## 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."

Before your robot begins to move on the lunar surface, you will have to complete the following activities:

- **1. Designate your robot** One student in each team must volunteer to be the robot. The robot will be the person who actually walks through the course, blindfolded, following the instructions of her/his team. The team should give their robot a name.
- **2. Map the robot's route** Using the map in your worksheets, mark out a route for the robot.
- **3. Learn to communicate with your robot** Each team must develop commands for your robot. You will practice these commands until you and the robot are comfortable with them. These will be the commands that you will give the robot to travel through the path you have drawn on the map.
- **4. Program the robot** Use the commands that you practiced to tell the robot how to navigate the path you have drawn on the map.





To execute a mini-simulation of a robotic mission with a goal to command a humanrobot through a set course to retrieve a piece of lunar ice.

Prepare for a Mission Student page

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#### **STEP 1 - Designate your robot.**

One person from your team must volunteer to be the robot.

#### **STEP 2 - Mapping**

On the next page is a map for the Discovery Mission. Using a pencil, draw arrows on your map and create a route your robot will take to get to the lunar ice sample. You must include at least one right turn and one left turn.





Create the route for your robot within the diagram below.



### Finish



To execute a mini-simulation of a robotic mission with a goal to command a humanrobot through a set course to retrieve a piece of lunar ice.

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Start

Approved by: \_



#### **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.

#### **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.

## **DESIGN** challenge

To execute a mini-simulation of a robotic mission with a goal to command a humanrobot through a set course to retrieve a piece of lunar ice.

#### **Command Sequence**

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

# **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!

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#### **Discovery Mission Data Table**

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

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