

Year 8 – Representations: from clay to silicon

Unit introduction

This unit conveys essential knowledge relating to binary representations. The activities gradually introduce learners to binary digits and how they can be used to represent text and numbers. The concepts are linked to practical applications and problems that the learners are familiar with.

Overview of lessons

Lesson	Brief overview	Learning objectives
1 Across time and space	Learners discuss familiar examples of representations, some of which date back millennia, to better understand their use and characteristics. This prepares learners for their encounter with binary representations in the context of computing, and places these within a much broader (and more familiar) context.	<ul style="list-style-type: none"> List examples of representations Recall that representations are used to store, communicate, and process information Provide examples of how different representations are appropriate for different tasks
2 Lights and drums	Learners work in groups through an activity that requires them to encode, transmit, and decode short messages, with each group using a different coding scheme and communication medium (signals, light, sounds, holes on paper, etc.). The activity reinforces the learners' understanding of text representation using sequences of symbols, while emphasis is placed on distinguishing between symbols and the way in which they are embodied in physical media.	<ul style="list-style-type: none"> Recall that characters can be represented as sequences of symbols and list examples of character coding schemes Measure the length of a representation as the number of symbols that it contains

		<ul style="list-style-type: none"> • Provide examples of how symbols are carried on physical media
3 Binary digits	<p>Learners grasp what binary digits are by associating them with familiar sets of symbols such as letters and decimal digits. Learners solve simple problems that reinforce the connection between (alphanumeric) information and its binary representation. They also consider the question of why binary digits are predominantly used in conjunction with computing systems.</p> <p>Week 3 multiple choice quiz will be completed within this class. This will inform the teacher of any misconceptions that need to be addressed before moving on.</p>	<ul style="list-style-type: none"> • Explain what binary digits (bits) are, in terms of familiar symbols such as digits or letters • Measure the size or length of a sequence of bits as the number of binary digits that it contains
4 Numbers in binary	<p>Learners build upon their familiarity with using a decimal numbering system, in order to draw analogies with how numbers can be represented using binary. They use activities, either unplugged or software-based, to become familiar with binary number representation and convert between binary and decimal.</p>	<ul style="list-style-type: none"> • Describe how natural numbers are represented as sequences of binary digits • Convert a decimal number to binary and vice versa
5 Large quantities	<p>This lesson familiarises learners with bytes and the prefixes used for measuring representation size, such as 'kilo-', 'mega-', 'giga-' and 'tera-'. Simple activities embed these concepts in real-life settings and introduce learners to conversions between the different units and multiples.</p>	<ul style="list-style-type: none"> • Convert between different units and multiples of representation size • Provide examples of the different ways that binary digits are physically represented in digital devices
6 Turing's mug	<p>The unit is concluded with a summative assessment quiz and a puzzle activity that challenges learners to unchain Alan Turing's mug.</p>	

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