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SUBJECT:	<b>Engineering Drawing and Graphical Communication</b>
DATE:	5 <sup>th</sup> October 2020
TIME:	4:00 p.m. to 7:05 p.m.

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**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**

The neck profile of a vase is constructed similar to two branches of a hyperbola. The vase is shown in Figure 1a. The conjugate axis, the foci F and F1, the vertex V and V1 and the transverse axis of the hyperbola are shown in Figure 1b.



Figure 1a

- a) Copy the given figure shown in Figure 1b. (2)
- b) Plot both branches of the hyperbola, showing the construction adopted. The position of the ends of the hyperbolic curve is shown in Figure 1b. (4)
- c) Draw the directrices, using an eccentricity of 5:3. (2)
- d) Construct the asymptotes, showing the method used. (3)
- e) Draw a normal and a tangent to the curve. (2)

**(Total: 13 marks)**

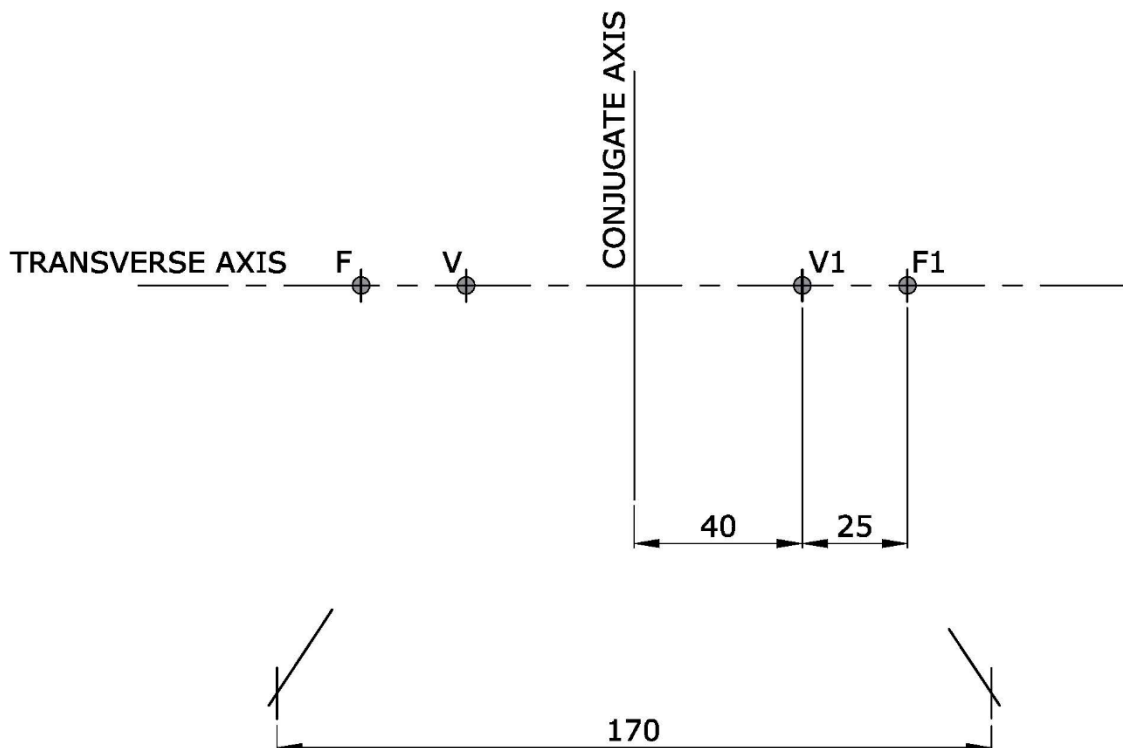


Figure 1b

**Question 2**

A rectangular prism and two spheres mutually in contact resting on a horizontal plane are shown in Figure 2a. Two views of the rectangular prism and a 100 mm diameter sphere resting on the horizontal plane and in contact are shown in Figure 2b.

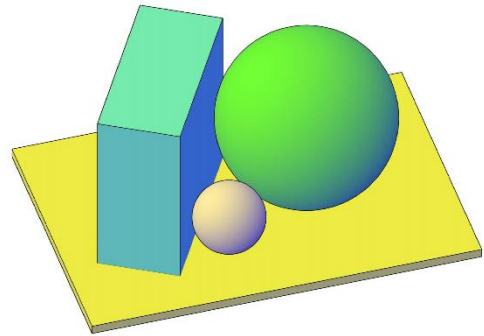


Figure 2a

a) Copy the two views shown in Figure 2b. Locate and mark the position of the point P on the front view. (3)

b) A 40 mm sphere is placed resting on the horizontal plane in mutual contact with the rectangular prism and the sphere.

Construct the points of contact of the 40 mm diameter sphere between the prism and the sphere on:

- i. the front view; (5)
- ii. the plan. (5)

Note: The 40 mm diameter sphere is to be placed in front of the two solids, fully visible in the front view. Show clearly **all** points of contact and how they are obtained.

**(Total: 13 marks)**

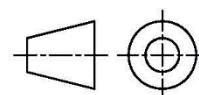
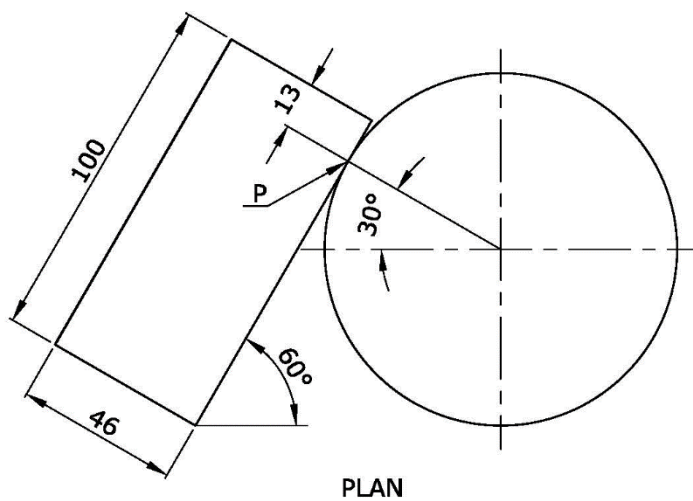
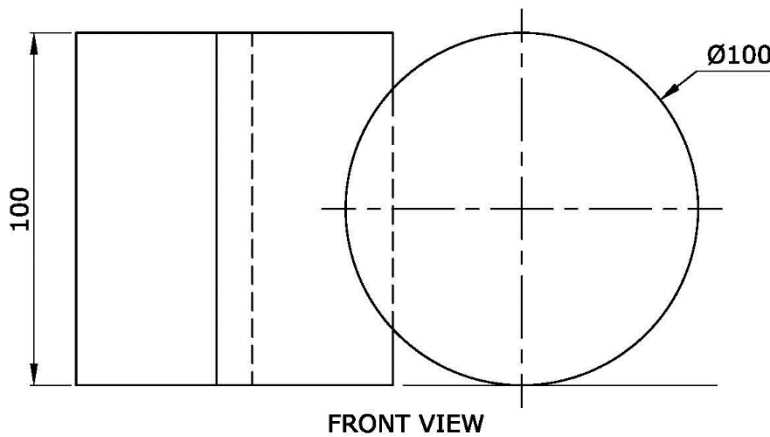


Figure 2b

**Question 3**

A pictorial representation of a cone intersected by a triangular prism is shown in Figure 3a. The incomplete orthographic projection of the cone and the triangular prism is shown in Figure 3b.

- a) Draw, full size, the views shown in Figure 3b. (4)
- b) Complete the plan by constructing the intersection curves. (4)
- c) Construct the intersection curves on the front view. (5)

**(Total: 13 marks)**

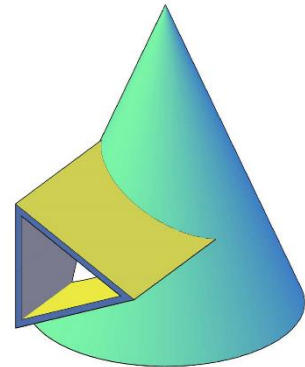


Figure 3a

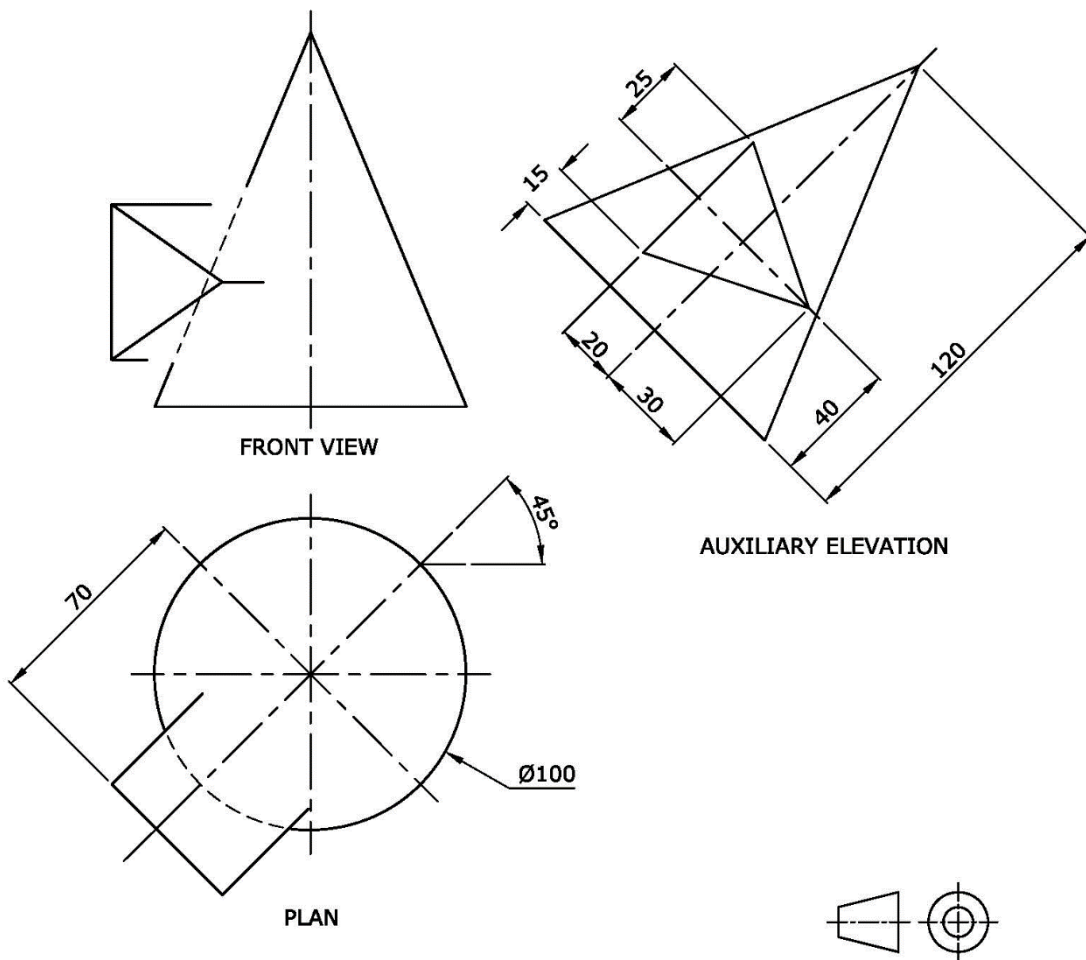


Figure 3b

**Question 4**

A pictorial illustration of an oblique pyramid which was designed to fit a particular opening is shown in Figure 4a. The orthographic projection of the oblique pyramid is shown in Figure 4b.

- a) Copy, full size, Figure 4b showing the truncated oblique pyramid. (4)
- b) Complete the plan by showing how the section is represented. (2)
- c) A pattern of the cut pyramid is to be drawn and the true lengths of the edges are required. Show how the true lengths of the required edges are obtained. (3)

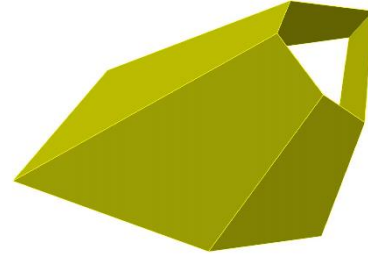
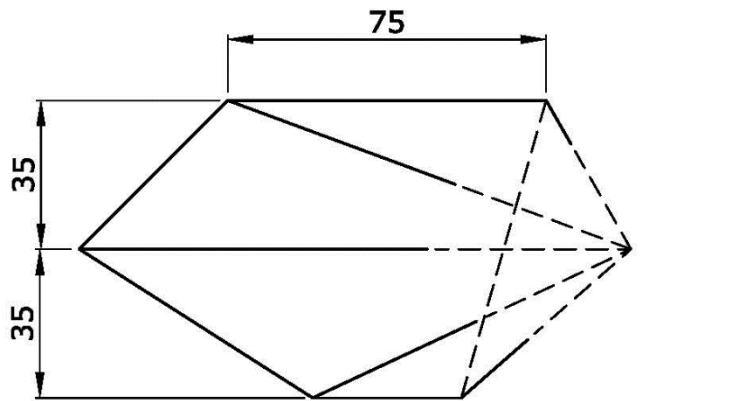


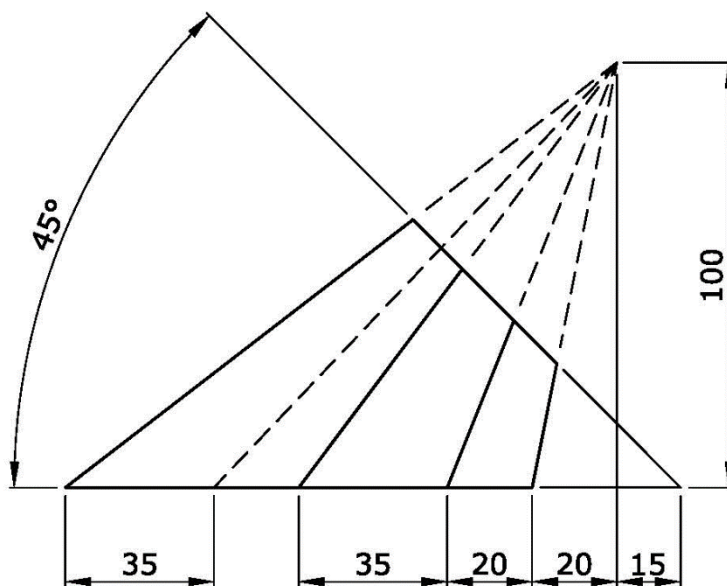
Figure 4a

- d) Construct a complete surface development of the truncated oblique pyramid. (4)

**(Total: 13 marks)**



PLAN



FRONT VIEW

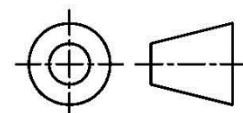


Figure 4b

**Question 5**

A beam loaded with five loads overhanging at one end, is shown in Figure 5a.

- a) Draw the space diagram, including the missing letters using Bow's notation and use the scale shown in Figure 5b. (3)
- b) Construct the polar diagram and use a vector scale of 10 mm representing 5 kN. (2)
- c) Draw the funicular polygon to determine graphically the values of the left and right reactions. State their values. (5)
- d) Draw the shear force diagram for the beam. (2)
- e) Indicate the position of the resultant/equilibrant. Dimension the distance from the left reaction. (1)

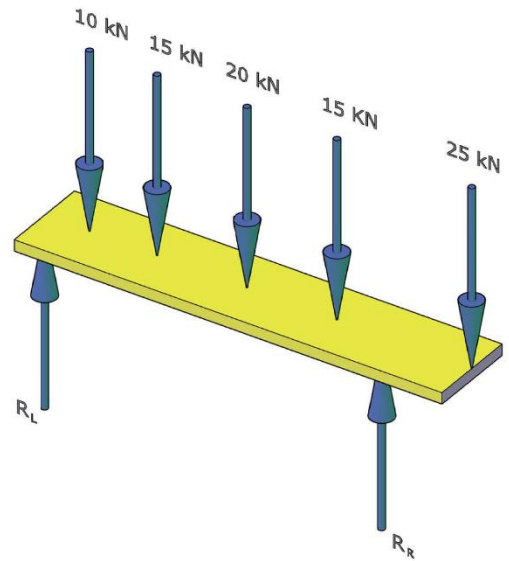


Figure 5a

**(Total: 13 marks)**

**SPACE DIAGRAM SCALE: 10 mm represent 0.5 m**

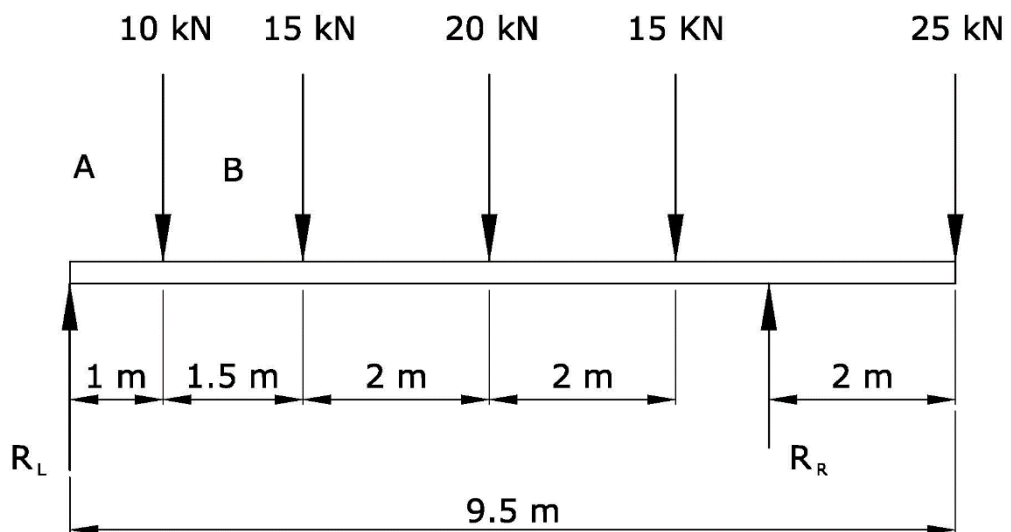


Figure 5b

**SECTION B**

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

**Question 6**

An illustration of a cable guide is shown in Figure 6a. The guide assembly is secure onto a 30 mm diameter bar (not shown). The cable guide is adjusted to the required position on the round bar and then locked by means of the clamping screw through the 'pinch slot' in the roller support. The component parts of the cable guide are shown in Figure 6b, on the A3 sheet attached. The complete cable guide is assembled as follows:

The guide roller (Item 2), is placed between the lugs of the forked end of the roller support (Item 1). The 14 mm diameter hole of the roller is aligned with the holes at the forked end.

The roller spindle (Item 3), is inserted in the unthreaded 14 mm hole of the roller support forked end and slipped through the guide roller. The spindle is tightened and secured in the M14 threaded hole at the forked end.

The clamp screw (Item 4), is assembled in the 16 mm diameter and in the M14 threaded hole at the 'pinch slot' end of the roller support.

With the parts correctly assembled, draw, full size:

a) a sectional front elevation of the section plane A-A of the complete assembly; (15)

b) a sectional plan of the section B-B. (9)

The 30 mm bar (not shown), is not required in the drawing.  
Hidden detail is not required.

**(Total: 24 marks)**

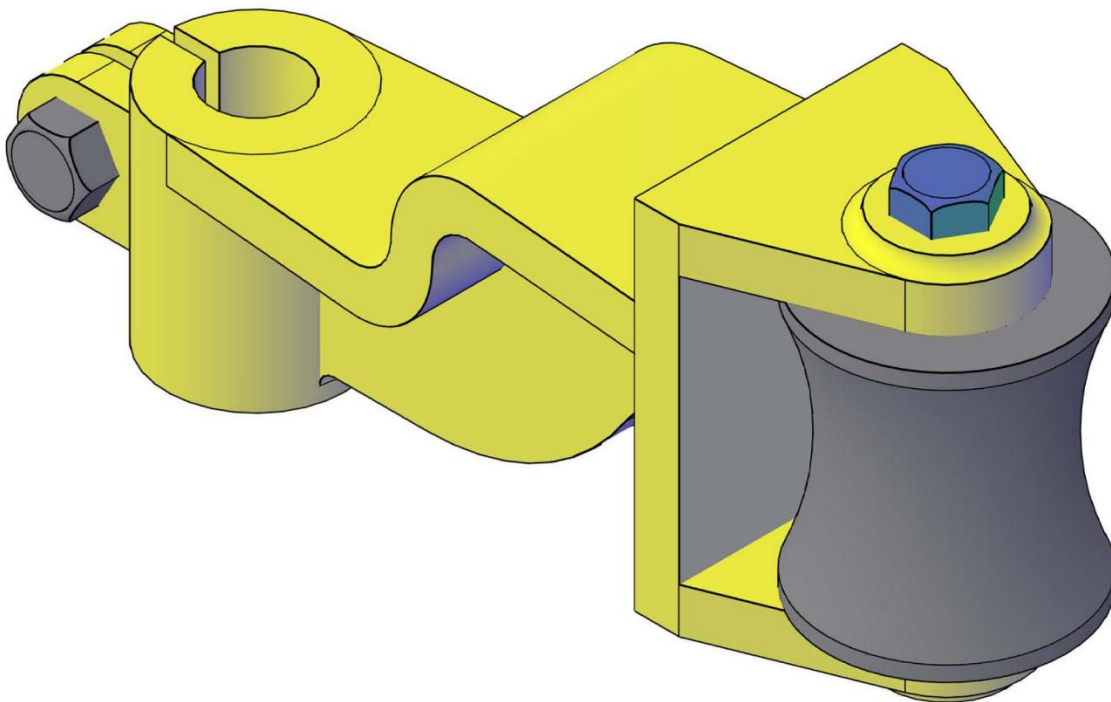


Figure 6a

### Question 7

An exploded pictorial projection of a C-clamp is shown in Figure 7a. Detailed orthographic drawing of the components that form the C-clamp are shown in Figure 7b.

The M20 lead screw (Item 2), is installed in the threaded end of the C-clamp (Item 1). The swivel (Item 3) is then inserted at the end of the lead screw. The pin (Item 4), is inserted in the 12 mm diameter hole of the lead screw head.

Draw, an isometric view of the assembled C-clamp, with the detail marked 'A' nearest to you, and the C-clamp standing up-right on face 'B'.

Show the lead screw with the swivel drawn 50 mm away from the 40 mm x 5 mm octagonal pad.

The pin (Item 4), to be shown slid midway through the diameter 12 hole of the screw, with its longitudinal axis horizontal to the base.

Note:

The 12 mm diameter end of the pin may be drawn free hand.

*The feature of securing the swivel to the screw is not shown on the drawing and is not required.*

Hidden detail is not required.

**(Total: 24 marks)**

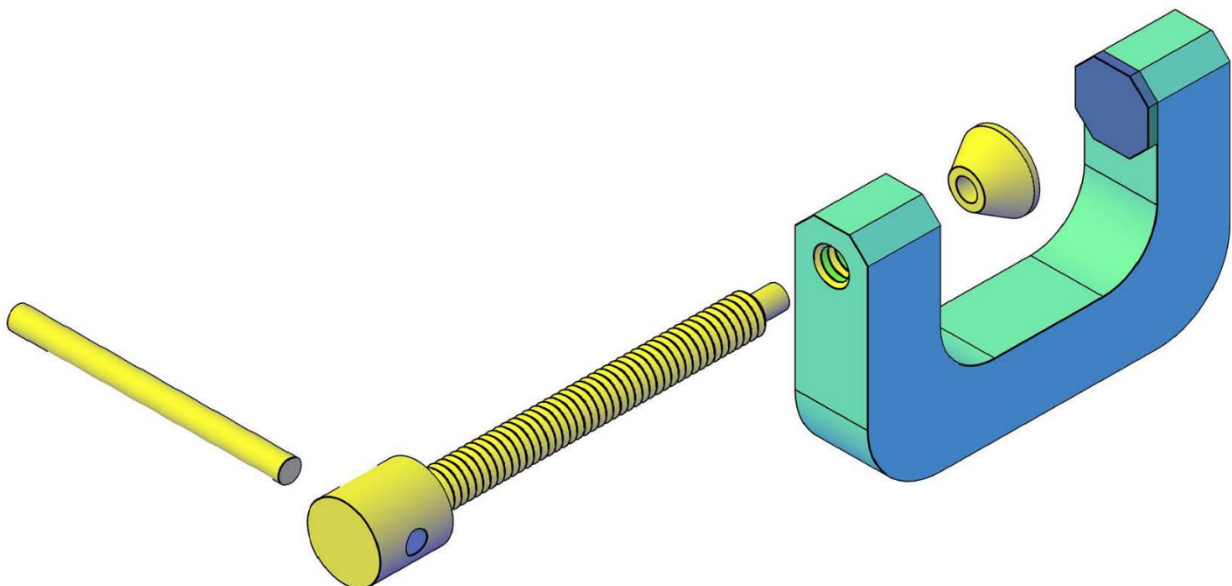
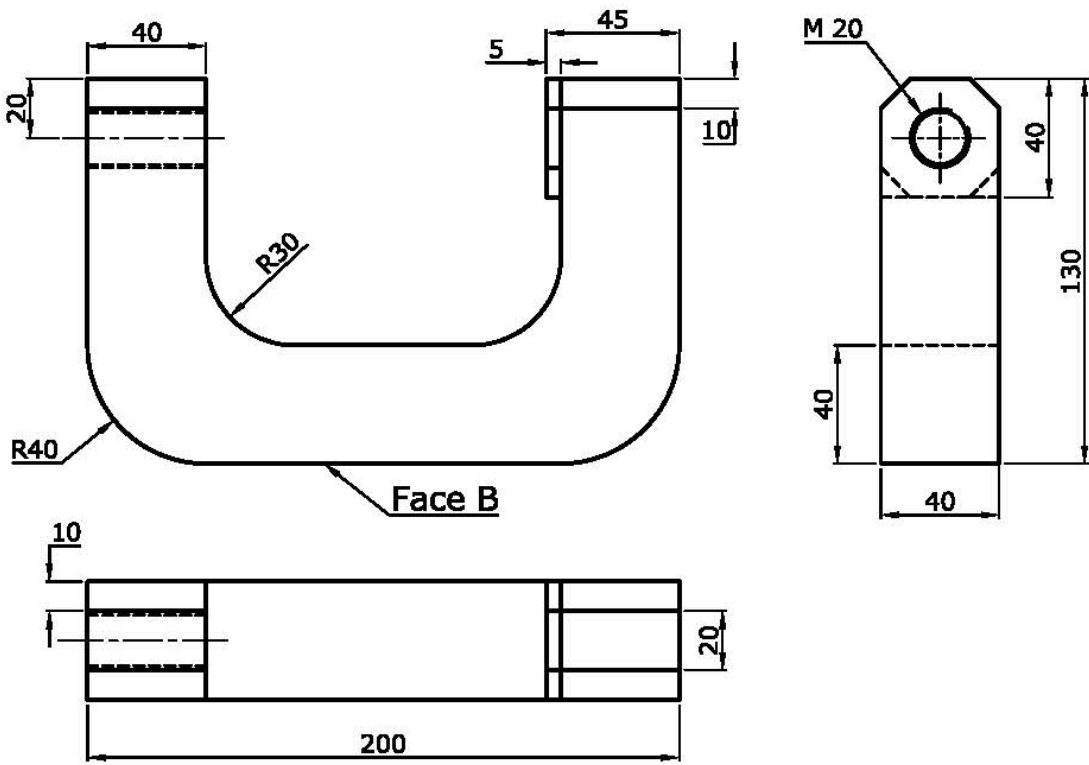
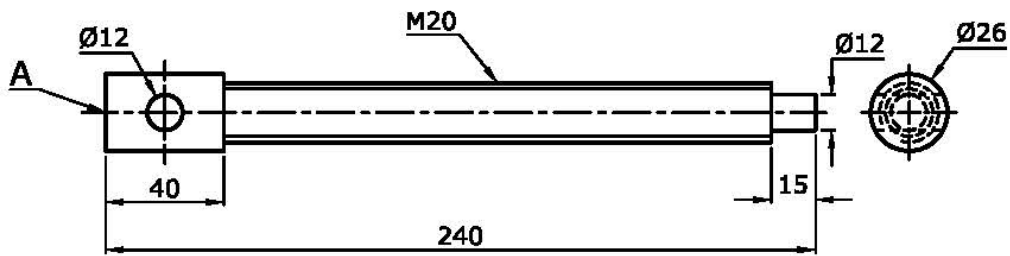


Figure 7a

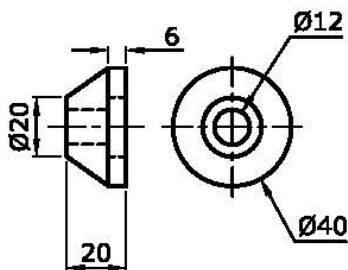




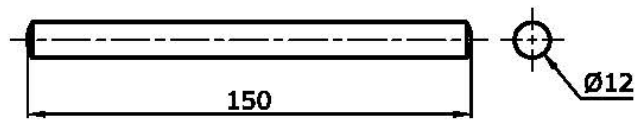
BODY (ITEM 1)



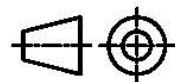
M 20 SCREW (ITEM 2)



SWIVEL (ITEM 3)



PIN (ITEM 4)



C - CLAMP

Figure 7b

**SECTION C**

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

**Question 8**

A school wants to prepare a **Poster** about obesity in Malta. The aim is to persuade its students, teachers and parents to opt for a healthy lifestyle. The students preparing the poster made some research, and the following are their findings:

Table 8.1: Overweight and obesity among 11, 13 and 15 year olds.  
[HBSC (2013 – 2014) study]

Gender	<b>Overweight and obesity among 11,13 and 15 year olds</b>		
	<b>11 year old</b>	<b>13 year old</b>	<b>15 year old</b>
Boys	38%	36%	34%
Girls	32%	33%	26%

Table 8.2: Increase in the percentage of obesity individuals between 2008 and 2016.  
[Weighing the cost of Obesity in Malta, PWC (2017)]

<b>Increase in the percentage of obese individuals between 2008 and 2016</b>		
<b>2008</b>	<b>2015</b>	<b>2016</b>
22.4%	25.3%	34.0%

Table 8.3: Percentage of Maltese adults who are overweight and/or obese.  
[Cuschieri et al. (2016) study]

<b>Percentage of Maltese adults who are overweight and/or obese</b>	
<b>Men who are overweight and/or obese</b>	<b>Women who are overweight and/or obese</b>
76.3%	63.1%

The students found reasonable explanations for the rise in obesity in the Maltese population being:

- i) The average Maltese diet is not a balanced healthy diet, it is especially rich in fats and sugar and low in fiber.
- ii) The average Maltese person is more likely to have biscuits, chocolates and processed meats for breakfast.
- iii) The consumption of vegetables and fruit is low, they are rarely eaten.
- iv) Physical activity is not popular among the population, rated one of the lowest around the world.

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 "Healthy lifestyle". (2)
- b) Produce three sketches to develop an idea of a logo to be used on the poster. The ideas should be chosen from the written analysis based on the students' reasonable explanations for the rise in obesity in Malta. (4)
- c) From your sketching, produce a final solution of the logo to be used in the poster. The logo submitted should be simple, memorable, legible and effective. (5)

- d) Draw a bar chart on your poster showing the percentage of overweight and obese persons among the 11, 13 and 15 year olds between boys and girls. (5)
- e) Draw a line graph showing the increase in the percentage of obese individuals between 2008, 2015 and 2016. (3)
- f) Draw a pie chart showing the percentage of Maltese men and women who are overweight and/or obese. (3)
- g) Finalise your designed poster. (2)

The poster is expected to have a visual impact and carry the intended message clearly.

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) SKETCH 1	c) LOGO	d) BAR CHART
b) SKETCH 2		
b) SKETCH 3	f) PIE CHART	e) LINE GRAPH
<b>UNIVERSITY OF MALTA</b>		
QUESTION No.	SESSION:	SCALE:
	DATE:	
	PAPER No:	SHEET OF

Figure 8a

***Please turn the page.***

**Question 9**

An isometric drawing of a small pub is shown in Figure 9a. The front view, end view and plan are shown in Figure 9c. The pub includes an L shape wooden bar, a large wooden cabinet and three paintings.

Use the dimensions given in the orthographic projection to construct an estimated two point perspective of the pub. 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)**

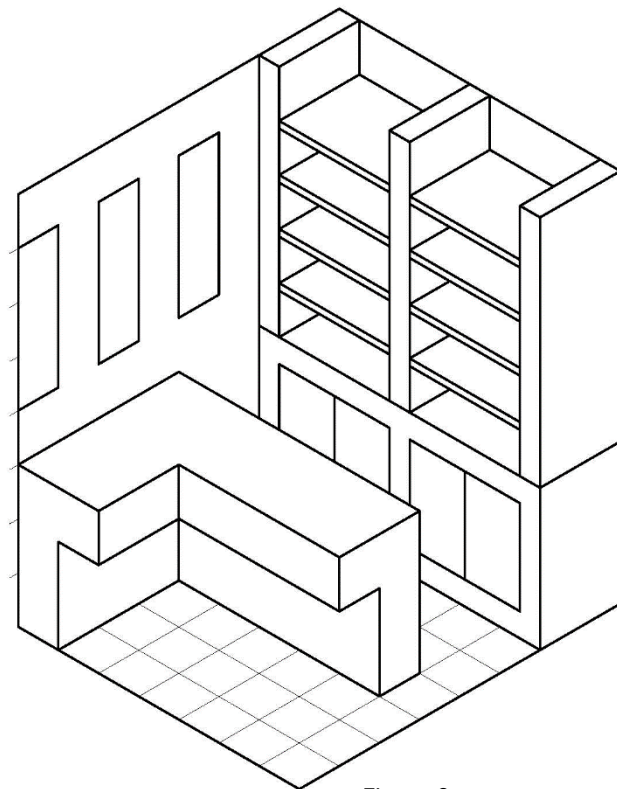


Figure 9a

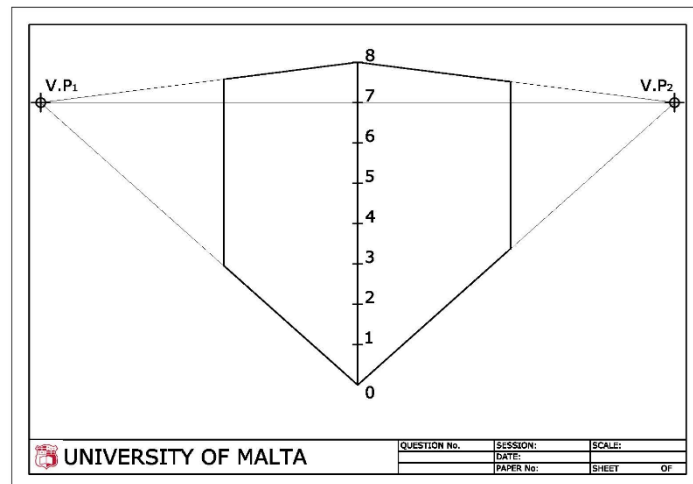


Figure 9b

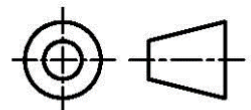
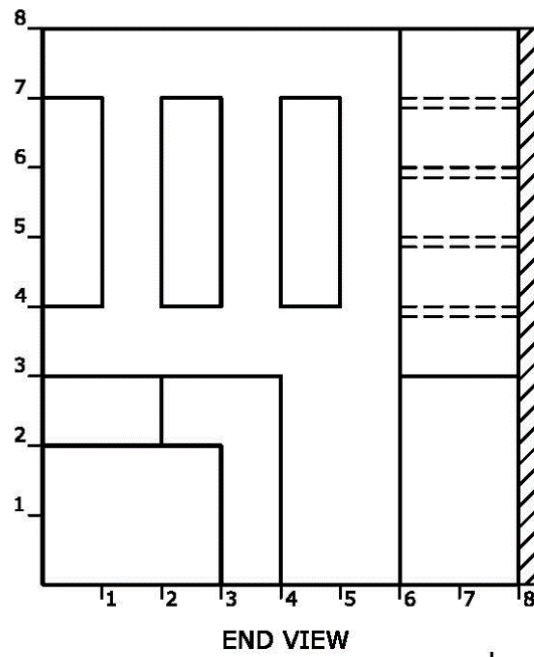
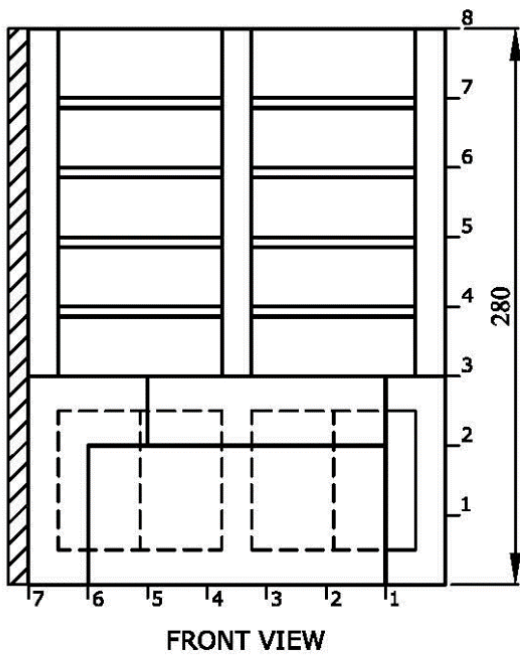
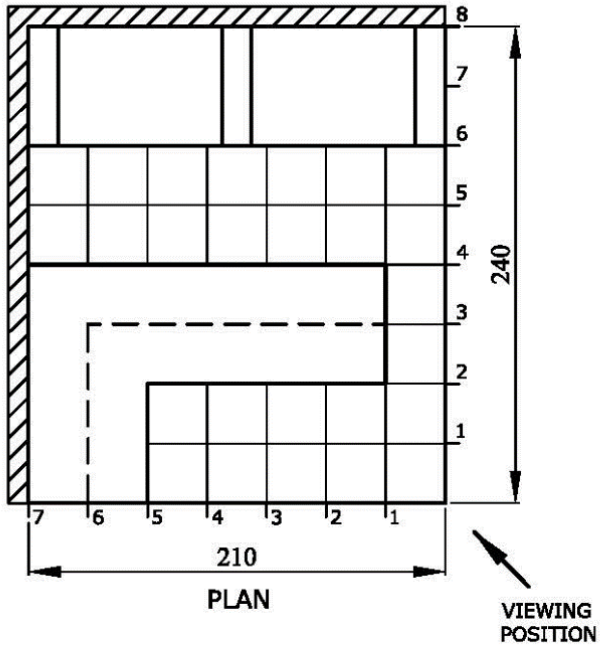
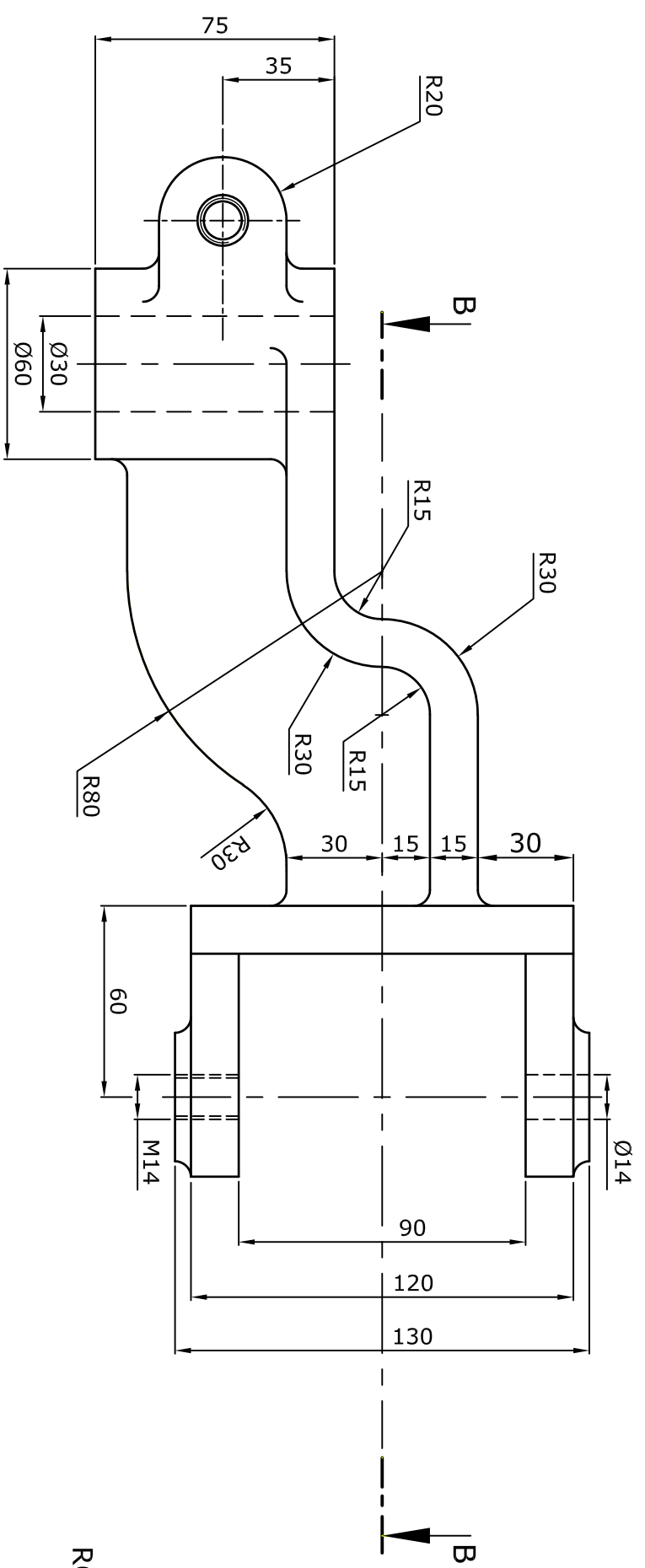
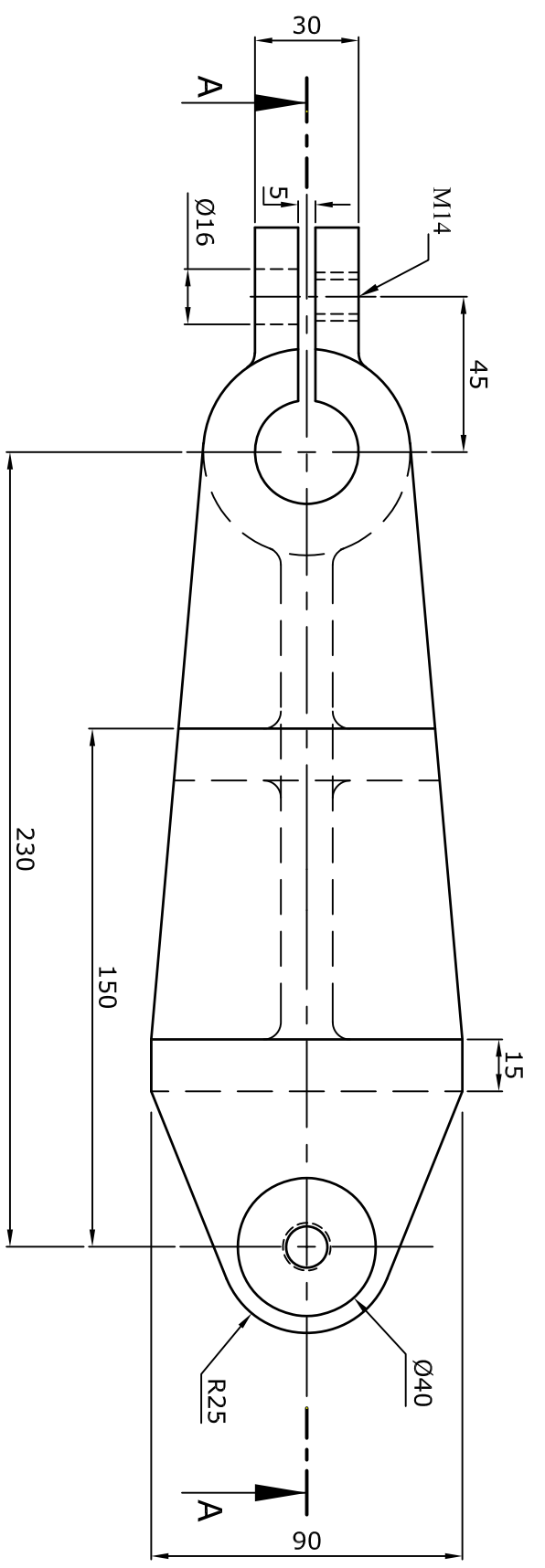


Figure 9c

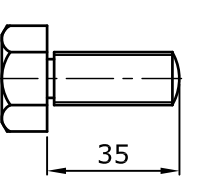


ROLLER SPINDLE (ITEM 3)

GUIDE ROLLER (ITEM 2)



ROLLER SUPPORT (ITEM 1)



M14 CLAMP SCREW (Item 4)

