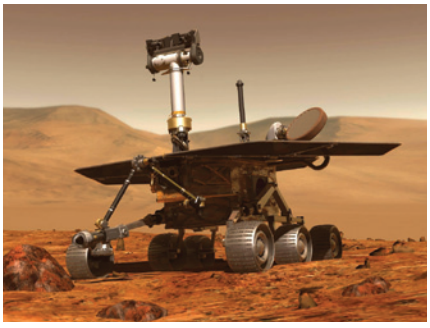
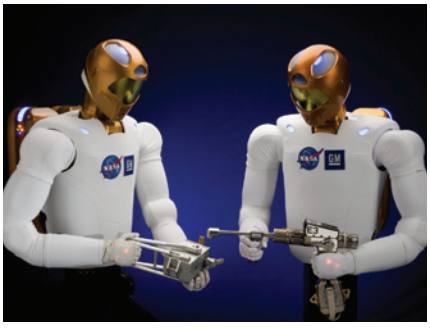
The Discovery Mission

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."

DESIGN challenge

To execute a mini-simulation of a robotic mission with a goal to command a human-robot through a set course to retrieve 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 your team practiced to tell the robot how to navigate the path you have drawn on the map. First you will make measurements of the distances in the course and the distance in one robot step. You will use these calculations to determine how many steps the robot needs to take in each direction.*

ASK IMAGINE &PLAN

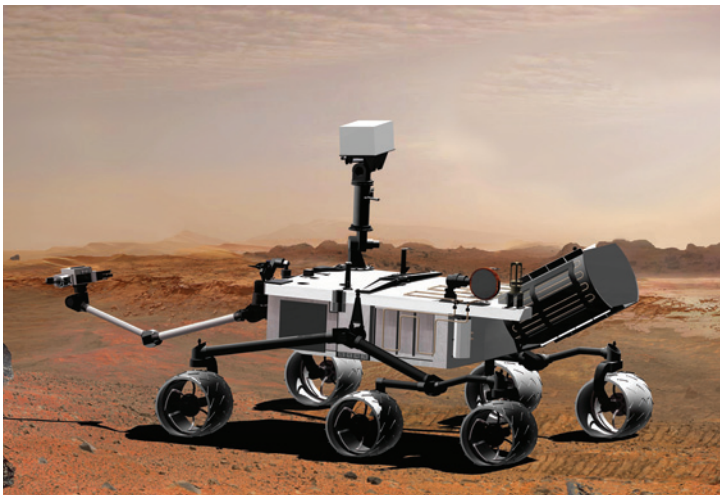
What questions do you have about today's challenge?

STEP 1 – Designate your robot.

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

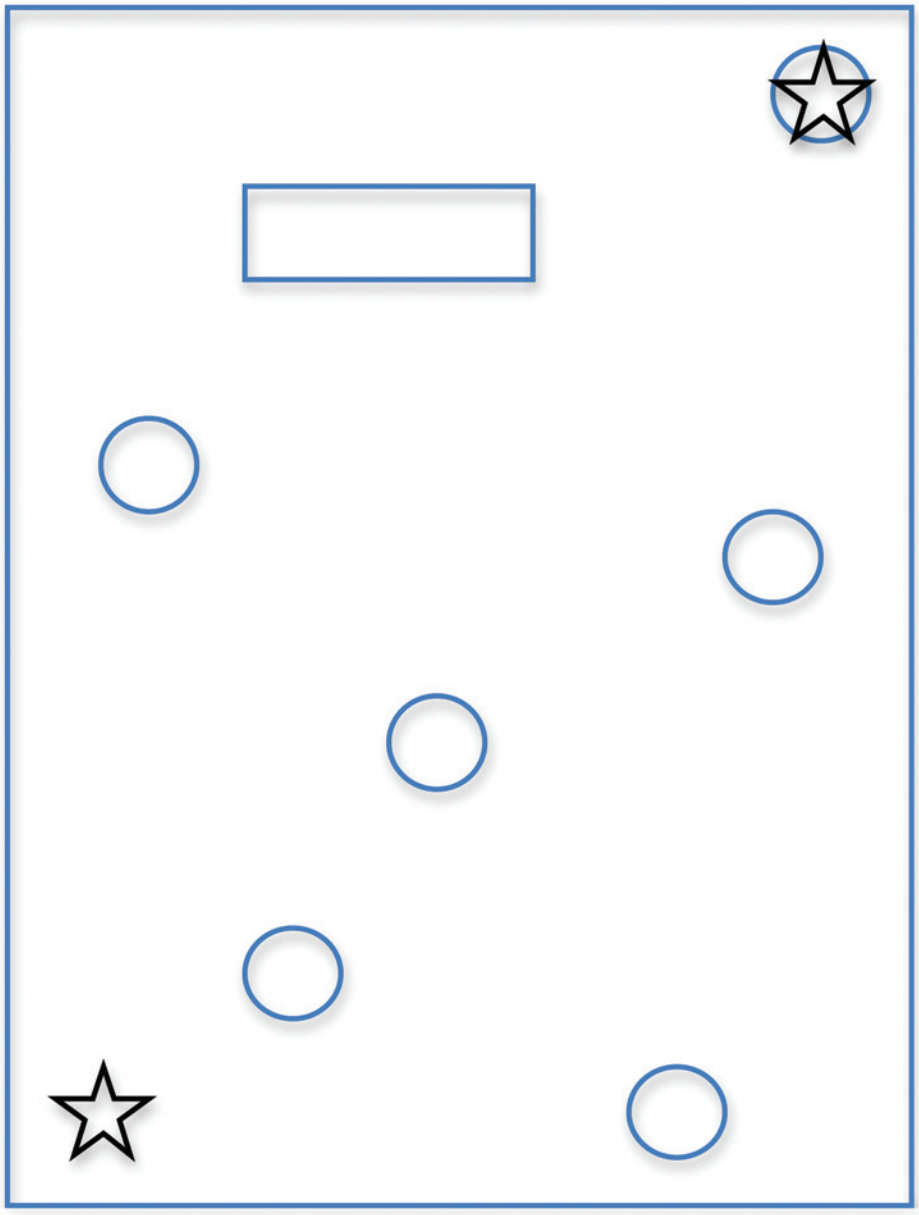
STEP 2 - Mapping

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



Start

DESIGN challenge

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

Prepare for a Mission
Student page

prepare for a mission

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?

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			

STEP 4 – Program your robot

Review the map with your robot's route and the chart with the number of steps for each movement. 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.

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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 let's complete the mission. One team member will be responsible for delivering the commands. Another team member must use a stopwatch to time how long it takes for the Robot to make each movement to reach the Lunar ice sample. Record each time on the next page to compare how long the mission took for each team!

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	

prepare for a mission