

Museum – Analysis

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Subtask 1

The additional constraint that the optimal paths do not repeat vertices in the graph and the lower upper bound for N allows us to enumerate all paths and store only the K -th shortest ones.

Subtask 2

Because $K = 1$ in this subtask, the problem reduces to the classic single source shortest path problem, which can be solved with Dijkstra's algorithm.

Subtask 3

We should observe that in any one of the K optimal paths, no vertex will be used more than K times – otherwise we can definitely shorten the path by skipping all edges between two visits of this vertex. Thus if we allow all vertices to be used up to K times (instead of at most once) in Dijkstra's algorithm, we will reach vertex N exactly K times in the K shortest paths.