Crop Circles

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Question

Design a center-pivot watering system that utilizes the maximum area available.

Standards of Learning

Virginia Standards of Learning for Mathematics: 6.7, 6.10
Virginia Standards of Learning for Science: 6.1, 6.5

21st Century Curriculum

Engineering: Nature of STEM (*1.21, 1.23*), Design and Build(*2.21, 2.22)*

Background

Crop circles have been located in North America; in fact the space shuttle can locate Nebraska just by the numerous green crop circles that exist. Where these placed by alien visitors, or manmade to create fictional stories in hopes of encouraging tourism? Neither actually. Crop circles have been utilized by farmers since the 1950s as a method of irrigation.

Center-pivot irrigation systems are designed to water circular areas of farm land. While this design does prevent some of the land from being cultivated with crops, farmers believe that it is very cost effective. With the center-pivot irrigation system, crops are not ruined by being over or under watered, and water is not wasted. Systems are designed to provide more water at the outside of the circle, decreasing the amount of water as you travel into the circle. This unique design is what prevents the waste of water; preventing plants from being over or under watered.

Safety

1. Observe regular classroom rules for safety.

Materials

For each group of students:

- Grid land areas
- Compasses
- Rulers
- Calculators

Procedure

1. Discuss with students what they think crop circles are. Show some illustrations of "alien" crop circles.
2. Discuss with the students how farmers utilize crop circles. Show them some views from space of these crop circles.
3. Introduce the center pivot irrigation system. Discuss with students the pros/cons for farmers that utilize this system.
4. Review how to find the area of quadrilaterals and circles.
5. Review how to use a compass.
6. Pass out several different land plots with tables and compasses.
7. Students are given the following task: "Design a center pivot irrigation system that utilizes the maximum amount of land area possible." Parameters: Circles must be fully in the land area. Circles can be different sizes. Parts of circles can be used as long as you can find the area.
8. As students are working, the teacher should be walking around the classroom observing each design. This is a good opportunity to discuss with students the reasoning behind their designs. Since the center pivot irrigation systems can be programmed to water a fraction of a circle, students should not be held to only complete circles in their design.

Data Analysis/ Results

1. What is the total land area of your plot? How much land area will be dedicated to the center pivot irrigation system?
2. Is this the most effective design? Why or why not?
3. Are there other possible designs that will provide the same amount of area?

Conclusion / Questions

1. What were the challenges in developing your center pivot irrigation system?
2. How did you determine where to place the circles and their sizes?

References

Google Images
This site provides many different images of "alien" and farming crop circles.
http://images.google.com/

Texas Agricultural Extension Service
Provides information on the center pivot irrigation system for consumers and educators.
http://itc.tamu.edu/documents/extensionpubs/B6096.pdf

Living History Farm
Describes the history of the center pivot irrigation system.
http://www.livinghistoryfarm.org/farminginthe50s/water_03.html

MathScience Innovation Center
Information on educational programs available to students, teachers and school divisions and procedures for registering for programs.
http://msinnovation.info

