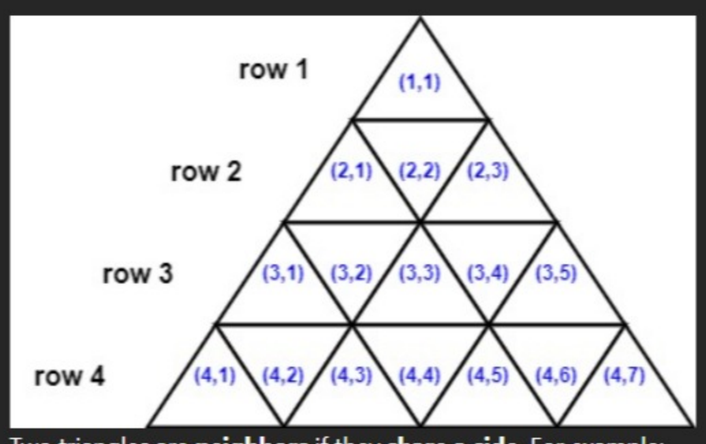
2647. Color the Triangle Red Premium

Hard Topics Hint

You are given an integer `n`. Consider an equilateral triangle of side length `n`, broken up into n^2 unit equilateral triangles. The triangle has `n` **1-indexed** rows where the i^{th} row has `2i - 1` unit equilateral triangles.

The triangles in the i^{th} row are also **1-indexed** with coordinates from `(i, 1)` to `(i, 2i - 1)`. The following image shows a triangle of side length `4` with the indexing of its triangle.



Two triangles are **neighbors** if they **share a side**. For example:

- Triangles `(1,1)` and `(2,2)` are neighbors
- Triangles `(3,2)` and `(3,3)` are neighbors.
- Triangles `(2,2)` and `(3,3)` are not neighbors because they do not share any side.

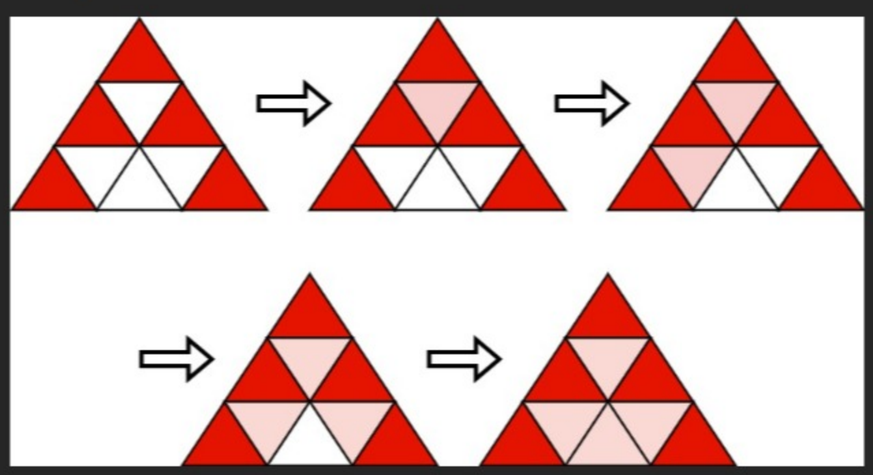
Initially, all the unit triangles are **white**. You want to choose `k` triangles and color them **red**. We will then run the following algorithm:

1. Choose a white triangle that has **at least two** red neighbors.
   - If there is no such triangle, stop the algorithm.
2. Color that triangle **red**.
3. Go to step 1.

Choose the minimum `k` possible and set `k` triangles red before running this algorithm such that after the algorithm stops, all unit triangles are colored red.

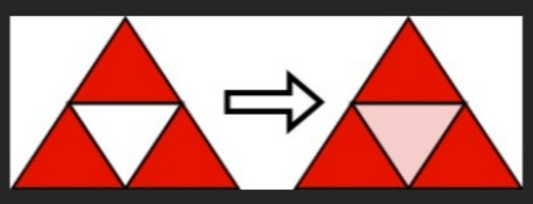
Return *a 2D list of the coordinates of the triangles that you will color red initially*. The answer has to be of the smallest size possible. If there are multiple valid solutions, return any.

Example 1:



```
Input: n = 3
Output: [[1,1],[2,1],[2,3],[3,1],[3,5]]
Explanation: Initially, we choose the shown 5 triangles to be red. Then, we run the algorithm:
- Choose (2,2) that has three red neighbors and color it red.
- Choose (3,2) that has two red neighbors and color it red.
- Choose (3,4) that has three red neighbors and color it red.
- Choose (3,3) that has three red neighbors and color it red.
It can be shown that choosing any 4 triangles and running the algorithm will not make all triangles red.
```

Example 2:



```
Input: n = 2
Output: [[1,1],[2,1],[2,3]]
Explanation: Initially, we choose the shown 3 triangles to be red. Then, we run the algorithm:
- Choose (2,2) that has three red neighbors and color it red.
It can be shown that choosing any 2 triangles and running the algorithm will not make all triangles red.
```

Constraints:

- `1 <= n <= 1000`

Seen this question in a real interview before? 1/5

Yes No

Accepted 337 | Submissions 508 | Acceptance Rate 66.3%

Topics

Array Math

Hint 1

Calculate the minimal value of k by strategically designing a monovariant.

Hint 2

Construct the solution four rows at a time, going bottom up.

Discussion (0)