Algorithms

Computational Thinking

Abstraction = the process of removing unnecessary detail from a problem.

Decomposition = breaking a larger problem into smaller manageable tasks.

Algorithmic thinking = a way of defining the steps required to reach a solution.

Searching Algorithms:

Binary Search

A binary search only works if the list is **sorted**. Split the list in two and discard the half which the value you are searching for will not be in. Repeat until the correct item is found.

Linear Search

A linear search does not require the list to be sorted. Start at one end of the list and check if the item is the one you are looking for. If it is not move onto the next item. Stop when the item has been found.

Sorting Algorithms:

Bubble sort

Bubble Sort is the simplest sorting algorithm that works by repeatedly swapping the neighbouring elements if they are in wrong order.

Merge sort

There are two stages to performing a merge sort; the first divides the cards into separate components. The second stage repeatedly merges them to produce new sorted sub-arrays until there is only one large sorted array remaining.

Insertion sort

Insertion sort works by removing the first item in the array and moving into another array sorting it into position immediately before bringing in the next item.

PSEUDOCODE

Pseudocode is a generic language used to help write algorithms in the planning stages of writing computer programs. It is not a specific programming language and there are no set rules but you must be consistent and the meaning should be clear.

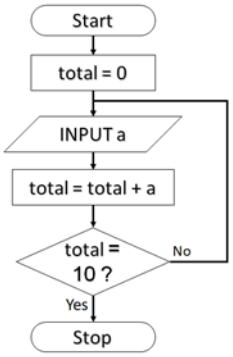
FLOW DIAGRAMS

Flow diagrams are a graphical representation of the routes available through an algorithm.

Symbol	Meaning
	Terminators used to define where the algorithm starts and stops
	Input / Output used to define the user input or the output to be shown
	Process used to define something that has to be performed by the algorithm for instance a mathematical function etc.
	Decision / Selection used to define a question and multiple arrows will define the possible outcomes
	Sub program used to show where the main program will be diverted to a sub program (shown as a separate flow chart)

Example pseudocode and flow diagram

```
total = 0
repeat
     a = input("Enter a number")
     total = total + a
UNTIL total = 10
```



This loop asks the user to enter a number and adds it to the total. The loop stops when the total reaches 10

Sub programs

Sub programs are used to split a large program into smaller chunks or enable repetition of code.