Circles, Arcs, and Tangents: the Geometry of Our Roadways

THE CHALLENGE
Learn how circles, arcs, and tangents create all of the geometry of our roadways.

GRADE LEVEL
High School.

ACTIVITY DURATION
30 minutes.

MATERIALS
Paper, rulers, and pens.
Road maps.

SET UP
Preexisting online roadway maps can be used as examples (see examples on page 2). Teachers can customize their roadways to fit the cities in which they live.

ACTIVITY
1. Get familiar with the concepts of arcs and tangents, the geometry of a roadway.
2. Instruct how to construct lines and curves.
3. Show what a successful roadway geometry design is (see next page).
Roadway Geometry

4. Have students work on a given roadway map.
5. Review as a class.
6. Relate to Transportation Engineering jobs that involve designing roadways.

FOR DISCUSSION

Focus on the design of the directional transition of the roadway in the horizontal plane.

Discuss how circles, arcs, and tangents are used to provide a transition between two points on a roadway map, and how they compose the geometry of a roadway.

LEVEL OF DIFFICULTY

IMPORTANT: It is crucial to have a conversation with the classroom teacher prior to performing the activity. This will aid in understanding the educational level of the class which will help determine the appropriate level of difficulty of the materials and items for discussion. For example, regular classes vs. gifted & talented or AP classes.

To increase the difficulty:

1. Let students construct lines and curves without given examples.
2. Increase level of questioning.
3. Include scientific method.
4. Add product outcome (graphs, observations, charts, group presentations).
5. Have students design a new roadway that connects a beginning point to an end point that is not linear.
   - Obstacles
   - Restrictions

To decrease the difficulty:

1. Give students constructed lines and let them draw curves, or vice versa.
2. Decrease level of questioning.

Examples

Example 1

Example 2