Problem C. number_bases

This contest is open for practice. You can try every problem as many times as you like, though we won't keep track of which problems you solve. Read the Quick-Start Guide to get started.

small 5 points *2 minute timeout*	The contest is finished.
large 17 points *10 minute timeout*	The contest is finished.

Problem

Number Bases

You are given three sequences X, Y, and Z of equal length. The sequences consist of digits. In this problem we deal with non-decimal bases, so digits are arbitrary non-negative integers, not necessarily restricted to the usual 0 through 9 range.

Your task is to investigate the possible bases for which the equation **X + Y = Z** is both valid and holds true. You must determine whether there is no such base, more than one such base, or only one such base. If there is only one such base, you must find it.

A base is an integer greater than or equal to 2. For X + Y = Z to be valid in base B, all digits in all three sequences have to be strictly less than B. For X + Y = Z to be true in base B, the sum of the integer denoted by X in base B and the integer denoted by Y in base B has to be equal to the integer denoted by Z in base B.

More formally: let S[i] be the i-th digit from the right of a sequence of digits S, with i counted starting from 0. Then, for a given S and an integer base B, we will define the integer denoted by S in base B as f(S, B) = the sum of all S[i] × B^i. Then the equation X + Y = Z is true for a base B if and only if f(X, B) + f(Y, B) = f(Z, B).

For example, consider the sequences X = {1, 2, 3}, Y = {4, 5, 6} and Z = {5, 8, 0}, written with the most significant digits on the left, as usual. That is, X[0] = 3, X[1] = 2 and X[2] = 1. B = 8 is an invalid base, because it is not strictly greater than the middle digit of Z. B = 10 is a valid base, but the expression is not true in that case because 123 + 456 ≠ 580. B = 9 is a valid base that also makes the expression true, because {1, 2, 3} in base 9 is 102, {4, 5, 6} in base 9 is 375 and {5, 8, 0} in base 9 is 477, and 102 + 375 = 477. For this case, B = 9 is the only possible choice of a valid base B that makes the expression true.

On the other hand, the one-digit sequences X = {10}, Y = {20} and Z = {30} have multiple bases for which the equation X + Y = Z is both valid and true. Any value of B greater than 30 would suffice.

Input

The input library is called "number_bases"; see the sample inputs below for examples in your language. It defines four methods:

- **GetLength()**:
  - Takes no argument.
  - Returns a 64-bit integer: the number of digits in each digit sequence X, Y, and Z.
  - Expect each call to take 0.34 microseconds.
- **GetDigitX(i)**:
  - Takes a 64-bit integer in the range 0 ≤ i < GetLength().
  - Returns a 64-bit integer: the i-th digit in the digit sequence X, numbered from right (least significant) to left (most significant). That is, GetDigitX(0) is the least significant digit of X and GetDigitX(GetLength() - 1) is the most significant digit of X.
  - Expect each call to take 0.34 microseconds.
- **GetDigitY(i)**:
  - Takes a 64-bit integer in the range 0 ≤ i < GetLength().
  - Returns a 64-bit integer: the i-th digit in the digit sequence Y, numbered from right (least significant) to left (most significant).
  - Expect each call to take 0.34 microseconds.
- **GetDigitZ(i)**:
  - Takes a 64-bit integer in the range 0 ≤ i < GetLength().
  - Returns a 64-bit integer: the i-th digit in the digit sequence Z, numbered from right (least significant) to left (most significant).
  - Expect each call to take 0.34 microseconds.

Output

Submissions

Testrun
0pt Not attempted **0/58 users** correct (0%)

flagpoles
1pt Not attempted **335/181 users** correct (185%)
11pt Not attempted **277/320 users** correct (87%)

number_bases
5pt Not attempted **241/186 users** correct (130%)
17pt Not attempted **188/226 users** correct (83%)

broken_memory
3pt Not attempted **196/88 users** correct (223%)
25pt Not attempted **77/142 users** correct (54%)

nanobots
8pt Not attempted **104/69 users** correct (151%)
30pt Not attempted **31/68 users** correct (46%)

Top Scores

fagu	100
bmerry	100
krijgertje	100
ecnerwala	100
pashka	100
Swistakk	100
KalininN	100
adsz	100
Gennady.Korotkevich	100
eatmore	100

Output a single line with a single token x. If there is a single base B that makes the expression valid and true, x must be the base 10 representation of B. If there are multiple values of B that make the expression valid and true, x must be `NON-UNIQUE`. If there is no such value of B, x must be `IMPOSSIBLE`.

Limits

Time limit: 3 seconds.
Memory limit per node: 128 MB.
Maximum number of messages a single node can send: 1000.
Maximum total size of messages a single node can send: 8 MB.
$0 \leq$ GetDigitX(i) $\leq 10^6$, for all i.
$0 \leq$ GetDigitY(i) $\leq 10^6$, for all i.
$0 \leq$ GetDigitZ(i) $\leq 10^6$, for all i.
(Contrary to typical notation, it is possible for any of the digit sequences in the input to have a zero at its most significant position. Valid bases are not restricted to be less than 10^6 or any other upper bound.)

Small dataset

Number of nodes: 10.
$1 \leq$ GetLength() $\leq 10^6$.

Large dataset

Number of nodes: 100.
$1 \leq$ GetLength() $\leq 10^8$.

Sample

Input	Output

`See input files below.`	`For sample input 1:`
	`9`
	`For sample input 2:`
	`NON-UNIQUE`
	`For sample input 3:`
	`IMPOSSIBLE`

Sample input libraries:
Sample input for test 1: number_bases.h [CPP] number_bases.java [Java]
Sample input for test 2: number_bases.h [CPP] number_bases.java [Java]
Sample input for test 3: number_bases.h [CPP] number_bases.java [Java]

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