Computing

National Curriculum

Key stage 1

Pupils should be taught to:

- understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions
- create and debug simple programs
- use logical reasoning to predict the behaviour of simple programs
- use technology purposefully to create, organise, store, manipulate and retrieve digital content
- recognise common uses of information technology beyond school
- 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.

Key stage 2

Pupils should be taught to:

- design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts
- use sequence, selection, and repetition in programs; work with variables and various forms of input and output
- use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs
- understand computer networks including the internet; how they can provide multiple services, such as the world wide web; and the opportunities they offer for communication and collaboration
- use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content
- select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information
- use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

Our School Aims

- Competence in coding for a variety of practical and inventive purposes, including the application of ideas within other subjects.
- The ability to connect with others safely and respectfully, understanding the need to act within the law and with moral and ethical integrity.
- An understanding of the connected nature of devices.
- The ability to communicate ideas well by using applications and devices throughout the curriculum.
- The ability to collect, organise and manipulate data effectively.

Opportunities

Key Stage 1	Key Stage 2
• Understand what algorithms are, how they are implemented as programs on digital devices, and that programs execute by following a sequence of instructions. • Write and test simple programs. • Use logical reasoning to predict the behaviour of simple programs. • Organise, store, manipulate and retrieve data in a range of digital formats. • Communicate safely and respectfully online, keeping personal information private and recognise common uses of information technology beyond school.	• Design and write programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts. • Use sequence, selections and repetition in programs; work with variables and various forms of input and output; generate appropriate inputs and predicted outputs to test programs. • Use logical reasoning to explain how a simple algorithm works, detect and correct errors in algorithms and programs. • Understand computer networks including the internet; how they can provide multiple services, such as the world wide web; and the opportunities they offer for communication and collaboration. • Describe how internet search engines find and store data; use search engines effectively; be discerning in evaluating digital content; respect individuals and intellectual property; use technology responsibly, securely and safely. • Select, use and combine a variety of software (including internet services) on a range of digital devices to accomplish given goals, including collecting, analysing, evaluating and presenting data and information.

Resources to Support the School Computing Curriculum

Coding

We have the latest versions of 2Simple 2Go, Logo and 2Code, all available in the browser for use at school and at home via PurpleMash (http://www.purplemash.co.uk/ - use school login for full access). Installed at school, we have legacy Scratch 1.4 and the offline editor for Scratch Version 2. Experience in 2014-15 has shown that 2Code and Scratch offer sufficient challenge for Y1-6 in the expected levels of general coding. An engaging extension using the Ruby API to SketchUp was successfully used with higher ability Y6 pupils in Spring 2015.

Resources to support the use of more advanced sensing and control need to be developed. There is the possibility to use the four sets of Lego Mindstorms equipment and/or a small number of Raspberry Pi computers. It is intended to meet this requirement during Summer 2015.

Computing Curriculum Objectives / Key Stage 1 / Year 1

Achievement	Knowledge and Independent Application			
	To code	To connect	To communicate	To collect
Emerging	**2Code** Make guided progress through Chimp Level lessons up to the **Vehicles** lesson**.**			
Expected	**BeeBots and 2Go** Give simple instructions to floor or screen based robot http://www.purplemash.co.uk/#tools/2go **2Code** Make progress through Chimp Level lessons up to the **Guard the Castle** lesson, beginning to learn and applying the following computing concepts: • **Object** – an item in the program's design that has its own properties (including its position and appearance). • **Event** – something that the program is expecting to happen and can respond to when it does.	Understand online risks and the age rules for sites. Understand how to switch on and off different types of IT	Use a range of applications and devices in order to communicate ideas, work and messages.	As a class, use simple databases (e.g. **2Investigate**) to record information in areas across the curriculum.
Exceeding	**BeeBots and 2Go** Give **consistently accurate** instructions to floor or screen based robot http://www.purplemash.co.uk/#tools/2go **2Code** Innovate and improvise with coding concepts within 'chimp' level concepts.	**Explain** online risks and the age rules for sites. Understand how to switch on and off different types of IT and be aware of additional power states (sleep, hibernation).	**Select tools when using** a range of applications and devices in order to communicate ideas, work and messages.	In small groups, use simple databases (e.g. **2Investigate**) to record information in areas across the curriculum.

Computing Curriculum Objectives / Key Stage 1 / Year 2

Achievement	Knowledge and Independent Application			
	To code	To connect	To communicate	To collect
Emerging	**Logo + Robots / Roamers** (e.g. BeeBots/Probots) Write simple instructions using 2Go with support. Specify the number of steps to travel and number of (quarter) turns to make to reach an objective. **2Code Lessons** (Coding) Make guided progress through Chimp Level lessons, sufficient to learn the concepts of **Objects** and **Events**.	Make guided participation in class social media accounts. Know that young children are not allowed to use common social media sites.	Use more than one application/device in order to communicate ideas, work and messages. E.g. 2Paint and 2Sequence	Experience group work that records information in databases
Expected	**Logo + Robots / Roamers (e.g. BeeBots/Probots)** Write simple instructions using 2Go. Specify the number of steps to travel, direction and angle to turn (in 90 degree steps or quarter turns). Control when drawings appear by setting the pen up or down. **2Code Lessons and Free Code Chimp** (Coding) Make progress through Chimp Level lessons, sufficient to learn and apply the following coding concepts: • **Object** – an item in the program's design that has its own properties (including its position and appearance). • **Event** – a recognised condition the program can respond to (eg. mouse click). • **Control** – program structures that allow instructions to be repeated a specified number of times and/or triggered by a timer. • **Testing** – the process of predicting what a programme will do and running it to check that it does what is expected / wanted. • **Debugging** – the process of fixing a program that is not doing what it should.	Participate in class social media accounts. **Rooster** **Understand online risks and the age rules for sites.**	Use a range of applications and devices in order to communicate ideas, work and messages. **2Paint** (Painting Tools), **2Publish** (from Templates) , **2Sequence** (Music Creation) , 2**Animate** (Animation) **2Create A Story** (Animated Stories) **2Count** (Pictograms) **2DIY**	Use simple databases to record information in areas across the curriculum in small groups.
Exceeding	**Logo / Robots** Learn and use extended **Logo** commands to control pen colour, size and shape. Set the pen colour, size and shape. **2Code** Understand that there are different types of events and describe what sort of event is needed for a desired effect in a program. Understand and apply precise coding 'grammar' (ensure 'coding sentences' are complete and make sense).	With support, make interesting contributions in Rooster. **Explain** online risks and the age rules for sites.	**Select a wider range of appropriate tools** when using a range of applications and devices in order to communicate ideas, work and messages.	**Lead small group work** using simple databases to record information in areas across the curriculum.

Computing Curriculum Objectives / Lower Key Stage 2 / Year 3

Achievement	Knowledge and Independent Application			
	To code	To connect	To communicate	To collect
Emerging	**2Code** Make guided progress through enough Chimp level lessons to grasp the concepts of timers and animation by changing images.	Make guided contributions to blogs moderated by teachers. Understand that it can be wrong to copy work from the internet.	Begin to know that application programs and devices often have settings that control their features.	Work in groups to use simple databases to record information in areas across the curriculum
Expected	**2Code** Make complete progress through **Chimp Level** lessons consolidating understanding of the computing concepts learned in Y2. • **Object** • **Event** • **Control** - Use timers - Use IF Then - Use Collision Detection • **Testing** and **Debugging** Begin to understand: • **Variable**	Contribute to blogs that are moderated by teachers. Understand the term 'copyright'.	Use settings and features of application programs and devices in order to communicate ideas, work or messages. Choose at least 2 from **2Paint** (Painting), **2Publish** (Publishing), **2Sequence** (Music), **2Animate** (Animation), **2DIY, 2Design and Make**	Use simple databases to record information in areas across the curriculum. **2Investigate** (Database) Aliens **2Count** (Pictograms)
Exceeding	**2Code – Debug Challenges (Chimp and Gibbon)** Independently complete challenges **2Code – Free Code** With some support use **Free Code** to design, create and debug a program of own design. Show a facility for testing and debugging. Show a willingness to experiment with objects, learning more about their capabilities.	Make thoughtful and relevant online contributions to class. **Rooster** (contributions) **PurpleMash** (class folder and display)	Select appropriate settings and features of application programs in order to communicate ideas work or message.	Suggest and make changes to simple databases to record additional information.

Computing Curriculum Objectives / Lower Key Stage 2 / Year 4

Achievement	Knowledge and Independent Application			
	To code	To connect	To communicate	To collect
Emerging	**2Code** Make progress through **Gibbon Level** lessons consolidating understanding of the key concepts learned in Y2 and Y3. • **Object, Event, Control** • **Testing** and **Debugging** (e.g. solve monkey's problem with all hints)	Understand that negative comments make online are hurtful	With guidance, use an advanced setting/feature of an application program or device in order to communicate ideas, work or messages.	With additional support, construct databases to record information in areas across the curriculum.
Expected	**2Code** Make progress through **Gibbon Level** lessons consolidating understanding of the computing concepts learned in Y2 and Y3. • **Object, Variable, Event, Control** • **Testing** and **Debugging** (e.g. solve monkey's problem with few hints) Begin to understand sequencing and selection using repeat blocks and conditional statements (IF/Then). Progress up to but not including 'Functions' is expected.	Understand that persistently making online comments that are hurtful or offensive are the same as bullying.	With guidance, use some of the advanced settings and features of application programs and devices in order to communicate ideas, work or messages. **PowerPoint** (WinPC), **Keynote** (iPad) **Audio recording** (iPad)	With support, devise and construct databases to record information in areas across the curriculum.
Exceeding	**2Code – Coding Principles** Show deeper understanding of sequencing, selection and repetition in programs; work with variables, **functions** and various forms of input and output. **2Code – Free Code Gibbon** With some support, use Free Code Gibbon to design, create and debug a program of own design. Show a facility for testing and debugging. Show a willingness to experiment with objects, learning more about their capabilities.	Explain responsible online behaviour and set a good example.	More independently use some of the advanced settings and features of application programs and devices in order to communicate ideas, work or messages.	Independently or in small groups, devise and construct databases to record information in areas across the curriculum.

Computing Curriculum Objectives / Upper Key Stage 2 / Year 5

Achievement	Knowledge and Independent Application			
	To code	To connect	To communicate	To collect
Emerging	**2Code – Gibbon to Gorilla** Consolidate understanding of sequencing, selection and repetition in programs; work with a simple variable, a built-in function (like Random) and use simple input and output.	In a class context, contribute to sites approved and moderated by teachers	With guidance and reassurance, make choices about which application or device to choose for a communication need.	Use suggested applications to manipulate data and present it in an effective manner.
Expected	**2Code – Gibbon to Gorilla** Consolidate understanding of sequencing, selection and repetition in programs; work with variables, built-in functions and various forms of input and output. Use and understand: • IF and IF/ELSE statements • REPEAT statements Learn that repeated blocks of instructions can be built into a new function and called whenever needed.	Collaborate with others online on sites approved and moderated by teachers. **Rooster** **PurpleMash** **Scratch** Give examples of the risks of online communities and demonstrate knowledge of how to minimise risk and report problems (choose 1 from box).	Choose the most suitable applications and devices for the purposes of communication. Choose at least 2 from: **MS Word** (WinPC), **MS Publisher** (WinPC), **MS PowerPoint** (WinPC) **Keynote** (iPad), **Audio recording** (iPad) Choose at least 1 of: 3D building project related to topic SketchUp (WinPC) Photo composite project related to topic Paint.NET (WinPC) Camera App (iPad)	Select appropriate applications to devise, construct and manipulate data and present it in an effective and professional manner. Supported by and supporting the Numeracy curriculum Data Handling elements. If necessary, provide additional skills sessions with appropriate tools: PurpleMash: **2Graph** **2Investigate** **2Calculate** Other possibilities: **Microsoft Excel**
Exceeding	**2Code** Show good understanding of functions by more independently noting repeated code and putting it into a function.	Explain and lead class in discussion about online risk.	Choose the most suitable applications and devices for the purposes of communication and give reasons for choices made.	Select precise methods to present, manipulate and construct data, giving clear reasons for choices.

E-Safety Leaflet http://www.purplemash.co.uk/#leaflets/esafety
Social Network Safety – Are children too young to be on a social network?
http://www.purplemash.co.uk/#pup/socialnetwork
Social Network Safety – A child has posted details of her party on a social network page?
http://www.purplemash.co.uk/#pup/friendbookparty
Social Network Safety – Should Tony meet up with a gamer he has met online?
http://www.purplemash.co.uk/#pup/onlinegame
Safer Searching – Ollie has seen an online video which he has found upsetting. What should he do? http://www.purplemash.co.uk/#pup/videowatch

Computing Curriculum Objectives / Upper Key Stage 2 / Year 6

Achievement	Knowledge and Independent Application			
	To code	To connect	To communicate	To collect
Emerging	**2Code and Beyond** Make significant progress through Gorilla level coding lessons, consolidating understanding of the key coding concepts (see Expected but with support using variables and functions).	Know that permission is often needed to copy work from the Internet. Understand that computers and devices are connected by networks.	Use more than one advanced application feature in order to create effective communications.	With some guidance, select appropriate applications to devise, construct and manipulate data and present it effectively.

Expected	**2Code and Beyond**
	Complete progress through Gorilla level coding lessons, consolidating and embedding understanding of the computing concepts learned:
	• **Object** – an entity with properties and abilities that can be manipulated by sending and receiving messages.
	• **Variable** – an object known to the program by name that can be inspected and changed during the program's execution.
	• **Event** – something that happens to which the program can respond (e.g. a timer, a user's mouse click or a trigger from an external sensor)
	• **Control using:**
	  • If Then Else
	  • Repeat and Repeat Until
	  • Collision Detection (including Walls)
	• **Functions**
	  • Built-in: Random, Sound, etc.
	  • Self coded with guidance
	• **Testing** and **Debugging**
	
	Demonstrate some ability, and with support, to apply concepts learned in **2Code** to other environments.
	
	Choose at least 1 of:
	javascript (via 2Code 'See Code')
	(though this is limited to a small subset of js)
	Scratch
	
	In Projects (where possible)
	• Use a range of sensing tools (including proximity, user inputs, loudness and mouse position) to control events or actions.
		Understand and demonstrate knowledge that it is illegal to download copyrighted material, including music or games, without express written permission, from the copyright holder.
		
		Understand the effect of online comments and show responsibility and sensitivity when online.
		
		Understand how simple networks are set up and used.
			Use many of the advanced features in order to create high quality, professional or efficient communications.
			
			Choose at least 2 from:
			
			MS Word (WinPC),
			MS Publisher (WinPC),
			MS PowerPoint (WinPC)
			Keynote (iPad),
			Audio recording (iPad)
			
			Choose from suggested projects not selected in Y5 or choose 1 from suggestions below:
			
			Publisher photobook recording experiences at Y6 residential (WinPC)
			
			Filmmaking Project
			Camera App (iPad)
			MS MovieMaker
				Select appropriate applications to devise, construct and manipulate data and present it in an effective and professional manner.
				
				Supported by and supporting the Numeracy curriculum Data Handling elements.
				
				Understand that concepts learned using PurpleMash will help them to use to similar professional applications:
				
				2Calculate / MS Excel
				2Investigate / MS Access

Computing Curriculum Objectives / Upper Key Stage 2 / Year 6 / Exceeding

Achievement	Knowledge and Independent Application			
	To code	To connect	To communicate	To collect
Exceeding	Demonstrate significant independence creating programs in 2Code (Free Code Gorilla) and an ability to understand, edit and debug using the subset of javascript available via 'See Code'. With guidance, demonstrate some independence applying coding concepts to other environments, including at least 1 text based language. Possibilities include: **Ruby (in Sonic Pi)** **Ruby (in the SketchUp API)**	To be able to explain and set a good example of responsible online behaviour.	Demonstrate significant independence during project work.	With guidance create data based presentations using the professional applications MS Excel and/or MS Access.

Phase Outcomes: To Code

End of Year 2	End of Year 4	End of Year 6
Controlling Objects with Instructions Control programmable objects (2Code objects and BeeBots), making them move in specific directions (left, right, up, down) and/or numbers of steps. Specify direction in multiples of quarter turns. Show and hide objects, change the appearance of objects.	Use the screen coordinates of an object to refine control.	Control objects confidently for a specific purpose (navigation, animation, user-feedback).
Responding to Events With support, create simple instructions that respond to events generated from the mouse, keyboard, timers and collisions between objects.	Design and code instructions that respond to events generated from mouse, keyboard, timers and collisions between objects and between objects and features in the background (e.g. walls/colours).	Independently select and specify appropriate events for programs designed for a specific purpose.
Functions Call built in functions to play sounds.	Call a wider range of built-in functions (print to screen, random) to manipulate objects and text.	With support, recognise repetitive elements in programs that can be abstracted into a function. Create and call functions.
	Control Program Flow Use and understand IF THEN statements to control a program's flow.	Use and understand more complex control structures such as IF THEN ELSE statements and nested statements.
	Variables Create a variable to store a value and write instructions that use basic operators to change the variable during program execution.	Create programs that use more than one variable (for example two score variable for player 1 and player 2). Use a wider range of operators to change these variables during program operation.

Phase Outcomes: To Connect

End of Year 2	End of Year 4	End of Year 6
Understand how to switch on and off different devices. Understand online risks and the age rules for sites. Participate in class social media accounts. Understand online risks and the age rules for sites.	Contribute to blogs that are moderated by teachers. Understand the term 'copyright'. Make thoughtful and relevant online contributions to class (Rooster / PurpleMash) Understand that comments made online that are hurtful or offensive are the same as bullying.	Collaborate with others online on sites approved and moderated by teachers (Rooster/PurpleMash) Give examples of the risks of online communities and demonstrate knowledge of how to minimise risk and report problems. Understand and demonstrate knowledge that it is illegal to download copyrighted material, including music or games, without express written permission, from the copyright holder. Understand the effect of online comments and show responsibility and sensitivity when online. Understand how simple networks are set up and used.

Phase Outcomes: To Communicate

End of Year 2	End of Year 4	End of Year 6
Use a range of applications and devices in order to communicate ideas, work and messages.	Use some of the advanced settings and features of application programs and devices in order to communicate ideas, work or messages	Choose the most suitable applications and devices for the purposes of communication. Use many of the advanced features in order to create high quality, professional or efficient communications.

Phase Outcomes: To Collect

End of Year 2	End of Year 4	End of Year 6
Use simple databases to record information in areas across the curriculum.	Devise and construct databases to record information in areas across the curriculum.	Select appropriate applications to devise, construct and manipulate data and present it in an effective and professional manner.

Computing P-Scales

P4	P5	P6	P7	P8	Early Years
Make selections to communicate meanings. Make selections to generate familiar and/or preferred sounds or images. Know that certain actions produce predictable results.	Use web or mobile applications to manipulate something on screen. Make connections between control devices and information on screen.	Use computing to interact with other pupils and adults. Use a keyboard or touch screen to select letters and/or images for own name. Show an understanding that information can be stored on a computer. Respond to simple instructions to control a device. Operate some devices independently.	Gather information from different sources. Use computing to communicate meaning and express ideas in a variety of contexts. Begin to choose equipment and applications for a familiar activity.	Find similar information in different formats (such as in photographs, books, websites or television programmes). Use computing to communicate and present ideas. Start an application and make a choice from it. Communicate about the uses of computing.	Recognise that a range of technology is used in homes and in schools. Use a simple application on a computer or mobile device. Use computing devices to interact with age-appropriate applications. Create simple representations of events, people and objects.

Computing Challenge for More Able Pupils – Key Stage 3

Computing opportunities	Coding	Connecting	Communicating	Collecting
Use a range of devices and applications across all curriculum subjects. Further develop coding skills and applications. Communicate a wide range of ideas to a variety of audiences. Collect, manipulate and analyse data.	Design and use computer abstractions that model real world problems and physical systems. Understand some key algorithms for sorting and searching. Use a number of programming languages to solve a variety of computational problems. Use data structures such as tables or arrays. Use procedures to write modular programs. Understand Boolean logic (such as AND, OR and NOT) and its use in determining which parts of a program are executed. Explain how instructions are stored and executed within a computer system.	Understand the devices and applications that make up networked computer systems and how they interact. Explain how networks such as the internet work. Understand how computers can monitor and control physical systems.	Undertake creative projects that involve selecting, using and combining multiple applications, across a range of devices, to achieve goals. Create, reuse, revise and repurpose digital information and content with attention to design, intellectual property and audience.	Explain how data of various types can be represented and manipulated in the form of binary digits including numbers, text, sounds and pictures. Collect and analyse data.