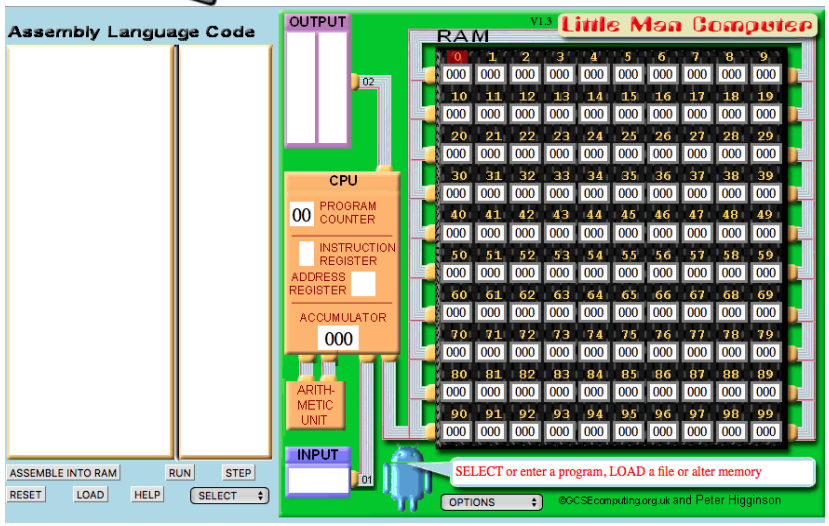
Y9_ Autumn Term 1: Computer Hardware

Key Vocabulary…

Term	Definition
Von Neumann Architecture	CPU design for a stored program.
Control Unit	The part of the CPU that controls the flow of data and execution of instructions.
Arithmetic Logic Unit	The part of the CPU that does all the mathematical and logical calculations.
Cache	Quick access memory in the CPU.
Clock speed	How fast the computer carries out the FDE cycle.
Registers	A temporary data store inside the CPU.
Program Counter	Holds the memory address of the next instruction needed by the CPU.
Memory Address Register	Holds the memory address of the instruction needed by the CPU
Memory Data Register	Holds data and instruction.
Low –Level Language	A language that is close to what the CPU would use. For example, machine code.
High –level language	A language that has a lot of common English words in it such as Print, IF , ELSE. An example is Python.
Random Access Memory	Memory that is used when the computer is running. Data is not held when then power is switched off.
Read Only Memory	Memory that is used to store the operating system and the BIOS on a chip. It can't be written over and doesn't lose the contents when the power is switched off.

Picture This…



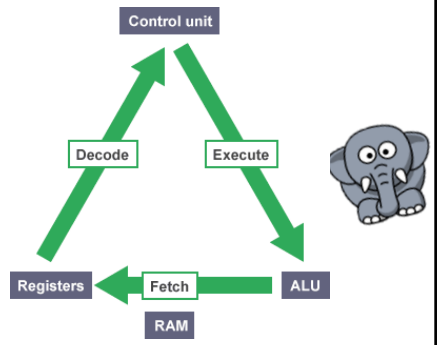
Little Man Computer is a simulator that shows how a CPU works with the registers.
You will learn how to type an assembly language which is very basic but will allow you to write some programs.

```
INP
STA 99
LDA 99
OUT
HLT
```

This code will ask a user to enter a number and then store it and load the number.

Always Remember…

CPUS are very fast at performing the FETCH-DECODE-EXECUTE cycle.
This is the process of a CPU going to collect an instruction from RAM, decoding it and then completing that instruction.



All of the data and instructions that the computer needs when is working is in the working memory.
It is loaded in from the secondary storage because it is quicker to get information from there.

Questions

1. Name two types of memory inside the computer.
2. Name two main components of the CPU.
3. State who a high level language is made for.
4. Give an example of a high level language.
5. State who a low level language is made for.
6. Give an example of a low level language.
7. What does the ADD/STA/SUB/HLT/INP/OUT command do?

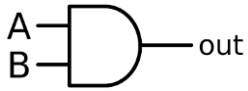
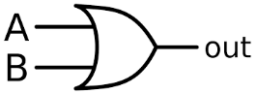
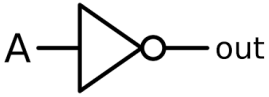
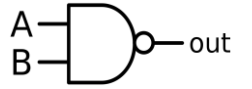
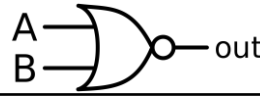
Deeper Learning…

CPUs only store a small amount of data as cache.
Cache is very quick memory.
Most of the time the working memory that the CPU needs to complete the tasks are held in the RAM.
Sometimes the RAM will become full , if the application is too powerful, then virtual memory(VM) will be used.
VM is part of the secondary storage (Hard Drive).
The computer will move data that is not needed at that time from the RAM to the secondary storage and bring it back when it is needed.
This can make the computer slower to respond.

Activity – Write a program in LMC which asks a user to enter two numbers and prints out the largest number.

Y9_Autumn Term 2: Boolean Logic

Key Vocabulary…

Term	Definition
Computational Thinking	Thinking like a computer in a logical way.
Abstraction	Removing unnecessary detail to make a problem easier to understand.
Decomposition	Breaking a complex problem down into smaller tasks.
Binary	A language made up on 1's and 0's. 1= on 0 = off
Logic gate	An electronic component that performs Boolean operation.
AND gate(^) 	A logic gate that has two inputs. Both of the inputs need to be ON for the output to be ON.
OR gate (v) 	A logic gate that has two inputs. Only one of the inputs need to be ON for the output to be ON.
NOT gate(¬) 	This reverses the output so. ON → OFF OFF → ON
NAND gate 	A logic gate that has two inputs. Both inputs need to be OFF for the output to be ON,
NOR gate 	A logic gate that has two inputs. This behaves in an opposite way to the OR gate.

Picture This…

AND

Input A	Input B	Output
0	0	0
0	1	0
1	0	0
1	1	1

NAND

Input A	Input B	Output
0	0	1
0	1	1
1	0	1
1	1	0

OR

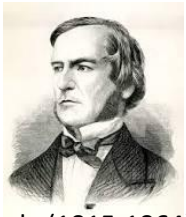
Input A	Input B	Output
0	0	0
0	1	1
1	0	1
1	1	1

NOR

Input A	Input B	Output
0	0	1
0	1	0
1	0	0
1	1	0

NOT

Input A	Output
0	1
1	0



George Boole (1815-1864)

Augustus DeMorgan (1806-1871)

Always Remember…

- Boolean logic uses the words, AND, OR, NOT.
- Boolean logic is used to test conditions in a program.

```
A = 5
B = 10
If A > B:
  Print ("A is the bigger number")
Else:
   Print( "B is the bigger number")
```

Computers must check values all the time and using operators like these below.

<	Less
>	greater
=	Equal to
!=	Not equal
<=	Less than or equal to

Questions

1. Define the term computational thinking.
2. Define the term decomposition.
3. Define the term abstraction.
4. Name two logic gates.
5. What does the 1 and 0 stand for in binary?
6. Name two threats to a network.
7. Why should passwords not be shared?

Deeper Learning…

Boolean logic is named after George Boole, an 19th English mathematician. He devised the terms AND, OR and NOT which are used in Boolean logic.

Augustus De Morgan was a 19th Century Cambridge mathematician and philosopher He devised two theorems in his lifetime which would have a big influence of computing and how computer chips are made. His first theory was that NOT(A AND B) is the same as (NOT A) AND (NOT B).

Activity – Create a poster which shows 3 logic gates and the truth tables and explain the rules for each of them.