

# GCSE Computer Science

## Topic 2.1 Algorithms

To find middle item:  
(amount of data items +1) / 2

### COMPUTATIONAL THINKING:

tackling a problem through abstraction, decomposition and algorithmic thinking.

**ABSTRACTION:** picking out important bits of information

**DECOMPOSITION:** breaking down a problem into smaller parts.

**ALGORITHMIC THINKING:** coming up with an algorithm to solve a problem.

**ALGORITHM:** a step by step set of instructions to solve a problem

### BINARY SEARCH:

1. Find the middle item of data
2. If this is the item of data you are looking for, stop as you've found it. 🐼
3. *If not*, compare the item you are looking for to the middle item. If it comes before the middle item, get rid of the second half of the data. If it comes after the middle item, get rid of the first half.
4. You'll be left with half the amount of data to search. Repeat steps 1-3 until you find the data you are looking for.

### INSERTION SORT

1. Look at the **second** item in the list.
2. Compare it to all of the items before it (in this case just the first item) and insert it into the **right** place.
3. Repeat step 2 for the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> item etc. until the last item has been inserted into the correct place.

### MERGE SORT:

1. Split the set of data in half. The second set of data should start with the middle item.
2. Repeat step 1 until each set of data only contains one item of data.
3. Merge pairs of data so that each set of data has twice as many data items. Each time you merge, sort the data into the right order.
4. Repeat step 3 until you have merged all the items of data back into one set.

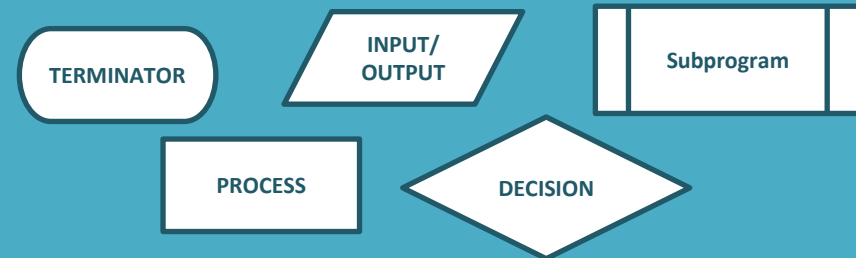
### LINEAR SEARCH

1. Look at the first item of data.
2. If this is the item you are looking for, stop searching, you found it. 🐼
3. *If not* then look at the next item.
4. Repeat steps 2-3 until you have found the item or you've checked every item.

### BUBBLE SORT

1. Look at the first 2 items in the list.
2. If they're in the right order you don't have to do anything, if they're in the wrong order, swap them.
3. Move on to the next pair of items (2 and 3) repeat step 2.
4. Repeat step 3 until you have got to the end of the data set (this is called one pass).
5. Repeat steps 1-4 until there are no swaps in a pass.

**FLOWCHART:** a visual way of representing algorithms.



Fake

# Pseudocode

A set of instructions in the style of programming language, written in plain English.

**INPUT , OUPUT, IF, THEN, ELSE**

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## What I need to know:

|  |  |  |  |
|--|--|--|--|
| Define computational thinking.   |  |  |  |
| Define abstraction.  |  |  |  |
| Define decomposition.  |  |  |  |
| Define algorithmic thinking.   |  |  |  |
| Define algorithm.  |  |  |  |
| Name the two most common ways of displaying algorithms.  |  |  |  |
| Define flowchart.  |  |  |  |
| Define pseudocode.   |  |  |  |
| Outline the steps of a binary search.  |  |  |  |
| Write an ordered list of numbers or words and perform a binary search to find an item.                       |  |  |  |
| Outline the steps of a linear search.  |  |  |  |
| Write a list of numbers or words and perform a binary search to find an item.                                |  |  |  |
| Outline the steps of a bubble sort.  |  |  |  |
| Perform a bubble sort on a list of unordered numbers / words to put them into ascending/descending order.    |  |  |  |
| Outline the steps of a insertion sort.   |  |  |  |
| Perform a insertion sort on a list of unordered numbers / words to put them into ascending/descending order. |  |  |  |
| Outline the steps of a merge sort.   |  |  |  |
| Perform a merge sort on a list of unordered numbers / words to put them into ascending/descending order.     |  |  |  |
| Draw and label the shapes used in flowcharts.  |  |  |  |
| List the keywords used in pseudocode.  |  |  |  |