Mining expedition

One of the goals of space conquest is to be able to take advantage of resources to be found on other planets. However, to make sure that you don't waste a planet on which it would be possible to settle, interplanetary mining must follow strict rules: you can only mine on planets following a particular pattern. These planets are called mining planets.

You have to determine how much ore you can accumulate in the next few days by mining planets.

Mining planets The particular pattern that describes the structure of all mining planets follows the following codes:

- The pattern defines the skeleton of the planet, composed of special, non-minable materials called structural components. Each of these materials is represented by a lower case letter.
- The pattern also defines the interior (represented by the "*" character) and exterior (represented by the "-" character) of such planets. In practice, the interior and exterior of a mining planet can contain any ores but never any structural component, and these ores can be different for each planet. The ores inside the planet are the ones you can recover by mining the planet.

On the map of the galaxy given to you, every piece that can match this pattern is a mining planet.

We assure you that the planets are disjointed (their skeleton, their interior, and their exterior are never shared with another planet).

The Mining Expedition A mining expedition is a round trip between your base and any square adjacent to the structure of a mining planet.

Each cell of the galaxy map is represented by a character that determines :

- the number of days needed to enter an area filled with this element from one of the 4 neighbouring squares (*you cannot move diagonally*);
- the value of the ore on the square if it is an ore.

Your mining tools are very advanced: as soon as your ship is on one of the 4 squares adjacent to a structural component of a mining planet, you can instantly recover all the ores inside the planet.

You must then return directly to your base to deposit the collected ores. **You will have to make one round trip per planet you want to mine.

Given the map of the galaxy, the pattern describing the mining planets, and the description of each ore, determine how many euros worth of ores you will be able to accumulate over the next few days.

Data

Input

Line 1: Two separate integers `N1` and `N2`. by a space: the dimensions of the galaxy.

The next N1 lines: On each `i` line, a string `Ci` of size `N2`: the `i`-th line of the galaxy map. The coordinates start at the box (0,0), at the top of the left.

The next line: Two integers `K1` and `K2` separated by a space: the dimensions of a mining planet.

The K1 following lines: On each `i` line, a string `Pi` of size `K2`: the `i`-th line of the pattern describing a mining planet.

The next line: An integer S: the number of structural components.

The next line: The S letters representing the S different structural components, separated by spaces.

The next line: An integer `M`: the number of ores.

The following M lines: On each line `i`, the letter representing the ore `i` and the value in euros of that ore, separated by a space.

The following M+S lines: On each line `i`, a letter representing a structural component or an ore, as well as the number of days needed to enter an area filled with this element from one of the 4 neighbouring boxes. This duration remains valid even after the area has been mined.

The next line: Two integers `x` and `y`, separated by a space: the coordinates of the base (and thus the starting position of the ship).

The next line: An integer `D` : the number of days you have to harvest ores.

Output

An integer: the highest value of minerals you can get in D days, in euros.

Constraints

- `1` <= `N1*N2` <= `105`
- `1` <= `Ki` <= `Ni`

The ores and structural components are represented by different lower case alphabetical characters.

The value of an ore is at most `1000€`.

The number of days to cross a square is at most `104`.

- `0` <= `x` < `N1`
- `0` <= `y` < `N2`
- `1` <= `D` <= `106`

The total number of planets in the galaxy is at most 100.

Examples

Example n°1

For the input:

```
5 18
oohgohhhoohoohooh
ohfhoohghoooohooh
oohoohoohoohoohghoh
ohooohofohghooho
ooohooohoohoohoooho
3 3
-h-
h*h
-h-
1
h
3
o 0
f 9
g 16
o 1
f 5
g 2
h 100
3 4
22
```

The maximum gain is: `16`.

In this example, there are 3 planets that can be mined, at positions (0, 1), (2, 9), and (1, 13). The respective distances for a round trip from the base to these planets are 4, 20, and 34 days. The map of the galaxy with the planets highlighted (in capital letters) :

```
oOHGohhhoohoohooh
oHFHoohghooooOHOoh
oOHOohohoOHOoHFHoh
ohooohofoHFHoOHOho
```

```
ooohooohoOHOooho
```

Given the time limit of 22 days, we can't go after the third planet, and we have to choose only one planet between the first and the second.

Finally, as the values of the ores on these two planets are respectively 9€ and 16€, we will prefer to go and get the second planet for a 16€ gain.

Example #2

For the input:

```
10 10
oooogoldo
goldoooooo
oooooooooo
oooooooooo
ooogoldooo
oooooooooo
ooogoldooo
oooooooooo
oooooooooo
oooooooooo
1 4
g*ld
3
g l d
1
o 1
o 1
g 1
l 1
d 1
0 0
17
```

The maximum gain is: 2.

You can mine a first planet instantly because the base is already adjacent to it.

A second planet can be mined with an 8-day round trip.

Unfortunately, we have time to make the 6-day trip to a third planet, but we don’t have time to make the 6-day return trip.

In total, you can mine 2 planets, each worth 1€.

Example #3

For the input:

```
10 10
etexjxxmet
xvcxvmejjt
xmtxejkcct
tvtvtjkjev
tecmtmmxjt
jtjvjctvjm
jecxcktxee
mckjvjvxxc
xjetctekkv
jktjvvjejc
3 4
-t*-
mtmm
*-*t
3
m t x
5
c 290
e 846
k 691
j 268
v 467
m 3
t 5
x 6
c 3
e 8
k 4
j 8
v 10
6 0
50
```

The map of the galaxy with the planets highlighted (in capital letters) :

```
etexjxxmet
xvcxvmejjt
xmtxejkcct
tvtVTJKjev
tecMTMMxjt
jtjVJCTvjm
jecxcktxee
mckjvjvxxc
xjetctekkv
jktjvvjejc
```

The maximum gain is: `1025`.