

Astronomy

Merit Badge Workbook



Merit badges are earned by doing: reading the pamphlet, practicing the skills, and showing your counselor what you have learned.
This workbook gives you a place to organize your notes and track your progress along the way.
Merit badge counselors may not require the use of this or any similar workbook.
You still must satisfy your counselor that you can demonstrate each skill and have learned the information.
Use the space under each requirement to note what you have done and what you want to talk about, not to write out full answers.
When a requirement says discuss, show, tell, explain, or demonstrate, that is what you must do.
No one may add to or subtract from the official requirements found on scouting.org (Guide to Advancement 7.0.4.8).

Scouting America last updated this badge's requirements page on September 19, 2025.
Requirements change from time to time. Double-check scouting.org before you start.

Scout's name: _____ Unit: _____ Date started: _____

Counselor's name: _____ Phone no.: _____ Email: _____

Links marked "Scouting America resources" are the ones Scouting America shares on its official badge page.
This workbook is unofficial and not endorsed by Scouting America.

---

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.

Scouting America resources: Preparing for Stargazing (video)

Astronomy hazards

Hazard	How I anticipate and help prevent it	How I mitigate and respond

(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 observations.

Scouting America resources: Dehydration (video) · Insect Bite and Sting Safety (video) · Heat and Cold Related First Aid (video)

First aid during observations

Injury or illness	First aid
heat and cold reactions	
dehydration	
bites and stings	
damage to your eyes	

(c) Describe the proper clothing and other precautions for safely making observations at night and in cold weather.

Scouting America resources: WINTER! Astronomy..How to Keep Warm & Stay Out Longer (video)

Proper clothing for night and cold-weather observing

Other precautions

(d) Explain how to safely observe the Sun, objects near the Sun and solar eclipses.

Scouting America resources: How to View the Sun Safely-Eclipses, Sunspots (video)

What I'm observing	How to observe it safely
the Sun	
objects near the Sun	
solar eclipses	

Requirement 1 completed on _____ counselor initials _____

2. Explain what light pollution is and how it and air pollution affect astronomy.

Scouting America resources: Where Are the Stars? (video) · Why No One Can See the Stars Anymore (video) How Dark Is Your Sky? The Bortle Scale Can Tell You (video) · Protecting the Night Sky From Light Pollution: Why Does It Matter? (video)

What light pollution is

How light pollution and air pollution affect astronomy

Requirement 2 completed on _____ counselor initials _____

3. With the aid of diagrams (or real telescopes if available), do the following:

(a) Explain why binoculars and telescopes are important astronomical tools. Demonstrate or explain how these tools are used.

Scouting America resources: How to Use a Telescope - A Beginner's Guide (video) · Telescopes and Binoculars (video)

Why binoculars and telescopes are important astronomical tools

How they are used (what I demonstrated or explained)

(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).

Scouting America resources: Telescopes: Crash Course in Astronomy (video)
Exploring the Universe: Non-Optical Telescopes Unveiled! (video) · The Basic Telescope Types (video)
10 Types of Space Telescopes (video)

Types of astronomical telescopes (at least one beyond visible light)

Telescope type	What it observes	Similarities and differences

(c) Explain the purposes of three instruments used with astronomical telescopes.

Scouting America resources: 10 Types of Space Telescopes (video) · Hubble Instruments (website)
The Hubble Space Telescope: Revolutionizing Our View of the Universe (video) · What Astronomers Use to Explore the Universe (video)

Three instruments used with telescopes

Instrument	Its purpose

(d) Describe the proper care and storage of telescopes and binoculars both at home and in the field.

Scouting America resources: How to Care for Your Telescope (website)
How to Care for Your Telescope Optics the Right Way. (website) · How to Care for Your Telescope (video)
Caring for Your Celestron Telescope: How to Maintain, Store, and Ship Your Telescope (website)

Where	Proper care	Proper storage
At home		
In the field		

Requirement 3 completed on _____ counselor initials _____

4. Do the following (if instruction is done in a planetarium, Scouts must still identify the required stars and constellations outside under the natural night sky):

(a) Identify in the sky 10 constellations, at least four of which are in the zodiac.

Scouting America resources: Naked Eye Observations (video) · 88 Officially Recognized Constellations (website)
10 FREE Stargazing Apps (video)

My 10 constellations (at least four in the zodiac)

Constellation	In the zodiac?	Date and place I saw it

My 10 constellations (at least four in the zodiac) (continued)

Constellation	In the zodiac?	Date and place I saw it

(b) Identify in the sky eight conspicuous stars, five of which are of magnitude 1 or brighter.

Scouting America resources: Naked Eye Observations (video) · Star Magnitude (Brightness) Explained (video)

My eight conspicuous stars (five of magnitude 1 or brighter)

Star	Magnitude	Date and place I saw it

(c) Make two sketches of the Big Dipper or Cassiopeia from direct observation. In one sketch, show the Big Dipper's or Cassiopeia's orientation in the early evening sky. Make another sketch, showing its position several hours later. In both sketches, show the North Star and the horizon. Record the date and time each sketch was made.

Scouting America resources: How to Use the Big Dipper and Cassiopeia to Find the North Star (website)
How to Find Ursa Major (Big Dipper) Constellation (video)
Find Cassiopeia the Queen Constellation by Looking North for the "W" Shape (video)

Big Dipper or Cassiopeia | Sketch 1 date | Time

Sketch 1: early evening, with the North Star and the horizon (draw here or attach)

Sketch 2 date | Time

Sketch 2: several hours later, with the North Star and the horizon (draw here or attach)

(d) Explain what we see when we look at the Milky Way.

Scouting America resources: The Milky Way: Crash Course Astronomy (video) · How Do We Study Stars? (video)
Imagine the Universe! The Milky Way Galaxy (website)

What we see when we look at the Milky Way

Requirement 4 completed on | counselor initials

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.

Scouting America resources: WOLFRAM Demonstrations Project (website)
Which Planets Appear in Phases Similar to Lunar Phases? (website) · Which Planets Appear in Phases Similar to Lunar Phases? (video)

The five most visible planets

Planet	Shows phases? (yes or no)	Why or why not

(b) Using the internet (with your parent or guardian's permission) and other resources, find out when each of the five most visible planets that you identified in requirement 5(a) will be observable in the evening sky during the next 12 months, then compile this information in the form of a chart or table.

Scouting America resources: Visible Planets Tonite (website) · Skywatching (website)

When each planet is in the evening sky over the next 12 months

Planet	Months it can be seen in the evening sky	Where I found this

(c) Describe the motion of the planets across the sky.

Scouting America resources: Apparent Retrograde Motion (video) · Understanding Planetary Motions and Retrograde Motion (video)

How the planets move across the sky

(d) Observe a planet and describe what you saw.

Scouting America resources: Planets Visible Tonight (website) · Night Sky Tonight (website) · Skywatching (website)

Planet _____ Date and time _____ Where _____

What I saw

Requirement 5 completed on _____ counselor initials _____

6. Do the following:

(a) Sketch the face of the Moon and indicate five seas and five craters. Label these landmarks.

Scouting America resources: Moon Craters Explained (video) · Easy Moon Sketching Step by Step (video)
The Craters on the Moon with Neil deGrasse Tyson (video) · Why Does the Moon Have Craters? (website)

My sketch of the face of the Moon, with landmarks labeled (draw here or attach)

Landmarks I labeled

Seas	Craters

(b) Sketch the phase and position of the Moon, at the same hour and place, for four nights (or days) within a one-week period by direct observation. Include landmarks on the horizon such as hills, trees, and buildings. Explain the changes you observe.

Scouting America resources: The Phases of the Moon Explained (video) · Moon Phase Animation (video)
Why Does the Moon Have Phases, but Planets Like Venus Also Show Phases? (video)

Place | Hour

My four Moon observations (within one week)

Night (or day)	Date	Phase I saw	Position in the sky and horizon landmarks
1			
2			
3			
4			

My four sketches (draw here or attach)

The changes I observed, and why they happen

(c) List the factors that keep the Moon in orbit around Earth.

Scouting America resources: Why Doesn't the Moon Fall Down? (video) · Why Doesn't the Moon Fall Into the Earth? (website) Why Does the Moon Stay With the Earth? (website)

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.

Scouting America resources: Lunar Eclipses Explained (video) · The Phases of the Moon Explained (website) Why Do Eclipses Happen? (website) · Solar Eclipses Explained (video)

Positions of the Sun, Earth and Moon

Event	Relative positions
lunar eclipse	
solar eclipse	
new	
first-quarter	
full	
last-quarter	

My diagrams (draw here or attach)

Requirement 6 completed on _____ counselor initials _____

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.

Scouting America resources: What Is the Sun Made of? (video) · Our Sun's Path Through the Milky Way Galaxy (video)

The Sun

Topic	My notes
Its composition	
Its relationship to other stars	
Effects of its radiation on Earth's weather	
Effects of its radiation on communications	

(b) Define sunspots and describe some of the effects they may have on solar radiation.

Scouting America resources: What Are Sunspots? (video) · Sunspots (video) · Sunspots - NASA (website)

What sunspots are, and some 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.

Scouting America resources: Why Are the Stars Different Colors? (video) · Naked Eye Observations (video)

Color	Star I identified	Date seen	What the color means
red			
blue			
yellow			

Requirement 7 completed on _____ counselor initials _____

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: activities occurring there, exhibits and displays you saw, telescopes and other instruments being used, and celestial objects you observed.

Scouting America resources: The 10 Best Observatories in the U.S. to Visit This Year (website) · U.S. Planetariums (website)

Planetarium or observatory _____ Date _____

- ☐ Written report
- ☐ Scrapbook
- ☐ Video presentation

What my report, scrapbook or video includes

Topic	My notes
activities occurring there	
exhibits and displays I saw	
telescopes and other instruments being used	
celestial objects I observed	

☐ **(b)** Plan and participate in an observation session that includes using binoculars or a telescope and includes at least 10 celestial objects beyond those observed in requirement 4. These might be lunar features, Messier objects, additional constellations or planets, or artificial satellites including the International Space Station. List the celestial objects you want to observe and find each in a star chart, guidebook or by using an app. Prepare a log or notebook. Discuss with your counselor what you hope to observe prior to your observation session. Review your log or notebook with your counselor afterward.

Date _____ Place _____ Binoculars or telescope _____

My observing list and log (at least 10 objects beyond requirement 4)

Celestial object	Found in (star chart, guidebook or app)	Time	What I saw

☐ Discussed what I hope to observe with my counselor beforehand
☐ Reviewed my log with my 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.

Scouting America resources: Transform your Astronomy Knowledge at a Star Party! (video) · I Went to a STAR PARTY! (video) What It's Like to Attend a Star Party (video)

Group I hosted _____ Date _____ Place _____

My star party plan

Celestial objects I showed

Object	What I explained

☐ **(d)** Help an astronomy club in your community hold a star party that is open to the public.

Scouting America resources: Transform your Astronomy Knowledge at a Star Party! (video) · I Went to a STAR PARTY! (video) What It's Like to Attend A Star Party (video)

Astronomy club _____ Date _____ Place _____

How I helped with the star party

☐ **(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.

Scouting America resources: Smartphone Astrophotography: A Beginner's Guide (website)

What I photographed _____ Where I showed my display _____

My image log

Image label	Date	Time	Notes

☐ Each image labeled with date and time
☐ All positions shown on a star chart or map
☐ Display shown at school or a troop meeting

The changes I observed

☐ **(f)** With your parent or guardian's and counselor's approval, use online observing opportunities such as SkyNet to observe planets, comets, galaxies, and/or the sun. Describe your experience to your counselor.

Scouting America resources: The Skynet Robotic Telescope Network (website)

Online observing service _____ Date _____

What I observed

Object	Notes

My experience, to describe to my counselor

Requirement 8 completed on _____ counselor initials _____

9. Do ONE of the following:

☐ **(a)** Identify three career opportunities that would use skills and knowledge in astronomy. Pick one and research the training, education, certification requirements, experience, and expenses associated with entering the field. Research the prospects for employment, starting salary, advancement opportunities and career goals associated with this career. Discuss what you learned with your counselor and whether you might be interested in this career.

Scouting America resources: What You Should Know About Getting a Career in Astronomy/Astrophysics (video)
Explore a Career in Astronomy (website)

Three careers in astronomy

Career	How it uses astronomy skills and knowledge

The career I picked _____

What I found out about it

Topic	What I found
Training	
Education	
Certification requirements	
Experience	
Expenses	
Prospects for employment	
Starting salary	

What I found out about it (continued)

Topic	What I found
Advancement opportunities	
Career goals	

Might I be interested in this career? Why or why not

☐ **(b)** Identify how you might use the skills and knowledge in astronomy to pursue a personal hobby. Research the additional training required, expenses, and affiliation with organizations that would help you maximize the enjoyment and benefit you might gain from it. Discuss what you learned with your counselor and share what short-term and long-term goals you might have if you pursued this.

Scouting America resources: Getting Started in Astronomy (video) · Astronomy: A Great Hobby (video)
Getting Started in Astronomy (website)

My astronomy hobby

How I might use astronomy skills and knowledge in this hobby

What I found out

Topic	What I found
Additional training required	
Expenses	
Affiliation with organizations	

Goals	If I pursued this hobby
Short-term goals	
Long-term goals	

Requirement 9 completed on _____ counselor initials _____

Counselor sign-off

Your counselor signs your blue card or approves the badge in Scoutbook, and your unit records it. This line is for your own records.

Counselor's signature _____ Date completed _____

Official Scouting America resources

Scouting America resources: Astronomy merit badge page (requirements and resources) · Astronomy merit badge pamphlet (free PDF)
All merit badges

Made by Cole at ScoutSmarts.com, an Eagle Scout who loves helping Scouts.
Spot an error or a requirement change? Tell me at scoutsmarts.com/contact.
Requirement text © Scouting America. Workbook layout © 2026 ScoutSmarts.com, free to copy for Scouting use.