GEOMETRICAL AND MECHANICAL DRAWING **9351/01**

Paper 1

May/June 2005

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.

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.

SP (CW/SLM) S81208/2
© UCLES 2005

UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

Section I (40 marks)

Answer **all** questions in this section

1 Fig. 1 shows a lever plate.

Draw a full size view of the lever plate using geometrical constructions for the tangent and tangential arcs. All construction lines including points of tangency must be shown. [6]
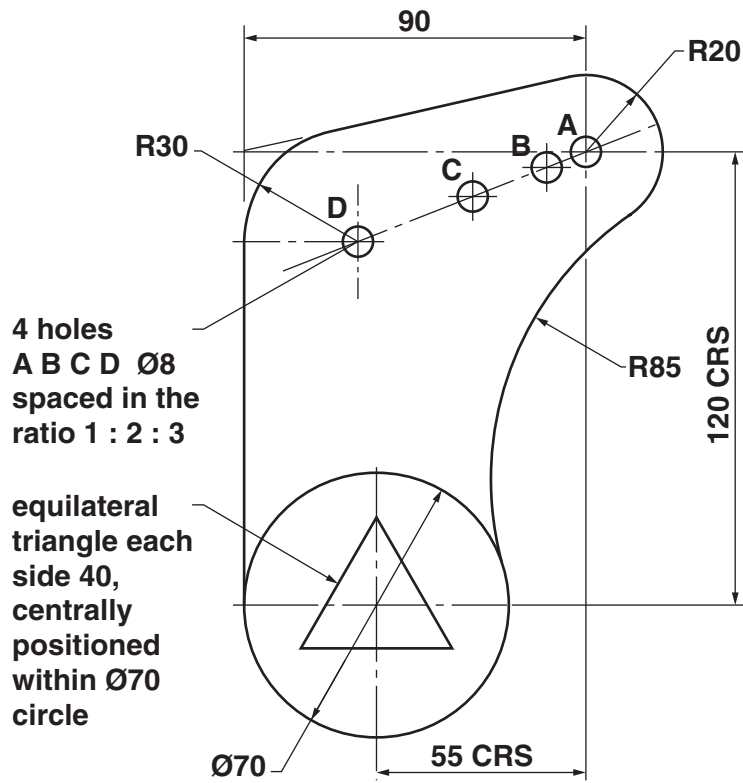

Fig. 1

2 Part of the mechanism of a packaging machine is shown in Fig. 2. The wheel, centre **O**, rolls without slipping along the horizontal surface **AB** and then up the inclined surface **BC**.

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

(b) Construct the locus of **P** on the circumference of the wheel until **P** is in contact with the inclined surface. [8]
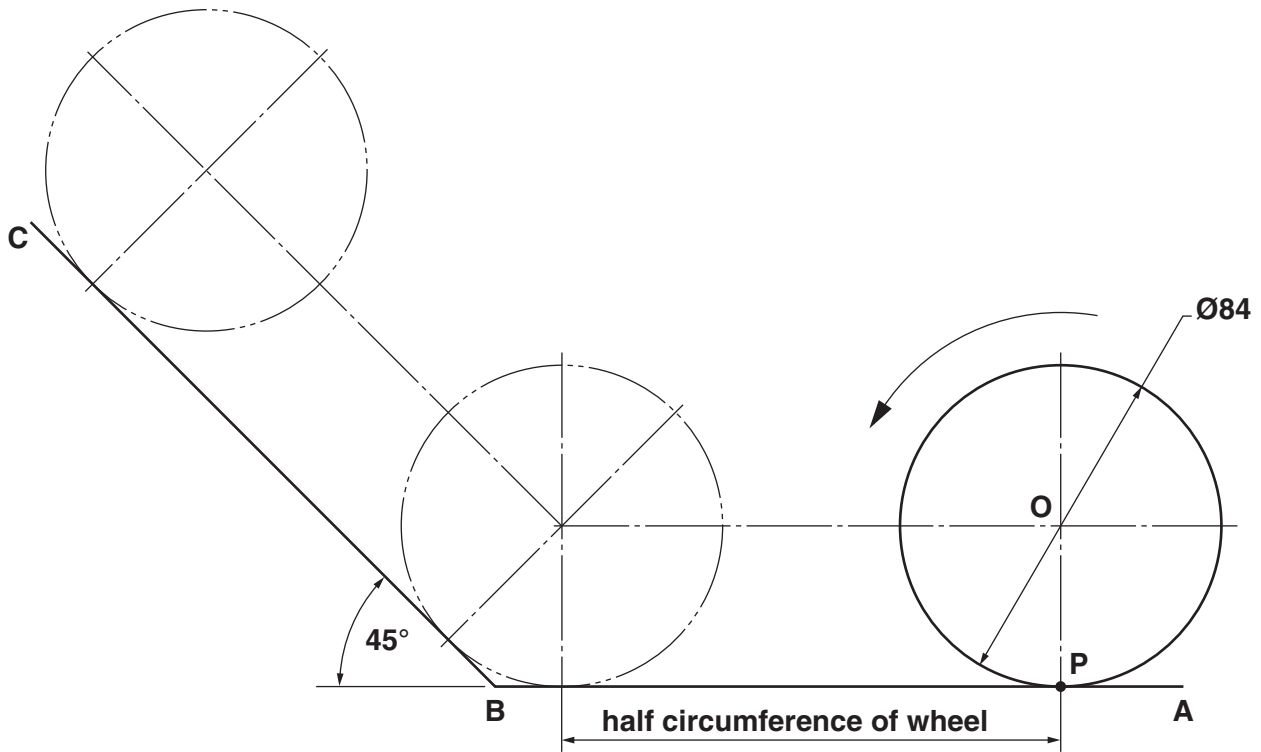
C

Ø84

45°

O

B   half circumference of wheel   A

P

Fig. 2

3 Fig. 3 shows:

- the traces **V.T.** and **H.T.** of an inclined plane;
- the front view $a_1 b_1$ of a line, which is shown in the plan as **ab**;
- a second line **cd**, which lies on the inclined plane such that **ab** and **cd** are coincident in the plan.

(a) Draw the given views full size. [2]

(b) Determine the point of intersection of the line **AB** with the inclined plane and indicate these positions as **P** and P_1. [6]

(c) Determine the true length of the line **CD** and print your answer under the drawing. [3]
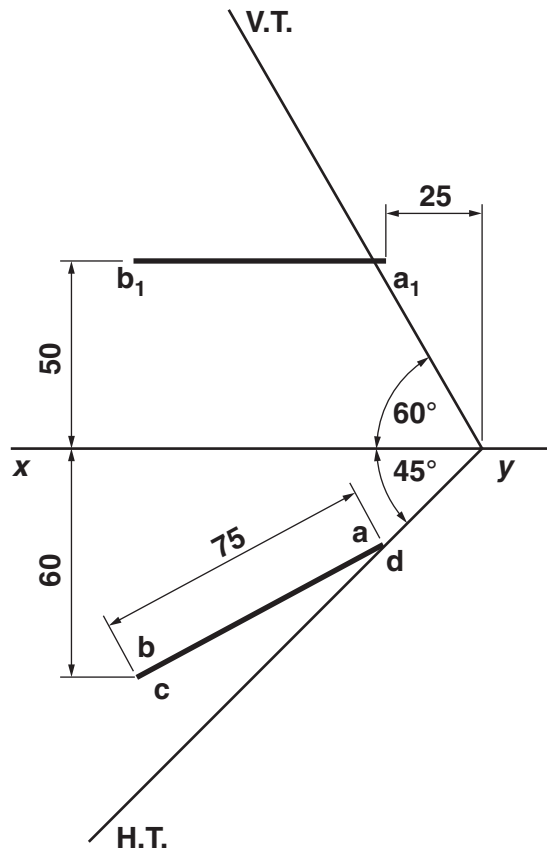

Fig. 3

4 An incomplete front view and a complete plan of the intersection between a cylinder and a square prism are given in Fig. 4.

(a) Draw the given views full size. [2]

(b) Complete the given front view by showing the line of intersection between the cylinder and the square prism.
Hidden detail is required. [7]
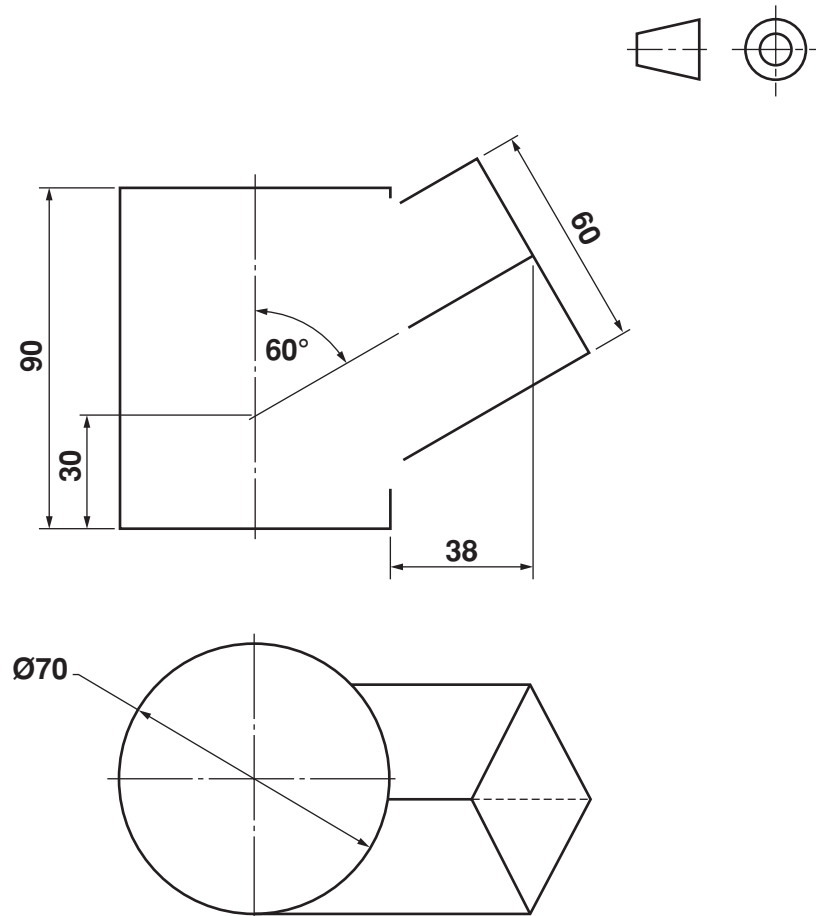
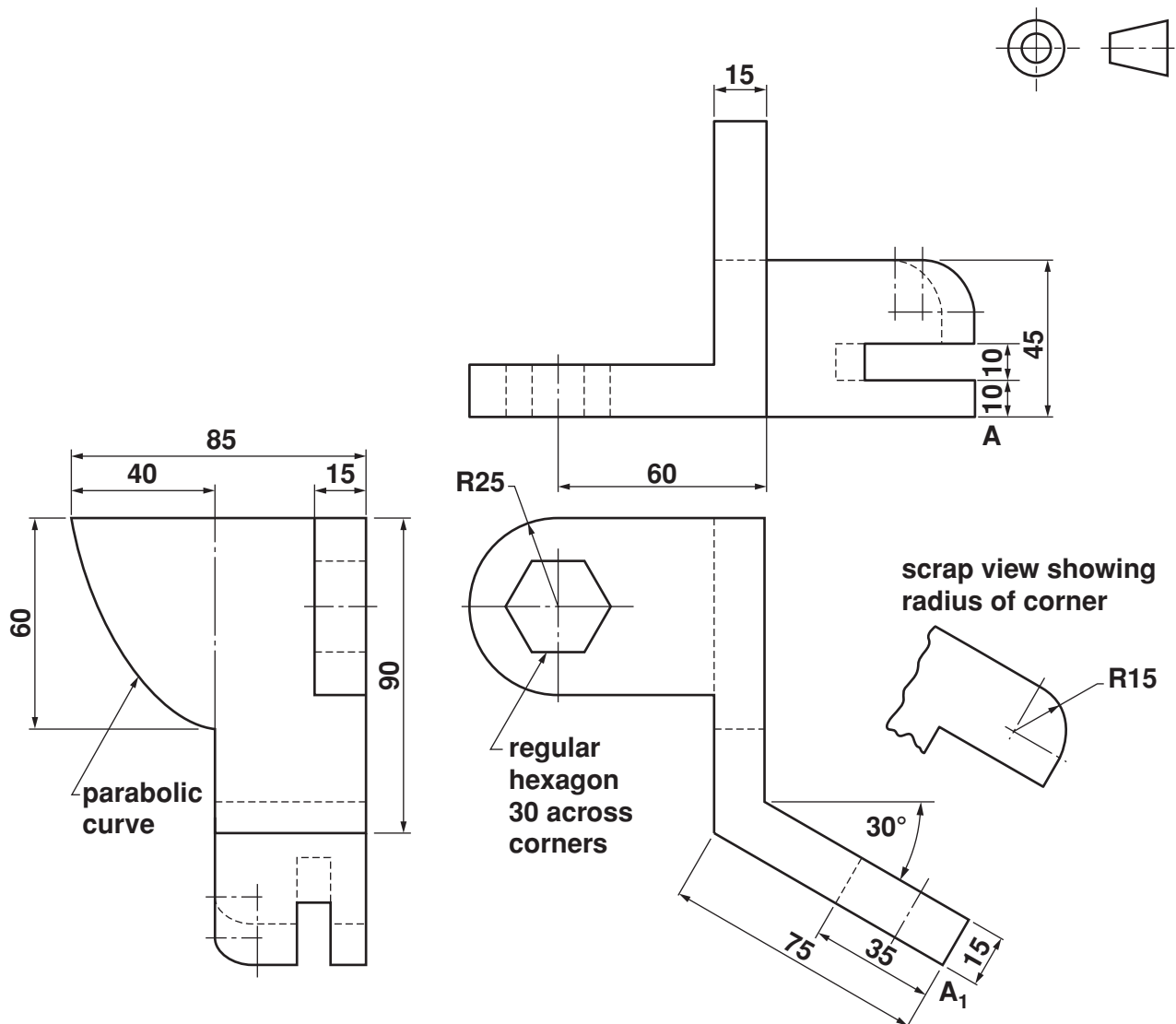**(c)** Construct the development of the square prism. [5]

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 bracket are given in Fig. 5.

(a) Construct an isometric scale.   [3]

(b) Construct an **isometric** view of the bracket with corner **A** to the front.
The isometric scale **must** be used.   [17]

Fig. 5

6 A beam with an overhang at both ends and with loads as indicated is shown in Fig. 6.

(a) Draw the given diagram to a scale of 1:100. [1]

(b) Determine graphically the magnitude of the reactions R_R and R_L. Use a polar distance of 50 mm and a scale of 10 mm = 10 kN. [7]

(c) Using the same scale as in **(b)**, construct a shear force diagram for the beam. Indicate the positions of zero shear force. [6]

(d) Construct a bending moment diagram for the beam on a horizontal base. Give the magnitude and position of the maximum bending moment. [6]

Your answers to **(b)**, **(c)** and **(d)** must be shown clearly on your drawing.

Fig. 6

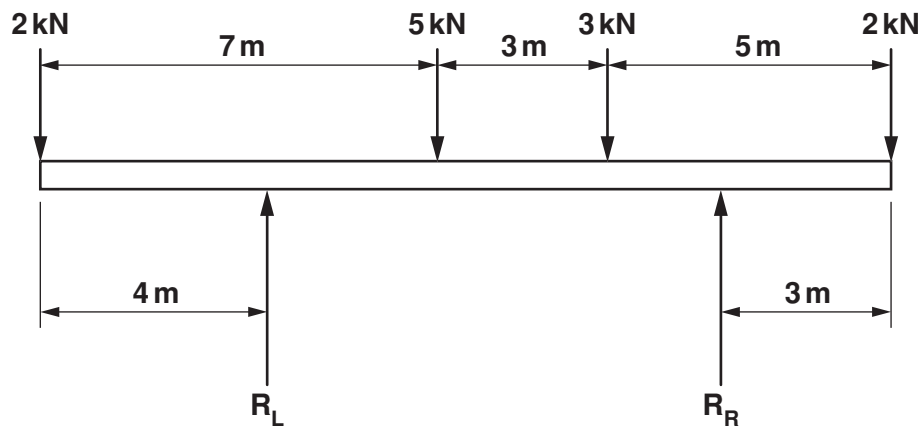**7** Incomplete orthographic views of two differently shaped and skewed pipes are given in Fig. 7.

    (a) Construct the given view to a scale of 1:10. [2]

    (b) To the same scale, construct a one-piece development of a transition piece between the two pipes, indicated by the shaded area **A**. [14]
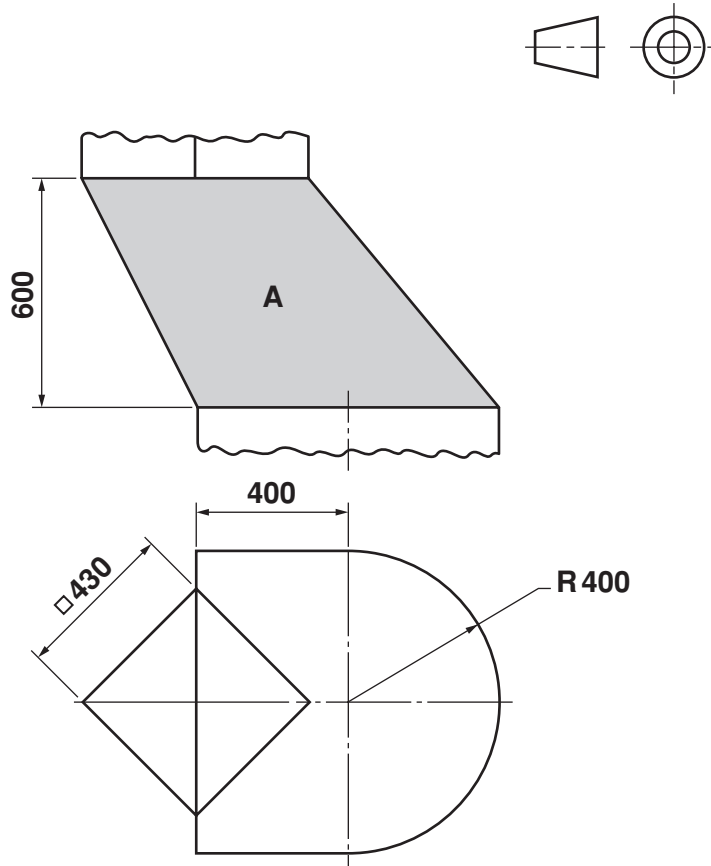
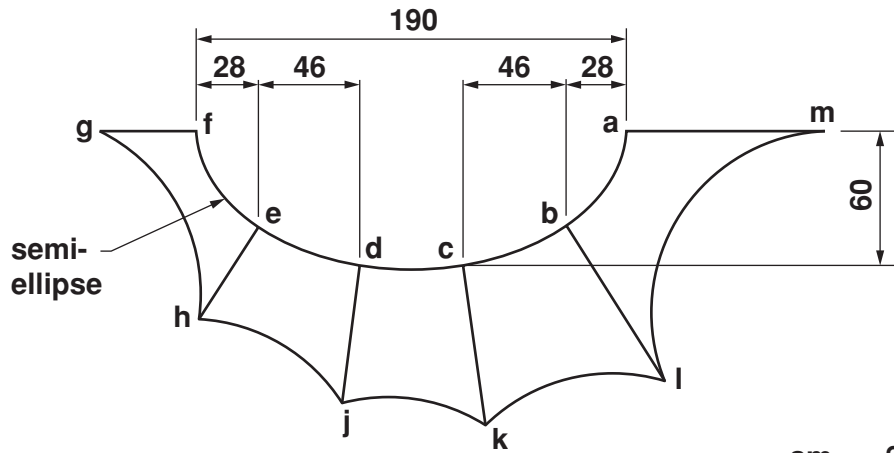   **(c)** Complete the two given views. [4]

Fig. 7

8 Fig. 8 shows a piece of costume jewellery. It is made from five pieces of silver plate.

(a) Construct the given view to a scale of 1:2. [10]

(b) Use graphical integration to determine the area of silver plate required to make the piece of jewellery. Print your answer clearly under your drawing. [10]

am = 90
bl = 80
ck = 70
dj = 60
eh = 50
gf = 40

bl, ck, dj and eh are normals to the ellipse

The arcs gh, hj, jk, kl and lm each have a radius of 80.

Fig. 8

9 Construct a radial plate cam, with a 20 mm diameter roller follower offset 25 mm to its right, which will give the following performance:

- the cam is to rotate clockwise;

- it rises 21 mm with Uniform Velocity from 0° to 60°;

- it rises a further 21 mm with Simple Harmonic Motion from 60° to 150°;

- it rests from 150° to 180°;

- it then falls 42 mm with Uniform Acceleration and Retardation from 180° to 360°.

The shaft diameter is to be 20 mm.

The minimum cam diameter is to be 80 mm. [20]

BLANK PAGE

12

BLANK PAGE