



YEAR 13 A LEVEL COMPUTER SCIENCE AUTUMN TERM 1 – PAPER 2

‘An ambitious curriculum that meets the needs of all’

Medium Term Planning – Algorithms

Curriculum Intent	Pupils will be taught the following National Curriculum guidelines this term:
Skills/Assessment Objective Links	<p>At the end of this Unit all students should be able to:</p> <ul style="list-style-type: none">▪ compare two algorithms in terms of efficiency▪ explain the principles of a linear and binary search▪ explain how an insertion sort works▪ state the two basic steps in a merge sort▪ show the result of merging two sorted lists <p>Most students will be able to:</p> <ul style="list-style-type: none">▪ state the time complexity of an algorithm▪ write an algorithm for a linear search▪ trace through a bubble sort algorithm▪ trace through an insertion sort algorithm▪ explain how the merge sort works <p>Some students will be able to:</p> <ul style="list-style-type: none">▪ write a recursive algorithm to solve a simple problem▪ show the changing contents of a call stack as a recursive routine is executed▪ write an algorithm for a binary search▪ write an algorithm to merge two lists▪ trace through the merge sort algorithm
Numeracy	Numbers, adding numbers, <, >
Literacy	<p>Vocabulary Tier 3: Algorithm, brute force method, divide and conquer, decrease and conquer recursion, recursive subroutine, Big-O notation, linear, polynomial, exponential, logarithmic functions, permutation, time complexity, linear search, binary search, binary tree search, bubble sort, insertion sort, merge sort, quick sort, Dijkstra’s shortest path algorithm, A* algorithm limits of computation, travelling salesman problem (TSP), computational problem, tractable and intractable problems, heuristic solution, computable and non-computable problems</p> <p>Vocabulary Tier 2: testing, anticipation, edit, run, logic, test, normal, invalid,</p> <p>Reading: Worksheets, presentations, answer sheets, exam questions, mark scheme, further reading for homework, conduct research for NEA</p> <p>Writing: Answer on the worksheet via word, complete NEA</p> <p>Oracy: listening and using tier 3 words</p>
Becoming future ready	<p>Careers/Employability:</p> <p>Understand the grade requirements at universities and the topics that can be applied for. Explore apprenticeship opportunities with a range of industries.</p> <ul style="list-style-type: none">▪ Software Architect.▪ Data Scientist.▪ Machine Learning Engineer.▪ Blockchain Developer▪ Cybersecurity Engineer.▪ Cloud Solutions Architect.▪ AI Research Scientist.▪ Full-Stack Developer.
Adaptation	Throughout this topic, quality first teaching will provide differentiation:

QFT/SEND Provision	<p>By product: Learners are asked to present outcomes writing different code, not all code will be equal in style and sophistication, all code will work with teachers input, top end programmers will be set challenges on how to extend code and be expected to conduct a level of independent research. Learners are asked to present outcomes in a different way via pieces of writing, targeted questioning, models and drawings and speaking.</p> <p>By resource: Worksheets are well presented and accessible. Instructions are clearly outlined and separate from the information so that pupils know where to begin and end. Handouts are differentiated by outcome. Resources used will appeal to the range of preferred learning styles of pupils e.g. visual, auditory or kinesthetic learners. Scaffolding of tasks – word frames.</p> <p>By Intervention: By providing different levels of supervision and support</p> <p>By Progressive Questioning: Exploring pupils' understanding through interactive dialogue using Blooms Taxonomy.</p> <p>By Grouping: According to prior coding attainment, gender, social preference, preferred learning style.</p> <p>By Task: Pupils identify targets which are meaningful via level of coding ability and feedback sheets</p> <p>By Offering Optional Activities: In class or as homework, to extend learning.</p> <p>This QFT/SEND provision will be explicit within the lesson by lesson schemes of work.</p>
Implementation Curriculum Delivery	To be able to:
Learning Outcomes (Knowledge)	<p>Topic 1 Bubble sort Be able to describe the bubble sort algorithm Be able to trace the bubble sort algorithm</p> <p>Topic 2 Insertion Sort Be able to describe the insertion sort algorithm Be able to trace the insertion sort algorithm</p> <p>Topic 3 Data Mining Understand what data mining is Be able to describe keywords and concepts Understand how Cambridge Analytica used data mining</p> <p>Topic 4 Linear and Binary Search Write and trace algorithms for linear search and binary search Analyse the time complexity of the linear search and binary search algorithms Describe and trace the binary tree search algorithm</p> <p>Topic 5 Merge Sort Understand a merge sorting method and apply Understand a merge sort algorithm and annotate Trace a merge sort algorithm using Python Visualize Complete a trace table</p> <p>End of unit assessment</p>
Current learning to be developed in the future within:	Links into understanding programming techniques, data structures and NEA
Assessment	See assessment maps for formative and summative assessment opportunities.
Impact	Review assessment results and target pupils that require further support via:- <ul style="list-style-type: none"> • Learning conversation • Changing seating plan • Plan lessons to address areas of concern in assessment • Targeted homework based on low performance areas identified in the assessment and marked pieces

- Stretch and challenge high ability pupils by identifying ambitious next steps to extend knowledge

Create a feedback sheet for each student

Each student identifies areas of Green, Amber and Red using Mark Assessment on their feedback sheet

Complete NOW task on areas identified as Amber and Red

