

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

GEOMETRICAL AND MECHANICAL DRAWING

9351/01

Paper 1

May/June 2004

3 hours

Additional Materials: A2 Drawing Paper (4 sheets)
Protractor
Standard Drawing Equipment

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name at the bottom right-hand corner of every sheet of paper you use.

Do not use highlighters, glue or correction fluid.

Answer **all** questions from Section I and any **three** questions from Section II.

Write or draw your answers on the separate Drawing Paper provided.

Work **all** your answers in SI units. Use both sides of the Drawing Paper.

All solutions are to be drawn full-size unless a contrary instruction is given. Construction lines must be clearly shown.

The diagrams are not necessarily drawn to scale.

All dimensions are in millimetres unless otherwise stated.

You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

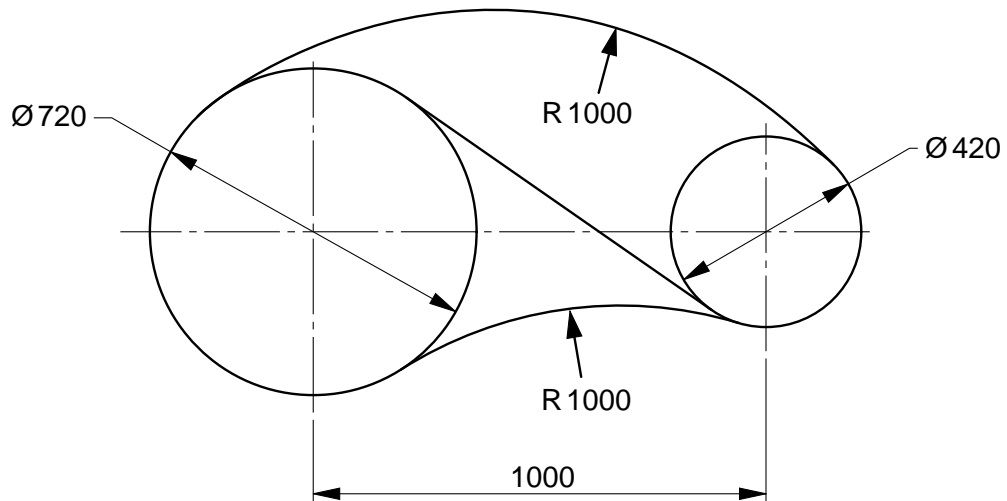
This document consists of **10** printed pages and **2** blank pages.



Section I (40 marks)Answer **all** questions in this section

- 1 A model electric train layout, with the track represented by a single line, is given in Fig. 1.

Using geometrical constructions for the tangent and tangential arcs, draw the track layout to a scale of 1:10. All construction lines including points of tangency must be shown. [8]

**Fig. 1**

2 Orthographic views of an electric fan are given in Fig. 2. The fan consists of the base and the fan casing. The fan casing swings through 30° either side of the base as indicated in the plan.

(a) Draw, to a scale of 1:10, the given views of the **fan casing only**. [2]

(b) Project a second end view, to the right of the front view, showing the **fan casing** in the position indicated by the short chain lines in the plan. [6]

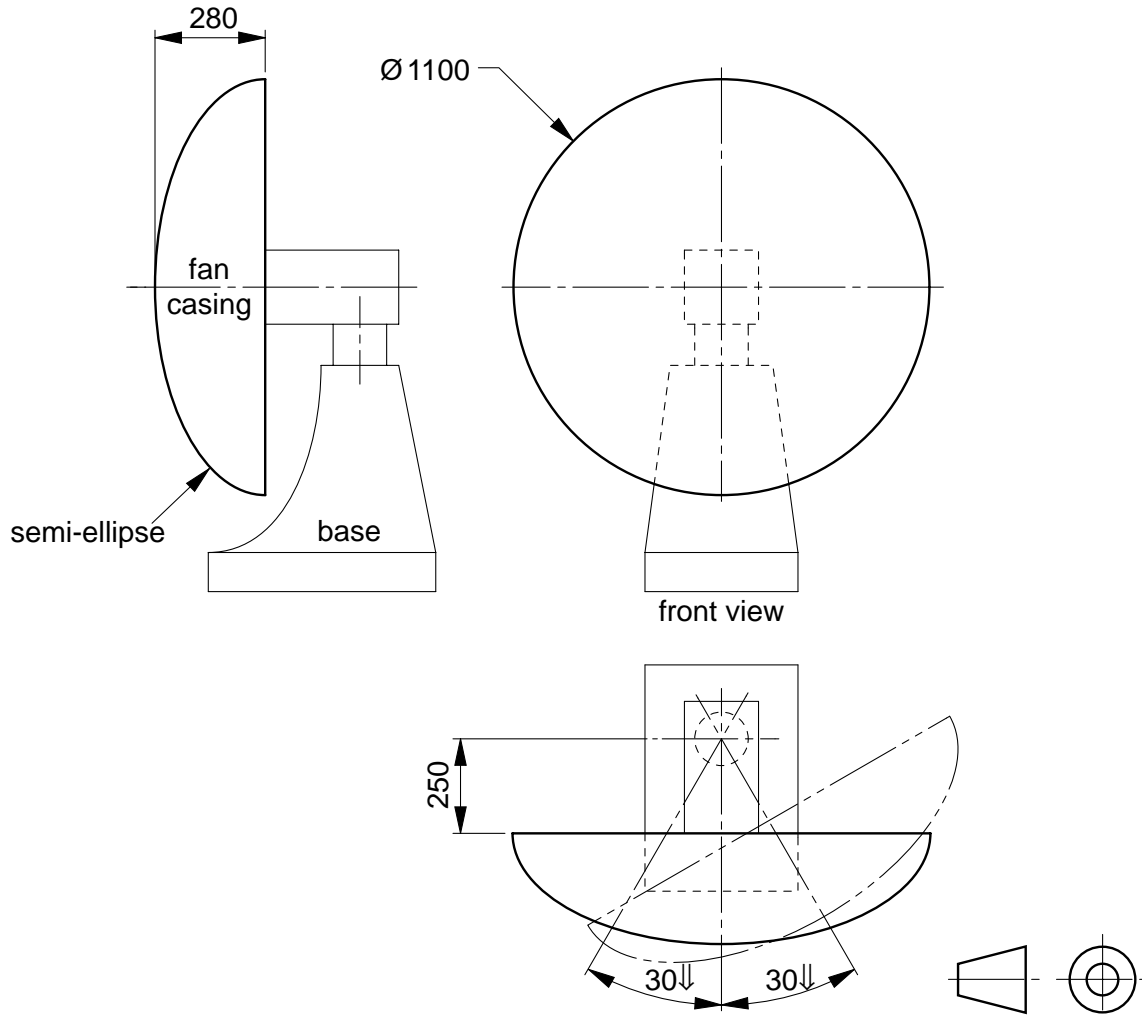


Fig. 2

3 The plan of a children's playground area is shown in Fig. 3.

(a) Draw the plan to a scale of 1:1000. [1]

(b) Using graphical methods:

(i) construct a similar **reduced** figure with the side **BC** 37 mm long. [5]

(ii) construct a similar figure that is 25% larger in area. [5]

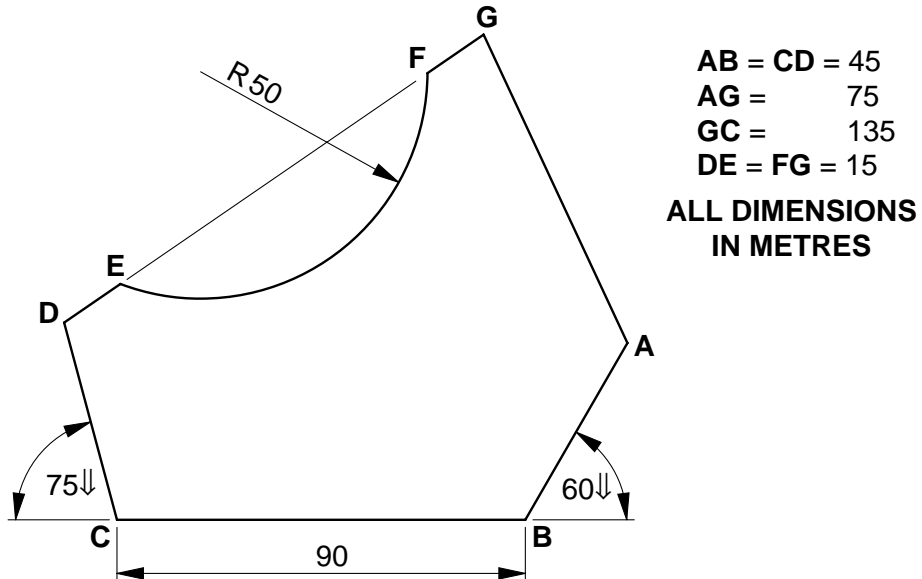


Fig. 3

- 4 A wall-mounted lampshade, made from thin aluminium, is shown in Fig. 4. The lampshade is in the shape of a regular hexagonal pyramid truncated at both ends.

Construct a scale 1:2 one-piece development of the front half **ABCDE** of the lampshade. Ignore the thickness of the metal. [13]

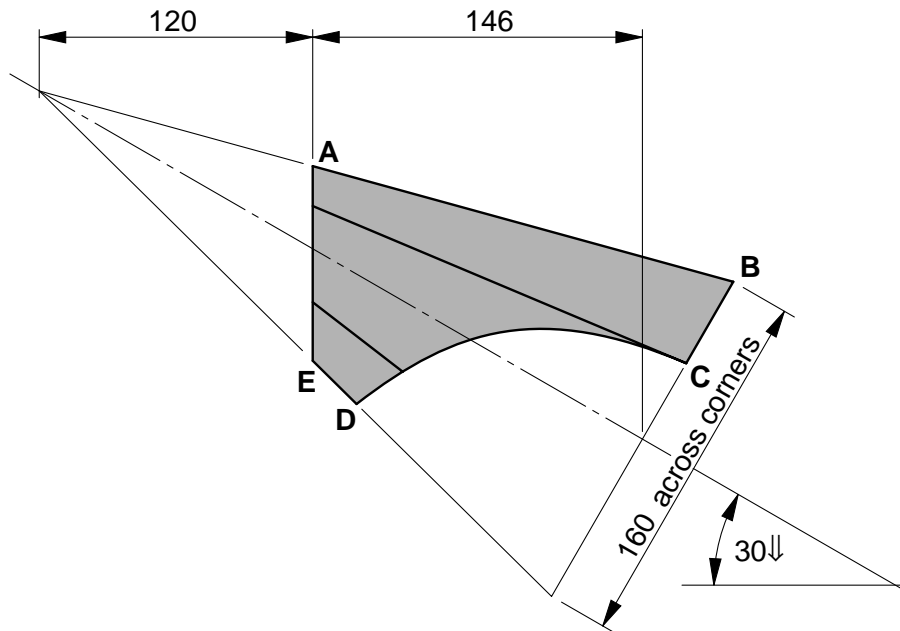


Fig. 4

Section II (60 marks)

Attempt no more than **three** questions from this section.
All questions carry equal marks.

- 5 Orthographic views of a sports trophy are given in Fig. 5.

Draw a full size **planometric (45° x 45°)** view of the trophy with the curve **C** to the front of your answer. [20]

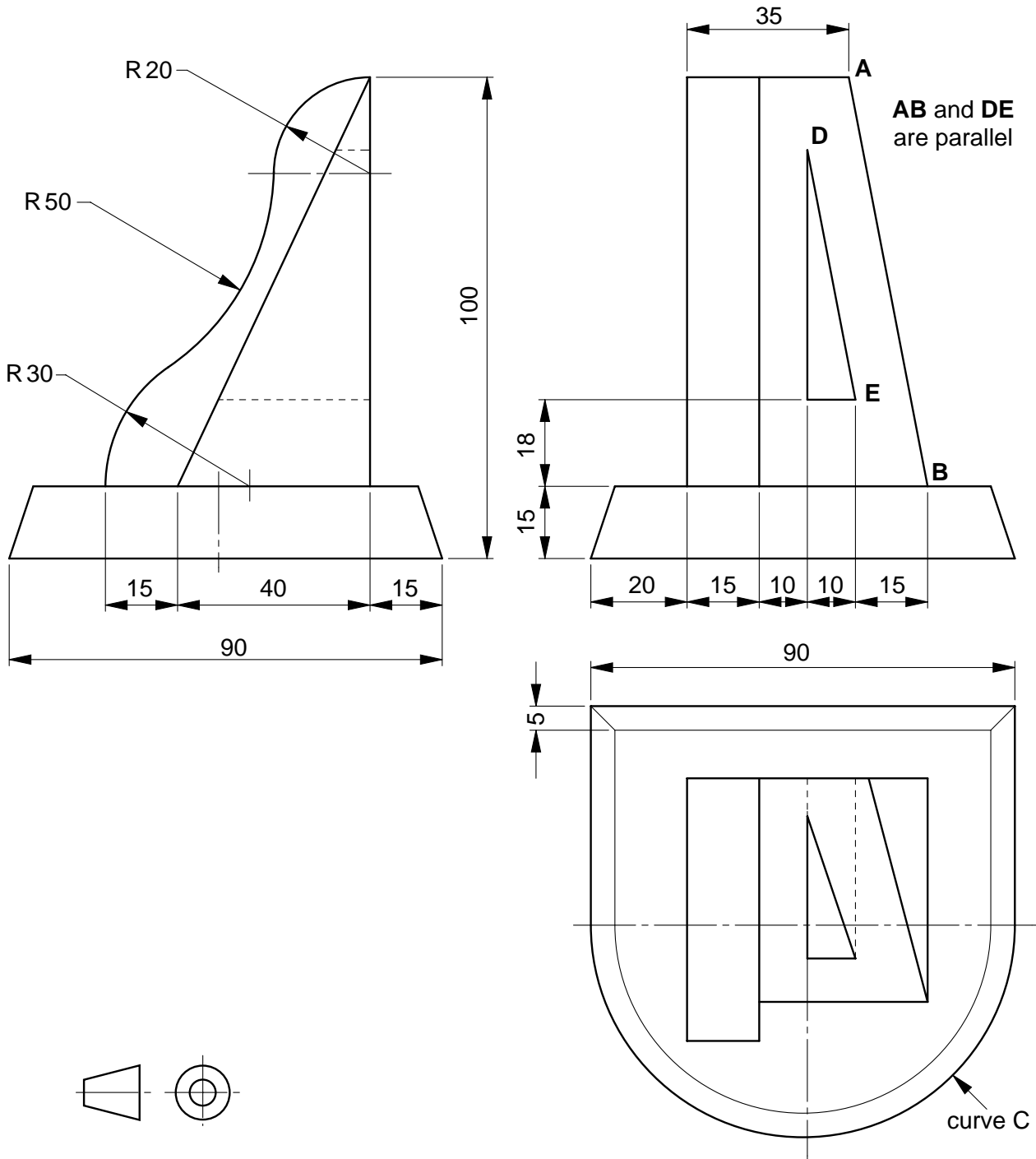


Fig. 5

- 6 Fig. 6 shows incomplete orthographic views of a chute for a grain storage silo. Both parts of the chute are hollow, open at both ends and constructed from thin sheet metal.

Draw and complete the given views to a scale of 1:100. Include the lines of intersection between the two parts in both views. Ignore the thickness of the metal. [20]

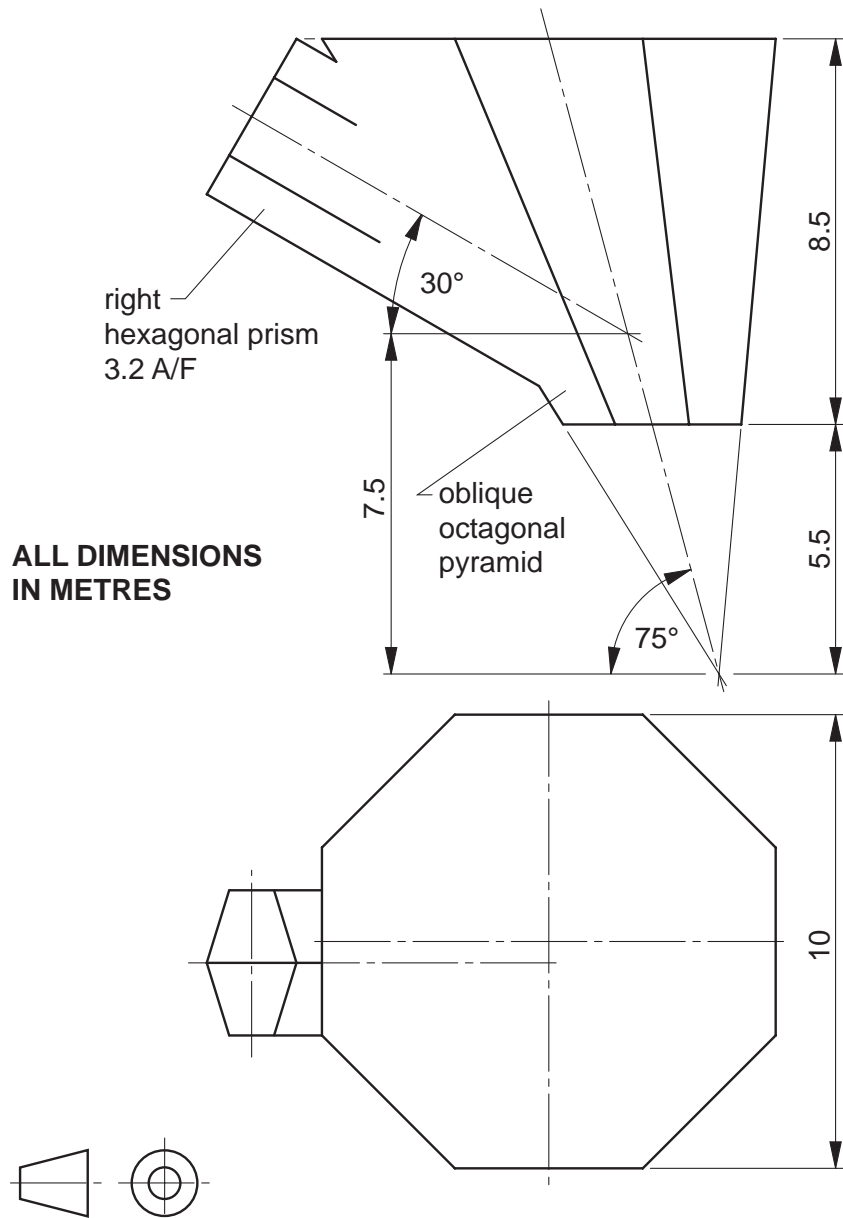


Fig. 6

7 Read all parts of the question before starting to draw.

The sketch Fig. 7a shows the metal frame of a cage for small reptiles at a zoo. The frame is to be covered with wire mesh (not shown), to form a cage in the shape of a truncated right cone, and attached to a vertical wall. A plan of the frame is given in Fig. 7b.

The two straight rods **AD** and **CF** are connected at **G** and the end **F** is attached to the wall.

- (a) Give the geometrical name for the curved edge of the frame **EAB**. [1]
- (b) Draw the given plan of the frame to a scale of 1:20. [2]
- (c) Above the plan, project the view **X** of the frame, including the rods **AD** and **CF**. [4]
- (d) Determine graphically:
- (i) the vertical height of **F** above the base of the frame; [3]
 - (ii) the true length of **AD**; [3]
 - (iii) the true angle made by **AD** and the wall; [3]
 - (iv) the true angle between the rods **AD** and **CF**. [4]

Give your answers to (a) and (d) clearly under your drawing.

Ignore the thickness of the metal. Do not show the wire mesh in your answer.

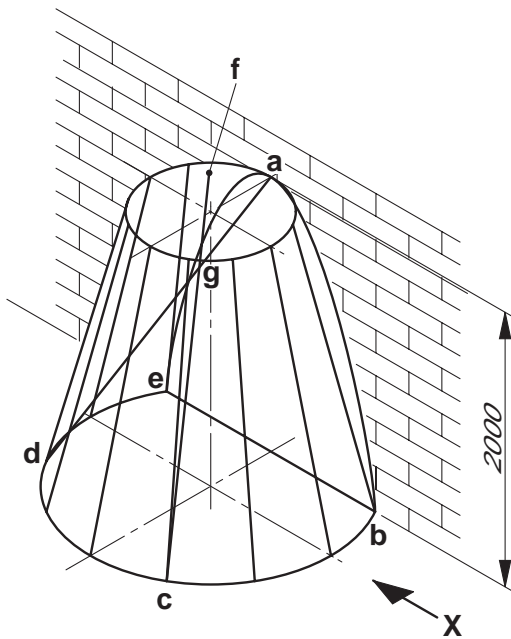


Fig. 7a

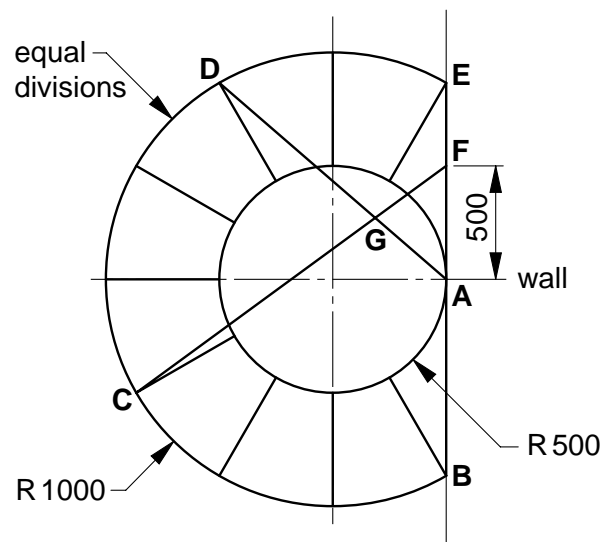


Fig. 7b

8 Fig. 8 shows a pin-jointed roof truss carrying dead and wind loads as indicated. The truss is supported at the right hand end by a frictionless roller and by a hinge at the left hand end.

- (a) Draw the roof truss to a scale of 1:100 and use Bow's notation to identify the members of the truss. [3]
- (b) Determine by construction the magnitude and direction of the reactions at the roller and hinge. Use a scale of 5 mm = 1 kN. [6]
- (c) Construct a force diagram for the roof truss. [5]
- (d) Use the force diagram to determine the magnitude and sense of the forces marked *. Do not tabulate the forces for the whole structure. [6]

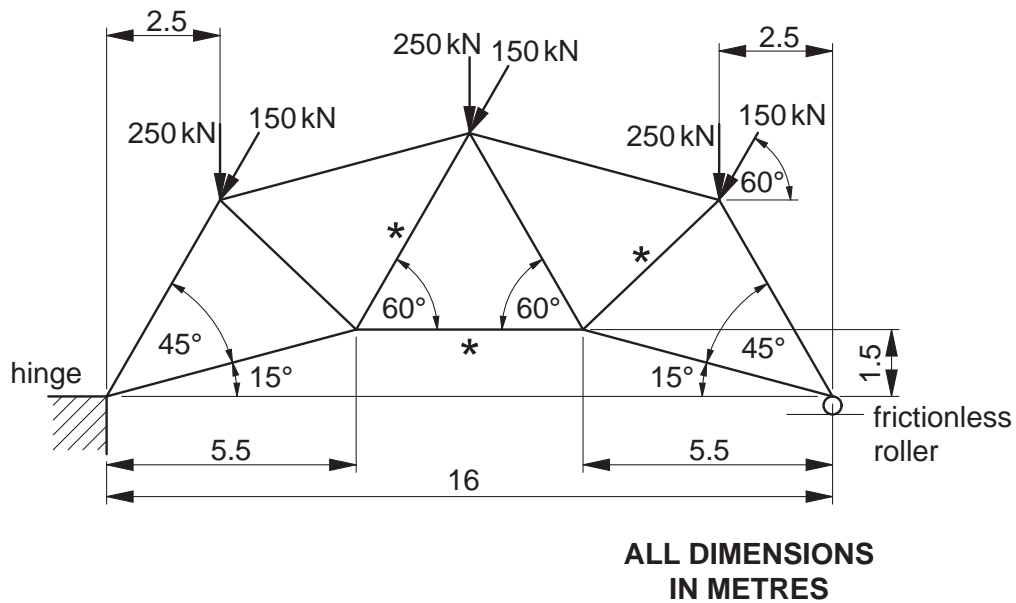


Fig. 8

9 Fig. 9 shows a knife follower that oscillates with uniform angular velocity about a fixed point **A**.

A link **CD**, pin-jointed to the follower, is constrained to pass through a fixed point **P**.

A cam is required that, during one complete revolution, provides one complete oscillation of the follower upwards through 42° and back to the original horizontal position.

- (a) Draw a suitable full size diagram of the mechanism. [2]
 (b) Construct the cam profile. [13]
 (c) Construct the locus of **D** for one complete revolution of the cam. [5]

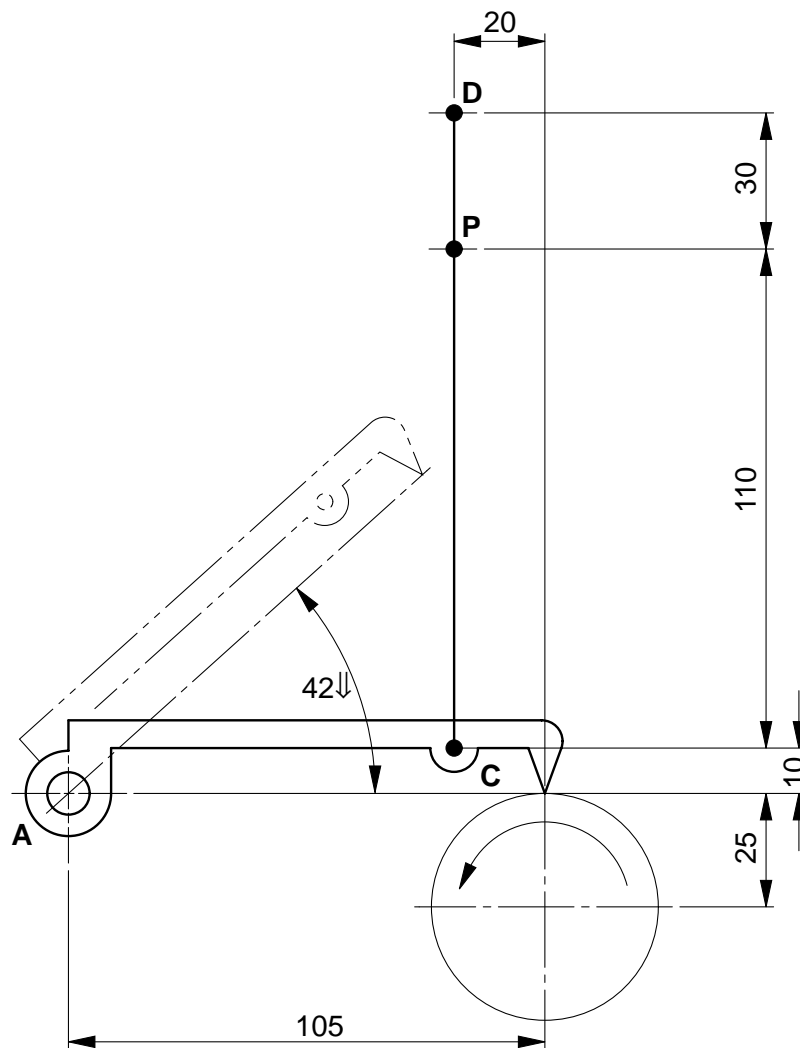


Fig. 9

