HKUST Local Programming Contest 2017

Room 4213, HKUST
16, September 2017

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Judges: ZHANG Haoqian & CAO Junhong

A. Minecraft

Time Limit: 1 Second
Memory Limit: 64MB

In the Minecraft, the basic architectural element is a cube whose sides are 1-unit long. Bob wants to build a cuboid with N cubes and decorate it with his stickers whose sides are 1-unit long. If a cube's face can be covered with a sticker, how many stickers does bob need to use at least to cover the surface of the cuboid?

Input:
There are multiple cases. Each case is one integer N (1<=N<=1000) in a single line.

Output:
For each test case, output the number of stickers that bob needs to use at least in a single line.

Sample Input:
1
9

Sample Output:
6
30

B. Integer Division

Time Limit: 1 Second
Memory Limit: 64MB

The positive integer N could be expressed as the sum of a series of positive integers. $N=n_1+n_2+...+n_k$, where $n_1>=n_2>=...>=n_k>=1$, $k>=1$. This representation of the positive integer n is called the division of the positive integer n.

Tony wants to know how many different divisions in three questions:
1. N is divided into k positive integers.
2. N is divided into a number of different positive integers.
3. N is divided into a number of odd positive integers.

Could you help Tony?

Input:

There are multiple test cases. Each case contains two integers, N and k ($0<N<=100$, $0<k<=N$).

Output:

For each test case:
The first line: the answer of the first question.
The second line: the answer of the second question.
The third line: the answer of the third question.

Sample Input:
5 2

Sample Output:
2
3
3

Hint:
For the first question: 4+1, 3+2
For the second question: 5, 4+1, 3+2
For the third question: 5, 3+1+1, 1+1+1+1+1

C. Reaction

Time Limit: 2 Second
Memory Limit: 64MB

Alice has n different chemical elements. Each of them has two attributes, a and b. Alice knows that when two chemical elements are mixed, the reaction will occur and energy will be released. Alice also knows that the amount of energy when the reaction occur follows the expression, when i-th element and j-th element are mixed.

$$|a_i - a_j| \times b_i \times b_j / max(|b_i|, |b_j|)$$

But what Alice does not know is maximal energy that can be released by mixing two elements. Could you help Alice?

Input:
The first line contains an integer T(1<=T<=10), the number of test cases.
For each test case:
The first line contains an integer n (2<=n<=500000).
Then follows n lines, each line contains two integers: a,b (0<=|a|<=10000,0<=|b|<=10000).

Output:
For each test case, output the maximum energy that can be released by mixing two elements in a single line.

Sample Input:
1
5
1 5
-2 4
3 7
5 -3
-6 -2

Sample Output:
22

Hint:
The value of the expression could be negative, which means the reaction absorbs energy. In this cases, we regard it as releasing negative energy.

D. Matrix Travel

Time Limit: 1 Second
Memory Limit: 64MB

There is an N×N matrix with a non-negative energy in each grid. Tom will travel from left-upper grid to right-bottom grid multiple times. In order to save time, tom moves only to the right or down. Tom will collect the energy in each grid he visited and energy in that grid will be 0. Now tom wants to know what is the maximum sum of energy he could collect after Kth travel. Could you help tom?

Input:
The first line contains two integers: N (1<=N<=50), K(1<=K<=10). The following N lines represent matrix. The numbers in the matrix are non-negative integer and no more than 1000.

Output:
Output the maximum sum of energy tom could collect after his Kth travel in a single line.

Sample Input:
3 2
1 2 3
0 2 1
1 5 2

Sample Output:
16

E. Counting

Time Limit: 1 Second
Memory Limit: 64MB

There are N rods of length 1,2, … , N. Bob could pick any three of rods to build a triangle. He soon realizes that he could build a lot of distinct triangles. How many distinct triangles bob could make?

Input:
There are multiple cases. Each case contains an integer N (3<=n<=1000000) in a single line. The end of input will be indicated by a case with n=0. Your program should not process this case.

Output:
For each case, output the number of distinct triangles that bob could make in one line.

Sample Input:
4
5
8
0

Sample Output:
1
3
22

F. Triangle

Time Limit: 1 Second
Memory Limit: 64MB

Given n points on land. Your task is to find a triangle area whose vertices are from given points. Of course, you hope the triangle have the maximum area. You may assume that you always can find at least one triangle whose area is greater than 0 in the given dataset.

Input:
There are multiple cases. Each case contains an integer n (1<=n<=50000) in a single line, indicating the number of points on land. Each of the following n lines contains two integers, X_i and Y_i (0<=|X_i|<=10000, 0<=|Y_i|<=10000). The end of input will be indicated by a case with n=-1. Your program should not process this case.

Output:
For each case, output the maximum area, which contains two digits after the decimal point.

Sample Input:
4
0 0
1 1
2 2
2 0
-1

Sample output:
2.00