**Subject:** Computing **Year** 7 **Ability** Mixed

| | Unit 4 | Unit 5 | Unit 6 |
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| **Topic** | Binary and Computer Logic | Programming in Scratch | End of Year Project |
| 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 | Explore the key programming constructs: sequence, selection and iteration and develop an understanding of using block-based programming to plan, design and evaluate solution to computational problems | Combine a range of IT knowledge to design a digital product that meets a specific brief, focused on the ways technology will impact on the future of society and individuals |
| **Components** | • Know that digital devices rely on switches to make the decisions involved in data processing in order to articulate how computers function.<br>• 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.<br>• 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.<br>• 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.<br>• Evaluated apps and improved them to demonstrate an understanding of a brief<br>• 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'.<br>• Decode binary strings to create black and white and colour images in order to show understanding of the meaning of 'data representation'.<br>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. | • Define sequencing in a program in order to identify where it has been used to solve a problem in the correct order; and use sequencing to solve problems with multiple elements in order to construct efficient code by identifying patterns and replicating them.<br>• Decompose a complex problem in order to identify the crucial components of sequence, selection and iteration and design algorithmic solutions using the appropriate programming constructs<br>• Define the term 'variable' and know how to use variables to temporarily store data in Scratch in order to understand how algorithms collect and use data and know how to input and output data.<br>• Use a block-based programming language to store inputs, apply concatenation to join strings and variables, perform calculations using variables, use if else statements to check a single condition and use nested if else statements to check multiple conditions in order to demonstrate proficiency in using key programming constructs and design programs that solve complex problems.<br>• Define selection in order to recognise it and use it to alter the pathway of a program using selection, use multiple condition checks with if else statements and use logical operators within if else statements, which will help to understand how programs can be made more efficient<br>• Define iteration in order to recognise it and use it to make programs shorter and easier to code, building confidence in thinking efficiently | • Identify a range of activities that humans have traditionally carried out and that over time, will be carried out instead by computers, such as self-service checkouts, driverless cars and manufacturing.<br>• Consider the possible positive and negative impacts to people and society if technology developed in this way<br>• Understand the possible risks associated with relying of technology and define terms such as automation and obsolescence<br>• Explore longer term changes, such as the classroom of the future<br>• Work through the system life-cycle to plan, design, review and improve a digital product, made with use of knowledge and skills developed throughout the year |
| **What pupils should already know (Prior learning components)** | In KS2 Computing, students should have been taught to –<br>• 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<br>• design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts<br>• use sequence, selection, and repetition in programs; work with variables and various forms of input and output | In KS2 Computing and in Unit 4 of Computing Year 7, students should have been taught to –<br>• design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts<br>• use sequence, selection, and repetition in programs; work with variables and various forms of input and output<br>• explore the concept of AND, OR and NOT logic gates and be able to complete truth tables for logic gates in order use these | In KS2 Computing, and through unit 1, 3 and 4 of Year 7s students should have been taught to –<br>• 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<br>• undertake creative projects that involve selecting, using, and combining multiple applications to achieve challenging goals<br>• understand computer networks including the internet; how they can provide multiple services, such as the world wide web |

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| | In Unit 1 of Computing Year 7, students should have been taught to –<br>• understand the qualities of bitmap graphics and the concept of pixels being made up of binary digits that represent a specific colour<br>• undertake creative projects that involve selecting, using, and combining multiple applications to achieve challenging goals<br><br>In KS3 Mathematics, students should have been taught to -<br>• 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<br>• 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<br>• | operators within programming to alter the pathway of an algorithm<br><br>Throughout Computing Year 7, students have been taught to –<br>• undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users | • use search technologies effectively<br>• explore the many ways that technology is used currently and the way it impacts our day-to-day lives (both positively and negatively)<br>• understand the risks posed by an ever-growing digital world |
| **Transferrable knowledge (skills)** | • Being able to access computer systems, navigate to specific files and organise work in a logical structure.<br>• 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.<br>• Use of inference and articulation to obtain key knowledge from a topic and apply understanding when presenting findings.<br>• Use of articulation to decide upon, use and justify the use of specific tools and skills to solve a computational problem<br>• Being able to predict the outcome when using specific skills and identify / correct errors when they occur<br>• Being able to predict a logical outcome based on a set of inputs (true or false).<br>• Being able perform mental arithmetic to convert a sequence of values into a specific integer value<br>• Being able to evaluate a project according to a success criterion | • Being able to use a block-based programming language and understand its syntax, when comparing it to a text-based language later in KS3<br>• Being able to recognise the use of sequencing, selection and iteration within an algorithm and applying them to computational problems to solve a problem efficiently<br>• Being able to break a problem down into key information (abstraction) and into small, manageable steps (decomposition) in order to solve larger problems independently<br>• Being able to understand the term variable and create them within programs to record, store and output data<br>• Being able to test and refine program code, identify errors and correct them in order to create working solutions<br>• Being able to recognise and use AND, OR and NOT within selection and iteration to alter pathways and repeat aspects of a program | • Being able to access computer systems, navigate to specific files and organise work in a logical structure.<br>• 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.<br>• Use of inference and articulation to obtain key knowledge from a topic and apply understanding when presenting findings.<br>• Use of articulation to decide upon, use and justify the use of specific tools and skills to solve a computational problem<br>• 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 | Scratch, block-base programming, programming construct, sequencing, variable, value, input, concatenation, output, selection, if statement, if else statement, logical operators, Boolean value, and, or, not, iteration, loop | Society, ethics, responsibility, the internet of things, obsolescence, digital divide, digital poverty, robotics, automation |
| **Assessment activities** | • Regular low stakes testing at the end of each lesson to check knowledge.<br>• Practical lesson activities which will self-mark students' work is correct, with cells turning green when students enter the correct answer.<br>• Do Now tasks which test previous learning and build recall | • Regular low stakes testing at the end of each lesson to check knowledge.<br>• An end of year 7 assessment contains a variety of knowledge-based questions, short answer tasks and extended writing tasks assessing the student's ability to identify key terms and demonstrate knowledge learned, developed, and interleaved within the unit.<br>• An end of year 7 assessment will also contain a skills-based task where students demonstrate a combination of research and | • Regular low stakes testing at the end of each lesson to check knowledge.<br>• An end of year 7 assessment contains a variety of knowledge-based questions, short answer tasks and extended writing tasks assessing the student's ability to identify key terms and demonstrate knowledge learned, developed, and interleaved within the unit.<br>• An end of year 7 assessment will also contain a skills-based task where students demonstrate a combination of research and software skills, by creating a product designed to meet a set of success criteria<br>• Do Now tasks which test previous learning and build recall |

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| **Resources available** | KS2 NC information<br>National Curriculum - Computing key stages 1 to 2 (publishing.service.gov.uk)<br>BBC Bitesize reference for Binary and Data Representation<br>Bits and binary - Introducing binary - GCSE Computer Science Revision - BBC Bitesize<br>BBC Bitesize reference for Logic Gates<br>Types of logic gates - Digital devices - KS3 Computer Science Revision - BBC Bitesize<br>Guide to creating a short quiz in Scratch<br>How to Make a Quiz on Scratch! - YouTube | KS2 NC information<br>National Curriculum - Computing key stages 1 to 2 (publishing.service.gov.uk)<br>Step-by-step guide to Scratch Programming Reference<br>Getting-Started-Guide-Scratch2.pdf (mit.edu)<br>Short guide to programming constructs<br>Computer Science Basics: Sequences, Selections, and Loops - YouTube | KS2 NC information<br>National Curriculum - Computing key stages 1 to 2 (publishing.service.gov.uk)<br>BBC Bitesize reference for future technology trends<br>Impact on industry - New and emerging technologies - AQA - GCSE Design and Technology Revision - AQA - BBC Bitesize |
| Notes<br><br>**Why this topic is important…** | 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).<br><br>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.<br><br>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**). | Programming can be broken down into three key constructs: sequence, selection and iteration. When students understand these three key constructs, they will not only be able to demonstrate problem-solving skills in a programming environment but also in everyday life. This unit will use Scratch as the mechanism for developing understanding of these concepts using a sequential range of engaging block-based programming activities, which will build upon the foundations explored in unit 4 (directly prior to this unit).<br><br>This unit will enable students to build proficiency in the use of one of two programming languages in KS3. By using WAGOLLs and tutorials, they will be able to model best practice when coding solutions to problems and develop resilience and independent learning through iterative testing and trial and error (key skills within careers in computing fields). It also acts as a foundation to learning the basic programming constructs, which can be applied to any other programming language and algorithmic thinking that will be explored further in KS3 and beyond. Once students have secured this foundation, they will be prepared to delve further into algorithmic design and specific programming aspects, within **Unit 4 and 5 Year 8**, and later in **Unit 2 Year 9**. | The world in which we live is rapidly evolving, and the way that technology impacts our world will have wide ranging impacts. This project will enable students to combine the research skills they have developed throughout Year 7, and the independent working practices they have gained to produce a significant digital product. It will require students to plan and identify knowledge and skills. It will also support literacy through reading news websites and articulating their own views on concepts such as robotics and automation, which may change the type of jobs available to them when enter the world of work.<br><br>This unit links well into the **unit 1 of year 8** by considering the risks of cyber crime when everything we use is connected to a network. It also supports **unit 1 of Year 9** by explore the ethics of using technology to carry out activities usually carried out by humans. |