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## Lab 4: Forces

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### Background Information:

Sir Isaac Newton proposed three laws to describe motion in the 17<sup>th</sup> century and we can still use them today to describe the motion we see in the world around us. These three laws work together to describe situations we encounter every day, from a cup sitting on a table to an athlete running around a race track. Following are Newton's three laws:

1. Objects in motion will stay in motion and objects at rest will stay at rest, unless acted upon by a net force.
2. Force is equal to mass times acceleration.
3. For every force, there is an equal and opposite force.

### Activity 1: Drop the egg in the cup

#### Safety Precautions:

- None

#### Materials:

- 1 dozen eggs
- 3 glasses
- Water
- Metal pie pan
- 3-4 empty toilet paper tubes
- Paper towels

#### Open Inquiry Procedure:

**Time Required:** Approximately 30 minutes.

**Step 1: Hypothesize/Predict:** How can you make an egg fall into a glass of water without touching the egg or the glass? How do Newton's laws determine what will happen and what steps you must take to be successful? Write your ideas in your lab notebook.

**Step 2: Procedure:** Follow the following procedure and record your results.

1. Fill the glass  $\frac{3}{4}$  full of water and place the pie pan on top, right side up. In the center of the pie pan, directly above the center of the glass, place the toilet paper tube vertically and lay the egg sideways on top of the toilet paper tube.

2. Find a way to get the egg to drop directly into the glass below, but you may only touch the pie pan. Once you achieve this (and have cleaned up the mess), attempt to improve upon this by dropping 2-3 eggs into 2-3 glasses at the same time (you may need to upgrade to something larger than a pie pan) or use a longer tube, like a paper towel tube, and get the egg into the glass. If possible, use a device to record a video of your success which will be turned in with the lab.

**Step 3: Analyze:** Using Newton's three laws, describe how the trick was accomplished. Be sure to use all three laws and explain how they all affect the motion of the egg. Also describe which laws were the cause of any failures you had in getting the egg into the glass before your first success.