Name _____ Date _____ Class _____



# Chapter Project Track the Moon

This project requires you to keep records of when and in what direction you see the moon in the sky. You will make and record your observations for a number of weeks. Then you will look for patterns in your observations and explain the patterns by using what you know about the moon's orbit around Earth and Earth's rotation. To help keep your observations organized, you need to record the following information:

1. **Date** Record the calendar date (example: November 10, 2004).
2. **Time of observation** For this project, you should try to make at least one observation each day. On at least one day, you should make at least two observations two or three hours apart.
3. **Moon visible** Try to make your observations from a place where you can see the sky in all directions. If you can see the moon, determine its direction, altitude, and appearance. Write this information on the data sheet as explained below. If you do not see the moon, the reason might be that the moon is not above the horizon or that it is hidden behind clouds. If the sky is too cloudy to tell whether the moon is above the horizon, record that information on your data sheet.
4. **Position** The moon travels a path through the sky as if it were an object moving on a dome over Earth. Any position on the dome can be described by its direction from the observation location and its altitude above the horizon.

   Directions follow the compass headings. A compass fixes one direction, north (N), and then all directions along the circle of the horizon can be described.

   The circle of the compass is divided into four directions, north (N), south (S), east (E), and west (W). Four other headings that fall exactly between the four main directions are usually marked on compasses—northwest (NW), northeast (NE), southwest (SW), and southeast (SE). For your observations, record in which of these eight directions you see the moon. Worksheet 1 guides you in making a map of your moon observatory and marking the compass directions on it.

   Altitude normally measures how high an object is above the ground. For very distant objects, a more useful way to record position in the sky is to measure the altitude in term of degrees above the horizon. When an object is on the horizon, its altitude is zero degrees (0°). When an object is directly overhead, its altitude is 90°. You can easily estimate altitude in degrees. Face in the direction of the moon, make a fist, and hold it straight out at arm's length, thumb side up. Count how many fists above the horizon the moon is. One fist above the horizon is about 10°, two fists are about 20°, and so on.
5. **Appearance** Make a sketch of the moon by shading in the circle. As you shade in the circle to show the moon's phase, try to sketch any slant or tilt of the bright part of the moon. When you are finished, the white part of your circle should look like the bright portion of the moon that you observed.

Name _____ Date _____ Class _____





## Project Rules

- Record observations 17 days over the next 28 days.
- Make observations more than once on at least one day. Try to schedule times that will be easy to remember. For example, you could look at the sky just before sunrise, just after sunset, and then right before you go to bed.
- Record all of the data listed in the table on Worksheet 2. Also use the worksheet to record any notes about your observations.
- After all observation data has been recorded, analyze the data. Make a class presentation about your observations. Your teacher will help you decide what should be included in your presentation. Your teacher will approve the idea for your presentation before you begin working on it.

## Project Hints

- The best site for viewing the moon will have the night sky visible in all directions.
- Try to find an observation site that is away from bright lights so that you can see the stars on a clear night. This will allow you to determine whether the sky is cloudy (no stars visible).
- Complete Worksheet 1 to identify landmarks so that you can determine each of the eight compass directions.

## Project Timeline

| Task | Due Date | Teacher's Initials |
|---|---|---|
| **1.** Direction Map (Worksheet 1) completed. | September 19 | |
| **2.** Moon observations begun. | | |
| **3.** Teacher check of data table. | September 23 | |
| **4.** Observations completed. | September 19 | |
| **5.** Data analyzed. | | |
| **6.** Presentation made. | | |

Name _____ Date _____ Class _____



# Chapter Project Make a Direction Map

1. Obtain or borrow a compass with a face that is at least 2 centimeters in diameter and that has marks for the eight directions (N, NE, E, SE, S, SW, W, NW).
2. During daylight hours, go to the site that you will use to record the moon observation data. On a blank sheet of paper, draw a large circle. Draw lines to divide the circle into halves, then quarters, and finally eighths. The center of the circle represents your position. Label your circle with the eight points of the compass.
3. Place the compass on a flat surface, such as a book. Make sure that the surface is level so that the compass needle is free to spin. Keep the compass away from metal objects because they will affect the compass readings.
4. Allow the compass needle to come to rest. One end of the needle (usually the end that is red or pointed) will be pointing north. Rotate the body of the compass until the needle lines up with the "N" on the face. Stand behind the needle and look in the "N" direction (the needle will be pointing in this direction). Identify a landmark, one far away if possible, and mark it on your drawn circle. Label it "north." If there is no landmark exactly north of your location, choose a landmark that is close to exactly north and put it in the approximate location on your direction map.
5. Now stand on the opposite side of the compass and look in the "S" direction. The back of the compass needle will be pointing south. Identify a distant landmark and mark it on your map. Do the same for all eight directions.
6. To check your direction map, stand at your observation location and throw an object, such as a ball, in any direction. Once it lands, *use your map* to determine in which compass direction the object lies relative to where you are standing. Next, use the compass to check the direction you obtained from your map (don't forget to align the needle and the "N"). If your map direction and compass direction do not agree, make the necessary corrections to your map.

Name _____ Date _____ Class _____



# Chapter Project Moon Observation Data Sheet



| Date | Time | Moon Visible? (yes, no) | Direction (N, S, etc.) | Altitude (degrees) | Appearance (sketch) | Notes (for example, cloudy, or clear but not visible) |
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Lab zone Chapter Project

# Track the Moon

In evaluating how well you complete the Chapter Project, your teacher will judge your work in four categories. In each, a score of 4 is the best rating.

| | 4 | 3 | 2 | 1 |
|---|---|---|---|---|
| ***Moon Observations and Daily Record Keeping*** | Observations made daily. Data table complete and neat with accurate sketches and notation of cloudy skies. | Observations made almost daily. A few data are incomplete or inaccurate. No distinction between cloudy skies and clear skies when moon below horizon. | Most days have observations. Quite a few data are incomplete or inaccurate. No distinction between cloudy skies and clear skies when moon below horizon. | Many days have no observations. Many errors and omissions. Data table sloppy. |
| ***Graphs and Analysis*** | Student makes complete and correct analysis of data. Graph is correct and clear. | Student makes mostly complete and correct analysis of data. Graph is correct. | Student's analysis of data is mostly correct but is partially incomplete. Graph may have minor errors. | Data analysis is minimal or significantly incorrect. Graph has at least one significant error. |
| ***Concept Understanding and Presentation of Results*** | Data analysis and presentation are thorough and indicate full understanding of how and why the position and appearance of the moon change over time. | Data analysis and presentation are adequate and indicate good understanding of how and why the position and appearance of the moon change over time. | Data analysis and presentation are acceptable and indicate some understanding of how and why the position and appearance of the moon change over time. | Data analysis and presentation are minimal and indicate important misunderstanding of how and why the position and appearance of the moon change over time. |
| ***Communication and Class Participation*** | Communicates clearly and accurately. Participates fully in class discussion. | Communication is fairly clear and accurate. Class participation is adequate. | Communication mostly accurate but is limited. Participation is limited. | Communication is unclear or mostly inaccurate and class participation is minimal. |