

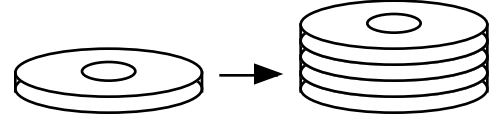
Name \_\_\_\_\_

## Newton's First Law of Motion

What is Newton's First Law of Motion?

### Part A: Wacky Washers

To prepare for this experiment, stack 4 washers one on top of the other so that you form a tower of washers. Place the stack of washers on top of your textbook or on the floor so that you have a smooth, slick surface.



Aim one washer at the bottom of the stack of four washers and give it a good hard flick with your finger or hand. What happens?

Flick a stack of two washers into a stack of four washers. What happens?

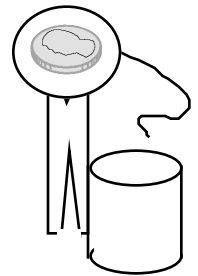
Flick a stack of four washers into a stack of four washers. What happens?

Explain your observations in terms of Newton's 1st Law.

### Part B: Tricky Tricks

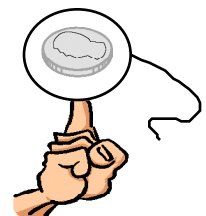
Now that you are an expert at Newton's First Law of Motion, try these tricks. Without inertia, they would not be possible!

Set up the situation shown in the top diagram. The goal is to remove the circle by pulling on the string, but the penny must remain in place on top of the clothespin. Can you do it? Keep trying until you are able to do it!



Try the experiment again using the plain circle (no string). Can you flick the circle out from under the penny and keep the penny on the end of the clothespin? Keep trying until you are able to do it!

Balance the penny on a circle (string or no string) on the tip of your finger as shown in the second diagram. Try to remove the paper circle to leave the penny balanced on your finger. Can you do it?



How does this activity relate to the "pull the tablecloth" trick used by magicians?

Name \_\_\_\_\_

## Newton's Second Law of Motion

What is Newton's Second Law of Motion?

### Newton's Race

**Step 1:** Set up a ramp using meter sticks and several books. Place one end of the ramp on the books and line up the other end with a piece of masking tape on the floor.

**Step 2:** Place the vehicle at the top of your meterstick and roll it down the ramp. Use a meter stick to measure how far the vehicle rolls. Repeat this step for Trials 2 & 3.

**Step 3:** Add five washers to the vehicle and repeat the process from Step 2. Record your measurements in the chart. Be sure all the washers remain on the vehicle! Repeat this step for Trials 2 & 3.

**Step 4:** Add ten washers to the vehicle and repeat the process from Step 2. Record your measurements in the chart. Be sure all the washers remain on the vehicle! Repeat this step for Trials 2 & 3.

# of Washers	Distance (cm)			Average Distance
	Trial 1	Trial 2	Trial 3	
0				
5				
10				

How does increasing mass (adding more washers) affect the force of objects in motion (the distance the vehicle rolls)? Explain your answer using data from the chart.

What would happen if you added fifteen washers to the car? Predict how far the car would roll.

Explain the results of your experiment in terms of Newton's 2nd Law.

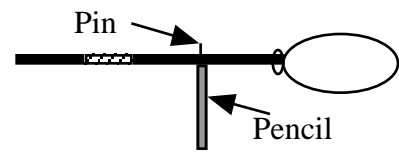
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## Newton's Third Law of Motion

What is Newton's Third Law of Motion?

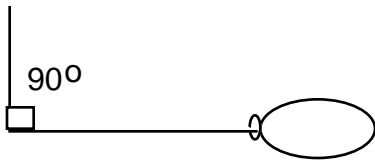
### Balloon Rally

Step 1: Attach a balloon to the end of a flexible straw with tape. Choose the end that is furthest away from the bend.

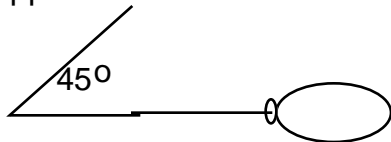


Step 2: Push a straight pin through the straw about halfway between the balloon and the bend in the straw. Fasten the pin in the eraser of a pencil.

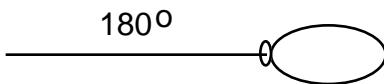
Blow up the balloon and bend your straw to a  $90^\circ$  angle before allowing the air to escape. What happens?



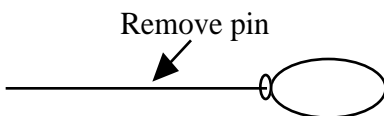
Blow up the balloon and bend your straw to a  $45^\circ$  angle before allowing the air to escape. What happens?



Blow up the balloon, but leave your straw straight ( $180^\circ$  angle). Release the air in the balloon. What happens?



Remove the pin and hold on to the straw as you blow up the balloon. Release the straw. What happens?



Explain your observations in terms of Newton's 3rd Law.