



# Coimisiún na Scrúduithe Stáit

## State Examinations Commission

### Leaving Certificate Examination

## Design & Communication Graphics

### Higher Level

### Section B and C (180 marks)

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** questions on drawing paper.
  - All questions in Section B carry **60 marks** each.

- SECTION C**
- Five questions are presented.
  - Answer **one** question (i.e. the option you have studied) on drawing paper.
  - All questions in Section C carry **60 marks** each.

**General Instructions:**

- *Construction lines must be shown on all solutions.*
- *The graphics presented are not necessarily drawn to scale and must not be used for scaling purposes.*
- *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.*

Do not hand this up.

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State Examinations Commission.

## SECTION B - Core

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

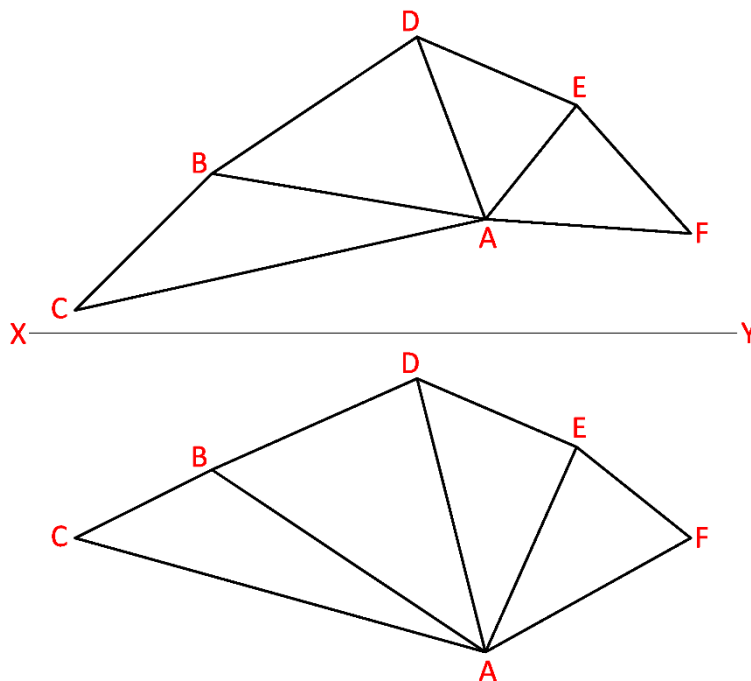
**B-1** The image on the right shows the headquarters of the Bilbao health department in Spain. The building includes a series of intersecting planar triangular surfaces.

Fig. B-1 shows the plan and elevation of four intersecting planar surfaces.

The horizontal and vertical coordinates for points **A, B, C, D,** and **E** are given. Partial coordinates for point **F** are also given.



Scale 1:1

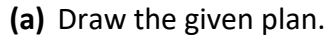


A:	190	---	25	---	70
B:	130	---	35	---	30
C:	100	---	5	---	45
D:	175	---	65	---	10
E:	210	---	50	---	25
F:	235	---	?	---	45

**Fig. B-1**

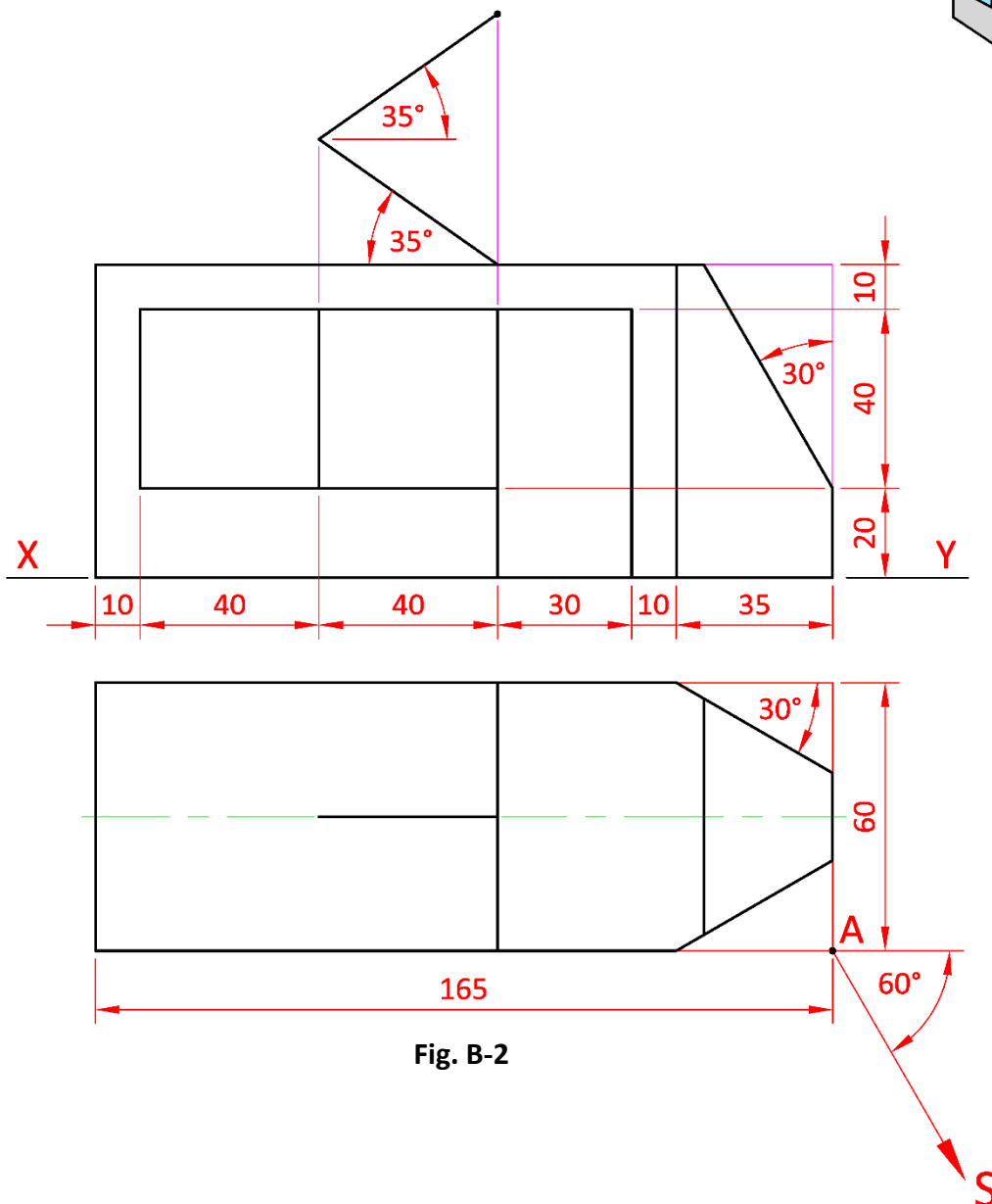
- (a) Draw the given elevation and plan of the intersecting planes **ABC**, **ABD**, and **ADE**.
- (b) Determine the dihedral angle between the planes **ABC** and **ABD**.
- (c) Draw the elevation and plan of a horizontal line on the surface **ADE** and project an auxiliary elevation which will show an edge view of the plane **ADE**. Indicate the angle of inclination of the plane **ADE** to the horizontal plane.
- (d) The dihedral angle between planes **ADE** and **AEF** is  $165^\circ$ . Complete the projections of the plane **AEF**.

The antenna is inclined at  $35^\circ$ .



- The spectator point **S**, is 120 mm from point **A**
- The picture plane is touching point **A**
- The horizon line is 100 mm above the ground line.

**Scale 1:1**



**Fig. B-2**

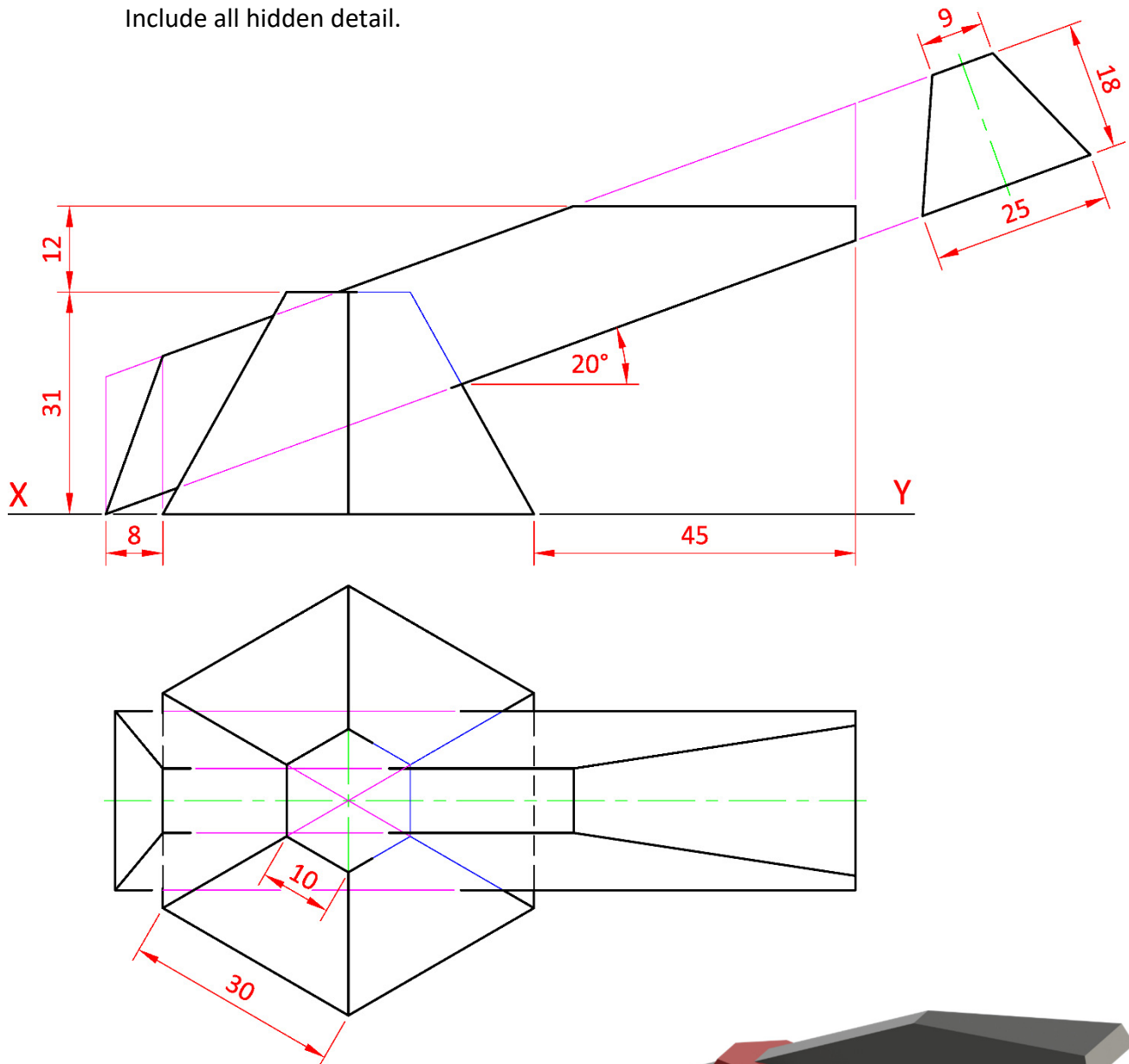
**B-3** The image on the right shows football boots and a stud remover tool.

Fig B-3 below shows the incomplete plan and incomplete elevation of a similar stud remover. The stud remover tool consists of a prism which intersects a truncated hexagonal pyramid as shown. A pictorial view of the stud remover tool is also shown.

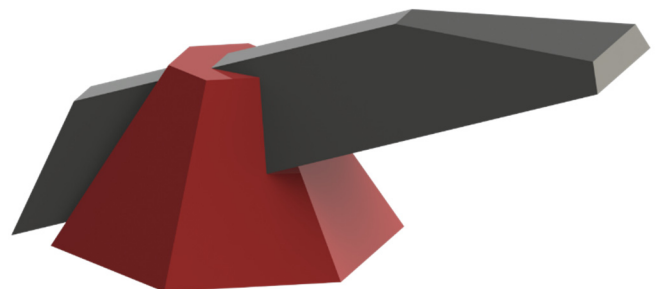


- Draw the given plan and elevation.
- Complete the projections of the stud remover tool showing all lines of interpenetration. Include all hidden detail.

Scale 2:1



**Fig. B-3**



## SECTION C - Applied Graphics

Answer **one** question (i.e. the option 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.

**ABCD** is the centreline of a proposed track for motorsport rallying. **O** is the centre of the circular curve.

The track has the following specifications:

- the portion of the track between **A** and **C** is level at an altitude of 50 m
- the portion from **C** to **D** is falling uniformly to a level of 40 m at **D**.

Using side slopes of 1 in 2 for the cuttings and 1 in 1.5 for the embankments, complete the earthworks necessary to accommodate the track on the northern side.

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



- (b)** On a separate diagram on the map, **P**, **Q** and **R** are three points on the top surface of a stratum of ore. **P** and **Q** are at altitudes of 20 m and 40 m respectively.
- Complete the elevation of the top surface of the stratum.
  - Determine the strike and dip of the stratum.
  - The thickness of the stratum of ore is 12 m. Determine the edge view of the bottom surface of the stratum.

**Scale 1:1000**

# Structural Forms

**C-2.** The image on the right shows an outdoor pavilion. The projections of a similar pavilion are shown in Fig C-2 below.

The curved surface is produced by translating the generating parabola **ABC**, in a vertical position, along the parabolic curve **EBD**, which is shown in elevation.

In the outline end view, the dotted line shows the generating parabola **ABC**. **B** is the vertex of both the parabola **ABC** and the parabola **EBD**, as shown.



- Draw the given elevation of the parabolic curve **EBD**.
- Draw the end view of the generating parabola **ABC**.
- Project the plan and complete the elevation of the pavilion.
- Determine the true shape of curve **AEC**.

Scale 1:100

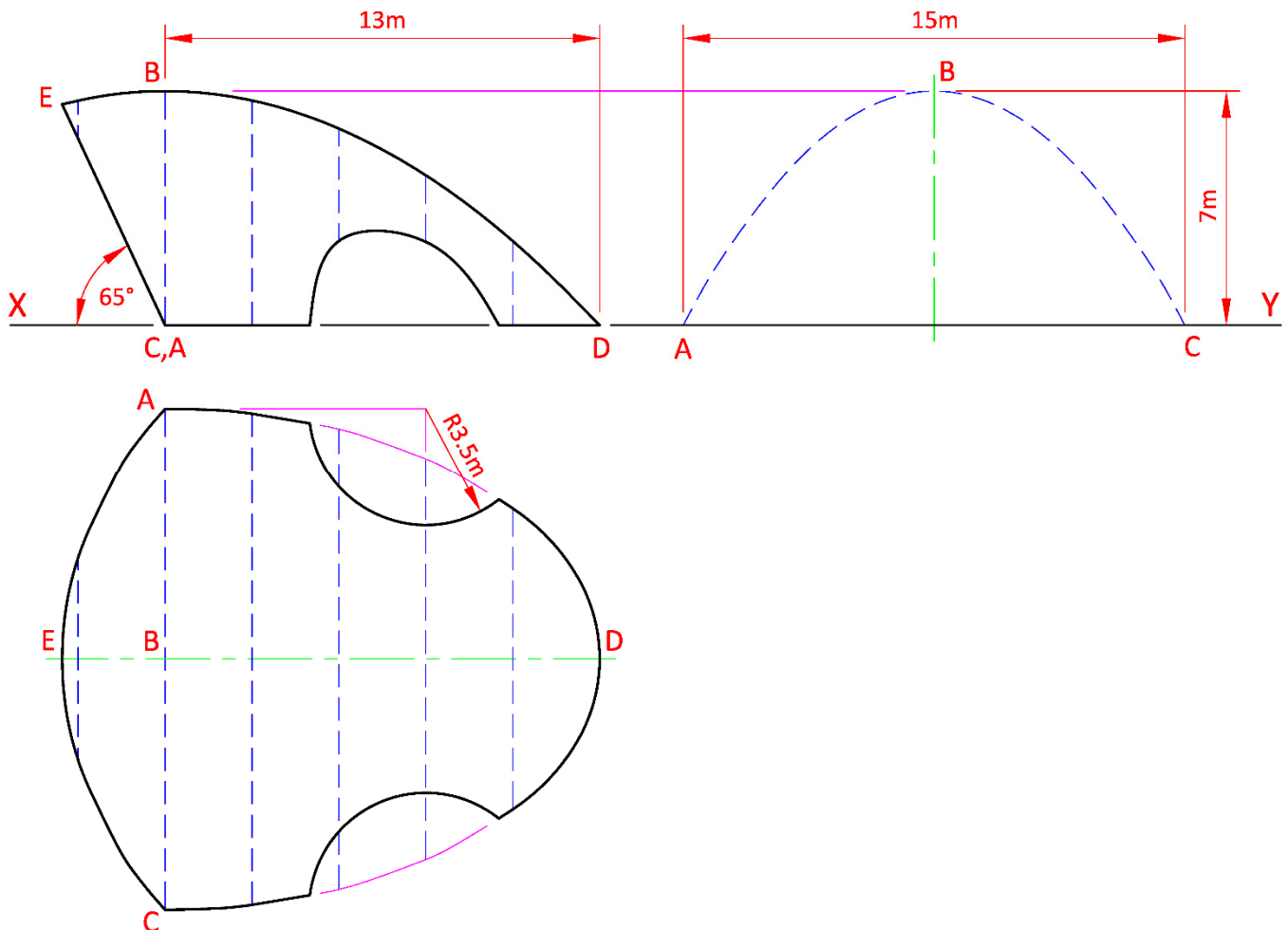


Fig. C-2



# Surface Geometry

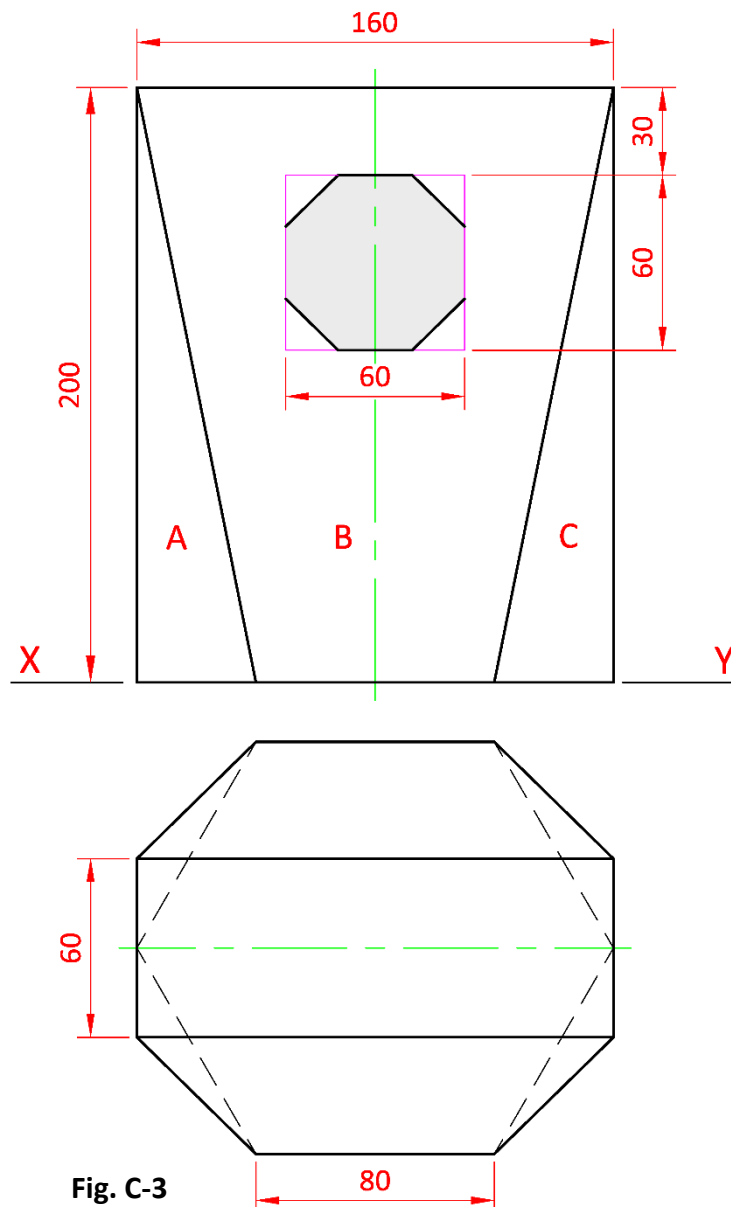
**C-3.** The image on the right shows the packaging for *Quality Street* chocolates.

Fig C-3 below shows the plan and elevation of a similar chocolate package. The base of the box is based on a hexagon of side 80 mm. A pictorial view is also given.

- Draw the given elevation and plan of the package without the octagonal logo (shaded in elevation).
- Determine the dihedral angle between the surfaces **A** and **B**.
- Draw a one-piece surface development of the surfaces **B** and **C**.
- The octagonal *Quality Street* logo is positioned in elevation as shown.  
Draw the elevation and project the plan of the logo.



Scale 1:2



# Dynamic Mechanisms

- C-4. (a)** The image on the right shows an oil pump. A line diagram representing a similar pump mechanism is shown in Fig. C-4(a) below.



Point **A** rotates in a circular motion about **O**. **AB** is 80 mm in length with pin joints at points **A** and **B**. **BD** has a length of 140 mm and oscillates about the fixed point **C**.

Link **ED** is pin-jointed at points **E** and **D**.

Link **EF** is constrained to move vertically and operates the plunger **P**.

- Draw the line diagram.
- On the diagram, redraw the mechanism when point **A** has rotated to position **A<sub>1</sub>**.  
Indicate the new depth for the plunger **P**.

Scale 1:1

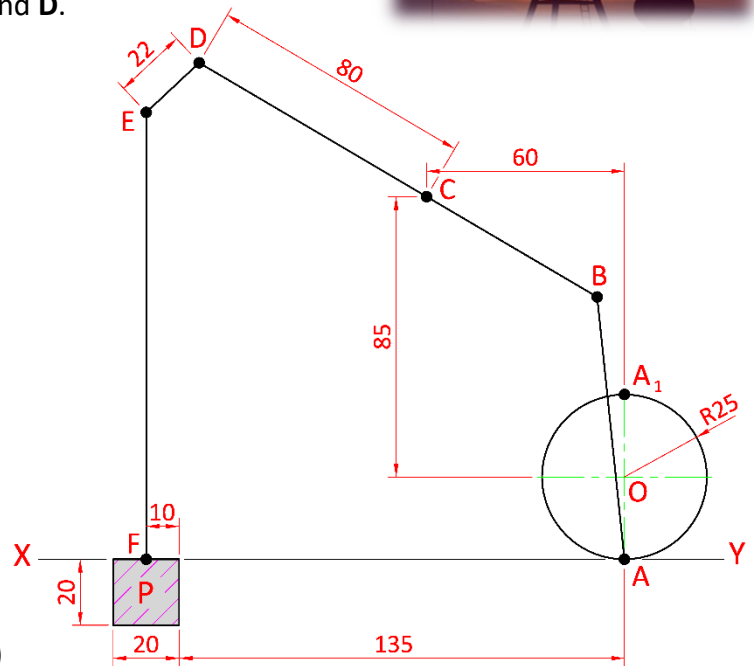


Fig. C-4(a)

- (b)** The image on the right shows a modern electric unicycle. The wheel is shown in line diagram format in Fig. C-4(b) below.

**P** is a point on the outer surface of the unicycle wheel. The wheel rolls clockwise along the line **AB**.

Plot the locus of point **P** for one full revolution of the wheel.

Scale 1:5

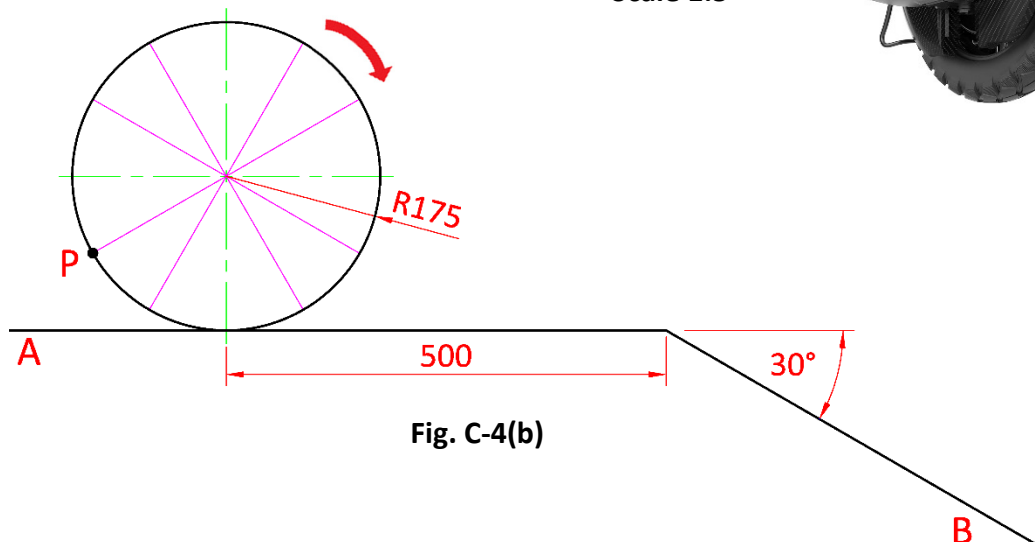


Fig. C-4(b)



# Assemblies

**C-5.** The image on the right shows a pipe vice for holding round bars. The details of a similar vice are given in Fig. C-5 below. The parts list is also given in a table.

Draw a sectional elevation on **A-A**, with the parts fully assembled and the *locking clamp* (part 4) in the closed position.

(Note: Any omitted dimensions may be estimated.)

Scale 1:1

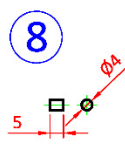
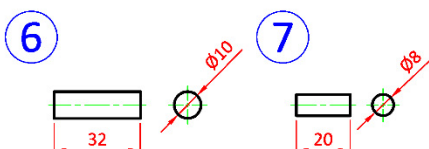
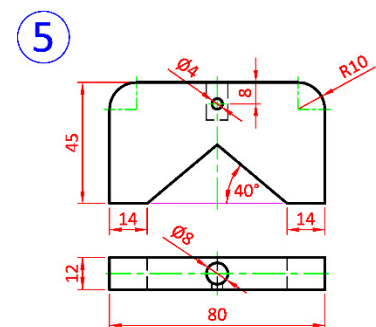
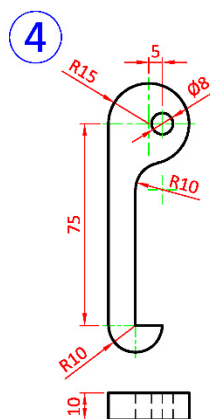
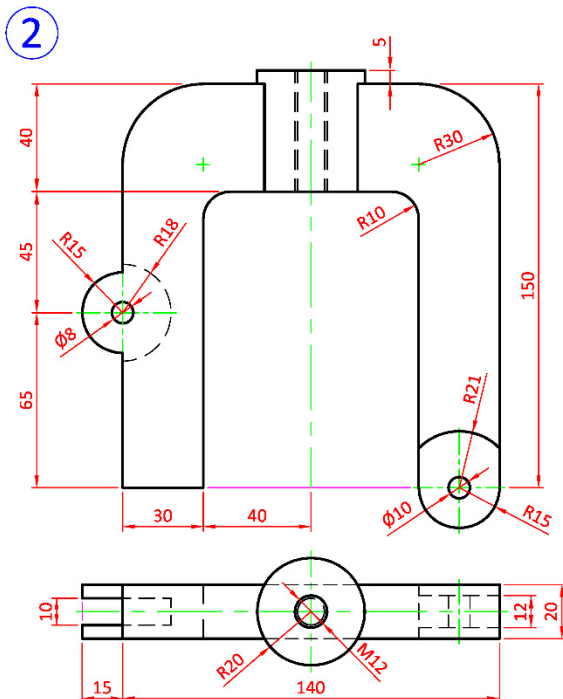
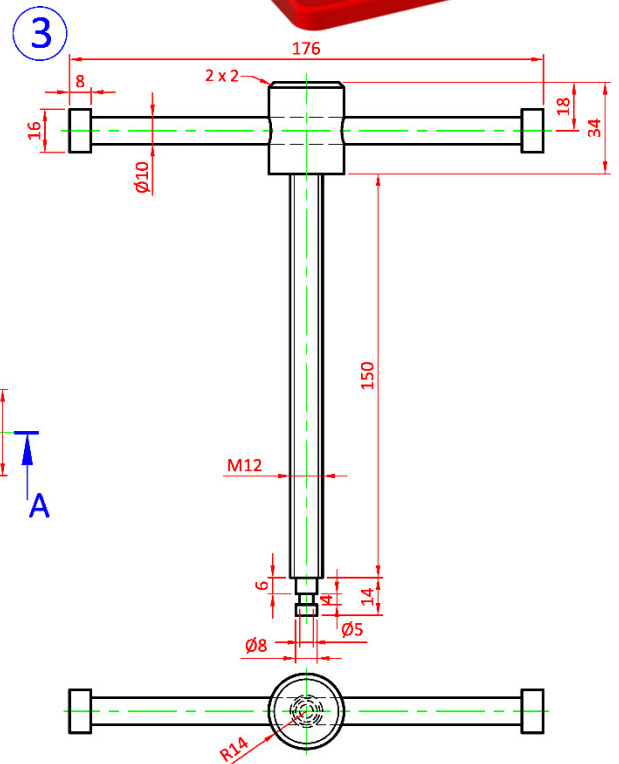
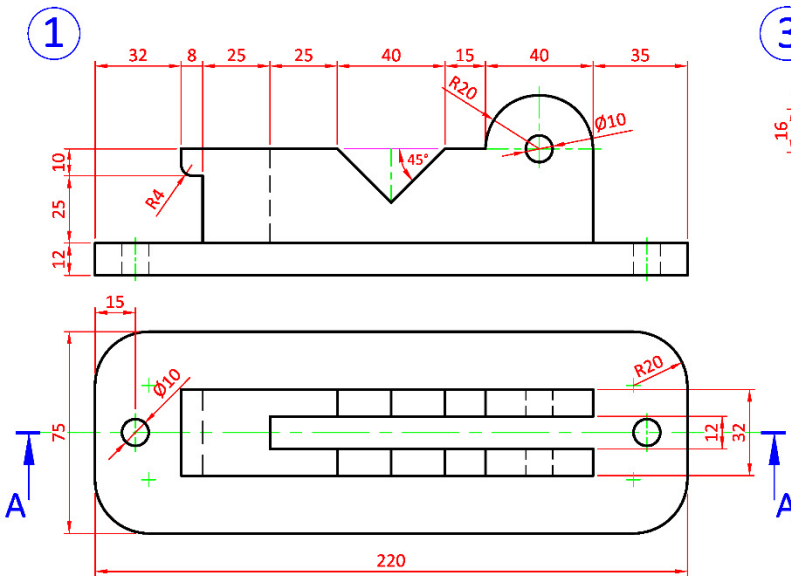
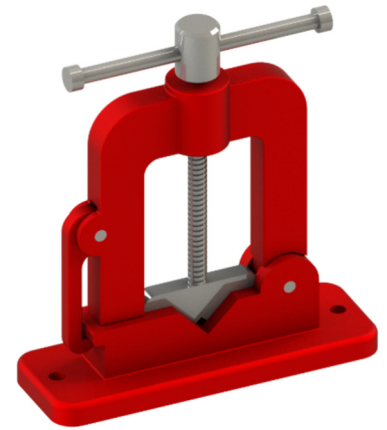


Fig. C-5

Part	Name	Qty.
1	Base	1
2	Main frame	1
3	Adjustment screw	1
4	Locking clamp	1
5	Moving Jaw	1
6	Ø10 Pin	1
7	Ø8 Pin	1
8	Ø4 Pin	1

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