

Subject Computing

Year 9 Curriculum

ASPIRE – ENDEAVOUR - SUCCEED

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 9

In year 9 the computing focuses more on the computer science side of the course, particularly programming. Students will be given ample opportunity to develop their coding expertise in python.

Year 9 also contains the units that might require some higher-level mathematical reasoning and also units that build on a lot of previous content.

Threshold concepts

Core knowledge – be able to recall the major pieces of knowledge throughout the year. E.g. what is a network, what does ASCII represent.

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 “is a wired or wireless network better for a school setup, explain why”

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 how long it would take to download a 10GB file over a 30Mb connection

Design – be able to apply the core knowledge to design a program or in this year a logic circuit 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 9 Units (in Order)

Networks – Networks gives students an understanding of how computers communicate with each other. This unit builds on knowledge from the digital divide in year 7 (bandwidth and the idea of kilo, mega, and gigabits) as well as Hardware and software also in year 7. This also builds on the year 8 binary unit (understanding what a bit, and byte of data really are). The year 7 Cyber Security unit is also put in a new context with the understanding of viruses on networks.

Python recap – This python recap unit builds on the year 8 python unit and has 2 aims. As well as reminding students of how to use the basics of python in preparation for the later python 2 unit, this unit gives students the opportunity to use their python knowledge in new contexts, building confidence, and providing an opportunity for some creativity in the code.

Representing and compressing data – This unit builds heavily on the year 8 binary unit. As this unit covers ASCII, bitmaps and the like, it is necessary that the fundamentals of binary have to be revisited. This unit gives a great spaced retrieval opportunity which should help students embed their current knowledge of binary, as well as introduce new concepts.

Boolean Logic – Boolean Logic builds heavily on both the binary and computer architecture units in year 8. This unit then gives insight into the building blocks of logic in computer systems. Students will learn how to use the functionally complete set of logic gates (AND, OR, NOT) to design logic circuits.

Python 2 – This unit builds upon the previous python units, students will be introduced to the concepts of Arrays, and structured programming using subroutines. Students will also incorporate AND, OR, NOT from the previous unit into if statements and While loops.

Subject knowledge

Topic 1 – Networks	
Subject knowledge Students should know....	Procedural Knowledge Students should know how to....

The difference between local and cloud-based storage and some advantages and disadvantages of each.	Identify if a given application is on the cloud or local
Upload – sending things from local to the cloud Download – sending from cloud to local Streaming – downloading a small bit a time and not stored permanently in local storage.	Identify if a given application is Uploading, Downloading, Streaming
Bandwidth refers to the max transfer speed across a network	Assess how long a download will take with a given bandwidth
Different forms of wired and wireless connectivity and some advantages and disadvantages of each.	
LAN – local area network WAN – wide area network PAN – Personal area network	Identify if a scenario is a LAN, WAN, or PAN
Bits and Bytes and their kilo, mega, giga, and tera versions	Convert between the different units of data
How bus and star topologies differ and the advantages and disadvantages of each	Draw each topology
Benefits and risks of using networks	
Extension: How messages are broken into packets and what is in the packets	
Extension: How a message travels from sender to recipient using the TCP/IP stack	

Topic 2 – Python Recap	
Subject knowledge Students should know....	Procedural Knowledge Students should know how to....
The input function	Be able to write an input function to take an input from the user.
The basic data types: integer, real, character, string, Boolean	Create a variable of a particular type and cast user inputs to specific data types
The print statement	How to print information to the screen in a program
The If statement	Use an if statement to make the program do different things depending on the input
The While loop	How to use a While loop to create both condition-controlled loops and count-controlled loops.

What is meant by sequence, selection, and iteration	
	Be able to quickly incorporate new premade functions into their programs in this case from the turtle library.
	Extension: Be able to understand and create nested if statements and while loops.

Topic 3 – Representing and Compressing Data

Subject knowledge Students should know....	Procedural Knowledge Students should know how to....
ASCII and basic Unicode	Encode and decode ASCII if they have and ASCII table, and calculate the file size for extended ASCII
Bitmaps, (how file size changes with colour depth and image size)	Calculate the file size of a given bitmap. Explain how the resolution and colour depth effect the picture quality
Sound storage (how file size changes with bit depth, sampling rate and length of the audio)	Calculate the file size of a given sound file. Explain how the bit depth and sampling rate effect audio quality (not including aliasing)
Why data needs to be compressed	
What is meant by lossy and lossless compression	Do Run length encoding and a dictionary as lossless compression techniques

Topic 4 – Boolean Logic

Subject knowledge Students should know....	Procedural Knowledge Students should know how to....
That almost all electronic machines use logic gates at some level.	
1 means on and 0 means off	
Some real-world examples of logic gates being used	
That logic gates are the building blocks of the logic in computer (example in the ALU in the CPU)	

	Draw the truth table for a given scenario
	Draw the logic gates AND, OR, NOT
	Draw the truth table for each logic gate and then logic circuits
	Draw the logic circuit for a given truth table (3 inputs max) and consequently any given scenario

Topic 5 & 6 – Python 2

Subject knowledge Students should know....	Procedural Knowledge Students should know how to....
What a subroutine is	call a subroutine in python
	create our own subroutines in python
	Pass parameters to a function and returning a value from a function. (fixed number of parameters too and single parameter back)
What an Array is	How to create an array in python
	How to find, change, add, and remove elements from an array
What is meant by local and global variables	

Curriculum links to careers

Students will look at the work of a network engineer and what this role involves and what sorts of salary and opportunities are available. Students will have a sheet with questions on to answer as they watch a video of someone who does this role who discusses the sorts of tasks they do each day from buying and installing hardware across a network to ensuring a network is protected from viruses and other forms of cyber threat.