

Contest Duration: 2025-06-14(Sat) 08:00 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250614T2100&p1=248>) - 2025-06-14(Sat) 09:40 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250614T2240&p1=248>) (local time) (100 minutes)

[Back to Home \(/home\)](/home)
[🏠 Top \(/contests/abc410\)](/contests/abc410)
[☰ Tasks \(/contests/abc410/tasks\)](/contests/abc410/tasks)
[❓ Clarifications \(/contests/abc410/clarifications\)](/contests/abc410/clarifications)
[🚀 Submit \(/contests/abc410/submit\)](/contests/abc410/submit)
[☰ Results ▾](/contests/abc410/standings)
[⏴ Standings \(/contests/abc410/standings\)](/contests/abc410/standings)
[⏴ Virtual Standings \(/contests/abc410/standings/virtual\)](/contests/abc410/standings/virtual)
[🔧 Custom Test \(/contests/abc410/custom_test\)](/contests/abc410/custom_test)
[📖 Editorial \(/contests/abc410/editorial\)](/contests/abc410/editorial)
[💬 Discuss \(https://codeforces.com/blog/entry/143737\)](https://codeforces.com/blog/entry/143737)


Official

D - XOR Shortest Walk

(/contests/abc410/tasks/abc410_d) Editorial by en_translator (/users/en_translator)

This problem can be solved with a technique informally called vertex multiplexing.

Let G be the given graph. Consider the following graph G' :

- G' is a graph with 1024 vertices $(1, 0), (1, 1), \dots, (1, 1023), (2, 0), (2, 1), \dots, (N, 1023)$.
- G' has a directed edge from vertex (x, s) to vertex $(y, s \text{ XOR } w)$ if and only if G has an edge from vertex x to vertex y with weight w .

A vertex (x, s) is reachable from vertex $(1, 0)$ in G' if and only if there is a walk from vertex 1 to vertex x of weight s in G .

Hence, it is sufficient to check if each of vertices $(N, 0), (N, 1), \dots, (N, 1023)$ is reachable from vertex $(1, 0)$. Since the graph G' has $1024N$ vertices and $1024M$ edges, the problem can be solved in $O((N + M) \max W_i)$ time by actually constructing the graph and performing BFS (Breadth-First Search) or DFS (Depth-First Search) on it.

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2025-06-16 (Mon)
23:44:21 -04:00

[Rule \(/contests/abc410/rules\)](/contests/abc410/rules) [Glossary \(/contests/abc410/glossary\)](/contests/abc410/glossary)

[Terms of service \(/tos\)](/tos) [Privacy Policy \(/privacy\)](/privacy) [Information Protection Policy \(/personal\)](/personal) [Company \(/company\)](/company)

[FAQ \(/faq\)](/faq) [Contact \(/contact\)](/contact)

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