Computational Thinking

A brief summary of Week 1

Variable: "A variable is a symbol which is used to represent a varying expression or quantity."

OR

"A variable is a symbol used for representing an unspecified/unknown term."

Example: 1. Counting number of cards present in the "**Scores"** dataset.
For that we created a variable called **Count** and **initialized** it to **0.**
Then we add one to **Count** as we move a card from pile 1 to pile 2.
Count = 0 + 1 = 1

Iteration: "Repetition of a process"

OR

"Iteration is the repetition of a process in order to generate a sequence of outcomes"

Example: In the previous example we saw that every time we move cards from pile 1 to pile 2, we add one to variable **Count**. This is nothing but an iteration.

Filtering: "Some specific decision"

OR

"In an iteration if we are only interested in specific item/data which are special to us and not all items."

Example: If we want to only count students from Chennai. In this case also we will move all cards from pile 1 to pile 2 but we will add one to variable **Count** only when we find students from Chennai.

Multiple filtering: For example if we want to find number of female students from Chennai.
Filters: (i) Checking gender: Male/Female
(ii) Checking City/Town
So, here total two filters are required to get the number of female students from Chennai.

Flowchart: “Pictorial representation of an algorithm”

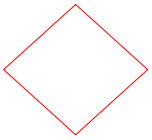
OR

“A flowchart is a step-by-step diagrammatic representation using some defined shaped boxes to solve a task.”

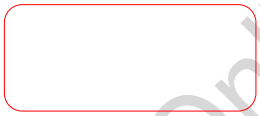
Rectangular box: Process or activity: Set of operations that change the value of data/variables

Arrow: Flowline: Shows the order of execution of the program steps

Diamond: **Decision**: Determines which path/direction the program will take (True/False)



Oval shaped box: Terminal: Indicates the start or end of the program.



Datatypes: (Lecture 1.7): “Defines the values that the variable can take, and the set of operations that are permitted.”

Basic datatypes:

Boolean datatype: Range: Has only two values: **True** and **False**

Operation: AND, OR (Result type: Boolean)

Result will be Boolean type either **True** or **False**

Example:

If (**X**.*Gender* == ‘M’ **AND** **X**.*City/Town* == “Chennai”)

If (**X**.*Gender* == ‘M’ **OR** **X**.*City/Town* == “Chennai”)

Integer datatype: Range: ...., -3, -2, -1, 0, 1, 2, 3,.....

Operation: +, -, x, / (Result type: Integer)

<, >, == (Result type: Boolean)

Character datatype: Range: All alphanumeric: A, B,....Z, a, b,.....,z, 0, 1,.....,9

Special characters: ., $, #, @, ...

Operation: == (Result type: Boolean)

Example: ‘C’, ‘1’, ‘#’, ‘M’, ‘F’

*

String: Range: Any **sequence of characters**
Operation: == (Result type: Boolean)
Example: “IIT Madras”, “21F00055”, “can@1#23”

Subtype of basic datatypes: “Restrict the basic datatypes in terms of their ranges and constrained on their operations”

Examples: **Seq. No.**: Ranges: 0, 1, 2, ..., Max (some reasonable number)
Operation: None of the integer operations make sense
: Boolean operations such as “==” can be performed
Marks: Ranges: 0, 1, ..., 100
Operation: Integer operation such as +, -

Transformation of sub-datatypes:
Date: 15 Jan : It is a string datatype.
Questions: What will be the date after 3 days?

We assume, 1 Jan : 0
2 Jan : 1
3 Jan : 2
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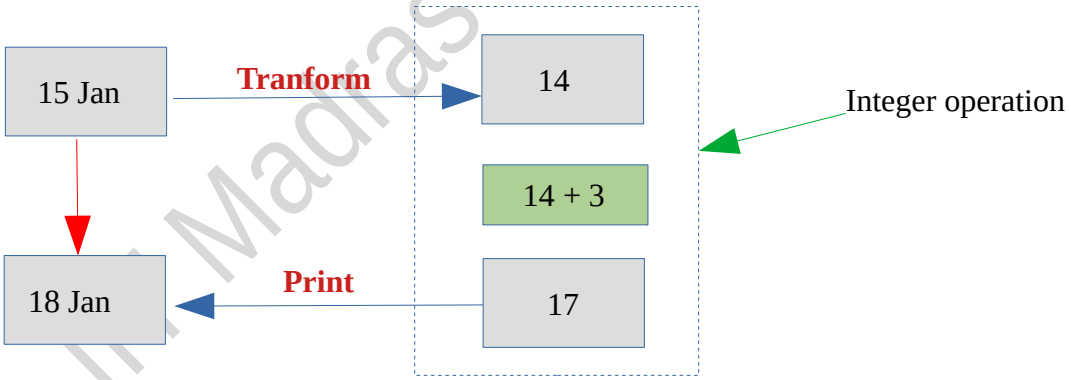
15 Jan : 14
---
18 Jan: 17
---
31 Dec : 364 (for non-leap year)



Marks: Physics marks = 80.5
Mathematics marks = 90.5

We want to add the above two subject marks.

80.5 → 80.5x100 = 8050
90.5 → 90.5x100 = 9050

Then we performed integer operation, 8050 + 9050 = 17100
After that we need to bring back in original form by using “**print**” (defined in lecture)

print(17100) = 171.00

Lists and Records:

List: “A sequence of data elements of same or may be of different datatypes”
Example: (i) Subject marks obtained by **Clarence:** [63, 88, 73]

(ii) Details of **Clarence:** [9, “Clarence”, ‘M’, “6 Dec”, “Bengaluru”, 63, 88, 73, 224]

Record: “Stores data with multiple fields: each of which has a **name** and a **value**”
Example: A card of the Scores dataset.
{“Seq. No.”: 9, “Name”: “Clarence”, “DoB”: “6 Dec”, “Town/City”: “Bengaluru”,
“Mathematics”: 63, “Physics”: 88, “Chemistry”: 73, “Total”: 224}