Example Questions for Final Exam

1- Write a program that inserts an element into a **sparse matrix**. Take *column*, *row* and *new value* from the user.

Example:

$$\mathbf{A} = \begin{pmatrix} 1.5 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 2.3 & 0 & 1.4 & 0 & 0 & 0 & 0 \\ 0 & 0 & 3.7 & 0 & 0 & -2.7 & 0 & 0 \\ 0 & -1.6 & 0 & 2.3 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 5.8 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 7.4 & 0 & 0 \\ 0 & 0 & 1.9 & 0 & 0 & 0 & 4.9 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 3.6 \end{pmatrix} \qquad \mathbf{A} = \begin{pmatrix} 1.5 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 2.3 & 0 & 1.4 & 0 & 0 & 0 & 0 \\ 0 & 0 & 3.7 & 0 & 0 & -2.7 & 0 & 0 \\ 0 & -1.6 & 0 & 2.3 & \mathbf{9.9} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 5.8 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 7.4 & 0 & 0 \\ 0 & 0 & 1.9 & 0 & 0 & 0 & 4.9 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 3.6 \end{pmatrix}$$

row	8	0	1	1	2	2	3	3	4	5	6	6	7
column	8	0	1	3	2	5	1	3	4	5	2	6	7
value	12	1.5	2.3	1.4	3.7	-2.7	-1.6	2.3	5.8	7.4	1.9	4.9	3.6

row	8	0	1	1	2	2	3	3	3	4	5	6	6	7
column	8	0	1	3	2	5	1	3	4	4	5	2	6	7
value	13	1.5	2.3	1.4	3.7	-2.7	-1.6	2.3	9.9	5.8	7.4	1.9	4.9	3.6

```
double[,] s = new int[,] {{8,8,12}, {0,0,1.5}, {1,1,2.3}, {1,3,1.4}, {2,2,3.7}, {2,5,-2.7}, {3,1,-1.6}, {3,3,2.3}, {4,4,5.8}, {5,5,7.4}, {6,2,1.9}, {6,6,4.9}, {7,7,3.6}};
```

Input:
row= 3
column= 4
value= 9.9

Output:
```
8 8 13
0 0 1.5
1 1 2.3
1 3 1.4
2 2 3.7
2 5 -2.7
3 1 -1.6
3 3 2.3
3 4 9.9
4 4 5.8
5 5 7.4
6 2 1.9
6 6 4.9
7 7 3.6
```

2- Assume that there is a polynomial expression which is stored as a **string**.
Write a **C# program** that takes a *new term* from the user and places it to the polynomial expression.

Notes: 1) Polynomial expression only contains + (plus) symbol, *x* symbol and numbers.
2) The exponent of the new term doesn't exist in the polynomial expression.

Example:
Polynomial expression: 3x12+2x9+5x4+20x3+15

```
Input string: 14x6
Output string: 3x12+2x9+14x6+5x4+20x3+15
```

Example:
Polynomial expression: x15+4x10+5x7+16x

```
Input string: 8x12
Output string: x15+8x12+4x10+5x7+16x
```

3- Write two solutions (**recursive** and **non-recursive (iterative)** solution) to sum squares from *n* to *m*.

SumS(n,m) = $n^2 + (n+1)^2 + (n+2)^2 + \ldots + m^2$

Example:

```
Inputs:     n=2    m=4
Output:     2^2 + 3^2 + 4^2 = 29
```

4- Create a **structured** dictionary array used to convert words from English to Turkish and from Turkish to English. You should write two **functions** *EnglishToTurkish* and *TurkishToEnglish*.

The user selects the direction of the conversion from a menu.

1- from English to Turkish
2- from Turkish to English

```
Apple, Elma
Banana, Muz
Book, Kitap
Key, Anahtar
March, Mart
Sale, Satış
Sea, Deniz
Table, Masa
Yellow, Sarı
```

5- Given an **array** of integers, find the *length* and *location* of the longest contiguous sequence of equal *values*.

Example:

```
int[] numbers= { 1, 2, 2, 1, 5, 1, 1, 7, 7, 7, 7, 1, 1};
Output:  number=7  length=4  starting_position=8
```