

**Lab Assignment 4**

1. (20%) Write a program that uses a random number generator to “draw” a user-specific number (N) of cards from a standard deck of 52 (從 52 張撲克牌中發 N 張牌、N 由使用者指定，撲克牌的大小是 2-10, J, Q, K, A; 花色是 diamonds, hearts, spades, clubs). If your N=52, you will output all the cards. Your sample runs might look like (make sure you get different outputs for different runs as it is meant to be a random process):



```
C:\WINDOWS\system32\cmd.exe
Enter a specific number <N>: 20
The results are:
9 of clubs
3 of spades
4 of spades
5 of hearts
2 of diamonds
6 of hearts
8 of spades
K of hearts
5 of clubs
5 of spades
6 of spades
A of spades
7 of clubs
J of spades
Q of hearts
2 of clubs
1 of spades
A of diamonds
7 of spades
5 of diamonds
請按任意鍵繼續 . . .
```

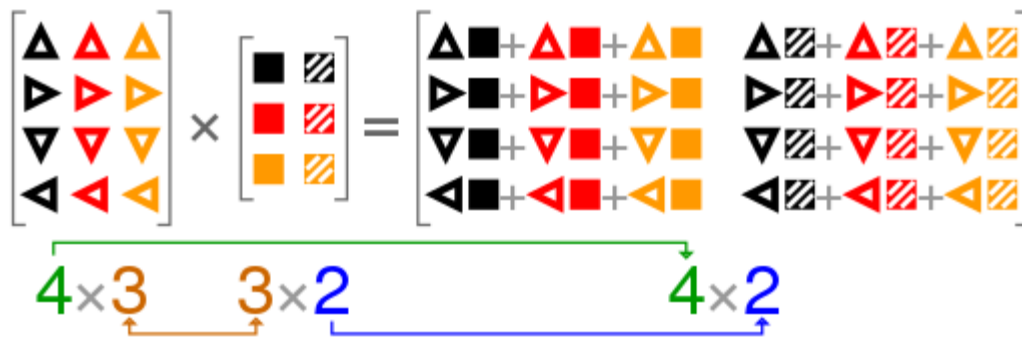
```

C:\WINDOWS\system32\cmd.exe
Enter a specific number (N): 52
The results are:
A of hearts
9 of diamonds
Q of hearts
9 of clubs
6 of clubs
6 of diamonds
1 of hearts
4 of hearts
J of hearts
2 of hearts
K of diamonds
8 of hearts
4 of clubs
7 of clubs
8 of clubs
9 of hearts
7 of diamonds
5 of spades
6 of spades
K of spades
3 of hearts
7 of spades
A of spades
8 of diamonds
5 of clubs
3 of clubs
5 of diamonds
3 of spades
Q of spades
2 of spades
J of diamonds
4 of diamonds
2 of clubs
Q of diamonds
K of hearts
1 of clubs
8 of spades
K of clubs
9 of spades
J of spades
6 of hearts
5 of hearts
J of clubs
3 of diamonds
1 of diamonds
2 of diamonds
1 of spades
A of clubs
A of diamonds
Q of clubs
4 of spades
7 of hearts
請按任意鍵繼續 . . . . _

```

2. (20%) Write a program for matrix multiplication for double numbers. Your program should read the number of row and column and the elements for the two matrices from standard input, perform matrix multiplication and write the results to standard output.

In case you forgot or do not know how to do matrix multiplication, below is multiplication of two matrices illustrated with a  $4 \times 3$  and a  $3 \times 2$  matrix with arbitrary symbols



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Below are two sample runs:

```
input the size of your matrix
1 3
3 2
input your 1st matrix
1.1 2.2 3.3
input your 2nd matrix
1.1 0.2
2.2 1.2
0.5 0.3
result matrix:
7.700000 3.850000
```

```
input the size of your matrix
4 3
3 2
input your 1st matrix
0.1 0.2 0.3
0.2 0.1 0.5
0.3 0.1 0.4
0.2 0.1 0.5
input your 2nd matrix
0.2 0.1
0.3 0.5
0.4 0.8
result matrix:
0.200000 0.350000
0.270000 0.470000
0.250000 0.400000
0.270000 0.470000
```

3. (20%) A simple text file called `potter.txt` available from the

MidExamFirst\_dist.zip contains some sentences as listed below.

Harry Potter and the Philosopher's Stone  
 Harry Potter and the Chamber of Secrets, harry potter series 2  
 Harry Potter and the Prisoner of Azkaban  
 harry potter and the Globlet of Fire, Harry Potter Series 4  
 harry potter and the Order of the Phoenix  
 Harry Potter and the Half-Blood Prince  
 Chapter 1: the boy who lives. Harry Potter is a young boy.

Write a C++ program to read in this file and do the following parsing:

- (a) Output those repeated words (case sensitivity) and their number of occurrence. Below is a sample run:

```
Harry occurs 6 times.
Potter occurs 6 times.
and occurs 6 times.
the occurs 8 times.
of occurs 4 times.
harry occurs 3 times.
potter occurs 3 times.
```

- (b) Output each line in reverse order and in lowercase. Below is a sample run:

```
enots s'rehposolihp eht dna rettop yrrah
2 seires rettop yrrah ,sterces fo rebmahc eht dna rettop yrrah
nabakza fo renosirp eht dna rettop yrrah
4 seires rettop yrrah ,erif fo telbolg eht dna rettop yrrah
xineohp eht fo redro eht dna rettop yrrah
ecnirp doolb-flah eht dna rettop yrrah
.yob gnuoy a si rettop yrrah .sevil ohw yob eht :1 retpahc
```

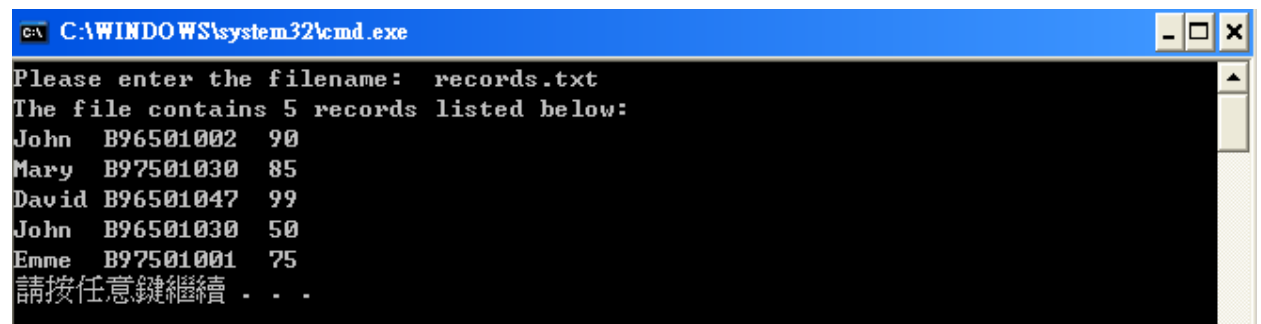
- (c) Remove "Potter" and "potter" from each line and output the remaining contents with line number. Below is a sample run:

```
Line 1: Harry and the Philosopher's Stone
Line 2: Harry and the Chamber of Secrets, harry series 2
Line 3: Harry and the Prisoner of Azkaban
Line 4: harry and the Globlet of Fire, Harry Series 4
Line 5: harry and the Order of the Phoenix
Line 6: Harry and the Half-Blood Prince
Line 7: Chapter 1: the boy who lives. Harry is a young boy.
Line 8:
Press any key to continue . . . █
```

4. (20%) An input file `records.txt` available from the `MidExamFirst_dist.zip` contains a few student records listed below (the first line is a comment to describe the contents of the records):

```
## This file contains five student records (name, id, score)
John B96501002 90
Mary B97501030 85
David B96501047 99
John B96501030 50
Emme B97501001 75
```

- (a) (10%) Prompt the user to input the filename and store all the student records into `vector<Student>` and print the size of the container and all the records. Your sample run looks like:

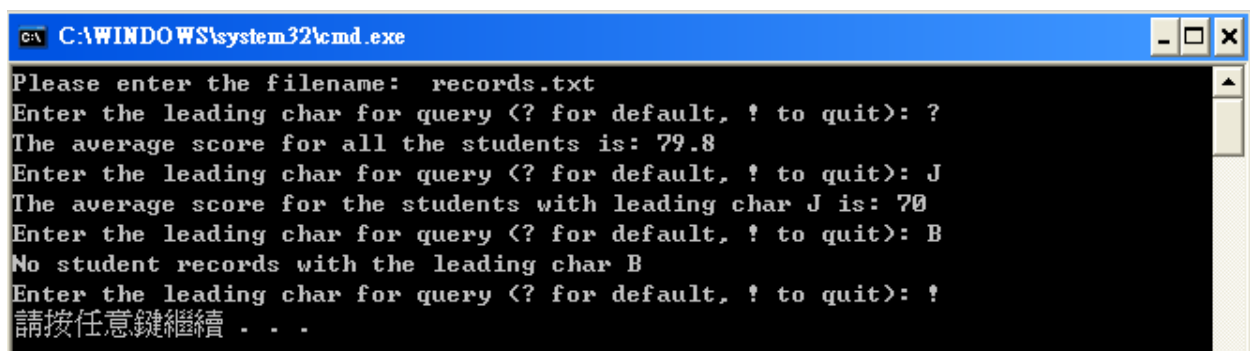


```
C:\WINDOWS\system32\cmd.exe
Please enter the filename: records.txt
The file contains 5 records listed below:
John B96501002 90
Mary B97501030 85
David B96501047 99
John B96501030 50
Emme B97501001 75
請按任意鍵繼續 . . .
```

- (b) (10%) Write a `compute_average` function with the following function declaration to compute the average score. The second parameter takes a `char` to compute only the average score from those who have the same leading character in their names. The function will compute the average score of all the records by default.

```
double compute_average(const vector<Student>& students, char Lead='');
```

Your sample run looks like:



```
C:\WINDOWS\system32\cmd.exe
Please enter the filename: records.txt
Enter the leading char for query (? for default, ! to quit): ?
The average score for all the students is: 79.8
Enter the leading char for query (? for default, ! to quit): J
The average score for the students with leading char J is: 70
Enter the leading char for query (? for default, ! to quit): B
No student records with the leading char B
Enter the leading char for query (? for default, ! to quit): !
請按任意鍵繼續 . . .
```