



ASTRONOMY

BIBLE VERSE

“And God said, ‘Let there be lights in the expanse of the sky to separate the day from the night, and let them serve as signs to mark seasons and days and years, and let them be lights in the expanse of the sky to give light on the earth.’ And it was so” (Genesis 1:14-15).

Have you ever been lost or unsure of where you were? Long-ago, travelers used the North Star to help them navigate the unexplored regions of our world. Christopher Columbus, Jacques Cartier, Ferdinand Magellan, and many others used the stars to guide their course of exploration.

Today people need a spiritual North Star. People need something that gives their lives direction and meaning in both the good times and the bad. They need Someone who helps them have a sense of direction. Jesus can be the One to guide you in the right direc-



SERVICE

What Can YOU Do With This Skill?

Knowing the constellations, moon phases, and other heavenly events provides a lifelong hobby. Knowing where to find the North Star can help

you if you are ever lost at night and need to find north without a compass. You will enjoy being able to identify and explain the constellations and planets you find in the night sky.

Badge Requirements

Choose four of the five requirements below for the completion of the Astronomy badge.

- ☐ Answer the following questions:
 - What are the names of the planets in order, starting with the one nearest the sun?
 - What is often mistaken as a falling star?
 - Why does the moon appear to change shape?
 - What is the name of our galaxy?
 - What is a light-year?
 - How many constellations are there?

- ☐ Visit a planetarium or watch a video about the planets and constellations.
- ☐ Plan a stargazing adventure. Use a star chart or book to locate at least three constellations. If the moon is visible, identify the current moon phase.
- ☐ Make a model of the solar system. Attempt to reproduce the scale of the planets and their distances from the sun.
- ☐ Find a way you can use your new Astronomy skills to minister to someone else.

#1 Safety

- **Always** be aware of your surroundings as you go out to look at stars at night.
- **Never** use a telescope to look directly at the sun.
- **Never** go out alone to look at stars at night.

WORDS TO KNOW

Find the words hidden in the word search puzzle below. Then search the chapter to discover each definition.

T	Z	P	L	A	N	E	T	V	N
E	B	S	I	S	M	A	Z	L	O
L	C	D	A	T	U	R	N	I	I
E	D	A	S	E	O	N	Y	G	T
S	P	E	A	R	T	H	M	H	A
C	O	M	Z	O	Y	O	O	T	L
O	R	A	I	I	A	W	N	-	L
P	T	C	N	D	W	H	O	Y	E
E	B	O	X	V	Y	Z	R	E	T
R	O	M	A	R	K	O	T	A	S
M	Z	E	A	P	L	U	S	R	N
R	T	T	M	O	I	L	A	V	O
E	S	W	O	N	M	Z	P	R	C
A	Z	G	A	L	A	X	Y	C	I

Asteroid: A very small planet or the remains of a broken-up planet.

Astronomy: The study of stars, planets, and space.

Comet: A bright heavenly body with a long tail of light.

Constellation: A group of stars that form a shape or pattern.

Earth: The planet on which we live.

Galaxy: A very large group of stars and planets.

Light-Year: The distance light travels in one year.

Milky Way: The galaxy in which our solar system is found.

Moon: The satellite that moves around the earth once each month and reflects light from the sun.

Planet: One of the nine large heavenly bodies circling the sun.

Star: A ball of burning gases in space.

Sun: The star that the Earth and other planets revolve around. It gives light and warmth.

Telescope: An instrument that makes distant objects seem larger and closer.

THE HEAVENS DECLARE: Session 1

Stars

Stars are balls of burning gas. They vary in size with some being about the size of the Earth. Others are over 1,000 times larger than our sun. Our sun is actually a star!

On a clear night you can see almost 2,000 stars with your eyes. Some stars are brighter and easier to see. There are three reasons for this. First, the nearer a star, the brighter it appears in the sky. Second, larger stars look brighter. Third, some gases burn hotter than others; stars with gases that burn hotter will look brighter in the sky.

You can also tell how hot a star is by the color it glows. Blue and white stars are the hottest. Yellow stars, like our sun, are in the middle. Red stars are the coolest.

How Big Is the Universe?

Because the universe is so large, no one has been able to discover its actual size or count all the stars. In space, it is impossible to measure things in miles. Astronomers use the

term light-year to describe distance. A light-year is the distance light travels in one year. This distance is 5,878,000,000,000 miles (5 trillion, 878 billion miles). The North Star, or Polaris, is about 431 light-years away. That means it took the light from that star 431 years to reach the earth!

Constellations

Constellations are groups of stars. Those who study the stars group them like different figures and shapes, like a connect-the-dots picture. Most of the constellations were named by the Greeks thousands of years ago.

We use constellations to mark locations of objects in the sky. When astronomers look into the sky and see something new or unusual, they can tell another person where to look by telling them what constellation it is in or near. There are 88 constellations, but not everyone sees the same constellations. Because the earth is round, some constellations are seen only in the northern hemisphere and some only in the southern hemisphere.

Easily Recognized



The most easily recognized constellations are the Big Dipper and the Little Dipper. Locate the North Star. The North Star is the brightest star in the Little Dipper. It is the last star in the handle. The Little Dipper also forms the Little Bear (Ursa Minor). The Big Dipper is beside the Little Dipper. The two stars in the Big Dipper's cup point to the North Star. The Big Dipper helps to form the Big Bear (Ursa Major).

If there are no clouds, go outside with your Pathfinder group and look at the night sky. Compare what you see to the constellations in this book. What constellations can you see?

Spring Constellations

1. Leo, the Lion

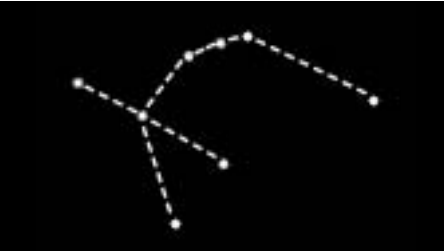


2. Cancer, the Crab

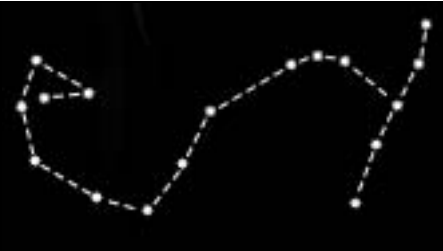


Summer Constellations

1. Aquila, the Eagle

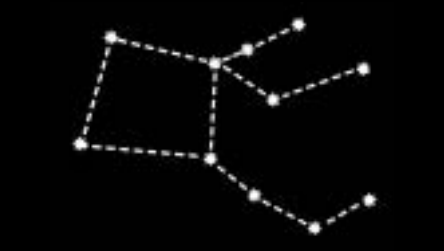


2. Scorpius, the Scorpion



Autumn Constellations

1. Pegasus, the Flying Horse



2. Andromeda



Winter Constellations

1. Orion, the Hunter



2. Canis Major (The Great Dog)



AN EVENING WITH THE STARS: Session 2

An Eye to the Sky

Until the 1600s, people had to depend on their eyes alone to learn about the sun, moon, planets, and stars. Hans Lipperhey invented the telescope in 1608, and the Italian astronomer Galileo made the telescope famous.

Galileo was the first person to use a telescope to explore the heavens. With the telescope, Galileo discovered that Jupiter had four moons. He also spent time observing our moon, star patterns, and sunspots. Galileo eventually went blind from looking at the sun through his telescope!

Before 1700, people thought only five planets existed—Mercury, Venus, Earth, Mars, and Jupiter. Uranus was discovered in 1781, Neptune in 1846, and Pluto in 1930.

Originally, telescopes were a series of lenses and mirrors in a tube. You will still find telescopes like this in your local stores. The more advanced telescopes of today can see much farther and with more detail. Using radio waves, satellite transmissions, and other technology, today's astronomers can see farther than ever before.

Is It a Star or a Planet?

You can see some planets in the night sky because they reflect the light of stars near them. How can you tell when you have found one? A planet is a “star” that does not twinkle.

The Sun

The sun is a medium-sized yellow star. It affects Earth's weather patterns. Warmth from the sun causes moisture to evaporate from lakes, seas, oceans, and rivers and form clouds. When the moisture in the clouds becomes too heavy, it rains or snows. The sun also heats large air masses floating high above the earth's surface. These warm air masses move, creating wind and changing weather conditions around the world.

Facts About Our Sun

- ☐ Our sun is made up of gases. About 75 percent of that gas is hydrogen.
- ☐ The sun is 93 million miles from earth.
- ☐ It is 864,370 miles across.
- ☐ The temperature on the surface of the sun is 10,333° F.

Sunspots

Sunspots are dark spots on the sun's surface. Some spots are as large as 50,000 miles across and up to 2,000° cooler than the rest of the sun. These spots are caused by solar flares, or small explosions on the sun. Solar flares shoot energy into space. When the energy hits the earth, it causes magnetic storms. You cannot feel magnetic storms, but you know one has hit the earth when satellite TV and cell phone signals are disrupted.

When the energy from the sun touches the earth's magnetic field, auroras are formed. Auroras are moving lights that look like thick patches of colored fog in the sky. The Aurora Borealis, often called the Northern Lights, can be seen throughout the northern hemisphere. The Aurora Australis is the southern hemisphere's light display. The further north and south you live, the more likely you are to see auroras. They happen near to the North Pole and the South Pole.

Asteroids, Comets, and Meteors

Located between Mars and Jupiter, there is a band of rocks and frozen gases called asteroids. Many believe these rocks to be the remains of a broken-up planet.

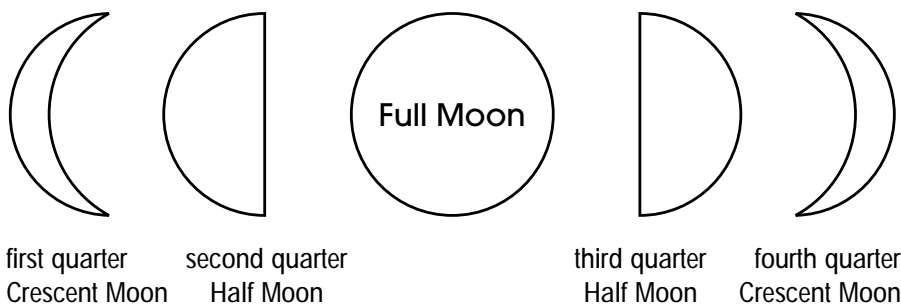
Without a telescope, comets look like large, fuzzy stars with a tail. The comet is much like a large, dirty, space snowball. It consists of frozen gases, ice, and dust. Comets orbit the sun like planets. The best known comet, Halley's Comet, is seen every 77 years.

Meteors are often mistaken as "shooting stars." They are really metallic or stony material. When captured by Earth's gravity, these chunks of rock streak through the atmosphere in a ball of flame. Millions of meteors fall to the earth every day. Most of them burn up before reaching the earth's surface, but some make it all the way to earth. The craters on the moon are caused by large meteors crashing into its surface.

The Moon

The moon is the Earth's only satellite and the easiest object to recognize in the sky. Large craters, caused by meteors striking its surface, can be seen from the earth. The "Man in the Moon" is actually a group of craters that form a face on the moon.

The moon glows because it reflects sunlight. As the moon orbits the earth, its shape seems to change. This happens because the earth comes between the sun and the moon, casting a shadow across the moon. The moon goes through a complete set of phases about once a month. These changes are called quarters.



Visit a local planetarium or look at stars with your Pathfinder group. If you are looking at stars, use a telescope or binoculars to find each of these things in the night sky:

- ☐ the moon
- ☐ a planet
- ☐ a blue star
- ☐ the major constellations (Remember, you will see different constellations at different times of the year.)

MAKE YOUR OWN SOLAR SYSTEM: Session 3

Galaxies

Galaxies are like islands in the universe. They are made up of thousands of stars, planets, and other solar systems. Our solar system is located in the Milky Way galaxy.

On a clear night, you can see a milky, cloudy band through the sky. You are looking at the Milky Way through its thickest part. It looks milky because there are over 100 billion stars in our galaxy. If you were able to travel from one edge of our galaxy to the other, it would take you almost 100,000 light-years.

Our Solar System

For centuries humans believed the earth was the center of the universe, and everything else revolved around it. Galileo was the first to question this belief, and he was put in jail for it.

Our solar system consists of the sun at the center, nine planets, and all the moons and other objects that orbit the sun. Here is some information about the planets in our solar system.

Planet	Miles from the Sun	Time to Orbit the Sun*	Time for Planet to Rotate One Time**	Satellites (Moons)***
Mercury	36 million	88 days	59 days	0
Venus	67 million	225 days	243 days	0
Earth	93 million	365 days	24 hours	1
Mars	142 million	687 days	24 hours	2
Jupiter	484 million	12 years	10 hours	58
Saturn	885 million	29 years	10½ hours	31
Uranus	2 billion	84 years	16-28 hours	21 +
Neptune	3 billion	165 years	18-20 hours	11
Pluto	3½ billion	248 years	6 days	1

The numbers in this chart have been rounded off.

* The time on the planet is equal to one Earth year.

** The time on the planet is equal to one Earth day.

Make a Model of the Solar System

Here's How to Make It

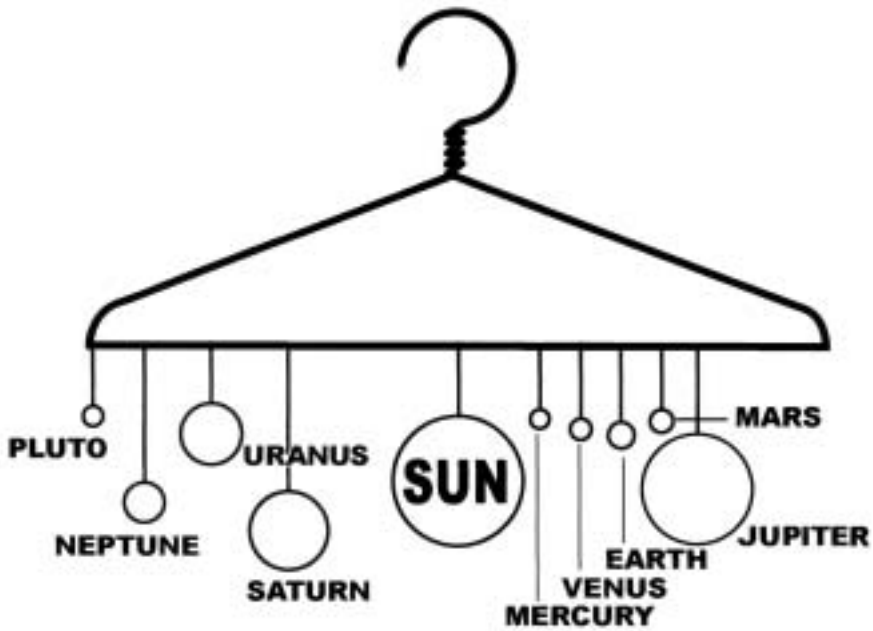
1. Gather your materials.
2. Paint the Styrofoam balls to look like the planets, moons, and sun. Choose smaller balls for smaller planets, and the largest ball for the sun. Label the planets with a marker after the paint dries.
3. Use a pencil to poke a hole through the balls. Slide the string through the hole.
4. Once the string is through the hole, tie it to a paper clip. This will hold the ball onto the string.
5. Tie the other end of the string to a coat hanger. Remember to hang the planets in the correct order!

SUPPLY CLOSET



- astronomy books or photographs of the solar system
- foam or Styrofoam balls of various sizes
- pens, pencils, and markers
- paint and paintbrushes
- string (precut)
- wire coat hanger
- paper clips
- marker

Option: For an extra challenge, stick push pins into the planets to represent moons.



'RAP IT UP!

1. God created the universe which is too big for us to measure. What does that say about God's power?

2. How can God use your ability to understand astronomy in the future?

3. We know that God is powerful because He created the universe. God also cares about each of us and works in our lives. How has God shown His power in your life?

Date

Guide's Signature