Objective

· To find the shortest distance from a point to a line to a point on the same side of the line.

The Shortest Path Problem

Introduction:

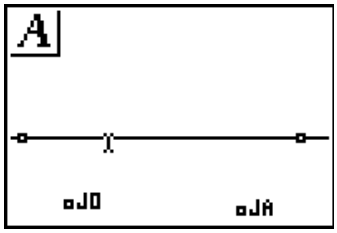
A PE teacher designs a relay race where one student stands 16 feet from a wall and another student stands 12 feet from the same wall, the students are 45 feet apart along the wall. On the teachers command of "GO", the first student must touch the wall then touch the other student in the fastest time, competing with other teams of students. Josh and Jake have been selected to go first, knowing that to have the fastest time, Josh must run the path that produces the shortest distance, he runs to the middle of the segment along the wall that is between the them. Will this path be the shortest? If not what path would be the shortest?

Construction & Exploration

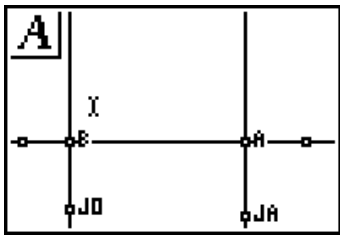
Part I: Construct a scaled model.

1. Draw a line to represent the wall. Move the two points that define the line to the side of the screen so that they are out of the way.

2. Place two points on the same side of the line. Label the points Ja, and Jo.



3. Construct a perpendicular from point Ja to the line. Find the intersection point and label it A. Repeat for point Jo, label the intersection point B.



4. Measure the distance JaA, JoB, and AB. Use scaling techniques to make sure the distances are to scale with the problem as stated above.

5. Place a point on the line between points A and B. Label the point C.

6. Draw segments from Ja to point C, and Jo to point C.

Part II: Data collection.

1. Measure the length of the segment JaC and JoC.

2. Use Calculate to find the sum of JaC and JoC.

3. Use the alpha key to move point C along the line to find the shortest distance from Ja to point C to Jo.

Questions and Conjectures

1. For the shortest path found above, does point C appear to be the midpoint of segment AB?

2. Reflect point Ja over the line. Connect the reflection of point Ja with point Jo. Make a conjecture about the shortest path.

3. Why does the intersection point of the line and the segment JaJo produce the point on the wall where Josh must touch the wall?