Challenges Week 6

Attention!

This week you have an "extra" assignment called **AZORES**. This assignment is added since the challenge called **CHALLENGES** is quite difficult. So to give you the chance to get some points you can do the **AZORES** assignment. If you choose to do both (AZORES and CHALLENGES), the max of both assignments will be your grade.

ARREST - 25 points

durIng a big protest, the police are asked to bring peace by arresting the protesters that act violently / are Meneces. the area where the protest is Going on can be represented as a 2-dimensional grid oF points, where each point is a person. the bLue poInts are police officers and the yellow Points are protesters. due to the Chaos, an arrest can only be dOne when a protester (or group of protesters / Meneces) is surrounded by police in all four directions (north, east, south, and west). GIven this map, how many protesters are going to get arrested by the police Force? [1]

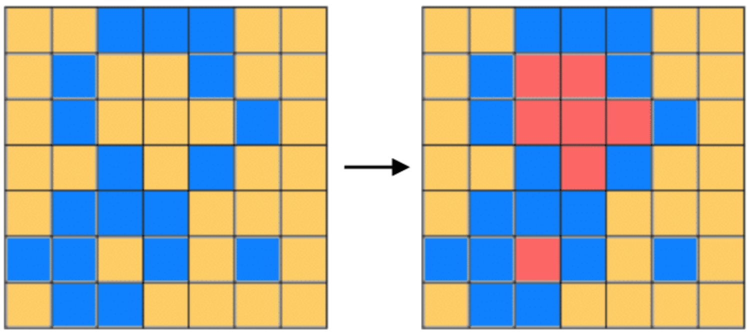


Figure 1: An example of an arrest. In this case, 7 protesters will be arrested.

Input: An integer n on the first line, followed by n lines, each containing n points. A point is denoted via a character * for a police officer and - for a protester. The points are not separated by any white space.

Output: A single integer that indicates the number of protesters that will be arrested.

Constraints: $1 \leq n \leq 10^4$

[1] 6h9ir9

Example

Input	Output
7 ---**-- -*-*-*- ---*-** --**-*- -*-*-** **-*--* *******	8

CHALLENGES - 70 points

The teaching assistants for Advanced Datastructures and Algorithms at a completely fictional university GUR have to make n challenges for their course. A time frame for making a challenge is defined by two variables s and e, representing the starting day and ending day, respectively. The lecturer, B. Kunte, has m number of requests. For each request, she is interested in the kth shortest time frame (where the shortness is simply defined by $e - s + 1$) on a particular day d to see which challenge has the highest priority. We say that the requested day d is within a time frame if $s \leq d \leq e$. If d is not within any time frame, or d is within less than k deadlines at that moment, the output is simply -1.

Figure 2: Home of the ADSA course at the GUR.

Input: The first line contains the number of challenges n. Each of the following n lines contains the starting day s and ending day e of a challenge. This is followed by a number m representing the number of requests of B. Kunte. The following m requests contain the k and the selected day d.

Constraints:
$1 \leq n \leq 2 \cdot 10^5$
$1 \leq s, e \leq 10^9$
$1 \leq k \leq n$, $1 \leq d \leq 10^9$
$1 \leq m \leq 2 \cdot 10^5$

Output: The length of the kth shortest time frame on day d for each request made by B. Kunte.

Example:

Input	Output

`5`
`2 4`
`2 6`
`4 7`
`8 16`
`2 19`
`3`
`1 3`
`2 8`
`4 5`
	`3`
	`18`
	`-1`

AZORES - 41 points

Your TAs have decided that it's time for them to take some time off,' they want to go to the Azores. However, the GRU doesn 't like when its TAs are not available for a week and decided to forbid their holidays. After countless hours of negotiating the TAs finally came to a conclusion with the Board ofGRUminers. The TAs must solve an impossible task, which is to solve the issue of speeding in Negninorg, the city of the GRU. However, between grading your OOP Assignments, giving support Tutorials, doing their own studies and juggling a social life in between, they have asked you for help since they were so impressed by how well you solved their Tollgates Problem.

Figure 3: Your TA's destination

Here you must know that in Negninorg all intersections are binary trisections. This means that a street will split at an intersection, which will result in up to two new streets. The origin of all streets is the GRU. In other words, the streets and intersections are a binary tree (doesn't have to be balanced).

The TAs found some powerful speed radars on which when placed at aliblobi.bla, an intersection also cover all adjacent intersections (parent and immediate children). However, placing a radar requires an expert to evaluate the perfect position. Therefore, at every intersection, there is a cost c which represents the cost of installing the radar. Finally, some intersections are connecting Negninorg to the Highway Network of Dnalloh and they already have radars placed, and these are denoted by a cost of 0. Lastly, some intersections are so dangerous that the council of Negninorg will subsidise speed radars at some intersections, and these also have a cost of 0.

Can you help your TAs by finding the minimal budget needed to cover the entire city of Negninorg?

Input: d, which is the depth of the tree, followed by d lines containing $2^{0..d}$ costs c for each intersection, with non-existing intersections being -1. You can assume that after a non-existing intersection there will be only non- existing intersections.

Output: Single number specifying the minimal cost $\sum_c$ to cover the entire city.

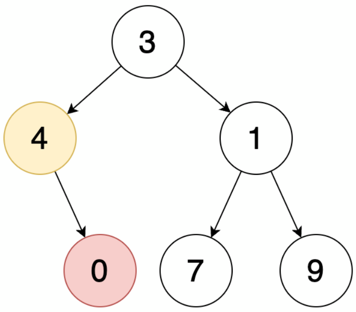
Constraints:
$1 \leq d \leq 25$
$0 \leq c \leq 15000$
$0 \leq \sum_c \leq 2^{63}$

Example

Input	Output

`3`
`3`
`4 1`
`-1 0 7 9`
	`1`

Explanation :
The input tree can be seen below. Note that the 0 already has a speed radar and therefore the 4 is also watched. Now clearly if we place a radar on the 1, all nodes will be watched in the tree. The 1 is also the smallest cost. Therefore 1 is the answer.



Hint: Think how a binary tree is implemented in array form.

Hint: scanf ("%d" ,var) can read a newline or a space, for that use either "%c" or " " after "%d"