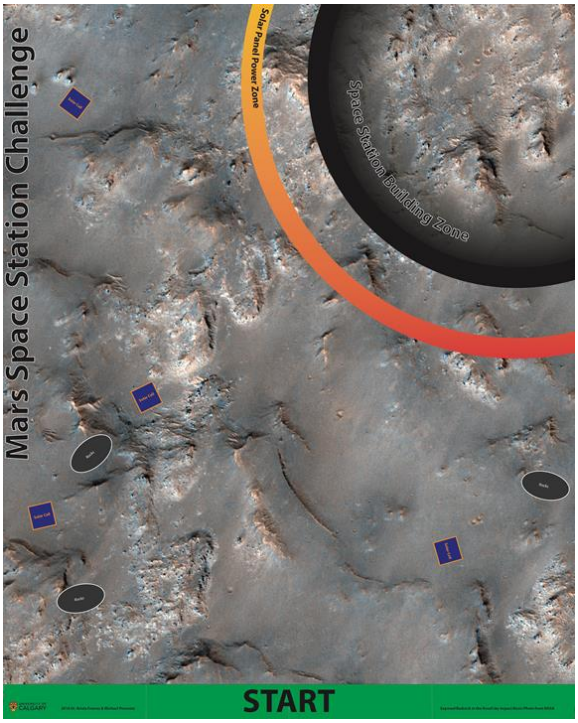
Mars Space Station Challenge

Task Description



Your task is to build a robot that will be sent to the surface of Mars, and autonomously build a habitable space station before the humans arrive.

The solar panels and building materials were already delivered before your robot arrived, but unfortunately the solar panels are out of reach of the robot control zone (green START area), and must be retrieved.

The robot must take building materials (building blocks) to the designated Space Station Building Zone (black circular zone), and then position the solar panels on the Solar Panel Power Zone (orange ring) so that they can power the space station.

Materials Needed

- **Mars mat**. We suggest printing a high-resolution copy of the mat on smooth vinyl, using a 4' x 6' format. It will cost approximately CAD 200 to print on smooth vinyl at a local print shop.
  - Please find a copy in **standard resolution** HERE (1.9 MB),
  - and a **high-resolution** copy is available for download HERE (191 MB).

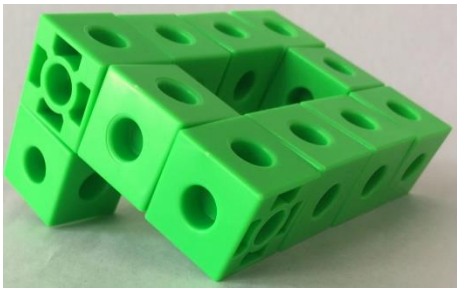
  You may also need some tape to fixate the Mars mat to the floor.
- **Building blocks**. We use Hex-a-Link cubes for this challenge.
- **EV3 robot**. The robot must operate independently, so one or more sensors will be needed. The Mars challenge allows for various robot designs, including some that may use the medium motor to move an arm.

Note for Teachers

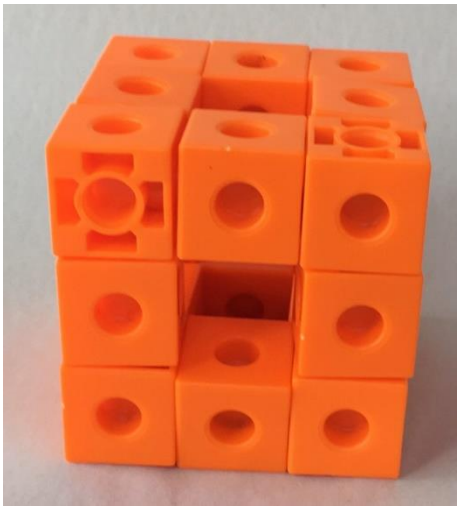
- The Mars Space Station Challenge is a complex task that requires a range of building and programming skills.
- There is no “ideal solution” for this task. Creative designs and different ways of collecting points offer endless opportunities to play and solve the challenge. Encourage your students to find a design and a solution in their group.
- We recommend that students showcase their designs at the end of the module in a co-opetition.

Set Up

Build solar panels and space station blocks. We suggest the following designs:



Solar Panel



Building Block

- Place the solar panels on the indicated locations on the Mars mat.
- The building blocks should be placed behind the green Start line. Building blocks can be stacked. The higher the stack of blocks that is transported to the Space Station Building Zone, the more points are awarded.
- Extra Challenge: Place rocks or other objects on labeled rock zones. Robots are not allowed to move the rock.

Task Breakdown and Points

There are three ways to collect points for this challenge:

1) Move Building Blocks to Space Station Building Zone (black circular zone)
   a. 5 points for each Building Block with only one level
   b. 25 points for each Building Block with two levels
   c. 125 points for each Building Block with three levels
   d. 500 point for each Building Block with four levels
2) Retrieve Solar Panel(s)
   20 points for each solar panel moved to the Robot Control Zone (green START area)
   Note: At least one solar panel must be retrieved prior to Building Block points being awarded.
3) Position Solar Panel(s)
   Position the solar panel(s) on orange Solar Panel Power Zone to power the space station (the solar panel(s) has to touch the orange ring or be positioned on it)
   250 points for each solar panel positioned on the Solar Panel Power Zone

We also developed a *Scoring Sheet* with the point breakdown for this task.

Scoring Sheet

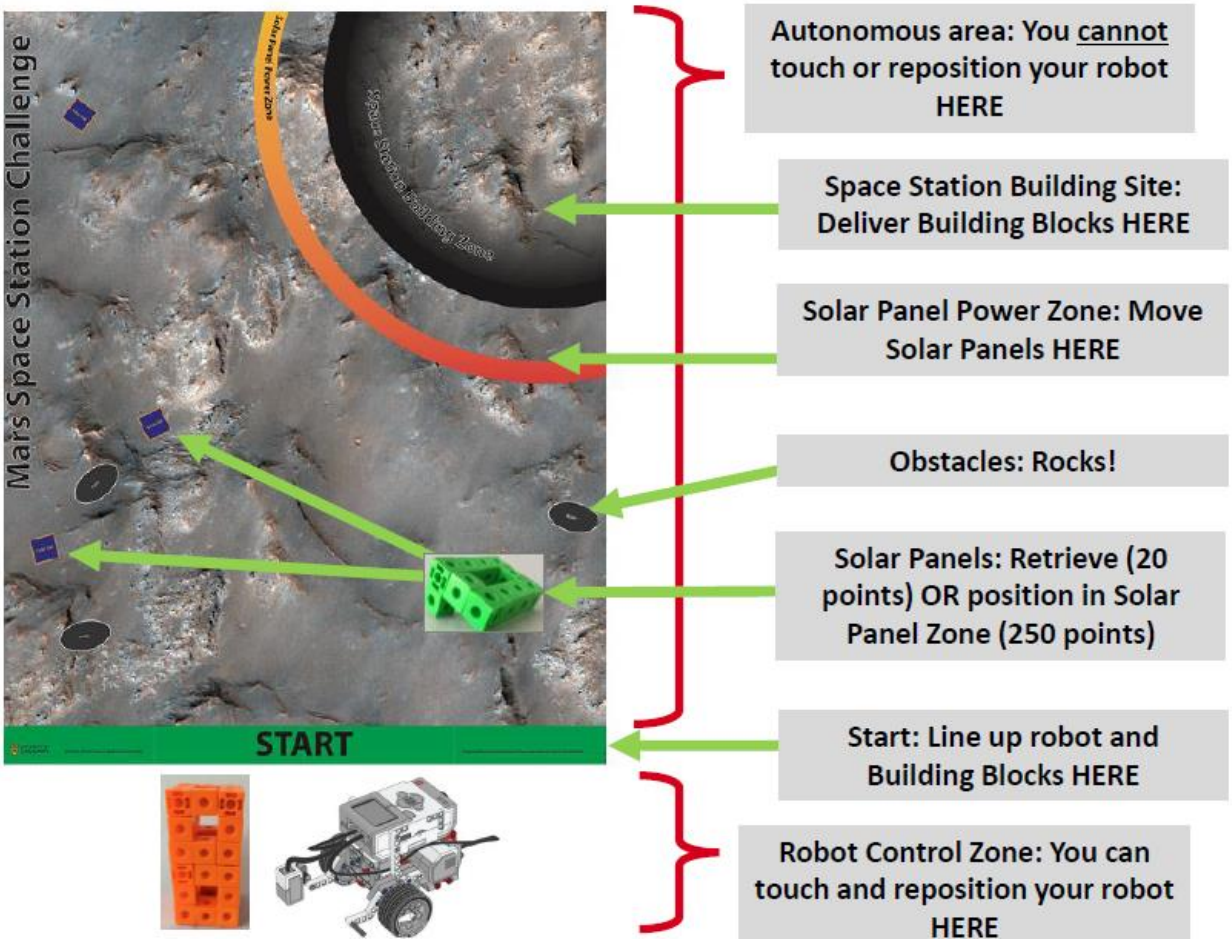
Please follow this link to access the Scoring Sheet or visit our website.

Rules

- The robot has only 3 years to complete its task before the humans arrive, so to represent this your robot will have 3 minutes.
- No more than 4 Building Blocks can be stacked/pushed at a time. Building Blocks must not be interlinked together, i.e., each block must be independent of the others.
- Players can only touch the robot behind the green START area.
- Players are disqualified for touching the robot when operating on the Mars surface.

- Robot and blocks must be completely behind or within the green START area. Only solar panels (and rocks if using) can be in the arena before start.
- *EXTRA: You may want to determine a minimum amount of points that have to be collected.*

The following graphic summarizes most of the rules:



Design Notes

Please find example videos of two sample designs by following the links below:

- Video 1
- Video 2