



HackVerse

09-08-2025

Agenda

Time	Events
8.30 am	Problem Statement description
8.45 am	Lab Allocation
9 am onwards	Start of the Hackathon
	Seniors will check-in with you hourly and guide
12.00 pm – 1.00 pm	Lunch
2.00 pm	Hackathon Final submission
2.30 pm	Ideation Discussion
2.40 pm	Evaluation

Problem Statement

The Aryabhata Cipher

Forget the dusty history books. The legend of **Svarnagri**, a mythical smart city powered by advanced Vedic science is trending everywhere! It's said that this ancient city possessed such brilliant technologies that they could solve modern problems effortlessly. But when danger approached, the city's greatest minds encrypted the city behind a multi-layered security protocol: **The Aryabhata Cipher**.

A group of bright coders (that's you!) just stumbled upon a **glitched ancient manuscript**, the first fragment of this lost technology. To unlock Svarnagri's secrets and bring its power back into our world, you must crack every stage of the cipher, one challenge at a time.

Theme: Hacking Ancient India's Lost Secrets

The Sentinel Script (Warm-up Challenge)

Before entering Svarnagri, you encounter a sentient security script guarding the gates. This guardian isn't malicious, it's just very picky. It demands proof of basic intelligence before granting access to the next level.

You're presented with a list of ancient numeric runes and a maximum energy capacity. The guardian allows you to pick runes, but you may only pick alternate runes (every other element), and the total energy must not exceed the limit.

Each time you attempt a path from any runes, the guardian notes the sum of the valid runes collected. You're allowed to try this a few times, but the maximum score you manage to collect in any single attempt will determine whether you're worthy.

This is your first test, don't mess it up!

Milestone 0

Milestone 1

Milestone 2

Milestone 3

Milestone 4

Input Format

An integer n — maximum energy capacity ($1 \leq n \leq 10^9$)

A space-separated list of integers - runes ($0 \leq \text{each element} \leq 10^6$)

Output Format

A single integer — the maximum valid sum obtained from alternate selections.

Test Case 1

Input: 10

1 2 13 4

Output: 6

Explanation:

Attempt 1 : $1 + 13 = 14 \rightarrow$ too high, so sum = 1

Attempt 2 : $2 + 4 = 6$

Attempt 3: 13 \rightarrow too high

Attempt 4: 4

Max = 6

Test Case 2

Input: 5

10 20 30 40

Output: 0

Explanation:

No valid selection can be made — all values exceed the limit.

The Maayavi Vana (The Enchanted Forest)

After proving your worth to the Sentinel Script at the gates of Svarnagri, you and your squad of code-wizards step into the mythical realm, clutching the glitched ancient manuscript. Your first clue points to the Maayavi Vana, an enchanted forest that acts as Svarnagri's living firewall. This isn't your average woodland, its paths shift like a labyrinth, trees block your way like unyielding sentinels, and only the sharpest minds can navigate its secrets. Your goal is to find a path from the forest's entry point, marked 'S', to a hidden shrine marked 'E', where the first key to the Aryabhata Cipher awaits. The forest is a grid of mystery: 'T' represents impassable trees, 'P' mark valid paths you can tread, but one wrong move could trap you forever. You can step up, down, left, or right, but never beyond the forest's boundaries. Your mission is clear, determine if a path to the shrine exists. It doesn't need to be the shortest but just a way through. Success returns a triumphant "True"; failure, a grim "False". Will you conquer the forest's defenses, or be lost in its enchanted maze?

Input Format

Two integers n and m ($1 \leq n, m \leq 1000$)

Next n lines: Each contains m characters (either 'S', 'E', 'T' or 'P'), representing the grid.

Output Format

A single boolean: True if a path from 'S' to 'E' exists, False otherwise.

Test Case 1

Input: 2 2

S P

P E

Output: True

Explanation:

A valid path exists from S to E.

Test Case 2

Input: 3 3

S P T

T T T

P P E

Output: False

Explanation:

The second row (1,0), (1,1), (1,2) is entirely 'T' (trees), that blocks all paths from 'S' to 'E'.

The Astral Cartographer's Map—Trace the Path

You have bravely fought and escaped the Maayavi Vana, crossing which, the manuscript glows brighter and reveals another puzzle. You're teleported to an ancient **observatory of the Astral Cartographers**, who once mapped every inch of Svarnagri using starlight.

Now it's your turn.

Instead of just finding **how far** things are, you must **trace the exact route** between points of interest. The grid looks the same as before—but this time, the focus is on **precision** and **clarity**. You must map the full journey from the start to the shrine.

This sacred map will be needed later to align the Yantras of the city. If you fail to trace it correctly, you may never align the city's celestial pathways.

Input Format

Two integers n and m ($1 \leq n, m \leq 1000$)

Next n lines: Each contains m characters (either 'S', 'E', 'T' or 'P'), representing the grid.

Output Format

Nested List - List of all the coordinates from S to reach E.

Test Case 1

Input: 2 2

S P

P E

Output: `[[0, 0], [0, 1], [1, 1]]`

Explanation:

A valid path exists: $(0,0) \rightarrow (0,1) \rightarrow (1,1)$,
moving right then down through 'P' cells.

Test Case 2

Input: 3 3

S P T

T T T

P P E

Output: `[]`

Explanation:

The second row $(1,0), (1,1), (1,2)$ is entirely 'T' (trees), that blocks all paths from 'S' to 'E'.

Rebooting the Yantra City

The shield guarding Svarnagri's core has fallen, and the fabled city begins to materialize from the mists of legend. But victory is bittersweet—Svarnagri is wounded, its gleaming islands floating in a cosmic void, disconnected and dormant. These islands, once humming with the power of ancient Yantras (mystical machines), now drift silently, their energy cores flickering faintly. Your mission is to restore the city by forging teleportation links between the islands, reactivating the Yantras with minimal energy expenditure. Each link comes at a cost, drawn from the city's finite cosmic reserves. Choose wisely, code-wizards, for only the most efficient network will unify Svarnagri and unlock its lost secrets, bringing its ancient technology back to life to reshape our world.

Task: Find the minimum total energy cost to connect all islands

Input Format

Two integers n (no. of nodes) and m (no. of edges) ($1 \leq n, m \leq 1000$)

Next m lines: u, v, w (edge between nodes u and v with weight w).

Output Format:

A single integer representing the minimum total energy cost.

Test Case 1

Input: 3 3
1 2 1
2 3 2
1 3 3

Output: 3

Explanation:

Nodes: 1, 2, 3. Edges: (1-2, $w=1$), (2-3, $w=2$), (1-3, $w=3$). MST edges: (1-2, $w=1$), (2-3, $w=2$). Total weight = $1 + 2 = 3$.

Test Case 2

Input: 3 1
1 2 5

Output: -1

Explanation:

Nodes: 1, 2, 3. Only one edge (1-2, $w=5$). Node 3 is isolated, so no MST exists.

Decoding the Nakshatras

With the sacred map from the Observatory of the Astral Cartographers in hand, your squad of code-wizards ventures deeper into Svarnagri's mysteries. The manuscript, now pulsating with otherworldly energy, leads you to the Chamber of Celestial Alignments, a vast hall where ancient Yantras once synchronized the cosmos. As noted in the Milestone 2, your precise forest grid mapping proves invaluable, but the challenge intensifies. The chamber's walls are etched with a network of nodes and pathways, representing celestial connections between Svarnagri's floating islands, demanding optimization of your journey through this complex astral web.

The task ahead echoes the Observatory's star chart precision. You must navigate this network, depicted as an adjacency matrix, to find the shortest path between key nodes—possibly a celestial power source and its sink. The guardian script insists that only the most efficient route will unlock the next Aryabhata Cipher layer. With time slipping away, your squad must calculate the shortest path length, or the chamber will seal, trapping Svarnagri's secrets forever.

Input Format

First line contains n (number of nodes). Next n lines contain n space-separated integers (0 or 1) representing the adjacency matrix.

$1 \leq n \leq 12$, $\text{matrix}[i][j]$ is 0 or 1, $\text{matrix}[i][i] = 0$

Output Format

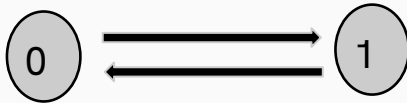
Single integer representing the shortest path length, or -1 if impossible.

Test Case 1

Input: 2

0 1

1 0



Output: 1

Explanation:

A valid path exists: $0 \rightarrow 1, 1 \rightarrow 0$

Both paths have a length of 1 (just one edge between them).

Test Case 2

Input: 4

0 1 0 0

1 0 1 0

0 1 0 1

0 0 1 0

Output: 3

Explanation:

The shortest path that visits all nodes exactly once is $0 \rightarrow 1 \rightarrow 2 \rightarrow 3$, using 3 edges.



Bonus Milestones

The Forest of Illusions

Having unlocked all prior secrets of Svarnagri, you now find yourself inside the **Forest of Illusions**, the final trial that stands between you and the ancient city's core power.

Before them lies a winding path filled with **mystical boxes**, each glowing faintly and containing a certain number of **exit tickets**. These tickets are the key to breaking the illusion and returning to the real world with all the power and knowledge you've earned.

But there's a catch—**Svarnagri's ancient curse** forbids collecting tickets from **two directly adjacent boxes**. The boxes are sensitive; opening two side-by-side will cause both to vanish without leaving any reward.

You must select a combination of boxes to **maximize the total number of tickets**, while following the rule:

- No two selected boxes can be adjacent.
- You can select as **many boxes as you like**, as long as they are not side-by-side.

Only by gathering the maximum possible tickets without triggering the curse, can you truly escape.

Input Format

A single integer n — the number of boxes. ($0 \leq n \leq 10^5$)

A list of n integers, `tickets`, where $0 \leq \text{tickets}[i] \leq 10^4$.

Output Format

A single integer — the **maximum number of tickets** that can be collected under the constraint

Test Case 1

Input: 5
2 7 9 3 1

Output: 12

Explanation:

Best pick: 2 (index 0) + 9 (index 2) + 1 (index 4) = 12
(Alternate option 7 + 3 = 10 is lower.).

Test Case 2

Input: 6
10 1 1 10 1 10

Output: 30

Explanation:

Pick boxes at indexes 0, 3, 5 $\rightarrow 10 + 10 + 10 = 30$. Other combinations are lower.

The Endgame

With your final test passed, you now enter the outlying grid of Svarnagri. This city was protected by an intelligent network, the *Aryabhata Mesh*, a web of knowledge nodes and encrypted pathways. The mesh isn't flat—it subdivides and self-expands based on energy flux. Ancient scholars embedded extra data nodes inside each link, making traversal unpredictable and expensive. You need to hack through this growing graph while conserving energy.

Your mission: Determine how many data nodes (both original and inserted) can be reached from the city's entry node (Node 0), given your limited movement energy.

Problem Statement

- You are given: A list of knowledge pathways edges in the form $[u, v, c]$, meaning the path from node u to node v has been encrypted with c internal data fragments (subnodes).
- A scalar value maxEnergy , representing the maximum amount of traversal energy you can expend.
- An integer n , the number of original Vedic knowledge nodes in Svarnagri.
- Each edge is dynamically expanded to include c intermediate subnodes:
- For edge $[u, v, c] \rightarrow$ the full expansion becomes: $u - x_1 - x_2 - \dots - x_c - v$ i.e., c subnodes and $c+1$ edges.
- You start at node 0 with maxEnergy . Count all distinct nodes you can reach (including original nodes and subnodes) within the energy limit.

Input Format

- edges: A list of triplets $[u, v, \text{cnt}]$ where $0 \leq u, v < n$ and $0 \leq \text{cnt} \leq 10^4$
- maxEnergy : An integer where $0 \leq \text{maxEnergy} \leq 10^9$
- n : Number of original Vedic nodes (0 to $n-1$)

Output Format

- A single integer: total number of reachable nodes (original + inserted)

Bonus 1

Test Case 1

Input: 3 3

0 1 10

0 2 1

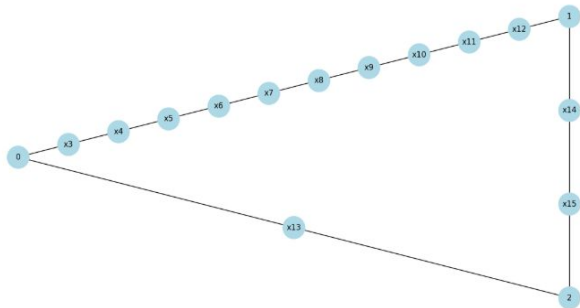
1 2 2

6

3

Output: 13

Subdivided Graph of the Aryabhata Mesh (maxEnergy = 6)



Bonus 2

Explanation:

- With only 6 units of traversal energy, you attempt to navigate the Aryabhata Mesh:
- The path from Node 0 to Node 2 has just one encrypted fragment. You use 2 steps to fully reach Node 2.
- The path to Node 1 is deeply encrypted with 10 sub-fragments—too costly to reach completely. Still, you access some fragments before your energy runs out.
- Instead, you reroute through Node 2 and reach a few fragments on the way to Node 1 via a less protected path.
- In total, you unlock 13 distinct knowledge nodes—some fully, some partially—proving you're ready to dig deeper into Svarnagri's secrets.



Thank you!
