Scheme of Learning: GCSE Computing

Topic Sequence:

1	2	3	4	5	6
Computational Thinking	Data	Computers	Networks	Issues and Impacts	Programming

Topic Overview:

Data can be represented in many different forms. You can see this happening throughout time, for example, in the use of cave paintings and clay tablets, through to the use of Morse code. Data and instructions in a computer are formed using a series of 1s and 0s. In this unit, learners will discover how numbers, letters, images, and sound are represented with 1s and 0s. They will also learn about the factors that impact on the quality of those representations, such as bit depth. Finally, learners will be introduced to the concept of compression and discover how to perform run length encoding and Huffman coding as forms of lossless compression.

Links:
GCSE Computing Topic 2

Lesson Sequence:

Lesson 1 Number bases: Learners will discuss examples of representation from storytelling to clay etchings. They will then be introduced to how data is represented in computers.

Lesson 2 Binary addition: Learners will discover how to count in binary so that they can establish an understanding of the patterns that occur when numbers increase by 1 in binary.

Lesson 3 Binary shifts: Learners will be introduced to binary shifting that can be used for multiplication and division of binary numbers.

Lesson 4 Signed binary integers: Learners will be introduced to the concept of signed and unsigned integers. They will find out how to identify the least significant and most significant bits. They will learn how to identify a positive and negative integer using sign and magnitude. Finally, they will discover two's complement.

Lesson 5 Hexadecimal: Learners will be reminded about base 2 and base 10, then they will be introduced to hexadecimal, which is base 16. They will be shown methods for converting between base 2 and base 16.

Lesson 6 ASCII: Learners will be introduced to the ASCII character set. They will learn that it traditionally used 7 bits, but now uses 8 bits. They will calculate the maximum number of characters that can be represented using 7 bits, then they will be introduced to the ASCII table.

Lesson 7 Representing bitmap images: learners will investigate what a pixel is by looking at a pixelated image. They will then discover how colour depth and resolution are used to determine the number of available colours and the image size.

Lesson 8 Bitmap file size calculation: Learners will recap their understanding of bitmap images. They will then discover how to calculate the file size of a bitmap image using different examples.

Lesson 9 Representing sound: Through examples and demonstrations, learners will find out about the key terms: sampling, sample rate, and sample resolution.

Lesson 10 Sound file size calculation: Learners will recap their understanding of how sound is interpreted digitally. They will then learn how to calculate the file size of a sound file through demonstrations and examples

Lesson 11 Measurements of storage: Learners will already be familiar with the terms 'bit', 'nibble', and 'byte'. They will now learn about other types of storage capacity, and they will practise converting between units of measurement.

Lesson 12 Lossy and lossless compression: Learners will be introduced to the concept of data compression and learn about why it is needed, and that it comes in different forms. They will be introduced to the terms 'lossy' and 'lossless'.

National curriculum links

Develop their capability, creativity and knowledge in computer science, digital media and information technology
Develop and apply their analytic, problem-solving, design, and computational thinking skills

Sequence of Lessons:

1	Storage Units & Binary numbers
2	Binary Arithmetic
3	Binary Shifts
4	2's Complement
5	Hexadecimal
6	ASCII
7	Representing bitmap images
8	Bitmap file size calculation
9	Representing sound
10	Sound file size calculation
11	Measurements of storage
12	Compression

Topic Resources:

Knowledge Map:	Data Representations Data-Images-Sound-Compression	Any other Resources:	

Assessment:

Knowledge:	Interim assessment after lesson 5 Full assessment after lesson 12
Application of Knowledge:	Mastery Book

Supportive Reading:

Craig n Dave Videos	GCSE (1CP2) EDEXCEL: Topic 2A Binary – YouTube GCSE (1CP2) EDEXCEL: Topic 2B Data representation & compression - YouTube
BBC Bite Size	Units - Data - Edexcel - GCSE Computer Science Revision - Edexcel - BBC Bitesize
Revision Guide	Pearson REVISE Edexcel GCSE Computer Science Revision Guide inc online edition - 2023 and 2024 Weidmann, Ann, Selby, Cynthia: 9781292374000: