

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA

MATRICULATION EXAMINATION
ADVANCED LEVEL
MAY 2016

SUBJECT:	ENGINEERING DRAWING/GRAPHICAL COMMUNICATION
PAPER NUMBER:	I
DATE:	25 th April 2016
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:

- drawings should conform to B.S. or equivalent (ISO) standards;
- all dimensions are in millimetres;
- all answers are to be accurately drawn with instruments;
- unless otherwise stated, 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.

Question 2

The rack and pinion illustrated in Figure 2a are connected to a part of a machinery. Various linkages are attached to the end of the rack so that when the pinion rotates other parts of the machinery are operated.

Draw full size:

- a) Two teeth of the pinion. *The number of teeth on the pinion is 20 and the module is 16. The pressure angle is 20°.* Show the construction of the spur pinion tooth profile of true involute on one flank side. **(14 marks)**
- b) Show three rack teeth in mesh with the pinion as shown in Figure 2b. **(6 marks)**

Note: Spur gear data is to be neatly presented.

(20 marks)

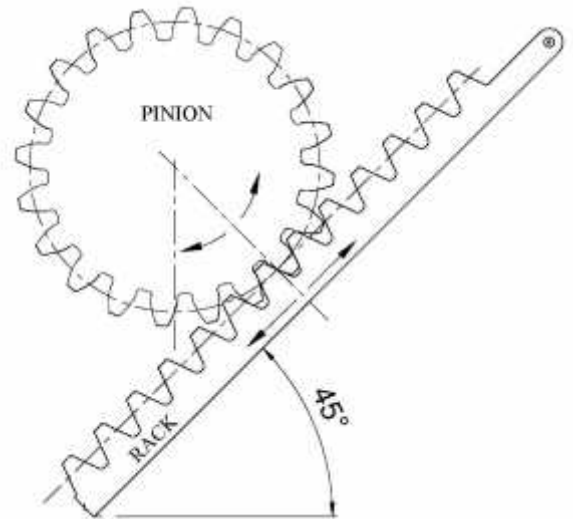


Figure 2a

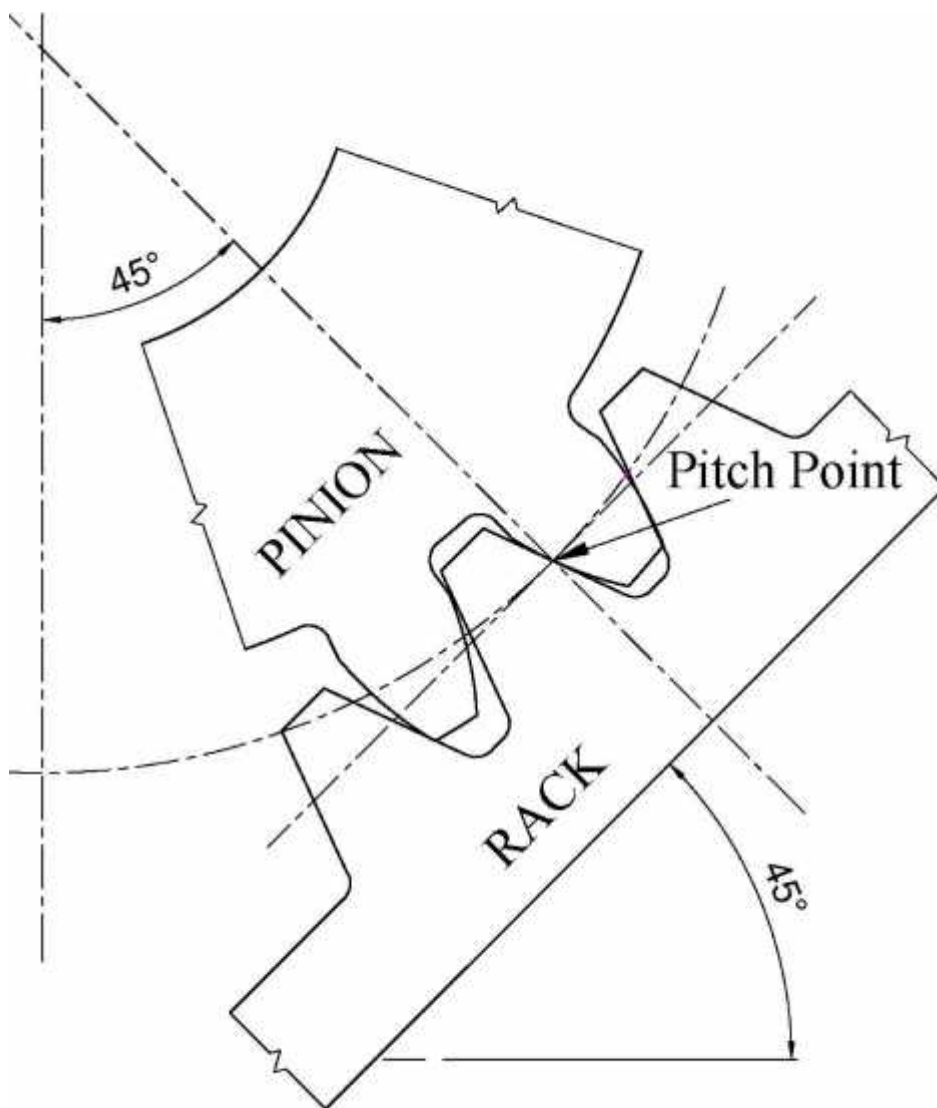


Figure 2b

Question 3

A cutting plane passing through a right cone is shown in Figure 3a. The line SP is a cutting plane which cuts the conical surface of the cone. The position of the cutting plane SP in relation to the vertical axis A-A is shown in Figure 3b. O is the centre of the focal sphere tangent to the slant sides of the cone and the line representing the section plane SP.

Copy, full size, Figure 3c, and:

- a) locate the position of the centre O of the focal sphere; **(4 marks)**
- b) find the position of the directrix, vertex and the focal point of the conic; **(3 marks)**
- c) state the ratio of eccentricity of the conic section; **(2 marks)**
- d) using a directrix line, a transverse axis, the position of the focus and vertex found in (b), draw the true shape of the section plane; **(10 marks)**
- e) name the shape of the generated conic. **(1 mark)**

(20 marks)

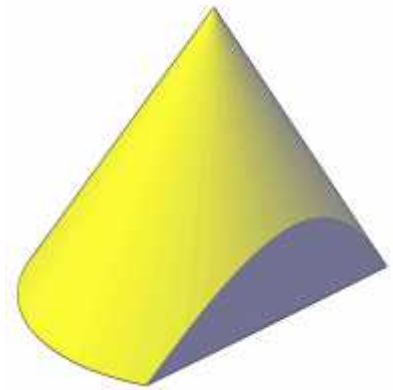


Figure 3a

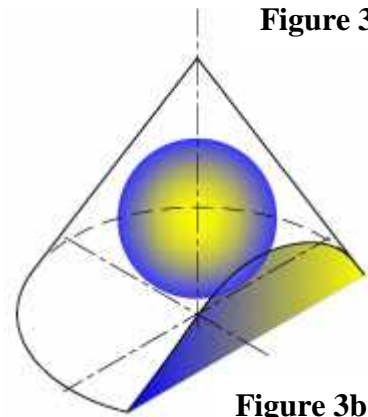


Figure 3b

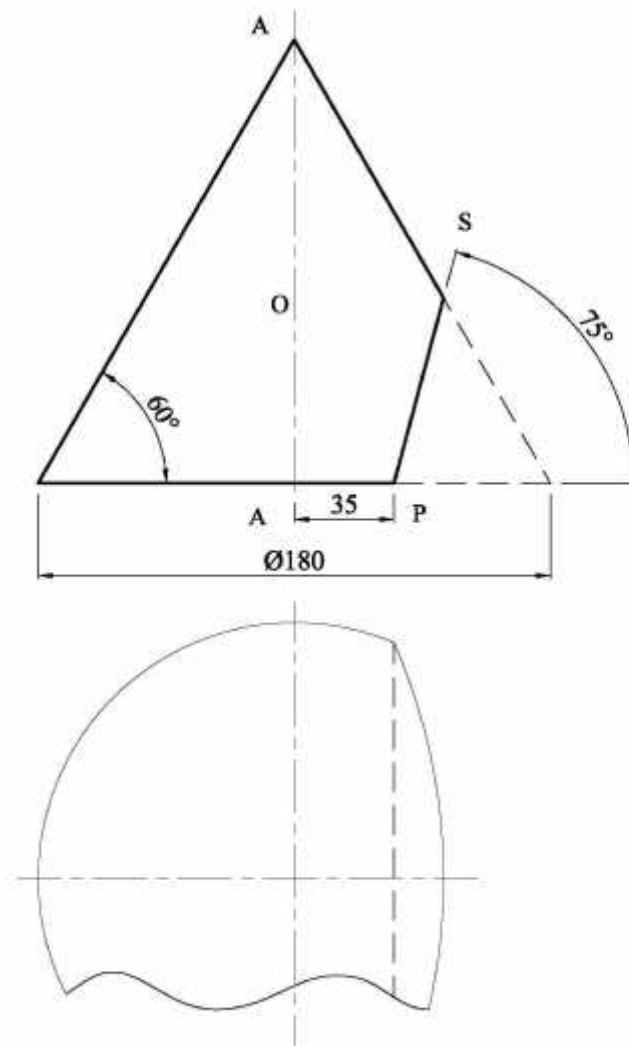


Figure 3c

Question 4

Figure 4a shows an illustration of a socket resting on an inclined plane.

Figure 4b shows the traces of the oblique plane and the location of the centre of the base of the socket (centre O).

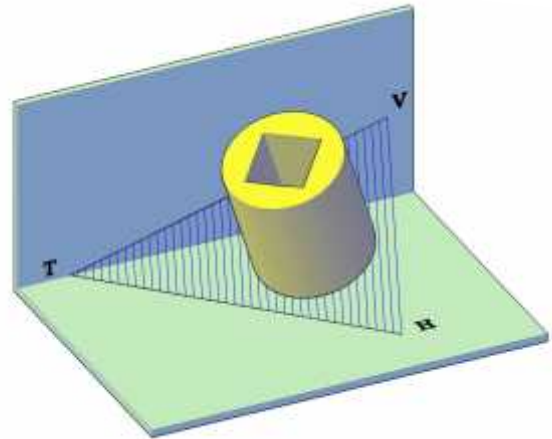


Figure 4a

- a) Copy, full size, Figure 4b and draw an auxiliary elevation showing the oblique plane as an inclined plane. State the angle that the oblique makes with the horizontal plane. **(5 marks)**
- b) Draw the cylindrical socket $\text{Ø}80$ mm and 90 mm long resting on the inclined plane. The 40 mm x 40 mm square hole on the top face is 45 mm deep. **(3 marks)**
- c) Complete the plan of the socket as in Figure 4b. **(6 marks)**
- d) Project the front elevation of the socket as in Figure 4b. **(6 marks)**

Note: Do not show hidden detail.

(20 marks)

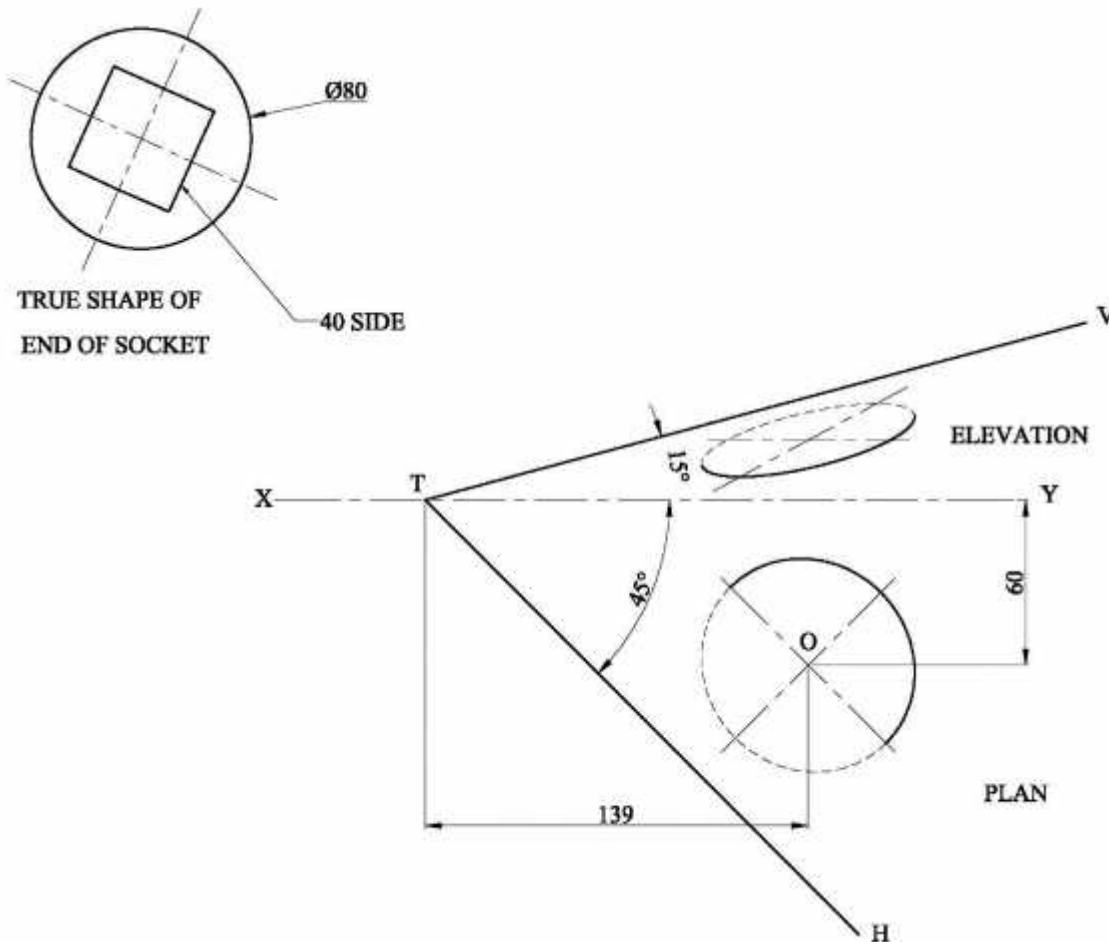


Figure 4b

Question 5

Incomplete views of two intersecting triangles are shown in Figures 5a and 5b.

- a) To a scale of 1:1, copy the elevation and plan in their correct position. **(4 marks)**
- b) Construct an auxiliary elevation of the planes, showing one of the triangle as an edge view and locate the points of intersection. **(4 marks)**
- c) Project the points of intersection to complete the plan and elevation of the two triangles. **(5 marks)**
- d) Draw an auxiliary view of the two triangles showing the line of intersection as a true length. **(3 marks)**
- e) Create a second auxiliary view showing the two triangles as two intersecting lines. State the true angles between the two triangles. **(4 marks)**

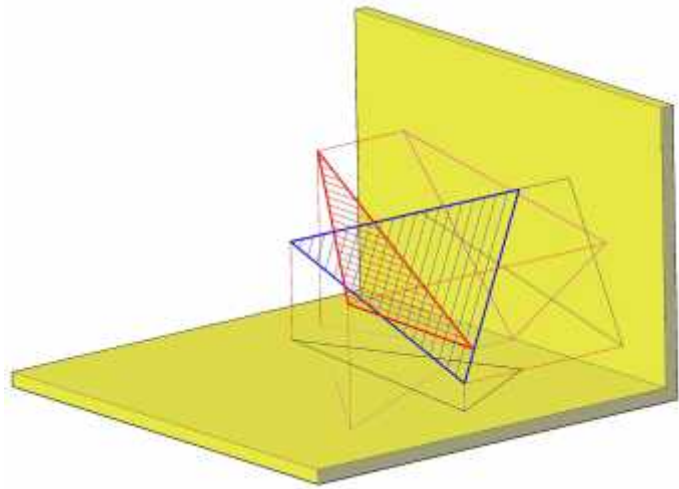


Figure 5a

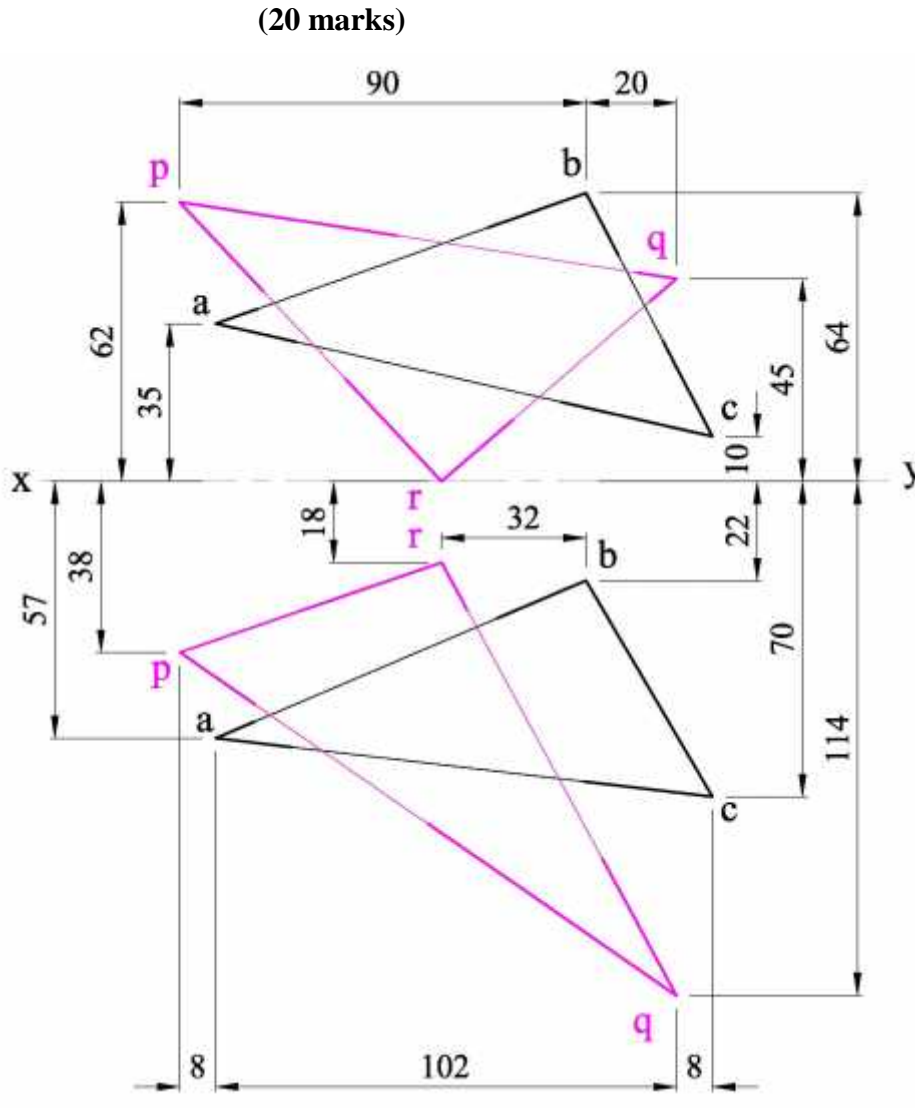


Figure 5b

Question 6

A jig is formed from a solid cylindrical rod. The lower part of the jig is a right cylinder and the upper part is machined to form a frustum of a cone. Two cylindrical holes are drilled centrally through the jig. The jig is finally machined by sectioning the conical portion by a cut parallel to the slant height and the cylindrical portion by a section plane of 45° to the horizontal.

- a) Copy, full size, the elevation of the jig detail as shown in Figure 6. **(3 marks)**
- b) Project an auxiliary plan in the direction of arrow A, perpendicular to the slant height of the cone. **(15 marks)**
- c) Label the names of the profiles generated by the cut cone and the cut cylinder. **(2 marks)**

Use third or first angle projection.

Do not show hidden detail.

(20 marks)

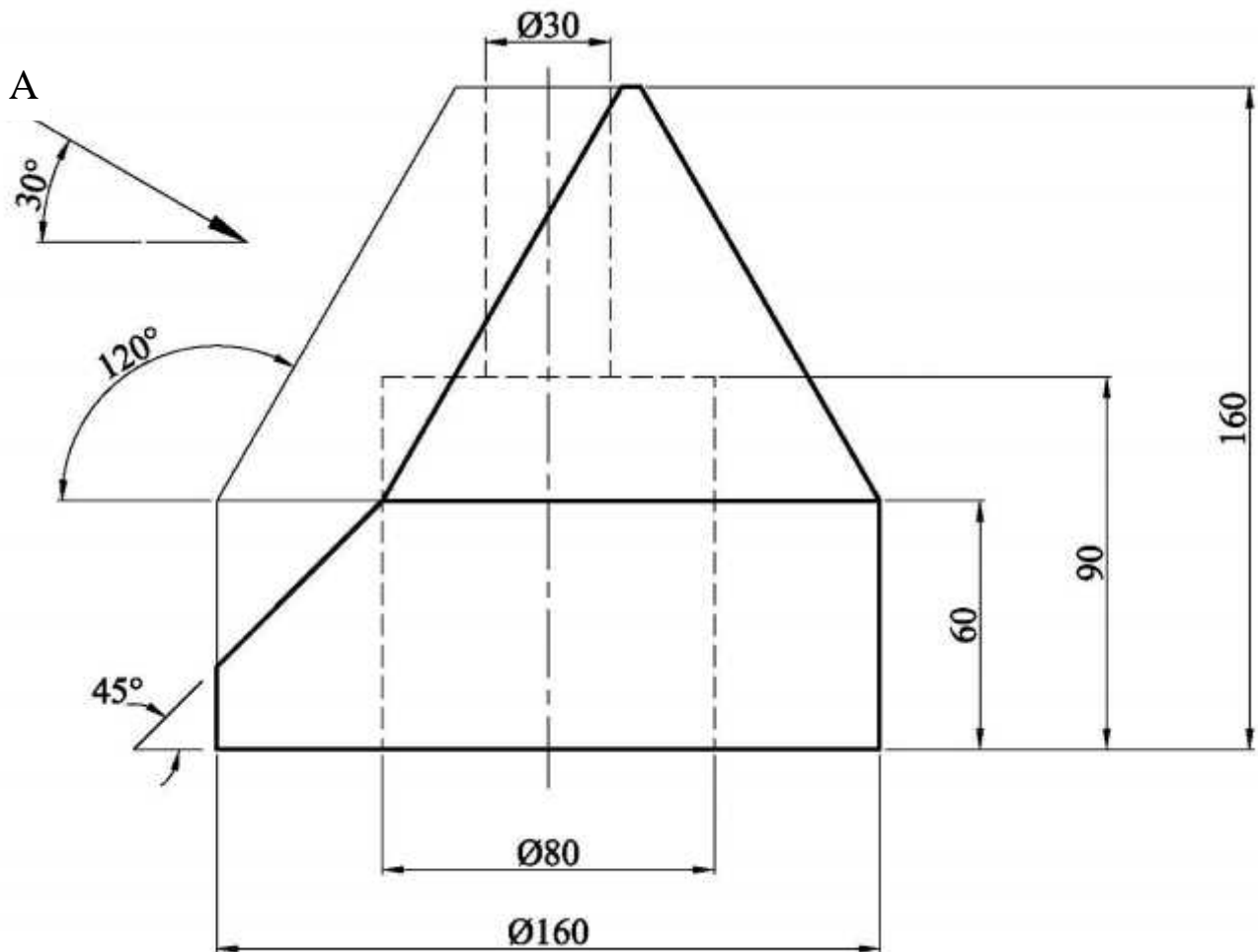


Figure 6

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MATRICULATION EXAMINATION
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SUBJECT:	GRAPHICAL COMMUNICATION
PAPER NUMBER:	II
DATE:	25 th April 2016
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.

Attempt **all** questions.

Programmable calculators **cannot** be used.

Unless otherwise stated:

- drawings should conform to B.S. or equivalent (ISO) standards;
- all dimensions are in millimetres;
- all answers are to be accurately drawn with instruments;
- all construction lines must be left on 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 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

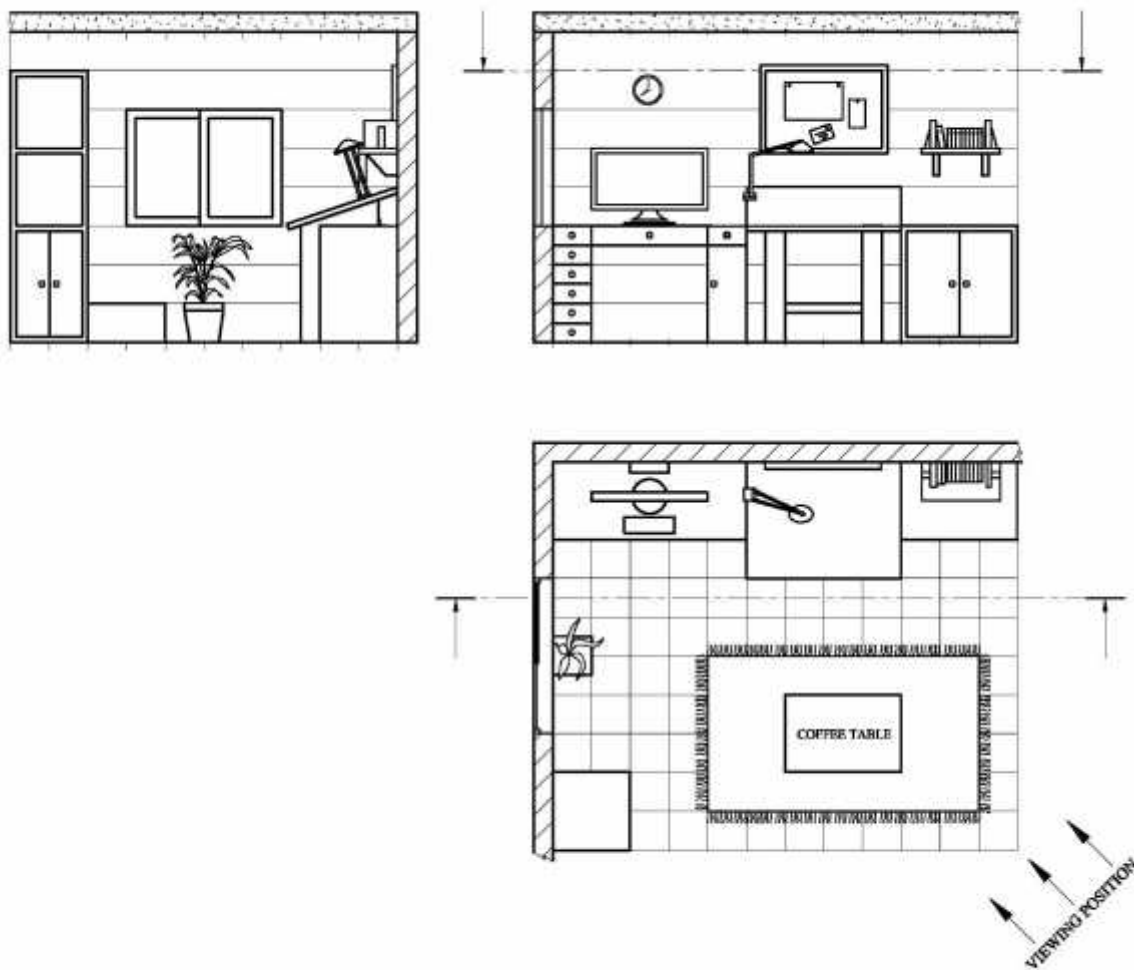
The front view, the end view and the plan of a graphic designer’s studio area are given in Figure 1. The studio furniture and accessories consist of a desk, touch screen computer, cupboard, drawing board, wall unit, bookshelf, coffee table on the carpet, wall clock, flower pot, and a cork board.

The given views constitute an integral part of the design process, but fail to convey a feeling of the **3D** proportions of this studio area.

You are to meet this requirement by drawing a **two-point estimated perspective drawing**. The viewing direction required is indicated by the arrows in the plan view.

- i) 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 studio area. **(3 marks)**
- ii) Based on the choice made in (i), produce the required illustration on a single side of an A2 size paper making the best use of the space available. **(23 marks)**
- iii) Add suitable ceiling lighting **(3 marks)**
- iv) Enhance your answer graphically using colours, tone and texture. **(5 marks)**

*You are not expected to apply colour/tone/texture to your whole illustration. You are advised to limit their use to a small area on each **different** item appearing in your illustration.*



(34 marks total)

Figure 1

Question 2

A start-up business that provides premium dog food and treats made with organic ingredients, is inviting graphic designers to design a **logo** for their new company named **Lucky Dog**. The company is targeting the affluent pet owners who want their pets to eat well (as they do). The logo is intended to be used on the company website, packaging, letterheads and all their promotional material. A three colour scheme is preferred. The logos submitted should be simple, memorable, legible and effective in black and white. The chosen logo has to work well in a versatile range of sizes.

The submitted entries are to be broken down in the steps given below and organised as indicated in Figure 2.

a) Written analysis

Identify, using keywords/short phrases, the main parameters of the design brief. **(2 marks)**

b) Graphical analysis

Based on your response to (a), produce a series of preparatory sketches that illustrate your developing ideas. **(4 marks)**

c) Graphical synthesis

Clearly identify the elements in your sketches which you intend to use in the final drawing. **(2 marks)**

d) Final realisation

Produce your final solution in a rectangle of your chosen format. **(14 marks)**

(22 marks total)

The diagram shows a rectangular frame containing the following elements:

- Top center: **LUCKY DOG LOGO**
- Left side (top to bottom):
 - WRITTEN ANALYSIS** followed by three horizontal lines.
 - GRAPHICAL ANALYSIS** followed by a 2x2 grid of squares.
 - GRAPHICAL SYNTHESIS** followed by three horizontal lines.
- Right side: A large empty rectangular box.
- Bottom right: **FINAL REALISATION**

Figure 2

Question 3

Four orthographic views of a torch light model are given in Figure 3. To improve the visual communication of the design, you are requested to:

- a) Draw a well-proportioned freehand **isometric sketch** to display the back view of the torch light model. **(7 marks)**
- b) Draw another well-proportioned pictorial sketch to display the front view of the torch light. **(7 marks)**
- c) Use your preferred drawing medium or media to colour and shade **one** of your sketches. **(8 marks)**

Note: Marks will be awarded for proper use of colours to represent textures and forms.

(22 marks total)

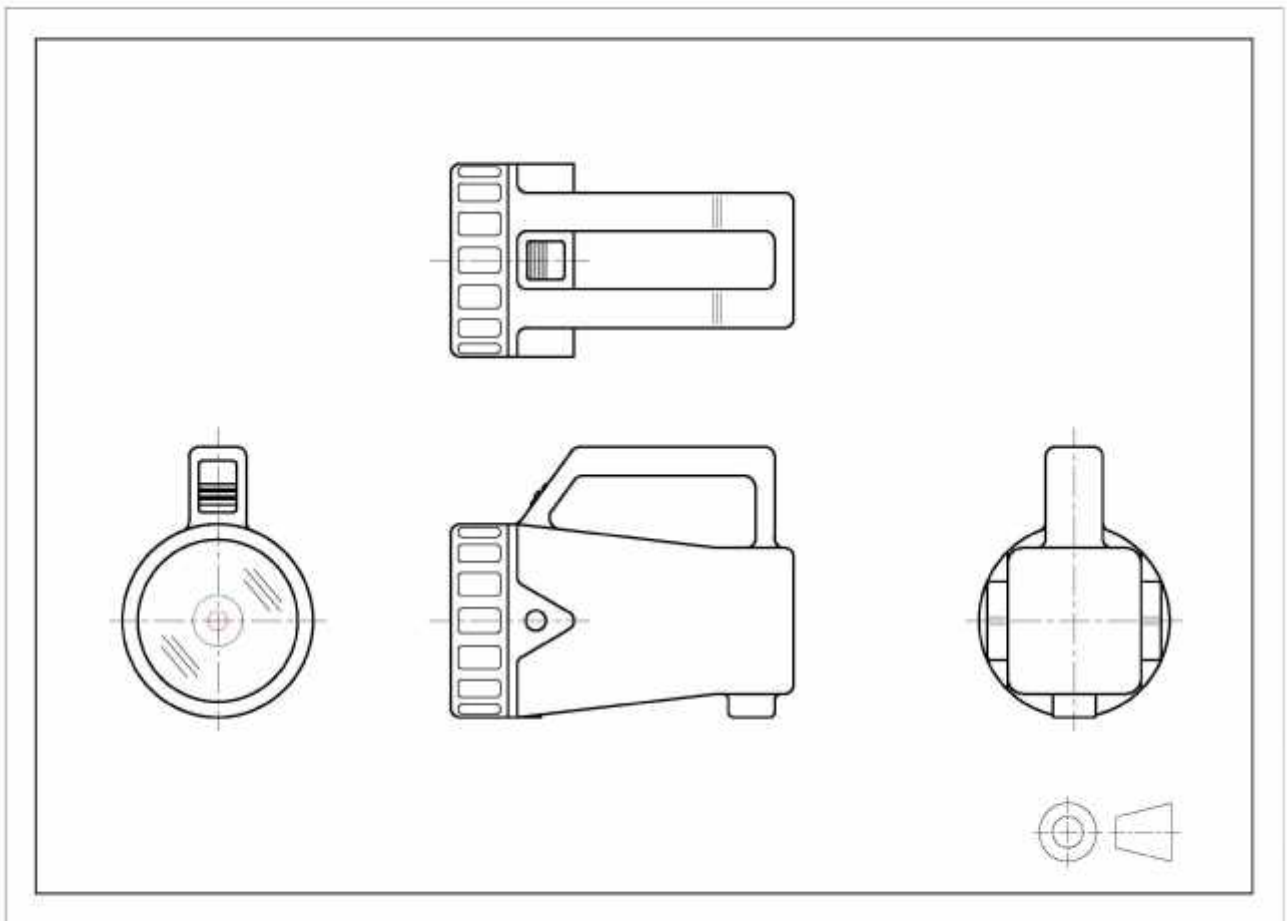


Figure 3

Question 4

A national campaign with the aim of maximising health for everyone is being planned. As part of the campaign, the organising committee decided to commission an **Infographic Poster** to persuade people to change their behaviour.

The suggested title of the poster is **SEVEN WAYS TO STAY HEALTHY**.

The seven ways are listed below:

- 1) Avoid **SMOKING**;
- 2) Limit **ALCOHOL** consumption;
- 3) Eat a healthy **DIET**;
- 4) Control your **WEIGHT**;
- 5) **EXERCISE** daily;
- 6) Limit your **SUN** exposure;
- 7) Get regular **CHECK-UPS**.

You are required to design an infographic poster which incorporates the given list (1 to 7) in **textual form** and **graphic symbols** which you will have to create.

Marks will be awarded for a suitable layout and the use of appropriate typefaces, colours and graphic symbols.

(22 marks total)

End of examination paper