

Force & Motion Lesson 1: “The Solve”

Educator’s Resource Guide

The Solve contains two mini lessons: The [live video lesson](#) and the [animation lesson](#). For the most comprehensive learning experience, conduct both. If you’re short on time, choose one. Which lesson?

- For a more structured lesson, choose the animation (the lesson below).
- For a more inquiry-based lesson, choose the live video lesson and assign the animation for homework.

Objective:

In The Solve, students will:

1. Solve a mystery that demonstrates the understanding that even seemingly inexplicable events are governed by natural laws of forces and motion.
2. Create a mind map to explore relationships among complex vocabulary involving Force & Motion.
3. Communicate understanding of Newton’s Laws and how they work.

Time Required: 45-80 minutes

Materials Required	Safety Considerations	Science & Engineering Practices
<ul style="list-style-type: none">• Student Guide (<i>includes student agenda and vocabulary handout</i>)• Newton’s Laws Episode• Computer with speakers• Scissors• Glue or Tape	None	<ul style="list-style-type: none">• Developing and Using Models• Constructing Explanations or Arguments From Evidence

Episode Description:

Strange events have been happening at Newton’s Supermarket, and the customers are fleeing what they now think is a haunted store. Mrs. Newton calls Mosa to help solve the mystery. Through a deep inspection of security camera footage and a series of reenactments, Mosa and her team realize that things aren’t as they seem! In the end, they discover that there are natural laws of forces and motion to blame.



Inquiry Scale: Leveling Information

The Solve can be completed in various settings, including presentation-style, small groups, or individually. In the case of a flipped or blended classroom, it can be completed entirely at home.

Level 1: Most teacher-driven (*recommended for grades 4–5*)

View the animated mystery twice: once in full, and a second time along with the discussion questions, pausing the video as needed to answer the episode questions as a group. Project and complete the Mind Map as a class-wide activity. This can be done digitally or on paper. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 2 (*recommended for grades 5–6*)

View the animated mystery in full. Afterwards, have students work through the episode questions to the best of their ability in small groups. Play the mystery a second time, pausing the video to discuss each question. Direct students to complete the Mind Map in small groups, either digitally or on paper. Come back as a class to review correct answers, as needed. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 3 (*recommended for grades 6–7*)

Provide students with their student URL and have students view the animated mystery in small groups. Have students play the animated mystery once in full and then answer episode questions in their table groups to the best of their ability. Then, as a class, project the mystery, pausing, as needed, to discuss episode questions in a think-pair-share format. Have students complete the Mind Map in table groups, either digitally or on paper. Have students quiz each other on the vocabulary until you feel they're familiar with the terms. In table groups, have students go through the discussion questions on their own, and review answers as a class. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 4 (*recommended for grades 7–8*)

Provide students with their student URL and have students view the animated mystery and complete episode questions in pairs. Have students review their answers with a neighboring table group. Have students complete the Mind Map in pairs, either digitally or on paper. Have students quiz each other on the vocabulary until they feel they're familiar with the terms. Have these same pairs go through the discussion questions. Finally, have students complete the quiz digitally or on paper as an exit ticket.

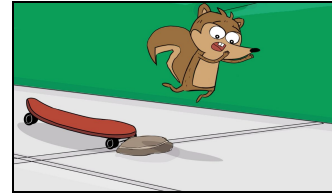
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Agenda

I. Solve the Force & Motion Video Mystery (20 minutes)

Differentiation Tip: The Video Mystery can be viewed as a class, in small groups, individually, or completed for homework. For additional support, students can view the episode twice: once before completing the questions and once with teacher guidance, pausing the video to discuss each answer.

1. Play the animated Mosa Mack Mystery on Newton's Laws.
2. Students answer questions either digitally on the Mosa Mack platform or on paper in the Student Guide as they watch. Encourage students to cite the specific time codes in the episode to promote writing with supporting evidence. Answers can be found in the key below.
3. View the answer video to confirm student understanding.

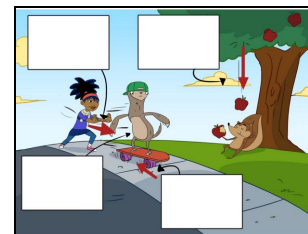
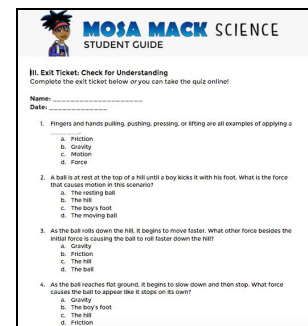
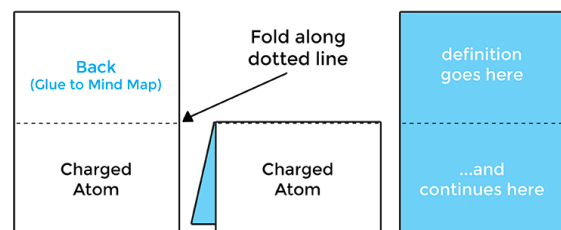


II. Vocabulary Mind Map Activity (15–45 minutes)

Differentiation Tip: The Mind Map can be done as a class, in small groups, individually, or completed for homework. It can be done digitally or on paper.

1. Students may complete the Mind Map **digitally**. Follow directions below. (15 minutes)
 - a. Go to <https://mosamack.com/home/force-motion>
 - b. Select **Lesson 1: The Solve**.
 - c. Select **Vocabulary** and complete **Part 1**: matching terms with definitions.
 - d. Complete **Part 2**: matching terms and definitions with images on a diagram.
2. To complete the Mind Map **on paper**, follow the directions below (45 minutes).
 - a. Print and pass out the Student Guide: Newton's Laws Lesson 1: *The Solve*.
 - b. Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Newton's Laws unit.
 - c. Model the directions carefully, emphasizing the following. Students should:

- **cut** out the vocabulary cards on the solid lines only
- **fold** the cards at the dotted lines
- write the definition of the term on the inside of the card using definitions provided



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- d. Students use the clues from the Mind Map images, definitions, and terms to place the cards in the correct location in the Mind Map.
- e. Check that the students have matched their cards correctly before moving on.
- f. Students use glue or double-sided tape to connect the back of the vocabulary card to the correct place on the Mind Map.
- g. Students discuss the questions with their group or as a class when they have completed the Mind Map.

Teacher Tips:

- Since this is the first time many of the students will have seen these vocabulary terms, have students work together to use the images, definitions, and collaborative thinking to figure out where the terms go.
- Check in on student groups throughout this process. When you see students or groups who have placed their card in the correct place, ask a facilitating question such as, “Why do you think that term goes there?” or, “What evidence leads you to believe that term goes there?” When students explain their thinking, this is a great opportunity to provide positive reinforcement. Then, encourage them to share their reasoning to the class or to other groups who may have trouble identifying the location of that specific term.
- If you do not have access to a color printer, provide students with black and white copies and project the colored Mind Map at the front of the room so that students can reference both images.

III. Exit Ticket: Check for Understanding (10–15 minutes)

Differentiation Tip: This can be done in groups, pairs, individually, or more formally as a quiz online.

1. Students complete the exit ticket to check for understanding. This can be done online by selecting the **Quiz** button in Lesson 1 or on paper in the Student Guide. Answers are in the Answer Key section below.

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Answer Key

Mind Map

Episode Questions Answers

1. Why is Mosa called to Mrs. Newton's Supermarket?

A series of strange events are happening: jars of food are flying off shelves, fruit is collapsing onto the ground and customers think it's haunted!

2. Why did the pickle jar "leap" off the shelf? What did this teach Mosa about what makes things move?

It was accidentally pushed by someone putting an item back on the shelf behind it. Mosa learns that a still object only moves when a force acts upon it.

3. What do you have to apply in order to start or stop an object in motion?

Force

4. When Mosa looks closer at the floor, what does she notice may be acting as the force that stops the shopping cart?

The floor's surface is not smooth. It has tiny bumps! These bumps act as a force called friction that stop the cart.

5. Why did all the oranges collapse onto the floor when only one was removed?

Gravity was acting on the oranges, bringing them to the floor. The only thing that had been keeping the oranges in place was the force of the initial orange, which was then removed by the girl.

6. What has Mosa learned so far about forces and motion based on her supermarket experiments? Fill in the missing information for each statement:

- Objects that are still stay still unless: _____
- Objects moving keep moving until: _____
- Forces that can impact the motion of an object include _____ and _____.

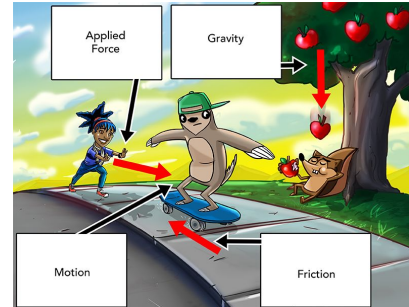
a. Objects that are still stay still unless a force is applied to an object (push or pull).

b. Objects moving keep moving until a force is applied to the object causing it to slow down (friction).

c. Forces that can impact the motion of an object include friction and gravity.

7. What did Mosa figure out? Why did the ketchup boxes fall to the floor?

Things that are still resist moving. The boxes on the hand-truck were still. When Charlie quickly pulled the cart, the boxes resisted moving, so the cart moved out from under them.



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Quiz:

1. Fingers and hands pulling, pushing, pressing, or lifting are all examples of applying a _____.
 - a. Friction
 - b. Gravity
 - c. Motion
 - d. **Force**
2. A ball is at rest at the top of a hill until a boy kicks it with his foot. What is the force that causes motion in this scenario?
 - a. The resting ball
 - b. The hill
 - c. **The boy's foot**
 - d. The moving ball
3. As the ball rolls down the hill, it begins to move faster. What other force besides the initial force is causing the ball to roll faster down the hill?
 - a. **Gravity**
 - b. Friction
 - c. The hill
 - d. The ball
4. As the ball reaches flat ground, it begins to slow down and then stop. What force causes the ball to appear like it stops on its own?
 - a. Gravity
 - b. The boy's foot
 - c. The hill
 - d. **Friction**
5. In the video, Mosa reviews what she has learned. Things that are still stay still and things that are moving stay moving unless a _____ acts upon it. What word works best in the blank?
 - a. friction
 - b. **force**
 - c. gravity
 - d. motion