

Subject: GCSE Computer Science **Year** 11 **Ability** Mixed

| Term / Date(s) | Component 1.3 (Strand 1), 2.1, 2.2 (Strand 2) | Component 1.4 (Strand 1), 2.1, 2.2 (Strand 2) | Component 1.5 (Strand 1), 2.1, 2.2 (Strand 2) |
|-----------------------------|--|--|---|
| Topic | Strand 1 - Networks and Topologies Strand 2 - Programming | Strand 1 - Network Security Strand 2 - Programming | Strand 1 - System Software Strand 2 - Programming |
| Topic overview | Strand 1 - Students will investigate types of networks (LAN and WAN / Peer to Peer and Client-Server), the hardware needed for each, how they can be represented in the form of topologies and the rules (protocols) that are used to govern the networks we use every day | Strand 1 - Students will investigate the biggest threats to computer networks, the impact they can have and the best methods of protecting against them. They will also explore the use of hacking as an ethical, employment or malicious act. | Strand 1 - Students will investigate how system software, such as operating systems are used to control all aspects of a computer system. They will also explore specific features that impact the security and performance of computer systems, such as encryption, defragmentation and compression. |
| Pupils will learn... | Strand 2 - Students will develop and implement algorithms to solve a set of computational problems, debug errors and refine solutions. | Strand 2 - Students will develop and implement algorithms to solve a set of computational problems, debug errors and refine solutions. | Strand 2 - Students will develop and implement algorithms to solve a set of computational problems, debug errors and refine solutions. |
| Components | <p>Strand 1</p> <ul style="list-style-type: none"> Recognise the features of LANs and WANs, the hardware needed to create each and the factors that impact their performance in order to understand how a network broadly functions and how its components contribute to a network Understand the role of hardware needed to connect standalone computers to networks such as WAP, routers, switches, NIC, servers and transmissions media in order to identify how a network is constructed Identify and explain the role played by DNS, hosts, web servers and clients and the cloud Identify the differences between STAR and MESH network layouts (topologies) Identify and compare the performance of connections methods used within networks in order to be able to justify the use of each in specific scenarios Identify the need for encryption within a network and how it works Identify the purpose of IP and MAC addresses in order to explain how a router can direct traffic from across a network to a specific device Recognise the need for layers within a network and the common protocols needed for a network to function to explain each set of specific rules (such as email protocols and secure web browsing) <p>Strand 2</p> <ul style="list-style-type: none"> Describe and use abstraction and decomposition when defining, and refining problems / creating solutions to identify how to break problems down into smaller, manageable parts with relevant detail, leading to more effective solutions Recognise the purpose of shapes used within flowcharts to present algorithms to read solutions and predict outcomes and possible errors Create algorithms using flowcharts and a high-level programming language (Python) to solve a set problem, correct a solution or improve it Identify and use variables, constants, operators, inputs, outputs, common arithmetic operators, assignment operators and assignments in order determine what data should be input into a solution, what is done with the data and what the outcome should be | <p>Strand 1</p> <ul style="list-style-type: none"> Identify the most common forms of network attack, including malware, social engineering, brute-force attacks, denial of service attacks, data interception and theft and SQL injections; to recognise the threats that networks are subjected to and the motivations behind those carrying out attacks Recognise the link between specific attacks and the laws they break (such as the Computer Misuse Act) in order to identify which attacks are illegal and the consequences Identify and describe common prevention methods for each type of attack, such as penetration testing, anti-malware / anti-virus, firewalls, user access levels, password control, encryption and physical security; in order to understand how a network can be protected from attacks Recognise the motivations for attacks and link to specific objectives, such as cyber-crime, ethical hacking and identity theft <p>Strand 2</p> <ul style="list-style-type: none"> Describe and use abstraction and decomposition when defining, and refining problems / creating solutions to identify how to break problems down into smaller, manageable parts with relevant detail, leading to more effective solutions Recognise the purpose of shapes used within flowcharts to present algorithms to read solutions and predict outcomes and possible errors Create algorithms using flowcharts and a high-level programming language (Python) to solve a set problem, correct a solution or improve it Identify and use variables, constants, operators, inputs, outputs, common arithmetic operators, assignment operators and assignments in order determine what data should be input into a solution, what is done with the data and what the outcome should be Understand the need for sequencing within algorithms to ensure steps take place in the correct order, and recognise / fix solutions when the order is incorrect | <p>Strand 1</p> <ul style="list-style-type: none"> Understand the role and functions an operating system plays within a computer system to identify how they are used Identify the features of a user interface to be able to articulate how a user interacts with a computer system Recognise how a computer can transfer data between memory in order to multitask and perform many tasks quickly Understand that an operating system can be used to allocate accounts, set access rights and security measures in order to manage users of the system and recognise controls that can be put into place Understand that operating systems can be used to arrange files and folders (naming, allocating to folders, moving files and saving them; in order to recognise the benefits created through the use of operating systems Understand that computers often come with utility software, and how this performs housekeeping tasks Recognise and identify examples of utility software and why it is required to explain how computer systems use software to manage specific tasks <p>Strand 2</p> <ul style="list-style-type: none"> Describe and use abstraction and decomposition when defining, and refining problems / creating solutions to identify how to break problems down into smaller, manageable parts with relevant detail, leading to more effective solutions Recognise the purpose of shapes used within flowcharts to present algorithms to read solutions and predict outcomes and possible errors Create algorithms using flowcharts and a high-level programming language (Python) to solve a set problem, correct a solution or improve it Identify and use variables, constants, operators, inputs, outputs, common arithmetic operators, assignment operators and assignments in order determine what data should be input into a solution, what is done with the data and what the outcome should be Understand the need for sequencing within algorithms to ensure steps take place in the correct order, and recognise / fix solutions when the order is incorrect |

| | | | |
|---|---|--|---|
| | <ul style="list-style-type: none"> Understand the need for sequencing within algorithms to ensure steps take place in the correct order, and recognise / fix solutions when the order is incorrect Understand and use selection within algorithms to make decisions and determine the next step within a solution, to design solutions that can adapt to the data inputted | <ul style="list-style-type: none"> Understand and use selection within algorithms to make decisions and determine the next step within a solution, to design solutions that can adapt to the data inputted | <ul style="list-style-type: none"> Understand and use selection within algorithms to make decisions and determine the next step within a solution, to design solutions that can adapt to the data inputted |
| <p>What pupils should already know (Prior learning components)</p> | <p>Strand 1</p> <ul style="list-style-type: none"> Networks can be formed by connecting more than one computer to another (<i>Year 10 1.6</i>) Devices can connect to networks through a range of mediums such as cabled or wirelessly (<i>Year 8 – Cyber Security</i>) Data travelling from one device to another can be sometimes affected by factors that limit its performance (<i>Year 9 – Networks</i>) The internet is the biggest example of a network we use every day (<i>Year 8 – Cyber Security / Year 9 – Networks and Ethics</i>) <p>Strand 2</p> <p>Within Key Stage 3 Computing, students will have been taught to</p> <ul style="list-style-type: none"> Recognise the use of shapes within flowcharts and apply them to design a solution to a real-world problem (<i>Year 9 – Algorithms</i>) Understand the meaning of abstraction and decomposition and apply them to break down or simplify problems (<i>Year 9 – Algorithms</i>) Use a programming language to solve several problems, and use a range data types and operators to perform arithmetic and logical operations (<i>Year 7 – Programming in Scratch, Year 8/9 – Python programming – Sequence</i>) Use logical operators and selection to determine decisions based on inputted data (<i>Year 7 / 8– Introducing Spreadsheets / Advanced Spreadsheets, Year 8/9 – Python programming – Sequence</i>) Recognise the use of specific programming syntax (rules) that must be followed when using a specific language <p>Within GCSE Compute Science, students will have been taught to</p> <ul style="list-style-type: none"> Use a high-level programming language to design programs to solve a specific problem Use specific data types to create variables Use sequencing, selection and iteration in combination to determine outcomes | <p>Strand 1</p> <ul style="list-style-type: none"> Data being transported around networks is at risk of interception (<i>Y11 1.3</i>) Data can be encrypted, meaning that even if intercepted, it is useless without the decryption key (<i>Year 8 – Cyber Security / Y11 1.3</i>) Hacking is one method of stealing data or damaging systems (<i>Year 9 Ethics / Y10 1.6</i>) Misusing computers is covered by the Computer Misuse Act (<i>Year 9 Ethics / Y10 1.</i>) Social engineering is the act of convincing people to give up data or access through fraud (phishing emails is an example of this) (<i>Year 8 – Cyber Security</i>) <p>Strand 2</p> <p>Within Key Stage 3 Computing, students will have been taught to</p> <ul style="list-style-type: none"> Recognise the use of shapes within flowcharts and apply them to design a solution to a real-world problem (<i>Year 9 – Algorithms</i>) Understand the meaning of abstraction and decomposition and apply them to break down or simplify problems (<i>Year 9 – Algorithms</i>) Use a programming language to solve several problems, and use a range data types and operators to perform arithmetic and logical operations (<i>Year 7 – Programming in Scratch, Year 8/9 – Python programming – Sequence</i>) Use logical operators and selection to determine decisions based on inputted data (<i>Year 7 / 8– Introducing Spreadsheets / Advanced Spreadsheets, Year 8/9 – Python programming – Sequence</i>) Recognise the use of specific programming syntax (rules) that must be followed when using a specific language <p>Within GCSE Compute Science, students will have been taught to</p> <ul style="list-style-type: none"> Use a high-level programming language to design programs to solve a specific problem Use specific data types to create variables Use sequencing, selection and iteration in combination to determine outcomes | <p>Strand 1</p> <ul style="list-style-type: none"> Hardware needs software to function (<i>Y10 1.1</i>) The base software used by any general-purpose computer system is called an Operating System (OS) (<i>Y10 1.1</i>) Any OS has software built into it to manage specific tasks, and its purpose is to manage the computer system and its performance (<i>Y10 1.1/ Y11 1.3/1.4</i>) <p>Strand 2</p> <p>Within Key Stage 3 Computing, students will have been taught to</p> <ul style="list-style-type: none"> Recognise the use of shapes within flowcharts and apply them to design a solution to a real-world problem (<i>Year 9 – Algorithms</i>) Understand the meaning of abstraction and decomposition and apply them to break down or simplify problems (<i>Year 9 – Algorithms</i>) Use a programming language to solve several problems, and use a range data types and operators to perform arithmetic and logical operations (<i>Year 7 – Programming in Scratch, Year 8/9 – Python programming – Sequence</i>) Use logical operators and selection to determine decisions based on inputted data (<i>Year 7 / 8– Introducing Spreadsheets / Advanced Spreadsheets, Year 8/9 – Python programming – Sequence</i>) Recognise the use of specific programming syntax (rules) that must be followed when using a specific language <p>Within GCSE Compute Science, students will have been taught to</p> <ul style="list-style-type: none"> Use a high-level programming language to design programs to solve a specific problem Use specific data types to create variables <p>Use sequencing, selection and iteration in combination to determine outcomes</p> |
| <p>Transferrable knowledge (skills)</p> | <p>Strand 1</p> <ul style="list-style-type: none"> The ability to search for information sources online and curate material based on relevance, factual content and needs of a specific purpose and audience Being able to use multiple pieces of software (such as a web browser, presentation software, image editing software and a cloud computing system) in quick succession to create and refine design projects The use of inference and articulation to obtain key knowledge from a topic and apply understanding when presenting findings <p>Strand 2</p> <ul style="list-style-type: none"> The use of a text-based programming language and its specific syntax to perform sequencing, selection and iteration | <p>Strand 1</p> <ul style="list-style-type: none"> The ability to search for information sources online and curate material based on relevance, factual content and needs of a specific purpose and audience Being able to use multiple pieces of software (such as a web browser, presentation software, image editing software and a cloud computing system) in quick succession to create and refine design projects The use of inference and articulation to obtain key knowledge from a topic and apply understanding when presenting findings | <p>Strand 1</p> <ul style="list-style-type: none"> The ability to search for information sources online and curate material based on relevance, factual content and needs of a specific purpose and audience Being able to use multiple pieces of software (such as a web browser, presentation software, image editing software and a cloud computing system) in quick succession to create and refine design projects The use of inference and articulation to obtain key knowledge from a topic and apply understanding when presenting findings |

| | | | |
|---|---|---|---|
| | <ul style="list-style-type: none"> Being able to articulate the need for programming constructs such as sequence, selection and iteration Being able to recognise the four main data types within programming Being able to use a combination of mathematical operators to perform arithmetic and logical operations within the text-based programming language which solve a specific problem Being able to use exemplar code snippets and explain the outcome, as well as modify the code to perform actions needed for a specific purpose | <p>Strand 2</p> <ul style="list-style-type: none"> The use of a text-based programming language and its specific syntax to perform sequencing, selection and iteration Being able to articulate the need for programming constructs such as sequence, selection and iteration Being able to recognise the four main data types within programming Being able to use a combination of mathematical operators to perform arithmetic and logical operations within the text-based programming language which solve a specific problem Being able to use exemplar code snippets and explain the outcome, as well as modify the code to perform actions needed for a specific purpose | <p>Strand 2</p> <ul style="list-style-type: none"> The use of a text-based programming language and its specific syntax to perform sequencing, selection and iteration Being able to articulate the need for programming constructs such as sequence, selection and iteration Being able to recognise the four main data types within programming Being able to use a combination of mathematical operators to perform arithmetic and logical operations within the text-based programming language which solve a specific problem Being able to use exemplar code snippets and explain the outcome, as well as modify the code to perform actions needed for a specific purpose |
| <p>Key vocabulary pupil will know and learn</p> | <p>Strand 1 - LAN, WAN, server, switch, router, NIC, WAP, transmission media (ethernet, Wi-Fi, fibre optic), bandwidth, client-server, peer-to-peer, topology, latency, lag, peripheral, protocol, layer, IP address, MAC address, DNA, IP, URL, HTTP, HTTPS, TCP/IP, FTP, POP, IMAP, SMTP, encryption, web servers, the cloud</p> <p>Strand 2 - Abstraction, Decomposition, pattern recognition, algorithm, Variables, constants, operators, inputs, outputs, selection, sequence, iteration, string, integer, float (decimal), Boolean operators, modules</p> | <p>Strand 1 - Malware, social engineering, phishing, adware, ransomware, DDOS, brute force attack, SQL injection, trojan horse, worm, virus, SQL, anti-malware, anti-virus, penetration testing, black hat hacker, grey hat hacker, white hat hacker, ethical hacking, firewalls, encryption</p> <p>Strand 2 - Abstraction, Decomposition, pattern recognition, algorithm, Variables, constants, operators, inputs, outputs, selection, sequence, iteration, string, integer, float (decimal), Boolean operators, modules</p> | <p>Strand 1 - Operating systems, user interface (command line and graphical user), memory management, multitasking, peripheral management, user management, file management, utility software, defragmentation, data compression</p> <p>Strand 2 - Abstraction, Decomposition, pattern recognition, algorithm, Variables, constants, operators, inputs, outputs, selection, sequence, iteration, string, integer, float (decimal), Boolean operators, modules</p> |
| <p>Assessment activities</p> | <ul style="list-style-type: none"> Regular low stakes assessment (MCQ, exam questions with peer and self-assessment) Use of online assessment (Forms, Kahoot, Blooket and Quizziz) Long written tasks with flash marking and extended responses <p>Content covered is used to form a Progress In class examination assessment, in the form of an exam style paper with past paper questions from the exam board (October 2022)</p> | | |
| <p>Resources available</p> | <p>Specification (Page 12, 13, 15 to 18) OCR GCSE (9-1) Computer Science Specification - J277 YouTube (Craig n' Dave) J277 videos (full specification) GCSE (J277): OCR Specification Order - YouTube BBC Bitesize Networks - Wired and wireless networks - OCR - GCSE Computer Science Revision - OCR - BBC Bitesize Star networks - Network topologies, protocols and layers - OCR - GCSE Computer Science Revision - OCR - BBC Bitesize KS4 NC information National Curriculum - Computing key stages 3 and 4 (publishing.service.gov.uk)</p> | <p>Specification (Page 14) OCR GCSE (9-1) Computer Science Specification - J277 YouTube (Craig n' Dave) J277 videos (full specification) GCSE (J277): OCR Specification Order - YouTube BBC Bitesize Forms of attack - System security - OCR - GCSE Computer Science Revision - OCR - BBC Bitesize KS4 NC information National Curriculum - Computing key stages 3 and 4 (publishing.service.gov.uk)</p> | <p>Specification (Page 15) OCR GCSE (9-1) Computer Science Specification - J277 YouTube (Craig n' Dave) J277 videos (full specification) GCSE (J277): OCR Specification Order - YouTube BBC Bitesize Systems software - Systems software - OCR - GCSE Computer Science Revision - OCR - BBC Bitesize KS4 NC information National Curriculum - Computing key stages 3 and 4 (publishing.service.gov.uk)</p> |
| <p>Notes</p> <p>Why this topic is important...</p> | <p>Strand 1 - We use networks daily. We use them to read our emails, to message our friends and family and so on. They are a vital part of our use of technology and an increasingly import aspect in our lives. Understanding the structure of networks and how they operate can help use them effectively. This component builds on the role of key components established in Year 10, now extending into the ways that millions of devices can connect and send / use data. It links specifically to 1.1 system architecture and 1.2 memory, whilst the encryption activities use algorithms explored in Year 10 with 2.1 algorithms and 2.2 programming techniques. It builds upon the Year 8 cyber security unit and leads onto the next Y11 unit; 1.4 network security.</p> <p>Understanding networks is one of the key areas for growth in the computing industry.</p> <p>Strand 2 - Students will use Boolean logic within programming and build Python representations that can act like logic gates. This is critical to being able to program effectively. Programming skills are constantly developed</p> | <p>Strand 1 - Due to the increased use of and reliance upon networks, understanding the risks they face, the damage each risk could cause and the methods for preventing attacks / limiting damage from attacks is a key concept of learning.</p> <p>As well as linking to British values (the rule of law) and 1.6 (from Year 10), this component seeks to understand the ethics behind social protest online and the damage such attacks on individuals and organisations.</p> <p>This component directly links to Year 8 – cyber security by building on top of the initial definitions set within the project. It also links to 1.6 (from Year 10) by considering the legal impact of each attack, and the ethical arguments for hacking. In terms of sequencing, this unit is vitally placed after 1.3, so as to maximise recall for parts of a network, and linking how attacks can impact each component on the network.</p> | <p>Strand 1 - This unit builds on 1.1 system architecture, by considering how hardware and software communication within a computer system. It's specific use in this sequence is to build onto an already established topic, much like with the previous two (1.3 and 1.4).</p> <p>Students will have devices that have an OS in order to function. This unit will allow them to contextualise their own usage experiences with examples of operating systems and link specific features to previous units. For example, memory management links specifically to 1.2 memory and storage from Year 10, by building on the idea of using virtual memory to keep the computer operational when carrying out lots of tasks. Equally, it builds upon some of the security features identified in Year 11 within component 1.4, as some of these features are built into operating systems. It also builds upon KS3 units such as computer components and cyber security.</p> <p>Strand 2 - Students will use Boolean logic within programming and build Python representations that can act like logic gates. This is critical to being able</p> |

| | | | |
|--|--|--|--|
| | and refined throughout all half terms or Year 10 and 11, sometimes linking directly to strand 1. | Strand 2 - Students will use Boolean logic within programming and build Python representations that can act like logic gates. This is critical to being able to program effectively. Programming skills are constantly developed and refined throughout all half terms or Year 10 and 11, sometimes linking directly to strand 1. | to program effectively. Programming skills are constantly developed and refined throughout all half terms or Year 10 and 11, sometimes linking directly to strand 1. |
|--|--|--|--|