

**Course Code – COS 121**

**Course Title - Problem Solving**

**Course Lecturer – Mr. Emmanuel Ododo**

What is a Problem: A problem is a case that requires solution. It could also be referred to as challenges that need to be solved or that a person is going through. It can therefore be dissolved that problem solving is a process to get the barrier(problem) removed by performing sequence of activities.

In order to solve a problem, you need to follow a step-by-step sequence to arrive at your solution.

Process in solving a problem:

1. Understand the problem – In order to solve a problem, you need to know what the inputs (operations) are to solve that problem.
2. Formulate a model
3. Develop your algorithm – Algorithm is beneficial to the human being and not the computer.
4. Implement the algorithm – This means that you're writing the program using the model.
5. Test and debug – To debug means finding a solution to that problem(bug). Bugs are errors with a program that causes it to stop working or produce incorrect result
6. Evaluate the solution – Once the program produces a solution that seems correct, the original problem needs to be reconsidered, to make sure that the answer is formatted into a proper solution to the problem

You can have both simple and complex problems. Simple problems are usually solved by a single individual while complex is by a group of people.

We would be looking at three strategies of problem solving;

1. Algorithm
2. Flowchart
3. Pseudocode

### **Algorithm**

What is algorithm: it is a precise sequence of instructions for solving a problem. It is a step-by-step process of solving a problem.

Problem 1: Write an algorithm for coming to school from your house

Step I: Waking up

Step II: House Chores

Step III: Bathroom Queue

Step IV: Breakfast

Step V: Dress up

Step VI: Stepping out

Step VII: Waiting for shuttle

Step VIII: Boarding the shuttle

Step IX: Arrival

Problem 2: Develop an algorithm to withdraw money from an ATM

Step 1: Get your card

Step 2: Insert the card

Step 3: Enter your pin

Step 4: Click on withdraw

Step 5: Enter amount

Step 6: Press Enter

Step 7: Wait for the money

Step 8: If the money is out, go to step 9, if not out go to step 10

Step 9: Get your money

Step 10: Report to the bank.

Write an algorithm that can calculate the area of a rectangle. The width and the height of the rectangle should be taken from the user.

Step 1: let the user input the height

Step 2: let the user input the width

Step 3: set area to height multiplied by width

Types of control program structures

1. Sequential

2. Selection

3. Iteration

- **Sequential:** You take series of steps that are executed in a sequential order. Each statement will be executed one by one
- **Selection:** it determines two courses of action depending upon the condition. A condition is given here which will result in either true or false. The key word is either 'if' and 'else' which almost all programming language support these key words. This is also known as branching statement because it provides two branches, one for true and another for false. Branching will be done depending upon the condition

Example:

- **Iteration:** it specifies block of one or more statements that are repeatedly executed till conditions remains true. Key words use is 'while', 'if with go to (pseudocode only)'. Iteration consists of three main parts
  - i. Initial value (from where iteration begins)

- ii. Condition (up to what condition iteration will continue)
- iii. Stepping (increment or decrement from initial value to reach the condition)

Example: Write an algorithm to add all numbers from 1 to 100

Start

A = 1

While A <= 100

Print A

A = A+1

End

Example: Write an algorithm that accepts five numbers and display the sum and average of the number.

Step 1: let the user input the five numbers

Step 2: add the five numbers to give you the sum

Step 3: divide the sum by 5 to give you the average

Step 4: display the sum and average

OR

Start

i = 1

sum = 0

```
while i <= 5
Get number
Sum = sum + number
i = i + 1
average = sum/5
display average
End
```

## Flowchart

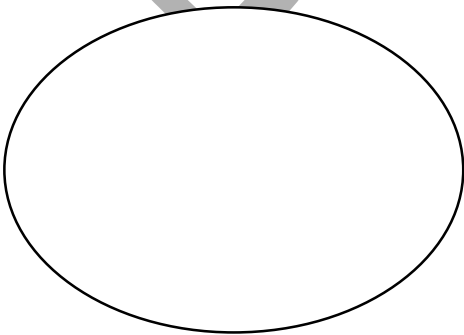
Flowchart is the pictorial representation of an algorithm. That means a flowchart is referred to as the diagrammatic representation of steps followed in solving a given problem.

Advantages of flowchart:

1. Visual clarity
2. Communication
3. Effective analysis
4. Efficient program maintenance

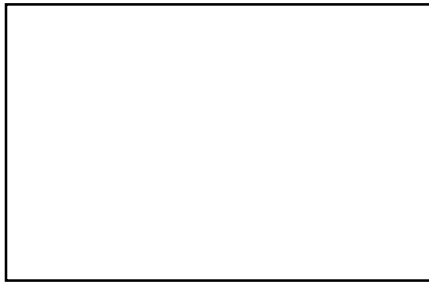
The symbols used consists of geometrical shapes that are connected with flowlines.

The oval Shape:



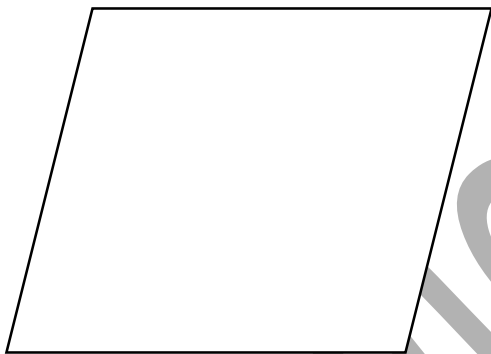
The oval shape is referred to as the terminal symbol. It is used to indicate the beginning and the ending of a flowchart.

The rectangle:



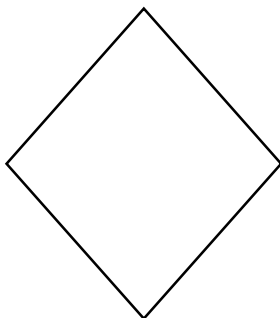
It is used to denote processing and computational activities.

The parallelogram or rhombus:



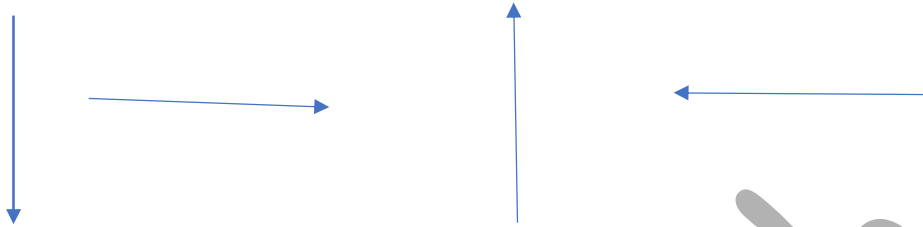
This symbol is known as the input/output symbol. It is used for feeding the computer with the set of needed inputs and used of generating output

The diamond shape:



It is known as the decision(selection) symbol. It is used while making decision or selection.

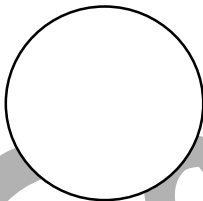
The flowlines:



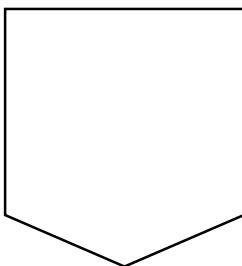
They are used to indicate the direction which a particular operation is going.

The connectors:

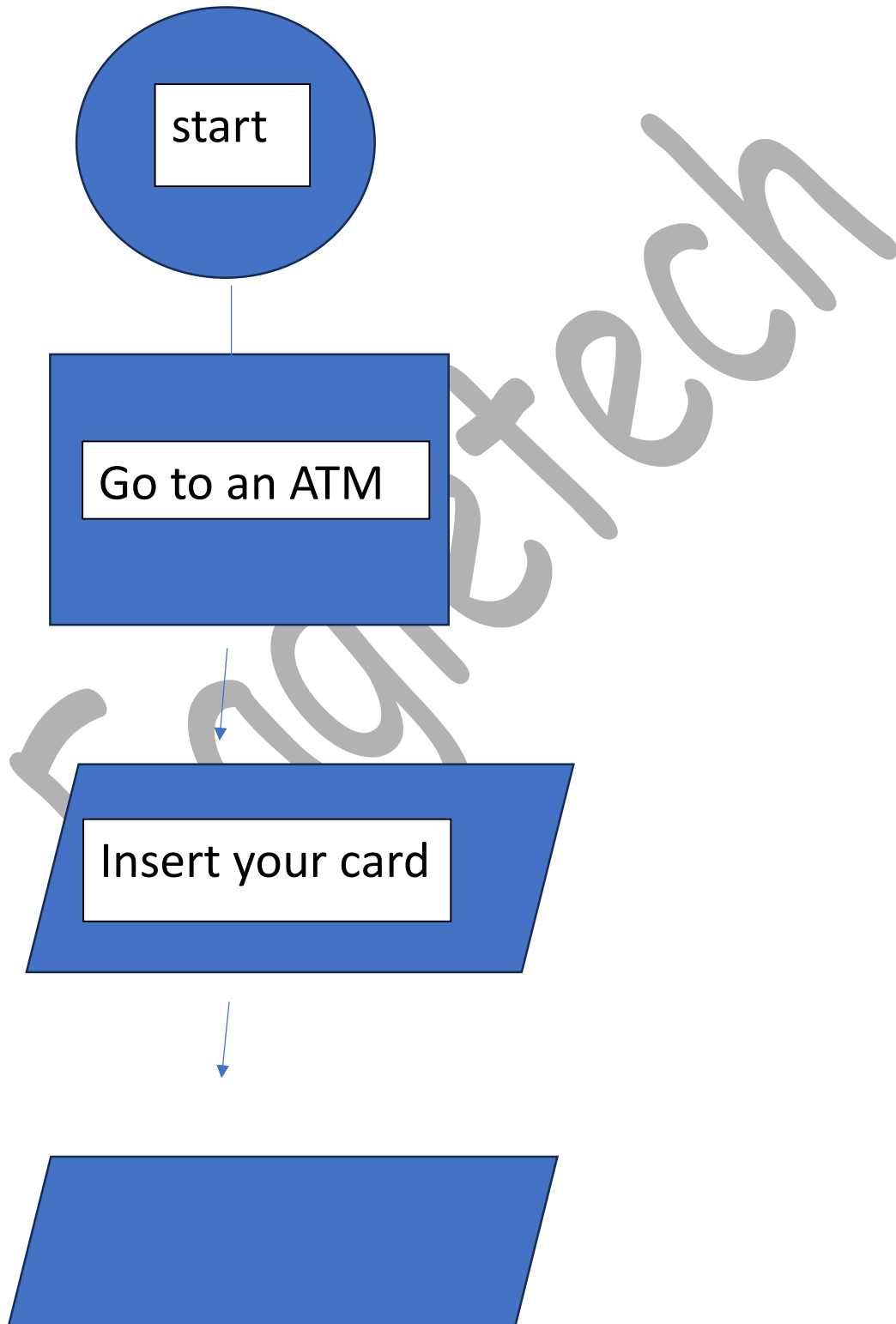
The on-page connector



The off-page connector



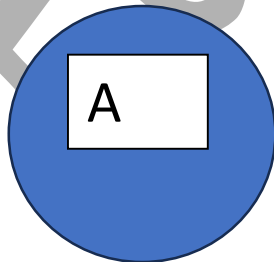
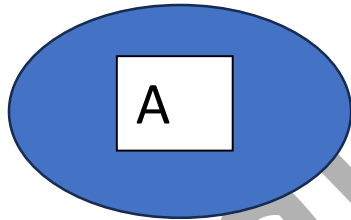
Draw a flowchart to withdraw money from ATM:

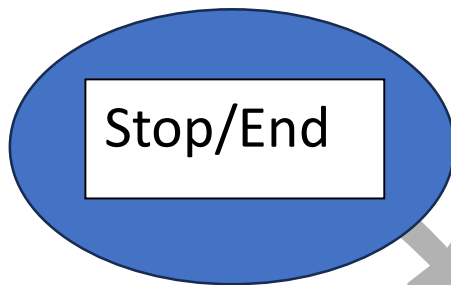
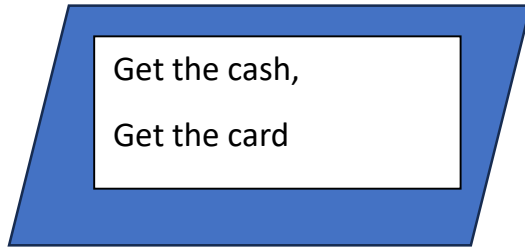




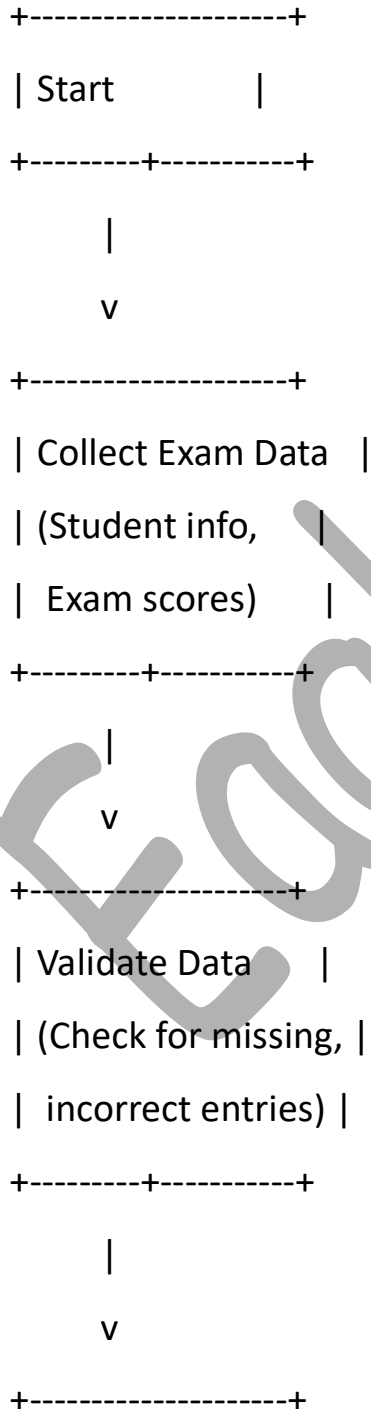
Enter your pin, enter amount

Process the cash





The Akwa-Ibom state govt is face with a challenge of solving the problem of first school leaving certification examination computation for over 10,000 pupils who took the exams in the last academic session. You have been consulted as a system analyst to come up with a document that contains a flowchart to solve the problem. Take on this task using your knowledge of problem solving in CED 121



| Store Valid Data |

| in Database |

+-----+-----+

|

v

+-----+

| Compute Results |

| (Aggregate scores, |

| calculate grades) |

+-----+-----+

|

v

+-----+

| Generate Reports |

| (Individual & |

| School-wise) |

+-----+

|

v

+-----+

| Validate Reports |

| (Ensure accuracy |

| of computed data) |

+-----+

|

v

+-----+

| Distribute Results |

| (To schools and |

| education boards) |

+-----+-----+

|

v

+-----+

| End |

+-----+

Eagletech