# Task 1 Individual Project: PlanarPuzzle

In the solitaire **PlanarPuzzle**, the player must fill every empty square with a color to create a *planar path* consisting of squares of the same color between two **base squares** filled with that color. You can fill an empty square with a color that belongs to one of its four neighboring squares (either up, down, left, or right). If an empty square does not have a filled square as one of its four neighbors, it cannot be filled.

Below is one possible solution to a 2 x 4 initial board with two red base squares and two orange base squares. First fill red square (1) in the lower left corner. You can do this because this square is adjacent to the base red square in the upper left corner. Then fill red square (2) to the immediate right of this square. Next fill an orange square (1) in the lower right corner, which you can do because it is adjacent to the base orange square in the upper right corner.

Chart, waterfall chart

Description automatically generated

Finally, fill the red square (3) which is directly adjacent to three red squares. This is a solution because:

* For the two colors (red and orange) there is a planar path (by moving up, down, left or right) from a base square with that color to the other base square (with same color) that visits each same-colored square once and only once, in ascending order of labeled squares.
* No empty squares remain.

There are some moves that ruin any chance of finding a solution:

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| Filling square 1 with orange makes it impossible to form a planar path from an initial orange square to the other orange square | If you extend Red from the upper left corner with two moves (#1 and #2) then square labeled ??? would be an invalid move because the path between the two red base squares will no longer be planar, in ascending order of labeled squares |
| Table  Description automatically generated |  |

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| Extending from two different base squares. If you first extend the base square in the top-left corner and then you extend the base square in the top-right corner, you will create two squares that are labeled “1”. This is not a planar path, since the numbers on these colored squares do not increase in ascending order. |  |

## Valid Moves

The player can fill a square with a color that is found in one of its neighboring four squares (up, down, left or right) – note that there may be multiple colors that can be used. The numbered label of the newly filled square is one greater than the numbered label of the square from which it originated (or becomes 1 when extending from a base square).

## Chart Description automatically generatedUnused Squares

In some initial configuration, there may be one or more squares filled BLACK. These are **unused squares** that cannot be filled by a color. Note that the board on the right has a valid solution. For any initial configuration, you can assume there is always a solution that fills all empty squares and which contains planar paths for each color.

## Selecting a Square

The player can select or unselect any empty square before requesting to fill that square. Note that **unused** and **base** squares cannot be selected.

## Initial Configurations

There will be three initial configurations that the player must be able to choose from. You can assume that for each configuration, there is a unique solution.

## Use Cases

1. Choose configuration
2. Select a square
3. Extend color
4. Reset **PlanarPuzzle** to initial state
5. Solve **PlanarPuzzle**

## StoryBoards

Mock-up some sample GUIs images to visualize the user experience from the point of view of the player. When a player has completed a valid coloring of all empty squares in the initial configuration, a congratulatory message must appear in some form and the game will become inactive until the player resets **PlanarPuzzle** to its initial state.

# Change Log

1. TBA