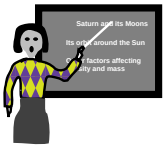
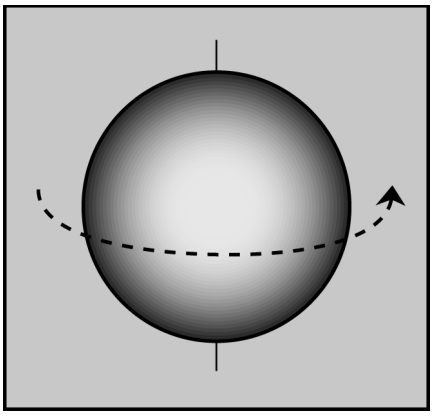
ACTIVITY 3:

DETERMINIMG THE RATE OF ROTATION AND PERIOD OF ROTATION



Guide to Teachers



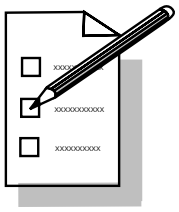
Goal: Students will learn how to determine the rate of rotation and the period of rotation for a sphere with identifiable surface features.

In this activity, students will better understand the concept of rotation by learning how to determine the period of rotation and how to calculate rotation rates, which they will apply to the Sun in the next lesson. It functions as an EXPLORE phase in Solarscapes.

Note: This activity uses a phonograph record turntable with adjustable speeds (at least down to 33-1/3 RPM) and a featureless styrofoam sphere (at least 6" in diameter, although the bigger the better). If a suitable sized sphere is not available, a cylinder such as a large roll of paper towels can be substituted. If none of these materials are available, a rotating globe can be used in place of the turntable and sphere. The teacher can simply turn the globe to provide the rotational motion. The turntable and sphere (or globe) should be strategically placed in the classroom so that all students are within good viewing distance.

MATERIALS NEEDED

- The student activity, "Determining the Rotation Rate of an Object" (included)
- A photocopy of the student activity, "Determining the Rotation Rate of an Object," - preferably one copy per student
- Turntable and styrofoam sphere
- Colored circular stickers to mark the globe



Procedure:

DISCUSS: Point out to the class that astronomers have to make observations of distant celestial objects from Earth (or from orbit above the atmosphere). They cannot travel to those objects and experience them first hand. Ask the class what sort of observations of these distant objects can be made using only telescopes. (Answers may include information about an object's features, its motion and its spectrum.)

Place the styrofoam sphere on the turntable (set at low speed) and ask students to make observations. After several minutes, ask students if it may help to place one or more colored dots on the rotating sphere. Instruct students to now write their ideas for how they might determine the **rate of rotation** for the sphere. Have them discuss in their answers why the dots may help.

Instruct the students to break into groups of 3 and to discuss their answers before moving on.

REFLECT: In groups of 3, students are to share their ideas and determine a best procedure for finding the object's **period of rotation.** They are to record a step-by-step procedure. In a class discussion have groups compare their answers and their methods. Students can make adjustments to their methods if they hear good ideas which they had not thought of.

APPLY: Discuss with students how you might apply this method to finding the rotation rates of heavenly bodies. Talk about the moon and that we always see its same face. What does that imply about its rotation? As an assignment, students are to find a picture of a planet (e.g. Jupiter) or other celestial body and identify a feature that could be used to determine its **rate of rotation** and answer other questions.

As a lead-in to the next activity, you might ask students how the fact that Earth is revolving around the Sun will complicate calculations if we are trying to determine the Sun's **period of rotation**. Students can actually orbit the rotating sphere ('the Sun") in the classroom and determine how their observations change.

Answer Key:

1. To find the period of rotation, locate a distinguishing feature on the globe. As the globe spins on its axis, time (in Earth hours) how long it takes for the feature to reappear. This is its rotational period. To find the rate of rotation, divide the number of times the feature reappears by the time in Earth hours.

2. Answers will vary. A sample of possibile answers is given in the table below.

	Definition	Example
Rotation	The spin of an object about its axis.	Earth, Jupiter, Sun, artificial satellites.
Rate of Rotation	How fast an object spins.	Jupiter spins (rotates) much faster than Earth.
Period of Rotation	The time it takes an object to complete one full rotation.	Jupiter's period of rotation is much shorter than Earth's.

3. Yes, estimating the rate of rotation would be difficult if there were no visible features that were permanent enough to count as the planet rotates on it's axis. (Some objects, not planets, may spin so reapidly that it is impossible to observe a feature.)

Scoring Rubric for Activity 3: Determining Rate of Rotation and Period of Rotation

Student Name: _____

Individual Assessment (goal met if student achieves a "3")

Task(s)	0	1	2	3	4
Providing picture of planet, identifying features and using them to determine rotation rate	Student did not complete the task.	Student provides picture of a planet, but does not identify a feature that could be used to determine rotation rate.	Student provides a picture of a planet, identifies a feature that could be used to determine rotation rate, but does not explain how to do it.	Student provides a picture of a planet, identifies a feature that could be used to determine rotation rate, correctly explains how to do it, and answers the other questions.	Student does all of #3, and correctly answers questions in student guide.

Group Assessment (goal met if group achieves a "2")

Task(s)	0	1	2	3	4
Determining the rotation rate	Group did not participate.	Group is not able to correctly determine the rotation rate and did not apply sound method.	Group is not able to correctly determine the rotation rate and did apply sound method.	Group is able to correctly determine the rotation rate and applied sound method.	

SUGGESTED USE: Make one copy per student; there is also room for you to add your own task and scoring criteria.