Lab Assignment 7
Arrays and Intro to Functions

COL 100

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1 Pair Sum:

You are given an array A of size n and an integer b. You have to find out all pairs of elements from array A whose sum is equal to b and print them.
In the first line, you are given 2 integers, n (size of array) and b. In the next line, you are given n integers (the elements of array A).
You have to output all pairs of elements from array A whose sum is equal to b. Output each new pair in a new line.

Example

Input:

```
5 5       // n = 5, b = 5
1 2 3 4 5   // Array A
```

Output:

```
1 4
2 3
```

2 Count number of words in a string:

Strings are one-dimensional array of characters terminated by a null character '\0'. In this question, you are given a string of characters as input and you have to output the number of words in the input string. Words are separated by space character (' ') or tab character ('\t')
The first line contains a single integer n denoting the size of the input string. The second line consists of the string with n characters.
Output a single integer denoting the number of words in the input.

Example

Input:

```
18                      // n = 18
Hello world COL100      // Input string
```

Output:

```
3
```

Input:

```
1        // n = 1
         // The single character input is a space character
```

Output:

```
0
```

3 Symmetric Matrix:

Given a matrix, identify if the matrix is symmetric or not. In the first line, you are given 1 integer n where n is the size of the input square matrix ($n \times n$).
The next n lines contain n integers each, these are the elements of the matrix
You have to output *Symmetric* if the matrix is symmetric and *Not Symmetric* otherwise.

Example

Input:

```
3      // n = 3 (Size of the matrix)
1 2 3
2 3 4
3 4 5
```

Output:

```
Symmetric
```

Input:

```
3 3     // n = 3 (Dimensions of the matrix)
1 2 3
4 5 6
7 8 9
```

Output:

```
Not Symmetric
```

4 Repeated Numbers

You are given an input array of size n. Every number in the array is repeated twice except one. Your job is to find and print that number.
In the first line, you are given an integer n (size of the array) as input. In the second line you are given n numbers (the elements of the array).
You are supposed to output a single integer which is the only non repeating element of the array.

Example

Input:

```
5              // Input Size of the array
1 1 5 5 6      // Input Array
```

Output:

```
6
```

Input:

```
9                              // Input Size of the array
22 87 87 34 54 22 65 54 34     // Input Array
```

Output:

```
65
```

5 Zero Sum Subarray

Given an array which contains both positive and negative numbers, find if there is a subarray (of size at-least one) with 0 sum.
What is a subarray? Well, a subarray is a contiguous part of array. An array that is inside another array. For example, consider the array [1, 2, 3, 4], There are 10 non-empty sub-arrays. The subarays are (1), (2), (3), (4), (1,2), (2,3), (3,4), (1,2,3), (2,3,4) and (1,2,3,4).
In the first line, you are given an integer n (size of the array) as input. In the second line you are given n numbers (the elements of the array).
You are supposed to output true in case there is a a subarray (of size at-least one) with 0 sum else output false

Example

Input:

```
5              // Input Size of the array
4 2 0 1 6      // Input Array
```

Output:

```
true
```

```
5              // Input Size of the array
-3 2 3 1 6      // Input Array
```

Output:

```
false
```

6 Second Smallest Element

Given an array of numbers, output the second smallest element in the array.
In the first line, you are given an integer n (size of the array) as input. In the second line you are given n numbers (the elements of the array).
You are supposed to output the second smallest number value (ignore duplicates).

Example

Input:

```
5               // Input Size of the array
4 2 0 1 6       // Input Array
```

Output:

```
1
```

```
5               // Input Size of the array
-3 2 3 1 6       // Input Array
```

Output:

```
1
```

7 Remove duplicates from sorted array

Given a sorted array, remove the duplicate elements from the array.
In the first line, you are given an integer n (size of the array) as input. In the second line you are given n numbers (the elements of the array).
You are supposed to output the size of the new array in the first line followed by the elements of the new array after removing duplicates in the second line.

Example

Input:

```
5               // Input Size of the array
2 2 2 2 2       // Input Array
```

Output:

```
1
2
```

```
9               // Input Size of the array
1 2 2 3 4 4 4 5 5       // Input Array
```

Output:

```
5
1 2 3 4 5
```

8 Function to check prime

Check if the input integer can be expressed as the sum of two prime numbers of all possible combinations using functions. You have to write and use a function (which checks if given integer is prime or not) to solve this problem.
Input is a positive integer.
You are supposed to output true or false as per the case.

Example

Input:

```
5               // Input Integer
```

Output:

```
true            // 5 = 3 + 2
```

```
7               // Input Integer
```

Output:

```
true            // 7 = 5 + 2
```

Challenge Problems (Ungraded)

Roman Numerals:

You are given a Roman numeral as a string in the input and you have to output the corresponding decimal integer.
The first line contains a single integer n denoting the size of the input string. The second line consists of the string with n characters denoting the Roman Numeral.
Output a single integer denoting the number corresponding to the Roman numeral input.
Following is a chart showing Roman characters corresponding to various integer values. The input will only consist of characters from the following table.

Roman Numeral	Number
I	1
V	5
X	10
L	50
C	100
D	500
M	1000

Example

Input:

```
1
X
```

Output:

```
10
```

Input:

```
10
MMMDCCXXIV
```

Output:

```
3724
```

Input:

```
8
MDCCXXIX
```

Output:

```
1729
```

Union and Intersection

You are given two sorted input arrays of size $n1$ and $n2$. Given these two sorted arrays, find their sorted union and sorted intersection.
In the first line, you are given an integer $n1$ (size of first array) as input. In the second line you are given $n1$ numbers (the elements of the first array). Similarly, in the third line, you are given an integer $n2$ (size of second array) as input. In the fourth line you are given $n2$ numbers (the elements of the second array).
You are supposed to output the size of sorted union array in the first line followed by elements of sorted union array in the second line, and the size of sorted intersection array in third line, followed by elements of sorted intersection array in the fourth line.

Example

Input:

```
5               // Input Size of first array
1 3 4 5 7       // First Array
4               // Input Size of second array
2 3 5 6       // Second Array
```

Output:

```
7
1 2 3 4 5 6 7
2
3 5
```

```
3               // Input Size of first array
2 5 6       // First Array
4               // Input Size of second array
4 6 8 10       // Second Array
```

Output:

```
6
2 4 5 6 8 10
1
6
```

Submission and other logistics

Submit at least 4 solutions (from the first 8 questions) as a zip file on Gradescope (to your respective group's course). There is no need to submit solutions to the challenge problems. Submit only one .c file for each question. Use separate .c files for each new question. Please name your .c files as per the question number (q1.c, q2.c, ... etc). Following this naming convention will help TAs to figure out where to look the answers easily. You can also submit more than 4 or all questions to increase your chances of full marks.

Example: To zip folder 'a7' as 'a7.zip':

```
zip -r a7.zip a7
```

It is highly **recommended** that you name the code files and variables in those code files with proper names as per the question to easily identify them. Comments in your codes are also highly **recommended** and makes life easier for everyone.
You can check **2nd Chapter** in NASA's C style guide for styling recommendations.
You can work either individually or with another student of your group for the assignment.
only one submission on gradescope is enough for a team but you need to **add your teammate** on gradescope after submission.
Follow these steps for adding your team member
Note: you can change your team for future assignments