

Star Stories

Learning Objectives:

- Learn about cultural interpretations of the night's sky.
- Learn about constellations.

Prep Time: 15 - 30 minutes

Duration: 25-50 minutes

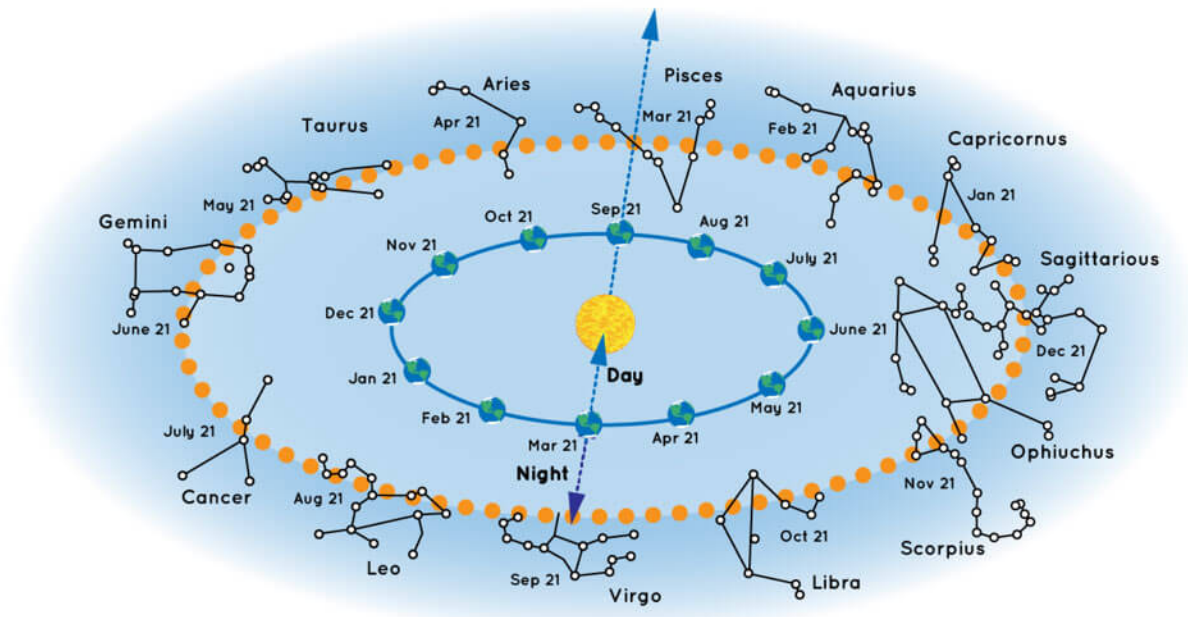
Learning content:

Astronomy is the scientific study of everything in outer space. Astronomers and other scientists study stars and galaxies, most of which are many light-years away from Earth. There are a few different definitions of constellations, but many people think of constellations as a group of stars. Often, it's a group of stars that looks like a particular shape in the sky and has been given a name. These stars are far away from Earth. They are not connected to each other at all. Some stars in a constellation might be close while others are very far away. But, if you were to draw lines in the sky between the stars like a dot-to-dot puzzle – and use lots of imagination – the picture would look like an object, animal, or person.

Over time, cultures around the world have had different names and numbers of constellations depending on what people thought they saw. Today, there are 88 officially recognized constellations recognized by the International Astronomical Union. The constellations you can see at night depend on the time of year. Earth orbits around the Sun once each year. Our view into space through the night sky changes as we orbit. So, the night sky looks slightly different each night because Earth is in a different spot in its orbit. The stars appear each night to move slightly west of where they were the night before.

Your location on Earth also determines what stars and constellations you see, and how high they appear to rise in the sky. The Northern Hemisphere is always pointing in a different direction than the Southern Hemisphere. This means that stargazers in Australia, for example, get a slightly different view of the sky and can see a few different constellations than those in the United States.

It can be a little confusing to picture how the night sky changes as we orbit the Sun. You can see how it all works in the illustration below.



Stars and constellations stay in approximately the same spot for many, many years. They only appear to move in the sky during the year because we are on a moving planet. Because the constellations are in a fixed location, they are often used as landmarks in the sky. Many stars, nebulae, and other objects are named after the constellations they are found in.

Known stars, such as those in well-known constellations, can also be used to navigate. For centuries, sailors used stars to determine their location when out at sea. This is called celestial navigation. NASA astronauts have also trained to use celestial navigation as a backup in case modern navigation systems have trouble. Studying the scientific properties of these objects in space helps us to understand how the universe was made, what else is out there, and how we fit in.

Astrology is not the same thing as astronomy. As a science, astronomy follows the scientific process involving evidence and data. Astrology is based on the belief that the location of certain stars and planets in the sky can predict the future or describe what a person is like. While astrology is important to some cultural traditions, its claims are not based on scientific evidence.

(NASA 2023)

Supplies:

- Planispheres (attached)
- Cardboard
- Black pipe cleaners
- Glow in the dark pony

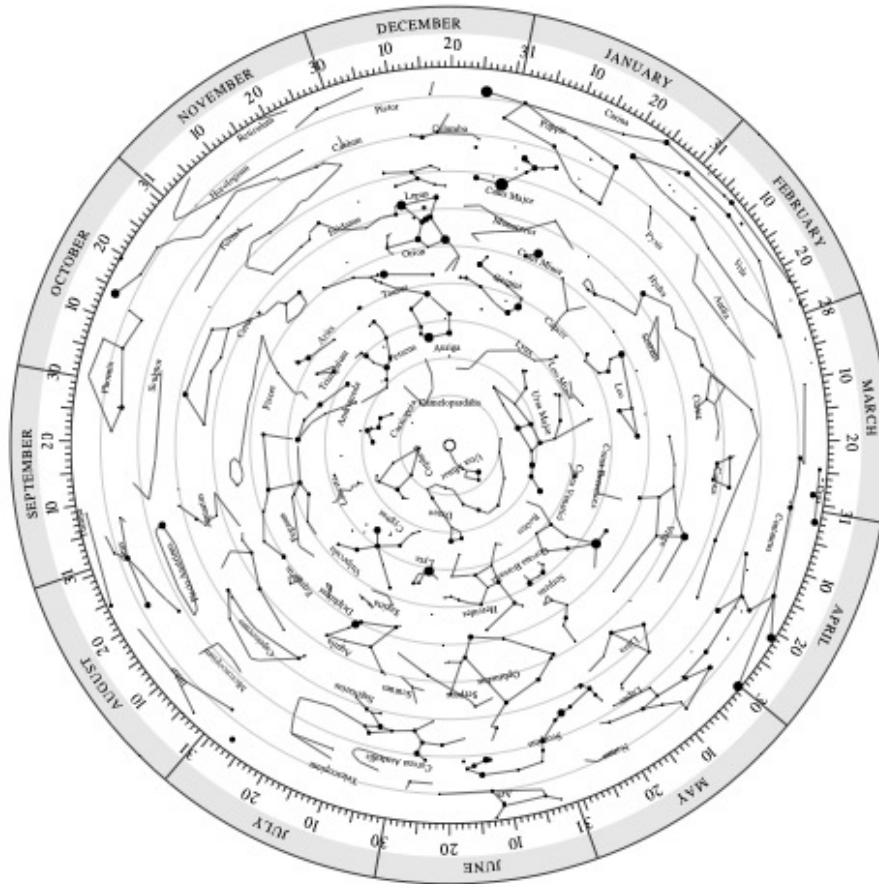
Set Up:

- Cut cardboard into a 6"x6" square for each student
- Write the students names on the back of their cardboard.

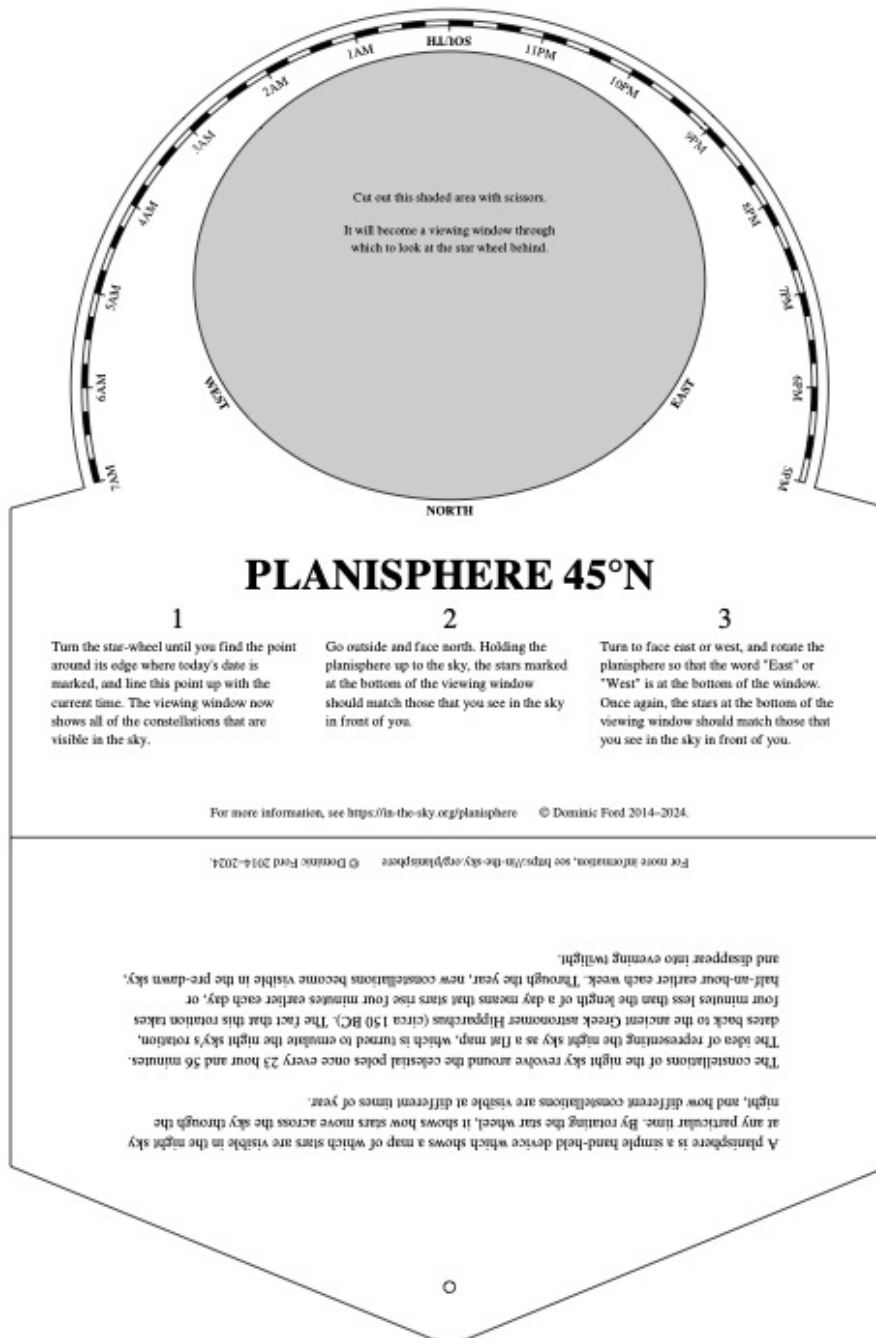
- beads
- Markers
- Scissors

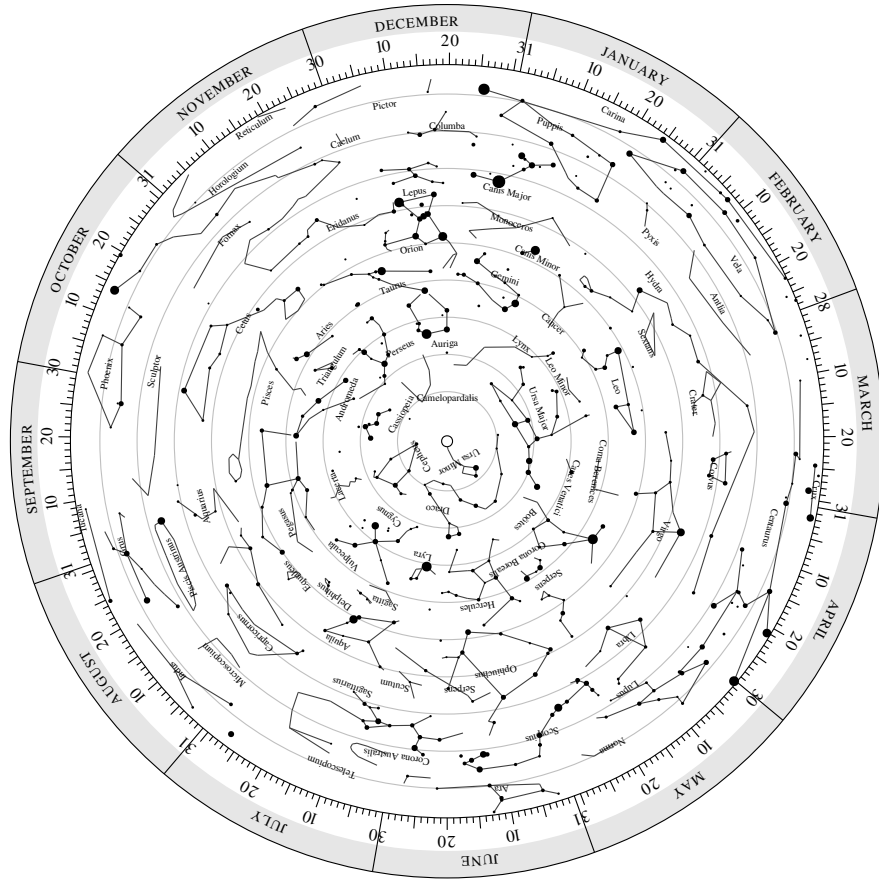
- Tape black paper over the cardboard on one side
- Cut black pipe cleaners into various lengths, with a maximum length of 6"
- Each student should have their own cardboard and ~8 pipe cleaners and beads. Students will need 1 bead per pipe cleaner.
- Ensure that glow in the dark beads have had sufficient light exposure to glow.
- Note: this activity works best in a dark room.
- Create an example constellation so students clearly understand the goal of the project.

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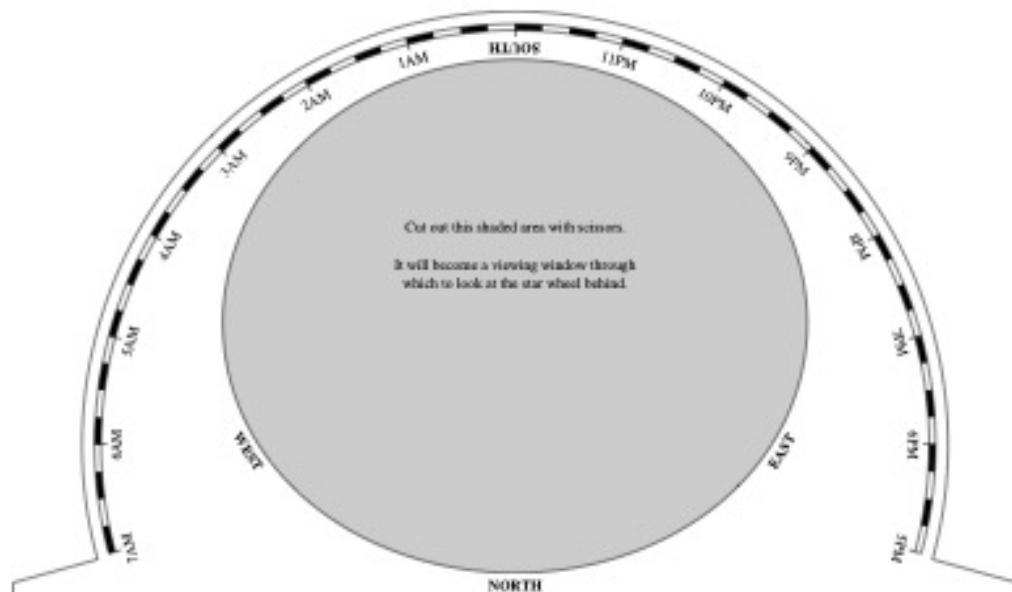


The planisphere's central star wheel, which should be sandwiched inside the folded holder.





The planisphere's central star wheel, which should be sandwiched inside the folded holder.



PLANISPHERE 45°N

1

Turn the star-wheel until you find the point around its edge where today's date is marked, and line this point up with the current time. The viewing window now shows all of the constellations that are visible in the sky.

2

Go outside and face north. Holding the planisphere up to the sky, the stars marked at the bottom of the viewing window should match those that you see in the sky in front of you.

3

Turn to face east or west, and rotate the planisphere so that the word "East" or "West" is at the bottom of the window. Once again, the stars at the bottom of the viewing window should match those that you see in the sky in front of you.

For more information, see <https://in-the-sky.org/planisphere> © Dominic Ford 2014–2023.

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A planisphere is a simple hand-held device which shows a map of which stars are visible in the night sky at any particular time. By rotating the star wheel, it shows how stars move across the sky through the night, and how different constellations are visible at different times of year.

The constellations of the night sky revolve around the celestial poles once every 24 hours and 56 minutes. The idea of representing the night sky as a flat map, which is turned to enable the night sky's rotation, dates back to the ancient Greek astronomer Hipparchus (c. 150 BC). The fact that this rotation takes four minutes less than the length of a day means that stars rise four minutes earlier each day, or half-an-hour earlier each week. Through the year, new constellations become visible in the pre-dawn sky, and disappear into evening twilight.

Activity:

1. **Introduce** the activity. When you look at the sky at night, what do you see?
2. **Show** students the planisphere and **ask** them if they see any constellations that they recognize. What will those constellations look like from a different angle? What about from Mars?
3. Invite students to **imagine** their own constellation using the planisphere. What does it look like? What story does it tell?
4. **Demonstrate** your example constellation.
5. Invite students to **create** their constellation using beads, pipe cleaners, and cardboard.
 - a. Poke a small hole through the cardboard and thread the pipe cleaner through.
 - b. On the back side of the cardboard, bend or knot the pipe cleaner so it doesn't fall out.
 - c. On the other side of the pipe cleaner, knot a bead so that it stays on the end of the pipe cleaner. The front side should have most of the pipe cleaner sticking all the way through, while the back just has the knotted end.
 - d. The cardboard represents the black space between stars, the beads represent the stars, and the pipe cleaners help demonstrate that the sky is not flat; stars can have significant 3-dimensional distance between each other. From the front the stars should look like the constellation, but from the side or another angle it should look different.
6. While students are building, **listen** to the Indigenous star stories on spectrUM's website umt.edu/spectrUM
7. When constellations are completed, invite students to **share the stories** of their constellation. Turn the **lights off** so students can see the constellation glow.
8. **Reflect** and make comparisons about how constellation models look different from different angles.

spectrUM Pedagogy:

Inspire Curiosity: Ask open-ended questions and encourage creative thinking.

Encourage Growth Mindset: Building can be challenging and a point of frustration for some students. Encourage students and praise them on their effort and problem-solving skills.

Make Meaning: Create personal connections between science and students by asking them about their relationship with the stars.

Navigate Your Future: Let students know about resources and opportunities for them to continue to pursue an interest in astronomy, such as classes, clubs, camps, and higher education.

Collaborate With Communities: spectrUM has collaborated with many tribal representatives to connect science with Indigenous traditions. These resources can be found on spectrUM's website, umt.edu/spectrUM.

Try It: Encourage student autonomy by providing them the opportunity to build their constellations and problem-solve independently.