

An Interesting Recursion Example

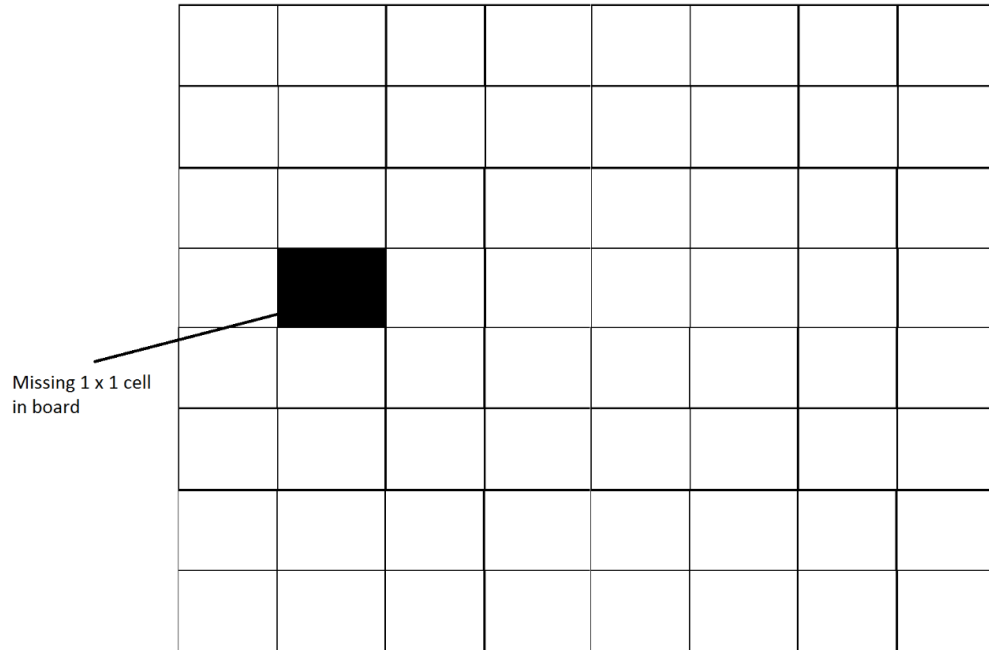
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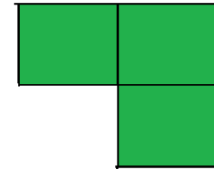
Example: Solving Tiling Problem using Recursion

- ▶ Given a n by n board
 - ▶ where n is of form 2^k where $k \geq 1$
 - ▶ (Basically n is a power of 2 with minimum value as 2).
- ▶ The board has one missing cell (of size 1×1).
- ▶ Fill the board using L shaped tiles.
- ▶ An L shaped tile is a 2×2 square with one cell of size 1×1 missing.

Example: Solving Tiling Problem using Recursion

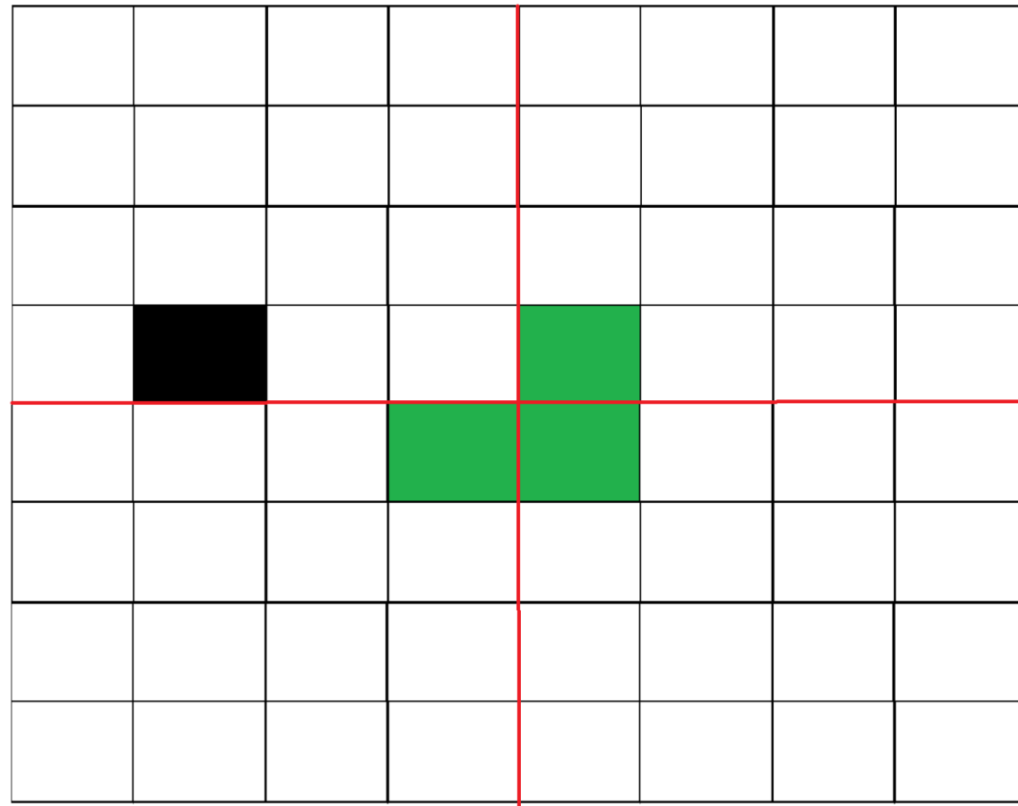


Missing 1 x 1 cell
in board

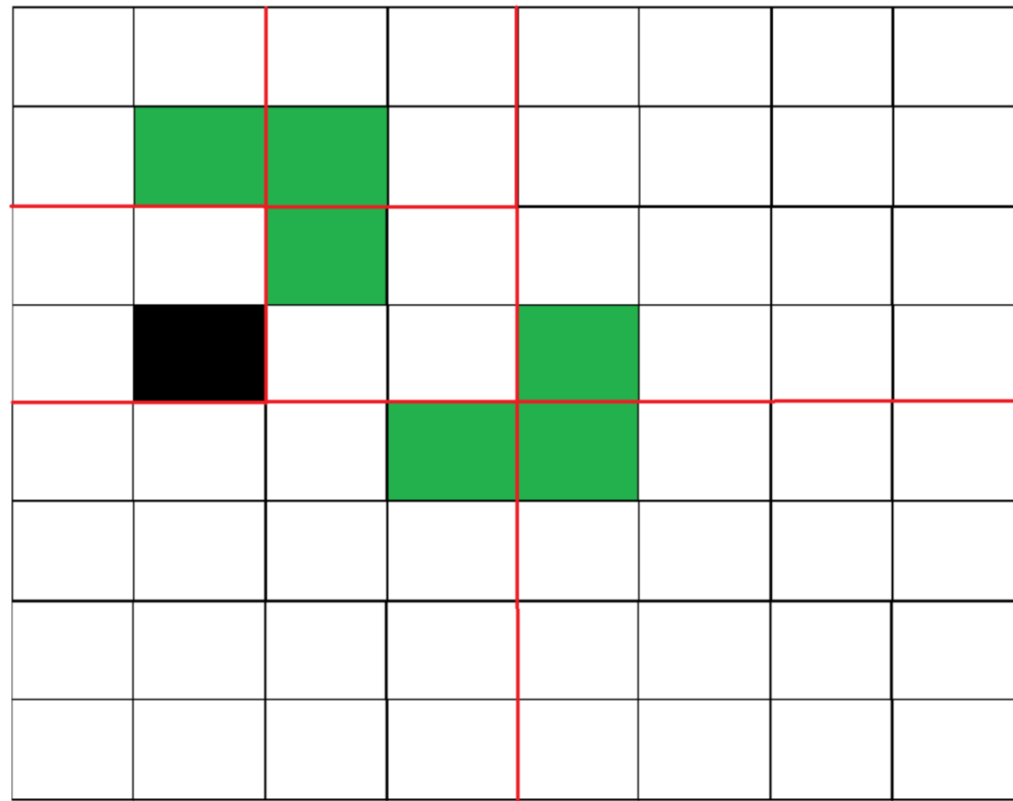


Given L shape tile that is to be used
to fill the board with 1 missing cell

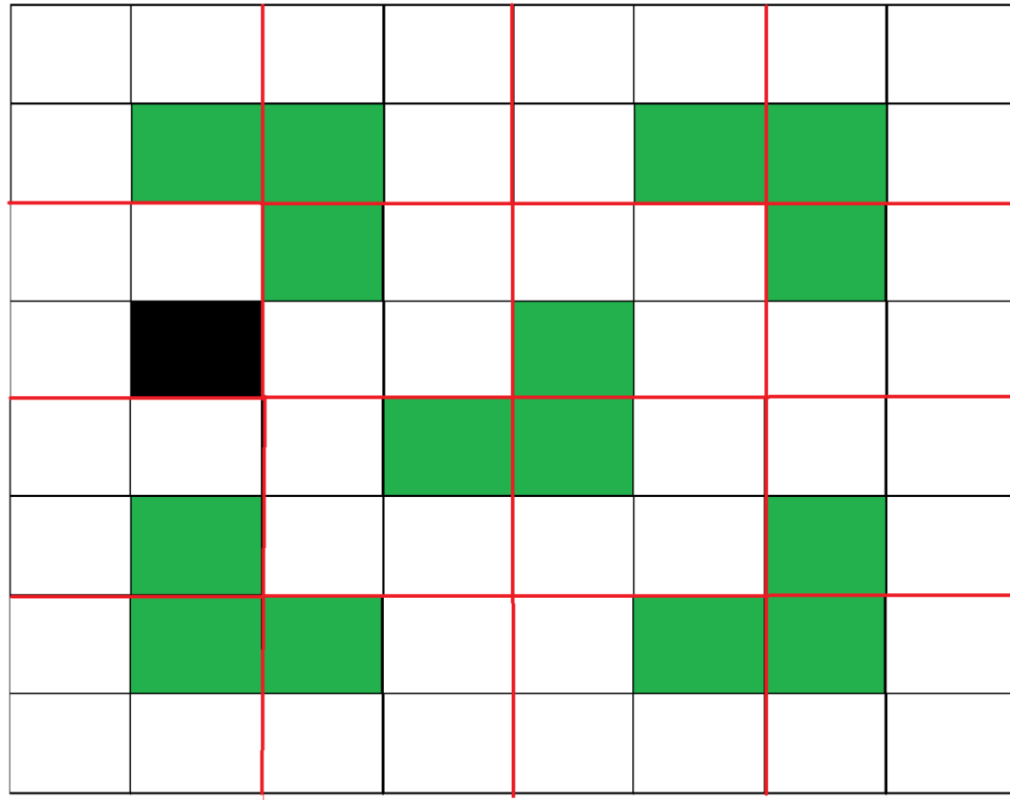
Recursion: Placing the First Tile & Making 4 Subproblems



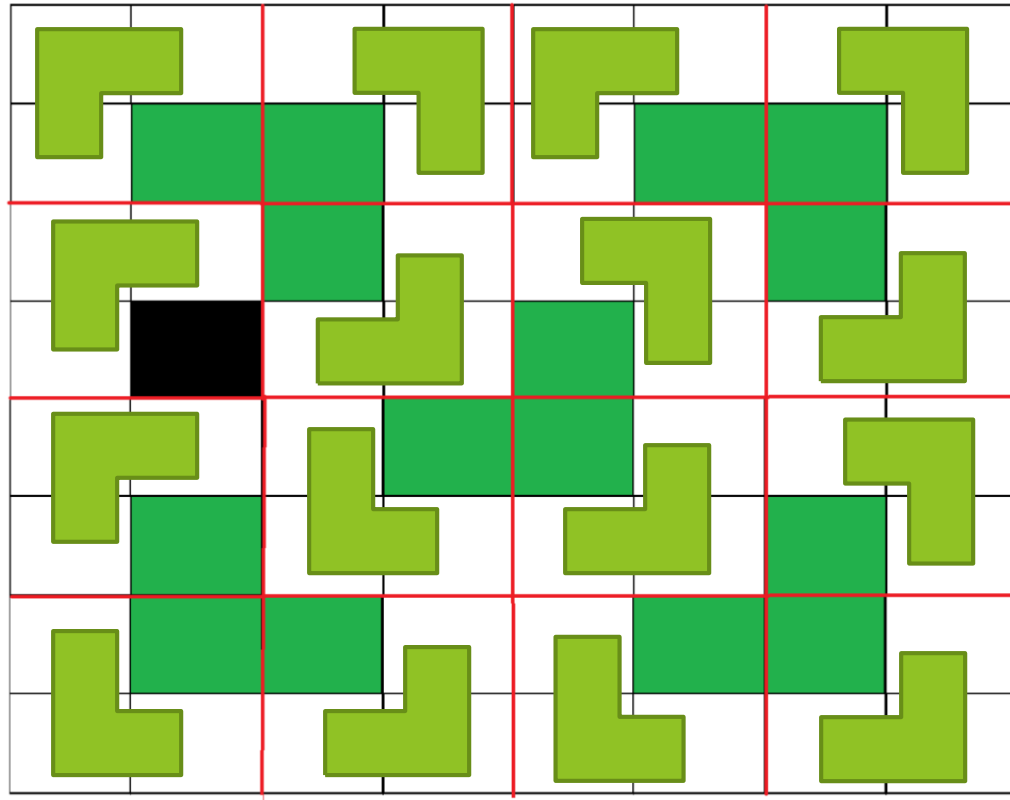
Recurring for the First Subproblem



Recurring for all First-Level Subproblems



Second-Level of Recursion: Filling a 2 x 2 Board



Java Solution

```
public class TileBoard {  
    private int width_log;  
    private int x_coordinate;  
    private int y_coordinate;  
    public TileBoard (int awidth_log, int ax, int ay) {  
        width_log = awidth_log;  
        x_coordinate = ax;  
        y_coordinate = ay;  
    }  
    private void placeTile (int x1, int y1, int x2, int  
        y2, int x3, int y3){  
        System.out.println ("Tile: (" + x1 + ", " + y1 + "),  
            " + "(" + x2 + ", " + y2 + "), " + "(" + x3 + ", " +  
            y3 + ")");  
    }  
}
```


Java Solution (Cont.)

```
public void recursiveTile () {
    int n = pow(2, width_log);
    if (x_coordinate < n/2 && y_coordinate < n/2) {
        placeTile(n/2, n/2-1, n/2, n/2, n/2-1, n/2);
        subBoard1 = new TileBoard (width_log-1,
                                    x_coordinate, y_coordinate);
        subBoard2 = new TileBoard (width_log-1, 0,
                                    n/2-1);
        subBoard3 = new TileBoard (width_log-1, n/2-
                                    1, 0);
        subBoard4 = new TileBoard (width_log-1, 0,
                                    0);
        subBoard1.recursiveTile();
        subBoard2.recursiveTile();
        subBoard3.recursiveTile();
        subBoard4.recursiveTile();
    }
    else if (x_coordinate < n/2 && y_coordinate >=
            n/2) {...
```