KEY KNOWLEDGE PROGRESSION DOCUMENT – Computing

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- At Early Years, the key knowledge progression document takes reference from the following documentation: Early Years Framework, Development Matters and Birth to 5 Matters

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- At key stage 1, the key knowledge progression document takes full account of the national curriculum's requirements and groups these into the following strands:
  - Algorithms
  - Creating Programs
  - Reasoning
  - Using Technology
  - Uses of IT beyond school
  - Online Safety and Literacy
  - Copyright
- The strands have been selected to reflect the key knowledge and skills in the national curriculum subject content.
- At key stage 2, the key knowledge progression document takes full account of the national curriculum's requirements and groups these into the following strands:
  - Algorithms
  - Creating Programs
  - Developing Programs
  - Reasoning
  - Networks
  - Search Engines
  - Using Programs
  - Online Safety and Literacy
  - Copyright
- The strands have been selected to reflect the key knowledge and skills in the national curriculum subject content.
- Key Concepts have been carefully considered and identified as the core knowledge, skills and confidence to engage with technology required to successfully achieve in a digital world:
  - Abstraction
  - Logic
  - Algorithms
  - Data representation
  - Computation

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KKPDs match the ambition of the National Curriculum. In some instances, knowledge specified within the KKPDs is more ambitious than the National Curriculum. For example:

- Pupils in Year 6 learn about the credibility of website content and how to use filters within digital content (C6.9 and C6.10). This is not specified within the National Curriculum.
- From KS1 onwards, pupils are taught about copyright issues. Again, this is not specified in the National Curriculum.

National Curriculum Aims:

- 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.

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- Substantive knowledge (**S**) is the truths or facts of a subject. Procedural knowledge (**P**) is the knowledge of how to do something. Disciplinary knowledge (**D**) is the knowledge, practices and traditions of a subject (that enable you to behave as a master of the subject e.g. as a digital citizen). These knowledge statements should be what pupils retain. In other words, this knowledge is within their long-term memory and will be remembered.

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- Skills are dependent on specific knowledge. A skill is the capacity to perform and in order to perform a deep body of knowledge needs to be acquired and retained.

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- When considering pupils' improvement in subject specific vocabulary, pupils could be provided with a knowledge organiser which contains the relevant words used for computing for their age group.

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Early Years	*Understanding the world involves guiding children to make sense of their physical world and their community. The frequency and range of children's personal experiences increases their knowledge and sense of the world around them – from visiting parks, libraries and museums to meeting important members of society such as police officers, nurses and firefighters. In addition, listening to a broad selection of stories, non-fiction, rhymes and poems* ***will foster their understanding of our culturally, socially, technologically and ecologically diverse world****. As well as building important knowledge, this extends their familiarity with words that support understanding across domains. Enriching and widening children's vocabulary will support later reading comprehension.*						
Strand	**Algorithms**	**Reasoning**	**Creating Programs**	**Using Technology**	**Uses of IT Beyond School**	**Online Safety and Literacy**	**Copyright**
Key Stage 1	• *Pupils should be taught to understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions*	• *Pupils should be taught to use logical reasoning to predict the behaviour of simple programs*	• *Pupils should be taught to create and debug simple programs*	• *Pupils should be taught to use technology purposefully to create, organise, store, manipulate and retrieve digital content*	• *Pupils should be taught to recognise common uses of information technology beyond school*	• *Pupils should be taught to use technology safely and respectfully, keeping personal information private; identify where to go for help and support when they have concerns about content or contact on the internet or other online technologies*	• *Pupils should be taught to understand ownership of their work and the work of others*

Strand	**Reasoning**	**Algorithms**	**Creating Programs**	**Developing Programs**	**Using Programs**	**Search Engines**	**Networks**	**Online Safety and Literacy**	**Copyright**
Key Stage 2	• *Pupils should be taught to use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs*	• *Pupils should be taught to use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs*	• *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*	• *Pupils should be taught to use sequence, selection, and repetition in programs; work with variables and various forms of input and output*	• *Pupils should be taught to 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*	• *Pupils should be taught to use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content*	• *Pupils should be taught to -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*	• *Pupils should be taught to use technology safely, respectfully and responsibly; recognise acceptable / unacceptable behaviour; identify a range of ways to report concerns about content and contact*	• *Pupils should be taught to understand that not all digital content belongs to them and they should gain permission to use others' work.*

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Strand	Nursery	Reception	Year 1	Year 2	Strand	Year 3	Year 4	Year 5	Year 6	Year 7
Algorithms	Reciprocity Reflective Resourceful Resilience Risk Taker		• C1.1 know that an algorithm is a set of instructions used to solve a problem or achieve an objective (**S**) • C1.2 know that an algorithm written for a computer is called a program (**S**)	• C2.1 know that an algorithm is used on digital devices and is a simple set of steps designed to complete a task (**S**)	**Algorithms**	• C3.1 know how to make logical, achievable steps absorbing new knowledge of coding structures **(P)**	• C4.1 know how to trace code (**P**) and use step-through methods to identify errors in code and make logical attempts to correct this (**D**)	• C5.1 know about code structure, (**S**) how to debug and interpret code (e.g. the use of tabs to organise code and the naming of variables) (**P**)	• C6.1 know how to design algorithms that use selection and repetition (**P**) • C6.2 know how to interpret a program in parts **(P)** and make logical attempts to put the separate parts of a complex algorithm together to explain the program as a whole (**D**)	• C7.1 know several key algorithms that reflect computational thinking [for example, algorithms for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem (**S**)
Creating Programs	• CN.1 know how to complete a simple program on an electronic device, (e.g. iPad, beebot) (**P**)	• CR.1 know how to complete a simple program on a computer (**P**)	• C1.3 know how to create a simple program and test it (**P**)	• C2.2 know how to create and debug a simple program (**P**) that achieves a specific purpose (**D**)	**Creating Programs**	• C3.2 know how to write programs that accomplish specific goals (**P**)	• C4.2 know how to create a program which accomplishes a specific goal in a simulated environment (e.g. give an 'on-screen' robot specific instructions that takes them from A to B) (**P**)	• C5.2 know how to turn complex real-life situations into algorithms for a program by deconstructing it into manageable parts **(D)** • C5.3 know how to write a program to control an external device (**P**) • C5.4 know how to change inputs to achieve different outputs(**P**)	• C6.3 know how to write a program that combines more than one variable and various forms of inputs and outputs (**P**)	• C7.2 know how to write a program that combines all three programming constructs (sequence, selection, iteration) to solve a problem (**P**)

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Strand	Nursery	Reception	Year 1	Year 2	Strand	Year 3	Year 4	Year 5	Year 6	Year 7
				• C2.3 know that programs require precise and unambiguous instructions (**S**)	**Developing Programs**	• C3.3 know how to design and debug a sequence of instructions, including directional instructions (**P**)	• C4.3 know how to experiment with variables to control models (**P**)	• C5.5 know how to develop a program that has specific variables identified (**P**) • C5.6 know how to test and debug a program as they go (**D**)	• C6.4 know how to develop a sequenced program that has repetition and variables identified (**P**)	• C7.3 know how to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions (**P**)
						• C3.4 know how to detect errors within programs (**P**)	• C4.4 know how to detect (**P**) and correct errors in programs (**D**)	• C5.7 know how to use logical methods to detect and correct errors (**D**)	• C6.5 know how to solve problems (**P**) by decomposing them into smaller parts (**D**)	
Using Programs					**Using Programs**	• C3.5 know how to use a range of software for similar purposes (**P**)	• C4.5 know how to select and use software to accomplish given goals (**P**) • C4.6 know how to create linked content using a range of software (**P**)	• C5.8 know how to combine a variety of software on a range of digital devices to design and create content to accomplish given goals (**P**)	• C6.6 know how to select and use a variety of software, on a range of digital devices to design and create a range of programs and systems (**P**)	• C7.4 use two or more programming languages, at least one of which is textual (**P**)

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Strand	Nursery	Reception	Year 1	Year 2	Strand	Year 3	Year 4	Year 5	Year 6	Year 7
						• C3.6 know how to collect and present information **(P)**	• C4.7 know how to make informed software choices when presenting information and data **(D)**	• C5.9 know how to analyse, evaluate and present data and information when creating content **(D)** • C5.10 know how to use several ways of sharing digital content **(P)**	• C6.7 know how to consider the audience when designing and creating digital content **(D)**	
Reasoning		• CR.2 know that information can be retrieved from technological devices and the internet **(S)**	• C1.4 know how to interpret what will happen at different stages of a program. **(P)**	• C2.4 know how to predict what the outcome of a simple program will be (logical reasoning) **(P)** • C2.5 know how to identify the parts of a program that respond to specific actions. For example, writing a cause and effect sentence of what will happen in a program. **(P)**	**Reasoning**	• C3.7 know how to use logical reasoning to explain how some simple algorithms work **(D)**	• C4.8 know how to make an accurate prediction **(P)** and explain why they believe something will happen (linked to programming) **(D)**	• C5.11 know how to analyse and evaluate information **(P)** reaching a conclusion that helps with future developments **(D)**		
						• C3.8 know how to discern when it is best to use technology and where it adds time or no value **(D)**				

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Strand	Nursery	Reception	Year 1	Year 2	Strand	Year 3	Year 4	Year 5	Year 6	Year 7
Using Technology	• CN.2 know how to acquire basic skills in turning on and operating some ICT equipment **(P)**	• CR.3 know how to access, understand and interact with a range of technologies, developing digital literacy skills **(P)**	• C1.5 know how to create, edit and store purposeful, simple digital content (e.g. children can name, save and retrieve their work and follow simple instructions to access online resources) **(P)**	• C2.6 know how to organise, retrieve and manipulate digital content purposefully **(P)** • C2.7 know how to create, name, save and retrieve content including photos, text and sound (**P**)						
	• CN.3 know how to operate simple equipment (e.g. turn on CD player, use a remote control, navigate touch-capable technology with support) **(P)**	• CR.4 know how to create content such as a video recording, stories, and/or draw a picture on screen (**P**)	• C1.6 know how to use a website and a camera (**P**) • C1.7 know how to record sound and play back (**P**)							

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Strand	Nursery	Reception	Year 1	Year 2	Strand	Year 3	Year 4	Year 5	Year 6	Year 7
Search engines				• C2.8 know how to effectively retrieve **(P)** relevant, purposeful digital content using a search engine. **(D)**	**Search engines**	• C3.9 know how to navigate the web to complete simple searches **(P)** • C3.10 know how to use search technology effectively **(P)**	• C4.9 know how to search for specific information **(P)** and know which information is useful and which is not **(D)** • C4.10 know how to appraise selected webpages for credibility and information at a basic level **(D)**	• C5.12 know how to identify credible webpages **(P)** • C5.13 know how search results are selected and ranked **(S)**	• C6.8 know that some search engines may provide misleading information **(S)** • C6.9 know how to explain in detail how credible a webpage is and the information it contains **(D)** • C6.10 know how to use filters when searching for digital content **(P)** • C6.11 know how to compare a range of digital content sources and rate them in terms of content quality and accuracy **(D)**	• C7.5 know how to search technologies effectively **(P)** • C7. 6 know the impact of search technologies and the issues that arise by the way they function and the way they are used **(P)** • C7. 7 know how to use hyperlinks to allow users to navigate between multiple web pages **(P)**

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Strand	Nursery	Reception	Year 1	Year 2	Strand	Year 3	Year 4	Year 5	Year 6	Year 7
Networks					**Networks**	• C3.11 know what computer networks do and how they provide multiple services (**S**)	• C4.11 know that computer networks can provide opportunities for communication and collaboration (**S**)	• C5.14 know the value of computer networks but are also aware of the main dangers (**S**)	• C6.12 know the difference between the internet and the World Wide Web (**S**)	• C7.8 know the differences between the 4 network topologies (Bus, ring, star, mesh) • C7. 9 know what effects network performance (**S**) • C7. 10 know the purpose of different network hardware (Switch, WAP, Router, NIC) (**S**)
Uses of IT Beyond School			• C1.8 know some of the IT uses in their own home (**S**) • C1.9 know how to make a distinction between objects that use modern technology and those that do not (e.g. a microwave vs a chair) (**P**)							
Online Safety and Literacy	• CN.4 know that an adult must be present when using the internet (**S**)	• CR.5 know how to use the internet, with adult supervision, to find and retrieve information of interest to them (**P**)	• C1.10 know how to use technology safely and respectfully (**P**) • C1.11 know how to keep personal information (such as	• C2.10 know the implications of inappropriate online searches (**S**) • C2.11 know the impact of screen time and when to	**Online Safety and Literacy**	• C3.12 know how to use technology safely, respectfully and responsibly (**P**) • C3.13 know the negative implications of	• C4.12 know how to recognise acceptable and unacceptable behaviour using technology (**P**)	• C5.15 know how to make choices when using technology and that not everything is true and/or safe (**P**)	• C6.13 know how to recognise the value in preserving privacy when online for their own and other people's safety (**P**)	• C7.11 know a range of ways to use technology safely, respectfully, responsibly and securely, including protecting

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Strand	Nursery	Reception	Year 1	Year 2	Strand	Year 3	Year 4	Year 5	Year 6	Year 7
			passwords) private (**P**) • C1.12 know how to save work to designated private space (**P**)	take a break from technology (**S**)		failure to keep passwords safe and secure (**S**) • C3.14 know that some games and online services are not age appropriate. (**S**)	• C4.13 know that games, films and online services have age restrictions, giving reasons for these. (**S**)			their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns (**P**)
			• C1.13 know that staying safe online is the same as staying safe in the real world. (**S**)	• C2.12 know where to go for help if concerned (**S**)		• C3.15 know different ways they can get help if concerned (**S**)	• C4.14 know a range of ways of reporting inappropriate content and contact (**S**)	• C5.16 know that there are other risks online which may require reporting (e.g. malware, spyware and pop-up ads) (**S**)	• C6.14 know the potential dangers in using aspects of IT and know when to alert someone if feeling uncomfortable (**S**)	
						• C3.16 know that a range of online communication tools exist (e.g. email) (**S**)		• C5.17 know what a blog is and identify the differences between and open and closed blogs (**S**)	• C6.15 know how to collaborate and communicate online in varied ways (e.g. podcasts) (**P**)	
Copyright			• C1.14 know that by adding a name and date creates ownership of work (**S**)	• C2.13 know how to respect the work of others stored on a shared drive (**P**)	**Copyright**	• C3.17 know what plagiarism is (**S**)	• C4.15 know and understand copyright issues relating to different multimedia (**S**)	• C5.18 know whether a file can be legally downloaded and used (or not) (**S**) • C5.19 know that permission must be gained before publishing others' work (**S**)	• C6.16 know how to find copyright free images and sounds from a range of different sources (**P**)	• C7.12 know how to reference copyrighted materials in their own work (**P**)

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Strand	Nursery	Reception	Year 1	Year 2	Strand	Year 3	Year 4	Year 5	Year 6	Year 7
Curriculum End Points The KKPDs are the input to the curriculum. The curriculum end points are the output. Curriculum end points capture the knowledge, skills and understanding that children should have at the end of each year. They build progressively over time so that children leave Year 6 well-prepared for the next stage of education as competent and capable digital citizens. **For subject leaders,** they provide a clear overview of the end of year expectations for each year group, which will support the planning and assessment of the curriculum. **For teachers**, they provide further clarity around what children should be able to do at the end of each year, using the knowledge they have gained from being taught the KKPDs. They support teachers to plan activities that help to develop children as effective digital citizens. They should be used to check what children know and how well they can apply this knowledge across the curriculum. **For children**, they ensure that they receive an equitable curriculum which gives them the substantive, procedural and disciplinary knowledge needed to be successful in their future studies.										
Curriculum end Points	Children should be able to: Recall the knowledge specified within the KKPDs for Nursery Operate basic technology safely with an adult (e.g. camera, remote control car, CD player and the internet) Complete simple programs (e.g. loading an app on an iPad and entering instructions for a Beebot to move)	Children should be able to: Recall the knowledge specified within the KKPDs for Reception Use a variety of technology (e.g iPad, laptop, internet, interactive board and apps) Create digital content with adult supervision (e.g. drawing pictures on an iPad/laptop screen and recording videos) Access information of interest from the internet with adult supervision	Children should be able to: Recall the knowledge specified within the KKPDs for Year 1 Begin to use specific programs (2Paint, 2Publish, Word) to achieve results (e.g creating, editing and storing) Apply knowledge of algorithms to create simple programs Explain why we keep information safe and private online	Children should be able to: Recall the knowledge specified within the KKPDs for Year 2 Create, edit and store a range of digital content (e.g. sound, photos, videos, text and images) Use technology purposefully to complete a task, using precise instructions, whilst debugging basic programs Explain what different parts of a program will do. Describe what a search engine is and how to use them safely to find relevant content Understand how to stay safe online and the	**Curriculum end Points**	Children should be able to: Recall the knowledge specified within the KKPDs for Year 3 Create a program using sequences and detect errors, explaining the actions of code. Present information for different purposes using appropriate software (Word, Excel, Publisher, PowerPoint, 2Paint and 2Publish) Search for information effectively in different programmes and online Understand how to stay safe online and the dangers of age-restricted games and online	Children should be able to: Recall the knowledge specified within the KKPDs for Year 4 Design and create a program with variables and detect and resolve errors, making predictions on the outcome at each stage Search for specific online information and assess the validity of the sources Combine different software to create content for specific purposes (e.g. snipping a picture from an website to include in a PowerPoint presentation) Explain how to use technology	Children should be able to: Recall the knowledge specified within the KKPDs for Year 5 Write and debug a programme that controls an external device with inputs and outputs to solve a real-world problem (e.g., traffic lights or crumbles) Create and debug a programme that uses variables Select hardware/software to effectively accomplish a set goal (e.g. present info as a blog, animation or poster/leaflet) Search for information on the web applying critical thinking skills and judging	Children should be able to: Recall the knowledge specified within the KKPDs for Year 6 Solve complex problems including, debugging detailed algorithms, whilst putting them together logically in program that contains various forms of inputs and outputs. Plan for and consider audience, whilst creating digital content/artefacts on pre-chosen programs, which enable the most effective results. Demonstrate understanding of how to search efficiently on different search engines (applying filters)	Children should be able to: Recall the knowledge specified within the KKPDs for Year 7 Understand technology can be used to overcome problems (including issues of equity) Understand the law in relation to copyright Use at least one programming language to generate a programme for a specific purpose Explain explicitly a wide range of dangers that exist online and how to stay safe Explain what computational thinking is and how to use this to solve a problem

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Strand	Nursery	Reception	Year 1	Year 2	Strand	Year 3	Year 4	Year 5	Year 6	Year 7
				impact of screentime on health and well-being		services Understand there are different forms of online communication (e.g email)	responsibly and how to recognise and report inappropriate activity	validity Interpret and present relevant data using technology (e.g. 2graph/Excel to show science data as a pie chart on a PowerPoint presentation) Safely share some information online (e.g. 2 blog) Identify further online risks (e.g malware and spyware)	Explain how you know a web page has credible information and why some may not Show awareness of digital footprints and the need for privacy online Collaborate and communicate online in different ways (e.g podcasts and blogs)	Understand and use programming constructs effectively.

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