

Sky Quest

Moon



Saturn



Horsehead Nebula





Sky Quest Pre-Visit Guide

INTRODUCTORY SUMMARY

1. Concepts presented in *Sky Quest*

- a. Looking through a telescope enables us to see objects in the sky better.
- b. Through a telescope, stars appear brighter, but they still are points of light.
- c. We see patterns of stars in the sky. We call the patterns constellations.
- d. The constellations we see today were named thousands of years ago.
- e. Knowing the constellations makes it easier to identify stars in the sky.
- f. Anyone can observe the night sky and find star patterns.
- g. Some stars are brighter than others.
- h. As time passes, the entire pattern of stars turns in a regular way.
- i. Through a telescope, a planet can appear large and round, like a coin.
- j. Looking through a telescope, we can learn about the planets.

2. Concepts presented in the guide

- a. We see patterns of stars in the sky. We call the patterns constellations.
- b. Ever since ancient times, people have looked at constellations and imagined pictures.
- c. Through a telescope, a planet can appear large and round, like a coin.
- d. Through a telescope, far more stars can be seen than with the unaided eye.
- e. Through a telescope, you can see the craters on the surface of the Moon.
- f. Some stars are brighter than others.

OVERVIEW

What do people imagine when they look at the stars?
Students match dot patterns representing constellations to become familiar with patterns of stars in the night sky. Then they make a drawing inspired by one of these patterns.

OBJECTIVES FOR THIS GUIDE

- ★ Match patterns of dots that correspond to parts of constellations.
- ★ Create imaginative drawings based on patterns of stars.
- ★ Compare and contrast how the night sky appears to the unaided eye and how it appears through a telescope.
- ★ Compare and contrast how the Moon appears to the unaided eye and how it appears through a telescope.

The following objective is for students in third grade and above:

- ★ Compare and contrast how a planet appears to the unaided eye and how it appears through a telescope.

ABOUT THIS GUIDE

This guide provides a pre-visit activity that will enable your students to have the best possible learning experience during their *Sky Quest* planetarium show. The activity familiarizes them with constellations and with the imaginative figures that constellations can inspire.

This guide is written for first through third graders, but older students can also benefit from the activity. To better anticipate what your students will need to learn and understand, you are encouraged to visit the Museum and see *Sky Quest* in advance.

EDUCATION STANDARDS ADDRESSED IN THIS ACTIVITY

National Science Education Standards

Earth and Space Science

- ★ Objects in the Sky

History and Nature of Science

- ★ Science as a Human Endeavor

Benchmarks for Science Literacy

The Physical Setting

- ★ There are more stars in the sky than anyone can easily count, but they are not scattered evenly, and they are not all the same in brightness.

BACKGROUND INFORMATION

The mythology of the constellations is as old as civilization itself. Most of our constellation myths come from cultures in Babylonia, Greece, Rome, and Egypt; others from China, Mexico, Africa, and from American Indians. The night sky provided a grand stage for the presence and action of mythological figures. For instance, the ancient Greeks imagined the figure of Orion, an arrogant hunter, in a group of bright winter stars. As the story went, the great god Juno was jealous of Orion and sent a scorpion to sting Orion and kill him. After the sting, the scorpion became its own constellation, Scorpius, on the opposite side of the sky from Orion, so they were separated as far as possible. We see Orion and Scorpius in the same places today, since the stars' relative positions have remained virtually unchanged over the last few thousand years.

Scorpius is one of the 12 signs of the zodiac that mark the path of the Sun, Moon, and planets. During the day, the scattering of sunlight by Earth's atmosphere makes the sky so bright that we cannot distinguish the stars, but they are present nonetheless. If we could see these stars, we could chart the Sun's path through the zodiacal constellations.

The pseudoscience of astrology claims that the Sun and planets exert an influence upon the future. Despite the longstanding popularity of the daily horoscope and birth signs, astrology has no scientific basis. No astrologer has made predictions that could be tested, and no astrologer has found an explanation for the assumed influence of the Sun and planets.

In the science of astronomy, the constellations provide a way to organize the heavens. The entire sky, as seen in both the Northern and Southern Hemisphere, is divided into 88 constellations. Every constellation has an identifiable star pattern (just like the ones in the activity), but remember that there is much more to a constellation than just these main

stars. For example, the Big Dipper is an asterism (a recognizable pattern of stars) in the constellation Ursa Major. Astronomers use these star patterns to help them find objects in the sky. The brightest stars are designated by Greek letters and the name of the constellation, so “ α Canis Majoris” is Sirius, the Dog Star, the brightest star in the sky, which is located below and to the left of the constellation Orion. If you viewed Sirius through a large telescope on a clear night, you could see that it actually consists of *two* stars: the bright one we see easily with the naked eye and a dim companion star. Of the stars we can see, more than half are multiple stars, and that holds true for stars throughout our galaxy. Our galaxy, which contains 100 to 300 billion stars, is shaped roughly like a large disk, similar to the one shown in Figure 1, with the Sun about two-thirds out from the center.

FIGURE 1



Our Milky Way galaxy is a spiral galaxy, shaped flat like a disc with prominent spiral arms winding out from the center bulge. Look for the Milky Way, an area of the sky so dense with distant stars that it appears as a bright band in the sky. This band of light is the edge-on view, or the plane of the galaxy. Stars seen outside this band of light are our neighboring stars, closer than those located in the murky band of the Milky Way. On a clear night in a remote location, the naked eye can see over a thousand separate stars. In an urban area, that number drops to a hundred or fewer, depending on viewing conditions, and unfortunately the Milky Way is obscured by haze and reflected light. Nevertheless, even in

the city, a small telescope reveals many wonders in the night sky. The telescope catches so much light that the resulting image is much brighter than what we see with the unaided eye, and in addition the telescope magnifies the image.

The three images on the front of the poster were taken through telescopes.

Stars: Notice the large number of stars in this image. Since the telescope gathers so much more light than the human eye, we can see many faint stars through the telescope that are invisible to the unaided eye. Without a telescope, we can see only the brightest stars, in the city on a clear night. This cloud of gas and dust, called a nebula, looks like a fuzzy patch through a telescope.

Saturn: To the unaided eye, Saturn appears as a bright star-like point in the sky. The telescope provides enough magnification to enable us to see Saturn as a disk and also to observe its magnificent ring system.

The Moon: This telescope's magnification provides us with a detailed view of the Moon's surface and reveals that some areas are heavily cratered, while others are quite smooth.

VOCABULARY

- ★ astronomer
- ★ constellation
- ★ pattern
- ★ star
- ★ telescope

PREPARATION

For each *group*, make one copy of the blackline master Star Patterns. In addition, make a copy for each *group* of Dot Patterns A and Dot Patterns B blackline masters. Cut out the individual dot pattern cards, tape to 3x5 cards, and collate them into sets for each group. You may wish to print the Dot Patterns and the Star Patterns sheet on heavy paper stock and laminate them for future use. Also, for each *student*, make one copy of the blackline master Make a Drawing in a Star Pattern.

Before beginning the activity, arrange for all students to take a close look at the front of the poster.

MATERIALS

For each group:

- ★ 1 set of seven dot pattern cards
(see Preparation)
- ★ 1 copy of blackline master Star Patterns

For each student:

- ★ 1 copy of blackline master Make a
Drawing in a Star Pattern
- ★ 1 sheet lined paper

For the class:

- ★ chart paper and marker (optional)

PROCEDURE

1. Ask students to go outside with an adult on a clear night and look at the stars. Emphasize that students should observe outside only if a safe place is available. If possible, have a follow-up discussion after students have had a chance to observe the night sky.
2. Ask students what they know about stars. You may wish to record their responses on chart paper.
3. Explain that the word “constellation” means a group of stars in the sky. Say that stars in a constellation form a pattern, and that they will now investigate some of these patterns.
4. Hand out a copy of the blackline master Star Patterns and a set of dot pattern cards to each group.
5. Ask students to find card 7 Big Dipper and also pattern A on the handout sheet. Ask students to compare and contrast these patterns. (The pattern on the card is larger than the one on the sheet, but the arrangement of dots is the same.) Explain that each group will now match the other cards to one of the patterns on the sheet. If students have writing skills, they can label the constellations on the Star Patterns worksheet.
6. Ask students what matches they found. Here are the answers, along with the names of their constellations.
 - ★ A7 (Big Dipper, part of Ursa Major)
 - ★ B3 (Little Dipper, part of Ursa Minor)
 - ★ C2 (Cassiopeia)
 - ★ D6 (Taurus)
 - ★ E4 (Leo)
 - ★ F5 (Gemini)
 - ★ G1 (Orion)
7. Explain that stars in the night sky make the same patterns as the dots. You can name star patterns and ask students to figure out which patterns have these names. You can mention that astronomers are scientists who study the stars, and that astronomers use the same kinds of patterns when they aim a big telescope at an object in the sky.
8. Pick up each set of cards. Now hand out a copy of the blackline master Make a Drawing in a Star Pattern to each student. Call students’ attention to the dot pattern on this sheet and ask them to find it on the Star Patterns sheet. (It is pattern E.)
9. Explain that since ancient times, people all over the world have imagined pictures from the arrangements of stars. Ask students what the drawing on the sheet is (an animal, in fact a lion) and ask how the dots might inspire someone to imagine an animal. (The dots on the right could be the head or the neck. Another line of dots could be a leg. Connecting dots in the middle could form the chest.)
10. Ask the students to tell what they imagine when they look at these dots. Call students’ attention to the lower box on the sheet (the box that contains only the dots) and have students make in this box a drawing of the picture they imagine.
11. Have students complete the sentence at the bottom of the sheet to give the name of what they drew. Ask students to tell about their drawings.
12. Hand out lined paper and encourage students to write a few sentences about what they drew.

REFLECTION AND DISCUSSION

Have students look again at the Star Patterns sheet. Ask what pictures they imagine from looking at the various dot patterns. (Be sure to point out the Big Dipper and Little Dipper.) Ask what they notice when they look at the sky on a clear night. (Collect the Star Patterns sheets and Dot Patterns cards and save them for future use.)

DISCUSSING THE POSTER

1. Have students sit so they can see the poster. Explain that all three photographs were taken through a telescope. Ask students what they see in the photograph of the stars. (many, many stars, some bright and some less bright). Explain that this photograph was taken through a telescope in a place far away from where many people live, and where there are no street lights or signs nearby, so the sky is very dark.
2. Explain that near a city, there is so much light in the sky from street lights and brightly lit signs that we can see only the brightest stars and some of the planets. Ask students what they notice about the brightness of the stars in the poster image. (Some stars are brighter than others.) Point out that the telescope shows there are far more stars in the sky than we can see with the unaided eye.
3. Have students compare and contrast the photograph of the Moon with what they see when they look at the night sky. The telescope shows that the Moon has craters and smooth areas, which appear only as vague patches to the unaided eye.
4. Point out that the planet Saturn looks like a point of light to the unaided eye. Ask students to compare the telescopic view of Saturn to a point of light. (Through a telescope, Saturn appears to be a disk with rings.)

EXTENSIONS

Middle school students and above: Go back to the photograph of the Moon on the poster. Ask students where the Moon gets its light (from the Sun: the Moon reflects sunlight in many directions, and some of it reaches Earth.) Ask how it happens that only part of the Moon is lit up. (To answer

this, you can use a ping-pong ball as a model of the Moon and a flashlight beam to simulate sunlight. With the room darkened, hold the ping pong ball in the flashlight beam. Move around the room so students can see all parts of the ball. (Only the half facing the flashlight is lit up.) This shows how the phases of the Moon are produced.

ASSESSMENT

Ask students what they know about stars. (This is the same question that was asked in Step 1 of Procedure, so you can compare the results.) You may wish to record their responses on chart paper.

RESOURCES FOR TEACHERS

Books

Discovery Box: Planets. New York: Scholastic, Inc., 1996.

Dickinson, T. *Exploring the Night Sky: The Equinox Astronomy Guide for Beginners*. Buffalo: Firefly Books, Inc., 1998.

Fraknoi, A., ed. *The Universe at Your Fingertips: An Astronomy Activity and Resource Notebook*. San Francisco: Astronomical Society of the Pacific, 1995.

Kerrod, R. *The Children's Space Atlas*. London: Quarto Children's Books, Ltd., 1991.

Levy, David. *Sharing the Sky: A Parent's and Teacher's Guide to Astronomy*. New York: Plenum Trade, 1997.

Rey, H. A. *The Stars: A New Way to See Them*. Boston: Houghton Mifflin Company, 1980.

ACKNOWLEDGEMENTS

This activity has been adapted from parts of “Creating Constellations” in *The Universe at Your Fingertips: An Astronomy Activity and Resource Notebook*, a publication of the Astronomical Society of the Pacific.

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VISITING THE NATIONAL AIR AND SPACE MUSEUM

On the National Mall in Washington, D.C.
The Smithsonian National Air and Space Museum maintains the largest collection of historic aircraft and spacecraft in the world. The Museum is open from 10:00 a.m. to 5:30 p.m. daily.



National Air and Space Museum
6th and Independence Ave., SW
Washington, DC 20560

Guided tours, science demonstrations, and planetarium programs are available free of charge for schools groups. Advanced registration is required. For more information on school programs, contact the Museum’s Reservation Office at (202) 357-1400 to request a School Programs Guide, or visit the Museum’s web site at <http://www.nasm.edu/> and navigate to “Educational Services.”

***Sky Quest* Planetarium Show**

Recommended for students in grades pre-K to 5, *Sky Quest* follows a young girl’s fascination with one special star and her dreams of exploring the Moon, the planets, and beyond.

A special *Sky Quest* program is offered on Tuesdays and Thursdays at 10:00 a.m. for school groups at no charge and with advance registration. The program includes a brief introduction, a free planetarium show, and time for questions and answers. The program lasts 45 minutes and is limited to 60 students. School groups can attend the public shows at other times but must pay regular admission.

Exploring the Planets Tour

Designed for Grades 3 through 6, the Exploring the Planets Tour leads students on an investigation of the planets and planetary probes, such as Viking, Pioneer, and Voyager. The tour includes the *Exploring the Planets* gallery and a look at models of Pathfinder and Sojourner, which recently explored Mars.

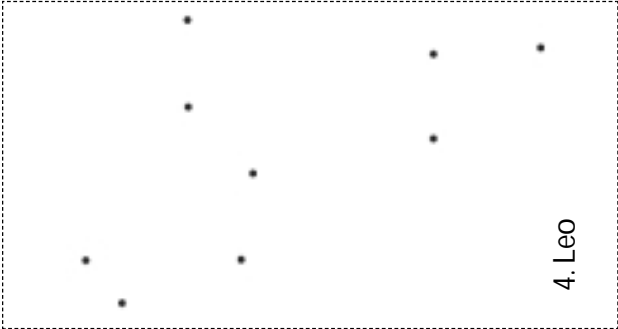
Exploring the Planets on the Web

For additional background information or to prepare for a self-guided tour, visit the Museum’s web site, where you will find descriptions of all the spacecraft exhibited in the Museum. Navigate to “Exhibitions” and then to the following galleries: *Milestones of Flight*; *Exploring the Planets*; *Where Next, Columbus?*; and *Looking at Earth*.

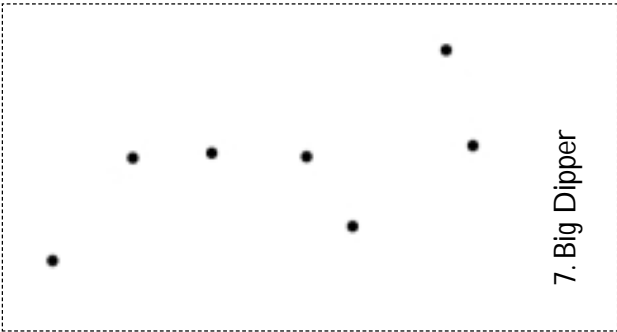
BLACKLINE MASTERS

Constellation Cards

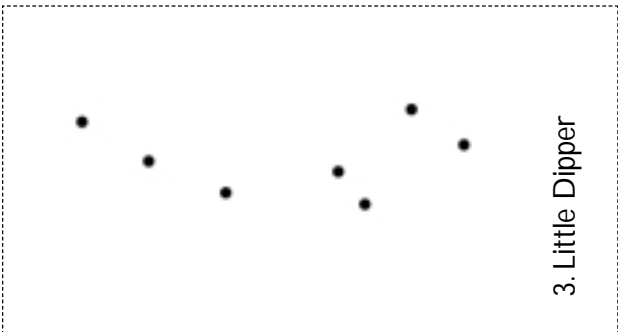
Photocopy these patterns and cut out along the dotted line. Tape or glue each one to a 3x5 card.



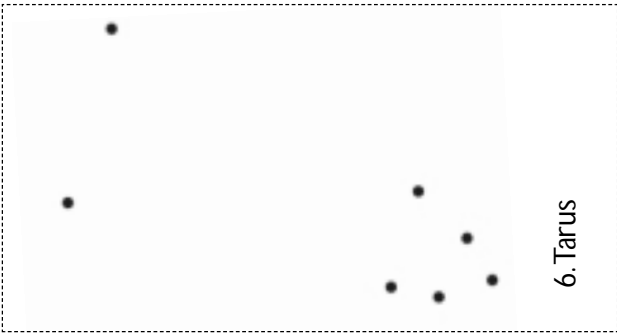
4. Leo



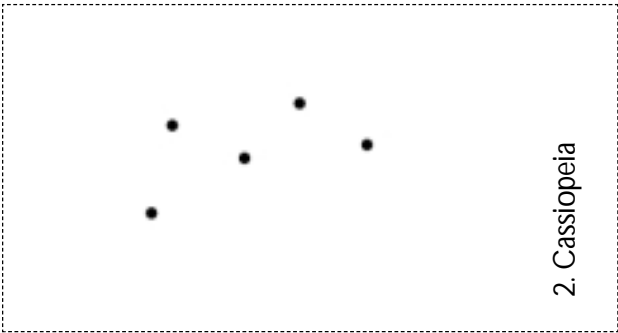
7. Big Dipper



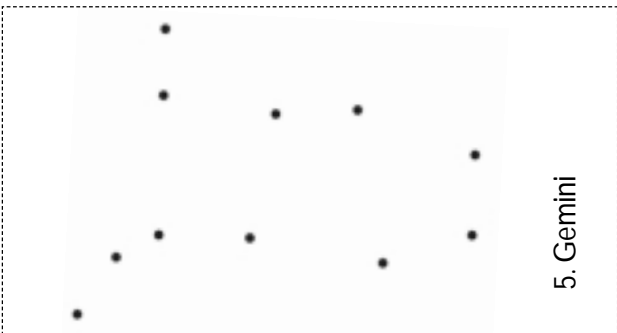
3. Little Dipper



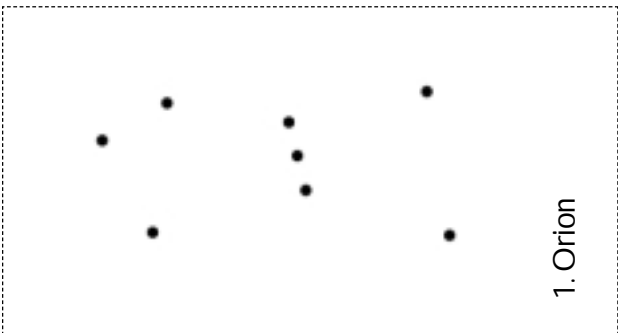
6. Taurus



2. Cassiopeia



5. Gemini



1. Orion

BLACKLINE MASTERS

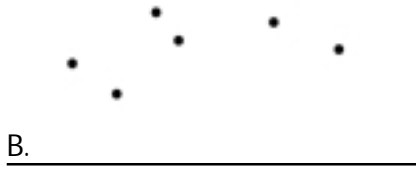
Star Patterns

Look at the Constellation cards. Match each pattern on this page to one of the cards. To help you get started, look at Pattern A and Constellation Card 7 (Big Dipper).

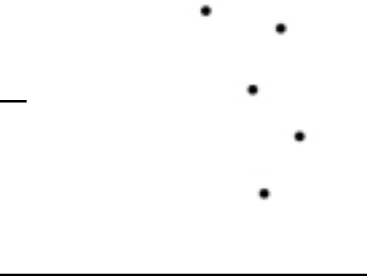
Each dot stands for a star. Star patterns are called constellations. This page shows constellations you can find in winter.



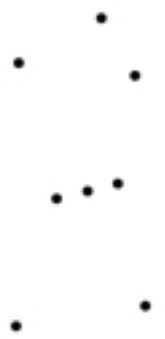
A. Big Dipper



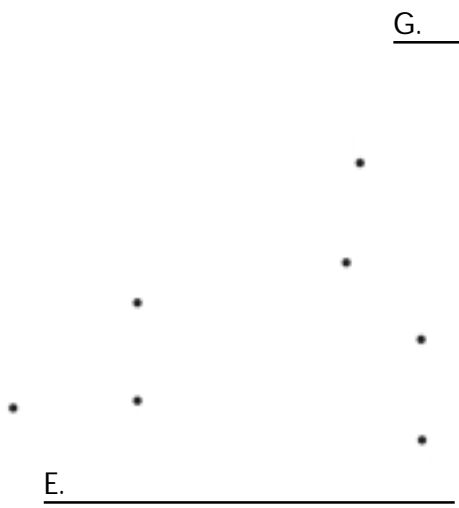
B.



C.

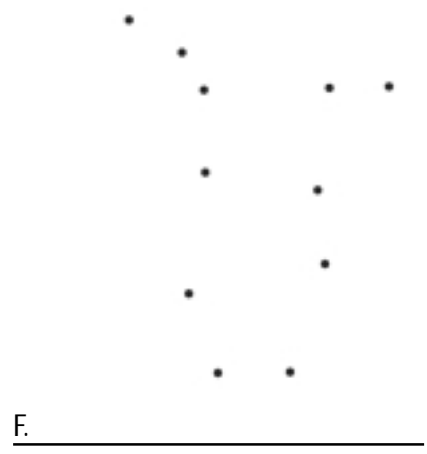


D.



E.

G.



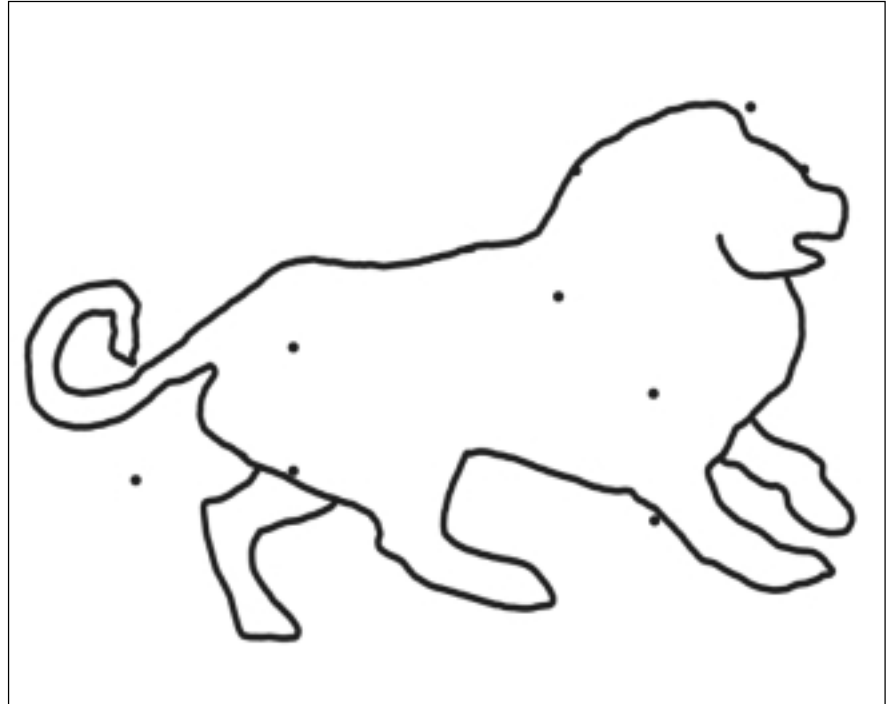
F.

BLACKLINE MASTERS

Make a Drawing in a Star Pattern

Name: _____

A person who lived a long, long time ago looked at this pattern of stars. That person drew this picture.



What drawing can you make? Try it here.

I drew a _____