

CHAPTER 9: ALGORITHM DESIGN AND PROBLEM-SOLVING

9.1 COMPUTATIONAL THINKING SKILLS

9.1.1 Abstraction

Definition: The process of removing unnecessary details to focus on essential features.

Need:

- Manage complexity
- Create models of real-world systems

Benefits:

- Focus on what matters
- Reusable solutions

9.1.2 Decomposition

Definition: Breaking down complex problems into smaller, manageable sub-problems.

Benefits:

- Easier to solve smaller problems
- Can work on different parts independently
- Leads to modular programming (procedures/functions)

9.2 ALGORITHMS

9.2.1 Algorithm Representation

Methods:

- Structured English
- Flowchart
- Pseudocode

Components:

- Input
- Process
- Output

Basic Constructs:

- Sequence (order of execution)
- Selection (IF, CASE)
- Iteration (loops)

9.2.2 Pseudocode Guidelines

Input/Output:

<TEXT>

INPUT variable

OUTPUT variable/value

Assignment:

<TEXT>

variable ← value

Selection:

<TEXT>

IF condition THEN

statements

ELSE

statements

END IF

CASE OF variable

value1 : statement

Iteration:

<TEXT>

```
FOR counter ← start TO end
  statements
NEXT counter
```

```
WHILE condition
  statements
END WHILE
```

9.2.3 Stepwise Refinement

statements

Process:

- Start with general solution
- Gradually add detail
- Continue until can be programmed

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