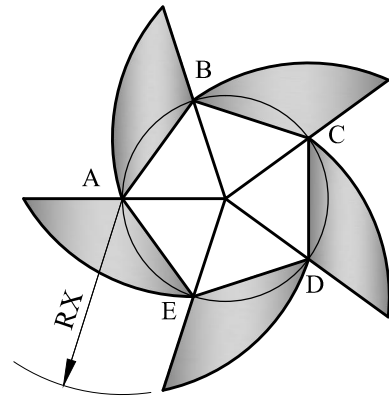**Question 1.**

The logo of a firm that manufactures rotary cutters, shown on the right, consists mainly of a regular pentagon with a blade attached to each side.

Inside the given circle, construct the logo by following the given steps:

a.  Locate, by construction, the centre of the circle.
b.  Inside the circle construct a regular pentagon.
c.  Draw radials from the centre of the circle to the corners of the pentagon and extend.
d.  Draw the five arcs to represent the blades. The centres (A,B,C,D,E) of the arcs (radius RX) lie on the opposite corners of the pentagon, as indicated on the given logo.

**(10 marks)**

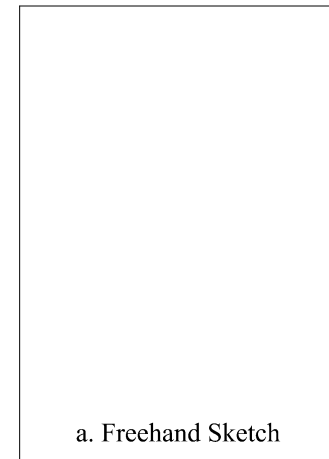Do not shade the blades.
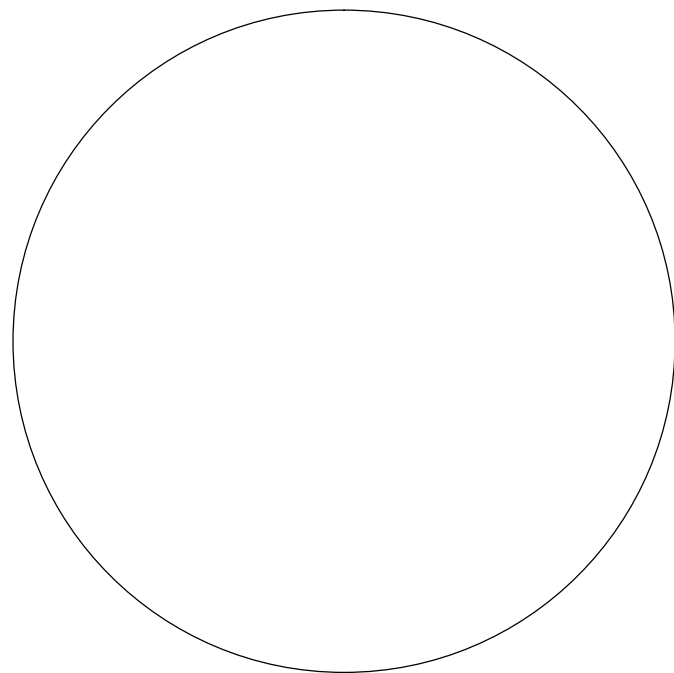
**Question 2.**

Three FULL SIZE orthographic views of a wooden STEP STOOL are given.

a.  In the space provided, draw a freehand pictorial sketch of the stool.
b.  On the given start lines, project an **ISOMETRIC** view placing corner X in the lowermost position.
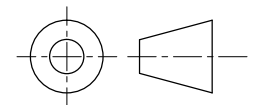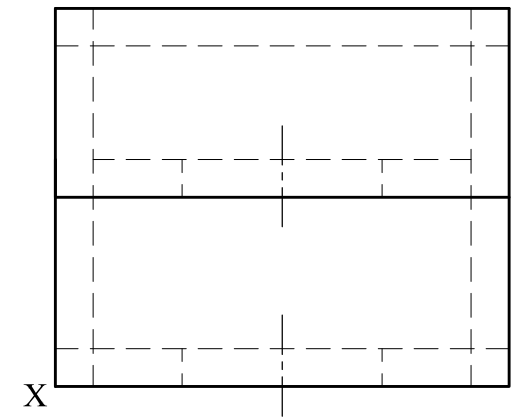
*Note:*
*1.  The material thickness is 5mm throughout.*
*2.  No hidden detail is required.*

**(14 marks)**

X

a. Freehand Sketch

X   X

b. Isometric Projection

X

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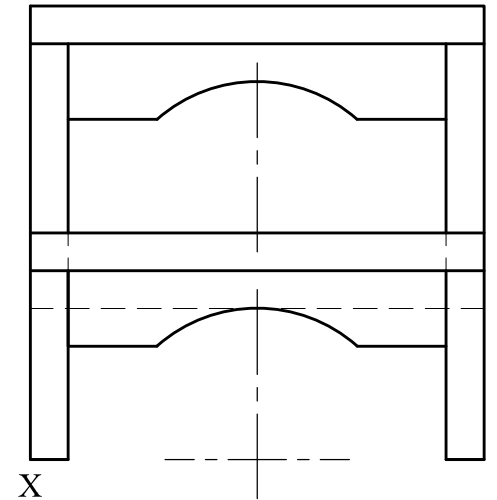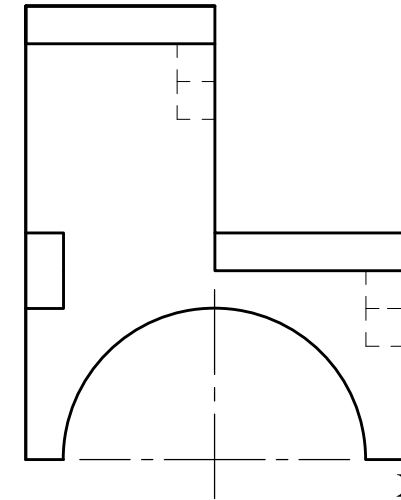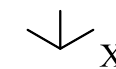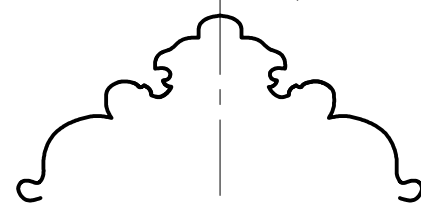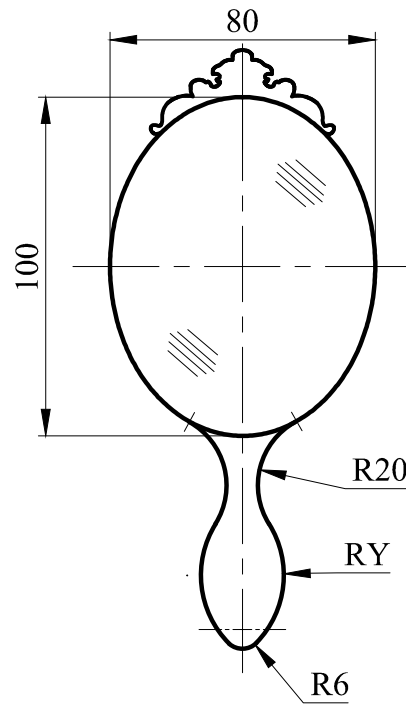
**Question 3.**

The profile of an elliptical hand-held mirror is given on the right. The ellipse has a major axis of 100mm and a minor axis of 80mm. Using the start lines given below:

a. Construct the ellipse.
b. Locate the focal points of the ellipse.
c. Construct normals at points P and Q to locate the centres of the R20 blending arcs.
d. Using the given centres, complete the handle profile.

*Note: Radius RY is to be found by construction.*

**(14 marks)**

80

100

R20

RY

R6

P        Q

Centre of RY        Centre of RY

Centre of R6

**Question 4.**

The outline of a hair dryer is composed of straight lines and arcs. On the given start lines construct the profile.

*Notes:*
- *The centres of arcs A ,B,C and D are given.*
- *The short dashes indicate points of tangencies.*
- *The main body of the dryer is symmetrical.*
- *Show all constructional work.*

**(14 marks)**

R10

R80

R80

R66

R20

C

D

A

B

R10

R10

R10

C

D

A

B

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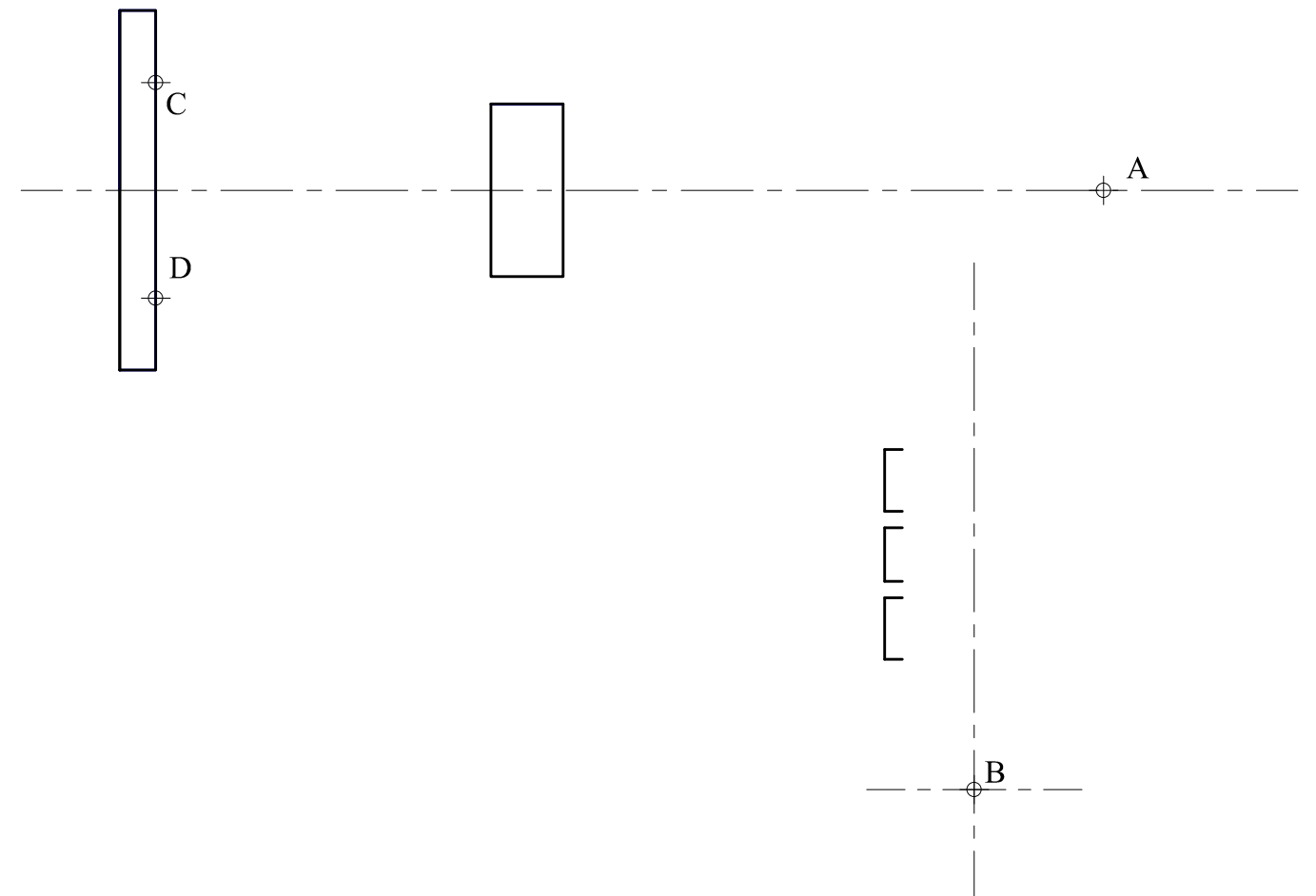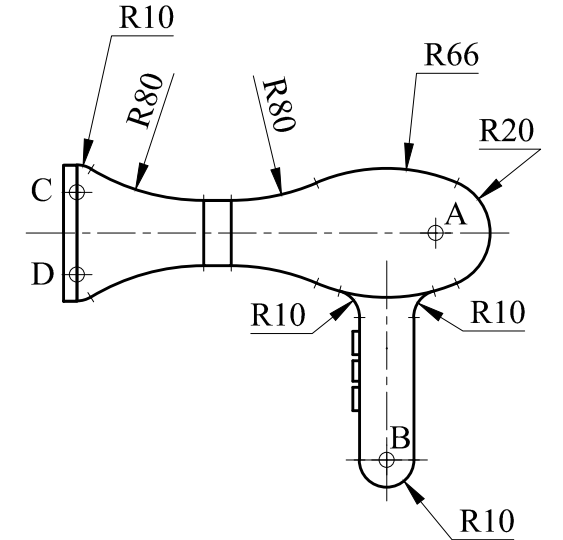
## Question 5.

An exploded pictorial view, an end view and a plan of an assembled **Cast Iron Bracket** are given.

In the space provided:

a. project a sectional front elevation on the cutting plane X-X indicated in the end view;

b. draw the symbol of the projection used.
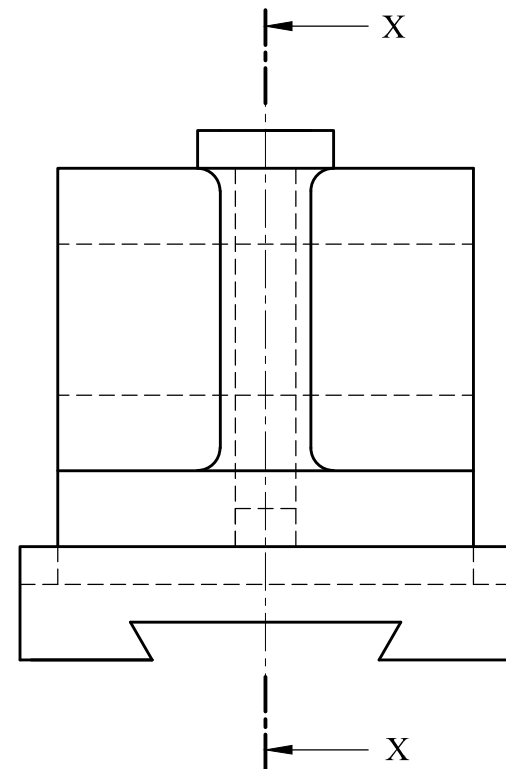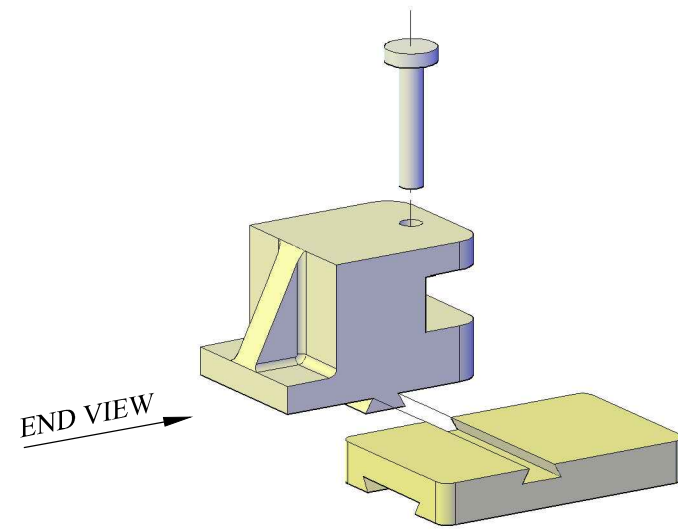
*Note: Do not show hidden details.*

**(15 marks)**

END VIEW

X

X

X - X
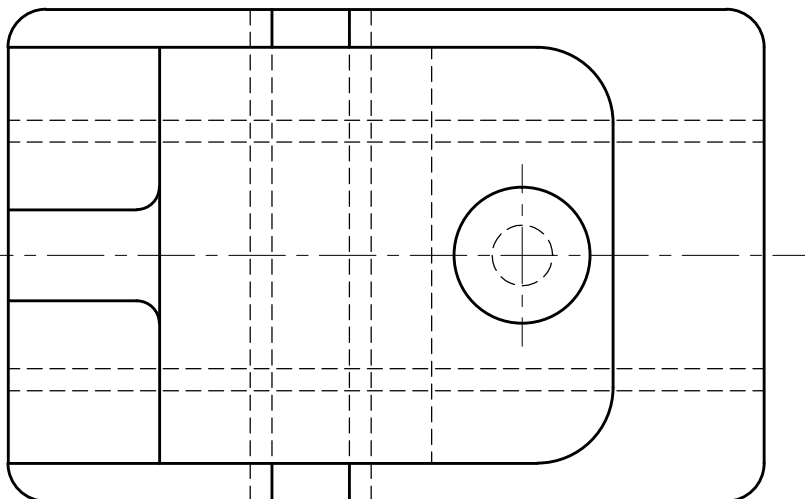
PROJECTION SYMBOL

## Question 6.

Three right cones are used to make the jug illustrated on the right. A complete front elevation and an incomplete plan of the top cone are given below.

a. Complete the plan.

b. Construct a half surface development of the truncated cone marked 'A'.

*Note: Place the joint line along JJ.*

**(15 marks)**

A

J

J

O

O

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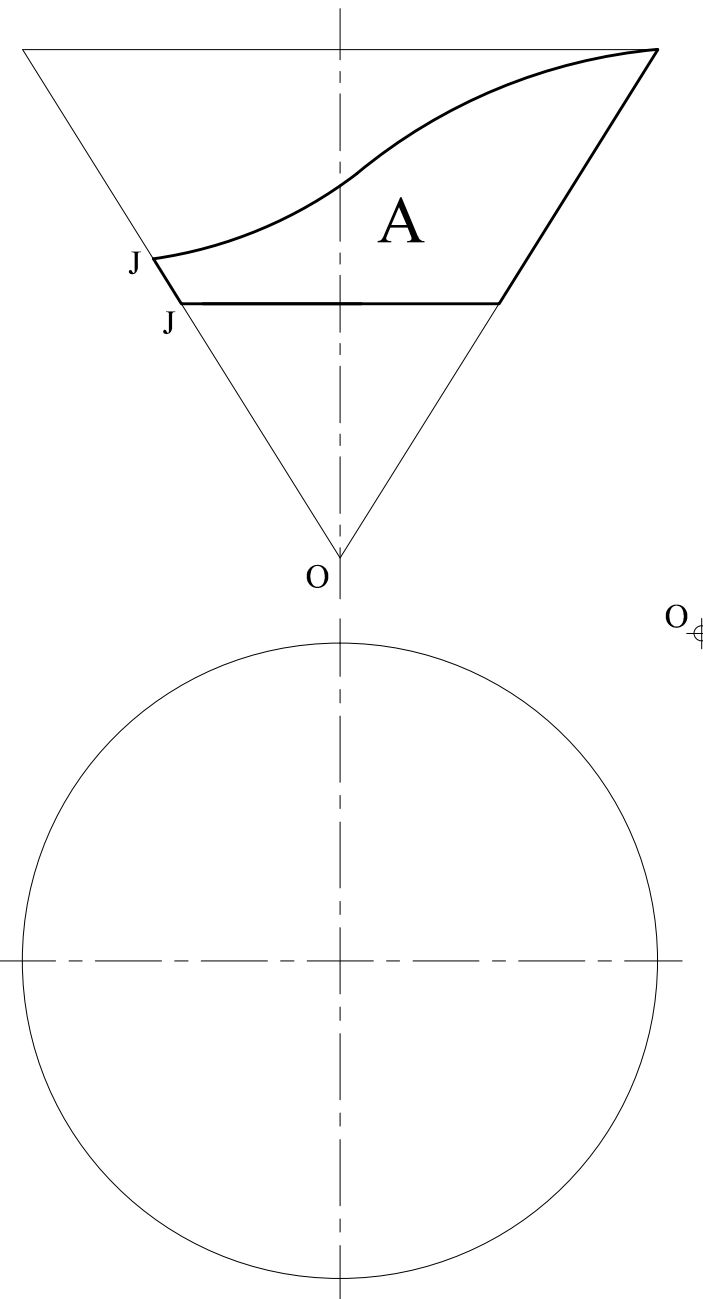
**Question 7.**

Two orthographic views and a planometric view of a **reception room** are given on the right. On the start lines given below, complete the estimated Single-Point **Perspective** view of the room. The following notes are to be read carefully:

a. The viewing direction is indicated by arrows, the main vanishing point is indicated at the centre of the room.
b. Two additional vanishing points, VP1 and VP2 may be used to complete the top angled corners of the counter C.
c. The given drop-down ceiling has equal outside dimensions as the reception counter C and is situated directly above it.
d. The tiles and courses are marked on the picture plane.
e. The corners of the wall opposite the viewer are given. The tiled floor is to be constructed by means of the diagonal method.
f. The measurements, the locations of the furniture and the carpet are indicated in the given views.
g. Leave all construction lines visible.

**(18 marks)**



PLANOMETRIC VIEW

10 TILES

10 TILES

VIEWER

ARM SOFA

FRONT VIEW

10 bricks high

A    VP    C    B

PLAN

A    D    C    B

VIEWING DIRECTION

VP1

VP2

Vanishing Point

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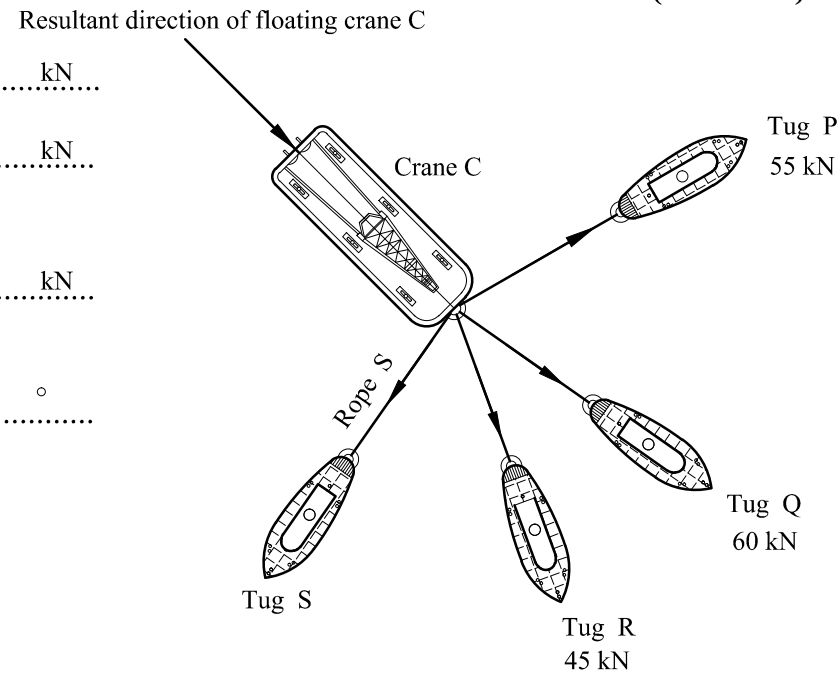
**Question 1**.

Four tugboats P, Q, R and S are pulling a floating crane C.  The pulling directions of the tugboats and the resultant direction of the floating crane are given.  The tension in ropes P, Q and R are also given.

a.    To a scale of 1mm representing 1 kN, construct a force diagram.

b.    Determine the tension in rope S attached to tugboat S and the resultant pull on the barge.

c.    Tugboat S leaves the scene and tugboat R changes its pull and direction to maintain the same direction and resultant pull on the crane. Using the same force diagram, find the force and direction that tugboat R should pull.

**(12 marks)**

b.  Pull exerted by tugboat S = ....................kN...

Resultant pull on crane.........................kN...

c.  Pull exerted by tugboat R

when tugboat S leaves = ........................kN...

New acute angle that tugboat R

makes with the horizontal = .....................°......

Resultant direction of floating crane C

Crane C

Rope S

Tug  P
55 kN

Tug  Q
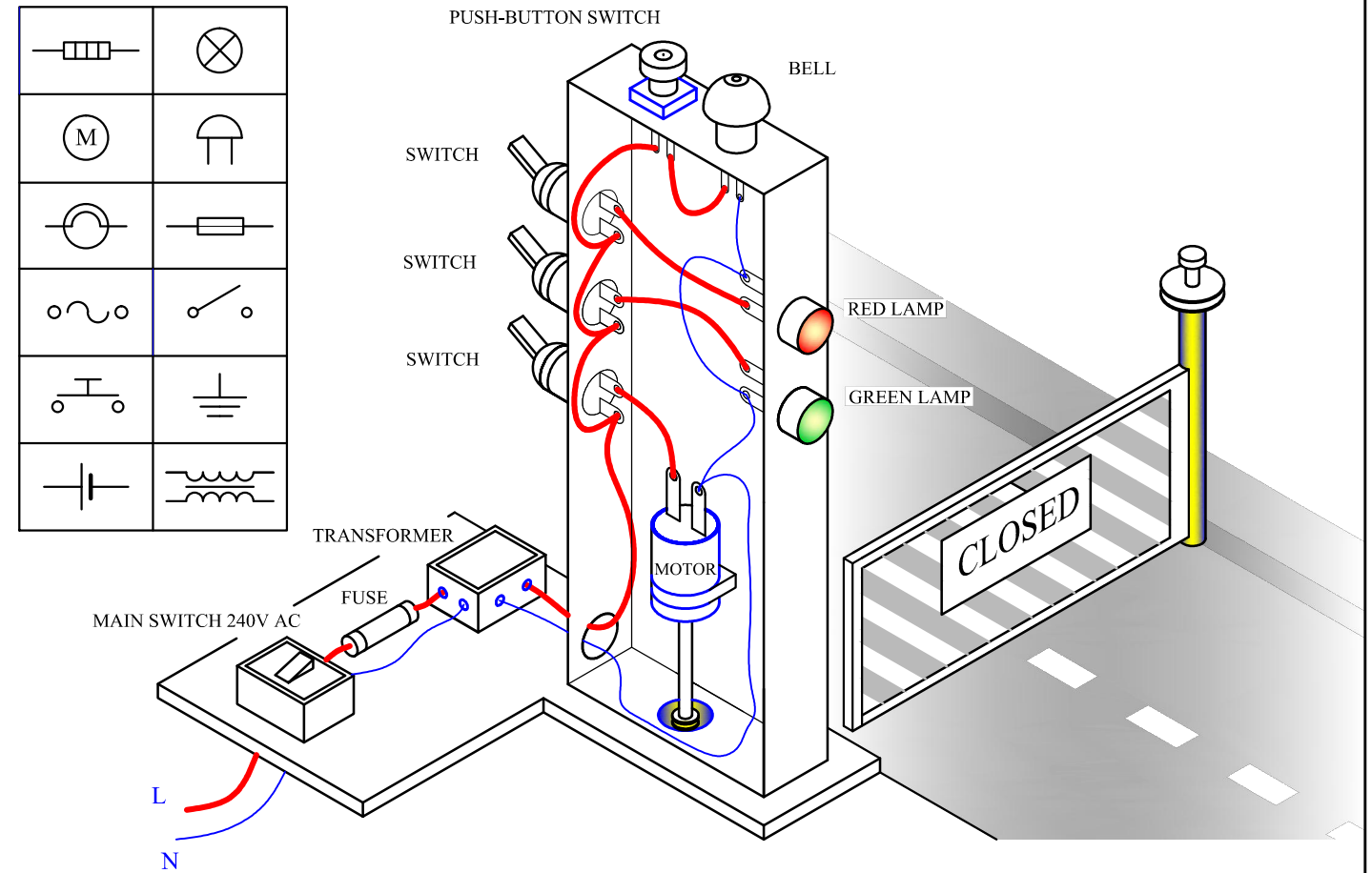60 kN

Tug  S

Tug  R
45 kN

**Question 2**.

The given drawing shows components assembled together for a model car/train crossroad.  The electrical circuit incorporates two lamps operated by separate switches, a bell operated by a push-button switch and a motor (to open the gate) operated by a switch.  A transformer supplies low voltage to the traffic control circuit.  The main switch turns on and off the power supply.

With the aid of instruments and drawing aids, draw a schematic circuit diagram incorporating electrical symbols from those given below.

**(12 marks)**

PUSH-BUTTON SWITCH

BELL

SWITCH

SWITCH

SWITCH

RED LAMP

GREEN LAMP

TRANSFORMER

FUSE

MAIN SWITCH 240V AC

MOTOR

CLOSED

L

N

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## Question 3.

The following computer programme is written to create a Logo for a Nature Awareness Organization.

DATA:   A = 50;  B = 100;  C = 150;  D = 200;  E = 250;  F = 300;  G = 350;  H = 400;  J=450;  K=500;  L=550;
ACI 7:   MOVE H,A;  DRAW G,D;  DRAW G,H;  DRAW H,K;  DRAW G,L:
ACI 3:   MOVE G,F;  DRAW F,F;  DRAW D,D;  DRAW D,C;  DRAW C,C;  DRAW C,D;  DRAW D,D:
ACI 3:   MOVE F,F;  DRAW D,H;  DRAW C,H;  DRAW C,J;  DRAW D,J;  DRAW D,H:
ACI 5:   MOVE G,E;  DRAW D,B;  DRAW B,B;  DRAW B,D;  DRAW D,F;  DRAW B,H;  DRAW B,K;  DRAW D,K;  DRAW G,G:
ACI 1:   MOVE G,D;  DRAW D,A;  DRAW A,A;  DRAW A,D;  DRAW C,F;  DRAW A,H;  DRAW A,L; DRAW D,L;  DRAW G,H:
            MIRROR  the plotted design, using the vertical centre line as the mirror line (line of symmetry).

*The **DATA** statement specifies the numeric values (in pixels) of given variables. **MOVE** positions the cursor at a new location without drawing a line. **DRAW** draws a line from a current location to a new location. **MIRROR** creates a mirror image (reflection) of the original. The instruction **ACI No**. makes the images that follow the instruction, appear in the colour associated with the number. The computer responds to the following colour commands:*

| Colour | ACI No. |
|--------|---------|
| RED    | 1 |
| GREEN  | 3 |
| BLUE   | 5 |
| BLACK  | 7 |

The starter sheet below shows a pre-printed grid representing an 800 x 600 graphical display.
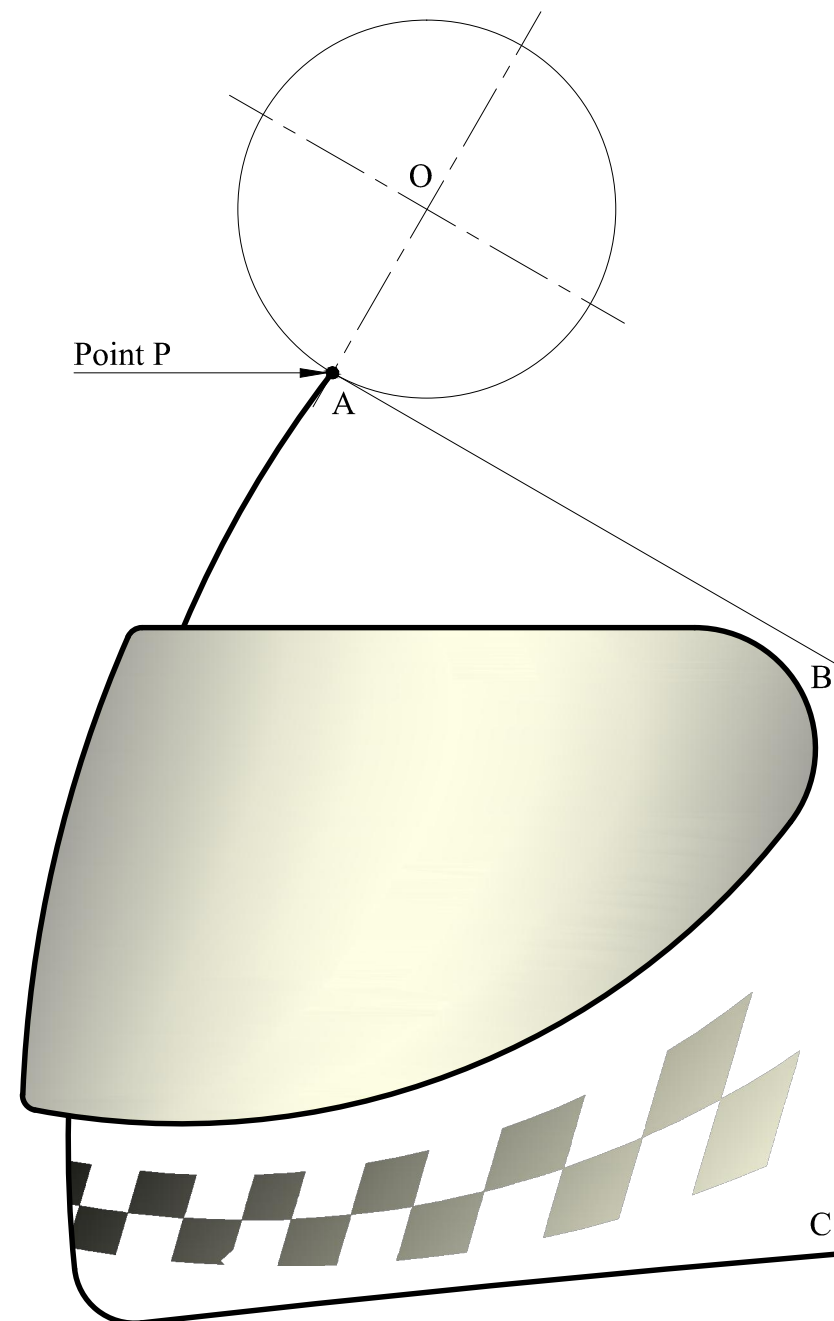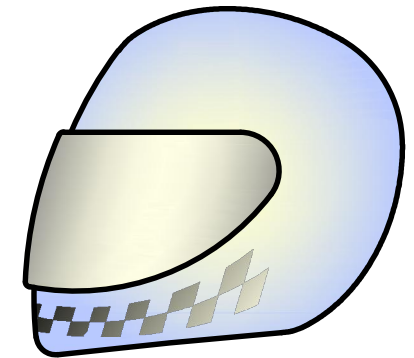Use the grid to plot the image produced by this programme.

**(12 marks)**
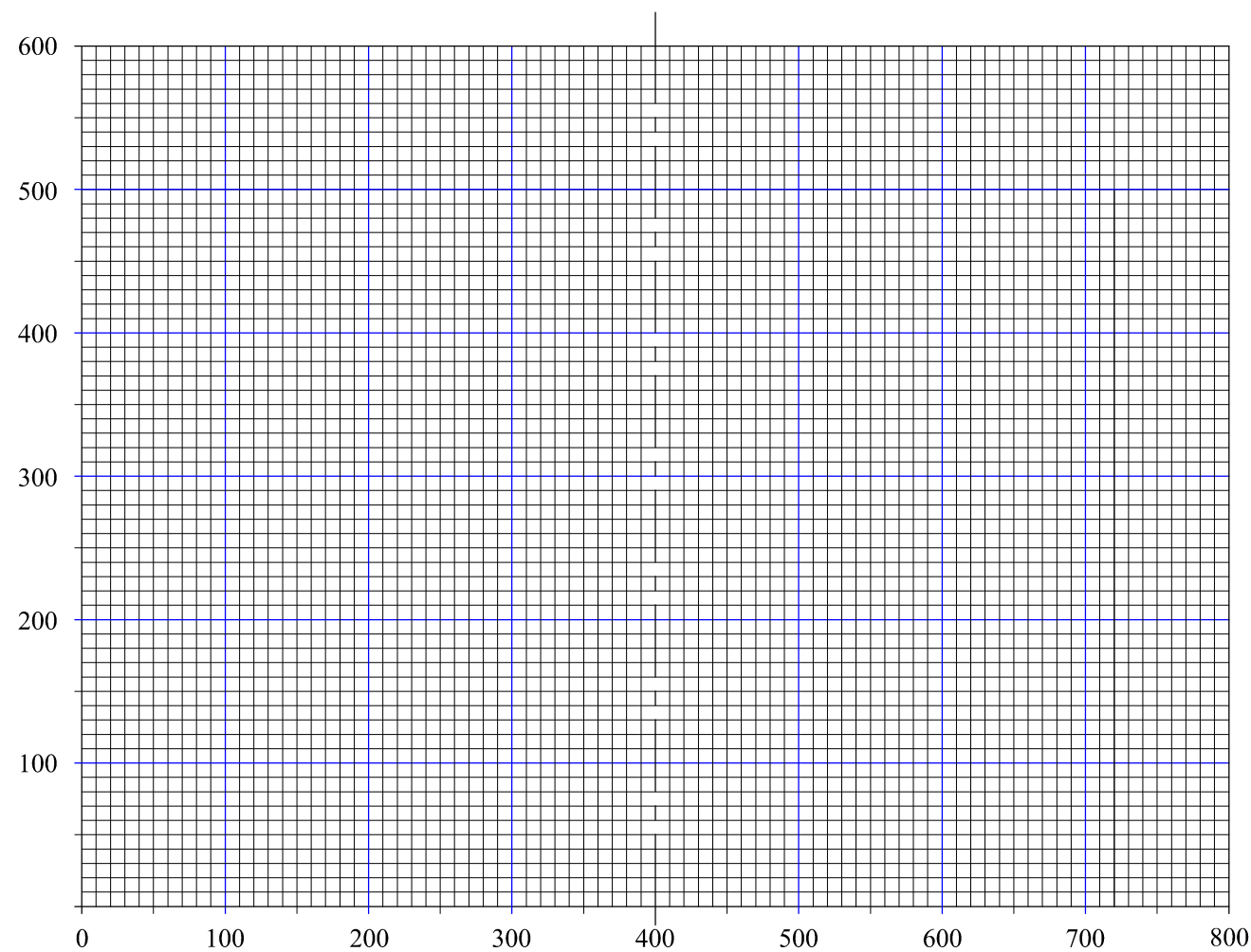


## Question 4.

The drawing of a crash helmet is shown on the right. An incomplete helmet is given below. The missing curves consist of two half cycloids and an arc. These curves are to be generated by point P on the circle, centre O, which rolls, without slipping on lines AB for the first half revolution and BC for the second half revolution.

Using the given start lines, construct the necessary curves to complete the profile of the helmet.

**(14 marks)**

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**Question 5**.

A survey carried out among 12-16 year old students revealed that an **alarming** 40% of those interviewed do not practice any sport and are inactive during their free time. The remaining students practice the following types of sport: 25% football, 20% cycling, 10% judo and 5% kayaking.

In the space provided below:

a. Draw a 3-D pie chart to show a comparison of the way students spend their free time.
b. Split (to emphasize) the slice of the pie chart that indicates the inactive students.
c. Draw three preparatory sketches to represent the football activity.
d. Draw the final version of the 'football activity' graphic symbol.
e. Complete the legend by drawing a small version of the football graphic symbol (d).
f. Add suitable colour to both pie chart and legend.

**(16 marks)**

SKETCHES    FOOTBALL GRAPHIC SYMBOL

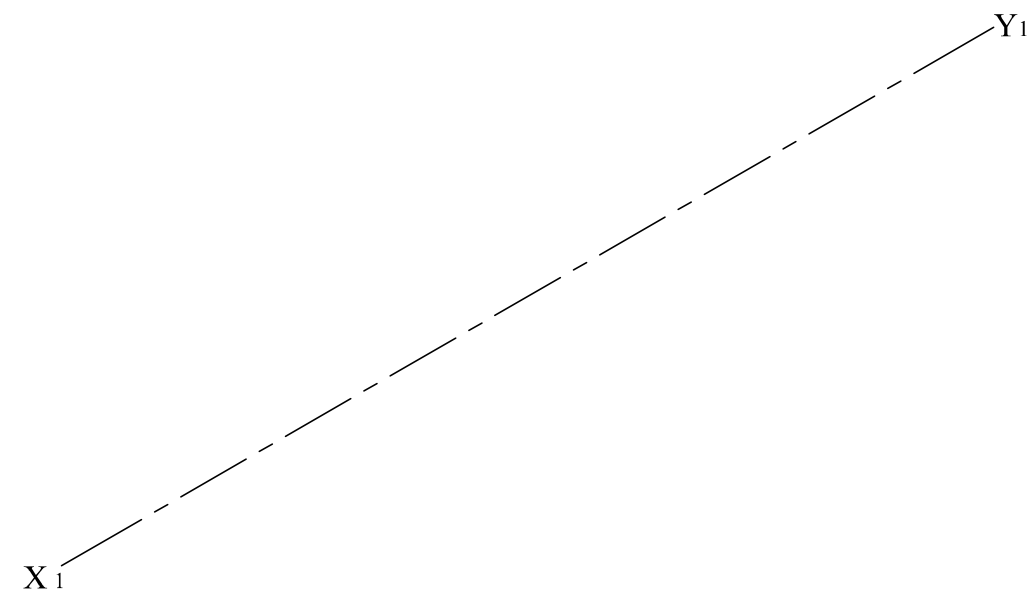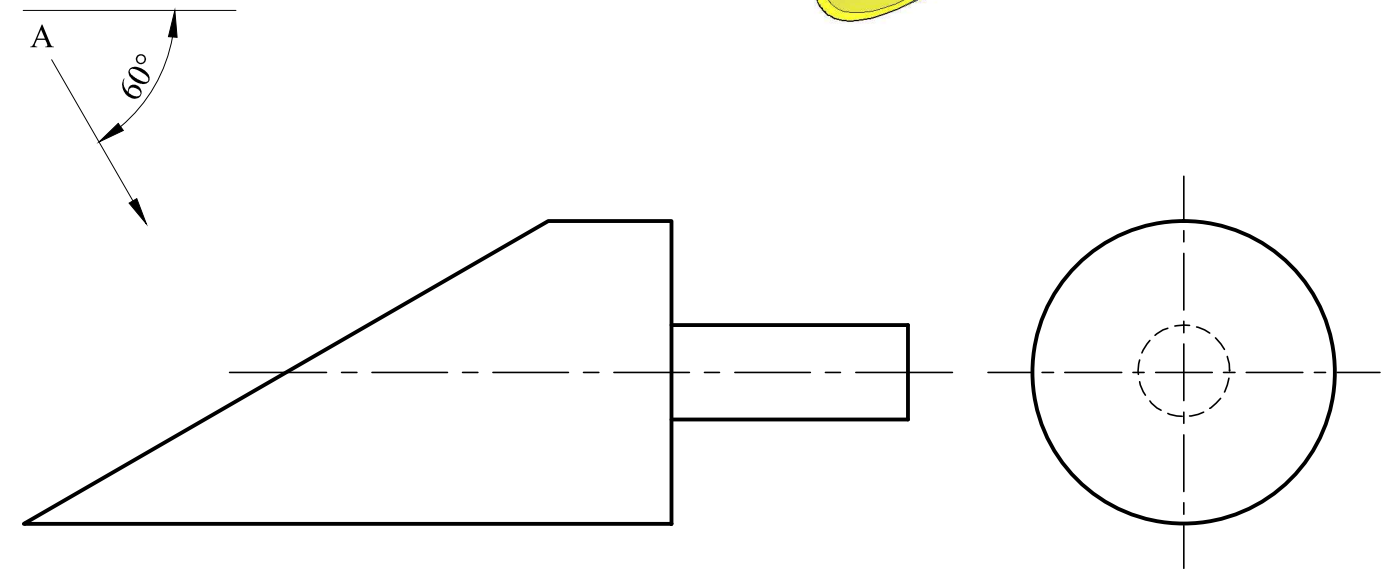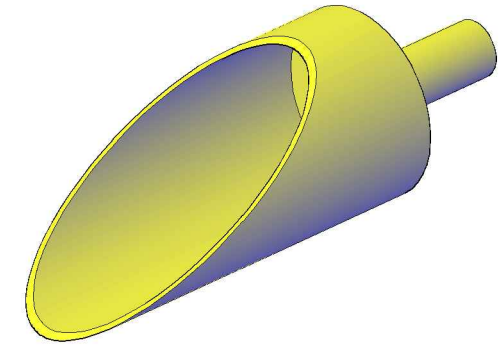| INACTIVE | 40% | o | | |
| FOOTBALL | 25% | o | | |
| CYCLING | 20% | o | | |
| JUDO | 10% | o | | |
| KAYAKING | 5% | o | | |

LEGEND (KEY)

**Question 6.**

A pictorial view and two orthographic views of a sugar scoop are given.

Draw an auxiliary elevation of the scoop by looking on the front elevation in the direction of arrow A.
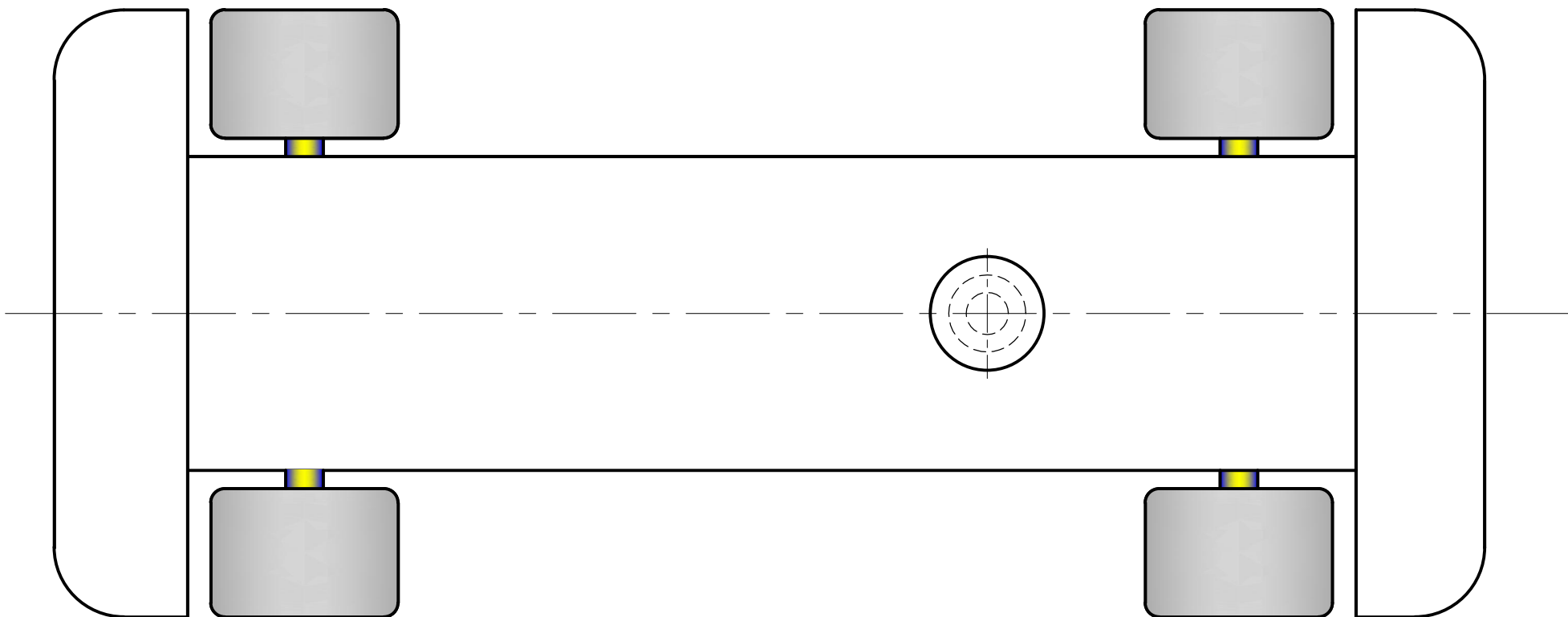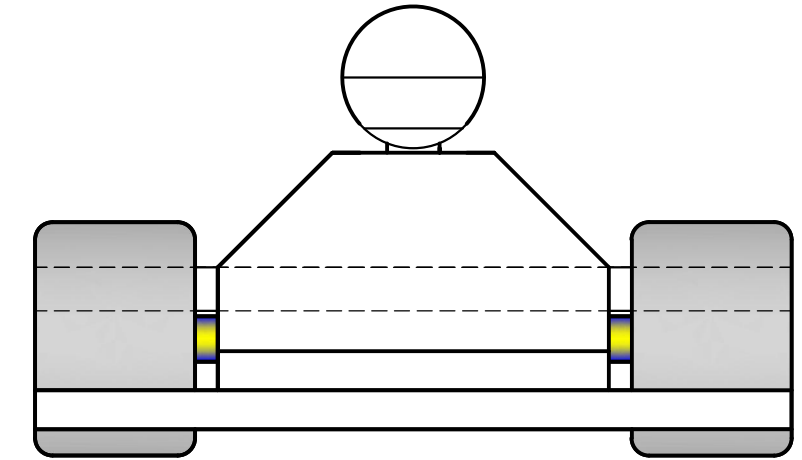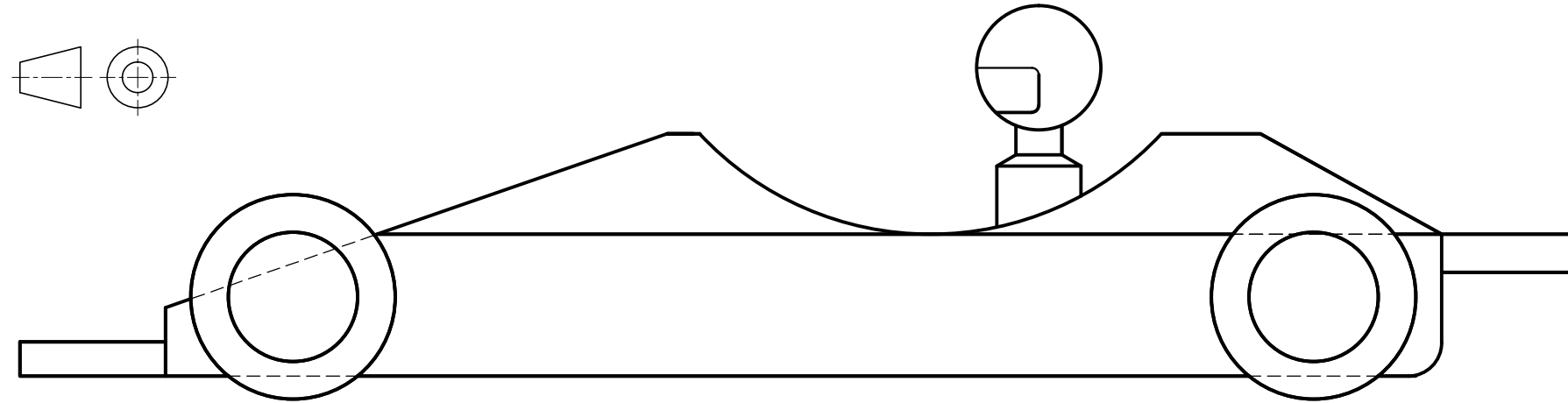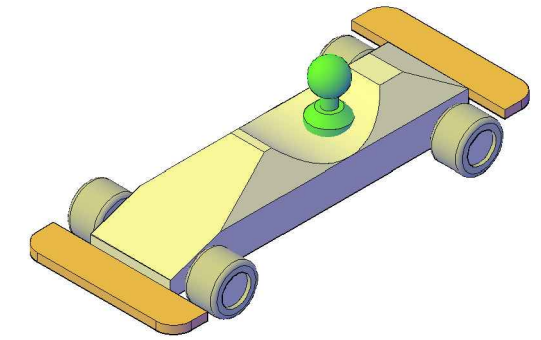
*Hidden detail is not required.*

**(16 marks)**

A
60°

Y₁

X₁

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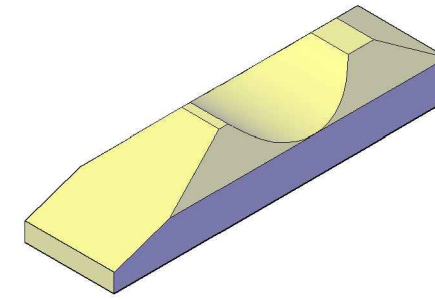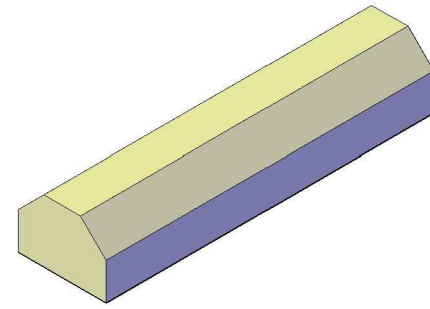**Question 7.**

The three pictorial views on the right show the main stages of making a wooden toy racing car. A front elevation, an end elevation and an incomplete plan are given below. The body of the car consists of a part octagonal prism which was cut as shown in the pictorial views and in the front elevation.

Using the information given, complete the **plan** showing clearly the constructions used to determine the lines and curves of intersection.

**(18 marks)**

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**Question 1**.

A crane ABC loads and unloads a weight of 350N. Using a scale of 10mm representing 100N:

a. Construct the force diagram to determine the magnitude and sense in AB and BC when the crane is stationary as in position (a). *Draw arrowheads on the lines of action of the forces.* **(6 marks)**

Position (a)

Rope

Pole

B

159°

133°

A

C

Space Diagram (a)

350N
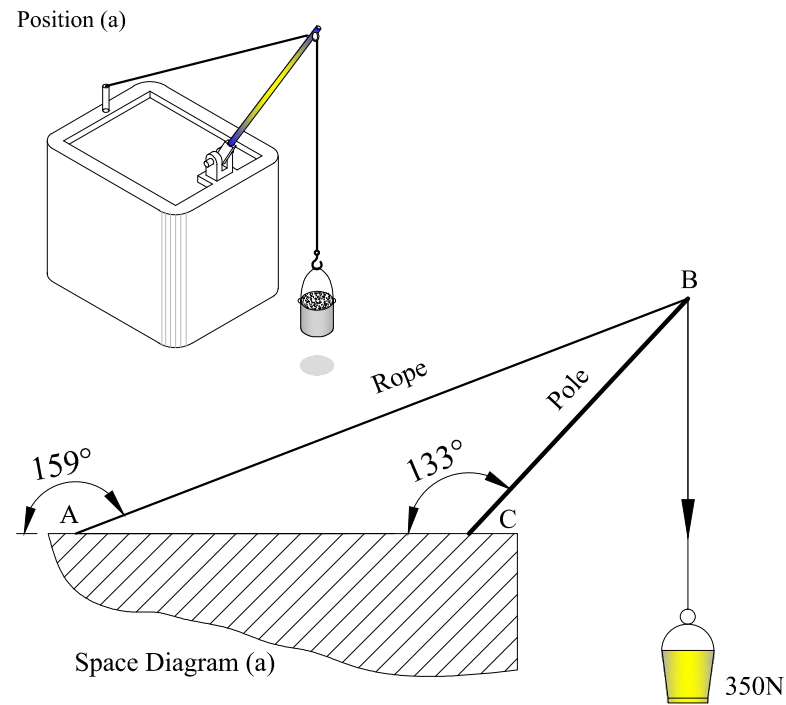
Force Diagram (a)

Force in rope AB..........................N

Force in pole BC..........................N

b. Construct a force diagram to determine the magnitude and sense of BD and BC when the crane is stationary as in position (b). *Draw arrowheads on the lines of action of the forces.* **(6 marks)**
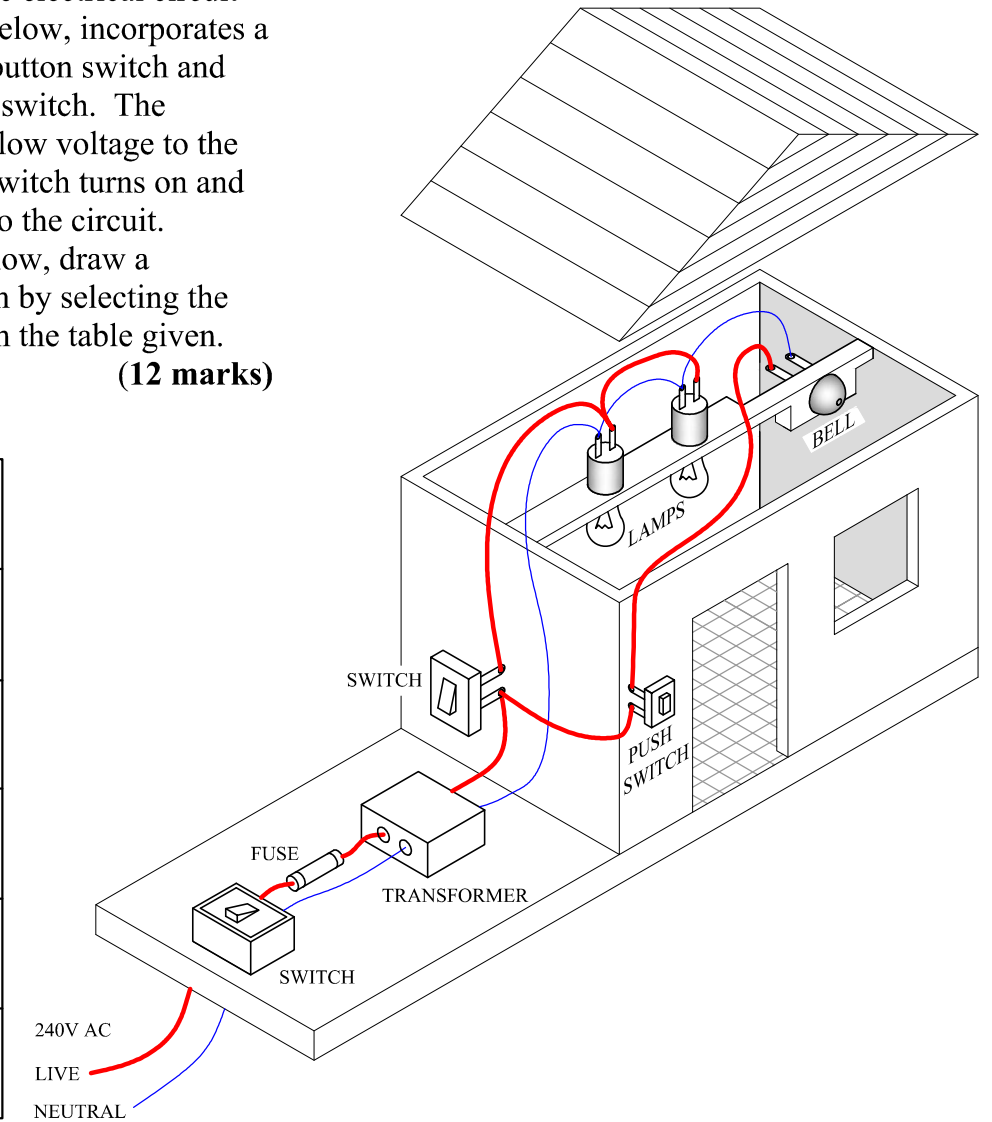
Position (b)

B

Rope

Pole

58°

350 N

C

30°

D
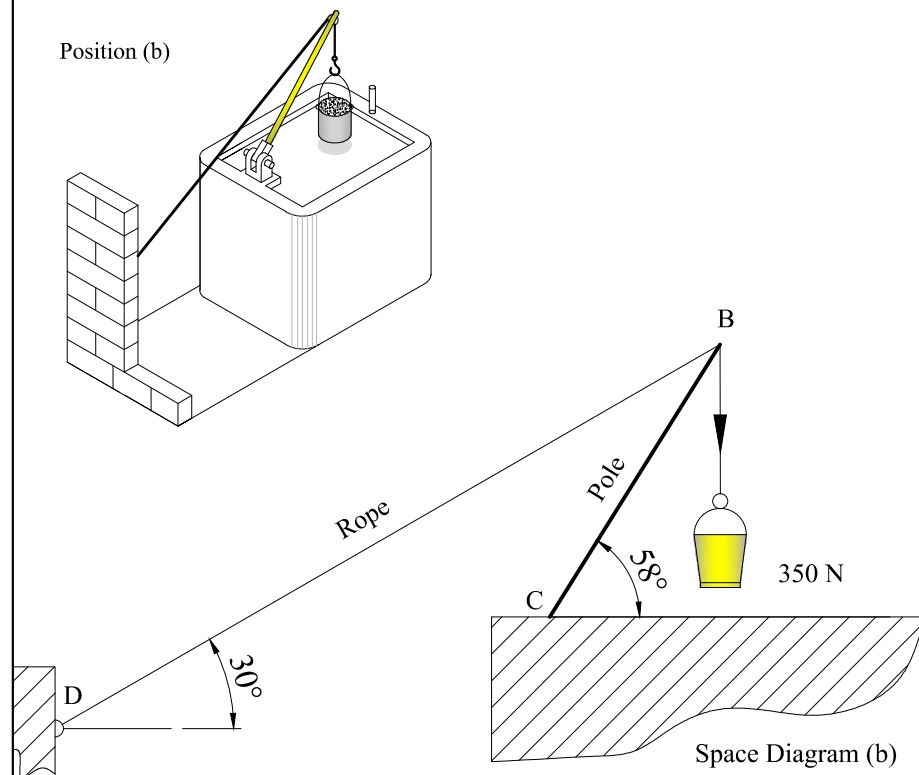
Space Diagram (b)

Force Diagram (b)

Force in pole BC.....................N

Force in rope BD.....................N

**Question 2.**

A pictorial drawing of the electrical circuit of a doll's house, given below, incorporates a bell operated by a push-button switch and two lamps operated by a switch. The transformer supplies the low voltage to the doll's house. The main switch turns on and off the supply of power to the circuit.

In the space provided below, draw a schematic circuit diagram by selecting the appropriate symbols from the table given.

**(12 marks)**

BELL

LAMPS

SWITCH

PUSH SWITCH

FUSE

TRANSFORMER

SWITCH

240V AC

LIVE

NEUTRAL

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**Question 3.**

The following computer programme is written to create a company logo.

DATA:    A = 50; B = 100; C = 150; D = 200; E = 250; F = 300; G = 350; H = 400;

ACI 7:    Move H,E;  Draw G,F:

ACI 5:    Move H,D;  Draw G,E;  Draw D,B;  Draw B,B; Draw B,D; Draw D,F:

ACI 5:    Move D,B;  Draw D,D;  Draw F,F:

ACI 5:    Move D,D;  Draw B,D;   Move F,F; Draw D,F:

ACI 1:    Move H,C;  Draw G,D;  Draw  D,A; Draw A,A; Draw A,D; Draw C,F:

          Mirror the plotted design using the vertical centre line as the mirror line (line of symmetry).

          Mirror the resulting design using the horizontal centre line as the mirror line.

*The **DATA** statement specifies the numeric values (in pixels) of given variables.  **MOVE** positions the cursor at a new location without drawing a line.   **DRAW** draws a line from a  current location to a new location.  **MIRROR** creates a mirror image (reflection) of the original.   The instruction **ACI  No**. makes the images that follow the instruction appear in the colour associated with the number.   The computer responds to the following colour commands:*

|  Colour |  ACI No. |
|---------|---------|
| RED     | 1       |
| BLUE    | 5       |
| BLACK   | 7       |

          The starter sheet below shows a pre-printed grid representing an 800 x 600 graphical display.

Use the grid to plot the image produced by this programme.
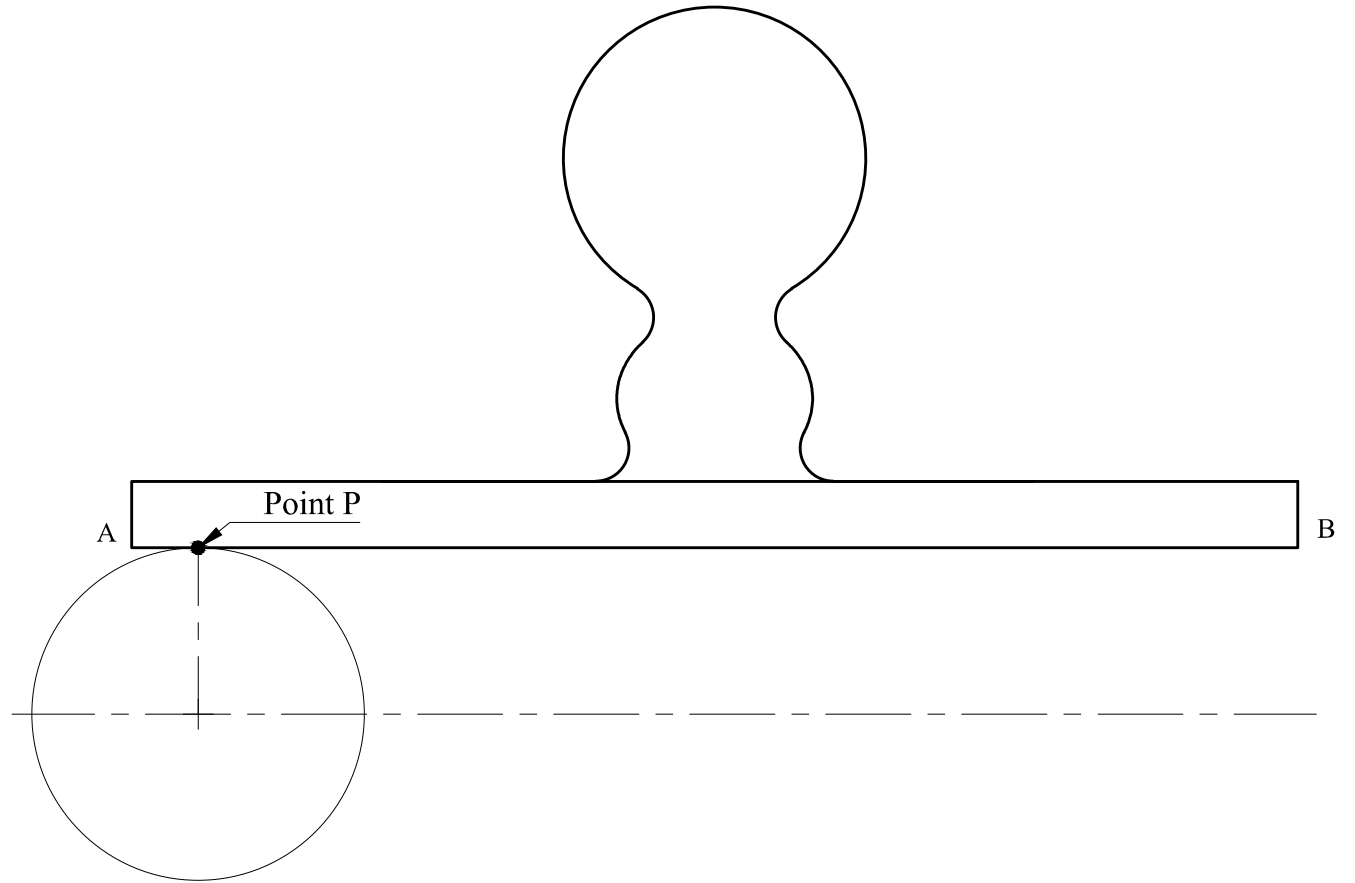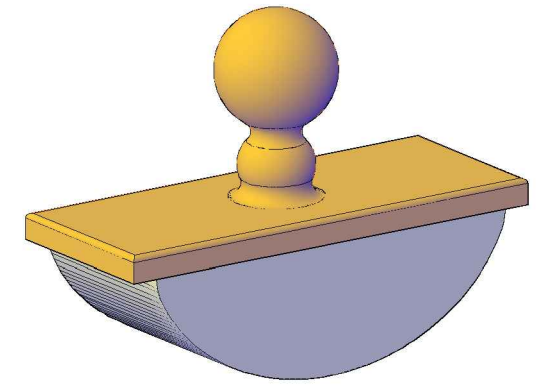
**(12 marks)**
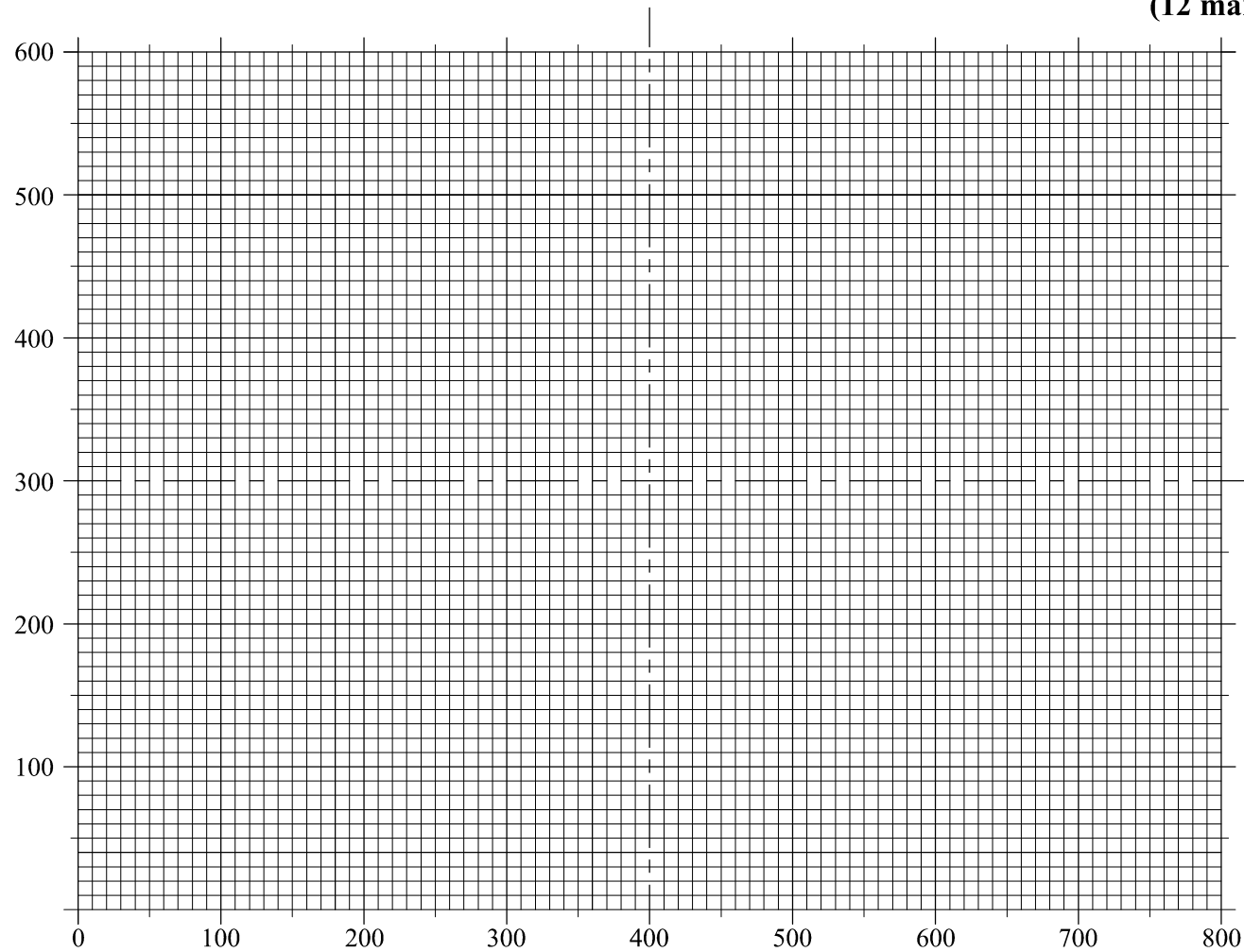
**Question 4**.

The Ink Blotter shown consists of a block of wood with a rounded face and a handle. The curve on the rounded face is generated by point P on the given circle which rolls one complete revolution without slipping along line AB.

Using the given start lines, construct the cycloid of point P.

**(14marks)**

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## Question 5.

A survey carried out among the workers in a particular factory revealed that 50% of those interviewed travel to work by means of their car, 25% by bus, 10% by motorcycle, 10% by bicycle and 5% travel on foot (by walking).

In the space provided below:

a. Draw a 3-D pie chart to show a comparison of the way workers travel to work.
b. Draw three small preparatory sketches to represent the workers who walk to the factory.
c. Draw the final version of the 'walk' graphic symbol.
d. Complete the legend by drawing a small version of the graphic symbol (d).
e. Add suitable colour to both pie chart and legend.

**(16 marks)**

| | CAR | 50% | o | | |
|---|---|---|---|---|---|
| | BUS | 25% | o | | |
| | MOTORCYCLE | 10% | o | | |
| | BICYCLE | 10% | o | | |
| | WALK | 5% | o | | |

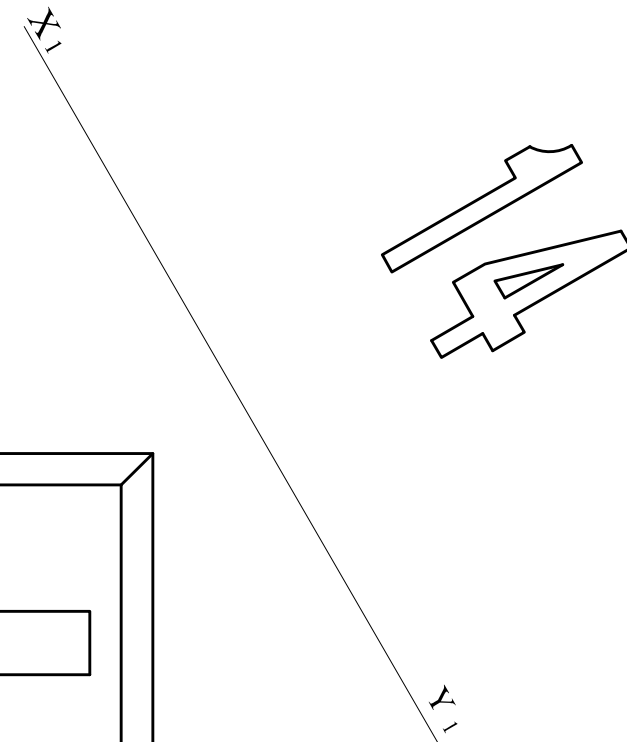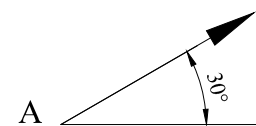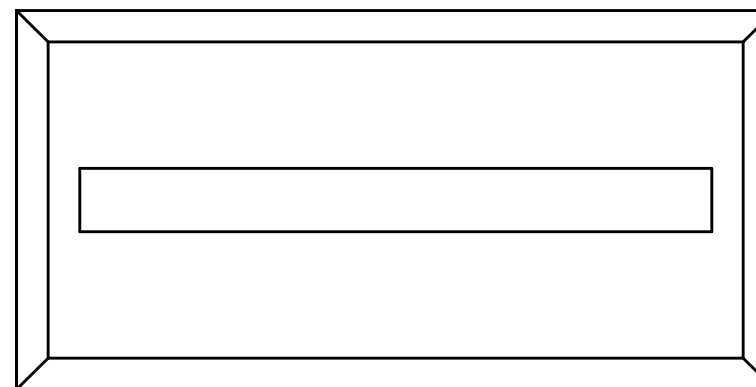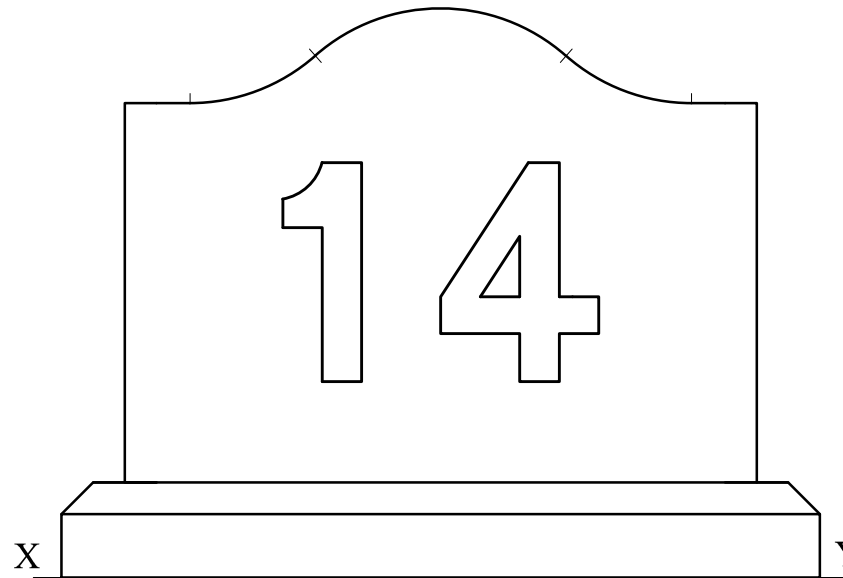SKETCHES      WALKING GRAPHIC SYMBOL                    LEGEND (KEY)

## Question 6.

The given views show a freestanding Wooden Table Number. Project an auxiliary elevation of the object by looking on the given plan in the direction of arrow A.
*Hidden detail is not required.*

**(16 marks)**

14

X                                                                          Y

X₁

14

Y₁

A          30°

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD,      UNIVERSITY OF MALTA,    MSIDA

GRAPHICAL COMMUNICATION    -    PAPER 2B (Page 3)   -   ATTEMPT ALL QUESTIONS   -   DATE: 12th May 2014.    -    TIME : 4.00 p.m.  to  6.00 p.m.       INDEX NUMBER : _____
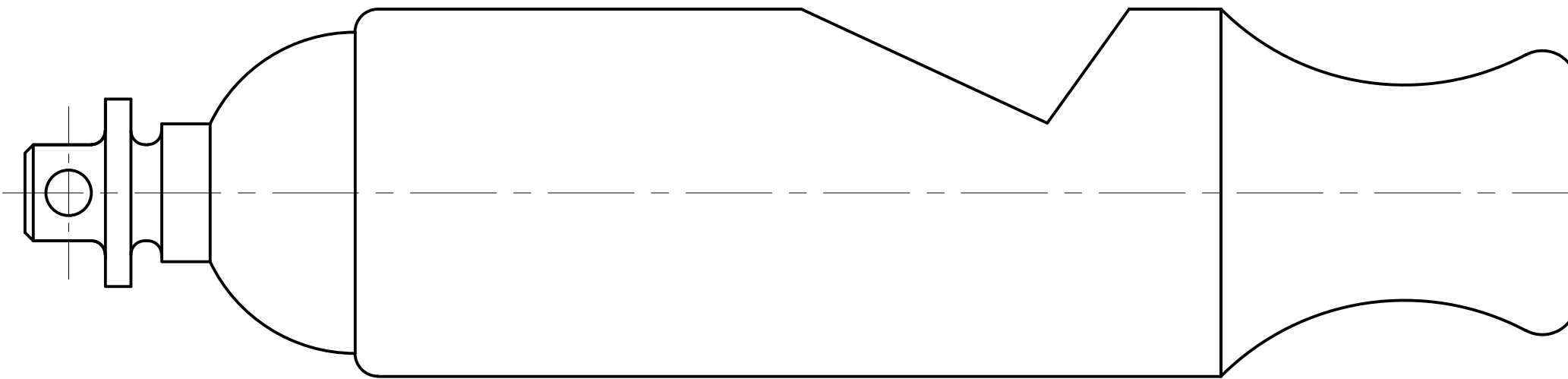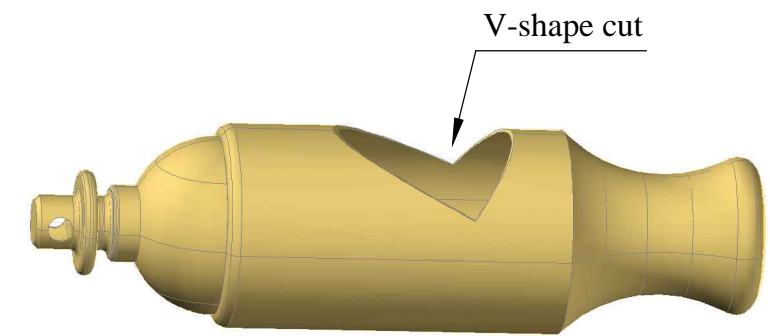
**Question 7.**
The pictorial view on the right shows a scout's whistle. It consists of a machined brass hollow cylinder with a V-shape cut to allow for air intake.
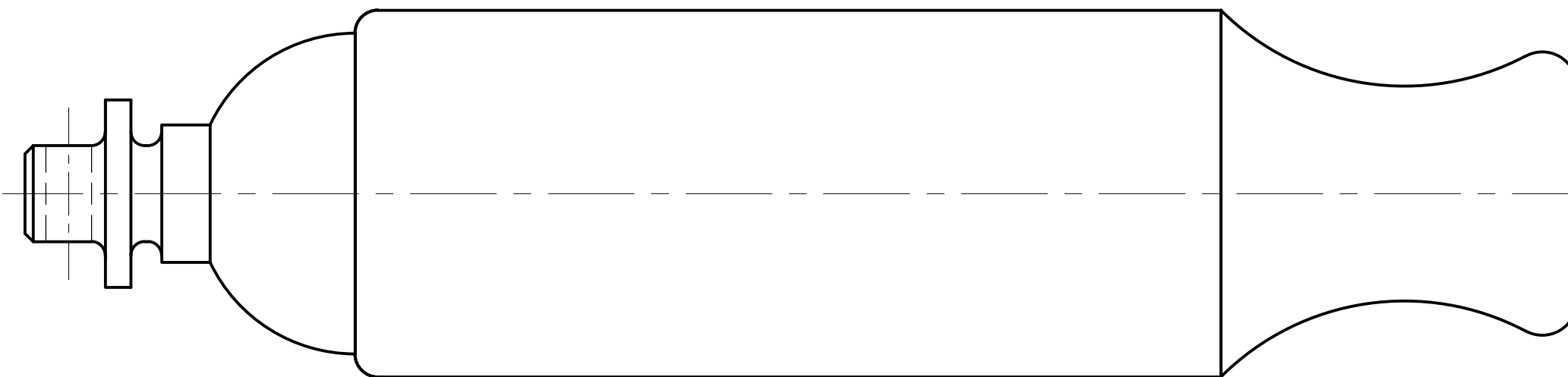The given orthographic drawings show a complete front view, an incomplete plan and an incomplete end view.

Complete the **PLAN** by projecting the curves of intersection which result from the V-shaped cut.

**(18 marks)**

V-shape cut

FRONT

PLAN