7 Year Curriculum Plan for Computing – St. Mark's Academy

Computing Department Vision Statement:

The goal of the computing department is that at the end of KS3, all learners are able to confidently use a computer. They can perform tasks that will be required for many jobs, like send and access emails, use word, teams, excel, developing software and solving problems. They should also have a good understanding of how to keep themselves and their computer/phone safe. In our current climate knowing how to keep safe online will be a priority.

Our aim to develop competent coders at the end of KS3. This is why we want to spend lots of time giving students practice. Coding takes many forms, there's block-based vs text-based and front-end vs back-end, so as part of KS3, learners will get the chance to experience coding in all these forms.

We also want learners to gain a good understanding of how a computer works. We want all students to be confident about the fundamentals, so they can use all the right terminology when describing their computer. This will enable them to navigate the real world

1. Coding
2. IT for Life
3. How a computer works

These 'big ideas' will feature across each year group with the planned schemes of work incorporating and building on the ideas so that knowledge and skills are repeated and embedded. This will enable the students to be confident on the computer as they complete their 7-year curriculum. At KS4 the students complete either the GCSE Computer Science or BTEC TECH award in Digital Information Technology. The concepts introduced at KS3 as part of these big ideas are built on at KS4.

	Year 7	Year 8	Year 9	Year 10		Year 11
Autumn Term 1	Under the hood Hardware, Software, CPU,RAM, ROM, Binary, Storage	Networks Network hardware, WWW, topologies, encryption	Data Manipulation Spreadsheet structure, Absolute & relative Cells referencing, formulas, functions, visual representation of data	IT Component 1 User Interface Aim A	Computer Science J277/01 Systems Architecture Memory and Storage Programming: Variables, Interactive inputs data types, selection	Component 2 Collecting Data Aim A	Algorithms Ethical, legal, cultural and environmental impact Theory Exam Revision
Autumn Term 2	Bebras Problem solving /esafety Problem solving school wide challenges Staying safe online	Bebras Problem solving Problem solving school wide challenges	Bebras Problem Solving Problem solving challenges	Component 1 User Interface Aim B	Data Representation Boolean Logic Networks Programming: FOR, WHILE, Subroutines, Arrays, String manipulation	Component 3 Unit D Forms of Notation + Exam Revision	Defensive design Testing Languages IDE Theory Exam Revision
Spring Term 1	Scratch Programming Sequence, variables, selection, iteration	Python Programming Algorithms, variables, errors, selection, iteration	Python Programming Recap, data types, boolean, arrays	Component 1 User Interface Aim C	Network security System software Programming: File handling Pre Programming project preparation SQL	Exam Component 2 Collecting Data Aim B	Searching and Sorting Algorithms Theory Exam Revision
Spring Term 2	Python challenges Text-based programming: variables, selection, loops(FOR & WHILE)	Data Representation Units, denary, hexadecimal conversion	Python Programming Recap, data types, boolean, arrays	Component 3 Unit A Modern Technologies & their impact	Ethical & Cultural issues Environmental issues Legal Issues Paper 1 In class assessment 20 hrs Programming project	Component 2 Collecting Data Aim C	Theory Exam Revision Practical Exam Revision

Summer Term 1	Spreadsheets Formatting, primary vs secondary sources, collect & analyse data, functions	Cyber Security Malware, hacking, social engineering, DDOS, prevention methods	Computing systems CPU, architecture, logic gates, hardware, memory & storage	Component 3 Unit B Cyber Security Preventing Threats Policy	Computational Thinking & Writing Algorithms 20 hrs Programming project		Final Exams Paper 1 & 2
Summer Term 2	Project	Project	Project	Component 3 Unit C Implications of digital systems Legal and ethical	Search & Sort Algorithms End of year assessment: Paper 1 & 2		

BIG IDEA 2: Coding

Coding is one of the most in demand skills in the world. Every piece of software we use, every piece of technology is made with coding. To introduce year 7 to this idea, we use Scratch, a very user-friendly block-based programming language. Students have often encountered Scratch in primary school. We use scratch as a tool to introduce fundamental coding ideas they'll need through the rest of KS3 and for KS4. Students are introduced to the idea of variables, selection and iteration – something that will be used in every coding unit students do. Year 7 is students' introduction, to make sure students of all ability levels understand these fundamentals, to be built on later in KS3.

Scheme of Work:

Scratch Programming

Spring Term 1

Summer Term 2

Key Skills and Techniques

Identifying a sequence

In year 8, students experience coding for the first time in a language that isn't block based. In Mobile App Development, students use a similar block-based language to scratch, to design an app for mobile. This is a unit that students can directly see the impact of in a real-world context. Later in year 8, students make their own webpages with html. This is front-end coding. Students will be able to design what a website looks like and understand the basics of what HTML is and how to use it. Finally, in year 8, students will encounter Python, the text-based coding language that students will be using throughout coding at school. They will revisit what variables, selection and iteration are, and learn what they look like in Python. Students will be faced with errors for the first time, and will be given the tools to be confident dealing with errors, like a developer would in a real-world context.

Scheme of Work:

1. Mobile App Development

In year 9, students work exclusively in Python to ensure they have secure and sufficient coding knowledge to prepare them for the rigour of GCSE CS at KS4. We will revisit sequence, variables, selection and iteration, which should be familiar for students who have been revisiting these techniques in each coding unit. We will recap what they look like in python and then introduce the idea of data types, building on their knowledge of variables. We will introduce Boolean, arrays, lists and file-handling. All ability students should be able to understand the basic concepts in python and be able to deal with errors independently.

Scheme of Work:

Python Programming

Spring Term 1

Summer Term 2

Key Skills and Techniques

BTEC Link:
Component 3 Unit D

Y10 BTEC won't cover the big idea of coding.

Problem Solving?

2.1.1 Computational thinking

Principles of computational thinking:

- Abstraction
- Decomposition
- Algorithmic thinking

2.1.2 Designing, creating and refining algorithms

Produce simple diagrams to show:

- The structure of a problem
- Subsections and their links to other subsections

Complete, write or refine an algorithm using the techniques listed

Syntax/logic errors

Trace tables

2.2.1 Programming fundamentals

The use of variables, constants, operators, inputs, outputs and assignments.

The use of:

Component 3 Unit D

Understand how organisations use different forms of notation to explain systems, data and information.

Be able to interpret information presented using different forms of notation in a range of contexts.

Be able to present knowledge and understanding using different forms of notations.

2.1.3 Searching and sorting algorithms

- Binary Search
- Linear Search
- Bubble Sort
- Merge Sort
- Insertion Sort

2.3.1 Defensive design

- Anticipating misuse
- Authenticating
- Input Validation
- Maintainability with naming conventions, indents, commenting

2.3.2 Testing

- Purpose of testing
- Iterative vs final
- Syntax & logic errors
- Test data – normal, boundary, erroneous
- Refining algorithms

2.5.1 Languages

- Purpose of different levels of language
- Translators
- Compiler and interpreter

Making a sequence Identifying a variable Using variables Identifying selection Using selection Identifying loops Using loops **BTEC Link:** **Component 3 Unit D** **GCSE Link:** **Programming throughout the course** **Direct Vocabulary** **Tier 2** User Blocks Sequence Operator **Tier 3** Selection Iteration Subroutine Variable	**2.** <u>**Developing for the Web**</u> **3.** <u>**Python Programming**</u> *1. Spring Term 1* *2. Summer Term 1* *3. Summer Term 2* **Key Skills and Techniques** Features of an app Basics of making an app Using HTML Knowing how a search engine works Making a basic webpage Using sequence Using variables Using selection Using iteration **BTEC Link:** **Component 3 Unit D** **GCSE Link:** **Programming throughout the course** **Direct vocabulary** **Tier 2** User – previously learnt Sequence – previously learnt Assignment Input Search Engine Interpreter **Tier 3**	**GCSE Link:** **Programming throughout the course** **Direct vocabulary** **Tier 2** List Array Integer Sequence – previously learnt **Tier 3** Variable – previously learnt Assignment – previously learnt Selection – previously learnt Iteration – previously learnt Boolean String Data type		• Sequence • Selection • Iteration 2.2.2 Data types Use of: • Integer • Real • Boolean • Character and string • Casting 2.2.3 Additional programming techniques • String Manipulation • File Handling Operations • Records to store data • Use SQL to search for data • Use arrays (1D, 2D) • Functions and procedures • Random number generator 2.4.1 Boolean logic • Use AND, OR and NOT • Truth Tables • Combining operators		2.5.2 The Integrated Development Environment (IDE) • Editors • Error diagnostics • Run-time environment • Translators

	Variable – previously learnt Selection – previously learnt Iteration – previously learnt GUI Algorithms Syntax Error Logic Error					

The big idea of using software exists to make students have good knowledge of how to use programs that are fundamental. In year 7 students will learn how to use Word and excel. Our unit on word gives students knowledge of the idea of referencing sources and the concept of copyright. It will also ensure all ability students are able to complete work on word, insert pictures, and save their work without issue as these are skills that will be very valuable for students. The unit on excel introduces students to what data is, how they collect it, and how they can use word to manipulate that data. They will learn about the formulas they can find on excel and have practice using the most common ones. **Scheme of Work:** **Using Media** **Spreadsheets** *Autumn Term 2* *Summer Term 1*	In year 8 students are given the opportunity to try out a piece of software called Inkscape. This unit is not about how well students can use Inkscape, but rather about students getting a taste of what graphic design on the computer is like. This introduces students to brand new software that they can be creative with and see cross-curricular links with other subjects. This unit is about students who perhaps don't enjoy coding, seeing the usefulness of computers and gaining an understanding of a possible new career. **Scheme of Work:** **Media - Vector** **Graphics** *Autumn Term 2* **Key Skills and Techniques** Making basic shapes Manipulating shapes Combining shapes Building a design **BTEC Link:**	The big idea of using software offers students in year 9 the opportunity to make their own animation. This is something students can immediately see the application of in a real-world context, and something students feel like can get creative with. This unit will introduce students to Blendr, a widely used piece of software that is also deeply rooted in the gaming industry when making video games. They will use this to explore 3d animation, and by the end of the unit, all students will produce a 3-10 second animation of their own using this software. **Scheme of Work:** **Media - Animations** *Autumn Term 2* **Key Skills and Techniques** Move objects Scale objects Play, pause through animation Apply colours to different parts Proportional editing Use subdivision Use lighting Render	**Component 1** **Aim B and C** Learners will develop their understanding of what makes an effective user interface and how to effectively manage a project. They will use this understanding to plan, design and create a user interface. B Use project planning techniques to plan and design a user interface Learners will investigate different project planning techniques. Teachers will provide learners with a brief for the design requirements of a user interface. Learners will: • select appropriate project planning tools and methodologies to create a project plan, including outlining the timescales, possible constraints and risks in their project • produce an initial design for a user interface that meets user, input, output and accessibility needs.	2.2.3 Additional Programming Techniques In year 10, students will learn about additional coding techniques. During that topic, they will mainly develop their coding skills. They will also be introduced to the use of SQL to search for data. **Software** Students will learn how to use python IDE software and take advantage os IDE software to support writing and debugging their code. Whilst students are learning how to write algorithms, they will use flowchart software to develop algorithms towards their programming project and paper 2 exam. They will need to be able to use the SQL commands: SELECT	**Component 2** Learners will understand the characteristics of data and information and how they help organisations in decision making. They will use data manipulation methods to create a dashboard to present and draw conclusions from information. A Investigate the role and impact of using data on individuals and organisations Learners will be given a scenario outlining the data collected in two different sectors (not the data itself). The scenario will outline the data collection methods and features. Learners will assess: • how the data collection method (for example primary and secondary) and the data collection features (for example sample size, who was in the sample, when and where the data	In year 11, students continue to encounter the big idea of using software, through completing their programming Project they will create design ideas with software. They will refine their programming skills using the software used in year 10. Online software such as TEAMs quizzes, Isaac Computing and Seneca will support students books an textbooks to revise their previous practice in year 10. These will be key for instant feedback for students practicing before their final exams.

Key Skills and Techniques				Their initial design should show the designs for at least four different screens in their user interface.	FROM WHERE	was collected) affect the quality of the data	

Key Skills and Techniques

Inserting pictures on word

Saving work on word

Basic word skills

Knowing what data is

Understanding data collection

Presenting data on excel

Using excel functions

Direct vocabulary

Tier 2

Word

File

Primary

Secondary

Data – previously learnt

Referencing

Copyright

Tier 3

Spreadsheet

Cell

Analyse

Function

Direct vocabulary

Tier 2

Fill

Stroke

Object

Pixels

Tier 3

Paths

Vector Graphics

Direct vocabulary

Tier 2

Object – previously learnt

Tier 3

Loop cut

Ray tracing

Subdivision

Keyframe

Render

Their initial design should show the designs for at least four different screens in their user interface.

C Develop and review a user interface.

Learners will follow their plan and create a user interface.

Learners will then:

• obtain feedback from potential users and refine the user interface until it is complete

• evaluate the strengths and weaknesses of their user interface

• evaluate the strengths and weaknesses of their project plan

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FROM

WHERE

Before their programming project they will learn how to manage their 20hrs allocated to them to design a solution to the scenarios set by their exam board.

Planning software such as Lucidchart.

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was collected) affect the quality of the data

• how the quality of data affects decision making across two different sectors (for example transport, education).

B Create a dashboard using data manipulation tools

Learners will:

• select and apply data manipulation methods to manipulate data in order to provide appropriate summaries of the data

• produce a dashboard to display the summaries of data using appropriate presentation features and presentation methods.

C Draw conclusions and review data presentation methods.

Learners will use their dashboard to draw conclusions and make appropriate recommendations. They will assess how the presentation features used in their dashboard affect how well the information is understood.

BIG IDEA 4: How a computer works

In year 7, students will learn about how computers are connected to each other and how they communicate. They will learn what a network is, what hardware is, and	For this big idea, year 8 students will recap what hardware is and then expand further on how memory and storage work on a computer. They will learn about input and output devices	In year 9, students will revisit what they learned in year 8 and expand on those ideas. They will revisit binary numbers and recap how to convert them. Then, they will learn about	**Component 1** **Aim A** Learners will develop their understanding of	 • The purpose of the CPU	Year 11 BTEC won't follow how a computer works, but students will come across some	**Revision of Systems Architecture**

what hardware makes up a network. They will look at what wireless/wired connections are and think about how the internet is a network. Students will get the chance to learn how data travels across the internet, and learn why the internet may be at different speeds for different people. This unit gives students an introduction into how computers are working together, in a way that they can understand.

Scheme of Work:

Networks

Spring Term 2

Key Skills and Techniques

Understand what a network is

Give examples of hardware

Understand what the internet is

Describe how data travels between computers

Describe effect of internet devices

BTEC Link:

N/A

GCSE Link:

Networks and topologies

Wired/wireless networks

Protocols

Direct vocabulary

Tier 2

Wired

Wireless

Internet

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as well as different storage devices the computer uses. They will start to learn how different parts of the computer interact with each other. They will learn what an operating system means, thinking about real world examples with iOS on their phones, or windows on the computer. Later in the year, they will learn about binary numbers. They will learn about the need for binary numbers and get lots of practice converting between denary numbers (1-9) and binary numbers.

Scheme of Work:

Memory and Storage

Binary

Autumn Term 1

Spring Term 2

Key Skills and Techniques

Identify hardware devices

Differentiate between input and output

Identify storage devices

Identify operating systems

Understand basics of how a computer works

Know the use of binary

Convert binary numbers

BTEC Link:

Component 1 - Interface

GCSE Link:

Operating Systems

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how binary is used with pixels to make up a picture, or how binary is used to represent sound. This will lead to how a computer can compress a text file, a picture, or sounds. Students will then revisit what they learnt about memory and storage, to be introduced to the idea of the CPU and what it does. They will recap how different parts of a computer interact and go in further depth, taking particular detail of what the CPU architecture is. All students will understand how different parts of a computer can make a computer work faster or slower. They will also be introduced to what logic gates are, and get their first practice using them.

Scheme of Work:

Representations

Computing Systems

Spring Term 2

Summer Term 1

Key Skills and Techniques

Converting binary

Understanding compression

Lossy vs lossless compression

Recalling input vs output devices

Able to explain how different parts of the computer work together

BTEC Link:

N/A

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what makes an effective user interface and how to effectively manage a project. They will use this understanding to plan, design and create a user interface.

A Investigate user interface design for individuals and organisations

Learners will select and investigate two different types of user interface. They will assess how:

• effectively the user interface meets the audience's requirements, including their accessibility needs, skills level and demographics

• effectively different design principles have been used to allow both appropriate and effective user interactions with hardware devices

• techniques have been used to allow different types of users to efficiently interact with the interface

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- Common CPU components and their function
- Von Neumann architecture

1.2 CPU performance

- How characteristics of the CPU affect performance

1.3 Embedded systems

- Purpose of embedded systems
- Examples

2.1 Primary Storage (memory)

- Purpose
- RAM vs ROM
- ROM purpose
- RAM purpose
- Virtual memory

2.2 Secondary Storage

- Purpose
- Types
- Pros & cons of types
- Suitability for purpose

2.3 Units

- Data storage
- Binary conversion
- Data capacity

2.4 Data Storage

- Denary to binary conversion
- Adding binary

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overlapping ideas whilst learning topics featured in other big ideas.

Identify the different components/parts of the CPU and their corresponding functions.

To fully understand the fetch-decode-execute function within the CPU

Recognize the purpose of embedded systems and identify examples.

Recognize the purpose of embedded systems and identify examples.

Understanding the different issues that are caused by the use of computer systems

Introduction to the ethical, legal and environmental impact of computer systems

Understand the laws/legislation of IT and their legal effects.

Ability to analyse situations and identify which laws will impact on these situations.

Identify how stakeholders are affected by technologies

Examine the positive and negative implications of technology on a given profession/scenario

Examine the cultural implications of

Hardware Data **Tier 3** Computer Networks Protocol Bandwidth Packets Addressing Connectivity	Secondary Storage Data storage Memory Storage devices **Direct vocabulary** **Tier 2** Input Output Hardware – previously learnt Software Decimal number Character – previously learnt **Tier 3** Operating System RAM ROM Artificial Intelligence Bits Bytes Binary	**GCSE Link:** Compression Architecture of the CPU CPU performance **Direct vocabulary** **Tier 2** Pixels – previously learnt Compression Architecture Hardware – previously learnt **Tier 3** Binary – previously learnt Bits – previously learnt Lossy Lossless Logic gate		• Denary to hexadecimal conversion • Binary to hexadecimal conversion • Binary shifts • Binary represent characters • Character set • Bits • Image is pixels • Metadata • Colour depth and resolution • Sound is stored • Duration and bit depth 2.5 Compression • Purpose • Lossy vs lossless 3.1 Networks and topologies • LAN vs WAN • Performance factors • Client-server vs peer-to-peer • Hardware needed • Internet • Star and mesh topologies 3.2 Wired and wireless networks, protocols and layers • Wired vs wireless • Encryption • IP vs MAC addressing • Standards • Common protocols		Computer Science technologies Explore the different cultural issues on Computer Science technologies Examine the environmental impact of Computer Science Explore key environmental issues related to Computer Science

				• Concept of layers		