

Rajalakshmi Engineering College

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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

Meera is organizing her art supplies, which are represented as a list of integers: red (0), white (1), and blue (2). She needs to sort these supplies so that all items of the same color are adjacent, in the order red, white, and blue. To achieve this efficiently, Meera decides to use QuickSort to sort the items. Can you help Meera arrange her supplies in the desired order?

Input Format

The first line of input consists of an integer n , representing the number of items in the list.

The second line consists of n space-separated integers, where each integer is either 0 (red), 1 (white), or 2 (blue).

Output Format

The output prints the sorted list of integers in a single line, where integers are arranged in the order red (0), white (1), and blue (2).

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 6

2 0 2 1 1 0

Output: Sorted colors:

0 0 1 1 2 2

Answer

```
#include <stdio.h>
void swap(int *a, int *b) {
    int temp = *a;
    *a = *b;
    *b = temp;
}
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;
}
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);
    }
}
int main() {
    int n;
```

```
scanf("%d", &n);
int arr[100];
for (int i = 0; i < n; i++) {
    scanf("%d", &arr[i]);
}
quickSort(arr, 0, n - 1);
printf("Sorted colors:\n");
for (int i = 0; i < n; i++) {
    printf("%d ", arr[i]);
}
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

```
#include <stdio.h>
void merge(int arr[], int left, int mid, int right) {
    int n1 = mid - left + 1;
    int n2 = right - mid;
    int L[n1], R[n2];
    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];
    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++];
    }
    while (i < n1) arr[k++] = L[i++];
    while (j < n2) arr[k++] = R[j++];
}
void mergeSort(int arr[], int left, int right) {
    if (left < right) {
        int mid = left + (right - left) / 2;
        mergeSort(arr, left, mid);
        mergeSort(arr, mid + 1, right);
        merge(arr, left, mid, right);
    }
}
int main() {
    int n;
    scanf("%d", &n);
    int arr[50];
    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

Marie, the teacher, wants her students to implement the ascending order of numbers while also exploring the concept of prime numbers.

Students need to write a program that sorts an array of integers using the merge sort algorithm while counting and returning the number of prime integers in the array. Help them to complete the program.

Input Format

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

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

Output Format

The first line of output prints the sorted array of integers in ascending order.

The second line prints the number of prime integers in the array.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 7

5 3 6 8 9 7 4

Output: Sorted array: 3 4 5 6 7 8 9

Number of prime integers: 3

Answer

```
// You are using GCC
#include <stdio.h>
#include <math.h>
int isPrime(int num) {
```

```

    if (num < 2) return 0;
    if (num == 2) return 1;
    if (num % 2 == 0) return 0;
    for (int i = 3; i <= sqrt(num); i += 2) {
        if (num % i == 0) return 0;
    }
    return 1;
}

void merge(int arr[], int left, int mid, int right) {
    int n1 = mid - left + 1;
    int n2 = right - mid;
    int L[n1], R[n2];
    for (int i = 0; i < n1; i++) L[i] = arr[left + i];
    for (int i = 0; i < n2; i++) R[i] = arr[mid + 1 + i];
    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++];
    }
    while (i < n1) arr[k++] = L[i++];
    while (j < n2) arr[k++] = R[j++];
}

void mergeSort(int arr[], int left, int right) {
    if (left < right) {
        int mid = left + (right - left) / 2;
        mergeSort(arr, left, mid);
        mergeSort(arr, mid + 1, right);
        merge(arr, left, mid, right);
    }
}

int main() {
    int N;
    scanf("%d", &N);
    int arr[10];
    for (int i = 0; i < N; i++) {
        scanf("%d", &arr[i]);
    }
    int primeCount = 0;
    for (int i = 0; i < N; i++) {
        if (isPrime(arr[i])) primeCount++;
    }
}

```

```
mergeSort(arr, 0, N - 1);

printf("Sorted array: ");
for (int i = 0; i < N; i++) {
    printf("%d ", arr[i]);
}
printf("\n");

printf("Number of prime integers: %d\n", primeCount);

return 0;
}
```

Status : Correct

Marks : 10/10