Homework 8 (Deadline 15:00, May 20, submit your files to TronClass)

Please submit the source code only. The file name should include your student ID number. For example, if your ID number is 406290123, then the file names for problems 1 and 2 should be **406290123_hw8_1.txt** and **406290123_hw8_2.txt**, respectively.

1. Write a program in C to check if an input number is a perfect numbers using a user-defined function,

   `void perfect_number(int i)`

   Input

   An integer.

   Output

   If the input xx is a perfect number, the output should look like

   “The number xx is a perfect number.”

   If the input xx is not a perfect number, the output should look lik

   “The number xx is not a perfect number.”

2. **Sum of Selections**

   Task Description

   寫一個程式計算從 n 個不同物品中取不超過 m 個物品的方法總數。可以先寫一個計算 C(n,k) 的函數(function)，之後計算 C(n,k), k 由 0 到 m 的和即可。

   $$\mathrm{F(n,m)} = \sum_{k=0}^{m} C(n,k)$$

   Input

   輸入只有一行 n 及 m (n>m)。

   Output

   輸出是 n 個不同物品中取不超過 m 個物品的方法總數。

3. Random Walk

Write a program to simulate two-dimensional random walks on a lattice as shown below. The probabilities for taking steps in all four directions are equal. The length of step is 1. Generate 50000 walks of 100 steps starting from the origin. You have to obtain both the x and y coordinates of the final position at the end of each walk. The square of distance is defined as $D=x^2+y^2$.Your program has to compute the following quantities.

A. The average displacement ($x_{average}$,$y_{average}$) from the origin at the end of the walks. To obtain $x_{average}$ and $y_{average}$, one has to sum over all final positions and divide by 50000. Note that the theoretical predictions are that $x_{average}=0$ and $y_{average}=0$.
B. The average square of distance ($D_{average}$) from the origin at the end of walks. Note that the theoretical predictions is that $D_{average}=100$.
C. The number of walks (within the 50000 walks) that return to the origin during 100 steps.

4. Armstrong number

Task Description

所謂 Armstrong number 指的是一個 n 位數的整數，它的所有位數的 n 次方和恰好等於自己。

如；$1634 = 1^4 + 6^4 + 3^4 + 4^4$

請依題目需求在一定範圍內找出該範圍內的所有 Armstrong numbers.

Input

輸入包含兩個數字 n, m(n<m, n>0, m<=1000000)，代表所有尋找 Armstrong number 的範圍

Output

將所有範圍內的 Armstrong number 依序由小到大輸出，如果沒有找到請輸出 none.