Year 5 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 an understanding of how networks including the internet can provide multiple services and appreciate how search results are ranked.
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 - 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

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- 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 analyse and evaluate information To understand how search results are selected and ranked	
Lesson	**Knowledge and key Vocabulary**
1	Pizza Party Unit Lesson 1: Research Introduce students to learning about Italy. In groups decide on the different aspects of Italy that the students will research e.g geography, history, culture etc. Lead a discussion to recap the effective use of search engines. How can pupils ensure they find the right information quickly and ensure it is reliable? (for example: use clear search terms, use 'reliable' websites, check information on multiple sites etc) Discuss the importance of abiding by copyright laws and choosing images the author has agreed can be reused. Also explain why we should add a credit or information about where the image has come from, or its 'source'. Pixabay.com is a good source of free-to-use images Give pupils time to research and create their Keynote presentation.
2	Lesson 2: Introduce the idea of holding a Pizza Party. Make two lists with the students; what is needed for the party and what will be prepared. Explain that decomposition has just been used to break down a problem into smaller chunks. Explain to pupils we are going to collect data to determine what toppings everyone would like on their pizza and that we need to think carefully about what data we need to collect, known as our data attributes, to answer this problem. Ask pupils to think-pair-share what

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	data attributes we need if we are to determine what pizza toppings everyone would like? Lead a class discussion to create a list of data attributes. If required, explain a top tip in determining data attributes is to think of a list of nouns describing the data we need. In this case, we will need an attribute of 'pupil name' and attributes to indicate pupil selections of each topping type e.g. 'cheese selected', 'mushroom selected'. The data values for pupil name will be a data type of text e.g. Jenny, Jane, Jonathan and the data values for the topping's selected attributes will be 1 for yes and 0 for no. Organise pupils into groups and model to pupils how to open the 'Pizza Planning spreadsheet' in their groups Explain that the Barefoot team have already created a template spreadsheet. (Spreadsheet works in Numbers) Highlight that the spreadsheet includes the data attributes we had identified as a class - e.g. pupil name, topping selected Invite a pupil to demonstrate how to add their name to your spreadsheet and select their three toppings by entering the number one in each relevant cell (two example entries, Jenny and Jane, are already included). Explain that in doing so we are adding the data values to the data attributes (slide 4) Give groups time to add their names and topping choices (data values) into the spreadsheet. Do pupils notice what is happening in row 38 as they do this? How do they think this is happening? What happens as more members of their group add their selections? What happens if they change their mind about a topping? Once pupils have had time to add their names and topping choices, lead a discussion to explore what pupils noticed as each pupil entered their data. Explain the program they are using is a spreadsheet and it can help us to record the data that is collected and analyse the data that has been entered. Spreadsheets help us make informed decisions from the data we have collected by automatically performing calculations, such as working out totals as is the case here (slide 5) They can easily see how many pupils want cheese or want ham for example, so this will help with buying the right ingredients Show pupils the formula in the cells finding the total for each topping (in row 38). Click into the cell to illustrate it is adding up all the figures using the 'SUM' (total) of the columns. Highlight this is the =SUM( ) function (a special pre-defined formula) and explore this by adding different values and asking pupils to predict what will happen before trying this out in the spreadsheet as a class or in their groups. Introduce pupils to columns and rows and cells by showing how each cell is referenced and highlighted - e.g. Pepperoni is in cell H4. Select different cells and ask pupils to give you the cell references to get them used to reading the layout.

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3	Display the completed spreadsheet from the previous lesson and ask pupils to share what they can recall about how it works. Can they recall what the terms 'data collecting', 'data attribute' and 'data values' mean? Ask pupils to think-pair-share how the spreadsheet can help them decide what quantity of each pizza topping they might need? They can look at the totals • Start a 'topping list' on the board by writing up the number of people who want each topping, e.g. ham = 6, mushrooms = 13 etc. Ask pupils to think-pair-share what else you will need besides the toppings. Add these to a separate list. e.g. pizza bases (or flour, yeast etc if you want to make these), tomato sauce (again, decide if you will buy or make) etc. Explain to pupils we will now work out how much the food on the list will cost and that a spreadsheet can help us calculate this; add that it might help to complete the calculation ourselves too, as it gives us something to check against and helps us think about what data attributes we will need. Can pupils recall what we mean by 'data attributes'? Give out the 'pizza costs' maths worksheet and ask pupils to work in pairs or small groups to complete the calculations (note – at this stage the worksheet assumes there are 30 pupils in the class – we will be able to alter this in the spreadsheet) Discuss answers as a class. Ask pupils if they were going to use a spreadsheet to calculate the cost of the pizza, what data attributes they would need? E.g. Cost of ingredients, how many pizzas each ingredient will make. Explain that Barefoot has created a spreadsheet for pupils to enter their data into using the same data as the worksheet. Lead a discussion to explore the spreadsheet as a class, covering the following areas: The cells highlighted in blue are those where we input data (called raw data). The data in the orange cells is the calculated data. Ask pupils to think-pair-share why using a spreadsheet could be more useful than working out calculations on paper? E.g. Demonstrate how quick it is to change a value in blue and have the new costs automatically update. Explain this is called data modelling (slides 4-5). Model, or ask a pupil to demonstrate, how to add additional ingredients to the list on the spreadsheet. Slide 6 contains toppings data which can be used for this. Note - you may have updated this if you are using different toppings or have accurate prices from where you plan to buy the ingredients. Is the overall total now correct? If not, how can we amend the formula? Slides 7 to 11 can be used to support as required. Give pupils time to open their own version of the original shopping list spreadsheet. Remind pupils of the question 'Can you find the total cost of the ingredients for the pizzas? Encourage pupils to add data attributes and values for the remaining toppings so they get an accurate prediction of cost.

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	Print or leave displayed slide 6 for pupils to use as data during this activity. They will also have the list of how many people want each topping written up during the introduction to the lesson.
4	Introduce the pupils to a set of instructions for making pizzas. Discuss the instructions with the pupils and put them in the correct sequence. Recap that a set of instructions is an algorithm normally used by a computer. As the instructions were in the wrong sequence we used debugging to solve the problem. Remind pupils of their chosen toppings by showing them their group spreadsheet. Pupils follow the algorithms to create their pizzas. While doing so the pupils take videos and photos of their progress. Once the pizzas are cooking, put some Italian music on for the party and enjoy the pizzas.
5	Explain that pupils are going to show their learning from this unit in a Keynote presentation. Give out the presentation plans and give pupils 5-10 minutes to plan their presentation When they have finished, ask them to swap with a partner and check their presentations against the class success criteria. Their partner can provide feedback on how their presentation could be improved Once they are confident their plan meets the criteria, ask pupils to create their presentation Depending on your pupils' experience, you may need to spend time demonstrating, or allowing pupils to add animations to their Keynote. Ensure pupils know how to create their presentation, insert images, video, and take screenshots etc. Pupils should be encouraged to regularly check their presentations against the criteria and make any changes accordingly.
6	<u>Selecting and Ranking lesson:</u> Ask a pupil to perform a web search linking to your topic and talk through the process, i.e. Enter search term(s), press search, a web page with search results loads, click on the page you wish to view.

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	Can pupils recall how search engines select the results to display? What was the role of web crawlers? What was a search engine's index and how is it used? Guide a discussion to recall key points: web crawlers create an index of the WWW; search engines use the index to work out which web pages contain the user's search term(s) Look at the search engine results page and explain to pupils that in this lesson they will learn how search engines rank the results they display. Introduce the learning objectives on slide 2 if this is your normal practice. Put pupils into groups of 4 and ask them to create a paper -based web page about a topic. What makes a good web page? Before pupils begin to create their paper-based web page explain what it must include. It should include a URL (e.g. www.allaboutvikings. com), heading, subheadings and paragraphs of information and a section at the bottom for links (explained in the web page links section below) Draw pupils attention to the links – what happens when you click a link? When you click on links on web pages, or in emails, you are taken to that web page Explain that groups will now choose to link from their web page to one of the other groups' web pages – just as actual web pages can be joined via links. What factors will groups consider when choosing which of the other pages to link to? Guide a discussion to determine that group's should link to 'good' web pages. E.g. Those which display the features from the class list and which have information to complement their own web page Give pupils a few minutes to look at each others' web pages to decide as a group which they should link to. Pupils should then write the URL of the group's web page they wish to link to at the bottom of their web page Explain that you are now going to simulate making a search to learn how a search engine ranks the results •Write a keyword into the search bar relating to the content of pupils' web pages. E.g. 'Viking'. Explain that search engines use algorithms to rank web pages. The algorithm looks at a number of factors on the webpage and gives a score for each. The web page with the highest score ranks top. Add that whilst the exact algorithms are kept secret (we'll learn why shortly), search engines typically rank pages based on factors including the following Ask pupils to score their pages for the following factors (they can tally their points on the web page): • Receive 1 point for each time the keyword appears in the paragraphs of text. • Receive 1 points for each time the keyword appears in the subheadings.

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	• Receive 1 points if the search term appears in the heading. • Receive 1 points if the search term appears in the URL • Receive 1 points for each other web page which has linked to your page (an inbound link). Ask groups to total their scores and work out the order of how the groups' web pages would rank Ask pupils to think-pair-share with a partner from their group how they could change their website to help it rank higher. Alter content, encourage other groups to link to their page etc. Give groups 5 mins to make the changes, which might include them negotiating with other groups to add links to their web pages Note: Some groups might decide to simply add line upon line of the keyword. Indeed in the early years of search engines altering text to include repeated reference to keywords was a tactic used to push pages up rankings, however search engines can now detect when writing is 'unnatural' and features the forced inclusion of keywords – and penalises web pages for this Once pupils have had the chance to alter their web page, repeat the ranking process for the same keyword

Computer Science

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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.

These National Curriculum objectives are delivered through the use of Everyone Can Code (**Learn to Code 1 and 2**). The lessons have been designed to develop and build on skills. The structure of each lesson should follow: introduction, activity, practise and reflection/ journal.

Children in Year 5 will use the app Swift Playgrounds.

Lesson	Objectives	Knowledge and key Vocabulary
Pre -Teaching	- Get an introduction to computer science - Understand the goals of this class - Learn how to use the portfolio app Seesaw.	Introduction: Discuss the goals with the students that we will be covering over the next seven sessions. Explain what the word coding means. Coding is telling a computer what to do. Developers write code to build their own apps and games. Activity: Explain to the students we are going to start to think about coding works and why we use an iPad in everyday life. Discuss that we use the camera a lot. Explain to the students that they are going to take a photo and edit the photo they take on camera. Using Airdrop students share their selfies. Journal: Using Seesaw get the students to post a picture of their favourite app and record what they like about the app.

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1	- Describe what commands and sequences are - Demonstrate the use of commands and sequences in an everyday situation - Code using commands and sequences.	Introduction: Explain to the students that we are going to play a game. They have to give the teacher an action to do without telling the teacher what the action is. For example, draw a flower on the board but they would only say the step by step commands. 1. Walk to the board. 2. Pick up a pen. 3. Draw a circle in the middle of the board etc Explain that when you code, you tell a computer a set of commands in a sequence, just like the game. Command is a specific action for the computer to perform. Sequence is the order in which the commands are given. Activity: Explain that we are going to play a game of 'hide the object'. In groups of two or three, one student hides a small object somewhere around the classroom. They create a video of themselves giving commands in a sequence to find the object. Show the Keynote template to the students as an example before starting (Pg15). Students in the group watch the video to try and find the object. Discuss with the students were they successful? Were the commands clear? Practise: Students use Swift Playground 'Learn to code 1' and complete puzzles in the 'Command' checklist. Journal: Students upload their coding video and photos of their coding on Swift Playground to their Seesaw portfolios.
2	- Describe what debugging is - Demonstrate the use of debugging in an	Introduction: Discuss with the students things that they may have built or made in the past. Lego, furniture etc. What would you have to do if you had a spare piece at the end of the build? Sometimes coding on a computer

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	everyday situation - Debug with code.	goes wrong and it does not work the way it is supposed to. We then need to fix it (debug it). A bug is an error in your code. Debugging is the process of identifying and fixing the problem. <u>Activity:</u> Brainstorm some ideas with the students of different things they have had a problem with. Write them on the board. For example, Lego they could not build or their games console not turning on. Introduce the 4 steps and discuss them with the students which we normally go through when debugging a problem. 1. Identify the problem 2. Retrace the steps 3. Fix one thing at a time 4. Test and retest. Show the video example to the students (pg19) Using Seesaw Drawing, students create a video where they explain how a problem they had was fixed using the four steps. Students present their recording to the class. <u>Practise:</u> Students complete the puzzles on Swift Playground listed for this session (see pg20) <u>Journal:</u> Students upload their recordings to Seesaw and any photos of their coding from Swift Playground. They also add notes explaining what debugging is.
3	- Describe what functions and for loops are - Demonstrate the use of functions and for	<u>Introduction:</u> Ask. the students to show you a dance move that they know. Does the dance move have a name? Show the students the dance moves for the 'Macarena'. Explain that in programming it is sometimes easier to combine commands together. This is called composition.

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	loops in an everyday situation - Code using functions and for loops	When you give this a name it so you can use it again in the future it is called a 'function'. A function is a collection of commands grouped together and given a name. The set of commands can then be run with just the name of the function whenever that set is needed. For loop - runs a block of code over and over for a set number of times. <u>Activity:</u> Show the students the example (see pg23). Explain that they are going to use Pages to create a pattern, using the shapes etc. Students repeat the pattern in words x20 and the name like the example. Discuss with the students how easy it was? Can they see the benefit of a function and for loop? <u>Practise:</u> In the Functions and For Loops chapter: Students complete all puzzles. The puzzles with asterisks are additional challenges that you can use accordingly with students who may be further ahead or students who need extra practice. Using commands they've learned, they'll write functions that act as new abilities for their characters. <u>Journal:</u> Students upload their pattern document to Seesaw and any photos of their coding from Swift Playground. They also add notes explaining what a function and for loop is.
R&R	- Review coding concepts from Lessons 1 to 3 - Reflect on what's been learned using their portfolios - Create a community with peer-to-peer review in Seesaw.	<u>Introduction:</u> Recap the coding concepts they have learned so far. Write them on the board and discuss what each one means. <u>Practise</u>: Students have time to practise the coding they have learned. They will complete the last three puzzles in the For Loop chapter. As they finish, remind the students to take screenshots of their code to upload to Seesaw.
4	- Describe what	<u>Introduction:</u>

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	conditional code, Booleans, and logical operators are - Demonstrate the use of conditional code, Booleans, and logical operators in an everyday situation - Code using conditional code, Booleans, and logical operators.	Explain that we are going to play a game of I Spy. Choose a student to be a spy, they choose an object and describe one thing about it. For example, I spy with my little eye something that is pink. What was the thought process when describing one thing about the object? Students were thinking in terms of conditions. Explain that conditions are something that you test that results in true or false. Discuss the following as a group. Conditional code - A block of code that will run only if something is true. Boolean - A value that can only be either true or false. So for the conditional statement to run, we have to tell the computer what the possible outcomes are. So in our example, we set the Boolean to be true "if the object is pink" and false "if the object is any other colour." Logical operator - A symbol or words like "and," "or," and "not" that connects two or more Booleans to make conditional decisions more specific. - AND (&&)—The AND operator results in true only if two statements are true; in coding, the statements are called operands; otherwise, the operator results in false. - OR (||)—The OR operator results in true if one or both operands are true; otherwise, the operator results in false. - NOT (!)—The NOT operator results in true if the value is false, and vice versa. It effectively inverts the value. True becomes false, and false becomes true. <u>Activity</u>: Explain that students are to create 2 questions to describe objects. Show examples on the board. Students put their questions into a tub and pick out two random questions. Show the example Keynote template (see pg35) Students use their questions to go around the classroom and take photos of objects that mean the conditions. Students use Keynote to create an album of photos for each condition (question). They create a new slide for

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		each condition but they do not name them yet. Students show their albums to one another and see if the other student can guess what the condition is. If it guessed correctly then a label can be added to the slide e.g If blue take a photo. <u>Practise:</u> In the Conditional Code chapter, Students complete all puzzles. The puzzles with asterisks are additional challenges that you can use accordingly with students who may be further ahead or students who need extra practice. Students will then move on to the Logical Operator chapter and complete puzzles there too. Remind students to take screenshots of their code for later. <u>Journal:</u> Students upload their photo condition albums to Seesaw and any photos of their coding from Swift Playground. They also add notes explaining what a condition, conditional coding, Boolean and logical operators are and how they are related? <u>Optional Activity:</u> In Swift Playground, download 'Blink' from the challenges section. With Blink, students will create and explore relationships between cells in a simulation of living organisms. They'll use mathematical rules to determine how cells replicate and societies evolve. They can make their own rules using if statements, and also edit the code to personalize the cell colors or even build their own custom simulation using emojis and custom photos and images. This challenge relates to math and science topics, but is useful for any coding class to reinforce conditional code and to expose students to Swift syntax.
5	- Describe what while loops are - Demonstrate the use of while loops in an everyday situation - Code using while loops.	<u>Introduction:</u> Remind the students of their dance moves from session 3. Explain that if they wanted to use the same dance moves over and over they would use a for loop. Can the students write the code for this? Model one together on the board. However what if they had different music and they did not know when the song was going to end?

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		Explain that they could use a 'While Loop' for this. A while loop is a loop that runs a block of code as long as a given condition is true. When the condition is false, the loop stops running. <u>Activity:</u> Remind the students of when they played hide the object in session 1. Explain that we are going to do this again but this time we are going to use functions, for loops and while loops in our coding. Show the Keynote template videos as a model for the students and model writing a code together (see pg41) Get students to swap videos and see if their partner can find the object. Were their instructions clear? Were they successful? Using Keynote, get the students to upload their videos and write up the functions, for loops and while loops they used. Think about the language they used to do this. (For example: if statements, while…until) <u>Practise:</u> In the While Loops chapter, Students complete all puzzles. The puzzles with asterisks are additional challenges that you can use accordingly with students who may be further ahead or students who need extra practice. Remind students to take screenshots of their code for later. <u>Journal:</u> Students upload their video and Keynote to Seesaw and any photos of their coding from Swift Playground. They also add notes explaining what the difference between a For Loop and While Loop is?
6	- Describe what algorithms are - Demonstrate the use of algorithms in an everyday situation - Code using algorithms.	<u>Introduction:</u> Ask students to think about something they do or perform all the time that has multiple steps to complete. List these on the board and choose one as an example. (For example, brushing their teeth). Ask different students to explain what the steps are they take to complete this act. Were they different? Explain that these are algorithms, but what is the difference between a function and an algorithm?

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		An Algorithm is a set of rules or instructions. Explain what a pseudocode is. A pseudocode is an informal description of code or a concept that's intended for human reading. <u>Activity:</u> Split the students into small groups and explain that we want to find out who is the tallest person in the class. We can not use what we can see as the tallest person. Each group must come up with an algorithm to find out. Instruct students to use Pages to brainstorm their ideas. Show the Keynote template to students as an example (see pg48). Get each group to explain and perform their algorithm to the class. Then discuss with the class the following questions: Which one seems most efficient? Would it work with 100 or 1000 people? If you wanted to find the shortest student, what would you change in your algorithm? Students can actually record the results in Numbers. If you're actually measuring the heights, use Numbers to create a list of students and their heights. Use the MAX() function in Numbers to find the tallest student. MAX() is an algorithm, too. <u>Practise:</u> In the Algorithm chapter, Students complete all puzzles. The puzzles with asterisks are additional challenges that you can use accordingly with students who may be further ahead or students who need extra practice. Remind students to take screenshots of their code for later. <u>Journal:</u> Students upload their Pages document and Numbers document to Seesaw and any photos of their coding from Swift Playground. They also add notes explaining what an algorithm and pseudocode is? <u>Optional activity:</u> In Swift Playground, download 'The Shapes' from the Starting Point section.

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		It can be a blank canvas for students to create images with basic shapes. Students can use this Starting Point to practice and improve their coding skills outside of Byte's world. Can students create an algorithm to draw a certain shape?
R&R	- Review coding concepts from Lessons 3 to 6 - Reflect on what's been learned using the portfolios - Create a community with peer-to-peer review in Seesaw	Review: Explain that Algorithms are very important when it comes to coding and that all of the coding aspects we have learned so far can be used within algorithms. Recap the concepts we have learned from session 4 to 6. Discuss them with the students. Practise: Students to complete the last two puzzles in the Algorithm chapter on Swift Playgrounds.

Glossary	
Algorithm	An algorithm is a set of steph-by-step rules or instructions.
Booleans	A value that can only be either true or false. So for the conditional statement to run, we have to tell the computer what the possible outcomes are. So in our example, we set the Boolean to be true "if the object is pink" and false "if the object is any other colour."
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.
Conditions	Conditions are something that you test that results in true or false
Conditional statement	Conditional statements or actions occur only under certain conditions.

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or action	
Debugging	Debugging is the process of identifying and fixing errors.
Developer	Developers write code to build their own apps and games.
Event	An event is an action that causes something else to happen.
For Loop	Runs a block of code over and over for a set number of times.
Function	A function is a collection of commands grouped together and given a name. The set of commands can then be run with just the name of the function whenever that set is needed.
Logical Operator	A symbol or words like “and,” “or,” and “not” that connects two or more Booleans to make conditional decisions more specific.
Loop	A loop is an instruction to repeat a set of commands for a specific number of times.
Pseudocode	A pseudocode is an informal description of code or a concept that’s intended for human reading.
Sequence	A sequence is the order in which things happen, like patterns and events.
While Loop	A while loop is a loop that runs a block of code as long as a given condition is true. When the condition is false, the loop stops running.