#### A. Owl Geeks

time limit per test: 1 second memory limit per test: 256 megabytes input: standard input output: standard output

The owls have the following equation:

 $Y = a \times x^2 + b \times x$ 

With *a*, *b*, and *N* given, they decide to put into a set the integer values of *Y* that are less than or equal to N and that are outputted from the equation from any positive integer *x*.

With that set of numbers, they come up with the problem of finding the winning digit among them.

The winning digit is a digit from 0 to 9 that will get the maximum number of points. How are points for a digit calculated you may ask? Well, be a bit more patient, I'm going to tell you now.

For each number in the set, if the digit was the most repeated digit or tied with other digits as the most repeated digit in the  $i^{th}$  number of set *S*, then it would get one point from that  $i^{th}$  number.

Can you tell the owls what the winning digit is?

#### Input

The first line of input is T – the number of test cases.

The first line of each test case is *a*, *b*, and  $N(1 \le a, b, N \le 10^5)$ .

#### Output

For each test case, print on a line the winning digit with the maximum number of points. If there is a tie, print the minimum digit among them. If the set is empty, print - 1.

input	
2	
1 2 50	
20 3 10	
output	
3	
-1	

#### B. Lazy Physics Cat

time limit per test: 1 second memory limit per test: 256 megabytes input: standard input output: standard output

Physics cat likes to draw shapes and figure out their area. He starts by drawing a circle. Then inside the circle, he draws the triangle X, Y, Z - where Y is the center point of the circle, and X and Z touch the circumference of the circle. Please note that points X and Y always have the same x-coordinate.

Given L (the distance between Points X and Y) and A (the angle XYZ in degrees); help physics cat find the shaded area between the right side of the triangle and the circumference of the circle. And when we say help, we mean do all the work for him.

#### Input

The first line of input is T – the number of test cases.

The first line of each test case is integers *L* and *A*  $(1 \le L \le 1000)$   $(1 \le A \le 180)$ .

#### Output

For each test case, output on a line the area of the shaded region rounded to 6 decimal places.

input	
. 90	
180	
0 30	
putput	
.285398	
179939	

## Problem C Hippopotamus

Input file:	stdin
Output file:	stdout
Time limit:	1 second
Memory limit:	64 megabytes

After fixing your roof, you still think that it looks unpretty. So you opt for a new one, consisting of n consecutive long narrow boards. You have two types of boards: wooden ones and iron ones, giving you an amazing total of  $2^n$  possible roofs.

But the safety should not be left aside. Having considered the weight and the cruising speed of a falling hippopotamus, you decide to have at least k iron boards among every m consecutive boards.

How many possibilities do you have?

#### Input

The input file contains three integers, n, m and k, separated by spaces and/or line breaks.  $1 \le n \le 60$ ,  $1 \le m \le 15, 0 \le k \le m \le n$ .

### Output

Output the number of possibilities.

stdin	stdout
10 2 1	144
552	26
3 2 2	1

# Problem D A Coloring Game

Input file:	stdin
Output file:	stdout
Time limit:	0.5  seconds
Memory limit:	64 megabytes

Two players play a graph coloring game. They make moves in turn, first player moves first. Initially they take some undirected graph. At each move, a player can color an uncolored vertex with either white or black color (each player can use any color, possibly different at different turns). It's not allowed to color two adjacent vertices with the same color. A player that can't move loses.

After playing this game for some time, they decided to study it. For a start, they've decided to study very simple kind of graph — a chain. A chain consists of N vertices,  $v_1, v_2, \ldots, v_N$ , and N - 1 edges, connecting  $v_1$  with  $v_2, v_2$  with  $v_3, \ldots, v_{N-1}$  with  $v_N$ .

Given a position in this game, and assuming both players play optimally, who will win?

### Input

The first line of the input file contains the integer  $N, 1 \le N \le 100\,000$ .

The second line of the input file describes the current position. It contains N digits without spaces.  $i^{th}$  digit describes the color of vertex  $v_i$ : 0 — uncolored, 1 — black, 2 — white. No two vertices of the same color are adjacent.

## Output

On the only line of the output file, print "FIRST" (without quotes) if the player moving first in that position wins the game, and "SECOND" (without quotes) otherwise.

stdin	stdout
5	SECOND
00100	
4	FIRST
1020	

## Problem E. Numbers

Input file:	stdin
Output file:	stdout
Time limit:	0.5  seconds
Memory limit:	64 megabytes

Young Andrew is playing yet another numbers game. Initially, he writes down an integer A. Then, he chooses some divisor  $d_1$  of A,  $1 < d_1 < A$ , erases A and writes  $A_1 = A + d_1$  instead. Then, he chooses some divisor  $d_2$  of  $A_1$ ,  $1 < d_2 < A_1$ , erases  $A_1$  and writes  $A_2 = A_1 + d_2$  instead.

I.e., at any step he chooses some positive integer divisor of the current number, but not 1 and not the whole number, and increases the current number by it.

Is it possible for him to write number B if he started with number A?

#### Input

The only line of the input file contains two integers A and B,  $2 \le A < B \le 10^{12}$ .

## Output

If there's no solution, output "Impossible" (without quotes) to the only line of output. If there's one, output the sequence of numbers written starting with A and ending with B, one per line. You're not asked to find the shortest possible sequence, however, you should find a sequence with no more than 500 numbers. It is guaranteed that if there exists some sequence for the given A and B, then there exists a sequence with no more than 500 numbers in it.

stdin	stdout
12 57	12
	16
	24
	27
	30
	40
	50
	52
	54
	57
3 6	Impossible

## Problem F Largest Circle

Input file:	stdin
Output file:	stdout
Time limit:	0.5  seconds
Memory limit:	64 megabytes

Yay! You've finally managed to buy a tiny plot of land just about 400 kilometers from Moscow. Only... only it was so expensive that you are no more able to afford building a house there. So you decide to go for a swimming pool. It should have the form of circle, and be as big as possible inside your plot. Having carefully measured the border of your plot, you know now that it is a convex N-gon.

What is the largest possible radius of a circular pool in it?

#### Input

The first line of the input file contains an integer  $N, 3 \leq N \leq 10\,000$ . The next N lines contain two integers each,  $x_i$  and  $y_i$ , not exceeding  $10^7$  by absolute value — the coordinates of the vertices of the plot (a convex polygon) in the counter-clockwise direction. No three vertices lie on the same line.

### Output

Output the sought radius. Your solution will be accepted if it is within  $10^{-3}$  of the correct one.

stdin	stdout
4	0.5
0 0	
1 0	
1 1	
0 1	