# Computing - Algorithms

Year 9    Term 6

## Week 1 - Computational Thinking

**Core Knowledge**
- **Algorithms** are a set of instructions that are followed in a sequential order. **Algorithmic thinking** is the process of developing an algorithm to solve a problem
- **Decomposition** is the process of breaking problems down into smaller, manageable parts.
- **Abstraction** is the process of removing unnecessary information and focusing on the important details.
- 

**Key Literacy Computational Thinking**
**Definition** - Computational thinking is a systematic approach to solving problems.
**Associated terms** - Algorithms, Abstraction, Pattern, Decomposition, Logical Reasoning, Problem Solving.
•**Computational thinking** requires logical reasoning to develop effective algorithms.
•Algorithms are a fundamental concept in **computational thinking**.
•Computational problem-solving involves using **computational** techniques, such as programming and data analysis.

## Week 2 - Representing Algorithms

**Core Knowledge**
- **Algorithms** describe the logic of a solution, the programme is an implementation of the solution written in programming language.
- **Flow chart** is used as a visual representation an algorithm or program
- **Flow charts** use a variety of symbols from the terminators, subroutines, arrows, input or output, decision and process
- Written description is used to specify the steps of an algorithm

**Key Literacy Algorithmic Thinking**
**Definition** - Algorithmic thinking is the process of developing an algorithm to solve a problem
**Associated terms** - Algorithm, Flowchart, Pseudocode, Computational thinking, Conditions, Solution
•Algorithms are at the core of algorithmic thinking
•Computational problem-solving is the application of algorithmic thinking to address challenges in various fields, including computer science and data analysis.
•Algorithmic thinking is widely applied in fields like computer science, data analysis, and artificial intelligence

## Week 3 - Tracing Algorithms

**Core Knowledge**
- **Trace tables** are used to trace the values of variables such as each line of code is executed. The values of the variables are displayed in a table and assist to identify any potential errors.

**Key Literacy Trace Table**
**Definition** - A trace table allows you to formally record the state of variables, the outputs, and the condition evaluations as you mentally execute the algorithm.
**Associated terms** - Program, Iteration, Condition, Debugging, Branching, Problem Solving
•Understanding how to create and interpret trace tables is an essential skill in problem-solving and program analysis in computing.
•A trace table records the values of variables at each step or iteration of a program.
•A trace table provides a visual representation of how a computer program executes

## Week 4 - Linear & Binary Search

**Core Knowledge: Linear Search**
- **Linear search** involves checking each item in a list or sequence of data one at a time.
- **Binary search** is more efficient way of searching through a list

**Key Literacy Binary Search**
**Definition** - Binary search is a the algorithmic approach when data is ordered from smallest to largest.
**Associated terms** - Sorted list, Indexing, Iteration, Arrays
•Binary search is commonly applied to search for items in ordered data.
**Key Literacy Linear Search**
**Definition** - Linear search is an algorithm that involves checking each item in a list or sequence of data at a time to check if it's right
**Associated terms** - Variable Values, List, Conditional, Statements, Iteration, Debugging
•Linear search is an iterative algorithm because it involves a repetitive process of checking each item

## Week 5 - Comparing searching Algorithms

**Core Knowledge**
- **Linear search** uses the sequence of items in the list can either be ordered or unordered **Every item** in the linear search is compared to the search item. **Linear Search** algorithms are simple to write
- **Binary Search** is the sequence of items in the list that must be in order. **Binary search** is a longer process that is complex to write over the other algorithms

**Key Literacy Algorithm**
**Definition** - An algorithm is a sequence of ordered instructions that are followed by step-by-step to solve a problem. This does not need to be on a computer.
**Associated terms** - Instructions, Procedure, Order, Sequence of steps, Flowchart
•Algorithms outline a sequence of logical steps to achieve a desired outcome or solve a particular problem.
•Algorithms provide a structured approach to problem-solving by breaking down complex tasks into manageable steps.
•A flowchart is a visual representation of an algorithm, using symbols and arrows to illustrate the sequence of steps.

## Week 6 - Bubble, Insertion & Merge Sort

**Core Knowledge: Bubble Sort**
- **Bubble sort** will check and swap items in a list if they are in the wrong order
- **Insertion sort** algorithm works by breaking down the list into two parts.
- **Splitting** the first part of the merge sort until all items are in a list by themselves. **Merging** the individual lists are then merged, one pair at a time.

**Key Literacy Bubble Sort**
**Definition** - Bubble sort algorithm works by repeatedly going through a list, comparing and swapping the items that are in the wrong order
•Bubble sort consists of multiple passes through the list

**Key Literacy Insertion Sort**
**Definition** - Insertion sort is grouping items in a list into two parts, sorted sublist and unsorted sublist
•Insertion sort is efficient for small lists or lists that are nearly sorted.

**Key Literacy Merge Sort**
**Definition** - Merge sort is items in a list that are divided in half until each item is in a sublist of one item.
•Merge sort is a stable sorting algorithm, meaning it preserves the relative order of equal elements

### Trinity TV

For more help, visit Trinity TV and watch the following videos:

**Trinity TV > Year 9 > Computing**