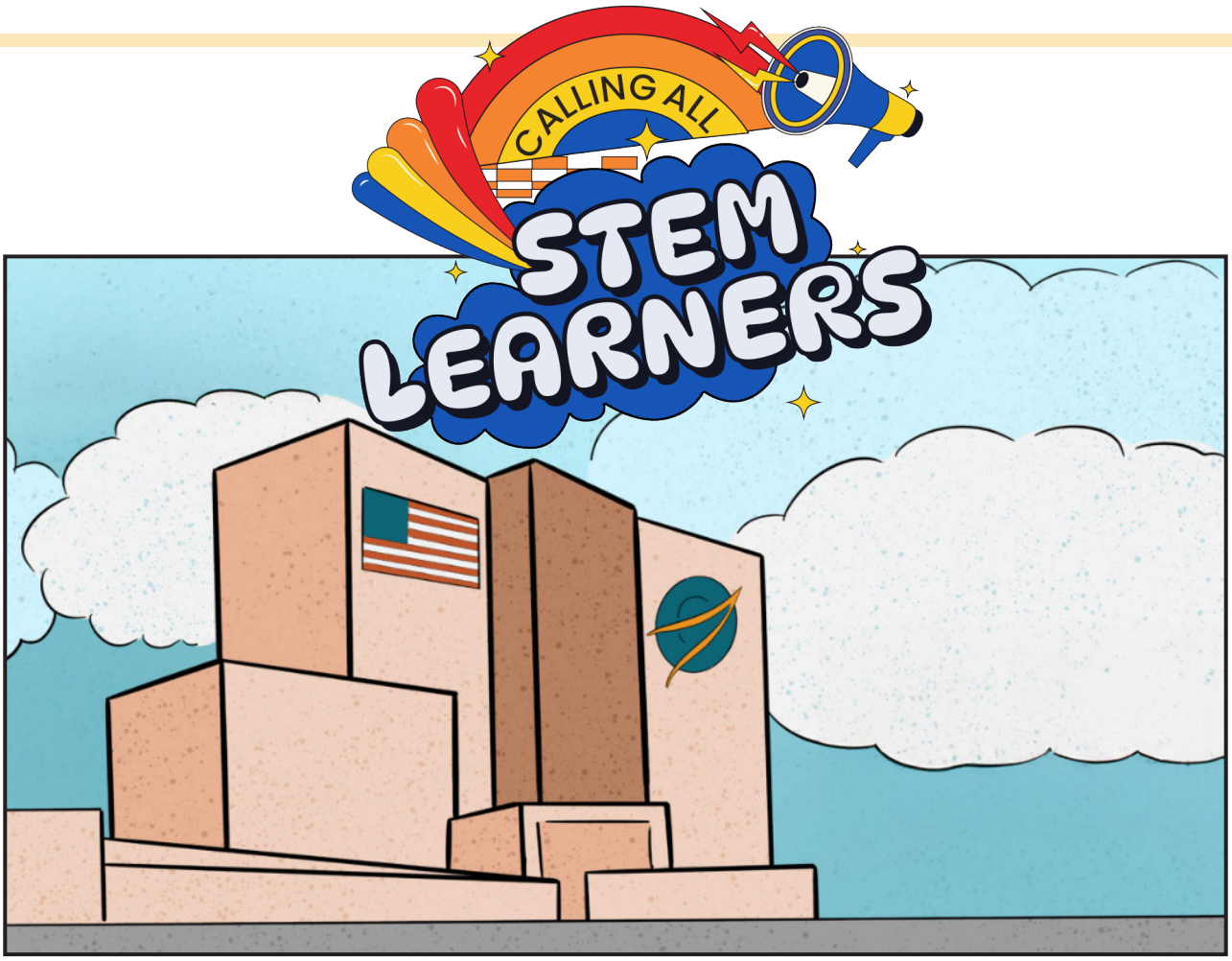


Your PLANETS Science Notebook

for:

Space Hazards: Preparing for a NASA Mission

Name: _____

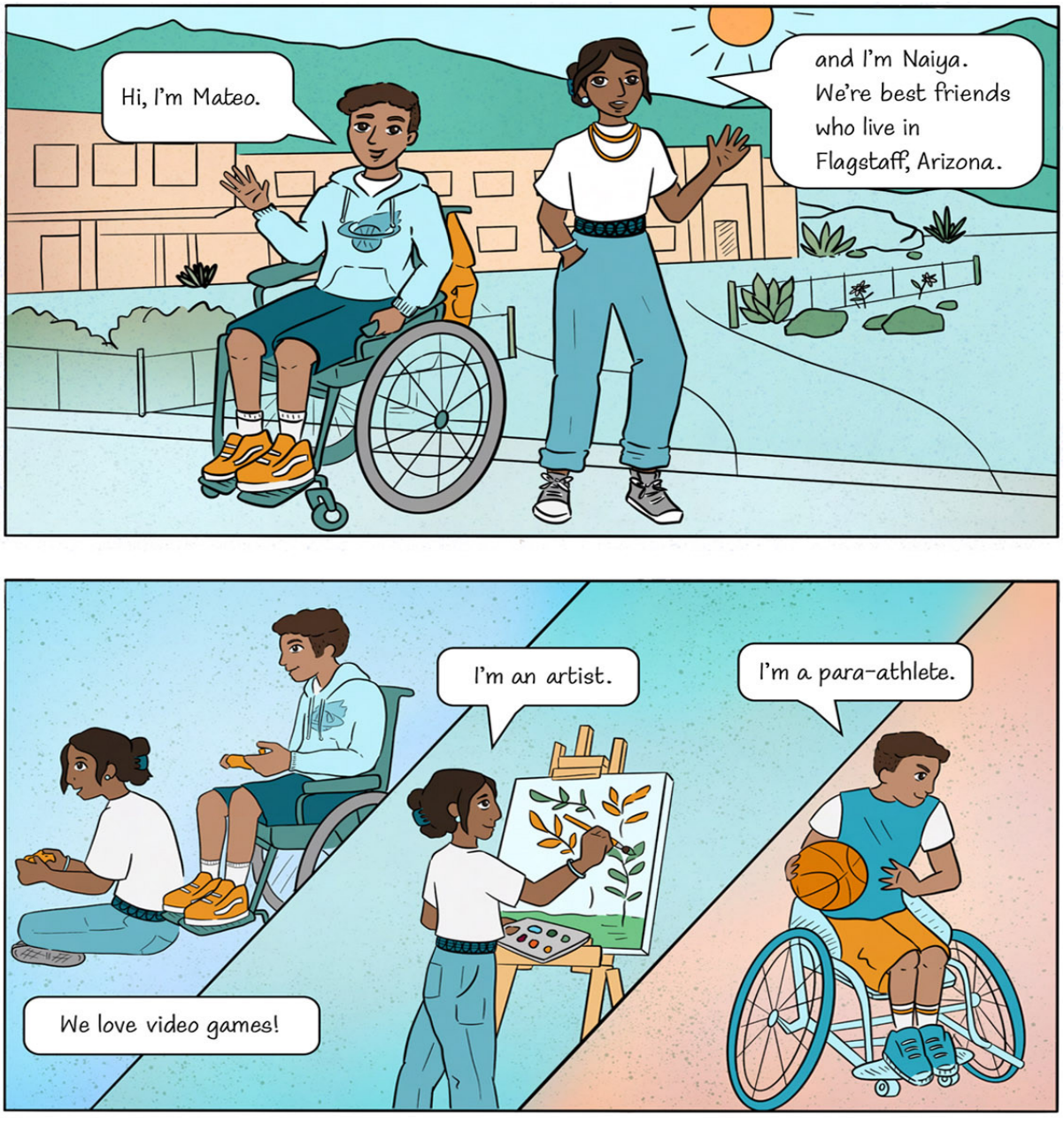
PLANETS

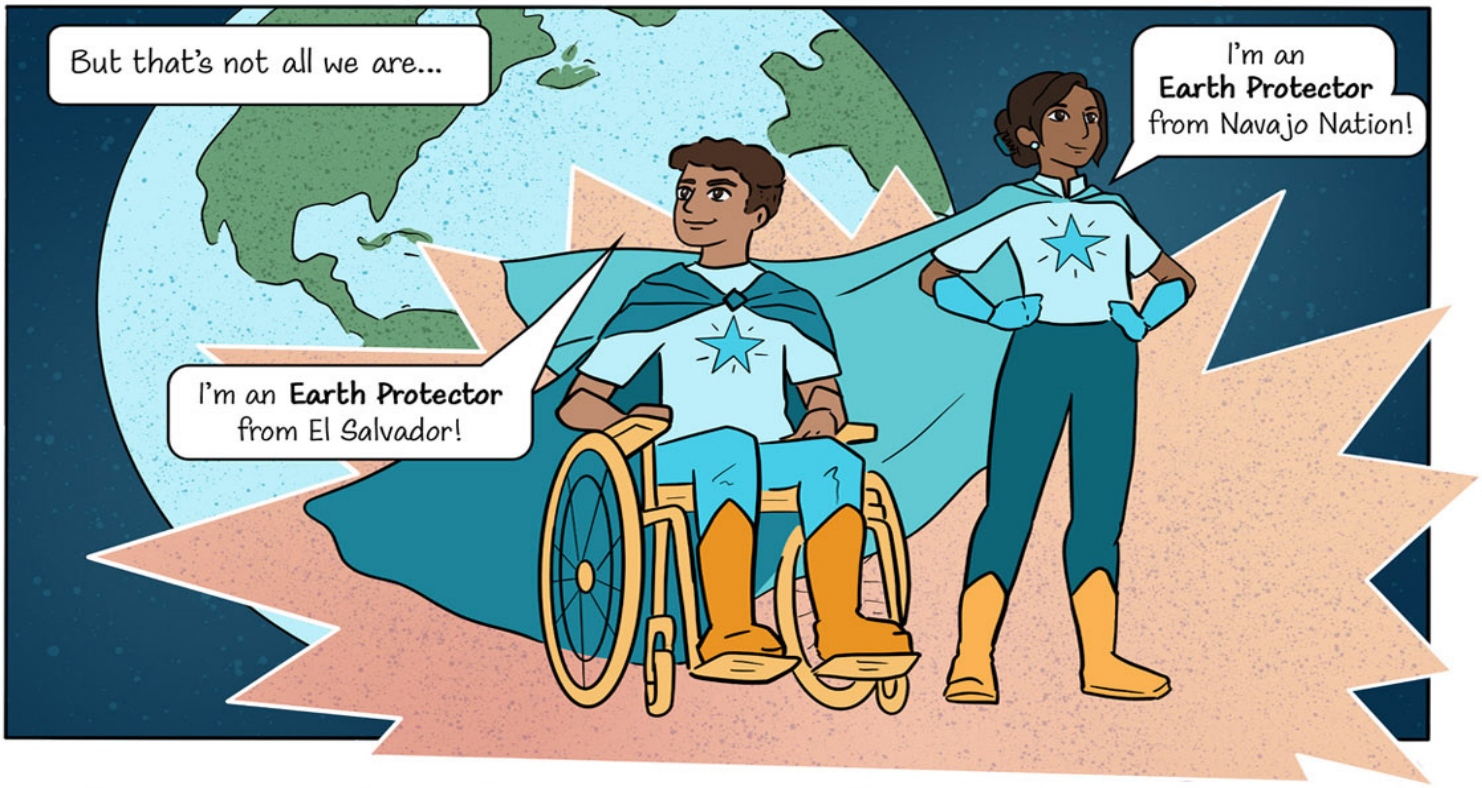
Ready, S.E.T., Go!

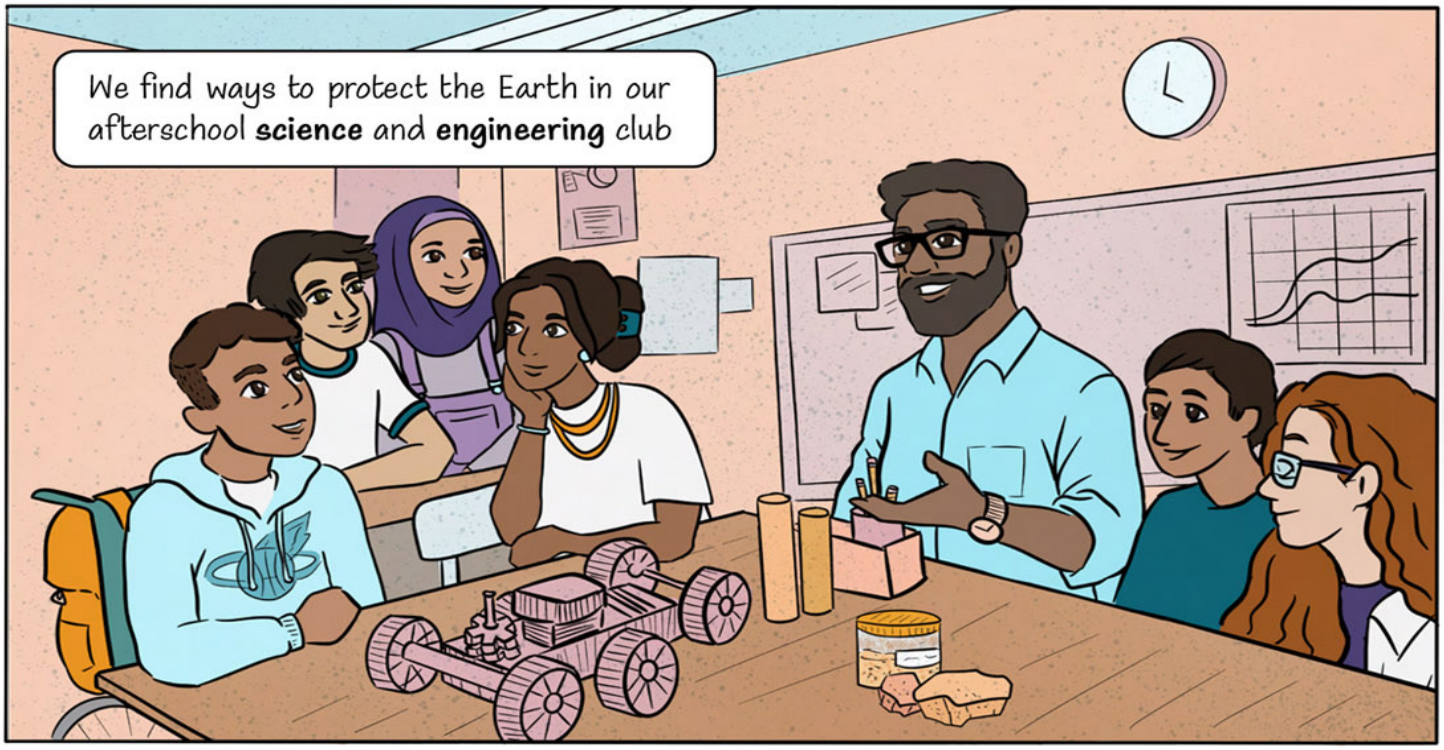
Science
Engineering
Technology

How can we learn about space trash and design ways to protect against it?

Ready, S.E.T., Go! Comic

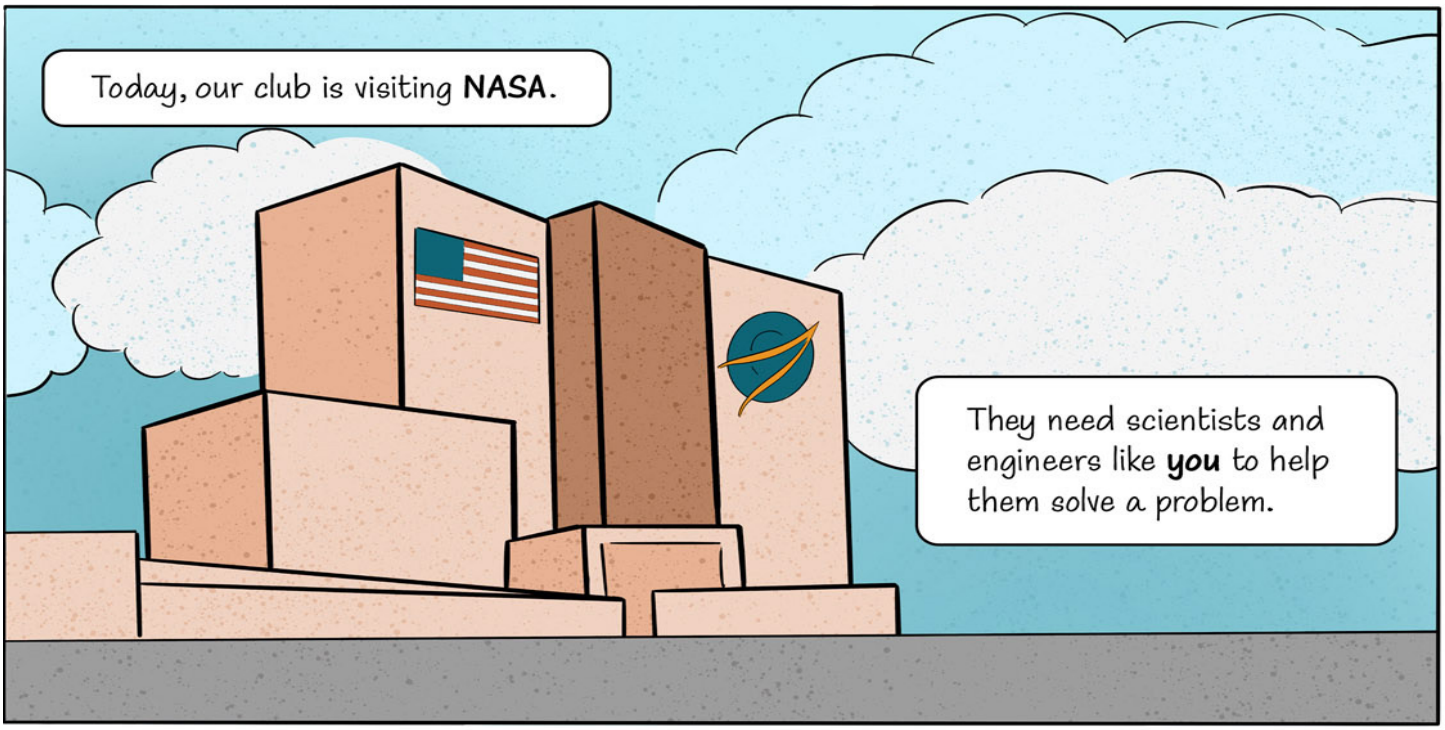



But that's not all we are...
I'm an **Earth Protector** from Navajo Nation!
I'm an **Earth Protector** from El Salvador!

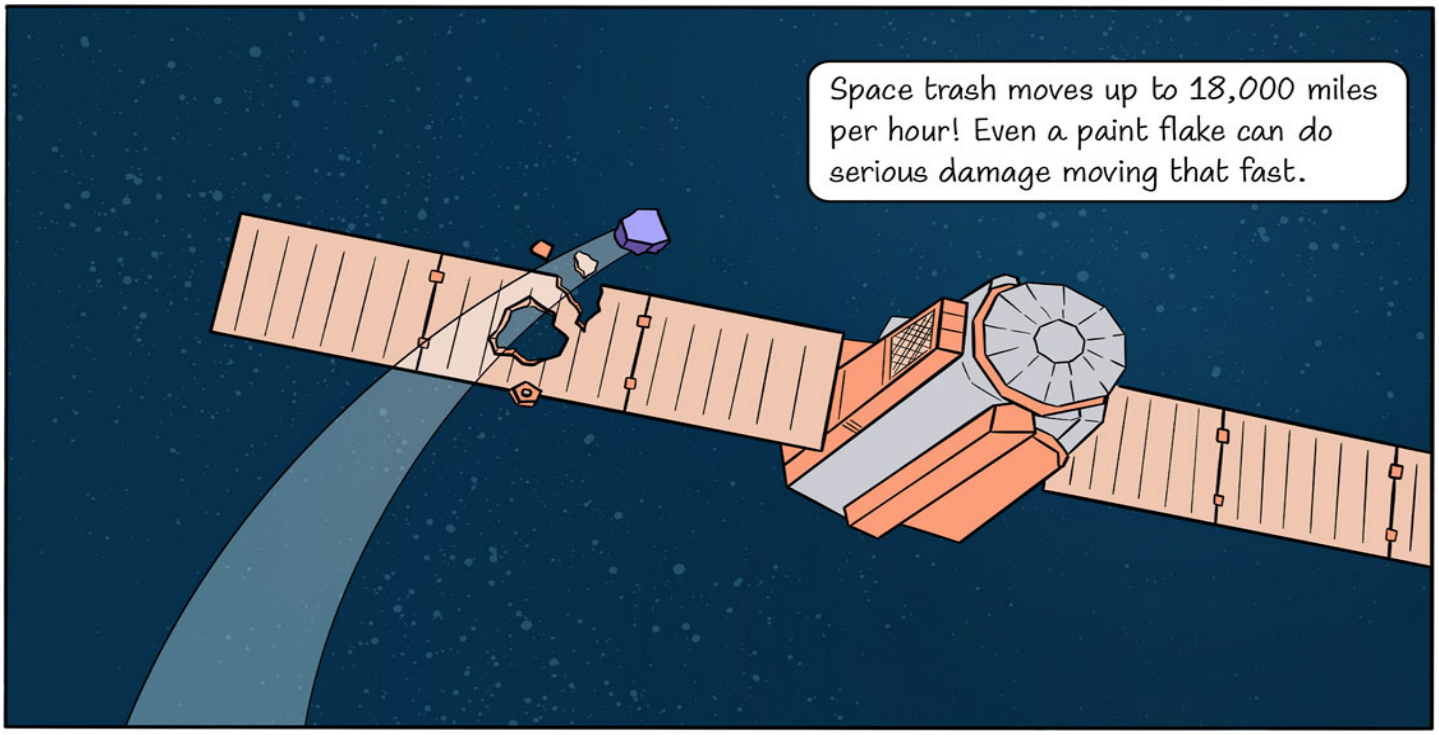

We find ways to protect the Earth in our afterschool **science** and **engineering** club


Scientists ask questions and gather evidence to try to answer them.


And **Engineers** design things that solve problems and make our lives better.


Today, our club is visiting **NASA**.
They need scientists and engineers like **you** to help them solve a problem.


The problem?
SPACE TRASH!


Space trash moves up to 18,000 miles per hour! Even a paint flake can do serious damage moving that fast.


Let's learn about space trash and design ways to protect against it!
Thanks for your help!

Investigate It!

1. Make predictions about how much damage 1, 2, 3, or 4 washers will do when dropped from 1 or 2 feet onto the tray. Write your predictions in the table. Then test by dropping the washers. Write the actual results in the table.

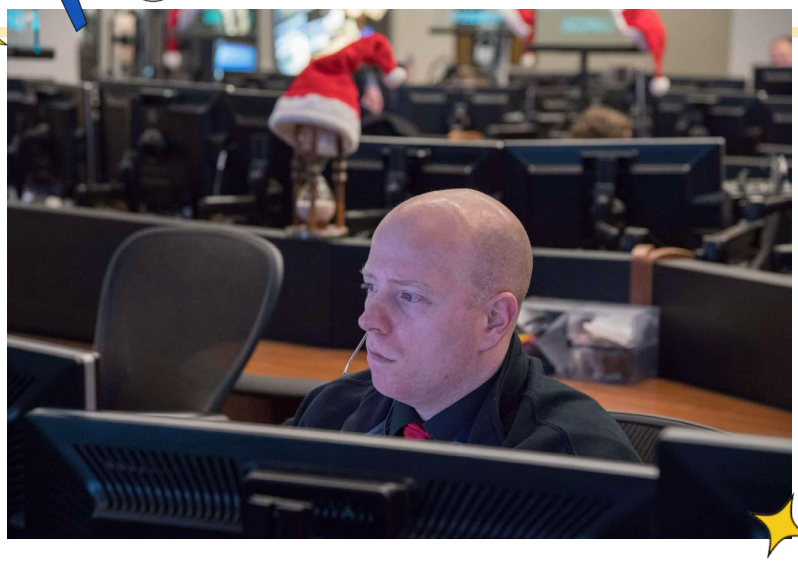
A = A little damage B = Some damage C = A lot of damage

Number of Washers Dropped	1 foot height (prediction)	2 foot height (prediction)	1 foot height (actual)	2 foot height (actual)
1				
2				
3				
4				

2. Next, you will protect the tray with different materials. First make predictions about how much damage 4 washers will do when dropped from 2 feet onto each material. Write your predictions below. Test, and write the actual results below.

Material	Prediction	Actual
cheesecloth		
felt		
foam		
foil		
index card		

NASA Career Spotlight



Daniel Sturber

My job at NASA is to work with astronauts and other engineers to make sure spaceships work the way astronauts need them to work.

Science Adventure 1: Safety Stories: Sharing Experiences

Why is it important to make hazards safer?

My Safety Story

Think of a story about a time you made a hazard safer in your home, town, or school.

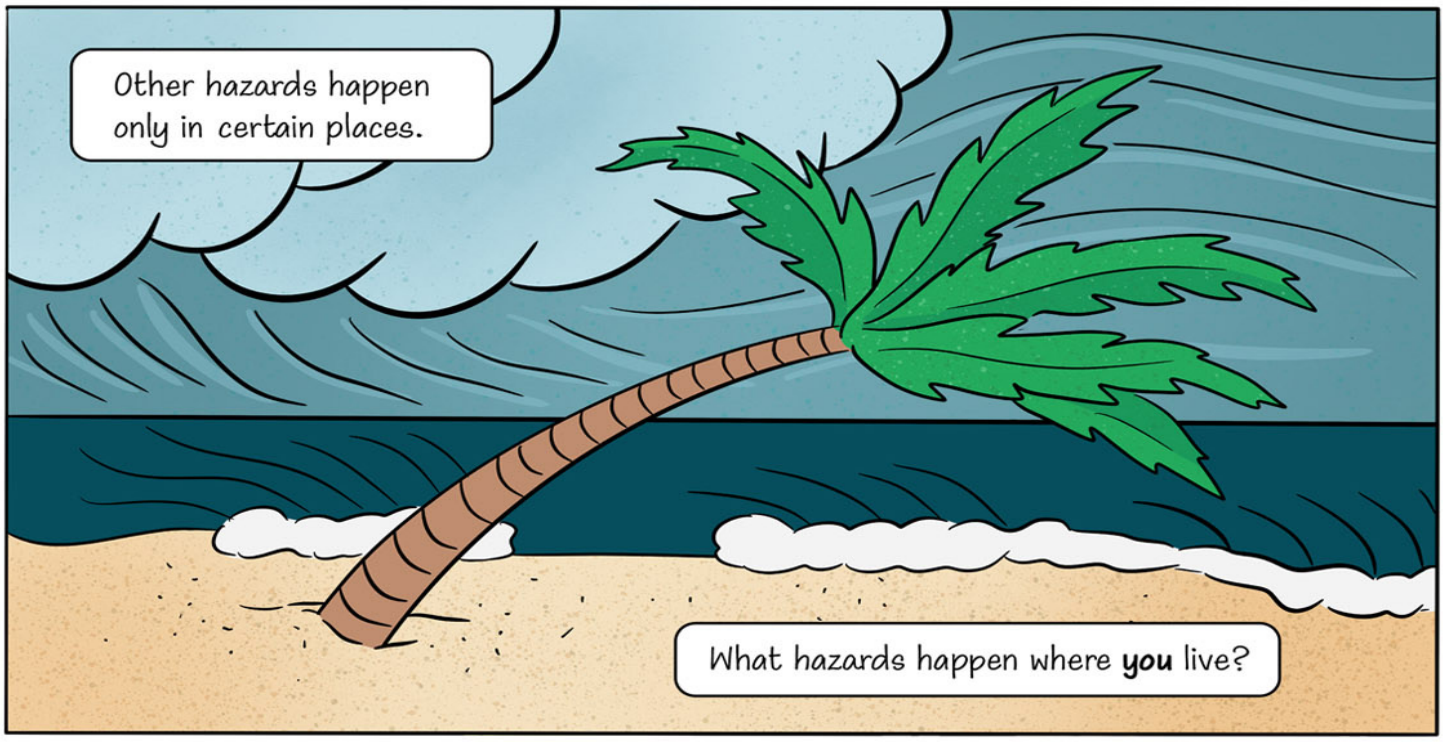
Then

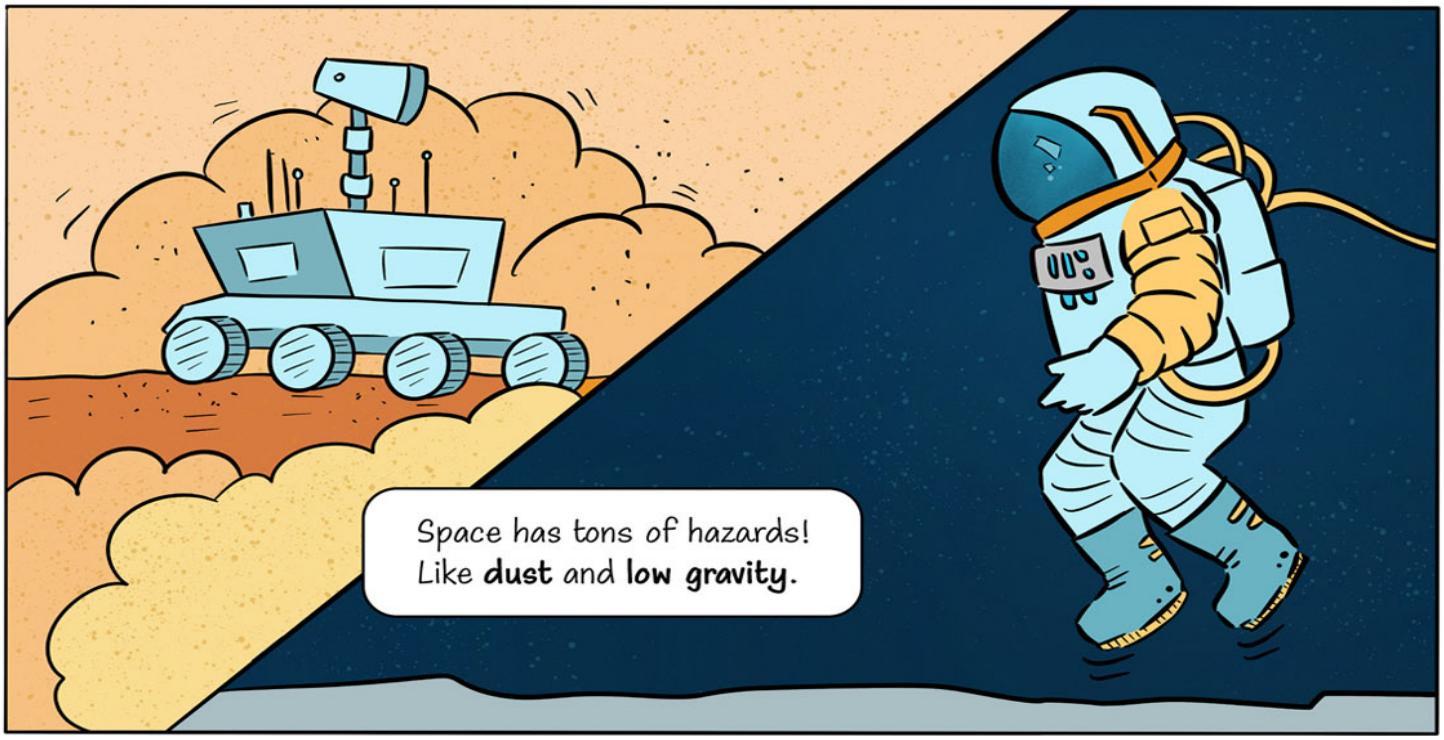
- write or draw your story on this page, or
- build something to demonstrate it.

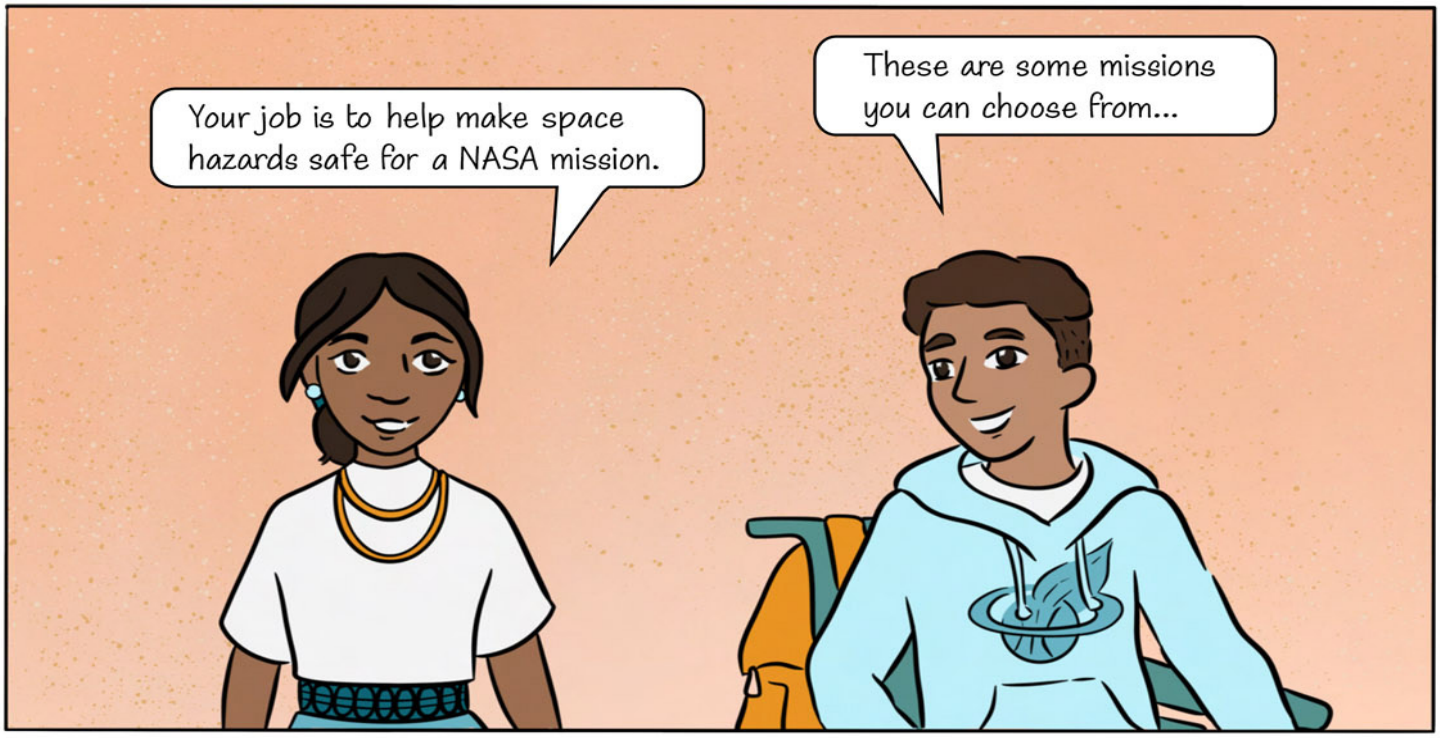
Science Adventure 2:
Everyday Hazards: Exploring Hazards and Mitigation

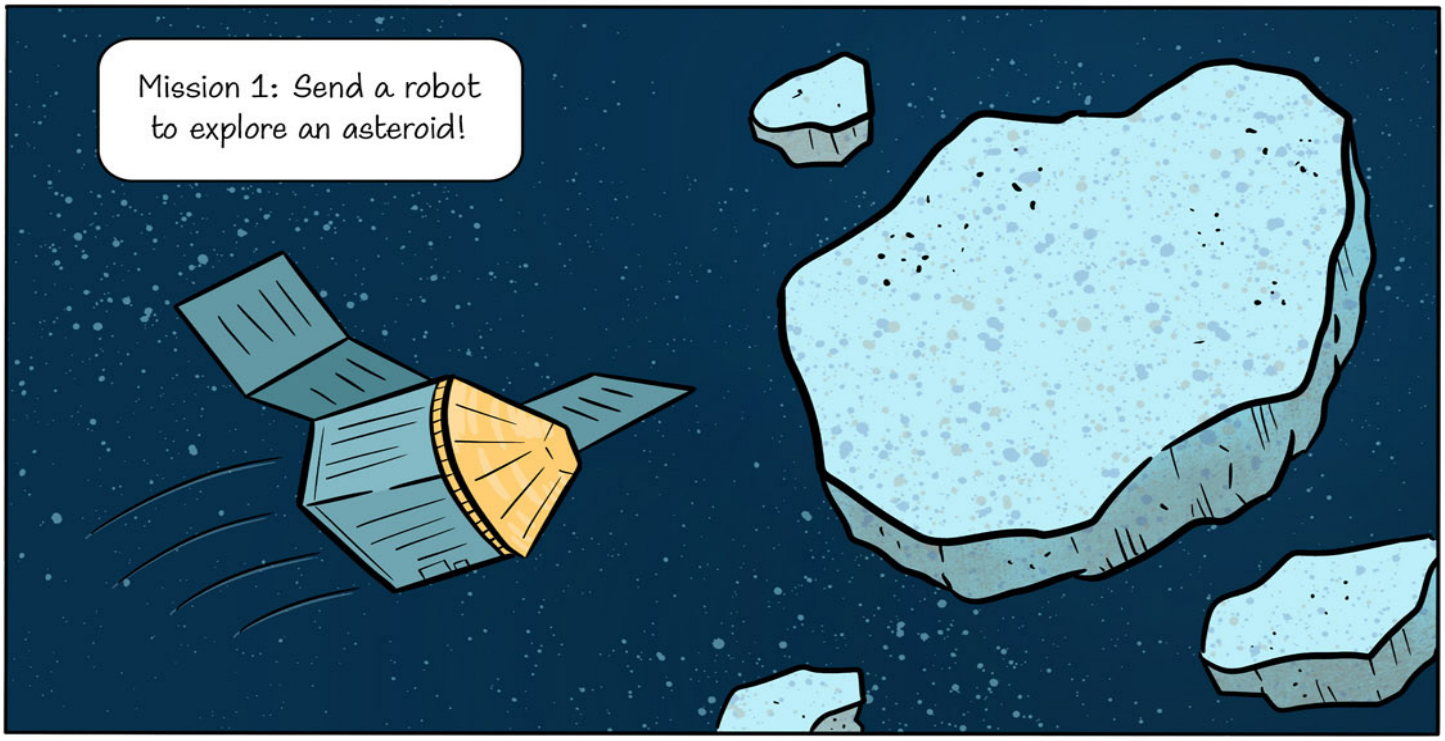
How do people stay safe from everyday hazards?

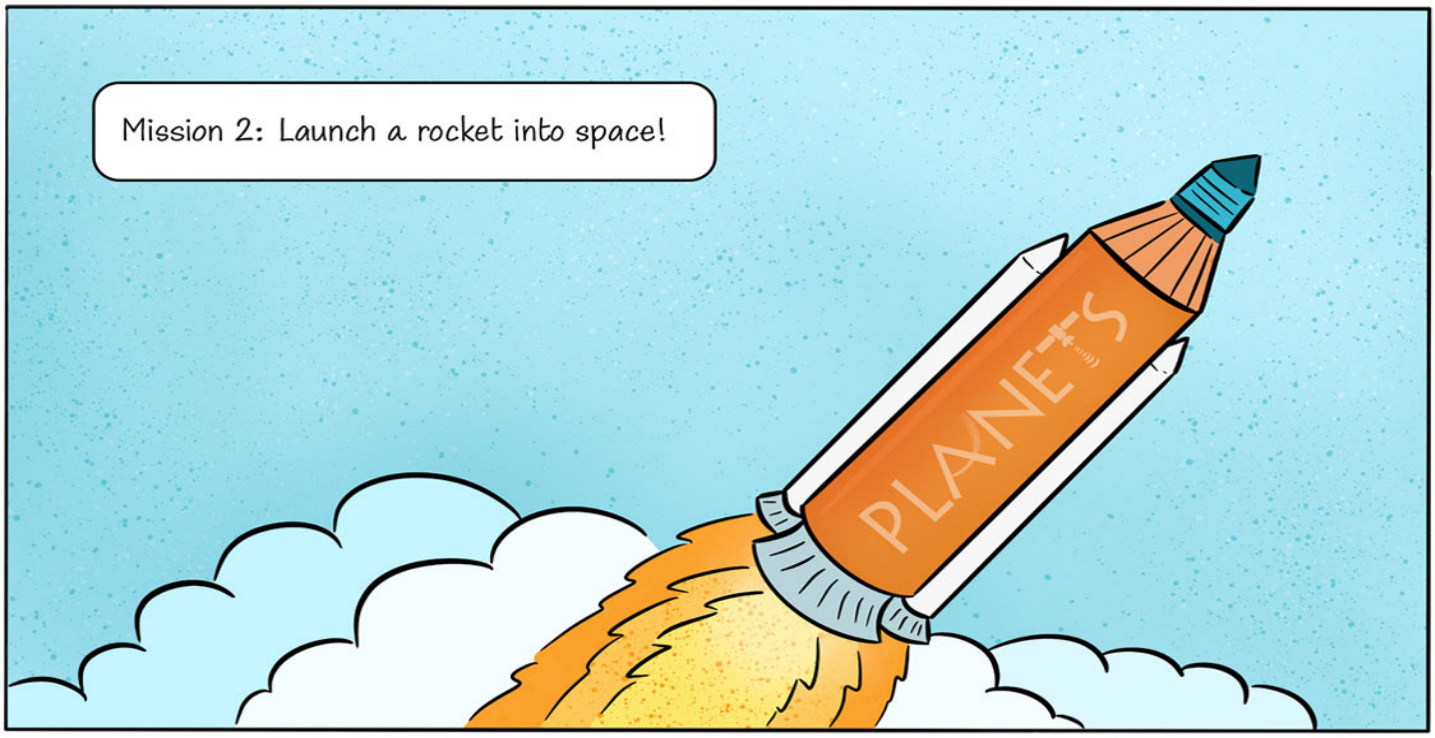
Science Comic

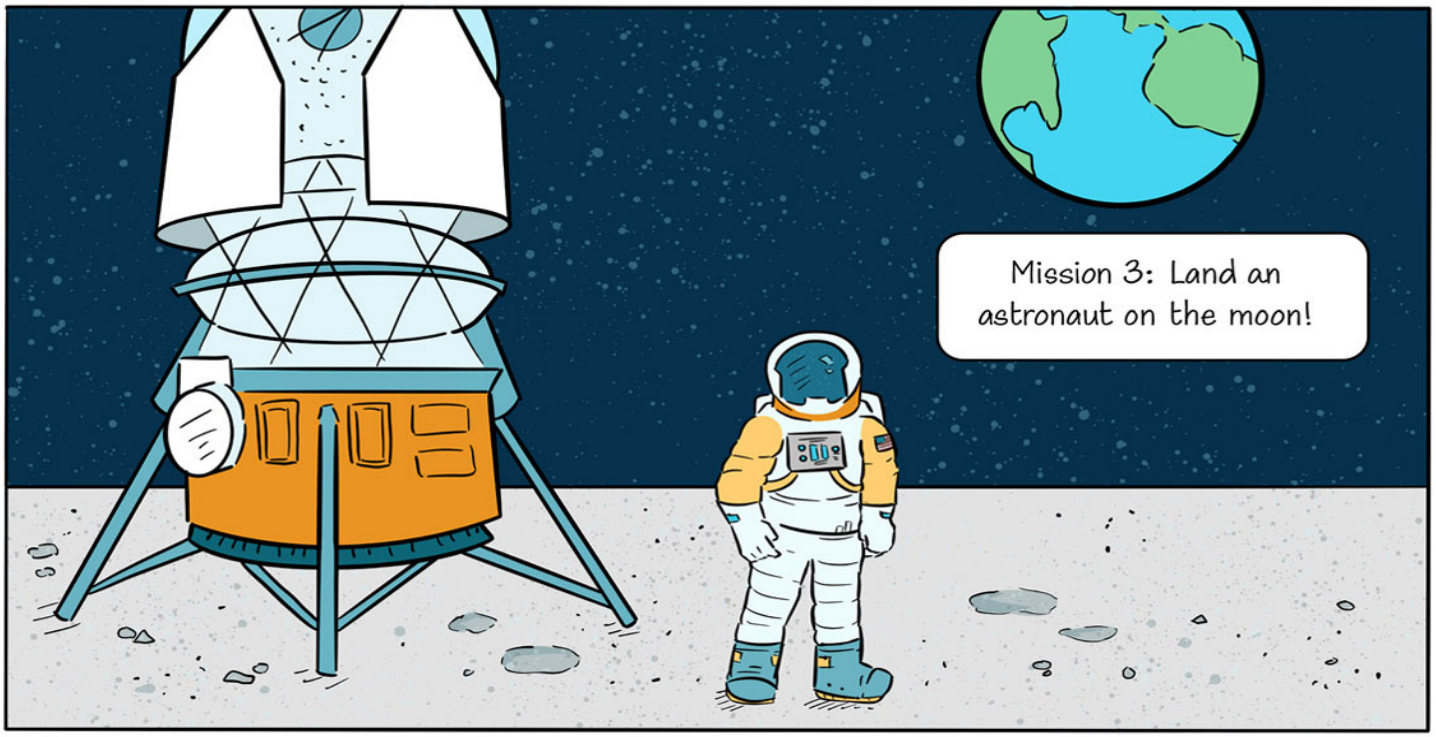

Other hazards happen only in certain places.
What hazards happen where **you** live?

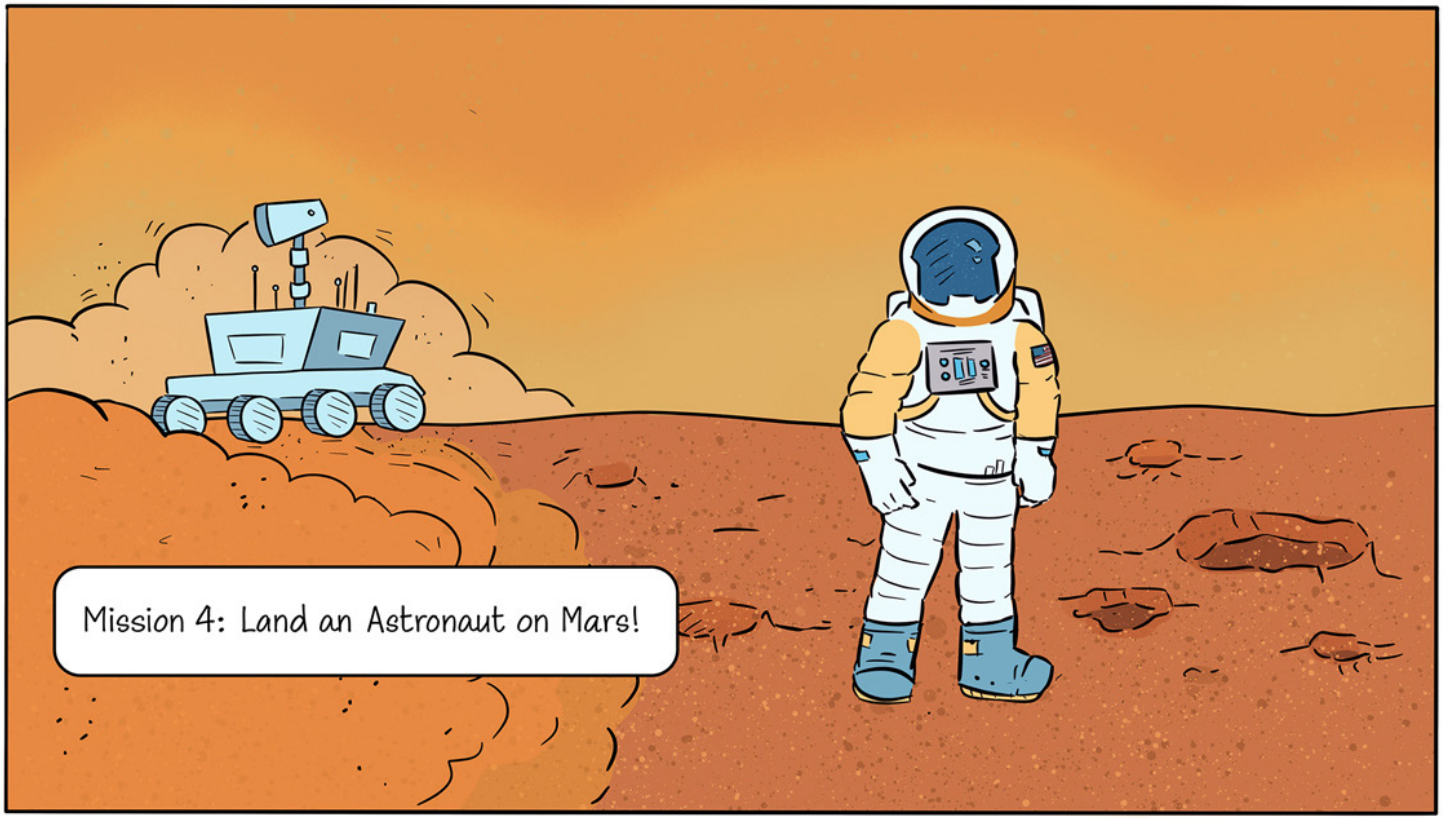

Space has tons of hazards! Like **dust** and **low gravity**.


Your job is to help make space hazards safe for a NASA mission.
These are some missions you can choose from...


Mission 1: Send a robot to explore an asteroid!


Mission 2: Launch a rocket into space!
PLANETS


Mission 3: Land an astronaut on the moon!


Mission 4: Land an Astronaut on Mars!

Science Adventure 4: Dangerous Planet: Earth Hazards

What natural hazards do people on Earth face and how do they mitigate them?

Earth Hazards

Draw lines to connect the hazards you faced to the ways you mitigated them. If you added your own cards, you can write them.

Hazards	Mitigations
Drought	Emergency Kit
Dust Storm	Engineering
Earthquake	Filters
Extreme Weather	Get Out of There!
Flood	Go Inside!
Meteoroid Impact	Manage Plants
Too Hot/Too Cold	Put Out Fire
Volcano: Lava Flow	Sand Bags
Wildfire	Thick Clothes/Walls
_____	Training
_____	_____
_____	_____
_____	_____

Science Adventure 5: Far from Home: Hazards in Space

How do NASA missions mitigate hazards in space?

Hazards in Space

Draw lines to connect the hazards you faced to the ways you mitigated them:

Hazards	Mitigations
Dust Storm	Bring It With You
	Emergency Kit
Low Gravity	Engineering
	Exercise
	Filters
Meteoroid Impact	Fix It
	Get Out of There!
No Food/Water/Air	Go Inside!
	Grow Plants
	Shielding
Poison Soil	Space Suit
	Thick Clothes/Walls
Space Radiation	Training
	Use It Again
	Use a Robot Instead
Too Hot/Too Cold	Use What Is Around
	Vitamins

Science Adventure 6:
Put It Together: Mitigating Hazards for Your Mission

How can we mitigate hazards on a particular NASA mission?

Mitigate Hazards for Your Mission

Congratulations!

Your team has been selected for one of the following missions.

1. Choose a mission.
2. Use the cards to identify hazards, mitigations, and chance factors that NASA needs to plan for.
3. Ask questions, make a list, brainstorm ideas, and be ready to explain which hazards and mitigations are most important for your mission.
4. Decide how to share your ideas.

NASA Career Spotlight

Phyllis Friello

My job at NASA is to work with my space medicine team to develop and provide what we need to keep our astronaut crews on moon and Mars missions healthy and safe.

Mission 1

We want to land a robotic spacecraft on an asteroid, get samples, and bring them back to Earth. How can we keep the spacecraft safe?

Tips

Look for the Asteroid and Robot icons.

Ask your educator to see the Educator Background section on Hazards faced by Robots.

Artist's illustration of the current OSIRIS-REx Spacecraft

https://www.jpl.nasa.govlnewslnews.php?feature= 7299

NASA Career Spotlights

Photo Credit: David Tuman

Aaron Yazzie

My job at NASA is to design robotic mechanisms and tools that allow us to gather rock samples from Mars and beyond.

Humans have never been to Mars, so it's important to learn as much as we can about the planet before we go there.

Mission 2

We're launching a rocket! What Earth hazards could there be in Florida and how should we mitigate them? What other chance factors could affect the launch?

Tips

Look for Earth icons.

The launch site is in Florida, so earthquakes and volcanoes are not around, but water and weather hazards are.

Dec 5, 2019 SpaceX Falcon 9 rocket launch

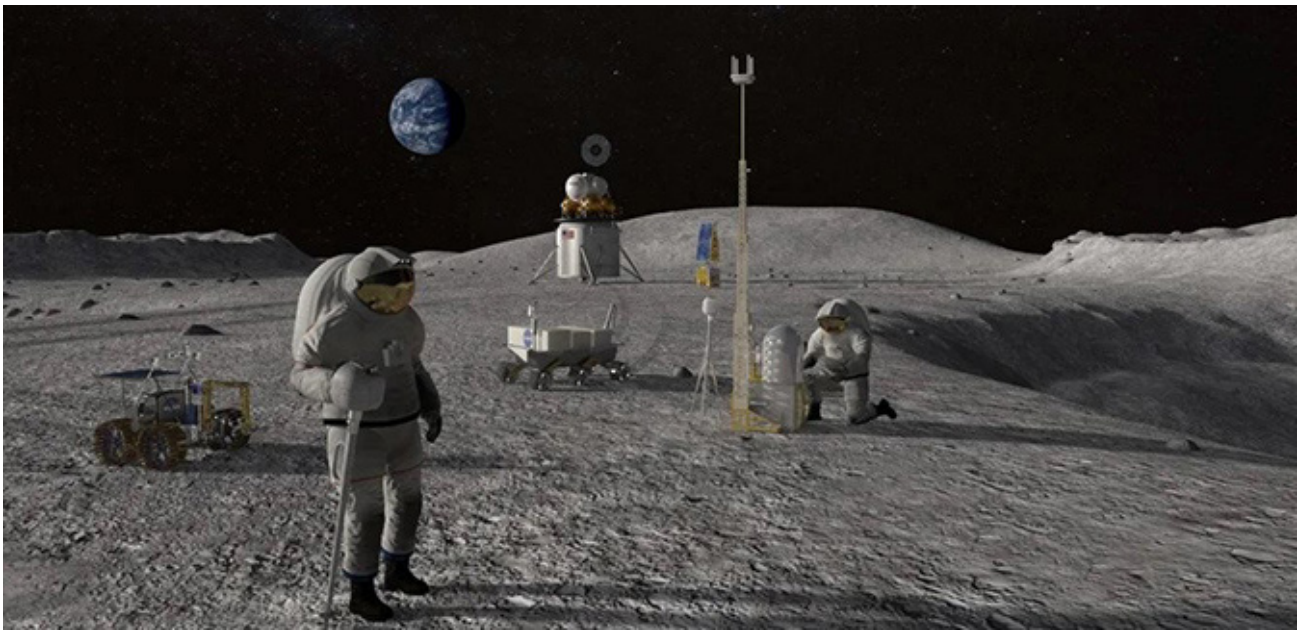
https://www.nasa.gov/launchschedule

Mission 3

We're going back to the Moon! Technology has improved since people were on the Moon in the 1970s. Once we get there we need to identify and mitigate hazards with better tools and suits.

Tip

Look for the Moon icons.



Artist's illustration of astronauts on the moon in 2024

https://www.nasa.gov/featurelsending-american-astronauts-to-moon-in- 2024-nasa-accepts-challenge

NASA Career Spotlights

Carl Dunn

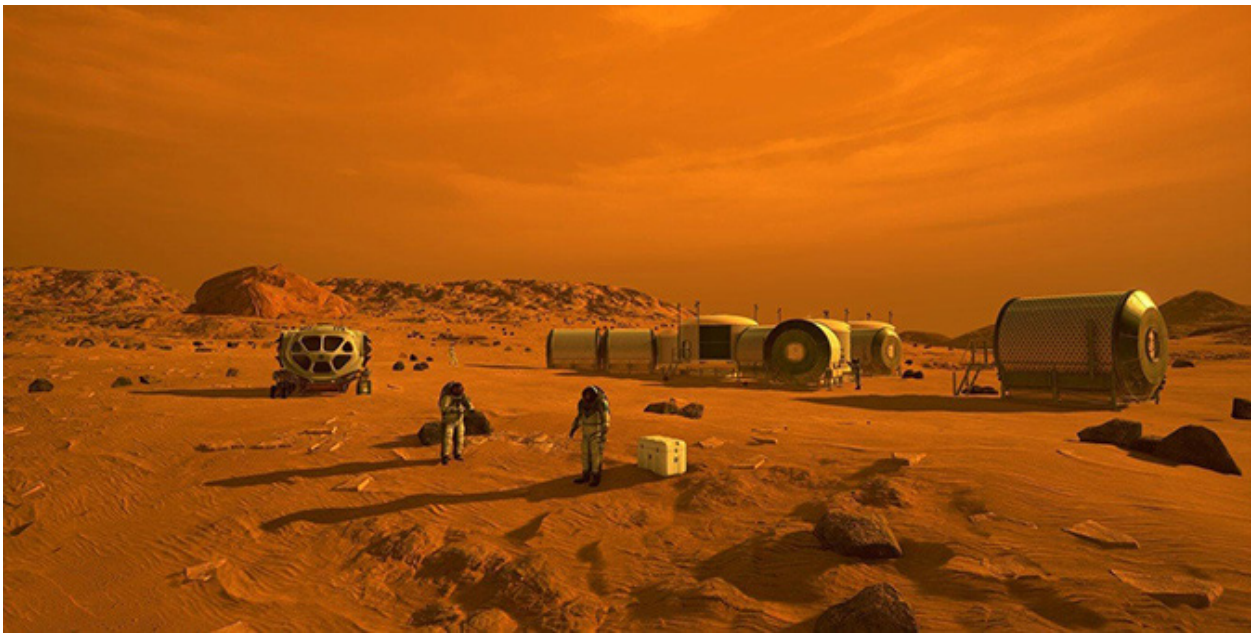
My job at NASA is to support the development of a lunar rover which will help astronauts explore the surface of the Moon.

Mission 4

Humans have never been to Mars, so we are sending someone there for the first time! What hazards and chance factors could be there? How should we mitigate them?

Tip

Look for the Mars icons.



Artist's illustration of astronauts and habitats on Mars

https://www.nasa.gov/featureljpllnasas-mars-2020-will-blaze-a-trail-for-humans

Plan Your Mission

Hazards	Mitigations	Chance Factors