

Year 8 Curriculum Overview ICT 2023-24

	Autumn 1 Data representation (8.1)	Autumn 2 Computer systems (8.2)	Spring Term Improving the internet (8.3)	Python programming (8.4)	Term 3 Ready Player One (8.5)
Approximate Number of Lessons	6	6	14	6	6
Curriculum Content	Students will study how data is stored on a computer as well as the logic that is required to make them work.	Students will study what computer systems are and how they work as well as how to create simple animations.	Students will study issues surrounding the use of the internet and how to create a variety of products to explain how it can be improved.	Students will use PRIMM to study how the computational constructs can be used in Python to solve problems.	Students will study the Ethical, Legal, Cultural and Environmental concerns surrounding the use of technology.
Links to prior learning	Students will need an understanding of computational logic from year 7 and of numbers	Students will build on their understanding of software used for different tasks as well as what they learned about network hardware in year 7	Students will need an understanding of Office software and digital literacy from all previous units.	This builds on algorithms from year 7 and will also make use of students understanding of logic from data representation	Students will build on their understanding of computers from the world around them.
Cultural Capital Opportunities	Watch The Martian and The Emoji movie One minute mentor videos	Watch Wreck-it Ralph breaks the internet, The social network and The circle Visit Bletchley park or the Computing history museum in Cambridge One minute mentor videos	Watch The social dilemma, The social network and The circle Challenge misuse of the internet Discuss better uses of the internet One minute mentor videos	Myths that need debunking about programmers https://recruitingtimes.org/recruitment-and-hr-technology-news/21724/myths-need-debunking-programming-jobs/ One minute mentor videos	Watch Ready Player One, War games, The social dilemma, The social network and The circle One minute mentor videos
Assessment Focus	Online assessment covering Data rep and year 7 units out of 50 marks.		Online assessment covering Data rep, hardware and software, e-safety and year 7 units out of 50 marks.	Online end of year assessment covering all year 7 and 8 units out of 50 marks.	
Name of Knowledge Organiser/Link to Organiser:	Data rep knowledge organiser	Computer systems knowledge organiser	Cyber wisdom knowledge organiser	Python knowledge organiser	Ready player one knowledge organiser

Data Representation

What do I need to know?

- Why binary is used in computing
- How to carry out denary / binary conversions
- Why hexadecimal is used in computing
- How to carry out denary/ binary / hexadecimal conversions
- How images are represented by a computer
- How sounds are represented by a computer
- How Boolean logic works
- How to carry out binary addition

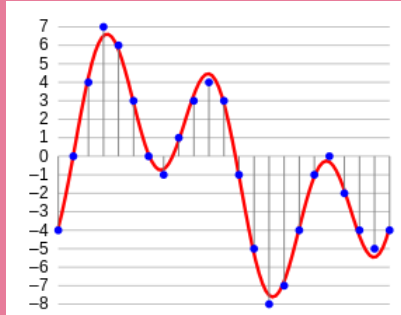
Text

- Each character is given a unique number
- This is converted into binary
- Characters will always be in order
- A popular character set is ASCII

Number	Letter
65	A
66	B
67	C
68	D

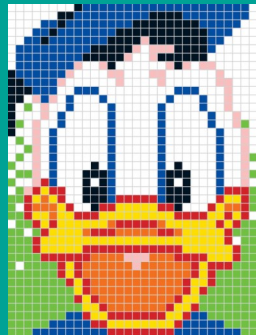
Sounds

- Analogue sounds must be converted into digital sounds (binary)
- A sample is taken at regular intervals (sample frequency/ rate)
- The accuracy of each sample is determined by the bit depth
- The accuracy of the wave is determined by the sample rate



Images

- Each image is made up of pixels
- The pixel is stored as a binary number which represents the colour of the pixel
- Each colour has a unique binary number
- The number of colours is determined by the colour depth
- The number of pixels in an image is known as its resolution. This is worked out by multiplying the width and height



Binary addition

There are four rules that need to be followed when adding two binary numbers which are:

- $0 + 0 = 0$
- $1 + 0 = 1$
- $1 + 1 = 10$ (binary for 2)
- $1 + 1 + 1 = 11$ (binary for 3)

Add the numbers in each column together and carry any numbers according to the rules above.

$$\begin{array}{r}
 01010011 \\
 +01110110 \\
 \hline
 11001001 \\
 \text{1 1 1 1 1} \leftarrow \text{This line is the carry-over from the sum before}
 \end{array}$$

Boolean Logic

The gates determine what is output for different combinations of the inputs.

AND			OR			NOT	
A	B	C	A	B	C	Input	Output
0	0	0	0	0	0	0	1
0	1	0	0	1	1	0	1
1	0	0	1	0	1	1	0
1	1	1	1	1	1		

Number conversions (Denary > Binary > Hex)

Binary to denary (01001101)

- Place the binary numbers under the binary place values starting from right to left

128	64	32	16	8	4	2	1
0	1	0	0	1	1	0	1

- Add together the headings where there is a 1 underneath
- E.g. $64+8+4+1=77$

Denary to binary (56)

- Work from the left and attempt to subtract the place value from your number
- If you can do it without getting a negative number then put a 1 under the heading and use the answer in the next column
- If you can't put a 0 under the heading and move to the next column
- Repeat until the end

128	64	32	16	8	4	2	1
0	0	1	1	1	0	0	0

Binary to hexadecimal (01001101)

- Split the Byte in half, this time use the top place values to convert each half (nibble) into denary
 - If the number is more than 9 use the letters A to F instead
- E.G. the left would be 4, the right would be $8 + 4 + 1 = 13$
 $13 = D$
Final answer = 4D

8	4	2	1	8	4	2	1
128	64	32	16	8	4	2	1
0	1	0	0	1	1	0	1

A	10
B	11
C	12
D	13
E	14
F	15

Hexadecimal to Binary (F5)

- Use the top headings to convert each digit of the hexadecimal number to binary
- Make sure you keep them on the correct side (left to left and right to right)

8	4	2	1	8	4	2	1
128	64	32	16	8	4	2	1
1	1	1	1	0	1	0	1

F=15

Vocabulary

Binary	Base 2 number system used by computers as they are made from transistors that only have 2 states.
Hexadecimal	Base 16 number system used by humans to represent long binary numbers.
Pixel	Smallest element of an image (Picture element).
Resolution	Number of pixels in an image or defined area.
Colour depth	Number of bits used to represent 1 pixel. This affects the number of colours which can be represented.
ASCII	One of the most common character sets computers use.
Character set	A list of symbols that a computer can recognise.
Digital sound	The result of a sound being sampled and stored on a computer.
Analogue sound	The original sound before it is sampled by a computer.
Sample	Measuring the height/ amplitude of a sound wave at a specific point in time.
Sample frequency/ rate	The number of samples recorded every second.
Bit depth	The number of bits used to represent each sample.
Boolean logic	This is the logic of a computer based on the result of expressions using AND, OR and NOT.

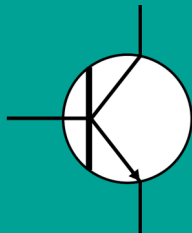
Computer Systems

What do I need to know?

- Why binary is used in computing
- What a computer is
- Some of the people responsible for development of computers
- What hardware components do
- What the operating system does
- How Boolean logic works
- What AI is
- What opensource software is

Binary

- Computers are made from switches which can only be on or off
- Logic rules are used to execute instructions
- Switches are made from transistors



General purpose computers

- Early computers were only calculation machines
- Modern computers are reprogrammable
- New apps/ software can be installed to allow the computer to do different tasks
- Modern computers still have the input, process output model of early computers



People responsible for computer development

- Blaise Pascal
- Charles Babbage
- Ada Lovelace
- George Boole
- Alan Turing
- Margaret Hamilton
- Mark Dean



Hardware

- **Memory**
 - Stores programs and data while they are open
 - Accessed by the processor
- **Storage**
 - Stores programs and data while they are closed
 - Allows data to be stored long term
- **Processor**
 - Runs instructions
 - Processes data



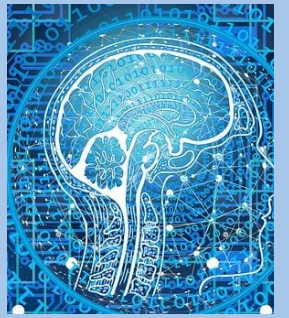
Boolean Logic

The gates determine what is output for different combinations of the inputs.

AND			OR			NOT	
Inputs		Output	Inputs		Output	Input	Output
A	B	C	A	B	C	A	C
0	0	0	0	0	0	0	1
0	1	0	0	1	1	1	0
1	0	0	1	0	1	1	0
1	1	1	1	1	1	1	0

Artificial intelligence

- Computer systems which automate processes
- Early AI allowed computers to carry out repetitive tasks
- Currently it is very good at:
 - Games
 - Maths simulations
 - Scheduling
- Improvements have been made in:
 - Identification of objects/ sounds/ text
 - Robotics
 - Generating speech from text
- **Machine learning** is driving improvements in:
 - Language translation
 - Understanding and answering questions
 - Self driving vehicles
 - Diagnosing medical conditions



Operating system jobs

- **File management:** Deciding where data is stored on storage devices
- **Resource management:** Deciding memory and processing time allocations
- **User interface:** The way the user interacts with the computer
- **Input/ output control:** Managing input and output devices (peripherals)
- **Task management:** Decides how program instructions are run
- **Security:** Ensuring that user files are protected

Open source software

- Software where source code can be accessed
- Allows a user to change how the software behaves
- Changes should be reshared to the community
- Original software should be acknowledged in any changes
- Mostly, this is free software but donations can be encouraged
- Testing is carried out by large communities
- Software may not be as thoroughly tested as closed source software



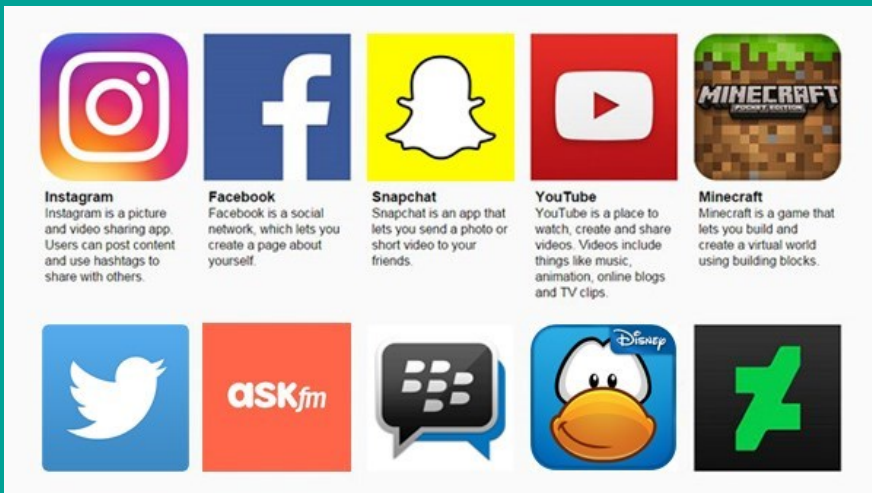
Vocabulary

AI	Short for Artificial intelligence, it is a term used to explain a computer able to do human tasks
Closed source (proprietary)	This refers to software where the program code is not accessible to be modified unless you work for the organisation
Communication	Where data is shared between devices
Device	A single object which can share, receive or process data
Instructions	Steps that a computer will follow
Logical operator	A symbol which indicates an action on two or more inputs
Machine learning	A more advanced form of AI where the computer attempts to get better at a task when it is given more data
Memory	A piece of hardware which stores programs and files whilst they are open
Open source	This refers to software where the source code is accessible by anyone and can be edited to suit the need of the user
Operating System	This is a piece of software responsible for managing the hardware, software and user interaction of a computer system
Processor	A piece of hardware which is responsible for carrying out instructions and processing data. It is also known as the CPU.
Program	A collection of instructions which allow the user to perform tasks
Storage	Also known as secondary storage, this is a piece of hardware which stores files and programs once they have been closed

What do I need to know?

- Main risks when online your using computers
- How you can keep yourself safe when using technology
- Where to go if you need advice or if you are worried about something
- What different laws mean
 - PEGI
 - Copyright
 - Child protection

Social media apps



Technology risks

- Cyberbullying
- Inappropriate content
- Online grooming
- Hacking
- Viruses
- Online gaming
- Sexting
- Privacy and identity theft
- Phishing



ZIP IT

Keep your personal stuff private and think about what you say and do online.



BLOCK IT

Block people who send nasty messages and don't open unknown links and attachments.



FLAG IT

Flag up with someone you trust if anything upsets you or if someone asks to meet you offline.

Tips for staying safe

- 1) Don't post any personal information online – like your address, email address or mobile number.
- 2) Think carefully before posting pictures or videos of yourself. Once you've put a picture of yourself online most people can see it and may be able to download it, it's not just yours anymore.
- 3) Keep your privacy settings as high as possible
- 4) Never give out your passwords
- 5) Don't befriend people you don't know
- 6) Don't meet up with people you've met online. Speak to your parent or carer about people suggesting you do
- 7) Remember that not everyone online is who they say they are
- 8) Think carefully about what you say before you post something online
- 9) Respect other people's views, even if you don't agree with someone else's views doesn't mean you need to be rude
- 10) If you see something online that makes you feel uncomfortable, unsafe or worried: leave the website, turn off your computer if you want to and tell a trusted adult immediately.



Vocabulary

Cyber Bullying	Repeated behaviour intended to hurt someone emotionally using technology.
Sexting	Sending messages (images, text, audio and video) of a sexual nature.
Virus	A computer program designed to damage or steal computer files.
Phishing	An attempt to gain information through pretending to be someone trusted.
Gaming	Playing computer games on phones, tablets, consoles and other computing devices.
Hacking	Attempting to gain access to a computer without permission.
Social media	Apps or websites which allow communication between people.
PEGI	A rating system designed to prevent people playing games not appropriate for them.
Copyright	A law which prevents people from using digital content (text, images, audio, games, software etc.)

Python Programming

What do I need to know?

- Explain the 3 computational constructs
- Describe what algorithms will do
- Use a range of programming functions, for example:
 - Print
 - Input
 - Variables
 - Loops
 - If statements

Programming examples

Task	Python Code
Output	<code>print("Text")</code>
String Input	<code>input("Prompt :")</code>
Int Input	<code>int(input(" : "))</code>
Decision	<pre>if pass == "1234": print("login") else: print("failed")</pre>
Conditional loop - While Unknown number of iterations	<pre>While pass != "1234": Pass = input(":")</pre>
Iterator Loop FOR Known number of iterations	<pre>for i in range(0,5): print(i) for item in list: print(item)</pre>

Understanding code

The code below will count from 0 up to the number typed in.

- Firstly it asks for a number
- It then sets the starting number
- A loop is set up to repeat until count is no longer less than number
- The loop will print count and then add 1 on to count

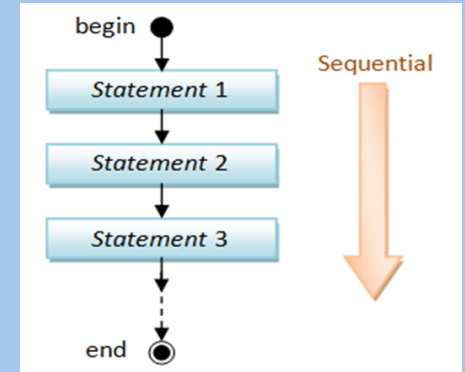
```
number=int(input("Please enter a number: "))
count=0

while count < number:
    print (count)
    count=count+1
```

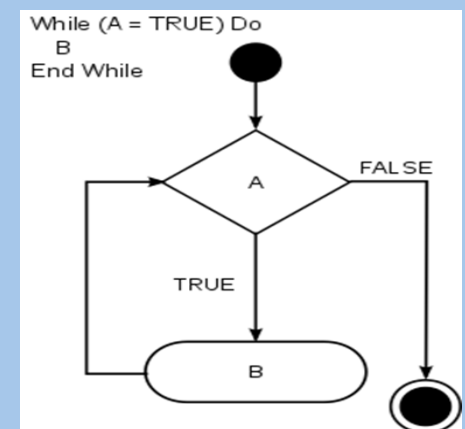
Programming constructs

There are 3 main elements that make up computational thinking. As you learn to program you will learn to use these building blocks to create ever more complex solutions to problems. The 3 computational constructs are explained below.

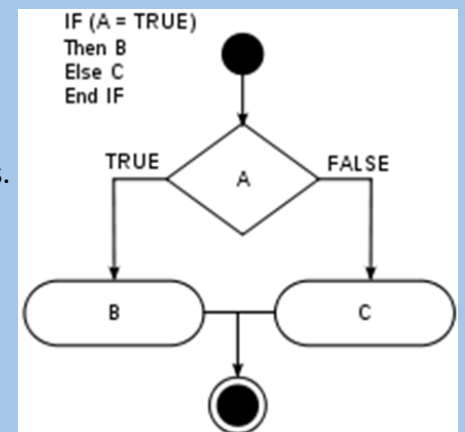
Sequence- This is a set of instructions in order.



Iteration- This is the process of repeating a set of instructions. Also known as a loop.



Selection- Where the algorithm makes a decision based on a choice of different paths.



Vocabulary

Algorithm	A set of instructions to complete a task.
Logic error	An error which doesn't stop the program from running but gives an unexpected result, e.g. used + instead of -.
Syntax error	An error which won't allow the program to run because the rules of the language have been broken, e.g. incorrect spelling of print.
Runtime error	An error which stops the program from running because it is trying to do something that is impossible, e.g. divide by 0.
IDE	The software used to help write the code.
Shell	Where a Python program is run.
String	Data consisting of collections of characters (text).
Float/ real	Data which is a decimal number.
Integer	Data that is a whole number.
Boolean	Data that is either True or False.
Mathematical operator	An operator used for Mathematical calculations (+, -, /, *, ^, %)
Comparison operator	An operator used to compare two values (==, !=, <, <=, >, >=)

Ready Player One

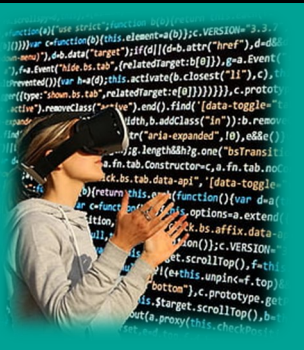
What do I need to know?

- Evaluate the need for the data protection act and surveillance laws
- Understand the need for copyright law
- Explain how to acknowledge other people's work
- Evaluate my impact on the environment when using technology
- Explain ways to help improve mental health when using technology
- Explain ways to help improve physical health when using technology



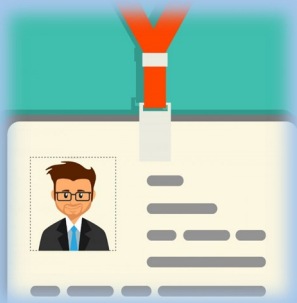
Virtual worlds

- Impacts of VR and IT technology on society
- Social skills and learning to interact in the real world
- Physical fitness, ergonomics, obesity
- Environmental impact less greenhouse more e-waste



Why protect personal data ?

- Privacy—people should be able to choose with whom they share personal information.
- Could be used by criminals to commit identify theft and fraud
- Could be used to illegally discriminate against the person



Data Protection Act 2018

Computer systems store lots of personal details, and personal data can be very valuable. This data needs to be protected and only used in the right way.

The principles

- Data should be processed lawfully and fairly
- You can only collect data for specific and legitimate purposes
- You can only collect the data you need, you can't ask for data that you don't need
- You have to keep the data accurate up-to-date
- You can't keep data for any longer than you need to use it
- You must ensure that data is protected securely



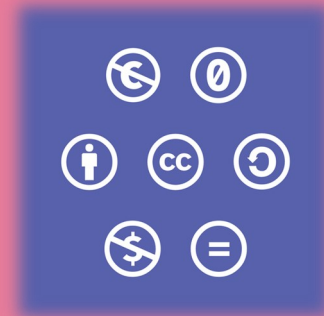
Copyright

- Copyright is the exclusive right of an author to make copies of their original work.
- For example the authors of book, films, games sell copies of their work to make a living encouraging them to make new works.



Creative Commons

Creative Commons are a set of licences allowing authors to share their work with the permissions they see fit.



This allows their work to be copied, distributed, edited, remixed, and built upon whilst keeping their original copyright.

Investigatory Powers Act 2016

- Allows authorities to hack into computer systems holding evidence
- Require telecom companies to store and provide authorities access too everyone's usage for 12 months.
- Has safeguards such as being overseen by a judge



Environmental Impact

- Computer usage contribute to our ever increasing demand for energy and greenhouse emissions
- Computers can be used in smart cities, homes cars to help reduce energy usage by making process more efficient.
- Computers/smartphones are replaced frequently leading to electronic waste
- Made of rare materials not readily recycled (e-waste laws)



Vocabulary

Virtual reality	A computer generated simulation of a world or environment which can be interacted with
Morals	Rules individuals follow based on their upbringing
Ethics	Rules set out that are governed by external sources
Law / Legislation	Rules set up by governments which must be followed by society
Personal data	Data linked/about a specific person
Plagiarism	Copying other people's ideas without crediting them
Copyright	A law designed to protect people's original works
Creative commons	A license which allows ideas to be shared but the copyright retained
Surveillance	Collecting data and information about people