

Background for Teachers

The Moon orbits around the Earth in approximately 29.5 days. Because of this, the moon rises later every day/night, and its phase changes a little bit every day/night.

Your students **won't** be investigating the **cause** of the changing phases, but for your information, the phase of the moon is determined by the angle between the sun and the moon in the sky. As the Moon orbits the Earth, sometimes the moon appears close to the sun in the sky (crescent phase), and sometimes it's far from the sun in the sky (gibbous or full phase). Because the moon is a sphere, half of the moon is lit up by the sun at any given time, but we can't always see the side that the sun is shining on. So the phase we see on the Earth depends on how much of the sunlit side of the moon we can see.

For more information, or to find answers to common questions related to the moon, check out the Moon F.A.Q. page on our web site (use the link on the Daytime Moon Calendar web page) or contact us. We'd be happy to help.

Main Goals

The main goal of this activity is to give students firsthand experience making observations of the moon. This activity is **not** intended to teach students what **causes** the changing phases. But it **is** intended to provide experiences which will help the students to understand what causes the phases when they are older. The observations students make in this activity will also help to resolve and possibly avoid misconceptions (see also Misconceptions section).

Important Points for Students to Understand

- Sometimes we see the moon in the daytime, sometimes we see the moon at night, and sometimes we can't see the moon in either the day or night sky.
- We see a pattern in the changes in the Moon's apparent shape which takes about a month. The pattern of change observed in the shape of this illuminated portion of the visible side of the Moon is what is called the Phases of the Moon.
- The moon is not always in the same place in the sky each day/night. The moon rises, on average, approximately 50 minutes later each day/night.

Misconceptions

Students are likely to have misconceptions related to the moon and its phases. The most common misconceptions are: the moon is always in the sky at night; you can't see the moon in the daytime; and there are many misconceptions related to what causes the phases. This activity will actually help students to address all of these; however, it is recommended that you do not try to directly address misconceptions related to the cause of the phases until they are older. It may be best to first make them aware of their preconceptions. Start your introduction for this activity with questions like "When can we see the moon in the sky? Can we see the moon in the daytime?" And you can leave it open-ended. The students will discover the answers through observations.

Materials: total for the class

- copies of the student pages for each student in the class.

Vocabulary for Teachers

NOTE: in 2nd grade, it is appropriate for students to learn to match the name of the phase with its appearance; however, the definitions below are only intended for teachers.

New Moon: The Moon is totally black as viewed from Earth as its lighted side is facing away from the Earth toward the Sun.

Waxing Moon: When the easily visible portion of the Moon is growing larger day after day.

Waning Moon: When the easily visible portion of the Moon is growing smaller day after day.

Gibbous Moon: More than half of the Moon's visible side is illuminated by the Sun.

Crescent Moon: Less than half of the Moon's visible side is illuminated by the Sun.

Quarter Moon: When exactly half of the side of the Moon which is facing the Earth is illuminated by the Sun. Since this is half of the half of the Moon that is visible, this is in fact a "quarter" of the Moon's surface. The Moon is also a quarter of the way around the Earth from a New Moon.

Full Moon: The entire visible side of the Moon is illuminated by the Sun.

Combinations of Terms: It is common to use either waxing or waning in combination with either crescent or gibbous when describing the pattern of the phases of the Moon.

Phase Names for Full Cycle:

New Moon
Waxing Crescent
First Quarter
Waxing Gibbous
Full Moon
Waning Gibbous
Last Quarter (3rd Quarter)
Waning Crescent
New Moon... repeat again...

Time Management

1. Make sufficient copies of this handout. If needed, note that the last sheet of Moon observation outlines are not numbered. Thus, if your observing project extends beyond 18 observations, make as many copies of these “blank” observing forms as are needed.
2. Decide on a starting date for the project. Start when you have several consecutive days in which you can see the moon during the school day. Consult our Daytime Moon Calendar on our web site for this information:

www.mmsd.org/planetarium (you’ll find a link on this page)
3. Introduce the activity. This will take anywhere from 30-50 minutes depending on how in depth you want to get into the names of the various phases of the Moon and discussing the difference between visible (the side toward’s Earth) and the illuminated (the side on which the Sun’s light is shining) sides of the Moon.
4. Conduct daytime observations. The first observation make take 30 minutes. Subsequent observations (could be same day, consecutive days, etc.) may take as little as 10 minutes.
5. Assign independent observations. Take 10 minutes to explain that the students should continue making observations of the moon in the daytime and nighttime sky, and to continue to log their observations. Continue to observe until students can see that the pattern repeats in about a month. Check in with the students every couple of days to see how they are doing with their observations. Remind them to look for the moon after school, evenings, before school, and even during school.
6. Conduct wrap-up discussion. Take 30-50 minutes to have students compare observations in small groups and look for patterns. Then share as a whole class. Draw conclusions similar to the Important Points for Students to Understand. In the discussion, if the subject of the cause of the phases comes up, encourage them to continue to wonder and investigate on their own, and reassure them that they will learn more about it in school when they are older.

Preparation

- Copy observation log pages for students.
- Use the Daytime Moon Calendar on the planetarium’s web site to determine when you’d like to start this project:
www.mmsd.org/planetarium (you’ll find a link on this page)

Suggestions for Further Study

- Use nonfiction books and videos to learn more about the characteristics of the moon.
- Use nonfiction books and videos to learn about the Apollo missions in which astronauts landed on the moon and explored the surface.
- Read fictional books that involve the moon and/or exploring the moon.
- If the students did not do the Jack and Jill on the Moon activity when they were in kindergarten, download the activity from the planetarium web site, and conduct the activity. If they have already done the activity, it would help to review it.

Observing the Moon

New Moon: You won’t be able to observe the moon, but that doesn’t mean that you shouldn’t have the students looking for it!

First Quarter: In a first quarter phase, the moon can be observed starting in the early afternoon and until about 6 hours after sunset.

Full Moon: In a Full Moon phase, you can observe the moon about 1 hour after the sun has set until about 1 hour prior to sunrise.

Last Quarter: In a Last Quarter phase, you can observe the moon approximately an hour after midnight until late morning.

NOTE: these are **rough guidelines** to assist you in determining whether the students should be able to observe the moon.

OBSERVING THE MOON

Background

The Moon is one of the easiest of all objects to locate in the sky. The observer who looks at the Moon on a regular basis can notice that it changes over time in a pattern. Once this pattern has been recognized, it can be used to make predictions of where and when you can see the moon, and what it will look like.



Procedure

1. Begin to observe the Moon at the time designated by your teacher.
 - A. For each observation, record the date and time.
 - B. Keep in mind that the moon is actually always round (sphere). In the circle, use a pencil to shade in the part of the Moon that you can't see. The part of the circle that is NOT shaded should look like the moon you see in the sky.
2. After your first observation, return to the same place at the same time the next day and repeat the observation.
3. Continue to make observations on every opportunity, and at various times of day and night, until you reach the end of your observing project. Your teacher will tell you when it is okay to end the project.
4. When your observations are complete, you will discuss your results in class.

Goal

The goal of this activity is to observe the pattern of change in the Moon's appearance and location in the sky over time.

Materials

- this Question and Conclusion handout.
- Moon observing log pages.
- Pencil

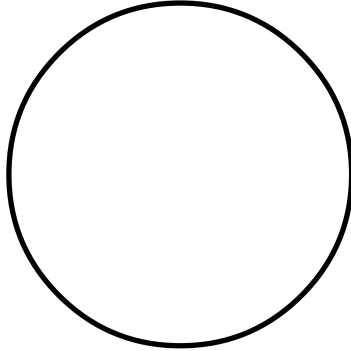


Observation #1:

Date: _____

Time: _____

Moon's Appearance:

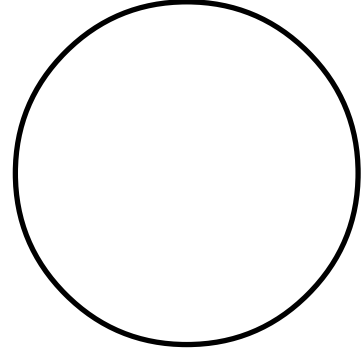


Observation #2:

Date: _____

Time: _____

Moon's Appearance:

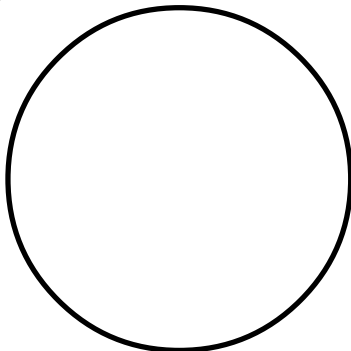


Observation #3:

Date: _____

Time: _____

Moon's Appearance:

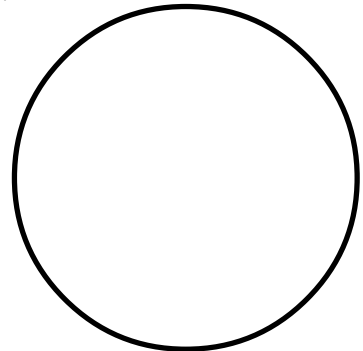


Observation #4:

Date: _____

Time: _____

Moon's Appearance:

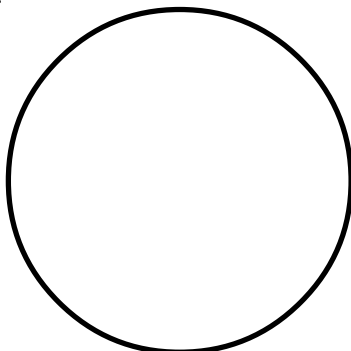


Observation #5:

Date: _____

Time: _____

Moon's Appearance:

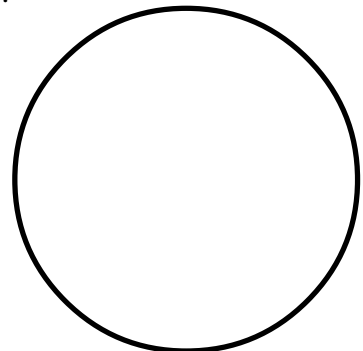


Observation #6:

Date: _____

Time: _____

Moon's Appearance:

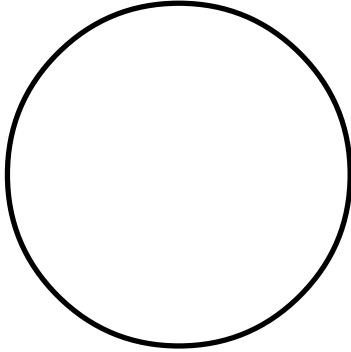


Observation #7:

Date: _____

Time: _____

Moon's Appearance:

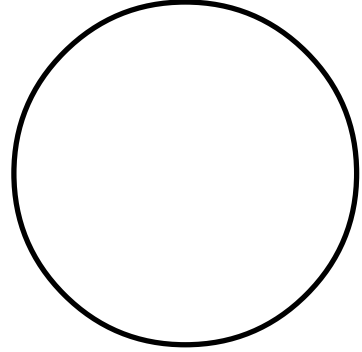


Observation #8:

Date: _____

Time: _____

Moon's Appearance:

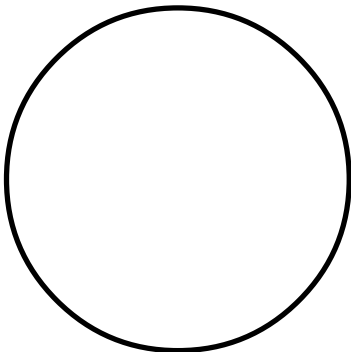


Observation #9:

Date: _____

Time: _____

Moon's Appearance:

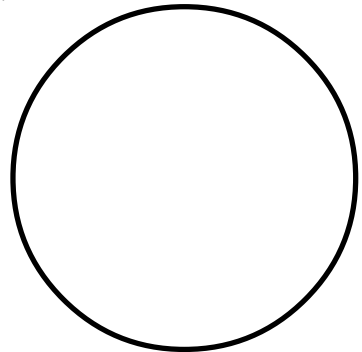


Observation #10:

Date: _____

Time: _____

Moon's Appearance:

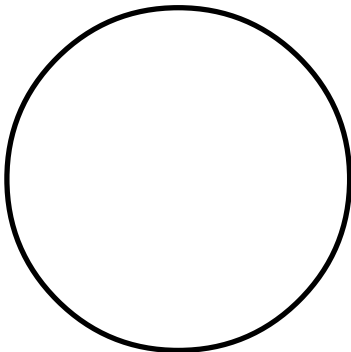


Observation #11:

Date: _____

Time: _____

Moon's Appearance:

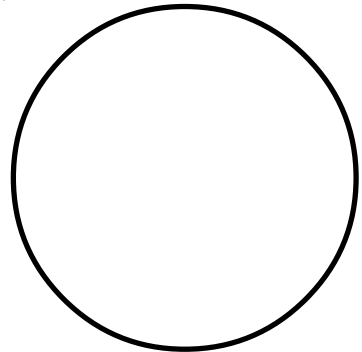


Observation #12:

Date: _____

Time: _____

Moon's Appearance:

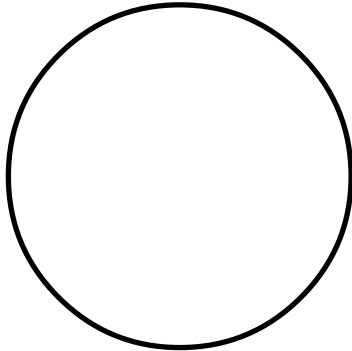


Observation #13:

Date: _____

Time: _____

Moon's Appearance:

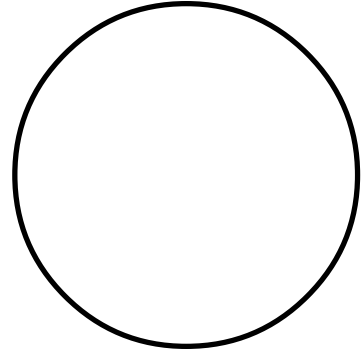


Observation #14:

Date: _____

Time: _____

Moon's Appearance:

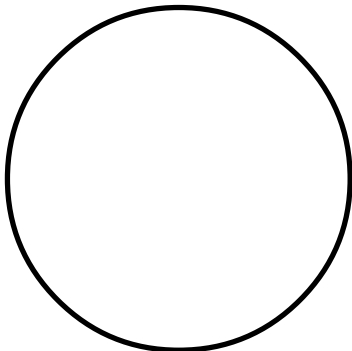


Observation #15:

Date: _____

Time: _____

Moon's Appearance:

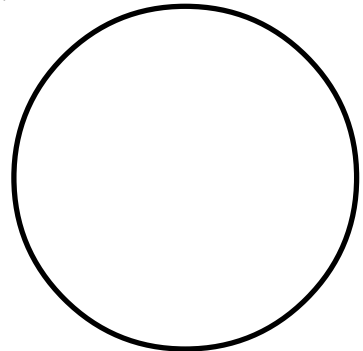


Observation #16:

Date: _____

Time: _____

Moon's Appearance:

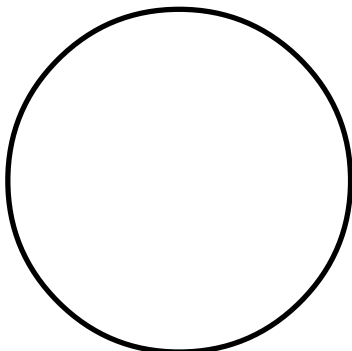


Observation #17:

Date: _____

Time: _____

Moon's Appearance:

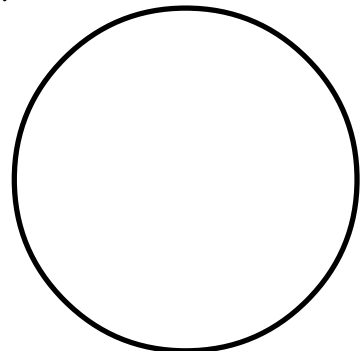


Observation #18:

Date: _____

Time: _____

Moon's Appearance:

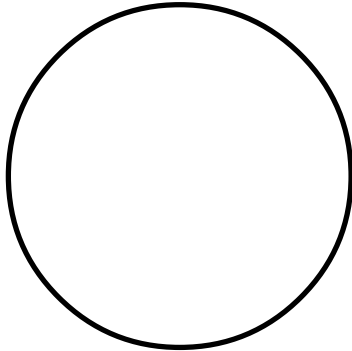


Observation #____:

Date: _____

Time: _____

Moon's Appearance:

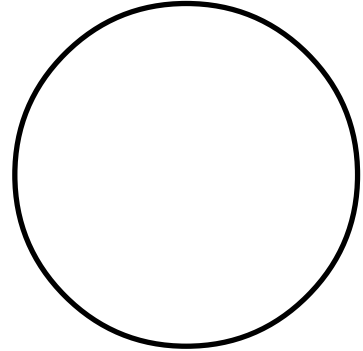


Observation #____:

Date: _____

Time: _____

Moon's Appearance:

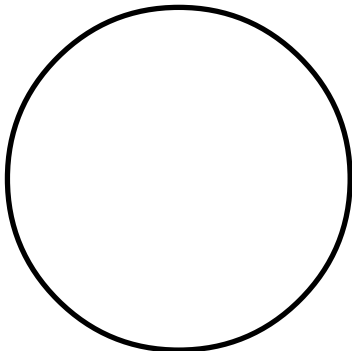


Observation #____:

Date: _____

Time: _____

Moon's Appearance:

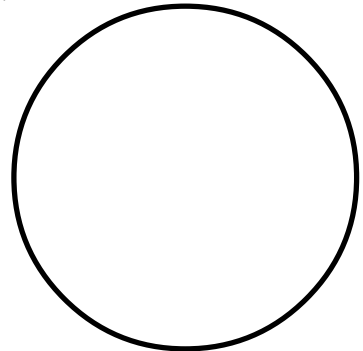


Observation #____:

Date: _____

Time: _____

Moon's Appearance:

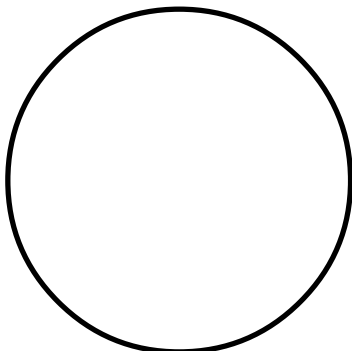


Observation #____:

Date: _____

Time: _____

Moon's Appearance:



Observation #____:

Date: _____

Time: _____

Moon's Appearance:

