Part 0. Write a program that performs following tasks respectively. These tasks will be performed with 1D and 2D arrays. The program must have a menu. There must be 4 operations and 1 output option on this menu.

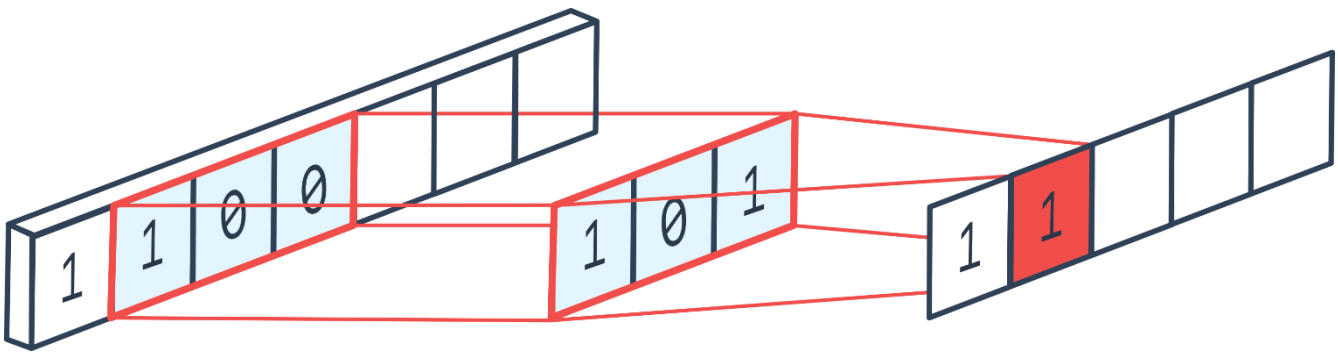
```
Choose the matrix operation,
----------------------------
1. Convolutional Filter for 1D array
2. Multiplication
3. Trace
4. Transpose
5. Exit
----------------------------
Enter your choice:
```

Part1. Convolutional filter allows you to perform some manipulations on arrays. In this part, a new array will be obtained by applying a filter on the 1-dimensional array. You will have an array with 10 elements and you will have a filter with 3 elements. By sliding this filter one by one from the beginning of the array to the end, you must perform calculations for all overlapping values and create the new array. Calculations should be made as follows; A value is obtained by adding the new values found after multiplying the values on the array with the overlapping values on the filter. In other words, the 1st element of the array and the 1st element of the filter should be multiplied, then the sum of these 3 elements should be taken as the new value. Call this 3-element array of the filter as Kernel. A similar example is given below. [1,0,1] is a kernel. Slide this kernel on the array and complete the calculation. When creating arrays you have to write additional functions to get input from the user and to create the array. You also have to print the external display() function to print the matrices to the screen.

$$(1*1)+(0*0)+(0*1) = \text{new value}$$

Select your boundaries carefully. You have to slide the kernel from the 2nd element to (n-1). element. You have to write the new values after the convolutional filter to a new array and print the results to the screen.

Filter Example



Example Result

```
Enter your choice: 1
1D Array
5       11      15      8       14      23      7       19      72      0

Convolutional Filter Result:
-9      -4      -21     -17     2       -35     -60     53
```

Part2. In this part you will perform Matrix Operations => Multiplication, Trace, Transpose operations on 2D arrays. When creating arrays you have to write additional functions to get input from the user and to create the array. You also have to print the external display() function to print the matrices to the screen. All matrices printed on the screen have to be printed with the display() function. You need to get the all matrix values from the user then you have to create 3x3 matrices.

Example Outputs

```
First Matrix:
5       6       7
8       9       10
3       1       2
Second Matrix:
1       2       3
4       5       6
7       8       9
```

```
Enter your choice: 2
Multiplication of matrix:
78      96      114
114     141     168
21      27      33
```

```
Enter your choice: 3
Trace of the first matrix:
5       6       7
8       9       10
3       1       2
Trace of matrix is: 16
Trace of the second matrix:
1       2       3
4       5       6
7       8       9
Trace of matrix is: 15
```

```
Enter your choice: 4
Transpose of the first matrix:
5       8       3
6       9       1
7       10      2
Transpose of the second matrix:
1       4       7
2       5       8
3       6       9
```