Color Theorem

The first color theorem proof that appeared was back in 1853 by Kempe. The original idea was a year earlier (1852) by Francis Guthrie, while he was coloring the England map and noticed that four colors sufficed. Since then many mathematicians had proved the theorem. However, most were failed, until 1976, Appel and Haken established their proof. Nevertheless, the proof is not completely satisfactory.

The basic rule for coloring a map or other things are that no two regions that share a boundary can be same color. It is okay for two regions that only meet at a single point to be colored the same color.

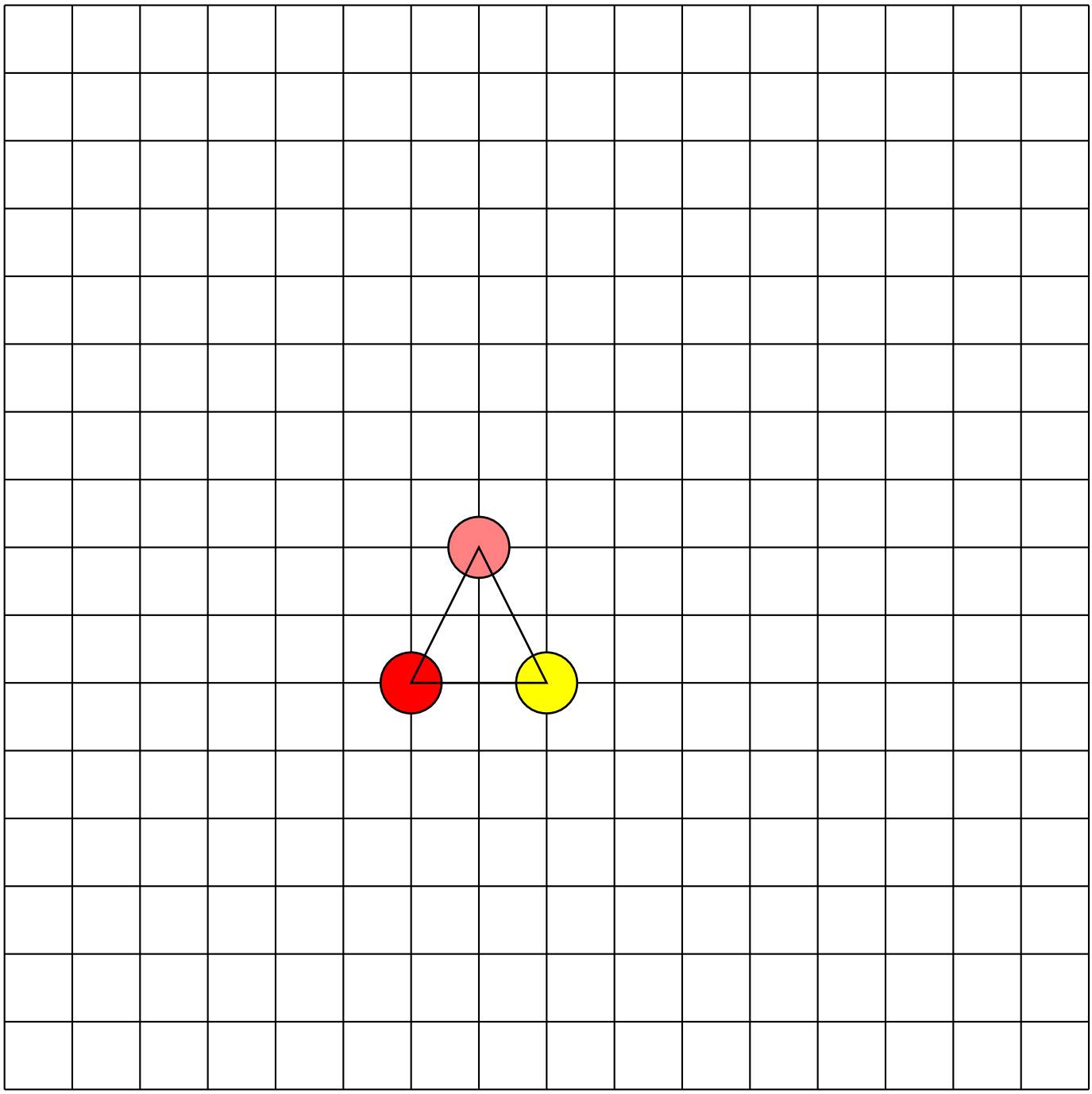
Color Theorem

Now here is the calculation parts for the theorem

First is Five-color theorem:

let V, E, and F denote as the number of edges, faces and vertices of the graph, by Euler's formula for plane (or sphere):

V - E + F = 2



Color Theorem

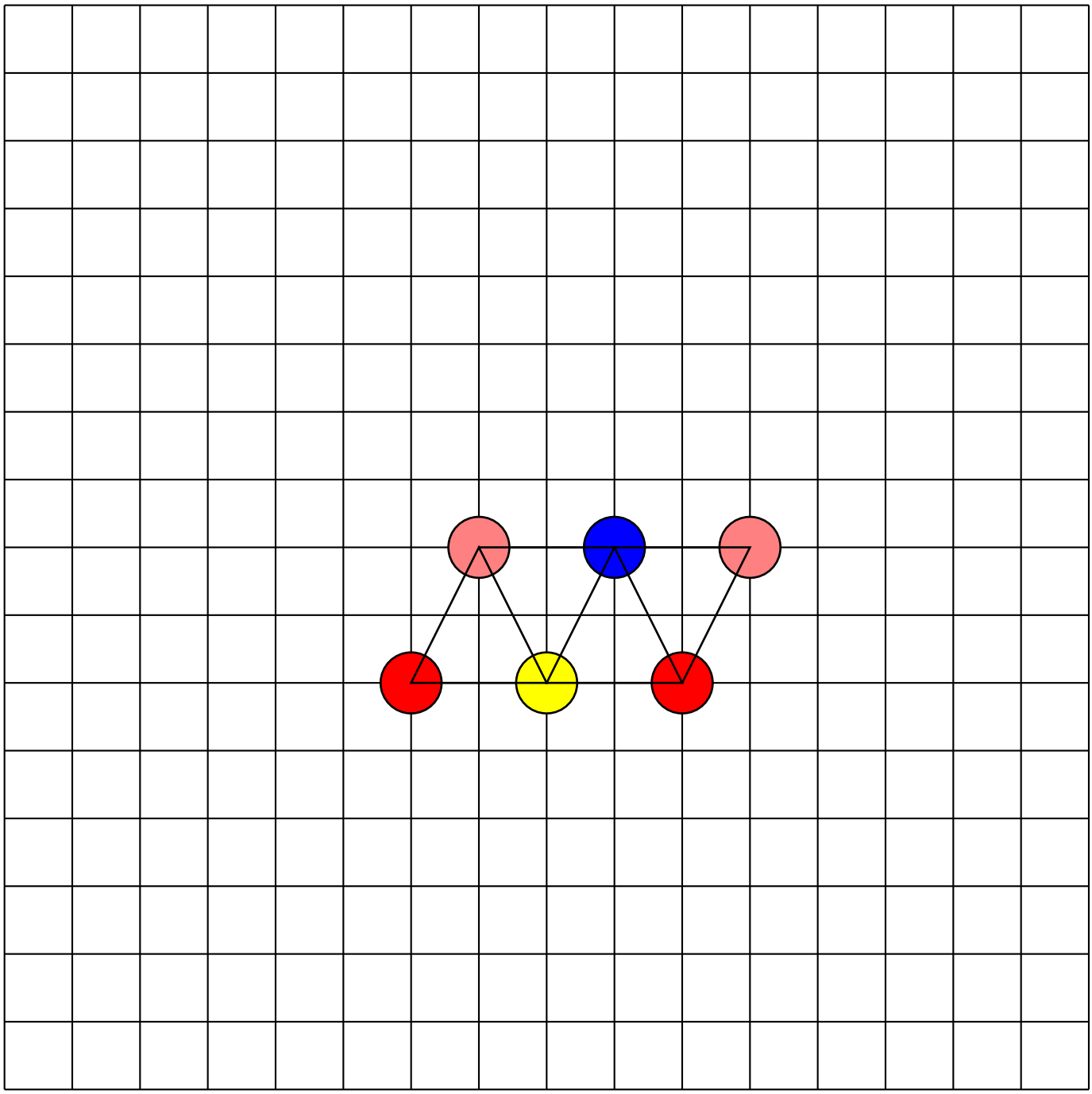
Each face of a complete graph is bounded by three edges,

and each edge is on the boundary of the two faces, therefore

F = 2E/3

and the Eular's formula for a complete planar graph is

E = 3V - 6



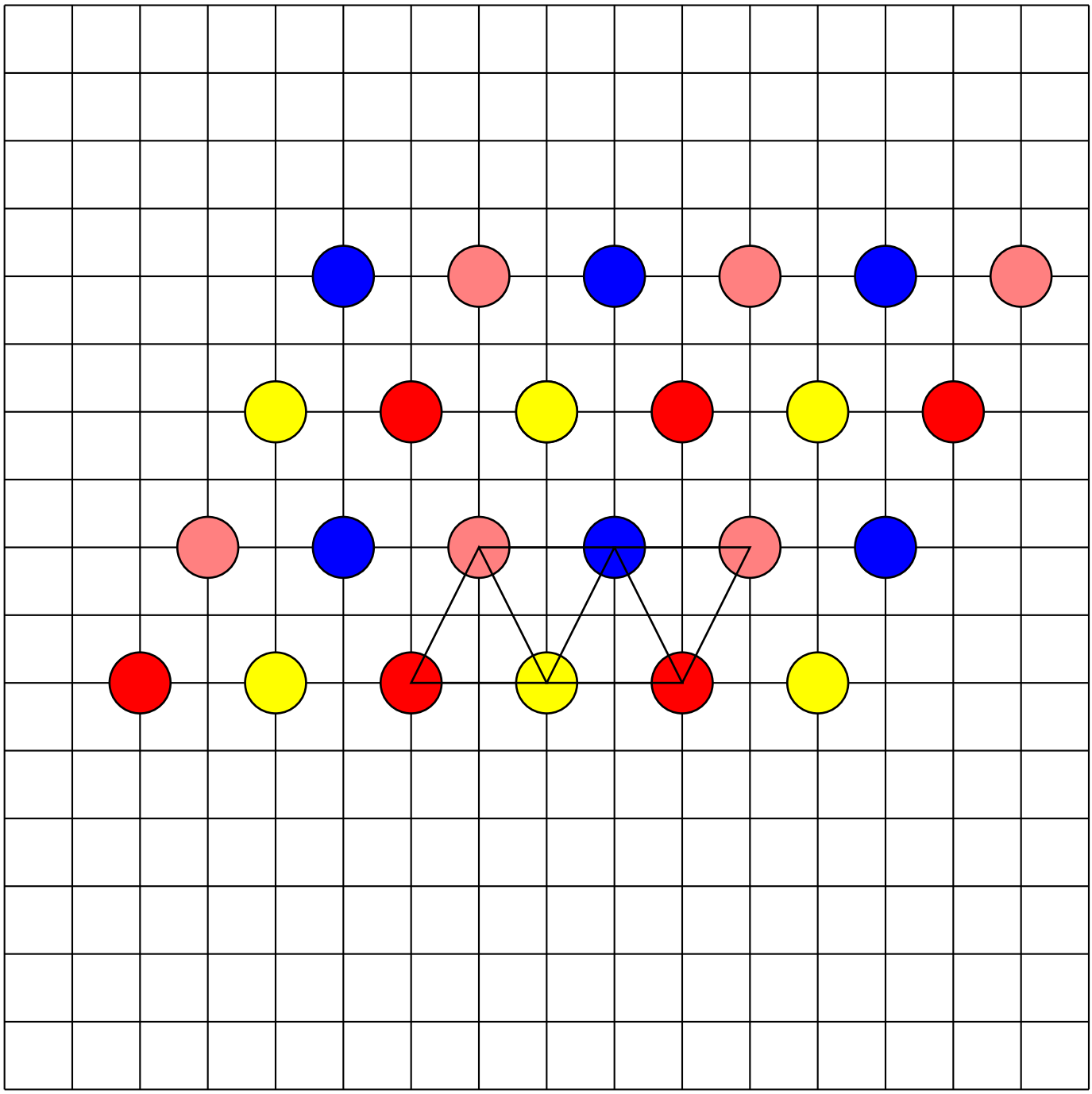
Color Theorem

Now,each edge is connected to two vertices, so the total number of attachments (in a complete graph) is

2E = 6V - 12

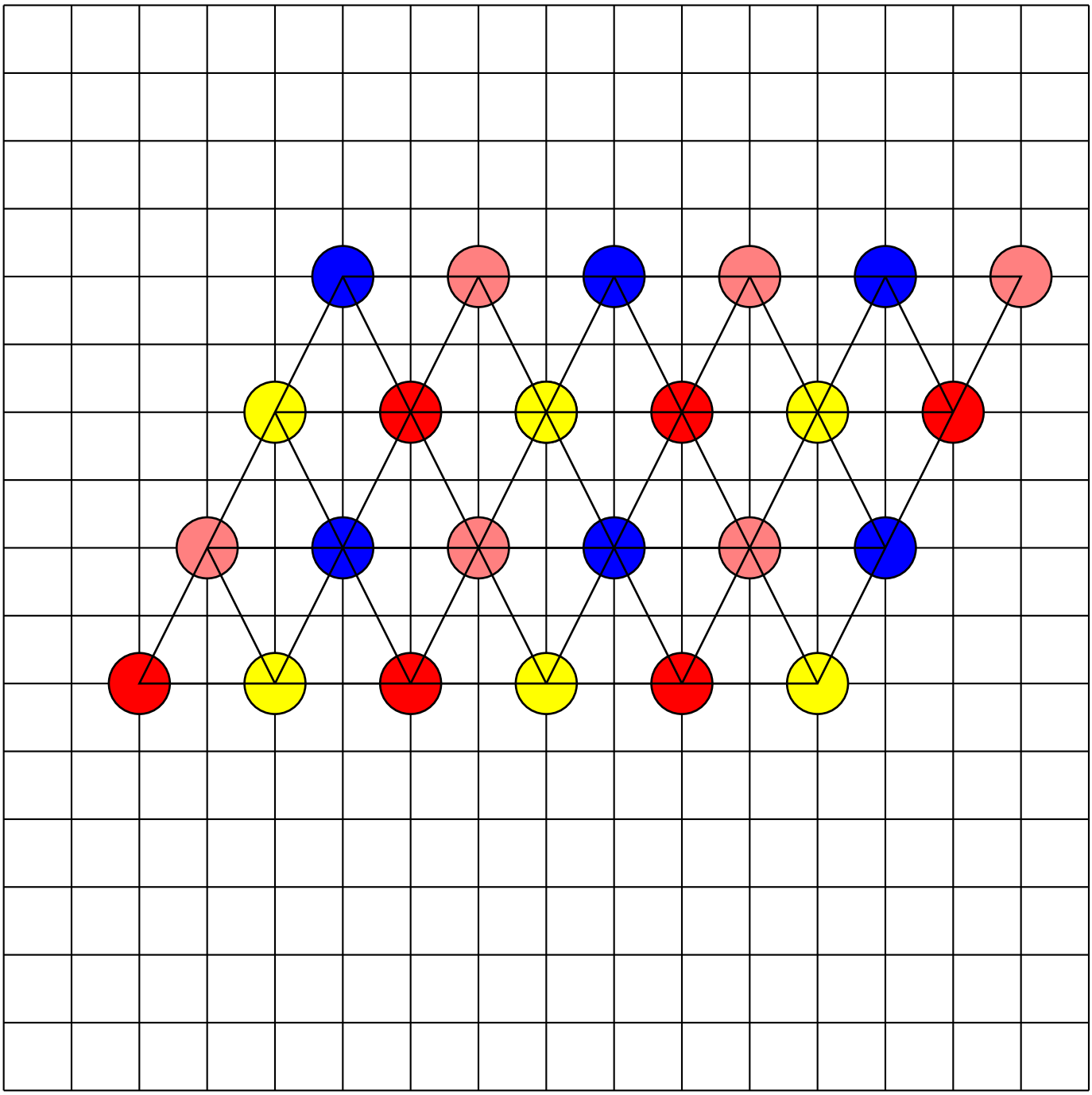
and hence the average number of attachments per vertex is

6 - 12/V



Color Theorem

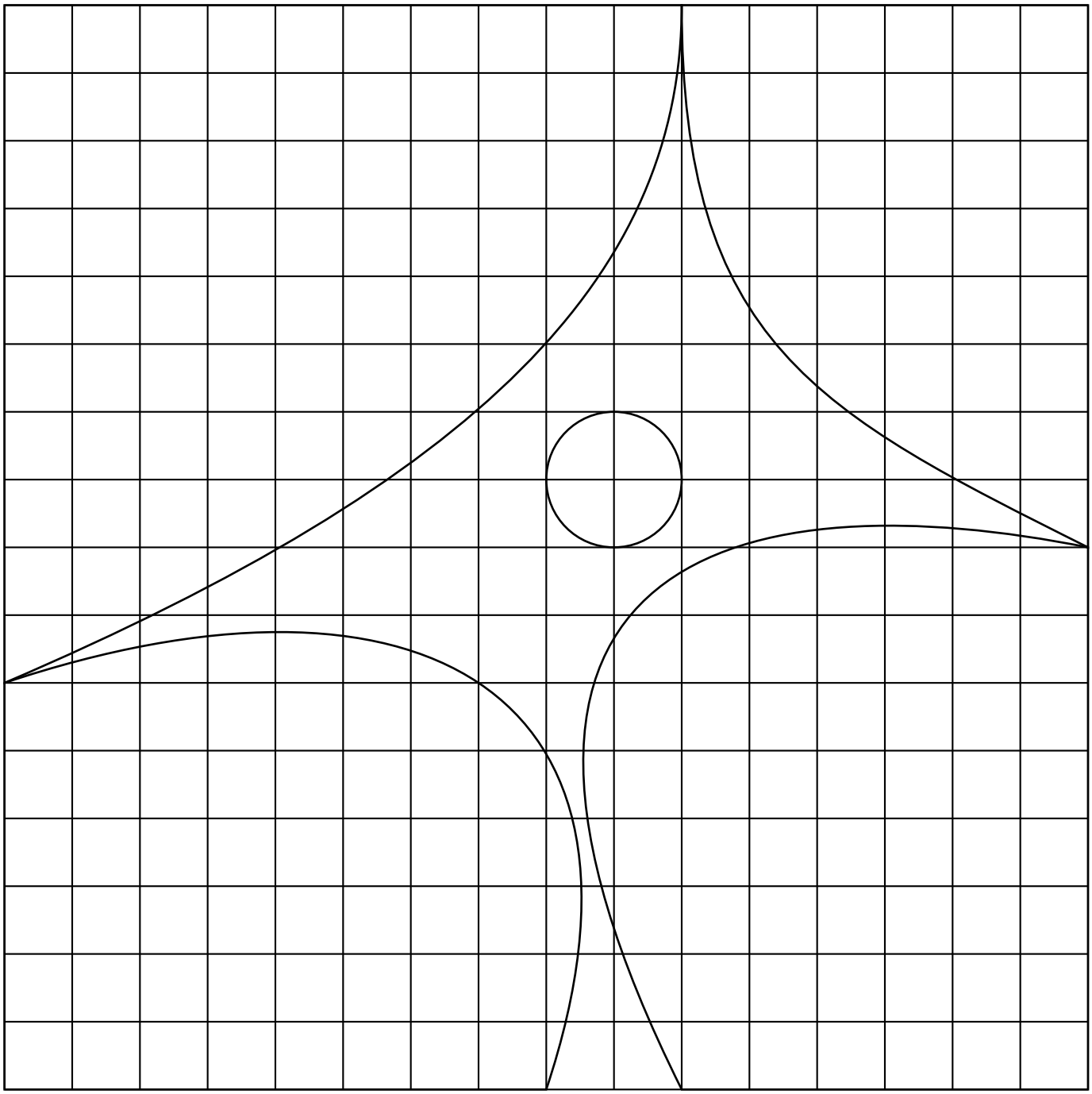
For any incomplete graph, the total number of attachments is less. Consequently the average number of attachments per vertex for any graph is less than 6, which implies that at least one vertex has only five or fewer attachments.



Five-Colour Theorem

Lets indicate the idea of "Five-Color Theorem" coloring.

Now we have draw several lines into the graph and each area refers as one country, then use five colorS to color them.



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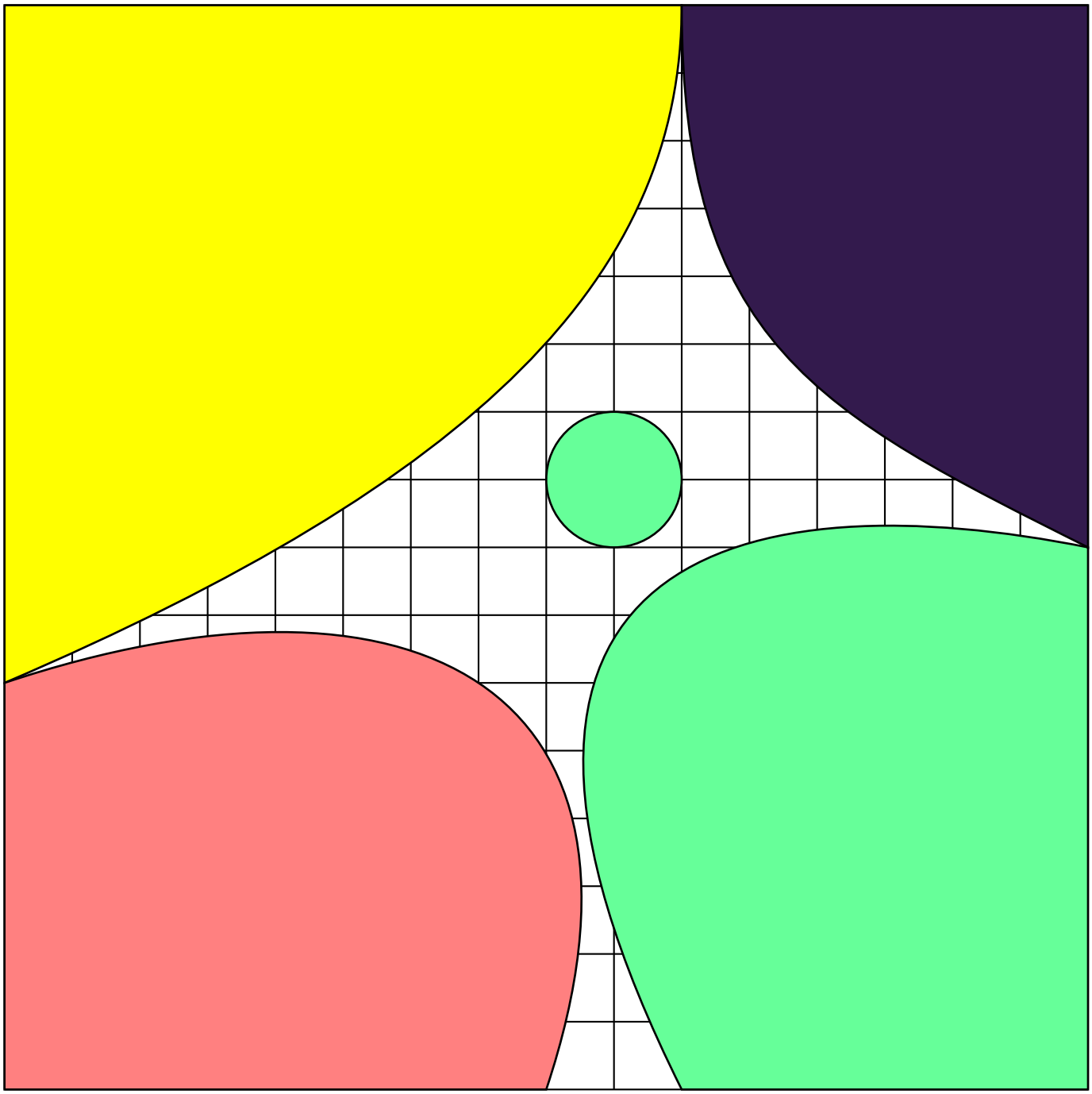
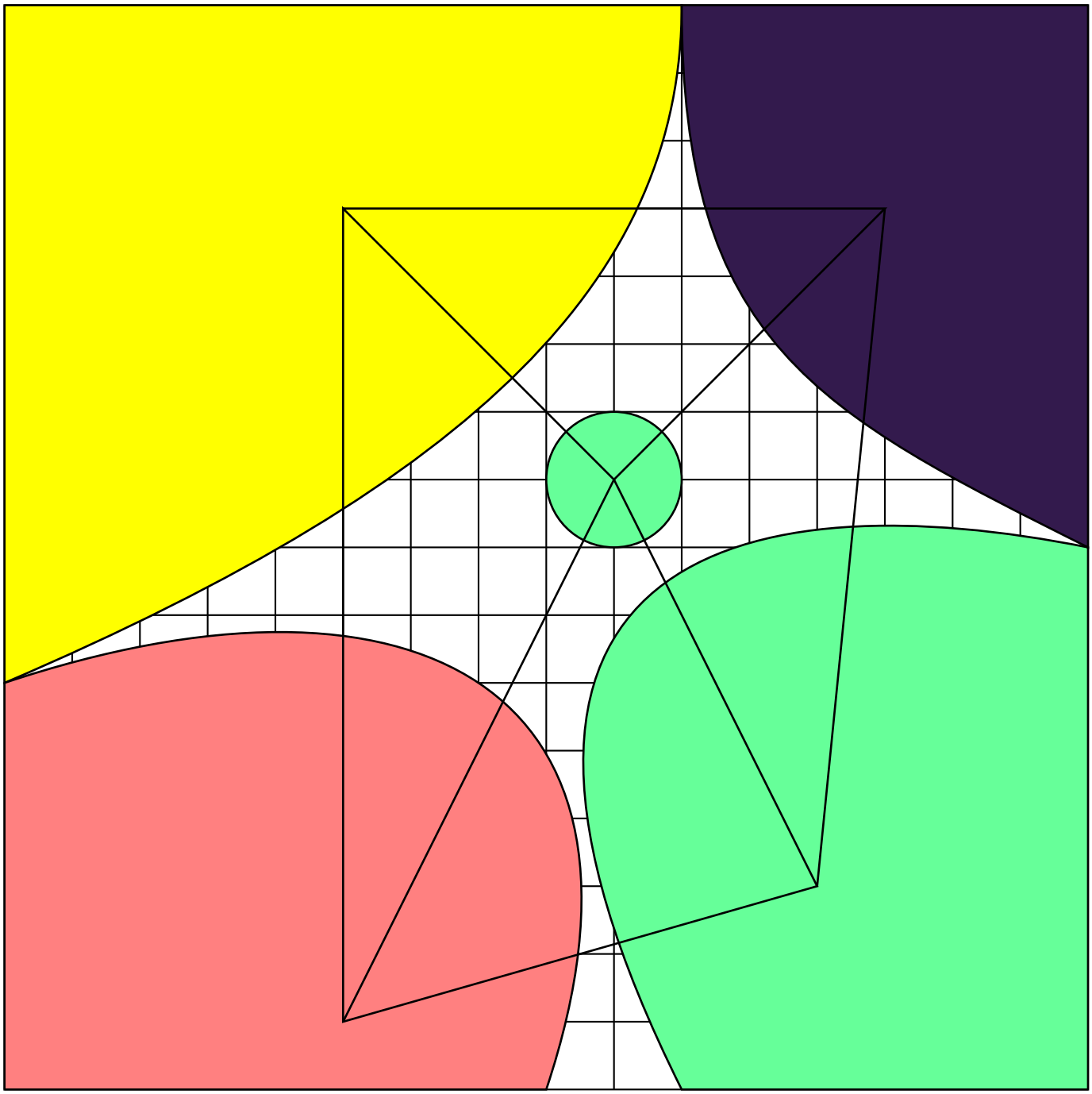


Five-Colour Theorem

as shown, there are five different colors and the white (uncolored) area sperated the two green areas, although they are close to each other, and clearly show all six different regions



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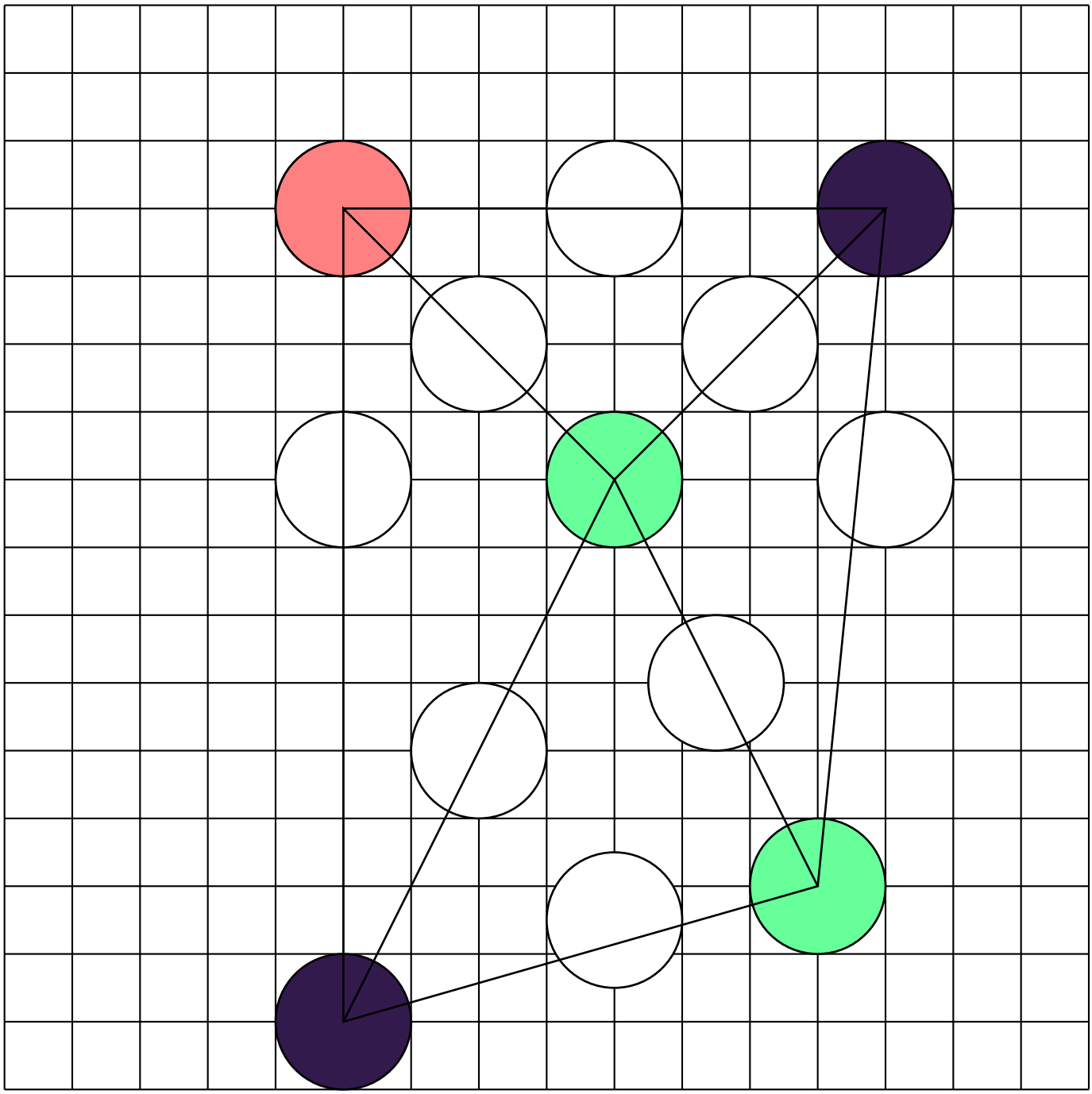
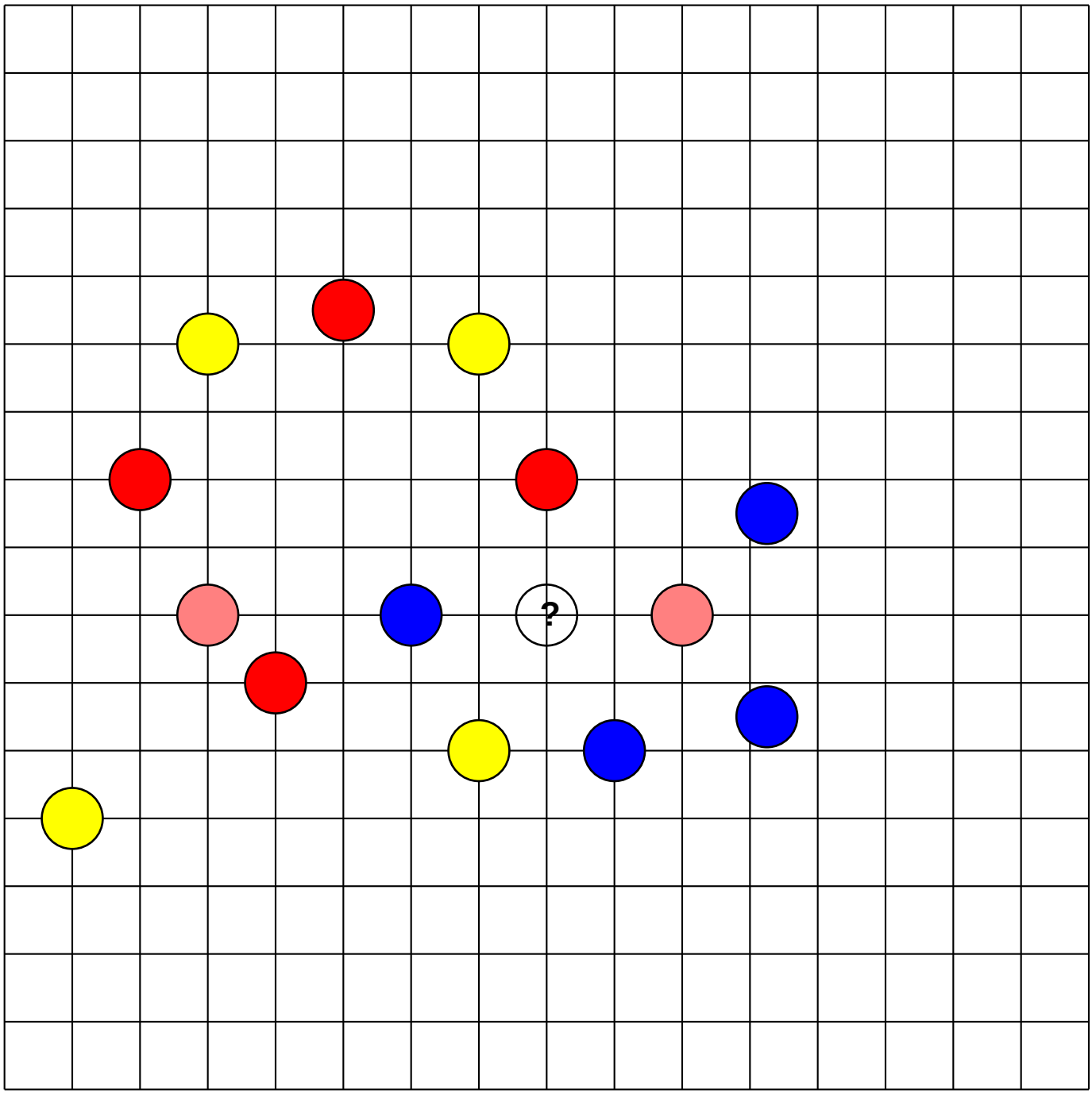


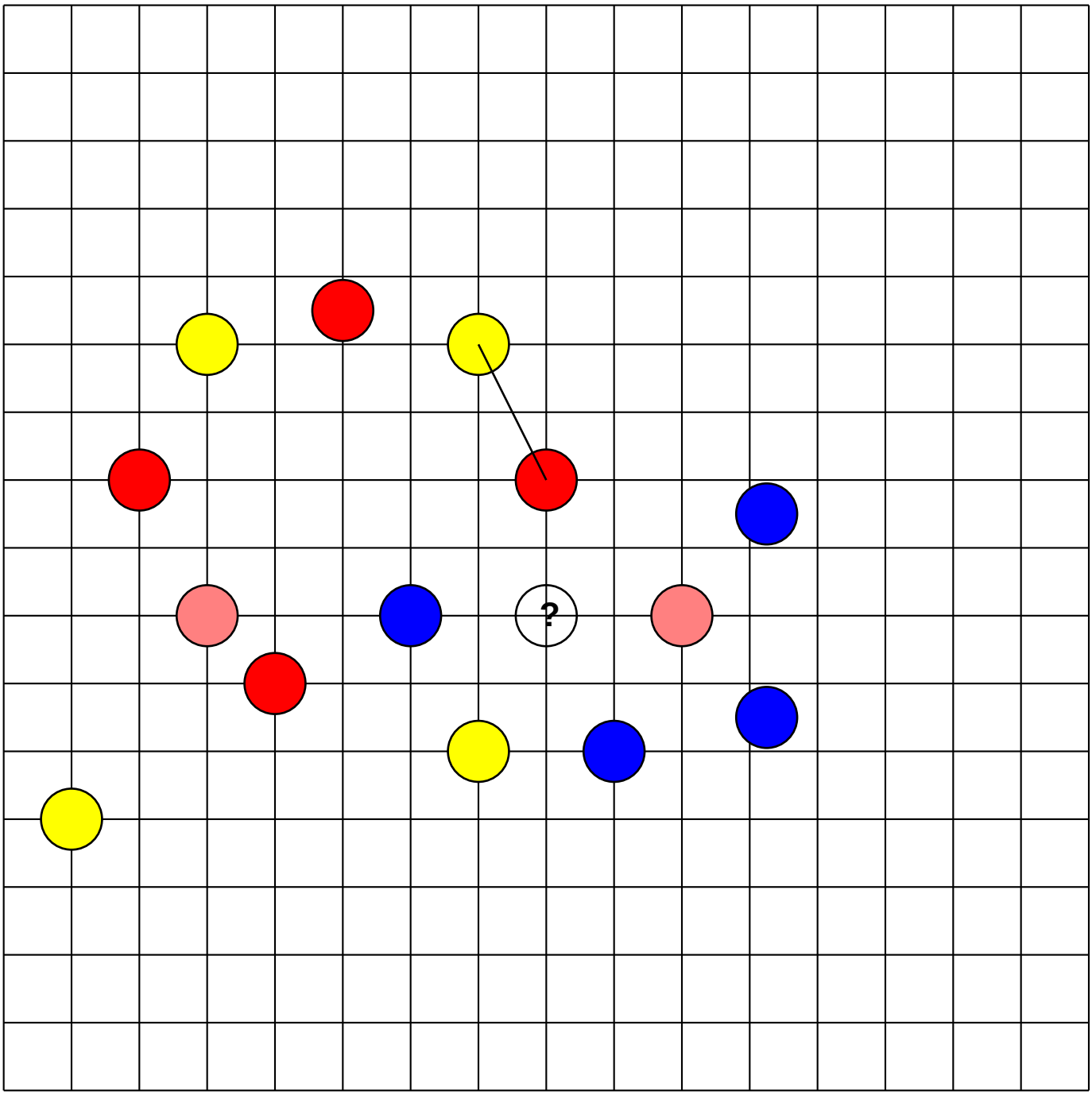
Five-Colour Theorem

Now let us do the "Vertex Colorings",this will show more clear about the edges and vertices. All the vertices must be colored differently if they are joined by an edge. So, we can have our vertices draw at wherever we like.



Five-Colour Theorem

Now let us join the vertices up and use the line to indicate as the edges or the borderlines of the countries.



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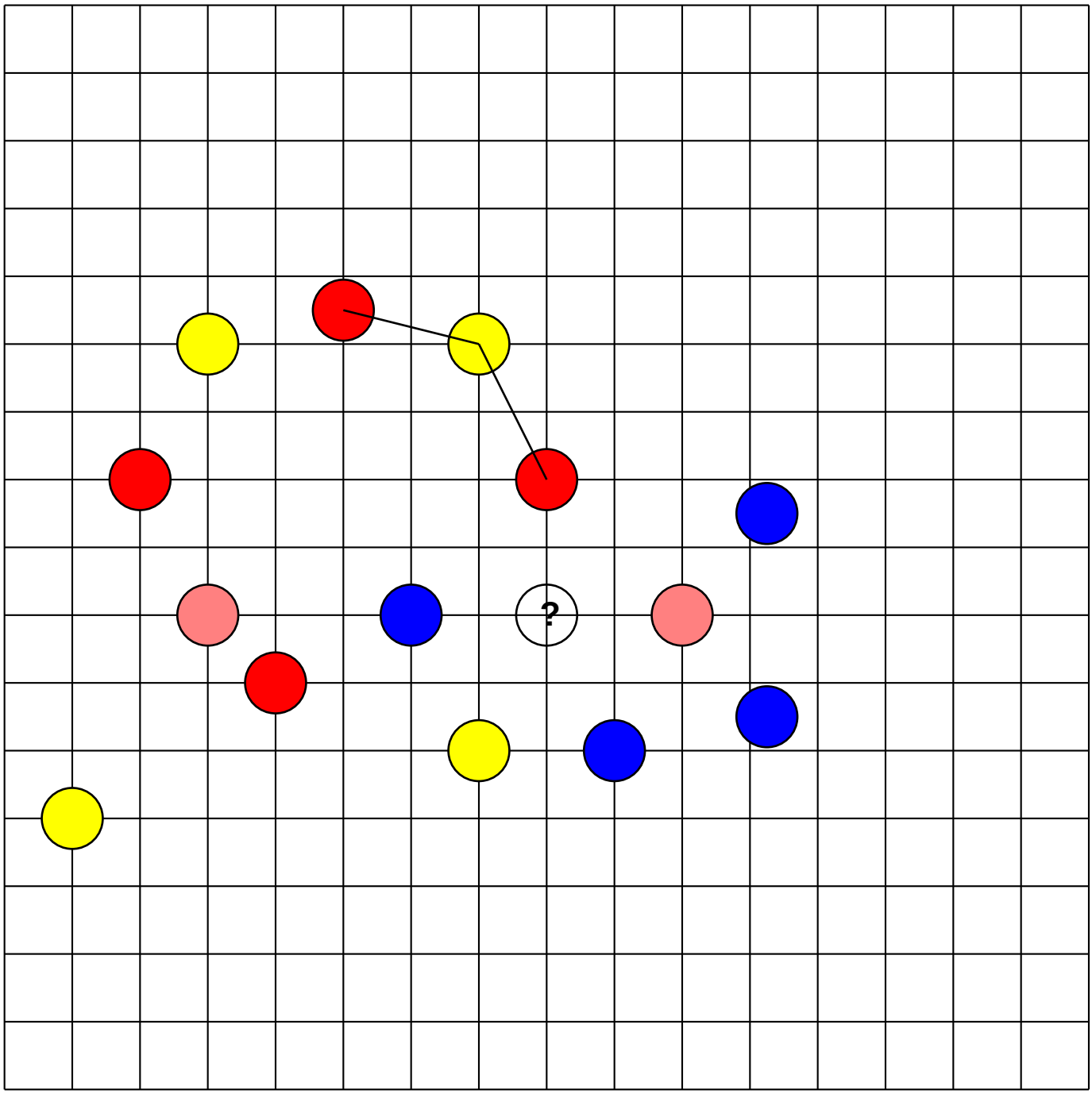

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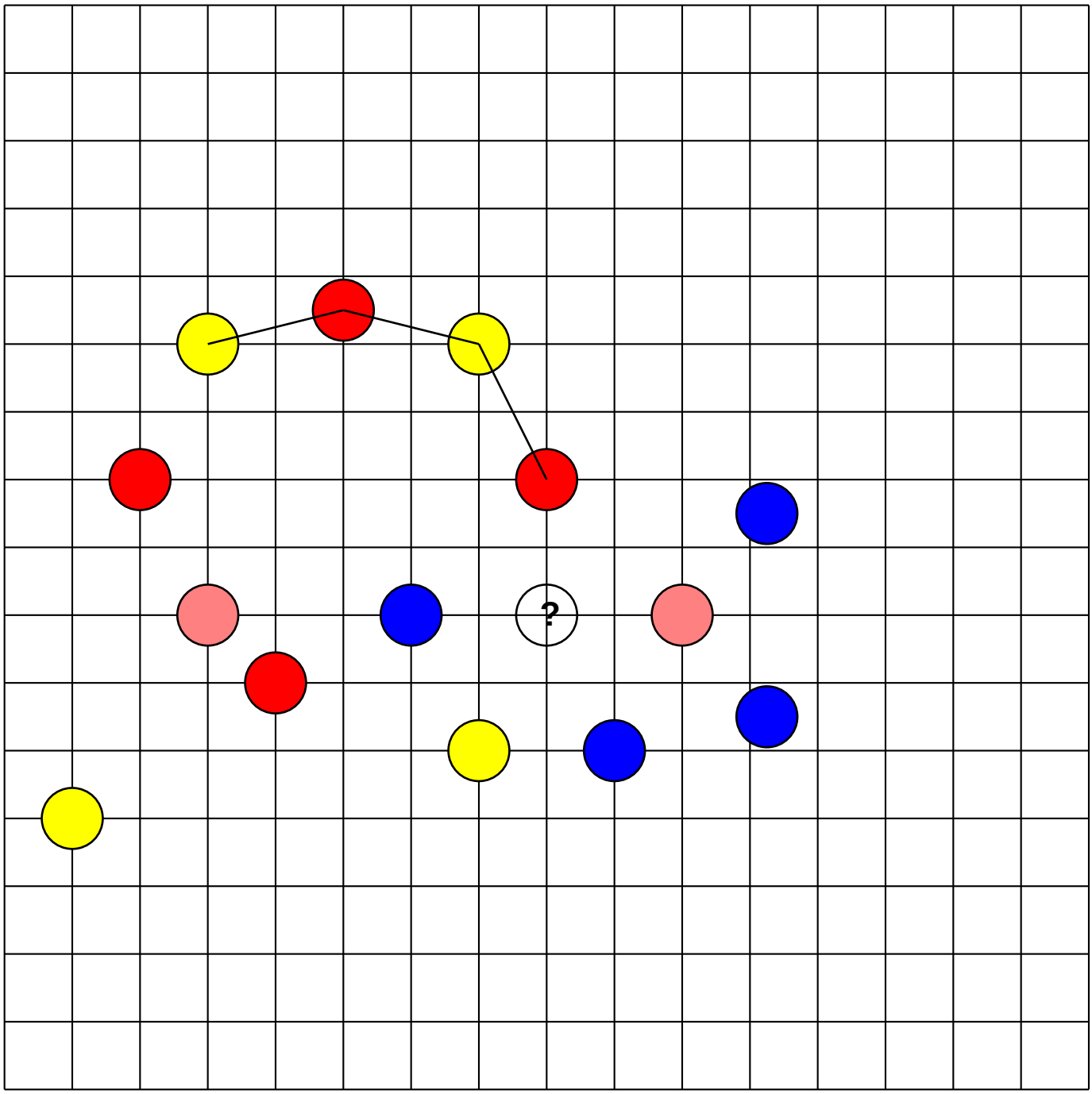

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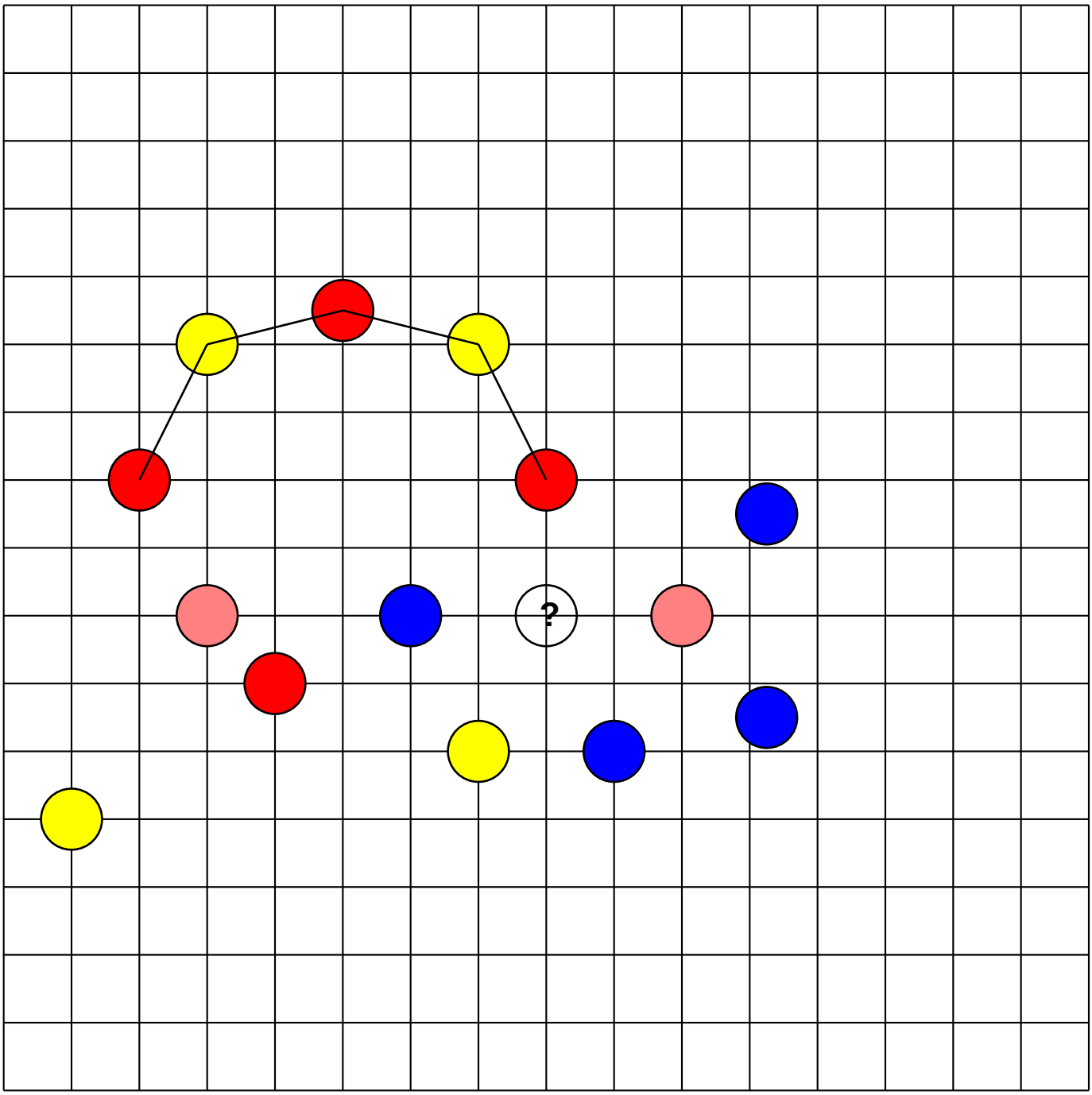

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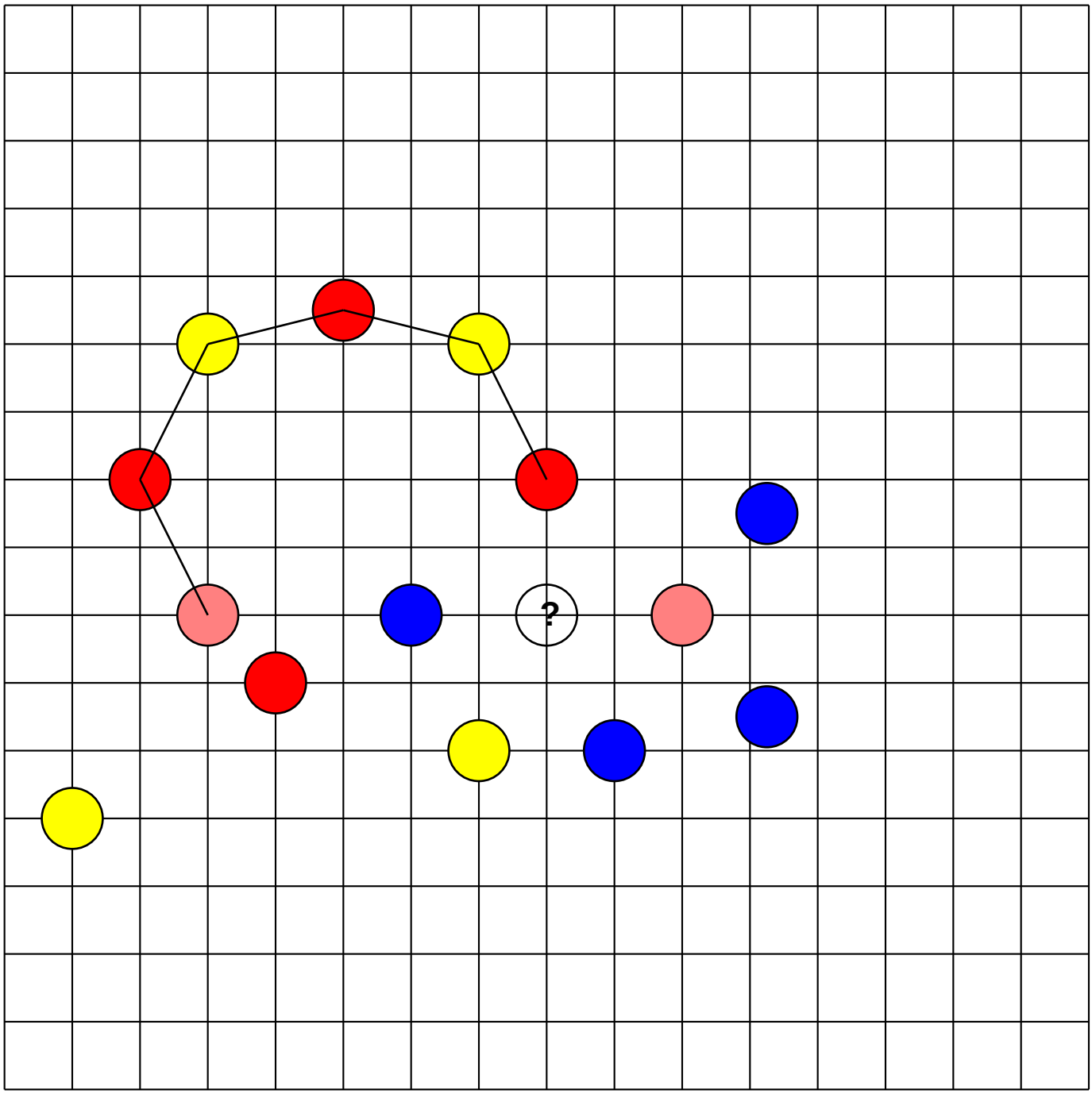

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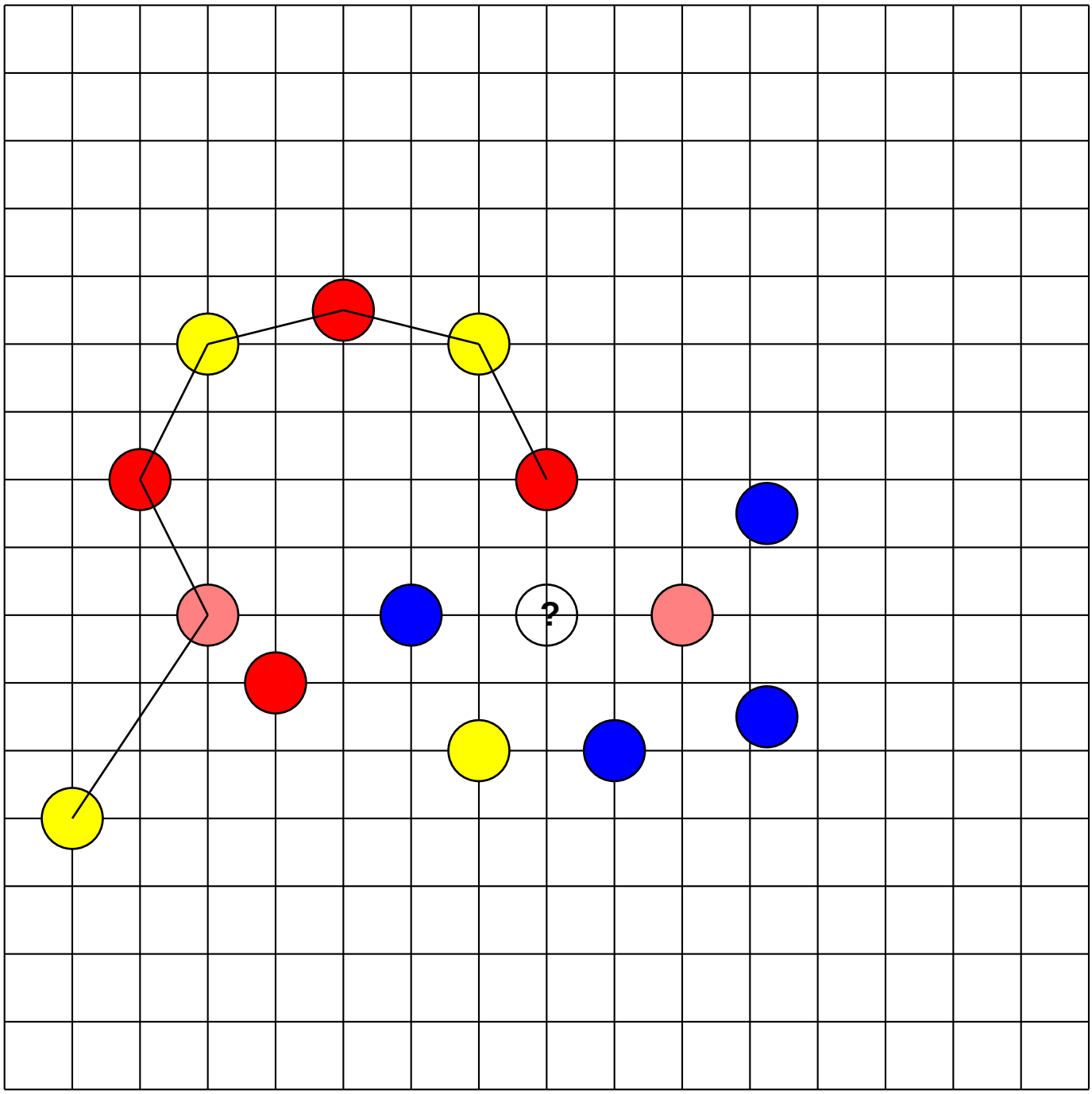

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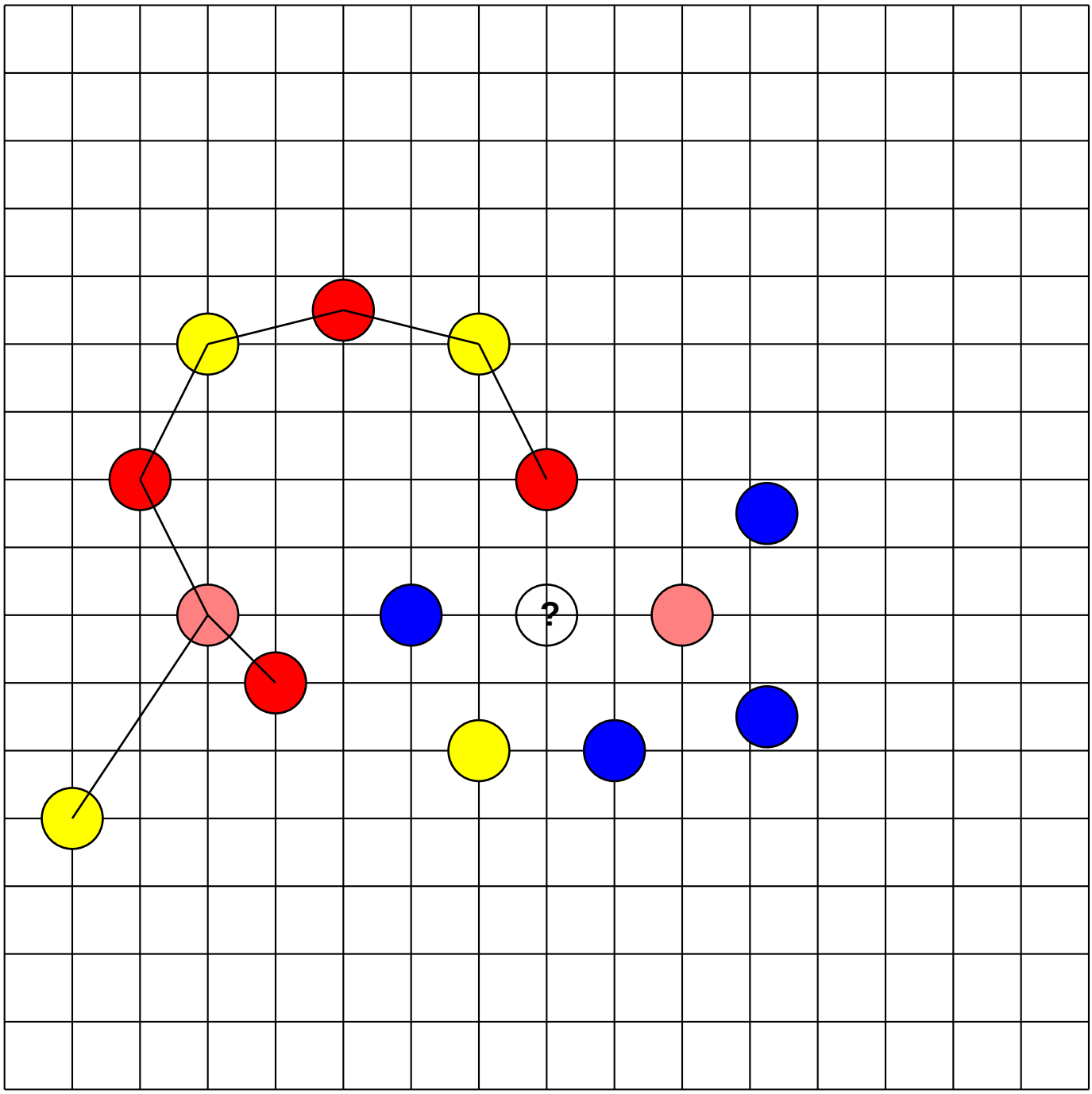

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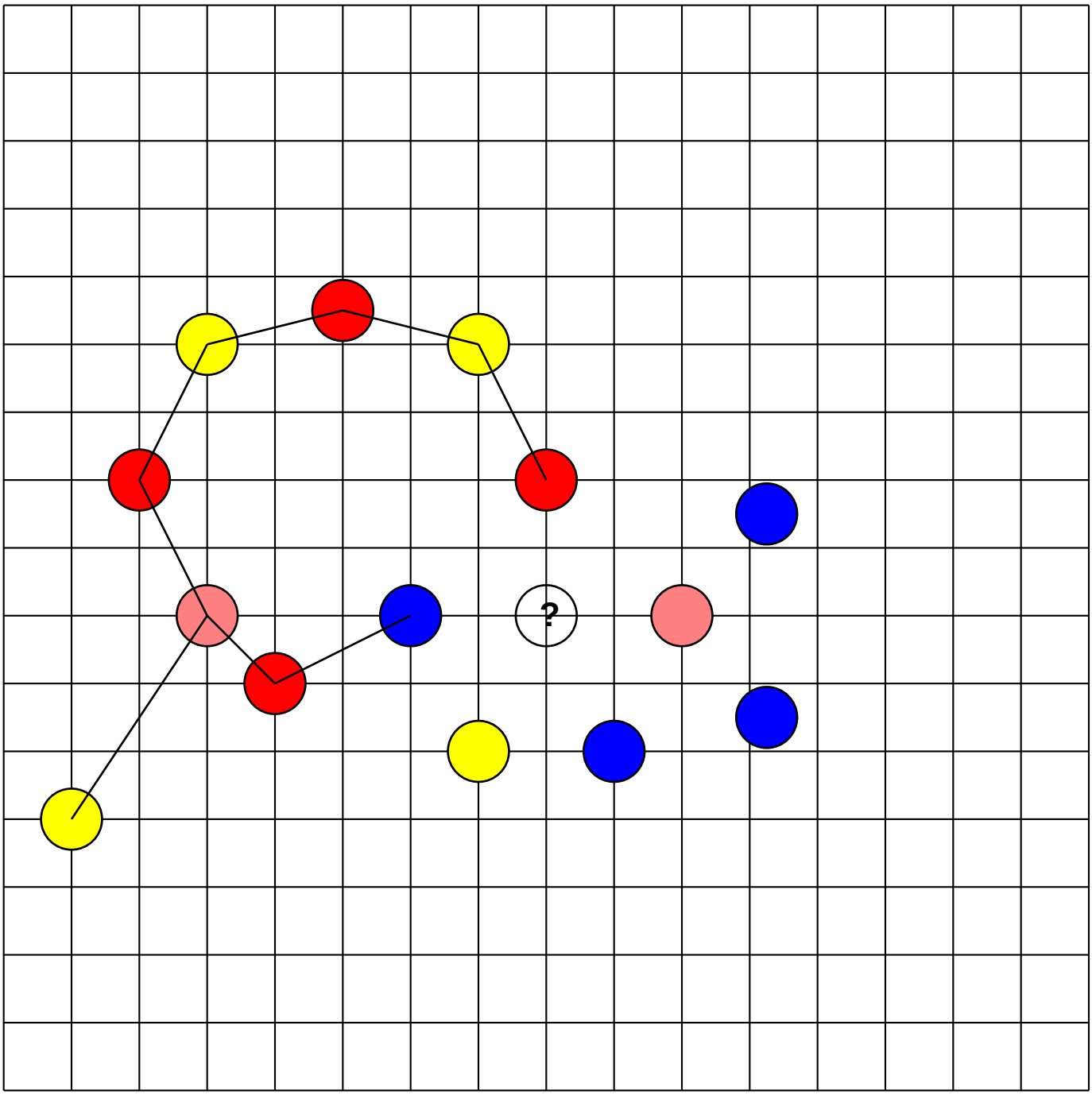

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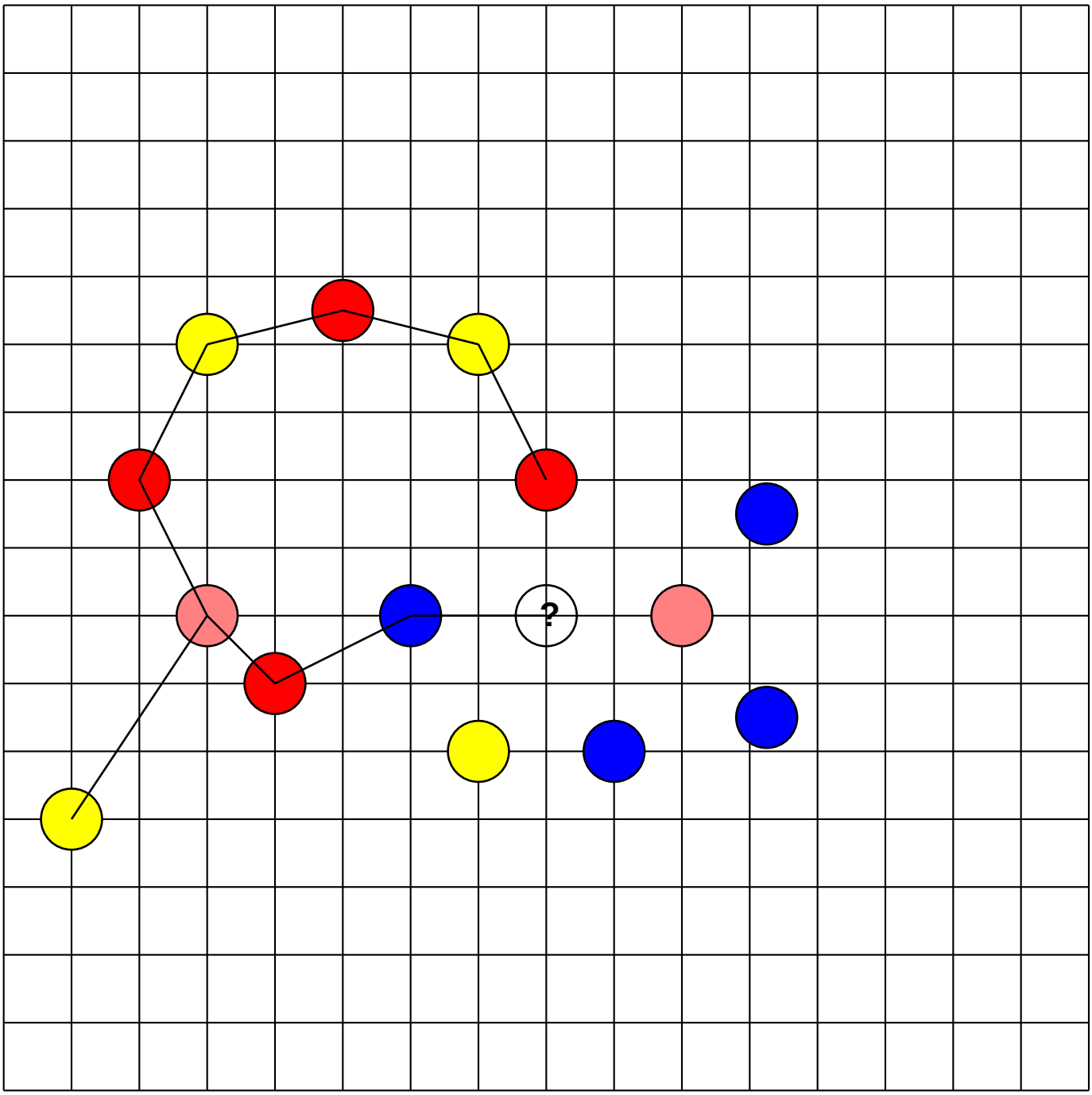

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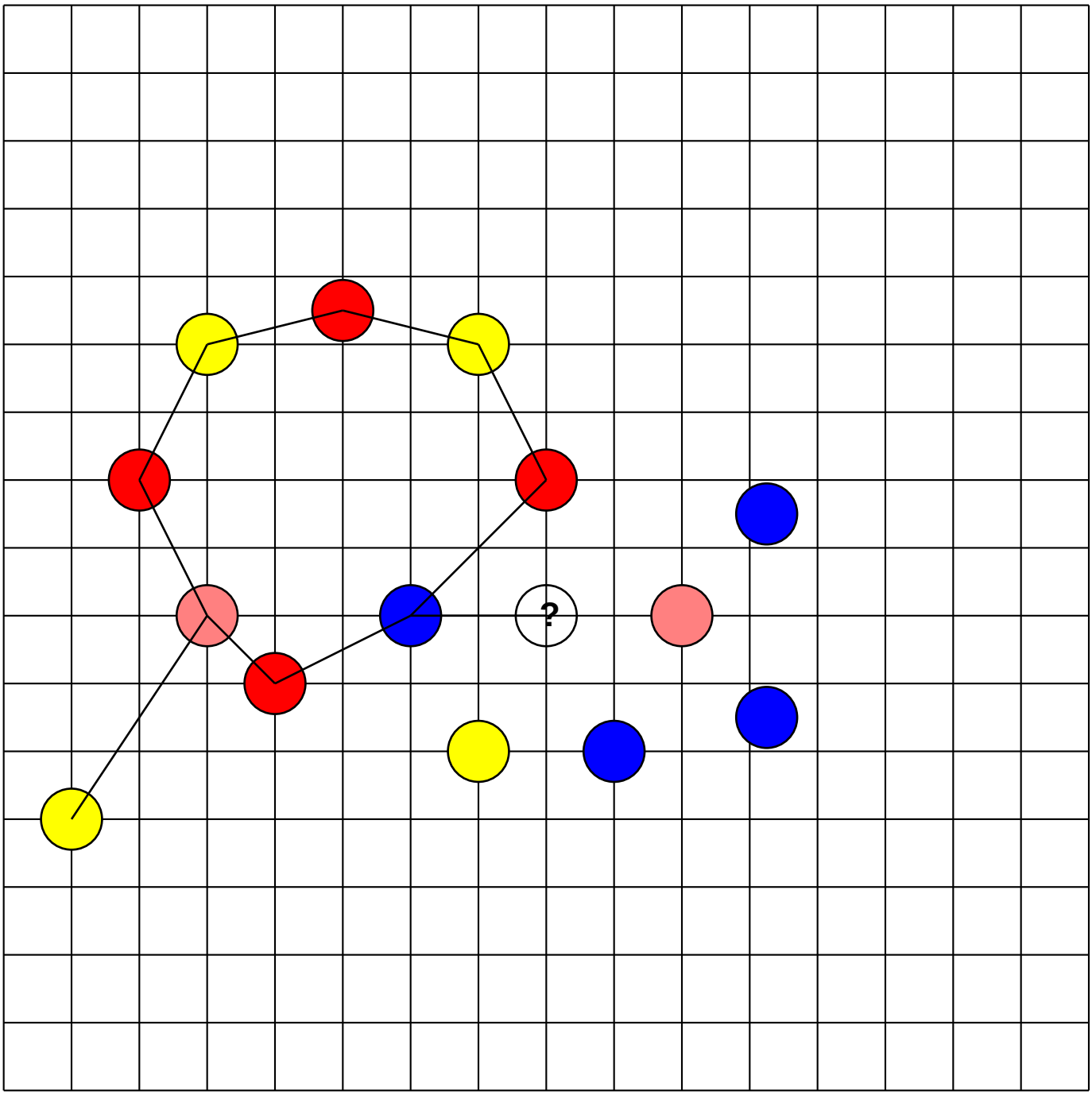

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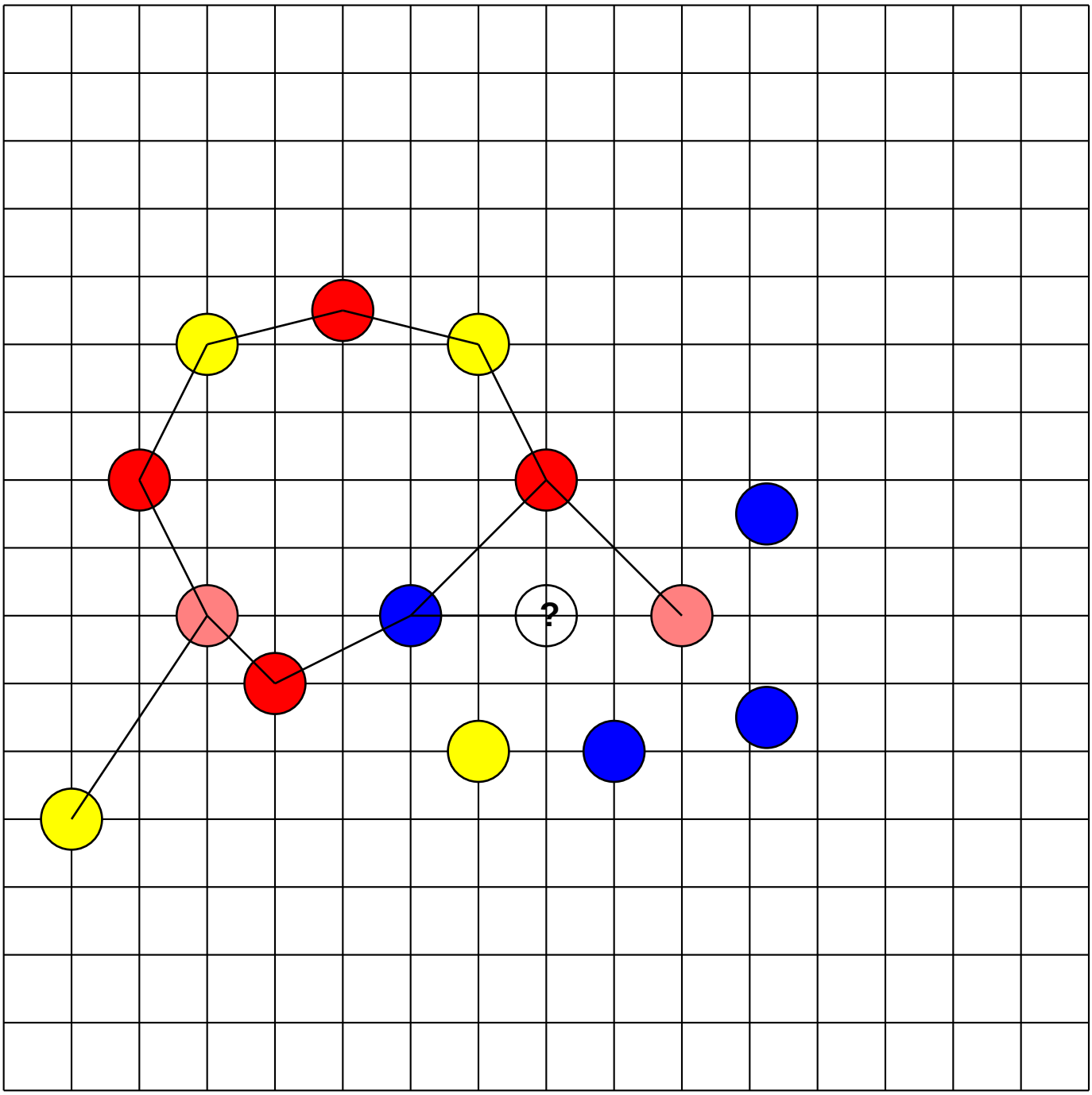

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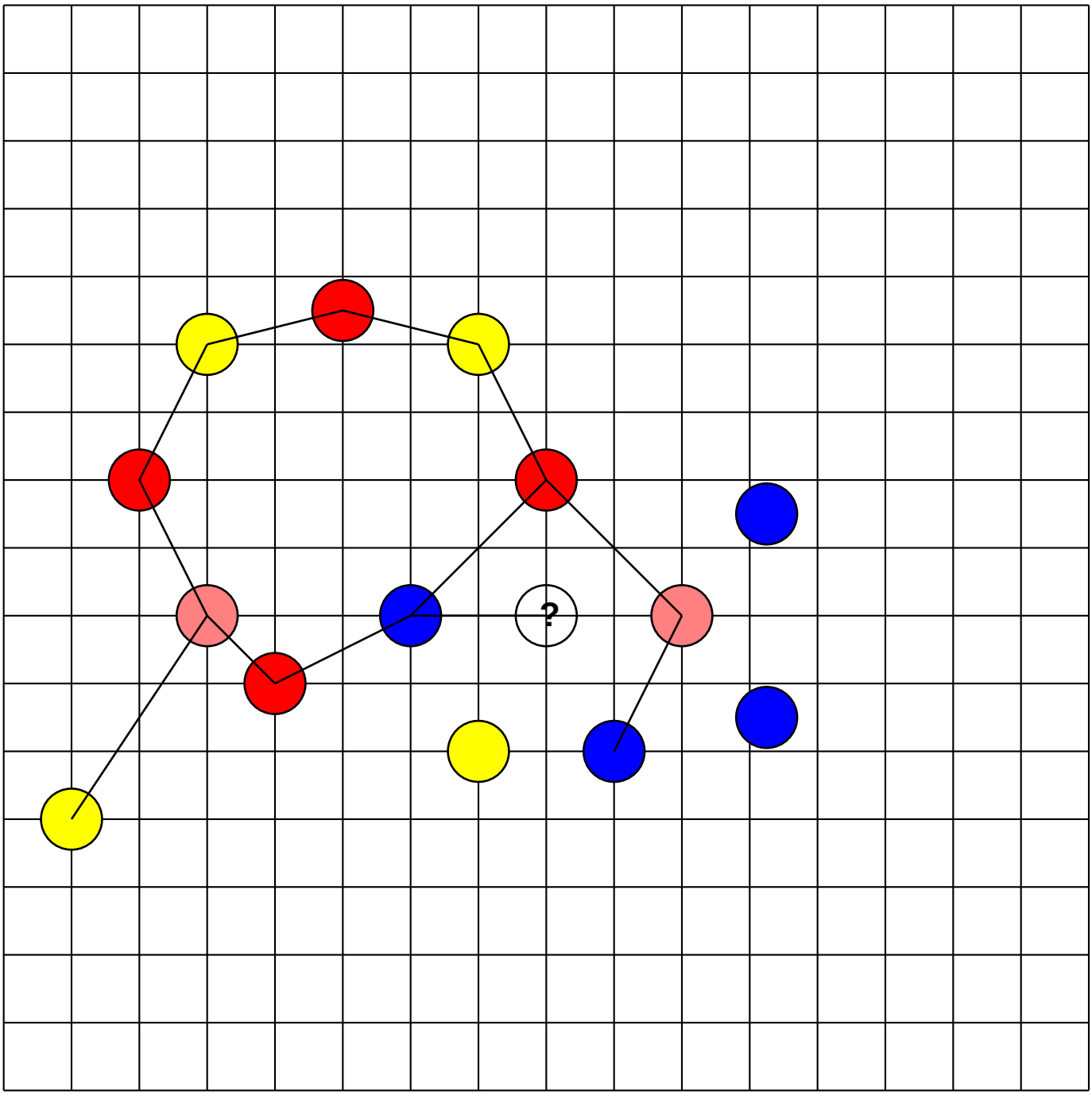

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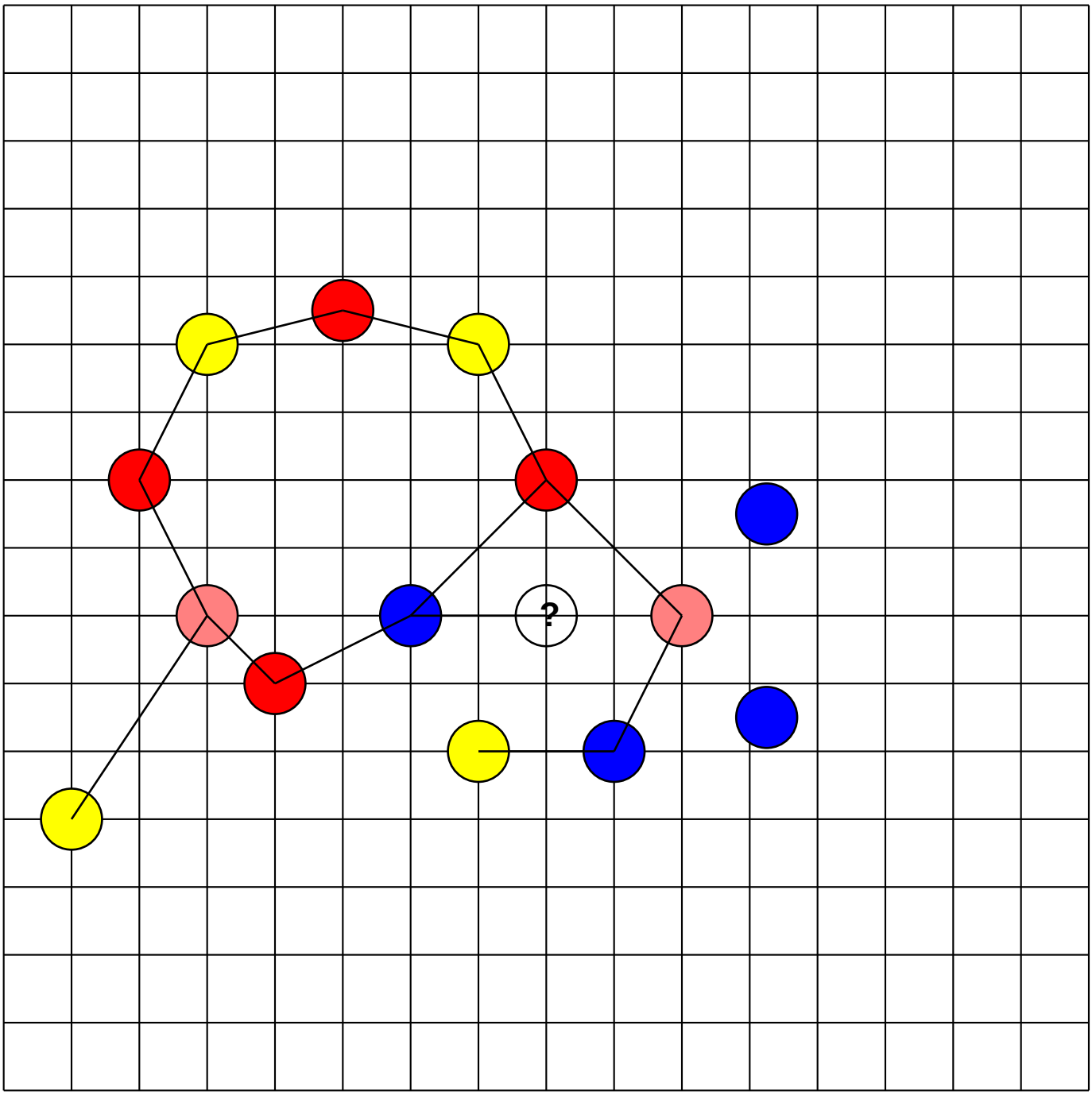

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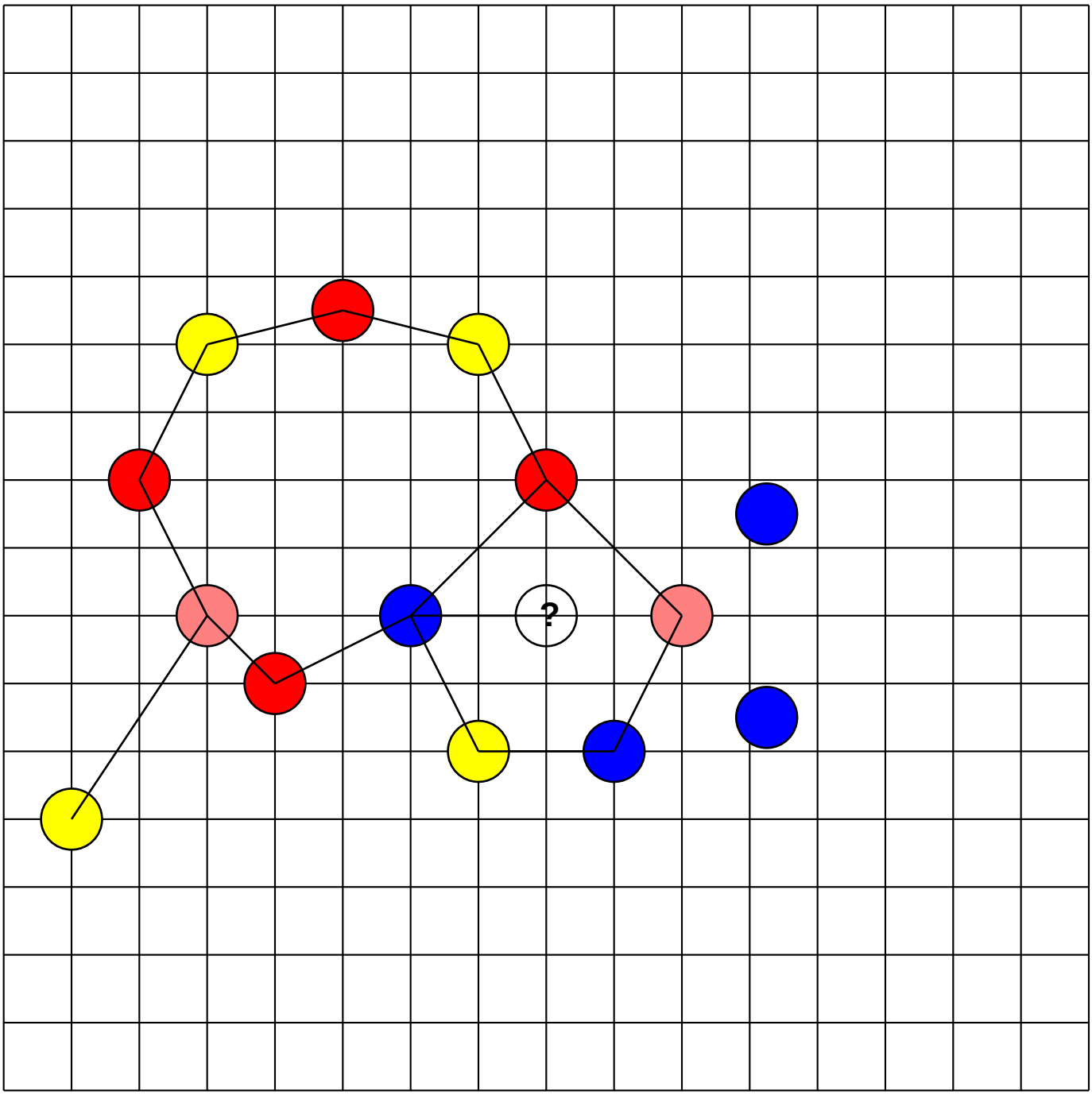

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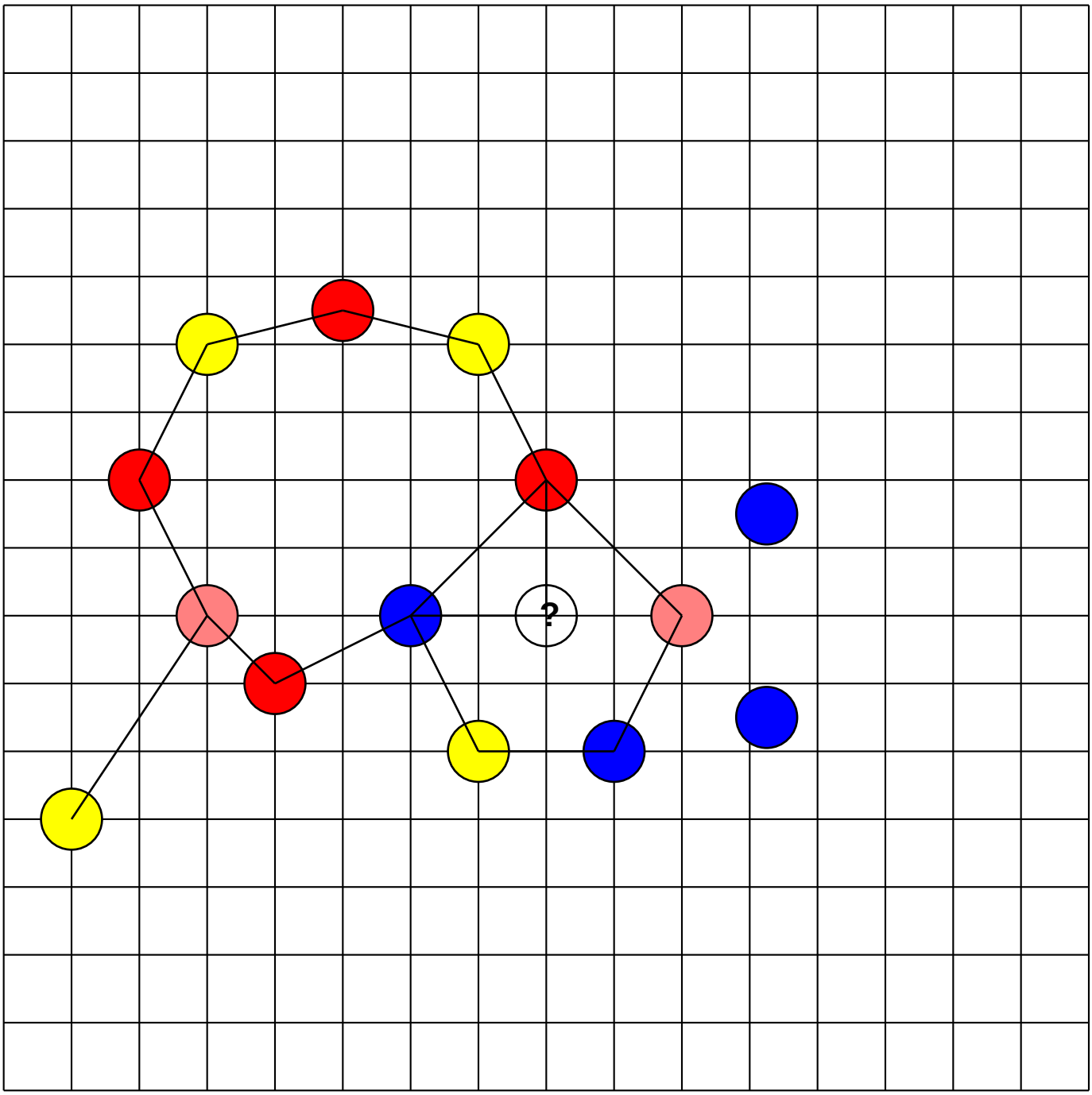

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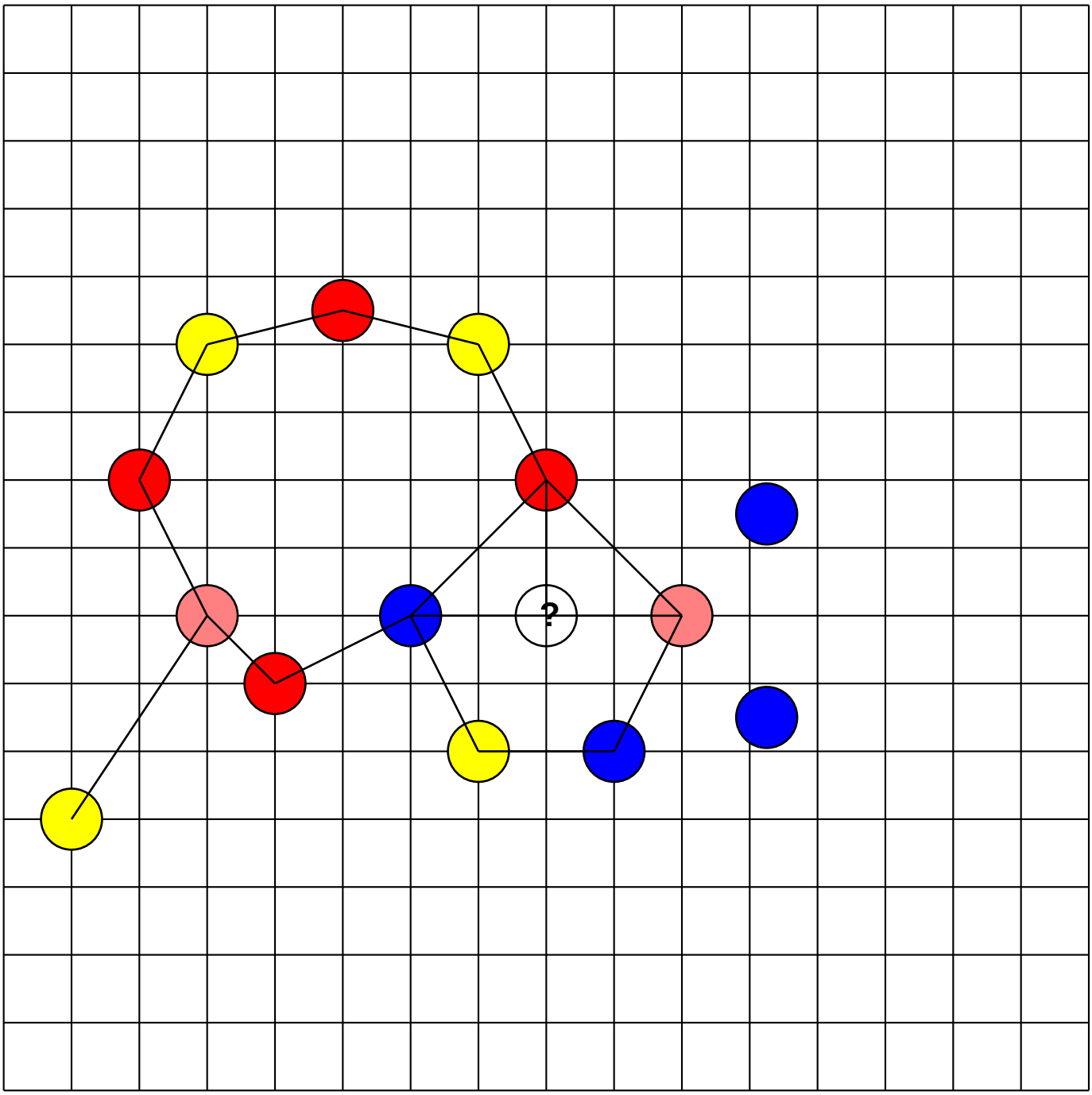

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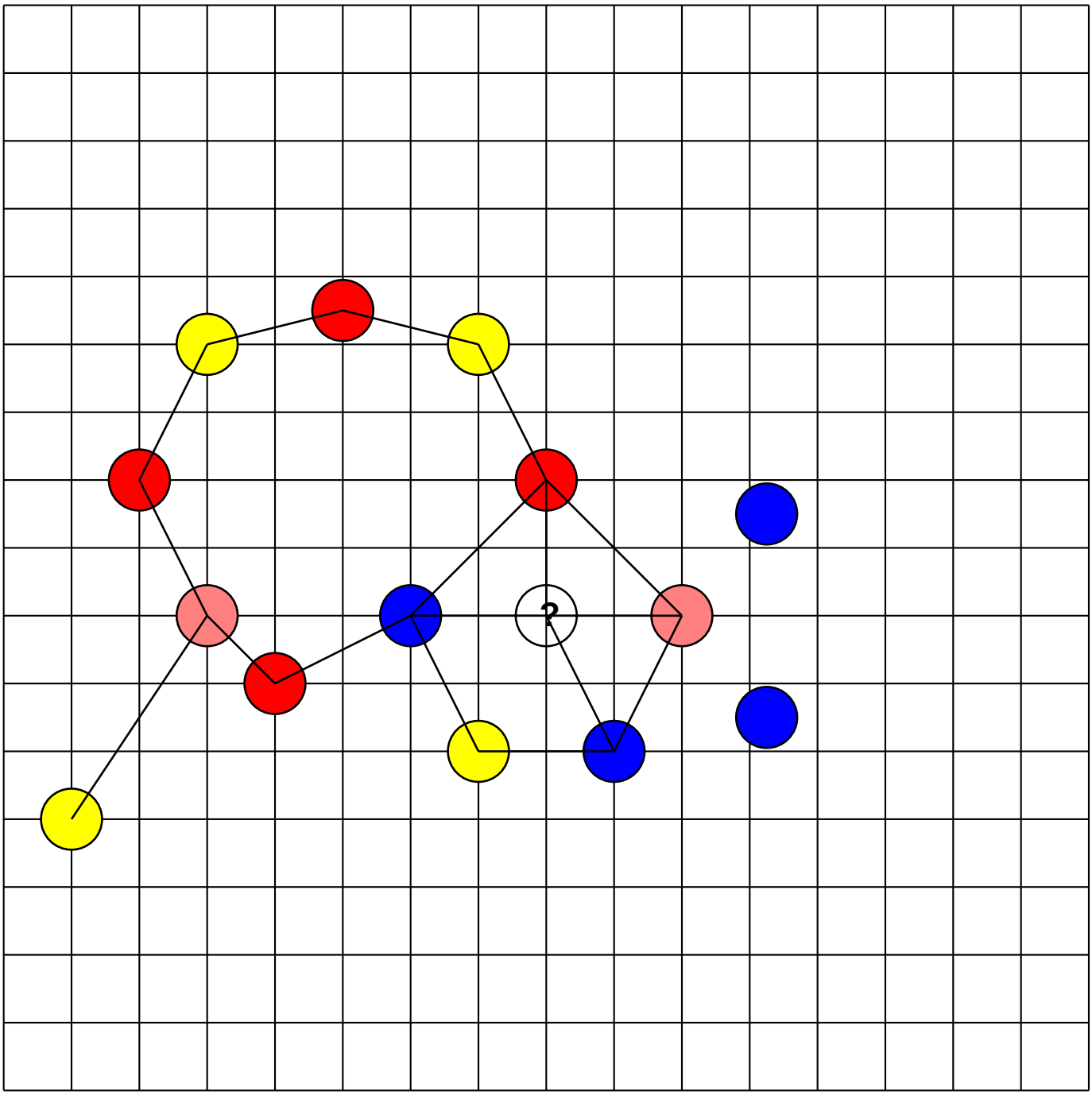

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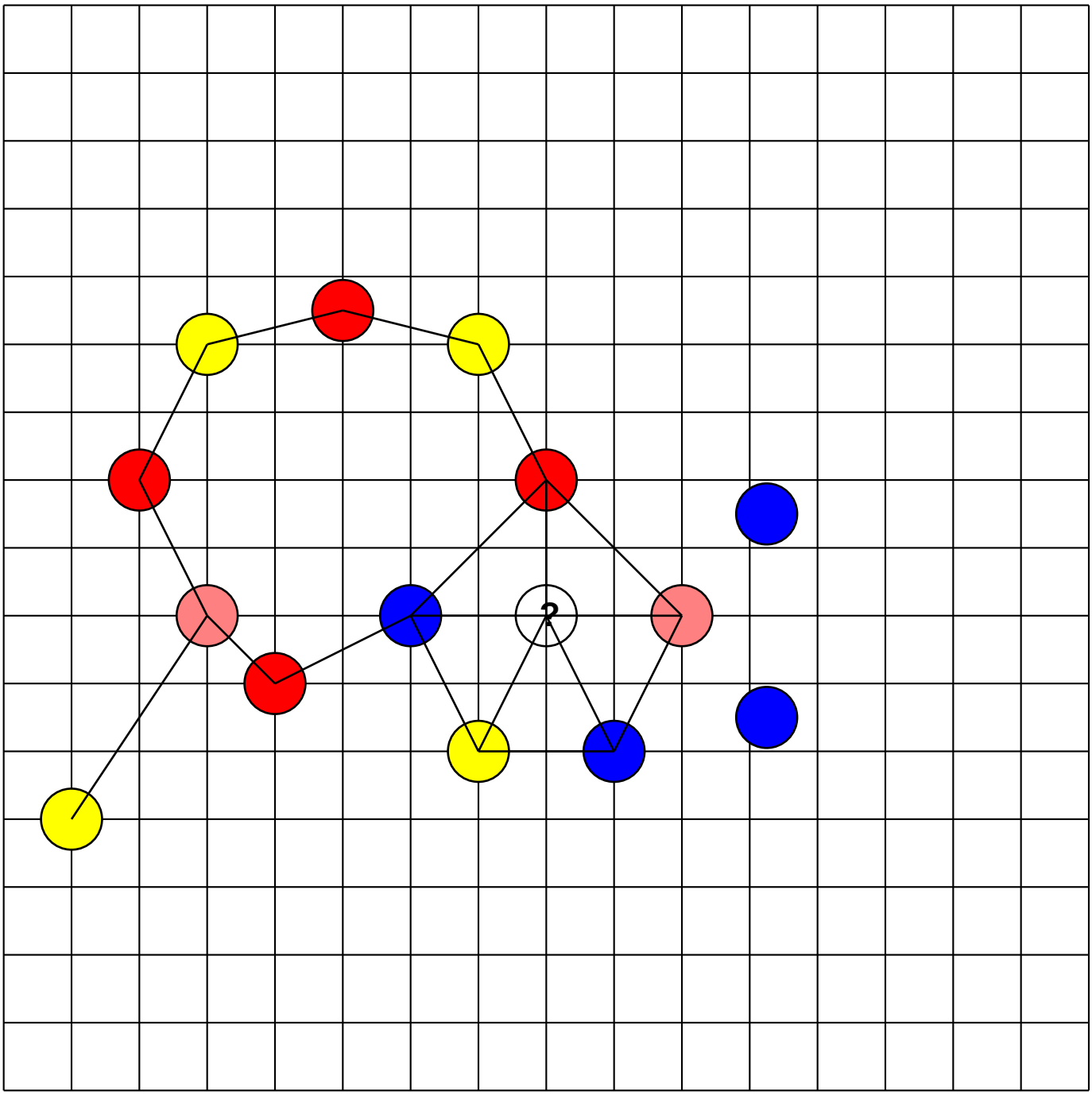

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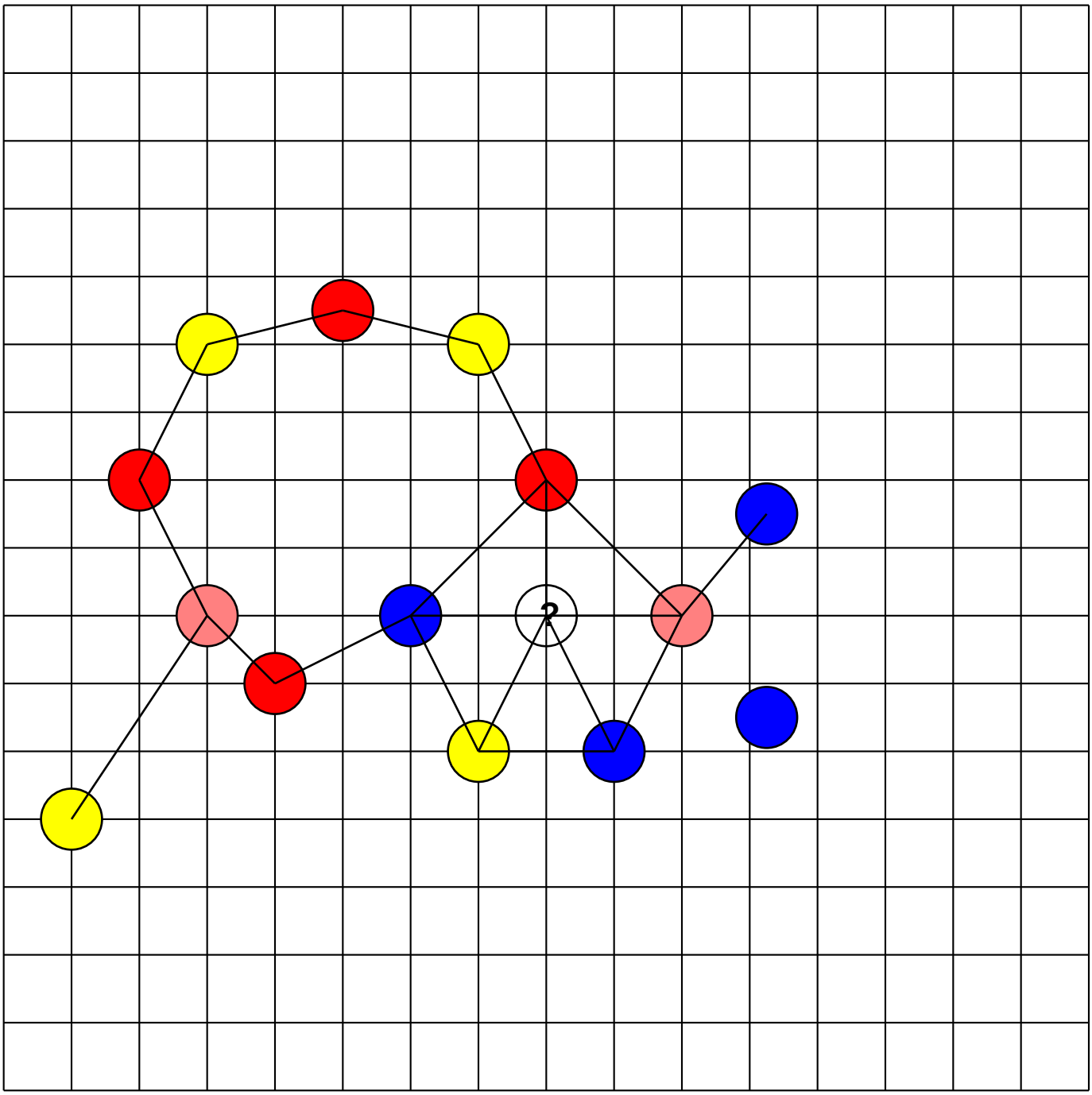
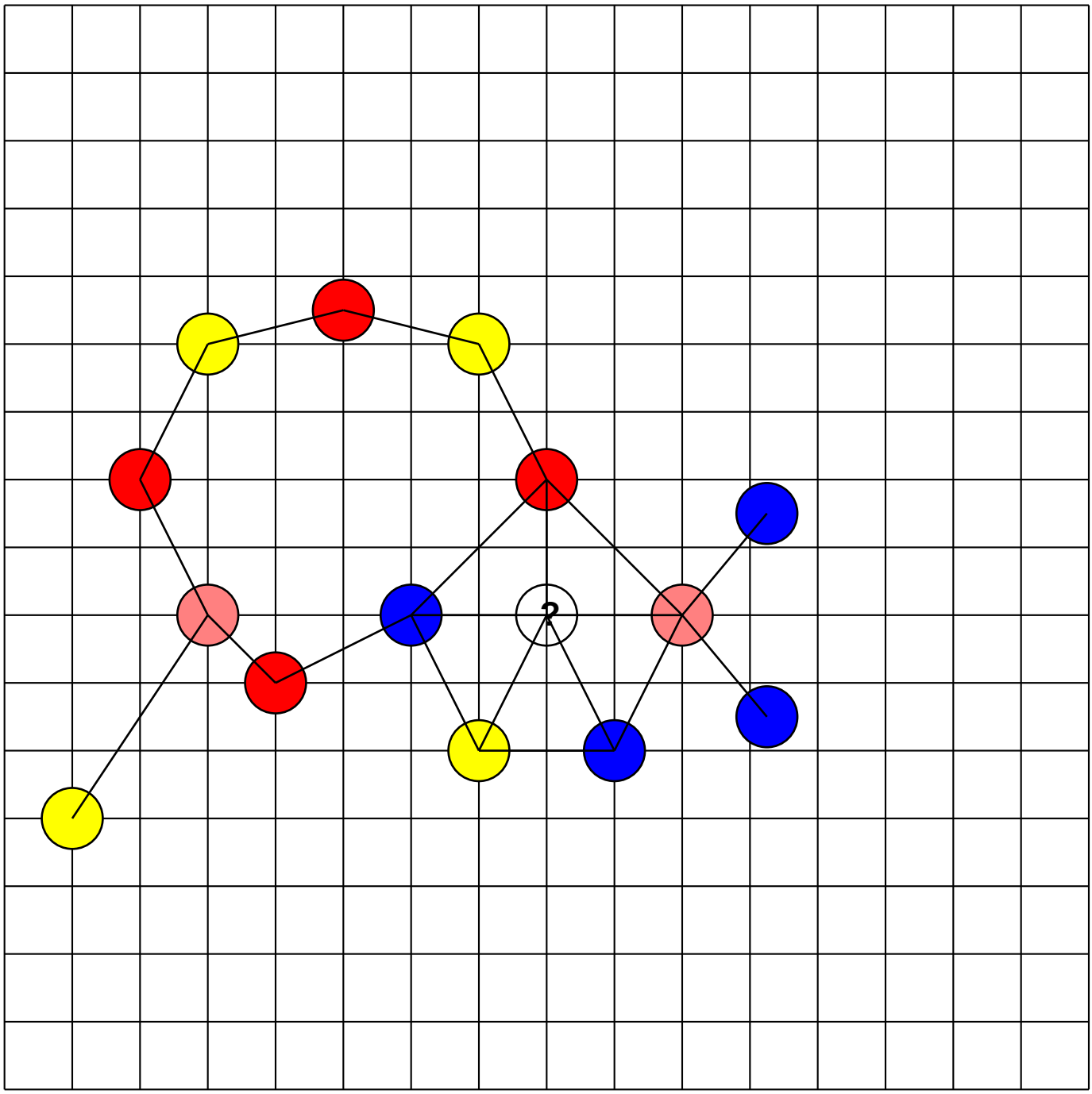


Five-Colour Theorem

After all the edges are joined, there is no same color which painted side by side except the center one with "?" The colors that are used is only four. However, with the center spot we have to use the fifth color, such that, by contradiction, 4 color theorem been rejected

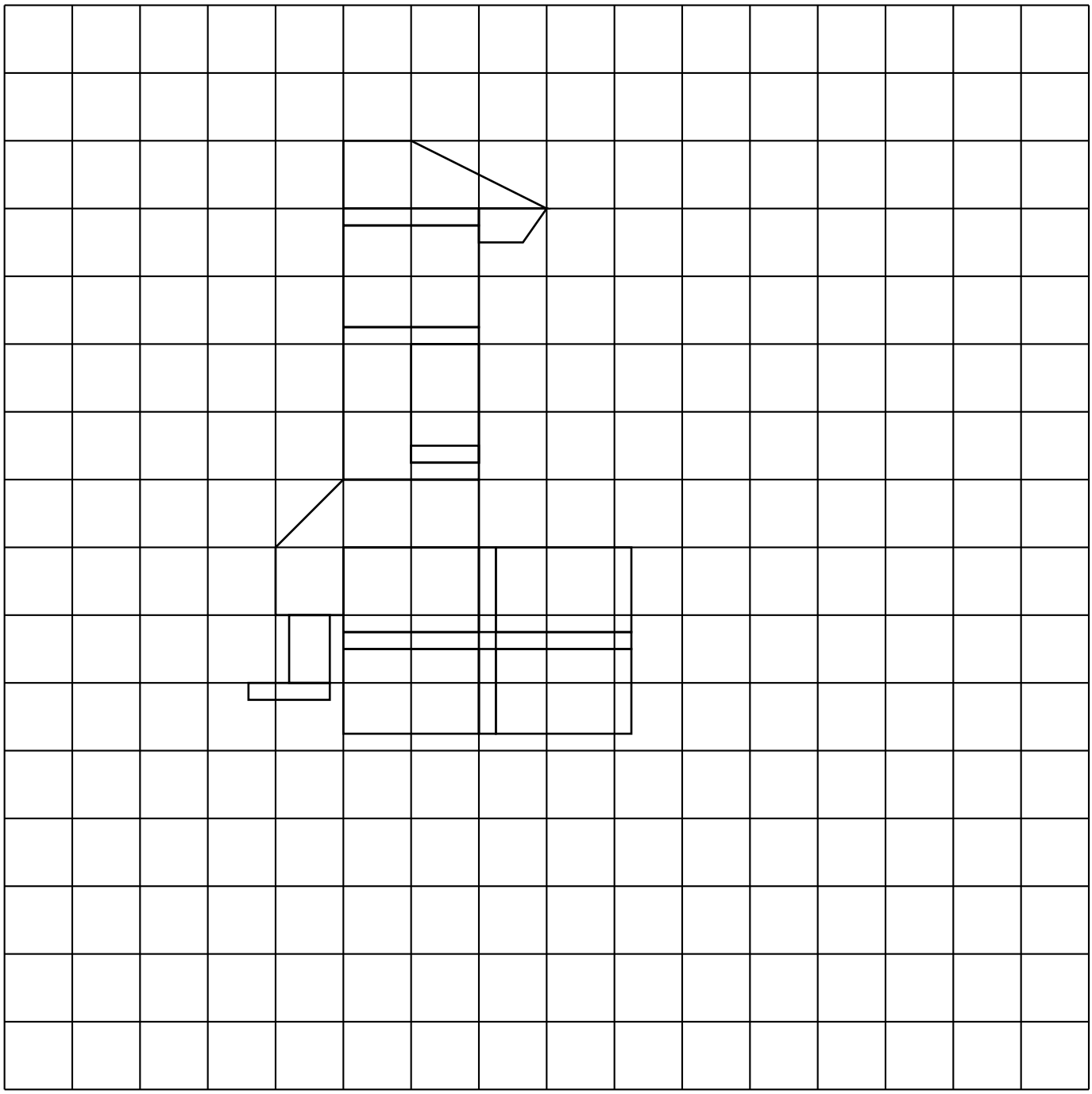


Five-Colour Theorem

Let’s having fun for learning, therefore here is a picture

which has to fill in colors, but can only choose five.

Then you can see do you understand how is Five-Color Thm works

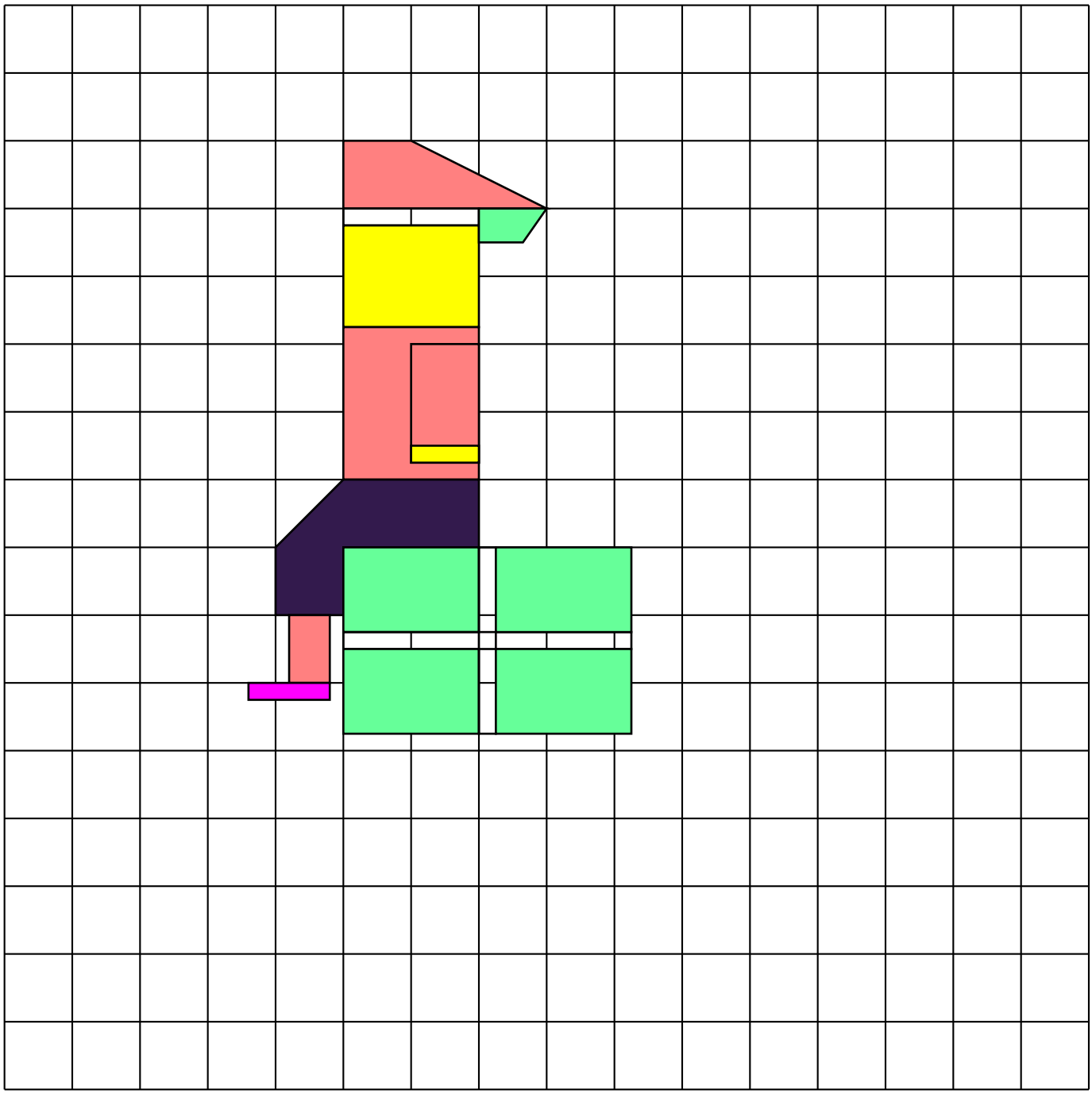


Five-Colour Theorem

The colors have been filled, five colors have been used

yellow, watermelonpink, darkblue, purple and white

Hope you can try to fill in the color!!



The End