

Homework Assignment No. 3

(Total 130%)

1. (20%) A textfile `input.txt` contains sentences of text. A line with an empty string indicates a paragraph break. Write a program to store all the lines in a vector container and print the lines in the first paragraph. For example, if our `input.txt` has the following contents (please copy and paste and generate the file by yourself):

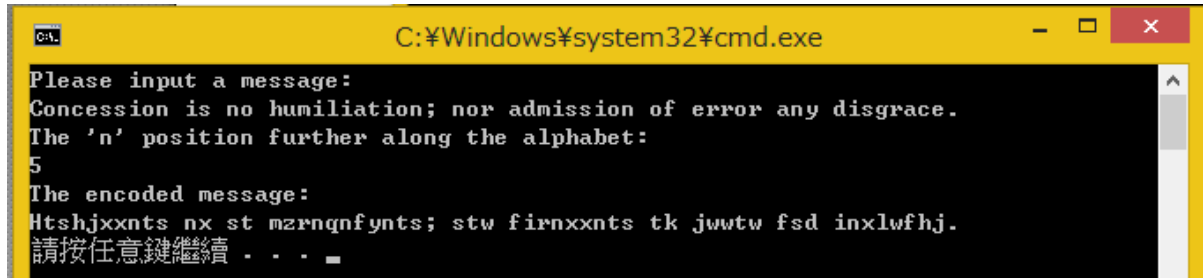
```
Two roads diverged in a yellow wood,  
And sorry I could not travel both  
And be one traveler, long I stood  
And looked down one as far as I could  
To where it bent in the undergrowth;  
  
Then took the other, as just as fair,  
And having perhaps the better claim  
Because it was grassy and wanted wear,  
Though as for that the passing there  
Had worn them really about the same,  
  
And both that morning equally lay  
In leaves no step had trodden black.  
Oh, I kept the first for another day!  
Yet knowing how way leads on to way  
I doubted if I should ever come back.  
  
I shall be telling this with a sigh  
Somewhere ages and ages hence:  
Two roads diverged in a wood, and I,  
I took the one less traveled by,  
And that has made all the difference.  
  
The Road Not Taken by Robert Frost
```

A sample output looks like:

```
The first paragraph of the input file is  
  
Two roads diverged in a yellow wood,  
And sorry I could not travel both  
And be one traveler, long I stood  
And looked down one as far as I could  
To where it bent in the undergrowth;
```

2. (30%) A *Caesar cipher* encodes a message by replacing each letter of the message with the letter that is `n` positions further along in the alphabet. For example, if you have a letter

a, its 2 positions in the alphabet is the letter c. Letters at the end of the alphabet wrap around to the beginning. For example, if you have a letter y, its 5 positions in the alphabet is the letter d. Write a program that takes a message to encode and an integer n as its parameters, and encodes the message using the n-shift. Below is a sample run:



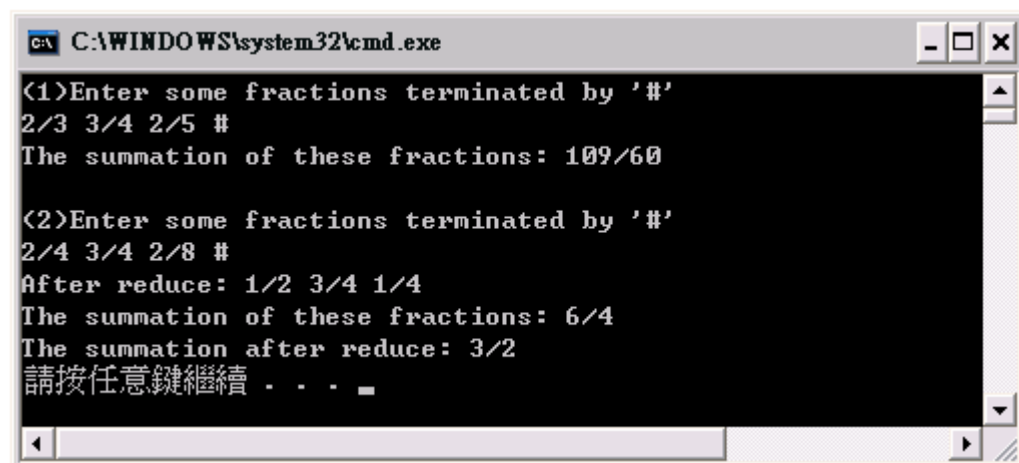
```
C:\Windows\system32\cmd.exe
Please input a message:
Concession is no humiliation; nor admission of error any disgrace.
The 'n' position further along the alphabet:
5
The encoded message:
Htshjxxnts nx st mznqnfynts; stw firnxxnts tk jwwtw fsd inxlfwjhj.
請按任意鍵繼續 . . . _
```

3. (40%) A fraction consisting of both a numerator and a denominator can be manipulated as a single object using the type Fraction:

```
struct Fraction{
    int num; //分子
    int den; //分母
};
```

Put the type definition in a header file Fraction.h with inclusive header guard.

- (1) In the first part, include the header file and write a program to allow users to enter some fractions from input (e.g., 2/3 3/4 2/5 and using # to terminate the input) then output the summation of these fractions (e.g., 109/60 in this case).
- (2) Extend the program to again allow users to enter some fractions from input (e.g., 2/4 3/4 2/8 and using # to terminate the input) then output their corresponding reduced form (e.g., 1/2 3/4 1/4 in this case).

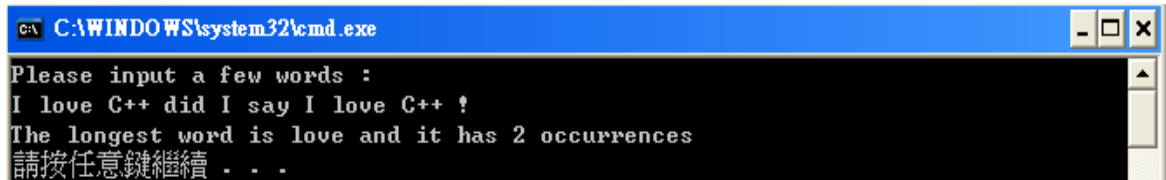


```
C:\WINDOWS\system32\cmd.exe
(1)Enter some fractions terminated by '#'
2/3 3/4 2/5 #
The summation of these fractions: 109/60

(2)Enter some fractions terminated by '#'
2/4 3/4 2/8 #
After reduce: 1/2 3/4 1/4
The summation of these fractions: 6/4
The summation after reduce: 3/2
請按任意鍵繼續 . . . _
```

4. (40%) (a) Write a program to input a few words. Then output the longest word and its occurrence. For simplicity, assume that each word separates from each with a space and no punctuation existed. Use ! to signify the end of inputs. Below is a sample input sentence and sample run:

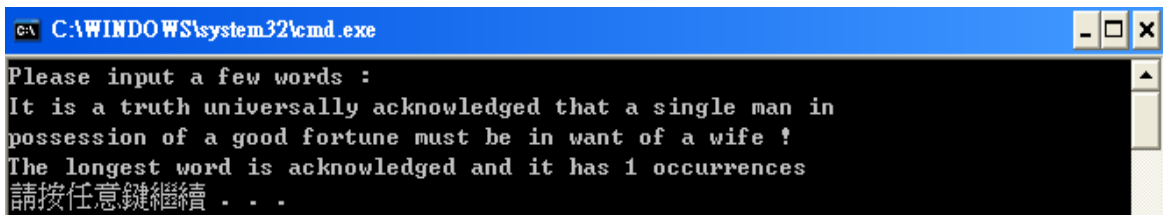
```
| I love C++ did I say I love C++ !
```



```
C:\WINDOWS\system32\cmd.exe
Please input a few words :
I love C++ did I say I love C++ !
The longest word is love and it has 2 occurrences
請按任意鍵繼續 . . .
```

A more complex input looks like (from Pride and Prejudice (傲慢與偏見))

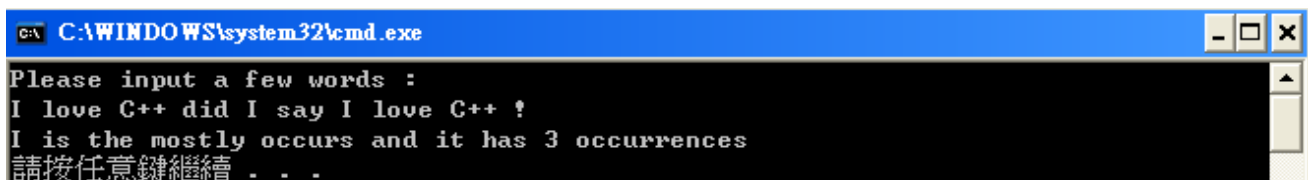
```
| It is a truth universally acknowledged that a single man in
| possession of a good fortune must be in want of a wife !
```



```
C:\WINDOWS\system32\cmd.exe
Please input a few words :
It is a truth universally acknowledged that a single man in
possession of a good fortune must be in want of a wife !
The longest word is acknowledged and it has 1 occurrences
請按任意鍵繼續 . . .
```

- (b) Write a program to input a few words again. Then output the word(s) that mostly occurs and its occurrence (出現最多次的字與出現次數). For simplicity, assume that each word separates from each with a space and no punctuation existed. Use ! to signify the end of inputs. Below are two sample input sentences and two sample runs:

```
| I love C++ did I say I love C++ !
```



```
C:\WINDOWS\system32\cmd.exe
Please input a few words :
I love C++ did I say I love C++ !
I is the mostly occurs and it has 3 occurrences
請按任意鍵繼續 . . .
```

```
| I love C++ did you say I love C++ yes I love it !
```

```

C:\WINDOWS\system32\cmd.exe
Please input a few words :
I love C++ did you say I love C++ yes I love it ?
I is the mostly occurs and it has 3 occurrences
love is the mostly occurs and it has 3 occurrences
請按任意鍵繼續 - - -

```

HW Grading Policy:

1. You should consider about exception handling, e.g. error input, file opening fail, etc.
請注意所有例外狀況的處理，例如：錯誤的符號字串輸入、檔案開啟失敗等。
2. The coding style includes your output format.
輸出資料的格式將納入格式評分。
3. **If your code is not compilable, your score in this problem is zero (including coding style).**
若程式無法編譯，則該題以零分計算。(包含格式分數)
4. Your program will be tested with other data which is not the same as provided samples.
除了題目所提供的範例測試資料以外，作業程式碼將以額外的測試資料進行測試。

- Coding Style (20%): 編碼格式分數

1. format
整體形式與輸出資料的格式
2. comments
註解
3. readability
可讀性
4. variables naming
變數命名方式
5. typesetting
型別設定

- Functionality (80%): 功能性分數

1. run-time performance:
執行時的表現
 - 1) samples not passed -> x
範例測資錯誤 => 此部分零分
 - 2) samples passed but some tests failed -> partial
範例測資通過但是部分測資失敗 => 部份給分
 - 3) samples and tests all passed
範例測資與所有測資通過 => 此部分滿分
3. excellent method++
綜合以上，又以能展現解決問題的巧思尤佳。