CPU

Central Processing Unit

“The main part of the computer, consisting of the registers, ALU and control unit.”

Fetch-decode-execute cycle

“The complete process of retrieving an instruction from storage, decoding it and carrying it out. Also known as the instruction cycle.”

ALU

Arithmetic Logic Unit

“Performs calculations (e.g., x = 2 + 3) and logical comparisons (e.g., IF x > 3) in the CPU.”

CU

Control Unit

“Decodes instructions. Sends signals to control how data moves around the CPU.”

Cache

“Memory in the processor that provides fast access to frequently used instructions and data.”

Register

“Tiny areas of extremely fast memory located in the CPU, normally designed for a specific purpose where data or control information is stored temporarily – e.g., MAR, MDR, etc.”

Von Neumann architecture

“Traditional computer architecture that forms the basis of most digital computer systems. Instructions are fetched, decoded and executed one at a time.”

MAR

Memory Address Register

“Holds the address of data ready to be used by the memory data register or the address of an instruction passed from the program counter. Step two of the fetch-decode-execute cycle.”

MDR

Memory Data Register

**“Holds data fetched from or to be written to memory.
Step three of the fetch-decode-execute cycle.”**

Program counter

**“Holds the address of the next instruction to be executed.
Step one of the fetch-decode-execute cycle.”**

Accumulator

“Holds the result of calculations.”

Clock speed

“Measured in hertz, the clock speed is the frequency at which the internal clock generates pulses. The higher the clock rate, the faster the computer may work. The clock is the electronic unit that synchronises related components by generating pulses at a constant rate.”

Cache size

“The larger the cache, the more data that can be stored without having to go back to main memory (RAM) – this has a significant impact on processing speed.”

Cores

“Part of a multi-core processor, a single component with two or more independent CPUs that facilitate the fetch-decode-execute cycle.”

Embedded system

“A computer built to solve a highly specific problem. Not easy to change. For example, the operating system placed inside a washing machine, microwave or set of traffic lights.”

Primary storage

“Comprised of random-access memory (RAM) and read-only memory (ROM). It holds data and instructions that the CPU can access more quickly and easily than from secondary storage devices.”

RAM

Random-Access Memory

“Volatile (data is lost when the computer is powered off). Read-and-write. Purpose: Temporary storage of currently executing instructions and data – e.g., applications and the operating system.”

ROM

Read-Only Memory

“Non-volatile (data is retained when the computer is powered off). Read-only. Purpose: Stores startup instructions, otherwise known as the bootstrap.”

Virtual memory

“Using part of the hard disk as if it were random-access memory. Allows more applications to be open than physical memory can hold.”

Secondary storage

“Permanent storage of instructions and data not currently in use by the processor. Stores the operating system, applications and data. Read-and-write and non-volatile.”

Optical storage

“CD-R, CD-RW, DVD-R, DVD-RW. Use: Music, films and archive files. Low capacity. Slow access speed. High portability. Prone to scratches. Low cost.”

Magnetic storage

“Hard disk drive. Use: Operating system and applications. High capacity. Medium data access speed. Low portability (except for portable drives). Reliable but not durable. Medium cost.”

Solid-state storage

“Memory cards and solid-state hard drives (SSD). Use: Digital cameras and smartphones. Medium capacity. High portability. Reliable and durable. No moving parts. Fast data access speed. High cost.”

Storage capacity

“The amount of data a storage device can store.”

Storage speed

“The read/write access speed of a storage device.”

Storage portability

“How easy it is to transport a storage device – e.g., solid-state and optical storage are highly portable, whereas magnetic storage is designed to stay in place.”

Storage durability

“How resistant a storage device is to damage and wear. Devices with low durability are likely to fail earlier.”

Storage reliability

“A relative measure of confidence that a storage device will function correctly and allow you to write, read, delete and modify data.”

Storage cost

“The relative price of a storage device – e.g., per megabyte of data.”

Bit

“The smallest unit of storage, represented by either a binary 1 or 0.”

Nibble

“Half a byte. Four bits.”

Byte

“A collection of eight bits.”

Kilobyte

“One kilobyte (KB) is 1024 bytes. For the purpose of calculations in an exam, you can treat a kilobyte as 1000 bytes.”

Megabyte

“One megabyte (MB) is 1024 kilobytes (KB). For the purpose of calculations in an exam, you can treat a megabyte as 1000 KB.”

Gigabyte

“One gigabyte (GB) is 1024 megabytes (MB). For the purpose of calculations in an exam, you can treat a gigabyte as 1000 MB.”

Terabyte

“One terabyte (TB) is 1024 gigabytes (GB). For the purpose of calculations in an exam, you can treat a terabyte as 1000 GB.”

Petabyte

“One petabyte (PB) is 1024 terabytes (TB). For the purpose of calculations in an exam, you can treat a petabyte as 1000 TB.”

Denary numbers

**“A numerical system of notation that uses 10 as its base.
The ten decimal base digits are 0 – 9.”**

Binary numbers

“Binary describes a numbering scheme with only two possible values for each digit, 0 and 1. In computing, binary refers to any digital encoding system with exactly two possible states – e.g., in memory, storage, processing and communications, 0 and 1 are sometimes called low and high, respectively.”

Binary arithmetic

“The process of adding two or more positive 8-bit binary numbers (0 – 255).”

Overflow

“The generation of a number that is too large to be represented by the device intended to store it.”

Hexadecimal

“A numerical system of notation that uses 16 rather than 10 as its base. The 16 hex base digits are 0 – 9 and the letters A – F.”

Binary shifts

**“Allows you to easily multiply or divide a base-2 binary number.
A left shift multiplies the number by 2, while a right shift divides it by 2.**

Character set

“A set of symbols represented by a computer. These symbols, called characters, can include letters, digits, spaces, punctuation marks and control characters.”

ASCII

America Standard Code for Information Interchange

“A character set devised for early telecommunication systems but proved to be ideal for computer systems. Uses 7 bits, providing 32 control codes and 96 displayable characters. The eighth bit is often used for error checking.”

Unicode

“Standard character set that replaces the use of multiple different character sets. Incorporates characters from almost all global languages. A 16-bit extension of ASCII.”

Pixels

“The smallest unit of a digital image or graphic that can be displayed on a digital device. A pixel is represented by a dot or square on a computer display.”

Metadata

“A collection of data that describes and provides information about other data.”

Colour depth

“Also known as bit depth. Either the number of bits used to indicate a) the colour of a single pixel in a bitmap image or video frame buffer or b) each colour component of a single pixel.”

Resolution

“The number of pixels (individual points of colour) in a display, expressed in terms of the number of pixels on the horizontal and vertical axes.”

Image quality

“The overall detail of an image, affected by colour depth and resolution.”

Image file size

“The total size of an image file in storage.
Size in bits = Width in pixels * Height in pixels * Colour depth in bits.”

Sample rate

“The number of samples taken per second, measured in hertz (Hz).”

Sample duration

“How many seconds of audio a sound file contains.”

Sample bit depth

“The number of bits available to store each sample (e.g., 16-bit).”

Playback quality

“The finished quality of the digital sound file – this is affected by the sample rate and bit depth. The higher the number, the better the quality and the larger the file size. CD quality is 44,100 samples per second.”

Sound file size

“The total size of a sound file in storage.
Size in bits = Sampling rate * Sample resolution * Number of seconds.”

Compression

“The process of reducing the size of a file.”

Lossy compression

“A compression method that generally involves a loss of quality where experience tells us that it will be least noticed.”

Lossless compression

“A compression method that allows a file to be recreated in its original quality.”

LAN

Local Area Network

“Small geographic area. All hardware is owned by the organisation using it. Wired with UTP or fibre optic cable or wireless using routers and Wi-Fi access points.”

WAN

Wide Area Network

“Large geographic area. Infrastructure is hired from telecommunication companies who own and manage it. Connected with telephone lines, fibre optic cables or satellite links.”

Client-server network

“A client makes requests to the server for data and connections. A server controls access and security to one shared file store. A server manages access to the internet, shared printers and email services, as well as running data backups.”

Peer-to-peer network

“All computers are equal and serve their own files to each other. Each computer is responsible for its own security and backups and usually has its own printer.”

Wireless access point

“Hardware that allows a Wi-Fi-enabled device to connect to a network.”

Router

“A router sends data between networks. It is needed to connect a local area network to a wide area network. It uses the IP address on a device to route traffic to other routers.”

Switch

“A switch sends data between computers on a local area network. It uses the NIC address on a device to route traffic.”

NIC

Network Interface Card/Controller

“Hardware that connects a computer to a network.”

The internet

**“A worldwide collection of interconnected computer networks.
An example of a WAN – the largest in existence.”**

DNS

Domain Name System

“The internet equivalent of the phone book. Maintains a directory of domain names and translates them to Internet Protocol (IP) addresses – this is necessary because, although domain names are easy to remember, computers access websites using IP addresses.”

Hosting

“Websites stored on dedicated servers. Used for websites that need to be available 24/7, be accessed by thousands of users at a time, be well-protected from hackers and have an IP address that doesn’t change.”

The cloud

“Remote servers that store data to be accessed over the internet. Access anytime, anywhere from any device. Automatic backups. Collaborate on files easily.”

Web server

“A program that uses HTTP (Hypertext Transfer Protocol) to deliver web pages to users. Page requests are forwarded by a computer’s HTTP client. Dedicated computers and appliances may also be referred to as web servers.”

Client

“A device that requests and/or uses services from a remote/connected server.”

Network topology

“The physical or logical arrangement of connected devices on a network – e.g., computers, switches, routers, printers, servers, etc.”

Star topology

“Computers connected to a central switch. If one computer fails, no others are affected. If the switch fails, all connections are affected.”

Mesh topology

“Switches/routers connected so there is more than one route to the destination – e.g., the internet. More resilient to faults but more cable is required.”

Wired connection

“Any computer network that predominantly connects hardware via physical cables – e.g., copper, fibre optic, etc.”

Ethernet

“A standard for networking local area networks using protocols. Frames are used to transmit data. A frame contains the source and destination addresses, the data and error-checking bits. Uses twisted pair and fibre optic cables. A switch is used to connect computers.”

Wireless connection

“Any computer network that predominantly connects hardware via Wi-Fi, eliminating much of the need for physical cabling.”

Wi-Fi

“Wireless connection to a network. Requires a wireless access point or router. Data is sent on a specific frequency. Each frequency is called a channel.”

Bluetooth

“A method of exchanging data wirelessly over short distances – much shorter than Wi-Fi. Examples of typical Bluetooth use could be, headphones, car mobiles etc.”

Encryption

**“Encoding readable data (plain text) into unreadable data (ciphertext).
Only the intended recipient can decode the data using a special key.
Protects sensitive communications against hacking.”**

IP address

Internet Protocol Address

Internet Protocol Address: "A unique string of numbers separated by full stops. Identifies each computer using IP to communicate via a network."

MAC address

Media Access Control Address

“Used as a unique identifier for most network technologies including Ethernet and Wi-Fi.”

Protocol

“A set of rules that allow two devices to communicate.”

TCP/IP

Transmission Control Protocol/Internet Protocol

**“TCP provides error-free transmission between two routers.
IP routes packets across a wide area network.”**

HTTP

Hypertext Transfer Protocol

“A client-server method of requesting and delivering HTML web pages. Used when the information on a web page is not sensitive or personal.”

HTTPS

Hypertext Transfer Protocol Secure

“Encryption and authentication for requesting and delivering HTML web pages. Used in websites that are sending and/or receiving sensitive data (e.g., passwords, bank details).”

FTP

File Transfer Protocol

“Used for sending files between computers, usually on a wide area network.”

POP

Post Office Protocol

“Used by email clients to retrieve email from an email server.”

IMAP

Internet Message Access Protocol

“Used by mail clients to manage remote mailboxes and retrieve email from a mail server.”

SMTP

Simple Mail Transfer Protocol

“Sends email to a mail server.”

Protocol layering

“The concept of protocol rules being built up in layers – the layered protocol stack facilitates the various rules being executed in a defined order.”

Malware

“A broad term that covers all software written to facilitate loss of data, encryption of data, fraud and identity theft.”

Social engineering

“Most vulnerabilities are caused by humans – not locking computers, using unsecure passwords, not following company network policy or implementing it poorly, not installing protection software, not being vigilant with suspicious emails/files and not encrypting sensitive data.”

Phishing

“Sending emails purporting to be from reputable companies to entice people into revealing personal information.”

Brute-force attack

“A trial-and-error method of attempting to guess passwords. Automated software is used to generate a large number of guesses.”

Denial-of-service attack

“Flooding a server with so much traffic that it cannot process legitimate requests.”

Data interception and theft

“Stealing computer-based information.”

SQL injection

“A hacking technique used to view or change data in a database by inserting SQL code into a form instead of data.”

Penetration testing

“Designed to test the security of a system and identify vulnerabilities.”

Anti-malware software

“Protects against many types of malware including viruses, worms, trojans, rootkits, spyware, key loggers, ransomware and adware.”

Firewall

“Network software or hardware designed to prevent external users from gaining unauthorised access to a computer system.”

User access level

“The degree of system access that a specific type of user is allowed. On a network, most users will have restricted access, whereas a system administrator or network technician will be allowed much greater access with fewer restrictions.”

Password

“A secret word or phrase used to gain access to a computer, program, interface or system.”

Physical security

“Any form of physical security intended to protect data and systems – e.g., alarms, locks, security patrols, etc.”

System software

“Software that manages the computer. Usually supplied with the computer.”

Operating system

“Specialised software that communicates with computer hardware to allow other programs to run. The most common operating systems are Windows, Linux, Unix, MacOS and iOS.”

User interface

“Allows a user to interact with a computer – e.g., input devices and software.”

Memory management

“The process of the operating system deciding what should be in memory at any given time. Responsible for loading data and programs into and out of memory when required.”

Multitasking

“Running multiple applications simultaneously by giving each one a slice of processor time.”

Peripheral management

“The management of connected input/output devices such as a mouse, keyboard, webcam, speaker, scanner, printer, etc.”

Driver

“Translates operating system commands into hardware-specific commands – e.g., a printer driver tells the printer how to print a document.”

User management

“Allows different people to log into the same computer with a username and password. Remembers personal settings. Manages file access rights.”

File management

“Access permissions for files (read and write). Opening files in programs. Moving, deleting and renaming files. Presenting a folder structure to the user.”

Utility software

“A program that performs a specific task relating to the operation of the computer – e.g., backup, virus scan, compression, defragmentation.”

Encryption software

“Turns plaintext data into unreadable ciphertext data using a key. Protects data from being read by hackers.”

Defragmentation software

“Files being deleted over time creates gaps on a hard disk. New files fill the gaps but may need more space than the gap provides, resulting in file fragments being spread across the disk. Defragmentation puts file fragments and free space back together in contiguous space, improving access speeds.”

Data compression software

“Reduces the size of a file so it takes up less disk space and is quicker to download over the internet. Compressed files must be extracted before they can be read.”

Algorithmic thinking

“A way of getting to a solution by identifying the steps required.”

Problem inputs

“Any information or data that is fed into a system.”

Problem processes

“Anything that happens to data while a system is running – e.g., calculations.”

Problem outputs

“Any information or data that leaves a system.”

Pseudocode

“A language-independent description of the steps of an algorithm. Intended for humans to express and design algorithms before coding.”

Flowchart

“A method of designing algorithms using symbols before coding.”

Trace table

“A technique used to test algorithms and ensure that no logical errors occur while the algorithm is being processed. The table usually has a column for each variable. Each row shows how the various values change as the algorithm runs.”

Searching algorithms

“An algorithm that attempts to find a specific value in a data set.”

Binary search

“Efficient search method that only works if a file’s records are arranged in sequence. Involves accessing the middle record in the file, determining whether the target record has been found and, if not, whether the target record is before or after the mid-point. The process is repeated on the part of the file where the target record is expected to be until it is found.”

Linear search

“Examining each entry in a file in turn until the target record is found or the end of the file is reached. Unless the file is arranged in a useful order, a serial search must be used.”

Sorting algorithm

“An algorithm that attempts to sort an unordered set of values.”

Bubble sort

“Simple and popular with inexperienced programmers but inefficient for sorting large amounts of data, as the length of time it takes to execute correlates to the square of the number of items – e.g., if a list of 10 items takes 1ms to sort, 100 items will take 100ms.”

Merge sort

“Divide-and-conquer algorithm created by John von Neumann. First, the list is divided into the smallest unit, known as an element. Each element is compared with the adjacent list with a view to sorting the records and merging the two lists back together.”

Insertion sort

“A simple sorting algorithm that builds the final sorted array/list one item at a time. Less efficient with large lists than advanced algorithms like quicksort, heapsort or merge sort.”

Variable

“A value that can change depending on conditions or information passed to the program.”

Constant

“A value that cannot be altered by the program during normal execution.”

Operator

“Tells a program how to manipulate or interpret values. Categories of operators you need to know about are arithmetic, Boolean and comparison.”

Assignment

“Giving a variable or constant a value (e.g., counter = 0).”

Programming construct

**“Lines/blocks of code that perform a certain function.
The three basic programming constructs are sequence, selection and iteration.”**

Sequence

**“One of the three basic programming constructs.
Instructions that are carried one after the other in order.”**

Selection

“One of the three basic programming constructs. Instructions that can evaluate a Boolean expression and branch off to one or more alternative paths.”

Count-controlled iteration

“An iteration that loops a fixed number of times. A count is kept in a variable called an index or counter. When the index reaches a certain value (the loop bound) the loop will end. Count-controlled repetition is often called definite repetition because the number of repetitions is known before the loop begins executing.”

Condition-controlled iteration

“A way for computer programs to repeat one or more steps depending on conditions set either a) initially by the programmer or b) by the program during execution.”

Arithmetic operator

+ - / * ^

“Used in mathematical expressions (e.g., num1 + num2 = sum).”

Boolean operator: AND

**“A logical operator used within a program.
Only returns TRUE if both values being compared are TRUE.”**

Boolean operator: OR

**“A logical operator used within a program.
Returns TRUE as long as either value being compared is TRUE.”**

Boolean operator: NOT

**“A logical operator used within a program.
Returns FALSE if the input is TRUE and returns TRUE if the input is FALSE.”**

Comparison operator: ==

“Equal to.”

Comparison operator: !=

“Not equal to.”

Arithmetic operator: MOD

“Integer division. MOD outputs the remainder left over after division – e.g., 10 MOD 3 = 1.”

Arithmetic operator: DIV

“Integer division: DIV outputs the number of times a number fits into another number – e.g., 10 DIV 3 = 3.”

Arithmetic operator: ^

“Exponent.”

Data type

“The basic data types provided as building blocks by a programming language. Most languages allow for more complicated, composite types to be constructed from basic types recursively – e.g., char, integer, float, Boolean. As an extension, a string data type is constructed behind the scenes of many char data types.”

Integer

“A data type used to store positive and negative whole numbers.”

Real

“A data type used to store an approximation of a real number in a way that can support a trade-off between range and precision. Typically, a number is represented approximately to a fixed number of scaled digits and scaled exponentially.”

Boolean

“Used to store logical conditions – e.g., TRUE/FALSE, ON/OFF, YES/NO, etc.”

Character

“A single alphanumeric symbol.”

String

“A sequence of alphanumeric characters and/or symbols – e.g., a word or sentence.”

Casting

“Converting a variable from one data type to another. For example, a variable entered as a string needs to be an integer for calculation – age = INPUT(“Enter your age: “) age = INT(age).”

Array

“A set of data items of the same type grouped together using a single identifier. Each item is addressed by its variable name and a subscript.”

Sub-programs

“A block of code given a unique identifiable name within a program. Supports code reuse and good programming technique.”

Procedure

“A block of code within a program that is given a unique, identifiable name. Can take upwards of zero parameters when it is called. Should be designed and written to perform a task or action that is clearly indicated by its name.”

Function

**“A block of code within a program that is given a unique identifiable name.
Can take upwards of zero parameters when it is called and should return a value. Should be designed and written to perform a task or action that is clearly indicated by its name.”**

Random number generation

“Most programming languages have built-in functions or libraries that allow you to easily generate random numbers. Creating truly random numbers is actually rather difficult for a computer, and these algorithms are quite complex.”

Logic diagram

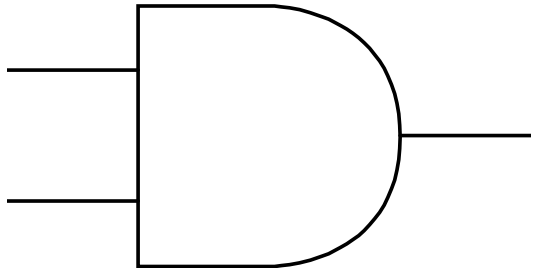
“A method of expression Boolean logic in a diagram using a set of standard symbols that represent the various logic gates – AND, NOT, OR, NAND, etc.”

Logic gate

“A symbol in a logic diagram that represents a single gate – e.g., AND, OR, NOT.”

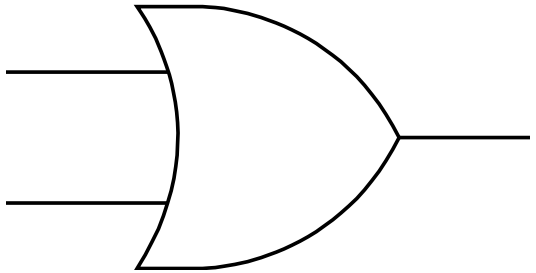
Logic gate: AND

“Accepts two inputs and produces one output. Both inputs must be TRUE (1) for the output to be TRUE (1) – otherwise, the output will be FALSE (0).”



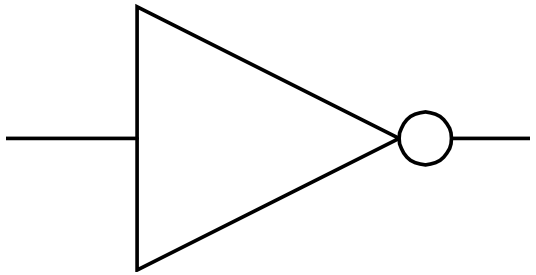
Logic gate: OR

“Accepts two inputs and produces one output. At least one input must be TRUE (1) for the output to be TRUE (1) – otherwise, the output will be FALSE (0).”



Logic gate: NOT

"Accepts one input and produces one output. If the input is TRUE (1), the output will be FALSE (0). If the input is FALSE (0), the output will be TRUE (1)."



Truth table

“A notation used in Boolean algebra to define the output of a logic gate or logic circuit for all possible combinations of inputs.”