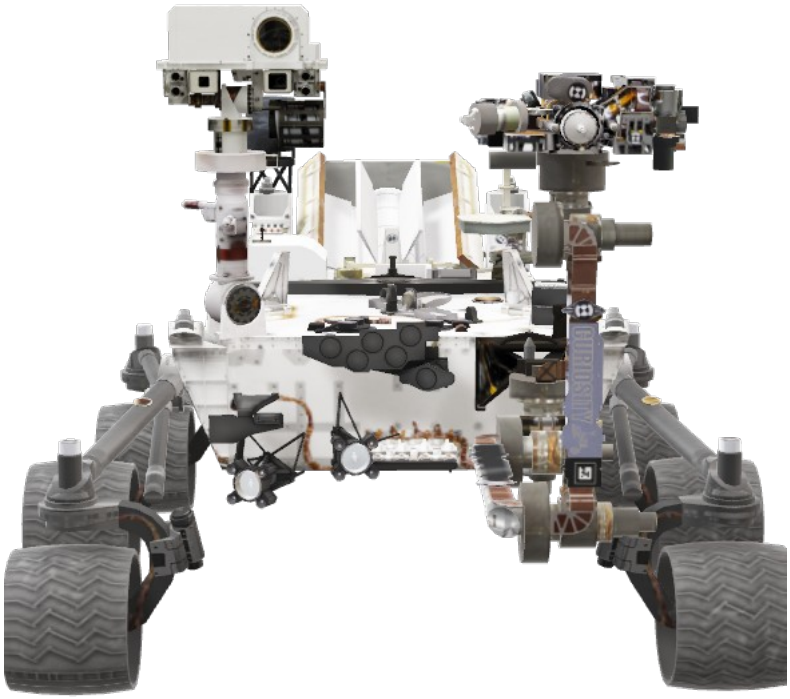


PEARRE CREEK
FAMILY STEM PROJECT

NASA and Robotics Themed

The following ideas are for all ages. Preschool ideas are on this page while K-2 and 3rd grade thru adult are on the next pages. You're encouraged to begin with one of the video or picture phenomena. They help engage background and discussion. No matter the age, ask what they notice and what they wonder. Let the discussion steer you in any direction from there or use these suggested activities as a guide. These activities can be done in one sitting or throughout the week. No matter what activity you choose, ask questions and let conversation

Preschool & Under

Engage with phenomena

Book suggestions:

- *Goodnight Moon*
- *Kitten's First Full Moon*
- *Mooncake*

Video suggestion:

PBS Kids

- https://pbskids.org/video/super-why/2301079549

Picture suggestion:

NASA Kids

- https://images-assets.nasa.gov/image/PIA00405/PIA00405~orig.jpg

Explore with activities:

- Make a spaceship out of boxes to fly to the moon.
- Create a rover explorer with a tricycle or bike to explore the moon's surface.
- Collect "moon" rocks while exploring. Use a hand lens to investigate. Categorize and describe them.

For the whole family:

Pearre Creek Family STEM Challenge

Kindergarten thru adult

Project Overview:

Your family has been chosen by NASA to operate a robotic Discovery Mission on the surface of the moon. You will design your robot rover on paper first. Then, you will build it with household items. It can be any size, from something handheld to something drivable.

When you are ready, your lunar commander will give you a specific starting location. You and your robot must move through the lunar landscape to the location of the “lunar ice” without bumping into any “lunar boulders” or other obstacles.

To successfully complete the Discovery Mission, your robot must pick up a piece of lunar ice. For more detail on your mission, please see the following pages.

Supplies

- Rulers, meter sticks, or tape measure
- Paper to sketch design
- Blindfolds
- “Prize” as lunar ice sample
- “lunar boulders” to navigate around
- Experiment and Record pages
- Optional: boxes and decorations to create a worn or handheld robot rover.

Now, let’s build background. Start with some engaging phenomena like the ones listed below. The links have been broken down into suggested age groups, but all of them are fascinating. You do not need to watch all of them at once to get started. But please watch them at some point because they are interesting. You will notice that the phenomena videos are a mixture of trips to Moon and trips to Mars.

- (all ages) Artemis is the ongoing project to Moon. https://youtu.be/_T8cn2J13-4
- (all ages) What Apollo 13 astronauts saw: https://youtu.be/llifg26TZrI
- (all ages) Mars in a Minute: How do you Get to Mars? https://youtu.be/-nAhag_iFx0
- (all ages) Inside the Control Room when Curiosity landed on Mars: https://youtu.be/Ti_yre6dsa4
- (all ages) Testing with a Martian Dune Buggy https://youtu.be/AVqsV4rQ4bE
- (K-3) Ada Twist, Scientist / Stories from Space https://youtu.be/Q7TLqqct42M
- (3-adult) Engineering challenges of getting to Mars: https://youtu.be/pzqdoXwLBT8

You’ve been told the mission.

You’ve built some background.

You’ve seen real pictures, computer generated pictures, and examples from scientists and astronauts.

You’re ready to explore.

The Discovery Mission

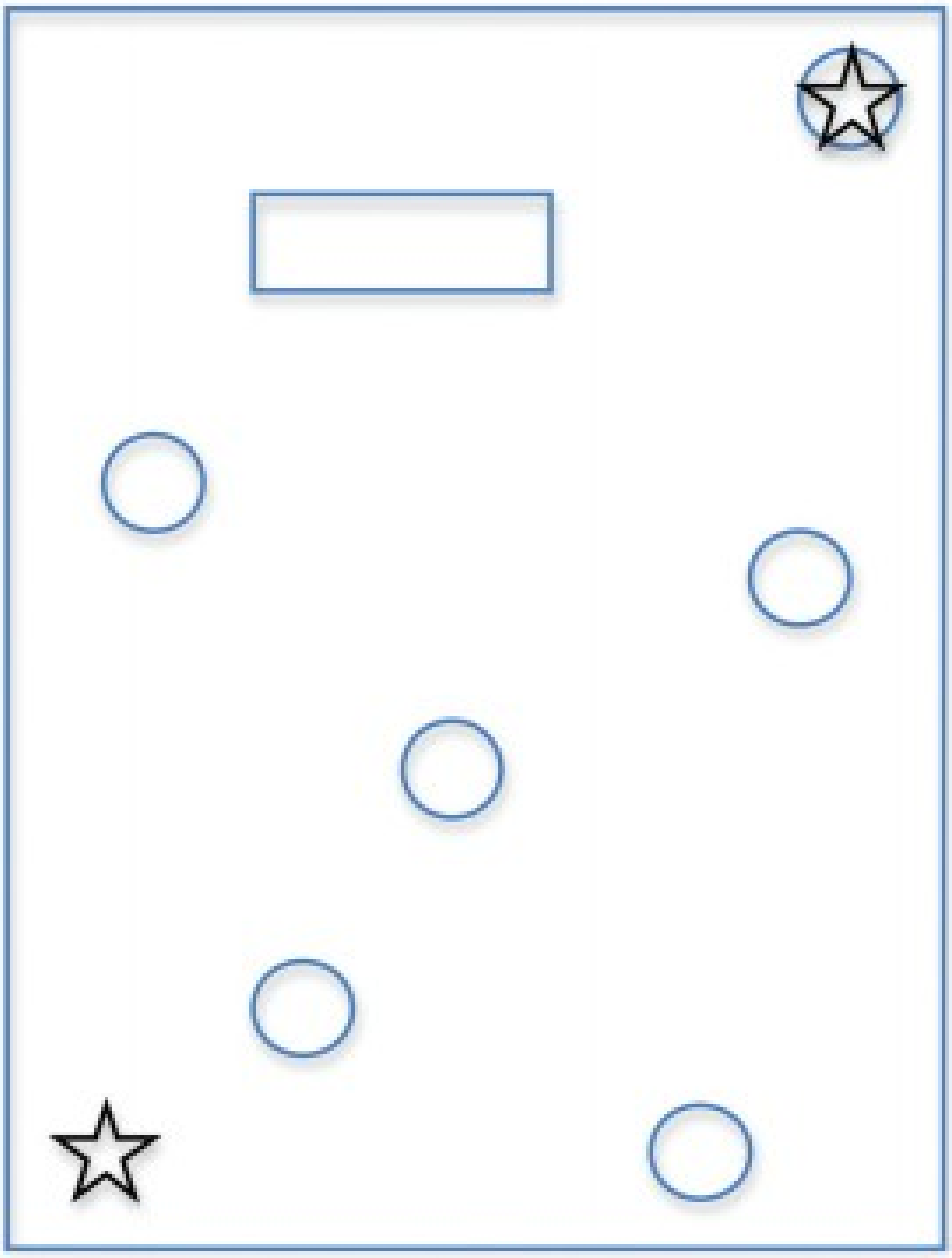
Every NASA mission has several parts leading to its success. When leading a remote mission on another planet or moon, NASA scientists and engineers must plan every step of the mission carefully. When using robots or rovers, each mission team calibrates and programs these machines to accomplish the mission objective, such as to travel to certain locations on that planet or moon. In addition, NASA must use radio signals to send their commands. So a mission on a distant planet could take minutes to hours to days to communicate to that robot.

The Challenge:

Your team has been chosen to operate a robotic Discovery Mission on the surface of the Moon. You will be given a specific starting location, and your robot must move through a lunar landscape to the location of the "lunar ice" without bumping into any "lunar boulders" or other obstacles. To successfully complete the Discovery Mission, your robot must pick up a piece of "lunar ice."

Create the route for your robot within the diagram below.

Finish



Start

STEP 3 – Communicate with your robot

When you program a robot, you must use simple words and be specific in your directions. If you want your robot to go forward, how many steps should the robot go?

Practice the words below with your robot and see if your robot follows the commands correctly.

Sample Command for Robot	Action by robot
MOVE FORWARD TWO STEPS	Walk forward two steps.
MOVE BACKWARD ONE STEP	Walk backward one step.
TURN RIGHT	Turn to the right.
TURN LEFT	Turn to the left.
PICK UP LUNAR ICE	Pick up the lunar ice sample.

Were any of these commands difficult for your robot to execute? If so, which ones?

_____

_____

Suggest a better command to use with your robot.

_____

SOURCE: *NASA'S BEST Students, An Educator's Guide to the Engineering Design Process, pages 39-51.*

STEP 4 – Program your robot

Review the map with the route your team has created for your robot. Now your team needs to create commands for your robot to match your route. Write down one command that matches each arrow on your map.

Command Sequence
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

SOURCE: *NASA'S BEST Students, An Educator's Guide to the Engineering Design Process, pages 39-51.*

Experiment & Record

Execute the Discovery Mission!

It is time to let your Robot explore the Moon! You planned your route and practiced your commands. Now complete the mission. Take the complete command sequence your team designed and cut each command out of the page as separate pieces of paper. Designate two team members to deliver the commands to the Robot and divide those sheets of paper amongst them. Another team member or your teacher can use a stopwatch to time how long it takes for the Robot to reach the Lunar ice sample. Record each team's time in the next page to compare how long the mission took for each team!

SOURCE: *NASA'S BEST Students, An Educator's Guide to the Engineering Design Process, pages 39-51.*

This "DATA TABLE" page is recommended for K-2. OPTIONAL "DATA TABLE" page for GRADES 3 and ABOVE is on the next page.

Discovery Mission Data Table

Team Name	Time (seconds)
1.	
2.	
3.	
4.	
5.	

SOURCE: *NASA'S BEST Students, An Educator's Guide to the Engineering Design Process, pages 39-51.*

***** OPTIONAL "DATA TABLE" PAGE FOR GRADES 3 and ABOVE**

Record each team's time in the table below to compare how long the mission took for each team!

Discovery Mission Data Table

Command and Movement	Time (seconds)
Movement #1	
Movement #2	
Movement #3	
Movement #4	
Movement #5	
Movement #6	
Movement #7	
Movement #8	

• Elaborate

When you program a robot, you must use simple words and be specific in your directions. If you want your robot to go forward, how many steps should the robot go?

1. **Measure your robot's step length in centimeters with a meter stick.**

   Our robot's step length is _____ centimeters.

2. **For example, if your first robotic movement is 420 centimeters and your robot's step length is 30 centimeters you can solve for the number of steps using this formula:**

   Distance of movement divided by Step length = Number of Robot Steps

   420 cm / 30 cm = 14 steps

Robot Calibration			
Path Taken by Robot	**Distance (cm)**	**Do the Math (Distance / Robot step length)**	**Number of Robot Steps**
Movement #1			
Movement #2			
Movement #3			
Movement #4			
Movement #5			
Movement #6			
Movement #7			
Movement #8			

SOURCE: *NASA'S BEST Students, An Educator's Guide to the Engineering Design Process, pages 39-51.*