IM09.26s

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

INTERMEDIATE MATRICULATION LEVEL
2026 SECOND SESSION

SUBJECT:	**Engineering Drawing and Graphical Communication**
DATE:	3rd September 2026
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;
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 any **FOUR** questions from this section.

Question 1.

The profile of the lampshade shown in Figure 1a is mainly composed of conic curves. The upper part is formed by the lower halves of a pair of hyperbolas. The middle part consists of an ellipse with tangents leading to the bottom part which has a parabolic shape. Figure 1b shows a dimensioned and annotated structure needed to construct the lampshade outline.

a. Copy the framework of Figure 1b. (1)
b. Construct the parabola in the indicated rectangle. (3)
c. Construct the ellipse using the locus of a point method. (4)
d. State the eccentricity of the ellipse. (1)
e. Construct the lower half of the pair of hyperbolas by using the intersecting arcs method (one side may be reflected). (3)
f. Complete the profile of the lampshade. The tangents to the ellipse are to be drawn without construction. (1)

(Total: 13 marks)

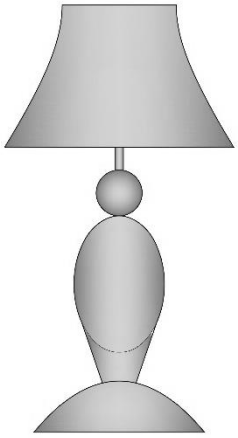


Figure 1a

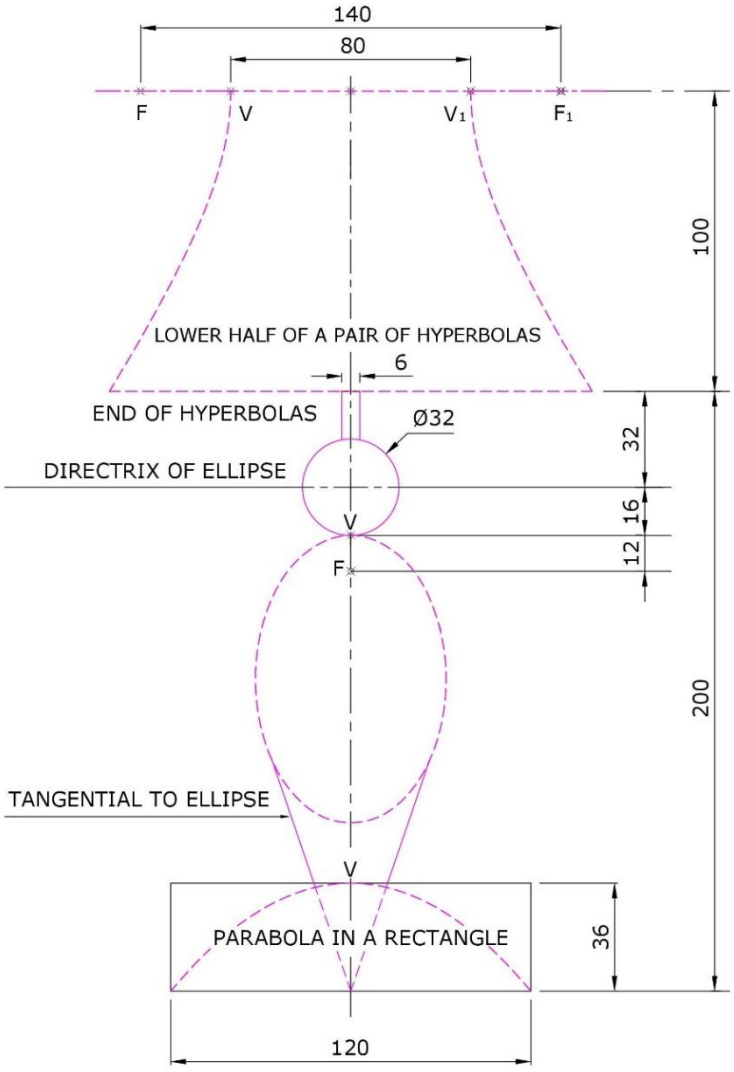


Figure 1b

Question 2.

An illustration of a hexagonal pyramid with a square hole on the front side is shown in Figure 2a.
A front elevation and an incomplete plan of the pierced pyramid are given in Figure 2b.

a. Copy Figure 2b. (1)
b. Complete the plan showing clearly the resulting lines of intersection. (4)
c. Project an end elevation. (4)
d. Construct the surface development of the pierced pyramid. (4)

(Total: 13 marks)

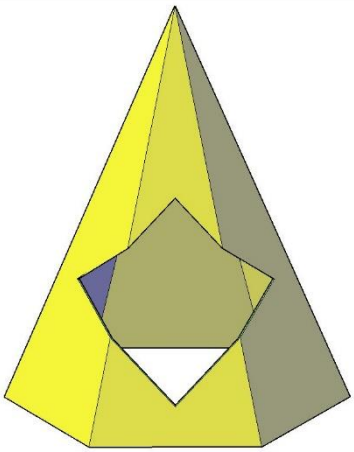


Figure 2a

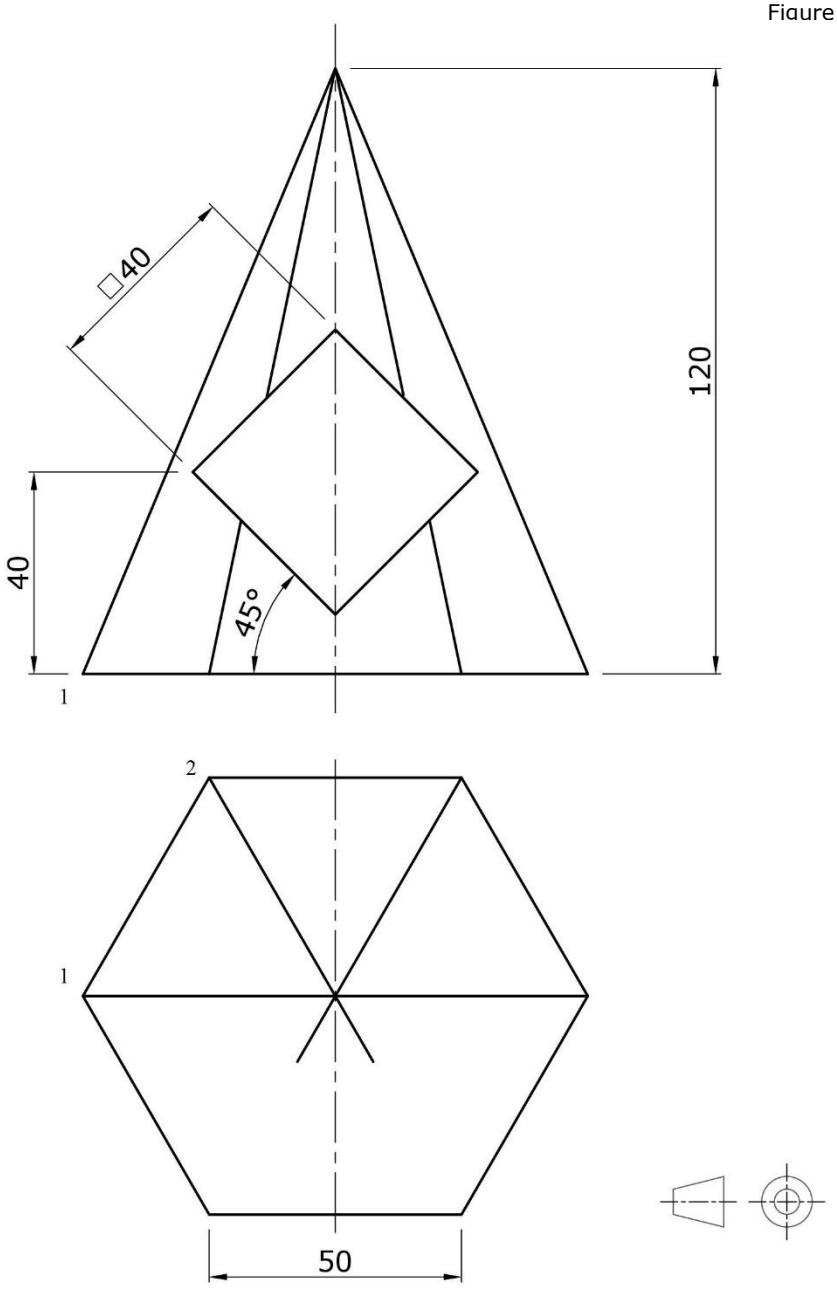


Figure 2b

Please turn the page.

Question 3.

An illustration of four solids resting on the horizontal plane is shown in Figure 3a. Orthographic views of the cone in contact with the SØ100 sphere are given in Figure 3b.
The Ø60 X 120 mm high cylinder is in mutual contact with the rear side of the cone and the SØ100 sphere. The smaller sphere of unknown diameter is in mutual contact with the front side of the cone and the larger sphere.

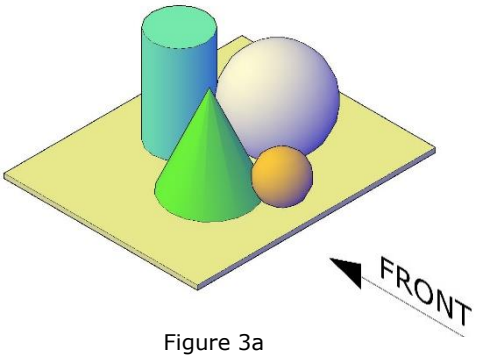


Figure 3a

a. Construct the given views. (2)
b. Locate, by construction, the position of the cylinder in both views. (3)

The diameter of the smaller sphere is unknown, however, the point of contact between this sphere and the cone occurs at point P which is 15 mm above the H.P.

c. Locate, by construction, the centre of the smaller sphere. (2)
d. State the diameter of the smaller sphere. (1)
e. Locate the position of the smaller sphere in mutual contact with the front side of the cone and the larger sphere. (2)
f. Locate and mark all points of contact. (3)

Note: Show hidden details in all views.

(Total: 13 marks)

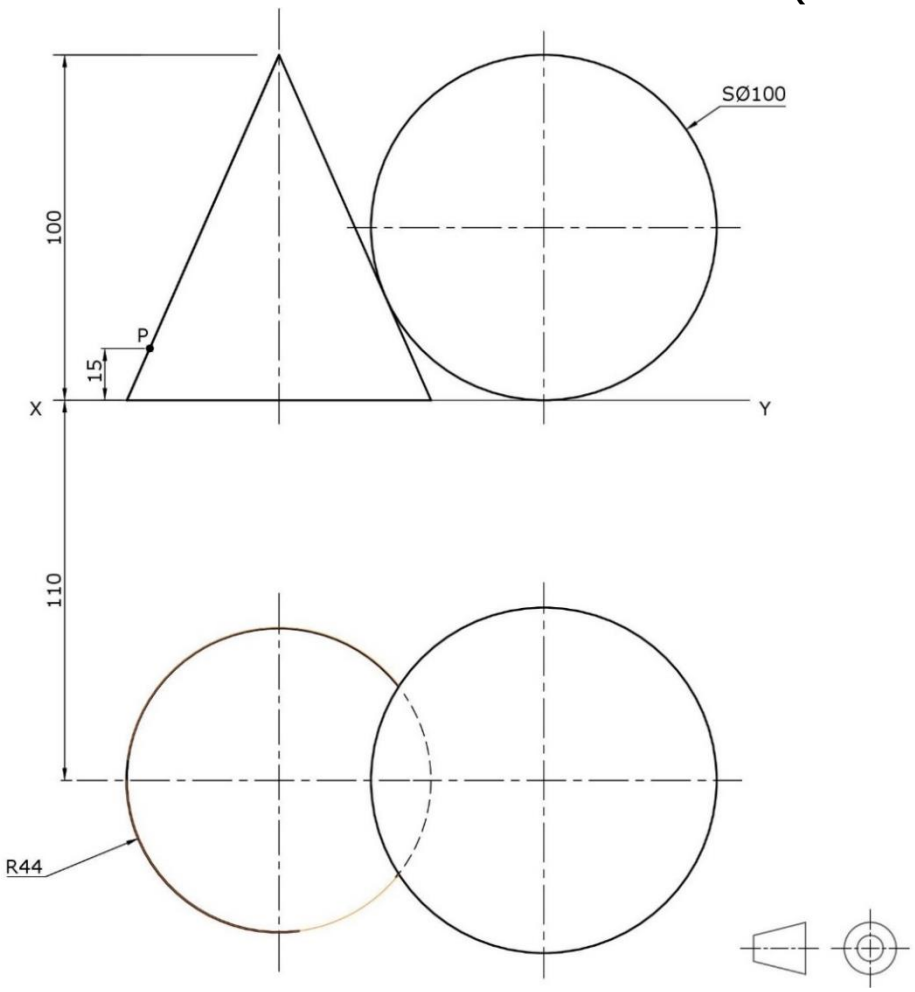


Figure 3b

Question 4.

An illustration of a rectangular to an elongated circle transition piece is shown in Figure 4a. Two dimensioned orthographic views are given in Figure 4b.

a. Copy Figure 4b. (1)
b. Draw the crease lines in both views. (2)
c. Label the crease lines from the left, seam line S_L, and to the right, seam line S_R. (1)
d. Construct the necessary true lengths. (3)
e. Construct a half surface development of the transition piece. (6)

(Total: 13 marks)

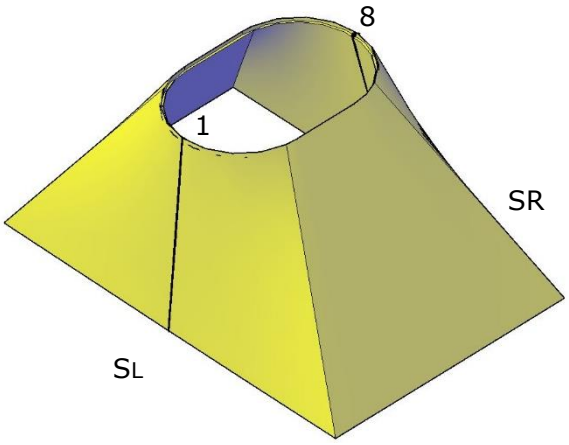


Figure 4a

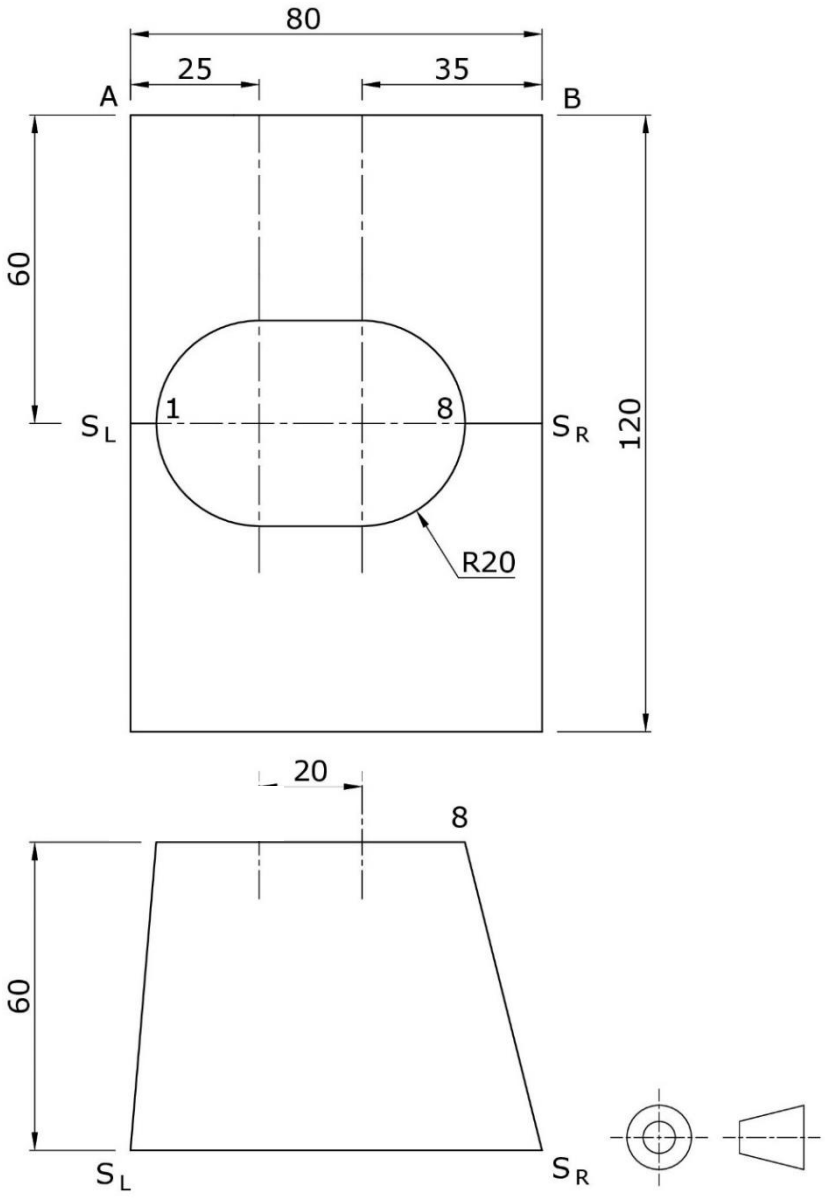


Figure 4b

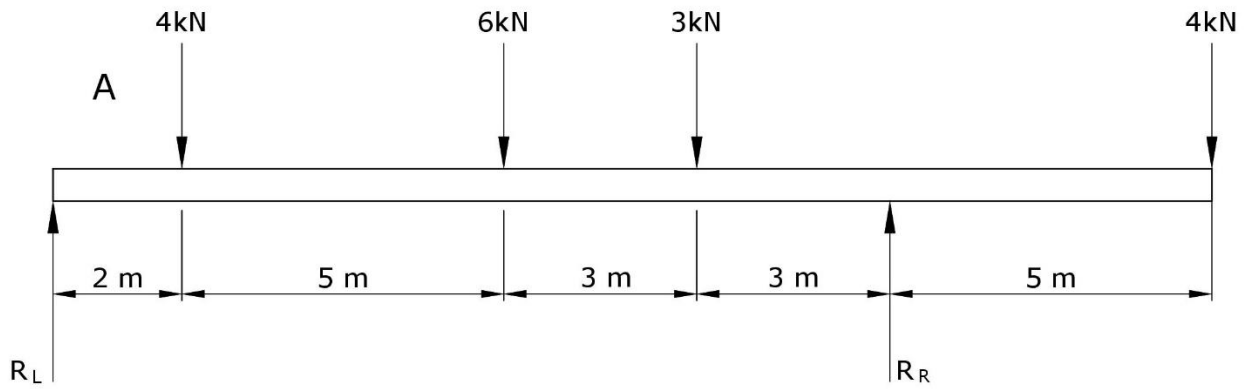
Please turn the page.

Question 5.

Figure 5 shows a loaded beam overhanging at one end.

a) Copy the space diagram by using the given scale. (1)
b) Complete the Bow's notation. (1)
c) Draw the load line using the given scale. (1)
d) Draw the polar diagram using the suggested polar distance. (2)
e) Construct the link polygon. (2)
f) Determine and state reactions R_R and R_L. (2)
g) Draw the shear force diagram. (3)
h) State the value of the shear force 6 m from the right-hand edge of the beam. (1)

(Total: 13 marks)



SPACE DIAGRAM SCALE: 10 mm = 1 m

FORCE DIAGRAM SCALE: 10 mm = 1 kN

POLAR DISTANCE: 150 mm

Figure 5

SECTION B

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

Question 6

An exploded pictorial view of a Crank assembly is shown in Figure 6a.
The assembly comprises the following components:

- Item 1: Crank;
- Item 2: Machined Shaft;
- Item 3: Tapered Crank Pin;
- Item 4: Parallel Key;
- Item 5: M42 Hexagonal Nut;
- Item 6: Washer.

Detailed orthographic views of each item are provided on Figure 6b on the attached A3 sheet.
Assembly Instructions:

- The Parallel Key (Item 4) is fitted into the keyway slot of the Machined Shaft (Item 2).
- The Machined Shaft (Item 2) is fully inserted into the main bore of the Crank (Item 1).
- The Tapered Crank Pin (Item 3) is inserted into the matching tapered hole of the Crank (Item 1).
- The Crank Pin (Item 3) is secured in position using the Washer (Item 6) and tightened with the M42 Hexagonal Nut (Item 5).

With the parts correctly assembled, draw full size a sectional front elevation taken on the cutting plane X - X.

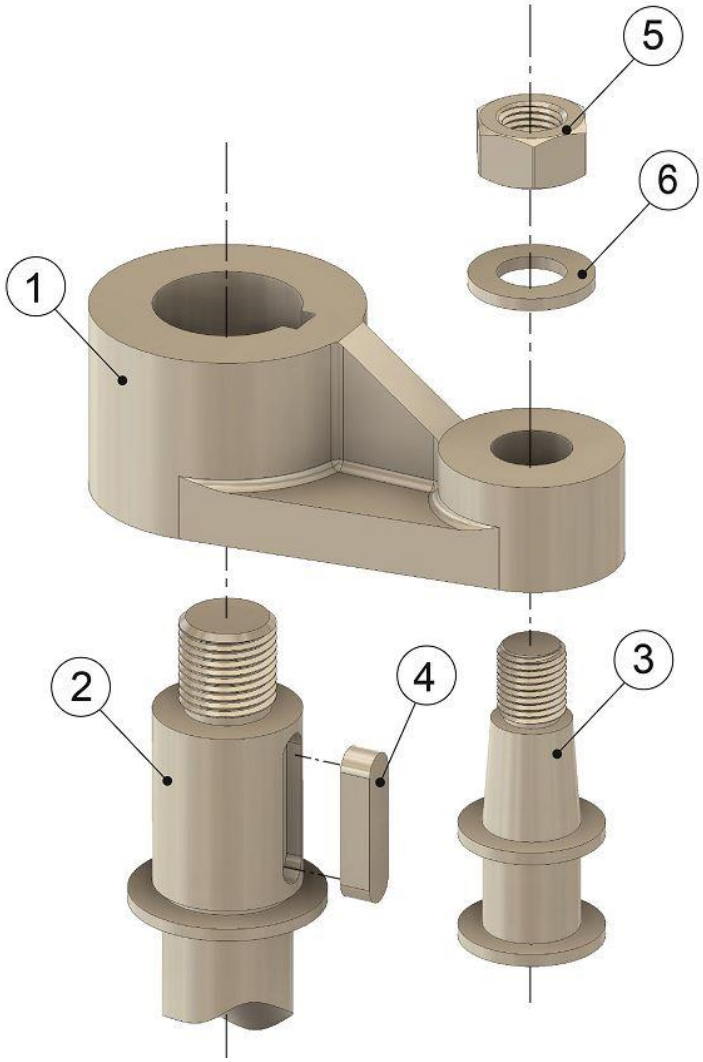


Figure 6a

Note:
Drawing must conform to B.S. or equivalent (ISO) standards.

(Total: 24 marks)

Please turn the page.

Question 7

A balloon referenced isometric drawing of a Vee Block assembly is shown in Figure 7a. The assembly consists of the following items:

- Item 1 Vee Block;
- Item 2 Clamp;
- Item 3 Clamp Screw;
- Item 4 Cylindrical bar (work piece);
- Item 5 M15 Lock Nut.

All the items are made of mild steel (MS).

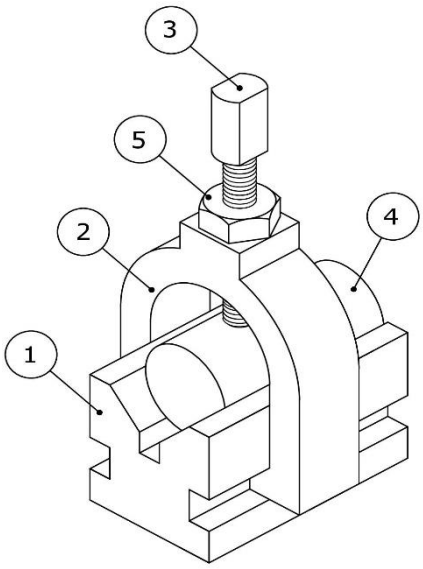


Figure 7a

An exploded view of the dimensioned components is given in Figure 7b (on the A3 paper attached).

a. Draw orthographic detail drawings of **each** item. (18)
b. Insert **SIX** important linear dimensions. (3)
c. Insert **FOUR** important radial dimensions. (2)
d. Draw the symbol of the projection used (1st angle). (1)

Notes:

- All the drawings should conform with ISO standards.
- Engineering Drawing conventions and practices such as thread representation, hexagonal nut proportions, flat surface, centre lines, hidden lines, dimension lines, extension line offset, proper line weights and labelling must be incorporated.
- The suggested layout of the solution is given in Figure 7c.

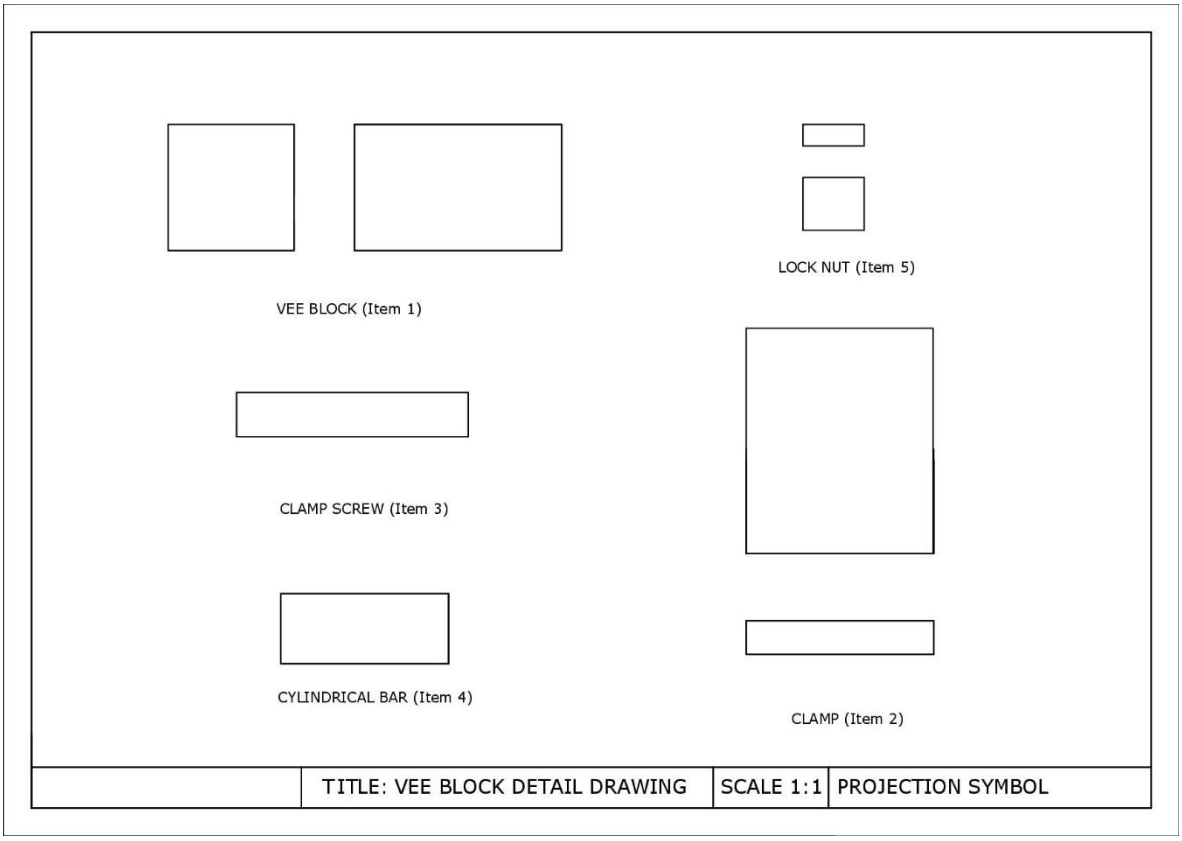


Figure 7c

(Total: 24 marks)

SECTION C

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

Question 8

An exploded pictorial drawing and two orthographic views of a wood hand plane are shown in Figures 8a and 8b, respectively. This tool consists of a prismatic wooden body with a flat sole (base). A spherical knob is fitted at the front of the body, while a curved rear tote (handle) is positioned at the back to provide a comfortable grip. Centrally located within the body is an inclined cutting blade, fitted by a cap iron and secured with a screw. The blade assembly is held firmly in position by a wooden wedge.

a) Make a well-proportioned isometric freehand drawing of the assembled wooden hand plane. (12)

b) Colour, shade and add texture to the drawing according to the following instructions:
- Prismatic body – varnished wood; (4)
- Spherical knob – varnished wood; (2)
- Rear tote (handle) – varnished wood; (2)
- Cutting blade –polished steel; (1)
- Cap iron – matt steel; (1)
- Wedge – raw (unvarnished) wood. (2)

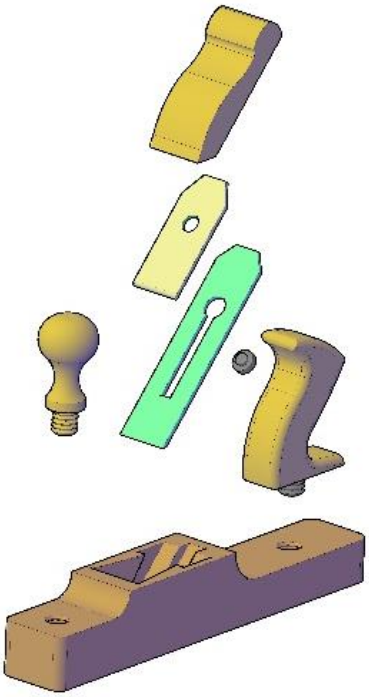


Figure 8a

(Total: 24 marks)

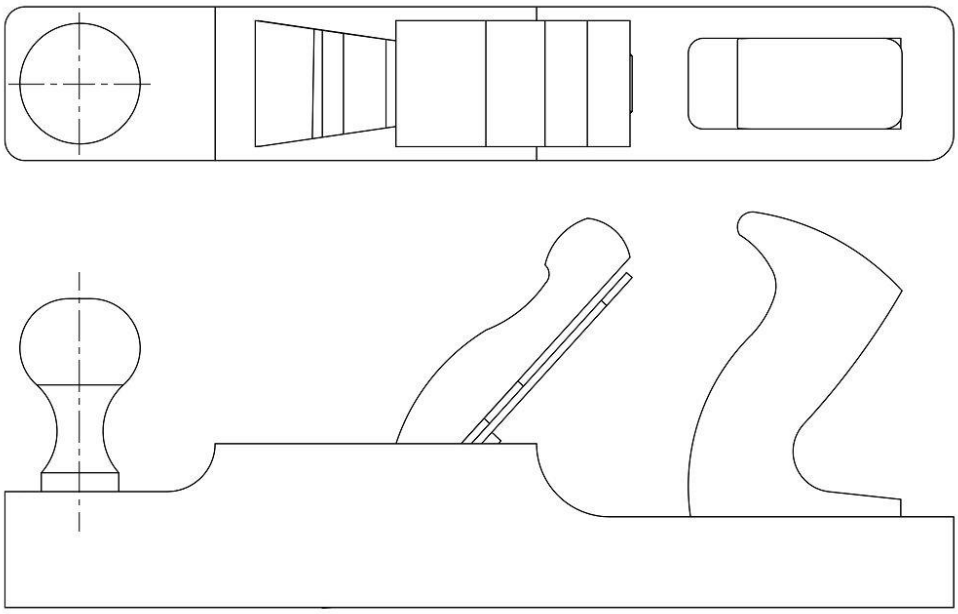
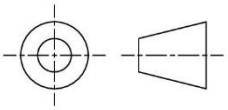


Figure 8b



Please turn the page.

Question 9

An isometric view of a student's architectural model of a modern residential house is given in Figure 9a. The ground floor features a recessed main entrance complemented by a large rectangular window. Adjacent to the entrance is a garage fitted with a roller shutter door. The first floor incorporates two large rectangular windows together with a recessed balcony accessed through a glass door, contributing to the building's contemporary architectural design.
Orthographic views of the model are presented in Figure 9c.

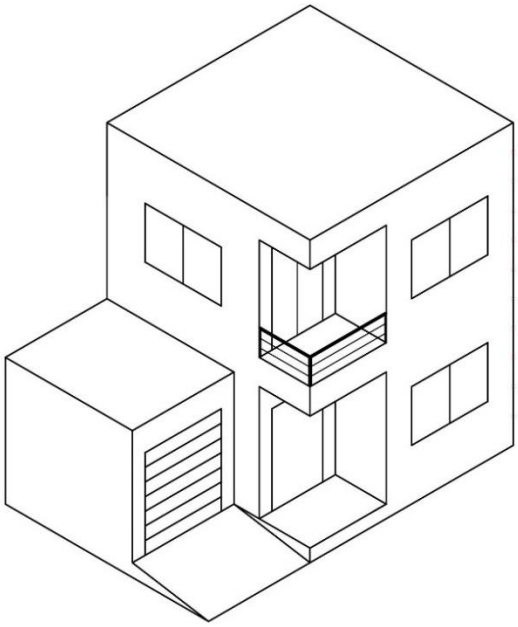


Figure 9a

a) Use the information given in the orthographic and isometric views to construct an estimated two-point perspective drawing of the house. The viewing direction required is indicated by the arrows in the plan. The position of the eye level is given in the layout of the two-point perspective shown in Figure 9b. (21)

b) Render elements of your drawing to enhance its presentation. (3)

(Total: 24 marks)

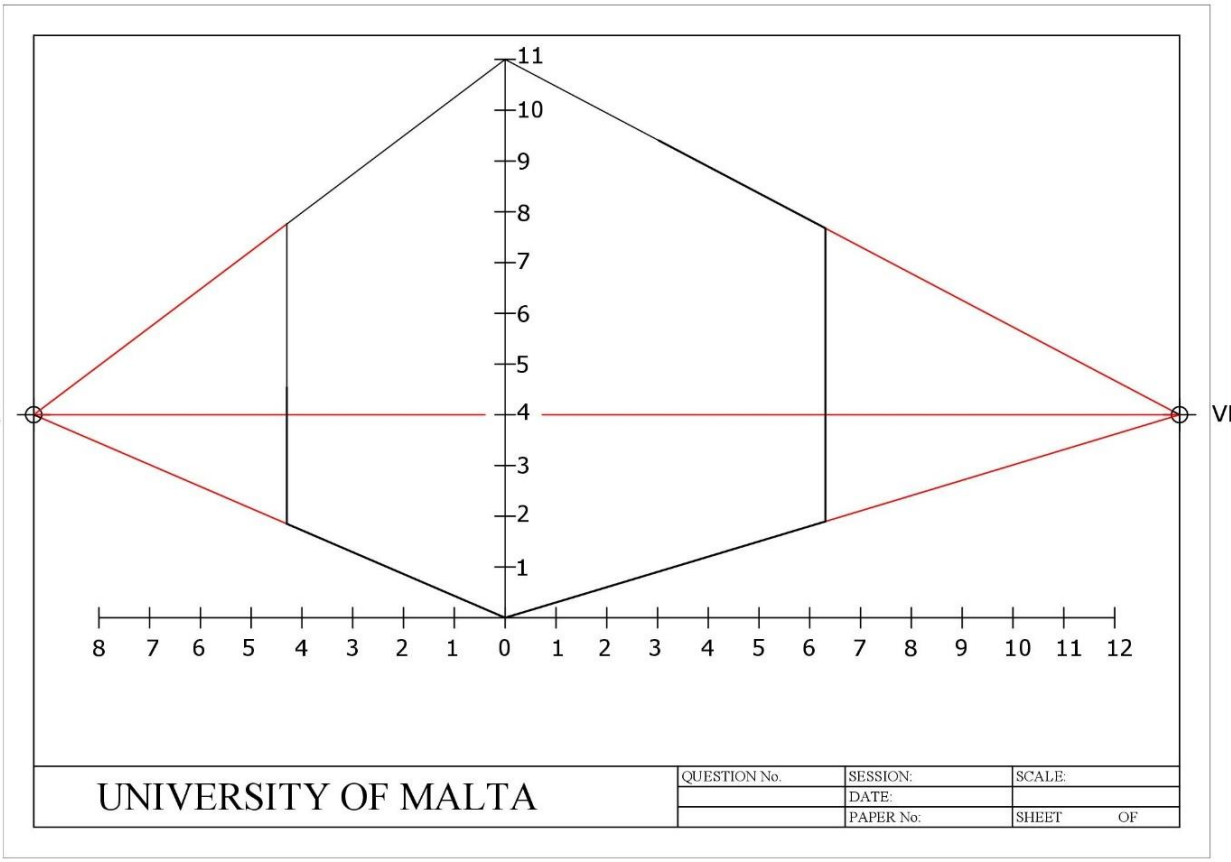


Figure 9b

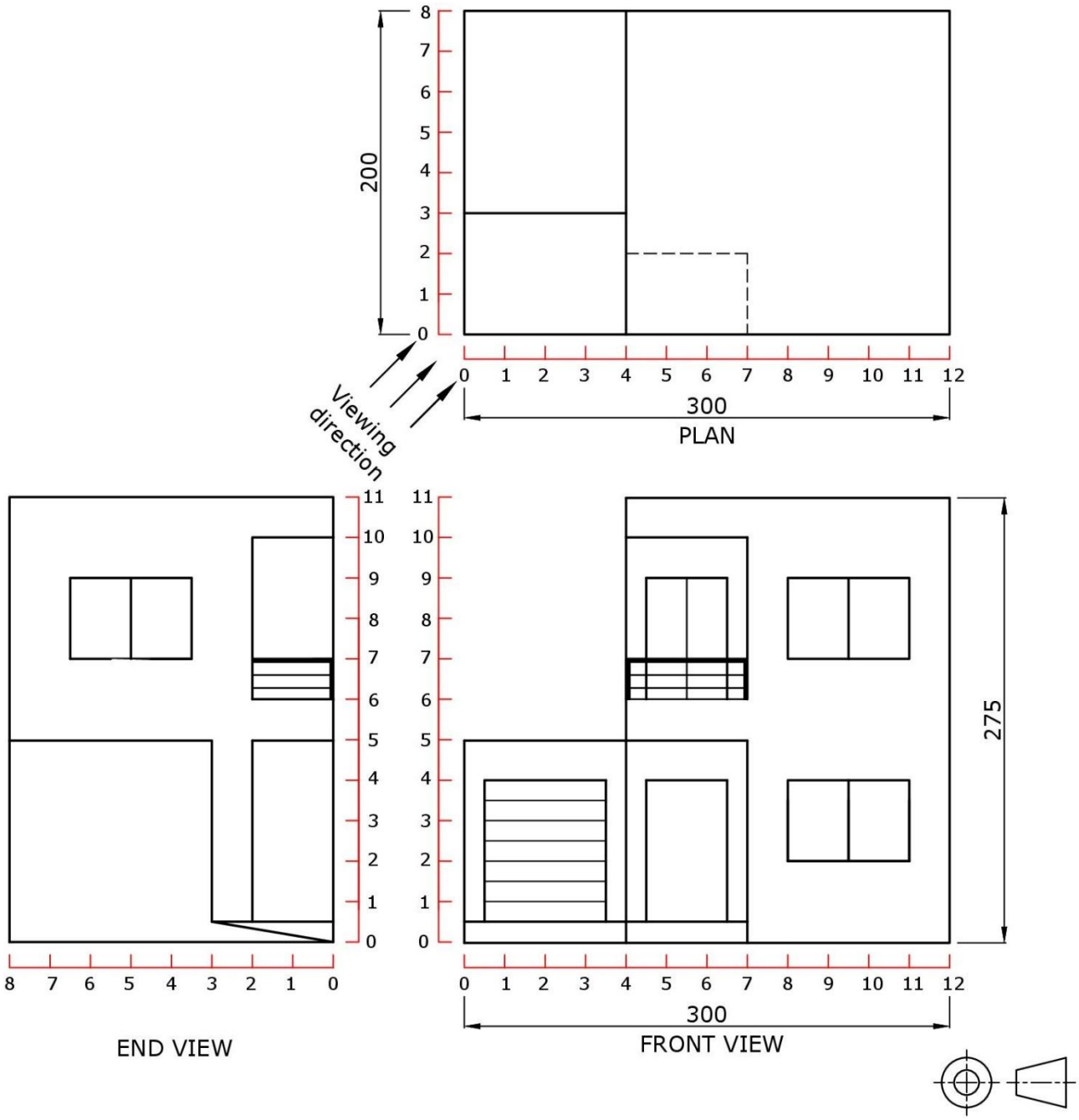
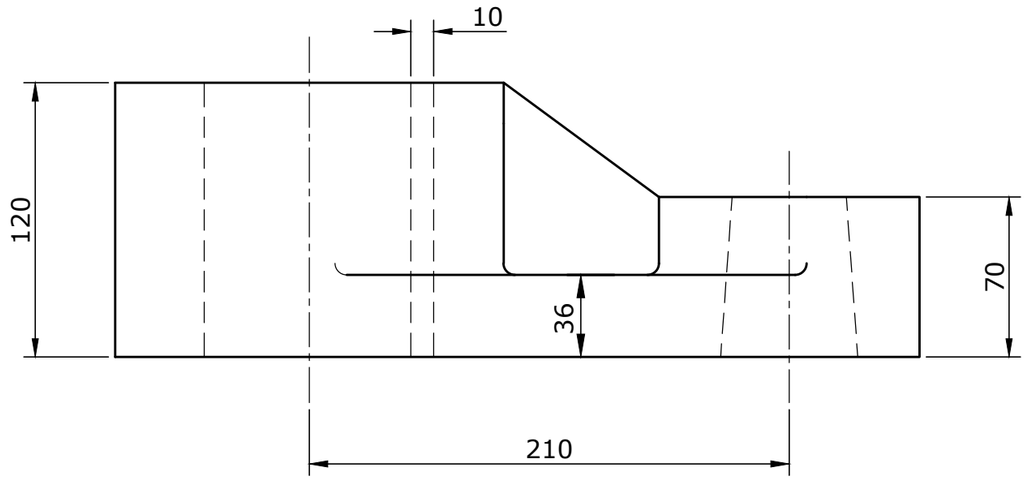
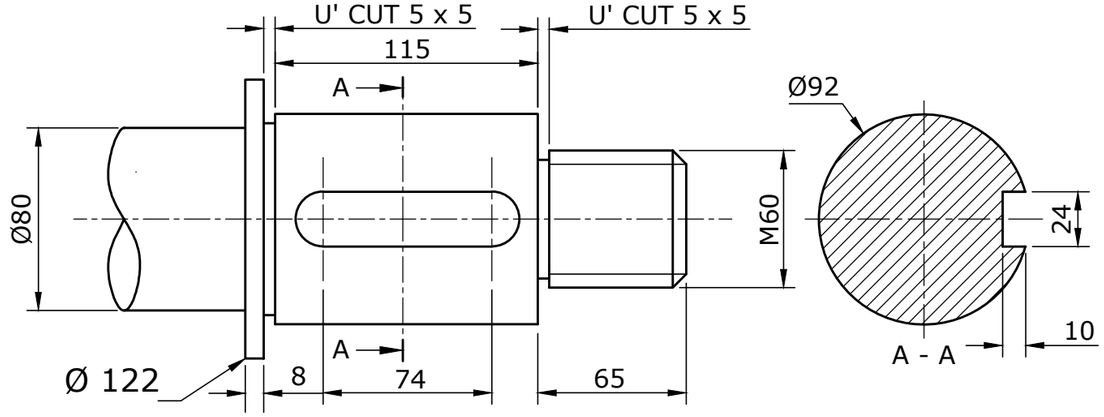
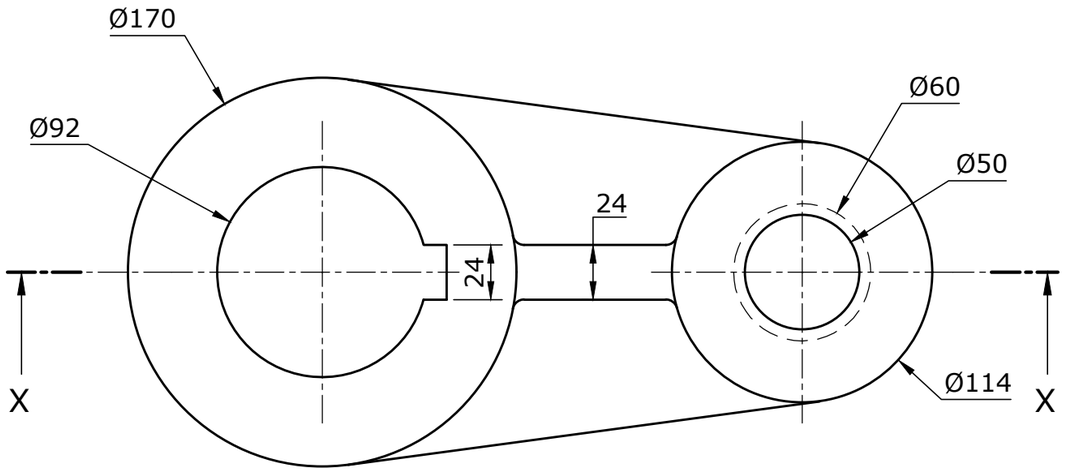


Figure 9c

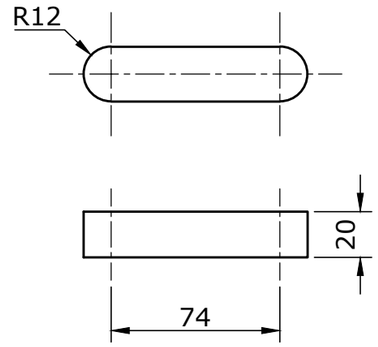




Item 2: Machined Shaft

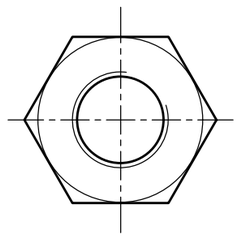


Item 1: Crank

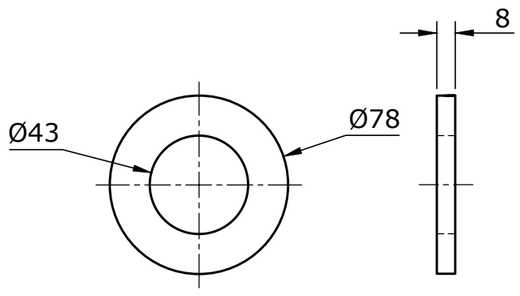


Item 4: Parallel Key

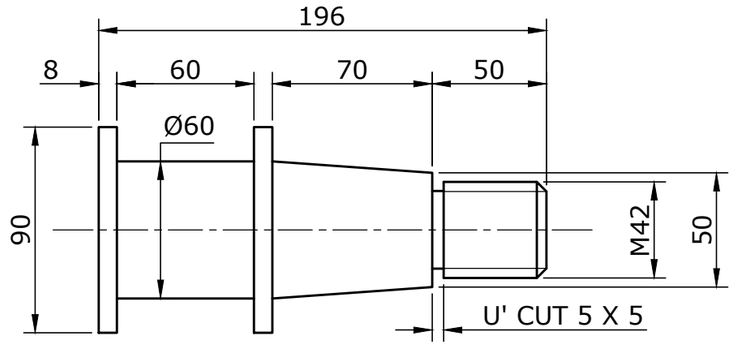
ITEMS LIST			
Item No.	Description	Material	Quantity
Item 1	Crank	CI	1 off
Item 2	Machined shaft	MS	1 off
Item 3	Tapered crank pin	MS	1 off
Item 4	Parallel key	MS	1 off
Item 5	M42 nut	MS	1 off
Item 6	Washer	MS	1 off



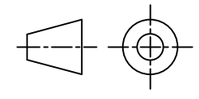
Item 5: M42 Nut



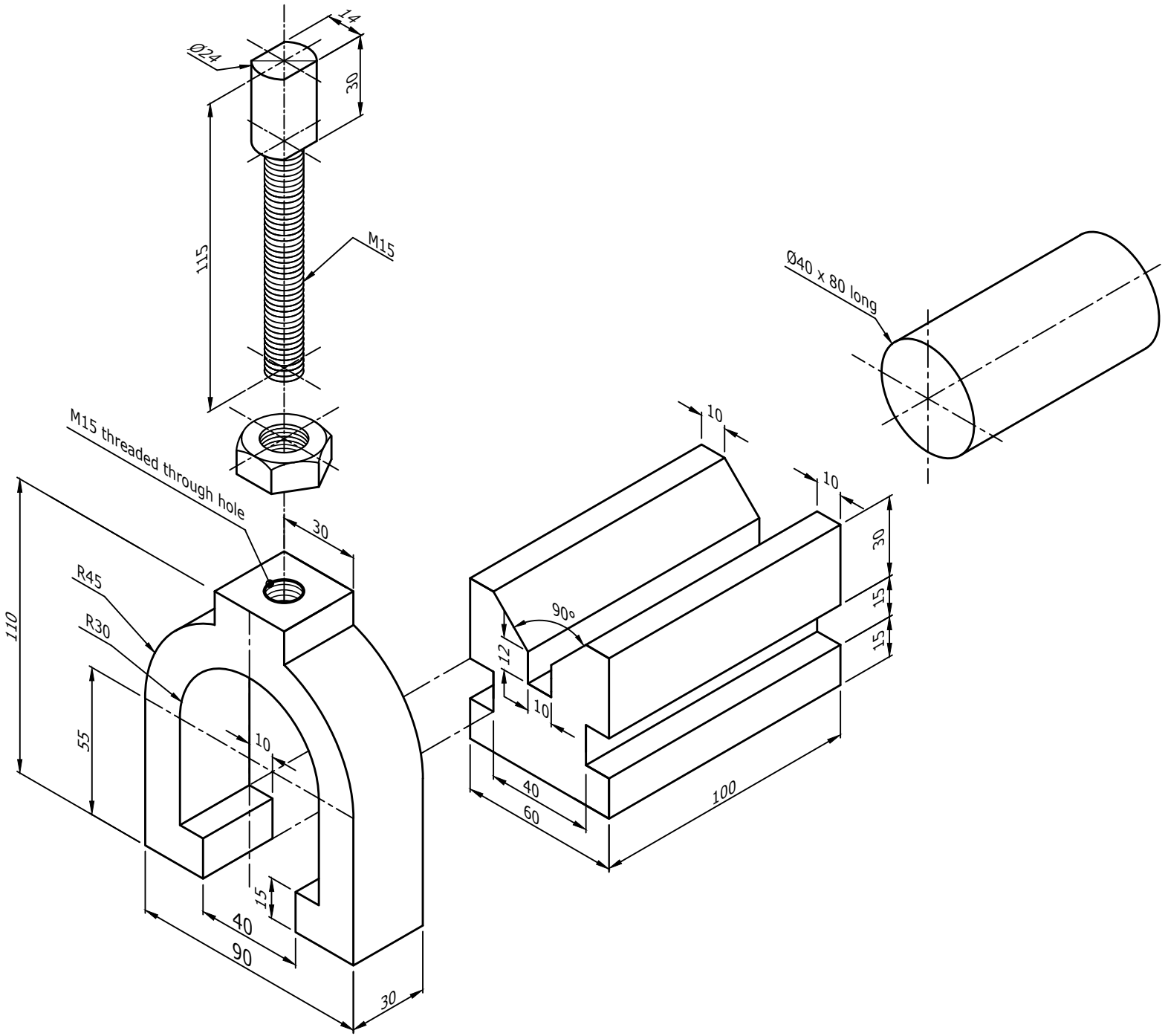
Item 6: Washer



Item 3: Tapered Crank Pin



UNIVERSITY OF MALTA	MATRICULATION CERTIFICATE EXAMINATION	IM09.26s SECTION 'B'	FIGURE 6b



UNIVERSITY OF MALTA	MATRICULATION CERTIFICATE EXAMINATION	IM09.26s SECTION 'B'	FIGURE 7b