GLOBAL CHALLENGE

The Sphero Global Challenge is a unique way to get your students involved in computational thinking, engineering, programming, and problem solving.

Teacher Supports:

Each challenge comes with a Coaches Guide to equip teachers with all of the information they would need to get started with the challenges. Some of the highlights of the coaches guides includes:

- Recommendations on student roles for each event

- Competition set up and required materials

- Lesson plans or meeting agendas to guide students through each mission objective and event. Meeting agendas can be combined, skipped, or repeated to meet the needs of the learners in your environment.

These meeting agendas include outlines for lessons and Sphero Edu Activities mapped to support students through each mission.

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sphero littleBits INVENT 4 GOOD

This hands-on event allows students to solve problems facing the Earth right now. Through collaboration, and critical thinking students will unleash their inner engineer as they work to identify problems and develop solutions using **littleBits and their Invention Cycle:**

- Create
- Play
- Remix
- Share

Students can take their skills and inventions to the next level with the incorporation of programming as part of their solutions.

Students will showcase their solutions and inventions with a creative infographic and video as part of their event submission.

Teacher / Coach Supports:

- 8 Lesson Plans/Meeting agendas

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BOLT
SPACE MISSION

Take flight on the BOLT Space Mission! During this mission, students are able to put their **programming** and **engineering** skills to work. This event progresses students through mission objectives that promotes computational thinking, problem solving, and collaboration. Students will be challenged to complete the mission objectives through different **programming skills** including:

- Loops
- Conditionals
- Variables
- Functions

Students will program BOLTs using block or text (JavaScript) programming in the Sphero Edu app.

Students will demonstrate their skills in their final submission for judging and evaluation.

Teacher / Coach Supports:

- 11 Lesson Plans/Meeting Agendas
- 4 Sphero Edu Activities mapped to lessons

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RVR + littleBits

MARS
MISSION

Students will design, build, and engineer solutions using RVR and littleBits. Throughout this event students will work on programming and debugging skills, engineering beginning to intermediate circuits with littleBits, and then combining the two in order to complete the mission objectives. **Students will focus on:**

- Algorithms
- Circuitry
- Engineering Design
- Debugging

Students can take their next level by programming with a micro:bit (purchased separately) and the littleBits micro:bit adapter.

Students will demonstrate their skills in their final submission for judging and evaluation.

Teacher / Coach Supports:

- 13 Lesson Plans/Meeting Agendas
- 3 Sphero Edu Activities mapped to lessons

Sample page from the BOLT: Space Mission Coaches Guide:

AGENDA #2

Achieving Precision with BOLT

Time Required: 45+ minutes

Supplies Needed	Learning Objectives
• BOLT Robots	• Students will be able to control BOLT with programming to achieve precision result.

1 **Warm-Up**

If students are new to programming BOLT robots, let them drive BOLT around using the joystick drive controls. This allows them to experience how BOLT moves.

2 **Steps**

After a few minutes of playtime in the drive controls, give students a series of new tasks:

1. Set up a line or target 10 ft. away from the students. Have students line up with their BOLT aimed at the target. With the joystick drive control, set the robot to full speed and ask the students to drive their robot to land exactly on the line/target 10 ft. away. Change the speed, and try again.

2. Set up a slalom activity for students with 4 "cones" or Obstacles about 1 foot apart. Have students drive their robots through the cones. Use a stopwatch to see which students can complete it the fastest without hitting an Obstacle.

After trying the tasks above, bring students together for a discussion around what they experienced with the simple tasks. Here are a few discussion questions:

- What task was the easiest to complete using the driving controls?
- How does speed change how easy the task task was?
- What could be done to make this more precise?
    - Hopefully this discussion leads to the idea of programming the robot. Programming allows for repeatable tasks and precise control of the robot.

Sample pages from the RVR+LB Mars Mission Coaches Guide:

RESOURCES

How to Use the Coaches Guide

This coaches guide will help you navigate your students through each objective of the BOLT Spacecraft Mission. This guide can be used as a template for lesson plans if you are incorporating the competition into your daily teaching plan, but it can also be used with after-school clubs. There isn't a required amount of time that you should spend on the completion of each objective, so students can move on to the next session if they're ready for it.

Each Mission Objective is broken down into two session types: learning sessions and work sessions. You can adapt these to your needs and provide more work sessions, or fewer learning sessions if need be. It is also very beneficial for the team coach to be established as a teacher in the Sphero Edu app so that activities can be assigned to the students and so that progress monitoring can take place on the Sphero Edu app.

Learning Sessions

The first session for each Mission Objective is geared towards learning a computer programming skill that will help students complete the mission. Learning sessions will be primarily students working through an activity in the Sphero Edu app to help approach the Mission Objective confidently.

Learning sessions are structured with the general outline of Exploration, Skills Building, Challenges, and Extended challenges. This allows students to dive into the concepts necessary to complete each of the Mission Objectives.

Working Sessions

Working sessions are designed to allow students time to complete the Mission Objective by applying their knowledge from the learning sessions. Think of this as project work time or Mission Objective completion time. The nature of these sessions are very open-ended, but coaches are given some framework and tips for guiding the students productively through the work session. After completing the learning sessions, students/teams may find that it would take 45-60 minutes to complete the challenge; however, some teams may wish to spend extended time on each Mission Objective to ensure they are submitting their best possible solution—this may require multiple working sessions.

RECOMMENDED MEETING SCHEDULE

Planning out your Competition Season Schedule

If you are working with your students from scratch in programming with RVR and littleBits, we recommend a minimum of 12-14 team meetings to address the learning needs of the students with programming and circuit building. If you are incorporating Sphero Global Challenge into your lesson plans, you can adjust to meet the needs of your classroom environment.

13 Meeting Agenda
1. Forming Teams
2. Intro to Invention Cycle
3. Intro to Programming
4. Challenge #1 Learning Session
5. Challenge #1 Working Session
6. Challenge #2 Learning Session
7. Challenge #2 Working Session
8. Challenge #3 Learning Session
9. Challenge #3 Working Session
10. Challenge #4 Working Session
11. Challenge #5 Learning Session
12. Challenge #5 Working Session
13. Work Session to finalize Submissions

9-10 Meeting Agenda
1. Forming Teams
2. Intro to Invention Cycle
3. Learning Session as needed
4. Learning Session as needed
5. Challenge #1 Working Session
6. Challenge #2 Working Session
7. Challenge #3 Working Session
8. Challenge #4 Working Session
9. Challenge #5 Working Session
10. Finalize submissions

If new to littleBits, but have some experience in Programming with Sphero

6-8 Meeting Agenda
1. Forming Teams
2. Challenge #1 Working Session
3. Challenge #2 Working Session
4. Challenge #3 Working Session
5. Challenge #4 Working Session
6. Challenge #5 Working Session
7. Learning Session as needed
8. Finalize submissions

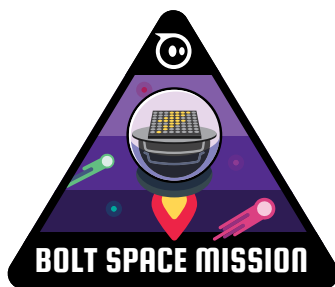**For students experienced in programming with Sphero and inventing with littleBits.**

OFFICIAL RULES
-SAMPLE-

Definitions

- **Student -** Anyone born after May 1, 2005

- **Elementary School Student -** Anyone born after May 1, 2009

- **Middle School Student -** Any Student that is not an Elementary School Student

- **Elementary School Division -** Teams competing in this division must consist of only Elementary School Students and at least one Coach.

- **Middle School Division -** Teams competing in this division may consist of Elementary School Students, Middle School Students, or both, and at least one Coach.

- **Coach -** An adult in a supervisory role for the students and will handle the registration, submission, and management of Team meetings. Teams may have more than one Coach.

- **Event -** Sphero Global Challenge comprises three unique Events:
    - littleBits Invent 4 Good: Mission Earth
    - RVR+littleBits: Mars Mission
    - BOLT: Space Mission

    Each Event is evaluated individually, and Teams can compete in one or up to all three Events.

- **Mission Objectives -** Each event has been broken up into mission objectives that teams will be evaluated on based on the event rubrics.

- **Program -** A program is the code file used to control a robot during the Mission Objectives. Programs must be written with block code or javascript from the Sphero Edu App, littleBits Code Kit App, or FUSE App.

- **Evaluation Rubric -** Rubrics are the official evaluation criteria provided for each Event & Mission Objective so that Teams can accurately predict their performance on each mission and know how they are being evaluated.

- **Competition Field -** RVR+littleBits Mission Mars Competition Field as defined in rule #RVR1.

    BOLT Space Mission uses the Space Code Mat as a Competition Field. While it's not required, it is highly recommended.

    littleBits Invent for Good does not have a specific Competition Field.

- **Obstacles -** Defined as any object placed in the competition field as part of the setup for a mission objective and not to be interacted with by the robot or invented elements as outlined in mission objectives.

- **Boundaries -** The outside area of a competition field as defined in the competition guides section of the Coaches Guide.

- **Event Rules -** Detailed rules specific for each Event. Event Rules are contained within this SGC Rules document.

- **Schematic -** A workspace from the FUSE app for each littleBits invention used with callouts to identify how each bit is used as part of the mission objective.

  OR

  A picture of your invention with callouts to identify each bit and how it is used as part of the Mission Objective.

  OR

  A detailed drawing of your invention with callouts to identify each bit and how it is used as part of the Mission Objective.

- **Infographic -** An infographic is a visual representation of an idea, process, or a dataset. Each event requires the submission of an infographic as outlined in event specific rules.

- **Event Score -** Team's score for an individual Event. Maximum possible Event Score is 1,000 points per Event.

- **Overall Performance Score -** Sum of Each Event Score attained by the Team. For the 2020-2021 season the maximum Overall Performance Score is 3,000 points.

- **Cargo -** 6" x 3.5" x 2" (15.25 cm x 8.9 cm x 5 cm) cardboard box used for RVR+littleBits Mars Mission Objective #3. If using the Sphero Craft Pack, the premade cardboard boxes are the correct sizes.

- **Debris -** 1.5" foam or ping pong balls used for RVR+littleBits Mars Mission Objective #2. If using the Sphero Craft Pack, the foam balls are the correct size for Debris.

- **Martian Friend -** Figurines (2) created from craft supplies for RVR+littleBits Mars Mission Objective #4. Figurines should measure at least 2" x 4" x 1" (5 cm x 10 cm x 2.5 cm).

- **Semi-Autonomously -** A robot completing a Mission Objective without intervention from a user in the course of a Mission Objective attempt.

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RVR + littleBits
## MARS
MISSION

EVENT SPECIFIC RULES

Competition Field Set Up

We recommend finding a way to have a semi permanent installation of the competition field so that you don't have to spend time setting it up each time your team plans to work on the mission objectives.

RVR-F1.

RVR+littleBits Mission Mars Competition Field Setup requirements are listed below.

    a. Competition Field Size: 10' x 10' (3.048 m X 3.048 m)

    b. Each grid on the field map is 1' x 1' (304.8mm X 304.8mm)

    c. You can use any material to mark the competition field

    d. Mark the space with Painter's tape, PVC, 2x4s, etc. Except for the exterior boundary of the competition field, use the outer perimeter to measure out spaces.

    e. The red areas are Martian Terrain that RVR cannot navigate across/through or over, except as outlined in RVR-M1f. Establish this area by using tape/paper/markerto mark the boundary of these areas.

    f. The black triangle in the lower corner is the RVR Martian Base and starting point. Establish this area by using tape/paper/marker to mark the triangle.

    g. The Landing Zone is an area of the competition field that will be used in some of the Mission Objectives. RVR can navigate through/across this area at any time during the completion of a Mission Objective.
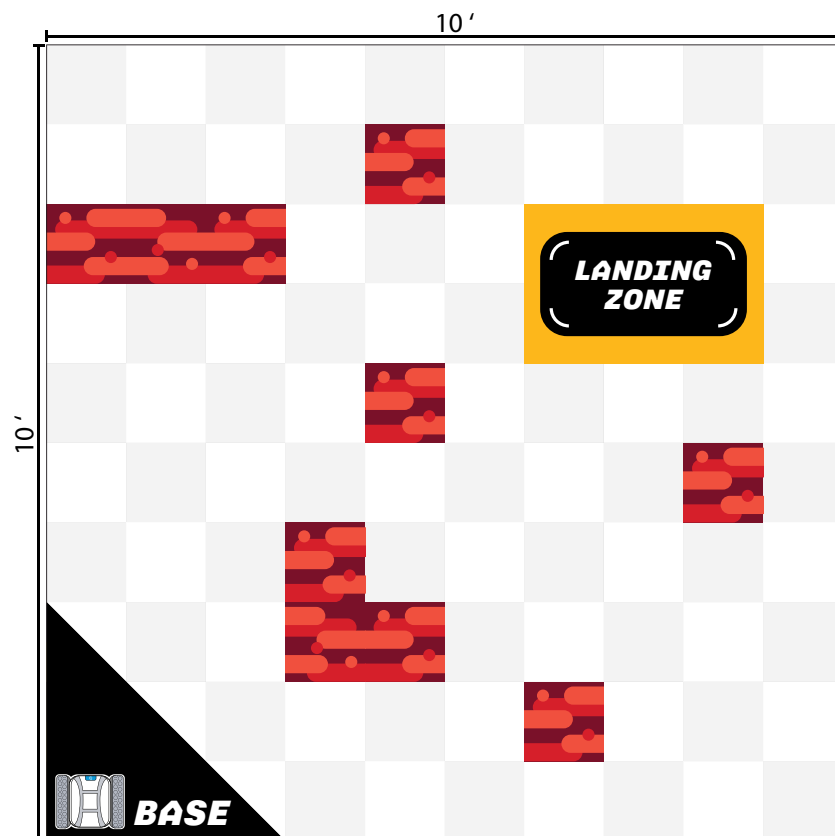
General Rules

- **RVR-G1.** RVR's treads may not pass over a Boundary line or an area labeled as "Martian Terrain".

- **RVR-G2.** A littleBits invention needs to be included in every Mission Objective.

- **RVR-G3.** For mission objectives 2-4, the littleBits invention must be attached to RVR.

- **RVR-G4.** On mission objectives that are timed, a variable must be established to announce the end time as the last blocks of your program; see example below:
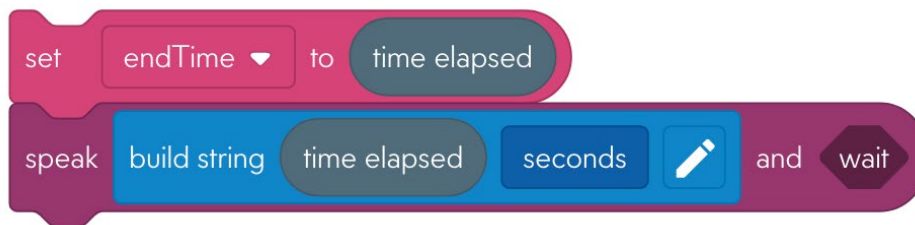
- **RVR-G5.** If using micro:bit to control RVR, you must use the littleBits micro:bit adapter.

- **RVR-G6.** Additional objects can be placed on to the Competition Field for visual aesthetics and creativity as long as they don't interrupt or create unfair benefits for the completion of the Mission Objectives.

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BOLT
SPACE MISSION

EVENT SPECIFIC RULES

Competition Field Set Up

We recommend finding a way to have a semi-permanent installation of the Competition Field so that you don't have to spend time setting it up each time your team plans to work on the Mission Objectives.

BOLT-F1.

Competition Field: Competition Field Size: 6.56' x 3.28' (2m X 1m)

**a.** The Outer Space Code Mat is the ideal competition field for the BOLT Space Mission:

b. If you do not have the Outer Space Code Mat, you may use tape to mark the grids every 10 cm like in the Code Mat. Or, print the Bolt Space Mission Grid printable.

c. Specific Mission Objectives will refer to grid coordinates in order to allow anyone with or without a Code Mat to compete.

d. For each Mission Objective, pay attention to the Competition Field setup for references to grid coordinates and the placement of BOLTs, Obstacles, and other items.

General Rules

- **BOLT-G1.** BOLT may not fully pass the boundary line of the code mat or Competition Field.

- **BOLT-G2.** On mission objectives that are timed, a variable must be established to announce the end time as the last blocks of your program; see example below.

- **BOLT-G3.** Additional objects can be placed onto the competition field for visual aesthetics as long as they don't interrupt the completion of the Mission Objectives.

- **BOLT-G4.** On mission objectives that are timed, a variable must be established to announce the end time as the last blocks of your program; see example below:
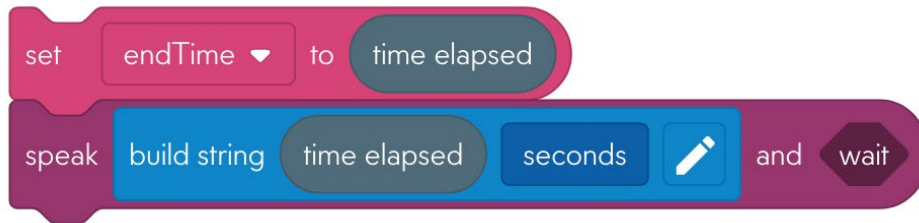
sphero littleBits

INVENT 4 GOOD

EVENT SPECIFIC RULES

General Rules

The littleBits Invent For Good Competition is a competition to help the next generation begin their journey towards solving the world's big problems. Teams are required to solve a problem of their own choosing by inventing a product/solution that can help those in need in their communities. In essence they will be Inventing For Good.

- **LB-G1.** Competitors must use littleBits electronics in conjunction with other materials and follow the littleBits Invention Cycle: Invent, Play, Remix, Share, to develop their solution. Teams must showcase their invention, via both video and infographic, to illustrate and explain why it is an effective and efficient solution to their chosen problem. Here are some examples of competition prompts. These are examples to get you thinking about ideas. You do not have to use these prompts and are encouraged to think about additional problems to solve.

   ### Examples

   a. The elderly face a multitude of challenges in their daily lives; what can you do to help them?

   b. Our society for the most part was designed with able bodied people in mind; what can you do to make things for accessible for those who have difficulties? (e.g. hearing impairments, visual impairments, missing limbs, etc.)

   c. When people get sick they face multiple obstacles; what can you do to help them?

   d. Local wildlife shelters take care of sick, injured, and abandoned animals; how can you help them tend to these animals?

   e. Our society produces an incredible amount of waste; what can you do to help reduce the amount of waste and/or better reuse items in your community?

   f. Education and the ability to attend school is crucial to the life of every child. What can you do to make education more accessible in your community?

   g. The recent pandemic has affected many communities in different ways. What can you do to help members of your community most affected by COVID-19?