

5 Key words to remember

- Abstraction** – a process which helps simplify things by identifying what is important and what detail can be hidden or ignored.
- Binary searches** – a search algorithm which repeatedly halves the sorted list of data to find the required target.
- Decomposition** – breaking a problem down into smaller parts. For example, using a divide and conquer approach.
- Greedy algorithm** – an algorithm that works on a ‘biggest first’ basis, applying divide and conquer to reduce the problem.
- Sorting algorithms** – instructions used for putting data (information) in order. For example, the selection, bubble and quick sort algorithms.

People – Dr Jeannette Wing

Dr Jeannette Wing (born 1956) is an American professor of computer science. She strongly believes that computational thinking, especially algorithmic instructions, should be used to tackle and solve all types of problems.

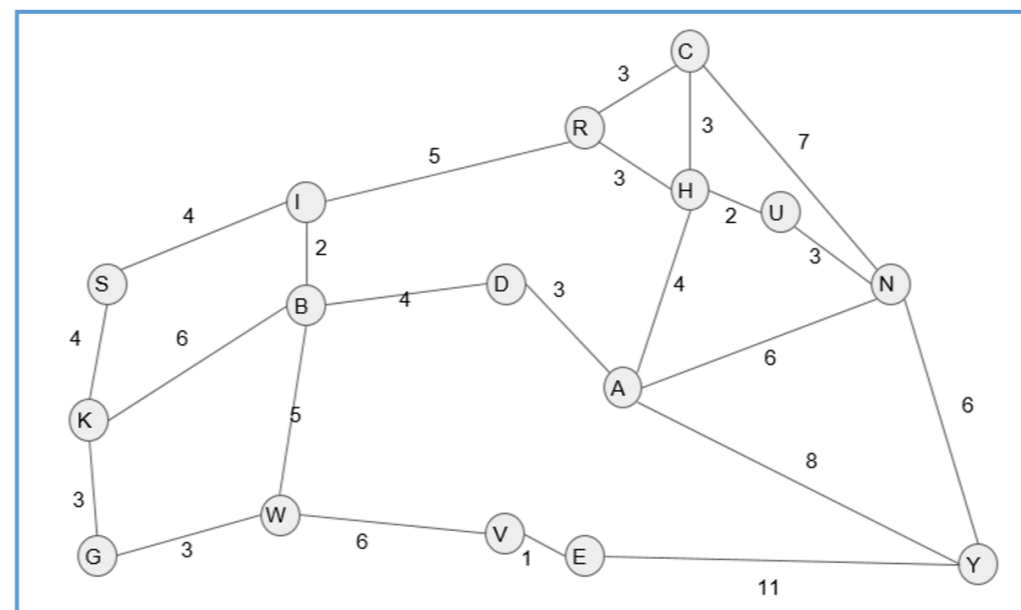
Key takeaways

- Computational thinking is a set of skills which help solve problems in efficient ways. These skills can help us to sort and search for information (data).
- Computational thinking can be seen in everyday life where computers and machines are programmed to solve problems and complete tasks in the most efficient way.
- Google Maps** uses graph algorithms to calculate the shortest distance from point A (starting location) to point B (destination).
- Decomposition** is a common computational thinking approach where a problem is broken down into smaller, more manageable parts. The **greedy algorithm** is an example of repeated decomposition.
- If trying to guess a number in the ‘guess my number’ game, we could use different search algorithms to identify which approach works best in this game, for example, random, linear and **binary searches**.
- Computational thinking does not always involve computers. For example, we can use efficient problem solving to sort playing cards or different weights by using **sorting algorithms**.

Knowledge check – Google Maps

Maps are an example of **abstraction**, where choices are made about which details are shown. Google Maps uses an algorithm which finds the shortest route when giving directions. Look at the network graph below. The letters in circles are nodes representing different towns and the lines and numbers represent the distance between nodes.

Test yourself: Calculate the shortest route from town C to W. Now express this solution as an algorithm.



Knowledge check – The greedy algorithm

Vending machines and self-service machines have a way of working out the best way to give change. The best way is the one that uses the smallest number of coins. This is known as a ‘**greedy algorithm**’, which starts with the largest possible coin value and reduces the problem to progressively smaller amounts.

Test yourself: What is the smallest number of coins that can be used to give change of 87p?