The Phase of the Moon is determined by how much of its sunlit surface can be seen from Earth. The Moon cannot be seen when it is between the Earth and the Sun because its illuminated face is turned away from us. This is the “Dark Moon” phase. After a day or two, the “New” Moon appears as a thin crescent at sunset. A week later, the First Quarter Moon looks like a pie cut in half. In another week the Full Moon rises at sunset and remains in the sky all night. After one more week, the Third Quarter Moon again looks like half of a pie. One week later the Dark Moon occurs again and one cycle of lunar phases has passed.

You can demonstrate the phases of the Moon with a white ball and a bright light. Gather your students in the center of a large room, turn off all the lights and put the bright light on one side of the room. Holding the ball, stand between the students and this light so they cannot see the ball’s illuminated side. Now, walk in a large circle around your students. Stop one quarter of the way around so they can see the First Quarter phase of your ball. Continue walking in a circle and stop halfway around so they can see your ball in its Full Moon phase. Continue walking in a circle, stopping three-quarters of the way around so your ball is in its Third Quarter phase. Finally, return to your starting point where your ball is again in its Dark Moon phase.
The same side of the Moon always faces the Earth no matter where the Moon is in its orbit. This has led many people to believe the Moon does not rotate. The Moon rotates but it does so very slowly. In fact, it rotates exactly once every time it completes an orbit around the Earth.

You can demonstrate this by putting an “x” on a ball to represent the side of the Moon that always faces the Earth. Gather your students in the center of a large room. Stand outside your group of students, hold the ball high so they can see it and turn the ball so the “x” faces a window on the far side of the room. Then, walk in a large circle around your students, keeping the “x” pointed at the window. As you walk, ask your students if they can see the “x”. Since the “x” always faces in the same direction, this ball is not rotating.

After you have walked one full circle, repeat the exercise. This time, however, turn the ball so the “x” is facing your students before you begin walking. Walk in the same large circle as before but remember that the “x”, like the near-side of the Moon, must always face your students. To keep the “x” constantly facing your students, you will have to rotate the ball as you walk. Your ball must rotate and so does the Moon.

The Moon is very small compared to the Sun. The diameter of the Sun is 400 times greater than that of the Moon. However, the Sun is about 400 times further away than the Moon, so they appear about the same size in the sky. When the Moon passes directly between the Earth and the Sun, the Moon’s shadow falls on the Earth and a solar eclipse occurs.

Only a small part of the Earth is completely covered by the Moon’s shadow, but within this area stars may become visible when the Moon hides the sun from view. Sunlight can cause eye damage so great care must be taken to properly observe a solar eclipse.
A lunar eclipse occurs when the Moon passes through the Earth’s shadow. It is perfectly safe to view a lunar eclipse without eye protection and it can be seen by anyone on Earth’s night-side. Even during a total lunar eclipse some sunlight still reaches the Moon. Our atmosphere refracts sunlight around the Earth and into its shadow where it falls on the Moon. Also, our atmosphere scatters blue light so the eclipsed moon looks red.

Solar and lunar eclipses do not occur every month. They are quite rare because the plane of the Moon’s orbit is tilted a few degrees away from the plane of the Earth’s orbit. You can demonstrate eclipses using a bright light (the Sun), a large white ball (the Earth) and a small white ball mounted on a pencil (the Moon). Place the large ball in the center of the room and move the small ball around it so they cast shadows on each other. Let your students see how the arrangements of the Sun, Earth and Moon cause the two types of eclipses.

**Sunshine State Standards addressed in this activity:**

**Kindergarten:**
K.E.5.4  Note the Moon can sometimes be seen at night and sometimes during the day.
K.E.5.6  Note that some things are far away and others are nearby as seen from Earth.

**1st Grade:**
1.E.5.4  Identify harmful & beneficial properties of the Sun.
1.P.12.1 Describe the various ways that objects can move: straight line, zig-zag, back & forth, fast & slow.

**3rd Grade:**
3.E.5.2 Explain that our Sun is a star that emits light energy.
3.P.10.3 Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another.
3.P.10.4 Demonstrate that light can be reflected, refracted and absorbed.

4th Grade:
4.E.5.2 Monthly change in the shape of the Moon.

5th Grade:
5.E.5.3 Identify solar system objects: Sun, planets, moons, asteroids & comets. Identify Earth's place in the Solar System.

7th Grade:
7.P.10.1 Illustrate that solar radiation contains many wavelengths including infrared, visible and ultraviolet and that white light is composed of many colors.
7.P.10.2 Observe and explain that light can be reflected, refracted and/or absorbed.

8th Grade:
8.E.5.9 Explain the impact of objects in space on each other including:
The Sun on Earth including seasons and gravitational attraction.
The Moon on Earth including phases, tides and eclipses.