Can you make the Aquinas Circuit?

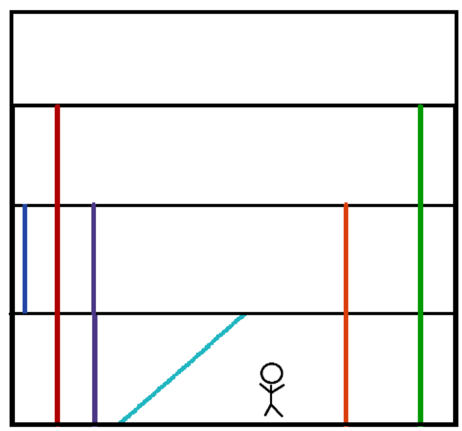
History:

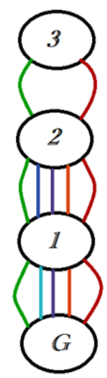
Aquinas Hall was built in 1963 and has been the central location for MSMC academics. Since the donation by the Kaplan family, the addition of the Math, Science & Technology center was opened in 2007. With this extension came many new staircases to access these wonderful new floors. There are six staircases with 12 connecting sections. Can you travel every step and return to where you started?

While this sounds like a current topic, the problem has centuries of history. Since in the 1600's, the residents and tourists of Konigsberg would attempt to walk the seven bridges connecting the Northeast European city's four regions in the same fashion that you have tried to walk the staircases of this building.

Problem:

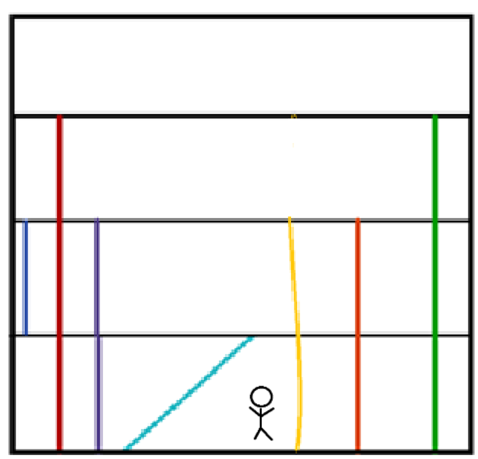
Trace your way up and down the halls and staircases using the diagram at the right. You must travel every section of every staircase in the building once and only once, and return to the same spot you started from. Emergency staircases are off limits. Draw directing arrows to show your path.

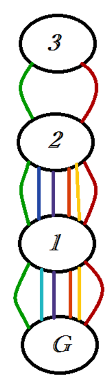




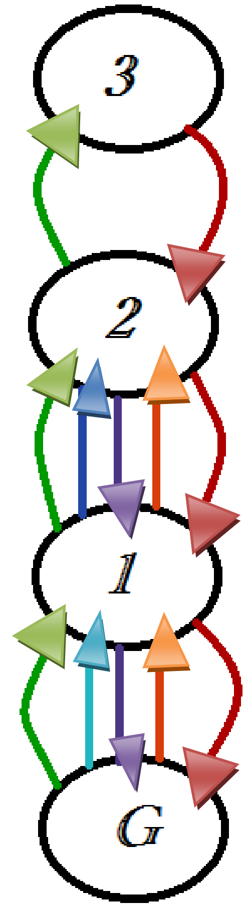
The diagrams can be represented through graph theory in the adjacent images. We can represent each floor as a vertex and each part of a staircase as an edge.

Now, try and navigate the building using both the staircase *and* the elevator running from the ground floor to floor 2.





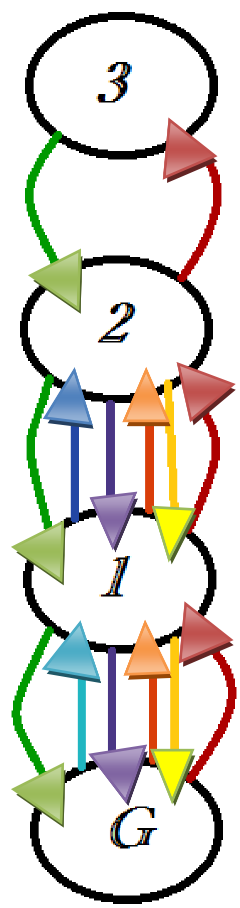
Can you make the Aquinas Circuit?



Trace your way up and down the halls and staircases using the diagram at the right. You must travel every section of every staircase in the building once and only once, and return to the same spot you started from. Emergency staircases are off limits. Draw directing arrows to show your path.

Solution:

This graph has exactly two vertices of odd degree. Thus, it does not contain an Euler circuit. However, it does contain an Euler Path. An example of a path is depicted to the right, starting on the ground floor and ending on the second floor.



Now, try and navigate the building using both the staircase *and* the elevator running from the ground floor to floor 2.

Solution:

This is possible to complete starting from any staircase. This graph, with the addition of the elevator, has no vertices of odd degree. Thus, both an Euler Path and an Euler Circuit can be formed. One example of a directed path is depicted to the right that starts and ends on the third floor.