Curiosity Guide #302
Sound Resonance

Accompanies Curious Crew, Season 3, Episode 2 (#302)

Powerful Pendulums

Investigation #5

Description

Learn more about resonance while having fun with a pendulum you make yourself!

Materials

- Empty magnetic paint can
- Sand
- Rope
- Ceramic ring magnet
- String, at least 10 feet in length

Procedure

1) Fill the paint can with sand to increase its mass.
2) Put the lid on the can.
3) Tie a rope around the can.
4) Suspend the can from an object, like the top of a swing set.
5) Cut a 10-foot length of string. Tie it to the ceramic magnet.
6) Stand several feet away from the suspended can and toss the magnet toward the can.
7) If the magnet hits the can, pull very gently, so as not to pull the magnet off.
8) Let the can swing away and gently pull as the can is swinging toward you.
9) How high can you get the can to swing with your gentle pulls?

10) What would happen if a person were standing perpendicular to the swing and gently pulling his or her own magnet with a string?

My Results

Explanation

Pendulums swing at a natural frequency. When a small force is added and timed to match the existing force, the additional force amplifies the motion of the object. This is referred to as resonance. Consider swinging on a swing. As the rider pumps his or her legs, the pumping motion adds energy to the direction of the swing, making the swinging motion increasingly larger, or having greater amplitude.

Think about it: Do you like swinging on a swing? Well, if it weren't for resonance, swinging wouldn't be nearly so much fun. You see, when you swing on a swing, each little push adds to the direction. If the pushes are timed with the swing already happening, those little pushes combine to make an even bigger motion. That is resonance. What would happen if you pushed at the wrong time? The swing would stop. Do you remember learning to pump your legs on the swing? By timing your leanback and the movement of your own legs, you can get going really high on the swings! You have to love resonance!

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