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#include <iostream>
#include <vector>
#include <chrono>

using namespace std;
using namespace std::chrono;

// Function to merge two sorted subarrays
void merge(vector<int>& arr, int low, int mid, int high) {
    int n1 = mid - low + 1;
    int n2 = high - mid;

    // Create temporary arrays
    vector<int> L(n1), R(n2);

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

    // Merge the temporary arrays back into arr[low..high]
    int i = 0, j = 0, k = low;
    while (i < n1 && j < n2) {
        if (L[i] <= R[j]) {
            arr[k] = L[i];
            i++;
        } else {
            arr[k] = R[j];
            j++;
        }
        k++;
    }

    // Copy the remaining elements of L[], if any
    while (i < n1) {
        arr[k] = L[i];
        i++;
        k++;
    }
    // Copy the remaining elements of R[], if any
    while (j < n2) {
        arr[k] = R[j];
        j++;
        k++;
    }
}

// Function to perform Merge Sort
void mergeSort(vector<int>& arr, int low, int high) {
    if (low < high) {
        // Find the middle point
        int mid = low + (high - low) / 2;

        // Sort first and second halves
        mergeSort(arr, low, mid);
        mergeSort(arr, mid + 1, high);

        // Merge the sorted halves
        merge(arr, low, mid, high);
    }
}

// Function to print array
void printArray(const vector<int>& arr) {
    for (int num : arr) {
        cout << num << " ";
    }
    cout << endl;
}

int main() {
    int n;
    cout << "Enter the number of elements: ";
    cin >> n;

    vector<int> arr(n);
    cout << "Enter " << n << " elements: ";
    for (int i = 0; i < n; ++i) {
        cin >> arr[i];
    }

    // Measure time taken by Merge Sort
    auto start = high_resolution_clock::now();
    mergeSort(arr, 0, n - 1);
    auto stop = high_resolution_clock::now();
    auto duration = duration_cast<microseconds>(stop - start);
    cout << "Sorted array: ";
    printArray(arr);

    cout << "Time taken by Merge Sort: " << duration.count() << "
microseconds" << endl;

    return 0;
}
```

OUTPUT:-

```
PS C:\Users\HP\Desktop\DAA EXperiment> cd "c:\Users\HP\Desktop\DAA
EXperiment\" ; if ($?) { g++ merge.cpp -o merge } ; if ($?) {
.\merge }

Enter the number of elements: 6
Enter 6 elements: 14 17 9 18 4 2 10
Sorted array: 2 4 9 14 17 18
Time taken by Merge Sort: 0 microseconds
```