
SUBJECT:	Engineering Drawing and Graphical Communication
DATE:	30 th May 2019
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:

- B.S. or equivalent (ISO) recommendations should be adopted throughout your answers;
- all dimensions are in millimetres, unless otherwise stated;
- all answers are to be accurately drawn with instruments;
- all construction lines must be left in each solution;
- 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.

SECTION A

Attempt only **FOUR** questions from this section.

Question 1

An illustration of a trumpet is shown in Figure 1a. The cross-section of the front trumpet is a conic curve and the other end, the mouth piece is another conic curve.

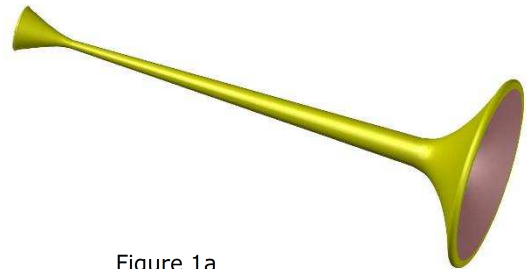


Figure 1a

- a) Construct, full size;
 - i. the front conic curve A, which is a parabola, using the directrix, axis and vertex shown in Figure 1b. State the eccentricity of the conic and locate the position of the focus. (4)
 - ii. the other end of the trumpet, curve B, which is a hyperbola, using an eccentricity of 6:2.5, the directrix, axis and vertex as shown in Figure 1b. (8)
- b) Define ratio of eccentricity. (1)

(Total: 13 marks)

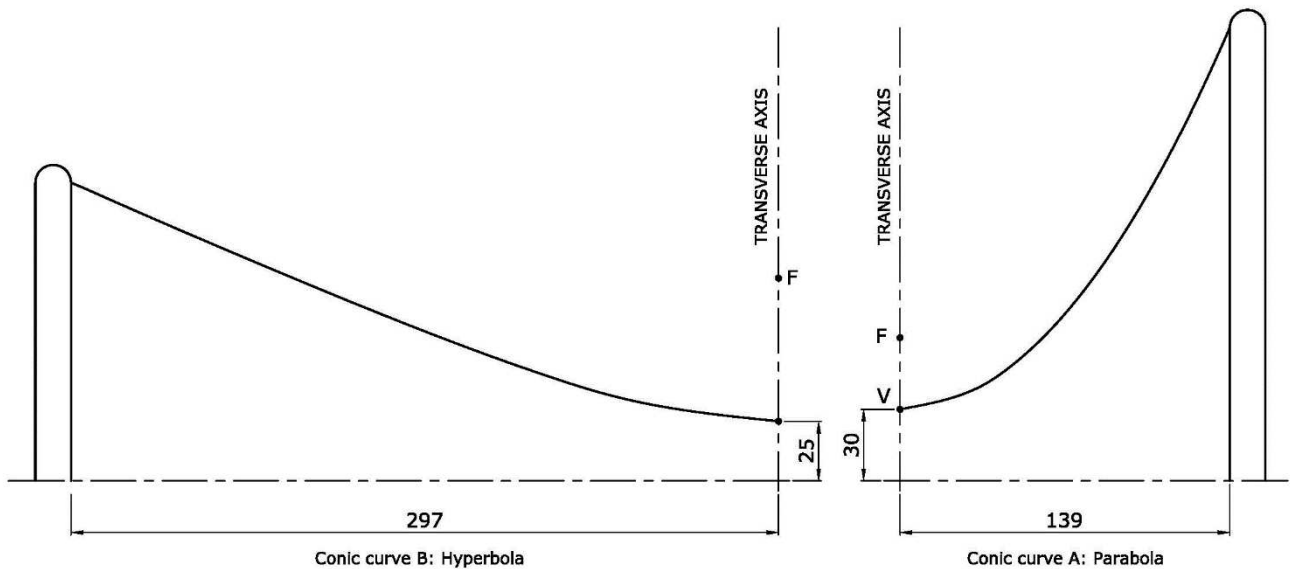


Figure 1b

Question 2

Rain water is diverted from a roof into a semi-circular open duct pipe. The rain water is then diverted to the vertical cylindrical pipe and into a reservoir. The vertical pipe is welded to the semi-circular open duct pipe. An illustration of the gutter and pipe is shown in Figure 2a.

Construct, full size:

- a) the given front view shown in Figure 2b; (3)
- b) an auxiliary plan looking in the direction of the arrow A, showing all hidden details; (7)
- c) an end view as seen when looking in the direction of the shown arrow B, showing the curve of intersection. (3)

(Total: 13 marks)

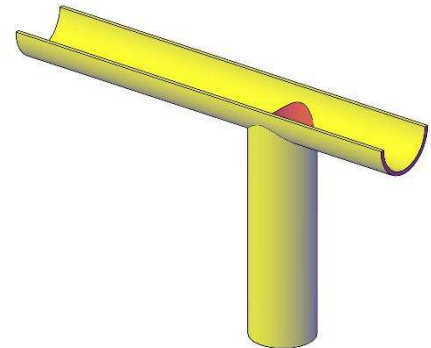


Figure 2a

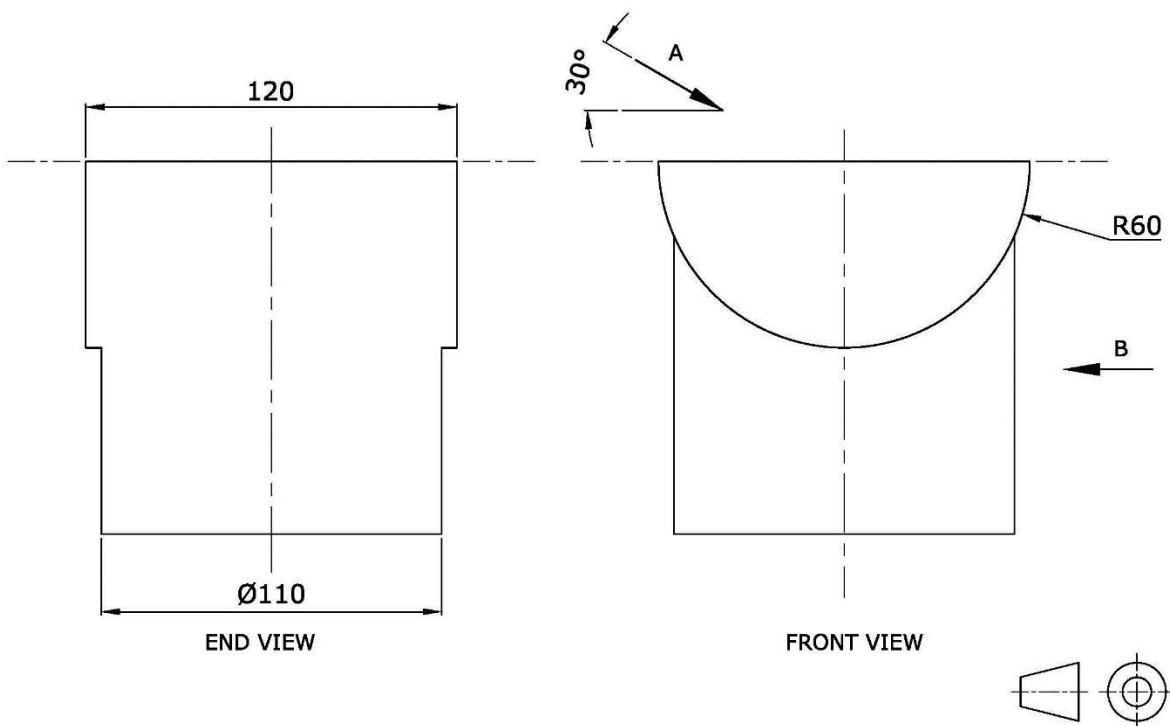


Figure 2b

Question 3

The layout for the basic design of a cam is shown in Figure 3a.

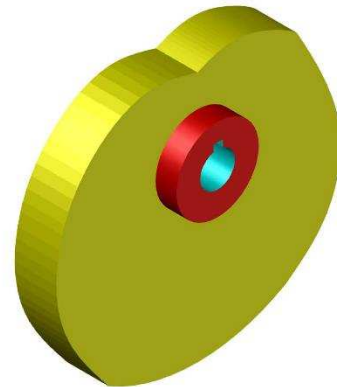


Figure 3a

- a) Copy, full size, Figure 3b and using the specification given below, construct:
 - i. a clockwise Archimedean spiral starting at point A on the 70 mm diameter circle and reaching a point B on the 55 mm radius in 60° rotation. (2)
 - ii. a uniform acceleration and uniform retardation displacement graph giving a lift of 30 mm in 90° rotation (from 60° to 150°). Graph scale 15 mm rep 15°. Project the graph on the cam. (4)
 - iii. an arc CD to represent the dwell. (1)
 - iv. an anti-clockwise Archimedean spiral, starting from point A on the 70 mm diameter base circle and reaching a point D on the the 170 mm diameter circle after 150° rotation. Line by a bold line the cam profile. (2)
- b) Write down **TWO** types of:
 - i. displacement graphs; (1)
 - ii. cam followers. (1)
- c) Draw an in-line cam follower suitable for the cam constructed. (2)

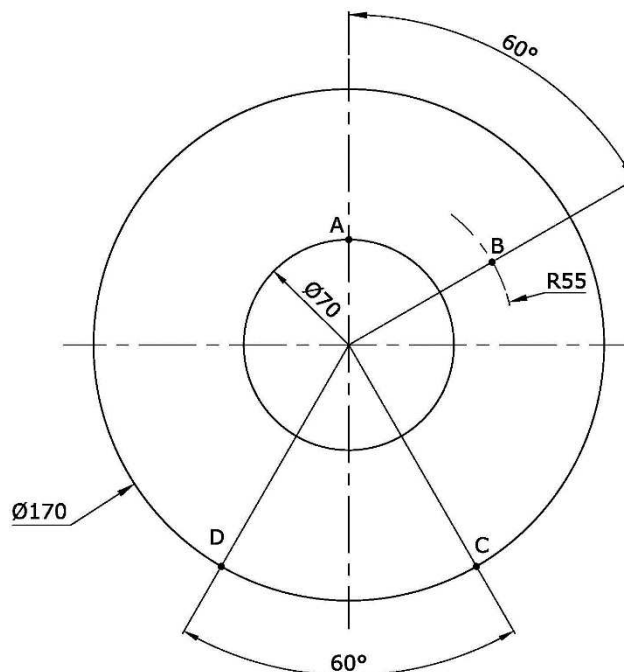


Figure 3b

(Total: 13 marks)

Question 4

An illustration of a delivery water spout fitted to a vertical wall is shown in Figure 4a. The spout is to be formed from an oblique pentagonal pyramid with the upper portion removed and is to be used for a model of an old village house.

- a) Construct, full size, the wall mounted face as a regular pentagon inscribed in the 110 mm diameter circle shown in Figure 4b and complete the end and front views of the truncated oblique pyramid. (4)
- b) Using an appropriate method, determine the necessary true lengths of the edges required. (3)
- c) Draw a half surface development of the spout. Show the joint on the shortest length. (6)

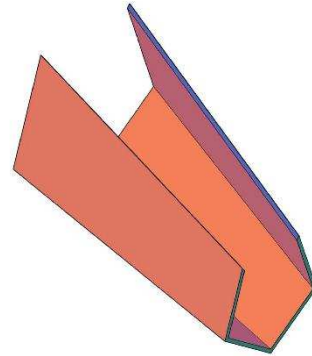


Figure 4a

(Total: 13 marks)

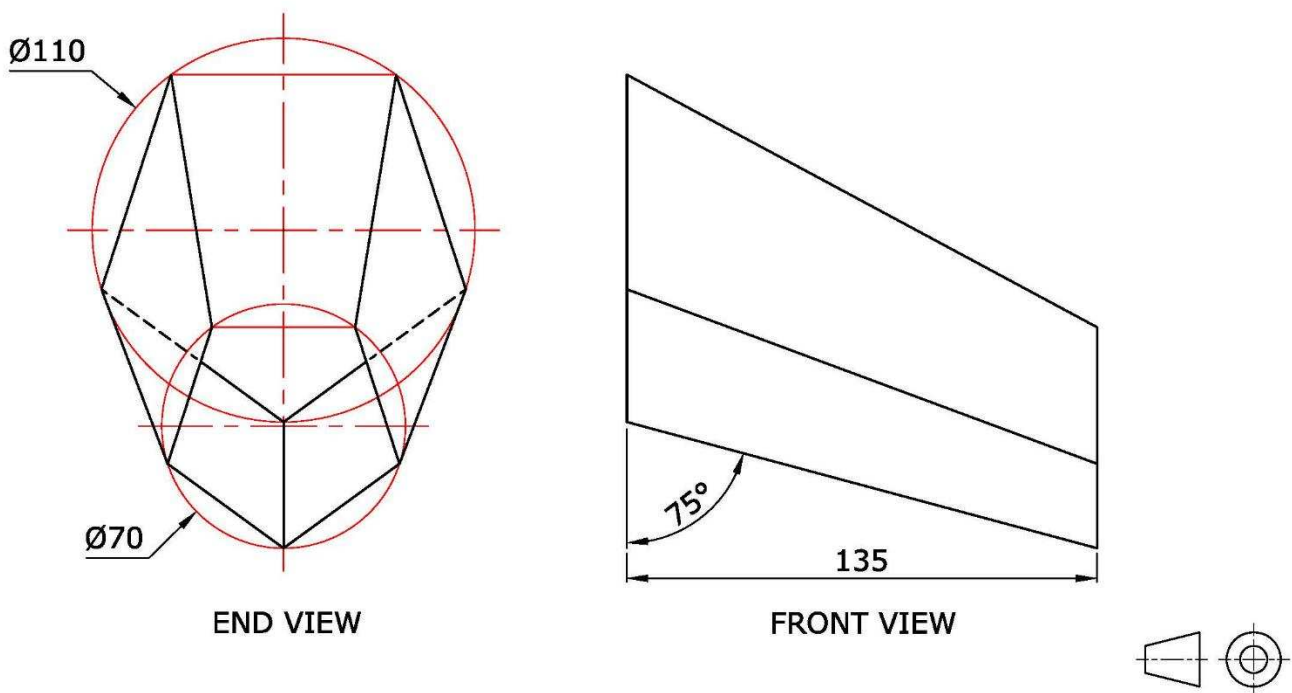


Figure 4b

Question 5

A steel beam weighing 1000 kg is shown in Figure 5a. The beam is of uniform thickness and its centre of mass is at the centre of the beam. The two vertical lines shown in the figure are the supporting cables.

- a) Using a scale of 10 mm representing 1 metre, reproduce the given space diagram shown in Figure 5b and complete with Bow's notation. (2)
- b) Draw the polar diagram. Use a scale of 10 mm representing 80 kg. (3)
- c) Draw the bending moment diagram to find graphically the tensions in the **TWO** supporting cables. State the values of the supporting cables. (5)
- d) Draw a shear force diagram. (3)

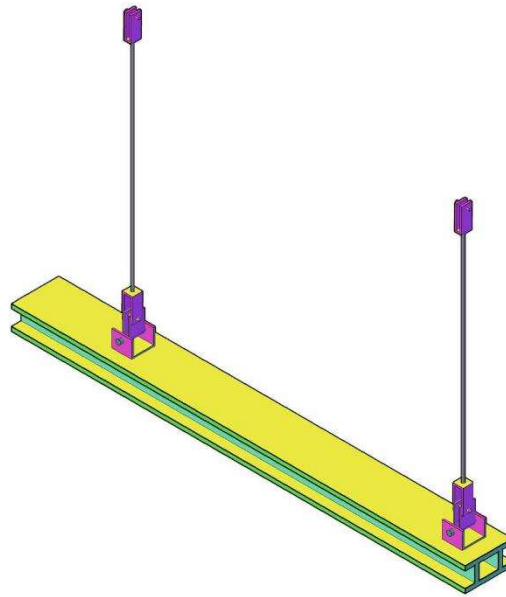


Figure 5a

(Total: 13 marks)

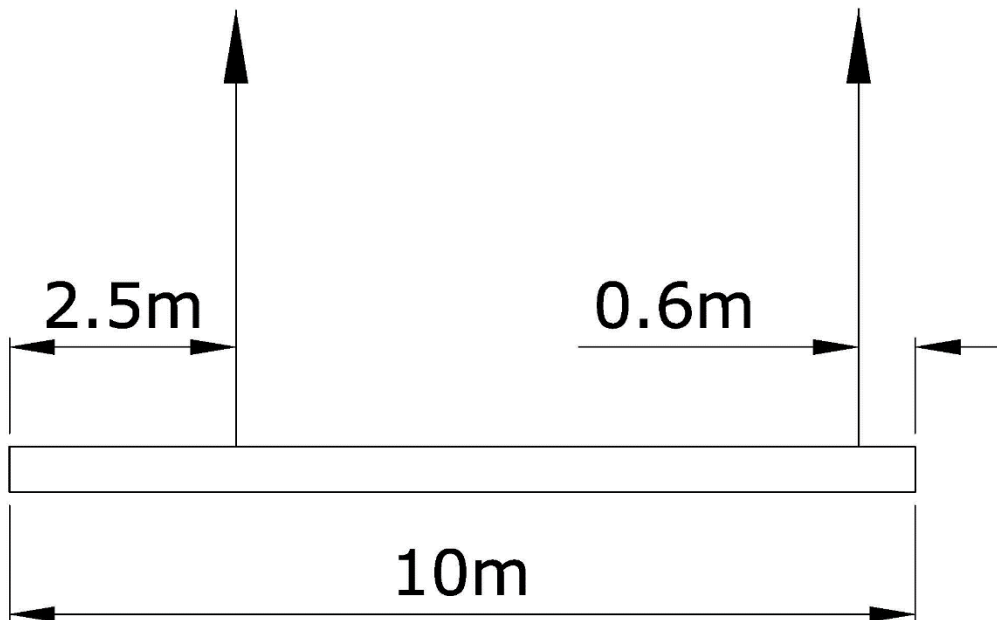


Figure 5b

SECTION B

Attempt only **ONE** question from this section.

Question 6

An illustration of a roller and bushing assembly with the parts pulled apart is shown in Figure 6a on the next page. The assembly comprises two brackets, two bushes, a shaft, a roller and a base. The base and the bracket are made of cast-iron.

Orthographic drawings of each item that is required for the assembled roller and bushing unit are shown on the attached A3 papers.

The following steps explain how the unit is assembled:

- the base (Item 1) is placed on a table (not shown) and the left bracket (Item 2) is mounted on the base with the 25 mm holes in line with the 25 mm holes of the base. The bracket and base are securely bolted to the horizontal surface of the table by means of two retaining bolts (not shown).
- the two bronze bushes (Item 3 & 4) are pressed into the 50 mm diameter bore of the roller (Item 5), with the 60 mm diameter by 5 mm flange of the bush rests against the 60 mm diameter edge of the roller.
- the stepped shaft (Item 6) is inserted into the 40 mm diameter of the bushes.
- the shaft, bushes and roller are fitted to the left bracket with the 30 mm diameter end of the stepped shaft (Item 6) inserted into the 30 mm hole of the bracket (Item 2). The step face resting against the inner face of the bracket.
- the right bracket (Item 7) is assembled to the shaft and the base. Two 25 mm diameter bolts (not shown) secure the bracket and base to the table.

Draw, full size, one view of the assembled roller and bracket, with a quarter of the assembled unit removed, showing:

- a) a sectional front view of the left hand side on the section line X-X; (16)
- b) an outside front view of the right hand side of the assembly. (8)

Do **not** show hidden detail. Include suitable fillet radii.

(Total: 24 marks)

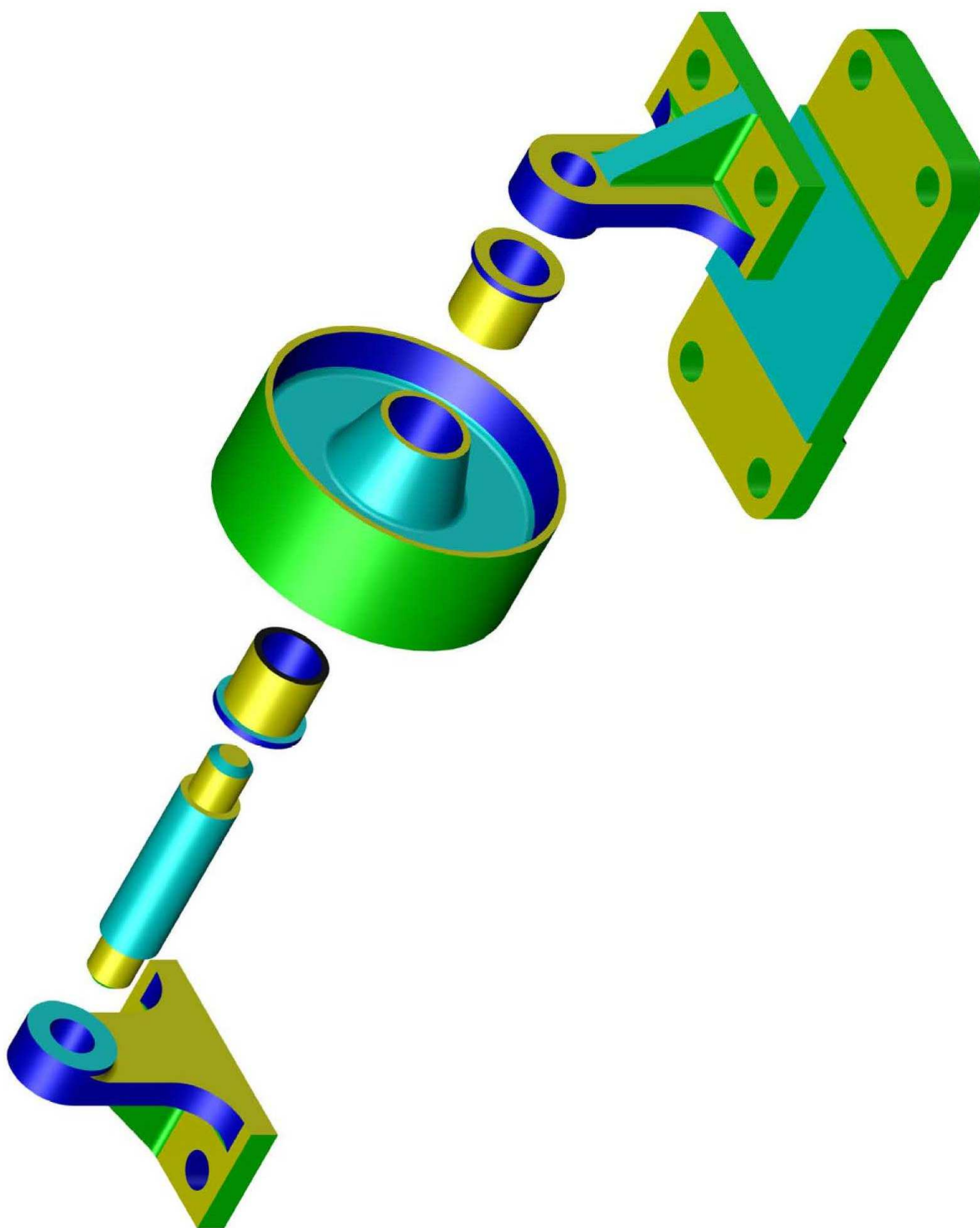


Figure 6a

Question 7

A front elevation and a plan of an angle bracket are shown in Figure 7, indicating the method of presenting a staggered section on two parallel planes. This system is used to provide a sectional view that includes detail which is not all in line. The section is taken through both holes.

- a) Copy, full size, the front elevation. (3)
- b) Construct an isometric view of the angle bracket with the left hand portion removed. Place edge marked by point P in the foreground. (15)
- c) Project a sectional elevation of the staggered/offset section A-A. (6)

(Total: 24 marks)

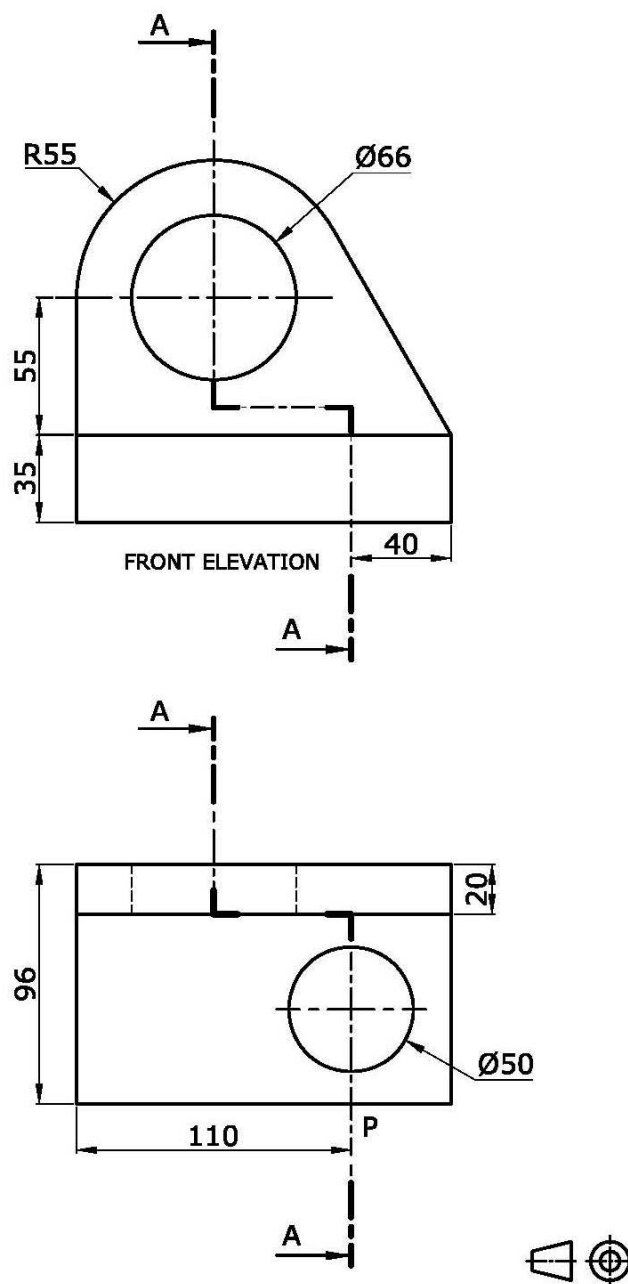


Figure 7

SECTION C

Attempt only **ONE** question from this section.

Question 8

A small bookshop is planning to have two bookshelves and a centre table with shelves underneath. The front view and the plan of the bookshop are shown in Figure 8a. A pictorial view of the bookshelf labelled A is shown in Figure 8b, the pictorial view of bookshelf labelled B is shown in Figure 8c and the pictorial view of bookshelf labelled C is shown in Figure 8d.

Using the scale given below, construct an estimated one-point perspective view of the bookshop. Take the vanishing point in the centre of the room on the 9th course. Assume wood thickness. (19)

Render in colour your drawing to enhance its presentation. (5)

(Total: 24 marks)

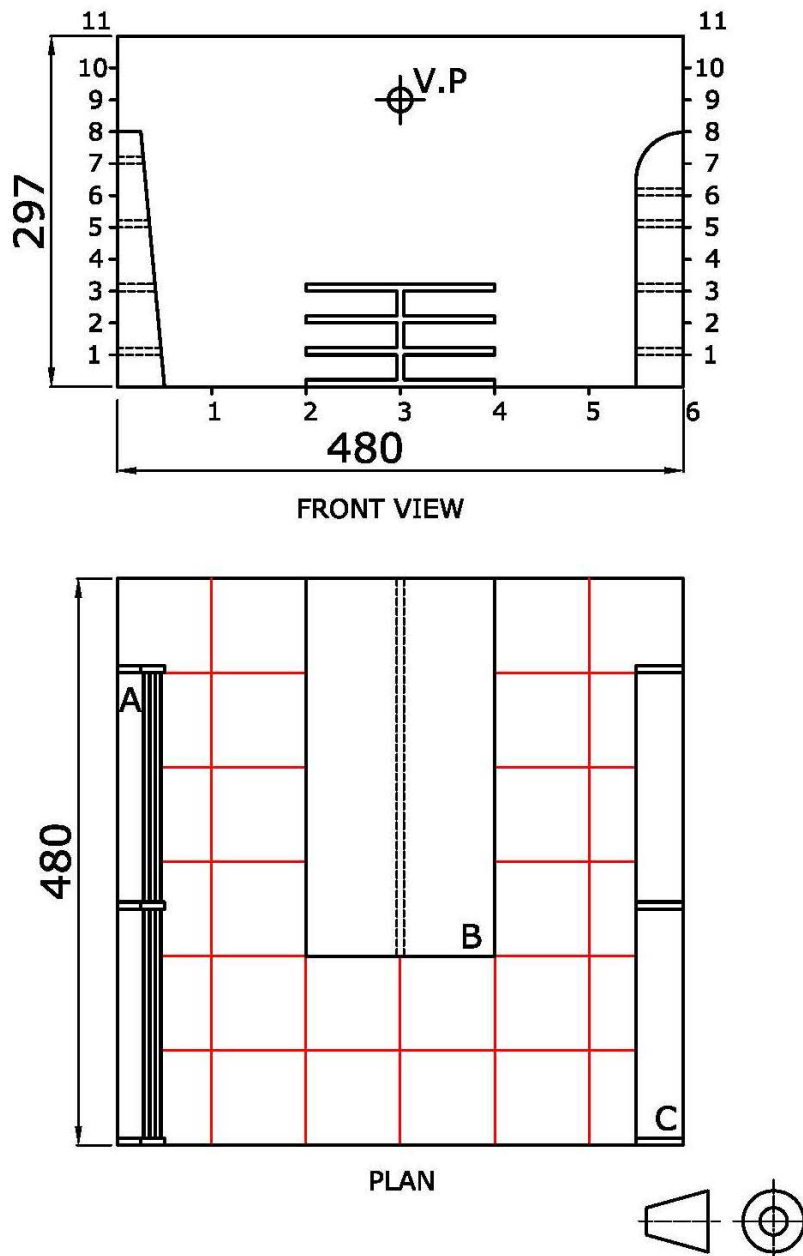


Figure 8a

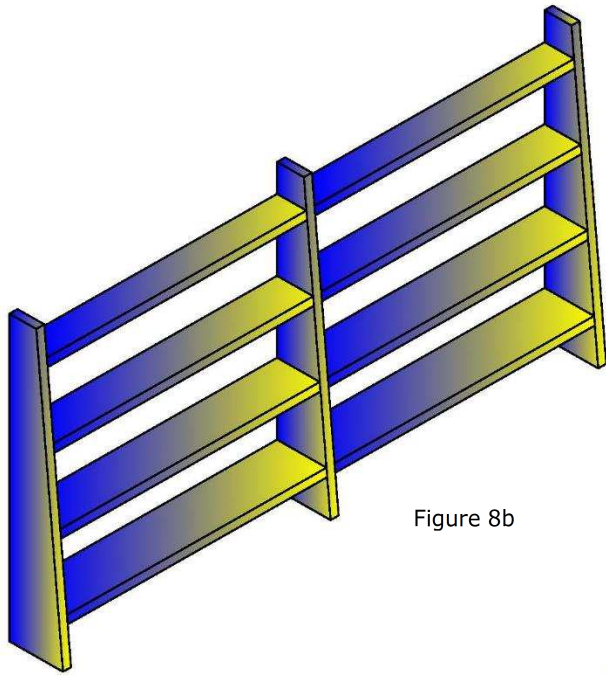


Figure 8b

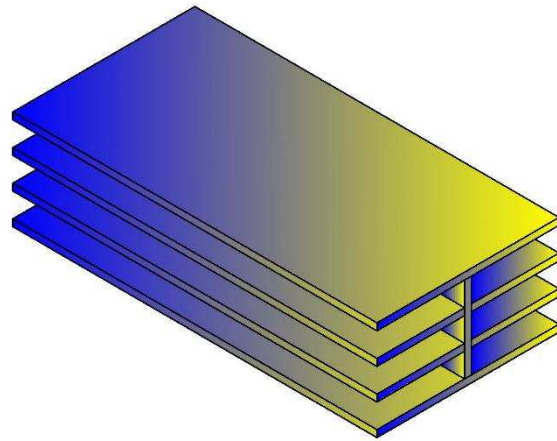


Figure 8c

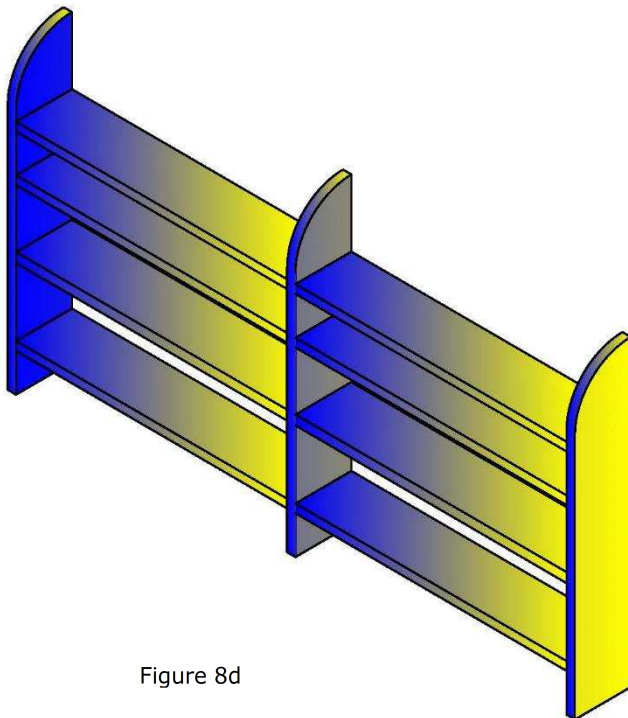


Figure 8d

Question 9

Table 9 shows the number of book loans from five public libraries in Gozo for 2015, 2016 and 2017 (*published by NSO, 2018*). Note that all figures have been rounded up.

Table 9: Number of book loans in five public libraries in Gozo for 2015, 2016 and 2017.

Locality	Book loans from public libraries for years		
	2015	2016	2017
Għarb	3400	3800	5200
Għasri	2700	2500	2500
Ta' Kerċem	1200	1200	1100
San Lawrenz	2900	2000	2700
Ta' Sannat	1400	1300	1800
Total	11,600	10,800	13,300

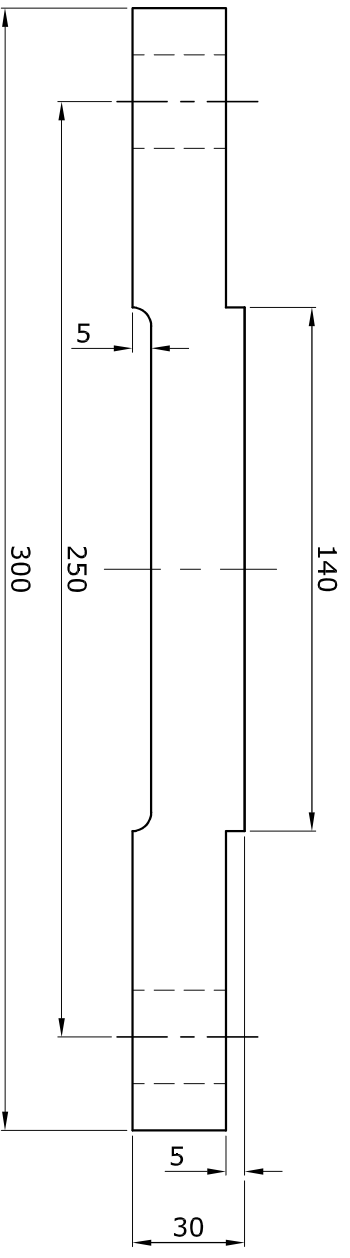
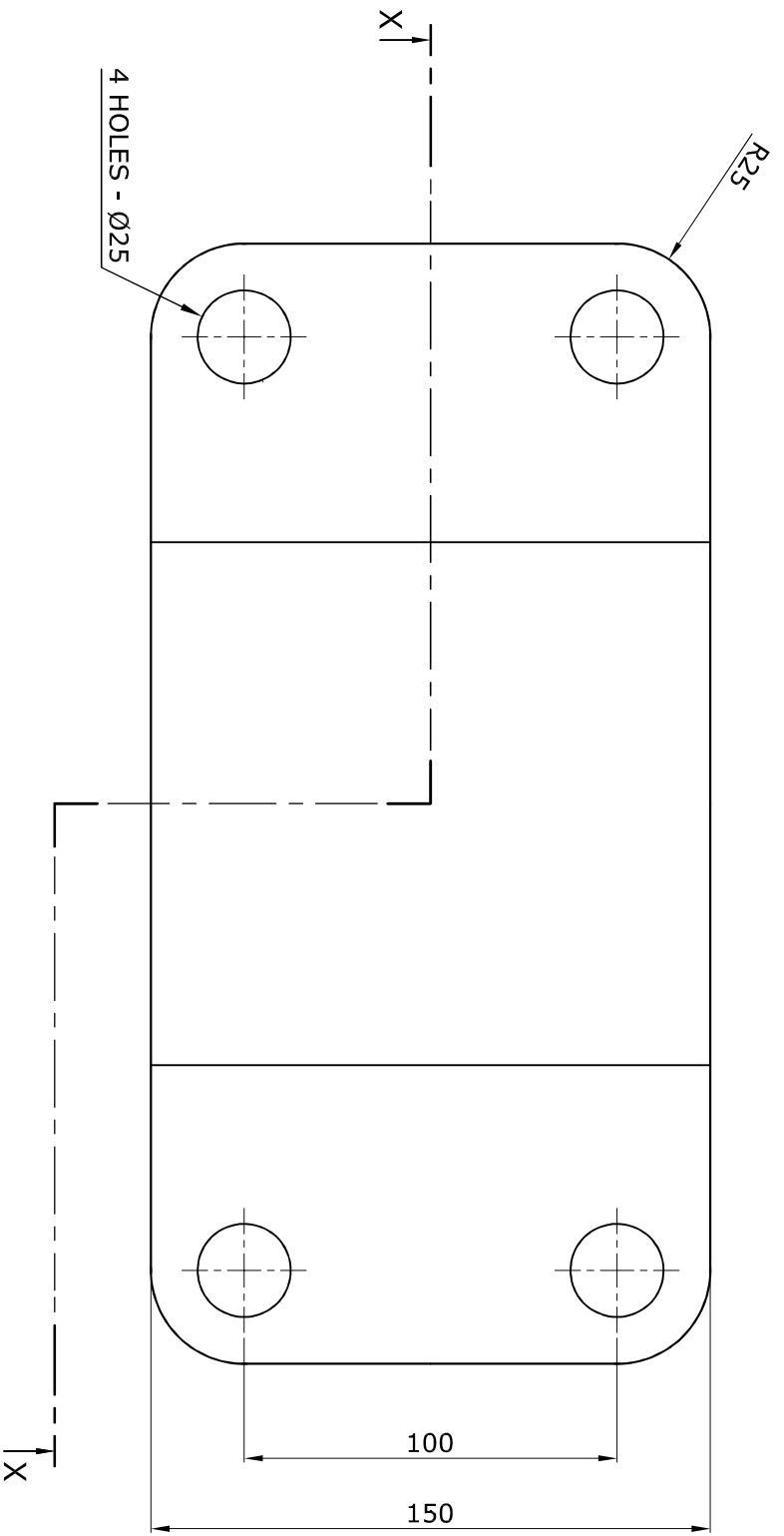
Design a poster which displays the statistics shown.

- Label the poster with the heading "Gozo Public Libraries". (2)
- Draw a line graph showing the number of book loans in Għarb, Għasri and Ta' Sannat for years 2015, 2016 and 2017. Label this line graph "Book Loans in Għarb, Għasri and Ta' Sannat". (7)
- Draw a bar chart showing the number of book loans in Ta' Kerċem and San Lawrenz for years 2015, 2016 and 2017. Label this bar chart "Book Loans in Ta' Kerċem and San Lawrenz". (7)
- Draw a planometric pie chart showing the total number of book loans for years 2015, 2016 and 2017. Label this pie chart "Total number of book loans". (8)

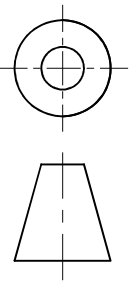
Poster design tips:

- use colour and shading to render the drawing;
- make use of typography (fonts);
- form an attractive presentation, clearly conveying the information.

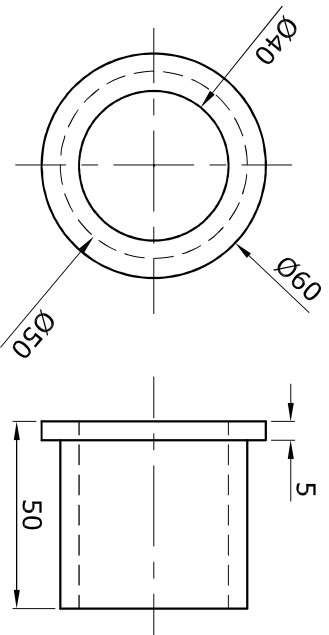
(Total: 24 marks)



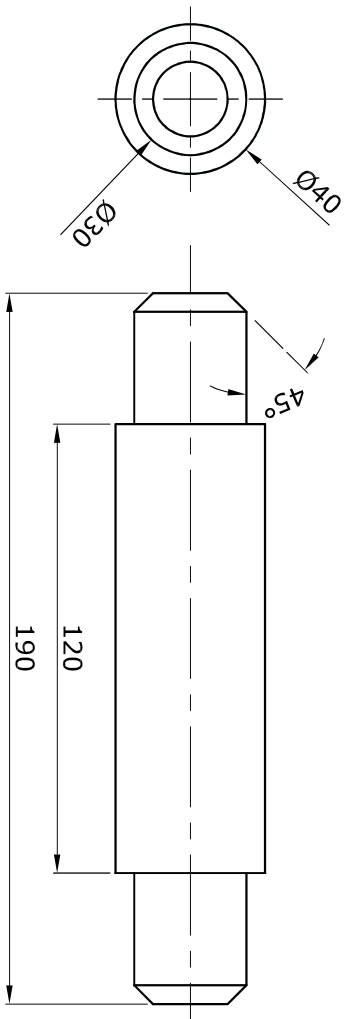
BASE (Item 1)



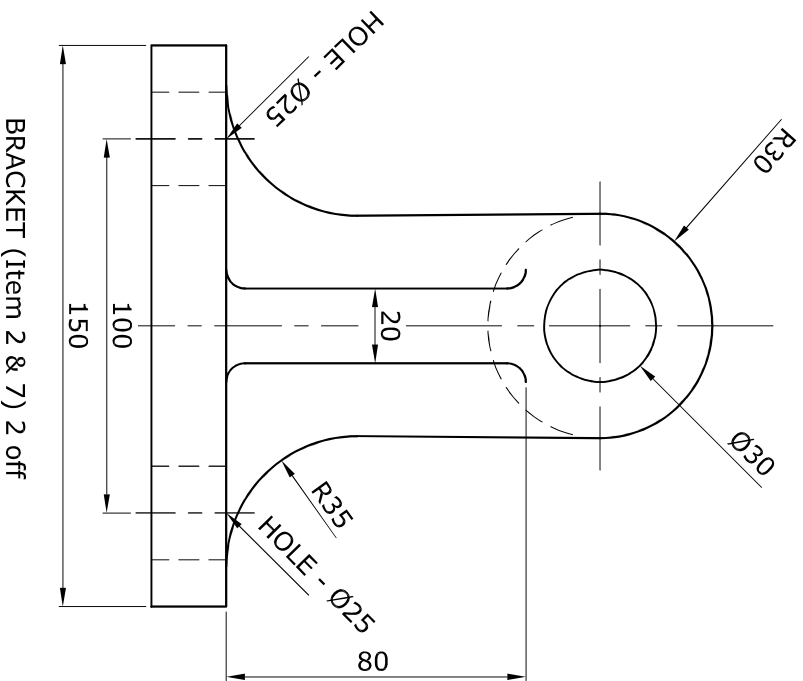
ROLLER AND BUSHING ASSEMBLY



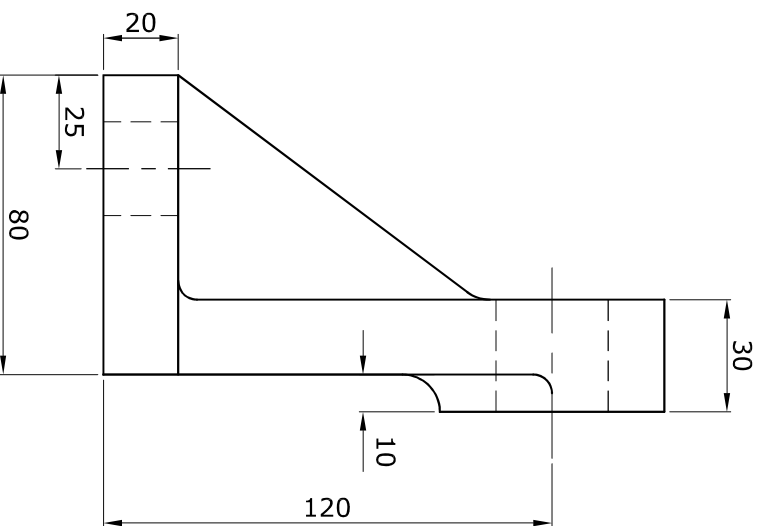
BUSH (Item 3 & 4) 2 off



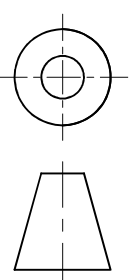
SHAFT (Item 6)

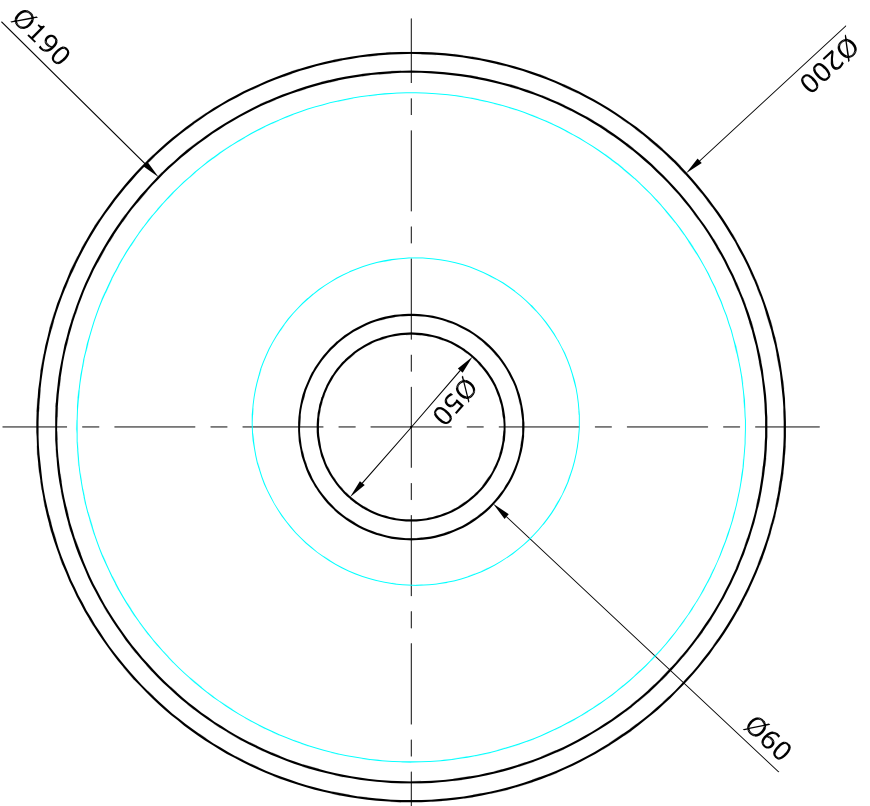


BRACKET (Item 2 & 7) 2 off

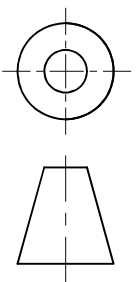
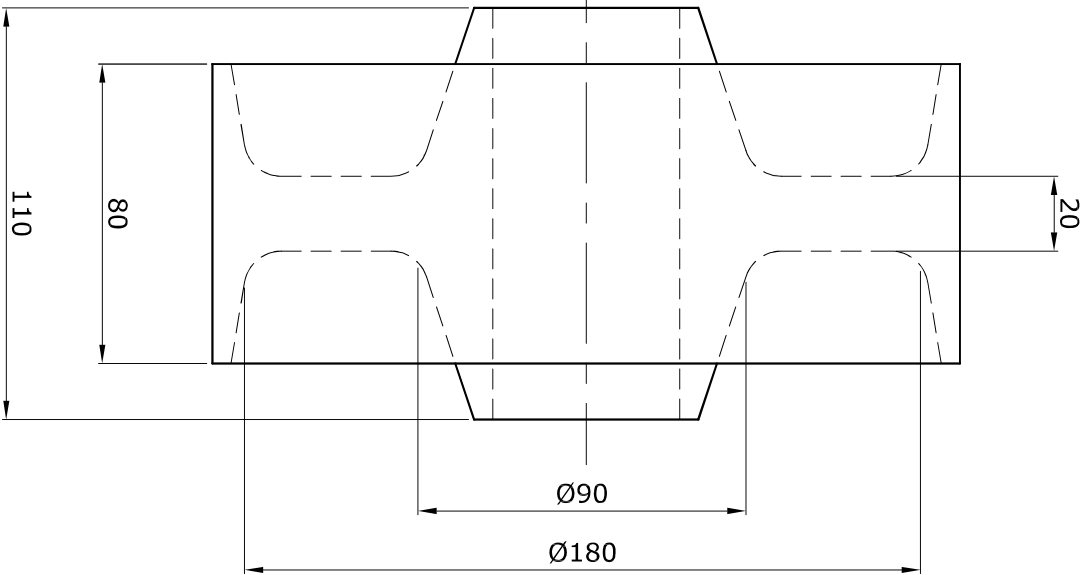


ROLLER AND BUSHING ASSEMBLY





ROLLER (Item 5)



ROLLER AND BUSHING ASSEMBLY