Forces and Motion

1. Make copies of Student Resource 1.1, *Vocabulary*, and distribute to students. Discuss the definitions with students as the terms come up throughout the section.

2. Ask: **What is a force?** *(a push or a pull)* Lead students to see that force can cause objects to move. Then ask: **Does it take more force to move a book or a desk?** *(a desk)* Point out that it takes more force to move heavy objects than light ones. Explain as needed that heavier objects have more mass than lighter objects.

3. Ask: **How do you know an object is moving?** *(It changes its position over time.)* Discuss with students how they can describe an object’s motion by comparing its position to other objects around it over time. As you walk across the classroom, ask: **How is my position changing?** *(Students may say, for example, that you were near the door and now you are near the window.)*

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**Staying Still**

**Part A**

1. Prediction: What will happen to the penny?
   - Predictions will vary.

2. Circle the picture that shows what happened to the penny.

**Part B**

3. Prediction: What will happen to the tissue?
   - Predictions will vary.

4. Circle the picture that shows what happened to the tissue.

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**Materials**

For the teacher

- *books, text, heavy, about the same size*
- 1 pc. *facial tissue*
- 1 index card
- 1 *penny*
- 1 plastic cup

*Not provided in kit*

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**Objectives**

- Students observe that objects with more mass resist a change in motion more than objects with less mass.
- Students recognize that gravity is a force that makes objects fall to Earth.
1. **Do the stacked books demonstration.**
   Make a stack of six books. Have students predict what will happen to the top books if the bottom book is pulled out quickly. Pull the bottom book out quickly. Point out that the books on top do not move sideways because your sideways force does not act directly on these books. However, the books do fall onto the table because the force of gravity acts on them. Explain that gravity is a force of attraction between objects.

2. **Distribute the Student Resource.**
   Make copies of Student Resource 1.2, *Staying Still,* and distribute to students.

3. **Do the card and penny demonstration.**
   Place the index card on the plastic cup. Place a penny on top of the card. Have students predict what will happen to the penny when you flick the card to the side, out from under the penny. Quickly flick the card to the side with your finger. Have students answer the questions in part A on the Resource page.

4. **Do the card and tissue demonstration.**
   Have students predict what will happen when you put a light object on the card and then flick the card. Replace the penny with a small piece of tissue. Again, flick the card to the side. Have students answer the questions in part B on the Resource page.

5. **Discuss the Resource page.**
   When students have completed the Resource page, discuss the answers as a class. Ask: **Why didn’t the penny move to the side when the card was flicked?** *(The sideways force acted on the card, not the penny.)* Remind students that the heavier the object, the more resistant it is to a change in motion. The penny resisted the sideways motion more than the tissue did because it is heavier.

**Assessment**
Ask: **If the card-flicking activity were done with a dime and a quarter, which coin would be less likely to move sideways?** *(the quarter)* **Why?** *(It is heavier and has more mass.)*
Stay Egg-stra Still

**Objectives**
- Students observe that objects with more mass resist a change in motion more than objects with less mass.
- Students recognize that gravity is a force that makes objects fall to Earth.

**Materials**

*For the teacher*
- 1 aluminum pie tin
- 1 *hard-boiled egg
- 1 *broom
- 1 *cardboard tube (from bathroom tissue)
- 1 plastic jar, wide-mouth
- • *water
  - *Not provided in kit

**Student Resource**
- 1.3 *Stay Egg-stra Still*

**Inquiry Focus**
- • Predict

1. **Distribute the Resource page.**
   Make copies of Student Resource 1.3, *Stay Egg-stra Still,* and distribute to students.

2. **Set up the materials.**
   Set up the materials as shown in the picture. The egg must be centered over the jar of water. The pie tin should hang slightly over the edge of the table.

3. **Students make predictions.**
   Tell students that you are going to hit the pie tin sideways with the broom. Ask them to predict which object(s) will not move sideways when this happens.

4. **Perform the activity.**
   Hold the broom against the table with your hip. Pull back on the stick. Release to hit the pie tin hard with the broomstick. You may want to practice this before class.

5. **Help students draw conclusions.**
   After students have completed their Resource pages, ask: **Why do the pie tin and the cardboard tube move sideways and the egg does not? (The egg has more mass.)** Remind students that the more mass an object has, the more it resists a change in motion.

**Assessment**

Ask: **What force made the egg fall into the water? (gravity)**