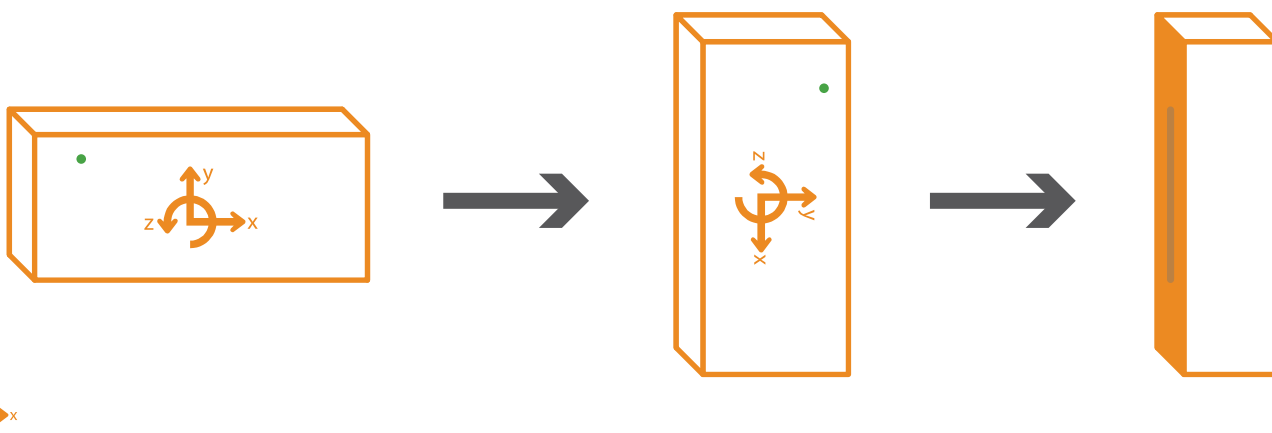




Angular Rotation Game

Exploration

Angular velocity is the rate of rotation of an object along a specific axes. For example, the blades of a ceiling fan rotate around the fan's central axis. Angular velocity is often measured in the number of degrees the object rotates every second ($^{\circ}/\text{sec}$) or the number of complete revolutions every minute (RPM). The PocketLab's gyroscope measures the angular velocity of the PocketLab about the x-, y-, and z-axis.



Materials

- PocketLab
- At least 2 people.

Objective

In this experiment students will:

1. Explore how the rotation of an object along three different axes can be represented graphically
2. Determine how the x-, y-, and z-axis are oriented on the PocketLab.

Method

1. One person gets the PocketLab, the other gets the graph.
2. The person with the graph cannot look at the PocketLab the entire time.
3. The person with the PocketLab must lay the PocketLab flat on a desk so all three-axes in the angular velocity graph read zero.
4. The person with the PocketLab gets three rotations. They must rotate the PocketLab half a rotation, three distinct times. The PocketLab will only be rotated about one axis at a time.
5. The person with the graph collects the data during the rotations, but cannot look at the PocketLab. When all three rotations are done, the person with the graph will predict the final orientation of the PocketLab. If the person's prediction is accurate, he/she receives three points, one for each rotation.
6. Switch roles with the partner and play again. After each round, decide whether to increase the number of rotations to add points to each round.

Data Analysis and Observations/Conclusions:

- Explain how angular rotation is graphed. How does the graph account for the speed of the rotation? How does the graph account for the direction of the rotation?
- Would this game be harder if you could move PocketLab about more than one axis at a time? Why? What would the graph look like?
- For what real world scenarios could measurements of angular velocity be useful? Explain.
- Draw three graphs showing the angular rotation of an object about all three axes. After drawing the graph, explain how the object is rotating.

