CODING

STEM works THINKit

Sphero Attack ⚡ Activity

Grades
K-12

Career Pathways
Computer Scientist
Cyber Security Analyst
Programmer
Strategic Planner

Academics
Math: Operations, Algorithms, Angles, Speed, Patterns
Computer Science: Block Coding

Professional Career Skills
Collaboration
Problem Solving
Perseverance

Materials
Sphero
Device with Sphero Edu App
Data Mats

Team Goal

Level 1

Code your Sphero to collect the most data and avoid data loss.

Level 2

Code your Sphero to collect the most data and avoid data loss. Be sure to update software and prevent cyber-attacks that steal your data!

Level 3

Preplan effective algorithms for the Sphero to collect the most data while avoiding data loss or cyber-attacks!

Think like a computer scientist with Sphero

Algorithm

As you drag and drop block code, you are giving the Sphero a list of steps to complete in a specific order.
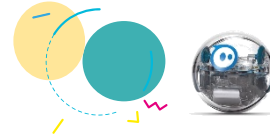
Cloud Computing

Your Sphero does not need to use the information from the cloud to run programs. Your device communicates via Bluetooth to the Sphero. All of the code is stored in the app and not on the internet.

Computer Program

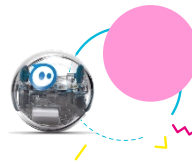You write sets of algorithms, or directions, which tell the Sphero what to do .

Computational Thinking

There are many different ways to solve a problem with Sphero; you need to recognize patterns, think abstractly, and write algorithms.

Debugging

When you test your code, you might find a bug that needs to be fixed and optimized.

Database

The Sphero Edu App has organized its database of block code into categories like movement, sounds, controls, events, etc.

Binary

A computer's brain reads only two options, like 1 or 0. All algorithms, or lists of steps, are made up of these two options. Code is translated into this binary "machine language."

Machine Language

Inside Sphero is a tiny computer brain (CPU – central processing unit) that translates the code you write into machine language, written in numbers.

Artificial Intelligence

Sphero can't hear your speech or recognize images. It is a robot with very limited sensors.

Program Language

Your Sphero can read three kinds of program types: drawing, basic coding blocks and JavaScript. JavaScript is one programming language used by professionals to create websites and games.

Natural Language Processing

Your Sphero can't understand (process, respond or manipulate) the words you say. Can you imagine using a Sphero with natural language processing in the future?

Parallel and Distributed Computing

Your Sphero can't do this yet, but imagine if they could communicate with others and share messages to solve problems together!
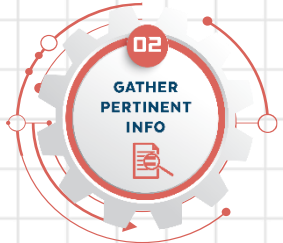
Engineering Design Process Directions:

01 DEFINE THE PROBLEM

Define the Problem
Choose a goal to tackle with your team!

02 GATHER PERTINENT INFO

Gather Pertinent Information
Download the Sphero Edu App. sphero edu

Create a new program and explore the block coding options.

Calibrate your Sphero by aiming it in the direction you need.
(See Sphero Edu Programming Tips sheet)

03 GENERATE MULTIPLE SOLUTIONS

Generate Multiple Solutions
Explore the available coding blocks. Which block code options might work?
Design algorithms that help the Sphero move to efficiently collect data.

04 REFLECT, ANALYZE, AND SELECT A SOLUTION

Choose a Solution
Choose line of code (algorithm) that will collect the most data. As a challenge, write programs with the fewest lines of code, programmers try to be efficient when writing algorithms!

05 DESIGN CULTURALLY RESPONSIVE SOLUTIONS

Design a Culturally Responsive Solution
How are you being supportive and responsible to your team?
How can everyone collaborate on team tasks and responsibilities?
Are you sharing resources and knowledge with your team?
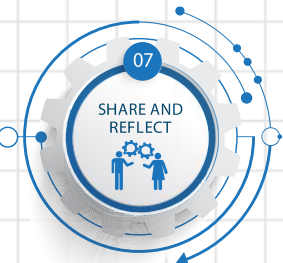
06 TEST AND OPTIMIZE

Test and Optimize
Run your program. Did the program run as you expected?
You may need to debug your program!
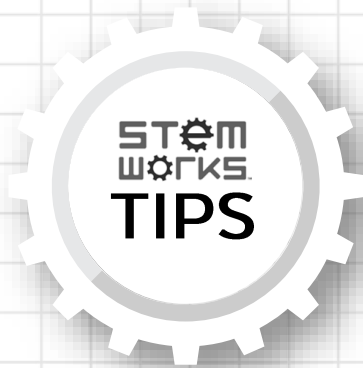Use what you learned to improve your algorithms.
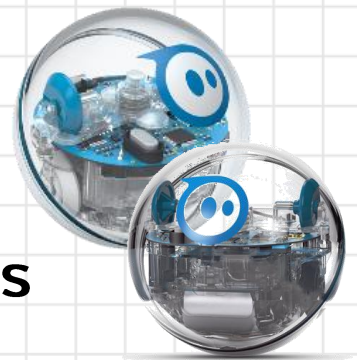
07 SHARE AND REFLECT

Share & Reflect
How did your team find solutions and practice perseverance? How did you problem solves?
Talk to your team: What went well? What could have gone better?

STEM WORKS TIPS

sphero edu
Programming Tips

Research: Use the Sphero Edu JavaScript Wiki for research to learn more about coding with Sphero!
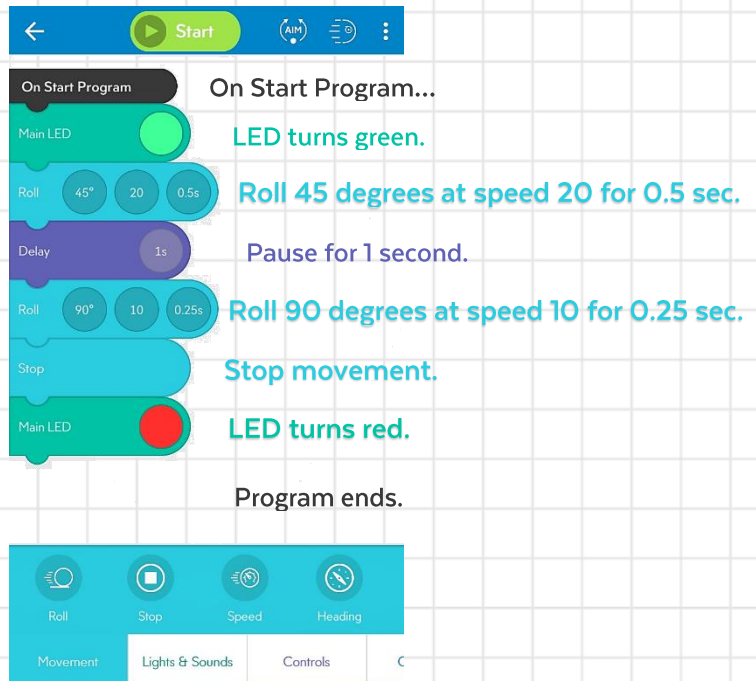
🔗 **https://sphero.docsapp.io**

Jump In!

1. Download and open the sphero edu App on your device.
2. Create a new program.
3. Name your program and save it.
4. If you haven't connected your Sphero, the app might ask you to connect.
   a) Tip: Hold your Sphero very close to your device. This will help it connect.
5. Touch the "AIM" button to aim your Sphero. Move the blue dot around until it faces you. This feature helps with controlling the accuracy of the direction, or heading, of your Sphero's movements.
6. Write, test and modify algorithms!
   a) Find each JavaScript Block in the color coded menu on the app. Drag and drop.
   b) Explore block code, or written code, through trial and error.
   c) Delete code by dragging it to the top of the screen.
   d) Changes are automatically saved.

Block Code & Description	JavaScript	Strategy & Purpose

Block Code & Description

On Start Program...

LED turns green.

Roll 45 degrees at speed 20 for 0.5 sec.

Pause for 1 second.

Roll 90 degrees at speed 10 for 0.25 sec.

Stop movement.

LED turns red.

Program ends.

JavaScript

```javascript
async function startProgram() {
    setMainLed({ r: 63, g: 255, b: 1
    await roll(45, 20, 0.5);
    await delay(1);
    await roll(90, 10, 0.25);
    stopRoll();
    setMainLed({ r: 255, g: 47, b: 4
}
```

Copy code

Strategy & Purpose

Use problem solving and strategic planning to purposefully move the sphero by coding algorithms.

Flip back and forth from block code to written JavaScript.

Notice that data can be processed faster when you use the fewest/most direct lines of code to solve a challenge! Strive to be efficient when programming!

Record Data:

TEST AND OPTIMIZE

06

Record Data:

TEST AND OPTIMIZE

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TEST AND OPTIMIZE

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Record Data:

TEST AND OPTIMIZE

06

STEM WORKS

THINKit

Where ideas come to play

STEM Works THINKit

Where ideas come to play
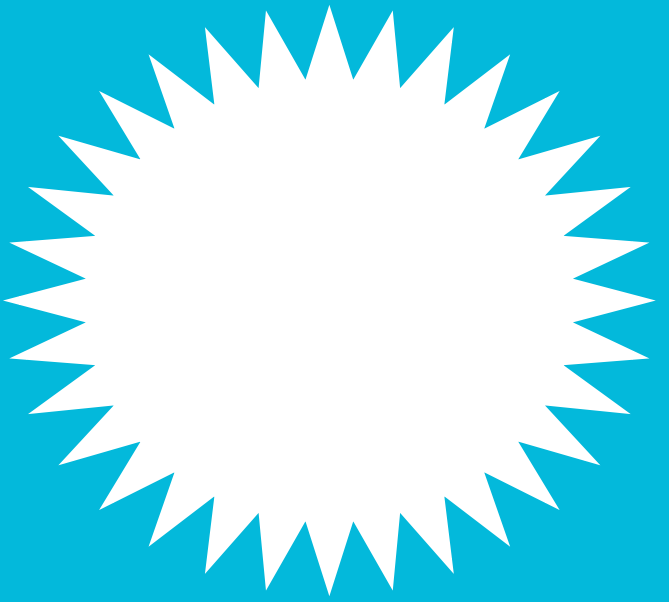
STEM Works THINKit

Where ideas come to play

START HERE

To Start: Data Points

STEM WORKS THINKit

Where ideas come to play

Software Update Card

(Data is protected)

STEM WORKS
THINKit
Where ideas come to play

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STEM WORKS
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Where ideas come to play
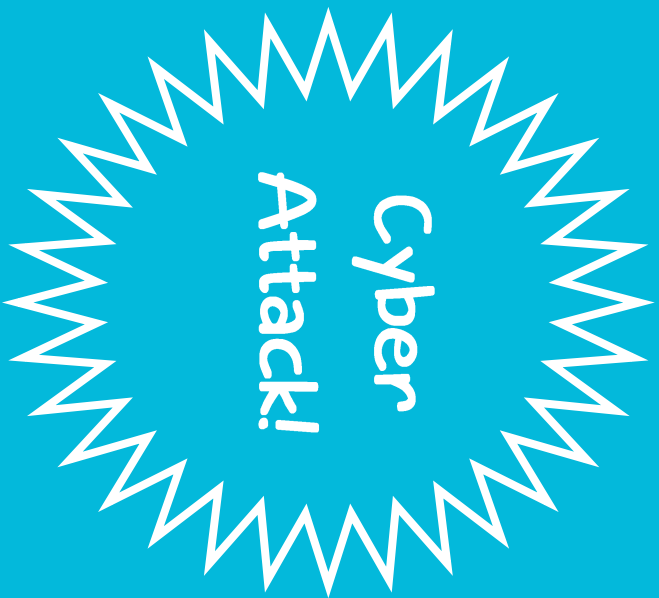
Cyber Attack!

Stolen Data!

Swap your data with someone who is not protected!

THINKit

STEM WORKS

Where ideas come to play

Malware Detected!

Everyone is vulnerable to a cyber-attack!

Everyone loses their Software Update Card!

STEM WORKS THINKit
Where ideas come to play

Cyber Security

Optimization

Software Update

Your data is protected and cannot be stolen

STEM WORKS
THINKit
Where ideas come to play

3 times larger

STEM WORKS
THINKit
Where ideas come to play

20 more

STEM WORKS
THINKit
Where ideas come to play

add

5

STEM WORKS
THINKit
Where ideas come to play

+10

THINKit
STEM WORKS
Where ideas come to play

15 more

STEM WORKS
THINKit
Where ideas come to play

double it

STEM WORKS
THINKit
Where ideas come to play

half it

STEM WORKS
THINKit
Where ideas come to play

15 less

STEM WORKS
THINKit
Where ideas come to play

20

subtract

STEM WORKS
THINKit
Where ideas come to play

Divide

by 2

STEM WORKS
THINKit
Where ideas come to play

Find One

Third

STEM Works
THINKit
Where ideas come to play

START HERE

To Start:
100 Data Points

STEM WORKS
THINKit
Where ideas come to play

START HERE

To Start:
10 Data Points

STEM WORKS
THINKit
Where ideas come to play

START HERE

To Start:
10 Data Points

STEM Works
THINKit
Where ideas come to play

START HERE

To Start:
10 Data Points

STEM WORKS
THINKit
Where ideas come to play

START HERE

To Start:
10 Data Points

STEM WORKS
THINKIT
Where ideas come to play

START HERE

To Start:
10 Data Points

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10 Data Points

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Where ideas come to play