



JUNIOR RANGER Spaceflight Explorer

Explorer's Activity Guide
AGES 5 TO 12

ANSWER KEY



APOLLO 50

NEXT GIANT LEAP

Explore. Learn. Protect.

The National Aeronautics and Space Administration, or NASA, and the National Park Service, or NPS, are partnering to celebrate the 50th anniversary of the Apollo Moon landing. NASA and NPS honor our national heritage and share the excitement of the future of human space exploration.

Apollo was the first time humans left Earth's orbit and traveled into deep space. NASA is again planning to send astronauts to the Moon and even farther into space. NASA and its partners are building the Lunar Gateway, a small spacecraft that will orbit the Moon. The Gateway will be a home base for astronauts as they explore space. How far into space do you think astronauts will travel in the next 50 years?

In 1804, Meriwether Lewis and William Clark led a group of explorers from St. Louis, Missouri, west across a great wilderness to the Pacific Ocean. Seaman, their large Newfoundland dog, helped as a watchdog, hunter, and friend over the entire two-and-a-half-year journey. Astronauts who explore space are like Lewis and Clark and their dog, Seaman, explorers of the western frontier. The National Park Service remembers the place where Lewis and Clark began their journey at the Gateway Arch National Park in Saint Louis, Missouri. Think about how the Gateway that will orbit the Moon is a gateway for astronauts to explore the solar system.



Meet Seaman Junior!

Seaman Junior is a plush toy dog that traveled to the International Space Station in 2018. Seaman Junior is named in honor of Seaman the large Newfoundland dog that traveled with Lewis and Clark. Seaman Junior hopes to continue this legacy by traveling with astronauts through space.

Each activity is rated by difficulty:

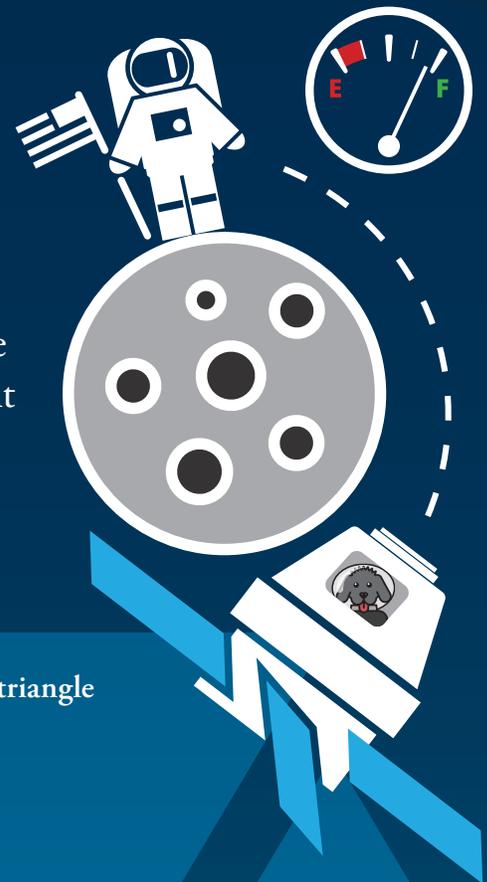
- ★ Ages 5 and up
- ★★ Ages 8 and up
- ★★★ Most challenging



Saving Fuel with Math

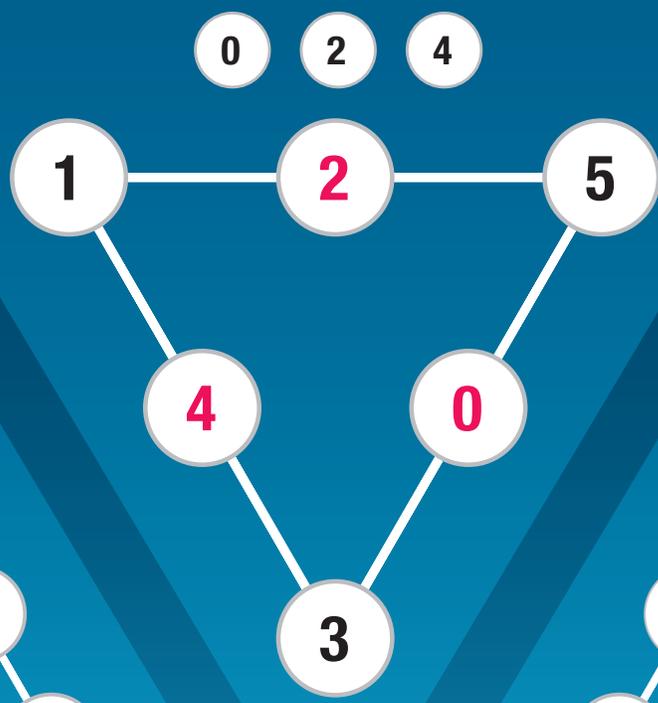
On July 20, 1969, Neil Armstrong became the first person to walk on the Moon. NASA is once again working to send astronauts to the Moon.

NASA needs people with strong math skills to calculate the most efficient route to the Moon. The most efficient route uses the least amount of rocket fuel.

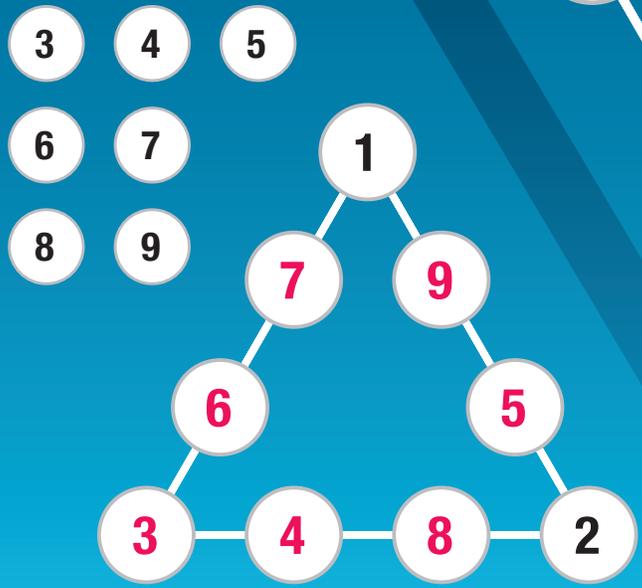


ACTIVITY Complete the Triangles

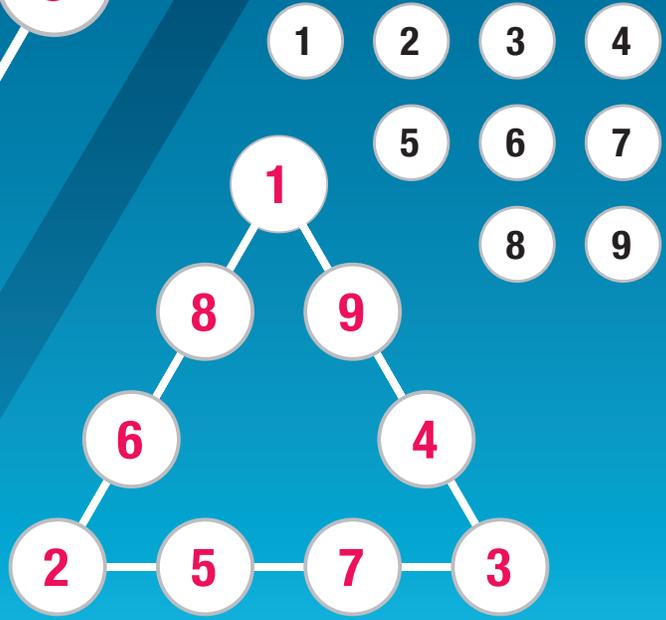
★ Using each number only once, complete the triangle so that each side equals 8.



★★ Using each number only once, complete the triangle so that each side equals 17.



★★★ Find another unique solution so that each side equals 17.

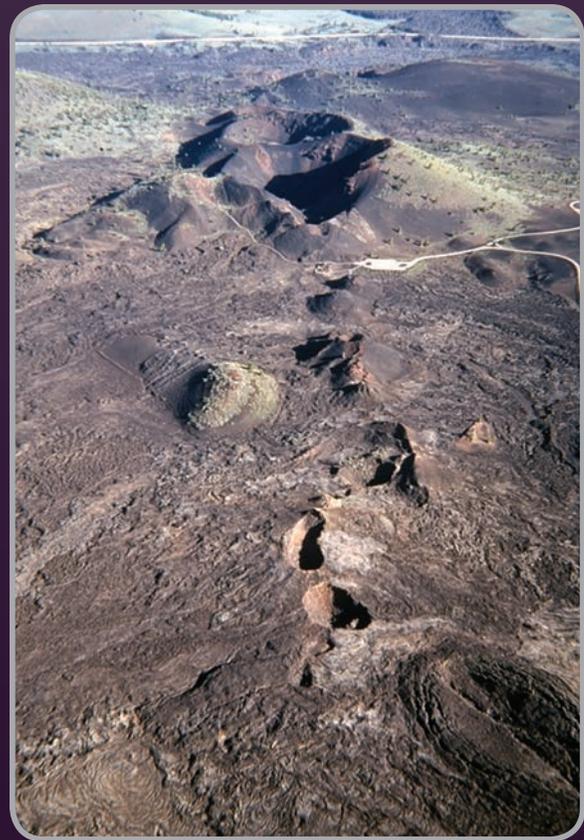




Craters of the Moon

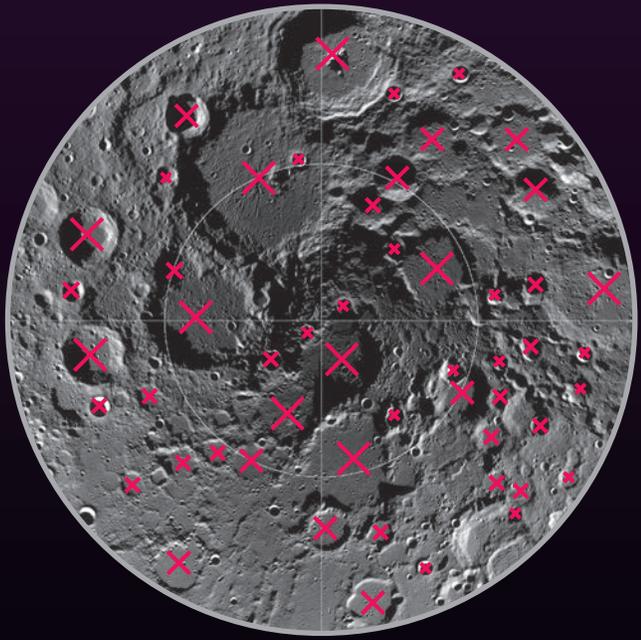
Before Apollo 14 astronauts traveled to the Moon, they first traveled to Craters of the Moon National Monument to explore the lava landscape. The astronauts learned about rocks and volcanic geology at the monument and used their training at Craters of the Moon to help them identify the most important rock samples from the lunar surface to bring back to Earth for scientific study.

Volcanic landscape at Craters of the Moon National Monument in Idaho.



ACTIVITY Impact Craters

★ Mark an “x” over all the craters you see. What do you notice about the number of craters on this image of the Moon’s north pole?



The Moon’s surface is covered with many, many craters, making it difficult to mark them all.

★★ Earth’s stronger gravity attracts more space debris, yet the Moon has many more visible craters. Can you think of why?

Erosion on Earth’s surface erases almost all evidence of past impacts. Erosion from weather, water, and plants breaks apart and wears down the ground. The Moon has almost no erosion because the Moon’s atmosphere is extremely thin. This means the Moon has no wind, no weather and it does not have any plants. Any impacts to the lunar surface remain whereas on Earth they are eroded away over time.



Space Launch System

Getting to the Moon requires a powerful rocket to overcome the pull of Earth's gravity. NASA is building the Space Launch System, or SLS, a powerful rocket that will carry astronauts and heavy cargo to the Moon! SLS will launch the Orion spacecraft from Kennedy Space Center in Cape Canaveral, Florida. Orion will keep astronauts safe hundreds of thousands of miles from home, where getting back to Earth takes days.

ACTIVITY Spot the Differences

- ★ Circle 5 differences
- ★★ Circle 8 differences
- ★★★ Circle 12 differences

★ Can you find Seaman Junior hiding in the second picture?



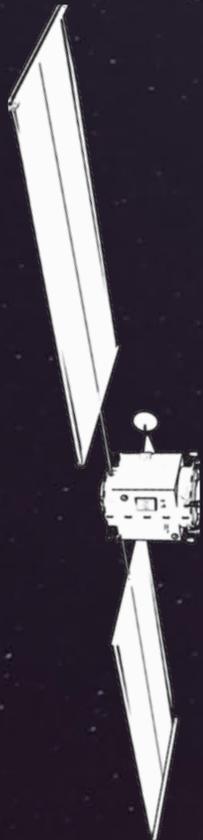


Living and Working in the Lunar Gateway

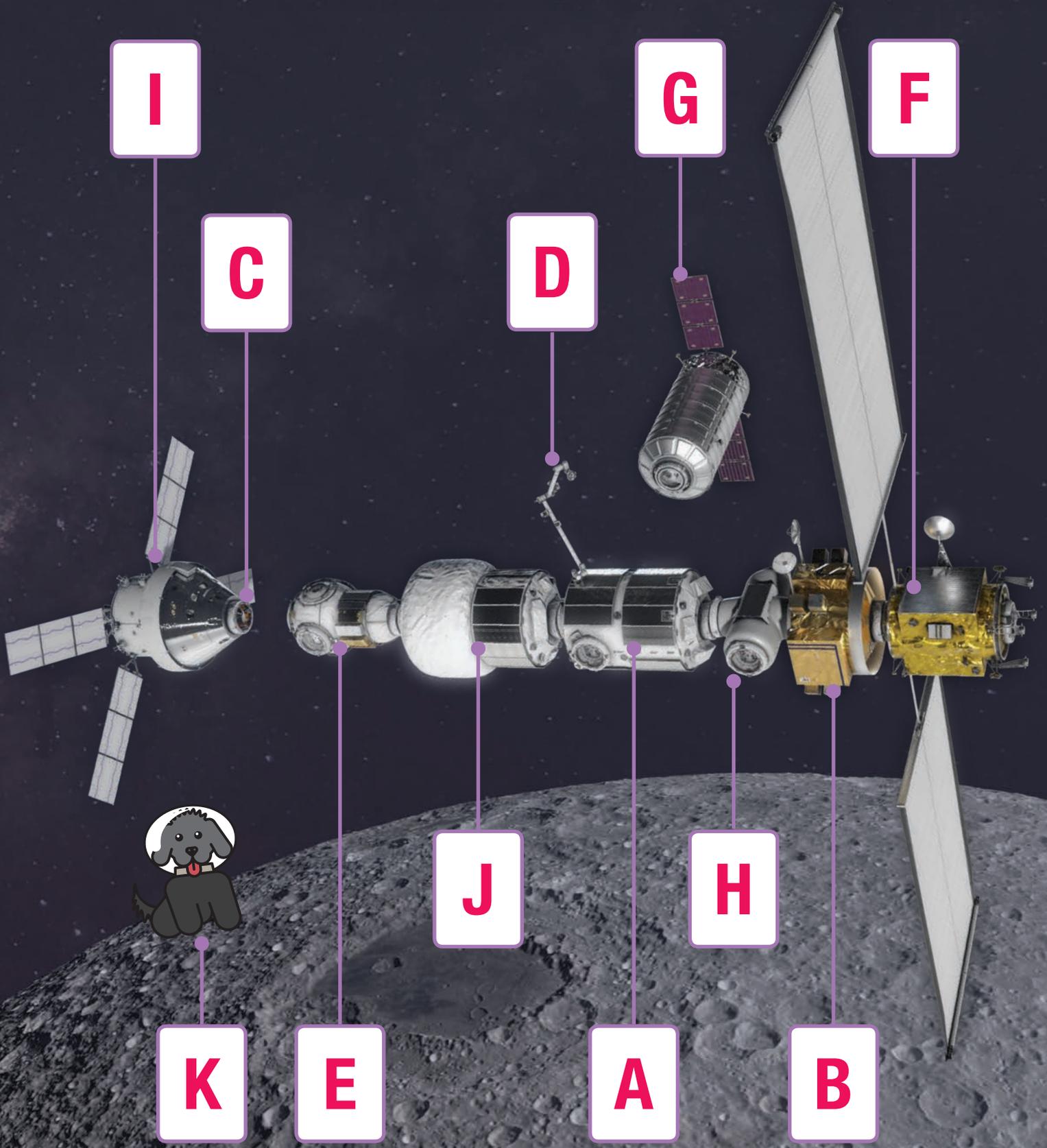
The Lunar Gateway is a small spacecraft that will orbit the Moon. Astronauts will travel from the Gateway to the surface of the Moon using reusable landers. The Gateway will be a habitat for astronauts to live and work in as they explore the Moon. The Gateway will also be a home base for future human missions to Mars and other faraway destinations.

ACTIVITY Match the Shapes

★ Match each part of the Lunar Gateway to the assembled model. Write the letter for each part in the boxes provided.



A	B	C	D	E
Habitat Where astronauts will live and work	ESPRIT Stores propellant and communications equipment	Orion Spacecraft Carries humans farther into space than ever before	Robotic Arm Mechanical arm to help spacecraft dock to the Gateway	Airlock Airtight room with two entrances. Allows astronauts to go on a spacewalk without letting air out of the Gateway
F	G	H	I	J
Power and Propulsion Element Provides power, communication to and from Earth, and in-space transportation	Cargo Resupply Module Delivers food and other cargo to the Gateway	Utilization Module Extra space for astronauts to live and work	Orion Service Module Supplies Orion with electricity, propulsion, temperature control, and the air and water needed for space travel	Habitat Where astronauts will live and work
				Seaman Junior Retraces the steps of Neil Armstrong to celebrate the Apollo landing 50 years ago



I

C

D

G

F

K

E

J

A

H

B



National Parks from Earth and from Space

Our national parks are filled with beautiful views and landscapes. Astronauts love to take photographs of national parks from the International Space Station. Compare the photos of parks from space with photos taken in the parks. Can you recognize some of the land features in the space photos?

ACTIVITY National Park Unscramble

★★ Unscramble the letters to identify the national parks.



This national park is home to brown bears, salmon, moose, bald eagles, and lynx.

I A K M T A
K A T M A I



The deepest lake in the United States is located in this national park.

R R A C E T K L E A
C R A T E R L A K E



The Colorado River has been eroding the steep sides of the canyon in this park for millions of years.

D N G A R Y N N C O A
G R A N D C A N Y O N



This park is home to the tallest sand dunes in North America.

A T E R G A D S N N D S E U
G R E A T S A N D
D U N E S



Visitors to this national park have encountered over 300 bird species including peregrine falcons, loons, bald eagles, and snowy owls.

D A A A I C
A C A D I A



Sustainable Exploration

NASA uses sustainable practices to explore space. The National Park Service uses sustainable practices in all of its parks. Why do you think this is important?

TRASH



This NASA astronaut is surrounded by bags of trash. NASA is investing in innovative trash compaction technologies to deal with trash in spacecraft.

WATER



Astronaut waste water from breath, sweat, urine, and wash water is treated, recycled, and reused for drinking and other needs. Sound disgusting? Water recycled in space is cleaner than what most Earthlings drink.



Pack It In, Pack It Out: The National Park Service encourages visitors to preserve our parks by taking their trash and personal belongings with them when they leave.



Parks use low-flow faucets and dual-flush toilets to conserve water. Parks use catchment tanks, like those pictured here, to collect and reuse rainwater. What can you do to help protect this precious resource?

Sustainable practices help protect resources. Sustainable space exploration means humans can travel on missions deep into space over long periods of time. Using sustainable practices in our national parks preserves them for future generations to enjoy!

ACTIVITY Sustainable Word Hunt

Make as many new words as you can from the letters in:

SUSTAINABLE

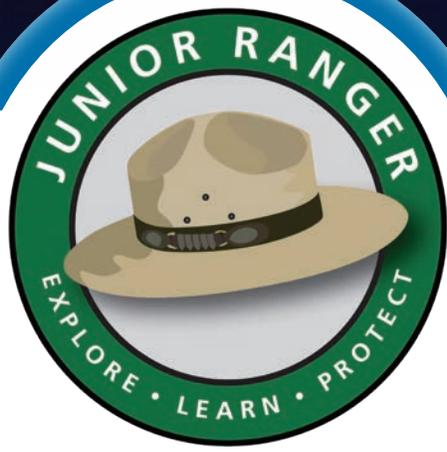
- ★ Find at least 8 words
- ★★ Find at least 8 words with 4 or more letters
- ★★★ Find at least 6 words with 5 or more letters

★: and, ant, bat, bun, bit, bus,
 eat, net, nut, sat, sub, sun, tan,
 tie, tin, tub, use

★★: aunt, bean, beat, belt, bent,
 east, lets, nail, nest, seat, suit,
 tail, tale, tile, tuba, tune

★★★: absent, alien, beast,
 insulate, issue, nausea, salute,
 sealant, stable, stain, subtle,
 unstable, utensils

...and many other words!



Junior Ranger Spaceflight Explorer Pledge

As a Junior Ranger, I promise to explore science, nature, and history at our national parks and science and space centers, teach others about what I learned today, and help preserve and protect these places for future generations to enjoy them.

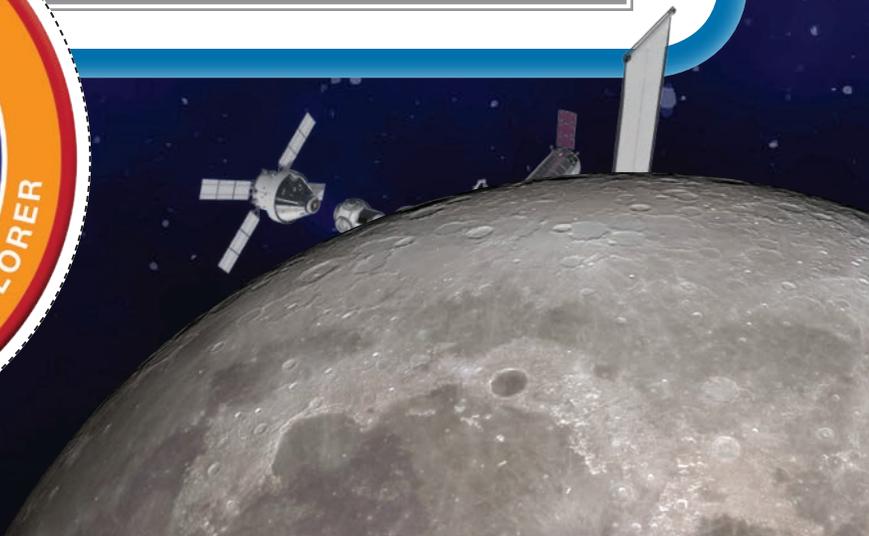
JUNIOR RANGER CERTIFICATE

This is to certify that

has completed the requirements and is a

Spaceflight Explorer Junior Ranger

Ranger Signature





More to Explore!

NASA

<https://www.nasa.gov>

STEM Engagement

<https://www.nasa.gov/stem>

Apollo Program

<https://www.nasa.gov/apollo50th>

Moon to Mars

<https://www.nasa.gov/moon2mars>

No Small Steps Rocket Science Videos

<https://www.nasa.gov/nosmallsteps>

Why Does the Moon have Craters?

<https://spaceplace.nasa.gov/craters/en>

Forward to the Moon Explorer Activities

<https://www.nasa.gov/exploreractivities>

National Park Service

<https://www.nps.gov>

Kids in Parks

<https://www.nps.gov/kids>

Junior Rangers Program

<https://www.nps.gov/kids/jrangers.cfm>

Seaman Junior in Space

<https://www.nps.gov/articles/seaman-jr-in-space.htm>

Astronauts – Craters of the Moon National Monument

<https://www.nps.gov/crmo/learn/historyculture/astronauts.htm>

History of Aviation

<https://www.nps.gov/aviation/aviation-history>

