

CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Advanced Level

**GEOMETRICAL AND MECHANICAL DRAWING**

**9351/01**

Paper 1

October/November 2003

**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 staples, paper clips, highlighters, glue or correction fluid.

**Section I**

Answer **all** the questions.

**Section II**

Answer any **three** questions.

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 Fig. 1 shows a sheet of metal with a triangular hole in it.

The metal sheet is to be formed by wrapping it round a cylinder diameter 50 mm so that **A** and **B** touch.

(a) Draw the given figure full size. [1]

(b) Draw the front view of the metal sheet after it has been formed into the cylinder. The point **AB** is to be at the front of the view. Hidden detail is required. [4]

Ignore the thickness of the metal. [4]

(c) Under your answer, print the geometrical name of the curved edge **AC** of the truncated cylinder. [1]

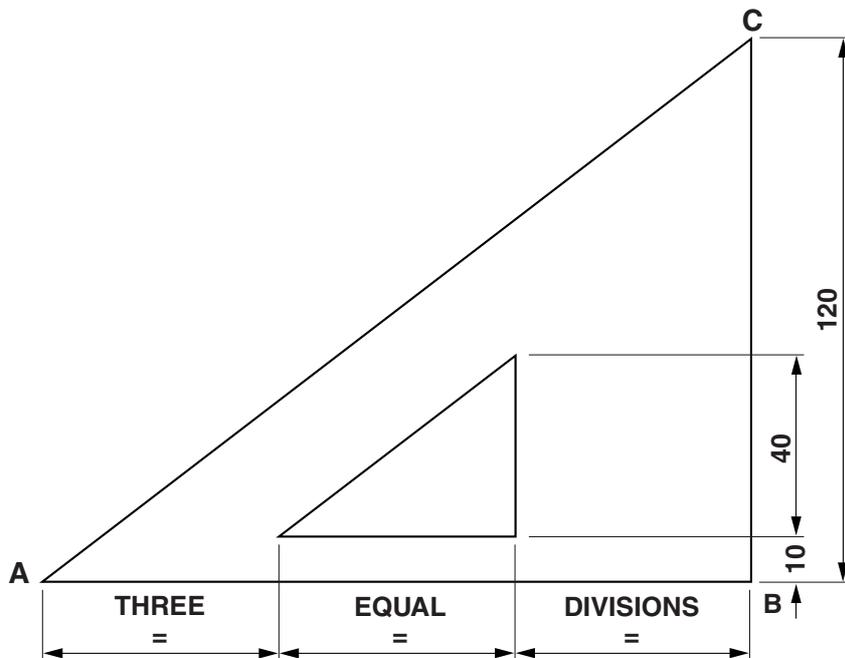


Fig. 1

- 2 Fig.2 shows a block of metal which has been turned in a lathe until the right hand end is cylindrical. The line **AB** represents the generating line of a surface of revolution about the axis **OO**.

(a) Draw the two given views full size. [1]

(b) Complete view **FV** by constructing the line of intersection formed by turning the block. [7]

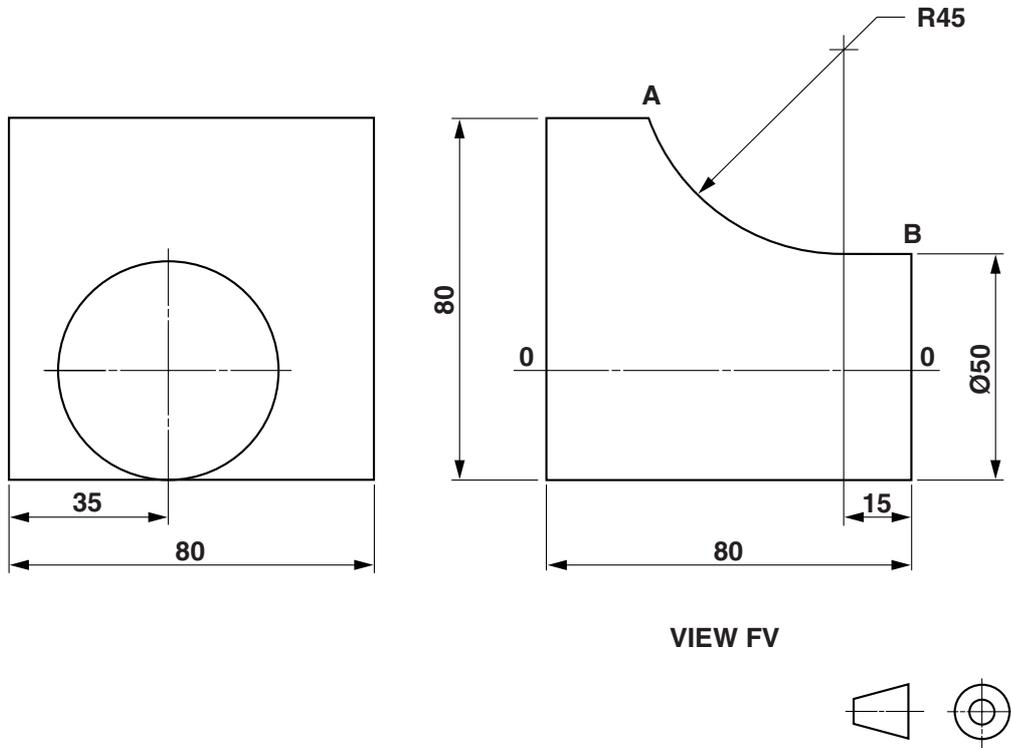


Fig.2

3 Orthographic views of a radial arm are given in Fig. 3.

(a) Make an accurate Cabinet Oblique drawing of the radial arm. [7]

(b) Sketch freehand, approximately full size, an Estimated Two-Point Perspective view of the radial arm. Vanishing points must be shown. [7]

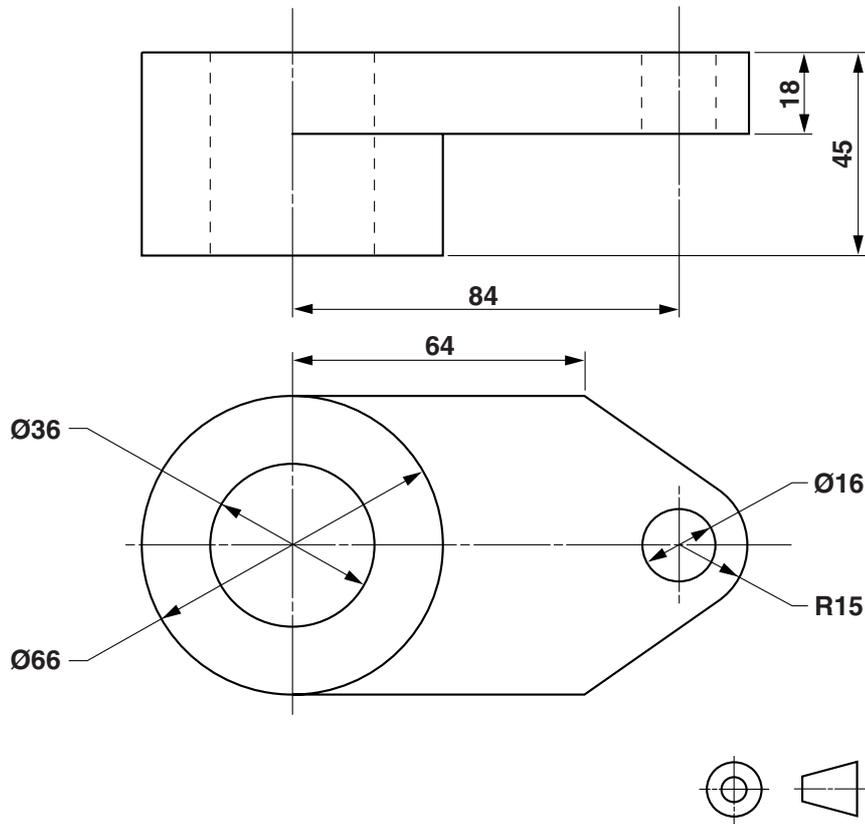


Fig. 3

- 4 A memorial stone is shown in Fig. 4. The stone is in the shape of a truncated right octagonal pyramid with an oblique cone centrally positioned on the pyramid as shown.

To a scale of 1:5, draw the following views of the memorial stone in third angle orthographic projection:

- (a) the view seen in the direction of arrow **FV**; [2]  
 (b) the view seen in the direction of arrow **EV**; [5]  
 (c) an auxiliary view of the memorial stone looking directly on the sloping top of the truncated pyramid. [5]

Hidden detail is not required in any view.

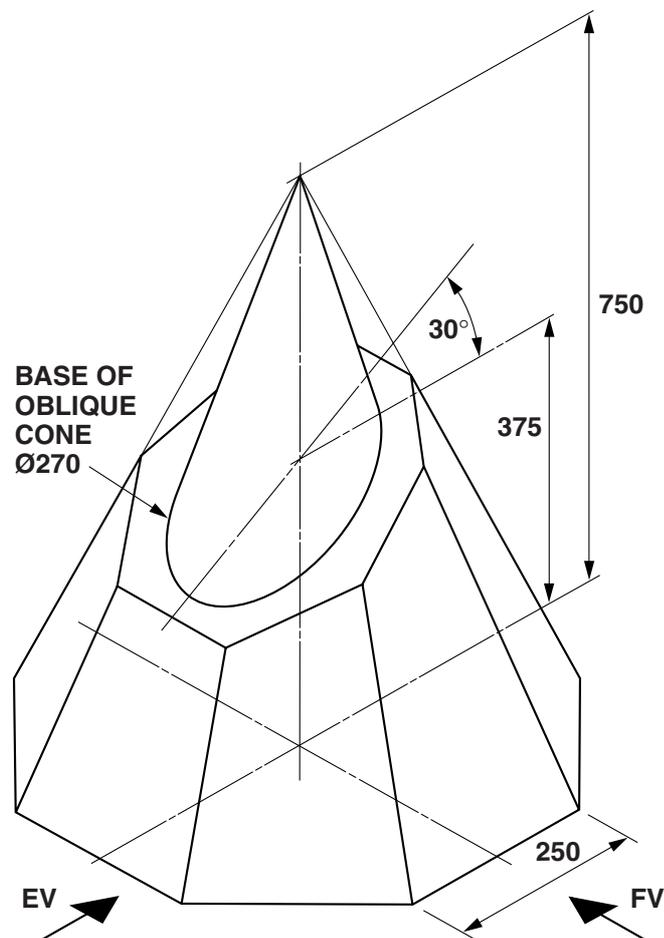


Fig. 4

## Section II (60 marks)

Attempt no more than **three** questions from this section.

All questions carry equal marks

5 Orthographic views of metal ducting are given in Fig. 5. The ducting consists of:

- a truncated elliptical pipe part 1
- a transition piece part 2
- an irregular four-sided duct part 3

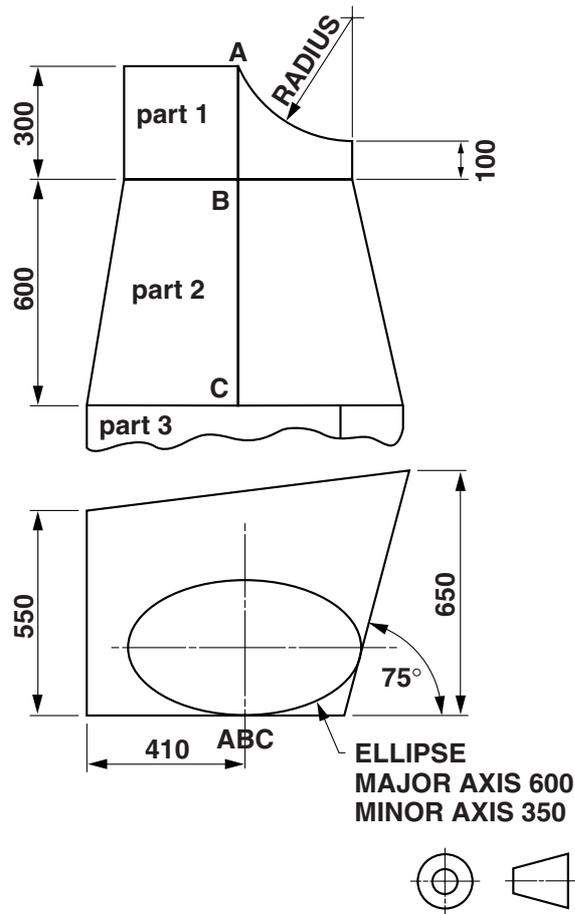
(a) Draw the given views to a scale of 1:10. [5]

(b) Construct a development of the truncated elliptical pipe part 1, with the join along the line **AB**. [4]

(c) Construct a development of the transition piece with the join along the line **BC**.

Ignore the thickness of the metal.

[11]



6 The sketch Fig. 6, shows part of the mechanism of a knitting machine.

The end **A** of the rod **AB** moves around the quadrant **AD** at a uniform rate whilst the slider **C**, through which **AB** passes, moves to **E** at a uniform linear rate.

(a) Draw, full size, a diagram of view **FV** and plan **P** of the mechanism. [2]

(b) Plot the locus of **B** in both views from the given positions until **A** reaches **D** and **C** reaches **E**. [18]

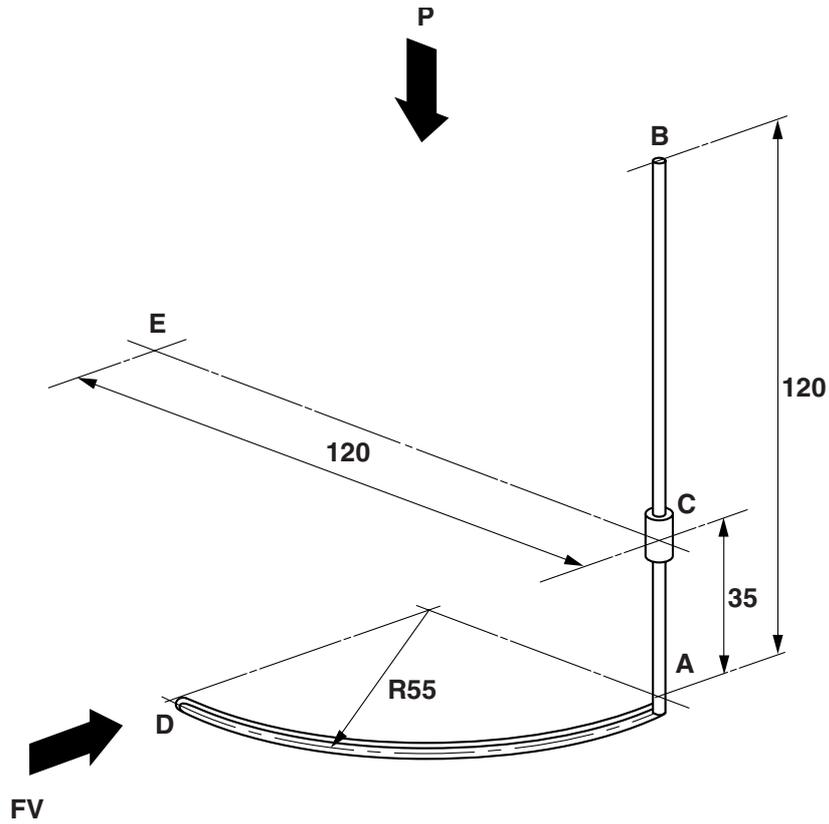


Fig. 6

- 7 A communications company called Small Planet Technology has a sign outside their offices, as shown in the sketch Fig. 7a.

The four spheres are in contact with the platform and all adjacent spheres.

In the plan:

the platform is 1300 mm square;

the 800 mm diameter sphere makes contact with the platform at the position shown in Fig. 7b;

the line joining the centres of the 800 mm and 500 mm diameter spheres makes an angle of 45 degrees with the front edge of the platform.

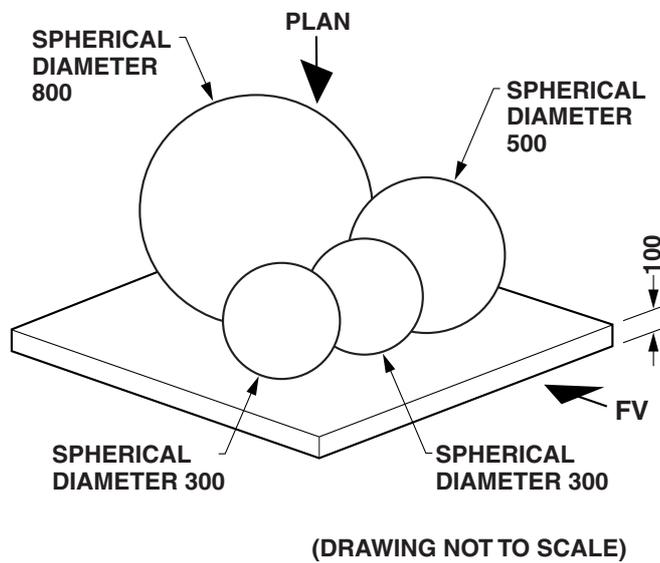
Construct the following views of the sign to a scale of 1:10.

- (a) the view **FV**;

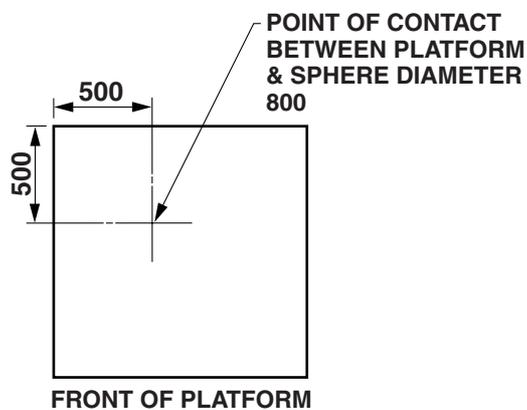
[10]

- (b) the plan.

[10]



**Fig. 7a**



**Fig. 7b**

8 A roof truss carrying both vertical and inclined loads is shown in Fig. 8.

The roof truss is supported by a hinge at **R** and rollers at **L**.

- (a) Draw the given roof truss to a scale of 1:20 and identify the members using Bow's notation. [2]
- (b) Determine the magnitude and direction of the two reactions. [5]
- (c) Construct a force diagram for the roof truss using a scale of 10 mm = 2 kN. [7]
- (d) Use the force diagram to determine the magnitude and nature of the forces in the members indicated by \*. Do not determine the forces for the whole structure. [6]

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

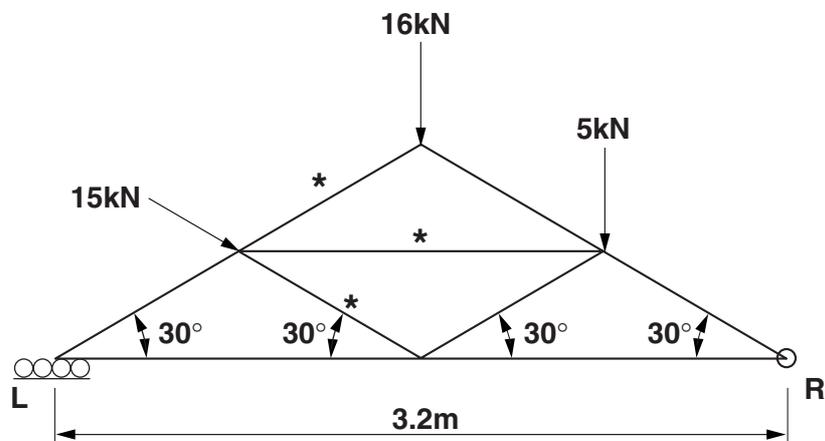


Fig. 8

9 A radial plate cam, with an on-centre knife follower, is required to:

- have a base circle of diameter 80 mm;
- rotate clockwise;
- raise the follower vertically 25 mm with simple harmonic motion during 90 degrees of rotation;
- raise the follower 25 mm with uniform velocity for the second 90 degrees;
- rest the follower for the next 30 degrees;
- allow the follower to fall back to the start with uniform acceleration and retardation.

(a) Draw a performance graph for the mechanism. [11]

(b) Construct a full size outline of the cam plate. [9]



