



YEAR 13 A LEVEL COMPUTER SCIENCE SPRING TERM 2 – 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">state applications of each graph traversalstate the purpose and applications of Dijkstra's shortest path algorithmExplain what is meant by a tractable or intractable problem <p>Most students will be able to:</p> <ul style="list-style-type: none">explain how the merge sort works and analyse its time complexityexplain how the quicksort worksdescribe applications of each graph traversalbe able to trace Dijkstra's shortest path algorithmGive examples of intractable problemsDescribe briefly the A* algorithm and its purpose <p>Some students will be able to:</p> <ul style="list-style-type: none">write a recursive algorithm to solve a simple problemshow the changing contents of a call stack as a recursive routine is executedderive the time complexity of an algorithmtrace through the quicksort algorithm
Numeracy	Polynomial, exponential and logarithmic
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 DeveloperCybersecurity 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</p>



	<p>differentiated by outcome. Resources used will appeal to the range of preferred learning 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 dialogu 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 Quick Sort Understand quick sort algorithm Be able to trace the quick sort algorithm</p> <p>Topic 2 Optimisation – Dijkstra Understand and be able to trace Dijkstra's shortest path algorithm Be aware of applications that use the shortest path algorithm</p> <p>Topic 3 Optimisation – A8/Heuristic Understand the difference between a traceable and untraceable algorithm Understand what an heuristic algorithm is Understand how to trace a heuristic algorithm</p> <p>Topic 4 Complexity Space and Time Analyse the suitability of different algorithms for a given task and data set Be familiar with measures and methods to determine the efficiency of different algorithms Define constant, linear, polynomial, exponential and logarithmic functions Use Big-O notation to compare the time complexity of algorithms Be able to derive the time complexity of an algorithm</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	<p>Review assessment results and target pupils that require further support via:-</p> <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 expand knowledge <p>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</p>