

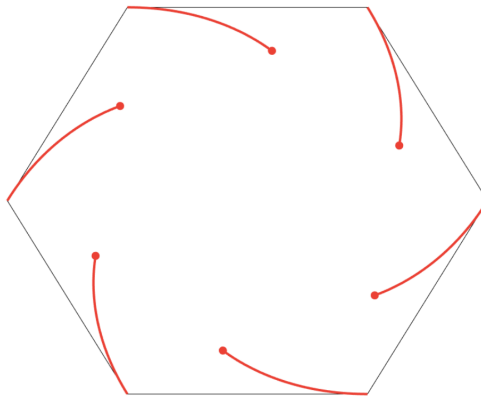
Riddler Express

1 November 2019

Riddle:

Six snails are situated at the corners of a regular hexagon whose sides are all 10 meters. Each snail is determined to reach its clockwise neighbor, and they all travel at the same speed. But keep in mind that as each snail moves along, slowly but surely, the snail it's traveling toward is *also* moving toward another snail.

The result is six snails—and six trails of slime—that spiral inward toward the center of the hexagon, as shown in the animation below:



How long is each snail's slimy trail?

Solution:

This is a pursuit problem, which have been extensively solved by people much smarter than me. In general, I don't know enough to solve them outright, but I am familiar with the “easy” version, which is four pursuers in a square formation. For this problem, I will call the pursuer A and the target B for any pair of pursuer and target. The solution to the square problem is that A moves exactly one side length. Although B is constantly moving, its velocity is perpendicular to the A's velocity, so the distance between A and B only changes based on A's velocity.

Now for the hexagonal version. I have added labeled the hexagon below, which shows that the exterior angle of each side is 60° . This is a basic result of the geometry of a regular hexagon. This also means that B is moving at 60° relative to A, not perpendicular as in the square case. Now, B is moving away from A, but at a smaller velocity. The rate at which it moves away from A is just $\cos(60^\circ) = 0.5$. Now A's relative velocity is only half, so it takes twice as long to reach B. In this time, it will move twice a single side length, so the solution is **20 m**.

