Solar Car Circles

Overview: Students will test solar cars using the 16 compass points to see how angle of the sun affects the velocity of the car.

TEKS:

Math: 6.2C, 6.4AB, 6.6C, 6.8B, 6.10D, 6.1A, 6.12A, 6.13, 7.2BD, 7.4AB, 7.9, 7.13A, 7.14, 8.2AB, 8.5AB, 8.14A, 8.15A

Science: 6.1A, 6.2ABCDE, 64A, 6.6A, 7.1A, 7.2ABCDE, 7.4AB, 7.13A, 7.14C, 8.1A, 8.2ABCDE, 8.4AB, 8.5ABC, 8.7A

Social Studies: 6.3, 6.21BCF, 6.22A, 7.21BCH, 7.22A, 8.30BCH, 8.31A

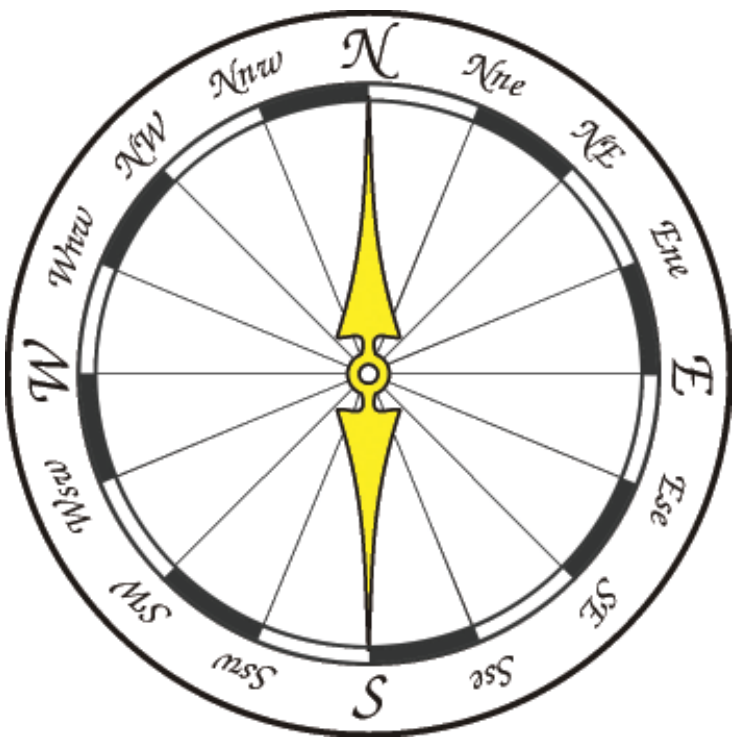
Materials: a completely built solar car, 3 meter length of string, chalk, compass, stop watch, parking lot or other large area in the sun, a sunny day

Time: one hour

Vocabulary: diameter, circumference, compass headings, time, distance, velocity, photovoltaic cell

Activity:

Draw a six meter diameter circle by attaching the string to the chalk and having one student stand in the center and hold the string, while the other holds the chalk and rotates around the center, keeping the string parallel to the ground.



Have the students mark the compass headings North, South, East and West as well as NE, NNE, ENE, ESE, SE, SSE, NNW, NW, WNW, SSW, WSW, and SW. Have the students write in the compass degrees next to these headings as well. Now draw a line across the circle to attach opposite headings (from North to South and so on). This will give the students a true line to follow when testing the car.

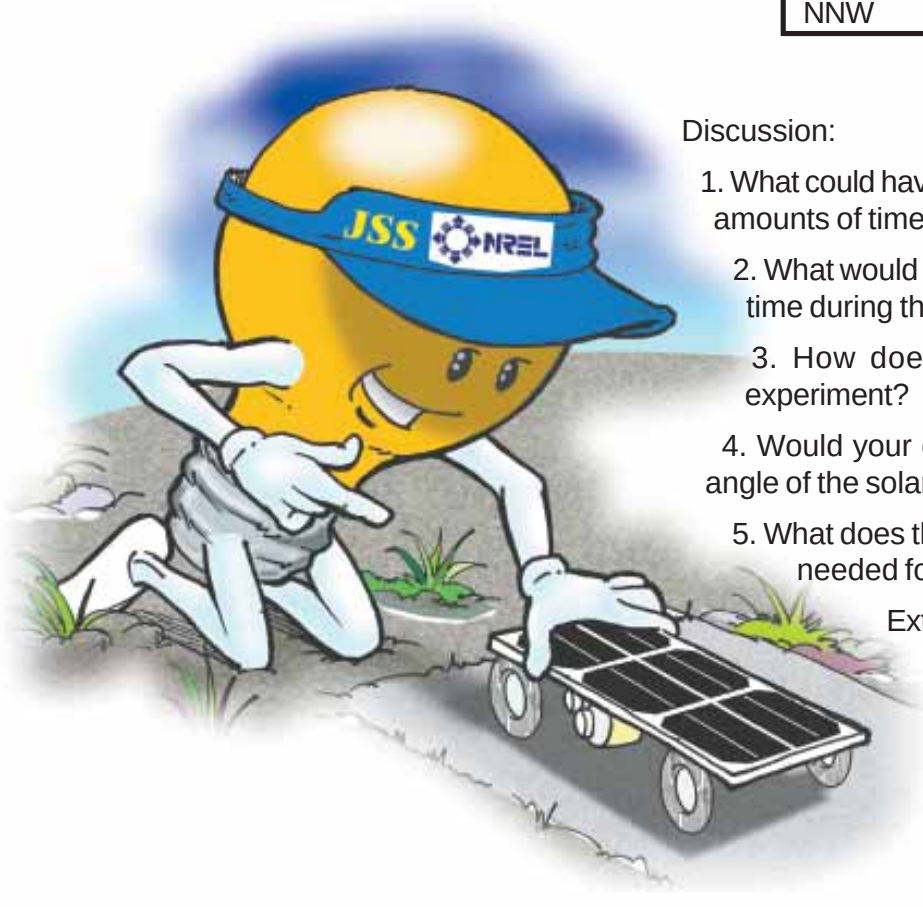
In teams of two (one to release the car and one to run the stopwatch), have the students place the car outside the circle. The student with the stopwatch will start it when the car enters the circle and stop the watch when it exits the circle. (You may want to have a "catch group" of students to stop the runaway solar cars once they are on the outside of the circle.) Record the time in the chart.

Continue around the circle until you have recordings of all the compass headings. If you are working with one car, you could have different groups of students take the data at each compass heading. If all students are testing their cars, you may want to have several circles running simultaneously.

When all the times have been recorded, your students can find the average velocity of the solar cars by dividing the distance in meters by time in seconds (average velocity = distance /time).

COMPASS HEADING	COMPASS DEGREES	TIME IN SECONDS	VELOCITY
N			
NNE			
NE			
ENE			
E			
ESE			
SE			
SSE			
S			
SSW			
SW			
WSW			
W			
WNW			
NW			
NNW			

"...Since the Arab oil embargo in 1973, the United States has gotten more than four times as much new energy from savings as from all net expansions of domestic energy supplies put together. The millions of little things people did to weatherize houses, get more efficient cars, plug up steam leaks, etc., plus some changes in economic structure, yielded four times as many additional BTUs as did the net increase in supply from all new American oil and gas wells, coal mines, and power plants built in the same period. Renewable sources provided a third of all the new supplies."
Rocky Mountain Institute
www.rmi.org



Discussion:

1. What could have caused the car to cross the circle in different amounts of time over the same distance?
2. What would change if we did the experiment at a different time during the day?
3. How does your location on the globe affect this experiment?
4. Would your car go faster or slower if you increased the angle of the solar cell?
5. What does this experiment tell us about the configuration needed for a solar array on a house?

Extension:

Repeat the experiment at different times during the day. Have each student group use a different angle for their solar cell and compare times.