

CHARIOT CHALLENGE

OVERALL TIME 4- to 6-hour lesson

GROUPS Three to four kids

PROGRAMMING LEVEL Intermediate
Block: Simple Controls (Loops), Sensors, and Comments

CONTENT THEME Art

OBJECTIVE

- I will identify how the Sphero BOLT can power a land-based vehicle constructed with inexpensive materials.
- I will drive the Sphero BOLT around a defined course with a chariot attached.
- I will analyze the effectiveness of my work with supporting facts and reflect on the learning.

OVERVIEW

Learn how chariots have been used throughout history. Design and create a unique Sphero BOLT chariot, then create a program for the Sphero BOLT to navigate the race course.

MATERIALS

- Sphero BOLT
- Paper
- Tape
- Cardboard
- LEGO®

- K'nex
- CDs
- Cups
- Large space on the floor for building the track
- Tin foil
- Felt
- Hot glue
- Craft sticks
- Straws
- Paper clips
- Other available found materials

EXPLORATION: HISTORY OF CHARIOTS

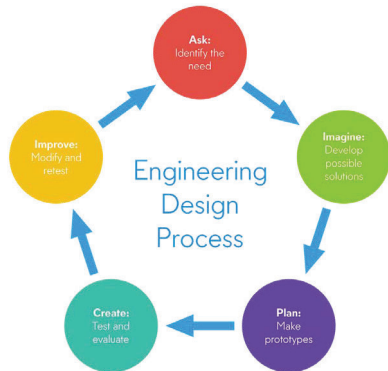
In ancient times, people used something called a “chariot” (a cart, usually pulled by horses) to haul materials, build things or even race against each other.

Draw a sketch of what a horse-drawn chariot looks like. Be as detailed as possible, but draw based on what you already know. Don't look online (yet!)

Your challenge is to design and build a Sphero BOLT chariot. Watch the video below for a quick glimpse into what you will be doing.

► <https://youtu.be/hB2Q5CHQTRQ>

Review the Engineering Design Process image below. Refer back to it throughout to better focus your efforts during the process.



EXPLORATION: RESEARCH DIFFERENT CHARIOTS

Research chariots online. Find photos and videos, noting their design and function. Consider these questions:

- *What materials were they made of?*
- *How many wheels did they have and how big were the wheels?*
- *How many horses/other animals were used to pull them?*

EXPLORATION: DESIGNING YOUR CHARIOT

How might the Sphero BOLT be used to pull a chariot? The video below is a good place to start.

► <https://youtu.be/lqYEcTHzA2Y>

Examine the chariot construction materials you have to build with. Brainstorm some possible designs by experimenting with the materials.

- *Will you use wheels?*
 - *What kind and size?*

- *What will you use for an axle?*
- *Which chariot design might work best? Why?*

Select your favorite idea to share with your team.

EXPLORATION: BUILD YOUR DESIGN

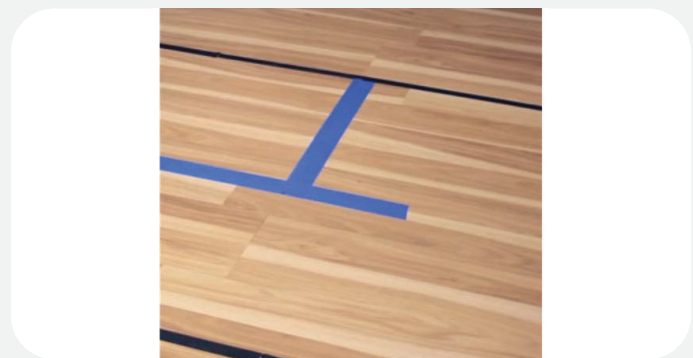
Begin building your chariot. Consider testing it along the way. Be sure that the Sphero BOLT fits.

If you are running into issues:

- *Look to see what is touching or dragging on the ground.*
- *Is the chariot too heavy for the Sphero BOLT to pull?*
- *Are the wheels stuck?*
- *Check for anything else that may keep the Sphero BOLT from pulling the chariot.*

EXPLORATION: BUILD YOUR TRACK

If you or your class haven't already, build an oval track on the floor measuring 10 feet long and about 5 feet wide. Blue painters tape works great for this.



SKILLS BUILDING: AUTONOMOUS CHARIOT

Create a program, using the Draw or Blocks canvas, that enables the Sphero BOLT to

complete the course autonomously; in other words, on its own. This program can be used as an opponent during the upcoming chariot race.

At this point, you should take some time to practice driving your chariot around the track. Keep in mind that faster isn't always better when it comes to the Sphero BOLT and chariots. *Why might that be?*

Observe how your chariot and the Sphero BOLT move. *Is there anything you can adjust or change to make it better?*

CHALLENGE: CHARIOT RACE

Time to put your Sphero BOLT Chariot up against your autonomous program and your classmates chariots.

Be sure to take some pictures or record a video to share.

REFLECTION

Write your reflections on this activity and discuss with the class.

- *What worked and what didn't?*
- *How would you do things differently in the future?*
- *Why do you think that the culture you studied used the chariot that they did?*
- *What materials worked best?*
- *What was the most challenging part of the activity?*
- *How did the size of the wheels or other design characteristics impact the results?*
- *What materials worked best?*
- *What was challenging and what worked well within your team?*

CHALLENGE - DATA ANALYSIS (OPTIONAL)

How can we make the Sphero BOLT Chariots faster? Let's gather data, evaluate the results, and make some predictions.

- Time the Sphero BOLT Chariots around the track.
- Compile best times in a spreadsheet.
- Evaluate each chariot by listing the materials and weighing it with and without the Sphero BOLT.
- Discuss what made that chariot faster or slower than the others.

Using this data, go back and make modifications to your chariot. Sometimes weight reduction helps. Other times shifting the balance of weight can help as well. Discuss the changes with a peer.

Once your updated chariot is ready, race again to see if the changes made any difference.