THE EDUCATION FUND

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2021-2022

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Variables, Vertices, and VEX:

Learning Math with VEX IQ

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Learning Math with VEX IQ

Farley, Marcelle A.

mfarley@dadeschools.net

Lake Stevens Elementary

Location: 2801

For information concerning Ideas with IMPACT opportunities including Adapter and Disseminator grants, please contact: The Education Fund305-558-4544, Ext. 113.
Email: audrey@educationfund.org www.educationfund.org

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Florida Standards

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.

4th Grade MAFS Standards

MAFS.4.MD.3.6

Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

MAFS.4.MD.3.7

Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

MAFS.4.MD.3.5

Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.
b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.

MAFS.4.MD.3.7

Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and

mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

5th Grade MAFS Standards

MAFS.5.G.1.1

Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).

MAFS.5.G.1.2

Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

MAFS.5.G.2.3

Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*

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.

Draw a House

Playground: Art Canvas

Challenge:

Level 1: Program the VR Robot to draw a house on the Art Canvas using the Pen block. Use a square for the house and triangle for the roof. The shapes do not have to be perfect.

Level 2: Program the VR Robot to add a garage to the side of the house. Use the Set pen color block to make the color of the garage different from the house.

Level 3: Decorate your house by adding windows, a door, a chimney, or other decorations. Be Creative!

1. Circle the type of angle that was used to draw the house.

   Acute angle obtuse angle right angle

2. Circle the type of angle that was used in the triangle.

   Acute angle obtuse angle right angle

3. Use the Drive Forward to write an equation to find the perimeter of the house.

   _____

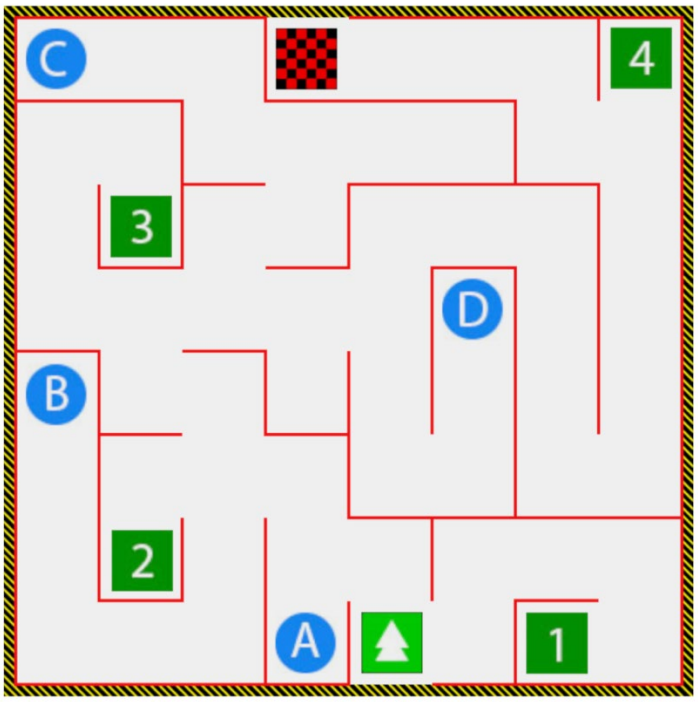
   _____

4. What is the perimeter of the house you drew?

   _____

5. What is the area of the house? _____

VEX CODE VR Wall Maze Lesson1



Playground: WALL MAZE -Drive Forward

Goal: Program the robot to move to A and then B, starting from the green start square.

You must use the following blocks:

What type of angle is a 90°angle? _____

Before Coding

1. Think about the path your robot will take. Use a pencil to trace the path on the picture.
2. What will your robot do after it gets to A?

_____

_____

After coding:

3. What was the most challenging part of the code?

_____

_____

4. Add all the Drive Forwards to calculate the total distance from A to B.

_____

5. What is one way you can improve your code?

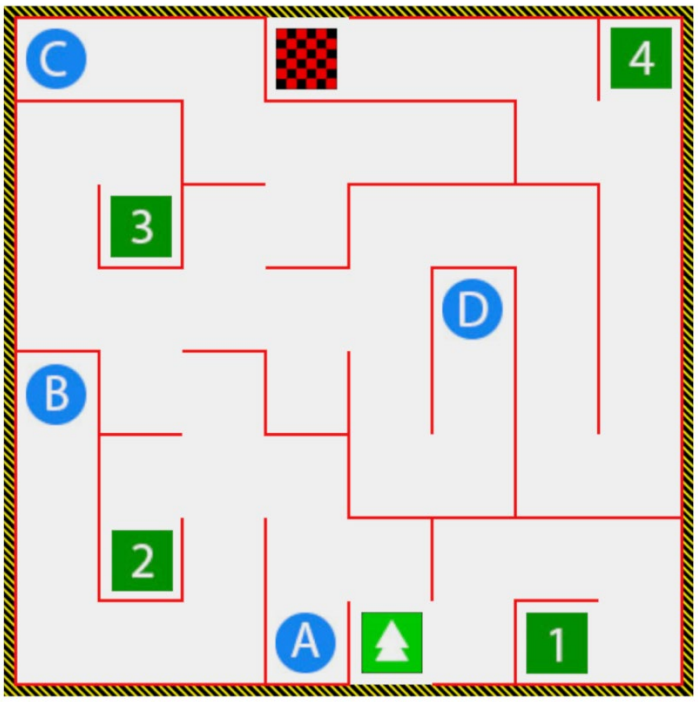
_____

_____

6. Is there another angle you can use to get from A to B Faster?

_____

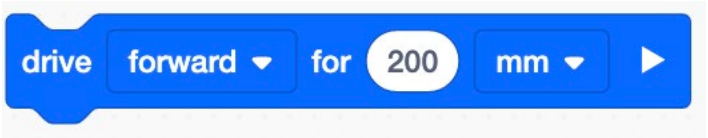
VEX CODE VR Wall Maze Lesson 2



Playground: WALL MAZE – Using Repeat

Goal: Program the robot to move to D starting from the green start square.

You must use the following blocks:



Before Coding

1. Think about the path your robot will take. Use a pencil to trace the path on the picture.
2. Do you notice any repeating patterns? Explain.

_____

_____

After coding: Watch the repeat tutorial.

3. Write the lines of the code that are repeated more than once?

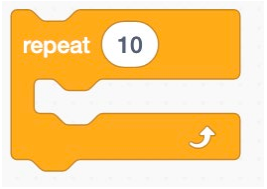
_____

_____

_____

_____

4. How many times? _____

5. How can you use the 

to improve your code?

_____

_____

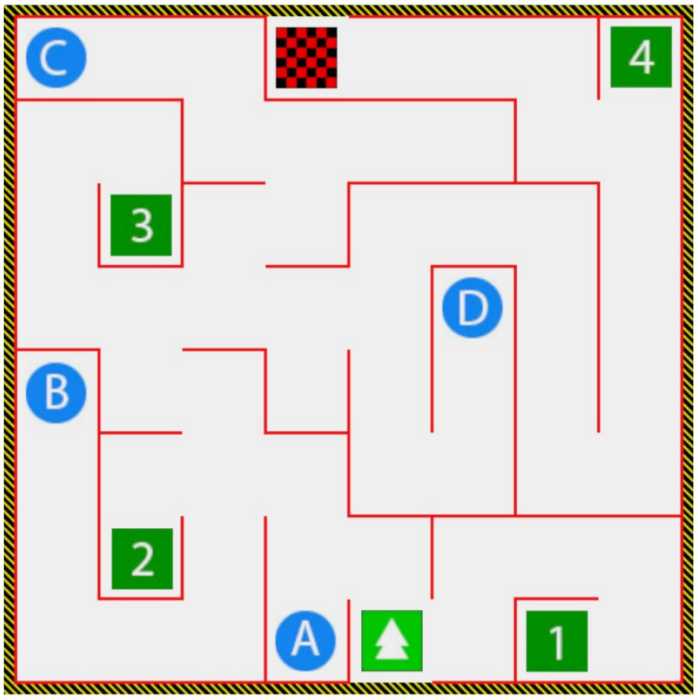
_____

6. Write an equation using the number in the repeat and the Drive Forward distance:

_____

_____

VEX CODE VR Wall Maze Lesson 3



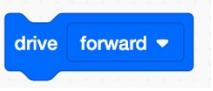
Playground: WALL MAZE – Using the distance or bumper sensor

Goal: Program the robot to move to C using the distance or bumper sensor.

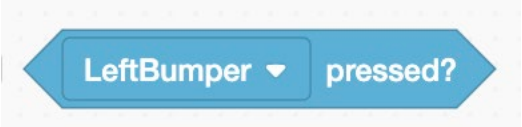
Before Coding

Watch the tutorial video for Distance sensor.

1. Think about the path your robot will take. Use a pencil to trace the path on the picture.
2. Which drive forward will you use? Circle one.



3. What happens when you use 

with 

?

_____

_____

_____

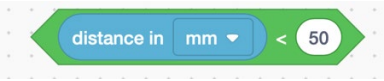
4. What happens when you use the 

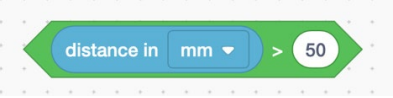
with the distance sensor?

_____

_____

_____

5. 

or 

Choose one of these blocks to use with 

. Explain how the robot will work with the block you selected? _____

_____

_____

_____

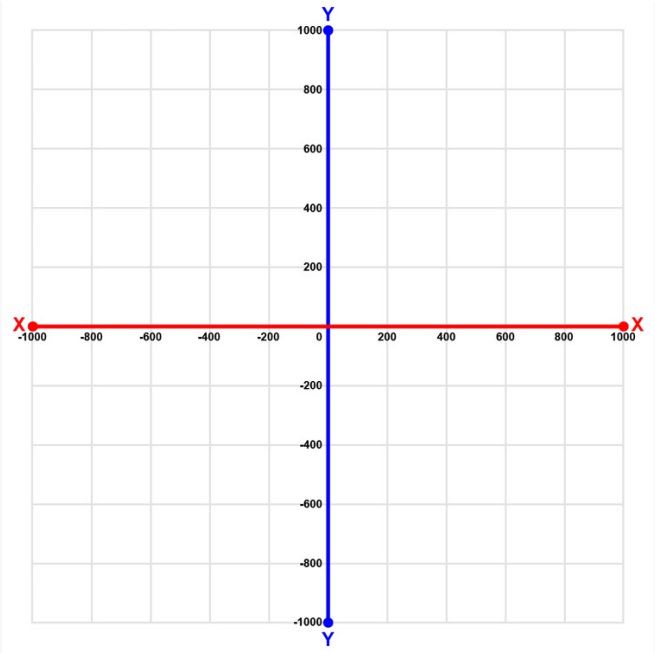
_____

Understanding the Coordinate System in VEXcode VR

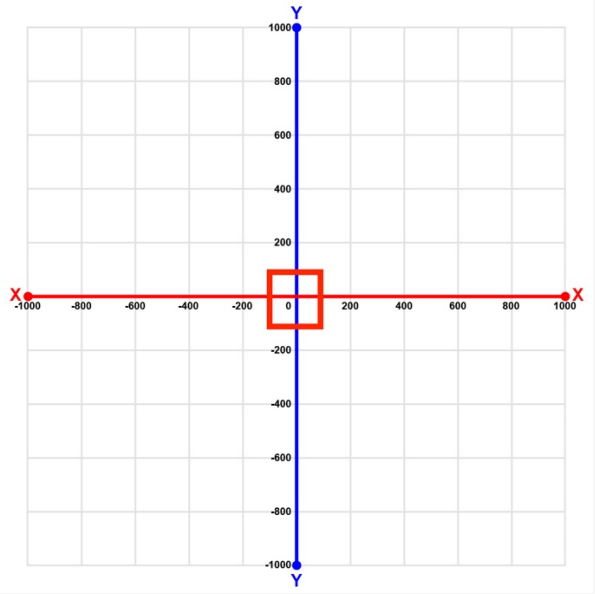
In VEXcode VR, the VR Robot moves around different Playgrounds that are based on a **coordinate system**.

The article will cover the following:

Coordinate Systems (X, Y)

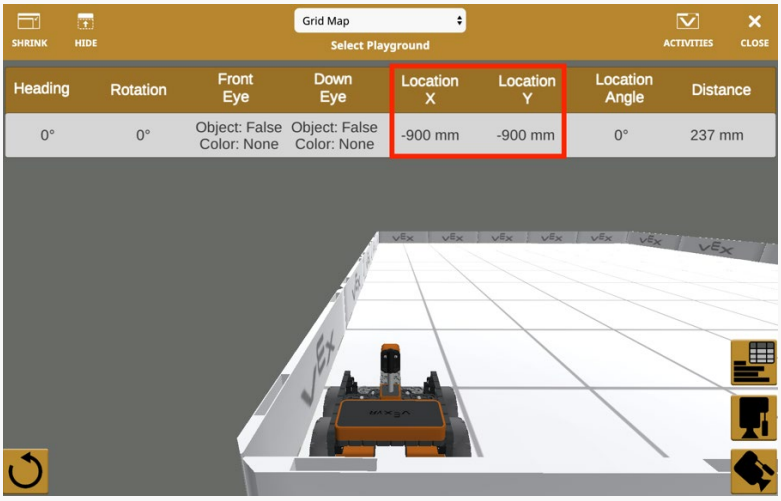


A coordinate system is a mathematical grid of values. There are different types of coordinate systems, but the **Cartesian Coordinate System**, or the (x,y) plane, is used in VEXcode VR. This is also known as a 2D (Dimensional) system, since its two dimensions are the X and Y axis.



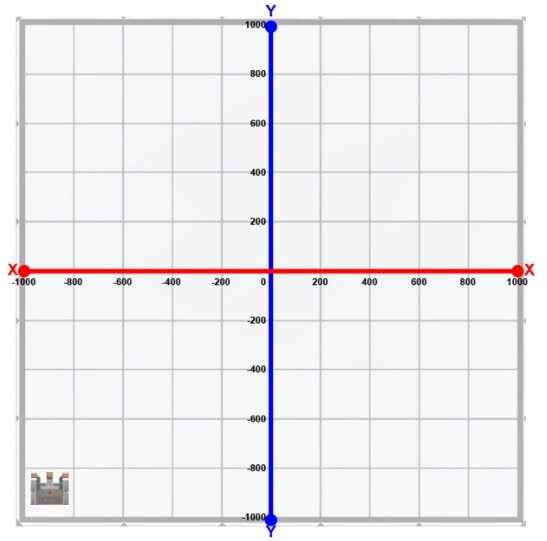
The X and Y axis can be used to locate a specific point, or coordinate, of the VR Robot on the Playground. The X-coordinate determines the horizontal (left to right) position of the specific point. The Y-coordinate determines the vertical (up and down) position of the point. The VEXcode VR Playgrounds range from -1000mm to 1000mm for both the X and Y axis.

The center of the Playground lies on the coordinate (0, 0) or also known as the origin.

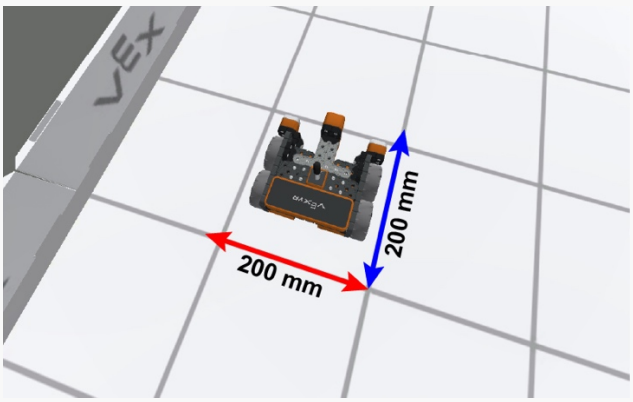


The specific X and Y location of the VR Robot can be found in the Dashboard of the Playground.

Playground Size

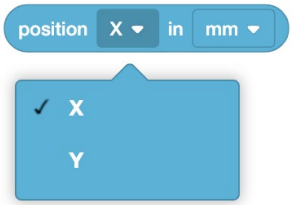


The Playgrounds range from -1000mm to 1000mm on both the X and Y axes. This makes the dimensions of the VEXcode VR Playground 2000mm x 2000mm.



The measurement of each of the individual squares used to make up the grids on many of the VEXcode VR Playgrounds, such as the Grid World, are 200mm by 200mm.

Blocks

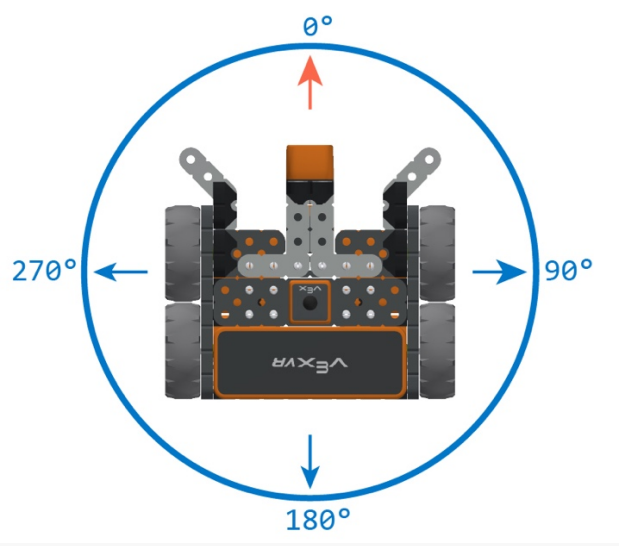


VEXcode VR features a Location sensor that reads (X,Y) coordinates from the front-center of the VR Robot. That sensor can be used with the *position for* block for both the X and Y values.

The Location sensor also will report on the position angle of the VR Robot by using the *position angle* block.

For more information about blocks, view the Help information.

Directions



The VR Robot follows a rotational number system from 0 to 359.99 in a clockwise rotation.

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

VEX IQ Education Kit (2nd generation). $399

VEX GO Education Kits. $199.00