



# ASTROBOT



SCIENCE AND TECHNOLOGY

## MISSION DESCRIPTION

Zone 01 Robotics has created the Astrobot Challenge, which includes four robotic missions to tackle a major challenge: spacewalks! For astronauts, spacewalks are among the most difficult and dangerous tasks, but they are sometimes necessary for:

- repairing or installing equipment;
- performing complex tasks that only human hands can do.

As part of the four missions of the Astrobot Challenge, participants must build a robot or a robotic arm that has the ability to go outside Gateway to do repairs and perform other tasks; attach an element to Gateway's exterior, such as a colour sensor; or learn how to use a programming loop or element. Participants will program their own robot, and it will be autonomous at the end of the activity!

The robot must be able to move around Gateway's exterior in order to repair damages and retrieve debris from a meteor shower. You are responsible for building and programming the robot so that it will be useful to our astronauts!

### TIMELINE

Description	Duration
Activity 1	45 minutes
Activity 2	45 minutes
Activity 3	45 minutes
Activity 4	45 minutes
<b>Total</b>	<b>180 minutes</b>

\*Each activity can be carried out independently or in parallel.

Difficulty: **MODERATE**

Duration: **1 TO 4 X 45 MINUTES**

Materials: **MINDSTORMS EV3 KIT**

You may be able to find some accessories in your classroom or at home

## GOAL

Participants will learn the basics of programming and building a robot while conducting space missions.

## OBJECTIVES

At the end of the activity, participants will be able to:

- Work together to build a robot
- Know the basics of programming
- Program with Mindstorms software
- Resolve small problems in a team

# BACKGROUND

Canada is a leader in space robotics. Whether you think of the Canadarm on the space shuttle or Canadarm2 and Dextre on the International Space Station (which are featured on Canada's five-dollar bill!), these are all space robots programmed by human beings.

Our country is participating in NASA's Lunar Gateway project. This space station will orbit the Moon and will serve as a science laboratory, a testbed for new technologies, and a hub for operations and exploration missions to the lunar surface.

Canada's contribution to the Lunar Gateway will be [Canadarm3](#), a smart robotic system which includes a next-generation robotic arm as well as equipment and specialized tools. Using cutting-edge software and advances in artificial intelligence, this highly autonomous system will be able to:

- maintain, repair and inspect the Gateway
- capture visiting vehicles
- relocate Gateway modules
- help astronauts during spacewalks
- enable science both in lunar orbit and on the surface of the Moon

The ability to perform these tasks without human intervention will be vital as the Gateway will not be crewed continuously, and communications delays caused by its lunar orbit will prevent direct real-time control of the robotic system from Earth.

# MISSION PREPARATION

## MATERIALS

The materials required for each lesson are listed in the lesson description on the [Astrobot Challenge](#) page on the Zone 01 Robotics website (which includes the Mindstorms EV3 kit):  
[www.zone01.ca/index.php/en-ca/resource/junior-astronauts](http://www.zone01.ca/index.php/en-ca/resource/junior-astronauts)

## SET-UP

Instructions for preparing for each lesson are featured in the lesson description on the [Astrobot Challenge](#) page on the Zone 01 Robotics website.



# MISSION INSTRUCTIONS

Please visit the Zone 01 Robotics [Astrobot Challenge](#) page to learn more and to register.