

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

**DESIGN AND TECHNOLOGY**

**9705/03**

Paper 3

October/November 2003

**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.

## Section A

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

## Part A – Product Design

- 1 Fig. 1 shows part of a tape dispenser.

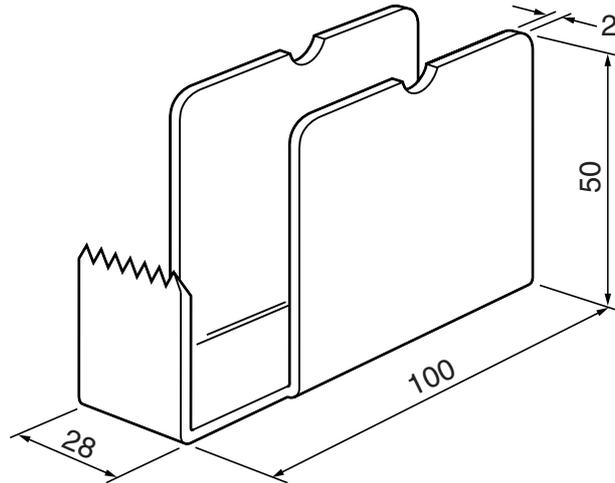


Fig. 1

- (a) State a suitable material for the dispenser giving reasons for your choice. [3]
- (b) Describe, using sketches and notes, how you would make a prototype dispenser. [8]
- (c) Explain, using sketches and notes, what changes may be necessary in the manufacturing method used and in the material selected if 5000 dispensers were required. [9]
- 2 Discuss the different aspects of approach an individual craftsperson, producing one off items, and a large furniture company, producing items in batches of 1000 or more, would have to the design and manufacture of a bench seat for a garden. [20]
- 3 The following are processes used in the manufacture of products:
- rotational moulding;
  - welding;
  - parallel turning between centres.
- Choose **two** of the processes and for each:
- (a) using sketches and notes, describe the process in detail; [7 x 2]
- (b) identify a situation where the process can be used and explain why it is particularly suitable. [3 x 2]

- 4 (a) Define the following terms:
- toughness;
  - ductility. [2]
- (b) State **one** material that is tough and **one** material that is hard. [2]
- (c) Use sketches and notes to describe a method of comparing the hardness of materials. Include details of the samples used. [10]
- (d) Explain the importance of hardness testing to a designer/engineer when developing new products. [6]
- 5 (a) (i) Describe the function of a resistor. [2]
- (ii) Explain in detail how the value of a resistor is identified. [4]

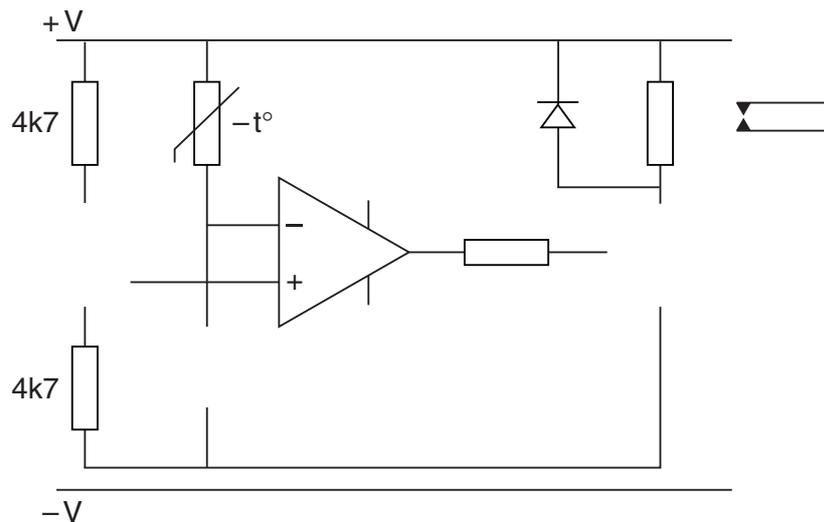
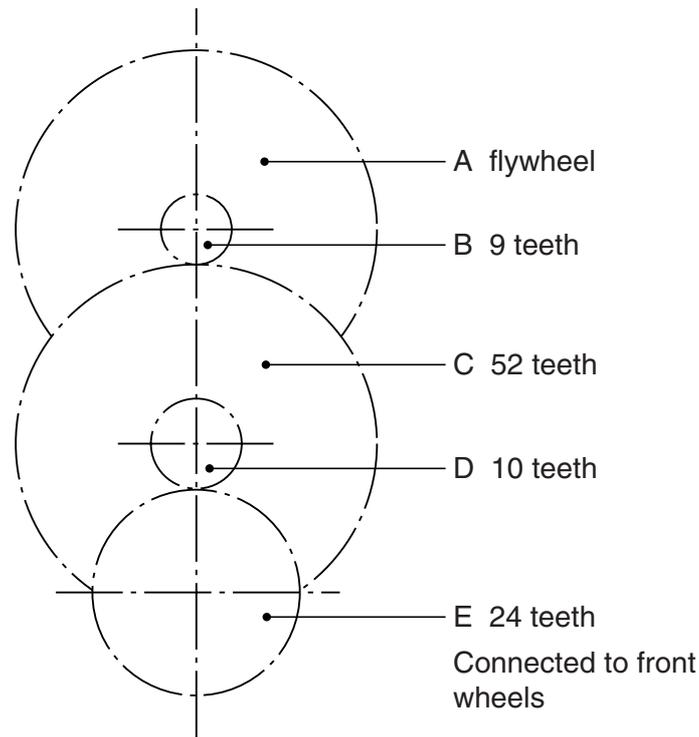


Fig. 2

- (b) Fig.2 shows an incomplete diagram of a thermostatically controlled comparator circuit including a 741 operational amplifier. Complete the circuit. [4]
- (c) Explain the working and give an example of the application of:
- a strain gauge;
  - a light dependant resistor (LDR). [10]

- 6 Fig. 3 shows the arrangement of gear wheels in a child's toy.



**Fig. 3**

Gear B is fixed onto the same shaft as flywheel A.

Gear C and D are fixed together and rotate on the same shaft

Gear E is fixed to the shaft onto which the front wheels are attached.

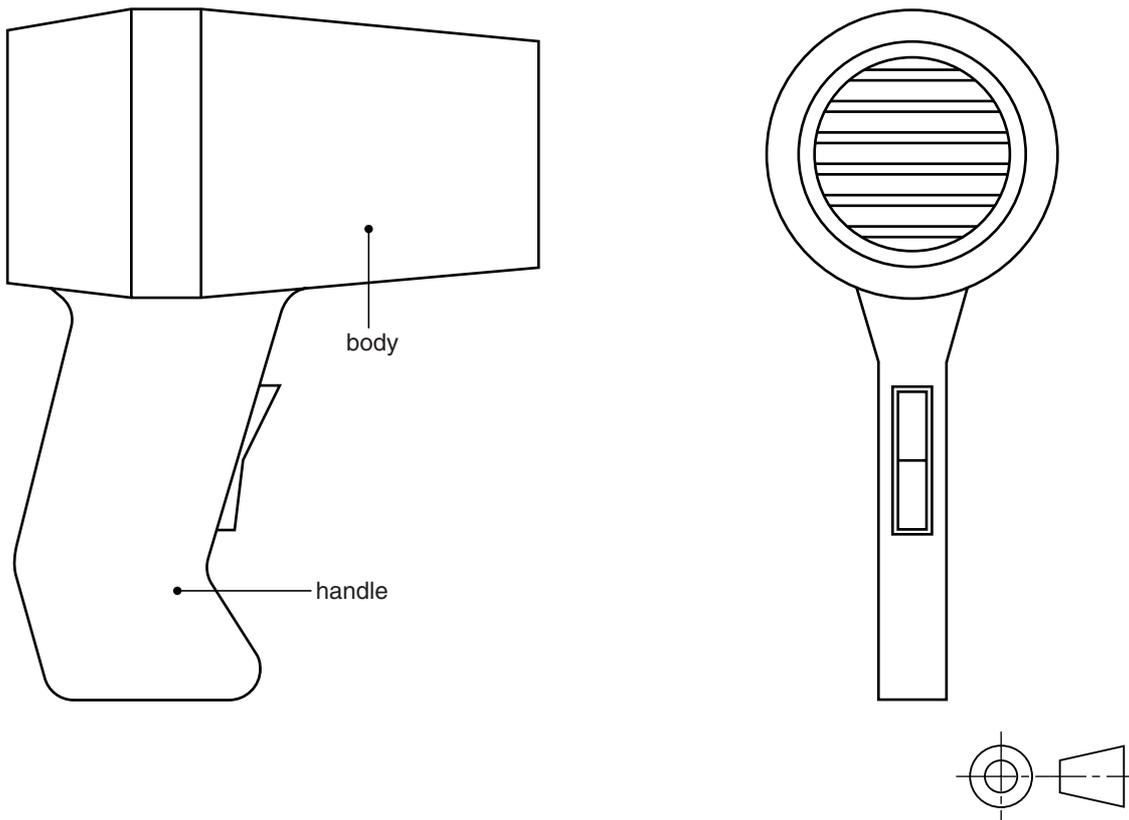
- (a) Calculate the number of rotations the flywheel makes for one complete revolution of the front wheels. [4]
- (b) Use labelled sketches to describe **two** methods of converting rotary motion to linear motion. [6]
- (c) Use examples to demonstrate the particular advantages of the following systems when producing linear motion:
- pneumatic systems; [5]
  - hydraulic systems. [5]

- 7 A multi-national electronics company wishes to extend its product range by designing, manufacturing and selling mobile phones.

Discuss the role of marketing in helping to ensure their commercial success.

[20]

- 8 Fig. 4 shows details of a hair dryer. It is drawn half full size.



**Fig. 4**

The manufacturer requires a high quality rendered presentation drawing to be used to promote the product.

- (a) Use a combination of freehand and instrument techniques to draw approximately full size, an isometric view of the hair dryer.

Select a view that gives maximum detail.

[14]

- (b) Render the drawing to show that the main body of the hair dryer is made from polished plastic and the handle grip from a matt textured plastic.

[6]

- 9 Fig. 5 shows details of a model for part of a child's adventure playground.

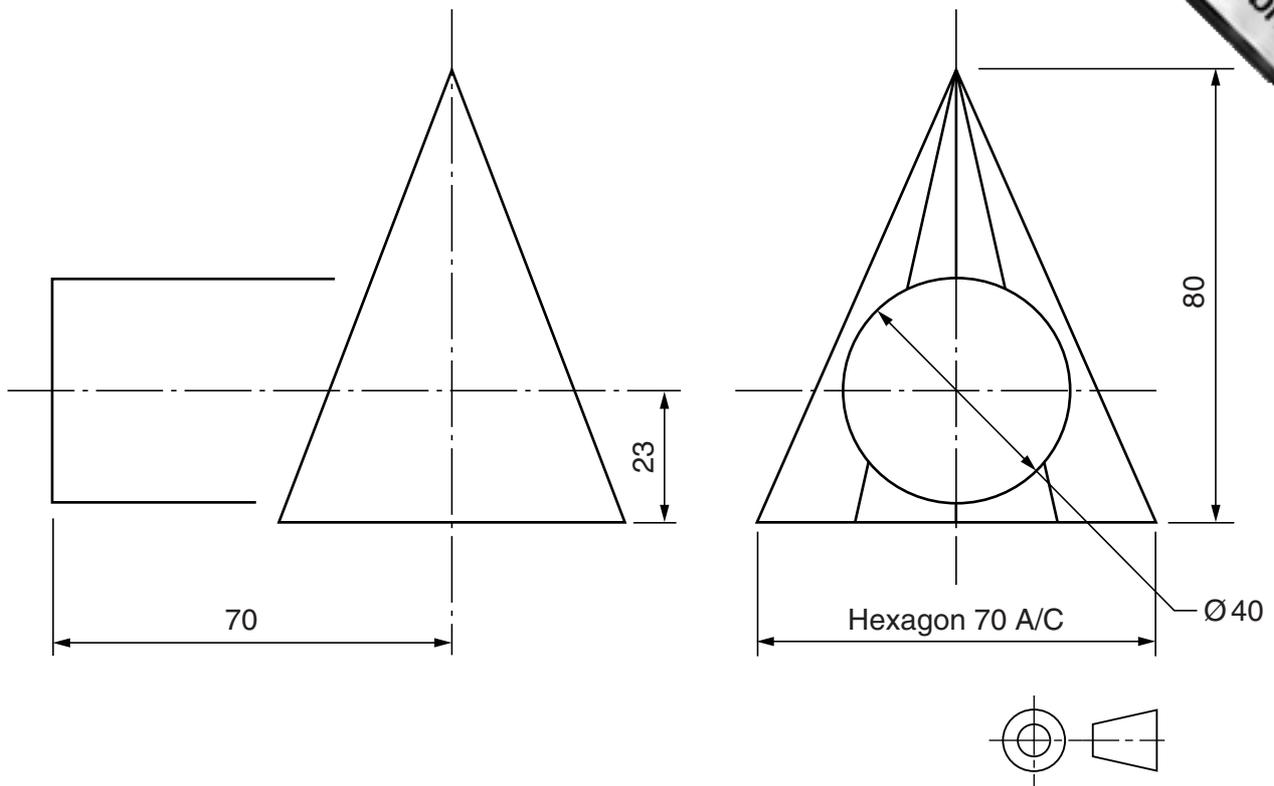


Fig. 5

- (a) Draw and complete the two views by constructing the intersection between the cylinder and the hexagonal pyramid.

Project a plan from the incomplete view.

[14]

- (b) Construct the development/net of the cylinder.

[6]

**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 'Outdoor Sports Promotions' is to sponsor a series of sporting events including golf, tennis, cycle road racing and cross country running.

As part of a promotional exercise, the company will be offering a lightweight, portable, folding seat for use by people watching the events.

Design a seat that is capable of:

- being easily carried over long distances in a folded position;
- providing some degree of rest for the legs by supporting part or all of the body weight.

To assist you in your design work, anthropometric data is given in Fig. 6.

- 11 For people suffering from disability in the hands, e.g. arthritis, simple tasks such as the following actions can present difficulties:

- switching on lights;
- drawing curtains;
- opening and closing doors.

Design a mechanical/electronic product that will solve **one** of the problems highlighted above.

The product must:

- be easily operated by hand;
- be used in more than one room.

ANTHROPOMETRIC DATA

STANDING ADULT MALE 50% TILE

STANDING ADULT FEMALE 50% TILE

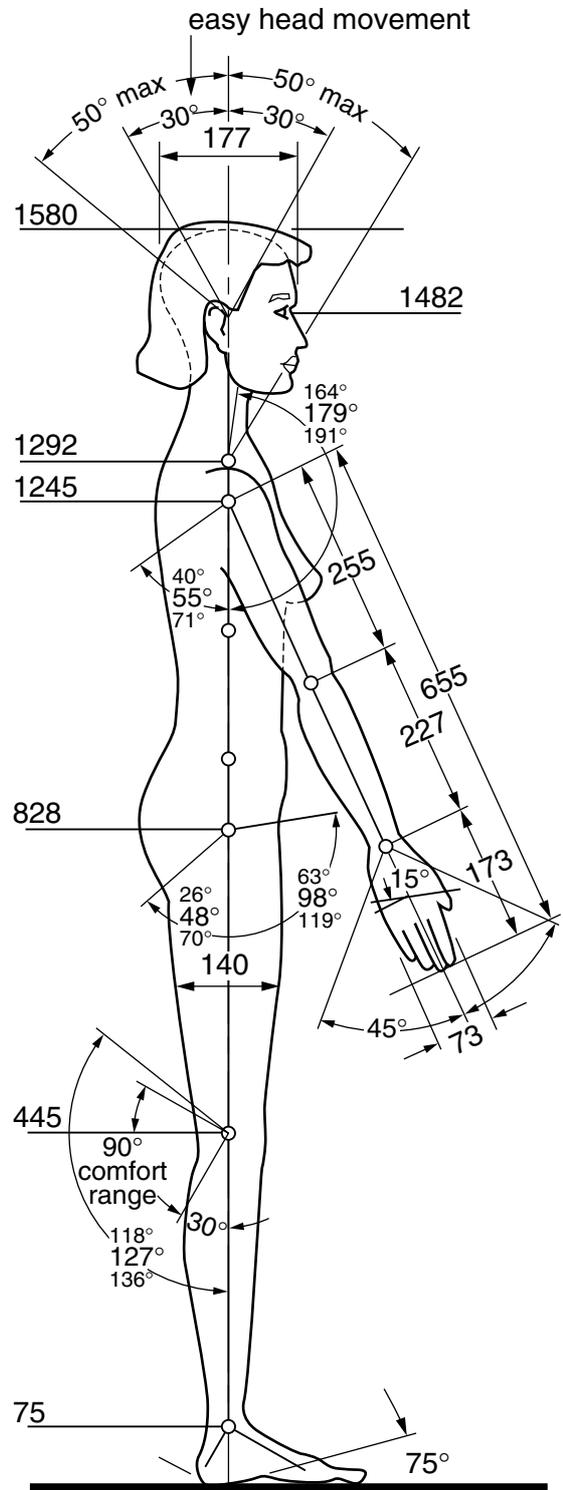
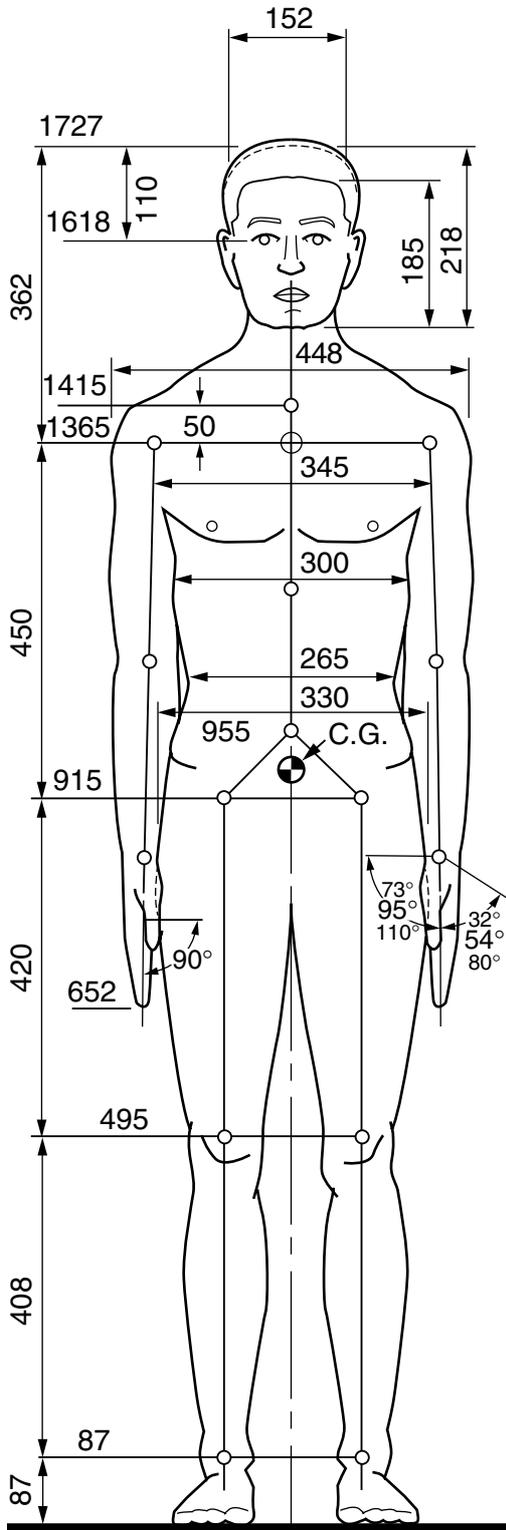


Fig. 6

- 12 A multi-national electronics company 'Digital Vision' wishes to promote a new digital stills camera.

You are to design a point of sale display to support the three dimensional model shown in Fig. 7.

- It must:
- be made out of one sheet of A3 card;
  - fold flat for distribution;
  - open out to provide a stable and attractive support;
  - include a logo based on the name 'Digital Vision';
  - include an appropriate lettering style for 'Digital Vision'.

Your final design must show:

- (a) the display with the model in position;
- (b) the detailed development (net) of the display.

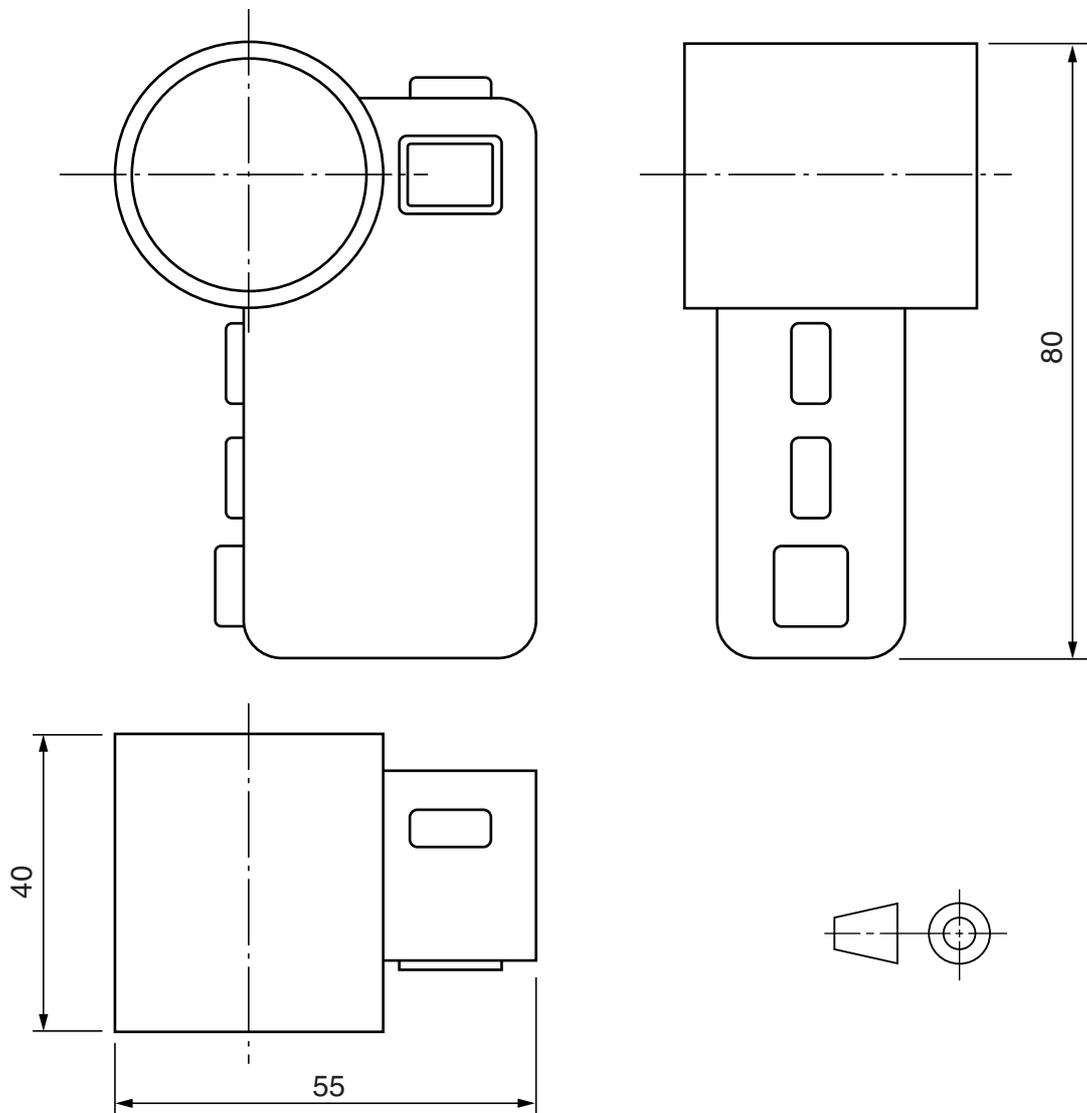


Fig. 7



