Programming assignment #2

iPhone 耐摔測試

Objective

1. To understand dynamic programming & recursion.
2. To compare the difference of them.

Problem Definition

1. Using dynamic programming and recursion, implement the program in C/C++
2. Compare the runtimes
3. 輸出最少次數(接下題)
4. 顯示此次數下可以丟到最高樓層的丟法，
   Ex: 假設 4 支 iPhone，10 層階梯高，答案得須丟 4 次，但 4 支丟 4 次最多可測得 15 層高

   (8 → 12 → 14 → 15)

Experiments

Adar 想知道新買的 iPhone 7 的耐摔程度，想請大家幫忙做實驗，例如: 從第 n 層階梯開始丟下 iPhone 會爆開，代表第 n-1 層丟下不會爆開，但是 iPhone 很貴，實驗經費有限，所以請大家找出能丟最少次的方法。

假如丟下去的 iPhone 沒有爆開，可以撿回重複使用，但是要計算丟了一次。

舉例: 現在有 1 支 iPhone，階梯最高為 3 層高，最少丟幾次可以測到所有情況?

ANS: 3 次，因為只能從第 1 層開始丟下直到爆為止。

I/O Format

Your program must be able to read an input file. The I/O file names are arguments to your program; in other words, those file name can NOT be fixed. In command line, your program is invoked by:

```
./a.out   0   inputfile   outputfile     //0代表用DP，1代表用recursive
```

Input file example

```
2 3        //first is number of iphones,    second is number of stairs
10 786599
4 786599
80 185473464654
0 0        //stop
```

在測資中，iPhone 數最高為 100 支，階梯最高為 2 的 64 次方減一(long long int)，測資不超過 20 筆，一筆 input 需輸出兩行解(次數&丟法)

output file example(format 必須換行，有空格的空一格)

```
2          //次數
2 3        //丟法(數字間空一格)        } 為第一筆 pattern (2,3)的解
21
431910 694054 849436 939282 …        //答案如附件
More then 63 times needed        //需要次數超過63次，不用輸出丟法
38
…   //答案如附件
```

Output format 必須遵守規定否則 0 分計算

如果次數超過 63 次就輸出" More then 63 times needed"，且不用輸出丟法

Program Submission

1. Please use C/C++ language and your program must be written in only one source file.
2. Your source file must be named as "Student_ID_number_hw2.cpp" and please make sure that all characters of the filename are in **lower case**. For example, if your student number is 9711592, the name of your program file should be "9711592_hw2.cpp".

Report

1. No more than 3 pages.
2. Your report must contain:
   a. The flow chart or the pseudo code of you program.
   b. The experimental results and analysis.
3. The report file name must be "Student_ID_number_hw2.doc(x)" or "Student_ID_number_hw2.pdf" and please make sure that all characters of the filename are in lower case. For example, if your student number is 9711592, the name of your program file should be "9711592_hw2.doc" or

"9711592_hw2.pdf".

Grading

You need to submit both your source code and report. Remember the submission rules mentioned above, or you will be punished on your grades.

- Unique and compilable source code 80 %
- Report 20 %

遲交成績打 8 折

Due Date

Upload your report and program to the course website and there will be a **demo** of this assignment. All of your files must be archived to only one file named "**Student_ID_number_hw2.zip**" or "**Student_ID_number_hw2.rar**". You have also to handed in the report when demo.

The upload dead line would be **at pm 11:59 on December 11, 2016**. The demo schedule would be released before Dec. 11.