

Cycling Competition

Input file: **standard input**
Output file: **standard output**
Time limit: 3 seconds
Memory limit: 256 megabytes

There are N cyclists $1, \dots, N$. Each cyclist has a distinct skill from 1 to N , and when two cyclists face off, the cyclist with higher skill always wins.

Cyclists like to participate in competitions. In a competition, the cyclists are ordered in a cyclic list. The competition then happens in rounds. In each round, a cyclist will race against each of their neighbors. If they lose to both, they are eliminated.

You do not know the skills of the cyclists and would like to figure them out. You can hold competitions of all the cyclists, choosing how they are ordered in the cyclic list each time, and will be told which round each cyclist was eliminated in.

Figure out the skills using the optimal number of competitions, or using N competitions for partial credit.

Interaction Protocol

Each test contains multiple test cases. The interaction begins with a line containing the single integer T ($1 \leq T \leq 10^4$), the number of test cases.

Each test case begins with a line containing the single integer N ($3 \leq N \leq 300$), the number of cyclists.

You can then hold competitions. To hold a competition, print a line “? $a_1 a_2 \dots a_n$ ” — a_k indicates that cyclist a_k is in the k^{th} spot of the cyclist list. The list a_1, \dots, a_n must be a permutation of $1, \dots, n$.

The answer to your query will be a line “ $r_1 r_2 \dots r_n$ ” — r_k satisfies $0 \leq r_k < n$. When $r_k > 0$, it indicates that the cyclist in the k^{th} spot was eliminated in round r_k of the competition. If $r_k = 0$, then said cyclist won the competition.

Once you have determined the skills of the cyclists, print a line “! $s_1 s_2 \dots s_n$ ” — s_k should be equal to the skill of cyclist k .

If you make an invalid query or try to hold more than N competitions, your solution will receive a Wrong Answer verdict. Additionally, if the set of skills you print is different from the set of skills the interactor has in mind, your solution will receive a Wrong Answer verdict. In both cases, the interaction will terminate immediately. Otherwise, you will receive a score as described in the scoring section.

Note that the interactor may be adaptive: the true skills of the cyclists may change throughout the interaction, but the current set of skills will always be consistent with all previous competitions.

Scoring

For each test case, let q be the number of competitions your solution held. Additionally, for each N , let c_N be the minimum number of competitions necessary to guarantee being able to determine the skills.

You will receive 100 points if $q \leq c_N$ for all test cases. Otherwise, you will receive 10 points. Note that under the constraints of the problem, receiving 10 points requires you to satisfy $q \leq N$ for all test cases.

Example

standard input	standard output
1	>>> 1
5 Fixed	>>> 5
4 2 1 5 3	? 1 2 3 4 5
	3 2 1 0 1
	? 1 3 5 2 4
	3 1 2 1 0
	? 1 4 2 5 3
	3 0 1 2 1
	? 1 5 4 3 2
	3 1 0 1 2
	! 4 2 1 5 3

Note

In the sample, the skills of the cyclists are 4, 2, 1, 5, 3 respectively.

In the first competition held, the cyclists are ordered into the cyclist list [1, 2, 3, 4, 5]. The competition proceeds as follows; in each round the cyclist list is shown with eliminated cyclists replaced with *X*.

- In round 1:
 - The cyclist in spot 3 (cyclist 3 with skill 1) loses to the cyclists in spots 2 and 4 (cyclists 2, 4 with skills 2, 5) and is eliminated.
 - The cyclist in spot 5 (cyclist 5 with skill 3) loses to the cyclists in spots 4 and 1 (cyclists 4, 1 with skills 5, 4) and is eliminated.
 - The cyclist in spot 1 (cyclist 1 with skill 4) beats the cyclists in spots 5, 2 (cyclists 5, 2 with skills 3, 2) and so is not eliminated.
 - The cyclist in spot 2 (cyclist 2 with skill 2) beats the cyclist in spot 3 (cyclist 3 with skill 1) and so is not eliminated.
 - The cyclist in spot 4 (cyclist 4 with skill 5) beats the cyclists in spots 3, 5 (cyclists 3, 5 with skills 1, 3) and so is not eliminated.
- In round 2, the cyclist list is [1, 2, *X*, 4, *X*].
 - The cyclist in spot 2 loses to the cyclists in spots 1 and 4 and is eliminated.
 - The cyclist in spot 1 beats the cyclist in spot 2 and so is not eliminated.
 - The cyclist in spot 4 beats the other two cyclists and so is not eliminated.
- In round 3, the cyclist list is [1, *X*, *X*, 4, *X*].
 - The cyclist in spot 1 loses to the cyclists in spots 4 and 4 (which are the same cyclist) and is eliminated.
 - The cyclist in spot 4 beats the cyclist in spot 1 and so is not eliminated.

Therefore,

- The cyclist in spot 1 was eliminated in round 3.
- The cyclist in spot 2 was eliminated in round 2.
- The cyclist in spot 3 was eliminated in round 1.
- The cyclist in spot 4 won the competition.

- The cyclist in spot 5 was eliminated in round 1.

making the answer to the query $[3, 2, 1, 0, 1]$.

In the second competition held, the cyclists are ordered into the cyclist list $[1, 3, 5, 2, 4]$. The competition proceeds as follows.

- In round 1:
 - The cyclist in spot 2 (cyclist 3 with skill 1) loses to the cyclists in spots 1 and 3 (cyclists 1, 5 with skills 4, 3) and is eliminated.
 - The cyclist in spot 4 (cyclist 2 with skill 2) loses to the cyclists in spots 3 and 5 (cyclists 5, 4 with skills 3, 5) and is eliminated.
 - The cyclist in spot 1 (cyclist 1 with skill 4) beats the cyclist in spot 2 (cyclist 3 with skill 1) and so is not eliminated.
 - The cyclist in spot 3 (cyclist 5 with skill 3) beats the cyclists in spot 2, 4 (cyclists 3, 2 with skills 1, 2) and so is not eliminated.
 - The cyclist in spot 5 (cyclist 4 with skill 5) beats the cyclists in spots 4, 1 (cyclists 2, 1 with skills 2, 4) and so is not eliminated.
- In round 2, the cyclist list is $[1, X, 5, X, 4]$.
 - The cyclist in spot 3 loses to the cyclists in spots 1 and 5 and is eliminated.
 - The cyclist in spot 1 beats the cyclist in spot 3 and so is not eliminated.
 - The cyclist in spot 5 beats the other two cyclists and so is not eliminated.
- In round 3, the cyclist list is $[1, X, X, X, 4]$.
 - The cyclist in spot 1 loses to the cyclists in spots 5 and 5 (which are the same cyclist) and is eliminated.
 - The cyclist in spot 5 beats the cyclist in spot 1 and so is not eliminated.

Therefore,

- The cyclist in spot 1 was eliminated in round 3.
- The cyclist in spot 2 was eliminated in round 1.
- The cyclist in spot 3 was eliminated in round 2.
- The cyclist in spot 4 was eliminated in round 1.
- The cyclist in spot 5 won the competition.

making the answer to the query $[3, 1, 2, 1, 0]$.