Year 4 Computing

Key Vocabulary

Digital Literacy		
National Curriculum Principles	**Objectives**	**Knowledge and key Vocabulary**
Understand the opportunities networks offer for communication and collaboration	• To be able to collaborate using a variety of systems.	• I can use Pages, Keynote and Numbers to collaborate with my peers. • I can use Google docs to collaborate with my peers.
Be discerning in evaluating digital content	• To be aware that not everything you read online is true.	• Use a range of online news reports • BBC Teach
Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact	• To be aware of the pros and cons of using the internet. • To know that cyber bullying is wrong. • To understand how to use social media responsibly.	• I can discuss why using the internet is good/bad and give justified reasons. • I can discuss what acceptable behaviour is online and how this affects people. • I can understand the pros and cons of social media and how to use it responsibly.

Information Technology
What's the big picture? To develop the children's skills and abilities with understanding and using a wide range of technology and platforms best suited to the their purpose.
National Curriculum Principles
- 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

Year 4 Computing

Key Vocabulary

- 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

The National Curriculum objectives are delivered through the use of Barefoot Computing Curriculum and all resources and planning can be found at www.barefootcomputing.org

Objectives
To understand computer networks, including the internet. To use search technologies effectively, appreciate how results are selected and ranked. To use a variety of internet services. To collect and analyse data and information.

Lesson	Knowledge and key Vocabulary
1	<u>Selecting search Activity.</u> Direct pupils how they might use the internet to find information on the WWW. Pupils understand that the WWW is made up of web pages stored on web servers on the internet. Talk through the steps to researching something on WWW. Explain that pupils will look at the key elements of how search engines work and then they will develop their own. Discuss the key points: 1. Search engines build up an index of the information on the world wide web. This is similar (but not exactly the same) to a book having an index of the information contained within it. 2. They do this using automated programs called 'web crawlers'. 3. Web crawlers follow links to move across web pages. They take a copy of the web pages to build up the search engine's index, which is stored on the search engine's servers. 4. Search engine's use the index stored in their servers to respond to search queries

Year 4 Computing

Key Vocabulary

	Put pupils into pairs and give them a copy of the 'Search engine index' sheet. Give pupils 30 seconds to come up with a name for their search engine and fill this in at the top of the sheet. Open the web page www.barefootcomputing.org/links (ask pupils to do the same). Show pupils this web page contains links to a number of other web pages with information about computing • Explain their first task is to act like web crawlers to create an index of a very, very small portion of the WWW so their search engine can respond to queries • Model to pupils how they will act as web crawlers: click on the first link on the www.barefootcas.org.uk/links page – this will take you to the web page (all web pages are BBC Bitesize materials on computing) • Ask a selection of pupils to read allowed the information on the web page. Each time a key word from their 'Search Engine Index' sheet occurs, pupils can add the web page address in the column next to the keyword, as shown below • After you have modelled indexing one web page, challenge pairs of pupils to index as many of the remaining pages as possible in 10 mins – by clicking on the next link and repeating the process. Pose this as a challenge by pitching pupils against one another – the larger each groups' search engine's index, the better they'll be able to respond to search queries in the next part of the lesson Explain pupils will now use their indexes to respond to searches that you are going to make. Pretend to make a search by writing one of the keywords into the 'search bar' on slide 5. Ask a selection of pupils to use their search engine's index to tell you the address of a web page where you will find information about this keyword. You can type this URL into a browser to view the page and confirm it features information about the keyword Repeat the above process entering a variety of keywords and have pupils respond using their search engine's index As you take responses from pupils, highlight that for some keywords pupils have multiple pages in their indexes. Ask pupils to discuss with a partner how search engines present multiple results? They rank them on the results page. Can pupils suggest how they might choose to rank them? (This is explained in the Barefoot Computing activity: Search: Appreciate how results are ranked) Workout which group indexed the most web pages. Pose the question: Can pupils think why search engines use automated web crawlers to index the web rather than humans? Plenary: Pupils create a clips video to explain their learning of search engines. They need to include keywords such as: web crawlers, search engine index etc
2	Introduction to HTML

Year 4 Computing

Key Vocabulary

	As a class recap the differences between the internet and WWW. Direct the children towards a web browser, which one do they use? Safari, Firefox? Explain that web pages are written using a special language called HTML. This tells the web browser how to structure and display the page. HTML stands for Hypertext Mark Up language. Use the Barefoot web link to show pupils a simple webpage that was written using HTML. What features can you see? (Title, headings, picture etc) The HTML tells the web browser how to display the information using special tags. Explain there are tools that can help us to examine the HTML tags more closely. Model showing the pupils x-ray goggles. On Google, type in 'x-ray goggles' and look for https://x-ray-goggles.mouse.org Follow the instructions on the web page to download x-ray goggles on to the iPad. (For the teacher demonstration it is easier to use a Mac. Model using the webpage and using the tools to change the tags. Direct the pupils to do the same. After they have had a go at changing the different elements, the teacher shows them on a computer/Mac how it can be used on any web page. (This does not work on iPads). Discuss with the pupils the different key points they have learnt so far - the different HTML tags - Text must be typed between the opening and closing tags Highlight that they are not actually changing the live website, only the version on their iPad. Plenary: Pupils showcase their changes to the rest of the class explaining which tags they changed. This could be done using Pages or Keynote.
3	Data dash lesson 1 Explain that pupils are going to be learning about how we use data to answer questions. Give pupils a set of the 'Multi-sports competition data cards' and discuss what data could be presented on the cards. Explain that the cards show how many gold, silver and bronze medals a country has won. Display slide 7 (see Barefoot website for resources) and ask pupils to consider the question 'Which country won the most bronze medals?' Discuss with pupils how they found the data to answer the question. How did this process differ from answering the previous

	questions? Pupils should indicate they had to compare the data on bronze medals for each country and that all countries needed to be checked rather than just one. Show pupils slide 8 and invite suggestions on what data is being displayed and its relationship with the medal cards they have been using. Establish the data from each card has been combined and presented in a table. Ask pupils to consider the question they just answered - which country won the most bronze medals? Would it have been easier to compare the data if it was in a table rather than individual cards? Give pupils the opportunity to rehearse comparing data using the table by either asking further questions such as, 'Which country won the fewest silver medals?' or getting pupils to pose questions to one another. Using slides 9 and 10 introduce the terms data attributes and data values. Can pupils suggest other possible data attributes for: a person, a country, a sports competition? Display the medal table on slide 11 and ask pupils to think/ pair/ share to identify the data attributes (Country, Gold Medals Won, Silver Medals Won, Bronze Medals Won) and data values (The values within the table for each data attributes). Answers on slide 12. Lead a discussion to check pupils' understanding returning to slides 9 & 10 if required. Display the question (slide 13) 'Are we as fast as a professional athlete?'. Explain to pupils that we are going to be using data to compare their speeds with those of professional athletes. Display the table on slide 14 and establish it is displaying speeds of athletes that have run in races of different lengths at a recent multi-sports competition. Ask pupils to see any patterns that they can identify in the data and predict why they think this might be. Display our question again (slide 15) and ask pupils if they are able to answer the question. Identify that they do not have data values for their own speed to compare against the speeds of professional athletes. Draw pupils attention to the hints on slide 15 i.e it will involve each pupil running 20m and a scientific formula has been provided to help us. Lead a discussion to establish that we will need to record the time taken for each pupil to run 20 metres and that we can then use the scientific formula to find each pupils' speed. Discuss with the pupils what data attributes are needed for the question and come to the conclusion that 'pupil name' and 'time taken to run 20m' are needed. Model with pupils how to create a table for data attributes to be collected. (Set up a time where data can be collected).

Year 4 Computing

Key Vocabulary

	Plenary: Pupils use Pages to create a glossary for the key terminology used in the lesson for example: data attributes, data value)
3	<u>Data Dash lesson 2</u> (Before lesson, download spreadsheet to Numbers and enter some of the running data into pupil numbers column) Recap previous lesson and key terminology. Show pupils the spreadsheet created with some of the data collected from the leading question. Discuss what a spreadsheet is and how it is used to collect data. Draw attention to column A and discuss why numbers have been used instead of names. So that data is safe and it can be shared. Explain to the pupils they are going to use numbers instead of names. Model how to enter the rest of the data into the spreadsheet and direct pupils to do the same. (Send pupils a copy of the spreadsheet) Lead a discussion to determine the speed in metres per second is calculated data as it is the result of a calculation. Can pupils recall the formula for speed that they were introduced to in the previous lesson? Model how to set up a formula in a spreadsheet so all the pupils' speeds can be calculated. The formula required to calculate the speed of the fifth pupil which should be entered into cell C6 is shown below. = 20/B6 Give pupils time to work in groups to add the formula to the spreadsheet. Plenary: Remind pupils that when we entered the calculation to find speed, we used the cell address of 'pupils' time to run 20 metres' rather than just typing this time into the cell. Can pupils think of any advantages of this approach? Lead a discussion to explain this is very useful since if the time needs to be changed (an error, the pupil reruns, etc.) then the calculated data will be updated automatically. Highlight this by changing the data values for some of the 'times taken' and note the change in the speed (calculated data).
4	<u>Data Dash lesson 3</u> Recap previous lesson and key terminology.

Year 4 Computing

Key Vocabulary

	Discuss the steps the pupils have taken so far to answer the question 'Are we as fast as a professional athlete?' And explain that by the end of this lesson we will have an answer. Show slide 7 and explain the formula shown can be used to convert metres per second to miles per hour. Ask pupils to suggest how they can make use of this to convert their speeds from metres per second to miles per hour? Direct pupils in their groups to open the spreadsheet in Numbers. Invite suggestions on what new data attribute needs to be entered into the spreadsheet - Speed (miles per hour). Write this in cell D1 of column D resizing the cell width if required. Model, taking suggestions from pupils, how to set up the formula to find the speed in miles per hour of pupil number 1. The formula will be '=C2*2.237' Give groups time to carry out this on their spreadsheet. Give out copies of the professional athletes speed table (slide 13). Ask pupils if it is now possible to compare the pupils' speeds they have just calculated with professional athletes? Establish this is now possible as the data values (speed) are in the same unit of measurement (miles per hour). Display the questions on slide 9 and ask pupils to think in their groups how they will use the data to answer the questions. Establish the data for each pupils will need to compared against the data for each professional athlete to see if any of the pupils are as fast as a professional athlete. Get pupils to work through the 'Comparing Speeds' worksheet in pairs. Plenary: Using both the data collected in the spreadsheet and the 'comparing speeds' worksheet discuss with the pupils their results and the original question posed. Pupils could document their results using Pages or Keynote.
5	Students use the internet to collect information and research using a given website. Students can use Notes and Pages to design and create different documents. Students can use keywords when searching the web and have the opportunity to use a search engine (e.g Google). Students download an image from a web page. Upload the image to Notes or Pages and use editing tools to manipulate and improve the image.

Year 4 Computing

Key Vocabulary

Computer Science		
What's the big picture? Children in Year 4 will continue to develop their computing skills by applying them across a range of software through the use of Raspberry Pi.		
National Curriculum Principles: - 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. - 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. Appreciate how [search] results are selected and ranked. Children in year 4 will develop their computing skill by using a Raspberry Pi. Children will use Sonic Pi and Scratch to design and construct a range of programs.		
Sonic Pi		
Lessons	**Teaching and learning.**	**Knowledge and Key vocabulary**
1 Unplugged lesson	What are functions and how can I use them? Aim: chn are to develop an algorithm that can be used to play a nursery rhyme. - Play the nursery rhyme 'Mary had a little lamb' on a pitched instrument. - Discuss what commands they are going to need. Such as: play, hit, pick up beater... - Start writing out the algorithm in groups. - Allow pupils time to write 3-4 lines of their algorithm then ask if there are any instructions being repeated. - Explain that in programming languages frequently repeated tasks are defined as functions. Sets of instructions are stored in the computer program and can be	Knowledge: The instructions must be precise and unambiguous Computers can not interpret unambiguous instructions Understanding: How functions can be used to avoid repeating a list of instructions several times

Year 4 Computing

Key Vocabulary

	used by calling the name they have been defined as. - Example - When you are asked to tidy up, what are you actually being asked to do? - Discuss how to define a command eg Define Play do Pick up Beater. Hit given note once with beater end - Pupils write their algorithms including defining a function to play 'Mary had a little lamb' and then to try their algorithm checking for bugs.	Skills: To write unambiguous instructions. To identify the instructions to be included in a function.
2	Can I use text based instructions and delays to program a musical phrase? Introduce Sonic Pi to pupils, explain that it is software that allows music to be programmed using text based instructions. Discuss how this is different to what they have used in previous years referring to block based programming. Show pupils the sonic pi interface and identify the main areas. Explain that when using text based programming languages instructions need to be accurate and follow the correct syntax. Ask children to type each line of code and find out what happens • play note 60 • 60 play • play 60 • note 60 play • play sixty Discuss which instruction worked, what happened to the text of correct instructions	*Knowledge:* *The pre determine language and syntax that Sonic Pi* *That errors will be a result of incorrect instructions* *Understanding:* *Why delays are need in the programs.* *How the value of notes is linked to their pitch* *Skills:* *To write instructions using the correct pre-determined language and syntax* *To sequence programs* *To identify and fix bugs in the system*

	and what they think each part of the correct code (play 60) means. Play is the command 60 is the note to play (the parameter). Ask pupils for ideas on how different notes could be played. Pupils test their ideas and complete the comparative statements. The greater the number the … The less the number the … Ask children how they could play several notes. Take ideas and allow pupils to test these. Discuss that all sounds are being played at once. *How could we play sounds individually? How do we get the computer to delay before reading the next instruction in scratch?* Model how to use sleep to delay the program and experiment with the number following. Show children how to use a hashtag (#) to write comments on their code that explains what they are doing. Give children the music for the 1st section of Mary had a little lamb. They use note to midi translator to write a program to play the music.	
3	Can I use repetition in my text based program? - Play section of Match of the Day theme tune to children and ask them to identify what it is. Play another version and ask pupils to debug the program (play spelt incorrectly; value before the note; number written in words instead of figures) - Show children the program and ask them to suggest ideas on how the program could be shortened. Discuss how we can tell the computer to repeat the same instructions several times. Model to children how to use n.times do/end to indent instructions to be repeated. *What will happen if we increase/decrease the number before times? How can you get the computer to play a sequence of three notes 5 times? What happens if you use the command loop do/end. What*	*Knowledge:* *That repetition is used to avoid repeating code* *Understanding:* Which sections of the program can be looped The effects of repetition lops (including forever loops) on their program *Skills:* *To create loops within their programs*

Year 4 Computing

Key Vocabulary

	will happen to the instructions after loop do/end? Discuss pupils ideas and allow them to test them out. - Pupils modify existing program to include repetition loops. Children are to look at the Midi note scale and to transpose a nursery rhyme from musical notes to Midi notes.	
4	Can I add effects to my musical phrases? - Play the different versions of MOTD theme tune to the children. For each one change the synth (use_synth :). Ask children to identify what is different about the versions. - Show children the code for each version and ask them to identify differences between the programs. Identify use_synth : as the command that has made the change. - Children tinker with synths. Which synth is your favourite? Which synth sounds dark/aggressive/lively/cheerful? Which synths are unable to play your notes? - Play another version of the match of the day theme tune with effects applied to sections within the program. Can children identify when the effects have been applied? Identify the command with fx xxx do/end. - Children continue to add to their program of musical phrases. Adding synths and effects to the program	*Knowledge:* *That the sound of the music can be changed without altering the tune.* *Understanding:* *How the synths and effects command modify the program* *Skills:* *To add synths to their program* *To nest instructions within effects commands*
5	Can I create and use variables? - Recap on children's understanding on what a variable is and where they have encountered variables before - scratch scoring system. Explain that variables are pieces of information stored in the program for the computer to use.	*Knowledge:* *What variables are.* *How variables are used* *Understanding:* *Why variables don't work in either workspaces.*

Year 4 Computing

Key Vocabulary

	- Play match of the day file with variables already created. Show children the code and ask why play Chiara* resulted in playing a note. Explain that the computer has already been told that Chiara = 67 . - Display the part of the program that creates the variables and ask children what will happen if play Casey is entered. Use an example of play followed by a word that hasn't been created as a variable (play Charlie) and ask why this returns an error message. Try recalling the variables in other workspace. What happens? Can children explain why this happens? The variable has to be created as part of the same program that uses it. It can not be passed to another program. - Children create a few variables and continue programming their musical phrases using, where appropriate, the variables they have created.	*That variables are created before they are used* *Skills:* *To create variables* *To use variables within their program*

Glossary	
Algorithm	An algorithm is a set of steph-by-step rules or instructions.
Bug	A bug is an error in your code.
Coding	Coding is telling a computer what to do.
Command	A command is a specific action.
Conditional statement or action	Conditional statements or actions occur only under certain conditions.
Debugging	Debugging is the process of identifying and fixing errors.

Year 4 Computing

Key Vocabulary

Developer	Developers write code to build their own apps and games.
Event	An event is an action that causes something else to happen.
Loop	A loop is an instruction to repeat a set of commands for a specific number of times.
Sequence	A sequence is the order in which things happen, like patterns and events.