Bangladesh Army International University of Science & Technology

Department of Computer Science and Engineering

Lab Report

Lab Report No	**02**						
Lab Report Name	**Sorting an Array Using Merge Sort**						
Course Title	**Computer Algorithms & Complexity Sessional**						
Course Code	**CSE 222**						
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Level	2	**Term**	II	**Section**	A	**Group**	G1
Date of Submission	12-10-2025			**Session**	Fall-2025		

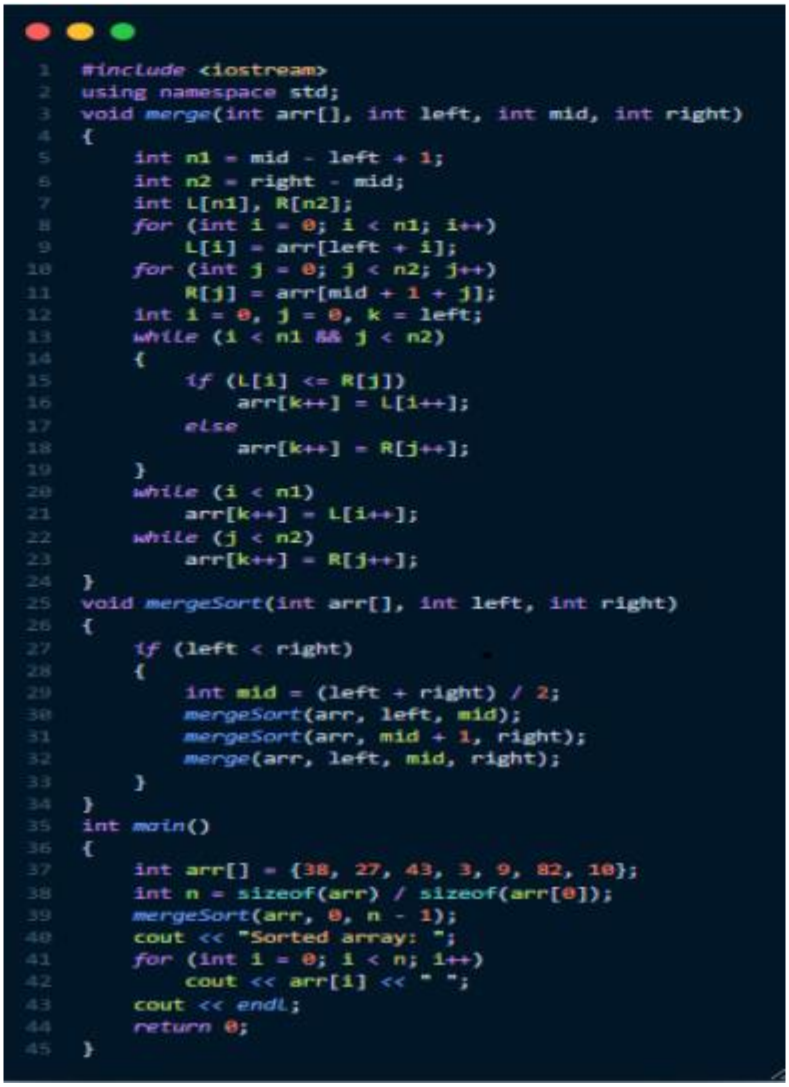
Marking Rubric:

Problem Understanding & Report Clarity (3)	Implementation (5)	Results & Analysis (2)	Total (10)

Key Learnings:

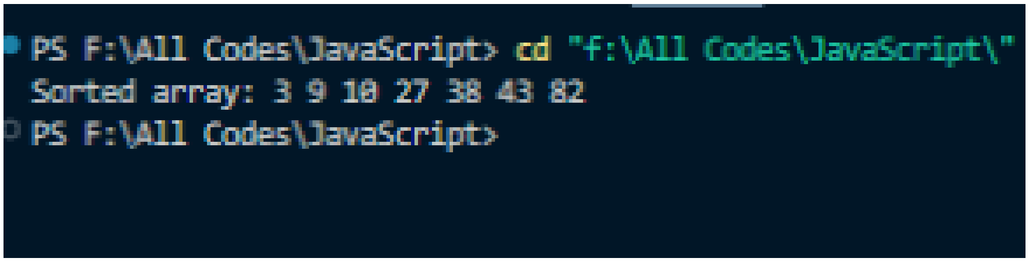
I have learned how to count equal items using a frequency array. I have understood that a regular polygon needs at least three sticks of the same length and learn to divide the sticks into groups of three to find how many polygons you can form. Finally, I have combined all groups to get the total number of polygons possible.

Code Implementation:



```cpp
#include <iostream>
using namespace std;
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) / 2;
        mergeSort(arr, left, mid);
        mergeSort(arr, mid + 1, right);
        merge(arr, left, mid, right);
    }
}
int main()
{
    int arr[] = {38, 27, 43, 3, 9, 82, 10};
    int n = sizeof(arr) / sizeof(arr[0]);
    mergeSort(arr, 0, n - 1);
    cout << "Sorted array: ";
    for (int i = 0; i < n; i++)
        cout << arr[i] << " ";
    cout << endl;
    return 0;
}
```

Sample Input - Output:



```
PS F:\All Codes\JavaScript> cd "f:\All Codes\JavaScript\"
Sorted array: 3 9 10 27 38 43 82
PS F:\All Codes\JavaScript>
```

Result Analysis / Discussion:

In this problem, we use a frequency array to count how many sticks of each length we have. Since a regular polygon needs at least three equal-length sticks, we divide the count of each length by three to find out how many polygons can be formed. Adding all these gives the maximum number of polygons possible. This teaches counting, grouping, and simple logical reasoning with constraints.