

**CURRICULUM MAP**

Subject	Computer Science
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Head of Department	G Flatley
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SCHOOL INTENT

Rutlish School Vision: Rutlish School is committed in providing **the highest quality education and opportunities** for students.

*Through all we do, we prepare students for opportunities, responsibilities and experiences later in life. We aim to inspire, enable and facilitate lifelong learners able to build on their individual strengths and capabilities, who achieve their ambitions. We seek to support our students becoming **healthy, happy, successful** modern people young adults; knowledgeable, kind, aware, confident, capable and skilful members of society. (Curriculum Intent)*

Rutlish School Mission Statement: “Modeste, Strenue, Sancte: Be modest, be thorough, pursue righteousness”

We want students to:

succeed (we strive to provide pathways to support their success)

embrace challenge, build resilience, overcome setbacks and become increasingly independent in pursuit of their goals

be aware of their responsibilities and feel confident to participate and contribute to society. (Curriculum Intent)

DEPARTMENT INTENT

The aim of Computer Science at Rutlish is to provide a high-quality computing education which equips students to use computational thinking and to creatively understand and change the world. We study Computer Science to help us think in a more logical way and become better at making decisions and solving problems in a world that is rapidly changing and demanding technological expertise. The curriculum will teach students key knowledge about how computers and computer systems work, and how they are designed and programmed.

KEY STAGE 3 RATIONALE/ INTENT

The KS3 curriculum has been designed to ensure learners have sufficient knowledge to stay safe online and use computers safely in life. The KS3 curriculum also provides a focus on developing resilient learners who are able to learn from mistakes and effectively solve problems. The topics at KS3 give a basis of knowledge, skills and understanding to allow students to progress onto either i-Media or Computer Science at KS4 and will provide exposure to those subjects so that students can make an informed decision on their GCSE choices.

KEY STAGE 4 RATIONALE/ INTENT

At KS 4 students build on the skills they have learned in KS 3. The curriculum develops the student’s ability to become a more resilient learner that is focused on logical thinking, decomposition and abstraction of problems to ultimately become advanced at solving computational problems. Students also continue to develop skills in digital literacy where they use computer systems to create and evaluate digital products for specific audiences and purposes.

KEY STAGE 5 RATIONALE/ INTENT

The KS 5 program of study develops the ability of students to become independent learners and to use research to extend their knowledge beyond the scope of the specification. Computer Science at KS 5 provides students with the challenge of programming a computer game that embeds complexities, creativity and allows students to problem solve and follow a test driven development process. The curriculum enables students to become critical thinkers that are able to apply and evaluate their knowledge to different scenarios. The curriculum enables students to become critical thinkers that are able to apply and evaluate their knowledge to different scenarios.

QUALITY FIRST TEACHING

- Scaffolding, modelling and sample answers incorporated into all lesson resources.
- All programming tasks and theory questions set in GCSE exam question format
- Metacognition strategies incorporated into lessons through providing opportunities to peer and self-assess and reflect on progress.
- Explicit teaching of programming and computational skills to enable students to become independent learners focused on problem solving.
- Continuous recap and revise promote knowing more and remembering more.
- Self-assessment to promote independent learning, self-correction and developing individual subject knowledge.
- Algorithmic quizzes targeted at student weaknesses.

**YEAR 10: Computer Science: THEORY**

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
KNOWLEDGE	UNIT OF WORK: <u>Systems Architecture</u>	UNIT OF WORK: <u>Data Representation</u>	UNIT OF WORK: <u>Image and Sound Representation, Compression</u>	UNIT OF WORK: <u>Networks and Protocols</u>	UNIT OF WORK: <u>Network Security</u>	UNIT OF WORK: <u>Ethical Legal Cultural</u>
	The purpose of the CPU, the common components and their functions. The different factors that affect CPU performance and how primary and secondary memory is used in computers. The need for secondary storage and the advantages and disadvantages of different types of storage.	How data is represented in binary and hex. To recall knowledge from KS 3 to convert binary to denary, add and subtract binary numbers. What ASCII is and to be able to recall knowledge from KS 3 on ASCII representation. To perform logic and arithmetic shifts.	Explore how images are represented as specific code and what the effects of images size and quality is in relation to bit depth. How analogue sound are represented in binary. What lossy and lossless compression is?	Explore the different types of networks and topologies and the hardware needed to connect to different types of networks. To explore wired and wireless networks and to understand the different protocols that operate at each layer of the different types of networks.	Explore how networks come under attack and how networks can be protected from threats. To be able to identify the type of network threats and vulnerabilities. To explore the different types of OS and to understand the different purposes and functions of an OS. Types of utility software and the purpose and function of each.	Impacts of digital technology on wider society. Explore the legislation relevant to Computer Science.
KEY SKILLS	Analyse the performance of the CPU. Remember and understand the architecture the CPU. Remember and understand the purpose and characteristics of embedded systems. Evaluate the use of secondary storage to a given scenario.	Understand the methods of conversions. Apply the formulae to various problems.	Analyse graphs – identify how sound are stored in digital format. Understand the effect of sample rate on sound quality file size. Apply formulae to calculate file sizes. Understand and remember lossy and lossless compression and be able to apply the correct method of compression to a given scenario.	Remember and understand the different types of network protocols and be able to recall the different network layers and their functions. To be able to apply formulae to calculate network speed. To be able to evaluate the advantages and disadvantages of different networks and topologies. Create summaries of flipped learning materials – create your own questions, develop independent learning.	Remember and understand each of the types of threats to a network. Remember and understand the types of utility software. Understand how to identify and prevent network vulnerabilities.	Apply the relevant legislation to a given scenario. To understand and remember the impact of technology on society. To be able to evaluate the impact of technology on society, culture and ethics. Discuss the impacts of digital technology on the wider society including ethical issues, cultural issues and environmental issues. Describe the features of open source and proprietary software licences.
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	Link to KS 3: Year 7 : Introduction to computers. Year 8 : How computers work.	Link to KS 3: Year 7 : Introduction to binary. Year 8 : Data representation (build on year 7 skills + compression and image representation) Year 9 - Build on year 8 recap knowledge of year 7 and 8 + intro to Two's complement and S & M, recap on ASCII.	Link to KS 3: Year 8 - Compression algorithms topic.	Link to KS 3: Year 8 - networks topic	Link to KS 3: Year 8 - networks topic KS 3 – Online safety topics	Link to KS 3: Year – Ethical and legal









LINKS TO THE WORLD i.e. links to careers; equality; gender, class, ethnicity, etc.; different subjects	<u>Careers:</u> Link to Jon Von Neuman and Alan Turing – see PPT.	<u>Careers:</u> Alan Turing – equalities - see ppt. <u>Cross curricular</u> Link to Maths – numeracy.	<u>Careers:</u> See ppt slide on links to careers in web design and graphic design. <u>Cross curricular</u> Link to Maths – numeracy. Link to English - extended writing questions.	<u>Careers:</u> See ppt slide on links to careers in networking jobs <u>Cross curricular</u> Link to Maths – numeracy. Link to English - extended writing questions.	<u>Careers:</u> See ppt slide on links to careers in cyber intelligence officer. <u>Cross curricular</u> PSHE – online safety	<u>Cross curricular</u> PSHE & Geography
ASSESSMENTS Summative and Formative as applicable	<u>Formative:</u> Self and peer assessment Class discussions Classwork and homework Exit tickets Think pair share Quizzes Mnemonics <u>Summative:</u> End of unit test	<u>Formative:</u> Self and peer assessment Class discussions Classwork and homework Starter questions Exit tickets Think pair share Quizzes Mnemonics <u>Summative:</u> End of unit test	<u>Formative:</u> Self and peer assessment Class discussions Classwork and homework Exit tickets Think pair share Quizzes Mnemonics Retrieval power Ticket <u>Summative:</u> End of unit test	<u>Formative:</u> Self and peer assessment Class discussions Classwork and homework Exit tickets Think pair share Quizzes Mnemonics Retrieval power Ticket <u>Summative:</u> End of unit test	<u>Formative:</u> Self and peer assessment Class discussions Classwork and homework Starter questions Exit tickets Think pair share Quizzes Mnemonics Retrieval power Ticket <u>Summative:</u> End of unit test	<u>Formative:</u> Self and peer assessment Class discussions Classwork and homework Exit tickets Think pair share Quizzes Mnemonics Retrieval power Ticket <u>Summative:</u> End of unit test
FEEDBACK LESSONS PLANNED	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>
SPECIALIST VOCABULARY	CPU RAM ROM Optical Magnetic Solid state Primary and secondary storage Cache Cores Clock speed	Bit Byte Kilobyte Megabyte Gigabyte Overflow Two's complement Sign and Magnitude.	Lossy Lossless Bit depth Binary Sample rate Compression	Wireless Wired Protocol IP address Encryption HTTP, HTTPS, FTP,POP, MAP, SMTP, TCP Routers, switches WAP, The cloud Star, Mesh	Malware Phishing Brute force attack DOS attack SQL Injection Pen test Firewalls User access levels Passwords Encryption	Ethical Legal Cultural Environmental Privacy Data Protection Act Computer Misuse Act Copyright Designs and Patents Act Software licences.
QUALITY FIRST TEACHING	<ul style="list-style-type: none"> ✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions 					

**YEAR 10: Practical**

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
KNOWLEDGE	UNIT OF WORK: <u>COMPUTATIONAL THINKING, ALGORITHMS AND PROGRAMMING</u>	UNIT OF WORK: <u>Algorithms & Pseudo Code</u>	UNIT OF WORK: <u>Algorithms & Pseudo Code</u>	UNIT OF WORK: <u>Subprograms</u>	UNIT OF WORK: <u>Lists and loops</u>	UNIT OF WORK: <u>Nested Lists & File Reading</u>
	<p>To know how to use Python to code small programs from the given tasks and will be able to apply knowledge to new programming scenarios. Students will know how to use Python to code programs using the key skills listed below.</p>	<p>Students will be able to solve computational problems using flowcharts and pseudo code. They will be able to use trace tables to trace through a program to identify logic errors and to trace data at different stages of a program. They will understand Boolean logic and will be able to recall the rules for AND, NOT and OR gates</p>	<p>Students will be able to solve computational problems using flowcharts and pseudo code. They will be able to use trace tables to trace through a program to identify logic errors and to trace data at different stages of a program. They will understand Boolean logic and will be able to recall the rules for AND, NOT and OR gates</p>	<p>Through practical programming students will be able to use and recall their knowledge of selection and iteration and apply it to code programs using functions and procedures. Understand the difference between a function and a procedure and learn to organise their subprograms into larger programs that solve problems</p>	<p>Through practical programming students will be able to use and recall their knowledge of index positions, selection, and iteration and apply it to code programs that makes use of lists. Students will understand the difference between 1 dimensional and 2 dimensional arrays. They will develop solutions to larger programs using lists.</p>	<p>Through practical programming students will be able to use and recall their knowledge of lists to create programs using nested lists. Students will build their existing knowledge to code a program that can read and write data to a file. They will apply all their programming knowledge to effectively solve a complex problem.</p>
KEY SKILLS	<p>Use Python to apply the following practical skills: <u>(Recall embed skills from KS 3)</u> Escape sequences Code small programs Identify and correct syntax errors independently Maths operators Data type, variable and inputs String formatting Relational operators Selection</p>	<p>Use Python to apply the following practical skills: To be able to: Use the correct flowchart symbols to accurately sequence the steps to solve a problem. Use .draw.io software to create flowcharts. Use normal data, boundary data and erroneous data to test a program. Use a trace table effectively to trace the content of data in variables. Use the OCR Exam ref language to write and read pseudo code. Draw Boolean gates and tables.</p>	<p>Use Python to apply the following practical skills: To be able to: Use the correct flowchart symbols to accurately sequence the steps to solve a problem. Use .draw.io software to create flowcharts. Use normal data, boundary data and erroneous data to test a program. Use a trace table effectively to trace the content of data in variables. Use the OCR Exam ref language to write and read pseudo code. Draw Boolean gates and tables.</p>	<p>Use Python to apply the following practical skills: Decomposition Breaking larger programs down into subprograms. Difference between functions and procedures. Calling function/procedure Return a value to a function</p>	<p>Use Python to apply the following practical skills: For loops While loops Built in functions Validation in programs Sub programs</p>	<p>Use Python to apply the following practical skills: Reading and writing to a file Nested lists Flowcharts Pseudo code</p>
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	<p>KS 3 SOW Year 7 – Input, Output, variables, selection, data types</p>	<p>KS 3 SOW Practical programming using OR, AND to code programs making use of Boolean logic e.g. grade calculator, password program.</p>	<p>KS 3 SOW Year 9 SOW – selection and iteration.</p>	<p>KS 3 SOW Year 9 SOW – selection and iteration</p>	<p>KS 3 SOW Year 9 SOW – sorting and searching algorithms</p>	<p>KS 3 SOW Iteration Selection Decomposition</p>



LINKS TO THE WORLD i.e. links to careers; equality; gender, class, ethnicity, etc.; different subjects	Careers: See PPT slides. Famous programmers from the past. Companies that use Python Programming software used in the world of work.	Careers: <u>Cross curricular</u> PSHE & Geography	Careers: Reference should be made to careers in programming. Careers in coding, software development and programming - icould	Careers: Reference should be made to careers in programming. Careers in coding, software development and programming - icould	Careers: Reference should be made to careers in programming. These can include: software development, network security, networking, AI.	Careers: Reference should be made to careers in programming. These can include: software development, network security, networking, AI.
ASSESSMENTS Summative and Formative as applicable	Formative: Self-evaluation of programs Class discussions Think pair share Peer feedback Summative: End of unit test	Formative: Self and peer assessment Class discussions Classwork and homework Exit tickets Think pair share Quizzes Mnemonics Retrieval power Ticket Summative: End of unit test	Formative: Self-evaluation of programs Class discussions Think pair share Peer feedback Summative: End of unit test	Formative: Self-evaluation of programs Class discussions Think pair share Peer feedback Summative: End of unit test	Formative: Self-evaluation of programs Class discussions Think pair share Peer feedback Summative: End of unit test	Formative: Self-evaluation of programs Class discussions Think pair share Peer feedback Summative: End of unit test
FEEDBACK LESSONS PLANNED	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. 	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. 	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. 	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. 	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. 	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. 
SPECIALIST VOCABULARY	Escape sequences Data types Variables String formatting Relational operators Input/Output IF ELSE	Algorithms Boolean Pseudo code Abstraction Trace table Flowchart Input, Process, Output Decision	Algorithms Boolean Pseudo code Abstraction Trace table Flowchart Input, Process, Output Decision	Function Procedure Parameter Argument Return Call Decomposition Len Min Max Scope Global vs Local Types of errors – Syntax, Logic, Runtime	For loop While loop Lists Array Functions Subprograms	Reading and writing to a file Decomposition Readline Writeline Try except else
QUALITY FIRST TEACHING	<ul style="list-style-type: none"> ✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions 					



YEAR 11: Programming project & Theory						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	
KNOWLEDGE	UNIT OF WORK: Algorithms-SECTION 6	UNIT OF WORK: <u>Ethical, Legal & Cultural</u>	UNIT OF WORK: <u>DIRT: DEC MOCKS</u>	UNIT OF WORK: <u>Revision</u>	UNIT OF WORK: <u>Revision</u>	UNIT OF WORK: <u>End of course</u>
	Understand and apply computational thinking methods. Understand what linear and binary search algorithms are. Understand what bubble, insertion and merge sort algorithms are.	Impacts of digital technology on wider society. Explore the legislation relevant to Computer Science.	Y11 Mock Results will determine topics which require a refresher or which need to be re-taught..	Recap subject knowledge for each topic using know more remember more strategies:	Recap subject knowledge for each topic using know more remember more strategies:	
KEY SKILLS	<u>Be able to:</u> Trace linear and binary search algorithms. Trace bubble, insertion and merge sort algorithms. Produce algorithms using flowcharts and pseudo code. Interpret correct or complete algorithms.	<u>Be able to:</u> Apply the relevant legislation to a given scenario. To understand and remember the impact of technology on society. To be able to evaluate the impact of technology on society, culture and ethics. Discuss the impacts of digital technology on the wider society including ethical issues, cultural issues and environmental issues. Describe the features of open source and proprietary software licences.	<u>Be able to:</u> Explain the purpose of the CPU and describe and explain the functions of its key components Explain why data must be stored in binary format and how characters are represented in binary Explain how sound is stored in binary format Describe and explain different types of networks; the hardware needed to create a network; Describe the different factors influencing network performance Explain IP and Stack Protocols	Study techniques enhanced Creating knowledge organisers Using exam reference language to write and read program code.	Study techniques enhanced Creating knowledge organisers Using exam reference language to write and read program code.	
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	<u>Link to KS 3:</u> Year 9 SOW sorting algorithms	<u>Link to KS 3 & year 10:</u> Year 9 – Ethical and legal	<u>Link to KS 3:</u> Years 7-10 inclusive (these are mini refresher courses)	<u>Revisit subject knowledge:</u> Section 1 Section 2 Section 3 Section 4 Section 5 Section 6 Programming revision theory	<u>Revisit subject knowledge:</u> Section 1 Section 2 Section 3 Section 4 Section 5 Section 6 Programming revision theory	



LINKS TO THE WORLD i.e. links to careers; equality; gender, class, ethnicity, etc.; different subjects	World of work: Explicit reference to how the searching and sorting algorithms are used in the world of work.	World of work: Explicit reference to how the searching and sorting algorithms are used in the world of work.	World of work: Explicit reference to networks and how they are built in the workplace			
ASSESSMENTS Summative and Formative as applicable	Formative: Self and peer assessment Class discussions Classwork and homework Exit tickets Think pair share Quizzes Mnemonics Summative: End of unit test	Formative: Self and peer assessment Class discussions Classwork and homework Exit tickets Think pair share Quizzes Mnemonics Retrieval power Ticket Summative: End of unit test	Formative: Self and peer assessment Class discussions Classwork and homework Exit tickets Think pair share Quizzes Mnemonics Retrieval power Ticket Summative: End of unit test	Retrieval practice Interleaving Spaced practice Dual coding Quizzes Summative Revision tests	Retrieval practice Interleaving Spaced practice Dual coding Quizzes Summative Revision tests	
FEEDBACK LESSONS PLANNED	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>	Opportunity for students to reflect on learning, respond to feedback, improve work, etc. <input checked="" type="checkbox"/>
SPECIALIST VOCABULARY	Bubble sort Merge sort Trace Flowcharts Linear search Binary search	Ethical Legal Cultural Environmental Privacy Data Protection Act Computer Misuse Act Copyright Designs and Patents Act Software licences.	Systems Architecture Computer Networks How sound is stored in binary Programming Languages & IDE ASCII	See year 10 Curriculum map for keywords related to each topic.	See year 10 Curriculum map for keywords related to each topic.	
QUALITY FIRST TEACHING	<ul style="list-style-type: none"> ✓ Strategies to learn more, remember more (metacognition) used in lessons e.g. retrieval, elaboration, interleaving, dual coding, etc. ✓ Differentiation and reasonable adjustments for students with SEND, EAL, etc. such as scaffolding, visual aids, audio, physical resources, planned questioning, etc. ✓ Opportunities for Literacy, Numeracy and Oracy, including a focus on reading ✓ Opportunities to apply key concepts and address misconceptions 					



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