CL-1002
Programming Fundamentals
Lab # 1

Objectives:

- Introduction to a typical program flow
- Develop an understanding of writing procedure of a program
- Draw Flow Diagrams of a program-I

Note: Carefully read the following instructions

1. Use proper **font family** and **font size** of **heading, sub heading** and **normal text**.
2. Major aim of this exercise is to develop an **understanding** of the program flow, so carefully read instructions and **exhibit** your understanding.
3. **Use Paper and Pencil to draw the diagrams and wrote pseudocodes.**
4. Do not copy from any source otherwise you will be straight away given ZERO Marks.
5. Submit your lab on **Google Classroom**.

Let's develop an Understanding

How do you communicate ?

- Language
- Gestures
- Writing

Which Language and why ?

Would you understand French ? if not, why not ?

What is a computer ? What is their base Architecture ? How do they operate ?

Computer Program:

Detailed plan or procedure for solving a problem with a computer; more specifically an unambiguous, ordered sequence of computational instructions necessary to achieve such a solution.

So, basically, we need to find a set of instructions to tell the computer what to do.

For now, let's take a small detour and think if a computer is a Smart device or not ?

A computer can be in any form, a supercomputer, a desktop PC, a smart phone, or even a calculator.

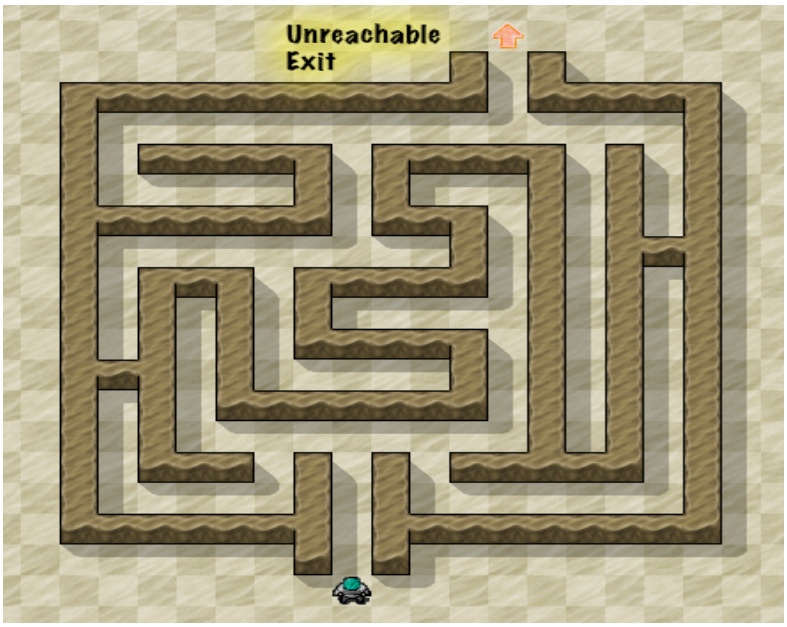
If you do ? why ? What are your criteria of 'Smartness' ? Is it the speed ? Should it be ?

Okay consider following scenarios:

- ✓ If a bear calculates 392 x 28 faster than a human, and still falls into a water pit, would you call it 'Smart' or 'Intelligent' ?
- ✓ If a dog ran faster than Human and yet bite its own tail, would you call it 'Smart' or 'Intelligent' ?

We may need to revise the definition of 'Intelligence'. Let's define as the capacity of reasoning.

Now Imagine a scenario, in which you have a Hedge Maze in which a guide(person) has to guide two people to meet each other in minimum time. Also, guide see a top view of the maze and both people in it.



The two people take 'Instructions' from the 'guide' to know whether to take left or right. And they eventually meet halfway. Would you say the two people were 'Intelligent' or the 'guide' ? If the guide was 'Intelligent' then the person following the order must be called 'not smart'.

Now let's review the definition of a **computer**:
"An electronic device for storing and processing data, typically in binary form, according to instructions given to it in a variable program."

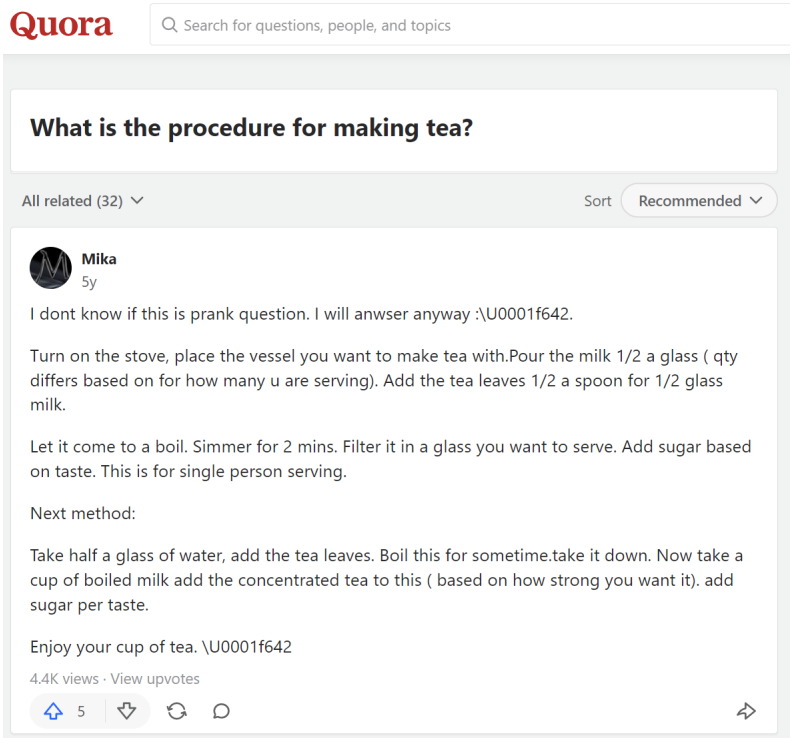
Again, a **computer program**:
"Detailed plan or procedure for solving a problem with a computer; more specifically an unambiguous, ordered sequence of computational instructions necessary to achieve such a solution."

So, basically a computer is a dumb machine, who will do only what it is asked to. "What to do" is told to 'computer' in the form of a 'computer program'. It only follows order.

So, we have to give instructions to a computer to perform a task. Let's imagine what type of tasks are there. Let's start with a real-life example:

Task: Make a Cup of Tea

One may use simple paragraph-based solution like this…



Does this look a structured solution ? How about we try a more structured way to approach the solution ?

One Such Solution could be:

How to make a cup of tea?

We will start this blog post with a very simple question "How do you make a cup of tea?" That's an easy one you may say. There are simple steps and order in which you must do things:

1. Fill up the kettle with water
2. Boil the kettle
3. Place a teabag in your favourite mug
4. Pour boiling water into your favourite mug
5. Brew the tea for a few moments
6. Remove and dispose of the teabag
7. Add milk
8. Add sugar
9. Stir the tea
10. Enjoy the hot beverage

The aim of this lab is to develop an understanding of how to formulate a solution for a problem. What we are aiming for is a step-by-step procedure to solve the problem. Nothing else.

If you can transform any solution to a problem in a step-by-step procedure, purpose of this lab is served.

Let's begin with some practice of such Problems:

Problem-1: Adding three Numbers given by a second person

1. Take Num1, Num2 and Num3 as inputs from second person.
2. Add Num1 and Num2. Remember the result.
3. Add Num3 and add it to the result.
4. Show the result to the second person.

Problem-2: Compute the parameter of your room with irregular shape

1. Get a measurement tape.
2. Measure all 4 sides of your room.
3. Add all those measurements together
4. Display the result

Problem-3: Calculate the percentage from a student's marks in a course

1. Ask the student to enter the marks in the specific course.
2. Ask the student to enter total marks.
3. Divide the student's obtained marks to the total marks.
4. Multiply the quotient to 100.
5. Display the answer to the user.

Problem: Write pseudocode and design of flow charts of simple sequence programs.

1. Write the steps of applying for University Admission.
2. Finding the average of three numbers.
3. Add the four numbers and then take the average of four numbers.
4. Find the area of a Rectangle. **(Area = Length * Width)**
5. Write the steps to calculate the percentage of student marks based on Math, Science, English, and Urdu. **(Percentage = (Obtained / Total) * 100)**
6. Calculate the Interest of a Bank Deposit **(Formula "Interest=Amount*Years*Rate/100)**
7. Convert Temperature from Fahrenheit (°F) to Celsius (°C) **(Formula: C=5/9*(F-32))**
8. Compute the perimeter of a rectangle. **(Perimeter = 2 * (Length * Width))**
9. A brand offered 10% discount on each shirt purchased. The original price of the shirt is 550, find the discounted price of one shirt. Write the pseudocode for this problem statement.
10. Write a program logic that calculates the total of a retail sale. The program should ask the user for the following: the retail price of the item being purchased and the sales tax rate. Once the information has been entered the program should calculate and display the following: the sales tax for the purchase and the total sale.
11. Write a program logic that calculate the total bill of the shopping, a person purchases two keyboards each worth of 100$, three mouse each worth of 50$. Calculate the Total in PKR. **(Note: Dollar to PKR 1$ = 215PKR)**
12. Write a program that calculates the current balance in a savings account. The program should obtain from the user the following information: the starting balance, the total amount of deposits made, and the total amount of withdrawals made. After the program has calculated the current balance, it should be displayed on the screen. Assume one input for deposits and one input for withdrawals. Make the pseudo-code for this problem.