LESSON 2

Sky Patterns over Time

What do you notice about the sunset?

I notice _____

_____

_____

_____

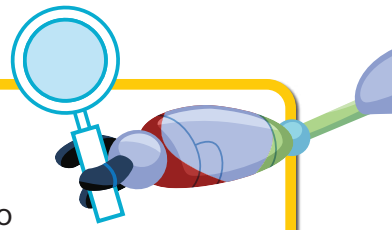
What do you wonder about the time that the sun sets? How might Earth's shape relate to the sun set?

I wonder _____

_____

_____

Can You Explain It?



Why does the time of sunset in a given place change from one day to the next? Sketch, write, or model your answer.

HANDS-ON ACTIVITY

The Night Moves

Some groups of stars, called **constellations,** appear to make patterns in the night sky. Your teacher will have placed a model of the sun in the middle of the room and posted names or images of constellations around the room. Imagine that your head is Earth and that it is nighttime when your back is to the sun and you can see the constellations. Explore a pattern in the sky caused by Earth's motion.

Form a question Ask a question about how Earth's motion relates to which constellations are visible.

Did you know?

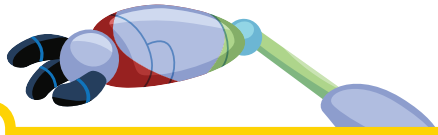
Astronomers officially recognize 88 constellations.

STEP 1 Stand in front of the sun model with your back to it. You are modeling Earth at night during a given time of year. Record your observations of the constellations you see in front of you.

STEP 2 Revolve one-quarter of the way around the sun in a counterclockwise direction, keeping the sun at your back. This position represents Earth at a different time of year. Record your observations of the constellations. Repeat Step 2 two more times until you are back to your starting position, making sure to always keep the sun at your back and to record your observations.

STEP 3 At your starting position, rotate counterclockwise to model Earth's rotation. Record your observations, and be ready to explain how this motion changes your view of the sky.

Make a **claim** about why different stars are visible during different times of the year. Cite **evidence** to support your claim, and explain your **reasoning**.



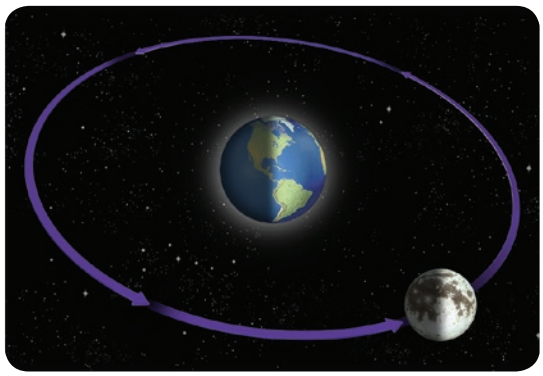
Making Sense

What patterns can be explained by Earth's revolution around the sun?

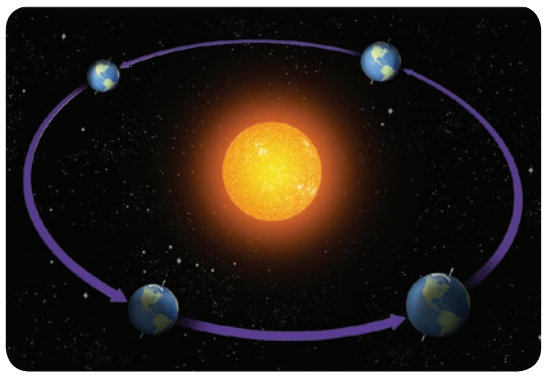
What Patterns Do the Sun and Moon Cause During the Year?

Round and Round

Each year, Earth makes one complete orbit around the sun. Earth is not the only object orbiting the sun in space. All of the objects in the solar system orbit the sun. Some planets also have moons orbiting them.



The moon is a natural satellite of Earth. It takes the moon about a month to make one **orbit** around Earth. An orbit is the path of one object in space around another.

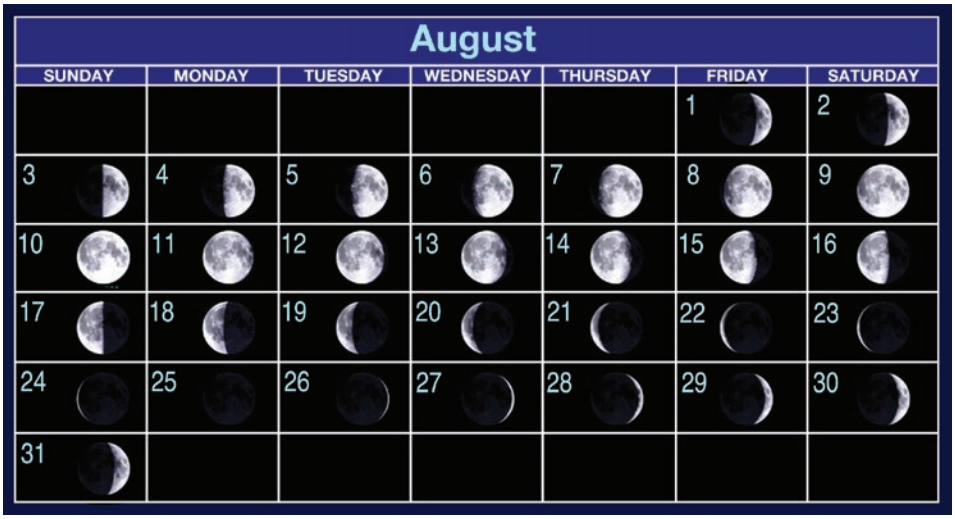


Earth orbits the sun in an almost perfect circle. This movement of Earth one time around the sun is called a **revolution**. It takes about 365 days for Earth to make one revolution around the sun. Our year is based on this movement of Earth.

Explain What patterns do you think are caused by the revolutions of Earth and the moon?

Moon Shapes

Have you ever seen a full moon? How about a crescent moon early in the morning? Each month, the moon goes through phases, or changes in its appearance as seen from Earth. Look at the sequence of moon phases observed in August. Look for a pattern as you study these phases.



Model Fill in the missing moon phases in the September calendar by drawing moons of the correct shape.

Describe What patterns in phases did you observe using the calendars?

Revolution and Patterns

The moon's phases are patterns of light and darkness caused by the moon's revolution around Earth. What patterns are caused by Earth's revolution around the sun? View the images below to see one effect of Earth's revolution on the day sky in the Northern Hemisphere.

Look at the sun's position in the sky during different seasons, as seen from the same spot. Note the time and month.

This also shows the sun's position in the midday sky during the same months. Note that this shows a different year.

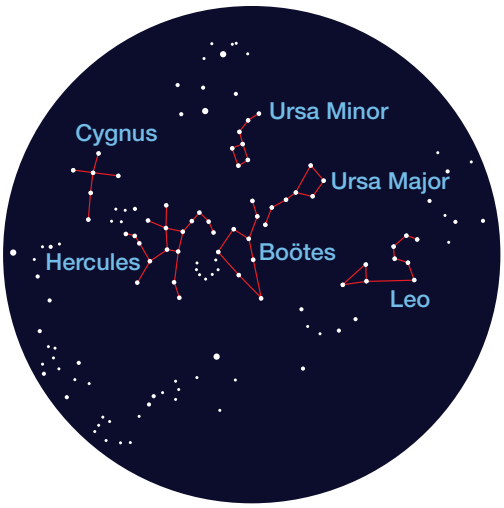
Chart the Sun

Interpret the information from the images. Then, construct a graph of the sun's noon position above the horizon during the observed time periods.

Shifting Stars

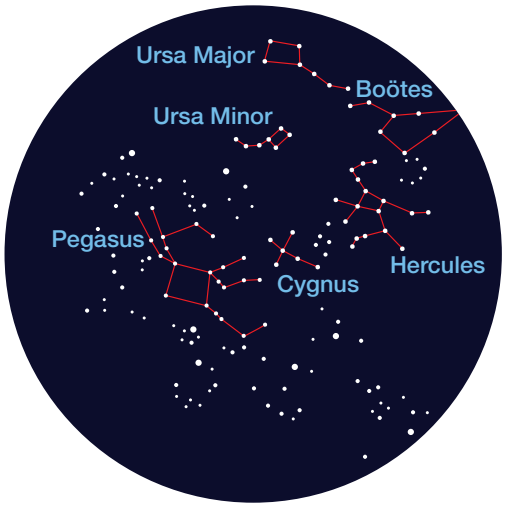
Earth's revolution affects how we view the sun's position in the sky. How does it affect our view of the stars at night? Study the images below to explore a pattern in the position of stars as Earth revolves around the sun. Discuss the questions below with a classmate.

10:00 p.m.



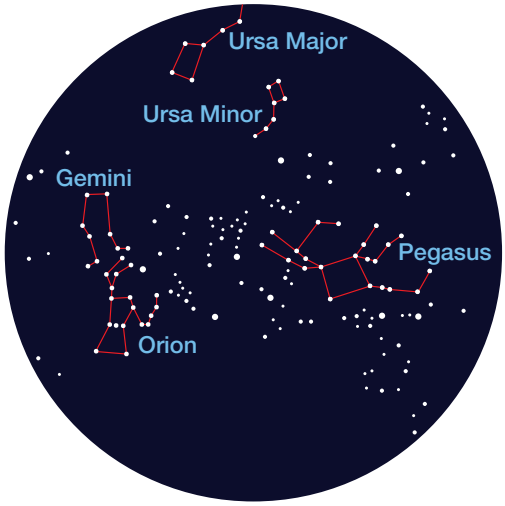
On a **summer** night, you see these constellations in the night sky from a given spot on Earth. Which constellations can you see?

10:00 p.m.



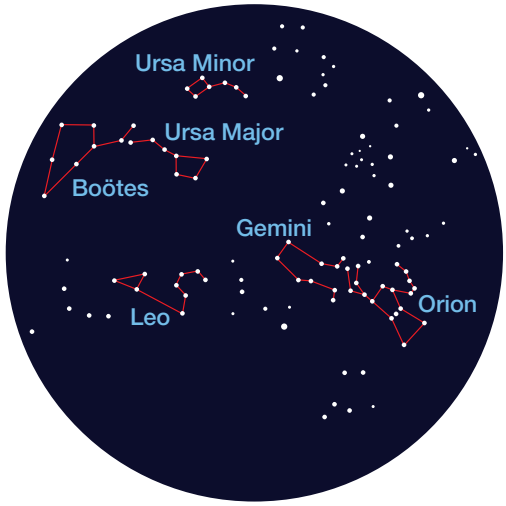
On a **fall** night, you see these constellations in the night sky from the same spot on Earth. How has Hercules changed from the summer view?

10:00 p.m.

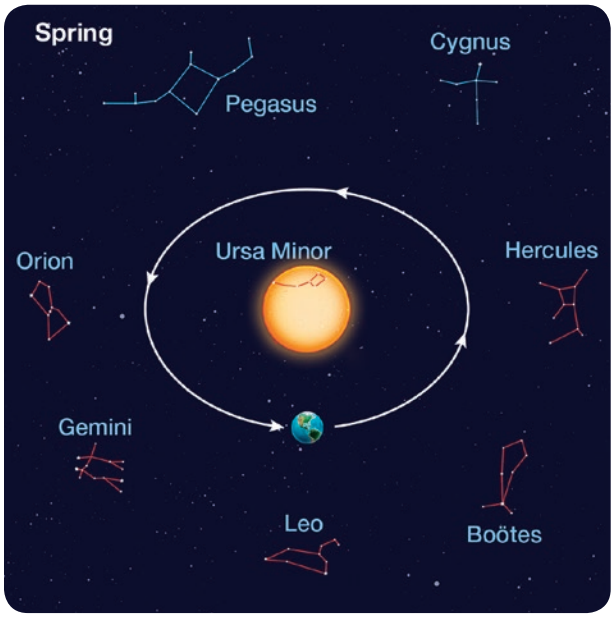


On a **winter** night, you see these constellations in the night sky from the same spot on Earth. Again, the night night sky features some different constellations. How has Ursa Minor changed?

10:00 p.m.



On a **spring** night, you see these constellations in the night sky from the same spot on Earth. Once again, the night sky looks different. Can you see Pegasus? What do you think happened?



Analyze Look back at the spring image on the previous page and take note of the constellations in the sky. Then, look at this star map that shows Earth's location in the spring. (The model is not to scale.) Circle the following: Earth and Pegasus. Explain why you can't see Pegasus in the spring.

Changing Constellations

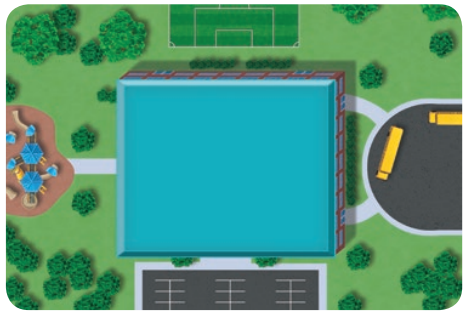
How do your observations of the constellations change with the seasons? Using the night images on the previous page, complete the data chart to record your observations. Write a large X if you see the constellations during the season. Leave a space blank if you do not see the constellation in that season.

	Summer	Fall	Winter	Spring
Orion				
Gemini				
Leo				
Ursa Minor				
Pegasus				
Hercules				
Boötes				
Cygnus				

Explain Which pair of constellations is visible in winter?

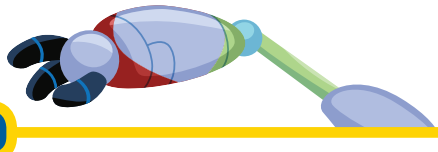
a. Orion and Leo
b. Gemini and Hercules
c. Ursa Minor and Boötes
d. Cygnus and Pegasus

Campus Constellations



Suppose you attend a school similar to one in this image. How is your ability to see different parts of your campus affected by your position? You are not able to see certain things depending on your location and orientation—the direction you are facing. This model can help you understand why we see different stars in different seasons.

Model Make a model to explain how the motions of Earth and the moon around the sun in space cause specific patterns in the sky. Select a daily, monthly, or yearly pattern to be the focus of your model.



Making Sense

How does evidence for yearly patterns in the sky help you explain why the sun sets at different times from one day to the next?