

Extracurricular Manual

for Coding Set Pro

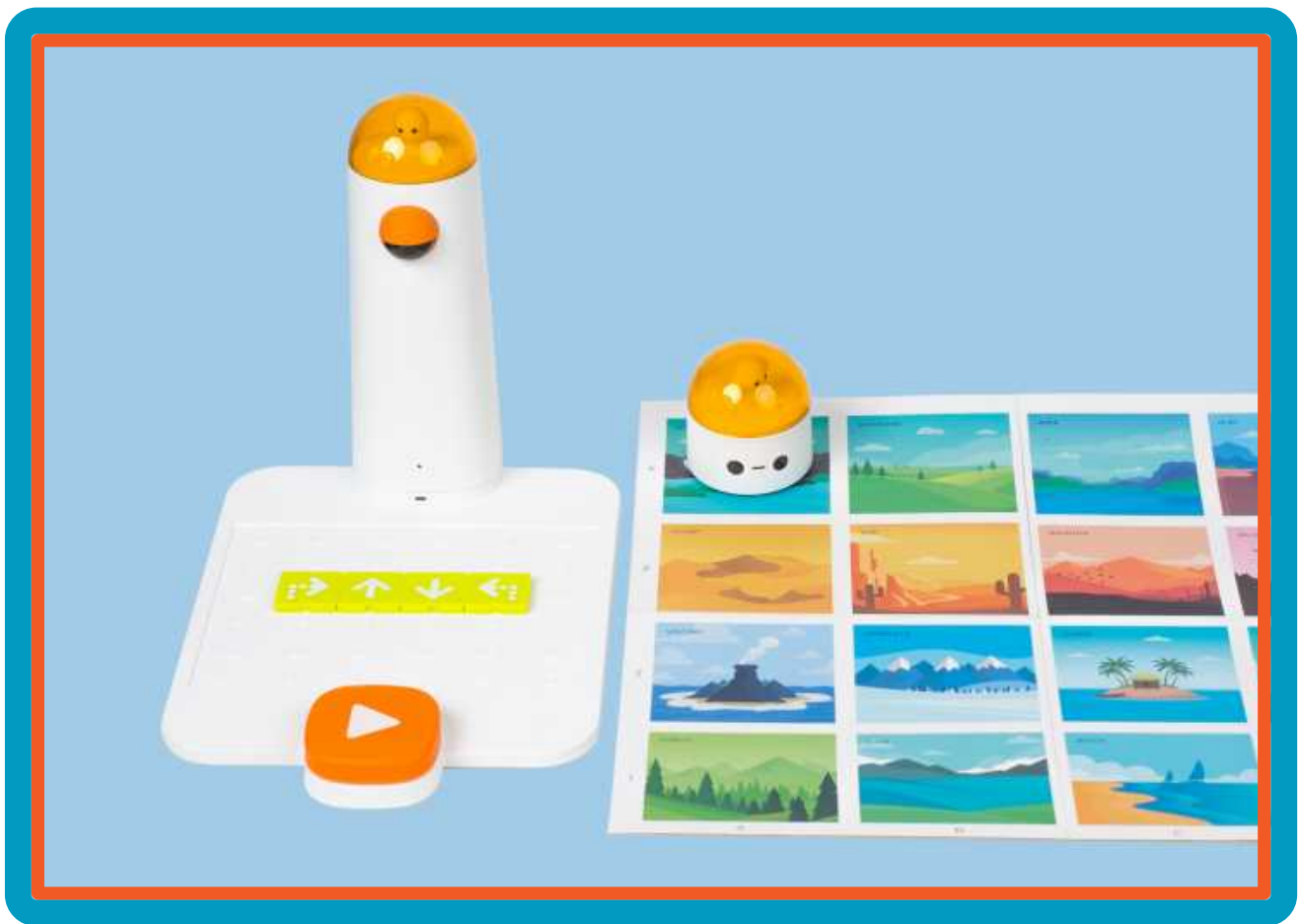


The logo for 'matata studio' is centered on the left side of the page. The text 'matata' is on the top line and 'studio' is on the bottom line, both in a bold, lowercase, sans-serif font. The text is surrounded by several colorful circles: a large yellow circle to the left, a medium green circle to the right, a smaller yellow circle below the green one, and a small teal circle to the left of the yellow one. A red circle is also present to the right of the text, and a teal circle is on the boundary of the large white circle on the right side of the page.

matata
studio

Lesson 1

Introduction



Overview

The MatataStudio Coding Set, appropriate for ages 4 to 9, is a block-based, tangible programming tool that allows students to move a robot through a nature map by way of a Bluetooth-enabled command tower and board.

The Coding Set includes a Bluetooth-enabled command tower, control board, wheeled robot, and coding blocks. The coding blocks, about the size of two Lego® bricks, allow students to place them in a coding configuration on the control board. The command tower takes a photo of the blocks configuration and at the touch of the large orange button, sends code to move the robot on the map.

Students can utilize and demonstrate their 21st Century skills through collaboration, critical thinking, communication, and creativity.

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

Essential Objective

- ▶ Understand use of MatataStudio Coding Set components in establishing directional movement.

Learning Objectives

- ▶ Describe function of the MatataStudio Coding Set components.
- ▶ Explain the difference between sending and receiving messages.
- ▶ Program MatataBot using direction blocks.
- ▶ Collaborate with other students to program MatataBot.

Standards

- ▶ **ISTE:** Empowered Learner 1d; Innovative Designer 4c, 4d; Computational Thinker 5c, 5d; Global Communicator 7b, 7c
- ▶ **NGSS:** K-2-ETS1-1, K-2-ETS1-3
3-5-ETS1-2, 3-5-ETS1-3
- ▶ **CSTA:** K-2: 1A-CS-02, 1A-CS-03, 1A-AP-10, 1A-AP-14
3-5: 1B-CS-03, 1B-AP-08, 1B-AP-10, 1B-AP-11, 1B-AP-15, 1B-AP-16

Time

60 minutes

Materials

Per group of 4 students:

- » 1 set of directional Card Symbols
- » 1 MatataStudio Coding Set - Parts used in this lesson will include:
 - » Command Tower
 - » Control Board
 - » MatataBot
 - » Directional Coding Blocks
 - » Nature Map
 - » Challenge Booklet 1
- » Student journals

Teacher Set-Up and Preparation

- » Charge all MatataStudio Command Towers and MatataBots.

For each group of students:

- » Print a set of 12 directional symbols (4-forward, 3-back, 3-right turn, 2-left turn).
- » Organize 1 set of MatataStudio parts used in this lesson.
- » Ensure students have access to Challenge Booklet 1.

Vocabulary

- » **Block-coding:** Tactile coding based upon arrangement of symbol or icon-labeled blocks.
- » **Sequence:** An arrangement of instructions to be followed in a particular order.
- » **Bluetooth communication:** A standard for short-wave wireless interconnection.
- » **Robot:** A machine capable of carrying out a complex set of instructions as programmed by a computer.
- » **Program or Code:** A specific set of instructions to be carried out by a computer.
- » **Nature:** Includes land and nature located within a specific area.

LESSON 1

Introduction

"The MatataStudio Coding Set is made up of a command tower, a control board, different types of coding blocks, musical coding blocks, and a wheeled robot. In this lesson, we will discuss the important parts of the MatataStudio Coding Set, understand the way in which the robot moves through a nature map, and complete MatataStudio Challenge Booklet 1."

- » Ask students the purpose of a turning signal in an automobile. What happens when their parent uses the turning signal? (The car turns left or right.) Ask students what other directions a car can move. (Forward and reverse).
- » Tell students to stand up and form a horizontal line and stand arm's length apart. Ask students to move forward one step, turn right, move backward one step, turn left. Repeat this once or twice more to gauge how well students understand directional movement. Reinforce directional movement with students as needed.
- » Assign groups of 3-4 students. Define a space in the room, hallway, etc. for each group. Each group will work collaboratively to complete the following sequence. Place a forward directional card down on the floor. Place the remaining direction cards in a sequence through which students will advance. Student groups work collaboratively to complete the sequence.
- » "The MatataStudio Coding Set is based upon arranged coding blocks placed on the control board and read by the command tower. The command tower takes a picture of the arrangement of coding blocks and through Bluetooth communication sends a picture of instructions to the MatataBot. The command tower sends the instructions and the robot receives the instructions. This allows the robot to perform the movements that were instructed by the arrangement of blocks on the control board." "What does it mean to send? What does it mean to receive?"
- » Allow students to discuss the difference between sending and receiving.
- » Command Tower = Sends » Robot = Receives

MatataStudio Activity

- » Distribute 1 MatataStudio Coding Set and Challenge Booklet 1 to each student group.
- » Point out each of the various parts: Command Tower, Control Board, MatataBot, Direction Blocks.
- » Explain and demonstrate how to turn on both command tower and MatataBot.
- » Explain how the tower communicates with the robot via Bluetooth communication.



- ▶ Ask students to open the MatataStudio nature map. Ask students to open their Challenge Booklet 1. Name (or have students name) the various ecosystems on the nature map. Point out the start and end symbols and have students locate these symbols on the map in Challenge Booklet 1. Have students place MatataBot on the Forest square with eyes pointing towards the Volcano square.
- ▶ Ask students how many steps MatataBot needs to take to move to the Volcano. (1 step) Have students place one direction arrow block on the Control Board. Point out to students the line on the bottom of the direction blocks. Tell students that the block needs to be placed on the Control Board with the line on the bottom. Students can check coding by looking on the next page in the booklet.
- ▶ Tell students to push the large white arrow on the Control Board. There may be a pause of a few seconds, but the MatataBot eyes will turn green and the robot will move forward one block to the Volcano. (Students remove coding block from Control Board.)
- ▶ Ask students to look at the next page in their booklet. Explain that the robot will complete a turn. Ask students to find a turn block which they think will allow MatataBot to make a right turn. Students will place the block on the Control Board, press the large white arrow and observe how MatataBot turns. Did it work? Do students need to try a different block?
- ▶ At this point students should be allowed to work collaboratively in their groups and continue with activities in Challenge Booklet 1. Teacher circulates to encourage and answer student questions.

Convene the group together for closing.

Closing

Assessment

“We have investigated the use of MatataStudio directional movement blocks. We have learned about the way in which Bluetooth communication allows the MatataStudio command tower, in conjunction with the control board and coding blocks, to send messages to the robot in order to effect movement and direction on a map.”

Have students answer the following questions:

- » What role do the labels on the MatataStudio coding blocks play?
- » How important is bluetooth technology to the MatataStudio Coding Set?
- » What did you learn from your directional movement cards activity?
- » How would you change the way in which you worked with the directional movement cards?
- » How successful was your group in completing challenges in Challenge Booklet 1?
- » What is meant by sending?
- » What is meant by receiving?

Once students have been given a chance to answer these questions, students will use their journals to draw pictures of their directional activity, the arrangement of coding blocks on the MatataStudio control board, and write about their experiences with their activities.

Extensions

Create a poster that lists, explains, and illustrates each of the directional coding blocks. The poster should also include a picture of the command tower and control board.

Create a game that involves sending a message and receiving a message. This could be based on a telephone game where one student makes up a message, says the message to someone next to that student, and that student sends the messages to the student next to him or her. This game could continue until the last student receives the message. Students could then discuss the way in which the message changed from the original message to the final message. Students could be challenged to create a different type of sending and receiving game. This could be based on the sending of a ball in a particular sports game and reception of the ball.

Real World Connections

Think About

Bluetooth communication technology is important and used in many different tools today. What tools can you think of that include Bluetooth technology? Why is Bluetooth technology important? What do you think would happen if we didn't have Bluetooth technology?

A program or code is a specific list of instructions to be used by a computer. In what other instances do we use a specific list of instructions? What would happen if one part of the list of instructions were to be taken away? How would that impact the code?

MATATASTUDIO
COMPONENT

WHAT DOES IT
DO?



**Control
Board**



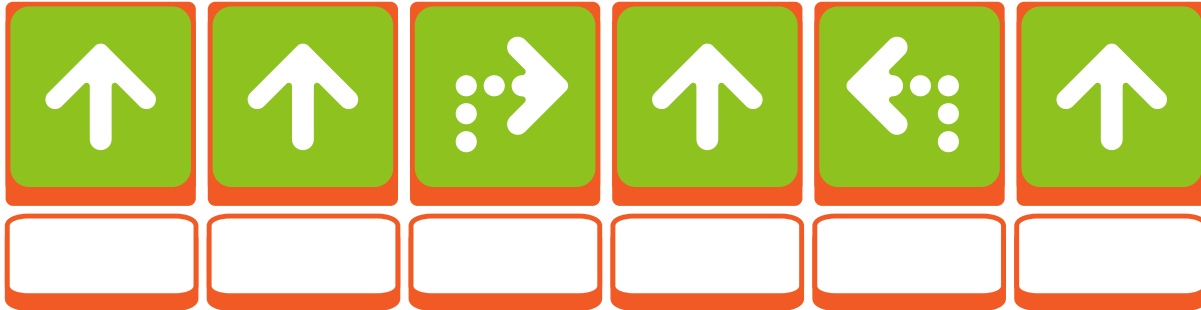
**Command
Tower**



MatataBot

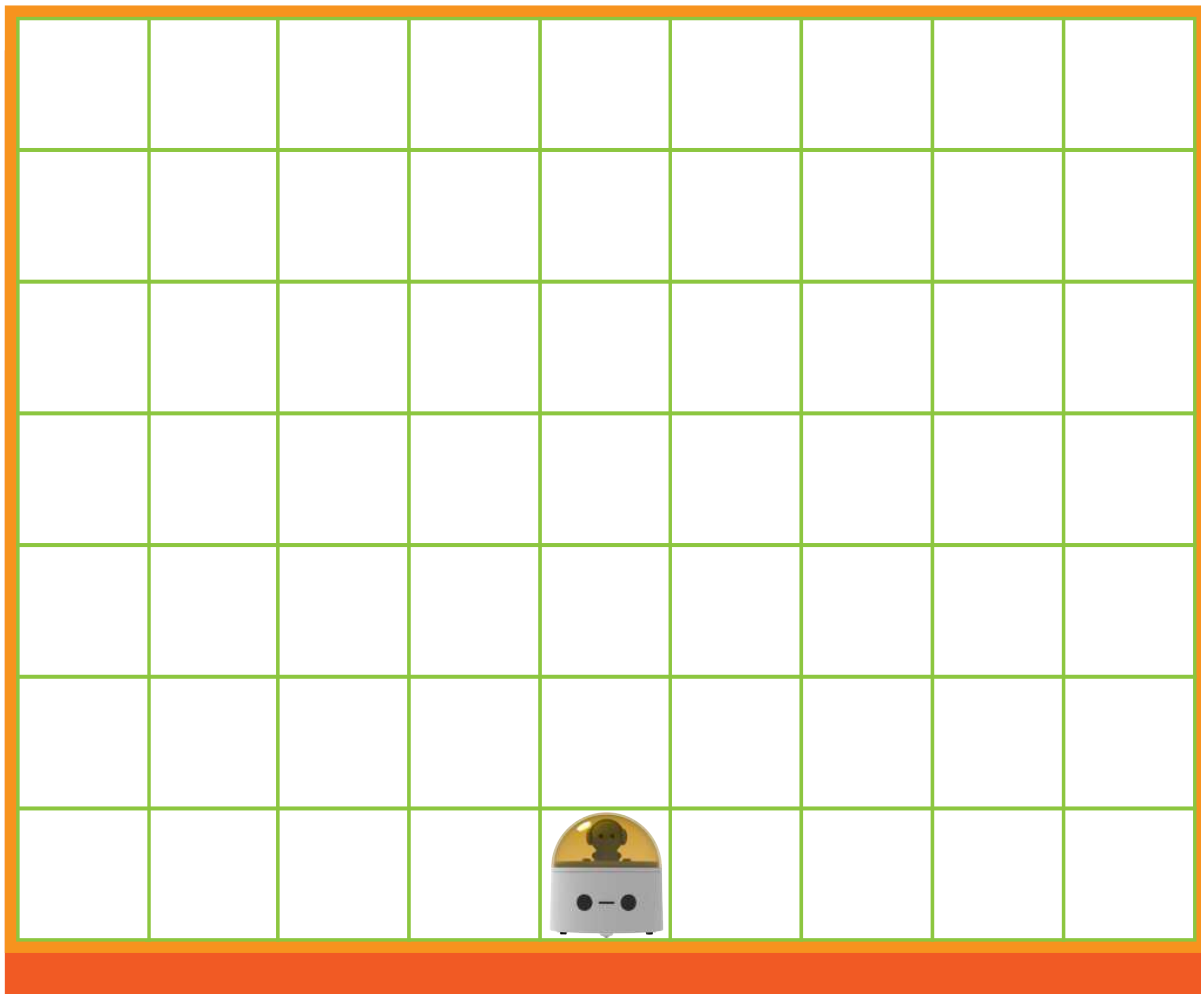
CAN YOU DECODE THIS SEQUENCE?

- USE THE WORDS IN THE WORD BANK
- WRITE THE WORD THAT DESCRIBES THE MOVEMENT FOR EACH TILE
- DRAW THE MOVEMENT FOR THIS SEQUENCE IN THE BOX AT THE BOTTOM



Six empty rectangular boxes, one under each tile, for writing the corresponding movement word.

- FORWARD
- LEFT TURN
- FORWARD
- RIGHT TURN
- FORWARD
- FORWARD



BLOCK

MOVEMENT

- DRAW A LINE FROM THE CODING BLOCK TO THE CORRECT MOVEMENT



FORWARD

BACKWARD

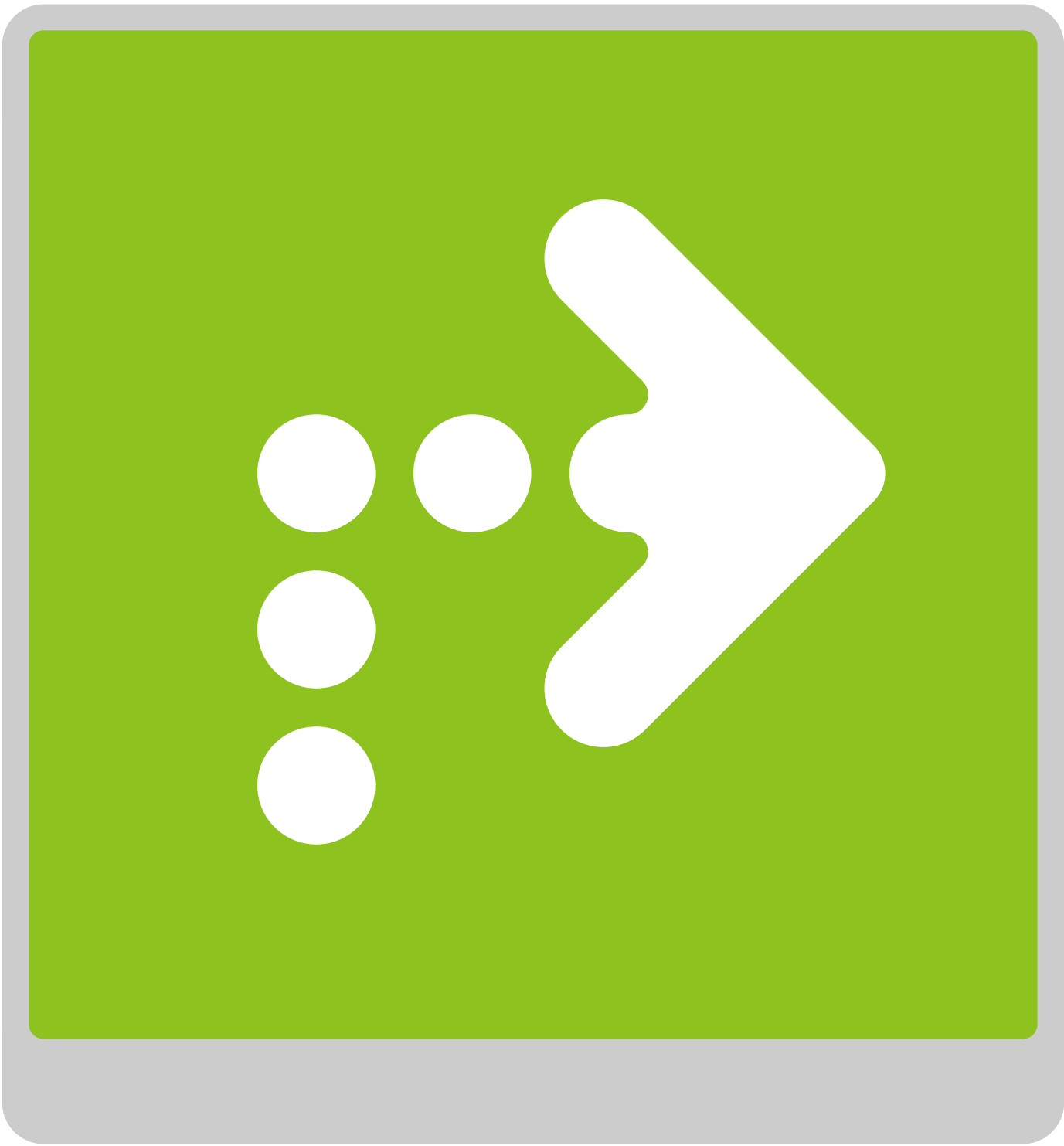
RIGHT

LEFT









Lesson 2

Coding Adventures



Overview

When a student starts the year at a new school, being able to locate the cafeteria, library, etc. may be difficult until the student learns the layout of the building. It may seem like a confusing maze. Additionally, giving and following a set of directions to move from one location in the school to another location takes practice. The MatataStudio Coding Set includes a variety of blocks that help MatataBot move around a map from one place to another. In this lesson students will be introduced to mazes. Students will use MatataStudio Challenge Booklets 2 and 3 to gain an understanding of the use of parameters, loops and functions in conjunction with direction blocks.

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

Essential Objective

- Understand the importance of code sequencing using MatataStudio direction, parameter and function blocks.

Learning Objectives

- Collaborate with other students.
- Code MatataBot using direction, parameter and function blocks to complete challenge activities.

Standards

- **ISTE:** Empowered Learner 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-AP-10, 1A-AP-11, 1A-AP-14, 1A-AP-15
3-5: 1B-CS-03, 1B-AP-08, 1B-AP-10, 1B-AP-11, 1B-AP-15, 1B-AP-16

Time

60 minutes

Materials

- » 1 paper maze per student
- » 1 pencil per student
- » Laptop and projector
- » For each student group:
 - » 1 MatataStudio Coding Set - Parts used in this lesson will include:
 - » Command Tower
 - » Control Board
 - » MatataBot
 - » Direction, Parameter, Loop, and Function Blocks
 - » Music Block
 - » Obstacles
 - » Flags
 - » Nature Map
 - » City Map
 - » Challenge Booklet 2
 - » Challenge Booklet 3
- » Student journals

Teacher Set-Up and Preparation

- » Charge all MatataStudio Command Towers and MatataBots.
- » Download PDF Maze, found as a template at the end of this lesson, to project during introductory activity.
- » Make 1 copy of PDF maze for each student.
- » Organize 1 MatataStudio Coding Set for each student group.
- » Ensure all students have access to Challenge Booklets 2 and 3.
- » Ensure all students have access to MatataStudio Nature Map and City Map.

Vocabulary

- » **Maze:** A network or path through which one has to find a way from start to finish.
- » **Map:** Drawing or representation usually on a flat surface of a whole or part of an area.
- » **Code:** Set of specific directions or instructions sent to and used by a computer.
- » **Debugging:** Finding and removing errors from computer hardware or software.
- » **Function:** All programming functions have input and output. The function contains instructions used to create the output from its input.
- » **Loop:** Sequence of instruction that is continually repeated until a certain condition is reached.

- » **Grid:** Arrangement of letters and numbers that allow one to locate a precise location on a map. Letters are usually one side of a map while numbers are usually located in a vertical fashion on the other side.
- » **Coordinate:** Set of values that show an exact position.
- » **Coordinate plane:** Two-dimensional surface by two intersecting and perpendicular number lines on which points are plotted and located by their x and y coordinates.
- » **Ordered pair:** Pair of numbers used to locate a point on a coordinate plane called an ordered pair. An ordered pair is written in the form (x, y) where x is the x-coordinate and y is the y-coordinate.
- » **Intersection:** Point where two lines intersect or come together.
- » **Parameter:** A value that is already "built in" to a function.

LESSON 2

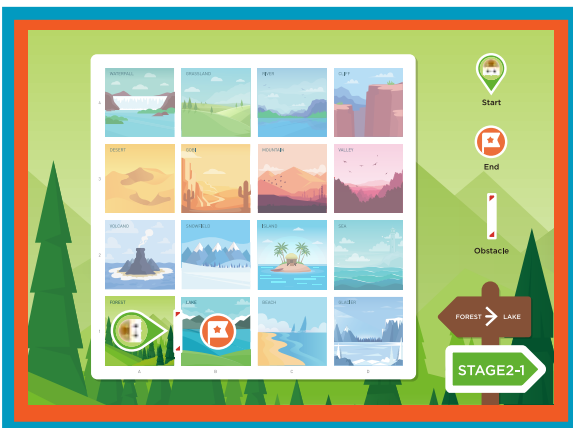
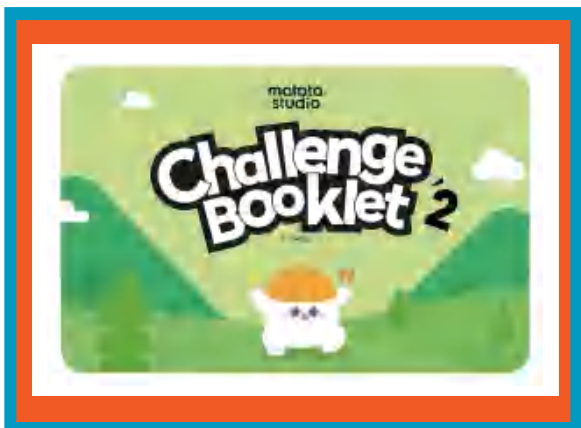
Introduction

“Mazes are paths through which you try your best to move successfully. Mazes have a start or beginning, a path that includes a set of movements and directional changes, and they have endpoints or finishing points. This lesson will allow students to work through a maze and to complete challenges in MatataStudio Challenge Booklets 2 and 3.”

- » Distribute one PDF paper copy of the maze per student. Maze in Resources below.
- » Instruct students to begin at start, and without lifting a pencil or erasing mistakes draw a path to end of the maze.
- » Ask students to share their success or challenges. Do they see where they had to go backward, turn in a different direction, rethink their movement?
- » Project teacher copy of maze and point out correct solution, reinforcing movement directions (right, left, forward).

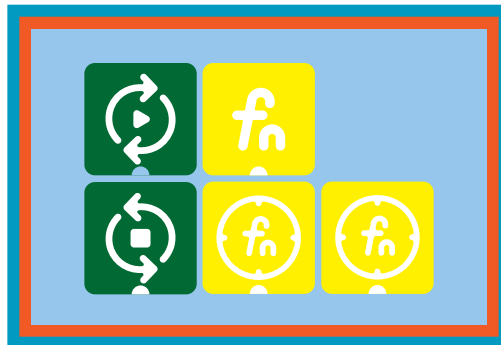
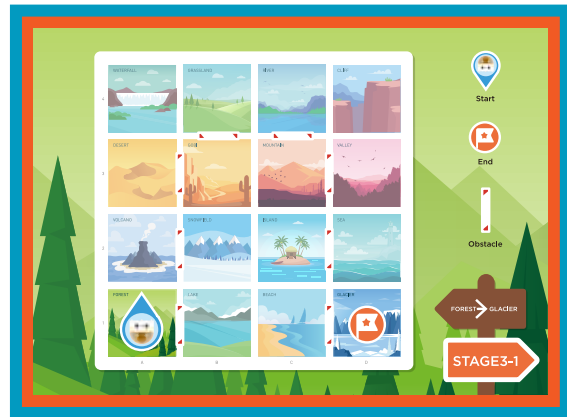
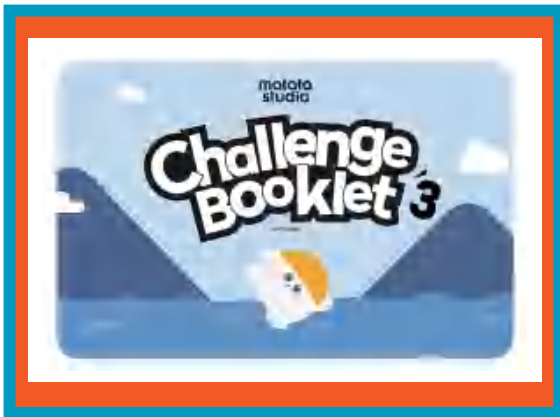
MatataStudio Activity

- » Distribute 1 MatataStudio Coding Set and Challenge Booklet 2 to each student group.
- » Point out each of the new blocks: parameter, loop, function and music blocks.
- » Ask students to open the MatataStudio Nature map.
- » Challenge Booklet 2:

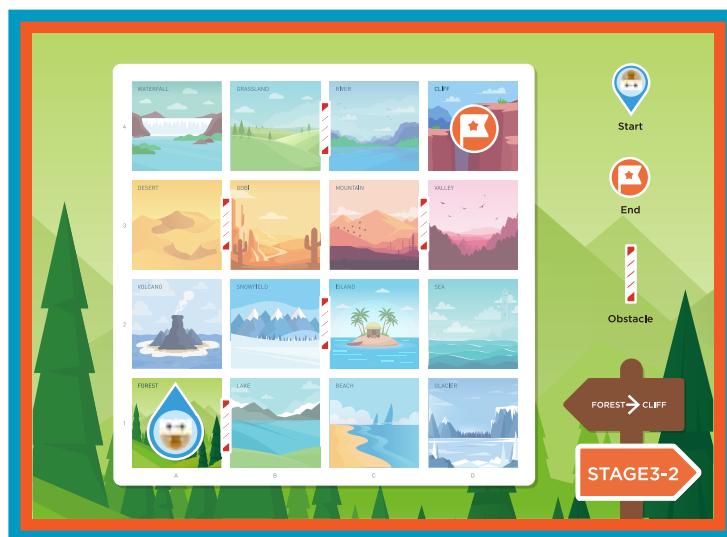


- Ask students to open their Challenge Booklet 2 to Stage 2-1. Have students place MatataBot on the Forest square with eyes pointing towards the Lake square. Point out the symbols at the top right page.
- Ask students how they might program MatataBot to move to the Lake, but point out that the robot needs to go around the obstacle. Students can check coding by looking on the next page in the booklet.
- Students work together to code a path and test their coding, debugging code if needed.
- Before students begin Stage 2-2 introduce the use of a parameter. Placing a number under a direction block indicates that this movement will be repeated a certain number of times. In Stage 2-2, the parameter 2 means that the robot will move two steps forward when it reads this direction block.
- Explain to students that this is a way to use fewer tiles but get the same results.
- At this point students should be allowed to work collaboratively in their groups and continue with activities in Challenge Booklet 2. Teacher circulates to encourage and help students with coding as needed.
- Ask students to open their Challenge Booklet 3 to Stage 3-1. Have students place MatataBot on the Home square with the eyes pointing towards the school. Have students place a flag at the ending location for this challenge. Ask students to arrange the obstacles according to the diagram.

➤ Challenge Booklet 3:



- Explain that the distance the MatataBot needs to travel is much further and there aren't enough coding blocks to accomplish this. Introduce the Loop blocks. Loop blocks are used along with Parameter blocks to have a sequence repeated. Point out the difference between the opening and closing loop blocks. Students may find this concept difficult to understand. The teacher may choose to help students create the correct code for this challenge. Students should test the code and then discuss how the loop blocks created the correct path for MatataBot to successfully travel to the bakery.



- Allow students to collaborate in their groups and complete Stage 3-2. Teacher circulates to encourage and help students with coding as needed.
- Ask students to look at Stage 3-3 and set up their board to match the picture. Ask students to explain where the ending point is located. (Students will likely state that the ending point is in the corner of the mat.) Point out the letters and numbers along the sides of the mat. Ask students to identify the ending point or ordered pair using a letter and number. (F,1) At this point students do not need a more in depth explanation to a coordinate plane.
- Explain to students that another way to use few coding blocks is to create a function. This involves two steps. First, a function block is placed on the Control Board, followed by a coding sequence. Second, another line of code is placed on the Control Board. This code incorporates a function block which will recognize and execute the first line coding sequence. The second line can also include other coding. The Command Tower takes a picture of both lines of code. MatataBot will execute the function code by reading only the Function block and any other code added to the second line. As with Loop blocks, Function blocks can be incorporated in coding to simplify the coding and use fewer coding blocks.
- Students may find this concept difficult to understand. The teacher may choose to help students create the correct code for this challenge. Students should test the code and then discuss how the

- Function blocks created the correct path for MatataBot to successfully travel to its ending point, (F,1).
- ▶ At this point, students should be allowed to work collaboratively in their groups and continue with activities in Challenge Booklet 3. Teacher circulates to encourage and help students with coding as needed.

Convene the group together for closing.

Closing

Assessment

“Today we have worked with mazes. We also used the MatataStudio coding blocks and helped MatataBot move around the Nature map.”

- » Have students answer the following questions:
- » How is a maze like the Nature map?
- » What are the similarities between a maze and a map?
- » How successful were you in making your robot follow your program according to the way you arranged the coding blocks on the control board?
- » How successful were you in completing Challenge Booklets 2 and 3?

Once students have been given a chance to answer and discuss these questions, ask students to draw or write about their experiences with the maps and the coding blocks in their journals.

Extensions

“We have worked on a previously created maze. In your journal, draw and create your own maze. Make sure to include a starting point and an ending point. Make sure the maze has lots of turns and twists. Illustrate your map with drawings around the path or inside of the path. Switch your maze with another student and try to complete each other’s mazes.”

“A maze and a map utilize a path with a beginning and an end. Create a 3-dimensional pathway to incorporate other types of barriers that will get in the way of your path. Use 3-dimensional materials to decorate your path. Materials may include gravel, leaves, or paper. You may want to think about creating a long bridge or a viaduct (waterway). Bridges are straight paths. Viaducts are paths for water. Viaducts look very much like bridges. Share out your 3-dimensional path.”

Real World Connections

Think About

Mazes are special types of games or puzzles that must be completed. What other types of puzzles or games incorporate a start and a finish? (Snakes and Ladders, Candy Land). What obstacles or problems do players run into when playing these games? What are the consequences when a player does not finish a puzzle or game? Why is it important to determine a start and a finish?

It's important to test your arrangement of coding blocks on the MatataStudio control board. Sometimes it's necessary to change your arrangement of blocks after you test it out. In what other circumstances might iteration and then change be needed? How is an experiment like a maze or board game? Is it important to include repetition or iteration for experiments? Why or why not?

Advanced Coding Blocks

Draw a line from the coding block to its description

- Parameter Block Number
- Loop Blocks
- Function Block
- Parameter Block Angle

3

Tells MatataBot to repeat a sequence



Tells MatataBot how many degrees to turn

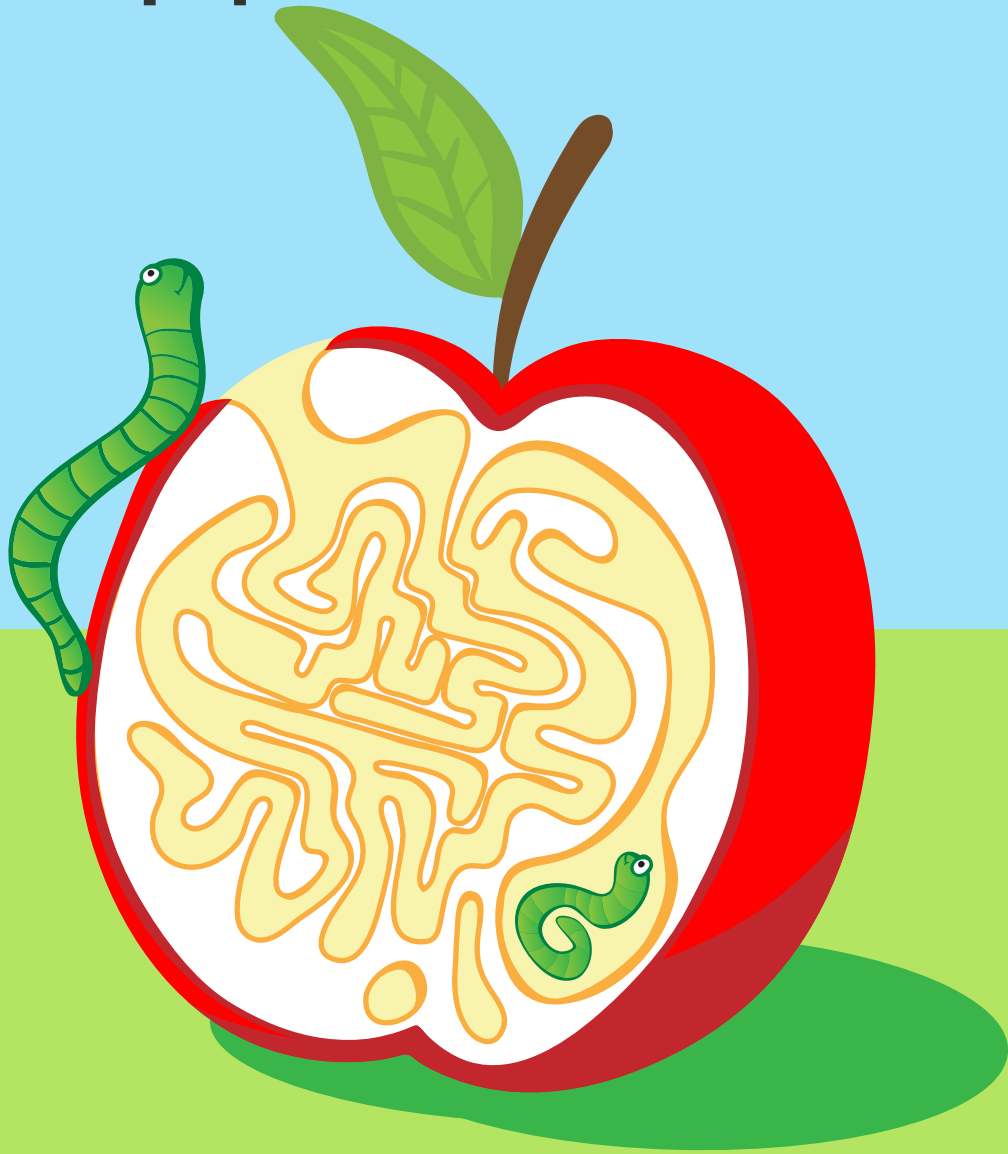


Tells MatataBot how many times to repeat a movement, loop, or function

144°

Tells MatataBot a lot of coding information using just one block

Apple Maze



Help the worm find
its way out of the
apple!