DSA Assignment 2 - (53457) M. Abdullah

Problem 1:

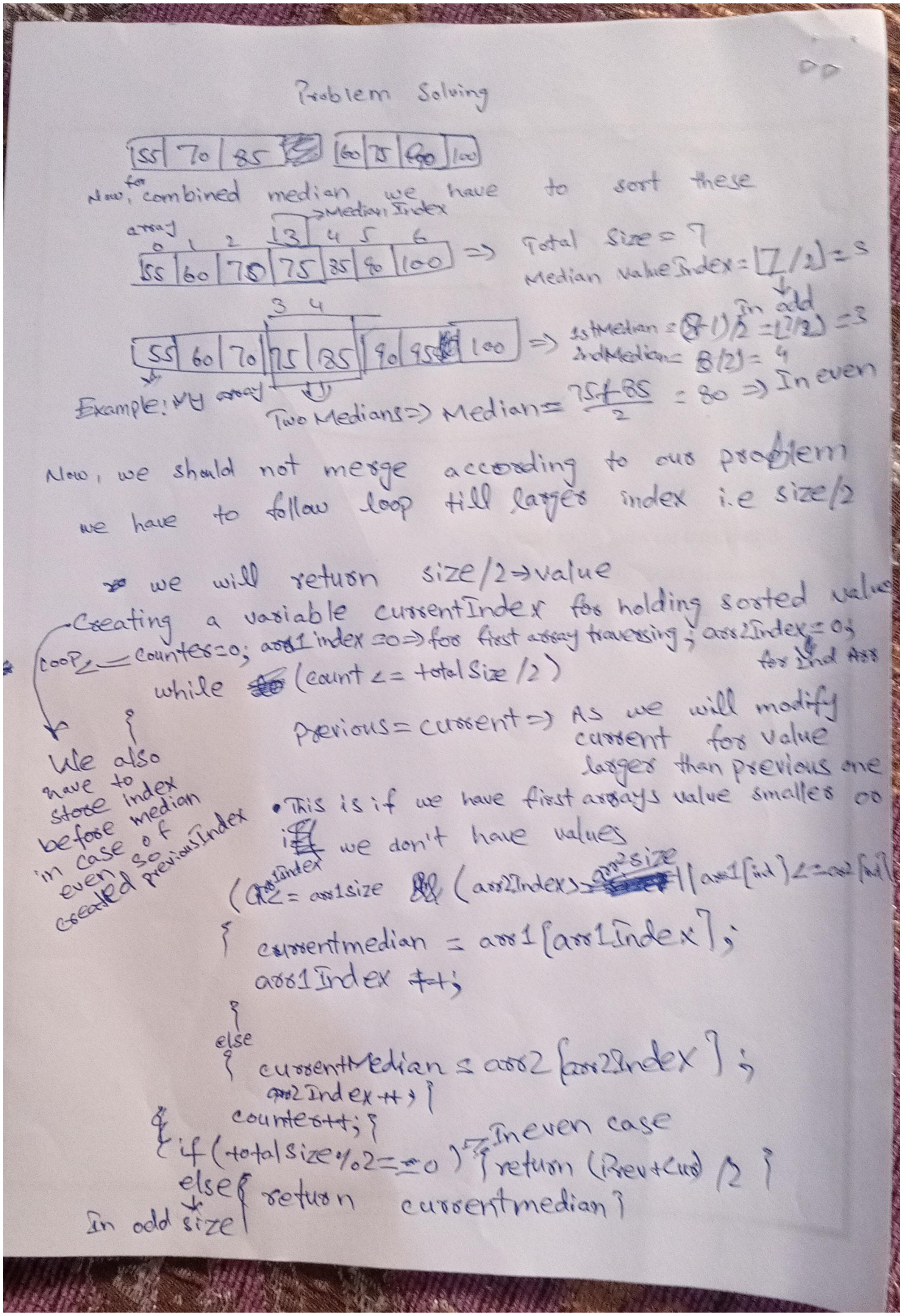
- **Problem**: You are given two sorted arrays representing exam scores from two different classes. Find the median score of the combined scores without fully merging them.
- **Input**: Two sorted arrays of integers, e.g., class1 = {55, 70, 85} and class2 = {60, 75, 90, 100}.
- **Output**: The median of the combined scores.
- **Hint**: Use a modified merge technique to find the middle elements without merging fully.
- **Test Case 1**:
    - Input: class1 = {55, 70, 85}, class2 = {60, 75, 90, 100}

Output: Median = 75

- **Test Case 2**:
    - Input: class1 = {55, 70, 85,95}, class2 = {60, 75, 90, 100}

Output: Median = 80

Problem Solving



Problem Solving

55	70	85		60	75	90	100

Now, for combined median we have to sort these

array → Median Index

0	1	2	3	4	5	6
55	60	70	75	85	90	100

⇒ Total Size = 7
Median Value Index = $\lfloor 7/2 \rfloor = 3$ ← In odd

			3	4			
55	60	70	75	85	90	95	100

⇒ 1st Median = $(8-1)/2 = \lfloor 7/2 \rfloor = 3$
2nd Median = $\lfloor 8/2 \rfloor = 4$

Example: My array

Two Medians ⇒ Median = $\frac{75+85}{2} = 80$ ⇒ In even

Now, we should not merge according to our problem we have to follow loop till larger index i.e size/2

* we will return size/2 → value

Creating a variable currentIndex for holding sorted value

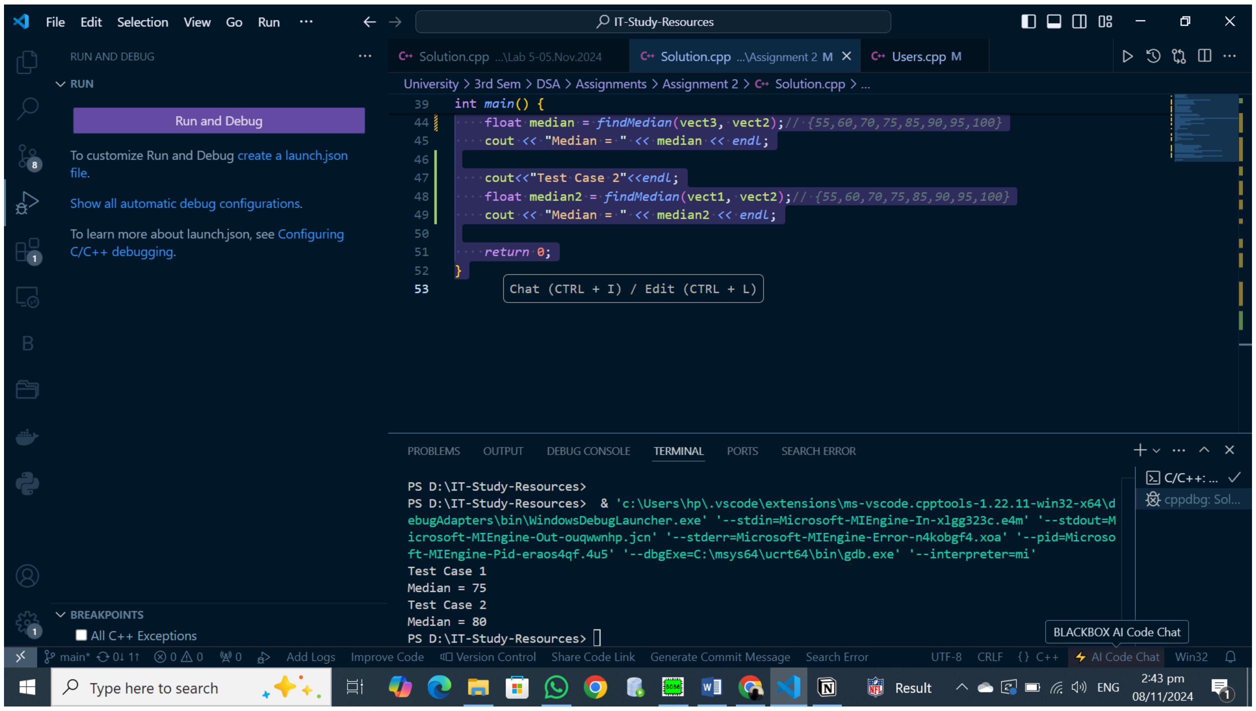
```
* loop ← counter=0; arr1index=0 ⇒ for first array traversing; arr2Index=0; for 2nd Arr
  while (count <= totalSize/2)
  {
        previous=current ⇒ As we will modify current for value larger than previous one
        • This is if we have first arrays value smaller or if we don't have values
      (arr1Index <= arr1size && (arr2Index >= arr2size || (arr1[ind] <= arr2[ind])
      {
        currentmedian = arr1[arr1Index];
        arr1Index ++;
      }
      else
      {
        currentMedian = arr2[arr2Index];
        arr2Index++; }
      counter++; }
  }
  if (totalsize%2==0) { return (Prev+Curr)/2 }  ← In even case
  else { return currentmedian }
  ↑
  In odd size
```

We also have to store index before median in case of even so created previousIndex

Code

```
#include <iostream>
#include<vector>
using namespace std;

float findMedian(vector<int> vect1,vector<int> vect2) {
    int size1 = vect1.size();
    int size2 = vect2.size();
    int newSize = size1 + size2;

    int vect1Count = 0;
    int vect2Count = 0;
    int loopCount = 0;
    int currentMedian = 0;
    int previousMedian = 0;

    while (loopCount <= newSize/2) {
        previousMedian = currentMedian;

        if (vect1Count < size1 && (vect2Count >= size2 || vect1
            currentMedian = vect1[vect1Count];
            vect1Count++;
        } else {
            currentMedian = vect2[vect2Count];
            vect2Count++;
        }

        loopCount++;
    }


    if (newSize % 2 == 0) {
        return (previousMedian + currentMedian) / 2.0;
    }
    else {
        return currentMedian;
    }
}

int main() {
    vector<int> vect1 = {55, 70, 85,95};
    vector<int> vect2 = {60, 75, 90, 100};
    vector<int> vect3 = {55, 70, 85};
    cout<<"Test Case 1"<<endl;
    float median = findMedian(vect3, vect2);// {55,60,70,75,85,9
    cout << "Median = " << median << endl;

    cout<<"Test Case 2"<<endl;
    float median2 = findMedian(vect1, vect2);// {55,60,70,75,85,
    cout << "Median = " << median2 << endl;

    return 0;
}
```

Output



```cpp
int main() {
    float median = findMedian(vect3, vect2);// {55,60,70,75,85,90,95,100}
    cout << "Median = " << median << endl;

    cout<<"Test Case 2"<<endl;
    float median2 = findMedian(vect1, vect2);// {55,60,70,75,85,90,95,100}
    cout << "Median = " << median2 << endl;

    return 0;
}
```

```
PS D:\IT-Study-Resources>
PS D:\IT-Study-Resources>  & 'c:\Users\hp\.vscode\extensions\ms-vscode.cpptools-1.22.11-win32-x64\d
ebugAdapters\bin\WindowsDebugLauncher.exe' '--stdin=Microsoft-MIEngine-In-xlgg323c.e4m' '--stdout=M
icrosoft-MIEngine-Out-ouqwwnhp.jcn' '--stderr=Microsoft-MIEngine-Error-n4kobgf4.xoa' '--pid=Microso
ft-MIEngine-Pid-eraos4qf.4u5' '--dbgExe=C:\msys64\ucrt64\bin\gdb.exe' '--interpreter=mi'
Test Case 1
Median = 75
Test Case 2
Median = 80
PS D:\IT-Study-Resources>
```