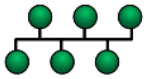
GCSE Computing

Essential Knowledge

Computer System	Combination of hardware and software;
Binary	Discrete Numbering System. Signifies voltage/current/electricity on or off. Allows for digital processing.
Data	Raw facts and figures. No context or processing.
Information	Data that has been processed.
Hexadecimal	Numbers are displayed in a more compact way than in binary.
Algorithm	A series of instructions that solves a problem in a finite number of steps.
Boolean	A variable data type which can be set to either true or false.
Integer	A variable data type which is a whole number.
Character	A variable data type which is either a letter, number or symbol. The number has no value.
String	A variable data type. A series of characters. Cannot perform a calculation on a number stored as a string. It must be converted to an integer or real value.
Date	Some languages have a date data type or the day, month and year could each be stored as separate integer or string values
Character Set	All the characters which are can be represented by the computer system. There are many different character set standards such as ASCII, Unicode.
Array / List	A group of variables of the same data type stored under one identifier. Each individual variable is given an index number by which it is referred to within the array.
ASCII	ASCII is a 7-bit character set. 128 characters represent English alphabet. Characters of many other alphabets (accept languages) cannot be represented.
UNICODE	Unicode has a much larger character set (16 bits) and can represent many more characters/characters from all alphabets.
CPU	Performs processing on a computer. Fetches instructions from memory. Fetches data from memory. Decodes instructions. Executes instructions. Performance can be improved through: number of cores clock speed/number of cycles

	word size architecture of the CPU type of cache memory
CPU processing of instructions	The instructions are held in memory The processor fetches an instruction from memory The processor decodes the instruction The processor executes the instruction The result may be stored back into memory The process is repeated continuously
Clock Speed	Instructions are fetched from memory. Decoded and Executed by the processor. The speed at which this cycle happens is the clock speed of the CPU. Higher clock speed means more instructions can be executed in same period of time.
Dual Core CPU	Two cores may be able to process two instructions in parallel.
Cache Memory	Superfast memory. Frequently used instructions/data are pre-loaded into cache which is faster to access than RAM. Reduces the time to fetch data/instructions;
Secondary Storage	A storage device other than RAM. Eg hard disk, solid state USB drive.
Magnetic Storage	Hard disk drive. Stores binary on a magnetised disc as series of magnetised/demagnetised areas which represent 0 or a 1. Unsuitable for mobile devices due to moving parts, slower data transfer times, less robust, larger in size and uses more power than solid state.
Solid State Storage	Storage device with no moving parts. Used in Smart Phones/Tablet. Faster access than other storage mediums. Less power consumption. Robust unlike magnetic drives.
Optical Storage	CD-R/DVD-R. Device read by a laser. Once data written cannot be altered on the device. Laser into the correct position over the CD. CD is spun to ensure all data can be read. The laser is shone on to the disk. The laser is reflected off disc. Bumps and Pits on disk change reflectivity of laser. This represents 1s and 0s of data.
RAM	Internal memory. A large amount of RAM enables more instructions/programs to be loaded from secondary storage into RAM so they can be executed by the processor. Volatile.
ROM	Internal memory. Stores bootstrapping instructions that allows device to boot up and search or OS. Non-volatile.
Virtual Memory	When a computer system has insufficient memory the backing store (HDD) is used as temporary RAM. When main memory is limited it allows computer to run more software/multi task.

Function	Block of code. Always returns a value. Procedures do not return a value. Allows reusability through parameters. Reduced lines of code required. They can be tested in isolation and only require testing once. Easily updated. Easier to read. Reduced chances of errors.
Parameter	Value sent to a Function/Procedure
External software sources/Software libraries	Blocks of pre-written/pre-tested code that can be used in programs. Saves programming time. Allows more professional looking input screens. Allows access to advanced validation code. May reduce the security of the site. External code may not be well documented. Limited by what the external source of code offers.
Bitmap Image	Image is represented as a sequence of pixels. Each pixel represents a colour. 1 bit per pixel – B&W image. 1 byte per pixel 256 different colours available. Quality of bitmap image depends on number of pixels used to make up image.
Digitised Sound Sampling	Microphone picks up sound waves converted from an analogue signal into a digital signal. Multiple values at specific points on sound wave (sample rate) are converted to a binary number and stored as a file
Network	Two or more computers that have been connected together. Can communicate to one another.
Advantages of connecting to a Network	Enables users to work from multiple physical locations. Hardware resources to be shared between computers eg printer Creates more resilient systems (than when you are reliant on just one computer) Access to web services and monitoring of web traffic Easier monitoring of all users. Centralised back-up is possible.
Disadvantages of connecting to a Network	Additional hardware is required. Introduces potential security risks eg viruses, hacking Additional support costs Certain hardware failures (e.g. main server or switch/router) could impact other devices
Network Topology	Method of connecting a group of devices together in a particular structure.
Bus	
Ring	

	One faulty device/connection means the network can fail. Connections are shared between all devices so not secure. Data has potentially to travel through many devices before reaching its destination
Star	 It allows each client to use full transmission over the network No data collisions Easy to connect new devices The failure of one client will not affect the others Packets are only sent to intended device;
Protocol	An agreed method of communication. Set of rules that govern communication.
Syntax Error	Errors that occur during the execution of a program as a result of mistakes in the program. Breaks rules of language. Picked up early in development. Easy to locate and fix. IDE will often identify. Prevent code from executing until fixed.
Run Time Error	Written as syntactically correct code. May only appear late (or never) in testing. IDE tools will help to identify syntax errors but are less useful in identifying run-time errors. Will cause a running program to crash. Run-time errors may not occur every time the program is run
Logic Error	Code will execute but will not perform desired outcome. Can be difficult to detect because code will execute. Can often be missed due to ineffective testing. The error only occurs very infrequently. Action taken after testing was incorrect. New software updated may introduce new logic errors. Code can be overly complex.
Methods to spot and reduce errors in code	Built in functions in IDE will include. Watch/Variable table Breakpoint; Step through Syntax colouring

	Automatic Code completion
Waterfall Method	Methodology of software development. Analysis, Design, Implementation, Testing, Evaluation Each phase clearly separated, inflexible, difficult to go back a step if needed.
Spiral Method	Methodology of software development. More client consultation, ability to return and fix problems. Involves prototyping during design and implementation phase.
Agile Method	Methodology of software development. Regular testing, faster development, difficult to develop large software using this method
Prototyping	Advantages Enable the system to be reviewed by the user during development. May provide a final system that is better suited to the users needs. Will detect incorrect features earlier than other models. Enable the developers to gain an early insight into how the system could be developed. Disadvantages Prototypes can be converted to final code that is hard to maintain. Prototypes can be converted to final code of lower quality than a properly analysed solution.
Unit Testing	Performed by the programmer as they are developing the program. They test the correctness of small blocks of code in isolation.
Integration Testing	Performed when all of the different parts of code, such as functions or modules, are complete. This tests whether the units of code work together correctly.
System Testing	Takes place after the code has been individually tested and is done without having to have any knowledge of the code itself (black box testing). This tests that the entire system functions correctly.
Test Data	Data that is used to test a new system. Is either Normal, Extreme or Erroneous.
Normal Test Data	Test data that falls within the bounds of the validation rules
Extreme Test Data	Test data that is at the upper or lower limit of the validation rules – eg. A Number between 1-10 would be either 1 or 10.
Erroneous Test Data	Test data that will force an error on a validation rule. It is purposely incorrect.
Database	An organised collection of data items
Relational Database	A database with 2 or more tables that are linked via primary and foreign keys,

Primary Key	Unique identifier within a table that identifies a record. Eg. Candidate Number
Foreign Key	A primary key in one table that exists within another table. Used to link tables together.
Advantages Social Networks	Data could be stored outside of country so (possibly) free from censorship. Allows other media to be shared along with text such as videos and photos to keep people more informed of important global events. Allows communication to many recipients simultaneously thus speeding up communication. Potential to allow anyone interested to see information and so potentially increasing the speed of the spread of information.