تجميعات وملخص – لكتشر 1.2

1. What is Computer Science / Algorithm

- Computer Science is about **problems, problem-solving, and solutions**.
- An **algorithm** is a step-by-step, logical, and clear procedure to solve a problem.
- Efficiency matters: multiple algorithms can solve the same problem, but the best one uses fewer steps.
- Algorithms must be **sequential, logical, and clear** before being coded.

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2. Problem Solving Approach – Analyze Problem

- **Analyze the problem**: fully understand what is required.
- Identify **inputs** (data provided by the user).
- Identify **outputs** (the required result).
- Identify **processing operations** (the calculations needed).
- Example: Adding/subtracting two numbers → inputs are two numbers & sign, process is calculation, output is result.

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3. Problem Solving Approach – Design Algorithm

- Once the problem is analyzed, design a **step-by-step solution**.
- Two main representations:
    1. **Written algorithm** (plain language steps or pseudocode).
    2. **Visual algorithm** (flowchart).

- **Pseudocode** is structured English that looks like code but isn't real programming.
- **Flowcharts** show the steps visually using standard symbols.

Part 1: Multiple Choice (Single Answer)

1. What is the primary goal of computer science?
a) To study the history of computers
b) To develop new hardware components
c) To study problems, problem-solving, and the solutions from that process
d) To learn how to type faster
Answer: c) To study problems, problem-solving, and the solutions from that process

2. An algorithm is best defined as:
a) A programming language like Java or Python
b) A set of clear, logical, and sequential steps to solve a problem
c) The physical components of a computer
d) The final output of a program
Answer: b) A set of clear, logical, and sequential steps to solve a problem

3. In the problem-solving approach, which step comes immediately after "Analyze the Problem"?
a) Run the program
b) Compile the code
c) Design an algorithm
d) Identify the outputs
Answer: c) Design an algorithm

4. What is the purpose of pseudocode?
a) To write code that a computer can execute directly
b) To formally express the logic of an algorithm in a code-like, language-agnostic way
c) To draw graphical representations of data flow
d) To fix errors in a program
Answer: b) To formally express the logic of an algorithm in a code-like, language-agnostic way

5. Which symbol in a flowchart is used to represent a decision?
a) Oval
b) Parallelogram
c) Rectangle
d) Diamond
Answer: d) Diamond

6. When analyzing a problem, identifying the "inputs" means:
a) The final result the program will display
b) The data you need to start solving the problem
c) The mathematical calculations required
d) The programming language you will use
Answer: b) The data you need to start solving the problem

7. Why is Solution A (2 steps) considered better than Solution B (6 steps) in the "Connect Dots" example?
a) It uses more colors
b) It is more complex and detailed
c) It is more efficient and less complex
d) It was written in pseudocode
Answer: c) It is more efficient and less complex

8. A flowchart is a:
a) Compilation of error messages
b) Graphical representation of an algorithm's sequence of operations
c) Type of high-level programming language

d) List of hardware requirements
Answer: b) Graphical representation of an algorithm's sequence of operations

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Part 2: True or False

1. An algorithm must be written in a specific programming language.
Answer: False

2. The steps of an algorithm must be clear, logical, and sequential.
Answer: True

3. The "Implement the algorithm" step involves drawing a flowchart.
Answer: False

4. Pseudocode is actual, runnable Java code.
Answer: False

5. In problem analysis, "Processing Operations" refer to the calculations needed to turn input into output.
Answer: True

6. It is acceptable for an algorithm to use data before it has been provided.
Answer: False

7. An oval symbol in a flowchart is typically used for input/output operations.
Answer: False

8. The goal of the "Analyze the Problem" phase is to understand what the solution must do, not how to do it.
Answer: True

Part 3: Definitions

1. Computer Science:
Answer: The study of problems, methods of problem-solving, and designing solutions that can be implemented using computers.

2. Algorithm:
Answer: A step-by-step set of clear, logical, and sequential instructions to solve a problem.

3. Pseudocode:
Answer: A way of writing the steps of an algorithm in simple, structured, code-like language that is easy for humans to read but not executable by a computer.

4. Flowchart:
Answer: A graphical representation of an algorithm using symbols to show the sequence of steps and decision-making paths.

5. Input (in problem analysis):
Answer: The data or information provided to a program in order to perform processing.

6. Output (in problem analysis):
Answer: The result or information produced after processing the inputs.

7. Processing Operations:
Answer: The set of calculations or logical steps performed on inputs to produce outputs.

8. Efficiency (in the context of algorithms):
Answer: The measure of how quickly and effectively an algorithm solves a problem using minimal resources (time and memory).

Part 4: Algorithm Analysis & Creation

1. Analyze the Problem: You are asked to write a program that calculates the average of three test scores.

- **Problem Target:** To calculate and display the average score of three tests.
- **Inputs:** Three test scores (score1, score2, score3).
- **Outputs:** The average of the three scores.
- **Processing Operations:** Add the three scores together and divide by 3.

2. Find the Error: The following algorithm is designed to calculate the square of a number.

1. Print the result.
2. Calculate result = number * number.
3. Get the number from the user.

Reason: The algorithm is incorrect because it tries to print and calculate before receiving the number from the user. The order of steps is wrong.

3. Write an Algorithm: Create a step-by-step algorithm in plain English to find the largest of three numbers.

1. Get three numbers from the user.
2. Compare the first number with the second number.
3. Keep the larger of the two as the current largest.
4. Compare the current largest with the third number.
5. The final largest number is the result.

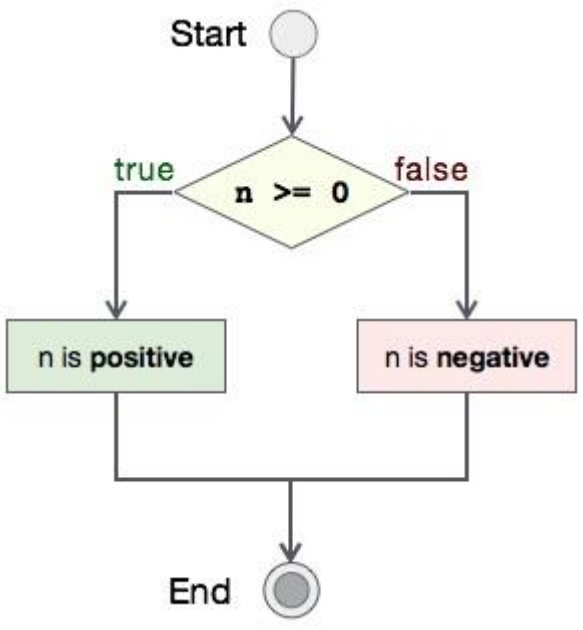
4. Write Pseudocode: Write the pseudocode for the algorithm above (to find the largest of three numbers).

```
START
INPUT num1, num2, num3
IF num1 > num2 THEN
    largest ← num1
ELSE
    largest ← num2
ENDIF
IF num3 > largest THEN
```

```
    largest ← num3
ENDIF
OUTPUT largest
STOP
```

5. Draw a Flowchart (Conceptual): Describe the flowchart symbols and logic you would use for a program that checks if a number is positive or negative.

- **Oval:** Used for "Start" and "End".
- **Parallelogram:** Used for "Input number" and "Output result".
- **Diamond:** Used for the decision "Is number > 0?".
- **Logic:** Start → Input number → Decision (Is number > 0?) → If "Yes" → Output "Positive" → End. If "No" → Output "Negative" → End.



Part 5: Matching

Match the Flowchart Symbol to its Meaning.

Symbols:

1. Oval
2. Parallelogram
3. Rectangle
4. Diamond

Meanings:
A. Represents a calculation or process step.
B. Represents the start or end of the algorithm.
C. Represents a decision point, leading to different paths.
D. Represents an input or output operation.

Answers:
1 - B
2 - D
3 - A
4 - C