Computing Key Stage 2

Curriculum map

OAK NATIONAL ACADEMY

1. Philosophy

Six underlying attributes at the heart of Oak's curriculum and lessons.

Lessons and units are **knowledge and vocabulary rich** so that pupils build on what they already know to develop powerful knowledge.

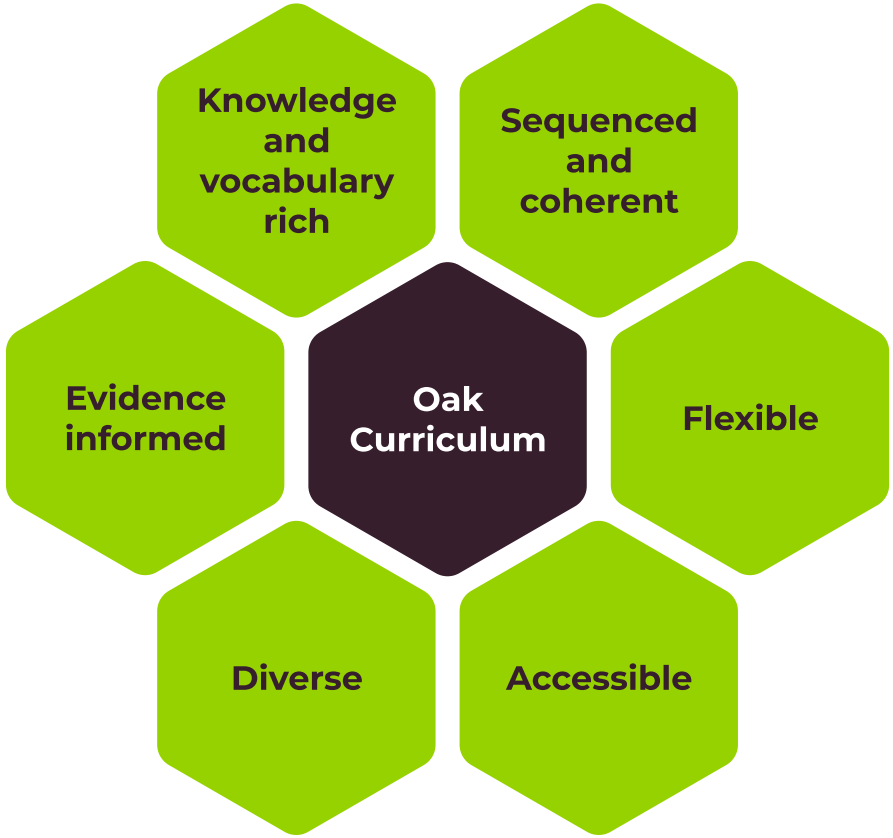
Knowledge is **sequenced** and mapped in a **coherent** format so that pupils make meaningful connections.

Our **flexible** curriculum enables schools to tailor Oak's content to their curriculum and context.

Our curriculum is **evidence informed** through rigorous application of best practice and the science of learning.

We prioritise creating a **diverse** curriculum by committing to diversity in teaching and teachers, and the language, texts and media we use, so all pupils feel positively represented.

Creating an **accessible** curriculum that addresses the needs of all pupils is achieved to accessibility guidelines and requirements.



2. Units

KS2 Computing is formed of 12 units and this is the recommended sequence:

Unit Title	Recommended year group	Number of lessons
1 Sharing Information	Year 5	6
2 Video Editing	Year 5	6
3 Selection In Physical Computing	Year 5	6
4 Flat-File Databases	Year 5	6
5 Vector Drawing	Year 5	6
6 Selection in Quizzes	Year 5	6
7 Communication	Year 6	6
8 Web Page Creation	Year 6	6
9 Variables in Games	Year 6	6

10	Spreadsheets	Year 6	6
11	3D Modelling	Year 6	6
12	Sensing	Year 6	6

3. Lessons

Unit 1 Sharing Information — 6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Systems**	• In this lesson, we will introduce the concept of a system. We will develop understanding of components working together to make a whole. We will also explore how digital systems might work and the physical and electronic connections that exist.
2.	**Computer systems and us**	• In this lesson, we will consider how larger computer systems work and how devices and processes are connected. We will also reflect on how computer systems can help us.
3.	**Transferring information**	• In this lesson, we will introduce the idea that parts of a computer system are not always in the same place or country. Instead, those parts of a system must transfer information using the internet. We will also gain an awareness of IP addresses and the rules (protocols) that computers have for communicating with one another.

4.	**Working together**	• In this lesson, we will consider how people can work together when they are not in the same location. We will discuss ways of working and simulate a collaborative online project. We would advise you to complete this lesson on a desktop device as you need to download and interact with additional files as part of the learning. These can be downloaded from the last slide of the worksheet. You should always ask your parent or carer for permission before downloading files from the internet.
5.	**Online collaboration**	• In this lesson, we will develop our collaborative work skills by commenting and suggesting in a shared document. We will also learn how to make comments and suggestions constructive and helpful. We would advise you to complete this lesson on a desktop device as you need to download and interact with additional files as part of the learning. These can be downloaded from the last slide of the worksheet. You should always ask your parent or carer for permission before downloading files from the internet.

6. Shared working

- In this lesson, we will introduce another approach to online working; reusing and modifying work done by someone else. We would advise you to complete this lesson on a desktop device as you need to download and interact with additional files as part of the learning. These can be downloaded from the last slide of the worksheet. You should always ask your parent or carer for permission before downloading files from the internet.

Unit 2 Video Editing

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**What is video?**	• In this lesson, we will explore a brief history of creating moving images from still images. We will also look at the role and benefits of the use of audio in a video, learning that the purpose of video is to communicate a message to an audience, or to record an event. Lastly, we will plan a video project using a story board.
2.	**Identifying devices**	• In this lesson, we will explore devices and computer applications that record audio and video. Learners will have the opportunity to investigate the pros and cons of using audio devices such as dictation machines or mobile sound recorders versus fully integrated AV (audiovisual) devices.
3.	**Using a device**	• In this lesson, we will explore devices and computer applications. We will make a short practise recording to familiarise ourselves with these devices and apps. Then we will locate the functions and practise the safe handling of the equipment. Lastly, we will encourage the use of zoom, angle, and movement (pan and tilt) in our recordings.

4.	**Features of an effective video**	• In this lesson, we will look at investigate further the features of an effective video. We will list some of these features and record a video which employs them in context. Lastly, we will explain why lighting and angle are important in filming an effective video.
5.	**Importing and editing video**	• In this lesson, we will learn how to export video to a computer (or other suitable device) and to make edits to it by means such as choosing the best recording, clipping videos, and adding transition effects. We will learn how to improve our videos through reshooting and editing. Lastly, we will learn which tools to use to perform the edits that we desire.
6.	**Video evaluation**	• In this lesson, we will have the opportunity to review the content of edited videos and finalise them by adding special effects such as animations, transitions, text, additional audio, and other visual effects.

Unit 3 Selection In Physical Computing

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Connecting Crumbles**	• In this lesson, we will will look at a Crumble microcontroller. We will connect it to a computer and program it to control an LED.
2.	**Combining output devices**	• In this lesson, we will connect at least two output devices to a Crumble microcontroller. We will write programs to control those outputs. Our programs will include loops.
3.	**Controlling with conditions**	• In this lesson, we will examine different conditions and identify when they are true or false. The we will write statements using 'do until'. Lastly, we will connect a switch to a Crumble microcontroller and write a program using that input as a condition.
4.	**Starting with selection**	• In this lesson, we will identify conditions and selection. We will also write a program which includes selection.

5.	**Drawing Designs**	• In this lesson, we will identify how selection might be used in 'real-life' examples. We will also design and build a model that we can control with a Crumble microcontroller.
6.	**Writing and testing algorithms**	• In this lesson, we will write an algorithm for controlling our models. We will then turn that algorithm into code. Lastly, we will test and debug our program.

Unit 4 Flat-File Databases

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Creating a paper-based database**	• In this lesson, we will create record cards and add data to them. We will then attempt to sort the cards and use those cards to answer questions.
2.	**Computer databases**	• In this lesson, we will use a database on a computer. We will sort data to answer questions. Then we will compare using a paper-based database with a computer database.
3.	**Using a database**	• In this lesson, we will search and order a database to answer questions.
4.	**Using search tools**	• In this lesson, we will use database search tools. We will search for results using 'AND' 'OR' criteria.
5.	**Comparing data visually**	• In this lesson, we will create charts using our previously compiled databases. Then we will compare different ways of viewing information.

6. Databases in Real Life

- In this lesson, we will use an online database to search and filter real data.

Unit 5 Vector Drawing

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**The drawing tools**	• In this lesson, we will be introduced to vector drawings and learn that they are made up of simple shapes and lines. We will then use the main drawing tools within a software package. Lastly, we will discuss how vector drawings differ from paper-based drawings.
2.	**Create a vector drawing**	• In this lesson, we will identify the shapes that are used to make vector drawings. We will be able to explain that each element of a vector drawing is called an 'object'. Then we will create their own vector drawing and duplicate objects to save time.
3.	**Being effective**	• In this lesson, we will increase the complexity of our vector drawings, using the zoom tool to add detail to our work. We will then learn how grids and resize handles can improve the consistency of our drawings. Lastly, we will use tools to modify objects and create different effects.

4.	**Layers and objects**	• In this lesson, we will gain an understanding of layers and how they are used in vector drawings. We will learn that each object is built on a new layer and that these layers can be moved forward and backward to create effective vector drawings.
5.	**Manipulating objects**	• In this lesson, we will be taught how to duplicate multiple objects. We will learn how to group objects to make them easier to work with, how to copy and paste these images, and how to make simple alterations.
6.	**Get designing**	• In this lesson, we will understand how digital images can be made from shapes or pixels. We will suggest and implement improvements to vector drawings and complete the unit by creating our own labels for the classroom using the skills we have learned.

Unit 6 Selection in Quizzes

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Exploring conditions**	• In this lesson, we will revisit our previous learning on selection and identify how conditions are used to control the flow of actions in a program. We will be introduced to the command blocks for conditions in programs using the Scratch programming environment, and modify the conditions in an existing program.
2.	**Selecting outcomes**	• In this lesson, we will use the 'if... then... else...' structure in algorithms and programs. We will revisit the need for selection to ensure conditions are repeatedly checked and will use this knowledge to write our own programs.
3.	**Asking questions**	• In this lesson, we will consider how the 'if... then... else...' structure can be used to identify two responses to a binary question (yes or no). We will learn how questions can be asked in Scratch and how the answer is used to control the outcomes. We will then design a program that uses selection to direct the flow of the program.

4.	**Planning a quiz**	• In this lesson, we will use selection to control the outcomes in an interactive quiz. We will outline the requirements of the task and use an algorithm to show how we can use selection. To do this, we will design a storyboard to identify the questions asked and the outcomes for both correct and incorrect answers.
5.	**Testing a quiz**	• In this lesson, we will use Scratch to implement our designed algorithms as a program. We will run this program to test if it correctly uses selection to control the outcomes and will debug as necessary. Once we have completed our programs, we will consider the value of sharing it with others to collect feedback.
6.	**Evaluating a quiz**	• In this lesson, we will return to our completed programs and identify ways to improve them. We will focus on issues where answers similar to those in the condition are given as the input and identify ways to avoid these issues. We will consider how to ensure all uses are provided with the same experience and identify if we have met the requirements of the given task.

Unit 7 Communication

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Searching the web**	• In this lesson, we will be introduced to a range of search engines. We will be given the opportunity to explain how we search, then we will write and test instructions.
2.	**Selecting search results**	• In this lesson, we will gain an understanding of why search engines are necessary to help us find things on the World Wide Web. We will conduct our own searches and break down, in detail, the steps needed to find things on the web.
3.	**How search results are ranked**	• In this lesson, we will use an unplugged activity in which we will learn about some of the main factors that influence how a search engine ranks a web page.
4.	**How are searches influenced?**	• In this lesson, we will explore how the person performing a web search can influence the results that are returned, and how content creators can optimise their sites for searching.

5.	**How we communicate**	• In this lesson, we will deepen our understanding of the term 'communication'. We will explore different methods of communication, then we will consider internet-based communication in more detail.
6.	**Communicating responsibly**	• In this lesson, we will use information provided and our prior knowledge to categorise different forms of internet communication. We will explore issues around privacy and information security.

Unit 8 Web Page Creation

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**What makes a good website?**	• In this lesson, we will explore and review existing websites and evaluate their content. We will have some understanding that websites are created using HTML code.
2.	**How would you lay out your web page?**	• In this lesson, we will look at the different layout features available in Google Sites and plan our own web page on paper.
3.	**Copyright or CopyWRONG?**	• In this lesson, we will become familiar with the terms 'fair use' and 'copyright'. We will gain an understanding of why we should only use copyright-free images and we will find appropriate images to use in our work from suggested sources.
4.	**How does it look?**	• In this lesson, we will revise web page creation in Google Sites. We will create a page and we will preview our web page as it appears on different devices and suggest or make edits to improve the appearance of the page across those devices.

5. Follow the breadcrumbs

- In this lesson, we will appreciate the need to plan the structure of a website carefully. We will plan our website, paying attention to the navigation paths (the way that pages are linked together). We will then create multiple web pages and use hyperlinks.

6. Think before you link!

- In this lesson, we will consider the implications of linking to content owned by other people and create hyperlinks on our own websites to link to other people's work. We will then evaluate the user experience when using our websites and the website of another student.

Unit 9 Variables in Games

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**Introducing variables**	• In this lesson, we will explore using variables in computer programs. We will explore variables in Scratch as well as designing and writing our own short programs.
2.	**Variables in programming**	• In this lesson, we will learn how variables are updated, and we will learn the importance of naming our variables carefully.
3.	**Improving a game**	• In this lesson, we will experiment with changing variables by different amounts and in different places. We will also learn how to display a variable in a different way.
4.	**Designing a game**	• In this lesson, we will work on the design of a computer game. We will choose artwork and design algorithms.
5.	**Design to code**	• In this lesson, we will turn our project designs into code to create our games.

6. Improving and refining

- In this lesson, we will add more variables to improve our games.

Unit 10 Spreadsheets

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	What is a spreadsheet?	• In this lesson, we will learn that a spreadsheet is a computer application which allows users to organise, analyse, and store data in a table. We will be introduced to the importance of data headings.
2.	Modifying spreadsheets	• In this lesson, we will be taught that objects can be described using data. We will build a data set (a collection of related data that can be manipulated using a computer) within a spreadsheet application and apply appropriate number formats to cells.
3.	What's the formula?	• In this lesson, we will begin to use formulas to produce calculated data. We will learn that the type of data in a cell is important (e.g. numbers can be used in calculations whereas words cannot). Then we will create formulas to use in our spreadsheets using cell references

4.	**Calculate and duplicate**	• In this lesson, we will recognise that data can be calculated using different operations: multiplication, subtraction, division and addition. We will create formulas in a spreadsheet. We will then understand the importance of creating formulas that include a range of cells.
5.	**Event planning**	• In this lesson, we will plan and calculate the cost of an event using a spreadsheet. We will use a list to choose what we would like to include in our event, and use our spreadsheet to answer questions on the data we have selected.
6.	**Presenting data**	• In this lesson, we will acquire the skills to create charts in Google Sheets. We will evaluate results based on questions asked using the chart that we have created. Finally, we will appreciate there are different software tools available within spreadsheet applications to present data.

Unit 11 3D Modelling

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**What is 3D modelling?**	• In this lesson, we will examine 3D objects from a variety of views within a 3D space. We will also explore the functionality of the buttons available within the software in order to create a 3D maze.
2.	**Making changes**	• In this lesson, we will alter the dimensions of 3D objects and recognise how to lift these objects to create 3D models. We will then enhance our 3D models by changing the colour of our 3D objects.
3.	**Rotation and position**	• In this lesson, we will produce a 3D model of a physical object, which will contain a number of different 3D objects. We will rotate and place these 3D objects into position in relation to other 3D objects, and we will use the copy tool to improve our modelling efficiency.
4.	**Making holes**	• In this lesson, we will produce a 3D model of a pencil holder. To do this, we will look at resizing objects to specific dimensions and we will use the group tool to create holes in 3D objects.

5.	**Planning my own 3D model**	• In this lesson, we will experiment with grouping 3D objects and demonstrate our ability to use our past learning to manipulate 3D objects in Tinkercad. We will then plan our own 3D models of a photo frame which we will develop in the next lesson.
6.	**Making my own 3D model**	• In this lesson, we will produce our own 3D model based on our plan from the previous lesson. We will evaluate our models and decide whether we have met the criteria provided. We will then have the opportunity to add improvements.

Unit 12 Sensing

6 Lessons

Lesson number	Lesson question	Pupils will learn
1.	**The micro:bit**	• In this lesson, we will be introduced to the micro:bit and its block based programming environment, MakeCode.
2.	**Go with the flow**	• In this lesson, we will explore how 'if... then... else...' statements are used to direct the flow of a program. We will then use this learning to create a fortune teller project to run on a micro:bit.
3.	**Sensing inputs**	• In this lesson, we will use the buttons to change the value of a variable using selection. We will then develop our programs to update the variable by using the micro:bit's accelerometer which senses motion. Finally, we will learn that a variable can be displayed after it is updated or in response to an input.
4.	**Finding your way**	• In this lesson, we will use the compass on the micro:bit as an input device. We will initially design and create a program to display the direction in which the micro:bit is pointing before turning it into a navigational device.

5. Designing a step counter

- In this lesson, we will design a project to make a micro:bit step counter. We will use a familiar design template to design the algorithm, appearance and to program flow of the project.

6. Making a step counter

- In this lesson, we will make a micro:bit based step counter following a design. We will test and debug our code and look for ways to improve the sensitivity of our counter.

4. Learn More

Contents

1. Coherence and flexibility

The computing curriculum is structured in units. For the units to be coherent, the lessons within them must be taught in order. However the curriculum is flexible in terms of the order in which you teach units within a year group, except for programming where concepts and skills rely on prior learning and experiences.

2. Knowledge organisation

The curriculum applies to the National Centre for Computing Education's computing taxonomy. This has been developed through a review of the KS1-4 computing programme of study, and the GCSE and A Level computer science specifications, across all awarding bodies. All learning outcomes can be described through a top-level taxonomy of ten topics, ordered alphabetically as follows:

- Algorithms
- Computer Networks
- Computer Systems
- Creating Media
- Data & Information
- Design & Development
- Effective use of tools
- Impact of technology
- Programming
- Safety & Security

The taxonomy categorises and organises content into strands which encapsulate the discipline. Whilst all strands are present at all phases, they are not always taught explicitly.

3. Inclusive and ambitious

We want Oak to be able to support all children. Our units will be pitched so that children with different starting points can access them. Our lessons will be sequenced so that each builds on prior learning. Our activities will be scaffolded so all children can succeed. We use unplugged or real world activities to unpack difficult concepts in computing as part of a semantic wave of learning. We also use a range of scaffolding approaches when teaching programming, ranging from copying code, exploring some commands or functions, fixing code with bugs to solving specific problems with code.

4. Application through software

We need pupils to be thinking during their lessons - both to engage with the subject and to strengthen memory of what is being learnt. Some of our lessons require practical application of concepts and skills on a computer using appropriate software. We supplement our lessons with guidance on how to use such software to reinforce the learning from the lesson.

5. Motivation through learning

We believe that computing is inherently interesting, and seek to motivate pupils through the subject matter. Where possible, we draw on real world experiences to provide an engaging viewpoint on computing concepts. Every student should have the opportunity to implement their skills and knowledge and ultimately feel a sense of achievement. We provide opportunities for pupils to be creative and solve problems by building their own programs and applications, for example.

6. Key stage 2 computing curriculum themes

Computing Systems and Networks

- Sharing Information
- Communication

Creating Media

- Video Editing
- Vector Drawing
- Web Page Creation
- 3D Modelling

Programming

- Selection In Physical Computing
- Selection in Quizzes
- Variables in Games

- Sensing

Data & Information

- Flat File Databases
- Spreadsheets

7. Key stage 2 computing unit summaries

Unit title	Year group	Unit summary
Sharing information	Year 5	• How computing systems share • Information • How the internet shares information • Collaboration
Video editing	Year 5	• Plan, record, edit a video • Add titles, credits etc to a video • Option to include green screen on a video
Selection in physical computing	Year 5	• Using Crumbles to explore physical inputs and outputs. • “if...then” introduced for final project.
Flat-file databases	Year 5	• Using records and fields to understand stored information.

		• Retrieving information using search & sort.
Vector drawing	Year 5	• Using shape tools, combining with group/ungroup,arranging layers, resizing, rotating etc.
Selection in quizzes	Year 5	• Exploring if...then...else statements and their use in block coding
Communication	Year 6	• How to effectively search and how search engines work.
Webpage creation	Year 6	• Using a wysiwyg editor to create and link several pages. • Links to external sites.
Variables in Games	Year 6	• Exploring the basics of collecting data to update variables in simple game design
Spreadsheets	Year 6	• Exploring how to organise data for purpose. • Creating new, calculated, data automatically using basic formulas.
3D Modelling	Year 6	• Using software like Tinkercad to create 3D models, exploring 3D

		space, applying scale, real world problems
Sensing	Year 6	• Exploring the basics of block coding to sense and record data