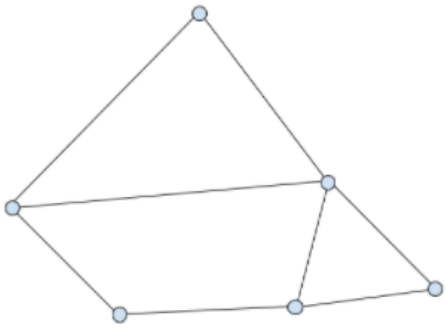
Background

You're given a set of vertices connected by edges in the plane. The edges do not intersect except at their endpoints. Together, they form a collection of closed polygons. The edges form a connected component. Here's an example with 6 vertices and 8 edges:



This data structure is provided in the form of a collection of vertex positions and an edge set. Here's an example. This defines a 2x2 rectangle with a diagonal interior edge:

```
{
  "vertices": [[0, 0], [2, 0], [2, 2], [0, 2]],
  "edges": [[0, 1], [1, 2], [0, 2], [0, 3], [2, 3]]
}
```

Basic requirements

1. *Algorithm 1:* Write an algorithm that finds all of the interior faces (polygons) of such a data structure. The output schema should be simple JSON in the format of your choice. Include tests (with text descriptions of the input data) demonstrating that it works. Comment your code with specifics about the computational complexity of your implementation.
2. *Algorithm 2:* Write an algorithm that processes the output of Algorithm 1 in order to find the neighboring faces of any face. It should take the output of Algorithm 1 as input, unique identifier for the face and output an array of face identifiers. The face identifiers might be an integer or string. Include tests (with text descriptions of the input data) demonstrating that it works. Comment your code with specifics about the computational complexity of your implementation.
3. Write a simple HTML page that presents the output of algorithm 1. Consider using SVG, Canvas, or WebGL. The page should display the faces using unique colors. This part of the challenge is simply to display that you've completed the project.

Commit all of this code to a public Github repository with instructions on how to pull and run the code. Also, provide a website endpoint where your code is deployed. All of the code should be implemented in JavaScript or TypeScript. You should not use any libraries, only browser API's.

Advanced requirements

If you find that you have extra time, pursue the Advanced requirements, don't embellish the UI.

1. *Algorithm 3:* Given a point and the output of Algorithm 1, find the face the point is contained within. Naturally, the point may not be inside of a face. Include tests (with text descriptions of the input data) demonstrating that it works. Comment your code with specifics about the computational complexity of your implementation.
2. *Algorithm 4:* Implement an algorithm that, given a start face, computes the neighboring faces, and then the neighbors of the neighbor faces and so on. The system should find "layers" of neighboring face sets. The output should be an array of arrays of face ids until all faces have been visited. Include tests (with text descriptions of the input data) demonstrating that it works.