1. **Shortest and Longest Pair (MyMath) (Easy)**

   In this problem, you need to find the shortest and longest distance between two three-dimensional points.

   Requirement:

   1) Input is a string which contains N sets of numbers with "double" data type (2<N<10000). Each set contains three values: x, y and z.

   2) Output number should contain two digits of precision of floating-point number.

   Hint

   You may need to include "iomanip" and "sstream" libraries in this problem.

   Sample Input

   1.00 1.00 1.00 1.05 1.00 1.00 3.05 4.87 5.78 3.87 4.12 8.24 7.19 100 9.57

   Sample Output

   0.05 99.56

   // shortest distance, longest distance

2. Minesweeper(踩地雷) (MyOther) (Easy)

The goal of the Minesweeper is to find where are all the mines within a M ×
N (0<M, N≤1000) field. Your goal is to find the original map that shows a
number in a square which tells you how many mines there are adjacent to
that square.

Example

Suppose the following 4 × 4 field with 2 mines (which are represented by
an '*' character):

*...

....

.*..

....

If we would represent the same field placing the hint numbers described
above, we would end up with:

*100

2210

1*10

1110

As you may have already noticed, each square may have at most 8 adjacent
squares.

Hint

You may need to use "stringstream" to achieve the function of cin and cout.

Sample Input

4 4 *... .... .*.. ....

3 5 **... ..... .*...

Sample Output

*100 2210 1*10 1110

**100 33200 1*100

3. Get Signature (MyOther) (Normal)

You have a blank paper. There are many celebrities in the plaza. You can only ask one celebrity to sign on the paper. Then the celebrity each pick one other person they know to sign for you. (exactly one, no less, no more and never themselves). Which celebrity should you ask to maximize the number of signatures that you get?

Requirement:

1) Each case starts with a line containing an integer N (2 ≤ N ≤ 50000) denoting the number of celebrities in the plaza. Each of the next N lines contains two integers: u v (1 ≤ u, v ≤ N, u≠ v) meaning that celebrity u asks celebrity v to sign for you.

2) Print out the celebrity m that you should ask first to get maximize the number of signatures. If there is more than one correct answer, output the smallest number.

Sample Input
3 1 2 2 3 3 1
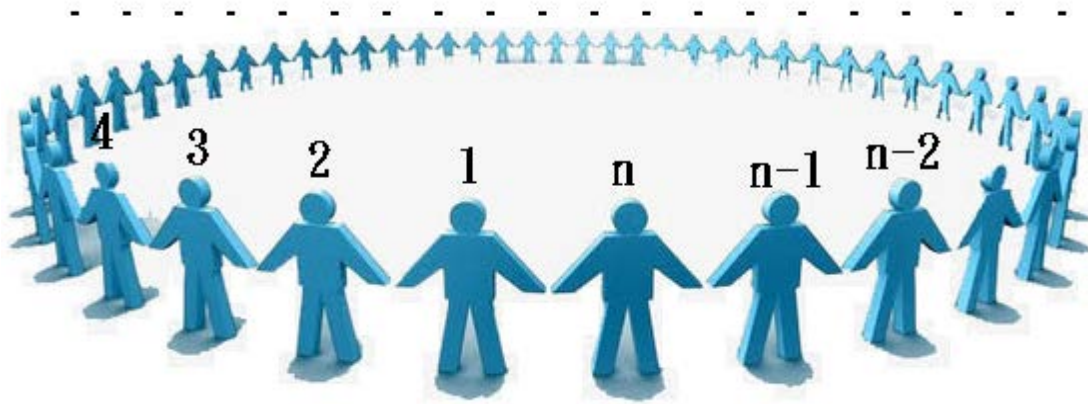4 1 2 2 1 4 3 3 2

Sample Output
1
4

4. Shy Game (MyMath) (Easy)

A circle is enclosed by n people. Now we start to count m people begin from person 1, then the person who was counted at m runs away shyly. Restart the counting begin from m+1 again. The process will end up with only one person being there, what is his/her number?

Example

The last number of set of m. (n = 4, m = 10)

Round1: 1 2 3 4 -> starts counting from 1-> count to 10 -> 2 runs away

Round2: 1 3 4 -> starts counting from 3 -> count to 10 -> 3 runs away

Round3: 1 4 -> starts counting from 4 -> count to 10 -> 1 runs away

Answer: person 4.

Hint

You can use "queue" in this problem.

Sample Input

4 6 7 8 9 10

//The first input number represent that there are n people enclosing the circle.

//The rest of numbers represent a set of m. (Input data won't exceed 10000)

Sample Output

3 2 3 3 4

5. Fibonacci of Fibonacci (MyMath) (Easy)

Fibonacci Sequence is a function that
- $\text{Fib}(0) = 0$
- $\text{Fib}(1) = 1$
- $\text{Fib}(2) = 1$
- $\text{Fib}(n) = \text{Fib}(n-1) + \text{Fib}(n-2), n \geq 2$

Mr. Fib is good at calculating the ones digit(個位數) of Fib(x) for any x, but he is curious of the ones digit of Fib(Fib(x)), please help him.

Example

Fibonacci series: 0 1 1 2 3 5 8 13 21
$$\text{Fib}\big(\text{Fib}(5)\big)\%10 = \text{Fib}(5)\%10 = 5\%10 = 5$$
$$\text{Fib}\big(\text{Fib}(6)\big)\%10 = \text{Fib}(8)\%10 = 21\%10 = 1$$

Hint

$$(a+b)\%m = \big((a\%m) + (b\%m)\big)\%m$$
Find the regular pattern of fibonacci series.

Sample Input

2 3 4 5 6

// Input are a set of x, which won't exceed INT_MAX

Sample Output

1 1 2 5 1
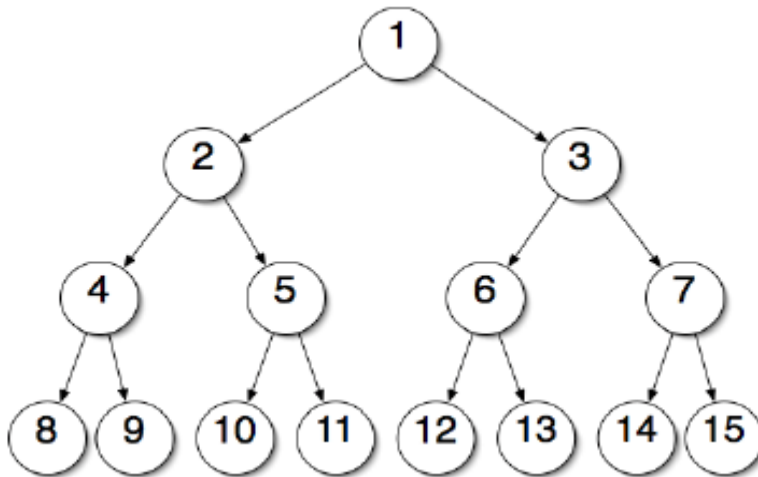
//output are a set of $\text{Fib}\big(\text{Fib}(x)\big)\%10$

6. Largest root (MyTree) (Easy)

According to the diagram below, find the largest value among these subtrees.(圖中數字代表節點的編號)

Definition of subtree: find an arbitrary node, this node can construct a tree with all of its child nodes.

Each node contains two values, one is its own node value, and another is the value of the subtree with this node being the root.

The value of each subtree is calculated by adding up the node value of its root and **half of the sum** of the values of its two child subtree.

You need to find out which subtree has the maximum value and what is its value.

**Sample input**

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

//15 values will be inputted, and the index of each input value correspond to the number of nodes, and these values aren't necessary to be positive

Sample output:

3:230.000

// display output value as a normal number(in comparison with scientific notation), and show three digits after decimal point

7. Find structures of trees (MyTree) (Hard)
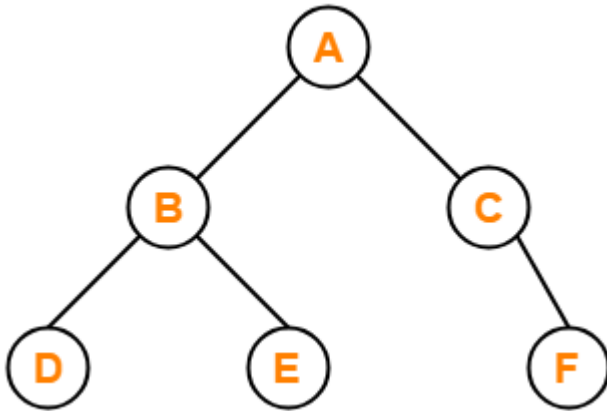
There are three ways to describe trees:
- Pre-order : visit root -> go left -> go right (ABDECF)
- In-order: go left -> visit root -> go right (DBEACF)
- Post-order: go left -> go right -> visit root (DEBFCA)

Your job is finding the tree's structure according to the description of it.

Hint

You can use the structure below in your "MyTree" class

```
struct node {
   struct node *left;  //left child node
   struct node *right; //right child node
   string keyStr;
   int keyInt;
}
```

Sample input (characters of inputs will be a-z or A-Z)

ABDECF DBEACF

// input are Pre-order description first, then In-order description

Sample output

DEBFCA

// output the Post-order description of the tree that construct from input.

8. Find Factorial (MyMath) (Easy)

Factorial numbers can be express as the multiplication of zero or prime factors. Take 4!, for example. We can find that 4! = 2 × 2 × 2 × 3 and total number of prime factors is 4.

Requirement:

Given $N(N<=10^7+1)$, the number of prime factors in X! (Factorial of X), you have to find the minimum possible value of X. If there is no solution, please print out "N".

Sample input:

1 2 4 5 7 8 9 10 11

271 279 116 253 346 352 334 333

Sample output:

2! 3! 4! 5! 6! 7! N N 8!

113! 116! N 106! 140! 143! N 135!

9. Shortest Summation Distance (MyMath) (Hard)

There are 2*N houses, you need to divide them into N groups, and each group has two houses. Let x_1 be the distance between two houses of group 1, x_2 be the distance between two houses of group 2, and so on. You have to make sure the summation ($x_1+x_2+x_3+...+x_N$) is minimized.

Requirement:
1) Each case starts with an integer N. (N groups)
2) The next 2 * N lines will give the coordinate of the house (int x, int y).
3) Print out the shortest summation distance.
4) Output number should contain two digits of precision of floating-point number.

Sample input:
5 10 10 20 10 5 5 1 1 120 3 6 6 50 60 3 24 6 9 0 0 1 9 9 10 10
↑(N)   ↑(N)

Sample output:
118.40 1.41

10. Add 1 (MyMath) (Easy)

In this problem, you need to add 1 to all elements. The input integer number lies between INT_MIN and INT_MAX-1. (INT_MIN $\leq$ N $\leq$ INT_MAX-1)

Sample Input

1 2 3 4 5 6 7 8 9

Sample Output

2 3 4 5 6 7 8 9 10

11. Distance Between Prime (MyMath) (Easy)

Given a positive integer k, k lies between two prime numbers p and p+n, i.e., p ≤ k ≤ p+n. Your goal is to find the distance between two prime numbers p and p+n.

Example

Take k=10, for example. k lies between two prime numbers 7 and 11, i.e., 7 ≤ 10 ≤ 11, so the answer is 4.

Sample Input

10 11 27 2

Sample Output

4 0 6 0

12. Mario Ojisan (MyMath) (Normal)

Mario likes coins. He travels to a country where there are N different types of coins. He wants to collect as many different types of coins as he can. Mario can withdraw any amount of money from the bank. He should maximize the number of different coins in a single withdrawal.

Requirement:
If we want to withdraw X amount of money from the bank, the bank will use the following algorithm.

```
withdraw(X){
        if( X == 0) return;
                //Let Y be the highest valued coin that does not exceed X.
                //Give the customer Y valued coin.
        withdraw(X-Y);
}
```

1) Each test case starts with N different types of coin.
2) Following N integers represent value of each coin type.
3) Find the maximum number of different coins in a single withdraw.
4) Each test case must have a coin type that the value is 1.

Sample input:
6 1 2 4 8 16 32 6 1 3 6 8 15 20
↑(N)   ↑(N)

Sample output:
6 4

13. Escape! If You Want to Survive (MyOther) (Easy)

Your name is Joe a janitor in the maze. One day, your ex set the fire in the maze, RUN JOE RUN for your life.

Given Joe's location in the maze and which squares of the maze are on fire, you must determine whether you can exit the maze before the fire reaches you, and find the fastest way you can escape.

Joe and the fire each move one square per minute, vertically or horizontally (not diagonally). The fire spreads all four directions from each square that is on fire. Joe may exit the maze from any square that borders the edge of the maze. Neither Joe nor the fire may enter a square that is occupied by a wall.

Requirement:
5) The first two integers are R and C, with 1 ≤ R, C ≤ 1000.
6) The following R string, separated by space, of the test case each contain one row of the maze. Each of these strings contains exactly C characters.
7) #=walls, .=place can pass, J=Joe, F=place on fire.
8) Output the fastest time Joe can safely exit the maze in minutes.
9) If there is not possible way to escape, please print "N".

Example

```
4 4
####        ####        ####
#JF#        #FF#        #FF#
#..#   =>   #JF#   =>   #FF#  =>   Escaped!   =>3 min
#..#        #..#        #JF#
```

Sample input:

4 4 #### #JF# #..# #..#

Sample output:

3

14.Subtract 1 (MyMath) (Easy)

In this problem, you need to subtract 1 to all elements. The input integer number lies between INT_MIN+1 and INT_MAX. (INT_MIN+1 ≤ N ≤ INT_MAX)

Sample Input

1 2 3 4 5 6 7 8 9 10

Sample Output

0 1 2 3 4 5 6 7 8 9

15. Find the Period of String (MyString) (Easy)

When a string repeats every N characters, it can be said that the string has a period N. In this problem, you need to find the shortest period of the string.

Example

Take the string "abcabcabcabcabc", for example. The string has repeated strings "abc", "abcabc", "abcabcabcabc", and the corresponding period is 3,6,12. We want to find the shortest period, so the answer is 3.

Sample Input

abbabb
abcdef
ababa

Sample Output

3
6
5

16.Large factorial (MyMath) (Easy)

Your job is to calculate the value of n!.

Sample input: (0 <= n < 10000)

20

Sample output

2432902008176640000

17. Sum of large hexadecimal integers (MyMath) (Normal)

Calculate the sum of large hexadecimal integers

Sample input: (only lower-case character will be inputted)

ffffffffff 10 1 f 0

//arbitrary number of data will be inputted, terminated by a single zero

Sample output

100000001f

//please use lower-case character in your output result

18.Longest Common Substring (MyString) (Easy)

Given two strings, you should capitalize all the character and remove all the punctuations including comma(,), period(.), question mark(?), and exclamation mark(!), then find the longest common substring between two strings. If there are more than one longest common substring between two strings, please print the first of them in dictionary order.

Sample Input

abcdefgh123456abcde vwxyz123456vwxyz

a,bc!defg?h12..345,.?6abc!!de vwx,.?yz12,3.45!!?6v.wx,!?yz!

Sample Output

123456   // Longest common substring

123456   // Longest common substring

19. Get Solution (MyMath) (Normal)

Given a N*N(1≤N≤10) square matrix **A** and a N*1 column vector b. Please solve the equation **A**x = b by Gaussian elimination and output the solution x . You don't need to consider singularity in Gaussian elimination but you should take row exchange into consideration.

In this problem, all elements in **A** and b are floating numbers. The output format contains two digits of precision of floating-point numbers.

Sample Input

3 2 4 -2 4 9 -3 -2 -3 7 2 8 10

3 2 1 0 1 2 1 0 1 2 30.35 32.67 23.65

//N, first row, second row, …, Nth row, b

Sample Output

-1.00 2.00 2.00

12.34 5.67 8.99

20. Longest Peek Palindrome (MyString) (Easy)

Given two strings, you should capitalize all the characters, remove all the punctuations including comma(,), period(.), question mark(?), and exclamation mark(!), then find the longest peek palindrome. If there are more than one longest peek palindrome in one string, please print the first of them in dictionary order.

Example

if the input string is "abcb", the peek palindrome contains "a", "b", "c", "bcb". You should print "bcb" on the screen.

Sample Input

TO,T
A!?b,cd,CB.A
2.A3,M,EA.S
A,BC,D.E!?FG

Sample Output

TOT
ABCDCBA
2
A