

Week 5 Reference Solutions

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1. Given n numbers, list them in reverse order.

- Idea: Just output the array from the last element to the first element.
- Sample Input:

```
1 5
2 10 20 30 40 50
```

- Sample Output:

```
1 50 40 30 20 10
```

- Solution:

```
1 #include<bits/stdc++.h>
2 using namespace std;
3
4 int main(){
5     int arr[10005], n;
6     cin >>n;
7     for(int i=0;i<n;++i){
8         cin >>arr[i];
9     }
10    for(int i=n-1;i>=0;--i){
11        cout<<arr[i]<<' ';
12    }
13 }
```

2. Given n numbers, list the frequency of each number. Note that the numbers are all between 0 and 100.

- Idea: Use an array to count the frequency of each number.
- Sample Input:

```
1 7
2 1 1 2 2 3 3 3 3
```

- Sample Output:

```

1 1:2
2 2:2
3 3:3

```

- Solution:

```

1 #include<bits/stdc++.h>
2 using namespace std;
3
4 int main(){
5     int arr[105]={0}, n, mx=-1;
6     cin >>n;
7     for(int i=0;i<n;++i){
8         int tmp;
9         cin >>tmp;
10        mx=max(mx, tmp);
11        ++arr[tmp];
12    }
13    for(int i=0;i<=mx;++i){
14        if(arr[i])cout<<i<<":"<<arr[i]<<'\n';
15    }
16 }

```

3. The formula of standard deviation is: $SD = \sqrt{\frac{1}{n} \sum_{i=1}^n (x_i - \mu)^2}$, where μ is the mean of the n numbers. Given n numbers, calculate the standard deviation.

- Idea: First calculate the mean, then calculate the standard deviation using the formula.
- Sample Input:

```

1 5
2 1 2 3 4 5

```

- Sample Output:

```

1 1.41421

```

- Solution:

```

1 #include<bits/stdc++.h>
2 using namespace std;
3
4 int main(){
5     int arr[10005], mean=0, n;
6
7     cin >>n;
8     for(int i=0;i<n;++i){
9         cin >>arr[i];
10        mean+=arr[i];
11    }
12    mean/=n;
13

```

```

14     double sd=0;
15     for(int i=0;i<n;++i){
16         sd+=(arr[i]-mean)*(arr[i]-mean);
17     }
18     sd=sqrt(sd/n);
19
20     cout<<sd;
21 }

```

4. Given n numbers, find the length of the longest continuous increasing subsequence.

- Idea: Enumerate the start of the subsequence, and extend it as long as possible.
- Sample Input:

```

1 13
2 10 22 9 33 21 50 41 60 80 3 5 7 8

```

- Sample Output:

```

1 4

```

- Solution:

```

1 #include<bits/stdc++.h>
2 using namespace std;
3
4 int main(){
5     int arr[10005], n, mx=-1;
6     cin >>n;
7     for(int i=0;i<n;++i)cin >>arr[i];
8
9     for(int i=0;i<n;++i){
10         for(int j=0;j<n-i;++j){
11             int now=i+j;
12             if(j==0 || arr[now]>arr[now-1]){
13                 mx=max(mx, j+1);
14             }
15             else break;
16         }
17     }
18     cout<<mx<<'\n';
19 }

```

5. Given n numbers, find their greatest common divisor (GCD) and least common multiple (LCM).

- Idea: Enumerate all numbers to find the GCD and LCM.
- Sample Input:

```

1 5
2 12 18 24 30 42

```

- Sample Output:

```
1 6 2520
```

- Solution:

```
1  #include<bits/stdc++.h>
2  using namespace std;
3
4  int main(){
5      int arr[10005], n, GCD, LCM, mi=1e9, ma=-1e9;
6      cin >>n;
7      for(int i=0;i<n;++i)cin >>arr[i], mi=min(mi, arr[i]), ma=max(ma, arr[i]);
8
9      GCD=1;
10     for(int i=1;i<=mi;++i){
11         bool flag=true;
12         for(int j=0;j<n;++j){
13             if(arr[j]%i!=0){
14                 flag=false;
15                 break;
16             }
17         }
18         if(flag)GCD=i;
19     }
20
21     LCM=ma;
22     for(int i=ma;;++i){
23         bool flag=true;
24         for(int j=0;j<n;++j){
25             if(i%arr[j]!=0){
26                 flag=false;
27                 break;
28             }
29         }
30         if(flag){
31             LCM=i;
32             break;
33         }
34     }
35     cout<<GCD<<" "<<LCM<<'\n';
36 }
```

6. Given n numbers, find the maximum sum of any contiguous subarray (elements in the array may be negative).

- Idea: Enumerate the start and end of the subarray, and calculate the sum.
- Sample Input:

```
1 7
2 -2 1 -3 4 1 -1 5
```

- Sample Output:

1 9

- Solution:

```
1  #include<bits/stdc++.h>
2  using namespace std;
3
4  int main(){
5      int arr[10005], n;
6      cin >>n;
7      for(int i=0;i<n;++i)cin >>arr[i];
8
9      int ma=-1e9, cur=0;
10     for(int i=0;i<n;++i){
11         for(int j=i;j<n;++j){
12             cur+=arr[j];
13             ma=max(ma, cur);
14         }
15         cur=0;
16     }
17
18     cout<<ma<<'\n';
19 }
```
