Moon Phases

LCROSS

Group Activity1: Identification of the Phases of the Moon – K – 4; 5 – 8

Procedure: In the following activity, you will read the brief description of the phases of the Moon and then identify the phases of the Moon by name in Figure 1

- **New Moon**—Rises at Sunrise and will set at Sunset. This phase of the Moon cannot be seen from Earth because the Moon is between the Sun and the Earth.

- **Waxing Crescent**—Rises after Sunrise and will set after Sunset. The shape of the Moon will look like the letter "D". Less than one-half of the Moon is illuminated by direct Sunlight. This Moon phase can be seen in the West just after Sunset.

- **First Quarter**—this phase of the Moon will rise at noon and will set at midnight. One-half of the Moon appears to be illuminated by direct Sunlight and the right-hand side of the Moon is illuminated. The first quarter Moon can be seen in the east at noon, the southeastern part of the sky in the afternoon and south at dusk.

- **Waxing Gibbous**—the Moon will rise in the middle of the afternoon and will set before Sunrise. The Moon appears to be more than one-half illuminated by direct Sunlight. You may see the waxing gibbous in the east during the afternoon and the southeast during dusk.

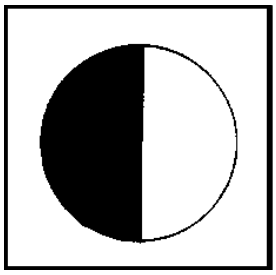
- **Full Moon**—will rise at Sunset and will set at Sunrise. The Moon appears to be fully illuminated

- **Waning Gibbous**—this phase will rise in the early evening and set after Sunrise. The Moon appears to be more than one-half illuminated by direct Sunlight. You may see the waning gibbous in the west in the morning.

- **Third Quarter**—the Moon will rise at midnight and will set at noon. One-half of the Moon appears to be illuminated by direct Sunlight and will be bright on the left side. This Moon phase can be seen in the southwest during the morning and in the west at noon.

- **Waning Crescent**—will rise in the early morning before Sunrise and set in early afternoon. This phase will look like the letter "C" and less than one-half of the Moon will be illuminated by direct Sunlight.

Figure 1: Identification of the Phases of the Moon



Name of Phase:

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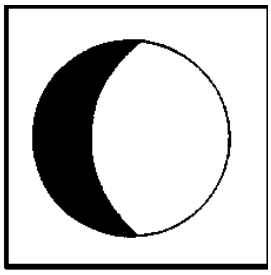

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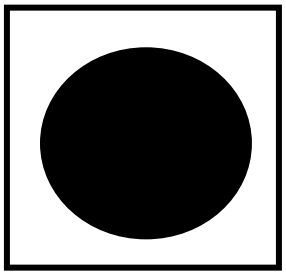

Name of Phase:

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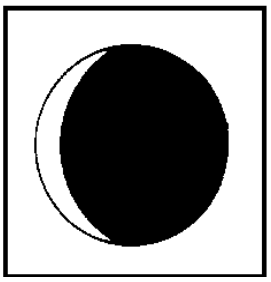

Name of Phase:

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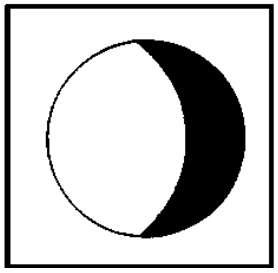

Name of Phase:

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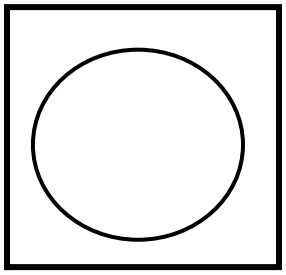

Name of Phase:

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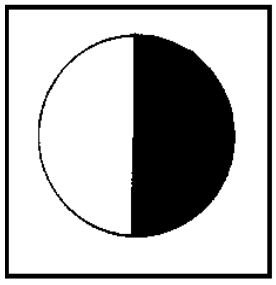

Name of Phase:

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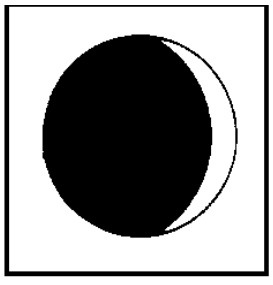

Name of Phase:

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Group Activity 2: Telling Time by the Light of the Moon – 5 – 8

The angular distance between the Sun, the Earth, and the Moon are responsible for the Moon phases. We use the term elongation to refer to the angles between the Sun and an object in space, such as the Moon, as viewed from Earth. These elongation measurements will allow us to calculate the time in which the phases of the Moon will appear in the sky.

Materials:

- Template for Elongation angles
- Protractor
- Pen or Pencil

Procedure:

- Beside the numbers in **Figure 1: Elongation Angles Template**, label the 8 phases of the Moon.
- Use the protractor draw the following angles from the center of the Moon phase to the center of the Earth and then to the center of the other Moon phase.

1. From Moon phase 1 to Moon phase 2, Number of Degrees _____
2. From Moon phase 1 to Moon phase 3, Number of Degrees_____
3. From Moon phase 1 to Moon phase 4, Number of Degrees_____
4. From Moon phase 1 to Moon phase 5, Number of Degrees_____
5. From Moon phase 1 to Moon phase 6, Number of Degrees_____
6. From Moon phase 1 to Moon phase 7, Number of Degrees_____
7. From Moon phase 1 to Moon phase 8, Number of Degrees_____

- How many degrees are in the angle from one Moon phase to the next Moon phase?

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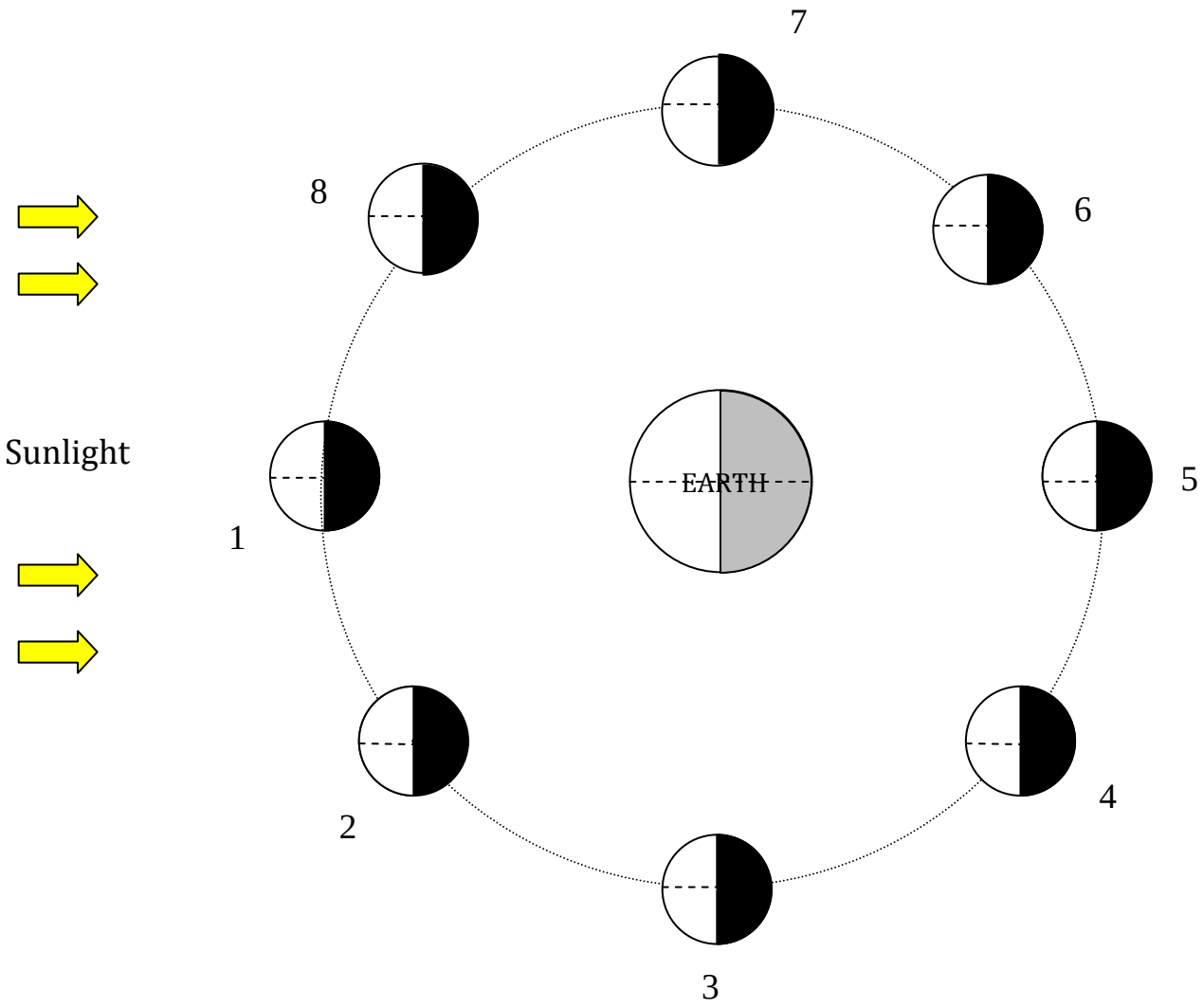
Figure 1: Elongation Angles Template



Group Activity 3: Construction of Moon Clock – K – 4; 5 – 8; 9 – 12

The Moon has long been used as a clock at night (when it is visible). In this activity students will construct a Moon Clock which will allow them to learn the relationship between the phases of the Moon and the time the Moon will rise or set. This activity will also show that the Moon does not always rise just at Sunset and set at Sunrise.

Before we begin the activity, we must understand the terms "rising" and "setting". The term horizon is used to describe a visible area of sky that meets the surface of Earth. When an object crosses the horizon and is visible, we call that rising. If the Earth prevents us from seeing an object, the object in the sky passes below the horizon and this is considered setting. Sunrise and Sunset are familiar terms we use in regard to the Sun, but we can also describe when various phases of the Moon will rise or set in the sky.

With the Moon Clock we can determine the times of Moonrise and Moonset for the various phases of the Moon. However, we must change the elongation angle of the Sun, Moon and Earth from degrees into time. The celestial sphere turns once every 24 hours. During this time, a point of the sky has traveled through the angle of 360° or one complete circle. The angle of 360° is equal to 24 hours. (360° ÷ 24 hours = 15°/hour). The Earth will then rotate 15° in one hour.

The angle 90° is one quarter of a complete circle. (360° ÷ 4 = 90°) One quarter of 24 hours is 6 hours. The angle 90° expressed in time units is 6 hours. Therefore, the elongation angle is 90° and the phase of the Moon is the first quarter. The Moon will lag 6 hours behind the Sun in rising. When the elongation angle is 270°, the Moon phase will be the third quarter and the Sun lags behind the Moon by 6 hours.

Materials:

- Moon Clock Template
- Horizon Pointer Template
- Brad
- Cocktail Straw
- Transparent Tape
- Scissors

Procedure:

Note: The name of the phase of the Moon is printed on the Moon Clock template. You may choose delete these names and have students write the name of the phases on the Moon on the clock. Always begin with the New Moon due east. Also, make sure you begin with the time Noon due East. An interval of 3 hours is used between each phase for this activity.

1. Cut out the Horizon Pointer from the template (you may want to print this on card stock)
2. Use the brad to secure the Horizon Pointer to the Moon Clock Template (print it on card stock)
3. Tape the cocktail straw to the brad, making sure the Pointer can turn freely
4. Place the Moon Clock Template so that the east side (the Sun) is on your left. We now have the Moon Clock oriented so that the top of the clock is south, the right side of the clock is west and the bottom of the clock is north.
5. From the activity on the elongation angles, there is 45° between each Moon phase. Converting 45° to time will give you a total of 3 hours between each phase. The time is given on the Moon

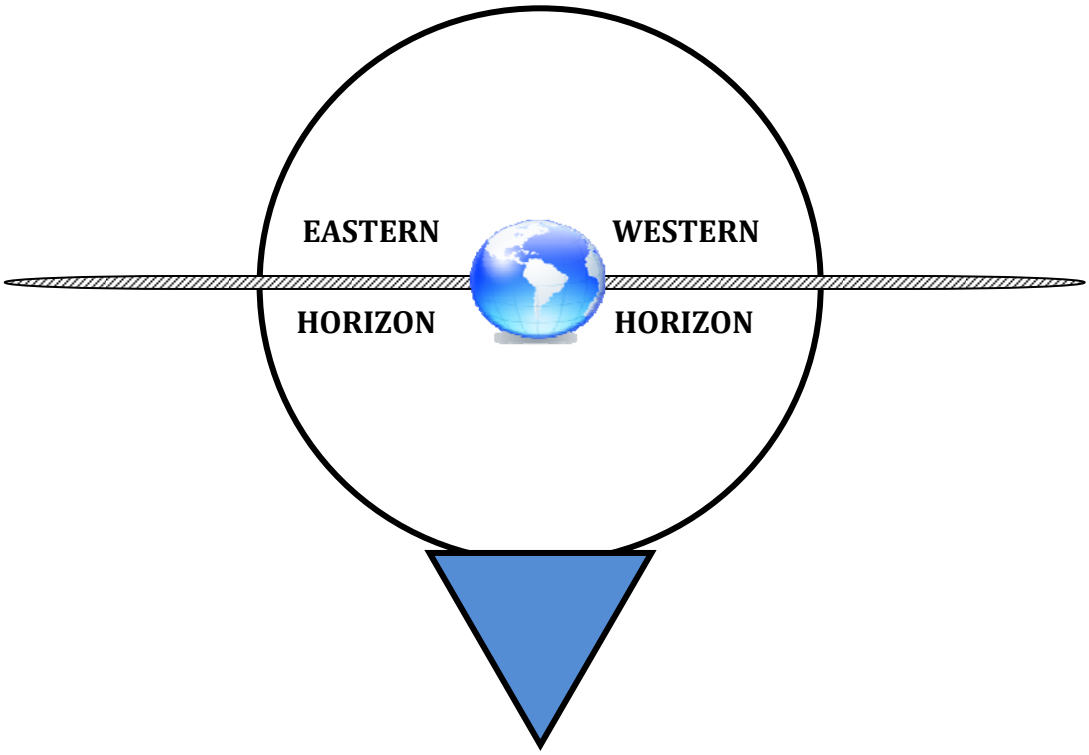
Clock template for the New Moon. Count counterclockwise and write the time beside the phase of the Moon ending at the Waning Crescent.

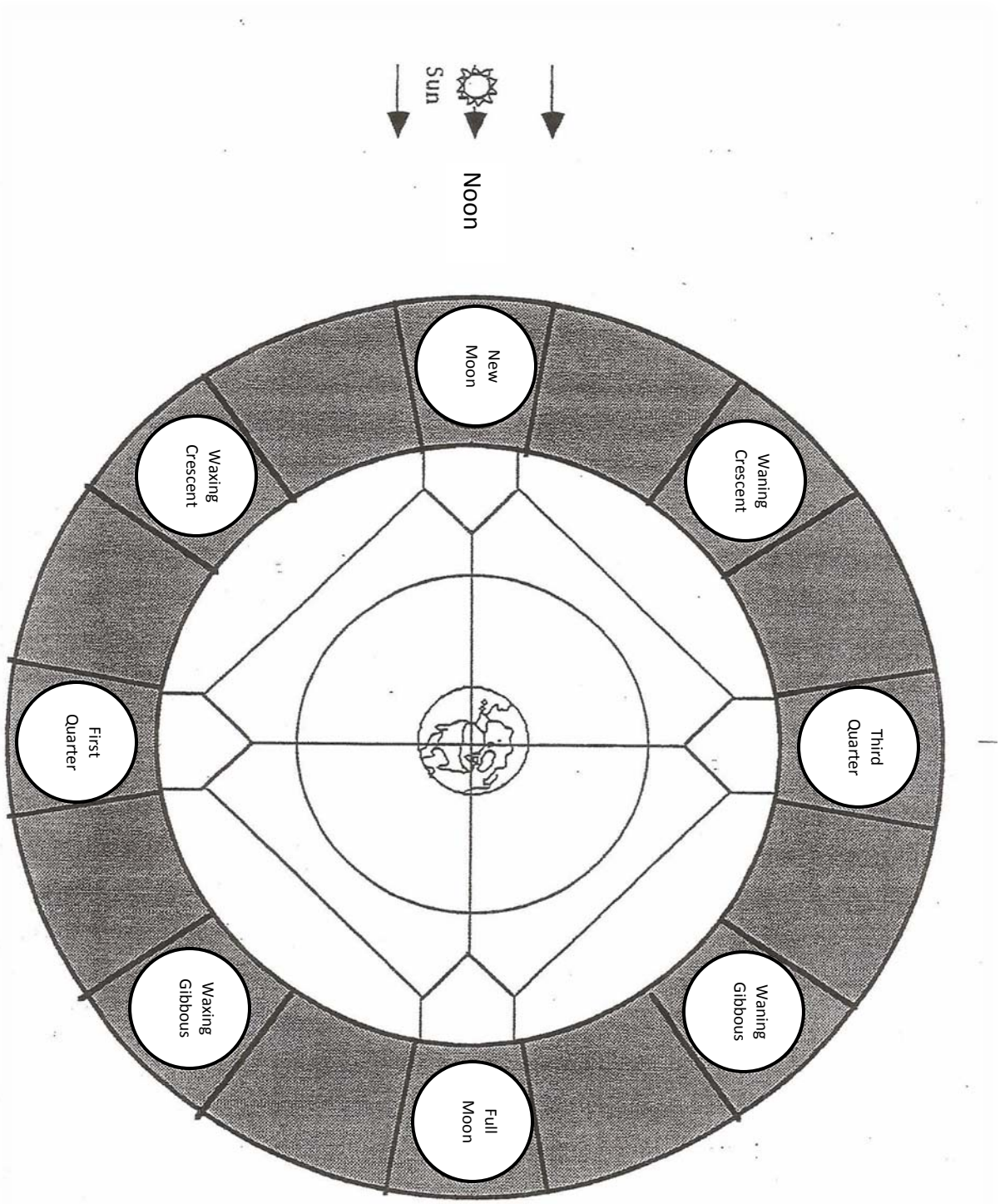
How to Use the Moon Clock:

For example: Turn the arrow to the New Moon. The arrow will indicate when the phase of the Moon is the highest in the sky. The New Moon will be the highest in the sky at Noon. Look at the Eastern Horizon. The straw is pointing to 6:00 AM. This will be the time that the New Moon will rise. The Western Horizon will give you the time the New Moon will set which is 6:00 PM. (Remember that the Eastern Horizon is the rising time and the Western Horizon is the setting time).

Use the Moon Clock to answer the following questions on the Moon Rise and Moon Set Worksheet.

Pointer Template





Worksheet for Moon Rise and Moon Set

Waxing Crescent Moon

Rise at _____am

Sets at _____pm

Highest Point in the sky_____

Elongation _____

First Quarter Moon

Rise at _____am

Sets at _____pm

Highest Point in the sky_____

Elongation_____

Waxing Gibbous Moon

Rise at _____am

Sets at _____pm

Highest Point in the sky_____

Elongation_____

Full Moon

Rise at _____am

Sets at _____pm

Full Moon (continued)

Highest Point in the sky _____

Elongation_____

Waning Gibbous Moon

Rise at _____am

Sets at _____pm

Highest Point in the sky _____

Third Quarter Moon

Rise at _____am

Sets at _____pm

Highest Point in the sky_____

Elongation_____

Waning Crescent Moon

Rise at _____am

Sets at _____pm

Highest Point in the sky_____

Elongation_____