Georgia 4-H is a partner in public education and strives to incorporate Georgia Standards in the education materials produced for in-school use. The following Georgia Standards are correlated to the content delivery included in this publication:

**Georgia Standard S4E1b:** Students will Evaluate strengths and limitations of models of our solar system in describing relative size, order, appearance and composition of planets and the sun.

**Georgia Standard S4E2b:** Students will develop a model based on observations to describe the repeating pattern of the phases of the moon (new, crescent, quarter, gibbous, and full).

**Georgia Standard S4E2c:** Students will construct an explanation of how the Earth’s orbit, with its consistent tilt, affects seasonal changes.

Georgia Performance Standards from www.georgiastandards.org

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**Can you define Astronomy?**

Basically, it is the study of the universe. Space is hard to study because everything is so spread out, but scientists have learned a lot about our little corner of the universe - the Milky Way!

Join me, Arch the Dawg, to find out what’s up in space!

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**Think Green!** Not just 4-H Green...but let's help do our part to recycle and reuse. Save this book, reread it or pass it along to a friend. If it's too worn, please recycle it.
The Sun is a star and is the center of our solar system. Its gravity keeps the planets in orbit. The Sun provides the light and energy we need to survive!

The Earth rotates on its axis once every 24 hours, giving us day and night. The Earth revolves or orbits around the Sun once a year. At any given time, half of the Earth will be illuminated by the Sun. This part of the Earth is experiencing daytime while the part not being illuminated is experiencing nighttime.

The Earth is also tilted on its axis by 23.4 degrees. This means that as we orbit or revolve around the Sun, parts of the Earth point towards the Sun while other parts point away from the Sun. This results in our seasons!

A moon is a natural satellite of a planet. Earth has only one moon, named Luna. Our moon is generally the brightest thing in the sky at night! But did you know that moonlight actually comes from the Sun? That’s true… the Moon doesn’t make its own light but instead is illuminated by the Sun. As the Moon orbits the Earth, we can see only the part of the Moon that is lit up by the Sun. It takes about a month for the Moon to make its way around the Sun. Based on the Moon’s relative location to the Sun and Earth, we see something different when we look at the Moon each night.

The Sun or Earth or Moon can orbit the Sun once every year.

The Moon or Earth or Sun can orbit the Earth once every month.

Check Your Space Smarts!

Fill in the following statement and the diagram below using the word bank. You will have to use one word twice.

The _________ orbits the _________ once every year.
The _________ orbits the _________ once every month.

Word Bank:
Sun
Earth
Moon
Let’s observe how the Moon changes over the next month.

**Moon Phase Observations Instructions:**

- For the next 28 nights, you’ll observe the Moon and draw what you see. (It’s okay if it’s cloudy or rainy. You can leave those nights blank.)
- Look up at the night sky and view the Moon. Then, grab your observation log from the next page.
- You’ll leave the parts of the Moon white when you can see it. You’ll color in black for the parts of the Moon that you can’t see.
- At the end of your observations, you will see the pattern of changes the Moon goes through at the end of the 28 days. These are called moon phases.

A **waxing moon** is a moon that gets more sunlight on it as the days go by. It is after we experience a new moon up to a full moon. A **waning moon** is after the full moon and will remain waning until we again experience a new moon.

To learn more about moon phases, please visit [moon.nasa.gov/moon-in-motion/moon-phases](http://moon.nasa.gov/moon-in-motion/moon-phases)
### Moon Phase Observation Log

<table>
<thead>
<tr>
<th>Night 1</th>
<th>Night 2</th>
<th>Night 3</th>
<th>Night 4</th>
<th>Night 5</th>
<th>Night 6</th>
<th>Night 7</th>
</tr>
</thead>
<tbody>
<tr>
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<td><img src="image2" alt="Moon" /></td>
<td><img src="image3" alt="Moon" /></td>
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<tr>
<td>Night 8</td>
<td>Night 9</td>
<td>Night 10</td>
<td>Night 11</td>
<td>Night 12</td>
<td>Night 13</td>
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<tr>
<td>Night 15</td>
<td>Night 16</td>
<td>Night 17</td>
<td>Night 18</td>
<td>Night 19</td>
<td>Night 20</td>
<td>Night 21</td>
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<tr>
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<td>Night 23</td>
<td>Night 24</td>
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<td>Night 26</td>
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<td><img src="image27" alt="Moon" /></td>
<td><img src="image28" alt="Moon" /></td>
</tr>
</tbody>
</table>

**Bonus:** Do you know your moon phases? Color in each phase on your chart using the key below. The example on the right shows a waxing gibbous, so it has been colored light green.

**Example:**

- **NEW MOON**
- **WAXING CRESCENT**
- **FIRST QUARTER**
- **WAXING GIBBOUS**
- **FULL MOON**
- **WANING GIBBOUS**
- **THIRD QUARTER**
- **WANING CRESCENT**

**Night 1**
The solar system is the gravitationally bound system of the Sun and the objects that orbit it. Our solar system’s diameter is 287.46 billion kilometers. Our solar system is divided into the inner planets and the outer planets. The inner planets are small, rocky, and have no or few moons. The outer planets are large, gaseous, and have many moons. The inner and outer planets are separated by the asteroid belt, a region between Mars and Jupiter that contains millions of asteroids or small space rocks.

Did you know?
It is really, really, really hard to represent the solar system accurately in models because the planets are so far away from each other. This model shows us what the planets look like and their order, but is not accurate for size of the planets or distance between them.
Pluto used to be considered a planet, but as scientists continued to explore our galaxy, they found tons of other celestial bodies about the same size as (or larger than) Pluto! Rather than naming ALL of these new discoveries as planets, they demoted Pluto to a dwarf planet in 2006. Dwarf planets are planets that are within orbit around the sun, are generally round due to their gravity, but have not cleared the debris in their orbit around the Sun. Most of the dwarf planets in our solar system are in the Kuiper Belt, beyond Neptune. In addition to Pluto, Haumea, Makemake, and Eris are in the Kuiper Belt. There is another dwarf planet in the inner solar system called Ceres, located between Mars and Jupiter.

Check Your Space Smarts!

Use your space smarts and the words in the word bank to fill in this map of the solar system!

Word Bank:
- Earth
- Jupiter
- Mars
- Mercury
- Neptune
- Saturn
- Sun
- Uranus
- Venus

But what about Pluto?
Pluto used to be considered a planet, but as scientists continued to explore our galaxy, they found tons of other celestial bodies about the same size as (or larger than) Pluto! Rather than naming ALL of these new discoveries as planets, they demoted Pluto to a dwarf planet in 2006. Dwarf planets are planets that are within orbit around the sun, are generally round due to their gravity, but have not cleared the debris in their orbit around the Sun. Most of the dwarf planets in our solar system are in the Kuiper Belt, beyond Neptune. In addition to Pluto, Haumea, Makemake, and Eris are in the Kuiper Belt. There is another dwarf planet in the inner solar system called Ceres, located between Mars and Jupiter.
On Monday, August 21, 2017, the Northwestern part of Georgia experienced a total solar eclipse. I learned about eclipses in school during my 4-H class.

An eclipse occurs when the shadow of one celestial body falls on another. A lunar eclipse is when the Earth comes between the Sun and the Moon, so the Earth’s shadow is on the Moon. A solar eclipse is when the Moon comes between the Earth and the Sun, so the Moon’s shadow is on the Earth.

Spectators traveled far and wide to my community to experience totality, which is the few moments of total darkness experienced when a new moon passes completely in front of the Sun during the day. We all had to wear special UV blocking eclipse glasses to protect our eyes from the Sun’s harmful rays. They were really cool!

A total solar eclipse happens on average once every 18 months, but only a sliver of the planet can see the eclipse each time. The last total solar eclipse visible from Georgia was in 1970, and the next one is in 2045! While total solar eclipses are uncommon, lunar eclipses usually happen twice each year.

The Old Farmer’s Almanac can tell you when the next eclipse is happening in your area: almanac.com/astronomy/eclipse-dates. I sure don’t want to miss out on the next eclipse!