

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

DESIGN AND TECHNOLOGY

9705/03

Paper 3

May/June 2004

2 hours 30 minutes

Additional Materials: Answer paper
A3 Drawing paper (5 sheets)
A range of design drawing equipment

READ THESE INSTRUCTIONS FIRST

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

Section A

Answer any **two** questions from **one** of the Parts **A**, **B** or **C**.

Section B

Answer **one** question.

Write your answers on the separate answer paper provided.

If you use more than one sheet of paper, fasten the sheets together.

The number of marks is given in brackets [] at the end of each question or part question.

All dimensions are in millimetres.

The instruction 'discuss' denotes that you should:

- examine critically the issues raised by the question;
- explain and interpret these issues as appropriate;
- introduce evidence wherever possible to support conclusions of arguments.

This document consists of **11** printed pages and **1** blank page.



Section A

Answer **two** questions from **one** of the Parts **A**, **B** or **C**.

Part A – Product Design

- 1 Select **two** of the following methods of removing material. Use sketches and notes to describe how different tools could be used when cutting wood or metal. You need to describe only **one** tool for each material.

(a) sawing

(b) turning

(c) drilling

[10 x 2]

- 2 Fig. 1 shows a CD rack.

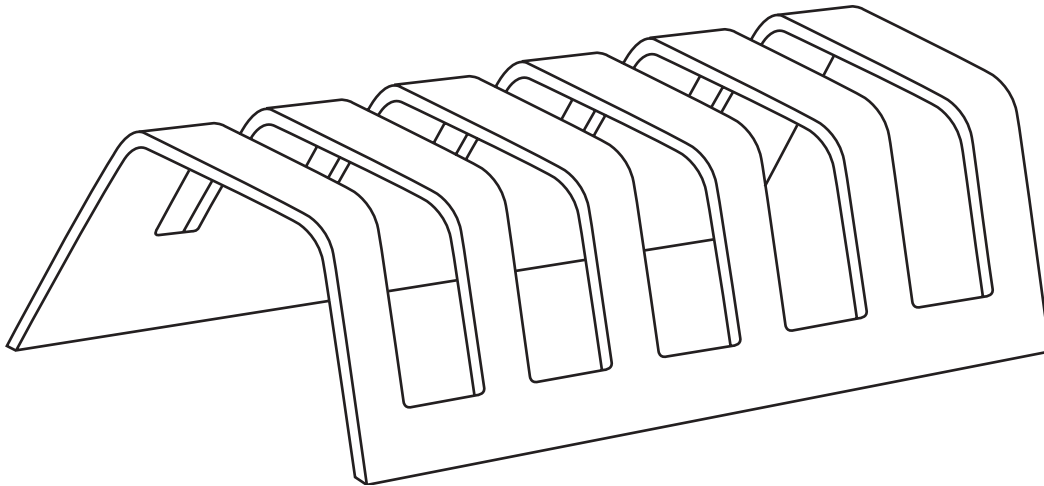


Fig. 1

(a) State a suitable material for the CD rack, giving reasons for your choice. [3]

(b) Describe, using sketches and notes, how you would make a prototype CD rack. [8]

(c) Explain, using sketches and notes, what changes may be necessary in the manufacturing method used and in the material selected if 1000 CD racks were required. [9]

- 3 The finish applied to products is very important in terms of appearance and/or protection.

(a) Use **two** different specific materials as examples to:

(i) describe how to prepare the surface; [2 x 2]

(ii) describe the application of suitable surface finishes. [2 x 2]

(b) Explain the appropriateness of **two** different finishes.

Include details of aesthetic and functional requirements of the finish and the type of environment in which the product is to be used. [6 x 2]

Part B – Practical Technology

- 4 Design and Technology students often have to make decisions on how best to join materials when manufacturing project work.

Use examples to compare and describe in detail **two** different methods and their suitability for purpose when:

either (a) joining using heat;

or (b) joining using a box construction.

Use sketches and notes to support your answer.

[10 x 2]

- 5 Tools and domestic products employ a wide range of mechanisms in their design.

Select a tool or product for each of the following and use sketches and notes to describe the mechanism and the principles involved.

(a) a linkage

(b) a third order lever

(c) rotary to reciprocating motion

(d) rotary to rotary motion through 90°

(e) a crank

[4 x 5]

- 6 Fig. 2 shows a simple crane structure.

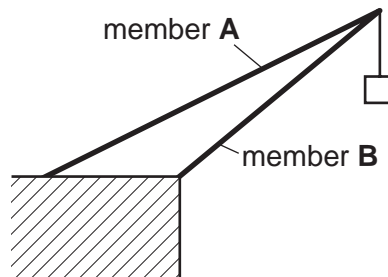
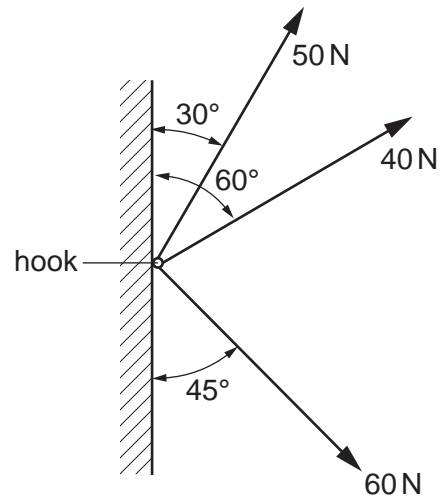


Fig. 2

(a) State which member of the crane is a strut and which member of the crane is a tie. [2]

(b) Use an example to describe how triangulation can be used to make a structure rigid. [2]

**Fig. 3**

- (c) Fig. 3 shows three ropes pulling against a hook. Find the direction and magnitude of the resultant force on the hook. [4]
- (d) Structures are subjected to different forces and loads and sometimes fail. Use examples to describe the following terms:
- (i) buckling;
 - (ii) twisting;
 - (iii) fatigue;
 - (iv) plastic hinging.

Use sketches and notes where appropriate to support your answer.

[12]

Part C – Graphic Products

7 Construct a cam profile and displacement diagram from the following information:

- (i) cam shaft diameter 24 mm;
- (ii) in line wedge shaped follower;
- (iii) minimum distance from centre to follower 24 mm;
- (iv) anticlockwise rotation;
- (v) 0 – 180° 40 mm lift simple harmonic motion;
- (vi) 180 – 360° fall with uniform velocity.

[20]

8 Fig. 4 shows an elevation and plan of a kitchen.

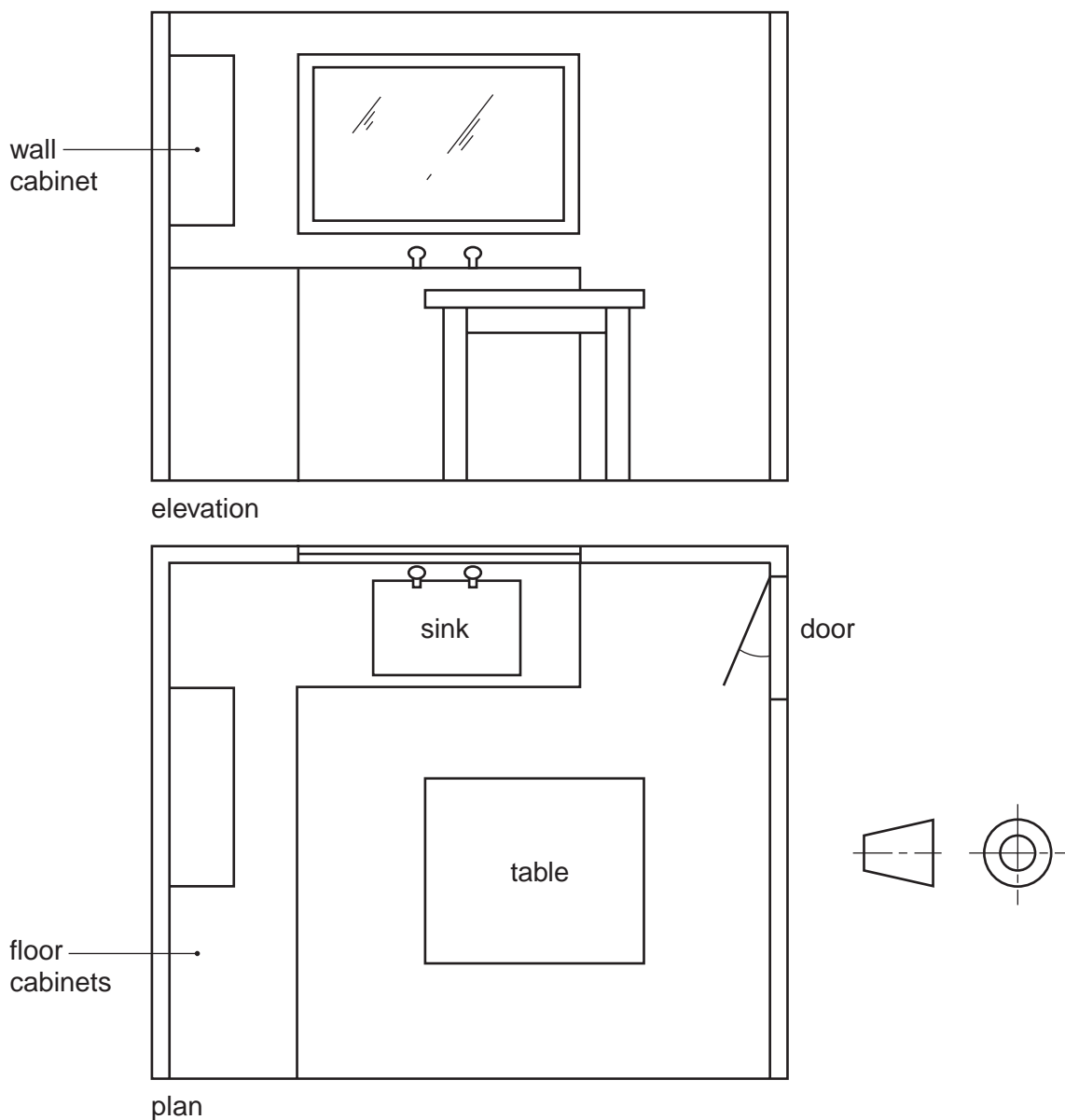


Fig. 4

Draw, on the A3 paper provided, a perspective drawing of the kitchen to an approximate scale.

[20]

- 9 Discuss how the use of computers has influenced the work of designers and manufacturers in the following processes:

designing;
costing;
stock control;
manufacture.

[20]

Section B

Answer **one** question on the A3 paper provided.

You should approach the design question of your choice in the following manner:

Analysis

Produce an analysis of the given situation/problem, which may be in written or graphical form. [5]

Specification

From the analysis produce a detailed written specification of the design requirements. [5]

Exploration

Use bold sketches and brief notes to show your exploration of ideas for a design solution, with reasons for selection. [25]

Development

Show using bold sketches and notes, the development, reasoning and composition of ideas into a single design proposal. Give details of materials, constructional and other relevant technical details. [25]

Proposed solution

Produce drawings of an appropriate kind to show the complete solution. [15]

Evaluation

Give a written evaluation of the final design solution. [5]

[Total: 80]

10 Many inspections and repairs to motor vehicles have to be carried out from underneath the vehicle. Mechanics need to be able to move easily under a vehicle and manoeuvre into a required position.

Design a trolley that will support an adult mechanic and is capable of:

- moving easily into position under a vehicle;
- holding a range of tools within easy reach of the user;

To assist you in your design work, anthropometric data is given in Fig. 5.

Details of tools to be held are given in Fig. 6.

Details of clearance under a vehicle is given in Fig.7.

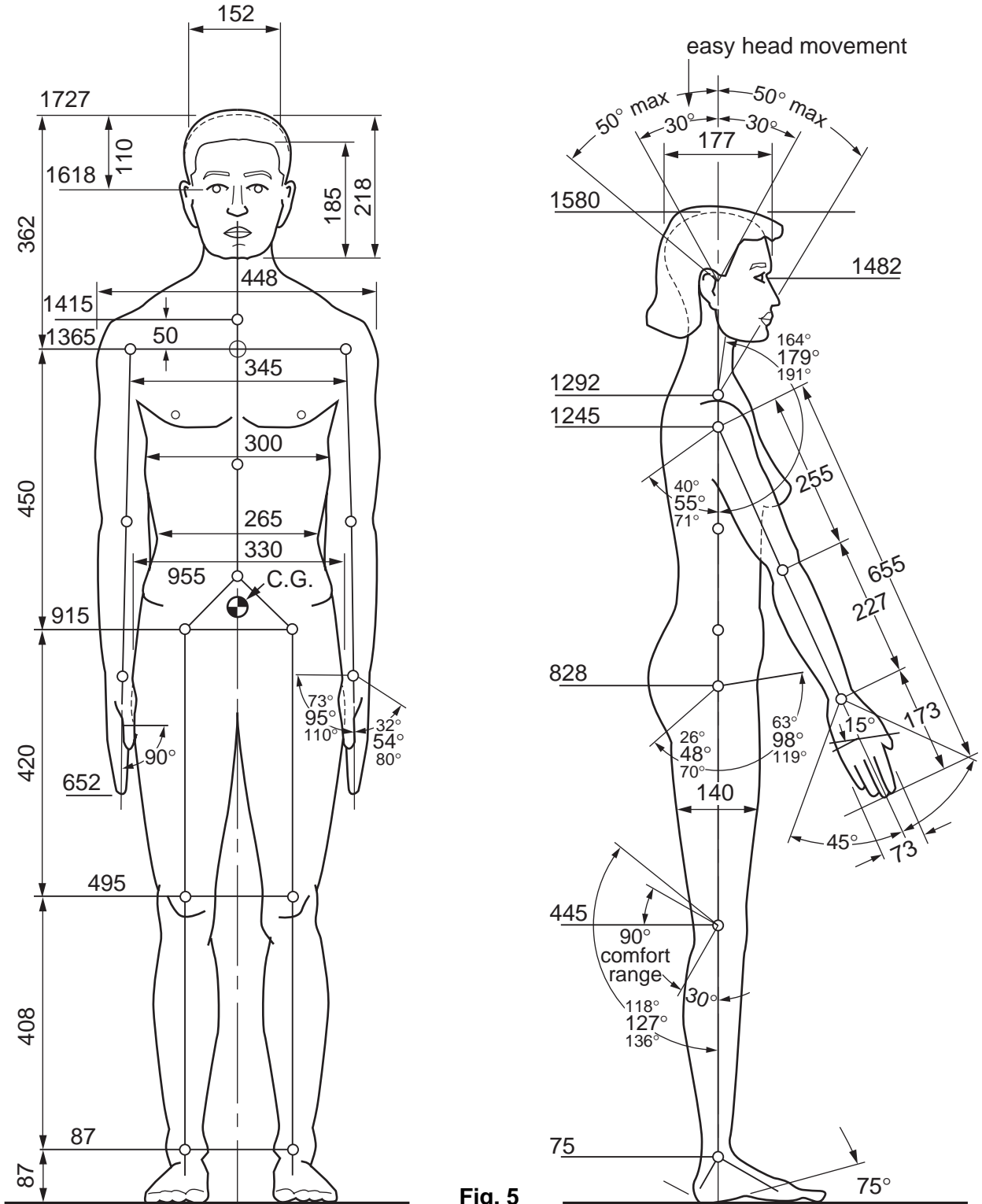


Fig. 5

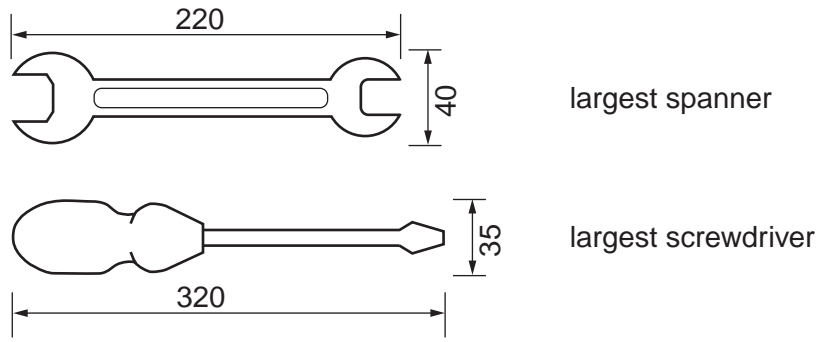


Fig. 6

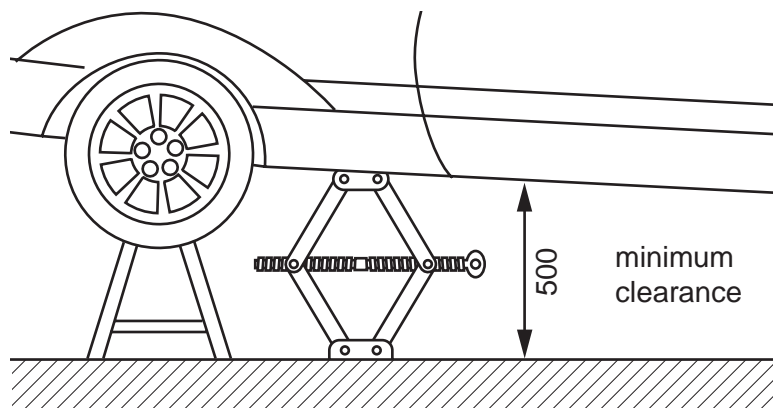


Fig. 7

- 11 Many families keep expensive garden equipment and tools in sheds or outbuildings. These families would feel more secure if the buildings were protected by an alarm that would alert the house owner if the outbuilding were to be entered by an intruder.

Design an alarm that can easily be fitted to an outbuilding that will:

- make it clear to an intruder that the outbuilding has an alarm;
- alert the owner if the window or door of the outbuilding is opened.

Include details of the circuit diagram required for your proposed solution.

Details of an outbuilding are shown in Fig. 8.

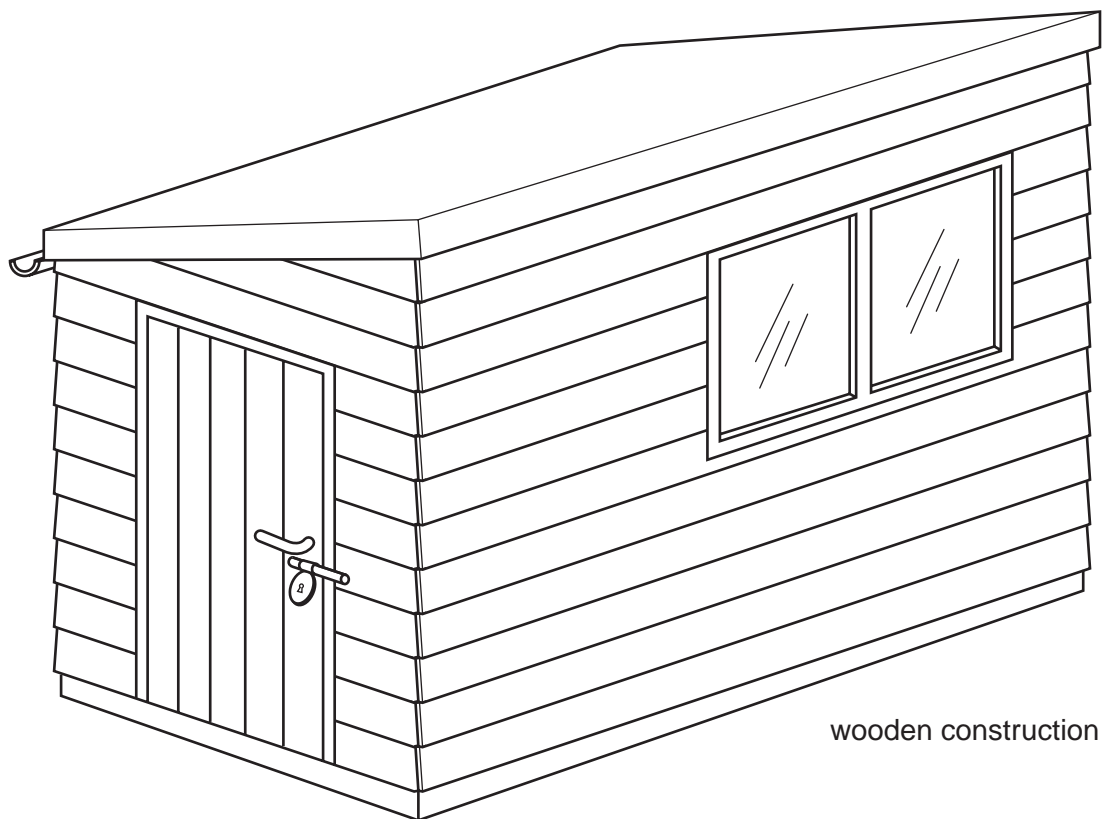


Fig. 8

- 12** A new firm specialising in graphics equipment named 'TechArt' wishes to promote its new products by giving potential clients a desk storage unit. The unit is to be made in card and posted to clients in an A4 size envelope.

Design a desk storage unit that is easily assembled and can hold a range of pens, pencils and stationery items such as paper clips. Your design should include a company logo and consideration should be given to an appropriate lettering style for the company name 'TechArt' .

