

# GCSE OCR Computer Science

Unit	YEAR 10
PAPER 1	Learning Objective
<b>1.1 Systems Architecture</b>	
1.1.1 Architecture of the CPU	<p>Name 4 registers</p> <p>Describe the purpose of the MDR</p> <p>Define the term 'register'</p> <p>Describe the purpose of the MAR</p> <p>Describe the purpose of the PC</p> <p>Describe the purpose of the Accumulator</p> <p>Draw the CPU, labelling each component and register</p> <p>Explain the role of the ALU</p> <p>Explain the role of the CU</p> <p>State where cache is located</p> <p>Describe the purpose of cache</p> <p>Explain what events occur at each stage of the F-D-E cycle</p>
1.1.2 CPU Performance	<p>Compare two processors, given the size of cache, number of cores and clock speed, to explain which is faster</p> <p>State what units clock speed is measured in</p> <p>Explain what is meant by clock speed</p> <p>State what is mean by the number of cores</p> <p>State three factors that affect CPU performance</p> <p>Explain how the number of cores affects the performance of the CPU</p> <p>Describe what is meant by the performance of the CPU</p> <p>Explain why doubling the numnber of cores doesn't necessarily mean doubling performance</p> <p>State what is meant by a clock speed of 3GHz</p> <p>Explain how increasing cache can increase performance of the processor</p> <p>Explain what is meant by different levels of cache</p>
1.1.3 Embedded Systems	<p>Describe the term 'embedded system'</p> <p>Give three examples of everyday embedded systems</p> <p>Explain the typical characteristics of embedded systems</p>

Compare embedded systems to general purpose systems, using an example of each

## 1.2 Memory and Storage

### 1.2.1 Primary Storage (Memory)

Define the term 'primary storage'

Describe when virtual memory is used and why it is needed

Explain how using virtual memory can affect the performance of the computer

State the characteristics of ROM and RAM

Give two examples of primary storage in a computer system

Explain how primary storage is used and why it is needed

Explain why instructions held on virtual memory need to be moved back into RAM before they can be used

Explain how virtual memory works

Describe the purpose of RAM

Describe the purpose of ROM

### 1.2.2 Secondary Storage

Explain why computers have secondary storage

Describe the types of data that secondary storage holds

Describe what is meant by optical storage

Describe what is meant by magnetic storage

Describe what is meant by solid state storage

Compare the characteristics of each type of storage medium, giving specific examples of devices for each type

Describe the advantages and disadvantages of each type of storage

Consider the following characteristics for each type: Capacity/Speed/Portability/Durability/Reliability/Cost

Understand which type of storage and storage devices are best for common scenarios

State how many bits in a byte

State how many bytes in a kilobyte

Convert between KB/ MB/ GB/ TB

Understand the difference between b and B used in units

Explain why data must be converted into binary format to be processed by a computer

Explain how to convert an amount given in bytes to KB

Give some common estimated capacity for common storage devices

1.2.3 Units

- Given the size of a single image in KB, work out the amount of storage space needed to store 10,000 images
- Know the difference between kilobyte and kibibyte etc.
- State the formula for calculating the size of a sound file
- State the formula for calculating the size of an image file
- State the formula for calculating the size of a text file

1.2.4 Data Storage: Numbers

- Convert denary numbers to binary (0 - 255)
- Convert denary numbers to hexadecimal (0-255 or hex 00-FF)
- Add binary integers (8bits)
- Explain how overflow errors occur, giving an example
- Describe what would need to be done to correctly store a number when an overflow error occurs
- Convert from binary to hexadecimal
- Convert from hexadecimal to binary
- Convert from binary to denary
- Carry out a binary shift to the left
- Explain the result of a binary shift to the left
- Carry out a binary shift to the right
- Explain the result of a binary shift to the right
- Describe what is meant by most significant bit, using an example
- Describe what is meant by least significant bit, using an example

1.2.4 Data Storage: Characters

- Define the term 'character set'
- Explain the differences and similarities between ASCII and Unicode
- Explain, using an example, how the number of bits used in a character set impacts the number of characters you can represent
- Explain how, if you know the bit pattern for the character A, you can work out the bit pattern for the character D
- Explain why upper case and lowercase letters need different bit patterns in a character set
- Explain how numbers are represented in the character set and compare this to their number form in binary

- Define the term 'pixel'
- Explain how an image is represented in binary

1.2.4 Data Storage: Images	<p>Define the term 'resolution'</p> <p>Define the term 'colour depth'</p> <p>Explain how increasing the colour depth and resolution of an image affects its size</p> <p>Explain how increasing the colour depth and resolution of an image affects image quality</p> <p>Describe the purpose of metadata and give examples of what data would be stored</p> <p>Explain how colours are represented in binary</p>
1.2.4 Data Storage: Sound	<p>Explain what is meant by sampling</p> <p>Describe how sound is recorded and represented in binary</p> <p>Explain what is meant by analogue</p> <p>Define the term 'sample rate'</p> <p>State what sample rate is measured in</p> <p>Define the term 'bit depth', using an example to help you</p> <p>Explain the effect of increasing the sample rate, duration and bit depth on the playback quality</p> <p>Explain the effect of increasing the sample rate, duration and bit depth on the size of the file</p>
1.2.5 Compression	<p>Explain what is meant by lossy compression</p> <p>Explain what is meant by lossless compression</p> <p>Give common examples of where lossy compression would be used and why</p> <p>Give common examples of where lossless compression would be used and why</p> <p>Compare the effect of lossless and lossy compression on a file</p> <p>List the advantages of lossless and lossy compression</p>
<b>1.3 Computer Networks, Connections and Protocols</b>	
	<p>List the similarities and differences between LANs and WANs</p> <p>Describe which factors affect the network range and speed</p> <p>Define the term 'LAN'</p> <p>Define the term 'WAN'</p> <p>Explain the role of a switch</p> <p>Explain the role of a WAP</p> <p>Explain the role of a router</p> <p>Explain what a NIC is</p> <p>Give examples of types of transmission media and where they are used</p> <p>Draw and star and mesh topology</p> <p>Give common examples of LANs and WANs</p>

1.3.1 Networks and Topologies

- Explain how increasing the number of devices connected to a network will affect its performance
- Explain how increasing the bandwidth will affect its performance
- Define the term 'bandwidth'
- Explain how data moves around a LAN, with reference to each hardware component and its role
- Compare the role of a switch with a hub
- List the advantages and disadvantages of storing data on the cloud
- Explain what is meant by the cloud
- Define the term 'hosting'
- Explain what a web server is
- Explain what is meant by the DNS and a URL
- Explain how a website is requested by your browser
- Explain what the Domain name service is, and how this concept is connected to domain name servers
- Explain how machines communicate in a client server network
- Explain the roles of devices in p2p networks

1.3.2 Wired and Wireless Networks, Protocols and Layers

- Compare benefits and drawbacks of wired versus wireless connection
- Suggest the best mode of connection to use for a given scenario and why
- Define the term 'encryption'
- Explain why encryption is needed and give an example of data that would need encrypting
- Explain how encryption plays a role in preventing threats to a network
- Explain the purpose, and give an example, of an IPv4 and IPv6 address
- Explain the purpose of a MAC address and how it is used within a network
- Compare a MAC address and IP address, both in how they appear and what their use is
- Define the term 'protocol'
- Define what is meant by the term 'layers', and explain the need for layers
- Explain the purpose of TCP/IP and give examples of where it is used
- Explain the purpose of HTTP and give examples of where it is used
- Compare HTTP and HTTPS and where they are used
- Explain the purpose of FTP and give examples of where it is used

Explain the purpose of POP and give examples of where it is used
Explain the purpose of IMAP and give examples of where it is used
Explain the purpose of SMTP and give examples of where it is used
Given a scenario, state which protocol would be used and why
Explain the 4 layers of the 4-layer TCP/IP model and how are they used
Explain the benefits of using layers

## 1.4 Network Security

1.4.1 Threats to Computer Systems and Networks	Explain what is meant by malware and what effects it might have on a computer system
	Explain what social engineering is and how it can be used to gain access to a computer system
	Explain how a DoS attack is carried out and why
	Briefly explain how an SQL Injection attack works and its purpose
	Explain why an attacker would want to intercept and steal data
	Explain the concept of 'humans as the weakest link' and how social engineering can be used to gain access to a system
	Give examples of social engineering attacks
	Explain the term 'phishing'
	Give an example of a brute force attack and why it is used
1.4.2 Identifying and Preventing Vulnerabilities	Briefly explain how a firewall works and what threats it can be used to prevent
	Briefly explain how anti-malware presents threats on a network and which types of events this is effective for
	Explain what user access levels are and how they are used to protect a network
	Explain how encryption works and what threats it can be used to prevent
	Explain how penetration testing works, when it is used, and what threats it can be used to prevent
	Explain how user access levels and password policies work together to help protect a computer system
	Explain what is meant by physical security and give examples of how it is used to protect a computer system
	For each type of threat to a network, explain which method(s) can be used to help to prevent it

## 1.5 Systems Software

### 1.5.1 Operating Systems

Define the term 'system software'

Describe what an operating system is and what it is responsible for

Describe what the features of a user interface are, and what the advantages of a graphical user interface are

Explain which user management functions an operating system provides

Explain which file management operations the operating system provides and how are they used

Explain what is meant by multitasking

Define a 'peripheral'

Describe what HCI stands for and what it is

Define the term 'driver', and explain why they are needed

Explain why memory management is needed and how it is carried out by the OS

### 1.5.2 Utility Software

Explain the purpose of encryption software and give an example of when this would be used

Explain the difference between a function of the operating system and a utility

Explain why defragmentation software is needed and in what systems

Explain the advantages of using data compression software, considering both data storage and data transfer

Explain how defragmentation works and how the issue occurs in the first instance

Explain why compression is beneficial when uploading/downloading files

## 1.6 Ethical, Legal, Cultural and Environmental Impacts of Digital Technology

Give an example of an open-source application

Give an example of a common proprietary software

Give an example of the impact that technology has on society

State the name and year of the act created to protect personal data

State the name and year of the act created to make malicious acts on computer systems illegal

State the name and year of the act created to protect the rights of creators of content

1.6.1 Ethical, Legal, Cultural and Environmental Impact

Explain how legislation protects computer systems and people

Using a technological invention as an example, explain the ethical issues this has had on society

Using a technological invention as an example, explain the legal issues this has had on society

Using a technological invention as an example, explain the cultural issues this has had on society

Using a technological invention as an example, explain the privacy issues this raises in society

Explain why software needs to be licensed

Compare the benefits and drawbacks of open-source software licences to proprietary software licences for the software developer or owner

Compare the benefits and drawbacks of open-source software licences to proprietary software licences for the customer (user of the software)