



Boy Scout Badge Workshop **ASTRONOMY**

Welcome to the Schenectady Museum & Suits-Bueche Planetarium! During this workshop, you will explore the museum, see a show in the planetarium, and try out some other activities in order to complete many of the requirements for your Astronomy Badge.

Astronomy is the study of the stars, planets, moons, galaxies, and other objects anywhere outside of Earth's atmosphere. By studying astronomy, we can learn about a lot of amazing things, like black holes, comets, and whirlpool galaxies. But we can also learn about a lot of ideas that we use all the time here on Earth, like the tides in our oceans and systems for telling time and for finding our location on Earth.

We will provide you with all the information you need for many of the badge requirements, but you will need to fill in the worksheets in this packet to complete the requirements. You will also need to complete requirements 4c, 5b, 6, 7b, 9, and 10 as follow-up activities at home (although parts of them will be completed here), since the best way to learn about astronomy is to look at the sky and see the real stars, planets, and moon!

For a more complete description of which requirement is fulfilled by each activity, see the table of contents on the next page.

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In parentheses you will find the requirement for the astronomy badge that is fulfilled by each activity.

ASTRONOMY

Merit Badge Requirements

1. Describe the proper clothing and other precautions for safely making observations at night and in cold weather. Tell how to safely observe the Sun, objects near the Sun, and the Moon. Explain first aid for injuries or illnesses, such as heat and cold reactions, dehydration, bites and stings, and damage to your eyes that could occur during observation.
2. Explain what light pollution is and how it and air pollution affect astronomy.
3. With the aid of diagrams (or real telescopes if available), do each of the following:
 - a. Explain why binoculars and telescopes are important astronomical tools. Demonstrate or explain how these tools are used.
 - b. Describe the similarities and differences of several types of astronomical telescopes.
 - c. Explain the purposes of at least three instruments used with astronomical telescopes.
4. Do the following:
 - a. Identify in the sky at least 10 constellations, at least four of which are in the zodiac.
 - b. Identify at least eight conspicuous stars, five of which are of magnitude 1 or brighter.
 - c. Make two sketches of the Big Dipper. In one sketch, show the Big Dipper's orientation in the early evening sky. In another sketch, show its position several hours later. In both sketches, show the North Star and the horizon. Record the date and time each sketch was made.
 - d. Explain what we see when we look at the Milky Way.
5. Do the following:
 - a. List the names of the five most visible planets. Explain which ones can appear in phases similar to lunar phases and which ones cannot, and explain why.
 - b. Find out when each of the five most visible planets that you identified in requirement 5a will be observable in the evening sky during the next 12 months, then compile this information in the form of a chart or table. Update your chart monthly to show whether each planet will be visible during the early morning or in the evening sky.
6. At approximately weekly intervals, sketch the position of Venus, Mars or Jupiter in relation to the stars. Do this for at least four weeks and at the same time of night. On your sketch, record the date and time next to the planet's position. Use your sketch to explain how planets move.

7. Do the following:

- a. Sketch the face of the moon and indicate at least five seas and five craters. Label these landmarks.
- b. Sketch the phase and the daily position of the Moon at the same hour and place, for a week. Include landmarks on the horizon such as hills, trees, and buildings. Explain the changes you observe.
- c. List the factors that keep the Moon in orbit around Earth.
- d. With the aid of diagrams, explain the relative positions of the Sun, Earth, and the Moon at the times of lunar and solar eclipses, and at the times of new, first-quarter, full, and last-quarter phases of the Moon.

8. Do the following:

- a. Describe the composition of the Sun, its relationship to other stars, and some effects of its radiation on Earth's weather. Define sunspots and describe some of the effects they may have on solar radiation.
- b. Identify at least one red star, one blue star, and one yellow star (other than the Sun). Explain the meaning of these colors.

9. With your counselor's approval and guidance, do ONE of the following:

- a. Visit a planetarium or astronomical observatory. Submit a written report, a scrapbook, or a video presentation afterward to your counselor that includes the following information:
 1. Activities occurring there
 2. Exhibits and displays you saw
 3. Telescopes and instruments being used
 4. Celestial objects you observed.
- b. Plan and participate in a three-hour observation session that includes using binoculars or a telescope. List the celestial objects you want to observe, and find each on a star chart or in a guidebook. Prepare an observing log or notebook. Show your plan, charts, and log or notebook to your counselor before making your observations. Review your log or notebook with your counselor afterward.
- c. Plan and host a star party for your Scout troop or other group such as your class at school. Use binoculars or a telescope to show and explain celestial objects to the group.
- d. Help an astronomy club in your community hold a star party that is open to the public.
- e. Personally take a series of photographs or digital images of the movement of the Moon, a planet, an asteroid or meteoroid, or a comet. In your visual display, label each image and include the date and time it was taken. Show all positions on a star chart or map. Show your display at school or at a troop meeting. Explain the changes you observed.

10. List at least three different career opportunities in astronomy. Pick the one you in which are most interested and explain how to prepare for such a career. Discuss with your counselor what courses might be useful for such a career.

REQUIREMENTS TO COMPLETE AT HOME

Requirement 4c.

Make two sketches of the Big Dipper. In one sketch, show the Big Dipper's orientation in the early evening sky. In another sketch, show its position several hours later. In both sketches, show the North Star and the horizon. Record the date and time each sketch was made. Use the spaces below for your sketches or use separate pieces of paper and attach them to this worksheet.

Date: _____ Time: _____

Date: _____ Time: _____

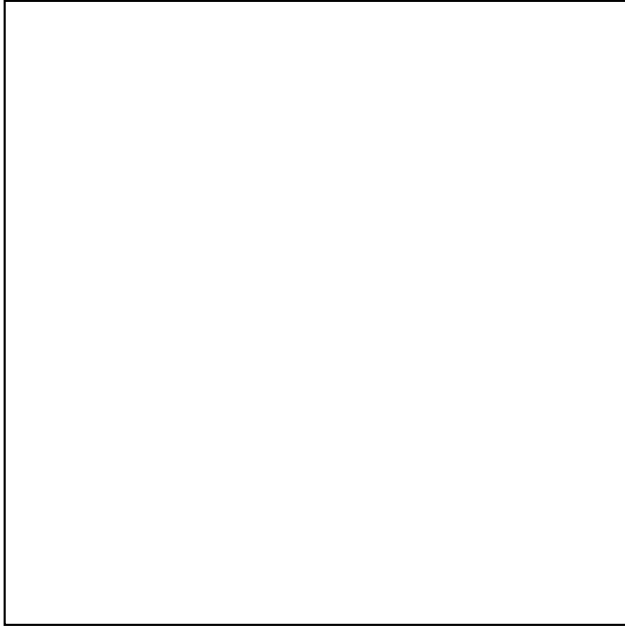
Requirement 5b.

Find out when each of the five most visible planets that you identify in requirement 5a will be observable in the evening sky during the next 12 months, then compile this information in the form of a chart or table. Update your chart monthly to show whether each planet will be visible during the early morning or in the evening sky. Use the chart below or make your own and attach it to the worksheet.

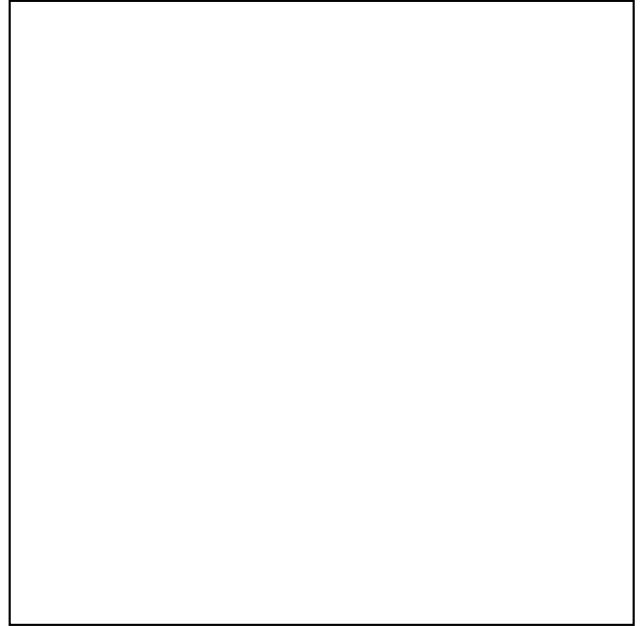
	PLANETS				
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					

Requirement 6

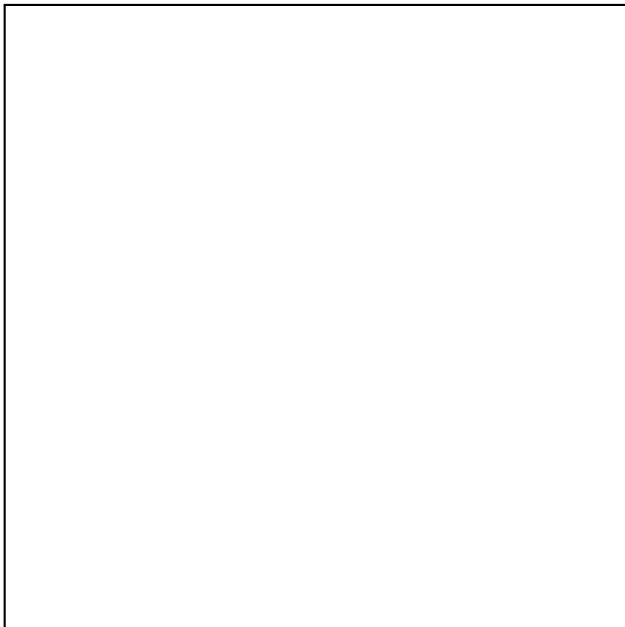
At approximately weekly intervals, sketch the position of Venus, Mars or Jupiter in relation to the stars. Do this for at least four weeks and at the same time of night. On your sketch, record the date and time next to the planet's position. Use your sketch to explain how planets move. Use the four areas below for your sketches or use your own paper and attach it to this worksheet when finished.



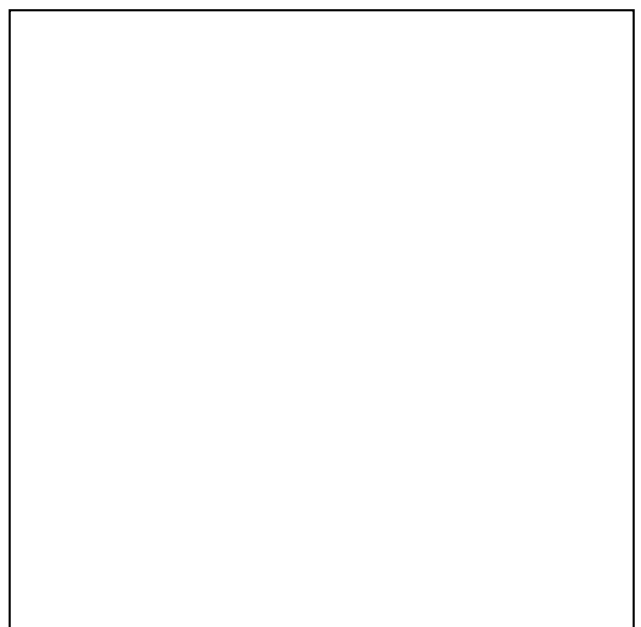
Planet: _____ Date: _____



Planet: _____ Date: _____



Planet: _____ Date: _____



Planet: _____ Date: _____

Requirement 7b.

Use the space below to sketch the phase and the daily position of the Moon at the same hour and place, for a week. Include landmarks on the horizon such as hills, trees, and buildings. Use more paper if needed and attach it to this worksheet.

Day 1

Day 2

Day 3

Day 4

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Day 5

Day 6

Day 7

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What changes did you observe?

Requirement 9. You have been given five options for this requirement. Select and complete ONE of them.

If you selected **Option A:**

Visit a planetarium or astronomical observatory. Submit a written report, a scrapbook, or a video presentation afterward to your counselor that includes the following information:

1. Activities occurring there
2. Exhibits and displays you saw
3. Telescopes and instruments being used
4. Celestial objects you observed.

If you selected **Option B:**

Plan and participate in a three-hour observation session that includes using binoculars or a telescope. List the celestial objects you want to observe, and find each on a star chart or in a guidebook. Prepare an observing log or notebook. Show your plan, charts, and log or notebook to your counselor before making your observations. Review your log or notebook with your counselor afterward.

If you selected **Option C:**

Plan and host a star party for your Scout troop or other group such as your class at school. Use binoculars or a telescope to show and explain celestial objects to the group. Write a report of how you planned your party, how you hosted it and what you did at your star party. Include this report with your packet.

If you selected **Option D:**

Help an astronomy club in your community hold a star party that is open to the public. Write a brief report of the star party you helped with and include it with your packet:

If you selected **Option E:**

Personally take a series of photographs or digital images of the movement of the Moon, a planet, an asteroid or meteoroid, or a comet. In your visual display, label each image and include the date and time it was taken. Show all positions on a star chart or map. Show your display at school or at a troop meeting. Explain the changes you observed.

Requirement 10

CAREERS IN ASTRONOMY

Learn about career opportunities in astronomy. You can talk to people who work in astronomy, read books, and also find out more on the internet. Here are some websites that can help:

- A career brochure from the American Astronomical Society:
<http://www.aas.org/education/publications/careerbrochure.pdf>
- Ask an Astronomer from Cornell University, info about astronomy, including careers:
<http://curious.astro.cornell.edu/careers.php>
- National Optical Astronomy Observatory, FAQ about being an astronomer:
<http://www.noao.edu/education/astfaq.html>

What are some different career opportunities in astronomy?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Which one interests you the most? _____

What high school courses would be most useful for preparing for this career?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____