

---

## Solutions

---

### ALARM

Suppose we enter the digits A, B, C and D.

The digits entered will display the desired time if  $(10*A+B) \bmod 24 = \text{desired\_hours}$  and  $(10*C+D) \bmod 60 = \text{desired\_minutes}$ .

Since there are few possible combinations of digits ( $10^4 = 10000$ ), we can consider all combinations and pick the one which requires the least effort.

A more efficient approach considers only combinations of digits which, when entered, display the desired time. More precisely, these are combinations where the entered hours are of the form  $\text{desired\_hours} + 24*k$  and the minutes are of the form  $\text{desired\_minutes} + 24*m$ , where k and m are integers (only several values make sense).

### KASKADE

We first need to find the width, height and title of each window.

We can use the following criterion to determine if a square is the upper left corner of some window: the square contains a '+', there is a '-' to its immediate right and a '|' immediately below. Additionally, the first character to its right different from '-' must be a '|'. The width and height of a window are found by looking for the next '+' below it and to its right.

What remains is to sort the windows by title and arrange them on the screen as described in the problem.

### TUNEL

If there is a way through the tunnel, then the y-coordinate of each horizontal line segment must be less than the y-coordinates of the previous, current and next ceiling segments and greater than the y-coordinates of the previous, current and next floor segments.

To obtain the shortest path, we always choose the y-coordinate which requires the least movement but satisfies the above criterion.

### TOPLISTA

Our goal is to extract as much information as possible from the input. One observation is that, if a song is explicitly declared to be one of the top B songs, then it is also implicitly one of the top B+1, B+2 etc.

If a song is among the top X, we can show that it is surely in position X if and only if we know all songs in the top X-1 (but not necessarily their order).

This is easy to prove: if we know the names of all X-1 songs in front of it, then the song must be in position X.

Conversely, if we do not know all X-1 songs in front of it, then the song can be in at least positions and comply with the input. There is no way to tell which one of the two is right.