Lucere Aude
Ormiston Bolingbroke Academy

YEAR 9
COMPUTER SCIENCE

KNOWLEDGE ORGANISER

The computer science department are introducing a new learning initiative in which all students in Key Stage 3 will be provided with knowledge organisers. We believe these will have a positive impact on your child's achievement and approach to revision, providing them with the best opportunity to be successful during assessments and examinations.

We have created a bank of resources, known as knowledge organisers, to be used both at home and in lesson. National research demonstrates knowledge organisers have a significant impact on the progress made by all students, no matter what their ability is. As a parent/carer it will also provide you with the opportunity to support your child at home.

How you the parent/carer can help:

- Print off and pin up knowledge organisers along with your child's timetable
- Encourage and reward your child when doing homework and revision
- Use the knowledge organisers to test and quiz your child on the current topic

HALF TERM 1

CYBERSECURITY

Cybersecurity looking at common attacks and methods to protect ourselves and our networks against these attacks.
Data: raw facts and figures
Information: data that has been processed and has context

Data Protection Act 2018:
All organisations and people using and storing personal data must abide by the DPA principles . It states how data should be stored/accessed and what rights a data subject has for the protection of their data.
Computer Misuse Act 1990: It is an offence to

have unauthorised access to computer material

have unauthorised access with intent to commit or facilitate the commission of further offences

commit unauthorised acts with intent to impair, or with recklessness as to impairing, the operation of a computer.

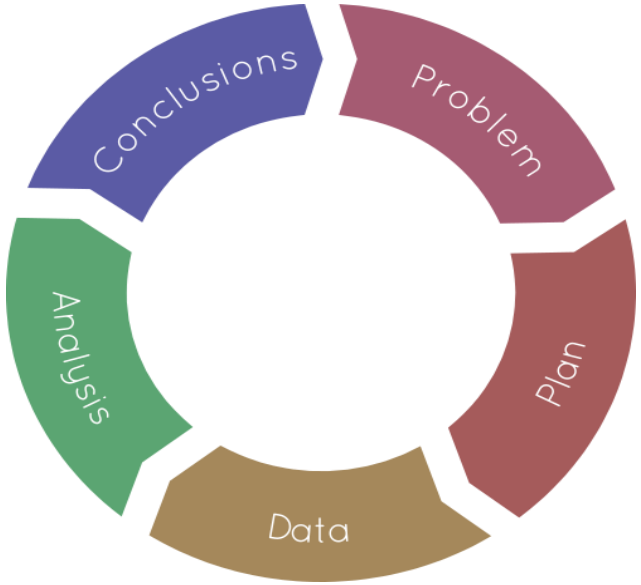
Hacking in the context of cyber security is gaining **unauthorised** access to or control of a computer system .

Unethical versus ethical hacking

Penetration testers (pen testers) are people who are paid to legally hack into computer systems with the sole purpose of helping a company identify weaknesses in their system.

Key words	
adware	adverts for products a user may be interested in, based on internet history
authentication	verifying the identity of a user or process
auto update	updating software to remove vulnerabilities automatically
biometrics	'password' created from the user fingerprint, iris, retina, facial, voice
blagging	inventing a scenario to obtaining personal information
CAPTCHA	Completely Automated Public Turing Test To Tell Computers and Humans Apart
DoS/DDoS	Denial of Service attack/Distributed Denial of Service
encryption	mathematically converts data into a form that is unreadable without a key
firewall	checks incoming and outgoing network traffic for threats
hacking	gaining **unauthorised** access to or control of a computer system'
malware	a variety of forms of hostile or intrusive software
penetration testing	testing a network/program for vulnerabilities
pharming	redirecting web traffic to fake websites designed to gain personal information
phishing	messages designed to steal personal details/money/identity
ransomware	virus which locks a computer and encrypts files until a "ransom" is paid
script kiddies	hackers with no technical hacking knowledge using downloaded software
shouldering	directly observing someone enter personal details e.g. PIN number, password.
social engineering	manipulating people so they give up personal/confidential information
spyware	gathers information about a person or organisation without their knowledge
trojans	masquerades as having a legitimate purpose but actually has malicious intent
viruses	self-replicating software attached to another program/file
worms	Replicate and spread through the network

HALF TERM 2



DATA SCIENCE

Extract meaning from large data sets to gain insights & support decision-making

Data visualisations are visual representation of data (such as charts and graphs) intended to help an audience process the information more easily and get a clear idea about the data at a glance.

Infographics are visual representations of data, often involving pictures that reflect patterns and help tell a story.

Infographics can include visualisations.

Define the problem that needs to be solved and pose questions that can be investigated.	**Predict an answer to the question(s). Find a data set or make a plan to collect the data.**	**Gather the data. You should then cleanse the data before moving onto the next step.**	**Visualise the data. Spot any patterns, trends, correlations, or outliers. Write down your observations about what the data is showing you.**	**Answer the question and explain what the data reveals. Decide on a conclusion. Take action or form further questions to investigate.**

Key words:		
anomalies	conclusion	correlation
criteria	data analysis	data capture
data cleansing	data collection	data source
insight	outliers	prediction

HALF TERM 3

MEDIA ANIMATIONS

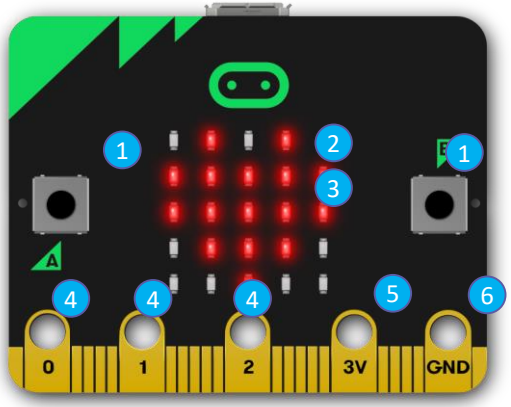
Stop motion - manually animate every frame of the animation e.g. Shaun the Sheep ● **slower to make animations** ● **More difficult to edit**	**Keyframe animation** - pick the important locations, the keyframes and the computer works out the rest (called tweening) e.g. Pixar films ● Faster to make animations ● Easier to edit ● Smoother animations ● Repeatable

Key words		
add	colour	cut
edge	knife tool	extrude
face	keyframe	focus
edit	vertex	location
loop	tweening	object
organic	proportional	rotate
render	ray tracing	scale
timeline	subdivision	mode

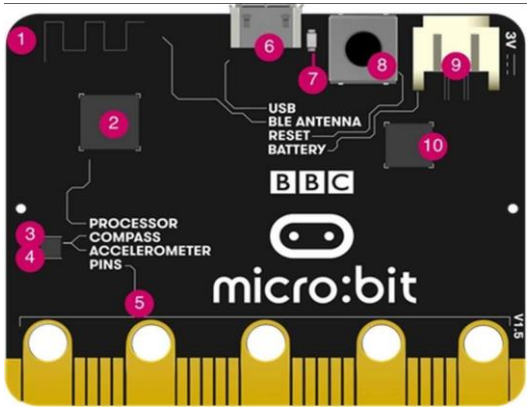
Definitions	
Face:	A surface made up of three or more sides. **Faces** are often referred to as **polygons.**
Vertex:	A point where one or more edges meet
Edge:	A line connecting two vertices
Objects:	Scenes are made up of geometric, control, lamp and camera objects
Keyframes:	Used for tracking change, a key is a marker in time
Ray tracing:	Rendering that involves tracing the path of a ray of light through the scene
Rendering:	The process of computationally generating a 2D image from 3D geometry
Subdivision:	Creating smooth higher poly surfaces which can take a low polygon mesh as input.
Proportional editing:	Transforming selected elements
Extrude:	Extend an object

HALF TERM 4

PHYSICAL COMPUTING



1. **Buttons: input**
2. **LED display: output**
3. **Light sensor: input**
4. **Pins – GPIO: input/output**
5. **Pin - 3 volt power**
6. **Pin - Ground**



1. **Radio & Bluetooth antenna**
2. **Processor & temperature sensor**
3. **Compass**
4. **Accelerometer**
5. **Pins**
6. **Micro USB socket**
7. **Single LED**
8. **Reset button**
9. **Battery socket**
10. **USB interface chip**

Keywords	
Micro:bit	A small computer with a microprocessor that can execute a single program at a time.
Buttons	Capture user input and makes things happen
LED display (Light Emitting Diodes)	5x5 LED matrix output used to display information.
Light Sensor	Input, measures how much light is falling on the micro:bit.
GPIO (General-Purpose Input Output) pins	Input and output connects headphone, sense touch and add other electronics.
Temperature sensor	Input measures how warm the environment is.
Compass	Input, finds magnetic north or measures magnetic field strength
Accelerometer	Input detects gestures and measures movement in 3 dimensions.
Radio	Communication input and output allows communication with other devices
MicroPython	The programming language
Algorithm	A set of instructions to be followed to complete a given task or solve a problem.
Program	A sequence of instructions used by a computer.
Sequence	The order which the computer will run code in, one line at a time.
Selection	A decision made by a computer, choosing what code should be run only when certain conditions are met.
Condition	Checking to see whether a statement or sum is true or false.
Iteration	When a section of code is repeated several times – also known as looping.
Variable	Something which can be changed in a computer. Made up of a name and some data to be saved.

HALF TERM 5

PYTHON PROGRAMMING

Python is a **text** based **programming language**. That can be used to create programs, games, applications and much more!

A **program** is a set of precise instructions, expressed in a **programming language**.
Translating the programming language is necessary for a machine to be able to **execute** the instructions.

To execute a Python program, you need a **Python interpreter**.

This is a program that translates and executes your Python program.

A list is where values can be stored. This is a comma-separated list of values (items) in square brackets.

```
flavours = ["strawberry", "chocolate", "mint",
"cherry","raspberry"]
```

This is an data structure organised in a structure, each item has its own index indicating its position in the list.
NOTE: List item numbering starts from 0—zero based system

When this code is executed
print (flavours[2])
Mint will be output as it is looking in the list flavours and selecting index position 2 to output

Arithmetic operators + addition, - difference, * multiplication, / division, // integer division % remainder of integer division, ** exponentiation (to the power of)

Useful snippets of code	
list.append(item)	Add an item to the end of a list
list.insert,index.item)	Inserts an item to a given index
list.pop(index)	Remove item at given index and return it
list.remove(item)	Remove the first item from the list with a particular value
list.index(item)	Search for the index of an item
list.count(item)	List the occurrences of the item
list.reverse()	Reverse the list
list.sort()	Sort the list

Use an structure , a (**while**) when the program needs to **repeat** actions, while a **condition** is satisfied.

for loops are convenient for **iterating** over any sequence of elements

Walk through the program keeping track of what is happening to lists and variables as the loops are executed.

HALF TERM 6

REPRESENTATIONS GOING AUDIO VISUAL

Computers represent all data, including numbers, letters, symbols, images, videos and sounds using binary numbers. All binary numbers are made up of the digits) and 1.

0s and 1s are called binary digits, or bits. All characters are represented using sequences of bits.

Computers only use the two binary digits 0 and 1 because all computers are built out of electrical switched which can only be on (1) or off (0).

When computers store **bitmap or raster** images they are broken down into individual elements called **pixels** and each pixel is represented by a binary number which the computer can interpret to determine what colour to display.

The **more pixels** you have in an image the **higher the resolution is**. This allows you to capture more detail and have **higher quality** but it also makes the **file larger** which means you need more storage space, **more processing time** and **more time for transmission** (e.g. over the internet)

Image manipulation is when we change or edit an image in some way. No matter what type of manipulation we use, the computer has to perform arithmetic operations on the digits that store our image in order for our changes to be displayed.

All sound is created by a variation in air pressure. Microphones convert those variations in air pressure into variations in electric voltage. Digital devices represent these waveforms as sequences of bits this is called digitising.

Key Words	
Binary number	A number system that contains two symbols, 0 and 1. Also known as base 2
Pixel	The elements of a digital image are called pixels (**pict**ure **el**ements)
Bit (b)	The smallest unit of data. 0 or 1.
Resolution	The number of pixels in a digital image.
megapixels	1 Megapixel is a million individual pixels.
Colour depth	The fixed number of binary digits used to represent each pixel's colour. E.g. in a black and white image we would only need to use 0 for white and 1 for black so we have a colour depth of 1 bit.
Bitmaps or raster images	Digital images that are formed using a binary representation of each pixel's colour.
RGB colour	One way of representing colour is to use a sequence of 24 bits, which are divided into three separate 8-bit components, each representing the quantity of red, green, and blue in the combination .
Representation size	How many bits are required to represent an image or sound
Digitising	Converting analogue data to digital data.
Sampling rate	The number of samples taken per second.
Sample Size	The number of bits recorded per sample.

Sound Representation Size = Sampling rate x sample size x duration x channels

Image Representation Size = Resolution (rows x columns) x Colour depth