MATATALAB
Lesson 3 & 4
SEQUENCES OF CODING

matatalab

Overview

Students have been experimenting with coding MatataBot to move forward, backward, to turn left and to turn right. In addition, students have also been introduced to advanced coding blocks. In lessons 3 and 4, students will use sequences along with advanced coding that will include parameter blocks, angle blocks, loop blocks and function blocks. Students will design a race car, map out a race course for their car and program their race car to successfully complete the race course using Matatalab coding blocks.

Additional resources for this lesson can be found at the end of the lesson.

Essential Objective

- Understand Matatalab advanced coding sequences to design and test a race car and race course.

Learning Objectives

- Create a race car.
- Create a race course.
- Test advanced coding sequences through the use of Matatalab components and the race car and race course.

Standards

- **ISTE:** Empowered Learner 1c, 1d; Knowledge Constructor 3d; Innovative Designer: 4a, 4d; Computational Thinker 5a, 5d; Global Collaborator 7b, 7c
- **NGSS:** K-2-ETS 1-1, K-2-ETS 1-2, K-2-ETS 1-3
  3-5-ETS1-2, 3-5-ETS1-3
- **CSTA:** K-2: 1A-CS-01, 1A-CS-02, 1A-AP-10,1A-AP-11, 1A-AP-12, 1A-AP-14, 1A-AP-15
  3-5: 1B-CS-03, 1B-AP-08, 1B-AP-10, 1B-AP-11, 1B-AP-13, 1B-AP-15, 1B-AP-16

Time

- Two lessons - 60 minutes each

Materials

Per group of 4 students:

- 1 Matatalab Coding Set - Parts used in this lesson will include:
  - Command Tower

- Control Board
- MatataBot
- Direction blocks
- Angle blocks
- Parameter blocks
- Loop blocks
- Function blocks

- Modeling clay
- Construction paper
- Scissors
- Glue and tape
- Styrofoam cups and containers (shell of race car)
- Markers
- Large sheets of paper or roll of paper for race course
- Student journals

Teacher Set-Up and Preparation

Charge all Matatalab Command Towers and MatataBots.
Preview use of parameter, loop and function blocks.
Make a model of a race car for students to view. Make a model with a paper cup and draw a wind-shield, headlights and taillights
For each group of students:

- Organize 1 set of Matatalab parts used in this lesson.
- Organize and make accessible race car materials.

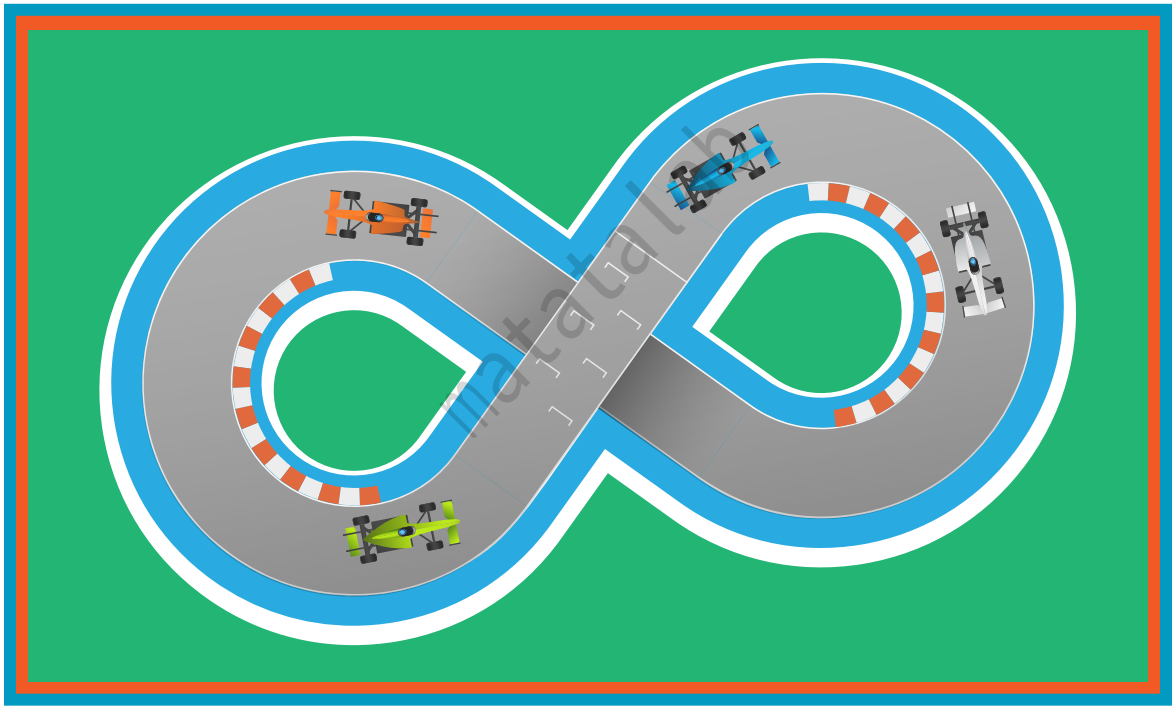
Vocabulary

- **Map:** A drawing or representation of an area usually on a flat surface.
- **Angle:** Space (usually measured in degrees) between two intersecting lines or surfaces at or close to the point where they meet.
- **Degree:** A measurement of a plane angle, defined so that a full rotation is 360 degrees which is equal to a circle.
- **Grid:** An arrangement of letters and numbers that allow one to locate a precise location on a map. Letters are usually on one side of a map while numbers are usually located in a vertical fashion on the other side.
- **Algorithm:** A set of rules or directions to be followed by a computer.
- **Function:** A math expression involving one or more numbers or variables. Can be expressed as a sequence or an equation. Example 1+2 = 3
- **Loop:** A sequence of instructions that is continually repeated until a condition changes it.
- **Parameter:** A number that tells a computer how many times to repeat a direction or rule.

LESSON 3

Introduction

"Race courses include lots of turns and movements that race cars must perform. A race course is similar to a map in that it includes angles and turns. In this lesson we will create a race car shell, place it over the MatataBot, and then we will create a large race course for the MatataBot to race upon. We will program our race car using Matatalab coding blocks for the race car to complete the course."



- Explain to students that they will work together to design a race car and a race course.
- Show students the teacher created race car shell and point out that it will fit over the MatataBot. (Note: The race car shell should fit over the MatataBot. Students are not to glue or tape race car to robot.)
- Review right and left turns with students. Point out that cars can make angular turns either greater or less than 90 degrees. Demonstrate coding block arrangements of these angles using Matatalab Coding Set. Explain that when students create their race course they might want to include some of these other angles.

Matatalab Activity

- Distribute 1 MatataBot and 1 large sheet of paper to each group.
- Identify materials and location of materials for students to create their race car and race course.
- Remind students that their race car should fit over the MatataBot.
- Student groups discuss, collaborate and sketch designs for both race car and race course in journals. Students divide tasks among group members and work to complete both race car and race course.
- Encourage students to test coding block arrangements of these angles using the Matatalab Coding Set. Allow students to modify and iterate their coding block arrangements as they learn about the angle coding block usage.

Closing

Assessment

"We have discussed and worked with Matatalab advanced coding blocks. We have especially focused on the Matatalab angle blocks which we must use in order to allow our race cars to make important turns."

Have students answer the following questions:

- What is meant by an angle?
- Why are angles important for race car movements?
- How successful were you as you tested out your Matatalab coding block arrangements?
- What would you have changed about this project and why?

Once students have been given a chance to discuss these questions, students will be given time to draw pictures of their Matatalab angle and coding block arrangements. Students will write about their experiences with more advanced coding blocks.

LESSON 4

Introduction

"More advanced coding blocks are very important as you work with Matatalab components. These advanced coding blocks include Loop, Parameter, Angle, and Function blocks. Remember that a function, when used with coding blocks, represents a sequence of instructions." Point out the specific function coding blocks and how they frame the arrangement of blocks. Point out that an algorithm is similar to a computer's function.

"Remember that a loop tells a computer to repeat something until it is instructed to stop." Point out the circled loop blocks and how it is important to frame a set of blocks or functions in order for the function to repeat. "Remember that a parameter is a number that tells a computer how many times to do something." Point out the numbered parameter blocks that, using prongs, connect at the bottom of the coding blocks. "In this lesson, we will work with more advanced coding blocks and race our race cars along our created race courses using these more advanced coding blocks."

As necessary, review use of advanced coding blocks: parameter (including angles), loop, and function.

Matatalab Activity

- Distribute 1 Matatalab Coding set per student group.
- Distribute the created race car and race course to each group.
- Student groups discuss possible sequence of coding blocks to use in order for their race car to complete a lap or a set of laps around the race course.
- Encourage students to use the advanced coding blocks including parameter blocks, loop blocks and function blocks.
- Student groups work to arrange coding blocks on the Matatalab command board to code MataBot and test their cars to see if they complete the race course successfully.
- Students debug code as necessary.
- Have each group present and demonstrate their race car and race course.

Closing

Assessment

"We have worked with the Matatalab advanced coding blocks and created a race car and race course. As we raced our race cars, we utilized angle blocks that allowed us to make important turns on our race course."

Have students answer the following questions:

- What were the Matatalab advanced coding blocks?
- Which advanced coding blocks were most important for allowing your race car to travel successfully through your race course? Why?
- How did you use the advanced coding blocks to race your race car?
- How successful was your race car as it traveled through your race course?
- How would you change the creation of your race car and race course to make this more successful?
- What surprised you most about this project?

Once students have been given a chance to discuss these questions, students will use their journals to draw pictures of their race courses and the movement of the race car. They will write about their experiences with the race course and more advanced coding blocks and then share out their experiences.

Extensions

There are many different types of car races. Some races include different types of vehicles such as trucks, or even amphibious (water and land) vehicles. Create a totally different type of race vehicle and then create a totally different type of race course. The race course may include water or other types of materials. Once the vehicle and race course have been created, test it out by racing the vehicle through the race course.

Function blocks incorporate the idea of a sequence. A sequence is a particular order in which things follow each other. What types of sequences do we use on a daily basis? A calendar utilizes a sequence of days in a particular order. Create a poster based upon different types of sequences. Explain and illustrate each sequence.

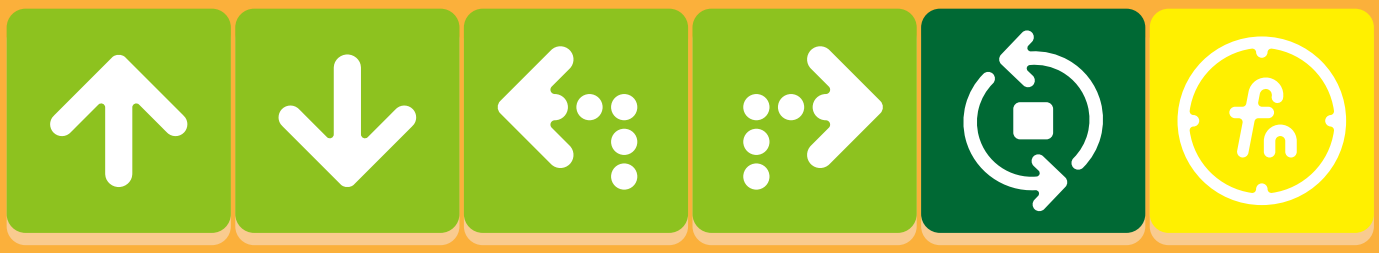
Real World Connections

Think About

Matatalab angle blocks allow the MatataBot to perform a variety of movements that would not be possible without them. Where do we see angles in movements used in our daily lives? One example might be degrees of angles necessary for cars on a road or highway. Other examples might include degrees of angles used when walking through a large store or angles used in clocks as the minute hand moves around the circle. What other examples do we see?

The Matatalab advanced coding blocks include a parameter or numbered coding block. This allows a particular movement to be repeated a specific number of times. Why might it be necessary for a movement to be repeated? What would happen if it was impossible to repeat something? What types of actions or events have you noticed that have been repeated? Examples might include repeating an experiment to find out whether the results are true. Another example might include being allowed to complete a standard test a number of times. What other examples do we find in life of events or things being repeated a certain number of times?

Race Car Code Plan



Use the coding blocks above. Draw the sequence you will need for your race car to travel on the race course. Include a start and finish line.

Angle Blocks

30° 45° 60° 90° 120° 150°

Write the measurement of each block?