

Model Scouts Lunar Challenge Game MoonBots 2012 Mission

In the Model Scouts Lunar Challenge Game, your robot will attempt a set of tasks on the Lunar Landscape. These tasks revolve around the following topics:

- Google Lunar X-Prize Mission
- Heritage Artifacts
- Solar Power on the Moon

The game starts with the referee announcing “Go” and the players signaling the robot to begin. Once the robot has been started, it must act autonomously to perform mission tasks without further assistance from the players. If a robot must be rescued and restarted, it incurs a 25 point penalty (see “Touch penalty” below).

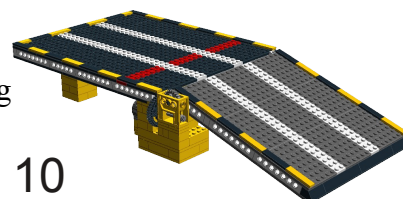
After four minutes from the start, the game ends and the Starting Base enters lunar night. The robot's game score is then calculated based on the tasks performed during the four minutes. Note that there are other penalties possible if the robot solves the wrong problem or disturbs the Heritage Artifacts.

TASK: LOWER RAMP AT STARTING BASE

Description: At the beginning of the game, the Starting Base ramp is upright. Robot lowers the ramp to enable access to and from the Starting Base.

SCORING:

- Ramp no longer upright: 10 points



TASK: LANDER DISMOUNT

Description: Robot successfully leaves the Starting Base and drives on the lunar surface.

SCORING:

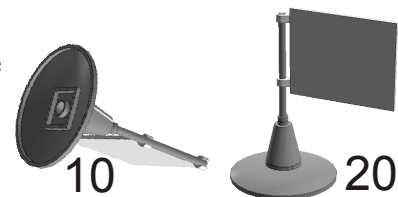
- Robot drives anywhere on the lunar surface: 10 points

TASK: PLACE FLAG ON RIDGE

Description: Robot places flag mission model on the High Ridge to commemorate its landing. The flag can be placed anywhere on the ridge to earn points.

SCORING:

- Robot leaves flag on ridge lying on its side: 10 points
- Robot leaves flag on ridge standing upright: 20 points



TASK: EXPLORE LAVA TUBE

Description: Robot lowers a probe into the lava tube on the west end of the High Ridge.

SCORING:

- Robot lowers anything into the hole (below the ridge surface): 20 points

TASK: CROSS HIGH RIDGE

Description: Robot successfully navigates across the High Ridge.

SCORING:

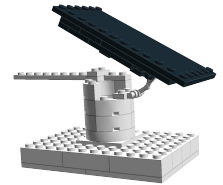
- Robot drives on the lunar surface north of the High Ridge: 20 points

TASK: FIX SOLAR COLLECTOR

Description: Robot turns the solar collector to face the Sun (east).

SCORING:

- Solar collector (black panel) facing east: 20 points

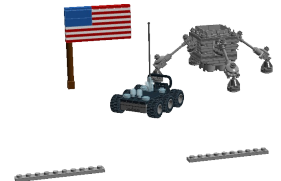


TASK: HERITAGE ARTIFACT REDISCOVERY

Description: Robot navigates to Heritage Artifact area on lunar surface north of the High Ridge and west of the area markers, then gets a close-up image of the Heritage Artifacts.

SCORING:

- Robot captures image of Heritage Artifacts while in Heritage Artifact area: 40 points
- PENALTY: Robot disturbs (touches) any Heritage Artifacts: -30 points

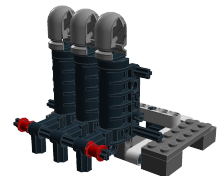


TASK: LUNAR MINE EXPLOSION

Description: Robot sets off an explosion to mine lunar ores.

SCORING:

- Robot triggers mine explosion model: 25 points

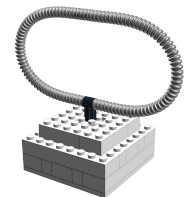


TASK: COLLECT ICE CORE

Description: Robot discovers ice at the bottom of the large crater and returns an ice core sample to the Starting Base.

SCORING:

- Ice core returned to Starting Base: 25 points

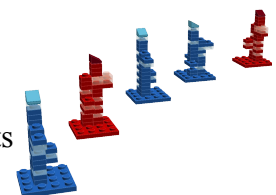


TASK: MINE TITANIUM

Description: Robot returns titanium (blue) mission models to the starting area.

SCORING:

- Titanium (blue) models in Starting Base: 5 points each
- At least one Titanium model loaded on Space Elevator: 20 additional points
- PENALTY: Returning non-titanium (red) rocks to Starting Base or Space Elevator: no task points



TASK: SPACE ELEVATOR

Description: Robot raises Space Elevator platform to make cargo available for return trip to Earth.

SCORING:

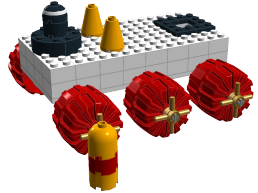
- Robot raises elevator so top of elevator car is in top section: 15 points

TASK: ROVER RESCUE

Description: A rover from a previous landing has stranded itself south of the High Ridge. Robot flips rover upright and performs maintenance.

SCORING:

- Rover is standing upright on lunar surface: 20 points
- Battery mission model placed into slot on rover: 20 points



TASK: ROBOT SOLAR POWER

Description: Robot carries a Dexter Industries Solar Panel.

SCORING:

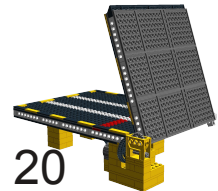
- Robot carries solar panel and returns to Starting Base with panel intact: 30 points

TASK: RETURN TO BASE

Description: Robot returns to the Starting Base before the lunar night begins (4 minutes after start of game).

SCORING:

- Robot in Starting Base at the 4:00 minute mark: 20 points
- Robot raises Starting Base ramp: 20 points



The maximum theoretical score is 350 points:

Lower ramp at starting base	10
Lander dismount	10
Place flag upright on ridge	20
Lava tube exploration	20
Cross High Ridge	20
Solar collector	20
Heritage Artifact picture	40
Lunar mine explosion	25
Ice core	25
Titanium mining (3 @ 5 points each)	15
Titanium on space elevator	20
Raise space elevator	15
Rescue rover	20
Battery in rover	20
Robot solar power	30
Return to starting base	20
Raise Starting Base ramp	20
Total	350

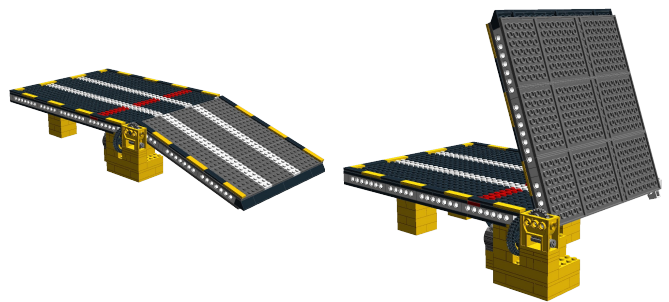


Model Scouts Lunar Challenge Game MoonBots 2012 Landscape Setup

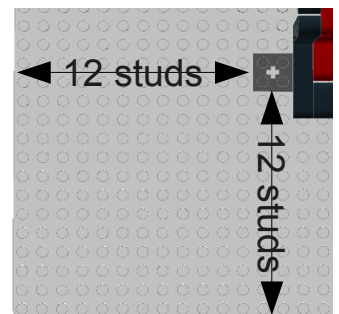
Landscape surface: The lunar landscape underboard is assembled on two 1m x 2m extruded styrofoam sheets laid side-by-side, for an underboard surface of 2m x 2m. Twenty-five LEGO 48x48 stud baseplates are then placed in a 5x5 grid on the styrofoam surface and connected using sixteen 4x4 plates.

High Ridge: The High Ridge is placed on top of the baseplates as illustrated in the scale drawing. The High Ridge is constructed from layers of 1" extruded styrofoam and carved/painted to look like a lunar ridge. The top of the High Ridge is generally flat and at least 10" (32cm) across. Ramps on the north and south sides of the High Ridge enable robots to ascend and descend the ridge.

Starting Base: The Starting Base is constructed from LEGO elements. It is a 2" platform attached to the lunar surface at the extreme southwest corner of the landscape. The base ramp begins in an upright position; the robot can send IR signals to motors attached to the ramp to cause the ramp to be raised or lowered.

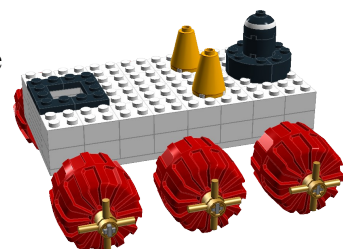


Space Elevator: The space elevator is attached to the lunar surface on the baseplate just north of the Starting Base. The brick attaching the southwest corner of the elevator to the lunar surface is placed 12 studs east of the west edge and 12 studs north of the south edge of the baseplate. The elevator begins the game in the "down" position.



Small Crater: The small crater is a painted and LEGO-decorated styrofoam arc placed at the southeast corner of the lunar surface. The ridge of the crater is approximately 1" tall.

Rescue Rover: The rover to be rescued is placed on its side on the north edge of the southeast baseplate. The underside of the rover is facing south, with the battery hole on the west edge of the rover.

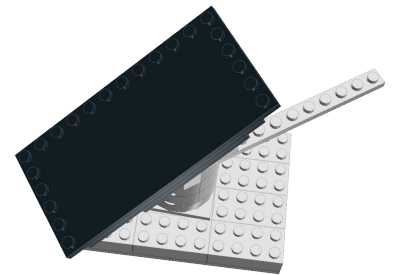


Sun: A low-wattage lamp is placed on the east border to simulate sunlight.

Navigation Beacon: A Hi-Technic Infrared Ball is placed on a small depression on the north edge of the High Ridge. At the beginning of the game, the IR ball is turned on to provide the lunar robot with an orientation mechanism.

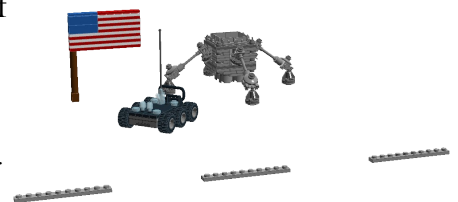


Solar Panel: The solar panel is attached to a LEGO plate permanently attached to the High Ridge. At the beginning of the game, the black solar panel should be facing southwest.

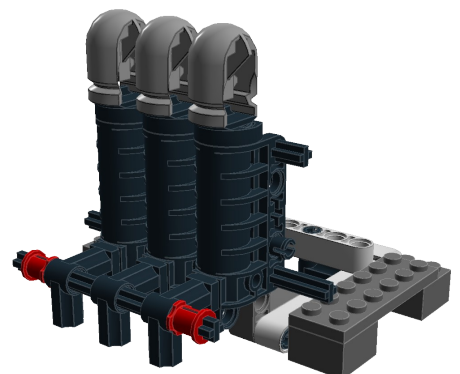


Lava Tube: The lava tube is a 3” hole cut vertically into the High Ridge at the west end of the ridge. The rim of the hole is surrounded with small LEGO plates (permanently attached to the ridge) to simulate rocks and uneven surface around the lava tube.

Heritage Artifacts: The Apollo landing site artifacts are placed on the northwest baseplate. The lander is four studs in from the north and west edges of the lunar surface. The flag pole is then 12 studs south of the lander, and the lunar roving vehicle is approximately 12 studs east of the flag. Small 1x10 plates mark the east edge of the heritage artifact area; these are placed north-to-south eight studs east of the westernmost baseplates (i.e., fifty-six studs east of the west boundary).

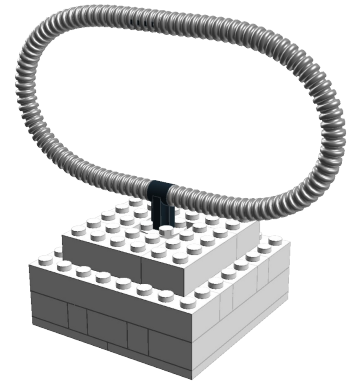


Mine Explosion: The exploding mine is placed at the center north of the landscape, four studs south of the north landscape border. Three LEGO arrows are inserted into the LEGO release housing/cannon at the start of the match. Streamers and/or tethers may be attached to the arrows to make them more visible or prevent them from being launched too far.

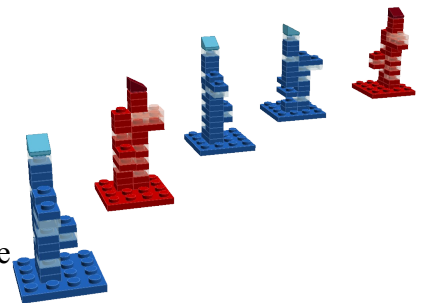


Large Crater: The large crater is a painted and LEGO-decorated styrofoam arc placed at the northeast corner of the lunar surface. The ridge of the crater is approximately 1” tall.

Ice Core: The ice sheet is attached to the lunar surface inside the large crater, eight studs from the north and east boundaries of the lunar surface. The ice core itself is lowered into the hole in the middle of the sheet, with the ring turned at a 45-degree angle to the sheet (i.e., the “hole” of the ring should be facing the center of the lunar surface).



Titanium Rocks: The titanium rock models are placed on top of 4x4 LEGO tile groups attached to the lunar surface (the tiles have no studs, thus the rock models are easily lifted from the lunar surface by the robot). One 4x4 tile group sits at the intersection of the four base plates just north of the ridge. Working west-to-east, the remaining tile groups are then (a) 10 studs east, 4 studs north, (b) 6 studs east, 2 studs north, (c) 4 studs east, 4 studs north, and (d) 4 studs east, 6 studs north. At the start of the game, the titanium rocks are then placed randomly on the tile groups.



Team Flag and Rover Battery: These mission models are available to the team to place anywhere in the landing area (southwest corner of the lunar surface), including on the robot or Starting Base. Teams are allowed to decorate the flag model with a team logo or other graphic (e.g., use stickers).

