Year 7 Knowledge Organizers
Understanding Computers
Spring term 1

Overview:

KEY WORDS: LOOK, COVER, WRITE AND CHECK

ASCII	American Standard Code for Information Interchange
Binary	A numeric system that only uses 2 digits, 0 and 1
CD-R	CD-Recordable. A CD/DVD that data can be saved to
CD-ROM	A read only CD/DVD/Blue-ray
CD-RW	CD-Rewritable. A Cd/DVD that data can be saved to then then reused
CPU	Central Processing Unit
Denary system	Also known as the decimal system
Hardware	A computing object you can touch, such as a keyboard or a printer
Input device	A piece of computing hardware that can be used to enter data into a computer, such as a keyboard or a mouse
Output device	A piece of computing hardware that displays or outputs data, such as a monitor or a speaker
RAM	Random Access Memory
RFID	Radio frequency ID
ROM	Read Only Memory
Software	A computer program (a computing object that you cannot touch) such as Microsoft Word, Internet explorer or Scratch
Storage device	A piece of computing hardware that is used to permanently record or store data, such as a hard drive or a CD

Key Learning that will take place in this unit:

- The elements of a computer, including hardware, software, Input devices, output devices and storage devices.
- The processes of the Central Processing Unit.
- The different storage devices, the advantages and disadvantages of these.
- Basic binary.
- Future technologies and the impact these may have on our lives.

Not just PCs (personal computers) but all computerised devices such as smart phones, the tills in the supermarkets, ATMs etc.

Hardware/Software:

Hardware is something that you can touch, such as a keyboard, the mouse, a printer or a CD but **Software** you cannot touch, it is the programs that run on the computer, such as Microsoft windows.

Input/Output/ storage devices:

Hardware is further defined as an input device, an output device or a storage device.

An **Input** device, such as the keyboard, enters data.

An **Output** device, such as the speakers outputs the data.

A **storage** device such as a CD-ROM or a USB memory stick, holds the data.

Data storage:

Stored data can be measured in bits, a bit is a very small amount of data, like the letter 'a'. There are 8 bits in 1 byte.

Data units:

	Bytes
Kilobyte	1,000
Megabyte	1,000,000
Gigabyte	1,000,000,000
Terabyte	1,000,000,000,000

Data translated:

Kilobyte = about 14 lines of text

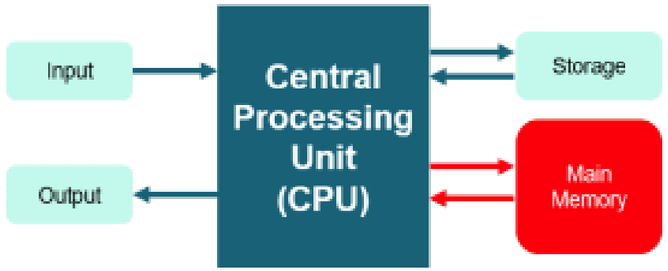
Megabyte = A good size novel

Gigabyte = About 300 MP3s or 40 minutes of a movie

Terabyte = About 1,000 copies of the Encyclopaedia Britannica.

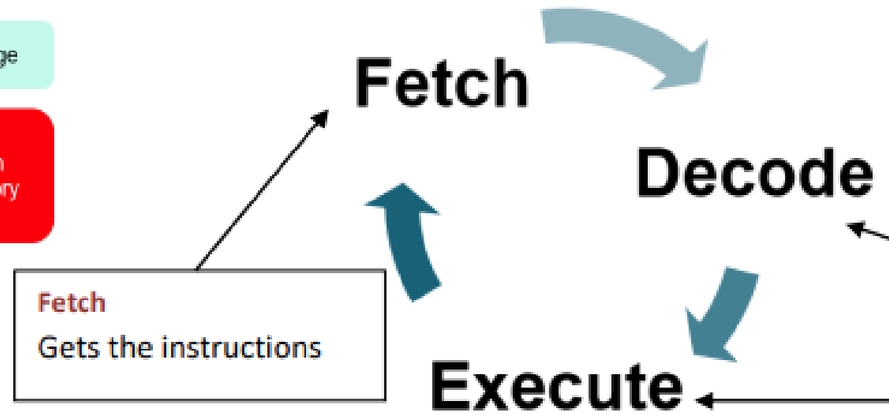
The CPU (Central Processing Unit):

The CPU is the part of the computer that carries out the instructions of the computer program, using the fetch-decode- execute cycle, it is like the brain of the computer.



The speed the CPU carries out each FDE (fetch-execute- decode) is measured in Hertz (Hz).

1 cycle per second = 1 Hz (1 instruction carried out per second)



Fetch
Gets the instructions

Decode
Works out what needs to be done

Execute
Carries out the instructions

Computer memory – RAM and ROM:

There are two different types of memory **ROM (Read only memory)** which hold data such as the software. It is read only so the data is protected. **RAM (Random Access Memory)** is like a short-term memory storage. It temporarily stores the data your computer is using but doesn't save it to a permanent file. The contents of RAM are lost as soon as the power to the computer is turned off.

Processing speeds now compared to processing speeds historically:

The guidance computer on the Apollo 11 mission had a processing speed of 0.043 MHz (1MHz = 1,000,000 cycles per second).
An iPhone 6 has a processing speed of 1.4 GHz. (1GHz = 1,000,000,000 cycles per second)

Emerging technologies:

Moore's Law states that the number of transistors in integrated circuit boards doubles every two years. This means that we need less devices to perform more tasks.

The effect of changing technologies

- Connectivity
- Convenience
- Creativity & Design
- Globalisation & Collaboration
- Potential & Innovation
- Research & Discovery

Emerging technologies include:

- Driverless cars
- Advanced robotic capabilities
- Advances in medicine
- Advances in space exploration
- And…. ?

If Moore's law is correct and continues at the same pace it would mean that a 32Gb memory card, in 10 years, can be replaced by a 1Tb memory card.

Binary: 0100001001101001011011100110000101110010011111001

Numbers - Binary compared to decimal:

The decimal system uses different characters 0 – 9 to represent numbers, laid out in units, 10s, 100s etc. We know that 156 is the same as 1x100 + 5x10 + 6x1 or:

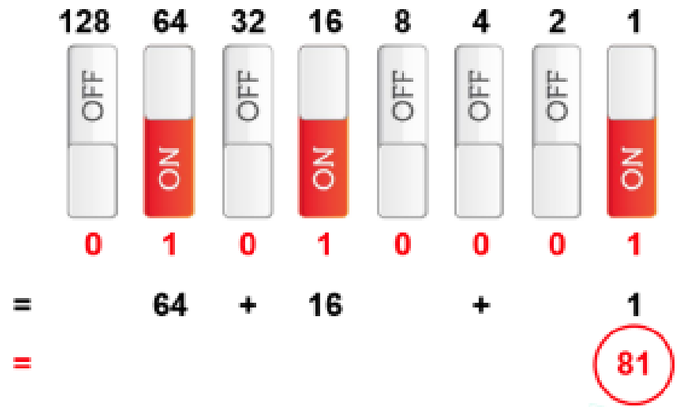
100	10	1 (unit)
1	5	6

Binary uses a similar different system, rather than 100, 10s etc as shown in the table below. 1 = yes or true and 0 = no or false.

156 in binary:

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

128+ 16+8+4 = 156



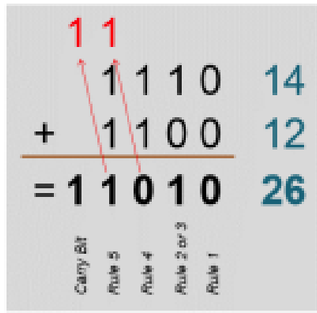
Addition in binary:

When adding binary numbers there are similarities with the rules used when adding integers…

The rules of binary addition

Work right to left and apply these simple rules:

1. 0 + 0 = 0
2. 0 + 1 = 1
3. 1 + 0 = 1
4. 1 + 1 = 0 *Carry 1*
5. 1 + 1 + 1 = 1 *Carry 1*



0100001001101001011011100110000101110010011110010110000001101100011011110110111101101011011100110110000001101000011000010111001001100100001100000001010110001100000001101000011010110110111001100000011101000011010110110111001100000011101000011010110110111001100000011101000100

Characters in binary (American Standard code for Information Interchange ASCII):

ASCII is used in nearly all computers. There is a binary code for every character on the computer keyboard as shown in the table below.

Decimal	Binary	Character	Decimal	Binary	Character	Decimal	Binary	Character
32	00100000	space	64	01000000	@	96	01100000	`
33	00100001	!	65	01000001	A	97	01100001	a
34	00100010	"	66	01000010	B	98	01100010	b
35	00100011	£	67	01000011	C	99	01100011	c
36	00100100	$	68	01000100	D	100	01100100	d
37	00100101	%	69	01000101	E	101	01100101	e
38	00100110	&	70	01000110	F	102	01100110	f
39	00100111	'	71	01000111	G	103	01100111	g
40	00101000	(	72	01001000	H	104	01101000	h
41	00101001	)	73	01001001	I	105	01101001	i
42	00101010	*	74	01001010	J	106	01101010	j
43	00101011	+	75	01001011	K	107	01101011	k
44	00101100	,	76	01001100	L	108	01101100	l

Originally only 7 bits were used but this limited the number of characters that were available.

Note:
The character '5' on the keyboard is not the same as the number 5 (think strings and integers coved in the python unit)

At home:

Use the useful links – select 'tests', test your knowledge.

Find the ASCII table online – can you decode the coded message? (hint: split it into blocks of 8 bits)

Can you find the processor speed of the devices you use at home?

Useful links:

BBC Bitesize: Hardware and software
https://www.bbc.co.uk/bitesize/guides/zcxgr82/revision/1
BBC Bitesize: The CPU and the fetch-execute cycle
https://www.bbc.co.uk/bitesize/guides/zws8d2p/revision/1
BBC Bitesize: Binary
https://www.bbc.co.uk/bitesize/guides/z26rcdm/revision/1
BBC Bitesize: Technology through time
https://www.bbc.co.uk/bitesize/guides/z4p4jxs/revision/1

Test yourself?

1. What is an input device? List as many as you can.
2. What is an output device? List as many as you can
3. What is a storage device? List as many as you can
4. What is hardware?
5. What is software?
6. What is ROM?
7. What is RAM?