LEGO® Education

Maze Map Treasure Hunt

Unplugged Activity

Explore Introductory Computer Science Sequences

Teacher Facilitation Notes

Objective:
Students will be able to create an algorithm for moving a LEGO® creation through a maze.

Audience:
Use with elementary or middle school students.

Suggested Duration:
30 – 45 min

CSTA Standards:

- **Elementary**
  - **1A-AP-08** Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.
  - **1A-AP-11** Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.

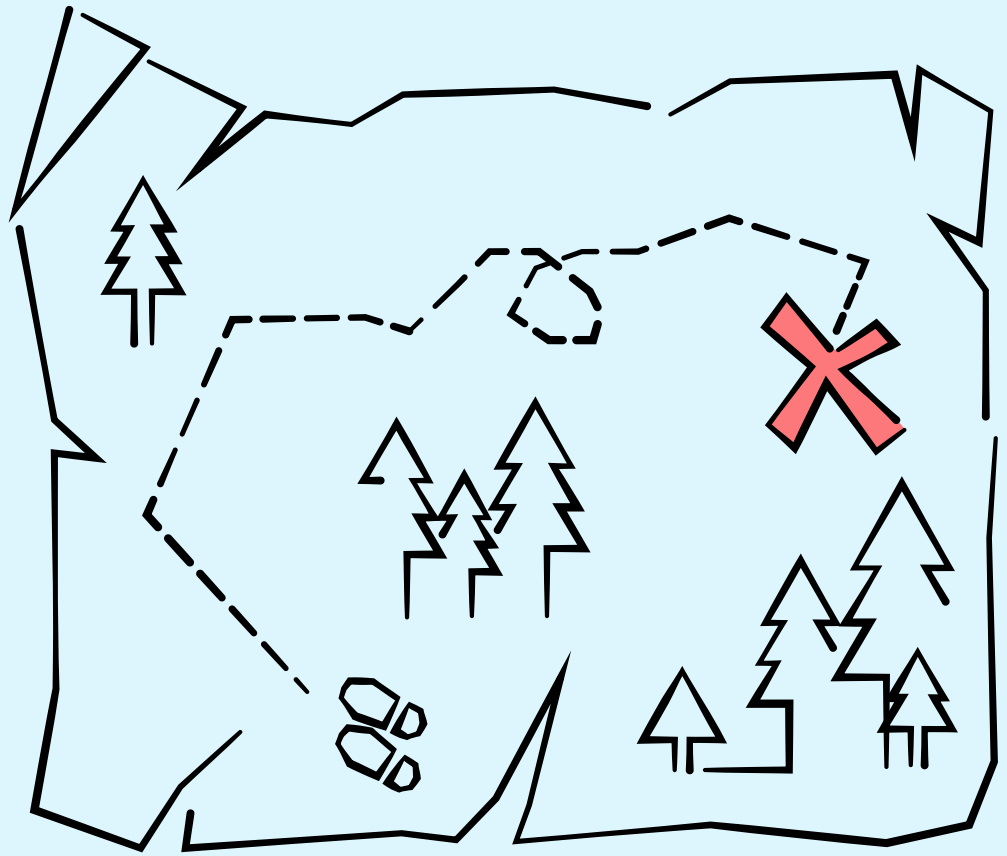
- **Middle**
  - **2-AP-10** Use flowcharts and/or pseudocode to address complex problems as algorithms.
  - **2-AP-13** Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.

Vocabulary:
- **Sequence** - A set of steps in a certain order
- **Algorithm** - A list of steps to finish a task
- **Decomposition** - Breaking a problem into smaller pieces or tasks

Teacher Facilitation Notes

Prepare:

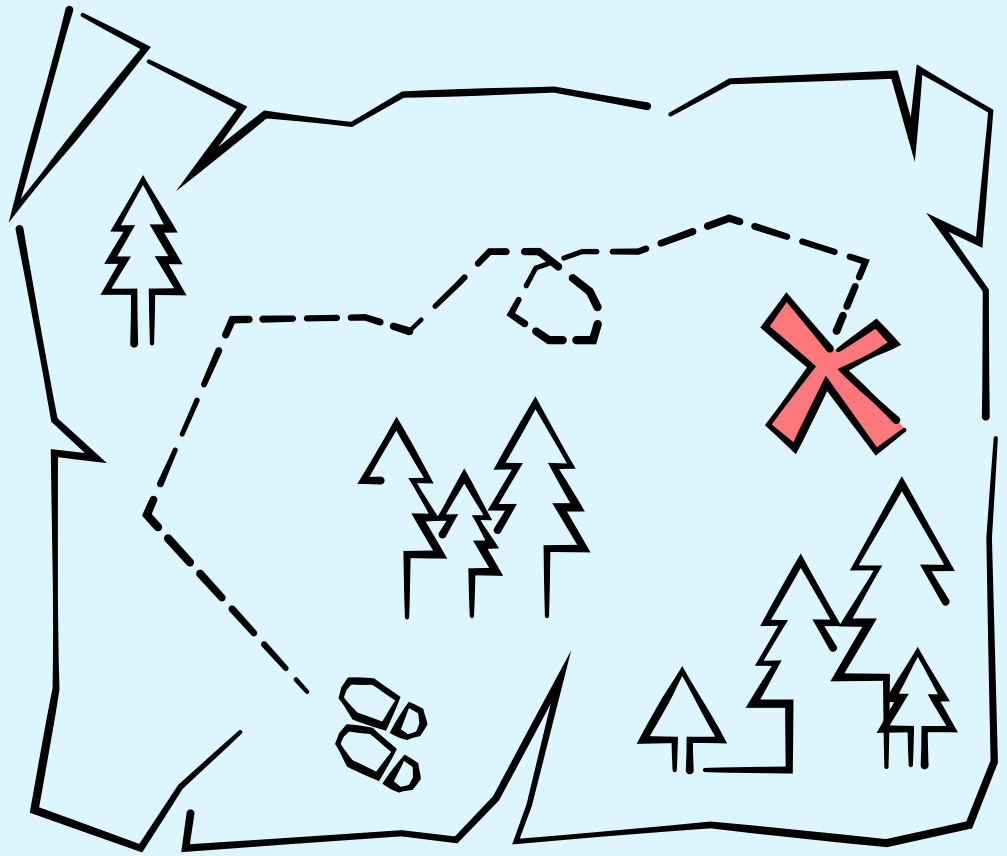
- Students will build something to navigate through the treasure map maze. Students may use
  - LEGO® Education SPIKE™ Prime sets.
  - LEGO® Education SPIKE™ Essential Sets
  - Any available LEGO® bricks or elements
  - Classroom or craft materials
- Gather the following materials for the lesson:
  - Copies of maze sheets
    - Alternatively, you may draw grids using copy paper or chart paper
  - Copies of arrows, Icon blocks, or Word blocks
  - Scissors



Teacher Facilitation Notes

Engage:

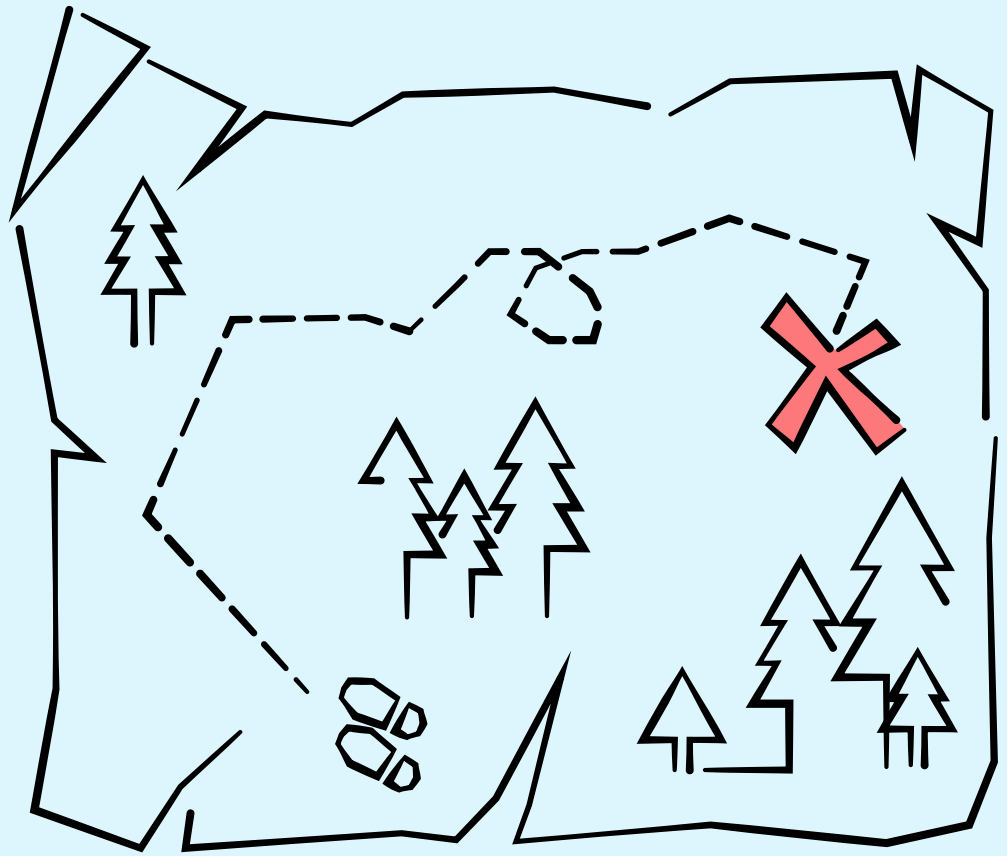
- Have students give directions to a place located in the school, such as the cafeteria or playground, from the classroom.
- Ask students:
  - *Describe how to get to the location you chose in the school from our classroom.*
- *Write the student-dictated directions.*
- *Have students follow their directions to check for accuracy. Ask questions to help the students realize they may need to add additional details into their directions to get to the destination. Consider asking questions like:*
  - *How do you know how far down the hall to go?*
  - *How could you measure how far to go (in steps, in feet, in hops)?*
  - *Did you describe which way to turn properly?*
- *After the first attempt to follow directions, ask students to imagine a robot or a computer following the directions – it can only follow exact directions written in code. In computer science, this is called an algorithm, or step-by-step directions in code to complete a certain task.*



Teacher Facilitation Notes

Engage:

- *Ask your students to re-write the directions with as much detail as possible.*
  - *Are your directions correct to get to the desired destination?*
  - *What do you need to add to the directions to make them better?*
- *Have students follow their new directions to reach the destination using the additional details.*
  - *Ask students what was different about follow the directions this time?*
  - *What happens when you do not have the right directions or enough detail?*
- *Wrap up the engage section, by having a class discussion on sequences. Each direction that was written down was like a step in a line of code. Each step tells the robot or computer one thing. Steps are combined into a list of step-by-step directions or an algorithm to explain what to do. When we have a big problem, we often decompose, or break down, the problem into smaller and more manageable steps.*



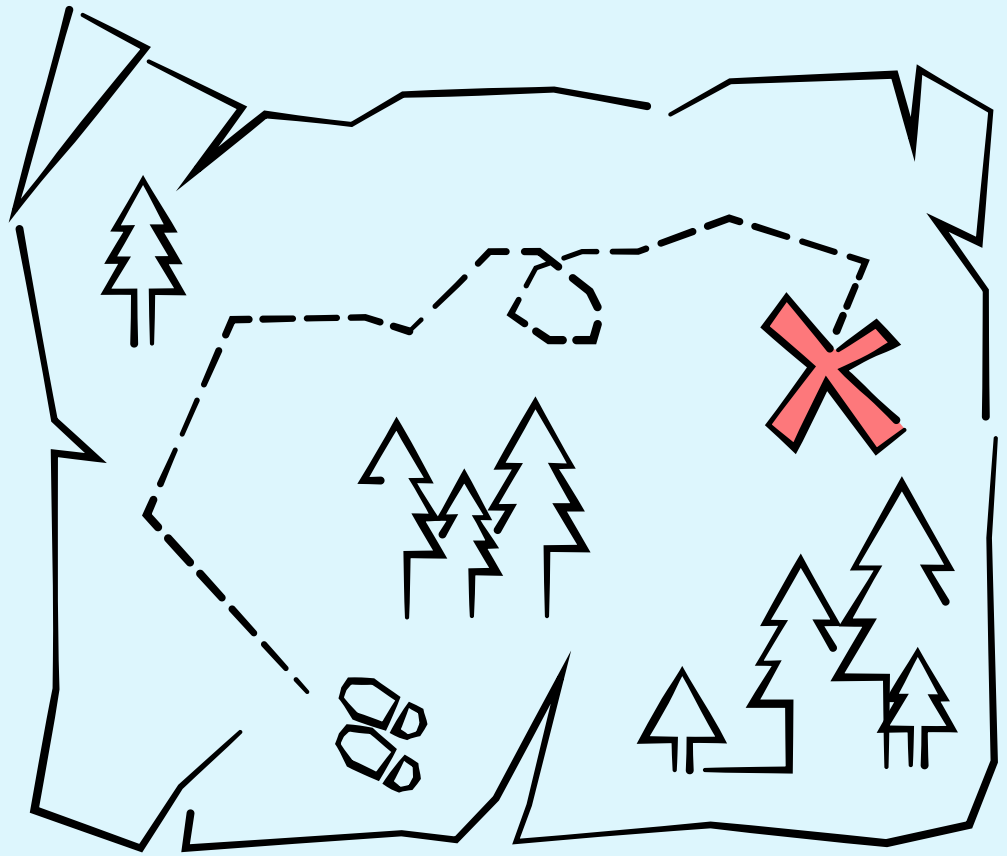
Teacher Facilitation Notes

Create and Explore:

- Distribute copies of arrows, Icon blocks, or Word blocks to students.
- Have students cut out the arrows or code blocks.
  - Alternatively, first model for the class using arrows or code blocks. Demonstrate how to use the arrows or blocks to represent a sequence.
  - Consider using the arrow or code blocks to model a sequence of steps to get from one location to another desired location within the school.

- Have students build a character to navigate their maze and seek the buried treasure. You may use:
  - LEGO® bricks
  - LEGO® Education SPIKE™ Essential bricks and elements
  - LEGO® Education SPIKE™ Prime bricks and elements
  - Classroom or craft materials

- Have students use the maze sheet to create a path for their character to follow to get through the maze.



Teacher Facilitation Notes

Create and Explore:

Round 1

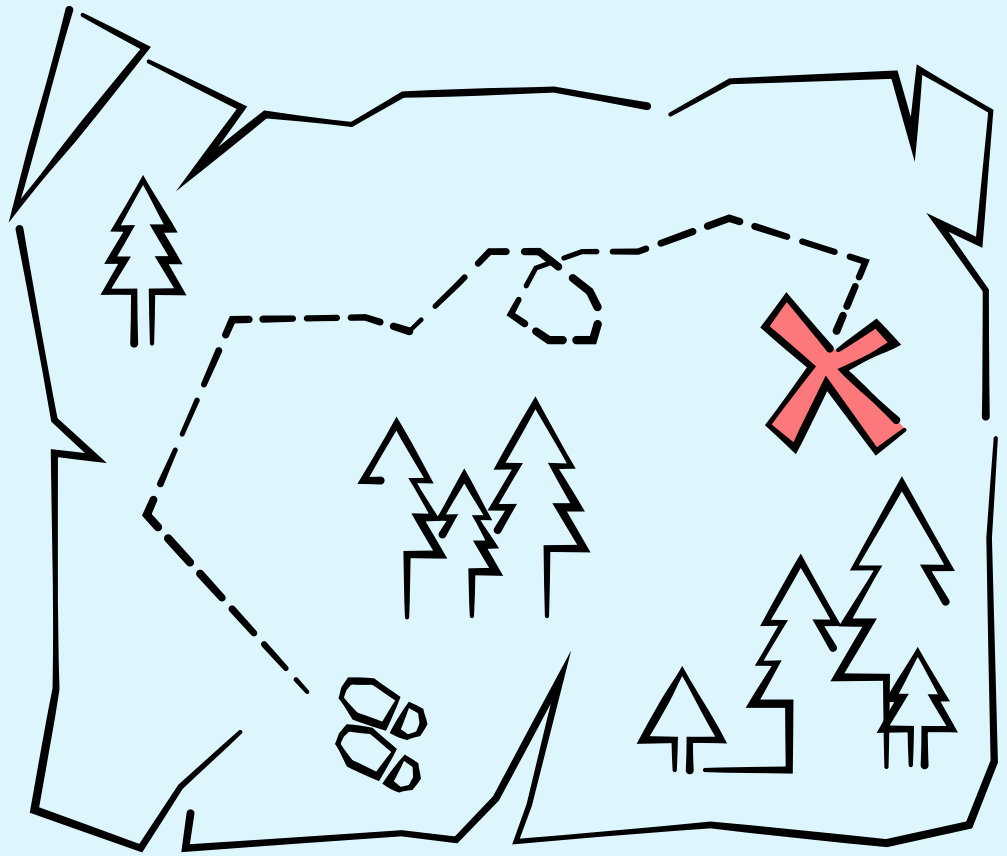
- Give students (or display) maze 1, where students must move the character they designed from the house (start) to the treasure chest (end) of the maze.
- Ask students to place the arrows on the sheet, or use code blocks to indicate the correct path to get from the start to the end.
- Have students move the character according to the arrows or code blocks, acting out and saying each step out loud.
- Allow several students or groups to share the path they chose by explaining their directions.

Round 2

- Repeat the process using maze 2, which includes obstacles the character will have to navigate around to get to the treasure.
- Explain to students that they will have to move around the square icons in the maze which are blocking the path.

Extend:

- Use the blank grid to allow students to design their own maze.
- Students place the house (start) and treasure (end) on the grid. Students may include obstacles on the grid to increase the challenge.



Teacher Facilitation Notes

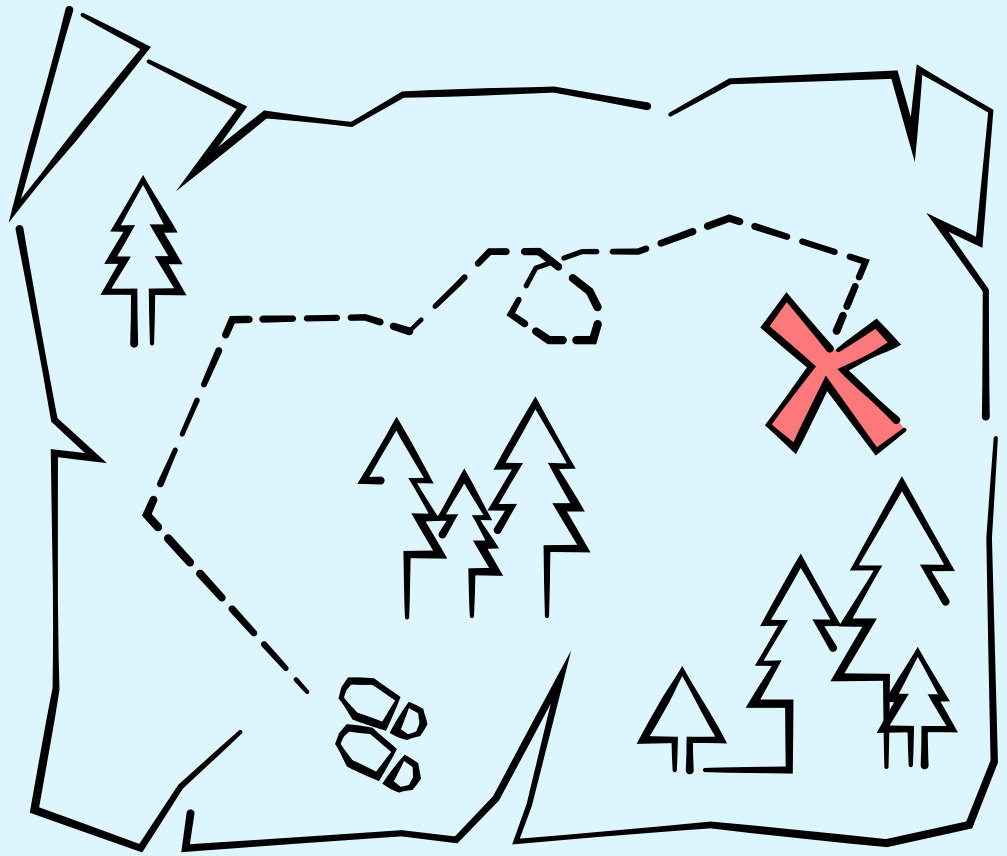
Reflect and Share:

After Each maze experience, ask students:

- What was difficult about this task?
- What was different about this maze than the last one?
- What directions are important to include for this task?
- Could you move the robot in more than one way to get to the treasure?
- Who can get the character to the maze in the fewest steps possible?

At the end of the activity:

- Ask students to share what they learned from completing the maze activities.
- Prompt students to explain why step-by-step directions are important and why we need to include important details.
- Encourage students to use appropriate terminology including sequence, algorithm, and decomposition.

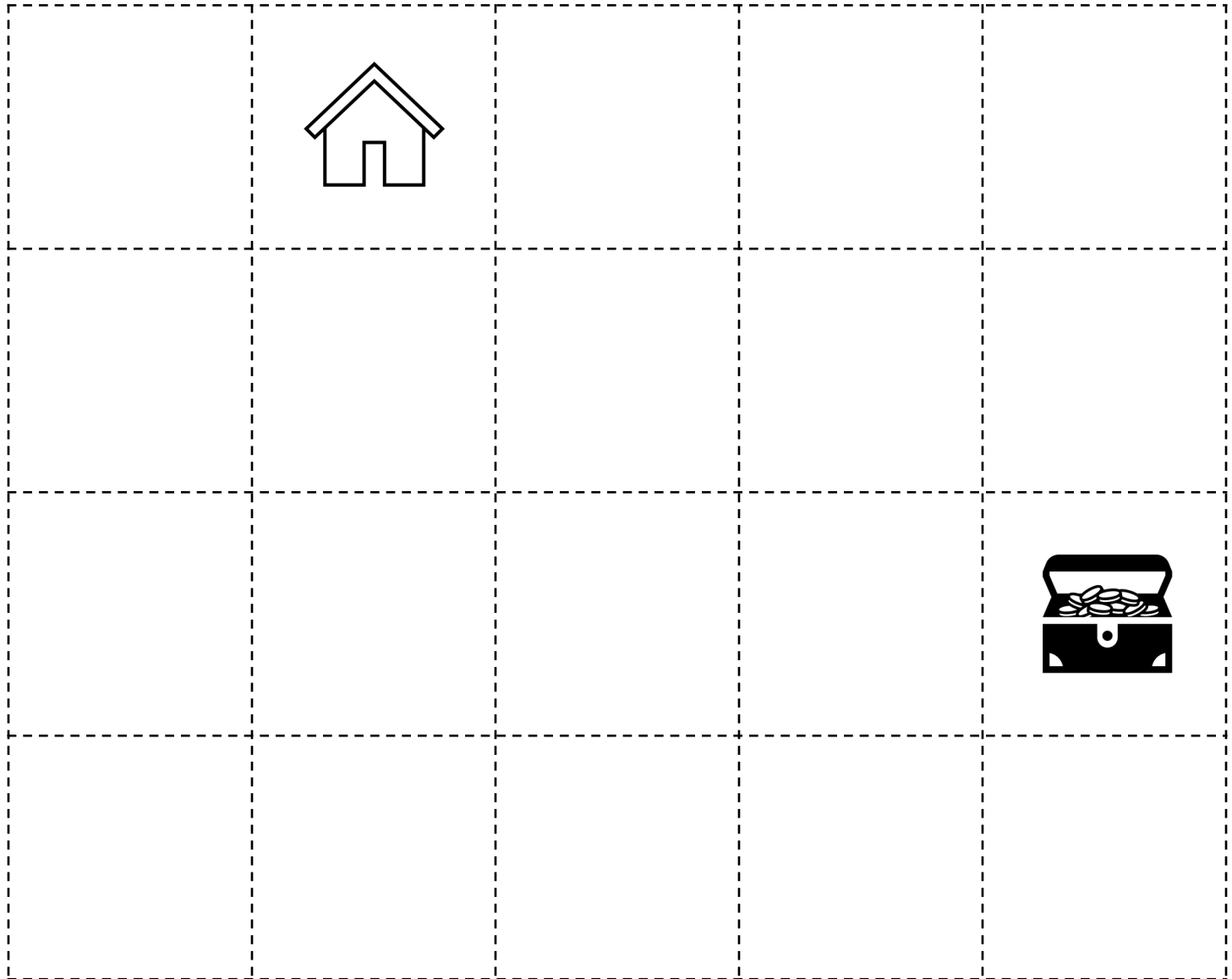


Appendix

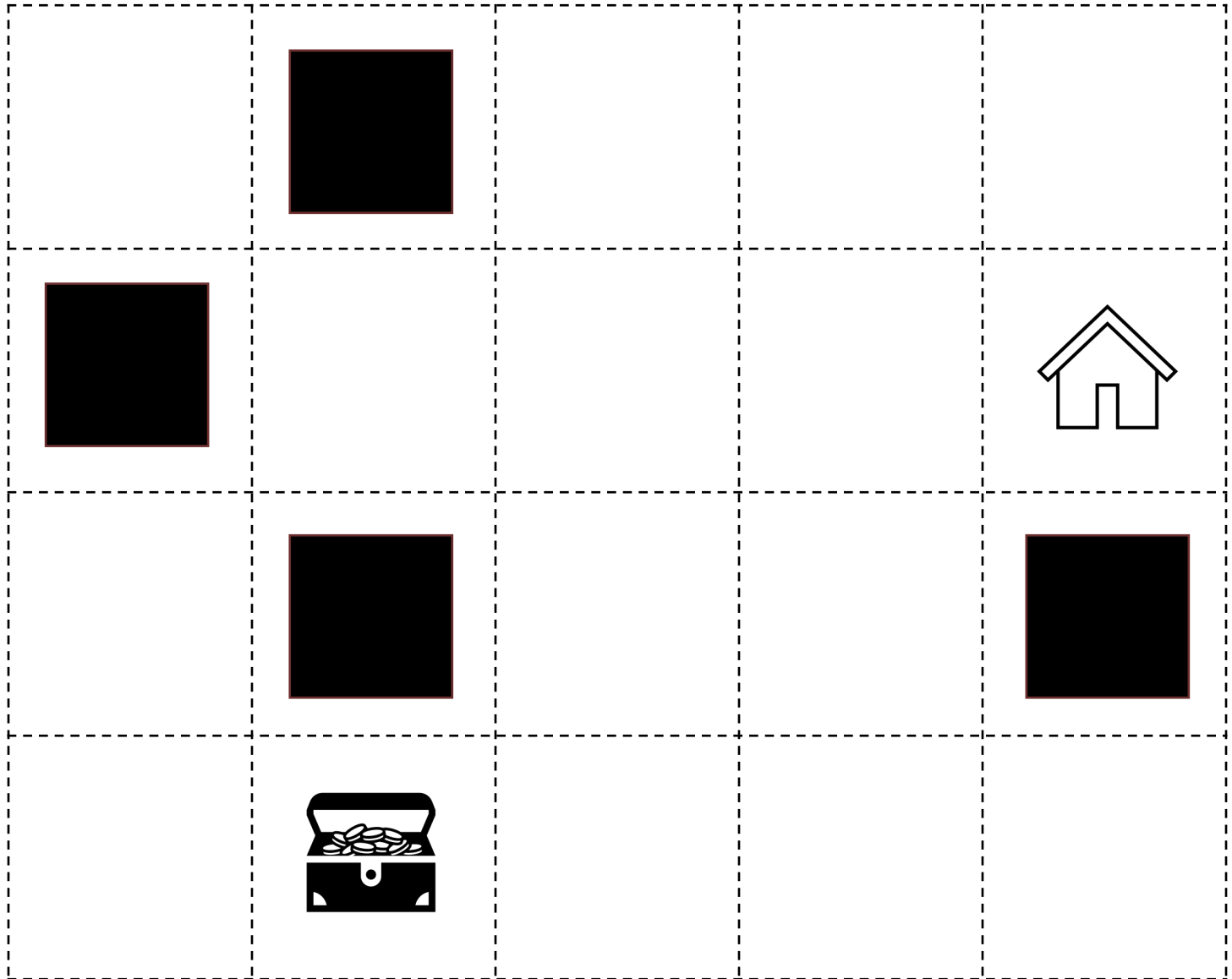
Printable Maps, Code Blocks, and Arrows

Printable Maps

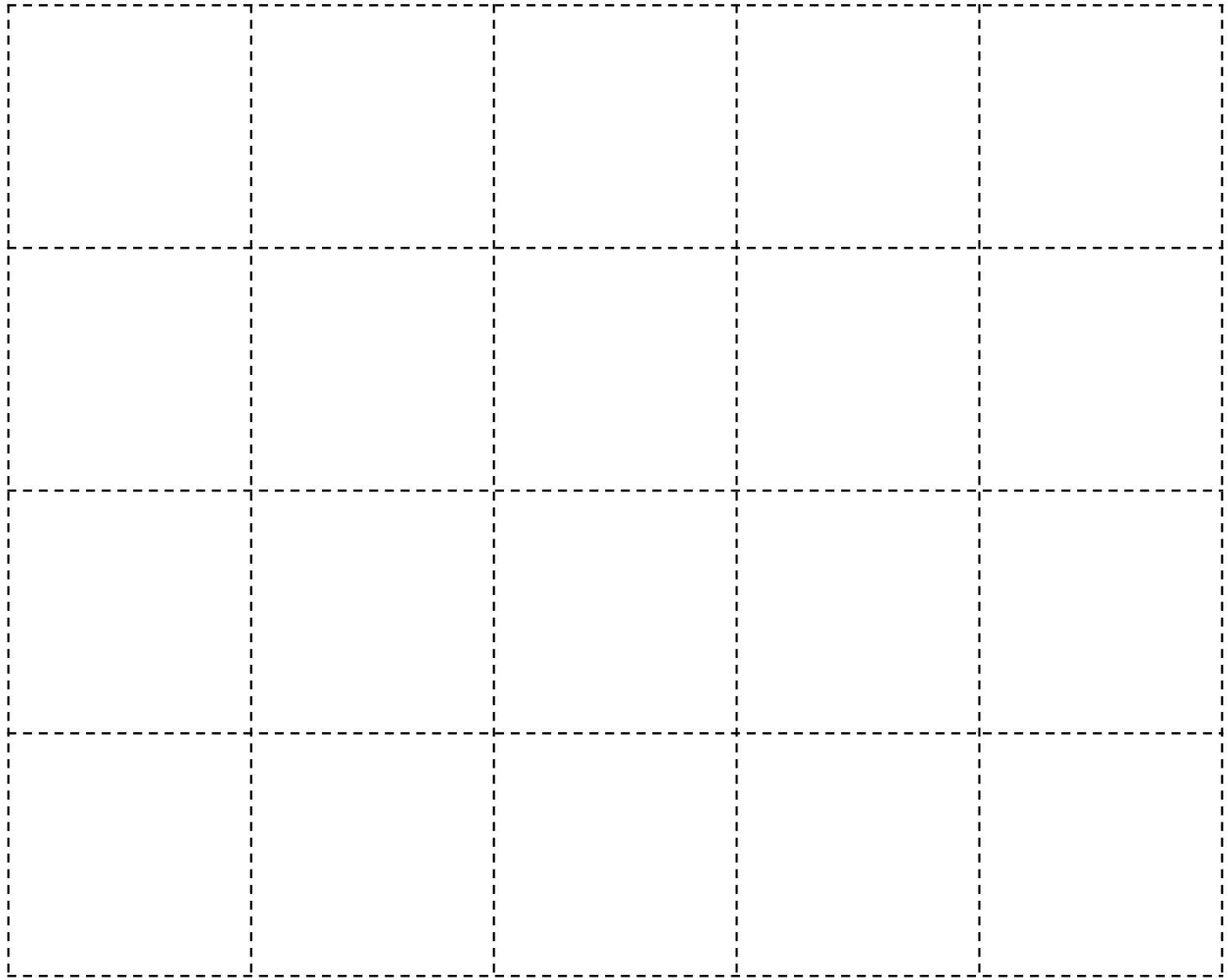
Map 1



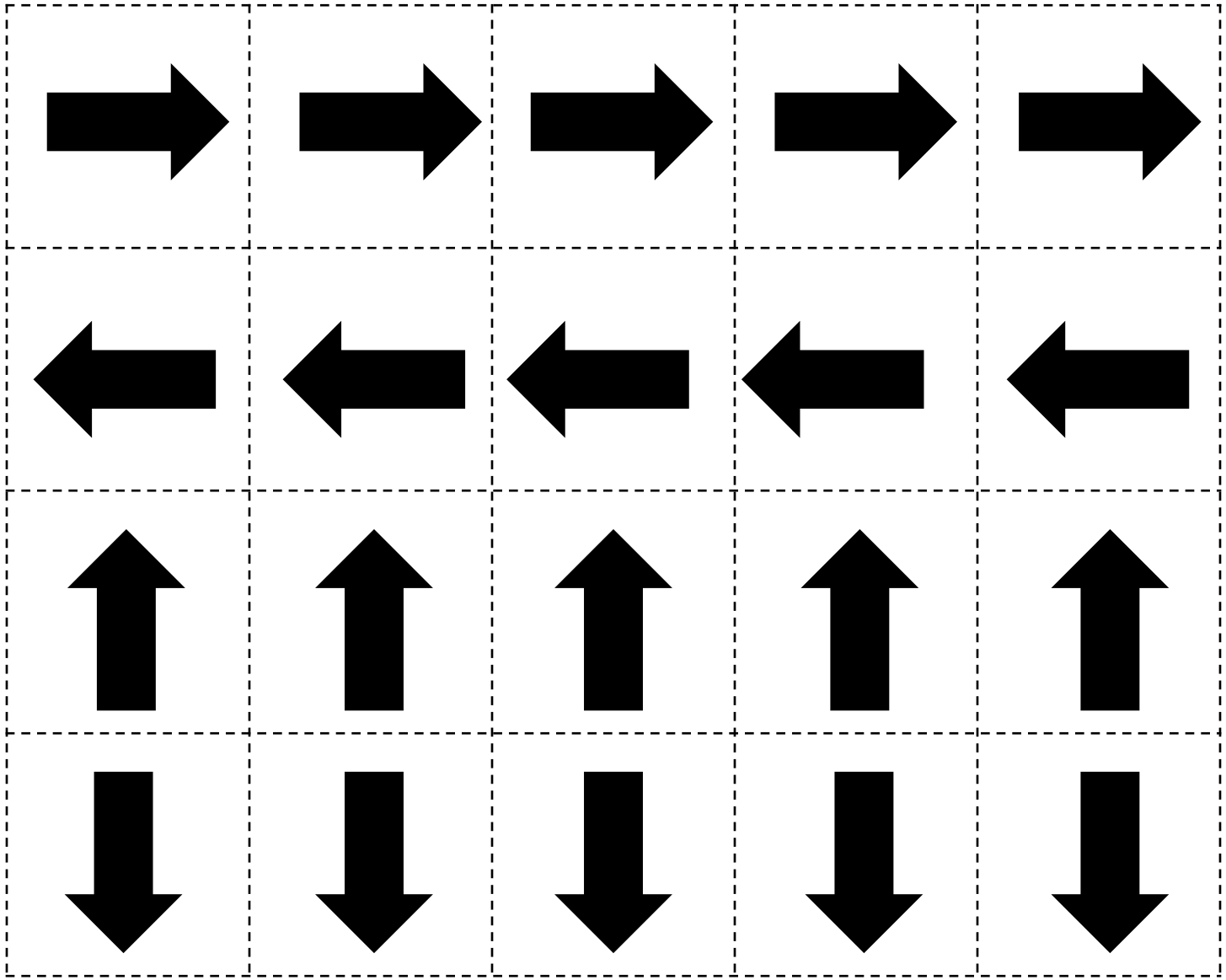
Map 2



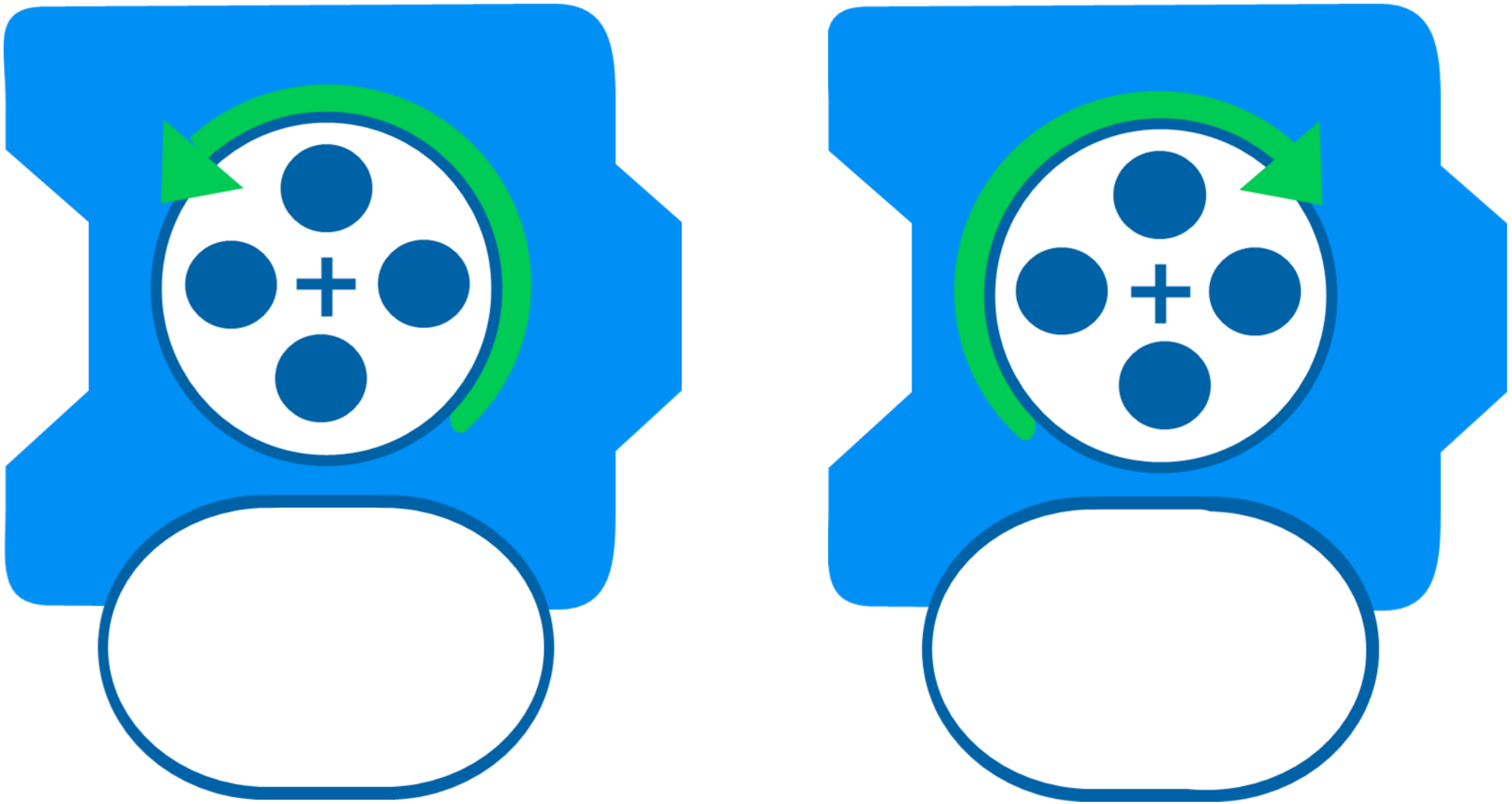
Design Your Own Map

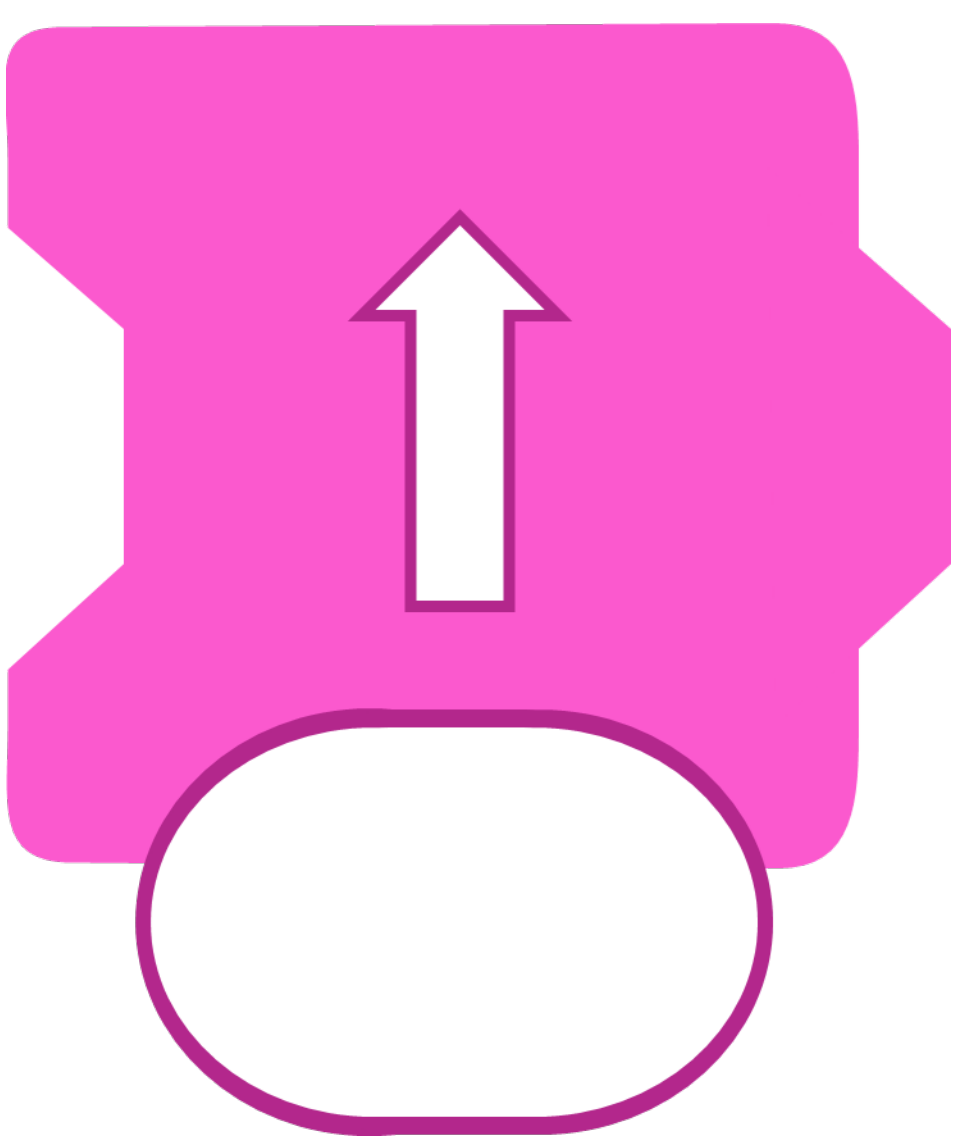


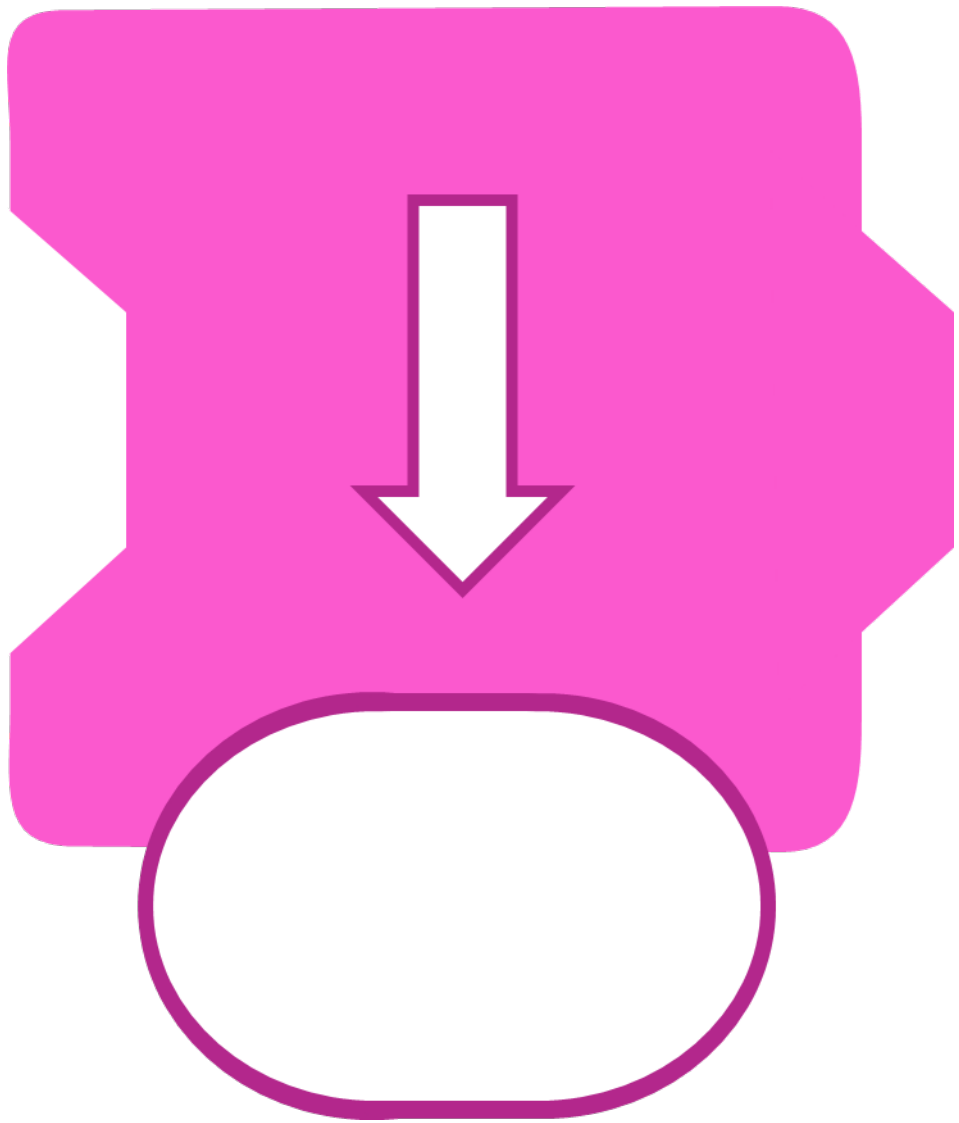
Arrows

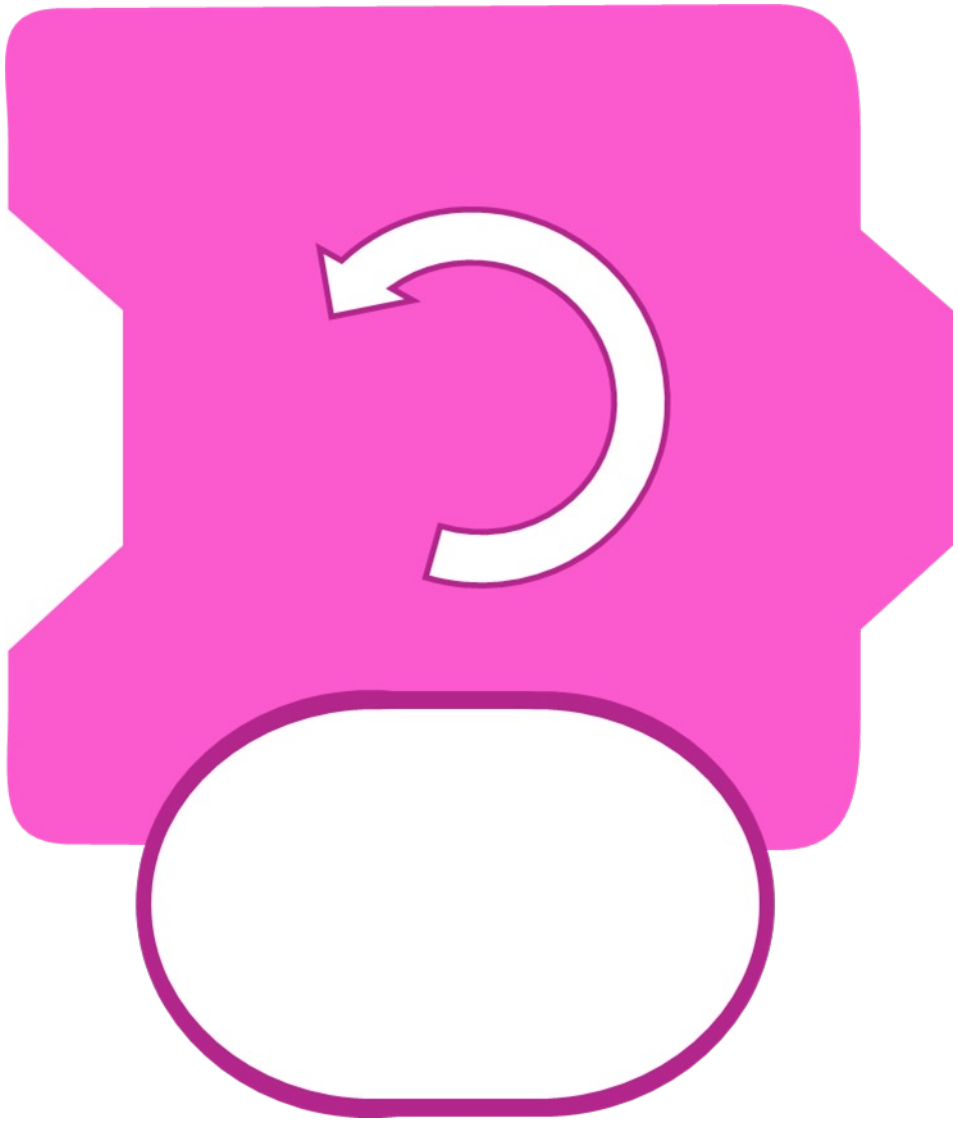


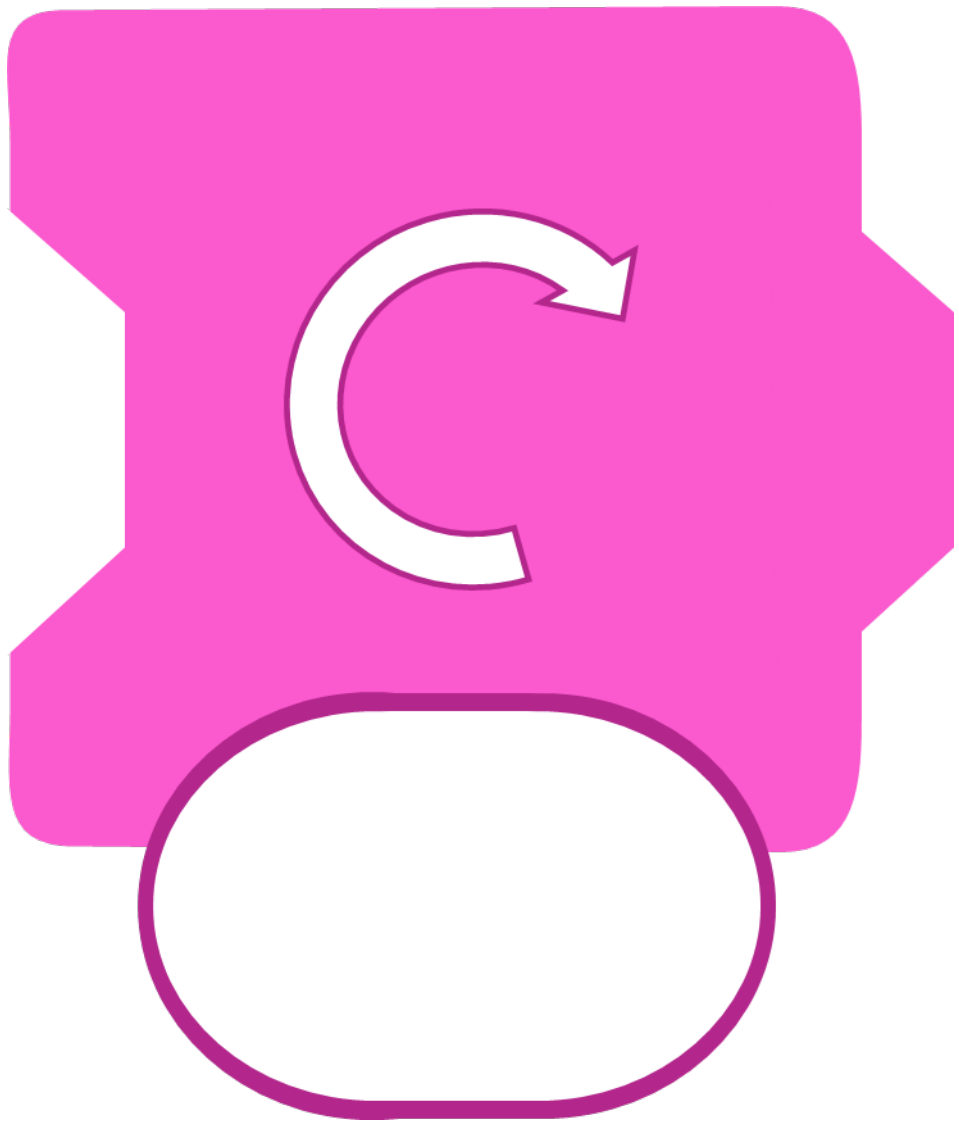
LEGO® Education SPIKE™ App Icon Blocks

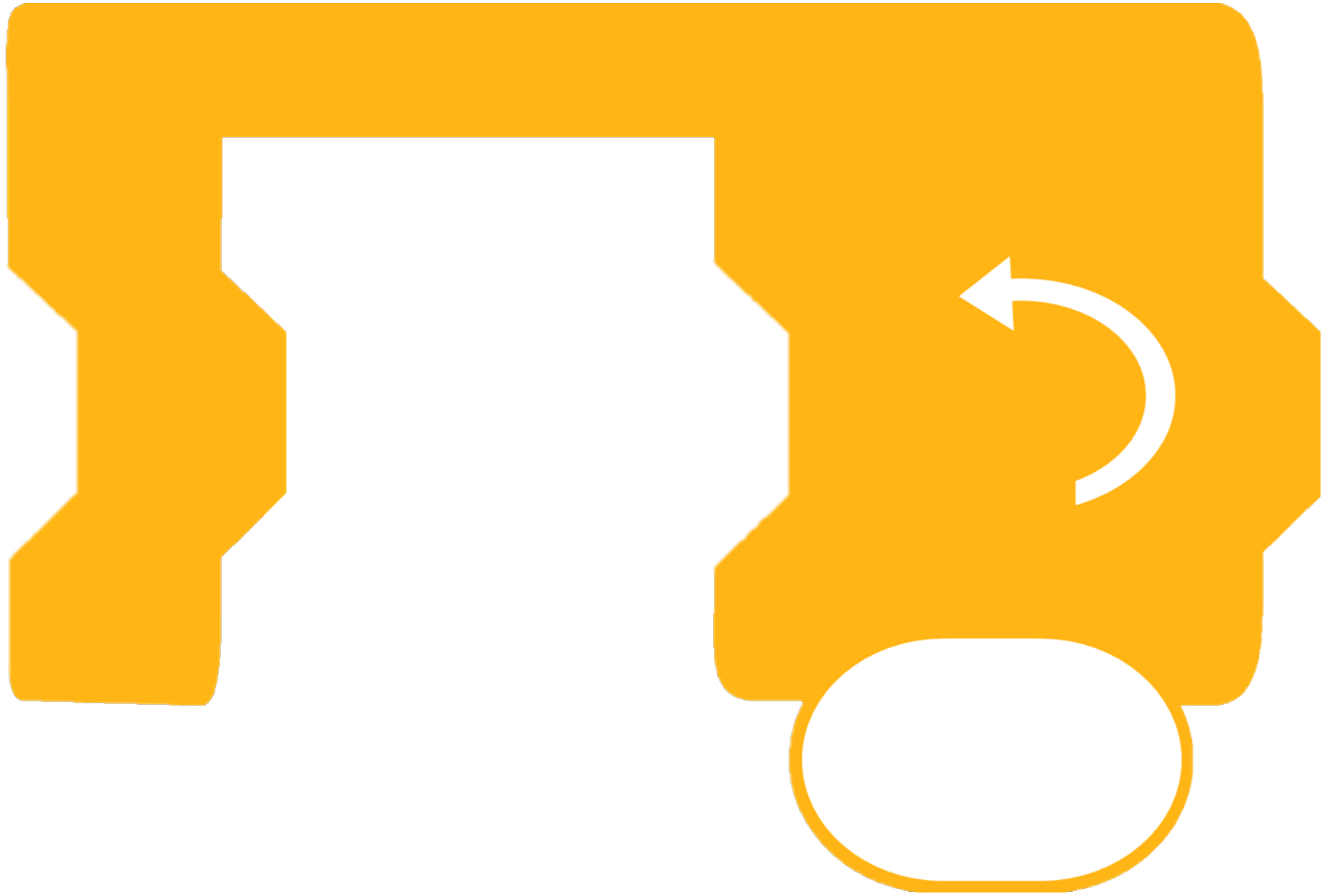


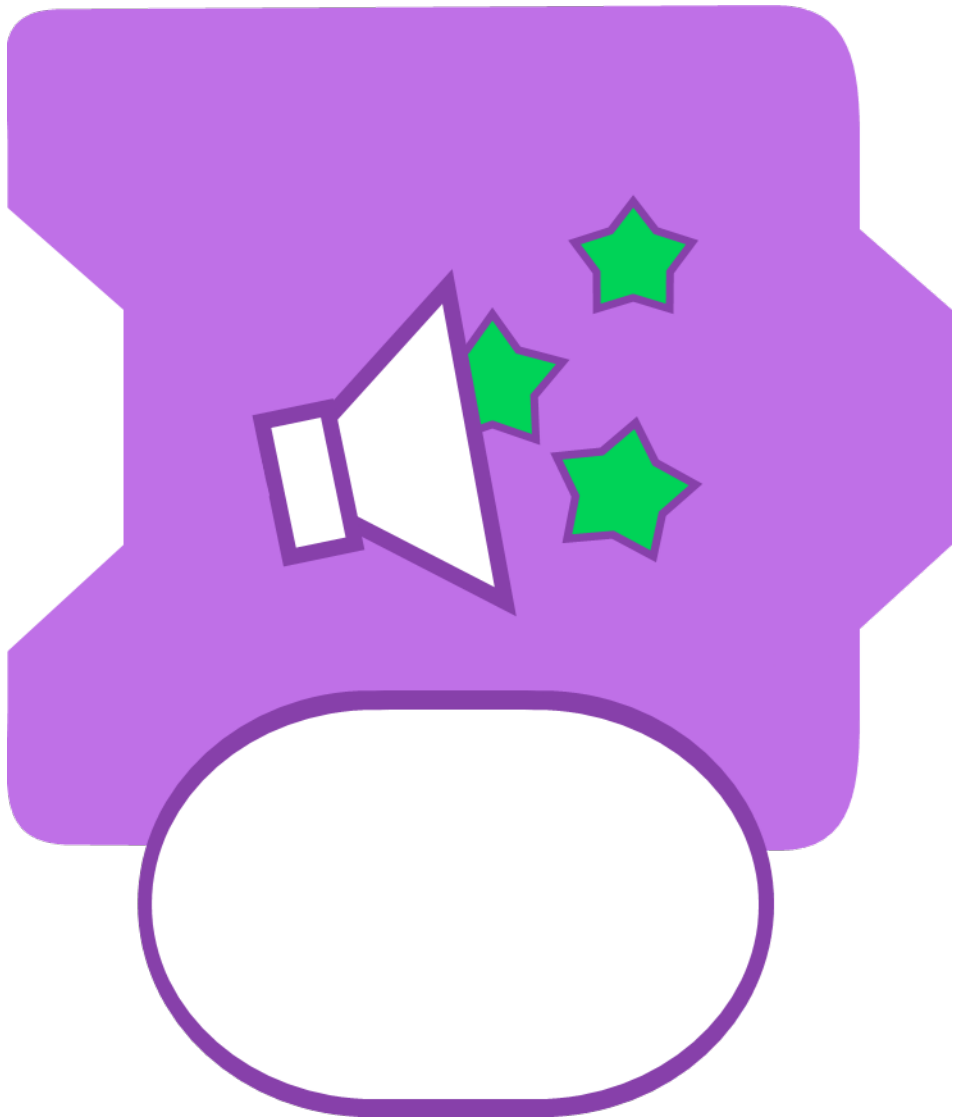






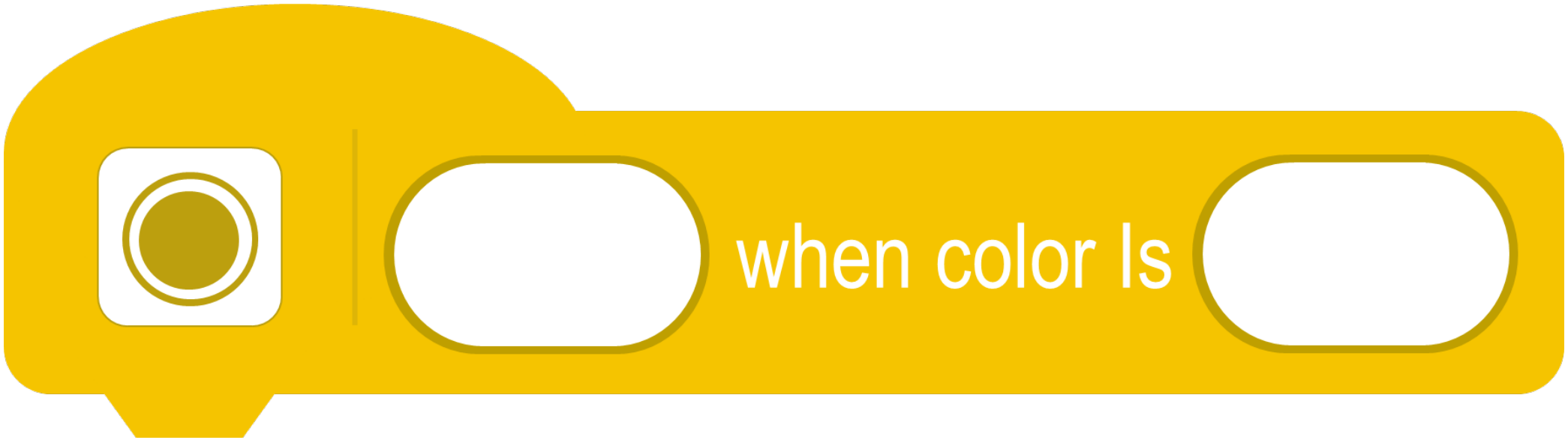


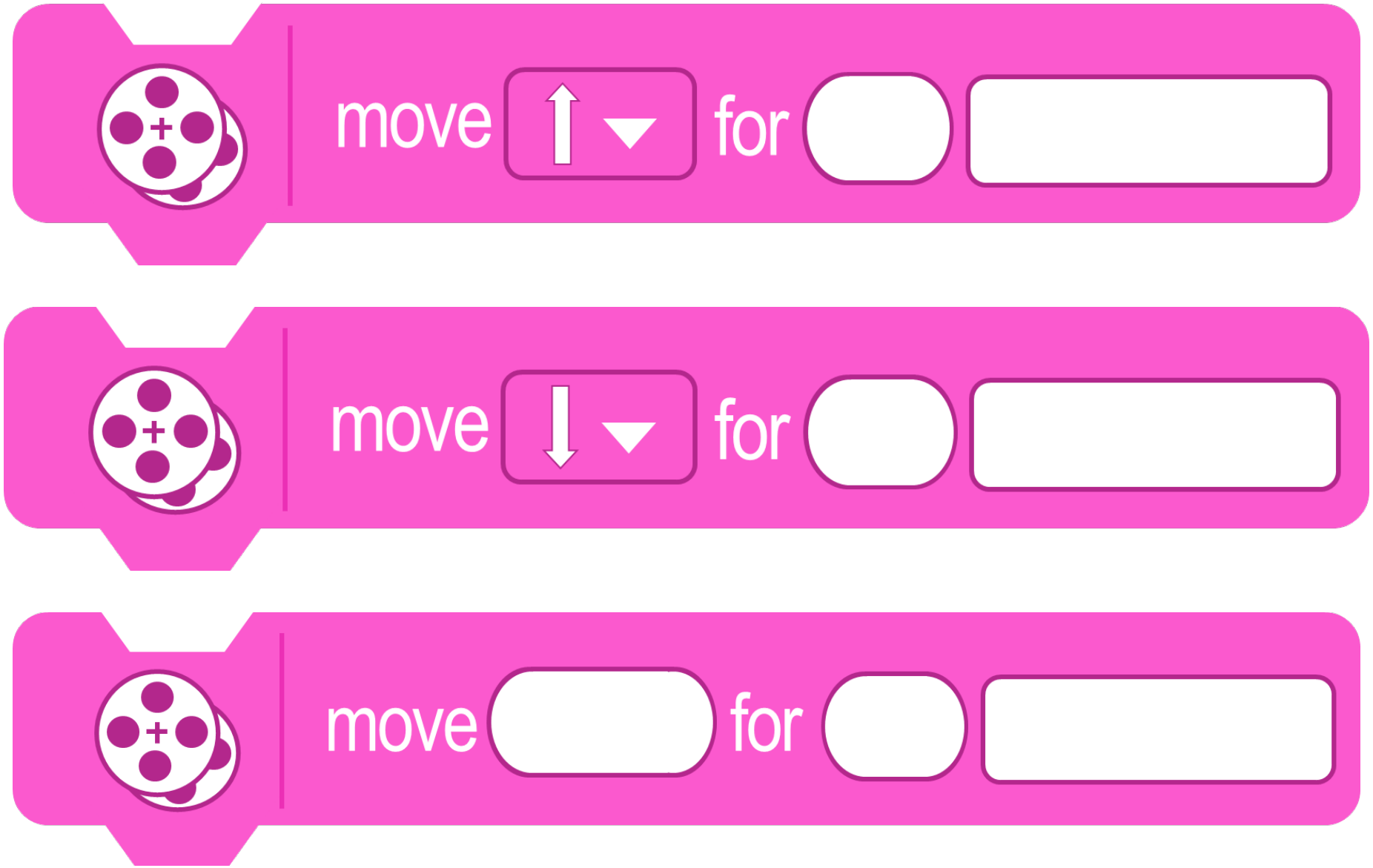




LEGO® Education SPIKE™ App Word Blocks


when program starts


when color Is


move
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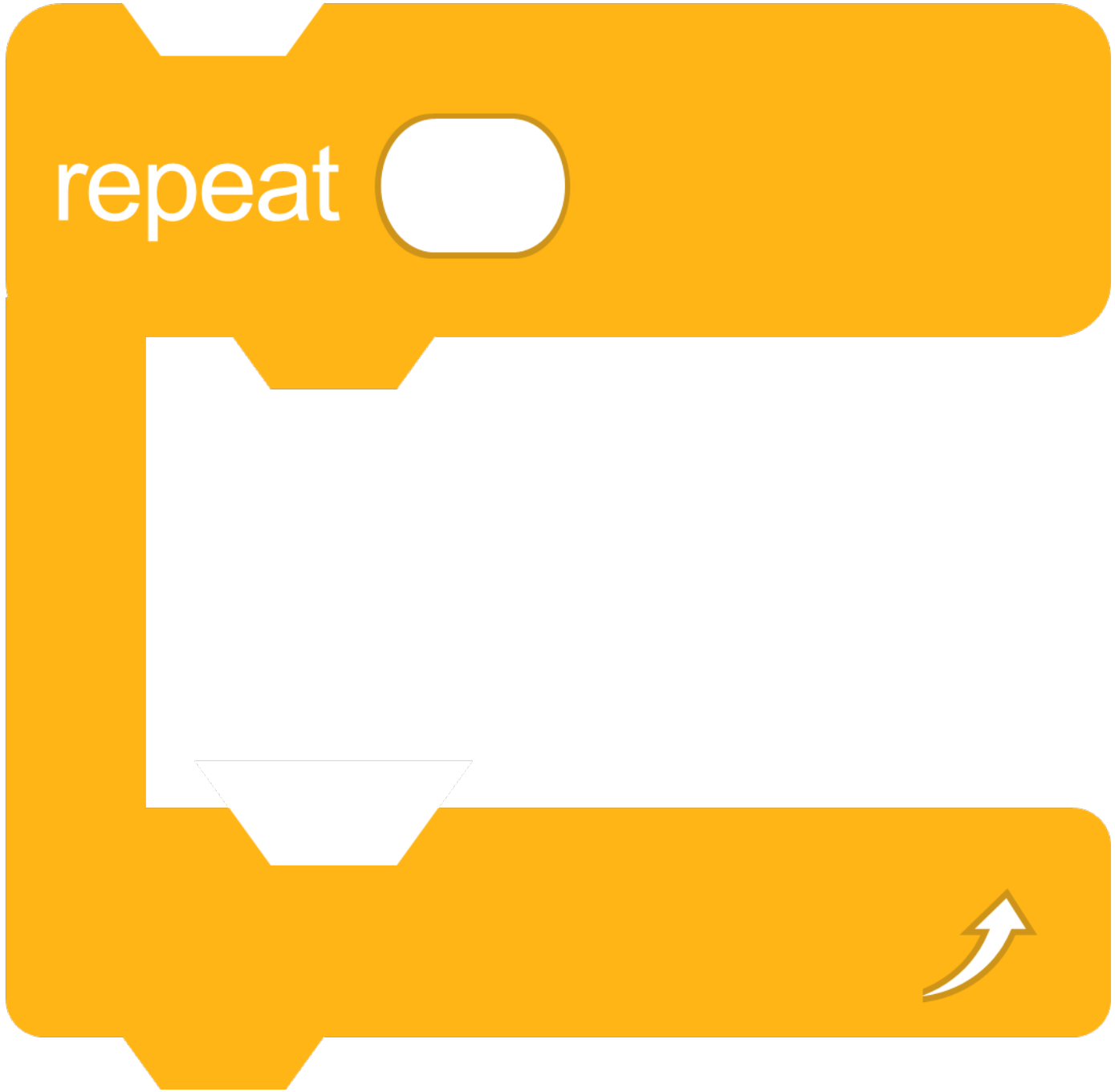
repeat

Appendix: Explore More

Explore More:

LEGO® Education SPIKE™ Essential Lessons:

- Arctic Ride – explore additional movement and maze algorithm challenges
- Taxi! Taxi! – identify and fix errors in a program (test and debug) to navigate the taxi to an intended designation
- Big Bus – improve a program to meet a specific need – navigate the bus to the intended destination

LEGO® Education SPIKE™ Prime Lessons:

- Training Camp 1: Driving Around – make precise and controlled movement
- Going the Distance – explore estimation to evaluate distance and program precise movement

LEGO® Education Community – Activities and Challenges