

MERIT BADGE SERIES



ASTRONOMY



BOY SCOUTS OF AMERICA®



STEM-Based

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"Enhancing our youths' competitive edge through merit badges"



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Requirements

1. Do the following:
 - a. Explain to your counselor the most likely hazards you may encounter while participating in astronomy activities, and what you should do to anticipate, help prevent, mitigate, and respond to these hazards.
 - b. 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.
 - c. Describe the proper clothing and other precautions for safely making observations at night and in cold weather. Then explain how to safely observe the Sun, objects near the Sun, and the Moon.
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, including at least one that observes light beyond the visible part of the spectrum (i.e., radio, X-ray, ultraviolet, or infrared).
 - c. Explain the purposes of at least three instruments used with astronomical telescopes.
 - d. Describe the proper care and storage of telescopes and binoculars both at home and in the field.
4. Do the following:
 - a. Identify in the sky at least 10 constellations, at least four of which are in the zodiac.

For requirement 4, if instruction is done in a planetarium, Scouts must still identify the required stars and constellations under the natural night sky.

- 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. Using the Internet (with your parent's permission), books, and other resources, 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.
 - c. Describe the motion of the planets across the sky.
 - d. Observe a planet and describe what you saw.
6. 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 four days in a row. 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.
7. 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 and communications.
 - b. Define sunspots and describe some of the effects they may have on solar radiation.

- c. Identify at least one red star, one blue star, and one yellow star (other than the Sun). Explain the meaning of these colors.
8. 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 other 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, meteor, 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.
 9. Find out about three career opportunities in astronomy. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.

Astronomy Resources

Scouting Literature

Deck of Stars; Night Sky pocket guide; *Chemistry, Computers, Geology, Nuclear Science, Photography, Radio, Space Exploration*, and *Weather* merit badge pamphlets

Visit the Boy Scouts of America's official retail website at <http://www.scoutstuff.org> for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

Books

Consolmagno, Guy, and Dan M. Davis. *Turn Left at Orion: Hundreds of Night Sky Objects to See in a Home Telescope—and How to Find Them*. Cambridge University Press, 2011.

Davis, Kenneth C. *Don't Know Much About Space*. HarperTrophy, 2001.

———. *Don't Know Much About the Solar System*. HarperCollins, 2001.

Dickinson, Terence. *The Backyard Astronomer's Guide*, 3rd ed. Firefly Books, 2008.

———. *Hubble's Universe: Greatest Discoveries and Latest Images*. Firefly Books, 2014.

———. *NightWatch: A Practical Guide to Viewing the Universe*. Firefly Books, 2006.

Hall, Allan. *Getting Started: Long Exposure Astrophotography*. CreateSpace Independent Publishing Platform, 2013.

Harrington, Philip, and Edward Pascuzzi. *Astronomy for All Ages*. Globe Pequot Press, 2000.

Lambert, David. *The Kingfisher Young People's Book of the Universe*. Kingfisher Books, 2001.

Lang, Kenneth R. *The Life and Death of Stars*. Cambridge University Press, 2013.

Legault, Thierry. *Astrophotography*. Rocky Nook, 2014

Mellinger, Axel, and Ronald Stoyan. *The Cambridge Photographic Star Atlas*. Cambridge University Press, 2011

Moche, Dinah L. *Astronomy: A Self-Teaching Guide*. Wiley, 2009.

Price, Fred W. *The Planet Observer's Handbook*. Cambridge University Press, 2000.

Schaaf, Fred. *40 Nights to Knowing the Sky: A Night-by-Night Skywatching Primer*. Owl Books, 1998.

CDs, DVDs, and Videos

Amazing Universe III. Hopkins Technology, 1995; CD-ROM.

High Resolution Astrophotography. DamianPeach.com, 2015; DVD.

IMAX Cosmic Voyage. Warner Home Video, 1996; DVD.

NOVA: Secrets of the Sun. PBS Home Video, 2012; DVD and Blu-ray.

Wonders of the Solar System. BBC Home Entertainment, 2010; DVD and Blu-ray.

Magazines

Astronomy

Kalmbach Publishing Co.

21027 Crossroads Circle

P.O. Box 1612

Waukesha, WI 53187-1612

Toll-free telephone: 800-533-6644

Website: <http://www.astronomy.com>

Sky & Telescope

Sky Publishing

90 Sherman St.

Cambridge, MA 02140

Toll-free telephone: 866-644-1377

Website:

<http://www.skyandtelescope.com>

Organizations and Websites

The Astronomical League

9201 Ward Parkway, Suite 100

Kansas City, MO 64114

Telephone: 816-333-7759

Website: <http://astroleague.org>

International Dark-Sky Association

Website: <http://www.darksky.org>

NASA Eclipse

Website: <http://eclipse.gsfc.nasa.gov/eclipse.html>

National Aeronautics and Space Administration

NASA Headquarters

Suite 2R40

Washington, DC 20546

Telephone: 202-358-0001

Website: <http://www.nasa.gov>

National Optical Astronomy Observatory

950 North Cherry Ave.

Tucson, AZ 85719

Telephone: 520-318-8000

Website: <http://www.noao.edu>

National Radio Astronomy Observatory

520 Edgemont Road

Charlottesville, VA 22903-2475

Telephone: 434-296-0211

Website: <http://www.nrao.edu>

The Planetary Society

60 S. Los Robles Ave.

Pasadena, CA 91101

Telephone: 626-793-5100

Website: <http://planetary.org>

Sky Maps

Website: <http://www.skymaps.com>

Solar System Exploration: Planets

Website: <http://solarsystem.nasa.gov/planets/index.cfm>

Space Telescope Science Institute

3700 San Martin Drive

Baltimore, MD 21218

Telephone: 410-338-4700

Website: <http://www.stsci.edu>

SpaceWander.com

Website: <http://www.spacewander.com>

spaceweather.com

Website: <http://www.spaceweather.com>