



# Cambridge International AS & A Level

DESIGN & TECHNOLOGY

9705/32

Paper 3

October/November 2021

3 hours



You must answer on the answer booklet/paper.

You will need: Answer booklet/paper                      Coloured pencils  
A3 drawing paper (5 sheets)  
A range of design drawing equipment

## INSTRUCTIONS

- Answer **three** questions in total:  
Section A: answer **two** questions from **one** of the Parts A, B or C.  
Section B: answer **one** question.
- If you have been given an answer booklet, follow the instructions on the front cover of the answer booklet.
- Use a black or dark blue pen.
- Write your name, centre number and candidate number on all the work you hand in.
- Do **not** use an erasable pen or correction fluid.
- You may use an HB pencil, or coloured pencils as appropriate, for any diagrams, graphs or rough working.
- At the end of the examination, fasten all your work together. Do **not** use staples, paper clips or glue.

## INFORMATION

- The total mark for this paper is 120.
- The number of marks for each question or part question is shown in brackets [ ].
- All dimensions are in millimetres.

This document has **12** pages. Any blank pages are indicated.

## Section A

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

## Part A – Product Design

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.

1 Fig. 1.1 shows a bracelet and the nameplate part of the bracelet.

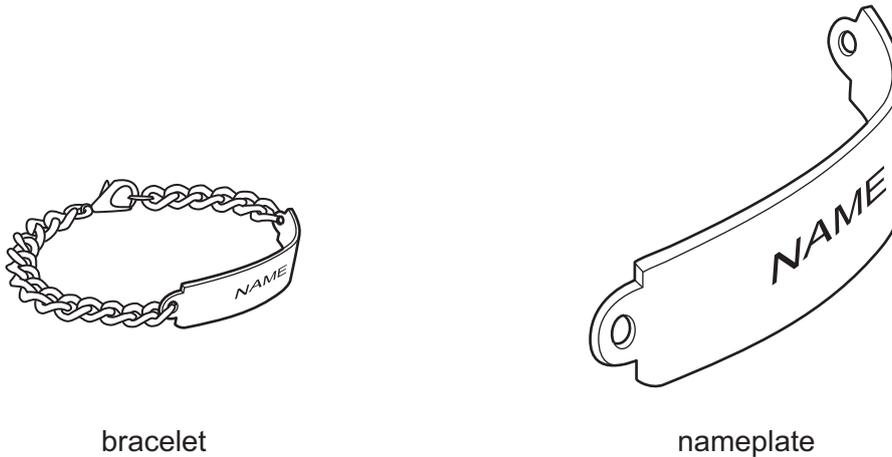
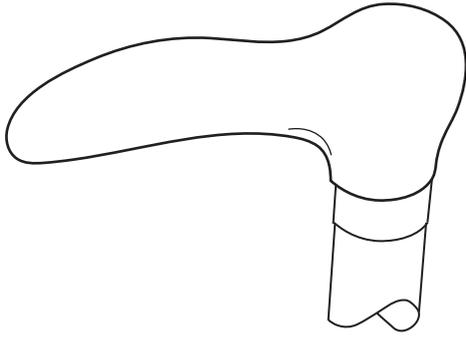


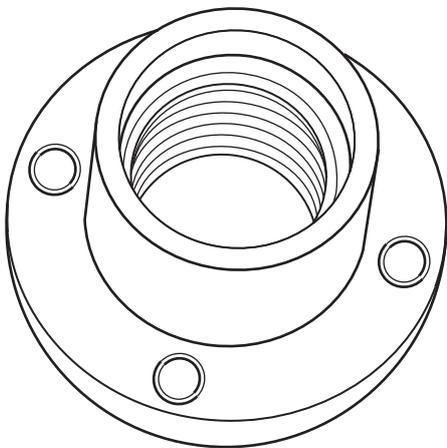
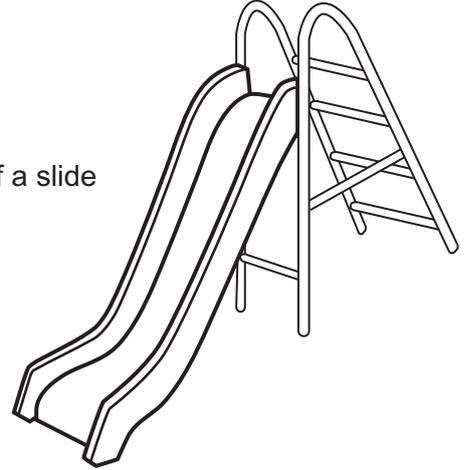
Fig. 1.1

- (a) State a suitable material for a bracelet of the type shown in Fig. 1.1 and give **two** reasons for your choice. [3]
- (b) Use sketches and notes to describe how you would make a prototype nameplate. [9]
- (c) Explain the changes which may be necessary to the design, the manufacturing method used and the material selected, if 500 identical nameplates were required. Use sketches and notes to support your answer. [8]
- 2 'The best design explicitly acknowledges that you cannot disconnect the form from the material – the material informs the form.'  
Discuss the issues raised by this statement and the implications for designers, manufacturers and consumers. [20]



**item:** hardwood walking stick handle  
**process:** shaping

**item:** GRP chute of a slide  
**process:** layup



**item:** metal faceplate  
**process:** casting

**Fig. 3.1**

Choose **two** of the items shown in Fig. 3.1. For **each**:

- (a) use sketches and notes to describe how the process has been used in the manufacture of the item [14]
- (b) explain why the process is particularly suitable for the production of the item. [6]

## Part B – Practical Technology

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.

4 Use notes and sketches to describe how **four** of the following are used in a product or structure.

- Linkage
- Lamination
- Rack and pinion
- Ratchet
- Compound gear train

[20]

5 Fig. 5.1 shows four forces acting on a point.

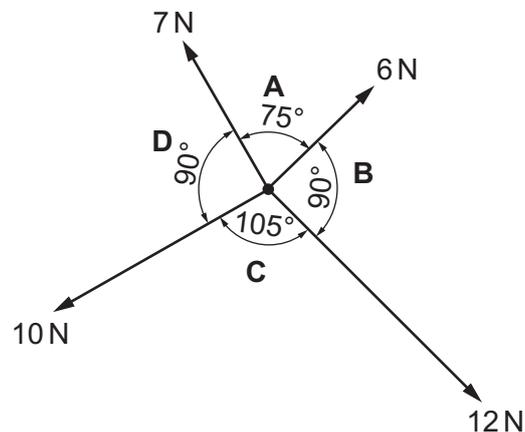


Fig. 5.1

(a) Determine the direction and magnitude of the equilibrant force. [4]

(b) Give an example to demonstrate the use of triangulation in a structure and describe how triangulation can be used to establish rigidity in a structure. Use sketches and notes to support your answer. [4]

(c) Discuss the effect of heat and fatigue on structures. [12]

6 Computers have had a significant impact on the manufacturing industry. Discuss the implications of the use of computers in production and management. [20]

## Part C – Graphic Products

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.

7 Fig. 7.1 shows the plan of a student university accommodation room.

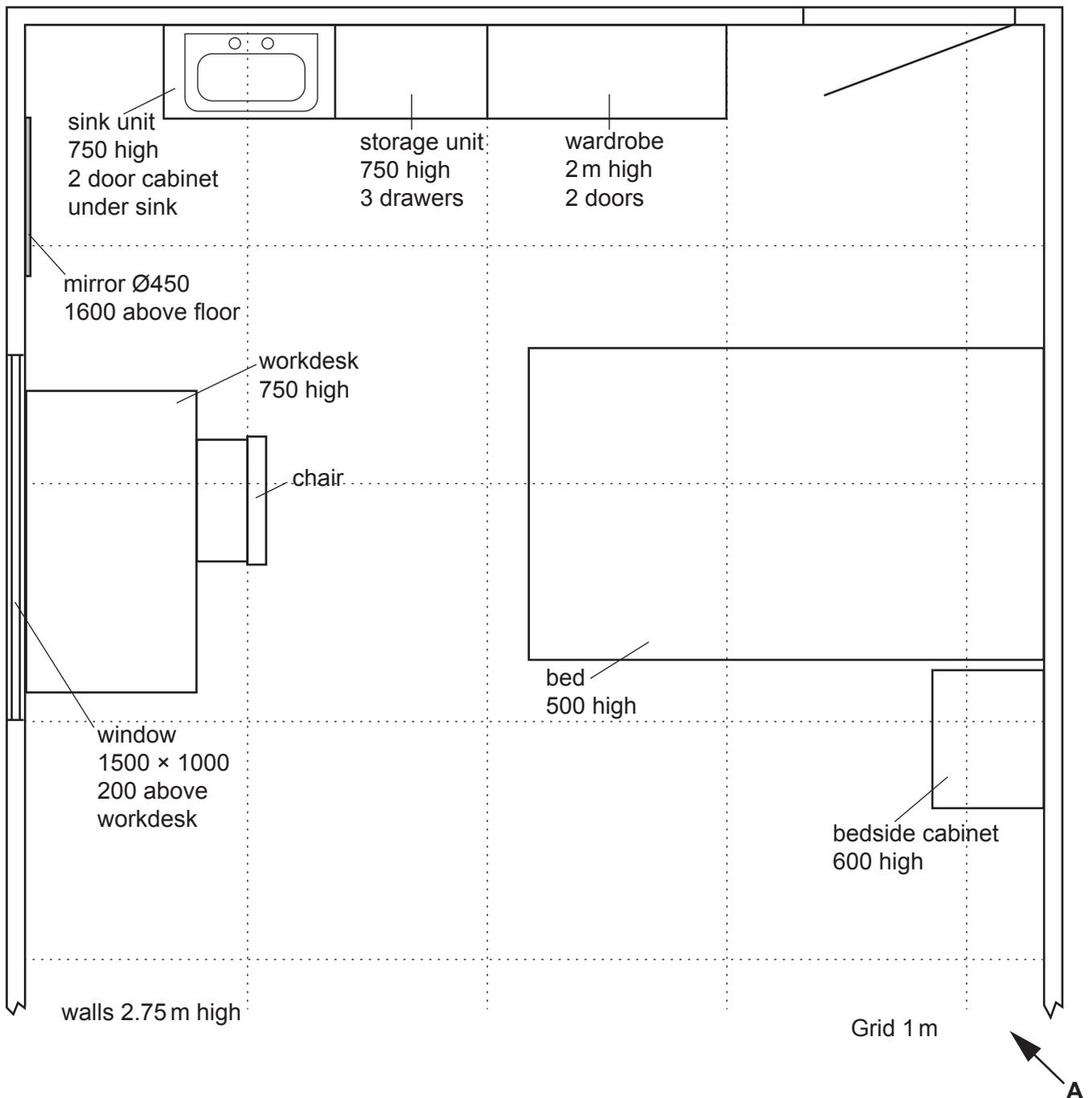


Fig. 7.1

Draw to an appropriate scale, a planometric drawing of the student university accommodation room viewed from arrow **A**.

Estimate any dimensions not given.

[20]

- 8 (a) Construct a cam profile and displacement diagram from the following information.
- (i) minimum diameter 40
  - (ii) in line knife edge follower
  - (iii) clockwise direction
  - (iv)  $0^\circ - 60^\circ$  dwell
  - (v)  $60^\circ - 150^\circ$  rise 40 simple harmonic motion
  - (vi)  $150^\circ - 240^\circ$  dwell
  - (vii)  $240^\circ - 360^\circ$  fall 40 uniform velocity
- [16]
- (b) Name and sketch **two** other types of cam follower. [4]
- 9 Discuss the impact of the advances in digital technology on graphic products and the graphic design industry. [20]

**Section B**

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

Each question is worth 80 marks.

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. Include at least five specification points other than those given in the question. [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]

- 10** A wildlife and amusement park wants to extend the use of an artificial lake by hiring out water vehicles to visitors.

You are to design a water vehicle to hold up to 2 adults or children over the age of 11.

The water vehicle must:

- be self-propelled
- reflect the theme of a wildlife park.

[80]

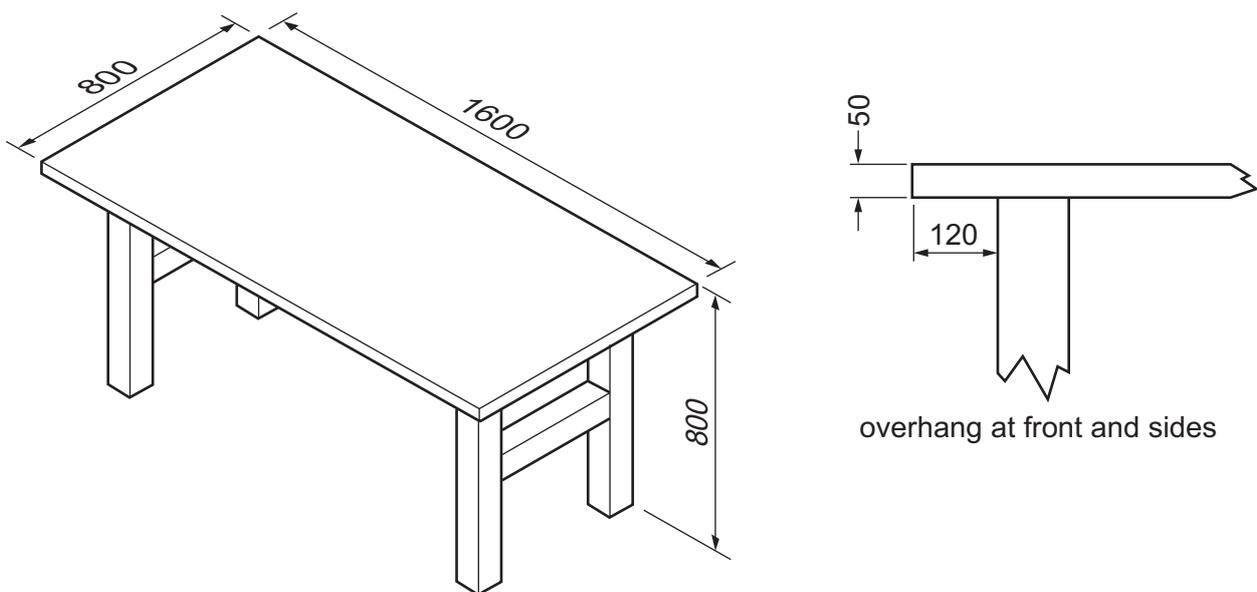
- 11** Craftspeople, such as engineers and jewellers, often require focused illumination when working at a bench.

You are to design an adjustable light to be attached to the bench.

The adjustable light must:

- be able to direct illumination to any required position
- attach firmly to the bench.

Details of the workbench are shown in Fig. 11.1.



**Fig. 11.1**

[80]

- 12 A company wishes to introduce a game that is suitable for children aged 5–10 years. The game will include nine skittles and a ball.

You are to design:

- a name and logo for the game
- innovative packaging for the game that is easy to carry.

Details of a skittle and ball are given in Fig. 12.1.

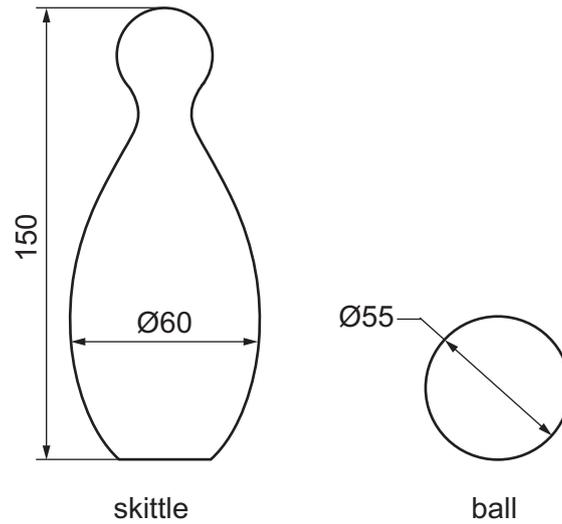


Fig. 12.1

[80]





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