Algorithm Tutorial

Week 2 Lecture 1

Question 1

What is an algorithm?

Question 2

Name a type of algorithm that is not a program.

Question 3

Algorithms are named after:

- Euclid
- Brahmagupta
- Muhammad ibn Musa al-Khwarizmi
- Al Gore

Question 4

Create a flowchart that expresses the following algorithm:

- Ask the user for their age
- If the user's age >= 18, print "Welcome to Rick's Place"
- Otherwise, print "Come back when you are of age"
- Go back to step 1 to serve the next user

Question 5

Create pseudocode for the same algorithm

Question 6

Create a flowchart and pseudocode for the process of getting ready to leave the house in the morning. Include such activities as hitting the snooze button several times, taking a shower, getting dressed, and so on. Make sure to have different procedures depending on whether it is a weekday or weekend.

Question 7

Suppose you want to guess a number between 1 and 100.

1. Show the exact sequence of numbers you would guess if the number was **73**.
2. What happens if the number is **1** or **100**? How many steps do you need in those cases?

Question 8

Imagine you have 8 exam papers to sort in alphabetical order.

1. Show how merge sort splits them into smaller groups step by step.
2. At what stage do the papers actually become "sorted"?

Question 9

You are trying to solve a maze.

1. Draw or describe one possible path you try.
2. Show where you would backtrack if you reach a dead end.
3. Why is this approach better than just wandering randomly?

Question 10

You are climbing stairs. You can take **1 step** or **2 steps** at a time.

1. Write the number of different ways to climb if there are **3 steps**.
2. Do the same for **4 steps**.
3. Can you see a pattern? Write the next number for **5 steps**.

Question 11

You want to estimate the chance of rolling a 6 on a dice.

1. If you roll the dice 10 times and see 2 sixes, what is your estimate?
2. If you roll 100 times and see 17 sixes, what is your new estimate?
3. Which estimate do you trust more, and why?

Question 12

Two websites exist: **Site A** has 10 other sites linking to it, while **Site B** only has 2.

1. Which site will appear higher in Google results?
2. What if the 2 sites linking to **Site B** are *very* popular themselves?