Curiosity Guide #303
Momentum

Accompanies Curious Crew, Season 3, Episode 3 (#303)

C D Spinners

Investigation #8

Description

Observe what happens to a spinning disc when mass is distributed in different ways.

Materials

- 2 or more C D discs
- 2 or more sharpened pencils
- Clay
- Tape or hot glue
- Pennies
- Black permanent marker
- Stopwatch

Procedure

1) Draw a heavy, single black line on one surface of each disc from the center of the disc to its edge.
2) Press two lumps of clay flat so that the lumps span and cover both the sides of the center hole in the disc.
3) Tape or hot-glue pennies on the top side of the disc in different patterns. Prepare at least one spinner with pennies spaced around the center of the disc and another with the pennies spaced around the outer edge.
4) Insert the pencil so the pencil penetrates through both sides of the clay and sticks about an inch under the disc.

5) Try gripping and spinning the pencil top so that it spins on the point.
6) Count how many rotations you can see by watching the black line.
7) Spin each disc for the same number of seconds and compare which one spins faster.
8) What do you notice?

My Results

Explanation

When objects are rotating, the objects are said to have angular momentum. The objects will continue to rotate with constant angular momentum unless another force acts on the system. Angular momentum is the product of angular velocity, which is the number of rotations per second, and the moment of inertia. The moment of inertia includes both the mass of the object, as well as how the mass is distributed. When the mass is further away from the object's center, like the pennies attached near the edge of the disc, the disc will rotate more slowly. When the mass is more centrally located, like the pennies attached near the center of the disc, the disc will spin faster. Angular momentum is conserved as well. This means that if the moment of inertia increases and the mass moves away from the center, then the

velocity decreases. If the moment of inertia decreases, the velocity increases. This is visible when an ice skater brings the arms in toward the body to spin more quickly or opens the arms up to slow the spin down.

Investigate further: You may want to use the internet to find photos or video clips of spinning skaters.

Have you ever seen a skater spin really fast on ice? The skater is taking advantage of the Law of Angular Momentum! You see when something rotates, it has velocity, which can change depending on how the mass of that object is distributed. When the skater starts to spin, he or she gradually brings the arms closer to the body. The closer the arms are to the skater's body, the faster the velocity. By opening the arms, the skater can slow down again. Angular momentum is fun to watch, but it sure can get you dizzy!

Parents and Educators: use #CuriousCrew #CuriosityGuide to share what your Curious Crew learned!

Curious Crew is a production of Michigan State University.
Learn more at WKAR.org.
© MSU Board of Trustees. All rights reserved.