Competitive Programming SS24

Submit until end of contest

Problem: chase (4.0 second timelimit)

Note: This is a problem that is harder to solve than usual. Solve the other problems first before spending too much time on this one.

You're being chased through the multiverse by *Emrakul, The Aeons Torn*. You need to plan a route through the planes that contains at least k planeswalks and then make a getaway attempt on exactly one of them.

Your chances are best when the planeswalk you make your attempt on is as long as possible. But *Emrakul* knows this and can use her time-altering powers to prevent such an attempt on half (rounded down) of your chosen planeswalks. She will of course use this power on the longest ones.

You therefore want to know the maximum size of the longest remaining planeswalk assuming you can choose your starting plane and plan your route optimally.

Formally, the multiverse can be represented as weighted, directed graph with n vertices (the planes) and m edges (possible planeswalks between the planes) where the edge weights represent the length of the planeswalks. A route through the planes is a sequence of edges $e_1, e_2, \ldots, e_s$ such that there are vertices $v_1, v_2, \ldots, v_{s+1}$ and the edge e_j is directed from v_j to v_{j+1} for all $1 \leq j \leq s$. Note that vertices and edges can be used multiple times.

Input   The first line of the input contains three integers n, m, k ($1 \leq n \leq 5 \cdot 10^4$, $1 \leq m \leq 10^5$, $1 \leq k \leq 30$), the numbers mentioned in the problem statement.

Then m lines follow. Each contains three integers u_i, v_i, w_i ($1 \leq u_i, v_i \leq n$, $1 \leq w_i \leq 10^6$), describing an edge from u_i to v_i with weight w_i.

Note that there may be self-loops but no multiple edges.

Output   If you can't plan a route that contains at least k edges, print -1. Otherwise print one number, the highest possible length of an edge in a route of length at least k that remains after *Emrakul* has deleted half (rounded down) of the edges in your route.

Sample input

```
7 7 4
2 1 3
7 2 5
1 7 4
7 5 6
6 4 9
5 2 3
2 3 9
```

Sample output

```
5
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