



Subject:	Engineering Drawing/Graphical Communication
PAPER NUMBER:	I
DATE:	29 th August 2024
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.

Attempt any **FIVE** questions.

Programmable calculators cannot be used.

Unless otherwise stated:

- a. drawings should conform to B.S or equivalent (ISO) standards;
- 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.

Question 1.

The 22 m beam shown in Figure 1a rests on two supports, R_R and R_L . The beam is in a state of equilibrium and holds two point loads (120 kN and 30 kN) and a uniformly distributed load (UDL). Dimensions and full details are given in Figure 1a.

You are requested to:

- a. copy the space diagram using a scale of 10 mm representing 1 m; (2)
- b. use Bow's notation to label the adjacent forces; (1)
- c. draw the load line using a scale of 10 mm representing 20 kN; (2)
- d. draw the polar diagram using a polar distance of 120 mm; (2)
- e. construct the bending moment diagram; (4)
- f. determine graphically the reaction forces of R_R and R_L and state their magnitude; (2)
- g. construct the shear force diagram; (4)
- h. determine the magnitude, nature and position of the greatest bending moment. (3)

(Total: 20 marks)

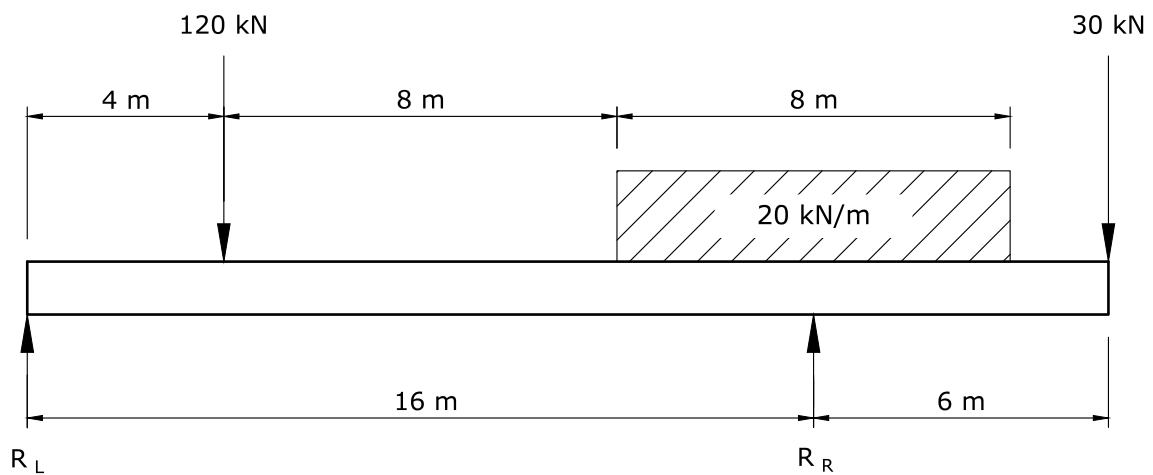


Figure 1a

Question 2.

The starting lines for a disc cam, radial arm and roller follower are given in Figure 2. The follower starts at the given position. The minimum distance between the roller centre and the cam centre is 44 mm.

The roller oscillates and gives a maximum lift of 50 mm for one complete anti-clockwise rotation. The motion of the roller-ended follower oscillates in the following order:

- from 0° to 180° - a rise of 40 mm with simple harmonic motion;
- from 180° to 240° - a rise of 10 mm with uniform velocity;
- from 240° to 270° - dwell;
- from 270° to 360° - a fall of 50 mm with uniform acceleration and retardation.

You are requested to:

- | | |
|---|-----|
| a. copy Figure 2; | (2) |
| b. construct the follower displacement diagram; | (8) |
| c. project the necessary points to find the loci of the roller centres; | (6) |
| d. construct the cam profile. | (4) |

(Total: 20 marks)

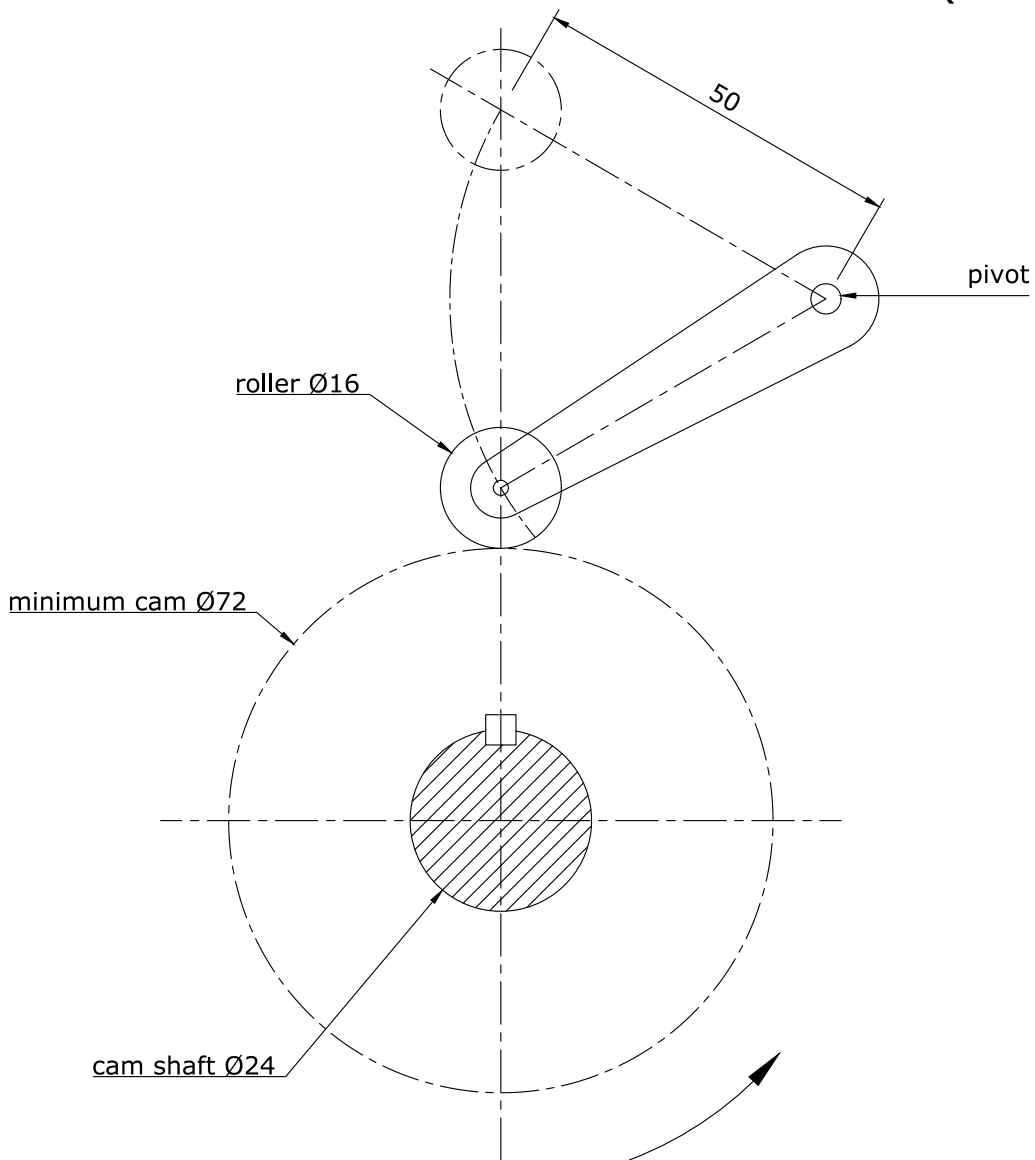


Figure 2

Question 3.

A pictorial view of a transition piece is shown in Figure 3a.
 A dimensioned front elevation and plan are given in Figure 3b.

You are requested to:

- a. copy the given views; (2)
- b. draw the crease lines and label using letters and numbers; (4)
- c. construct the necessary true lengths; (6)
- d. draw a half surface development of the transition piece taking X-1 as the seam line. (8)

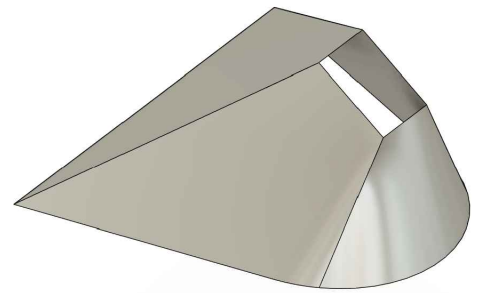


Figure 3a

(Total: 20 marks)

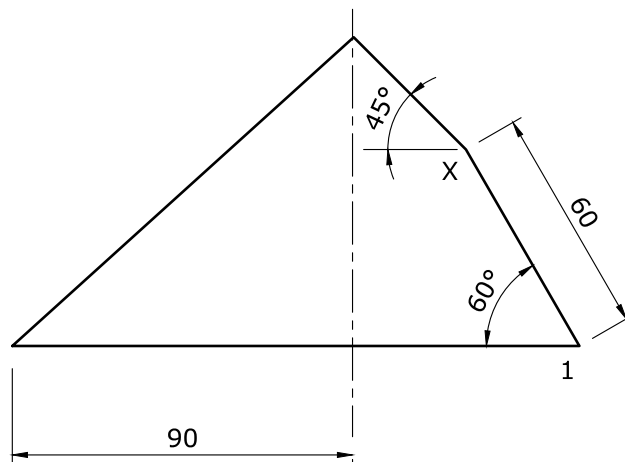
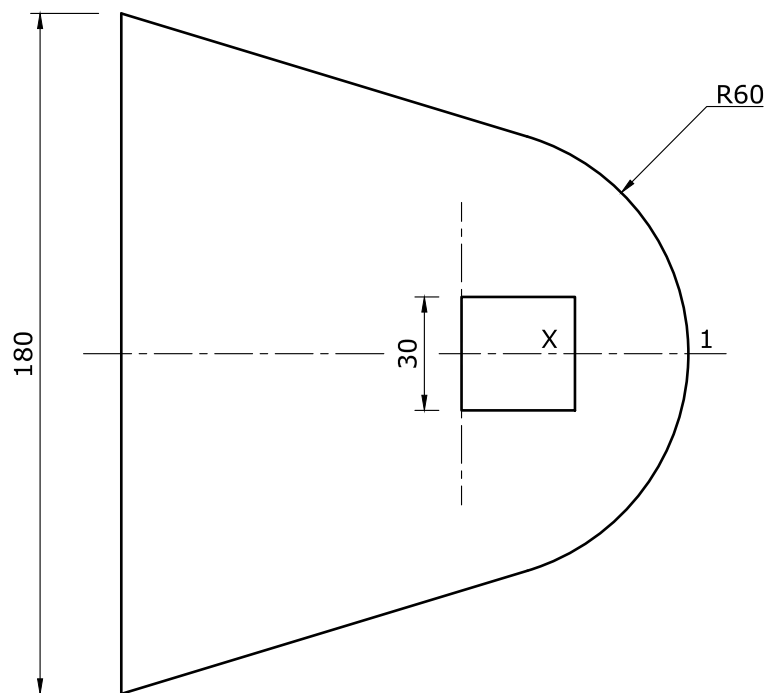
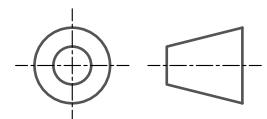


Figure 3b



Question 4.

Figure 4a shows a pictorial view of a regular pentagonal prism intersecting a right cone. The position of the pentagonal prism is offset both vertically and horizontally. Dimensioned orthographic views of the intersecting solids are given in Figure 4b

You are requested to:

- a. copy the plan and the starting lines in the front elevation; (2)
- b. draw the curves of intersection on the front elevation; (10)
- c. project an end elevation as seen from the direction of arrow 'E'. (8)

Note: **All** hidden lines are required.

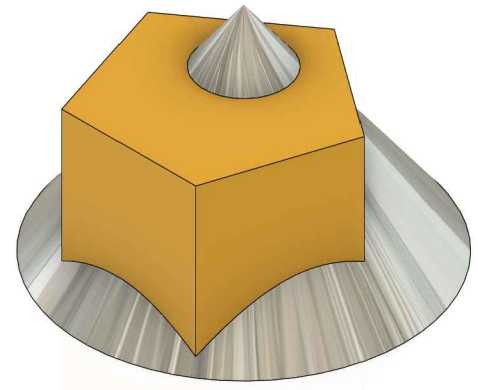


Figure 4a

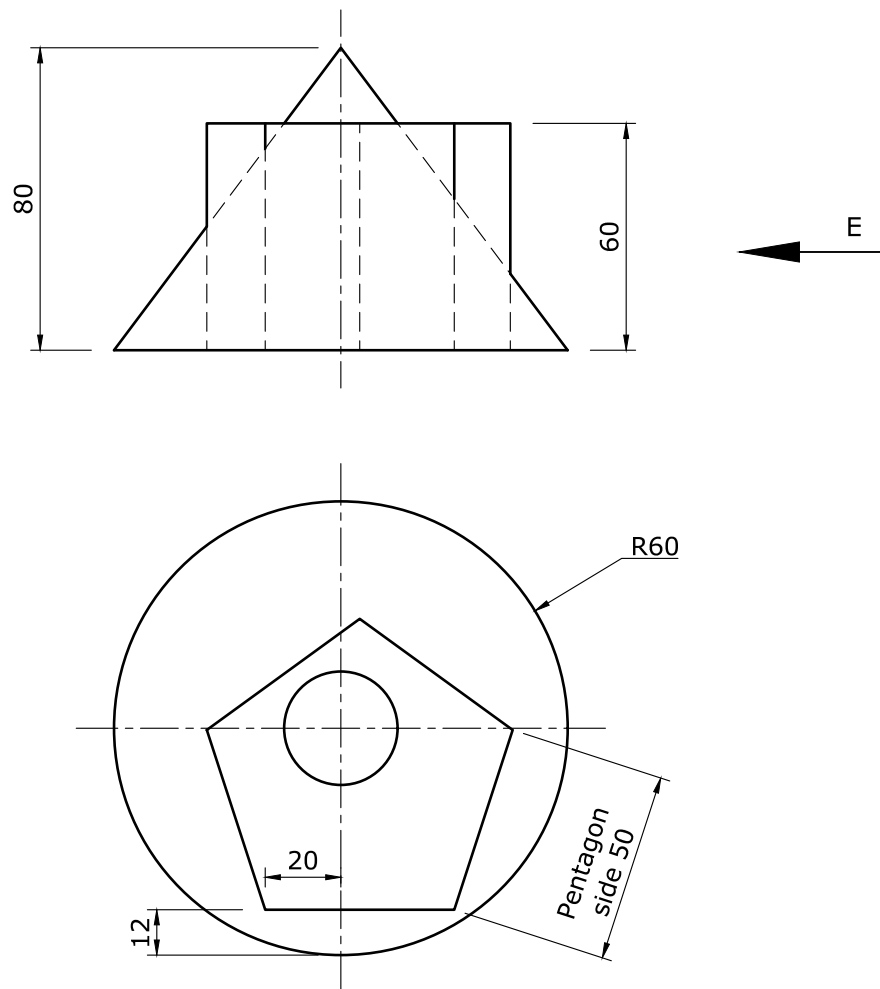
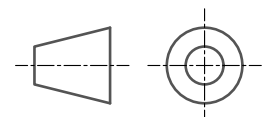


Figure 4b



Question 5.

Figure 5a illustrates a pictorial view of a machined component. The component has a hexagonal base, a short cylindrical column and a hemispherical top. A hexagonal hole is machined throughout. Two orthographic views of the component and the traces of the oblique cutting plane VTH are given in Figure 5b.

You are requested to:

- a. copy the orthographic views and the traces; (4)
- b. project an auxiliary elevation of the component, showing the oblique plane as an inclined cutting plane; (4)
- c. project a second auxiliary plan, showing the lower part of the truncated component and the true shape of cut; (8)
- d. project the cutting plane on the plan. (4)

(Total: 20 marks)

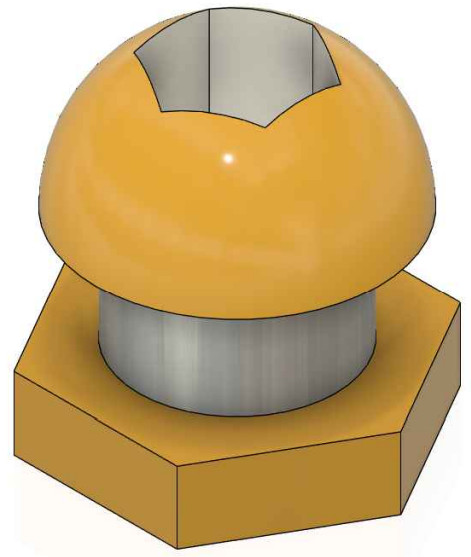


Figure 5a

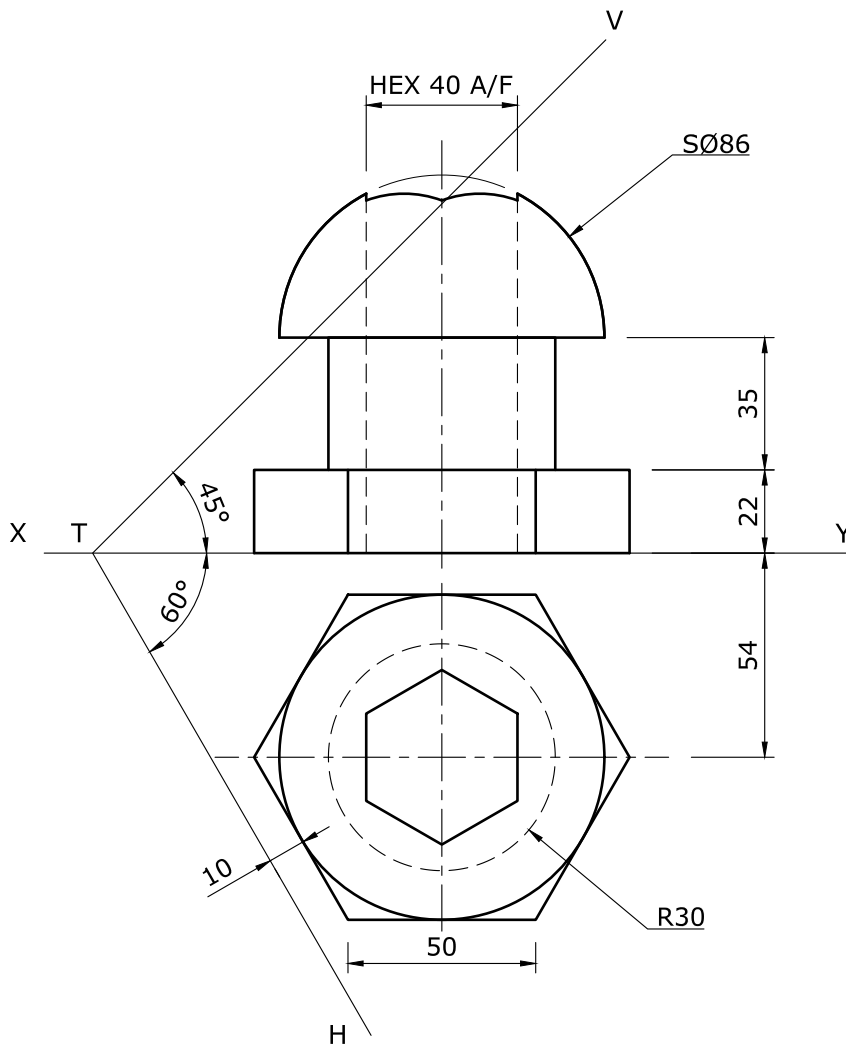
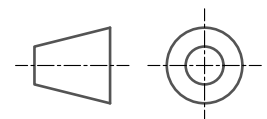


Figure 5b



Question 6.

A structural illustration of a four-bar walking linkage is shown in Figure 6a. The mechanism is made up of a rotating crank AB pivoted at A, an oscillating crank CD pivoted at D and a solid triangular structure BCE. Points A and D are fixed pivots and points C and B are free pivots. A partly dimensioned line drawing of the linkage is shown in Figure 6b.

You are requested to:

- a. copy the line diagram given in Figure 6b; (2)
- b. plot the locus of point P for one complete revolution of crank AB; (6)
- c. plot the locus of point E for one complete revolution of crank AB. (12)

Notes:

- Crank AB = 36 mm
- Crank CD = 50 mm
- Link BC = 110 mm
- BP = CP
- Crank AB rotates clockwise.

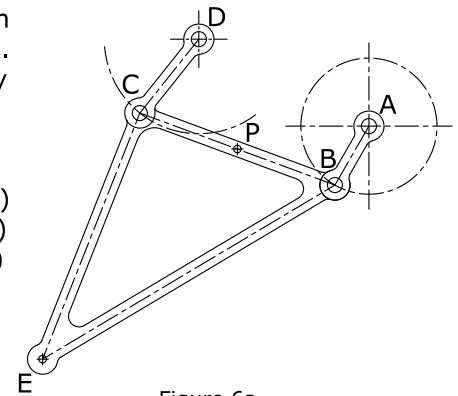


Figure 6a

(Total 20 marks)

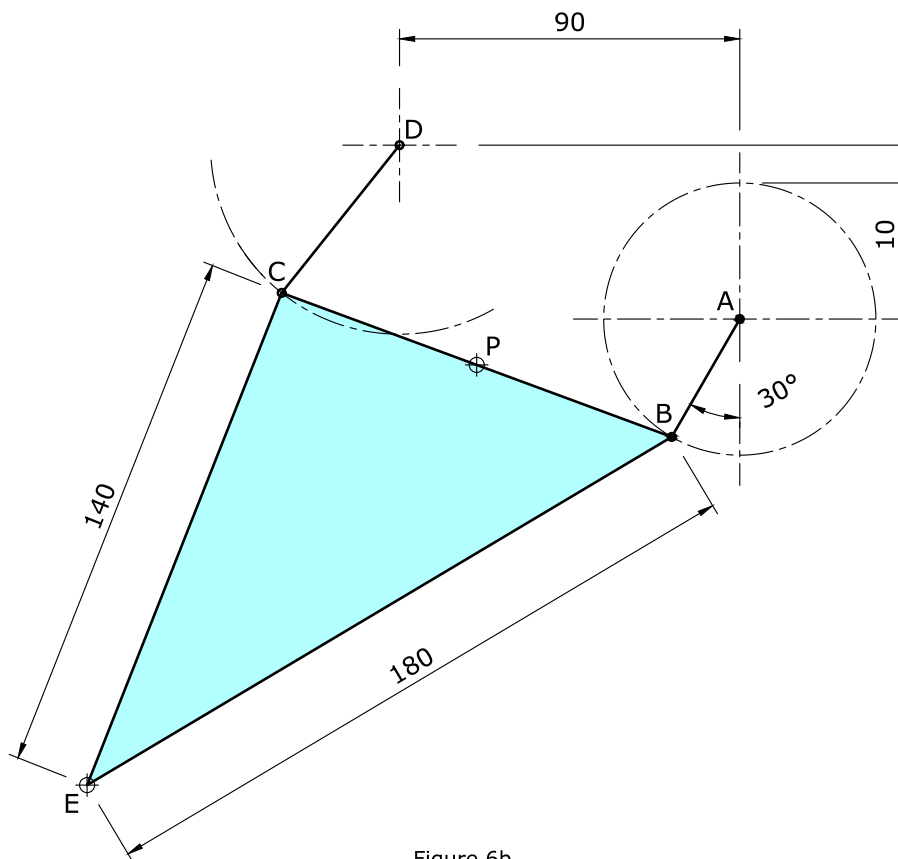


Figure 6b



SUBJECT:	Graphical Communication
PAPER NUMBER:	II
DATE:	30 th August 2024
TIME:	9:00 a.m. to 12:05 p.m.

Directions to Candidates

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Attempt all **FOUR** questions.

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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 should be used where appropriate.

Mark allocations are shown in brackets.

Question 1 carries 34 marks. Questions 2, 3, and 4 carry 22 marks **each**.

Question 1.

Figure 1 shows three orthographic views of a playground construction. These orthographic views feature the proportion of every element within the entire setting. Use this information to construct a **two-point** estimated perspective of this setting. The arrows on the plan indicate the viewing direction.

- a) Using **THREE** preliminary sketches, explore alternative positions of the horizon line and identify the one which, in your opinion, best describes the spaciousness of the entire area. (3)
- b) Based on the choice made in part (a), use a suitable scale to produce the required illustration on a single side of an A2 size paper, making the best use of the space available. (26)
- c) Enhance your drawing by colouring small areas of the different items appearing in your illustration. (5)

Notes:

- The entire structure is made of timber.
- The slide's surface is made of stainless steel.
- The checked flooring is made of green rubber tiles.
- The slanting roof is painted red.

(Total: 34 marks)

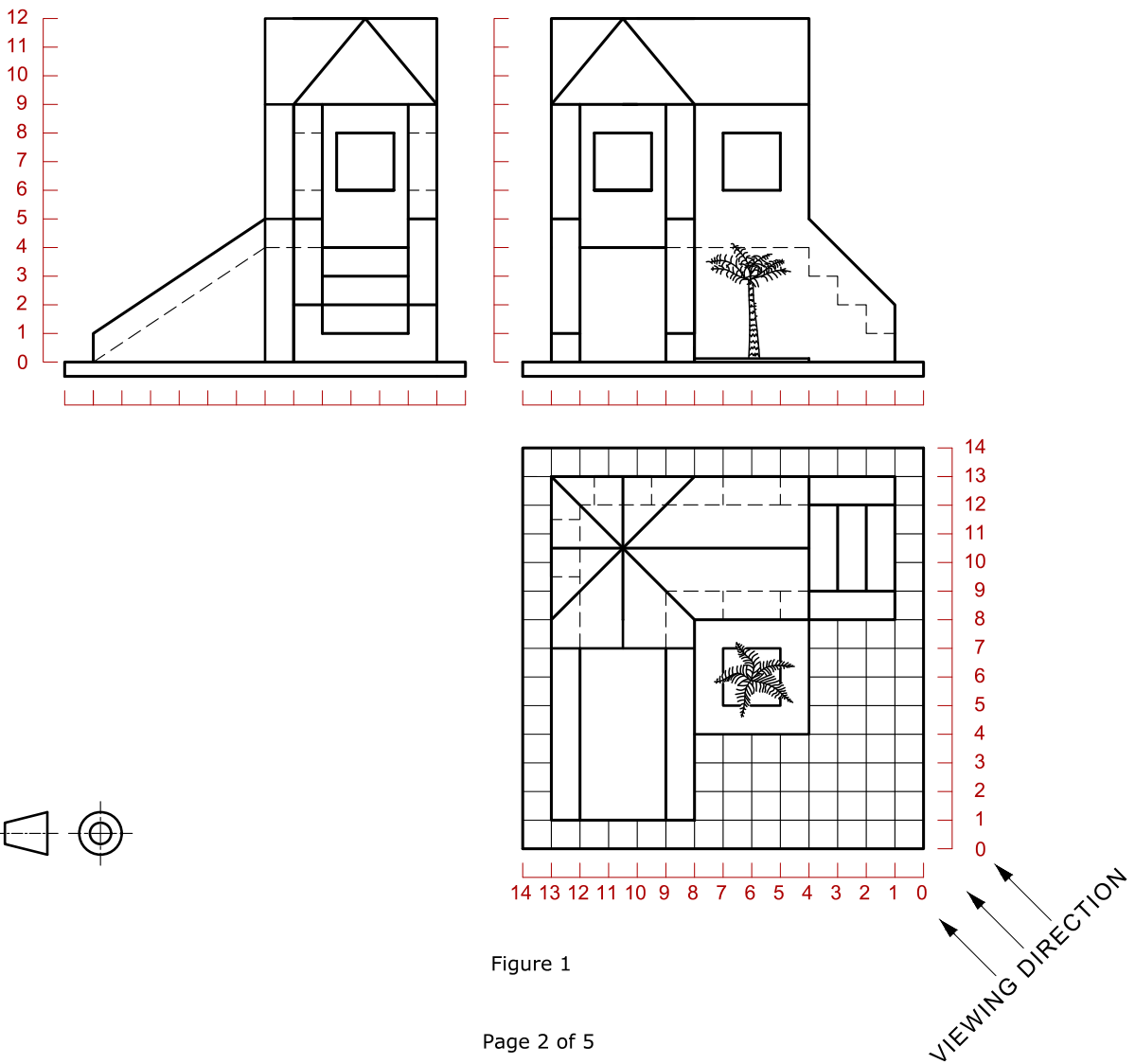


Figure 1

Question 2.

The organizers of an open-air fruit and vegetables market need to design an eye-catching rectangular banner. The banner needs to be titled 'FRUIT AND VEGETABLES MARKET' and comprise fruit and vegetables graphics.

Design this banner and present your work broken down according to the following steps and as shown in Figure 2 below.

- a. Written analysis.
Identify, using keywords/short phrases, the main parameters of the design brief. (2)
- b. Graphical analysis.
Based on your response to the written analysis, produce a series of preparatory sketches that illustrate your developing ideas. (4)
- c. Design synthesis.
Clearly identify those elements present in your sketches that you intend to use in your final design. (2)
- d. Final realisation.
Use colour and shading to produce your final realisation. (14)

Notes:

- Use suitable typefaces for your design.
- Details of the page layout and the design space are shown in Figure 2 below.

Total: (22 marks)

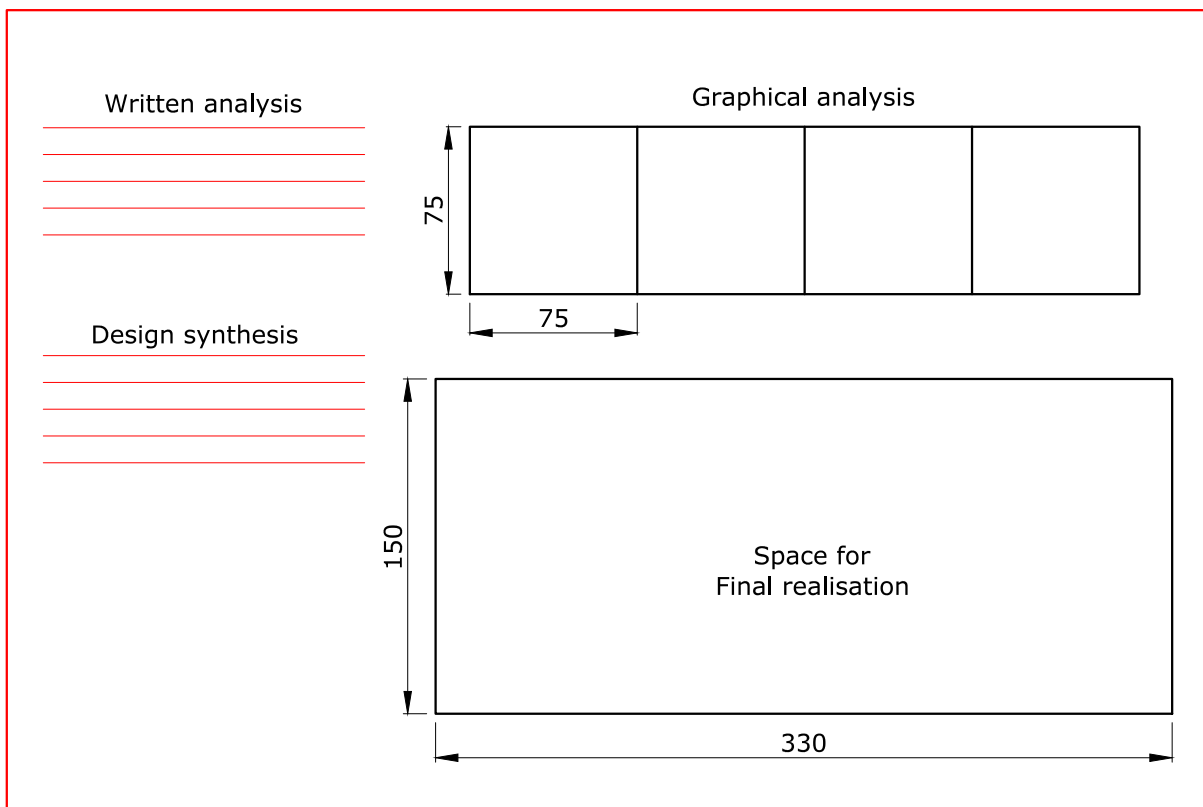


Figure 2

Question 3.

A company that sells electric staplers needs a set of six illustrations that will be used to instruct its customers on the safe use of these staplers. Design these six illustrations that need to adhere to the following steps:

- a. Push the button to unlock the stapler's drawer. (3)
- b. Pull the drawer and place the staples inside. (3)
- c. Close the drawer by pushing it into place until it clicks. (3)
- d. Shift the recess measurement slide to set staples' position on paper. (3)
- e. Plug to AC outlet. (3)
- f. Insert the papers to be stapled into the stapler's mouth with your fingers kept safely away. Papers will get stapled automatically. (3)

Present your work as shown in Figure 3b. Marks will be awarded for the preliminary sketches. (4)

Use the illustration below (Figure 3a) to help you plan and design this sequence of illustrations.

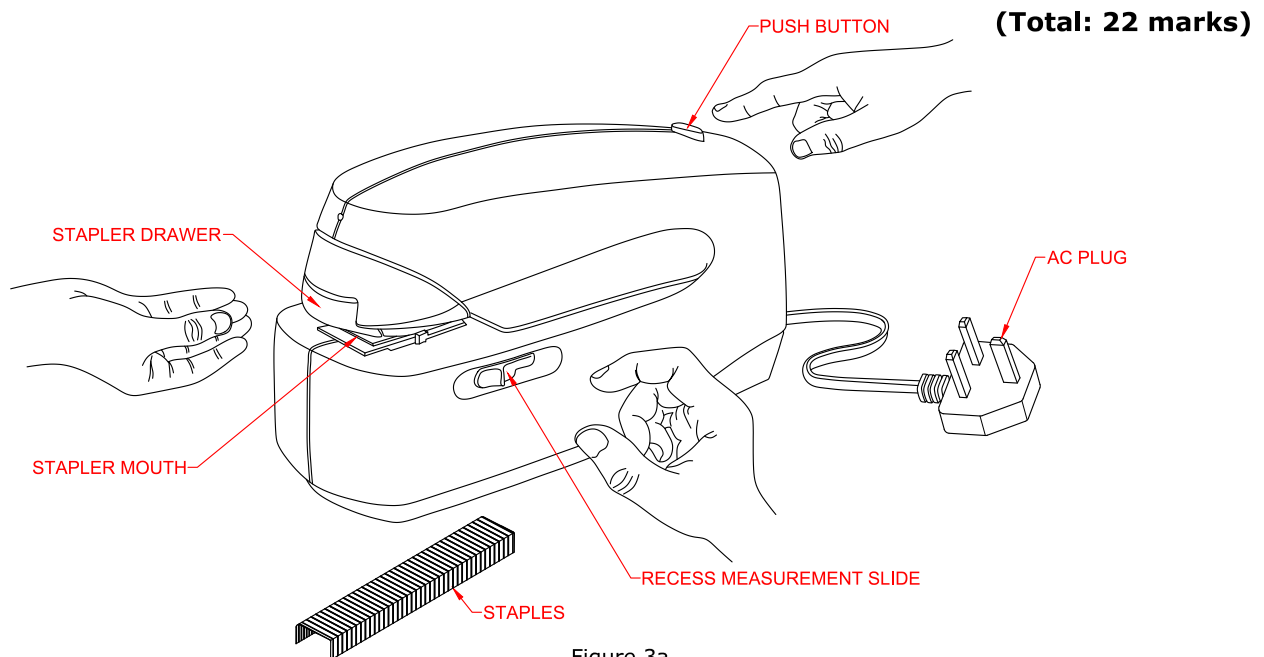


Figure 3a

SAFE USE OF ELECTRIC STAPLER		
space for preparatory sketches	step 1	step 4
	step 2	step 5
	step 3	step 6

Figure 3b

Question 4.

Five orthographic views of a toy power saw are shown below.

You are requested to:

a) make a well-proportioned pictorial (3D) freehand drawing of this power saw. (14)

b) colour and shade your drawing using the following instructions: (8)

- main body - durable plastic (yellow and white);
- blade - durable plastic (polished gray);
- trigger - durable plastic (black).

(Total: 22 marks)

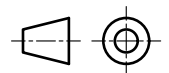
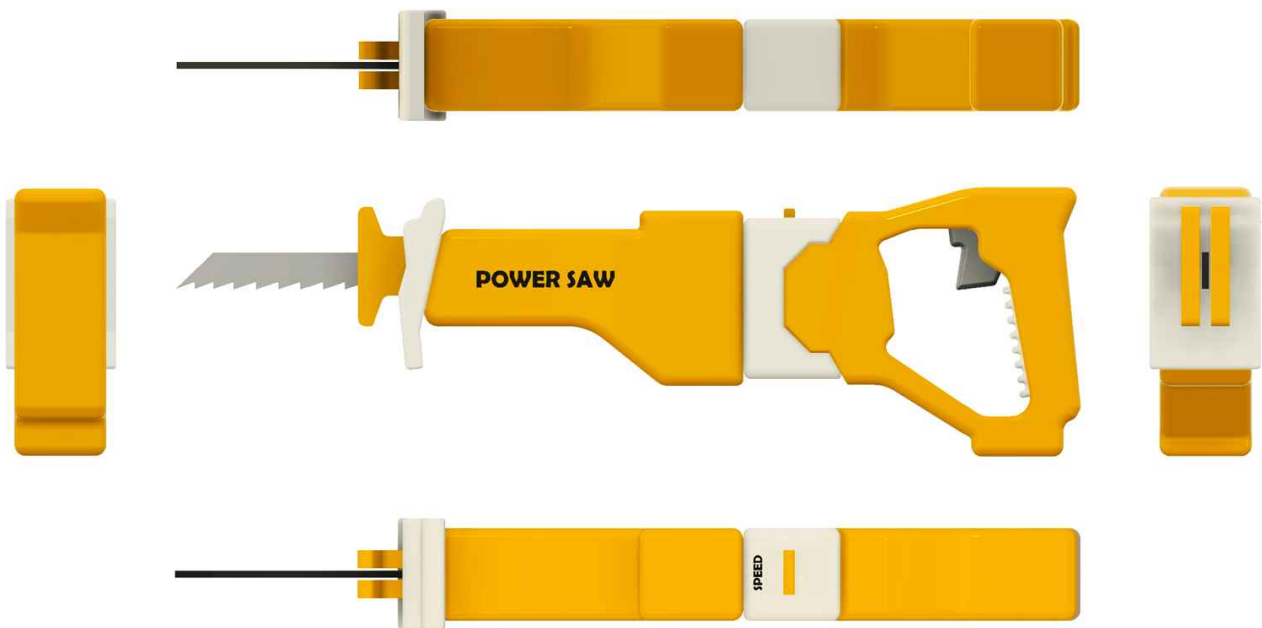


Figure 4