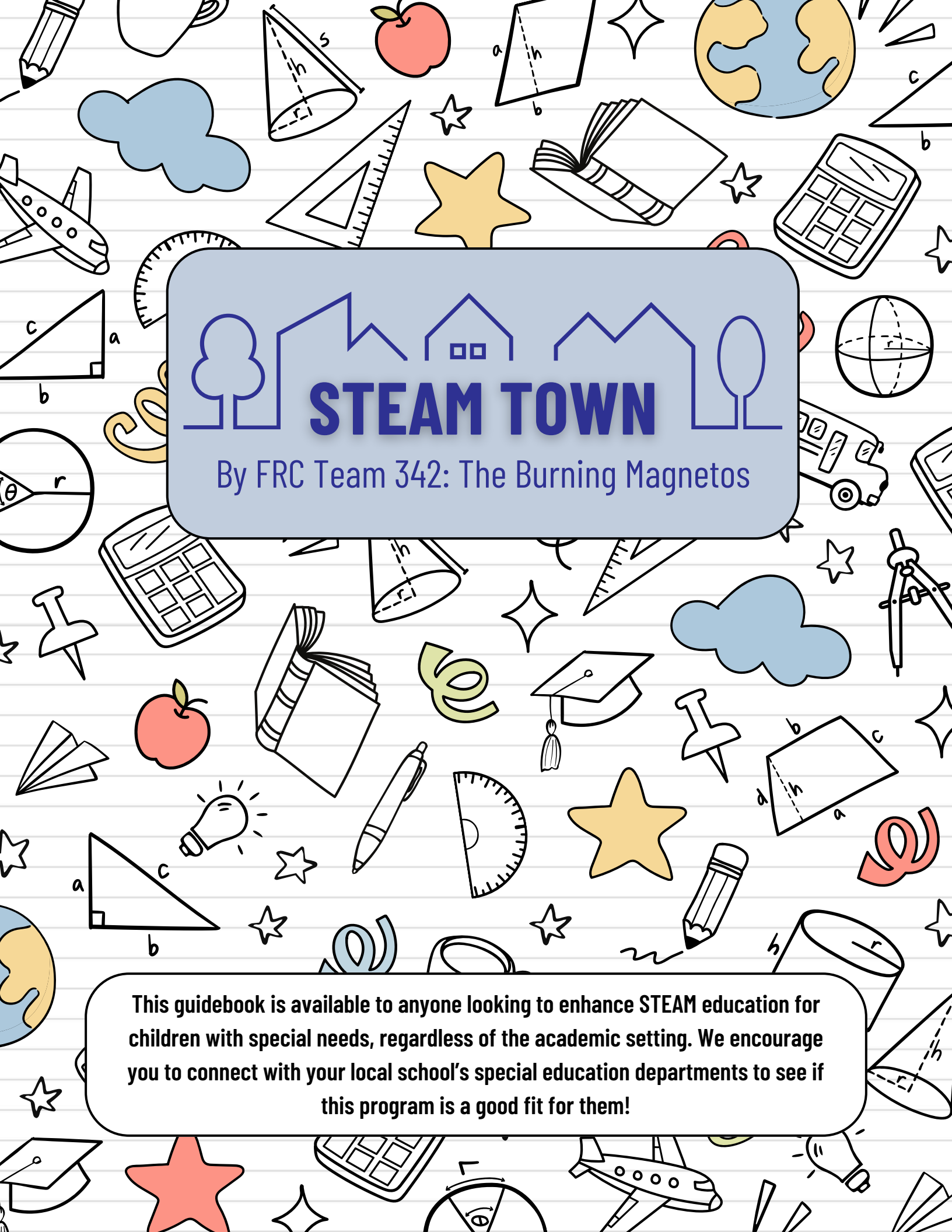


STEAM TOWN

By FRC Team 342: The Burning Magnetos

This guidebook is available to anyone looking to enhance STEAM education for children with special needs, regardless of the academic setting. We encourage you to connect with your local school's special education departments to see if this program is a good fit for them!

STEAM TOWN

By FRC Team 342: The Burning Magnetos

Wenn Sie die deutsche Version dieses Handbuchs wünschen, senden Sie uns bitte eine E-Mail an burnemedia@gmail.com

STEAM TOWN

By FRC Team 342: The Burning Magnetos

TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUED

STEAM TOWN

By FRC Team 342: The Burning Magnetos

MISSION

To expand access to STEAM education to underserved special education programs across the globe.

VISION

To bring excitement to STEAM education and promote inclusion by teaching STEAM skills to students who face unique learning challenges and students in special education programs.

SPONSORS

TEAM THE BURNING MAGNETOS 342

The Magneto Project

FD

STEAM TOWN

By FRC Team 342: The Burning Magnetos

Curriculum Overview and Recognitions

What is STEAM Town?

STEAM Town is a unique 1-3 day experience designed to create opportunities for special education students, sparking curiosity and introducing them to the world of STEAM. You can mix and match any of our six town-themed activities to create a one of a kind learning journey - or dive in and explore all six for the ultimate STEAM experience!

Why should you introduce STEAM Town to your school?

Science, Technology, Engineering, Art, and Mathematics (STEAM) should not be limited to any one group of students. This program will not only help teach hard and soft STEAM skills to students in SPED classrooms, but it will also teach your student mentors/facilitators leadership skills and core values, like; Gracious Professionalism, cooperation, compassion, etc..

Skills gained from this experience will broaden a student's knowledge and understanding of STEAM related extracurriculars, allow students to become career ready, and also help to build their college résumés.

Other programs we recommend:

If you are looking to continue STEAM education after our STEAM Town program, we highly recommend incorporating FIRST® LEGO® League (FLL). Team 342 has found great success with FLL Explore in their high school SPED classroom, making it a valuable learning experience for all students involved!

STEAM TOWN

By FRC Team 342: The Burning Magnetos

CURRICULUM BREAKDOWN

1. Theme Park Adventure - with Ozobots
2. Traverse the Town - with Sphero Bolts
3. Buoyancy Boats
4. Save the Town
5. Race to the Market
6. Arts and Craft Station

MEET THE TEAM!

This guidebook was written by mentors & students of FRC Team 342: The Burning Magnetos!

Our team is passionate about making STEAM education accessible to all, regardless of their circumstances. Through our team's partnership with Fort Dorchester High School's Special Education program, we have worked to ensure that every student has the opportunity to experience the excitement of science, technology, engineering, art, and mathematics in a way that may have previously been unavailable to them. The experiences our team has gained by working with our school's Special Education department and its students have *sparked* a deeper commitment to inclusivity, *attracting* us to new ways of making STEAM education a reality for everyone. No matter the challenges we face, our passion for spreading STEAM continues to *ignite* new opportunities for learning, ensuring that no student is left behind from the power of innovation.

STEAM TOWN

By FRC Team 342: The Burning Magnetos

Getting Started

BREAKDOWN

Theme Park Adventure with Ozobots - Total: $364

- Evo Entry Kit (x2): $350
- How to Code a Rollercoaster Book: $14

Traverse the Town with Sphero Bolts - Total: $578

- Sphero BOLT+ Single Robot (x2): $398
- Code Mat - City: $180

Buoyancy Boats - Total: $64-$69

- Aluminum Foil (125ft): $10
- Large Bin (x1): $25
- Weight Kit (x1 Imperial OR x1 Metric): $29 OR $34

Save the Town - Total: $50

- Assorted Popsicle Sticks (x1): $24
- Play-Doh: $26

Race to the Market - Total: $55-$75

- Duplo Brick Box and Duplo F1 Team Race Cars & Drivers: $75
- Lego Creative Vehicles Kit: $55

Binary Code Bracelets - Total: $26

- 0.8mm Nylon String: $7
- Multicolored Plastic Beads: $19

Airplane Kit - Total: $29

- Biodegradable Straws: $13
- Construction Paper: $6

Button-making Supplies - Total: $43

- Button Maker Machine: $43

Physical Copy of the STEAM Town Guidebook - Total: $10

STEAM TOWN

By FRC Team 342: The Burning Magnetos

STEAM Town Materials Kits* - Total: $520 - $730**

- **Kit 1: $520*****
  - Theme Park Adventure - with Ozobots
  - Save the Town & Race to the Market
  - Airplane Kit
- **Kit 2: $550*****
  - Theme Park Adventure - with Ozobots
  - Buoyancy Boats & Race to the Market
  - Button-making Supplies
- **Kit 3: $730**
  - Traverse the Town - with Sphero Bolts
  - Save the Town & Race to the Market
  - Binary Code Bracelets

Please note: STEAM Town Materials Kit request will not be processed until full payment has been received or your application for the "STEAM Town Materials Kit Grant" has been approved.

For payment, you may either

- Email your kit request along with your preferred payment method (e.g., Zelle, PayPal, check).

OR

- Send a check made payable to "Team 342 Robotics Foundation" for the appropriate amount. Checks should be mailed to the following address:

Team 342 Robotics Foundation
110 Arithmetic Ct
Ladson, SC 29456

The amounts provided in this cost analysis are estimates and may vary due to shipping costs, as well as your specific state, region, or country. All amounts referenced are in **USD**. Additionally, you are **not required** to purchase materials from us.

*If you'd like to make any modifications to the activities in the kits, please calculate the updated total based on the prices outlined in the “Breakdown” sheet. Be sure to also specify which activities you are adjusting in your email/letter.
**Add $25 to your total if you would like a physical copy of our STEAM Town guidebook.
***Add $14 to your total if you would like a physical copy of “How to Code a Rollercoaster”.

STEAM TOWN

By FRC Team 342: The Burning Magnetos

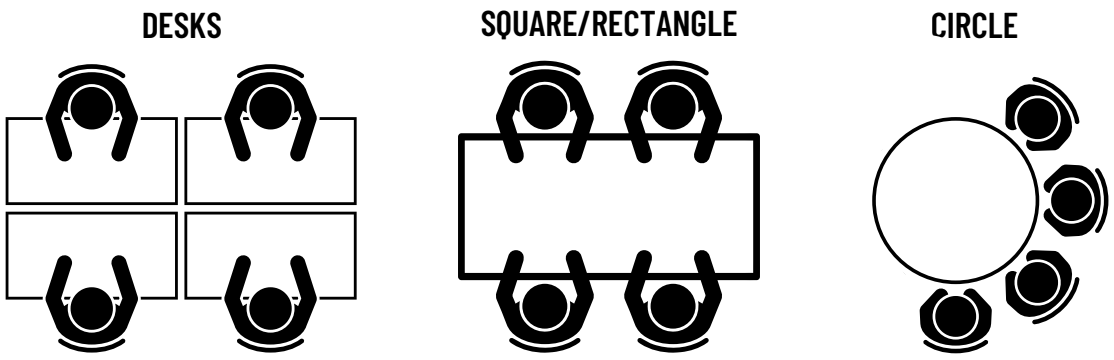
SETTING UP

Group Sizes:

- **Student Mentors:** 2 mentors per group of 4 or fewer students.
- **Faculty Support:** At least 1 special education teacher should be present to assist students needing accommodations.

Room Setup*:

- **Desks:** Arrange 4 single-student desks pushed together to form a shared workspace **(see "Desks" for orientation guide)**.
- **Table Configurations:**
  - Square/Rectangle: 4 students total—2 on each side, facing each other **(see "Square/Rectangle" for details)**.
  - Circle: Students should be seated in a semicircle for a clear view of the instructing students **(see "Circle" for details)**.



Activity Setup:

Preparation & Setup Tips

To ensure smooth transitions and minimize downtime:

- Stage materials in advance by organizing labeled bins with all necessary supplies.
- Pre-read any instructional packets or materials to familiarize yourself with the activities.
- Set up activity stations ahead of time to keep the session running efficiently.

By following these guidelines, you can create a well-structured and engaging learning experience for all participants.

GROUP & ROOM SET UP CONT.

We recommend the following balance of activities to fill 2 class periods**:

- 1 long activity: 45-60 minutes
- 2 medium activities: 30-45 minutes per activity
- 1-2 crafts: 15-30 minutes per activity

Use a timer to indicate when groups should rotate activities. Allow 2-3 minutes for cleanup and resetting activities at the next groups table.

Group Rotation Instructions

- Divide students into groups, ensuring each group starts with a different activity.
- Groups should rotate activity bins clockwise once all students have competed their current activity.***

Tips Before Getting Started:

Safety Briefing: Explain the activity's purpose and outline any safety precautions, such as handling liquids or small items carefully.

Simplify Language: Use clear and straightforward language in all instructions and discussions.

Be Patient and Flexible: Allow extra time for each step and be prepared to adapt the activity to meet individual needs.

Section Notes:

*Your classroom can be arranged in various ways. If none of the suggested seating work for your group, configure the learning space as needed ensuring there is enough room for student mentors to guide the activities.

**We suggest starting STEAM Town after lunch to allow students ample time for preparation, and continuing the program until the end of the school day (roughly 3hrs).

***You can pair two different craft stations together to fill up time while waiting for a long stations to be completed.

STEAM TOWN

By FRC Team 342: The Burning Magnetos

Theme Park Adventure - with Ozobots!

INTRODUCTION

This lesson introduces students to all the various color codes the Ozobot Evo recognizes. Students explore basic computer science principles with the book "how to CODE a rollercoaster" and recreate the various rides through different color commands. In addition, students explore language arts concepts through their interactions with the book. This lesson can be adapted to the number of days or time available with your students by excluding some of the rides from the activity.

MATERIALS

- "How to Code a Rollercoaster" by Josh Funk
  - Link to the Read Aloud: *https://www.youtube.com/watchv=kUuR_mQ7o9Q&ab_channel=Tuesday.with.Tausha*
- Link to PowerPoint
  - https://docs.google.com/presentation/d/167mAjkw69mt9tWiynOXfRsjOEQGySvmU/edit?usp=sharing&ouid=117263584157777164719&rtpof=true&sd=true
- Ozobot Evo
- Ozo Color Codes (1 for each student)
- Color Markers
- Activity Packet (https://drive.google.com/file/d/1tNkhBsl1ZwFkmaFcn2p7sXEAPfGAf510/view)
  - Activity Answer Key (https://drive.google.com/file/d/1AT098_GaCezfAc-ECOgeHSG2IxQWu8fw/view)

Color Codes | Chart

Speed

Short Super Slow	Slow	Cruise	Fast	Turbo	Nitro Boost
					
R G B	RBKR	GBKG	BBKB	B G B	B G R

Direction & Special Moves

Left at Intersection	Straight at Intersection	Right at Intersection	Line Switch Left	Line Switch Straight	Line Switch Right
					
GBKR	B BKR	B R G	G R G	G B G	R G R

U-Turn	U-Turn (line end)	Tornado	Zigzag	Spin	Backwalk
					
B R B	B R	R G R G	B BK G R	G R G R	R G BK B

Timers

Pause (3 sec.)	Timer on (30 sec. to stop)	Timer off
		
R B R	RBK BG	G BBKR

Wins/Exits

Win/Exit (Play Again)	Win/Exit (Game Over)
	
G B	G R

Counters

See reverse for definitions

Enable X-ing Counter	Enable Turn Counter	Enable Path Color Counter	Enable Point Counter	Point +1	Point -1
					
G R B G	R B G B	R G B R	R B R G	R B G	G B R

Key: **BK** = Black **B** = Blue **G** = Green **R** = Red

Speed

Speed codes change your Ozobot's velocity from Short Super Slow (slowest) to Nitro Boost (fastest).

- **Short Super Slow**
A three-second dose of super slow speed.
- **Slow**
A slow speed command effective until the bot reads a new speed code or is turned off.
- **Cruise**
The default speed command.
- **Fast**
A high speed command effective until the bot reads a new speed code or is turned off.
- **Turbo**
An extra high speed command effective until the bot reads a new speed code or is turned off.
- **Nitro Boost**
A three-second dose of Ozobot's highest speed.

Short Super Slow (slowest) > Slow > Cruise (default) > Fast > Turbo > Nitro boost (fastest)

Cool Moves

Cool Move codes tell your Ozobot to bust a move!

- **Tornado**
A command to spin around twice at increasing speed, then continue following the line in the same direction.
- **Zigzag**
A command to sway right-left-right-left while moving forward, then continue moving straight.
- **Spin**
A command to spin around twice at a consistent speed, then continue following the line in the same direction.
- **Backwalk**
A command to quickly turn 180 degrees, wiggle backwards for one second, then turn 180 degrees again and continue following the line in the same direction.

Timer

Timer codes tell your Ozobot to pause or count seconds.

- **Timer On (30 sec. to stop)**
A command to make your Ozobot countdown from 30 sec., but continue to move and read codes while counting down. Ozobot will flash its light(s) at a rate of one flash/sec., flash rapidly to signify time is up, then shut off.
- **Timer Off**
A command to stop counting down seconds and return to default behavior.
- **Pause (3 sec.)**
A command to stop moving for three seconds, then continue with default behavior.

Direction

Direction codes tell your Ozobot what to do at an intersection.

- **Left at Intersection**
A command to turn left at the next intersection.
- **Straight at Intersection**
A command to continue straight at the next intersection.
- **Right at Intersection**
A command to turn right at the next intersection.
- **Line Switch Left**
A command to immediately turn 90 degrees to the left, move forward to a new line, then make a random turn to follow along the new line.
- **Line Switch Straight**
A mid-line command to continue straight after the line ends. The code will not work if Ozobot encounters an intersection before the line ends.
- **Line Switch Right**
A command to immediately turn 90 degrees to the right, move forward to a new line, then make a random turn to follow along the new line.
- **U-Turn**
A mid-line command to turn around 180 degrees and follow the same line in the opposite direction.
- **U-Turn (Line End)**
A line-end command to turn around 180 degrees and follow the line in the opposite direction.

Ozobot's default intersection behavior is random. If a given turn, i.e.'Go Left' is not possible, Ozobot defaults back to random behavior.

Counters

Counter codes tell your Ozobot to count five intersections, turns, or line color changes.

- **Enable X-ing Counter**
A command to make your Ozobot stop following lines after it crosses five intersections ('T' or '+' intersections). After the fifth intersection, Ozobot executes a "done" maneuver, stops following the line, and blinks red.
- **Enable Turn Counter**
A similar command to the Enable X-ing Counter, except that Ozobot only counts intersections where it makes a turn. It will not count intersections where it continues straight. Ozobot can randomly choose to go straight at an intersection, or be commanded to go straight with a "Straight at Intersection" code.
- **Enable Path Color Counter**
A command to make your Ozobot stop following lines after it reads five color changes in the line. If the line Ozobot is following transitions from red to green, it counts as one color change. Transitions to and from black lines are not counted, and color segments less than two centimeters in length are not counted.
- **Enable Point Counter**
A command that tells your Ozobot to count point codes down from five. Each time Ozobot reads a "**Point -1**" code it counts down. After the fifth "**Point -1**" code Ozobot will make a "done" maneuver, stop following lines, and blink red. You can add more to the total count (not to exceed five) with "**Point +1**" codes. You can reset Ozobot by turning it off, then on.

Wins/Exits

Win/Exit codes tell your Ozobot to celebrate its success, then either start over or stop.

- **Win/Exit (Play Again)**
A command to perform a "success" animation, then continue to follow the line.
- **Win/Exit (Game Over)**
A command to perform a "success" animation, then stop following the line.

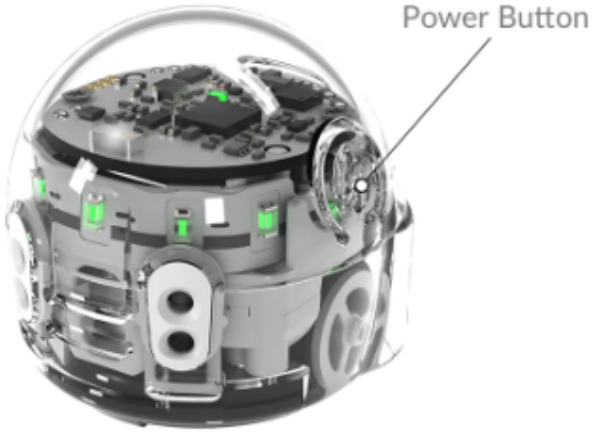
SLIDES

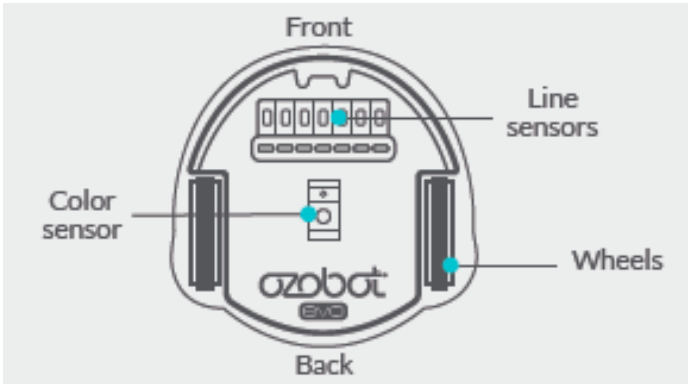
Activity

Today, we're going to give another robot the best day ever at the amusement park. The Ozobot.

Ozobot

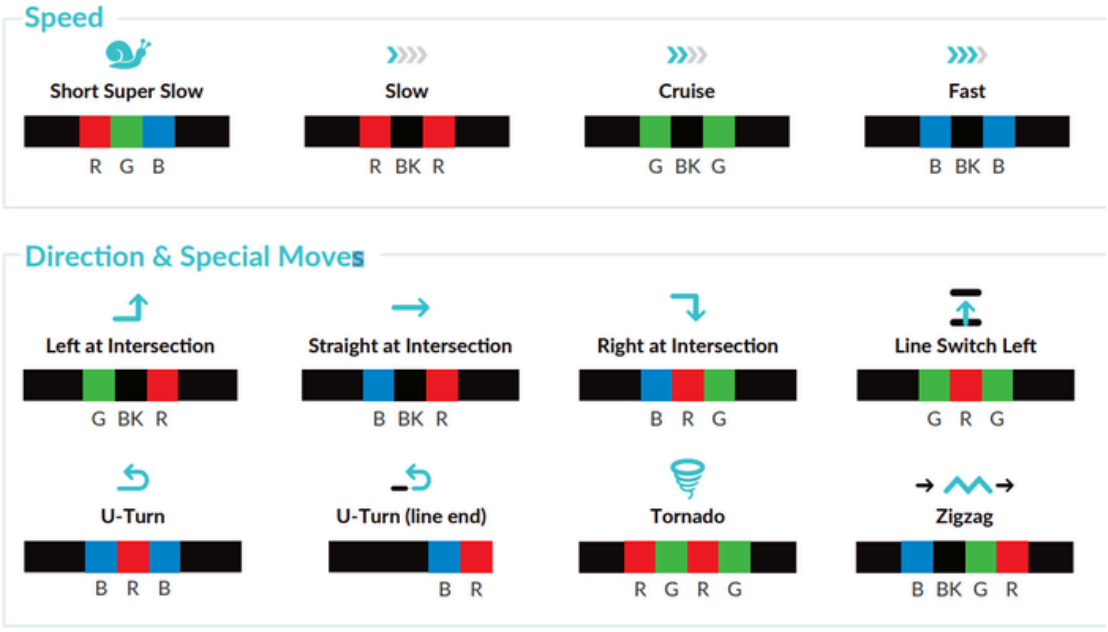
The Ozobot is a miniature robot with wheels, a color sensor, and a line sensor at the bottom.





Ozobot

The Ozobot is pre-programmed to follow lines when turned on. In addition, certain patterns of colors will make the robot perform pre-programmed behaviors.

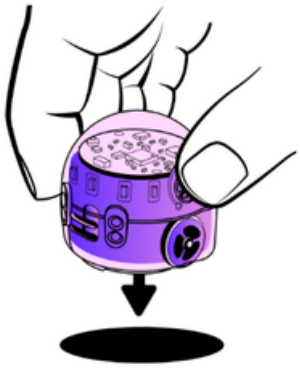


Calibration*

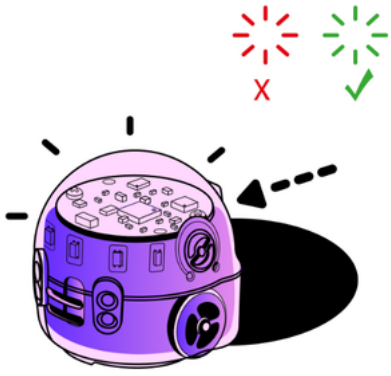
Follow the instructions to calibrate your robot.

Press and hold the button until the light is white

Place the Ozobot on the Calibration Circle



Repeat if you don't get a green light at the end

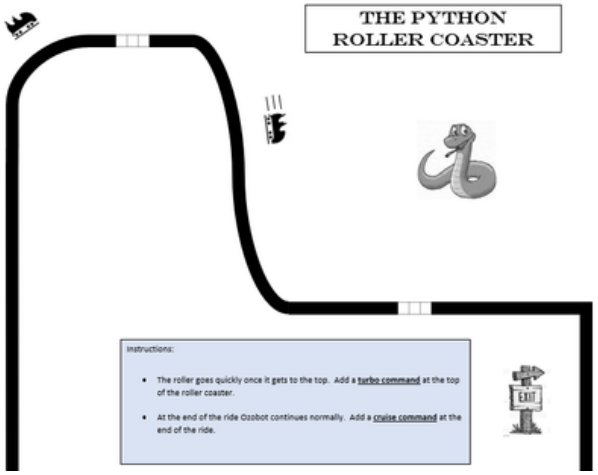


Calibrate: adjust or set up the Ozobot so it can work properly by recognizing its environment—like making sure it can see and follow lines or colors correctly

Python Roller Coaster

Let's have Ozo recreate the Python Roller Coaster

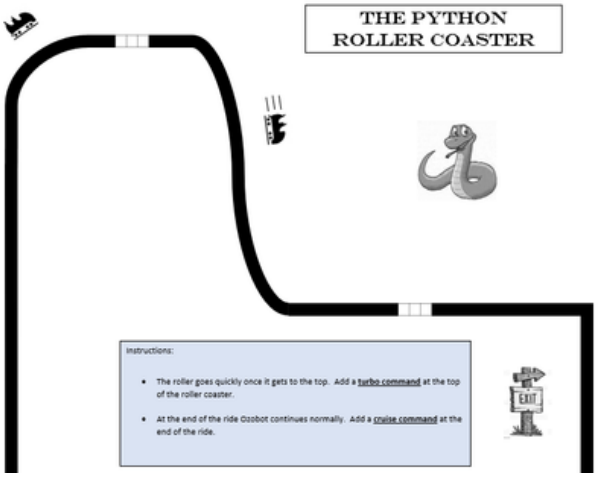
- The roller coaster goes quickly once it gets to the top.
  - What color pattern makes the **TURBO COMMAND**?



Python Roller Coaster

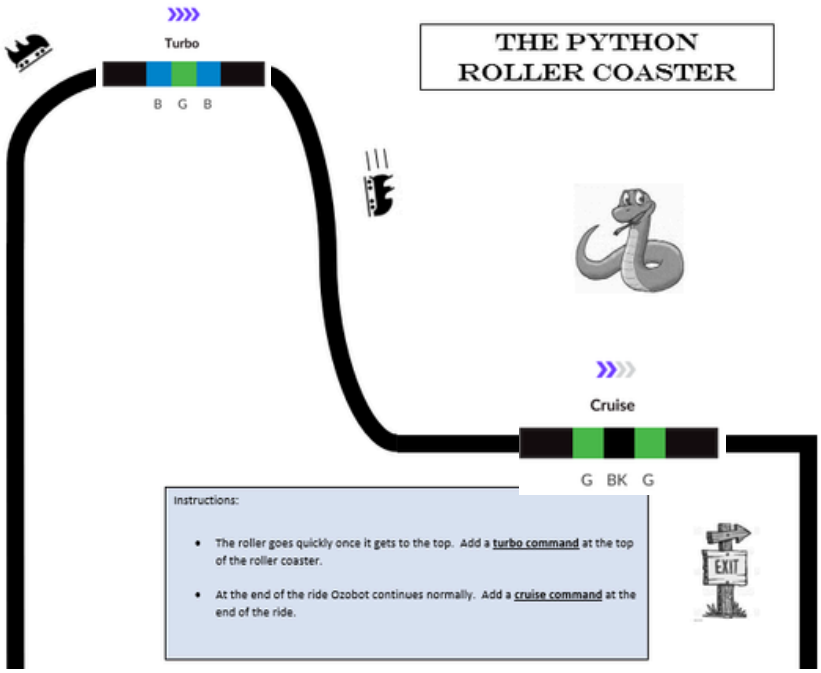
Let's have Ozo recreate the Python Roller Coaster

- At the end of the ride, Ozobot continues normally.
  - What color pattern makes the **CRUISE COMMAND**?



Python Roller Coaster

Start your robot at the ticket stub and test your code. What happens? Give a step-by-step explanation.



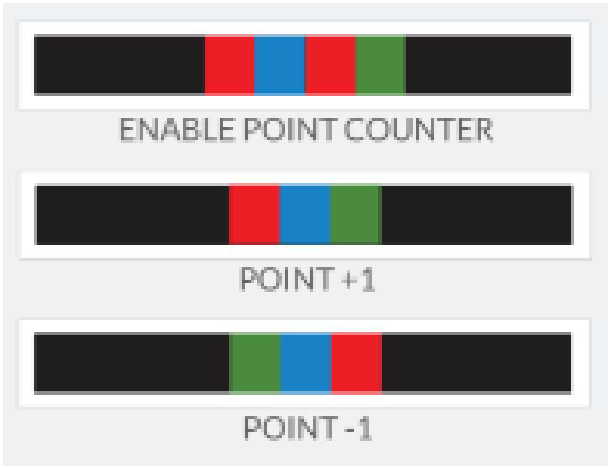
Way's you can help students engage in this portion of the activity is to provide a few suggestions or examples of what might happen and why.

Ozobot

One of the main problems in the story was not having enough tickets for the Python Roller Coaster.

Ozobot

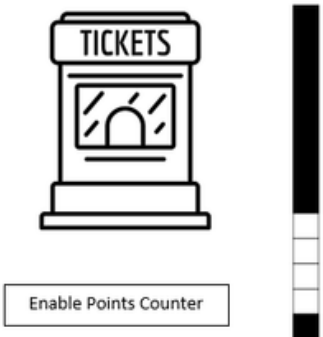
Ozobot also has special commands for creating variables (like the ones we learned about in the story and adding (+) and subtracting (-) numbers.



Ticket Booth

Let's have Ozo visit the ticket booth.

- First, we need to give Ozobot the ability to count tickets. We'll use this command.

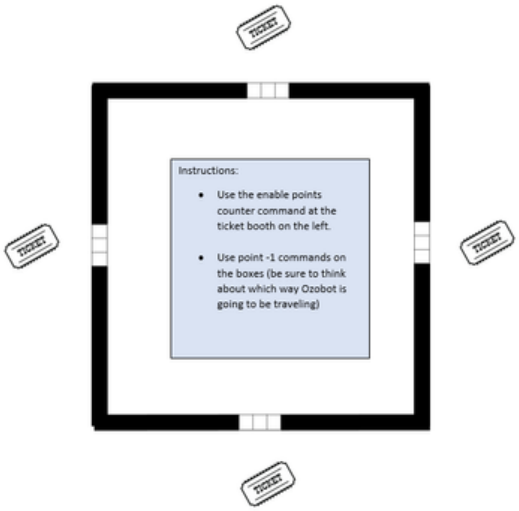


- This gives Ozobot 4 tickets that it can spend.
- This command creates a variable, very similar to **myTokens** in the story.

Ticket Booth

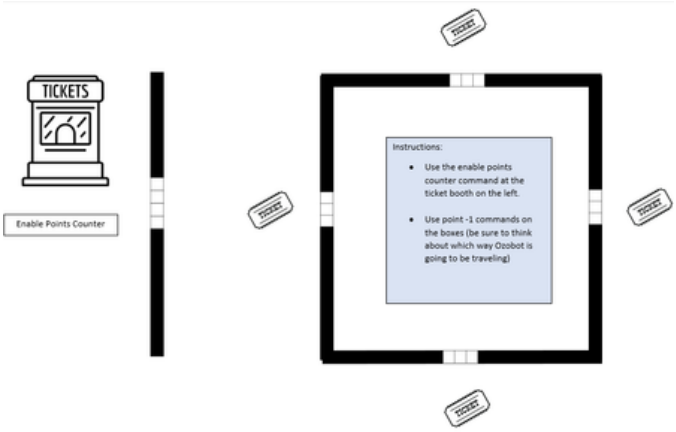
Now that Ozobot has its tickets. Let's see what happens when it spends all of its tickets.

- Use the point - 1 command at each ticket.



Ticket Booth

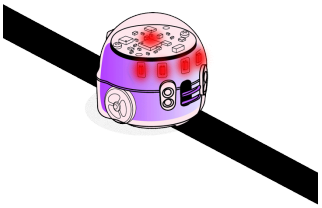
Start your Ozobot at the ticket booth to get its tickets. When it reaches the end of the line, move the Ozobot to the loop with tickets.



What happens? Give a step-by-step explanation.

Log Flume

Whatever color line Ozobot is on, will change his light.

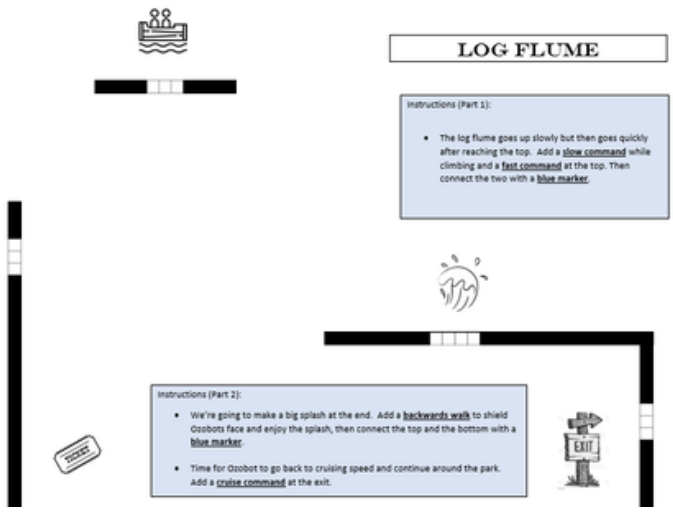


Red lines give Ozobot a red light, green lines give Ozobot a red light, blue lines give Ozobot a blue light and black lines give Ozobot a white light.

Log Flume

Let's have Ozo recreate the Log Flume

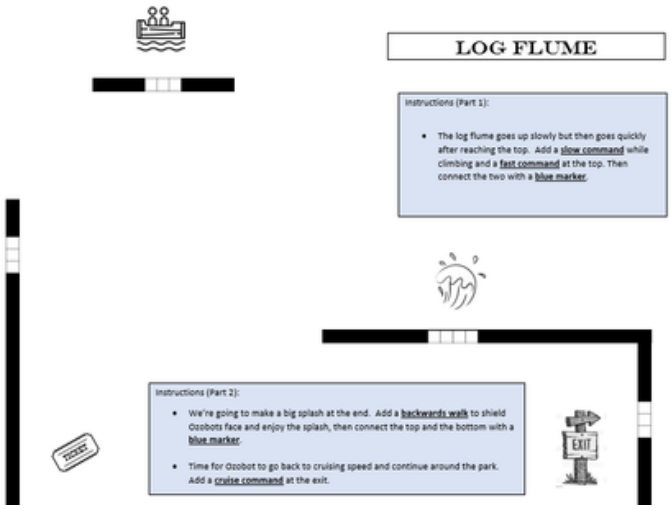
- The log flume goes up slowly to start.
  - What color pattern makes the **SLOW COMMAND**?



Log Flume

Let's have Ozo recreate the Log Flume

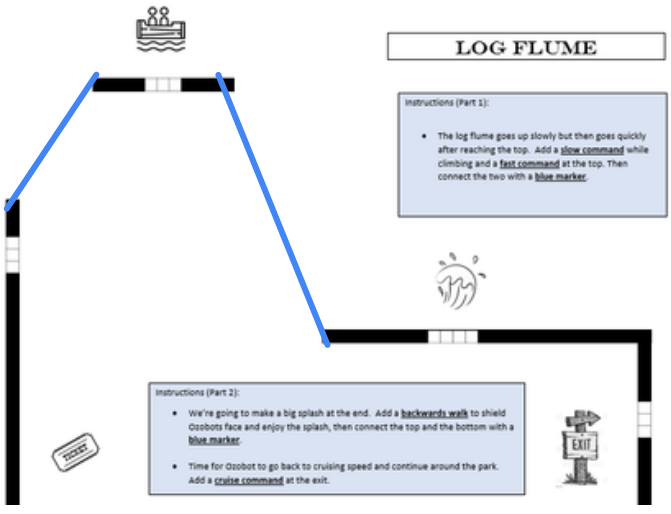
- The log flume goes fast at the top.
  - What color pattern makes the **FAST COMMAND**?



Log Flume

Let's have Ozo recreate the Log Flume

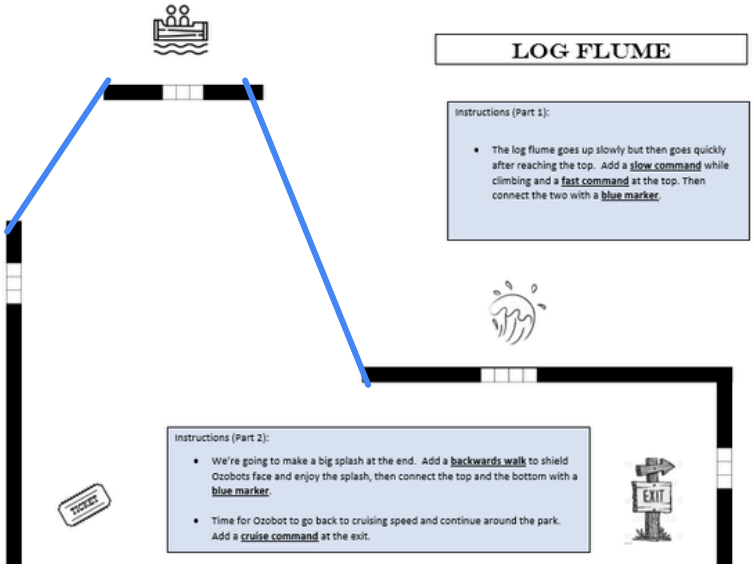
- Now we want to have the Ozobot make a splash!
  - What color pattern makes the **BACKWALK COMMAND**?



Log Flume

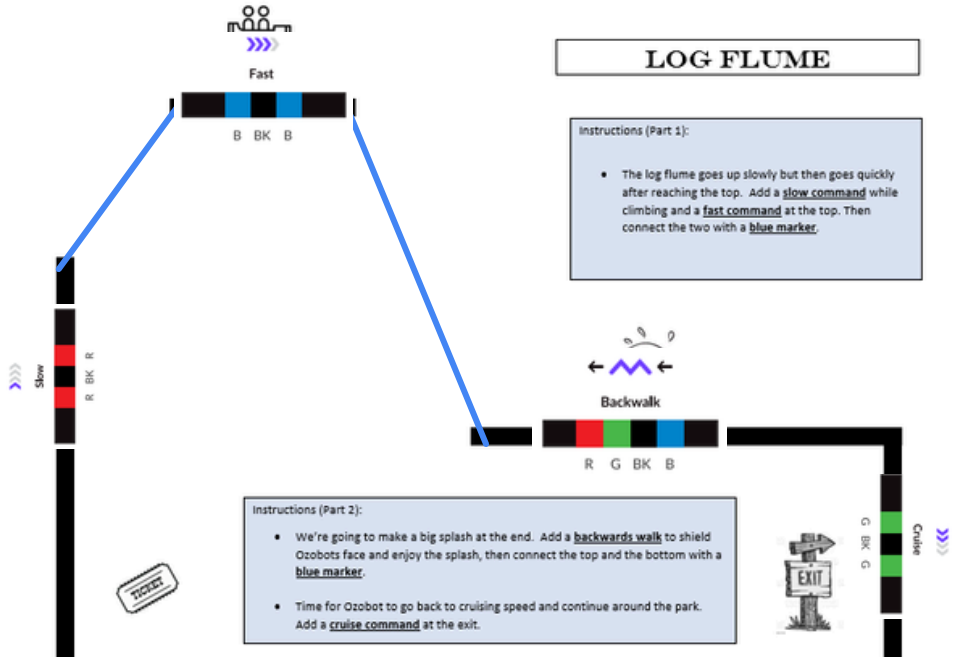
Let's have Ozo recreate the Log Flume

- Now we need our Ozobot to continue on its way.
  - What color pattern makes the **CRUISE COMMAND**?



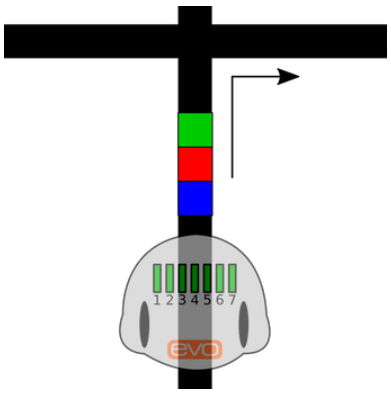
Log Flume

Start your robot at the ticket stub and test your code. What happens? Give a step-by-step explanation.



Teacup

When Ozobot gets to an intersection - a divide in a path where two or more streets cross each other -, it's a random chance of what he does.



We can use directional commands to specify which way we want the Ozobot to go at an intersection

Teacup

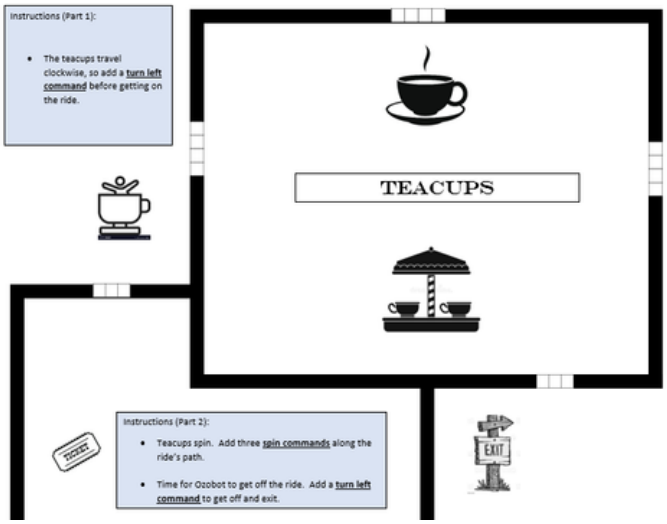
We have three direction commands.

Don't use the "Line Switch" commands, we'll talk about those later.

Teacups

Let's have Ozo recreate the Teacups

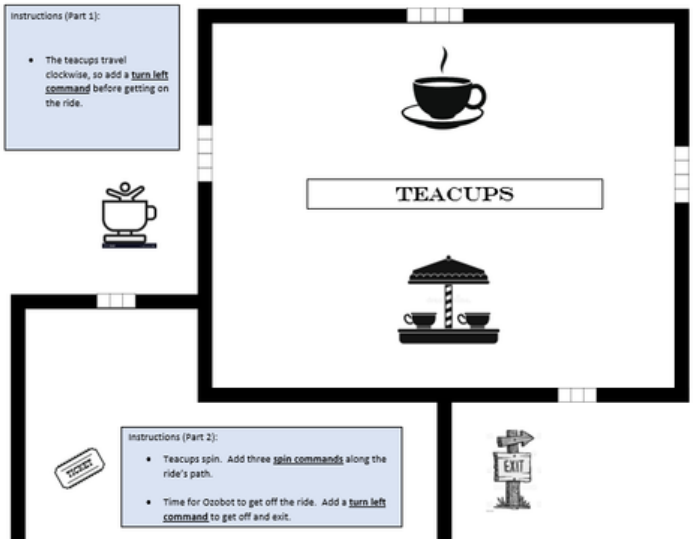
- To get on the ride, the Ozobot has to turn left.
  - What color pattern makes the **LEFT AT INTERSECTION**?



Teacups

Let's have Ozo recreate the Teacups

- Now we need to make our teacups spin three times.
  - What color pattern makes the **SPIN COMMAND**?



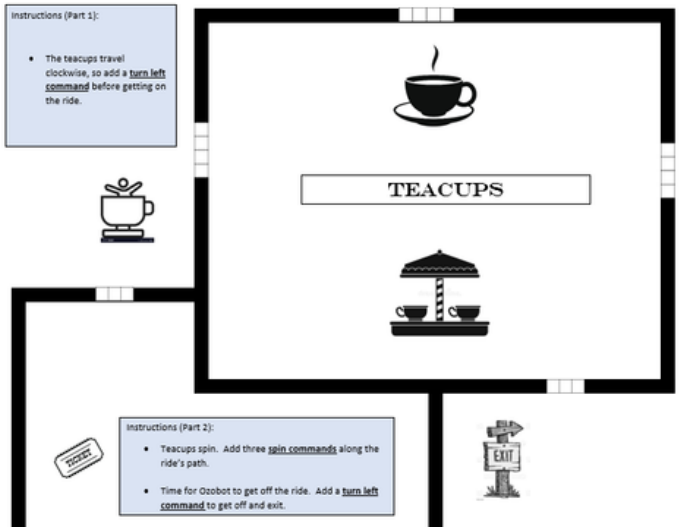
STEAM TOWN

By FRC Team 342: The Burning Magnetos

Teacups

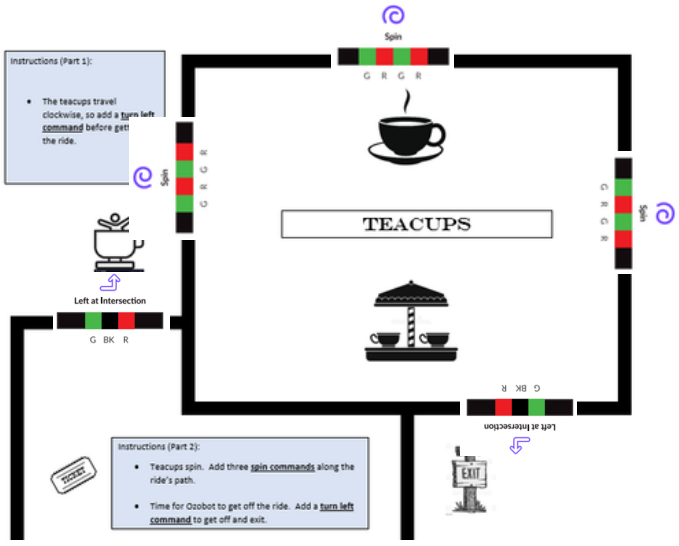
Let's have Ozo recreate the Teacups

- Now the Ozobot needs to get off the ride.
  - What color pattern makes the **LEFT AT INTERSECTION COMMAND**?



Teacups

Start your robot at the ticket stub and test your code. What happens? Give a step-by-step explanation.

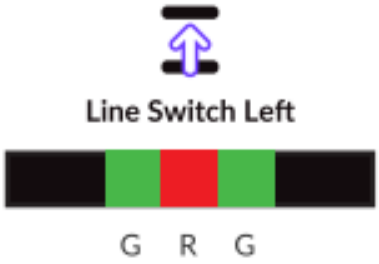


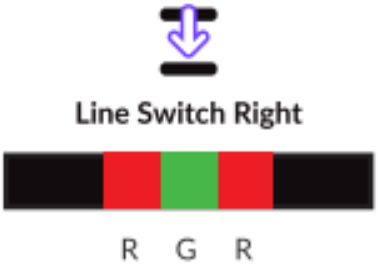
STEAM TOWN

By FRC Team 342: The Burning Magnetos

De-Bugger

Ozobot is also able to jump between lines with his line switch commands.

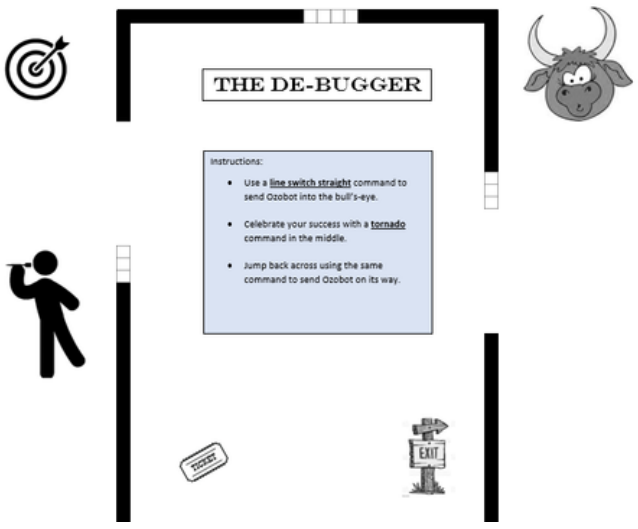




De-Bugger

Let's have Ozo recreate the De-Bugger

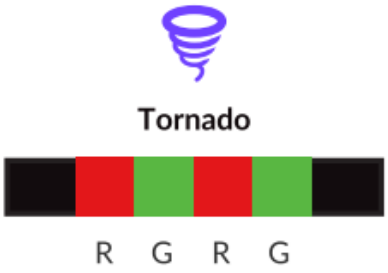
- For the De-bugger, we need to throw the Ozobot to the bulls-eye.
  - What color pattern makes the **LINE SWITCH STRAIGH COMMAND**?

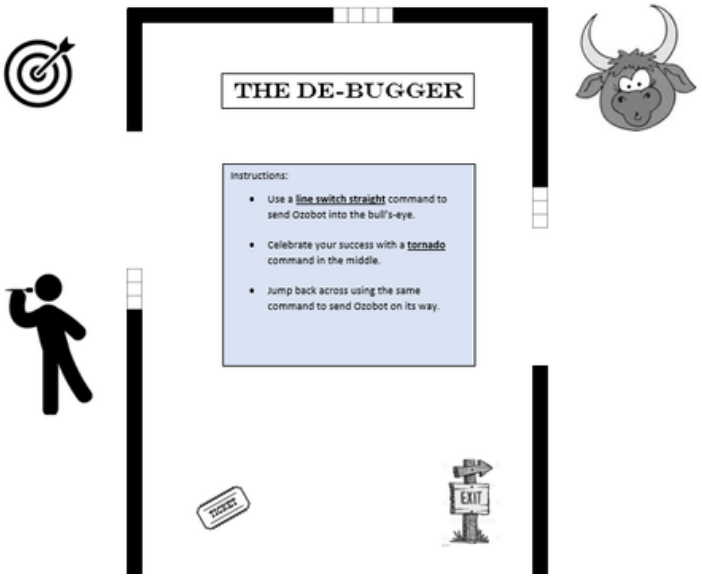


De-Bugger

Let's have Ozo recreate the De-Bugger

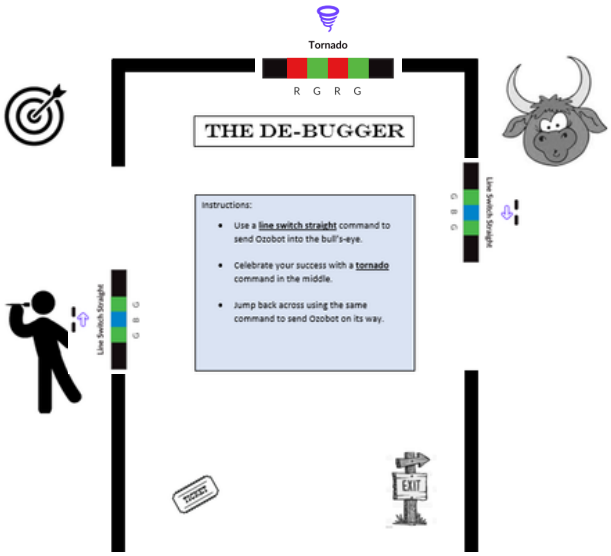
- Afterwards, the Ozobot needs to celebrate!
  - What color pattern makes the **TORNADO COMMAND**?





De-Bugger

Start your robot at the ticket stub and test your code. What happens? Give a step-by-step explanation.



STEAM TOWN

By FRC Team 342: The Burning Magnetos

Traverse the Town - with Sphero Bolt

INTRODUCTION

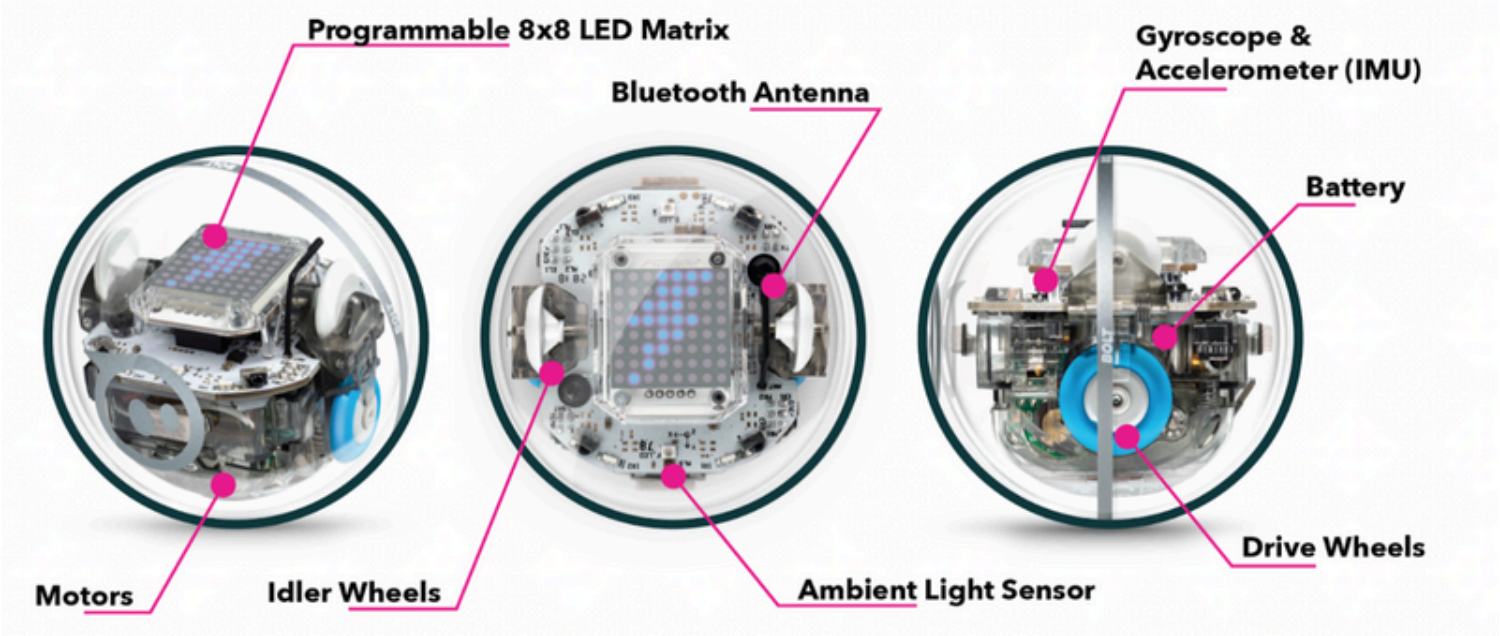
This lesson introduces students to the "roll command" for Sphero. Students first explore the town and come up with an algorithm for finding their way through a neighborhood to their friends house. Students will then use sequencing to navigate a maze through the town.

MATERIALS

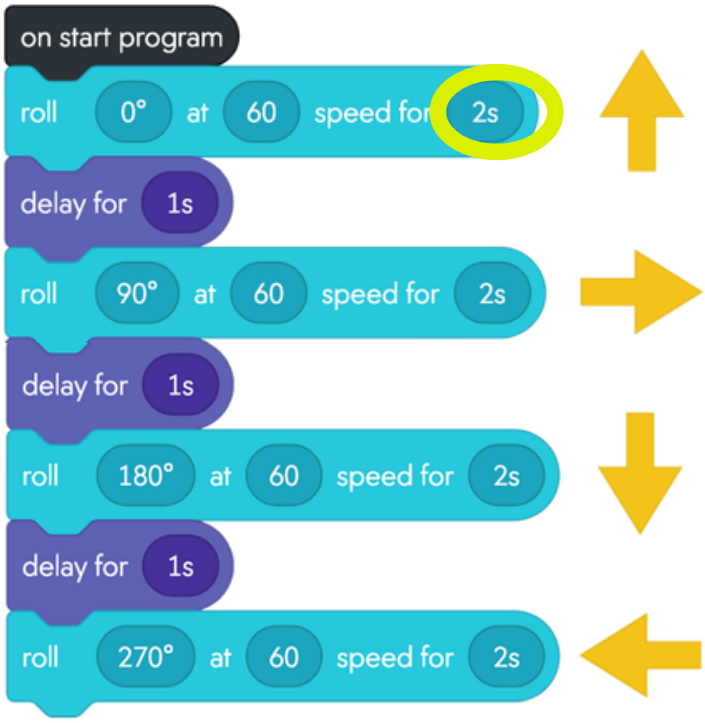
- Sphero Bolt/Sphero Spark+/Sphero Mini (1 per group)
- Link to PowerPoint
    - https://docs.google.com/presentation/d/1XUmhIrzRIlbfZZoCArNTqeFAG85pxqZs/edit?usp=sharing&ouid=117263584157777164719&rtpof=true&sd=true
- Access to the Sphero Edu App (tablets) or access to the web app: *https://edu.sphero.com/code*
- Sphero City Mat **OR** Maze/Map making materials:
    - Painters tape and books or cones.

SLIDES

Meet Sphero



Movement

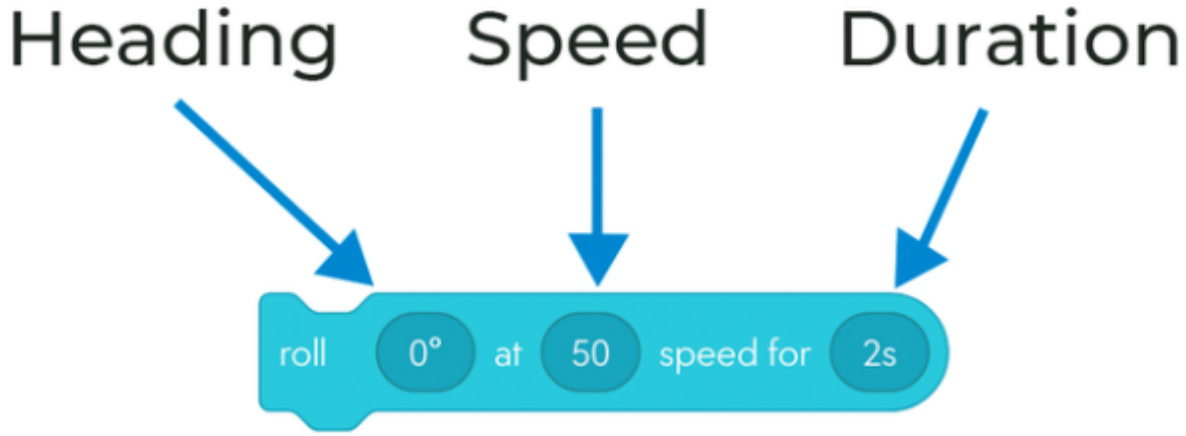


The Sphero can be programmed using block-based commands.

- What do you think the first part of the command does?
- The Second Part?
- The Third Part?

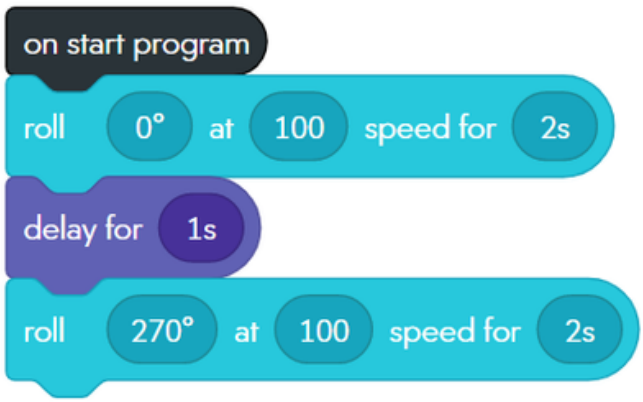
Let's Practice

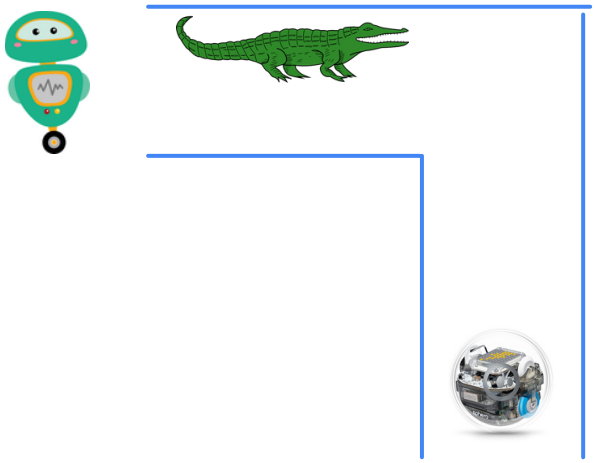
The dark circles in the command are called **parameters** - specific instructions or settings that control how a program or robot behaves (like speed, direction, or how long to do something) - and can be changed to change their effect.



Question

Suppose Sphero is trying to get to Ruby, but there is an alligator in his way. On his practice run, **he gets eaten**.

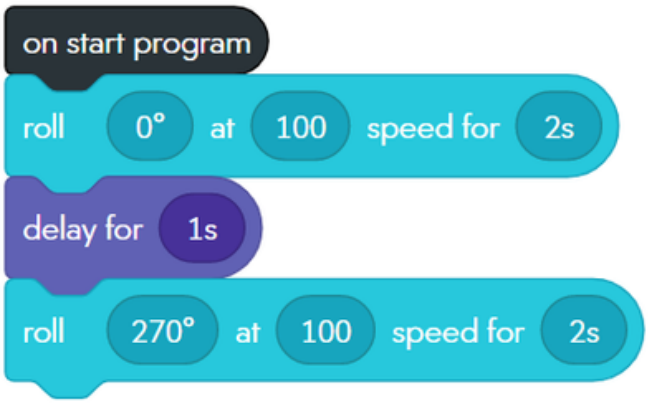


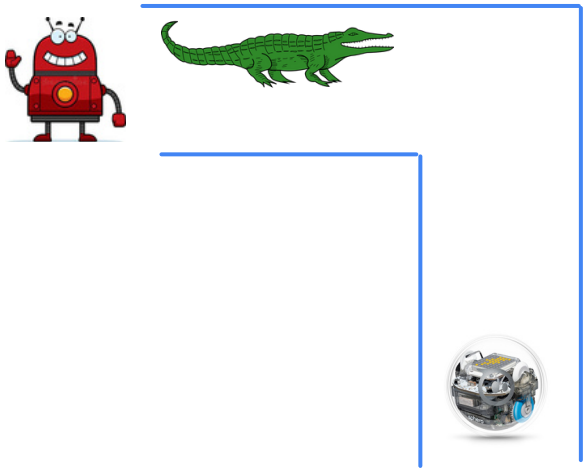


We could change the speed and the time in the code to **make him travel a shorter distance before he turns**.

Question

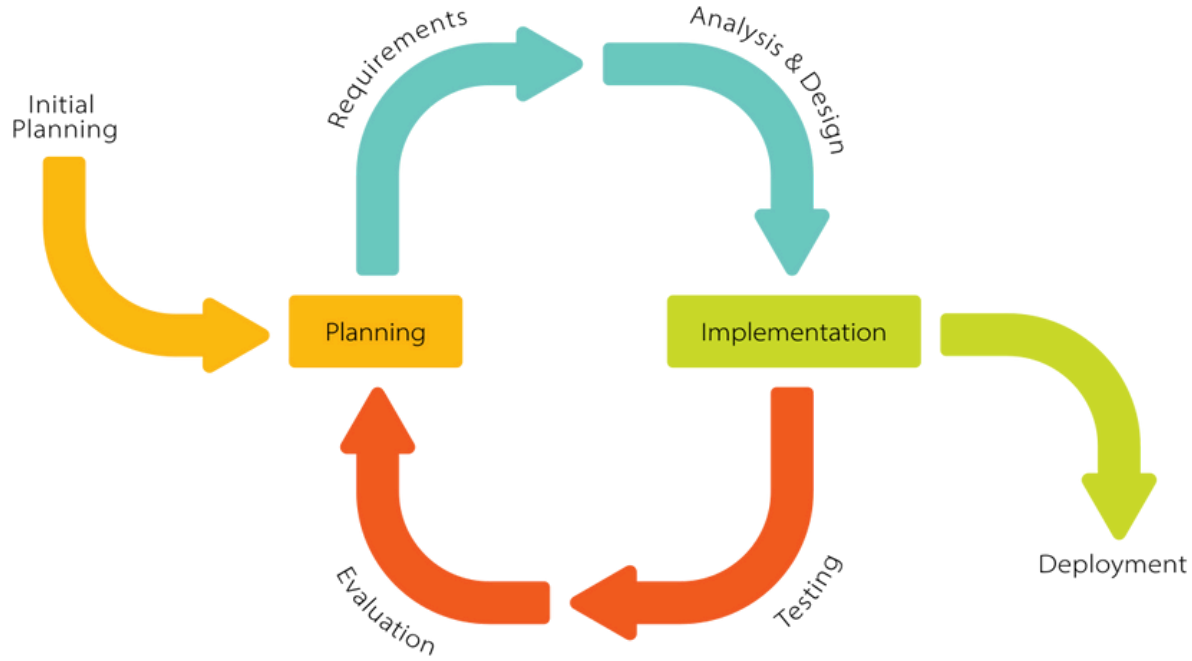
Suppose Sphero is trying to get to Rust, but there is an alligator in his way. On his practice run, he **gets eaten.**





What are **two things** we could change in the code to **make him travel a longer distance before he turns**.

Persevere



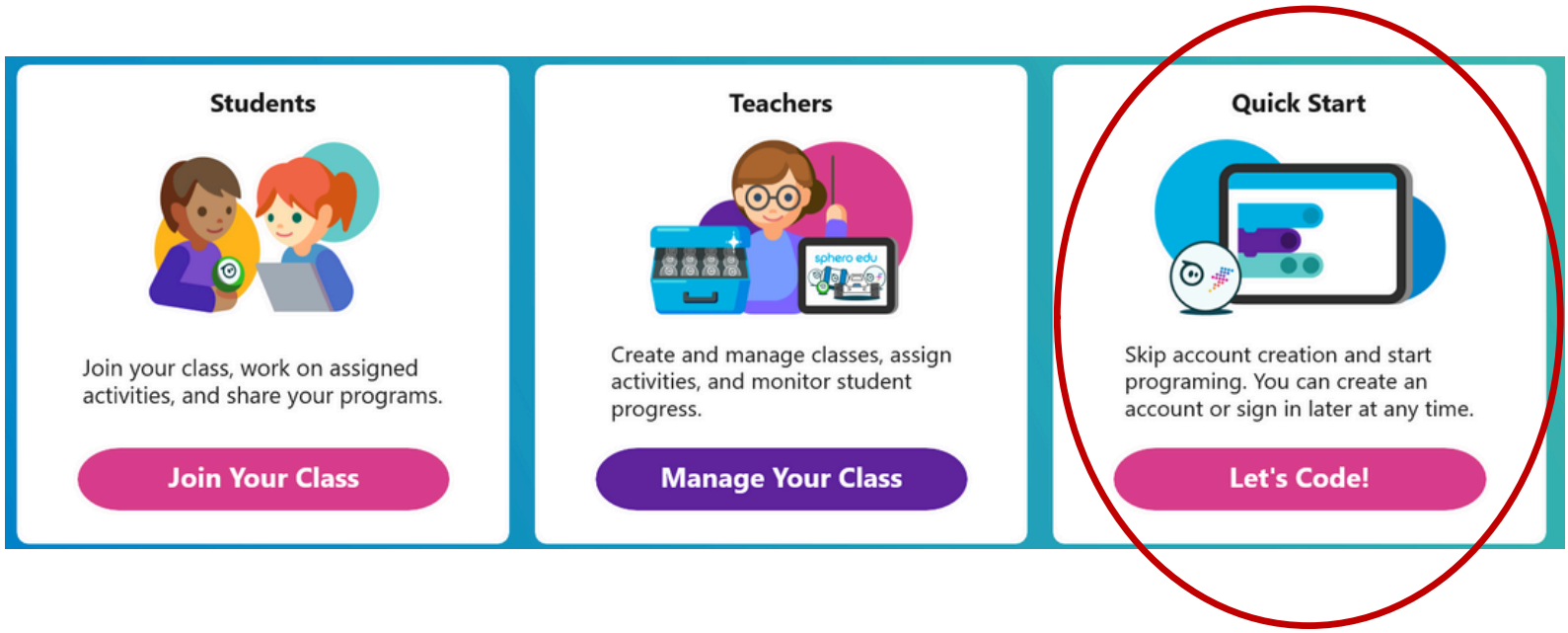
Pair Programming

- You will be using pair-programming in this activity.
- In pair-programming one person is in charge of manipulating the code and the other person is in charge of safety and giving guidance to the task at hand.
- We call these roles “Driver” and “Navigator” and we switch roles often.
- With your partner decide who's going to be “Heads” and who's going to be “Tails”.

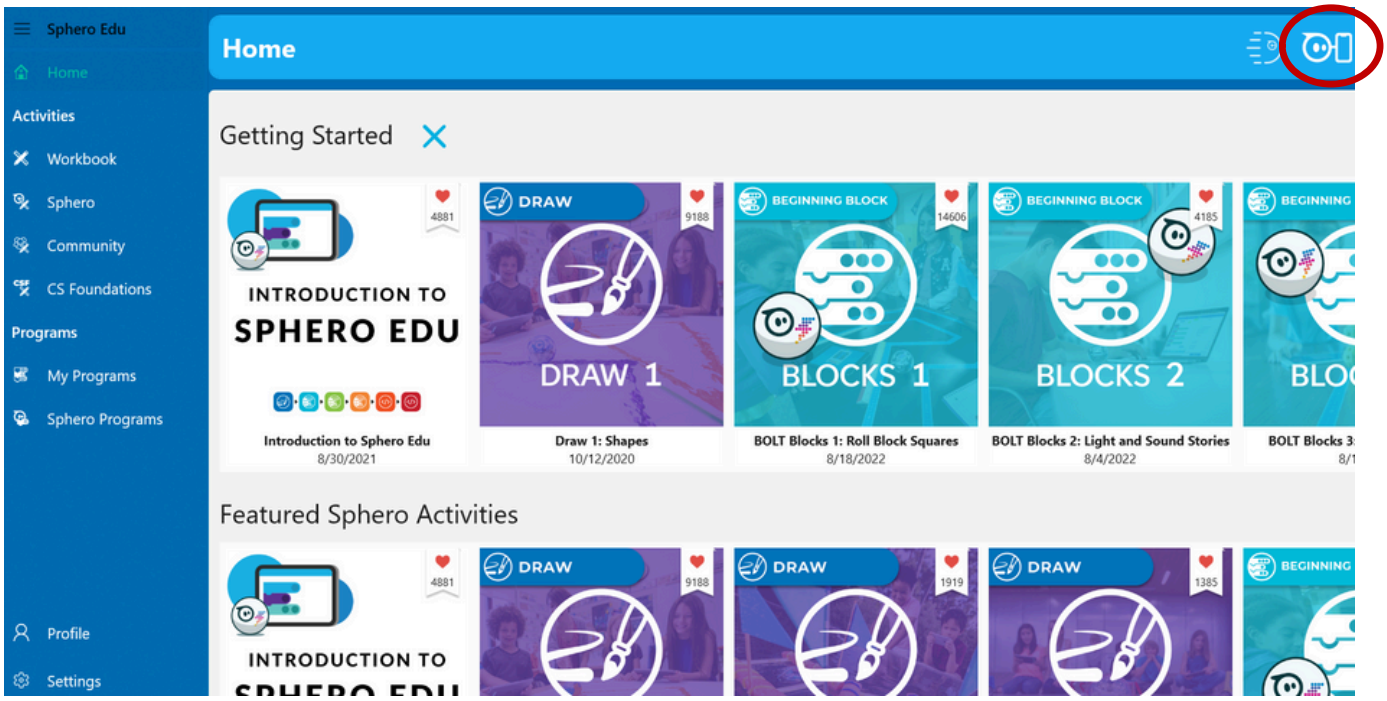
Getting Started

- Please open your **laptops.**
- After you login, open the Sphero app.

Getting Started



Connecting



STEAM TOWN

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Connecting

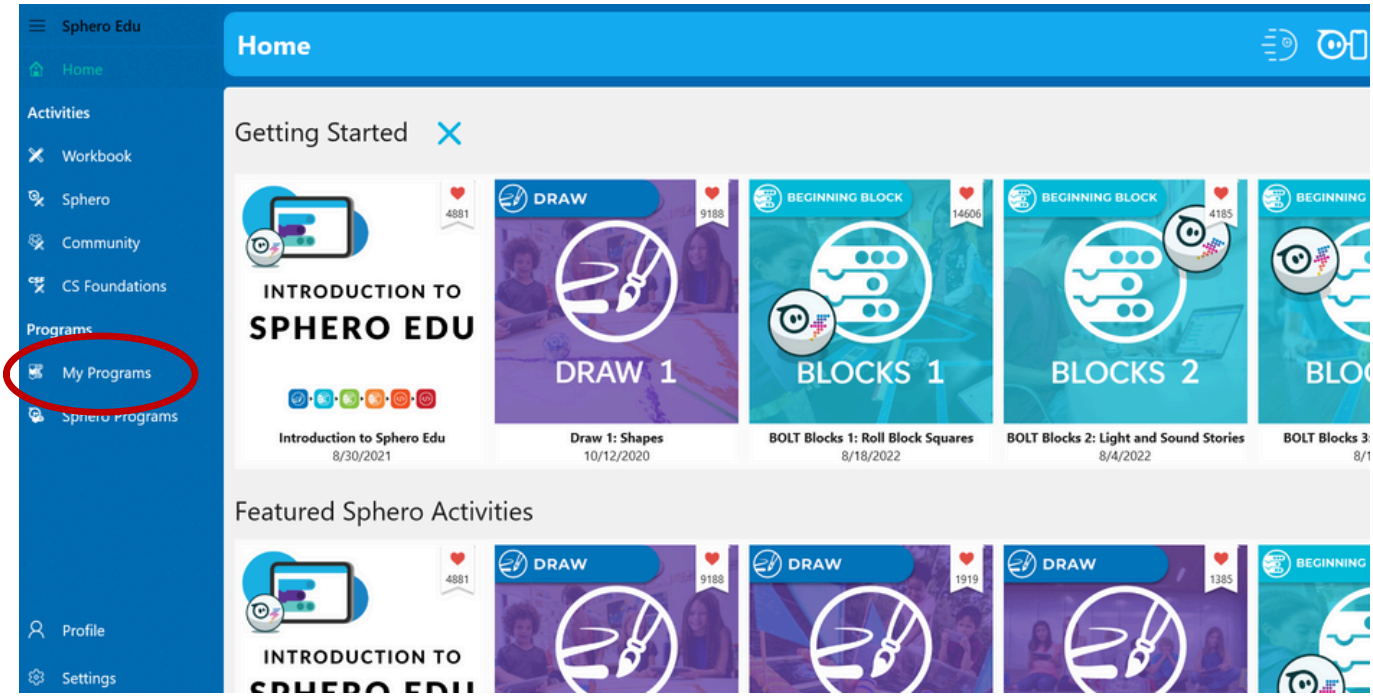
We will be programing the **Sphero BOLT**

Find the Sphero's "ID" printed on the inside.

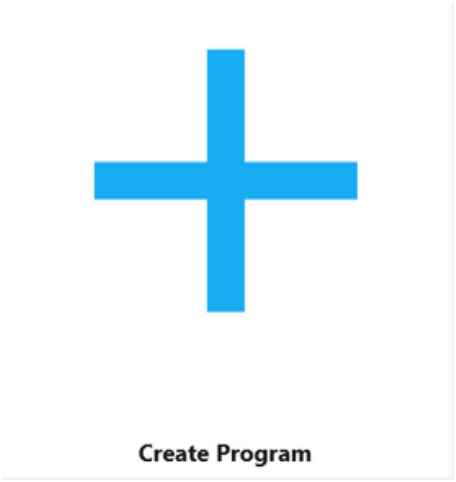
Click on the connect options

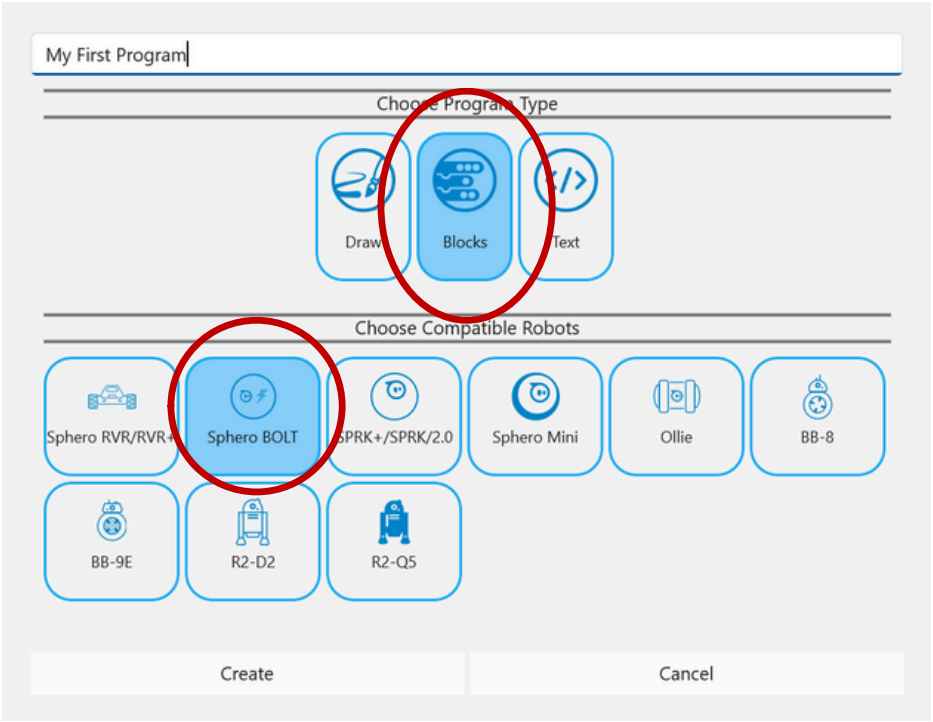
Select your robot.

My Programs

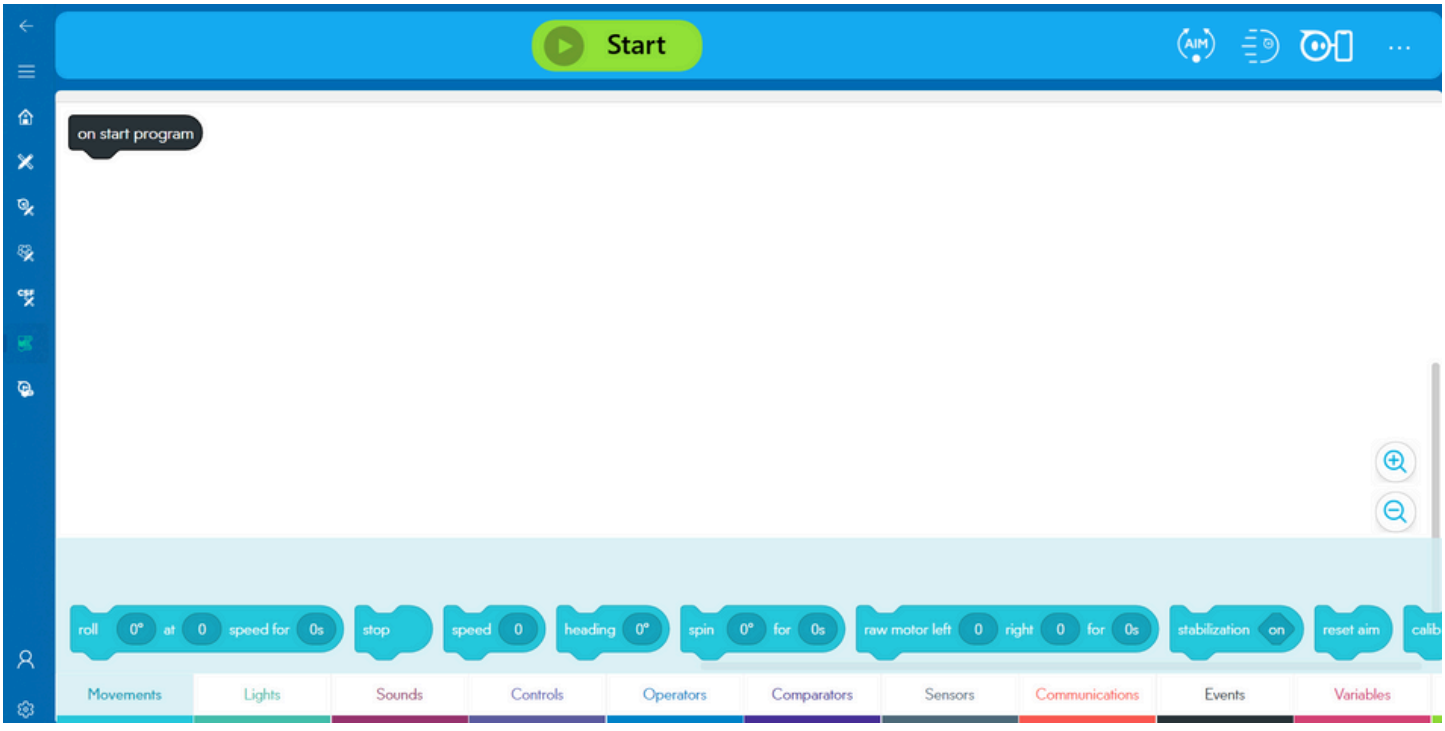


My Programs

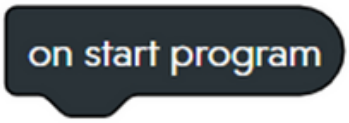




My Programs



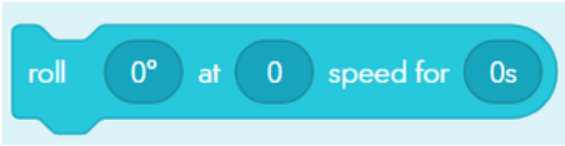
Lets Practice

Each program starts with the 

block.

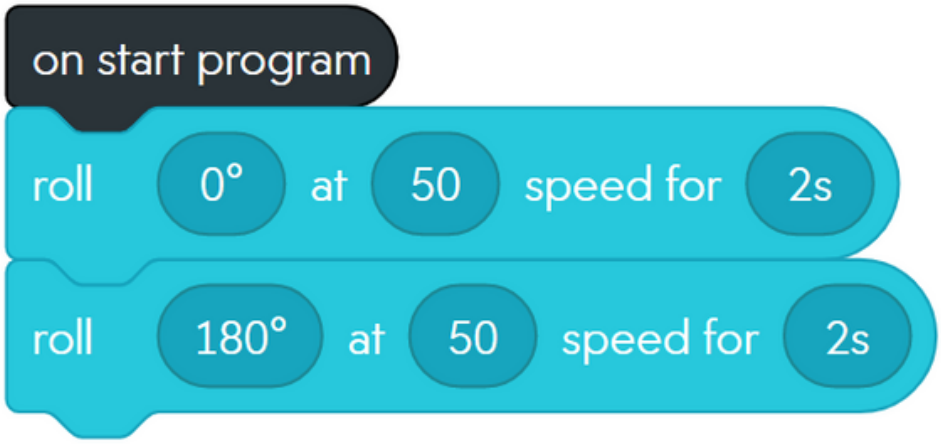
At the bottom, you'll see a list of commands you can use and their categories.

For now, we're going to use the movement blocks and the "roll command". Attach two of these under your start program block.



Guided Practice

Change the parameters of the two roll commands to match the ones on the screen.



Will the robot go forwards? Will the robot go backwards? Or will it do both? Verify by clicking the 

button

Aiming

The robot has no sense of “forward” so we have to tell it which direction forward is.

At the top right, click the “Aim” option”. The blue light is the BACK of the robot.

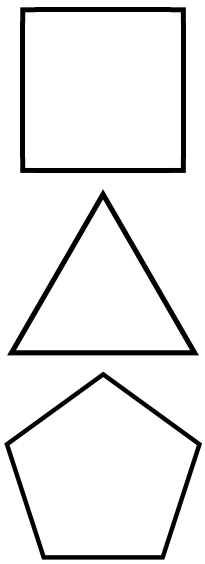
Afterwards relaunch your program.

You Try (Change Roles)

Let’s write our first program. We want to make the robot do the following:

- Roll in a square

  Finished?
- Roll in a triangle
- A pentagon



You Try (change roles)

Did you notice that our square had rounded corners?

Add a delay block between each roll command for sharper corners.

- Find the delay command under “Controls”.
- Add a 1s Delay command between each roll.

Robot Rescue

You and your partner are tasked with helping Sphero reach his friends. Remember to change partners often.

Useful Hints:

- Break down your problem into smaller steps and test them first.
- Make sure to start your robot at the same spot each time.
- Take turns testing your code on the maze, if the maze is being used, be editing your code.

STEAM TOWN

By FRC Team 342: The Burning Magnetos

Buoyancy Boats

INTRODUCTION

This lesson teaches students about buoyancy. By designing and constructing aluminum foil boasts, students are introduced to the basics of engineering and are able to determine how much weight their boats can carry before sinking.

MATERIALS

- Aluminum foil (3 sheets OR 3 feet per student)
- Plastic metric or imperial weight sets (or small coins such as pennies)
- A large plastic container filled halfway with water
- Towels (paper or clothe towels will work)
- Pencil
- Worksheet

Extra Support Options

✅ Use visual examples of house shapes (pictures or models).

✅ Offer hand-over-hand assistance for students who need help building.

✅ Allow students to work with a partner.

✅ Provide alternative ways to respond (talking, drawing, or using a sentence starter).

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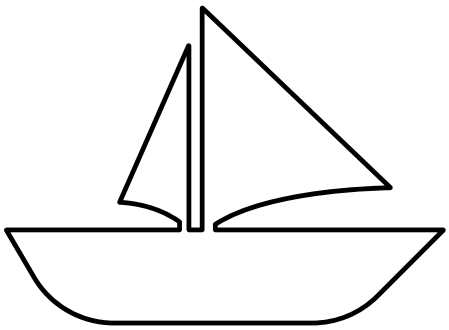
By FRC Team 342: The Burning Magnetos

BUOYANCY BOAT WORKSHEET

Boat 1	Boat 2	Boat 3
Design Square 	Design Square 	Design Square
Does it float?	Does it float?	Does it float?
Predicted weight?	Predicted weight?	Predicted weight?
Actual weight?	Actual weight?	Actual weight?

STEAM TOWN

By FRC Team 342: The Burning Magnetos

INSTRUCTIONS

1. **Design Phase:**
    a. Provide each participant with a worksheet and a pencil.
    b. Sketch 1-3 different boat designs, considering factors like size, shape, and stability.
    c. Discuss how different shapes might affect the boat's ability to hold weight.
2. **Boat Construction:**
    a. Using the aluminum foil, guide participants to construct their desired boat design.
    b. Assist as needed, ensuring the boats are sealed properly to prevent leaks.
3. **Testing Phase:**
    a. Place the boat gently into the water-filled container.
    b. Observe if the boat floats. If it sinks, discuss possible design adjustments.
    c. Using the weights, gradually add them to the boat, counting each one.
        i. Pause after adding each weight to observe the boat's stability.
    d. Continue adding weights until the boat sinks.
    e. Record the total weight the boat held before sinking.
4. **Reflection and Adjustment:**
    a. Encourage participants to modify their boat designs based on observations.
    b. Repeat the testing phase with the new designs.
5. **Discussion:**
    a. After completing the tests, gather participants to discuss their findings.
    b. Talk about how different designs affected the boat's capacity.
    c. Discuss the concept of buoyancy and how it relates to their observations.

STEAM TOWN

By FRC Team 342: The Burning Magnetos

Save the Town

INTRODUCTION

This activity is designed to teach students about the importance of engineering buildings to be able to hold up to earthquakes. Students will also be able to strengthen motor skills by creating model building using popsicle sticks and Play-Doh.

MATERIALS

- Popsicle sticks*
- 1 Play-Doh per student (other Play-Doh alternatives may also be used)
- Earthquake shake table (a small desk or chair can work for this experiment as well)
- Blank paper and a pencil

Extra Support Options

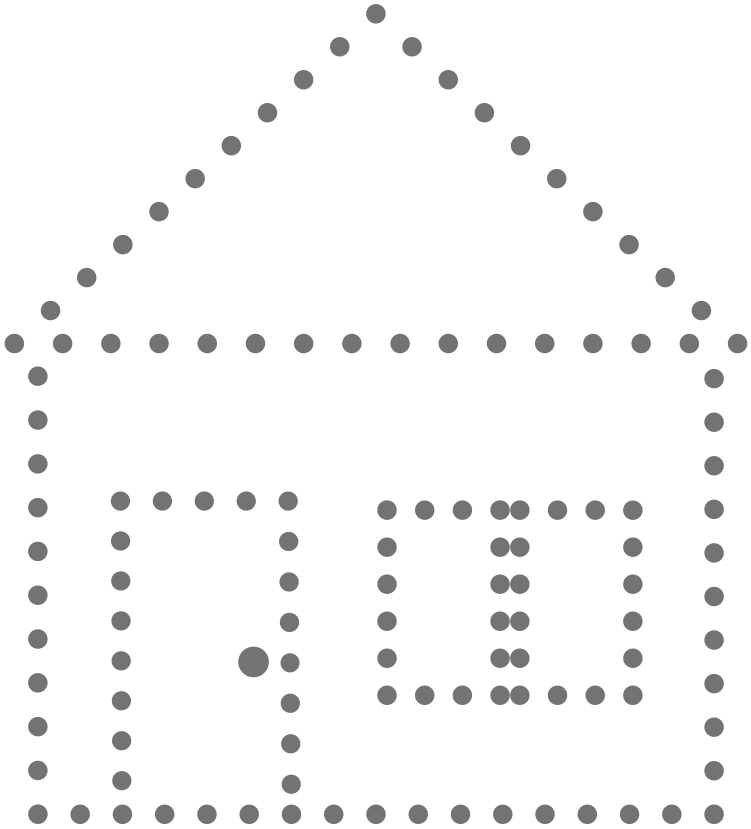
✅ Use visual examples of house shapes (pictures or models).

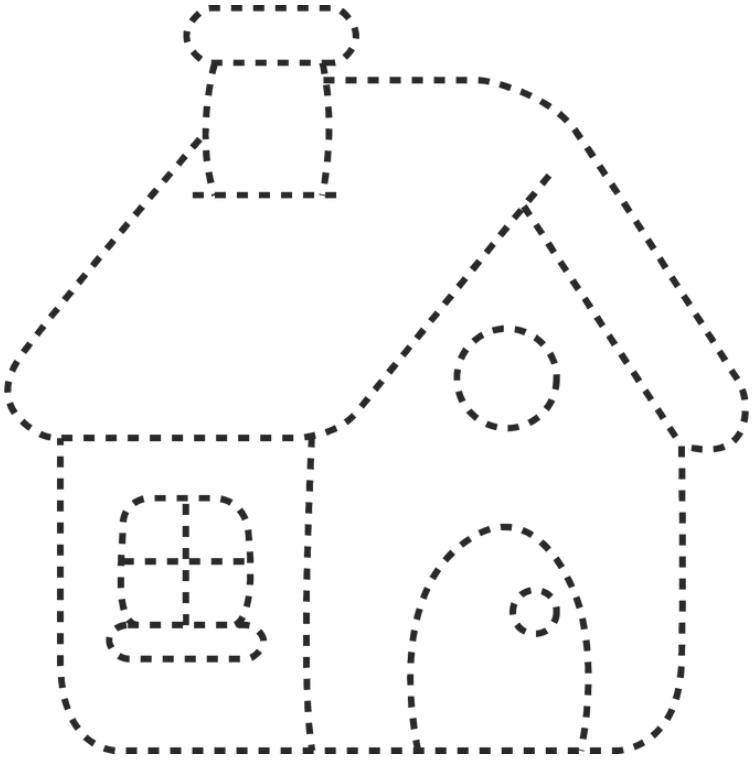
✅ Offer hand-over-hand assistance for students who need help building.

✅ Allow students to work with a partner.

✅ Provide alternative ways to respond (talking, drawing, or using a sentence starter).

Section Notes:
*The size of the popsicle sticks can be changed to assist kids with fine motor disabilities for accessibility.





STEAM TOWN

By FRC Team 342: The Burning Magnetos

Draw your own house!

STEAM TOWN

By FRC Team 342: The Burning Magnetos

INSTRUCTIONS

1. Draw Your House Ideas

- Take a piece of paper and a pencil. Draw two different house ideas. These can be simple shapes like squares, triangles, or rectangles.
- Look at your two drawings and choose the one you like best!

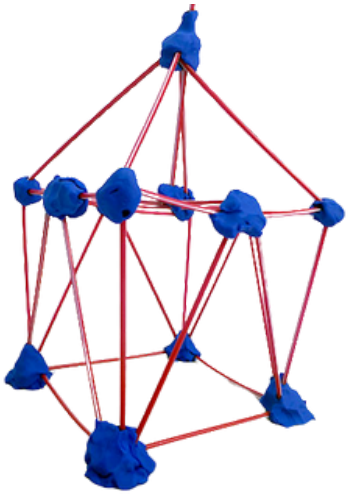
2. Build Your House Frame

- Use popsicle sticks to create the shape of your house. The popsicle sticks will be the walls, roof, and supports of your house.
- Use Play-Doh to stick the popsicle sticks together. The Play-Doh is like glue! It helps keep the sticks in place.
- Look at your house. **Does it stand up on its own?** If it falls over, try adding more Play-Doh or popsicle sticks for support.

3. Test Your House on the Earthquake Table

- Carefully place your house on the earthquake shake table and gently shake the table.

4. Write or Draw Your Results



- What happened? Did your house stay together or fall apart?
- You can write, draw, or talk about what you saw.

5. Talk About It!

- If you want to, share with the class:
  - What happened to your house?
  - What shapes made your house strong?
  - What could you change to make it even stronger?

6. Repeat!

- You can repeat this activity again to fill up time while waiting for other groups to finish their activities.
  - Make sure you have at least 20 minutes of remaining time before repeating the activity.

STEAM TOWN

By FRC Team 342: The Burning Magnetos

Race to the Market

INTRODUCTION

This activity is used to teach the engineering process and allow students to develop teamwork, creativity, and problem solving skills. Through planning, building, and testing students work to design the Lego car that will travel the furthest distance!

MATERIALS

- Legos*
  - Assortment of Legos
  - Lego wheels (4 per student)
  - Lego axels (2-4 per student)
- Ramp (a long book or a wooden board propped up on other books may work as well)
- Tape
- Marker

Extra Support Options

✅ Use visual examples (pictures or models).

✅ Offer hand-over-hand assistance for students who need help building.

✅ Allow students to work with a partner.

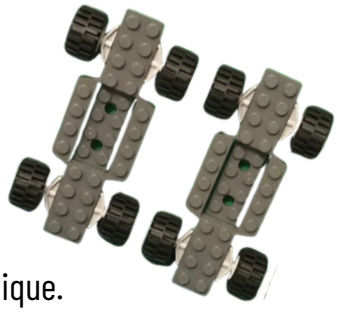
✅ Provide alternative ways to respond (talking, drawing, or using a sentence starter).

Section Notes:
*The Legos can be substituted for Duplo Legos to assist those with fine motor disabilities.

STEAM TOWN

By FRC Team 342: The Burning Magnetos

INSTRUCTIONS



1. Gather Your Supplies

- Give each student 4 wheels and 2-4 axels.
- Also provide a variety of extra Lego bricks to make your car unique.

2. Build Your Car

- Use your Legos to build a car to roll down a ramp.
- Test your build by rolling it across the floor. **Does it roll smoothly?** If not, adjust the pieces.

3. Race!

- One by one, allow students to roll their cars down the ramp.
- Use a piece of tape to mark where each car stopped.
- Write the student's names on their piece of tape to see whose car went the furthest.

4. Talk About It!

- If you want to, share with the class:
  - Whose car went the furthest?
  - What are some ways to improve your car?
  - Share your ideas!

5. Repeat!

- You can repeat this activity again to fill up time while waiting for other groups to finish their activities.
- Make sure you have at least 20 minutes of remaining time before repeating the activity.

STEAM TOWN

By FRC Team 342: The Burning Magnetos

Arts and Craft Station

INTRODUCTION

There are a variety of different crafts to choose from for this station! We recommend choosing one craft to run and then having come coloring sheets available in case of extra time.

MATERIALS

Binary Bracelets

- Assortment of Beads*
- String
- Tape
- Paper
- Pencil
- Binary Code Sheet (see next page)

Button Making

- Button template
- Coloring Supplies
- Button Backs
- Button Fronts
- Clear Button Film
- Button Cutter
- Button Maker

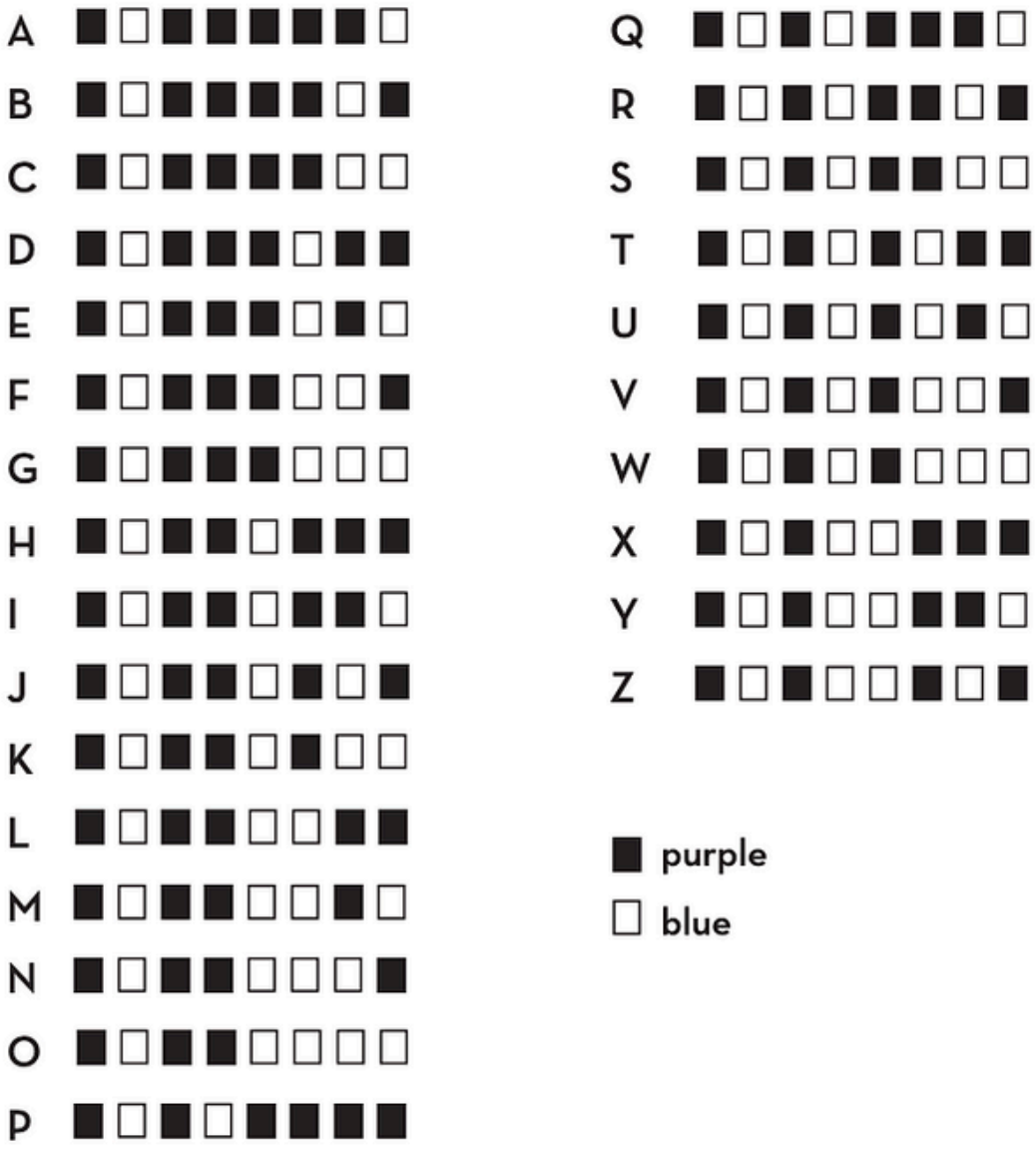
Straw Airplanes

- Straws
- Construction paper
  - Cut into 1 inch thick long and short strips
- Scissors
- Tape

Section Notes:

*You can use a variety of different sized beads to assist those with fine motor disabilities.

BINARY BRACELETS



STEAM TOWN

By FRC Team 342: The Burning Magnetos

INSTRUCTIONS FOR BINARY BRACELETS

1. **Set Up**
   - Measure and cut the string to fit each student.
   - Tape one side of the string to the table to avoid dropping beads.
   - Have each student choose 2 different colored beads to make their bracelet.
   - Place the binary code sheets around so each student can see.
2. **Write out Your Name**
   - Have each student write their name on a small sheet of paper.
   - For students with longer names, have them choose a nickname or a shorter word to spell out with beads.
   - Instruct students to cross out each letter of their name or word each time they complete the corresponding binary code on their bracelet.
3. **Code!**
   - Have students begin making their bracelets, creating each letter using the corresponding code.
   - When finished, tie each bracelet and put it on the student.

STEAM TOWN

By FRC Team 342: The Burning Magnetos

INSTRUCTIONS FOR BUTTON MAKING

1. Create Your Button

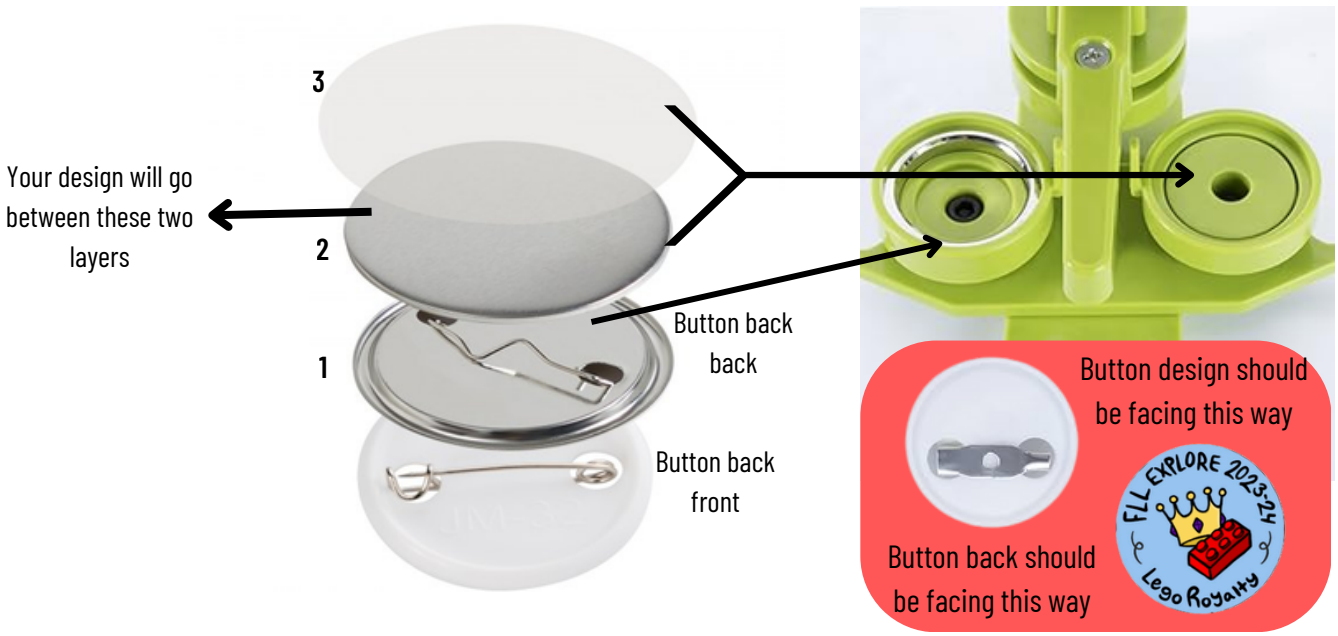
- Give each student a button template.
- Allow them to be creative and design their button however they want.
- Instruct them to keep their design within the button template lines. Anything outside the lines will get cut off.

2. Press Your Button

- Use the button cutter to cut out your button from your sheet of paper.
- Arrange button pieces before pressing
  - In the shallow side of the button press, stack the following items in this order: Flat metal button front, your cut-out button design, clear button film. Press this side first!
  - Place the metal button back in the deep side of the button press, pin side down. Press this side second, securing the back to the front.
  - Help the students pin it on!

3. Repeat!

- You can repeat this activity again to fill up time while waiting for other groups to finish their activities.
  - Have at least 20 minutes of remaining time before repeating the activity.

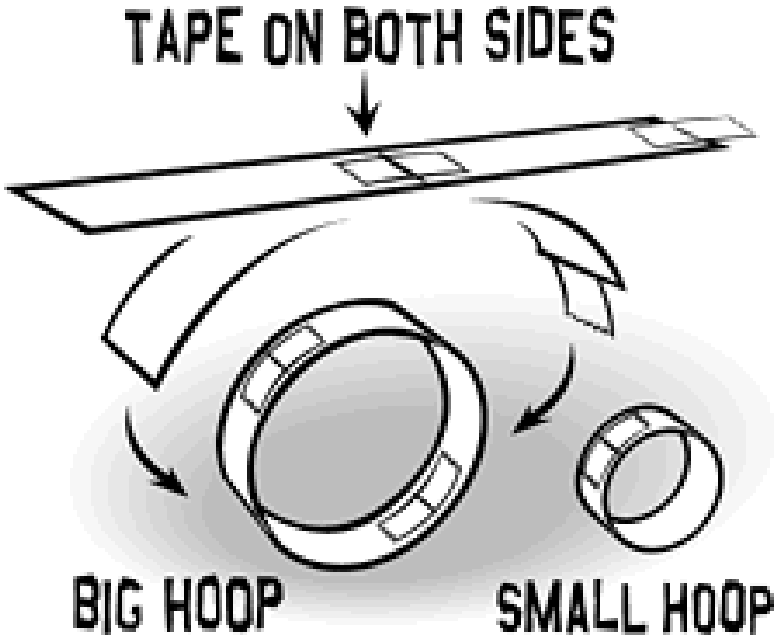


STEAM TOWN

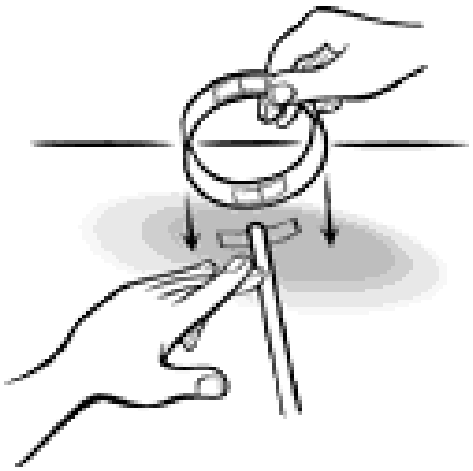
By FRC Team 342: The Burning Magnetos

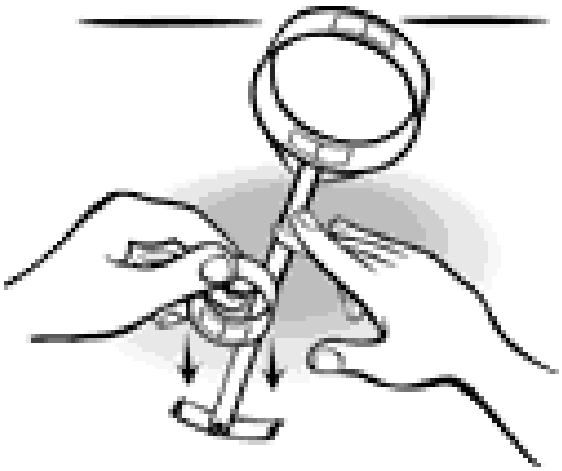
INSTRUCTIONS FOR STRAW AIRPLANES

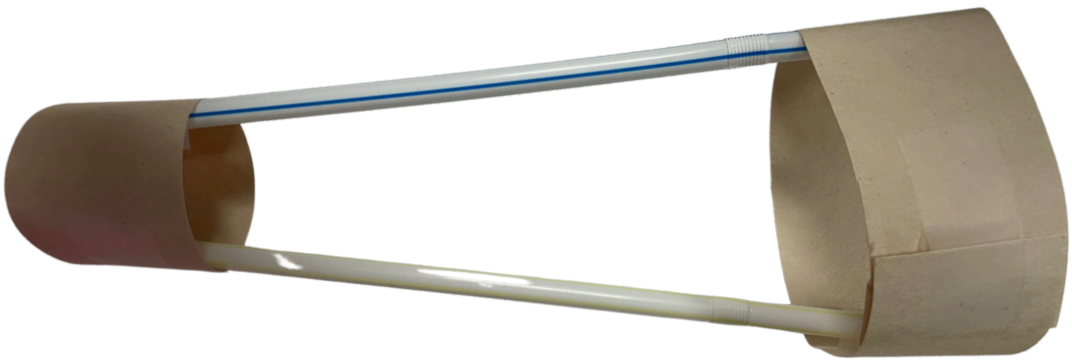
1. Give each student supplies
    - 1 long strip of construction paper about an inch thick
    - 1 short strip of construction paper about 1 inch thick
    - 2 straws
2. **Construct Your Plane**
    - Fold your long strip of construction paper to create a loop. Tape to secure
    - Repeat with the short strip
    - Tape one straw to the inside of the larger circle
    - Tape your second straw to the opposite side of the circle
    - Repeat with the smaller circle on the other side of the straws
3. **Test**
    - One by one, allow students to throw their plane.
    - Use a piece of tape to mark where each plane landed.
    - Write the student's names on their piece of tape to see whose plane went the furthest.
4. **Talk About It!**
    - If you want to, share with the class:
        - Whose plane went the furthest?
        - What are some ways to improve your plane?
        - Share your ideas!
5. **Repeat!**
    - You can repeat this activity again to fill up time while waiting for other groups to finish their activities.
        - Make sure you have at least 20 minutes of remaining time before repeating the activity.


TAPE ON BOTH SIDES
BIG HOOP
SMALL HOOP


overlap the paper a bit before taping







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