TOP SECRET

004 SEASON 4

SPHERO GOES

INCOGNITO

SPHERO GLOBAL CHALLENGE

COMPETITION RULES

2023-2024

sphero GLOBAL CHALLENGE

EVENT SPECIFIC RULES

Calling all spies! Gather your fellow spies, grab your spy gear, and report immediately to BOLT HQ for season four of the Sphero Global Challenge. The BOLT *Event* will challenge undercover agents of all ability levels to work together to solve five fun and fresh *Mission Objectives*.

In addition to your programming skills, you'll have access to **Sphero Global Challenge Season 4 Blueprint Kit**. You'll use the kit to engineer inventions that will help your BOLT robots accomplish their *Mission Objectives*.

The *Mission Objectives* aren't IMPOSSIBLE, but they will challenge you to take your BOLT programming skills to the next level:

- Program two BOLT robots to move with accuracy around the *Competition Field*
- Create if then conditionals to make your programs respond to inputs from BOLT's sensors
- Use problem solving and creative thinking skills to decode encrypted messages
- Use infrared communications to send messages from one BOLT to another

BOLT-G1 Teams may have up to five total *Students*.

BOLT-G2 Teams considered *Upper Elementary School Teams* will be scored on three *Mission Objectives* and their Slide Presentation for a total of 400 points (300 from *Mission Objectives*, and 100 from the presentation). See the *Evaluation Rubric* for more information on scoring.

a. *Upper Elementary School Teams* must complete one *Mission Objective* from each difficulty category:

- **Beginner:** *Mission Objective #1*
- **Intermediate:** *Mission Objective #2* OR *#3*
- **Advanced:** *Mission Objective #4* OR *#5*

b. *Upper Elementary School Teams* may choose to submit all five *Mission Objectives*. If you choose to do this, your submission will still be scored on a scale of 400 points (300 from *Mission Objectives*, and 100 from the presentation). However, in this case, the judges will score all five *Mission Objectives* and your final score will consist of points from *Mission Objective #1*, the highest score from *Mission Objective #2* and *#3*, the highest score from *Mission Objective #4* and *#5*, and the Slide Presentation.

BOLT-G3 Teams considered *Middle School Teams* will be scored on five Mission Objectives and their Slide Presentation for a total of **600 points**. (500 from *Mission Objectives*, and 100 from their Slide Presentation.)

BOLT-G4 Teams will need to use parts from the Sphero Global Challenge Season 4 Blueprint Kit to complete the *Mission Objectives* as outlined in the rules. The Kit includes the following pieces:

- (6) 10x Pitch Truss
- (8) 5x Pitch Truss
- (12) 4x Pitch Truss
- (12) 3x Pitch Truss
- (8) 2x Pitch Truss
- (40) Connectors
- (2) Turntables
- (6) Linear Motion Brackets
- (2) 45mm Pulleys
- (2) 3x Pitch Shafts
- (8) 0.5x Pitch Shaft Collars
- (1) Removal Tool

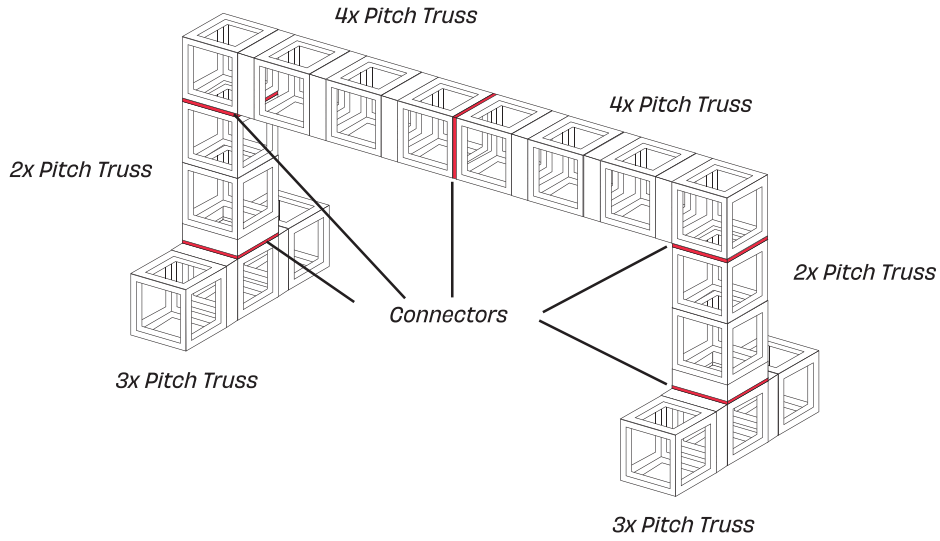
Each team can only use parts included in one Sphero Global Challenge Season 4 Blueprint Kit. No additional Blueprint parts can be used.

BOLT-G5 Once "Start" is pressed on any BOLT program, no human interaction can take place for the reminder of the program unless otherwise indicated in the *Mission Objective* rules.

001 | *Level: Beginner*

Mission Objective #1: Spy Gates

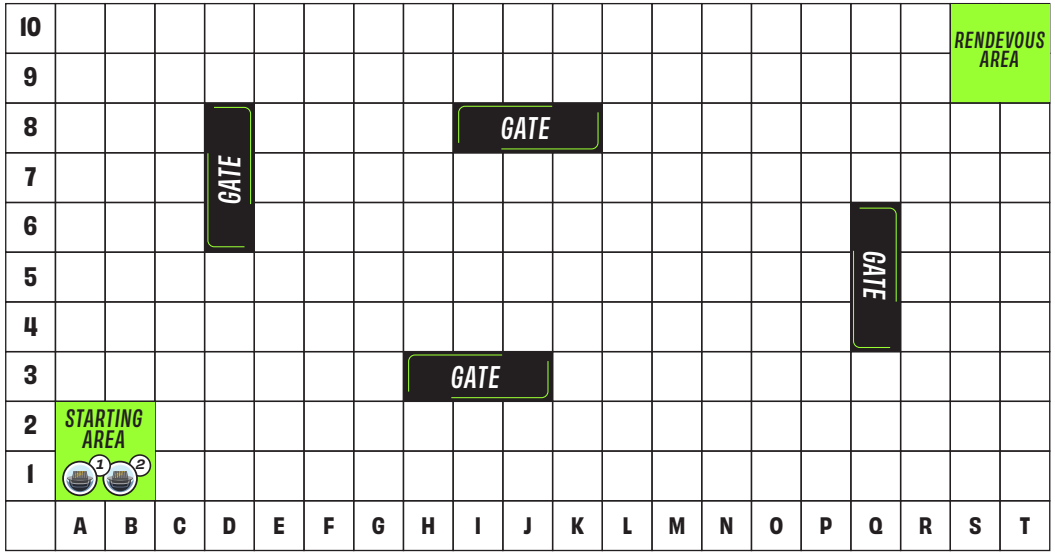
Communication and collaboration are important, especially if you are a spy! In this *Mission Objective*, your team will program BOLT 1 and BOLT 2 to pass through all the *Gates*—tunnels built with Blueprint pieces—on the *Competition Field*. Then the robots must meet up at the *Rendezvous Area*. Which *Gates* each BOLT passes through is up to you. **Just make sure your BOLTs don't run into each other!**



SET-UP

1. Use a **printout** or **Code Mat** as the *Competition Field*. Or create your own *Competition Field* with tape or other method.
2. **Build** four *Gates*, or tunnels for BOLT to pass under, from Blueprint parts. For each *Gate*, you'll need:
   - (2) 2x Pitch Trusses
   - (2) 3x Pitch Trusses
   - (2) 4x Pitch Trusses
   - (5) Connectors

   If using the parts from the Sphero Blueprint Build Kit, it is ok to build a *Gate* to the same dimensions with different Blueprint parts.
3. Place the *Gates* on the *Competition Field* in the following coordinates. *Gates* may be attached to the *Competition Field* with tape or other adhesive.
   - D6-D8
   - H3-J3
   - I9-K9
   - Q4-Q6



MISSION OBJECTIVE #1 RULES

BOLT-MI-1 BOLT 1 and BOLT 2 must begin in the *Starting Area*.

BOLT-MI-2 Execution of the programs for BOLT 1 and BOLT 2 must begin at the same time.

BOLT-MI-3 Together, BOLT 1 and BOLT 2 must pass through all four *Gates* on the *Competition Field*. *Gates* can be passed through in any order, in either direction, and by either of the BOLTs. For example, you may decide to have BOLT 1 pass through two *Gates* and have BOLT 2 pass through the other two *Gates*.

BOLT-MI-4 BOLT 1 and BOLT 2 must meet up at the *Rendezvous Area* after program execution.

BOLT-MI-5 Extra Blueprint parts may be used to decorate the *Competition Field*.

BOLT-MI-6 *Mission Objective* points will be awarded based on the *Evaluation Rubric*.

- **a.** Five Points will be deducted if BOLT 1 and BOLT 2 bump into each other in any location on the *Competition Field*, except in the *Rendezvous Area* at the end of the programs.
- **b.** A one time penalty of five points will be deducted if a BOLT robot crosses the *Competition Field Boundary Lines* at any point during the program.
- **c.** Points may be added for creative use of lights and sounds.

DELIVERABLES

1. Video (.mp4, .mov, .avi) of the *Mission Objective*
   - Ideally a top down view
   - Both BOLTs visible while their respective programs are running
2. Picture of code for BOLT 1 and BOLT 2 included in the submission (See page 16 for submission details)

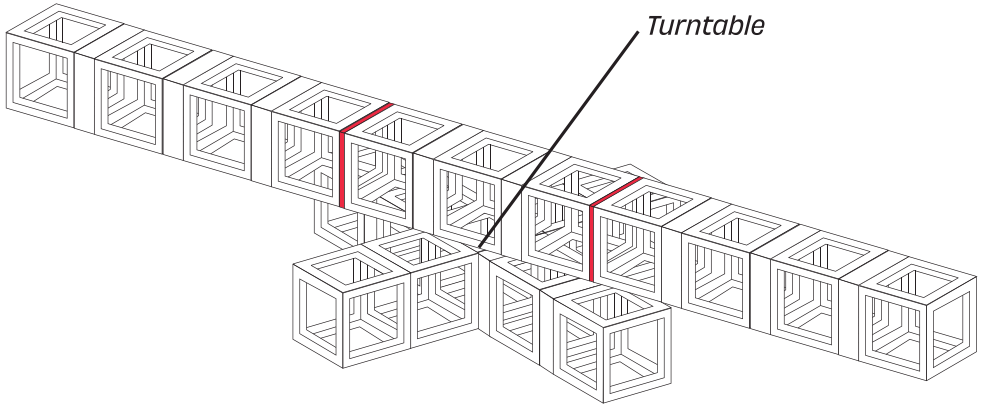
002 | *Level: Intermediate*

Mission Objective #2: Spy Messages

BOLT 1 will tell you everything you need to know to solve this *Mission Objective*, but your team will have to bring your best thinking skills to crack the codes and understand its instructions. **Decode the secret message** from BOLT 1 and then program BOLT 2 to move Blueprint parts to achieve the goal.

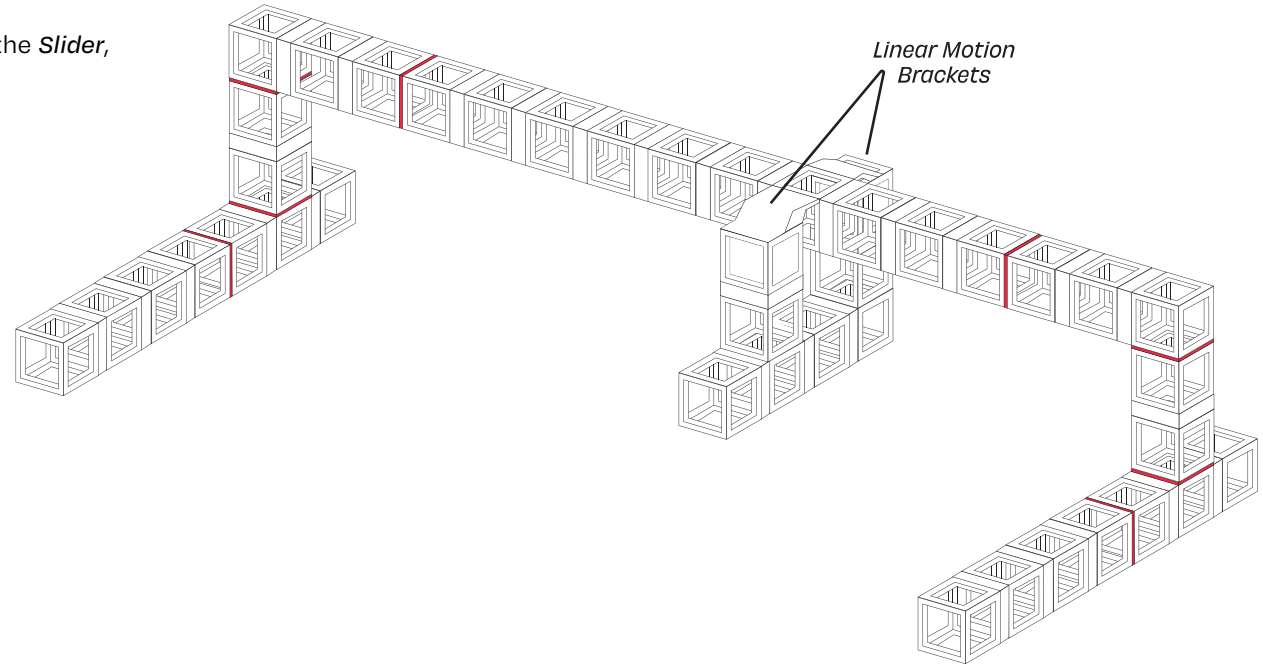
SET-UP

1. Use a **printout** or **Code Mat** as the *Competition Field*. Or create your own *Competition Field* with tape or other method.
2. **Build** a *Turnstile* from Blueprint parts. For the *Turnstile*, you'll need:
   - (5) Connectors
   - (1) Turntable
   - (3) 2x Pitch Trusses
   - (2) 3x Pitch Trusses
   - (2) 4x Pitch Trusses
3. Place the base of the *Turnstile* at the **intersection of** the **R5** and **R6** grid squares. The *Turnstile* may be attached to the *Competition Field* with tape or other adhesive.

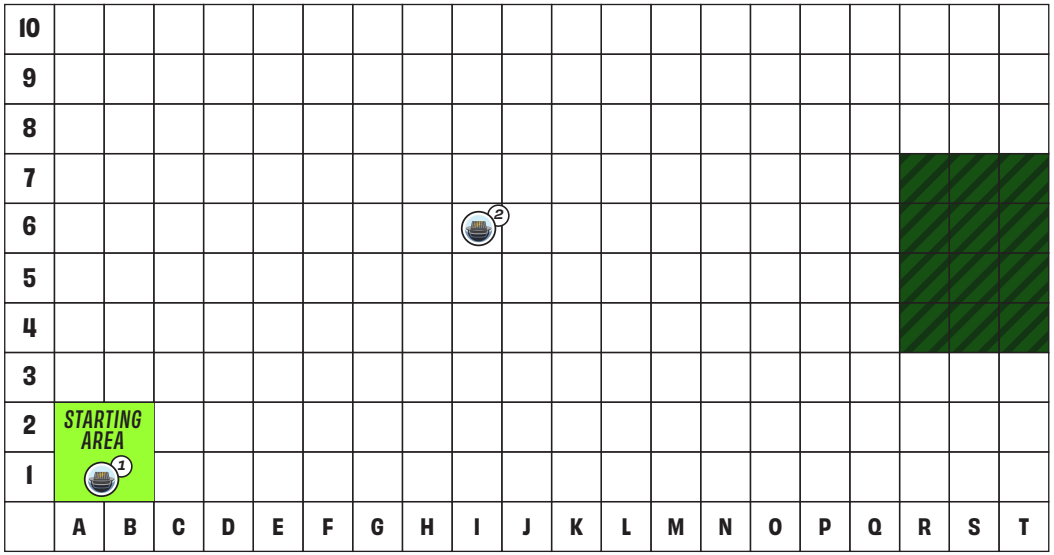


4. Build a ***Slider*** from Blueprint parts. For the ***Slider***, you'll need:

- (10) Connectors
- (2) Linear Motion Brackets
- (1) 10x Pitch Truss
- (3) 4x Pitch Trusses
- (4) 3x Pitch Trusses
- (2) 2x Pitch Trusses



5. Place the ***Slider*** in grid squares **T4-T7**. The ***Slider*** may be attached to the ***Competition Field*** with tape or other adhesive.



MISSION OBJECTIVE #2 RULES

BOLT-M2-1 BOLT 1 must begin its program in grid squares A1, A2, B1, and B2 and remain in these squares for the duration of the *Mission Objective*.

BOLT-M2-2 BOLT 2 may begin the *Mission Objective* anywhere on the *Competition Field* except in the area R4-R7, S4-S7, and T4-T7.

BOLT-M2-3 Execute the pre-created program on BOLT 1 that will display an encrypted message.

a. Access the program with the following QR code or link: **sphero.cc/mo2program**

b. Execute the code and decrypt the encrypted message. The message is broken into three parts, each using a different method of encryption. You will likely have to run the program multiple times to decrypt the message. If it helps, you can run one code function at a time to focus on one part of the message at a time. You do not need to adjust the program in any way to successfully complete this *Mission Objective*.

c. For support, refer to a code cheat sheet from spygeek.net: **sphero.cc/spycodes**

BOLT-M2-4 The program for BOLT 1 will provide the instructions for what to do with BOLT 2. Create a program to follow the instructions with BOLT 2.

BOLT-M2-5 To complete the *Mission Objective*, send an IR message from BOLT 2 to BOLT 1 on the channel designated in the secret message. BOLT 1 is pre-programmed to receive the message, however, you will need to make sure that the BOLT 1 program is running.

BOLT-M2-6 Extra Blueprint parts may be used to decorate the *Competition Field.*

BOLT-M2-7 *Mission Objective* points will be awarded based on the *Evaluation Rubric*.

DELIVERABLES

1. Video (.mp4, .mov, .avi) of the *Mission Objective*
   - Ideally a top down view
   - Both BOLTs visible while their respective programs are running
2. Picture of code for BOLT 1 and BOLT 2 included in the submission (See page 16 for submission details)

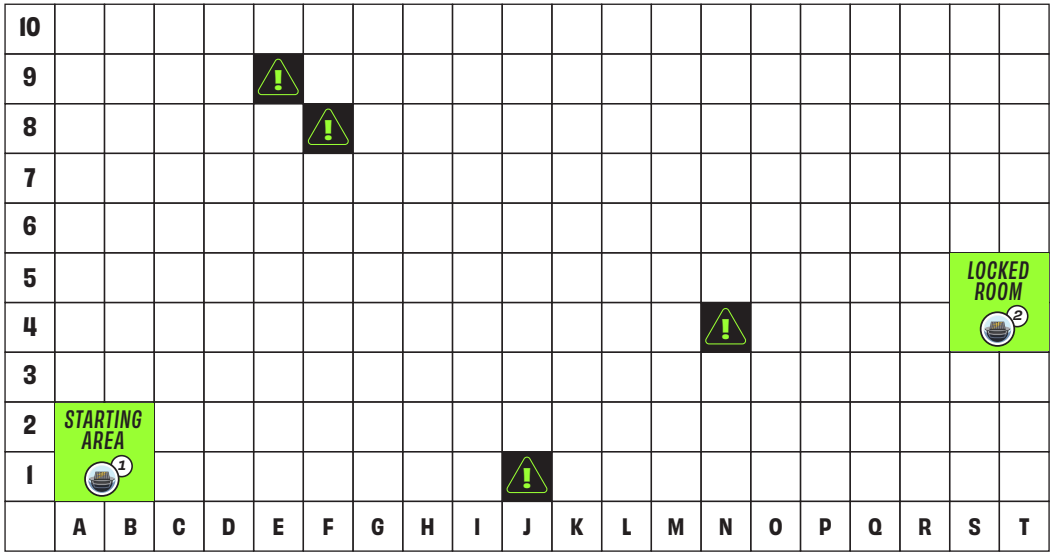
003 | *Level: Intermediate*

Mission Objective #3: Spy Rescue

Oh no! BOLT 2 is stuck in a *Locked Room* built with Blueprint parts and needs your help to escape. **Program BOLT 1 to rescue their spy partner** under the cover of darkness. BOLT 1 must roll over to the door, open it, and help BOLT 2 back to spy headquarters. If a spotlight (flashlight) shines on the BOLT 1, it must stop in its tracks and wait for the cover of darkness before it moves again.

SET-UP

1. Use a **printout** or **Code Mat** as the *Competition Field*. Or create your own *Competition Field* with tape or other method.
2. **Engineer** a *Locked Room* for BOLT 2 with Blueprint pieces as outlined in BOLT-M3-3 and place at coordinates **S4-S5** and **T4-T5**.
3. Place four leftover Blueprint trusses of any size on the *Competition Field* at the following locations. These will be used as *Obstacles*.
   - E9
   - F8
   - J1
   - N4



MISSION OBJECTIVE #3 RULES

BOLT-M3-1 BOLT 1 must start fully contained in the *Starting Area*.

BOLT-M3-2 BOLT 2 must start fully contained in the *Locked Room*.

BOLT-M3-3 You must design and build a *Locked Room* with Blueprint pieces.

- **a.** The *Locked Room* should have **four sides**.
- **b.** The *Locked Room* should be **approximately 20cm x 20cm**, although devices for opening and closing the door can extend past this footprint.
- **c.** The *Locked Room* must have a door with a device that allows BOLT 1 to **open it from the outside**.
- **d.** Reference the *Turnstile* and *Slider* in *Mission Objective 2* for ideas.

BOLT-M3-4 The program for BOLT 1 must use **roll blocks** with durations of no more than 0.75 seconds to travel from the *Starting Area* to the *Locked Room* to rescue BOLT 2.

BOLT-M3-5 The program for BOLT 1 must use a **control block** and a conditional statement to check the luminosity levels with the **light sensor** after each **roll block**. If the luminosity is above a certain level, BOLT must pause in place for three seconds.

BOLT-M3-6 You must use a flashlight or other light source to stop BOLT 1's movement at least two times as it travels to the *Locked Room*.

BOLT-M3-7 BOLT 1 must open the *Locked Room* without any human help.

BOLT-M3-8 After releasing BOLT 2 from the *Locked Room*, both BOLTs must make their way back to the *Starting Area*. The programs for BOLT 1 and 2 do not need to check for light levels while returning to the *Starting Area*.

BOLT-M3-9 *Mission Objective* points will be awarded based on the *Evaluation Rubric*.

- **a.** **Five points** will be **deducted** from the overall score each time contact is made with an *Obstacle*.
- **b.** **Ten bonus points** will be awarded if the door to the *Locked Room* is closed after BOLT 2's escape.

DELIVERABLES

1. Video (.mp4, .mov, .avi) of the *Mission Objective*
   - Ideally a top down view
   - Both BOLTs visible while their respective programs are running
2. Picture of code for BOLT 1 and BOLT 2 included in the submission (See page 16 for submission details)
3. Close up pictures of *Locked Room* along with an explanation of the device for opening (and closing) the *Locked Room*

004 | *Level: Advanced*

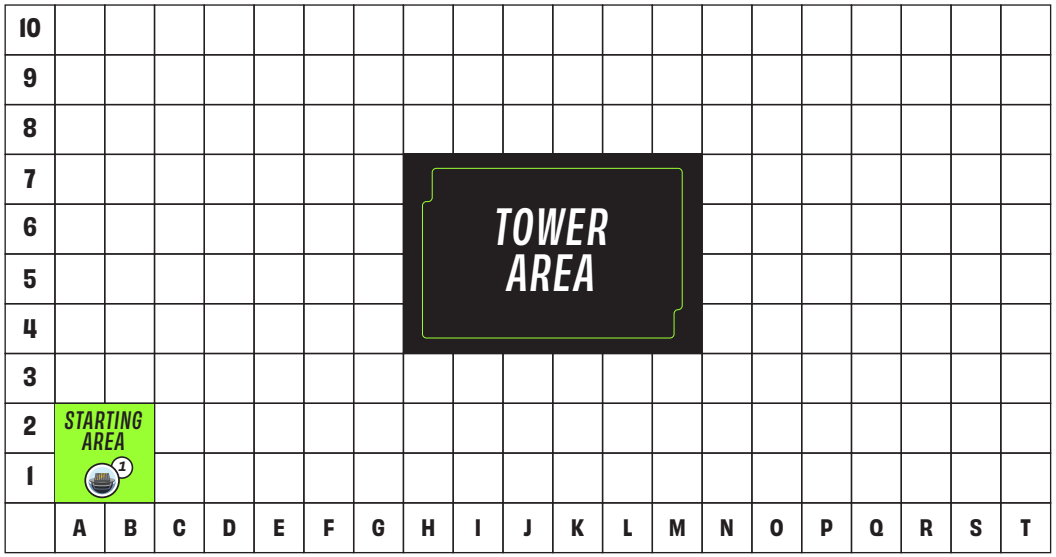
Mission Objective #4: Spy Tower

How can your BOLT spies communicate with their supervisors?

Through a spy antenna *Tower* of course! Build the tallest *Tower* possible with Blueprint parts. Then, use BOLT 1 as a remote control to patrol BOLT 2 around the *Tower*. Finally, park BOLT 2 directly underneath the *Tower*.

SET-UP

1. Use a **printout** or **Code Mat** as the *Competition Field*. Or create your own *Competition Field* with tape or other method.
2. **Engineer** a *Tower* outlined in BOLT-M4-3.
3. Place the *Tower* on the *Competition Field* within the following grid squares:
   - H4-H7
   - I4-I7
   - J4-J7
   - K4-K7
   - L4-L7
   - M4-M7



MISSION OBJECTIVE #4 RULES

BOLT-M4-1 BOLT 1 must be held in a team member's hand for the duration of the program.

BOLT-M4-2 BOLT 2 must begin the program in grid squares **A1, A2, B1, and/or B2**.

BOLT-M4-3 You must design and build a *Tower* with Blueprint parts.

- **a.** BOLT 2 must be able to roll into the center of the *Tower* base from at least **three different entry points**.
- **b.** The *Tower* **may not be attached** in any way to the *Competition Field*.
- **c.** Build your *Tower* to **as tall as possible** with available Blueprint parts while still remaining stable. Taller *Towers* will earn more points according to the scoring outlined in the *Evaluation Rubric*.
- **d.** Teams are limited to Blueprint parts as outlined in BOLT-G4

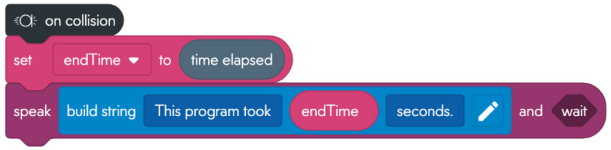
BOLT-M4-4 Program BOLT 1 to be an **IR message remote control** for BOLT 2. For example, when both programs are running and BOLT 1 is tilted forward, BOLT 2 should move in one direction. When BOLT 2 is tilted backwards, BOLT 2 should move in another direction.

BOLT-M4-5 Program BOLT 2 to listen for IR messages from BOLT 1 and move according to the input it receives from BOLT 1.

BOLT-M4-6 Use BOLT 1 to drive BOLT 2 all the way around the *Tower* and then drive underneath the *Tower* and stop. BOLT 2 can touch the *Tower* but the *Tower* should not fall over.

BOLT-M4-7 To end the *Mission Objective*, use a **programming event** to make BOLT 1 speak the total time it took to drive BOLT 2 around the *Tower* and park it underneath the *Tower*.

- **a.** To show this in your program and video, create a **variable (endTime)** and have your program speak this variable after an event occurs. See the code snippet below for an example.



BOLT-M4-8 *Mission Objective* points will be awarded based on the *Evaluation Rubric*.

DELIVERABLES

1. Video (.mp4, .mov, .avi) of the *Mission Objective*
   - Ideally a top down view
   - Both BOLTs visible while their respective programs are running
2. Picture of code for BOLT 1 and BOLT 2 included in the submission (See page 16 for submission details)
3. Close up pictures of the *Tower* along with an explanation of its structural engineering. Please clearly label the height of your *Tower* in the number Blueprint truss pitches (i.e. 12 pitches). **A pitch is equal to 1 square on a Blueprint truss. Each pitch is 25mm in length.**

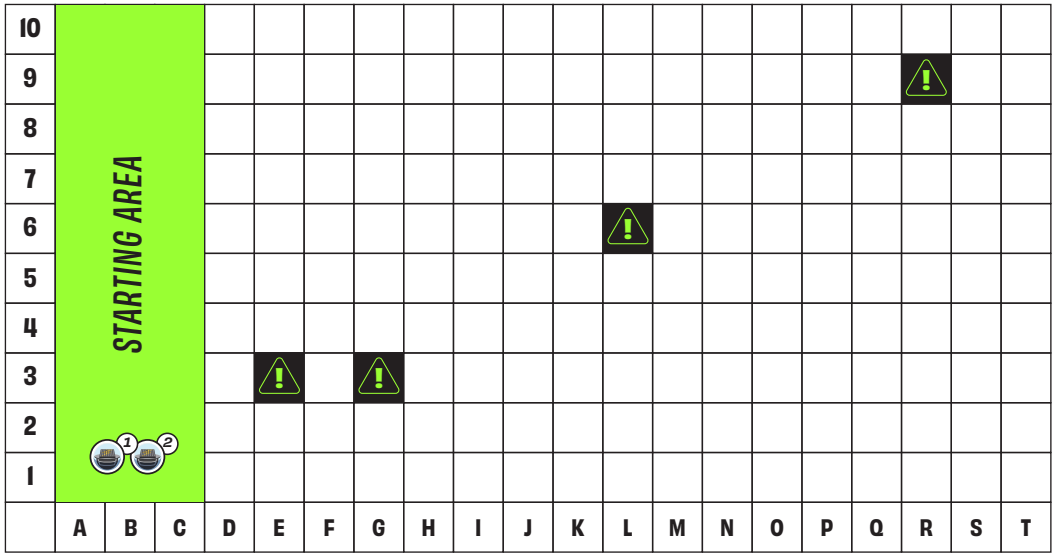
005 | *Level: Advanced*

Mission Objective #5: Spy Sweeper

Your nemesis has planted ***Bugs***—listening devices—around the *Competition Field*. In order to **make the zone safe again**, you'll need to **engineer** a *Sweeper* that both BOLTs can move around the *Competition Field* and remove the *Bugs*.

SET-UP

1. Use a **printout** or **Code Mat** as the *Competition Field*. Or create your own *Competition Field* with tape or another method.
2. **Place four 2x Pitch Trusses** at the following locations to represent the *Bugs*:
   - E3
   - G3
   - L6
   - R9
3. Engineer a *Sweeper* for your BOLT robots with Blueprint pieces as outlined in BOLT-M5-1.



MISSION OBJECTIVE #4 RULES

BOLT-M5-1 Design and build a *Sweeper* with Blueprint parts that two BOLT robots can push, pull, or otherwise move around the *Competition Field* to remove the Bugs:

- **a.** The *Sweeper* must be built with Blueprint parts only.
- **b.** The *Sweeper* can be any length, width, or height.

BOLT-M5-2 Your *Sweeper* and both BOLT robots must begin entirely within the *Starting Area*.

BOLT-M5-3 Program both BOLTs to collaboratively move the *Sweeper* around the *Competition Field* and remove as many of the *Bugs* as possible.

BOLT-M5-4 The BOLTs and the *Sweeper* should finish the *Mission Objective* outside of the *Competition Field Boundary Lines*.

BOLT-M5-5 *Mission Objective* points will be awarded based on the *Evaluation Rubric*.

DELIVERABLES

1. Video (.mp4, .mov, .avi) of the *Mission Objective*
   - Ideally a top down view
   - Both BOLTs visible while their respective programs are running
   - Both BOLTs visible while their respective programs are running
2. Picture of code for BOLT 1 and BOLT 2 included in the submission (See page 16 for submission details)
3. Close up pictures of *Sweeper* along with explanations of functionality

Submission Requirements

BOLT-S1 Submissions should include **all deliverables** from each completed *Mission Objective* in a Slideshow, **using the Google Slide template (sphero.cc/SGC4BOLTtemplate)**

- The template is meant to help ensure you include all the submission requirements. You can get creative with layouts, fonts, add slides, etc.

BOLT-S2 **Videos** for each *Mission Objective* may be embedded into the Slide Presentation, but also must be uploaded in the **submission form**.

- If you chose to embed videos make sure the sharing permissions are changed to **"anyone with the link"**.

BOLT-S3 Each submission must be uploaded to the Google Drive folder that will be sent to all the Coaches **once the submission window is open**.

BOLT-S4 Submissions will be scored based on the *Evaluation Rubric*.

EVENT SPECIFIC RULES

One of a spy's most important side-kicks is their **spy vehicle**. **RVR+ is on the case!** Equipped with a powerful drive train and lots of sensors, RVR+ is ready for season four of the Sphero Global Challenge. The RVR+ ***Event*** will challenge spies and detectives of all ability levels to work together to navigate RVR+ through five ***Mission Objectives***, using different programming skills to solve the case!

Along with your **programming skills**, the RVR+ *Mission Objectives* will tap into your **engineering skills**. Using the **Sphero Global Challenge Season 4 Blueprint Kit** you'll be able to build structures on the ***Competition Field*** and on top of RVR+ to complete ***Mission Objectives***. Only the most dedicated, practiced, and sneaky programmers will advance to the Sphero World Championships in spring 2024.

RVR+-G1 Teams may have up to five total students.

RVR+-G2 Teams considered *Upper Elementary School Teams* will be scored on three *Mission Objectives* and their Slide Presentation for a total of **400 points** (300 from *Mission Objectives*, and 100 from the presentation). See the *Evaluation Rubric* for more information on scoring.

a. *Upper Elementary School Teams* must complete one *Mission Objective* from each difficulty category:

- **Beginner:** *Mission Objective #1*
- **Intermediate:** *Mission Objective #2* OR *#3*
- **Advanced:** *Mission Objective #4* OR *#5*

b. *Upper Elementary School Teams* may choose to submit **all five** *Mission Objectives*. If you choose to do this, your submission will still be scored on a scale of **400 points** (300 from *Mission Objectives*, and 100 from the presentation). However in this case, the judges will score **all five** *Mission Objectives* and your final score will consist of points from *Mission Objective #1*, the **highest score** from *Mission Objective #2* and *#3*, the **highest score** from *Mission Objective #4* and *#5*, and the Slide Presentation.

RVR+-G3 Teams considered *Middle School Teams* will be scored on five Mission Objectives and their Slide Presentation for a total of **600 points**. (500 from *Mission Objectives*, and 100 from their Slide Presentation.)

RVR+-G4 All RVR+ *Mission Objectives* are meant to be completed fully through programming of RVR+. Once "Start" is pressed on any RVR program, no human interaction can take place for the reminder of the program.

RVR+-G5 Teams will need to use parts from the Sphero Global Challenge Season 4 Blueprint Kit to complete the *Mission Objectives* as outlined in the rules. The Kit includes the following pieces:

- (6) 10x Pitch Truss
- (8) 5x Pitch Truss
- (12) 4x Pitch Truss
- (12) 3x Pitch Truss
- (8) 2x Pitch Truss
- (40) Connectors
- (2) Turntables
- (6) Linear Motion Brackets
- (2) 45mm Pulleys
- (2) 3x Pitch Shafts
- (8) 0.5x Pitch Shaft Collars
- (1) Removal Tool

Each team can only use parts included in one Sphero Global Challenge Season 4 Blueprint Kit. No additional Blueprint parts can be used.

RVR+-G5 RVR+: Spies on the Move *Competition Field* setup for all *Mission Objectives* requirements are listed below. We recommend teams find a space to set up the *Competition Field* semi-permanently so you do not have to re-build it every time you meet.

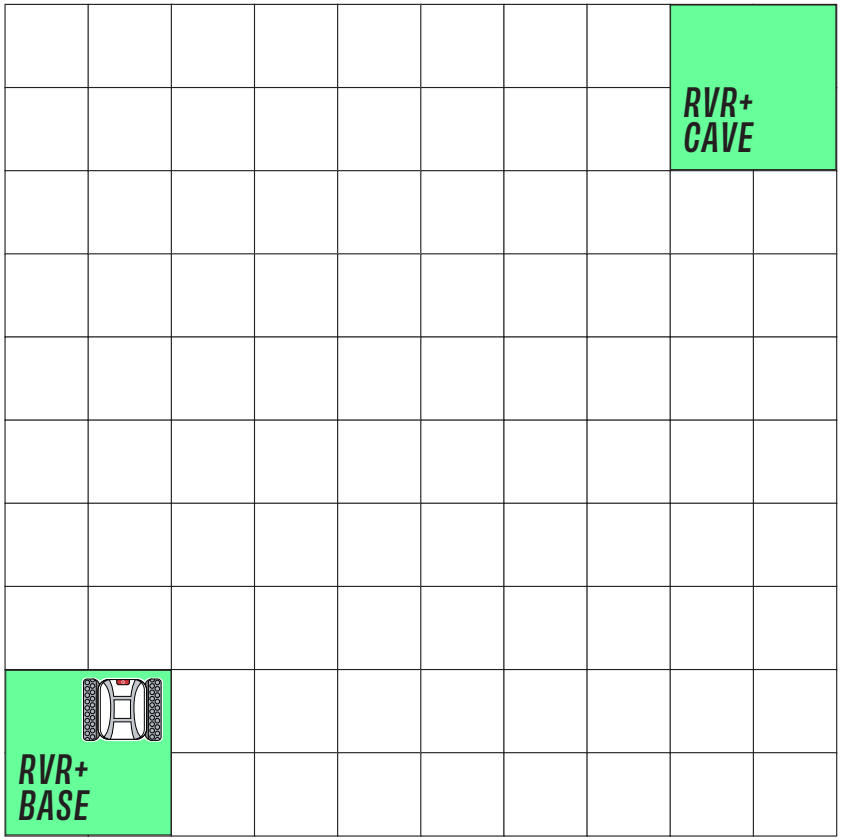
a. Competition Field Size: 10′ x 10′ (3.048 m X 3.048 m).

b. Divide the Competition Field into 1′ x 1′ (304.8mm X 304.8mm) grid squares.

c. You can use any material to mark the Competition Field and grid squares i.e Painter's tape, PVC, 2x4s, etc.

d. The square in the **lower left corner** is the *RVR+ Base*. Establish this area by using tape to mark the square and label it as the *Base*.

e. The square in the **top right corner** is the *RVR+ Cave*. Establish this area by using tape to mark the outline of the *Cave*.

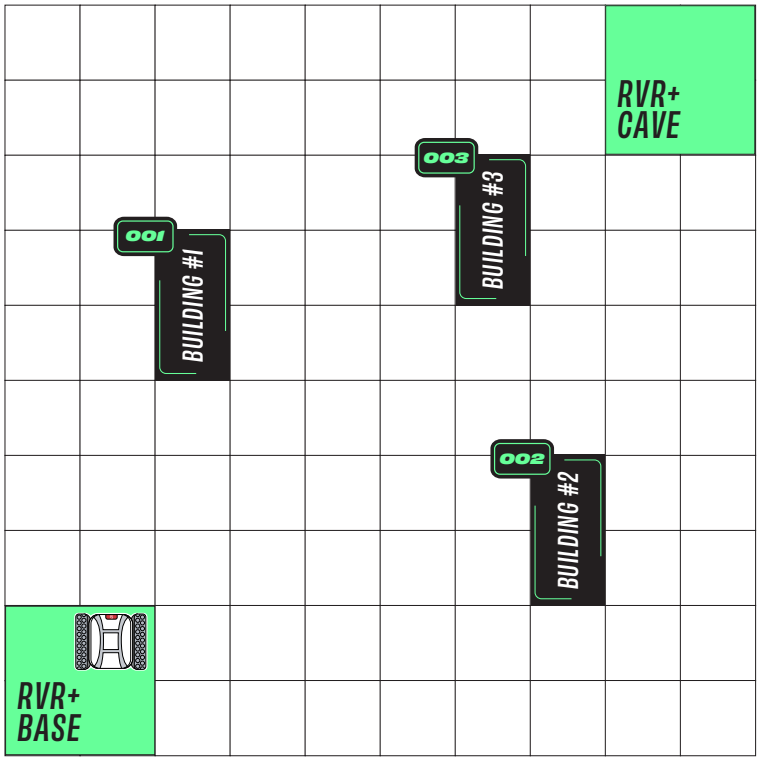


001 | *Level: Beginner*

Mission Objective #1: Clear the Buildings

RVR+ is ready to patrol the competition area. With movement, lights and sounds RVR+ must drive around each building to ensure it's safe. Once the **"all clear"** is given, head back to *Base* to get ready for the next *Mission Objective*.

SET-UP



MISSION OBJECTIVE #1 RULES

RVR+-MI-1 RVR+ must start and finish the *Mission Objective* fully inside the *RVR+ Base*.

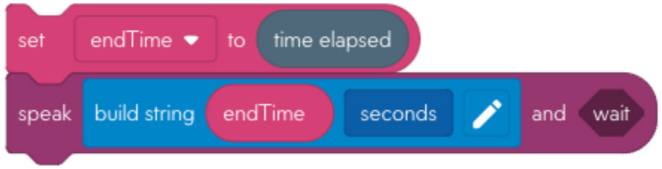
RVR+-MI-2 RVR+ must patrol all three buildings in order on the *Competition Field* and give an all clear signal after sweeping each building. A building is considered swept and clear if the following conditions are met:

- **a.** RVR+ has driven on each of the ten grid squares surrounding each building.
- **b.** After the 10 grid squares around each building have been driven on, RVR+ turns all its LEDs green.
- **c.** While the LEDs on RVR+ are green, RVR+ speaks "Building (number) Clear".
- **d.** After RVR+ has announced the building is clear, the LEDs should either turn off or change colors to something other than green.

RVR+-MI-3 RVR+ may not drive in the grid spaces that are occupied by the buildings. These spaces should be **marked in some way** (ie: tape, PVC pipe, cardboard etc.)

RVR+-MI-4 When RVR+ reaches the base, it should celebrate using movement, light, and sound in some way– it's your time to get creative!

RVR+-MI-5 Program runtime should not exceed **90 seconds**, and RVR+ should speak the time it took to complete the mission once it has finished its celebration. The blocks below provide an example of how you can accomplish this with a variable:



DELIVERABLES

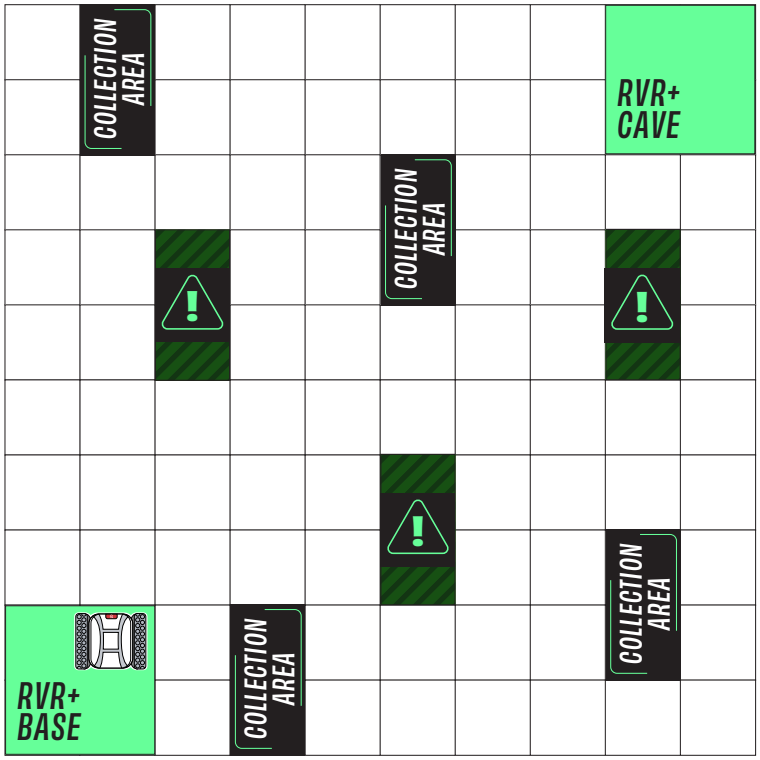
1. Video (.mp4, .mov, .avi) of the *Mission Objective*
   - Ideally a top down view
   - RVR+ visible while their respective programs are running
2. Picture of code for RVR+ included in the submission

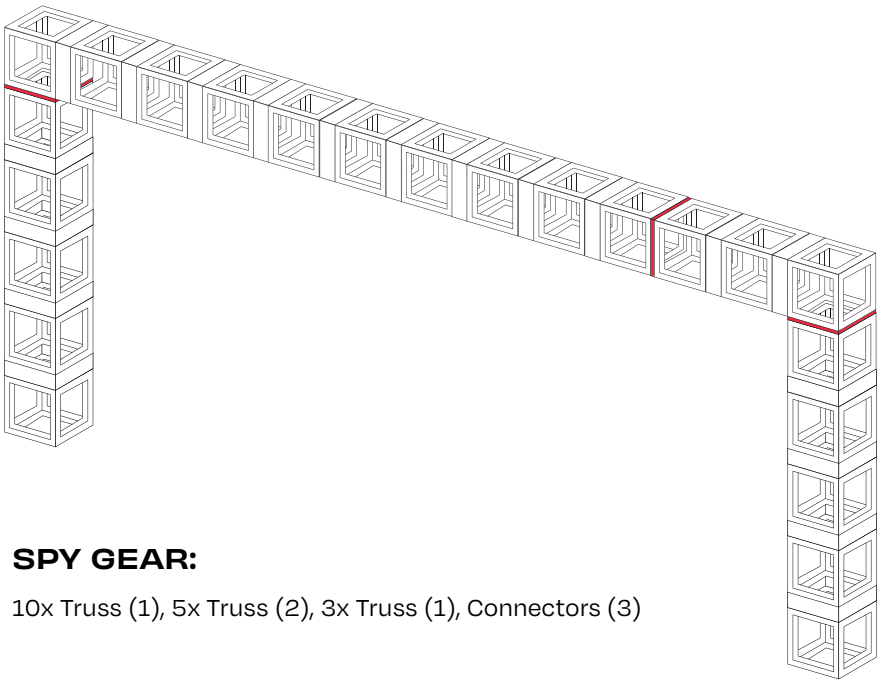
(See page 29 for submission details)

Mission Objective #2: Spy Gear Collection

It's time to collect your *Spy Gear* and take it to safety. Using **on color events** your RVR+ must drive through each collection area, collect your *Spy Gear*, and avoid the *Traps* set by enemy spies. **Your mission is complete** when all your *Spy Gear* is **safe** in the *RVR+ Cave*.

SET-UP





SPY GEAR:

10x Truss (1), 5x Truss (2), 3x Truss (1), Connectors (3)

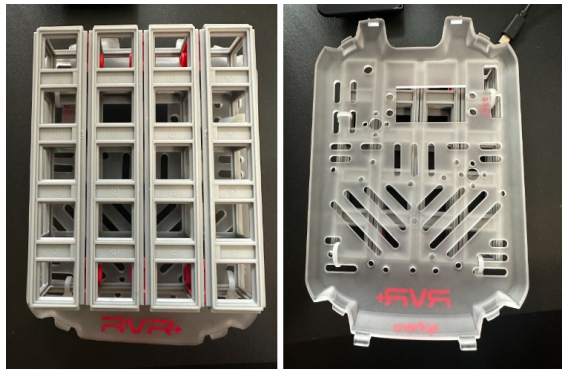
MISSION OBJECTIVE #2 RULES

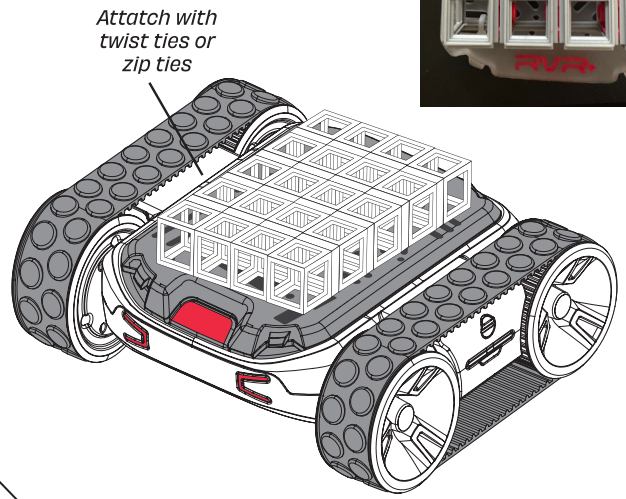
RVR+-M2-1 RVR+ must start and finish the *Mission Objective* fully inside the *RVR+ Base*.

RVR+-M2-2 RVR+ must end the *Mission Objective* fully inside the *RVR+ Cave* with all four pieces of *Spy Gear*.

RVR+-M2-3 Use the Sphero Global Challenge Season 4 Blueprint Kit to build the collector on top of RVR+, and your four pieces of *Spy Gear*. Each piece of *Spy Gear* must be placed inside collection areas (green spaces) to start the *Mission Objective*.

a. **To build on top of RVR+** consider adding the following Blueprint pieces on top of the developer plate.





RVR+-M2-4 Once RVR+ has exited the *RVR+ Base*, it must use **on color events** to trigger any movement. The only movement block not under an on color event can be the first movement RVR+ makes in the M*ission Objective* to exit the *Base.*

RVR+-M2-5 RVR+ should not drive over any *Traps* during the *Mission Objective*.

RVR+-M2-6 Teams may use a **maximum** of **five color tiles**, or other colored paper, to trigger the movement of RVR+.

RVR+-M2-7 Teams should establish a **variable** in their program, *num_tiles*, that counts the number of tiles RVR+ drives over during the *Mission Objective*.

RVR+-M2-8 RVR+ should start the program by turning its main LED to white **(R: 255 G:255 B:255)**. Then when RVR+ passes over a color tile, it must change the main LED to match the tile, until RVR+ passes over another tile.

RVR+-M2-9 Once RVR+ is in the *Cave* it should speak the number of tiles it drove over, using the variable created.

DELIVERABLES

1. Video (.mp4, .mov, .avi) of the *Mission Objective*
   - Ideally a top down view
   - RVR+ visible while their respective programs are running
2. Picture of code for RVR+ included in the submission

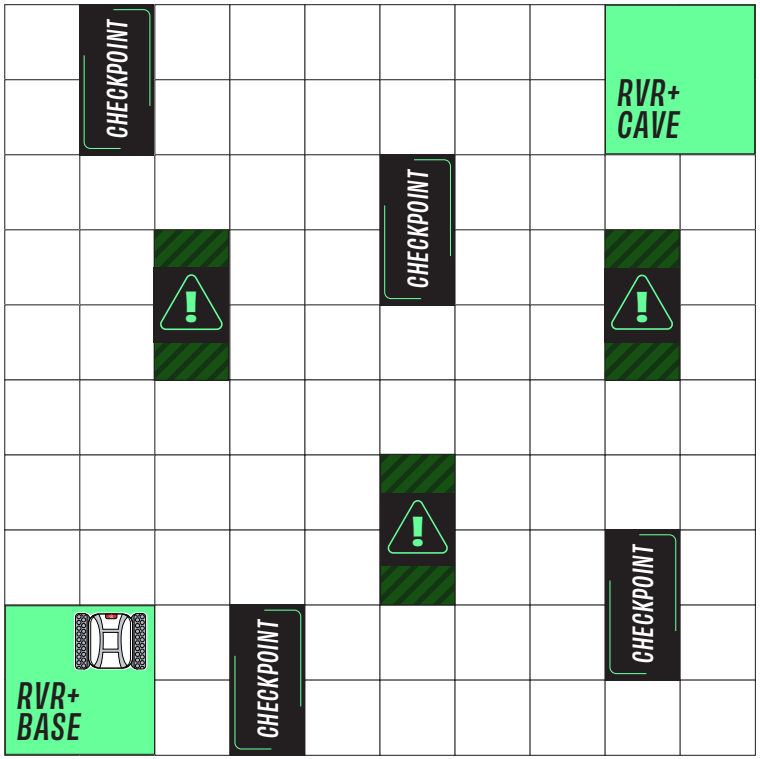
(See page 29 for submission details)

003 | *Level: Intermediate*

Mission Objective #3: RVR+ Navigation

Oh no! RVR+ Navigation system has malfunctioned. The drive and roll blocks are no longer available in your code. Use the **RVR+ distance block**, **conditionals**, and **comparators** to help RVR+ navigate through the checkpoints, while avoiding enemy *Traps*. Make it back safely to the *RVR+ Cave* to complete this *Mission Objective*.

SET-UP



MISSION OBJECTIVE #3 RULES

RVR+-M3-1 RVR+ must **start** the *Mission Objective* fully inside the *RVR+ Base*.

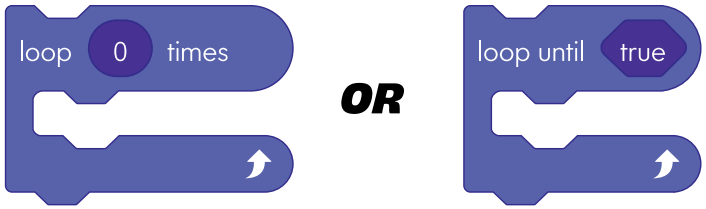
RVR+-M3-2 RVR+ must **end** the *Mission Objective* fully inside the *RVR+ Cave.*

RVR+-M3-3 **No drive** or **roll blocks** can be used in your program for this *Mission Objective*.

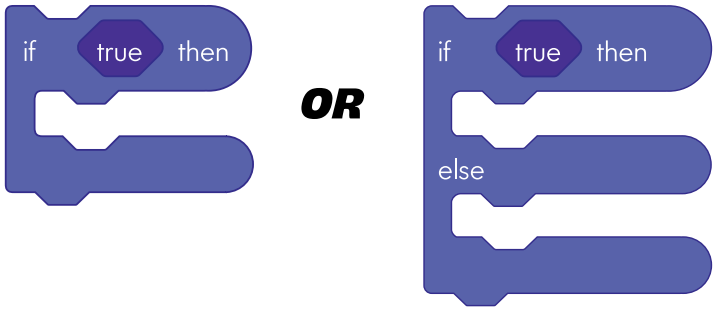
RVR+-M3-4 RVR+ must drive through each of the **four green check points**, while avoiding the grid spaces taken up by the three red enemy spy *Traps*.

RVR+-M3-5 Each block below must be used at least once in your program:

a. Loop block



b. If block



c. Comparator block

d. Distance block

RVR+-M3-6 Program runtime should **not** exceed **60 seconds**, and RVR+ should speak the time it took to complete the *Mission Objective* once it has finished. (See RVR+-M1-5 for an example)

DELIVERABLES

1. Video (.mp4, .mov, .avi) of the *Mission Objective*

- Ideally a top down view
- RVR+ visible while their respective programs are running

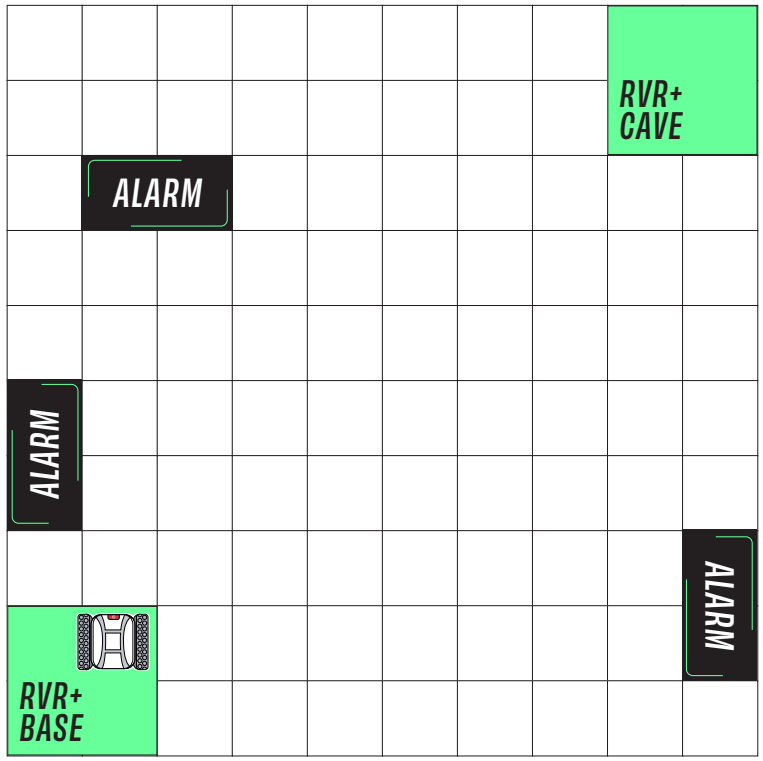
2. Picture of code for RVR+ included in the submission

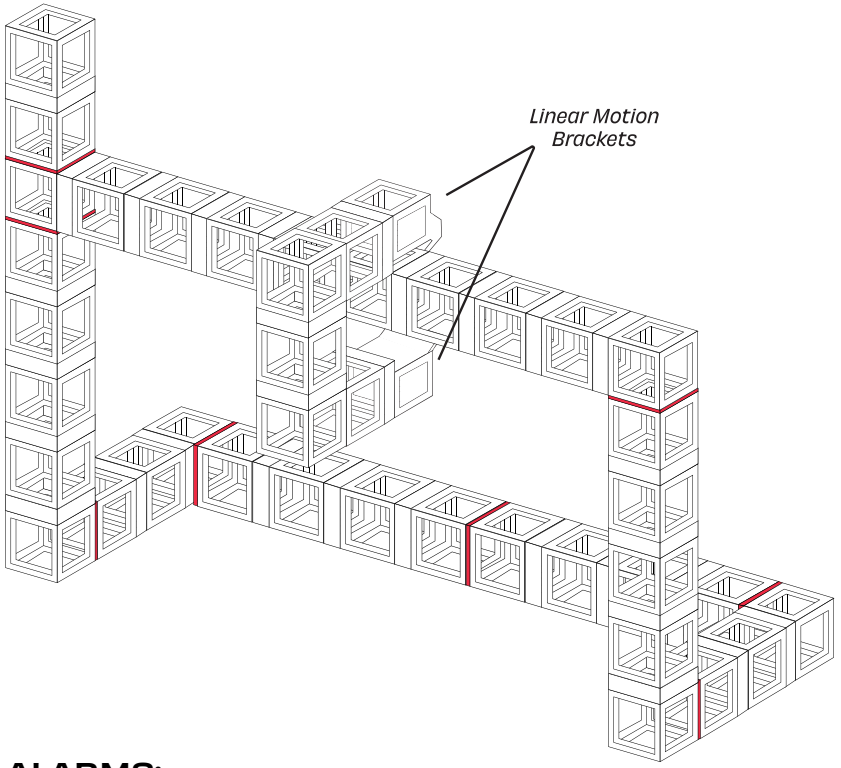
(See page 29 for submission details)

Mission Objective #4: Deactivate the Alarms

RVR+ needs to get back to *Base*, but the enemy spies have set *Alarms* to alert them when RVR+ is on the move. In this *Mission Objective* you must **deactivate the three** *Alarms* on the *Competition Field* and head back to *Base* before you are discovered! Use the Sphero Global Challenge Season 4 Blueprint Kit to **build a disarming device** on RVR+ and functions in your program to complete your mission.

SET-UP





ALARMS:

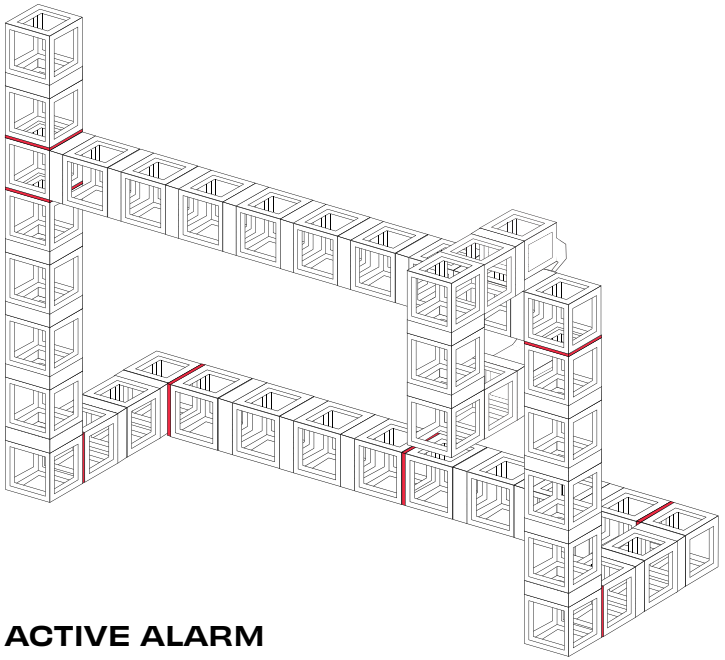
10x Truss (1), 5x Truss (2), 4x Truss (2), 3x Truss (3), 2x Truss (1), Linear Motion Brackets (2), Connectors (11)

RVR+-M4-1 RVR+ must start the *Mission Objective* fully inside the *RVR+ Cave*.

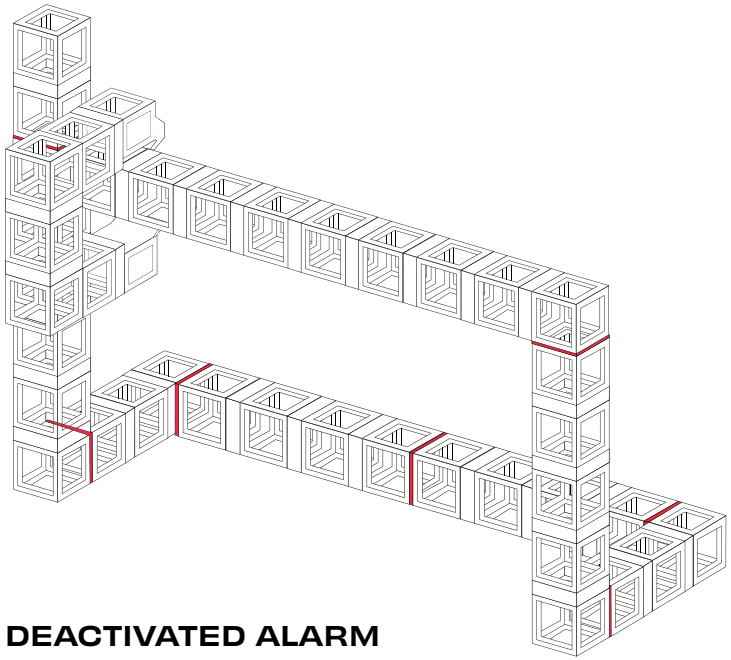
RVR+-M4-2 RVR+ must end the *Mission Objective* fully inside the *RVR+ Base*.

RVR+-M4-3 *Alarms* will be built according to the diagram in the set up, and the Sphero Global Challenge Season 4 Blueprint Kit. They must start and remain in the *Alarm* zones for the duration of the *Mission Objective*. You may secure them to the *Competition Field* using tape, if needed.

RVR+-M4-4 The **top cross bar** of each *Alarm* must start **closest** to the *RVR+ Base* and is considered **deactivated** when the cross bar has been moved to the **opposite side** of the *Alarm* structure.



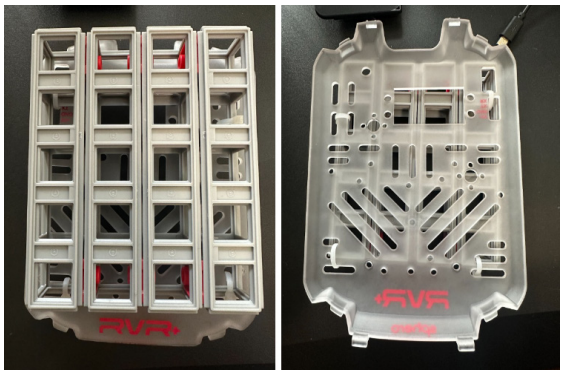
ACTIVE ALARM

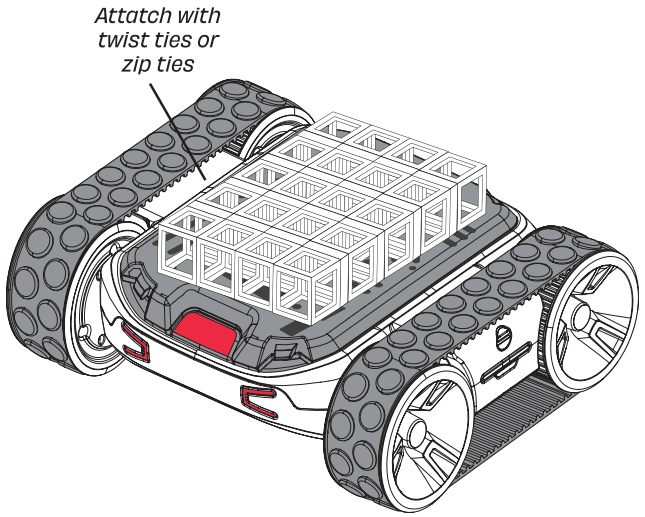


DEACTIVATED ALARM

RVR+-M4-5 Using the remaining pieces from the Sphero Global Challenge Season 4 Blueprint Kit, you must design and build a **structure on top of your Blueprint RVR+ topper** to deactivate the *Alarms*. **Only** Blueprint pieces from the Sphero Global Challenge Season 4 Blueprint Kit **can touch** the *Alarms* to **deactivate** them.

a. **To build on top of RVR+** consider adding the following Blueprint pieces on top of the developer plate using zip ties or twist ties to attach them.





RVR+-M4-6 In the RVR+ program, each *Alarm* must be deactivated using a **function** named *deactivate*. This function **must include** the following:

a. All movement of RVR+ when the Blueprint pieces on the RVR+ topper plate is touching the *Alarms*

b. An original **LED light pattern** when the *Alarm* is deactivated

c. A **sound** or **speak block** that indicated the *Alarm* is deactivated

RVR+-M4-7 *Alarms* can be deactivated in **any order**.

DELIVERABLES

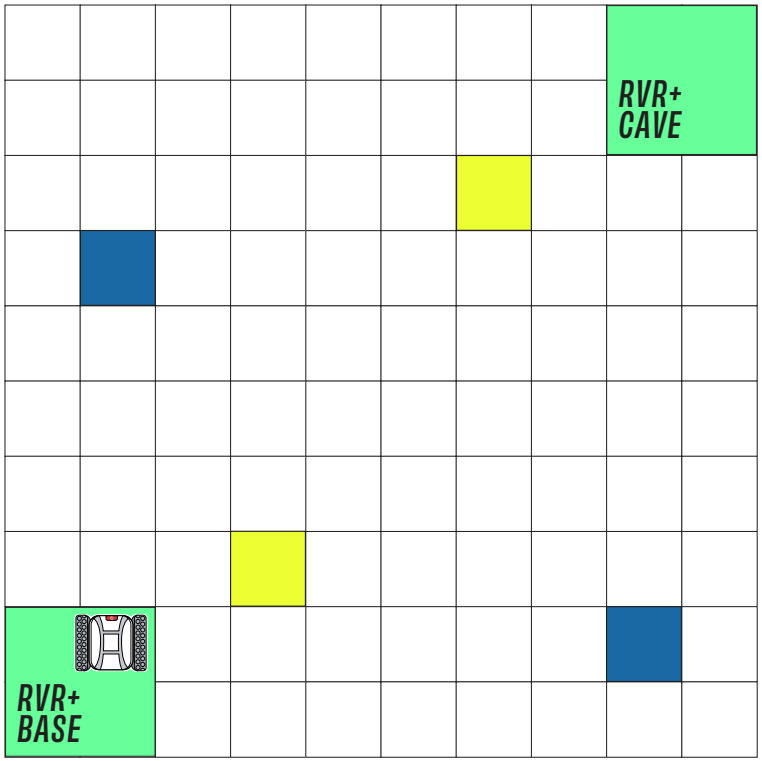
1. Video (.mp4, .mov, .avi) of the *Mission Objective*
   - Ideally a top down view
   - RVR+ visible while their respective programs are running
2. Picture of code for RVR+ included in the submission (See page 29 for submission details)
3. A close up picture of the structure that was built on top of the RVR+ topper plate included in the submission slides.

005 *Level: Advanced*

Mission Objective #5 Artifact Retrieval

Four *Artifacts* have been located in the RVR+ *Competition Field*. Your *Mission Objective* is to **build an attachment** for RVR+ out of the Sphero Global Challenge Season 4 Blueprint Kit pieces to **collect** the *Artifacts*. Once collected they must be returned to the *RVR+ Base* and *RVR+ Cave*.

SET-UP



MISSION OBJECTIVE #3 RULES

RVR+-M5-1 RVR+ must **start** the *Mission Objective* fully inside the *RVR+ Cave*.

RVR+-M5-2 RVR+ can **end** the *Mission Objective* **anywhere** in the *Competition Field.*

RVR+-M5-3 *Artifacts* shown in the *Competition Field* set up that are **yellow**, must be put into the *RVR+ Cave.* *Artifacts* shown in the *Competition Field* set up that are **blue**, must be put into the *RVR+ Base*.

RVR+-M5-4 *Artifacts* are made out of upside down paper or plastic cups of any size. You must somehow **creatively distinguish** between the *Artifacts* that need to be returned to the *Cave* and the *Base*.

RVR+-M5-5 *Artifacts* must be collected by a device **built on the RVR+ Topper Plate** out of the Sphero Global Challenge Season 4 Blueprint Kit pieces.

RVR+-M5-6 When RVR+ returns all the *Artifacts*, it should **celebrate** using movement, light, and sound in some way–it's time to get **creative**!

DELIVERABLES

1. Video (.mp4, .mov, .avi) of the *Mission Objective*
   - Ideally a top down view
   - RVR+ visible while their respective programs are running
2. Picture of code for RVR+ included in the submission (See page 29 for submission details)
3. A close up picture of the structure that was built on top of the RVR+ topper plate included in the submission slides.

Submission Requirements

RVR+-S1 Submissions should include **all deliverables** from each completed *Mission Objective* in a Slideshow, **using the Google Slide template (sphero.cc/SGC4RVRtemplate)**

- The template is meant to help ensure you include all the submission requirements. You can get creative with layouts, fonts, add slides, etc.

RVR+-S2 **Videos** for each *Mission Objective* may be embedded into the Slide Presentation, but also must be uploaded in the **submission form**.

- If you chose to embed videos make sure the sharing permissions are changed to **"anyone with the link"**.

RVR+-S3 Each submission must be uploaded to the Google Drive folder that will be sent to all the Coaches **once the submission window is open**.

RVR+-S4 Submissions will be scored based on the *Evaluation Rubric*.

EVENT SPECIFIC RULES

indi is the perfect vehicle for sneaking around–**small**, **fast**, and **maneuverable**. In this year's Sphero Global Challenge, students will **create a path** for indi to sneak through as it carries a **secret message**. Students will develop their **computational thinking**, **collaboration skills**, and **creativity** by:

- designing a map and route for indi
- creating an indi disguise
- constructing a secret message

Designate an Android or iOS device that students can use as a **programming device (optional)**. indi can be used in a screen-free environment and programming indi with the **Sphero Edu Jr app** is **not** a requirement for a successful solution to each *Mission Objective*.

GENERAL RULES / LEVELS

indi-G1 Teams may have up to five total students.

indi-G2 All participants must abide by the Sphero Global Challenge age requirements for ***Students*** and *Early Elementary Students*.

001 MISSION OBJECTIVE #1

indi's Sneaky Path

indi has **secret information** that needs to get from one place to another. In this *Mission Objective*, you'll **design a path** for indi to sneak through.

MISSION OBJECTIVE #1 RULES

indi-MI-1 Using the **color tiles**, create a path for indi that contains:

a. a starting point (first tile)

b. a spot where indi **stops** so students can **add a disguise** before continuing. Students can pick up indi and transfer to a different tile once they've applied their disguise.

c. an ending point (last tile)

d. at least eight (8) tiles

indi-MI-2 Your path should contain:

a. at least one (1) **tunnel** that indi can drive through

b. a **hidden location** where indi is disguised by students

002 MISSION OBJECTIVE #2

Secrets & Disguises

indi is sneaking–but why? In this *Mission Objective,* you'll create a **secret message** that hides the name of your team from prying eyes and a **disguise** to help your indi evade detection.

MISSION OBJECTIVE #1 RULES

indi-M2-1 Create a **secret code** for your team name that can be deciphered with a key. Write your code on a piece of paper that you can attach to indi. You can use images, shapes, letters, emojis, or something else to create your own code. Your code will need to stay attached to indi from beginning to end as indi drives along your path. **Be sure to include the key** so we can decipher it!

indi-M2-2 Use stickers and/or craft supplies to create a **disguise** for indi.

DELIVERABLES

1. Video (.mp4, .mov, .avi) of indi running its complete route
   - Ensure indi is visible during the video except when in the tunnel and the hidden location.
   - Ensure any narration is audible in the video.
2. **Optional:** Pictures of any modifications made to indi in the Sphero Edu Jr. app, if applicable, is included in the submission (See page 34 for submission details)

Submission Requirements

indi-S1 Submissions should include **all deliverables** from each completed *Mission Objective* in a Slideshow, **using the Google Slide template (sphero.cc/SGC4inditemplate)**

- The template is meant to help ensure you include all the submission requirements. You can get creative with layouts, fonts, add slides, etc.

indi-S2 **Videos** for each *Mission Objective* may be embedded into the Slide Presentation, but also must be uploaded in the **submission form**.

- If you chose to embed videos make sure the sharing permissions are changed to **"anyone with the link"**.

indi-S3 Each submission must be uploaded to the Google Drive folder that will be sent to all the Coaches **once the submission window is open**.

indi-S4 Submissions will be scored based on the *Evaluation Rubric* out of **300 points**.

SEASON 4 GLOSSARY

Early Elementary School Student

Any *Student* born after June 1, 2015, meaning they will be 8 or younger when the Sphero World Championship is held.

Upper Elementary School Student

Any *Student* born after June 1, 2012, meaning they will be 11 or younger when the Sphero World Championship is held.

Middle School Student

Any *Student* born after June 1, 2009.

Early Elementary School Division

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

Upper 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* that 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*:

- Undercover indi
- BOLT: Spies Like BOLT
- RVR+: Spies on the Move

Mission Objective

Each *Event* is broken up into *Mission Objectives* that *Teams* will be evaluated on Based on the *Evaluation Rubrics*.

Evaluation Rubric

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

Competition Field

A defined space for each *Event's Mission Objectives.*

- The **Indi** *Event* does not have a Competition Field
- Any Sphero Code Mat can be used as the *Competition Field* for the **BOLT** *Event*. You can also print out and assemble a *Competition Field* from the *Event* resources.
- The **RVR+** *Event Competition Field* should be constructed as outlined in RVR+-G5.

Obstacles

Defined as any object placed in the *Competition Field* as part of the setup for a *Mission Objective* that should be avoided as outlined in the rules.

Boundary Lines

The area outside of the *Competition Field* dimensions of each *Event* as defined in the rules section of this document.

Competition Rules

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

Event Score

Team's score for an individual *Event*.

Finalist

Team invited to participate in the Sphero World Championship.

Gate

An arch built from Blueprint parts that is used on the *Competition Field* in the BOLT *Event Mission Objective 1*.

Starting Area

The area of the *Competition Field* where robots begin a *Mission Objective*.

Rendezvous Area

The area of the *Competition Field* where BOLT 1 and BOLT 2 meet up in the BOLT *Event Mission Objective 1*.

Turnstile

A device built with Blueprint parts that BOLT 2 needs to interact with in the BOLT *Event Mission Objective 2*.

Slider

A device built with Blueprint parts that BOLT 2 needs to interact with in the BOLT *Event Mission Objective 2*.

Locked Room

An enclosure in the BOLT *Event Mission Objective 3* that is built with Blueprint pieces and can be opened and closed by another robot outside of the enclosure

Tower

A structure built with Blueprint parts that is placed on the *Competition Field* in the BOLT *Event Mission Objective 4*.

Bug

A listening device, represented by 2x Blueprint trusses that need to be removed from the *Competition Field* in the BOLT *Event Mission Objective 5.*

Sweeper

A contraption, moveable by two BOLT robots, that will push or pull Bugs from the *Competition Field* in the BOLT *Event Mission Objective 5*.

RVR+ Base

The space on the *Competition Field* taken up by the 2x2 grid spaces in the bottom left corner of the *Competition Field.*

RVR+ Cave

The space on the *Competition Field* taken up by the 2x2 grid spaces in the upper right corner of the *Competition Field.*

Spy Gear

Structures made out of the Sphero Global Challenge Season 4 Blueprint Kit and used in the RVR+ *Event Mission Objective 2*.

Alarm

Structures made out of the Sphero Global Challenge Season 4 Blueprint Kit, and used in the RVR+ *Event Mission Objective 4*.

Artifacts

Upside down plastic cups used in the RVR+ *Event Mission Objective 5*.

Trap

Red areas on the *Competition Field* in the RVR+ *Event Mission Objectives 2* and *3*.