Year 9- Unit 1 Artificial Intelligence

Context and Introduction to Unit: This unit introduces pupils to the world of Artificial Intelligence (AI) – where computers are designed to think and learn like humans. Pupils will explore how AI works, its real-life uses, and the impact it has on jobs, society, and the future.

Prior knowledge: No prior knowledge

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Core Knowledge:

1. AI stands for Artificial Intelligence – it means machines doing tasks that usually need human thinking.
2. AI can learn, solve problems, understand language, and make decisions like a human would.
3. The idea of AI started in the mid-1900s with early computer scientists like Alan Turing.
4. AI has grown because of better computers, more data, and smarter software.
5. Machine Learning (ML) is a part of AI – it means computers learn from data instead of being given exact instructions.
6. Two examples of machine learning are supervised learning and reinforcement learning.
7. Supervised Learning. Teach the machine to perform the task. Provide the machine with examples. Program the machine to learn from examples
8. Reinforcement Learning Teach the machine to perform the task. Provide the machine with feedback. Program the machine to learn from feedback
9. AI is already part of daily life – for example, Siri, Alexa, YouTube recommendations, and smart home devices.
10. AI makes life easier by saving time, giving useful suggestions, and doing boring tasks automatically.
11. AI is used in many industries like healthcare, transport, entertainment, and finance.
12. In healthcare, AI helps doctors find diseases and choose the best treatments.
13. In transport, AI helps run self-driving cars and manage traffic.
14. In finance, AI can spot fraud and help with investing.
15. AI can replace some jobs, so people may need to learn new skills for future work.
16. AI can be unfair if the data it learns from has bias – this can lead to wrong or unfair results.
17. A chatbot in Python is a simple AI that can talk to users and collect feedback to improve a product.

Challenge Learning:

Research a current real-world problem (e.g. climate change, traffic congestion, medical diagnosis, or online safety) and design a proposal for how Artificial Intelligence could help solve it.

Core Vocabulary (Tier 3):

Artificial Intelligence
Machine Learning
Deep Learning
Neural Network
Algorithm
Data
Automation
Bias
Virtual Assistant
Chatbot

Upcoming Unit:

Unit 2 – Computer Systems and Networks.

KS3 NC links:

Not currently on KS3 NC

Career Links:

An **AI Engineer** develops and programs smart systems that can think, learn, and make decisions like humans. The average UK salary is between **£50,000 and £70,000** per year.
A **Data Scientist** uses data to find patterns, make predictions, and help businesses make better decisions. The average UK salary is between **£45,000 and £65,000** per year.

Year 9- Unit 2 Computer Systems & 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 be 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:
Year 8: Pupils have an understanding of the basic definition of a computer system along with an awareness of the function of the CPU.

Core Knowledge:
1. The CPU has three main parts
2. Control Unit (CU) has overall control and executes data and instructions.
3. Arithmetic Logic Unit (ALU) performs all calculations and logical operations.
4. Cache is very fast memory inside the CPU which stores regularly used data.
5. RAM is a types of memory that stores the data for currently running programs.
6. RAM is a type of volatile storage.
7. ROM is a type of memory that stores the BIOS / (Boot up instructions).
8. ROM is a type of non-volatile storage.
9. A server is a computer that manages and stores files and provides services to other computers on the network.
10. A WAP stands for wireless access point and allows wireless devices to connect to a network.
11. A router are used to send data signals across the internet.
12. In a client server network a client sends requests to the server. A server processes the requests for the client.
13.In a peer-to-peer network there are no servers and peers store their own files.
14. Packet switching is the process of breaking down files into packets to send across a network.
15. Packets are transmitted over a network from one computer to another through routers before reaching their final destination. When packets arrive at their destination, they are reassembled into the original data.
16. Packets can travel through oceans through fibre-optic cables.
17. A packet contains a header and a payload.
18. A header contains destination address / sending address / order and sequence.

Challenge Learning:

Pupils can explain the impact of cache on a computer system.

Core Vocabulary (Tier 3):

Processor
Architecture
volatile/non-volatile
ROM
RAM
Permanent
Client
Server
Router
WAP
Packets
Payload
Header

Upcoming Unit:

Unit 3- Data Representation and algorithms.

KS3 NC 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.

Career Links:
Cyber Security professionals are responsible for protecting IT infrastructure, devices, networks, and data. Average annual salary = £65,000

Year 9- Unit 3 Data Representation & Computational Thinking: 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:
Year 8: 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.

Core Knowledge:

1. Hexadecimal is a base-16 number system using digits 0–9 and letters A–F.
2. In hexadecimal, A to F represent decimal values 10 to 15.
3. One hexadecimal digit equals four binary digits (bits).
4. Hex is commonly used in computing for compact binary representation.
5. It simplifies reading and writing long binary numbers.
6. Hexadecimal is often used in memory addresses and colour codes.
7. Converting hex to binary involves replacing each digit with its 4-bit binary equivalent.
8. Converting hex to decimal involves multiplying each digit by powers of 16.
9. Web colours use hexadecimal codes like #FF0000 for red.
10. Pixels are the smallest units of a digital image.
11. Image resolution is the number of pixels in width and height.
12. Colour depth is the number of bits used to represent each pixel's colour.
13. Higher colour depth allows more colours but increases file size.
14. Higher resolution improves image quality but also increases file size.
15. Image file size depends on resolution, colour depth, and compression.
16. Sorting algorithms arrange data in a specific order.
17. Bubble sort repeatedly swaps adjacent elements if they are in the wrong order.
18. Bubble sort is simple but inefficient for large datasets.
19. Insertion sort builds a sorted list by inserting elements into the correct position.
20. Insertion sort is more efficient than bubble sort for small or nearly sorted data

Challenge Learning:

Pupils will learn how complex logic gates work.

Core Vocabulary (Tier 3):

Binary
Denary
Algorithm
Circuit
Switch
Boolean
Logic
Truth table
Linear search
Binary search
Pseudocode

Upcoming Unit:

Unit 4- Python Programming.

KS3 NC 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

Career Links: Graphic Designer

Year 9- Unit 4 Programming: Journey of Knowledge

Context and Introduction to 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
Year 8: Pupils can apply key programming concepts including such as variables, inputs, selection and loops.

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 variable is a named location which can hold data. Variables can be assigned or added based on user input.
4. String handling is when strings can be manipulated for example: reverse string, length of string.
5. Concatenation means joining strings together
6. Casting is changing from one data type to another
7. If statements can test multiple conditions using and / or
8. A list is a variable which hold several values.
9. An array is a list of related data saved under one variable name
10. For loop will repeat code a specific number of times
11. A for loop can be used to iterate through an array
12. While Loop will repeat until a condition is met
13. A procedure is a block of reusable code.
14. A function is a block of reusable code that returns a value back into the main program.

Challenge Learning:

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

Core Vocabulary (Tier 3):

Logic
Syntax
Variable
Array
Iteration
Operation
Sequencing
Concatenation
Casting
Iteration

Upcoming Unit:

Unit 5- Creativity.

KS3 NC 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.

Career Links:
Programmer- Writing and testing code. Average annual salary = £36,419

Year 9- Unit 5 Creativity: Journey of Knowledge

Context and Introduction to unit:
Spreadsheets are powerful tools used to organise, calculate, and analyse data efficiently using a grid of rows and columns. In this unit, you will learn how to use key features such as formulas, functions, data validation, and charts to manage and present information clearly.

Prior Knowledge:
Basic knowledge of spread sheet through Year 8 mail merge task

Core Knowledge:

1. A spreadsheet is used to store, organise, and manage data.
2. A row is a horizontal line of cells, such as Row 1.
3. A column is a vertical line of cells, such as Column A.
4. A cell is the intersection of a row and a column, like A1.
5. Each cell can contain text, numbers, or formulas.
6. Formulas perform calculations using cell values.
7. The =SUM() function adds values in a range of cells.
8. The =AVERAGE() function calculates the mean of selected cells.
9. The =MAX() function finds the highest number in a range.
10. The =MIN() function finds the lowest number in a range.
11. The =IF() function returns different values based on a condition.
12. The =COUNTIF() function counts cells that meet a specific condition.
13. Cell references can be relative (A1) or absolute (A1).
14. Charts can be created to visually represent spreadsheet data.
15. Data can be sorted in ascending or descending order.
16. Filters allow users to display only the data that meets certain criteria.
17. Conditional formatting changes cell appearance based on rules.
18. Validation rules help prevent incorrect data entry.
19. Spreadsheets can be used for budgeting, analysis, and planning.
20. Saving and backing up spreadsheets helps protect important data.

Challenge Learning:

Pupils will be able to use advanced skills such as using Macros.

Core Vocabulary (Tier 3):

Spreadsheet
Cell
Row
Column
Formula
Function
IF
COUNTIF
Validation
Chart

Upcoming Unit:

GCSE Computer Science or ICT

KS3 NC links:

Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users

Create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability

Career Links:
Accountancy and Finance