The demons had captured the princess (**P**) and imprisoned her in the bottom-right corner of a dungeon. The dungeon consists of M x N rooms laid out in a 2D grid. Our valiant knight (**K**) was initially positioned in the top-left room and must fight his way through the dungeon to rescue the princess.

The knight has an initial health point represented by a positive integer. If at any point his health point drops to 0 or below, he dies immediately.

Some of the rooms are guarded by demons, so the knight loses health (*negative* integers) upon entering these rooms; other rooms are either empty (*0's*) or contain magic orbs that increase the knight's health (*positive* integers).

In order to reach the princess as quickly as possible, the knight decides to move only rightward or downward in each step.

**Write a function to determine the knight's minimum initial health so that he is able to rescue the princess.**

For example, given the dungeon below, the initial health of the knight must be at least **7** if he follows the optimal path RIGHT-> RIGHT -> DOWN -> DOWN.

|  |  |  |
| --- | --- | --- |
| -2 (K) | -3 | 3 |
| -5 | -10 | 1 |
| 10 | 30 | -5 (P) |

**Note:**

* The knight's health has no upper bound.
* Any room can contain threats or power-ups, even the first room the knight enters and the bottom-right room where the princess is imprisoned.