

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

Ravi is given an array of integers and is tasked with sorting it uniquely. He needs to sort the elements in such a way that the elements at odd positions are in descending order, and the elements at even positions are in ascending order.

Your task is to help Ravi create a program that uses insertion sort to sort the array as per the specified conditions and then print the sorted array. Position starts from 1.

Example

Input:

Size of the array = 10

Array elements = 25 36 96 58 74 14 35 15 75 95

Output:

Resultant array = 96 14 75 15 74 36 35 58 25 95

Explanation:

Initial Array: 25 36 96 58 74 14 35 15 75 95

Elements at odd positions (1, 3, 5, 7, 9): 25 96 74 35 75

Elements at odd positions sorted descending order: 96 75 74 35 25

Elements at even positions (2, 4, 6, 8, 10): 36 58 14 15 95

Elements at even positions sorted ascending order: 14 15 36 58 95

So, the final array is 96 14 75 15 74 36 35 58 25 95.

Input Format

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

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

Output Format

The output displays integers, representing the sorted array elements separated by a space.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 4

3 1 4 2

Output: 4 1 3 2

Answer

// You are using GCC

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

```
void insertionSortDescending(int arr[], int n) {  
    for (int i = 1; i < n; i++) {  
        int key = arr[i];  
        int j = i - 1;  
  
        while (j >= 0 && arr[j] < key) {  
            arr[j + 1] = arr[j];  
            j--;  
        }  
        arr[j + 1] = key;  
    }  
}
```

```
void insertionSortAscending(int arr[], int n) {  
    for (int i = 1; i < n; i++) {  
        int key = arr[i];  
        int j = i - 1;  
  
        while (j >= 0 && arr[j] > key) {  
            arr[j + 1] = arr[j];  
            j--;  
        }  
        arr[j + 1] = key;  
    }  
}
```

```
int main() {  
    int n;  
    scanf("%d", &n);  
    int arr[n], odd[n / 2 + 1], even[n / 2 + 1], oddCount = 0, evenCount = 0;  
  
    for (int i = 0; i < n; i++) {  
        scanf("%d", &arr[i]);  
        if ((i + 1) % 2 != 0) {  
            odd[oddCount++] = arr[i];  
        } else {  
            even[evenCount++] = arr[i];  
        }  
    }  
}
```

```

insertionSortDescending(odd, oddCount);
insertionSortAscending(even, evenCount);

oddCount = 0;
evenCount = 0;

for (int i = 0; i < n; i++) {
    if ((i + 1) % 2 != 0) {
        arr[i] = odd[oddCount++];
    } else {
        arr[i] = even[evenCount++];
    }
}

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

return 0;
}

```

Status : Correct

Marks : 10/10

2. 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>
```

```
int isPrime(int num) {  
    if (num < 2) return 0;  
    for (int i = 2; i * i <= num; i++)  
        if (num % i == 0) return 0;  
    return 1;  
}
```

```
void merge(int arr[], int l, int m, int r) {  
    int left_size = m - l + 1;  
    int right_size = r - m;
```

```
    int left[left_size], right[right_size];
```

```
    for (int i = 0; i < left_size; i++)  
        left[i] = arr[l + i];  
    for (int i = 0; i < right_size; i++)  
        right[i] = arr[m + 1 + i];
```

```
    int i = 0, j = 0, k = l;
```

```
    while (i < left_size && j < right_size) {
```

```

        if (left[i] <= right[j])
            arr[k++] = left[i++];
        else
            arr[k++] = right[j++];
    }

    while (i < left_size)
        arr[k++] = left[i++];
    while (j < right_size)
        arr[k++] = right[j++];
}

void mergeSort(int arr[], int l, int r) {
    if (l < r) {
        int m = l + (r - l) / 2;
        mergeSort(arr, l, m);
        mergeSort(arr, m + 1, r);
        merge(arr, l, m, r);
    }
}

int countPrimes(int arr[], int n) {
    int primeCount = 0;
    for (int i = 0; i < n; i++)
        if (isPrime(arr[i])) primeCount++;
    return primeCount;
}

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);

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

```

```
printf("Number of prime integers: %d\n", countPrimes(arr, 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

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

```
void merge(int arr[], int l, int m, int r) {
    int left_size = m - l + 1;
    int right_size = r - m;
```

```
    int left[left_size], right[right_size];
```

```
    for (int i = 0; i < left_size; i++)
```

```
        left[i] = arr[l + i];
```

```
    for (int i = 0; i < right_size; i++)
```

```
        right[i] = arr[m + 1 + i];
```

```
    int i = 0, j = 0, k = l;
```

```
    while (i < left_size && j < right_size) {
```

```
        if (left[i] <= right[j])
```

```
            arr[k++] = left[i++];
```

```
        else
```

```
            arr[k++] = right[j++];
```

```
    }
```

```
    while (i < left_size)
```

```
        arr[k++] = left[i++];
```

```
    while (j < right_size)
```

```
        arr[k++] = right[j++];
```

```
}
```

```
void mergeSort(int arr[], int l, int r) {
```

```
    if (l < r) {
```

```
        int m = l + (r - l) / 2;
```

```
        mergeSort(arr, l, m);
```

```
        mergeSort(arr, m + 1, r);
```

```
        merge(arr, l, m, r);
```

```
    }
```

```
}
```

```
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