ACTIVITY CARDS

SOCCER PITCH & OUTER SPACE MAT

Welcome to the Sphero Code Mat Activity Cards! In the following cards, you'll find some activities and challenges to promote collaboration, problem solving, and fun with the Sphero Edu Code Mat.

Draw  Blocks  Text 

Each card is labeled with the programming type to help you and your students understand the level of programming required to complete the activities.

Students should scan the QR code on the front of each card to access the program associated with the activity.

As you work through the activities on the cards, we recommend the following:

- Have students work in groups of two or more to complete activities.
- Each group needs one challenge card, one programming device, and one BOLT or SPRK+.
- Each card has more than one solution. See how many different ways students can solve each activity.
- When using multiple roll blocks, use a delay block in between each roll block to help with accuracy.
- Remind students they should always AIM their robot.

Computational Thinking Practice:

Pattern Recognition
Observing patterns, trends, and regularities in data.

Decomposition
Breaking down data, processes, or problems into smaller, manageable parts.

Abstraction
Identifying the general principles that generate these patterns.

Algorithm Design
Developing the step by step instructions for solving this and similar problems.

PATTERN PASSING

You'll pass Sphero to each assigned number group and then try to score on goal.

Pattern Recognition

Pattern Passing

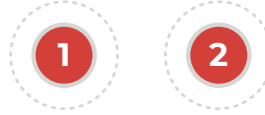
Blocks

PATTERN PASSING

How accurate is your passing? Using block programming, program your robot to go to each odd or even numbered target.

1. Scan the QR code to create a block program.

2. Place your robot on your starting number.
(1 for odd or 2 for even)



3. Aim your robot.

4. Using roll blocks, program Sphero to roll to each number in your pattern.

5. Aim and score a goal once you have passed to all of your numbered targets.

EXTENSIONS

Create other patterns on the Code Mat to play different variations of the game.

- Skip counting (3s, 4s, and 5s)
- Prime Numbers
- Ordered Pairs

NUMBER LINE (+/-)

Program the robotto move along a number line to score a goal first!

Pattern Recognition

Number Line (+/-)

Blocks

NUMBER LINE (+/-)

Partner up and play a game to see who can score a goal first along a number line.

1 *Setup:*

- Gather two dice.
- Place the robots at centerfield near (0, 0).
- Decide who will be **team 1** and **team 2**.

2 *Game Play:*

- First Turn - **Team 1** rolls, then **team 2** rolls.
- Find the difference between the two numbers.

  Example:

  5 – 3 = 2 (roll 2 forward)
- Whatever the number is, use roll blocks to program the robot to travel that many spaces.
- Switch Turns - Team 2 rolls, then team 1 rolls.

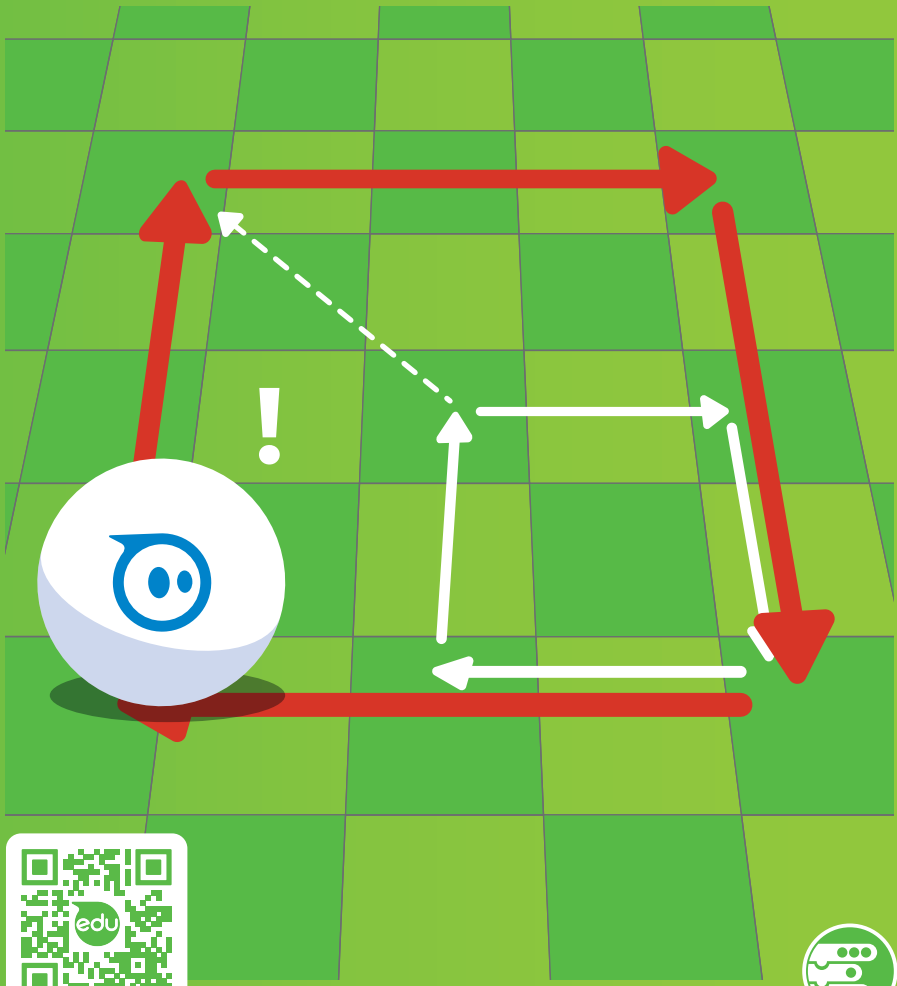
  Example:

  3 – 6 = -3 (roll 3 backward)
- Continue alternating turns until one team scores a goal.

FÚTBOL FUNCTIONS

Change the numbers in a function to have your robot roll to a new position.

Pattern Recognition



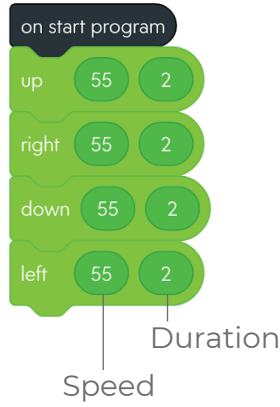
FÚTBOL FUNCTIONS

1. Scan the QR Code to open the program.

2. Place robot in the lower left corner.

3. Aim robot so the blue light faces South.

4. Run the program to see what happens.



5. Notice the first number controls the speed of the robot, and the second number controls the duration or overall distance.

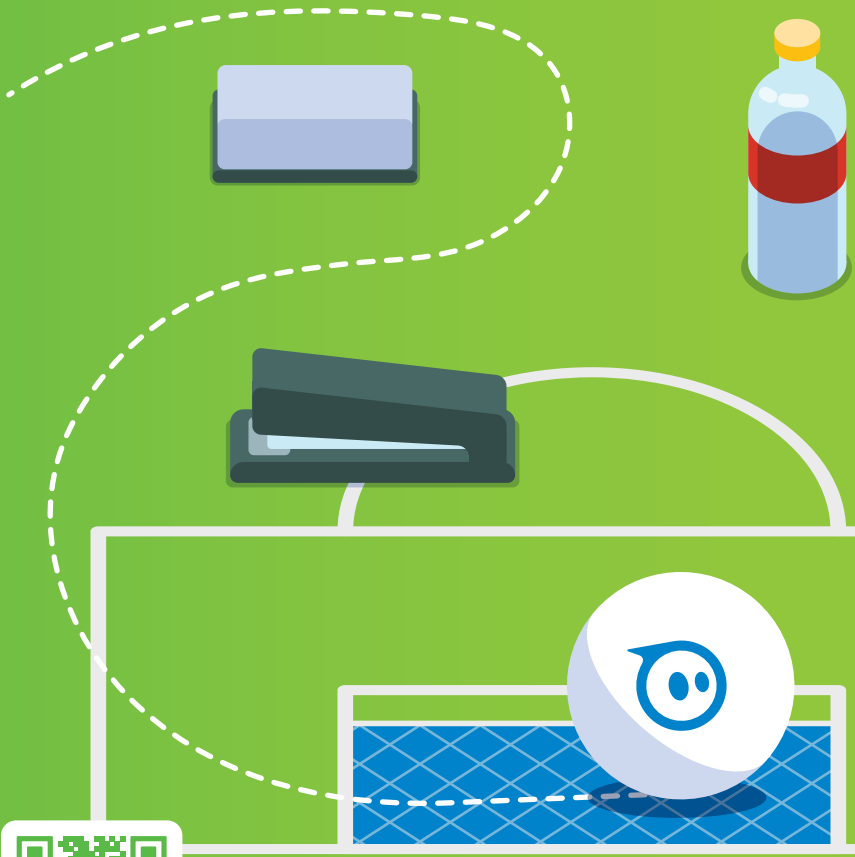
6. Adjust the numbers to find a pattern that will move the robot to grid squares of the same shade of green.

7. After finding that pattern, build a program using the function blocks that gets the robot to the opposite corner.

SPLIT THE DEFENDER

Start in the middle of the field and try to score a goal without hitting a defender.

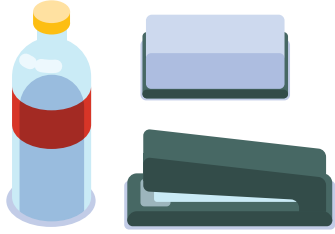
Decomposition



SPLIT THE DEFENDER

The defense is holding strong. How can you pass around the defender to get your Sphero Robot to where it needs to go?

1. Set obstacles on the code mat that you can find in the classroom (Whiteboard erasers, staplers, water bottles, etc.)



2. Place your robot in the center circle.

3. Scan the QR code to create a block program.

4. Attempt to score without hitting an obstacle.

GAME PLAY

Another team starts in the middle at the same time and tries to score on goal. If you hit an obstacle you have to place your robot back in the center of the mat.

SOCCER PONG

Time for a little “foot”ball. Can you debug the program to play this version of Sphero Soccer Pong?

Decomposition

Soccer Pong

Blocks

SOCCER PONG

Use your foot as a pong paddle to debug this program.

1. Scan the QR code to open the program.

2. Place the robot at center field.

3. Aim the robot so the blue light is facing South.

4. Run the program to see what happens.

5. Look at the blocks and explain what each part of the program is doing when you start the program.

6. Figure out how to get your robot to go from one side of the field to the other when it hits your foot.

POLYGON PLOTTER

Plot the given ordered pairs and identify the polygon. Program Sphero to create the same shape using the given coordinates.

Abstraction

Ordered Pair Polygons

Blocks

POLYGON PLOTTER

1. Place your robot on the first ordered pair in a set. Program your robot to go to each coordinate in your set.

2. Pick one set of ordered pairs below:

   - ***(-8, -4), (8, -2), (7, 4), (-9, 2)***
   - ***(-2, 3), (-6, 3), (-9, 0), (-6, -3), (-2, -3), (1, 0)***
   - ***(0, 4), (10, 4), (7, 1), (3, 1)***
   - ***(4, -4), (0, -4), (6, 0)***
   - ***(-7, 4), (-9, 1), (-3, 1), (-1, 4)***

3. Look at the location sensor data as the program is running to help identify the type of polygon.

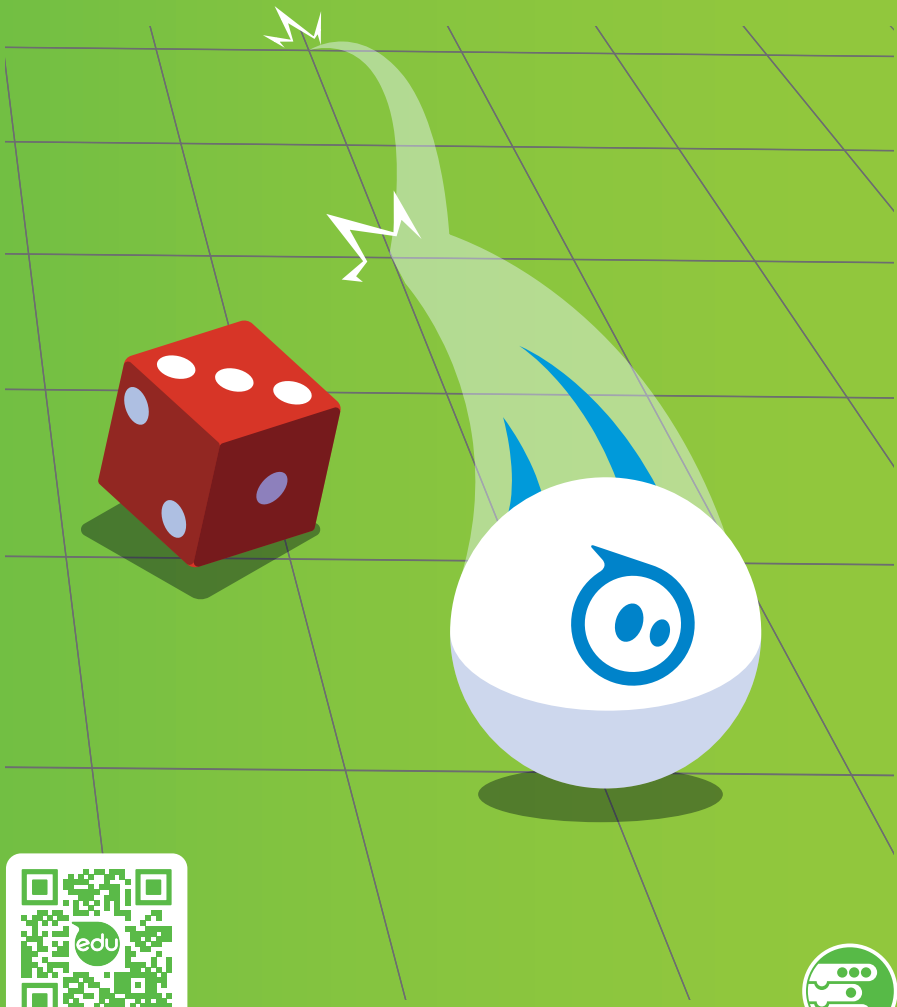
EXTENSIONS

Have students create their own set of ordered pairs (but mixed up) and challenge their friends to put the ordered pairs back in order to create the intended polygon.

VARIABLE ADVANCE

Whoever makes it from one end of the mat to the other first wins! Use a random variable to generate your speed and distance.

Abstraction



Variable Advance Sprint

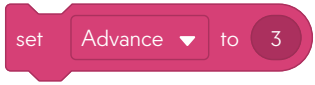
Blocks

VARIABLE ADVANCE

Variables allow you to simplify your programming by storing values that can be called back in your program. Use the a variable called “Advance”.

1. Scan the QR Code to open the program.

2. Identify where the variable is **Set**.



3. Identify where the variable is **Called**.

4. Roll a dice or pick a random number between 1-6.

5. Whatever the random number chosen was, change the **Set Variable block** to that number.

6. Place the robot in the blue goal and aim the robot.

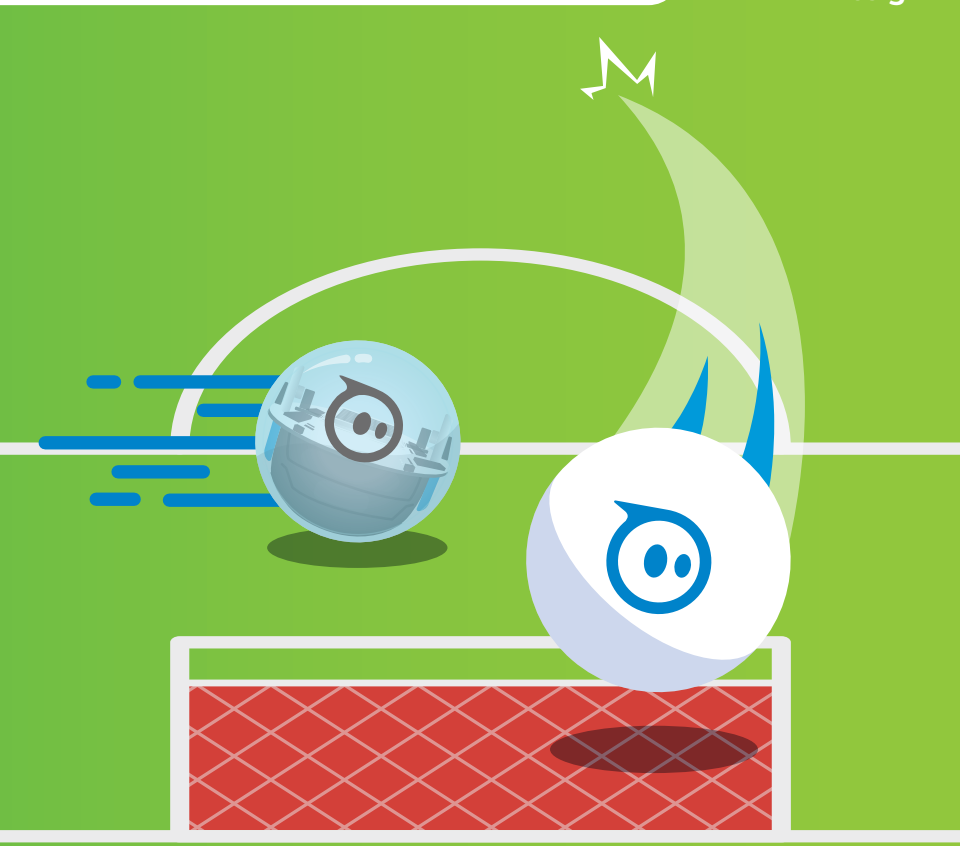
7. Run the program.

8. Repeat until the first robot reaches the end of the field.

DIRECT FREE KICK

Harness your inner Messi and try to score a goal from a direct free kick spot using a draw program.

Algorithm Design



Direct Free Kick

Draw

DIRECT FREE KICK

Using two robots—one as a goalie, and one as the ball—use a draw program to score a goal without hitting the goalie robot

1

Robot 1:

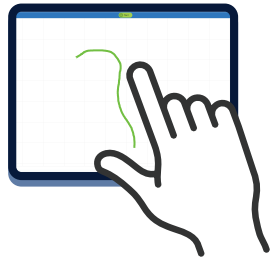
- Scan the QR code to open the program.
- Place the robot in front of the goal you are defending.
- Aim the Goalie robot so the blue light faces South.
- Run the program.

2

Robot 2:

- With another robot, create a Draw Program.
- Place your robot on a number.

- Aim your robot.
- Draw your program.
- Press Start to “kick” the ball.



3-PASS SET PIECE

It's a race to see who can score first, but you have to complete 3 passes before you can shoot on goal.

Algorithm Design

3-Pass Set Piece

Blocks

3 PASS SET PIECE

It's a race to see who can score first, but you have to complete 3 passes before you can shoot on goal.

1. Each team will place their robot inside the center circle.

2. Choose 3 numbers as targets for your passes.

3. Program your robot to roll to each numbered target and then shoot on goal.

4. Your robot must land inside each numbered target.

5. Decide which team will go first.

GAME PLAY

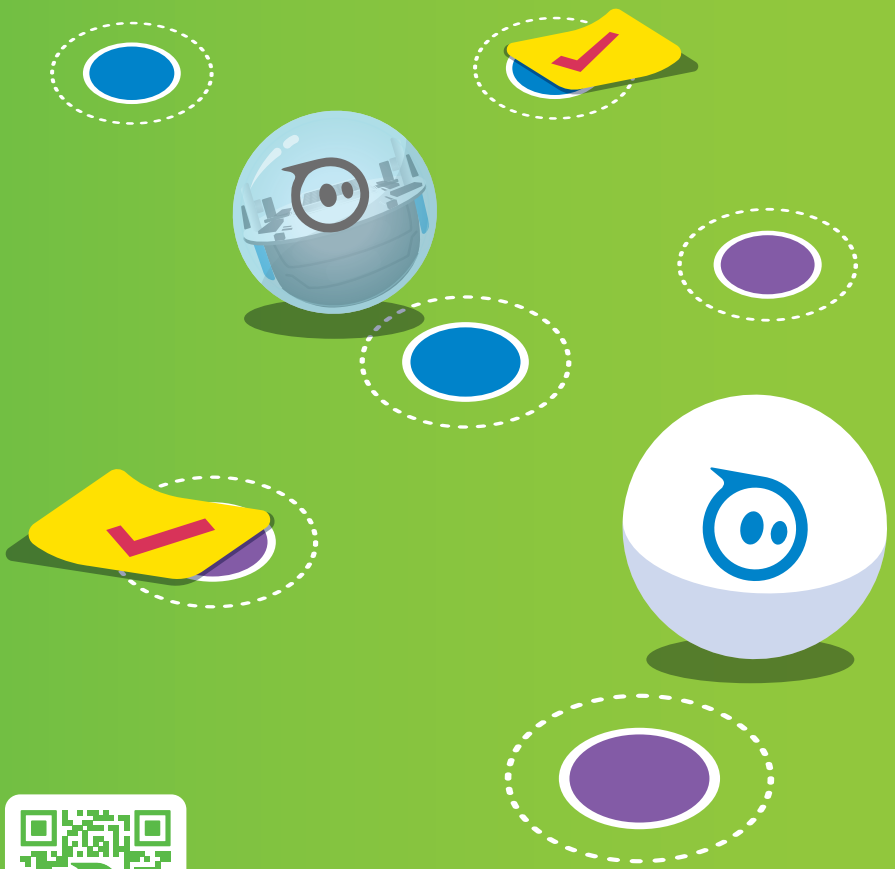
- First team programs their first pass. If the robot hits the target, program the next pass.
- If the target is missed, return the robot to the center circle. Your turn is up, team 2 goes next.

Continue with game play until one team's robot lands inside the blue or red goal.

COLOR ELIMINATION

Precisely program your robot to eliminate your opponents targets before your opponents have a chance to eliminate your targets.

Algorithm Design



Color Elimination

Blocks

COLOR ELIMINATION

1. Create 4 teams.
2. Each team gets a color.

3. Place your robots in the corners of the field.

GAME PLAY

- Take turns programming your robot to land in your opponents color targets.
- If you miss the target, return the robot to your corner.
- If you hit the target, put a sticky note on the target.

- Replace the robot to the corner for each turn.
- Robot must be completely inside the dotted circle to count as a successful target.
- Last team with color targets on the field of play wins!

LUNAR ORBIT

Turn your robot into a moon and learn how to program a circle to create a lunar orbit for any planet.

Pattern Recognition

Lunar Orbit

Blocks

LUNAR ORBIT

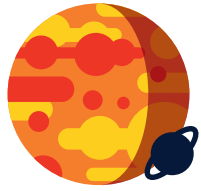
1. Scan the QR code to open the program.

2. Aim your robot so the blue light is facing the bottom of the mat.

3. Run the program.

4. Observe the robot's actions and decide which planet it is big enough to orbit.

5. Choose a new planet.


Planets

6. Adjust the program so that your lunar orbit is big enough for the planet that you've chosen.

MOONWALKING

Get your robot's dancing shoes ready for some moonwalking!

Pattern Recognition

Moon Walking

Blocks

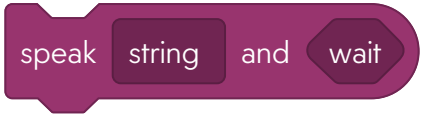
MOONWALKING

Earth isn't the only planet that has a moon. Can you identify and navigate to the other moons

1. Scan the QR Code to create a block program.
2. Place your robot on Earth's Moon.

3. Aim your robot.
4. Use the following blocks to program a mission to each planet's moons

EXTENSIONS

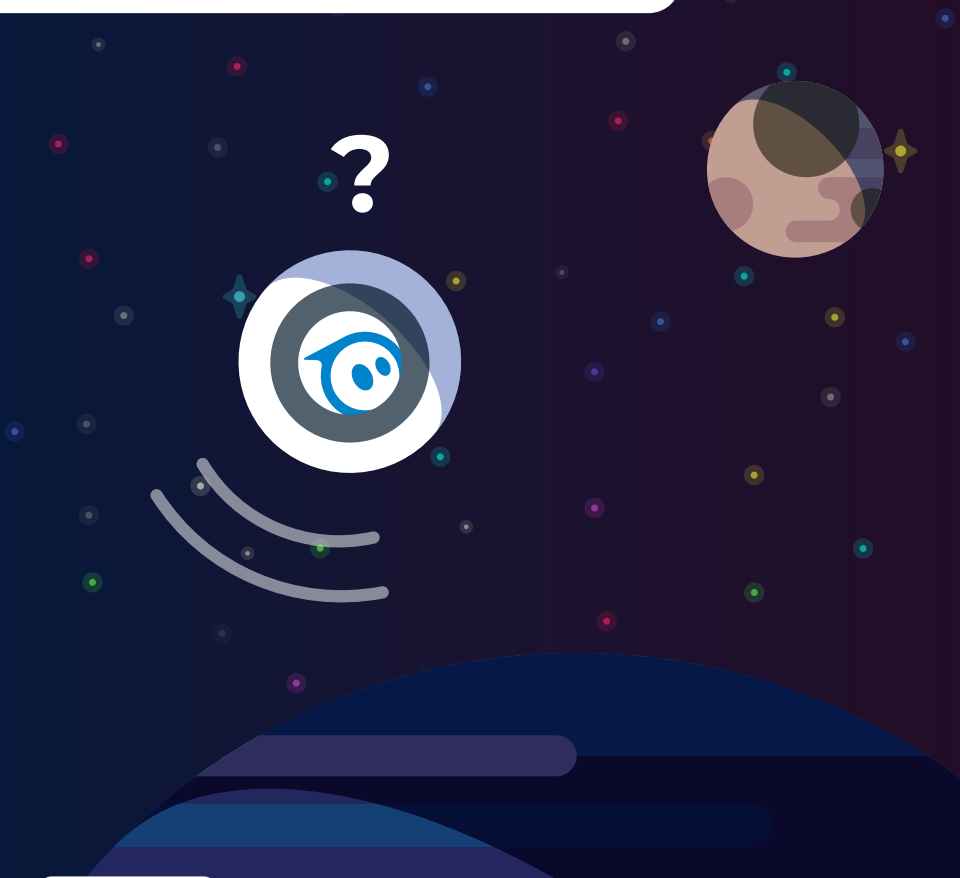


Research each moon, and use the speak block at each moon to share an interesting fact about it.

HIDE AND SEEK

It's easy to get lost in outer space. Play a game of hide and seek with a partner, but don't get lost!

Decomposition



Hide and Seek

Blocks

HIDE AND SEEK

With a partner, take turns programming and playing hide and seek.

1. Place your robot in one of the corner spaces.

2. One person in your group decides on an object on the mat and gives the group an “I Spy” clue.

   Example: I spy a man made object.

3. Using a roll block, program your robot to roll to the secret object.

4. Keep playing until you get the object correct.

ROCKET PAYLOAD

Did you know that it costs about $10,000 to put one pound of payload in Earth orbit?

Decomposition

edu

Rocket Payload

Blocks

ROCKET PAYLOAD

The robot is the rocket, and it has to carry objects into space to complete the mission. Understand how the weight of an object changes its behavior in this engineering challenge.

1. Place your robot on Earth.
2. Scan the QR Code to create a block program.
3. Aim the robot.
4. Use the following blocks to navigate to 3 different objects in the solar system.

EXTENSIONS

Create a physical rocket from craft supplies for the robot to move through space. (craft sticks, straws, pipe cleaners, 18oz cups, etc)

Run the program again

- Did the robot complete the mission as designed?
- Adjust your program so that the robot can transport its new payload.

LOST IN SPACE

Houston, we have a problem! An astronaut is lost on a planet.

Abstraction

Lost in space

Text

LOST IN SPACE

Figure out what planet the lost astronaut is on.

1. Scan the QR code to open the program.

2. Run the program. Shake the robot to see a morse code message.

3. Record the morse code transmission. Letters will alternate between red and blue to indicate when the letter changes.

Example:

MARS — — •— •—• •••

4. Transmission will loop until you tilt the robot 45 degrees to the right when it gives you the choice.

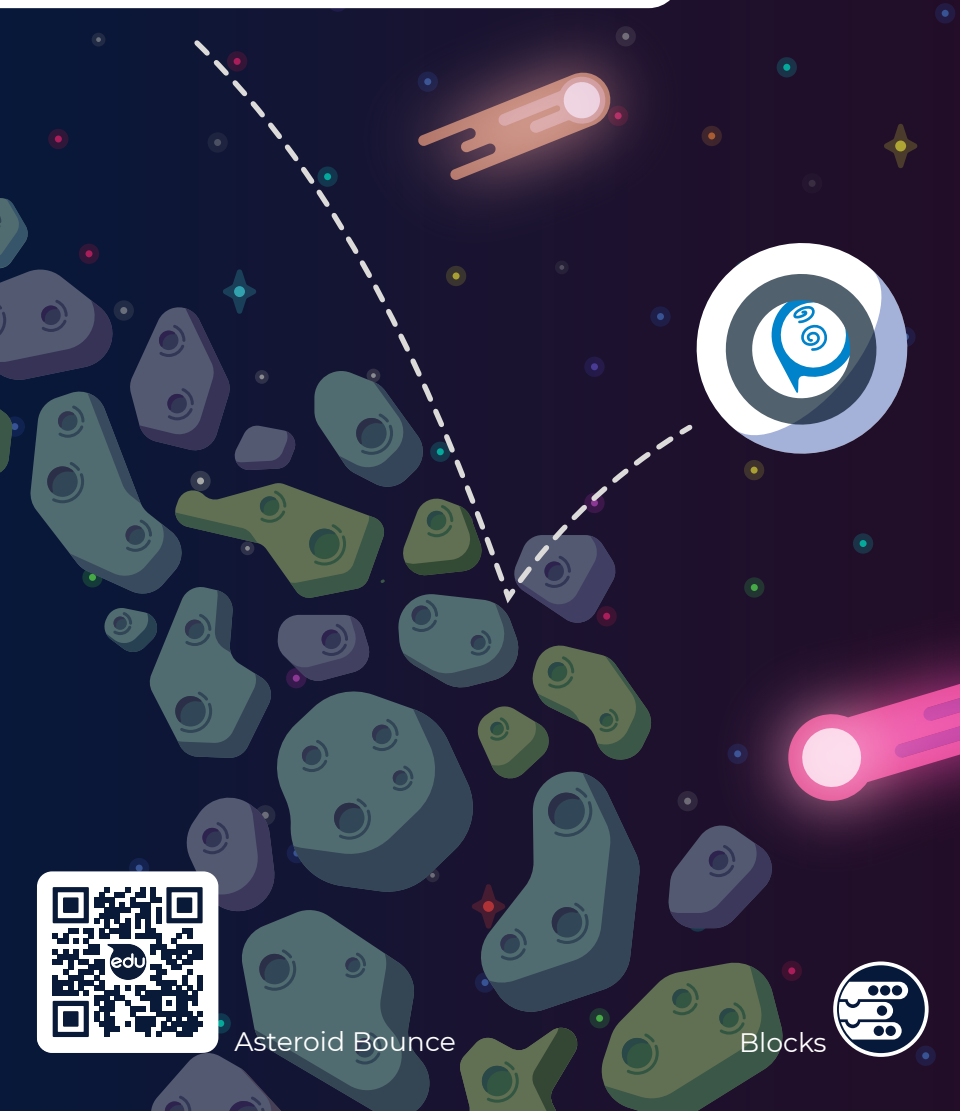
5. Place the robot on the lost astronaut’s planet.

A •—	**H** ••••	**O** ———	**V** •••—
B —•••	**I** ••	**P** •——•	**W** •——
C —•—•	**J** •———	**Q** ——•—	**X** —••—
D —••	**K** —•—	**R** •—•	**Y** —•——
E •	**L** •—••	**S** •••	**Z** ——••
F ••—•	**M** ——	**T** —	
G ——•	**N** —•	**U** ••—	

ASTEROID BOUNCE

The robot hits an asteroid and spins out of control! Get it back on course to make it to a target planet.

Abstraction



Asteroid Bounce

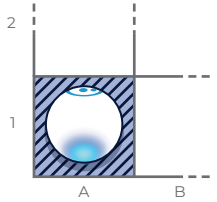
Blocks

ASTEROID BOUNCE

1. Scan the QR Code to open the program.

2. Place your robot inside grid A1.

3. Aim the robot so the blue light faces the letter A



4. Run the program to see what happens.

5. Reset the robot.

6. Choose your target planet and run the program. After the asteroid belt spin out, manually aim the robot during the countdown to try and get it to land on your desired planet.

EXTENSIONS

To play this as a game, use two robots and two devices. Press start at the same time, and the first robot to land on the desired planet wins!

ROCKET LAUNCH

Don't overshoot it, you might get lost in space!

Algorithm Design

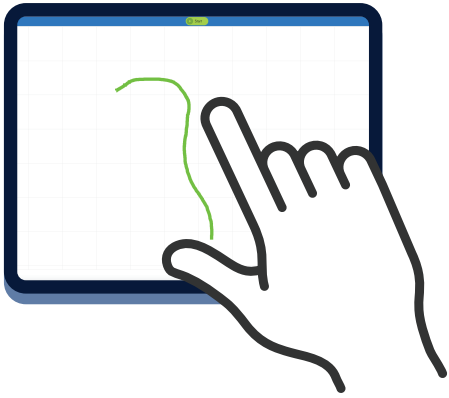
Rocket Launch

Draw

ROCKET LAUNCH

NASA has just appointed you as the mission director for an all new space exploration mission.

1. Place your robot on Earth.
2. Scan the QR Code to create a draw program.
3. Aim your robot.
4. Draw a rocket launch path to a celestial object to explore and return to earth.



SAVE THE PLANETS

There are meteoroids threatening all of the planets and the robot is the only craft that can save the solar system.

Algorithm Design

Save the Solar System

Blocks

SAVE THE PLANETS

Program your robot to land on all 7 meteoroids and spin it off course.

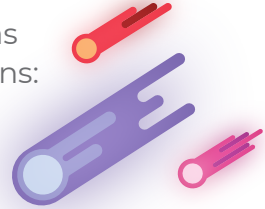
1. Place your robot on Earth.

Earth

2. Scan the QR code.

3. Aim your robot so that the blue light is pointed to the bottom of the mat.

4. Using the blocks on the canvas complete the following motions:



- ***travel to a meteoroid***

- ***spin your robot so the meteoroid goes off course***

- ***pause before spinning and before travelling to the next meteoroid***

EXTENSIONS

Program an animation wit1h the robot LEDs to simulate destroying the meteoroid.

PLANETARY FACTOIDS

Is Pluto a planet?!? My Very Excited Mother Just Served Us Nine Pizzas!

Algorithm Design

Planetary Factoids

Blocks

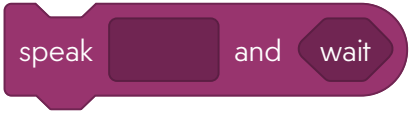
PLANETARY FACTOIDS

Using your robot, program a trip to all of the planets and share a fun fact about each planet.

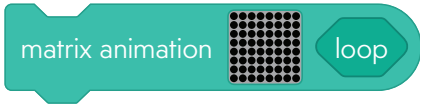
1. Scan the QR Code to create a block program.

2. Program your robot to roll to each planet.

3. Use a speak block to announce the planet your robot lands on.



4. Use a Main LED or Matrix animation block to match the planet's properties.

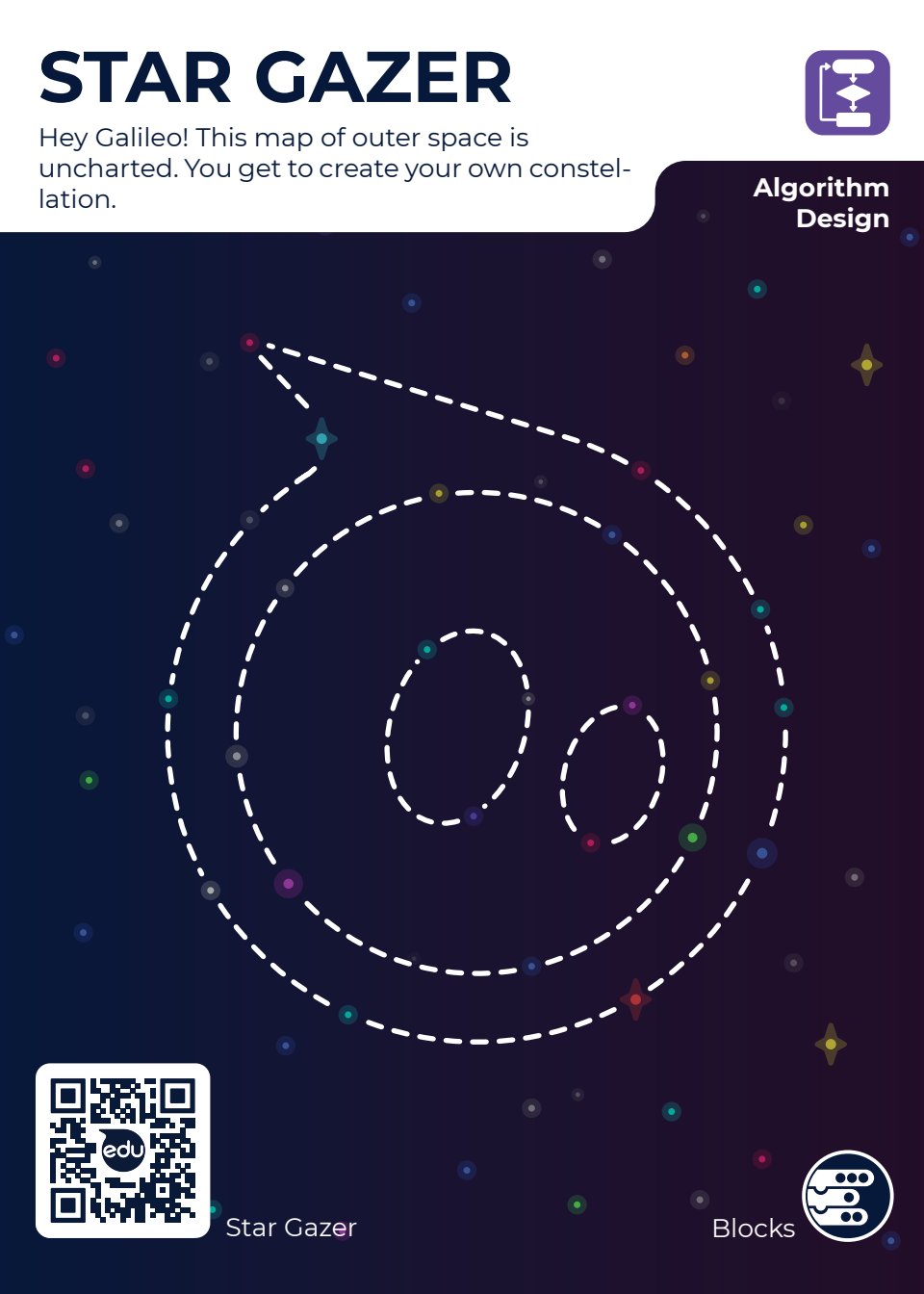


5. Use another speak block to give a factoid.

STAR GAZER

Hey Galileo! This map of outer space is uncharted. You get to create your own constellation.

Algorithm Design



Star Gazer

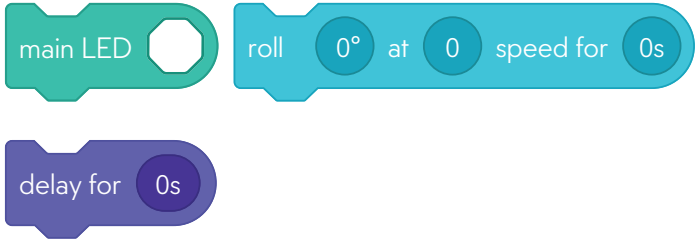
Blocks

STAR GAZER

1. Scan the QR Code to create a block program.

2. Decide which stars on the mat you want to be a part of your constellation.

3. Using the main LED, roll and delay blocks, program your constellation.



4. Look at the Location Data to see what your constellation looks like!

EXTENSIONS

Using a long exposure camera or app, do some light painting of your constellation.

FLIGHT PLAN

Spacecraft traveling in space can't fly through planets. Utilize effective mission planning to navigate to all spacecraft in orbit.

Algorithm Design

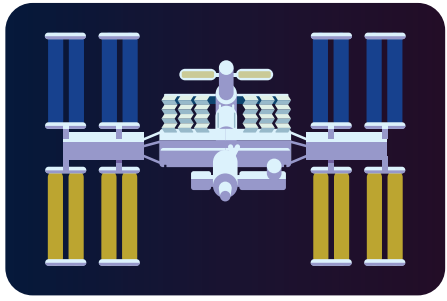
Flight Plan

Blocks

FLIGHT PLAN

Use the key in the lower corner to find all of the spacecrafts. Program your Sphero Robot to each spacecraft location on the map without touching a planet or its moons.

1. Place your robot on the International Space Station (ISS).



2. Aim your robot.

3. Using roll blocks and delay blocks, program your Sphero robot to get to each spacecraft on the map.

Hint: There are 7 different spacecrafts. (not including the Sphero crafts)