# 1604 Cubic Eight-Puzzle

Let's play a puzzle using eight cubes placed on a $3 \times 3$ board leaving one empty square.

Faces of cubes are painted with three colors. As a puzzle step, you can roll one of the cubes to the adjacent empty square. Your goal is to make the specified color pattern visible from above by a number of such steps. The rules of this puzzle are as follows.

1. **Coloring of Cubes:** All the cubes are colored in the same way as shown in Figure 3. The opposite faces have the same color.

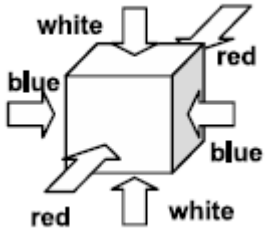



Figure 3: Coloring of a cube

2. **Initial Board State:** Eight cubes are placed on the $3 \times 3$ board leaving one empty square. All the cubes have the same orientation as shown in Figure 4. As shown in the figure, squares on the board are given $x$ and $y$ coordinates, (1, 1), (1, 2), ..., and (3, 3). The position of the initially empty square may vary.

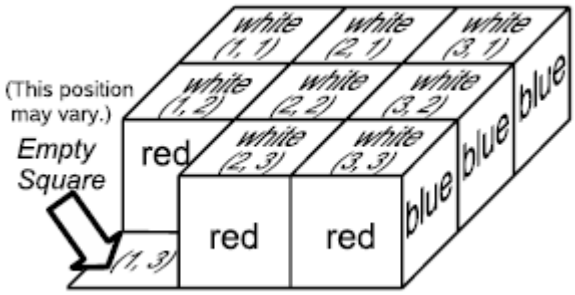



Figure 4: Initial board state

3. **Rolling Cubes:** At each step, we can choose one of the cubes adjacent to the empty square and roll it into the empty square, leaving the original position empty. Figure 5 shows an example.

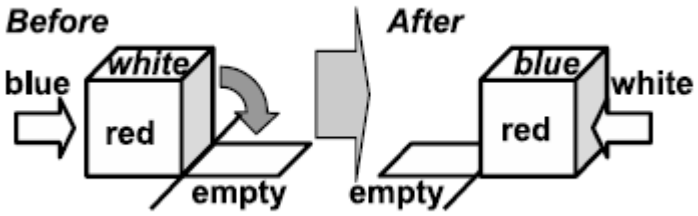



Figure 5: Rolling a cube

4. **Goal:** The goal of this puzzle is to arrange the cubes so that their top faces form the specified color pattern by a number of cube rolling steps described above.

Your task is to write a program that finds the minimum number of steps required to make the specified color pattern from the given initial state.

## Input

The input is a sequence of datasets. The end of the input is indicated by a line containing two zeros separated by a space. The number of datasets is less than 16. Each dataset is formatted as follows.

$$
\begin{array}{lll}
x & y & \\
F_{11} & F_{21} & F_{31} \\
F_{12} & F_{22} & F_{32} \\
F_{13} & F_{23} & F_{33}
\end{array}
$$

The first line contains two integers $x$ and $y$ separated by a space, indicating the position $(x, y)$ of the initially empty square. The values of $x$ and $y$ are 1, 2, or 3.

The following three lines specify the color pattern to make. Each line contains three characters $F_{1j}, F_{2j}$, and $F_{3j}$, separated by a space. Character $F_{ij}$ indicates the top color of the cube, if any, at position $(i, j)$ as follows:

`B`: Blue,

`W`: White,

`R`: Red,

`E`: the square is Empty.

There is exactly one '`E`' character in each dataset.

## Output

For each dataset, output the minimum number of steps to achieve the goal, when the goal can be reached within 30 steps. Otherwise, output '`-1`' for the dataset.

## Sample Input

```
1 2
W W W
E W W
W W W
2 1
R B W
R W W
E W W
3 3
W B W
B R E
R B R
3 3
B W R
B W R
```

```
B E R
2 1
B B B
B R B
B R E
1 1
R R R
W W W
R R E
2 1
R R R
B W B
R R E
3 2
R R R
W E W
R R R
0 0
```

## Sample Output

```
0
3
13
23
29
30
-1
-1
```