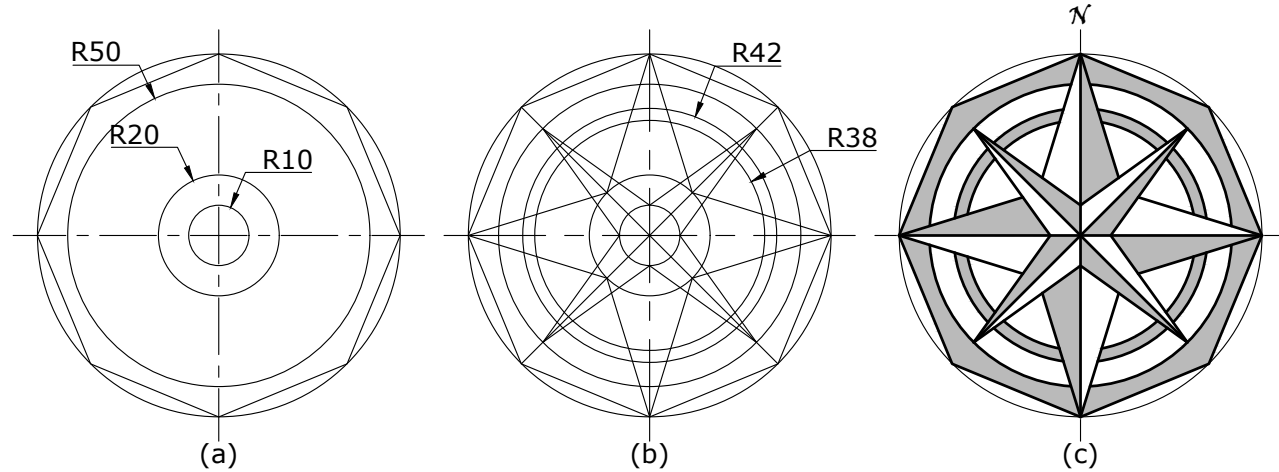**Question 1.**
Three stages of a construction to produce a geometric design are given below.
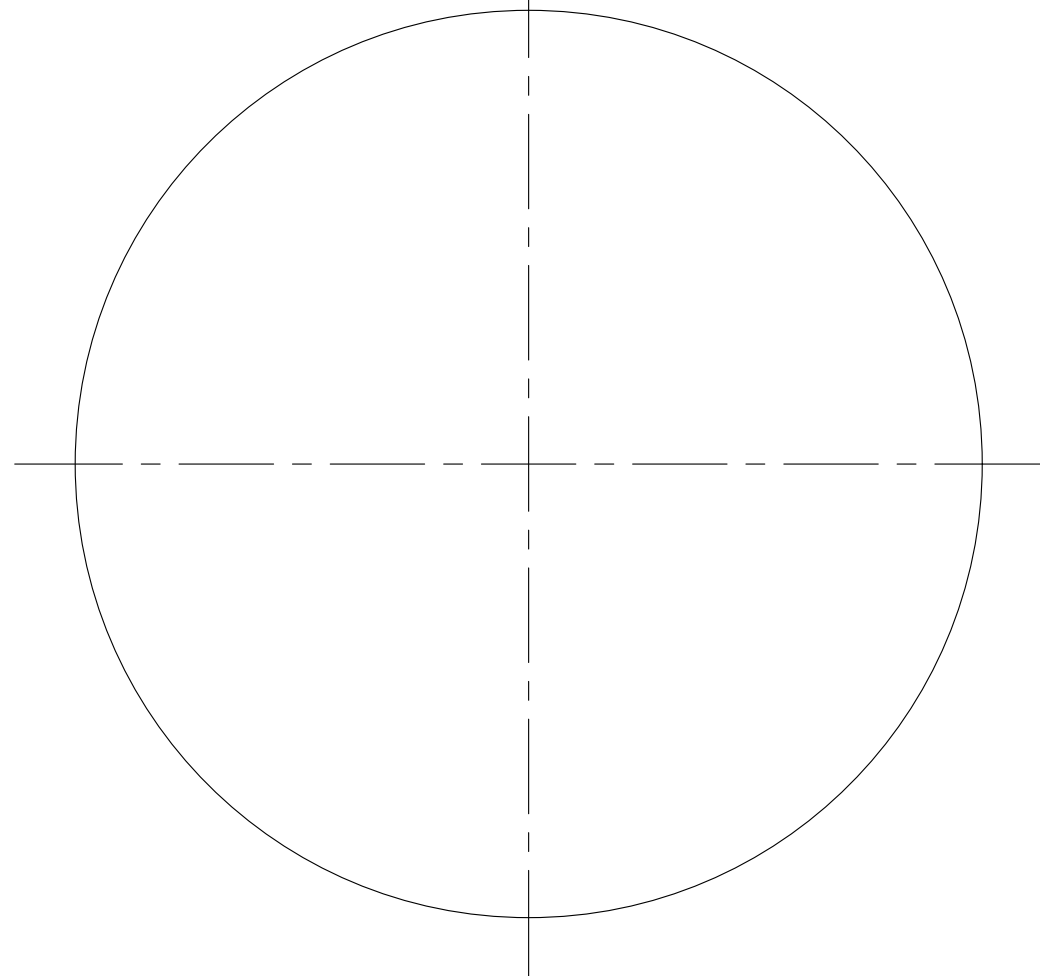
Construct the tile design by following these steps:
a.   inscribe an octagon and draw **THREE** circles having R50, R20 and R10;   (4)
b.   draw the construction lines and **TWO** other circles having R42 and R38;   (4)
c.   shade and finish off the geometrical design as shown.   (6)

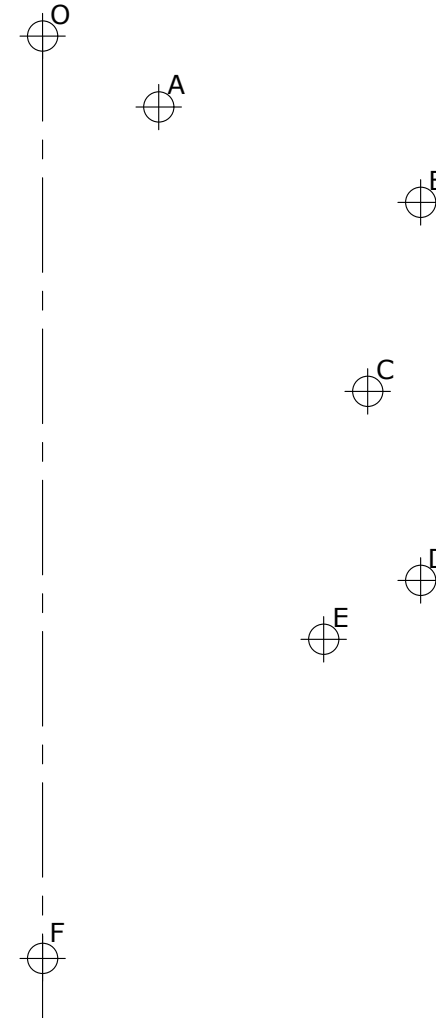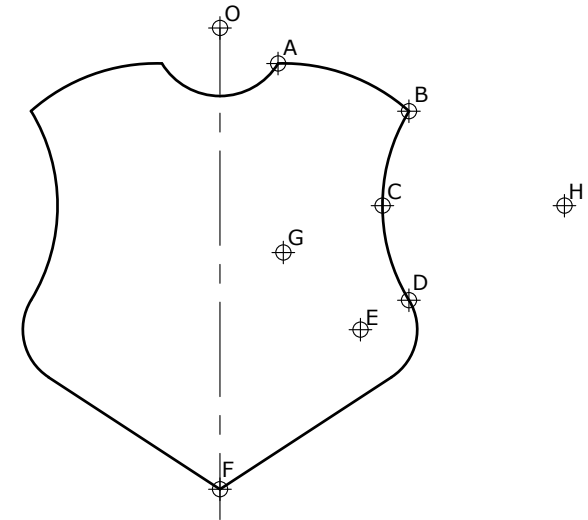**(Total: 14 marks)**

(a)   (b)   (c)

𝒩

Question 2.
The profile of a medieval shield is shown on the right. Construct the profile using the instructions given below.

You are requested to:
a.   draw arc OA having centre O;   (1)
b.   find, by construction, centre G of arc AB R50;   (2)
c.   find, by construction, centre H of arc BCD using the three point circle method;   (4)
d.   draw arc ED having centre E;   (1)
e.   construct the tangent from F to arc ED;   (4)
f.   finish off the profile by mirroring the design to the left.   (2)

(Total: 14 marks)

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Question 3.

A help line icon is shown on the right. The icon consists of a telephone symbol and a speech bubble containing the word 'Help!'. The outline of the telephone symbol consists of lines and tangential arcs. The outline of the speech bubble consists of a part ellipse, a tangent at point T, and an arc tangential to the ellipse at the intersection with the minor axis.

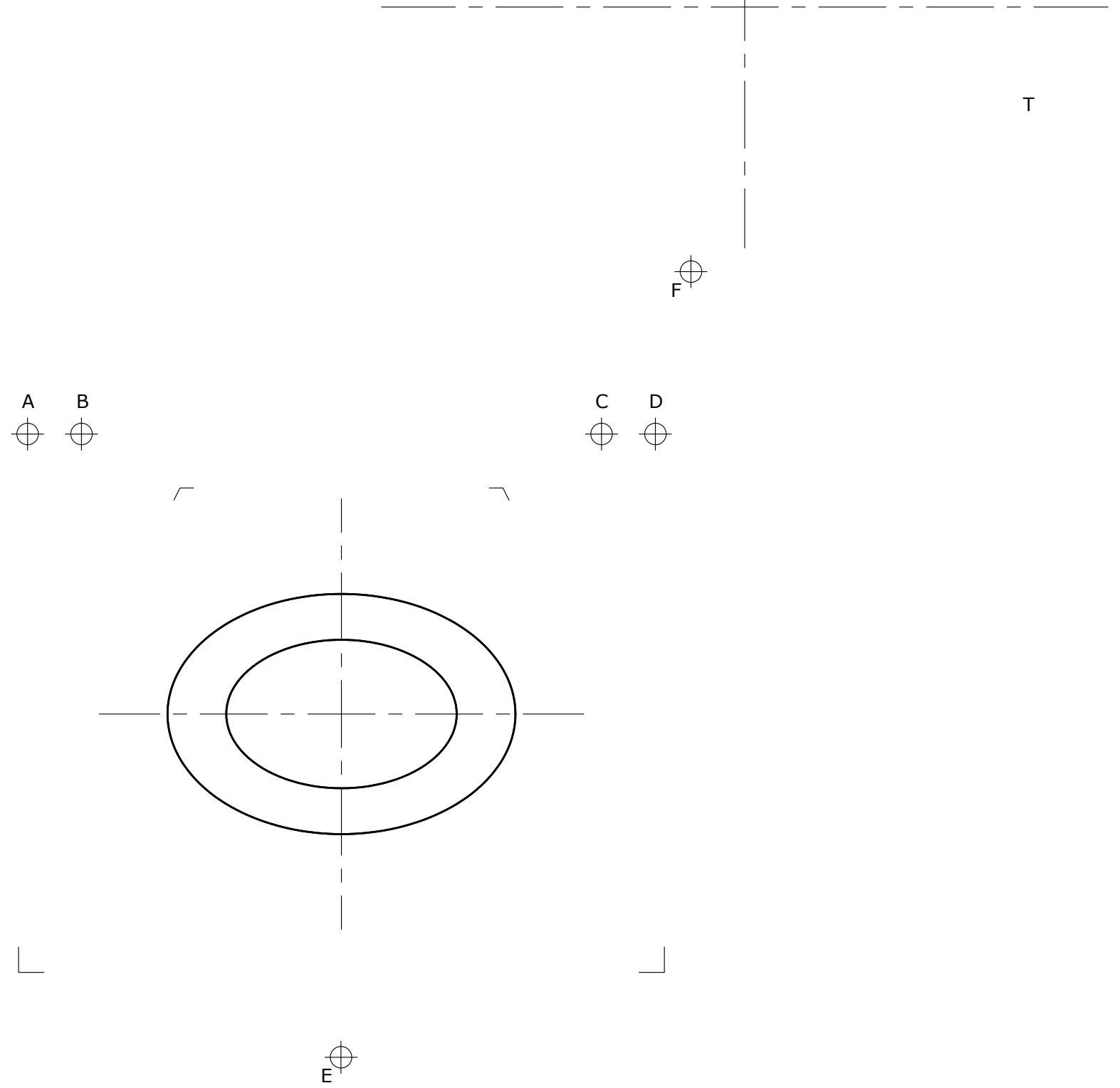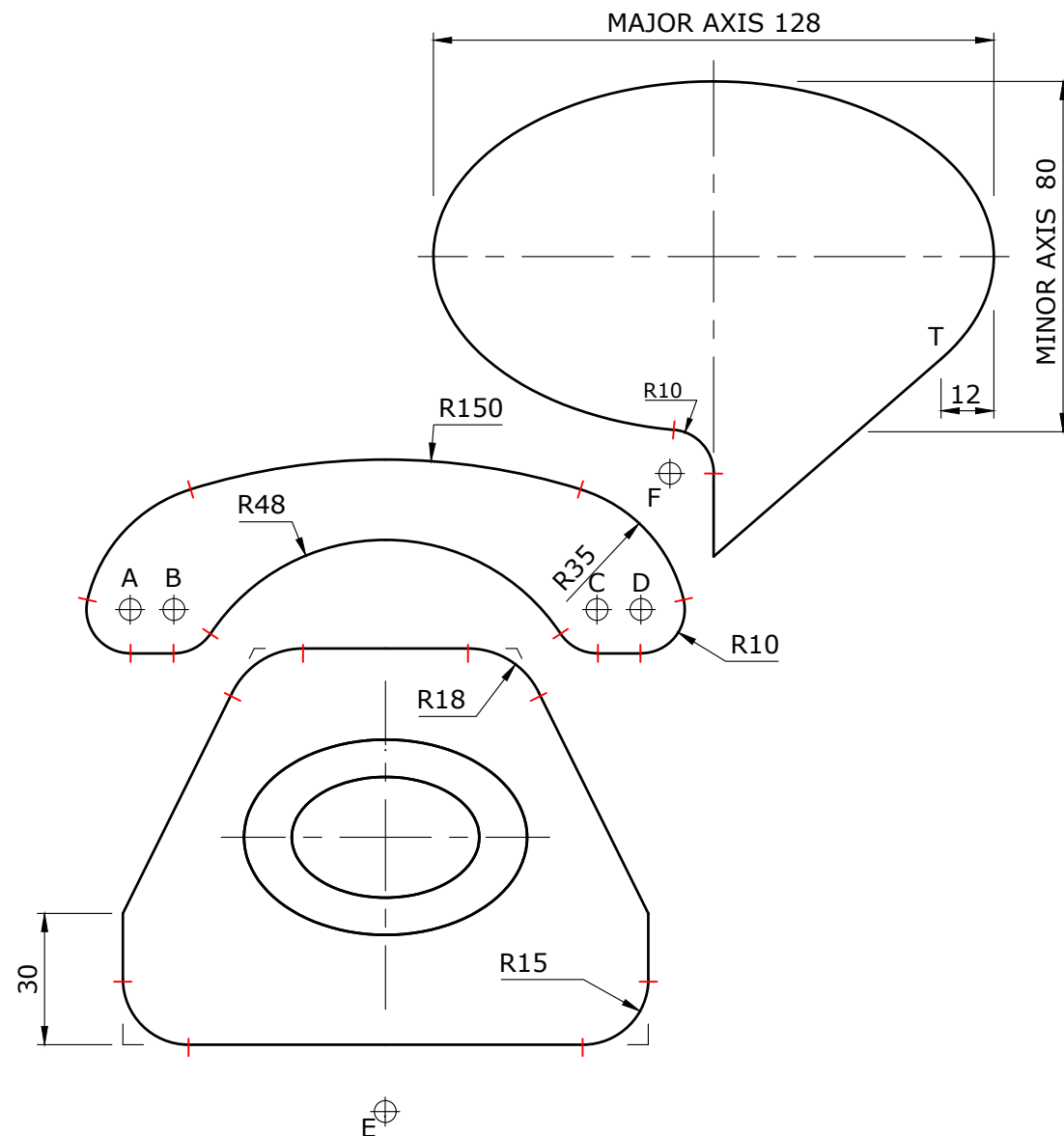A dimensioned drawing of the icon is given below. You are requested to:

a. construct the speech bubble; (8)
b. construct the telephone icon, showing **all** points of tangencies. (12)

(Total: 20 marks)

Help!

NOTES

- A, B, C, and D are centres of R10 arcs.
- E is the centre of the R150 arc.
- The telephone icon is symmetrical about the vertical axis.
- T is the point of tangency on the ellipse.
- F is the centre of the R10 arc.
- Points of tangencies are denoted by means of short dashes as shown. ⊢──────┤

MAJOR AXIS 128

MINOR AXIS 80

T

R10

R150

12

R48

R35

A B

C D

R10

R18

R30

R15

A B

C D

F

T

E

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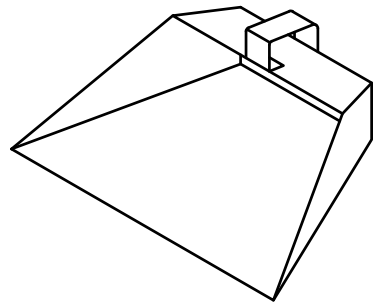
Question 4.
The figure below shows a pictorial view of a thin sheet metal dust pan.

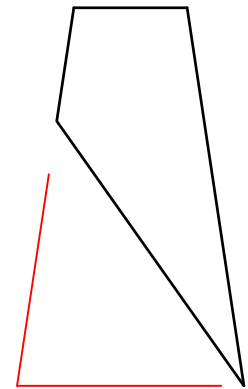Two orthographic views of the dust pan are also given. You are requested to:
a.   project the third view;   (4)
b.   construct a one-piece full surface development of the pan which must include the sides and the top of the truncated rectangular pyramid.   (12)
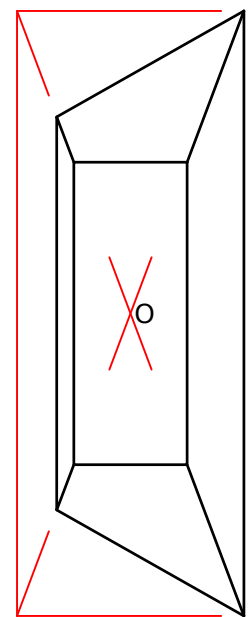
Note: Do **not** draw the handle.

(Total: 16 marks)

pictorial view of
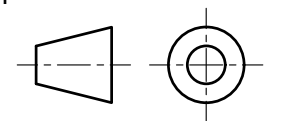thin sheet metal dust pan

O

O

FRONT ELEVATION

END ELEVATION

O

PLAN

ONE-PIECE SURFACE DEVELOPMENT

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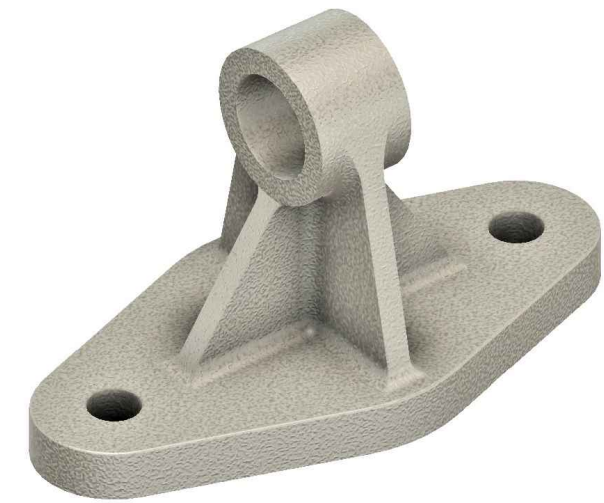
Question 5.
A pictorial view of a cast bearing plate is given on the right. The plan, the end elevation and the profile of the sectional front elevation are also given.

a.   In the space provided, complete the sectional front elevation of the bearing plate on cutting plane M-M.   (14)
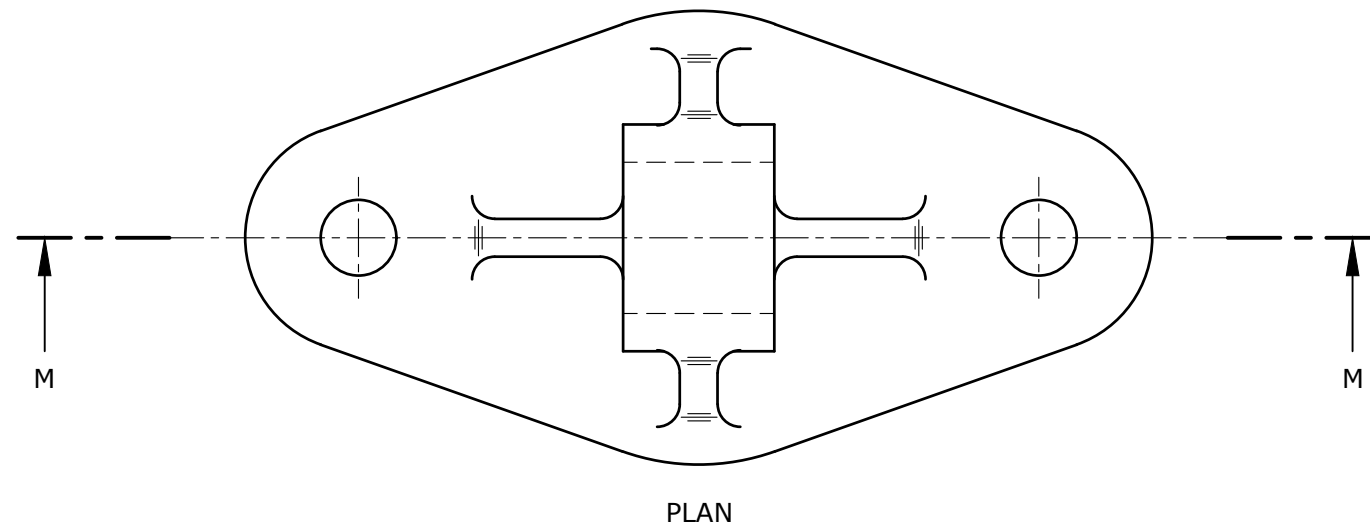b.   Insert **ONE** radial and **ONE** linear dimension on the orthographic views.   (2)

Notes:
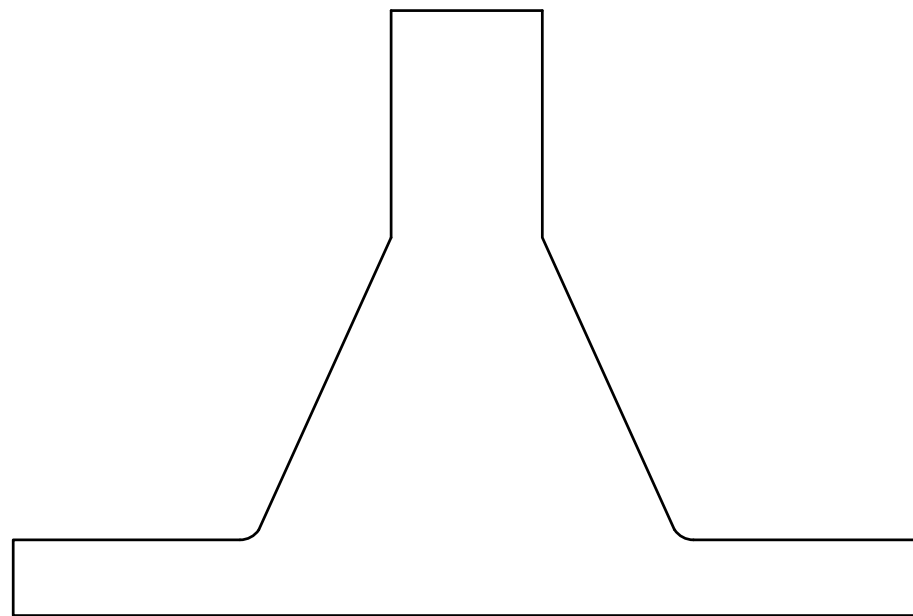• Show **all** centre lines.
• Do **not** show hidden detail.
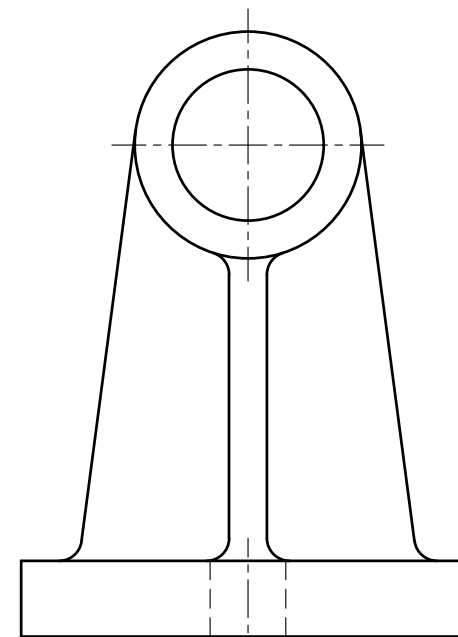
(Total: 16 marks)

pictorial view of
cast iron bearing plate

PLAN

M-M

END ELEVATION

M   M

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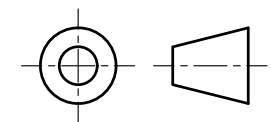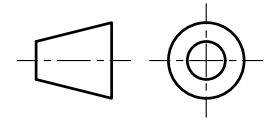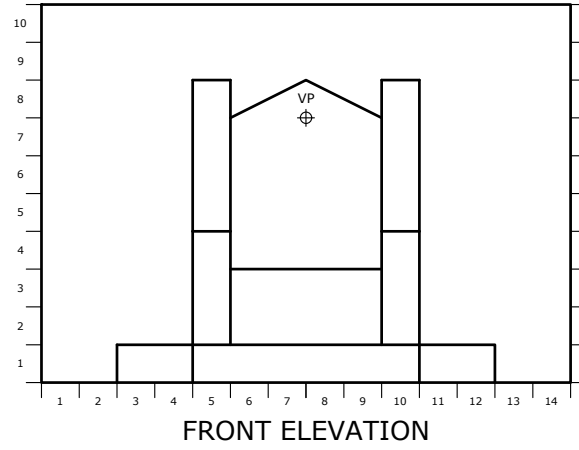**Question 6.**
Two orthographic views and one pictorial projection of a royal throne room are given. Using the given starting lines and VP, draw an estimated one-point perspective view of the throne, including the platform, carpet and surrounding tiles.
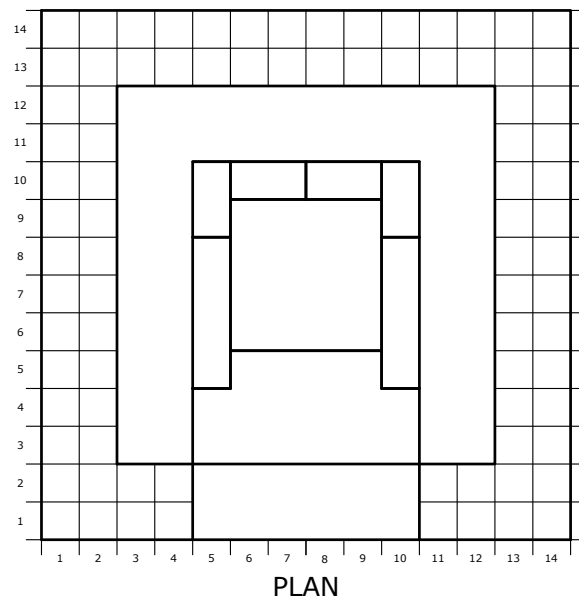
Notes:
- VP and some starting lines have been given.
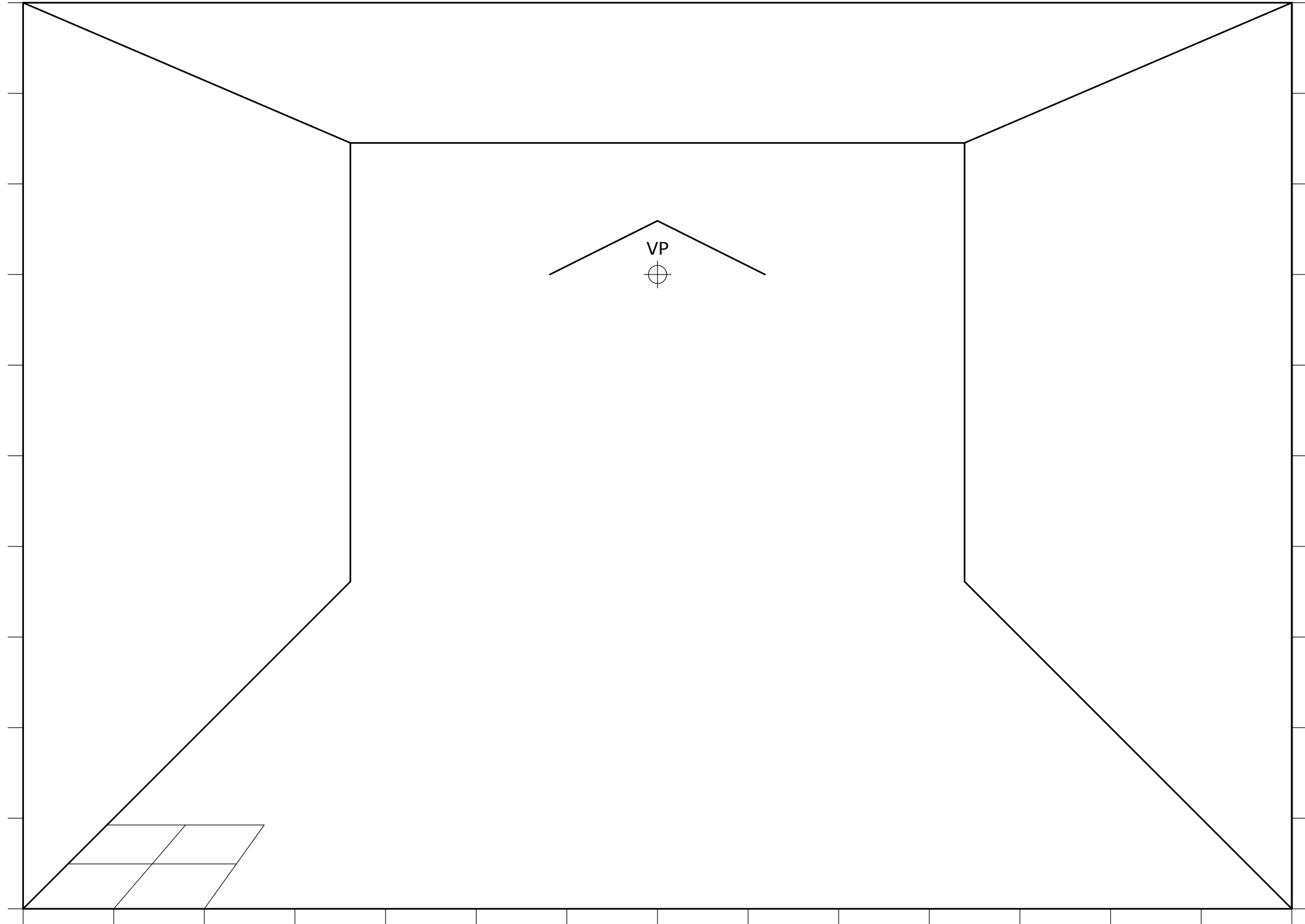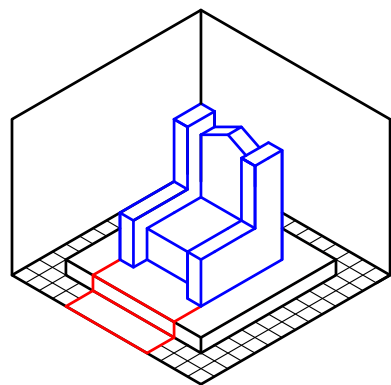- Estimate any missing dimension.

(Total: 20 marks)

FRONT ELEVATION

VP

PLAN

VP

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Question 1.

The following computer programme is written to create a design layout for a gladiator's helmet.

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; Q = 850; R = 900.

ACI 7:   MOVE I,E; DRAW H,F; DRAW H,J; DRAW E,K; DRAW E,J; DRAW G,H; DRAW H,A;
           DRAW C,C; DRAW D,M; DRAW I,M:

ACI 5:   MOVE I,N; DRAW F,N; DRAW D,M:
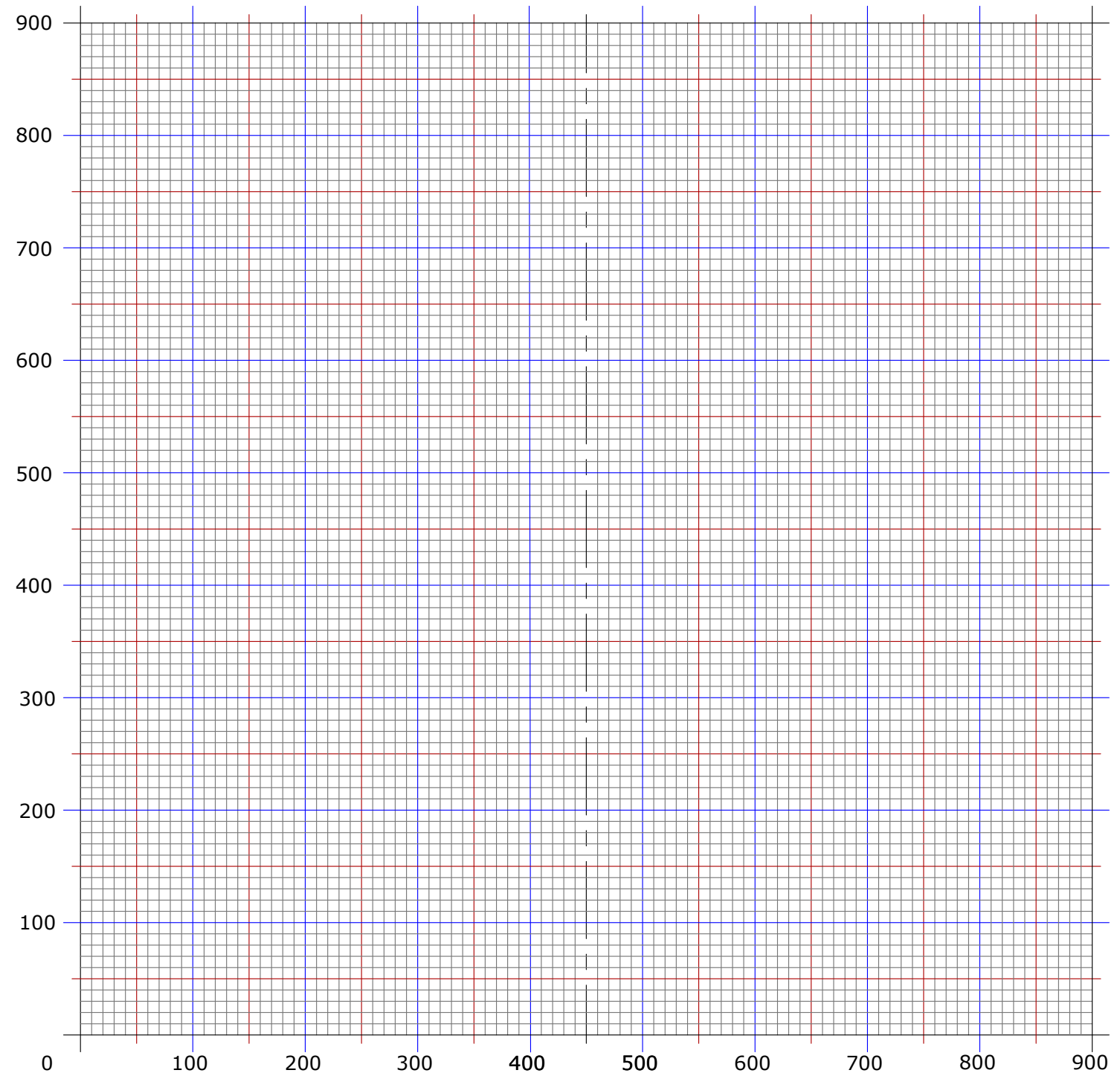
ACI 3:   MOVE H,O; DRAW G,O; DRAW F,N:

ACI 1:   MOVE I,Q; DRAW H,P; DRAW H,N.

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:

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

a.   Plot the image produced by this programme on the 900 X 900 grid given on the right. (7)

b.   Mirror the plotted design using the vertical centre line as the mirror line (line of symmetry). (3)

(Total: 10 marks)

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Question 2.

The figure below shows a crane lifting a beam of concrete. The forces acting on the crane's hook are shown and labelled accordingly on the space diagram.

a. Draw a freehand sketch of the vector diagram in the space provided. (2)

b. Based on your freehand sketch and by using a scale of 10 mm to represent 1 kN, construct graphically the vector diagram to find the resultant force exerted on the crane's hook. (5)

c. Write down the resultant force exerted on the crane's hook and show the direction of the resultant by adding an arrowhead to it on the vector diagram. (2)

d. Draw **TWO** safety signs in the space provided, one representing a warning sign for 'falling objects' and the other a mandatory sign to 'wear a safety helmet'.
At least **ONE** freehand preparatory sketch for each sign should be drawn in the space provided. (7)
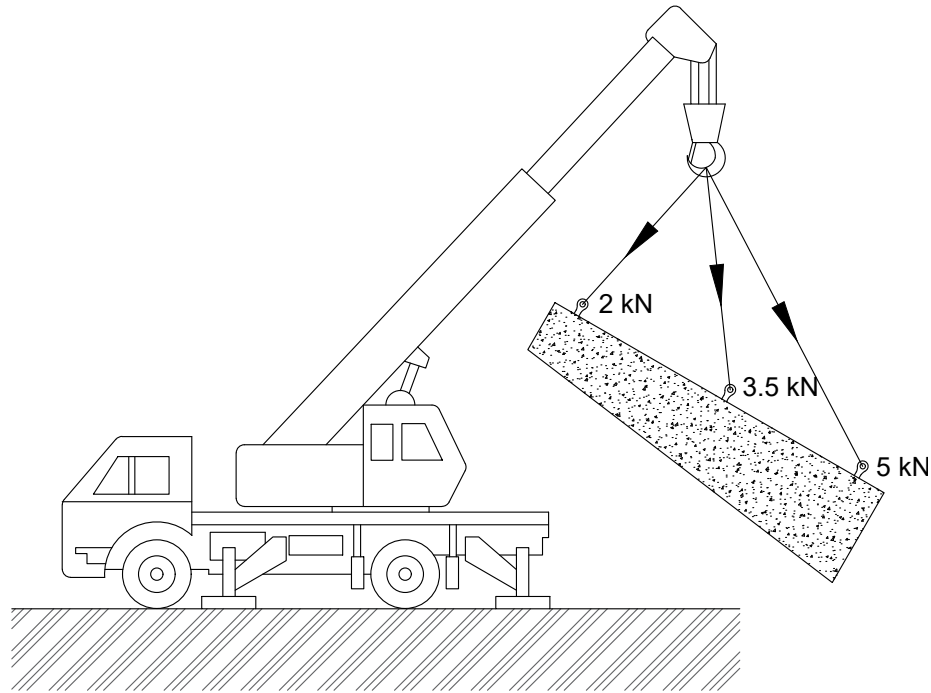
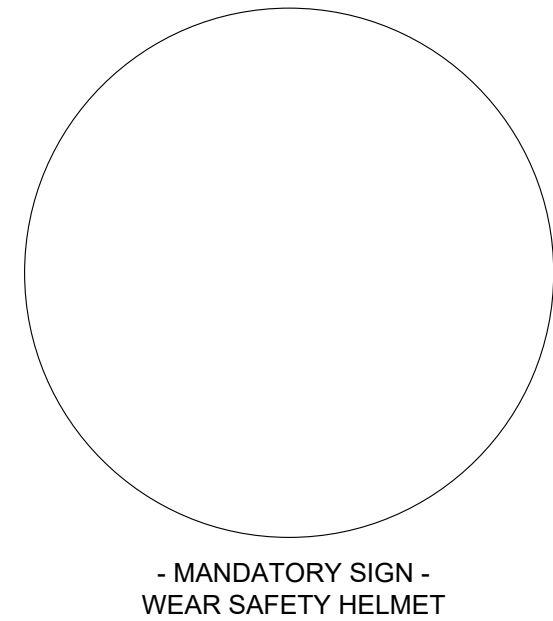**(Total: 16 marks)**

2 kN

3.5 kN

5 kN

space for preparatory freehand
sketch (vector diagram)

resultant: _____ kN

space for preparatory freehand sketches (safety signs)

falling objects

wear safety helmet

- WARNING SIGN -
FALLING OBJECTS

- MANDATORY SIGN -
WEAR SAFETY HELMET

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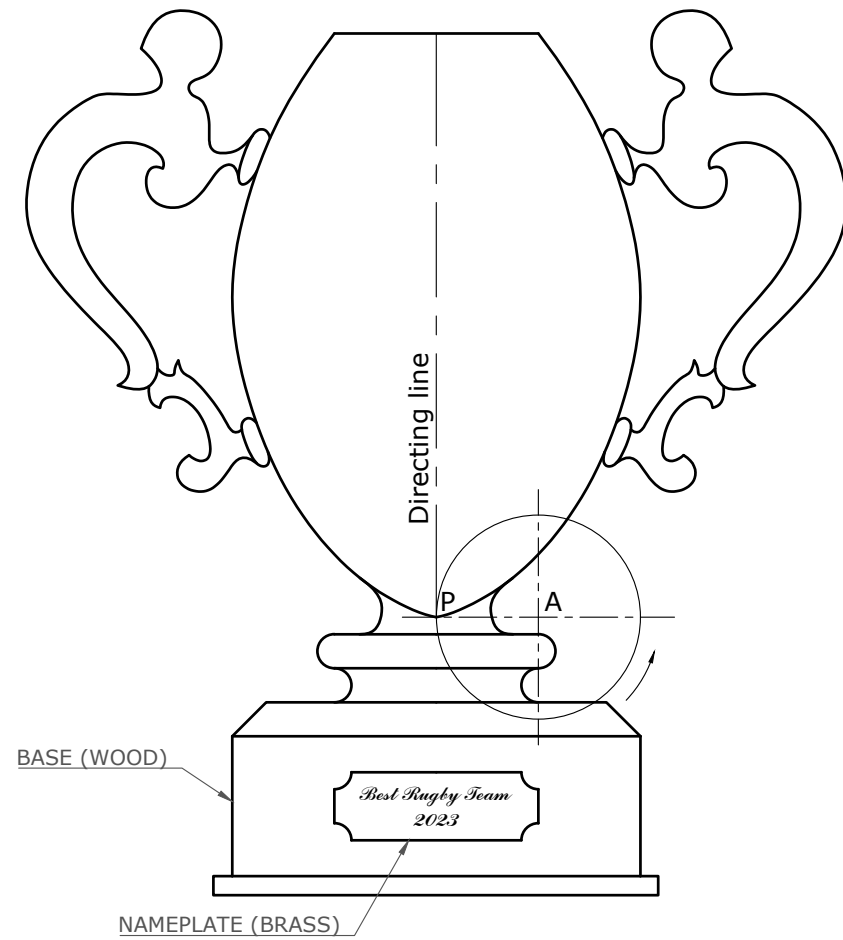
INDEX NUMBER : _____
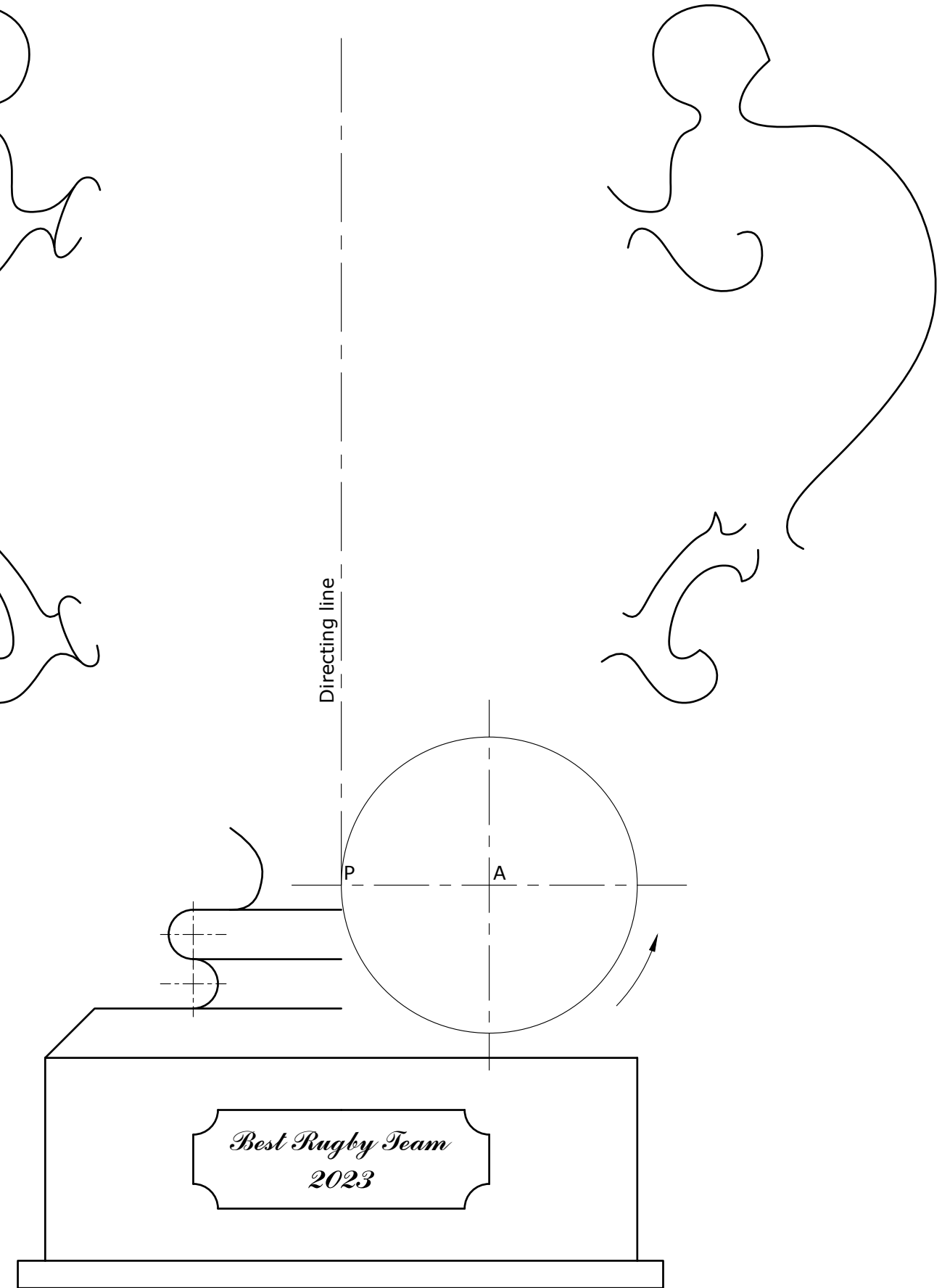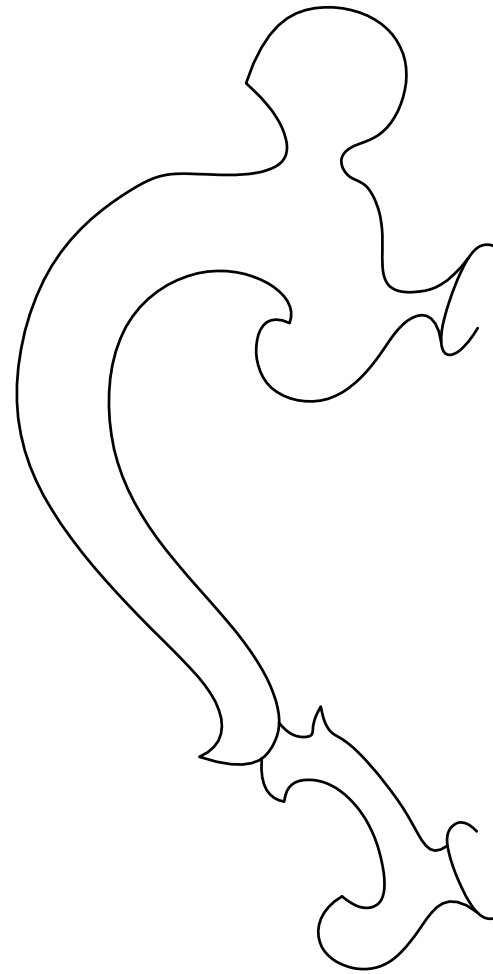
Question 3.
A trophy cup is shown below.

Draw the trophy design by constructing:

a. the locus of point P, as circle center A rolls without slipping on the
    given directing line for three-fourths of a revolution;   (6)
b. mirror the locus of point P on the directing line;   (2)
c. mirror the bottom part of the trophy on the directing line;   (1)
d. draw, in freehand, the missing parts of the handle;   (1)
e. state and label the name of the generated locus;   (2)
f. render the base (material: wood) and the nameplate (material: brass).   (4)

(Total: 16 marks)

Directing line

BASE (WOOD)

Best Rugby Team
2023

NAMEPLATE (BRASS)

Name of the locus: _____

Directing line

P   A

Best Rugby Team
2023

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Question 4.
Three orthographic views of a solid block are given below.

Draw:
a. a freehand sketch in the space provided;   (4)
b. a full size isometric drawing of the block using the given starting lines and placing A at the lowest point.   (8)
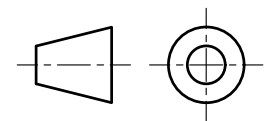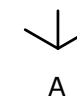
Note:
All dimensions are to be taken directly from the views.

(Total: 12 marks)
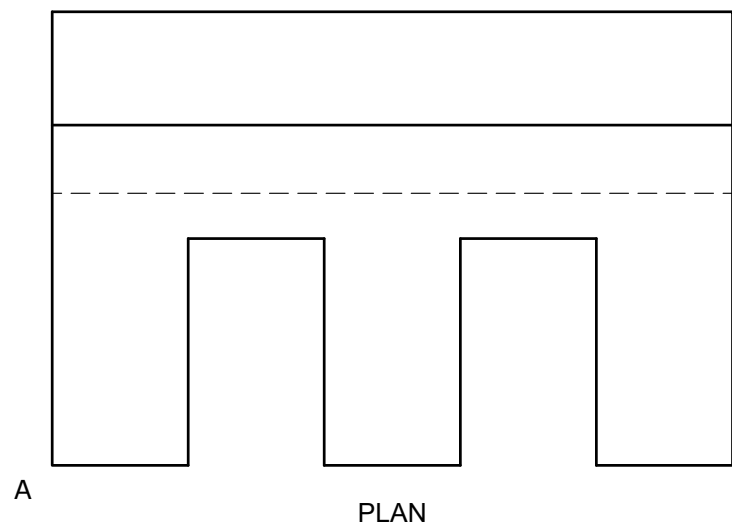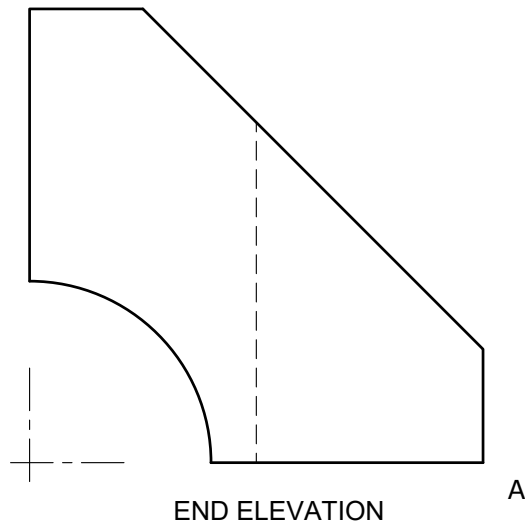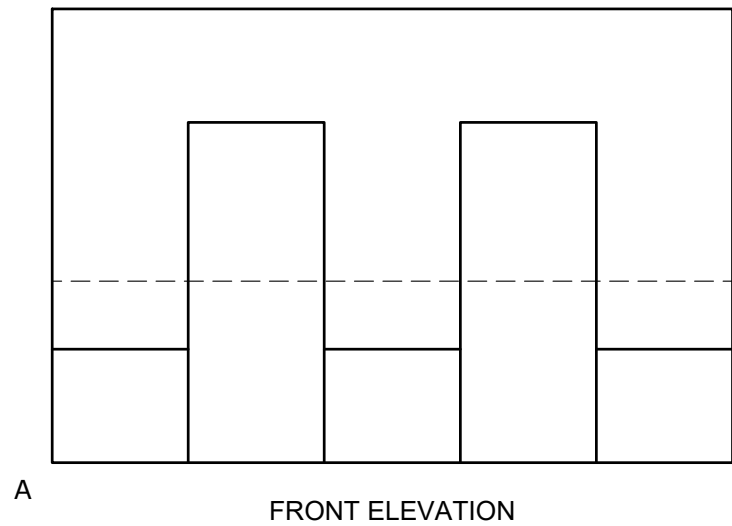
Freehand sketch

FRONT ELEVATION

END ELEVATION

PLAN

A

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Question 5.

The pictorial drawing on the right shows a bedside alarm clock. Its design is made out of a pentagonal prism intersecting a cylinder.

Three orthographic views of this alarm clock are given below. These consist of an incomplete front elevation, an end elevation, and a plan in first angle projection.
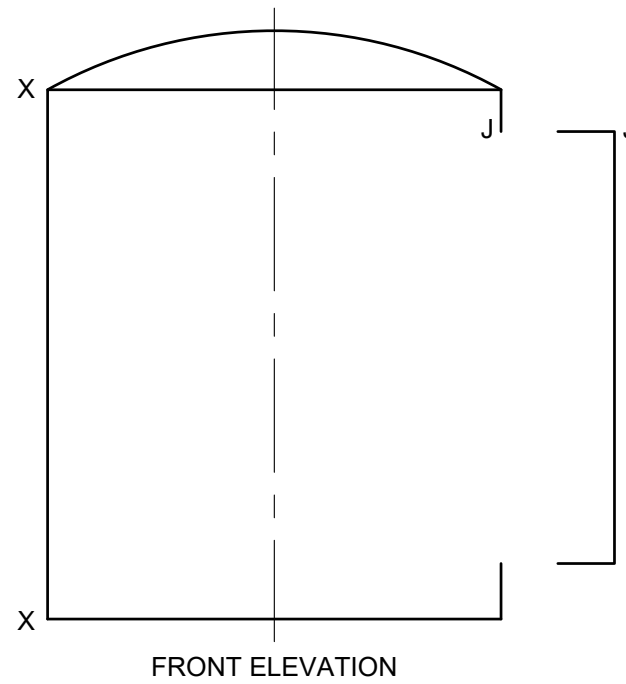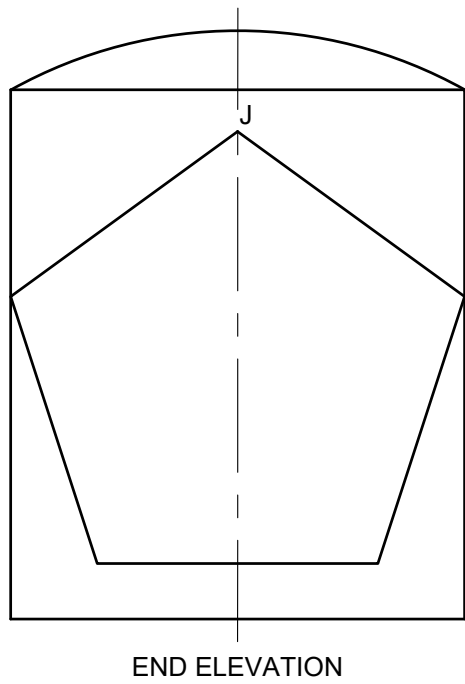
a.   Complete the front elevation by constructing the intersection between the two solids.   (4)
b.   Construct the development of the outer surface of the cylinder in the space provided, with the joint line at X-X.   (6)
c.   Construct the development of the outer surface of the pentagonal prism in the space provided, with the joint line at J-J.   (6)

Note:
The function buttons and display screen have been removed from all elevations for simplicity purposes.
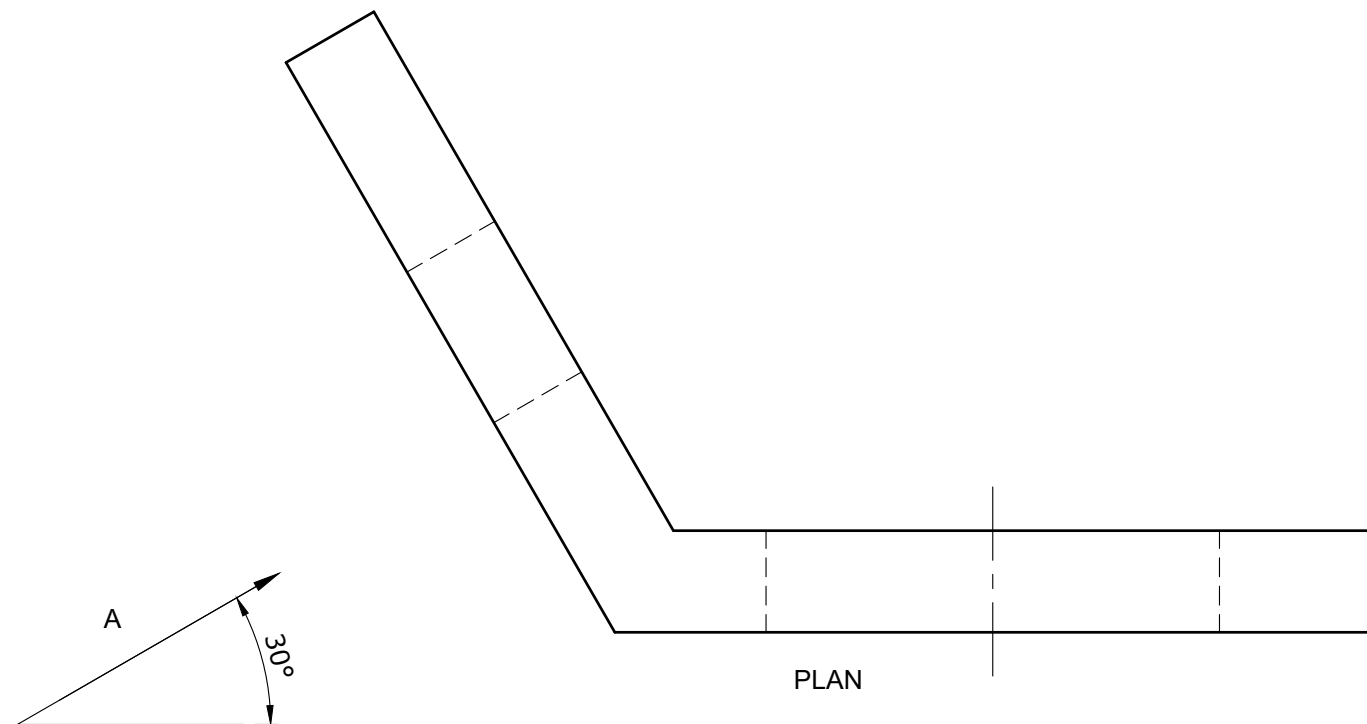
(Total: 16 marks)

pictorial view
of alarm clock
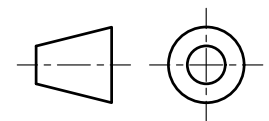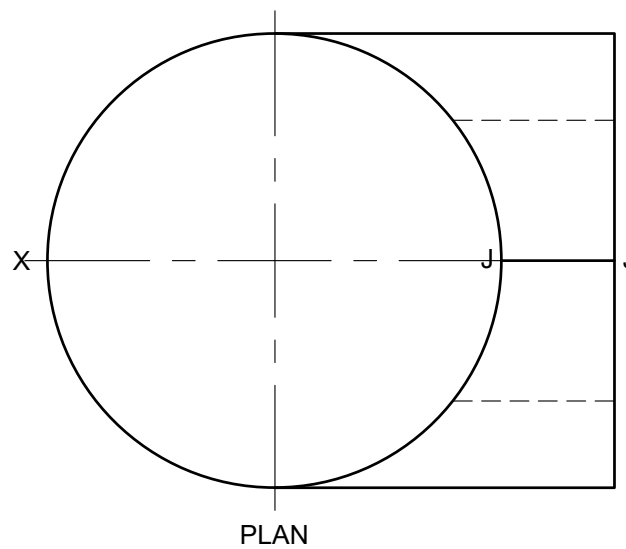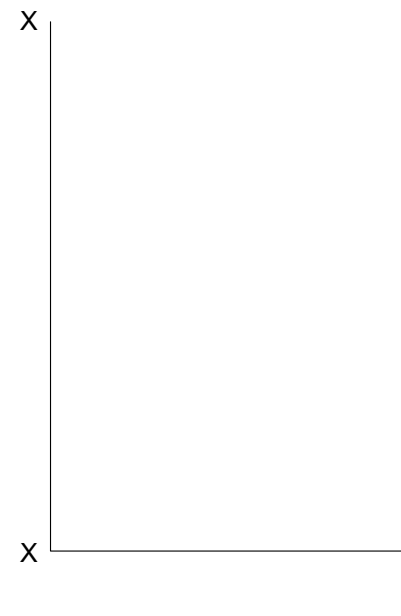
END ELEVATION

FRONT ELEVATION

SURFACE DEVELOPMENT OF CYLINDRICAL PART

PLAN

SURFACE DEVELOPMENT OF PENTAGONAL PRISM

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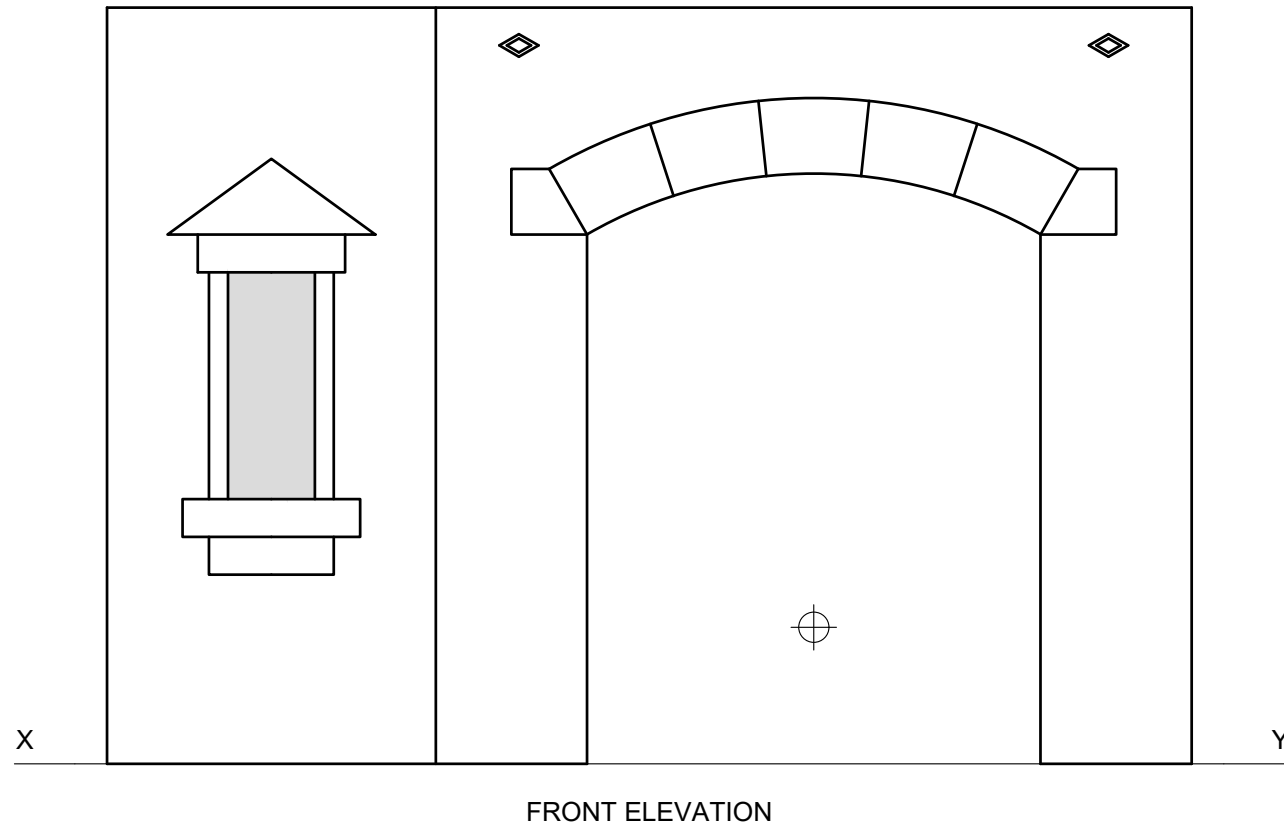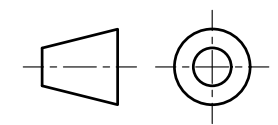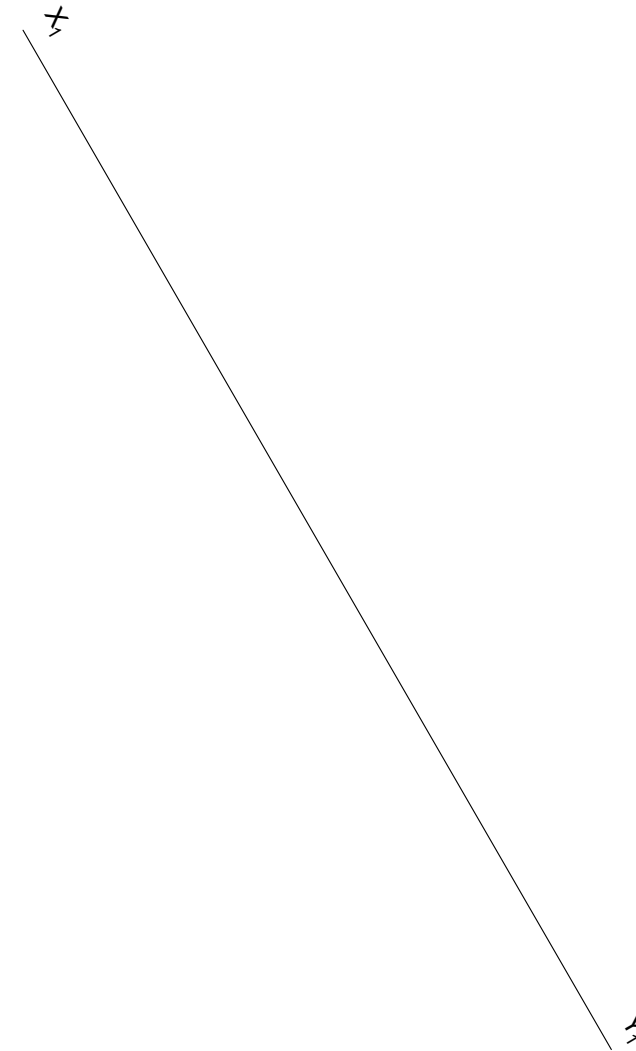
Question 6.
A pictorial view and two orthographic views of a corner façade for a stage prop are given. Project an auxiliary view as seen from the direction of arrow A on line X_1-Y_1.

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

(Total: 16 marks)

pictorial view
of corner façade

X   Y

FRONT ELEVATION

X_1

Y_1

PLAN

A

30°

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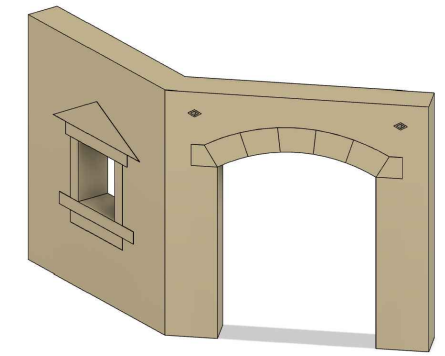
Question 7.

An exploded pictorial view of a toy boat is shown on the right. Detail drawings of the separate parts and an items list are given.
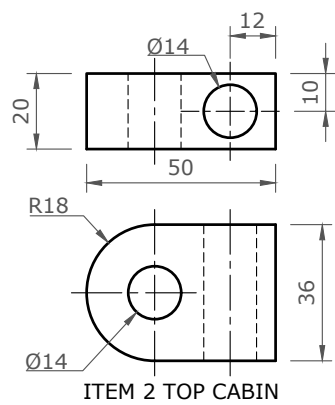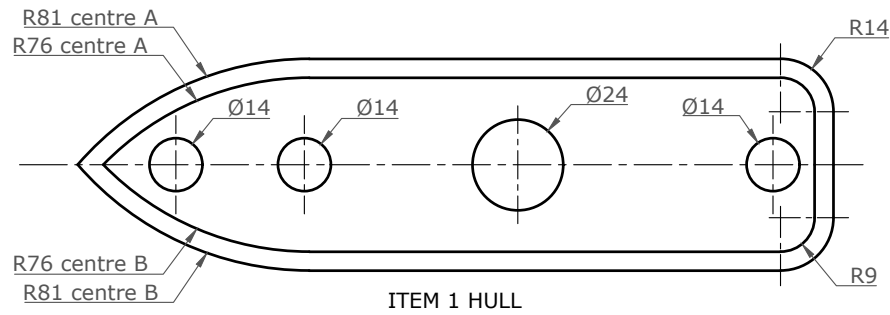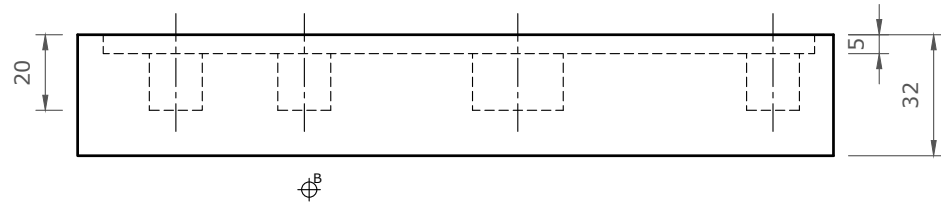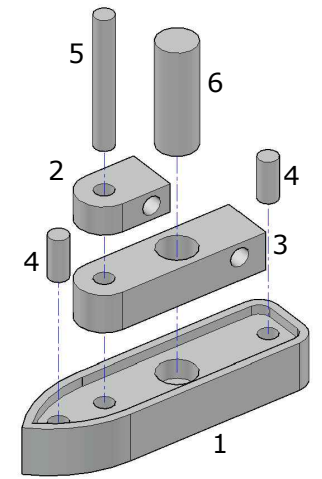
Use the given starting lines to complete:
a. the front elevation of the assembled boat; (7)
b. the plan of the assembled boat. (7)

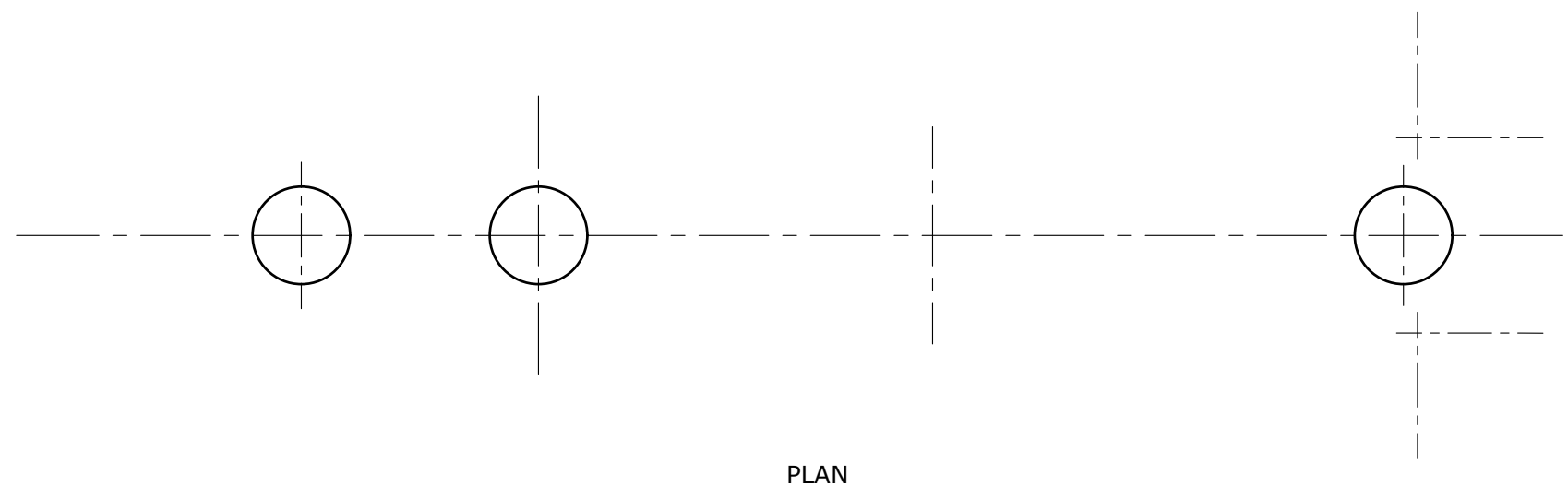Note: Show **all** hidden detail.

(Total: 14 marks)

ITEMS LIST		
ITEM No.	DESCRIPTION	QUANTITY
1	HULL	1 off
2	TOP CABIN	1 off
3	DECK CABIN	1 off
4	DOWEL	2 off
5	MAST	1 off
6	CHIMNEY	1 off

ITEM 1 HULL

R81 centre A
R76 centre A
R14
Ø14 Ø14 Ø24 Ø14
R76 centre B
R81 centre B
R9

ITEM 2 TOP CABIN
Ø14 12 10 20 50 R18 36 Ø14

ITEM 3 DECK CABIN
126 25 10 Ø14 20 R18 Ø24 36 Ø14

ITEM 4 DOWEL
30 Ø14

ITEM 5 MAST
90 Ø14

ITEM 6 CHIMNEY
72 Ø24

FRONT ELEVATION

PLAN

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

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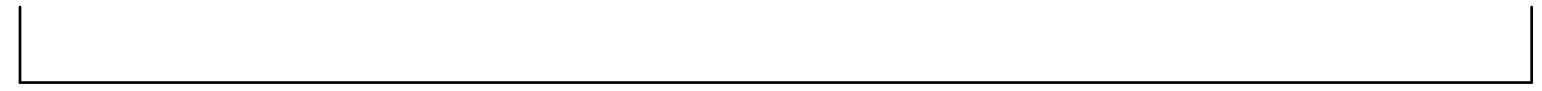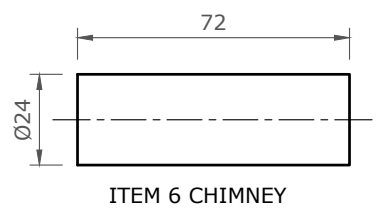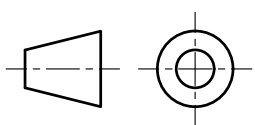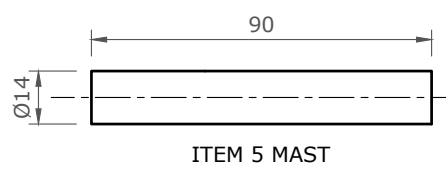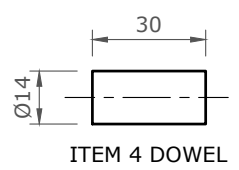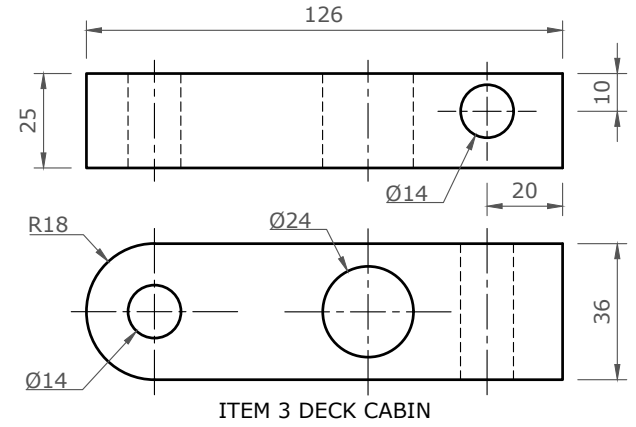
Question 1.
The following computer programme is written to create a design layout for a gladiator's dagger.

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; Q = 850; R = 900.

ACI 7: MOVE I,A; DRAW H,B; DRAW H,F; DRAW F,F; DRAW F,G; DRAW I,G:

ACI 1: MOVE I,C; DRAW H,D:

ACI 1: MOVE H,E; DRAW I,F:

ACI 1: MOVE G,F; DRAW G,G:

ACI 3: MOVE H,G; DRAW I,Q.

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:

COLOUR	RED	GREEN	BLACK
ACI No.	1	3	7

a. Plot the image produced by this programme on the 900 X 900 grid given on the right. (7)

b. Mirror the plotted design using the vertical centre line as the mirror line (line of symmetry). (3)

(Total: 10 marks)
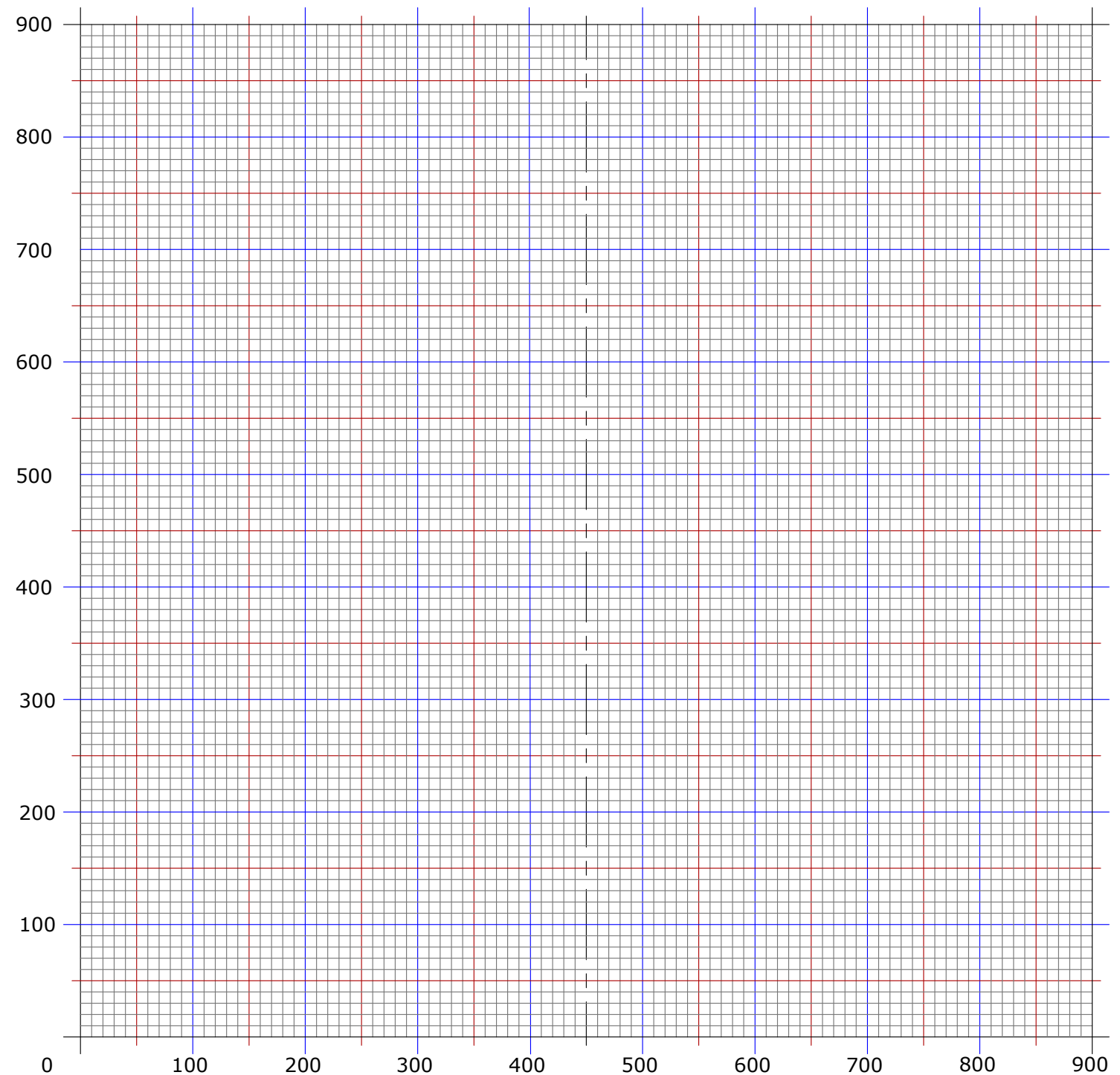
Question 2.
The figure below shows a crane lifting a metal beam. The forces acting on the crane's hook are shown and labelled accordingly on the space diagram.

a. Draw a freehand sketch of the vector diagram in the space provided.   (2)
b. Based on your freehand sketch and by using a scale of 10 mm to represent 1 kN, construct graphically the vector diagram to find the resultant force exerted on the crane's hook.   (5)
c. Write down the resultant force exerted on the crane's hook and show the direction of the resultant by adding an arrowhead to it on the vector diagram.   (2)
d. Colour the warning sign for 'falling objects'.   (2)
e. Draw a mandatory sign to wear a safety helmet. At least **ONE** freehand preparatory sketch should be drawn in the space provided.   (5)

(Total: 16 marks)
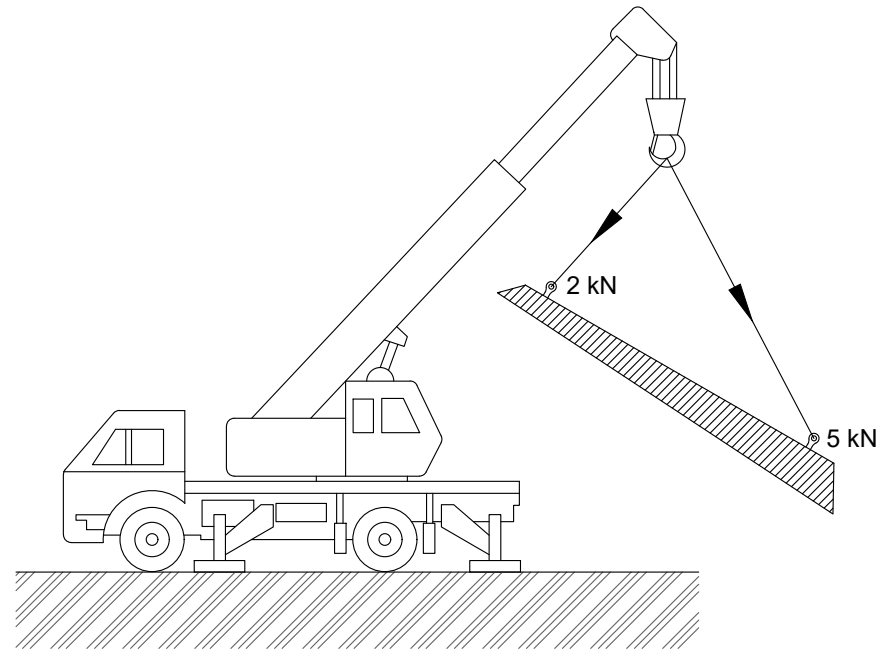
2 kN

5 kN

space for preparatory freehand
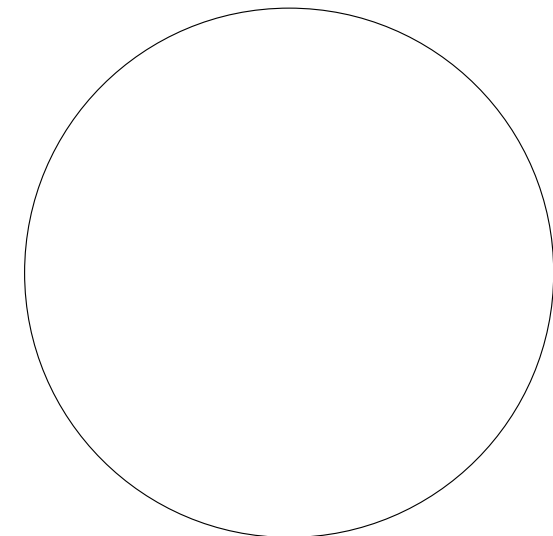sketch (vector diagram)

resultant: _____ kN

space for preparatory freehand sketches (safety signs)

wear safety helmet
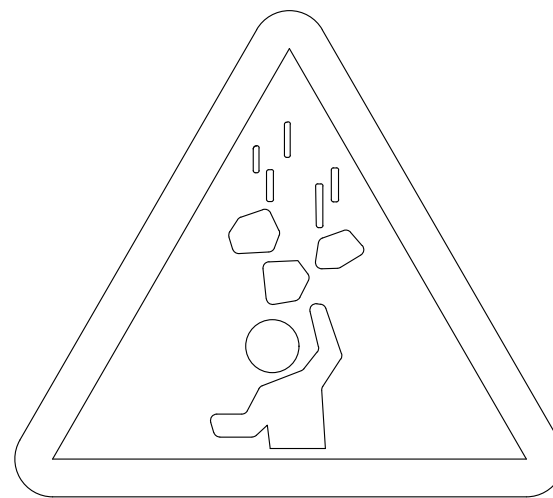
- WARNING SIGN -
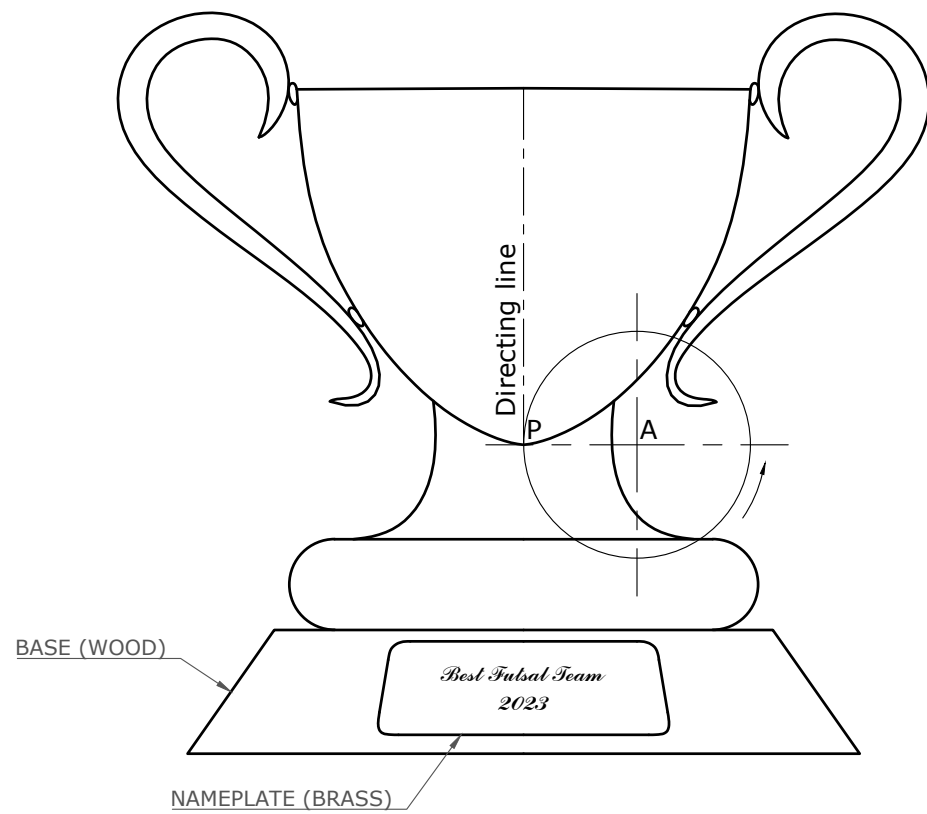FALLING OBJECTS

- MANDATORY SIGN -
WEAR SAFETY HELMET

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Question 3.
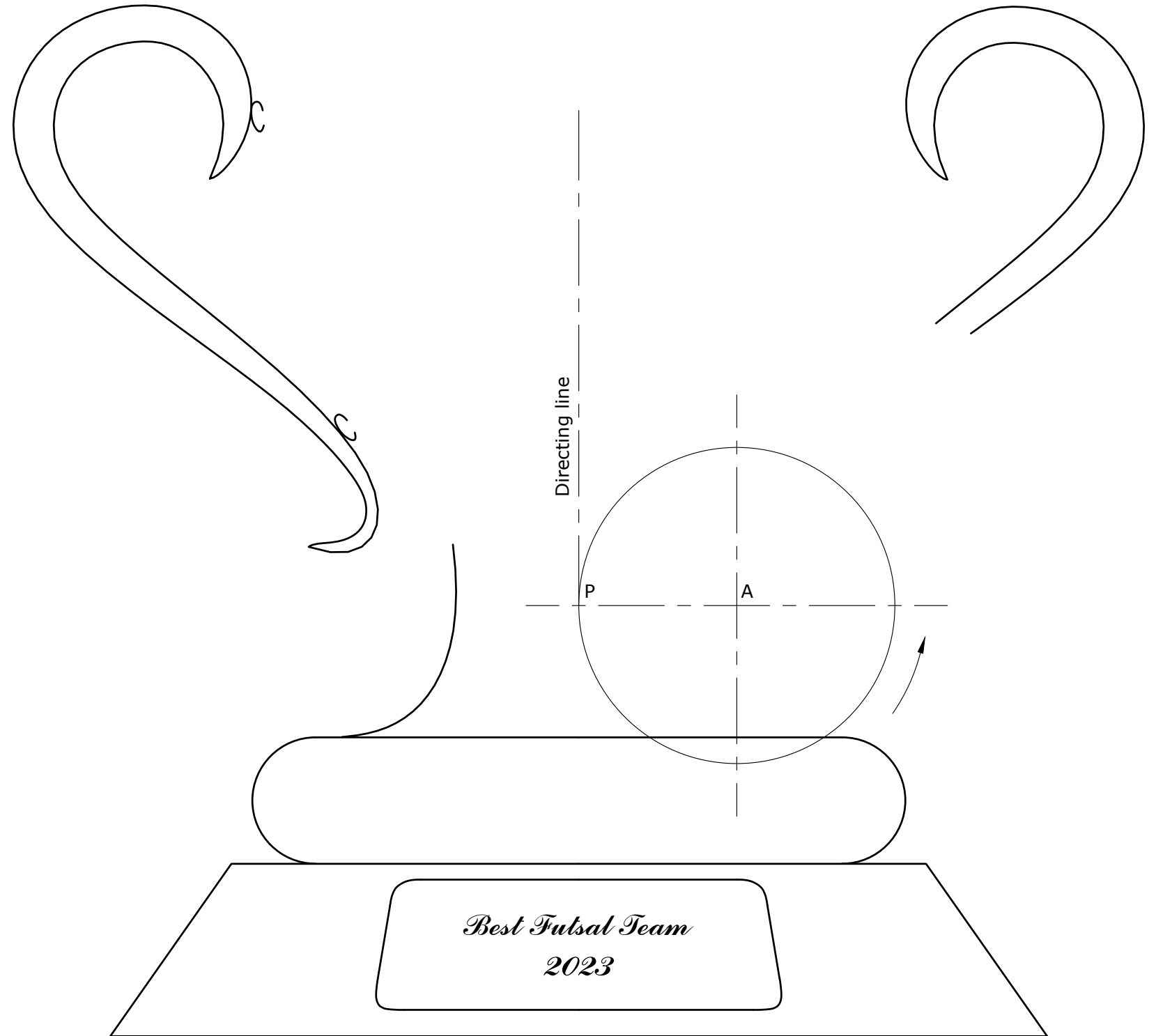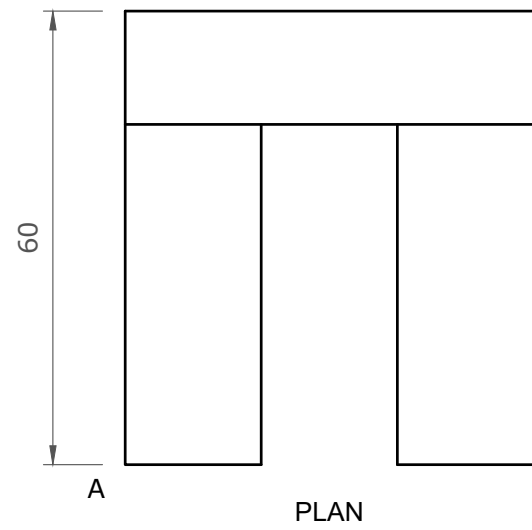
A trophy cup is shown below.

Draw the trophy design by constructing:

a. the locus of point P, as circle center A rolls without slipping on the given
    directing line for half a revolution;   (6)
b. mirror the locus of point P on the directing line;   (2)
c. draw, in freehand, the missing parts of the trophy on the right;   (2)
d. state and label the name of the generated locus;   (2)
e. render the base (material: wood) and the nameplate (material: brass).   (4)

(Total: 16 marks)

Directing line

P   A

Best Futsal Team
2023

BASE (WOOD)

NAMEPLATE (BRASS)

Name of the locus: _____

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Question 4.
Three orthographic views of a solid block are given below.

Draw:
a. a freehand sketch in the space provided;   (4)
b. a full size isometric drawing of the block using the given starting lines, dimensions and placing A at the lowest point.   (8)

(Total: 12 marks)
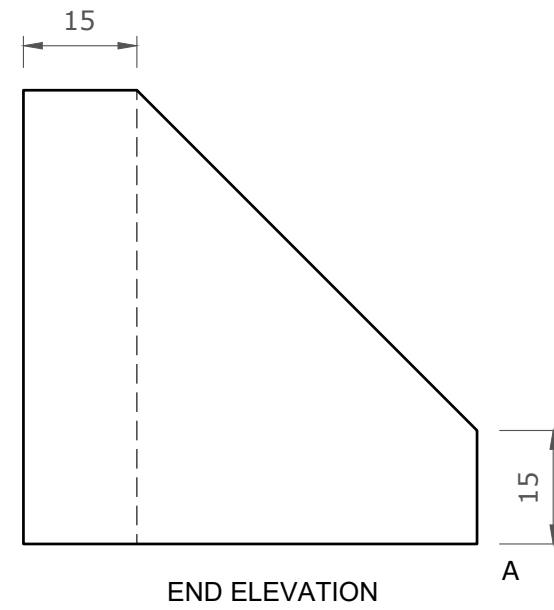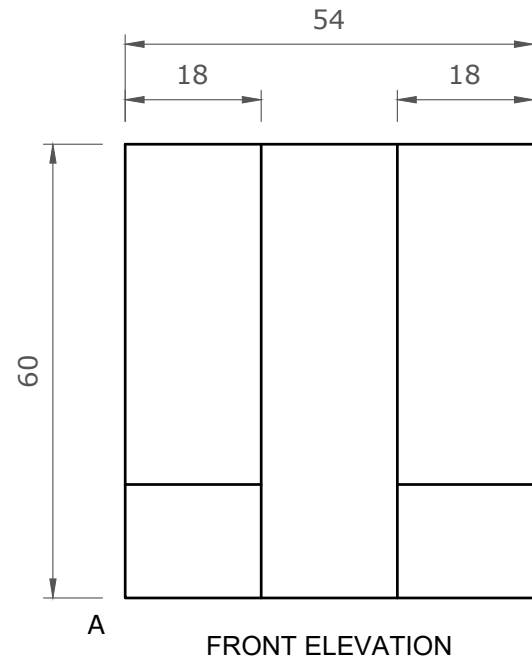
Freehand sketch
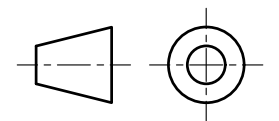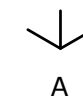
54

18   18

60

A   FRONT ELEVATION

15

15

A   END ELEVATION

60

A   PLAN

A

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Question 5.
The pictorial drawing on the right shows a bedside alarm clock. Its design is made out of a pentagonal prism intersecting a cylinder.

Three orthographic views of this alarm clock 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.   (6)
b. Construct the development of the outer surface of the cylinder in the space provided, with the joint line at X-X.   (6)
c. Use the digital grid provided beneath the development to print the time at 15:47 (time at 23:06 is being given as an example).   (2)
d. Use simple block letters to label the remaining buttons as 'SETTINGS' and 'LIGHT' like the examples shown.   (2)

Note:
The function buttons and display screen have been removed from all elevations for simplicity purposes.

pictorial view
of alarm clock

(Total: 16 marks)

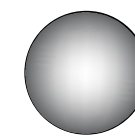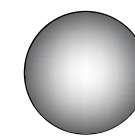END ELEVATION

FRONT ELEVATION

X   X
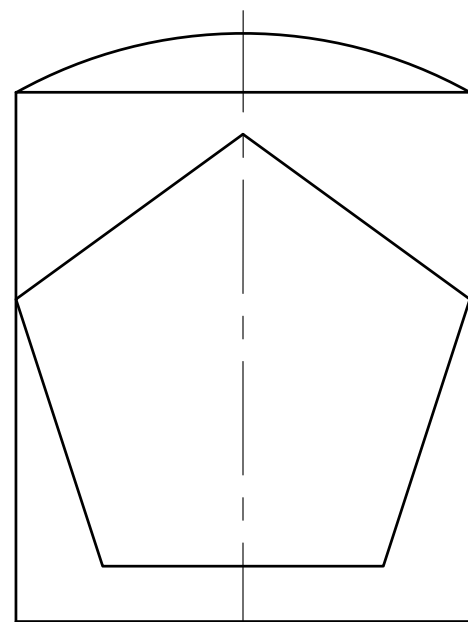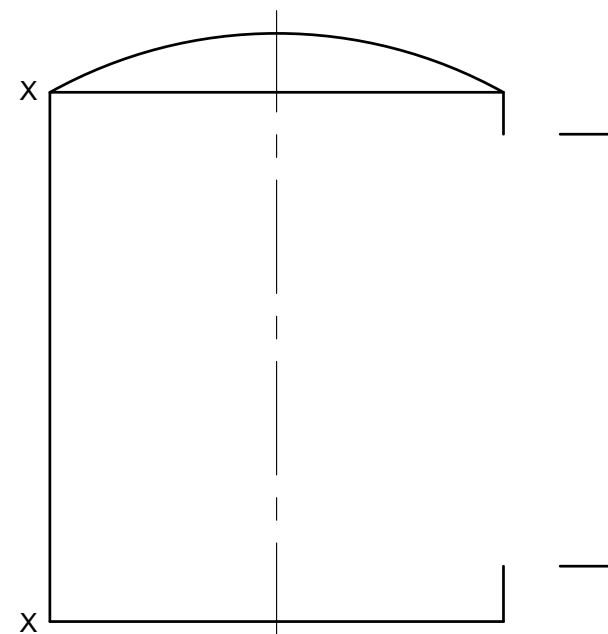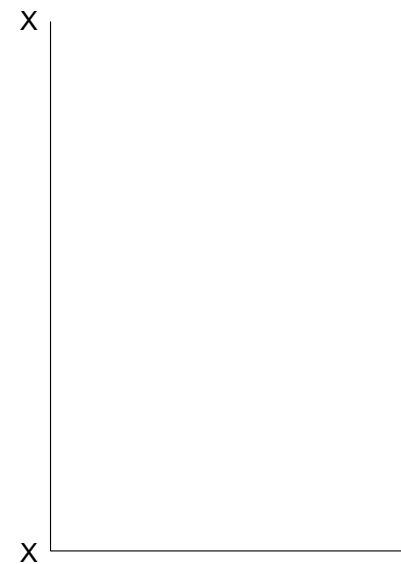
SURFACE DEVELOPMENT OF CYLINDRICAL PART
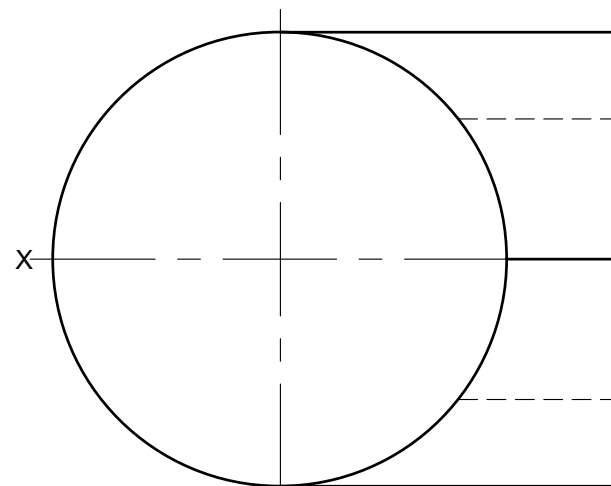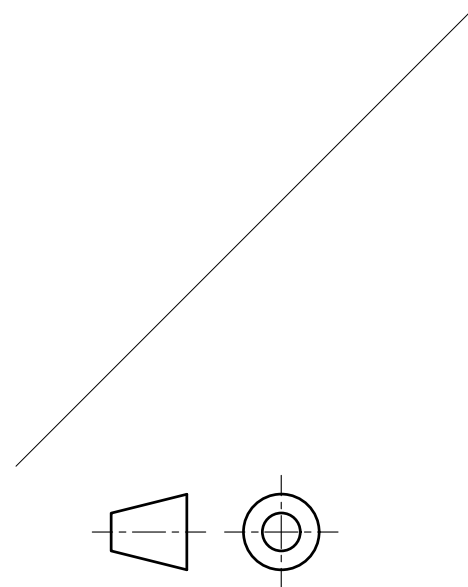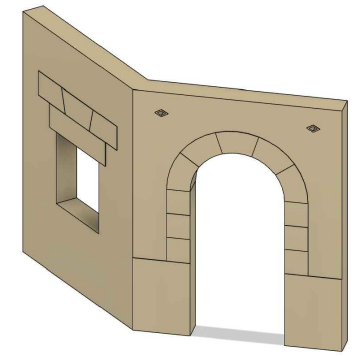
PLAN
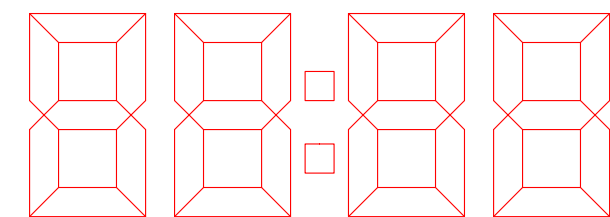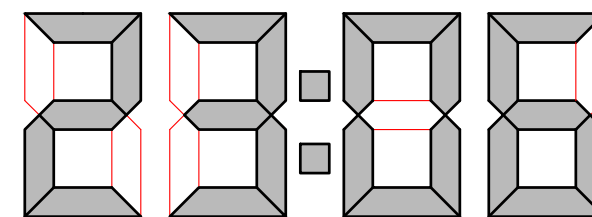
DIGITAL GRID
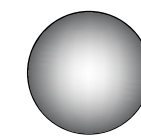
ALARM   SNOOZE
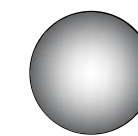
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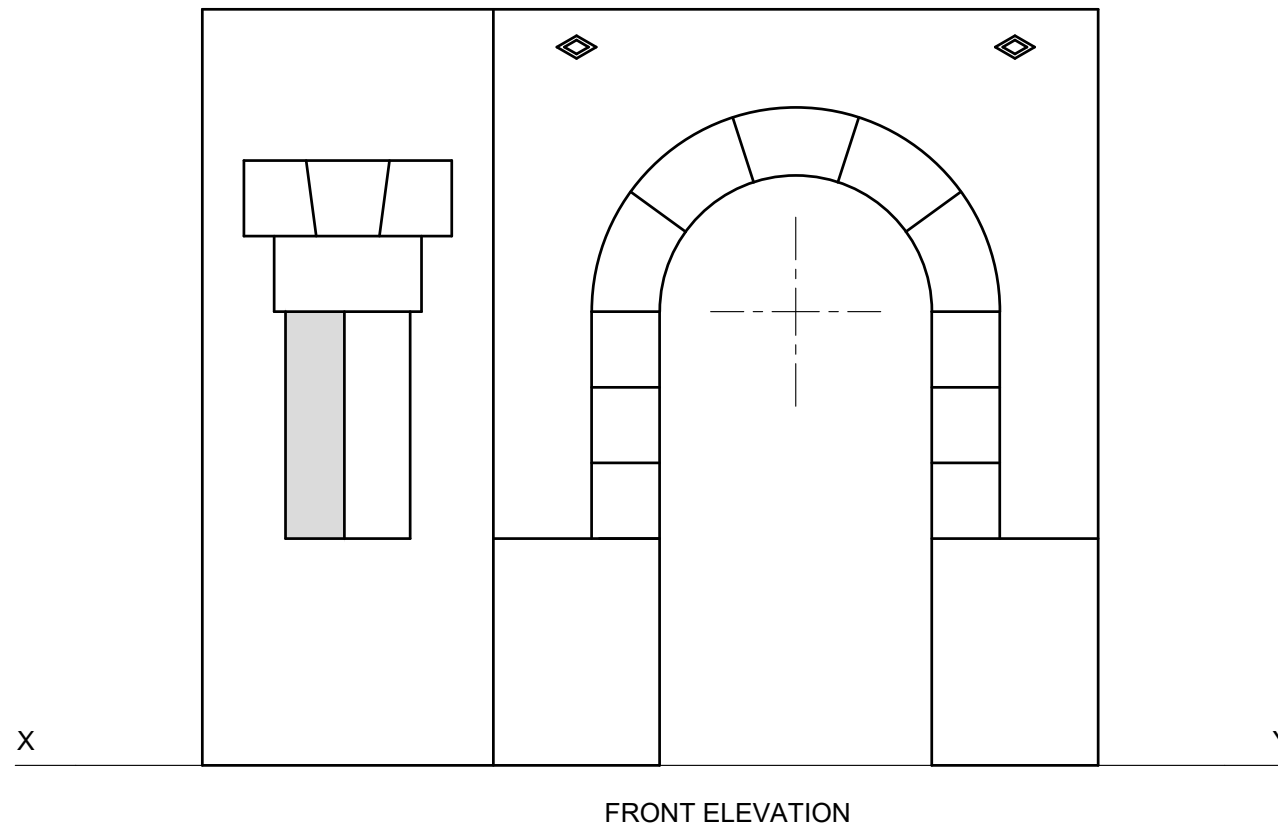
Question 6.
A pictorial view and two orthographic views of a corner façade for a stage prop are given. Project an auxiliary view as seen from the direction of arrow A on line X_1-Y_1.

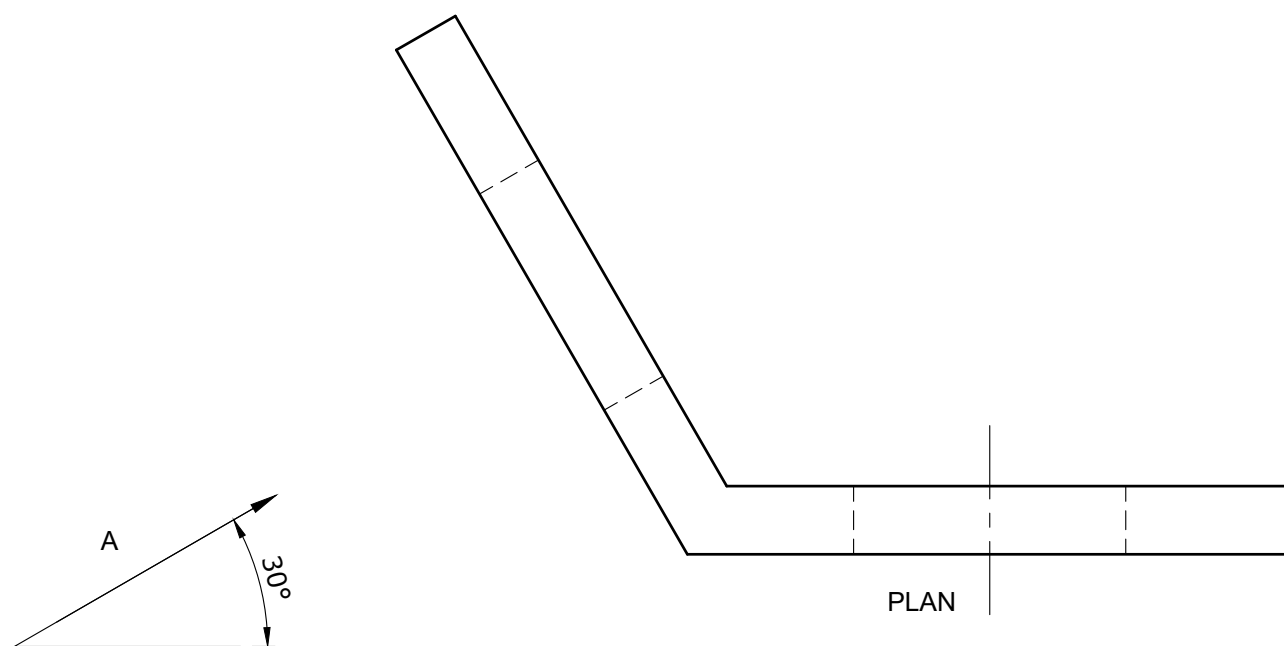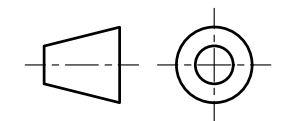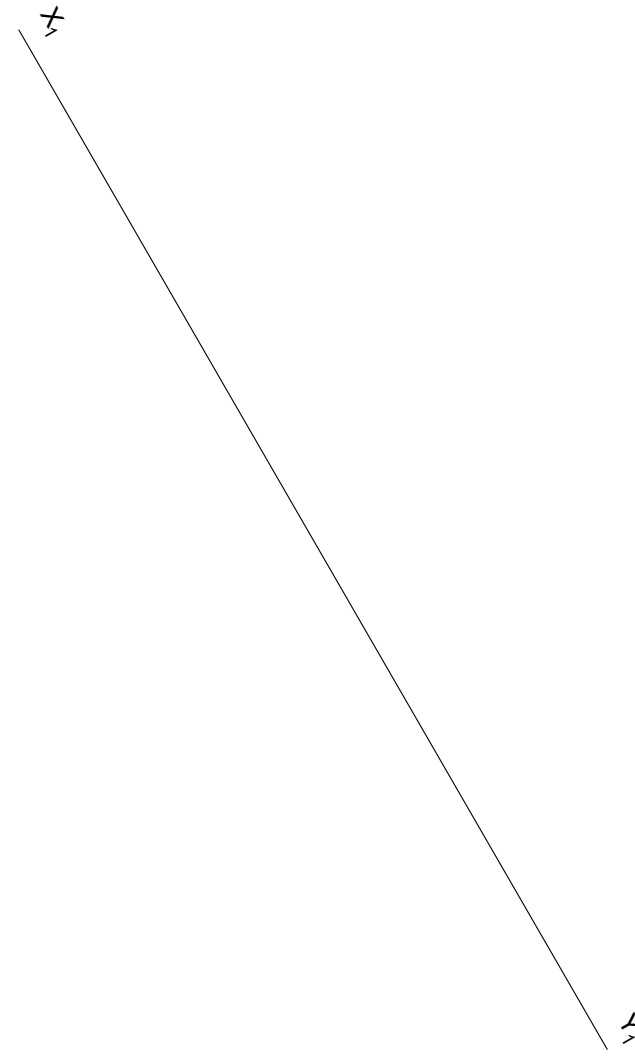Note:
Do **not** show hidden details.

(Total: 16 marks)

pictorial view
of corner façade

X

Y

FRONT ELEVATION

X_1

Y_1

A

30°

PLAN

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Question 7.

An exploded pictorial view of a toy boat is shown on the right. Detail drawings of the separate parts and an items list are given.
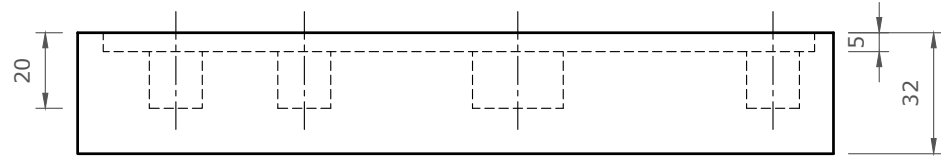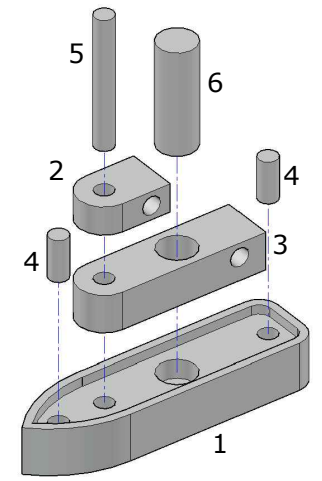
Use the given starting lines to complete:
a. the front elevation of the assembled boat;   (6)
b. the plan of the assembled boat;   (6)
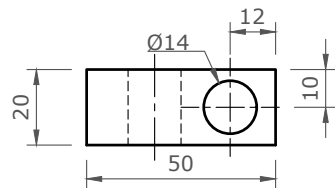c. the first angle projection symbol.   (2)
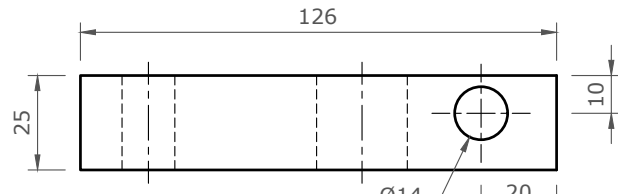
Note: Show **all** hidden detail.

(Total: 14 marks)

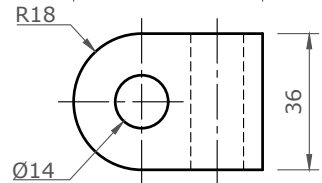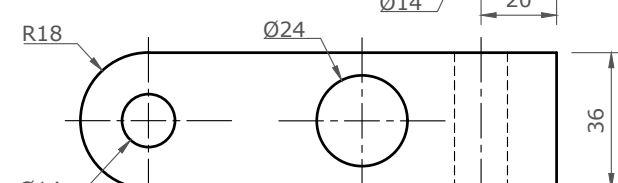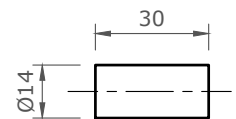| ITEMS LIST		
ITEM No.	DESCRIPTION	QUANTITY
1	HULL	1 off
2	TOP CABIN	1 off
3	DECK CABIN	1 off
4	DOWEL	2 off
5	MAST	1 off
6	CHIMNEY	1 off
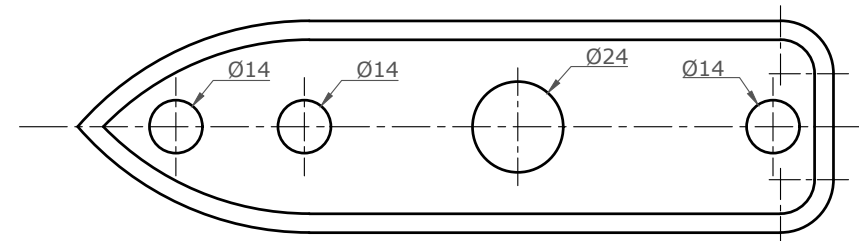
ITEM 1 HULL

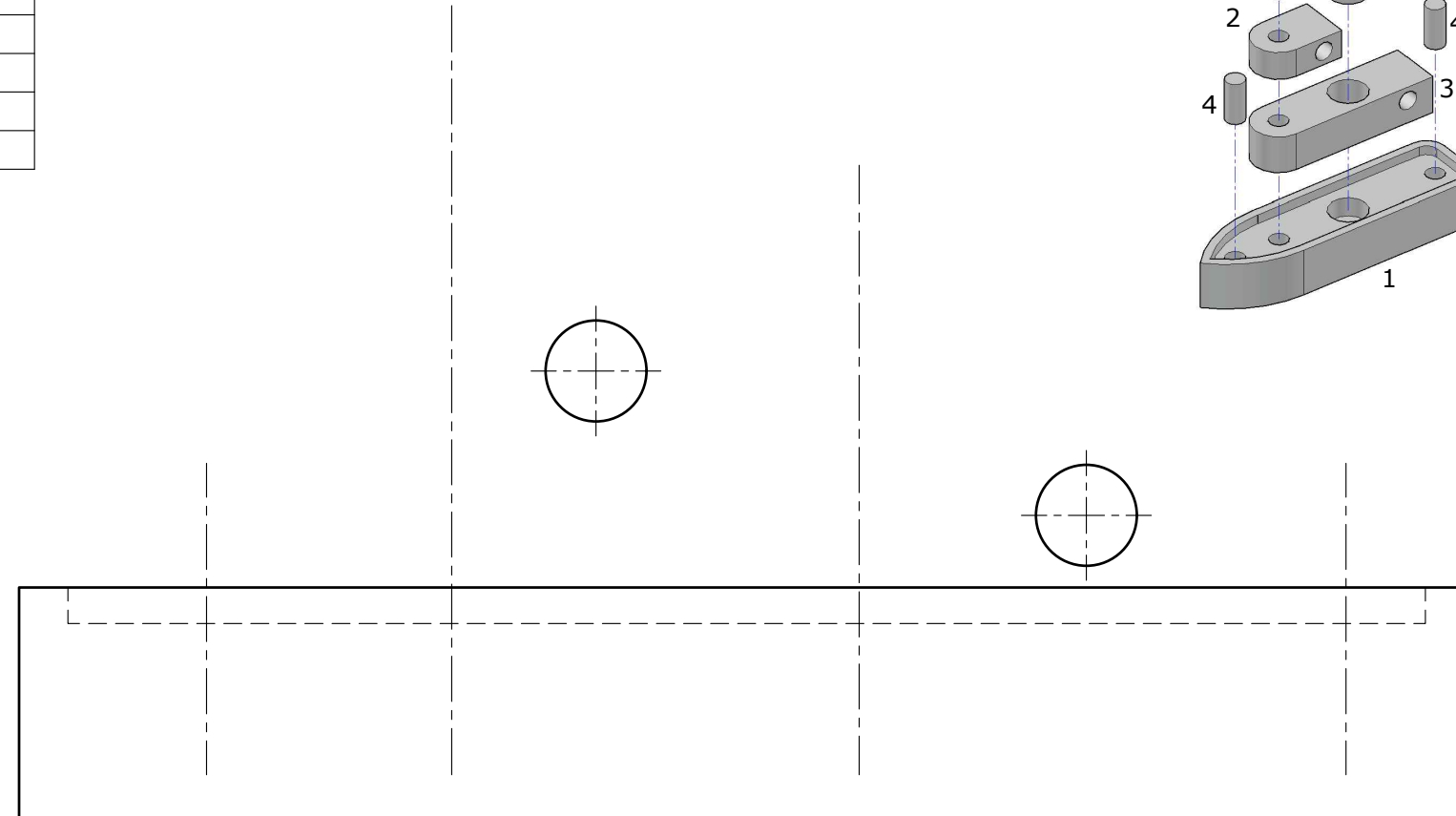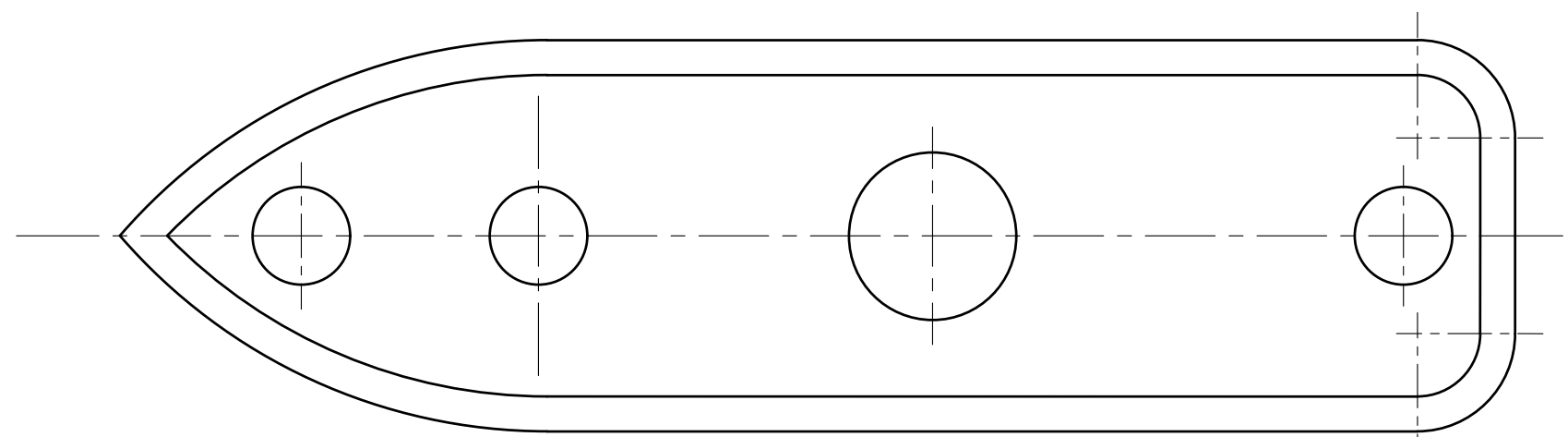ITEM 2 TOP CABIN

ITEM 3 DECK CABIN

ITEM 4 DOWEL

ITEM 5 MAST

ITEM 6 CHIMNEY

FIRST ANGLE PROJECTION

FRONT ELEVATION

PLAN

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