

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

DESIGN AND TECHNOLOGY

9705/03

Paper 3

October/November 2005

2 hours 30 minutes

Additional Materials: Answer paper / answer booklet
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.

Section A

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

Part A – Product Design

- 1 Fig. 1 shows the design of a holder used to display a mobile phone.

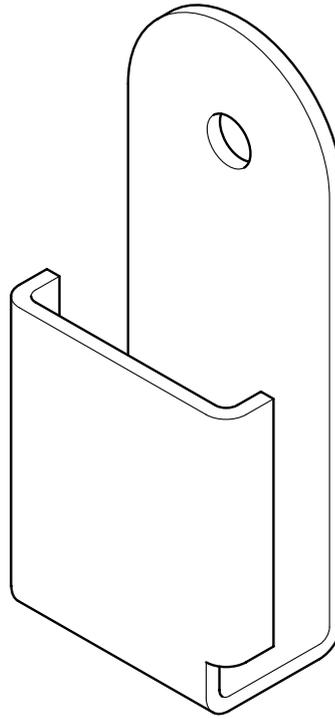


Fig. 1

- (a) State a suitable material for the holder and give **two** reasons for your choice. [3]
- (b) Describe, using sketches and notes, how you would make the prototype holder. [8]
- (c) Explain what changes may be necessary in the manufacturing method used and in the material selected if 500 holders were required. Use sketches and notes to support your answer. [9]

2 Fig. 2 shows a cyclist riding a bicycle.

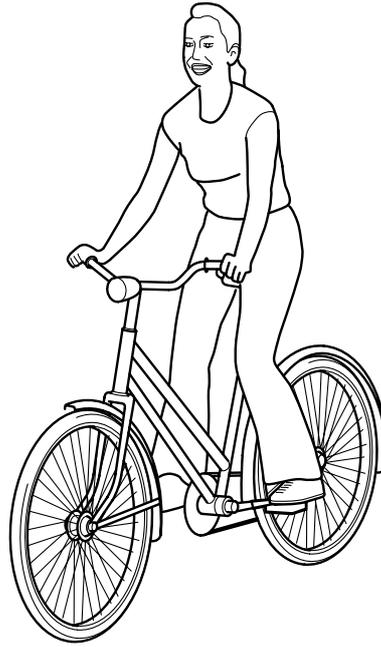


Fig. 2

- (a) Identify **four** examples from Fig. 2, and explain for each, why the designer would have used anthropometric data. [12]
- (b) Use examples, other than the use of anthropometric data, to explain **two** other features of bicycle design that would be influenced by the application of ergonomic principles. [8]

3

4

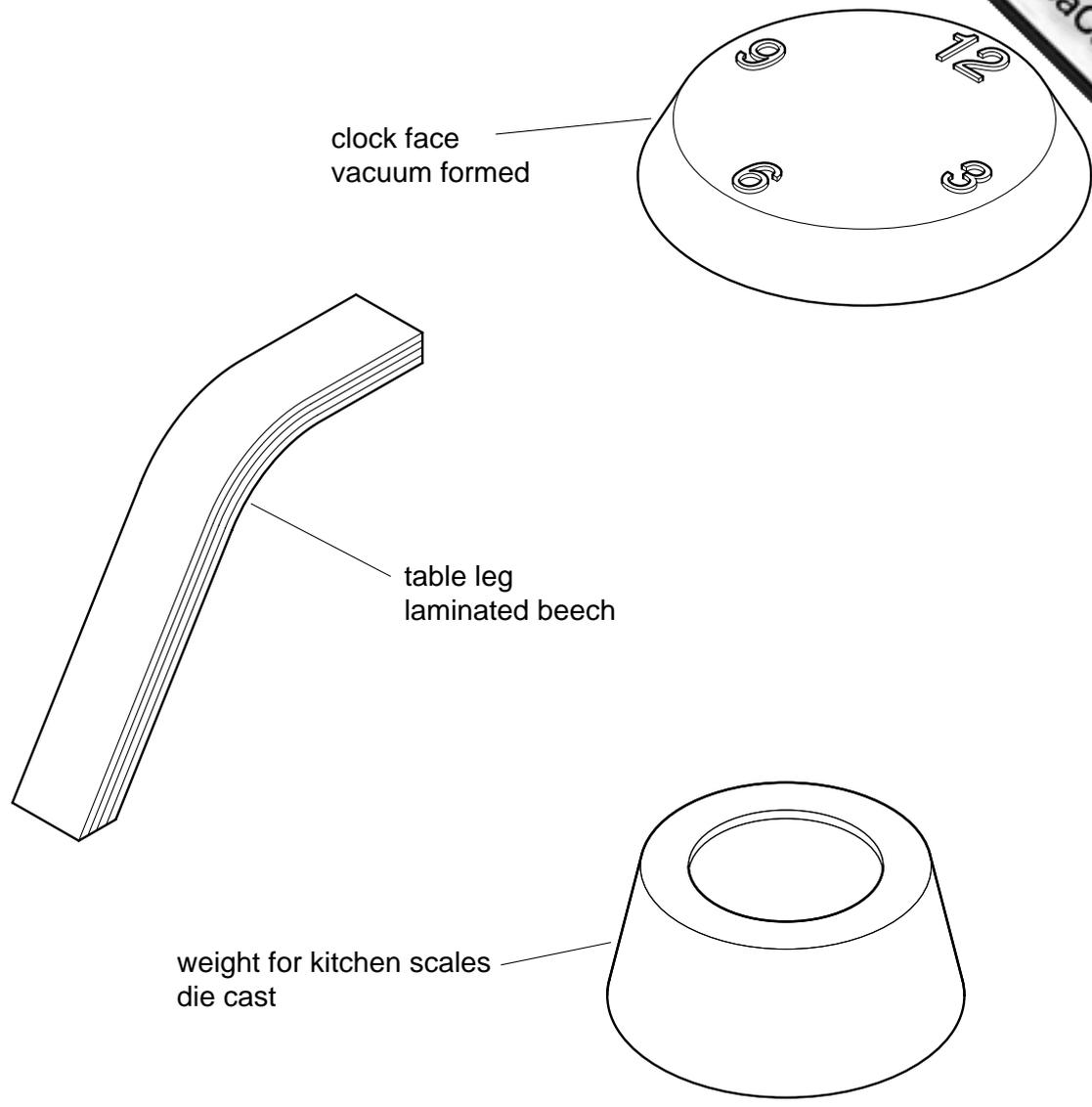


Fig. 3

Choose **two** of the items shown in Fig. 3 and for each:

- (a) use sketches and notes to describe the manufacturing process that relates to the chosen item; [7 x 2]
- (b) explain why the process is particularly suitable for the production of the item. [3 x 2]

Part B – Practical Technology

- 4 (a) Use **one** example in each case to describe how the following are used to test performance of materials and / or prototypes:
- (i) strain gauge; [3]
 - (ii) photoelasticity. [3]
- (b) (i) Give an example of a material that has good torsional strength and state an appropriate product application. [2]
- (ii) Give an example of a material that has good tensile strength and state an appropriate product application. [2]
- (c) Discuss the importance of non-destructive testing in the development of new products. [10]

- 5 Fig. 4 shows a loaded beam.

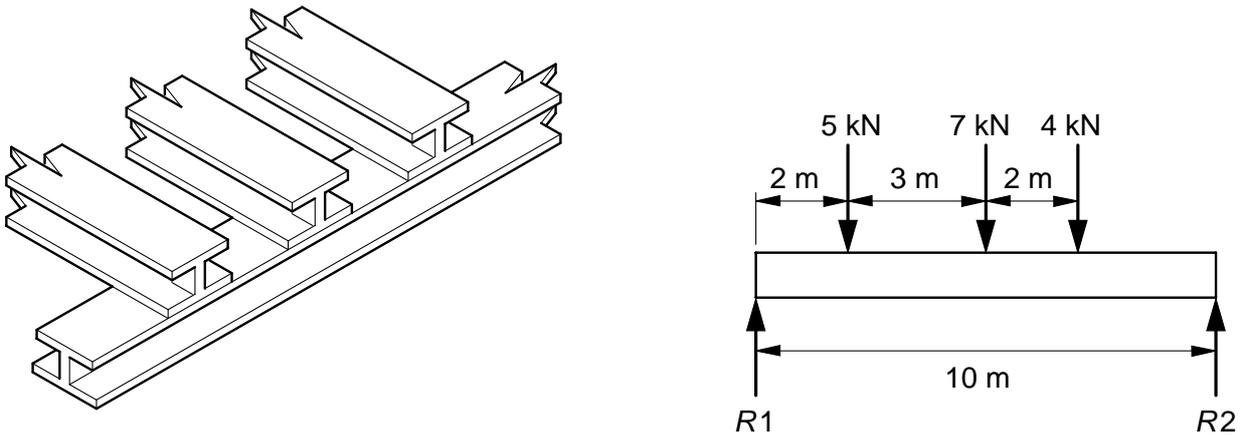


Fig. 4

- (a) Determine the reactions at $R1$ and $R2$. [8]
- (b) Problems caused by friction can occur in products that contain moving parts. Discuss the design issues of providing lubrication for the following products:
- (i) domestic electric food mixer;
 - (ii) bicycle;
 - (iii) car engine. [12]

- 6 (a) Explain in detail how the following components work:
- (i) reed switch;
 - (ii) relay.
- (b) Describe an appropriate application for each component. [2 x 2]
- (c) Draw a complete circuit diagram for each application. [5 x 2]

- 7 Fig. 5 shows a plan view of the design of a 'Coffee Shop' to be used by senior students school.

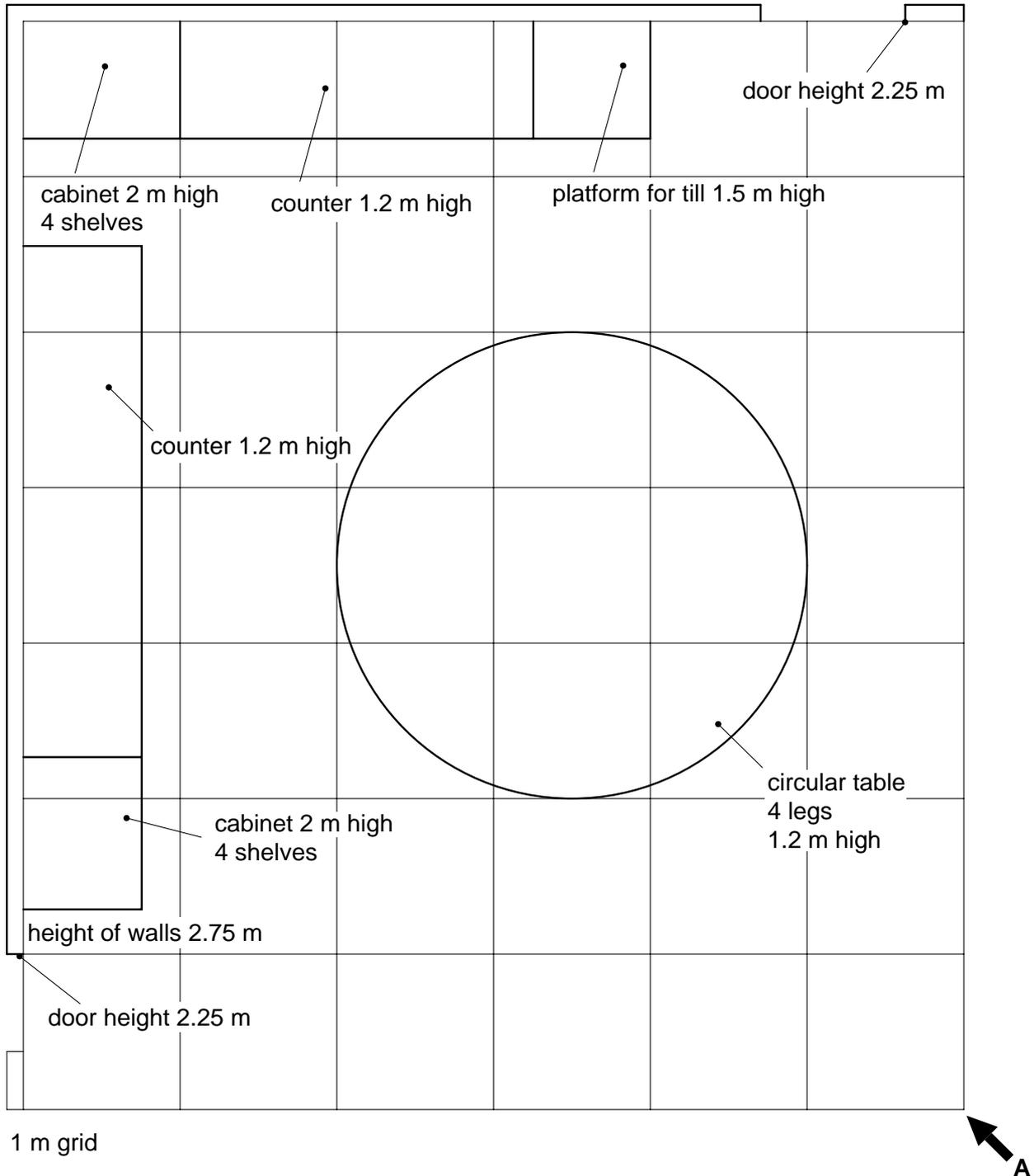


Fig. 5

Draw to an approximate scale, a planometric view of the 'Coffee Shop'.
Draw the planometric view from the direction of arrow **A**.

[20]

8 Discuss the implications of the increased use of computers when:

- designing products;
- managing and controlling the manufacture of products.

9 Designers use a range of methods to record and present information.

(a) Use an example for each to explain the use of:

- (i) pictograms;
- (ii) pie charts;
- (iii) flow charts;
- (iv) graphs.

[12]

(b) Fig. 6 shows orthographic views of a toy train.

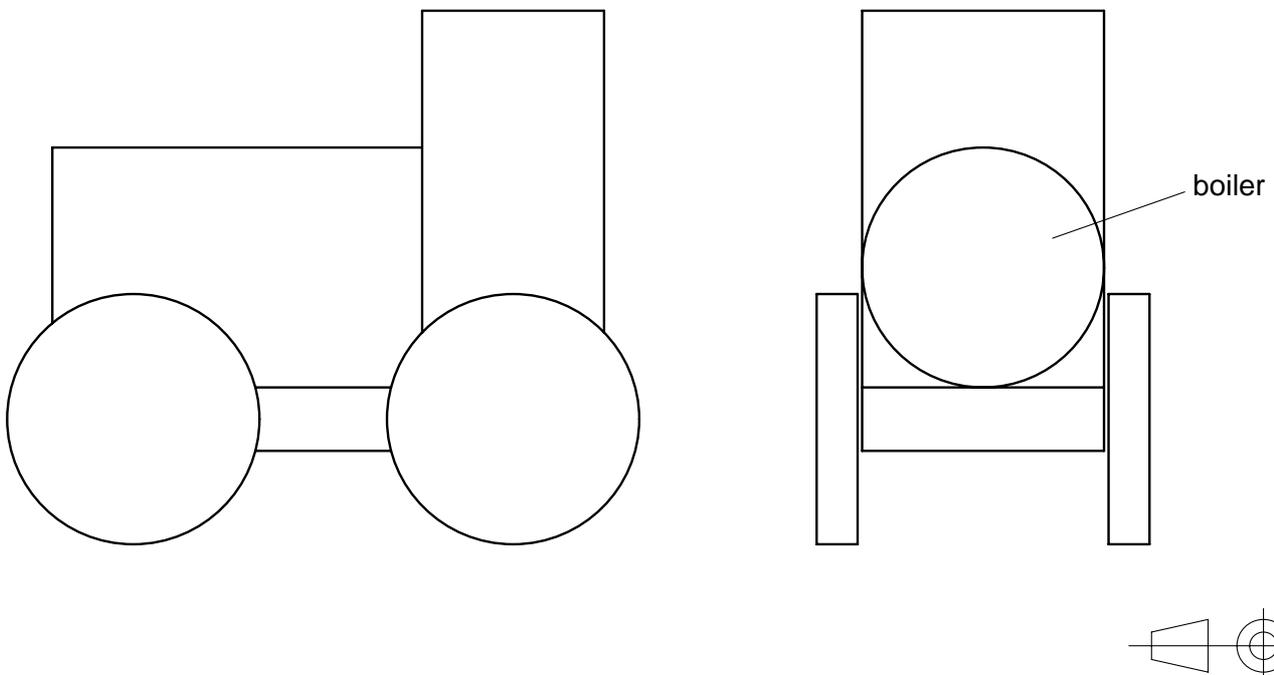


Fig. 6

Draw a freehand pictorial view of the train.

Render the boiler to show that it has been made from wood.

[8]

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 Children aged 5-11 years are planning a 'Conservation Week' looking at a range of environmental issues. You have been asked to help in the design and manufacture of a simple device to crush aluminium cans for recycling.

Design a device that can be easily and safely:

- operated;
- secured to a desk top.

To assist you in your design work, anthropometric data is given in Fig. 7.

Details of the desk top are given in Fig. 8

Details of the size of a can are given in Fig.9

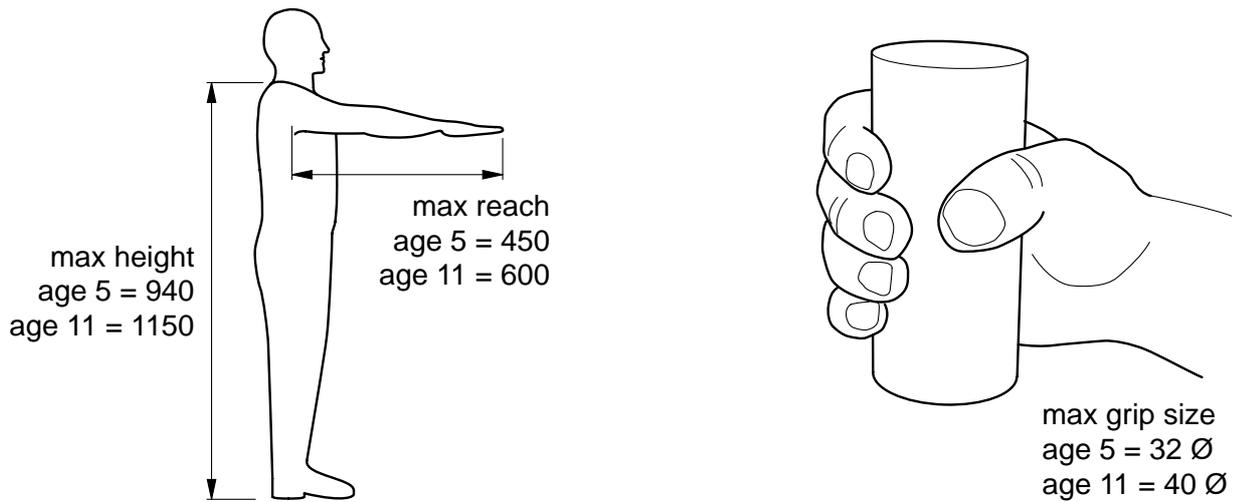


Fig. 7

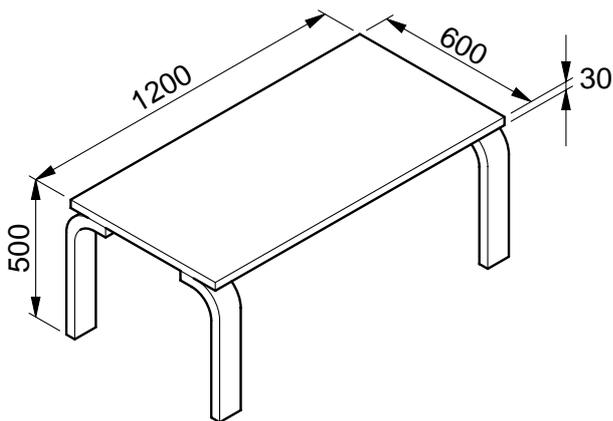


Fig. 8

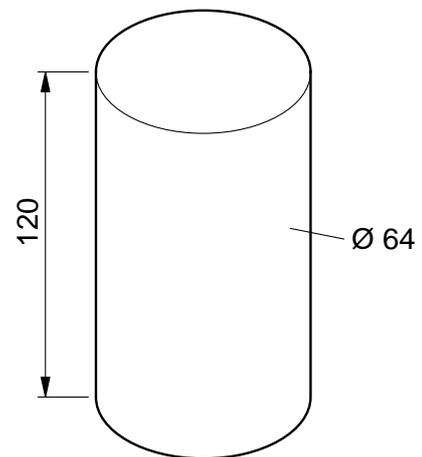


Fig. 9

- 11 Many teachers find that the teaching of the basic principles of electricity and electronics to children (11-14 years of age) can be made more interesting and effective if the children carry out practical experiments.

Design a kit (for one child) which will assist the teacher in the teaching of parallel and series circuits that:

- can be easily and safely used by an 11-14 year old;
- will excite and interest young students;
- is housed in a compact and easy to check form.

- 12 A school requires a display system to exhibit coursework of Design and Technology students. The display system is to be used on Open Evenings for parents.

Design an inter-linked display system that will:

- consist of four boards, each being able to display up to six sheets of A3 paper;
- include an area for two examples of practical project work;
- be easily assembled to form a stable display;
- have a life expectancy of at least three years.

