Question No. 1

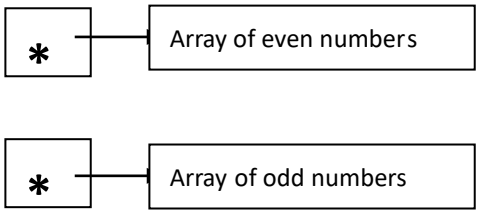
Apply your knowledge of pointers and structs to **construct** C++ code for the following problems:

I. Write a C++ program to perform following tasks:

a. Declare a dynamic array of size 's'. Take input in s from user

b. Fill the array with random numbers between 1 and 100 using built-in rand( ) function (https://www.cplusplus.com/reference/cstdlib/rand/)

c. Find all the even and odd numbers and implement following array of pointers.



d. Write a function void Display(int **x, int size) and call it appropriately for array created in part c.

II. Write a C++ function called **numOfOccurences** which receives two cstrings (character arrays) called *sentence* and *find* respectively. The goal of the function is to return the number of times *find* appers in *sentence*. For example, if *sentence* is the string "Posing a possible post of possibilities", and *sub* is the string "pos" – your function should return the value 4. Please note the following: Make sure there are no memory leaks in your function.

- Get values for sentence and find from the user in the main function.
- Pay special attention to the the function arguments and their data types.

III. Write a program in C++ that loads data about student from a textfile called <your rollnumber>.txt into a struct called Student. Looking at the sample file below you can decide the data members for this struct. Your program should ask the user for the student rollnumber and course code and output whether the student has studied that course or not (you may use the function written in part II for this).

You have to write the input file **including your own rollnumber** and list of courses, a sample is given below. You should add as much data in the file as you like.

For the sample input file below if the user enters 19L-2113 as student rollnumber and CS2001 as the course code, the output should be that the student has not studied this course. If the user enters 19L-1117 then the

output should be that the student doesn't exist. if the user enters 19L-2113 as student rollnumber and CS2011 as the course code, the output should be that the student has studied this course

19L-2113 Haider Saqib CS2002 CS2011 CS1004

20L-1113 Sadia Ahmed CS1002 CS1004 CS2002 CS2011
20L-1123 Hadia Ali CS1002 CS1004 CS2002 CS2011 EE4011 EE1001

IV. Consider the following code:

```
int main ()
{
    int * arr=0;
int size, k;

    cin>>size>>k;

// function1: dynamically initializes an integer array of size given
allocateMemory(arr, size);
 for (int i=0; i<size; i++)
          cin>>arr[i];
//function2: explanation given below
    RotateArray (arr, size, k);

//function3: deallocates memory assigned to the integer array
deallocateMemory(arr);

    return 0;
}
```

You are required to implement the 3 functions called in the above **main**, in the space provided below.

The **RotateArray** function rotates the elements of the array **a**, **k** positions to the right. The last **k** elements are rotated around to the beginning of the array.

e.g., if **arr** is the array shown below:

0	1	2	3	4	5	6	7
22	33	44	55	66	77	88	99

the function call **RotateArray(arr, 8, 1)** would transform

0	1	2	3	4	5	6	7
99	22	33	44	55	66	77	88

Again, rotating this newly transformed array using the function call **RotateArray (arr, 8, 3)** would transform

0	1	2	3	4	5	6	7
66	77	88	99	22	33	44	55