

Simplify  
Science™

# **Lab Activity**

## ***Patterns of Motion***



# Patterns of Motion Lab

## Standards

**3-PS2-2:** Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

*[Clarification Statement: Examples of motion with a predictable pattern could include a child swinging on a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.] [Assessment Boundary: Assessment does not include technical terms such as period and frequency.]*

## Vocabulary

- force: *a push or pull in a particular direction*
- motion: *a change in position based on a force*
- pattern: *a predictable set of motions such as spinning, waves, and forward and down*

## Learning Goal

The student will predict the future motion of the cotton ball, and identifying the pattern of motion from the force on the cotton ball.

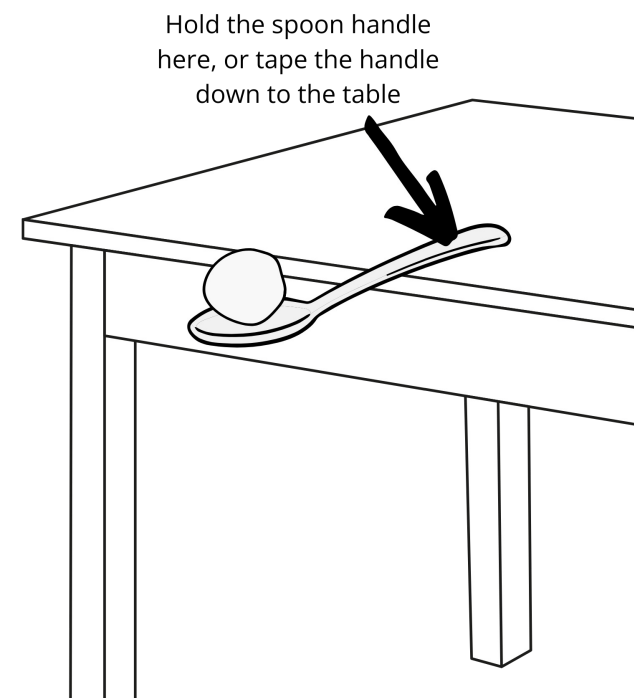
## Success Criteria

- **Criteria 1-** The student observes and identifies a pattern in the motion of the cotton ball based on the amount of force used to flip the spoon.
- **Criteria 2-** The student accurately predicts how the cotton ball will move with a given amount of force.
- **Criteria 3-** The student explains that their prediction is based on the previous motion of the cotton ball.

## Materials

- In addition to a pencil and the lab procedure sheet, each student or group will need:
  - 1 plastic spoon
  - 1 cotton ball

*NOTE: Cotton balls can be substituted with ping pong balls or pom poms.*





# Teacher Directions

## Patterns of Motion Lab

### **Preparing for the Lab**

- Provide each student with a copy of the lab recording sheet (pg. 6). Provide each student (or group) with one spoon and one cotton ball.
- Optional: separate students into partners or groups.

### **During the Lab**

- Explain to students that they will be using their spoons on the edge of the table, spoon side hanging off of the edge of the table, to flip the cotton ball out of the spoon and up into the air. **See pg. 2 for a video of the setup.**
- Ask students to make a hypothesis about how high they expect the cotton ball to fly based on how much force they flip the spoon with. After students write their hypothesis on their lab recording sheet (pg. 6), allow a few students to share their answers and explain their reasoning.
- Show an example flip, and let students take a trial flip with their cotton ball.
- Explain to students that they will be conducting four trials on the cotton ball, flipping it with different amounts of force. Each trial will have a specified amount of force on the lab recording sheet (pg. 6).
- Before each trial, students will need to predict how high the cotton ball will go based on the amount of force used to flip the spoon and record it on the lab recording sheet (pg. 6).
- After each trial, students will record if the cotton ball had a low or high flight out of the spoon on the lab recording sheet (pg. 6).
- Complete the first two trials with the students. Then allow students to complete trials 3 and 4 in pairs (or the identified grouping from previous instruction).
- After the four trials are over, students should answer #3 and #4 determining the pattern of the cotton ball and what they could expect if they continued to perform more trials.

### **Post-Lab Reflection**

- Allow a few students to share their answers to #3 and #4: What was the pattern of the cotton ball's height based on the amount of force applied to the spoon? The answer should be that the higher the amount of force, the higher the cotton ball went up in the air. The lower the amount of force on the cotton ball, the lower the cotton ball flew up in the air. What can you predict about the future motion of the cotton ball if large amounts of force were acting on the spoon? The answer should be that large amounts of force would make the cotton ball fly higher in the air. The students should be able to explain that they know this because in the trials, large amounts of force made the cotton ball fly high, and low amounts of force did not fling the cotton ball very high in the air. The cotton ball would continue the pattern.
- Explain to students that through observation and measurement, data can be used to describe why an object has the motion that it does, and the strength of the force can greatly impact the motion.



# Teacher Script

## Patterns of Motion Lab

### Preparing for the Lab

- "Today we will be using a spoon, a cotton ball, and our lab recording sheet and pencil."
- "You will be working in partners to complete this lab." *[Optional: students can work alone, in pairs, or in groups.]*

### During the lab

- "We will be using our spoons on the edge of the tables to flip cotton balls. In the air, they will follow a parabolic path. Take a look at #1 on your lab recording sheet. How far in the air do you think these cotton balls will fly? Do you think there is anything that will change how far they go in the air? Write down your thinking." *[Give students a few minutes to write their answers. Then, allow a few students to share their answers with the class.]*
- "Let me show you how you will be using your spoons to flip the cotton balls. Now, take a test run of your own." *[Show students how they will use the spoon off of the edge of the table to flip the cotton ball out of the spoon. Allow students to flip their cotton ball up in the air one time.]*
- "You will be conducting 4 different trials on your cotton ball with different amounts of force. Look at #2 on your lab recording sheet. This identifies how hard you will be flipping your spoon in each trial. There is a designated area to write your prediction for how high the cotton ball will fly with that amount of force, and write down the initial motion of the cotton ball after the trial." *[Allow students to look over the lab recording sheet and get familiar with what they will be doing.]*
- "The first trial says that we will be using low force. How do you think the cotton ball will fly low or high up in the air when you barely flip the spoon?" *[Allow students to write their prediction.]*
- "Now, let's try it out! Lightly flip the edge of the spoon to send your cotton ball into the air. How high did the cotton ball fly? Record your observation." *[Allow students to flip their spoon, gather their cotton ball, and record their observation of the cotton ball.]*
- "Next, we are using high amounts of force on the spoon. If we forcefully push down on the spoon to fling the cotton ball, how high do you think it will fly?" *[Allow students to write down their prediction.]*
- "It is time to use high force on the spoon. Push down with force, without breaking the spoon, and let your cotton ball fly. Record your observations." *[Allow students to flip the spoon, gather their cotton ball, and record their observation.]*
- "Complete the next two trials with your partner. Make sure you follow the directions, and use the right amount of force for each trial. Write your predictions and observations on the lab recording sheet." *[Circulate as students are working to monitor for understanding, and to make sure the intended force is being used for each trial.]*
- "When you have completed your trials, please return your spoon and cotton ball, and complete #3 and #4 on your lab recording sheet. Make sure to think about what you have seen during the lab today." *[It is good to have a specified area to collect supplies so that students can focus on completing the next questions.]*



# Teacher Script

## Patterns of Motion Lab

---

### **Post-lab reflection**

- "Let's take a look at question #3. What pattern did you notice with the cotton ball based on the amount of force applied?" *[The answer should be that the cotton ball flew higher with larger amounts of force on the spoon. The cotton ball did not fly as high when low amounts of force were acting on the spoon.]*
- "What could you predict about the future motion of the cotton ball if large amounts of force continued to act on the spoon? How do you know?" *[Students should identify that if large amounts of force were applied to the spoon, the cotton ball would fly high in the air. They should explain that they know this because in the trial large amounts of force made the cotton ball fly high in the air. Low amounts of force did not push the cotton ball very high into the air. The cotton ball would continue the pattern.]*

Sample

Name: \_\_\_\_\_

# Lab Recording Sheet

## Patterns of Motion Lab

1. Make a hypothesis: Will the cotton ball fly the same height with different forces acting on the spoon? Why or why not?

---

---

2. Complete each trial. Make sure to write your prediction (high or low flying) before the trial, and your observation after flipping the spoon.

Trial 1: Low Force
Prediction:
Observation:

Trial 2: High Force
Prediction:
Observation:

Trial 3: Low Force
Prediction:
Observation:

Trial 4: High Force
Prediction:
Observation:

3. What pattern did you notice with the height that the cotton ball flew and how much force was applied to the spoon?

---

---

---

---

4. What do you predict would happen if a large amount of force continued to flip the cotton ball? How do you know?

---

---

---

---

Name: \_\_\_\_\_

# Lab Recording Sheet

## Patterns of Motion Lab

1. Make a hypothesis: Will the cotton ball fly the same height with different forces acting on the spoon? Why or why not?

### Sample Work

I think the cotton ball will fly higher when I push on the spoon with more force because when I throw a ball harder, it goes further.  
When I push on the spoon with less force, it will not go as far, because when I barely throw a ball, it does not go very far.

2. Complete each trial. Make sure to write your prediction (high or low flying) before the trial, and your observation after flipping the spoon.

Trial 1: Low Force
Prediction: I will not fly very high.
Observation: I barely flew off of the spoon.

Trial 2: High Force
Prediction: I will fly high in the air.
Observation: I flew over my head.

Trial 3: Low Force
Prediction: I will not fly very high.
Observation: I flew only a few inches off of the spoon.

Trial 4: High Force
Prediction: I will fly high in the air.
Observation: I flew almost to the ceiling.

3. What pattern did you notice with the height that the cotton ball flew and how much force was applied to the spoon?

When there was more force applied to the spoon, the cotton ball went higher. When there was less force applied to the spoon, the cotton ball went lower.

4. What do you predict would happen if a large amount of force continued to flip the cotton ball? How do you know?

The cotton ball would go very high if large amounts of force were on the spoon. I know this because in the lab, the pattern showed that high force made the cotton ball fly higher, and low force made it fly lower.