Step1:

Step2:

The starter code has some flaws as it is just a simple “recording” structure used to store a given mesh into a file. As a result, we fix it by several steps below.

Firstly, the starter code is not structed properly since everything is in one class. So we divide the code into separate class by various objects like vertex,segment,polygon, which makes the code more modular and organized. It also makes the code more readable.

Secondly, the starter code only has a function of recording. We add some method for adding vertex, segment, polygon. We also add a transform method to make mesh we designed into the mesh that io library provided.

At last, we added new features like adding usedby to segments, which allows segments to remember which polygons use these segments. This feature could help us find neighbours of polygons easily.

To ensure the invariants support the requests from the user, we added some checks. For vertex, the code checks whether a vertex with the same coordinates already exists in the mesh. If so, it returns the existing vertex instead of creating a new one. Similarly, before adding a new segment, the code checks whether a segment with the same two vertices already exists in the mesh. If so, it returns the existing segment instead of creating a new one. When adding a segment to a polygon, the code updates the "usedBy" attribute of the segment to include the polygon's ID, thus ensuring that the segment remembers which polygon it belongs to.

Testing helped me identify and fix bugs and logical errors in the code, such as incorrect indexing and null references, which would have otherwise caused the code to fail or produce incorrect results.

Step3: