# Light and Angle

Driving Question

How does the angle of the sun’s light affect the light intensity?

Materials and Equipment

|  |  |
| --- | --- |
| * Data collection system | * Ruler |
| * Wireless Light sensor | * Flashlight (or similar light source) |
| * Protractor | * Tape or Rubber bands |

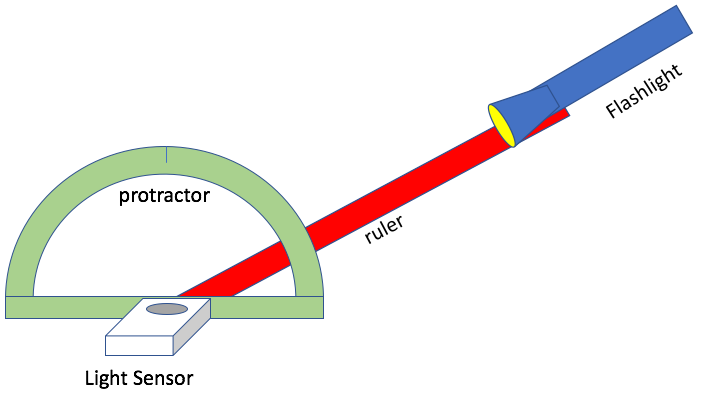
Background

As the earth moves throughout the day, the angle that the sunlight strikes the earth also changes. Sunlight intensity can affect power output of a solar cell. To be most effective, solar cells need to be positioned at a direction and angle so they collect the highest intensity of light for the longest amount of time.

Procedure

1. Be certain that the Light sensor is connected by Bluetooth (flashing green) and that the SPARKvue software is open in a table format with Time (s) in Column 1 and Illuminance (lux) in Column 2.

2. Use tape or rubber bands to attach the flashlight to the ruler so the light source is at about the 6-inch mark.

3. Lay the light sensor on the desk so the Ambient detector is facing upward.

You may want to darken the room for the experiment to limit background light.

4. Start Data collection – with green arrow button on software.

5. Start with one end of the ruler on the table near the light sensor, use the protractor to hold the light source at about 10o from the table.

6. Keep the value (with the check mark).

7. Repeat steps 7-8 in 10o increments until you reach 170o.

8. Press the stop button. Record the light illuminance at each 10o increment in the table below.

|  |  |
| --- | --- |
| Angle  (degrees o) | Light illuminance  (lux) |
| 10 |  |
| 20 |  |
| 30 |  |
| 40 |  |
| 50 |  |
| 60 |  |
| 70 |  |
| 80 |  |
| 90 |  |
| 100 |  |
| 110 |  |
| 120 |  |
| 130 |  |
| 140 |  |
| 150 |  |
| 160 |  |
| 170 |  |

Questions

* 1. According to your data, what is the best angle to measure the highest intensity of light?
* 2. Astronomers on earth can set up their instruments to track objects as they move across the sky. For example, during an eclipse, they could point a sensor at the sun and have it mounted to a telescope with an electric motor that follows the sun. Why do you think this is important to make meaningful measurements?
* 3. If you were setting up solar cells on a house in the northern hemisphere, would it be more efficient to have the solar cells on the part of the roof that faces north (away from the sun) or on the part of the roof that faces south (towards the sun)? Explain your answer.
* 4. What is the meaning of the unit lux?
* 5. Use the glossary in the book, *Go See The Eclipse and Take a Kid with You*, to determine the meaning of Altitude. Examine the charts 102-104. Just prior to totality will the sun’s rays be stronger on the West Coast or the East Coast? How do you know?
* 6. What will be the altitude of the sun in Tennessee at the end of the Total Eclipse? 

Use these digits to open your next lock.