

## Big O Basic Concepts:

- **$O(1)$ : Constant Time**
  - Doesn't depend on the size of the data set.
  - Example: Accessing an array element by its index.
- **$O(\log n)$ : Logarithmic Time**
  - Splits the data in each step (divide and conquer).
  - Example: Binary search.
- **$O(n)$ : Linear Time**
  - Directly proportional to the data set size.
  - Example: Looping through an array.
- **$O(n \log n)$ : Linearithmic Time**
  - Splits and sorts or searches data.
  - Example: Merge sort, quick sort.
- **$O(n^2)$ : Polynomial Time**
  - Nested loops for each power of  $n$ .
  - Example: Bubble sort ( $O(n^2)$ ).

## Omega ( $\Omega$ ) – Best Case

- **What it means:** Omega ( $\Omega$ ) describes the best-case scenario for an algorithm.
- **In simple terms:** It tells you the fastest an algorithm can run in the best circumstances.

## Theta ( $\Theta$ ) – Average Case

- **In simple terms:** It tells you what to generally expect in terms of time complexity.

## Big O ( $O$ ) - Worst Case

- **What it means:** Big O ( $O$ ) describes the worst-case scenario for an algorithm.
- **In simple terms:** It tells you the slowest an algorithm can run in the worst circumstances.

## Other Concepts:

- **Drop Non-Dominant Terms**
  - In  $O(n^2 + n)$ , focus on  $O(n^2)$  as it will dominate for large  $n$ .
- **Drop Constants**
  - $O(2n)$  simplifies to  $O(n)$ .