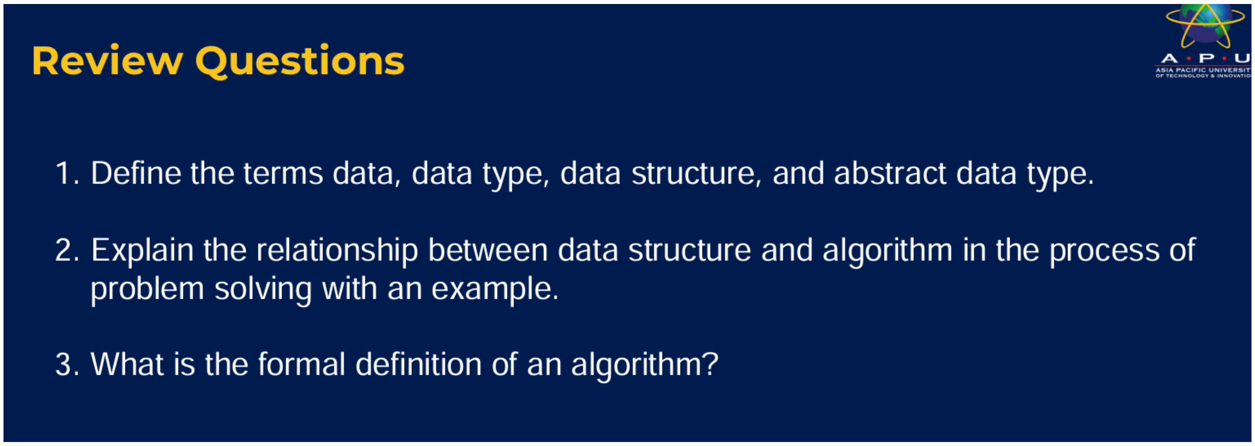

Review Questions

1. Define the terms data, data type, data structure, and abstract data type.

2. Explain the relationship between data structure and algorithm in the process of problem solving with an example.

3. What is the formal definition of an algorithm?

1. Data refers to raw facts, values, or pieces of information that can be processed to generate meaningful insights. It can be numbers, characters, symbols, or any collection of unprocessed details.
   A data type specifies the kind of value of a variable can hold and the operations that can be performed on it. It defines memory usage, value limits, and valid operations.
   A data structure is a way of organizing and storing data in memory so that it can be accessed and modified efficiently. Data structures provide the foundation for implementing algorithms effectively.
   An abstract data type defines a logical model for a data structure, specifying the operations that can be performed on it without detailing its implementation. It focuses on what operations are performed rather than how they are executed.
2. A data structure organizes data, and an algorithm processes it. The efficiency of n algorithm depends on the choice of data structure.
   Example: Solving “Next Greater Element” problem
   Problem: Given an array, find the next greater element for each number
   Efficient Solution: Use a stack (data structure) to optimize an algorithm
3. An algorithm is a finite, well-defined sequence of steps that accepts input, performs computations, and produces an output within a finite time.
   Key properties of an Algorithm:
   1. Input: Takes zero or more inputs
   2. Output: Produces at least one result
   3. Definiteness: Steps must be clear and unambiguous
   4. Finiteness: Must terminate after a finite number of steps
   5. Effectiveness: Each step must be simple and executable