



Space Exploration

Scouts BSA · STEM

Name

Started

Completed

Space Exploration is about how people learn about and travel beyond Earth. You will build and launch a model rocket, study real missions, and imagine what living in space might be like. It's science, engineering, and imagination all in one.

Requirements

Every official requirement, in plain language. Check the official wording when you sign off (scouting.org/merit-badges/space-exploration/). Tips and examples are ideas, not extra requirements.

1 Why we explore space

Tips for this section: Think about inventions that came from space research, like weather satellites, and talk about why exploring space matters.

Example for this section: Give three real benefits: weather satellites that warn of hurricanes, GPS that helps ambulances find addresses, and science that helps us understand Earth's climate. Then share why you think exploring is worth it.

- ☐ **1a** Explain the historical reasons for exploring space

- ☐ **1b** Explain the near-term goals of space exploration in terms of specific things we want to learn

- ☐ **1c** Explain the benefits for Earth's resources, technology, and new products

- ☐ **1d** Explain how space exploration affects international relations and cooperation

- ☐ **2** Make a collector's card for your favorite space pioneer, with a picture on the front and facts on the back. Share it with your counselor and discuss four other space pioneers

Tip: Pick a space pioneer you admire and make a collector's card with a drawing and a few key facts.

Example: On the front of your card, draw or print a picture of someone like Katherine Johnson, Neil Armstrong, or Mae Jemison. On the back, list when they lived, what they did, and one fact that surprised you.

- ☐ **3** With an experienced or qualified person your counselor approves supervising, and following Scouting's rocket safety rules, build, launch, and recover a model rocket, then launch again for a set goal. Identify and explain the parts below. If launches are illegal locally, model a NASA rocket instead, explain its parts, and give its history

Tip: Build a simple rocket kit and launch it in an open field with an experienced adult your counselor approves, following Scouting's rocket safety rules. Then launch it again to reach a goal you set, like a target height.

- ☐ **3a** Body tube

- ☐ **3b** Engine mount

- ☐ **3c** Fins

Space Exploration worksheet (continued)

☐ **3d** Igniter

☐ **3e** Launch lug

☐ **3f** Nose cone

☐ **3g** Payload

☐ **3h** Recovery system

☐ **3i** Rocket engine

4 Rocket and satellite science

Tips for this section: Watch a launch video and talk about how rockets push themselves upward and stay in orbit.

Example for this section: Explain propulsion with a balloon rocket on a string: air rushing out one way pushes the balloon the other way. Then describe how a satellite stays in orbit because it's falling around Earth while moving sideways fast.

- ☐ **4a** Discuss and demonstrate the law of action and reaction

- ☐ **4b** Discuss and demonstrate how rocket engines work

- ☐ **4c** Discuss and demonstrate how satellites stay in orbit

- ☐ **4d** Discuss and demonstrate how images of Earth and other planets are captured by spacecraft and sent back

5 Space missions: Choose 2 of 3

Tips for this section: Pick two of the three options, like comparing a robotic mission with a historic crewed one, or designing your own sample-return mission.

Example for this section: Your two activities could be a talk comparing the Voyager probes with the Apollo 11 landing, and a scrapbook or slide show following a current mission, like a Mars rover or Europa Clipper, with photos and articles you collect.

- ☐ **5a** With your counselor, discuss one robotic space mission and one historic crewed mission: what each found, why it mattered, and what it taught us about the places explored

- ☐ **5b** Make a blog, website, slide show, or scrapbook about a current planetary mission using photos, articles, and other material from the internet, magazines, or newspapers

- ☐ **5c** Design a robotic mission that brings surface samples back to Earth from a planet, moon, comet, or asteroid. Name your target and show how your design handles its environment

6 Crewed spacecraft: Choose 1 of 2

Tips for this section: Find pictures of the space station or a crew capsule and describe how astronauts live and work inside.

- ☐ **6a** Explain what a space shuttle or other crewed orbital vehicle (government, U.S. or foreign, or commercial) is for, how it works, and its main parts

- ☐ **6b** Explain what the International Space Station is for, how it works, and its main parts

- ☐ **7** Design a base where people could live somewhere in our solar system, such as Titan or an asteroid, and make drawings or a model of it. Your plan must cover the items below

Tip: Sketch a base on the Moon or Mars and think about how people would get air, water, and food.

Example: Sketch a base on Mars and label how people get air (from water or the atmosphere), water (from underground ice), food (greenhouses), power (solar panels), and protection from radiation (covering the base with soil).

- ☐ **7a** Where its energy comes from

- ☐ **7b** How it will be built

- ☐ **7c** Its life-support system

- ☐ **7d** Its purpose and function

- ☐ **8** Explore careers in space exploration. Research one: training, education, costs, job outlook, pay, duties, and advancement (searches, interviews, or visits need a parent's or guardian's OK). Discuss with your counselor what you found and what makes it interesting to you

Tip: Look up careers at NASA or private space companies, and ask a science teacher which classes help.