

Experiment M-5 360 Degrees of Light



Objectives

- To learn about the main points of a compass.
- To investigate how light intensity changes at varying directional points during different times of the day.

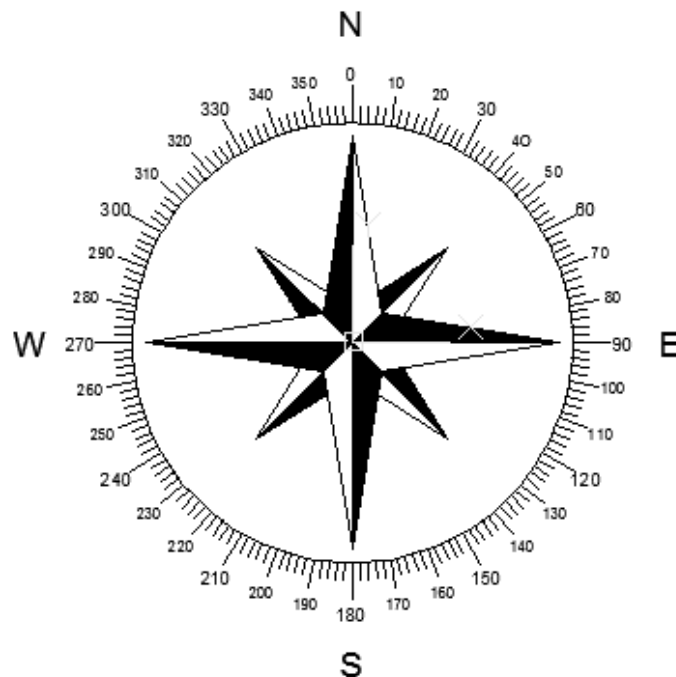
Modules and Sensors

- PANDA-1 Panda Multi-sensor 

Introduction

A compass is an instrument containing a magnetized pointer that shows the direction of magnetic north and bearings from it.

The four cardinal points are all 90 degrees apart, with East being at 90 degrees, South at 180 degrees, West at 270 degrees, and North at 360 degrees (or 0 degrees). Identifying the degrees by 45 degree increments gives us the eight points of direction: North (0 or 360 degrees), North East (45 degrees), East (90 degrees), South East (135 degrees), South (180 degrees), South West (225 degrees), West (270 degrees), and North West (315 degrees).



At any given moment, we are all moving at a speed of about 1,674 kilometers an hour, thanks to the Earth's rotation. The Earth's rotation is the amount of time that it takes to rotate once on its axis. This is accomplished once a day – i.e. every 24 hours. This is the amount of time it takes the Sun to “return” to the same spot in the sky.

Most people think that the Sun “rises in the east and sets in the west.” However, they don't realize that this is a generalization. Actually, the Sun only rises due east and sets due west on 2 days of the year, the spring and fall equinoxes!

Each day the rising and setting points change slightly. At the summer solstice (the onset of summer), the Sun rises as far to the northeast as it ever does, and sets as far to the northwest. Every day after that, the Sun rises a tiny bit further south.

At the fall equinox, the Sun rises on the east point and sets on the west point. It continues on its journey southward until, at the winter solstice (the onset of winter), the Sun rises as far to the south as it ever does, and sets as far to the southwest.











In this activity, you will measure the light intensity outdoors at 360 degrees using the internal light and magnetic field sensors. This will be done at different times of the day and, if possible, at different times of the year.


Procedure

Experiment setup

1. Pick the hours of the day you plan to measure the light intensity (along with the degrees). It is best to spread the time of measuring throughout the day. Also choose a day that is not cloudy.
2. For the first measurement, go outside with the Panda to a place with the least amount of buildings or things that can affect the readings as possible. Also keep the panda away from metals and electronic devices.

Settings


3. Press on the **Sound sensor** icon  on the top left of the screen.
4. Use the arrows   to select the light sensor.
5. Press on the “lx” button on the top right of the screen.
6. Press on the **0-240000 lx** button.
7. Press on the **Back** icon .
8. Press on the **Light sensor** icon .
9. Use the arrows   to select the magnetic field (“magnetic”) sensor.
10. Press on the **Range** icon on the top right of the screen.
11. Press on the **Angle** button.
12. Click on the **Record** icon .
13. Set the duration of 30 seconds using the arrows  .

14. Press on the **Add sensor** icon  on the top right of the screen.
15. Select the light sensor.

Testing and measurements

16. Point the sensor horizontal to the ground. The measuring part is on the upper side of the panda (next to the icons).



17. Click on the **Record** icon  to start the measurement.
18. Immediately turn around slowly until the 30 seconds are over and the experiment is finished.

19. This experiment was conducted at 3 pm in the beginning of August. Notice that red lines were added on the photo to show the degree in which the light intensity was the highest.



20. We can see that on the sample experiment, the highest light intensity was at slightly above 270 degrees, probably around 290 degrees (In order to see the exact value, you can use the Panda application to upload the experiment and put the cursor on the graph). This consists with the introduction data because in summer the sunset will be between North West and West.

21. Proceed with your experiment throughout the day and fill the following table:

Date: _____

Time of day	Degree in which light intensity was the highest	Which direction fits to this degree according to the figure in the introduction.

22. If possible, conduct this experiment again during a different time of year.

Date: _____

Time of day	Degree in which light intensity was the highest	Which direction fits to this degree according to the figure in the introduction.

Summary questions

- Analyze your results in terms of: sunrise, sunset, solar noon and their directions according to the figure in the introduction.
- Do your results fit to what you expected according to the time of year? Explain.