Abstract Education

LESSON PLAN

LEARNER	
CLASS	IGCSE Computer Science

UNIT 1: DATA REPRESENTARTION

All data is represented as binary digits, whether it is numbers, text, images or sound. Calculations are also done in binary.

In a computer, all data is stored in binary form. A binary digit has two possible states, 1 and 0.

A binary digit is known as a bit. A bit is the smallest unit of data a computer can use. The binary unit system is used to describe bigger numbers too.

Eight bits are known as a byte.

OBJECTIVES

Data Representation

- Number systems
- Text, sound and images
- Data storage and compression

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RESOURCES

Data Representation

Cambridge IGCSE Computer Science

David Watson

Chapter 1

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Number Systems

- Understand how and why computers use binary to represent all forms of data
- Understand the denary, binary and hexadecimal number systems
- Convert between
    - positive denary and positive binary
    - positive denary and positive hexadecimal
    - positive hexadecimal and positive binary
- Understand how and why hexadecimal is used as a beneficial method of data representation
- Add two positive 8-bit binary integers
- Understand the concept of overflow and why it occurs in binary addition
- Perform a logical binary shift on a positive 8-bit binary integer and understand the effect this has
- on the positive binary integer
- Use two's complement to represent positive and negative 8-bit binary integers

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Binary Systems

Binary and denary
https://www.bbc.co.uk/bitesize/guides/zwsbwmn/revision/3

Converting Binary to Denary
https://www.youtube.com/watch?v=q7nZbAUTSC4&feature=youtu.be

Converting Denary to Binary
https://www.youtube.com/watch?v=70lM1qAD5u4&feature=youtu.be

What are Binary (base 2), Denary (base 10) and Hexadecimal (base 16)?
https://www.youtube.com/watch?v=QL3uDJDuSjo&feature=youtu.be

Hexadecimal

Converting Binary to Hexadecimal
https://www.youtube.com/watch?v=G5Rpxhtmo3I&feature=youtu.be

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Converting Hexadecimal to Binary
https://www.youtube.com/watch?v=Z2pvB1L3IOI&feature=youtu.be

Converting Denary to Hexadecimal
https://www.youtube.com/watch?v=NTiBqXm9u8Q&feature=youtu.be

Converting Hexadecimal to Denary
https://www.youtube.com/watch?v=bjpMvXd1TTQ&feature=youtu.be

Data capacity calculations
https://www.youtube.com/watch?v=KzgbVfnJ7I4

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Text, sounds and images

- Understand how and why a computer represents text and the use of character sets, including American standard code for information interchange (ASCII) and Unicode
- Understand how and why a computer represents sound, including the effects of the sample rate and sample resolution
- Understand how and why a computer represents an image, including the effects of the resolution and colour depth

Units and data representation - Hexadecimal
https://www.bbc.co.uk/bitesize/guides/zfspfcw/revision/5

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Data storage and compression

- Understand how data storage is measured
- Calculate the file size of an image file and a sound file, using information given
- Understand the purpose of and need for data compression
- Understand how files are compressed using lossy and lossless compression methods

The need for secondary storage

https://www.youtube.com/watch?v=YRPYYo1_rbw

Data capacity and calculation of data capacity requirements

https://www.youtube.com/watch?v=KzgbVfnJ7I4

Common types of storage

https://www.youtube.com/watch?v=xVEqumA5y6A

Memory, Storage Devices and Media

https://www.youtube.com/watch?v=DR37CrwQ0mU

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GLOSSARY

Binary - a base 2 number, can be 1 or 0

Denary – a base 10 number, can be 0, 1, 2, 3, 4, 5, 6, 7, 8 or 9

Analogue – the stream of data used in the 'real world', e.g. a sound wave

Digital – data that is represented in 1s and 0s (binary)

Register – a small piece of memory that can hold a piece of data or an instruction

Hexadecimal – a base 16 number, can be 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

Character set – the numbers, letters and symbols that can be represented by a computer

ASCII – a character set that uses 7 or 8 bits per character

Bitmap – an image made up of pixels

Pixel – a small square within an image that can contain only one colour

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Sampling – reading the height of a sound wave at a set interval; this is converted into a binary number

Data compression – reducing the size of a file

Lossy compression – when decompressed, the file will not be identical to the original

Lossless compression – when decompressed, the file will be identical to the original