THE BOWLAND FEDERATION OF SCHOOLS

COMPUTING CURRICULUM NARRATIVE KS2

THE NATIONAL CURRICULUM

Purpose of study
A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work, and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

Aims The national curriculum for computing aims to ensure that all pupils:
- ♣ can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation
- ♣ can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
- ♣ can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems
- ♣ are responsible, competent, confident and creative users of information and communication technology.

Key Stage 2 Pupils should be taught to:
- ♣ 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
- ♣ use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs
- ♣ understand computer networks including the internet; how they can provide multiple services, such as the world wide web; and the opportunities they offer for communication and collaboration
- ♣ use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content
- ♣ select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information
- ♣ use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

TEN COMPUTING STRANDS

ALGORITHMS	COMPUTER NETWORKS	COMPUTER SYSTEMS	CREATING MEDIA	DATA AND INFORMATION
Be able to comprehend, design, create, and evaluate algorithms	Understand how networks can be used to retrieve and share information, and how they come with associated risks	Understand what a computer is, and how its constituent parts function together as a whole	Select and create a range of media including text, images, sounds, and video	Understand how data is stored, organised, and used to represent real-world artefacts and scenarios
DESIGN AND DEVELOPMENT	**EFFECTIVE USE OF TOOLS**	**IMPACT OF TECHNOLOGY**	**PROGRAMMING**	**SAFETY AND SECURITY**
Understand the activities involved in planning, creating, and evaluating computing artefacts	Use software tools to support computing work	Understand how individuals, systems, and society as a whole interact with computer systems	Create software to allow computers to solve problems	Understand risks when using technology, and how to protect individuals and systems

LOWER KEY STAGE 2 TOPICS			
TITLE	**COMPUTING SYSTEMS AND NETWORKS**	**CREATING MEDIA**	**PROGRAMMING A**
CONCEPT	Connecting computers - Identifying that digital devices have inputs, processes, and outputs, and how devices can be connected to make networks. The internet - Recognising the internet as a network of networks including the WWW, and why we should evaluate online content.	Stop-frame animation - Capturing and editing digital still images to produce a stop-frame animation that tells a story. Audio production - Capturing and editing audio to produce a podcast, ensuring that copyright is considered.	Sequencing sounds - Creating sequences in a block-based programming language to make music. Repetition in shapes - Using a text-based programming language to explore count-controlled loops when drawing shapes.
BIG IDEAS/KEY QUESTIONS/LEARNING FOCUS	To explain how digital devices function (accepting inputs and producing outputs). To identify input and output devices. Can I design a digital device? To recognise how digital devices can change the way that we work. To explain how a computer network can be used to share information. Can I explain how messages are passed through multiple connections? Can I discuss why we need a network switch? To explore how digital devices can be connected. Can I explain the role of a switch, server, and wireless access point in a network? To describe how networks physically connect to other networks. To recognise how networked devices make up the internet. Can I explain that the internet is used to provide many services? Can I recognise that the World Wide Web contains websites and web pages? To outline how websites can be shared and stored via the World Wide Web (WWW). To describe how content can be created, added and accessed on the World Wide Web (WWW). Can I suggest who owns the content on websites? Can I explain that there are rules to protect content? To evaluate the consequences of unreliable content.	To explain that animation is a sequence of drawings or photographs. Can I create an effective flip book—style animation? Can I predict what an animation will look like? To plan an animation. Can I use onion skinning to help me make small changes between frames? Can I evaluate the quality of my animation? To review and improve an animation. To evaluate the impact of adding other media to an animation. Can I identify the input and output devices used to record and play sound? To explain that audio recordings can be edited and how to do it. To recognise the different parts of creating a podcast project. To apply audio editing skills independently. To combine audio to enhance my podcast project Can I evaluate the effective use of audio?	To explore a new programming environment – Sprite (objects, attributes, blocks). To identify that commands have an outcome. Can I create a program following a design? To explain that a program has a start. Can I explain that the objects in my project will respond exactly to the code? To recognise that a sequence of commands can have an order. To change the appearance of my project. To create a project from a task description. Can I implement my algorithm as code? To identify that accuracy in programming is important. To create a program in a text-based language Can I write an algorithm to produce a given outcome? To explain what 'repeat' means. Can I use a count-controlled loop to produce a given outcome? To modify a count-controlled loop to produce a given outcome. To decompose a task into small steps. Can I explain that a computer can repeatedly call a procedure? Can I design a program that includes count-controlled loops? Can I develop my program by debugging it?

VOCABULARY	**High Frequency VOCABULARY** **Use – Download – Sharing – Ownership - Permission** **Information – Accurate – Honest – Content - Adverts**	**Subject Specific VOCABULARY** **Digital device – Input - Process - Output** **Program – Digital - Non-digital** **Connection – Network - Network Switch** **Server - Wireless Access Point** **Network Cables - Network Sockets** **Internet – Router - Network Security** **Website - Web Page - Web Address – Routing - Web Browser** **World Wide Web, - Content – Links – Files**	**High Frequency VOCABULARY** **Animation - Flip Book Sequence** **Image - Photograph** **Setting – Character - Events** **Consistency** **Evaluation - Delete** **Sound – Podcast** **Edit – Trim – Align – Layer - Import** **Record – Playback – Edit – Selection – Load – Save - Export** **Evaluate - Feedback**	**Subject Specific VOCABULARY** **Stop-Frame Animation – Frame - Onion Skinning** **Media – Import - Transition** **Audio – Microphone – Speaker – Headphones** **Input Device - Output Device** **MP3**	**High Frequency VOCABULARY** **Costume – Stage - Backdrop** **Motion – Turn - Point in Direction - Go To - Glide** **Sequence – Event – Task - Design** **Order – Note – Chord** **Pattern – Repeat – Repetition - Value** **Trace - Decompose Procedure**	**Subject VOCABULARY** **Scratch – Programming Blocks - Sprite,** **Code - Commands, - Run The Code** **Algorithm – Bug - Debug** **Turtle** **Code snippet** **Count-controlled Loop**

TITLE	DATA AND INFORMATION	CREATING MEDIA	PROGRAMMING B
CONCEPT	Branching databases - Building and using branching databases to group objects using yes/no questions. Data logging - Recognising how and why data is collected over time, before using data loggers to carry out an investigation.	Desktop publishing - Creating documents by modifying text, images, and page layouts for a specified purpose. Photo editing - Manipulating digital images, and reflecting on the impact of changes and whether the required purpose is fulfilled.	Events and actions in programs - Writing algorithms and programs that use a range of events to trigger sequences of actions. Repetition in games - Using a block-based programming language to explore count-controlled and infinite loops when creating a game.

BIG IDEAS/KEY QUESTIONS/LEARNING FOCUS	To create questions with yes/no answers. To identify the attributes needed to collect data about an object. Can I arrange objects into a tree structure? To create a branching database and test to see if it works. To explain why it is helpful for a database to be well structured. To plan the structure of a branching database. To independently create an identification tool. Can I suggest real-world uses for branching databases? To explain that data gathered over time can be used to answer questions. To use a digital device to collect data automatically. To explain that a data logger collects 'data points' from sensors over time. Can I talk about the data that I have captured? To recognise how a computer can help us analyse data. To identify the data needed to answer questions and use a data logger to collect data. To use data from sensors to answer questions and draw conclusions from the data that I have collected. Can I explain the benefits of using a data logger?		To recognise how text and images convey information. To recognise that text and layout can be edited (font style, size, and colours). To choose appropriate page settings. Can I create a template for a particular purpose? To add content to a desktop publishing publication. To consider how different layouts can suit different purposes. To consider the benefits of desktop publishing Can I compare work made on desktop publishing to work created by hand? To explain that the composition of digital images can be changed (rotating and cropping). To explain that colours can be changed in digital images. To explain how cloning can be used in photo editing. To explain that images can be combined Can I use a range of tools to copy between images? To combine images for a purpose. To evaluate how changes can improve an image.		To explain how a sprite moves in an existing project. Can I identify a way to improve a program? To create a program to move a sprite in four directions. To adapt a program to a new context. To develop my program by adding features. Can I build more sequences of commands to make my design work? To identify and fix bugs in a program. To design and create a maze-based challenge. Can I evaluate my project? To develop the use of count-controlled loops in a different programming environment. Can I modify a snippet of code to create a given outcome? To explain that in programming there are infinite loops and count-controlled loops Can I recognise that some programming languages enable more than one process to be run at once? To develop a design that includes two or more loops which run at the same time. To modify an infinite loop in a given program. To design a project that includes repetition. To create a project that includes repetition. Can I evaluate the steps I followed when building my project?	
VOCABULARY	**High Frequency VOCABULARY** **Questions** **Equal – Even - Separate** **Structure – Compare – Order – Organise - Selecting** **Analyse – Review - Conclusion**	**Subject Specific VOCABULARY** **Attribute – Value – Table - Objects** **Branching Database – Database – Information - Decision Tree** **Data – Table - Layout** **Input device – Sensor - Data Logger – Logging** **Data Point - Interval Data Set** **Import - Export** **Logged - Collection**	**High Frequency VOCABULARY** **Advantages – Disadvantages - Communicate** **Landscape – Portrait – Orientation - Placeholder** **Copy - Paste** **Purpose - Benefits** **Adjustments – Effects – Colours – Hue – Saturation – Sepia - Vignette** **Made Up – Real** **Background - Foreground**	**Subject Specific VOCABULARY** **Text, - Images** **Font - Font Style** **Template - Layout, Content** **Desktop Publishing** **Image – Edit – Digital – Crop – Rotate – Undo - Save** **Retouch – Clone – Select - Combine** **Composite – Cut – Alter - Zoom - Font**	**High Frequency VOCABULARY** **Move - Resize** **Pen – Design - Event - Action** **Costume** **Repetition - Duplicate** **Modify – Refine - Evaluate**	**Subject Specific VOCABULARY** **Motion – Sprite – Algorithm - Logic** **Extension Block - Pen Up - Set Up** **Debugging – Errors** **Design – Code – Test - Debug** **Scratch – Programming** **Sprite -Blocks – Code** **Loop – Repeat - Value** **Forever - Infinite Count-controlled Loop - Infinite Loop - Count-controlled Loop Animate - Event Block** **Algorithm - Debug**

UPPER KEY STAGE 2 TOPICS			
TITLE	**COMPUTING SYSTEMS AND NETWORKS**	**CREATING MEDIA**	**PROGRAMMING A**
CONCEPT	Systems and searching - Recognising IT systems in the world and how some can enable searching on the internet. Communication and collaboration - Exploring how data is transferred by working collaboratively online.	Video production - Planning, capturing, and editing video to produce a short film. Webpage creation - Designing and creating webpages, giving consideration to copyright, aesthetics, and navigation.	Selection in physical computing - Exploring conditions and selection using a programmable microcontroller. Variables in games - Exploring variables when designing and coding a game.
BIG IDEAS/KEY QUESTIONS/LEARNING FOCUS	To explain that computers can be connected together to form systems. Can I describe the input, process, and output of a digital system? To recognise the role of computer systems in our lives. To identify how to use a search engine. To describe how search engines select results. Can I recognise the role of web crawlers in creating an index? To explain how search results are ranked. Can I explain how search engines make money? To explain the importance of internet addresses. To recognise how data is transferred across the internet. Can I explain that all data transferred over the internet is in packets? To explain how sharing information online can help people to work together. Can I explain that the internet allows different media to be shared? Can I explain how the internet enables effective collaboration? To recognise how we communicate using technology. To evaluate different methods of online communication.	Can I compare features in different videos? To use a digital device to record video. Can I experiment with different camera angles? To capture video using a range of techniques. To create a storyboard. To identify that video can be improved through reshooting and editing. Can I store, retrieve, and export my recording to a computer? To consider the impact of the choices made when making and sharing a video. Can I evaluate my video and share my opinions? To review an existing website and consider its structure. Do I know that websites are written in HTML? To plan the features of a web page. To consider the ownership and use of images (copyright) Can I describe what is meant by the term 'fair use'? To recognise the need to preview pages. To outline the need for a navigation path Can I make multiple web pages and link them using hyperlinks? To recognise the implications of linking to content owned by other people.	To control a simple circuit connected to a computer. Can I explain what an infinite loop does? To write a program that includes count-controlled loops. To explain that a loop can stop when a condition is met. Can I program a microcontroller to respond to an input? To explain that a loop can be used to repeatedly check whether a condition has been met. Can I use selection (an 'if…then…' statement) to direct the flow of a program? To design a physical project that includes selection. To create a program that controls a physical computing project. To define a 'variable' as something that is changeable. To explain why a variable is used in a program. Can I identify a program variable as a placeholder in memory for a single value? Can I recognise that the value of a variable can be changed? To choose how to improve a game by using variables. To design a project that builds on a given example. To use my design to create a project. Can I create the artwork for my project? Can I test the code that I have written? To evaluate my project.

VOCABULARY	**High Frequency VOCABULARY** **Search - Refine - Selection Ordering - Ranking** **Chat - Explore Reuse – Remix - Collaboration Public – Private - One-way - Two-way - One-to-one - One-to-many**	**Subject Specific VOCABULARY** **System - Connection Digital – Input - Process Output Search Engine Index – Crawler – Bot Links – Algorithm - Search Engine Optimisation (SEO) Content Creator** **Communication – Protocol – Data – Address - Internet Protocol (IP) address - Domain Name Server (DNS) Packet – Header - Data payload - Slide deck**	**High Frequency VOCABULARY** **Video – Audio -Camera - Close up – Microphone – Lens - Static camera Storyboard Filming – Review – Delete – Reorder – Evaluate - Share** **Logo – Layout – Header – Purpose – Preview – Evaluate – Device – Implication - Embed**	**Subject Specific VOCABULARY** **Talking head - Panning, - Mid range - Long shot - Moving subject - Side by side - High angle - Low angle - Normal angle Zoom – Pan - Tilt Import – Export – Split – Trim – Clip – Edit - Reshoot** **Website - Web page – Browser – Media Hypertext Markup Language (HTML) Copyright - Fair use Home page - Google Sites Breadcrumb trail – Navigation – Hyperlink – Subpage - External link**	**High Frequency VOCABULARY** **Change- Name – Design – Event – Task – Artwork - Project Improve – Evaluate - Share**	**Subject Specific VOCABULARY** **Microcontroller – Components – Connection - Infinite loop Output component – Motor – Repetition - Count-controlled loop Crumble controller – Components – Switch – LED – Sparkle - Crocodile clips – Connect - Battery box – Program - Condition Input – Output – Selection – Action – Repetition - Debug** **Variable – Value – Set Algorithm – Code - Program Test - Debug**

TITLE	DATA AND INFORMATION	CREATING MEDIA	PROGRAMMING B
CONCEPT	Flat-file databases - Using a database to order data and create charts to answer questions. Introduction to spreadsheets - Answering questions by using spreadsheets to organise and calculate data.	Introduction to vector graphics - Creating images in a drawing program by using layers and groups of objects. 3D modelling - Planning, developing, and evaluating 3D computer models of physical objects.	Selection in quizzes - Exploring selection in programming to design and code an interactive quiz. Sensing movement - Designing and coding a project that captures inputs from a physical device.

BIG IDEAS/KEY QUESTIONS/LEARNING FOCUS	To use a form to record information. To compare paper and computer-based databases Can I navigate a flat-file database to compare different views of information? Can I choose which field to sort data by to answer a given question? To outline how you can answer questions by grouping and then sorting data. To explain that tools can be used to select specific data Can I choose which field and value are required to answer a given question? To explain that computer programs can be used to compare data visually. To use a real-world database to answer questions. To create a data set in a spreadsheet. To build a data set in a spreadsheet. To explain that formulas can be used to produce calculated data Can I construct a formula in a spreadsheet? To apply formulas to data Can I create a formula which includes a range of cells? To create a spreadsheet to plan an event. To choose suitable ways to present data. Can I suggest when to use a table or chart?		To identify that drawing tools can be used to produce different outcomes. Can I discuss how vector drawings are different from paper-based drawings? To create a vector drawing by combining shapes. Can I move, resize, and rotate objects I have duplicated? Can I use the zoom tool to help me add detail to my drawings? Can I explain how alignment grids and resize handles can be used to improve consistency? To recognise that vector drawings consist of layers. To group objects making them easier to work with. Can I create a vector drawing for a specific purpose? To recognise that you can work in three dimensions on a computer. To identify that digital 3D objects can be modified by resizing, lifting/lowering and recolouring. To recognise that objects can be combined in a 3D model by rotating, duplicating and grouping. To create a 3D model for a given purpose. To plan my own 3D model. To create my own digital 3D model.		To explain how selection is used in computer programs. Can I recall, identify and modify a condition in a program? To relate that a conditional statement connects a condition to an outcome. Can I use selection in an infinite loop to check a condition? Can I identify the condition and outcomes in an 'if… then… else…' statement? To design, create and evaluate a program that uses selection. To create a program to run on a controllable device To explain that selection can control the flow of a program Can I use a variable in an if, then, else statement to select the flow of a program? To update a variable with a user input. To use a conditional statement to compare a variable to a value Can I use an operand (e.g. <>=) in an if, then statement? To design and develop a project that uses inputs and outputs on a controllable device.	
VOCABULARY	**High Frequency VOCABULARY** **Information – Record – Field – Sort – Order – Group – Search - Criteria Graph – Chart – Axis Compare – Filter - Presentation** **Collecting – Table – Structure - Format Calculation – Duplicate Propose – Question - Organised Chart – Evaluate – Results - Comparison**	**Subject Specific VOCABULARY** **Database – Data - Value** **Spreadsheet – Cell - Cell reference - Data item Formula – Input – Output – Operation – Range – Sigma - Data set – Software - Tools**	**High Frequency VOCABULARY** **Move – Resize – Colour – Rotate - Duplicate/copy Zoom – Select – Align - Modify Reflection** **2D - 3D – Shapes – Select – Move – Perspective - View Handles– Lift – Lower Rotate – Duplicate - Cylinder – Placeholder - Hollow Choose - Combine Construct -Evaluate - Modify**	**Subject Specific VOCABULARY** **Vector - Drawing tools – Object - Toolbar Layers - Order Copy – Paste – Group – Ungroup - Vector drawing - Reuse**	**High Frequency VOCABULARY** **True - False Outcomes - Conditional statement (the linking together of a condition and outcomes) Question - Answer Task – Design - Input Implement – Test – Run - Setup** **Sensing – Accelerometer - Value Compass – Direction - Navigation Design – Task - Step counter Plan - Create**	**Subject Specific VOCABULARY** **Selection – Condition - Count-controlled loop Algorithm – Program – Debug** **Micro:bit - MakeCode, - Process – Output – Flashing – USB - Trace Selection – Condition - If then else – Variable - Random Code – Test - Debug**