THE EDUCATION FUND

FOR EXCELLENCE IN MIAMI-DADE PUBLIC SCHOOLS

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Ideas with IMPACT

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FPL

Shapes, Angles and Perimeter: Learning Math With VEX GO

Shapes, Angles and Perimeter:

Learning Math with VEX Go

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Florida Standards

1st Grade Standards

MA.1.M.1.1
Estimate the length of an object to the nearest inch. Measure the length of an object to the nearest inch or centimeter.

MA.1.M.1.2
Compare and order the length of up to three objects using direct and indirect comparison.

MA.1.GR.1.4
Given a real-world object, identify parts that are modeled by two- and three-dimensional figures. Figures are limited to semi-circles, triangles, rectangles, squares and hexagons, spheres, cubes, rectangular prisms, cones and cylinders.

MA.1.DP.1.1
Collect data into categories and represent the results using tally marks or pictographs.

2nd Grade Standards

MA.2.M.1.1
Estimate and measure the length of an object to the nearest inch, foot, yard, centimeter or meter by selecting and using an appropriate tool.

MA.2.GR.2.1
Explore perimeter as an attribute of a figure by placing unit segments along the boundary without gaps or overlaps. Find perimeters of rectangles by counting unit segments.

MA.2.DP.1.1
Collect, categorize and represent data using tally marks, tables, pictographs or bar graphs. Use appropriate titles, labels and units.

3rd Grade Standards

MAFS.3.MD.2.4
Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

MAFS.3.MD.3.6
Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

MAFS.3.G.1.2
Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.

Course Overview

Students can learn mathematics through coding. As students think about ways to make their robot move, and the tasks they want them to complete, they are also exploring many mathematic concepts and ideas. Teachers can capitalize on this information and use coding as a way to motivate students to learn more math. Sometimes students don't see the connection between what they are learning in the classroom and the real world. This is a great opportunity to expose them to a fun way to learn math. In this project, students will program the robot to turn at various angles. They will draw geometric patterns and calculate distance the robot challenge. VEXcode VR allows the student to code a virtual robot using a block-based coding environment powered by Scratch Blocks. VEXcode VR is based on VEXcode, the same programming environment used for VEX 123, GO, IQ and V5 robots. Robots make Computer Science (CS) come to life with real world applications. STEAM learning can continue while at home for students, teachers and mentors with no access to their VEX robots.

Goals and Objectives:

1. The curriculum is multidisciplinary where subject-integrated **problem-based-reality** lessons with hands-on projects are the norm.
2. Students will have access to courses that offer them the opportunity to advance up through **rigorous** pathways
3. STEAM students will show improvement on math and science subject area test as well district and **state required assessments**
4. Help students develop an attitude of curiosity and problem solving.
5. Students will learn to communicate their idea.

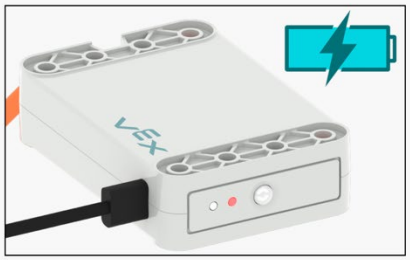
Planning for Instruction

1. Build the code base robot.

   https://content.vexrobotics.com/vexgo/pdf/builds/code_base/CodeBase_Rev6.pdf

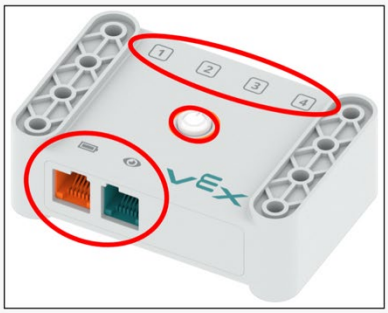
2. Make sure robot battery is charges
3. Organize class into group based on how many robots you have. If there is only one robot consider have robot and STEAM activities for students to try during
4. Show students the job cards and have them decide who will be assigned to specific tasks. See job cards.

Tips for building the robot and organizing materials



Begin by opening each Kit and placing the Batteries on chargers. If you purchased a Classroom Bundle, the chargers will be located in the extra parts bin.

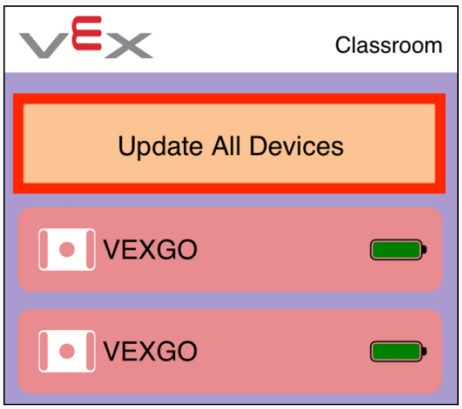
For more information on using the VEX GO Battery, see this article.



Ensure that while labeling the Brain, you keep the Smart Ports, Smart Port labels, and center button clear.

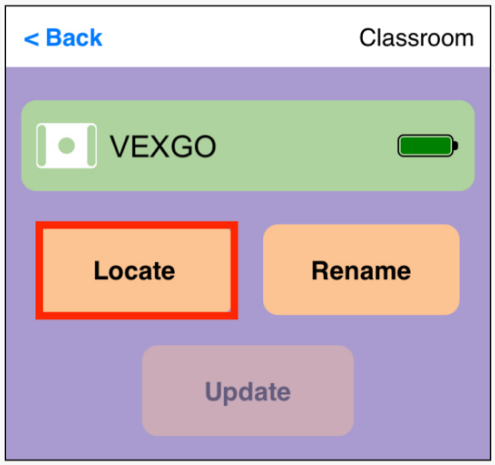
After labeling your Kits and Brains and charging Batteries, bring all of the items to a central location. This could be a large table or counter where you can see all of the elements at one time.

Open the VEX Classroom App. Because you have up to 15 VEX GO Brains turned on, you should see the same number of Brains inside of the app.



Before you can name the Brains, they will need to be updated. Select "Update All Devices" at the top of the screen, and you will see each Brain begin the update process.

This will update the Brains one at a time, so you will see the progress bar move through each Brain individually. Each update can take up to 2 minutes to complete. For more information about updating the firmware on multiple Brains with the VEX Classroom App, see this article.



After the Brain's have been updated, you can begin to name the Brain's so that their labels match their name within the VEX Classroom App and VEXcode GO. All VEX GO Brains begin with the same name - "VEXGO." You need to locate the Brain in order to distinguish the Brains from one another in the Classroom App.

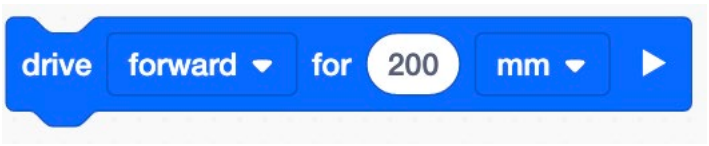
To begin, open the first Brain in the list and **locate** it.

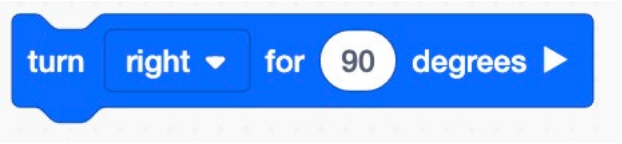
For more information on how to locate a Brain in the Classroom App, see this article.

Activity 1: Travel the Path

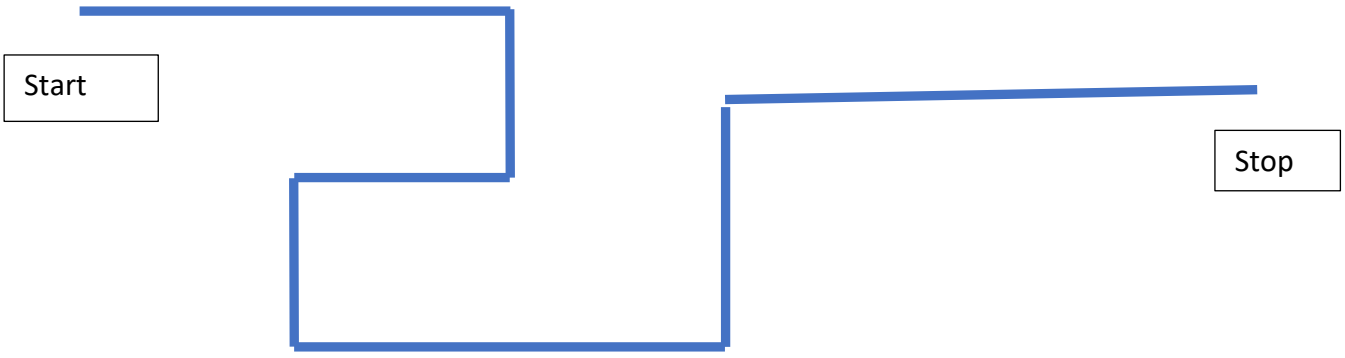
Students will use their code bot to maneuver a path. They will estimations and comparing lengths to accomplish the tasks.

1. Mark out a path with tape.
2. Have student build the code bot.
3. Demonstrate how to use the https://codego.vex.com/ (show the tutorial)
4. Allow students a few minutes to explore moving the code bot forward, backwards and making turns.





Sample path:



Activity 1: Travel the Path-Student Activity sheet:

Group Name: _____

Group Member 1:_____

Group Member 2:_____

Group Member 3:_____

Group Member 4:_____

Problem:_____

_____

_____

Write 3 things you will do to complete the task.

1._____

_____

2._____

_____

3._____

_____

After first trial:

What Worked: _____

_____

_____

What's the next step: _____

_____

_____

Activity #2-Around the Rectangle

Use tape to make a rectangle on the table.

Write the pseudocode for the robot to around the rectangle.

1. _____
2. _____
3. _____
4. _____
5. _____

Use the comments blocks to transfer pseudocode to Vexcode Go.

Write the distance of each side.

Side 1: _____

Side 2: _____

Side 3: _____

Side 4: _____

Find the perimeter of the rectangle:

Show work here.

Perimeter =_____

Group Name: _____ Date: _____

Build: _____ The Goal of our build is: _____

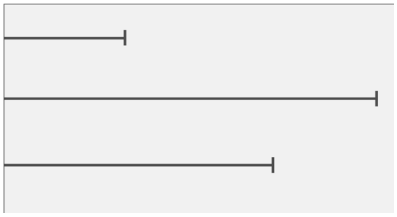
Builder Responsibilities	Journalist Responsibilities
Builder Name(s)	Journalist Name(s)

We are ALL responsible for:

- Keeping track of our VEX GO Kits and pieces so nothing gets lost
- Following directions and working together
- Making decisions by: _____

What works well in our group that we will do today?	What is a new strategy that we will try today?
What did not work well in our group today?	What is a possible plan for next time?

VEX GO Activity



Practice Measuring

Use your robot to check your answer!

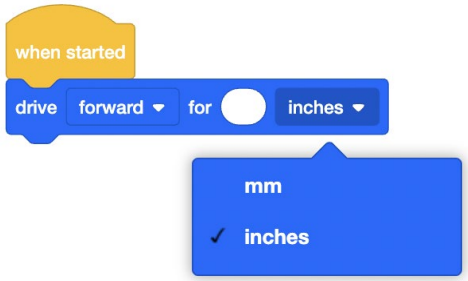
Use what you know about measuring to drive your Code Base a specific distance.

Step by Step

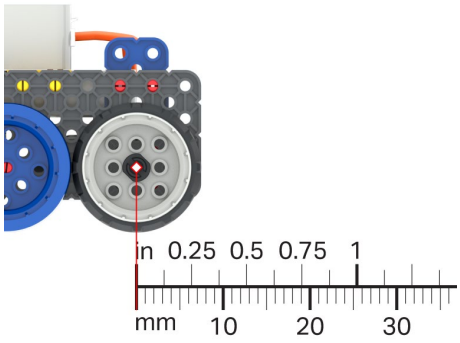
1. Draw 3 straight lines of different lengths on a piece of paper. Use the edge of the paper as the starting point of the line, and mark the end of the line clearly, as shown in the image above.

2. Use a ruler to measure the length of the first line, and write that measurement down.

3. Open VEXcode GO, and drag a [Drive for] block into your project, as shown to the right. Enter the number you measured in the parameter. Select the drop down to select inches or millimeters (mm).



4. Line up your Code Base so the wheel shaft aligns with the start of the line, as shown to the right. Connect your Code Base to VEXcode GO and start the project. The Code Base should drive and stop with the wheel shaft aligned with the end of the line. If it does not, measure and try again!



5. Repeat this process to drive your Code Base along each line that you drew and measured.

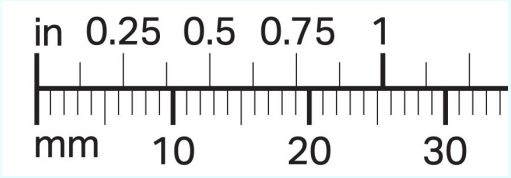
‘LEVEL UP’

- **Add more lines -** Draw and measure more lines of different lengths and use your Code Base to check your measurement!
- **Try another unit -** Try measuring in a different unit (inches or millimeters). Or, add a challenge by using your first measurements and convert them to inches, centimeters, or millimeters.

Pro Tips

Fractions and Decimals

- When measuring, you can have fractions as your distances. These are shown as tick marks between the whole numbers on the ruler.



- If you have a fraction as a distance, you can represent it in your project as a decimal (eg., 3 ¼ = 3.25).

Standards: CCSS.MATH.CONTENT.2.MD.A.1: Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

Resources

https://vr.vex.com

https://education.vex.com/stemlabs/iq/activities

https://education.vex.com/stemlabs/cs/computer-science-level-1-blocks/knowing-your-location/lesson-1-location-sensor

https://www.vexrobotics.com/iq

Materials Needed to Adapt

VEX GO Education Kits.	$199.00
VEX IQ Engineering Notebooks (composition motes can also be used)	$11.49 (pack of 5)