# Tantalizing Triangles

## Introduction

Sphero is learning about the different types of triangles: isosceles, right, acute, obtuse, scalene, and equilateral. It is your job to teach Sphero how to create each shape and then program Sphero to draw the shapes.

In this lesson students will refine and practice the ability to use precise measurements, identify and construct different triangles, and code. Cross-curricular outcomes will be incorporated including Math and Art.

## Prior Knowledge

It is expected that students have been introduced to Sphero and the "Lightning Lab" coding app. It is also expected that students will have studied the various types of triangles. This challenge will act as a review for classifying and creating various types of triangles.

## Curriculum Outcomes:

**Grade 6 Math**
- Demonstrate an understanding on angles (SS1)
  - classifying angles according to their measure
  - estimating the measure of angles using 45°, 90° and 180° as reference angles
  - determining angle measures in degrees
  - drawing and labelling angles when the measure is specified.
- SS2: Demonstrate that the sum of interior angles is:
  - 180° in a triangle

**Grade 6 Art**
- Create an image and modify it using another medium
- Demonstrate an understanding of the elements of art and principles of design using the computer to generate images
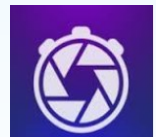- Create design/images on subjects, topics and themes relevant to the art and other curriculum areas

# Day 1 - Sketching Triangles

## Helpful hint

Some students prefer "Sphero Macrolab" vs. "Lightning lab" for coding as Macrolab allows users to input precise numbers for speed as opposed to the drag function on Lightning lab.
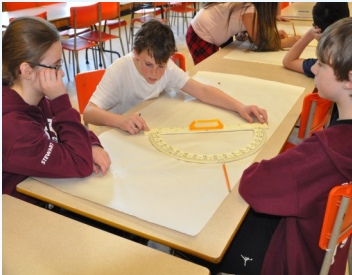
<u>Setup</u>.

- Display the SMART presentation "Tantalizing Triangles Introduction" on the SMART Board. You can access the presentation by clicking <u>here</u>.

- Make sure large sheets of paper are available (If you choose to use them for the sketching activity).

- The teacher should familiarize themselves with Kahoot quizzes. Click <u>here</u> for an introduction.

- Divide students into groups of 3-4 and assign roles such as: Recorder, Team Captain, Surveyor (aka "measurer"), Tester, Lead Artist, Assistant, etc.

<u>Introduction (10 mins.)</u>

- Review the outcomes you will be working on with students. These are provided in  the SMART presentation on page 2.

- Explain the challenge on slide 3 to students—"Sphero is learning about the different types of triangles: isosceles, right, acute, obtuse, scalene, and equilateral. It is your job to teach Sphero how to create each shape and then program Sphero to draw the shapes.

- Show the video: "Painting with Robots: Sphero 2.0 Street Art" and/or "Sphero Light Painting". You can access the videos by clicking on the links on page 4 of the SMART presentation.

<u>Activate Prior Knowledge (20-30mins)</u>

- It is assumed students have already learned about sorting triangles in Math class. However, as an engaging review, play <u>Kahoot quiz</u> with your students to activate their prior knowledge and review important concepts. Have students divided into their Sphero teams, sign in to Kahoot and search for "G6: SS4 - Construct and Compare Triangles". Play this Kahoot in "Team Mode".

<u>Learning Activity (20mins)</u>

-  Assign groups the triangles they will be working with (Depending on time the teacher may choose to assign all 6  triangles to each group or 1-2 per group).

- Before students begin coding with Sphero they should  individually sketch the triangle(s) their group has been assigned using a pencil, protractor, and ruler/meter stick (Depending on the availability of large sheets of paper these sketches can either be "life size" - meaning the size they will actually have Spehro trace— or a scaled model). Once each person has finished their sketch the group will then select which design(s) they will try to replicate using Sphero.

- Once triangles have been sketched their internal angles, and side measurements should be noted on the paper.

<u>Conclusion (2mins)</u>

Formative Assessment

- The teacher will collect the individual triangle designs as a means to formatively assess student understanding of the 6 different triangles. These sketches, along with the results from the Kahoot quiz, will allow the teacher to gain insight into student understanding of the concepts.

# Day 2 - Tracing Triangles with Sphero

Setup.

- Display the SMART presentation "Tantalizing Triangles—Day 2" on the SMART Board. You can access the presentation by clicking here.

- Make sure large sheets of paper are available (If you chose to have students use "life size" sketches during "Day 1"). If not, students can simply start the program and watch the Spheros perform the program to visualize if they make a triangle. This will be verified once the light art is created.

- Make sure Spheros and iPads are charged

- Divide students into groups of 3-4 and assign roles such as: Recorder, Team Captain, Surveyor (aka "measurer"), Tester, Lead Artist, Assistant, etc.

Introduction (5 mins.)

- Review any misconceptions or errors you may have noted while formatively assessing the sketches from "Day 1".

Learning Activity (45mins)

- During this lesson students will be programming Sphero to trace the triangle(s) they have sketched. It is assumed that students have already worked with "Lightning lab" or Macro-lab" coding app.

Conclusion (2mins)

Formative Assessment

- Conclude by having a discussion about some observations made during the class: How well students are working in groups? What did students notice about programming the interior angles using Sphero? Why don't the angles used when programming Sphero add up to 180 degrees? What were some challenges/success?

## Learning Extension

If students finish coding their triangles and are satisfied with the results, challenge them to code Sphero so that is turns a different color for each side of the triangle. This will produce an added effect if students choose to do "Light art" do draw their triangles.
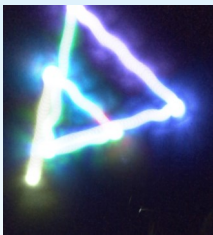
One day = approximately 1 hour.

## Slow Shutter App



## Helpful Hint

Using a dark room that has a dark floor or carpet works best. The dark floor or carpet helps reduce the glare or "noise" and should produce sleeker lines in the photography.



This picture was taken using the slow shutter app on a standard white tile floor. As you can see, the light from the Sphero produced come glare on the floor.

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# Day 3 - Drawing with Sphero

Setup.

- If you choose to have students paint with Sphero you will need large pieces of paper, paint and a bucket of warm water to immediately wash Sphero after it has finished painting each triangle. (Note: Sphero is water proof)

- If you choose to do light art with Sphero you will need a tripod for an iPad, "Slow Shutter" app downloaded, and a dark room. This app is very user friendly. For a brief tutorial click here.

Option 1: Painting with Sphero

- This option has not be tested yet. Once it is, I will update this lesson with tips and trick (ex: type of paint to use, how to clean Sphero, crowd control, etc.)

Option 2: Light art (30-40mins)

- Place iPad on tripod and place the tripod in a high location (ex: on a desk).

- Each group will have the opportunity to have their Sphero play the commands they have coded in a darkened room. This will be captured on the iPad with "Slow Shutter" app.

- After the first attempt the groups may want an opportunity to make some minor adjustments to their codes.

- Have each group perform the code a second time and capture the final version with Slow Shutter app.

Conclusion (10-15 mins)

Formative Assessment

- Plug the iPad into a computer attached to the SMART and display the images captured. While the images are on the board have a discussion about how the code could be improved and what triangle was formed. Discuss which triangle was the most difficult to code/easiest to code. Why?

# Day 4 - Art Design with Sphero

Setup.

- Day 4 will consist of students coding Spheros to create a pattern or abstract art design.

Introduction (5 mins.)

- Show students the samples of student light art provided by the Grade 6 class at North and South Esk Elementary School (NSEE). To access the images click here.

Learning Activity (45mins)

- Students will use this time to code and test their designs. Encourage students to use multiple colours in their coding and choose their colours with purpose (ex: contrasting colors, complimentary colors, etc.).

- Remind students that the shutter speed on the "Slow shutter" app will be set to 15 seconds. Therefore, their program should not last more than 15 seconds.

Conclusion (2mins)

Formative Assessment

- Plug the iPad into a computer attached to the SMART and display the images captured. While the images are on the board have a discussion about color composition, image composition and any possible meaning or themes behind the pieces of art.

- If funding is available, print images and display in classroom or allow students to take them home.

- Also, please send any images to adam.hayward@nbed.nb.ca so we can display them on http://stemnorth.nbed.nb.ca/

Sample Student Work From NSEE