Programming Outdoor Fun

A LEGO® Education Program

Introductory SPIKE™ Essential

Programming Outdoor Fun

LEGO® Education SPIKE™ Essential Introductory Program
5 days

Program Overview:
This 5-day camp outline will provide students with STEAM-focused, hands-on activities to promote 21st-century skills and social and emotional learning as well as computational thinking, introductory programming, math, and language arts. Each day, students will participate in team building activities and opportunities for physical activity, as well as receive a team briefing for challenges aligned to standards. Daily challenges will help students develop skills and knowledge to complete the culminating project of designing and programming outdoor fun on an amusement park ride.

	Big Questions	Daily Activities
Day 1	**Welcome and Orientation** • How can we tell a computer or a robot what to do? • Why are clear instructions and correct sequences important? • How can we program motors to help us travel across the snow?	**Start menu Tutorial Activities: The Motor** **Arctic Ride** **Meet the Team: Minifigure Bios**
Day 2	**Make Sense with Sensors** • How can we use lights and sensors in our programs? • How can we make two things happen at the same time? • How can we make an action repeat? • How can we use sensors to help us outdoors?	**Start menu Tutorial Activities: The Light** **Start menu Tutorial Activities: The Color Sensor** **Animal Alarm** **Underwater Quest**
Day 3	**Get Rid of the Bugs!** • How can we test and fix (debug) our code? • How can we improve our programs? • How can fixing programs help us solve problems wherever we go?	**Treehouse Camp** **The Perfect Swing**
Day 4	**Programming Some Fun** • How can we use a sensor to control a motor? • How can we make a new action start in the middle of a program?	**Snack Stand** **Twirling Teacups**

	• What fun activities already have programs in them? • How can we use programs to make the activities even better?	
Day 5	**Putting It All Together** • How can we use random numbers in programming to add excitement to our creations? • How can we use what we learned to design and program our own creation? • How do people create new designs that will interest others?	**The Spinning Ferris Wheel** Class Showcase

Prior to First Day of the Program:

1. Sort the LEGO® Education SPIKE™ Essential sets.
2. Go through the introduction to SPIKE Essential: https://education.lego.com/en-us/start/spike-essential#Introduction
3. Download and install the LEGO® Education SPIKE™ App on devices to be used for camp.
4. Determine a naming convention for each set and label each lid and inventory sheet. Suggestions include using school initials and a number. (Example: Millcreek Elementary set names could be MES1, MES2, and MES3.)
5. If you will not be using the cables, charge the SPIKE Essential hubs. You will need to charge the hub each day after use if they are Bluetooth-connected during the day.
6. Connect SPIKE Essential to iPad, Chromebook, or computer. Update the hub and rename each hub to match the name you assigned to the set.
7. Locate the building instructions in the SPIKE App, embedded both in the individual lessons and separately under Home>Building Instructions. If you wish to share printed building instructions, create one set per student pair for the lessons referenced in each day's outline.
8. Gather any consumable materials (listed below) needed for the week.
9. Locate student journal ideas. Ideas for types of journals can be found online.
10. Print team logo templates and Bricktionary cards to share with students.
11. Make sure devices are fully charged, Bluetooth is enabled (if needed), and that students can access the app.
12. Determine the procedure for when a LEGO® piece is dropped (e.g., "Everyone freeze; say LEGO down/LEGO found") and where to place LEGO pieces that do not belong to the finder.
13. While teams are working, assign each group a SPIKE Essential set to use for the week.
14. Plan to take photographs and/or record video during the week for use at the final Showcase.
15. Preview this course document. In particular:
    - Read the Big Questions for each day. Use them to understand each day's content and to prepare for sharing each day's final question with students.
    - Locate and read the referenced lessons in the SPIKE App and on legoeducation.com/lessons. Read the Meet the Team: Minifigure Bios found in each lesson

plan under Teacher Support>Additional Resources and consider how/when to reference them during the day.

Materials:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Chart paper
- Student journals (could be paper stapled together, with students creating the outside of the journal using construction paper and other consumable materials)
- Pens
- Pencils
- Markers
- Colored pencils
- Sticky notes
- Timer/clock
- Tape
- Team logo templates
- Scissors
- Paper
- Group Rules chart (created on Day 1)
- Children's books or articles about:
    - Computer programming or fiction book with computer-programming-themed story or
    - A female pioneer in computing, such as Ada Lovelace, Katherine Johnson, or Grace Hopper.
- Craft materials, including construction paper
- Bricktionary cards (Cards with objects to build – see templates provided)
- Certificates of Completion

Programming Outdoor Fun Day 1

Welcome and Orientation/Arctic Ride

Big Questions:

- How can we tell a computer or a robot what to do?
- Why are clear instructions and correct sequences important?
- **To share with students:** How can we program motors to help us travel across the snow?

Materials needed for the day:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Start menu Tutorial Activities: The Motor
- Meet the Team: Minifigure Bios (under Teacher Support>Additional Resources in all lesson plans)
- Arctic Ride lesson (Great Adventures unit)
- Building instructions for Arctic Ride
- Chart paper
- Student journals
- Pens
- Pencils
- Markers
- Colored pencils
- Sticky notes
- Tape
- Team logo templates
- Scissors
- Timer/clock
- Construction paper and other craft materials
- Articles or book about computer programming or fiction book with computer-programming-themed story

Day 1: Outline for the Day

Outline of Day	Tasks	Time	Materials
9:00 - 10:30	Introductions	30 min	• SPIKE Essential set
	Establishing group rules and expectations	15 min	• Chart paper • Markers • Pens

	Team Building Activity	15 min	• LEGO® Education SPIKE™ Essential set • Timer/clock
	Team Briefing 1	5 min	None
	Partner selection, team name and team logo	25 min	• Varies, based on the activity selected • Team logo templates • Markers • Pencils • Scissors • Craft materials, including construction paper
10:30 - 10:35	Break		
10:35 - 11:25	Workplace Wellness (physical activity)	10 min	Varies, based on the activity selected
	Design a journal for record keeping	20 min	• Student journals • Markers • Scissors • Paper • Other craft materials
	Team Briefing 2	5 min	SPIKE Essential set
	Challenge 1: Meet the SPIKE Essential set, Start menu Tutorial Activities: The Motor	15 min	• SPIKE Essential sets • Devices with LEGO® Education SPIKE™ App • Start menu Tutorial Activities: The Motor • Meet the Team: Minifigure Bios (in each lesson plan under Teacher Support>Additional Resources)
11:25	Get ready for lunch		

11:30 - 12:00	Lunch		
12:00 - 2:10	Reading and wondering about computer programming	20 min	• Article or book about computer programming or fiction book with computer-programming-themed story • Student journals • Pencils • Markers • Colored pencils
	Team Briefing 3	5 min	None
	Challenge 2: Arctic Ride—Make the Snowmobile Go (through lesson Step 7)	50 min	• LEGO® Education SPIKE™ Essential sets • Devices with LEGO® Education SPIKE™ App • Arctic Ride lesson • Building instructions for Arctic Ride • Student journals • Pencils • Markers • Colored pencils
	Break	5 min	None
	Challenge 3: Leo's Next Ride (lesson Step 8)	40 min	• SPIKE Essential sets • Devices with SPIKE App • Arctic Ride lesson • Building instructions for Arctic Ride • Student journals • Pencils • Markers • Colored pencils
	Disassemble and inventory sets	10 min	• SPIKE Essential sets
2:10 - 2:30	Daily debrief and wrap up	20 min	• Sticky notes • Chart paper

			• Pencils • Pens • Markers

Introductions
Time: 30 minutes
Materials:

- LEGO® Education SPIKE™ Essential Set

This open-ended activity will help students get to know one another.

Ask students what it's like to be outside if there are a lot of bugs. (It can get in the way of fun and activities.)

Share that errors in computer programs are also called *bugs* and that they can also get in the way of actions. One skill students will learn this week is *debugging*—finding and fixing errors in their codes and creations.

To start the week, distribute SPIKE Essential sets and have students build a physical bug using the LEGO® pieces from the set. Encourage them to be creative — there's no right "bug" to build.

Elicit sharing and point out the diversity of bugs made from the same pieces. Say: *Programming is like that too. You will find many different and creative solutions to problems this week. Good programmers and engineers share ideas and learn from one another.*

Emphasize that working well together will be an important part of the week's activities.

Group Rules and Expectations
Time: 15 minutes
Materials:

- Chart paper
- Markers
- Pens

Using a piece of chart paper, establish group rules and expectations for the week as a class. You can have campers sign the chart paper and then place the rules and expectations in a location that can be reviewed each day. Ask students to think about how they would like to be treated and the role of a partner. Consider the role of feedback and how it can help to improve ideas. Have two people work together when building with LEGO® elements so they each have the opportunity to find pieces and to put pieces together.

Team Building Activity
Time: 15 minutes
Materials:

- LEGO® Education SPIKE™ Essential set
- Timer/clock

Explain to students that each day will include a team building challenge. Working together is an important skill and just like other skills, we can practice it to get better and better.

Build the Tallest Tower
Have students work in pairs. Make sure each group has the same bricks or give a constraint of using a specific number of bricks. Challenge students to build the tallest tower they can within 5 minutes. At the end of the 5 minutes, encourage students to reflect on:

- What was challenging?
- How did you overcome the challenge?
- What was successful?
- How did you work together?
- If you were to do this tower build again, what would you change?

Have a short discussion on how individuals work together as a team. Ask students what works well and what does not.

Team Briefing 1:
Time: 5 minutes
Materials: None

Say:

Welcome to orientation! Your first tasks for today are as follows:

- *Determine a partner for training exercises.*
- *Work with partner to determine a name for your design company and a logo.*
- *Design a journal for keeping important records this week.*
- *Explore how we can program a computer to do what we'd like it to do.*

Share this Big Question to frame the day: *How can we program motors to help us travel across the snow?*

Partner Selection, Design Company (Team) Name, and Team Logo
Time: 25 minutes
Materials:

- Team logo templates
- Markers
- Pencils
- Scissors
- Construction paper

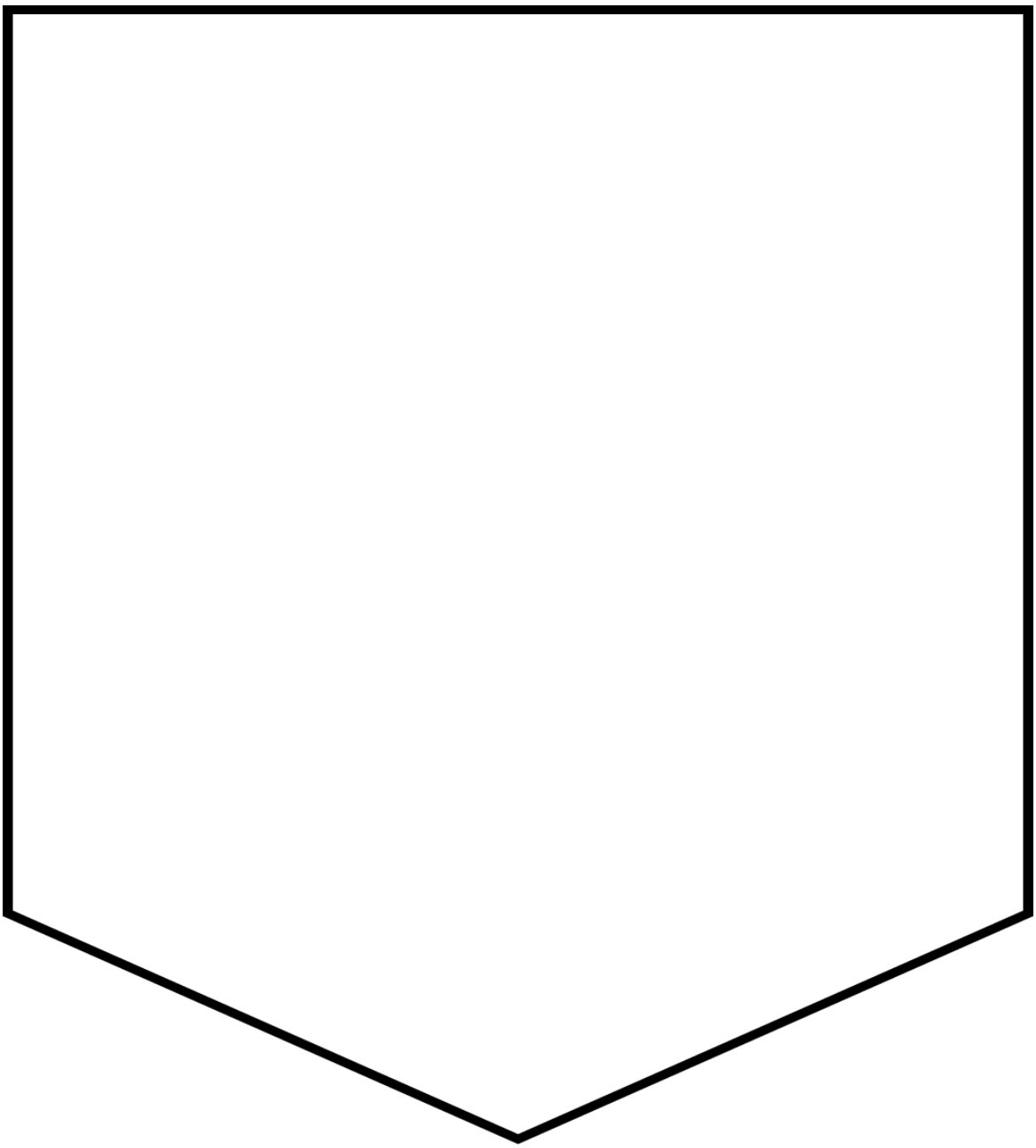
- Other craft materials

You can use several different activities to help students find a partner to work with for the week.

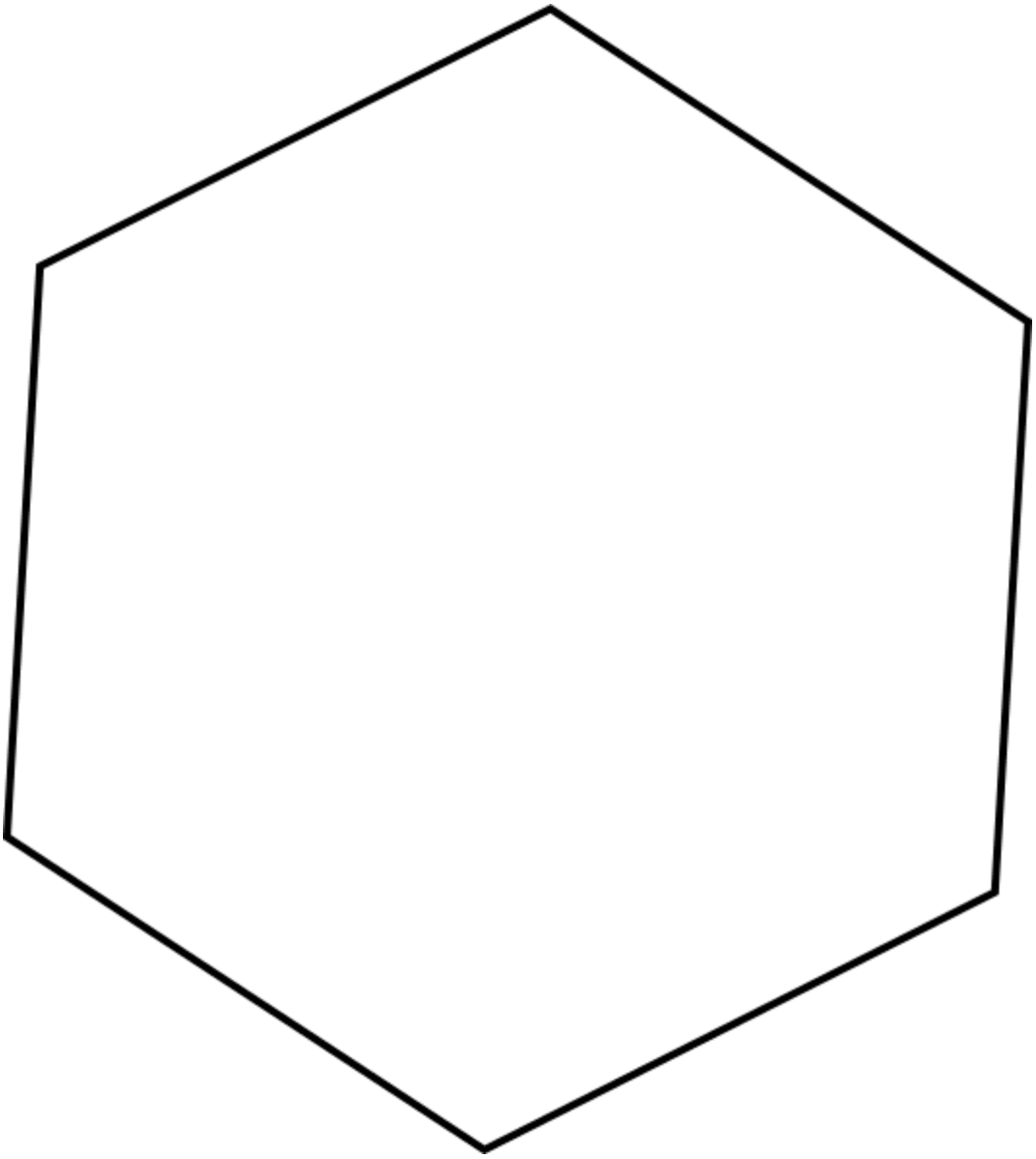
Once partners have been established, student teams can determine a design company name (team name) for their team and design a logo.

While teams are working, assign each group a LEGO® Education SPIKE™ Essential set to use for the week.

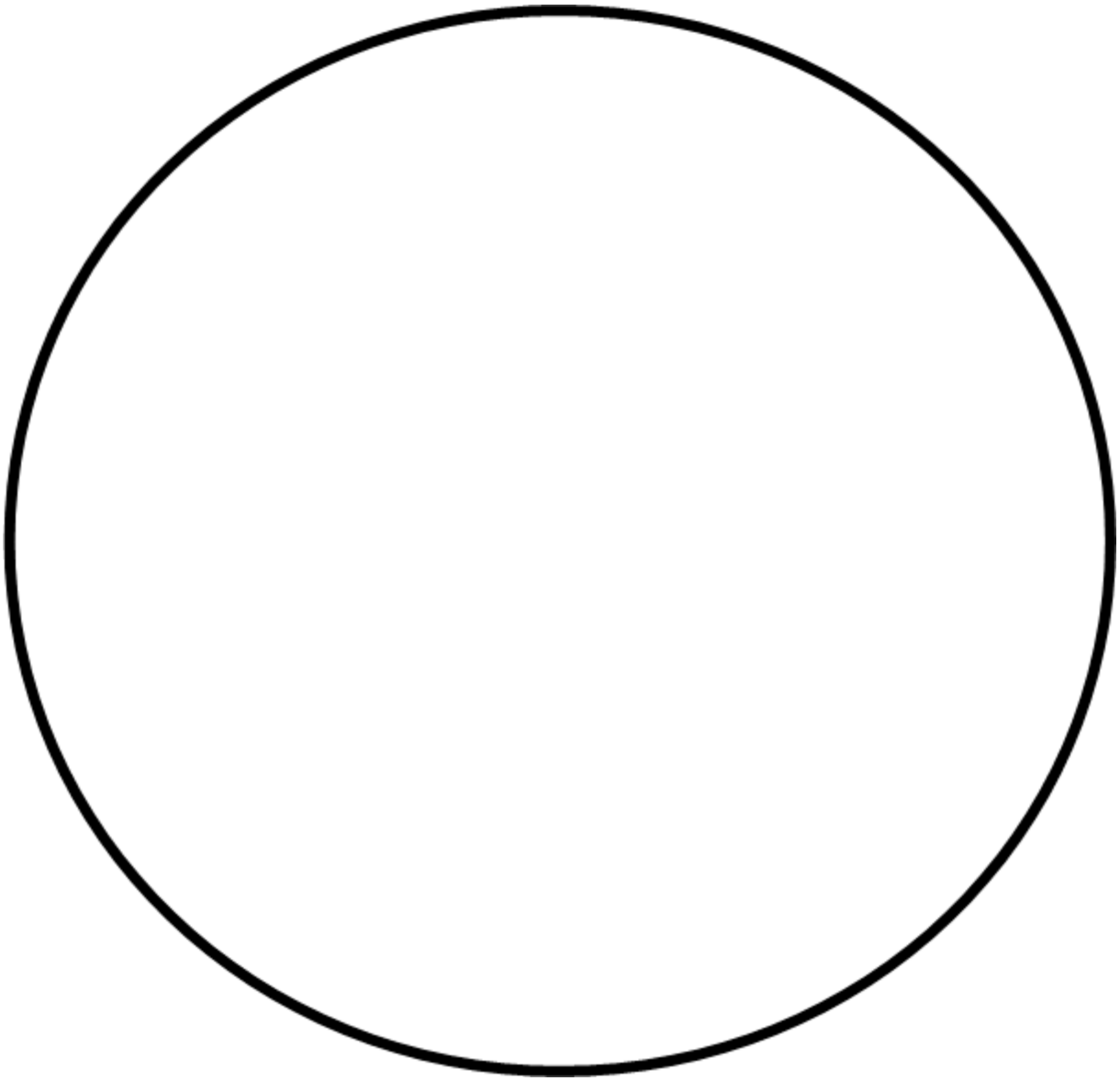
Logo Templates



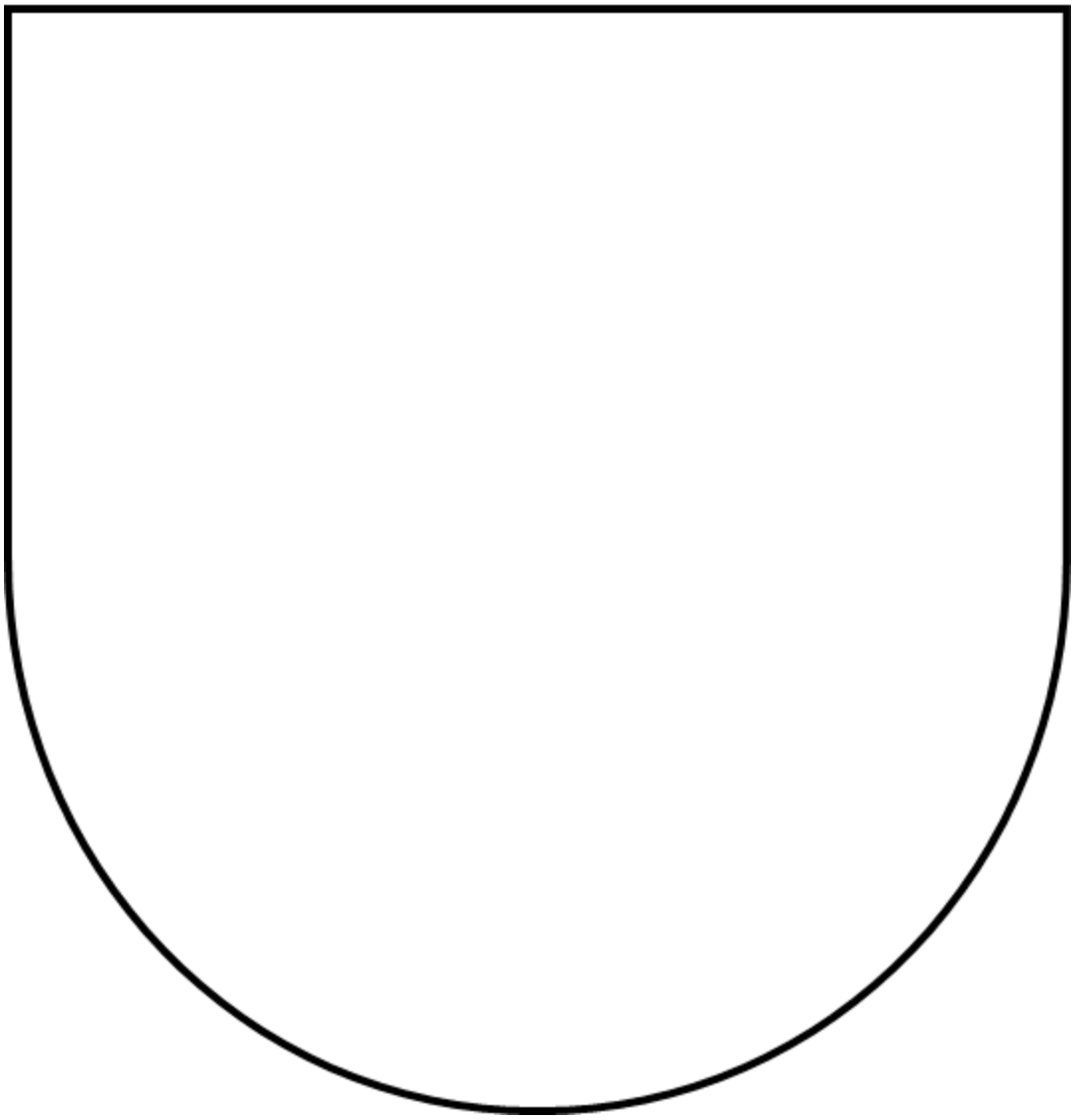
Logo Template



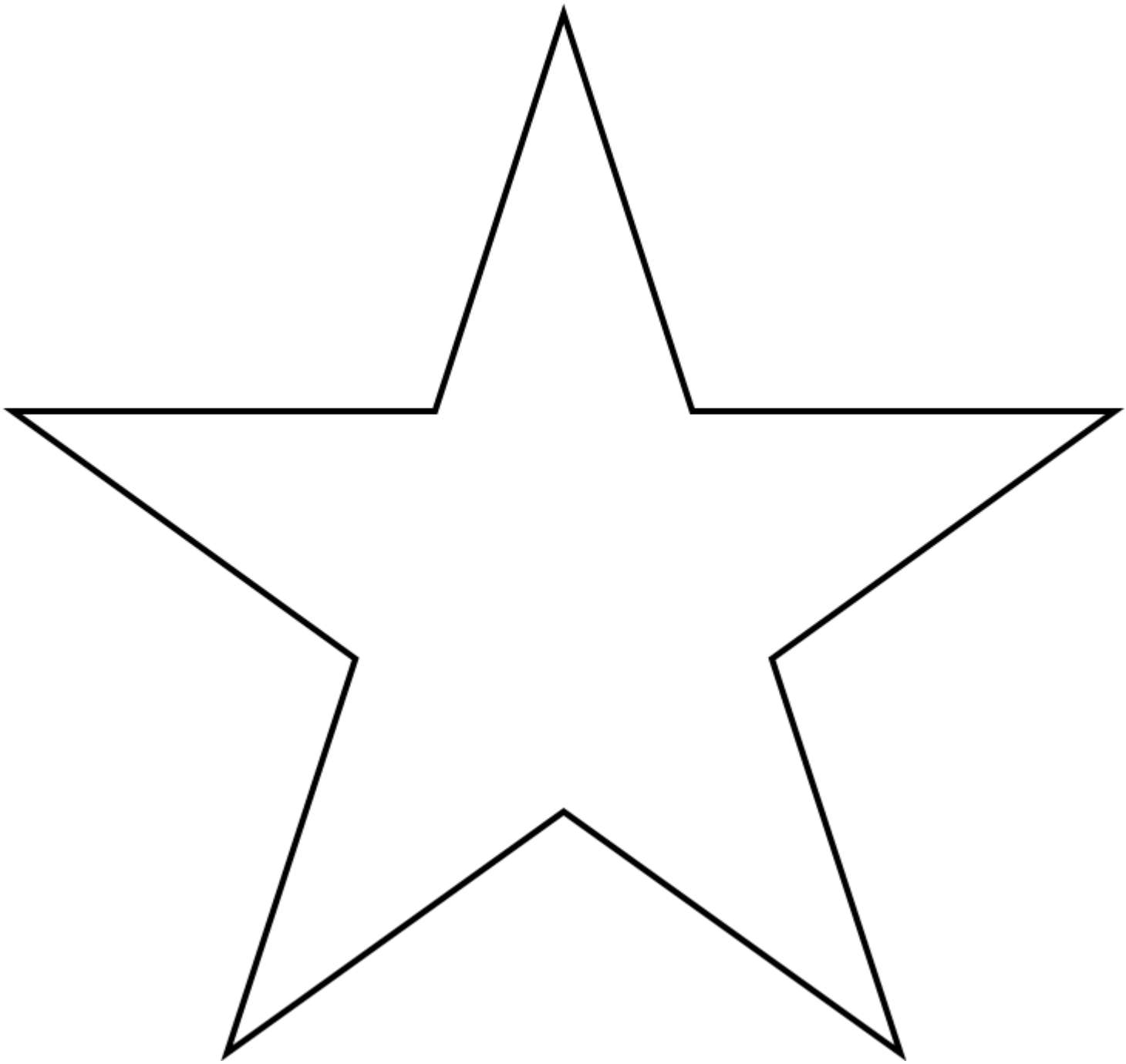
Logo Template



Logo Template



Logo Template



Break
Time: 5 minutes

Workplace Wellness: Physical Fitness
Time: 10 minutes
Materials:

- May vary depending on what activity is selected

Take a few minutes to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search. Ideas include simple exercises like jumping jacks or running in place. Many companies encourage physical activity during the workday.

Design a Journal
Time: 20 minutes
Materials:

- Student journals
- Markers
- Scissors
- Paper
- Other craft materials

Have students create a design journal to take notes, share wonderings, write reflections, and collect ideas. Ideas for types of journals can be found online.

Team Briefing 2
Time: 5 minutes
Materials: LEGO® Education SPIKE™ Essential set

Say this:
Let's get started with the SPIKE Essential set. I will show you how it's arranged and then you can explore it. Think about creations you can make to explore, solve problems, and have fun outdoors.

Share the two trays and the bottom compartment. Point out that the tray compartments are sorted by color and that the paper insert lists what's in each compartment.

Challenge 1: Meet the SPIKE Essential Set and Start Menu Tutorial Activities: The Motor
Time: 15 minutes
Materials:

- SPIKE Essential sets
- Devices with LEGO® Education SPIKE™ App
- Start menu Tutorial Activities: The Motor
- Meet the Team: Minifigure Bios (under Teacher Support>Additional Resources in each lesson plan)

Allow time for students to explore the pieces in the sets. Draw their attention to the four minifigures. Say: *These characters, Maria, Daniel, Sofie, and Leo, represent people like you who explore the world. They like to go outdoors and do things that are fun for them.*

After a few minutes, stop students and introduce the app.

Demonstrate how to find the to Start menu tutorial The Motor. Have students follow the app instructions to connect the hub to their device and run the motor.

At the end, have students replace the materials in the proper compartments of their sets.

Lunch
Time: 30 minutes

Readings and Wonderings
Time: 20 minutes
Materials:

- Article or book about computer programming or fiction book with computer-programming-themed story
- Student journals
- Pencils
- Markers
- Colored pencils

Read an article or book about computer programming or a story that involves coding. In their journals, have students write or draw things they already know or wonder about programming computers.

Team Briefing 3
Time: 5 minutes
Materials: None
Say this:

> *You met your SPIKE™ Essential set this morning and learned how to run a motor. Now we'll use the set for our first challenge, the Arctic Ride. In this challenge, you will use two motors to make a snowmobile that can drive across the snow for some outdoor fun and exploration!*

Review general guidelines for using the LEGO® Education SPIKE™ Essential sets (what to do if you drop a piece on the floor, where to put a piece you found, what sharing looks like, etc.).

Challenge 2: Arctic Ride—Make the Snowmobile Go
Time: 50 minutes
Materials:

- SPIKE Essential sets
- Devices with LEGO® Education SPIKE™ App
- Arctic Ride lesson (Great Adventures unit)
- Building instructions for Arctic Ride

- Student journals
- Pencils
- Markers
- Colored pencils

Guide students to the introductory story in the app about Leo wanting to see the polar bears. Explain that they will build a snowmobile to help Leo visit the polar bears.

Ask students to
- Build the Arctic Ride model (take turns finding pieces and building) in the app, through lesson Step 7.
- Connect the hub to the device using Bluetooth or a USB cable. Program the snowmobile to move forward.
- Figure out how many seconds they must program their snowmobile to run in order to reach a target object that you have placed on the floor. (You may want to demonstrate how to use decimal times to get more precise distances.)
- Write or draw to reflect on their experiences building and programming in their journals.

Gather students for a discussion:
- *What did they enjoy most about the activity?*
- *What was most challenging for them?*
- *How were clear instructions and sequences important in the activity?*

Point out that the building steps gave them clear instructions—a step-by-step guide to reach a goal. The sequence was important—they had to follow the steps in the correct order to be successful in building the snowmobile.

Have students return any stray pieces to their kits, but leave their models assembled to use again after the break.

Break
Time: 5 minutes

Challenge 3: Arctic Ride—Leo's Next Ride
Time: 40 minutes
Materials:
- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Arctic Ride lesson (Great Adventures unit)
- Building instructions for Arctic Ride
- Student journals
- Pencils
- Markers
- Colored pencils

In the app, have students advance to lesson Step 8. Point out the four new pink movement blocks now available to add to their programs.

Ask students to:

- Brainstorm what each of the new blocks might do.
- Test each block in a program to discover what it does.
- Write or draw their findings in their journals.

Share that for Leo's next ride, he wants to join his friends. However, there is an obstacle in the way. Create a simple course with a starting line and an ending place, where the other minifigures are gathered. Place one of the ice mountains that students built in Challenge 2 as an obstacle on the course. Clarify that students will need to code a sequence—a set of programming blocks in a particular order—in order for Leo get around the ice mountains and reach his friends.

Ask students to:

- Program their snowmobile to go from the starting line to the ending point, avoiding the obstacle.
- Draw or write about their program in their journal.

Once students have navigated the simple course successfully, increase its complexity by adding additional obstacles.

Ask students to:

- Add steps to their programs to navigate around the additional obstacles.
- If time permits, write an additional program to return from the ending place back to the starting line.

After students have completed the challenge, facilitate class discussion. Ask:

- *How did you change the code to get around the new obstacles?*
- *Did your programs work the first time? If not, how did you test and modify them?*

Point out that programmers constantly test and improve their code.

Disassembly and Inventory Check
Time: 10 minutes
Materials: LEGO® Education SPIKE™ Essential sets

Ask students to take apart the Arctic Ride model. Then, working in pairs, have them conduct an inventory check to ensure all pieces in their set are present and stored in the correct spots.

Students should make sure that all the:

- Major components are present in the lower half of the set (hub, motors, wheels, etc.).
- Pieces are in the correct color compartments in the top trays.

Note: For a full inventory: Have students place items from one compartment on the lid of the box. Then, using the paper insert in the kit (the one that is placed under the lid of the box), have students count and replace pieces into the compartment. Teams should be able to complete two compartments in five minutes. If pieces are missing, have students search other compartments, look to see if the piece is stuck in or on another piece, and/or check the LEGO lost and found area in your classroom.

Daily Debrief and Wrap Up
Time: 20 minutes
Materials:

- Sticky notes
- Chart paper
- Pencils
- Pens
- Markers

Confirm that models have been taken apart and all pieces correctly replaced in the sets. Devices and hubs should be powered off and plugged in or stored for the day.

Label three pieces of chart paper with “Enjoyed” or “Learned” or “Wondering” so students can categorize their responses.

Have students use sticky notes to write:

- One thing they enjoyed
- One thing they learned
- One thing they are wondering about

Place the sticky notes in the appropriately labeled charts.

Go through some of the responses on each chart.

Programming Outdoor Fun Day 2

Make Sense with Sensors—Animal Alarm/Underwater Quest

Big Questions:

- How can we use lights and sensors in our programs?
- How can we make two things happen at the same time?
- How can we make an action repeat?
- **To share with students:** How can we use sensors to help us outdoors?

Materials needed for the day:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Animal Alarm lesson (Great Adventures unit)
- Underwater Quest lesson (Great Adventures unit)
- Start menu Tutorial Activities: The Light
- Start menu Tutorial Activities: The Color Sensor
- Chart paper
- Student journals
- Pens
- Pencils
- Markers
- Colored pencils
- Bricktionary cards

Day 2: Outline for the Day

Outline of Day	Tasks	Time	Materials
9:00 - 9:30	Welcome	5 min	• Debrief charts from Day 1
	Team building activity	15 min	• SPIKE Essential sets • Bricktionary cards
	Review group rules and expectations and activities from yesterday.	5 min	• Group Rules chart (from Day 1)
	Team Briefing 1	5 min	None
9:30 - 10:25	Challenge 1:	15 min	• SPIKE Essential sets • Devices with SPIKE App

	Start menu Tutorial Activities: • The Light • The Color Sensor		• Start menu Tutorial Activities: ○ The Light ○ The Color Sensor
	Challenge 2: Animal Alarm—Blue Creature (through lesson Step 7 in the app)	40 min	• LEGO® Education SPIKE™ Essential sets • Devices with LEGO® Education SPIKE™ App • Animal Alarm lesson • Building instructions for Animal Alarm
10:25 - 10:30	Break		
10:30 – 11:35	Workplace Wellness (physical activity)	15 min	• Varies, based on the activity selected
	Team Briefing 2	5 min	None
	Challenge 3: Improving the Animal Alarm—Red Creature (lesson Step 8 in the app) + Make Alarms	40 min	• SPIKE Essential sets • Devices with SPIKE App • Animal Alarm lesson • Building instructions for Animal Alarm • Student journals • Pencils • Markers • Colored pencils
	Clean up	5 min	• SPIKE Essential sets
11:35 - 11:40	Get ready for lunch		
11:40 - 12:10	Lunch		
12:10 – 2:10	Team Briefing 3	15 min	None
	Inventory Check	5 min	• SPIKE Essential sets

	Challenge 4: Underwater Quest—Move the Submarine (through lesson Step 7 in the app)	45 min	• LEGO® Education SPIKE™ Essential sets • Devices with LEGO® Education SPIKE™ App • Underwater Quest lesson • Building instructions for Underwater Quest
	Break	5 min	
	Team Briefing 4	10 min	None
	Continue Challenge 5: Improving the Submarine—Maria's Next Trip (lesson Step 8 in the app)	40 min	• SPIKE Essential sets • Devices with SPIKE App • Underwater Quest lesson • Building instructions for Underwater Quest • Student journals • Pencils • Markers • Colored pencils
2:10 - 2:30	Clean up Daily debrief and wrap up	20 min	• SPIKE Essential sets • Student journals • Pencils • Markers • Colored pencils

Welcome
Time: 5 minutes
Materials: Debrief charts from Day 1

Welcome students back. Have students take a minute to read over the sticky notes placed on charts the previous day. Have students share their favorite moments from the previous day with a partner.

Team Building Activity
Time: 15 minutes
Materials:
- LEGO® Education SPIKE™ Essential sets
- Bricktionary cards

Place students in groups of 4–5 for team building activity: Bricktionary.

Bricktionary:

Have students play one round of Bricktionary. Students will draw a card from the stack without showing the word to their teammates. Then using bricks, students will build the object while teammates try to guess what it is. The game is over when everyone has had a turn. Below are some example cards you can use for the game.

Bricktionary Cards

Truck	Place
Bridge	TV
Flower	Tree
Boat	House

LEGO education

Review Group Rules Chart
Time: 5 minutes
Materials:

- Group Rules chart (from Day 1)

Quickly review the group rules and expectations that students created on Day 1. Highlight positive moments from Day 1 (times when students helped each other, asked great questions, showed teamwork, helped to clean up…)

Team Briefing 1
Time: 5 minutes
Materials: None

Share this Big Question to frame the day: How can we use sensors to help us outdoors?

Then say:

> *Yesterday, you helped Leo visit the polar bears by programming motors to make a snowmobile that could move across the snow. Today we're going to help him have some more outdoor fun. This time he wants to know when animals visit his campsite. You can help him by learning to program lights, sounds, and sensors.*

Challenge 1: Tutorial Activities: The Light and the Color Sensor
Time: 15 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Start menu Tutorial Activities:
  - The Light
  - The Color Sensor

Briefly review how to navigate to Start menu to find the Tutorial Activities. Have students use the Light instructions to program the light and then the Color Sensor instructions to program the color sensor.

At the end, have them return all the materials to the proper compartments of their sets.

Challenge 2: Animal Alarm—Blue Creature
Time: 40 minutes
Materials:

- SPIKE Essential sets
- Devices with SPIKE App
- Animal Alarm lesson (Great Adventures unit)
- Building instructions for Animal Alarm

Share the introductory story in the app about Leo wanting to see the animals that visit his campsite at night. Explain that they will build an animal alarm to let Leo know when animals are around.

Ask students to

- Build the Animal Alarm model (take turns finding pieces and building) using the app instructions through lesson Step 7.
- Connect the hub to the device using Bluetooth or a USB cable. Program the alarm to detect a blue animal to move forward.
- Have students test their alarms using blue creatures. Point out that there are three shades of blue bricks in the kit. Ask: *Which ones will trigger the "blue" alarm?*

Have students return any stray pieces to their kits, but leave their models assembled to use again shortly.

Gather students for a brief discussion.
Ask: *Did the alarm work more than once or did you have to restart the program each time?*
(The alarm works multiple times, but some students may not realize this and may have restarted the program each time.)

Clarify that students have been programming *events*, which allow things that happen (like a blue creature coming) to affect the way the program runs.

Break
Time: 5 minutes

Workplace Wellness: Physical Fitness
Time: 15 minutes
Materials:

- May vary depending on what activity is selected

Take a few minutes to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search. Ideas could include simple exercises like jumping jacks or running in place. Many companies encourage physical activity during the workday.

Team Briefing 2
Time: 5 minutes
Materials: None

Tell students:

> *During the last activity, we learned how to use an* event *in our programs. Every time a blue creature appeared, the alarm went off. Now, we'll use more than one event in our programs so we can make alarms with lights and sounds. We'll also be able to detect more than one color of creature.*

Challenge 3: Improving the Animal Alarm—Red Creature
Time: 40 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Animal Alarm lesson (Great Adventures unit)
- Building instructions for Animal Alarm
- Student journals
- Pencils
- Markers
- Colored pencils

Have students advance to lesson Step 8 in the app.

Point out the new blocks available and demonstrate how to use events to create additional alarms for other colored creatures. Model how to use two events with the same color (two blue-alarm blocks, for example) to create an alarm that involves light and sound happening at the same time.

Ask students to:

- Build three differently colored creatures to code three different alarms, one for each color of creature. They may use sound and/or light for each alarm.
- Use their creature to test each alarm. They can also use their creatures to test each other's alarms.
- Create a multi-colored creature that can trigger all three alarms.

In their journals, have students make sketches of one or more of the creatures they created.

Clean up
Time: 5 minutes
Materials: SPIKE Essential sets

Have students take apart the models and replace the pieces correctly in the bin trays.

Lunch
Time: 30 minutes

Team Briefing 3
Time: 10 minutes
Materials: None

Tell students:

> *Hello, Coders! This morning you learned a powerful programming tool,* ***events****. This afternoon, we will learn another powerful tool,* ***loops****, that will help you create even more outdoor fun.*

A loop in a program lets you repeat a step, or several steps, over and over. Let's think of some places that you see loops in everyday life. For example, the seasons are a loop: spring, summer, fall, winter, spring, summer, fall, winter…

Lots of dances involve loops, too—moves that you repeat over and over. Who can share an example? (Invite to students demonstrate a few dance moves they know.)

What other examples of loops can you think of? (Take student responses.)

Inventory Check
Time: 5 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets

Have students confirm that all items in the bin are in the proper trays. Ask them to inventory the red and blue tray compartments.

Challenge 4: Underwater Quest—Move the Submarine
Time: 45 minutes
Materials:

- SPIKE Essential sets
- Devices with LEGO® Education SPIKE™ App
- Underwater Quest lesson (Great Adventures unit)
- Building instructions for Underwater Quest

Share the introductory story in the app about Maria wanting to visit the turtle underwater. Explain that they will build a submarine for Maria so she can explore underwater.

Ask students to:

- Build the Underwater Quest model (take turns finding pieces and building) using the app instructions through lesson Step 7.
- Connect the hub to the device using Bluetooth or a USB cable.
- Program the submarine to move forward and make a splashing sound, then rock back and forth.
- Use a loop to make the rocking actions repeat.

Have students replace any stray pieces in their kits, but keep their models to use again after the break.

Break
Time: 5 minutes

Team Briefing 4
Time: 10 minutes

Materials: None
Tell students:

> *Maria loves her new submarine. Can you make it even better for her so she can see even more under the water? What are some ways that we could improve it?*
> Take student ideas and encourage them to use one of these ideas or a different idea to improve Maria's submarine.

Challenge 5: Improving the Submarine—Maria's Next Trip
Time: 40 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Underwater Quest lesson (Great Adventures unit)
- Building instructions for Underwater Quest
- Student journals
- Pencils
- Markers
- Colored pencils

Have students advance to lesson Step 8 in the app and review that they'll be designing an improved submarine for Maria. They can use ideas from the team brainstorm or the idea sketches in the app as inspiration.

When the models are completed, invite sharing. Then ask students to sketch their submarine design in their journal.

Have students take apart the models and replace the pieces in the bin trays.

Cleanup, Daily Debrief and Wrap Up
Time: 20 minutes
Materials:

- SPIKE Essential sets
- Student journals
- Pencils
- Markers
- Colored pencils

Make sure that models have been disassembled and all pieces are correctly placed in the sets. Devices and hubs should be powered off and plugged in or stored for the day.

Have students write three words in their journals that reflect what they have learned today. Have them choose one of these words and draw a sketch that illustrates why they chose the word.

Programming Outdoor Fun Day 3

Get Rid of the Bugs!—Treehouse Camp/Perfect Swing

Big Questions:

- How can we test and fix (debug) our code?
- How can we improve our programs?
- **To share with students:** How can fixing programs help us solve problems wherever we go?

Materials needed for the day:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Treehouse Camp lesson (Great Adventures unit)
- Building instructions for Treehouse Camp
- The Perfect Swing lesson (Amazing Amusement Park unit)
- Building instructions for The Perfect Swing
- Student journals
- Chart paper
- Pens
- Pencils
- Markers
- Colored pencils

Day 3: Outline for the Day

Outline of Day	Tasks	Time	Materials
9:00 - 10:15	Welcome	10 min	• Student journals • Pencils
	Team building activity	15 min	• SPIKE Essential set • Timer/clock
	Review Group Rules chart	5 min	• Group Rules chart
	Team Briefing 1	5 min	None
	Challenge 1: Treehouse Camp—See the Moon! (through lesson Step 8 in the app)	40 min	• SPIKE Essential sets • Devices with SPIKE App • Treehouse Camp lesson

			• Building instructions for Treehouse Camp
10:15 - 10:20	Break		
10:20 - 11:25	Team Briefing 2	5 min	None
	Challenge 2: Treehouse Camp—Improve the Roof for Sofie (lesson Step 9 in the app)	40 min	• LEGO® Education SPIKE™ Essential sets • Devices with LEGO® Education SPIKE™ App • Treehouse Camp lesson • Building instructions for Treehouse Camp
	Readings and Wonderings: Women pioneers in computing	20 min	• Children's book about a female pioneer in computing, such as Ada Lovelace, Katherine Johnson, or Grace Hopper • Student journals • Pencils
11:25 - 11:30	Get ready for lunch		
11:30 - 12:00	Lunch		
12:00 - 1:10	Workplace Wellness (physical activity)	10 min	• Varies, based on the activity selected
	Team Briefing 3	5 min	None
	Inventory Check	5 min	• SPIKE Essential sets
	Challenge 3: The Perfect Swing—Make the Swing Move (through lesson Step 8 in the app)	50 min	• SPIKE Essential sets • Devices with SPIKE App • The Perfect Swing lesson • Building instructions for The Perfect Swing • Student journals

			• Pencils • Markers • Colored pencils
1:10 - 1:15	Break	5 min	
1:15 - 2:10	Challenge 4: The Perfect Swing—Make the Swing More Exciting (lesson Step 9 in the app)	50 min	• LEGO® Education SPIKE™ Essential sets • Devices with LEGO® Education SPIKE™ App • The Perfect Swing lesson • Building instructions for The Perfect Swing • Student journals • Pencils • Markers • Colored pencils
2:10 - 2:30	Clean up Daily debrief and wrap up	20 min	• SPIKE Essential sets • Student journals • Pencils

Welcome
Time: 10 minutes
Materials:

- Student journals
- Pencils

Welcome students back. Have students briefly share the words they wrote in their journals at the end of Day 2 with a new partner. As a group, compile a list of the words on chart paper. Discuss what words were repeated, if any.

Team Building Activity
Time: 15 minutes
Materials:

- SPIKE Essential set
- Timer/clock

Build a Bridge
In pairs, challenge students to build a LEGO® bridge that spans two tables. You can determine the minimum length of the bridge. Allow pairs only 5 minutes to complete their bridge.

Suggested Extensions:

- Build the longest bridge

- Build the tallest bridge
- Build a bridge that can hold the most weight (use a bucket and some weights to test)

Review Group Rules Chart
Time: 5 minutes
Materials: Group Rules chart (from Day 1)

Quickly review the group rules and expectations that students created on Day 1. Highlight positive moments from Day 2 (times when students helped each other, asked great questions, showed teamwork, helped to clean up…)

Team Briefing 1
Time: 5 minutes
Materials: None

Share this Big Question to frame the day: *How can fixing programs help us solve problems wherever we go?*

Then say:

> *You've gained many new coding skills this week. Your programs got longer and more complicated. With bigger programs there are more chances to make a mistake. All programmers make mistakes! Finding and fixing them is an important programming skill called* ***debugging****.*
>
> *Today we'll practice debugging programs! Are you ready?*

Challenge 1: Treehouse Camp—See the Moon!
Time: 40 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Treehouse Camp lesson (Great Adventures unit)
- Building instructions for Treehouse Camp

In the app, show students the introductory story about Sofie wanting to see the moon from her treehouse camp. Explain that they will build a motorized roof that Sofie can open to see the moon.

Ask students to

- Build the Treehouse Camp model (take turns finding pieces and building) through lesson Step 8 in the app.
- Connect the hub to the device using Bluetooth or a USB cable. Run the program that opens the treehouse roof.

(Note: The program that students are guided to create is intentionally incorrect—the roof goes in the wrong direction.)

Once students discover that the program is incorrect, pause their work to review debugging. Acknowledge that the program is not functioning as expected. Lead brainstorming to surface ways that students can find and fix the problem.

Encourage students to experiment with debugging their programs and then to discuss what they found.

Have the students return any stray pieces to their kits, but keep their models assembled to use after the break.

Break
Time: 5 minutes

Team Briefing 2
Time: 5 minutes
Materials: None

Tell students:

> *Earlier you saw the importance of finding and fixing bug in your programs. Another important part of design is testing your creations and making improvements to them. How could we make Sofie's treehouse even better for her?*

Challenge 2: Treehouse Camp—Improve the Roof for Sofie
Time: 40 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ app
- Treehouse Camp lesson (Great Adventures unit)
- Building instructions for Treehouse Camp

In the app, have students advance to lesson Step 9. Explain that they will design an even better treehouse for Sofie. Ask them to brainstorm ideas and then start building, using the inspiration images in the app or ideas of their own.

As the students design and build, circulate to explicitly name when they are testing, debugging, and redesigning. These steps are an integral part of the design process; students will benefit from recognizing when they are using them.

Have students disassemble their models and return the pieces to their sets.

Research and Wonderings
Time: 20 minutes

Materials:

- Student journals
- Pencils
- Article or children's book about a female pioneer in computing, such as Ada Lovelace, Katherine Johnson, or Grace Hopper

Read the story aloud. Facilitate discussion and elicit students' ideas about:

- Contributions the featured person made to computer programming and science.
- Obstacles that she overcame.

In their journals, have students write the person's name, one important contribution she made, and two words or phrases that describe her.

Lunch
Time: 30 minutes

Workplace Wellness: Physical Fitness
Time: 10 minutes
Materials:

- May vary depending on what activity is selected

Take a few minutes to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search. Ideas could include simple exercises like jumping jacks or running in place. Many companies encourage physical activity during the workday.

Team Briefing 3
Time: 5 minutes
Materials: None

Say to students:

> *For our final project later this week, we will build amusement park rides. That's outdoor fun, right!*
>
> *Today, we'll start exploring some rides. As we do, think about what kind of amusement park ride you'd like to make for your final project.*

Inventory Check
Time: 5 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets

Have students confirm that all items are correctly stored in their bin's trays and that they have the hub, motors, light, and color sensor.

Challenge 3: The Perfect Swing—Make the Swing Move

Time: 50 minutes
Materials:

- LEGO® Education SPIKE Essential sets
- Devices with LEGO® Education SPIKE™ App
- The Perfect Swing lesson (Amazing Amusement Park unit)
- Building instructions for The Perfect Swing
- Student journals
- Pencils
- Markers
- Colored pencils

In the app, show students the introductory story about Maria wanting a gentle ride at the amusement park. Explain that they will build a swing for Maria, so she can have outdoor fun the way she wants to.

Ask students to:

- Build the Perfect Swing model (take turns finding pieces and building) through Step 8 in the app.
- Connect the hub to the device using Bluetooth or a USB cable. Program the swing to rock back and forth.
- Advance to lesson Step 8 and use a loop to make the rocking actions repeat. Encourage students to upgrade their program by adding lights and sounds.
- Share their swing programs with a classmate.
- Sketch their programs in their journals.

Have the students return any stray pieces to their kits, but keep their models assembled to use after the break.

Break
Time: 5 minutes

Challenge 4: The Perfect Swing—Make the Swing More Exciting
Time: 55 minutes
Materials:

- SPIKE Essential sets
- Devices with SPIKE App
- The Perfect Swing (Amazing Amusement Park unit)
- Building instructions for The Perfect Swing
- Student journals
- Pencils
- Markers
- Colored pencils

Say to students:

You did a great job building a swing that's just right for Maria. Now, you can try your own ideas to make the swing even better.

In the app, have students advance to lesson Step 9. Explain that they will design an improved swing for Maria. Ask them to brainstorm ideas and then start building, using the inspiration images in the app or their own ideas.

Review the importance of testing, debugging, and redesigning the swings, emphasizing that engineers constantly test and improve their designs.

Invite students to share their completed creations and identify either a:

- Problem they encountered and how they fixed it.
- Change they made to their design as they worked.

Ask them to sketch their swing design in their journal.

Clean Up, Daily Debrief, and Wrap Up
Time: 20 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets
- Student journals
- Pencils

Confirm that models have been disassembled and all pieces correctly replaced in the sets. Devices and hubs should be powered off and plugged in or stored for the day.

In their journals, have students write two things they learned today and if either learning surprised them.

Ask and facilitate discussion:

- *Would you be interested in designing amusement park rides as a career?*
- *What would be important to think about besides fun when designing rides? (safety, sturdiness, ease of operation, etc.)*

Reiterate that students will design their own LEGO® amusement park rides as a final project this week.

Programming Outdoor Fun Day 4

Programming Some Fun—Snack Stand/Twirling Teacups

Big Question:

- How can we use a sensor to control a motor?
- How can we make a new action start in the middle of a program?
- **To share with students:**
    - What fun activities already have programs in them?
    - How can we use programs to make the activities even better?

Materials needed for the day:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Snack Stand lesson (Amazing Amusement Park unit)
- Building instructions for Snack Stand
- Icon Blocks>Bar Graphs (Help section in the app)
- Twirling Teacups (Amazing Amusement Park unit)
- Building instructions for Twirling Teacups
- Icon Blocks>Event Blocks>Received Message & Send Message (Help section in the app)
- Student journals
- Chart paper
- Group Rules chart
- Various craft materials
- Pens
- Pencils
- Markers
- Colored pencils

Day 4: Outline for the Day

Outline of Day	Tasks	Time	Materials
9:00 - 10:25	Welcome	10 min	• Student journals • Pencils • Markers • Colored pencils
	Team building activity	20 min	• SPIKE Essential set • Student journals • Pencils • Markers

			• Colored pencils
	Review group rules and expectations and activities from yesterday	5 min	• Group Rules chart
	Team Briefing 1	5 min	None
	Challenge 1: Snack Stand — New Snack for Daniel (through lesson Step 7 in the app)	45 min	• LEGO® Education SPIKE™ Essential sets • Devices with the LEGO® Education SPIKE™ App • Snack Stand lesson • Building instructions for Snack Stand
10:25 - 10:30	Break		
10:30 - 11:25	Team Briefing 2	10 min	• SPIKE Essential set • Devices with the SPIKE app • Icon Blocks>Bar Graphs (Help section in the app)
	Challenge 2: Snack Stand—Track the Snacks (lesson Step 8 in the app)	45 min	• SPIKE Essential sets • Devices with the SPIKE App • Snack Stand lesson • Building instructions for Snack Stand • Icon Blocks>Bar Graphs (Help section in the app) • Craft materials
11:25 – 11:30	Get ready for lunch		
11:30 - 12:00	Lunch		
12:00 - 2:10	Workplace Wellness (physical activity)	10 min	• Varies, based on the activity selected
	Inventory Check	5 min	• SPIKE Essential sets

	Team Briefing 3	10 min	• LEGO® Education SPIKE™ Essential sets • Devices with the LEGO® Education SPIKE™ App • Icon Blocks>Event Blocks>Received Message & Send Message (Help section in the app)
	Challenge 3: Twirling Teacups—Start the Ride (through lesson Step 8 in the app)	45 min	• SPIKE Essential sets • Devices with the SPIKE App • Twirling Teacups lesson • Building instructions for Twirling Teacups • Icon Blocks>Event Blocks>Received Message & Send Message • Student journals • Pencils • Markers • Colored pencils
	Break	5 min	
	Team Briefing 4	5 min	None
	Challenge 4: Twirling Teacups—Make Room for Friends (lesson Step 9 in the app)	50 min	• SPIKE Essential sets • Devices with SPIKE App • Twirling Teacups lesson • Building instructions for Twirling Teacups
2:10 - 2:30	Cleanup Daily debrief and wrap up	20 min	• SPIKE Essential sets • Student journals • Pencils • Markers • Colored pencils

Welcome
Time: 10 minutes
Materials:

- Student journals

- Pencils
- Markers
- Colored pencils

Welcome students back. Have each student share ideas about rides an amusement park could include. As needed, share photographs or examples to build background about amusement parks. In their journals, have students write or sketch an idea for a ride.

Team Building Activity
Time: 20 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets
- Student journals
- Pencils
- Markers
- Colored pencils

Create a Creature
Have each student build a creature using LEGO® pieces from their sets. Have them name their creature and give it a special characteristic, then share with their partner. Ask partners to create a short story that includes both creatures. Finally, have them write or draw in their journal about their creatures and the story.

Review Group Rules and Expectations
Time: 5 minutes
Materials: Group Rules chart

Quickly review the group rules and expectations. Highlight positive moments from Day 3 (times when students helped each other, asked great questions, showed teamwork, helped to clean up…)

Team Briefing 1
Time: 5 minutes
Materials: None

Share these Big Questions to frame the day:

- *What fun activities already have programs in them?*
- *How can we use programs to make the activities even better?*

Then say:

> *Today you will use your building and programming skills to make two parts of an amusement park: a twirling teacup ride for some outdoor fun and a snack stand, because fun can make people hungry.*

Challenge 1: Snack Stand—New Snack for Daniel
Time: 45 minutes

Materials:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Snack Stand lesson (Amazing Amusement Park unit)
- Building instructions for Snack Stand

In the app, show students the introductory story about Daniel dropping his snack and wanting to get another. Explain that they will build and program a snack stand to help Daniel get a new snack.

Ask students to

- Build the Snack Stand model (take turns finding pieces and building) through lesson Step 7 in the app.
- Connect the hub to the device using Bluetooth or a USB cable.
- Program the snack stand to deliver a snack when the color sensor sees a blue ticket.

After students build and test their snack stands, facilitate a whole-group discussion. Ask:

- *Which program from earlier this week does the snack stand program remind you of?* (Animal Alarm.)
- *In what way?* (Discuss that both programs are triggered by the color sensor. Point out that one runs a motor in response to color while the other turns on a light.)

Have students return any stray pieces to their bins, but keep their models assembled to use after the break.

Break
Time: 5 minutes

Team Briefing 2
Time: 10 minutes
Materials:

- SPIKE Essential Set
- Device with SPIKE App
- Icon Blocks>Bar Graphs (Help section in the app)

Elicit student ideas about bar graphs. What do they look like? What are they used for?
Share that:

> *Something special about the SPIKE Essential app is that it lets you make graphs! We can use a graph to keep track of all the different kinds of snacks that the snack stand serves at the amusement park.*

Use the Bar Graphs support in the Help>Icon Blocks section of the app to model how to add a graph to a SPIKE Essential program.

Challenge 2: Snack Stand—Track the Snacks
Time: 45 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Icon Blocks>Bar Graphs (Help section in the app)
- Snack Stand lesson (Amazing Amusement Park unit)
- Building instructions for Snack Stand
- Craft materials

In the app, have students advance to lesson Step 8 of the Snack Stand lesson.

- Challenge them to
    - Write a program that will
        - Deliver three different colors of snacks and
        - Keep track of how many of each color it serves.
- Test each other's snack stands to confirm that they:
    - Detect colors,
    - Deliver snacks, and
    - Keep track of what color tickets they've received.

As needed, support students by:

- Brainstorming ways to test the programs to make sure they work.
- Recalling that students wrote a very similar program earlier to detect three different colors of creatures for Leo's animal alarm. Reinforce that recognizing and using similarities is an important skill in computer programming.
- Reviewing the directions about using Icon Block Bar Graphs in the Help section of the app.

If time permits, have students

- Design their own snacks from LEGO® pieces and/or craft materials and see which ones their programs can detect and count.
- Disassemble the Snack Stand model and return the pieces to their correctly tray compartments.

Lunch
Time: 30 minutes

Workplace Wellness
Time: 10 minutes
Materials:

- May vary depending on what activity is selected

Take a few minutes to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search. Ideas could include simple exercises like jumping jacks or running in place. Many companies encourage physical activity during the workday.

Inventory Check
Time: 5 minutes

Materials:

- LEGO® Education SPIKE™ Essential sets

Have students confirm that all pieces are present and correctly stored in the tray compartments.

Team Briefing 3
Time: 10 minutes
Materials:

- SPIKE Essential set
- Device with LEGO® Education SPIKE™ App
- Icon Blocks>Event Blocks>Received Message & Send Message (Help section in the app)

Share:

> *We've learned to use **events** to make two things happen at once. For example, an alarm can turn on a light and play a sound at the same time. But what happens if you want a sound to start in the middle of your program? We can do that using event blocks programmers often call Mail or Message blocks. That's because they can send or receive messages. These blocks can make outdoor activities like a twirling teacup ride even more fun. Let's explore how.*

Use the Event Blocks>Received Message and Send Message support in the Help>Icon Blocks section of the app to model how to use Message blocks in a program.

Challenge 3: Twirling Teacups—Start the Ride
Time: 45 minutes
Materials:

- SPIKE Essential sets
- Devices with SPIKE App
- Icon Blocks>Event Blocks>Received Message and Send Message blocks (Help section in the app)
- Twirling Teacups lesson (Amazing Amusement Park unit)
- Building instructions for Twirling Teacups
- Student journals
- Pencils
- Markers
- Colored pencils

In the app, show students the introductory story about Sofie and Leo wanting to try the new teacup ride at the amusement park. Ask the students if they'd like to go on a twirling teacup ride. Then explain that they will build a ride for Sofie and Leo.

Ask students to

- Build the Twirling Teacups model (take turns finding pieces and building) through lesson Step 7 in the app.

- Connect the hub to the device using Bluetooth or a USB cable. Use a Received Message and Send Message event block to program the teacups to twirl while music plays.
- Advance to lesson Step 8 and improve the program to make the teacup ride even better.
- Share their teacup programs with each other.
- Sketch their programs in their journals.

Have students return any stray pieces to their bins, but keep their models assembled to use after the break.

Break
Time: 5 minutes

Team Briefing 4
Time: 5 minutes
Materials: None

Say:

> *The twirling teacup ride is lots of fun. But it only holds two people! People are tired of waiting in line to ride. Can you change the ride so that it holds more people? Remember that all the seats still need to spin or it's not a twirling teacup ride.*

Challenge 4: Twirling Teacups—Make Room for Friends
Time: 50 minutes
Materials:
- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Twirling Teacups (Amazing Amusement Park unit)
- Building instructions for Twirling Teacups

In the app, have students advance to Step 9 of the Twirling Teacups lesson. Explain that they will design an improved twirling teacup that can hold more minifigures. Reinforce that all the seats must be able to move or spin.

Facilitate brainstorming and support students in building. They can use the inspiration images in the app or their own ideas.

Challenge students to include a seat that holds a wheelchair so that Daniel can ride too!

Clean Up, Daily Debrief, and Wrap Up
Time: 20 minutes
Materials:
- SPIKE Essential sets
- Student journals
- Pencils

- Markers
- Colored pencils

Confirm that models have been disassembled and all pieces are correctly replaced in the sets. Devices and hubs should be powered off and plugged in or stored for the day.

Preview that tomorrow students will build an amusement park! Ask them to think about their favorite ride—from an amusement park, the playground, or even something like a bike or a horse. Why do they like that ride? What makes it fun? How can they make the ride they will build tomorrow fun too?

In their journals, ask students to sketch themselves on their favorite ride and to write a few words or a sentence about why that ride is fun.

Programming Outdoor Fun Day 5

Putting It All Together—Spinning Ferris Wheel/Amusement Park Showcase

Big Questions:

- How can we use random numbers in programming to add excitement to our creations?
- **To share with students:**
  - How can we use what we learned to design and program our own creation?
  - How do people create new designs that will interest others?

Materials needed for the day:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ app
- The Spinning Ferris Wheel lesson (Amazing Amusement Park unit)
- Building instructions for The Spinning Ferris Wheel lesson
- Student journals
- Chart paper
- Group Rules chart
- Pencils
- Markers
- Colored pencils
- Certificates of Completion (one per student)
- Charts from the week
- Pictures from the week
- Video from the week

Day 5: Outline for the Day

Outline for Day	Tasks	Time	Materials
9:00 - 10:10	Welcome	5 min	• Chart paper • Markers
	Team Programming Activity	15 min	• SPIKE Essential set • Devices with SPIKE App
	Review Group Rules Chart	5 min	• Group Rules chart
	Team Briefing 1	5 min	• None

	Challenge 1: The Spinning Ferris Wheel—Start the Wheel (through lesson Step 8 in the app)	40 min	• LEGO® Education SPIKE™ Essential sets • Devices with LEGO® Education SPIKE™ App • The Spinning Ferris Wheel lesson • Building instructions for The Spinning Ferris Wheel
10:10 - 10:15	Break		
10:15 - 10:20	Team Briefing 2	5 min	• None
10:20 - 11:25	Showcase Discussion, Planning, and Building	65 min	• SPIKE Essential sets • Devices with SPIKE App • Student journals • Pencils • Markers • Colored pencils
11:25	Get ready for lunch		
11:30 - 12:00	Lunch		
12:00 - 12:45	Showcase Preparation	45 min	• SPIKE Essential sets • Devices with SPIKE App • Student journals • Pencils • Markers • Colored pencils • Construction paper
12:45 – 1:45	Showcase	60 min	• SPIKE Essential sets • Devices with SPIKE App • Student journals • Charts from the week • Pictures from the week • Video from the week

1:45 - 2:30	Clean Up, Wrap Up, and Celebrate	45 min	• LEGO® Education SPIKE™ Essential sets • Student journals • Certificates of Completion

Welcome
Time: 5 minutes
Materials:
- Chart paper
- Markers

Welcome students back. On a piece of chart paper, draw a very large light bulb. Inside your drawing, have students write positive discoveries they've made about themselves during the week.

Team Programming Activity
Time: 15 minutes
Materials:
- SPIKE Essential set
- Devices with LEGO® Education SPIKE™ App

Light Show

Say:

With your partner, use what you've learned about programming lights and loops to create a light show with changing and repeating patterns. Include both partners' favorite colors and their design ideas. You may even want to use your light show in your amusement park ride final project.

Review Group Rules Chart
Time: 5 minutes
Materials:
- Group Rules chart

Quickly review the group rules and expectations students created. Highlight positive moments from Day 4 (times when students helped each other, asked great questions, showed teamwork, helped to clean up…).

Introduce that the class will welcome guests today. Students will share the cool new amusement park rides that they create.

Team Briefing 1
Time: 5 minutes
Materials: None

Share these Big Questions to frame the day:

- *How can we use what we learned to design and program our own creation?*
- *How do people create new designs that will interest others?*

Challenge 1: The Spinning Ferris Wheel—Start the Wheel
Time: 40 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- The Spinning Ferris Wheel lesson (Amazing Amusement Park unit)

In the app, show students the introductory story about the Ferris wheel not stopping long enough for the friends to get on. Explain that they will build the Ferris wheel and then use their programming skills to fix the program so that riders can get on.

Ask students to:

- Build the Spinning Ferris Wheel model (take turns finding pieces and building) through lesson Step 8 in the app.
- Connect the hub to the device using Bluetooth or a USB cable. Run the program.
- Improve the program so that the ride stops long enough for the friends to climb aboard.
- Add lights and music to their programs or continue to lesson Step 9 to modify the ride itself (time permitting).

Break
Time: 5 minutes

Team Briefing 2
Time: 5 minutes
Materials: None
Say:

> *We've built three amusement park rides this week—the swing, the twirling teacups, and the Ferris wheel. We've built a lot of other fun things, too: a treehouse, a submarine, and even a snowmobile. Now it's time for you to build and program your own amusement park ride. Bring all your learning together to make a ride you think will be super fun!*

Showcase Discussion, Planning, and Building
Time: 65 minutes
Materials:

- SPIKE Essential sets
- Devices with SPIKE App
- Student journals
- Pencils
- Markers

- Colored pencils

Say:

Now it's time to design, build, and program your own amusement park ride. Here are the guidelines:

- *Your ride must hold at least one minifigure.*
- *Your ride must be safe. The minifigures cannot bang into things, fall out of the ride, etc.*
- *Your ride must include both building and programming.*
- *You must show me a plan for your ride before you start building/programming.*

Elicit and answer student questions. As needed, facilitate a brainstorming session to generate possible ride ideas.

Review expectations for the afternoon showcase to prepare the students for guests.

Allow planning time. Circulate to discuss each plan with pairs to confirm that the plan is feasible in the available time and to identify ways to support students as they build and program.

Once you have approved a pair's plan, encourage them to build and program.

Lunch
Time: 30 minutes

Showcase Preparation
Time: 45 minutes
Materials:

- LEGO® Education SPIKE™ Essential sets
- Devices with LEGO® Education SPIKE™ App
- Student journals
- Pencils
- Markers
- Colored pencils
- Construction paper

Allow additional building and programming time, supporting students in creating models that can be completed in the allotted time. You may need to help them scale back their plans. After the rides are complete, have students test them and make any necessary fixes.

If pairs finish early, have them make construction-paper placards for their rides, including their names and the name or a picture of their ride.

Showcase
Time: 60 minutes
Materials:

- Student projects—SPIKE Essential amusement park rides (LEGO® Education SPIKE™ Essential sets and devices with LEGO® Education SPIKE™ App)
- Student journals
- Charts created during the week
- Pictures from the week
- Videos from the week

Students should be set up and ready when guests arrive.

After welcoming guests and introducing them to the week's theme, have student pairs take turns presenting their ride. Invite guests to circulate to watch the rides run with minifigures on board.

Clean Up, Wrap Up, and Celebrate
Time: 45 minutes
Materials:

- Student journals
- SPIKE Essential sets
- Certificates of Completion

Have students disassemble their rides and return the pieces to their sets. Conduct complete inventories, assigning a location for extra pieces and noting sets with pieces that are missing. Make sure devices are powered off and stored.

Have students clean up materials from the showcase.

Celebrate all the students and their rides and all they have learned.
You can present each student with a certificate of completion.
Students can take home their journals.