Share Multi Academy Trust

Curriculum Plan

Subject: **OCR GCSE Computer Science** **Year** **10** **Ability** **All**

Term / Date(s)	**Topic 1 (6-8 Weeks)**	**Topic 3 (3-4 Weeks)**	**Topic 4 (3-4)**
Topic	Systems architecture	Memory and storage Methods	Memory and storage Data Representation
Topic overview **Pupils will learn…**	In this topic, students will learn about the structure of the CPU and how it works, along with the most common Von Neumann Architecture. They will also look at what can affect a CPUs performance and the purpose and uses of embedded systems.	In this topic, students will learn about the need for primary and secondary storage and how computers store all types of data from text, images and sound.	In this topic, students will learn about the need for primary and secondary storage and how computers store all types of data from text, images and sound.
Components	Students will learn and understand about: **Architecture of the CPU** • What actions occur at each stage of the fetch-execute cycle, the role/purpose of each component and what it manages, stores, or controls during the fetch-execute cycle; the purpose of each register and what it stores (data or address); and the difference between storing data and an address, in order to understand how a CPU works and functions in all computer systems. **CPU performance** • Understanding of each characteristic, the effects of changing any of the common characteristics on system performance, either individually or in combination, in order to understand how CPU performance can be affected. **Embedded Systems** • What embedded systems are, typical characteristics of embedded systems and raise familiarity with a range of different embedded systems in order to understand their uses and functions.	Students will learn and understand about: **Primary storage (memory)** • Why computers have primary storage and how this usually consists of RAM and ROM, including the key characteristics of RAM and ROM. • Why virtual memory may be needed in a system and how virtual memory works by transferring data between RAM and HDD when RAM is filled. **Secondary storage** • Why computers have secondary storage and recognise a range of secondary storage devices/media. • The differences between different types of storage device/medium, in order to compare advantages/disadvantages for each storage device and be able to apply their knowledge in context within scenarios. **Units** • Why data must be stored in binary format for the computer to understand it and the different sizes of binary units that are common place within computer systems and how to move between them in order to calculate capacity of devices and required capacity for a given set of files, including sound, images and text files. ○ sound file size = sample rate x duration (s) x bit depth ○ image file size = colour depth x image height (px) x image width (px) ○ text file size = bits per character x number of characters	Students will learn and understand about: **Data Storage** • **Numbers** ○ Denary number range 0 – 255, Hexadecimal range 00 – FF, Binary number range 00000000 – 11111111 in order to convert any number in these ranges to another number base. They must also understand about, in order to demonstrate their ability to deal with binary numbers containing between 1 and 8 bits e.g. 11010 is the same as 00011010 and of performing and understanding the effects of binary shift (both left and right) on a number. • **Characters** ○ How characters are represented in binary using ASCII and Unicode, how the number of characters stored is limited by the bits available, the differences between and impact of each character set and how character sets are logically ordered, in order to recommend one character set over another and work out the position of a character with a given set. • **Images** ○ How images are made up of many pixels, that each pixel has a specific colour, represented by a specific code, the effect on image size and quality when changing colour depth and resolution and how metadata stores additional image information, in order to specify any of these for a given scenario. • **Sound** ○ How and why analogue sounds must be stored in binary and how sample rate, duration, and bit depth can effect sound file size and quality. **Compression** • Common scenarios where compression may be needed and the advantages and disadvantages of lossy and lossless compression and the effects each has on the file, in order to recommend a suitable compression method for given scenarios.
What pupils should already know (prior learning components)	In Key Stage 3 students have learnt about the purpose of the CPU within a computer system, clock speed and embedded systems.	In Key Stage 3 students have learnt about computer memory storage devices and their uses, units of data storage and how to get from one unit to another.	In Key Stage 3 students have learnt about different storage devices and their uses, units of data storage, how data is represented as images, characters, and numbers (binary to denary and vice-versa)
Transferrable knowledge (skills)	Students must be able to recall any information regarding CPU architecture, performance and embedded systems in order to apply it to any given scenario and identify certain aspects of each within the exam. CPU architecture links with Memory and Storage as to how memory is used by the CPU and how all data needs to be converted in to binary for use by the CPU. It also links to systems software with regards multitasking and data transfer between the processor and devices.	Within the exam, students must be able to explain the need for memory and secondary storage and the differences between different devices within these areas in order to suggest the most suitable device for a given scenario. They must also be able to calculate required storage capacities for storing different files within a given scenario.	Within the exam, students must be able to convert between different number systems and perform binary addition and shifts, understanding the effects of performing these for various given scenarios. The must also be able to identify and explain different character sets and explain the effects of changing properties within images and sound files. They must also be able to explain the most appropriate compression method for a given scenario and explain the effects on compressing files using lossy and lossless compression.
	The fetch-execute cycle, CPU, ALU (Arithmetic Logic Unit), CU (Control Unit), Cache, Registers, Von Neumann architecture, MAR (Memory Address Register), MDR (Memory Data Register), Program Counter, Accumulator, CPU performance, Clock speed, Cache size, cores, embedded system.	Memory, storage, RAM, ROM, volatile, non-volatile, primary, secondary, optical, magnetic, solid state, virtual, capacity, Speed, portability, Durability, Reliability, Cost, Bit, Nibble (4 bits), Byte (8 bits), Kilobyte (1,000 bytes or 1 KB), Megabyte (1,000 KB), Gigabyte (1,000 MB), Terabyte (1,000 GB), Petabyte (1,000 TB)	Binary, denary, hexadecimal, numbers, characters, ASCII, Unicode, images, pixel, colour depth, resolution, metadata, sound, analogue, digital, sample rate, duration, bit depth, compression, lossy, lossless.

Assessment activities	Starter and plenary mini assessments End of unit tests (40mins at the end of each unit) Use of online assessments (forms, Kahoot, quizizz) Content covered is used within the PPG assessments in the form of an exam style paper using past exam questions from the exam board.	Starter and plenary mini assessments End of unit tests (40mins at the end of each unit) Use of online assessments (forms, Kahoot, quizizz) Content covered is used within the PPG assessments in the form of an exam style paper using past exam questions from the exam board.	Starter and plenary mini assessments End of unit tests (40mins at the end of each unit) Use of online assessments (forms, Kahoot, quizizz) Content covered is used within the PPG assessments in the form of an exam style paper using past exam questions from the exam board.

Resources available	• Lesson Resources: I:\Maths and Computing\ICT\OCR Computer Science
	• SOW: I:\Maths and Computing\ICT\Curriculum
	• CGP Revision Guide - 178908556X
	• Online:
	  ○ BBC Bitesize – Systems Architecture
	  ○ Teach-ICT.com
	  ▪ Computer Systems
	  ▪ CPU Components
	  ▪ Von Neumann Architecture
	  ▪ Fetch-Decode-Execute
	  ▪ CPU Performance
	  ▪ Embedded Systems
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Notes **Why this topic is important…**	Having a better understanding of how computers work allows students to determine the how's and whys of computer systems, which helps them become more effective in using the different hardware and software. Knowing about different computer systems makes it easy to understand their benefits and limitations, and their intended used. This helps students maintain realistic expectations about computers and attached devices and maximise their use.	Having a better understanding of how computers work allows students to determine the hows and whys of computer systems, which helps them become more effective in using the different hardware and software. Knowing about different computer systems makes it easy to understand their benefits and limitations, and their intended used. This helps students maintain realistic expectations about computers and attached devices and maximise their use.	