COMPUTING PROGRESSION: Disciplinary and Substantive knowledge

Digital Literacy					
	KS1	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Safety and Security Understanding risks when using technology and how to protect individuals and systems		• Give simple examples of why information should not be shared	• Discuss why a network needs protecting • Explain that not everything on the World Wide Web is true • Explain why I need to think carefully before I share or reshare content • Explain why some information I find online may not be honest, accurate, or legal • Sort images into 'fake' or 'real' and explain choices Discuss fake images in the real world	• Decide when I should and should not share • Explain that communication on the internet may not be private	• Describe what is meant by the term 'fair use' Find copyright-free images • Say why I should use copyright-free images
Effective use of Tools Use software tools to support computing work		**Pictograms** • Enter data onto a computer & use a computer to view data in a different format • Organise data in a tally chart & use a tally chart to create a pictogram • Create a pictogram to arrange objects by an attribute • Create a pictogram and draw conclusions from it • Use a computer program to present information in different ways	**Branching Databases** • Group objects using own yes/no questions • Select objects to arrange in a branching database • Create a branching database that reflects a plan **Photo Editing** • I can change the composition of an image by selecting parts of it • I can choose effects to make my image fit a scenario • Choose appropriate tools to retouch an image • Give examples of positive and negative effects that	**Flat file Databases** • Navigate a flat-file database to compare different views of information • Group information using a database • Choose which field and value are required to answer a given question • Outline how 'AND' and 'OR' can be used to refine data selection • Refine a chart by selecting a particular filter **The Internet** • Compare results from different search engines	**Spreadsheets** • Enter data into a spreadsheet • Apply an appropriate format to a cell & choose a format for a cell • Construct a formula in a spreadsheet • Apply a formula to multiple cells by duplicating it • Calculate data using different operations • Create a formula which includes a range of cells • Apply a formula to calculate the data I need to answer questions • Use a spreadsheet to answer questions • Produce a chart

		Desktop Publishing • Change font style, size, and colours for a given purpose & edit text • Explain that text can be changed to communicate more clearly • Create a template for a particular purpose • Choose the best locations for content & make changes to content after it's added • Paste text and images to create a magazine cover **Stop Frame Animation** • Use onion skinning to help me make small changes between frames • Improve my animation based on feedback • Add other media to my animation •	retouching can have on an image • Combine parts of images to create new images **Audio Editing** • Use a device to record audio and play back sound • Discuss why it is useful to be able to save digital recordings • Save a digital recording as a file • Edit sections of an audio recording • Open a digital recording from a file • Use editing tools to arrange sections of audio • Use onion skinning to help me make small changes between frames	• Complete a web search to find specific information • Refine a search • Relate a search term to the search engine's index • Suggest some of the criteria that a search engine checks to decide on the order of results • Describe some of the ways that search results can be influenced • Choose methods of communication to suit particular purposes • Identify that there are a variety of ways of communicating over the internet • Compare different methods of communicating on the internet **Video Production** • Create and save video content • Select the correct tools to make edits to my video • Store, retrieve, and export my recording to a computer • Make edits to my video and improve the final outcome **Vector Drawings** • Move, resize, and rotate objects I have duplicated • Explain how alignment grids and resize handles can be used to improve consistency • Modify objects to create different effects • Use the zoom tool to help me add detail to my drawings • Change the order of layers in a vector drawing	Use a chart to show the answer to questions • Explain how the internet enables effective collaboration • Compare working online with working offline • Make thoughtful suggestions on my group's work • Suggest strategies to ensure successful group work **Website Development** • Explore a website • Add content to my own web page • Make multiple web pages and link them using hyperlinks **3D Modelling** • Explain why we might represent 3D objects on a computer • Select, move, and delete a digital 3D shape • Change the colour of a 3D object • Resize a 3D object • Position 3D objects in relation to each other • Rotate a 3D object • Select and duplicate multiple 3D objects • Create digital 3D objects of an appropriate size • Group a digital 3D shape and a placeholder to create a hole in an object

				• Copy part of a drawing by duplicating several objects • Group to create a single object • Reuse a group of objects to further develop my vector drawing	
Impact of Technology How individuals, systems and society as a whole interact with computer systems		• Recognise similarities between using digital devices and non-digital tools • Suggest differences between using digital devices and non-digital tools • Identify the benefits of computer networks • Compare work made using desktop publishing to work created by hand • I identify the uses of desktop publishing in the real world & Explain why desktop publishing might be helpful	• Consider why someone might want to change the composition of an image	• Describe some of the ways that search results can be influenced • Explain how search engines make money • Recognise some of the limitations of search engines • Explain the benefits of using a computer to create charts	• Explain the benefits of a given computer system • Explain that the internet allows different media to be shared • Recognise that connected digital devices can allow us to access shared files stored online • Explain the implication of linking to content owned by others

Information Technology					
	KS1	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Computer Systems & Networks Understand how networks can be used to retrieve and share information and come with associated risks What is a computer, how do its constituent parts function together as a whole		• Explain that digital devices accept inputs & that digital devices produce outputs • Classify input and output devices • Describe a simple process • Design a digital device • Explain how to use digital devices for different activities • Recognise similarities between using digital devices and non-digital tools • Suggest differences between using digital devices and non-digital tools • Discuss why a network switch is needed • Recognise different connections & explain how messages are passed through multiple connections • Demonstrate how information can be passed between devices • Explain the role of a switch, server, and wireless access point in a network • Recognise that a computer network is made up of a number of devices • Identify how devices in a network are connected together • Identify networked devices in the real world • I can identify the benefits of computer networks • Identify digital devices that can record sound and play it back	• Demonstrate how information is shared across the internet • Describe the internet as a network of networks • Discuss why a network needs protecting • Describe networked devices and how they connect • Explain that the internet is used to provide many services • Recognise that the World Wide Web contains websites and web pages • Describe how to access websites on the WWW • Describe where websites are stored when uploaded to the WWW • Explain the types of media that can be shared on the WWW • Explain that internet services can be used to create content online • Explain what media can be found on websites • Recognise that I can add content to the WWW • Explain that there are rules to protect content • Explain that websites and their content are created by people • Suggest who owns the content on websites • Explain that not everything on the World Wide Web is true • Explain why I need to think carefully before I share or reshare content	• Compare results from different search engines • Complete a web search to find specific information • Refine a search • Explain why we need tools to find things online • Recognise the role of web crawlers in creating an index • Relate a search term to the search engine's index • Explain that a search engine follows rules to rank relevant pages • Explain that search results are ordered • Suggest some of the criteria that a search engine checks to decide on the order of results • Describe some of the ways that search results can be influenced • Explain how search engines make money • Recognise some of the limitations of search engines • Choose methods of communication to suit particular purposes • Explain the different ways in which people communicate • Identify that there are a variety of ways of communicating over the internet • Compare different methods of communicating on the internet • Decide when to share and not share	• Describe that a computer system features inputs, processes, and outputs • Explain that computer systems communicate with other devices • Explain that systems are built using a number of parts • Explain the benefits of a given computer system • Identify tasks that are managed by computer systems • Identify the human elements of a computer system • Explain that data is transferred over networks in packets • Explain that networked digital devices have unique addresses • Recognise that data is transferred using agreed methods • Explain that the internet allows different media to be shared • Recognise that connected digital devices can allow us to access shared files stored online • Send information over the internet in different ways • Compare working online with working offline • Make thoughtful suggestions on my group's work • Suggest strategies to ensure successful group work • Explain how the internet enables effective collaboration

		• Identify the inputs and outputs required to play audio or record sound	• Explain why some information I find online may not be honest, accurate, or legal	• Explain that communication on the internet may not be private **Selection in Physical Computing** • Create a simple circuit and connect it to a microcontroller • Connect more than one output component to a microcontroller • Program a microcontroller to respond to an input	• Identify different ways of working together online • Recognise that working together on the internet can be public or private **Website Development** • Know that websites are written in HTML • Describe why navigation paths are useful • Explain what a navigation path is • Make multiple web pages and link them using hyperlinks • Create hyperlinks to link to other people's work **Sensing (Physical Computing)** • Transfer my program to a controllable device • Experiment with different physical inputs
Creating Media (digital Artefacts) Select and create a range of media including text, images, sounds and video.		**Desktop Publishing** • Explain the difference between text and images & identify the advantages and disadvantages of them • Recognise that text and images can communicate messages clearly • Change font style, size, and colours for a given purpose & edit text • Explain that text can be changed to communicate more clearly • Create a template for a particular purpose • Define the term 'page orientation • Recognise placeholders and explain their importance	**Photo Editing** • Explain the effect that editing can have on an image & explore how images can be changed in real life • Identify changes that we can make to an image • Change the composition of an image by selecting parts of it • Consider why someone might want to change the composition of an image • Explain what has changed in an edited image • Choose effects to make my image fit a scenario • Explain why my choices fit a scenario • Talk about changes made to images	**Video Production** • Identify & compare features in different videos • Explain that video is a visual media format • Experiment with different camera angles & identify and find features on a digital video recording device • Make use of a microphone • Capture video using a range of filming techniques • Review how effective my video is • Suggest filming techniques for a given purpose • Create and save video content • Decide which filming techniques I will use	**Website Development** • Discuss the different types of media used on websites • Explore a website • Know that websites are written in HTML • Draw a web page layout that suits my purpose • Recognise the common features of a web page • Suggest media to include on my page • Describe what is meant by the term 'fair use' • Find copyright-free images • Say why I should use copyright-free images • Add content to my own web page

		• Choose the best locations for content & make changes to content after it's added • Paste text and images to create a magazine cover • Identify different layouts, choose a suitable layout for a given purpose & then match a layout to a purpose • Compare work made using desktop publishing to work created by hand • I identify the uses of desktop publishing in the real world & Explain why desktop publishing might be helpful **Stop Frame Animation** • Create an effective flip book—style animation • Draw a sequence of pictures • Explain how an animation/flip book works • Create an effective stop-frame animation • Explain why little changes are needed for each frame • Predict what an animation will look like • Break down a story into settings, characters and events • Create a storyboard & describe an animation that is achievable on screen • Evaluate the quality of my animation • Review a sequence of frames to check my work • Use onion skinning to help me make small changes between frames • Evaluate another learner's animation • Explain ways to make my animation better	• Choose appropriate tools to retouch an image • Give examples of positive and negative effects that retouching can have on an image • Identify how an image has been retouched • Combine parts of images to create new images • Sort images into 'fake' or 'real' and explain choices Discuss fake images in the real world • Compare the original image with the completed publication • Consider the effect of adding other elements to the work • Evaluate the impact of the created publication on others through feedback **Audio Editing** • Identify digital devices that can record sound and play it back • Identify the inputs and outputs required to play audio or record sound • Recognise the range of sounds that can be recorded • Discuss what other people include when recording sound for a podcast • Suggest how to improve my recording • Use a device to record audio and play back sound • Discuss why it is useful to be able to save digital recordings • Plan and write the content for a podcast • Save a digital recording as a file	• Outline the scenes of my video • Explain how to improve a video by reshooting and editing • Select the correct tools to make edits to my video • Store, retrieve, and export my recording to a computer • Evaluate my video and share my opinions • Make edits to my video and improve the final outcome • Recognise that my choices when making a video will impact on the quality of the final outcome **Vector Drawing** • Discuss how a vector drawing is different from paper-based drawings • Identify the main drawing tools • Recognise that vector drawings are made using shapes • Explain that each element added to a vector drawing is an object • Identify the shapes used to make a vector drawing • move, resize, and rotate objects I have duplicated • Explain how alignment grids and resize handles can be used to improve consistency • Modify objects to create different effects • Use the zoom tool to help me add detail to my drawings • Change the order of layers in a vector drawing • Identify that each added object creates a new layer in the drawing	• Evaluate what my web page looks like on different devices and suggest/make edits • Preview what my web page looks like • Describe why navigation paths are useful • Explain what a navigation path is • Make multiple web pages and link them using hyperlinks • Create hyperlinks to link to other people's work • Evaluate the user experience of a website • Explain the implication of linking to content owned by others **3D Modelling** • Discuss the similarities and differences between 2D and 3D shapes • Explain why we might represent 3D objects on a computer • Select, move, and delete a digital 3D shape • Change the colour of a 3D object • Identify how graphical objects can be modified • Resize a 3D object • Position 3D objects in relation to each other • Rotate a 3D object • Select and duplicate multiple 3D objects • Create digital 3D objects of an appropriate size • Group a digital 3D shape and a placeholder to create a hole in an object

		• Improve my animation based on feedback • Add other media to my animation • Evaluate the final film • Explain why I added other media to my animation	• Discuss ways in which audio recordings can be altered • Edit sections of an audio recording • Open a digital recording from a file • Choose suitable sounds to include in a podcast • Discuss sounds that other people combine • Use editing tools to arrange sections of audio • Discuss the features of a digital recording I like • Explain that digital recordings need to be exported to share them • Suggest improvements to a digital recording	• Identify which objects are in the front layer or in the back layer of a drawing • Copy part of a drawing by duplicating several objects • Group to create a single object • Reuse a group of objects to further develop my vector drawing • Apply what I have learned about vector drawings • Suggest improvements to a vector drawing • Create alternatives to vector drawings	• Identify the 3D shapes needed to create a model of a real-world object • Choose which 3D objects I need to construct my model • Modify multiple 3D objects • Plan my 3D model • Decide how my model can be improved • Evaluate my model against a given criterion • Modify my model to improve it
Data & Information How is data stored, organised and used to represent real world artefacts and scenarios		• Compare totals in a tally chart • Record data in a tally chart & represent a tally count as a total • Enter data onto a computer & use a computer to view data in a different format • Use pictograms to answer simple questions about objects • Explain what the pictogram shows • Organise data in a tally chart & use a tally chart to create a pictogram • Answer 'more than'/'less than' and 'most/least' questions about an attribute • Create a pictogram to arrange objects by an attribute • Tally objects using a common attribute • Choose a suitable attribute to compare people • Collect data needed	• Create two groups of objects separated by one attribute • Investigate questions with yes/no answers & make up a yes/no question about a collection of objects • Arrange objects into a tree structure • Create a group of objects within an existing group • Select an attribute to separate objects into groups • Group objects using own yes/no questions • Select objects to arrange in a branching database • Test the branching database to see if it works • Compare two branching database structures • Create yes/no questions using given attributes • Explain that questions need to be ordered carefully to split objects into similarly sized groups	• Create a database using cards • Explain how information can be recorded • Order, sort, and group my data cards • Choose which field to sort data by to answer a given question • Explain what a field and a record is in a database • Navigate a flat-file database to compare different views of information • Combine grouping and sorting to answer specific questions • Explain that data can be grouped using chosen values • Group information using a database • Choose multiple criteria to answer a given question • Choose which field and value are required to answer a given question	• Collect data & enter data into a spreadsheet • Suggest how to structure the data • Apply an appropriate format to a cell & choose a format for a cell • Explain what an item of data is • Construct a formula in a spreadsheet • Explain which data types can be used in calculations • Identify that changing inputs changes outputs • Apply a formula to multiple cells by duplicating it • Calculate data using different operations • Create a formula which includes a range of cells • Apply a formula to calculate the data I need to answer questions • Explain why data should be organised

		• Create a pictogram and draw conclusions from it • Give simple examples of why information should not be shared • Share what I have found out using a computer • Use a computer program to present information in different ways	• Create a physical version of a branching database • Create questions that will enable objects to be uniquely identified • Independently create questions to use in a branching database • Create a branching database that reflects a plan • Suggest real-world uses for branching databases • Work with a partner to test the identification tool	• Outline how 'AND' and 'OR' can be used to refine data selection • Explain the benefits of using a computer to create charts • Refine a chart by selecting a particular filter • Select an appropriate chart to visually compare data • Ask questions that will need more than one field to answer • Present findings to a group • Refine a search in a real-world context	• Use a spreadsheet to answer questions • Produce a chart • Suggest when to use a table or chart • Use a chart to show the answer to questions
Design & Development The activities involved in planning, creating and evaluating computing artefacts		**Desktop Publishing** • Compare work made using desktop publishing to work created by hand • Identify different layouts, choose a suitable layout for a given purpose & then match a layout to a purpose **Stop Frame Animation** • Create a storyboard & describe an animation that is achievable on screen • Evaluate the quality of my animation • Review a sequence of frames to check my work • Evaluate another learner's animation • Explain ways to make my animation better • Improve my animation based on feedback • Evaluate the final film • Explain why I added other media to my animation **Sequencing in Music** • Make design choices for my artwork	**Photo Editing** • Explain why my choices fit a scenario • Talk about changes made to images • Compare the original image with the completed publication • Consider the effect of adding other elements to the work • Evaluate the impact of the created publication on others through feedback **Audio Editing** • Discuss what other people include when recording sound for a podcast • Suggest how to improve my recording • Plan and write the content for a podcast • Discuss the features of a digital recording I like Suggest improvements to a digital recording **Repetition In Shape** • Make use of my design to write a program	**Video Production** • Identify & compare features in different videos • Review how effective my video is • Outline the scenes of my video • Evaluate my video and share my opinions **Vector Drawings** • Suggest improvements to a vector drawing • Create alternatives to vector drawings **Selection in Physical Computing** • Create a detailed drawing of my project **Selection in Quizzes** • Use a design format to outline my project • Test my program Identify ways the program could be improved	**Website Development** • Discuss the different types of media used on websites • Suggest media to include on my page • Find copyright-free images • Evaluate what my web page looks like on different devices and suggest/make edits • Preview what my web page looks like • Evaluate the user experience of a website **3D Modelling** • Identify the 3D shapes needed to create a model of a real-world object • Choose which 3D objects I need to construct my model • Modify multiple 3D objects • Plan my 3D model • Decide how my model can be improved • Evaluate my model against a given criterion Modify my model to improve it **Variables in Games** • Choose the artwork for my project

		• Identify and name the objects I will need for a project Relate a task description to a design **Events and Actions in Scratch** • Modify a program using a design • Evaluate my project Make design choices and justify them	**Repetition In Games** • Explain what the outcome of the repeated action should be • Explain the effect of my changes • Develop my own design explaining what my project will do • Evaluate the use of repetition in a project • Evaluate the steps I followed when building my project • Refine the algorithm in my design		• Explain my design choices • Create the artwork for my project • Identify ways that my game could be improved **Sensing (Physical Computing)** • Design the algorithm for my project • Design the program flow for my project • Create a program based on my design • Test my program against my design

Computer Science					
	KS1	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Algorithms and Programming Being able to comprehend, design, create and evaluate algorithms Creating software to allow computers to solve problems		**Sequencing in Music** • Explain that objects in Scratch have attributes (linked to) • Identify the objects in a Scratch project (sprites, backdrops) • Recognise that commands in Scratch are represented as blocks • Choose a word which describes an on-screen action for my plan • Create a program following a design • Identify that each sprite is controlled by the commands I choose • Create a sequence of connected commands • Explain that the objects in my project will respond exactly to the code • Start a program in different ways • Combine sound commands • Explain what a sequence is • Order notes into a sequence • Build a sequence of commands • Decide the actions for each sprite in a program • Make design choices for my artwork • Identify and name the objects I will need for a project • Implement my algorithm as code • Relate a task description to a design	**Repetition In Shape** • Create a code snippet for a given purpose • Explain the effect of changing a value of a command • Program a computer by typing commands • Test my algorithm in a text-based language • Use a template to create a design for my program • Write an algorithm to produce a given outcome • Identify everyday tasks that include repetition as part of a sequence, e.g. brushing teeth, dance moves • Identify patterns in a sequence • Use a count-controlled loop to produce a given outcome • choose which values to change in a loop • Identify the effect of changing the number of times a task is repeated • Predict the outcome of a program containing a count-controlled loop • Explain that a computer can repeatedly call a procedure • Identify 'chunks' of actions in the real world • Use a procedure in a program • Design a program that includes count-controlled loops • Develop my program by debugging it • Make use of my design to write a program	**Selection in Physical Computing** • Create a simple circuit and connect it to a microcontroller • Explain what an infinite loop does • Program a microcontroller to make an LED switch on • Connect more than one output component to a microcontroller • Design sequences that use count-controlled loops • Use a count-controlled loop to control outputs • Design a conditional loop • Explain that a condition is either true or • Program a microcontroller to respond to an input • Explain that a condition being met can start an action • Identify a condition and an action in my project • Use selection (an 'if…then…' statement) to direct the flow of a program • Create a detailed drawing of my project • Describe what my project will do • Identify a real-world example of a condition starting an action • Test and debug my project • Use selection to produce an intended outcome • Write an algorithm that describes what my model will do	**Variables in Games** • Explain that the way that a variable changes can be defined • Identify examples of information that is variable • Identify that variables can hold numbers or letters • Explain that a variable has a name and a value • Identify a program variable as a placeholder in memory for a single value • Recognise that the value of a variable can be changed • Decide where in a program to change a variable • Make use of an event in a program to set a variable • Recognise that the value of a variable can be used by a program • Choose the artwork for my project • Create algorithms for my project • Explain my design choices • Choose a name that identifies the role of a variable • Create the artwork for my project • Test the code that I have written • Extend my game further using more variables • Identify ways that my game could be improved • Share my game with others

		Events and actions in Scratch • Choose which keys to use for actions and explain my choices • Explain the relationship between an event and an action • Identify a way to improve a program • Choose a character for my project • Choose a suitable size for a character in a maze • Program movement • Choose blocks to set up my program • Consider the real world when making design choices • Use a programming extension • Build more sequences of commands to make my design work • Choose suitable keys to turn on additional features • Identify additional features (from a given set of blocks) • Match a piece of code to an outcome • Modify a program using a design • Test a program against a given design • Evaluate my project • Implement my design • Make design choices and justify them	**Repetition in Games** • List an everyday task as a set of instructions including repetition • Modify a snippet of code to create a given outcome • Predict the outcome of a snippet of code • Choose when to use a count-controlled and an infinite loop • Modify loops to produce a given outcome • Recognise that some programming languages enable more than one process to be run at once • Choose which action will be repeated for each object • Evaluate the effectiveness of the repeated sequences used in my program • Explain what the outcome of the repeated action should be • Explain the effect of my changes • Identify which parts of a loop can be changed • Re-use existing code snippets on new sprites • Develop my own design explaining what my project will do • Evaluate the use of repetition in a project • Select key parts of a given project to use in my own design • Build a program that follows my design • Evaluate the steps I followed when building my project • Refine the algorithm in my design	**Selection in Quizzes** • Identify conditions in a program • Modify a condition in a program • Recall how conditions are used in selection • Create a program with different outcomes using selection • Identify the condition and outcomes in an 'if... then… else...' statement • Use selection in an infinite loop to check a condition • Design the flow of a program which contains 'if… then… else…' • Explain that program flow can branch according to a condition • Show that a condition can direct program flow in one of two ways • Identify the outcome of user input in an algorithm • Outline a given task • Use a design format to outline my project • Implement my algorithm to create the first section of my program • Share my program with others • Test my program • Extend my program further • Identify the setup code I need in my program • Identify ways the program could be improved	**Sensing (Physical Computing)** • Apply my knowledge of programming to a new environment • Test my program on an emulator • Transfer my program to a controllable device • Determine the flow of a program using selection • Identify examples of conditions in the real world • Use a variable in an if, then, else statement to select the flow of a program • Experiment with different physical inputs • Explain that if you read a variable, the value remains • Use a condition to change a variable • Explain the importance of the order of conditions in else, if statements • Modify a program to achieve a different outcome • Use an operand (e.g. <>=) in an if, then statement • Decide what variables to include in a project • Design the algorithm for my project • Design the program flow for my project • Create a program based on my design • Test my program against my design • Use a range of approaches to find and fix bugs