Problem G: Game of Falling Blocks

In this problem you have to program a simple AI for the game *Tetris*. The objective is simple: complete at least one row. More specifically, for the purposes of this problem we play Tetris according to the following modified set of rules:

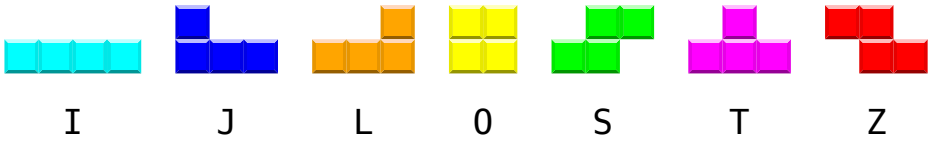

Figure G.1: The seven tetrominoes in their initial orientations.

- The playing area is a grid of height 20 and width 10, initially empty.
- One by one, the game presents the player with a random sequence of tetromino shaped pieces, as seen in Figure G.1. The game uses a bag randomiser for this, that is, the first seven pieces are all distinct, then the next seven pieces are distinct, and so on.
- The player may shift each piece sideways and rotate it by multiples of 90 degrees. These adjustments take place *above* the grid.
- The piece then drops down into the playing area and locks into place as soon as some part of it cannot drop any further because part of some previous piece is in the way. It is *not* possible to shift or rotate the piece during the drop.
- The game ends as soon as one of the following happens:
  - A horizontal row of the grid is fully occupied by tetromino tiles, the player wins.
  - Some piece does not fully drop into the grid, the player loses.

Interaction Protocol

Your submission will be interacting with a special program called the *grader*. This means that the output of your submission is sent to the grader and the output of the grader is sent to the standard input of your submission. This interaction must follow a specific protocol:

The grader repeatedly sends random pieces (see the note below), denoted by one of the uppercase letters $\{\texttt{I}, \texttt{J}, \texttt{L}, \texttt{O}, \texttt{S}, \texttt{T}, \texttt{Z}\}$ as in Figure G.1 above. In reply to each piece, your submission must answer with its desired placement, in the following format:

- Two integers r and x ($0 \leq r \leq 3, 1 \leq x \leq 10$), where r indicates how many times the piece should be rotated in clockwise direction, and x indicates the leftmost column occupied by the piece (columns are indexed from left to right, starting at 1).

The grader will then rotate and position the piece accordingly and drop it in the desired location.

After sending each placement, you should *flush* the standard output to ensure that it is sent to the grader. For example, you can use `fflush(stdout)` in C++, `System.out.flush()` in Java, and `sys.stdout.flush()` in Python.

The game ends as soon as your submission successfully completes a row or sends an invalid placement, whichever happens first (if both happen at the same time, the invalid placement takes precedence). A placement is invalid if some part of the piece would have to be placed outside of the playing area, either to the top or to the side.

If your submission completes a row, the grader will send a single character `W`. Upon receiving this, your submission must terminate with exit code `0` as usual.

Your submission will be accepted if it follows the protocol above and completes a row. If it makes an invalid placement, it will be judged as “Wrong Answer”.

As described above, the sequence of pieces is determined by a bag randomiser. The seed values for this randomiser have been fixed in advance, such that every submission is run on the same piece sequences.

Sample Input 1

```
S

O

T

J

I

W
```

Sample Output 1

```

1 1

2 4

2 2

3 9

0 6

```

In the example interaction above, one possible output of the grader is on the left and one possible correct output of a submission is on the right.
The empty lines on both sides only serve to emphasise the chronological order. The grader will never output any empty lines.

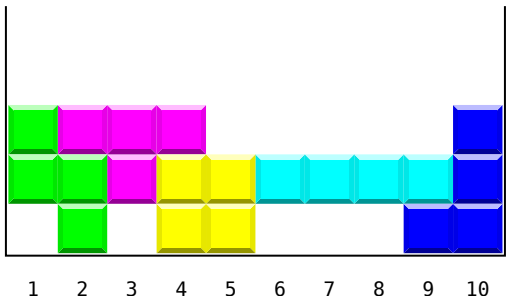

Figure G.2: Illustration of the example interaction.