STL Pairs, sort() and structure in C++

pop_back() in vector

- Removes the last element of a vector

```
vector<int> vec={1,2,3,4,5}; // (size=5)
vec.pop_back();
```

After pop_back(),

vec becomes {1,2,3,4}; (size=4)

Time Complexity = O(1)

sort()

Time Complexity = O(n log n)

vec:={5,1,7,3,4,9}

syntax-> sort(starting_iterator, ending_iterator)

starting_iterator-> vec.begin();

ending_iterator-> vec.end();

Example

```
sort(vec.begin(),vec.end());
```

swap()

Syntax: swap(a, b);

swap() is used to interchange the values of any 2 variables

Example:

```
int a=5;
int b=6;
swap(a,b);
cout<<a<<endl;
cout<<b<<endl;
```

Example for sort() :

Let n = size of vector
vec:= {1,2,3,4,5,6};
Staring_itr -> vec.begin();
Second_itr -> vec.begin()+1;
Third_itr -> vec.begin()+2;
..
Last_itr -> vec.begin()+n-1;
vec.begin()+n == vec.end();
sort(vec.begin(), vec.begin()+n);
sort(vec.begin(), vec.end());
L---r sort(l,r+1);

reverse()

Time complexity: O(n)

vec-> {4,1,2,8,3};

How will you sort in decreasing order ?

```
sort(vec.begin(),vec.end()); // {1,2,3,4,8}
reverse(vec.begin(),vec.end()); // {8,4,3,2,1}
```

How do we sort in case of array?

```
int arr[5] = {4,1,2,8,3};
```

n = size of array (Here, it is 5)

Staring_itr -> arr;

Second_itr -> arr+1;

Third_itr -> arr+2;

..

Last_itr -> arr+n-1;

Ending_itr -> last_itr+1 == arr+n-1+1 == arr+n;

```
sort(arr, arr + n);
```

Code-1 (To reverse an array without using reverse())

```
#include <bits/stdc++.h>
using namespace std;
int main(){
    int arr[5]={4,1,2,8,3};
```

```
    int n=sizeof(arr)/sizeof(int);
    int l=0,r=n-1;
    while(l<=r){
        swap(arr[l],arr[r]);
        l++;
        r--;
    }
    for(int i=0;i<n;i++) cout<<arr[i]<<" ";
    return 0;
}
```

Struct

Code-1

```
#include <bits/stdc++.h>
using namespace std;

struct Freshers{
    string name;
    string AdmNo;
    int age;
    double height;
};
// structure definition ends with a semicolon (;)
```

```
int main(){

    Freshers fresher;
    fresher.name = "Manyank";
    fresher.AdmNo = "20JE0655";
    fresher.age = 18;
    fresher.height = 6.1;

    cout<<"Info of freshers is :"<<endl;
    cout<<fresher.name<<endl;
    cout<<fresher.AdmNo<<endl;
    cout<<fresher.age<<endl;
    cout<<fresher.height<<endl;
    return 0;
}
```

Code-2

```
    #include <bits/stdc++.h>
using namespace std;

struct Point{
    int x;
    int y;
};
int main(){
```

```
    Point point[n];
    for(int i=0;i<n;i++)
cin>>point[i].x>>point[i].y;

    (x1,y1);
    (x2,y2);
    (x3,y3);
    ...
    (xn,yn);

    int X[n];
    int Y[n];
    for(int i=0;i<n;i++) cin>>X[i]>>Y[i];

    (xi,yi);

    cout<<X[i]<<" "<<Y[i]<<endl;


    return 0;
}
```

Pair in C++ STL

```cpp
#include <bits/stdc++.h>
using namespace std;

int main(){

    pair<int,int> point;

    cin>>point.first>>point.second;
    cout<<point.first<<" "<<point.second<<endl;

    pair<string,double> Fresher;

    cin>>Fresher.first;
    cin>>Fresher.second;

    cout<<"The name of the student is: " <<
Fresher.first << endl;
    cout<<"The height of the student is: " <<
Fresher.second << endl;

    return 0;
}
```

Point in 3D->

```cpp
#include <bits/stdc++.h>
using namespace std;
int main(){

    pair<int,pair<int,int>> point3D;
    // x-> point3D.first;
    // y-> point3D.second.first;
    // z-> point3D.second.second;

    return 0;
}
```

Hackerrank Problem: Equalize the array

Link:
https://www.hackerrank.com/challenges/equality-in-a-array/problem
(First, try it by yourself, then only look at the solution below)

```cpp
#include<bits/stdc++.h>
using namespace std;
int main()
{
    int n;
    cin>>n;
    int a[n]; // 3 1 1 2 2 2 3 3 3
```

```
    for(int i=0;i<n;i++){
        cin>>a[i];
    }
    sort(a,a+n); // 1 1 2 2 2 3 3 3 3
    int ans = 10000;
    for(int i=0;i<n;i++){
        int freq=0;
        int com = a[i];
        while(i<n&&a[i]==com){
            freq++;
            i++;
        }
        i--;
        ans = min(ans,n-freq);
    }
    cout<<ans;
}
```

Try the below problem, it would be discussed in next class:

https://atcoder.jp/contests/abc187/tasks/abc187_d