# Futura Computing

## Curriculum Framework

# Computing Curriculum Framework

**Intent:**

The Futura Learning Partnership intent for Computing is that an exciting and rigorous Computing education will ensure children are immersed in engaging, technology-rich learning experiences which allow them to learn deeply and embed core computing skills, think independently and problem solve in an ever evolving digital world. Regardless of changes within technology and the world we live in, our children will possess the core skills and behaviours required to safely and confidently access new technology to enhance their wider learning, access the curriculum throughout their school journey and inspire a future where technology is used to innovate and make positive change.

We believe that learning about Computing provides an important context for the development of pupils' key learning skills, particularly problem-solving, creative and critical thinking and resourcefulness.

Futura recognise that social context plays a vital role in children's education and as such we aim to provide opportunities for children to experience Computing in ways that are unique to their local and wider community.

**Inclusion:** Our curriculum is ambitious for all and strives to address inclusion and disadvantage in its intent and implementation

**Aims:**
Underpinning the intent are key **concepts** and the National Curriculum Computing statements for Key stages 1 and 2 (see blue bullet points in the coverage sections, below). These are further refined with **key substantive and disciplinary concepts**:

| Substantive Concept | Definition. |
|---|---|
| Computer Science | The technical design. The design of new software, the solution to computing problems and the development of different ways to use technology. |
| Information Technology | The technical knowledge. The design, use and understanding of hardware and software; computers and electronic systems for storing and using information. |
| Digital Literacy | The technical skills. The ability to use information and communication technologies to find, create, evaluate, and communicate information. |

| Disciplinary Concept | Definition. |
|---|---|
| Code | Using and writing codes to produce instructions and algorithms; to solve problems; to test and use logic and sequences against inputs and outputs. |
| Connect | Being able to safely, efficiently and confidently digitally connect with others. |
| Communicate | Being able to safely, efficiently and confidently use apps and information technology to communicate ideas. |
| Collect | Being able to safely, efficiently and confidently find, evaluate, store, sort and use appropriate data. |

Implementation:

To meet the aim of delivering this comprehensive set of substantive and disciplinary concepts, the National Centre for Computing Education (NCCE) "Teach Computing" curriculum is followed. These resources and foci may be adapted to suit the school and cohort as well as to match the available software and

hardware. Termly planning as well as Lesson plans and resources can be downloaded from the NCCE site (note: teachers need to create a free account to do so) and web-links to relevant topic pages are included in the coverage sections (below).

## Primary Computing Curriculum (Secondary Computing Curriculum starts on p38)

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## Contents

Coverage:

KS1

| | Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|---|
| **Year 1** | Computing systems and networks – Technology around us. Y1 | Creating media – Creating media digital painting Y1 | Creating media – Digital writing Y1 | Data and information – Grouping data Y1 | Programming A – Moving a robot Y1 | Programming B – Introduction to animation Y1 |
| | • Connect<br>• Digital Literacy<br>• Information Technology | • Communicate<br>• Connect<br>• Digital Literacy | • Communicate<br>• Connect | • Collect<br>• Information Technology | • Computer Science<br>• Code | • Computer Science<br>• Code |
| **Year 2** | Computing systems and networks – IT around us. Y2 | Creating media – Digital photography. Y2 | Creating media – Making music Y2 | Data and information – Pictograms Y2 | Programming A – Robot algorithms Y2 | Programming B – An introduction to quizzes Y2 |
| | • Connect<br>• Digital Literacy<br>• Information Technology | • Communicate<br>• Connect<br>• Digital Literacy | • Communicate<br>• Connect | • Collect<br>• Information Technology | • Computer Science<br>• Code | • Computer Science<br>• Code |

## KS2

| | Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|---|
| **Year 3** | Computing systems and networks – Connecting Computer Y3 | Creating media – Animation Y3 | Creating media – Desktop publishing Y3 | Data and information – Branching databases Y3 | Programming A – Sequence in Music Y3 | Programming B – Events and Actions Y3 |
| | • Connect<br>• Digital Literacy<br>• Information Technology | • Communicate<br>• Connect<br>• Digital Literacy | • Communicate<br>• Connect | • Collect<br>• Information Technology | • Computer Science<br>• Code | • Computer Science<br>• Code |
| **Year 4** | Computing systems and networks – The Internet Y4 | Creating media – Audio editing Y4 | Creating media – Photo editing Y4 | Data and information – Data logging Y4 | Programming A – Repetition in shapes Y4 | Programming B – Repetition in games Y4 |
| | • Connect<br>• Digital Literacy<br>• Information Technology | • Communicate<br>• Connect<br>• Digital Literacy | • Communicate<br>• Connect | • Collect<br>• Information Technology | • Computer Science<br>• Code | • Computer Science<br>• Code |
| **Year 5** | Computing systems and networks – Sharing Information Y5 | Creating media – Vector Drawing Y5 | Creating Media – Video editing Y5 | Data and information – spreadsheets Y5 Flatfile databases. | Programming A – Selection in Physical Computing Y5 | Programming B – Selection in quizzes Y5 |
| | • Computer Science<br>• Information Technology<br>• Digital Literacy | • Computer Science<br>• Information Technology<br>• Digital Literacy | • Collect<br>• Computer Science<br>• Connect<br>• Information Technology<br>• Digital Literacy | • Collect<br>• Computer Science<br>• Information Technology<br>• Digital Literacy | • Information Technology<br>• Digital Literacy<br>• Code | • Information Technology<br>• Digital Literacy<br>• Code<br>• Collect |
| **Year 6** | Computing systems and networks – Communication Y6 | Creating media – 3D modelling Y6 | Creating media – Web page creation Y6 | Data and information – spreadsheets Y6 | Programming A – Variables in game Y6 | Programming B – Sensing Y6 |
| | • Communicate<br>• Connect<br>• Information Technology<br>• Digital Literacy | • Computer Science<br>• Information Technology<br>• Digital Literacy | • Communicate<br>• Computer Science<br>• Code<br>• Information Technology<br>• Digital Literacy | • Collect<br>• Information Technology<br>• Digital Literacy | • Computer Science<br>• Information Technology<br>• Digital Literacy<br>• Code | • Code<br>• Information Technology<br>• Digital Literacy<br>• Computer Science |

Coloured text ("Computer Science, Information Technology, Digital Literacy, Code, Connect, Communicate, Collect") refer to the key computing substantive and disciplinary concepts. Primary curriculum source is the NCCE scheme of work but these topics can be adapted to suite cohort, available resources, etc.

## EYFS

From September 2021 the early learning goal (ELG) in technology will be removed from the EYFS statutory framework. Previously the ELG stated "Children recognise that a range of technology is used in places such as homes and schools. They select and use technology for particular purposes."

Despite its exclusion from the renewed framework, technology undoubtedly has a role to play in early years classrooms, both in preparation for the National Curriculum and within the context of a technologically advanced society.

Below are a range of *suggestions* for how technology can both support and enhance children's learning towards the ELGs in the Reception classroom.

## Substantive Knowledge

| Computer Science | Information Technology | Digital Literacy |
|---|---|---|
| I can explore programmable toys such as Botley, Beebot or Cod-e-apillar.<br>I can use some words like forwards and backwards to describe how I want to make a programmable toy move.<br>I can give a simple set of instructions e.g. how to brush your teeth. | I can name some sources of IT from home and school.<br>I know that typing using a keyboard is another way of writing information.<br>I know that digital devices can be used to create pictures.<br>I know that things can be similar or different in lots of ways and can talk about some of these similarities and differences. | I know what to do if I see something that worries me when I am using a digital device. |
| **Links to ELGs (Sept 2021)** | | |
| **1. Listening, Attention and Understanding**<br>Listen attentively and respond to what they hear with relevant questions, comments and actions when being read to and during whole class discussions and small group interactions.<br>**2. Speaking ELG**<br>Participate in small group, class and one-to-one discussions, offering their own ideas, using recently introduced vocabulary;<br>Offer explanations for why things might happen, making use of recently introduced vocabulary from stories, non-fiction, rhymes and poems when appropriate.<br>**7. Fine Motor Skills**<br>Use a range of small tools, including scissors, paint brushes and cutlery. | **7. Fine Motor Skills**<br>Use a range of small tools, including scissors, paint brushes and cutlery.<br>Begin to show accuracy and care when drawing.<br>**10. Writing**<br>Spell words by identifying sounds in them and representing the sounds with a letter or letters;<br>Write simple phrases and sentences that can be read by others.<br>**15. The Natural World**<br>Explore the natural world around them, making observations and drawing pictures of animals and plants.<br>**16. Creating with Materials** | **3. Self-Regulation**<br>Show an understanding of their own feelings and those of others, and begin to regulate their behaviour accordingly.<br>**4. Managing Self**<br>Explain the reasons for rules, know right from wrong and try to behave accordingly. |

| | | |
|---|---|---|
| | Safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function. | |

Disciplinary Knowledge:

| Code | Connect | Communicate | Collect |
|---|---|---|---|
| I can push a button to make a programmable toy move.<br>I can find a power button on a programmable toy and that I need to switch it on to make it work. | I can find and start a favourite app on a digital device.<br>I can search for things I like with support on a child-safe search engine. | I can select letters on a keyboard to write simple words and sentences.<br>I am learning where the spacebar and enter button are and what they can do.<br>I can use a mousepad to move a click a cursor, or my finger on a touchscreen to move and select. | I can sort a group of objects using two given criteria e.g. feathers and fur or curved and straight edges. |

Year 1

Substantive Knowledge:

| Computer Science | Information Technology | Digital Literacy |
|---|---|---|
| I can predict the outcome of a command on a device<br>I can match a command to an outcome<br>I can recall words that can be acted out<br>I can compare forwards and backwards movements<br>I can start a sequence from the same place<br>I can predict the outcome of a sequence involving forwards and backwards commands<br>I can compare left and right turns<br>I can experiment with turn and move commands to move a robot<br>I can predict the outcome of a sequence involving up to four commands<br>I can explain what my program should do<br>I can choose the order of commands in a sequence<br>I can debug my program<br>I can compare different programming tools<br>To show that a series of commands can be joined together<br>To identify the effect of changing a value<br>To explain that each sprite has its own instructions<br>To design the parts of a project<br>To use my algorithm to create a program<br><br>(NC) Understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions.<br><br>(NC) Create and debug simple programs<br><br>(NC) Use logical reasoning to predict the behaviour of simple programs. | Identify IT in the home and beyond school.<br>Explain how IT benefits us.<br>Recognise how IT can change the way we work.<br>Understand that some digital software can create art.<br>Explain reasoning behind text choices e.g. colour, size and font<br>I can explain what the keys that I have learnt about already do<br>I can say what tool I used to change the text<br>I can compare using a computer with using a pencil and paper<br>I can describe objects using labels<br>I can describe an object<br>I can describe a property of an object<br>I can find objects with similar properties<br>I can choose how to group objects<br>I can describe groups of objects<br>I can record how many objects are in a group<br>I can decide how to group objects to answer a question<br>I can compare groups of objects<br><br>(NC) Use technology purposefully to create, organise, store, manipulate and retrieve digital content | I can identify rules that help keep us safe and healthy in and beyond the home when using technology<br>I can give some simple examples.<br>I know that the work I create belongs to me.<br>I can name my work so that others know it belongs to me.<br><br>(NC) Recognise common uses of information technology beyond school<br><br>(NC) 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. |

Disciplinary Knowledge:

| Code | Connect | Communicate | Collect |
|---|---|---|---|
| I can run a command on a device<br>I can follow an instruction<br>I can give directions<br>I can find the commands to move a sprite<br>I can use commands to move a sprite | Use a mouse in different ways.<br>Use a keyboard to type and edit text.<br>Use a computer to paint a picture.<br>Selecting and opening a programme or application.<br>Saving and closing a programme or application. | I can open a word processor<br>I can recognise keys on a keyboard<br>I can enter text into a computer<br>I can use letter, number, and space keys<br>I can use backspace to remove text<br>I can type capital letters<br>I can identify the toolbar and use bold, italic, and underline<br>I can select a word by double-clicking<br>I can select all of the text by clicking and dragging<br>I can change the font<br>I can use 'undo' to remove change<br>I can write a message on a computer and on paper | I can match objects to groups<br>I can count objects<br>I can group objects<br>I can count a group of objects<br>I can group similar objects<br>I can group objects in more than one way<br>I can count how many objects share a property |

Suggested Key topics:

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| Computing systems and networks – Technology around us. | Creating media – Creating media digital painting | Creating media – Digital writing | Data and information – Grouping data | Programming A – Moving a robot | Programming B – Introduction to animation |
| Connect<br>Digital Literacy<br>Information Technology | Communicate<br>Connect<br>Digital Literacy | Communicate<br>Connect | Collect<br>Information Technology | Computer Science<br>Code | Computer Science<br>Code |
| Suggested Resources<br>Computer<br>Online paint app e.g. Paintz.app<br>Purple Mash | Suggested Resources<br>Computer or Tablet<br>Paint app e.g. Paintz.app<br>Purple Mash 2paint | Suggested Resources<br>Google Docs<br>Microsoft Word<br>Purple Mash writing templates | Suggested Resources<br>NCCE resources<br>Purple Mash 2Quiz | Suggested Resources<br>Purple Mash 2Go<br>Purple Mash 2code<br>Floor robots (e.g. Beebots) | Suggested Resources<br>Purple Mash 2Create<br>Scratch Jr App |
| **Content links to prior and future learning** | | | | | |
| **Interdisciplinary link:**<br>History, PSHE<br><br>**Linked prior learning**: As this is a Year 1 unit, no prior knowledge is assumed.<br><br>**Linked future learning:**<br>knowledge of parts of a computer and skills needed to effectively use a computer keyboard and mouse. | **Interdisciplinary link:** Art<br><br>**Linked prior learning:**<br>As this is a Year 1 unit, no prior knowledge is assumed.<br><br>**Linked future learning:**<br>Digital content can be manipulated Y1, T3 | **Interdisciplinary link:**<br>English<br><br>**Linked prior learning:**<br>As this is a Year 1 unit, no prior knowledge is assumed.<br><br>**Linked future learning:**<br>Ability to use keyboard and different functions crosses over all units (T4, 5 and 6) and into Year 2 | **Interdisciplinary link:**<br>Maths<br>Science<br><br>**Linked prior learning:**<br>As this is a Year 1 unit, no prior knowledge is assumed.<br><br>**Linked future learning:**<br>Year 2, term 4 - pictograms | **Interdisciplinary link:**<br>Maths<br><br>**Linked prior learning:**<br>As this is a Year 1 unit, no prior knowledge is assumed.<br><br>**Linked future learning:**<br>Year 2, term 5 on algorithms | **Interdisciplinary link:**<br>Art<br>Maths<br><br>**Linked prior learning:**<br>As this is a Year 1 unit, no prior knowledge is assumed.<br><br>**Linked future learning:**<br>Year 3, term 2 animation |

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| **Computing Vocabulary** | | | | | |
| technology, computer, laptop, desktop, keyboard, screen, click, drag, mouse, program, type, save, edit, file, cursor, delete, text, Log in, username, password, log out, notification, save | tools, line, shape, fill, undo, erase, brush | keys | Sort, criteria, data, collate, object | Instruction, algorithm, program, debug, direction, arrow, undo, forward, backwards, right turn, left turn | Animation, sound effect |
| **Online Safety** | | | | | |
| Health, well-being and lifestyle.<br>Copyright and ownership. | Children begin to understand what personal information is and who you can share it with, including the need to keep passwords private. They begin to recognise the need to know who they are sharing their learning with online and recognise the difference between real and imaginary online experiences.<br><br>Digiduck's Big Decision http://kidsmart.org.uk/teachers/ks1/digiduck.aspx | Children know who to tell when they see something that makes them uncomfortable and make sure an adult knows what they are doing. | Children recognise the Internet as an exciting place to be but understand the need for a balance in how they spend their time and make good choices about age appropriate activities.<br><br>I know that work I create belongs to me<br><br>I can name my work so that others know it belongs to me | Managing Online Information<br><br>I understand that when I am working on an online platform, I may have access to the rest of the internet.<br><br>I know who to tell when I see something that makes me uncomfortable. | Managing Online Information<br><br>I understand that when I am working on an online platform, I may have access to the rest of the internet.<br><br>I know who to tell when I see something that makes me uncomfortable.<br><br>I know that work I create belongs to me<br><br>I can name my work so that others know it belongs to me |

Year 2

Substantive Knowledge:

| Computer Science | Information Technology | Digital Literacy |
|---|---|---|
| I can show the difference in outcomes between two sequences that consist of the same commands<br>I can follow a sequence<br>I can predict the outcome of a sequence<br>I can compare my prediction to the program outcome<br>I can explain the choices I made for my mat design<br>I can identify different routes around my mat<br>I can test my mat to make sure that it is usable<br>I can explain what my algorithm should achieve<br>I can create an algorithm to meet my goal<br>I can use my algorithm to create a program<br><br>(NC) Understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions.<br><br>(NC) Create and debug simple programs<br><br>(NC) Use logical reasoning to predict the behaviour of simple programs. | I can identify examples of computers<br>I can describe some uses of computers<br>I can identify that a computer is a part of information technology<br>I can explain the purpose of information technology in the home<br>I can talk about uses of information technology<br>I can compare types of information technology<br>I can list different uses of information technology<br>I can recognise how to use information technology responsibly<br>I can say how those rules/guides can help me<br>I can identify the choices that I make when using information technology<br>I can explain simple guidance for using information technology in different environments and settings<br>I can enjoy a variety of activities<br>Digital Photography<br>I can sort devices into old and new<br>I can talk about how to take a photograph<br>I can explain the process of taking a good photograph<br>I can identify what is wrong with a photograph<br>I can discuss how to take a good photograph<br>I can improve a photograph by retaking it<br>I can explore the effect that light has on a photo<br>I can experiment with different light sources<br>I can recognise that images can be changed<br>I can use a tool to achieve a desired effect<br>I can explain my choices<br>Making Music<br>I can connect images with sounds<br>I can relate an idea to a piece of music<br>I can identify that music is a sequence of notes | I can recognise that images can be changed.<br><br>(NC) Recognise common uses of information technology beyond school<br><br>(NC) 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 |

| | | |
|---|---|---|
| | I can use a computer to create a musical pattern using three notes<br>I can refine my musical pattern on a computer<br><br>(NC) Use technology purposefully to create, organise, store, manipulate and retrieve digital content | |

Disciplinary Knowledge:

| Code | Connect | Communicate | Collect |
|---|---|---|---|
| I can follow instructions given by someone else<br>I can choose a series of words that can be enacted as a sequence<br>I can give clear and unambiguous instructions<br>I can create different algorithms for a range of sequences (using the same commands)<br>I can use an algorithm to program a sequence on a floor robot<br>I can plan algorithms for different parts of a task<br>I can test and debug each part of the program<br>I can put together the different parts of my program | I can find examples of information technology<br>To recognise that images can be changed | Computing Systems<br>I can open a file<br>I can move and resize images<br>I can demonstrate how information technology is used in a shop<br>I can recognise that information technology can be connected<br>I can explain how information technology helps people<br>Digital Photography<br>I can capture digital photos and talk about my experience<br>I can take photos in both landscape and portrait format<br>I can focus on an object<br>Making Music<br>I can use a computer to experiment with pitch and duration | Pictograms<br>I can record data in a tally chart<br>I can represent a tally count as a total<br>I can compare totals in a tally chart<br>I can enter data onto a computer<br>I can use a computer to view data in a different format<br>I can use pictograms to answer simple questions about objects<br>I can organise data in a tally chart<br>I can use a tally chart to create a pictogram<br>I can explain what the pictogram shows<br>I can tally objects using a common attribute<br>I can create a pictogram to arrange objects by an attribute<br>I can answer 'more than'/'less than' and 'most/least' questions about an attribute<br>I can choose a suitable attribute to compare people<br>I can collect the data I need<br>I can create a pictogram and draw conclusions from it<br>I can use a computer program to present information in different ways<br>I can share what I have found out using a computer<br>I can give simple examples of why information should not be shared |

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Suggested Key topics:

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| Computing systems and networks – IT around us. | Creating media – Digital photography. | Creating media – Making music | Data and information – Pictograms | Programming A – Robot algorithms | Programming B – An introduction to quizzes |
| Connect<br>Digital Literacy<br>Information Technology | Communicate<br>Connect<br>Digital Literacy | Communicate<br>Connect | Collect<br>Information Technology | Computer Science<br>Code | Computer Science<br>Code |
| Suggested resources<br>NCCE<br>Different technological devices to show children. | Suggested resources<br>Digital cameras/ iPads<br>https://pixlr.com/x/<br>Pixlr app | Suggested resources<br>Chrome music lab<br>Untuned percussion instruments | Suggested resources<br>J2e pictogram | Suggested resources<br>Floor robot<br>Beebot | Suggested resources<br>Scratch Jr<br>Purple Mash 2quiz |
| Content links to prior and future learning | | | | | |
| **Interdisciplinary link:**<br>PSHE<br><br>**Linked prior learning:**<br>Year 1, term 1<br><br>**Linked future learning:**<br>Year 3, term 1 connecting computers | **Interdisciplinary link:**<br>Art<br><br>**Linked prior learning:**<br>Year 1, term 2 using technology<br><br>**Linked future learning:**<br>Year 4, term 3 | **Interdisciplinary link:**<br>Music<br><br>**Linked prior learning:**<br>First time children will have looked at making music<br><br>**Linked future learning:**<br>Year 2, term 5 | **Interdisciplinary link:**<br>Maths, Science<br><br>**Linked prior learning:**<br>Year 1, term 4 – grouping data<br><br>**Linked future learning:**<br>Year 3, term 4 branching databases | **Interdisciplinary link:**<br>Maths, Science<br><br>**Linked prior learning:**<br>Year 1, term 5 programming a robot<br><br>**Linked future learning:**<br>Year 3, term 6 | **Interdisciplinary link:**<br>English<br><br>**Linked prior learning:**<br>First time children will have used a programme to create a quiz<br><br>**Linked future learning:**<br>Year 4, term 6 |

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| **Computing Vocabulary** | | | | | |
| technology | tools, line, shape, fill, undo, erase, brush | sound effects, digitally | pictogram, data, collate | action, algorithm, bug, character, code block, command, debug/ debugging, input, object, properties, repeat | |
| **Online Safety** | | | | | |
| Children understand what personal information is and who you can share it with, including the need to keep passwords private.<br><br>Children begin to recognise the need to know who they are sharing their learning with online and recognise the difference between real and imaginary online experiences.<br><br>I can identify rules that help keep us safe and healthy in and beyond the home when using technology.<br>I can give some simple examples. | Recognising that images can be changed. Development an awareness that not all pictures they see are 'real' | Children know who to tell when they see something that makes them uncomfortable and make sure an adult knows what they are doing.<br><br>I know that work I create belongs to me. | Children recognise the Internet as an exciting place to be but understand the need for a balance in how they spend their time and make good choices about age appropriate activities. | | Managing Online Information<br><br>I understand that when I am working on an online platform, I may have access to the rest of the internet.<br><br>I know who to tell when I see something that makes me uncomfortable.<br><br>I know that work I create belongs to me<br><br>I can name my work so that others know it belongs to me |

Year 3

Substantive Knowledge:

| Computer Science | Information Technology | Digital Literacy |
|---|---|---|
| Understand how event blocks can be used to start a project in a variety of different ways.<br><br>Learn how to create sequence of commands<br><br>Understand how to programme movement<br><br>(NC)Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts.<br><br>(NC)Use sequence, selection and repetition in programs; work with variables and various forms of input and output.<br><br>(NC)Use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs<br><br>(NC) 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. | To understand how a digital device works and what parts make up a digital device.<br><br>Understanding how digital devices help us and how computers are connected.<br><br>Understand what a branching database is<br><br>(NC) Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content.<br><br>(NC) 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. | Copyright and ownership<br>Explain why copying someone else's work from the internet without permission can cause problems and give examples.<br><br>When searching on the internet for content to use, explain why you need to consider who owns it.<br><br>Give examples of content that is permitted to be reused.<br><br>(NC) Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact. |

Disciplinary Knowledge:

| Code | Connect | Communicate | Collect |
|---|---|---|---|
| Use code to make a musical instrument.<br>Learn how to debug a programme. | Managing online information<br>Use key phrases in search engines<br>Use search technologies effectively.<br>Copyright and ownership<br>Use of search tools to find and access online content which can be reused by others. | Learn how to make a stop-frame animation or other type of presentation.<br>Use text and images to communicate clearly<br>Use return, backspace and shift keys<br>Learn how to create a magazine. | Create a branching database<br>Use a branching database to answer questions. |

Suggested Key topics:

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| Computing systems and networks – Connecting Computer | Creating media – Animation | Creating media – Desktop publishing | Data and information – Branching databases | Programming A – Sequence in Music | Programming B – Events and Actions |
| Connect<br>Digital Literacy<br>Information Technology | Communicate<br>Connect<br>Digital Literacy | Communicate<br>Connect | Collect<br>Information Technology | Computer Science<br>Code | Computer Science<br>Code |
| Suggested Resources<br>Paint programme<br>Purple Mash 2Paint | Suggested Resources<br>Stop-frame animation<br>Purple Mash 2Animate<br>Lego figure animation<br>Pivot Animator | Suggested Resources<br>Microsoft Publisher<br>Adobe Spark App<br>Canva<br>Purple Mash 2Publish | Suggested Resources<br>J2data<br>Purple Mash 2Question | Suggested Resources<br>Scratch<br>Purple Mash 2code | Suggested Resources<br>Scratch<br>Purple Mash 2code |
| Content links to previous learning | | | | | |
| **Interdisciplinary link:**<br>Maths – number and place value<br>Art<br><br>**Linked prior learning:**<br>Year 2, term 1<br><br>**Linked future**<br>Learners will explore the internet as a network of networks.<br>Year 4, term 1 | **Interdisciplinary link:**<br>Art<br>Writing<br><br>**Linked prior learning:**<br>Year 1, term 6<br><br>**Linked future learning:**<br>Learners will further develop their video editing skills in Year 5.<br>Year 5, term 3 | **Interdisciplinary link:**<br>Art, English<br><br>**Linked prior learning:**<br>It builds on their knowledge of data and information from key stage 1<br>Year 1 and 2, term 2<br><br>**Linked future learning:**<br>Year 4, term 3 | **Interdisciplinary link:**<br>Science, Maths<br><br>**Linked prior learning:**<br>Year 1 and 2, term 4<br><br>**Linked future learning:**<br>Year 4, term 4 | **Interdisciplinary link:**<br>Maths and Music<br><br>**Linked prior learning:**<br>Year 2, term 3 and Year 2, term 5<br><br>**Linked future learning:**<br>Year 4, term 5 | **Interdisciplinary link:**<br>Maths and Design and Technology<br><br>**Linked prior learning:**<br>Year 3, term 5<br><br>**Linked future learning:**<br>Year 4, term 6 |

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| **Computing Vocabulary** | | | | | |
| password, internet, blog, username, website, webpage, spoof website, PEGI rating | animation, audio, design templates, entrance animation, font, media, presentation, presentation programme, slide, slideshow, stock image, text box, text formatting, transition | | questioning, database, construct, contribute, recording, data, data logger, present data data | Action, algorithm, bug, code block, code design, command, debug/ debugging, design mode, event, If, input, output, repeat, object, properties, timer, computer simulation, selection, variable | |
| **Online Safety** | | | | | |
| Children recognise the need to keep personal information and passwords private. They recognise the need for a secure password. | Copyright and ownership<br>Managing online information | Children understand that an adult needs to know what they are doing online and understand how to report concerns, including cyberbullying. | Children understand that any personal information they put online can be seen and used by others. | Copyright and ownership<br>Managing online information | Safety features of different apps and games |

Year 4

Substantive Knowledge:

| Computer Science | Information Technology | Digital Literacy |
|---|---|---|
| To identify that accuracy in programming is important<br>To explain what 'repeat' means<br>To decompose a program into parts<br>To develop the use of count-controlled loops in a different programming environment<br>To explain that in programming there are infinite loops and count-controlled loops<br>To develop a design that includes two or more loops which run at the same time<br>To modify an infinite loop in a given program<br>To design a project that includes repetition<br><br>(NC) Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts<br><br>(NC) Use sequence, selection and repetition in programs; work with variables and various forms of input and output.<br><br>(NC) Use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and program<br><br>(NC) 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. | To identify that sound can be digitally recorded<br>To explain that a digital recording is stored as a file<br>To explain that audio can be changed through editing<br>To show that different types of audio can be combined and played together<br>To evaluate editing choices made<br>To describe how images can be changed for different uses<br>To make good choices when selecting different tools<br>To evaluate how changes can improve an image<br>To explain that data gathered over time can be used to answer questions<br>To explain that a data logger collects 'data points' from sensors over time<br>To identify the data needed to answer questions<br><br>(NC) Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content.<br><br>(NC) 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. | To describe how networks physically connect to other networks<br>To recognise how networked devices make up the internet<br>To outline how websites can be shared via the World Wide Web<br>To describe how content can be added and accessed on the World Wide Web<br>To recognise how the content of the WWW is created by people<br>To evaluate the consequences of unreliable content<br>To explain that digital images can be changed<br>To recognise that not all images are real<br><br>(NC) Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact. |

Disciplinary Knowledge:

| Code | Connect | Communicate | Collect |
|---|---|---|---|
| To create a program in a text-based language<br><br>To modify a count-controlled loop to produce a given outcome<br><br>To create a program that uses count-controlled loops to produce a given outcome<br><br>To create a project that includes repetition | To understand that any personal information they put online can be seen and used by others.<br><br>To recognise the effect their writing or images might have on others. | To use a digital device to record sound<br><br>To change the composition of an image | To use a digital device to collect data automatically<br><br>To use data collected over a long duration to find information<br><br>To use collected data to answer questions |

Suggested Key topics:

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| Computing systems and networks – The Internet | Creating media – Audio editing | Creating media – Photo editing | Data and information – Data logging | Programming A – Repetition in shapes | Programming B – Repetition in games |
| Connect<br>Digital Literacy<br>Information Technology | Communicate<br>Connect<br>Digital Literacy | Communicate<br>Connect | Collect<br>Information Technology | Computer Science<br>Code | Computer Science<br>Code |
| Suggested resources<br><br>The Internet<br>Purple Mash – online safety | Suggested resources<br><br>Audacity<br>Purple Mash 2sequence | Suggested resources<br><br>Paint<br>Purple Mash 2paint<br>Sketchbook (touch screen app) | Suggested resources<br><br>App – Google science journal<br>Purple Mash 2calculate | Suggested resources<br><br>Logo (turtle)<br>Purple Mash 2Logo | Suggested resources<br><br>Scratch<br>Purple Mash 2Code<br>Kodu |
| Content links to previous learning | | | | | |
| **Interdisciplinary link**:<br>PSHE<br><br>**Linked prior learning:**<br>Year 3, term 1<br><br>**Linked future learning:**<br>Year 5, term 1 | **Interdisciplinary link:**<br>Music<br><br>**Linked prior learning:**<br>Year 3, term 5<br><br>**Linked future learning:**<br>Year 5, term 3 | **Interdisciplinary link:**<br>Art, PSHE<br><br>**Linked prior learning:**<br>Year 2, term 2<br><br>**Linked future learning:**<br>Year 5, term 2 and 3 | **Interdisciplinary link:**<br>Science, Maths<br><br>**Linked prior learning:**<br>Year 3, term 4<br><br>**Linked future learning:**<br>Year 5 ,term 4 | **Interdisciplinary links:**<br>Maths and Science<br><br>**Linked prior learning:**<br>Year 3, term 5<br><br>**Linked future learning:**<br>Year 5, term 6 and Year 4, term 6 | **Interdisciplinary links:**<br>Maths, Science and Design Technology<br><br>**Linked prior learning:**<br>Year 3, term 6 and Year 4, term 5<br><br>**Linked future learning:**<br>Year 5, term 5 |

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| **Computing Vocabulary** | | | | | |
| computer virus, cookies, copyright, digital footprint, email, identity theft, malware, phishing, plagiarism, spam, motherboard, CPU, RAM, Graphics Card, Network, Card, monitor, speakers keyboard and mouse | Pitch, rhythm, pulse, tempo, dynamics, melody, rippler, texture | Animation, background, frame, flipbook, onion skinning, stop motion, play, sound, video clip | Average, copy and paste, columns, cells, charts, equals tool, formula, formula wizard, move cell tool, random tool, rows, spin tool, spreadsheet, timer | Logo, BK, FD, RT, LT, REPEAT, SETPC, SETPS, PU, PD | Action, alert, algorithm, code design, control, command, debug/ debugging, design mode, event, flowchart bug, get input, If, If/Else, input, object, repeat, selection, computer simulation, simulation, timer, variable |
| **Online Safety** | | | | | |
| Children understand the need for rules to keep them safe when exchanging ideas online. They understand that an adult needs to know what they are doing online and understand how to report concerns, including cyberbullying.<br><br>Children recognise the need to choose age appropriate games to play on their devices, and when to limit use. They recognise the need to protect their devices from viruses. | Copyright and ownership | Self-image and identity<br><br>Children understand that any personal information they put online can be seen and used by others. They recognise that they can use online tools to collaborate and communicate with others and the importance of doing this responsibly, choosing age-appropriate websites.<br><br>Children recognise the effect their writing or images might have on others. | Keeping data safe<br><br>Confidentiality | Copyright and ownership<br><br>Managing online information | Staying safe when gaming online |

Year 5

Substantive Knowledge:

| Computer Science | Information Technology | Digital Literacy |
|---|---|---|
| To explain that computers can be connected together to form systems<br>To recognise the role of computer systems in our lives<br>To recognise how information is transferred over the internet<br>To explain how sharing information online lets people in different places work together<br>To contribute to a shared project online<br><br>(NC) 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.<br><br>(NC) 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 | To identify that drawing tools can be used to produce different outcomes<br>To recognise that vector drawings consist of layers<br>To recognise video as moving pictures, which can include audio<br>To identify digital devices that can record video<br>To recognise the features of an effective video<br>To identify that video can be improved through reshooting and editing<br>To explain that a loop can stop when a condition is met, eg number of times<br>To conclude that a loop can be used to repeatedly check whether a condition has been met<br>To explain how selection is used in computer programs<br><br>(NC) 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 | To evaluate my vector drawing<br>To use tools to achieve a desired effect<br>To create a vector drawing by combining shapes<br>To group objects to make them easier to work with<br>To design a physical project that includes selection<br>To create a controllable system that includes selection<br>To relate that a conditional statement connects a condition to an outcome<br>To design a program which uses selection<br>To create a program which uses selection<br>To evaluate my program<br><br>(NC) 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 |

Disciplinary Knowledge:

| Code | Connect | Communicate | Collect |
|---|---|---|---|
| To write a program that includes count-controlled loops<br>To explain how selection directs the flow of a program<br><br>(NC) design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts.<br><br>(NC) use sequence, selection, and repetition in programs; work with variables and various forms of input and output.<br><br>(NC) use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs | To consider the impact of the choices made when making and sharing a video | To evaluate different ways of working together online | To capture video using a digital device<br><br>(NC) use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact. |

Suggested Key topics:

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| Computing systems and networks – Sharing Information | Creating media – Vector Drawing | Creating Media – Video editing | Data and information – flat file databases | Programming A – Selection in Physical Computing | Programming B – Selection in quizzes |
| Computer Science<br>Information Technology<br>Digital Literacy | Computer Science<br>Information Technology<br>Digital Literacy | Collect<br>Computer Science<br>Connect<br>Information Technology<br>Digital Literacy | Collect<br>Computer Science<br>Information Technology<br>Digital Literacy | Information Technology<br>Digital Literacy<br>Code | Information Technology<br>Digital Literacy<br>Code<br>Collect |
| Suggested resources:<br>Powerpoint (teaching and for students to create work)<br>Online videos of Systems<br>NCCE Lesson resources | Suggested resources:<br>Google Drawings (docs.google.com/drawings/)<br>Microsoft Publisher, or Microsoft PowerPoint<br>Sketchbook (tablet/touchscreen app)<br>Other paint tools | Suggested resources:<br>IPad camera (files may need converting)<br>Digital camera<br>Movie Maker | Suggested resources:<br>Excel<br>Google sheets<br>NCCE Lesson resources | Suggested resources:<br>Crumble controller (hardware)<br>Kodu or Scratch.mit (not physical – virtual alternative)<br>NCCE Lesson resources | Suggested resources:<br>Scratch.mit<br>NCCE Lesson resources |
| Content links to previous learning | | | | | |
| **Interdisciplinary links:**<br>DT, Science<br><br>**Linked prior learning:**<br>Year 4, term 1<br><br>**Linked future learning:**<br>Year 6, term 1 | **Interdisciplinary links:**<br>Art and Maths<br><br>**Linked prior learning:**<br>Year 4, term 3 and 5<br><br>**Linked future learning:**<br>Year 6, term 2 | **Interdisciplinary links:**<br>Music, PSHE and Art<br><br>**Linked prior learning:**<br>Year 4, term 2 and 3<br><br>**Linked future learning:**<br>Year 6, term 3 | **Interdisciplinary links:**<br>Maths<br><br>**Linked prior learning:**<br>Year 3 and 4, term 4<br><br>**Linked future learning:**<br>Year 6, term 4 | **Interdisciplinary links:**<br>Art, Science and Maths<br><br>**Linked prior learning:**<br>Year 4, term 6 and Year 4, term 6<br><br>**Linked future learning:**<br>Year 6, term 5 | **Interdisciplinary links:**<br>DT, Writing, History, Geography<br><br>**Linked prior learning:**<br>Year 5, term 5<br><br>**Linked future learning:**<br>Year 6, term 5 |

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| **Computing Vocabulary** | | | | | |
| system, hub, information, device, component, collaboration | Vector, shape, drawing, image, rotate, resize, colour, layer, effect, pixel | Video, moving images, sound / audio, camera, lens, record, zoom, angle / movement / pan, effects, transitions, edit | Spreadsheet, graph, chart, record, data, order, sort, field | Logic, command, input, output, variable, control, algorithm, program | Condition, outcome, flow, control, If..., else... |
| **Online Safety** | | | | | |
| Copyright and ownership | Using social media apps safely | Managing online information<br><br>Online relationships<br><br>Online reputation<br><br>Self-image and identity | Trusted sources of data | Copyright and ownership | Staying safe when on different apps |

Year 6

Substantive Knowledge:

| Computer Science | Information Technology | Digital Literacy |
|---|---|---|
| To construct a digital 3D model of a physical object<br>design a digital model by combining 3D objects<br>To develop and improve a digital 3D model<br>To plan the features of a web page<br>To define a 'variable' as something that is changeable<br>To create a program to run on a controllable device<br><br>(NC) use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs | To explain how search results are ranked<br>To compare working digitally with 2D and 3D graphics<br>To identify that physical objects can be broken down into a collection of 3D shapes<br>To review an existing website and consider its structure<br>To explain that objects can be described using data<br>To explain why a variable is used in a program<br>To explain that selection can control the flow of a program<br><br>(NC) 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 | To recognise why the order of results is important, and to whom<br>To use a computer to create and manipulate three-dimensional (3D) digital objects<br>To identify questions which can be answered using data<br>To create a spreadsheet to plan an event<br>To choose how to improve a game by using variables<br>To design a project that uses inputs and outputs on a controllable device<br><br>(NC) 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 |

Disciplinary Knowledge:

| Code | Connect | Communicate | Collect |
|---|---|---|---|
| To design a [variable game] project that builds on a given example<br>To use my design to create a project<br>To evaluate my project<br>To update a variable with a user input<br>To use an conditional statement to compare a variable to a value<br>To develop a program to use inputs and outputs on a controllable device<br><br>(NC) use sequence, selection, and repetition in programs; work with variables and various forms of input and output.<br><br>(NC) use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs. | To identify how to use a search engine<br>To consider the ownership and use of images (copyright)<br><br>(NC) use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content.<br><br>(NC) use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact. | To recognise how we communicate using technology<br>To recognise the need to preview pages<br>To outline the need for a navigation path<br>To recognise the implications of linking to content owned by other people<br>To choose suitable ways to present data<br><br>(NC) 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.<br><br>(NC) use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact | To describe how search engines select results<br>To explain that formula can be used to produce calculated data<br>To apply formulas to data, including duplicating |

Suggested Key topics:

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| Computing systems and networks – Communication | Creating media – 3D modelling | Creating media – Web page creation | Data and information – spreadsheets | Programming A – Variables in game | Programming B – Sensing |
| Communicate<br>Connect<br>Information Technology<br>Digital Literacy | Computer Science<br>Information Technology<br>Digital Literacy | Communicate<br>Computer Science<br>Code<br>Information Technology<br>Digital Literacy | Collect<br>Information Technology<br>Digital Literacy | Computer Science<br>Information Technology<br>Digital Literacy<br>Code | Code<br>Information Technology<br>Digital Literacy<br>Computer Science |
| Suggested resources<br>Outlook (or other email platform)<br>Search engines such as Google or Bing or Ecosia<br>School controlled Social Media such as Natterhub | Suggested resources<br>Tinkercad (https://www.tinkercad.com)<br>Kodu<br>NCCE Resources<br>3D printer if available | Suggested resources<br>Google Sites<br>Wordpress<br>Powerpoint (web-page functionality without web access can be created on here)<br>Dreamweaver<br>NCCE resources | Suggested resources<br>Excel<br>Google Sheets<br>NCCE resources | Suggested resources<br>Kodu<br>Scratch.mit<br>NCCE resources | Suggested resources<br>NCCE resources (linked to use of physical device...)<br>micro:bit (physical device – if not available, use...)<br>makecode.microbit.org<br>emulator |
| Content links to previous learning | | | | | |
| **Interdisciplinary link:**<br>PSHE, Oracy, Writing<br><br>**Linked prior learning:**<br>Year 5, term 1<br><br>**Linked future learning:**<br>Year 8, term 5 | **Interdisciplinary link:**<br>Art, Design Technology<br><br>**Linked prior learning:**<br>Year 5, term 2<br><br>**Linked future learning:**<br>Year 7, term 2 | **Interdisciplinary link:**<br>Writing, Art, History, Geography<br><br>**Linked prior learning:**<br>Year 5, term 3<br><br>**Linked future learning:**<br>Year 9, term 3 | **Interdisciplinary link:**<br>Maths<br><br>**Linked prior learning:**<br>Year 5, term 4<br><br>**Linked future learning:**<br>Year 7, term 6 | **Interdisciplinary link:**<br>Science, Maths<br><br>**Linked prior learning:**<br>Year 5, term 5<br><br>**Linked future learning:**<br>Year 7, term 4 | **Interdisciplinary link:**<br>Science, Maths, DT<br><br>**Linked prior learning:**<br>Year 6, term 5<br><br>**Linked future learning:**<br>Year 7, term 5 |

| Term 1 | Term 2 | Term 3 | Term 4 | Term 5 | Term 6 |
|---|---|---|---|---|---|
| **Computing Vocabulary** | | | | | |
| Search, search engine, address bar, ranking, privacy, security | Physical, virtual, 2D / 3D, view / angle, manipulate, model | Website, web pages, page, address, link, HTML, fair use / copyright, home page | Spreadsheet, data set, row, column, format, calculation, formula, cell, chart / graph | Game, variable, control, input, score, algorithm | Input, process, sense, variable, data flow, device |
| **Online Safety** | | | | | |
| Managing online information<br><br>Online reputation<br><br>Trusting content | Privacy and security | Privacy<br><br>Copyright<br><br>Inappropriate content | Trusted source of data | Time spent online / gaming | Staying safe when making friends online (thinking about transition to secondary) |

## Impact:

### Assessment

Primary assessment of Computing is expected to be mostly teacher assessment through observation in lessons and review of created content. More formal methods (such as tests) could be used where these suit the topic. Teachers may wish to use these attainment descriptors to inform their assessment and reporting (note: the skills cited below may be taught across various year-groups depending on topic, cohort, available resources, etc):

*EYFS*

There is no specific ELG for Technology following the September 2021 reforms. Practitioners *may* wish to consider children's readiness for the Year 1 Computing Curriculum by assessing the following:

- Children are beginning to be able to give and follow a precise set of instructions.
- Children can name some forms of technology used at home and in school.
- Children have had the opportunity to play with and explore codable toys.
- Children know what to do and who to tell if they see or hear something that worries them online.
- Children are able to interact with age-appropriate programs for painting and word processing.

KS1

| Year Group | Key NC statement. | Working towards | Meeting | Exceeding |
|---|---|---|---|---|
| Year 1 | Understand that programs execute by following precise and unambiguous instructions. | **Working towards:** Beginning to understand that programs execute by following precise and unambiguous instructions. | **Meeting:** Can understand that programs execute by following precise and unambiguous instructions. | **Exceeding:** Demonstrates a secure understanding that programs execute by following precise and unambiguous instructions. |
| | Create simple programs. | **Working towards:** Has to started to create simple programs. | **Meeting:** Can create simple programs. | **Exceeding:** Can confidently create simple programs. |
| | Use technology safely and respectfully. | **Working towards:** Has started to use technology safely and respectfully. | **Meeting:** Can use technology safely and respectfully. | **Exceeding:** Can consistently use technology safely and respectfully. |
| | Keep personal information private when using technology. | **Working towards:** Is usually able to keep personal information private when using technology. | **Meeting:** Keeps personal information private when using technology. | **Exceeding:** Consistently keeps personal information private when using technology. |
| | Know to ask for help if they feel unsure about any online content. | **Working towards:** Beginning to know they should ask for help if they feel unsure about any online content or contact and who to ask. | **Meeting:** Knows they should ask for help if they feel unsure about any online content or contact and who to ask. | **Exceeding:** Asks for help if they feel unsure about any online content or contact. |
| Year 2 | Understand what algorithms are and how they are implemented as programs on digital devices. | **Working towards:** Beginning to understand what algorithms are and how they are implemented as programs on digital devices. | **Meeting:** Can understand what algorithms are and how they are implemented as programs on digital devices. | **Exceeding:** Possesses a secure understanding of what algorithms are and how they are implemented as programs on digital devices. |
| | Debug simple programs. | **Working towards:** Has started to debug simple programs. | **Meeting:** Can debug simple programs. | **Exceeding:** Can debug simple programs with assurance. |
| | Use logical reasoning to predict the behaviour of simple programs. | **Working towards:** Has started to use logical reasoning to predict the behaviour of simple programs. | **Meeting:** Can use logical reasoning to predict the behaviour of simple programs. | **Exceeding:** Can readily use logical reasoning to predict the behaviour of simple programs. |
| | Describe common uses of information technology beyond school. | **Working towards:** Is usually able to describe common uses of information technology beyond school. | **Meeting:** Can describe common uses of information technology beyond school. | **Exceeding:** Can readily describe common uses of information technology beyond school. |
| | Use technology purposefully. | **Working towards:** Has started to use technology purposefully to create, organise, store, retrieve and manipulate digital content. | **Meeting:** Can use technology purposefully to create, organise, store, retrieve and manipulate digital content. | **Exceeding:** Can use technology purposefully to create, organise, store, retrieve and manipulate digital content. |

LKS2

| Year Group | Key NC statement. | Working towards | Meeting | Exceeding |
|---|---|---|---|---|
| Year 3 | Design and create programs that use a sequence. | **Working towards:** Is sometimes able to design and create programs that use a sequence. | **Meeting:** Can design and create programs that use a sequence. | **Exceeding:** Can design and create programs that use a sequence with confidence. |
| | Control physical systems. | **Working towards**: Can often control physical systems. | **Meeting:** Can control physical systems. | **Exceeding**: Can confidently control physical systems. |
| | Use technology responsibly. | **Working towards:** Has started to use technology responsibly. | **Meeting:** Can use technology responsibly. | **Exceeding**: Can consistently use technology responsibly. |
| | Recognise acceptable / unacceptable behaviour and content. | **Working towards:** Can often recognise acceptable / unacceptable behaviour and content. | **Meeting**: Can recognise acceptable / unacceptable behaviour and content. | **Exceeding**: Can consistently recognise acceptable / unacceptable behaviour and content. |
| | Understand the opportunities computer networks offer for communication. | **Working towards:** Beginning to understand the opportunities computer networks offer for communication. | **Meeting:** Understands the opportunities computer networks offer for communication. | **Exceeding**: Possesses a secure understanding of the opportunities computer networks offer for communication. |
| | Collect and combine information and data. | **Working towards:** Beginning to collect and combine information and data. | **Meeting:** Can collect and combine information and data. | **Exceeding**: Can confidently collect and combine information and data. |
| Year 4 | Design and debug programs that accomplish specific goals. | **Working towards**: Is usually able to design and debug programs that accomplish specific goals. | **Meeting**: Can design and debug programs that accomplish specific goals. | **Exceeding**: Can design and debug programs that accomplish specific goals with assurance. |
| | Use logical reasoning to detect and correct errors in programs. | **Working towards**: Has started to use logical reasoning to detect and correct errors in programs. | **Meeting**: Can use logical reasoning to detect and correct errors in programs. | **Exceeding**: Can use logical reasoning accurately to detect and correct errors in programs. |
| | Appreciate how search results are selected. | **Working towards:** Can often appreciate how search results are selected. | **Meeting:** Can appreciate how search results are selected. | Exceeding: Fully appreciates how search results are selected. |
| | Is selective when using digital content. | **Working towards:** Has started to be selective when using digital content. | **Meeting:** Is selective when using digital content. | **Exceeding:** Is consistently selective when using digital content. |
| | Understand how computer networks can provide multiple services. | **Working towards:** Beginning to understand how computer networks can provide multiple services, such as the world wide web. | **Meeting:** Understands how computer networks can provide multiple services, such as the world wide web. | **Exceeding:** Demonstrates a secure understanding of how computer networks can provide multiple services, such as the world wide web. |
| | Choose from a variety of software and internet services to accomplish given goals. | **Working towards:** Can often choose from a variety of software and internet services to accomplish given goals. | **Meeting:** Can choose from a variety of software and internet services to accomplish given goals. | **Exceeding:** Can readily choose from a variety of software and internet services to accomplish given goals. |
| | Design and create content to accomplish a given goal. | **Working towards:** Can often design and create content to accomplish a given goal. | **Meeting:** Can design and create content to accomplish a given goal. | **Exceeding:** Can readily design and create content to accomplish a given goal. |

UKS2

| Year Group | Key NC statement. | Working towards | Meeting | Exceeding |
|---|---|---|---|---|
| Year 5 | Solve problems in writing programs by decomposing them into smaller parts. | **Working towards:** Is usually able to solve problems in writing programs by decomposing them into smaller parts. | **Meeting:** Can solve problems in writing programs by decomposing them into smaller parts. | **Exceeding:** Can confidently solve problems in writing programs by decomposing them into smaller parts. |
| | Understand the importance of using technology safely, respectfully and responsibly. | **Working towards:** Beginning to understand the importance of using technology safely, respectfully and responsibly. | **Meeting:** Can understand the importance of using technology safely, respectfully and responsibly. | **Exceeding:** Demonstrates a secure understanding of the importance of using technology safely, respectfully and responsibly. |
| | Explain how some simple algorithms work and detect and correct errors in them. | **Working towards:** Can sometimes use logical reasoning to explain how some simple algorithms work and detect and correct errors in them. | **Meeting:** Can use logical reasoning to explain how some simple algorithms work and detect and correct errors in them. | **Exceeding:** Can consistently use logical reasoning to explain how some simple algorithms work and detect and correct errors in them. |
| | Appreciate how search results are ranked. | **Working towards:** Can often appreciate how search results are ranked. | **Meeting:** Can appreciate how search results are ranked. | **Exceeding:** Fully appreciates how search results are ranked. |
| | Understand the basic workings of computer networks including the internet. | **Working towards:** Has started to understand the basic workings of computer networks including the internet. | **Meeting:** Understands the basic workings of computer networks including the internet. | **Exceeding:** Possesses a secure understanding of the basic workings of computer networks including the internet. |
| | Combine a variety of software to accomplish given goals on a range of digital devices. | **Working towards:** Is usually able to combine a variety of software to accomplish given goals on a range of digital devices. | **Meeting:** Can combine a variety of software to accomplish given goals on a range of digital devices. | **Exceeding:** Can confidently combine a variety of software to accomplish given goals on a range of digital devices. |
| Year 6 | Work with variables. | **Working towards:** Can often work with variables. | **Meeting:** Can work with variables. | **Exceeding:** Can confidently work with variables. |
| | Use selection and repetition in programs. | **Working towards:** Can sometimes use selection and repetition in programs. | **Meeting:** Can use selection and repetition in programs. | **Exceeding:** Can use selection and repetition in programs with assurance. |
| | Simulate physical systems. | **Working towards:** Is sometimes able to simulate physical systems. | **Meeting:** Can simulate physical systems. | **Exceeding:** Can confidently simulate physical systems. |
| | Identify a range of ways to report concerns about content and contact. | **Working towards:** Can often identify a range of ways to report concerns about content and contact. | **Meeting:** Can identify a range of ways to report concerns about content and contact. | **Exceeding:** Can readily identify a range of ways to report concerns about content and contact. |
| | Evaluate digital content discerningly. | **Working towards:** Can sometimes be discerning in evaluating digital content. | **Meeting:** Is discerning in evaluating digital content. | **Exceeding:** Is consistently discerning in evaluating digital content. |
| | Understand the opportunities computer networks offer for collaboration. | **Working towards:** Has started to understand the opportunities computer networks offer for collaboration. | **Meeting:** Understands the opportunities computer networks offer for collaboration. | **Exceeding:** Demonstrates a secure understanding of the opportunities computer networks offer for collaboration. |
| | Analyse and evaluate information and data. | **Working towards:** Has started to analyse and evaluate information and data. | **Meeting:** Can analyse and evaluate information and data. | **Exceeding:** Can accurately analyse and evaluate information and data. |
| | Design and create systems that accomplish given goals. | **Working towards:** Can often design and create systems that accomplish given goals. | **Meeting:** Can design and create systems that accomplish given goals. | **Exceeding:** Can confidently design and create systems that accomplish given goals. |

# Secondary Computing Curriculum

## Contents

# Updates

| | | |
|---|---|---|
| 18/06/21 | FW | GCSE CS Overview - Topics by Year / Term updated |
| 22/06/21 | FW | Y7 T3 to Y9T6 |
| 22/06/21 | FW | Y7 T5 to T6 |
| 25/06/21 | FW | Order of KS3 Delivery |

**IMPORTANT NOTE: This document uses Word stylesheet. Please do not make any changes to formatting unless you use the styles.**

# Key Stage 3

**KEY**

| | | |
|---|---|---|
| Substantive Concepts: | **CS** Computer Science \| **IT** Information Technology \| **DL** Digital Literacy | |
| Disciplinary Concepts: | **Code** | Using codes to produce instructions, logic and sequences. |
| | **Connect** | Able to safely connect with others. |
| | **Communicate** | Using apps and information technology to communicate one's ideas. |
| | **Collect** | Creating and using data |

Links: **&** Interdisciplinary **<<** Previous **>>** Future

Note: Education for a connected world is published by the UK Council for Internet Safety. It appears here as it is delivered through PSHE by referenced by the NCEE in their learning resources.

## Overview – Suggested Topics by Year / Term

| Year \| Term | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 7 | Working with Computers | Formatting & Sources of Information | Algorithms & Flowcharts | Scratch Game 1 | Microbit | Networks |
| 8 | Ciphers & Codes | Cybersecurity | Scratch Game 2 | Python Programming 1 | Modelling & Data | Components of a PC |
| 9 | Data Representation 2 | Data Science | Web Production | App Creation | Python Programming 2 | Artificial Intelligence & Robots |

## Assessment

| Time | Type | Purpose |
|---|---|---|
| Bi- Annual<br>End of Terms 3, 6 | • Assignment marked by teacher, written feedback | • Checking student learning<br>• Provide individual feedback |
| Termly | • Online Test<br>• Self-Reviewed Personal Learning Checklist | • Checking student learning<br>• Identify gaps of learning |
| Lesson by Lesson | • Practice questions | • Class discussion and teacher targeted questioning. |

# Where we teach the National Curriculum at KS3

| # | SC | National Curriculum Criteria<br><br>*(*SC Substantive Concepts. NC items are numbered for reference)* | 7-1 Working with Computers | 7-2 Formatting & Sources of Information | 7-3 Algorithms & Flowcharts | 7-4 Scratch Game 1 | 7-5 Microbit | 7-6 Networks | 8-1 Ciphers & Codes | 8-2 Cybersecurity | 8-3 Scratch Game 2 | 8-4 Python Programming 1 | 8-5 Modelling & Data | 8-6 Components of a Computer System | 9-1 Data Representation 2 | 9-2 Data Science | 9-3 Web Production | 9-4 App Creation | 9-5 Python Programming 2 | 9-6 Artificial Intelligence & Robots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | CS<br>IT | Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems | | | y | | Y | | Y | | | Y | Y | | | Y | | Y | Y | Y |
| 2 | CS | Understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem | | | y | Y | Y | | Y | | Y | Y | | | | | | Y | Y | |
| 3 | CS | Use 2 or more programming languages, at least one of which is textual, 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 | | | | Y | Y | | | | Y | Y | | | | | Y | Y | Y | |
| 4 | CS | Understand simple boolean logic [for example, and, or and not] and some of its uses in circuits and programming; understand how numbers can be represented in binary, and be able to carry out simple operations on binary numbers [for example, binary addition, and conversion between binary and decimal | | | | Y | | | | | Y | | | Y | Y | | | | | |
| 5 | CS | Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems | Y | | | | | Y | | | | | | Y | | | | | | Y |
| 6 | CS | Understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits | | | | | Y | | Y | | | Y | | Y | | | | | Y | |
| 7 | CS<br>IT<br>DL | Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users | | Y | | | | | | | | | Y | | | Y | Y | | | Y |
| 8 | IT<br>DL | Create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability | Y | Y | | Y | | | | | Y | | | | | | Y | Y | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | IT<br>DL | Understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns | Y | | | | | | | Y | | | | | | | | | | | |

| # | SC | National Curriculum Criteria<br><br>*(*SC Substantive Concepts. NC items are numbered for reference)* | 7-1 Working with Computers | 7-2 Artificial Intelligence & Robots | 7-3 Algorithms & Flowcharts | 7-4 Scratch Game 1 | 7-5 Networks | 7-6 Microbit | 8-1 Components of a Computer System | 8-2 Scratch Game 2 | 8-3 Python Programming 1 | 8-4 Ciphers & Codes | 8-5 Modelling & Data | 8-6 Cybersecurity | 9-1 App Creation | 9-2 Data Science | 9-3 Web Production | 9-4 Python Programming 2 | 9-5 Data Representation 2 | 9-6 Formatting & Sources of Information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | CS<br>IT | Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems | | Y | y | | | Y | | | Y | Y | Y | | Y | Y | | Y | | |
| 2 | CS | Understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem | | | y | Y | | Y | | Y | Y | Y | | | Y | | | Y | | |
| 3 | CS | Use 2 or more programming languages, at least one of which is textual, 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 | | | | Y | | Y | | Y | Y | | | | Y | | Y | Y | | |
| 4 | CS | Understand simple boolean logic [for example, and, or and not] and some of its uses in circuits and programming; understand how numbers can be represented in binary, and be able to carry out simple operations on binary numbers [for example, binary addition, and conversion between binary and decimal | | | | Y | | | Y | Y | | | | | | | | | Y | |
| 5 | CS | Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems | Y | Y | | | Y | | Y | | | | | | | | | | | |
| 6 | CS | Understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits | | | | | | Y | Y | | Y | Y | | | | | | Y | | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | **CS**<br>**IT**<br>**DL** | Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users | | Y | | | | | | | | | Y | | | Y | Y | | | Y |
| 8 | **IT**<br>**DL** | Create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability | Y | | | Y | | | | Y | | | | | Y | | Y | | | Y |
| 9 | **IT**<br>**DL** | Understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns | Y | | | | | | | | | | | Y | | | | | | |

# Year 7 Term 1: Working with Computers

## NATIONAL CURRICULUM

- Create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability
- Understand a range of ways to use technology safely, respectfully, responsibly, and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct and know how to report concerns

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| INFORMATION TECHNOLOGY | • Understand the rules of the computing lab |
| DIGITAL LITERACY | • Plan effective presentations for a given audience<br>• Recognise a respectful email<br>• Describe how to communicate with peers online<br>• Explain the effects of cyberbullying<br>• Construct an effective email and send it to the correct recipients |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CONNECT | • I can create an effective email |
| COMMUNICATE | • I can make positive contributions to the online community.<br>• I can create a memorable and secure password for an account on the school network<br>• I can find personal documents and common applications<br>• I can recognise cyberbullying<br>• I can check who I am talking to online |

| | |
|---|---|
| SUGGESTED RESOURCES | WMAT Computer Systems: Insight, Outlook, OneDrive, Folder. File Explorer \| NCCE Lesson Plan, Activities, Worksheets at Impact of technology – Collaborating online respectfully |
| LINKS | **&** Education for a Connected World **<<** Year 6, Term 1 **>>** Year 8, Term 1 |
| VOCABULARY | Digital footprint, Email, Emoji, Login, Logout, Hazards, Cyber Bullying, Online identity, Presenting Information, Social Media |
| SAFETY | Cyberbullying, Tone, Online etiquette |

# Year 7 Term 2: Formatting & Sources of Information

## NATIONAL CURRICULUM

- Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users
- Create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| INFORMATION TECHNOLOGY | • Select the most appropriate software to use to complete a task<br>• Identify the key features of a word processor<br>• Evaluate formatting techniques to understand why we format documents<br>• Apply appropriate formatting techniques |
| DIGITAL LITERACY | • Critique digital content for credibility<br>• Apply referencing techniques and understand the concept of plagiarism<br>• Evaluate online sources for use in own work<br>• Design the layout of the content to make it suitable for the audience |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| COMMUNICATE | • I can apply techniques in order to identify whether or not a source is credible<br>• I can question the accuracy and veracity of sources of information |
| COLLECT | • I can apply the key features of a word processor to format a document<br>• I can select appropriate images for a given context<br>• I can demonstrate an understanding of licensing issues involving online content by applying appropriate Creative Commons licences<br>• I can demonstrate the ability to credit the original source of an image |

| | |
|---|---|
| SUGGESTED RESOURCES | NCCE Lesson Plan, Activities, Worksheets at Using media – Gaining support for a cause |
| LINKS | **&** Education for a Connected World **<<** Year 5, Term 4 **>>** Year 9, Term 2 |
| VOCABULARY | Fake News |
| SAFETY | Spotting Phishing scams |

# Year 7 Term 3: Algorithms & Flowcharts

## NATIONAL CURRICULUM

- Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
- Understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| COMPUTER SCIENCE | • Describe the inputs and outputs into the problem?<br>• Articulate what order do instructions need to be carried out?<br>• Define the difference between serial search and binary search, bubble sort and bucket sort<br>• Recognise how algorithms are important in programming, saving time and improving accuracy<br>• Recognise Pseudocode and its link between programming and English written instruction |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CODE | • Construct algorithms based on simple day to day actions<br>• Perform the drawing of a shape using an algorithm |
| COMMUNICATE | • Produce step-by-step instructions for a login system using a flowchart<br>• Evaluate basic algorithm on feedback from peers |

| | |
|---|---|
| SUGGESTED RESOURCES | BBC Bitesize \| |
| LINKS | << Year 9, Term 4 >> GCSE P2 |
| VOCABULARY | logical thinking, decomposition, algorithm, step-by-step, pseudocode, flowchart, Searching, Sorting, Sequencing, Selection, Iteration, Logical reasoning |
| SAFETY | |

# Year 7 Term 4: Introduction to Secondary Scratch

## NATIONAL CURRICULUM

- Use two or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures (e.g. lists, tables, or arrays); design and develop modular programs that use procedures or functions
- Understand several key algorithms that reflect computational thinking; use logical reasoning to compare the utility of alternative algorithms for the same problem
- Understand simple Boolean logic (e.g. and, or, and not)
- Create, reuse, revise, and repurpose digital artefacts for a given audience, with attention to trustworthiness, design, and usability

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| COMPUTER SCIENCE | • Compare how humans and computers understand instructions (understand and carry out)<br>• Define a sequence as instructions performed in order, with each executed in turn<br>• Define a condition as an expression that will be evaluated as either true or false<br>• Recognise that computers follow the control flow of input/process/output<br>• Create conditions that use comparison operators (>,<,=) and logic operators (and/or/not)<br>• Describe the need for iteration and define it as a group of instructions that are repeatedly executed |
| DIGITAL LITERACY | • Making a basic game using programming concepts |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CODE | • I can modify a sequence and a program to include selection<br>• I can define a variable as a name that refers to data being stored by the computer<br>• I can predict the outcome of a simple sequence that includes variables<br>• I can trace the values of variables within a sequence<br>• I can make a sequence that includes a variable<br>• I can identify where count-controlled iteration can be used in a program<br>• I can detect and correct errors in a program (debugging) |
| COMMUNICATE | • I can create a game for others to play |

| | |
|---|---|
| SUGGESTED RESOURCES | Scratch \| NCCE Lesson Plan, Activities, Worksheets at Programming essentials in Scratch – part I |
| LINKS | **&** Maths **<<** Year 5, Term 6 **>>** Year 8, Term 2 |
| VOCABULARY | flow, subroutine, selection, count-controlled iteration, operators, and variables, modify, sequence, selection, count-controlled iteration, debugging, conditions, comparison operators (>,<,=), logic operators (and/or/not) |
| SAFETY | Opening files from the Internet, Danger of macros and exes, Malware |

# Year 7 Term 5: Microbit

## NATIONAL CURRICULUM

- Use two or more programming languages, at least one of which is textual, to solve a variety of computational problems
- Understand several key algorithms that reflect computational thinking; use logical reasoning to compare the utility of alternative algorithms for the same problem
- Understand how instructions are stored and executed within a computer system
- Design, use, and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems

*Design and technology programmes of study: key stage 3*

- Apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors], and control outputs [for example, actuators], using programmable components [for example, microcontrollers].

## SUBSTANTIVE CONCEPTS

COMPUTER SCIENCE

- List the micro:bit's input and output devices
- Write programs that use the micro:bit's built-in input and output devices
- Write programs that use GPIO pins to generate output and receive input
- Write programs that communicate with other devices by sending and receiving messages wirelessly
- Decompose the functionality of a physical computing system into simpler features
- Implement a physical computing project, while following, revising, and refining the project plan

## DISCIPLINARY CONCEPTS

CODE

- I can set up a development environment to write, execute, and debug a Python program for the micro:bit
- I can write as simple program to run on the microbit

CONNECT

- I can design a physical computing artifact purposefully, keeping in mind the problem at hand, the needs of the audience involved, and the available resources

| | |
|---|---|
| SUGGESTED RESOURCES | Microbit and/or python.microbit.org \| NCCE Lesson Plan, Activities, Worksheets at Physical computing |
| LINKS | **&** Design and technology **<<** Year 5, Term 5 **>>** Year 8, Term 1 |
| VOCABULARY | Sensors, GPIO, Input, Output |
| SAFETY | Physical Hazards |

# Year 7 Term 6: Networks

## NATIONAL CURRICULUM

- Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems
- Understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| COMPUTER SCIENCE | • Define what a computer network is and explain how data is transmitted between computers across networks |
| INFORMATION TECHNOLOGY | • Define what the internet is<br>• Describe key words such as 'bandwidth', 'protocols', 'packets', and 'addressing'<br>• Describe how internet-connected devices can affect me<br>• Describe how services are provided over the internet |
| DIGITAL LITERACY | • Be able to protect your online identity<br>• Recognise inappropriate content<br>• How to report concerns |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CONNECT | • I can compare wired to wireless connections<br>• I can identify network hardware components<br>• I can describe components (servers, browsers, pages, HTTP and HTTPS protocols, etc.)<br>• I can measure the rate at which data is transmitted and discuss familiar examples where bandwidth is important |
| COMMUNICATE | • I can explain the term 'connectivity' to collect and share information about me with or without my knowledge |

| | |
|---|---|
| SUGGESTED RESOURCES | NCCE Lesson Plan, Activities, Worksheets at Networks from semaphores to the Internet |
| LINKS | **&** Education for a Connected World, Maths **<<** Year 5, Term 1 **>>** Year 8, Term 1 |
| VOCABULARY | Network, protocol, mainframe, personal computer, stand-alone, HTTP, Network cable, hub, server, router, ISP, Wired, wireless, 3G, 4G, 5G, WiFi, bandwidth, bit, megabit, gigabit, broadband, buffering, Internet, World Wide Web, WWW, internet services, email, Voice over Internet Protocol (VoIP), Internet of Things (IoT), spam, privacy, security, web browser, web server, web page, search engine, HTTPS, URL, domain name, domain name system |
| SAFETY | Shoulder Surfing, Virus Threats, Safe WIFI connections, Browser Vulnerabilities, HTTP |

# Year 8 Term 1: Ciphers & Codes

## NATIONAL CURRICULUM

- Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
- Understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem
- Understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| COMPUTER SCIENCE | • Apply the principles of encryption and decryption in the classroom<br>• Understand the way computers interpret characters through Unicode, ASCII, hexadecimal and binary |
| INFORMATION TECHNOLOGY | • Realise the need for individuals to use encryption<br>• Be able to discuss the benefits and drawbacks of governments and other organisations having access to individuals data<br>• Give examples of how encryption and decryption has benefited society<br>• Determine the type of encryption used for different types of scenarios |
| DIGITAL LITERACY | • Recognise how encryption impacts your day-to-day life |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CODE | • I can perform conversion between hexadecimal and binary to integers<br>• I can encrypt basic codes<br>• I can encrypt substitution codes<br>• I can explain how Vernam ciphers work<br>• I can demonstrate the means of using public and private keys<br>• I can use different codes to encrypt and decrypt code |

| | |
|---|---|
| SUGGESTED RESOURCES | BBC Bitesize  Bletchley Park |
| LINKS | **&** Maths  **>>** Year 9, Term 5 |
| VOCABULARY | Binary, Hexadecimal, Cipher, Substitute, Encrypt, Decrypt, Morse Code, Vernam, Public Key, Private Key, End-to-end |
| SAFETY | HTTPS, using unsecure channels of communication |

# Year 8 Term 2: Cybersecurity

## NATIONAL CURRICULUM

- Understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| INFORMATION TECHNOLOGY | • Critique online services in relation to data privacy<br>• Question how malicious bots can have an impact on societal issues |
| DIGITAL LITERACY | • Explain how a DDoS attack can impact users of online services<br>• Understand the laws involved in laws around computer use<br>• Recognise how human errors pose security risks to data<br>• Implement strategies to minimise the risk of data being compromised through human error |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CONNECT | • I can explain the difference between data and information<br>• I can explain the need for the Computer Misuse Act and Data Protection Act<br>• I can identify the most effective methods to prevent cyberattacks<br>• I can identify strategies to reduce the chance of a brute force attack being successful<br>• I can describe how different types of malware causes problems for computer systems<br>• I can explain how networks can be protected from common security threats |

| | |
|---|---|
| SUGGESTED RESOURCES | https://threatmap.checkpoint.com/ \| NCCE Lesson Plan, Activities, Worksheets at Cybersecurity |
| LINKS | **&** Education for a Connected World **<<** Year 7, Term 1 **>>** GCSE P1 |
| VOCABULARY | Anti-virus, Blagging, CAPTCHA, Ethical hackers, Firewall, Hacking, Installing a firewall, Penetration testers, Phishing, Ransomware, Shouldering, Social engineering, Spam, System administrators, The Computer Misuse Act, The Copyright, Designs, and Patents Act ,The Data Protection Act, The Freedom of Information Act, Trojans, Two-factor authentication, User permissions, Viruses, Worms |
| SAFETY | Implicit throughout |

# Year 8 Term 3: Scratch Game 2

## NATIONAL CURRICULUM

- To use two or more programming languages, at least one of which is textual, to solve a variety of computational problems; to make appropriate use of data structures (for example, lists, tables, or arrays); to design and develop modular programs that use procedures or functions
- To understand several key algorithms that reflect computational thinking; use logical reasoning to compare the utility of alternative algorithms for the same problem
- To understand simple Boolean logic (for example, AND, OR, and NOT)
- To create, reuse, revise, and repurpose digital artefacts for a given audience, with attention to trustworthiness, design, and usability

## SUBSTANTIVE CONCEPTS

COMPUTER SCIENCE

- Define decomposition as breaking a problem down into smaller, more manageable subproblems
- Identify how subroutines can be used for decomposition
- Define a subroutine as a group of instructions that will run when called by the main program or other subroutines
- Evaluate which type of iteration is required in a program
- Define a list as a collection of related elements that are referred to by a single name

## DISCIPLINARY CONCEPTS

CODE

- I can identify when lists can be used in a program and use them
- I can decompose a larger problem into smaller subproblems
- I can apply appropriate constructs to solve a problem
- I can identify where condition-controlled iteration can be used in a program and implement its use

| | |
|---|---|
| SUGGESTED RESOURCES | Scratch \| NCCE Lesson Plan, Activities, Worksheets at Programming essentials in Scratch – part II |
| LINKS | **&** Maths **<<** Year 7, Term 4 **>>** Year 9, Term 4 |
| VOCABULARY | Decomposition, Subroutines, Condition-controlled iteration, Lists, Tables, Arrays, Problem solving, Boolean logic - AND, OR, and NOT |
| SAFETY | Opening files from the Internet, Danger of macros and exes, Malware |

# Year 8 Term 4: Python Programming 1

## NATIONAL CURRICULUM

- Use 2 or more programming languages, at least one of which is textual, 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
- Understand how instructions are stored and executed within a computer system;
- Understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem
- Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems

## SUBSTANTIVE CONCEPTS

COMPUTER SCIENCE

- Describe what algorithms and programs are and how they differ
- Recall that a program written in a programming language needs to be translated in order to be executed by a machine
- Describe the semantics of assignment statements
- Use simple arithmetic expressions in assignment statements to calculate values
- Generate and use random integers
- Use multi-branch selection (if, elif, else statements) to control the flow of program execution
- Describe how iteration (while statements) controls the flow of program execution
- Combine iteration and selection to control the flow of program execution
- Use Boolean variables as flags

## DISCIPLINARY CONCEPTS

CODE

- I can write simple Python programs that display messages, assign values to variables, and receive keyboard input
- I can locate and correct common syntax errors
- I can use iteration (while loops) to control the flow of program execution
- I can use variables as counters in iterative programs
- I can use relational operators to form logical expressions
- I can use binary selection (if, else statements) to control the flow of program execution
- I can receive input from the keyboard and convert it to a numerical value

SUGGESTED RESOURCES

Repl.it or similar IDE | NCCE Lesson Plan, Activities, Worksheets at Introduction to Python programming

| | |
|---|---|
| LINKS | << Year 6, Term6  Year 7, Term 4  >> Year 9, Term 4 |
| VOCABULARY | |
| SAFETY | |

# Year 8 Term 5: Modelling & Data

## NATIONAL CURRICULUM

- Design, use, and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
- Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| COMPUTER SCIENCE | • Use formulas and functions to perform calculations |
| INFORMATION TECHNOLOGY | • Explain the difference between data and information<br>• Explain the difference between primary and secondary sources of data<br>• Analyse data<br>• Collect data<br>• Create appropriate charts in a spreadsheet |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CODE | • I can use cell references, format data, autofill<br>• I can implement conditional formatting<br>• I can create formulas for add, subtract, divide, and multiply<br>• I can create functions for SUM, COUNTA, AVERAGE, MIN, MAX, COUNTIF |
| COMMUNICATE | • I can create graphs and charts |
| COLLECT | • I can collect, sort and filter data |

| | |
|---|---|
| SUGGESTED RESOURCES | Microsoft Excel, Google Sheets \| NCCE Lesson Plan, Activities, Worksheets at Modelling data – Spreadsheets |
| LINKS | **&** Maths **<<** Year 6, Term 4 **>>** Year 9, Term 2 |
| VOCABULARY | +, -, *, /, columns, rows, cells, formatting, formulas, autofill, graphs, SUM, COUNTA, AVERAGE, MIN, MAX, COUNTIF |
| SAFETY | Misinformation through graphs |

# Year 8 Term 6: Components of a Computer System

## NATIONAL CURRICULUM

- Understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming
- Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems
- Understand how instructions are stored and executed within a computer system

## SUBSTANTIVE CONCEPTS

**COMPUTER SCIENCE**

- Analyse how the hardware components used in computing systems work together in order to execute programs
- Recall that a general-purpose computing system is a device for executing programs
- Recall that a program is a sequence of instructions that specify operations that are to be performed on data
- Explain the difference between a general-purpose computing system and a purpose-built device
- Recall that all computing systems, regardless of form, have a similar structure ('architecture')
- Describe how hardware is built out of increasingly complex logic circuits
- Describe the steps involved in training machines to perform tasks (gathering data, training, testing)

## DISCIPLINARY CONCEPTS

**CODE**

- I can describe the function of the hardware components used in computing systems
- I can describe how the hardware components used in computing systems work together in order to execute programs
- I can define what an operating system is, and recall its role in controlling program execution
- I can describe the NOT, AND, and OR logical operators, and how they are used to form logical expressions
- I can use logic gates to construct logic circuits, and associate these with logical operators and expressions
- I can recall that, since hardware is built out of logic circuits, data and instructions alike need to be represented using binary digits
- I can explain the implications of sharing program code

| | |
|---|---|
| SUGGESTED RESOURCES | NCCE Lesson Plan, Activities, Worksheets at Computing systems |
| LINKS | << Year 7, Term 1 >> GCSE P1 |
| VOCABULARY | hardware, software, programs, executing, sequence, general-purpose, embedded system, architecture, logic circuits, training machines, testing, NOT, AND, OR, expressions, operators, binary, digits |
| SAFETY | |

# Year 9 Term 1: Data Representation 2

## NATIONAL CURRICULUM

- Understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits

## SUBSTANTIVE CONCEPTS

**COMPUTER SCIENCE**

- Recall that the colour of each picture element is represented using a sequence of binary digits
- Define key terms such as 'pixels', 'resolution', and 'colour depth'
- Explain the function of microphones and speakers as components that capture and generate sound
- Recall that sound is a wave
- Explain how the manipulation of digital images amounts to arithmetic operations on their digital representation
- Explain how attributes such as sampling frequency and sample size affect characteristics such as representation size and perceived quality, and the trade-offs involved
- Recall that bitmap images and pulse code sound are not the only binary representations of images and sound available (Vectors, MIDI)
- Describe how digital images are composed of individual elements and can be represented as a sequence of bits

## DISCIPLINARY CONCEPTS

**CODE**

- I can perform basic image and sound editing tasks using appropriate software and combine them in order to solve more complex problems requiring image and sound manipulation
- I can define key terms such as 'sample', 'sampling frequency/rate', 'sample size'
- I can compute the representation size of a digital image, by multiplying resolution (number of pixels) with colour depth (number of bits used to represent the colour of individual pixels)
- I can calculate representation size for a given digital sound, given its attributes
- I can describe the trade-off between representation size and perceived quality for digital images
- I can define 'compression', and describe why it is necessary

**COMMUNICATE**

- I can describe and assess the creative benefits and ethical drawbacks of digital manipulation

| | |
|---|---|
| SUGGESTED RESOURCES | GIMP, Audacity, Fireworks \| NCCE Lesson Plan, Activities, Worksheets at Representations – going audiovisual |
| LINKS | **&** Maths **<<** Year 4, Term 2 & 3 **>>** GCSE P1 |
| VOCABULARY | Bit Depth, Bitmap, Binary, Capture, Colour Depth, Compression, Conversion, Digitised, File Size, GIF, JPG, Manipulation, MIDI, Mosaic, Pixel, Pulse, Resolution, Sampling Rate, Sample Size, Vector |
| SAFETY | Image, sound, video manipulation, fake news |

# Year 9 Term 2: Data Science

## NATIONAL CURRICULUM

- Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users
- Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| INFORMATION TECHNOLOGY | • Explain how visualising data can help identify patterns and trends in order to help us gain insights<br>• Use an appropriate software tool to visualise data sets and look for patterns or trends |
| DIGITAL LITERACY | • Recognise examples of where large data sets are used in daily life<br>• Select criteria and use data set to investigate predictions<br>• Define the terms 'correlation' and 'outliers' in relation to data trends<br>• Identify the steps of the investigative cycle<br>• Describe the need for data cleansing<br>• Analyse visualisations to identify patterns, trends, and outliers |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CONNECT | • I can define data science<br>• I can identify the steps of the investigative cycle and can solve a problem by implementing steps of the investigative cycle on a data set<br>• I can identify the data needed to answer a question defined by the learner<br>• I can use findings to support a recommendation, draw conclusions and report findings<br>• I can evaluate findings to support arguments for or against a prediction<br>• I can visualise a data set<br>• I can apply data cleansing techniques to a data set |
| COLLECT | • I can create a data capture form |

| | |
|---|---|
| SUGGESTED RESOURCES | NCCE Lesson Plan, Activities, Worksheets at Data science |
| LINKS | **&** Maths **<<** Year 7, Term 3 |
| VOCABULARY | Accessible, Analysis, Axis, Cleanse, Conclusion, Correlation, Data, Data science, Graph, Infographic, Outlier, Plan, Problem, Trend, Visualisation |

# Year 9 Term 3: Web Production

## NATIONAL CURRICULUM

- Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users
- Create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability
- Use 2 or more programming languages, to solve a variety of computational problems

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| COMPUTER SCIENCE | • Modify HTML tags using inline styling to improve the appearance of web pages<br>• Assess the benefits of using CSS to style pages instead of in-line formatting<br>• Recognise how JavaScript can add functionality to a webpage |
| DIGITAL LITERACY | • Discuss the impact of search technologies and the issues that arise by the way they function and the way they are used<br>• Use search technologies effectively<br>• Describe what a search engine is<br>• Explain how search engines 'crawl' through the World Wide Web and how they select and rank results |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CODE | • I can code a webpage using HTML |
| CONNECT | • I can create hyperlinks to allow users to navigate between multiple web pages |
| COMMUNICATE | • I can recognise different types of navigation on websites<br>• I can use CSS to style a webpage<br>• I can use JavaScript to add functionality to a webpage<br>• I can make a functioning website using HTML, CSS & JavaScript to communicate a topic |
| COLLECT | • I can perform different types of search based on operators<br>• I can describe how webpages are searched and ranked |

| | |
|---|---|
| SUGGESTED RESOURCES | Notepad, Notepad ++, Dreamweaver \| NCCE Lesson Plan, Activities, Worksheets at Developing for the web |
| LINKS | **&** Education for a Connected World **<<** Year 6, Term 3 |
| VOCABULARY | Tags, Navigation, Links, HTML, CSS, Javascript, Forms |
| SAFETY | Security Threats, Giving information online, trust, HTTPS |

# Year 9 Term 4: App Creation

## NATIONAL CURRICULUM

- Design, use, and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
- Use two or more programming languages, at least one of which is textual, 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
- Understand several key algorithms that reflect computational thinking; use logical reasoning to compare the utility of alternative algorithms for the same problem
- Create, reuse, revise, and repurpose digital artefacts for a given audience, with attention to trustworthiness, design, and usability

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| COMPUTER SCIENCE | • Identify when a problem needs to be broken down<br>• Implement and customise GUI elements to meet the needs of the user<br>• Recognise that events can control the flow of a program<br>• Use user input in an event-driven programming environment and in a block-based programming language<br>• Use variables in an event-driven programming environment and in a block-based programming language<br>• Develop a partially complete application to include additional functionality |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CODE | • Use a block-based programming language to create a sequence and to include sequencing and selection<br>• Identify and fix common coding errors<br>• Pass the value of a variable into an object |
| COLLECT | • Establish user needs when completing a creative project<br>• Reflect and react to user feedback<br>• Evaluate the success of the programming project<br>• Apply decomposition to break down a large problem into more manageable steps |

| | |
|---|---|
| SUGGESTED RESOURCES | MIT App Inventor http://appinventor.mit.edu/ \| NCCE Lesson Plan, Activities, Worksheets at Mobile app development |
| LINKS | **&** Education for a Connected World |
| VOCABULARY | Design, Usability, Interface, Syntax, Logic, Debugging, Modify, Sequence, Selection, Iteration, Input, Controls |
| SAFETY | Sharing information, data harvesting, in-app purchases |

# Year 9 Term 5: Python Programming 2

## NATIONAL CURRICULUM

- Use 2 or more programming languages, at least one of which is textual, 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
- Understand how instructions are stored and executed within a computer system;
- Understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem
- Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems

## SUBSTANTIVE CONCEPTS

COMPUTER SCIENCE

- Recall if-elif-else statement, while statements, for statements, loops
- Combine key programming language features to develop solutions to meaningful problems
- Selection (if-elif-else statements) to control the flow of program execution
- Iteration (while statements) to control the flow of program execution,(for statements) to iterate over list items, (for loops) to iterate over lists and strings
- Use variables to keep track of counts and sums

## DISCIPLINARY CONCEPTS

CODE

- I can write programs that display messages, receive keyboard input, and use simple arithmetic expressions in assignment statements
- I can locate and correct common syntax errors
- I can create lists and access individual list items
- I can perform common operations on lists or individual items
- I can perform common operations on strings or individual characters

| | |
|---|---|
| SUGGESTED RESOURCES | NCCE Lesson Plan, Activities, Worksheets at Python programming with sequences of data |
| LINKS | **&** Maths **<<** Year 8, Term 3 **>>** GCSE P2 |
| VOCABULARY | Selection, flow, program execution, iteration, while statements for statements, for loops), lists, strings, variables, counts, sums, keyboard input, arithmetic expressions, assignment statements, syntax errors |
| SAFETY | |

# Year 9 Term 6: Artificial Intelligence & Robots

## NATIONAL CURRICULUM

- Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
- Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems
- Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users

*Design and technology programmes of study: key stage 3*

- Apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors], and control outputs [for example, actuators], using programmable components [for example, microcontrollers].

## SUBSTANTIVE CONCEPTS

| | |
|---|---|
| COMPUTER SCIENCE | • Describe how machine learning differs from traditional programming |
| INFORMATION TECHNOLOGY | • Provide broad definitions of 'artificial intelligence' and 'machine learning'<br>• Identify examples of artificial intelligence and machine learning in the real world |
| DIGITAL LITERACY | • Recognise privacy issues associated with AI<br>• Associate the use of artificial intelligence with moral dilemmas |

## DISCIPLINARY CONCEPTS

| | |
|---|---|
| CODE | • I can list advantages and disadvantages of current technology<br>• I can examine the ways that separate the physical, mental and emotional limits of humans from robots |
| CONNECT | • I can examine the requirements to make a basic robot for a specific purpose<br>• I can evaluate the uses of artificial intelligence to help humans in the future for different purposes |

| | |
|---|---|
| SUGGESTED RESOURCES | Learn \| Code.org - Robotics |
| LINKS | **&** Design & Technology **<<** Year 1, Term5 **>>** Year 9, Term 4 |
| VOCABULARY | Digital Assistants, Robots, Sensors, Privacy, Speech recognition systems, Turing Test, Machine learning, Self-learning |
| SAFETY | Privacy, Ethics of automation |

# Key Stage 4 – GCSE Computer Science

## Intent

KS4 offers GCSE Computer Science (OCR J277). Substantive content and focus is almost entirely computer science and the disciplinary work has an emphasis centred largely on code and programming. The GCSE builds on principles and skills from Key Stage 3 in greater depth.

### National Curriculum Key stage 4

All pupils must have the opportunity to study aspects of information technology and computer science at sufficient depth to allow them to progress to higher levels of study or to a professional career.

All pupils should be taught to:

- develop their capability, creativity and knowledge in computer science, digital media and information technology
- develop and apply their analytic, problem-solving, design, and computational thinking skills
- understand how changes in technology affect safety, including new ways to protect their online privacy and identity, and how to report a range of concerns

The National Centre for Computing Education maps the previous specification (valid only for Year 12 during 2020-21) to the National Curriculum.

**KS4 Intent**

From OCR:

The qualification will build on the knowledge, understanding and skills established through the Computer Science elements of the Key Stage 3 programme of study. The content has been designed not only to allow for a solid basis of understanding but to engage learners and get them thinking about real world application.

OCR's GCSE (9–1) in Computer Science will encourage learners to:

- understand and apply the fundamental principles and concepts of Computer Science, including abstraction, decomposition, logic, algorithms, and data representation
- analyse problems in computational terms through practical experience of solving such problems, including designing, writing and debugging programs
- think creatively, innovatively, analytically, logically and critically
- understand the components that make up digital systems, and how they communicate with one another and with other systems
- understand the impacts of digital technology to the individual and to wider society
- apply mathematical skills relevant to Computer Science.

# Content & Assessment

**Formal Assessment**

The course has 2 examined paper both worth 50% and a compulsory non-examined assessment worth 0%

| | |
|---|---|
| Paper 1 'Computer Systems' focuses on<br>• Systems Architecture<br>• Memory<br>• Storage<br>• Wired and wireless networks<br>• Network topologies, protocols and layers<br>• System security<br>• System software<br>• Ethical, legal, cultural and environmental concerns | Paper 2 – 'Computational thinking, algorithms and programming' focuses on:<br>• Algorithms<br>• Programming techniques<br>• Producing robust programs<br>• Computational logic<br>• Translators and facilities of languages<br>• Data representation |

**Ongoing Assessment**

| Time | Type | Purpose |
|---|---|---|
| Bi- Annual | Year 10 – Mock – June<br>Year 11 Paper 1 – November<br>Year 11 Paper 2 - March | Testing knowledge, understanding and skills under exam conditions. Provides a measure of progress to date.<br>Student answers are fed into a personal learning checklist which then is given to students. Students can view the learning objectives that they need to focus on and refer to a learning links document with links to online sources of information. |
| Termly/ Twice a term | Online Test<br>Assignment marked by teacher, written feedback | Checking student learning. Assignments provide individual feedback. |
| Lesson by Lesson | Practice questions | Class discussion and teacher targeted questioning. |
| Late Year 10 | Programming Project | Compulsory – centre assigned, not an NEA |

# Overview - Topics by Year / Term

| Term | Year 10 | Year 11 |
|---|---|---|
| **1** | 2.5.1 Languages<br>2.5.2 The Integrated Development Environment (IDE)<br>2.2.1 Programming fundamentals - Sequence<br>*2.2.1 Programming fundamentals - Selection* | *NEA – Non Examination Assessment* |
| **2** | 1.2.3 Units<br>1.2.4 Data storage<br>*2.2.1 Programming fundamentals - Iteration*<br>2.1.1 Computational thinking | 1.5.1 Operating systems<br>1.5.2 Utility software<br>1.1.3 Embedded systems<br>1.3.1 Networks and topologies |
| **3** | 2.3.1 Defensive design<br>2.1.2 Designing, creating and refining algorithms<br>2.1.3 Searching and sorting algorithms<br>*2.2.1 Programming fundamentals - Remainder* | 1.3.2 Wired and wireless networks, protocols and layers<br>1.4.1 Threats to computer systems and networks<br>1.4.2 Identifying and preventing vulnerabilities |
| **4** | 2.2.2 Data types<br>2.2.3 Additional programming techniques | 1.6.1 Ethical, legal, cultural and environmental impact |
| **5** | 2.3.2 Testing<br>2.4 Boolean logic<br>1.2.5 Compression | *Revision* |
| **6** | 111 CPU Architecture<br>112 CPU Performance<br>121 Primary Memory<br>122 Secondary Memory | *Examinations* |

# Key Stage 4 – Non GCSE

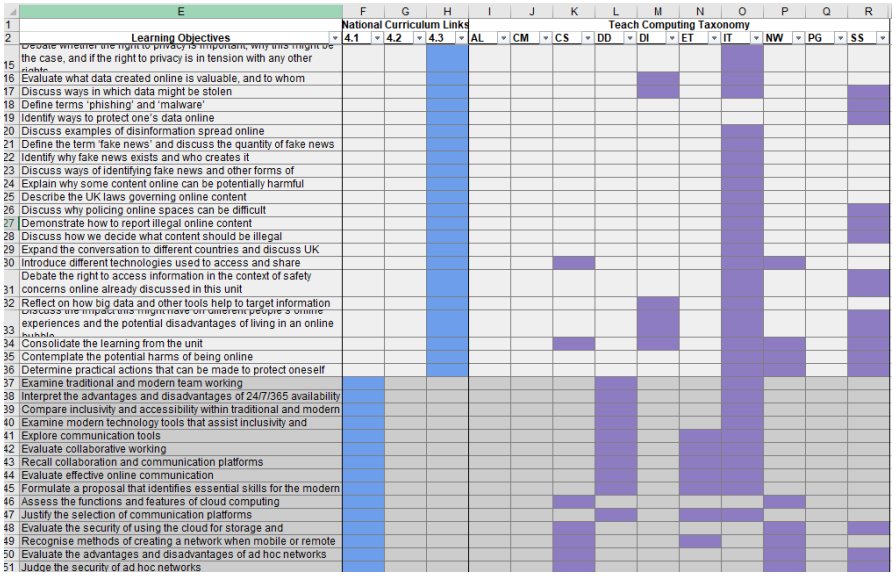
## National Curriculum Key stage 4 (Non GCSE)

All pupils must have the opportunity to study aspects of information technology and computer science at sufficient depth to allow them to progress to higher levels of study or to a professional career.

All pupils should be taught to:

- develop their capability, creativity and knowledge in computer science, digital media and information technology
- develop and apply their analytic, problem-solving, design, and computational thinking skills
- understand how changes in technology affect safety, including new ways to protect their online privacy and identity, and how to report a range of concerns

The National Centre for Computing Education lists 110 learning objectives for non GCSE computing.



| | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | National Curriculum Links | | | Teach Computing Taxonomy | | | | | | | | | |
| 2 | Learning Objectives | 4.1 | 4.2 | 4.3 | AL | CM | CS | DD | DI | ET | IT | NW | PG | SS |
| 15 | Debate whether the right to privacy is important, why this might be the case, and if the right to privacy is in tension with any other rights | | | | | | | | | | | | | |
| 16 | Evaluate what data created online is valuable, and to whom | | | | | | | | | | | | | |
| 17 | Discuss ways in which data might be stolen | | | | | | | | | | | | | |
| 18 | Define terms 'phishing' and 'malware' | | | | | | | | | | | | | |
| 19 | Identify ways to protect one's data online | | | | | | | | | | | | | |
| 20 | Discuss examples of disinformation spread online | | | | | | | | | | | | | |
| 21 | Define the term 'fake news' and discuss the quantity of fake news | | | | | | | | | | | | | |
| 22 | Identify why fake news exists and who creates it | | | | | | | | | | | | | |
| 23 | Discuss ways of identifying fake news and other forms of | | | | | | | | | | | | | |
| 24 | Explain why some content online can be potentially harmful | | | | | | | | | | | | | |
| 25 | Describe the UK laws governing online content | | | | | | | | | | | | | |
| 26 | Discuss why policing online spaces can be difficult | | | | | | | | | | | | | |
| 27 | Demonstrate how to report illegal online content | | | | | | | | | | | | | |
| 28 | Discuss how we decide what content should be illegal | | | | | | | | | | | | | |
| 29 | Expand the conversation to different countries and discuss UK | | | | | | | | | | | | | |
| 30 | Introduce different technologies used to access and share | | | | | | | | | | | | | |
| 31 | Debate the right to access information in the context of safety concerns online already discussed in this unit | | | | | | | | | | | | | |
| 32 | Reflect on how big data and other tools help to target information | | | | | | | | | | | | | |
| 33 | Discuss the impacts this might have on different people's online experiences and the potential disadvantages of living in an online bubble | | | | | | | | | | | | | |
| 34 | Consolidate the learning from the unit | | | | | | | | | | | | | |
| 35 | Contemplate the potential harms of being online | | | | | | | | | | | | | |
| 36 | Determine practical actions that can be made to protect oneself | | | | | | | | | | | | | |
| 37 | Examine traditional and modern team working | | | | | | | | | | | | | |
| 38 | Interpret the advantages and disadvantages of 24/7/365 availability | | | | | | | | | | | | | |
| 39 | Compare inclusivity and accessibility within traditional and modern | | | | | | | | | | | | | |
| 40 | Examine modern technology tools that assist inclusivity and | | | | | | | | | | | | | |
| 41 | Explore communication tools | | | | | | | | | | | | | |
| 42 | Evaluate collaborative working | | | | | | | | | | | | | |
| 43 | Recall collaboration and communication platforms | | | | | | | | | | | | | |
| 44 | Evaluate effective online communication | | | | | | | | | | | | | |
| 45 | Formulate a proposal that identifies essential skills for the modern | | | | | | | | | | | | | |
| 46 | Assess the functions and features of cloud computing | | | | | | | | | | | | | |
| 47 | Justify the selection of communication platforms | | | | | | | | | | | | | |
| 48 | Evaluate the security of using the cloud for storage and | | | | | | | | | | | | | |
| 49 | Recognise methods of creating a network when mobile or remote | | | | | | | | | | | | | |
| 50 | Evaluate the advantages and disadvantages of ad hoc networks | | | | | | | | | | | | | |
| 51 | Judge the security of ad hoc networks | | | | | | | | | | | | | |

# Key Stage 5

## Intent

From the examination board:

> The OCR A Level in Computer Science will encourage learners to be inspired, motivated and challenged by following a broad, coherent, practical, satisfying and worthwhile course of study. It will provide insight into, and experience of how computer science works, stimulating learners' curiosity and encouraging them to engage with computer science in their everyday lives.

KS5 offers A Level Computer Science (OCR H446). Substantive content and focus is almost entirely computer science and the disciplinary work has an emphasis centred largely on code and programming. The A Level builds on principles and skills from the GCSE in greater depth so knowledge links frequently refer back to key stage 4

## Content & Assessment

| | | |
|---|---|---|
| **Paper 1** Examination 40%<br>• Characteristics of processors, input, output and storage devices<br>• Software and software development<br>• Exchanging data<br>• Data types, data structures and algorithms<br>• Legal, moral, cultural and ethical issues | **Paper 2** Examination 40%<br>• Elements of computational thinking<br>• Problem solving and programming<br>• Algorithms to solve problems and standard algorithms | **NEA** Internally marked, Externally moderated 20%<br>• Programming Projeect |

Ongoing Assessment

| Time | Type | Purpose |
|---|---|---|
| Bi- Annual | Year 13 – Mock – Paper 1 October<br>Paper 2 – January<br>Year 12 Mock April | Testing knowledge, understanding and skills under exam conditions. Provides a measure of progress to date.<br>Student answers are fed into a personal learning checklist which then is given to students. Students can view the learning objectives that they need to focus on and refer to a learning links document with links to online sources of information. |
| Termly/ Twice a term | Online Test<br>Assignment marked by teacher, written feedback | Checking student learning. Assignments provide individual feedback. |

| | | |
|---|---|---|
| Lesson by Lesson | Practice questions | Class discussion and teacher targeted questioning. |
| Late Year 12 to early 13 | Programming Project documentation and development | Ongoing submissions and written feedback given to students |

# Overview - Topics by Year / Term

| Term | Year 12 | Year 13 |
|---|---|---|
| **1** | • 1.1.1 - Processor Structure Function<br>• 1.1.2 - Types of processor<br>• 1.1.3 - Input Output Storage | • 2.1.1 - Thinking abstractly<br>• 2.1.2 - Thinking ahead<br>• 2.1.3 - Thinking procedurally<br>• 2.1.4 - Thinking logically<br>• 2.1.5 - Thinking concurrently<br>• 2.2.2 - Computational methods |
| **2** | • 2.2.1 - Programming techniques<br>• 1.4.1 - Data Types<br>• 1.4.2 - Data Structures<br>• 1.4.3 - Boolean Algebra | • 1.2.1 - Systems Software<br>• 1.3.2 - Databases<br>• 1.3.1 - Compression Encryption Hashing |
| **3** | • 1.2.2 - Application Generation<br>• 1.2.3 - Software Development | • 1.3.3 - Networks<br>• 1.3.4 - Web Technologies |
| **4** | • 1.2.4 - Types of Programming Language<br>• 2.3 - Algorithms | • 1.5.1 - Computing Related Legislation<br>• 1.5.2 - Moral Ethical Issues |
| **5** | Project<br>• Analysis<br>• Design<br>• Testing<br>• Evaluation | *Revision* |
| **6** | Project<br>• Developing the solution<br>• Testing<br>• Evaluation | *Examinations* |