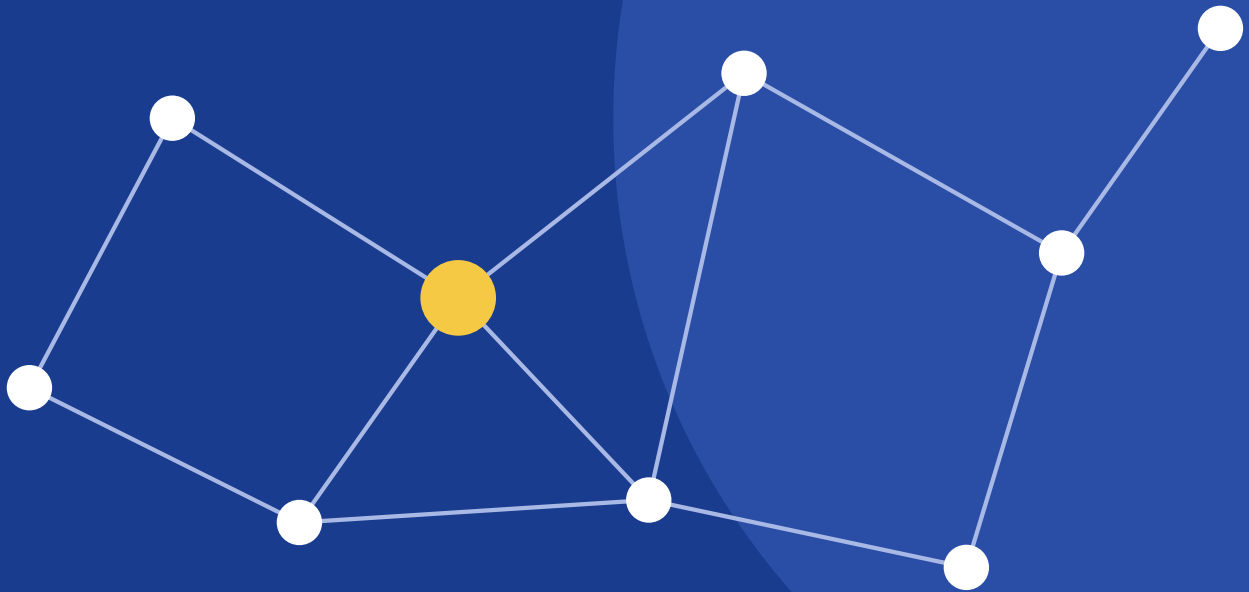




CAMBRIDGE IGCSE · SYLLABUS 0417 · 2026 – 2028

Information and Communication Technology

Complete Study Guide

Paper 1 Theory (sections 1–10) · Papers 2 and 3 Practical (sections 11–21)

Notes · Diagrams · Exercises · Exam-style questions · Answer keys

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Practise online at www.sigungusekuyala.com

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About this guide

This guide turns the **Cambridge IGCSE Information and Communication Technology (0417)** syllabus for examinations in 2026, 2027 and 2028 into a complete revision course. Every one of the **21 syllabus sections** has its own chapter. **Part A (sections 1 to 10)** covers the theory tested in **Paper 1**. **Part B (sections 11 to 21)** covers the practical skills tested in **Papers 2 and 3**: file management, images, layout, styles, proofing, charts, documents, databases, presentations, spreadsheets and website authoring.

Each chapter contains the same parts, so you always know where you are:

Part of the chapter	What it gives you
By the end of this chapter	The syllabus objectives for the section, in plain language, so you can tick them off.
Notes with illustrations	Short, exam-focused notes. Bold type marks the core concepts, definitions and key words that earn marks.
Core concept, Worked example and Exam tip boxes	Definitions to learn, skills set out step by step, and advice on how marks are won and lost.
Exercise	Short questions to check your understanding straight after reading the notes.
Practise on the web app	A link to the practice tests for that section on the Sigungusekuyala website.
Exam-style question	A structured question with marks, written in the style of the examination papers.
Answer Key	Answers to every exercise and exam-style question, at the back of the guide.

How to study a chapter. (1) Read the objectives. (2) Read the notes and redraw each diagram from memory. (3) Learn the bold terms. (4) Do the exercise without looking at the answers. (5) Attempt the exam-style question under timed conditions. (6) Mark your own work, then take the online practice test for the section.

PRACTISE ONLINE

Every chapter ends with a link to its practice tests. The main entry point is the Practice Center at www.sigungusekuyala.com/Practice, where you choose **IGCSE**, then **ICT 0417**, then a test, on the Sigungusekuyala website (www.sigungusekuyala.com). Use this guide to learn a topic, then use the web app to check that it has stuck.

Practical sections (Part B). The skills are shown for **any** office package. Menu names differ between programs, so the guide describes *what* to do and *why*, with the names of the settings you should look for. **No marks are given for brand names of software or hardware**, so never write a brand name in a Paper 1 answer.

Source of syllabus content: Cambridge IGCSE Information and Communication Technology (0417) syllabus for examination in 2026, 2027 and 2028 (version 3). This guide is independent study material written by the author. It is not produced or endorsed by Cambridge University Press & Assessment. Always check the current syllabus and specimen papers at www.cambridgeinternational.org/igcse.

The syllabus at a glance

IGCSE ICT teaches you to use **information technology** to solve problems, and to understand how computers, networks and software affect people and organisations. It is assessed by **one theory paper and two practical papers**. Grades **A* to G** are available.

The three papers

Paper	Duration	Marks	Weighting	Content tested
Paper 1 Theory	1 h 30 min	80	40%	Sections 1 to 21 . Multiple-choice, short-answer and structured questions, each set in an everyday ICT context. Answer on the question paper.
Paper 2 Document Production, Databases and Presentations	2 h 15 min	70	30%	Sections 17, 18 and 19 , using the practical skills of sections 11 to 16 . Source files are supplied. No internet or email.
Paper 3 Spreadsheets and Website Authoring	2 h 15 min	70	30%	Sections 20 and 21 , using the practical skills of sections 11 to 16 . Source files are supplied. No internet or email.

In the practical papers you work through the steps of each task **in order**. You produce evidence by taking **screenshots**, placing them in an **Evidence Document**, and making printouts. Remember to enter your **centre number, candidate number and name** on every piece of evidence before it is printed. You may use any hardware, operating system and applications, provided they can show all the skills. For website authoring, you need a working knowledge of **HTML and CSS**; no scripting language is required.

Assessment objectives

Objective	Learners should be able to	Overall weighting
AO1 Recall knowledge and understanding	Show knowledge and understanding of the facts, terms, concepts, devices and systems of ICT.	32%
AO2 Apply knowledge and understanding	Apply what you know to do practical tasks in applications, using the skills of sections 11 to 21.	60%
AO3 Analyse, evaluate, make reasoned judgements and present conclusions	Analyse situations, judge advantages and disadvantages, justify choices, and design and evaluate solutions.	8%

Paper 1 is **80% AO1 and 20% AO3**. Papers 2 and 3 are **100% AO2**.

Which chapter prepares you for which paper

Chapters	Topic area	Paper
1 to 10	Computer systems, devices, storage, networks, effects of IT, applications, systems life cycle, safety and security, audience and copyright, communication	Paper 1
11 to 16	File management, images, layout, styles, proofing, graphs and charts	Papers 2 and 3 (skills used in every task); also Paper 1
17, 18, 19	Document production, databases, presentations	Paper 2 (and Paper 1)
20, 21	Spreadsheets, website authoring	Paper 3 (and Paper 1)

Exam technique and command words

Marks are won by answering the **question that is asked**. The first word of a question, its **command word**, tells you how much to write. The full list of command words from the syllabus is in the **Glossary** at the back of this guide. These are the ones used most often:

Command word	What to do	Example
State, Give, Identify	Give a short answer with no explanation.	State one input device.
Define	Give the precise meaning.	Define the term <i>verification</i> .
Describe	State the points and main features.	Describe how a barcode reader works.
Explain	Give reasons. Use <i>because</i> or <i>so</i> , and say why or how.	Explain why a firewall is used.
Compare, Contrast	Comment on similarities and differences (contrast: differences only).	Compare wi-fi and Bluetooth.
Discuss	Write about the issue in depth, in a structured way, with both sides.	Discuss the effects of online banking.
Evaluate, Justify	Judge the quality or value, and support your case with evidence.	Justify the choice of direct changeover.
Suggest	Apply what you know to a new situation; several answers may be valid.	Suggest a suitable validation check.

Ten habits of high scorers

1. **Use the mark allocation.** A 3-mark question needs three separate points.
2. **Never use brand names.** Write *a word processor*, not the name of a product. No marks are given for brand names.
3. **Answer in context.** Paper 1 questions are set in everyday situations: refer to the school, shop, bank or hospital in the question.
4. **Give advantages and disadvantages in pairs**, and compare them to the alternative that the question names.
5. **Avoid vague words** such as *faster* or *easier* on their own. Say what is faster and why.
6. **In practical papers, follow the steps in order** and read each instruction twice before acting.
7. **Enter your name, centre number and candidate number** on every printout and screenshot.
8. **Check accuracy.** Enter text and numbers with total accuracy: one wrong character can lose a mark.
9. **Save regularly and use the file names given**, in the folder structure asked for.
10. **Proofread at the end.** Check spelling, spacing, styles, alignment, and that tables and lists are not split across pages.

PRACTICAL PAPERS: EVIDENCE

Marks are given for what the examiner can see. Take a screenshot when the task says so, make the text readable, and show **formulae and values** when asked. If a task asks for a particular view (for example HTML view or a database report), your evidence must show that view.

PART A

Theory

Sections 1 to 10 · Paper 1

1 Types and Components of Computer Systems

Syllabus reference: **Section 1 (1.1 to 1.5)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Describe hardware, software, and the difference between **applications** and **system** software
- Describe **analogue and digital** data and explain why conversion is needed
- Explain the roles of the **CPU, RAM, ROM**, input and output devices and **backing storage**
- Compare **CLI, GUI, dialogue-based and gesture-based** interfaces
- Compare **desktop and mobile** computers, and describe emerging technologies (**AI, VR, AR**)

1.1 Hardware and software

HARDWARE

Hardware is the **physical components** of a computer system: the parts you can touch.

Internal components are inside the case: the **central processing unit (CPU)** (also called the **processor**), the **motherboard** (the main circuit board that connects all the parts), **internal memory (RAM and ROM)**, the **graphics card, sound card and network interface card (NIC)**. Other hardware includes the camera, internal and external storage devices, and all input and output devices.

SOFTWARE

Software is the **programs** that control the operation of a computer or process electronic data. It cannot be touched.

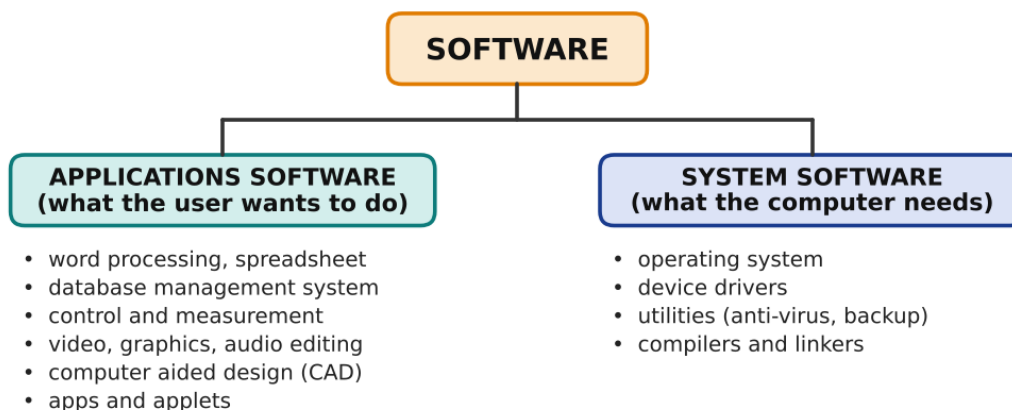


Figure 1.1 Applications software and system software, with examples.

- **Applications software** provides the services that the **user** requires to solve a task, for example word processing, spreadsheets, database management systems, control and measurement software, apps and applets, video, graphics and audio editing, and computer aided design (CAD).

- **System software** provides the services that the **computer** requires to operate: the **operating system**, **device drivers** (let the computer talk to a device such as a printer), **utilities** (such as anti-virus or backup tools), **compilers** (translate a whole program into machine code) and **linkers**.

Analogue and digital data

Analogue data is **continuous** and can take any value in a range, for example temperature, sound and light. **Digital data** is **discrete**: it is stored and processed as separate values, represented in a computer by the binary digits **0** and **1**. A computer can only process digital data.

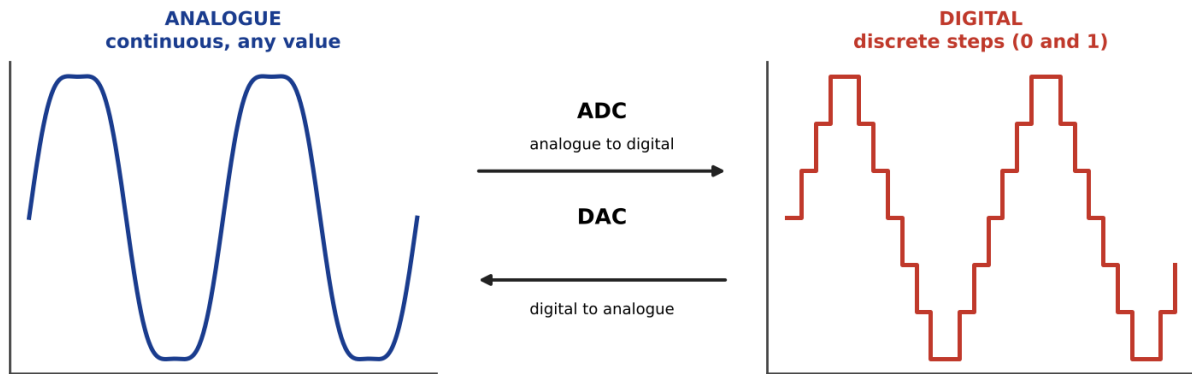


Figure 1.2 Analogue and digital signals, with the converters between them.

- An **analogue-to-digital converter (ADC)** is needed when data from a **sensor** (temperature, sound, light) must be **processed by a computer**.
- A **digital-to-analogue converter (DAC)** is needed when the computer must **control a device** that works with analogue signals, such as a motor, heater or loudspeaker.

1.2 Main components of a computer system

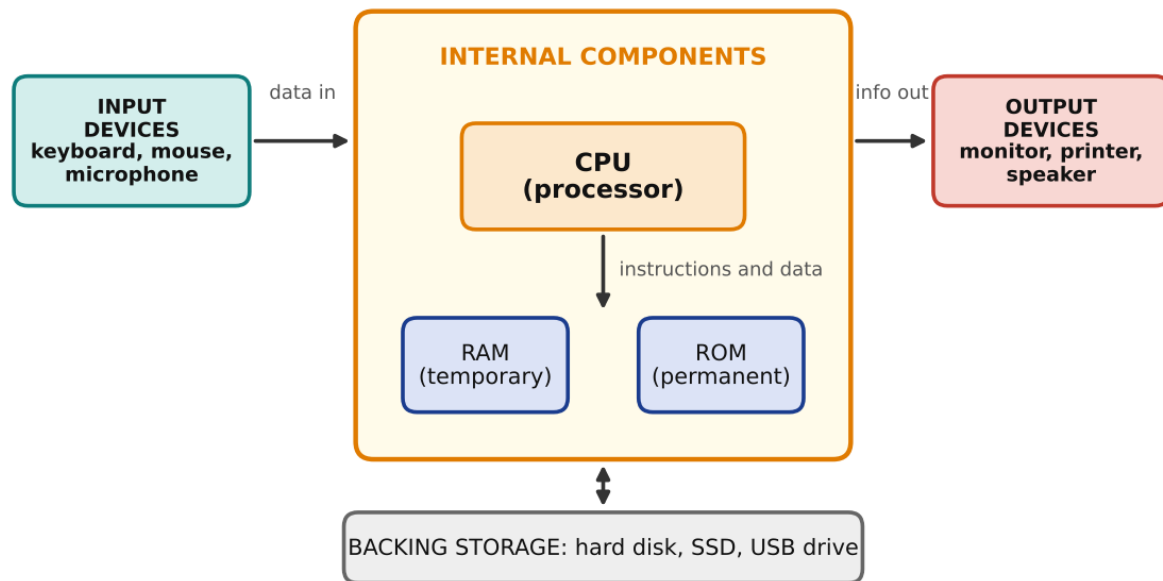


Figure 1.3 The main components of a computer system and the flow of data.

CPU

The **central processing unit fetches, decodes and executes** instructions entered into the computer, in order to produce an output. It is the "brain" of the computer.

	RAM	ROM
Full name	Random access memory	Read-only memory
Contents	Current programs, files and data in use	Start-up instructions (the boot program / BIOS)
Volatile?	Volatile : contents are lost when power is off	Non-volatile : contents are kept when power is off
Read / write	Can be read and written	Can only be read (not changed by the user)
Size	Large (gigabytes)	Small

	Input / output devices	Backing storage
Purpose	Input devices send data in ; output devices present information out	Keeps programs and files permanently when the power is off
Examples	Keyboard, microphone; monitor, printer	Hard disk drive, SSD, optical disc, USB drive

EXAM TIP

Backing storage is **not** the same as internal memory. Internal memory (RAM and ROM) is directly used by the CPU and is fast; backing storage is **slower, has a far larger capacity**, and keeps data when the power is off.

1.3 Operating systems and user interfaces

The **operating system (OS)** manages the hardware, memory, files, security and the running of applications. The user communicates with it through a **user interface**.

Interface	How it works	Advantages	Disadvantages
Command line interface (CLI)	The user types commands at a prompt	Uses little memory; fast for experts; precise control	Must learn exact commands; one typing error causes failure; hard for beginners
Graphical user interface (GUI)	Windows, icons, menus and pointer (WIMP) ; the user clicks	Easy to learn and use; no commands to remember	Needs more memory and a faster processor; less control than a CLI
Dialogue-based	The computer and user talk (voice commands and spoken replies)	Hands-free; useful for people who cannot use a keyboard	Affected by noise and accents; may mis-hear commands
Gesture-based	Hand, body or finger movements (swipe, pinch) are detected by a camera or touch screen	Natural; no device to hold	Needs sensors and space; gestures can be misread or tiring

1.4 Types of computer

	Desktop computer	Mobile computers (laptop, tablet, smartphone, phablet)
Characteristics	Separate monitor, keyboard, mouse and system unit; stays in one place	Small, light, battery-powered, built-in screen; often touch screen and wireless
Uses	Office and business management, education, gaming and entertainment	Same, plus remote control of devices, communication and navigation on the move
Advantages	More powerful for the price, easy to upgrade and expand , bigger screen, comfortable to use	Portable , can be used anywhere, no need for a power socket for a time
Disadvantages	Not portable , needs mains power, takes up space	More expensive for the same power, limited expandability , easily lost or stolen, battery life limited

A **phablet** is a phone with a screen large enough to behave like a small tablet.

1.5 Emerging technologies

- **Artificial intelligence (AI)**: computer systems that perform tasks normally needing human intelligence, such as recognising speech and faces, translating, making recommendations or driving. Impacts: faster decisions, personal assistants, medical help; but job losses, bias and privacy concerns.
- **Extended reality (XR)**: **virtual reality (VR)** replaces the real world with a computer-made one (headset); **augmented reality (AR)** adds computer-generated images on top of the real world (phone camera). Uses include training, education, gaming, design and shopping; disadvantages include cost, motion sickness and time spent away from real life.

Exercise 1: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 1.1 State the difference between hardware and software.
- 1.2 Name **one** example of applications software and **one** example of system software.
- 1.3 Explain why a computer that reads a temperature sensor needs an analogue-to-digital converter.
- 1.4 Give **two** differences between RAM and ROM.
- 1.5 Describe **one** advantage and **one** disadvantage of a command line interface compared with a GUI.
- 1.6 Give **two** reasons why a business might choose desktop computers rather than laptops for an office.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Types and Components of Computer Systems** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=1.

EXAM-STYLE QUESTION · 1 · [8 marks]

A school is buying computers for a new computer room and for the teachers to use at home.

- (a) State what is meant by the term *hardware*. [1]
- (b) Explain the purpose of the CPU. [2]
- (c) Describe **two** differences between internal memory (RAM) and backing storage. [2]
- (d) Compare desktop computers and laptop computers for use in the computer room. [3]

2 Input and Output Devices

Syllabus reference: **Section 2 (2.1 to 2.3)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Describe the **characteristics, uses, advantages and disadvantages** of input devices
- Describe **direct data entry** devices: magnetic stripe, chip and PIN, RFID, OMR, OCR, barcode and QR
- Describe **output devices**: monitors, projectors, printers, plotters, 3D printers, speakers and actuators
- Choose a suitable device for a given situation and justify the choice

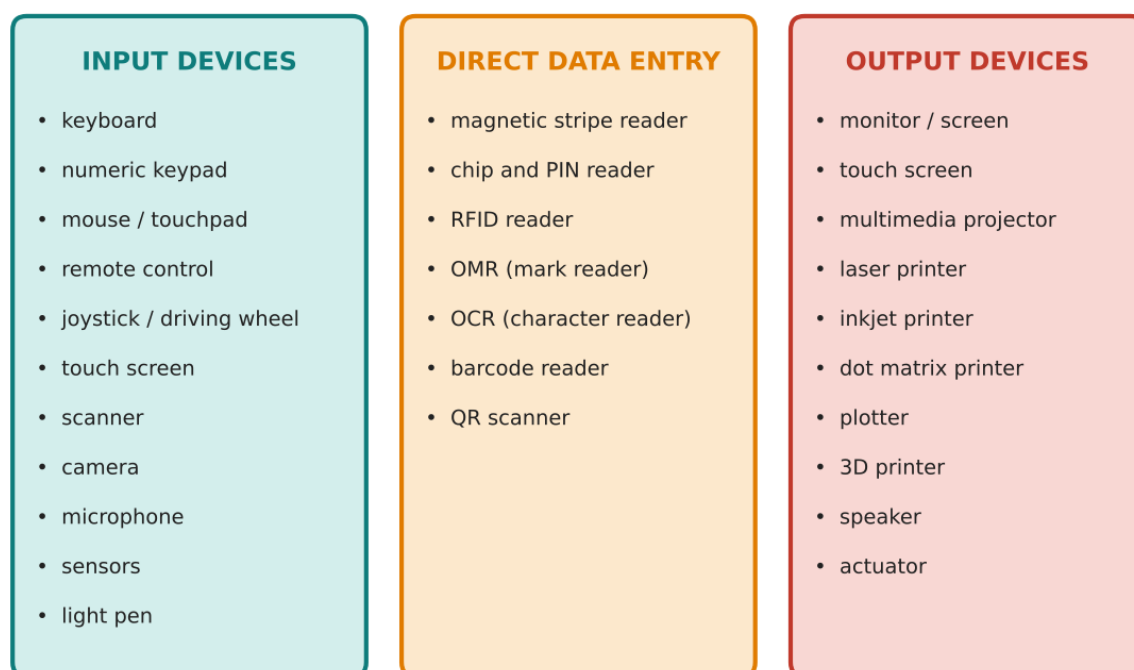


Figure 2.1 Input, direct data entry and output devices in the syllabus.

INPUT DEVICE

An **input device** sends **data into** the computer. An **output device** presents the **results** (information) from the computer to the user.

2.1 Input devices and their uses

Device	Use	Advantages	Disadvantages
Keyboard	Typing text and numbers; entering commands	Fast for trained users; accurate; familiar	Slow for beginners; takes up space; can cause RSI
Numeric keypad	Entering numbers: ATM PINs, tills, door entry	Fast, accurate for numbers; small	Numbers only (or few characters); keys small
Pointing devices (mouse, touchpad, trackerball)	Moving a pointer, selecting, drawing, GUIs	Easy to select items; trackerball needs little desk space	Needs a flat surface (mouse); less accurate for drawing; can cause RSI
Remote control	Controlling TVs, projectors, multimedia systems from a distance	Operate from a distance	Needs line of sight (infrared); batteries; can be lost
Joystick / driving wheel	Games, simulators, controlling machines and robots	Easier than a keyboard for steering and movement	Less accurate for selecting; more expensive
Touch screen	Phones, tablets, kiosks, tills, ATMs	Easy to use; no extra device; fast	Screen gets dirty; poor accuracy for small items; can be damaged
Scanner	Converting paper documents and photos to digital files; OCR	Quickly makes digital copies; can be edited and shared	Quality limited by resolution; large files; slow for many pages
Camera	Photos and video; video-conferencing; security	Pictures can be edited and stored easily	Large file sizes; quality depends on resolution
Microphone	Recording sound; voice commands; VoIP	Hands-free	Background noise; large audio files
Sensors	Measuring physical quantities (temperature, light, pressure, moisture, motion) for monitoring and control	Readings are accurate and continuous; can work without people	May need calibrating; give analogue data that needs an ADC
Light pen	Selecting or drawing on a screen (CAD)	Accurate for drawing; no need for a touch screen	Only works with certain screens; rarely used now

2.2 Direct data entry devices

Direct data entry reads data straight from its source, so there is **no need to type it in**. This is **faster and more accurate** than keying data, which cuts typing errors, but the equipment can be expensive and damaged codes may not be readable.

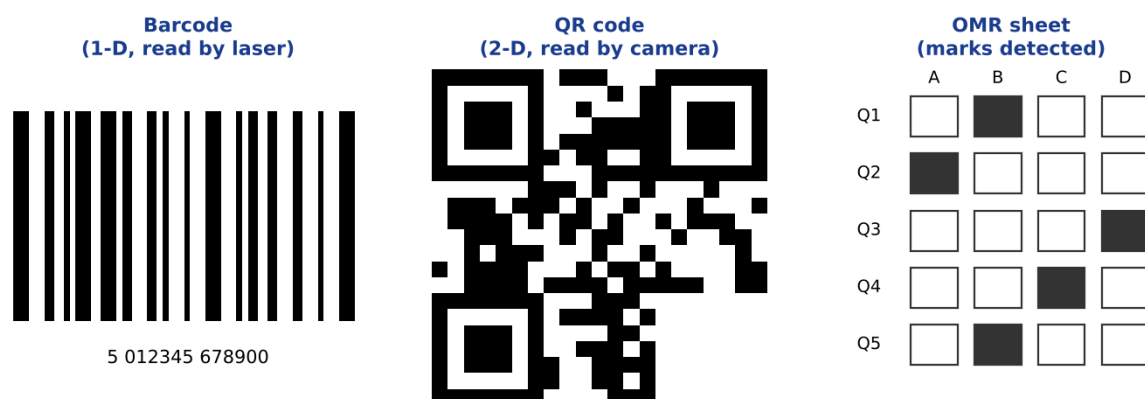


Figure 2.2 A barcode, a QR code and an OMR answer sheet.

Device	How it works / use	Advantages	Disadvantages
Magnetic stripe reader	Reads data on the magnetic stripe of a card (bank card, hotel key card, ID card)	Fast; simple; cheap	Stripe can be damaged or cloned; data is not encrypted well
Chip and PIN reader	Reads the chip in a bank card; the user types a PIN to confirm identity	More secure than a stripe; the PIN proves the owner	PIN can be seen (shoulder surfing); chip can be damaged
RFID reader	Radio waves read a tag without touching it: stock tracking, passports, livestock tags, contactless payment	Reads many tags at once, through packaging, from a distance	Expensive; signals can be blocked or intercepted
OMR (optical mark recognition)	Detects pencil marks in set positions: multiple-choice papers, registers, surveys	Very fast for many forms; accurate	Marks must be correctly made; forms are expensive; cannot read handwriting
OCR (optical character recognition)	Converts printed or handwritten characters into text that can be edited; number-plate recognition (ANPR)	Quick; text can be edited and searched	Not 100% accurate, especially for handwriting; needs checking
Barcode reader	Laser reads the black and white bars; the number is looked up in a database: supermarket POS, libraries, luggage	Fast; accurate; reduces pricing errors	Damaged or dirty codes fail; only identifies the product (needs a database)
QR scanner	Camera reads a square 2-D code that stores more data (web address, contact, payment, ticket)	Stores much more data; can be read from any angle	Fake QR codes can lead to harmful sites; needs a camera

2.3 Output devices and their uses

Device	Use	Advantages	Disadvantages
Monitor (screen)	Displaying text, images and video in real time	Instant results; can be large; no paper used	Cannot be taken away; can cause eye strain
Touch screen (as output)	Displays information as well as taking input (phone, tablet, till)	Combines input and output in one device	Fingerprints; can be damaged
Multimedia projector	Showing a screen to a large audience (classroom, meeting)	Large image for many people	Needs a dark room for best results; bulb is costly; noisy
Laser printer	High-quality, fast printing of many pages (offices, schools)	Fast; high quality; cheap per page for large jobs	Expensive to buy; colour models costly; ozone/toner
Inkjet printer	Good-quality colour photos and a few pages	Cheap to buy; good colour photos	Ink is expensive; slow; ink runs if wet
Dot matrix printer	Multi-part forms, receipts, in dirty or harsh places	Prints carbon copies; tough; cheap to run	Noisy; low quality; slow
Plotter	Large drawings: plans, posters, maps (architects, engineers, CAD)	Very accurate lines on large paper	Expensive; slow; large
3D printer	Builds a solid object layer by layer from a design: prototypes, prosthetics, models	Makes complex shapes; saves cost of tooling; customised	Slow; limited materials; expensive
Speaker	Sound output: music, alarms, messages, voice assistants	Sound can be heard by many; helps visually impaired users	Can disturb others; poor quality at low cost
Actuator	Turns a signal from the computer into movement : motors, valves, pumps, robot arms	Allows the computer to control physical things	Needs a DAC and power; can fail mechanically

EXAM TIP

Questions ask you to **choose a device and justify it**. Name the device, then link the feature to the task: "A **barcode reader** is suitable because the price is looked up automatically, which is **faster and avoids typing errors**." Never use a brand name.

Exercise 2: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 2.1 Give **two** advantages of using direct data entry rather than typing data using a keyboard.
- 2.2 State the output device that is used to produce a large, accurate drawing of a building plan.
- 2.3 Describe how a barcode reader is used at a supermarket checkout.
- 2.4 Explain why an actuator is needed in an automatic watering system.
- 2.5 A teacher wants to mark 200 multiple-choice answer sheets quickly. Name a suitable input device and give **one** reason.
- 2.6 Give **two** disadvantages of a touch screen as an input device.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Input and Output Devices** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=2.

EXAM-STYLE QUESTION · 2 · [6 marks]

A supermarket uses a point of sale terminal at each checkout, and sends the monthly sales report to the manager on paper.

- (a) Name **two** input devices that are used at the checkout. [2]
- (b) Describe **two** advantages of using a barcode reader rather than entering the product code using a keyboard. [2]
- (c) The manager prints the report in colour. State, with a reason, whether a laser printer or an inkjet printer is more suitable if 500 pages are printed every month. [2]

3 Storage Devices and Media

Syllabus reference: **Section 3** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Explain the difference between a **storage device** and **storage media**
- Describe **magnetic, optical and solid-state** storage with examples
- Compare the characteristics, uses, advantages and disadvantages of each type
- Choose a suitable storage device for a stated purpose

STORAGE DEVICE AND MEDIA

The **storage device** is the **machine** that reads and writes data (for example a hard disk drive or DVD drive). The **storage media** is what the data is **stored on** (for example the magnetic disk, tape or DVD). Some devices are built in with their media (a hard disk drive, an SSD).

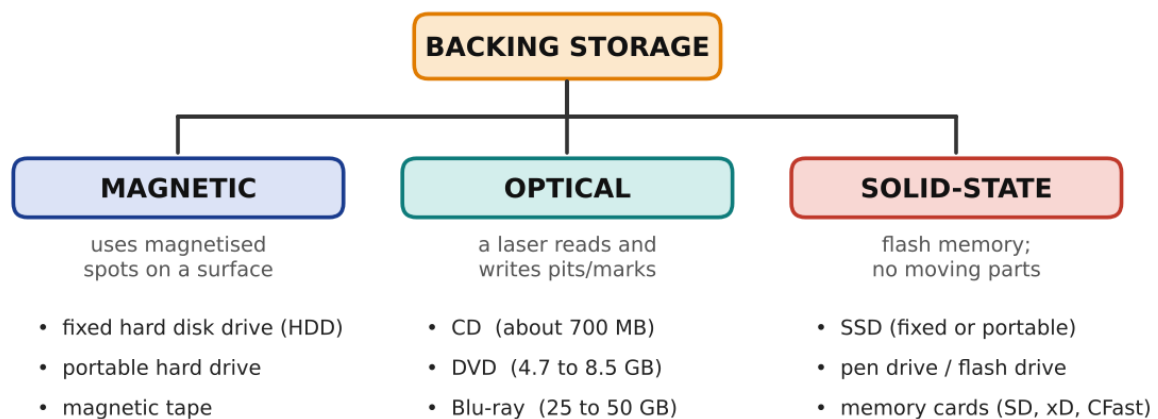


Figure 3.1 Backing storage divided into magnetic, optical and solid-state.

Type	Device and media	Uses	Advantages	Disadvantages
Magnetic (fixed hard disk drive)	Spinning magnetic disks read by a moving head	Storing the operating system, programs and files in a computer; servers	Large capacity ; low cost per gigabyte; fast access	Moving parts: can break if dropped ; slower than SSD; noisy
Magnetic (portable hard drive)	A hard drive in a case, connected by USB	Backing up files; carrying large amounts of data	Large capacity; cheap; portable	Fragile; can be lost or stolen; slower than SSD
Magnetic tape	Long tape read serially (in order) by a tape drive	Backing up whole systems; archives (banks, large organisations)	Very large capacity; very cheap per gigabyte; long life	Slow access (must wind to the data); not suitable for everyday use

Type	Device and media	Uses	Advantages	Disadvantages
Optical (CD, DVD, Blu-ray)	A laser reads (and writes) pits and flat areas on a disc. CD < DVD < Blu-ray in capacity	Distributing music, films, software and games; small backups	Cheap; light; easy to post; read-only discs cannot be changed	Low capacity; easily scratched; slower; many computers no longer have drives
Solid-state (SSD)	Flash memory chips with no moving parts	Laptops, tablets, phones and fast computers	Fast ; silent; uses less power; durable; lightweight	More expensive per gigabyte; limited number of write cycles
Solid-state (pen drive / flash drive, memory card)	Flash memory in a USB stick or card (SD, xD, CFast)	Transferring files; storing photos in cameras, phones and tablets	Very portable; durable; no moving parts; reusable	Small capacity compared with hard drives; easily lost; may be expensive per gigabyte

Capacity units

Unit	Size
bit	a single 0 or 1
byte (B)	8 bits; one character
kilobyte (KB)	1 000 bytes
megabyte (MB)	1 000 KB
gigabyte (GB)	1 000 MB
terabyte (TB)	1 000 GB

EXAM TIP

When asked to compare, mention **capacity, speed, portability, cost and durability**. Say *why*: "An SSD is faster **because it has no moving parts**."

Exercise 3: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 3.1** State the difference between a storage device and storage media.
- 3.2** Name **three** types of backing storage.
- 3.3** Give **two** advantages of an SSD compared with a magnetic hard disk drive.
- 3.4** A bank wants to back up all customer records every night. Suggest a suitable storage medium and give a reason.
- 3.5** A photographer wants to store photos in a digital camera. Name a suitable device and give **one** reason.
- 3.6** Explain why a Blu-ray disc can store more data than a CD.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Storage Devices and Media** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=3.

EXAM-STYLE QUESTION · 3 · [6 marks]

A video editor stores large video files and takes work to a client on removable storage.

- (a) Name **one** magnetic storage device and **one** solid-state storage device. [2]
- (b) Describe **two** advantages of using a pen drive rather than a DVD to take the files to the client. [2]
- (c) Explain why the video editor uses a fixed hard disk drive for editing, instead of magnetic tape. [2]

4 Networks and the Effects of Using Them

Syllabus reference: **Section 4 (4.1, 4.2)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Describe the **router** and other network devices (**NIC, hub, bridge, switch**)
- Compare **wi-fi and Bluetooth**, and **LAN, WLAN and WAN**
- Describe **cloud computing** and compare cloud storage with other methods
- Compare the **internet, intranet and extranet**
- Describe network security: **passwords, authentication, anti-malware**
- Describe **video-, audio- and web-conferencing**

4.1 Networks

NETWORK

A **network** is a group of computers and devices **connected** so that they can **share data, files, hardware and an internet connection**.

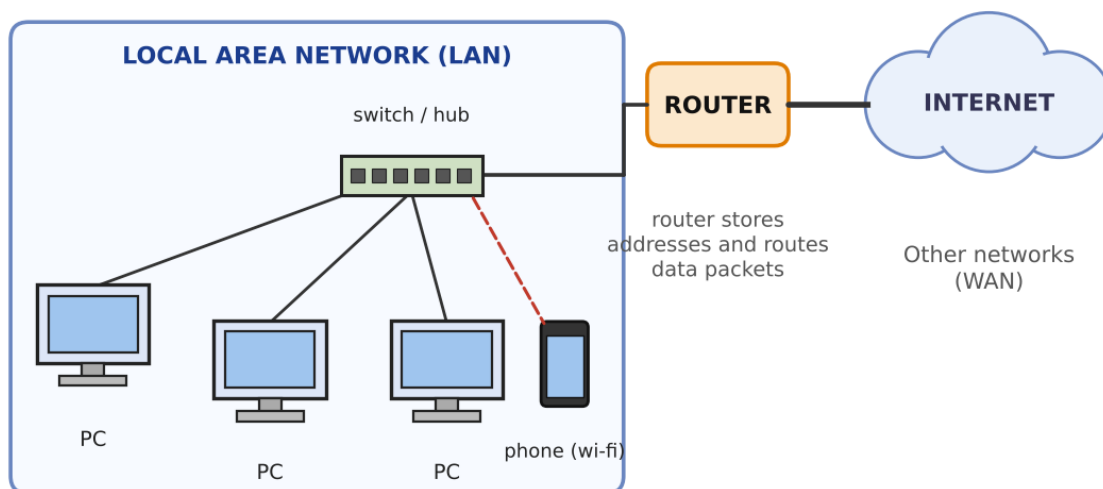


Figure 4.1 A LAN connected to the internet through a router.

ROUTER

A **router connects networks to each other and devices to the internet**. It **stores the addresses** of the computers on the network and **routes data packets** to the correct destination. A home router often includes a wi-fi access point and a switch.

Device	Purpose
Network interface card (NIC)	Hardware inside (or attached to) a device that allows it to connect to a network. It has a unique MAC address .

Device	Purpose
Hub	Joins devices on a LAN. It sends incoming data to all connected devices, so it is inefficient and less secure.
Switch	Joins devices on a LAN but sends data only to the device it is meant for (it learns each device's address), so it is faster and more secure than a hub.
Bridge	Connects two separate LANs (or segments of a network) so they behave as one network.
Router	Connects different networks (such as a LAN to the internet) and routes packets.

Wi-fi and Bluetooth

	Wi-fi	Bluetooth
Range	Longer (tens of metres)	Short (about 10 metres)
Speed	Faster data transfer	Slower
Uses	Connecting laptops, phones and tablets to a wireless network and the internet	Connecting nearby devices : headphones, speakers, keyboards, phones to cars, file transfer
Connecting	Choose the network name (SSID), enter the password/key ; the device joins via the router	Pair devices: turn Bluetooth on, search, select the device, confirm a code
Similarities	Both are wireless , use radio waves , and need devices with built-in transmitters/receivers	

Network types

Network	Meaning	Characteristics
LAN (local area network)	Devices in a small area such as a school or office	Cables or wireless; owned and managed by one organisation; fast
WLAN (wireless LAN)	A LAN using wireless (wi-fi) connections	No cables; devices can move; weaker security and speed than wired
WAN (wide area network)	Covers a large geographical area , such as countries (the internet is the largest WAN)	Uses leased lines, satellites or telephone links; slower; often several LANs joined by routers

Network environments

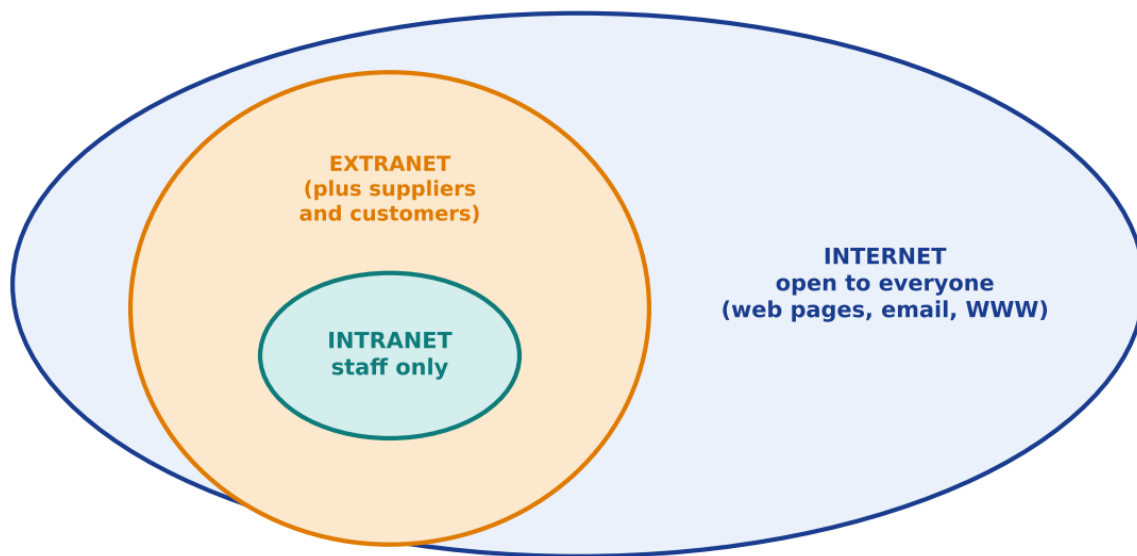


Figure 4.2 Internet, intranet and extranet.

	Internet	Intranet	Extranet
Access	Public ; anyone can use	Private ; only members of the organisation	Private, but selected outsiders (suppliers, customers) can log in
Content	Information from anywhere, not controlled by one organisation	Internal information: policies, timetables, staff pages	Parts of an intranet such as orders, stock and invoices
Security	Low: open to all	High: behind a firewall, login needed	Medium: login and permission levels
Similarity	All use internet technology (browsers, web pages, protocols)		

Cloud computing

Cloud computing means storing data and using software on **remote servers** reached through the internet, instead of on the user's own device. Data is stored on large servers owned by a service provider, managed (backed up, secured, updated) by the provider, and can be **shared** by giving other people access to the files.

Advantages of cloud storage	Disadvantages of cloud storage
Access files from any device, anywhere , with internet access	Needs an internet connection , and a fast one for big files
Easy sharing and collaboration on one copy	Security and privacy risks: data held by a third party and could be hacked
No need to buy storage devices; extra space is easy to add	Subscription costs can become expensive for large amounts of data
Provider makes backups ; protects against loss of a local device	Depends on the provider: if its service fails, you lose access

4.2 Network issues and communication

- **Security of data transfer.** Data sent over a network can be **intercepted**, so privacy and confidentiality must be protected, for example by **encryption**.
- **Strong and weak passwords.** A **strong password** is **long**, has a **mix of upper and lower case letters, digits and symbols**, is **not a word or personal detail**, and is **different** for each account. A **weak password** is short, a word or a name or date (such as *password* or *12345*). To avoid interception: use **up-to-date anti-spyware** (to stop software recording keystrokes) and **change passwords regularly**.

Other authentication methods	How it works
Zero login	The user is identified automatically using the device, location, behaviour or a trusted token; no typing needed
Biometrics	Fingerprint, face, iris, retina, voice, hand: unique to the person
Magnetic stripe / smart card	A card holds the user's identity; the smart card has a chip
Physical token	A small device that generates a one-time code
Electronic token	An app or text message that supplies a one-time code

ANTI-MALWARE

Anti-malware / anti-virus software scans files and programs, **compares** them with a database of known threats, and **removes or quarantines** (isolates) any infected file. It must be **kept up to date**. Scan **storage media** (such as a USB drive) used to transfer data, and scan **data and software when downloading**.

Electronic conferencing

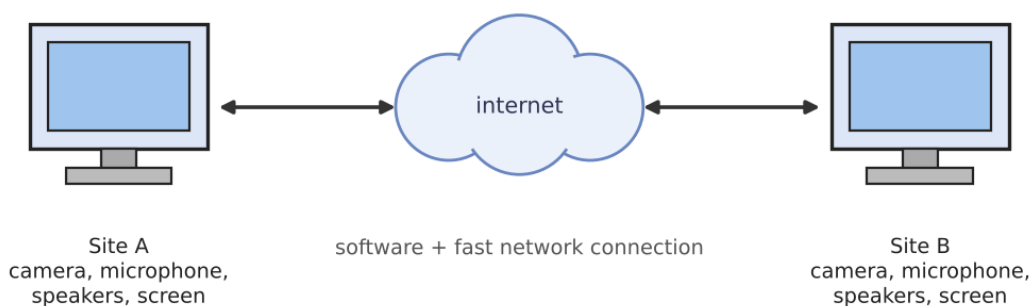


Figure 4.3 Two sites joined for a video-conference over the internet.

Type	Characteristics and use	Equipment needed
Video-conferencing	People at different places see and hear each other in real time; business meetings, lessons, interviews	Computer or phone, webcam, microphone, speakers/headset, screen , conferencing software, internet connection
Audio-conferencing	Voice only over a phone or the internet; meetings where video is not needed	Phone or computer, microphone, speakers, conferencing software or phone network
Web-conferencing	Meeting through a browser : share screens, slides and a chat; webinars , training	Computer, browser, microphone, speakers, internet; optional webcam

Advantages of conferencing: saves **travel time and cost**, quick to arrange, allows people far apart to meet, can record meetings. **Disadvantages:** needs good, reliable internet; **time zone** differences; less personal; equipment and software cost; harder to read body language; technical failures.

Exercise 4: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 4.1 State the purpose of a router.
- 4.2 Give **one** difference between a hub and a switch.
- 4.3 Compare wi-fi and Bluetooth by giving **one** similarity and **one** difference.
- 4.4 Explain the difference between an intranet and the internet.
- 4.5 Describe **two** advantages of storing files in the cloud rather than on a pen drive.
- 4.6 Describe **two** features of a strong password.
- 4.7 A company holds a meeting between offices in two countries. Name the type of conferencing and **two** items of hardware needed.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Networks and the Effects of Using Them** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=4.

EXAM-STYLE QUESTION · 4 · [10 marks]

A school has a computer room where all computers are connected to each other and to the internet.

- (a) State the type of network that connects computers in one building. [1]
- (b) Describe the purpose of a router in the school network. [2]
- (c) The school wants staff to be able to see timetables from home but not allow the public to see them. Name the network environment that is most suitable and explain your choice. [3]
- (d) Explain **two** ways the school can protect its network from malware. [4]

5 The Effects of Using IT

Syllabus reference: **Section 5 (5.1, 5.2)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Describe the positive and negative effects of **microprocessor-controlled devices** in the home and in transport
- Describe the health problems: **RSI, back problems, eye problems, headaches**
- Explain the **causes** of these problems and the **strategies** for preventing them

5.1 Microprocessor-controlled devices

A **microprocessor** is a tiny CPU built into a device. **Smart devices** use microprocessors, sensors and wireless links to **monitor and control** things automatically: washing machines, ovens, security cameras, thermostats, smart speakers and fitness trackers.

Area	Positive effects	Negative effects
Lifestyle and leisure time in the home	Chores are done automatically (more leisure time); control devices remotely from a phone; energy saved by smart heating; convenience for older or disabled people	People may become lazy and less physically fit ; less social interaction when people stay on their devices; over-reliance on technology; a fault can stop the home working; devices cost money
Security of data	Smart security systems (cameras, locks) protect the home	Devices connected to the internet can be hacked ; personal data about habits can be collected and misused
Transport (autonomous vehicles, smart traffic control)	Fewer accidents caused by human error; safer transport ; optimised journeys; people can rest or work while travelling; better for people who cannot drive	Expensive; system or sensor failure may cause accidents; who is responsible in a crash?; vehicles can be hacked; job losses for drivers; location data is collected

5.2 Health problems from prolonged use of IT equipment

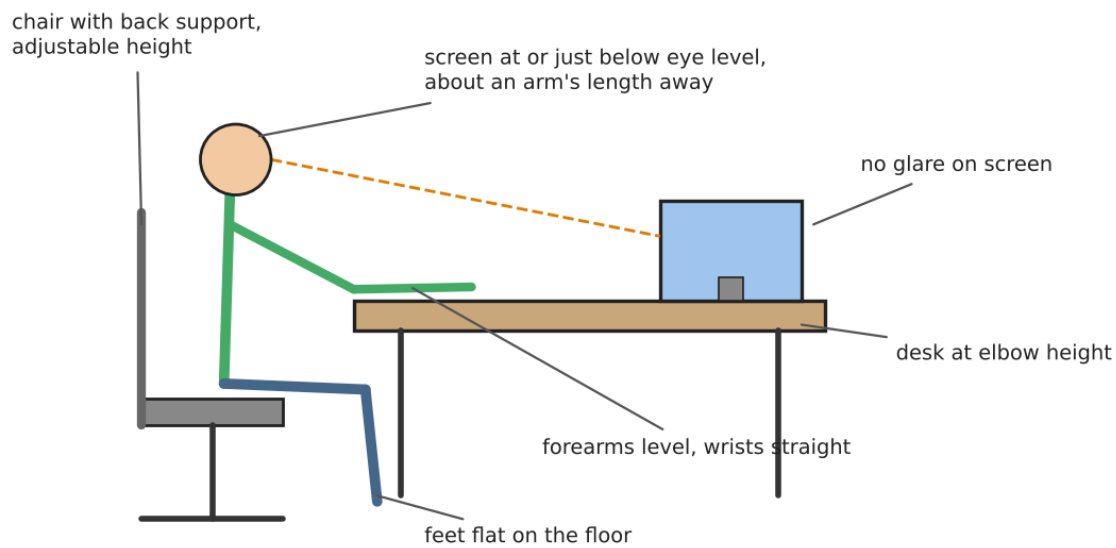


Figure 5.1 A healthy computer work position.

Health issue	Cause	Prevention
Repetitive strain injury (RSI): pain in wrists, hands or arms	Repeating the same small movements for long periods (typing, clicking)	Take regular breaks; wrist rests; ergonomic keyboard and mouse; correct posture; stretch exercises; use voice input
Back and neck problems	Sitting for long periods in a poor posture or in a bad chair	Adjustable chair with back support; sit upright; take breaks to stand and walk; screen at the right height
Eye problems (eye strain, tired or dry eyes)	Staring at a screen for a long time; glare; poor lighting; screen too close	Take breaks to look away; use an anti-glare screen or filter; suitable lighting; adjust brightness; have regular eye tests
Headaches	Eye strain, glare, poor lighting, poor posture	Same as for eye problems; take breaks; keep the room well lit and ventilated

EXAM TIP

Answer **health** questions in three parts: **name** the problem, give its **cause**, then give a **preventive strategy**. "Take regular breaks" is correct for RSI, back and eye problems, but give a **specific** extra strategy too.

Exercise 5: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 5.1 Give **two** positive effects of using smart devices to control the home.
- 5.2 Describe **one** negative effect of autonomous vehicles.
- 5.3 Name **two** health problems caused by prolonged use of a computer.
- 5.4 State the cause of RSI.
- 5.5 Describe **two** ways to reduce eye strain when using a computer.
- 5.6 Explain how a wrist rest and an adjustable chair help prevent health problems.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **The Effects of Using IT** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=5.

EXAM-STYLE QUESTION · 5 · [6 marks]

Mr Dlamini works at a computer for eight hours each day. He has started to get pains in his lower back and wrists.

- (a) Name the health problem that is most likely to cause the pain in his wrists. [1]
- (b) Describe **two** causes of back problems for computer users. [2]
- (c) Explain **three** ways that Mr Dlamini could reduce these problems. [3]

6 ICT Applications

Syllabus reference: **Section 6 (6.1 to 6.11)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Describe communication media and **mobile communication**
- Describe **computer modelling** and **computer controlled systems**, with advantages and disadvantages
- Describe school management, booking, banking, medical, retail, **recognition** and **satellite** systems
- Describe the components of an **expert system** and how it produces solutions

This chapter covers the **everyday uses of ICT**. For each application, learn what it **does**, how it **works**, and its **advantages and disadvantages**. Questions are set in a context, so link your answer to it.

6.1 Communication

Medium	Characteristics and uses
Newsletters, posters	Printed or digital, produced with desktop publishing or word processing; advertise events and inform readers
Websites	Pages on the internet; information, shopping, news; can be updated instantly; reach a global audience
Multimedia presentations	Slides combining text, images, sound, video and animation; for teaching and meetings
Audio, video, media streaming	Sound and video played as it arrives without downloading the whole file (music, films, live lessons); needs a fast connection
ePublications	Digital books, magazines and newspapers, read on screens; cheap to distribute, searchable, updated easily

Mobile communication uses mobile devices for **SMS** text messages, **phone calls**, **VoIP** (voice calls over the internet, cheaper for long distance), **video calls** and **accessing the internet**.

6.2 Modelling applications

COMPUTER MODELLING

Computer modelling (simulation) uses a program with **rules and variables** to **imitate a real situation**, so that results can be predicted and different options tested. Examples: **personal finance**, **bridge and building design**, **flood water management**, **traffic management** and **weather forecasting**.

Advantages over using people or real tests	Disadvantages
Cheaper and safer: no need to build or risk a real structure	Only as good as the rules and data used; the model may not match reality
Can test many scenarios quickly ("what if?")	Needs expensive computers and trained staff
Can model dangerous or impossible situations (floods, earthquakes)	Cannot predict unexpected events; results can be wrongly trusted

6.3 Computer controlled systems

In a computer controlled system, **sensors** send data to a computer, which processes it and sends signals to **actuators** to adjust things automatically. Examples: **robots in manufacture** (welding, painting), **production line control**, and **autonomous vehicles**.

Advantages over using people	Disadvantages
Work 24 hours a day without breaks, wages or illness	Expensive to buy, install and maintain
Very accurate and consistent ; same quality every time	Job losses in workers replaced by machines
Can work in dangerous places (chemicals, heat)	Cannot cope with unexpected situations ; a fault can stop the whole line

6.4 School management systems

Schools use a **database** to **manage learner registration and attendance** (for example by OMR registers, barcode or biometric scans) and to **record learner performance**, with reports produced for parents. **Computer aided learning (CAL)** lets learners study using software, with instant feedback, at their own pace.

6.5 Online booking systems

Used for **flights and travel, concerts, cinemas and sporting events**. The customer picks a seat or date on a website, the **database is updated at once** so a seat cannot be sold twice (**no double booking**), and a ticket is issued electronically.

Advantages	Disadvantages
Book from home at any time ; see all seats and prices; instant confirmation; no queues	Needs internet access and a payment card; personal data may be hacked
Fewer staff needed; can compare prices	Cannot see the exact seat view or ask a person; system failures; booking fees; double booking if the system fails

6.6 Banking applications

Application	Characteristics and uses	Advantages	Disadvantages
ATM (automatic teller machine)	Card and PIN used to withdraw cash, deposit cash or cheques, check balances, print mini statements, pay bills, transfer money	Available 24 hours; no queue; many locations	Risk of card theft, skimming and shoulder surfing ; limits on cash; may be out of cash
Electronic funds transfer (EFT)	Money moved between accounts electronically (salaries, bills)	Fast and cheap; fewer errors	Needs a bank account; fraud risk
Credit and debit card transactions	Pay at shops and online; debit takes money straight from the account; credit borrows from the bank	Convenient; no need for cash	Card fraud; credit may lead to debt
Cheques	A written order to the bank to pay	Safe for large sums; a record	Slow to clear (days); can bounce; can be forged
Internet banking	Manage the account on a website or app: pay, transfer, see statements	24/7; no travel; instant	Phishing and hacking risk; needs internet; not suited to all users

6.7 Computers in medicine

- **Patient records** and **pharmacy records** are held on computers: they can be found quickly, shared between doctors, and checked for **drug interactions and allergies**; but there are **privacy and security** concerns.
- **3D printers** build objects layer by layer from a digital design. Medical uses: **prosthetics** (artificial limbs made to fit), **tissue engineering**, **artificial blood vessels** and **customised medicines**.

6.8 Expert systems

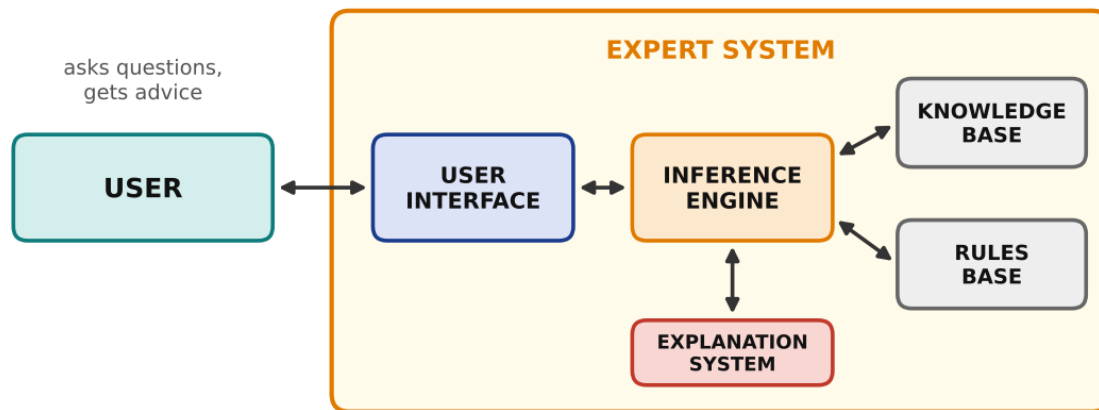


Figure 6.1 The parts of an expert system.

EXPERT SYSTEM

An **expert system** is software that **imitates a human expert** by using a **knowledge base** and a **rules base** to give advice or a diagnosis. Examples: **mineral prospecting, car engine fault diagnosis, medical diagnosis, chess games, financial planning, route scheduling for delivery vehicles, plant and animal identification.**

Component	Purpose
User interface	Lets the user answer questions (often yes/no or choices) and see results
Knowledge base	A database of facts and data about the subject, from human experts
Rules base	A set of IF-THEN rules that link facts to conclusions
Inference engine	The part that reasons : it matches the user's answers against the knowledge base and rules to find possible solutions, with probabilities
Explanation system	Explains how and why the conclusion was reached

How it is used: the user answers the questions asked by the interface; the inference engine searches the knowledge base using the rules; it produces **one or more possible solutions** (often with a % likelihood) and the explanation system shows the reasoning. A new scenario can be tested simply by entering different answers.

6.9 Computers in the retail industry

- **POS (point of sale) terminals:** the barcode is scanned; the product is **looked up** in the stock file; the price shows; **stock is updated automatically**; when stock falls below a set level, the computer **orders new stock automatically**.
- **EFTPOS terminals:** take payment by card. The card is read, the **validity of the card is checked**; the customer uses **chip and PIN, contactless card or NFC (phone) payment**; the **supermarket computer communicates with the bank computer**, which checks funds and transfers the money.

- **Internet shopping:** advantages: shop at any time from home; wider choice; often cheaper; delivered to the door. Disadvantages: cannot try or see the goods; delivery delay; card fraud and security risks; needs internet; **local shops lose business and jobs.**

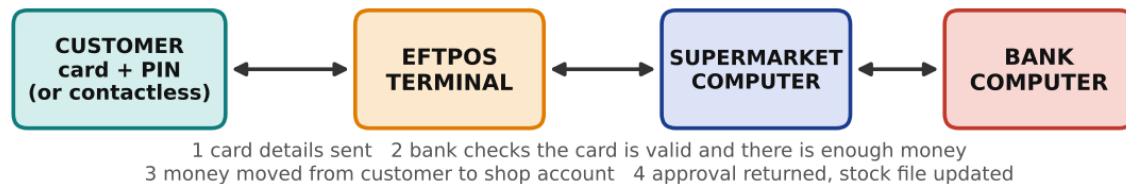


Figure 6.2 An EFTPOS payment between the shop and the bank.

6.10 Recognition systems

System	Characteristics and uses	Advantages	Disadvantages
OMR	Reads marks: school registers, multiple-choice papers ; also barcode and QR codes	Fast, accurate	Wrong marks; forms cost; jams
OCR and ANPR	Converts printed characters to text; automatic number plate recognition for car parks and speed cameras	Quick; no human needed	Dirty plates or poor light give errors
RFID	Radio tags for tracking stock, passports, automobiles and contactless payment	No line of sight; many at once	Costly; can be read by others
NFC	Very short-range radio; pay with a smartphone ; share files	Convenient and fast; secure for tap payments	Only a few centimetres; phone theft risk
Biometric recognition	Face, iris, retina, finger/thumb, hand, voice : door entry, phones, ID	Cannot be forgotten or easily copied; unique	Expensive; can fail (cuts, masks); privacy concerns

6.11 Satellite systems

System	Characteristics and uses
GPS (global positioning system) and satellite navigation	A receiver uses signals from several satellites to find its position; used for route guidance, tracking vehicles, mapping . Advantage: works anywhere, up-to-date directions. Disadvantage: weak signal indoors or in tunnels; can give wrong route if maps are old
GIS (geographic information system)	Stores and displays data linked to places on a map: planning, farming, land use, disaster management
Media communication : satellite TV and satellite phone	Broadcast to a large area, including remote places without cables. Disadvantage: signal affected by weather; delay; dish and subscription cost

Exercise 6: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 6.1 Give **two** advantages of using computer modelling to test a bridge design, instead of building it.
- 6.2 State **three** components of an expert system.
- 6.3 Describe how an EFTPOS terminal is used to pay for goods.
- 6.4 Give **two** disadvantages of internet shopping for the customer.
- 6.5 A school takes attendance using a fingerprint scanner. Name this type of system and give **one** advantage and **one** disadvantage.
- 6.6 Describe **two** uses of 3D printers in medicine.
- 6.7 Explain why robots are often used on a car production line instead of people.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **ICT Applications** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic:=6.

EXAM-STYLE QUESTION · 6 · [8 marks]

A bank is introducing an online banking service and a new expert system to help staff advise customers on loans.

- (a) Describe **two** advantages to a customer of using internet banking. [2]
- (b) Describe **two** risks of internet banking. [2]
- (c) Explain the role of the **inference engine** in the expert system. [2]
- (d) Name **two** other parts of an expert system. [2]

7 The Systems Life Cycle

Syllabus reference: **Section 7 (7.1 to 7.6)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Describe how a system is **analysed**: observation, interviews, questionnaires and document examination
- Describe the **design** of file structures, input and output formats and **validation routines**
- Describe **testing** with test plans, and normal, abnormal and extreme data
- Compare the four methods of **implementation**
- Describe **technical and user documentation**, and how a system is **evaluated**

SYSTEMS LIFE CYCLE

The **systems life cycle** is the series of stages followed to **develop a new computer system** to replace an old system: **analysis, design, development and testing, implementation, documentation and evaluation**.

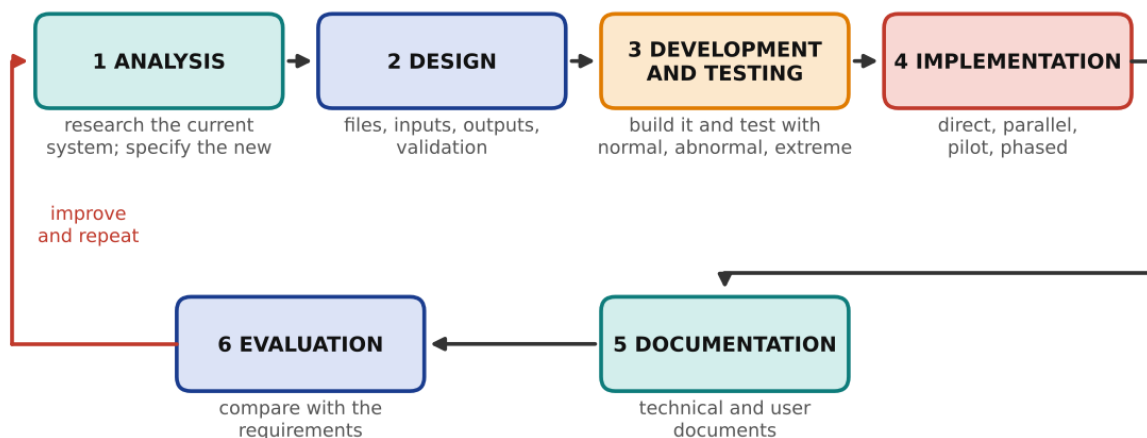


Figure 7.1 The stages of the systems life cycle.

7.1 Analysis

The analyst studies the **current system** to find out **what it does and what is wrong with it**. Data is collected using four **research methods**:

Method	Description	Advantages	Disadvantages
Observation	Watching the system and users at work	Gets reliable, first-hand information; see what really happens	Time-consuming ; staff may behave differently when watched
Interviews	Asking questions face to face	Can ask follow-up questions ; detailed answers	Slow and expensive ; interviewee may be nervous; hard to analyse
Questionnaires	Written questions given to many people	Quick, cheap ; many people; easy to analyse; can be anonymous	Answers may be dishonest or incomplete ; no follow-up; many not returned

Method	Description	Advantages	Disadvantages
Examination of existing documents	Reading forms, reports, manuals, records	Shows how data is used , the inputs and outputs; real examples	Time-consuming ; documents may be out of date

The analyst **records and analyses** the information, identifying the **inputs, outputs and processing** of the current system, the **problems** with it, and the **user and information requirements** for the new system. The **system specification** then **identifies and justifies suitable hardware and software** for the new system, with the goals of the project.

7.2 Design

The designer plans **file or data structures, input formats, output formats and validation routines**.

Field name	Data type	Field length	Coding / validation
StudentID	Text	6	Presence check; format check (e.g. S12345)
Surname	Text	25	Presence check; length check
DateOfBirth	Date/time	10	Format check dd/mm/yyyy; range check
Gender	Text	1	Coded: M for male, F for female
Mark	Integer	3	Range check 0 to 100; type check

- **File/data structures:** field names, **field length**, **data type**, and **coding of data** (for example M and F instead of Male and Female, which saves space and avoids errors).
- **Input formats:** **data capture forms** (paper forms to collect data) and on-screen input forms. **Output formats:** **screen layouts and report layouts**.
- **Validation routines:** **range, character, length, type, format, presence and check digit** checks (see Appendix B).

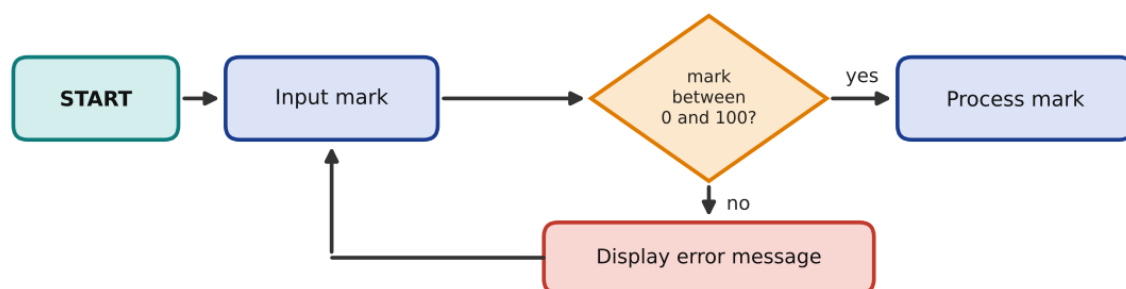


Figure 7.2 A flowchart showing a range check, one way of presenting a validation routine.

7.3 Development and testing

The system is built and then **tested before implementation** to find and fix errors. A **test plan** lists the **test data, expected outcomes, actual outcomes and remedial action** (the fix for a failure).

- **Test designs** check the data structures, file structures, input and output formats and validation routines. **Test strategies** test **each module, each function and the whole system**.
- **Normal data:** valid data the system should accept (mark 65). **Abnormal data:** data that should be **rejected** (mark *abc* or 150). **Extreme data:** the **largest and smallest valid** values (0 and 100). Extreme data is therefore at the very edge of the valid range.

- **Live data** is real data from the real system, used after testing, where the correct results may not be known beforehand.

Test	Test data	Type	Expected outcome	Actual outcome	Remedial action
1	65	Normal	Accepted	Accepted	None
2	0 and 100	Extreme	Accepted	100 rejected	Change the rule to ≤ 100
3	150	Abnormal	Error message	Error message	None

7.4 Implementation

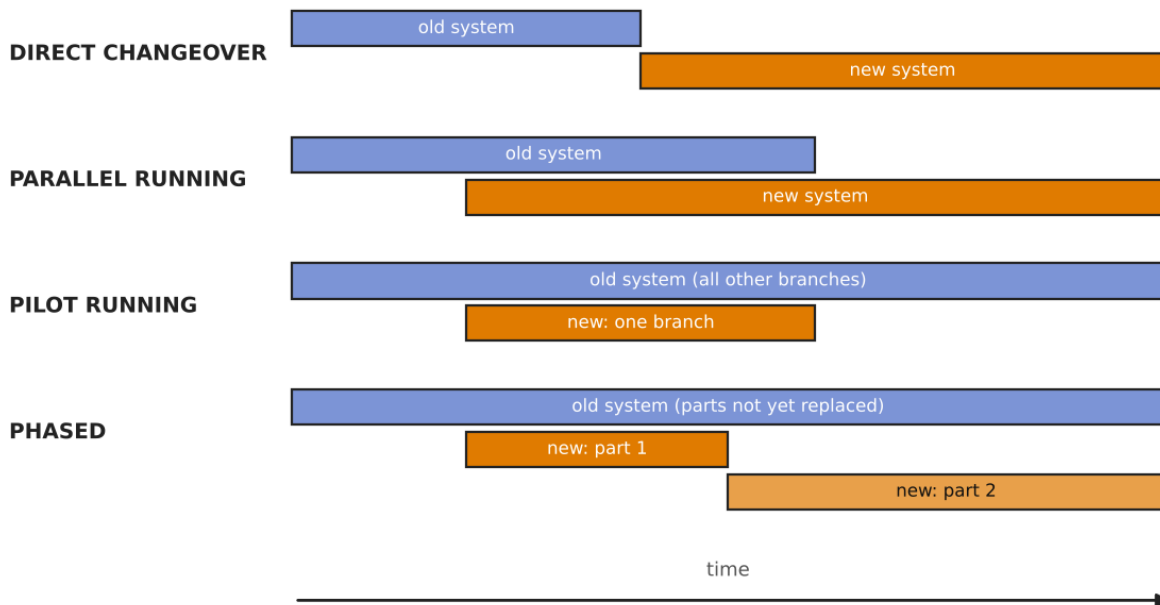


Figure 7.3 The four methods of implementation.

Method	Description	Advantages	Disadvantages
Direct changeover	Old system stopped and new system started immediately	Quick; cheap ; benefits at once	Risky : if the new system fails there is no backup; staff may not cope
Parallel running	Old and new systems both run for a time	Safest : old system is a backup; results can be compared	Expensive and slow : staff do the work twice
Pilot running	New system used in one branch/department first	Problems found on a small scale; other sites are safe; staff there can train others	Takes longer; the rest of the organisation waits
Phased implementation	New system introduced one part at a time	Easier to train staff gradually; problems contained; a faulty part can be fixed before the next	Slow; the old and new parts must work together; costly

7.5 Documentation

	Technical documentation	User documentation
Who it is for	Programmers and system analysts who maintain or improve the system	End users who operate the system
Purpose	Lets the system be maintained and updated	Helps users learn and use the system
Components	Purpose and limitations of the system; program listing and language; program flowcharts/algorithms ; system flowcharts ; hardware and software requirements; file structures ; list of variables ; input and output formats; sample/test runs ; validation routines	Purpose and limitations; hardware and software requirements; how to install/load/run, save a file, print, add, delete or edit records ; input and output formats; sample runs ; error messages and error handling ; troubleshooting guide/helpline ; FAQs ; glossary of terms

7.6 Evaluation

The solution is **evaluated** by judging its **efficiency** (does it save time and resources?), **ease of use**, and **appropriateness** (is it suitable for its purpose?). Evaluators **compare the solution with the original task requirements**, identify **limitations and necessary improvements**, and review the **users' responses** to the results of testing. The results may start a new cycle of development.

EXAM TIP

Questions often ask you to **compare two implementation methods** or **justify** one for a given business. Link to the scenario: a hospital cannot afford errors, so **parallel running** is best; a small shop with limited money might choose **direct changeover**.

Exercise 7: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 7.1 Name **two** methods of researching a current system.
- 7.2 Give **one** advantage and **one** disadvantage of using questionnaires.
- 7.3 A field called Age must hold whole numbers from 11 to 18. State the validation checks that could be used.
- 7.4 State the type of test data for each: (a) 15, (b) 11, (c) -5.
- 7.5 Describe parallel running.
- 7.6 Explain why technical documentation is needed.
- 7.7 Give **three** items that would be included in user documentation.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **The Systems Life Cycle** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=7.

EXAM-STYLE QUESTION · 7 · [10 marks]

A hospital replaces its paper appointment system with a computer system. A systems analyst is hired.

- (a) Describe **two** methods the analyst could use to find out how the current system works. [4]
- (b) The analyst designs a data entry screen. Name **three** validation checks that can be used. [3]
- (c) Evaluate the use of parallel running for the hospital. [3]

8 Safety and Security

Syllabus reference: **Section 8 (8.1 to 8.3)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Describe physical **safety** risks and how to prevent them
- Explain **data protection**, **personal data** and **eSafety** for internet, email, social media and online gaming
- Describe **threats to data**: hacking, phishing, pharming, smishing, vishing, viruses, malware, card fraud
- Describe **protection of data**: biometrics, digital certificates, SSL, encryption, firewall, two-factor authentication, passwords

8.1 Physical safety

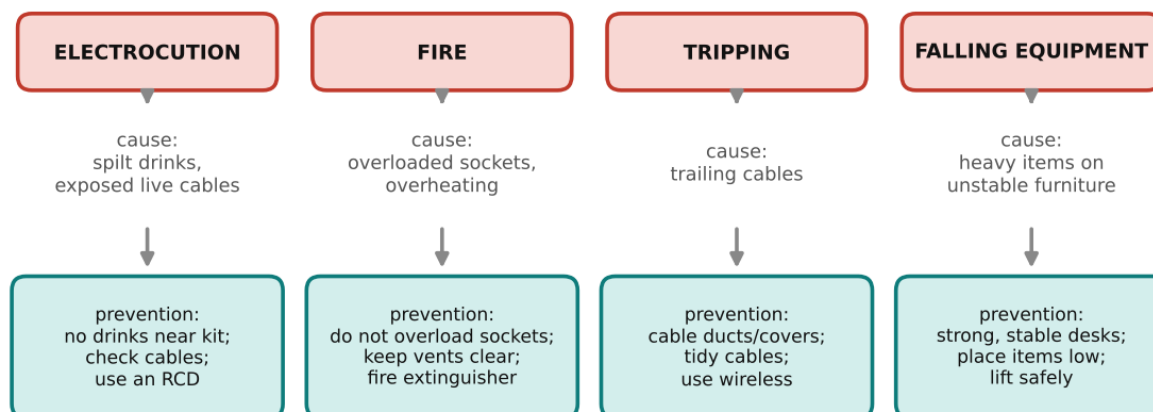


Figure 8.1 Physical safety risks, their causes and prevention.

8.2 eSafety

DATA PROTECTION

Data protection legislation (a typical data protection act) sets legal rules for how **personal data** is collected, stored and used. It is needed because organisations hold large amounts of personal data that could be **misused, sold, lost or stolen**. Typical principles: data must be **collected fairly and lawfully**; used **only for the stated purpose**; **accurate and up to date**; **kept no longer than needed**; **kept secure**; not passed on without permission; and people may **see and correct** their own data.

Personal data identifies a living person: **name, address, date of birth, photograph in school uniform**, phone number. **Sensitive data** is more private: **medical history**, religion, political opinions, biometric data. Both must be kept **confidential and protected** to avoid **inappropriate disclosure**, which can lead to identity theft, fraud, or harm.

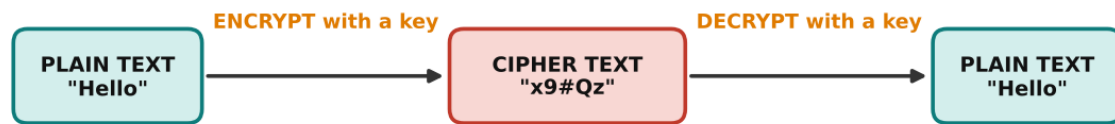
Area	How to stay safe (eSafety)
The internet	Use trusted websites recommended by teachers ; use a child-friendly search engine that only gives age-appropriate sites; never give personal details
Email	Do not open or reply to emails from unknown people ; do not click links or attachments in them; avoid sending personal data or images by email
Social media	Use privacy settings ; know how to block and report unwanted users; never meet an online contact face to face alone; do not post inappropriate images or language; respect other people's confidentiality
Online gaming	Do not use your real name (use a nickname); do not give out personal or financial data ; keep chat to the game

8.3 Security of data: threats

Threat	What it is and its effect	How to help prevent it
Hacking	Gaining unauthorised access to a computer or network to steal, damage or change data	Firewall ; strong passwords; encryption ; anti-malware; keep software updated; two-factor authentication
Phishing	Fake emails that look genuine and ask for personal or bank details, often with a link to a fake website	Do not click links ; check the sender's address; look for spelling mistakes; go to the website directly; use a spam filter
Pharming	Malicious code redirects a user to a fake website even when they type the correct address, to collect details	Anti-malware; check for HTTPS and the padlock; keep the browser updated
Smishing	Phishing by SMS text message	Do not click links in unexpected texts; do not reply; report them
Vishing	Phishing by voice phone call ; the caller pretends to be a bank or helpdesk	Never give details by phone to a caller; hang up and call the organisation using a number you know
Viruses and malware	Malicious software ; a virus copies itself and spreads; effects: deleted/corrupted files, slow computer, stolen data	Anti-malware/anti-virus kept updated; scan downloads and USB drives; do not open unknown attachments; download from trusted sites only
Card fraud	Shoulder surfing (watching someone enter a PIN), card cloning (copying a card's data at an ATM/reader), key logging (software recording keystrokes)	Cover the keypad; use chip and PIN/contactless; check readers for devices; anti-spyware; use on-screen keyboards

Protection of data

Method	How it protects data
User ID and password	The user ID identifies; the password proves it. Only the person who knows both can log in. Use strong passwords and change them regularly
Two-factor authentication (2FA)	Needs two different proofs , for example a password <i>and</i> a one-time code sent to a phone. Stolen passwords alone are not enough
Biometrics	Uses a unique body feature (fingerprint, face, iris) to log in; hard to copy or forget. The data itself must be protected
Firewall	Hardware or software between a computer/network and the internet that monitors traffic against rules and blocks unauthorised traffic
Encryption	Scrambles data into cipher text so that, if intercepted, it cannot be read without the key . Used on hard discs, email, the cloud and HTTPS websites
Secure socket layer (SSL)	Creates an encrypted link between a web server and the client (browser). A website using it shows https and a padlock
Digital certificate	An electronic document that proves a website or person is genuine. It contains the owner's name, a public key, the expiry date, the issuer (certificate authority) and a serial number/digital signature



A hacker who intercepts the middle message cannot understand it

Figure 8.2 Encryption turns readable text into cipher text and back again.

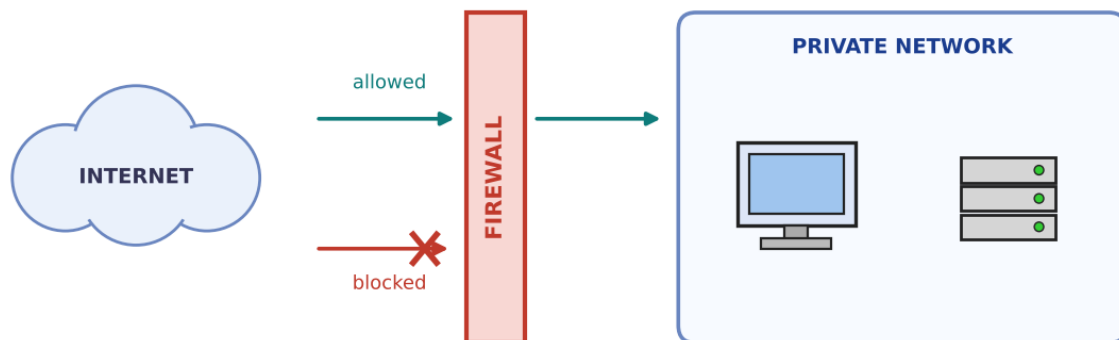


Figure 8.3 A firewall allows safe traffic and blocks unauthorised traffic.

EXAM TIP

Encryption does not stop hacking; it makes stolen data **unreadable**. When explaining a method, say *what it does* and *what threat it stops*.

Exercise 8: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 8.1 State **two** causes of fires in a computer room and **one** way to prevent each.
- 8.2 Name **two** items of personal data.
- 8.3 Describe **two** rules for staying safe when using social media.
- 8.4 Explain the difference between phishing and pharming.
- 8.5 State the purpose of a firewall.
- 8.6 Explain how two-factor authentication improves security.
- 8.7 Describe **two** ways to protect a computer from viruses.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Safety and Security** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic:=8.

EXAM-STYLE QUESTION · 8 · [7 marks]

Amina banks online using her smartphone. She receives a text message saying her account is locked, with a link to "unlock" it.

- (a) Name this type of security threat. [1]
- (b) Describe **two** things Amina should do. [2]
- (c) Explain **two** ways the bank protects customer data during online banking. [4]

9 Audience and Copyright

Syllabus reference: **Section 9 (9.1, 9.2)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Show a clear sense of **audience and purpose** when planning an ICT solution
- Analyse the **needs of an audience**
- Explain the need for **copyright legislation** and how piracy is prevented

9.1 Audience appreciation

AUDIENCE

The **audience** is the group of people who will **read, view or use** an ICT product. The **purpose** is what the product is for (to inform, persuade, entertain, teach or sell). Every design decision must suit **both**.

Before creating a document, presentation, spreadsheet or website, the designer must **analyse the needs of the audience**. A product aimed at young children is very different from one for company managers.

Consider	Questions to ask	Example: children aged 7 to 9 or business managers
Age and ability	How old are they? Can they read well? Any disabilities?	Children: large fonts, simple words, bright pictures. Managers: formal, concise, charts
Language and tone	Formal or informal? Technical terms?	Children: friendly. Managers: professional
Interests and prior knowledge	What do they know already?	Explain terms for beginners; use jargon only for experts
Content and length	How much information is right?	Short chunks for children; summary and data for managers
Colours, fonts, images, layout	Are they readable and appropriate?	Avoid colour combinations that are hard to read; consider colour blindness; alt text for screen readers
Device and access	Phone, tablet or PC? Connection speed?	Responsive page for phones; small file sizes

Be **respectful**: avoid offensive, biased or culturally insensitive content, and give **accessibility** (alternative text, readable text size, good contrast) so that everyone can use the solution.

9.2 Copyright

COPYRIGHT

Copyright is a **law that protects the creator's work** (software, music, films, books, images, web content). It gives the owner the right to **control copying, sharing, selling and changing** it. Without the owner's **permission**, copying is illegal.

Why legislation is needed: to let creators **earn money** from their work and so **encourage them to create more**; to stop others from **stealing** it and claiming it is theirs.

Software piracy is the illegal **copying, sharing or use** of software without a licence, for example installing one copy on many computers, sharing a licence key, or using a **cracked** copy. It is illegal and may spread malware, and developers lose income.

Principles of copyright for software	Methods software producers use to prevent copying
You may not make copies to sell or give away	A product key / serial number must be entered to install the software
You may not use the software on more computers than the licence allows	Activation online, or the software only runs if a licence is valid
You may not change the software and claim it as your own	A sticker or hologram on the case; a CD/DVD in the drive needed to run it
You may make a backup copy for yourself (if allowed by the licence)	Encryption of the program; the software cannot run without the original dongle

EXAM TIP

Do not copy images, text or music from websites into your own work without **permission or a licence**. In the practical exams, use only the images and files provided or your own.

Exercise 9: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 9.1** State what is meant by the term *audience*.
- 9.2** A presentation is made for 6-year-old children. Describe **two** features that make it suitable.
- 9.3** State **one** reason why copyright legislation is needed.
- 9.4** Give **two** ways a software company can stop users making illegal copies.
- 9.5** Explain why using a photograph from a website in a school magazine without permission may break the law.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Audience and Copyright** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=9.

EXAM-STYLE QUESTION · 9 · [5 marks]

A teacher is creating a website to show younger learners how to stay safe online.

- (a) Describe **two** ways the teacher should design the website for the audience. [2]
- (b) Explain why the teacher must not copy cartoons from another website without permission. [2]
- (c) State **one** other way the website should respect its audience. [1]

10 Communication

Syllabus reference: **Section 10 (10.1, 10.2)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Describe the characteristics, uses and constraints of **email**, including **cc**, **bcc**, **attachments** and **netiquette**
- Describe the effects of **spam** and how to prevent it
- Explain the structure of a **web address**, **hyperlinks**, **browsers**, **ISPs** and **search engines**
- **Evaluate** information found on the internet: up to date, reliable, biased, valid
- Describe the internet protocols **HTTP**, **HTTPS**, **FTP**, **SSL**, and the risks of using the internet

10.1 Communication using email

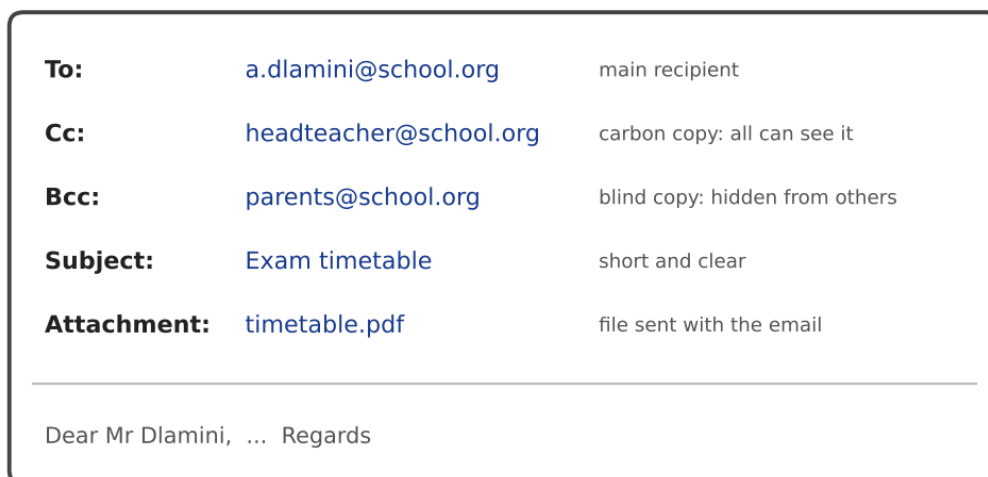


Figure 10.1 The parts of an email message.

Feature	Meaning
Carbon copy (cc)	A copy sent to other people; all recipients can see who received it
Blind carbon copy (bcc)	A copy sent to people whose addresses are hidden from the other recipients (protects privacy)
Forward	Send a received email on to another person
Attachment	A file sent with the email (document, picture); large files may need compressing
Email group	A group of addresses saved under one name so one message reaches all of them

Characteristics and uses: fast, cheap, can be sent to many people, can carry attachments, and the message is stored as a record. **Constraints:** you need internet access; the recipient may not read it quickly; messages can be misunderstood; **attachments can carry viruses**; and email is not always secure.

- **Acceptable language and employer guidelines:** use **polite, professional, correct** language; follow the **employer's rules** (no personal use, no offensive content, signature, disclaimer).
- **Netiquette:** be polite; **do not use CAPITALS (shouting)**; use a clear subject line; keep it short; do not forward private emails or chain letters; check before you **reply all**; think before you send; reply in a reasonable time.
- **Need for security:** do not open attachments from unknown senders; use strong passwords; be careful sending confidential data.

SPAM

Spam is **unwanted bulk email**, usually advertising or scams. **Effects:** wastes time, **fills the inbox**, uses network bandwidth, may carry **viruses and phishing links**. **Prevention:** use a **spam filter**; do not reply or click links; do not give your email address to unknown sites; use a separate email address for online forms; report/mark as junk.

10.2 Effective use of the internet

Term	Meaning
Internet	The worldwide collection of connected networks ; it carries email, the web, streaming, and more
World Wide Web (WWW)	The collection of web pages that can be reached using the internet (the web is one service on the internet)
ISP (internet service provider)	A company that provides a connection to the internet
Web browser	Software that displays web pages
Hyperlink	Text or a picture that takes you to another page, file or place when clicked
Blog / forum / wiki / social networking	A blog is a personal online diary; a forum is a discussion board; a wiki is a site everyone can edit; a social network connects people to share content

https://www.example.com/school/timetable.html

protocol

domain name

folder / path

file name

A URL (uniform resource locator) is the address of a web page.

Figure 10.2 The parts of a URL.

Using a search engine and evaluating information

A **search engine** finds pages for typed keywords, giving **speed** and a huge **amount of information**, but a large number of results can make it **slow to find relevant pages** and hard to tell what is **reliable**. Use **specific keywords**, quotation marks for exact phrases, and refine the search.

EVALUATING INFORMATION

Anyone can publish on the internet, so check whether information is **up to date** (when was it written?), **reliable** (who wrote it? is it an expert or trusted organisation?), **unbiased** (does it favour one view or sell something?) and **valid** (is it accurate and supported by evidence from other sources?).

Protocol	Purpose
HTTP (HyperText Transfer Protocol)	Rules for transferring web pages between a web server and a browser
HTTPS (secure variant)	HTTP with encryption (using SSL/TLS); used on banking and shopping sites; shows a padlock
FTP (File Transfer Protocol)	Transferring files between computers, such as uploading a website to a server
SSL (secure socket layer)	Creates an encrypted link between server and browser

Advantages of the internet	Disadvantages and risks
Huge amount of information ; fast; cheap communication; shopping and banking from home; learning	Information may be unreliable or biased ; inappropriate or criminal material is available; security risks : viruses, hacking, phishing

Advantages of the internet	Disadvantages and risks
Reach a worldwide audience; social and collaborative sites	Needs a connection; can waste time; cyberbullying; parental, educational and ISP controls (filters) can restrict access to data

Exercise 10: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 10.1** State the difference between cc and bcc.
- 10.2** Give **two** rules of netiquette.
- 10.3** Describe **two** effects of spam email.
- 10.4** State the difference between the internet and the World Wide Web.
- 10.5** Name the parts of the URL <https://www.school.org/maths/test.html>.
- 10.6** A student finds a website about a health topic. Describe **two** checks to decide whether to trust it.
- 10.7** State the purpose of HTTPS.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Communication** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic=10.

EXAM-STYLE QUESTION · 10 · [8 marks]

A student is researching a project on climate change using the internet and emailing the results to a teacher.

- (a) Give **two** ways the student can find information quickly using a search engine. [2]
- (b) Describe **three** checks the student should make on information found on a website. [3]
- (c) The student sends the report to the teacher and a copy to a parent without the teacher seeing the parent's email address. State the email feature used. [1]
- (d) Describe **two** problems of spam for the teacher's email account. [2]

PART B

Practical Skills

Sections 11 to 21 · Papers 2 and 3

11 File Management

Syllabus reference: **Section 11 (11.1, 11.2)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- **Locate, open and import** files; save in a planned **folder hierarchy** with suitable **file names**
- **Save, export and print** in application and generic file formats
- Describe the characteristics and uses of **file formats** and the need for generic formats
- **Compress** files and explain why file sizes are reduced

File management is used in **every** practical task. Marks can be lost for saving in the wrong place, with the wrong name, or in the wrong format.

11.1 Manage files effectively

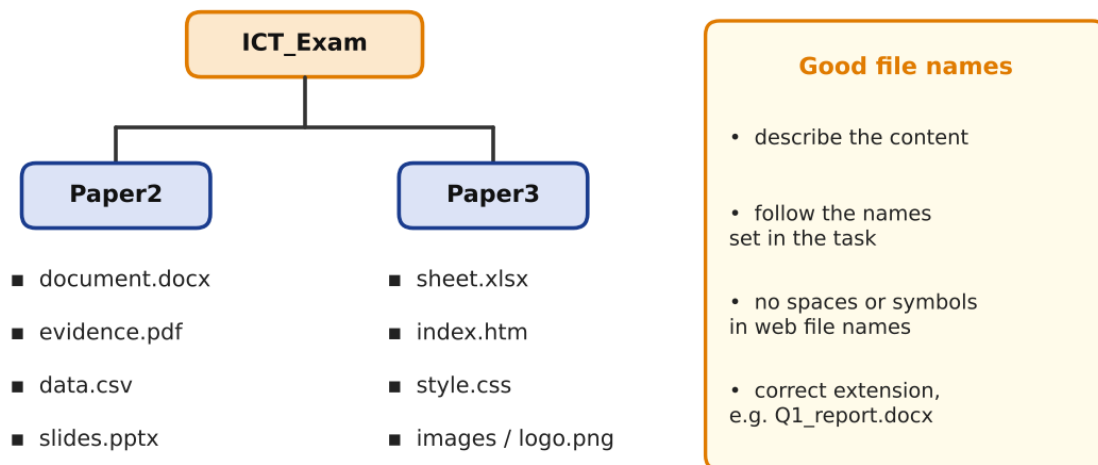


Figure 11.1 A planned hierarchical folder structure.

- **Locate** stored files using the file manager or the Open/Save dialogue (browse folders, or search by name). **Open and import** files of different types (for example a .csv into a spreadsheet or database, or a .txt file into a presentation).
- **Save in a planned hierarchical directory/folder structure:** a main folder for the task, with sub-folders for each paper, application, or file type.
- **Use appropriate file names** that describe the content and follow the task: names without unusual symbols, and **extensions** that match the format. For web pages avoid spaces and capital letters in names.

APPLICATION AND GENERIC FORMATS

An **application format** is the format of one package (.docx, .xlsx, .accdb, .pptx); it keeps all features but needs that package. A **generic (general) file format** can be opened by **many different programs** (.csv, .txt, .rtf, .pdf, .css, .htm, .jpg, .png), so it is used to **share files between different software or computers**.

Format	Characteristics and uses
.css	Cascading stylesheet: text file of style rules for web pages
.csv	Comma separated values: plain text; each row on a new line, fields split by commas. Moves data between spreadsheets and databases
.gif	Image with up to 256 colours; animated images; small files; logos and simple graphics
.htm / .html	Web page written in HTML; displayed by a browser
.jpg	Compressed (lossy) image; photographs; small file; some quality lost
.pdf	Portable document format: looks the same on any device; difficult to edit; for sharing and printing
.png	Compressed (lossless) image; screenshots, logos; supports transparency
.rtf	Rich text format: text with basic formatting (bold, fonts); opens in most word processors
.txt	Plain text with no formatting; very small; opens in any text editor
.zip / .rar	Compressed archives containing one or more files

Saving and printing in a variety of formats may be needed for: a document, a **screenshot**, a **database report**, a **data table**, a **graph or chart**, a **web page in browser view**, and a **web page in HTML view** (source

code). Application packages can also **save and export** into other formats (for example a spreadsheet as .csv, a document as .pdf, a table as .txt).

11.2 Reduce file sizes for storage or transmission



Smaller files use less storage and are quicker to send by email or download.

Figure 11.2 File compression.

FILE COMPRESSION

File compression reduces the size of a file by removing repeated data, using a **compressed archive** such as **.zip** or **.rar**. The original is recovered by **extracting** (unzipping) the archive.

Why reduce file size: to use **less storage space**; to **send files faster** by email or the internet; to **fit within the email attachment limit**; to **download faster**; to **save bandwidth and cost**. Several files can be put in **one** archive.

EXAM TIP

If asked why a **generic format** is needed, say: so a file made in one package can be **opened in other software** (or on other computers) that does not have the original package.

Exercise 11: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 11.1** State what is meant by a generic file format and give **two** examples.
- 11.2** Describe the characteristics of a .csv file.
- 11.3** Give **one** difference between .jpg and .png.
- 11.4** Explain why a student compresses 10 photographs before emailing them.
- 11.5** State **two** things that should be considered when choosing a file name.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **File Management** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=11.

EXAM-STYLE QUESTION · 11 · [5 marks]

Esther is given a spreadsheet saved as a .csv file and must produce a report to send to a client who does not have the same software.

- (a) Describe how Esther would open the .csv file in her spreadsheet package. [2]
- (b) State the generic file format that she should use to send the finished report so that the layout cannot be changed. [1]
- (c) Explain **two** reasons why she compresses the files before emailing them. [2]

12 Images

Syllabus reference: **Section 12** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- **Place** an image with precision and **resize** it, keeping or changing the **aspect ratio**
- **Crop, rotate, reflect (flip)** an image and adjust **brightness and contrast**
- **Group and layer** images (front/back)
- Explain how to **reduce image file size** by lowering **resolution or colour depth**

Placing and editing an image

Images are placed into documents, presentations, web pages and spreadsheets. **Place the image with precision:** in the exact position stated (for example aligned to the left margin, in the correct cell, or in the header), using the alignment or layout options.

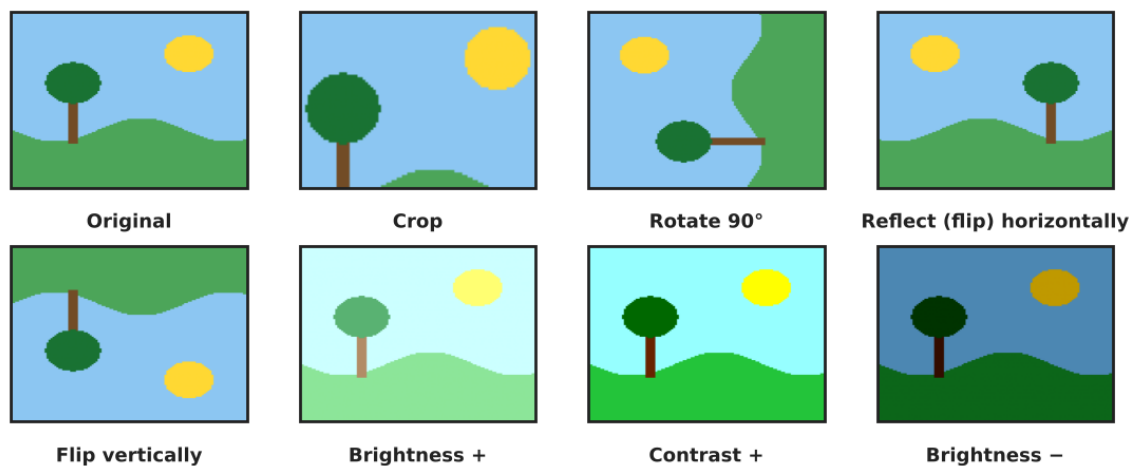


Figure 12.1 Common image-editing operations.

Operation	What it does	How
Resize	Makes the image larger or smaller. To maintain the aspect ratio (width : height) the picture is not distorted. To adjust the ratio, the lock is turned off and height/width entered separately	Drag a corner handle , or enter the exact height and width (with lock aspect ratio on/off)
Crop	Removes unwanted outer parts of the image; the rest keeps its size and quality	Crop tool; drag the edges
Rotate	Turns the image by a number of degrees (90°, 180°, any angle)	Rotate handle or the rotate command
Reflect (flip)	Makes a mirror image, horizontally (left to right) or vertically (top to bottom)	Flip horizontal / flip vertical
Brightness	Makes the whole image lighter or darker	Brightness slider (+ or -)
Contrast	Changes the difference between the light and dark areas : high contrast makes edges stand out	Contrast slider

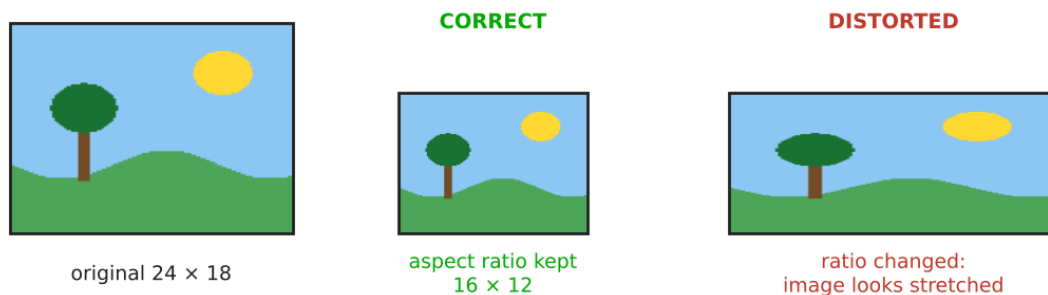
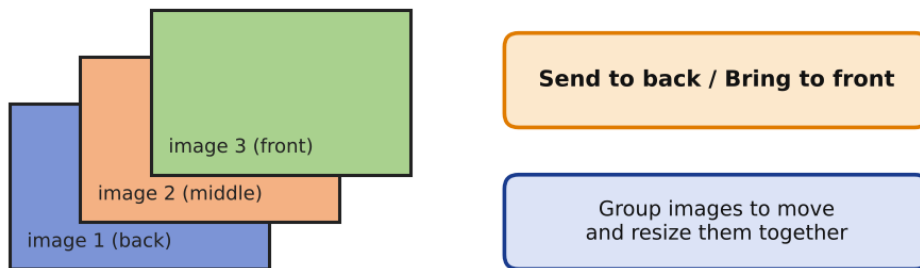


Figure 12.2 Resizing: keep the aspect ratio unless the question says otherwise.

EXAM TIP

When a task says *resize to a width of 5 cm and keep the aspect ratio*, set the width only with **Lock aspect ratio** on and let the height change by itself. Check that the picture is **not stretched**.

Grouping and layering



Layers: the last image placed sits in front

Figure 12.3 Layers and grouping.

- **Layering:** when objects overlap, the one placed last is **in front**. Use **Bring to front / Send to back** (or forward/backward) to change the order.
- **Grouping** joins several objects (images, shapes, text boxes) into one object so they can be **moved or resized together**. **Ungrouping** separates them again.

Reducing the file size of an image

REDUCING IMAGE FILE SIZE

An image is made of **pixels**. The **resolution** is the number of pixels (more pixels = more detail). The **colour depth** is the number of bits used to store each pixel's colour. **Reducing the resolution or the colour depth reduces the file size**, but the **quality** is reduced too. Cropping and resizing also help, as do compressed formats such as .jpg.

Exercise 12: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 12.1** State what is meant by the aspect ratio of an image.
- 12.2** Describe what happens to an image when its aspect ratio is not maintained while resizing.
- 12.3** Explain the difference between cropping and resizing.
- 12.4** An image of a flag faces the wrong way. State the editing operation needed.
- 12.5** Describe **two** ways to reduce the file size of an image.
- 12.6** A logo hides part of a photograph. State how to show the photograph in front.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Images** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic:=12.

EXAM-STYLE QUESTION · 12 · [5 marks]

You are given a photograph of a school building that is 12 cm wide and 8 cm high, to put in a newsletter.

- (a) State the width the image would have if it is reduced to a height of 4 cm and its aspect ratio is maintained. [1]
- (b) The photograph has a lot of sky at the top. Describe how to remove it. [2]
- (c) The photograph file is too large to email. Describe **two** ways to reduce its size. [2]

13 Layout

Syllabus reference: **Section 13 (13.1 to 13.3)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- **Create or edit** a document, entering text with total accuracy, and **place objects** from different sources
- **Wrap text** around a table, chart or image (above, below, square, tight)
- **Create, edit and format tables** (rows, columns, merge, alignment, borders, shading)
- Use **headers and footers** with automatic fields and consistent alignment

13.1 Create or edit a document

Enter and modify **text and numbers with total accuracy**; one wrong letter can lose marks. Use **editing techniques**: **highlight (select)**, **delete**, **move**, **cut**, **copy**, **paste**, **drag and drop**.

Place objects into a document from a variety of sources: **text**, **images**, **screenshots**, **shapes**, **tables**, **graphs/charts**, **a spreadsheet extract**, **a database extract**. Position them as instructed.

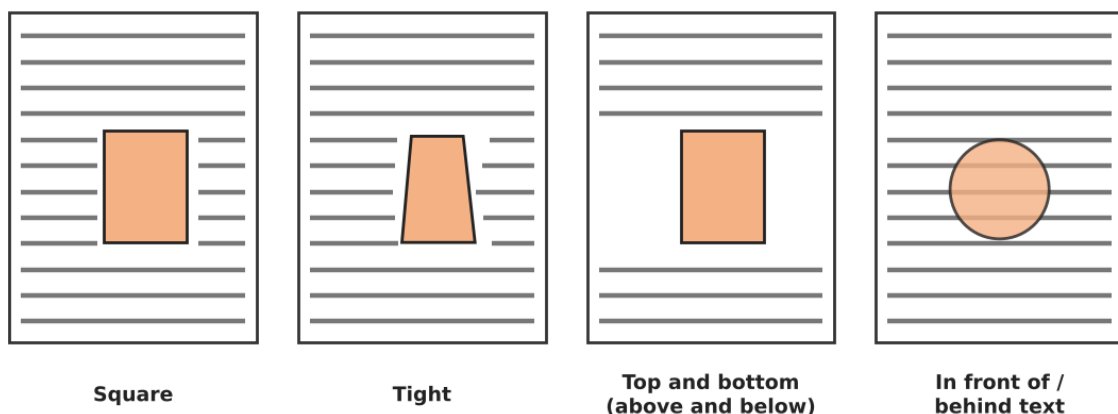


Figure 13.1 Text wrapping around an object.

Wrapping	Effect
Square	Text flows around a rectangular box around the object
Tight	Text flows close to the outline of the object
Above and below (top and bottom)	Text stops above the object and restarts below it; nothing beside it
In line with text / in front / behind	The object sits in the line of text, or covers or sits behind the text

13.2 Tables

Item (left)	Price (right)	Qty (centre)
Pencil	5.00	10
Ruler	12.50	4

- merge cells: join cells into one
- insert or delete rows and columns
- horizontal alignment: left, right, centre, justified
- vertical alignment: top, middle, bottom
- shading; gridlines on or off
- row height and column width
- wrap text within a cell

Figure 13.2 Table features that may be examined.

- **Create** a table with the **specified number of rows and columns**; **place text or objects** (such as an image) in cells.
- **Edit**: **insert or delete rows and columns**; **merge cells** to make one cell across several.
- **Format**: **horizontal alignment** (left, right, centre, fully justified); **vertical alignment** (top, middle, bottom); **show or hide gridlines**; **wrap text within a cell**; **shade cells**; adjust **row height** and **column width**.

EXAM TIP

Check that a table is **not split across two pages**. If it is, set a **page break before it** or keep rows together, as the examiner may penalise it. Right-align numbers, and align decimals.

13.3 Headers and footers

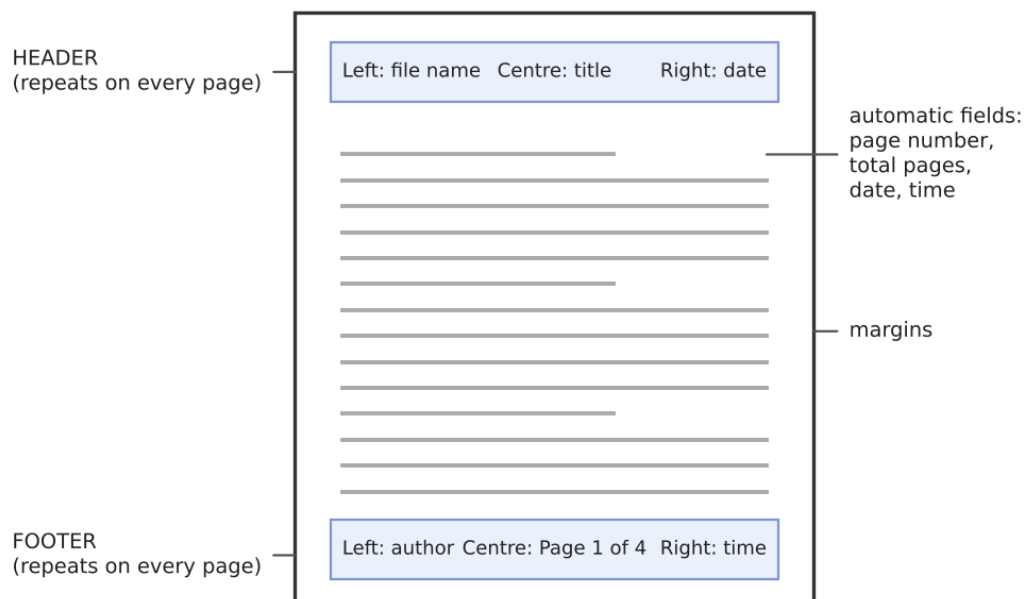


Figure 13.3 A header and footer with automatic fields.

HEADERS AND FOOTERS

A **header** is text or objects in the **top margin** and a **footer** is in the **bottom margin**; both **repeat on every page**, so they are used for the **file name, title, author, page number, total pages, date and time (automated objects)** that update by themselves).

- **Align the contents consistently:** left margin, centred, and right margin using the **tab stops or alignment** (for example file name at the left, page number in the centre, date at the right).
- Insert **automatic fields** (page number, number of pages, date, time, file information) instead of typing the values.

Exercise 13: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 13.1** State **two** editing techniques that can be used to move text.
- 13.2** Describe the difference between square and tight text wrapping.
- 13.3** A table has 4 rows and 3 columns. Describe how to join the three cells of the top row.
- 13.4** Explain why page numbers are inserted as automatic fields instead of being typed.
- 13.5** State where a header and a footer are placed on a page.
- 13.6** A document footer must show the file name at the left, the page number in the centre and the date at the right. Describe how to set this up.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Layout** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=13.

EXAM-STYLE QUESTION · 13 · [6 marks]

Ahmed is producing a one-page report for the school council. The report must include a table and a picture.

- (a) Describe how Ahmed would place the picture in the centre of the page with text above and below it only. [2]
- (b) The table must be 3 columns by 5 rows with a heading across the top. State the steps to create the heading. [2]
- (c) State **two** items that Ahmed should place in the footer. [2]

14 Styles

Syllabus reference: **Section 14** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- **Create, edit and apply styles** to keep presentation consistent
- Set the **font** (face, serif/sans-serif, point size, colour), **alignment**, **enhancement**, **spacing** and **bullets**
- Explain the purpose of a **corporate house style**

STYLE

A **style** is a **saved set of formatting** (font, size, colour, alignment, spacing) given a name, that can be **applied to text in one step**. If the style is **modified**, **all text using it changes at once**, which keeps the document **consistent**.

Style setting	Options
Font	Font face (the typeface), type (serif or sans-serif), point size, colour
Alignment	Left, right, centre, fully justified
Text enhancement	Bold, underline, italic
Spacing	Paragraph spacing (before and after) and line spacing (single, 1.5, double)
Bullets	Shape, alignment, line spacing and indent of bulleted and numbered lists



8 pt 12 pt 18 pt (point size)

Left

Centre

Right

Justified

Figure 14.1 Serif and sans-serif fonts, point size and alignment.

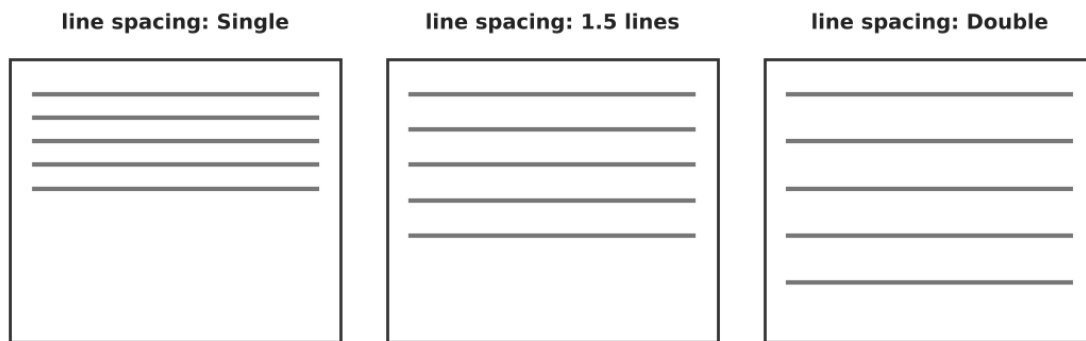


Figure 14.2 Line spacing options.

Creating, modifying and applying styles

1. **Create** a new style (for example **Heading1** or **Body**): choose a name, set the font, size, colour, alignment and spacing.
2. **Apply** it by selecting the text and choosing the style from the styles list. Never format each paragraph by hand.
3. **Modify or update** the style (for example change the font size); all text with that style updates automatically.
4. Use a **different style** for headings, body text, captions, lists and table text, so that the structure is clear.

CORPORATE HOUSE STYLE

A **corporate house style** is a **set of rules** for an organisation's documents: **colours, fonts, logo position, layout and language**. Its **purpose** is to give all documents a **consistent, recognisable identity**, make the organisation look **professional**, and save time because the design decisions have already been made. It is applied through **styles and templates**.

EXAM TIP

A common mistake is applying **inconsistent styles** (for example two different heading sizes). Use styles, not manual formatting, and **check** every heading, list and paragraph.

Exercise 14: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 14.1 State the difference between a serif and a sans-serif font.
- 14.2 Give **two** advantages of using styles.
- 14.3 State **three** settings that can be defined in a style for body text.
- 14.4 Explain what is meant by a corporate house style.
- 14.5 A style named Heading1 is changed from 14 pt to 16 pt. Describe the effect on the document.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Styles** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic:=14.

EXAM-STYLE QUESTION · 14 · [5 marks]

A company wants all its documents to follow the same corporate house style.

- (a) Describe **two** features that could be part of the company house style. [2]
- (b) Explain **two** benefits to the company of using a corporate house style. [2]
- (c) State how a style can be used to change all headings from blue to red at the same time. [1]

15 Proofing

Syllabus reference: **Section 15 (15.1, 15.2)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Use **spell check** and **grammar check** and understand that their suggestions are not always right
- Describe the **validation checks**: range, character, length, type, format, presence
- Perform **visual verification** and **proofread** for layout and style errors
- Explain **verification** (visual check, double data entry) and why **both** validation and verification are needed

VALIDATION

automatic check by the computer that data is reasonable and allowed

range, character, length, type, format, presence

VERIFICATION

checking that data was entered or copied accurately

visual check;
double data entry

PROOFREADING

reading the finished work for layout and format errors

spacing, styles, widows, orphans, split tables

Validation can say 31/04/2025 is not a date, but cannot tell that 11/04/2025 was meant to be 11/05/2025.

Figure 15.1 Validation, verification and proofreading.

15.1 Software tools

Use **automated tools** (**spell check** and **grammar check**) to remove errors, and make **appropriate changes**. **Spell check does not always give the correct response**: it cannot find a **correctly spelled but wrong word** (*there* for *their*, *form* for *from*), it may flag **names and technical terms**, and its suggestion may be the wrong word. Always **read the suggestion** before accepting it.

VALIDATION

Validation is an **automatic check by the computer** that data entered is **reasonable and allowed**. It **reduces** data-entry errors but **cannot prove the data is correct**.

Check	What it does	Example and test
Range check	Data must lie between a lower and upper limit	Month 1 to 12: 13 rejected
Character check	Only allowed characters (letters, digits, symbols)	Surname: no digits; Smith3 rejected
Length check	Data has an exact or limited number of characters	8-digit phone number: 1234 rejected
Type check	Data is the right data type (integer, text, date)	Age must be an integer: twelve rejected
Format check	Data is in the correct pattern	Date dd/mm/yyyy: 2025-04-11 rejected
Presence check	A required field is not left empty	Surname field blank is rejected

In **databases and spreadsheets** validation is set on a field or cell (**data validation** rules, with an **error message** shown for invalid data).

15.2 Proofing techniques

VERIFICATION

Verification checks that data has been **entered or copied accurately**. Methods: **visual checking** (comparing the entered data with the source, on screen or on paper) and **double data entry** (the data is typed in **twice** and the computer compares the two entries). Both reduce data-entry errors. **Verification is needed in addition to validation**, because valid data can still be wrong.

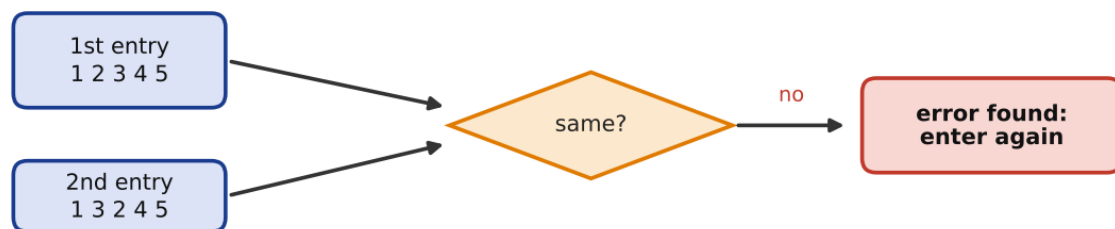


Figure 15.2 Double data entry.

Visual verification: find and correct data-entry errors such as **transposed numbers** (2158 typed as 2518), **incorrect spelling**, **inconsistent character spacing** (double spaces) and **inconsistent case** (some words with capitals, some without).

Proofreading: read the finished work carefully and correct:

- **Inconsistent line spacing** (single in one place, 1.5 in another).
- **Blank pages or slides;** delete them.
- **Widows and orphans:** a **widow** is the last line of a paragraph alone at the top of a page; an **orphan** is the first line of a paragraph alone at the bottom of a page.
- **Inconsistent or incorrect use of styles** (for example different heading sizes).
- **Tables and lists split** over columns or pages/slides.

EXAM TIP

Spell-check is **not enough**. Allow time at the end of a practical paper to **proofread each page**. Compare every figure you typed with the source, and check that your name, centre number and candidate number are on the evidence.

Exercise 15: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 15.1** Give **one** reason why a spell checker may not find all errors.
- 15.2** A form asks for a month of the year as a number. State the validation check and one value that would be rejected.
- 15.3** State the validation check that stops a field being left blank.
- 15.4** Explain the difference between validation and verification.
- 15.5** Explain why validation cannot guarantee that data is correct.
- 15.6** Describe what a widow is in a word-processed document.
- 15.7** Describe **two** things you check when proofreading a table.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Proofing** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=15.

EXAM-STYLE QUESTION · 15 · [6 marks]

A clerk types customer records into a database. Each record has a customer ID (6 characters), a date of birth and a telephone number.

- (a) Name **two** validation checks that could be used for the telephone number field. [2]
- (b) Describe **one** method of verification the clerk could use. [2]
- (c) Explain why both validation and verification are needed. [2]

16 Graphs and Charts

Syllabus reference: **Section 16** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- **Select data** (contiguous, non-contiguous, specified ranges) and the correct **chart type**
- **Label** a chart: title, legend, axis titles and labels, sector labels, values, percentages
- Add a **second data series** and a **second axis**
- **Format** numbers, set **axis scale** (minimum, maximum, increments), and enhance a chart (colours, pie sector extraction)

Choosing the chart type

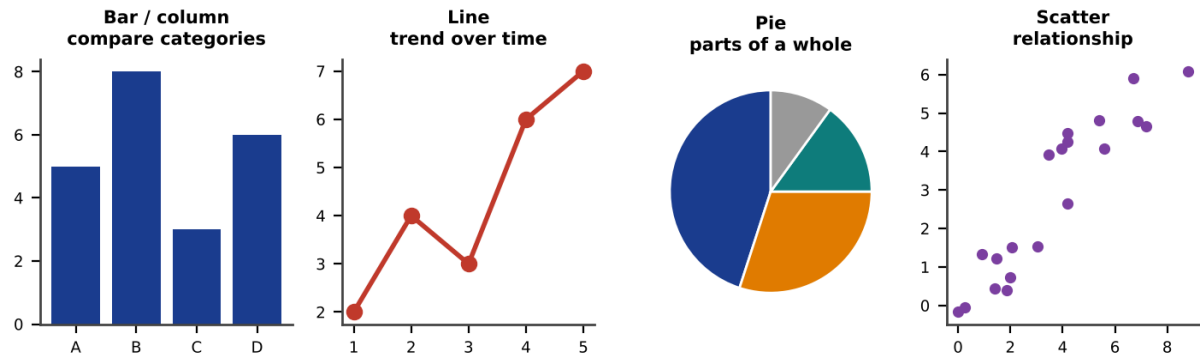


Figure 16.1 Common chart types.

Chart	Use it for	Notes
Bar or column chart	Comparing values in different categories	Bars can be clustered for two or more series
Line graph	Showing a trend over time (continuous data)	Points joined by a line; several series possible
Pie chart	Showing parts of a whole (shares, percentages)	Use one data series ; sector labels and percentages are needed; extract (explode) a sector to emphasise it
Scatter graph	Showing the relationship between two sets of numbers	Points are not joined

Selecting the data

- **Contiguous data:** a block of cells together, for example A1:B6, selected by dragging.
- **Non-contiguous data:** separate blocks, for example the names in A2:A6 and the values in D2:D6; hold **Ctrl** while selecting the second block.
- **Specified data ranges:** type or select the exact ranges given in the task. Check that **labels (not data)** are used for the category axis and **series names**.

Labelling a chart

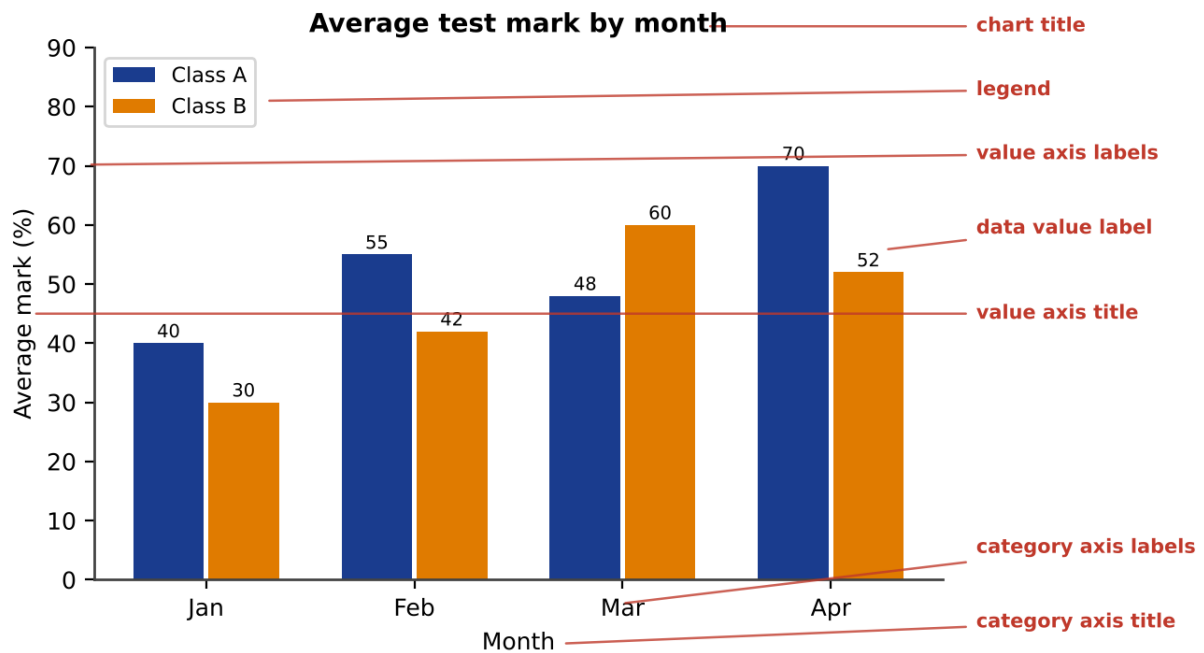


Figure 16.2 The parts of a chart that may need labels.

- **Chart title**; **legend** (key to the series); **category axis title** and **value axis title**; **category axis labels** and **value axis labels**.
- For pie charts: **sector labels**, **sector values** and **percentages**.
- **Data value labels** on the bars/points when asked.

Second series and second axis

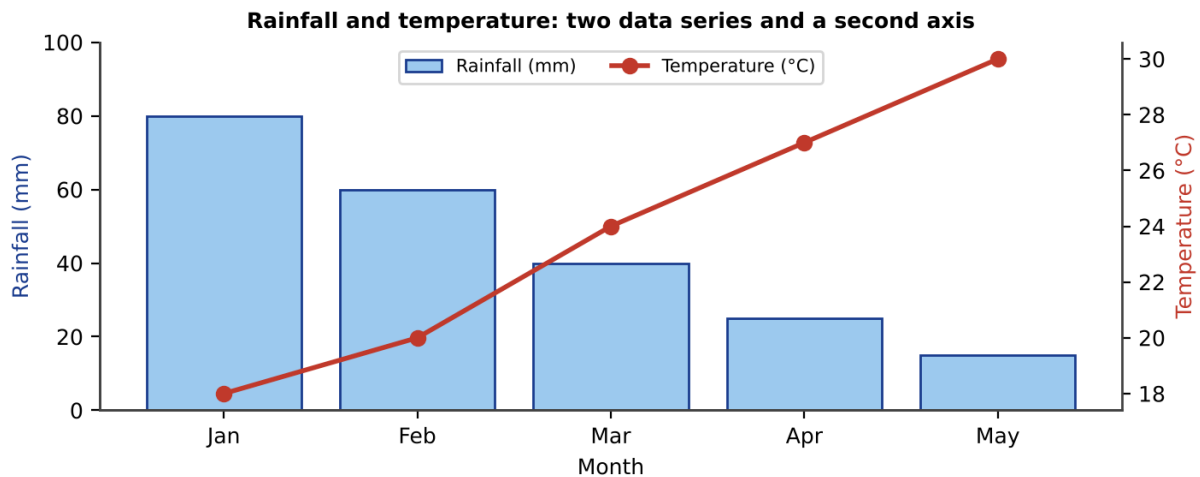


Figure 16.3 A column series with a line series on a second axis.

Add a second data series to compare two sets of data. Use a **second axis** when the series have **different units or scales** (for example rainfall in mm and temperature in °C), so both can be read clearly. Give each axis its own title.

Formatting

- **Number format:** set the **decimal places** (for example 2) and a **currency symbol** (for example E or \$) on value labels and axis.
- **Axis scale:** set the **minimum and maximum** values and the **major unit (increment)**, for example 0 to 100 in steps of 10.
- **Enhance:** change the **colour scheme or fill patterns**; **extract a pie sector**; resize and position the chart as asked.

EXAM TIP

Read the task wording exactly: if it says *the chart must show only the Name and Total columns*, a chart with all columns loses the mark. Always **add titles and axis titles** unless told not to, and make the text **readable** in your evidence.

Exercise 16: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 16.1** State the most suitable chart type for showing the percentage of a class that chose each sport.
- 16.2** A task says to chart the names (A2:A6) and the totals (D2:D6). State how to select the data.
- 16.3** State **three** labels that a chart should have.
- 16.4** Explain why a second axis is used when plotting rainfall and temperature together.
- 16.5** Describe how to make a pie chart sector stand out.
- 16.6** Describe how to change a value axis to run from 0 to 100 in steps of 20.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Graphs and Charts** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=16.

EXAM-STYLE QUESTION · 16 · [7 marks]

A teacher has a spreadsheet with learners' names in column A and their marks for Test 1 (column B) and Test 2 (column C).

- (a) Name the most suitable chart type to compare each learner's marks in the two tests. [1]
- (b) Describe how the teacher selects the data for the chart. [2]
- (c) List **four** features that the teacher should add to the chart so that it can be understood. [4]

17 Document Production

Syllabus reference: **Section 17** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- **Organise page layout:** page size, orientation, margins, columns, column width and spacing, breaks
- **Format text:** line spacing, tabs, indents, enhancement, case, lists
- Use **find and replace**, and **bookmarks and hyperlinks**
- Explain **pagination** and the **gutter margin**

Paper 2 includes a **document production** task: you are given a source file and a series of steps. Work in order, and check each requirement.

Page layout

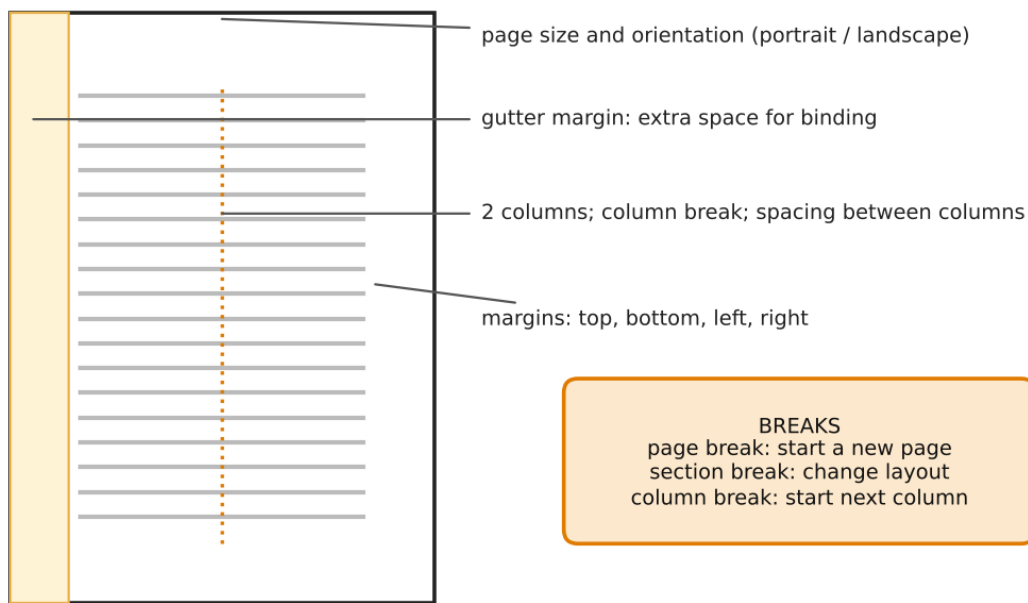


Figure 17.1 Page layout features.

- **Page size** (A4, A5, letter) and **orientation**: **portrait** (taller than wide) or **landscape** (wider than tall).
- **Page margins**: the blank space at the **top, bottom, left and right** edges. Set exact values (for example 2.5 cm).
- **Number of columns, column width and spacing between columns**: newspaper-style text. Use **column breaks** to start the next column.
- **Set and remove breaks**: **page break** (next page), **section break** (lets different sections have different layout, columns, orientation or headers), **column break**.

PAGINATION AND GUTTER

Pagination is the **division of a document into pages**. Page, section and column breaks **control where a page or column ends**, so that headings stay with their text, tables are not split and each section starts where it should. A **gutter margin** is **extra space added at the inside (binding) edge** so that text is not lost in the binding when pages are printed and bound.

Formatting text

L tab	C tab	R tab	D tab
Item	Qty	Price	Total
Pen	12	3.5	42.00
Ruler	4	12.25	49.00

Hanging indent:
 Term The first line starts at the left margin and all the other lines are indented, as in a glossary or reference list.

Bullet list • item (shape, alignment, indent can be set)
 Numbered list 1. item 2. item

Figure 17.2 Tabs, hanging paragraphs and lists.

Feature	Options and use
Line spacing	Single, 1.5 lines , double, or a multiple (for example 1.15); also spacing before and after paragraphs
Tabulation	Left, right, centred and decimal tabs : line up columns of text and numbers without using spaces. A decimal tab aligns numbers on the decimal point
Indents	Indented paragraphs move the whole paragraph in from the margin; hanging paragraphs indent all lines except the first
Text enhancement	Bold, underline, italic, superscript (x^2), subscript (H_2O), and changes in case (UPPER, lower, Title Case, Sentence case)
Lists	Bulleted and numbered lists; edit the shape, numbering style and indent

Find and replace and navigation

- **Find and replace** text: **replace one word or phrase with another** throughout the document, using **match case** (*Mark* is not *mark*) and **whole words only** (so *art* does not change *part*). Check each change: **Replace All** can create errors.
- **Navigation**: add and delete **bookmarks** (a named place in the document) and **hyperlinks** (to a bookmark, another file or a web page) so the reader can jump to a place.

EXAM TIP

When a task says **single spacing for the table but 1.5 for the text**, use **styles**, not manual spacing. Check the final document for **blank pages** and **headings at the bottom of a page** (pagination).

Exercise 17: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 17.1** State the difference between portrait and landscape orientation.
- 17.2** Describe the purpose of a section break.
- 17.3** Explain why a gutter margin is used.
- 17.4** State which tab should be used to line up prices with the decimal points.
- 17.5** Explain why "whole words only" should be selected in find and replace when changing the word *art* to *painting*.
- 17.6** Describe how to create a hanging paragraph.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Document Production** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic:=17.

EXAM-STYLE QUESTION · 17 · [6 marks]

You are given a word-processed article that must be printed in two columns on an A4 page and bound as a booklet.

- (a) State **two** page-layout settings that must be changed so the article is in the correct format. [2]
- (b) Explain the purpose of setting a gutter margin for the booklet. [2]
- (c) The heading of a section is at the bottom of a page and its text starts on the next page. Describe how to correct this. [2]

18 Databases

Syllabus reference: **Section 18 (18.1 to 18.3)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- **Create a database structure:** import data, set field names, data types, display formats, **primary and foreign keys** and **relationships**
- Create and use a **data entry form**; explain **good form design**
- Compare a **flat file** and a **relational** database
- **Perform calculations, sort and search** data (single and multiple criteria, operators and wildcards)
- Produce **reports** with headers, footers, titles, alignment and number formats

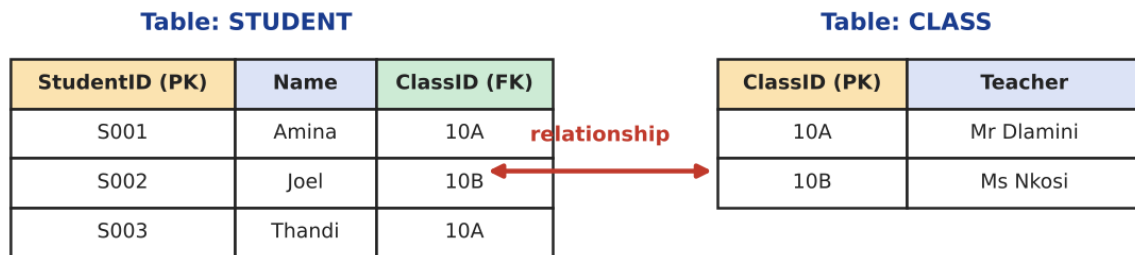
DATABASE

A **database** is an **organised collection of data**. A **table** holds the data in **records** (rows) made of **fields** (columns). Each field has a **name** and a **data type**.

18.1 Create a database structure

- **Import** data from existing files (.csv, .txt) into a new table, choosing the delimiter and whether the first row holds field names.
- **Create tables with specified field names**; choose the right data type for each field.

Data type	Use	Options
Text (alphanumeric)	Names, codes, addresses, phone numbers (do not calculate with them)	Field length
Numeric: integer	Whole numbers	No decimal places
Numeric: decimal	Numbers with fractions	Number of decimal places ; percentage sub-type
Numeric: currency	Money values	Currency symbol and decimal places
Date/time	Dates and times	Display format (dd/mm/yyyy, 12 or 24 hour)
Boolean / logical	Only two values	Display as Yes/No, True/False or check box



PRIMARY KEY (PK): a field whose value is unique for every record, so it identifies it.
 FOREIGN KEY (FK): a field that holds the primary key of another table and so links the tables.

One ClassID (10A) is stored once in CLASS and used many times in STUDENT:
 no repeated data, and a change is made in one place only.

Figure 18.1 Primary key, foreign key and a relationship.

	Flat file database	Relational database
Structure	One table holds all the data	Two or more linked tables
Data	Data is repeated (for example a teacher's name on every learner)	Each item is stored once and linked by keys
Advantages	Simple to set up and use; suited to small amounts of data	Less repeated data , fewer errors, easier to update, saves storage ; can answer complex queries
Disadvantages	Data duplication ; errors when updating; wastes space	More complex to design and set up; needs more skill

Primary key: the field that **uniquely identifies each record** (no duplicates, never empty), such as StudentID.

Foreign key: a field in one table that is the **primary key of another table**; it creates the **relationship** between the tables. **Create and edit** keys in the table design, and **create relationships** between the tables.

Data entry forms

Figure 18.2 A data entry form with different controls.

- **Create a form** with the specified fields in the right order, with a **clear title**, **appropriate font styles and sizes**, **appropriate spacing** between fields, **character spacing** of fields, and good use of **white space**.
- Use **radio buttons** (choose one), **check boxes** (yes/no) and **drop-down menus** (choose from a list) to **limit what can be entered**, which reduces errors.

GOOD FORM DESIGN

A good form has a **clear title**, **labels placed next to each field**, **logical order**, **enough space** for the data, **consistent fonts and alignment**, **instructions**, **limited choices** (radio buttons, drop-downs), a **minimum of text**, and **validation** on fields.

18.2 Manipulate data

- **Calculations:** use **calculated fields** (in a query) or **calculated controls** (in a form/report), with arithmetic operators or functions to perform calculations at run time: **+**, **-**, **x**, **÷**, **SUM**, **AVERAGE**, **MAX**, **MIN**, **COUNT**. For example Total: [Price]*[Qty].
- **Sort:** put records in **ascending or descending order** using one or more fields (for example by Class **ascending**, then Mark **descending**).
- **Search and select:** run a **query** to select a **subset** of records with one or more criteria.

Operator	Meaning	Example
= <>	equal to; not equal to	[Class] = "10A"; [Class] <> "10A"
> < >= <=	greater than; less than; greater than or equal to; less than or equal to	[Mark] >= 50
AND	both conditions true	[Class]="10A" AND [Mark]>=50
OR	either condition true	[Class]="10A" OR [Class]="10B"
NOT	excludes	NOT [Class]="10A"
LIKE with a wildcard	matches a pattern: * (or %) stands for any characters; ? (or _) for one character	[Surname] LIKE "D*" (starts with D)

EXAM TIP

A **query with two criteria** on **different rows** works like **OR**; on the **same row** they work like **AND**.
Check the number of records returned in your results against the data.

18.3 Present data: reports

Report header: Learners by class			report header (title, once at the start)
Page header: Name	Class	Mark	page header (column headings, every page)
Amina Dlamini	10A	60.50	detail: the records; numbers right-aligned, same decimal places, currency symbol
Amina Dlamini	10A	63.50	
Amina Dlamini	10A	66.50	
Amina Dlamini	10A	69.50	
Amina Dlamini	10A	72.50	
Amina Dlamini	10A	75.50	
Amina Dlamini	10A	78.50	
Page footer: Page 1 of 2			page footer (page numbers)
Report footer: Average mark 67.50			report footer (totals, once at the end)

Figure 18.3 The sections of a database report.

- **Produce a report** showing **all required data and labels in full** (widen fields; nothing truncated).
- Use a **report header/footer** (title and totals, once) and **page header/footer** (column headings and page numbers, on every page); set the **report title**.
- Choose the **layout: tabular** (columns) or **columnar** (one record at a time); control which data and labels are shown.
- **Align** data and labels: **right-align numbers** and **align decimals**; set **decimal places, currency symbol and percentage** display.

Exercise 18: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 18.1** Explain what a primary key is.
- 18.2** Describe **one** disadvantage of a flat file database.
- 18.3** State the best data type for each: (a) a telephone number, (b) a price in dollars, (c) whether a book is on loan.
- 18.4** Write the search criteria to find learners in class 10A with a mark below 40.
- 18.5** State what the search [Surname] LIKE "S*" finds.
- 18.6** Describe **two** features of a well designed data entry form.
- 18.7** Explain why numbers in a report are right-aligned.
- 18.8** State where in a report the total of a column is displayed once.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Databases** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic=18.

EXAM-STYLE QUESTION · 18 · [8 marks]

A school stores learner and club information. The LEARNER table has LearnerID, Surname, Form, ClubID. The CLUB table has ClubID, ClubName, Teacher.

- (a) State which field is the primary key in the CLUB table and which is the foreign key in the LEARNER table. [2]
- (b) Give **two** advantages of using a relational database rather than a flat file for this data. [2]
- (c) Write the search criteria to find learners in Form 4 whose surname starts with M. [2]
- (d) Describe how the report should show a total number of learners per club. [2]

19 Presentations

Syllabus reference: **Section 19** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- **Create a presentation** (for example from a text file) and use a **master slide**
- **Edit** a presentation: layouts, new slides, moving and deleting slides, objects, notes
- Insert and edit **hyperlinks** and **action buttons**; add **alternative text**
- Apply consistent **transitions and animations**; **hide** slides
- **Output** the presentation: looped carousel or presenter controlled; print **slides, notes, handouts**

Create a presentation and use the master slide

A presentation can be created from scratch or from a **text file** (an outline: each heading becomes a slide title, indented lines become bullets).

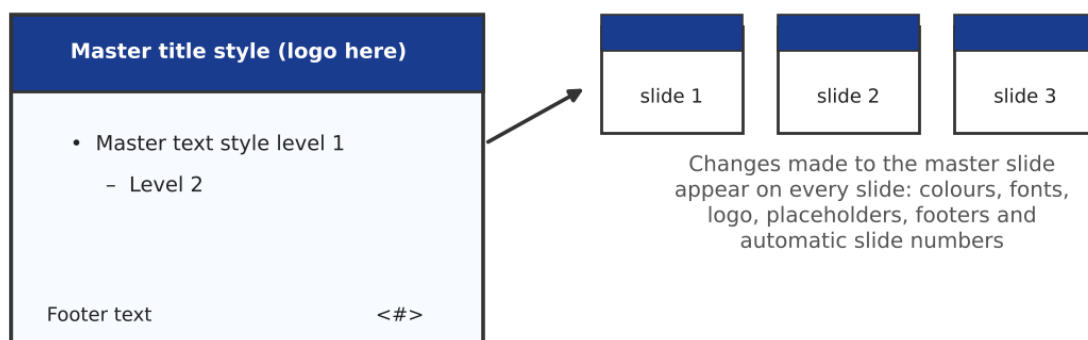


Figure 19.1 The master slide controls every slide.

MASTER SLIDE

The **master slide** is a template that **controls the appearance of all slides**. Objects and formatting placed on it appear **consistently** on every slide, so you do not format each slide by hand.

- **Insert and edit objects** on the master: images, text, shapes, **logos, slide headers and footers, placeholder positions, automated slide numbering**.
- **Format master objects**: headings, subheadings, bullet styles, **background colour**.

Edit a presentation

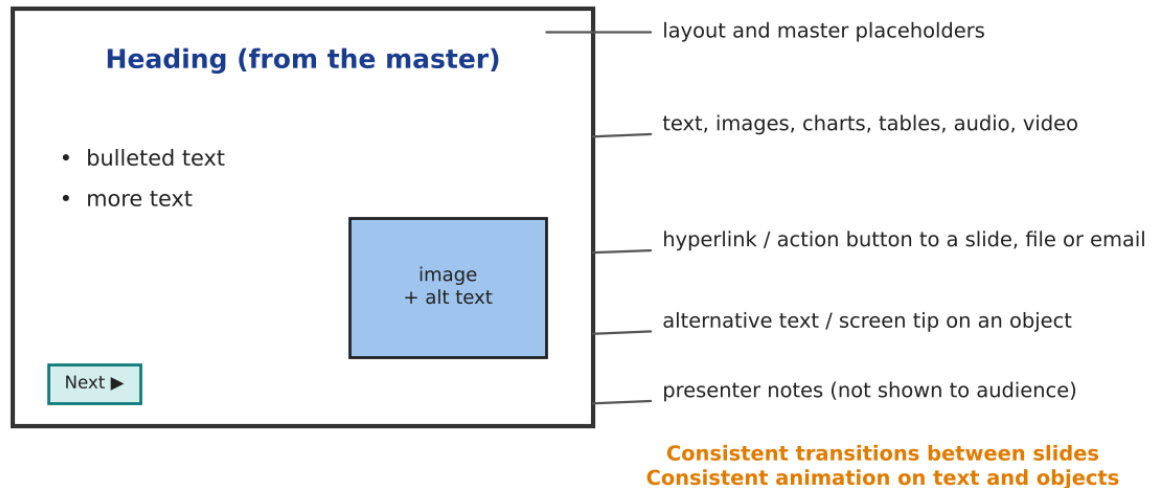


Figure 19.2 Features of a slide.

- **Apply a slide layout** (title, title and content, two content) and **insert a new slide**; **move or delete** slides (slide sorter or panel).
- **Insert and edit objects**: text (headings, subheadings, bulleted lists), **images** (still images, **video clips**, **animated images**), **charts**, **tables**, **audio clips**, **symbols**, **lines**, **arrows**, **call-out boxes** and **shapes**.
- **Add presenter notes**: text for the speaker, not shown to the audience.
- **Add alternative text or a screen tip** to an object, so that it can be read by a screen reader and described to people who cannot see it.
- **Hide slides** that are in the file but not shown in the slide show.

Hyperlinks, action buttons, transitions and animations

Feature	What it does	Settings
Hyperlink	Text or an object jumps to a slide in the same presentation, an external file , a web page or an email address	Select the text or object, then insert hyperlink and choose the destination
Action button	A button that navigates (next, previous, first, a specified slide or file)	Insert the button shape and set the action
Transition	The effect between slides (fade, wipe)	Apply the same transition to every slide for consistency
Animation	Movement of text, images and objects on a slide (appear, fly in)	Apply consistent effects ; set the order and start (on click, automatically)

Output

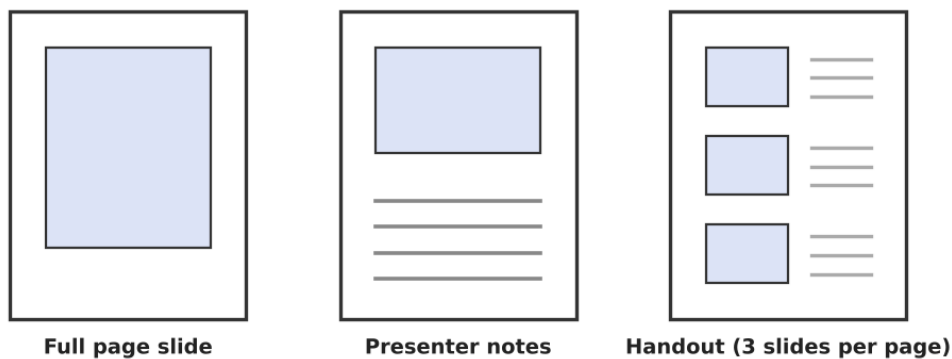


Figure 19.3 Printed layouts: full page, notes and handouts.

- **Display:** a **looped on-screen carousel** (runs continuously with automatic timings, for a kiosk or open day) or **presenter controlled** (the speaker clicks to move on).
- **Print** in a variety of layouts: **full page slides**, **presenter notes** (slide with the notes below) and **handouts** (several slides per page).

EXAM TIP

Good presentation design: **few words** per slide, **bullet points** not paragraphs, **large readable fonts**, **high contrast** between text and background, **relevant images**, and **consistent** layout from the master. Match the **audience** (chapter 9).

Exercise 19: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 19.1** State the purpose of a master slide.
- 19.2** Name **three** objects that can be placed on a master slide.
- 19.3** Describe how an action button is used.
- 19.4** Give **one** reason for adding alternative text to an image.
- 19.5** Describe the difference between a looped carousel and a presenter-controlled presentation.
- 19.6** A teacher wants to give learners a paper copy of the slides to write notes on. State the print layout.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Presentations** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic=19.

EXAM-STYLE QUESTION · 19 · [6 marks]

Sipho builds a ten-slide presentation about healthy eating for Grade 7 learners. It will play on a screen in the school hall during break.

- (a) Describe **two** ways Sipho uses the master slide to make the slides consistent. [2]
- (b) State the output mode that should be used and give a reason. [2]
- (c) Describe **two** features that make the presentation suitable for Grade 7 learners. [2]

20 Spreadsheets

Syllabus reference: **Section 20 (20.1 to 20.3)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- **Create and edit** a spreadsheet model: insert and delete cells, rows and columns, merge cells
- Create **formulae** with cell references; use **relative and absolute** references; **named cells and ranges**
- Use **functions**: SUM, AVERAGE, MAX, MIN, INT, ROUND, COUNT, IF, LOOKUP, VLOOKUP, HLOOKUP, XLOOKUP, and **nested functions**
- **Sort** and **search/select** data with operators and wildcards
- **Format and present**: display formulae or values, visibility, wrap text, number formats, **conditional formatting**, page layout

20.1 Create a data model

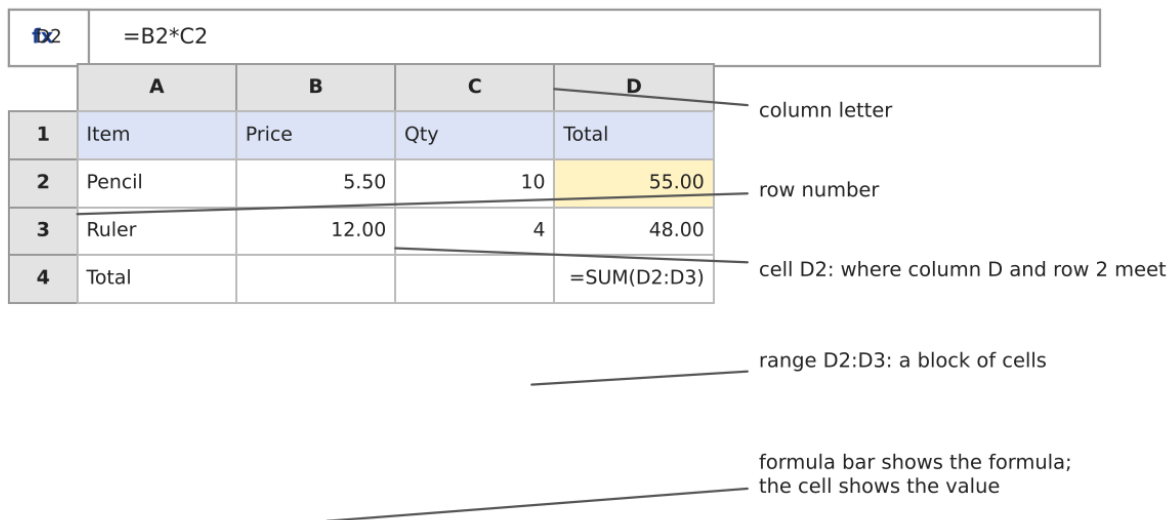


Figure 20.1 Cells, rows, columns, ranges and the formula bar.

A **spreadsheet model** uses **formulae** so that results **update automatically** when the data changes. Edit the model by **inserting or deleting cells, rows and columns**, and **merging cells** for titles.

	Formula	Function
Meaning	A calculation you write yourself , starting with =, using cell references and operators	A ready-made calculation with a name that takes arguments
Example	=B2*C2	=SUM(B2:B9)

ORDER OF OPERATIONS

Spreadsheets calculate in this order: **brackets first**, then **indices (powers, ^)**, then **multiplication and division** (left to right), then **addition and subtraction**. Use **brackets** to make a formula work as intended: =(A1+B1)/2 is the mean, but =A1+B1/2 is not.

Arithmetic operators: + (add), – (subtract), the **asterisk symbol** (multiply), / (divide), ^ (indices/power).

Cell referencing

	A	B	C
1	Price	Qty	Cost
2	5	2	=A2*B2
3	8	3	=A3*B3
4	VAT	0.15	
5			

RELATIVE reference A2*B2

Copied down it changes: A3*B3, A4*B4

ABSOLUTE reference B4

Copied anywhere it stays B4
(\$ locks the column and the row)

e.g. =A2*B2*(1+B4) copied down

Figure 20.2 Relative and absolute references when a formula is replicated.

- **Relative reference (A2):** changes when the formula is **copied or replicated** to another cell, relative to the new position. Use for calculations repeated down a column.
- **Absolute reference (\$B\$4):** **does not change** when copied; the \$ locks the column and/or row. Use for a **fixed value** such as VAT or an exchange rate in one cell.
- **Named cell or named range:** give a cell or range a **name** (for example VAT) and use it in formulae: =A2*(1+VAT). It is clearer and acts as an absolute reference.

EXAM TIP

Replicate formulae by copying and pasting or dragging the fill handle. Always **check one copied formula** to see that references moved (or stayed) correctly: this is a very common source of errors.

Functions

Function	What it does	Example
SUM	Adds a range	=SUM(B2:B9)
AVERAGE	Calculates the mean	=AVERAGE(B2:B9)
MAX, MIN	Largest and smallest value	=MAX(B2:B9)
COUNT	Counts cells containing numbers (COUNTA counts any entries; COUNTIF counts cells meeting a condition)	=COUNT(B2:B9)
INT	Whole-number part (rounds down)	=INT(7.8) gives 7
ROUND	Rounds to a number of decimal places	=ROUND(B2,1)
IF	Returns one result if a test is true and another if false	=IF(B2>=50,"Pass","Fail")
LOOKUP, VLOOKUP, HLOOKUP, XLOOKUP	Find a value in a table and return a related value	=VLOOKUP(B2,F2:G5,2,FALSE)

Grade table (F2:G5)			=VLOOKUP(B2, F2:G5, 2, TRUE)	
1	0	U	B2	the value to look up (mark 72)
2	40	C	F2:G5	the lookup table
3	60	B	2	return from column 2 of the table
4	80	A	TRUE	approximate match (FALSE = exact match)

mark 72 falls between 60 and 80, so the result is B

VLOOKUP searches DOWN the first column.
HLOOKUP searches ALONG the top row.
XLOOKUP can search any column or row.

Figure 20.3 VLOOKUP with an approximate match.

WORKED EXAMPLE: A NESTED IF

A **nested function** has one function **inside** another: =IF(B2>=80,"A",IF(B2>=60,"B","C")). The inner IF is only used when the first test is false. You can also nest functions inside others, for example =ROUND(AVERAGE(B2:B9),1). **External data sources** can be used inside functions, for example a lookup table in another sheet or workbook, written as =VLOOKUP(A2,Prices!\$A\$2:\$B\$20,2,FALSE).

20.2 Manipulate data

- **Sort** by **one or more criteria** in **ascending or descending** order, for example by Class A to Z, then by Mark highest to lowest. **Select all the data** (including all columns) before sorting so records stay together.
- **Search and select** a subset using a **filter** or a query-style search with **AND, OR, NOT** and the operators **>, <, =, >=, <=, <>**; use **wildcards** (for example D* matches any text starting with D).

20.3 Present data

Skill	How and why
Display formulae or values	Show the cells' contents as formulae (to prove the method) or as values (the results). Evidence often needs both
Row height, column width, cell size	Make sure all data, labels and formulae are fully visible (no ##### or cut-off text); wrap text inside cells
Hide / display rows and columns	Hide data that must not be printed (for example working columns), and show it again when needed
Enhance	Text colour, cell colour, bold, italic, underline, shading for headings and totals
Number formats	Set decimal places, currency symbols (E, \$, £) and percentages
Conditional formatting	Format changes automatically depending on the cell's contents, for example marks below 40 shown in red
Page layout	Portrait or landscape; specified number of pages (fit to one page wide); print area ; show or hide gridlines and row/column headings

EXAM TIP

Before the final printout, **check** column widths, that numbers show the **correct decimal places and currency**, and that your **name, centre and candidate numbers** are in the header or footer.

Exercise 20: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 20.1** State the difference between a formula and a function.
- 20.2** Explain why $=A1+B1/2$ does not calculate the mean of A1 and B1.
- 20.3** A VAT rate is in cell F1. Write a formula for D2 to add VAT to the price in B2 so it can be copied down.
- 20.4** State what happens to the reference A2 when a formula is copied one cell down, and what happens to \$A\$2.
- 20.5** Write a formula to display "Yes" if cell C2 is greater than 100, otherwise "No".
- 20.6** Describe what conditional formatting is and give an example.
- 20.7** Explain why you should select all the columns before sorting a list.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Spreadsheets** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=20.

EXAM-STYLE QUESTION · 20 · [6 marks]

A shop keeps a spreadsheet. Column A holds item names, column B the price, column C the quantity sold. The VAT rate is in cell F1.

- (a) Write a formula for D2 to calculate the sales value excluding VAT. [1]
- (b) Write a formula for E2 to calculate the sales value including VAT, which can be replicated down column E. [2]
- (c) Write a formula to find the highest quantity sold. [1]
- (d) Describe how the shop could show items with quantity below 5 in red text automatically. [2]

21 Website Authoring

Syllabus reference: **Section 21 (21.1 to 21.3)** · [Practice tests for this topic](#)

BY THE END OF THIS CHAPTER YOU SHOULD BE ABLE TO

- Describe the **three web development layers**
- Create web pages with **HTML**: head and body, **metatags**, tables, images, media, div, headings, lists, classes, bookmarks, **hyperlinks**
- Use **CSS**: external stylesheets, inline styles and classes; font, background, table and border properties
- Explain **relative and absolute file paths**, and the **style/class** and **attached/inline** differences

Paper 3 includes a **website authoring** task. You may use web editing software, but you must be able to **edit the HTML and CSS code** it produces. No scripting is required.

21.1 Web development layers

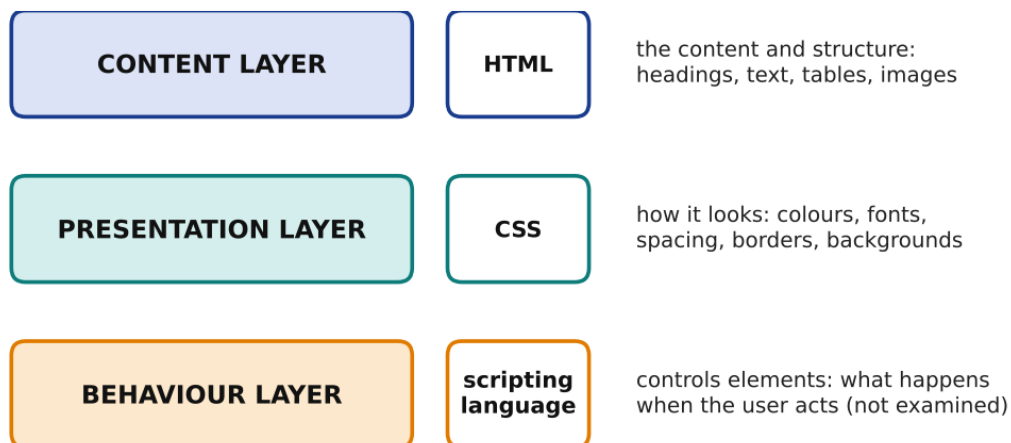


Figure 21.1 The three layers of web development.

21.2 Create a web page with HTML

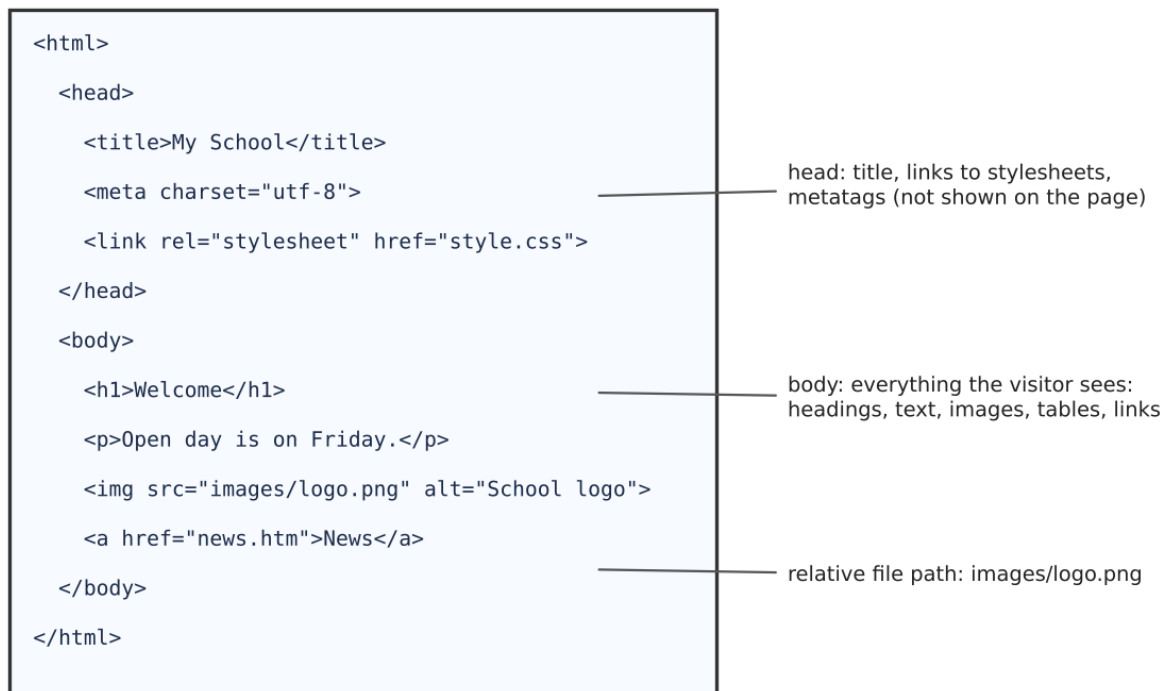


Figure 21.2 The structure of an HTML page.

A COMPLETE PAGE

```

<!DOCTYPE html>
<html>
<head>
  <title>Esigangeni High School</title>
  <meta charset="utf-8">
  <meta name="author" content="Q Dlamini">
  <meta name="description" content="School website">
  <meta name="keywords" content="school, ICT">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <base target="_blank">
  <link rel="stylesheet" href="style.css">
</head>
<body>
  <h1 class="title">Welcome</h1>
  <p>Read our <a href="news.htm">news</a>.</p>
</body>
</html>

```

In the head	Purpose
<title>	Text shown in the browser tab
<link rel="stylesheet" href="style.css">	Attaches an external stylesheet using a relative file path ; if several are attached, the later one has priority
<meta charset="utf-8">	Sets the character set so text displays correctly
<meta name="author" / "description" / "keywords" content="...">	Names the author, describes the page and gives keywords for search engines
<meta name="viewport" ...>	Makes the page display well on all devices , including phones
<base target="_blank">	Sets the default target window for hyperlinks

METATAGS AND THE TWO SECTIONS

The **head section** holds information **about** the page (title, stylesheets, metatags); it is **not displayed** in the page itself. The **body section** holds the **content that is displayed**. **Metatags** ("data about data") define the character set, keywords, author, description and viewport.

TEXT, LISTS, IMAGES, MEDIA

```
<h1>Main heading</h1>    <h2>Sub heading</h2>    <h3>Smaller heading</h3>
<p>A paragraph of text.</p>
<ul> <li>unordered (bulleted) item</li> </ul>
<ol> <li>ordered (numbered) item</li> </ol>

<audio src="song.mp3" controls autoplay></audio>
<video src="clip.mp4" controls width="320"></video>
<div class="box"> <p>Text inside a division</p> </div>
```

- **Images:** set **width/height** (keep the **aspect ratio**) and always add **alternative text** (alt) for users who cannot see the image.
- **Sound and video:** **controls** shows play/pause controls; **remove controls** by leaving the attribute out; **autoplay** starts it automatically.
- **<div>:** a **division** that groups elements so that **styles and classes** can be applied to the whole group.

TABLES

```
<table border="1" style="width:80%">
  <tr> <th colspan="2">Timetable</th> </tr>
  <tr> <td rowspan="2">Mon</td> <td>ICT</td> </tr>
  <tr> <td>Maths</td> </tr>
</table>
```

<table> makes a table, **<tr>** a row, **<th>** a header cell and **<td>** a data cell. **colspan** and **rowspan** make a cell span more than one column or row. Table and cell sizes can be set in **pixels (px)** or **percentages (%)**. Tables are used to **structure and align** elements on a page (for example a menu beside text).

Hyperlinks and bookmarks

LINKS

```
<a href="news.htm">Local page (relative path)</a>
<a href="https://www.example.com" target="_blank">Website by URL, new window</a>
<a href="mailto:office@school.org">Send email</a>
<a href="#contact">Jump to bookmark on this page</a>
<h2 id="contact">Contact us</h2>          <!-- the bookmark, made with an id -->
<a href="news.htm"></a>      <!-- image as a link -->
```

HYPERLINK, ANCHOR AND BOOKMARK

A **hyperlink** takes the user to another place when clicked. The **anchor tag <a>** creates the link; its **href** gives the destination. A **bookmark** is a **named place on a page**, created with an **id attribute**, which a link such as **#contact** jumps to. **target** sets where it opens: **_self** (same window), **_blank** (new window) or a **named window**.

21.3 Use stylesheets

```
p { color: blue; font-size: 12pt; }
```

selector **property** **value**

selector: which HTML tag the rule applies to. property: what to change. value: how to change it.
Each declaration ends with a semicolon, and all are inside curly brackets.

```
.note { background-color: yellow; }   a CLASS: applied with class="note" to any element
```

Figure 21.3 Anatomy of a CSS rule.

AN EXTERNAL STYLESHEET: style.css

```
/* style.css - external stylesheet for the school site */
body { background-color: #F5F5F5; font-family: Arial, sans-serif; }
h1 { color: #1A3C8E; font-size: 24pt; text-align: center; }
h2 { color: #1A3C8E; font-size: 16pt; }
p, li { font-size: 12pt; color: black; }
.note { background-color: yellow; font-weight: bold; }
table { border-collapse: collapse; width: 80%; }
th, td { border: 1px solid black; padding: 5px; text-align: left; vertical-align: top; }
th { background-color: #DCE3F6; }
```

- **CSS in the presentation layer:** create **external styles** for **h1, h2, h3, p, li, classes**, and table properties (size, background colour, **horizontal and vertical alignment, spacing, padding, borders** (collapsed, colour, thickness, visible/invisible)).
- **Font properties:** font-family, font-size, colour, text-align, **bold, italic**. **Background properties:** colour or image. **Comments** in CSS are written between **/* and */**. Save the stylesheet with the **.css** extension (cascading stylesheet format).
- **Attach** the stylesheet to every page using `<link rel="stylesheet" href="style.css">`, with a **relative path**.

	Attached (external) stylesheet	Inline style
Where	In a separate .css file linked from the head	Inside one tag: <code><p style="color:red;"></code>
Scope	Controls many pages from one file; a change updates all	Only that one element
Priority	Lowest priority; if several stylesheets are attached, the last one overrides earlier ones	Highest priority: overrides the stylesheets

	Style	Class
Applies to	Every instance of an HTML tag (all p, all h1)	Only elements that are given the class name , of any tag
Written	<code>p { ... }</code>	<code>.note { ... }</code> and <code><p class="note"></code>

RELATIVE AND ABSOLUTE FILE PATHS

A **relative file path** gives the location **from the current page** (images/logo.png). An **absolute file path** gives the **full location** (C:/Users/.../logo.png). **Absolute paths must not be used for locally saved pages, images and stylesheets**, because the files will not be at that location when the website is moved to another computer or a server, so the links, images and styles **break**. **Relative paths must be used for attached stylesheets** for the same reason.

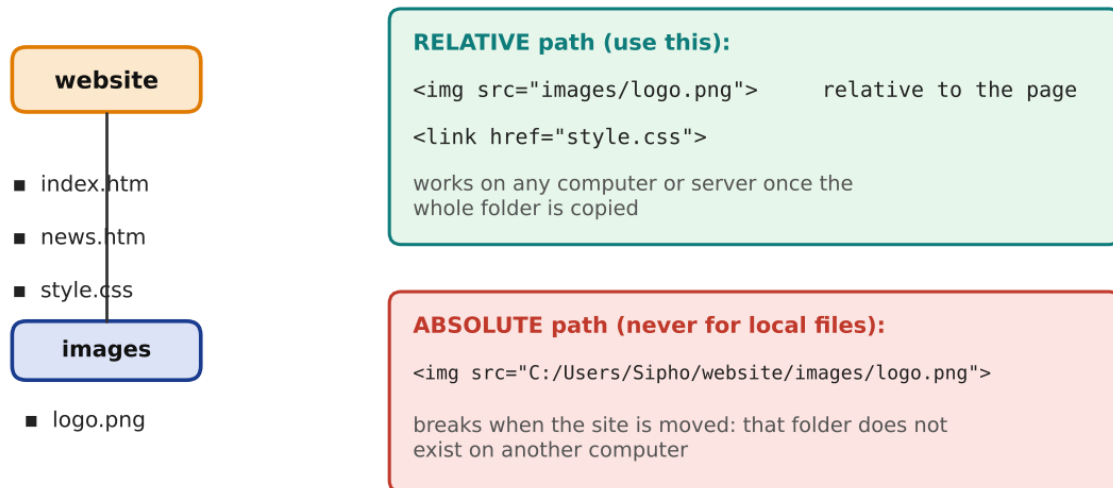


Figure 21.4 Relative paths work when the site is moved.

EXAM TIP

In the exam, **work in the HTML (source) view**, save **all files in one site folder** with the structure given, and use **relative paths**. Take a screenshot of the **browser view** and of the **HTML view** when asked. Check that every image has **alt text**.

Exercise 21: check your understanding

Answer in your exercise book, then check your work in the **Answer Key** at the back of this guide.

- 21.1** Name the three layers of web development and state what each does.
- 21.2** State **two** items that are placed in the head section.
- 21.3** Write the HTML to display the image logo.png from the folder images, with alternative text "School logo".
- 21.4** Write a CSS rule to make all level 1 headings centred and red.
- 21.5** Explain why an absolute file path should not be used for an image on a locally stored web page.
- 21.6** Describe the difference between a style and a class.
- 21.7** Write the HTML to make the text *Top* a link to a bookmark with id="top".
- 21.8** Explain the purpose of the viewport metatag.

PRACTISE THIS TOPIC ON THE WEB APP

Open **Practice Center** → **IGCSE** → **ICT 0417** and choose the tests for **Website Authoring** at www.sigungusekuyala.com/Practice?subject=ICT0417&topic;=21.

EXAM-STYLE QUESTION · 21 · [9 marks]

You are creating a school website with a home page (index.htm), a stylesheet (style.css) and an images folder containing logo.png.

- (a) Write the line of HTML, placed in the head section, that attaches the stylesheet. [2]
- (b) Write the HTML to place logo.png on the page, 200 pixels wide, with alternative text. [3]
- (c) Write the CSS to make all paragraphs Arial, size 12 pt. [2]
- (d) Explain why the stylesheet is attached using a relative file path. [2]

Mixed Practice Paper

Paper 1 style. Answer **all 25 questions**. Each question has four options, **A, B, C and D**. Choose the **one** correct answer and write its letter. Each question is worth **1 mark** (total **25 marks**). Allow **30 minutes**. The answers are in the **Answer Key**.

1. Which component fetches, decodes and executes instructions?
 - A RAM
 - B CPU
 - C motherboard
 - D NIC
2. Which type of memory is volatile?
 - A ROM
 - B RAM
 - C SSD
 - D optical disc
3. Which device converts analogue sensor data so that a computer can process it?
 - A DAC
 - B actuator
 - C ADC
 - D router
4. Which input device is best for reading multiple-choice answer sheets?
 - A OCR reader
 - B OMR reader
 - C microphone
 - D light pen
5. Which storage medium is cheapest per gigabyte for backing up a whole system?
 - A magnetic tape
 - B SSD
 - C DVD
 - D memory card
6. Which device sends data packets to the correct destination between networks?
 - A hub
 - B router
 - C NIC
 - D bridge
7. Which network is restricted to a company's own staff and uses internet technology?
 - A internet
 - B extranet
 - C intranet
 - D WAN
8. Which is an example of two-factor authentication?
 - A a long password
 - B password then a code sent to a phone
 - C two passwords
 - D an anti-virus scan

9. A fake email asking the user to enter bank details on a copied website is called:
- A pharming
 - B phishing
 - C hacking
 - D spyware
10. Which security measure checks and blocks unauthorised traffic into a network?
- A encryption
 - B firewall
 - C digital certificate
 - D proxy
11. RSI is most likely to be caused by:
- A bright screens
 - B repeated keyboard and mouse use
 - C trailing cables
 - D loud speakers
12. Which method of implementation runs the old and new systems at the same time?
- A direct changeover
 - B parallel running
 - C pilot running
 - D phased
13. Which validation check ensures that a field is not left empty?
- A range check
 - B presence check
 - C type check
 - D length check
14. A test of the age field with the value 17 when the valid range is 11 to 16 is:
- A normal data
 - B extreme data
 - C abnormal data
 - D live data
15. Which part of an expert system applies rules to the knowledge base to reach conclusions?
- A user interface
 - B inference engine
 - C rules base
 - D explanation system
16. Which file format is a compressed image that supports animation?
- A jpg
 - B gif
 - C csv
 - D rtf
17. Which cell reference does not change when a formula is copied?
- A B2
 - B \$B\$2
 - C B\$2 only
 - D 2B

18. Which formula gives the largest value in cells A1 to A10?
- A =MIN(A1:A10)
 - B =MAX(A1:A10)
 - C =SUM(A1:A10)
 - D =COUNT(A1:A10)
19. In a database, a field that uniquely identifies each record is the:
- A foreign key
 - B primary key
 - C report
 - D query
20. Which HTML tag creates the largest heading?
- A <h6>
 - B <head>
 - C <h1>
 - D <p>
21. In CSS, which is used to apply a style to several elements of different types?
- A a class
 - B a comment
 - C a hyperlink
 - D a table
22. Which page break setting keeps a table from splitting across two pages?
- A use a larger margin
 - B use a page break before it
 - C use a smaller font
 - D reduce line spacing
23. What should be reduced to make an image file smaller without changing its dimensions?
- A colour depth
 - B brightness
 - C contrast
 - D border
24. Which of these is the main purpose of a corporate house style?
- A to make files smaller
 - B to give all documents a consistent look
 - C to speed up printing
 - D to protect copyright
25. Copyright legislation protects:
- A only hardware
 - B software and other creators' work from being copied illegally
 - C only websites
 - D only emails

YOUR SCORE

Total: _____ / 25. **Over 85%:** excellent. **65% to 85%:** good, revise the topics you missed. **Below 65%:** read the chapters again and repeat the exercises. Then try the full-length tests at www.sigungusekuyala.com/Practice.

Appendix A: Common File Formats

Know the **characteristics and uses** of these formats. **Generic** formats (csv, txt, rtf, pdf, css, htm, jpg, png) can be opened by many different programs, which is why they are used to **share files between different software**.

Format	Type	Use and characteristics
.docx / .doc	Word-processing file	Documents; keeps all formatting; needs a word processor
.xlsx / .xls	Spreadsheet file	Spreadsheet workbooks with formulae and charts
.accdb / .odb	Database file	Tables, queries, forms and reports
.pptx / .ppt	Presentation file	Slides with animations and transitions
.rtf	Rich text format (generic)	Text with basic formatting; opens in most word processors
.txt	Plain text (generic)	Text only, no formatting; very small; opens everywhere
.csv	Comma separated values (generic)	Table data separated by commas; moves data between spreadsheets and databases
.pdf	Portable document format (generic)	Looks the same on every device; read-only; for sharing
.htm / .html	Web page	HTML mark-up that a browser displays
.css	Cascading stylesheet	Styles that format web pages
.jpg	Compressed image (lossy)	Photographs; small files; some quality lost
.png	Compressed image (lossless)	Graphics, logos, screenshots; supports transparency
.gif	Compressed image, 256 colours	Simple graphics and short animations
.zip / .rar	Compressed archive	Reduces file size for storage or sending; several files in one
.mp3 / .mp4	Audio / video	Compressed sound and video for streaming

Appendix B: Validation Checks

Validation is an automatic check that data is **reasonable and allowed**. It does **not** prove the data is correct (a valid date of birth can still be the wrong one), so **verification** is also needed.

Validation check	What it does	Example
Range check	Data lies between a lower and an upper limit	Month between 1 and 12
Character check	Only allowed characters are accepted	A name contains no digits
Length check	Data has the correct number of characters	Phone number of 8 digits
Type check	Data is the correct data type	Age must be an integer
Format check	Data is in the correct pattern	Date as dd/mm/yyyy
Presence check	Data has been entered; field is not blank	Surname must be entered
Check digit	An extra digit calculated from the others detects mistakes in codes	Last digit of a barcode or ISBN

Appendix C: Spreadsheet Functions and HTML/CSS Quick Reference

Function	Use	Example
SUM	Adds numbers	=SUM(B2:B10)
AVERAGE	Mean of numbers	=AVERAGE(B2:B10)
MAX / MIN	Largest / smallest	=MAX(B2:B10)
COUNT	Counts cells holding numbers	=COUNT(B2:B10)
INT / ROUND	Whole number / rounded to places	=ROUND(B2,2)
IF	Returns one value or another depending on a test	=IF(B2>=50,"Pass","Fail")
VLOOKUP	Looks down the first column of a table for a value	=VLOOKUP(A2,\$F\$2:\$G\$9,2,FALSE)
HLOOKUP	Looks along the top row of a table	=HLOOKUP(A2,\$B\$1:\$G\$2,2,FALSE)
XLOOKUP	Looks up in any column or row and returns from another	=XLOOKUP(A2,\$F\$2:\$F\$9,\$G\$2:\$G\$9)

HTML / CSS	Purpose
<html> <head> <body>	Structure of a page: head holds title, links and metatags; body holds the content
<h1> to <h3>, <p>,	Headings, paragraphs and list items
<table> <tr> <th> <td>	Table, row, table header, table data (colspan / rowspan merge cells)
	Hyperlink (target="_blank" opens a new window); marks a bookmark
	Image with alternative text
<link rel="stylesheet" href="style.css">	Attaches an external stylesheet (use a relative path)
selector { property: value; }	A CSS rule, for example p { color: blue; font-size: 12pt; }
.name { ... }	A class rule, applied with class="name"

Answer Key

Answers to every exercise and exam-style question, in chapter order. In exam-style answers, **[1]** shows where a mark is earned. Accept any other correct answer.

Mixed practice paper (25 marks)

Q	Ans.	Working	Q	Ans.	Working
1	B	The CPU processes instructions.	14	C	17 is outside the range, so it is abnormal.
2	B	RAM loses its contents when power is off.	15	B	The inference engine does the reasoning.
3	C	An analogue-to-digital converter.	16	B	GIF supports animation and uses few colours.
4	B	OMR detects marks in set positions.	17	B	\$B\$2 is absolute.
5	A	Tape has huge capacity at low cost.	18	B	MAX returns the highest value.
6	B	A router routes packets and connects networks to the internet.	19	B	The primary key is unique.
7	C	An intranet is private to an organisation.	20	C	<h1> is the top-level heading.
8	B	Two different factors: something known and something owned.	21	A	A class can be applied to any elements.
9	B	Phishing uses email; pharming redirects the web address.	22	B	A page break before the table moves it to the next page.
10	B	A firewall monitors traffic against rules.	23	A	Lower resolution or colour depth reduces file size.
11	B	Repetitive strain injury comes from repeated movements.	24	B	House style gives a consistent identity.
12	B	Parallel running keeps both systems until the new one is proven.	25	B	Copyright protects the creator's work.
13	B	A presence check makes sure data has been entered.			

1 Types and Components of Computer Systems

- 1.1** Hardware is the physical components of a computer system (parts you can touch); software is the programs that control the computer or process data.
- 1.2** Applications: word processor / spreadsheet / database / video editor (any). System: operating system / device driver / utility / compiler / linker (any).
- 1.3** A temperature sensor produces analogue (continuous) data; the computer can only process digital data (0s and 1s), so the ADC converts it to digital.
- 1.4** RAM is volatile (loses contents when power is off) but ROM is non-volatile; RAM can be read and written but ROM is read-only; RAM holds programs and data in use but ROM holds the start-up (boot) instructions. (any two)
- 1.5** Advantage: needs less memory / is faster for expert users. Disadvantage: user must learn and type exact commands, and one error stops it working / harder for beginners.
- 1.6** Easier to upgrade and expand; more powerful for the same cost; less likely to be stolen; larger screen and more comfortable. (any two)

Exam-style question 1

- (a) The physical components of a computer system. [1] [1]
- (b) It fetches and decodes instructions [1] and executes (processes) them to produce an output [1]. [2]
- (c) RAM is volatile but backing storage is not [1]; RAM is faster but has a smaller capacity than backing storage [1]. (or: RAM holds data in use; backing storage stores files permanently) [2]
- (d) Desktops are cheaper/more powerful for the price [1]; desktops are easier to upgrade/expand [1]; laptops are portable/take less space but are easier to steal [1]. (any three points, both types referred to) [3]

2 Input and Output Devices

- 2.1 Faster; more accurate / fewer typing errors; no need for a person to key the data. (any two)
- 2.2 A plotter.
- 2.3 The reader scans the barcode with a laser; the number is sent to the computer; the number is looked up in the product database; the price and name are returned and displayed/printed on the receipt; the stock level is updated.
- 2.4 The computer decides when to water, but an actuator (a valve or pump) converts the control signal into movement to turn the water on and off.
- 2.5 OMR reader; it reads the marks directly and very quickly and accurately without anyone typing the answers.
- 2.6 Screen gets dirty or scratched; less accurate for small items / hard to use with dirty or wet hands; can be damaged; tiring to hold the arm up. (any two)

Exam-style question 2

- (a) Barcode reader/scanner [1]; keypad / touch screen / chip and PIN reader / magnetic stripe reader / microphone [1]. (any two) [2]
- (b) It is faster [1]; it reduces errors from mistyping [1]; no need to learn product codes. (any two) [2]
- (c) Laser printer [1] because it is faster and cheaper per page for large print jobs [1]. [2]

3 Storage Devices and Media

- 3.1 The device reads/writes the data; the media is what holds the data (e.g. device: DVD drive; media: DVD).
- 3.2 Magnetic (hard disk/tape), optical (CD/DVD/Blu-ray), solid-state (SSD/pen drive/memory card). Any three devices or types.
- 3.3 Faster access; no moving parts so more durable; silent; uses less power; lighter. (any two)
- 3.4 Magnetic tape; very large capacity and cheap per gigabyte, suitable for backups where slow access does not matter.
- 3.5 Memory card (SD); small, portable, no moving parts, can be removed and put into a computer.
- 3.6 The laser has a shorter wavelength (blue), so the pits are smaller and closer together and more data fits on the disc (also multiple layers).

Exam-style question 3

- (a) Magnetic: hard disk drive / portable hard drive / tape drive [1]. Solid-state: SSD / pen drive / memory card [1]. [2]
- (b) Larger capacity [1]; can be rewritten/reused [1]; more durable / does not scratch [1]; faster to transfer [1]. (any two) [2]
- (c) A hard disk gives direct (random) access to any part of the file [1]; tape is serial and slow because it must wind to the data [1]. [2]

4 Networks and the Effects of Using Them

- 4.1 It connects networks / devices to the internet and routes data packets to the correct destination.
- 4.2 A hub sends data to all connected devices; a switch sends data only to the intended device.
- 4.3 Similarity: both are wireless/use radio waves. Difference: wi-fi has a longer range and faster speed; Bluetooth is short range for connecting nearby devices.

- 4.4** An intranet is private to one organisation and needs a login, whereas the internet is public and open to everyone.
- 4.5** Can be accessed from any device anywhere with internet; easier to share; provider makes backups so files are not lost if the device is lost; large storage capacity. (any two)
- 4.6** Long; mixture of upper and lower case, digits and symbols; not a dictionary word or personal detail; different for each account. (any two)
- 4.7** Video-conferencing; webcam, microphone, speakers/headset, monitor (any two).

Exam-style question 4

- (a)** LAN (local area network) [1]. [1]
- (b)** It connects the school network to the internet [1]; it directs data packets to the correct device/address [1]. [2]
- (c)** Intranet / extranet (accept intranet with remote login) [1]; it is private [1]; only users with a login can access it, unlike the internet [1]. [3]
- (d)** Install anti-malware/anti-virus software and keep it updated [1] so that it scans and quarantines/removes infected files [1]; use a firewall [1] to block unauthorised traffic [1]; scan USB drives/downloads before opening [1]. (any two pairs) [4]

5 The Effects of Using IT

- 5.1** Saves time / gives more leisure time; can be controlled remotely; saves energy; improves security. (any two)
- 5.2** A sensor or software failure could cause an accident / jobs lost for drivers / vehicle could be hacked / expensive.
- 5.3** RSI, back problems, eye problems, headaches (any two).
- 5.4** Repeated movements of the hands and wrists, such as typing and mouse clicking for a long time.
- 5.5** Take regular breaks and look away from the screen; use an anti-glare filter; adjust screen brightness and lighting; have regular eye tests. (any two)
- 5.6** A wrist rest keeps the wrist straight and supported, reducing RSI. An adjustable chair with back support lets the user sit with good posture, preventing back problems.

Exam-style question 5

- (a)** Repetitive strain injury (RSI) [1]. [1]
- (b)** Sitting for long periods [1]; poor posture / a chair with poor support [1]; incorrect desk or screen height [1]. (any two) [2]
- (c)** Take regular breaks to walk and stretch [1]; use an adjustable chair with back support [1]; use a wrist rest / ergonomic keyboard [1]; position the screen at eye level [1]. (any three) [3]

6 ICT Applications

- 6.1** Cheaper; safer; can test many designs and conditions quickly. (any two)
- 6.2** User interface, inference engine, knowledge base, rules base, explanation system (any three).
- 6.3** The card is read (chip and PIN, contactless or NFC); the terminal contacts the bank computer; the bank checks the card is valid and funds are available; the money is transferred to the shop; confirmation is returned and a receipt printed.
- 6.4** Cannot see or try the goods; delivery delay; risk of card fraud; need internet access. (any two)
- 6.5** Biometric recognition; cannot be copied or passed to another learner / absence recorded quickly; scanners are expensive / may fail with dirty or injured fingers / privacy concerns.
- 6.6** Printing prosthetic limbs; tissue engineering; artificial blood vessels; customised medicines. (any two)
- 6.7** They work continuously, are accurate and consistent, can lift heavy parts and work safely in dangerous places, and are cheaper in the long term.

Exam-style question 6

- (a)** Can access the account at any time / from anywhere [1]; no need to travel or queue [1]; transfers and payments are instant [1]. (any two) [2]

- (b) Phishing / pharming to get login details [1]; hacking of the account [1]; need for a reliable internet connection [1]. (any two) [2]
- (c) It applies the rules in the rules base [1] to the facts in the knowledge base and the customer's answers, to produce a suggested solution/advice [1]. [2]
- (d) User interface [1]; knowledge base [1]; rules base; explanation system. (any two) [2]

7 The Systems Life Cycle

- 7.1 Observation, interviews, questionnaires, examination of existing documents (any two).
- 7.2 Advantage: many people can answer quickly and cheaply; easy to analyse. Disadvantage: people may not answer honestly / many not returned / no follow-up questions.
- 7.3 Range check (11 to 18); type check (integer); presence check.
- 7.4 (a) normal; (b) extreme; (c) abnormal.
- 7.5 The old and new systems are run together for a period; the results are compared; the old system is then stopped when the new one works.
- 7.6 It allows programmers/analysts to maintain, repair and update the system by showing how it works (program listings, flowcharts, file structures, variables).
- 7.7 How to run/install the software, how to save/print, error messages, troubleshooting guide, FAQs, glossary, sample runs (any three).

Exam-style question 7

- (a) Observation: watching staff use the paper system [1] to see what really happens [1]; Interviews: asking staff questions [1] to get detailed answers and ask follow-ups [1]; Questionnaires [1]; examination of existing documents [1]. (any two described) [4]
- (b) Range check [1]; presence check [1]; format check/length check/type check/character check [1]. (any three) [3]
- (c) Safe: if the new system fails the old one is still available [1]; patients' care is not put at risk [1]; but it is expensive/slow because staff do the work twice [1]. [3]

8 Safety and Security

- 8.1 Overloaded sockets: do not plug too many devices into one socket. Overheating equipment: ensure ventilation / do not cover vents.
- 8.2 Name, address, date of birth, phone number, photograph in school uniform (any two).
- 8.3 Use privacy settings; do not share personal details; block and report unwanted users; do not meet contacts in person; do not post inappropriate images/language. (any two)
- 8.4 Phishing uses a fake email asking the user to enter details; pharming uses malicious code to redirect the user to a fake website even when the right address is typed.
- 8.5 To monitor traffic between a computer/network and the internet and block unauthorised access.
- 8.6 The user must provide two different things, for example a password and a one-time code on a phone, so a stolen password alone does not give access.
- 8.7 Install and update anti-virus software; scan USB drives and downloads; do not open unknown email attachments; download only from trusted sites. (any two)

Exam-style question 8

- (a) Smishing [1]. [1]
- (b) Not click the link [1]; contact the bank using a known phone number/app [1]; delete/report the message [1]. (any two) [2]
- (c) Encryption: data is scrambled so it cannot be read if intercepted [1][1]; two-factor authentication: a code is sent as well as a password [1][1]; SSL/HTTPS secure link [1]; firewall [1]. (any two explained) [4]

9 Audience and Copyright

- 9.1 The people who will read, view or use the ICT product.

- 9.2** Large, clear font; simple words; bright, relevant pictures; little text per slide; sound/animation. (any two)
- 9.3** To stop people copying and selling creators' work illegally / so creators are paid and rewarded.
- 9.4** Product key; activation online; licence agreement; encryption; dongle; needing the original disc. (any two)
- 9.5** The photographer owns the copyright; copying and publishing it without permission is illegal copying.

Exam-style question 9

- (a) Use simple language [1]; large readable text/bright, clear colours [1]; short pages with pictures [1]. (any two) [2]
- (b) The cartoons are protected by copyright [1]; copying them without permission is illegal [1]. [2]
- (c) Avoid offensive/inappropriate content [1]; accessibility features such as alternative text [1]. (any one) [1]

10 Communication

- 10.1** With cc, all recipients can see the addresses; with bcc the addresses are hidden from other recipients.
- 10.2** Do not use all capitals; be polite; clear subject line; do not forward private emails; keep it short. (any two)
- 10.3** Fills the inbox / wastes time; may carry viruses or phishing links; wastes bandwidth. (any two)
- 10.4** The internet is the worldwide network of networks; the World Wide Web is the collection of web pages accessed over it.
- 10.5** https = protocol; www.school.org = domain name; maths = folder/path; test.html = file name.
- 10.6** Check who wrote it / is the author an expert; check the date; check whether other sources agree; check for bias or advertising. (any two)
- 10.7** To transfer web pages securely using encryption, so data cannot be read if intercepted.

Exam-style question 10

- (a) Use specific keywords [1]; use quotation marks for an exact phrase [1]; use filters/advanced search [1]. (any two) [2]
- (b) Check it is up to date [1]; check the author/organisation is reliable [1]; check it is not biased [1]; check it is valid/accurate by comparing with other sources [1]. (any three) [3]
- (c) Bcc (blind carbon copy) [1]. [1]
- (d) Fills the inbox/hard to find real messages [1]; may contain viruses or phishing links [1]; wastes time deleting them [1]. (any two) [2]

11 File Management

- 11.1** A format that can be opened by many different programs, e.g. .csv, .txt, .rtf, .pdf, .png, .jpg (any two).
- 11.2** Plain text file; data in rows with each field separated by a comma; used to transfer data between spreadsheet and database software.
- 11.3** JPG is lossy (loses some quality) and best for photographs; PNG is lossless and supports transparency, good for logos and screenshots.
- 11.4** To reduce the total file size so they upload and send faster and stay within the attachment size limit.
- 11.5** It should describe the content; follow the instruction given; use the correct extension; avoid spaces/special characters for web files. (any two)

Exam-style question 11

- (a) Open the package and use Open/Import [1], browse to the file and select it, choosing comma as the delimiter [1]. [2]
- (b) .pdf [1]. [1]
- (c) Smaller files send/upload faster [1]; they use less storage and may fit within the attachment size limit [1]. [2]

12 Images

- 12.1** The ratio of the image's width to its height.
- 12.2** It looks stretched or squashed (distorted).

- 12.3** Cropping removes parts of the image; resizing changes the size of the whole image without removing any of it.
- 12.4** Reflect (flip) the image horizontally.
- 12.5** Reduce the resolution; reduce the colour depth; crop unwanted areas; save in a compressed format such as jpg. (any two)
- 12.6** Select the photograph and use Bring to front (or send the logo to the back).

Exam-style question 12

- (a)** 6 cm [1]. [1]
- (b)** Select the image and use the crop tool [1]; drag the top edge down to remove the sky [1]. [2]
- (c)** Reduce the resolution [1]; reduce the colour depth [1]; crop/resize [1]. (any two) [2]

13 Layout

- 13.1** Cut and paste; drag and drop (select the text and drag).
- 13.2** Square wraps text around a rectangle; tight wraps text closely round the shape of the object.
- 13.3** Select the three cells of the top row and use Merge cells.
- 13.4** Automatic fields update automatically, so the numbers stay correct when pages are added or removed.
- 13.5** The header is in the top margin; the footer is in the bottom margin.
- 13.6** Open the footer; insert the file name field left-aligned; centre tab for page number field; right tab/alignment for date field.

Exam-style question 13

- (a)** Insert the picture and centre it [1]; set text wrapping to 'top and bottom' / above and below [1]. [2]
- (b)** Insert a table with 3 columns and 5 rows [1]; merge the three cells in the top row and type the heading [1]. [2]
- (c)** Page number [1]; date / author / file name / total pages [1]. (any two) [2]

14 Styles

- 14.1** Serif fonts have small strokes (feet) on the letters; sans-serif fonts do not.
- 14.2** Consistent appearance; quick to apply; a change to the style updates all text; saves time. (any two)
- 14.3** Font face, size, colour, alignment, line spacing, paragraph spacing, enhancement (any three).
- 14.4** A set of rules for fonts, colours, logos and layout used in all of an organisation's documents so they look consistent.
- 14.5** All text formatted with Heading1 is updated to 16 pt automatically.

Exam-style question 14

- (a)** Specific fonts/point sizes [1]; colours [1]; logo position [1]; alignment/line spacing [1]. (any two) [2]
- (b)** Documents look consistent/professional [1]; the company is easily recognised [1]; saves time because styles are ready-made [1]. (any two) [2]
- (c)** Modify the heading style's colour and update it [1]. [1]

15 Proofing

- 15.1** It cannot find words that are spelled correctly but are the wrong word (e.g. their/there); it may not know names.
- 15.2** Range check (1 to 12); 13 (or 0) is rejected.
- 15.3** Presence check.
- 15.4** Validation is an automatic check that data is reasonable/allowed; verification checks that data has been entered accurately, e.g. by double entry or visual checking.
- 15.5** Data can be valid (sensible and in range) but still wrong, e.g. an age of 15 entered instead of 16.
- 15.6** The last line of a paragraph left alone at the top of the next page.

- 15.7** That it is not split across pages; consistent alignment, text and number formats; correct data; headings. (any two)

Exam-style question 15

- (a) Length check [1]; type check/character check (digits only) [1]; presence check [1]. (any two) [2]
- (b) Double data entry: type the data twice [1] and have the computer compare the entries [1]. OR visual check: read the data on screen against the source document [1][1]. [2]
- (c) Validation only checks that data is possible/allowed [1]; it does not check it is the correct data, so verification is needed to check it was entered accurately [1]. [2]

16 Graphs and Charts

- 16.1** Pie chart.
- 16.2** Select A2:A6, hold Ctrl and select D2:D6 (non-contiguous), then insert the chart.
- 16.3** Chart title, legend, axis titles, axis labels, data labels (any three).
- 16.4** The two series have different units and scales, so a second axis lets both be read accurately.
- 16.5** Extract (explode) that sector, or change its colour.
- 16.6** Format the axis; set the minimum to 0, the maximum to 100 and the major unit to 20.

Exam-style question 16

- (a) Clustered bar/column chart [1]. [1]
- (b) Select the names and both columns of marks, with their headings [1]; for contiguous data, select A1:C11 (or hold Ctrl for non-contiguous) [1]. [2]
- (c) Chart title [1]; legend [1]; category axis title [1]; value axis title [1]; axis labels/data labels [1]. (any four) [4]

17 Document Production

- 17.1** Portrait is taller than wide; landscape is wider than tall.
- 17.2** It divides the document into sections so that each can have different layout, such as columns, orientation or headers.
- 17.3** It adds extra space at the binding edge so text is not hidden when the pages are bound.
- 17.4** A decimal tab.
- 17.5** Otherwise *part* and *cart* would also be changed.
- 17.6** Set the paragraph indentation so the first line starts at the margin and all other lines are indented (hanging indent).

Exam-style question 17

- (a) Set the number of columns to two [1]; set the page size to A4 / orientation / margins [1]. [2]
- (b) Extra space is left at the binding side [1] so text does not disappear into the binding [1]. [2]
- (c) Insert a page break before the heading [1] so the heading moves to the start of the next page with its text [1]. [2]

18 Databases

- 18.1** A field that uniquely identifies each record in a table; its values are never repeated.
- 18.2** Data is repeated (duplicated), wasting space and causing errors when updating.
- 18.3** (a) Text; (b) Numeric currency; (c) Boolean/logical (yes/no).
- 18.4** [Class]="10A" AND [Mark]<40.
- 18.5** All records where the surname starts with S.
- 18.6** Clear title; labels next to fields; logical order; enough space; radio buttons/drop-downs to limit choices; consistent fonts. (any two)
- 18.7** So that the digits line up (units, tens, hundreds) and are easy to compare.
- 18.8** In the report footer.

Exam-style question 18

- (a) Primary key: ClubID [1]; foreign key: ClubID in LEARNER [1]. [2]
- (b) Less repeated data / each club stored once [1]; easier and less error-prone to update [1]; saves storage space [1]. (any two) [2]
- (c) Form = 4 [1] AND Surname LIKE "M*" [1]. [2]
- (d) Group by club [1] and use a COUNT calculated control in the group/report footer [1]. [2]

19 Presentations

- 19.1** To control the layout and format of all slides so that they are consistent.
- 19.2** Logo, image, text, shapes, slide number, header/footer, date (any three).
- 19.3** A button shape is inserted and set to jump to a specified slide, file or the next/previous slide when clicked.
- 19.4** So that screen readers can describe it to users who cannot see it.
- 19.5** A carousel runs automatically and repeats; presenter controlled moves on when the presenter clicks.
- 19.6** Handouts (e.g. 3 slides per page).

Exam-style question 19

- (a) Place the school logo on the master so it appears on every slide [1]; set fonts, colours and bullet styles/background on the master [1]; add slide numbers/footer [1]. (any two) [2]
- (b) Looped on-screen carousel [1] because it runs automatically without a presenter [1]. [2]
- (c) Short bullet points and large fonts [1]; bright, relevant pictures/animation [1]; simple language [1]. (any two) [2]

20 Spreadsheets

- 20.1** A formula is written by the user using cell references and operators; a function is a ready-made calculation, e.g. SUM.
- 20.2** B1 is divided by 2 first (order of operations); brackets are needed: =(A1+B1)/2.
- 20.3** =B2*(1+\$F\$1)
- 20.4** A2 becomes A3 (relative); \$A\$2 stays the same (absolute).
- 20.5** =IF(C2>100,"Yes","No")
- 20.6** Formatting that changes automatically depending on the cell contents, e.g. marks below 40 shown in red.
- 20.7** So that each record stays together; otherwise only one column is sorted and the data no longer matches.

Exam-style question 20

- (a) =B2*C2 [1]. [1]
- (b) =D2*(1+\$F\$1) [1] with absolute reference for F1 [1]. [2]
- (c) =MAX(C2:C20) [1]. [1]
- (d) Select the quantity cells [1]; apply conditional formatting with rule 'less than 5' and red text format [1]. [2]

21 Website Authoring

- 21.1** Content layer (HTML) creates content and structure; presentation layer (CSS) formats and displays it; behaviour layer (scripting) controls elements.
- 21.2** Title, link to stylesheet, metatags (charset, author, description, keywords, viewport), default target (any two).
- 21.3**
- 21.4** h1 { color: red; text-align: center; }
- 21.5** The path only exists on the author's computer; when the site is moved the image is not found, so it does not display.
- 21.6** A style applies to every use of an HTML tag; a class applies only to the elements given that class name and can be used on any tag.
- 21.7** Top

21.8 It makes the page display correctly on all devices, such as phones and tablets.

Exam-style question 21

- (a) `<link rel="stylesheet" href="style.css">` [1][1] (rel and href with a relative path). [2]
- (b) `` [1] [3]
- (c) `p { [1] font-family: Arial; font-size: 12pt; } [1]` [2]
- (d) The pages and stylesheet will be moved to a server/another computer [1]; relative paths still work, whereas an absolute path would no longer find the file [1]. [2]

Glossary

This glossary has two parts. **Part 1** lists the **command words** from the syllabus with their meanings. **Part 2** lists key ICT terms in alphabetical order.

Part 1: Command words

Command word	Meaning
Analyse	examine in detail to show meaning, identify elements and the relationship between them.
Compare	identify/comment on similarities and/or differences.
Contrast	identify/comment on differences.
Define	give precise meaning.
Demonstrate	show how or give an example.
Describe	state the points of a topic / give characteristics and main features.
Discuss	write about issue(s) or topic(s) in depth in a structured way.
Evaluate	judge or calculate the quality, importance, amount, or value of something.
Explain	set out purposes or reasons / make the relationships between things clear / say why and/or how and support with relevant evidence.
Give	produce an answer from a given source or recall/memory.
Identify	name/select/recognise.
Justify	support a case with evidence/argument.
State	express in clear terms.
Suggest	apply knowledge and understanding to situations where there are a range of valid responses in order to make proposals / put forward considerations.

Part 2: Key terms

A

Absolute cell reference: a spreadsheet reference such as \$B\$2 that does not change when a formula is copied.

Actuator: an output device that converts a control signal from a computer into movement.

Analogue data: continuous data that can take any value, such as sound or temperature.

Anti-malware: software that detects, quarantines and removes malicious software.

Applications software: programs that let the user carry out a task, such as word processing.

Artificial intelligence (AI): computer systems that carry out tasks normally needing human intelligence.

Aspect ratio: the ratio of the width to the height of an image.

Audience: the people who will read, view or use an ICT product.

Augmented reality (AR): computer-generated images added on top of a view of the real world.

B

Backing storage: permanent, large-capacity storage that keeps data when the power is off.

Bar code: a pattern of black and white lines that stores a number, read by a laser.

Bcc (blind carbon copy): a copy of an email sent to a person whose address is hidden from other recipients.

Biometrics: identification using a body feature such as fingerprint, face, iris or voice.

Bluetooth: a short-range wireless technology for connecting nearby devices.

Bookmark: a marked place in a document or web page that a hyperlink can jump to.

Browser: software used to view web pages.

C

- Cell:** one box in a spreadsheet, found where a row and a column meet.
- Check digit:** a digit calculated from the other digits of a code and added to it, used to detect errors.
- Class (CSS):** a named style that can be applied to any number of web page elements.
- Cloud computing:** storing and using data and software on remote servers reached over the internet.
- Compression:** reducing the size of a file so that it uses less storage and transfers faster.
- Conditional formatting:** formatting that changes automatically depending on the contents of a cell.
- Copyright:** the legal right of a creator to control the copying and use of their work.
- Core (concept):** an idea or definition that carries marks and must be learned exactly; shown in **bold** in this guide.
- CPU:** the central processing unit; fetches, decodes and executes instructions.
- CSS:** cascading stylesheets; the language that sets the presentation of web pages.

D

- Data protection law:** legislation that controls how personal data may be collected, stored and used.
- Database:** an organised collection of data stored in tables.
- Device driver:** system software that lets the operating system communicate with a device.
- Digital certificate:** an electronic document that proves the identity of a website or person.
- Digital data:** data stored as separate values, represented by 0 and 1.
- Direct changeover:** implementing a new system by stopping the old one and starting the new one immediately.
- Documentation:** technical and user documents that explain a system.

E

- EFTPOS:** electronic funds transfer at point of sale; paying by card at a till.
- Encryption:** scrambling data so that it cannot be understood without the key.
- Expert system:** software with a knowledge base and rules that gives advice like a human expert.
- Extranet:** a private network that allows controlled access to selected people outside the organisation.

F

- Field:** one item of data in a database record, for example Surname.
- Firewall:** hardware or software that monitors traffic and blocks unauthorised access.
- Flat file database:** a database that stores all data in a single table.
- Footer:** text that repeats at the bottom of every page.
- Foreign key:** a field in one table that is the primary key of another table, creating a link.
- Formula:** a calculation typed by the user, starting with =, for example =B2*C2.
- Function:** a ready-made calculation in a spreadsheet, for example SUM or VLOOKUP.

G

- GIS:** geographic information system; stores and displays data linked to places on a map.
- GPS:** global positioning system; satellites tell a receiver where it is.
- GUI:** graphical user interface; uses windows, icons, menus and a pointer.

H

- Hacking:** gaining unauthorised access to a computer system.
- Hardware:** the physical components of a computer system.
- Header:** text that repeats at the top of every page.
- House style:** a set of rules for fonts, colours and layout that gives an organisation's documents a consistent look.
- HTML:** hypertext mark-up language; defines the structure and content of web pages.
- HTTPS:** the secure version of HTTP, which encrypts data between browser and server.
- Hyperlink:** text or an image that opens another page, file or location when clicked.

I

Inference engine: the part of an expert system that applies the rules to the knowledge base.

Intranet: a private network that uses internet technology, for use inside an organisation.

K

Knowledge base: the store of facts and data used by an expert system.

L

LAN: local area network; computers connected in a small area such as a school.

M

Malware: malicious software such as viruses, worms and spyware.

Master slide: a slide that sets the design of all slides in a presentation.

Metatag: HTML in the head section that gives information about a page, such as author or description.

N

NFC: near field communication; very short range wireless used for contactless payment.

NIC: network interface card; allows a computer to connect to a network.

O

OCR: optical character recognition; turns images of printed text into editable text.

OMR: optical mark recognition; detects marks made in set positions on a form.

Operating system: system software that manages the hardware, files and running of programs.

Orphan and widow: a single line of a paragraph left at the bottom (orphan) or top (widow) of a page.

P

Pharming: redirecting a user to a fake website, even when the correct address is typed.

Phishing: fake emails that trick users into giving personal or financial details.

Presence check: a validation check that data has been entered.

Primary key: a field that uniquely identifies every record in a table.

Q

QR code: a two-dimensional square code read by a camera.

Query: a search of a database that selects records meeting stated criteria.

R

RAM: random access memory; volatile memory that holds programs and data in use.

Record: all the data about one person, thing or event in a database table.

Relational database: a database with several linked tables.

Relative cell reference: a spreadsheet reference such as B2 that adjusts when a formula is copied.

RFID: radio frequency identification; a tag read using radio waves.

ROM: read-only memory; non-volatile memory holding start-up instructions.

Router: a device that sends data packets between networks, such as to the internet.

S

Search engine: a website that finds web pages matching a search term.

Sensor: an input device that measures a physical quantity.

Smishing: phishing carried out by SMS text message.

Software: the programs that control a computer or process data.

Spam: unwanted bulk email.

SSL: secure socket layer; creates an encrypted link between a server and a client.

Style: a saved set of formatting that can be applied to text for consistency.

Systems life cycle: the stages of analysis, design, development and testing, implementation, documentation and evaluation.

T

Test plan: a table of test data, expected outcomes, actual outcomes and remedial action.

Two-factor authentication: proving identity with two different items, such as a password and a code.

U

URL: uniform resource locator; the address of a web page.

V

Validation: an automatic check that data is reasonable and allowed.

Verification: checking that data has been entered or copied accurately, such as by double entry.

Virtual reality (VR): a computer-made world that replaces the real world, seen through a headset.

Virus: a program that copies itself and spreads, usually causing harm.

Vishing: phishing carried out by a voice phone call.

VoIP: voice over internet protocol; telephone calls made over the internet.

W

WAN: wide area network; a network covering a large geographical area.

Wi-fi: wireless local network technology using radio waves.

Wildcard: a symbol such as * that stands for any characters in a search.

WLAN: wireless local area network.

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