Unit 1 Cybersecurity: Journey of Knowledge

Context and Introduction to Unit:
This unit takes the learners on an eye-opening journey of discovery about techniques used by cybercriminals to steal data, disrupt systems, and infiltrate networks. The learners will start by considering the value of their data to organisations and what they might use it for. They will then look at social engineering techniques used by cybercriminals to try to trick users into giving away their personal data. The unit will look at the more common cybercrimes such as hacking, DDoS attacks, and malware, as well as looking at methods to protect ourselves and our networks against these attacks.

Prior knowledge:
Difference between data and information

Career links:
Cybersecurity Analyst
Cybersecurity Incident Responder
Forensic Analyst
Ethical hackers

RSE:
Staying safe online

CORE KNOWLEDGE

1. Data is valuable to businesses.
2. Data is collected by all businesses.
3. Data is raw facts and figures. Information is data with context.
4. Social Media companies will hold information about users including email address, payments details, locations and content liked.
5. An assumption is accepted as true without proof.
6. Social Media companies and other websites make assumptions on peoples lives to make a profile about their life.
7. Information held by social media companies leads to a more personalised experience based on likes and interests.
8. Information held by social media companies leads to personalised adverts appearing on social media pages.
9. All organisations have privacy policies which state how they collect data and what they will do with the data they collect.
10. The Data protection Act (2018) protects your data. Companies who collect your data MUST make sure it is. Secure, Used fairly, Used for a specific reason and Kept for right amount of time.
11. Data Protection Act ensures businesses protect our data or they will face fines and convictions.
12. Humans are weak points in IT systems
13. Social engineering is used by criminals to trick users into giving away data.
14. Social engineering is where data is given away and hacking is where data is stolen.
15. Three types of social engineering are shouldering, blagging and phishing.
16. Phishing emails can be spotted by a lack of spelling and grammar, links to click on, not using customer name.
17. Shouldering describes a person who looks over another person's shoulder as they enter data into a computer or another device.
18. Hackers exploit weak points in systems.
19. A DoS attack is where a network is flooded by traffic by one device. These are easier to prevent as the firewall is able to detect the IP address and block incoming requests.
20. A DDoS attack is where the network is flooded by multiple devices. These attacks are more difficult to prevent.
21. Malware is malicious software that is stored on a device without the owner's knowledge or consent.
22. Three types of malware or trojans, ransomware, viruses and spyware.
23. A ransomware attack occurs when a hacker holds information until a fee is paid.
24. Spyware is software that installs itself onto devices and then steals personal information about the user, like passwords, email addresses and other important information. A firewall monitors connections to and from your computer. If it spots something suspicious, it closes the connection or disconnects it.Anti-malware software locates and destroys malware.
25. An ethical hacker is a person who hacks into a computer network in order to test or evaluate its security, rather than with malicious or criminal intent.

ABOVE AND BEYOND

Pupils can explain the reasons why white hat hacking is ethical.
Pupils will learn about the Computer Misuse Act and the Data Protection Act and understand how they protect in different ways.

VOCABULARY

Data
Information
Data Protection
Privacy
Assumption
Social Engineering
Shouldering
Phishing
Firewall
Malicious
Malware
Ransomware
Spyware
Ethical

WHERE NEXT?

Unit 2 Computer Systems and Networks.
Pupils will develop their understanding of computer systems and networks from Y8. They will learn about the components of the CPU and how data is sent through networks as packets.

NC KS3 Links

Understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns.

Unit 2 Computer Systems and Networks: Journey of Knowledge

Context and Introduction to Unit:
In this unit pupils will learn the Von Neumann computer architecture. Pupils will learn the function and purpose of the PU along with its three main parts. Pupils will learn how the performance of a CPU can me maximised. Pupils will learn the difference between memory and storage and study each main type of memory and storage in depth in order to be able to compare and contrast.

Prior knowledge:
Pupils will need a prior understanding of the basic definition of a computer system along with an awareness of the function of the CPU.

Career links:
IT Technician
Systems Designer
Network Engineer

CORE KNOWLEDGE

1. The CPU has three parts
2. Control Unit (CU) Has overall control and executes instructions
3. Arithmetic Logic Unit (ALU) performs all calculations
4. Cache Very fast memory inside the CPU which stores regularly used data.
5. Von Neumann's architecture describes a system where the CPU runs programs stored in memory
6. Three factors that effect the performance of a CPU include clock speed, cache memory and number of cores.
7. Overclocking is the practice of increasing the clock rate of a computer to exceed that certified by the manufacturer
8. Underclocking is when the computers clock speed is decreased lower than the recommended speed.
9. Memory contains data currently being used by the CPU
10. ROM is a form of permanent storage which contains the BIOS / Boot up instructions.
11. RAM is a form of temporary storage which contains the data currently in use.
12. Storage can be internal or external.
13. Storage is how data is stored when it is not being used by the CPU
14. HDD (Hard Disk Drive) is the computers internal storage.
15. A network is where two or more devices are connected together to communicate.
16. A server is a large computer that controls a network.
17. A client sends requests to the server. A server processes the requests for the client.
18. A LAN is a local area network, a WAN is a wide area network.
19. A network needs to be connected wirelessly or wired.
20. A network needs to have a NIC / Router / Modem and a WAP (wireless)
21. A client is a device
22. Packet switching is the process of breaking down files into packets to send across a network.
23. A packet contains a header and a payload.
24. A header contains destination address / sending address / order and sequence

ABOVE AND BEYOND

Explain the impact of cache on a computer system.
Discuss the most effective method of improving performance of cache.
Programming LMC.
Registers (MAR / MDR / PC)

VOCABULARY

processor
architecture
cache
executes
volatile/non-volatile
storage
memory
ROM / RAM
Permanent
Solid state
Magnetic
Optical
Client
Server
Router
NIC
WAP
Packets

WHERE NEXT?

Unit 43 Data Representation and algorithms

Pupils will develop their knowledge of data representation by learning how to convert hex to denary and binary and why programmers use hex. They will learn the key sorting algorithms.

NC KS3 Links

Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems
understand how instructions are stored and executed within a computer system.

Unit 3 Data representation and algorithms : Journey of Knowledge

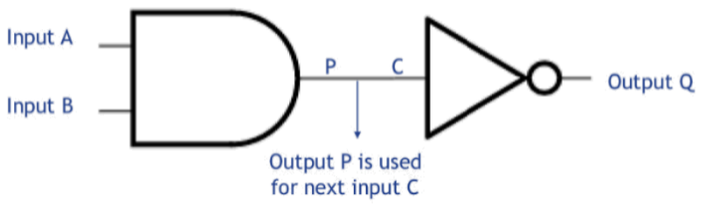
Context and Introduction to Unit:
In this unit pupils will build on their existing knowledge of data representation and will be able to convert between binary/denary /hexadecimal. Pupils will understand how images are represented by binary . Pupils will expand on their existing knowledge of logic gates and will be able to complete truth tables for complex logic gates. Finally, pupils will be able to explain the purpose of sorting algorithms and will carry out bubble and insertion sorts.

Prior knowledge:
Pupils can convert between binary/denary. Pupils can add binary numbers. Pupils understand how AND, OR and NOT logic gates work and complete truth tables.

Career links:
Learning Engineer
Digital Transformation Engineer
AI Software Engineer

CORE KNOWLEDGE

1. Hexadecimal uses a Base-16 number system. It has 16 units (0-9) and the letters A, B, C, D, E and F.
2. Hex 1 = 1, or the Hex A = 10, B = 11 and so on….
3. Images are broken down into pixels and each pixel is represented using one specific colour.
4. Resolution measures the quality of an image.
5. The amount of available colours used within an image depends on colour depth. The Pixels Per Inch (PPI) is how many pixels there are in an image per inch.
6. Using a higher the resolution and/or colour depth would result in an increased file size.
7. A complex logic gate is when two or more logic gates are combined (EXAMPLE BELOW)
8. A bubble sort swaps pairs of data into the correct order. A bubble sort may have to go through a list more than once to sort the data.
9. A bubble sort is inefficient but uses few instructions and is a simple algorithm.
10. An Insertion sort uses two lists, a sorted list and unsorted list. Data from the unsorted list is inserted into the sorted list in the correct position.
11. Q = NOT (A AND B)



ABOVE AND BEYOND

Draw and construct NOR / XOR gates and complete a truth table.
Write a Boolean expression for all logic gates.

VOCABULARY

Hexadecimal
Binary
Denary
Bitmap
Vector
Bit depth
Resolution
Pixel
Algorithm
Pseudocode
Flowchart
Boolean
Insertion

WHERE NEXT?

Unit 4 Programming

Pupils will develop their knowledge of Python programming language to write programs using sequencing, selection and iteration.

NC KS3 Links

- Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems.
- Understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem

Unit 4 Python Programming : Journey of Knowledge

Career links.
Programmer
Ethical Hacker
Software Engineer
AI Engineer
Games developer
Web development
SQL

Context and Introduction to Unit: Computational Thinking/Python

Overview statement of the unit.
In this unit pupils will expand on their existing computational thinking knowledge. Pupils will be able to sort and search complex computational problems. Pupils will be able to compare algorithms to evaluate which will work best. Pupils will expand on their existing knowledge of Python programming. Pupils will be able to construct programs which include IF statements, loops and functions.
Prior knowledge (KS2/KS3)
Python basics including printing, variables and data types

CORE KNOWLEDGE

1. A syntax error is an error in the programming language and the code will not run
2. A logic error means the program will run but not as intended.
3. A list is a variable which hold several values.
4. For loop will repeat code a specific number of times
5. A for loop can be used to iterate through an array
6. An array is a list of related data saved under one variable name
7. While Loop will repeat until a condition is met
8. Casting is changing from one data type to another
9. Concatenation - joining strings together
10. Float is a decimal number
11. If statements can test multiple conditions using and / or

Python Syntax

Data types	Float (Real,. Decimal) float()
Condition statements	and / or i if x == 3 or x == 7 if name ==”Tom” and age == 6
Iteration - Looping	for loop for I in list while loop while x ==7
Casting – changing from one data type to another	str() int()
Concatenation - joining strings together	+
Arrays – Lists	1d - list = [2,3,4,5,1,2,3]
Subroutines	def MySub() print “Hello welcome to my game) MySub()

ABOVE AND BEYOND

Pupils can construct programs which include lists, tables and arrays.
Functions / procedures
Advanced string handling

VOCABULARY

Condition statement
Boolean
Logic
Syntax
Variable
Array
Iteration
Operation
Sequencing
Concatenation
Casting
Selection
Iteration
Float

WHERE NEXT?

GCSE Computer Science

NC KS3 Links

Use 2 or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays];
design and develop modular programs that use procedures or functions
understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming.