COMPUTING – Y7 Knowledge Map Autumn Term 2

29/10/18: ALGORITHMS

Decomposition	Breaking down a complex problem or system into smaller parts that are more manageable and easier to understand.
Pattern Identification	Finding the similarities or patterns among small, decomposed problems that can help us solve problems that are more complex more efficiently.
Abstraction	Filtering out – essentially, ignoring - the characteristics that we do not need in order to concentrate on those that we do.
Algorithm	A plan, a logical step-by-step process for solving a problem

When **designing an algorithm** there are two main areas to look at:

- The **big picture** - What is the final goal?
- The **individual stages** – What hurdles need to be overcome on the way to the goal?

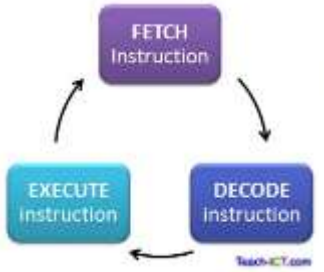
Before an algorithm can be designed, it is important to check that the problem is completely understood. There are a number of basic things to know in order to really understand the problem:

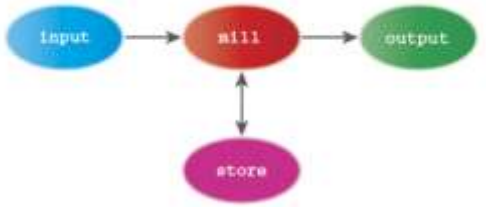
- What are the **inputs** into the problem?
- What will be the **outputs** of the problem?
- In what **order** do instructions need to be carried out?
- What **decisions** need to be made in the problem?
- Are any areas of the problem **repeated**?

John Snow (1813 –1858) was an English physician and a leader in the adoption of anaesthesia and medical hygiene. He is considered one of the fathers of modern epidemiology, in part because of his work in tracing the source of a cholera

5/11/18: COMPUTER SYSTEMS

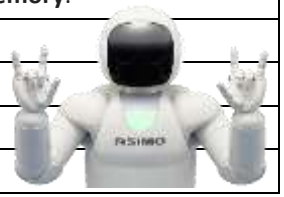
What are the <u>similarities</u> between Babbage's analytical machine and the **model** for a **computer system?**
Both have input and output and both have storage, called 'store' in the Babbage model. The mill is the processor, and there is a correspondence between the mill and the CPU, and the store and memory.





The five generations of computers

1940 – 1956: **First Generation** – Vacuum Tubes. These early computers used vacuum tubes as circuitry and magnetic drums for **memory**.
1956 – 1963: **Second Generation** – Transistors
1964 – 1971: **Third Generation** – Integrated Circuits
1972 – 2010: **Fourth Generation** – Microprocessors
2010 - : Fifth Generation – Artificial Intelligence



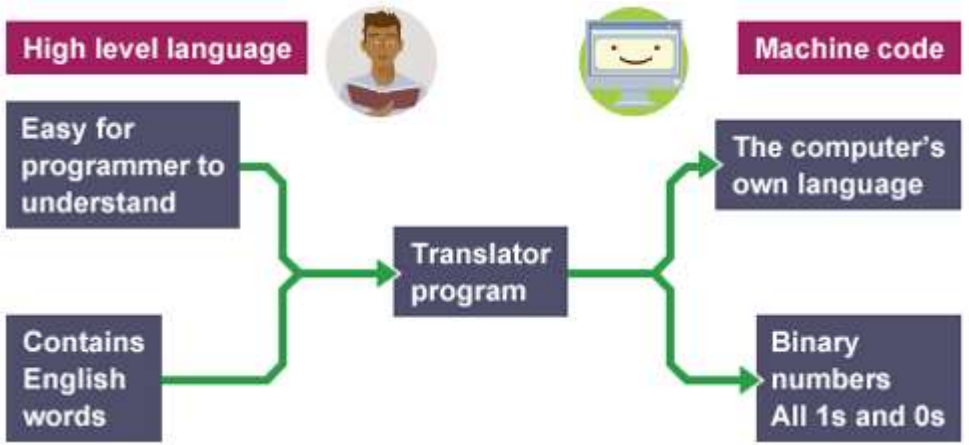
12/11/18: COMPUTING TIMELINE

Stepped Reckoner 1672	The first calculator that could perform all **four arithmetic** operations (+ - / x)
Jacquard punched cards 1800	Used replaceable punched cards to control a sequence of operations
Babbage's analytical machine 1834	The Analytical Engine was to be a general-purpose, fully program-controlled, automatic mechanical digital computer.
Colossus 1943	Colossus, the world's first electronic computer, had a single purpose: to help decipher the Lorenz-encrypted messages between Hitler and his generals during World War II.
The Manchester Baby 1948	The machine was not intended to be a practical computer, but was instead designed as a testbed for the *Williams tube*, the first truly random-access computer memory.

19/11/18: Key Term: HIGH LEVEL PROGRAMMING LANGUAGE

A programming language which is more abstracted so **easier to read and write** and therefore more **user friendly**. High-level languages include Java, JavaScript, C++, Ruby, BASIC or Python, while low-level languages include C, assembly language, and machine code.

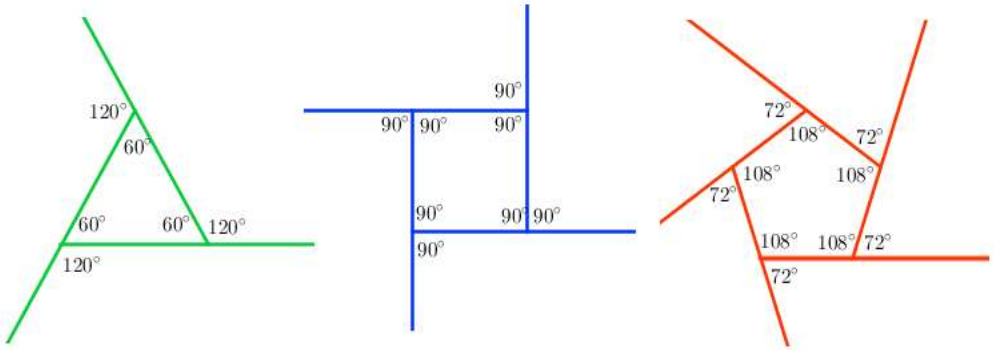
A computer's CPU only understands (executes) series of binary numbers - **so all programming languages are converted** into **binary** code. Low-level instructions can be processed more speedily than high-level languages, but they are more difficult for people to read and write.



26/11/18: DRAWING AND MANIPULATING SHAPES

fd (Forward)	Example: **fd 10** will move the turtle forward ten steps.
bk (Backward)	Example: **bk 5** will move the turtle backwards five steps.
rt (Right turn)	Example: **rt 90** will turn the turtle 90° to the right.
lt (Left turn)	Example: **lt 45** will turn the turtle 45° to the left.
ct	**Centre turtle**
cs	**Clear screen**
pu (Pen up)	The turtle can move without drawing a line.
pd	**Pen down**
repeat	Example: **repeat 4[fd 10 rt 90]** will draw a square.
pc (Pen colour)	Example: **pc 2** 0 = black, 1 = blue, 2 = red etc

Shape	**Exterior Angle:**
Pentagon (5 sides)	72
Equilateral Triangle	120
Square	90
Octagon (8 sides)	45
Hexagon (6 sides)	60



KEY TERM:

ITERATION: in programming means repeating steps, or instructions, over and over again. This is often called a 'loop'. Remember to use iteration to make sure the algorithm is as *efficient* as possible.

```
With iteration
Repeat the following
  five times:
Put right foot forward
Put left foot forward
```

Extension:

1. What is **pseudocode**?
2. Write the code for drawing a **square** using Pseudocode
3. How do you think computer science, art and maths are linked?