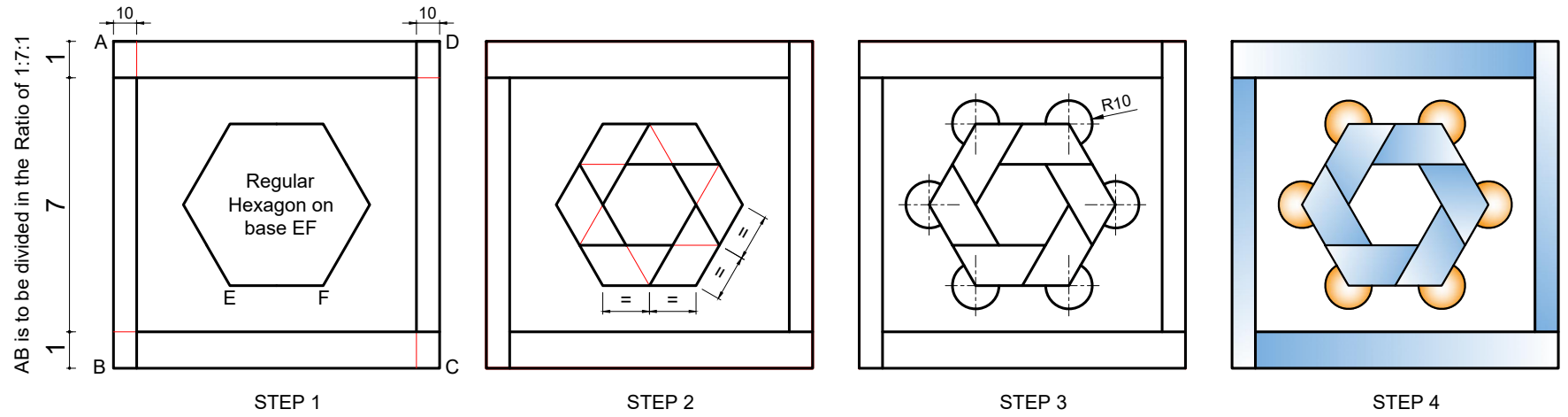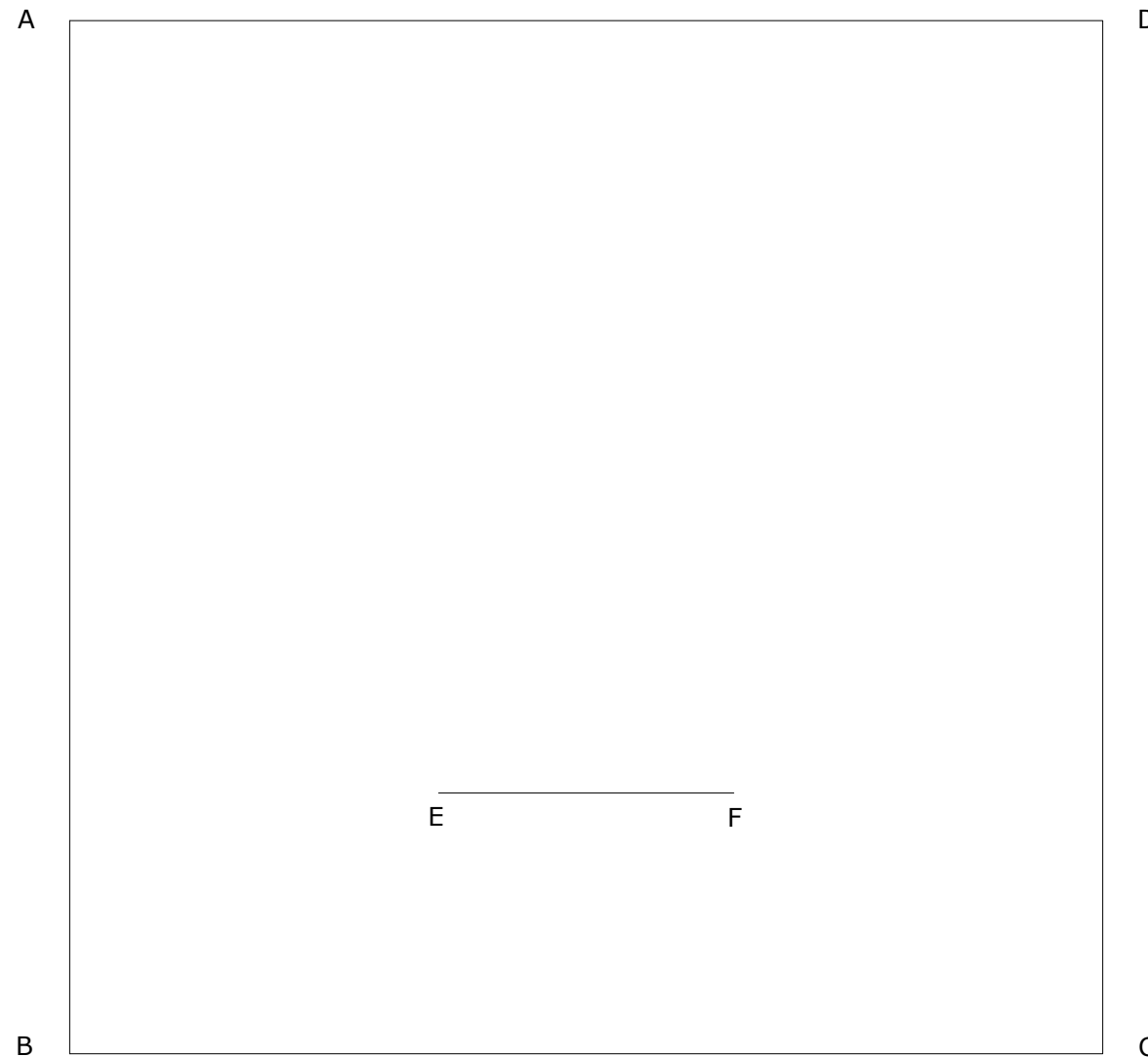**Question 1.**

Four steps for the construction of an antiviral software logo are shown on the right.
Reproduce this logo by:

a. dividing line AB in the ratio of 1:7:1 and completing the framing
    of the square as shown in step 1;   (3)
b. drawing a regular hexagon with base EF as shown in step 1;   (2)
c. bisecting line EF in two equal parts and completing the
    hexagonal design as shown in step 2;   (2)
d. drawing circles of radius 10mm to the corners of the hexagon
    as shown in step 3;   (1)
e. shading in any colour the copy of the given logo marked (G)
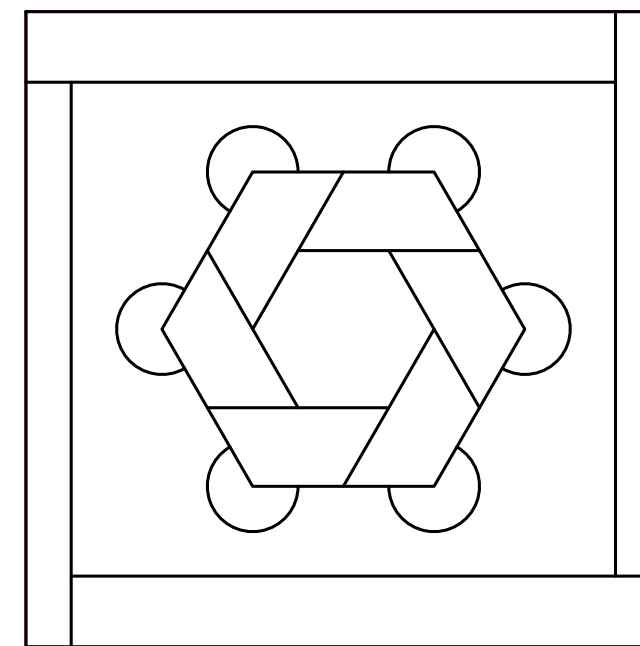   as shown in step 4.   (2)

Note:
Leave all construction work visible.

(Total: 10 marks)

STEP 1   STEP 2   STEP 3   STEP 4

finished logo to be shaded in colour

(G)

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

GRAPHICAL COMMUNICATION - PAPER I (Page 1 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 9.00 a.m. to 11.05 a.m.   INDEX NUMBER : _____
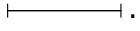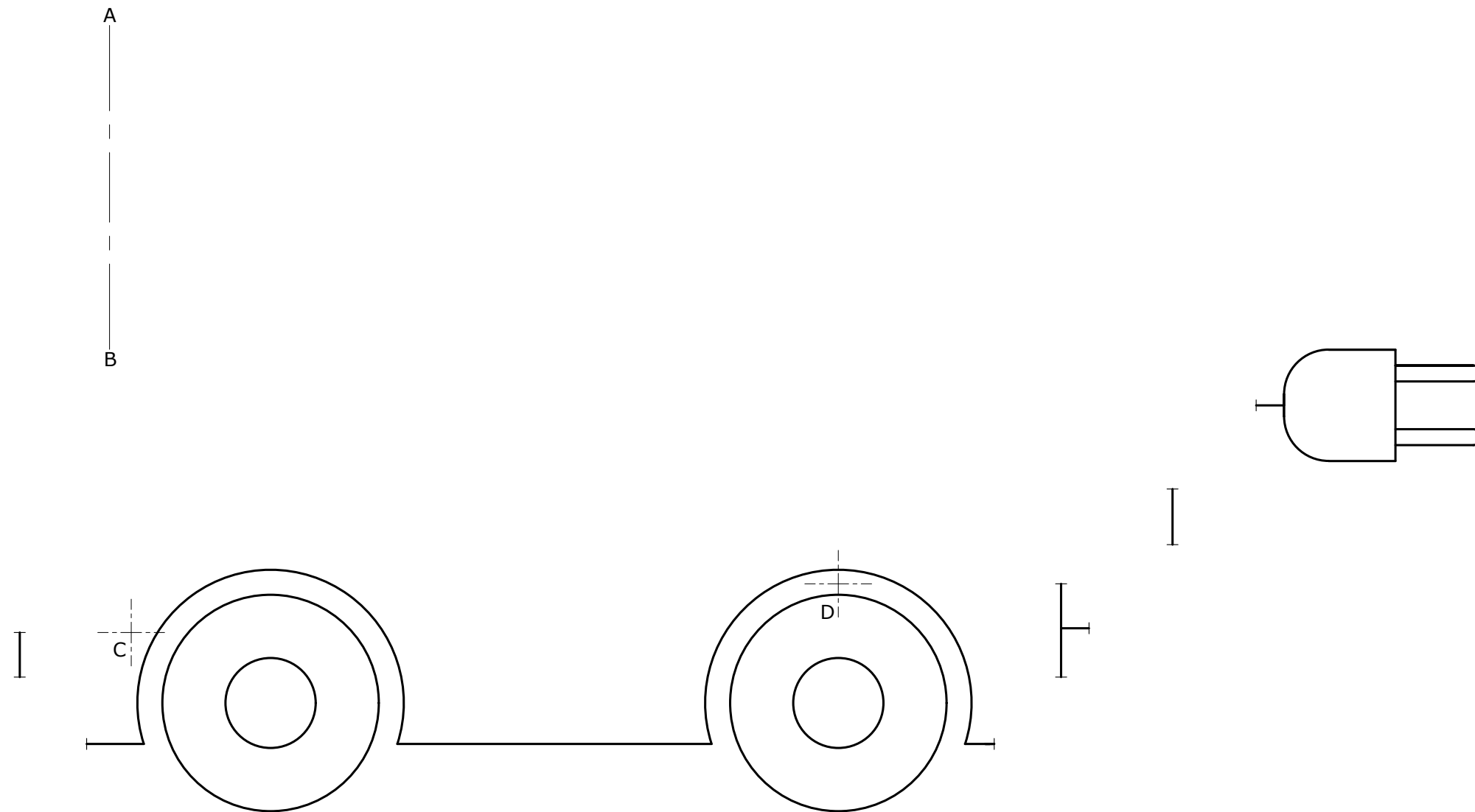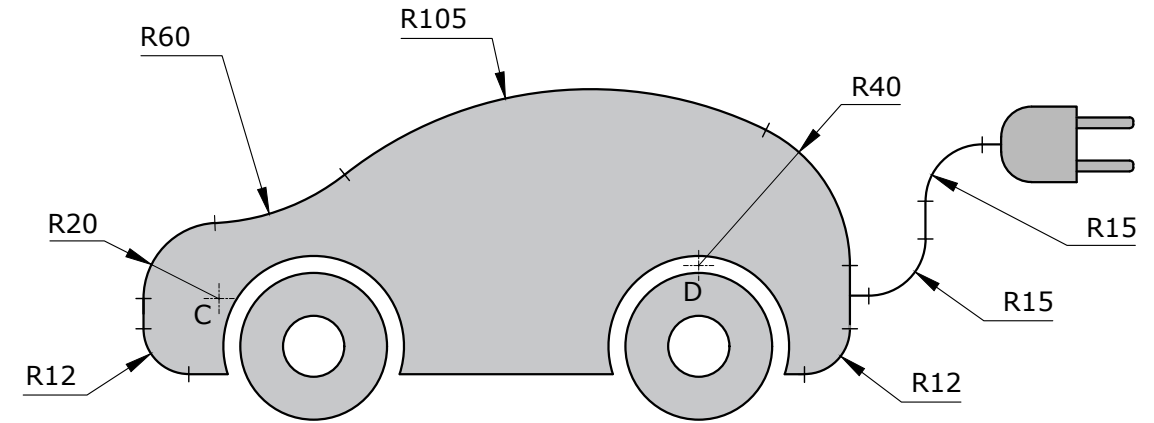
Question 2.

An electric vehicle charging sign is shown on the right. The profile of the sign is composed of arcs and lines in contact.

Using the given starting lines and dimensions, complete the given profile showing clearly how the centres, tangential arcs and points of tangency were derived.

Notes:
- The centre of the R60 arc lies on centre line AB.
- C is the centre of the R20 arc.
- D is the centre of the R40 arc.
- Points of tangency are denoted by means of short dashes as shown ⊢────⊣.

(Total: 12 marks)

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

GRAPHICAL COMMUNICATION - PAPER I (Page 2 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 9.00 a.m. to 11.05 a.m.

INDEX NUMBER : _____

Question 3.
The pictorial view of a wooden key holder is given on the right. This key holder is composed of an irregular pentagonal back and a curved base. Find the surface area of both pieces by:

a. converting the pentagon marked (a) into a square having the same area and then completing Table A; (9)
b. using the mid-ordinate method for the curved base marked (b) and then completing Table B. (5)
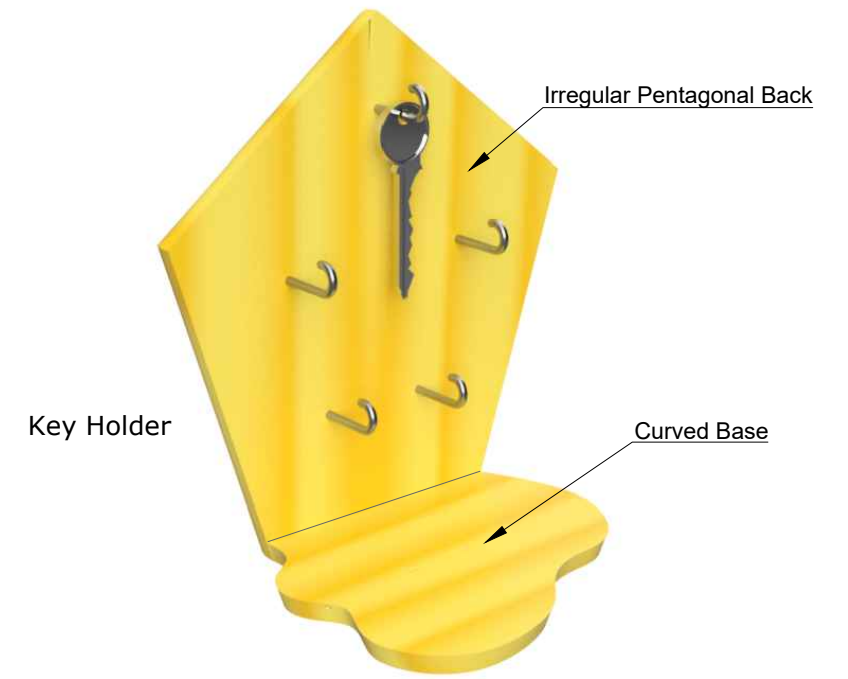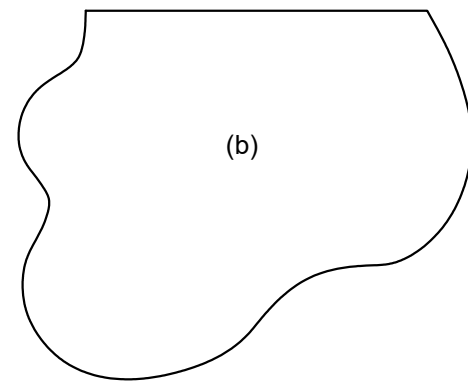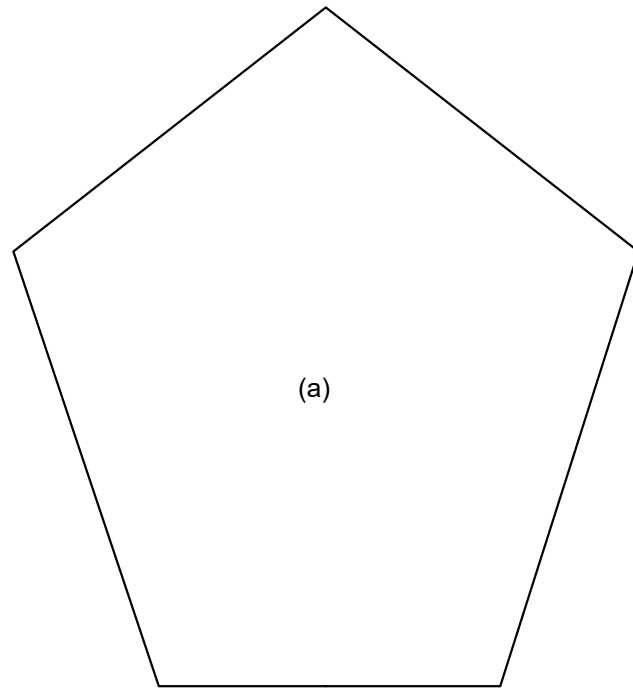
(Total: 14 marks)

Irregular Pentagonal Back

Key Holder

Curved Base

(a)

(b)

Table A

Pentagonal back marked (a)
Side of square = _____ mm
Area of square = _____ mm^2

Table B

Curved base marked (b)
Area of curve base = _____ mm^2

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

GRAPHICAL COMMUNICATION - PAPER I (Page 3 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 9.00 a.m. to 11.05 a.m.

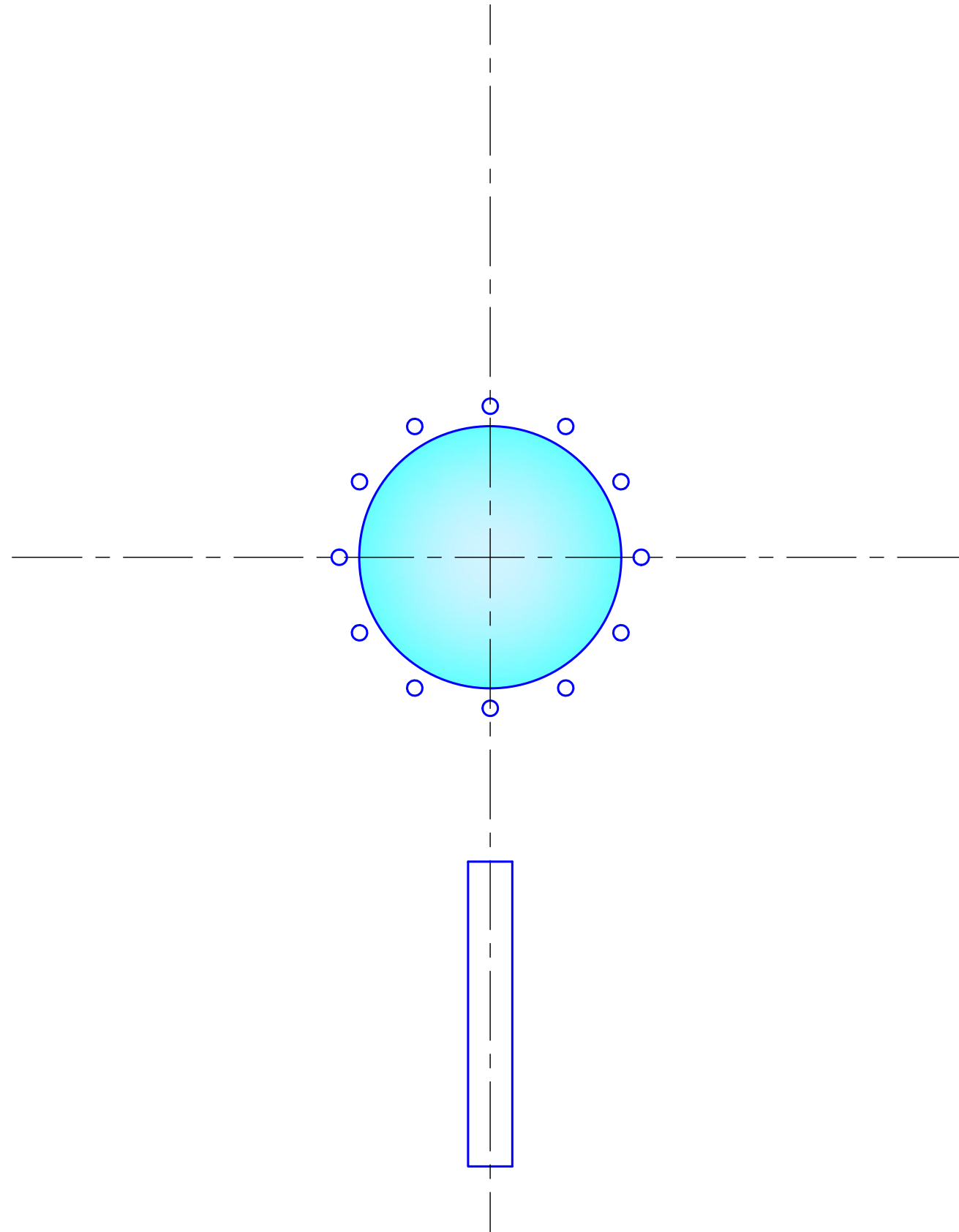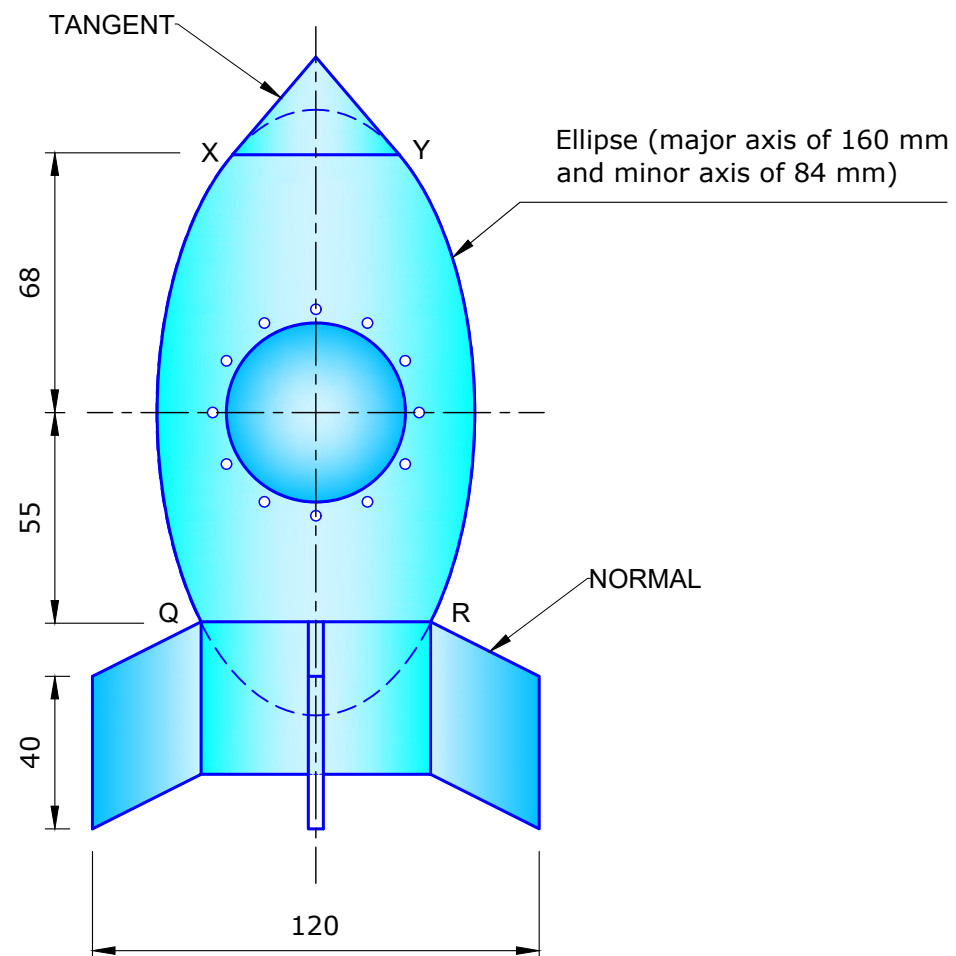INDEX NUMBER : _____

Question 4.

A dimensioned profile of a toy rocket is given below.

- The main body of the rocket is designed on the shape of an ellipse having a major axis of 160 mm and a minor axis of 84 mm.
- The conical nose is tangential to the ellipse at points X and Y.
- The upper parts of the fins are normals to the ellipse at points Q and R.

Use the given starting lines and dimensions to:
a. construct the ellipse; (6)
b. construct the tangent at point X and reflect it at point Y; (3)
c. construct the normal at point R and reflect it at point Q; (3)
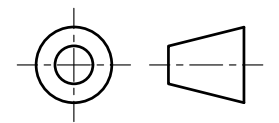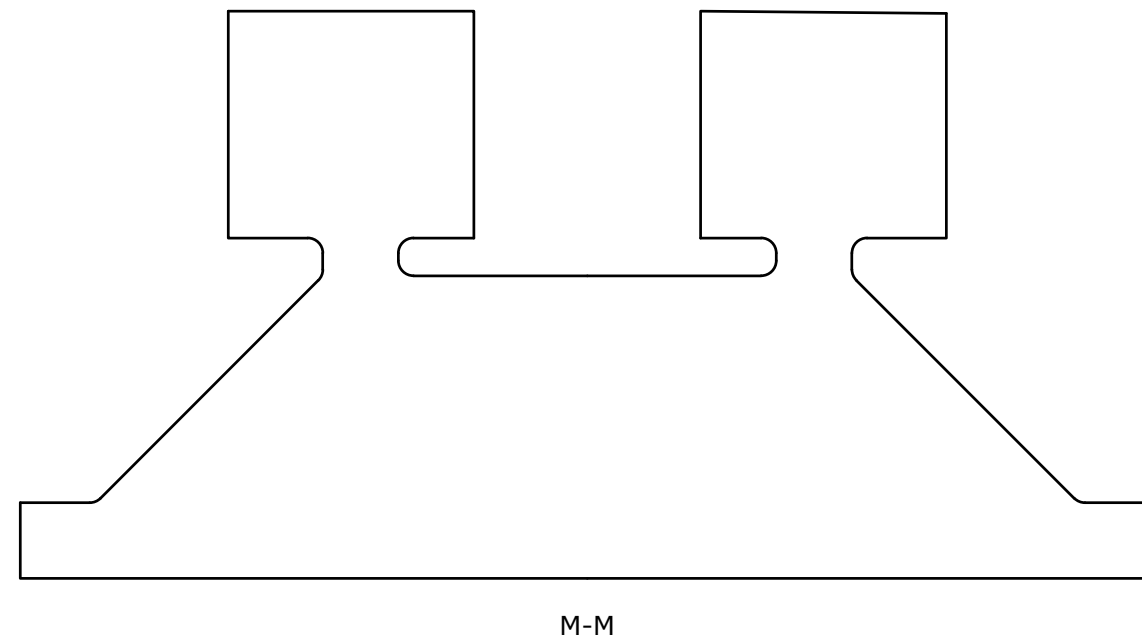d. complete the profile of the toy rocket. (2)

(Total: 14 marks)

TANGENT

X   Y

Ellipse (major axis of 160 mm and minor axis of 84 mm)

68

55

NORMAL

Q   R

40

120

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

GRAPHICAL COMMUNICATION - PAPER I (Page 4 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 9.00 a.m. to 11.05 a.m.   INDEX NUMBER : _____
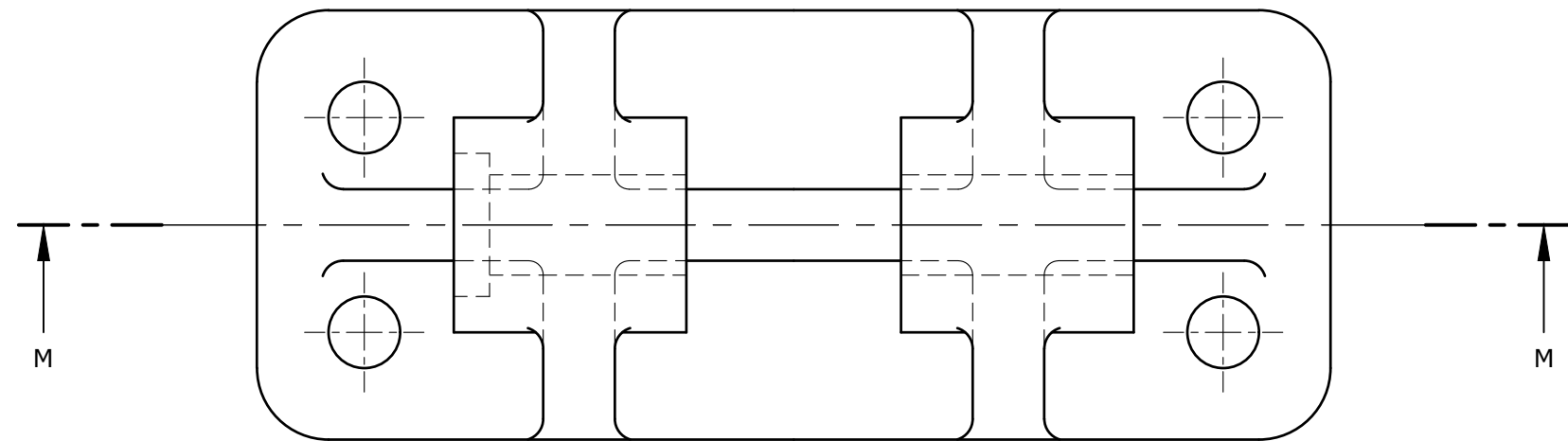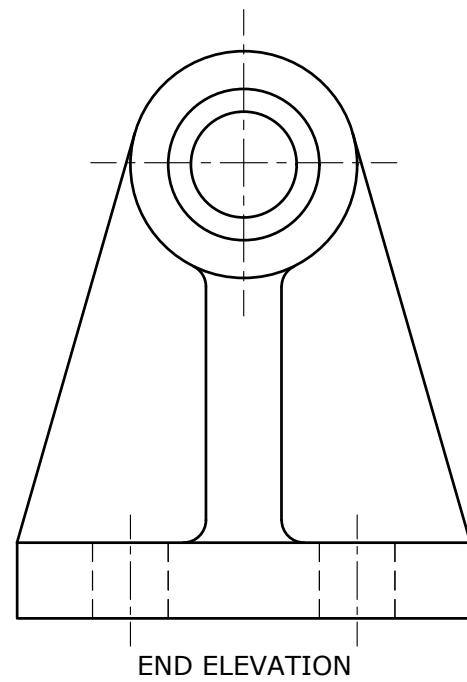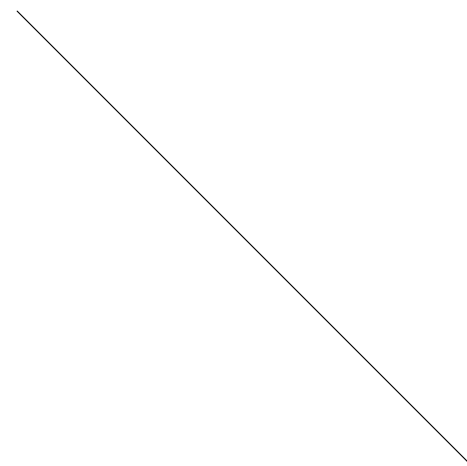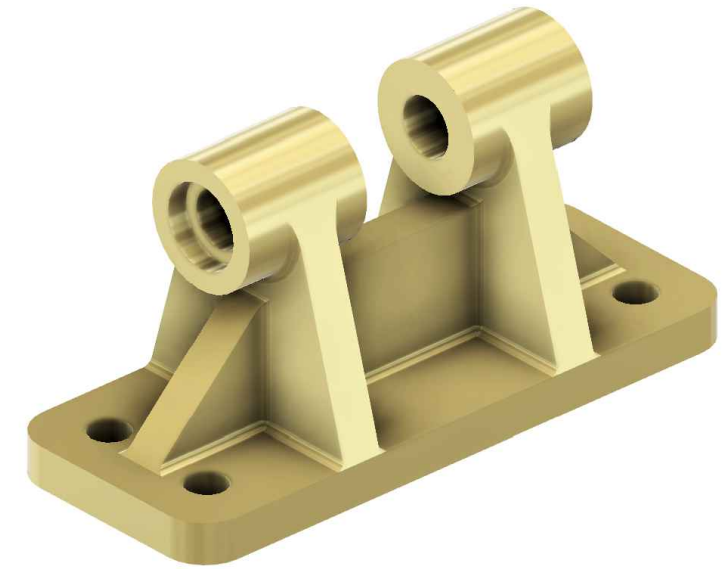
Question 5.
A pictorial view of a cast support bracket is given on the right. The plan, the end elevation, and the profile of the sectional front elevation are also given.

a. In the space provided, complete the sectional front elevation of the support bracket on cutting plane M-M.   (12)
b. Insert **ONE** radial and **ONE** linear dimension on the orthographic views.   (2)

Notes:
- Show all centre lines.
- Do not show hidden detail.

(Total: 14 marks)

PLAN

M   M

END ELEVATION

M-M

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

GRAPHICAL COMMUNICATION - PAPER I (Page 5 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 9.00 a.m. to 11.05 a.m.   INDEX NUMBER : _____
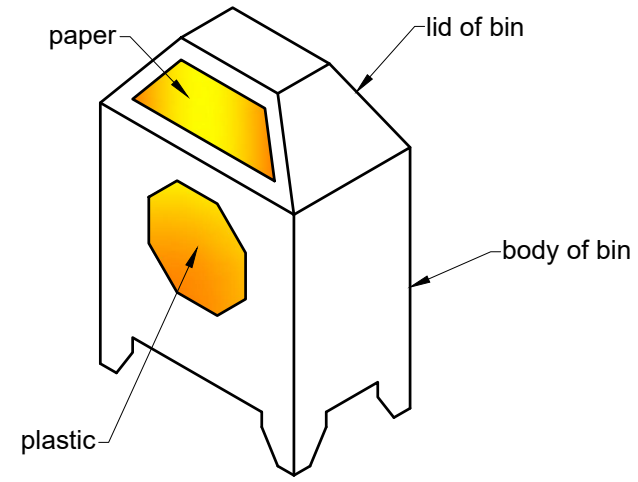
Question 6.

A pictorial view of a recycling bin model is shown on the right. The bin is composed of a rectangular prism and a rectangular-based pyramid. It features two compartments for paper and plastic waste.
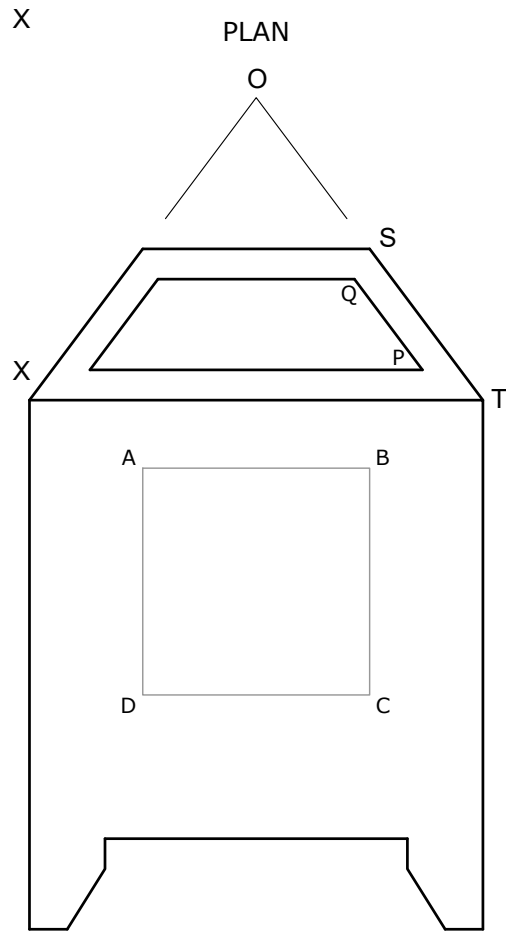
Using the given starting lines and dimensions:
a. complete the front elevation by constructing an octagon in square ABCD; (2)
b. complete the development of the body of the bin (rectangular prism) by taking the seam line as X-X (include the octagonal hole); (4)
c. complete the plan; (3)
d. determine the true lengths of OS and OT and write these down in the space provided; (4)
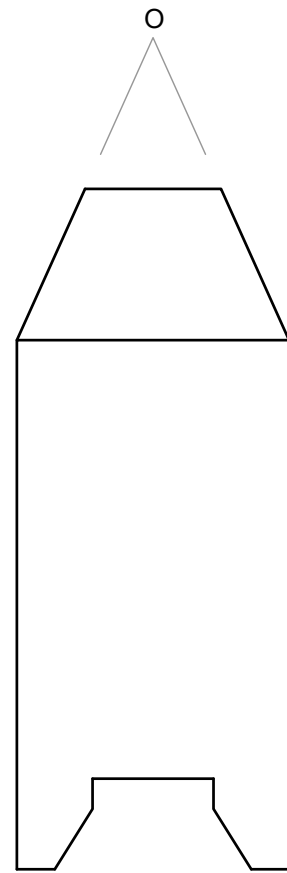e. construct the development of the truncated pyramidal top taking the seam line as O-T. (5)

(Total: 18 marks)

paper
lid of bin
body of bin
plastic

CARDBOARD MODEL OF
RECYCLING BIN

PLAN
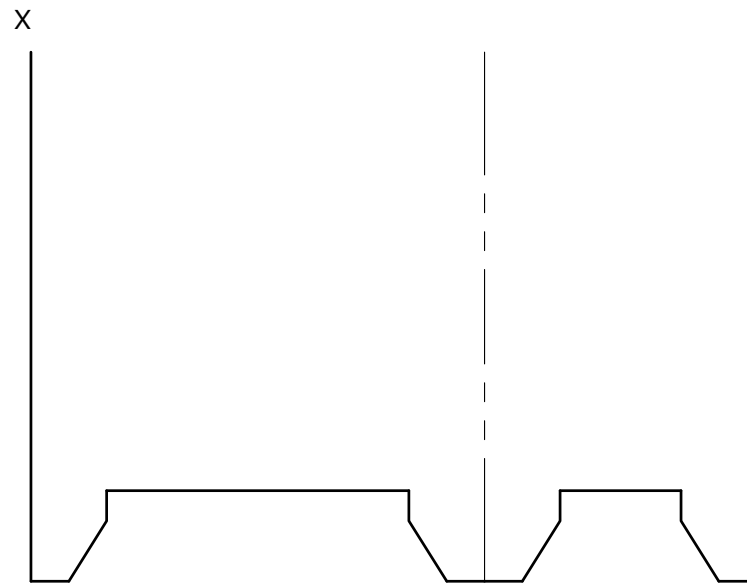
TRUE LENGTH OF OS: _____

TRUE LENGTH OF OT: _____
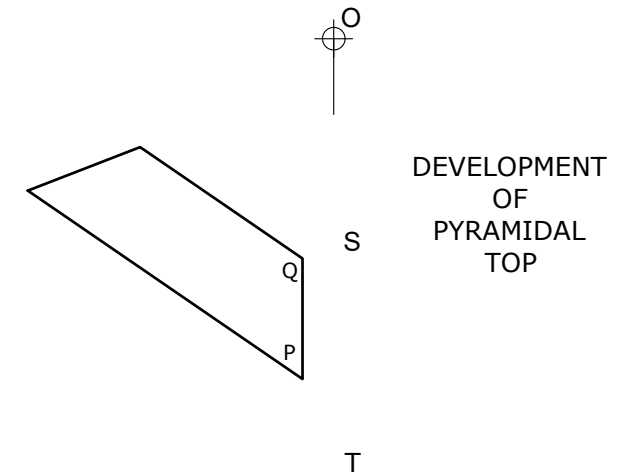
DEVELOPMENT
OF
PYRAMIDAL
TOP

FRONT ELEVATION

END ELEVATION

DEVELOPMENT OF BODY

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

GRAPHICAL COMMUNICATION - PAPER I (Page 6 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 9.00 a.m. to 11.05 a.m. INDEX NUMBER : _____
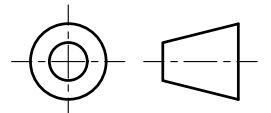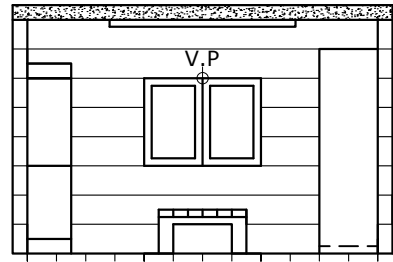
Question 7.

A room consisting of two shower cubicles, a bench and lockers is shown in the drawings below. The length, width and height of the room are 12 units X 12 units X 8 units.
The vanishing point, the heights and widths of the furniture are indicated on the orthographic and planometric views.

Use the given information to draw an estimated one-point perspective view of the room as indicated by the viewing direction.

(Total: 18 marks)

FRONT ELEVATION
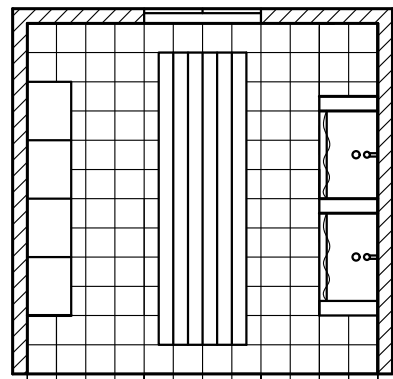
PLAN

VIEWING DIRECTION

V.P

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

GRAPHICAL COMMUNICATION - PAPER I (Page 7 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 9.00 a.m. to 11.05 a.m. INDEX NUMBER : _____
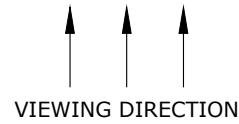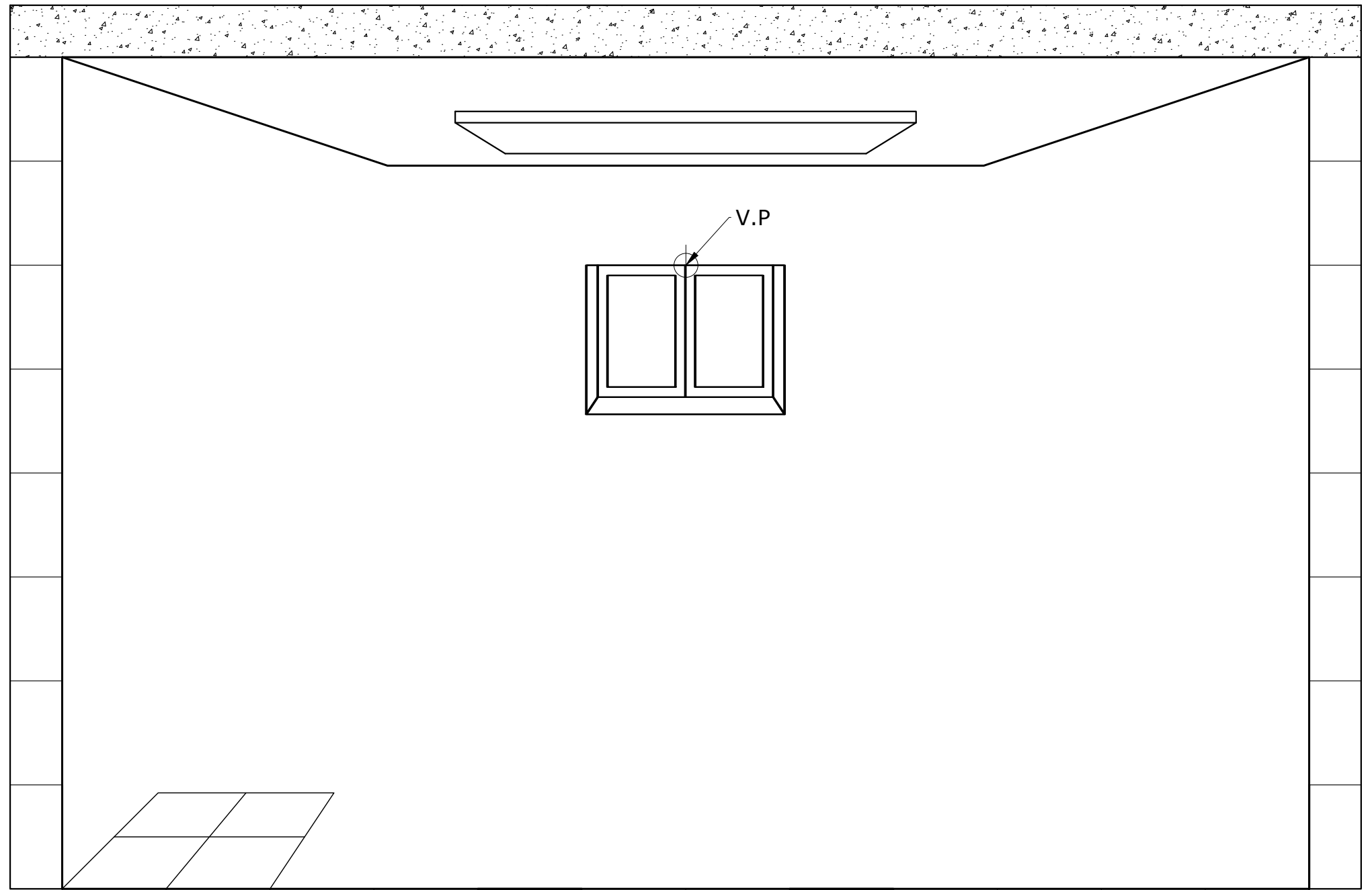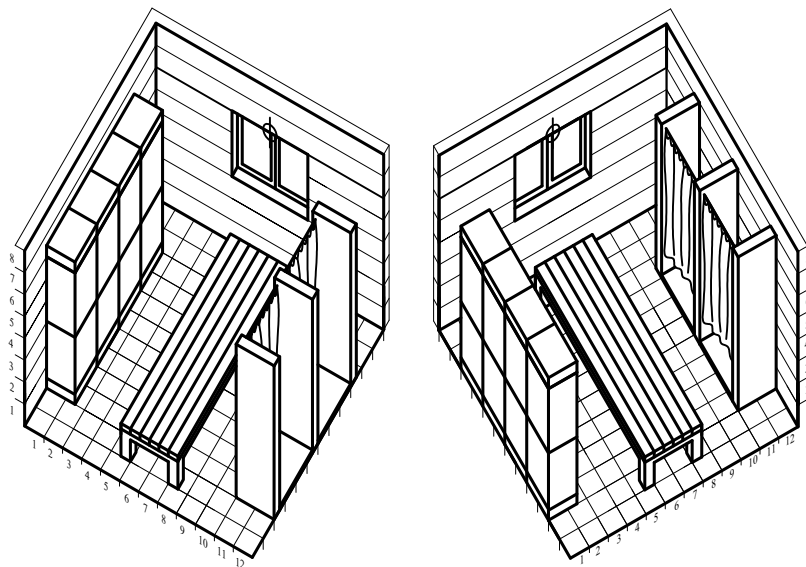
Question 1.
The following computer programme is written to create a design layout for a coat of arms.

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 3:   MOVE A,I; DRAW I,I; DRAW I,Q; DRAW G,K; DRAW A,I:
ACI 3:   MOVE I,I; DRAW G,K:

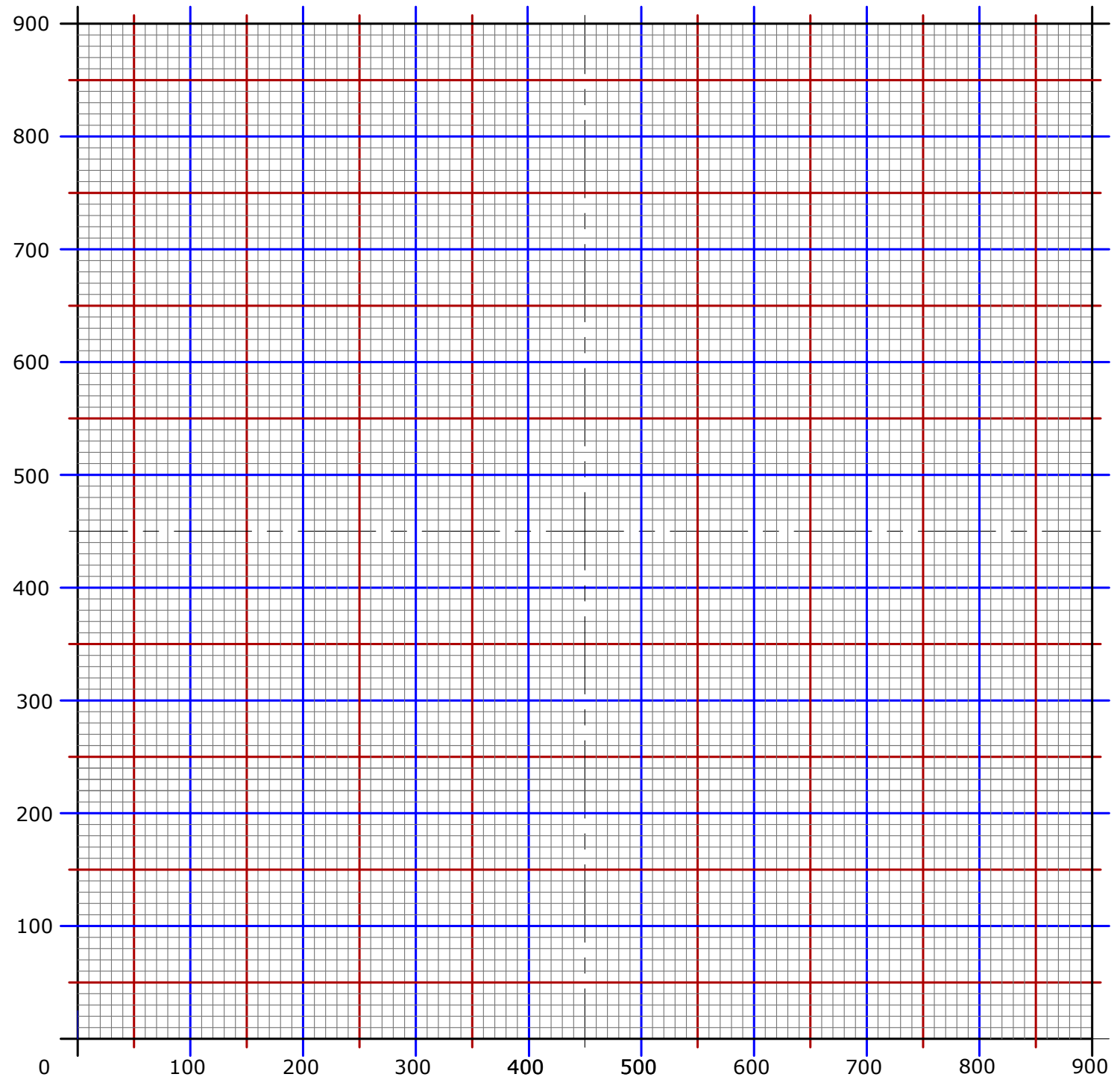ACI 1:   MOVE H,N; DRAW G,M; DRAW C,O; DRAW E,K; DRAW D,J:

ACI 5:   MOVE C,O; DRAW C,P; DRAW A,Q; DRAW B,O; DRAW C,O:

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
ACI No.	1	3	5

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 and horizontal centre lines as the mirror lines (lines of symmetry).
(3)

(Total: 10 marks)

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

GRAPHICAL COMMUNICATION - PAPER IIA (Page 1 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.   INDEX NUMBER : _____
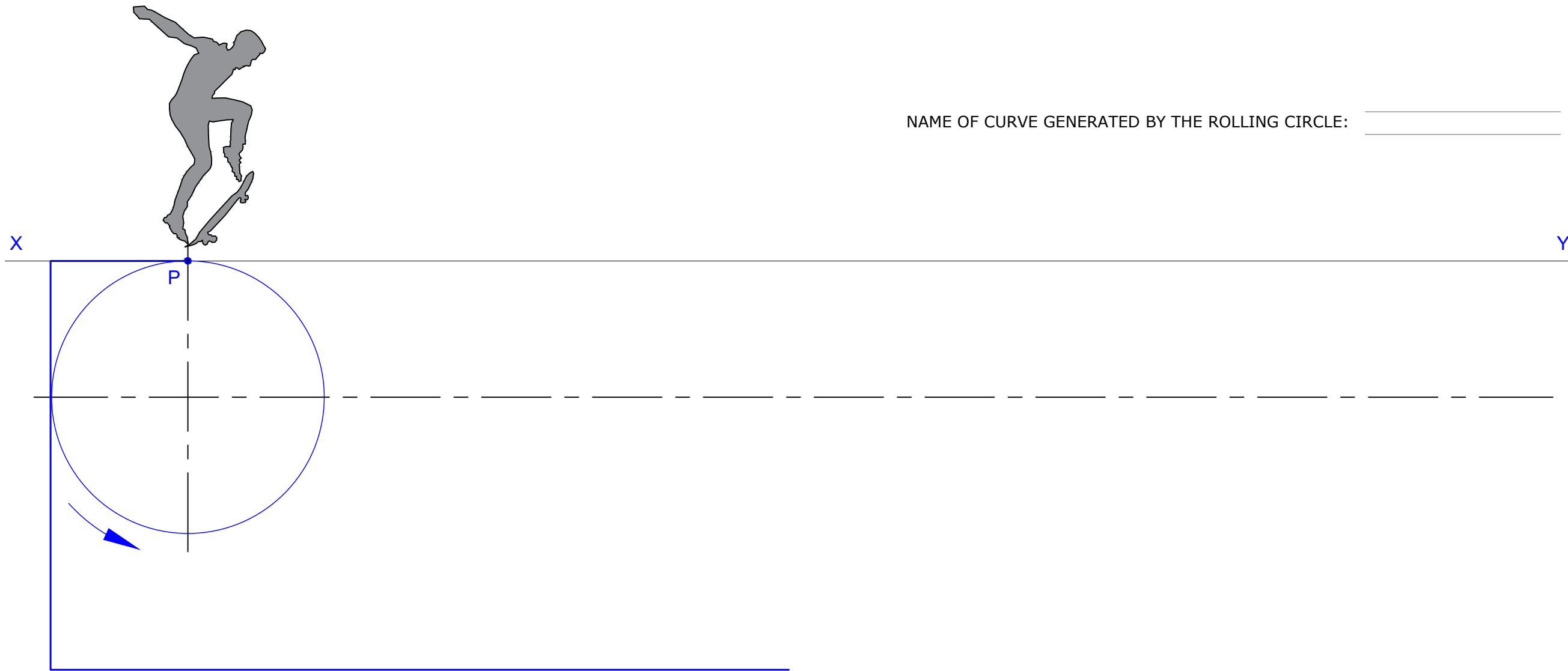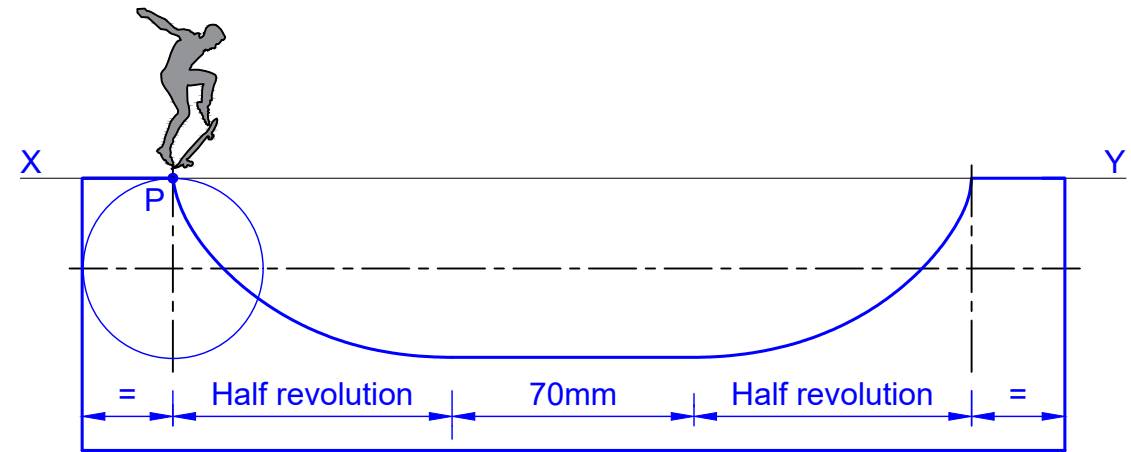
Question 2.

The profile of a skate ramp is given on the right. The ramp is generated by the locus of point P on a circle which rolls and slides below directing line XY.

a. Draw this ramp by using the starting lines below.   (12)
b. Complete the rest of the drawing.   (1)
c. State the name of the curve generated by the rolling circle. (1)

Notes:

• The circle rolls without slipping for half a revolution in an anticlockwise direction.
• The circle then slides without rolling for 70 mm.
• The circle continues to roll without slipping in an anticlockwise direction for another half of a revolution.

(Total: 14 marks)

X   Y

P

= | Half revolution | 70mm | Half revolution | =

X   Y

P

NAME OF CURVE GENERATED BY THE ROLLING CIRCLE: _____

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

GRAPHICAL COMMUNICATION - PAPER IIA (Page 2 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.   INDEX NUMBER : _____
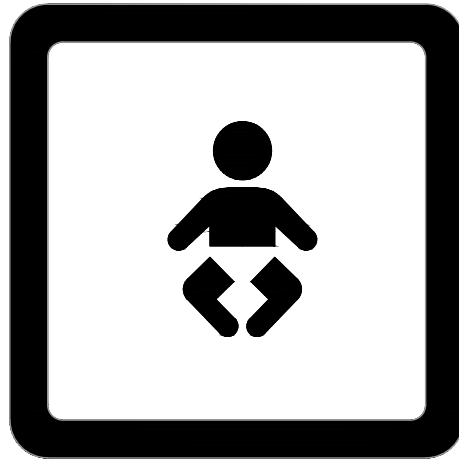
Question 3.
The signs featured below are used in hospital wards. The first one indicates 'general information' for a baby changing station. It features a black pictogram on a white background with a black border.

Complete the other signs by:

a. colouring the safe condition sign for first aid; (2)
b. colouring the warning sign for radiation; (3)
c. colouring the mandatory sign and writing down its meaning; (3)
d. drawing **TWO** sketches and a final prohibition sign entitled "NO ACCESS FOR PEDESTRIANS" using the conventional shape and colour. (8)

(Total: 16 marks)

(a)

- general information -
baby changing station
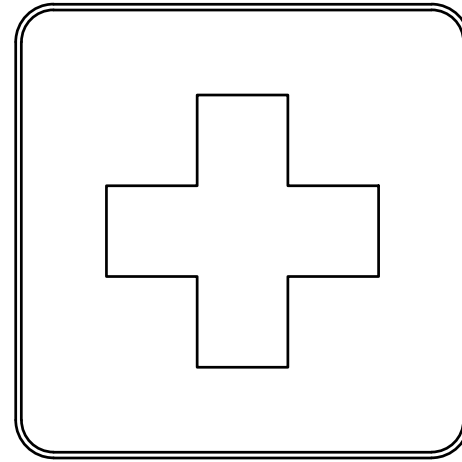
- safe condition -
first aid

(b)
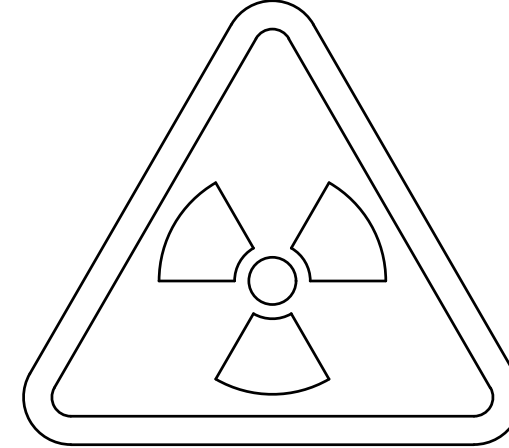
- warning -
radiation

(c)
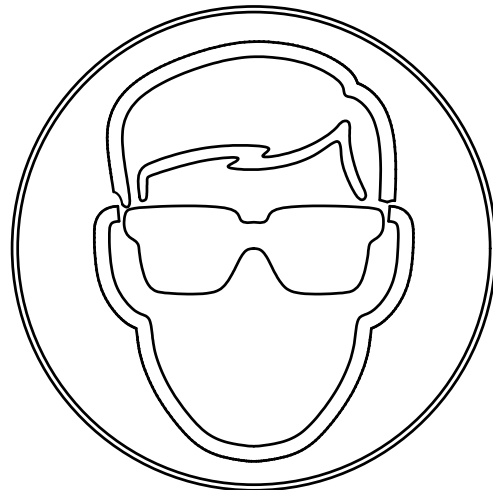
- mandatory -
_____
_____

(d)

space for two sketches

(e)

final drawing

- prohibition -
no access for pedestrians

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

GRAPHICAL COMMUNICATION - PAPER IIA (Page 3 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.

INDEX NUMBER : _____

Question 4.
Four towing vehicles are pulling an aeroplane in the directions and with the magnitudes shown.

a. Draw a freehand sketch of the vector diagram in the space provided below.   (2)
b. Based on your freehand sketch and by using a scale of 30 mm to represent 1 kN,
    construct graphically the vector diagram to find the resultant force exerted on the aeroplane.   (8)
c. In Table A, state the magnitude and the acute angle of the resultant to the horizontal.   (3)
d. Show the direction of the resultant by adding an arrowhead to it on the vector diagram.   (1)

(Total: 14 marks)

2 kN

2.6 kN

2 kN

3 kN
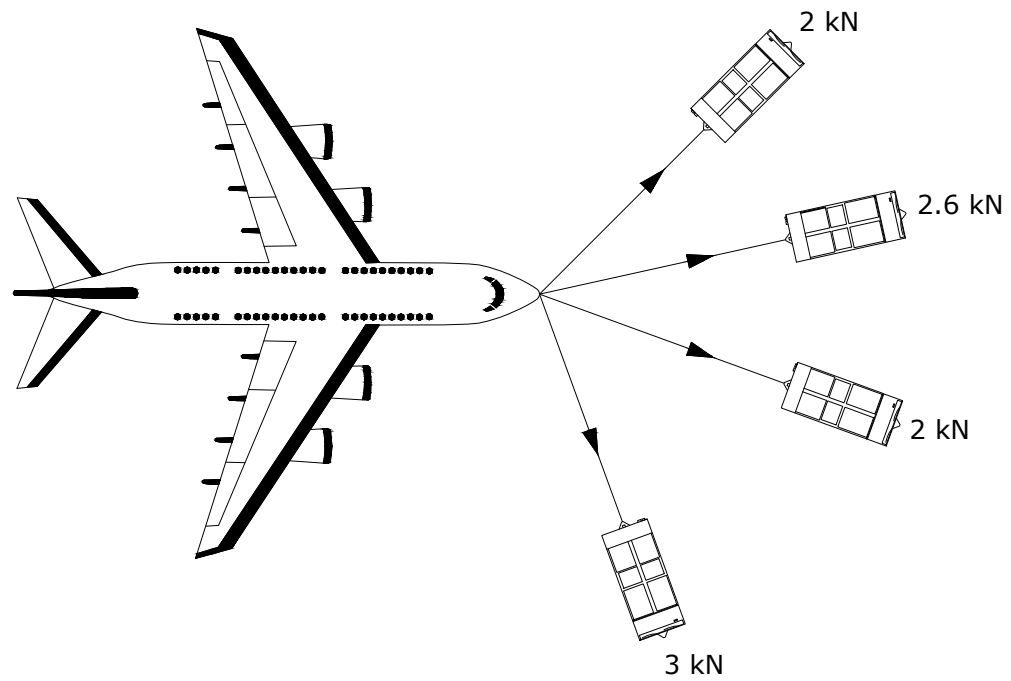
space for freehand sketch

TABLE A

Resultant force exerted on the aeroplane: _____kN

Acute angle of the resultant to the horizontal: _____°

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

GRAPHICAL COMMUNICATION - PAPER IIA (Page 4 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.

INDEX NUMBER : _____

Question 5.

The results of a survey on the use of the Internet were issued. These have been presented in three tables. Table A shows the use of the Internet in Malta compared to average use in other countries of the European Union (EU). Table B shows the preferred technological means for accessing the Internet remotely. Table C shows the reasons why the Internet is mostly used.

Use the information supplied in these tables to complete:

a.   the line graph for Table A;   (3)
b.   the 3D pie chart and legend for Table B;   (7)
c.   the isometric bar graph and legend for Table C.   (6)

(Total: 16 marks)

TABLE A

age category	Malta	EU
16 - 24	100%	90%
25 - 34	95%	85%
35 - 44	90%	75%
45 - 54	85%	70%
55 - 64	65%	65%
65 - 74	45%	35%
legend	——————	— — — — —

line graph

(age category)
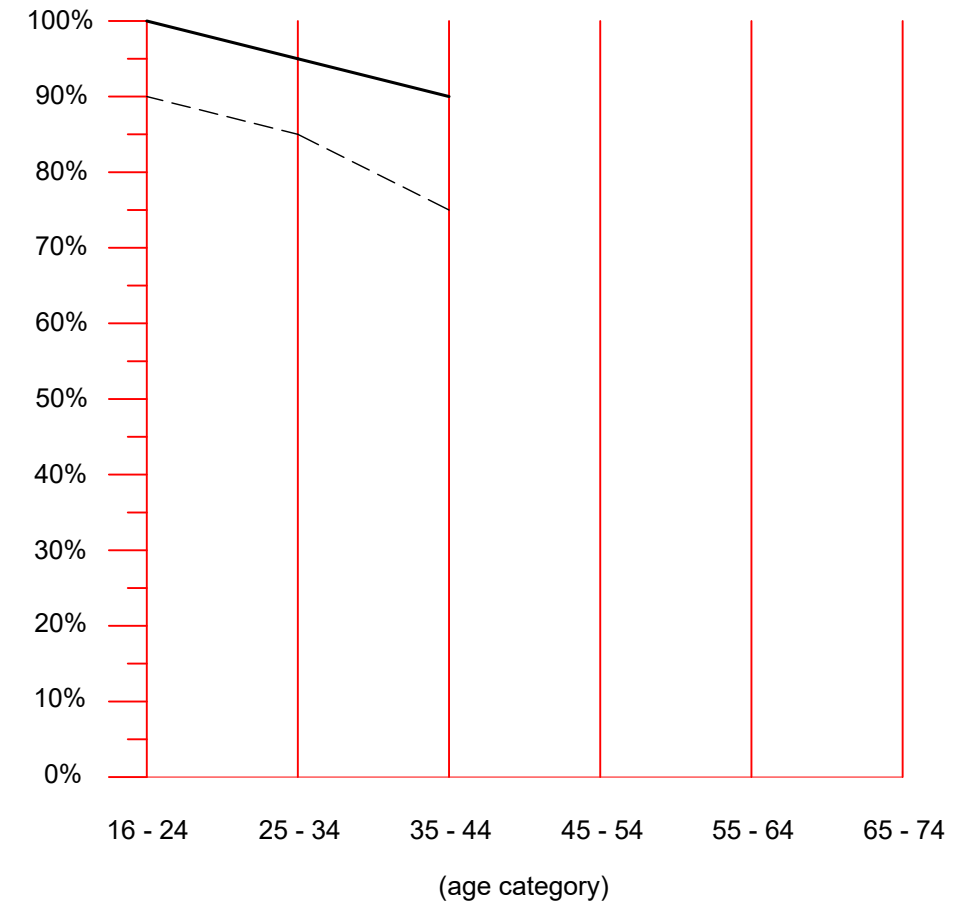
TABLE B

smartphones	65%
laptops	20%
tablets	15%

legend (colour)

space for calculations

pie chart
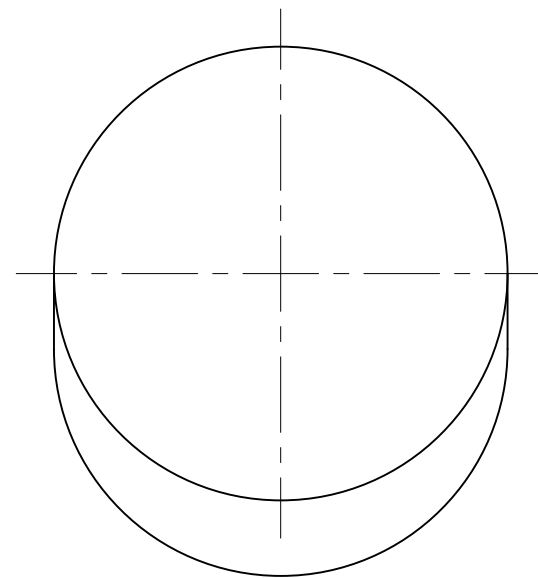
TABLE C

news	10%
online services	15%
entertainment	25%
communication	50%

legend (colour)

isometric bar graph

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

GRAPHICAL COMMUNICATION - PAPER IIA (Page 5 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.   INDEX NUMBER : _____
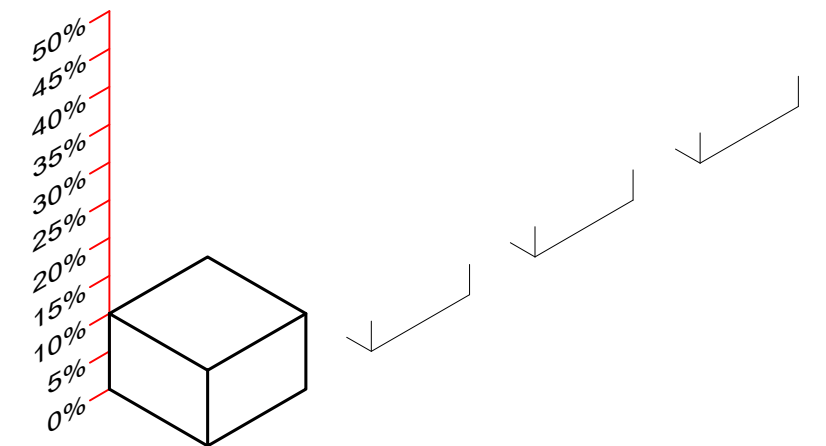
Question 6.

A 3D view, a front elevation, a plan, and an incomplete end elevation of a kite festival trophy are given.

The trophy consists of a kite-shaped prism intersecting a cylinder.

a. Complete the end elevation showing clearly the curve of intersection between the kite-shaped prism
    and the cylinder.   (8)
b. Construct the surface development of the cylindrical portion of the trophy.   (6)
c. Construct the surface development of the truncated kite-shaped prism.   (6)
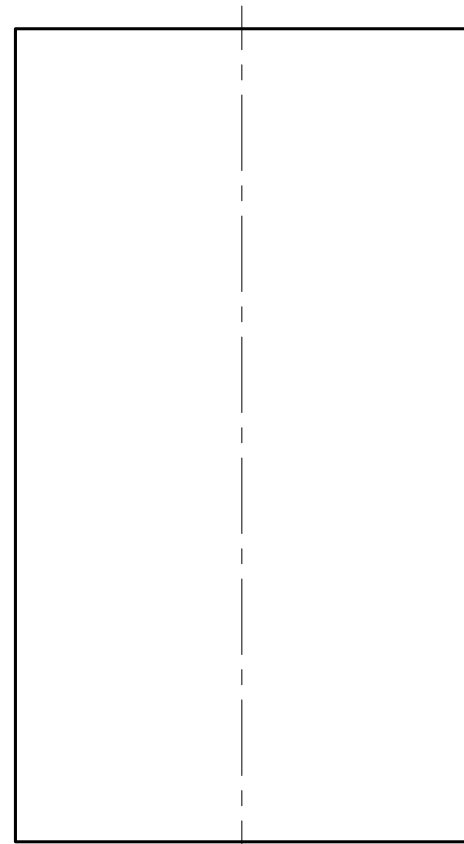
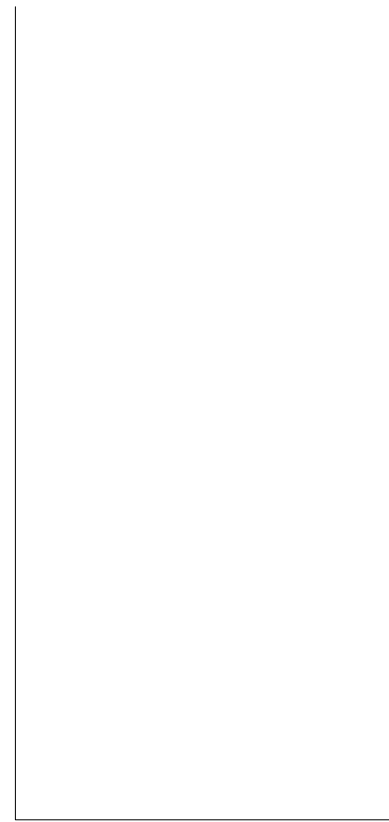Note: Leave all constructions visible.   **(Total: 20 marks)**

KITE
FESTIVAL
2022

Illustration of
trophy
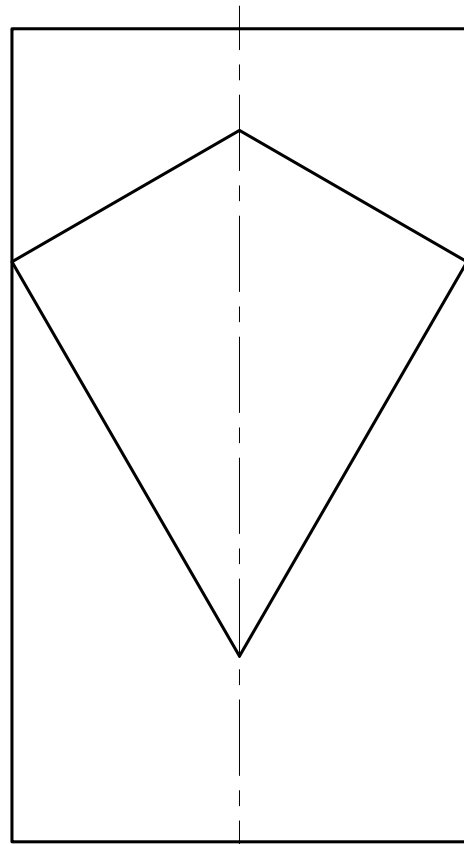
FRONT ELEVATION

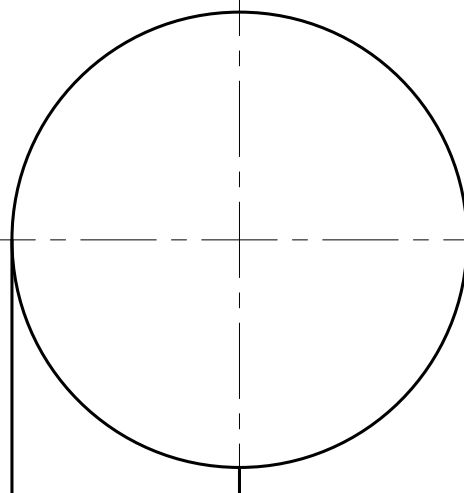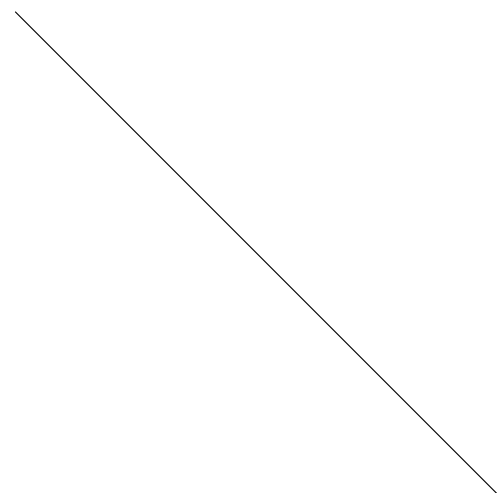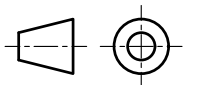END ELEVATION

SURFACE DEVELOPMENT OF THE CYLINDRICAL PORTION OF THE TROPHY

PLAN

SURFACE DEVELOPMENT OF TRUNCATED KITE-SHAPED PRISM

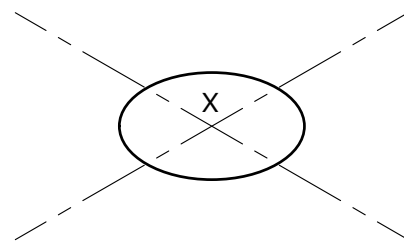MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD,   UNIVERSITY OF MALTA,   MSIDA

GRAPHICAL COMMUNICATION - PAPER IIA (Page 6 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.

INDEX NUMBER : _____

Question 7.
A front elevation and a plan of a machined block are shown on the right.

a. In the space provided below draw a pictorial freehand sketch of this block. (3)
b. Use the starting lines provided to complete the machined block in isometric. Estimate any missing dimensions. (7)

(Total: 10 marks)

space for freehand sketch

FRONT ELEVATION

20
40

X

PLAN

50
R25
50
Ø20
15
60
25

X

X

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

GRAPHICAL COMMUNICATION - PAPER IIA (Page 7 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m. INDEX NUMBER : _____
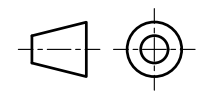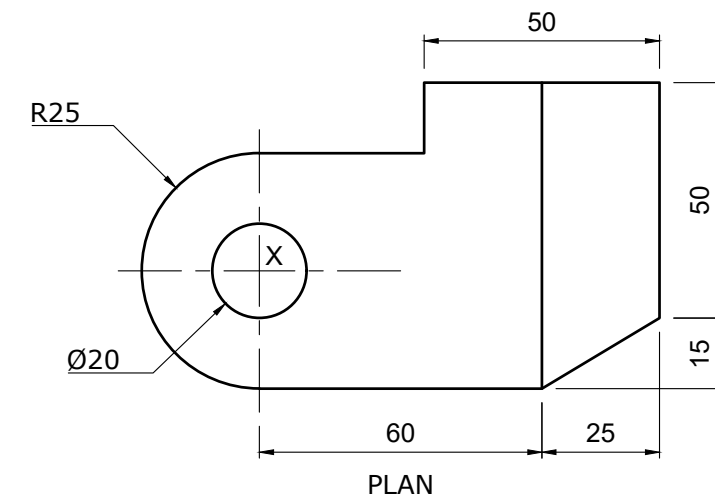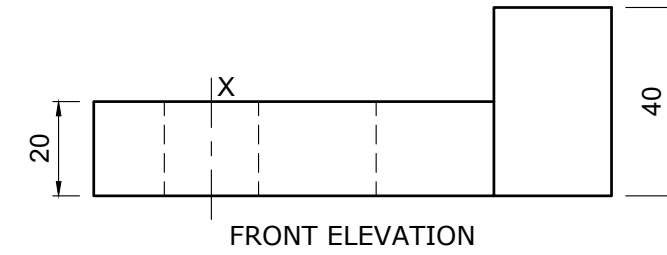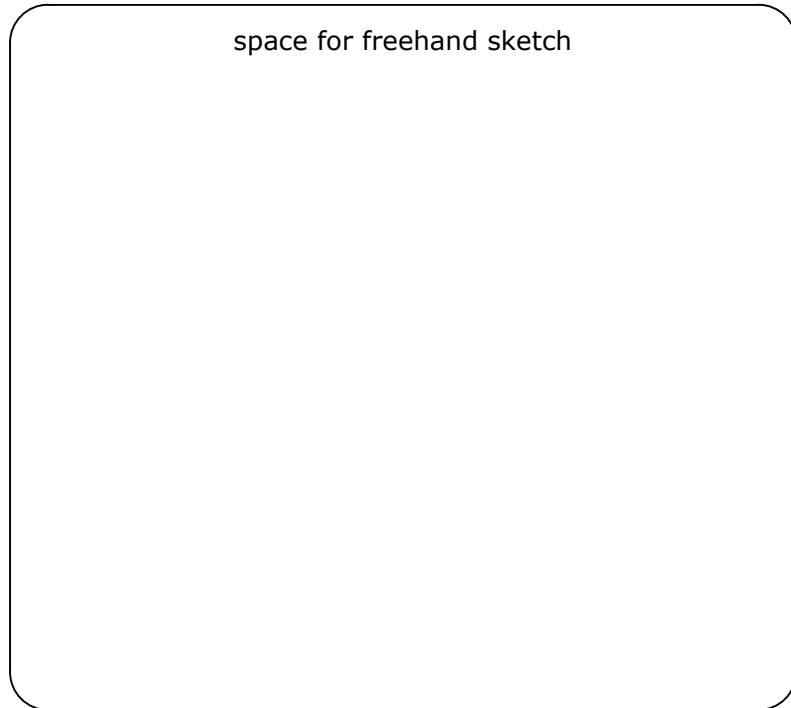
Question 1.

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

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 3:   MOVE G,M; DRAW A,M; DRAW B,N; DRAW C,N; DRAW D,P; DRAW E,O;
          DRAW G,Q; DRAW I,O:

ACI 7:   MOVE I,F; DRAW F,F; DRAW A,K; DRAW H,H; DRAW I,H:
          MOVE H,H; DRAW F,F:

ACI 1:   MOVE A,K; DRAW F,J; DRAW I,N:
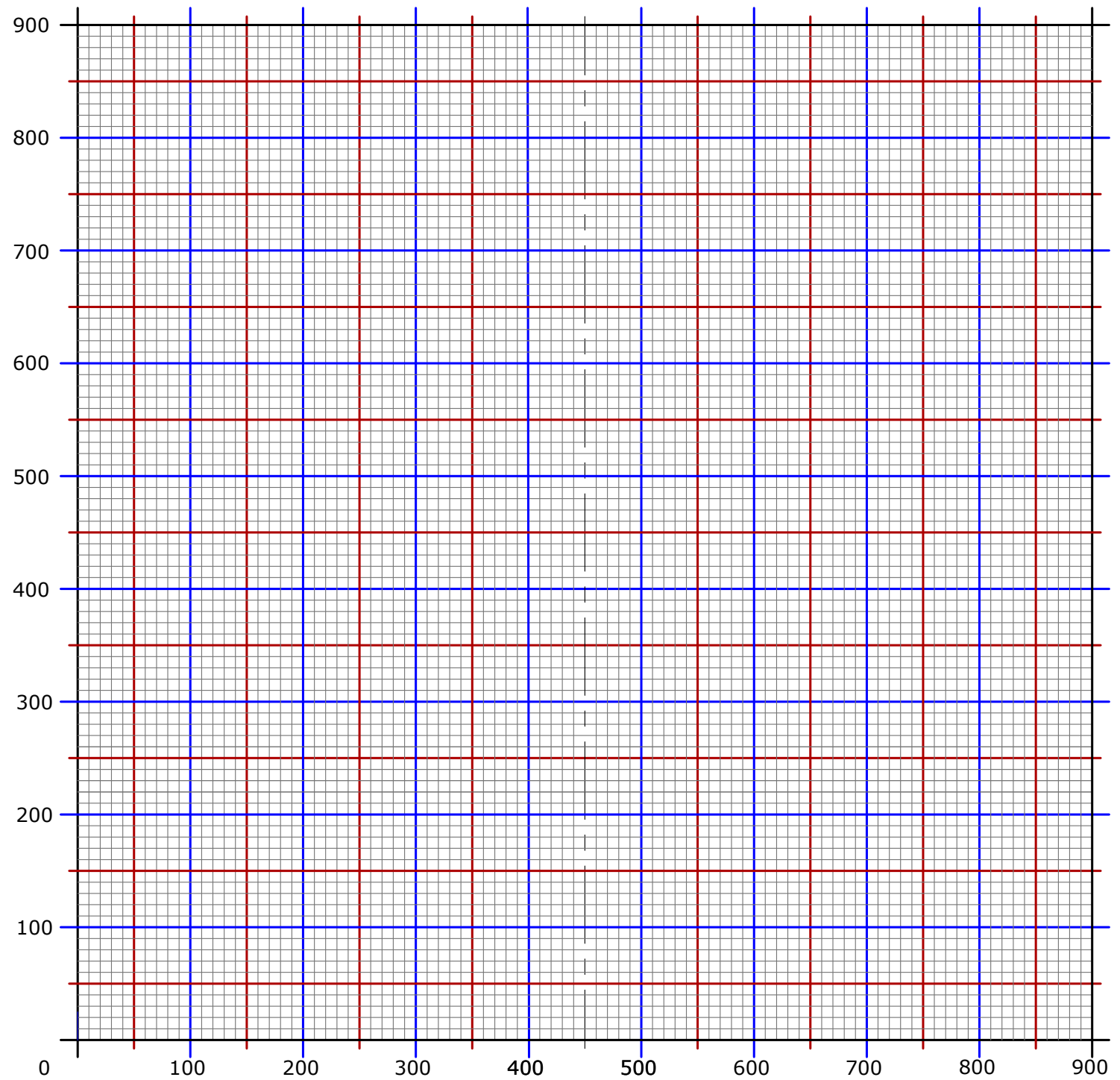   MOVE I,K; DRAW G,I; DRAW F,J:

ACI 5:   MOVE I,E; DRAW A,E:
ACI 5:   MOVE I,C; DRAW C,C:
ACI 5:   MOVE I,A; DRAW E,A:

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	GREEN	BLACK	RED	BLUE
ACI No.	3	7	1	5

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)

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

GRAPHICAL COMMUNICATION - PAPER IIB (Page 1 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.
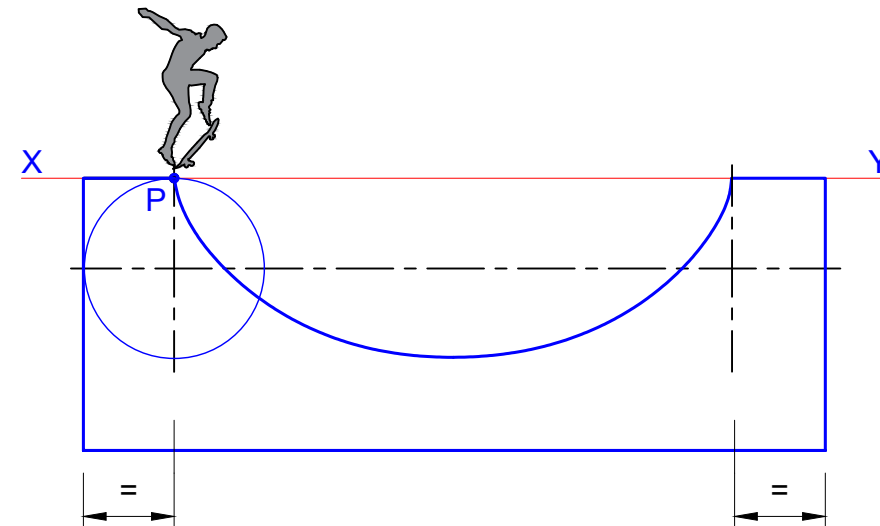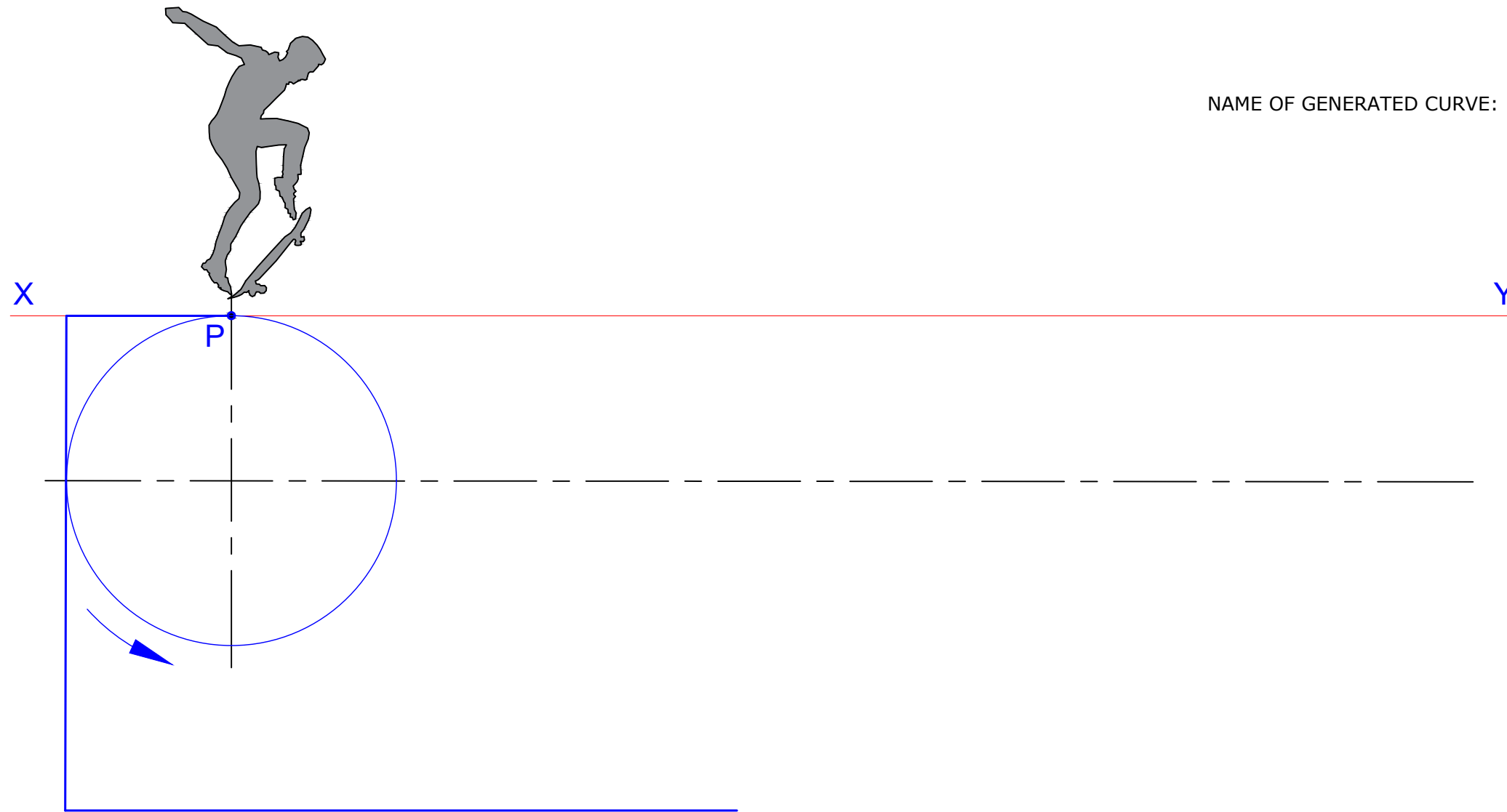
INDEX NUMBER : _____

Question 2.

The end view of a skate ramp is given on the right. The ramp is generated by the locus of point **P** on a circle which rolls anticlockwise for one revolution below directing line XY.

a.   Draw this ramp by using the starting lines below.   (12)
b.   Complete the rest of the drawing.   (1)
c.   State the name of the generated curve.   (1)

(Total: 14 marks)

X   Y

NAME OF GENERATED CURVE: _____

X   Y

P

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

GRAPHICAL COMMUNICATION - PAPER IIB (Page 2 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.
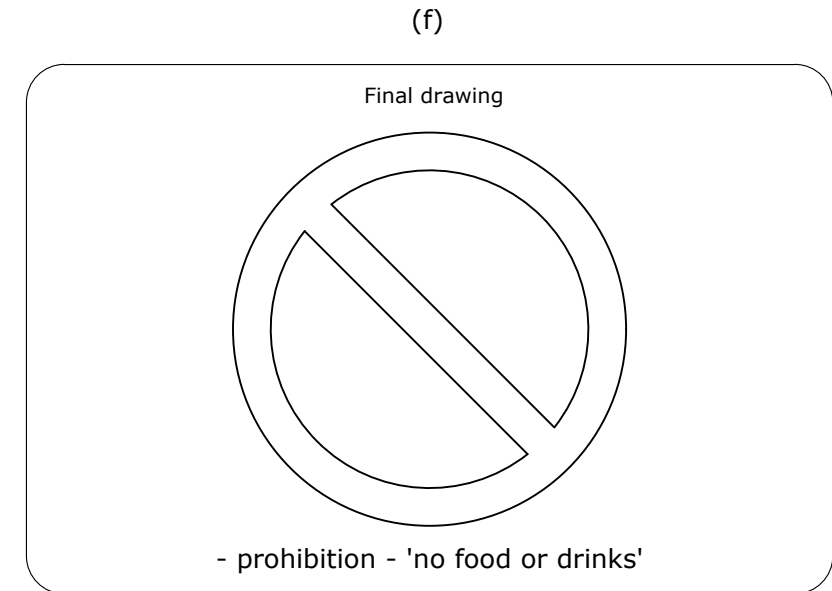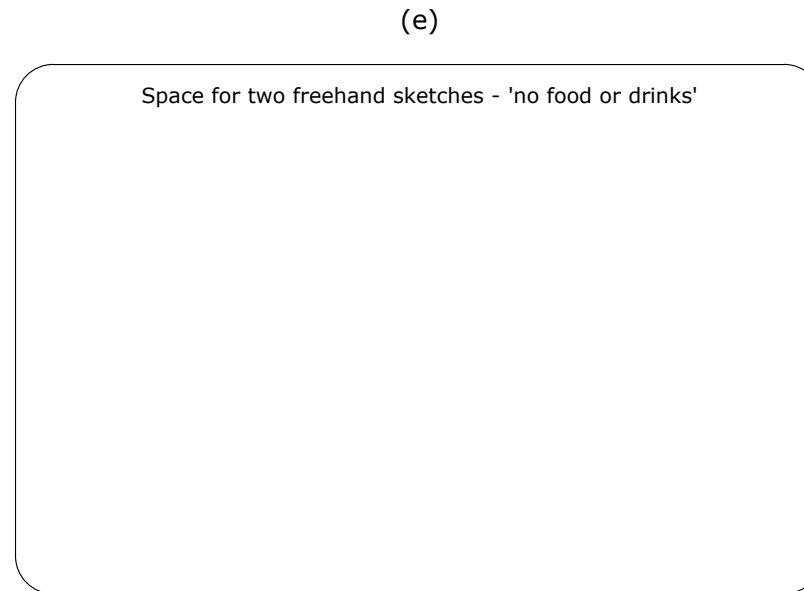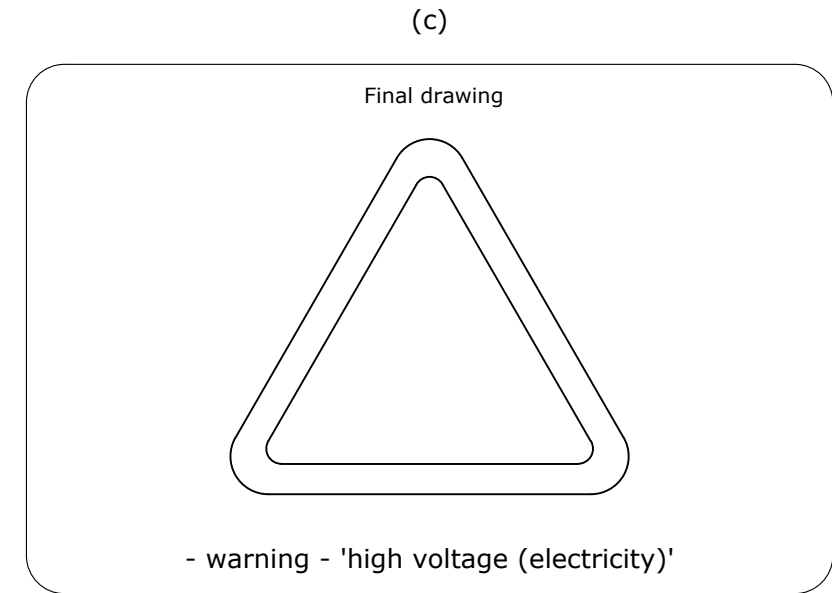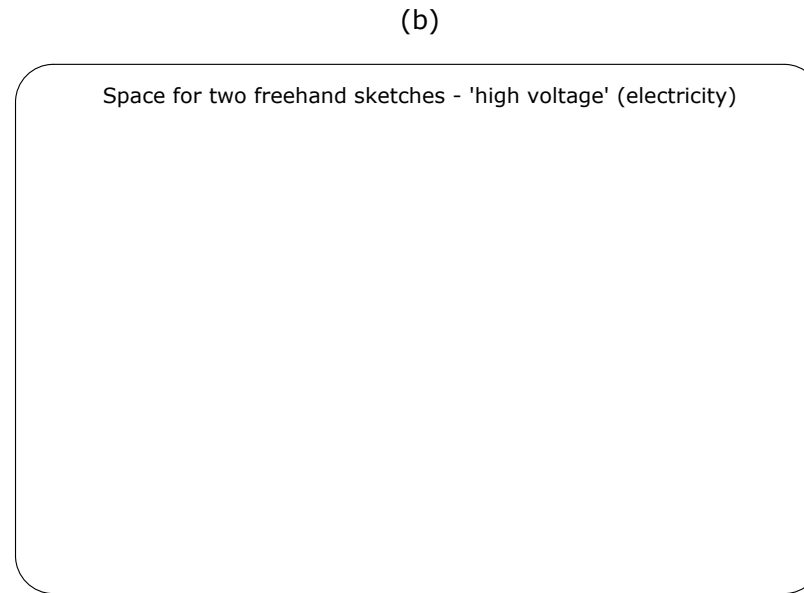
INDEX NUMBER : _____

Question 3.
The signs below indicate a warning and a prohibition sign respectively.

a. Complete the warning sign (a) by applying the missing conventional colour.   (2)
b. Produce **TWO** freehand sketches to generate ideas for a warning sign indicating 'high voltage (electricity)' (b).   (2)
c. Use conventional colours together with the sketches generated in part (b) to produce a 'high voltage (electricity)' warning sign (c).   (4)
d. Complete the prohibition sign (d) by applying the missing conventional colour.   (2)
e. Produce **TWO** freehand sketches to generate ideas for a prohibition sign indicating 'no food and drinks' (e).   (2)
f. Use conventional colours together with the sketches generated in part (e) to produce a 'no food or drinks' prohibition sign (f).   (4)

(Total: 16 marks)

(a)

- warning -
'strong magnetic field'

(b)

Space for two freehand sketches - 'high voltage' (electricity)

(c)

Final drawing

- warning - 'high voltage (electricity)'

(d)

- prohibition -
'do not drink'

(e)

Space for two freehand sketches - 'no food or drinks'

(f)

Final drawing

- prohibition - 'no food or drinks'

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

GRAPHICAL COMMUNICATION - PAPER IIB (Page 3 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.   INDEX NUMBER : _____

Question 4.
Three towing vehicles are pulling an aeroplane in the directions and with the magnitudes shown.

a. Draw a freehand sketch of the vector diagram in the space provided below.   (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 aeroplane.   (8)
c. In Table A, state the magnitude and angle of the resultant to the horizontal.   (3)
d. Show the direction of the resultant by adding an arrowhead to it on the vector diagram.   (1)

(Total: 14 marks)

6 kN

7.8 kN

6.3 kN
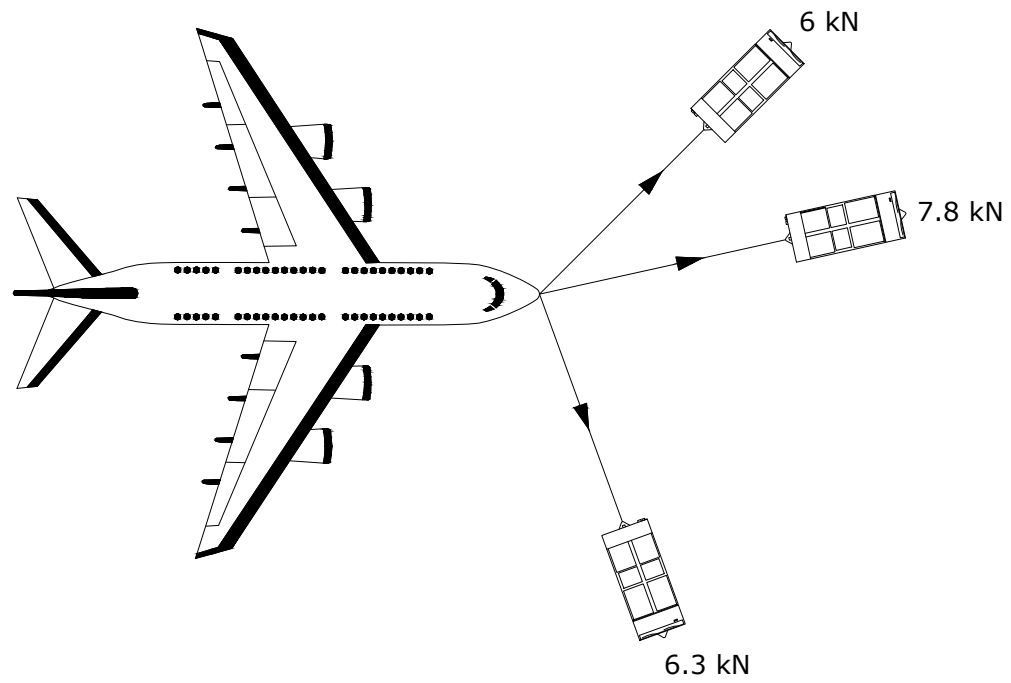
space for freehand sketch

TABLE A

Resultant force exerted on the aeroplane: _____kN

Angle of the resultant to the horizontal: _____°

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

GRAPHICAL COMMUNICATION - PAPER IIB (Page 4 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.   INDEX NUMBER : _____

Question 5.

The results of a survey on the use of the Internet were issued. These have been presented in three tables. Table A shows the use of the Internet in Malta compared to average use in other countries of the European Union (EU). Table B shows the preferred technological means for accessing the Internet remotely. Table C shows the reasons why the Internet is mostly used.

Use the information supplied in these tables to complete:

a.   the line graph for Table A;   (3)
b.   the pie chart and legend for Table B;   (6)
c.   the isometric bar graph and legend for Table C.   (7)

(Total: 16 marks)

TABLE A

age category	Malta	EU
16 - 24	100%	90%
25 - 34	95%	85%
35 - 44	90%	75%
45 - 54	85%	70%
55 - 64	65%	65%
65 - 74	45%	35%
legend	——————	— — — — —

line graph

(age category)

TABLE B

legend (colour)

space for calculations

smartphones	65%
laptops	20%
tablets	15%

pie chart

TABLE C

legend (colour)

news	10%
online services	15%
entertainment	25%
communication	50%

bar graph

news   online services   entertainment   communication

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

GRAPHICAL COMMUNICATION - PAPER IIB (Page 5 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.

INDEX NUMBER : _____
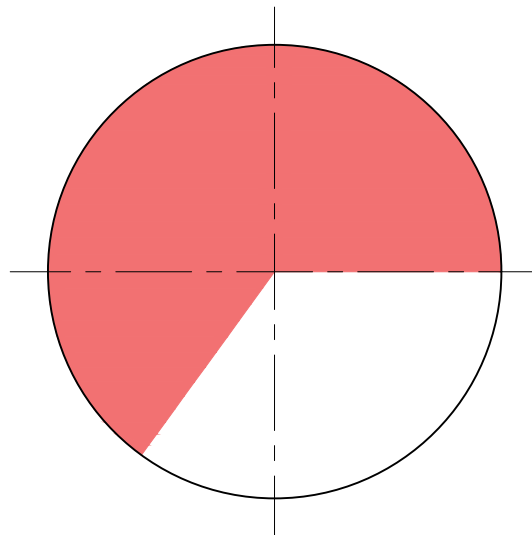
Question 6.
A 3D illustration, a front elevation, a plan, and an incomplete end elevation of a kite festival trophy are given. The trophy consists of a kite-shaped prism intersecting a cylinder.
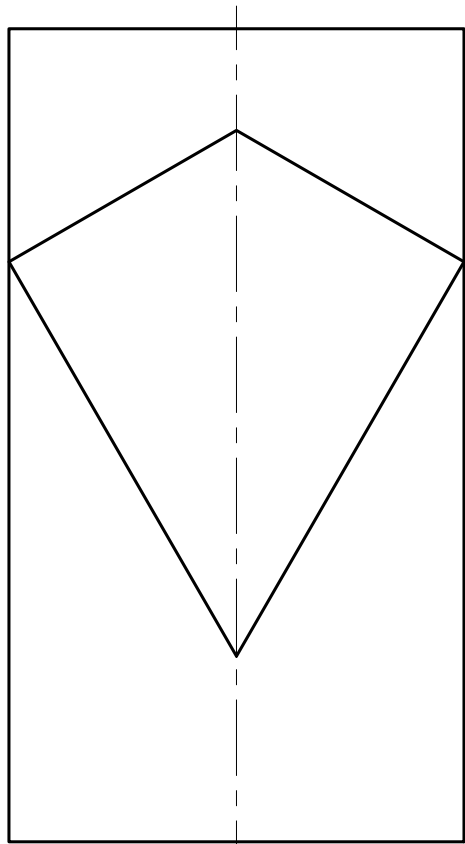a. Complete the end elevation showing clearly the curve of intersection between the kite-shaped prism and the cylinder. (8)
b. Construct the surface development of the cylindrical portion of the trophy. (6)
c. Render in colour the base of the trophy (Material: wood). (6)
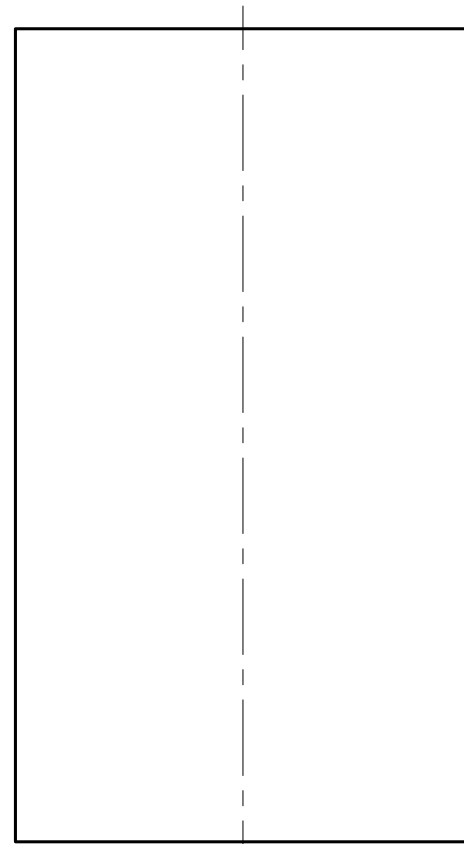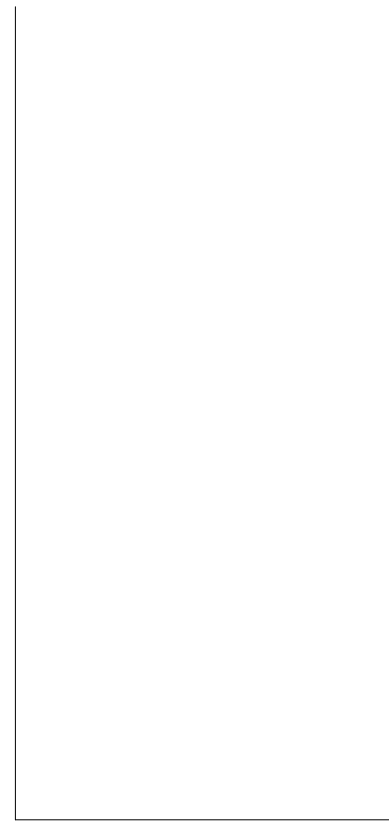
Note: Leave all constructions visible.

(Total: 20 marks)
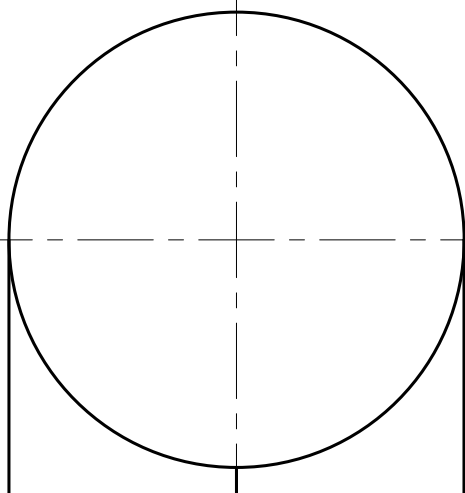
KITE
FESTIVAL
2022

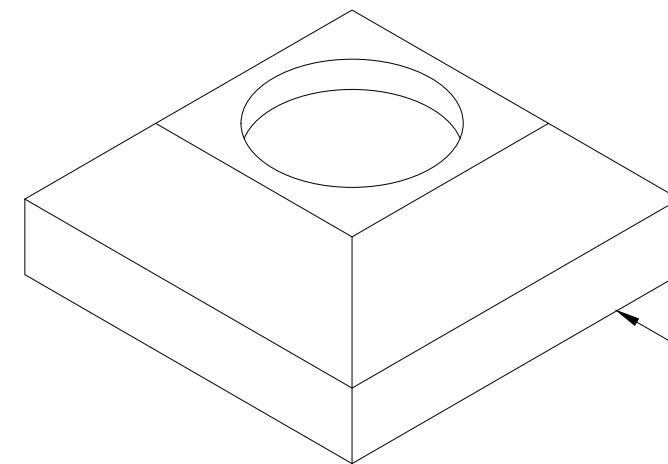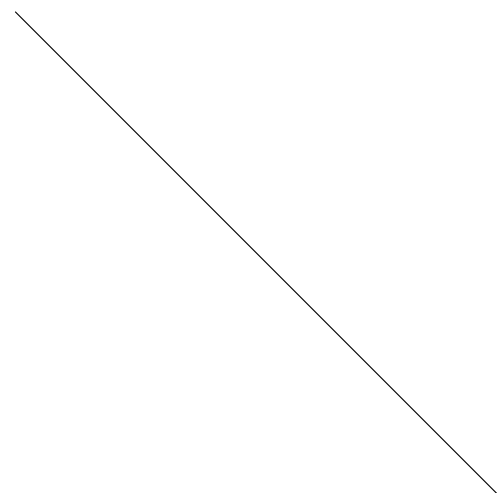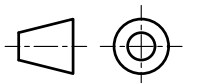Illustration of trophy

FRONT ELEVATION

END ELEVATION

PLAN

SURFACE DEVELOPMENT OF THE CYLINDRICAL PORTION OF THE TROPHY

BASE OF TROPHY
(MATERIAL: WOOD)

Question 7.
A front elevation and a plan of a machined block are shown on the right.

a.   In the space provided below draw a pictorial freehand sketch of this block.   (3)
b.   Use the starting lines provided to complete the machined block in isometric. Estimate any missing dimensions.   (7)

(Total: 10 marks)

20

X

FRONT ELEVATION

50

R25

X

Ø20

50

15

60   25

PLAN

space for freehand sketch

X

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

GRAPHICAL COMMUNICATION - PAPER IIB (Page 7 of 7) - ATTEMPT ALL QUESTIONS - DATE: 31st May 2022 - TIME : 4.00 p.m. to 6.05 p.m.