Asymptotic Notation and Arrays

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Asymptotic Notations

- Asymptotic notations are used to represent the complexities of algorithms for asymptotic analysis.
- These notations are mathematical tools to represent the complexities.
- There are three notations that are commonly used.

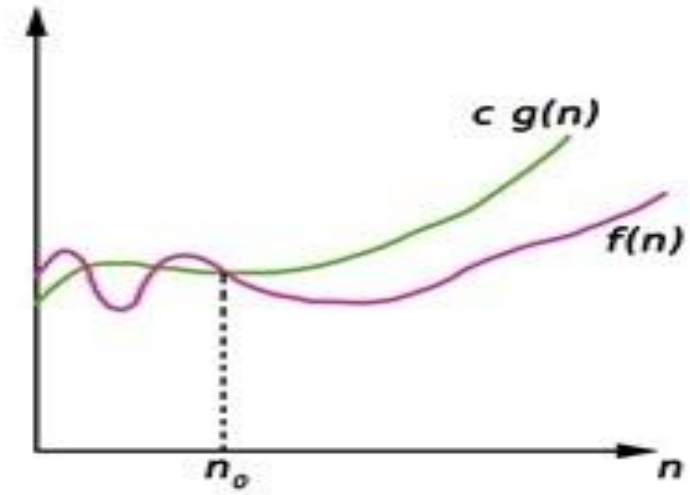
Big Oh Notation

Big Omega Notation

Big Theta Notation

Big Oh Notation

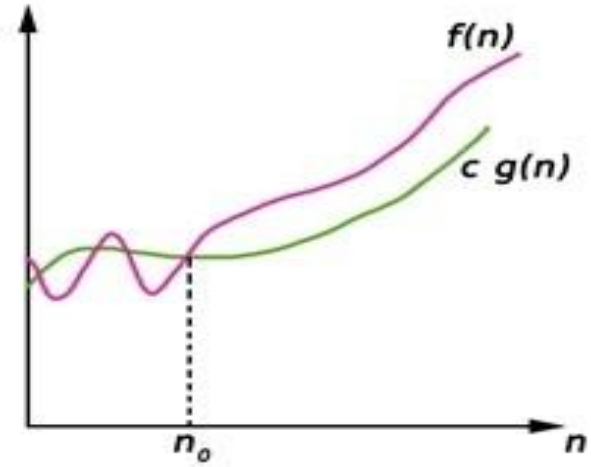
- Big-Oh (O) notation gives an upper bound for a function f(n) to within a constant factor.



- We write f(n) = O(g(n)), If there are positive constantsn0 and c such that, to the right of n0 the f(n) always lies on or below c*g(n).
- O(g(n)) = { f(n) : There exist positive constant c and n0 such that $0 \leq f(n) \leq c\ g(n)$, for all $n \geq n0$}

Big Omega Notation

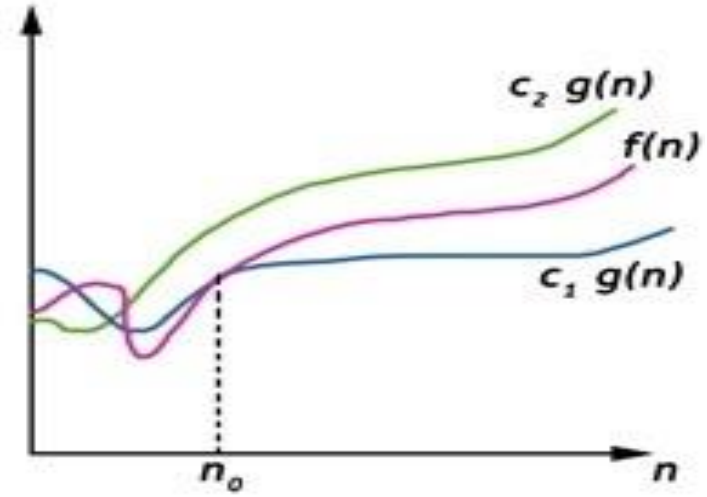
- Big-Omega (Ω) notation gives a lower bound for a function f(n) to within a constant factor.



- We write f(n) = Ω(g(n)), If there are positive constantsn0 and c such that, to the right of n0 the f(n) always lies on or above c*g(n).
- Ω(g(n)) = { f(n) : There exist positive constant c and n0 such that $0 \leq c\ g(n) \leq f(n)$, for all $n \geq n0$}

Big Theta Notation

- Big-Theta(Θ) notation gives bound for a function f(n) to within a constant factor.



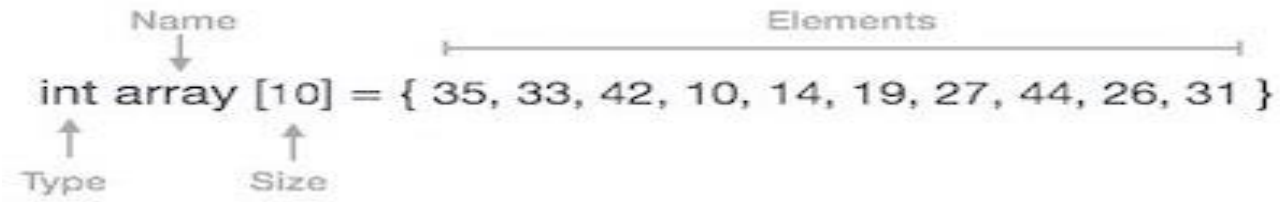
- We write f(n) = Θ(g(n)), If there are positive constantsn0 and c1 and c2 such that, to the right of n0 the f(n) always lies between c1*g(n) and c2*g(n) inclusive.
- Θ(g(n)) = {f(n) : There exist positive constant c1, c2 and n0 such that $0 \leq c1\ g(n) \leq f(n) \leq c2\ g(n)$, for all $n \geq n0$}

ARRAYS

- Array is a container which can hold a fix number of items and these items should be of the same type.
- Most of the data structures make use of arrays to implement their algorithms.
- **Element** – Each item stored in an array is called an element.
- **Index** – Each location of an element in an array has a numerical index, which is used to identify the element.

Array Representation

- Arrays can be declared in various ways in different languages. For illustration, let's take C array declaration.



- Arrays can be declared in various ways in different languages. For illustration, let's take C array declaration.

- As per the above illustration, following are the important points to be considered.
- Index starts with 0.

Basic Operations

Following are the basic operations supported by an array.

- **Traverse** − print all the array elements one by one.
- **Insertion** − Adds an element at the given index.
- **Deletion** − Deletes an element at the given index.
- **Search** − Searches an element using the given index or by the value.
- **Update** − Updates an element at the given index.