

Day 4

Mars: The Red Planet



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Introduction

Let's explore one of the planets that has really captured our imaginations: [Mars](#). Mars has been known since ancient times because you can see it without a telescope. The [planet](#) is covered in rocks and sand, colored red by [iron oxide](#). Mars has [volcanoes](#), though they are not active. We once thought there might be life on Mars, but space [orbiters](#), [landers](#), and [rovers](#) have revealed a cold [desert](#) world. Scientists are still looking for clues that would tell us if Mars has (or once had) the right conditions to support even small life forms, called [microbes](#).

Questions to guide explorations and experiments

- Why is Mars called the Red Planet?
 - What do we know about volcanoes on Mars? What happens when a volcano erupts?
 - What kinds of spacecrafts have landed on Mars? How do space engineers get them to land without crashing? How do the Mars rovers move around?
 - What if humans traveled to Mars? What would we need to bring in order to survive?
 - If we met a Martian, what would it look like?
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Books and activities

- **Books:** fiction, nonfiction and poetry all about the planet Mars, how rovers explore Mars, and whether there is life on the Red Planet.
- **Activities:** explore the surface of Mars (including volcanos!), learn about Mars rovers, invent your own Martian, and write a Journey to Mars travel guide.



Children's Books

Fiction

- *The Boy Who Went to Mars* by Simon James (Ages 4-8)
- *The Countdown Conspiracy* by Katie Slivensky (Ages 9-12)
- *Life on Mars* by Jon Agee (Ages 4-8)
- *Luciana: Out of This World* by Erin Teagan (Ages 9-12)
- *Max Goes to Mars* by Jeffrey Bennett (Ages 6-9)
- *Mousetronaut Goes to Mars* by Mark Kelly (Ages 4-8)
- *Mr. Wuffles* by David Wiesner (Ages 4-8)
- *The Truth About Martians* by Melissa Savage (Ages 9-12)
- *The Way Back Home* by Oliver Jeffers (Ages 4-8)
- *There Was an Old Martian Who Swallowed the Moon* by Jennifer Ward (Ages 4-8)

Poetry

- *Comets, Stars, the Moon, and Mars: Space Poems and Paintings* by Douglas Florian (Ages 6-9)
- *Out of This World: Poems and Facts About Space* by Amy Sklansky (Ages 6-9)

Nonfiction

- *Curiosity: The Story of the Mars Rover* by Markus Motum (Ages 9-12)
- *Destination Mars* by Seymour Simon (Ages 6-9)
- *Exploring Space: From Galileo to the Mars Rover and Beyond* by Martin Jenkins (Ages 9-12)
- *Mars: Our Future on the Red Planet* by Leonard David (Ages 9-12)
- *The Mighty Mars Rovers* by Elizabeth Rusch (Ages 9-12)
- *Mission: Mars* by Pascal Lee (Ages 9-12)
- *Mission to Mars* by Franklyn Branley (Ages 4-8)
- *National Geographic Kids: Mars* by Elizabeth Carney (Ages 6-9)
- *The Rocket that Flew to Mars* by Audrey Sauble (Ages 4-8)
- *Welcome to Mars: Making a Home on the Red Planet* by Buzz Aldrin (Ages 9-12)
- *You Are the First Kid on Mars* by Patrick O'Brien (Ages 6-9)



Space Words

Atmosphere

The layer of gases surrounding Mars, Earth, and other planets, held in place by gravity.

Canyon

A deep valley with steep sides.

Crater

A bowl-shaped cavity caused by an asteroid impact.

Curiosity, Spirit, and Opportunity

Three car-sized Mars rovers designed to collect information about the Red Planet. Curiosity was launched November 26, 2011 and is still active.

Desert

A very dry area with little or no rainfall to support plant life.

Gravity

A force that pulls matter together; a force that pulls people and objects toward the ground.

Iron Oxide

A substance formed when iron mixes with oxygen and water. Also called rust, it is red in color.

Lander

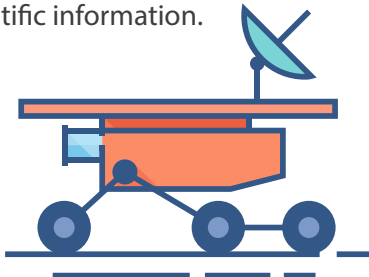
A type of spacecraft that is designed to land on the surface of a planet, comet, or moon, to retrieve or send scientific information.

Mars

The fourth planet from the Sun. It is the second smallest planet in the solar system, and is about half the size of Earth. Often called the Red Planet.

Mars Rover

A space vehicle designed to travel on the surface of Mars to retrieve or send scientific information.



Martian

A fictional creature from the planet Mars. Also, something from the planet Mars, such as Martian soil.



Microbe

A life form that can only be seen with a microscope. Bacteria and viruses are microbes.

Orbiter

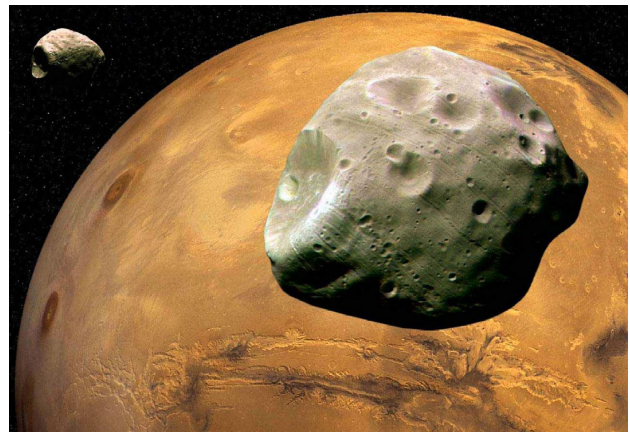
A spacecraft designed to move around (orbit) a planet or moon.

Olympus Mons

The largest volcano in the solar system and located on Mars. It is almost 3 times taller than Mt. Everest!

Phobos and Deimos

The two small, rocky moons orbiting around Mars; they look like asteroids.



Polar ice cap

Dome-shaped sheets of ice found at the north and south areas (polar regions) of a planet.

Terrestrial

Earth-like. A terrestrial planet has a solid rocky surface, with metals deep in its core.

Volcano

A hole (vent) in a planet's surface that releases lava (melted rock) and gases to the surface.



Activity 1: Why Is Mars Red?

Introduction

The soil (dust) on Mars contains iron, one of the elements found in nature. People have used iron to make things like tools and weapons for more than 3,000 years.

Astronomers believe that Mars once had liquid water and it has a tiny amount of oxygen. When iron mixes with water and oxygen, it produces iron oxide, or rust.

Rust is reddish brown in color. That's where Mars gets its name, the Red Planet, because it's soil is full of iron turned to rust.

Supplies

- Photograph of the Martian landscape (provided)
- Two jugs of water
- Small tray filled with 1-2 cups of light-colored sand
- Rusty nail or other rusty object
- Pens, pencils
- Crayons and/or colored pencils

Plain steel wool pads look like this:



Work in teams of 2-3 kids. For each team:

- Plastic container or small tray
- About 1 cup of light-colored sand
- 1-2 **plain steel wool pads** (do NOT use soap pads or stainless steel pads)
- Worksheet to record observations (one for each child, see the template on page 87)

This experiment takes 3 days to complete

Get kids thinking

Mars is sometimes called the Red Planet because of the color of its soil. How did the soil become red or rusty colored. Have you ever seen a rusty object — maybe the handlebars on your bike or an old nail you found in your neighborhood. **Ask kids:** Do you have any ideas about why the metal turned rusty?



Activity 1: Why Is Mars Red?

Explain to the kids that water is the culprit! When water (from rain, for example) mixes with air (oxygen) and the iron in your bike handlebars or a nail, a chemical reaction starts. That chemical reaction changes iron to iron oxide, or rust. The color of your handlebars will turn from silver to rusty red or rusty brown. That's what happened on Mars.

Iron + Oxygen + Water = rust

In this activity, kids will be creating their own Martian soil.

Let's get started!

Give each pair of kids a container with sand. Also give them 2-3 pads of steel wool, which you've pulled apart. Explain that the sand represents the soil on Mars. Have the kids put the steel wool in the container and mix the sand and steel wool.

Go around the room with the water jugs and pour a little water into all the containers. The sand and the steel wool should be very damp, but there shouldn't be a layer of water in the container.

Tell the kids that they will be observing their sand over 3 days. Ask the kids to record what they see each day, in words and pictures. Give each child their own worksheet.

Create two "controls" for the experiment: (1) an extra tray filled with sand and steel wool, but NO water; and (2) an extra tray filled with sand and enough water to moisten the sand but NO steel wool. Kids will compare the controls with their own containers to observe the difference that water and steel wool make in creating the rusty soil.

On days 2 and 3, add a bit of water to each child's tray and control #2 to keep the sand from drying out.

Ask kids: What happened during the experiment? Did the sand turn red? Why? If none of the theories are right, tell the kids that the steel wool contains iron and when mixed with water and air the iron starts to rust. The rust mixes with the sand to turn the whole mixture reddish-brown.



Activity 1: Why Is Mars Red?

Explain that there is a lot of iron in the ground on Mars. That is why we see Mars as a red planet. Pass the rusty nail around the class, so that the children get an idea of what rust looks like on 'real' objects, and what it feels like. **What else rusts?** Encourage the kids to think of other things that can rust.



Photo © First Grader At Last

More activities

Video: [Why Is Mars Red? \(Mystery Doug\)](#)

https://www.youtube.com/watch?v=eAj_f6JjOUo

Why Is Mars Red? The Martian Soil Experiment

My name: _____

Day 1

Describe what the sand looks like:

Draw what the sand looks like:

Day 2

Describe what the sand looks like:

Draw what the sand looks like:

Day 3

Describe what the sand looks like:

Draw what the sand looks like:



Activity 2: Eruption!

Olympus Mons, the Mars Volcano

Introduction

Mars has the largest [volcano](#) in our solar system! Astronomers believe that the volcano called [Olympus Mons](#) last erupted 25 million years ago, and that it may still be an active volcano. Olympus Mons is as big around as the state of Arizona (about 400 miles) and rises 16 miles above the Martian surface — almost three times taller than Mt. Everest.

Get kids thinking

Volcanoes can be found on Earth, but did you know that there are volcanoes all around our solar system? Io, one of the large moons orbiting around Jupiter, is covered with active volcanoes, and scientists have found evidence of volcanoes on our Moon as well as the moons of Saturn and Neptune.

Ask kids: Have you ever watched a movie of a volcano eruption? What does it look like? Describe what is coming out of the top of the volcano. What would the air feel like if you got too close to a volcano? What sounds might you hear?

Images from Mars [orbiters](#) and [rovers](#) show us what [Olympus Mons](#) looks like.

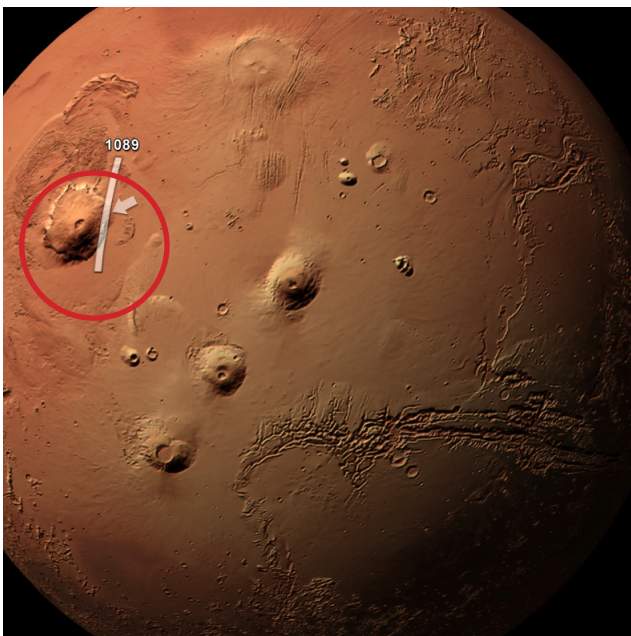


Photo © NASA. Olympus Mons shown in red circle



Photo © NASA. Olympus Mons seen from above



Activity 2: Eruption! Olympus Mons, the Mars Volcano

Supplies

- Deep baking dish
- 2-liter plastic bottle
- Large mixing bowl
- Spoon(s) for mixing
- Drop cloth or place where volcano can erupt and make a mess

For the volcano "cone"

- 6 cups flour
- 2 cups salt
- 2 cups warm water (more if needed)
- 4 tablespoons cooking oil
- Food coloring: mixture of red and black to make brown (optional)

For the volcano "lava"

- Hot tap water
- Funnel
- 2 tablespoons baking soda
- 2 cups white vinegar
- Red food coloring (optional)
- 6 drops of dish detergent
- Smart phone to videotape eruption (optional)





Activity 2: Eruption! Olympus Mons, the Mars Volcano

Let's get started!

First, make the “cone” of the volcano

Mix 6 cups flour, 2 cups salt, 4 tablespoons cooking oil, and 2 cups of water. Add food coloring to make the dough brown, if you like. The resulting mixture should be smooth and firm (add more water if needed).

Then, stand the soda bottle in the baking pan and mold the dough around it into a volcano shape. Don't cover the hole or drop dough into it.

Now for the lava!

Fill the soda bottle most of the way full with warm water and a bit of red food coloring. Next, add 6 drops of detergent to the bottle contents. The detergent helps trap the bubbles produced by the reaction so you get better lava. Then add 2 tablespoons of baking soda to the liquid.

Slowly pour vinegar into the bottle. Watch out — eruption time!

You can make your volcano erupt over and over by adding more baking soda. Pour in more vinegar to trigger the reaction. You may need to pour off some of the “lava” between eruptions.





Activity 2: Eruption!

Olympus Mons, the Mars Volcano

Ask kids: what's happening? The cool red lava is the result of a chemical reaction between the baking soda and vinegar. Carbon dioxide gas is produced, which is also present in real volcanoes. As the carbon dioxide gas is produced, pressure builds up inside the plastic bottle, until the gas bubbles out of the volcano.

Instead of water bubbling out, when a volcano erupts, hot melted rock gets pushed out. Share the infographic on the next page that shows how a volcano erupts. If you have Internet access, you can also watch videos of volcano eruptions.

Volcanoes 101 (National Geographic) shows videos of real volcanic eruptions and lava flow, as well as an animation explaining how and why volcanoes erupt.

<https://video.nationalgeographic.com/video/101-videos/00000144-0a2c-d3cb-a96c-7b2d221d0000>

More activities

Video: DIY Volcano (PBS Parents)

<http://www.pbs.org/parents/crafts-for-kids/diy-volcano/>

Space Volcanoes! (NASA Space Place)

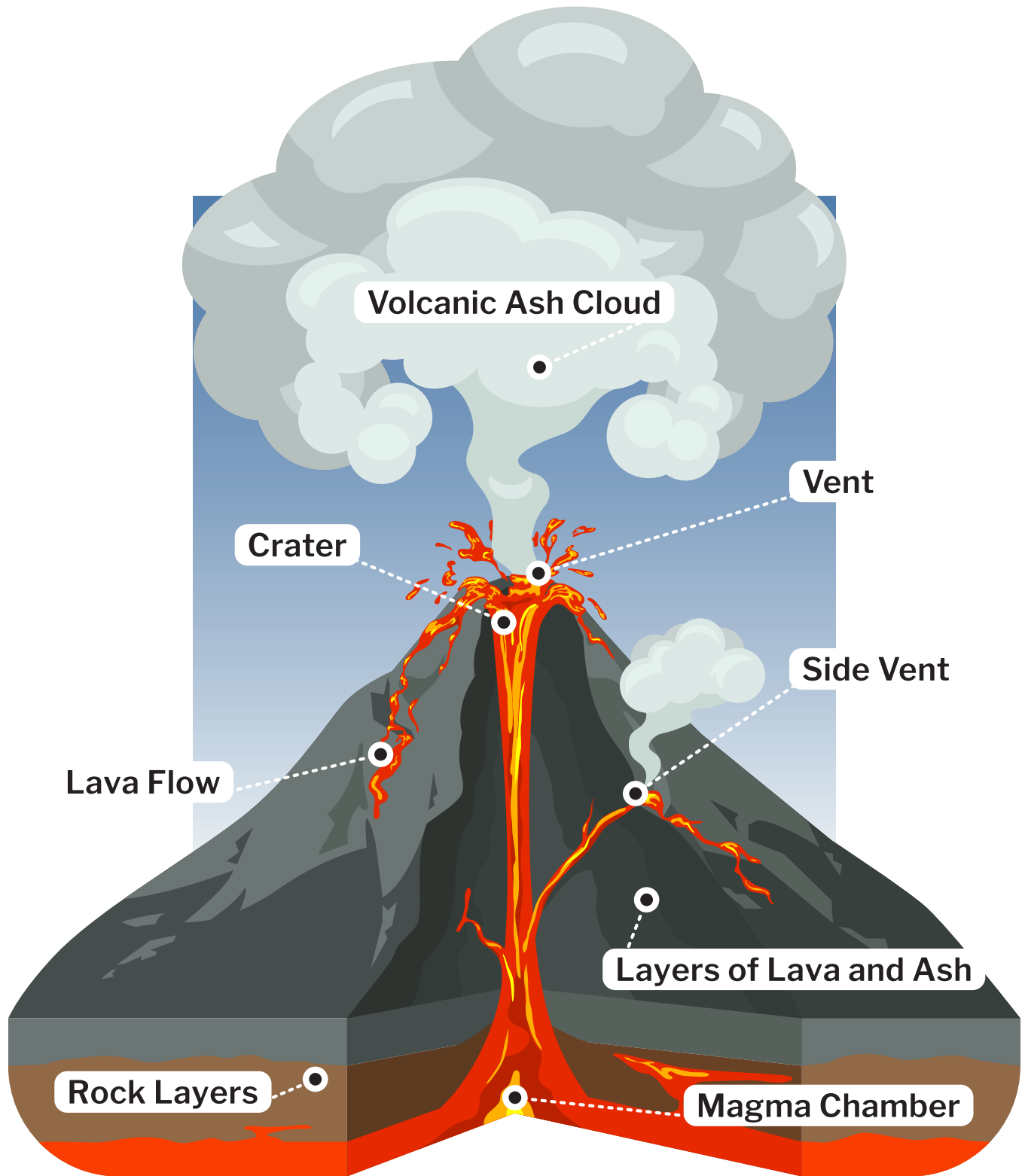
<https://spaceplace.nasa.gov/volcanoes/en/>

Explore Volcanoes (National Geographic Kids)

<https://kids.nationalgeographic.com/explore/youtube-playlist-pages/youtube-playlist-volcano/>

Diagram of a Volcano Eruption

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Activity 3: Landing on Mars

Introduction

To learn about the Red Planet, our NASA scientists and engineers have sent [landers](#) and [rovers](#) to the surface of Mars. So far, the U.S. has had eight successful Mars landings.

Imagine this: your rover is approaching Mars, going at high speed and you need to land it gently on the surface of the Red Planet, with the spacecraft and all of its equipment safe and sound. The [atmosphere](#) on Mars is very thin, so it doesn't help slow the rover down much.

Supplies (for each child)

- Heavy weight paper or card stock cut into 8-inch triangle (see template on page 96)
- Hole puncher
- 2 large paper clips
- 4 lengths of string, each 18-24 inches long (longer strings for a higher drop point)
- 12" x 12" piece of newspaper
- 12" x 12" piece of cloth
- 12" x 12" piece of plastic wrap or plastic trash bags
- Adhesive tape or packing tape
- Consistently-sized small plastic toy vehicles, crayons, or larger rubber erasers
- Stopwatch, clock with a second hand, or timer on cell phone
- Notepad, pen or pencil

Get kids thinking

Engineers at NASA have explored many new ways to slow down the landers for a safe arrival.

Ask kids: can you think of anything that might slow down a Mars lander to make it safe for landing? A parachute does the trick! It opens up after the lander enters the Mars atmosphere, catches air as it floats, creating drag (working against the downward pull of [gravity](#)) — that slows down the landing.



Activity 3: Landing on Mars

If you have Internet access, watch this video from NASA and the Jet Propulsion Lab (JPL), **We Brake for Mars:** <https://www.youtube.com/watch?v=9h1NtQJ59kM>

NASA and JPL are testing a supersonic parachute under Mars-like conditions for future exploration.

Ask kids: have you ever seen a parachute in action? What did you observe?

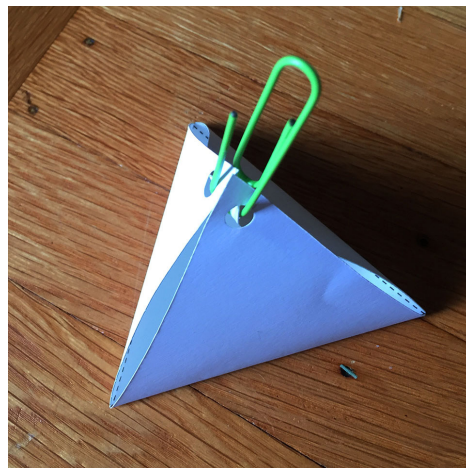
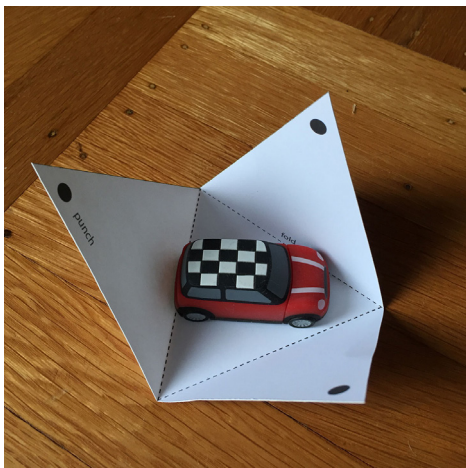
Let's get started!

In this challenge, kids will explore which material makes the best parachute for a slow, soft landing of their Mars lander.

Recommended: Have an adult demonstrate how to assemble the "lander" and then attach the test parachute. It's best to do this activity on a day that isn't windy.

First, build the lander with the triangle cut from heavy weight paper. Take one of the triangle corners and fold it over so that its point is in the middle of the triangle's other side. Crease the fold well, then unfold it. Repeat with the two remaining corners. Use the hole punch to create one hole near the tip of each point. This is your lander!

Next, place the small toy vehicle, crayon or large eraser (the "payload" or scientific equipment) in the lander. Insert the paper clip through the three punched holes to form a little carrier.





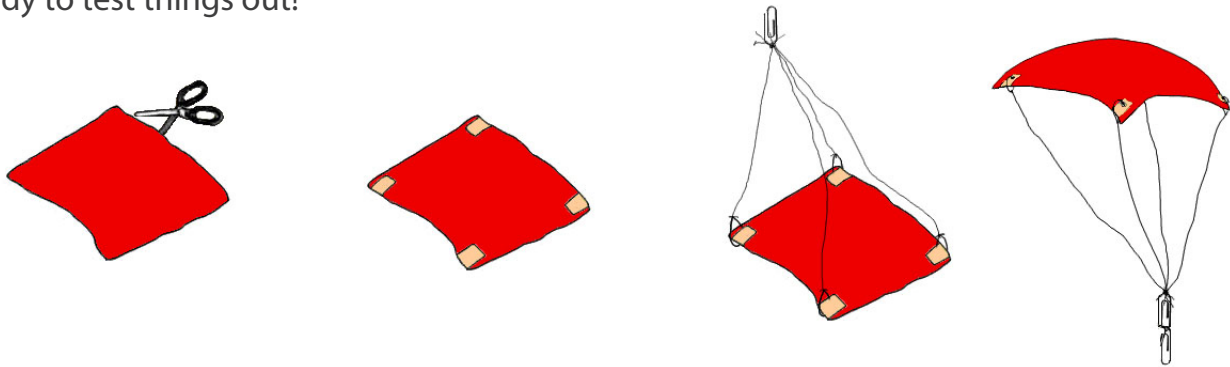
Activity 3: Landing on Mars

Then, gather the four strings and tie together in a knot at one end. Attach a large paper clip to the knotted end.

The newspaper, cloth, and plastic wrap are your test parachutes. **Ask kids:** predict which material will create the slowest landing and write it down in your notepad.

Have kids choose one material for the first test run and tape the ends of each string to a corner of the test parachute — being careful not to tangle up the strings.

Finally, attach the lander to the parachute by interlocking the two paper clips. Now you're ready to test things out!



Find a high place — stairwell, balcony, edge of a deck — to toss your lander and time it to see how long it takes to reach the ground. Record the observations in your notepad.

Repeat with the two other parachute materials.

Ask kids: Which parachute slowed down the lander the most? Is that what you predicted? What other materials might make a better parachute and why?

Option B: You can also do this experiment using raw eggs in the lander, instead of plastic toy vehicles, crayons, or erasers. This will also test how soft the landings really are! Warning: it can get messy, so use a dropcloth to catch any broken eggs.

More activities

Egg Drop Challenge (Buggy and Buddy)

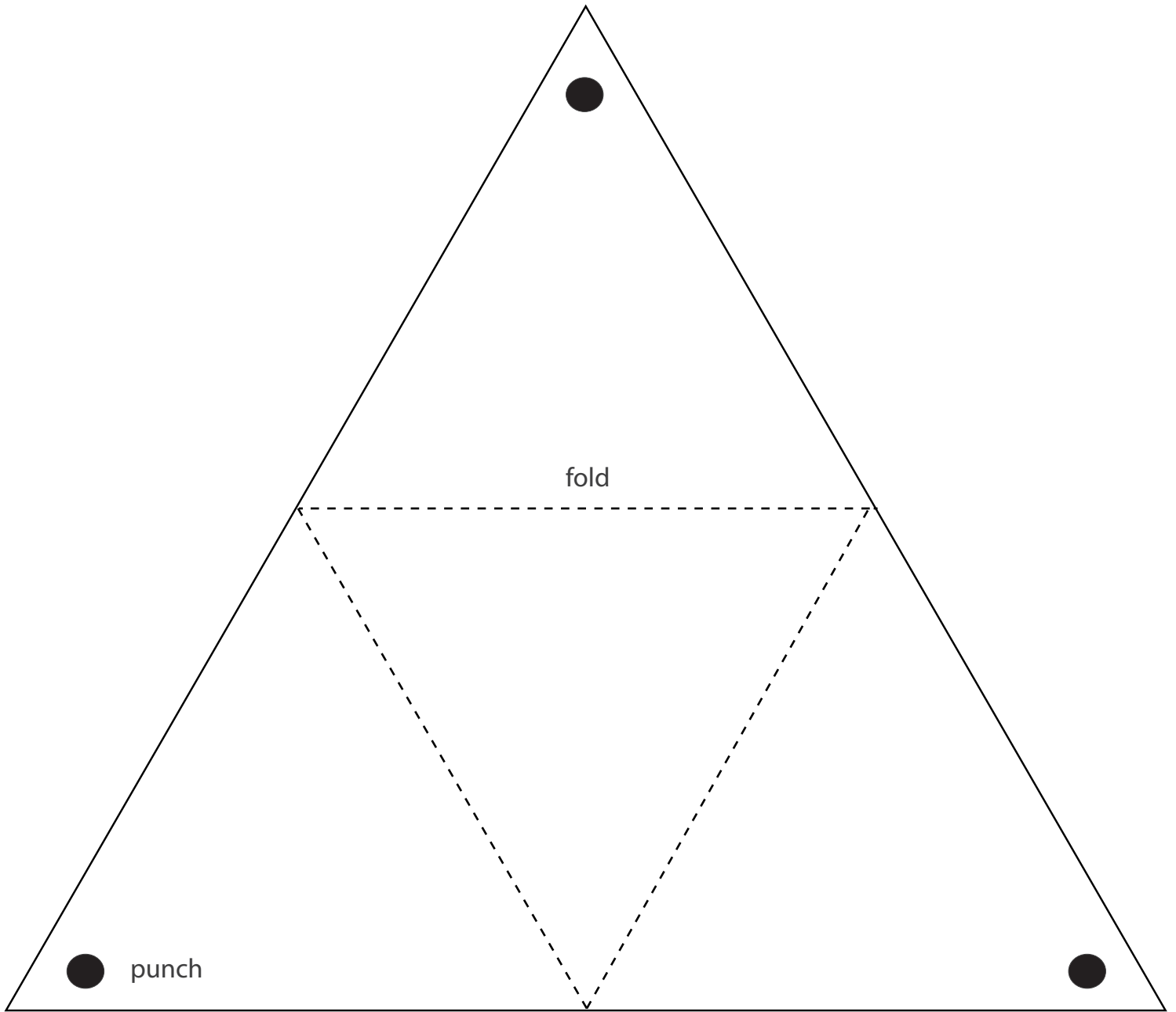
<https://buggyandbuddy.com/egg-drop-challenge-free-planning-printable-2014/>

Design Squad: Soft Landing (PBS Kids)

<https://pbskids.org/designsquad/build/soft-landing/>

Mars Lander Template

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Activity 4: Create a Martian!

Introduction

Do **Martians** exist?

An early 20th Century American astronomer named Percival Lowell believed that there was intelligent life on Mars — not just **microbes** or plants. He claimed that canals seen on Mars were built by Martians to move water from the **polar ice caps** to the dry areas on Mars in order to grow plants.

When the U.S. spacecraft Mariner 4 flew past Mars in 1965, it took pictures that showed Lowell's theory to be false. But the fascination with Martians and imagining what they might be like is still strong! Many science fiction stories explore the possibility of Martians and what they would be like. Now, many people use the word Martian to mean any alien creature.

Supplies

- White and colored paper
- Colored pencils, markers, or crayons
- Googly eyes, pipe cleaners, felt scraps, glue (optional)
- Large piece of brown kraft paper (you can cut up old grocery bags and tape them together)
- Tape
- Scissors

Get kids thinking

In this activity, kids will create their own Martian — a life form that could survive on Mars. Read a nonfiction book together about Mars, and talk about what the weather and land forms are like.

Ask kids: Is Mars hot or cold? How do animals adapt to live in very cold or very hot climates? Is Mars windy, dusty, rocky? Does it rain on Mars? What if Martians lived in special spaceships?



Activity 4: Create a Martian!

Let's get started!

Have the kids draw, color and embellish their Martians, thinking about the Mars environment as they create their character.

Once they are done, asks the kids to cut their Martian drawing out of the sheet of paper. The kids can add googly eyes and pipe cleaners with glue (optional).

Tape everyone's Martians to a wall covered with brown kraft paper (that's your Mars surface)

Get everyone together in a group, and encourage the kids to talk about their ideas for their Martian. **Ask kids:** what makes your Martian able to live on Mars?





Writing About Mars

Writing helps kids process and solidify new knowledge and gives them an opportunity to use new vocabulary and concepts. Offer one or more of these prompts or questions to get your Space Rangers writing.

Journey to Mars travel guide

The journey from Earth to Mars takes about 6 months or longer. What will you need to pack on your trip to get there? What kind of gear will you need when you get there?

What is different on Mars compared with Earth?

- There's less gravity so you weigh less and would float (If you weigh 65 lbs on Earth, your weight on Mars would be 24 lbs).
- It's cold and can be windy and dusty.
- There's no oxygen to breathe.
- There's no food on Mars.

More questions about going to Mars:

- Where would you get water?
- What's there to see on Mars?
- What will you do on Mars?
- How will you travel around?
- Where will you live?
- What will you do on the long journey back to Earth?

You can have the kids use the template provided on the following 4 pages or create your own design.

If you have Internet access, watch *Max Goes to Mars*, a story read by astronauts from the International Space Station!

<https://storytimefromspace.com/max-goes-to-mars-2/>



My Trip to Mars



My Trip to Mars

Getting around Mars

We've sent rovers to Mars — car-sized vehicles that can move around the Mars surface and take pictures and collect samples. The Curiosity Rover is still on Mars today!

Design your own Mars rover.



My Trip to Mars

Studying Mars

What do you want to learn about Mars? Will you collect Mars rocks and conduct experiments?

Living on Mars

Mars is cold, dry, and dusty and there's no water or food. Describe how you will survive while you are staying on Mars.





Kid-friendly Websites and Apps

Websites

Video: Mars in a Minute (JPL)

<https://www.jpl.nasa.gov/edu/teach/activity/mars-in-a-minute/>

Video: Mars 101 (National Geographic)

<https://video.nationalgeographic.com/video/101-videos/00000163-92eb-dc54-a7e7-b2ff-da4c0000>

Send a Postcard to Curiosity (NASA)

<https://mars.nasa.gov/msl/participate/postcard/>

Curiosity Mission (NASA)

<https://mars.jpl.nasa.gov/msl/>

The Mars Rovers (NASA Space Place)

<https://spaceplace.nasa.gov/mars-rovers/en/>

Mars Rover Game (NASA)

<https://mars.nasa.gov/gamee-rover/>

The Mars Rovers (NASA Space Place)

<https://spaceplace.nasa.gov/mars-rovers/en/>

Mars (Dragonfly TV, PBS)

<https://www.pbslearningmedia.org/resource/9d8481ab-ad37-4386-9a38-1681654f2fa5/9d8481ab-ad37-4386-9a38-1681654f2fa5/#.XJP3bLh7ncs>

Mars (NASA) You can check today's weather on Mars!

<https://mars.nasa.gov/>

Adventure to Mars online game (NASA Space Place)

<https://spaceplace.nasa.gov/mars-adventure/en/#>



Kid-friendly Websites and Apps

Imagine Yourself on Mars (Exploratorium)

<http://www.exploratorium.edu/mars/activities.php>

Mars Trek (NASA)

<https://trek.nasa.gov/mars/>

Experts discuss plans for sending astronauts to Mars in 20 years (Newsela)

<https://newsela.com/read/mars-exploration/id/15852/>

Liquid Water Found on Mars (NOVA)

<https://www.pbs.org/wgbh/nova/video/liquid-water-found-on-mars/>

Educational apps

Be a Martian (NASA)

<https://itunes.apple.com/us/app/nasa-be-a-martian/id543704769?mt=8>

NASA (Apple)

<https://www.commonsemmedia.org/app-reviews/nasa>

Solar System Explorer (Android)

<https://www.commonsense.org/education/app/solar-system-explorer>

Britannica Kids: Solar System (Apple) \$

<https://www.commonsemmedia.org/app-reviews/britannica-kids-solar-system>

Solar System (Apple) \$

<https://www.commonsemmedia.org/app-reviews/solar-system-for-ipad>

Mars Game (Apple)

<https://itunes.apple.com/us/app/mars-mars/id1108964305?mt=8>

Mars Globe (Apple)

<https://itunes.apple.com/us/app/mars-globe/id324185998?mt=8>