

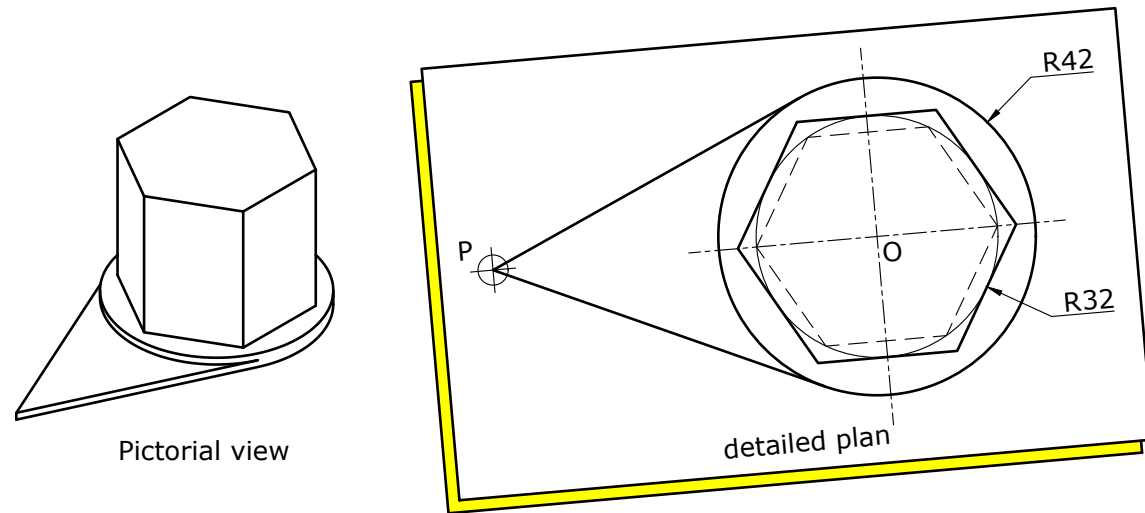
**Question 1.**

A pictorial view and a detailed plan of a wheel nut indicator are shown below. Wheel nut indicators are used as a safety feature to indicate loosen nuts on heavy equipment vehicles and buses.

Construct the plan of the wheel nut indicator by following these steps:

- Draw **TWO** concentric circles, R32 and R42, using Centre O; (2)
- Construct a hexagon across flats (A/F) to the R32 circle; (2)
- Construct a hexagon across corners (A/C) to the R32 circle in hidden detail; (2)
- Construct **TWO** tangents from point P to the R42 circle. (4)

**(Total: 10 marks)**



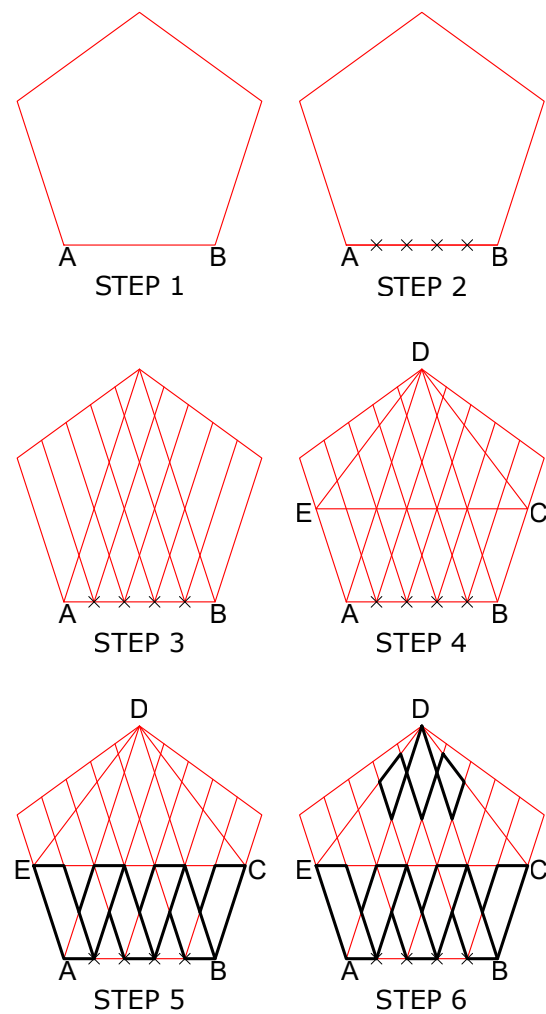
**Question 2**

The logo on the right belongs to a jewellery company by the name of Wilson & Wilson. Follow the steps below to construct the logo.

- Construct a regular pentagon using base A-B (Step 1). (4)
- Divide base A-B into 5 equal parts using the division of line method (Step 2). (2)
- Draw construction lines parallel to the sides of the pentagon as shown in Step 3. (2)
- Add the triangle within the pentagon as shown in Step 4. (1)
- Outline the lower part of the logo as shown in Step 5. (2)
- Outline the upper part of the logo as shown in Step 6. (1)
- Shade the given logo on the right using colour. (2)

Note: Do **not** add the words 'JEWELLERY' and 'WILSON & WILSON' to the logo.

**(Total: 14 marks)**



(logo to be shaded)

**Question 3.**

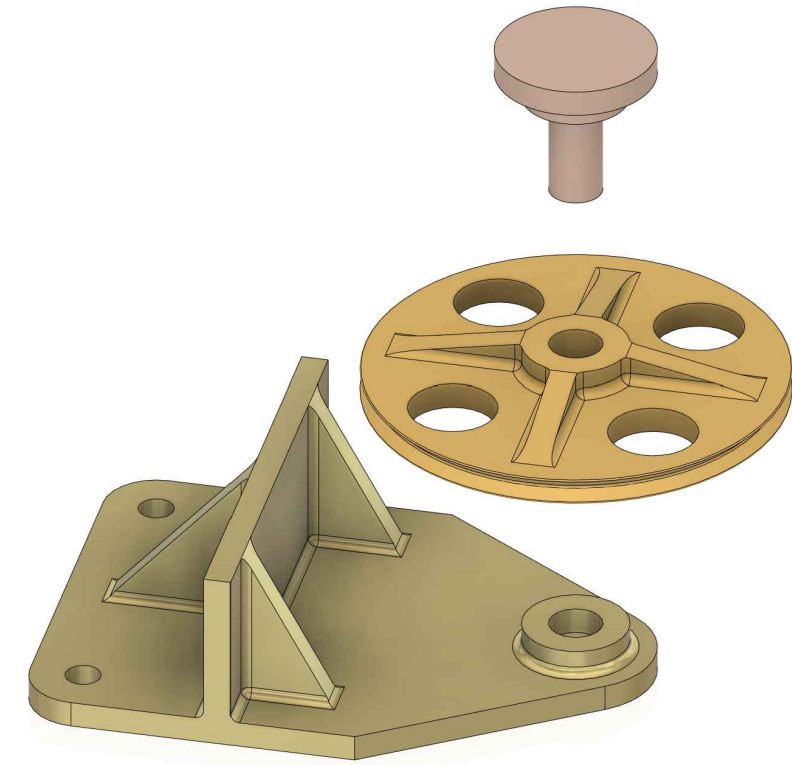
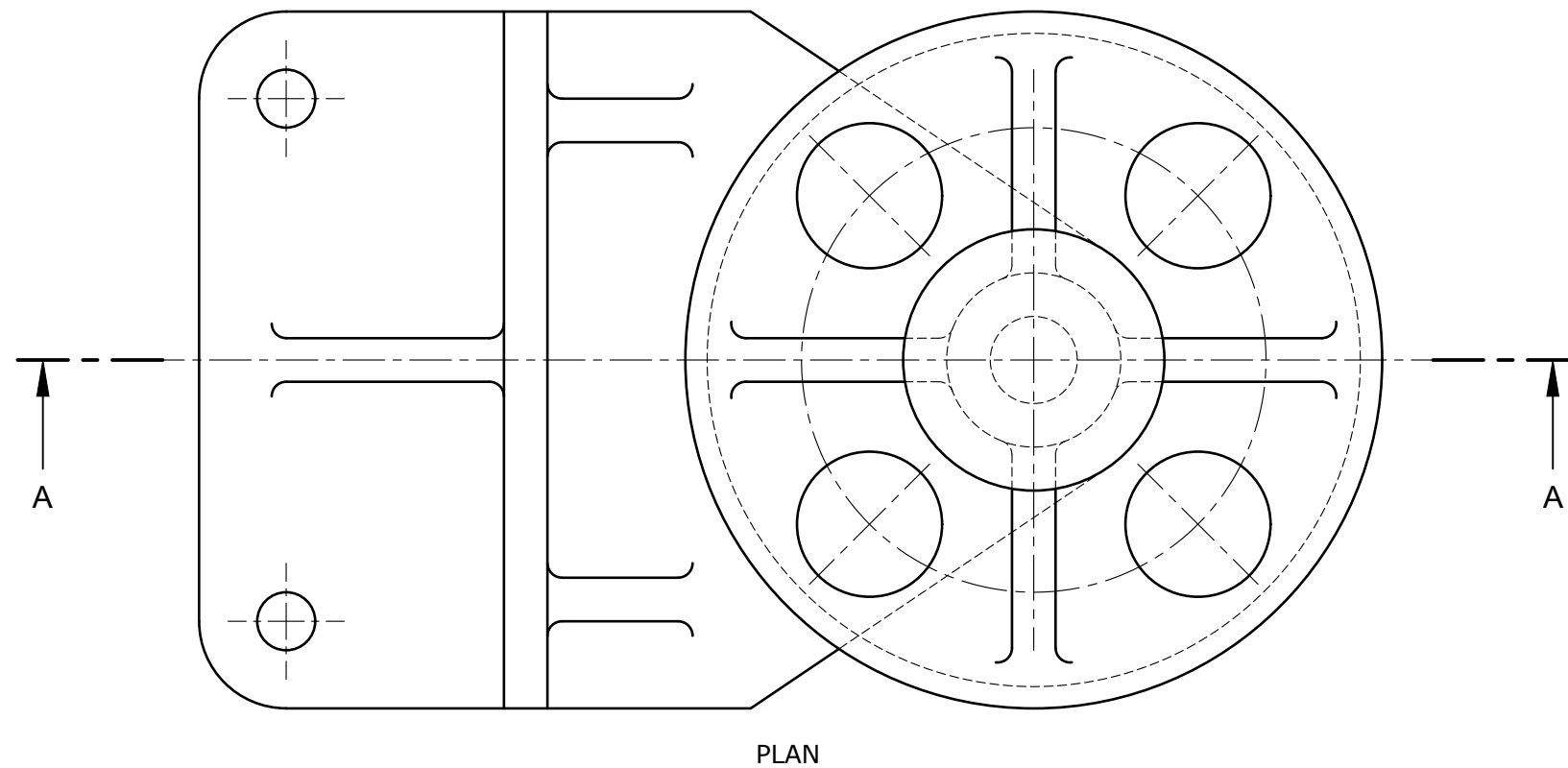
An exploded pictorial view of a toy pulley is given on the right. The plan, the end elevation and the profile of the sectional front elevation are also given.

- a. In the space provided, complete the sectional front elevation of the toy pulley on cutting plane A-A. (18)  
 b. Insert **ONE** radial and **ONE** linear dimension on any of the orthographic views. (2)

Notes:

- Show **all** centre lines.
- Do **not** show hidden detail.

(Total: 20 marks)



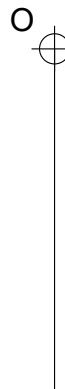
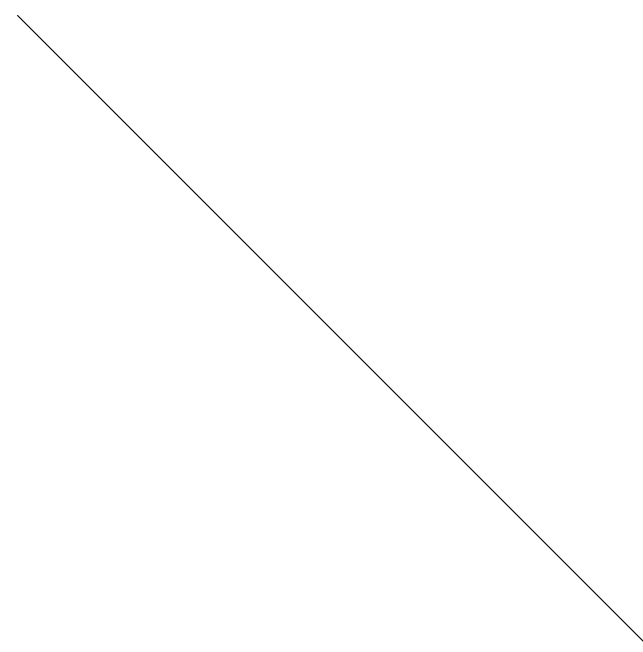
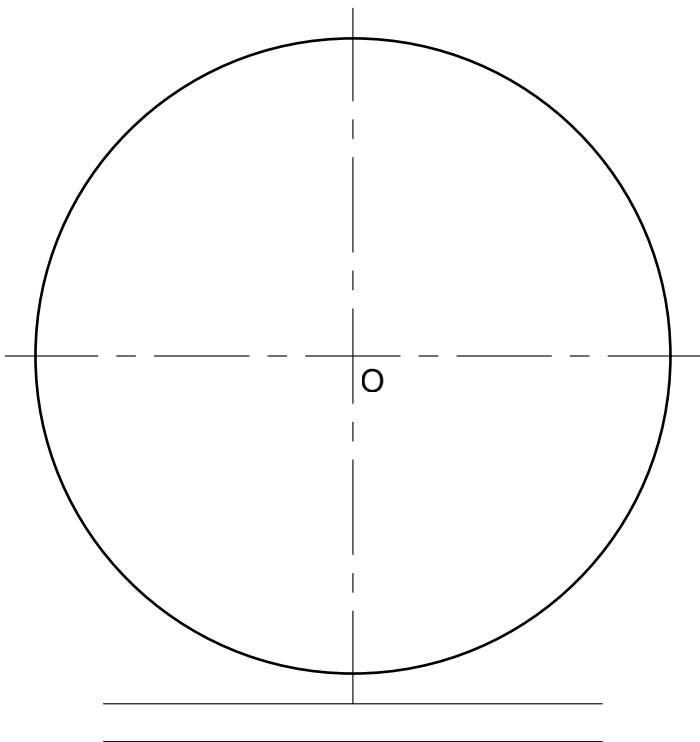
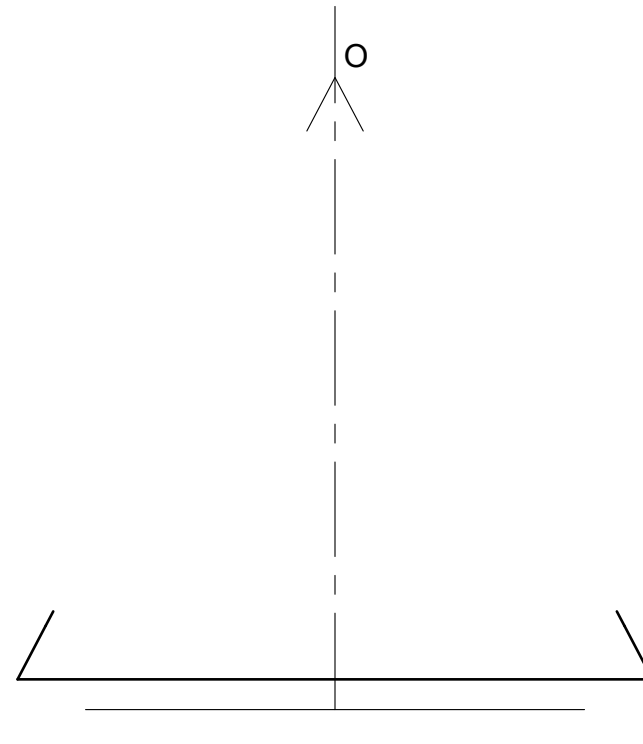
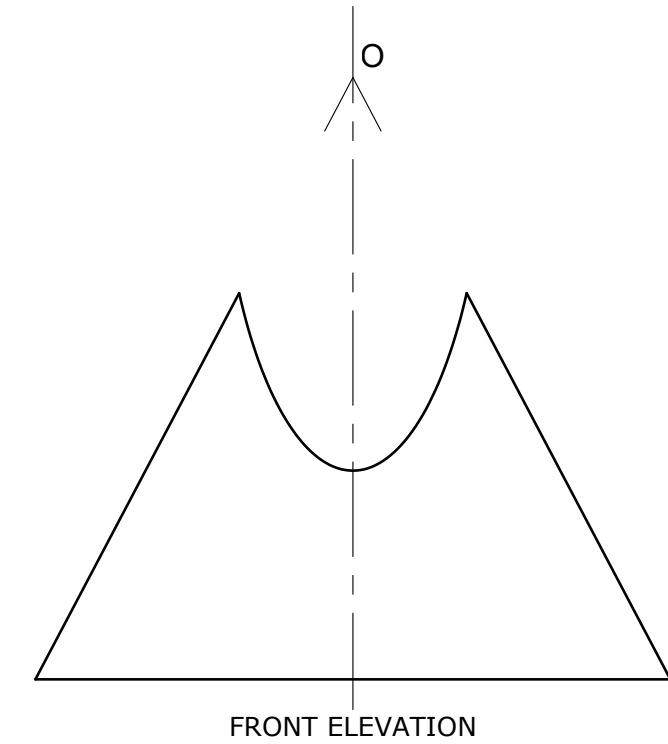
exploded pictorial view of the toy pulley

**Question 4.**

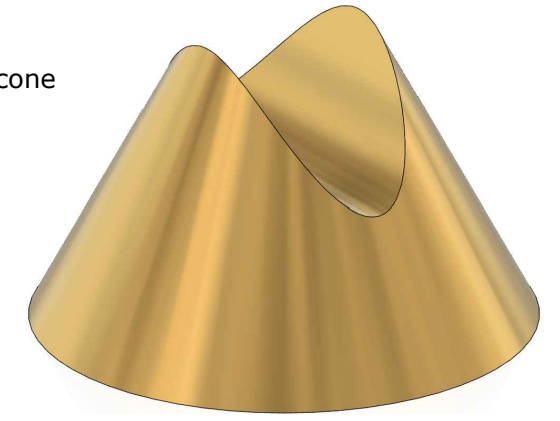
The drawing on the right shows a truncated cone support for a rod. The front elevation, an incomplete plan and an incomplete end elevation have been given.

- a. Label the end elevation and the plan. (2)
- b. Construct the plan. (4)
- c. Project the end elevation. (4)
- d. Construct the full development of the truncated cone using Point O as the apex. (8)

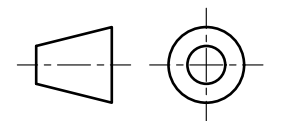
**(Total: 18 marks)**



pictorial view of the truncated cone support for a rod



full development of truncated cone



**Question 5.**

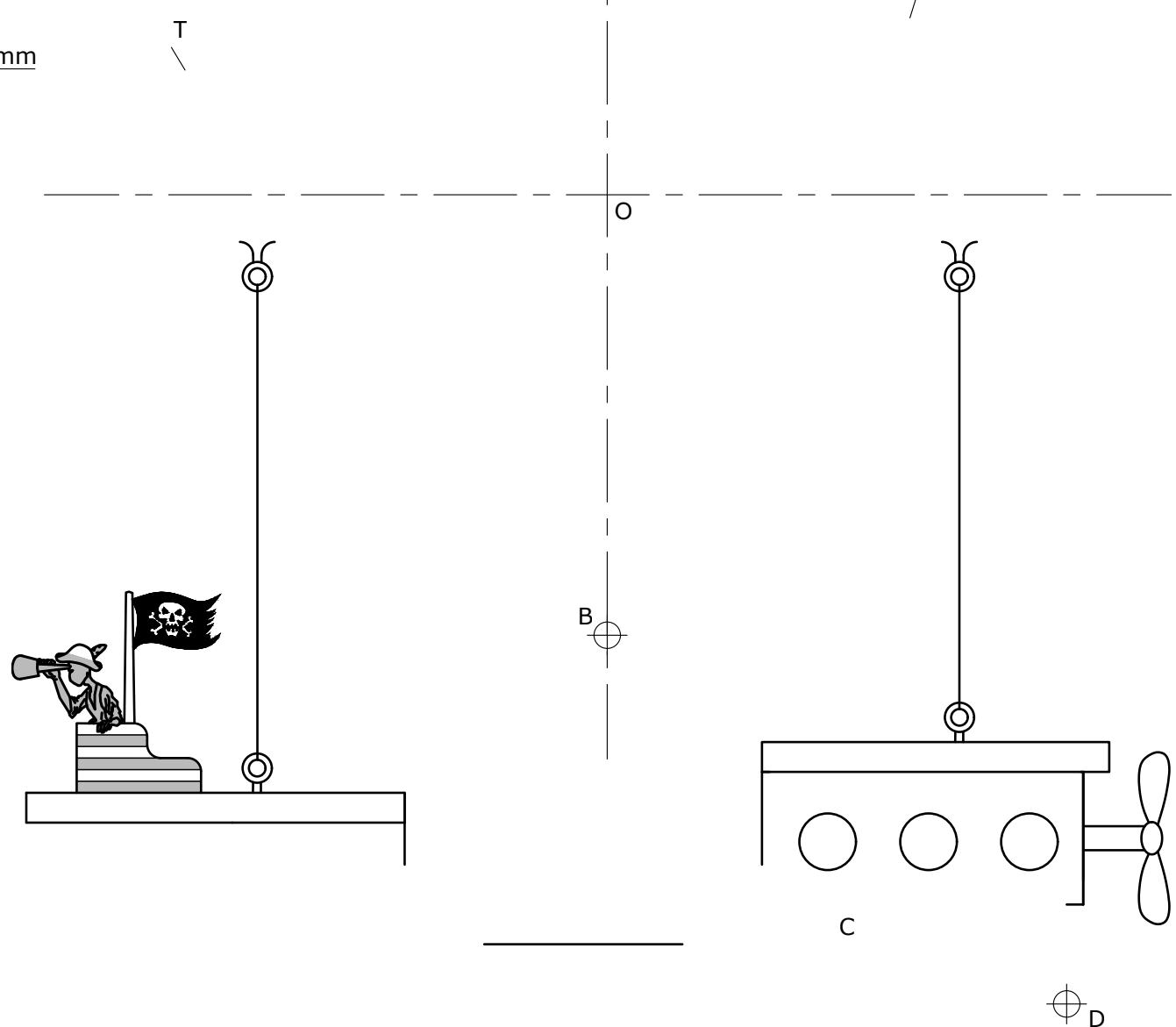
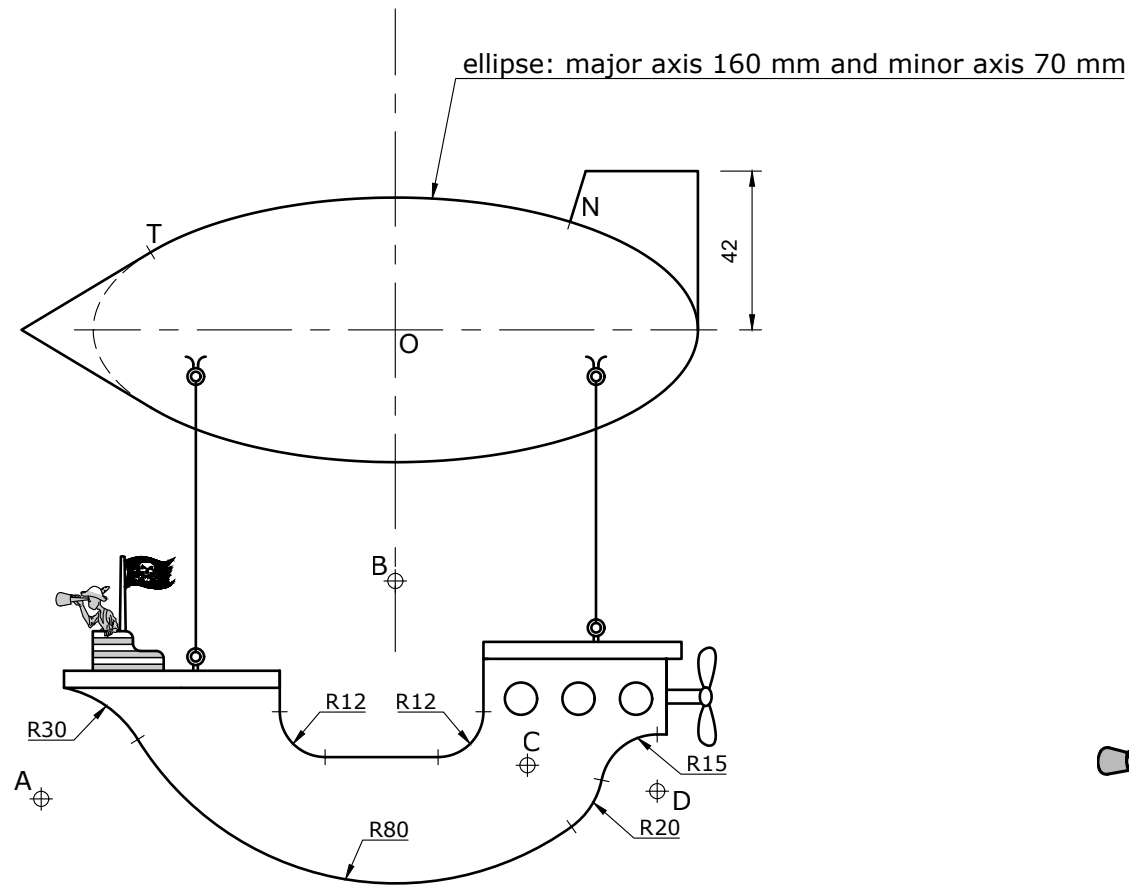
A fantasy pirate ship is shown below. The design consists of the profiles of a ship and a zeppelin. The outline of the ship consists of lines and tangential arcs. The outline of the zeppelin consists of an ellipse, a tangent at Point T and a normal to the ellipse at Point N.

On the start lines provided:

- a. construct the ship profile showing **all** points of tangency; (8)
- b. construct the zeppelin with the tangent at Point T and the normal at Point N; (8)
- c. mirror the tangent and finish off the rudder of the zeppelin. (2)

Note: Show **all** construction.

**(Total: 18 marks)**



**NOTES**

- Construct 2 corner arcs of R12.
- Construct arcs A:R30, B:R80, C:R20 and D:R15.
- Ellipse: major axis = 160 mm, minor axis = 70 mm.
- Construct a tangent at Point T and a normal at Point N.
- Points of tangency are denoted by means of short dashes as shown. ————

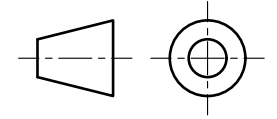
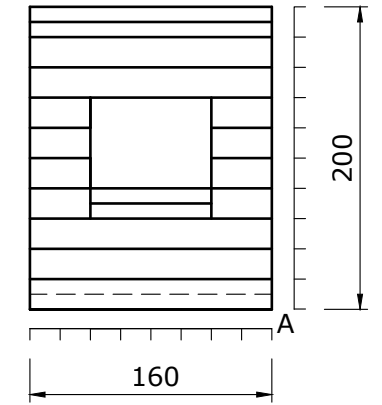
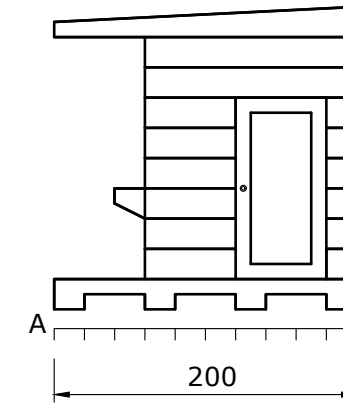
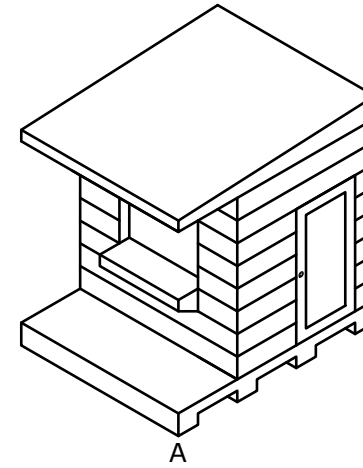
**Question 6.**

A pictorial view and two orthographic views of a beach kiosk are given. Using the given start lines, VP1 and VP2, draw an estimated two-point perspective view of the kiosk.

Notes:

- VP1, VP2 and some start lines have been given.
- The roof is sloped.
- Draw the horizontal timber planks.
- Estimate any missing dimension.

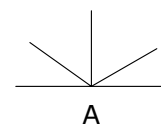
**(Total: 20 marks)**



VP1



VP2



**Question 1.**

The following computer programme is written to create a design layout for a tile.

DATA: A = 50; B = 100; C = 150; D = 200; E = 250; F = 300; G = 350;  
 H = 400; I = 450; J = 500; K = 550; L = 600; M = 650; N = 700;  
 O = 750; P = 800.

ACI 1: MOVE F,H; DRAW F,I; DRAW G,I; DRAW G,J; DRAW H,J:

ACI 2: MOVE F,H; DRAW E,I; DRAW G,K; DRAW H,J:

ACI 3: MOVE D,H; DRAW D,I; DRAW C,J; DRAW D,K; DRAW E,K; DRAW E,L;  
 DRAW F,M; DRAW G,L; DRAW H,L:

ACI 5: MOVE C,H; DRAW B,I; DRAW B,J; DRAW A,J; DRAW F,O; DRAW F,N;  
 DRAW G,N; DRAW H,M:

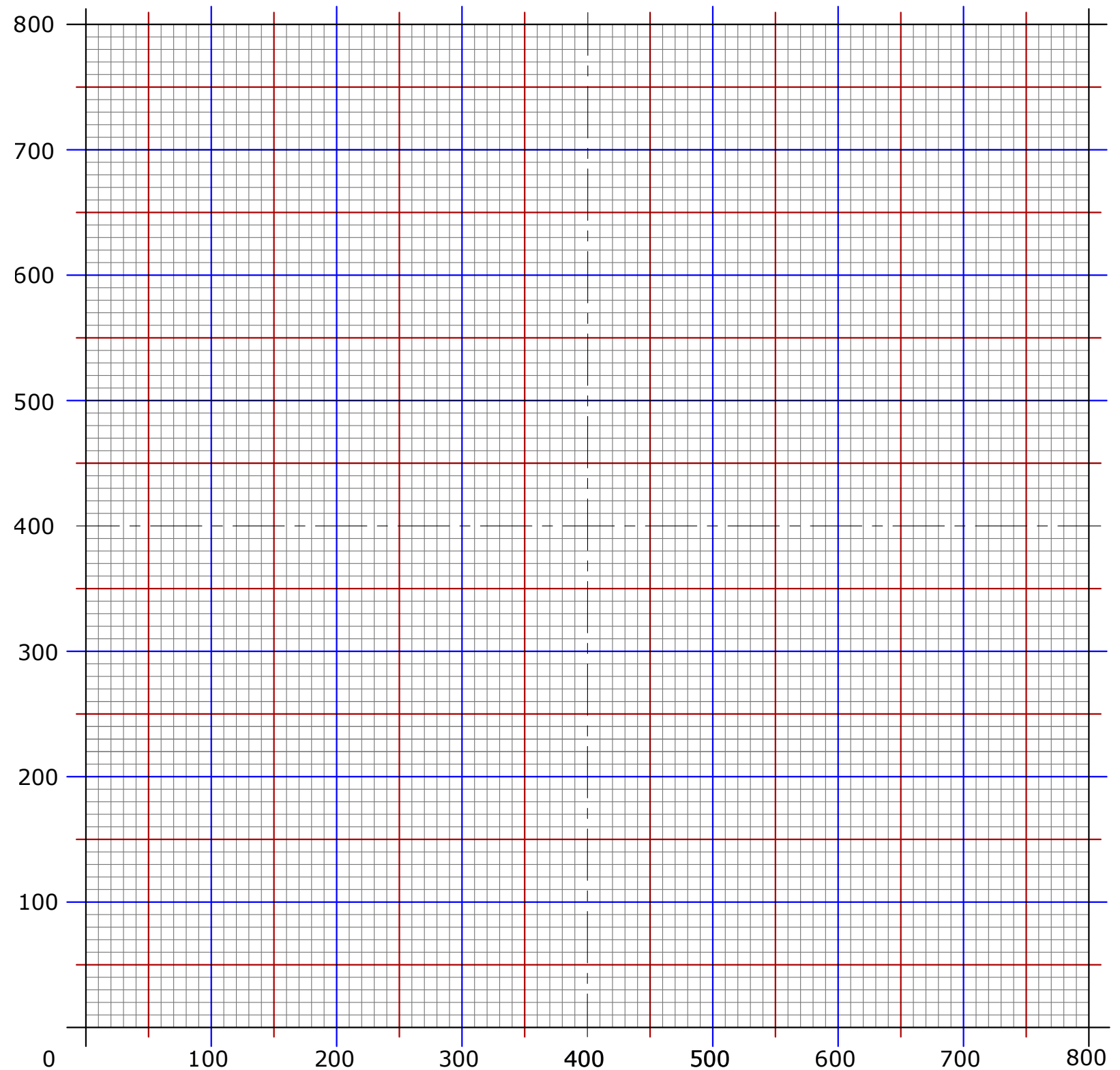
ACI 7: MOVE A,L; DRAW A,N; DRAW B,O; DRAW D,O; DRAW A,L.

COLOUR	RED	YELLOW	GREEN	BLUE	BLACK
ACI No.	1	2	3	5	7

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. 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:

- Plot the image produced by this programme on the 800 X 800 grid given on the right. (7)
- Mirror the plotted design using the vertical and horizontal centre lines as the mirror lines (lines of symmetry). (3)

**(Total: 10 marks)**



**Question 2.**

A school conducted a survey among fifteen-year-olds in order to organise sport tournaments. The following table shows the results of this survey:

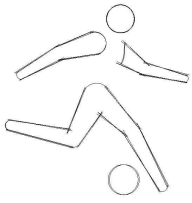

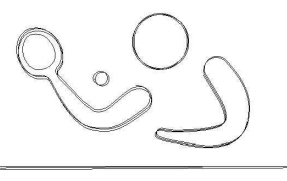

PREFERENCE	BOYS	GIRLS
football	50	40
basketball	50	35
volleyball	45	55
table tennis	35	20
TOTAL no. of students:	180	150

These results need to be presented by graphical means. You are asked to:

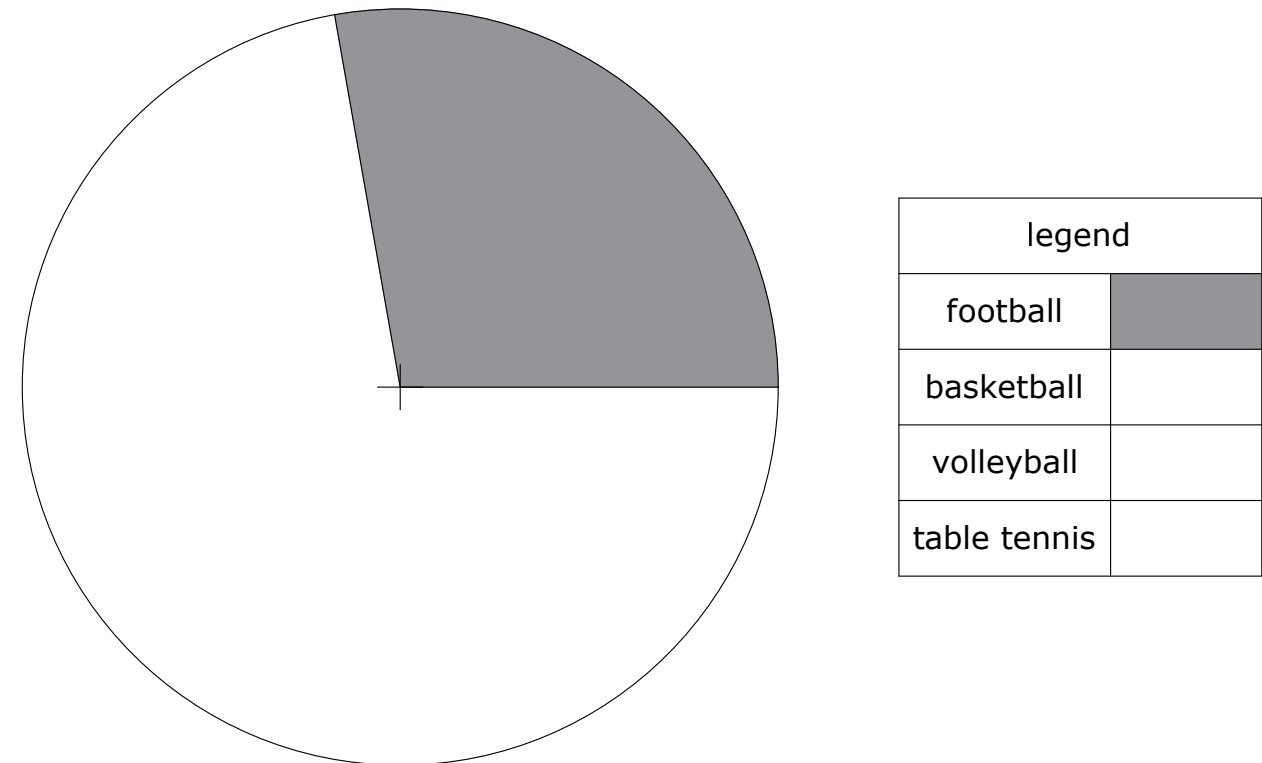
- a. design the missing pictograms in Section A (**TWO** freehand sketches and **TWO** final pictograms); (6)
- b. complete the 2D pie chart and legend for the results of preferences among boys, in Section B; (6)
- c. complete the 3D bar graph for the results of preferences among girls, in Section C. (4)

**(TOTAL: 16 marks)**

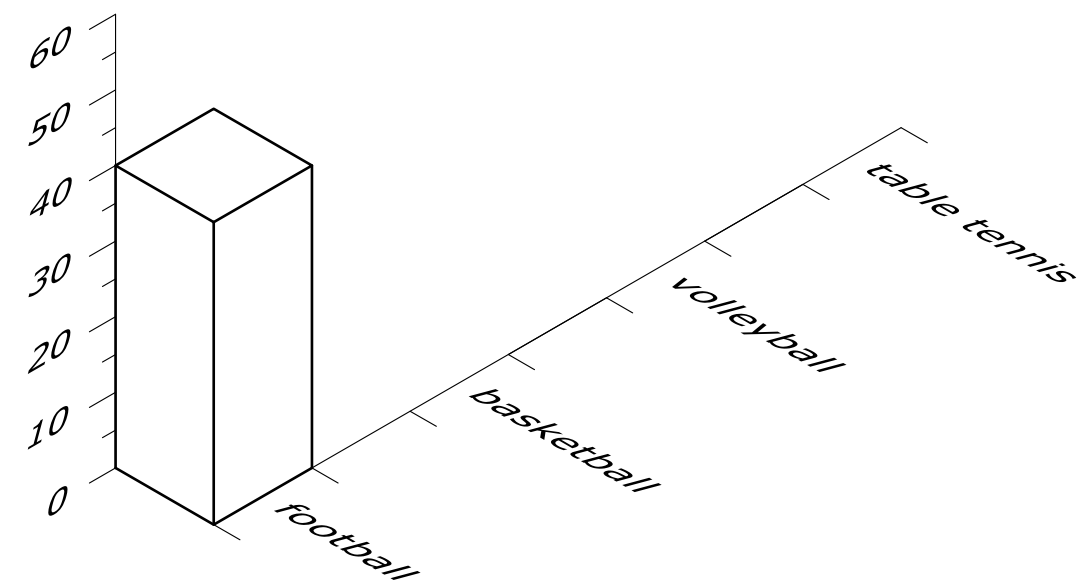
Section A - pictograms:

sport	freehand sketch	final pictogram
football		
basketball		
volleyball		
table tennis		

Section B - 2D pie chart and legend (boys' preference):



Section C - 3D bar graph (girls' preference):



**Question 3.**

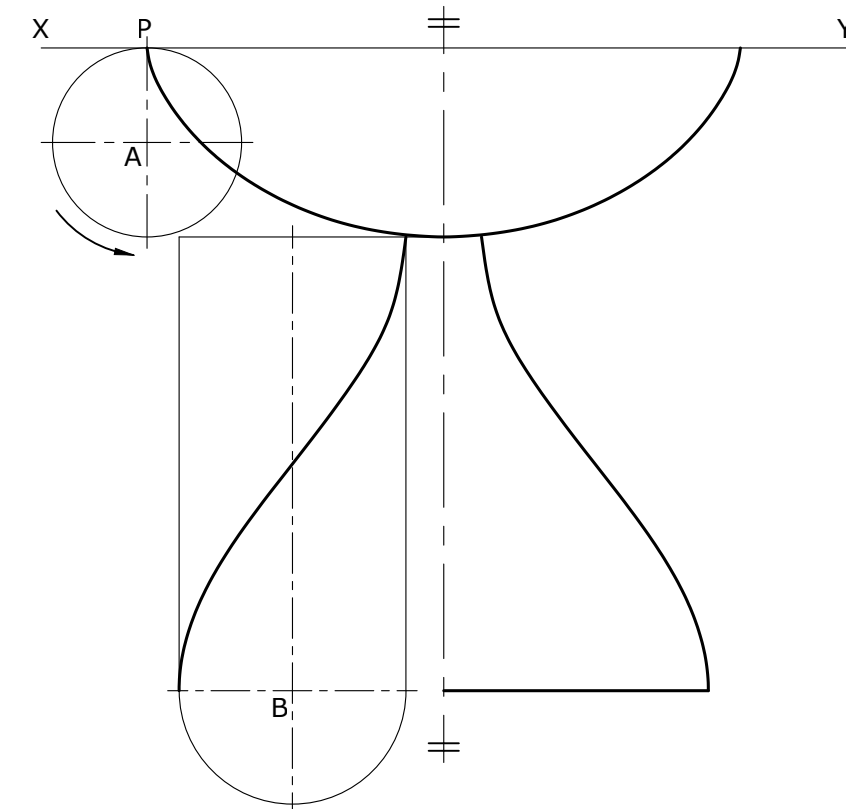
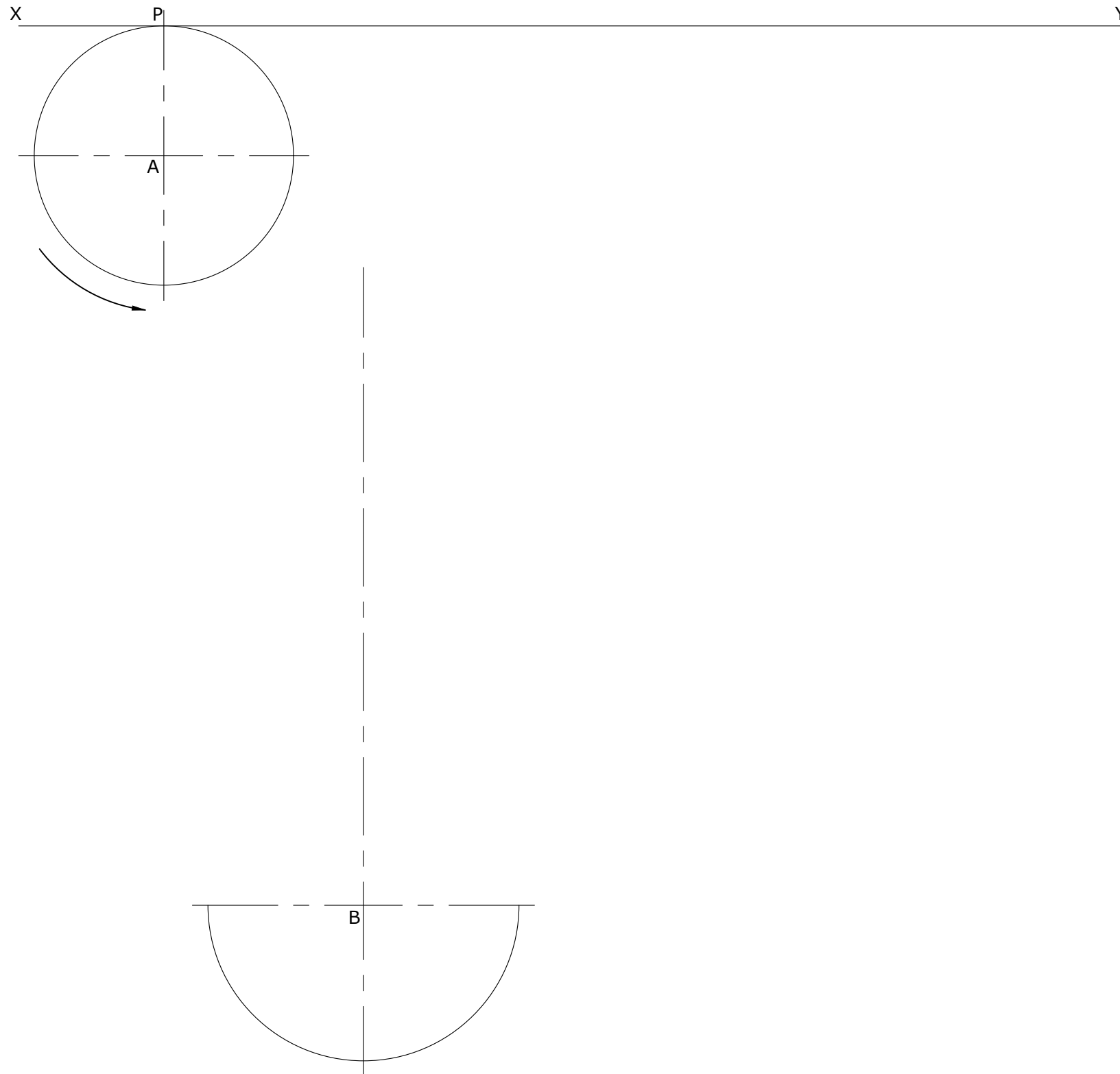
A pictorial view and a detailed view of a chalice have been given. The upper part of this profile is formed by a cycloid and the lower part by half the lead of a helix. Construct this profile on the start lines given by:

- a. generating a cycloid with the locus of Point P, of the circle with Centre A, which rolls anticlockwise without slipping for one revolution below directing line X-Y; (5)
- b. generating half the lead of a helix as indicated (lead length: 240 mm) on the circle with Centre B; (5)
- c. mirroring vertically the part-helix to the right and closing the top and base of the chalice. (4)

**(Total: 14 marks)**



pictorial view of chalice



detailed view of chalice

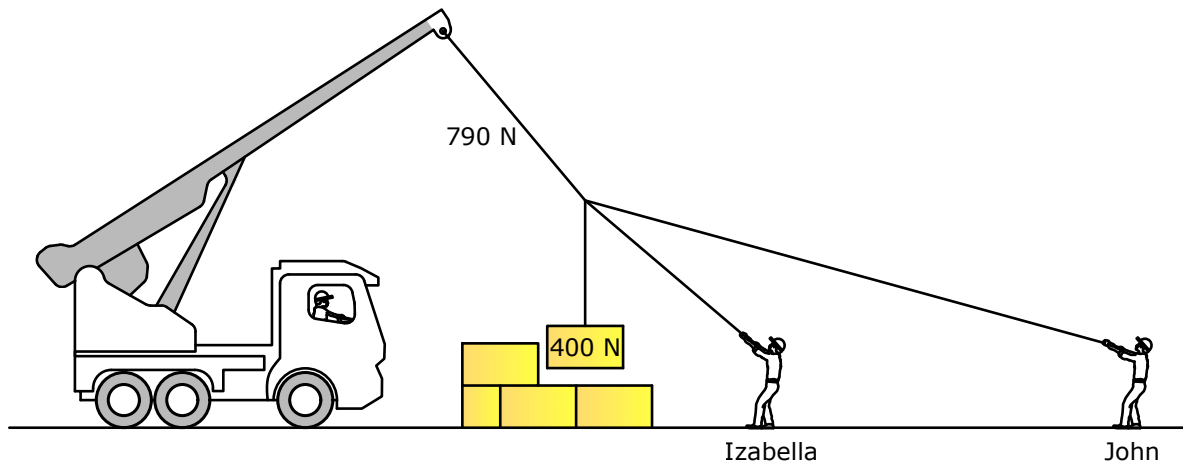


**Question 4.**

Two persons are pulling a load suspended from a crane as shown below. The forces are in a state of equilibrium at the joint.

- Draw a freehand sketch of the vector diagram in the space provided below. (2)
- Based on your freehand sketch and using a scale of 10mm:100N, construct graphically the vector diagram to find the forces pulled by John and Izabella. (8)
- State the magnitude of both forces in Table A. (4)

**(Total: 14 marks)**



space for freehand sketch

Table A

John is pulling _____ N
Izabella is pulling _____ N

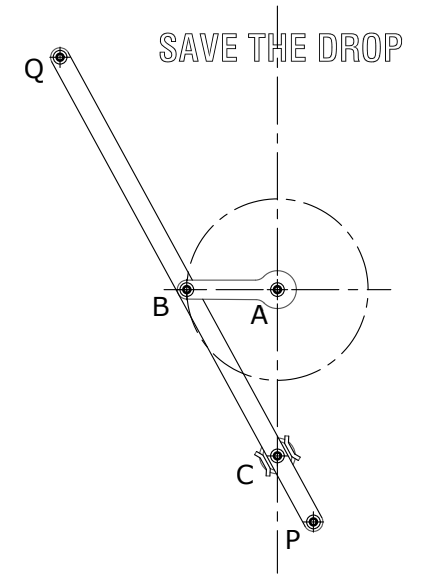
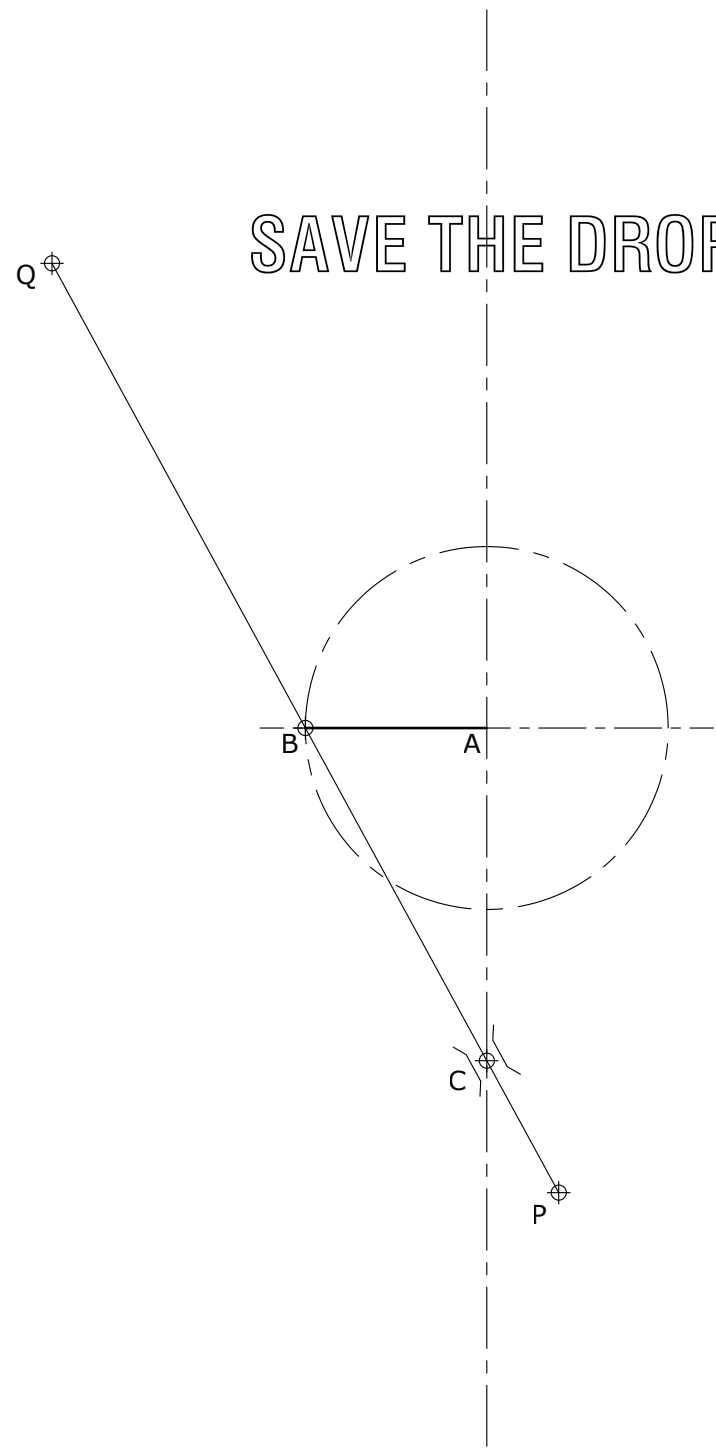
**Question 5.**

A profile of a mechanism is shown on the right. The mechanism produces an environmental awareness logo. It consists of:

- a crank AB;
- a sliding pivot at C;
- a linkage QP.

Crank AB rotates about Point A, while Point B is a free pivot. Point C is a sliding pivot. Using the starting points provided, plot the locus of Points Q and P for **ONE** complete revolution of the crank.

**(Total: 12 marks)**



**Question 6.**

The pictorial drawing on the right shows a tailor-made HDMI to USB adapter used in a school computer lab. Its design is made out of a hexagonal prism intersecting a cylinder.

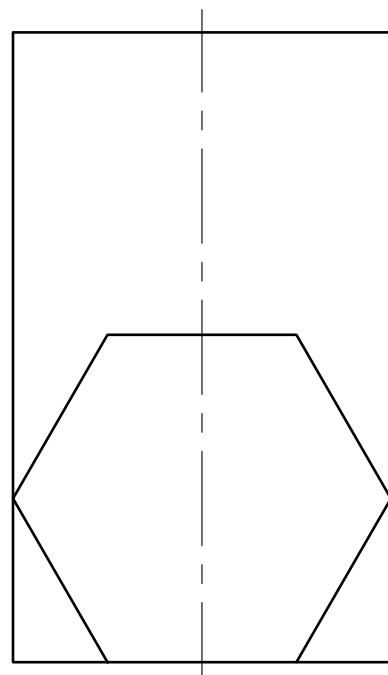
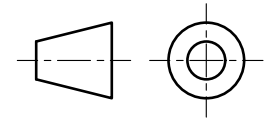
Three orthographic views of this adapter are given below. These consist of an incomplete front elevation, an end elevation, and a plan in first angle projection.

- a. Complete the front elevation by constructing the intersection between the two solids. (4)
- b. Construct the surface development of the cylinder in the space provided, with the joint line at X-X. (6)
- c. Construct the surface development of the hexagonal prism in the space provided, with the joint line at A-A. (6)

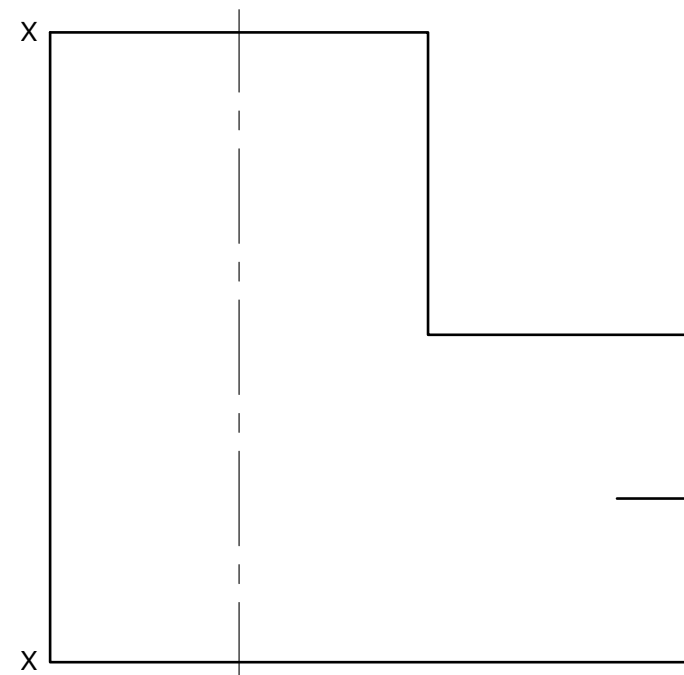
**(Total: 16 marks)**



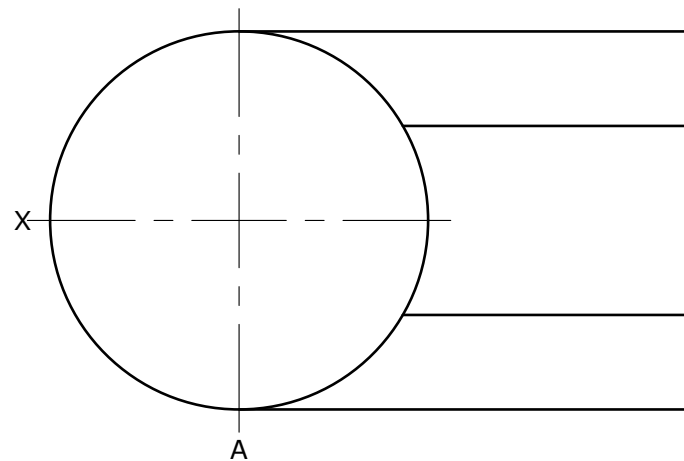
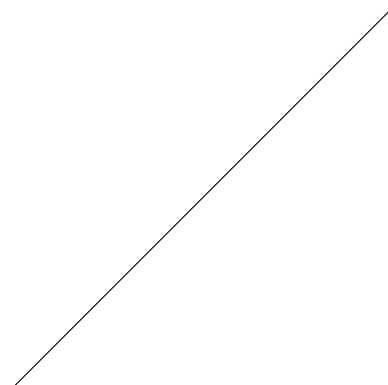
HDMI to USB adapter



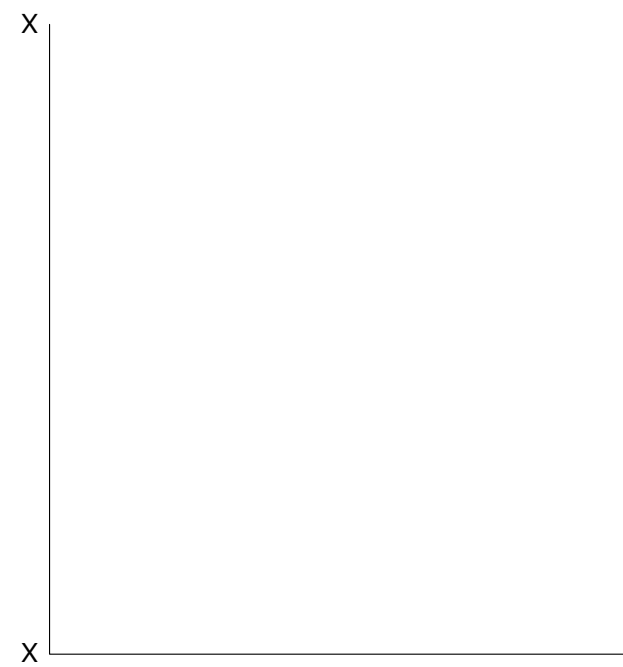
END ELEVATION



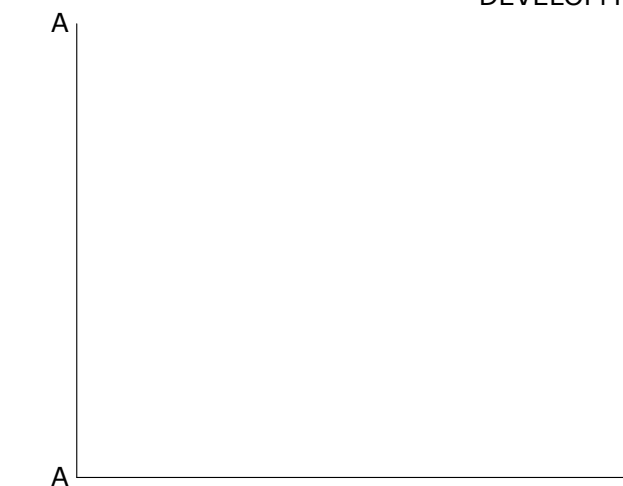
FRONT ELEVATION



PLAN



DEVELOPMENT OF CYLINDER



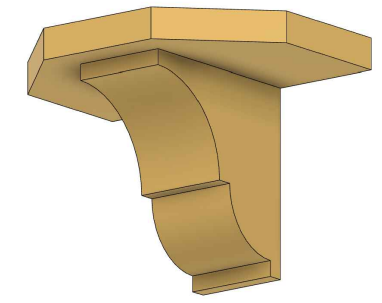
DEVELOPMENT OF HEXAGONAL PRISM

**Question 7.**

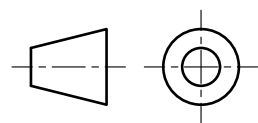
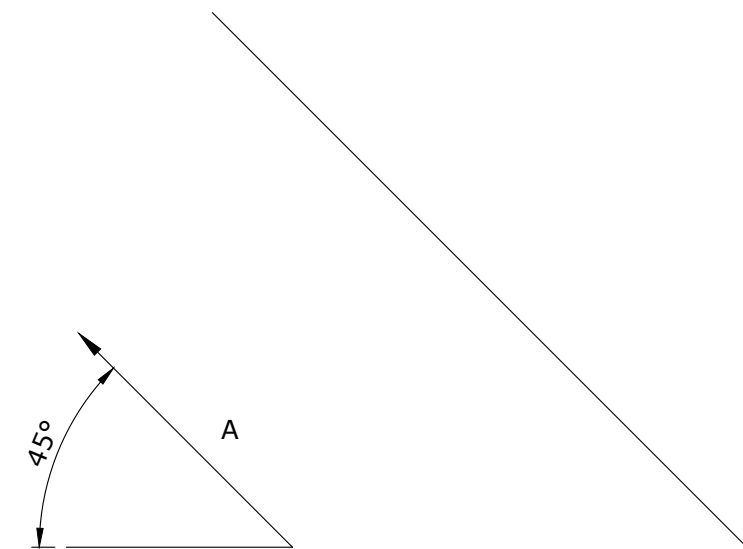
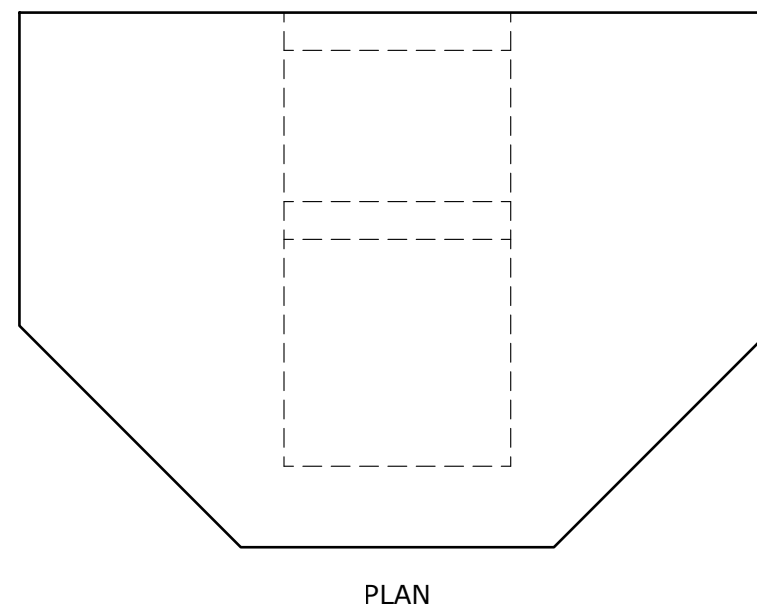
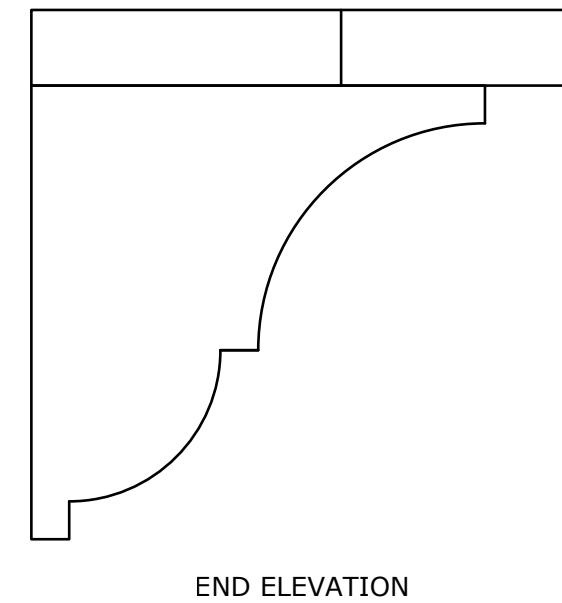
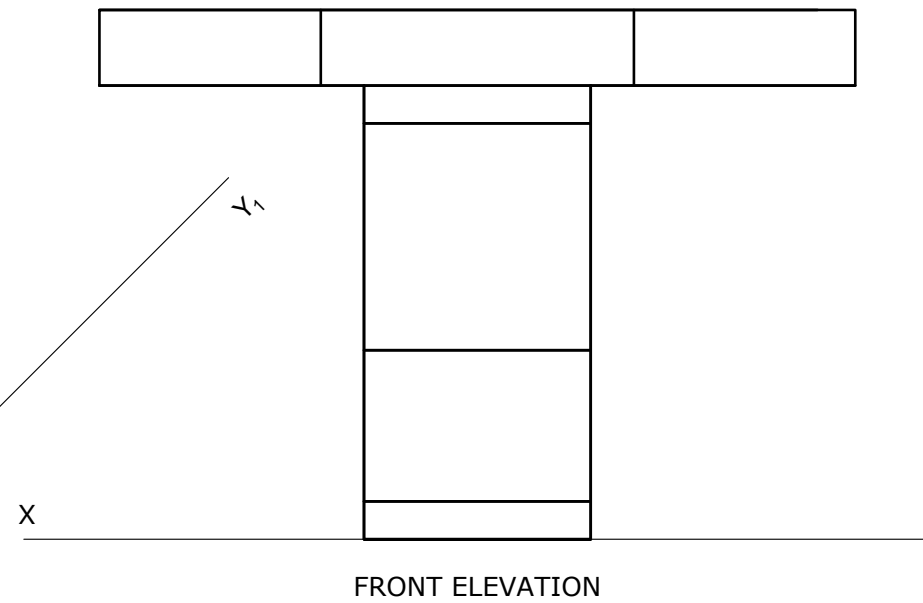
A pictorial view and three orthographic views of a decorative stand are given. Project an auxiliary view as seen from the direction of arrow A on line  $X_1-Y_1$ .

Note:  
Do **not** show hidden detail.

**(Total: 18 marks)**



pictorial view of decorative stand



**Question 1.**

The following computer programme is written to create a design layout for a tile.

DATA: A = 50; B = 100; C = 150; D = 200; E = 250; F = 300; G = 350;  
H = 400; I = 450; J = 500; K = 550; L = 600; M = 650; N = 700;  
O = 750; P = 800.

ACI 1: MOVE F,H; DRAW H,J:

ACI 2: MOVE E,H; DRAW E,I; DRAW G,K; DRAW H,K:

ACI 3: MOVE D,H; DRAW D,I; DRAW C,J; DRAW F,M; DRAW G,L; DRAW H,L:

ACI 5: MOVE C,H; DRAW B,I; DRAW A,I; DRAW A,J; DRAW F,O; DRAW G,O;  
DRAW G,N; DRAW H,M:

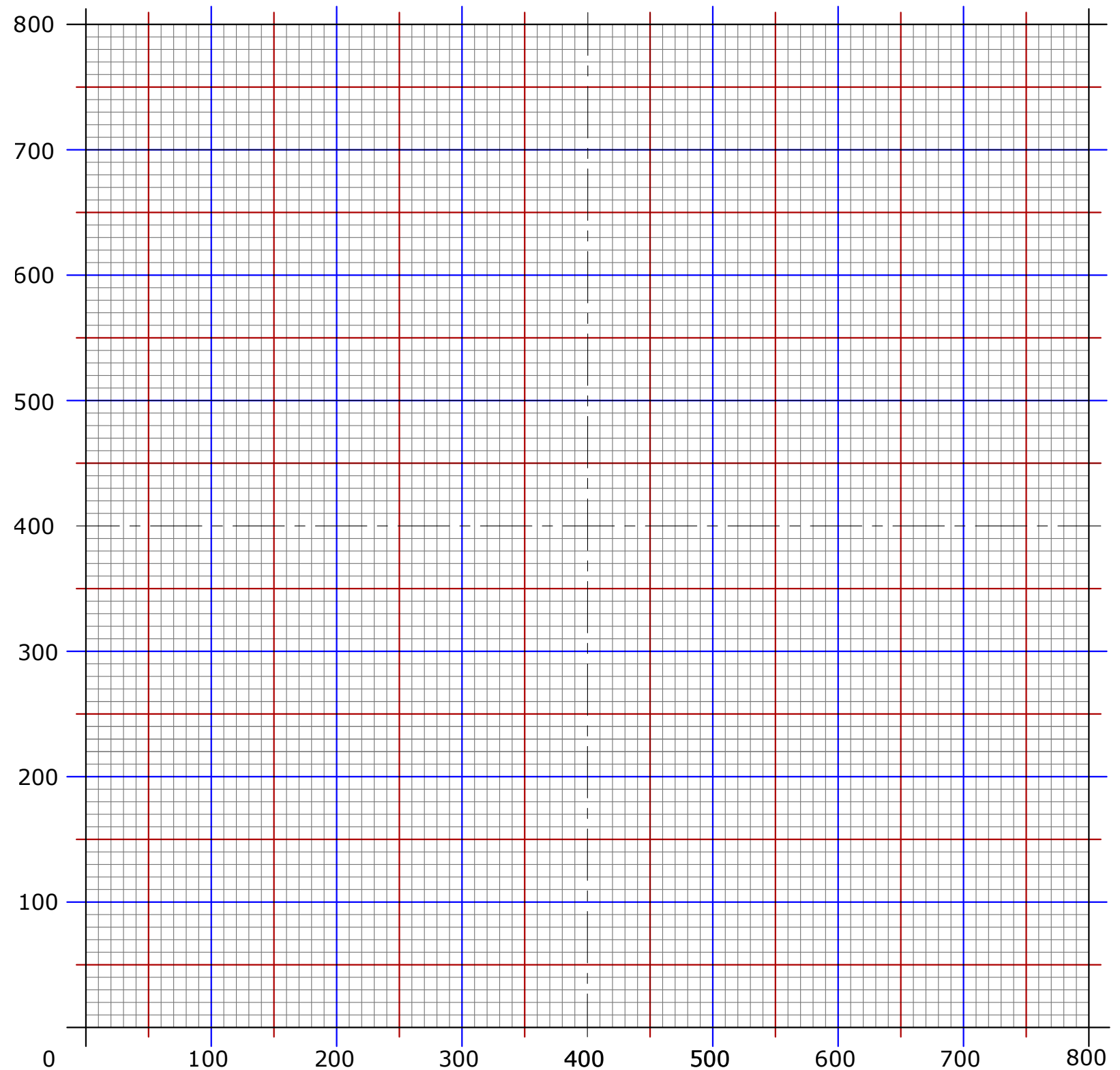
ACI 7: MOVE A,L; DRAW A,N; DRAW B,O; DRAW D,O; DRAW A,L.

COLOUR	RED	YELLOW	GREEN	BLUE	BLACK
ACI No.	1	2	3	5	7

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. 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:

- a. Plot the image produced by this programme on the 800 X 800 grid given on the right. (7)
- b. Mirror the plotted design using the vertical and horizontal centre lines as the mirror lines (lines of symmetry). (3)

**(Total: 10 marks)**



**Question 2.**

A school conducted a survey among fifteen-year-olds in order to organise sport tournaments. The following table shows the results of this survey:

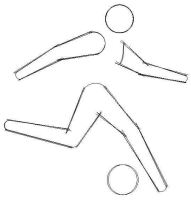

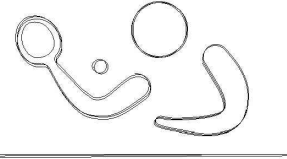

PREFERENCE	BOYS	GIRLS
football	50	40
basketball	50	35
volleyball	45	55
table tennis	35	20
TOTAL no. of students:	180	150

These results need to be presented by graphical means. You are asked to:

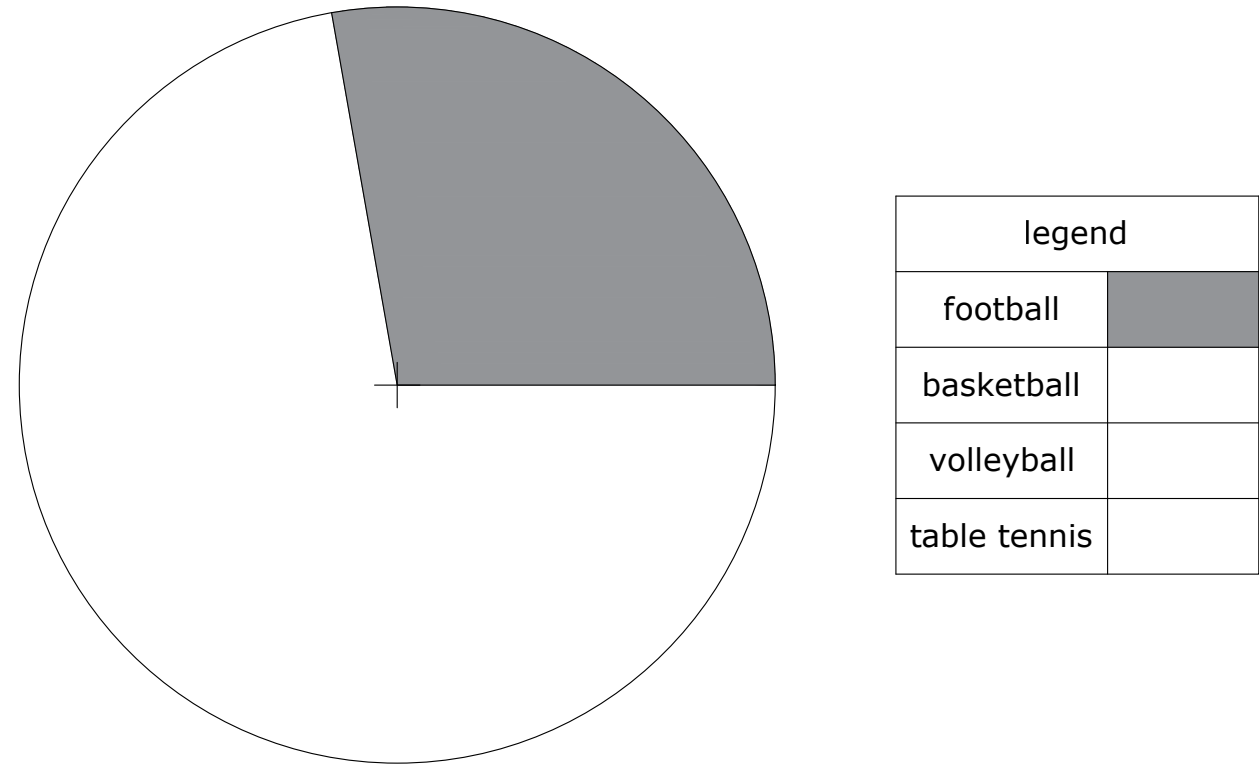
- a. design the missing pictograms in Section A (**TWO** freehand sketches and **TWO** final pictograms); (6)
- b. complete the 2D pie chart and legend for the results of preferences among boys, in Section B; (6)
- c. complete the 2D bar graph for the results of preferences among girls, in Section C. (4)

**(TOTAL: 16 marks)**

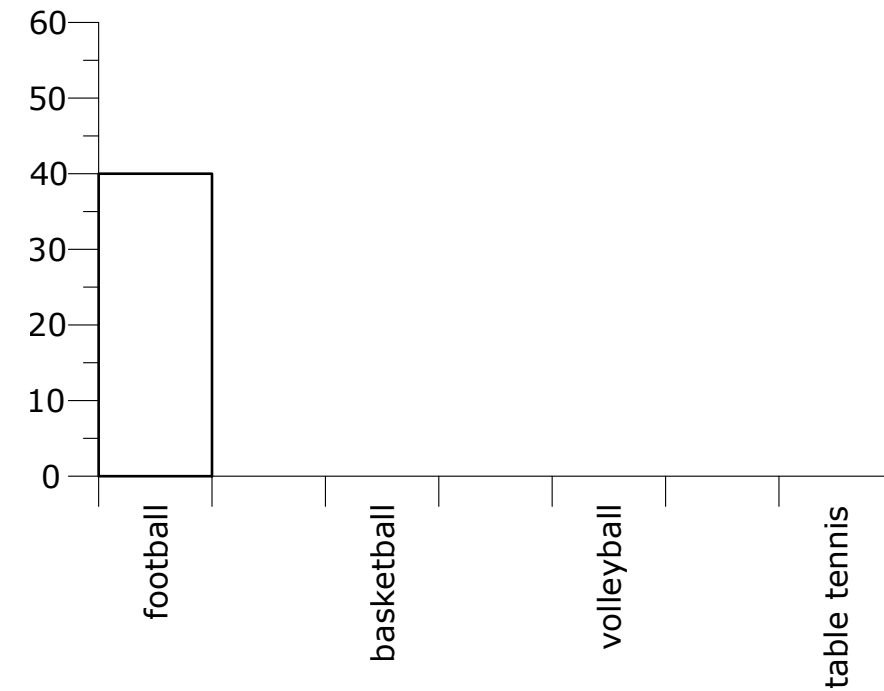
Section A - pictograms:

sport	freehand sketch	final pictogram
football		
basketball		
volleyball		
table tennis		

Section B - 2D pie chart and legend (boys' preference):



Section C - 2D bar graph (girls' preference):



**Question 3.**

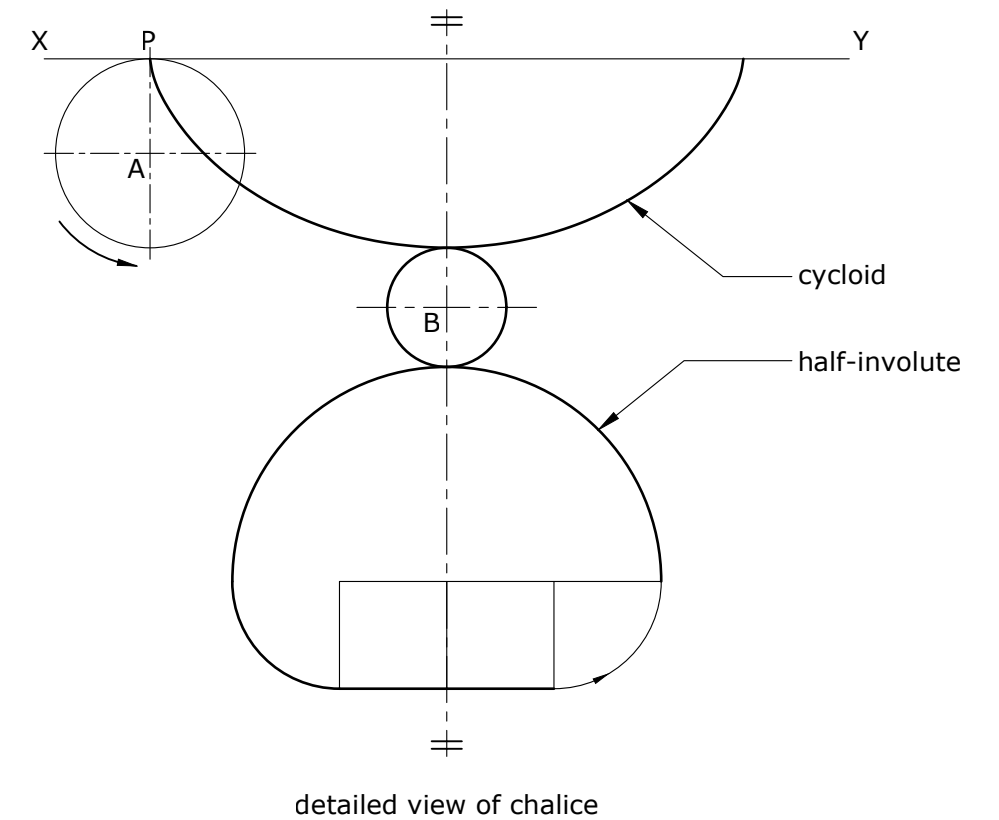
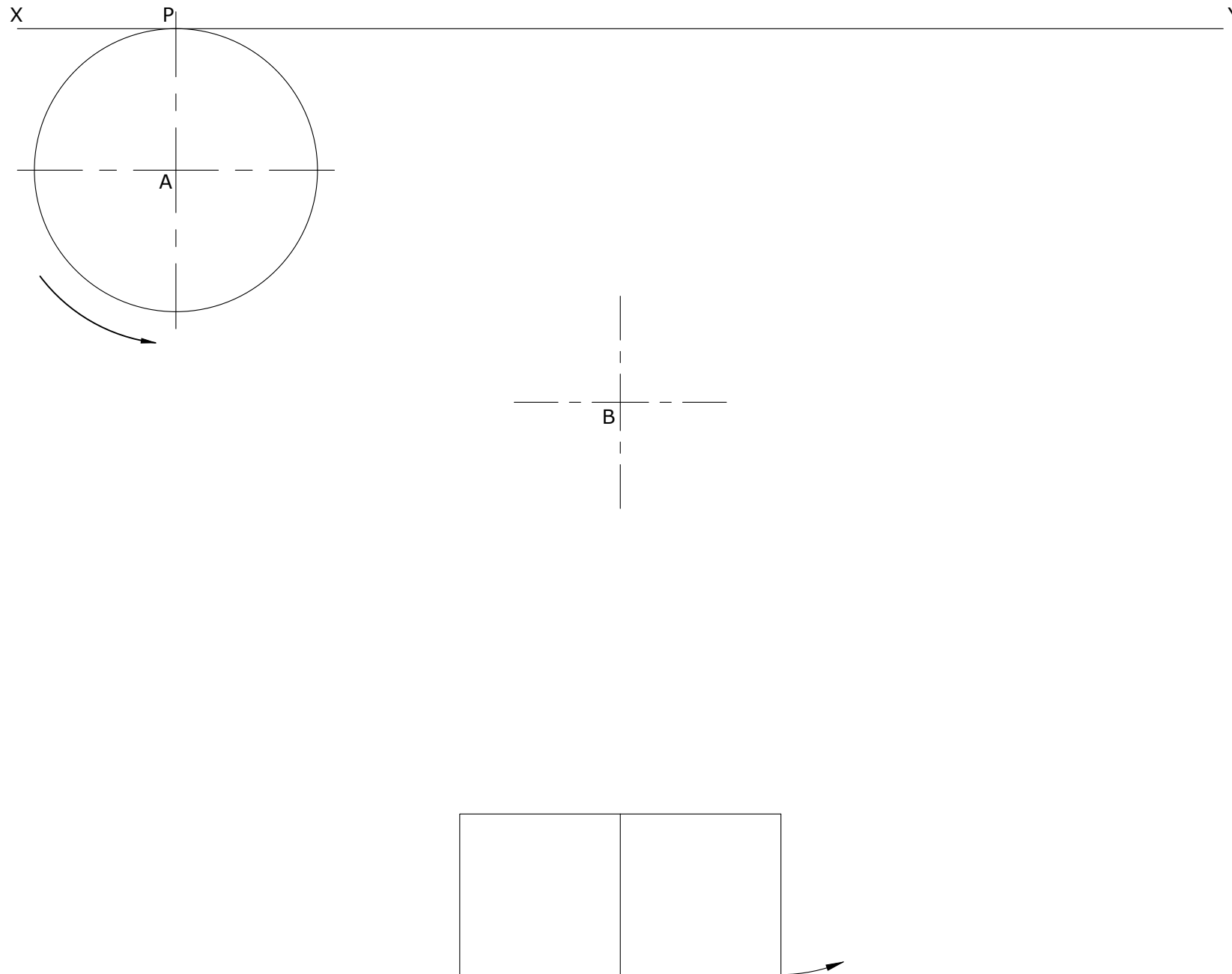
A pictorial view and a detailed view of a chalice have been given. The upper part of this profile is formed by a cycloid and the lower part by a half-involute of a square. Construct this profile on the start lines given by:

- a. generating a cycloid with the locus of Point P, of circle with Centre A, which rolls anticlockwise without slipping for one revolution below directing line X-Y; (8)
- b. drawing a circle of R16 with Centre B; (1)
- c. generating **TWO** half-involutes of a square as shown. (5)

**(Total: 14 marks)**



pictorial view of chalice

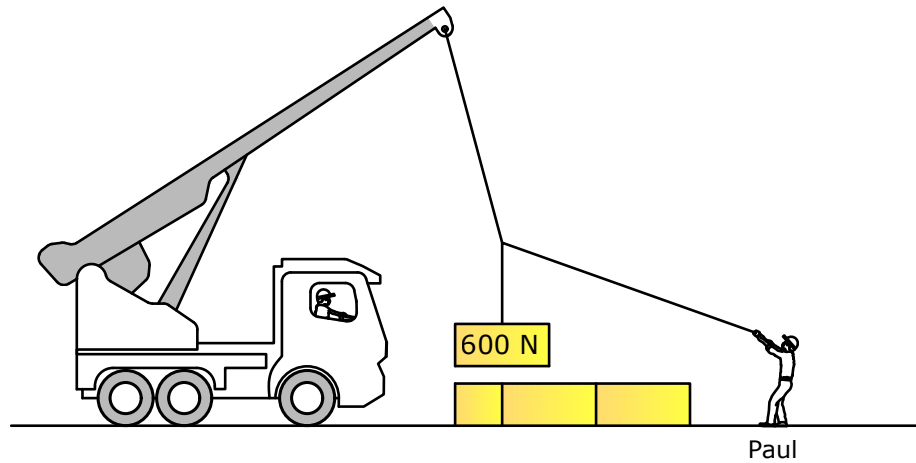


**Question 4.**

Paul is pulling a load suspended from a crane as shown below. The forces are in a state of equilibrium at the joint.

- Draw a freehand sketch of the vector diagram in the space provided below. (2)
- Based on your freehand sketch and using a scale of 10mm:100N, construct graphically the vector diagram to find the forces pulled by the crane and Paul. (8)
- State the magnitude of both forces in Table A. (4)

**(Total: 14 marks)**



space for freehand sketch

Table A

The crane is pulling _____ N
Paul is pulling _____ N

**Question 5.**

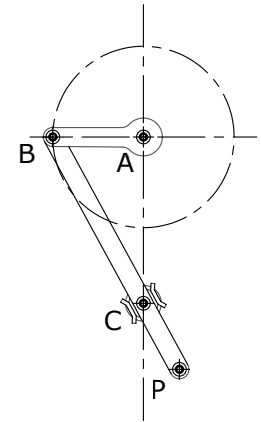
A profile of a mechanism is shown on the right. The mechanism produces an environmental awareness logo. It consists of:

- a crank AB;
- a sliding pivot at C;
- a linkage BP.

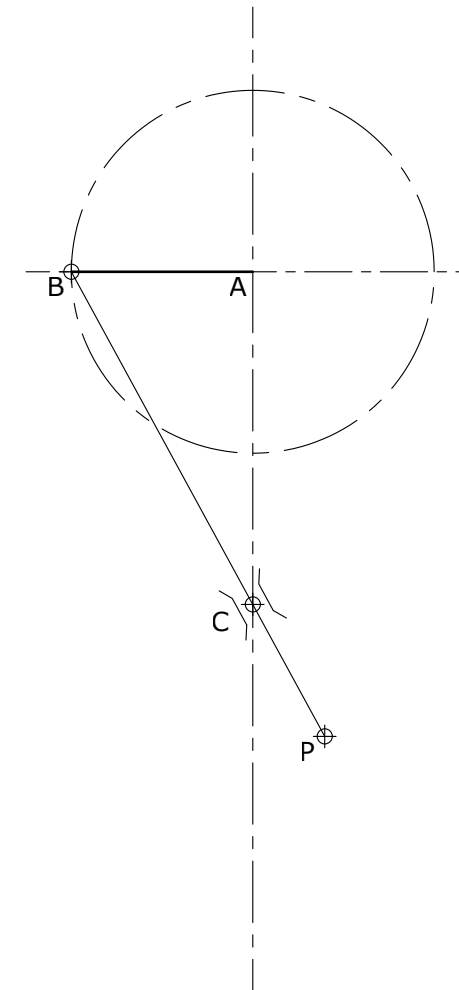
Crank AB rotates about Point A, while Point B is a free pivot. Point C is a sliding pivot. Using the starting points provided, plot the locus of Point P for **ONE** complete revolution of the crank.

**(Total: 12 marks)**

SAVE THE DROP



SAVE THE DROP



**Question 6.**

The pictorial drawing on the right shows a tailor-made HDMI to USB adapter used in a computer lab. Its design is made out of a hexagonal prism intersecting a cylinder.

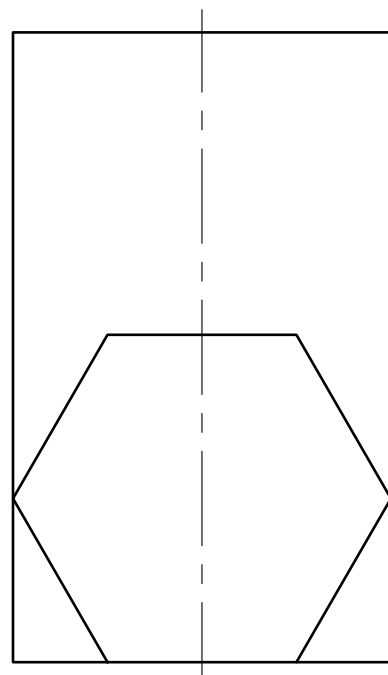
Three orthographic views of this adapter are given below. These consist of an incomplete front elevation, an end elevation, and a plan in first angle projection.

- a. Complete the front elevation by constructing the intersection between the two solids. (4)
- b. Construct the surface development of the cylinder in the space provided, with the joint line at X-X. (6)
- c. Colour the given safety signs according to the supplied information. These safety signs will be affixed in the computer lab. (6)

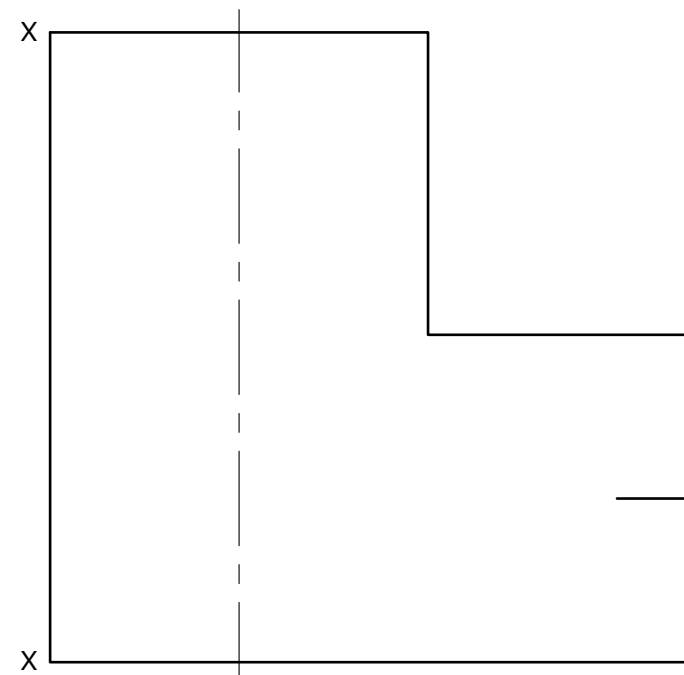
**(Total: 16 marks)**



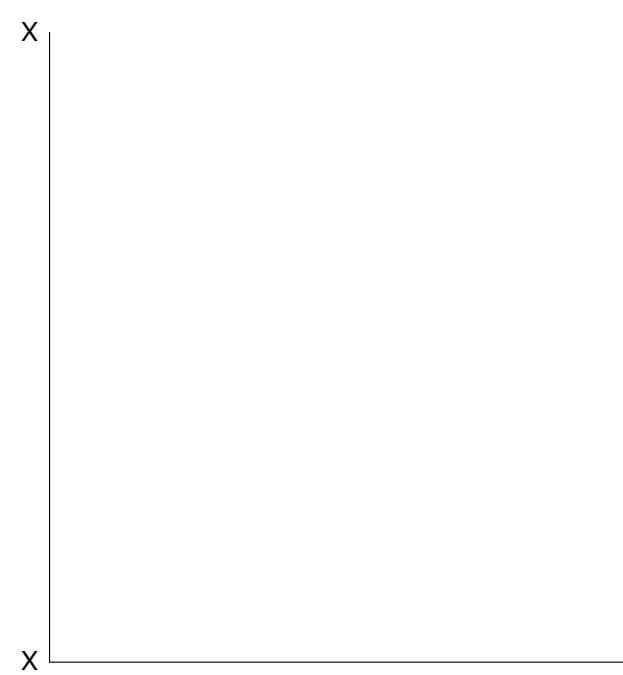
HDMI to USB adapter



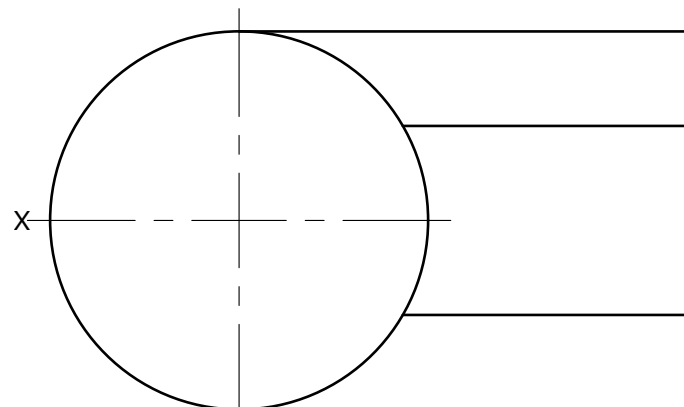
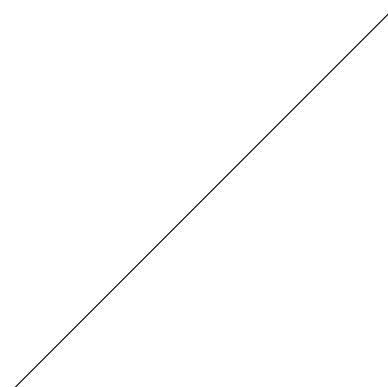
END ELEVATION



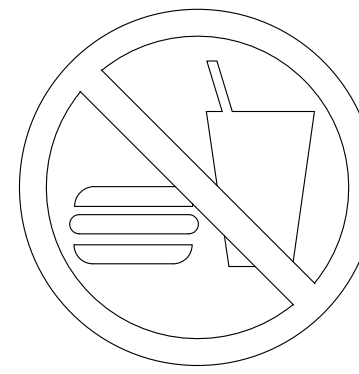
FRONT ELEVATION



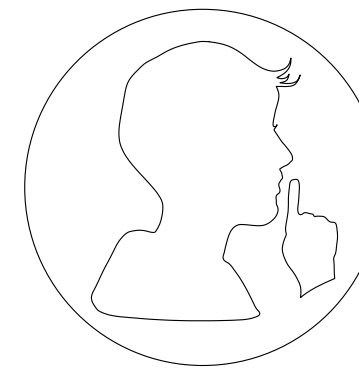
DEVELOPMENT OF CYLINDER



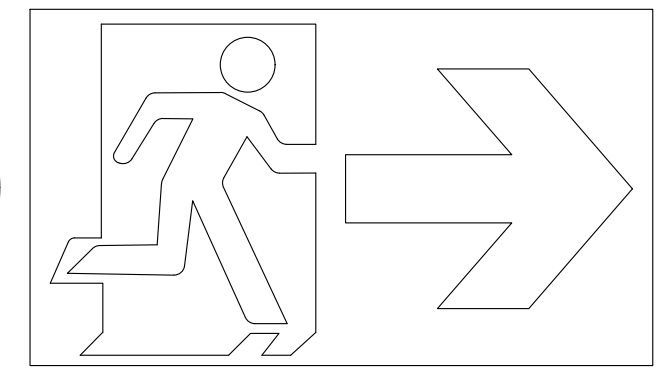
PLAN



- prohibition -  
no food or drinks



- mandatory -  
keep silence



- safe conditions -  
emergency exit



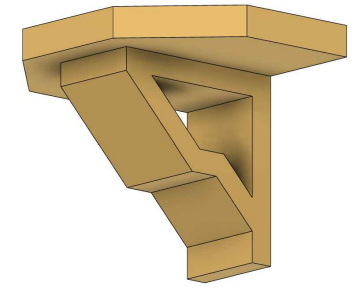
**Question 7.**

A pictorial view and three orthographic views of a decorative stand are given. Project an auxiliary view as seen from the direction of arrow A on line  $X_1-Y_1$ .

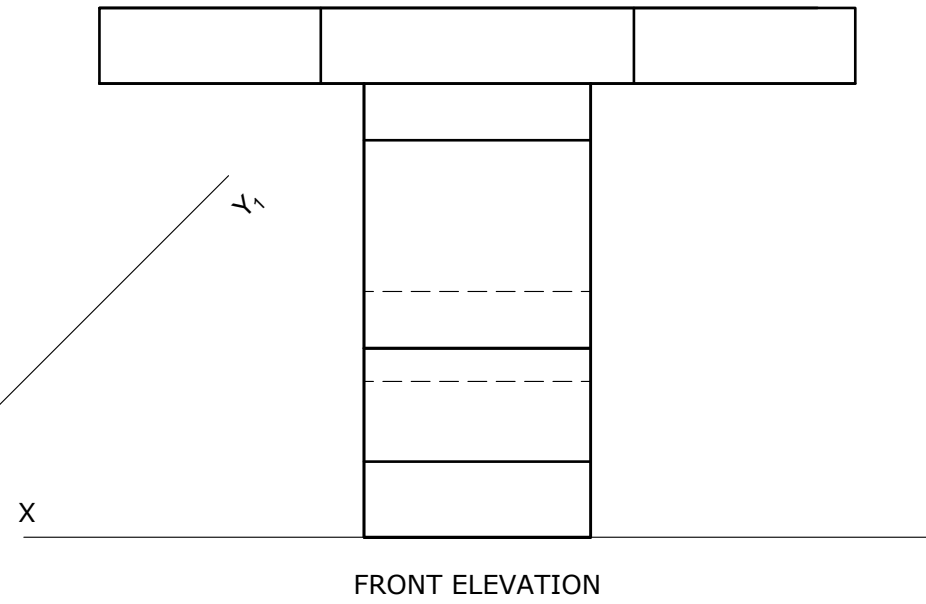
Note:

Do **not** show hidden detail.

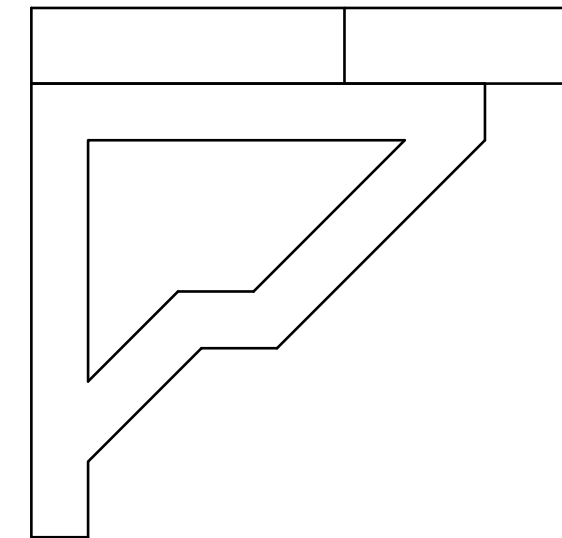
**(Total: 18 marks)**



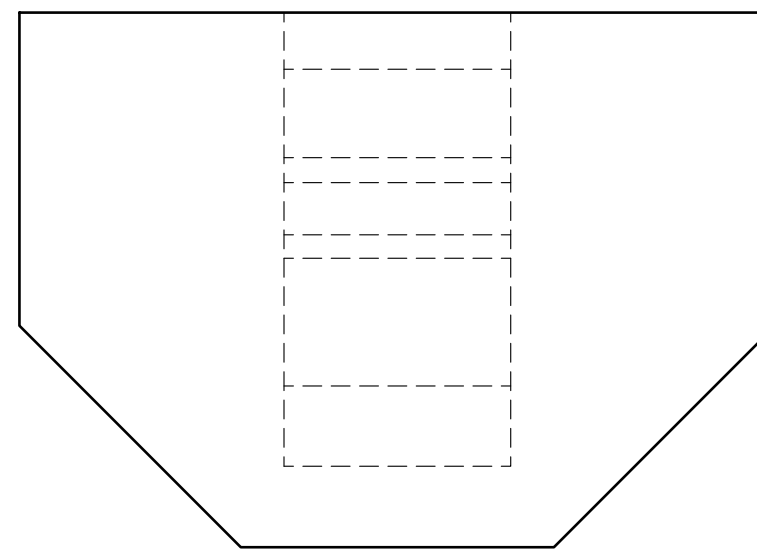
pictorial view of decorative stand



FRONT ELEVATION



END ELEVATION



PLAN

