KOINONIA FEDERATION – ALL THROUGH SUBJECT MAP

SUBJECT: Computing

CURRICULUM INTENT: We want our pupils to develop an interest in the field of computer science by providing them with the knowledge, understanding and skills to support them in the fast-paced world of technology; while ensuring that they understand the potential dangers of modern technology, and are able to use it safely.

We aim for pupils to develop their ability to solve computational problems using a range of programming skills, consisting of both visual and textual programming languages. Our intent is to enable pupils to not only become confident users but creators of technology.

Please identify what the key themes / concepts are, that all students at all key stages will study in your subject.

These will obviously get progressively more challenging in terms of content / expectations as the years progress and different language might be used to describe them however, they should still be able to fit under a blanket heading.

Please allocate a colour to each of these themes so that it is clear how they are revisited and built upon throughout the curriculum. Please add or remove as appropriate

Programming Skills	Digital literacy and skills	Hardware/Software	Logic

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	AUTUMN 1	AUTUMN 2	SPRING 1	SPRING 2	SUMMER 1	SUMMER 2
NURSERY – KEY THEMES / CONCEPTS	**Wider Technology**			**Computing devices**		
NURSERY – KEY CONTENT / LEARNING	Pupils will learn to operate mechanical toys, e.g., turns knob on wind-up toy or pulls back on a friction car. Pupils will learn how to operate simple equipment. Pupils will learn to use buttons to play back songs, sound recording or videos. Pupils will learn about real objects such as cameras and mobile phones and their basic functions.			Pupils will learn to use a single button mouse to drag and drop. Pupils will learn that text and images on a computer can be printed out. Pupils will learn to use arrow keys on a keyboard to control movement on the screen.		
RECEPTION - KEY THEMES / CONCEPTS	**Wider Technology**			**Computing devices**		
RECEPTION - KEY CONTENT/ LEARNING	Pupils will learn to operate mechanical toys, e.g., turns knob on wind-up toy or pulls back on a friction car. Pupils will learn how to program a simple floor robot with a series of instructions. Pupils will learn how to use play, pause and stop buttons when playing back on recording devices.			Pupils will learn to use a single button mouse to drag and drop. Pupils will learn that text and images on a computer can be printed out. Pupils will learn to use arrow keys on a keyboard to control movement on the screen. Pupils will start to learn that the internet can be used for research purposes.		
YEAR 1 - KEY THEMES / CONCEPTS	E-Safety	Keyboard Skills Control	Commands Control	Directions Visual Coding	Internet Control	Using a website Visual Coding
YEAR 1 - KEY CONTENT/ LEARNING	Pupils will be taught how to safely use the internet and the dangers that may occur. They will: Understand the dangers of social media	Pupils will develop a range of keyboard skills. They will start to develop touch typing. They will use the mouse on a laptop. They will choose different fonts/size for texts.	Pupils will choose an object to command and give multi-step instructions.	Pupils will use an app to direct a sprite to different objects.	Pupils will be able to use keyboard to type in different websites and learn to use a website safely.	Pupils will learn to use a search engine website and name different search engines. They will know how to look for accurate information and compare information sources.

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YEAR 2 - KEY THEMES / CONCEPTS	E-Safety Understand the dangers of social media	Programming using an app Continue to develop touch typing	Laptop Skills	Comics and Graphs	Internet Usage	Graphs and Search Engines
YEAR 2 - KEY CONTENT/ LEARNING	Pupils will be taught how to safely use the internet and the dangers that may occur. Pupils will develop programming skills and be taught the safety of using the internet and the dangers that may occur. They will: Understand the dangers of social media; Continue a range of keyboard skills; Continue to develop touch typing; Use the mouse on a laptop and use an app		Pupils will learn how to create a comic strip and graphs and will be able to compare and analyse them. Use iphoto and the comiclife app; Understand the dangers of social media and Continue a range of keyboard skills		Pupils will use different search engines to find accurate information about a specific topic as well as be able to present findings from a graph. Use a keyboard and a mouse Use a search engine and compare information with a partner	
YEAR 3 - KEY THEMES / CONCEPTS	E-Safety	Programming on an App	Code Writing	Code Writing	Ipad Usage	Animations and Email
YEAR 3 - KEY CONTENT/ LEARNING	Pupils will develop programming skills and be taught the safety of using the internet and the dangers that may occur. Understand the dangers of social media Continue a range of keyboard skills and touch typing; Use the mouse on a laptop Use an app; Use of a sprite and multi-level game creation		Pupils will use the Swift Playground app and start to using basic coding to debug, evaluate and review their chosen shape/pattern. Use the keyboard and a mouse; Speak using correct terminology and use a code		Building on their knowledge, Pupils will be able to create animation on imovie as well as understand the benefits and consequences of using email. Use imovie and email; open email app And know the benefits and consequences; Create animation	
YEAR 4 - KEY THEMES / CONCEPTS	E-Safety	Build with Lego Wedo	Video Programming	Editing	Information and Wikipedia	Information and Wikipedia

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YEAR 4 - KEY CONTENT/ LEARNING	Pupils will develop programming skills and be taught the safety of using the internet and the dangers that may occur. Pupils will develop programming skills and be taught the safety of using the internet and the dangers that may occur. They will: Understand the dangers of social media; Continue a range of keyboard skills and develop app use; Use the mouse on a laptop; Build a device and use different mechanisms; Improve a device		Pupils will use imovie to create a video and use editing tools to improve the video. They will be able to use advance search and continue to use the internet safely. create a video sequence; film a video; use editing software; use advance search terms to find more accurate information		Continuing to refine their knowledge of how to find accurate information, Pupils can use their theme for the half term to create a "Wikipedia" page of accurate knowledge that they have built up last half term. Use "Wikipedia" and improvement of the page by increasing accurate links; Confident use of mouse and typing skills	
YEAR 5 - KEY THEMES / CONCEPTS	E-Safety	Lego and Scratch	Documentary	Filming and Editing	Documentaries	Script and filming
YEAR 5 - KEY CONTENT/ LEARNING	Pupils will develop programming skills and be taught the safety of using the internet and the dangers that may occur. They will: Understand the dangers of social media; Confident use of a range of keyboard skills; Confident use of different apps; Use of a sprite on SCRATCH; Build a device; Use of different mechanisms; Improve a device and a game		Pupils will be able to plan, make and improve a documentary of their chosen subject. They will be able to use cutaways and understand the difference between different light and sound techniques and why these are used. They will: Create a film and a documentary; Add in cutaways; Explore using different lighting and sound; Construct a script		Pupils will be able to plan, make and improve a documentary/film of their chosen subject. They will be able to construct a script for their performance and understand how to review their work constructively. They will: Improve your film; Improve your documentary; Transition scenes	
YEAR 6 - KEY THEMES / CONCEPTS	E-Safety	App Building	De-Bugging	Excel	Information Video	Spreadsheets and Project
YEAR 6 - KEY CONTENT/ LEARNING	Pupils will develop programming skills and be taught the safety of using the internet and the dangers that may occur. They will:		Pupils will be able to debug their app and add in pictures. They will be able to use a spreadsheet and its formulas. Debug your app; Evaluate your		Pupils will be able to create a farewell video (which can be played on the school website) as well as know the outcomes of spreadsheets and what the data tells us.	

	Understand the dangers of social media; Confident use of a range of keyboard skills Confident use of different apps; Use of a webpage; Build a webpage; Use of different apps to inspire your design; Design an app Pitch your app		app; Explain the 2.0 version; Open Excel; Insert and analyse data; Use of different formulas		understand how data is analysed create scenes for the video; Year 6 project; Analyse data; Use different methods to gather data; Use of cutaways and transitions for video	
YEAR 7 - KEY THEMES / CONCEPTS	E-Safety Computer literacy Online threats Privacy Cyber-bullying Digital footprint	Computer systems Hardware and software. Data representation. Input-Process-Output cycle. Input and output devices.	Data Representation Binary/denary conversion Data vs. information Structured data Data types	Algorithms Flowchart symbols Flowcharts Sequence Selection Iteration	Variables Operators String Integer Boolean Real/float	Block programming with scratch
YEAR 7 - KEY CONTENT/ LEARNING	1. Understands how to recognise and be legally and emotionally safe from threats such as grooming, sexting and cyber bullying. 2. Understands the importance of communicating safely and respectfully online, and the need for keeping personal information private. Your online digital presence. 3. Confidently uses PC based systems to create, rename and edit different file types.	1. Classifies a range of software including operating systems, utility and application software. Explains the difference between hardware and software, and their roles within a computer system. 2. Gives examples of how data is stored on a computer. Explains the function of the main internal parts of basic computer architecture. 3. Outlines the concepts behind the input-process-output cycle. Recognises that a range	1. Classifies different types of data and understands how these are used in different situations. 2. Understands the difference between data and information. 3. Recognises that data can be structured in tables to make it useful. 4. Understands why a computer stores data in binary 5. Can convert denary to binary and vice versa 6. Add two binary numbers	1. Defines what an algorithm is. 2. Interprets and creates algorithms that use simple real-world sequences. 3. Use sequence, selection and iteration in flowcharts 4. Understand the four basic data types used in algorithms 5. Understand what a variable is 6. Understand how to assign and compare variables using operators 7. Interprets and creates simple	1. Defines what an algorithm is. 2. Interprets and creates algorithms that use simple real-world sequences. 3. Use sequence, selection and iteration in flowcharts 4. Understand the four basic data types used in algorithms 5. Understand what a variable is 6. Understand how to assign and compare variables using operators 7. Interprets and creates simple flowcharts using	1. Create block structures for sequence, selection and iteration 2. Move a sprite based upon user input events 3. Move a sprite using iteration with no user input 4. Detect collision between sprites 5. Write a simple game which includes user input control, moving sprites and collision detection

	4. Obtains content from the world wide web using a web browser.	of digital devices can be considered a computer. 4. Recognises and can classify a range of input and output devices.		flowcharts using sequence, operators and variables. 8. defines decomposition and abstraction	sequence, operators and variables. 8. defines decomposition and abstraction	
YEAR 8 - KEY THEMES / CONCEPTS	Computer systems Hardware and software. Data representation. Input-Process-Output cycle. Input and output devices.	Algorithms Flowchart symbols Flowcharts Sequence Selection Iteration	Definition of network and network types. Cloud based networking. Internet vs WWW. Network connection technologies.	Concepts of number bases Why we use binary. Why we use hexadecimal. Binary/denary conversions	The use of spreadsheets for data storage Create spreadsheets	The use of spreadsheets for data storage Create spreadsheets
YEAR 8 - KEY CONTENT/ LEARNING	1. Classifies a range of software including operating systems, utility and application software. Explains the difference between hardware and software, and their roles within a computer system. 2. Gives examples of how data is stored on a computer. Explains the function of the main internal parts of basic computer architecture. 3. Outlines the concepts behind the input-process-output cycle. Recognises that a range	1. Defines what an algorithm is. 2. Interprets and creates algorithms that use simple real-world sequences. 3. Use sequence, selection and iteration in flowcharts 4. Understand the four basic data types used in algorithms 5. Understand what a variable is 6. Understand how to assign and compare variables using operators 7. Interprets and creates simple	1. Define a network and know the differences between LAN and WAN 2. Understand the differences between client server and P2P networks 3. Understands the difference between the internet and the WWW 4. Understand how data is stored remotely on servers or cloud 5. Know the advantages and disadvantages of cloud-based systems	1. Be able to convert from denary to binary and binary to denary 2. Be able to add two 8-bit binary numbers 3. To understand why bases over 10 need symbolic representations 4. To be able to convert from hex to denary and denary to hex 5. To be able to convert from hex to binary and binary to hex	1. Makes judgements about digital content when evaluating and repurposing it for a given audience. Recognises the audience when designing and creating digital content. 2. Undertakes creative projects that collect, analyse, and evaluate data to meet the needs of a known user group. Effectively designs and creates digital artefacts for a wider or remote audience. 3. Uses a variety of software to manipulate and present digital	1. Makes judgements about digital content when evaluating and repurposing it for a given audience. Recognises the audience when designing and creating digital content. 2. Undertakes creative projects that collect, analyse, and evaluate data to meet the needs of a known user group. Effectively designs and creates digital artefacts for a wider or remote audience.

	of digital devices can be considered a computer. 4. Recognises and can classify a range of input and output devices.	flowcharts using sequence, operators and variables. 8. defines decomposition and abstraction	6. Understand different connection methods such as Bluetooth, wi-fi and ethernet		content: data and information. 4. Evaluates their work and makes improvements to solutions based on feedback received.	3. Uses a variety of software to manipulate and present digital content: data and information. 4. Evaluates their work and makes improvements to solutions based on feedback received.
YEAR 9 - KEY THEMES / CONCEPTS	LAN vs WAN Network topologies Internet protocol Common network protocols	Computational thinking Abstraction Decomposition Pattern recognition Algorithms Flowcharts Sequence Selection Iteration	Boolean logic Truth tables Logic gates AND gate OR gate NOT gate Boolean algebra	Memory and storage. FDE cycle. Virtual memory.	Data types Operators Basic python syntax	Programming project
YEAR 9 - KEY CONTENT/ LEARNING	1. Know the hardware that comprises a typical LAN 2. Understand network topologies and how they affect the resilience of a network 3. Understand the concept of data transfer protocols 4. Describe in detail how data is split into packets and transferred	1. Defines what an algorithm is. 2. Interprets and creates algorithms that use simple real-world sequences. 3. Use sequence, selection and iteration in flowcharts 4. Understand what a variable is 5. Understand how to assign and compare	1. Understand the concept of digital vs analog systems 2. Relate real world systems to using AND, OR and NOT gates to represent possible outcomes 3. Write truth tables for AND, OR and NOT logic gates 4. Write logic diagrams based upon	1. Understand how data and instructions are stored in main memory and how instructions are fetched from memory to be processed by the CPU 2. Understand the concept of secondary storage and know a range of secondary storage devices	1. Know the basic data types and operators in Python 2. Demonstrate input and output and variable assignation in Python 3. Interpret and create Python programs using sequence, selection, iteration, variables and operators	1. Prepare requirements for a self-determined programming project 2. Build, test and evaluate a non-trivial program (or set of programs) to fulfill the requirements 3. Use functions and persistence using files in a non-trivial program

	over a network using the internet protocol 5. Know a range of common network protocols	variables using operators 6. Interprets and creates simple flowcharts using sequence, operators and variables. 7. Understand the 4 computational thinking techniques	truth tables for AND, OR and NOT 5. Write truth tables for logic circuits with more than one logic gate 6. Draw logic circuits for truth tables representing systems with more than one logic gate	3. Evaluate secondary storage devices and be able to choose appropriately based upon speed, robustness, capacity and portability 4. Understand the concept of virtual memory and explain its importance 5. Predict possible computer systems of the future.	4. Test trivial Python programs using trace tables 5. Identify and fix logic and syntax bugs in Python programs	
YEAR 10 - KEY THEMES / CONCEPTS	Variables and constants Data types Operators Programming constructs - Sequence - Selection - Iteration	Searching and sorting algorithms Computational thinking techniques Designing, creating and refining algorithms	String manipulation File handling Data storage and SQL Arrays Subprograms Random number generator	Computer Systems Common CPU components and their functions Characteristics of CPU and the way they affect the performance of the CPU Embedded systems Secondary storage	Primary storage Secondary storage Strands of data storage Data storage Characters Images Sound Compression	Types of networks (LAN and WAN) Factors that affect network performance Client-server and P2P networks Network hardware The internet Network topologies Wired and wireless networks Encryption IP and MAC addressing Standards Network protocols Concept of layers
YEAR 10 - KEY	Data types The use of data types	Searching and sorting algorithms - Binary search	*Revisit previously taught programming techniques*	Computer Systems - The purpose of the CPU	Primary storage: - The need for primary storage	Networks and topologies - Types of networks:

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CONTENT/ LEARNING					
- Integer, real/float, boolean, character and string - Casting The use of variables, constants, operators, input, outputs and assignment Programming constructs - Sequence, selection, iteration Arithmetic operators Boolean operators - AND, OR, NOT	- Linear search - Bubble sort - Merge sort - Insertion sort Computational thinking techniques - Abstraction - Decomposition - Algorithmic thinking Designing, creating and refining algorithms - Identify the inputs, processes and outputs for a problem - Structure diagrams - Create, interpret, correct, complete and refine algorithms using pseudocode, flowcharts and reference language/high-level programming language	Use of basic string manipulation - String slicing, indexing, LEN Use of basic file handling operations - Open, read, write, close The use of records to store data The use of SQL to search for data The use of arrays (or equivalent) when solving problems, including 1D and 2D arrays. Subprograms - Functions and procedures Random number generator	- The fetch-execute cycle - Common CPU components and their function: ALU (Arithmetic Logic Strand), CU (Control Strand), Cache, Registers, MAR (Memory Address Register), MDR (Memory Data Register), Program Counter, Accumulator - CPU performance: How common characteristics of CPUs affect their performance: - Clock speed - Cache size - Number of cores Embedded systems: The purpose and characteristics of embedded system Examples of embedded systems Secondary storage: The need for secondary storage Common types of storage:	- Difference between RAM and ROM - Purpose of RAM and ROM in a computer system - Virtual memory Secondary storage: The need for secondary storage Common types of storage: - Optical, magnetic and solid state Suitable storage devices and storage media for a given application. The advantages and disadvantages of different storage devices and storage media relating to these characteristics: Capacity, Speed, Portability, Durability, Reliability, Cost Units of data storage - Bit, nibble, byte, KB, MB, GB, TB, PB - How data needs to be converted to binary - Data capacity and calculations	-LAN (Local Area Network) -WAN (Wide Area Network) Factors that affect the performance of networks -The different roles of computers in a client-server and a peer-to-peer network The hardware needed to connect stand-alone computers into a Local Area Network: -Wireless access points, Routers, Switches, -NIC (Network Interface Controller/Card), Transmission media The Internet as a worldwide collection of computer networks: -DNS (Domain Name Server) -Hosting -The Cloud -Web servers and clients -Star and Mesh network topologies

				- Optical - Magnetic - Solid state Suitable storage devices and storage media for a given application. The advantages and disadvantages of different storage devices and storage media relating to these characteristics: Capacity, Speed, Portability, Durability, Reliability, Cost	Data storage and conversions - Denary to binary conversions and vice versa - Denary to hexadecimal conversions and vice versa - Bit shifting - Binary addition and overflow errors Characters - What is a character? - ASCII and Unicode character sets Images - How an image is represented as a series of pixels, and represented in binary - Metadata - Colour depth and resolution and its effect on the size and quality of an image file Sound - How is sound sampled and stored in digital form - Effect of sample rate, duration and bit depth on the playback quality	Wired and wireless networks, protocols and layers: Modes of connection: Wired, Ethernet, Wireless, Wi-Fi, Bluetooth, Encryption, IP addressing and MAC addressing Standards Common protocols including: TCP/IP, HTTP, HTTPS, FTP, POP, IMAP, SMTP The concept of layers

					and size of the sound file Compression - Need for compression - Lossy and lossless compression	
YEAR 11 - KEY THEMES / CONCEPTS	Threats to computer systems and networks - Forms of attack Identifying and preventing vulnerabilities - Common prevention methods	The purpose and functionality of operating systems The purpose and functionality of utility software	Defensive design considerations High-level and low-level programming languages Translators IDEs Ethical, legal, cultural and environmental impacts of digital technology on wider society Legislation relevant to computer science	Exam Prep and Revision	Exam Prep and Revision	
YEAR 11 - KEY CONTENT/ LEARNING	Forms of attack - Malware - Social engineering e.g., phishing, people as the "weak point" - Brute force - Denial of service attacks - Data interception and theft - The concept of SQL injection	The purpose and functionality of operating systems - User interface -Memory management and multitasking -Peripheral management and drivers - User management - File management	Defensive design considerations - Anticipating misuse - Authentication Input validation Maintainability - Use of sub-programs - Naming conventions - Indentation - Commenting Characteristics and purpose of different	Exam Prep and Revision	Exam Prep and Revision	

Common prevention methods - Penetration testing - Anti-malware software - Firewalls -User access levels - Passwords - Encryption - Physical security	The purpose and functionality of utility software - Encryption software - Defragmentation - Data compression (Lossy and lossless)	levels of programming languages: - High-level and low-level languages - The purpose of translators - The characteristics of a compiler and an interpreter The IDE Common tools and facilities in an IDE - Editors - Error diagnostics - Run-time environment - Translators impacts of digital technology on wider society including: - Ethical issues - Legal issues - Cultural issues - Environmental issues - Privacy issues Legislation relevant to computer science - The data protection act 2018 - Computer misuse act 1990

			- Copyright designs and patents act 1988 - Software licences (i.e., open source and proprietary)			
YEAR 12 - KEY THEMES / CONCEPTS	Principles of Computer Science (External assessment – Exam)				IT Systems Security and Encryption (Internal Assessment)	
YEAR 12 - KEY CONTENT/ LEARNING	Learners study the fundamental principles of how computer systems work, including the role of hardware and software, the way components of a system work together and how data in a system is used.				Learners will study IT system security threats and the methods used to protect against them. Learners undertake activities to protect IT systems from security threats, including data encryption.	
YEAR 13 - KEY THEMES / CONCEPTS	Fundamentals of Computer Systems (External assessment – Exam)		Optional internal assessment unit		Exam prep and revision	
YEAR 13 - KEY CONTENT/ LEARNING	Learners study the fundamental principles of how computer systems work, including the role of hardware and software, the way components of a system work together and how data in a system is used.		Content taught is dependent on the learners' chosen unit.		Exam prep and revision	