

5. Intersection Repairs (remont)

3 sec / 7 sec

100 points

You live in a city consisting of N intersections (numbered $1, \dots, N$) and M two-way streets. Each street has an integer length. The city has a plan to gradually repair the intersections. However, people still need to get to work. Your task is to help them find the shortest paths that do not pass through any intersections being repaired.

Initially, no intersections are being repaired. You are given Q queries; there are three types of queries:

- $- u$: Intersection u goes under repair.
- $+ u$: The repair at intersection u is finished. This query can only occur if intersection u is currently being repaired.
- $? u v$: Find the length of the shortest path between intersections u and v (where $u \neq v$), which does not pass through any intersection that is under repair. Intersections u and v themselves **may** be under repair.

For each intersection u , there is at most one query of the form “ $- u$ ”: if an intersection has been recently repaired, there is no point in starting to repair it again.

It is known that no street connects an intersection to itself and that there is no more than one street between any pair of intersections. It is also known that if no intersection is being repaired, it is possible to reach any intersection from any other intersection by moving along the streets.

Input. The first line of the input contains three integers N , M and Q ($2 \leq N \leq 350$, $N - 1 \leq M \leq \frac{N(N-1)}{2}$, $1 \leq Q \leq 10^6$).

The following M lines describe the streets. Each line contains three integers U , V and L ($1 \leq U, V \leq N$, $U \neq V$, $1 \leq L \leq 10^9$), which mean that there is a street of length L between intersections U and V .

The following Q lines describe the queries. The queries are formatted as described above. The input contains at least one query of the form “ $? u v$ ”.

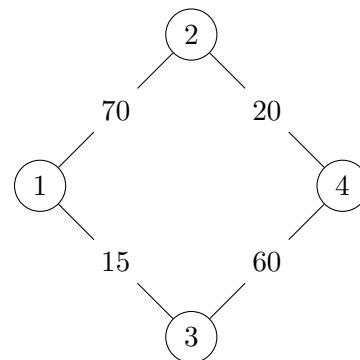
Output. For each query of type 3, output a line containing the answer to the query: the length of the shortest path. If no suitable path exists, output -1 .

Grading. In this task, tests are divided into groups. Only the solutions that solve **all** the tests in a group correctly will get points for that group. In the test groups, the following additional conditions hold:

0. (0 points) The examples from the task statement.
1. (20 points) $N \leq 60$.
2. (25 points) There are no queries of the form “ $- u$ ” in the input.
3. (30 points) The input starts with N queries of the form “ $- u$ ”.
4. (25 points) No additional constraints.

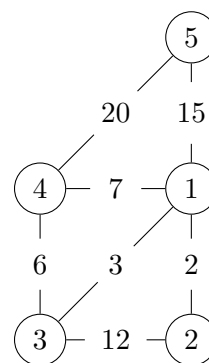
In this task, solutions are allowed to use 1 GB of memory instead of the usual 256 MB.

Example.	Input	Output
	4 4 9	75
	1 2 70	90
	1 3 15	-1
	2 4 20	80
	3 4 60	75
	? 1 4	20
	- 3	
	? 1 4	
	- 2	
	? 1 4	
	? 2 3	
	+ 3	
	? 1 4	
	? 4 2	



In this example, the shortest path between intersections 1 and 4 is initially $1 - 3 - 4$, with a length of $15 + 60 = 75$. But then intersection 3 goes under repair and this path can no longer be used. Now the shortest path between 1 and 4 is $1 - 2 - 4$ with a length of $70 + 20 = 90$. After that, when intersection 2 also goes under repair, it is no longer possible to get from intersection 1 to intersection 4, as both possible intermediate stops 2 and 3 are under repair. Therefore, the answer is -1 . Later, when the repair at intersection 3 gets done, the shortest path is again $1 - 3 - 4$ with a length of 75. The repair at intersection 2 is not finished within the observed time period.

Example.	Input	Output
	5 7 6	5
	1 2 2	6
	1 3 3	20
	1 4 7	18
	1 5 15	9
	2 3 12	7
	3 4 6	
	4 5 20	
	? 2 3	
	? 3 4	
	? 4 5	
	? 3 5	
	? 2 4	
	? 1 4	



In this example, there are no queries of the form “- u”, so the test corresponds to the conditions of subtask 2. The shortest paths are:

- between 2 and 3, $2 - 1 - 3$ with a length of $2 + 3 = 5$;
- between 3 and 4, $3 - 4$ with a length of 6;
- between 4 and 5, $4 - 5$ with a length of 20;
- between 3 and 5, $3 - 1 - 5$ with a length of 18;
- between 2 and 4, $2 - 1 - 7$ with a length of 9;
- between 1 and 4, $1 - 4$ with a length of 7.

Example.	Input	Output	Input	Output
	5 5 14	-1	4 3 11	-1
	1 5 2	5	1 2 1000000000	-1
	1 3 30	37	2 3 1000000000	1000000000
	4 1 3	33	3 4 1000000000	3000000000
	2 4 7	12	- 2	1000000000
	3 2 5		- 3	2000000000
	- 1		? 1 4	
	- 3		? 4 2	
	- 4		? 4 3	
	- 2		+ 2	
	- 5		+ 3	
	? 4 5		? 1 4	
	? 2 3		- 1	
	+ 1		? 1 2	
	+ 3		? 1 3	
	? 2 5			
	? 3 4			
	+ 2			
	+ 4			
	? 3 4			

The left example starts with N queries of the form “- u”, so the test corresponds to the conditions of subtask 3.

Example.	Input	Output	Input	Output
	7 17 9	13	7 16 13	36
	2 3 29	13	6 5 14	12
	6 4 4	6	3 2 9	56
	7 4 29	12	1 6 36	35
	5 7 7	5	5 1 39	5
	3 1 26	9	3 5 50	45
	5 1 28	14	2 4 41	
	5 4 23	9	7 1 5	
	7 2 16	14	1 2 27	
	2 6 11		1 4 15	
	6 7 1		2 6 12	
	3 5 16		4 5 6	
	3 4 14		7 3 39	
	3 6 13		2 5 24	
	6 1 1		4 7 50	
	6 5 17		6 7 31	
	2 4 6		7 2 4	
	1 2 4		- 2	
	? 5 2		- 5	
	? 6 3		? 1 6	
	? 7 2		+ 5	
	? 4 5		? 6 2	
	? 4 1		? 3 4	
	? 1 5		? 1 6	
	? 1 3		? 7 1	
	? 5 1		- 1	
	? 3 1		- 6	
			- 4	
			+ 6	
			? 5 7	