**Algorithms**

**3. Sorting**

**Bubble Sort**

1. **Bubble Sort**

**#include<bits/stdc++.h>**

**using namespace std;**

**int main()**

**{**

**int num,temp;**

**int count=0;**

**int flag = 1;**

**cin>>num;**

**int a[num];**

**for(int i=0;i<num;i++)**

**{**

**cin>>a[i];**

**}**

**while(flag!=0)**

**{**

**flag=0;**

**count++;**

**for(int i=0;i<num-1;i++)**

**{**

**if(a[i]>a[i+1])**

**{**

**temp = a[i];**

**a[i] = a[i+1];**

**a[i+1] = temp;**

**flag = 1;**

**}**

**}**

**}**

**cout<<count;**

**}**

1. **Selection Sort**

**1. Old keypad in a Foreign Land**

**#include <iostream>**

**#include <bits/stdc++.h>**

**using namespace std;**

**int main() {**

**int n;**

**cin >> n;**

**int a[n];**

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

**cin >> a[i];**

**}**

**sort(a,a+n,greater<int>());**

**int k;**

**cin >> k;**

**vector<int> key;**

**int keySize[k];**

**int s = 0;**

**for(int i=0;i<k;i++){**

**cin >> keySize[i];**

**s += keySize[i];**

**for(int j = 0; j<keySize[i];j++){**

**key.push\_back(j+1);**

**}**

**}**

**if(s < n){**

**cout << "-1" << endl;**

**return 0;**

**}**

**sort(key.begin(),key.end());**

**int ans = 0;**

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

**ans += (a[i] \* key[i]);**

**}**

**cout << ans << endl;**

**}**

1. **Insertion Sort**

**Monk and Nice String**

**#include <iostream>**

**using namespace std;**

**int main() {**

**int n;**

**cin >> n;**

**char arr[n];**

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

**cin >> arr[i];**

**}**

**int j = 0;**

**int count = 0;**

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

**{**

**if (i == 0)**

**{**

**cout << "0" << endl;**

**}**

**else**

**{**

**j = i-1;**

**count = 0;**

**while (j >= 0){**

**if ((int)arr[i] > (int)arr[j]){**

**count++;**

**}**

**j--;**

**}**

**cout << count << endl;**

**}**

**}**

**}**

1. **Merge Sort**

**Fredo and Sums**

**#include<bits/stdc++.h>**

**using namespace std;**

**int main()**

**{**

**int t;**

**cin>>t;**

**while(t--){**

**int n;**

**cin>>n;**

**long arr[n];**

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

**{**

**cin>>arr[i];**

**}**

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

**long max\_sum=0,min\_sum=0;**

**for(int i=0;i<n;i=i+2)**

**{**

**min\_sum+=abs(arr[i]-arr[i+1]);**

**}**

**int j=n-1;**

**for(int i=0;i<n/2;i++,j--)**

**{**

**max\_sum+=abs(arr[i]-arr[j]);**

**}**

**cout<<min\_sum<<" "<<max\_sum<<endl;**

**}**

**return 0;**

**}**

1. **Quick Sort**

**Specialty of sequence**

**#include <iostream>**

**#include <bits/stdc++.h>**

**#define ll long long**

**using namespace std;**

**int main() {**

**int n,k;**

**cin >> n >> k;**

**ll arr[n];**

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

**cin >> arr[i];**

**}**

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

**int sum = 0;**

**for(int i=0;i<n-k;i++){**

**sum += arr[i];**

**}**

**cout << sum;**

**}**

1. **Counting Sort**

**Shil and birthday present**

**#include<bits/stdc++.h>**

**using namespace std;**

**int main()**

**{**

**int n;**

**cin>>n;**

**int a[n];**

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

**cin>>a[i];**

**}**

**sort(a,a+n);**

**int duplicate=0;**

**for(int i=0;i<n-1;i++)**

**{**

**if(a[i]==a[i+1])**

**{**

**duplicate++;**

**}**

**}**

**int exact\_sze=n-duplicate;**

**long ans=(long)exact\_sze;**

**ans=ans\*(ans-1)/2;**

**cout<<ans<<endl;**

**}**

1. **Heap Sort**

**Raghu Vs Sayan**

#include<bits/stdc++.h>

#define ll long long int

using namespace std;

int main(){

ios\_base::sync\_with\_stdio(false);

cin.tie(NULL);

int t;

cin>>t;

while(t--){

ll A, B,N;

cin>>A>>B>>N;

vector<ll> v;

for(int i=0;i<N;i++){

ll x;

cin>>x;

v.push\_back(x);

}

ll countr =0;

ll counts =0;

sort(v.begin(),v.end());

for(int i=0;i<N;i++){

A=A-v[i];

if(A<0){

break;

}

countr++;

}

for(int i=0;i<N;i++){

B=B-v[i];

if(B<0){

break;

}

counts++;

}

if(countr>counts){

cout<<"Raghu Won"<<endl;

}

else if(counts>countr){

cout<<"Sayan Won"<<endl;

}

else{

cout<<"Tie"<<endl;

}

}

}

1. **Bucket Sort**

**Descending Weights**

**#include<bits/stdc++.h>**

**using namespace std;**

**int main(){**

**ios\_base::sync\_with\_stdio(0);**

**cin.tie(0);**

**int n,k;cin>>n>>k;**

**vector<pair<int,int>>v;**

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

**int x;cin>>x;**

**int y = x%k;**

**v.push\_back({y,-x});**

**}**

**sort(v.rbegin(),v.rend());**

**for(int i = 0; i<v.size(); i++){**

**cout<<(-v[i].second)<<" ";**

**}**

**return 0;**

**}**