Component 2.1: Elements of Computational Thinking

2.1.1 Thinking Abstractly

Abstraction: Simplifying a problem by only taking into consideration the necessary details required to obtain a solution, leaving a representation without any unnecessary details.

Data Abstraction: The storage and representation of data in a computer system along with its logical description and interaction with operators. E.g. Stacks, queues, integers.

Graph Theory: A branch of mathematics that can be used to abstractly represent problems using a collection of nodes connected by edges.

2.1.2 Thinking Ahead

Caching: The temporary storage of data by the system in cache or memory for the benefit of faster retrieval if it is needed again in future.

Inputs: Any information relevant to the problem that is required by the system for processing according to an algorithm.

Outputs: The result returned by a system for a given input after running the entire process or part of a process.

Preconditions: A prerequisite or state of a system and its surroundings required to run a use case return a valid solution.

Reusable Program Components: Components that have already been written, debugged and tested that can be transplanted into new systems to save development time in project completion.

2.1.3 Thinking Procedurally

Procedural Abstraction: Achieving a task by relying on a procedure of sequential steps.

Components of a Problem: The smaller, simpler series of tasks and sub-procedures a problem can be broken down into to be completed modularly.

2.1.3 Thinking Logically

Flowcharts: A diagrammatic representation of the flow of a program that includes all the points where a decision needs to be taken in order to obtain a solution.

Logical Conditions: Conditions which may depend on one or more variables used to determine the next step whenever a system has to make a decision. They are typically implemented using control structures such as sequences, selections and iterations.

2.1.4 Thinking Concurrently

Concurrent Processing: Processing where the system appears to perform multiple tasks simultaneously.