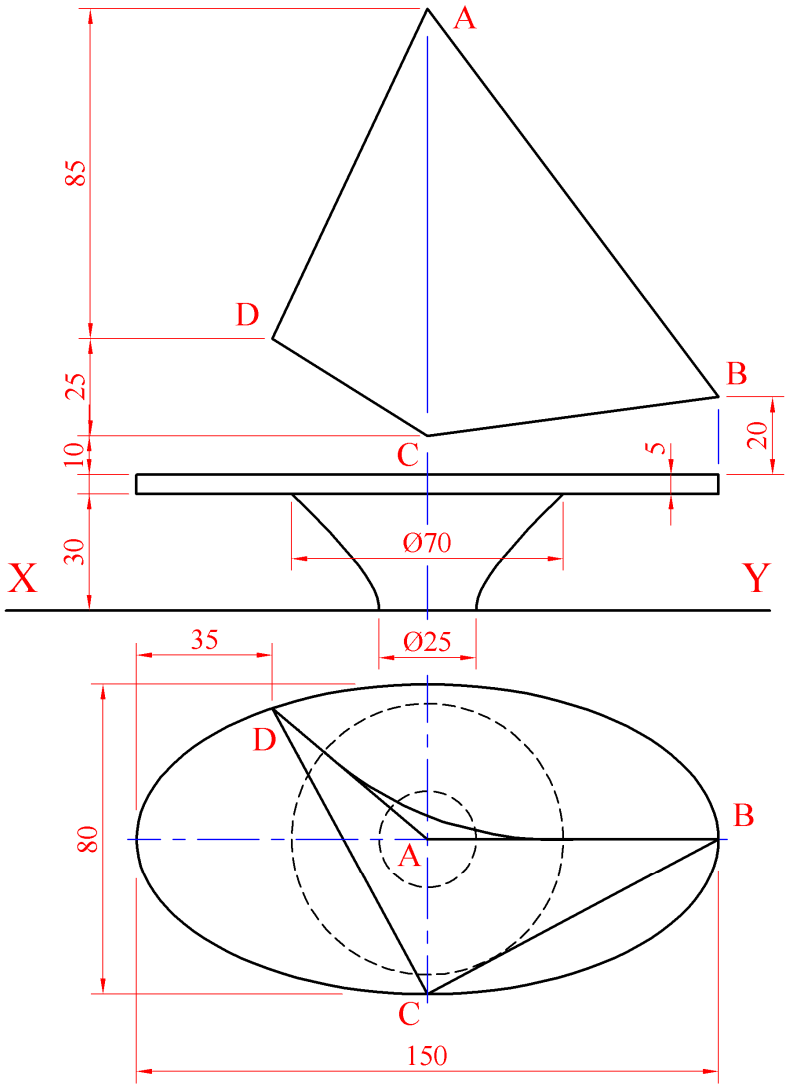


Fig. C-2

Surface Geometry

C-3. The 3D graphic on the right shows a piece of handheld playing equipment which is used to catch and throw a small ball in a child's game. It consists of a wooden handle and a metal upper portion in the form of a cone which has been shaped as shown.

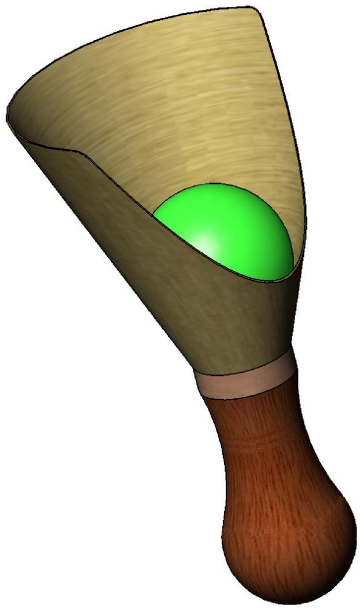


Fig. C-3 below shows the plan and elevation of the conical portion of the object. The projections of the ball are also shown.

(a) Draw the given plan and elevation.

(b) Draw the development of the conical surface.
The join seam should be on the shortest possible line.

(c) Determine the true shape of the semi parabola PV.
On the true shape indicate the position of the axis and focus.

Scale 1:2

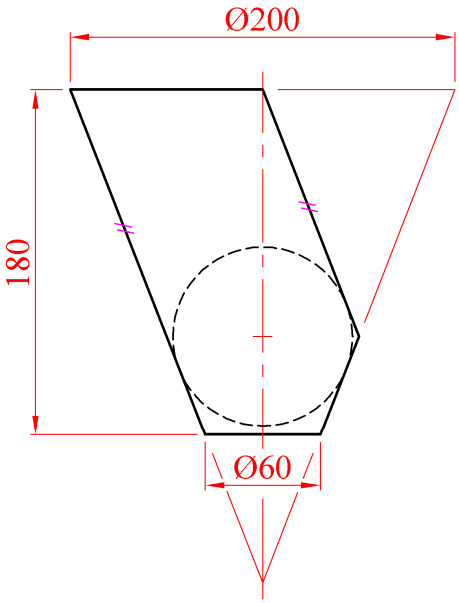
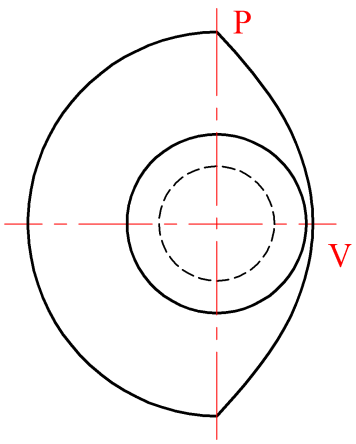


Fig. C-3



Dynamic Mechanisms

C-4. **(a)** The 3D graphic and enlarged balloon detail on the right show part of a steering mechanism from a go-cart.

The mechanism is shown in line diagram format in Fig. C-4(a) below.

In the diagram, the circle rolls clockwise along the line AB for half of one revolution. The link QP, which is 125mm long, is constrained to slide through the fixed point S. Q is a pin joint.

Draw the locus of point P for the movement.

Scale 1:1

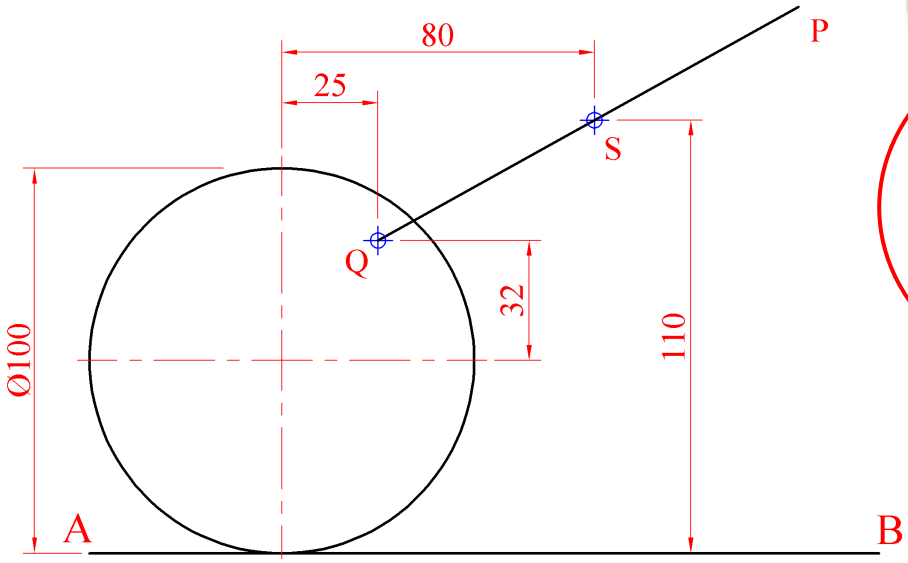


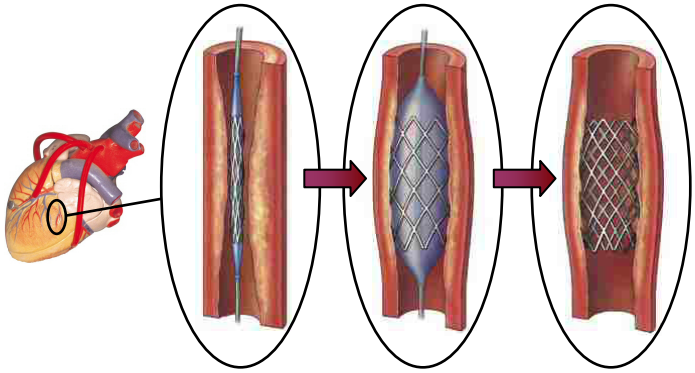
Fig. C-4(a)

(b) A ***stent*** is a small bio-medical device that is often inserted during heart surgery. As is shown in the graphic below, its helical structures allow surgeons to expand it with a tiny balloon in order to unblock blood vessels.

Fig. C-4(b) shows the cylindrical outline of a ***stent*** in plan and elevation.

Draw the given plan and elevation of a single helix which moves from A to B in half of a clockwise revolution about the cylinder as shown.

Scale 20:1 (Enlarged scale)



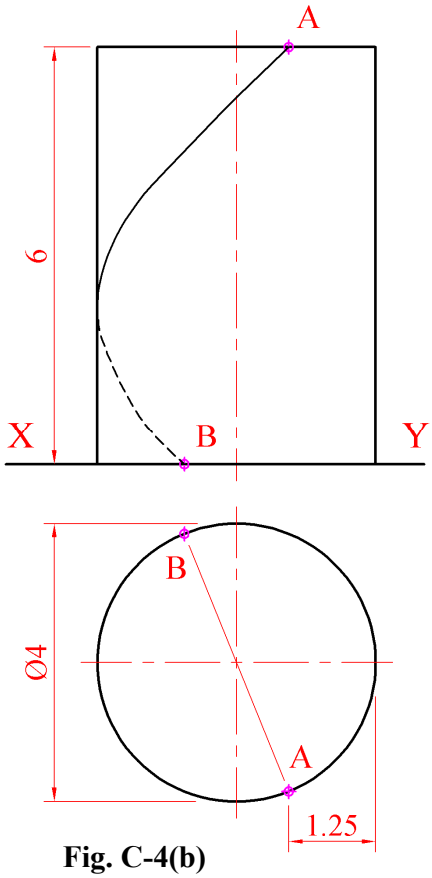


Fig. C-4(b)

Assemblies

C-5. **(a)** Details of a Juice Press, which was bought in pre-assembled format, are shown in Fig. C-5. The parts list is given on the right. A 3D Graphic of the parts is also shown.

Draw a full size sectional elevation on A-A showing the parts fully assembled. The Press Lever should be horizontal in the assembly.

Note: *All fillets are 6mm.*

(b) When parts 2, 5 and 8 are removed for cleaning the Press Lever falls until the curved surface C touches the flat surface S. Determine the distance between the centre of circle O and the horizontal plane when the Press Lever is in this position.

PART	NAME	QTY.
1	Base	1
2	Juice Strainer	1
3	Hinge Pin	2
4	Press Lever	1
5	Juice Cup	1
6	Hinge Cap	1
7	Vertical Bar	1
8	Plunger	1

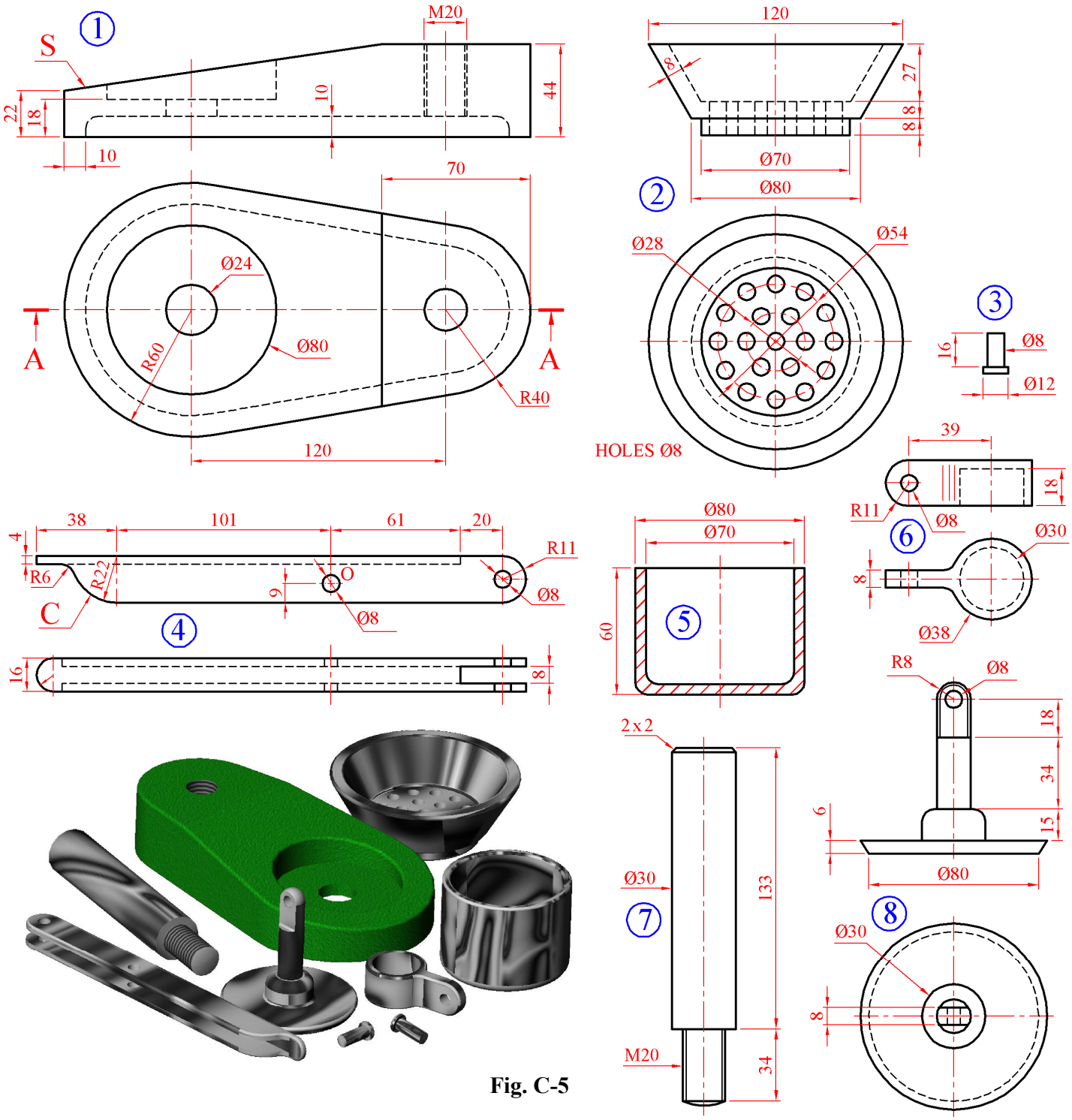


Fig. C-5

BLANK PAGE

BLANK PAGE

BLANK PAGE