Meden School Curriculum Planning							
Subject	GCSE Computer Science	**Year Group**	10	**Sequence No.**	2	**Topic**	Data Representation

Tier 3 List:

Bit, nibble, byte, kilo, mega, giga, tera, peta, binary, Bit depth, sample rate, colour depth, pixel, bit per character, Binary shift, shift left, shift right, most significant bit, least significant bit, Character set, ASCII, Unicode, metadata, hertz, compression, lossy, lossless

Week Number	Retrieval	Core Knowledge	Student Thinking
-	What do teachers need to **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need to teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **develop our students' thinking, encouraging them to see the inequalities around them** and 'do something about them!'
1: U2: Data Representation, Units and Binary	KS3 – students completed topics on binary and will be able to convert from denary to binary and binary to denary.	Define the terms bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte and petabyte Understand that data needs to be converted into a binary format to be processed by a computer Convert positive denary whole numbers (0-255) into 8-bit binary numbers and vice versa • **Nibble** - 4 bits (half a byte) • **Byte** - 8 bits • **Kilobyte** (KB) - 1000 bytes • **Megabyte** (MB) - 1000 kilobytes • **Gigabyte** (GB) - 1000 megabytes • **Terabyte** (TB) - 1000 gigabytes The binary system on computers uses combinations of 0s and 1s.	Students will be able to compare computer specifications and suggest the most appropriate for given audience and purpose. Further embed links within ICT / Computer science and Mathematics. Prepare students for further studies at A-Level and University for Computer Science. Understand how the impact of file size can affect disk space, therefore impacting day to day storage practises.

		In everyday life, we use numbers based on combinations of the digits between 0 and 9. This counting system is known as decimal, denary or base 10. A number base indicates how many digits are available within a numerical system. Denary is known as base 10 because there are ten choices of digits between 0 and 9. For binary numbers there are only two possible digits available: 0 or 1. The binary system is also known as base 2. All denary numbers have a binary equivalent and it is possible to convert between denary and binary.	Photography links regarding file sizes and how these can be used cross subjects.
2: U2: Data Representation, Binary arithmetic and hex	KS3 – students completed topics on binary and will be able to convert from denary to binary and binary to denary.	Convert positive denary whole numbers (0-255) into 2-digit hexadecimal numbers and vice versa Convert between binary, denary and hexadecimal equivalents of the same number. Add two 8-bit binary integers and explain overflow errors which may occur Understand the use of binary shifts **Binary shifts** - Binary numbers are multiplied and divided through a process called shifting.	
3: U2: Data Representation, Characters	KS3 – understanding of computer language and the use of binary for storage	Understand the use of binary codes to represent characters Understand the term 'character set'	

		Explain the relationship between the number of bits per character in a character set, and the number of characters that can be represented using: • ASCII • Extended ASCII • Unicode Text and numbers can be encoded in a computer as patterns of binary digits. Hexadecimal is a shortcut for representing binary. ASCII and Unicode are important character sets that are used as standard. The **ASCII character set** is a 7-bit set of codes that allows 128 different characters. That is enough for every upper-case letter, lower-case letter, digit and punctuation mark on most keyboards. ASCII is only used for the English language. **Extended ASCII code** is an 8-bit character set that represents 256 different characters, making it possible to use characters such as é or ©. Extended ASCII is useful for European languages. **Unicode** uses between 8 and 32 bits per character, so it can represent characters from languages from all around the world. It is commonly used across the internet. As it is larger than ASCII, it might take up more storage space when saving documents. Global companies, like Facebook and Google, would not use the ASCII character set because their users communicate in many different languages.	

4: U2: Data Representation, Images	KS3 – understanding of computer language and the use of binary for storage	Understand how a bitmap graphic is made up of individual pixels Explain how each pixel is represented in binary Understand that the number of bits per pixel determines the number of available colours for an image Explain the need for image metadata Explain the relationship between file size and image resolution Graphics on a screen are made up of tiny blocks called **pixels**. The more pixels on the screen, the higher the resolution and the better the quality of the picture will be. The higher the image resolution, the more memory is needed to store the graphic. Image files can be either bitmaps or vectors. **Bitmap images** are widely used on digital cameras, smartphones and online. Common bitmap image file types include JPEG, GIF and PNG. Bitmaps are also known as pixelmaps or raster graphics. Bitmap images are organised as a grid of coloured squares called pixels (short for 'picture elements'). When zooming in or enlarging a bitmap image, the pixels are stretched and made into larger blocks. This is why bitmap images appear as poor quality when enlarged too much. A **vector image** uses scalable shapes such as straight lines and curves, using coordinates and geometry to precisely define the parts of the image. It is more efficient than bitmaps at storing large areas of the	

		same colour because it does not need to store every pixel as a bitmap does. Vector graphics can be scaled without losing resolution. They can be enlarged or reduced in size - but the file size will stay almost exactly the same.	
5: U2: Data Representation, Sound	KS3 – understanding of computer language and the use of binary for storage	Understand how sound is sampled and stored in digital form Be able to represent a short sound file in binary Explain how sampling intervals and resolution affect the size of a sound file using the terms: • Sample rate • Bit depth Explain the trade-off between file size and the quality of playback **Bit depth** is the number of bits available for each sample. The higher the bit depth, the higher the quality of the audio. Bit depth is usually 16 bits on a CD and 24 bits on a DVD. A bit depth of 16 has a resolution of 65,536 possible values (ranging from 0 to 65,535), and a bit depth of 24 has over 16 million possible values (ranging from 0 to 16,777, 216). 16-bit resolution means each sample can be any binary value between 0000 0000 0000 0000 and 1111 1111 1111 1111. **Sample Rate** - How many samples of data are taken per second. This is normally measured in hertz, eg an audio file usually uses samples of 44.1 kHz (44,100 audio samples per second).	

6: U2: Data Representation, Compression	KS3 – understanding of computer language and the use of binary for storage	Explain the need for compression Describe the difference between lossy and lossless compression **<u>Lossless</u>** - A form of compression that encodes digital files without losing detail. Files can also be restored to their uncompressed quality **<u>Lossy</u>** - A form of compression that reduces digital file sizes by removing data	