GEOMETRICAL AND MECHANICAL DRAWING **9351/01**

Paper 1

May/June 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 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.

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Local Examinations Syndicate

[Turn over

Section I (40 marks)

Answer **all** questions in this section.

1   Fig. 1 shows the front view of a spherical block of metal with a cylindrical hole half way through it. The horizontal centre line of the hole is parallel with the horizontal plane.

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

   (b) Construct a view of the spherical block looking in the direction of arrow **P**.   [7]
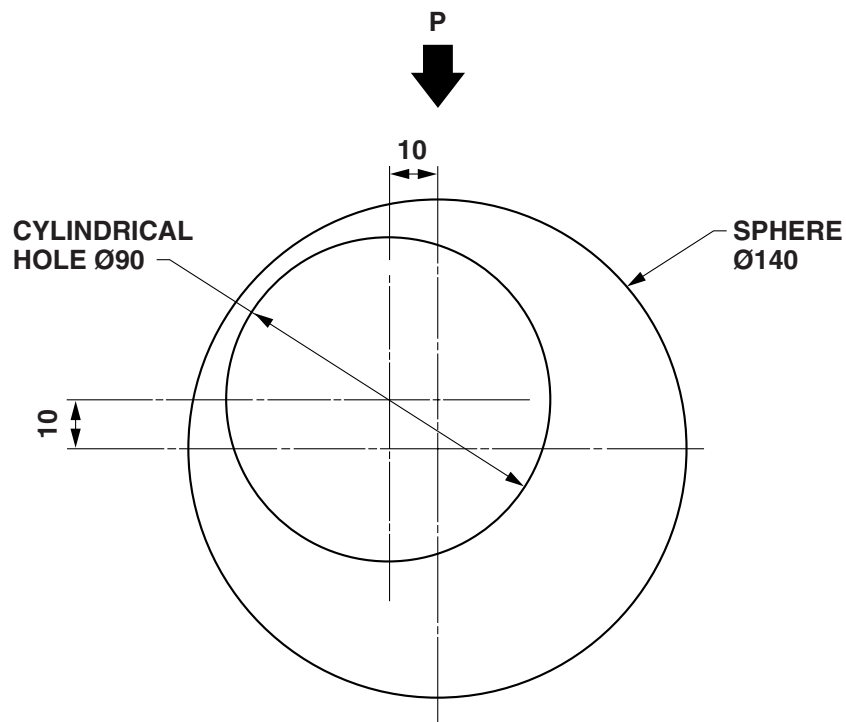
   Hidden detail is not required.

P

10

CYLINDRICAL
HOLE Ø90

SPHERE
Ø140

10

Fig. 1

2 A complete front view and an incomplete plan of an indoor T.V. aerial are given in Fig. 2. The arms **AB** and **AC** are the same true length.

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

(b) Project an end view to the right of the front view. [2]

(c) Determine by construction the true angle between the two arms and print your answer clearly under your drawing. [4]
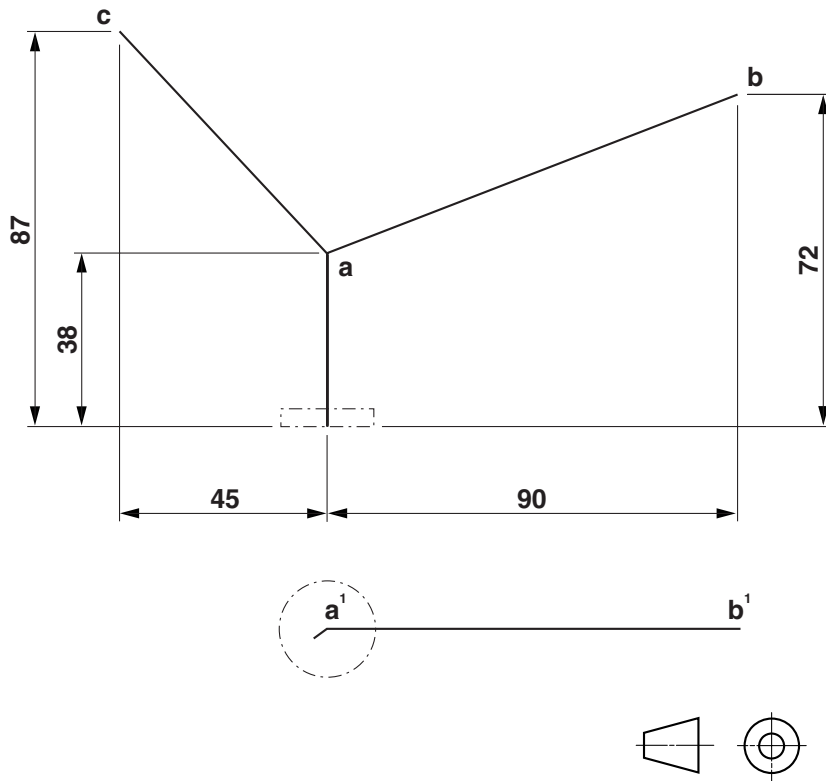

Fig. 2

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3 The chute **ABD** of a 'ready-mix' concrete delivery truck consists of part of a regular cone as shown in Fig. 3. The chute, which is made from sheet metal, is symmetrical about the horizontal axis in plan.

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

(b) (i) Name the conic section **AC**. [1]

(ii) Name the conic section **BD**. [1]

(c) To the same scale, construct a development of the chute. Ignore the thickness of the metal. [8]

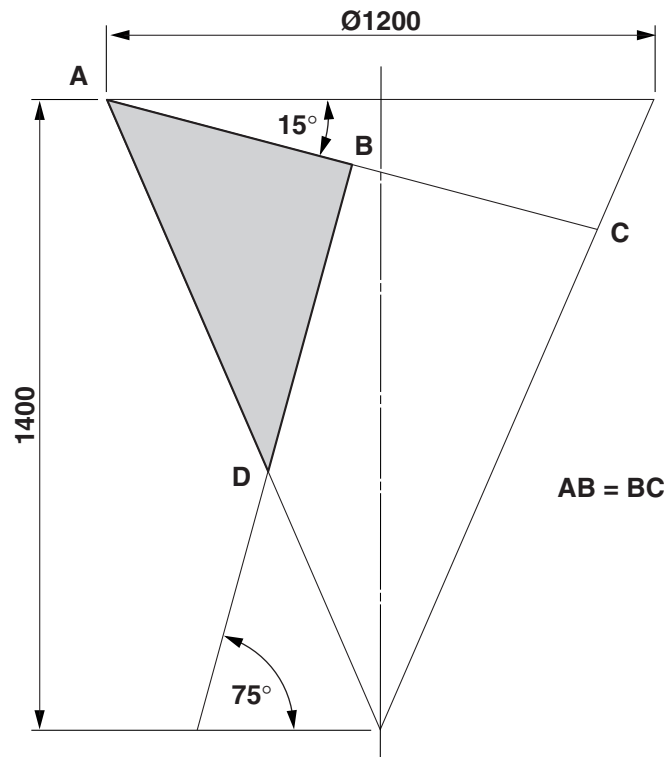**Fig. 3**

4 The logo of a company making gears is shown in Fig. 4.

The logo consists of a regular pentagon with a symmetrical hole in its centre.

(a) Construct the logo full size. A protractor may be used. [3]

(b) Determine the area of the pentagon before the hole is cut. [2]

(c) Using graphical integration, determine the area of the hole. [6]

(d) Print the area of the shaded part of the logo clearly under your drawing. [2]
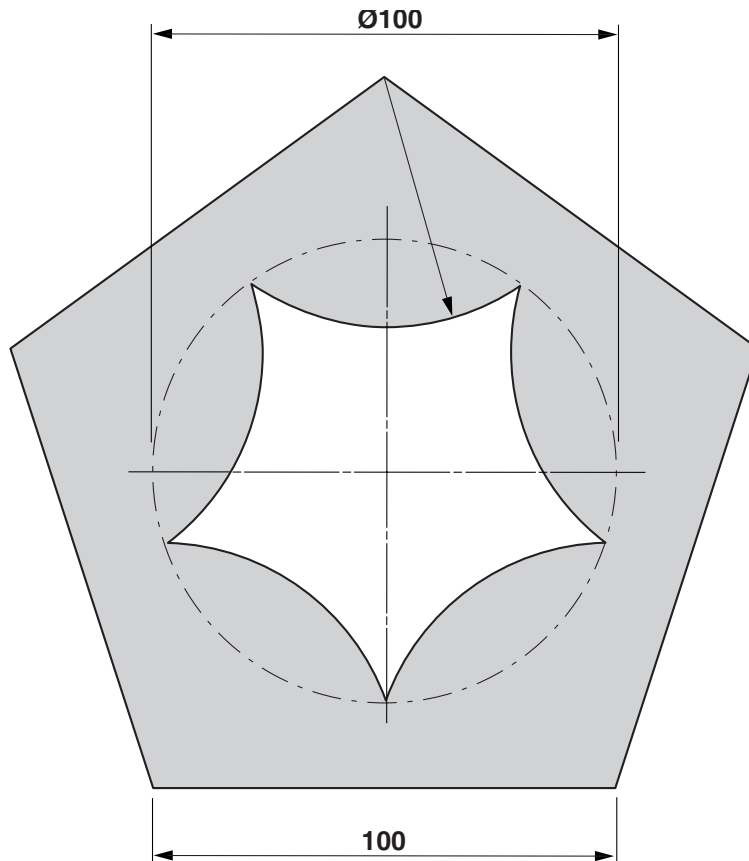

Ø100

100

Fig. 4

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Section II (60 marks)

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

All questions carry equal marks

5 Orthographic views of a casting are given in Fig. 5.

Construct an ISOMETRIC view of the casting with corner **A** to the front.

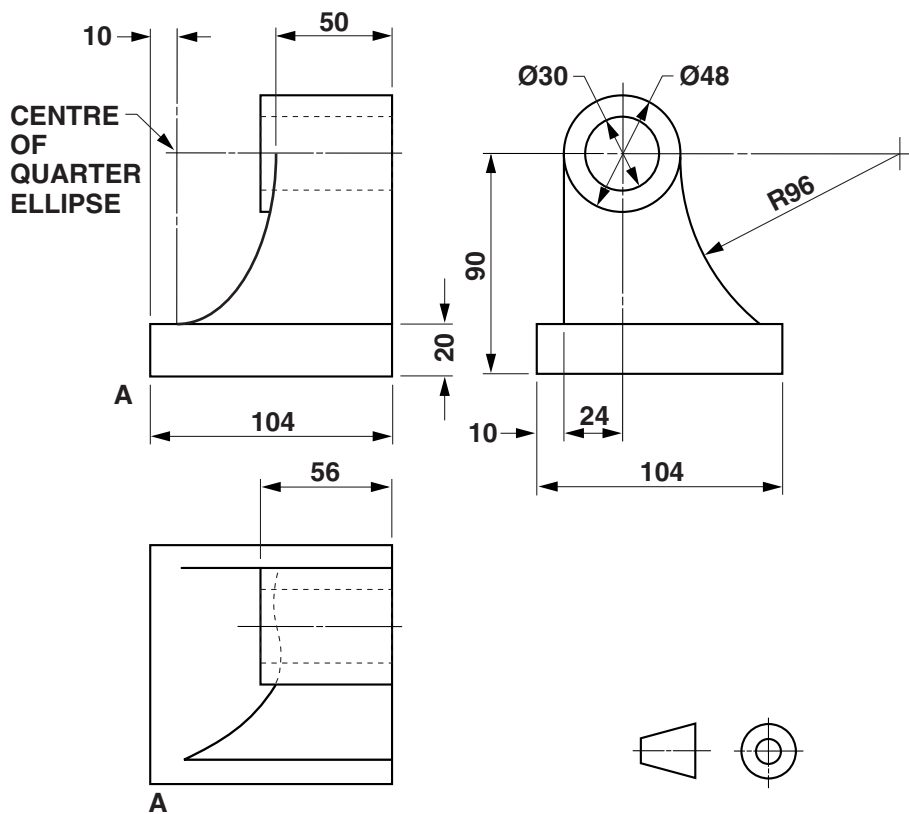The isometric scale must be used. [20]

Fig. 5

6 Fig. 6 is a displacement diagram for a radial plate cam with an offset follower.

CAM DATA

Offset	25 mm to the left.
Lift/Fall	30 mm.
Roller follower	20 mm diameter.
Shaft diameter	20 mm.
Minimum cam radius	40 mm.
Rotation	Anti-clockwise.

The follower is to reciprocate vertically.

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

(b) Construct the outline of the cam. [16]

(c) Indicate clearly on your answer that part of the perimeter of the cam which produces simple harmonic motion. [2]
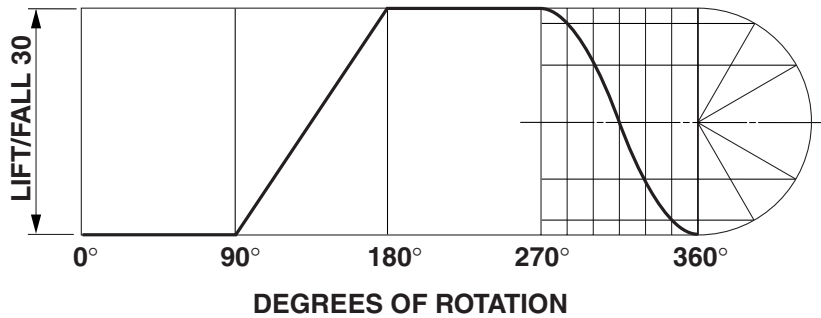

Fig. 6

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7 Fig. 7 shows part of the mechanism of a wrapping machine. The flanged wheel centre **O** rolls clockwise without slipping along the arc **AB**. The arm **CD** is pin-jointed at **C** and **D**. The piston at **D** is constrained to a reciprocating movement along the line **FG**.

(a) Draw a full size diagram of the mechanism. [3]

(b) Construct the locus of **C** as the wheel rolls from **A** to **B**. [12]

(c) Plot the locus of **E** as the wheel rolls from **A** to **B**. [5]
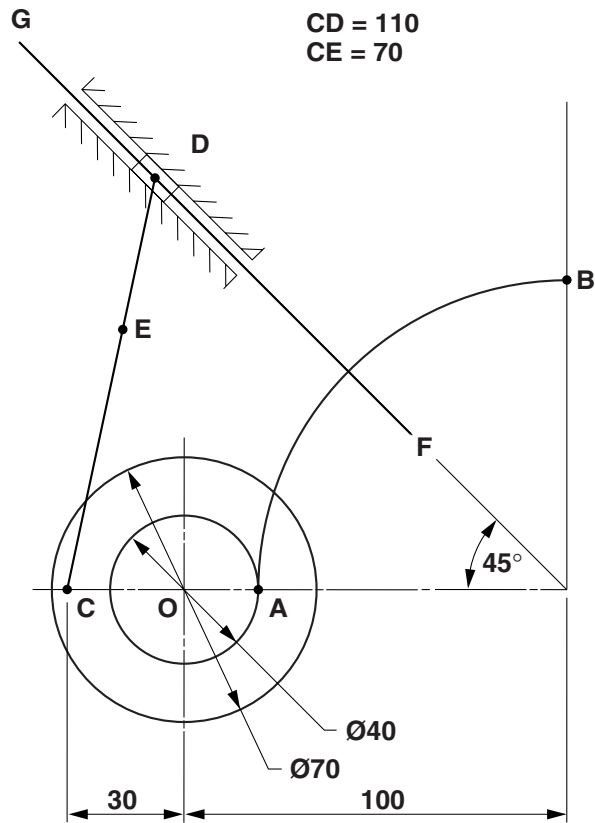
CD = 110
CE = 70

Fig. 7

8   Fig. 8 shows part of the framework of a bridge, which is subject to the loads given.

(a) Draw the framework to a scale of 10 mm to 1 m and use Bow's notation to identify the members.   [4]

(b) Determine graphically the magnitude and direction of the reactions R_L and R_R.   [7]

(c) Using a suitable scale, determine the magnitude and nature of the forces in the three members indicated with *. Do not determine the forces for the whole structure.   [9]

Give your answers to parts **(b)** and **(c)** clearly under your answer to part **(a)**.
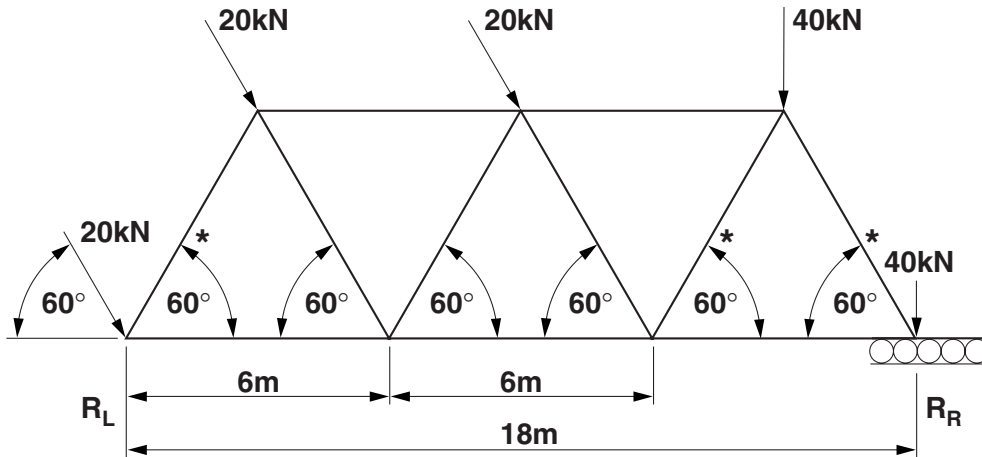

Fig. 8

[Turn over

9 Orthographic views of a Drill Press Bracket are given in Fig. 9.

You are required to draw full size:

(a) the two given views; [6]

(b) the first auxiliary view looking on to Face **F** in the direction of arrow **A**.

The position of **X₁ Y₁** is shown. [7]

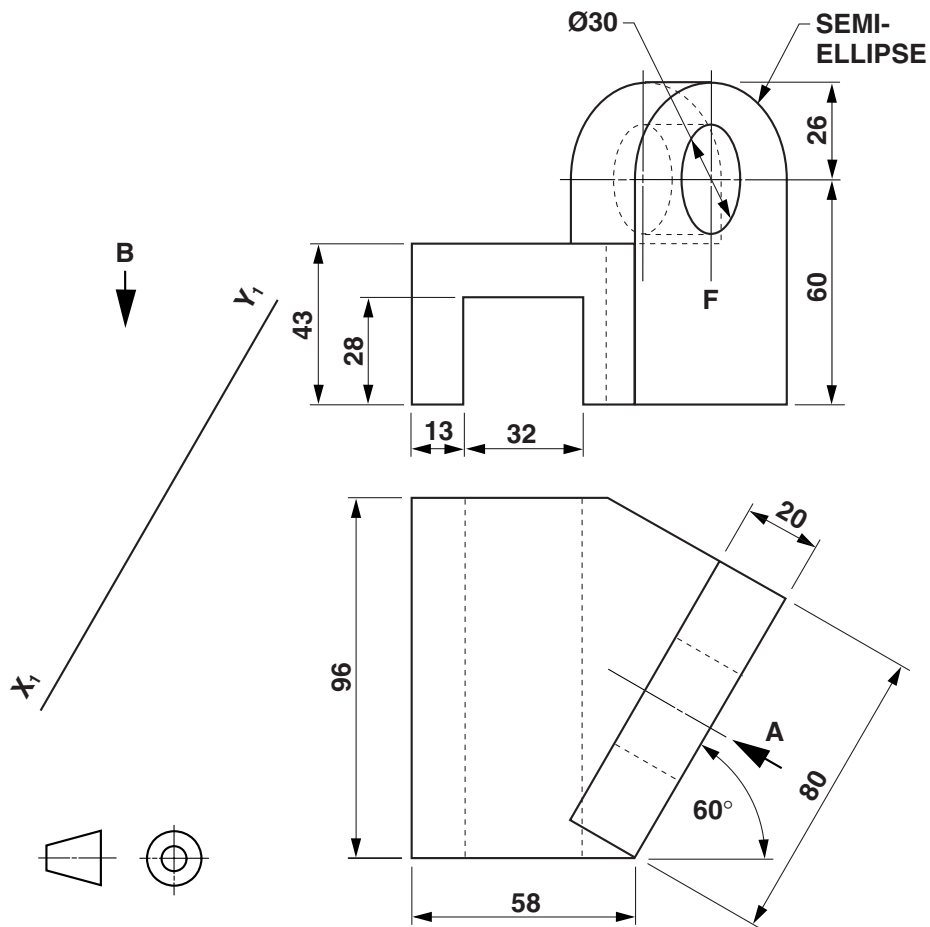**(c)** the second auxiliary view, projected from **(b)**, looking in the direction of arrow **B**. [7]

Fig. 9

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