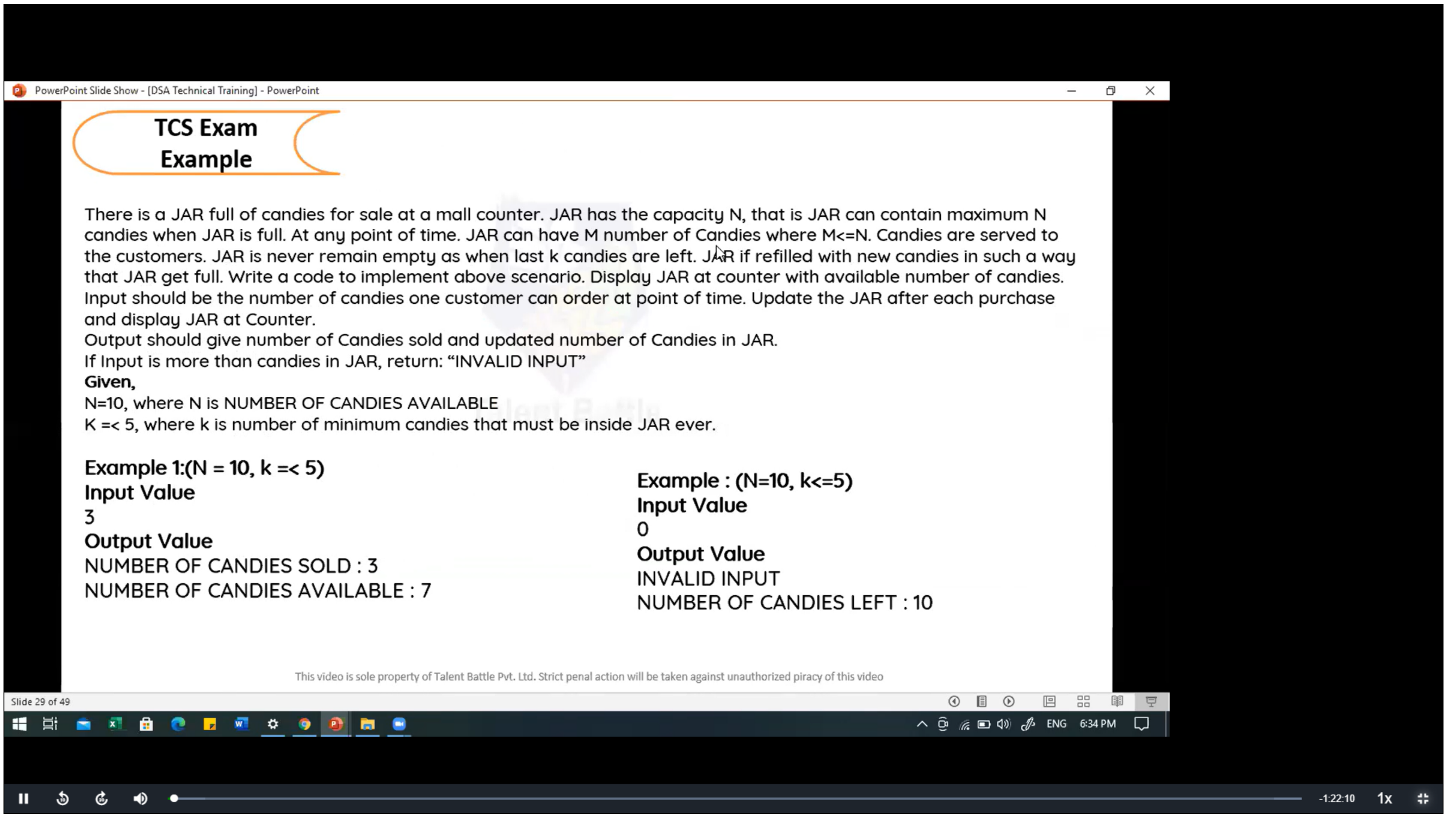
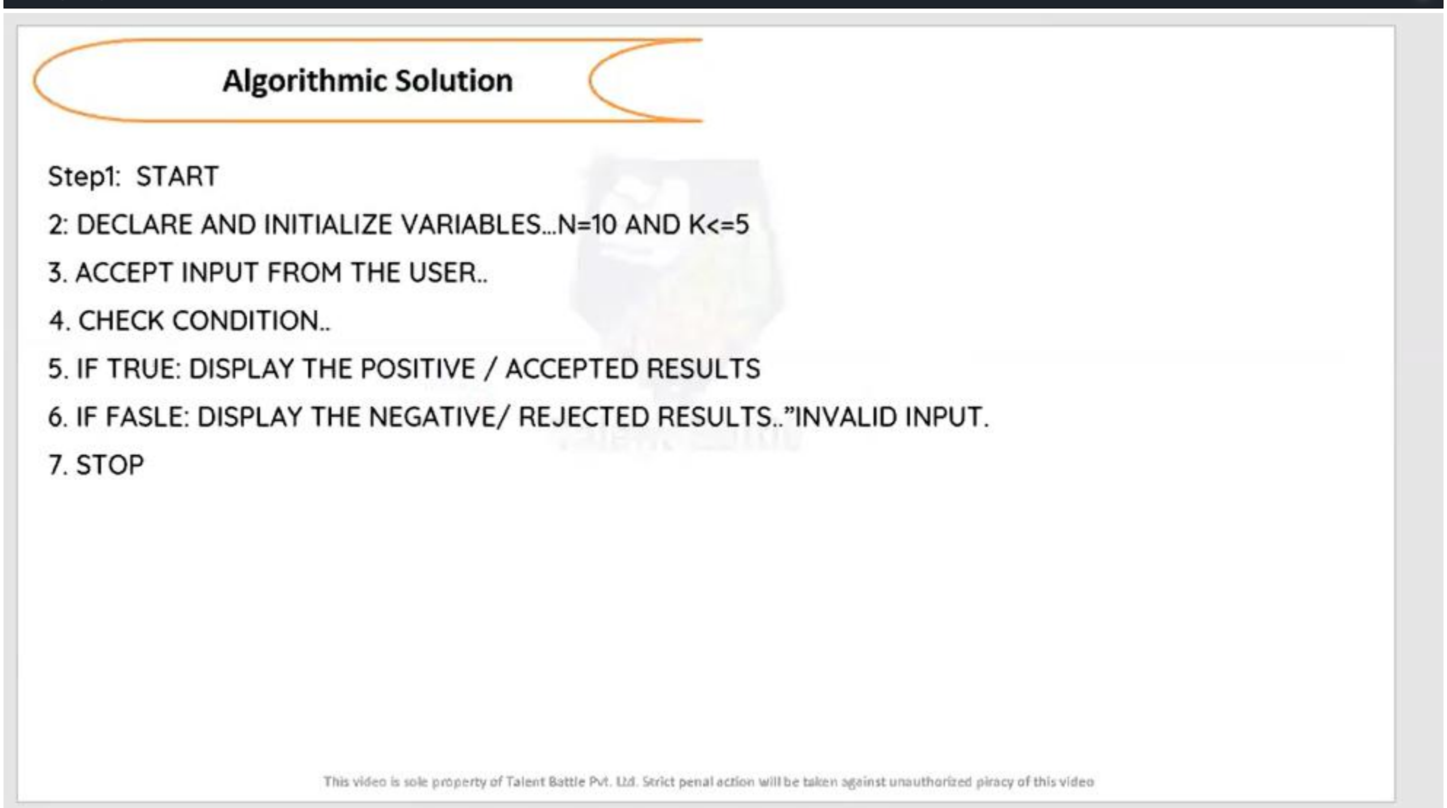
Day2

DSA Introduction Part 2



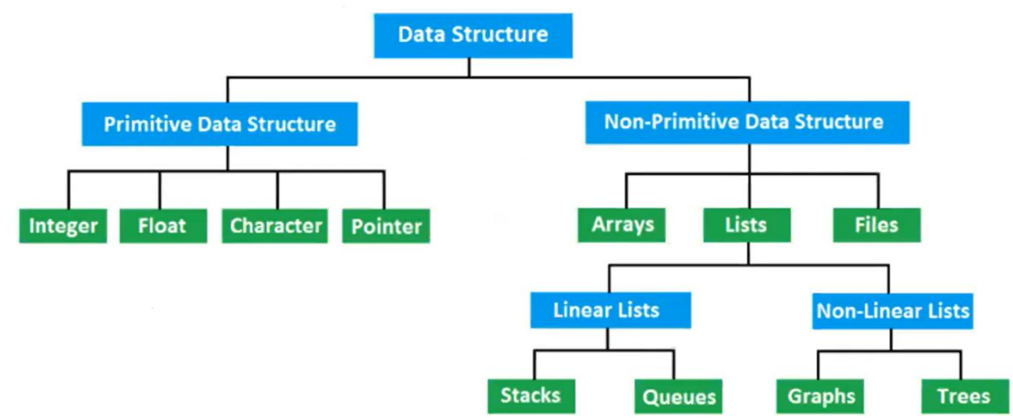


Need for Data Structures

- Data Structures organize data = efficient programs.
- The choice of data structure??
- A data structure requires certain amount of:

  "Time , Space, Programming efforts."
- Data Structures deals with the study of how data is organized in the memory, how efficiently the data can be retrieved and manipulated, and possibly the different data items are logically related.

Classification of Data Structures



Classification of Data Structures

- Dynamic Data Structures: grow and shrink during execution
- Linked Lists: insertions and removal made anywhere
- Stacks: insertions and removal made only at top of the stack
- Queues: insertion made at the back and removal made from the front
- Binary Trees: high speed searching and sorting of data
- Graphs: non-linear data structure consisting nodes and edges

TCS Exam Example

Problem Statement: Checking if a given year is leap year or not

Explanation:
To check whether a year is leap or not

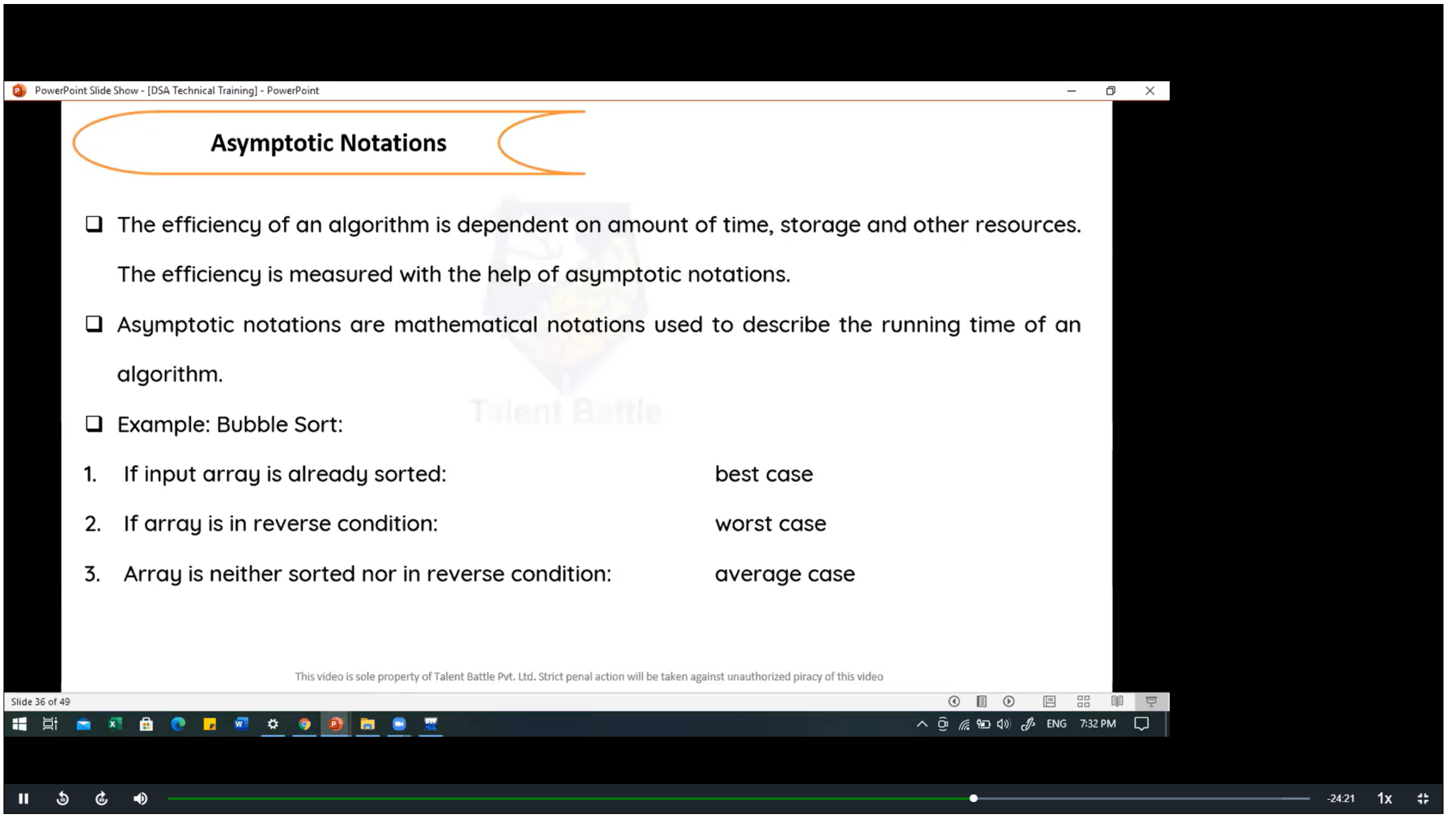
Step 1:
- We first divide the year by 4.
- If it is not divisible by 4 then it is not a leap year.
- If it is divisible by 4 leaving remainder 0

Step 2:
- We divide the year by 100
- **If it is not divisible by 100 then it is a leap year.**
- If it is divisible by 100 leaving remainder 0

Step 3:
- We divide the year by 400
- If it is not divisible by 400 then it is a leap year.
- If it is divisible by 400 leaving remainder 0

Then it is a leap year

leap year
a year, occurring once every four years, which has 366 days including 29 February as an intercalary day.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Asymptotic Notations
❑ The efficiency of an algorithm is dependent on amount of time, storage and other resources. The efficiency is measured with the help of asymptotic notations.
❑ Asymptotic notations are mathematical notations used to describe the running time of an algorithm.
❑ Example: Bubble Sort:
1. If input array is already sorted: best case
2. If array is in reverse condition: worst case
3. Array is neither sorted nor in reverse condition: average case
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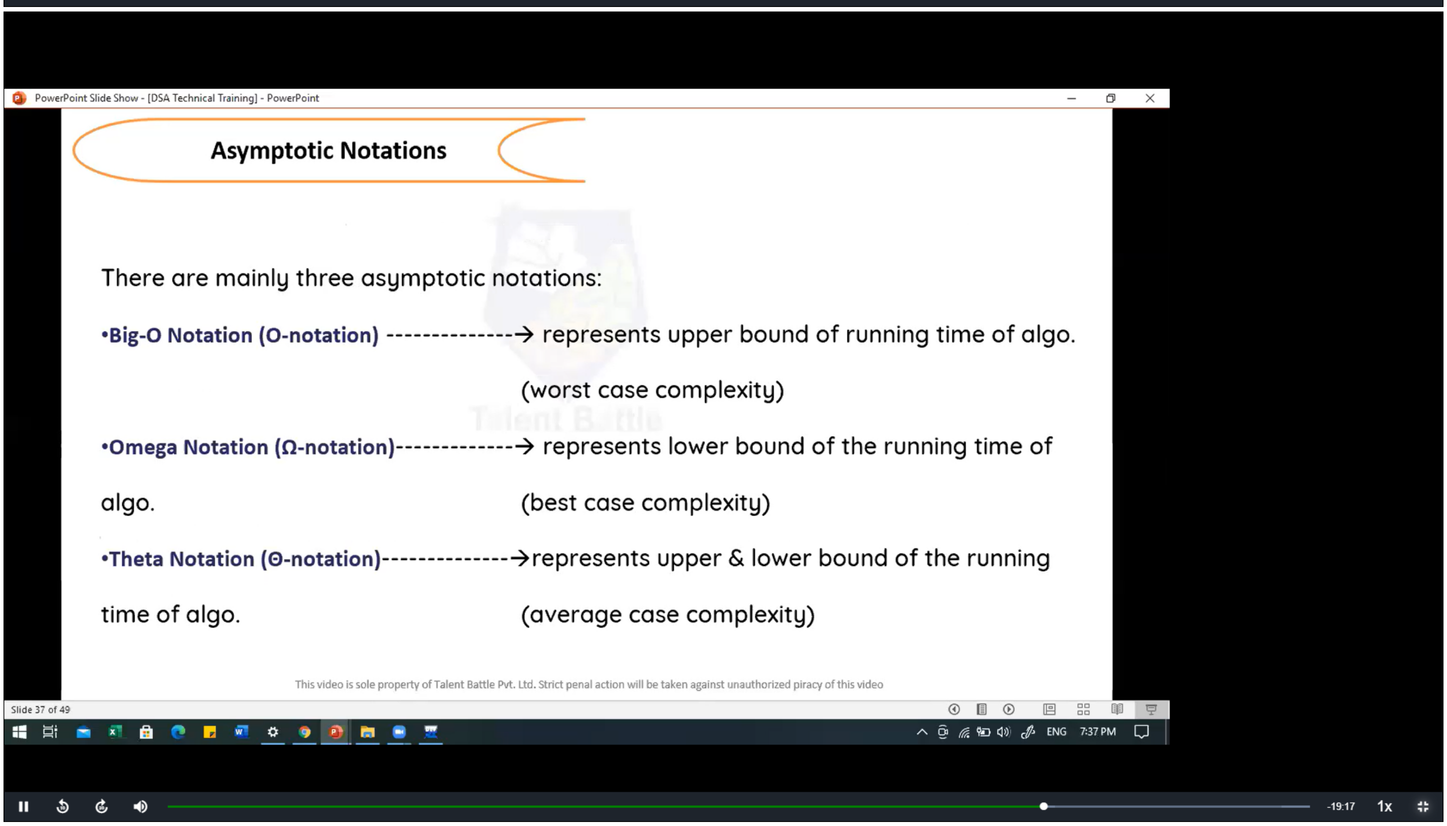
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Asymptotic Notations
There are mainly three asymptotic notations:
•Big-O Notation (O-notation) --------------→ represents upper bound of running time of algo. (worst case complexity)
•Omega Notation (Ω-notation)-------------→ represents lower bound of the running time of algo. (best case complexity)
•Theta Notation (Θ-notation)--------------→represents upper & lower bound of the running time of algo. (average case complexity)
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