BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
HYDERABAD
CAMPUS,
Data Structures and Algorithms
CS F211 / IS F211

Homework Assignment – 3

1. Write a C program to achieve the following. When the user inputs any number, show that in words. **Note:** User input range 0 – 999999
   Input:
   5435

   Output:
   Five Thousand Four Hundred and Thirty Five

2. A Soundex code is the phonetic code of the word. If the Soundex codes of two words are same, that means they are pronounced same way.
   For more details refer:
   http://creativyst.com/Doc/Articles/SoundEx1/SoundEx1.htm#SoundExConverter

   Write a C program to print those lines of a file that contain a word that sounds like a given word.

   Input:
   test.txt (input a file name)
   ball (input word)

   Output:
   He addressed every class in a terrifying bawl.
   Your father will bawl you out when he sees this mess.

3. **Pattern based questions:**
   a. Write a program to read a number n and print the numbers from 1 to n^2 pattern in a spiral order. You have to use a square matrix. And it should be dynamically allocated using **malloc**().

   for ex. n = 4 , output is :

```
 1  2  3 4
12 13 14 5
11 16 15 6
10  9  8 7
```

   b. Write a program that searches for a pattern (word) in a given file(command line arg):
   $./a.out pattern file2
   prints line number followed by the line, for all lines that contains the pattern
   Also, an optional argument -x may be provided (for except) :

   $./a.out -x pattern file2
   prints line number followed by the line for all lines that don't contain the pattern

4. You have to read a square matrix **a** of size n x n. Find the maximum sum of a sub-matrix which is also a square matrix of size m x m in $O(n^3)$,where $1 \leq m \leq n$ & $1 \leq n \leq 100$ & $-100 < a[i][j] < 100$.

Input Format :
n
n row's having n numbers separated by spaces.

Sample Input:
3
1 2 3
4 5 6
7 8 9
Output:
45

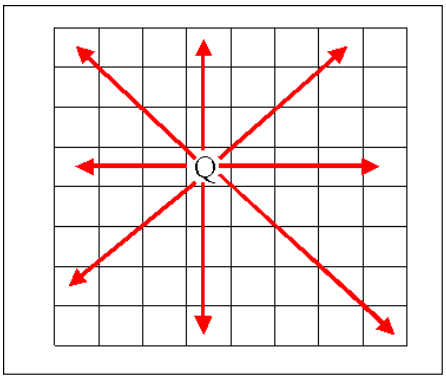
5. Long back people used key based phones which had ten digits on the keypad. If you have to type characters from 'a'-'z' you have to press keys in a certain sequence to get the desired character. The letters are mapped onto the digits as shown in figure below. For instance to type the character 'n' you have to press "66" and to type two characters in sequence from the same key, the user must pause before pressing the key a second time. The space character ' ' indicate a pause. For example, "6 6" indicates "mm" whereas "66" indicates "n".

Now your job is to read a line of string which have only lowercase characters 'a'–'z' and space and output the sequence of key presses(which can have pauses also).

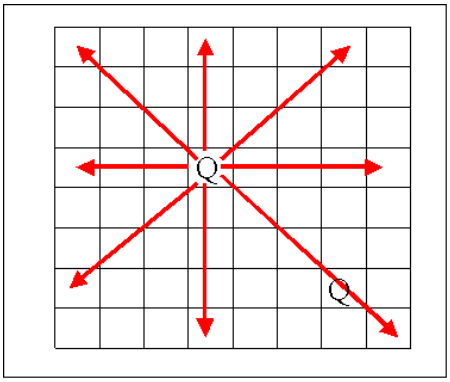
Sample Input-1:
hello
Sample Output-1:
4433555 555666

Sample Input-2:
dsa is cool
Sample Output-2:
377772044477770222666 666555

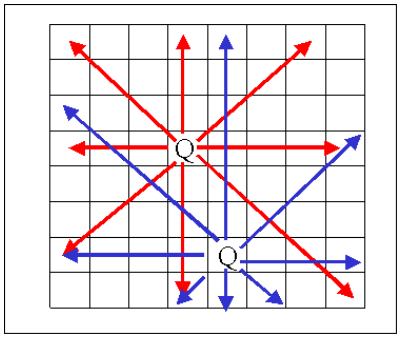
6. You are given a chess board(8 X 8 board) where some queens ranging from 2 to 8 are placed on it .In chess a queen may move any number of spaces straight up, down, left, right, or along any of the 4 diagonals shown in Fig. 1. Any two queen can attack each other's position. Queens are said to be in attacking or not safe position when no two queens are in the same row, column, or diagonal Fig. 2 depicts that two queens are attacking each other (same diagonal). Fig 3 represents two queens in non-attacking or safe position. You will be given a 2D integer array of dimension 8 X 8 containing 0s and 1s where 1 represent the presence of queen and 0 represent open spaces. You need to check if all queens are placed in non-attacking position i.e. safe position. If safe output YES otherwise NO



(Fig.1)



(Fig. 2)



(Fig. 3)

Input Format: 8 line of input, each line contains eight numbers separated by spaces.
Output Format: YES or NO

Sample Input-1
0 0 0 0 0 0 0 0

0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0
1 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0
1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

Sample Output-1

NO

Explanation:

There exist pairs of queen which are attacking each other one pair is { Queen placed at cell (3,0) , Queen placed at (6,0) } both are in same column. and other pair is { Queen placed at cell (1,6) , Queen placed at (4, 3) } both are in same diagonal

Sample Input-2

0 0 0 1 0 0 0 0
1 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 1
0 1 0 0 0 0 0 0
0 0 0 0 0 0 1 0
0 0 1 0 0 0 0 0
0 0 0 0 0 1 0 0

Sample Output-2

YES

Explanation

All the queens are non-attacking hence YES

7. a. Write a program to count and display the number of lines, words, and characters in a text file (similar to Unix wc program). There can be multiple files as an argument. You have to use file handling to solve this problem.

8. WAP to print first n lines or last n lines from a file in the order they are present, where n, filename and a character (‘t’ or ‘b’) are given as command line arguments and n is optional. If no argument is given, the first 10 lines are printed. In case of improper use, a usage message is printed. The optional argument is always written like in the example below:

   $./a.out myfile.txt t
   prints first 10 lines or as many lines as present

   $./a.out -15 myfile.txt t
   prints first 15 lines, or as many lines as present

   $./a.out 10 myfile.txt t
   Usage:./a.out -numlines filename t

$./a.out myfile.txt b
prints last 10 lines, or as many lines as present

$./a.out -20 myfile.txt b
prints last 20 lines, or as many lines as present

$./a.out 10 myfile.txt b
Usage:./a.out -numlines filename b

Note: You must not read entire file in a buffer (i.e. 2D array).

9. WAP that prints the month, date of the month and day, given year & day of the year as command line arguments. Keep track of leap years. (Assume: 1st Jan 1900 was Monday)
   e.g.
   $./a.out 2015 50
   Feb 19, Thursday
   $./a.out 2000 65
   Mar 5, Sunday

10. WAP to rearrange the lines in a file such that first line is swapped with second, third with fourth,...and so on until the file is over or a single line remains. The original file should be modified. Ex. if file1 contains:
    dsa
    2
    Lab third
    4
    5
    $./a.out file1
    will modify file1 to:
    2
    dsa
    4
    Lab third
    5

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