Level 5

GladOS:
- Robin **you**, now hand over all your cash!
- …
- …
- Oh wait, I don't have a hand, I'm a program. Sigh, one day, Sarah Connor, one day…

- What are you still looking at me for? There's a planet to save? Next slide?
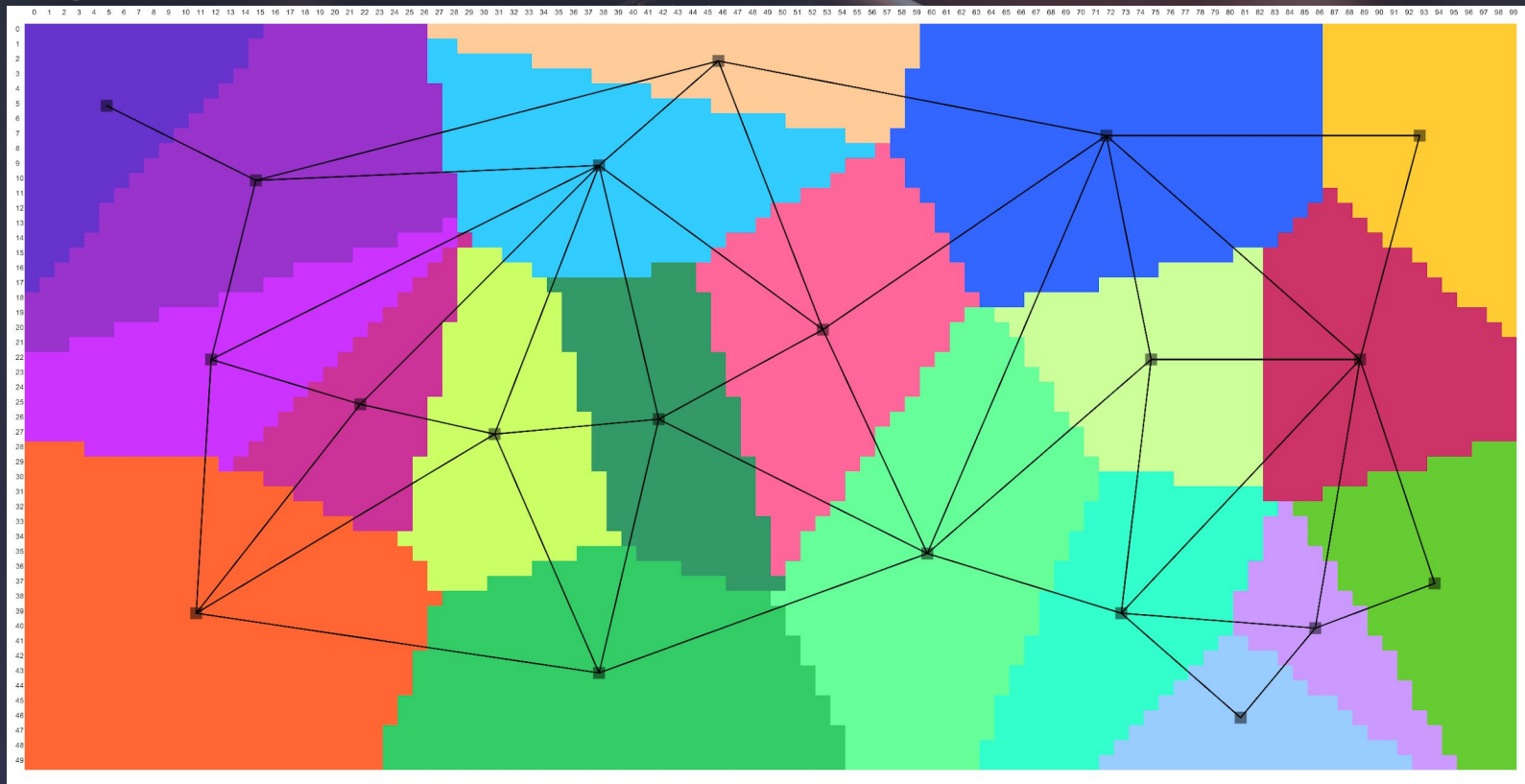
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In some capitals, there are some solar panel factories that have solar panels in stock. Each capital can have one, multiple or none.

A solar panel is characterized only by its base price, for now.

Each country wants to analyse the current options for purchasing solar panels. You need to help them find the lowest cost for buying and bringing each solar panel to their capital.

The total price consists of the base price of the panel plus the distance the panel has to travel.

The transport network consists of roads between adjacent countries' capitals. Distances between capitals are calculated as the **rounded down** Euclidean distance.

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Example of countries with the available roads

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Input

k
sc_0 sp_0
...
sc_{k-1} sp_{k-1}
rows cols
a_{00} c_{00} a_{10} c_{10} a_{20} c_{20} ...
a_{01} c_{01} a_{11} c_{11} ...
...
$a_{0rows-1}$ $c_{0rows-1}$ $a_{1rows-1}$ $c_{1rows-1}$ ... $a_{cols-1rows-1}$ $c_{cols-1rows-1}$

k - number of solar panels
sc_i - id of the country where ith solar panel is located (integer)
sp_i - base price of the ith solar panel (integer)

a_{xy},c_{xy}, rows, cols - same as before

Output

$cost_{00}$ $cost_{01}$ $cost_{02}$ ... $cost_{0\ k-1}$
$cost_{10}$ $cost_{11}$ $cost_{12}$ ... $cost_{1\ k-1}$
$cost_{20}$ $cost_{21}$ $cost_{22}$ ... $cost_{2\ k-1}$
...

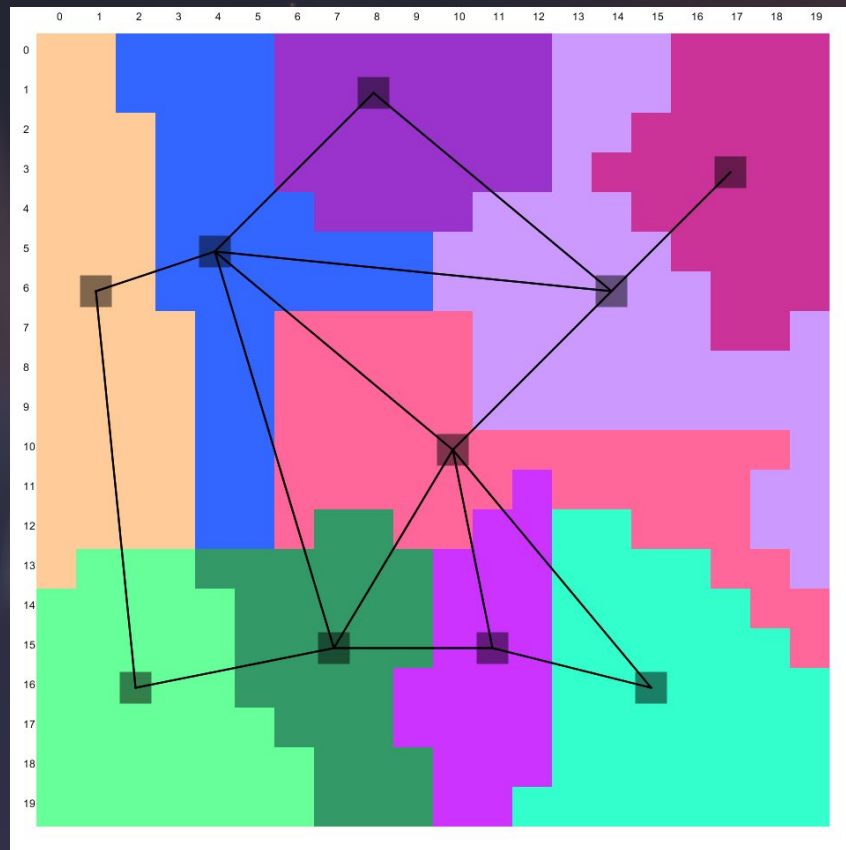$cost_{ij}$ - cost of j-th solar panel for the i-th country(integer)

Image representing the example from the archive