Base By Base

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	1024 mebibytes

This is an interactive problem.

There is a secret positive integer n between 1 and 10^{15} (both inclusive).

You may ask questions of the following type: "Given base $2 \le b \le 10^9$, what is the sum of digits in base b representation of the integer n?" You have to guess n in no more than 2 queries.

Interaction Protocol

Interaction is started by the jury program sending a line with the number of scenarios t ($1 \le t \le 1000$).

In each scenario, the interaction is started by your program sending the request in the format "`?` b", where b ($2 \le b \le 10^9$) is the base of the numeral system to represent n. The jury program prints a line with the answer s — the sum of the digits of representation of n in the b-based numeral system. When you are ready to tell the value of n, print "`!` n". This action is not counted as a query.

If you use more than two queries or your answer is incorrect, your solution is rejected and interaction stops immediately. Otherwise the next scenario is started (or the interaction stops if this was the last scenario).

You may assume that for each scenario the value of n is fixed before the start of interaction (i.e. that the interactor is not adaptive). All integers in the process of interaction (b, s and n) are sent and received in the usual decimal system.

Example

standard input	*standard output*
1 2023 1	 ? 1000000 ? 2023 ! 2023