IGCSE COMPUTER SCIENCE • EXERCISE SHEET

3.2 Input and output devices

Name: _____ Class: _____ Date: _____ **Total: 27 marks**

KEY WORDS input and output devices 输入输出设备 • barcode scanner 条形码扫描器 • speaker 扬声器 • touch screen 触摸屏 • actuator 执行器

Objective

Build the skills to answer exam questions on **input and output devices** 输入输出设备 — how common devices work and choosing a suitable device.

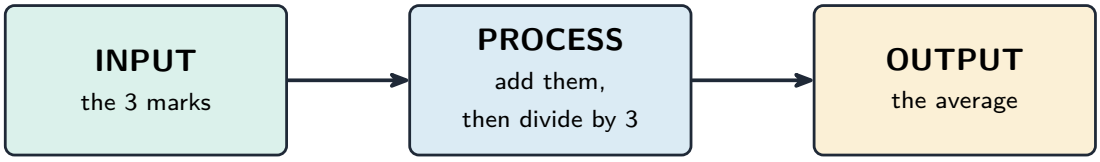
You must be able to:

- describe how input devices (scanner, sensor, touch screen) work
- describe how output devices (printers, actuator, speaker) work
- choose a suitable device for a task

1 Worked examples

Input and output

Input sends data in; output sends data out to the user



Input devices feed the processor, which drives output devices

- **input:** barcode scanner (reads reflected light), sensor (measures a quantity), touch screen.
- **output:** inkjet/laser/3D printer, monitor, speaker, **actuator** (signal → movement).

The stages, and where the addresses come from

A packet 数据包 has three parts: a **header** (the sender's and receiver's IP addresses, the packet number, and how many packets there are), the **payload** (the piece of the data), and a **trailer** (a way to tell the packet has ended, and an error-checking value such as a checksum).

Packet switching 分组交换, in the order the marks are given:

1. The data is split into equal-sized packets and each is numbered.
2. Each packet is sent separately and routers choose the route for each one, using the shortest or least congested path available at that moment.
3. Packets may take different routes and arrive out of order.
4. At the destination they are reassembled into the original order using the packet numbers.
5. Any packet that does not arrive is requested again.

Why it is used: there is no need to reserve a whole line for the transfer; if one route is busy or broken, packets take another; and many transfers share the same network. The drawback is that packets can be delayed or lost, which matters for real-time video or voice, and reassembly takes time.

Worked example. A 2 MB file is split into 2 KB packets. How many packets are needed, and what happens if packet 47 does not arrive? 2 MB = 2048 KB, so $2048 \div 2 = 1024$ packets. If packet 47 is missing, the receiver notices the gap in the numbering and asks the sender to transmit that packet again; the rest of the file does not need resending.

2 Practice

2.1 State whether a sensor is an input or an output device. [1]

2.2 State what an actuator does. [1]

2.3 Identify the three parts of a packet. [3]

2.4 Identify two pieces of information stored in a packet header. [2]

2.5 Explain why packets may arrive out of order. [2]

3 Exam-style questions

3.1 Which is an output device? [1]

- **A** keyboard
- **B** microphone
- **C** speaker
- **D** barcode scanner

3.2 A supermarket uses a barcode scanner at the checkout.

(a) Describe how a barcode scanner inputs data. [2]

(b) Name a suitable output device to print a paper receipt, and say why. [2]

3.3 A user downloads a 6 MB file. It is sent using packet switching in packets of 3 KB.

(a) Calculate the number of packets needed. [2]

(b) Identify the three parts of a packet and state what each contains. [3]

(c) Describe how the packets travel from the server to the user's computer. [4]

(d) Explain what happens if one packet fails to arrive. [2]

(e) Give one situation in which packet switching is a poor choice, and explain why. [2]

Solutions

2.1 an input device.

2.2 it turns an electrical signal into movement.

3.1 C. A speaker is an output device.

3.2 (a) it shines light at the bars and reads the pattern reflected back; this is sent to the computer as the product code.
(b) an inkjet (or laser) printer; because it can print the receipt quickly on paper.

2.3 Header, payload, trailer.

2.4 Any two of: the sender's IP address; the receiver's IP address; the packet number; the total number of packets.

2.5 Each packet is routed separately, so different packets take different routes; routes differ in length and congestion, so packets arrive at different times.

3.3 (a) 6 MB = 6144 KB; $6144 \div 3 = 2048$ packets.
(b) Header: the sender's and receiver's IP addresses and the packet number. Payload: the piece of the file being carried. Trailer: a marker showing the end of the packet and an error-checking value such as a checksum.
(c) The file is split into numbered packets of equal size; each packet is sent separately, and routers choose a route for each one based on the shortest or least congested path; the packets may take different routes and arrive out of order; the receiving computer reassembles them into the correct order using the packet numbers.
(d) The receiver notices the missing number in the sequence and asks the sender to transmit that packet again, so only the lost packet is resent.
(e) Real-time video calls or live streaming, because a delayed or lost packet arrives too late to be useful and the picture or sound breaks up.