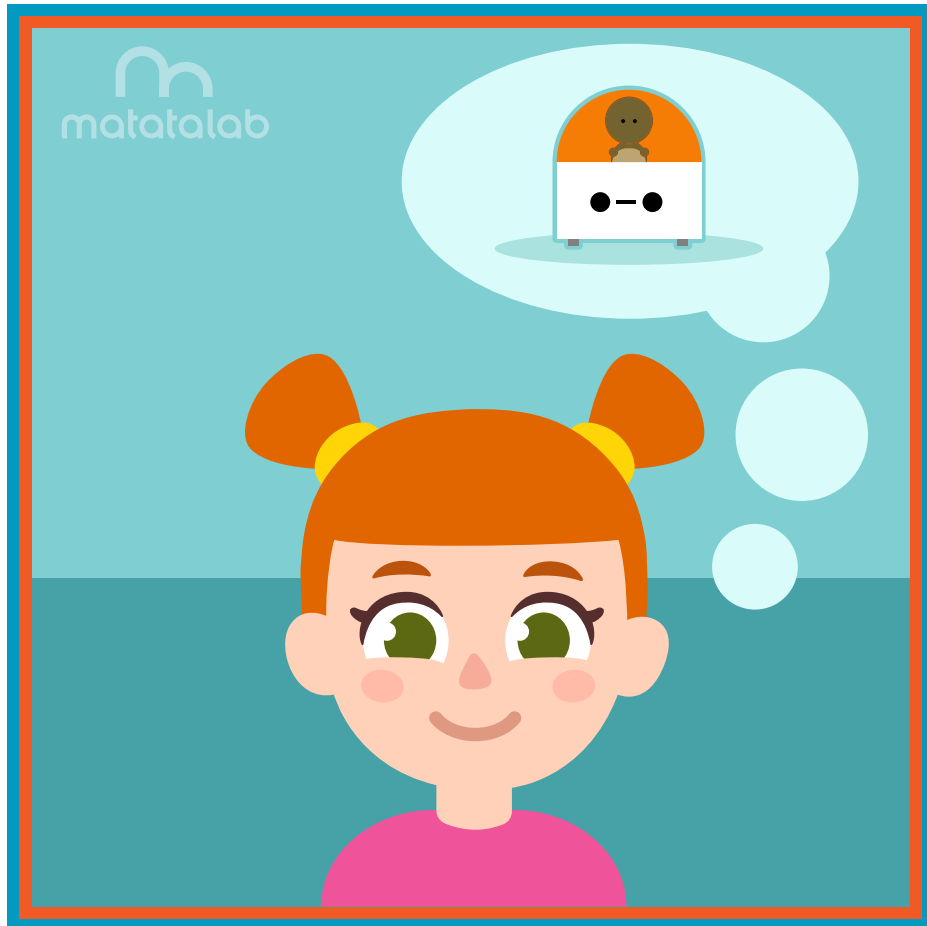


Matatalab Artist Add-On Overview and Introduction



Artist Add-On

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Overview and Introduction

The following lessons utilize the Matatalab Coding Set along with the Matatalab Artist Add-On set in order to code Matatabot and to create unique projects. Coding, number, and angle blocks are used within these projects which incorporate various types of materials and media. These lessons are aligned with the CSTA (Computer Science Teachers Association) standards and with the NCAS (National Core Arts) standards. The NCAS standards were established in 2014 through the National Art Education Association to ensure consistent guidelines and expectations in the teaching of visual arts.

standards

NCAS, CSTA

Aligned Standards

NCAS (National Core Arts Standards)

Creating

Investigate - Plan - Make

VA:Cr1.1.1a Engage collaboratively in exploration and imaginative play with materials.

VA:Cr1.2.2a Make art or design with various materials and tools to explore personal interests, questions, and curiosity.

Investigate

VA:Cr2.1.2a Experiment with various materials and tools to explore personal interests in a work of art or design.

VA:Cr2.3.2a Repurpose objects to make something new.

Reflect - Refine - Continue

VA:Cr3.1.2a Discuss and reflect with peers about choices made in creating artwork.

Presenting

Analyze

VA:Pr5.1.7a Based on criteria, analyze and evaluate methods for preparing and presenting art.

Share

VA:Pr6.1.3a Identify and explain how and where different cultures record and illustrate stories and history of life through art.

Responding

Perceive

VA:Re7.1.2a Perceive and describe aesthetic characteristics of one's natural world and constructed environments.

Analyze

VA:Re8.1.5a Interpret art by analyzing characteristics of form and structure, contextual information, subject matter, visual elements, and use of media to identify ideas and mood conveyed.

Interpret

VA:Re9.1.5a Recognize differences in criteria used to evaluate works of art depending on styles, genres, and media as well as historical and cultural contexts.

Connecting

Synthesize

VA:Cn10.1.Ka Create art that tells a story about a life experience.

VA:Cn10.1.2a Create works of art about events in home, school, or community life.

Relate

VA:Cn11.1.Ka Identify a purpose of an artwork.

CSTA (Computer Science Teachers Association)

K-2

1A-CS-01 Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use.

1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem.

1A-AP-11 Decompose (break down) the steps needed to solve the problem into a precise sequence of instructions.

1A-AP-12 Develop plans that describe a program's sequence of events, goals, and expected outcomes.

1A-AP-14 Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops.

1A-AP-15 Using correct terminology, describe steps taken and choices made during the iterative process of program development.

3-5

1B-AP-08 Compare and refine multiple algorithms for the same task and determine which is the most appropriate.

1B-AP-09 Create programs that use variables to store and modify data.

1B-AP-10 Create programs that include sequences, events, loops, and conditionals.

1B-AP-11 Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.

1B-AP-12 Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features.

1B-AP-13 Use an iterative process to plan the development of a program by including others' perspectives and considering user preferences.

1B-AP-15 Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended.

1B-AP-16 Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development.

1B-AP-17 Describe choices made during program development using code comments, presentations, and demonstrations.

Grade by grade descriptions of art standards can be found at the National Core Arts Standards website: <https://www.arteducators.org/learn-tools/national-visual-arts-standards>

Detailed description of computer science standards can be found at the Computer Science Standards website: <http://www.csteachers.org/page/standards>

These lessons provide a sequential, meaningful curriculum with fundamental learning experiences. The lessons are sequenced by level of difficulty for each project. Difficulty is reflected in the learning progression and the use of complex problem-solving with angles, as well as difficulty and time needed with different types of media and instructions.

Lessons Overview

LESSON 1: Grades K-1 Introduction to Coding Shapes

OBJECTIVE: Students will practice the steps involved in manipulating coding blocks and angle blocks in order to create shapes. Students will learn how to code and manipulate Matatabot to create simple shapes.

LESSON 2: Grades K-1 Ice Cream Cones

OBJECTIVE: Students will learn how to code and manipulate Matatabot in order to code, create a simple shape and work in two-dimensions creating a two-dimensional ice cream cone.

LESSON 3: Grades K-1 Hanging Mobile

OBJECTIVE: Students will learn how to code and manipulate Matatabot in order to code, create and display a variety of simple shapes to create a hanging mobile.

LESSON 4: Grades 2-3 Sailboat

OBJECTIVE: Students will learn how to code and manipulate Matatabot in order to code, create and

display a variety of simple shapes as a cohesive design.

LESSON 5: Grades 2-3 Pinwheel

OBJECTIVE: Students will learn how to code and manipulate Matatabot in order to code, create and display a variety of simple shapes as a simple machine.

LESSON 6: Grades 2-3 Family Tree

OBJECTIVE: Students will learn how to code and manipulate Matatabot in order to code, create and display a more complex shape.

LESSON 7: Grades 2-3 Robot

OBJECTIVE: Students will learn how to code and manipulate Matatabot in order to code, create and display a robot as a compilation of a complex design.

LESSON 8: Grades 4-5 Dreamcatcher

OBJECTIVE: Students will learn how to code and manipulate Matatabot in order to code, create and display the complex design of a traditional Native American Dreamcatcher.

LESSON 9: Grades 4-5 Marionette

OBJECTIVE: Students will learn how to code and manipulate Matatabot in order to code, create and display a more complex design adding movement and engineering.

LESSON 10: Grades 4-5 Go Fish Game

OBJECTIVE: Students will learn how to code and manipulate Matatabot in order to code, create and display a more complex design adding movement and engineering.

LESSON 11: Grades 4-5 3D Geometric Shapes

OBJECTIVE: Students will learn how to sequence coding in order to draw a geometric net that can be assembled into a 3D geometric shape and display a more complex design.

LESSON 12: Grades 4-5 Coding a Message

OBJECTIVE: Students will learn how to code and manipulate Matatabot in order to code, create and display a series of letters and to form a word as a message.

Matatalab

Lesson 1

Introduction To Coding Shapes



Overview

Geometric shapes are found throughout nature, used in building skyscrapers, analyzed in geometric proofs, and are the basis of art pieces. The Matatalab Artist Add-On Set, used in conjunction with the Matatalab Coding Set, gives students the necessary tools to create a large variety of geometric shapes.

In this lesson, students will code Matatabot to draw various geometric shapes using instructions on the six Matatalab Artist Warm-Up Cards. Students will extend their understanding of coding shapes by exploring ways to create additional shapes.

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

Essential Objective

- Understand coding and manipulation of Matatabot to create various basic shapes.

Learning Objectives

- Learn how to code and manipulate Matatabot in order to create each of the six basic shapes on the Matatalab Draw Warm-Up cards.

Standards

- NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.1
- CSTA: K-2: 1A-CS-01, 1A-AP-10, 1A-AP-11, 1A-AP-12, 1A-1P-14, 1A-AP-15

Time

60 minutes

Materials

For each student group:

- 1 Matatalab Coding Set - Parts used in this lesson will include:
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
- 1 Matatalab Artist Add-On Set

- Marker
- Large sheet of white paper (approximately 3 feet x 2 feet)
- Tape
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

- Charge all Matatalab Command Towers and Matatabots.
- Ensure there are enough copies of worksheets for each student.
- Locate a place for each student group to work. Tape a large sheet of paper (approx. 3 ft. x 2 ft.) to table.
- Distribute 1 Matatalab Coding Set, 1 Matatalab Artist Add-On Set for each student group.

Vocabulary

- **Shape:** The outline appearance of an area or a figure.
- **Angle:** The space, measured in degrees, between two intersecting points or lines at or close to where they meet.
- **Triangle:** A plane figure with three straight sides and three angles.
- **Square:** A plane figure with four straight sides and four right ninety-degree angles.
- **Sunburst:** A decoration resembling the sun and its rays.

Introduction

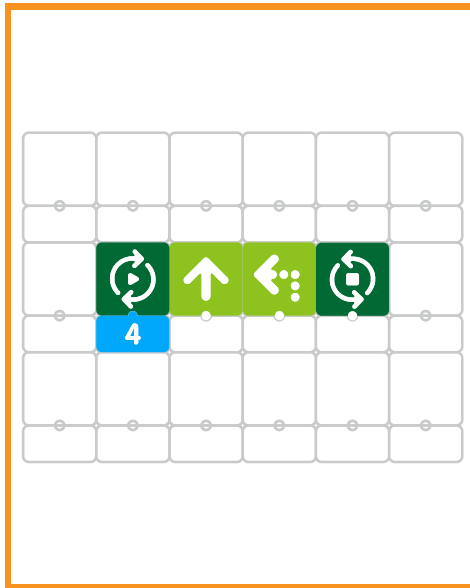
- Are students in a classroom? Are they outside?
- Ask students to look around and make observations about their surroundings; what objects do they see?
- Next, ask students to name some of the shapes of some of these objects. (rectangles of doors, square floor blocks, circle clock, triangular shape of leaves, etc.)
- Discuss with students other places where they can see different shapes.
- Explain to students that in this lesson they will use a robot and programming blocks to draw a variety of shapes.

Matatalab Activity

- Point out each of the various parts: Command Tower, Control Board, Matatabot, various types of coding and angle blocks.
- Explain and demonstrate how to turn on both the Command Tower and Matatabot.
- Explain how the tower communicates with the robot via Bluetooth communication.

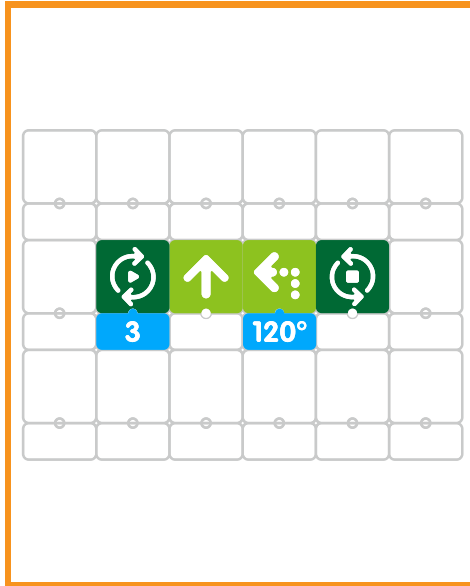
- Ask students to examine Draw 1 Warm-up card. Ask students to name the shape they see on the card. Explain that Matatabot can draw that card using the coded blocks shown below the square.
- Demonstrate how to set up Matatabot with one of the markers and placement of the coding blocks on the Control Board.
- Place the Matatabot on a sheet of paper and press the Play button. Students will observe the movement of Matatabot as it draws a square.
- Allow student groups time to code and draw their own square by following the coding instructions on the Draw 1 Warm-Up Card.
- Explain to students that a left or right turn coding block tells Matatabot to turn 90° to the left or 90° to the right. Demonstrate this movement with student volunteers.

Draw 1 Warm-Up Card:



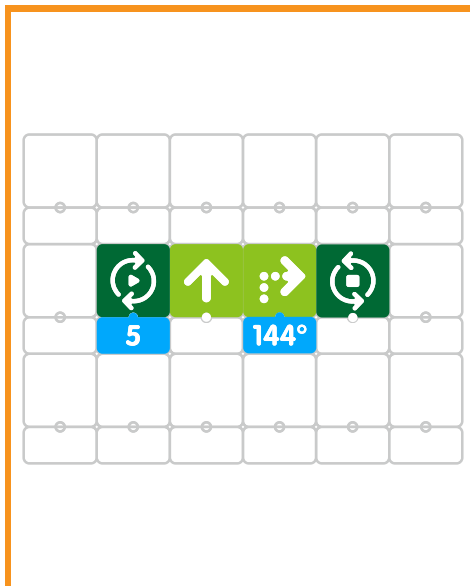
- Tell students to look at the Draw 2 Warm-Up Card. Ask students how this object is different from the square. (It has three sides instead of four and the angles are different. At this point it isn't necessary to explain the size of the angles, but point out that the coding of the triangle is different from the square because it is a different shape, and that each shape has its own unique coding.)
- Allow student groups time to code and draw their own triangle by following the coding instructions on the Draw 2 Warm-Up Card.

Draw 2 Warm-Up Card:

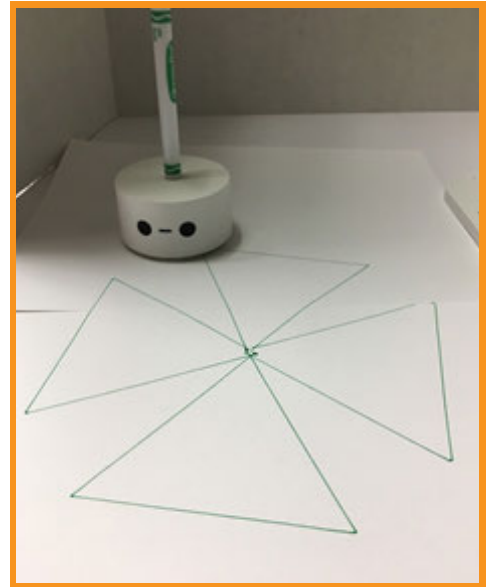
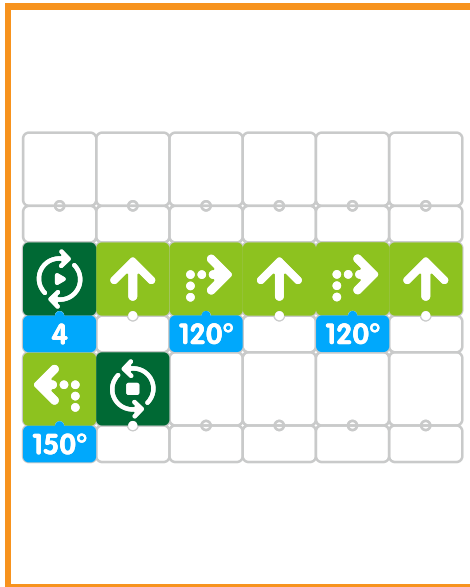


- At this point, students should be allowed to work collaboratively in their groups and continue to code and draw the remaining shapes shown on the Warm-Up Cards. Circulate to help students with coding and answer questions they may have regarding the procedures.

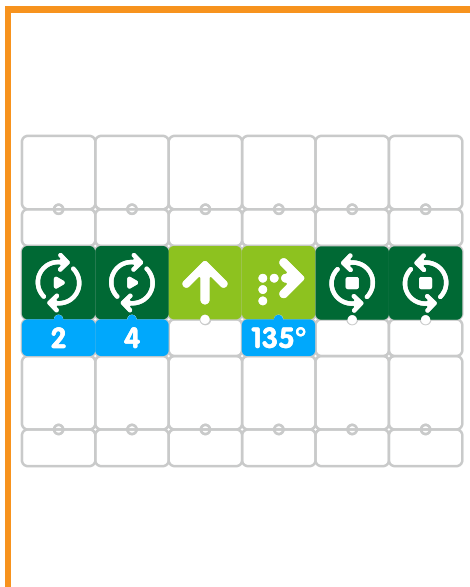
Draw 3 Warm-Up Card:



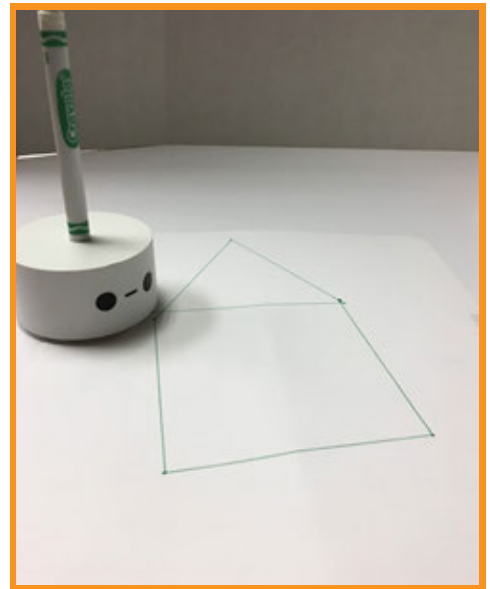
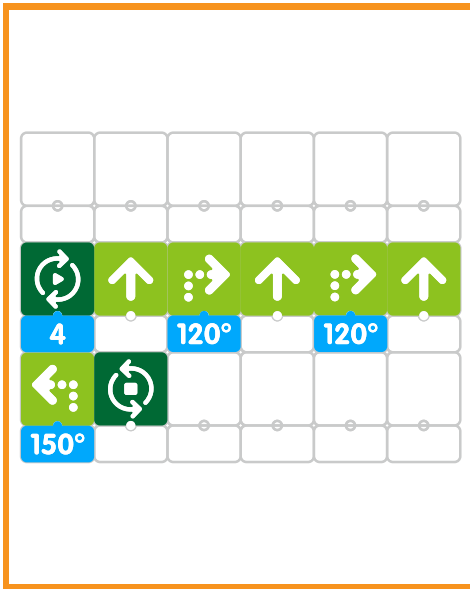
Draw 4 Warm-Up Card:



Draw 5 Warm-Up Card:



Draw 6 Warm-Up Card:



Closing

Assessment

Today we have practiced coding and creation of a variety of shapes using the Matatalab Artist Warm-Up Drawing Cards. All collaborative groups were given time to complete each of the shapes on the cards.

Have students answer the following questions:

- Which shapes did your group find to be the most difficult to create? Why?
- Which shapes did your group like best?
- How helpful was each of the Warm-Up Drawing Cards in the creation of each shape?
- How would you strengthen or change this project?

Once students have been given a chance to answer these questions, ask students to draw pictures of each of the shapes they created and their experiences with their creations in their journals.

Extensions







So far we have utilized each of the Artist Warm-Up Drawing Cards which help students to code each shape on each card successfully. Use your student journal to draw and write the coding needed to create a unique shape different than the shapes found on the Warm-Up Drawing Cards. Use Matatalab Artist Add-On Set along with the Matatabot and command tower to configure the blocks according to your plan and create your unique shape based upon a new configuration. What was the unique shape that you created? How difficult was it to code the creation of that shape?

Real World Connections

The Matatalab Draw Warm-Up Cards give hints and clues that allow you to successfully complete a project. In what other activities might someone get hints and clues to complete something successfully? Do hints and clues help? Why? What would happen if an activity or a project had to be completed without any help or clues? How might this make the completion more difficult? Have you ever worked on a project without any help at all? How did this affect your success with the project?

Lesson 1 - Introduction to Coding Shapes

Match the Shapes and Tiles with the Correct Description

	Triangle
	Start
	Square
	Right Turn
	Stop
	Forward

Matatalab

Lesson 2

Ice Cream Cone



Overview

As students learned in the first lesson, the simple shapes coded using Matatabot and the Artist Add-On Set can be connected together to make more complex and interesting objects. Matatabot can be coded to draw a square and a triangle to create a house. The length of the sides of these geometric objects can be increased by changing the coding to create larger objects.

In this lesson, students will alter the coding for a triangle to create a larger triangle which will become the cone of an ice-cream cone. Students will then decorate the top to look like ice cream and embellish the ice cream with sprinkles and other decorations.

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

Essential Objective

- Understand coding and manipulation of Matatabot to create various basic shapes.

Learning Objectives

- Code and manipulate Matatabot in order to create a large triangle.
- Utilize the large triangle to create a large decorated ice cream cone.

Standards

- NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.1, VA:Cn10.1, VA:Cn10.2
- CSTA: K-2: 1A-CS-01, 1A-AP-10, 1A-AP-11, 1A-AP-12, 1A-1P-14, 1A-AP-15

Time

60 minutes

Materials

For each student group:

- 1 Matatalab Coding Set - Parts used in this lesson will include:
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks

- 1 Matatalab Artist Add-On Set
- White Cardstock - 2-3 pieces per student
- Scissors
- Markers
- Glitter and/or candy sprinkles
- Glue
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

- Create a display model of the ice cream cone with one or two scoops of ice cream.
- Charge all Matatalab Command Towers and Matatabots.
- Ensure there are enough copies of worksheets for each student.
- Locate a place for each student group to work.
- Distribute a set of materials for each student group.

Vocabulary

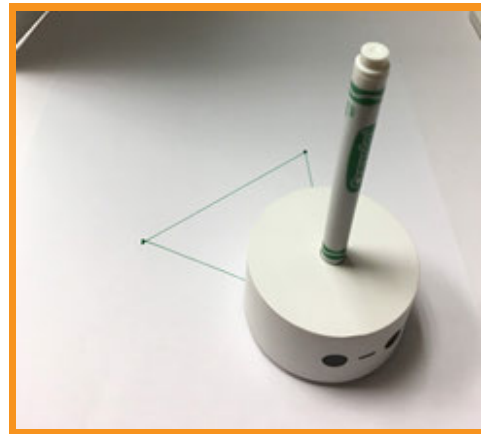
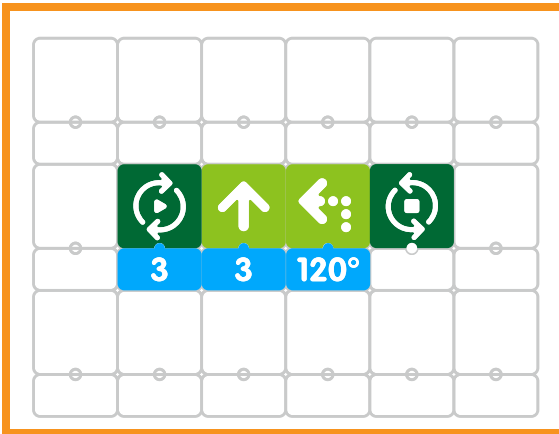
- **Triangle:** A plane figure with three straight sides and three angles.
- **Flavor:** The way something tastes when you eat it.
- **Geometric Objects:** Shapes that include circles, triangles, squares, rectangles and others.
- **Weather:** The condition of the atmosphere in a given area at a given time and date.

Introduction

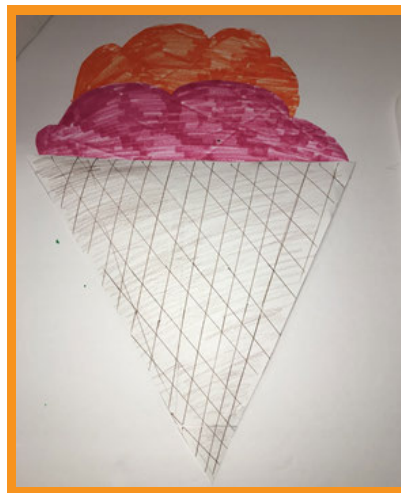
- Ask students to imagine they are outside playing on a hot, hot summer day.
- What would help them cool off? (running through a sprinkler, a dip in a pool, a walk along a beach, maybe an ice cream cone)
- Ask students to name their favorite flavor of ice cream.
- Choose 3-5 flavors and ask students, "Out of these which one do you like the most?"
- Have students stand up, form groups according to their choice and make observations about the number of students who chose each flavor.
- Explain to students that they will code Matatabot to draw an ice cream cone. They will color and cut out the cone, draw and color one or two scoops of ice cream, add sprinkles and assemble their ice cream cone.

Matatalab Activity

- Ask students to take out and examine the triangle shown on the Draw 2 Warm-Up Card. Review the coding blocks with students and discuss how Matatabot drew a triangle by reading the coding blocks.
- Ask students what 1 other block they could add to the line of coding in order for Matatabot to draw a larger triangle. (adding an additional \uparrow block). Explain that this will give them a larger cone to hold more ice cream.



- Tell students to draw a picture of their ice cream cone on the Planning Worksheet and to plan out and write/draw the coding they will use to draw their cone.
- Check coding on the Planning Worksheet and address any misconceptions.
- Using a piece of white cardstock, student groups will program Matatabot to draw a large triangle that students will use for the cone. Circulate to help students with coding questions.
- Ask students to color their cone, draw and color one or two scoops of ice cream on paper and color the scoops. Students will then cut out their cones and ice cream, glue on sprinkles and/or glitter and assemble their ice cream cone using tape and/or glue.



Closing

Assessment

We have planned out, coded, and created a large cone for an ice cream cone. We then decorated the ice cream.

Have students answer the following questions:

- How did you change or modify the coding to enlarge the sides of your triangle cone?
- What surprised you about this project?
- What did you like best about this project?
- What would you change about this project if you could?

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals.

Extensions

An ice cream cone is a favorite snack or dessert for many people. What are some other snacks or desserts that you like? Some examples might be apple pie, cheesecake, chocolate cake, chocolate bars or candy.

Plan out the coding needed to create a different snack or dessert. Write the coding with the number and angle block configurations needed to create the shapes for your snack or dessert in your student journal.

Using the Matatalab Coding Set with the Artist Add-On Set, configure the blocks according to your plan, and create your unique snack or dessert. Decorate your unique creation and add other types of media.

Real World Connections

When eating ice cream, people often like to add additional things like sprinkles, marshmallows, and other types of treats. With what other types of treats do people like to add decorations and other things? Think about the shapes of the things you add on. Think about the shapes of decorations, for example chocolate chips are three dimensional triangles. What other shapes are used for decorations?

Ice Cream Cone Planning Worksheet

*Plan the
shape for
your cone*

*Draw your
ice cream
cone*

Lesson 2 - Ice Cream Cones

Copy the coding word. Choose
a tile that matches each word.
Draw the tile next to the word.

Start

Forward

Right Turn

Angle

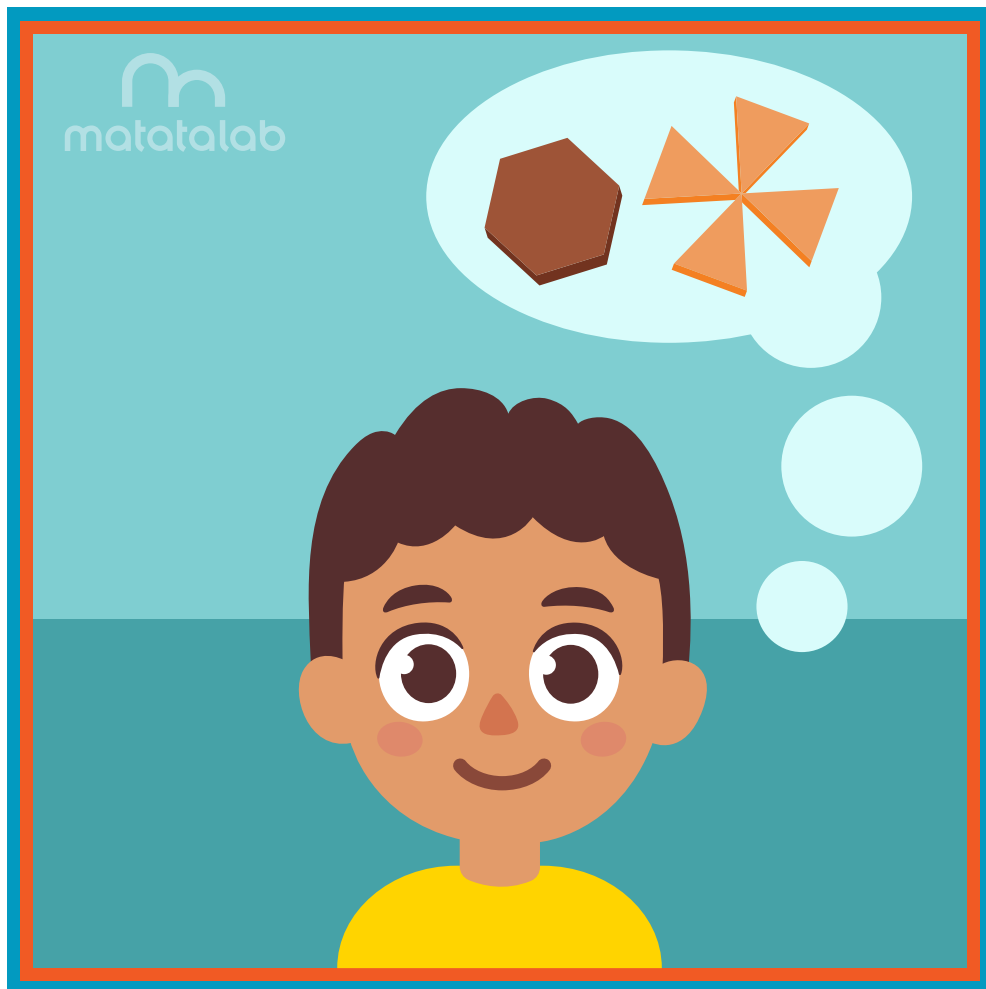
Stop



Matatalab

Lesson 3

Hanging Mobile



Overview

The Matatalab Artist Add-On Set includes six Warm-Up Cards which help students understand the coding involved in creating geometric shapes. Students can alter the coding to enlarge and change these shapes. For instance, the coding for a square can be altered to create a rectangle. Additionally, the Artist Add-On Set includes a variety of angle blocks with which students can experiment to move beyond the six basic geometric shapes to code and create even more shapes.

In this lesson, students will create and construct a mobile comprised of geometric shapes. Students will code Matatabot to draw each of the six basic shapes and will be challenged to code and draw two or three additional geometric shapes to add to their mobile.

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

Essential Objective

- ▶ Understand coding and manipulation of the Matatabot to create various basic shapes.

Learning Objectives

- ▶ Learn how to code and manipulate the Matatabot in order to create a series of shapes.
- ▶ Learn how to create a hanging mobile using dowels, ribbons and other media, and shapes through coding the Matatabot to create a variety of shapes.
- ▶ Experiment with the Matatabot in order to create two or three unique shapes to add to the hanging mobile.

Standards

- ▶ NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.1, VA:Re8.1, VA:Cn11.1
- ▶ CSTA: K-2: 1A-CS-01, 1A-AP-10, 1A-AP-11, 1A-AP-12, 1A-1P-14, 1A-AP-15

Time

60 minutes

Materials

For each student group:

- 1 Matatalab Coding Set - Parts used in this lesson will include:
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
- 1 Matatalab Artist Add-On Set
- 10 pieces cardstock
- Note: Students could use colored cardstock for shapes. Alternatively, students could use white cardstock and then color/decorate each shape.
- Scissors
- Single hole punch
- Markers
- Ribbon (approximately 20 feet)
- 2 pieces dowel (approximately 18 inches each)
- String (approximately 24 inches)
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

- Create a display model of a hanging mobile.
- Charge all Matatalab Command Towers and Matatabots.
- Ensure that there are enough copies of worksheets for each student.
- Locate a place for each student group to work.
- Distribute a set of materials for each student group.

Vocabulary

- **Shape:** The outline appearance of an area or a figure.
- **Angle:** The space, measured in degrees, between two intersecting points or lines at or close to where they meet.
- **Triangle:** A plane figure with three straight sides and three angles.
- **Square:** A plane figure with four straight sides and four right ninety-degree angles.
- **Sunburst:** A decoration resembling the sun and its rays.
- **Maltese Cross:** A cross with arms of equal length that broaden from the center and have their ends indented.
- **Hanging Mobile:** A decoration or sculpture whose parts are balanced in order to move in response to

air currents.

Introduction

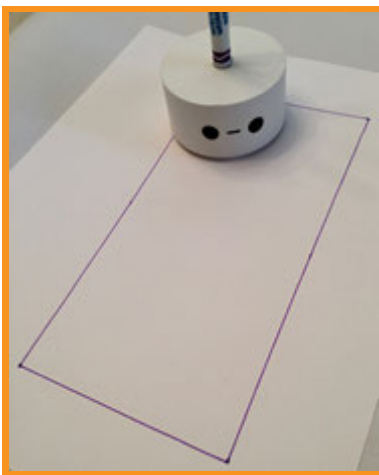
- Ask students if they have heard of the word “mobile.”
- Ask students if they understand the meaning of the term “mobile.” Explain that the term refers to the ability to show movement. (Teacher may ask students to stand up and become mobile for a minute.)
- Ask students why they think that a mobile is the name given to a set of hanging toys that might be found above a baby’s crib.
- Explain that in this lesson students will code Matatabot to draw different geometric shapes and create a mobile with the shapes.



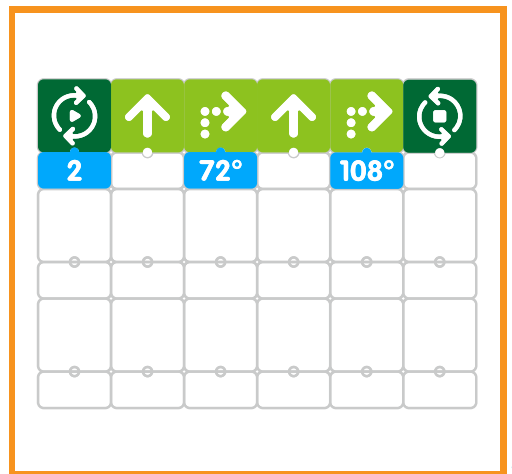
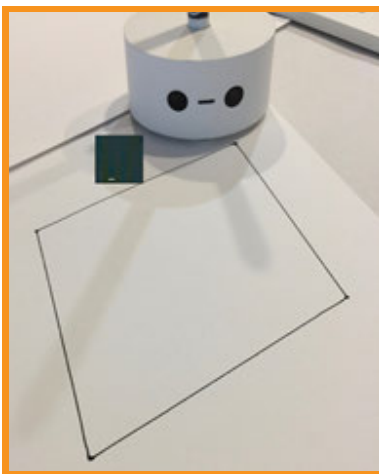
Matatalab Activity

- Have student groups set up and turn on the Matatalab coding set and examine the coding for the six Draw Warm-Up Cards. Explain to students that they have coded these shapes in the first two lessons. Review coding as necessary.
- Have students plan out their mobiles on the Hanging Mobile Planning Worksheet.
- Using one piece of cardstock for each shape and the Matatalab set, students draw and cut out the six shapes found on the Draw 1- 6 Warm-Up Cards.
- In student groups, students discuss possible coding to create three additional shapes: rectangle, diamond, pentagon. Teacher directions for coding these shapes are found below.

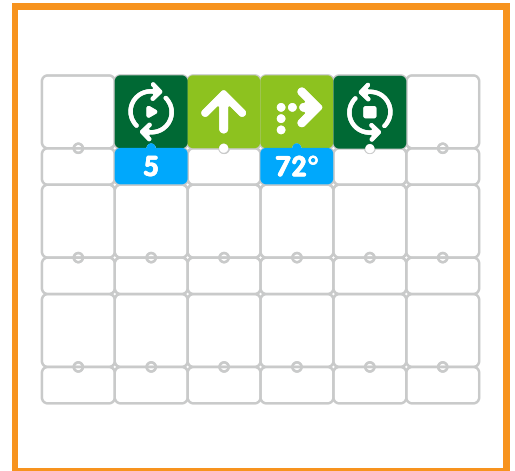
Rectangle with Coding:



Diamond with Coding:



Pentagon with Coding:



- Students can decorate their shapes using any available material - markers, glitter, yarn, stickers, etc.
- Explain to students that to assemble their mobile they will need to:
 - Assemble 2 pieces of dowel perpendicular to each other and use string to tie the 2 pieces of dowel together.
 - Add a string loop to the middle of the mobile which will be used to suspend the completed mobile.
 - For each shape, use a piece of ribbon (approximately 12 inches) in length. Tie one end to each shape.
 - Tie each shape to the dowel. The shapes should be placed so when suspended the mobile hangs level. Students adjust placement of the shapes if needed.
- Locate a place in classroom to hang mobile.

Closing

Assessment

We have utilized the Matatalab Artist Add-On Set to code various shapes in order to create a decorated hanging mobile. We also coded and created at least three additional and unique shapes that we added to the hanging mobile.

Have students answer the following questions:

- How difficult was it to create the shapes for which you did not have clues from any Warm-Up Card?
- What was your favorite part of this project?
- How successful were you at creating the various shapes for this project?
- What would you change for this project that may have strengthened or made this project more successful? Why?

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals.

Extensions

We created a hanging mobile and decorated it with various shapes that we coded and created using the Matatalab Art Add-On Set. The decorations we used were shapes themselves.

Imagine how shapes like triangles and squares could be combined to look like different kinds of animals. You could plan out the coding of the coding blocks, angles, and numbers you would need, and create a variety of different shapes using the Matatabot and command tower along with the Matatalab Art Add-On Set. You could create three to four different animals by combining these shapes, and then arrange these animals on a different set of dowels to create a new mobile. You could then decorate these animals with color and other media.

Real World Connections

Hanging mobiles move in response to the movement of air currents. Mobiles are balanced and hung high in the air. There are other types of machines that are high in the air and/or are propelled or move forward through the movement of air currents.

What causes the movement of air currents? What causes wind?

What types of other machines are powered by the movement of air currents? Examples might be sailboats, wind turbines, weathervanes, and other examples.

What role does each of these machines play in our country's economy or in our country's daily life? Explain.

Hanging Mobile Planning Worksheet

Draw a plan or design for your hanging mobile.

Lesson 3 - Hanging Mobile

Put a ☒ in the box that shows the correct code to draw a triangle with sides 3 steps in length

☐



3





120°




☐


3




3



☐


3


3


120°



Matatalab

Lesson 4

Sailboat



Overview

Motor boats, sailboats, freighters and many other types of watercraft ply our waterways. Whether the material used in the construction of these vessels is wood, steel, fiberglass, or some other material, the ultimate goal is that the vessel is able to float on water. Additionally, the ability of watercraft to move through the water may be accomplished by manpower such as paddling a canoe, use of a motor, or reliance on the winds such as with a sailboat.

In this lesson, students will create a sailboat using the Matatalab Art Add-On Set. Students will use the basic triangle shape coded in the Draw 2 Warm-Up Card for the sails. They will then experiment with the angles in the set to create an outline for the boat. The completed sailboat will be mounted on a large sheet of white paper and students will complete the project by adding an ocean scene.

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

Essential Objective

- Understand coding and manipulation of Matatabot to create various basic shapes.

Learning Objectives

- Learn how to code and manipulate Matatabot in order to create shapes needed for a sailboat and to create triangles for two sails.
- Experiment with Matatalab coding to create a unique shape for the sailboat hull.
- Create an ocean scene to include a sailboat, ocean waves, sun, and maritime wildlife.

Standards

- NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.1, VA:Cr10.1
- CSTA: K-2: 1A-CS-01, 1A-AP-10, 1A-AP-11, 1A-AP-12, 1A-1P-14, 1A-AP-15
3-5: 1B-AP-08, 1B-AP-09, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-13, 1B-AP-15, 1B-AP-16, 1B-AP-17

Time

60 minutes

Materials

For each student group:

- 1 Matatalab Coding Set - Parts used in this lesson will include:
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
- 1 Matatalab Artist Add-On Set
- Large piece of white paper (approximately 2 feet x 3 feet)
- 2-3 pieces colored and/or white cardstock
- Scissors
- Tape and/or glue
- Markers
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

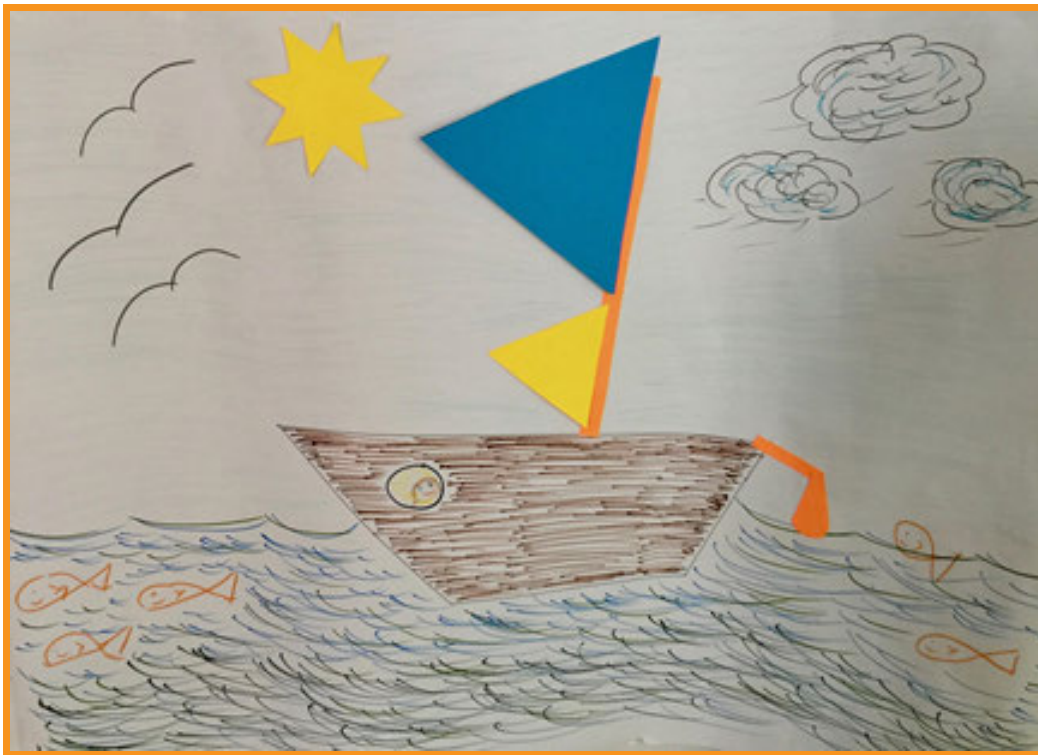
- Research and create a display of a few typical sails that might be found on a sailboat.
- Charge all Matatalab Command Towers and Matatabots.
- Ensure there are enough copies of worksheets for each student.
- Locate a place for each student group to work.
- Distribute a set of materials for each student group.

Vocabulary

- **Shape:** The outline appearance of an area or a figure.
- **Triangle:** A plane figure with three straight sides and three angles.
- **Sailboat:** A boat propelled or driven forth by the use of sails and wind.
- **Sail:** A piece of material, often in the form of a triangle, held up by a mast, and used to propel a boat forward in the water.
- **Mast:** A tall upright post that is used to carry a sail or a set of sails on a boat.
- **Hull:** The body or bottom of a boat which includes the sides and decking.

Introduction

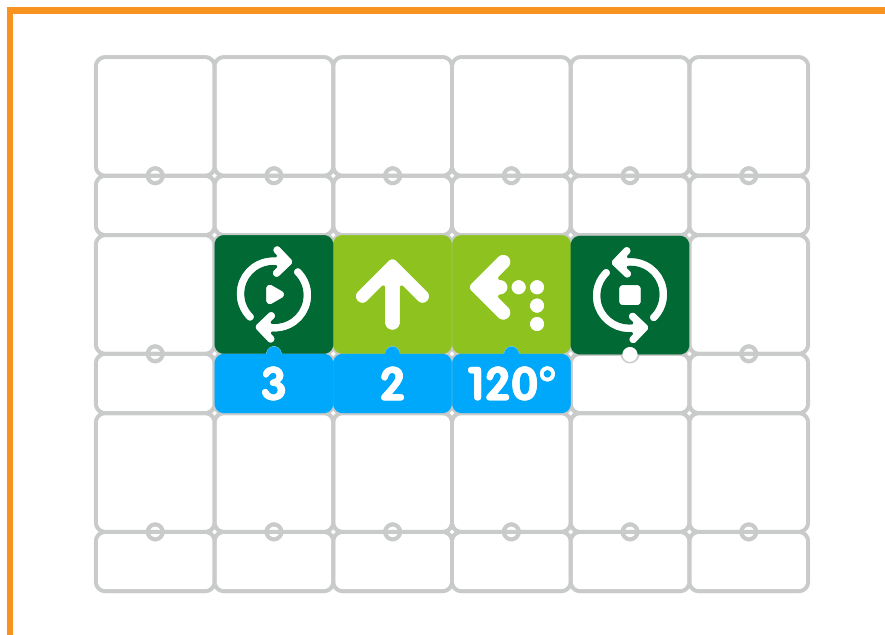
- Ask students if they have been on a sailboat or watched a sailboat on the water.
- Ask them to describe the movement of a sailboat when it's sails fill with wind.
- Ask students to infer what would happen to the movement if the winds stopped blowing, explaining that the wind fills the sails and pushes the boat forward. When the winds die down, the push is reduced and the boat will slow down or stop moving forward.
- Explain that in this lesson students will program Matatabot to draw a sailboat and sails. Students will add a design to their sails and the boat. The boat will be mounted on a large sheet of paper and students will draw in the water, fish and other sea life to complete their project.



Matatalab Activity

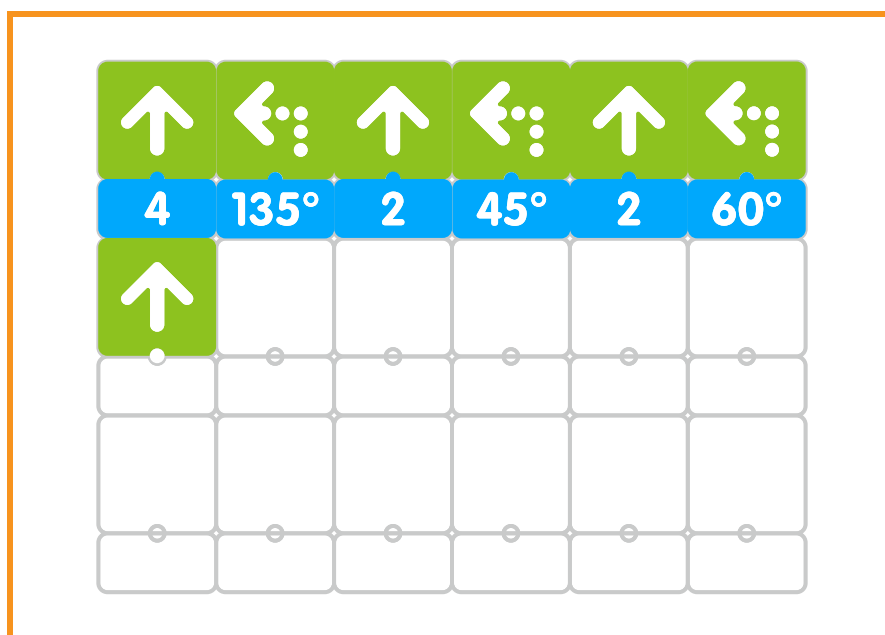
- Distribute a set of project materials for each student group.
- Students should be familiar with coding a triangle and sunburst (Draw 2 and 5 Warm-Up Cards). Have students create one of each on cardstock.
- Students will code an additional, larger triangle and create one on cardstock. (Teacher note - coding for larger triangle can be found below.) Students now have two sails for their sailboat and a sun to add to the display.

Coding for large triangle:



► On the large white piece of paper students will code Matatabot to draw a hull or bottom for the sailboat. (Teacher note - Students will need to draw the hull on the bottom half of the paper.)

Sailboat hull code:



- Students continue project by:
 - Adding a mast to their sailboat
 - Decorate/design sails and glue sails to mast
 - Glue sun to paper
 - Color background - sailboat, water, sky, adding fish, birds, clouds, etc.
- Display project on classroom wall.

Closing

Assessment

We have coded a variety of shapes using the Matatalab Coding Set along with the Artist Add-On Set in order to create a sailboat and ocean design.

Have students answer the following questions:

- How did you create the bottom or hull of your sailboat? How difficult was the coding that you needed to create the sailboat's hull? Why?
- What did you like best about this project?
- What surprised you most about this project? Why?
- How would you change or strengthen this project?

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals.

Extensions

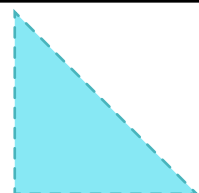
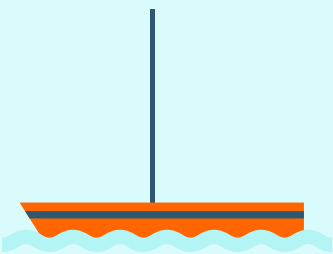
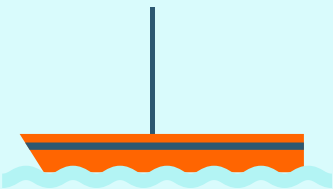
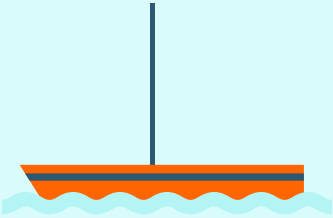
We have created a two-dimensional ocean design and sailboat. Create a three-dimensional ocean diorama with different kinds of ocean-going vessels using the Matatalab Coding Set and Artist Add-On Set. Examples of other vessels might be military ships, gasoline tankers, passenger liners, and smaller yachts. You could utilize a large box or create a larger standing frame. Cut out each vessel and suspend them from the top with string. Add three-dimensional waves, marine life, a sun, and clouds.

Real World Connections

Sailboats are vessels that might be used to transport products or objects on a large body of water. What kinds of products might be transported through international waters to be sold or for trade? What other kinds of ocean-going vessels might be used to transport products? How does international trade help each country? What benefit does each participating country get when each country trades or sells to each other? Do you own something that was made in another country?

Lesson 4 - Sailboat

*Cut out the 3 sails and tape one to each mast.
Cut out the coding strips and tape the correct strip next to the boat*



Matatalab

Lesson 5

Pinwheel



Overview

A pinwheel is a very basic example of a turbine machine. Made of a series of adjacent blades, often in the form of diamonds, triangles, or overlaying Maltese crosses, wind energy hits the blades and this causes the shaft to turn. The movement of the shaft of this basic turbine produces wind energy. This machine can then be used as energy for other types of machines.

In this lesson, students will learn to code and manipulate Matatabot in order to create a series of Maltese cross shapes. Students will overlap these crosses, push a hole through them, and attach them to a long dowel creating a non-working pinwheel. Students will learn about basic turbine machines and their importance as energy for other machines.

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

Essential Objective

- Understand coding and manipulation of Matatabot to create various basic shapes.

Learning Objectives

- Learn how to code and manipulate Matatabot in order to create a series of Maltese crosses.
- Create a pinwheel using a long dowel, overlaying Maltese crosses, and a center shaft.
- Explore the importance and use of wind turbines.

Standards

- NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.1, VA:Re7.1, VA:Cn10.1
- CSTA: K-2: 1A-CS-01, 1A-AP-10, 1A-AP-11, 1A-AP-12, 1A-1P-14, 1A-AP-15
3-5: 1B-AP-08, 1B-AP-09, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-13, 1B-AP-15, 1B-AP-16, 1B-AP-17

Time

60 minutes

Materials

For each student group:

- 1 Matatalab Coding Set
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
- 1 Matatalab Artist Add-On Set
- 3 pieces of cardstock
- Note: Students could use three different pieces of colored cardstock for their pinwheel. Alternatively, students could use white cardstock and then color/decorate each shape, or wrapping paper glued onto cardstock.
- Markers
- Scissors
- Single hole punch
- 1 push pin
- 1 piece dowel (approximately 6-10 inches)
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

- Charge all Matatalab Command Towers and Matatabots.
- Ensure that there are enough copies of worksheets for each student.
- Locate a place for each student group to work.
- Distribute a set of materials for each student group.

Vocabulary

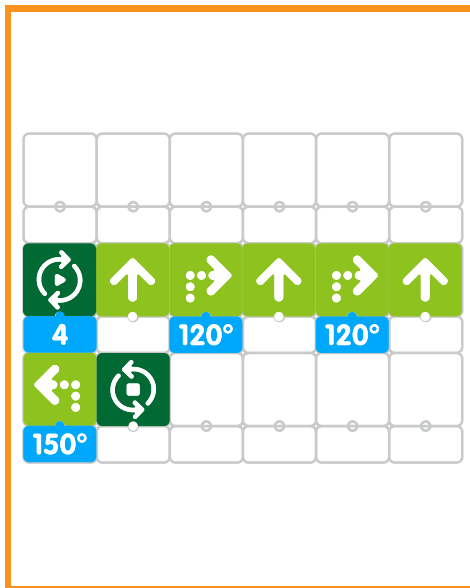
- **Turbine:** A machine that produces continuous power with a wheel or rotor, fitted with rotating vanes, is made to revolve by way of water, wind, or some other kind of energy.
- **Maltese cross:** A cross with arms of equal length that broaden from the center and have their ends indented.
- **Shaft:** A long, narrow part or section that forms the handle of a tool.
- **Wind Energy:** Energy or movement created by wind.
- **Wind:** The movement of air.
- **Adjacent:** Something that is next to something else.
- **Energy:** Power derived from using resources.

- **Electricity:** A form of energy resulting from charged particles either as an accumulation of a charge or as a current.

Introduction

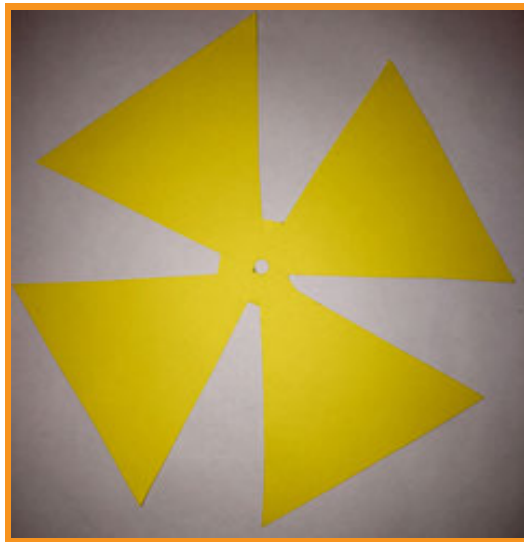
- Give students time to discuss the following:
 - “What is wind?”
 - “How can the power of wind be captured and used?”
 - “What is electricity?”
 - “Give examples of tools that you see and use in your home on a daily basis that use electricity.”
 - *As you ride through the countryside, often you see large whirling wind turbines off in the distance. A wind turbine is a machine that produces electricity through the use of wind energy. These wind turbines are tall, have attached blades which move with the movement of wind, and create or generate electricity. A toy pinwheel is basically a much smaller wind turbine. Pinwheels also are attached to some type of a pole with a shaft attached at a right angle. A pinwheel has attached blades that move on the shaft when someone blows toward the blades or when wind creates the movement.*
- Explain to students that in this lesson, they will program Matatabot to draw some basic shapes and to create a very basic type of wind turbine called a pinwheel.

Pinwheel and Coding:



Matatalab Activity

- Students should be familiar with coding the pinwheel design (Draw 4 Warm-Up Card). If not, review coding needed for this activity.
- Explain to students that they will code and draw three pinwheels on separate sheets of cardstock.
- **Teacher Note** - Matatabot must be placed in the center of the cardstock before the code is executed.
- Give students time to plan and design their pinwheel using the Pinwheel Planning Worksheet.
- Explain to students that when they cut out the pinwheel, they should not cut completely to the center as this will cause the triangles to separate. They need to leave enough cardstock in the center to be able to make a hole with a hole-punch.



- When students have finished cutting out and decorating their three pinwheels they will need to make a hole in the center of each pinwheel with a hole-punch.



- The pinwheels are attached to the dowel by pushing a pushpin through the center hole of all three pinwheels into the dowel. Students can then fan out their pinwheels so each layer is visible.



Closing

Assessment

We have used the Matatalab Coding Set along with the Artist Add-On Set to code and create shapes that were used to create a moveable pinwheel.

Have students answer the following questions:

- How successful were you in creating the shapes needed to create your pinwheel?
- How was your pinwheel creation similar to a wind turbine? Explain.
- What was the most surprising thing about the creation of your pinwheel?
- What did you like most about the creation of your pinwheel?
- How would you change or strengthen the instructions to create your pinwheel?

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals.

Extensions

We have created a moveable pinwheel whose blades were constructed by using the Matatalab Coding Set along with the Artist Add-On Set. Create different kinds of machines using the Matatalab Coding Set and Artist Add-On Set whose blades move either because of the movement of air or water. Examples might include rotary blades for a fishing boat propelled by the movement of water through the blades, or a fan that hangs from a ceiling. You could glue the blade shapes on stiff paper or onto plastic. You could attach or hang the blades from a fishing vehicle that they create or hang the fan from the top of a shoebox fitted onto the top of the box itself.

Real World Connections

Pinwheels are often sold as toys used by children for amusement. Check out this video of people creating a wind turbine out of pinwheels:

https://youtu.be/WQrzkkku_Emo

Now view this video to understand how wind turbines work:

https://youtu.be/qSWm_nprfqE

Pinwheel Planning Worksheet

***Draw the shapes
you will use
for your Pinwheel***

***Draw your
Pinwheel***

Natural Resources Mix and Match

Renewable resources are resources that can be replaced in a few years or decades, at about the same rate they are being used. Nonrenewable resources are resources that are being used up faster than they can be replaced. These resources can take anywhere from hundreds to millions of years to regenerate -- and in some cases, they never will.

Use the chart below to classify each resource as renewable or nonrenewable

Renewable	Nonrenewable

NATURAL GAS

**TREES
OIL**

**AIR
WIND**

**WATER
SUN**

Matatalab

Lesson 6

Family Tree



Overview

A family tree is a tool or chart by which a person can illustrate the connections and ancestry within the generations of his or her family unit. Family trees utilize the image of the branches of a tree in order to show these connections. Usually these trees begin with a single person's name and picture at the bottom of the tree with sisters and brothers spreading horizontally from that individual. This would spread into two diverting branches for parents, and additional branches spreading apart from each parent to indicate grandparents. Thus, family connections can be illustrated.

In this lesson, each student will use the sunburst shape of the Matatalab Artist Add-On set in order to create shapes for leaves of his or her own family tree. Students will utilize the basic sunburst shape coded in Draw 5 Warm-Up Card for frames for family photographs to place on the leaves of the tree to indicate these connections. Students will utilize a large poster board to draw a tree with at least seven branches. Students will collect photographs or draw pictures of the members of his or her family, glue these photos on top of each of the sunburst shapes, and arrange these leaves correctly on the family tree. Once students have arranged their family connections correctly, they will label and decorate their family tree.

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

Essential Objective

- Understand coding and manipulation of Matatabot to create various basic shapes.

Learning Objectives

- Code and manipulate Matatabot to create a series of sunburst shapes on top of which they will place family photos.
- Understand the importance of family connections and personal family ancestry.
- Create a family tree illustrating personal family ancestry and family connections.

Standards

- NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.1, VA:Pr5.1, VA:Pr6.1, VA:Cn10.1
- CSTA: K-2: 1A-CS-01, 1A-AP-10, 1A-AP-11, 1A-AP-12, 1A-1P-14, 1A-AP-15
3-5: 1B-AP-08, 1B-AP-09, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-13, 1B-AP-15, 1B-AP-16, 1B-AP-17

Time

60 minutes

Materials

- For each student group:
- 1 Matatalab Coding Set - Parts used in this lesson will include:
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
- 1 Matatalab Artist Add-On Set
- For each student:
 - Cardstock (1 piece for each family member to be included in family tree)
 - Large piece of white paper (approximately 2 feet x 3 feet)
 - Scissors
 - Markers
 - 1 copy of each worksheet per student
 - Student journals

Teacher Set-Up and Preparation

- Charge all Matatalab Command Towers and Matatabots.
- Ensure that there are enough copies of worksheets for each student.
- Ensure access to all necessary materials.
- Ensure student access to student journals.

Vocabulary

- **Family:** Members of a person's unique clan or group consisting of parents and children living together in a household.
- **Generation:** People born at or around the same time. For example: Children within a family represent a young generation, parents within a family represent an older generation. Grandparents of the same family represent an even older generation.
- **Ancestry:** A family's background to include several generations.
- **Family tree:** A diagram or chart illustrating relationships between several generations of a family.
- **Angle:** The space, measured in degrees, between two intersecting points or lines at or close to where they meet.

Introduction

We all have some form of a family. We all live in some form of a family group. Families come in all shapes

and sizes. Sometimes families are connected by birth, and sometimes families are connected by choice. Some families are large with many children, and some families are smaller with fewer children. Often, family histories go back many generations. Charts can be made to outline the history of a family. These charts are often called family trees. Today, we will be creating family trees. Each student will create his or her own family tree.

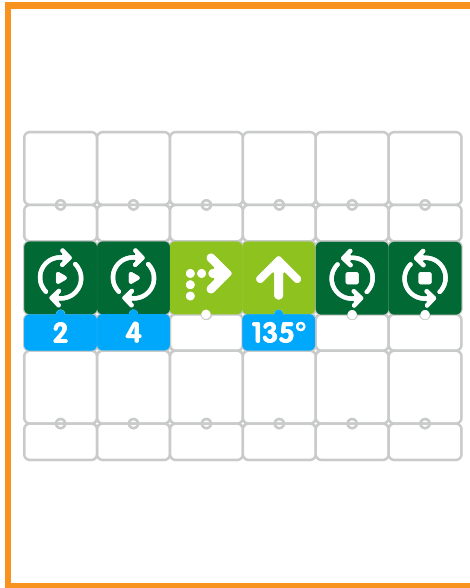
- Give students time to discuss the composition and makeup of their families.
- Give students time to plan out their own family tree using the *Family Tree Planning Worksheet*.
- Ask students to collect photos of family members that they would like to place on their family tree branches. These members might include brothers, sisters, parents, aunts, uncles, cousins, and grandparents.



Matatalab Activity

- Students should be familiar with the coding used to create the sunburst (Draw 5 Warm-Up Card). If necessary, review the coding sequence.

Sunburst and coding:



- Explain to students that Matatabot will need to be placed in the center of the cardstock in order to complete the sunburst drawing within the borders of the cardstock.
- Students will code Matatabot to draw a sunburst for each family member they will include on their family tree. Allow students time to create the sunbursts they will use for their family tree.

Teacher Notes:

- The number needed will be different for each child based upon his/her family.
- Students who are waiting to create their sunbursts could create their tree on a large sheet of white paper.
- Circulate to facilitate student transitions between coding and drawing of family tree.
- When sunbursts have been drawn, students will cut out shapes, glue photos or drawings onto center of sunburst and label sunburst with individual's name. Shapes will then be glued onto the tree.
- After all students have complete their projects, each student will present their family to the class.

Closing

Assessment

We have created a family tree and populated it with pictures of our family members. We created frames for these pictures by creating a set of sunburst shapes utilizing the Matatalab Coding Set and the Artist Add-On Set.

Have students answer the following questions:

- How successful were you in creating a family tree for your specific family?
- What was your favorite aspect or part of this project?
- What surprised you most about this project?
- What would you change in order to strengthen this project? Explain.

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals.

Extensions

Students could create more of the family tree shapes with the Matatalab Coding set. For example, they could create different sized diamond shapes for leaves and different sized rectangular shapes for the tree trunk and branches.

Choose a famous person in history. Research his or her family and create a family tree that reflects the personal history of that person. Using the Matatalab sets, code shapes to represent the family tree. Using digital storytelling tools, create a movie or stop motion animation video to show how you used the Matatalab set to create the family tree.

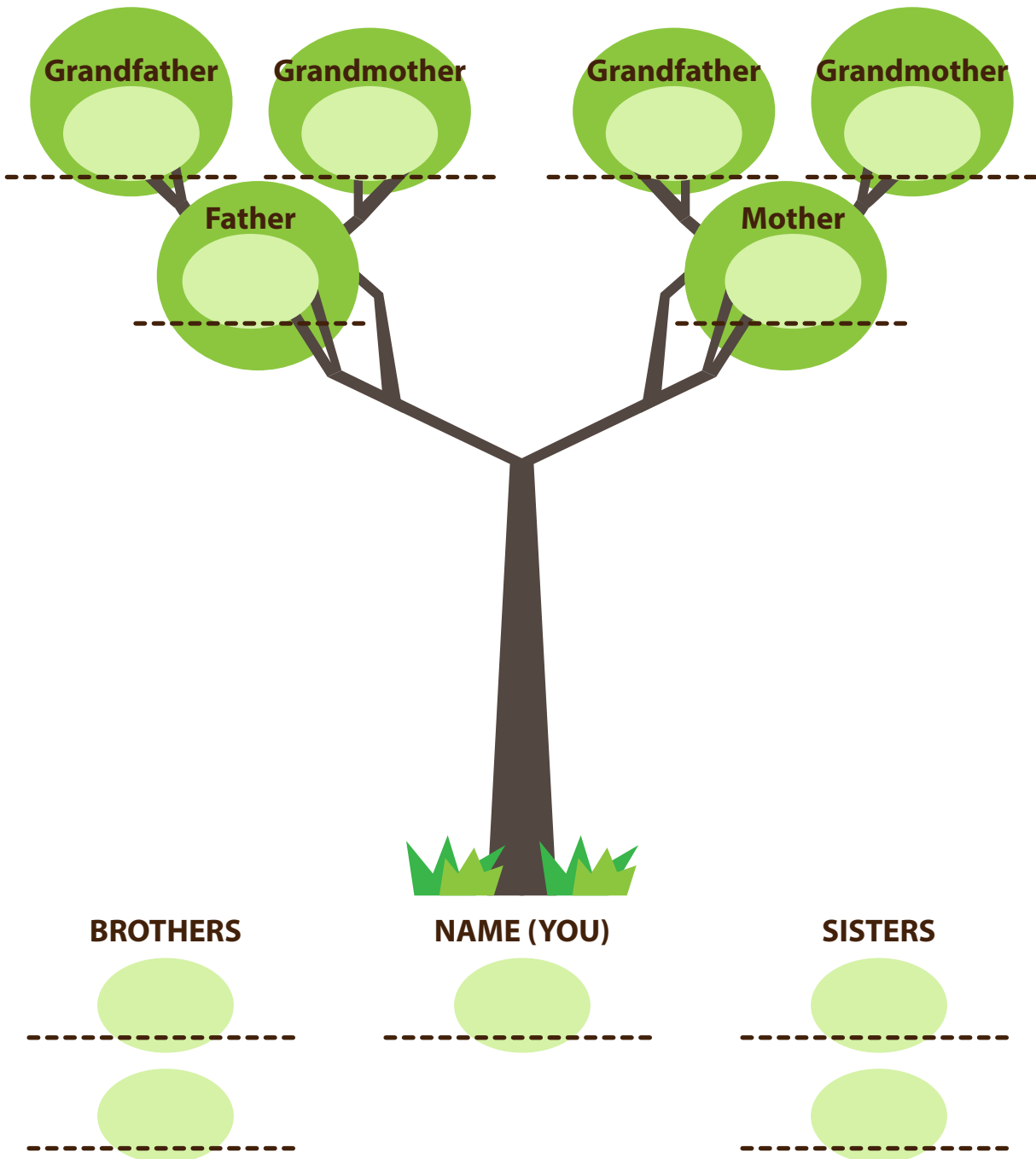
Real World Connections

For this project you thought about and constructed a family tree based upon your own family. There are many types of groups that together make up families. New DNA technology can connect people across generations and continents. What are some characteristics about you and your family members that are alike and different?

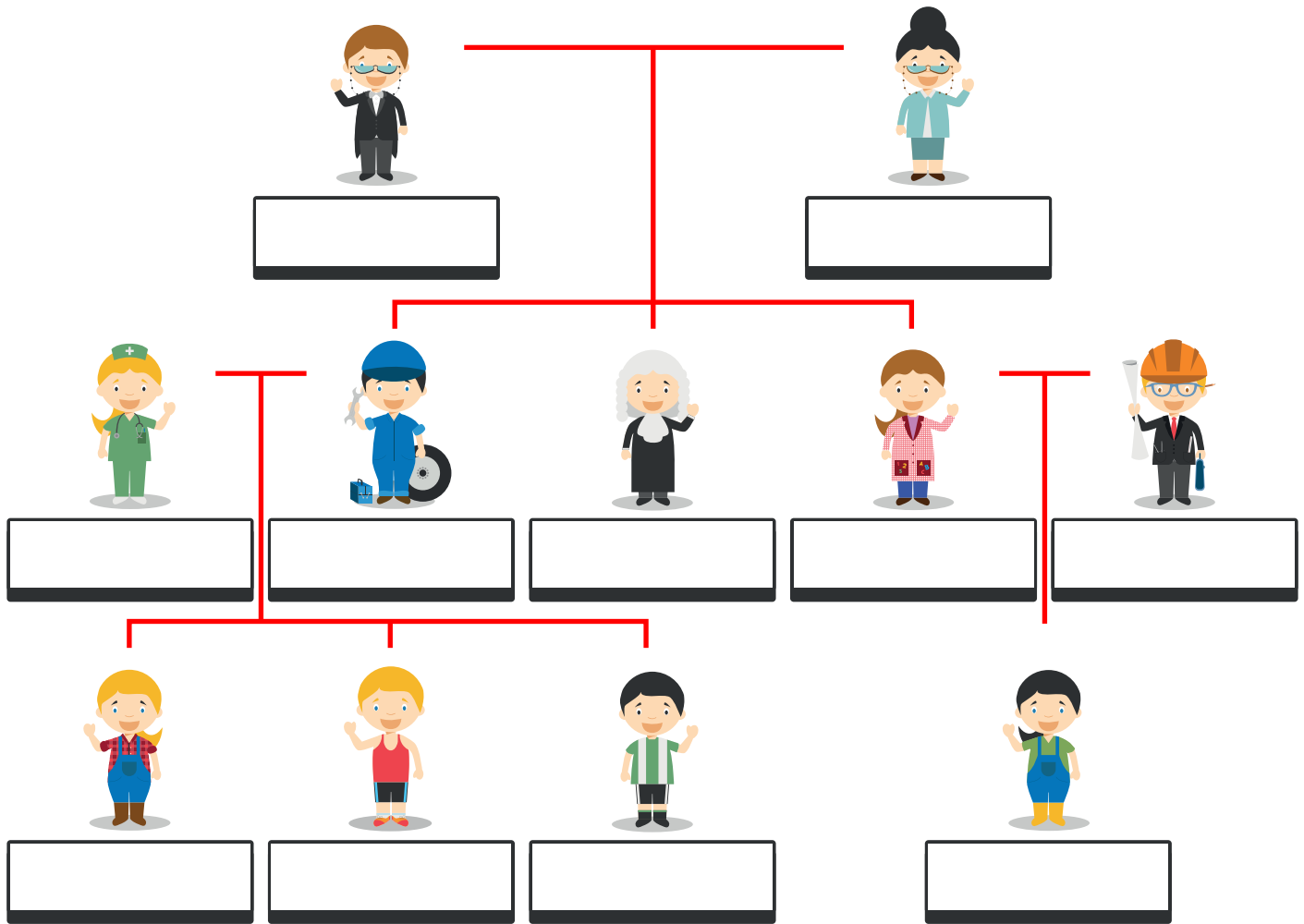
Family Tree Planning Worksheet

Chart your family below with their names

Family Name: _____



Family Tree



mother
brother
sister

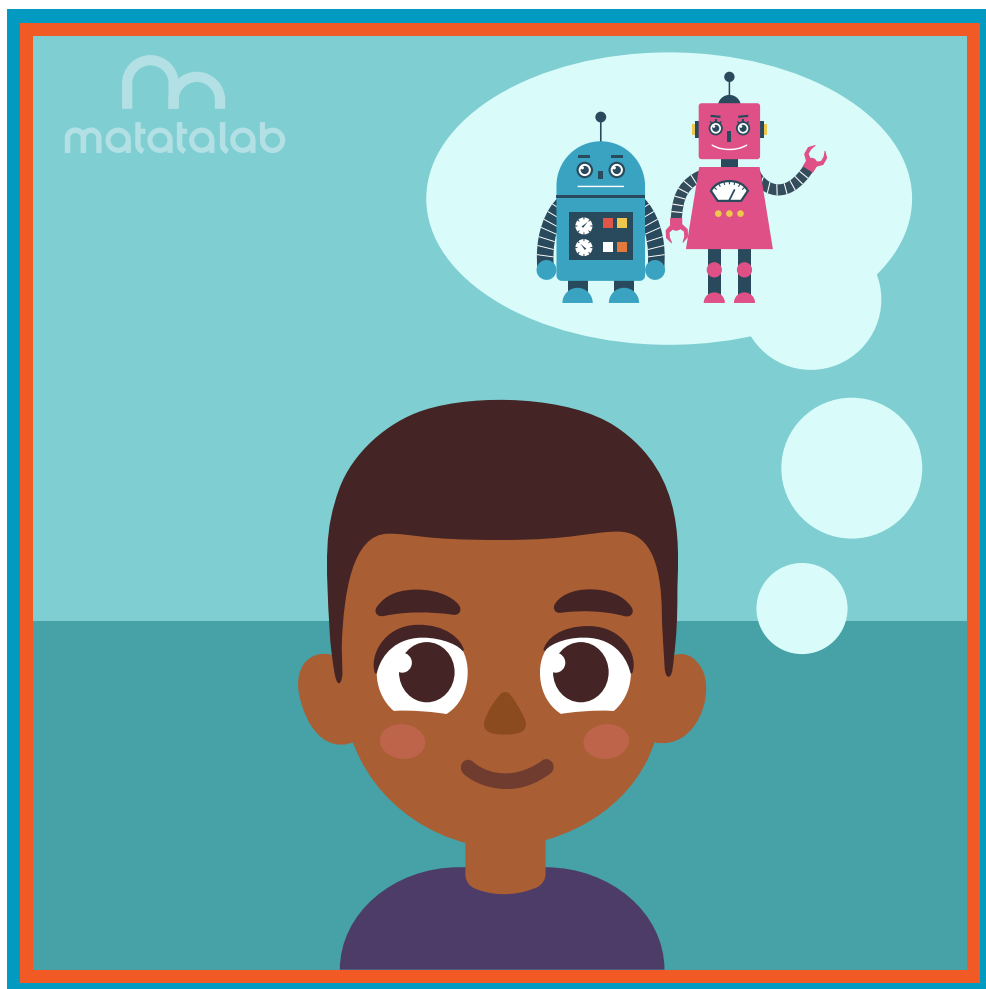
uncle
father
aunt

cousin
grandmother
grandfather

Matatalab

Lesson 7

Robot



Overview

A robot is a machine that is capable of carrying out a complex set of instructions automatically and is programmable by a computer. Robots serve many functions. There are robots that are programmed to perform surgery. There are robots that are involved in search and rescue functions. Some robots package products for sale. Some robots are involved in transportation. Robots can do many things. Many robots also combine artificial intelligence, or AI. Some robots can learn to think and reason.

In this lesson, students will design and code various shapes utilizing the Matatalab Coding Set and the Artist Add-On Set. Students will cut out the shapes and construct a robot. Students will then decorate, embellish and present their robots to the class.

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

Essential Objective

- ▶ Understand coding and manipulation of Matatabot to create various basic shapes.

Learning Objectives

- ▶ Design and create a robot using basic Matatalab Artist Add-On Set to program shapes.
- ▶ Explore different examples of robots and the purposes for which robots are created.

Standards

- ▶ NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.1, VA:Cn10.1
- ▶ CSTA: K-2: 1A-CS-01, 1A-AP-10, 1A-AP-11, 1A-AP-12, 1A-1P-14, 1A-AP-15
3-5: 1B-AP-08, 1B-AP-09, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-13, 1B-AP-15, 1B-AP-16, 1B-AP-17

Time

60 minutes

Materials

For each student group:

- 1 Matatalab Coding Set - Parts used in this lesson will include:
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
 - 1 Matatalab Artist Add-On Set
- Large sheet of white paper
- White or colored cardstock
- Corrugated cardboard (from large boxes) - to make a stand for robot
- Scissors
- Markers
- Glue and/or tape
- Glitter, stickers, other craft-type items
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

- Create a display model of a robot.
- Charge all Matatalab Command Towers and Matatabots.
- Ensure that there are enough copies of worksheets for each student.
- Locate a place for each student group to work.
- Distribute a set of materials for each student group.

Vocabulary

- **Robot:** A robot is a machine that is capable of carrying out a complex set of instructions automatically and is programmable by a computer.
- **Program:** Coded instructions for the automatic performance of a particular task.
- **Debug:** Identify and remove errors from code.
- **Computer:** A machine that is programmed by humans in order to perform a series of tasks.
- **Artificial Intelligence:** Development of computer systems able to perform tasks that are normally limited to human intelligence. Examples include visual perception and speech recognition.

Introduction

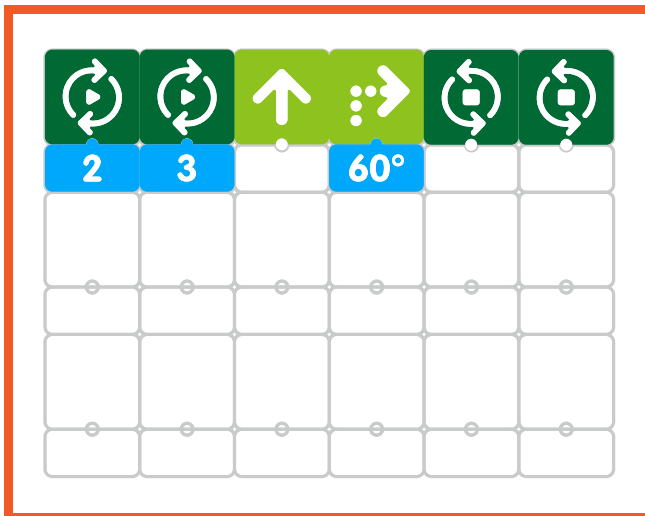
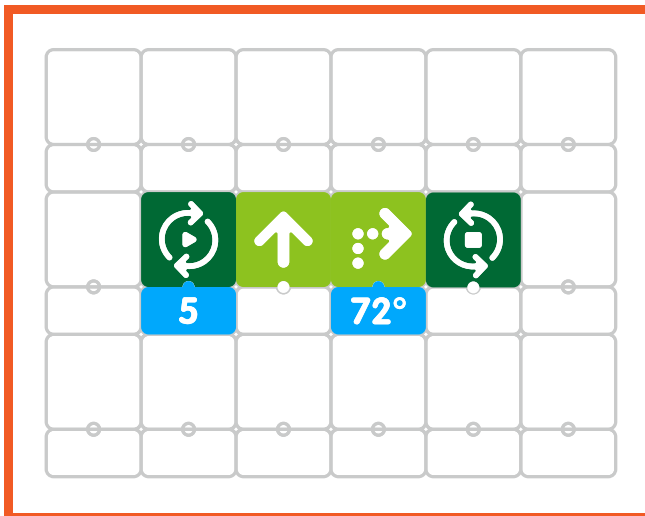
- Have students imagine reasons that they may want to have or use a robot.

- *What is a machine?*
- *What is a robot?*
- *How is a robot a machine?*
- *What are some of the most important reasons to have or use a robot?*
- *How do robots look?*
- *How are robots constructed?*
- *How would you use a robot?*
- Have students collaborate, plan, design and draw a robot on the *Robot Planning Worksheet* that they might make using geometric designs.
- Explain that they will use the Matatalab Coding Set and the Matatalab Artist Add-On Set to create, code and draw the geometric shapes for their robot.
- Challenge students to be creative and imaginative with their robot design. What will their robot do? Will they give the robot a name?
- Encourage students to use not only the six basic shapes, but to think about trying to code other shapes to use. For instance, could students code a large regular or irregular polygon to use as the body of their robot? A large rectangle could be cut in strips for arms and legs.



Matatalab Activity

- Discuss with students the possible geometric shapes they may want to use for their robot. Review that the use of a number under a forward arrow will increase the length of a side of a shape.
- Allow students time to code shapes they will use for their robot. Students should test their shapes on the large white paper and then debug for coding issues before Matatabot draws the shapes on card stock.
- **Teacher Note:** Challenge students to think about coding Matatabot to draw more complex shapes to use for their robot. For instance, the sample robot in the this lesson included a rectangle cut into strips for the arms and legs, half a sunburst, a pentagon for the head and a hexagon for the body. Coding for the pentagon and hexagon is shown below.



- As students finish coding, drawing and cutting out shapes they will assemble their robot, adding craft items such as glitter, pom poms, ribbon, etc. to give their robot some unique characteristics.
- Hold a “Robot Convention” and have each group introduce their robot to the class, explaining special characteristics of their robot and the role it plays.

Closing

Assessment

We have created unique robots today by coding and creating several different types of shapes to make it and then decorated it using different media.

Have students answer the following questions:

- What did you like best about your robot?
- What surprised you most about coding and creating the shapes for your robot?
- How successful was the creation of your robot? Explain.
- What would you change or strengthen about the instructions for this project?

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals

Extensions

This lesson involved the creation of two-dimensional robots made of paper utilizing coding and creation of a variety of different shapes. Create a three-dimensional robot using a variety of different-sized boxes and other media. Plan out the arrangement and configuration of your three-dimensional robot. Utilize the Matatalab Coding Set and Artist Add-On Set in order to create shapes to glue on top of the boxes. These shapes might represent heads or faces, keyboards, and switches. Present your three-dimensional robots to the class.

Real World Connections

Robots are machines that carry out complex instructions as programmed by a person or group of people. Robots carry out many different types of activities that might be difficult for people to complete or fulfill. What types of activities might be more efficiently carried out by a robot? Why? How might a robot’s actions help people in day to day activities? How might a robot be helpful in search and rescue operations? Why might it be helpful to utilize robots in these operations? How might a robot complete directions more efficiently than a person?

Robot Planning Worksheet

*Draw the
shapes for
your robot*

*Draw and design
your robot*

Robot Words

Can you find all the hidden words in this word search?

Words can go in the following directions: → ← ↓ ↑



BIOMETRIC
SOFTWARE
ARTIFICIAL
OPERATOR
SENSOR
DEVICE

ROBOTIC
SIMULATION
MOTION
HYBRID
MECHANICAL
MANIPULATE

DIGITAL
INTELLIGENCE
COMPUTER
FEEDBACK
FUNCTION

Solution

B	I	O	M	E	T	R	I	C	.	.	.	.	.	.
.	N	.	O	.	C	.	F	E	E	D	B	A	C	K
.	O	H	P	.	O	S	E	.	.	.	.	.	M	.
.	I	Y	E	D	M	E	C	H	A	N	I	C	A	L
.	T	B	R	E	P	N	N	.	.	.	.	.	N	.
.	C	R	A	V	U	S	E	.	.	.	.	.	I	S
.	N	I	T	I	T	O	G	.	.	.	C	.	P	O
.	U	D	O	C	E	R	I	.	.	.	I	.	U	F
.	F	.	R	E	R	.	L	.	.	.	T	.	L	T
.	.	.	S	I	M	U	L	A	T	I	O	N	A	W
M	O	T	I	O	N	.	E	.	.	.	B	.	T	A
.	.	.	.	.	.	.	T	.	.	.	O	.	E	R
.	.	.	.	.	.	.	N	.	.	.	R	.	.	E
.	.	.	.	A	R	T	I	F	I	C	I	A	L	.
.	.	.	.	L	A	T	I	G	I	D	.	.	.	.

(Over, Down, Direction)

BIOMETRIC (1, 1, E)

ROBOTIC (12, 7, N)

DIGITAL (5,15, W)

SOFTWARE (15, 6, S)

SIMULATION (4, 10, E)

INTELLIGENCE (8, 3, N)

ARTIFICIAL (5, 14, E)

MOTION (1,11, E)

COMPUTER (6, 2, S)

OPERATOR (4, 2, S)

HYBRID (3, 3, S)

FEEDBACK (8, 2, E)

SENSOR (7, 3, S)

MECHANICAL (6, 4, E)

FUNCTION (2, 2, N)

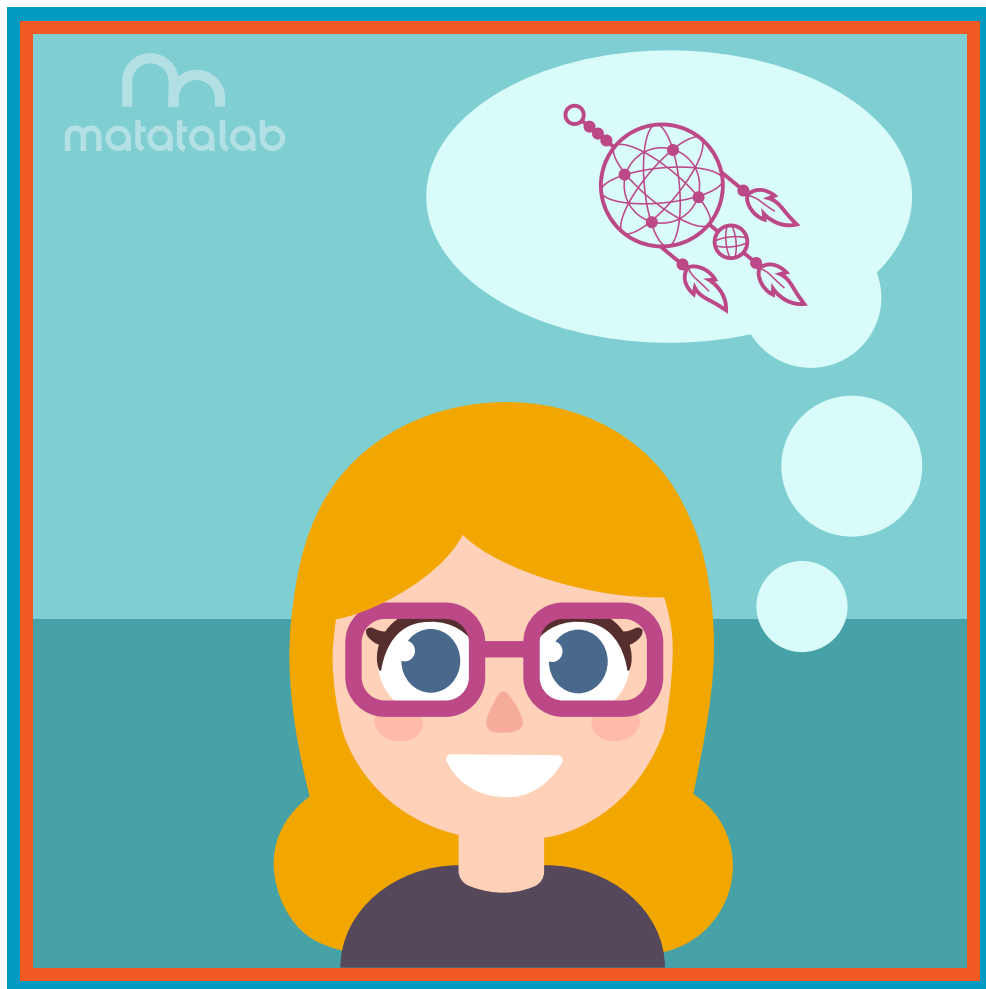
DEVICE (5, 4, S)

MANIPULATE (14, 3, S)

Matatalab

Lesson 8

Dreamcatcher



Overview

Dreamcatchers have been important in many Native American cultures for generations. For example, the Ojibwe Native Americans used dreamcatchers as charmed objects or talismans to guard and protect people, especially children, from bad dreams and nightmares while they were sleeping. It was thought that a dreamcatcher could “catch” the bad dream in the spider’s web or netting in its center.

Dreamcatchers were usually constructed of some type of circle or hoop, often of willow wood with a netting around and through the circle itself. The netting represented the mythical spider woman from Native American mythology who taught members how to weave and protected people. The netting could be constructed of many different materials.

In this lesson, students will code and create a round sunburst, cut out a circle in the center, overlay that shape onto a larger circle, and create dreamcatchers by looping string or yarn through and within the circle in the center. Students will then decorate their dreamcatcher with yarn, beads, and other media.

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

Essential Objective

- Understand coding and manipulation of Matatabot to create various basic shapes.

Learning Objectives

- Create a dreamcatcher using coded shapes.
- Explore the history, stories, and purpose of dreamcatchers.

Standards

- NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.1, VA:Re7.1, VA:Re8.1, VA:Re9.1, VA:Cn10.1, VA:Cn11.1
- CSTA: 3-5: 1B-AP-08, 1B-AP-09, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-13, 1B-AP-15, 1B-AP-16, 1B-AP-17

Time

60 minutes

Materials

- Laptop, projector and internet access
- For each student group:
- 1 Matatalab Coding Set - Parts used in this lesson will include:
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
- 1 Matatalab Artist Add-On Set
- For each student:
 - White Cardstock or poster board
 - Scissors
 - Markers
 - Yarn
 - String
 - Beads
 - Feathers
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

- Create a display model of a dreamcatcher with embellishments.
- Charge all Matatalab Command Towers and Matatabots.
- Ensure that there are enough copies of worksheets for each student.
- Locate a place for each student group to work.
- Distribute a set of materials for each student group.

Vocabulary

- **Dreamcatcher:** Small hoop often created out of willow wood with a netting in and through the center and decorated with various media such as beads and feathers. Dreamcatchers were made and used by various Native American tribes as talismans to catch bad dreams and help create good dreams.
- **Native American:** First Americans whose place of origin was the Western Hemisphere including North and South America. These people lived in North and South America before the arrival of Europeans.
- **Myth:** Traditional story concerning the early history of a group of people. An example would include Greek mythology.
- **Nightmare:** A dream that can be characterized as scary or disturbing.
- **Spider Woman:** A character appearing in several different native American cultures that taught

members how to weave.

- **Ojibwe Tribe:** Also known as Chippewa tribe, this Native American tribe is located both in today's Canada and different parts of the United States.
- **Culture:** A group of peoples way of life including shared customs, beliefs, food and arts.
- **Tribe:** A group of people who are connected to each other by way of their culture, language, and shared history.

Introduction

Have you ever had a bad dream? How did you feel when you woke up from the bad dream? What is meant by a good dream? What types of things might happen in your good dream? How do you feel after waking up from a good dream? Is there any way to make sure that you have more good dreams than bad dreams?

- Allow students time to discuss these questions.

Many Native American cultures believed that there was a way to ensure good dreams. Many of these tribes created something called a dreamcatcher, which was intended to trap bad dreams and allow people to have more good dreams.

- Discuss the creation of and purpose of dreamcatchers.
- Discuss the myth of the spider woman and the belief in the spider woman in many Native American cultures.

In this lesson, we will be creating our own dreamcatcher using the Matatalab Coding Set with the Artist Add-On Set.

View videos about the use of the dreamcatcher-

Myth of Dreamcatchers:

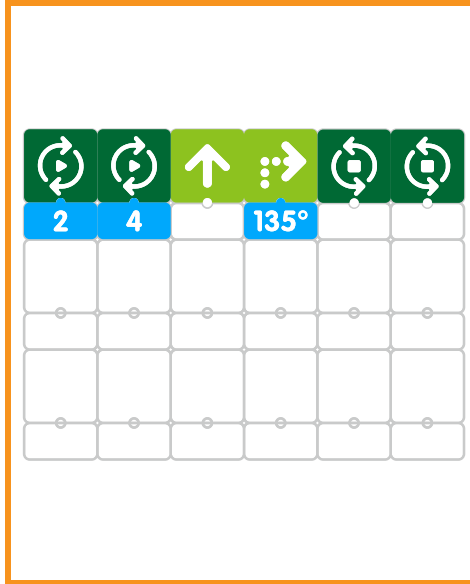
<https://www.youtube.com/watch?v=CmzCk47g6dI>

Dreamcatchers:

<https://www.youtube.com/watch?v=faBtA2OFOi0>

- Give students time to plan and draw a dreamcatcher using the Dreamcatcher Planning Worksheet.

Matatalab Activity



Each student will follow the steps below to create his/her own dreamcatcher using the Matatalab Coding Set and the Artist Add-On Set.

- Have students take out and examine the starburst shape shown on the Draw 5 Warm-Up Card. Discuss the way in which a space is formed on the interior of the sunburst shape. Students will use that space.
- Review the coding blocks with students and discuss how Matatabot can draw a sunburst shape by reading the coding blocks. Ask students what one other block they could add to the line of coding in order for Matatabot to draw a larger sunburst with a larger space on the inside (a number under the \uparrow).
- Configure the needed coding blocks to create the sunburst shape on poster board or a large sheet of cardstock.
- Cut out the sunburst shape. Next, cut a circle in the interior space of the sunburst.



- ▶ Using string or yarn, wrap the string or yarn around and around the inside of the rays of the sunburst. This will create a net on the inside of the sunburst shape.
- ▶ Using the sunburst cut out, place this shape on top of large cardstock or poster board. Using a pencil or pen, draw around the outside rays of the sunburst, forming a larger circle on the poster board. Cut out the larger circle and then cut out the interior of the larger circle.
- ▶ Glue or tape the cut out and now netted sunburst circle on top of the larger cut out circle. There will be holes between the inside of the larger circle and the sunburst shape.



- ▶ Using yarn or string, tie the yarn or string onto the inside of the larger circle. Attach beads, feathers, or other media to the end of this string or yarn.
- ▶ Using yarn or string, tie the yarn or string onto the top of the inside of the larger circle. This will be the string that students will use to tie their dreamcatcher onto their bedpost, window, or ceiling.
- ▶ Embellish and decorate the dreamcatcher with beads, feathers, and other media.

Closing

Assessment

We have discussed the importance of dreamcatchers in Native American cultures and we have created our own dreamcatcher using the Matatalab Coding Set and the Artist Add-On Set in order to create the needed shapes.

Have students answer the following questions:

- What did you think about the myth of the spider woman? Do you think dreamcatchers would help to prevent bad dreams? Why or why not?
- What did you like best about your project?
- What surprised you most about your creation? Why?
- How would you have changed or strengthened the instructions for this project? Why?

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals.

Extensions

Dreamcatchers are often used to tell the Native American myth or legend of the spider woman who taught the people how to weave. Investigate artifacts or objects like dreamcatchers that are important in myths or legends from other cultures. Examples might include the artifacts from the mythology of ancient Greeks, or of ancient Romans. For example: in ancient Greek mythology, Athena wears a helmet and holds a spear. She is known for wisdom, so one of the animals that represents her is an owl.

Using the Matatalab Coding Set with the Artist Add-On set, create a shape or series of shapes in order to design and create a three dimensional artifact for one of the gods in ancient Greek mythology. Create digital storytelling about these myths or legends using a movie app. Present your creations.

Real World Connections

Dreamcatchers have been created and used for many generations by many different Native American cultures. There are many different Native American tribes located within today's United States. Today, many Native American tribes are located on and own tracts of land called reservations. What is meant by a reservation? How are reservations different from states or cities? How were reservations created through history?

Dreamcatcher Planning Worksheet

***Draw shapes needed for your dreamcatcher,
then draw the dreamcatcher itself***

Shapes	Dreamcatcher

Matatalab

Lesson 9

Marionette



Overview

A marionette is a type of puppet whose head and limbs are attached with wires or strings. Usually the strings are attached to sticks or dowels held above the puppet. Often, marionettes are used to perform in puppet theatres for entertainment and are operated by a marionettist or puppeteer.

The history of the use of marionettes goes back for thousands of years. Ancient Egyptians created marionettes out of clay and ivory. In Thailand, marionettes were historically created out of paper and sticks and were performed behind fabric with the audience watching shadows of the puppets.

In this lesson, students will code and create various shapes that are needed to attach to strings and wooden sticks or dowels in order to create a marionette. Students will then decorate and embellish their marionettes.

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

Essential Objective

- Understand coding and manipulation of Matatabot to create various basic shapes.

Learning Objectives

- Design a marionette.
- Create a marionette based on coding of geometric shapes using the Matatalab Artist Add-On Set.

Standards

- NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.1, VA:Cn10.1
- CSTA: 3-5: 1B-AP-08, 1B-AP-09, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-13, 1B-AP-15, 1B-AP-16, 1B-AP-17

Time

60 minutes

Materials

For each student group:

- 1 Matatalab Coding Set - Parts used in this lesson will include:
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
- 1 Matatalab Artist Add-On Set
- Large sheet of white paper
- White cardstock (2-3 pieces per student)
- 2 sticks or wooden dowels
- 1 Plastic tapestry needle or hole punch
- Scissors
- Markers
- String
- Yarn
- Fabric
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

- Create a display model of a marionette with embellishments.
- Charge all Matatalab Command Towers and Matatabots.
- Ensure that there are enough copies of worksheets for each student.
- Locate a place for each student group to work.
- Distribute a set of materials for each student group.

Vocabulary

- **Puppet:** A moveable model of a person or animal used for entertainment and moved either by strings above, or a hand inside of some type of material.
- **Marionette:** A type of puppet created with strings or wire attached to head and limbs.
- **Marionettist:** A person who moves the marionette and performs with the marionette.
- **Theatre:** A building or structure inside of which there is some type of performance.
- **Performance:** An act of staging or presenting some type of entertainment.

Introduction

Have students imagine their favorite puppet show and discuss the following questions:

- What did they like about it?
- What is a puppet?
- How is a puppet made?
- What kinds of puppets have you seen on television or in the movies? (Examples might include Sesame Street puppets or Pinocchio.)
- How is a puppet like or similar to a marionette?
- How is a marionette different from a puppet?
- What are the characteristics of a marionette?
- How is a marionette operated?

We will be planning the design, then coding the shapes needed using the Matatalab Coding Set with the Artist Add-On Set in order to create our own marionettes. We will be cutting out the needed shapes, connecting the shapes with string, and then we will decorate and embellish our marionettes.

- Give students time to plan and draw their marionettes using the *Marionette Planning Worksheet*.
- View videos of marionettes:

Marionette Video:

<https://www.youtube.com/watch?v=44leeueHG4w>

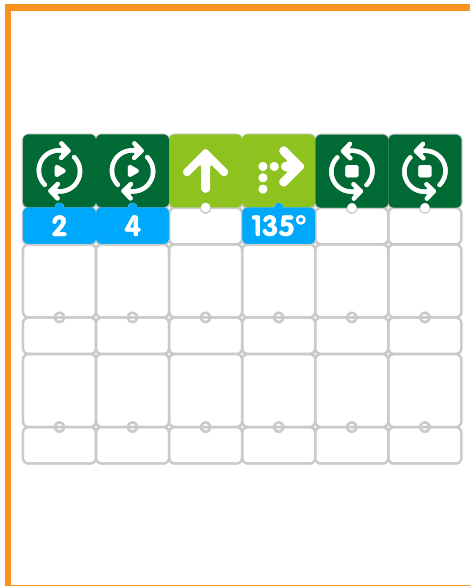
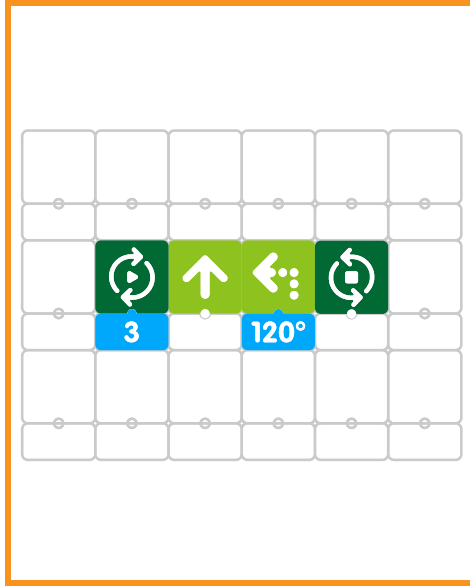
Marionette Video:

https://www.youtube.com/watch?v=PC_7eMAUEg4&list=RDLiLPkrWYans&index=7

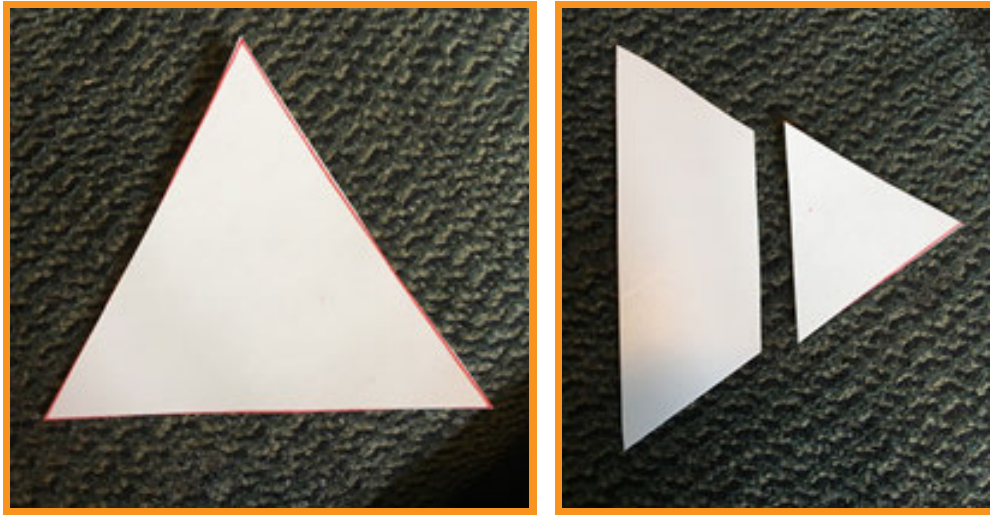
Matatalab Activity

Each group of students will follow the steps below to code the shapes needed to create a marionette.

- Have students take out and examine the triangle shape shown on the Draw 2 Warm-Up Card and the sunburst shape shown on the Draw 5 Warm-Up Card. Notice that inside of the sunburst shape is an open space. Review the coding blocks for each shape with students and discuss how Matatabot can draw a triangle as well as a sunburst by reading the coding blocks. Examples follow on the next page.
- Explain to students that these two shapes will be used to construct the marionette.
- Discuss the number of each type of shape that will be needed to create the marionette.
- Configure the required coding needed for Matatabot to draw and create the number of required shapes on large cardstock or poster board.

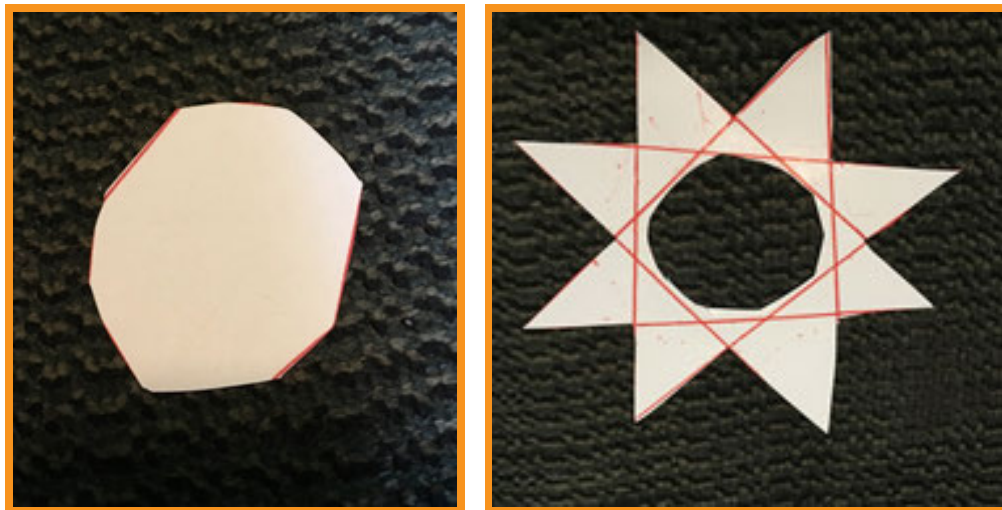


- ▶ Since four of the triangles needed for your marionette are smaller than Matatabot creates, refer to the image below in order to cut a section off of each triangle.



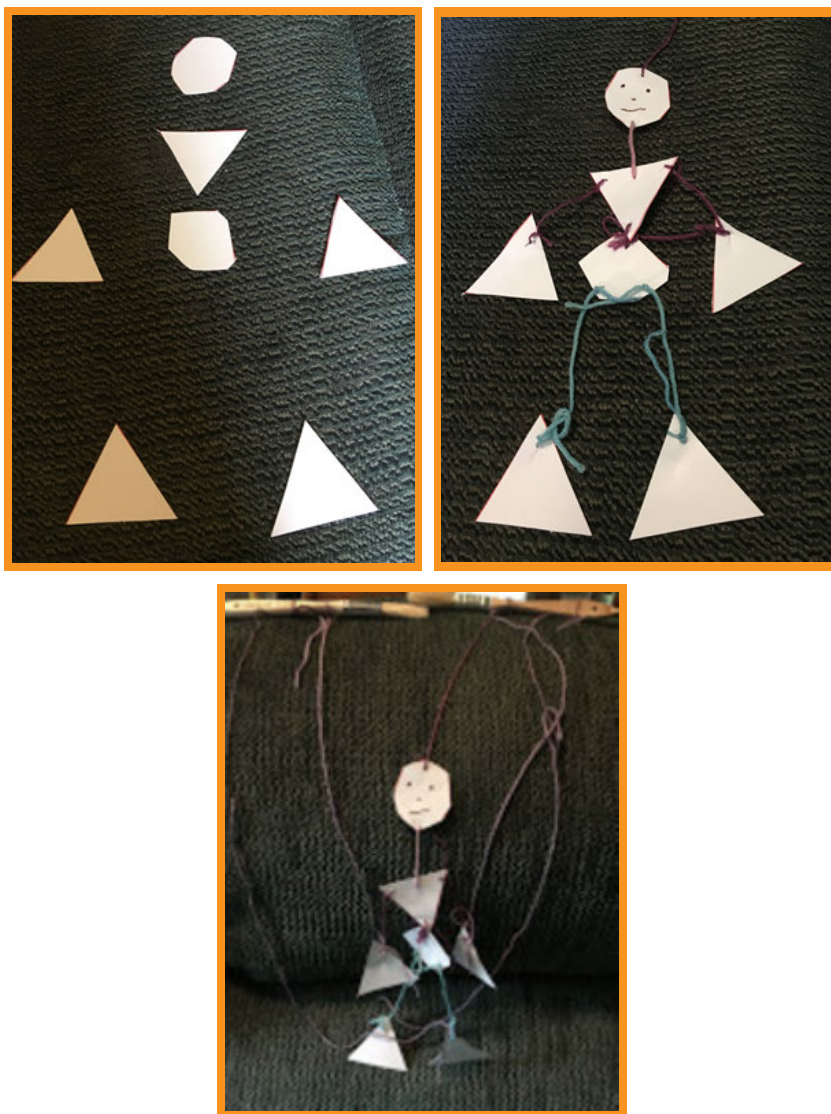
Now that students have the required shapes, they will follow the steps below to construct their marionette:

- ▶ Using the sunburst shapes, cut out the interior circles to create the head and bottom part of the body from the sunburst shape and discard or use the rays to create the marionette.



- ▶ Using a plastic tapestry needle or a hole punch, make a hole at the top of the head circle, and a hole at the bottom of the head circle. Tie yarn at the top and then tie yarn at the bottom. Tie the top of the yarn connected to the top of the head to a stick or wooden dowel.

- Refer to the images below in order to punch holes with the tapestry needle or hole punch at the top of each of the triangle shapes. Punch two holes on both sides of the body triangle to make shoulders and punch another hole at the bottom to connect the circular bottom part of the body shape.
- Punch two holes on either side of the bottom body circle for leg joints. Punch holes in the hand triangle shapes and holes in the foot triangle shapes. Connect yarn to each of these shapes.
- Refer to the pictures below for more information.
- Connect yarn from each foot to one of the two sticks at the top. Connect yarn from each hand to one of the two sticks at the top.
- Embellish the connected marionette using markers to draw a face, make hair with yarn and glue to head; use ribbon, fabric and other media to create clothing, shoes, etc.



Allow students time to complete and manipulate their marionettes.

Closing

Assessment

We have utilized the Matatalab Coding Set along with the Artist Add-On Set to create shapes and then constructed and decorated a moveable marionette.

Have students answer the following questions:

- What did you like best about this project?
- What surprised you most about this project?
- How successful was your group in constructing your marionette?
- How would you change or strengthen the this project?

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals.

Extensions

We have created marionettes using the Matatalab Coding Set and the Artist Add-On Set. Design fabric puppets utilizing the Matatalab Sets to plan, code, and then create the shapes that are necessary for each puppet. You could create a basic puppet theatre. You could then write a puppet play and act it out. You could film the puppet play using a movie app and present your films.

Real World Connections

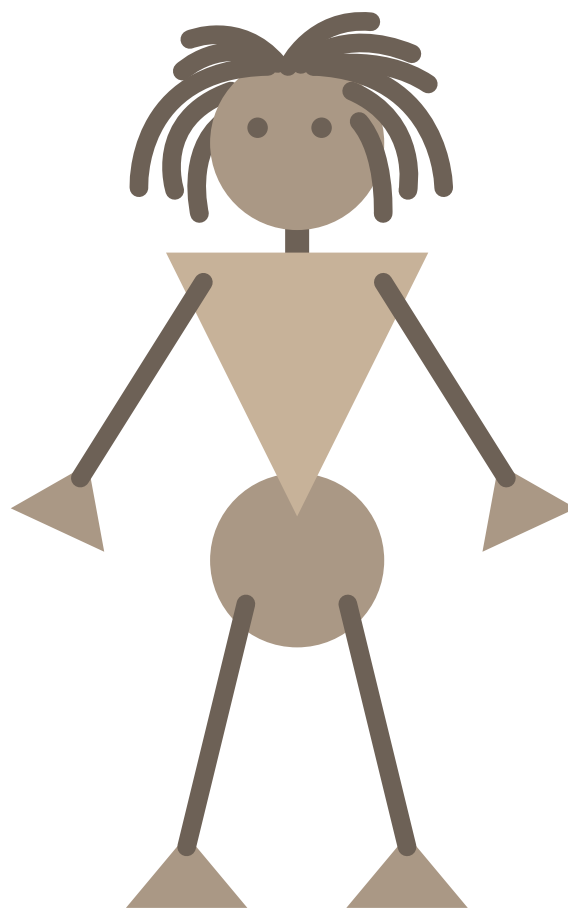
Marionettes are created for entertainment. Marionette performances require extensive human skills to make the puppets move realistically. New technology is using CGI to create puppets for TV and film. How is the creation of a marionette or puppet by hand vs. CGI different? What are the advantages and disadvantages of each?

Marionette Planning Worksheet

Draw each shape you need for your marionette

Your Shapes:

Example:



Matatalab

Lesson 10

Go Fish Game



Overview

Whether fishing for sport, to provide a meal, or as an industry, there are many techniques used to catch fish. Fish can be caught with a spear, a net, by hand, or with a rod and reel. Fishing is a relaxing pastime for many people and they enjoy catching a variety of fish of all different sizes in ponds, lakes and streams as well as in the oceans.

In this lesson, students will use the Matatalab Coding Set along with the Matatalab Artist Add-On Set. Students will code a design that can be used to draw a fish and alter the design to draw fish of different sizes. Students will also code and draw a shape to serve as a large pond for a Go Fish game. Students will then play the Go Fish game.

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

Essential Objective

- ▶ Understand coding and manipulation of Matatabot to create various basic shapes.

Learning Objectives

- ▶ Experiment with Matatalab Artist Add-On Set to code and draw various sized diamond shapes.
- ▶ Create game pieces (pond and fish) with shapes using Matatalab Coding Set and Matatalab Artist Add-On Set.
- ▶ Develop a set of rules for playing the Go Fish game.

Standards

- ▶ NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.
- ▶ CSTA: 3-5: 1B-AP-08, 1B-AP-09, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-13, 1B-AP-15, 1B-AP-16, 1B-AP-17

Time

60 minutes

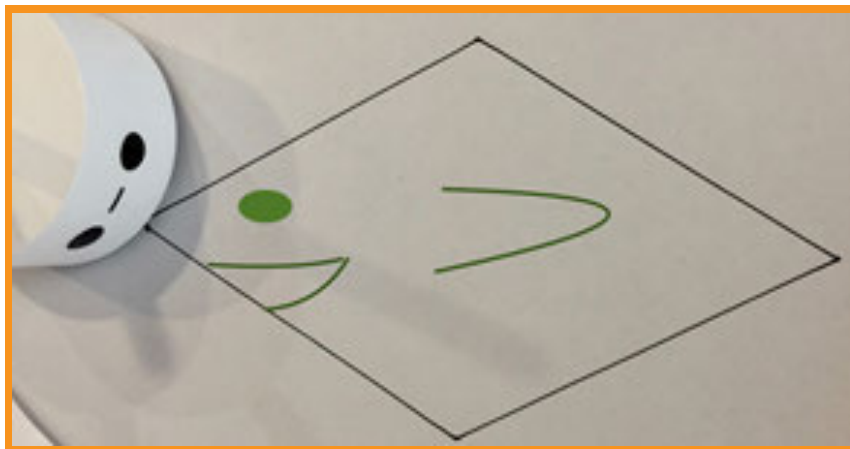
Materials

For each student group:

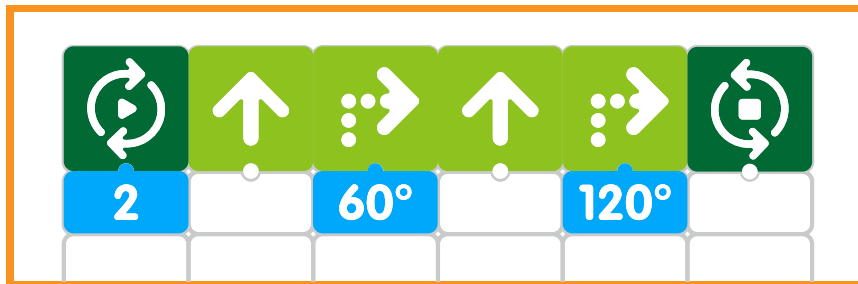
- 1 Matatalab Coding Set - Parts used in this lesson will include:
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
- 1 Matatalab Artist Add-On Set
- Cardstock (approximately 5-10 sheets)
- Large sheet of white paper (approximately 2ft. X 3ft.)
- Scissors
- Glue/tape
- Markers/colored pencils
- Magnetic tape (1/2")
- String
- Magnetic push pins (1 per fishing rod)
- Dowel approximately 18 inches (1 per fishing rod)
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

- Charge all Matatalab Command Towers and Matatabots.
- Create survey and "What Kind of Fish Have You Fished?" sheets (see Introduction below).
- Ensure that there are enough copies of worksheets for each student.
- Draw a basic design of a fish on a sheet of paper for students to examine.



- Copy coding for this shape on a large sheet of white paper.



- Ensure access to all necessary materials.
- Ensure student access to student journals.

Vocabulary

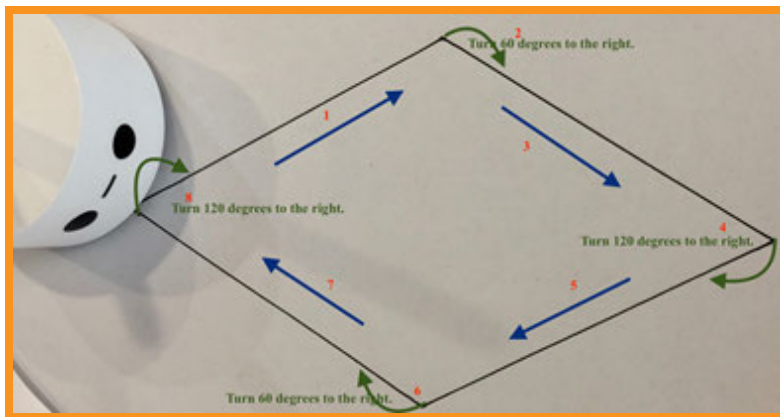
- **Fish:** Wildlife found in saltwater and freshwater. Fish are vertebrate animals (with a backbone or spine) that have gills which allow them to breathe in water, are without limbs, and have fins that allow them to swim.
- **Pond:** Small body of still or non-moving water.
- **Angle:** The space, measured in degrees, between two intersecting points or lines at or close to where they meet.
- **Supplementary Angles:** Two angles are supplementary when they add up to 180 degrees.
- **Sport:** An activity involving physical energy and competition against another.
- **Pastime:** Activity that people do for leisure or entertainment.
- **Game:** Play or sport that involves rules and competition.
- **Rules:** A set of understood regulations that govern behavior or conduct during a particular activity.

Introduction

- Make a list of different places people fish (lake, pond, stream, ocean) on a large sheet of white paper. Title another sheet of white paper "What Kind of Fish Have You Fished?"
- Take a survey of students and have each student place an X next to the places they have fished.
- Ask students what types of fish they have caught or would like to catch and have one student record all answers.
- Allow students time to tell their favorite "fish story."
- Explain to students that in this lesson they will create a simple Go Fish game by using the Matatalab Coding Set and the Matatalab Artist Add-On Set. They will experiment with coding a basic shape for their fish and then experiment with the angles to create fish of different sizes. Students will also draw and create a "pond" for their fish to live in and collaborate in their group to devise rules for their game. They will then be given time to play their game.
- Give students time to plan out their game by completing the Go Fish Planning Worksheet.

Matatalab Activity

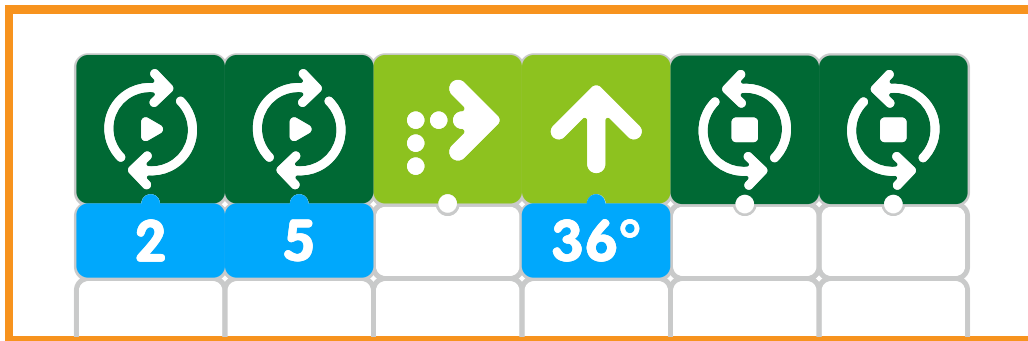
- Show students the basic design for a fish. Point out the interior angles and ask students what they notice about the angles. (opposite angles are of equal size). Explain to students that all of the interior angles of this shape equal 360° degrees. (Teacher Note - If necessary, review and/or demonstrate measurement of angles.)
- Show students coding for this shape and trace the path of Matatabot as it would be drawn using this code. Explain that while Matatabot turns 60° at #2, it is actually making an interior angle of 120° because of the rule of supplementary angles. Use the rule of supplementary angles and complete the path of Matatabot as it completes the shape. Refer to the coding blocks and point out that the two angles in the coding create supplementary angles.



- Challenge students to look at the set of angles in Matatabot Artist Add-On Set and find other pairs of supplementary angles they can use to create fish of the same shape, but that might be thinner or wider (30° and 150° , 36° and 144° , 45° and 135° , 72° and 108° , etc.).



- Allow students time to code and create fish of different sizes for their game on cardstock, cut them out and add details to the fish.
- To create a pond, students will code and draw a large decagon on a large sheet of white paper.
- **Teacher note** - challenge students to try to code the pond with the information that the interior angle of a decagon is 144° . The code is shown below.



- Fishing poles are made from string and dowel, tying a magnet to the end of the string. A piece of adhesive magnetic tape is added to the back of each fish.
- Ask students to come up with a set of directions for their game. For what age level is the game intended? What is the goal of the game? What directions are needed to play the game?
- As student groups finish their game they will present it to the class and demonstrate how the the game is played.
- Students will be given time to play their games.

Closing

Assessment

We have created a Go Fish game today by coding different types of shapes that represent different fish and by creating a pond for the fish. We came up with rules and then played the Go Fish game.

Have students answer the following questions:

- How successful were you in creating your Go Fish game?
- How did you come up with rules for your game?
- What was your favorite aspect or part of this project?
- What surprised you most about this project?
- What would you change in order to strengthen this project? Explain.

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals

Extensions

In this lesson, we created a particular kind of game. Using the Matatalab sets, create a different type of game. Examples might include board games involving sports, role-play game, or another type of game of your choice. Decide upon the pieces or props needed, the people who will play, and the rules that are required. Once your new game is created, present and then play your game.

Real World Connections

People go fishing for lots of different reasons. Some people prefer to fish in lakes or ponds, and some people prefer to fish in oceans or seas.

What are some of the reasons that people fish? Answers might include for food, for sport, or for entertainment. Some fish are endangered and can no longer be caught in order to protect the species. Australian researchers and a Microsoft co-founder created new technology to detect when illegal fishing is taking place. Why is it important to protect fish species?

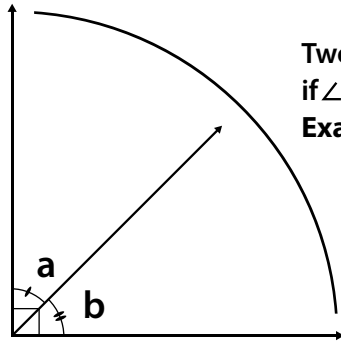
Go Fishing Planning Worksheet

Plan your fish
shapes to create

Draw and plan
your fish and pond

Complementary and Supplementary Angles

Complementary Angles



Two angles are complementary if they add up to 90 degrees (a right angle).
if $\angle a + \angle b = 90^\circ$, then $\angle a$ and $\angle b$ are complementary angles.

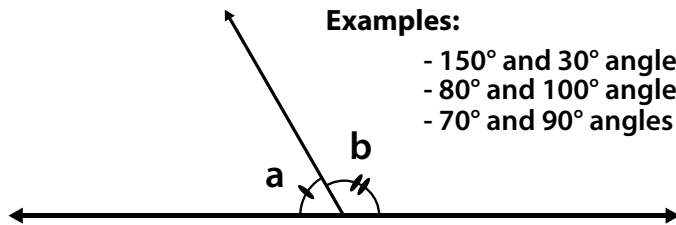
Examples:

- 60° and 30° angles are complementary angles
- 80° and 10° angles are complementary angles
- 20° and 10° angles are **not** complementary angles

Practice Problems: solve for the missing complementary angle, x .

$$\angle 45 + \angle X = 90^\circ, \angle x = \underline{\hspace{2cm}} \quad \angle x + \angle 32 = 90^\circ, \angle x = \underline{\hspace{2cm}} \quad \angle 80 + \angle X = 90^\circ, \angle x = \underline{\hspace{2cm}}$$

Supplementary Angles



Two angles are supplementary if they add up to 180 degrees.
if $\angle a + \angle b = 180^\circ$, then $\angle a$ and $\angle b$ are supplementary angles.

Examples:

- 150° and 30° angles are supplementary angles
- 80° and 100° angles are supplementary angles
- 70° and 90° angles are **not** supplementary angles

Practice Problems: solve for the missing complementary angle, x .

$$\angle x + \angle 75 = 180^\circ, \angle x = \underline{\hspace{2cm}} \quad \angle x + \angle 50 = 180^\circ, \angle x = \underline{\hspace{2cm}} \quad \angle 80 + \angle X = 180^\circ, \angle x = \underline{\hspace{2cm}}$$

Determine whether $\angle a$ and $\angle b$ are complementary or supplementary

$$\angle a = 50, \angle b = 40 \underline{\hspace{2cm}}$$

$$\angle a = 80 \angle b = 100 \underline{\hspace{2cm}}$$

$$\angle a = 35, \angle b = 145 \underline{\hspace{2cm}}$$

$$\angle a = 75, \angle b = 15 \underline{\hspace{2cm}}$$

$$\angle a = 20, \angle b = 70 \underline{\hspace{2cm}}$$

$$\angle a = 60, \angle b = 120 \underline{\hspace{2cm}}$$

$$\angle a = 65, \angle b = 115 \underline{\hspace{2cm}}$$

$$\angle a = 65, \angle b = 25 \underline{\hspace{2cm}}$$

Matatalab

Lesson 11

3D Geometric Shapes



Overview

Examples of geometric shapes and designs can be found in nature, buildings and other settings. Dating back to ancient times, the principles of geometry, based on natural forms, have been used in both art and architecture. The ancient Roman architect, Marcus Vitruvius, wrote a set of rules for architecture which are still used today. The Matatalab Artist Add-On Set includes a set of angle blocks which can be used to draw geometric shapes.

In this lesson, students will be challenged to use their knowledge of interior angles of various polygons and code Matatabot to draw geometric nets. Students will create 3D geometric shapes from the nets.

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

Essential Objective

- ▶ Understand coding and manipulation of Matatabot to create various basic shapes.

Learning Objectives

- ▶ Write code for different geometric nets.
- ▶ Create three-dimensional geometric shapes.

Standards

NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1 VA:Cr2.3, VA:Cr3.1

CSTA:3-5: 1B-AP-08, 1B-AP-09, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-13, 1B-AP-15, 1B-AP-16, 1B-AP-17

Time

60 minutes

Materials

For each student group:

- 1 Matatalab Coding Set - Parts used in this lesson will include:
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
- 1 Matatalab Artist Add-On Set
- Pictures of 3D Geometric nets
- Cardstock - white or color
- Scissors
- Transparent Tape or Glue
- Markers and/or colored pencils
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

- Charge all Matatalab Command Towers and Matatabots.
- Ensure access to all necessary materials.
- Ensure that there are enough copies of worksheets for each student.
- Ensure student access to student journals.
- Print 1 copy of the *3D geometric Nets* for each student group (found at end of lesson).
- Create a display sample of one of the 3D geometric figures.

Vocabulary

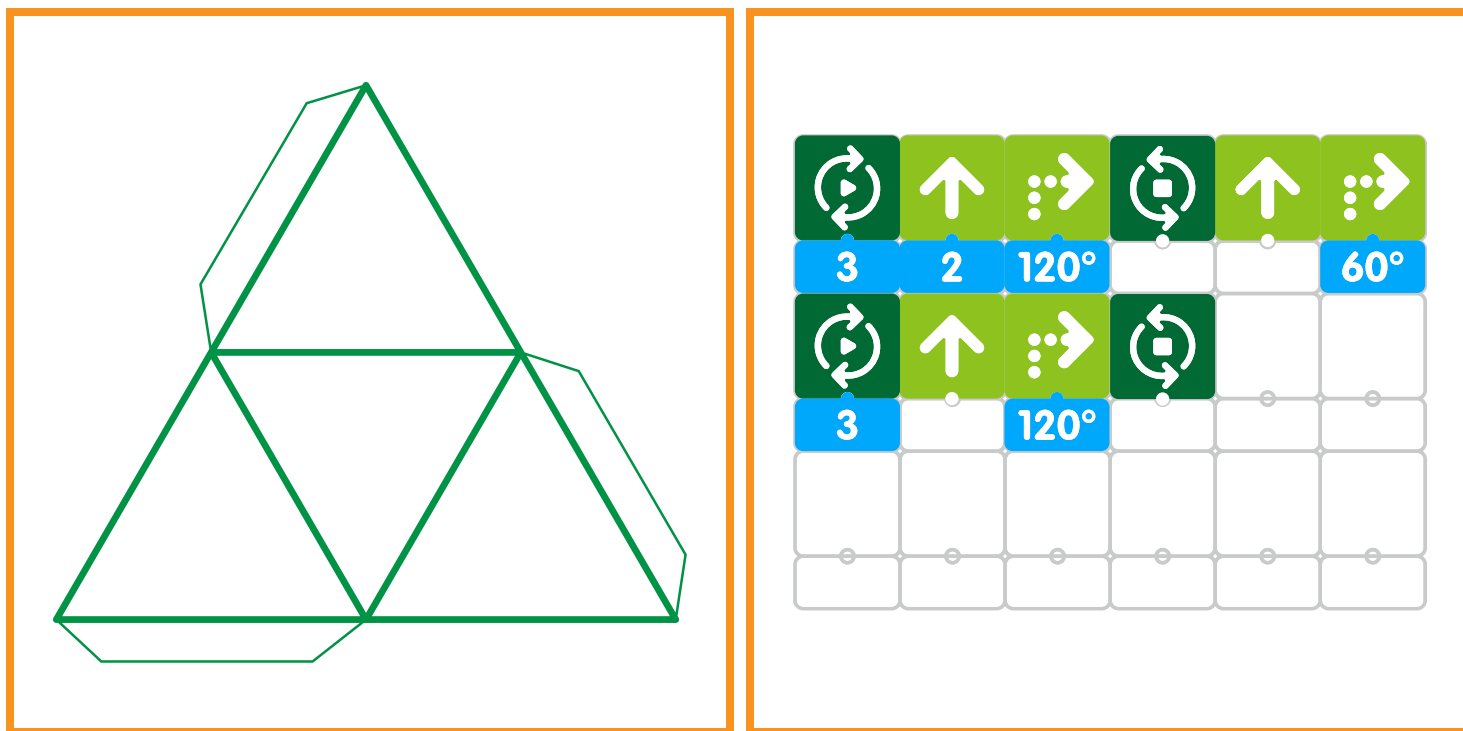
- **Geometry:** The branch of mathematics related to characteristics of points, lines, surfaces, solids, and higher dimensions.
- **Shape:** The outline appearance of an area or a figure.
- **Geometric Net:** A geometric pattern that can be cut and folded to make a model of a solid, three-dimensional shape.
- **Three-Dimensional:** Shape having length, breadth and depth.
- **Angle:** The space, measured in degrees, between two intersecting points or lines at or close to where they meet.
- **Polygon:** A closed plane figure bounded by three or more straight sides that meet in pairs in the same number of vertices, and do not intersect.
- **Vertex:** A meeting point of two lines that form an angle.

Introduction

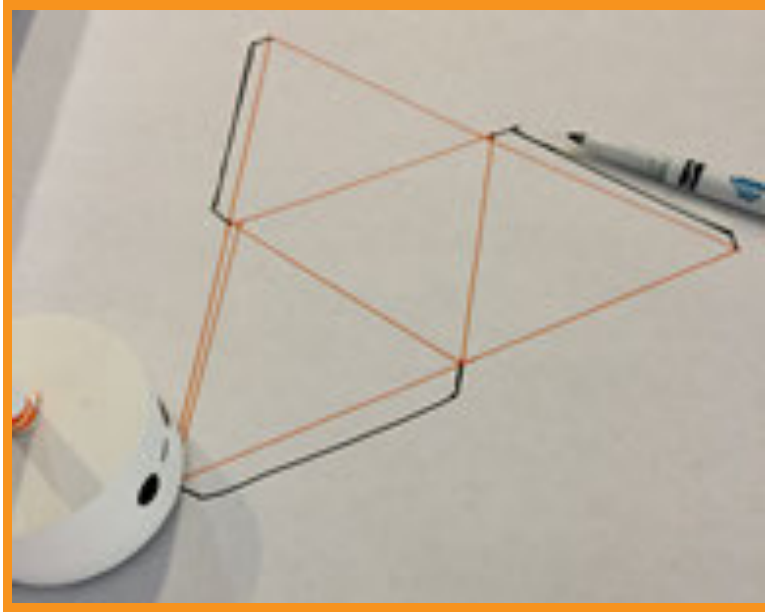
- Ask students to name some of the various geometric shapes they have used in previous lessons.
- Review coding needed to create some of these shapes and discuss the use of angles to create these shapes.
- Explain that in this lesson students will extend their understanding of geometric principles to produce 3D geometric shapes.
- Display a finished 3D geometric shape and show students how it was made from a template called a "net."
- Explain to students that they will examine pictures of geometric nets, collaborate in student groups to develop coding for the nets, and use Matatabot to draw the geometric net.

Matatalab Activity

- Have students examine the net of the triangle prism. Ask students to work in groups and plan code that might be needed to draw this net.



- Allow students time to code Matatabot to draw the triangle prism net and debug any coding issues. Circulate to answer student questions and address misconceptions.
- Students will need to draw the folding tabs on their net after Matatabot finishes drawing the net. The net is then cut out, designed, and folded using tape or glue to adhere sides.



- Distribute additional geometric nets to each student group. Have students choose a net, discuss the coding and creating a new 3D geometric shape.
- Students may see that they do not have enough blocks to complete coding in one step. In this case, when Matatabot finishes one set of code, students should not move Matatabot, but simply change the coding and allow Matatabot to finish drawing the net.

Closing

Assessment

We have coded and created a series of geometric nets. We then folded the shapes into three-dimensional objects.

Have students answer the following questions:

- How successful were you in creating your geometric nets?
- How challenging was the folding and creation of three-dimensional objects from your geometric nets?
- What was your favorite aspect or part of this project?
- What surprised you most about this project?
- What would you change in order to strengthen this project? Explain.

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals

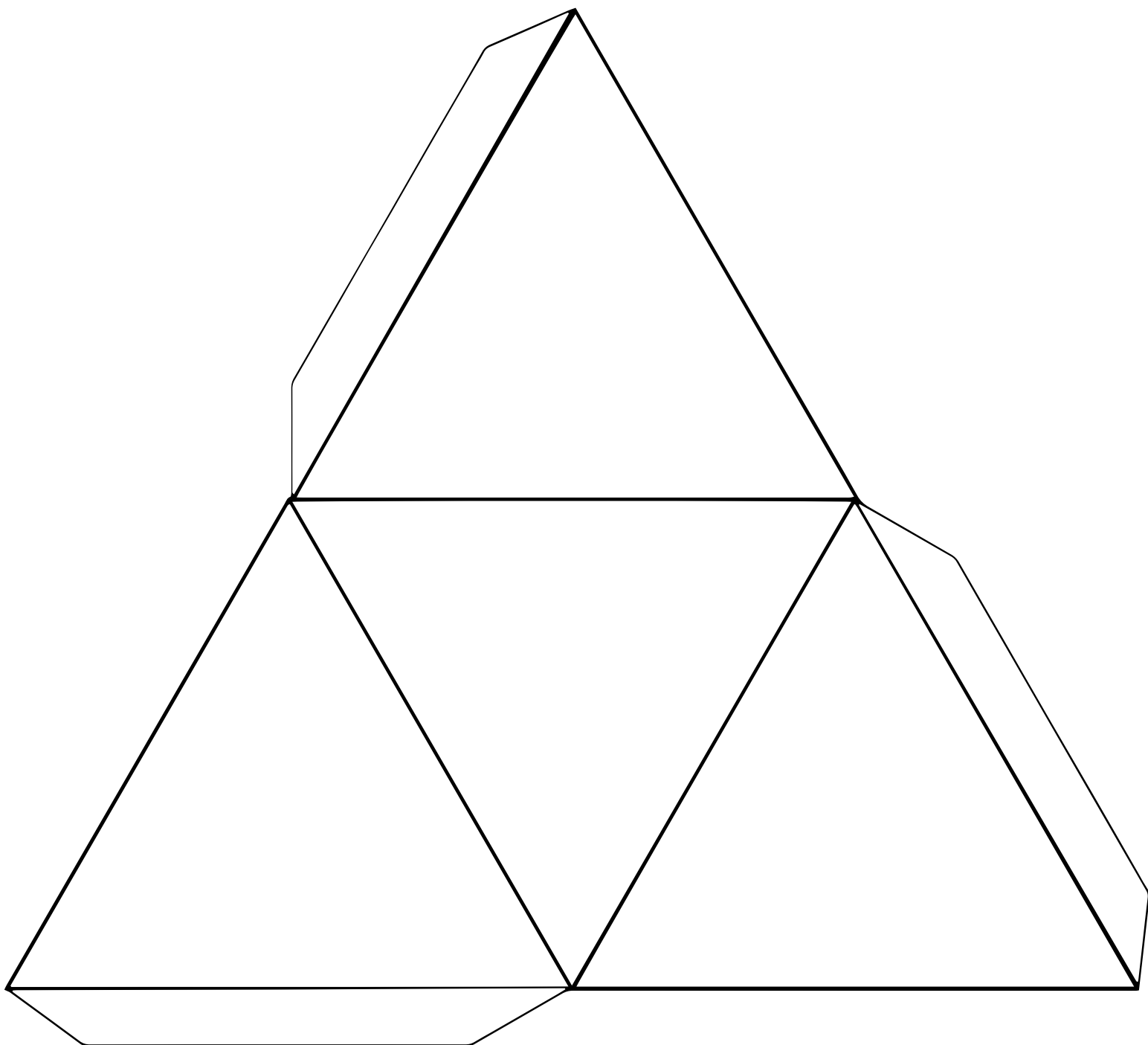
Extensions

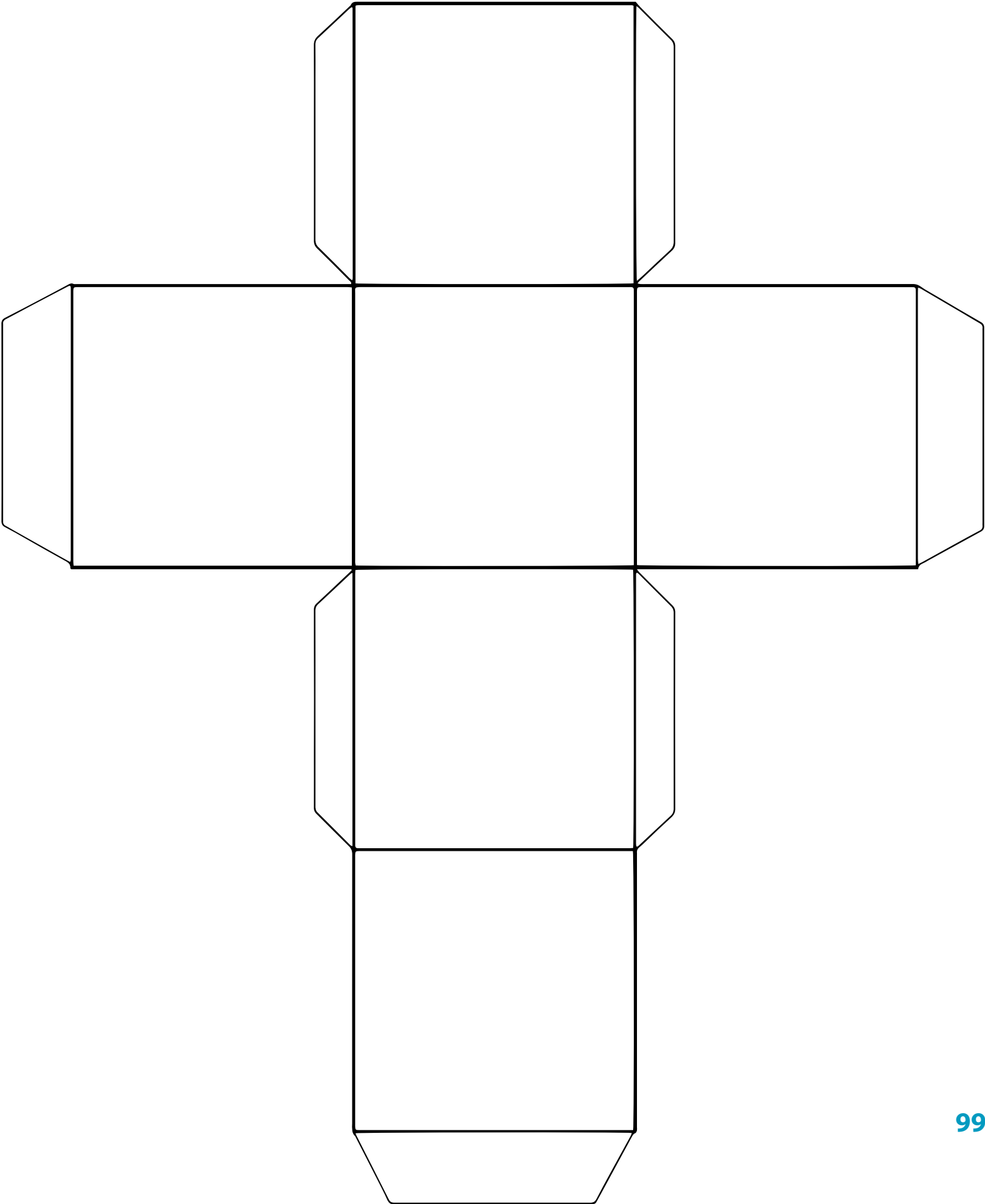
In this lesson we created geometric nets and folded them to create three-dimensional objects. Consider other shapes or objects that have three-dimensional characteristics and that may look similar to things or objects found in nature. You may consider the way that pine trees may look like a triangle.

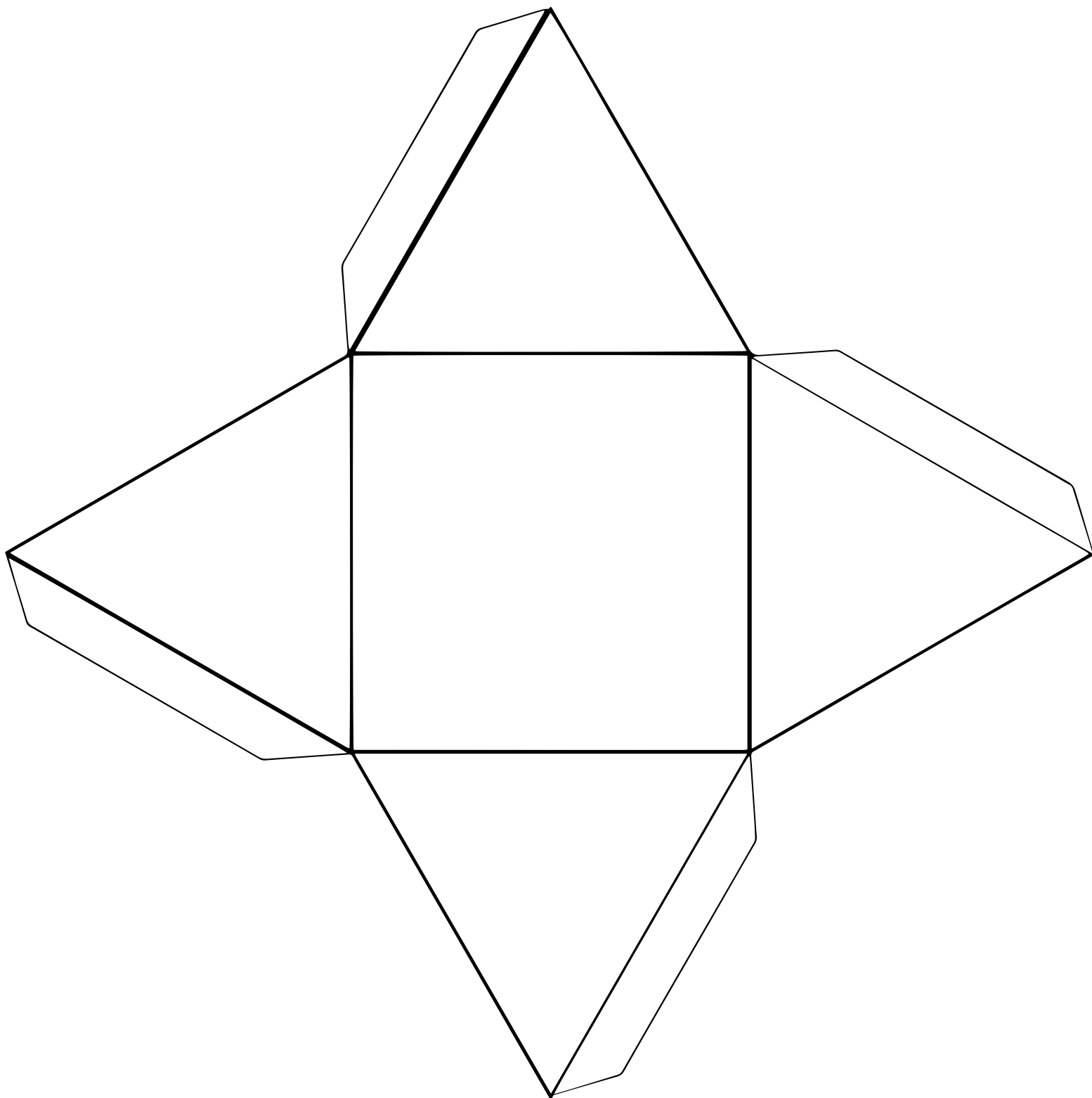
Using the Matatalab sets, create a diorama using a large box or make a large frame out of cardboard or styrofoam. Within the diorama or frame, after coding and creating at least three other unique geometric nets and folding them into three-dimensionality, place the shapes within the diorama or frame in order to create a scene from nature or blocks to make a city or new shapes for free form art. Decorate and embellish your scene.

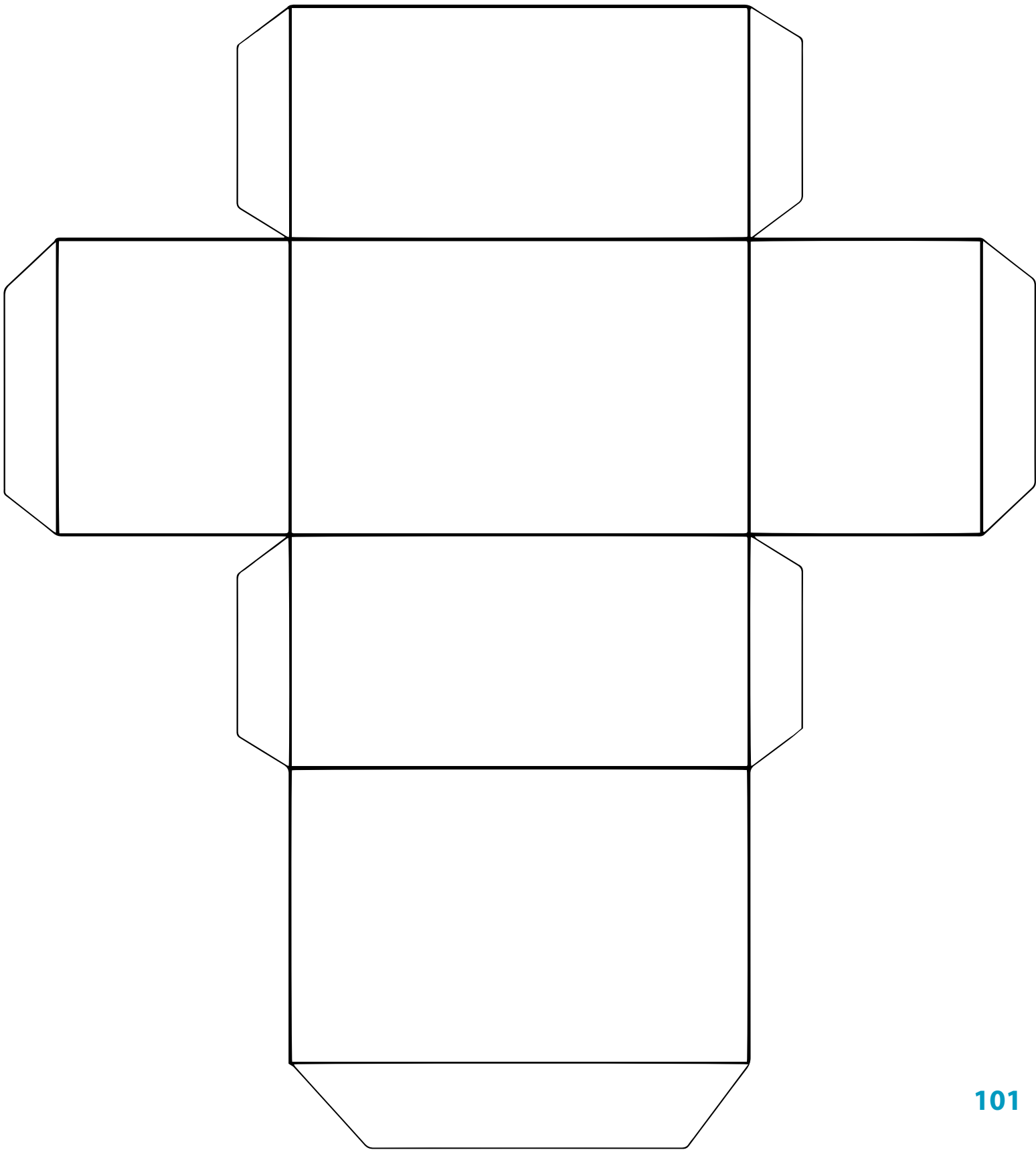
Real World Connections

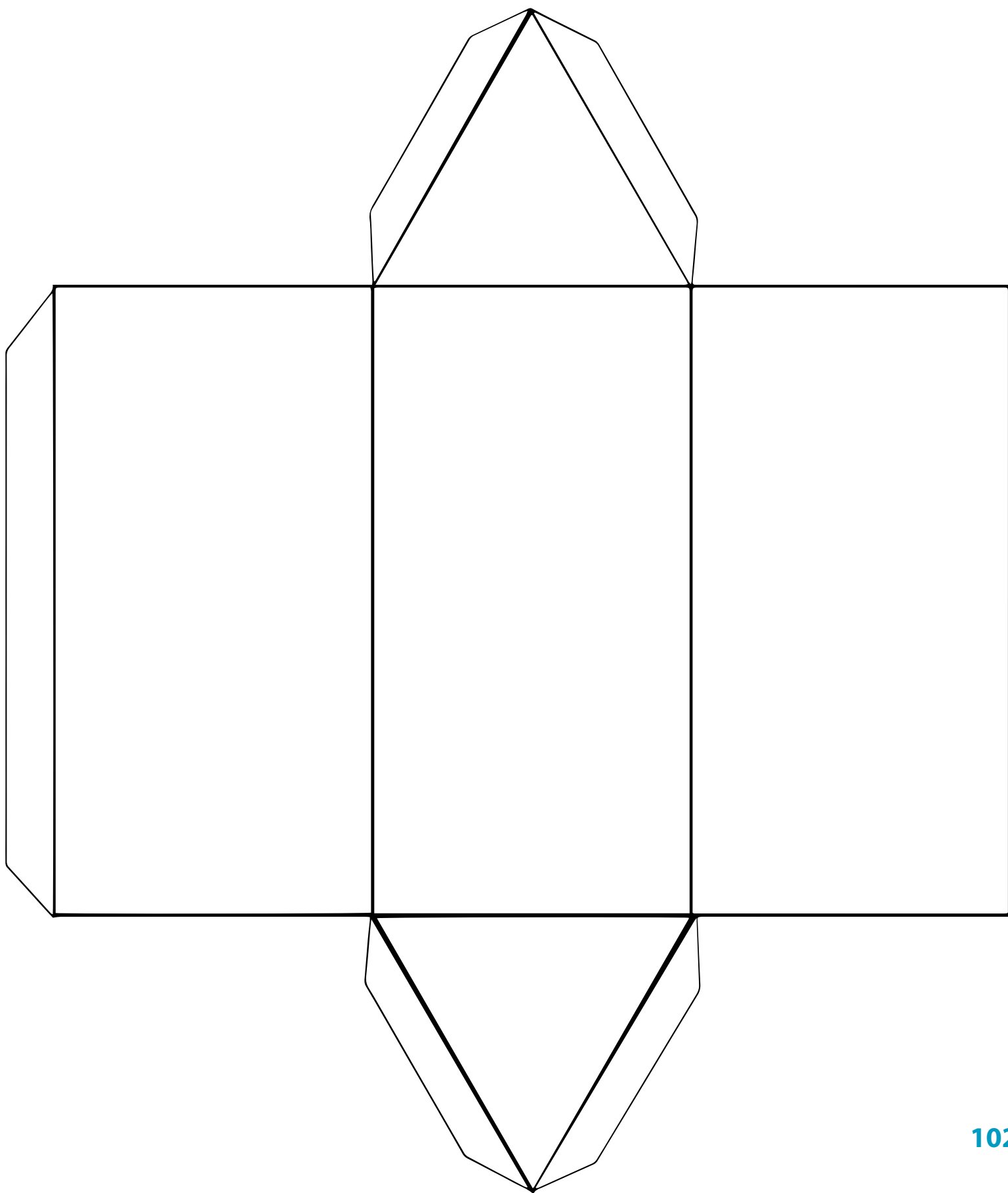
We have coded and created a series of geometric nets, and folded them into three-dimensional objects. 3D printers are now widely used to create all types of three-dimensional objects that are designed in a computer. Most 3D printed objects are for manufacturing or reproducing an object but artists are now utilizing 3D printers to create unique and individual objects. What other technologies have you seen used in artistic or original creations?





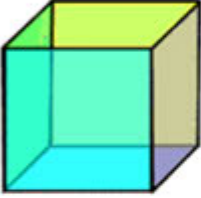
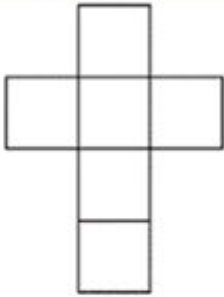
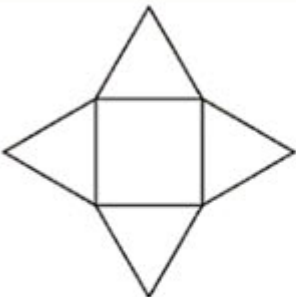
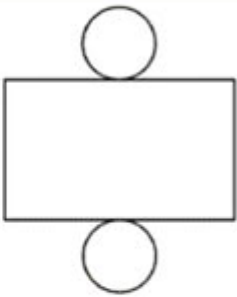
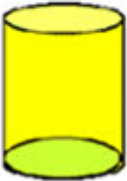
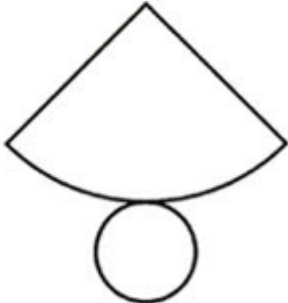
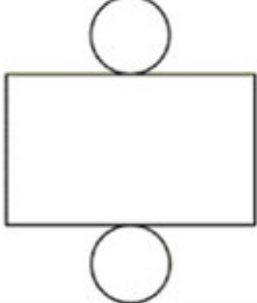

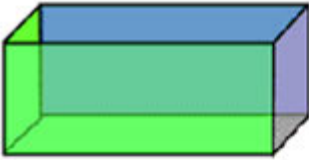
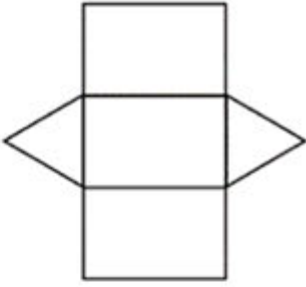
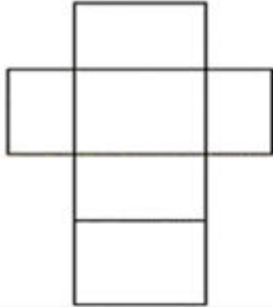
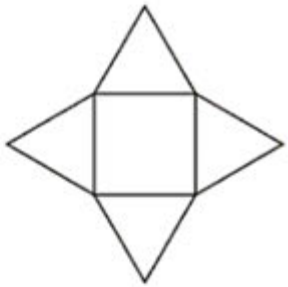
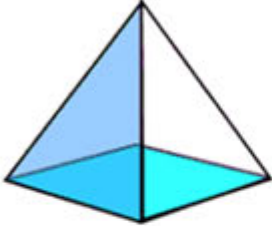
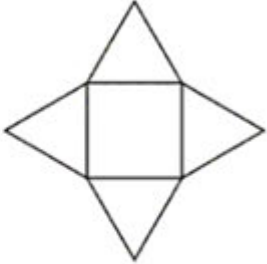
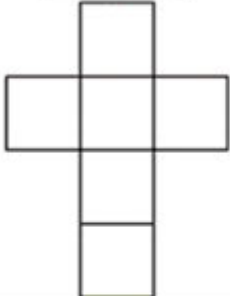
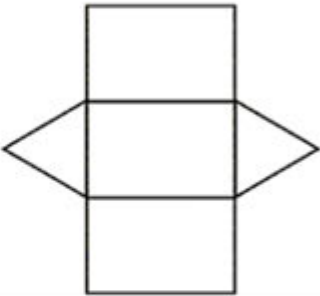
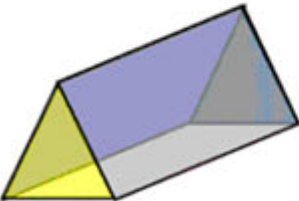
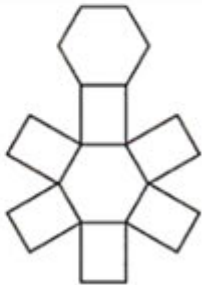
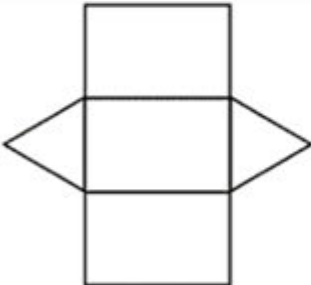
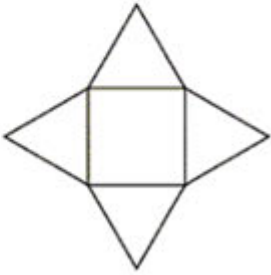






FIND THE NETS SHEET 1

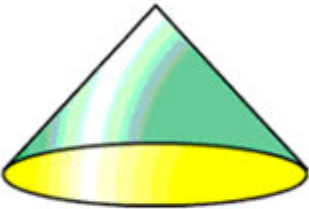
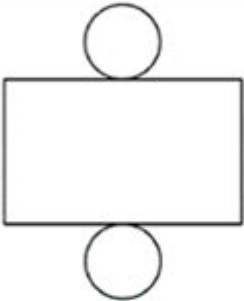
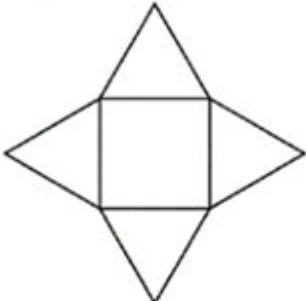
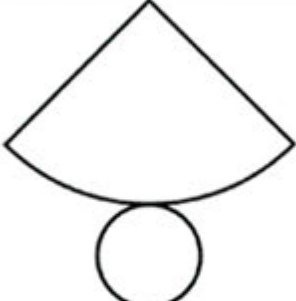
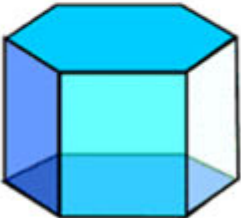

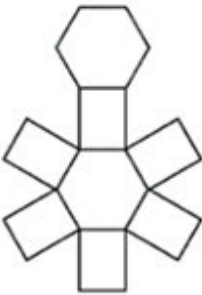

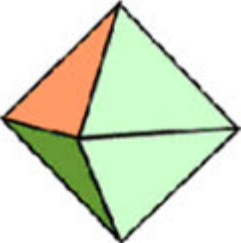
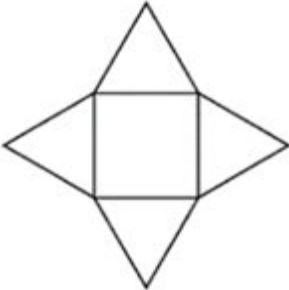
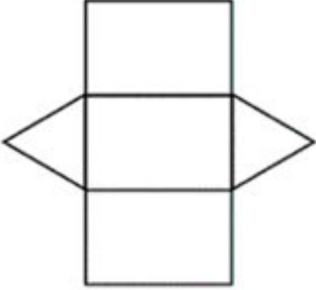


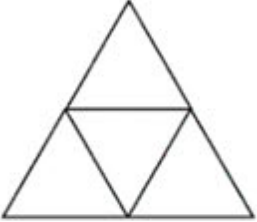
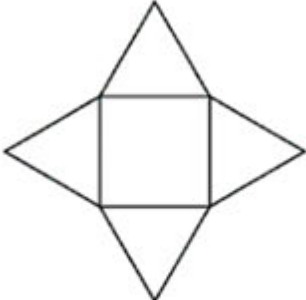
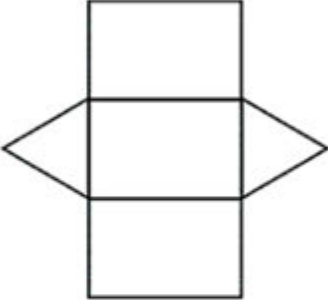
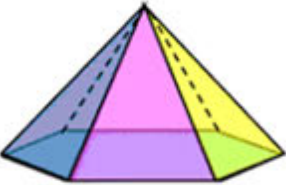
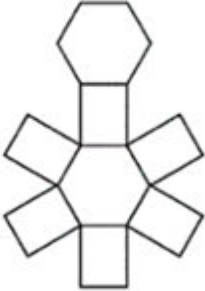

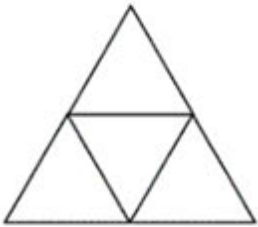
For each 3d shape, shade the correct net.

Name _____

FIND THE NETS SHEET 2

For each 3d shape, shade the correct net.

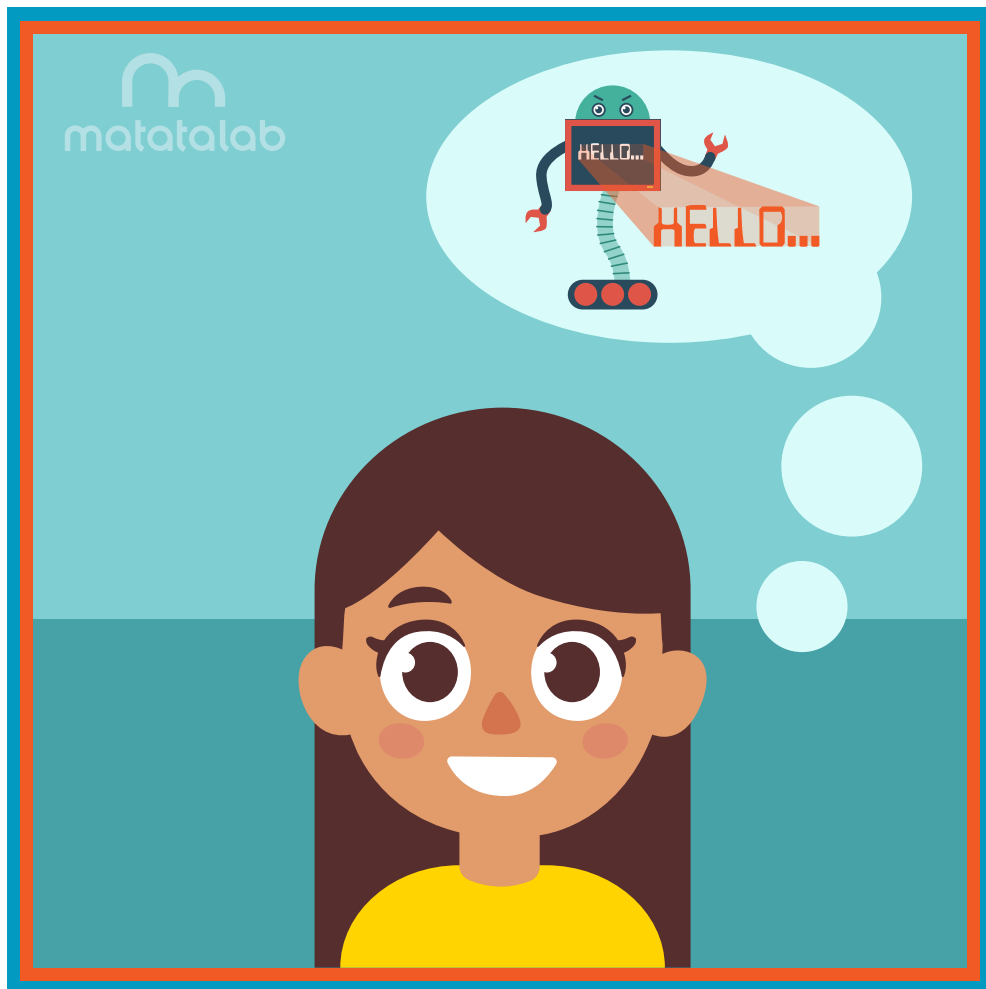
			
			
			
			
			

Name _____

Matatalab

Lesson 12

Coding A Message



Overview

People communicate using verbal and written language using either characters or alphabets. An alphabet is a set of letters or symbols representing the basic sounds of language and speech organized in a particular order. Letters, often representing the sounds of speech, are shaped using lines and angles. Grouped together, letters form words that have specific meanings and sometimes send messages.

In this lesson, students will code and manipulate Matatabot in order to create block letters to form a one word message. Students will plan out specific coding, number, and angle blocks that will be required to allow Matatabot to form the one word message.

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

Essential Objective

- Understand coding and manipulation of Matatabot to create block letters.

Learning Objectives

- Examine angles used in block letter font alphabetical letters.
- Develop code needed to draw block letters.
- Program Matatabot to draw block letters that form a word or message.

Standards

- NCAS: VA:Cr1.1, VA:Cr1.2, VA:Cr2.1
- CSTA: 3-5: 1B-AP-08, 1B-AP-09, 1B-AP-10, 1B-AP-11, 1B-AP-12, 1B-AP-13, 1B-AP-15, 1B-AP-16, 1B-AP-17

Time

60 minutes

Materials

For each student group:

- 1 Matatalab Coding Set
 - Command Tower
 - Control Board
 - Matatabot
 - Direction, Parameter and Loop Blocks
- 1 Matatalab Artist Add-On Set
- Cardstock (approximately 10 sheets)
- Scissors
- Glue/tape
- Markers
- 1 copy of each worksheet per student
- Student journals

Teacher Set-Up and Preparation

- Charge all Matatalab Command Towers and Matatabots.
- Ensure that there are enough copies of worksheets for each student.
- Ensure access to all necessary materials.
- Ensure student access to student journals.

Vocabulary

- **Letters:** A character representing one or more sounds used in speech.
- **Block Letters:** Letters that are created by using a combination of lines and 90 degree angles.
- **Alphabet:** A written set of letters or symbols representing the basic sounds of language and speech organized in a particular order.
- **Language:** An organized system of oral communication for a particular culture.
- **Angle:** The space, measured in degrees, between two intersecting points or lines at or close to where they meet.

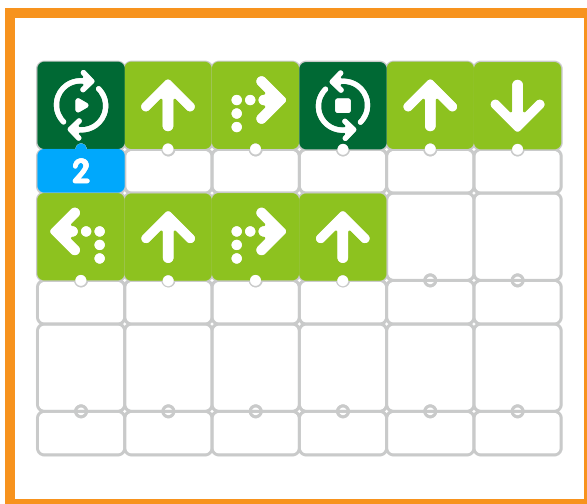
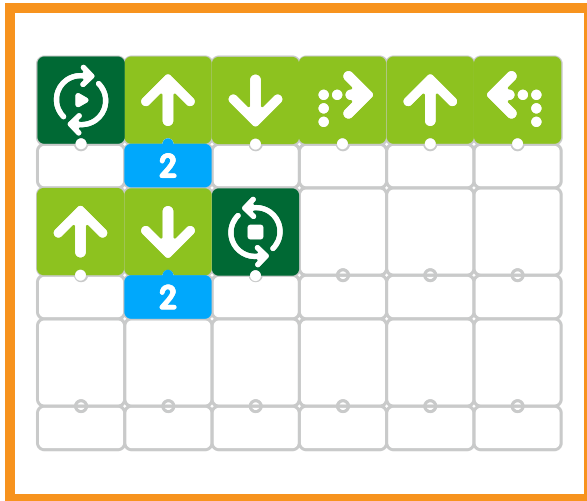
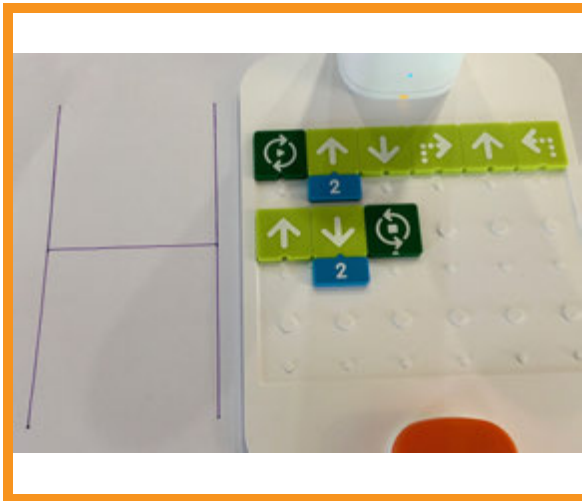
Introduction

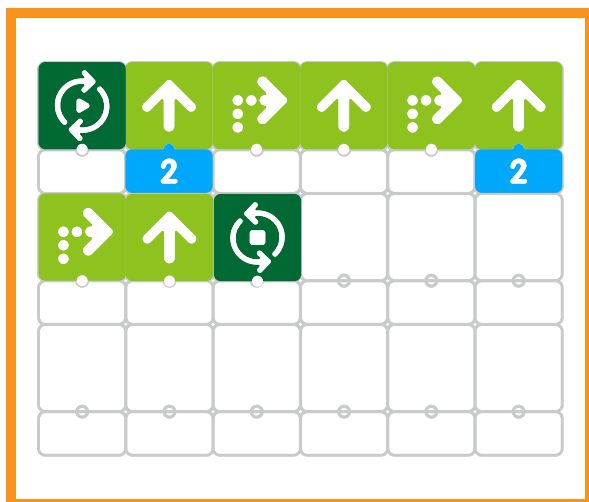
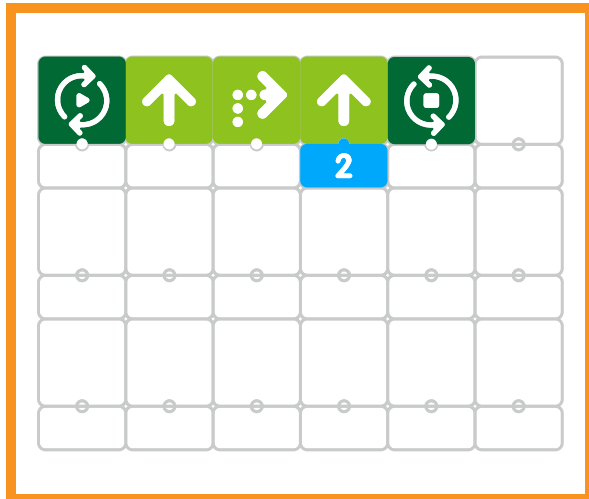
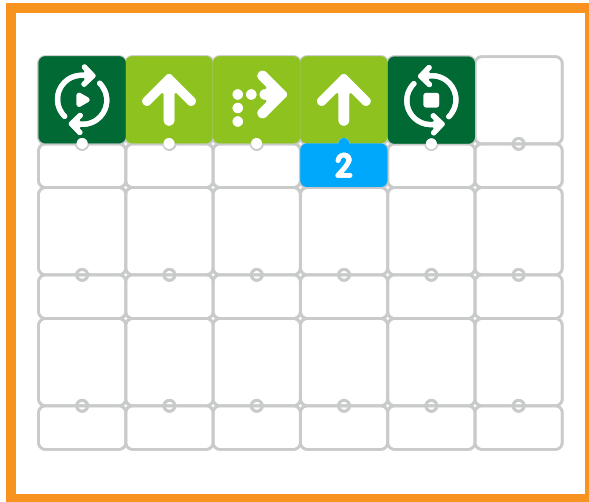
Alphabets are utilized by people to communicate written words and messages. People utilize letters or characters in order to form these words or messages. Words are combined to form the elements of a language. Letters of a specific word can be created by using lines and angles.

- Ask students to think about the uppercase letters of the alphabet. In student groups, have students take turns walking out a letter (uppercase) with 90 degree angles like a robot and have the other students in their group try to guess the letter.

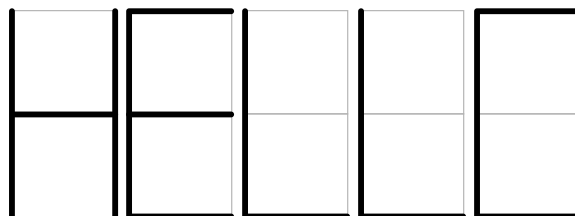
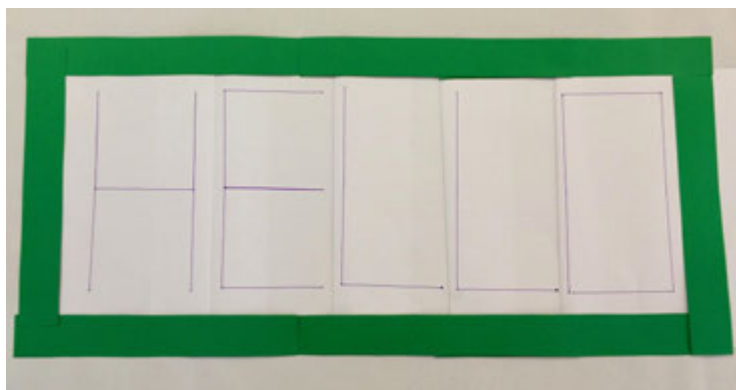
Matatalab Activity

- Give time to allow students to plan and write out the coding for the word “HELLO” in **block letters** on their Letter Code Worksheet.
- Students will then use Matatabot to test their code and debug any coding mistakes.
- **Note:** Letter code shown below is for teacher use to help address misconceptions.





Students will decorate or embellish their created word message and present it to the class.



Closing

Assessment

We have coded a word message utilizing the Matatalab Coding Set along with the Artist Add-On Set.

- Have students answer the following questions:
- How successful were you in creating your word message?
- What were the most difficult challenges that you faced in creating your word message? Why?
- What was your favorite aspect or part of this project?
- What surprised you most about this project?
- What would you change in order to strengthen this project? Explain.

Once students have been given a chance to answer and discuss these questions, ask students to draw pictures of each of the shapes they created and write about their experiences with their creations in their journals

Extensions

Have students create other words using block letters. For example, write the code for STAR using block letters. The challenge will be coding the letter R as students will need to investigate the angled portion of the letter. (Other challenging block letters students could try to code include K, M, N, Q, V, W, X, Y, Z.)

What do alphabets look like in China or Russia? Try to program the Matatalab set to make a letter in the Chinese or Russian alphabet.

Real World Connections

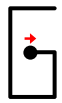
What are some examples of different kinds of alphabets? For example, do alphabets in China or Russia look like our alphabets? How has technology allowed us to communicate with other cultures and languages? Can you speak English into an app on a smart phone and have it translate your sentence to another language?

LETTER CODE WORKSHEET

LETTER	CODE

Lesson 12 - HELLO

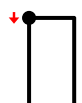
Fill in the missing code tiles to make the words below
Start at the • and in the direction of the arrow



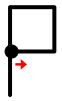
2



2



4



2



2

3

4

Lesson 12 - HELLO

Answers

