THE DUSTON SCHOOL 4-19

Knowledge Organiser

Computing

Year 7 term 2: Systems architecture & Binary

Enquiry Questions

- What **Computer Systems** do we use in our daily life?
- What are the main **elements** of a computer that differentiate it from other devices?
- What are the Key **differences** between an input, output and a process?
- What are some of the key components of a **Computer System**?
- How to Computers **communicate** with each other using **Binary** language?
- How do we **add** a **binary** number?
- How new **developments** in IT/Computer technology have helped improve the following aspects of our life in the **modern world.**

Vocabulary

Computer System is a machine that can store, or taken an input of data, process it and output it to meaningful information.	**Data** Computer data is a bunch of ones and zeros, known as binary data. Because all computer data is in binary format, it can be created, processed, saved, and stored digitally.	**Information** Meaningful representation of data into text, sound, images, which humans can actually use in their day to day use is described as information. Information is computer data processed or stored by a computer.
Hardware Any computer component that you can physically touch is hardware for example, CPU, RAM, keyboard	**Software** Any data/ information in the form of programs you run on your computer as classed as soft3ware. An example of this could be Mac OSx, I OS, even windows 10, Fortnight game.	
Input When data is fed into the computer system by a human being or a sensor for processing.	**Process** is when the Central Processing Unit (CPU) is able to carry out the thinking. So as an example, tasks such as calculations, sort, comparing, and searching of data and representing it into meaningful data which we call information.	**Output** When data or information is represented to us in the form of sound, image, text. These could be outputted by various devices that we know as speakers, monitor and even a printer.
CPU is the brain of a computer system which carries out the fetch- decode – execute cycle, in other words all the processing of data is carried out in this unit.	**Motherboard** Is the main circuit board found in the PC system, which connects all the hardware components of the PC, and allows all components to talk to each other?	**Ram** The random access memory holds data temporarily which needs to be accessed immediately by the CPU, this data could be anything that you are currently using while browsing websites, using word documents or playing a game.
Secondary Storage Is device which stores information long term such as your hard drive which stores your files, documents and your movies?	**FDE cycle** Is when the CPU fetches data from the RAM, Decodes it and then executes it.	**Hertz** Is when a CPU completes one FDE cycle per second, these day our PCs can do this 1,000,000,000 per second , in other words 1 Ghz.
Binary language is simplest language which computers use to communicate with each other, and it is comprised up of only two numbers, a 0 and a 1.	**ASCII** The letter "A" on a keyboard converts to 01000001 in binary A code where each number represents a character can be used to convert text into binary. One code we can use for this is called ASCII.	**Byte** Is an 8 bit number , such as 00001111 , our school computers can contain One billion of similar numbers.

Homework & Knowledge

Homework Tasks

1. What is the Input, Output and the process in supermarket Self-checkout system? Due ……..
2. Can you use your skills and knowledge gained from lessons using ASCII to convert a secret message into Binary, and also include the answer so that your peer can convert it back successfully? Due ……..

Knowledge:

What is a computer system?

Is a machine made up of hardware and software. This machine can store, or taken an input of data, process it and output it to meaningful information.

What is Hardware?	What is Software?
Objects that you can touch, like a Music CD. For example: **Disks, disk drives, display screens, keyboards, printers, boards, and chips**.	You cannot 'touch' software. Software refers to the programs that run on a computer, rather like the music playing on a CD. Examples of software: **Windows, MS Word, MS Excel, Kodu and Logo**.

Homework & Knowledge

Central Processing Unit

The main chip in a computer is the microprocessor chip, which is also known as the CPU (central processing unit). The CPU is mounted on a printed circuit board called the main board or mother board. This chip is considered to be the controlling chip of a computer system since it controls the activities of other chips as well as outside devices connected to the computer, such as monitor and printer. In addition, it can also perform logical and computational tasks.

Memory or Storage Unit

Memory or Storage unit is used for storing Data during before and after processing. The capacity of storage is expressed in terms of Bytes.

Memory

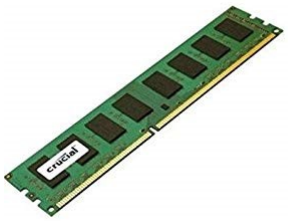
This unit retains temporarily results till further processing, For example, Random Access Memory (RAM).This memory is volatile, which means data is disappears when the power is lost.

Storage

The storage or "secondary storage" is used for retain digital data after processing for permanently. For example hard drive. The Storage is non-volatile in nature.

Output Unit

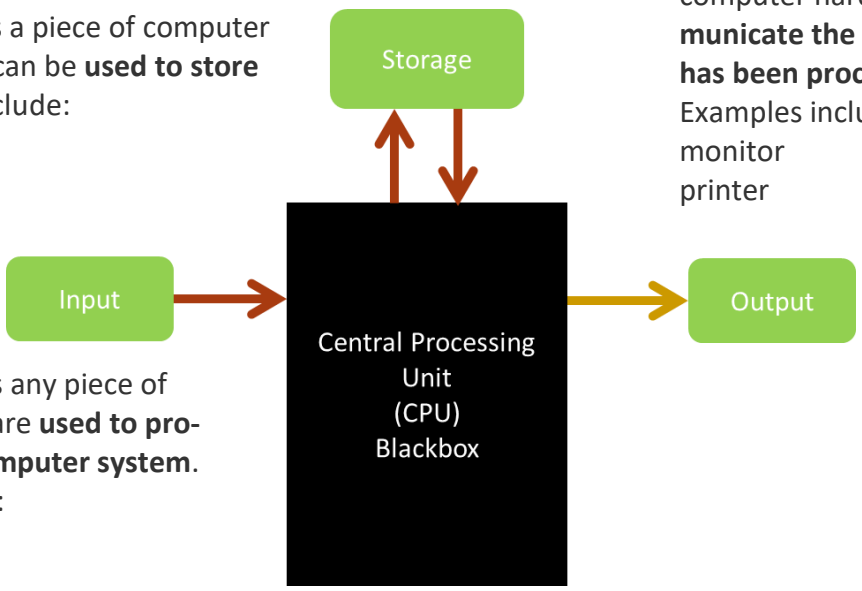
Output Unit receives information from the CPU and then delivers it the external storage or device in the soft or hard processed form. The Monitor or printer is common output device.



Knowledge

The Main elements of a computer

A **storage device** is a piece of computer equipment which can be **used to store data**. Examples include:
hard disk drive
DVD drive
USB stick



An **output** device is any piece of computer hardware **used to communicate the results of data that has been processed.**
Examples include:
monitor
printer

An **input** device is any piece of computer hardware **used to provide data to a computer system**.
Examples include:
keyboard
mouse
scanner
digital camera
webcam

Knowledge

The Central Processing Unit (CPU) Black box

Fetch- Decode – Execute Cycle

Computer has a list of instructions in memory to carry out.
CPU **Fetches** top instruction from the list
Instructions is passed to **Decoder** to interpret
Decoder passes on the instruction
Instruction is **Executed** or carried out
CPU **Fetches** top instruction from the list…

Processing speed:

One cycle per second = 1 Hertz (Hz) = 1 instruction carried out each second
1 Kilohertz (KHz) = 1024 cycles per second
1 Megahertz (MHz) = 1,048,576 cycles per second
1 Gigahertz (GHz) = 1,073,741,824 cycles per second (Approximately 1 Billion!)
How fast is your computer's processor?

Decimal to Binary Conversion:

Convert 28 to Binary
Method

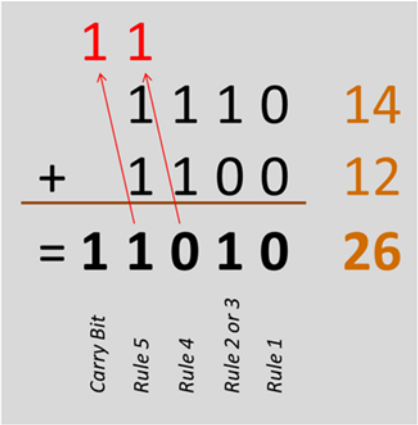
- Working right to left write out the numbers 1, 2, 4, 8 and so on doubling each time to 128.
- 28 has a 16 in it, leaving 12. 12 is 8 + 4.

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

The Rules of Binary Addition

Work Right to Left and apply these simple rules:

0 + 0 = 0
0 + 1 = 1
1 + 0 = 1
1 + 1 = 0 *Carry* ***1***
1 + 1 + 1 = 1 *Carry* **1**



Knowledge

Binary Conversion II:

Binary to decimal method

00010101 = 21 Why?

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

Add the numbers together where the 1 appears.

16+ 4+1 = 21

10000001 = 129

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

Convert 186 from Denary to Hexadecimal

0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	10
B	11
C	12
D	13
E	14
F	15

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

128 + 32 + 16 + 8 + 2 = 186

8	4	2	1
1	0	1	1

8 + 2 + 1 = 11

B

8	4	2	1
1	0	1	0

8 + 2 = 10

A

Knowledge

Ascii Table

Symbol	Decimal	Binary
a	97	01100001
b	98	01100010
c	99	01100011
d	100	01100100
e	101	01100101
f	102	01100110
g	103	01100111
h	104	01101000
i	105	01101001
j	106	01101010
k	107	01101011
l	108	01101100
m	109	01101101
n	110	01101110
o	111	01101111
p	112	01110000
q	113	01110001
r	114	01110010
s	115	01110011
t	116	01110100
u	117	01110101
v	118	01110110
w	119	01110111
x	120	01111000
y	121	01111001
z	122	01111010

Symbol	Decimal	Binary
A	65	01000001
B	66	01000010
C	67	01000011
D	68	01000100
E	69	01000101
F	70	01000110
G	71	01000111
H	72	01001000
I	73	01001001
J	74	01001010
K	75	01001011
L	76	01001100
M	77	01001101
N	78	01001110
O	79	01001111
P	80	01010000
Q	81	01010001
R	82	01010010
S	83	01010011
T	84	01010100
U	85	01010101
V	86	01010110
W	87	01010111
X	88	01011000
Y	89	01011001
Z	90	01011010

Symbol	Decimal	Binary
Space	32	00100000
!	33	00100001
"	34	00100010
#	35	00100011
$	36	00100100
%	37	00100101
&	38	00100110
'	39	00100111
(	40	00101000
)	41	00101001
*	42	00101010
+	43	00101011
,	44	00101100
-	45	00101101
.	46	00101110
/	47	00101111
:	58	00111010
;	59	00111011
<	60	00111100
=	61	00111101
>	62	00111110
?	63	00111111

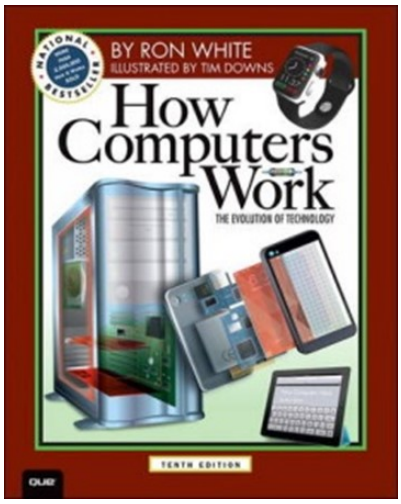
Symbol	Decimal	Binary
@	64	01000000
[	91	01011011
\	92	01011100
]	93	01011101
^	94	01011110
_	95	01011111
`	96	01100000
{	123	01111011
¦	124	01111100
}	125	01111101
~	126	01111110

Decimal Hex Conversion Chart

Decimal	Hexadecimal
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F

Wider Reading List

- GCSE Computer Science by OCR
- How computers work: The evolution of technology by Ron White
- PC Hardware: A beginners guide



- https://www.bbc.com/education/topics/zmpsgk7
- https://www.cambridgegcsecomputing.org/
- https://www.overclockers.co.uk/