# Catch the ant!

We have spider and we have an ant. They are sitting on a web. The spider wants to catch the ant!

The web is a set of points, some connected and some not.

Assume the ant is stationary, and the spider moves from one point to a random connected point. So in the square below, there are two equally likely choices for where the spider moves next. In the cube, there are three.

1. The web is a square as shown below left and the spider can visit each point only once. What is the average number of turns before the spider reaches the ant? How about the minimum and maximum?
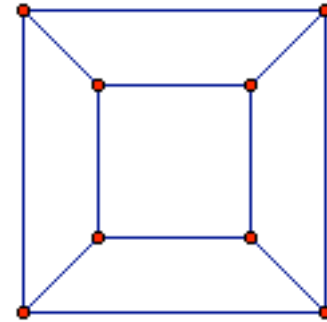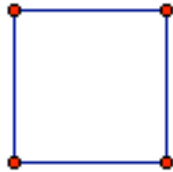
2. If the web is a cube as shown above at right, what is the average number then? How about the minimum and maximum number of turns?

3. Supposing that the spider can revisit points, what's the answer for the square?

4. How about for the cube? And do the minimum or maximum numbers change?

5. Is there a path that the spider can follow so that he will visit each point exactly once?

6. How about each edge (connection) exactly once?

7. What about each edge and point exactly once?

8. Try the same problems for an octahedron (8 faces, 4 edges from each point), icosahedron (20 faces, 5 edges from each point) or a dodecahedron (12 faces, 3 edges from each point).

9. What if the spider starts at 1 and the ant at 0 on the number line? Or in 2D?

10. What if the ant is also able to move at random?