



SUBJECT:	Engineering Drawing and Graphical Communication
DATE:	11 th December 2020
TIME:	9:00 a.m. to 12:05 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 any **FOUR** questions from this section.

Question 1

Figure 1a shows a snap-action toggle clamp mechanism. The mechanism also shown on Figure 1b exerts a vertical force of 300 N on the rectangular block when the line AB makes an angle of 30° with the horizontal. AC is vertical and DA is horizontal.

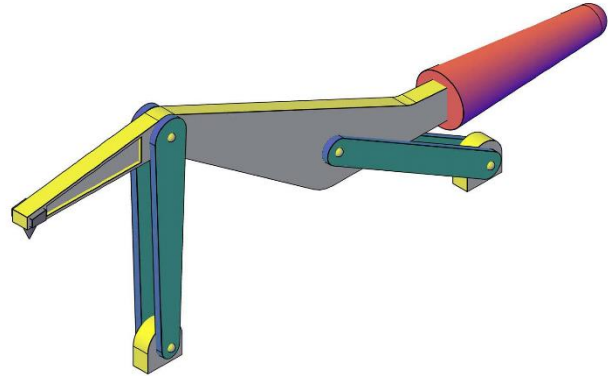


Figure 1a

a) Draw full size, the space diagram shown in Figure 1b on your drawing sheet. (3)

b) Determine and write the magnitude, the direction and the angle of inclination to the horizontal plane of the reaction at the pivot point C. (10)

(Total: 13 marks)

SPACE DIAGRAM

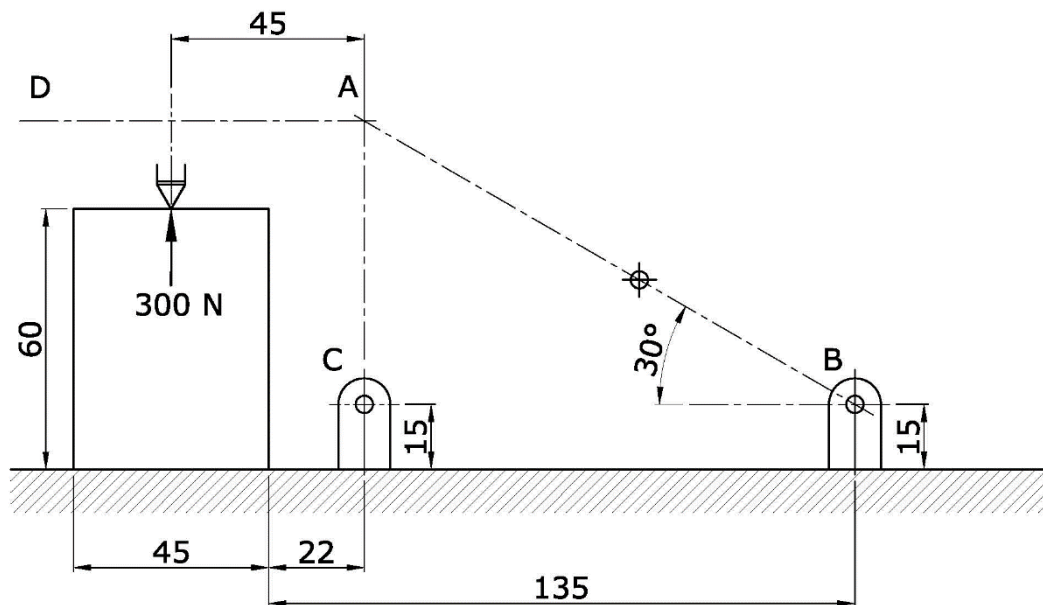


Figure 1b

Question 2

Three different positions of section planes passing through a right cone are shown in Figure 2a. The different positions of the section planes give three different particular conic shapes. An illustration of one of the sections is shown in Figure 2b.

- a) Draw, full size, the **TWO** views and the section planes as shown in Figure 2a. (2)
- b) On the same two drawn views, construct the true shape of the section produced by the:
 - i. section plane A - A. Name the conic section. (3)
 - ii. section plane B - B. The section plane is parallel to the slant height. Name the conic section. (4)
- c) Construct an auxiliary elevation, using the **TWO** drawn views, to show the true shape of the section C - C. Name the conic section. (4)

(Total: 13 marks)

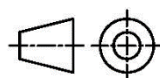
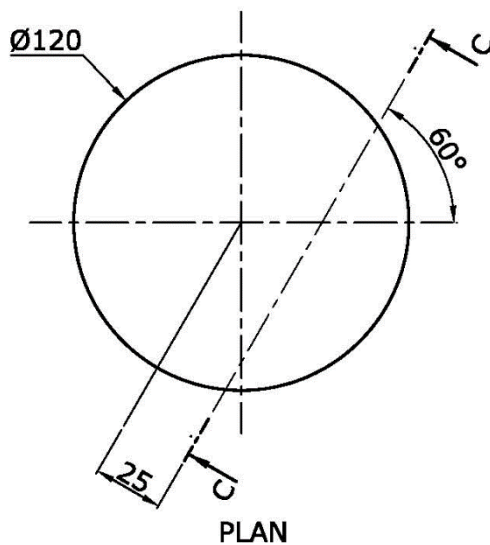
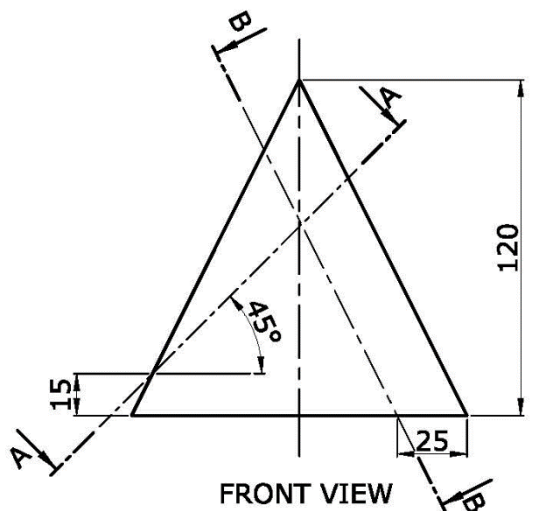


Figure 2a

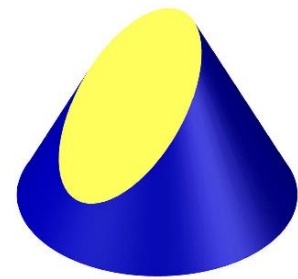


Figure 2b

Question 3

A right pentagonal prism resting on a horizontal plane has one face parallel to the vertical plane visible to the observer. The pentagonal prism is intersected by an irregular shaped triangular prism. The triangular prism is inclined to the vertical plane and its edges are parallel to the horizontal plane. An illustration of the two solids is shown in Figure 3a and an incomplete orthographic projection of the arrangement is shown in Figure 3b.

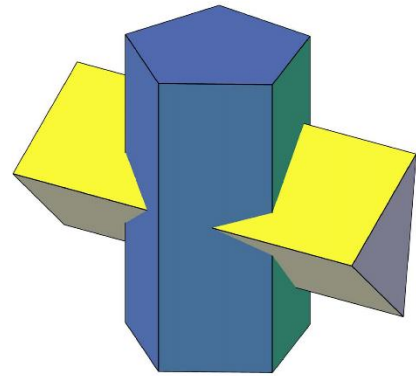


Figure 3a

a) Draw, full size, the plan and the auxiliary elevation of the two views shown in Figure 3b. (5)

b) Complete the front elevation of the arrangement including all lines of interpenetration of the surfaces. Show all hidden details. (8)

(Total: 13 marks)

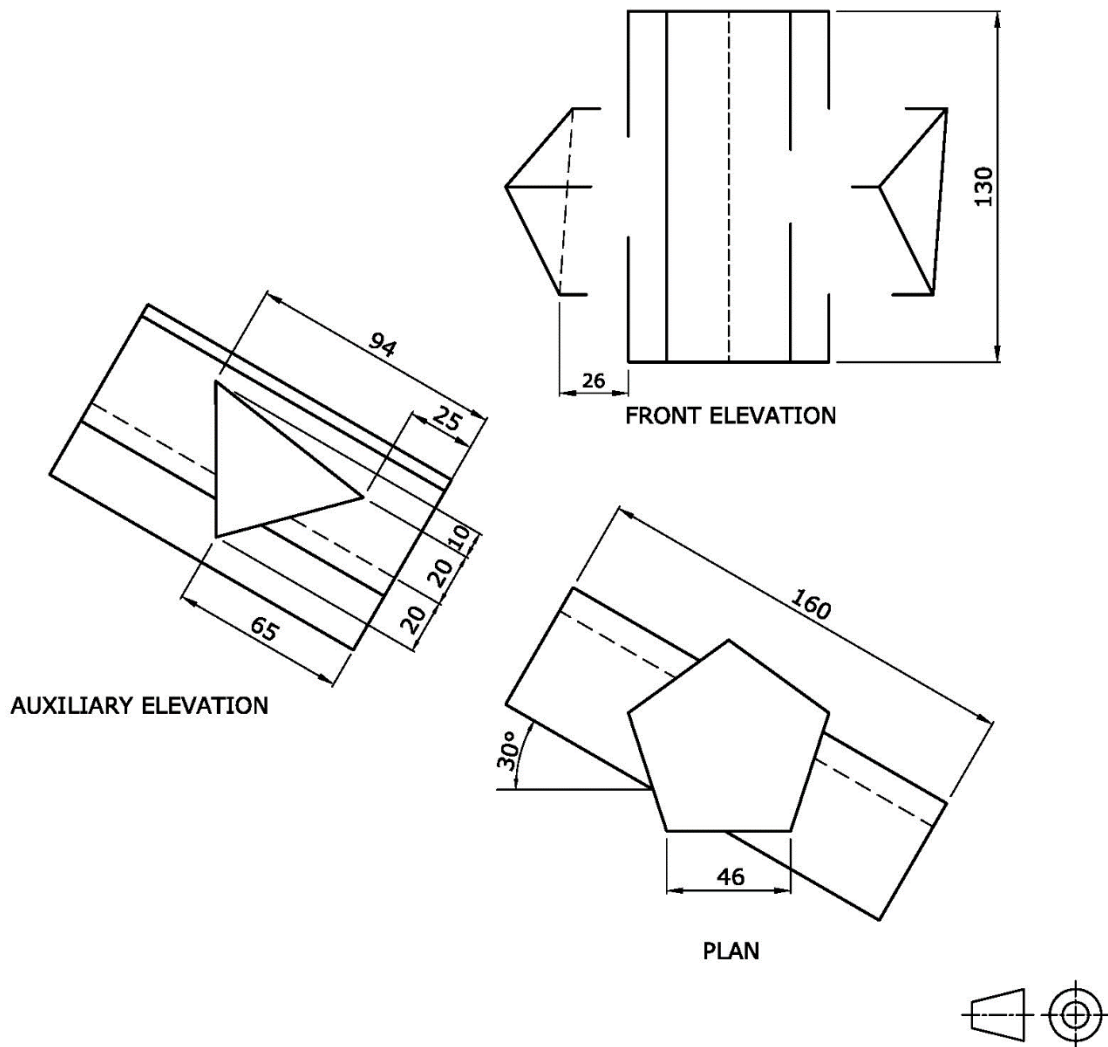


Figure 3b

Question 4

A pictorial view of a transition piece, suitable for connecting a circular pipe to a rectangular duct is illustrated in Figure 4a.

- a) Draw, full size, the orthographic views of the transition piece shown in Figure 4b. (3)
- b) Show clearly the method used to find the necessary true lengths required for the development. (4)
- c) Construct, using the method of triangulation, a half surface development of the transition piece. Ignore bending allowance and material thickness. A clear notation must appear on your drawing. (6)

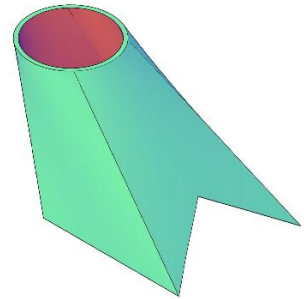


Figure 4a

(Total: 13 marks)

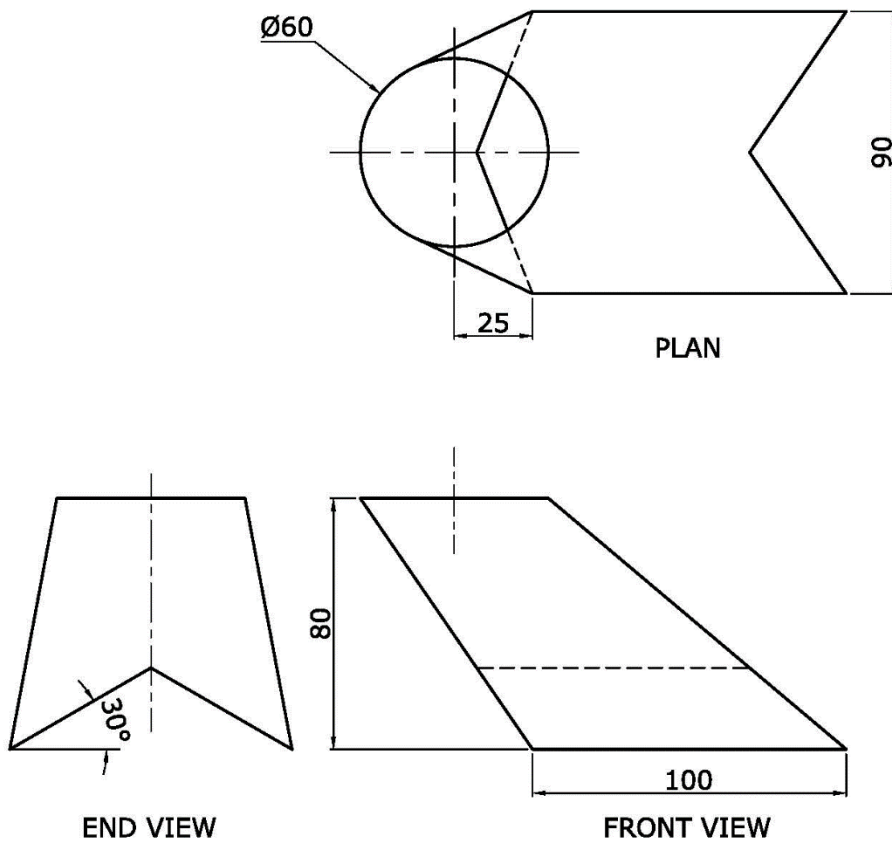
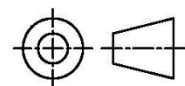


Figure 4b



Please turn the page.

Question 5

The front view and an incomplete end view of two hollow cylinders are shown in Figure 5a. As the external cylinder rotates, the element represented by line A-B move forward and backward along the axis of two hollow cylinders in a clockwise rotation.

- a) Copy, full size, the given two views shown in Figure 5a. (2)
- b) Trace the locus of the ends A and B, as the line A-B, moves:
 - i. a distance of 224 mm and 105° of clockwise rotation from the initial position shown to the position shown as line C-D; (3)
 - ii. a distance of 192 mm and 180° of clockwise rotation from the position shown as line C-D to the line E-F; (4)
 - iii. a distance of 192 mm and 180° of clockwise rotation from the position shown as line E-F to the line C-D. (4)

Point 'A' is to be always in contact with the inside of the 180 mm diameter cylinder and point 'B' always in contact with the outside of the 110 mm diameter circle.

(Total: 13 marks)

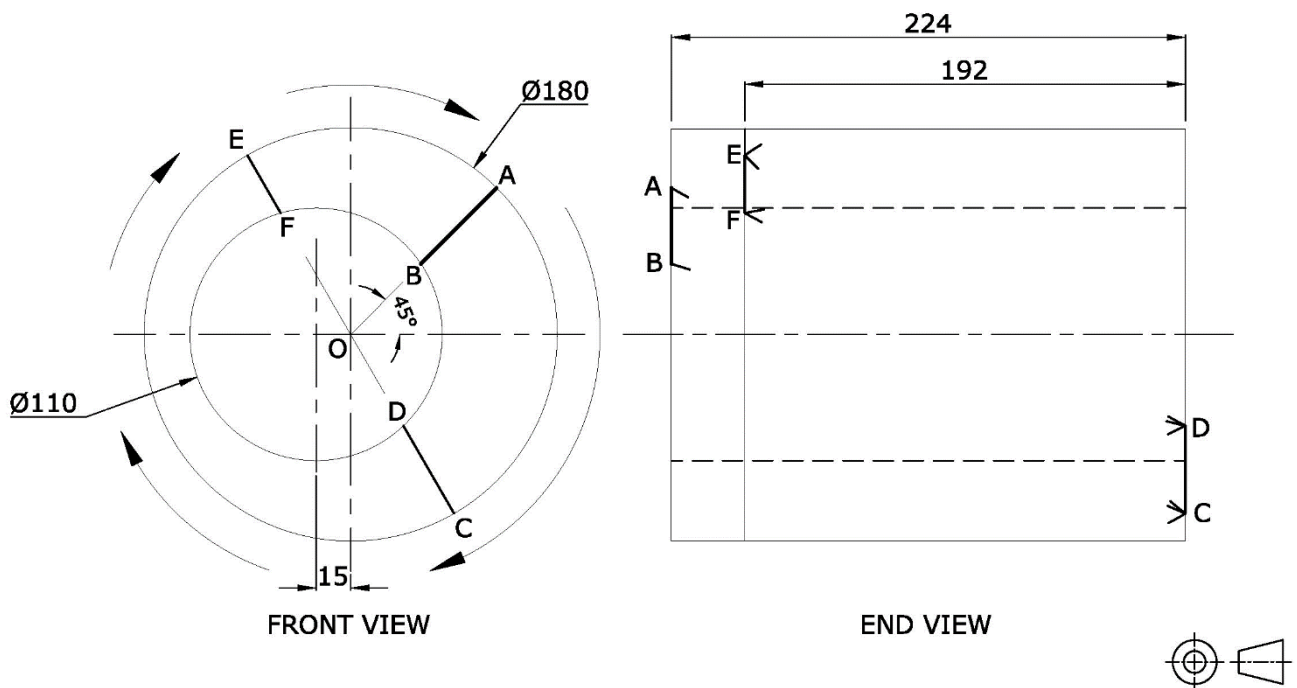


Figure 5a

SECTION B

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

Question 6

The illustration in Figure 6a shows a switch bracket with the various attachments pulled apart. Detail drawings of the bracket and the items which are to be assembled to the bracket are shown in Figure 6b on the attached A3 paper. The bracket and parts are assembled as follows:

- i. the square end of the spindle (Item 1) is fed through the 24 mm diameter bore of the bracket (Item 2). The 32 mm diameter step face of the spindle resting against the 84 mm square face of the bracket.
- ii. the 16 mm square hole of the hand wheel (Item 3), is fed onto the 50 x 16 mm square - drive end of the spindle. The hand wheel is inserted with the 42 mm diameter x 25 mm end resting against the 42 mm diameter x 5 mm step of the bracket.
- iii. a washer (Item 4) and an M6 hexagonal bolt (Item 5) retain the hand wheel on the spindle.

With the parts correctly assembled, draw, full size:

- a) a sectional elevation on the section line X – X. Only the portion marked 'A' of the hand wheel is to be showed sectioned, the rest of the hand wheel is to be shown as an outside view; (16)
- b) an end elevation looking in the direction of arrow E. Do **not** show hidden details. (8)

(Total: 24 marks)

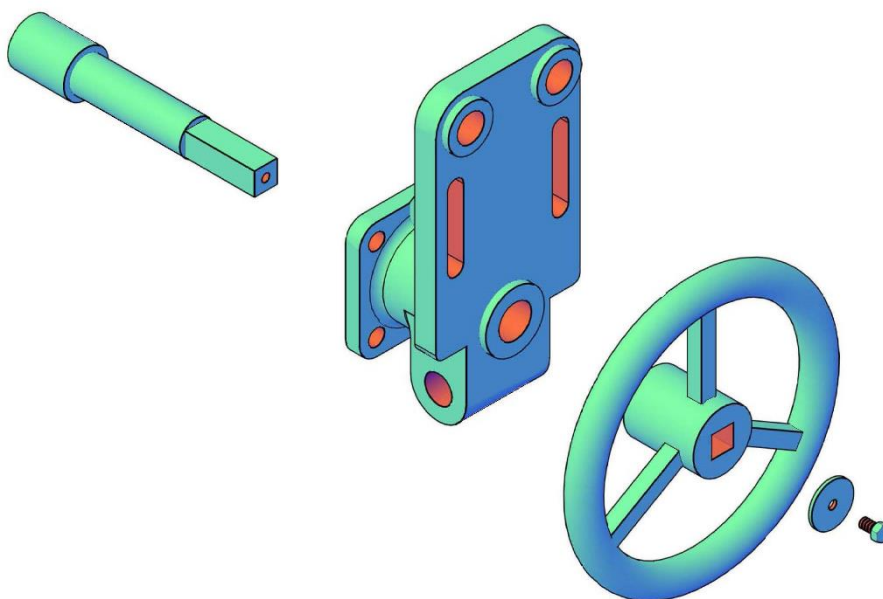


Figure 6a

Question 7

An illustration of a cam profile is shown in Figure 7a. The orthographic projection of the same cam profile is shown in Figure 7b on page 9.

a) Construct a cam profile with an in-line roller ended follower, given the following information:

- diameter of cam shaft is 20 mm,
- nearest approach of cam profile to cam centre is 30 mm,
- rotation of cam is anticlockwise,
- diameter of roller is 20 mm,
- from 0° to 180°, the follower lifts through 60 mm with uniform acceleration and retardation,
- from 180° to 195°, the follower rests. (7)

b) Copy, the contour of the cam profile A, B, C shown in Figure 7b. Draw the 60 mm diameter circle tangential to the cam profile drawn. Complete the front view of the item shown in Figure 7b. (4)

c) Draw an oblique projection of the cam. (13)

The solution may be presented as shown in Figure 7c on page 9.

(Total: 24 marks)

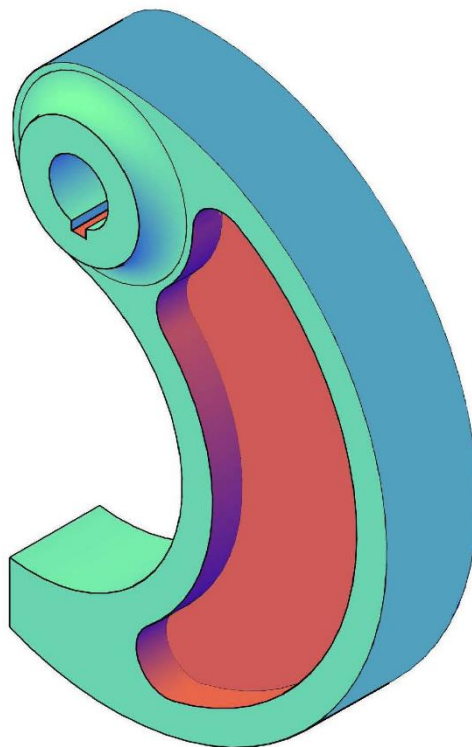


Figure 7a

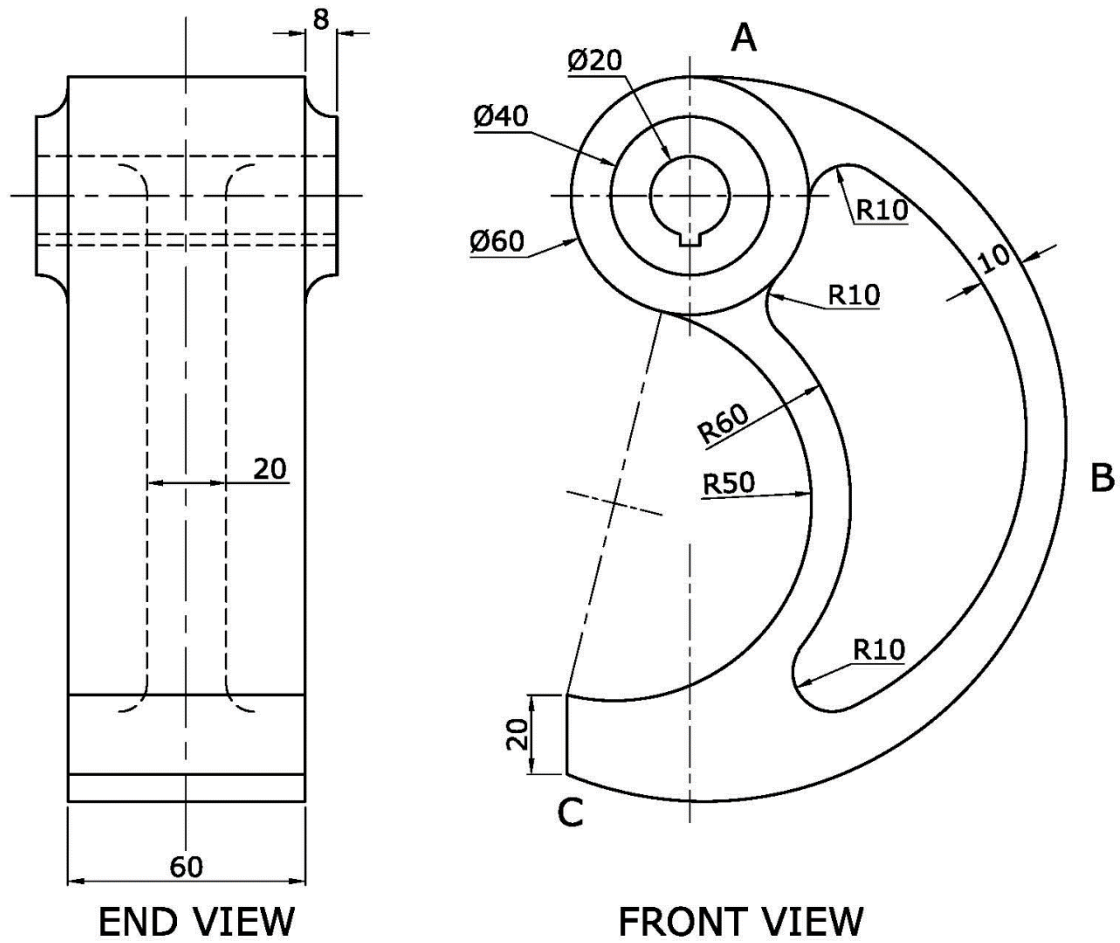


Figure 7b

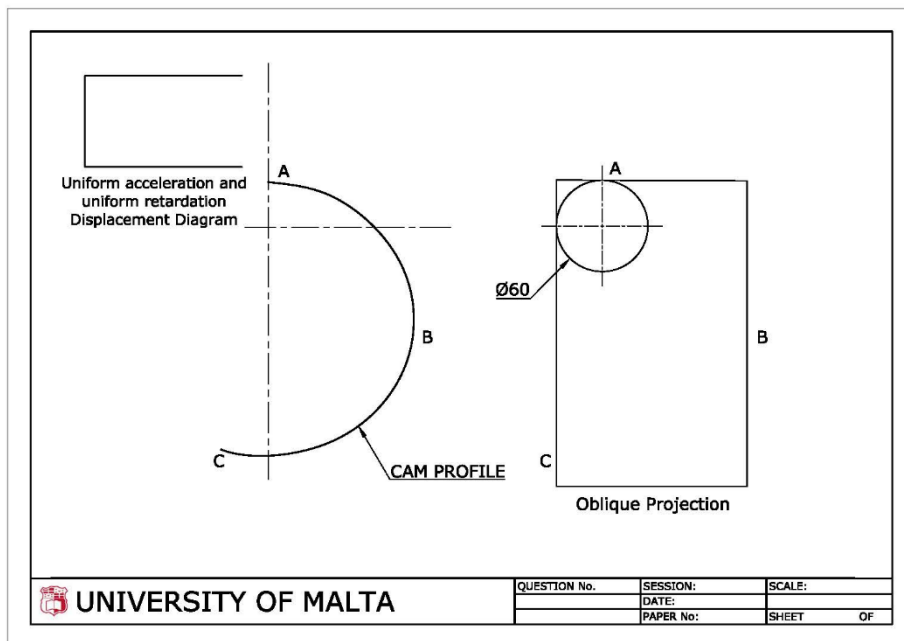


Figure 7c

SECTION C

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

Question 8

A group of students were asked to prepare a Poster on sleep health and the impact it has on daily activities, mood, mental activity and productivity.

In their research, the students learned that sleep is essential for the body to rest and recover energy for the next day. Sleeping pattern routine helps better rest. Our body organisms benefit from sleep to survive. Most kids between 5 years to 12 years need 10 hours of sleep every night.

The students' research tips to help them catch sleep, were:

- i. go to bed at the same time every night;
- ii. read before you go to sleep;
- iii. do not consume drinks that contain caffeine;
- iv. do not watch television before you go to sleep;
- v. avoid to watch scary movies;
- vi. do not exercise before you go to bed.

The students carried out a survey on sleep health. The data is recorded in the tables below.

Table 8.1: Average hours of sleep during the week.
[students' survey]

Gender	Average hours of sleep during the week		
	4 - 5 hours	6 - 7 hours	8 - 10 hours
Number of Girls	3	14	7
Number of Boys	4	16	5

Table 8.2: Number of students that feel sleepy and/or tired during the day.
[students' survey]

Gender	Feeling sleepy and tired during the day		
	Morning	Afternoon	Evening
Number of girls	1	6	3
Number of boys	2	5	1

Table 8.3: Activities done before going to sleep by the students.
[students' survey]

Activities done before going to sleep	Number of students
Read	6
Listen to music	5
Watch television	10
Play video games	15
On the internet	13

You are required to design a poster. Your presentation must follow the steps given below and organised as suggested in Figure 8a.

- a) Label the poster with the heading "Sleep Health". (2)
- b) Draw **THREE** pictograms representing the idea and concept in a simple drawing chosen from the tips to help you catch sleep, researched from students as shown on page 10. Sketches to develop ideas can be drawn at the side of your A2 sheet. (8)
- c) Draw a bar chart on your poster showing the average hours of sleep during the week between boys and girls. Label the bar chart. (4)
- d) Draw a line graph showing the number of girls and boys that feel tired or sleepy during the day. Label the line graph. (4)
- e) Draw a pie chart showing the number of students and the activities they do before sleeping. Label the pie chart. (4)
- f) Finalise your designed poster. The poster is expected to have a visual impact and carry the intended message clearly. (2)

Special consideration is to be given to the following aspects:

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

(Total: 24 marks)

a) HEADING			b) SKETCHES TO DEVELOP IDEAS FOR PICTOGRAMS
b) PICTOGRAM 1	b) PICTOGRAM 2	b) PICTOGRAM 3	
c) BAR CHART	d) LINE GRAPH	e) PIE CHART	
UNIVERSITY OF MALTA			
QUESTION No.	SESSION:	SCALE:	
	DATE:		
	PAPER No:	SHEET OF	

Figure 8a

Question 9

An isometric drawing of a small loft used for storage is shown in Figure 9a. The front view, end view and plan are shown in Figure 9c. The loft consists of a staircase with underneath storage, cabinets and overlying storage space.

Use the dimensions given in the orthographic projection to construct an estimated two point perspective of the loft. The viewing direction required is indicated by the arrow in the plan. Use the suggested layout of the two point perspective shown in the Figure 9b. (21)

Render in colour your drawing to enhance its presentation. (3)

(Total: 24 marks)

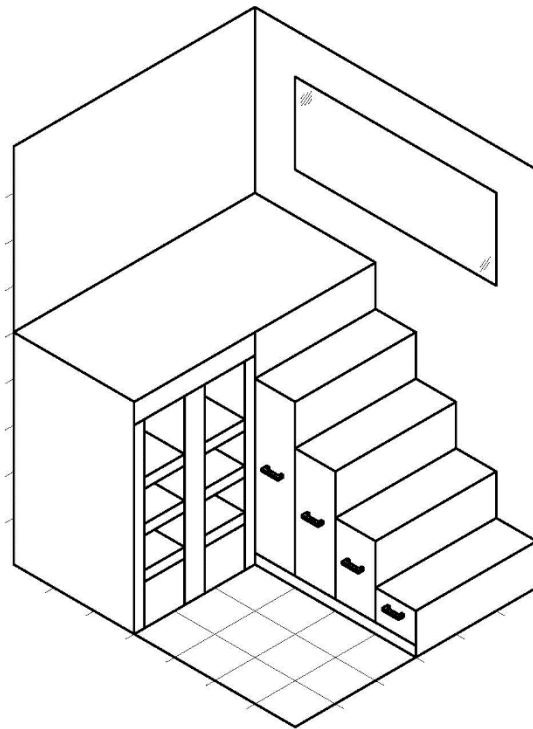


Figure 9a

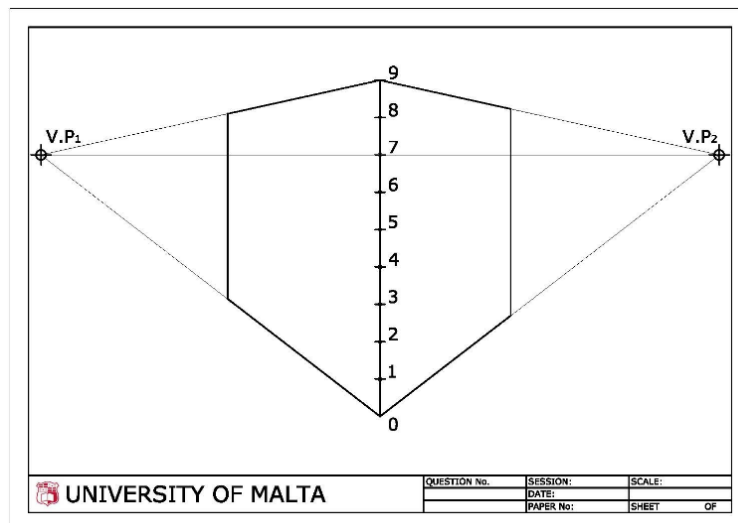


Figure 9b

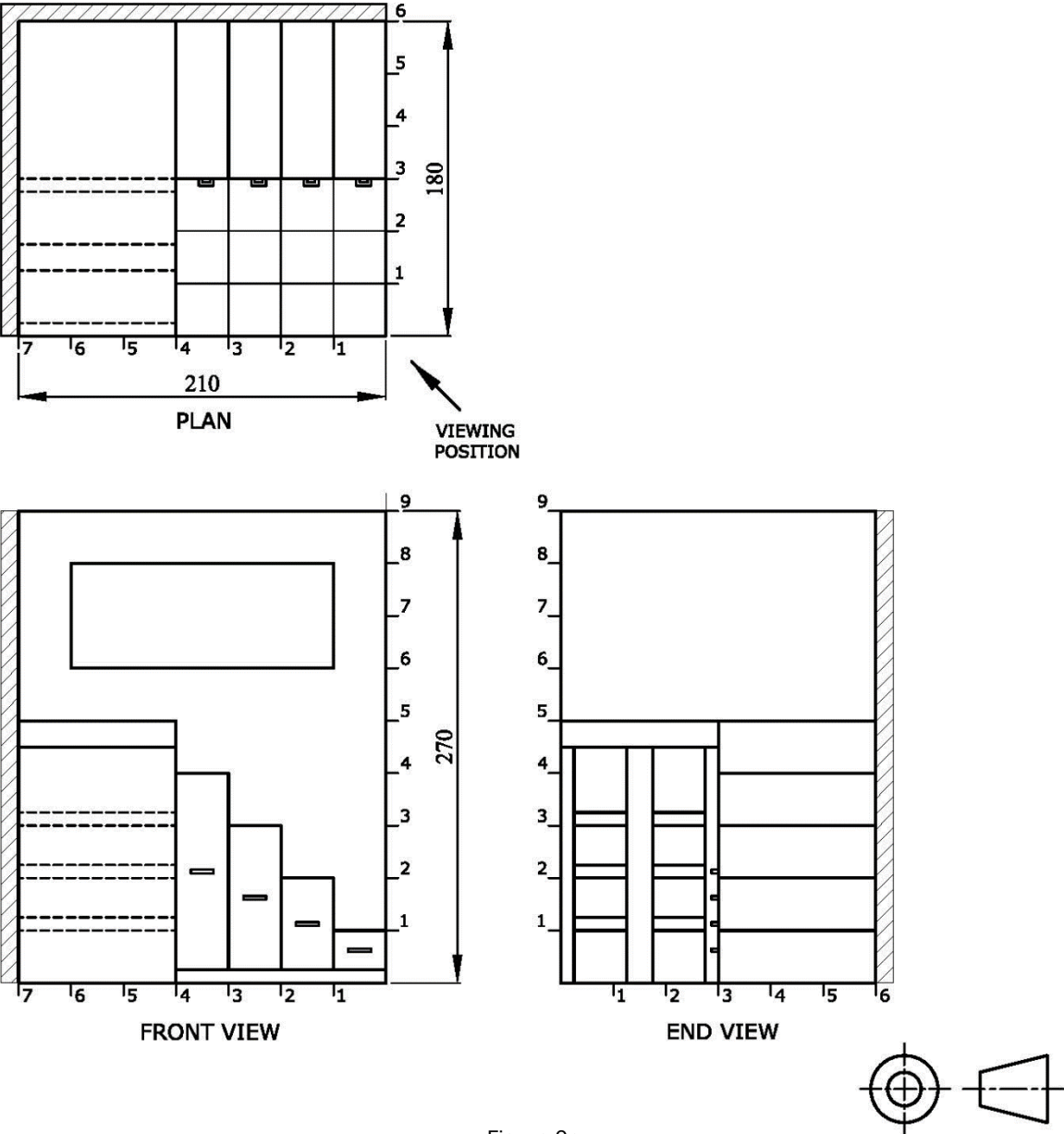
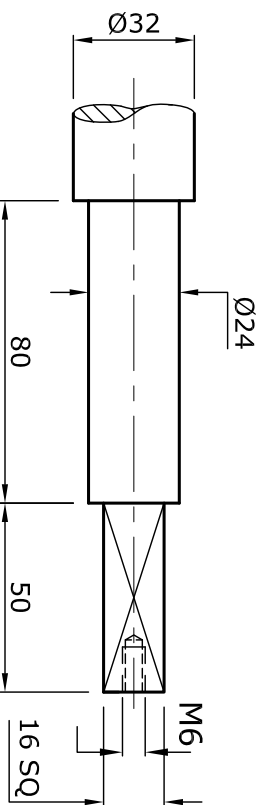


Figure 9c

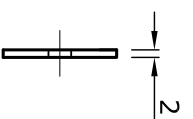
SWITCH BRACKET

Figure 6b

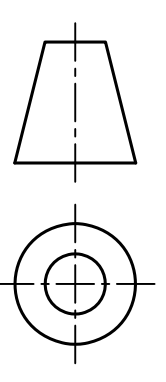
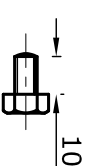
SPINDLE (ITEM 1)



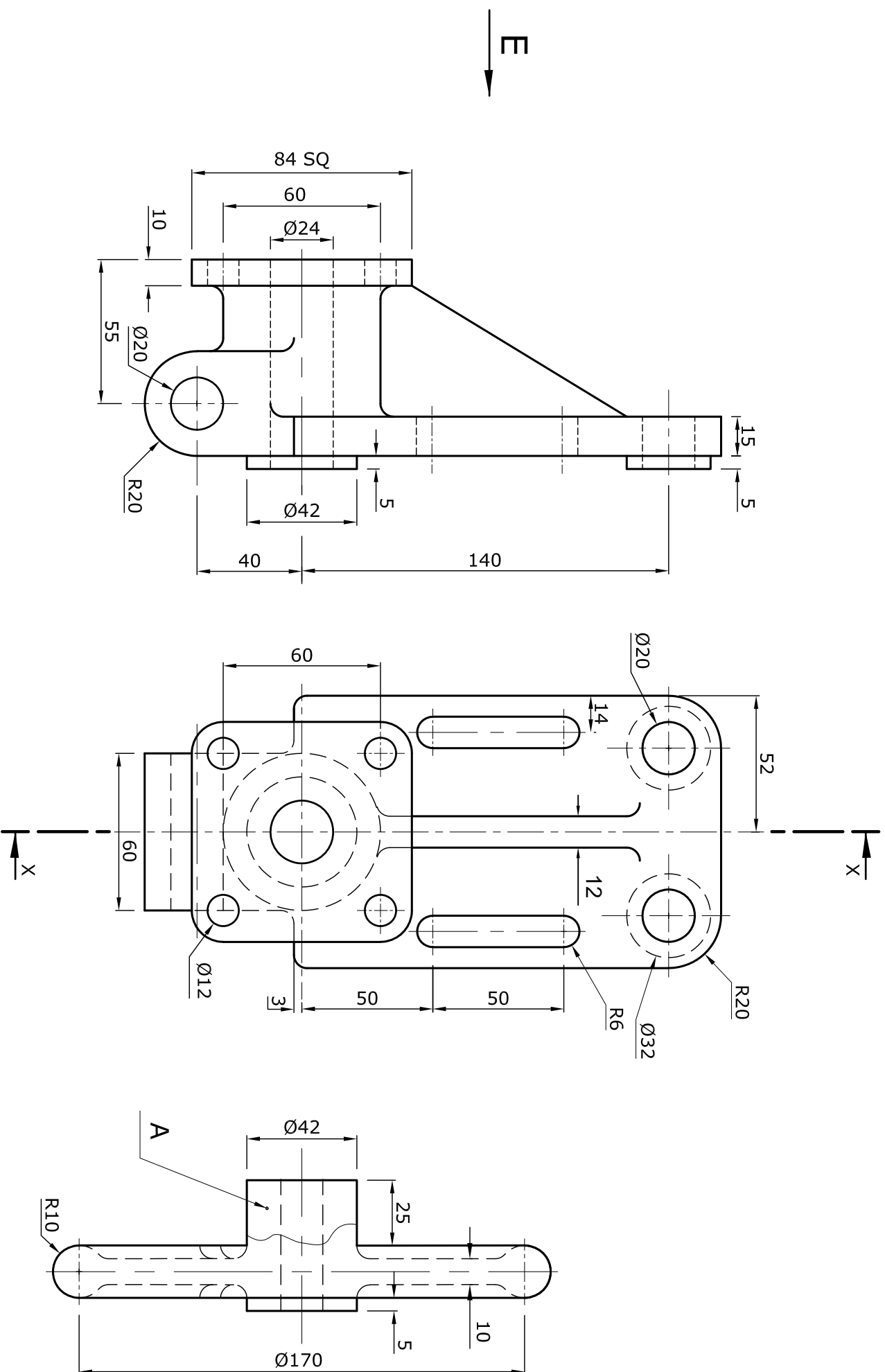
WASHER (ITEM 4)



M6 BOLT (ITEM 5)



BRACKET (ITEM 2)



HAND WHEEL (ITEM 3)

