IM09.18m

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

INTERMEDIATE MATRICULATION LEVEL
2018 FIRST SESSION

SUBJECT:	**Engineering Drawing and Graphical Communication**
DATE:	2nd May 2018
TIME:	4:00 p.m. to 7:05 p.m.

Directions to Candidates

Write your index number where indicated at the top of all drawing sheets.

Only scientific calculators may be used. Programmable calculators are not allowed.

Unless otherwise stated:

a. B.S. or equivalent (ISO) recommendations should be adopted throughout your answers;
b. all dimensions are in millimetres, unless otherwise stated;
c. all answers are to be accurately drawn with instruments;
d. all construction lines must be left in each solution;
e. drawing aids may be used.

Dimensions not given should be estimated.

Careful layout and presentation are important.

Marks will be awarded for accuracy, clarity and appropriateness of constructions.

Colour/shading may be used where appropriate.

Section A: Attempt any **FOUR** questions from five.

Section B: Attempt any **ONE** question from two.

Section C: Attempt any **ONE** question from two.

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SECTION A

Attempt only FOUR questions from this section.

Question 1

Figure 1a shows a spherical bowl, an inverted conical shaped glass and an inverted spherical shaped glass on a plane horizontal surface.

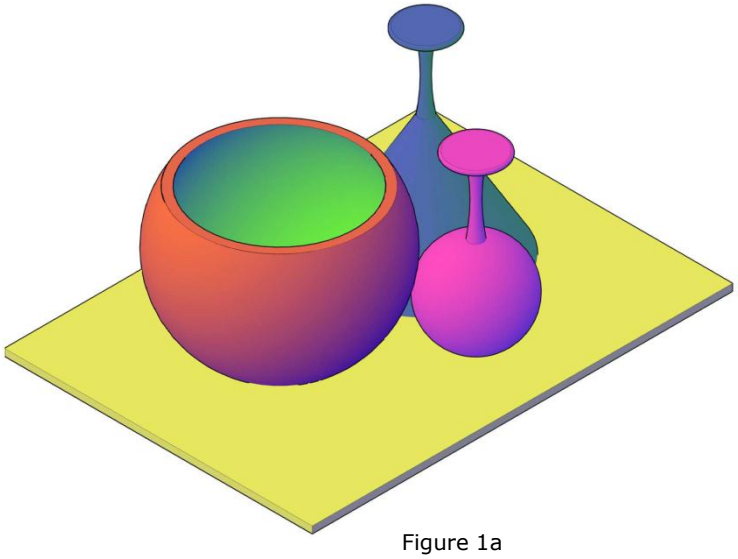


Figure 1a

a) Draw the **TWO** views of the spherical bowl and the inverted conical shaped glass presented in Figure 1b, showing how the points of contact in the two views are obtained. (3)

b) Draw the inverted spherical shaped glass shown in the front view on the right hand side of Figure 1b and show by construction the points of contact between the inverted spherical shaped glass and the inverted conical shaped glass. (4)

c) Construct and show the points of contact when the inverted spherical shaped glass is in mutual contact with the bowl and the inverted conical shaped glass. (6)

(Total: 13 marks)

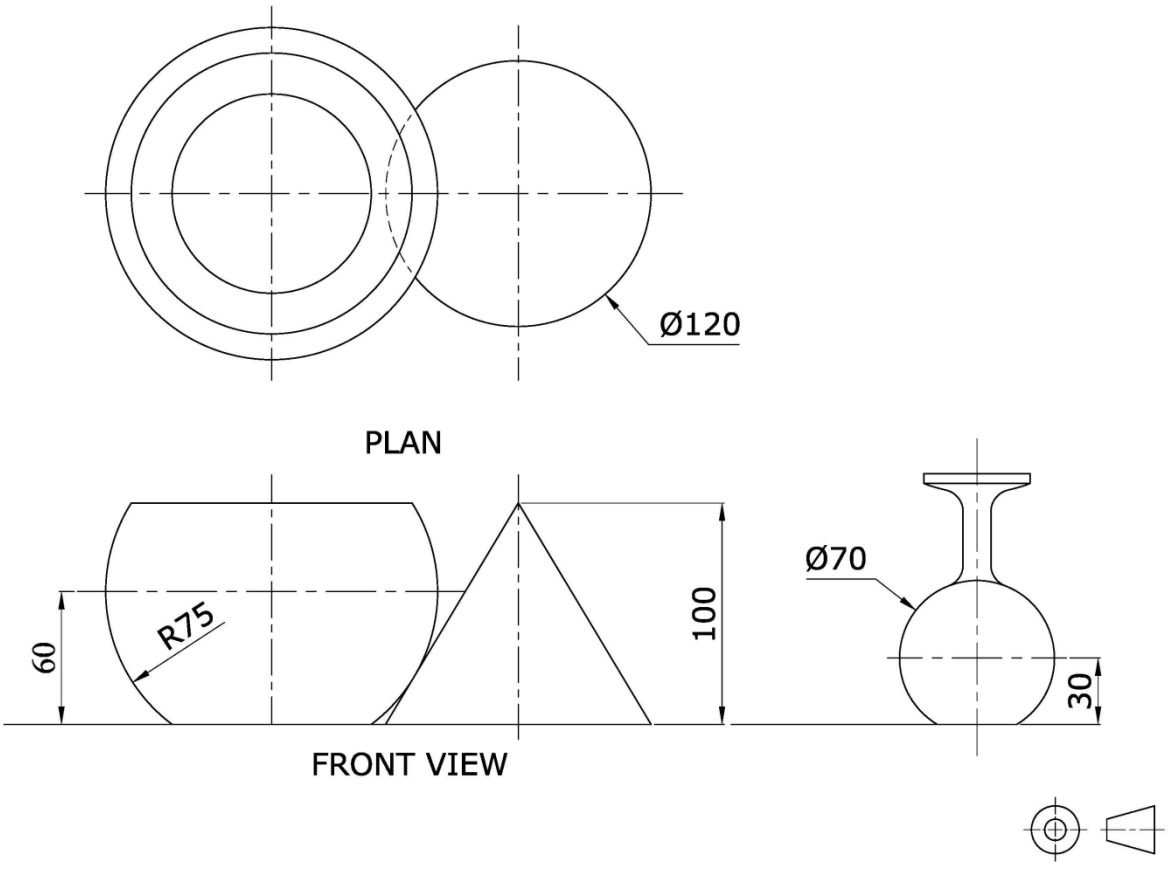


Figure 1b

Question 2

A nozzle of a vacuum cleaner is shown in Figure 2a. The nozzle is shaped and cut from an oblique cone as shown in Figure 2b.

a) Copy the given front view. (2)

b) Copy and construct the cuts on the plan showing all hidden details. (4)

c) Construct the necessary true lengths and draw a half surface development of the cut oblique cone. (7)

(Total: 13 marks)

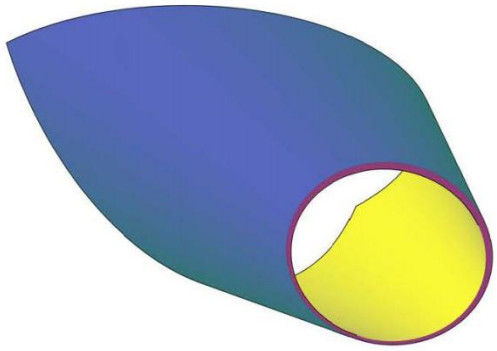


Figure 2a

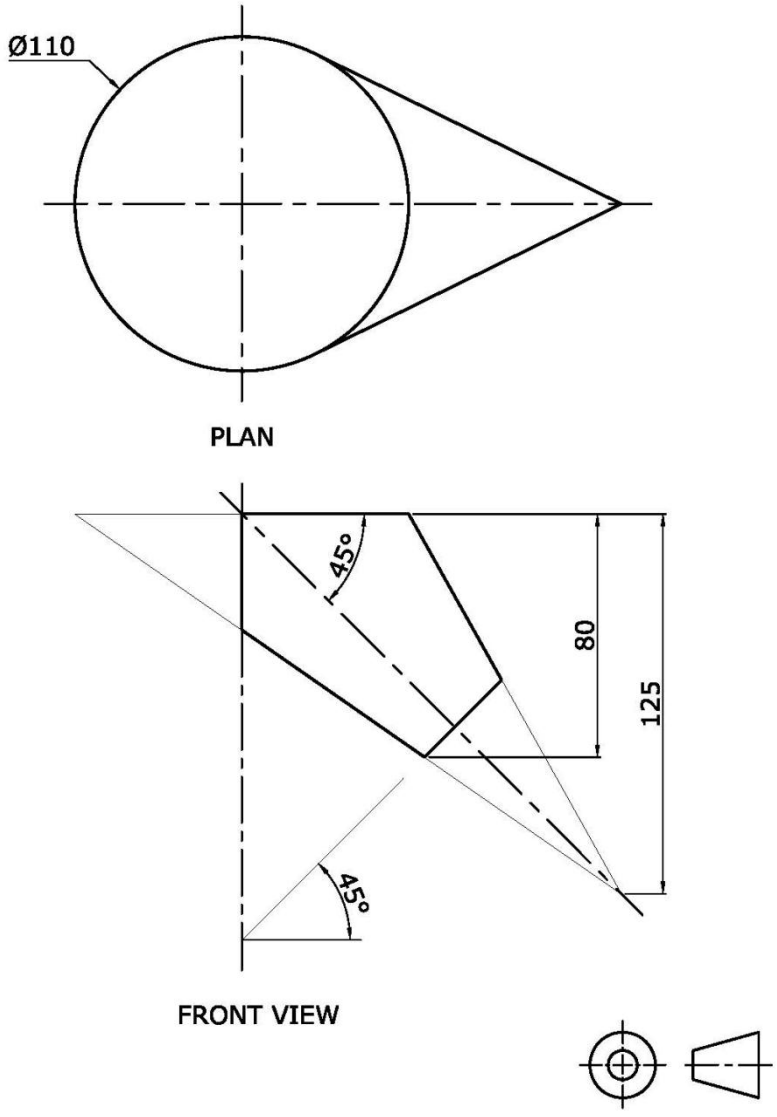


Figure 2b

Question 3

A triangular sign board shown in Figure 3a weighing 500 N is supported in the manner indicated in Figure 3b.

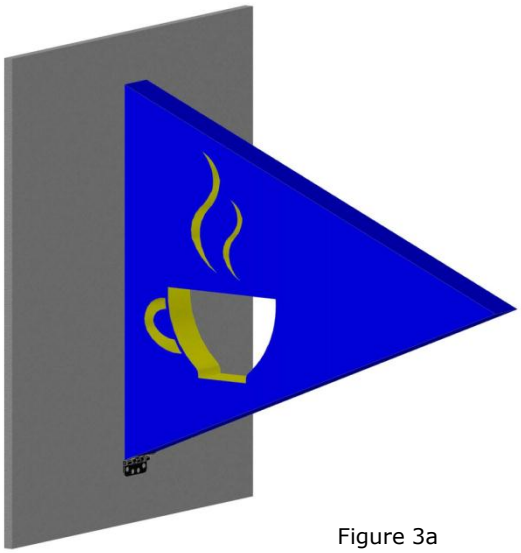


Figure 3a

a) Copy the space diagram shown in Figure 3b, use a scale of 100 mm representing 1 metre. Find by bisecting side ac and side bc (as shown in Figure 3b) the centre of gravity of the sign board. (2)

b) Find the point of concurrency and the angle of the reaction at the hinge. State the angle. (2)

c) Draw a vector diagram representing the weight of the sign by a line 200 mm long and determine graphically:
   i. the top reaction of the sign;
   ii. the magnitude and direction of the reaction of the hinge. (7)

d) Dimension the **THREE** sides of the vector diagram and print your answers neatly. (2)

(Total: 13 marks)

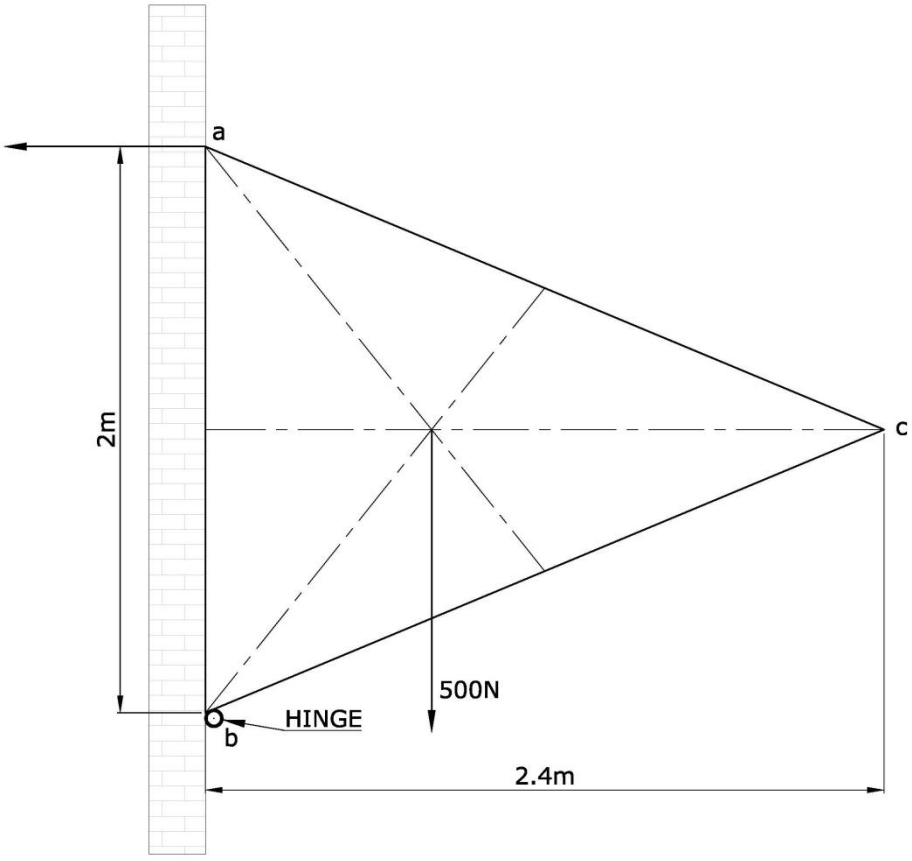


Figure 3b

Question 4

An illustration of the top corner of a room on the top of an old house is shown in Figure 4a. The masonry works were constructed to accommodate and support a flag pole. The lower end of the flag pole pass through the hole of the upper stone slab and rest in the hole of the lower stone.

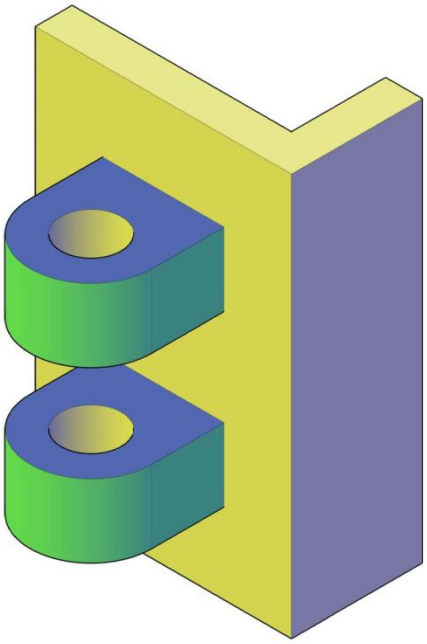


Figure 4a

a) Copy, full size, the front view and plan of the flag pole post shown in Figure 4b, ignore the background wall. (3)

b) Project an auxiliary plan of the flag post when viewed in the direction of arrow R. Do not present the wall and do not show hidden detail in this view. (10)

(Total: 13 marks)

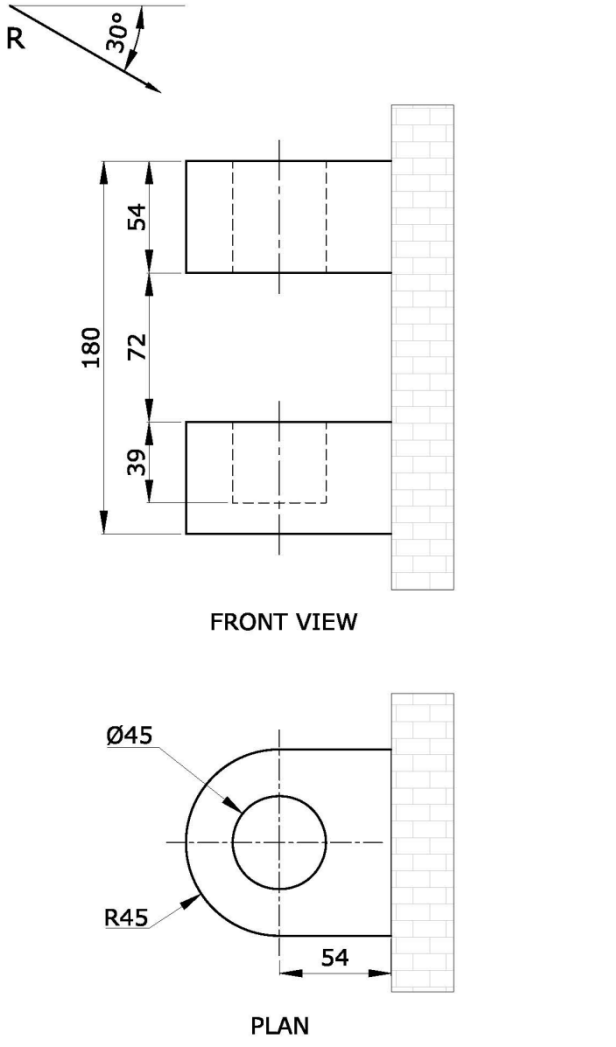


Figure 4b

Question 5

An intersection between an inverted right cone and a quadrilateral prism is shown in Figure 5a.

a) Draw, full size, the elevations of the cone shown in Figure 5b. Divide the plan into **TWELVE** equal parts and project the generators on the front view and end view. (2)

b) Complete the end view by including the quadrilateral. The edges of the prism 'c' and 'd' intersect the generators of the cone as shown in Figure 5b. (3)

c) Complete the front view by finding the interpenetrating curve between the inverted right cone and the quadrilateral prism. Show all hidden details. (4)

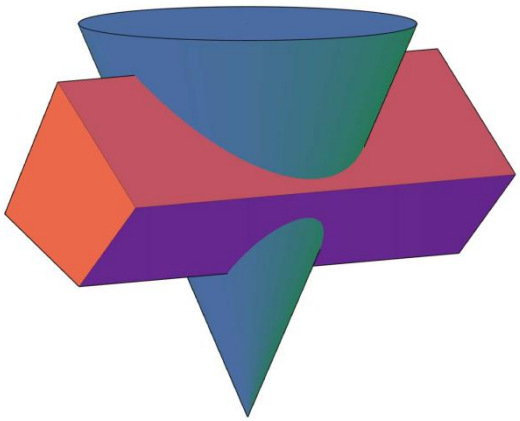


Figure 5a

d) Construct the curve of intersection on the plan. Show all hidden details. (4)

(Total: 13 marks)

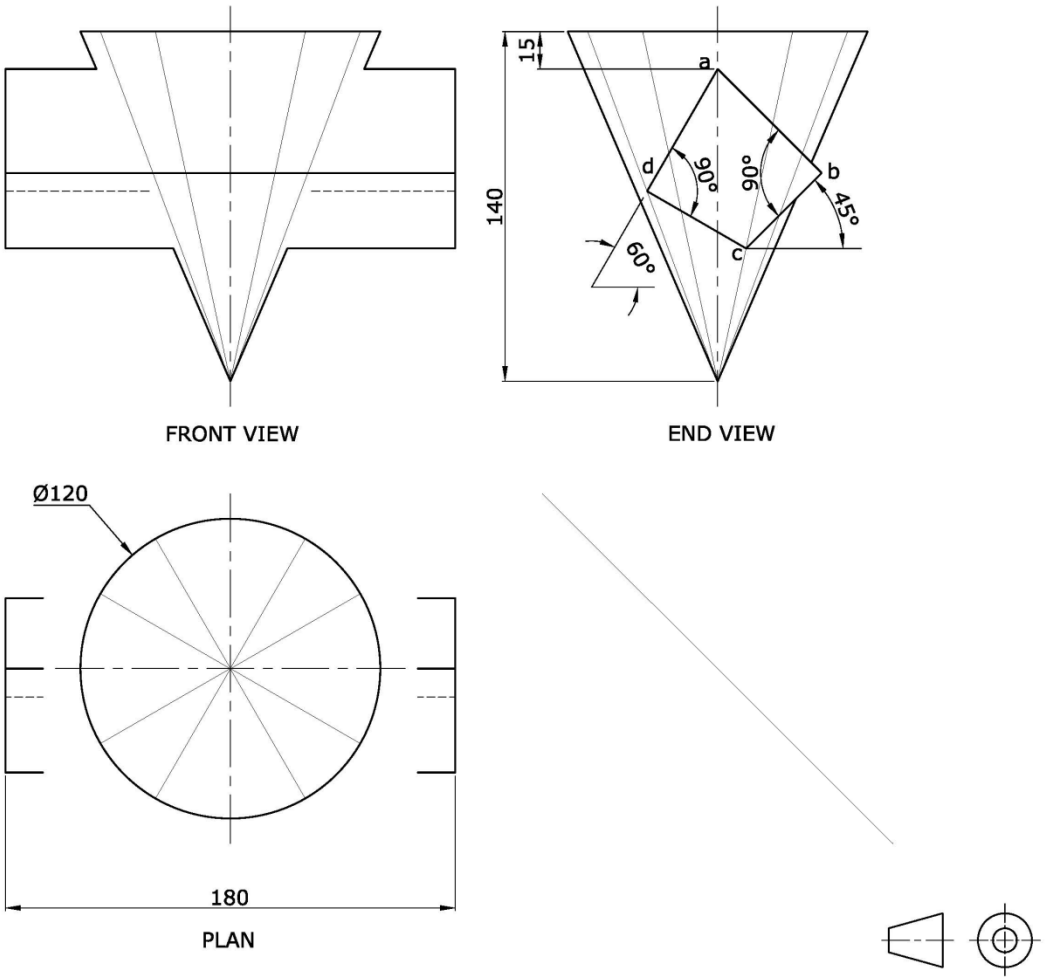


Figure 5b

SECTION B

Attempt only ONE question from this section.

Question 6

Figure 6a shows the illustration of a footstep bearing, in which the supporting pressure is vertically upwards, parallel to the shaft axis and the end of which rests within the bearing. The assembled bearing is suitable for supporting a 50 mm diameter vertical shaft.

Figure 6b on the attached A3 paper shows the orthographic drawing of the parts that together form the footstep bearing assembly.

The bearing is assembled as follows:

- the supporting bracket (Item 1) is secured to a horizontal surface by means of four retaining bolts (not shown). The supporting bracket has two bevelled edges and two recesses at the bottom face;
- the brass bush (Item 2) is inserted with its 76 mm diameter end in the 76 mm diameter hole of the supporting bracket (Item 1). The 100 mm diameter by 15 mm flange of the bush rest above the casting;
- the 50 mm diameter by 15 mm thick brass disc (Item 3) is placed in position in the 50 mm diameter hole of the brass bush (Item 2). This brass disc serves as a pad for the shaft;
- the 50 mm diameter end of the stepped shaft (Item 4) is inserted vertically in the 50 mm diameter hole of the bush (Item 2) and rests on the disc (Item 3). This allows the shaft to rotate freely during operation.

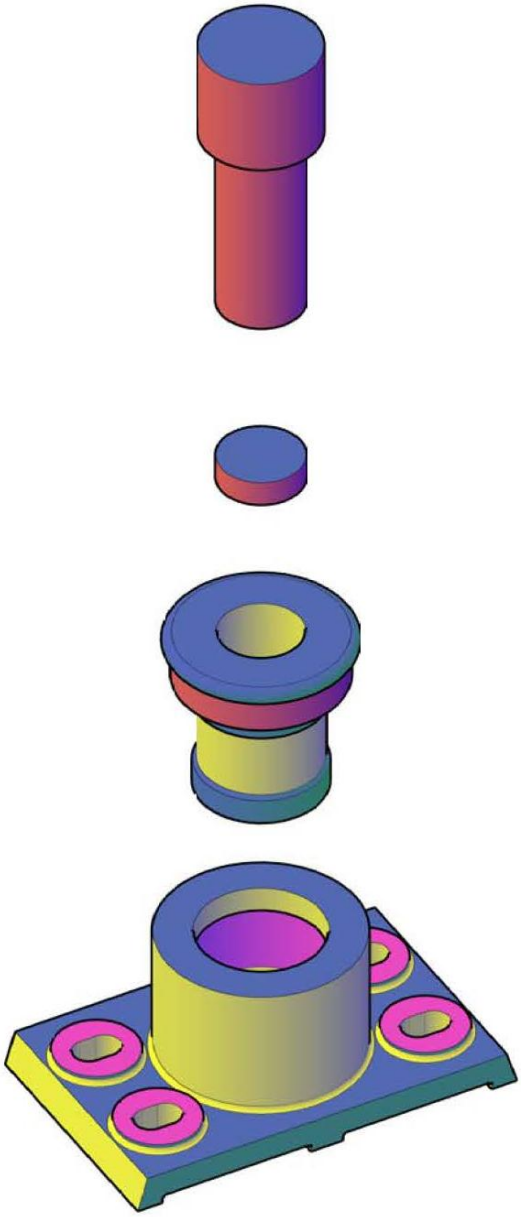


Figure 6a

Draw full size:

a) a sectional front view of the left hand side of the assembled footstep bearing along the section plane line X-X; (16)

b) an outside front view of the right hand side of the assembled footstep bearing. (8)

Do not show hidden detail. Include suitable fillet radii.

(Total: 24 marks)

Question 7

An illustration of a cam is shown in Figure 7a. The cam is made by machining a disc with bosses on each side.

a) Draw an isometric scale for the cam. (3)

b) Convert the dimensions of the cam given in the detailed drawing of the cam shown in Figure 7b. and draw the front view of the cam. Show how the centres of the radius of the two arcs, tangential to the two given circles are obtained. (5)

c) Construct the isometric view of the cam using the isometric scale. Place the indicated point T of the cam in the foreground (lowest point). (14)

d) Insert **THREE** leading dimensions, showing a diameter, a radius and a horizontal length. (2)

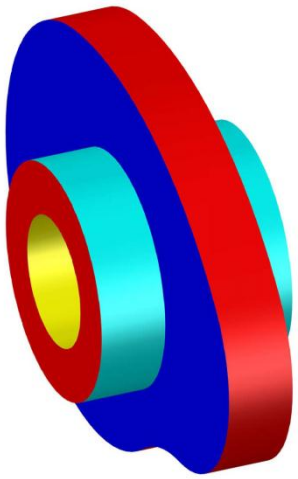


Figure 7a

(Total: 24 marks)

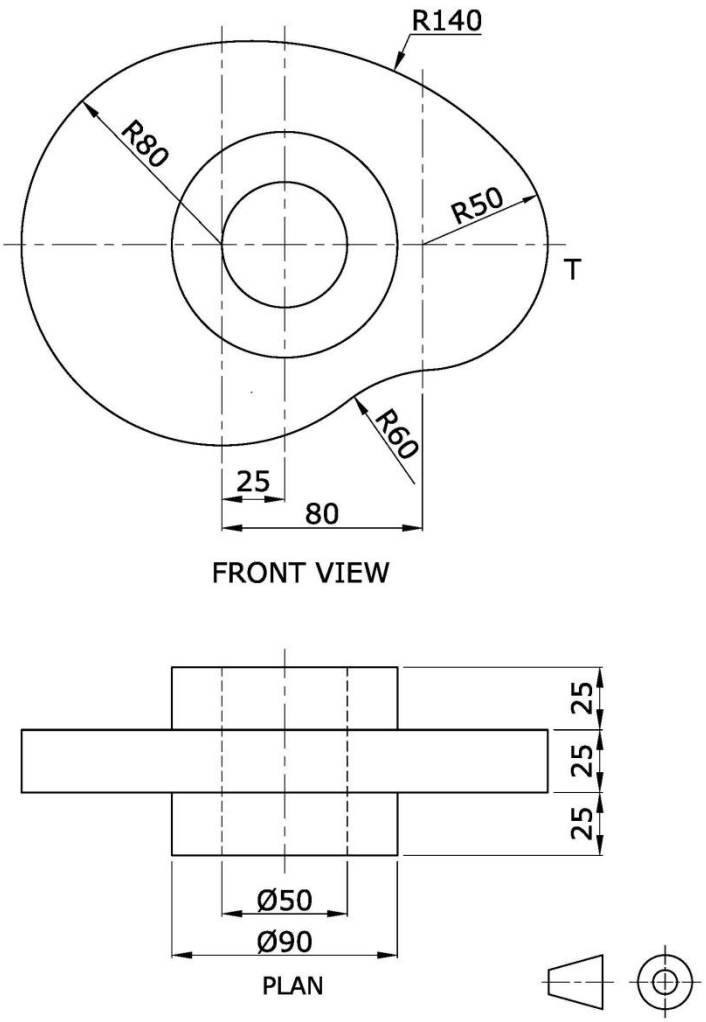


Figure 7b

SECTION C

Attempt only ONE question from this section.

Question 8

A couple came to you with the idea of a modern style bookshelf for their small library. The bookshelf can either be freestanding, or can be aligned to a wall. It should be stable, sturdy and safe, with at least two spacious shelves. The shelves should be robust and able to hold the weight of books on them. The material used can be either wood, glass or any material of your choice that will last for several years.

a) Based on the design brief given, produce **FOUR** sketches to illustrate your ideas for a bookshelf. Present the four sketches in four rectangles 120 mm by 100 mm. (12)

b) Construct a planometric drawing of your final solution for the book shelf. (10)

c) To enhance your solution, you must pay attention to the general layout of your A2 sheet. An example on how to compose your layout is shown in Figure 8. (2)

(Total: 24 marks)

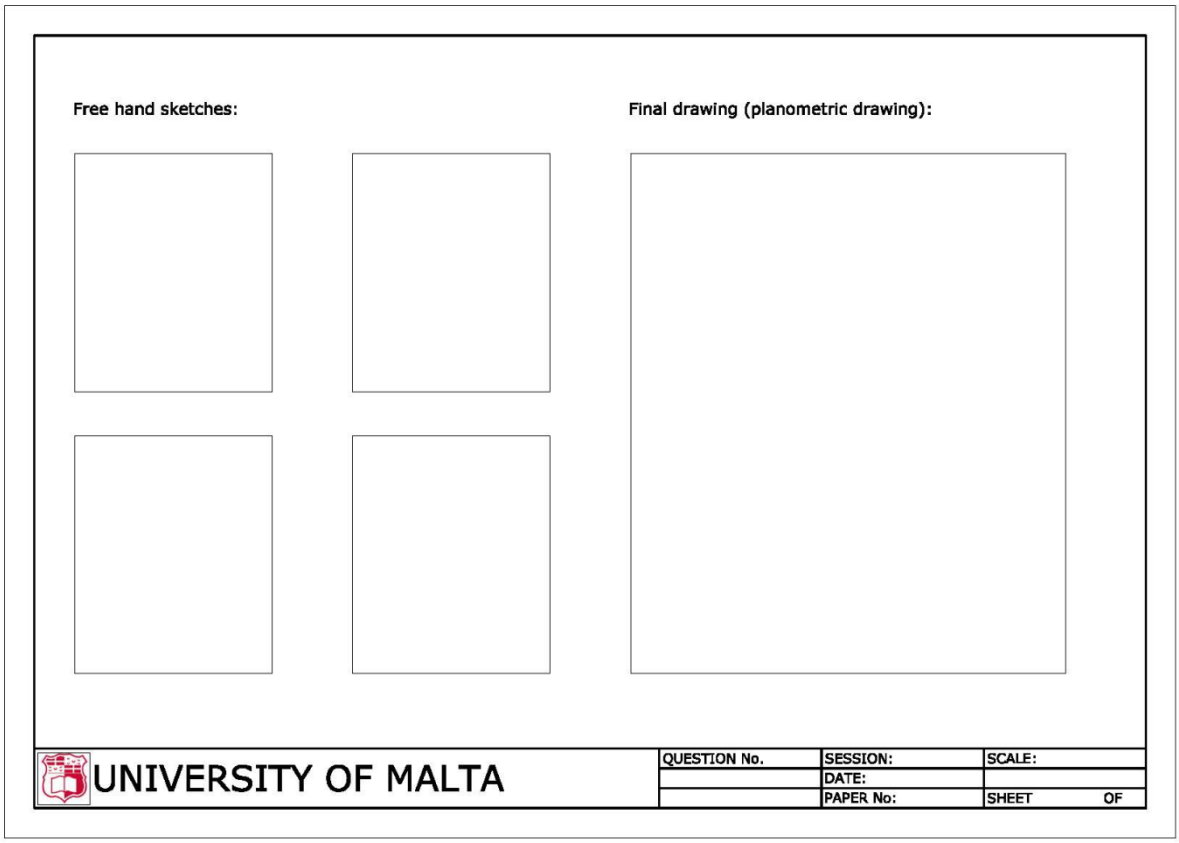


Figure 8

Question 9

An isometric drawing of a bathroom is shown in Figure 9a. The plan and front view of the bathroom are shown in Figure 9b. The bathroom includes a free-standing toilet, a free-standing cabinet with sink, a rectangular mirror on top of the cabinet and a rectangular bath with three steps to facilitate access to the bath. The bathroom also has a window above the toilet.

Use the dimensions given in the orthographic projection to construct an estimated single-point perspective of the bathroom, placing the vanishing point inside the window, as shown in both Figures 9a and 9b. (19)

Add a few free-hand drawn bathroom accessories of your choice in the bathroom. Render in colour your drawing to enhance its presentation. (5)

(Total: 24 marks)

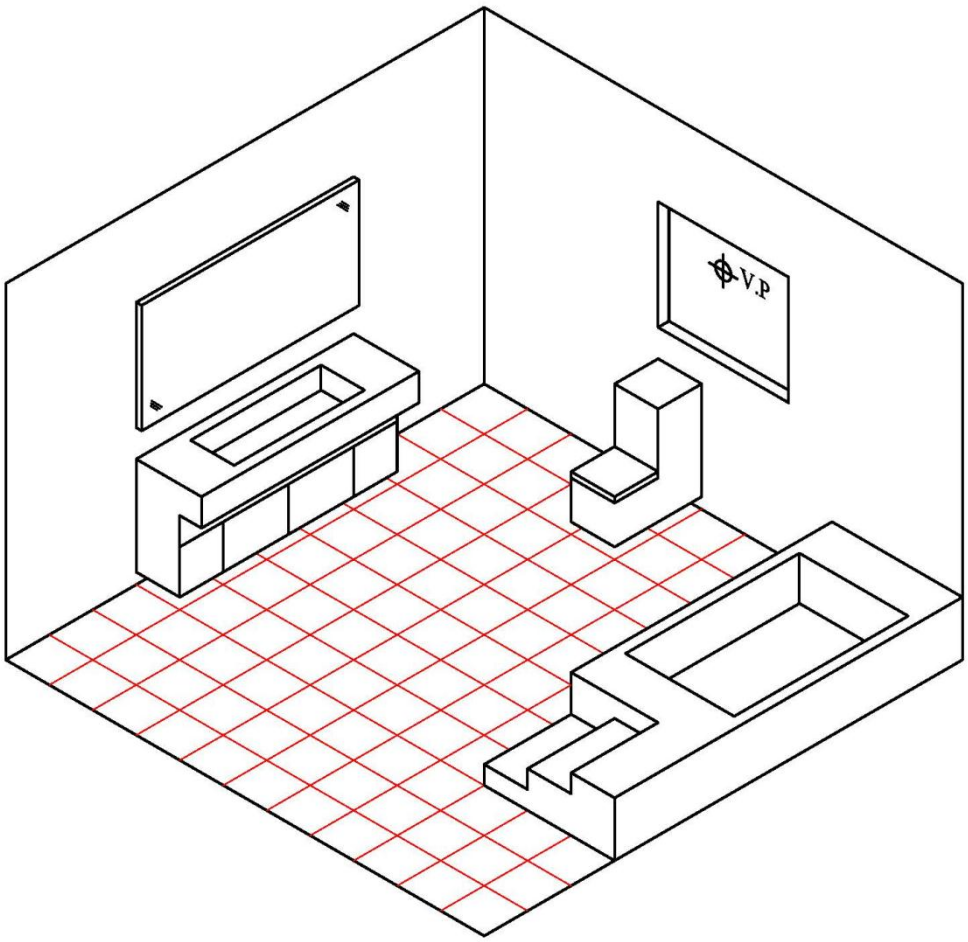


Figure 9a

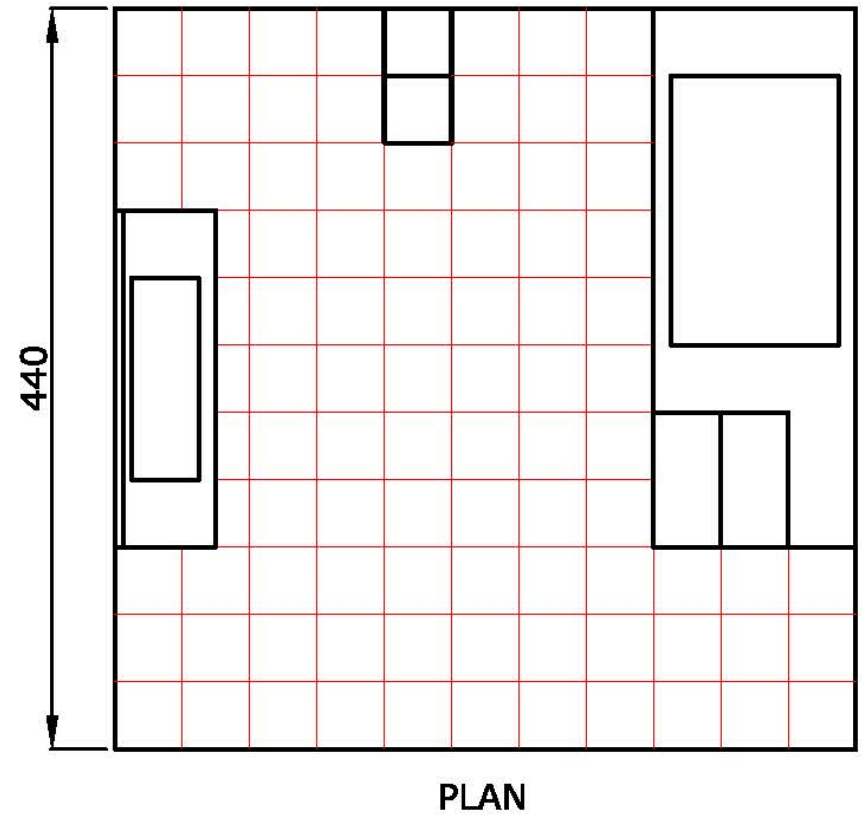
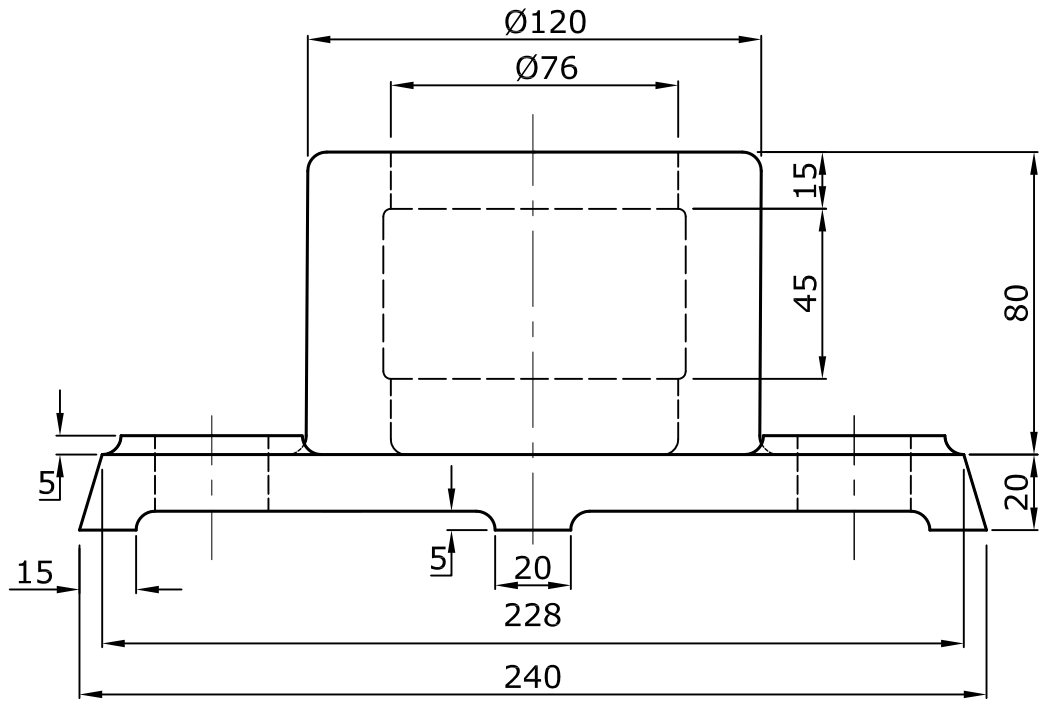
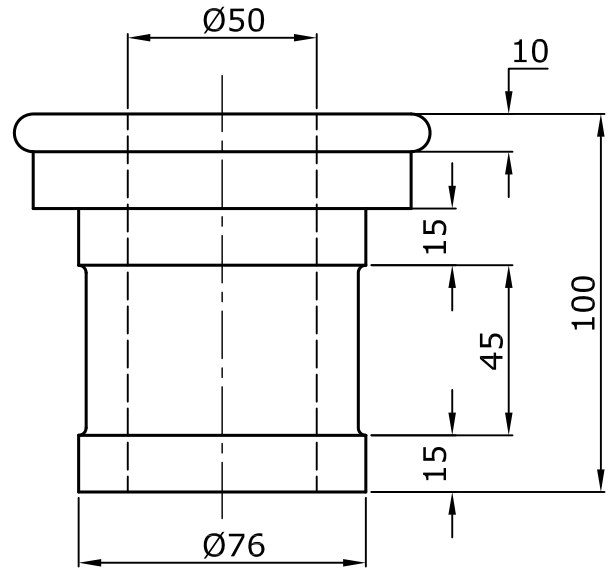


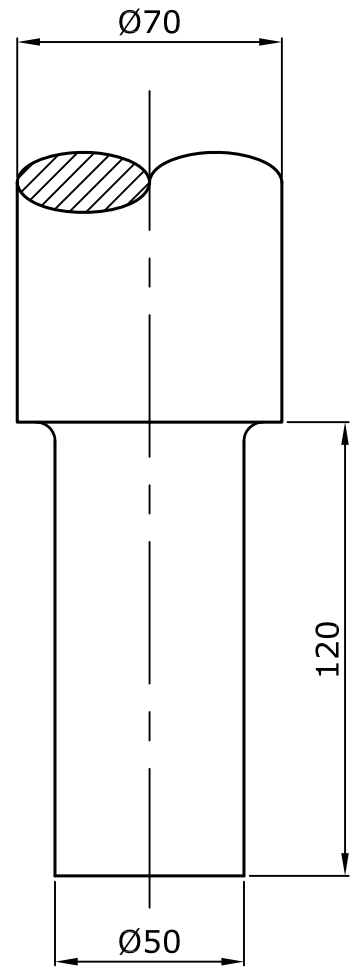
Figure 9b



FRONT VIEW

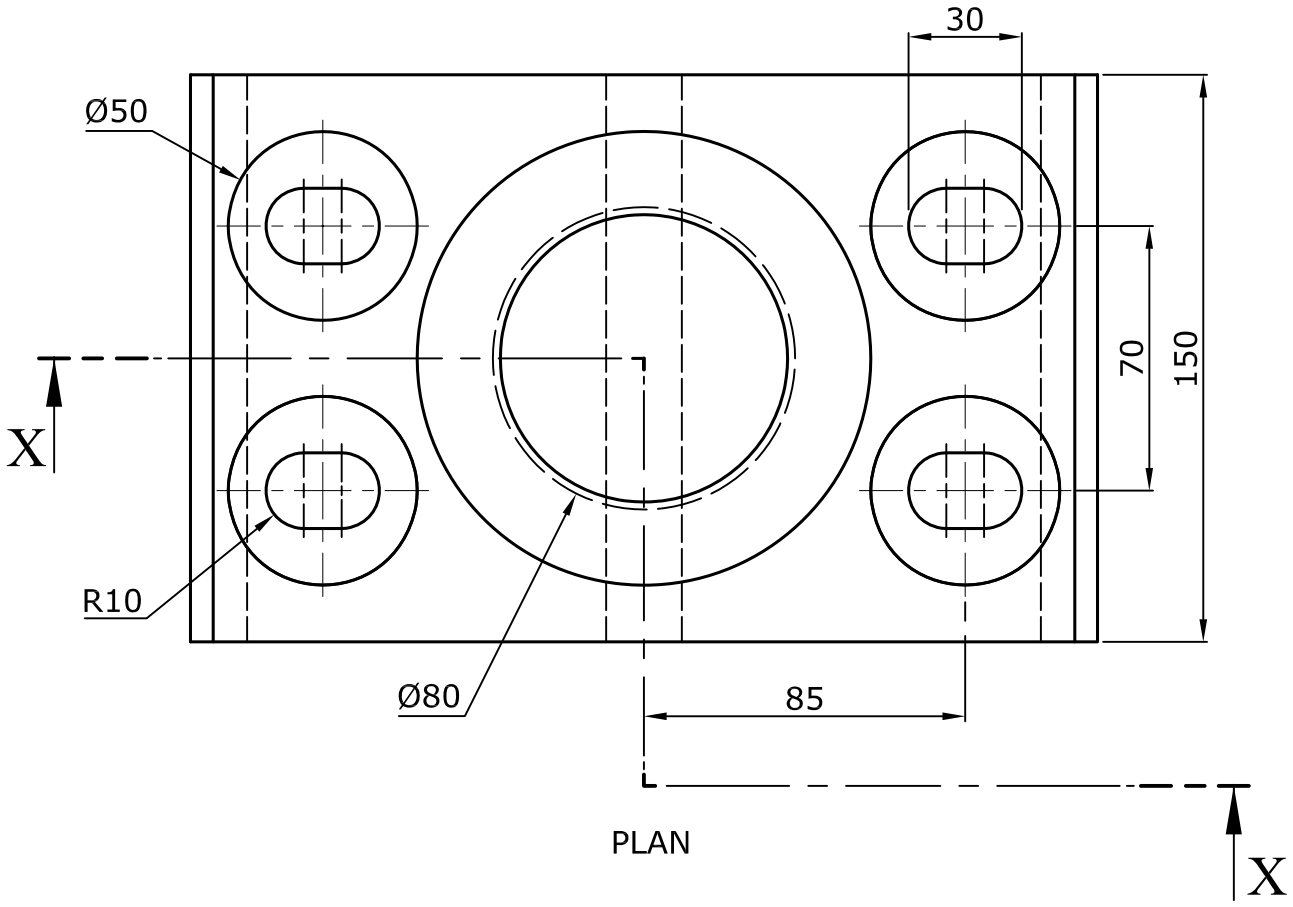


FRONT VIEW



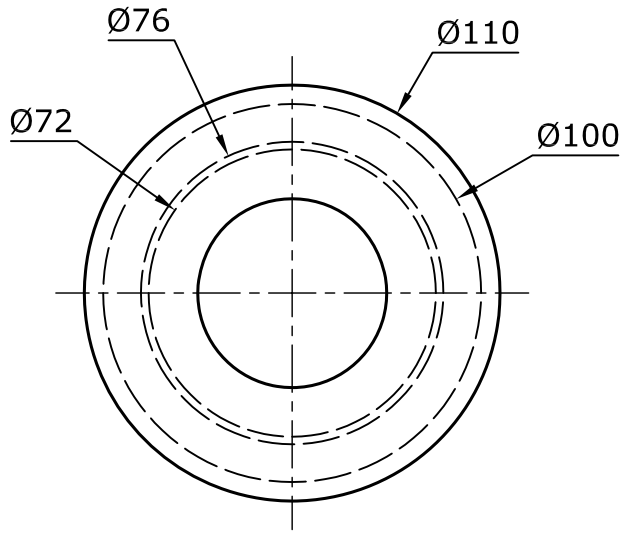
FRONT VIEW

SHAFT (Item 4)



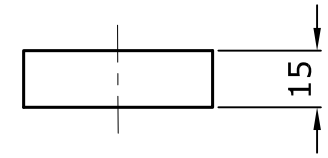
PLAN

SUPPORTING BRACKET (Item 1)

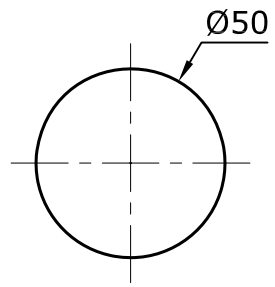


PLAN

BUSH (Item 2)

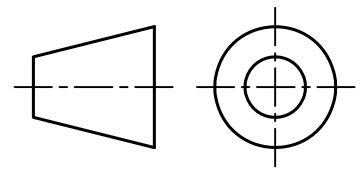


FRONT VIEW



PLAN

DISC (Item 3)



FOOTSTEP BEARING

UNIVERSITY OF MALTA	MATRICULATION CERTIFICATE EXAMINATION	IM 09.18M	ENG DRG & GRAPH COMM SEC B QUES 6 FIG. 6b