

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

DESIGN AND TECHNOLOGY

9705/03

Paper 3

May/June 2005

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 **12** printed pages.



Section A

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

Part A – Product Design

1

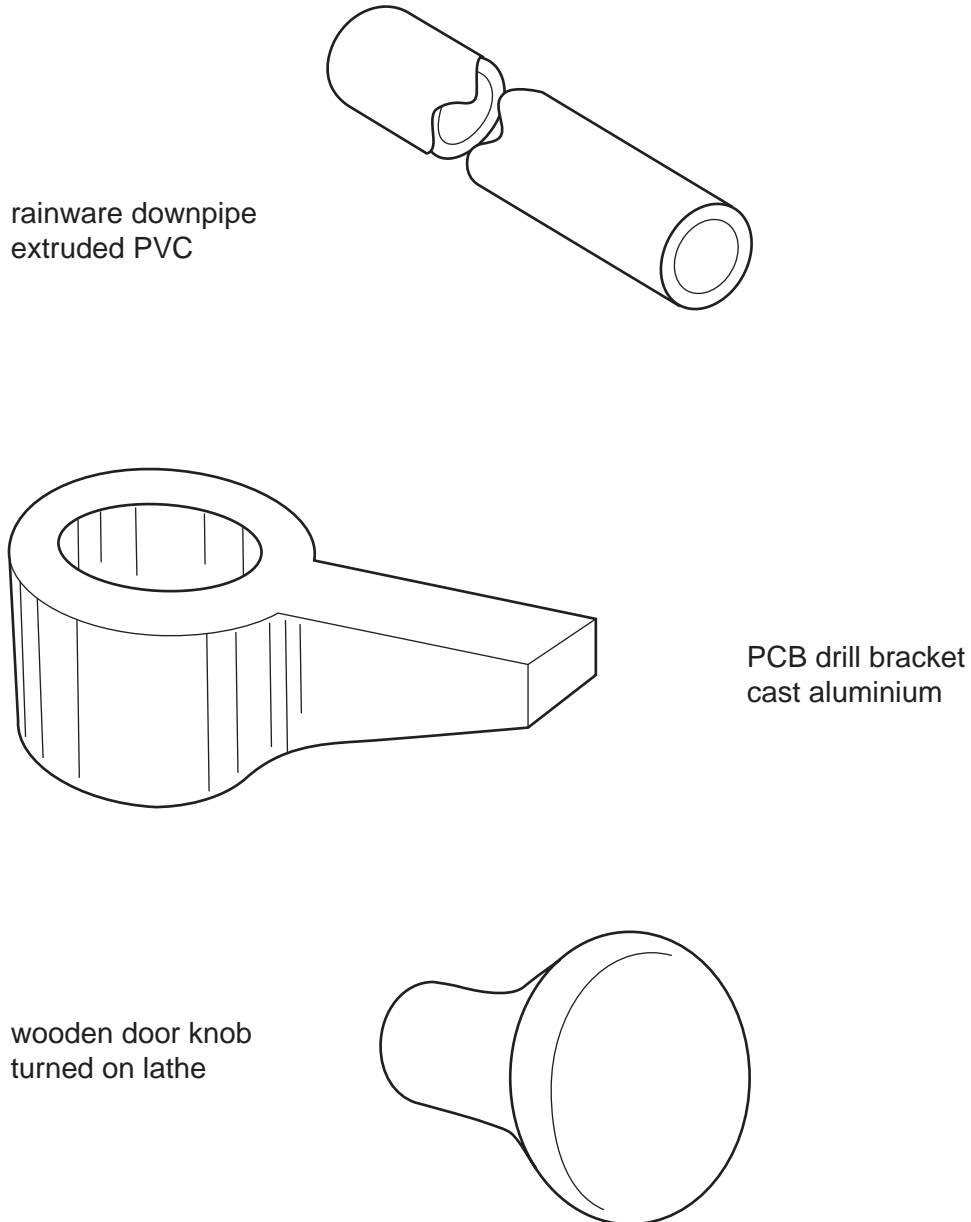


Fig. 1

Choose **two** of the items shown in Fig. 1 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]

2 Fig. 2 shows the design of a toothbrush holder.

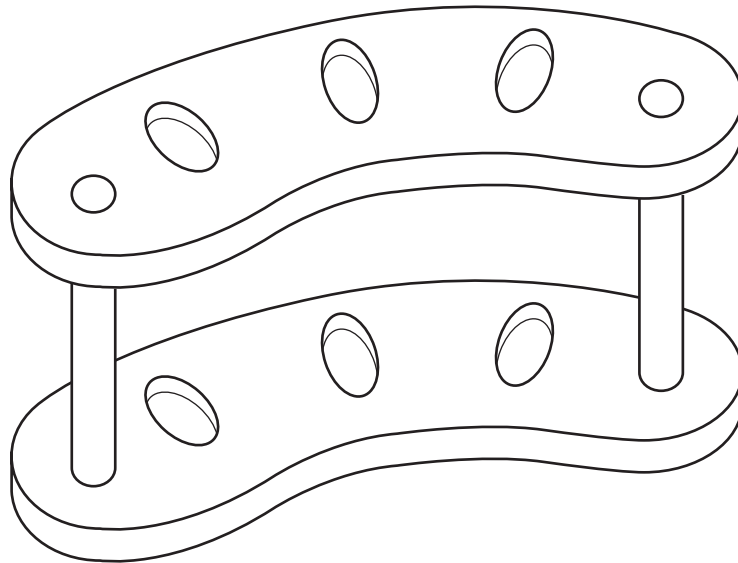


Fig. 2

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

3 In most cases, new products are either a result of 'market-pull' or 'producer led'.

Discuss the influence on the development of new products of the following:

- consumers;
- manufacturers;
- advances in technology.

[20]

Part B – Practical Technology

4 (a) Define the following terms:

- brittleness;
- corrosion resistant.

[2]

(b) State **one** material that is brittle and **one** material that is resistant to corrosion.

[2]

(c) Use sketches and notes to describe a method of comparing the toughness of materials. Include details of the samples used.

[10]

(d) Explain the importance of the data obtained from toughness testing to a designer/engineer when developing new products.

[6]

5 Fig. 3 shows part of a garden rake made from mild steel.

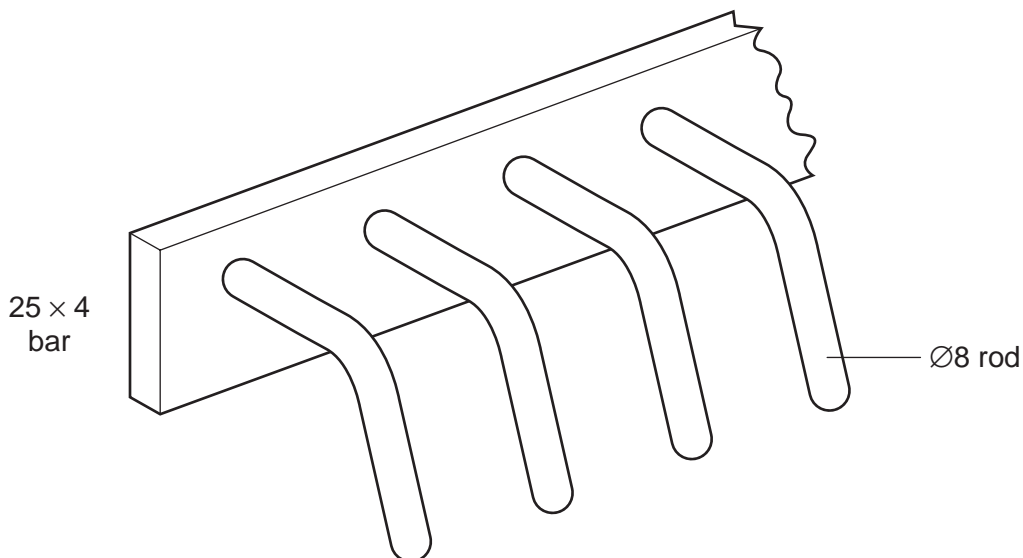


Fig. 3

(a) The rake is to be kept outdoors. Describe how you would protect the mild steel.

[2]

(b) Describe in detail, using notes and sketches, how you would hard solder (braze) the rods to the bar.

[8]

(c) (i) Identify the key differences in the process used if the rods were to be gas welded to the bar.

[6]

(ii) Explain the advantages of gas welding over brazing.

[4]

6 Fig. 4 shows a compound gear train for a toy car.

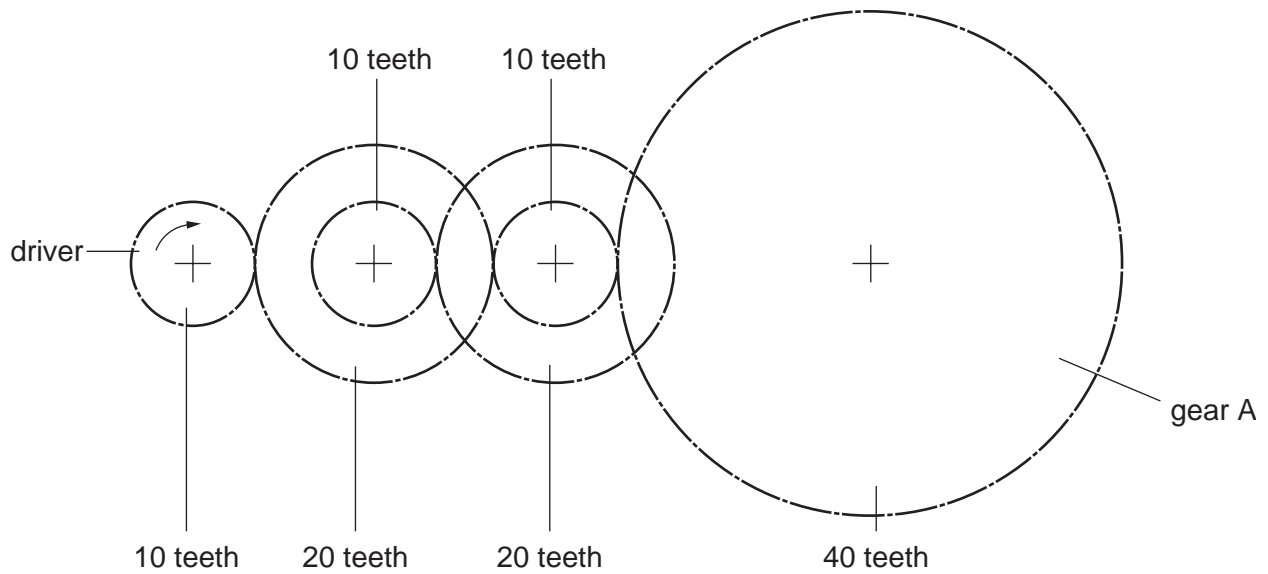


Fig. 4

- (a) The driver rotates clockwise. State the direction of rotation of gear A. [1]
- (b) Calculate the Velocity Ratio of the gear train in Fig. 4. [3]
- (c) Use an example for each to describe the use of:
- (i) a crank;
 - (ii) a cam. [6]
- (d) Gears can be made from a range of materials.
Use an example for each to explain the advantages and disadvantages of making gears from:
- (i) thermoplastic (nylon);
 - (ii) brass;
 - (iii) mild steel. [10]

Part C – Graphic Products

7 Fig. 5 shows orthographic views of a camera.

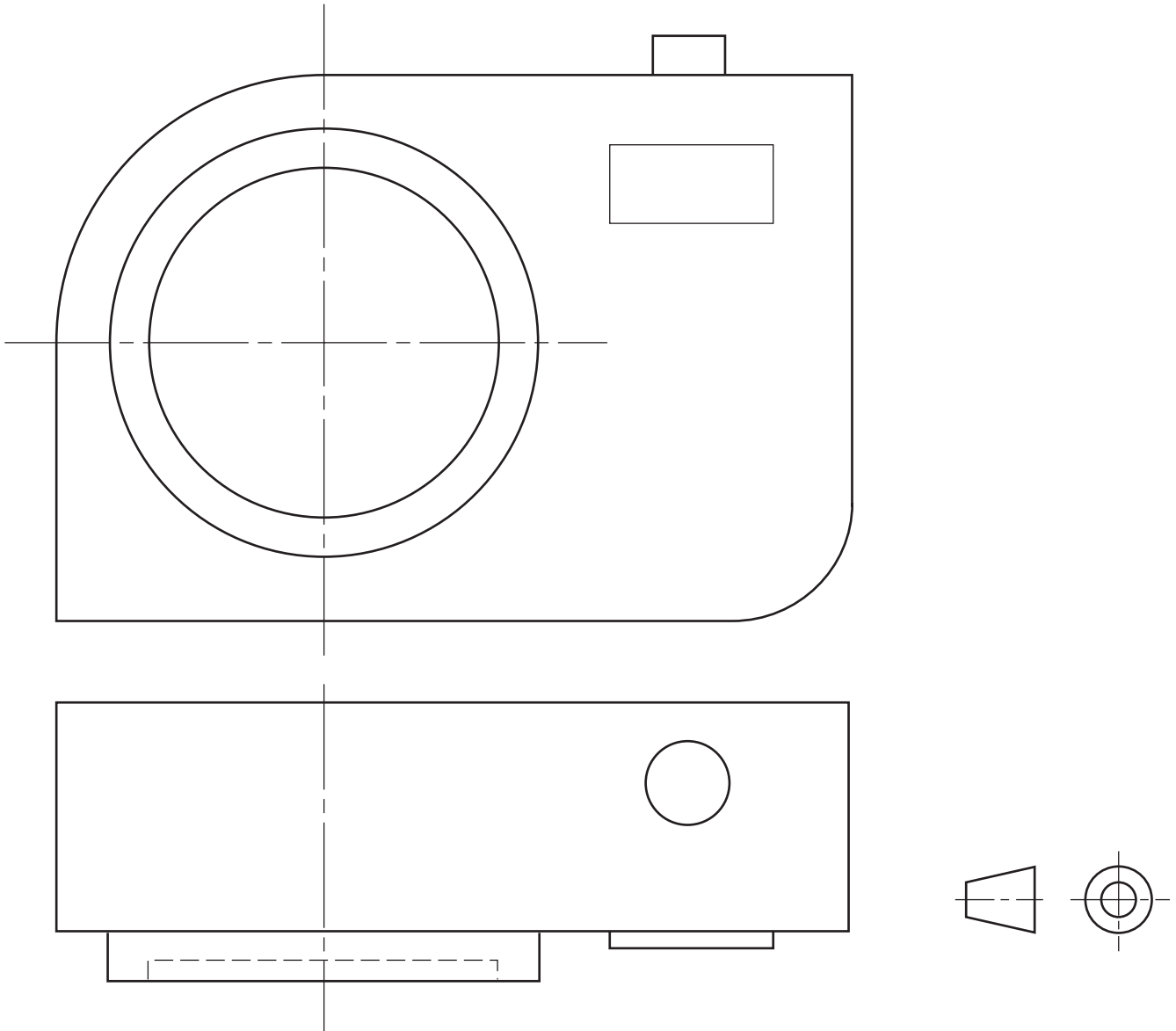


Fig. 5

Draw, approximately full size, an isometric view of the camera.

[17]

Use appropriate enhancement technique/s to make your drawing look more realistic.

[3]

- 8 Fig. 6 shows a scale model of the roof of a new boiler house for a school. The model is to be constructed from thin card.

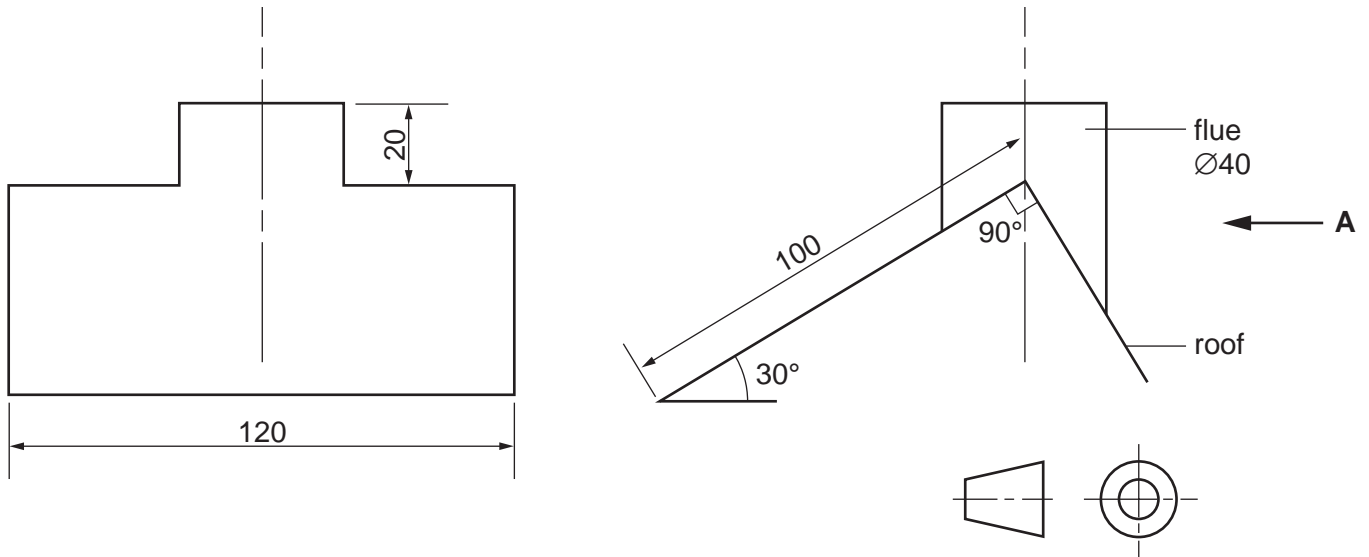


Fig. 6

- (a) Complete an elevation seen from arrow **A**. [6]
Do not include hidden detail.
- (b) Produce the development (net) of:
- (i) the roof, including detail of the hole that will need to be cut out to connect the flue; [6]
- (ii) the flue. [8]
- Do not include gluing tabs.

- 9 You have been asked to set up an exhibition of examination coursework for a school Open Day. It will include:

A level Art, paintings, drawings and sculpture;

A level Design and Technology coursework, design sheets and practical work.

Fig. 7 shows an outline of the room in which the display is to be set up.

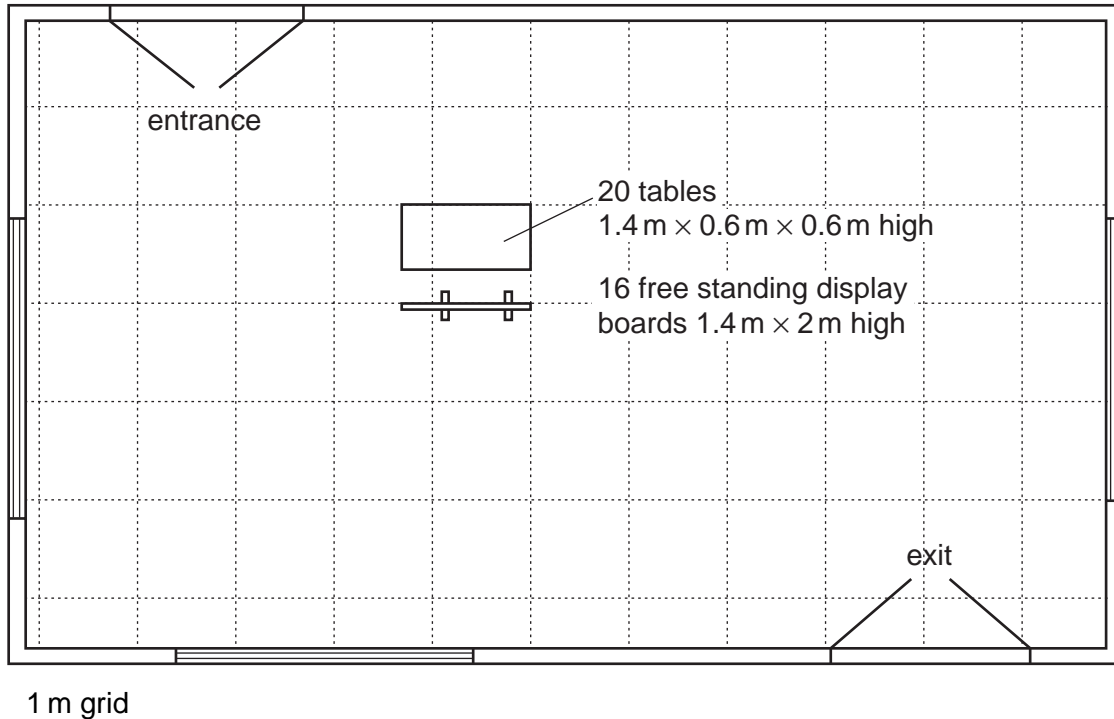


Fig. 7

- (a) Describe the stages in producing:
- (i) a one-off, hand-produced A3 colour poster to advertise the Open Day in local shops; [4]
 - (ii) 500 A4 leaflets to send to parents inviting them to the Open Day. [6]
- (b) You are required to provide instructions to indicate to others how the room is to be set up. Use sketches and notes to describe how the room is to be set up to display a range of work. Consider the circulation of visitors and protection of delicate exhibits. [10]

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]

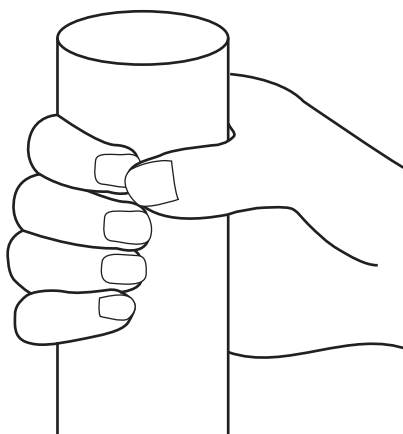
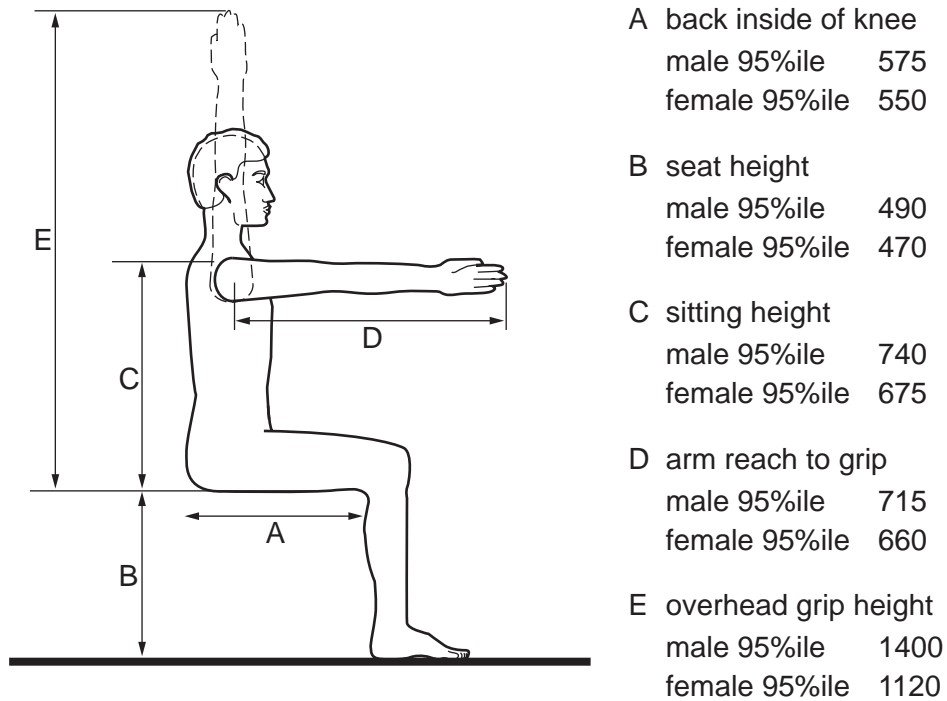
[Total: 80]

- 10 Many adults are paying greater attention to personal fitness. The ability to carry out regular exercise at home would be a convenient option.

Design a piece of fitness apparatus for personal use that will:

- exercise the stomach, arms and legs from a seated position;
- use a limited floor space (max 2 m × 1 m)
- be easy to store.

To assist you in design work, anthropometric data is given in Fig. 8



grip max \varnothing male 48
female 42

Fig. 8

- 11 School caretakers often have to inspect school buildings and grounds at night. On occasions repairs and maintenance may need to be carried out.

Design a torch that will:

- be easy to carry;
- give two levels of light intensity;
- be stable when positioned on the floor;
- be easily adjustable to direct light to where it is required.

To assist you in your answer, the dimensions of the battery to be used are given in Fig. 9

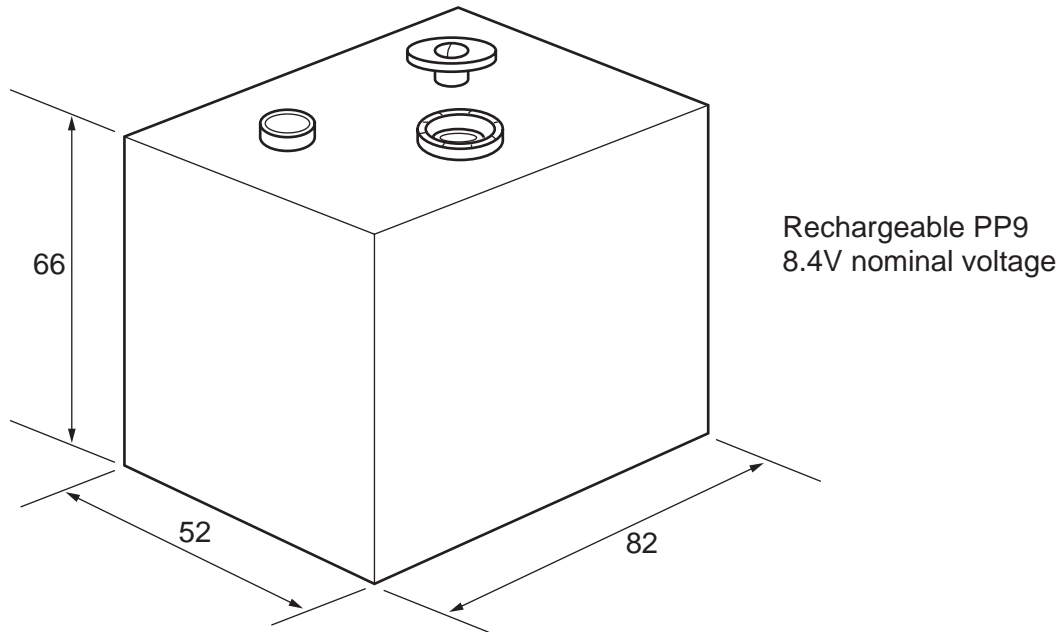


Fig. 9

- 12 A chain of shops offers a range of films for hire in the form of videos and DVDs. The latest film releases need to be promoted to encourage customers to hire them.

Design a floor standing unit that will:

- be made from thick card;
- display six DVDs and 6 videos of the latest films;
- be easily assembled.

The unit must include provision for an easily attachable cut-out of a life-size character from the latest film release.

To assist you in your design work, sizes of Video cases and DVD cases are given in Fig. 10

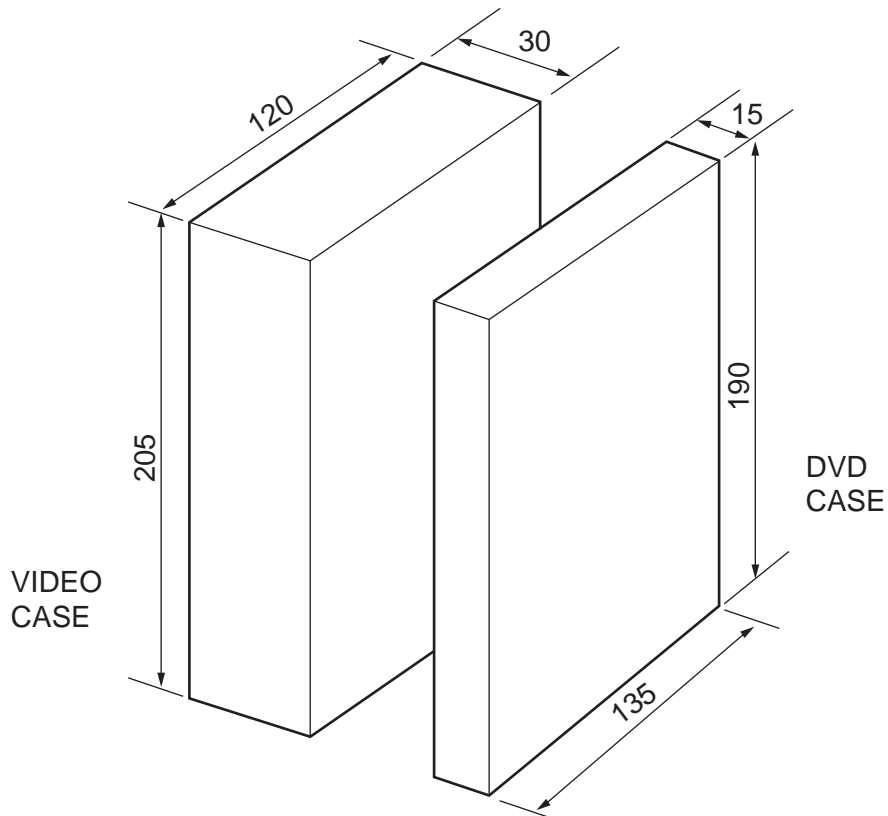


Fig. 10

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