KAZAKH BRITISH TECHNICAL UNIVERSITY

Faculty of Information Technologies
Department of Electrical Engineering and Computer Science
Final Exam on Programming Languages, Fall 2016

Problem 1

You are given a Fibonacci sequence a_0, a_1, ..., a_n, ..., where $a_0 = 0$, $a_1 = 1$, $a_k = a_{k-1} + a_{k-2}$ ($k > 1$).

You need to find the N-th number in the sequence.

Input:

N ($0 \le N \le 30$)

Output:

N-th number in the Fibonacci sequence

Example	Answer
7	13

Problem 2

You are given a string line consisting of '>', '<' and '-' symbols. You need to find the number of arrows that is hidden in the string. An arrow is a substring of either '>>-->' or '<--<<' form.

Input:

A single line consisting only of '>', '<' and '-' symbols.

Output:

Output the number of hidden arrows.

Example	Answer
<<<<>>--><--<<--<<>>>--><<<<<	4

Problem 3

John and Martha are playing a game called guess the word. Martha is writing down a word consisting of only upper case letters and John will try to recognize it. Guessed letter will be opened in all positions where it occurs. Your task is to say what minimum number of tries will John need to find out the given word.

Input:

A single line consisting of only upper case letters.

Output:

A single number the answer to the problem.

Example	Answer
GOOGLE	4

Problem 4

You are given a number m(in base 10) which is a positive integer. You need to convert it into binary form and rearrange it in reverse order, and convert the number into decimal form.

Input:

number m ($m <= 10^9$).

Output:

A single number the answer to the problem.

Example	Answer
4	1
6	3

Problem 5

You need to write a program that determines the least common multiple (LCM) of the numbers a and b.

Input:

Two numbers separated by space ($A, B \leq 10^9$).

Output:

A single number the answer to the problem.

Example	Answer
36 27	108
39 65	195

Problem 6

You are given two integers A and B and you need to find their greatest common divisor(GCD).

Input:

Two numbers separated by space ($A, B \leq 10^9$).

Output:

A single number the answer to the problem.

Example	Answer
12 42	6
10 25	5

Problem 7

You need to do the sorting of time moments given as hours, minutes and seconds.

Input:

First line contains number N (1≤N ≤ 100) – the number of time moments. Next N lines has three integer numbers hour(between 0 and 23), minute(between 0 and 59) and second(between 0 and 59).

Output:

Output sorted time moments in ascending order.

Example	Answer
4 10 20 30 7 30 00 23 59 59 13 30 30	7 30 0 10 20 30 13 30 30 23 59 59

Problem 8

Bob doesn't like the C++ language, but he at least tries to submit home tasks and get pass. In the current term, Bob noticed the following pattern: on odd days of the month, he received fail mark, and on even days – pass mark. He also remembers the days when he received these marks. So he wrote down all these days on paper in order to estimate how many fails and passes he got for a term. Please help Bob to solve his problem by placing the odd and even numbers in different lines. Bob can rely on pass if the numbers of non-fail marks are greater than failed ones.

Input:

The first line contains a single number N - the number of days when Bob had marks (1 <= N <= 100). The second line contains N numbers separated by space representing certain day of month (between 1 to 31 inclusively).

Output:

First line must contain the days' number when Bob got failed. Second line must contain days' number when Bob got a pass mark. In the third line you must display «YES», if Bob will pass the course and «NO» otherwise. Each number should be displayed in the same order as they were read from input source.

Example	Answer
5 4 16 19 31 2	19 31 4 16 2 YES

8 29 4 7 12 15 17 24 1	29 7 15 17 1 4 12 24 NO

Problem 9

You are given a linear equation with one unknown x. The equation is 5 characters at all. The second character of the string is either a '+' (plus) or '-' (minus), the fourth symbol is '=' sign (equals). There are two numbers and one unknown x between first, third and fifth symbols.

Need to write a program that will find the answer to the equation.

Input:

A single line representing an equation.

Output:

Output the answer to the equation.

Example	**Answer**
x+5=7	2
3-x=9	-6

Problem 10

The famous painter decided to write a new picture. After many days of hard work, he wanted to look at his creation and explore it. Painter remembered that the picture was written as following: a white rectangular canvas was taken for the basis of width w and height h. Then, the painter painted on that canvas n rectangles with sides parallel to the sides of the canvas and vertices located at integer coordinates. Please help painter to determine the area of the unpainted canvas.

Input:

The first line contains two positive integers w and h ($1 \le w, h \le 100$). The second line contains an integer n ($0 \le n \le 5000$) - the number of rectangles. Next n lines contain information about all the boxes. Each line represents one rectangle as four numbers x1, y1, x2, y2, where (x1, y1) and (x2, y2) - coordinates of the upper left and lower right corner of the rectangle, respectively.

Output:

Print a single number - the area of the unpainted canvas.

Example	**Answer**
5 5 2 1 1 3 3 2 2 4 4	18
6 7 3 0 0 5 5 1 1 4 4 2 2 3 3	17

Bonus Problem 1*

Display expression representing integer N as the product of prime numbers.

Input:

The first line contains a single integer N (2 <= N <= 2^{31} - 1)

Output:

An expression which consist of numbers in ascending order, separated by the multiplication sign "*".

Example	**Answer**
30	2*3*5

Bonus Problem 2*

Display all unique expressions representing the sum of natural numbers that is equal to N.

Input:

The first line contains a single integer N (2 <= N <= 40)

Output:

Output all the unique sum expressions, where the numbers are separated by "+" sign.

Example	**Answer**
6	1+5 1+1+4 1+1+1+3 1+1+1+1+2 1+1+1+1+1+1 1+1+2+2 1+2+3 2+4 2+2+2 3+3

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