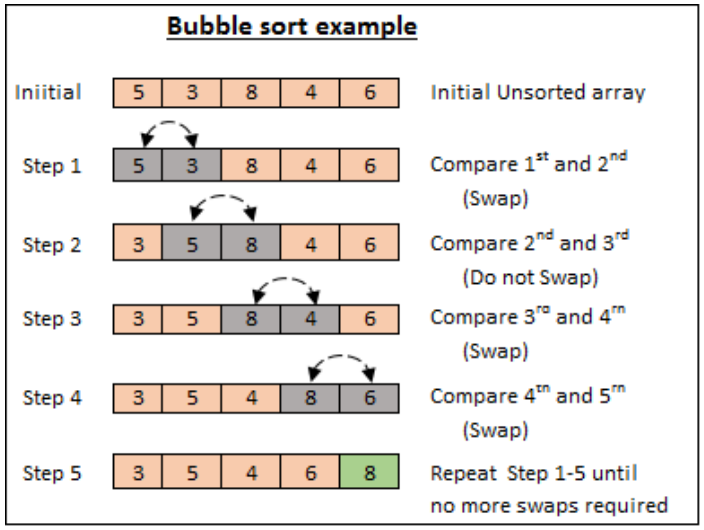
Paper 2 | GCSE Computer Science | **Sorting Algorithms**



Bubble Sort

Compares pairs of items in a list

Pros-

- simple algorithm.
- Efficient to check ordered list.

Cons-

- Does not cope well with large lists.

Merge Sort

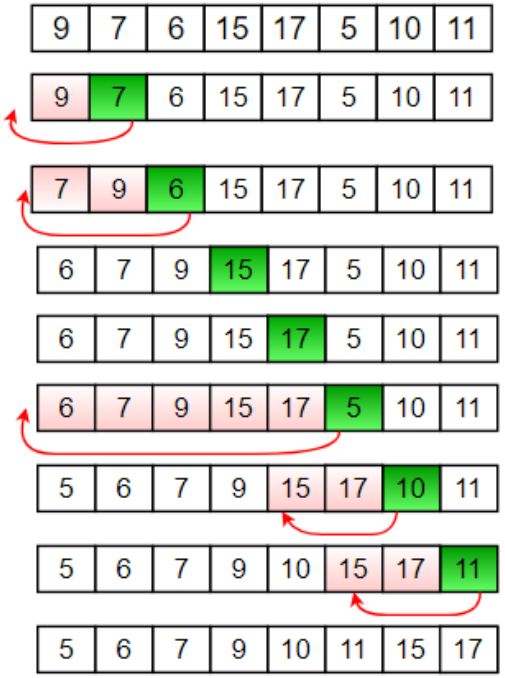
Splits the list apart and then merges it back together.

Pros-

- Quicker than bubble sort and insertion sort for large lists.
- Consistent running time.

Cons-

- Even when the list is already sorted it still goes through the merging process.
- Uses more memory.
- Slower when using small lists in comparison to other algorithms.



Insertion Sort

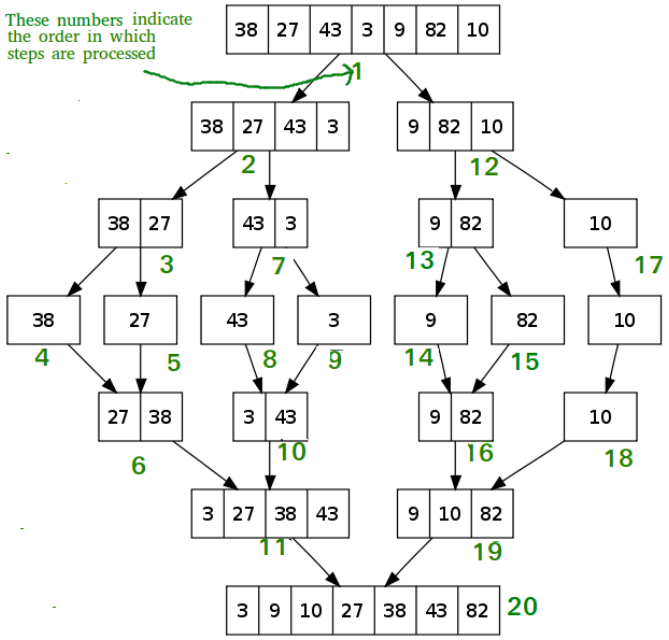
Looks at 2nd item in list, compares all items before it and inserts the number into the right place. Repeats for each item.

Pros-

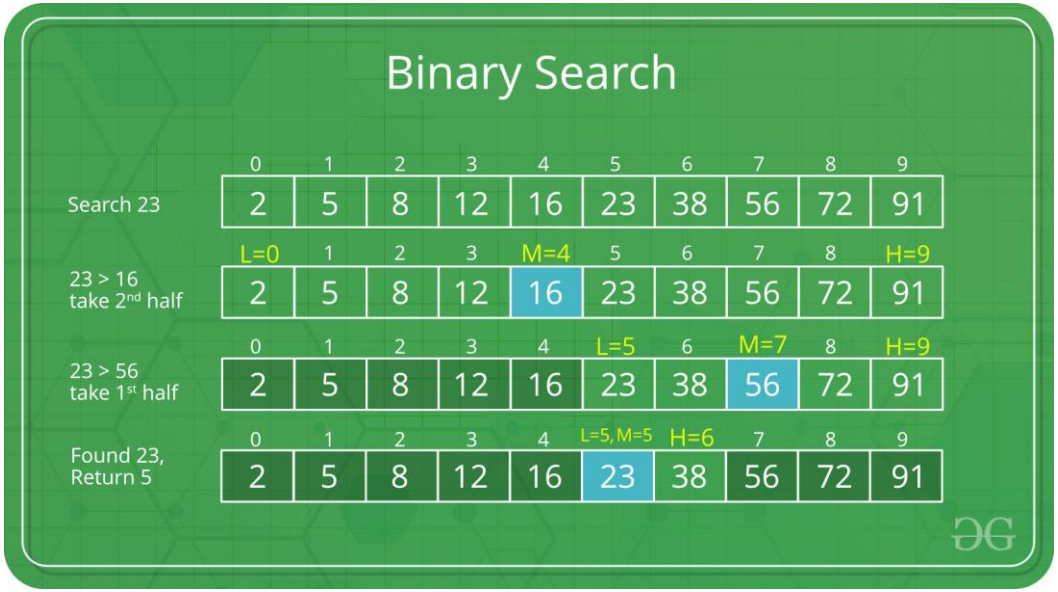
- Easily coded and does not require much memory.
- Quick to add items to original lists.
- Quick to check if list is sorted.
- Copes well with small lists.

Cons-

- Does not cope well with large lists.



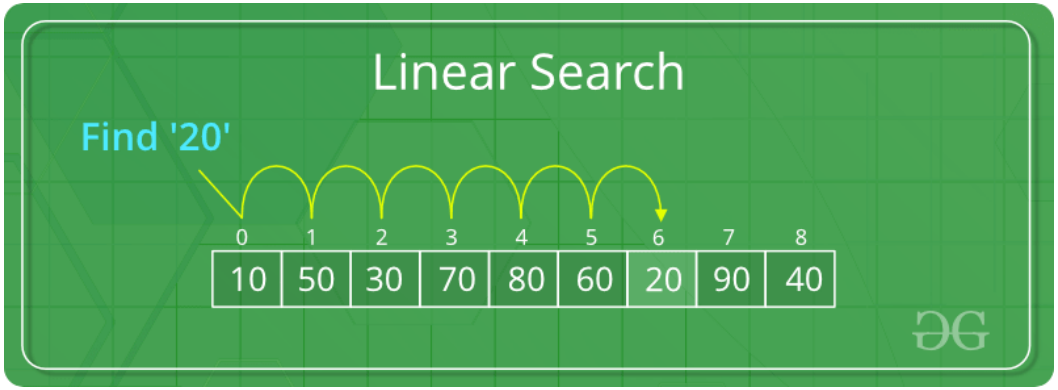
Paper 2 | GCSE Computer Science | **Searching Algorithms**



Binary Searches

Looks for **items** in an ordered list

1. Find the middle **item** in list- (n+1)/2.
2. If this is the **item** then stop.
3. Compare the **item** you are looking for-
   - If it comes before middle, get rid of 2nd half of list.
   - If it comes after the middle, get rid of the 1st half of list.
4. Repeat steps on the smaller list.
5. Keep going until you find the **item** you are looking for.



Linear Searches

Looks for items in an unordered list

1. Looks at first item in the unordered list.
2. If this is the item then stop.
3. If it is not the item then look at the next item.
4. Repeat steps 2 & 3 until item is found.

Paper 2 | GCSE Computer Science | **Pseudocode**

Pseudocode

This means 'fake code'. It's part way between English sentences, and programming code. It is language neutral (it can be read by programmers who are able to use any language).

Examples of pseudocode syntax and explanations	
`x = 5`	Declares a new variable called x and gives it a numerical value of 5
`name = "Bob"`	Creates a new variable called name and sets its value to "Bob"
`str(x)`	Casts the value in x to be a string value
`int(x)`	Casts the value in x to be an integer value
`float(x)`	Casts the value in x to be a float value
`print(name)`	Prints a variable to the screen
`print("Hello")`	Prints the given string in quotes to the screen.
`name = input("Please enter your name")`	An input from the user which asks them for their name and stores in a variable.

`for i = 0 to 7`
`  print("Hello")`
`next i`
	A count controlled loop which will print "Hello" 8 times (0-7 inclusive).

`while answer != "Computer"`
`  answer = input("What is the password?")`
`endwhile`
	A condition controlled loop which asks a user for a password until they correctly guess with "Computer".

`do`
`  answer = input("What is the password?")`
`until answer == "Computer"`
	A condition controlled loop which asks a user for a password until they correctly guess with "Computer".

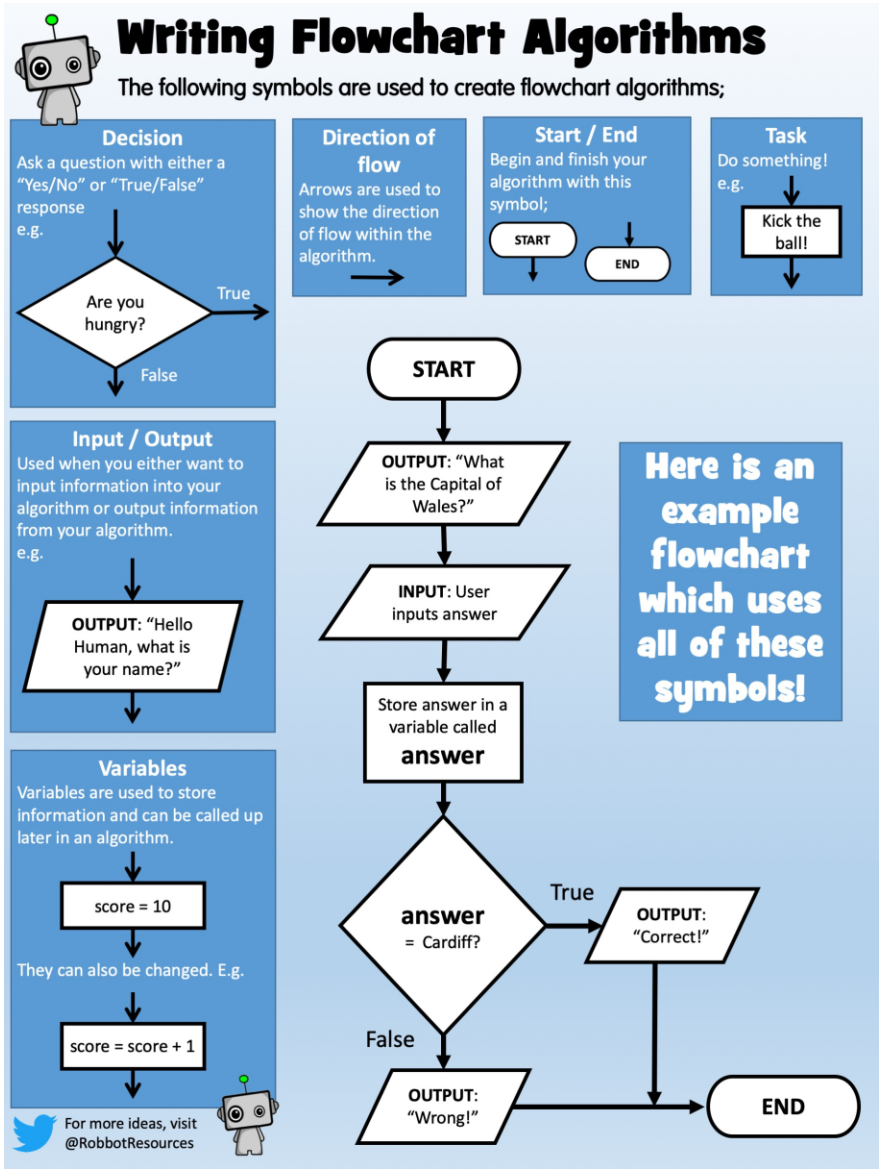
`entry = input("Enter a selection")`
`if entry == "a" then`
`  print("You selected a")`
`elseif entry == "b" then`
`  print("You selected b")`
`else`
`  print ("Unrecognised selection")`
`endif`
	Selection can be carried out to identify certain situations within a program. The program here takes an input and prints different statements for the A and B selection.

`function triple(number)`
`return number * 3`
`endfunction`
	Creates a simple function to triple a number given as an input.

`array names[3]`
`names[0] = "Ahmad"`
`names[1] = "Ben"`
`names[2] = "Catherine"`
	Creates an array called names, the length is set to 3. Names are then added to the positions in the array.

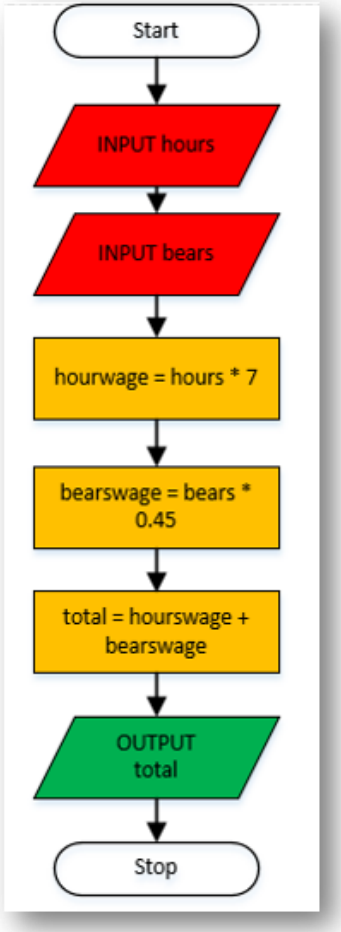
Paper 2 | GCSE Computer Science | **Flowchart Algorithms**

Key Vocabulary	
Algorithm	An abstracted program which completes a given task, whatever the data provided
Abstraction	Abstraction is moving a problem out of the specific in order to create a general solution that would work in similar scenarios. Ignoring the gritty details to focus on the problem
Decomposition	Breaking a problem down into smaller, computational solvable chunks
Pseudo Code	A structured way of planning code, which is 'computational' in style (uses Boolean logic, variables, comparisons and arithmetic for example). **Advantage** is that it is not tied to a strict high-level language's syntax i.e. does not need the finer detail. Must be **readable, easy to interpret and not too vague.**
Flow Diagram	A diagram, made using specific shaped boxes, that mocks up the flow of a program through various stages, processes and decisions.
Program Control	Using Boolean logic to guide the computer through a program based on decisions
Comparison Operators	The symbols used to look at a variable or piece of data in relation to is similarity to another piece of data or variable
Arithmetic Operators	The symbols used to show the mathematics to be carried out on a piece of data



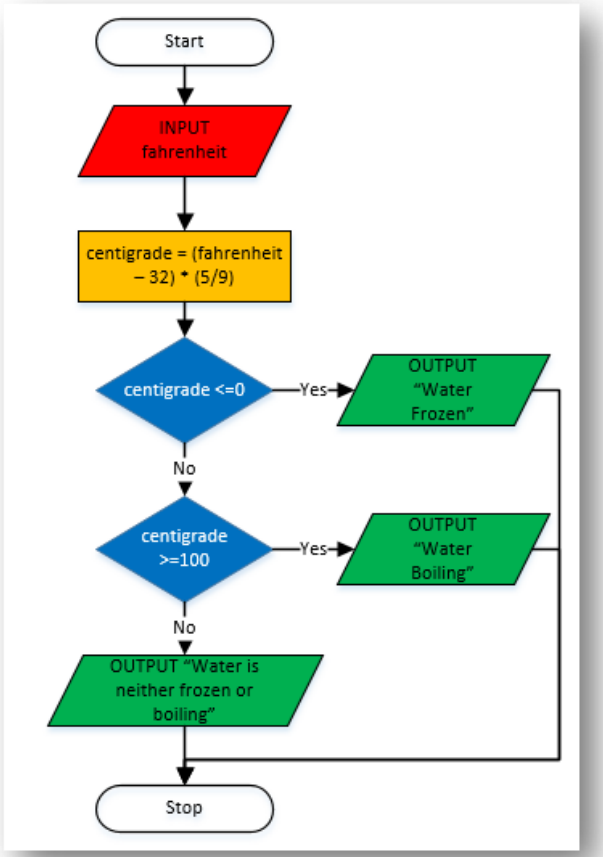
Paper 2 | GCSE Computer Science | **Flowchart Algorithms**

Sequence



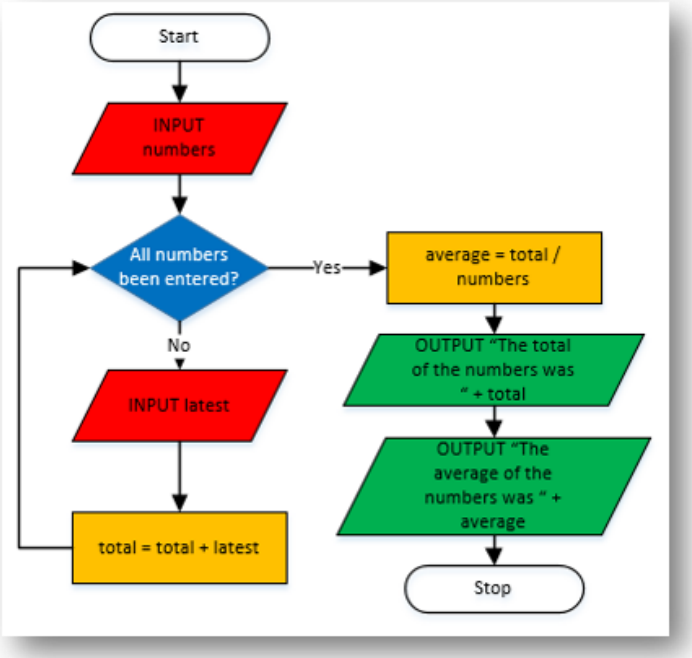
Example 1 - Teddy Bears Program - **Sequencing**

Selection



Example 2 - Water Temperature Program - **Selection**

Iteration



Example 3 - Average Calculator – **Iteration** (FOR)

Active revision for Algorithms

What is meant by decomposition and abstraction?

Give three features of well written pseudocode.

What's the benefits of writing in pseudocode not a programming language?

Can you draw the five box types for a flow chart and explain what each is used for?

Can you draw an example of a flow chart for each of the following- Sequence, selection and iteration.

Describe the steps of a binary search.

Use a binary search to find 92 in-

7, 21, 52, 59, 68, 92, 94, 99, 133,

Describe the steps of a linear search.

Use a linear search to find 92 in-

7, 21, 52, 59, 68, 92, 94, 99, 133,

What are the benefits and drawbacks of using a linear search over a binary search?

Describe the steps of a bubble sort algorithm.

Perform a bubble sort algorithm to sort this list into alphabetical order.

Orange, Banana, Apple, Peach, Grape, Lime.

What are the strengths & weaknesses of the bubble sort algorithm?

Describe the steps of an insertion sort algorithm.

Perform an insertion sort algorithm to sort this list into lowest to highest order.

2, 26, 24, 29, 3, 16, 19, 40.

What are the strengths & weaknesses of the insertion sort algorithm?

Describe the steps of a merge sort algorithm.

Perform a merge sort algorithm to sort this list alphabetically.

F, P, A, L, T, D, K, H

What are the strengths & weaknesses of the merge sort algorithm?