**Linear search**

Linear search is a very simple search algorithm. In this type of search, a sequential search is made over all items one by one. Every item is checked and if a match is found then that particular item is returned, otherwise the search continues till the end of the data collection.

**Sample:**

int linearSearch(int ara[],int x)

{

for(int i=0; i<n; i++)

if(x==ara[i])

return i;

return -1;

}

**Analysis:**

Suppose have a Array of 5 element,

Ara={10,15,35,5,25}

Let x=20, we want know the existence of x in the array so the procedure is given below:

Step 1:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 10 | 15 | 35 | 5 | 25 |

Compare x with 1st element of the array

ara[0], x!=ara[0] ,go to the next step

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 10 | 15 | 35 | 5 | 25 |

Step 2:

Compare x with 2nd element of the array

ara[1], x!=ara[1] , go to the next step

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 10 | 15 | 35 | 5 | 25 |

Step 3:

Compare x with 3rd element of the array

ara[1], x!=ara[2] , go to the next step

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 10 | 15 | 35 | 5 | 25 |

Step 4:

Compare x with 4th element of the array

ara[1], x!=ara[3] , go to the next step

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 10 | 15 | 35 | 5 | 25 |

Step 5:

Compare x with 5th element of the array

X==ara[4] ,so function will return index of ara[4]

**Time complexity**

Best case:

We must know the case that causes minimum number of operations to be executed. In the linear search problem, the best case occurs when x is present at the first location. The number of operations in the best case is constant (not dependent on n). So time complexity in the best case would be: Θ(1)

Worst case:

For Linear Search, the worst case happens when the element to be searched (x in the above code) is not present in the array. When x is not present, the search() functions compares it with all the elements of arr[] one by one. Therefore, the worst case time complexity of linear search would be : Θ(n).

Average case:

For average case Sum all the calculated values and divide the sum by total number of inputs.

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Ignoring the constant co-efficient, we can say that the complexity in average case of linear search is : O(n).