

The 3rd UIT – ACM Programming Contest 2015



Problems Overview

Problem A: Prime Number

Problem B: March

Problem C: The Game

Problem D: Highway

Problem E: Uit's Movements Scoring

Problem F: Polygon

Problem G: Sum

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Note: The input and output for all problems are standard input and output.

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Problem A: Prime Number

We know that: it is possible to represent an even positive integer $X > 2$ in the form of the sum of two prime numbers.

Input

The input file consists of several datasets. The first line of the input file contains the number of datasets which is a positive integer and is not greater than 500. The following lines describe the datasets.

Each dataset contains a positive integers X_i ($2 < X_i < 10^6$).

Output

For each dataset, write in one line the prime form of X_i . In the case of many prime forms of X_i existing; only one form, which has a minimum prime number, is written down to the output file . For each dataset, output must be sorted from the smallest number to the greatest number.

Sample input	Sample output
2	3 3
6	7 3 9 19
992	

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Problem B: March

In World War II, an Allied division have to march across Belgium land to rescue a trapped unit behind enemy line.

The area's map is represented by a $n \times m$ matrix, each cell in the matrix has a value correspond to the terrain they represent. The value 1 indicate flat land, 2 indicate elevated terrain and 5 is water.

The division have to march from the top left cell to bottom left. The division can move from one cell to any of the adjacent cell. Moving across flat land require 1 time unit, across elevated terrain require 2 time units and water require 5 time units to cross.

You will have to find the shortest route for the division to march so they can reinforce the endangered unit as soon as possible.

Input

The input file consists of several test cases, but no more than 10. Each test case has form:

- The first line of each test case is the size of the area $n \times m$ ($1 \leq n, m \leq 100$).
- The next n line is the matrix represented the map.

Output

For each test case, print on a single line the time it takes the division to march if they chose the shortest possible route.

Spample Input	Sample Output
5 6 1 1 1 2 1 1 2 2 5 2 1 1 1 1 5 1 1 1 2 1 2 5 5 5 1 1 1 1 1 1	11

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Problem C: The Game

Phuong is a student and he likes mathematic. Hence, he likes to play the game which makes him brainstorm. In those games, he likes the game named “Finding secret number” the most. This game is described as followed:

The game needs n players. At the beginning of the game, one player will choose a random integer m . After that, n players will stand in a circle and will be numbered from 1 to n clockwise. The players will count from the first player clockwise and start at 1, if one player count to m , he will be the loser, and the next player will restart to count from 1. The game will continue until there's only one player standing and that player will be the winner.

Phuong wants to find the number which can help him to win the game. Your task is writing a computer program that solves this problem.

Input

The input file consists of several test cases, but no more than 10. Each test case consists of a single line contains 2 numbers: n and m ($1 \leq n, m \leq 10^6$).

Output

For each test case, print on a single line the number of the winner.

Sample Input	Sample Output
7 3	4

Explanation:

With $n = 7$ and $m = 3$, the order of the numbered loser will be 3, 6, 2, 7, 5, 1 and the winner will have the number 4.

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Problem D: Highway

North Africa have n cities scatter across a desert waste land. The highway connected those cities is in bad condition and not safe to travel so World Bank decided to give a few millions buck in loan to help rebuild those vital road. After careful inspection, the cost to build a highway connect each city to all others was calculated.

With this information, find a way to build the highway with minimum amount of money yet guarantee that those cities are interconnected.

Input

The input file consists of several test cases, but no more than 10. Each test case has form:

- The first line of each test case consists of 3 number n, m and t ($2 \leq n \leq 100$, $1 \leq m \leq 10^4$, $1 \leq t \leq 10^6$), n is the number of cities, m is the number of highway that can be build and t is the money borrow from World Bank.
- The next m lines each consists 3 number x, y, z ($1 \leq x, y, z \leq 100$); in which x is the index of the first city, y is the index of the second city, z is the cost to build a highway connect those two cities.

Output

For each test case, print on a single line the following information:

- If the cost to build our desired highway network is less than the loan, Print "YES" and k , in which k is the amount of money left over.
- If the cost is higher than the loan, print "NO" and k , in which k is the amount that fall short.
- If an interconnected highway network cannot be build, print "NO".

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Sample Input	Sample Output
6 6 12 1 2 3 2 4 3 2 5 3 4 5 2 4 6 2 5 6 1	NO

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Problem E: Uit's Movements Scoring

In University of Information Technology (UIT), with regard to ensure that the graduated students have to have strong social and teamwork skills, there are a great number of movements set up by the Ho Chi Minh Communist Youth Union and the Vietnam Students' Association of UIT every year. The lacking of social skills that lead to a skillful but weak and unhealthy student always is the most topical issue about which Mr. Nguyễn Trác Thức, who is the Secretary of Ho Chi Minh Communist Youth Union of UIT truly concerned. Therefore, he would like to establish as many good movements for student as possible. All the same, everything usually have two sides, so the students become pretty confused because of the more and more number of movements as well. To be more precise, each student needs to have at least 80 points to become the good student and each of movements will give from 1 to 10 points and take from an hour to few days depended on the difficulty. However, there are 4 kinds of movements and students can not get more than 25 points in a kind even they had done movements which have more than total of 25 points. Due to the complexity of choosing which movement a student should do, Mr. Nguyễn Văn Toàn, who is the Chief of Political Work of Students Department, would like to create a software that helps new students to choose the most effective movements for them, which mean it takes them as few number of hours as possible but still keeps their points greater than or equal to what they want. To all intents and purposes, Mr. Nguyễn Văn Toàn is very busy now with his works and he would like to ask you for help.

Input

At the very first line, there is a number which is the number of tests in the input file, but no more than 15. In each test, the first line contains 5 numbers in which the first 4 numbers n_1, n_2, n_3, n_4 are the number of movements in the kind 1, 2, 3, 4 respectively ($0 \leq n_1 + n_2 + n_3 + n_4 \leq 10000$), the 5th number is the expected points that the student wants which is not greater than 100, and in the next n ($n = n_1 + n_2 + n_3 + n_4$) lines, each line contains the points ($0 \leq p \leq 10$) and the number of hours ($1 \leq h \leq 360$) of a movement (first n_1 lines are movements in kind 1, next n_2 lines are movements in kind 2 and so on). All numbers in the file are separated by spaces.

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Output

For each test case, output contains a single line which is the total number of hours that the student needs to get his expected points or a string "impossible".

Sample Input	Sample Output
1 1 2 1 1 20 5 4 5 3 10 5 15 3 3 1	6
2 2 2 0 0 40 5 3 2 3 1 1 5 1 1 1 1 1 10 10 1 10 1 10 1 10 2	impossible 1

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Problem F: Polygon

Give n points a_1, a_2, \dots, a_n on a 2D coordinate plane. Each point's coordinates are 2 integers and there are not any 3 points on a straight line. Write a program to specify a polygon which is not a self-intersect polygon and it's vertices are some of n given points above. This polygon contains all points given and must have smallest perimeter. After that, you have to calculate the perimeter and the area of this polygon.

Input

The input file contains $n + 1$ lines. The first line contains an integer n ($n \leq 100$). The next n lines, each line contains 2 integers x_i, y_i ($-10000 \leq x_i, y_i \leq 10000$) are the coordinates of point a_i .

Output

The output first line contains 3 numbers k, v, s with k is the number of edges of the polygon, v is the perimeter and s is the area of this polygon (perimeter and area are real numbers and are rounded to 2 digits in fractional part). The next k lines, each line contains x_i, y_i is the coordinates of point a_i (with a_i is a vertex of the result polygon) sort in descending order by ordinate, if 2 points have same ordinates, sort in descending order by abscissa.

Sample Input	Sample Output
5	4 15.12 14.00
0 1	4 4
4 4	0 4
0 4	0 1
4 0	4 0
2 2	

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Problem G: Sum

Given three positive integers a, b and c . We call T is the smallest positive integer which is divisible by a, b and c . After know T , we can easy to find the $2^{nd}, 3^{rd}, \dots, n^{th}$ smallest numbers which are divisible by a, b and c .

Write the program to compute the sum of n smallest positive integers which are divisible by a, b and c .

Input

The input file consists of several test cases, but no more than 10. Each test case consists of a single line contains 4 positive integers a, b, c and n ($1 \leq a, b, c \leq 100$; $1 \leq n \leq 1000$).

Output

For each test case, print on a single line the computed sum.

Sample Input	Sample Output
1 2 3 5	90

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Problem H: Infinite Sequence

Give a positive integer n . Write program to find the n^{th} character of sequence which create by writing continuously the number 1 to infinity.

For example : the 10^{th} character of sequence 12345678910111213... is 1.

Input

The input file contains many number of n in different lines.

Output

The output store the corresponding n^{th} characters (each print on in a single line).

Sample Input	Sample Output
5	5
10	1
54	3