Newton’s second law states that the acceleration of an object equals the net force acting on the object over the object’s mass.

Acceleration is what causes an object’s velocity to change over time. Which means the object will speed up, slow down, or change direction.

(show force equation and acceleration)

Here are the equations for both the net force (F-net), and acceleration (A). Where mass is kilograms (kg), distance is meters (m), and time is seconds (s).

As you can see, the more mass an object has, the less it will accelerate from the net force.

(hide equation) (hide title)

(show axis: force, acceleration, velocity)

Note that: force, acceleration, and velocity are all vectors. This means that they have a direction, and a magnitude.

A vector is composed of a value for each axis. In our case, the x and y values. These values can also tell us the direction, and the magnitude (for example: speed).

(hide axis)

(knight enters)

A brave sir knight has brought us a wheel to demonstrate. The wheel is enchanted with magical trails to allow us to observe its motion.

(Show as pop-up pointing to LAUNCH button:)  
Press LAUNCH to begin.

(wait to finish)

(display highlight on the trail during push)

Observe how each trail’s distance starts to increase around this area. This shows us the force being applied to the wheel.

(hide highlight)

(display highlight on the trail after push, and before the cliff)

Around here, the distance between each trail is the same. This tells us that the net force on the wheel equals zero.

(hide highlight)

(display highlight around the fall area)

At this point the trails are going down. We can observe that the only force acting on the wheel is the gravity.

(hide highlight)

(enable graph button, show pop-up on it:)  
Press this button to show the graph of the position, velocity, and acceleration of the wheel.

(wait for graph to close)

(enable interfaces)

(show knight again)

(show goblins)

The nefarious goblins have appeared out of thin air! They are surely up to no good. Get rid of them by using the wheel!