

1. Sort and then locate

Write a program on **modified Bubble Sort algorithm** to sort a given array and then locate a user input number in the sorted array by using **Binary Search algorithm**.

Input Specification

- First line of the input is an integer N, representing the number of elements in the array.
- Second line of the input will comprise of N integers separated by space, representing the elements of the array.
- Third line of the input will an integer S, which is to be located in the sorted array using Binary Search.

Output Specification

- First line of the output should be the index value representing the location of integer S in the sorted array.
- Second line of the output should be the number of integer comparisons done for determining the location of the integer S.

<u>Sample Input</u>	<u>Sample Input</u>
5	6
40 20 30 50 10	5 1 7 4 9 3
40	1
<u>Sample output</u>	<u>Sample output</u>
3	0
2	2

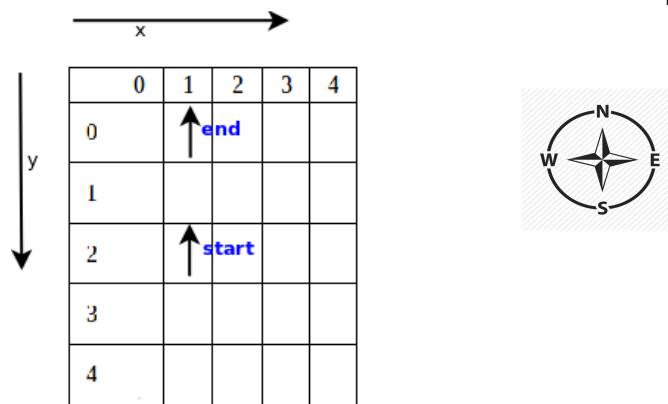
2. A Trip to Mars

A squad of robotic rovers are to be landed by NASA on a plateau on Mars. This plateau, which is curiously rectangular, must be navigated by the rovers so that their on-board cameras can get a complete view of the surrounding terrain to send back to Earth.

A rover's location and position is represented by a combination of x and y coordinates and a letter representing one of the four cardinal compass points. The plateau is divided up into a grid to simplify navigation. An example position might be 0, 0, S, which means the rover is in the upper-left corner and facing South.

In order to instruct a rover to move forward in the direction its facing, NASA sends a simple string comprising of a sequence of 'M'. Each 'M' means move forward one grid point if the point lies in the limits of the grid, otherwise remain in the same position without moving forward, and maintain the same heading direction and throw a message saying **Out Of Boundary** indicating the point lies out of the defined limits.

Assume that the location directly South from (x, y) is (x, y+1), where x is the horizontal axis and y is the vertical axis. Also assume the directions are as per the diagram below:



Input Specification

- First line of the input is the lower-right coordinates of the plateau, and the upper-left coordinates are assumed to be 0, 0.
- Second line of the input gives the coordinates representing the position of the rover on the grid and its heading direction
- Next line is a series of 'M' telling the rover to explore the plateau by moving one location for each 'M'.

Output Specification

- Print the final coordinates with the direction of heading of the rover, all separated by a space, otherwise print the **Out Of Boundary** message if the location coordinates land beyond the given defined boundary and print the present coordinates.

Sample Input1	Sample Output1	Sample Input2	Sample Output2
5 5	1 0 N	5 5	1 2 N
1 2 N		1 2 N	Out Of Boundary
MM		MMM	

3. CrossWord

Consider the 5 * 5 (5 rows and 5 columns) matrix given below :-

	0	1	2	3	4
0	*	*	*	*	*
1	*	*	C	*	*
2	*	B	A	L	L
3	*	*	T	*	*
4	*	*	*	*	*

The matrix shown above is containing two words CAT and BALL. CAT is printed vertically and BALL is printed horizontally. Rest of the elements are represented by '*' only. The first character of the string CAT is represented at first row and second column (1,2). That means the co-ordinate of first character of string CAT i.e 'C' is (1,2). The remaining characters of the string CAT i.e 'A' and 'T' are placed vertically just below the first character 'C' in the same column.

There is a common character between string CAT and string BALL. The common character is 'A'. The representation of the second string BALL is based upon the common character 'A'. The string BALL is represented horizontally in the same row which is containing the common character 'A'.

Write a program which accepts two strings as input and represents them in a 10 * 10 matrix in the similar manner as explained above.

Input specification:

- First line of the input comprises of the string to be placed vertically and followed by a space, then followed by the space separated coordinates indicating the location of the first character of the string.
- Second line of the input comprises of the string to be placed horizontally intersecting with the string placed vertically.

Output specification:

- The 10 * 10 matrix with both the strings placed appropriately. And the remaining of the matrix contents should be represented by the character '*'.
- Each row of the matrix should be terminated by a new line and the contents of the row be separated by a single space.

Assumptions:

- a) The strings length will be ≥ 3 and ≤ 5 .
- b) Both the strings remain within the bounds of 10 * 10 matrix.
- c) There is one and only one same character among the two strings.

SampleInput 1	SampleOutput 1	SampleInput 2	SampleOutput 2
CAT 1 2 BALL	* * * * * * * C * * * * * B A L L * * * * * * T *	INDIA 3 5 GOA	* * * * * * * * * * * * * * * * * * * I * * * * * * * N * * * * * * * D * * * * * * * I * * * * * * G O A * * * * * * * * * * * * *