

CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

DESIGN AND TECHNOLOGY
PAPER 3

9705/3

OCTOBER/NOVEMBER SESSION 2002

2 hours 30 minutes

Additional materials:

- Answer paper
- A3 Drawing paper (5 sheets)
- A range of design drawing equipment

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

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.

INFORMATION FOR CANDIDATES

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 question paper 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 shows the design of a handle to be used on a small toolbox.

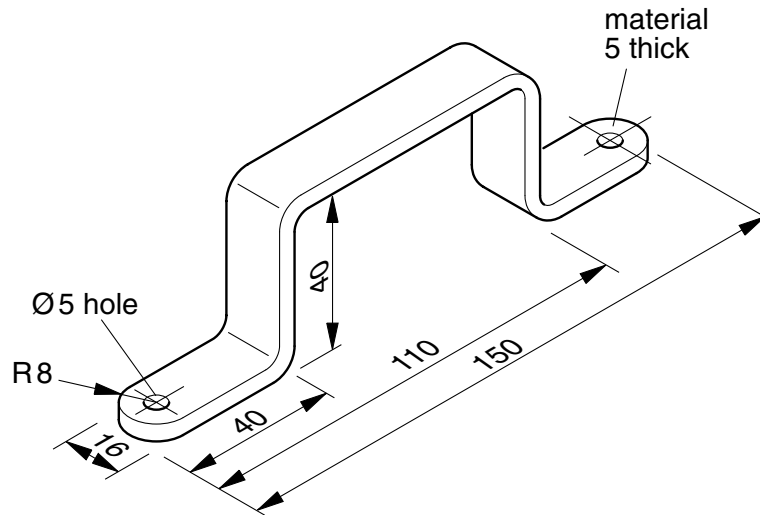


Fig. 1

- (a) State a suitable material for the handle giving reasons for your choice. [3]
- (b) Describe using sketches and notes, how you would make the prototype handle. [8]
- (c) Explain what changes may be necessary in the manufacturing method used and in the material selected if 5000 handles were required.

Use sketches and notes to support your answer. [9]

2 Fig. 2 shows the interior of a car.

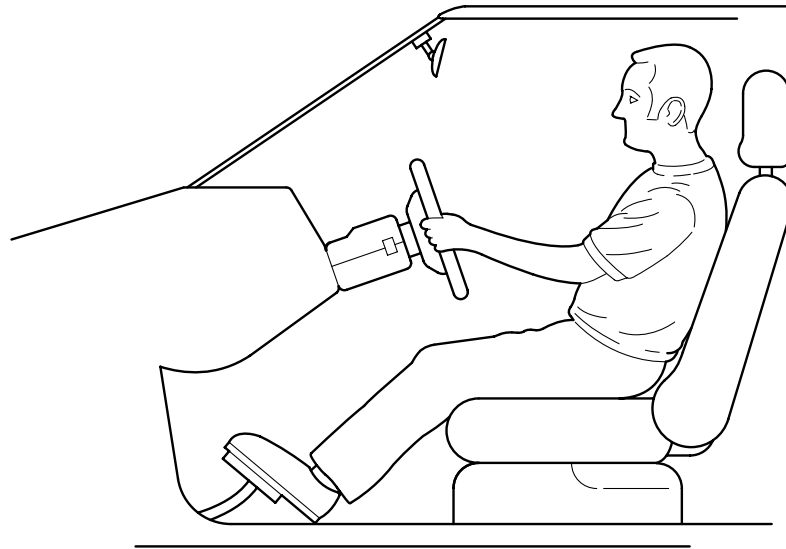
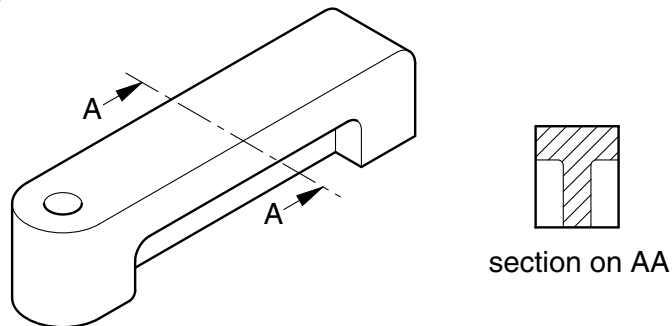


Fig. 2

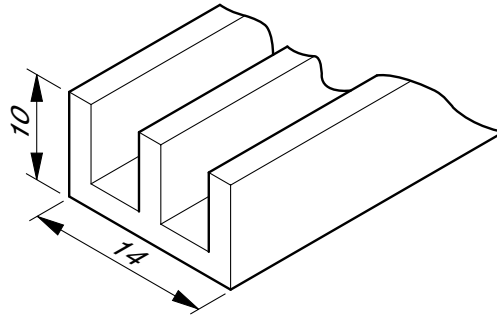
- (a) Identify **four** examples from Fig. 2 and explain for each, why the designer would have used anthropometric data. [12]
- (b) Use examples, other than the use of anthropometric data, to explain **two** features of car design that would be influenced by the application of ergonomic principles. [8]
- 3 A seating unit to accommodate up to four adults is required for a large open area space in a new shopping mall.
- (a) List **five** main design requirements for the seating unit. [5]
- (b) Sketch and annotate a suitable design for a seating unit showing details of construction. [6]
- (c) State a suitable material for the seating unit and give reasons for your choice. [3]
- (d) Explain how a designer would consider aesthetics when designing objects for public places. [6]

Part B – Practical Technology

- 4 Handle for a junior hacksaw
Process: die casting



- Runner for sliding doors
Process: extrusion



- Drinks bottle
Process: blow moulding

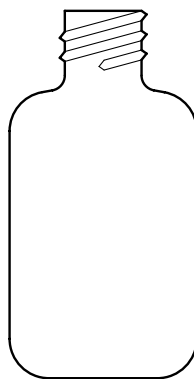


Fig. 3

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

- (a) use sketches and notes to describe the 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]

- 5 (a) Use examples to explain the difference between frame and monocoque structures. [4]
- (b) Determine the direction and magnitude of the equilibrant force in each of the examples given in Fig. 4. [4]

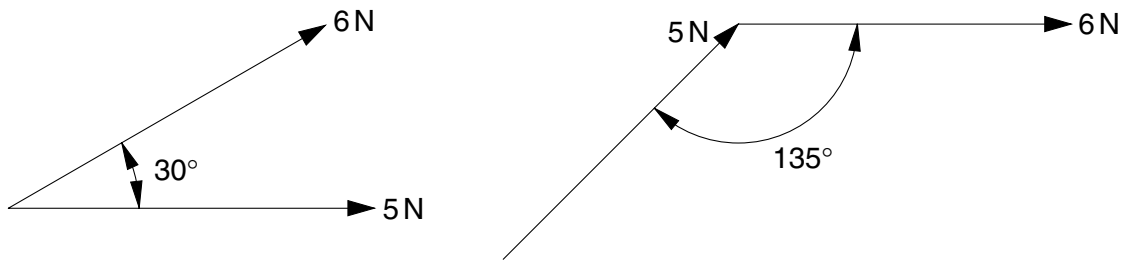
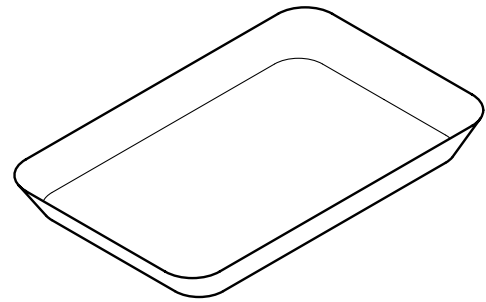


Fig. 4

- (c) Use notes and sketches to show how Bow's notation is used to assist the resolution of forces. [6]
- (d) Use labelled sketches to show how the structural performance can be improved in each of the examples given in Fig. 5 below. [6]

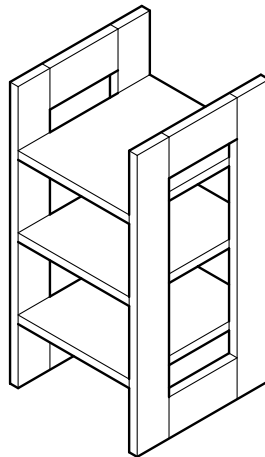
Vacuum formed plastic tray

Problem – the shape is not stable when picked up



Tall wooden bookshelf

Problem – not rigid



Bolted steel structure

Problem – stress concentrated at fixings

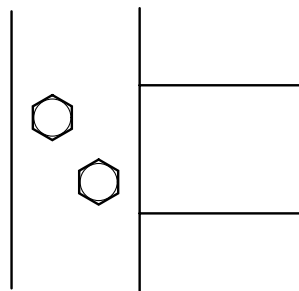


Fig. 5

6 Fig. 6 shows two resistors in parallel.

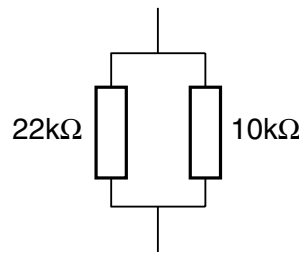


Fig. 6

- (a) Calculate the total resistance of the arrangement shown in Fig. 6. [3]
- (b) Explain the working of each of the following in electronic circuits and give one example of its use in each case:
- diode;
 - strain gauge. [6]
- (c) You are to prepare a draft of a worksheet on Logic Gates.
- (i) Explain what is meant by the term logic gate. [2]
- (ii) Draw the symbol and create a truth table for each of the following logic gates:
- NAND;
 - OR;
 - NOR. [9]

7 Fig. 7 shows a full size orthographic drawing of a hole cutter.

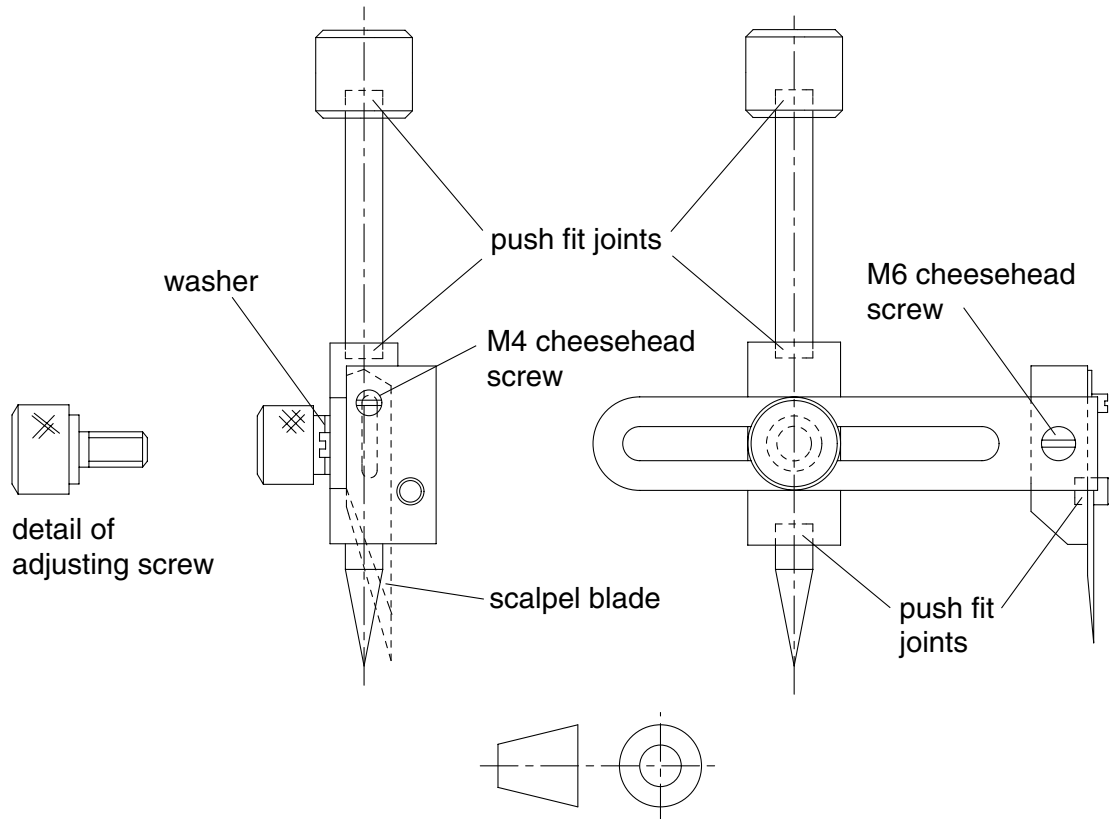


Fig. 7

Produce an exploded isometric sketch of the hole cutter, approximately twice full size.

Use thick and thin line technique to enhance your sketch.

[20]

- 8 Two models are required to help inform youngsters about the dangers of using fireworks. They are to be made from card, in the form of a truncated pyramid and a truncated cone. Details are given in Fig. 8

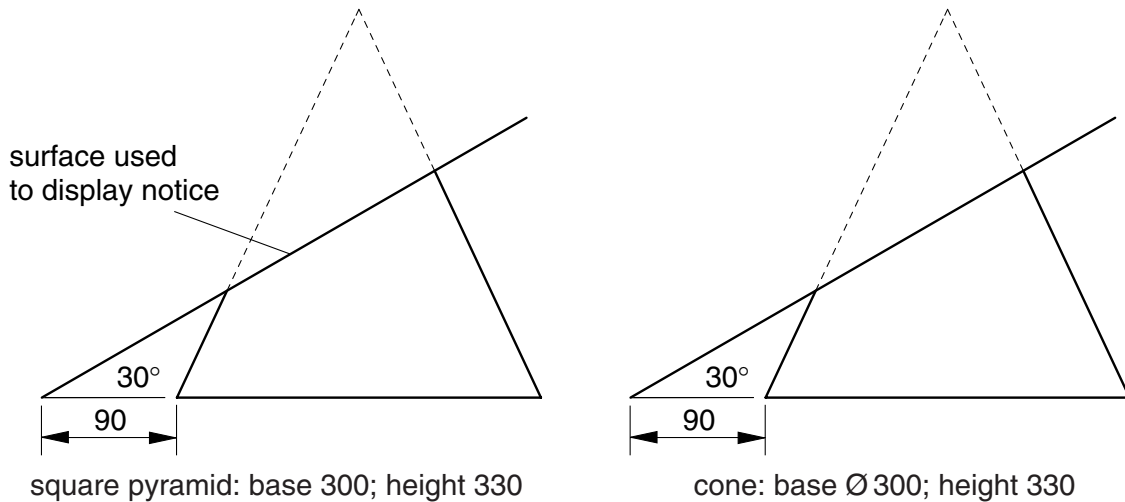


Fig. 8

- (a) Construct the developments (nets) for each model. Include gluing tabs. [15]
- (b) Describe how one of the models could be produced as a batch of 500. [5]
- 9 A major study of car accident statistics has highlighted that a significant number involve new drivers. A worldwide campaign is to be launched in school to encourage young car drivers to drive with more care.

The campaign will involve a series of A4 size leaflets and A3 posters.

- (a) List **four** considerations that a designer of the poster would have to take into account. [4]
- (b) Design a monochrome graphic symbol that will highlight the dangers of driving. The symbol is to appear on the leaflets. [8]
- (c) Design a simple freestanding unit to hold up to 100 A4 leaflets and an A3 poster.

The unit is to stand in the entrance hall of the school and be:

- made from stiff card;
- 1.2 metres high;
- stable in use but able to be folded flat or disassembled for storage.

[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** Many students deliver newspapers as a part time job. In some areas the delivery route can be quite long and it would be better to use a bicycle.

Design a trailer that can be attached to the bicycle to hold up to 50 newspapers.

It must be able to:

- attach securely to the bicycle;
- be easily and quickly attached and removed;
- hold securely up to 50 newspapers (details given in Fig. 9);
- protect the newspapers in adverse weather conditions.

To assist you with your design work, details of a bicycle are given in Fig. 10.

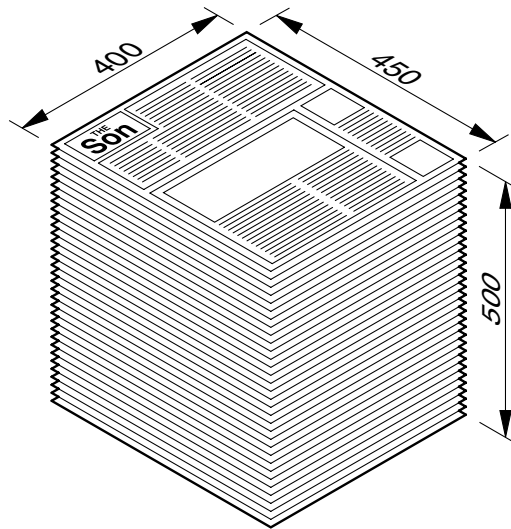


Fig. 9

DETAILS OF A BICYCLE

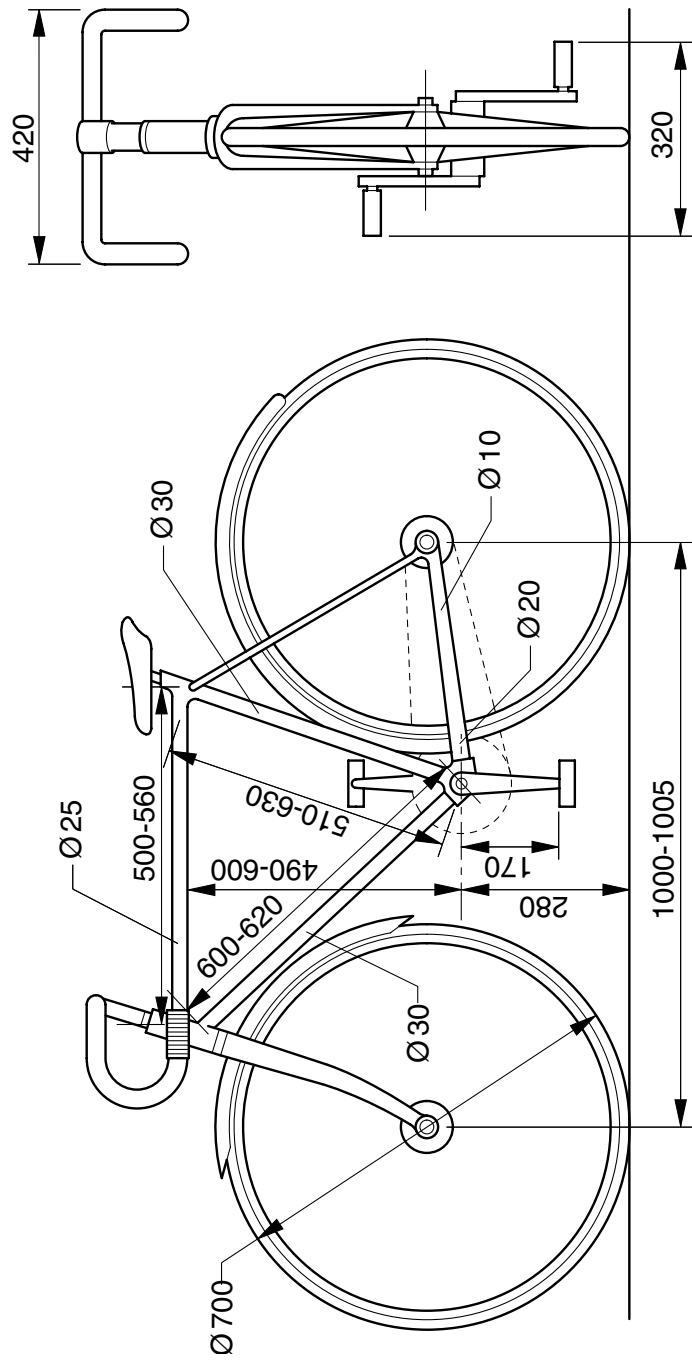


Fig. 10

- 11 A Design and Technology Department requires working models to demonstrate the use of alternative sources of energy.

Design a working model that will:

- generate energy from **either** wind, moving water or the sun;
- record and measure the energy generated;
- stand on a school desk with a base size of 600 x 500;
- be able to be used outside if necessary.

- 12 A major sports company, Multi-Sport has decided to promote the sale of footballs and tennis balls.

The footballs are to be packaged singly, the tennis balls are to be packaged in packs of three.

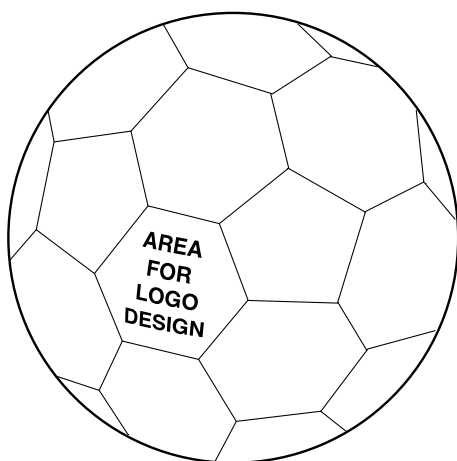
It is intended that the packaging can be used for storing and transporting the balls by the user and would not be discarded immediately after purchase.

Both packages are to be made from card.

Design the following, including details of nets/developments where appropriate:

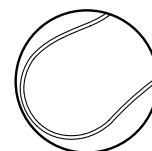
- the package for a football that is easy to carry and clearly displays the logo on the ball;
- the package for three tennis balls that is easy to carry with the logo included on the package;
- the logo based on the name Multi-Sport, to be used on the football and the tennis ball package.

To assist you with your design work, details of a football are given in Fig. 11 and details of a tennis ball are given in Fig. 12.



football
 $\text{Ø} 225$

Fig. 11



tennis ball
 $\text{Ø} 70$

Fig. 12