

# ORBITS

Prep Time: 45 minutes

Teaching Time: 1.75 hours

## Science Concept:

Gravity and inertia keep planetary bodies in a specific orbit.

## Objectives:

The student will:

- describe and illustrate two of the three forces that keep planetary bodies in a specific orbit; and
- make observations and communicate findings.

## GLEs Addressed:

*Science*

[6] SD4.1 The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by contrasting characteristics of planets and stars (i.e., light reflecting, light emitting, orbiting, orbited, composition).

[6] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

## Vocabulary:

*gravity*- the gravitational attraction of the mass of a heavenly body (as the earth) for bodies at or near its surface

*inertia*- a property of matter by which it remains at rest or in unchanging motion unless acted on by some external force

## Materials:

- Disney Educational Productions. (2003). *The Moon*. [Video recording]. Elk Grove Park, IL: Disney Educational Productions.
- Medium garbage cans (one per group)
- Medium garbage bags (one per group)
- Balls of various sizes, such as softballs, golf balls, ping pong balls, tennis balls, racquet balls, marbles, Styrofoam balls (three to four each)

## Activity Preparation:

Cut a section of garbage bag so that it will completely cover the mouth of the garbage can. Tape the cut piece of garbage bag over the open end of the garbage can, so it is flat and has a little tension. Repeat for each bag and can (one per group).

## Activity Procedure:

### Gear Up

**Process Skills:** *observation, inference, communication*

1. Show a short clip from *The Moon*.
2. Ask students the following questions:
  - a. Where does the moon go in the daytime?
  - b. Why doesn't the moon crash into Earth?
  - c. Why doesn't the moon "fly off into space"?
  - d. What would happen to Earth if the moon did "fly off into space"?

3. Write the vocabulary words on the board, and ask students for definitions of each word. Come to a class consensus on the definition, and invite a student to write the definitions on the board after each word. Do not provide students with the correct definition.

## Explore

### *Process Skills: observation, inference, communication*

4. Divide students into pairs, and ask one student from each pair to retrieve two balls. One ball should be bigger than the other, otherwise any balls may be chosen. Place the larger ball in the middle of the plastic on top of the garbage can. It should make a depression in the plastic. The second ball should be placed on the bag within the depression made by the first ball next to the large ball. One student in each pair should pick up the garbage can and move it in a circle, so the small ball rolls around the larger ball. The smaller ball must stay the same distance away from the larger one and not fly off the plastic. Demonstrate for students, and then provide time for students to explore. Instruct students to record their observations. NOTE: It may be necessary to glue the larger ball down to prevent it from moving.

## Generalize

### *Process Skills: observation, inference, communication*

5. Ask the following questions:
  - a. What happened to the small ball when the garbage can was moved too fast? Compare this answer to the student definition of inertia, and correct the students' definition if needed.
  - b. What happened to the small ball when the garbage can was moved too slowly? Compare this answer to the students' definition of gravity, and correct if needed.
  - c. How do gravity and inertia work in our solar system?

## Apply/Assess

### *Process Skills: observation, inference, communication*

6. Instruct students to write a few paragraphs, or complete a journal entry, describing the two forces that acted on the balls during the exploration activity. Students should include illustrations to clarify their writing.

## Extension Ideas:

### *Process Skills: observation, inference, communication*

1. Repeat the activity using balls of differing sizes and masses.
2. Repeat the activity using two balls to orbit the center one.

<b>Objective</b>	<b>GLE</b>	<b>Emergent</b>	<b>Developing</b>	<b>Proficient</b>	<b>Advanced</b>
The student will describe and illustrate two of the three forces that keep planetary bodies in a specific orbit.	[6] SD4.1	The student states and explains in oral or written form one of the forces acting on a planetary body to keep it in a specific orbit.	The student explains in oral or written form that there are two forces acting on a planetary body to keep it in a specific orbit.	The student states in oral or written form, and illustrates, that gravity and inertia are two forces acting on a planetary body to keep it in a specific orbit, and the student explains how these forces work together to maintain the orbit.	The student predicts, in oral or written form, and illustrates what would happen to the two planetary bodies if either one of the forces was decreased or removed.
The student will make observations and communicate findings.	[6] SA1.1	The student does not make observations or communicate findings.	The student makes observations or communicates findings but does not do both.	The student makes observations of the explore activity and communicates findings during the generalization section of the lesson.	The student makes observations of the explore activity, communicates findings during the generalization section of the lesson, and is able to answer questions related to his or her observations.