

Fencing Frenzy

Students are presented with the problem of creating an electric circuit that they must position using a compass. To solve this problem, students will apply the concepts they have learned about electricity and Earth's magnetism.

◆ Expected Outcome

Students will construct an electric circuit in the shape of a square with a light bulb at each corner. The square should be about 50 cm on each side. A battery will be used to power the circuit. A switch will be installed on one side to turn the circuit on and off. You will have previously marked the location of the southern corner of the circuit on a piece of poster board. Students should use a compass and the location of this corner to position their circuit. Circuits should be taped to the poster board to keep the model in the correct position.

◆ Content Assessed

The Performance Assessment tests students' understanding of Earth's magnetism and electric circuits.

◆ Skills Assessed

making models, applying concepts

◆ Materials

- ◆ Provide students with the following materials for making their circuits: 3 electrical wires 50 cm in length, 2 electrical wires 25 cm in length, 4 small light bulbs, 4 light bulb sockets, a switch, and a 6-V battery.
- ◆ Provide students with the following materials for positioning their circuits: a compass, a ruler, masking tape, and a piece of poster board.

◆ Advance Preparation

- ◆ Use wire cutters and a ruler to cut wires to the correct lengths. Remove the insulation from the ends of the wires with wire strippers.
- ◆ Draw an "X" on the poster board to represent the southern corner of the circuit. Make sure that you position the "X" so that students' circuits will fit on the poster board when they are correctly positioned.

◆ Time

40 minutes

◆ Safety

Remind students not to touch the bare ends of wires in an electric circuit. Make sure that students' work areas are dry and that they don't leave their battery connected to the circuit for longer than a few seconds at a time.

◆ Monitoring the Task

- ◆ Demonstrate for students how to position their poster board with respect to the classroom. For example, you might mark true north on the chalkboard, then have students align the northern corner marked on their posterboards with this marking. Walk around the classroom during the Performance Assessment to make sure that students keep their posters aligned.
- ◆ Demonstrate how to connect wires to a light bulb socket.



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In assessing students' performance, use the following rubric.

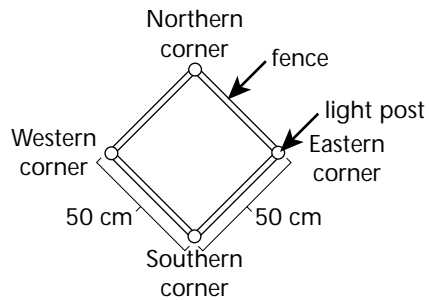
	4	3	2	1
Making and Positioning the Model	Student constructs a working electric circuit. The circuit is in the shape of a square with a light bulb at each corner. Student has used a compass to determine the direction of magnetic north and has used this information to correctly position the model on the poster board.	Student constructs a working electric circuit. The circuit is in the shape of a square with a light bulb at each corner. Student has used a compass to determine the direction of magnetic north. However, student uses the marked corner on the poster board to position either the southwestern or southeastern corner of the model instead of the southern corner (i.e., the model is incorrectly positioned by about 45°).	Student constructs a working electric circuit. The circuit is four-sided with a light bulb at each corner. Student has used a compass to determine the direction of magnetic north. However, student uses the marked corner on the poster board to position the northern corner of the model instead of the southern corner (i.e., the model is incorrectly positioned by about 180°).	Student fails to construct a working electric circuit and, as a result, the bulbs do not light. Student does not use the compass to determine the direction of magnetic north. Instead, student simply positions the model with respect to the top edge of the poster board.
Concept Understanding	Student demonstrates a mastery of concepts related to electric circuits and Earth's magnetic field.	Student demonstrates an adequate understanding of concepts related to electric circuits and Earth's magnetic field.	Student demonstrates only a partial understanding of concepts related to electric circuits and Earth's magnetic field.	Student demonstrates a minimal understanding of concepts related to electric circuits and Earth's magnetic field.



PERFORMANCE ASSESSMENT

Fencing Frenzy

You have recently purchased a square section of land in the country. You want to build a fence around your property with a lightpost at each corner.



◆ Problem

How can you make a working model of your fence? How can you use Earth's magnetic field to position your model?

◆ Suggested Materials

compass	3 wires 50 cm in length	6-V battery	switch
4 small light bulbs	2 wires 25 cm in length	ruler	
4 sockets	masking tape	poster board	

◆ Devise a Plan

1. Study the materials and determine how you could use them to make an electric circuit in the shape of a square with a light bulb at each corner. One side of the square should have a switch installed to allow you to turn the circuit on and off. The square should be about 50 cm on each side.
2. The position of the southern corner of your property will be marked on the poster board with an "X." Use your compass to decide how to position your model.
3. Build and test your model. Use masking tape to hold the pieces of the circuit in the correct positions on the poster board.

◆ Analyze and Conclude

After following the plan you devised, answer the following questions on a separate sheet of paper.

1. How did you use the compass to position your model?
2. Why is it important not to have an electric circuit nearby when positioning your model?
3. A neighbor tells you that you have included part of his land inside your fence. What might be the source of your mistake? (*Hint: Consider magnetic declination.*)

