Rajalakshmi Engineering College

Name: Lakshmi Narayanan S
Email: 241801133@rajalakshmi.edu.in
Roll no: 241801133
Phone: 9345832054
Branch: REC
Department: I AI & DS - AE
Batch: 2028
Degree: B.E - AI & DS

Scan to verify results

NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 6_CY_Updated

Attempt : 1
Total Mark : 30
Marks Obtained : 30

Section 1 : Coding

1. Problem Statement

Sheela wants to distribute cookies to her children, but each child will only be happy if the cookie size meets or exceeds their individual greed factor. She has a limited number of cookies and wants to make as many children happy as possible. Priya decides to sort both the greed factors and cookie sizes using QuickSort to efficiently match cookies with children. Your task is to help Sheela determine the maximum number of children that can be made happy.

Input Format

The first line of input consists of an integer n, representing the number of children.

The second line contains n space-separated integers, where each integer represents the greed factor of a child.

The third line contains an integer m, representing the number of cookies.

The fourth line contains m space-separated integers, where each integer represents the size of a cookie.

Output Format

The output prints a single integer, representing the maximum number of children that can be made happy.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 3
1 2 3
2
1 1
Output: The child with greed factor: 1

Answer

```
#include <stdio.h> // Required for printf and scanf

// Swap function
void swap(int *a, int *b) {
    int temp = *a;
    *a = *b;
    *b = temp;
}

// Partition function for QuickSort
int partition(int arr[], int low, int high) {
    int pivot = arr[high];
    int i = low - 1;

    for (int j = low; j < high; j++) {
        if (arr[j] <= pivot) {
            i++;
            swap(&arr[i], &arr[j]);
        }
```

```
    }

    swap(&arr[i + 1], &arr[high]);
    return i + 1;
}

// QuickSort function
void quickSort(int arr[], int low, int high) {
    if (low < high) {
        int pi = partition(arr, low, high);
        quickSort(arr, low, pi - 1);
        quickSort(arr, pi + 1, high);
    }
}

// Function to count maximum happy children
int countHappyChildren(int greed[], int n, int cookies[], int m) {
    quickSort(greed, 0, n - 1);
    quickSort(cookies, 0, m - 1);

    int i = 0, j = 0, happyCount = 0;

    while (i < n && j < m) {
        if (cookies[j] >= greed[i]) {
            happyCount++;
            i++;
            j++;
        } else {
            j++;
        }
    }

    return happyCount;
}

int main() {
    int n, m;

    // Input number of children
    scanf("%d", &n);
    int greed[n];
    for (int i = 0; i < n; i++) {
```

```
        scanf("%d", &greed[i]);
    }

    // Input number of cookies
    scanf("%d", &m);
    int cookies[m];
    for (int i = 0; i < m; i++) {
        scanf("%d", &cookies[i]);
    }

    int result = countHappyChildren(greed, n, cookies, m);
    printf("The child with greed factor: %d", result);

    return 0;
}
```

Status : Correct **Marks : 10/10**

2. Problem Statement

Aryan is participating in a coding competition where he needs to sort a list of numbers using an efficient sorting algorithm. He decides to use Merge Sort, a divide-and-conquer algorithm, to achieve this. Given a list of n elements, Aryan must implement merge sort to arrange the numbers in ascending order.

Help Aryan by implementing the merge sort algorithm to correctly sort the given list of numbers.

Input Format

The first line of input contains an integer n, the number of elements in the list.

The second line contains n space-separated integers representing the elements of the list.

Output Format

The output prints the sorted list of numbers in ascending order, separated by a space.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 5
80 40 20 50 30

Output: 20 30 40 50 80

Answer

```
// You are using GCC
#include <stdio.h>

void merge(int arr[], int left, int mid, int right) {
    int i, j, k;
    int n1 = mid - left + 1;
    int n2 = right - mid;

    // Temporary arrays
    int L[n1], R[n2];

    // Copy data to temp arrays L[] and R[]
    for (i = 0; i < n1; i++)
        L[i] = arr[left + i];
    for (j = 0; j < n2; j++)
        R[j] = arr[mid + 1 + j];

    // Merge the temp arrays back into arr[left..right]
    i = 0; // Initial index of first subarray
    j = 0; // Initial index of second subarray
    k = left; // Initial index of merged subarray

    while (i < n1 && j < n2) {
        if (L[i] <= R[j]) {
            arr[k] = L[i];
            i++;
        } else {
            arr[k] = R[j];
            j++;
        }
        k++;
    }
```

```
    // Copy remaining elements of L[] if any
    while (i < n1) {
        arr[k] = L[i];
        i++;
        k++;
    }

    // Copy remaining elements of R[] if any
    while (j < n2) {
        arr[k] = R[j];
        j++;
        k++;
    }
}

void mergeSort(int arr[], int left, int right) {
    if (left < right) {
        // Same as (left + right)/2, but avoids overflow
        int mid = left + (right - left) / 2;

        // Sort first and second halves
        mergeSort(arr, left, mid);
        mergeSort(arr, mid + 1, right);

        // Merge the sorted halves
        merge(arr, left, mid, right);
    }
}

int main() {
    int n;
    scanf("%d", &n);
    int arr[n];

    for (int i = 0; i < n; i++)
        scanf("%d", &arr[i]);

    mergeSort(arr, 0, n - 1);

    for (int i = 0; i < n; i++)
        printf("%d ", arr[i]);
```

```
    printf("\n");
    return 0;
}
```

Status : Correct ***Marks : 10/10***

3. Problem Statement

Reshma is passionate about sorting algorithms and has recently learned about the merge sort algorithm. She wants to implement a program that utilizes the merge sort algorithm to sort an array of integers, both positive and negative, in ascending order.

Help her in implementing the program.

Input Format

The first line of input consists of an integer N, representing the number of elements in the array.

The second line of input consists of N space-separated integers, representing the elements of the array.

Output Format

The output prints N space-separated integers, representing the array elements sorted in ascending order.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 9
5 -3 0 12 7 -8 2 1 6
Output: -8 -3 0 1 2 5 6 7 12

Answer

```
#include <stdio.h>
```

```
// Function to merge two subarrays
void merge(int arr[], int left, int mid, int right) {
    int n1 = mid - left + 1; // Size of left subarray
    int n2 = right - mid;    // Size of right subarray

    int L[n1], R[n2]; // Temp arrays

    // Copy data to temp arrays
    for (int i = 0; i < n1; i++)
        L[i] = arr[left + i];
    for (int j = 0; j < n2; j++)
        R[j] = arr[mid + 1 + j];

    // Merge the temp arrays
    int i = 0, j = 0, k = left;
    while (i < n1 && j < n2) {
        if (L[i] <= R[j]) {
            arr[k++] = L[i++];
        } else {
            arr[k++] = R[j++];
        }
    }

    // Copy remaining elements of L[], if any
    while (i < n1) {
        arr[k++] = L[i++];
    }

    // Copy remaining elements of R[], if any
    while (j < n2) {
        arr[k++] = R[j++];
    }
}

// Merge sort function
void mergeSort(int arr[], int left, int right) {
    if (left < right) {
        int mid = left + (right - left) / 2;

        // Sort first and second halves
        mergeSort(arr, left, mid);
```

```
        mergeSort(arr, mid + 1, right);

        // Merge the sorted halves
        merge(arr, left, mid, right);
    }
}

int main() {
    int n;
    scanf("%d", &n);

    int arr[n];

    // Input array elements
    for (int i = 0; i < n; i++) {
        scanf("%d", &arr[i]);
    }

    // Sort using merge sort
    mergeSort(arr, 0, n - 1);

    // Print sorted array
    for (int i = 0; i < n; i++) {
        printf("%d ", arr[i]);
    }
    printf("\n");

    return 0;
}
```

Status : Correct ***Marks : 10/10***