Searching and Sorting

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Searching in Arrays

- Searching an array means to find a particular element in the array. The search can be used to return the position of the element or check if it exists in the array.

- In searching, there are two types: sequential search(Linear search) and interval search.

  - Linear or Sequential Search
    This algorithm works by sequentially iterating through the whole array or list from one end until the target element is found. If the element is found, it returns its index, else -1.

C++ code for Linear Search

```cpp
#include<iostream>
using namespace std;
int main()
{
    int arr[10], i, num, index;
    cout<<"Enter 10 Numbers: ";
    for(i=0; i<10; i++)
        cin>>arr[i];
    cout<<"\nEnter a Number to Search: ";
    cin>>num;
    for(i=0; i<10; i++)
    {
        if(arr[i]==num)
        {
            index = i;
            break;
        }
    }
    cout<<"\nFound at Index No."<<index;
    cout<<endl;
    return 0;
}
```

Sorting in Arrays

- Sorting in C++ is a concept in which the elements of an array are rearranged in a logical order. This order can be from lowest to highest or highest to lowest. Sorting an unsorted array helps to solve many problems such as searching for the minimum or maximum element, etc.

- There are many algorithms to sort a numerical array such as bubble sort, insertion sort, selection sort, merge sort, quick sort, heap sort etc.

- Bubble sort:
  - Bubble sort is a data sorting algorithm that works by randomly copying elements from the first array into a smaller second array, and then reversing the order of these arrays. After this process has been repeated multiple times, the sorted data will be located in the middle of the larger array.

C++ code for Bubble sort

```cpp
#include<iostream>
using namespace std;
int main()
{     int arr[10], i, j,temp;
cout<<"Enter 5 integers: \n";
for(i=0;i<5;i++)
  { cout<<"Enter values: ";
    cin>>arr[i];
   }
cout<<"The original values in an array:\n";
for(i=0;i<5;i++)
    cout<<arr[i]<<"  ";
for(i=0;i<5;i++)
   for(j=0;j<4;j++)
   if(arr[j]>arr[j+1])
  {  temp=arr[j];
    arr[j]=arr[j+1];
    arr[j+1]=temp;
  }
cout<<"\nThe sorted Array:\n";
 for(i=0;i<5;i++)
    cout<<arr[i]<<"  ";
    return 0;
}
```

Output:

Enter 5 integers:

Enter values: 9

Enter values: 60

Enter values: 23

Enter values: 43

Enter values: 11

The original values in an array:

9 60 23 43 11

The sorted Array:

9 11 23 43 60