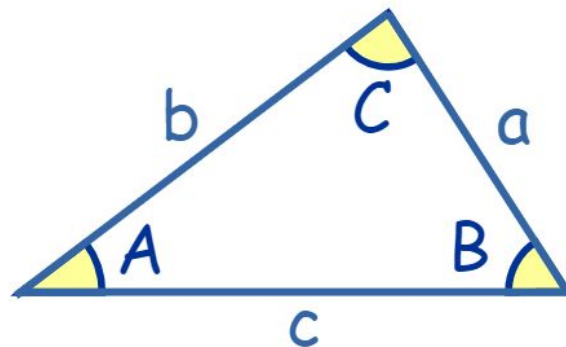


Sphero RVR: Trig Triangle Paths

The teacher will print and hand out several triangle pictures to each group of students. They will calculate the side lengths and angle measures with only limited given information. This lesson involves using trig functions and formulas studied in Algebra 1 or 2 and is a great application of "Solving a Triangle". Once the triangle is solved, students will code the robot to move along the triangle's path.



Materials

- Sphero RVR robot
- Student Worksheet "[Drop-off and Delivery](#)"
- Measuring Tape, markers
- Floor Space

Student Objectives

- Given two sides of a triangle and its non-included angle (or two angles and a non-included side), students will be able to calculate the measure of the missing parts using the Law of Sines.
- Once they have solved the triangle and know all three angle measures and sides, students will figure out the RVR movement headings and create a program to have the RVR robot travel along this path ("Drop-off and Delivery").
- During this process, students will think like programmers and engineers, designing the best process to collect data and analyze their results while reflecting on their process.

Teacher Technology Skills Needed

- Understanding of the Sphero RVR movement blocks including heading and speed settings



Standards

NYSED Standards

- **GEO.G.SRT.11** Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles.

Activity Procedure

1. The teacher will review the “Law of Sines” and show examples of triangles where information is missing and the Law of Sines is the appropriate tool for solving the triangle (as opposed to the “Law of Cosines”).
 - a. a triangle with two sides and a non-included angle given
 - b. a triangle with two angles measured and the non-included side given
2. Distribute the student worksheet “Drop-off and Delivery” as a printed handout or a shared Google Doc. Discuss the two triangle examples shown and remind them to show their work in the given workspace. The students will figure out:
 - a. Any missing angle measures
 - b. Any missing side lengths, in centimeters
 - c. The headings for each turn of the RVR tracing the triangle paths.
3. Allow students to work in twos or threes, taking on the roles of programmer, data scientist and mathematician to get the Sphero RVR programs written and tested with the RVR robot.
4. When ready, students will share their programs with the class, either with a floor demonstration or a video record of their work.

Extension Activities

This basic programming challenge can be enhanced by having students add the following ideas to their program (assuming it works and follows the teacher’s criteria):

- ✓ Use speech and sound blocks in the EDU program to have the robot announce its arrival at each “station”. Also, add pause and other timing blocks to “wait for loading and unloading”.
- ✓ Students can actually construct containers for the top of the RVR plate where objects can be placed for delivery and/or loading. Have each member of the RVR coding team be stationed at each vertex of the triangle to handle the loading/unloading of the objects.
- ✓ Use speech blocks to have the robot say the triangle angles, sides and heading settings at each vertex of the triangle.