Subject Computing
Year 8 Curriculum

Purpose and aims

Computing at David Nieper Academy aims to both equip students with the skills they will need to confidently use computers as they will do in the world of work, but also to provide a robust foundation to students who wish to continue with their studies in computer science through GCSE and beyond. As well as developing skills in computing, we also recognise that computing offers a fantastic opportunity to practice and apply core skills (particularly numeracy) to new situations. The course is designed with these numeracy links in mind and provides opportunities to practice numeracy wherever possible.

Our curriculum for computing aims to ensure that all pupils:

- can understand and apply the fundamental principles and concepts of computing including abstraction, logic, algorithms and data representation

- have a solid understanding of the function of the key components inside of a computer

- can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems

- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems

- are responsible, competent, confident and creative users of information and communication technology

In year 8

Year 8 is structured as a blend of computer science and ICT. The first unit is on spreadsheets teaches students invaluable ICT skills for the world of work. The other units give an insight into the world of computer science allowing students to understand in more detail how computers operate and laying the groundwork for units in year 9 and in GCSE

Threshold concepts

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Core knowledge – be able to recall the major pieces of knowledge throughout the year. E.g. what is the memory bus? How many bits are in a byte?

Critical reasoning – be able to explain the pros and cons of a system/approach/component and decide if it is the best option in a given situation. E.g. be able to answer "explain using the fetch decode execute cycle why having a cache improves the performance of a system"

Applied Mathematics – be able to answer questions that require maths to be applied to the core knowledge. Students should be able to decide on what calculations need to be done and carry them out. E.g. be able to work out binary addition, and binary to denary conversions

Design – be able to apply the core knowledge to design a program in python to solve a problem.

Sequence of learning
At KS3 the sequence of learning is a sequence that stretches year 7,8, and 9, rather than being easily split into 3 separate schemes. For an overarching view the KS3 curriculum Map will give a better picture.

Year 8 Units (in Order)

Spreadsheets – This unit as well as giving an invaluable skill also feeds in to the python 1 unit. The use of formulas and functions is the same and students will be familiar with the concept by the time they get to the python 1 unit

Binary – This unit lays down the groundwork for a lot of computer science. Building slightly on the year 7 digital literacy unit this unit embeds the idea that all data in a computer is represented in binary. This lays the groundwork for the Computer Architecture unit, as well as the representing and compressing data and Boolean algebra units from year 9

Algorithms and Sorts – Algorithms and sorts covers a range of algorithms (step by step operations) that computers use to sort and search for data. This ingrains the need to be precise and to follow each step exactly. This supports students in the subsequent year 8 and 9 python units

Computer Architecture – This Unit Builds on the Hardware and software unit from year 7. The unit focuses around the fetch decode execute cycle and only extends as far as the RAM giving students a good idea of how a program works its way through the heart of a computer.

Python 1 – This unit Builds on the year 7 unit on scratch. The concepts established in year 7 will be used, but this time in a proper text based programming language. Students will also use concepts such as functions which have been introduce (more thoroughly than in year 7) in the spreadsheets topic.

Subject knowledge

Topic 1 – Spreadsheets	
Subject knowledge *Students should know….*	**Procedural Knowledge** *Students should know how to….*
That excel is a spreadsheeting program	How to perform calculations with formulae and functions
That excel can do calculations	How to use cell references in calculations
That the cell references can be used to make sums using other cells as input	How to use replication to quickly fill out large amounts of data
That formulae and functions are used to manipulate data	How to create graphs of different data

That charts and graphs can be used to graphically display data	

Topic 2 – Binary	
Subject knowledge *Students should know….*	**Procedural Knowledge** *Students should know how to….*
That computers use binary	How to convert between binary and denary
That binary is a base 2 number system	How to add up binary numbers
That computers store data in groups of 8 bits called bytes	How to identify if overflow has occurred
That computers use flags to show when the answer to a calculation is unusual eg. With rollover.	How to convert to and from binary ascii (when given a table)
That computers use binary to represent words and pictures, not just numbers	How to convert bitmap images to binary
	How to calculate the number of bytes needed for a specific task

Topic 3 – Algorithms and Sorts	
Subject knowledge *Students should know….*	**Procedural Knowledge** *Students should know how to….*
That an algorithm is a set of step by step instructions that are followed exactly	
That computers are much more efficient at sorting large quantities of data than human beings.	How to complete a bubble sort on up to 8 pieces of data.
	How to complete a merge sort on up to 8 pieces of data.
	How to complete a binary search
	How to accurately follow any novel algorithm

Topic 4 – Computer Architecture	
Subject knowledge *Students should know….*	**Procedural Knowledge** *Students should know how to….*
What the fetch, decode, execute cycle is and how this works.	
The key components of the CPU	
The 3 major busses that run from CPU to RAM and what data each one carries	
The idea of cache and how it can improve the performance of a computer	
What an opcode is	Trace the journey of data through the RAM, cache and CPU as a single instruction goes through the fetch decode execute cycle
	Critically evaluate the effect on performance of clock speed, and cache

Topic 5 & 6 – Python 1	
Subject knowledge *Students should know….*	**Procedural Knowledge** *Students should know how to….*

How variables can be assigned and subsequently used.	Write a program that stores a value in a variable and later uses it in a calculation and saves result in a variable
That variables can have different data types	Write programs that take inputs and convert them to an appropriate data type for use in calculations
That functions can be used to take an argument(s) and return a value(s) based on those arguments.	Use and write functions in python
What abstraction and decomposition are.	Write simple programs to calculate thing for simple real world scenarios
How a flow chart represents a code.	Create a flow chart for a given problem and code for a given flow chart
What an if statement does	Solve more complex problems using if statements
What a while loop does	Solve more complex problems using while loops
What a for loop does	Solve more complex problems using for loops and all 3 (if, while and for) choosing when each is appropriate.

Curriculum links to careers

Within the unit Python and Computational Thinking topic students will look at coding as a profession within the field of computer games development. Students watch a video of a coder who works for a top games company and he talks about the skills needed to get into coding and what he does.

Students will also look at employability and the need for IT skills within almost all jobs.