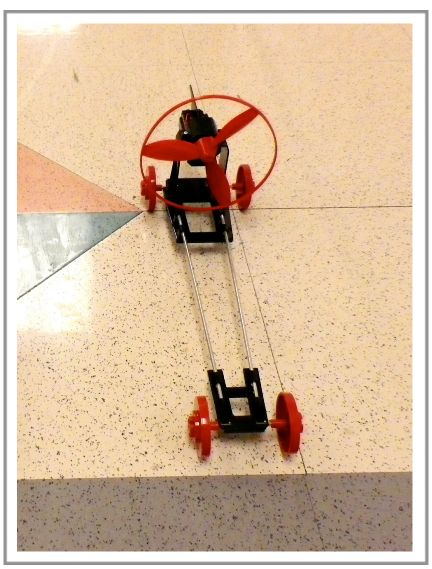
Force & Motion

An overview of the activities in the kit

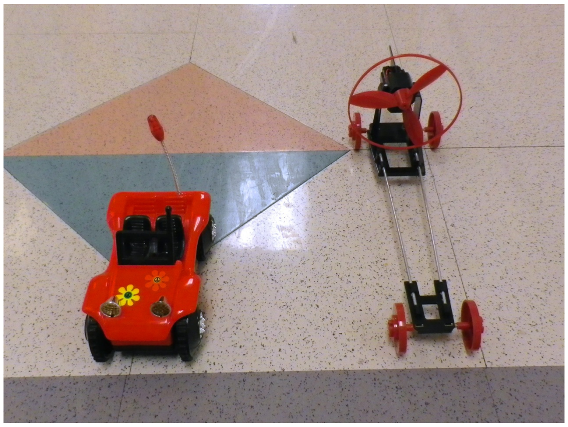
Describing Motion

The first step toward *understanding* something is to *describe* it. In this sequence of activities, your students will learn how to use words like position and speed, and to consider changes in both.

Tumble Buggy	Overview
	The tumble buggy does one thing, and it does it well: It moves at a *constant* speed. Students can observe the motion by marking successive positions with a Bingo marker. The buggy will switch direction when it hits a wall, an important change to consider.

Propeller Racer	Overview
	The tumble buggy moves at a constant speed. The propeller car moves with a *constantly changing* speed, as students will discover by marking successive positions with a bingo marker. The fact that the speed keeps changing is quite a surprise to most folks!

Who Wins the Race?



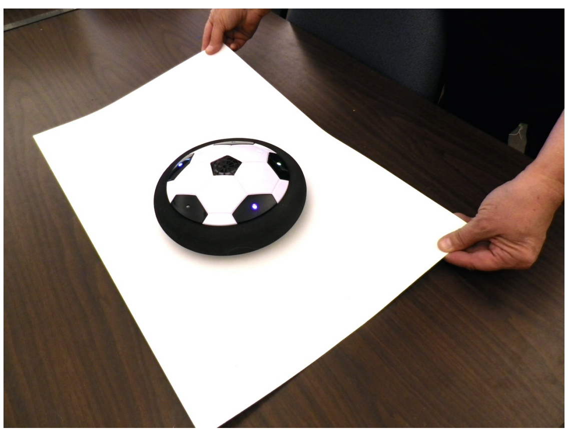
Overview

In a race between a vehicle with a constant speed, and one with a constantly increasing speed, who wins? Interesting question for your students to ponder! The net result: It depends on the length of the race!

Newton's Laws

Once we've described motion, we can talk about what *causes* motion: Forces. Describing how forces affect motion is the job of Newton's Laws.

Forces, Friction & Floating



Overview

Newton's first law tells us that an object in motion will remain in motion, an object at rest will remain at rest unless there is a force acting on it. The puck rests on a cushion of air, so the usual friction force doesn't apply.

Starting and Stopping

Overview

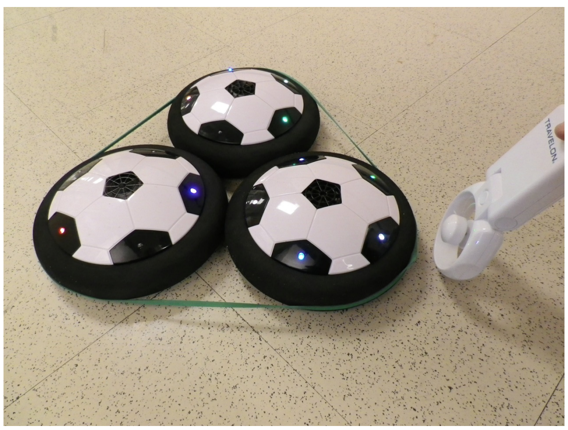
You can get a puck moving by pushing on it with a fan. But the surprise comes when it's time for the fan to stop. How do you use the fan to bring the puck to rest?

Turning Corners

Overview

This is a kinesthetic activity that's designed to let your students explore the connection between force and motion. How do you need to push to have a puck follow a course?

More Mass Means Less Motion



Overview

The fans push on the pucks with a steady force. What happens when you increase the mass that you push on? More mass means slower changes in motion. The pucks will move, but it will take more time for them to get up to speed.

Pulling a Car

Overview

The mass of a car is pretty large—certainly 40 times that of the teacher in the photo. But her small, steady force slowly but surely gets the car moving. The key is this: All she needs to do is overcome the (relatively) small friction force that is slowing the car down. Her forward force exceeds this. There's a small net forward force, and the speed slowly, slowly changes. This is a dramatic demonstration!

Objects and Agents

You can’t push yourself. If you start moving, there must be something outside of you that brings this change about. We finish this series of investigations with a number of demonstrations of this principle.

You Can’t Push Yourself

Overview

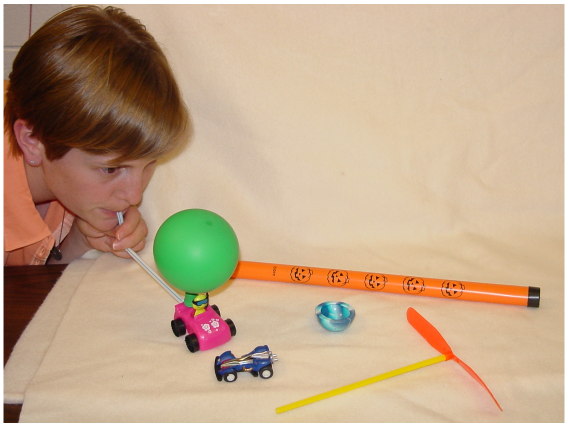
The hovercraft rides on a cushion of air; there’s very little friction. Once it’s in motion it will stay in motion. But getting it moving requires an agent... Something to push or pull! If your student sits on the hovercraft and tries to move by rocking back and forth, not much happens! If he or she pushes on the floor, the floor pushes back, and that’s what causes the motion!

Small Forces, Big Changes

Overview

The string of pop beads provides a very small pulling force. But, just as for pulling the car, it slowly and steadily gets the hovercraft (and the student riding!) up to speed.

What is Pushing? What is Pulling?



Overview

Your students will work with a few simple toys (and you can use others as well!) to answer these questions: What is pushing? What is pulling? The toy is the object... What is the agent?

Friction Tug of War

Overview

When you play tug of war, you are really the object. The agents—the things that pull on you—are the rope and the floor. The floor pulls on you with friction. And if you are wearing bags on your feet... The rope wins, and you lose!

Updates

We regularly update the detailed documents for the activities described above. You can get updated versions at the Little Shop web site:

http://littleshop.physics.colostate.edu/fnm