

Unit 4

Topic	Binary and Computer Logic
Topic overview Pupils will learn...	Understand how digital devices process data through the user of binary, Boolean logic and encoding and develop the skills needed to perform processes in order to represent numbers, text and images
Components	<ul style="list-style-type: none"> • Know that digital devices rely on switches to make the decisions involved in data processing in order to articulate how computers function. • Explore the concept of AND, OR and NOT logic gates and be able to complete truth tables for logic gates in order to describe how computers make complex decisions. • Understand the significance of 1s and 0s in data processing within digital systems and how binary numbers relate to denary numbers and in order to count in binary and convert binary numbers to denary numbers. • Use a block-based programming language to plan and design a quiz app to consolidate learning about logic and binary in order to implement a planned algorithm that uses sequencing and selection. • Evaluated apps and improved them to demonstrate an understanding of a brief • Explore how the ASCII system has standardised the way characters are represented and be able to convert ASCII text into binary strings and vice versa in order to show understanding of the meaning of 'data representation'. • Decode binary strings to create black and white and colour images in order to show understanding of the meaning of 'data representation'. <p>Describe the importance of metadata by exploring what in contains, in order to understand the types of information that are stored within an image file.</p>
What pupils should already know (Prior learning components)	<p>In KS2 Computing, students should have been taught to –</p> <ul style="list-style-type: none"> • select, use, and combine a variety of software (including internet services) on a range of digital devices to design and create a range of content that accomplish given goals • design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts • use sequence, selection, and repetition in programs; work with variables and various forms of input and output

	<p>In Unit 1 of Computing Year 7, students should have been taught to –</p> <ul style="list-style-type: none"> • understand the qualities of bitmap graphics and the concept of pixels being made up of binary digits that represent a specific colour • undertake creative projects that involve selecting, using, and combining multiple applications to achieve challenging goals <p>In KS3 Mathematics, students should have been taught to -</p> <ul style="list-style-type: none"> • understand and use basic arithmetic operators to perform mental arithmetic and use a sequence of integer values to create a specific value between 0 and 255 • understand the use of indices to determine powers (2 to the power of 8) and the link between indices and the possible number of outcomes •
Transferrable knowledge (skills)	<ul style="list-style-type: none"> • Being able to access computer systems, navigate to specific files and organise work in a logical structure. • Being able to use multiple pieces of software (such as a web browser presentation software and a cloud computing system) in quick succession to create and refine design projects. • Use of inference and articulation to obtain key knowledge from a topic and apply understanding when presenting findings. • Use of articulation to decide upon, use and justify the use of specific tools and skills to solve a computational problem • Being able to predict the outcome when using specific skills and identify / correct errors when they occur • Being able to predict a logical outcome based on a set of inputs (true or false). • Being able perform mental arithmetic to convert a sequence of values into a specific integer value • Being able to evaluate a project according to a success criterion
Key vocabulary pupil will know and learn	input, output, switch, logic gate, AND gate, OR gate, truth table, NOT gate, inverter, binary, denary, bit, transistor, application (app), ASCII, byte, Unicode, bitmap graphics, pixel, pixelated, resolution, data representation, metadata
Assessment activities	<ul style="list-style-type: none"> • Regular low stakes testing at the end of each lesson to check knowledge. • Practical lesson activities which will self-mark students' work is correct, with cells turning green when students enter the correct answer. • Do Now tasks which test previous learning and build recall
Resources available	<p>KS2 NC information</p> <p>National Curriculum - Computing key stages 1 to 2 (publishing.service.gov.uk)</p> <p>BBC Bitesize reference for Binary and Data Representation</p>

	<p>Bits and binary - Introducing binary - GCSE Computer Science Revision - BBC Bitesize</p> <p>BBC Bitesize reference for Logic Gates</p> <p>Types of logic gates - Digital devices - KS3 Computer Science Revision - BBC Bitesize</p> <p>Guide to creating a short quiz in Scratch</p> <p>How to Make a Quiz on Scratch! - YouTube</p>
<p>Notes</p> <p>Why this topic is important...</p>	<p>The world today is one in which digital devices are both ubiquitous and indispensable. The word 'digital' is used to describe electronic technology that generates, stores and processes data in one of two states, high or low voltage. In simple terms, the processing that causes digital devices to operate is like an enormous number of electrical switches. Each switch can be either on or off and it moves between these two states. It is because processing in a digital device is carried out by two-state switches, known as transistors, that all the data processed by a digital device must be represented by just two digits, a 1 and a 0. The term for each discrete item of data, a 'bit', comes from the both the word 'binary' (involving two things) and 'digit' (a number from 0 to 9).</p> <p>This unit will provide the students with an insight into how a digital processor works, as well as teaching them how data can be represented as a series of bits. This acts as a foundation to understanding how any computer device is capable of translating inputs into what they see and hear on the screen, such as text, images, sound and even the idea that the computer can carry out complex calculations through combinations of binary digits.</p> <p>This unit also gives students the opportunity to carry out some targeted block-based programming to replicate some of the processing carried out, which extends further into the fundamentals of computational thinking and algorithms, which form a central aspect of any future career in computing fields. Students will start this unit, having already considered the role of the CPU (Unit 3 Year 7). This, and the use of programming will enable them to access the concepts explored in Unit 5 Year 7 and later in Unit 3, 4 and 5 Year 8).</p>