Newton's laws of motion

In the final example of the last section, we saw how we could calculate a dynamic acceleration based on a vector pointing from a circle on the screen to the mouse location. The resulting motion resembled a magnetic attraction between circle and mouse, as if some force were pulling the circle in towards the mouse. In this section, we will formalize our understanding of the concept of a force and its relationship to acceleration. Our goal, by the end of this, is to understand how to make multiple objects move around the screen and respond to a variety of environmental forces.

Before we begin examining the practical realities of simulating forces in code, let's take a conceptual look at what it means to be a force in the real world. Just like the word "vector," "force" is often used to mean a variety of things. It can indicate a powerful intensity, as in "She pushed the boulder with great force" or "He spoke forcefully." The definition of *force* that we care about is much more formal and comes from Isaac Newton's laws of motion:

<div class="callout">

A force is a vector that causes an object with mass to accelerate.

</div>

The good news here is that we recognize the first part of the definition: *a force is a vector*. Thank goodness we just spent a whole section learning what a vector is and how to program with `PVector`s!

Let's look at Newton's three laws of motion in relation to the concept of a force.