Digital Learning Cornwall
Independent guidance | consultation | training
Helping busy schools make informed EdTech choices

Probus Primary School

Next steps: make the explicit progression obvious between year groups, key vocabulary inserted on this document, computing 'patter' - how do we explain what algorithms are? Decomposition? etc

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Computer Science: **Programming Concepts and Controlling Hardware**	**Computational thinking** Children explore a range of computational thinking, featuring lots of non-screen, practical activities. Key concepts that such activities relate to include: logic, debugging, algorithms, repetition, modifying and commands.	**Programming Concepts: Introduction to Animation** Children are introduced to on-screen programming. Children explore the way a project looks by investigating sprites and backgrounds. They use programming blocks to use, modify, and create programs. Children will also be introduced to the early stages of program design through the introduction of algorithms. **Hardware: Moving a Robot** Children are introduced to early programming concepts. Children explore using individual commands, both with other children and as part of a computer program. They will identify what each floor robot command does and use	**Programming Concepts: Scratch Jr** Children take on-screen programming further. Children continue to use programming blocks to use, modify, and create programs. Children create algorithms or multiple algorithms. They practise predicting the behaviour of simple programs. They practise debugging (finding and fixing problems) within programs they have created. **Controlling Hardware: Robot Algorithms** Pupils develop their understanding of instructions in sequences and the use of logical reasoning to predict outcomes. Pupils use	**Programming Concepts: Sequence in Music** Children explore the concept of sequencing in programming. Children are introduced to a programming environment, which will be new to most children. They will be introduced to a selection of motion, sound, and event blocks which they will use to create their own programs, featuring sequences. Children will explore all aspects of sequences, building knowledge incrementally.	**Programming Concepts: Repetition with shapes** Children will create programs by planning, modifying, and testing commands to create shapes and patterns. Children will use a text-based programming language. *Alternative with Hardware:* **Sphero Programmable Hardware** Children programme Sphero programmable hardware. Children will create programs by planning, modifying, and testing commands to create shapes and patterns. Children will use block-based coding.	**Programming Concepts: Selection in Quizzes** Pupils develop their knowledge of 'selection' by revisiting how 'conditions' can be used in programming, and then learning how the 'if… then… else...' structure can be used to select different outcomes depending on whether a condition is 'true' or 'false'. They represent this understanding in algorithms, and then by constructing programs using an on-screen programming environment. They learn how to write programs that ask questions and use selection to control the outcomes based on the answers given. They use this knowledge to design a quiz in response to a given task and implement it as a program. To conclude the unit, children evaluate their	**Programming Concepts: Variables in games** Children explore the concept of variables in programming. First, pupils will learn what variables are, and relate them to real-world examples of values that can be set and changed. Children will then use variables to create a simulation of a scoreboard. With the *Use-Modify-Create* model, children will experiment with variables in an existing project, then modify them. They will create their own project and apply their knowledge of variables and design to improve a created game.

		that knowledge to start predicting the outcome of programs. Time is spent on a broad range of programming aspects, and builds knowledge in a structured manner. Children are also introduced to the early stages of program design through the introduction of algorithms.	given commands in different orders to investigate how order can affect outcome. They will design algorithms and then test those algorithms as programs and debug them.	**Programming Concepts: Events and Actions** Children explore the links between events and actions, while consolidating prior learning relating to sequencing. Children begin by moving a sprite in four directions (up, down, left, and right). They then explore movement within the context of a maze, using design to choose an appropriately sized sprite. Children design and code their own maze-tracing program. *Alternative with Hardware:* **Sphero first Use** Children programme Sphero programmable hardware. Children will explore directional movement of the Sphero devices, using drawn programming before moving to block-based work.	**Programming Concepts: Repetition with games** Children will continue to explore the concept of repetition in programming using an on-screen coding environment. Children will compare and contrast this coding environment with the one they explored previously, noting similarities and differences between the two environments. Children look at the difference between count-controlled and infinite loops, and use their knowledge to modify existing animations and games using repetition. Children will design and create a game which uses repetition, applying stages of programming design throughout.	program by identifying how it meets the requirements of the task, the ways they have improved it, and further ways it could be improved. **Controlling Hardware: First use Microbits** Children will use physical computing to explore programming concepts. Children will be introduced to a microcontroller (Microbit) and learn how to connect and program components (including output devices such as built-in LEDs). Children will be introduced to conditions as a means of controlling the flow of actions, and explore how these can be used in algorithms and programs through the use of input devices (physical switches / tilts). Children will make use of their knowledge of repetition and conditions when introduced to the concept of selection (through the 'if... then...' structure) and write algorithms and programs that utilise selection.	**Controlling Hardware: Sensing with Microbits** Children will bring together elements of all the four programming constructs: sequence from Year 3, repetition from Year 4, selection from Year 5, and variables (introduced in Year 6). Children will have the opportunity to use all of these constructs in a different but still familiar environment, while also utilising a physical device — the micro:bit. Children begin with a simple program for children to build in and test in the programming environment, before transferring it to their micro:bit. Children take on increasingly difficult projects as their skills heighten and progress.

Independent guidance | consultation | training

Helping busy schools make informed EdTech choices

Strand	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Computer Science							
Programming, including Controlling Hardware	*I can understand a large task as smaller steps (links to algorithms and decomposition)*	*I can understand and create **algorithms** (steps or rules as instructions, e.g. how to make a sandwich)* *I understand that **algorithms** must be precise*	*I can **predict** the behaviour of simple programs* *I can create and run a **program** (an algorithm or multiple algorithms that can be understood by a computer)* *I can **debug** (find and fix a problem) within a simple program*	*I can identify that **sprites** can be controlled by commands that I choose* *I can create a **sequence** of connected commands* *I can control or simulate **programmable hardware** (e.g. a Sphero robot)* *I can **decompose** (break into smaller chunks) a programming problem* *I can **debug** errors across a sequence of code*	*I can create a program that uses **loop** commands to achieve a particular outcome* *I can recognise that some programs can be run at the same time (**concurrency**)* *I can recognise that the order of commands may produce a different outcome* *I can identify a way to **refactor** (improve) my code* *I can explain the outcome of changes to code*	*I can use **selection** in my programs. (Also known as **conditionals** or If / Then statements). (e.g. if a character moves onto a yellow square, then gain two points)* *I can create an **'if... then... else...'** statement that will result in different outcomes* *I can explain that instructions in a **program** will produce specific outcomes* *I can create and modify a **count** or **event-controlled** loop*	*I can create my own **variable** in a program* *I can program the way that a **variable** changes* *I can use the value of a **variable** as a trigger for another event* *I can **program** and **debug** multiple functions on programmable hardware (e.g. with a Microbit)*

Digital Learning Cornwall

Independent guidance | consultation | training
Helping busy schools make informed EdTech choices

Probus Primary School

**Implementation;
Knowledge & Skills curriculum overview**

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Information Technology: Knowledge & Understanding	Children explore a range of mostly non-screen based activities that relate to: devices, word recognition and data.	**IT Around us: Technology Around Us** Children develop their understanding of technology and how it can help us. They will start to become familiar with the different components of a computer by developing their keyboard and mouse skills. Children will also consider how to use technology responsibly. **Data & information: Grouping Data** Pupils are introduced to labelling, grouping and searching - important aspects of data and information. Pupils will begin by using labels to put objects into groups, and labelling these groups. They will demonstrate that they can count a small number of objects, before and after the objects are grouped. Pupils will begin to demonstrate their ability to sort objects into different groups, based on the properties they choose. Finally, pupils will use their ability to sort objects into different	**IT Around us: Computer Systems & Networks** Children will look at information technology at school and beyond, in settings such as shops, hospitals, and libraries. Children will investigate how information technology improves our world, and they will learn about using information technology responsibly. **Data & information: Pictograms** Children will begin to understand what the term data means and how data can be collected in the form of a tally chart. They will learn the term 'attribute' and use this to help them organise data. They will then progress onto presenting data in the form of pictograms and finally block diagrams. Children will use the data presented to answer questions.	**IT Around Us: Connecting Computers** Children develop their understanding of digital devices, considering inputs, processes, and outputs. Children compare digital and non-digital devices. Following this, children are introduced to computer networks, including devices that make up a network's infrastructure, such as wireless access points and switches. The unit concludes with children discovering the benefits of connecting devices to a network. **Data & Information: Branching Databases** Children develop their understanding of what a branching database is and how to create one. They will gain an understanding of what attributes are and how to use them to sort groups of objects by using yes/no questions. The children will create physical and on-screen branching databases. Finally, they will	**IT Around Us: The Internet** Children will apply their knowledge and understanding of networks, to appreciate the internet as a network of networks which needs to be kept secure. They will learn that the World Wide Web is part of the internet, and be given opportunities to explore the World Wide Web for themselves to learn about who owns content and what they can access, add, and create. Finally they will evaluate online content to decide how honest, accurate, or reliable it is, and understand the consequences of false information. **Data & Information: Data Logging** Children will consider how and why data is collected over time. Children will consider the senses that humans use to experience the environment and how computers can use special input devices called sensors to monitor the environment. Children	**IT Around Us: Systems & Searching** Children develop their understanding of computer systems and how information is transferred between systems and devices. Children consider small-scale systems as well as large-scale systems. They explain the input, output, and process aspects of a variety of different real-world systems. Children discover how information is found on the World Wide Web, through learning how search engines work (including how they select and rank results) and what influences searching, and through comparing different search engines. **Data & Information: Flat-file Databases** Children look at how a flat-file database can be used to organise data in records. Children use tools within a database to order and answer questions about data. They create graphs and charts from their data to help solve problems. They use a real-life database to answer a question, and present their work to others.	**IT Around Us: Communication & Collaboration** Children learn about the World Wide Web as a communication tool. First, they will learn how we find information on the World Wide Web, through learning how search engines work (including how they select and rank results) and what influences searching, and through comparing different search engines. They will then investigate different methods of communication, before focusing on internet-based communication. Finally, they will evaluate which methods of internet communication to use for particular purposes. **Data & Information: Spreadsheets** Children are introduced to the fundamental operations of spreadsheets. They will be supported in organising data into columns and rows to create their own data set. Children will be taught the importance of formatting data to support calculations, while also being introduced to formulas and will begin to understand how they can be used to produce calculated data. Children will be taught how to apply formulas that

			groups to answer questions about data.		evaluate the effectiveness of branching databases and will decide what types of data should be presented as a branching database.	will collect data as well as access data captured over long periods of time. They will look at data points, data sets, and logging intervals. Children will spend time using a computer to review and analyse data. Towards the end of the unit, children will pose questions and then use data loggers to automatically collect the data needed to answer those questions.		include a range of cells, and apply formulas to multiple cells by duplicating them. Children will use spreadsheets to plan an event and answer questions. Finally, children will create graphs and charts, and evaluate their results in comparison to questions asked.
Information Technology: Media & Sound	**Media & Sound Foundations** Children explore a range of mostly non-screen based activities that relate to: painting, pattern making, real / not real, sound making and music.	**Digital Design: Digital Painting** Children develop their understanding of a range of tools used for digital painting. They use these tools to create their own digital paintings, while gaining inspiration from a range of artists' work. Children consider their preferences when painting with and without the use of digital devices.	**Digital Design: Digital Photography** Children will learn to recognise that different devices can be used to capture photographs and will gain experience capturing, editing, and improving photos. Finally, they will use this knowledge to recognise that images they see may not be real.	**Digital Design: Animation** Children will use a range of techniques to plan and create stop-frame animations. Next, they will apply those skills to create a story-based animation. Children will add other types of media to their animation, such as music and text.	**Digital Design: Photo Manipulation** Children will develop their understanding of how digital images can be changed and edited, and how they can then be resaved and reused. They will consider the impact that editing images can have, and evaluate the effectiveness of their choices.	**Digital Design: Vector Graphics** Children will find out that vector images are made up of shapes. They will learn how to use the different drawing tools and how images are created in layers. They will explore the ways in which images can be grouped and duplicated to support them in creating more complex pieces of work.	**Digital Design: 3D Modelling** Children will develop their knowledge and understanding of using a computer to produce 3D models. Children will initially familiarise themselves with working in a 3D space, including combining 3D objects to make a house and examining the differences between working digitally with 2D and 3D graphics. Children will progress to making accurate 3D models of physical objects, such as a pencil holder, which include using 3D objects as placeholders. Finally, children will examine the need to group 3D objects, then go on to plan, develop, and evaluate their own 3D model.

Digital Learning Cornwall

Independent guidance | consultation | training

Helping busy schools make informed EdTech choices

Probus Primary School

		Digital Design: Digital Writing Children will develop their understanding of the various aspects of using a computer to create and manipulate text. Children will become familiar with using a keyboard and trackpad/mouse to enter and remove text. Children will also consider how to change the look of their text, and will be able to justify their reasoning in making these changes.	**Digital Sound: Making Music** Children will use a computer to create music. They will listen to a variety of pieces of music and consider how music can make them think and feel. Children will compare creating music digitally and non-digitally. Children will look at patterns and purposefully create music.	**Digital Design: Book Creator** Children will develop their understanding of the creation and manipulation of text. Children will increase their confidence and abilities with keyboard typing, including grammar and punctuation. Children will experiment with pictorial elements and design features. Children will have the opportunity to publish their work to the world wide web.	**Digital Sound: Audio Editing** Children will examine devices capable of recording digital audio, which will include identifying the input device (microphone) and output devices (speaker or headphones) if available. Children will discuss the ownership of digital audio and the copyright implications of duplicating the work of others. In order to record audio themselves, children will use software to produce a podcast, which will include editing their work, adding multiple tracks, and opening and saving the audio files. Finally, children will evaluate their work and give feedback to their peers.	**Digital Design: Video Editing** Children have the opportunity to learn how to create short videos in groups. As they progress, they will develop the skills and processes of capturing, editing, and manipulating video. Active learning is encouraged through guided questions and by working in small groups to investigate the use of devices and software. Children are guided to take their idea from conception to completion. The use of green screen may be incorporated into this sequence of learning, giving an opportunity for children to use cross-curricular knowledge and giving extra purpose to the main video project.	**Digital Design: Web Page Creation** Children learn how to create websites for a chosen purpose. Children identify what makes a good web page and use this information to design and evaluate their own website. Throughout the process, children pay specific attention to copyright and fair use of media, the aesthetics of the site, and navigation paths.

Digital Learning Cornwall — Independent guidance | consultation | training — Helping busy schools make informed EdTech choices

Probus Primary School

Information Technology							
Computer Systems & Contexts	I can talk about technology, using pictures and memory recall	I can identify examples of **technology** in the classroom	I can identify the major parts of **digital devices** *(e.g. keyboard, screen, power, batteries, touchscreen)* I can **identify** information technology in the school, home, and beyond	I can identify **networked devices** around me (e.g. networked printer, wireless laptop) I can identify **inputs** and **outputs** of common computing devices *(e.g inputs: keys on a keyboard, temperature sensor, tilting a device; outputs: screen display, printer)*	I can recognise that the **world wide web** is part of the internet I understand that the global interconnection of networks is the **internet**	I can explain that a **search engine** uses **web crawlers** to create an **index** I can explain that a search engine follows **rules** to **rank** results I understand that **emails** and other digital communications can be sent and received from various types of digital device	I understand that **computer systems** transfer information over networks in **data packets** I understand that **connections** between computers allow us to work together
Data & Information	I can begin to notice **similarities** between items	I can place **objects** into groups *(e.g. these shapes are all red)* I can decide on **labels** for groups *(e.g. these shapes all have four sides)*	I can **enter data** into a computer system I can use a computer to **present data** I can find **answers** to **questions** by looking at **data**	I can create questions with yes / no answers to **categorise** objects I can retrieve **information** from different levels of a **branching database**	I can use a digital device to **collect data** automatically I can choose how often to collect **data samples**	I can choose multiple criteria to **search** data to answer a given question (**AND and OR**) I can choose which **attribute** to **sort** data by answering a given question I can choose an appropriate graph to visually compare **data**	I can collect data and enter it into a **spreadsheet** I recognise that data can be **calculated** using different **operations** I can apply a **formula** to **calculate** the data I need to answer questions

Digital Artefacts & Media	I can talk about pictures, **video** and **sound** that are viewed on **digital devices**	I can use an **app** or **website** to make graphical marks or pictures	I can use **technology** to capture *(e.g. with an iPad)* and manipulate *(position, re-size, rotate)* photos I can create and adjust **audio** using digital technology	I can design and create an **animation** *(e.g. stop-frame animation on an iPad)* I can recognise that different **font styles** and **effects** are used for particular purposes I can use technology to organise and manipulate **digital content**	I can plan for a **podcast** or music production I can **record** and **edit** sound using digital technology as part of a podcast or music production I can edit images for purpose I can manipulate and adjust images for a particular purpose	I can edit **video**, bringing together different media elements *(e.g. stills, video, captions and sound)* to produce an effective final product I can create a **vector drawing** that is comprised of lines and shapes of different colours I can **resize, duplicate, rotate** and **align** objects in vector drawings I can use **grouping** and **layers** in a vector drawing	I can recognise the common features of a **web page** I can devise my own web design which contains navigation paths (menus, hyperlinks etc.) I can recognise the difference when working with **3D objects** in comparison to 2D shapes I can produce a **3D model** and decide how it can be improved

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Digital Literacy	**Operational Core Skills** Children *use hand-eye coordination to operate devices such as touch-screens and touchpads*	**Operational Core Skills** Children will use websites and apps to aid their learning. Children are able to save and retrieve work they have produced. Children learn to move a cursor with the trackpad on a laptop,	**Operational Core Skills** Children will develop their understanding of creating and manipulate text further. Children will become familiar with using a keyboard to enter, edit and remove text. Children will also consider how to change the appearance of text, and will be able to justify their reasoning in making such changes. Children will consider the differences between using a computer to create text, and handwritten approaches. Children practise key skills such as two-finger scrolling, use of the shift key for capital letters, and deleting chosen parts of on-screen text.	**Operational Core Skills** Children use software to edit and improve written work from a cross-curricular subject. Children develop their use of the shift key, using numerous basic punctuation marks correctly within their on-screen writing. Children type to achieve a completed written piece that can be printed or published directly to the internet. Children use specific typing software to improve keyboard skills and awareness.	**Operational Core Skills** Children further improve their ability to type towards completed work, including more advanced punctuation marks and accuracy. Children use digital spell-check facilities to locate and correct spelling mistakes. Children will use multiple tabs within a web browser or move between different apps as part of a task.	**Operational Core Skills** Children will become confident and competent users of web-based programs and apps, combining numerous web-based programs and/or apps to accomplish goals. Children hone and improve their ability to type and improve on-screen written work, and continue to access typing practise software to develop this area. Children use digital thesaurus facilities to replace words and phrases with better choices.	**Operational Core Skills** Children will look critically at their written on-screen pieces, and re-order on-screen sentences for clarity, purpose or effect. They will be able to type at speed, with accurate spelling and a range of correctly incorporated punctuation. Children will use digital spelling checkers and thesaurus facilities with confidence.

					Internet Safety Children explain how their online identity can be different to the identity they present in 'real life'. Children explain what it means to 'know someone' online and why this might be different from knowing someone in real life. Children describe how they can find out information about someone by looking online. Children explain why they need to think carefully about how content they post might affect others, their feelings and how it may affect how others feel about them (their reputation). Children analyse information and differentiate between 'opinions', 'beliefs' and 'facts'. Children understand what criteria have to be met before something is a 'fact. Children describe ways technology can affect healthy sleep and can describe some of the issues. Children explain how internet use can be monitored. Children assess and justify when it is acceptable to use the work of others.	**nternet Safety** Children explain how identity online can be copied, modified or altered. Children explain how impulsive and rash communications online may cause problems. Children describe ways that information about people online can be used by others to make judgments about an individual.) Children explain how they would report online bullying on the apps and platforms that they use. Children explain why lots of people sharing the same opinions or beliefs online does not make those opinions or beliefs true. Children describe common systems that regulate age-related content (e.g. PEGI, BBFC, parental warnings) and describe their purpose. Children explain how lots of free apps or services may read and share private information (e.g. friends, contacts, likes, images, videos, voice, messages, geolocation) with others. Children demonstrate the use of search tools to find and access online content which can be reused by others.	**Internet Safety** Children explain how they can represent themselves in different ways online. Children demonstrate how they would support others (including those who are having difficulties) online. Children describe some simple ways that help build a positive online reputation. Children identify a range of ways to report concerns both in school and at home about online bullying. Children demonstrate strategies to enable them to analyse and evaluate the validity of 'facts. Children explain why using these strategies are important. Children assess and action different strategies to limit the impact of technology on their health (e.g. nightshift mode, regular breaks, correct posture, sleep, diet and exercise). Children describe ways in which some online content targets people to gain money or information illegally; children describe strategies to help them identify such content (e.g. scams, phishing). Children demonstrate how to make references to and acknowledge sources they have used from the internet.
	Internet Safety Children explore internet safety concepts at an appropriate level through retelling of stories and discussion. Children explore safe use of technology along with other physical items within their settings,	**Internet Safety** Children give examples of when and how to speak to an adult when they need to. Children recognise some ways in which the internet can be used to communicate. Children describe what information I should not put online without asking a trusted adult first. Children describe how to behave online in ways that do not upset others Children identify devices they could use to access information on the internet. Children explain rules to keep us safe when we are using technology both in and beyond the home. Children identify some simple examples of personal information (e.g. name, address, birthday, age, location). Children name their work so that others know it belongs to them.	**Internet Safety** Children describe ways in which people might make themselves look different online. Children explain some risks of communicating online with others they don't know well. Children explain how information put online about them can last for a long time. Children describe how to behave online in ways that do not upset others. Children demonstrate how to navigate a simple webpage to get to information they need (e.g. home, forward, back buttons; links, tabs and sections). Children create rules for using technology safely Children explain why they should always ask a trusted adult before they share information about themselves online. Children recognise that content on the internet may belong to other people.	**Internet Safety** Children describe ways in which media can shape ideas about gender. Children explain how their own and other people's feelings can be hurt by what is said or written online. Children know who they should ask if they are not sure if they should put something online. Children describe rules about how to behave online and how to follow them. Children evaluate digital content and can explain how to make choices from search results. Children identify situations where they might need to limit the amount of time they use technology. Children describe simple strategies for creating and keeping passwords private. Children explain why copying someone else's work from the internet without permission can cause problems.			

Computing knowledge & skills underpin modern life and the 21st Century economy. Children need to build a vital confidence, knowledge and understanding of the way technologies work - and how internet-connected systems can be employed - in order to adapt flexibly to rapid change over coming years.

Our framework is mapped into three broad strands: Computer Science, Information Technology and Digital Literacy. The National Curriculum's Computing content is used as a starting point for devising our curriculum - yet lengthy objectives are broken down into manageable, sequenced chunks for children over the six year groups, with further objectives added that widen the scope and reach of the subject to reflect its ever-growing breadth and importance.

Progression through the framework is based on key items of knowledge and skill being re-visited and expanded upon, allowing children to build solid foundations in their long-term understanding of Computing. Our bespoke framework provides children with a broad, balanced set of learning experiences. With strategic hardware and software choices made by schools, a multitude of high-quality, yet easy-to-access, learning experiences are made available for staff and students.

At Probus, we want our children to be digitally confident learners equipped with modern Computing knowledge who will:

- *Understand how information technology, data systems, and the internet function*
- *Understand and be able to apply key programming concepts*
- *Design, create and manipulate different digital artefacts and media*
- *Competently apply operational skills to many types of technology*
- *Be cautious and safe users of screen and internet-based services*
- *Explain knowledge and understanding using key vocabulary*

Intention
It is important that Computing knowledge begins to develop from the earliest years, and builds appropriately as children develop. As learners revisit areas of understanding, and become ever-more confidently equipped, they will be able to harness the many opportunities that modern technology presents, while remaining safe and necessarily critical.

Our intent for children's learning across Computing is mapped into three strands, dividing this broad subject into 3 main areas that build progressively throughout a child's time in primary education.

Computer Science;
Information Technology;
Digital Literacy.

Computer Science

A hugely important element of Computing subject knowledge, all children should have an understanding of how modern devices and software operate at code level. Many children are competent consumers of screen-based media and games – we want them to progress to become confident in their understanding of *how* such systems work. We want children to know that algorithms and programs are devised by humans and, if created successfully, will perform functions for us under the surface, seamlessly and systematically.

The key theme of **Programming, including Controlling Hardware** is introduced through numerous unplugged activities at the early years stage, consolidated with further related terminology such as **algorithms** in year 1. **Predicting** and **debugging** are brought in as learning is consolidated in year 2. Ever more advanced concepts then follow throughout Key Stage 2: **sequencing** and **decomposing** in year 3; **loops** and **refactoring** (improving code) in year 4; **selection** concepts, **event** and **count-controlled loops** at year 5; **variables** and applying these to hardware in year 6. Learner's understanding builds through this spiral-based approach to the curriculum, with each year group's tasks necessarily referring back to knowledge and understanding that has been built up in earlier units.

It is worth noting that the *Information Technology* strand (see below) has themes that relate back to *Computer Science*. For example, **Computer Systems & Concepts** covers **inputs and outputs** at year 3 – these concepts lay the groundwork very much for understanding selection (if/then/else statements) in year 5, and also to the functioning of variables in year 6.
Data & Information contains understanding of web-based databases and following rules to rank results – very much aligned to the algorithmic understanding that is built up starting from the earliest stages of *Computer Science*.

Information Technology

Children need to understand the broad range of roles and purposes for technology in the modern world. We split this section into three themes: **Computer Systems & Concepts**, **Data & Information**, and **Creating Digital Artefacts & Media**.

Computer Systems & Concepts builds awareness, followed by deeper understanding, of the hardware and software systems that people increasingly use for purpose in everyday life. This includes an understanding of the technical processes that occur between devices, now that internet-connected services are a ubiquitous part of leisure and work. Children begin their understanding in Reception by exploring **devices**, leading to the identification of examples of **information technology** in Year 1. Year 2 moves understanding onwards with identifying major **parts of devices**, and identifying examples of information technology beyond children's immediate lives. Year 3 tackles the basics of **networked devices**, while also exploring the key concepts of **input** and **output**; learning builds upon this in year 4, moving to understand the **interconnection of networks** (the **internet**) and the **world wide web**. Year 5 adds understanding of **web search processes** and **digital communications** such as **email** and web-based collaboration, building on inputs

and outputs and networking knowledge from the previous two years. Year 6 moves knowledge onwards and consolidates once again, covering how networks function in further detail, including **data packets**, and understanding the many different ways that connections between computers allow us to work in different ways.

Data & Information is an ever-important theme of Computing for the modern, data-driven age. **Similarities** are noted in the early years through non-screen based activities, with children creating and naming **groups** in year 1. Year 2 strengthens understanding, with children uncovering **answers** to **questions** by looking carefully at data, while also learning how to input data. Year 3 adds understanding of a branching database, with children **categorising** objects according to yes/no answers. In year 4, previous knowledge helps children to then **collect data** and choose how often to collect **data samples**. Year 5 moves to flat-file database thinking, with children using criteria to **search data** and **sort** according to attributes. In year 6, previous understanding culminates in spreadsheet competency, recognising that formulas can calculate using data that has been input, and answer questions that are posed.

Digital Artefacts & Media is a broad theme that reflects how technology has become an integral part of the way images, video, animation and audio are manipulated and published – children can become very inspired by an understanding of such processes, enabling modern and useful creativity. Schools have the ability to let children design, edit, produce, perform and publish, in a seamless way that has never been so easy or accessible.

In Reception, children begin by talking about **pictures**, **video** and **sound** that are viewed on **digital devices**, before moving on to make their own **graphical marks** and **images** using **devices** in year 1. Year 2 moves on to children **capturing** and **manipulating** digital images, while also introducing **sound creation** and adjustment in a fun and accessible way. Year 3 brings previous understanding together as children create **animation**, while experimenting with **font styles** and **effects** in their creative **design** work. Children create **podcasts** in year 4, adding to previously taught understanding of **audio** and **editing**, while also improving their **image editing** understanding. Year 5 takes previous **image editing** techniques into the realm of **video editing**, while introducing **vector graphics** into the repertoire of graphic design skills that children have accumulated. Year 6 adds to children's understanding further, with **web design** including **navigation paths**, and **3D model** creation for purpose.

Key teaching principles to provide variety and breadth of experience

It's important to recognise that Computing is a vastly broad subject, and different areas of learning will be enhanced by employing different pedagogical approaches. Variety is the key to keeping this subject alive and interesting - while presentations and 'teacher talk' can have their place, Computing has the potential to be one of the most explorative, creative and interesting subject areas that children will encounter at school. Computing is a chance for children to thrive within very hands-on creative tools, and learning that relates directly to the modern world.

Unplugged

At Probus, we believe that there are many advantages to pursuing 'unplugged' activities as much as possible, particularly within the early years and KS1 – where classrooms often act as a well-needed sanctuary away from the bombardment of screen-based activities elsewhere in children's lives. Unplugged activities carry inherent advantages in terms of teacher's perceptions, resource reliability, and practicalities in a classroom.

When understanding networks or how computers have infiltrated modern life, so much can be gained away from screens themselves, with discussion, pencil/paper work and design becoming key parts of focused learning. Fun, kinaesthetic activities such as, for example, the use of coloured floor tiles with young children, allow children to explore direction as they build algorithms and improve special awareness.

Digital Literacy
Modern life is infused by technology and powerful cloud-based facilities. Children need to understand the potential of such technologies, and how to interact with such services on a daily basis. Our framework includes the theme of **Operational Core Skills**, including an emphasis on children's ability to operate devices, utilise multiple apps, and type at speed. Such skills become a modern toolkit of understanding, that enables individuals to communicate and collaborate successfully and skillfully.

We take children from experimentation and hand-eye coordination at Reception level, to using **websites, touch-screens** and **trackpads** with increasing fluency in year 1, to basic keyboarding skills of **typing** and **editing** at year 2. Year 3 moves understanding onwards with **punctuation**, typing confidence and **searching** the internet, with year 4 adding correct **spell-checker** usage plus using **multiple apps** and **web browser tabs**. Year 5 adds proficient editing and improving of **on-screen writing**, including **digital thesaurus** usage, while combining multiple pieces of software to accomplish **specific goals**. Year 6 consolidates all previous skills, with an emphasis on editing on-screen writing for **clarity**, **purpose** and **effect** – we also, at this last point, believe that children should be able to type at speed with accurate spelling and punctuation, including digital conventions.

Staying Safe
Internet Safety continues its rise to become one of the most important topics for young people's wellbeing. While it's true that internet-based services will become more regulated over time – as society interprets and responds to the pros and cons of such facilities for children – there can be no doubt that preparing children for the nuances and dangers of internet-based communication is an essential goal. We need to give children the knowledge to understand when services may not be safe; that contact and content could be inappropriate or dangerous; that they can look after their bodies and minds and understand that limits on screen-based activities are necessary to stay healthy; that posting pictures or videos to internet-based services may carry considerable risk; that fraud and scams are rife on the internet and to be wise with guarding personal information.

the curriculum milestones in this area progress across the eight themes suggested by the government-backed UK Council for Internet Safety. We have picked what we consider to be the most salient and relevant milestones from their revised Education for a Connected World framework, and ordered them into an age-appropriate progression.

Self-image and Identity;
Online relationships;
Online reputation;
Online bullying;

Managing online information;
Health, well-being and lifestyle;
Privacy and security
Copyright and ownership

We understand that this area of learning belongs as much within PSHE as it does within Computing,
Our PSHE scheme, JigSaw, explores these elements.

Each year, we follow Safer Internet Day – this is a great opportunity to share and discuss computing issues as a school together.
However, e-safety is discussed and taught throughout the year.

Stories and Discussion

Computing can be brought to life, especially for the youngest children, through stories around internet safety and discussing the usage of technology in everyday life. All children of primary age are keen to discuss the technology they have experienced both inside and outside of school. Such discussions can further knowledge and understanding, and set the scene for the relevance of further learning.

Embedding in Creative Processes and Business links
Children thrive when online, digital tools are embedded into creative projects, and/or the design of products and services that relate heavily to real world opportunities, such as business plans and technology-infused ventures. Giving Computing grounding in action outside All areas of the country have tech and businesses communities that are often keen to forge links with schools to promote relevant knowledge and skills.

Linking to Maths
Whether its directional motion, programming the creation of shapes, or following logical processes, computer science and information technology often make significant links with maths learning. Data focused learning around pictograms, databases or spreadsheets also provide scope to work in a cross-curricular fashion with maths learning.

Next steps: make the explicit progression obvious between year groups, key vocabulary inserted on this document, computing 'patter' - how do we explain what algorithms are? Decomposition? etc