

Computative programming

Assignment 3-5

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Batch no:02

Assignment -1 Subset Sum Using Meet-in-the-Middle

Problem Statement:

You are given an array of N integers and a target sum S.

Using the Meet-in-the-Middle technique, determine whether there exists a subset whose sum is exactly equal to S.

Input Format:

- The first line contains an integer T, the number of test cases.

For each test case:

- The first line contains two integers N and S.
- The second line contains N integers.

Output Format:

For each test case, print YES if such a subset exists, otherwise print NO.

Constraints:

- $1 \leq T \leq 20$
- $1 \leq N \leq 40$
- $-10^9 \leq A[i] \leq 10^9$

Sample input

2

4 9

3 1 5 7

5 10

2 4 6 8 1

Sample output

YES

NO

CODE (java):

```
import java.util.*;

public class Ass {
    static void subsetSums(int[] arr, int index, long sum, ArrayList<Long> list) {
        if (index == arr.length) {
            list.add(sum);
            return;
        }
        subsetSums(arr, index + 1, sum, list);    // exclude
        subsetSums(arr, index + 1, sum + arr[index], list); // include
    }
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int T = sc.nextInt();
        while (T-- > 0) {
            int N = sc.nextInt();
            long S = sc.nextLong();
            int[] arr = new int[N];
            for (int i = 0; i < N; i++) {
                arr[i] = sc.nextInt();
            }
            int mid = N / 2;
            int[] left = Arrays.copyOfRange(arr, 0, mid);
            int[] right = Arrays.copyOfRange(arr, mid, N);
            ArrayList<Long> leftSums = new ArrayList<>();
            ArrayList<Long> rightSums = new ArrayList<>();
            subsetSums(left, 0, 0, leftSums);
            subsetSums(right, 0, 0, rightSums);
            Collections.sort(rightSums);
            boolean found = false;
            for (long x : leftSums) {
                if (Collections.binarySearch(rightSums, S - x) >= 0) {
                    found = true;
                    break;
                }
            }
            if (found)
                System.out.println("YES");
            else
                System.out.println("NO");
        }
        sc.close();
    }
}
```

```

3      static void subsetSums(int[] arr, int index, long sum, ArrayList<Long> list) { no usages
4          if (index == arr.length) {
5              list.add(sum);
6              return;
7          }
8          subsetSums(arr, index + 1, sum, list); // exclude
9          subsetSums(arr, index + 1, sum + arr[index], list); // include
10     }
11     public static void main(String[] args) {
12         Scanner sc = new Scanner(System.in);
13         int T = sc.nextInt();
14         while (T-- > 0) {
15             int N = sc.nextInt();
16             long S = sc.nextLong();
17             int[] arr = new int[N];
18             for (int i = 0; i < N; i++) {
19                 arr[i] = sc.nextInt();
20             }
21             int mid = N / 2;
22             int[] left = Arrays.copyOfRange(arr, 0, mid);
23             int[] right = Arrays.copyOfRange(arr, mid, N);
24             ArrayList<Long> leftSums = new ArrayList<>();
25             ArrayList<Long> rightSums = new ArrayList<>();
26             subsetSums(left, 0, 0, leftSums);
27             subsetSums(right, 0, 0, rightSums);
28             Collections.sort(rightSums);
29             boolean found = false;
30             for (long x : leftSums) {
31                 if (Collections.binarySearch(rightSums, S - x) >= 0) {
32                     found = true;
33                     break;

```

```

30         for (long x : leftSums) {
31             if (Collections.binarySearch(rightSums, S - x) >= 0) {
32                 found = true;
33                 break;
34             }
35         }
36         if (found)
37             System.out.println("YES");
38         else
39             System.out.println("NO");
40     }
41     sc.close();
42 }
43 }

```

```

Terminal Local x
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ass.java:3: error: class Main is public, should be declared in a file named Main.java
public class Main {
      ^
1 error
PS C:\Users\shyam\OneDrive\Desktop\java codes> & javac Ass.java
PS C:\Users\shyam\OneDrive\Desktop\java codes> java Ass
3 1 5 7
YES
5 10
2 4 6 8 1
YES
PS C:\Users\shyam\OneDrive\Desktop\java codes>

```

Code (python):

def subset_sums(arr):

 sums = [0]

for x in arr:

```

    new_sums = []

    for s in sums:

        new_sums.append(s + x)

    sums = sums + new_sums

return sums

T = int(input())
for _ in range(T):
    N, S = map(int, input().split())
    arr = list(map(int, input().split()))
    mid = N // 2
    left = arr[:mid]
    right = arr[mid:]
    left_sums = subset_sums(left)
    right_sums = subset_sums(right)
    right_set = set(right_sums)
    found = False
    for x in left_sums:
        if S - x in right_set:
            found = True
            break
    if found:
        print("YES")
    else:
        print("NO")

```

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main.py

```
1 def subset_sums(arr):
2     sums = [0]
3     for x in arr:
4         new_sums = []
5         for s in sums:
6             new_sums.append(s + x)
7         sums = sums + new_sums
8     return sums
9
10
11 T = int(input())
12
13 for _ in range(T):
14     N, S = map(int, input().split())
15     arr = list(map(int, input().split()))
16
17     mid = N // 2
18     left = arr[:mid]
19     right = arr[mid:]
20
21     left_sums = subset_sums(left)
22     right_sums = subset_sums(right)
23
24     right_set = set(right_sums)
25
26     found = False
27     for x in left_sums:
28         if S - x in right_set:
29             found = True
30             break
31
32     if found:
33         print("YES")
34     else:
35         print("NO")
```

input

3 1 5 7
YES
5 10
2 4 6 8 1
YES

close

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