Problem Solving

The act of finding a solution to a perplexing, distressing, vexing, or unsettled question

Types of Problem

1. Problems that can be solve with a series of actions
2. Problems that can be solve with knowledge and experience, and a process of trial and error

Algorithmic Solutions

1. Solutions that can be reached in a series of steps solves first type

Heuristic Solutions

2. Solutions that cannot be reached through a direct set of steps, usually on a trial and error basis solve second type.

How do you solve problems?

Understand the problem, Identify the problem , Identify alternative ways to solve problem, Select best alternative , List solution steps for alternative chosen , Evaluate solution

Difficulties with Problem Solving

Lack of problem solving experience ,Inadequate solution steps ,Incorrect problem definition ,Alternatives chosen incorrectly , When choosing the best alternatives, you might eliminate good ones ,Invalid logic ,Incorrect solution evaluation

Flowchart & Algorithms

A flowchart is a type of graphical/symbolic representation of the program logic (the algorithm) it takes to solve a given problem

o Uses standardized symbols

o Each step is represented by a different symbol

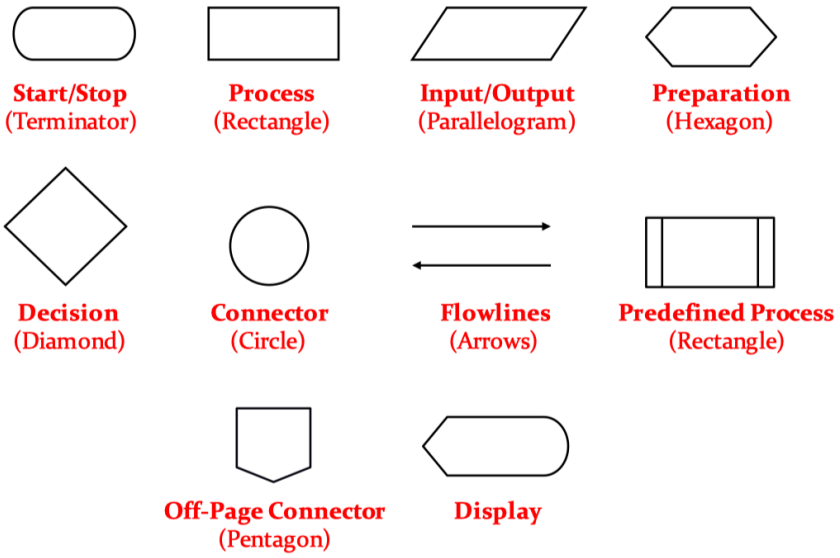
o Symbols are linked together with arrows showing the steps flow direction

o Utilize formula notation

o Typically read from top to bottom or from left to right on a page

o Used in designing or documenting a process/program

o Independent of any programming language



o The SEQUENCE process is just a series of processes carried out one after the another
Most programs are represented at the highest level by the sequence, possible with a loop from end back to the beginning

Decision (Selection) – IF/ELSE
o The DECISION process logically completes the binary decision block by providing two separate processes
o One of the processes will be carried out in the each path from the binary decision
Decision (Selection) – Multiway IF/ELSE

Decision (Selection) – Case Logic Structure

o Alternate form of multiway selection
o Used to select one task out of many tasks (or possibly none)

Loop (Repetition)

o The LOOP process is the representation of repeating a series of operations over and over until some event occurs.

A typical programming process can be divided into TWO phases:

Problem-solving phase: Produce an ordered sequence of steps that describe solution of problem called algorithm

Implementation phase: Implement the program in some programming language

Problem-solving phase

1. Analysis and Specification

Understand (define) the problem and what the solution must do, Identify the problem requirements

2. General Solution (Algorithm Development)

Specify the required data types and the logical sequences of steps that solve the problem

3.Verify

Follow the steps exactly to see if the solution really does solve the problem ,Desk checking
o Walk-through
o Inspection

Implementation Phase

1. Concrete Solution (Program): Translate the general solution (algorithm) into a programming language

2. Test : Syntax errors (by compile) and logical errors (by test) :Executing the program with some sample data Then manually check the results

3. Maintenance & Documentation: Require modification of the program to meet changing requirements or to correct any errors that show up while using it

Pseudocode & Algorithms

It means: IMITATION or FALSE CODE
It is an imitation of the computer instruction
Using this programmer can concentrate on developing logic without worrying about syntax
Easy to convert into real programming language

Pseudocode

Input

o READ=> Input from a record
o GET=> Input from keyboard
o Store input values in memory locations, which we can give them names

GET <variableName1> [, <variableName2>, …]

Output Result

o PRINT=> send output to printer
o WRITE => send output to file
o PUT, OUTPUT, DISPLAY => send output to screen

So the general structure of sending output is:
PUT <variableName1> [, <variableName2>, …]
PUT 'A string between two single quotes'

Assign a value to a variable (memory location):

o To assign an initial value, the verb INITIALIZE or SET is used
o To assign a value as a result of some arithmetic expression, the symbol '=' or ' ⍰ is used
o To keep a variable for later use, the verb SAVE or STORE is used

DECISION, or SELECTION

to select one of two alternate actions to perform

IF (<CONDITION>)
<Statements>
ELSE
<Statements>
ENDIF

LOOP , or Repetition: to keep performing a sequence of processing steps until some condition occurs?

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WHILE (<CONDITION>)
    <Statements>
ENDWHILE
```

```
REPEAT
    <Statements>
UNTIL (<CONDITION>)
```

Advantages & Disadvantages

Flowchart Advantages:

- ✓ Standardized
- ✓ Visual

Pseudocode Advantages

- ✓ Easily modified
- ✓ Implements structured concepts
- ✓ Done easily on Word Processor

Flowchart Disadvantages:

- ✓ Hard to modify
- ✓ Structured design elements not implemented
- ✓ Special software required
- ✓ Time Consuming

Pseudocode Disadvantages:

- ✓ Not visual
- ✓ No accepted standard, varies from company to company