Problem A. Sum By Modulo

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 megabytes

Given three nonnegative integers a, b, m. Find a sum of numbers a and b modulo m; in other words, calculate the remainder of division of this sum by m.

Input

The only line contains three integers a, b, m, $0 \le a, b < m \le 10^9$.

Output

Print one line — answer to the problem.

Examples

standard input	standard output
2 3 100	5
2 3 6	5
2 3 4	1

Problem B. Subtraction by modulo

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Given three nonnegative integers a, b, m. Find a difference between numbers a and b by modulo m; in other words, calculate the remainder of division of this sum by m.

Input

The only line contains three integers a, b, m, $0 \le a, b < m \le 10^9$.

Output

Print one line — answer to the problem.

Examples

standard input	standard output
7 2 100	5
2 2 100	0
2 7 100	95

Problem C. Multiplication by modulo

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Given three nonnegative integers a, b, m. Find a product of numbers a and b modulo m; in other words, calculate the remainder of division of this product by m.

Input

The only line contains three integers a, b, m, $0 \le a, b < m \le 10^9$.

Output

Print one line — answer to the problem.

Examples

standard input	standard output
2 3 100	6
2 3 4	2
900000000 9000000 1000000000	0
9000000 9000000 999999997	243000

Problem D. Division by modulo

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Given three nonnegative integers a, b, m. Divide a by b by modulo m; in other words, find such an integer c, $0 \le c < m$ such that $c * b \equiv a \ (mod\ m)$ by modulo m.

Input

The only line contains three integers a, b, m, $0 \le a, b < m \le 10^6$.

Output

If needed number c exists and unique, print this number. If such a c does not exist print "`NO SOLUTION`". If there are two or more suitable c-s then print "`AMBIGUOUS`".

Examples

standard input	standard output
6 5 16	14
6 4 8	NO SOLUTION
6 2 8	AMBIGUOUS
0 4 7	0
0 2 8	AMBIGUOUS
0 0 7	AMBIGUOUS

Note

In the first sample, $5 * 14 = 70 \equiv 6 (mod\ 16)$.

In the third sample both numbers 3 or 7 can be quotient of division of 6 by 2 modulo 8.

Problem E. Great Theorem

Input file: *standard input*
Output file: *standard output*
Time limit: 1 second
Memory limit: 256 mebibytes

Given four positive integers X, Y, Z and N. Calculate $X^N + Y^N$ modulo $10^9 + 7$ and Z^N modulo $10^9 + 7$.

Input

Input contains four integers X, Y, Z and N ($1 \le X, Y, Z, N \le 10^9$).

Output

Print two integers — values of $X^N + Y^N$ modulo $10^9 + 7$ and Z^N modulo $10^9 + 7$.

Examples

standard input	standard output
3 4 5 2	25 25
1 1 1 1000000	2 1

Problem F. Inverse by Prime Modulo

Input file: *standard input*
Output file: *standard output*
Time limit: 1 second
Memory limit: 256 mebibytes

In this problem, you are to find such a natural number x for given natural number a that $a * x = 1$ is divided by prime number $10^9 + 9$; in other words, $a * x$ should be equal to 1 modulo $10^9 + 9$.

Input

First line contains integer T, $1 \le T \le 10^5$ — number of test cases.

Each of the following T lines contains natural number a, $1 \le a < 10^9 + 9$.

Output

For each number a print one number in separate line - answer x to the problem; x should be less than $10^9 + 9$.

Example

standard input	standard output
4 1 2 1000000007 1000000008	1 500000005 500000004 1000000008

Problem G. Zeroes and Ones - 6

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 256 megabytes

Find a number of sequences of length N consisting of zeroes and ones, such that there are no neighbouring ones.

Input

The only string of the input contains the only integer n, $1 \le n \le 10^6$.

Output

Print the answer to the problem modulo $10^9 + 7$.

Examples

standard input	standard output
1	2
2	3
1000000	452491922

Problem H. Prime Numbers

Input file: *standard input*
Output file: *standard output*
Time limit: 1 second
Memory limit: 256 mebibytes

You are to write program which is given a natural number k and print k-th in increasing order prime

number.

Input

First line contains positive integer T which is no more than 10^4 — number of queries. Then, T queries follow. Each query is a positive integer k which is no more than 10^5.

Output

For each query, print corresponding prime number.

Example

standard input	standard output
4 1 2 3 100000	2 3 5 1299709

Problem I. Factorization

Input file: *standard input*
Output file: *standard output*
Time limit: 1 second
Memory limit: 256 mebibytes

Write a program which print all prime divisors of given natural n, taking into account their multiplicity.

Input

The only line contains one number n ($1 \le n < 2^{31}$).

Output

Print all prime natural divisors of number n taking into account multiplicity in the order of non-decreasing.

Examples

standard input	standard output
6	2 3

Problem J. Coprimes

Input file: *standaard input*
Output file: *standard output*
Time limit: 1 second
Memory limit: 256 mebibytes

Given an integer n. It is needed to count a number of integer x: $1 \le x \le n$, such that $gcd(x, n) = 1$; here gcd means "greatest common divisor".

Input

Input contains at least 1 and no more than 1000 lines; each of them contains separate test sample — number n ($1 \le n \le 2\,000\,000\,000$), for which you are to find a number of numbers x such that x and n are coprime and $1 \le x < n$.

Output

For each given n print needed number of numbers coprime with n.

Examples

standaard input	standard output
10 100	4 40

Problem K. C_n^k

Input file: *standard input*
Output file: *standard output*
Time limit: 1 second
Memory limit: 256 mebibytes

In this problem, you are to calculate the following sum: $\sum_{k=1}^{l} C_n^{mk} \mod P$; here $P = 10^9 + 7$. In case $n < mk$ you should assume that $C_n^{mk} = 0$.

Remind that for integers z, x, $0 \le x \le z$, $C_z^x = \frac{z!}{x!(z-x)!}$; here, for any positive integer l, $l! = 1*2*3*\ldots*l$. Also, 0! is defined to be 1.

Input

The only line contains positive integers n, m and l ($1 \le n, m, l \le 10^6$).

Output

Print one integer number — needed sum.

Examples

standard input	standard output
3 1 3	7
3 4 5	0

Problem L. GCD

Input file: *standard input*
Output file: *standard output*
Time limit: 1 second
Memory limit: 256 mebibytes

Given two positive integers a and b. Find their greatest common divisor.

Don't use standard algorithms for finding GCD in your language if it exists — you should write your own algorithm. If you use the standard algorithm you will possibly gets OK; but later verdict will be MI (manual inspection).

Input

Two integers a and b are given ($1 \le a, b \le 10^9$).

Output

Print one number — greatest common divisor of given numbers.

Examples

standard input	standard output
26 44	2

Problem M. Experimental Physict

Input file: *standard input*
Output file: *standard output*
Time limit: 1 second
Memory limit: 256 mebibytes

During experimental works on mechanics Moose Valera and other participants of Marsian Spring Olympiad Bootcamp made experiments with pure billiards. You are to write a program which checks the correctness of given reports about results.

There is the only ball at the point A on the rectangular billiard table. The ball is hit in such a way that before first meeting the border, the ball meets the point B. It is needed to check whether the ball will move, possibly after some number of collisions with border of billiard, through point C or not. The ball is considered to be perfectly elastic, and linear sizes of the ball and frictional force are negligible. During the collision of the ball with the border, angle of incidence is equal to angle of reflection.

Input

First line of input contains two integer numbers x_1 and y_1 — coordinates of upper right vertex of the table ($1 \le x_1, y_1 \le 10^4$) (lower left point has coordinates (0, 0), and borders are parralel to coordinate axis).

Second line contains two integers x_a and y_a ($0 \le x_a \le x_1$, $0 \le y_a \le y_1$) — coordinates of the ball.

Third line contains two integers x_b and y_b ($0 \le x_b \le x_1$, $0 \le y_b \le y_1$) — coordinates of the point B.

Fourth line contains two integers x_c y_c ($0 \le x_c \le x_1$, $0 \le y_c \le y_1$) — coordinates of point C.

Points A, B and C are pairwise distinct.

Output

Print "YES" if after some (possibly, zero) number of collisions with border, the ball will move through point and "NO" otherwise.

Examples

standard input	standard output
10 10 2 1 5 8 6 3	YES
2 2 1 0 0 1 1 1	NO

Problem N. Factorization

Input file: *standard input*
Output file: *standard output*
Time limit: 1 second
Memory limit: 256 mebibytes

Input

Output

Examples

standard input	standard output
	2