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
Teams may have up to five total Students.

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.

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.)

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.

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.
**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!

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.

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)
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.

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.
**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.

**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*.

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**DELIVERABLES**

1. Video (.mp4, .mov, .avi) of the *Mission Objective*
   - Ideally a top down view
   - Both BOL Ts 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)

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**Extra Blueprint parts may be used to decorate the Competition Field.**

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

**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*.

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

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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*  
   a. Ideally a top down view  
   b. 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*
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*.

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

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**SET-UP**

10
9
8
7
6
5
4
3
2
1

**STARTING AREA**

**TOWER AREA**

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
| 10 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 8  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 7  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 6  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 5  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 4  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 2  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 1  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
**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.
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.
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.

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.
**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.

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**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 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/SGC4BOLTTtemplate)

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

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.

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.)

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.

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+: 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*.
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+ 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:

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.

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**SET-UP**

**SPY GEAR:**
10x Truss (1), 5x Truss (2), 3x Truss (1), Connectors (3)
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.

   ![Blueprint pieces](image)

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 *Mission 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)
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.

**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

  ![Loop block](image)

  OR

  ![Loop until true](image)

  b. If block

  ![If true then](image)

  OR

  ![If true then else](image)
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)

**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)
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.

**Mission Objective #4: Deactivate the Alarms**

**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
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

Alarms can be deactivated in any order.

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.

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.
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.

RVR+ must start the Mission Objective fully inside the RVR+ Cave.

RVR+ can end the Mission Objective anywhere in the Competition Field.

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.

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.

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

When RVR+ returns all the Artifacts, it should celebrate using movement, light, and sound in some way—it’s time to get creative!

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*. 
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.

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**indі-G1**

Teams may have up to five total students.

**indі-G2**

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

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

- a starting point (first tile)
- 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.
- an ending point (last tile)
- at least eight (8) tiles

**indi-MI-2**  
Your path should contain:

- at least one (1) tunnel that indi can drive through
- a hidden location where indi is disguised by students
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.

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.

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](http://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**.
### 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.