

Lateral Area, Surface Area and Nets – Robotics Game

Lesson Overview

In this lesson, students will be able to sketch the net of the given 3-dimensional figure, calculate the lateral area and surface area of the figure, and control the robot to go around the perimeter of the figure in the fastest and most efficient way.

SC Standards Addressed

Geometric Measurement & Dimension G.GGMD.3 Apply surface area and volume formulas for prisms, cylinders, pyramids, cones, and spheres to solve problems and justify results. Include problems that involve algebraic expressions, composite figures, geometric probability, and real-world applications.

This lesson was written for a private school with its own set of standards (above). However, this lesson can be used with sixth grade students for the following standard:

6.GM.4 Unfold three-dimensional figures into two-dimensional rectangles and triangles (nets) to find the surface area and to solve real-world and mathematical problems.

Disciplinary Literacy Strategies

Collaborative Grouping, Collaborative Comments

Computational Thinking

Tools:

Games & Robotics

Cornerstone(s) Addressed:

- **Decomposition:** The students will need to break down the given 3-dimensional figure into the correct net (*scaled for robotic movement & the device controlling it*).
- **Pattern Recognition:** In order to complete the tasks and win the game, students determine: (a) what signals the robot receives and sends to the device and, (b) how the signals translate into movements. A robot's time improves as the team discovers the connection between controller movement, robot movement and signal acquisition on the robot (GPS of the signal). The more robot movements the team masters, the clearer the pattern of control becomes and the easier it is to control the robot as it traces the perimeter of the team's figure (see attached team geometry sheets).
- **Abstraction:** Students will need to use only area formulas specific to their figure and ignore formulas that do not pertain to their specific figure. A robot's time will improve as the students eliminate unnecessary movements (i.e. formulas for signaling the robot).

Lesson Plan

Time required: 50 minutes

Focus Question(s): The faces of 3-dimensional figures are made up of many types of 2-dimensional figures. How does this help you in finding the lateral area and surface area of a 3-dimensional figure?

Disciplinary Vocabulary: Area, Lateral Area, Surface Area, prism, pyramid

Materials needed:

- *Remote controlled robot / Sphero*
- *Electronic device to control robot (tablets or cell phones)*
- *Painter's tape – 4 rolls*
- *4 Yard sticks*
- *Markers*
- *Attached Handouts*

Devices Set-up:

Prior to the lesson download Sphero play app to each device – Or you can have students download it prior to class (Google Play or Apple Store): <https://www.sphero.com/about/play-app/> (*windows through chrome*).

Engage

- Divide students into four groups.
- Each group gets a device with the *Sphero play app*, the Sphero, painter's tape and a meter stick
- Have each group define lateral area and surface area and explain how to find each
- Have each group share one of the following:
 - Using 3-dimensional figures to find lateral area
 - Using 2-dimensional figures to find lateral area
 - Using 3-dimensional figures to find surface area
 - Using 2-dimensional figures to find surface area

Explore

- Give each group their shapes handout (*see attached*).
- Review general instructions for students to tape their given net of the 3-dimensional figure on the floor. *The net will also need to include the side measurements written on the tape.*

Explain

- Each individual student must calculate the lateral area and surface area of the 3-dimensional figure.
- Use Collaborative Comments (*Disciplinary Literacy Strategy – see above*):
 - Provide the sentence stems from the collaborative comments strategy (*see Disciplinary Strategy link above – amend as needed*)
 - Set the stage for the discussion – engage activity
 - Present the topic: Each team member will describe “HOW” they calculate **one** of the areas. Revisit the stems and the listening/responding points.
 - Move around from group to group and give students specific feedback regarding their use of the collaborative comments as they work together (*model as needed*).

Elaborate

- Practice controlling the Sphero using the play app (*see extensions below for more advanced users*).
- Determine how the Sphero moves i.e., which controls create which movements (*be sure they pay attention to directional movement of the robot*).
- Relay the Sphero around the perimeter of the figure.
- Record the most efficient and effective method for getting completely around their net as a **team relay**.

Evaluate

Groups choose the best method and demonstrate, maneuvering Sphero around the net.

Adaptation: Have groups use their method on another groups net.

Extension:

If you wish you can use the sphero.edu app which connects lessons, badging and activities for the Sphero (<https://www.sphero.com/education/>). In addition, there is also block coding available for the Sphero (intermediate) <https://edu.sphero.com/cwists/preview/1671x>. Also possible is programing with java script.

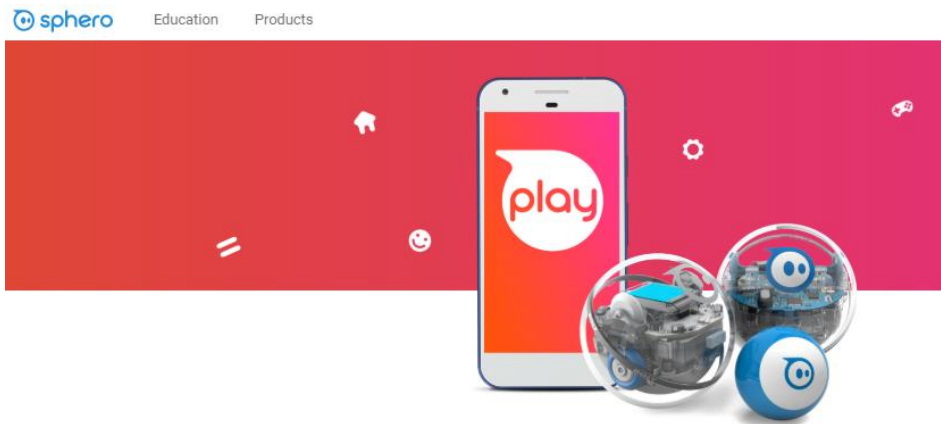
Assessment Notes:

This activity can be used as an in-class group assessment. The individuals are required to show their own work on the calculation of lateral and surface area. This could also be graded on an individual level.

Teacher Biographical Information

Lesson Author: *Mrs. Deborah Waters, 8 years teaching high school math, BS:Mathematics – Minor: Education*

App for Steering the Sphero: <https://www.sphero.com/about/play-app/>

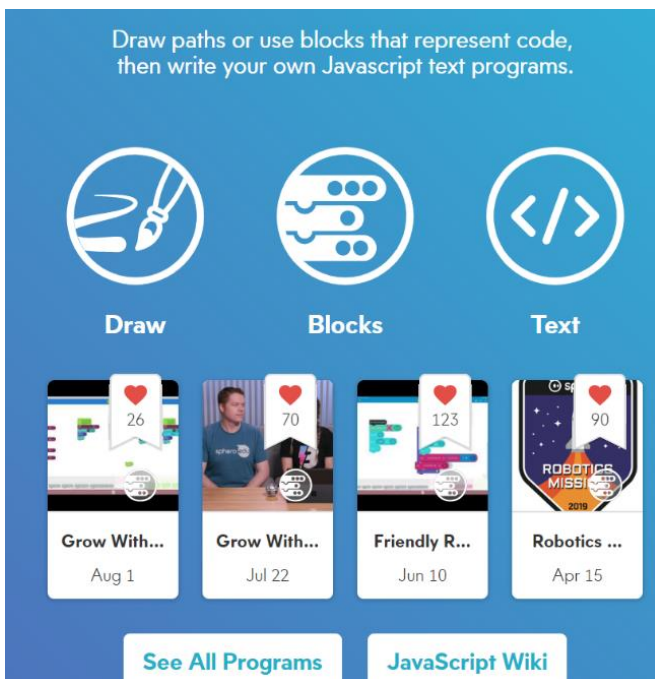


Are we having fun yet?

Because that's what this app is all about. Drive and play games from ONE app with your Sphero Mini, SPRK +, Sphero 2.0, SPRK Edition and BOLT robots.



App for coding Sphero: <https://edu.sphero.com/>



Geometry

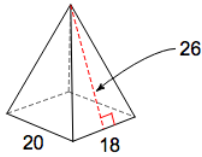
Name _____

Sphero Project - Group 1

Date _____

Use the painter's tape to "sketch" the net of the given figure on the floor. Make sure you label the tape with the correct measurements in inches.

1)



Calculate the Lateral Area and Surface Area of your figure (Show your work)

2) LA: _____

SA: _____

Have each team member practice moving the BB8. Do a relay race around the outside perimeter of your net. Time your results.

3) Best Time: _____

Geometry

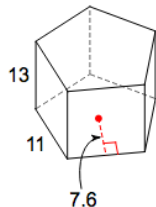
Name _____

Sphero Project - Group 2

Date _____

Use the painter's tape to "sketch" the net of the given figure on the floor. Make sure you label the tape with the correct measurements in inches.

1)



Calculate the Lateral Area and Surface Area of your figure. (Show your work)

2) LA: _____

SA: _____

Have each team member practice moving the BB8. Do a relay race around the outside perimeter of your net. Time your results.

3) Best time: _____

Geometry

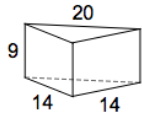
Name _____

Sphero Project - Group 3

Date _____

Use the painter's tape to "sketch" the net of the given figure on the floor. Make sure you label the tape with the correct measurements in inches.

1)



Calculate the Lateral Area and Surface Area of you figure. (Show your work)

2) LA: _____

SA: _____

Have each team member practice moving the BB8. Do a relay race around the outside perimeter of your net. Time your results.

3) Best time: _____

Geometry

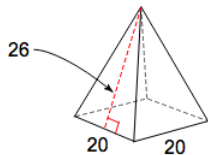
Name _____

Sphero Project - Group 4

Date _____

Use the painter's tape to "sketch" the net of the given figure on the floor. Make sure you label the tape with the correct measurements in inches.

1)



Calculate the Lateral Area and Surface Area of your figure. (Show your work)

2) LA: _____

SA: _____

Have each team member practice moving the BB8. Do a relay race around the outside perimeter of your net. Time your results.

3) Best time: _____