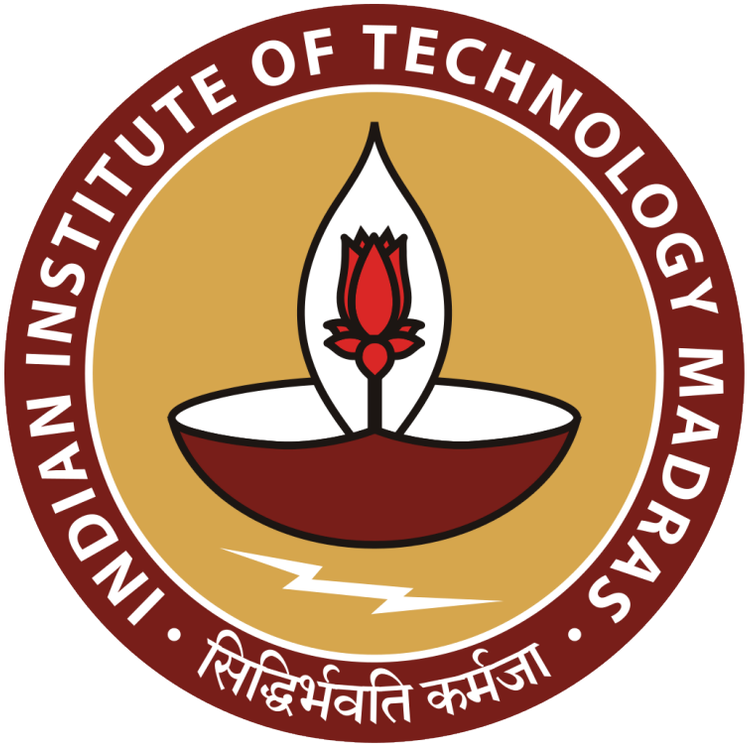

IIT Madras

ONLINE DEGREE

Summary of concepts introduced in weeks 1-4

Iterators and Variables

- The **iterator** is the most commonly used pattern in computational thinking
- Represents the procedure of doing some task repeatedly
  - requires an initialisation step,
  - the steps for the task that needs to be repeated,
  - and a way to determine when to stop the iteration

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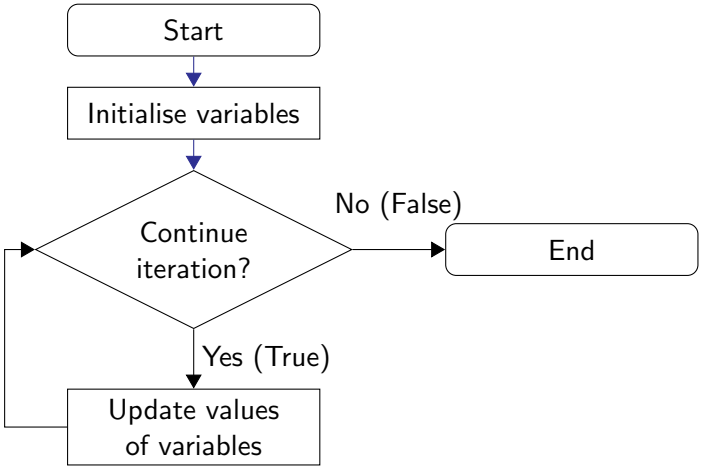
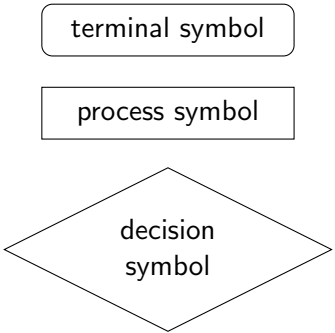
- Initialisation and updates of variables are done through **assignment statements**

Iterator represented as a flowchart

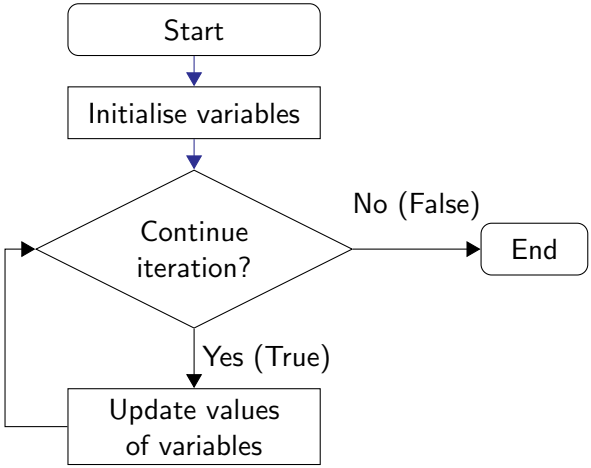




$\longrightarrow$ show progress from one step to another

Iteration expressed through pseudocode

```
Initialise variables
while (Continue with Iteration?) {
  Update values of variables
}
```



Iteration to systematically go through a set of items

Initialise variables

while (Pile 1 has more cards) {

  Pick a card **X** from Pile 1

  Move **X** to Pile 2

Update values of variables

}

The set of items need to have well defined values

- Sanity of different data fields of the item

  ... leads us to the concept of **datatypes**, which clearly identifies the values and allowed operations
- Basic data types - **boolean, integer, character**
- Add to this **string** data type
- **Subtypes** put more constraints on the values and operations allowed
- Lists and Records are two ways of creating bigger bundles of data
- In a **list** all data items typically have the same datatype
- Whereas, a **record** has multiple named fields, each can be of a different datatype

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- Expressed in pseudocode, it would look something like this:

```
Initialise variables
while (Continue with Iteration?) {
  ...
  if (condition is satisfied?) {
    Update some variables
  }
  ...
}
Prepare final results from variable values
```

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  - Example: max

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- e.g. finding max for each subject

Accumulation through Iteration

- The most common use of an iterator is to create an aggregate value (**accumulation**) from the available values
- Simple examples of this are count, sum, average
- We could also apply filtering while doing accumulation - e.g. sum of boys marks
- We could also collect a list of elements - e.g. list of students with max marks in a subject

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- Second iteration can do filtering using the accumulator variables
- e.g. find above average students - average is an accumulator from the first iteration
- This establishes a relationship between any element and the aggregate of all elements
- e.g. find out the more frequently occuring word, higher spending customers, etc

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- How do we store such relationships?
- To be discussed in the next 4 weeks