Rajalakshmi Engineering College

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 6_COD_Question 1

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

John and Mary are collaborating on a project that involves data analysis. They each have a set of age data, one sorted in ascending order and the other in descending order. However, their analysis requires the data to be in ascending order.

Write a program to help them merge the two sets of age data into a single sorted array in ascending order using merge sort.

Input Format

The first line of input consists of an integer N, representing the number of age values in each dataset.

The second line consists of N space-separated integers, representing the ages of participants in John's dataset (in ascending order).

The third line consists of N space-separated integers, representing the ages of participants in Mary's dataset (in descending order).

Output Format

The output prints a single line containing space-separated integers, which represents the merged dataset of ages sorted in ascending order.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 5
1 3 5 7 9
10 8 6 4 2

Output: 1 2 3 4 5 6 7 8 9 10

Answer

```
#include <stdio.h>

void merge(int arr[], int left[], int right[], int left_size, int right_size) {
    int i = 0, j = 0, k = 0;
    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 size) {
    if (size < 2) return;

    int mid = size / 2;
    int left[mid], right[size - mid];

    for (int i = 0; i < mid; i++) {
        left[i] = arr[i];
    }
    for (int i = mid; i < size; i++) {
        right[i - mid] = arr[i];
    }

    mergeSort(left, mid);
    mergeSort(right, size - mid);
    merge(arr, left, right, mid, size - mid);
}
int main() {
    int n, m;
    scanf("%d", &n);
    int arr1[n], arr2[n];
    for (int i = 0; i < n; i++) {
        scanf("%d", &arr1[i]);
    }
    for (int i = 0; i < n; i++) {
        scanf("%d", &arr2[i]);
    }
    int merged[n + n];
    mergeSort(arr1, n);
    mergeSort(arr2, n);
    merge(merged, arr1, arr2, n, n);
    for (int i = 0; i < n + n; i++) {
        printf("%d ", merged[i]);
    }
    return 0;
}
```

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

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 6_COD_Question 2

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Nandhini asked her students to arrange a set of numbers in ascending order. She asked the students to arrange the elements using insertion sort, which involves taking each element and placing it in its appropriate position within the sorted portion of the array.

Assist them in the task.

Input Format

The first line of input consists of the value of n, representing the number of array elements.

The second line consists of n elements, separated by a space.

Output Format

The output prints the sorted array, separated by a space.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 5
67 28 92 37 59

Output: 28 37 59 67 92

Answer

```
#include <stdio.h>

void insertionSort(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 printArray(int arr[], int n) {
   for (int i = 0; i < n; i++) {
      printf("%d", arr[i]);
      if (i != n - 1) printf(" ");
   }
   printf("\n");
}

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

```
    insertionSort(arr, n);
    printArray(arr, n);
    return 0;
}
```

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

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 6_COD_Question 3

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

You are the lead developer of a text-processing application that assists writers in organizing their thoughts. One crucial feature is a character-sorting service that helps users highlight the most critical elements of their text.

To achieve this, you decide to enhance the service to sort characters in descending order using the Quick-Sort algorithm. Implement the algorithm to efficiently rearrange the characters, ensuring that it is sorted in descending order.

Input Format

The first line of the input consists of a positive integer value N, representing the number of characters to be sorted.

The second line of input consists of N space-separated lowercase alphabetical characters.

Output Format

The output displays the set of alphabetical characters, sorted in descending order.

Refer to the sample output for the formatting specifications.

Sample Test Case

Input: 5
a d g j k

Output: k j g d a

Answer

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

void swap(char *a, char *b) {
   char temp = *a;
   *a = *b;
   *b = temp;
}

int partition(char arr[], int low, int high) {
   char 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(char 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);

    char characters[n];

    for (int i = 0; i < n; i++) {
        char input;
        scanf(" %c", &input);
        characters[i] = input;
    }

    quicksort(characters, 0, n - 1);

    for (int i = 0; i < n; i++) {
        printf("%c ", characters[i]);
    }

    return 0;
}
```

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

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REC_DS using C_Week 6_COD_Question 4

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Kavya, a software developer, is analyzing data trends. She has a list of integers and wants to identify the nth largest number in the list after sorting the array using QuickSort.

To optimize performance, Kavya is required to use QuickSort to sort the list before finding the nth largest number.

Input Format

The first line of input consists of an integer n, representing the size of the array.

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

The third line consists of an integer k, representing the position of the largest number you need to print after sorting the array.

Output Format

The output prints the k-th largest number in the sorted array (sorted in ascending order).

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 6
-1 0 1 2 -1 -4
3
Output: 0

Answer

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

int partition(int arr[], int low, int high) {
    int pivot = arr[high];
    int i = low - 1;
    for (int j = low; j <= high - 1; j++) {
        if (arr[j] < pivot) {
            i++;
            int temp = arr[i];
            arr[i] = arr[j];
            arr[j] = temp;
        }
    }
    int temp = arr[i + 1];
    arr[i + 1] = arr[high];
    arr[high] = temp;
    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);
    }
}

void findNthLargest(int* nums, int n, int k) {
    quickSort(nums, 0, n - 1);
    printf("%d\n", nums[n - k]);
}

int main() {
    int n, k;
    scanf("%d", &n);
    int* nums = (int*)malloc(n * sizeof(int));
    for (int i = 0; i < n; i++) {
        scanf("%d", &nums[i]);
    }
    scanf("%d", &k);
    findNthLargest(nums, n, k);
    free(nums);
    return 0;
}
```

Status : Correct *Marks : 10/10*

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 5_COD_Question 5

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

In his computer science class, John is learning about Binary Search Trees (BST). He wants to build a BST and find the maximum value in the tree.

Help him by writing a program to insert nodes into a BST and find the maximum value in the tree.

Input Format

The first line of input consists of an integer N, representing the number of nodes in the BST.

The second line consists of N space-separated integers, representing the values of the nodes to insert into the BST.

Output Format

The output prints the maximum value in the BST.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 5
10 5 15 2 7

Output: 15

Answer

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

struct TreeNode {
   int data;
   struct TreeNode* left;
   struct TreeNode* right;
};
struct TreeNode* createNode(int key) {
   struct TreeNode* newNode = (struct TreeNode*)malloc(sizeof(struct
TreeNode));
   newNode->data = key;
   newNode->left = newNode->right = NULL;
   return newNode;
}
struct TreeNode* insert(struct TreeNode* root, int value)
{
   if (root == NULL)
   {
      return createNode(value);
   }
   if (value < root->data)
   {
      root->left = insert(root->left, value);
   }
   else
   {
      root->right = insert(root->right, value);
```

```
    }
    return root;
}
int findMax(struct TreeNode* root)
{
    while (root->right != NULL)
    {
        root = root->right;
    }
    return root->data;
}

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

    struct TreeNode* root = NULL;

    for (int i = 0; i < N; i++) {
        int key;
        scanf("%d", &key);
        if (i == 0) rootValue = key;
        root = insert(root, key);
    }

    int maxVal = findMax(root);
    if (maxVal != -1) {
        printf("%d", maxVal);
    }

    return 0;
}
```

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

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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

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>
#include <stdlib.h>
void swap(int* a, int* b)
{
   int t = *a;
   *a = *b;
   *b = t;
}
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, m, i, j, count = 0;
    scanf("%d", &n);
    int g[n];
    for (i = 0; i < n; i++)
    {
        scanf("%d", &g[i]);
    }
    scanf("%d", &m);
    int s[m];
    for (i = 0; i < m; i++)
    {
        scanf("%d", &s[i]);
    }
    quickSort(g, 0, n - 1);
    quickSort(s, 0, m - 1);
    i = 0;
    j = 0;
    while (i < n && j < m)
    {
        if (s[j] >= g[i])
        {
            count++;
            i++;
            j++;
        }
        else
        {
```

```
        j++;
      }
    }
    printf("The child with greed factor: %d\n", count);
    return 0;
}
```

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

2. 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

```
// You are using GCC
#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, i;
    scanf("%d", &n);
    int nums[n];
    for (i = 0; i < n; i++) {
        scanf("%d", &nums[i]);
    }
    quickSort(nums, 0, n - 1);
    printf("Sorted colors:\n");
    for (i = 0; i < n; i++) {
        printf("%d ", nums[i]);
    }
    printf("\n");
    return 0;
}
```

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

3. Problem Statement

Priya, a data analyst, is working on a dataset of integers. She needs to find the maximum difference between two successive elements in the sorted version of the dataset. The dataset may contain a large number of integers, so Priya decides to use QuickSort to sort the array before finding the difference. Can you help Priya solve this efficiently?

Input Format

The first line of input consists of an integer n, representing the size of the array.

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

Output Format

The output prints a single integer, representing the maximum difference between two successive elements in the sorted form of the array.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 1
10

Output: Maximum gap: 0

Answer

```
#include <stdio.h>
#include <stdlib.h>
void swap(int* a, int* b) {
   int t = *a;
   *a = *b;
   *b = t;
}
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, i;
    scanf("%d", &n);
    int nums[n];
    for (i = 0; i < n; i++) {
        scanf("%d", &nums[i]);
    }
    quickSort(nums, 0, n - 1);
    int maxGap = 0;
    if (n > 1) {
        for (i = 1; i < n; i++) {
            int gap = nums[i] - nums[i - 1];
            if (gap > maxGap) {
                maxGap = gap;
            }
        }
    }
    printf("Maximum gap: %d\n", maxGap);
    return 0;
}
```

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