



Create a Generation of Problem Solvers

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Follow Along and Share Your Experience



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#CSEdWeek
#EiEcomputes



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Welcome

#CSEdWeek

Robot Game:
Programming Your Family

Audience: Parents





Where are you located?



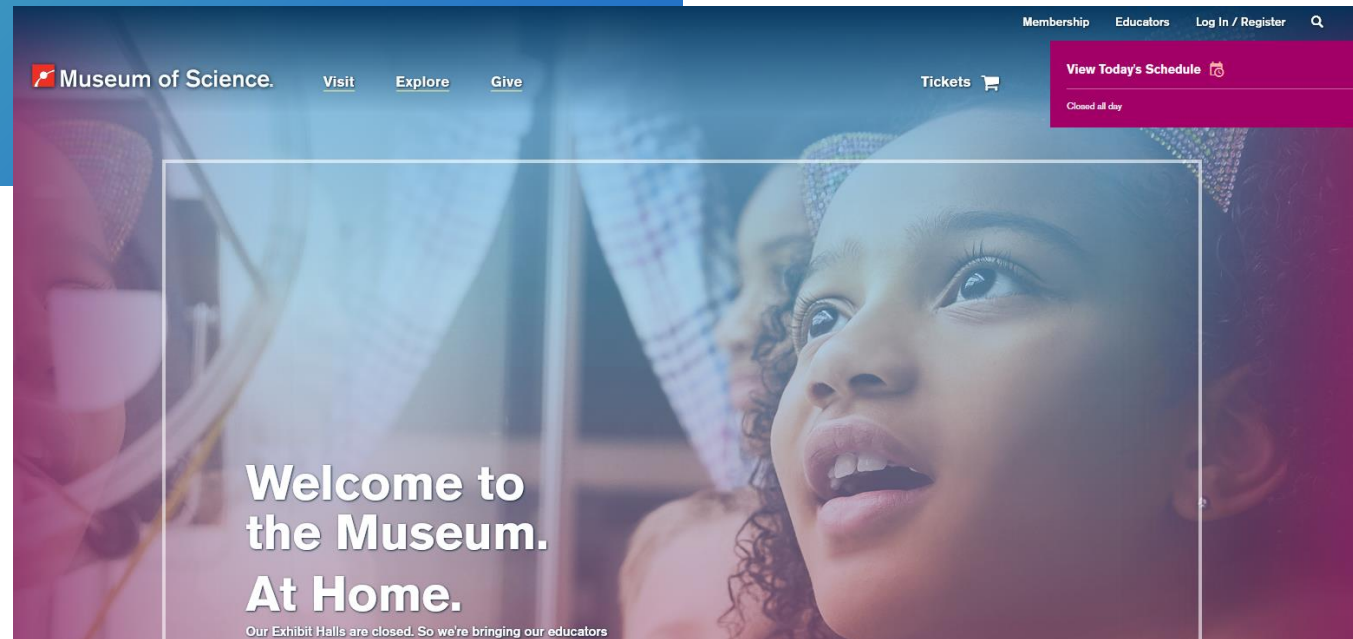
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What is the Museum of Science, Boston?



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Professional Development



DO try this at home!

**We've made it easy for you to
implement this STEM resource
at home!**

As we go through the activity, keep in mind that it is designed to be either

- read by learners on their own or
- presented as a webinar to learners.

This slide presentation and the materials for this activity are available online. [Stay tuned for the web address.](#)



Goals:

During this webinar, parents, educators, and influential adults will:

- experience an "unplugged" computer science activity as a learner
- gain guidance to facilitate the Robot Game at home



Goals:

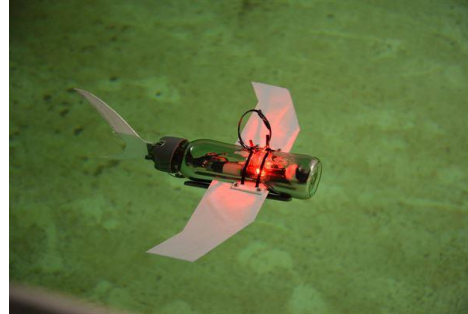
During this activity, learners will:

- apply computational thinking while creating algorithms to move a robot from start to finish.
- have fun as they practice decomposition and debugging.



What is a Robot?

Robots are machines
that can be
programmed to carry
out tasks on their
own.



Robots Are Everywhere!

Scientists and engineers around the world develop robots to help solve different problems.

Robots are able to do jobs that are dangerous or boring for humans such as

- lifting heavy loads,
- handling toxic substances, and
- performing repetitive tasks.



**How does a
robot know
what to do?**



**Robots are
computers.
They need to
follow instructions
the same way
a computer does.**



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How does a person tell a computer what to do?

People create **algorithms** to tell
computers what to do.

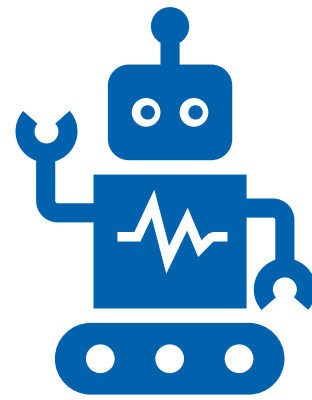
*...what is an **algorithm**?*



“Code Words”

Algorithm	a set of step-by-step instructions to complete a task
Program	an algorithm expressed in a way that a computer understands
Code	instructions in a computer program

Tip: The word “code” is singular in computer science.



The Robot Game

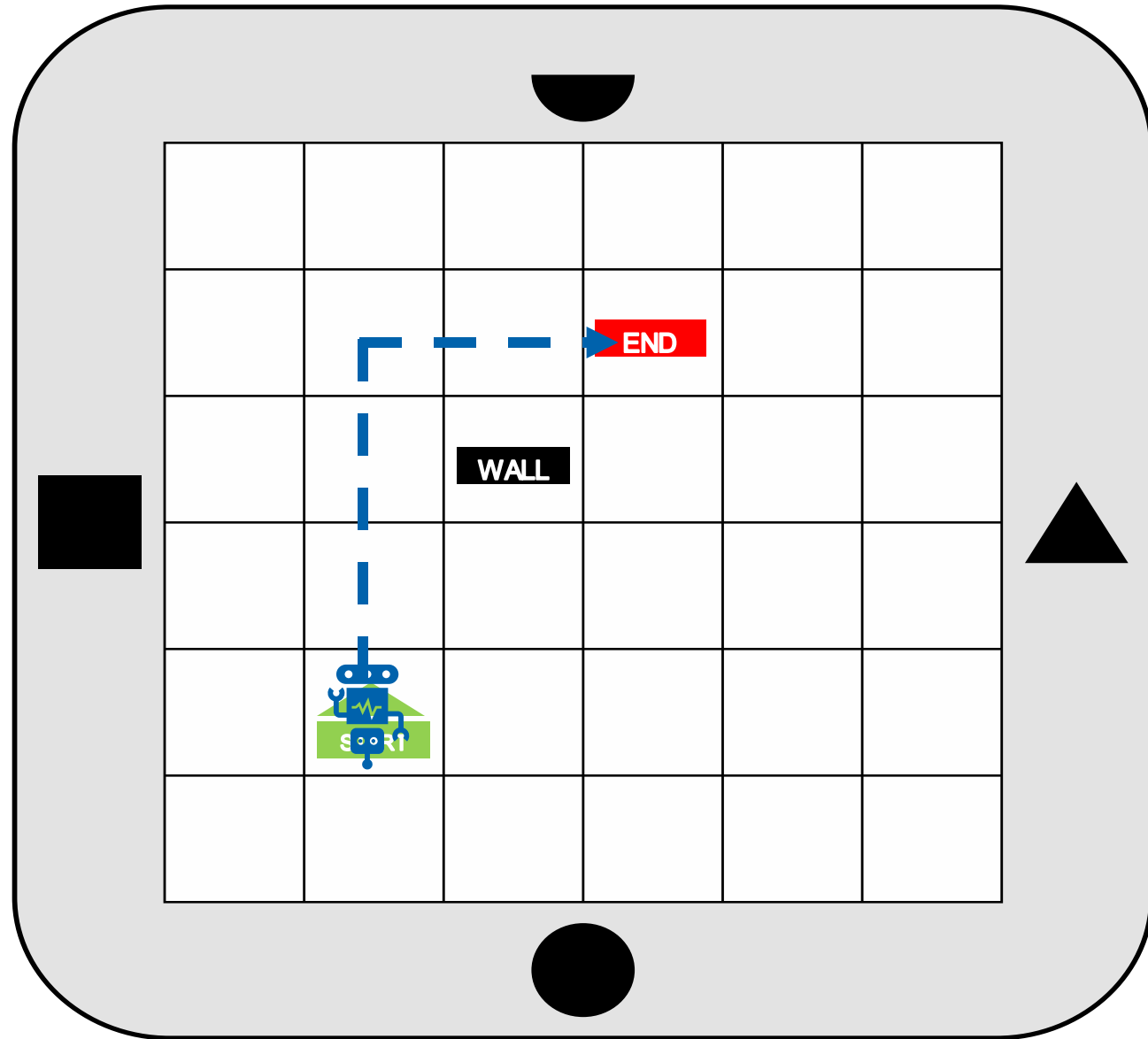
Now we are going to do an activity where we act like robots.

This means you will need to follow instructions in the same way a computer would.

You will also write **algorithms** for robots to follow.

GOAL

- ✓ Program the robot to get from **START** to **END**.





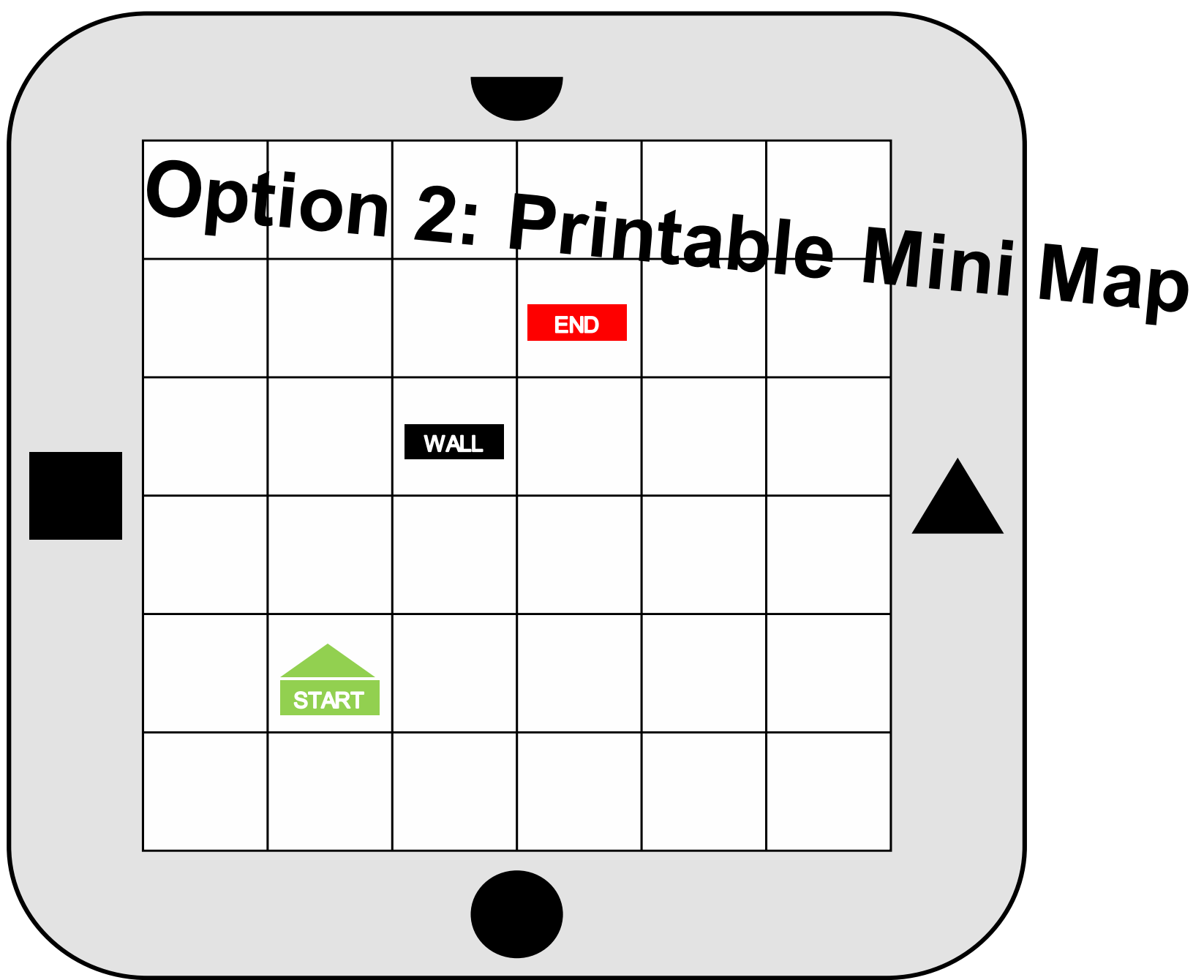
Option 1: Floor Map

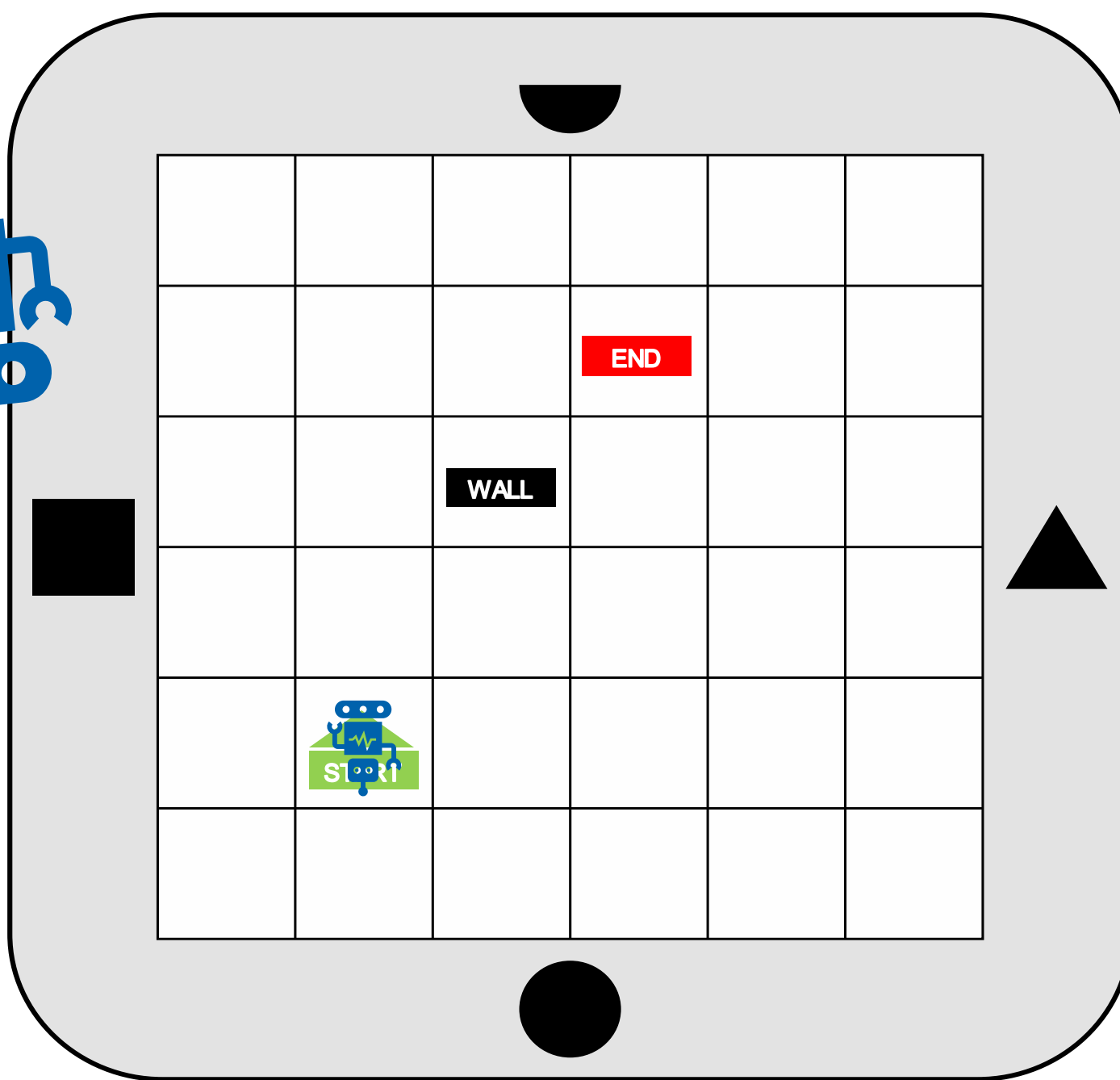
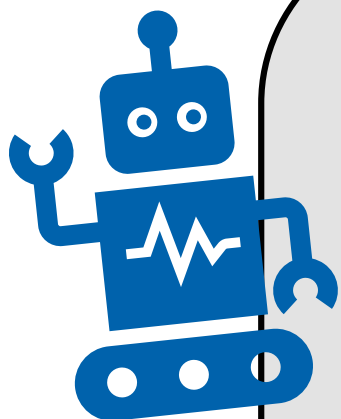


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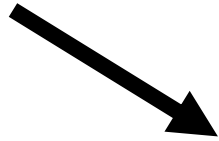
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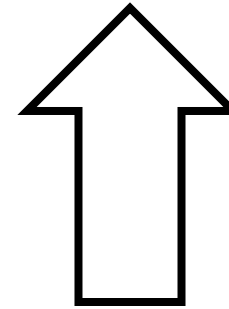
Algorithm Sheet



**Record each
step by circling
code symbols**

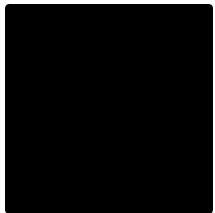
Step 1:	    	START
Step 2:	    	
Step 3:	    	
Step 4:	    	
Step 5:	    	
Step 6:	    	
Step 7:	    	

Code Symbols

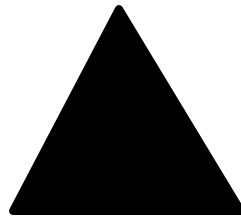


Arrow

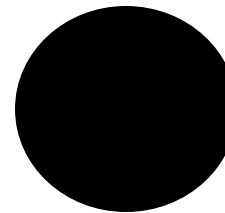
Movement



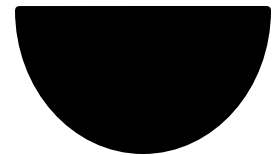
Square



Triangle



Circle



Half-circle

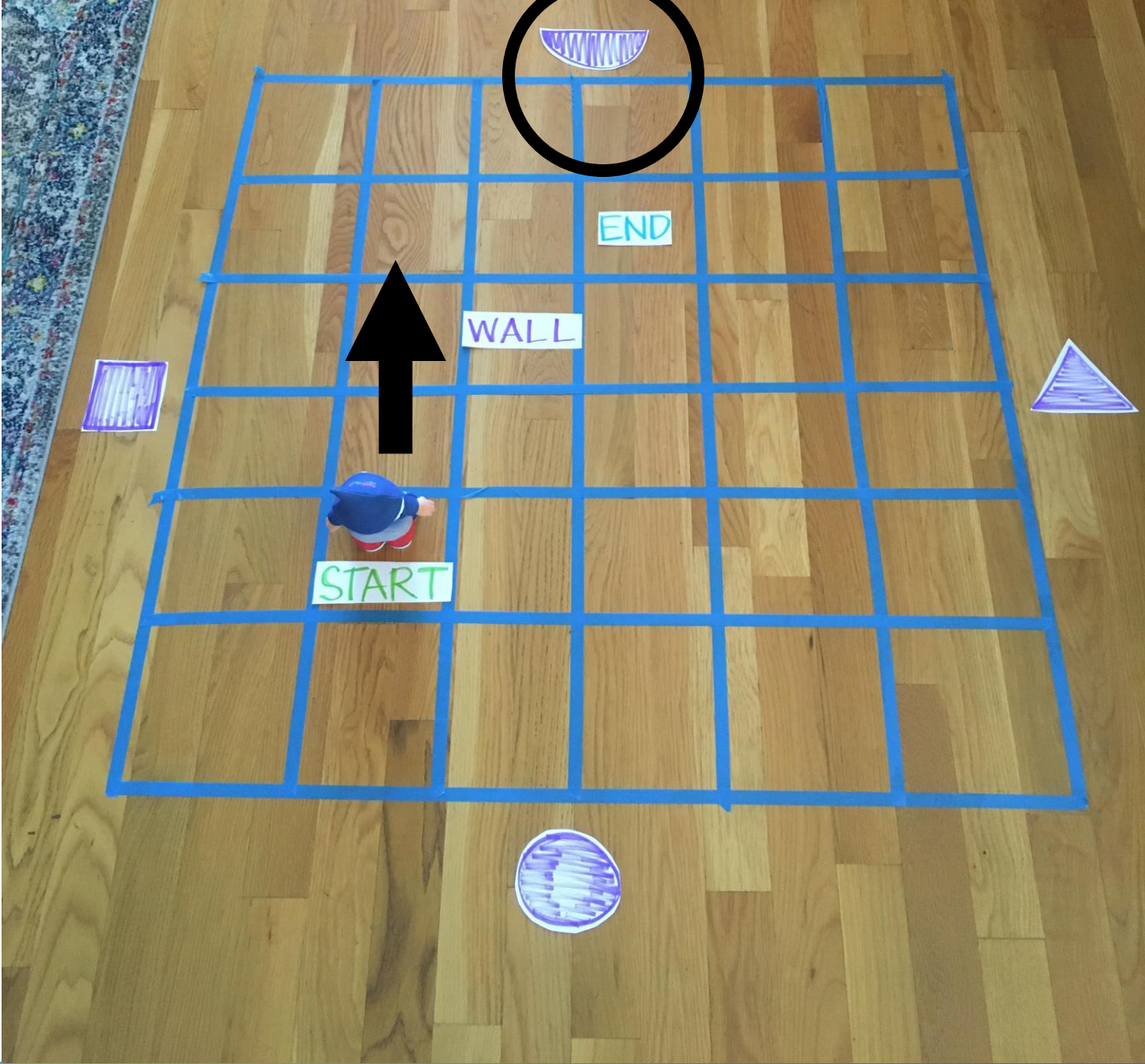
Directions

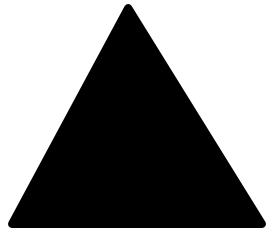
MATH CONNECTION

Let's review the shapes around the map. What shapes can you name? How many sides do the shapes have? How many angles do the shapes have?

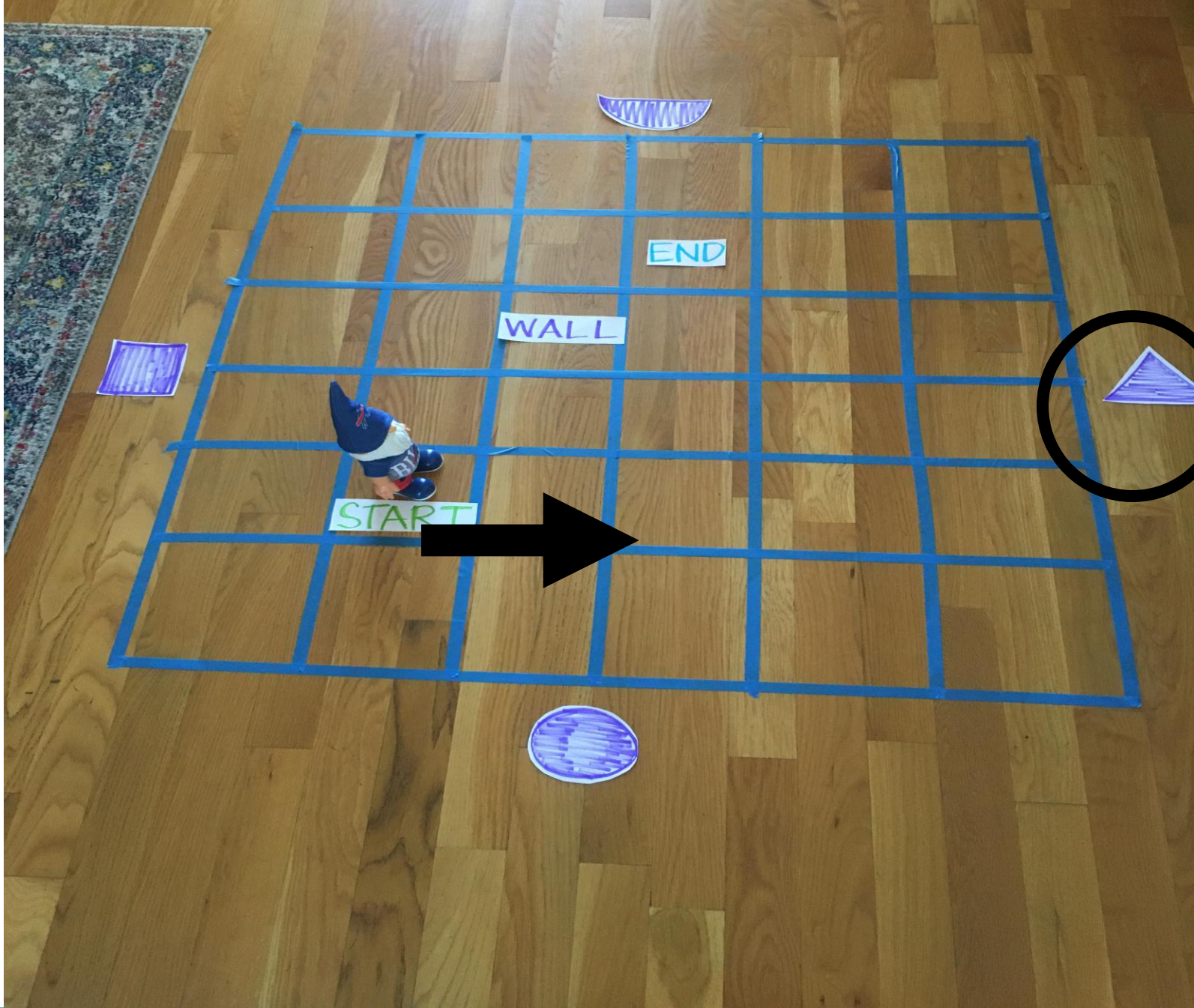


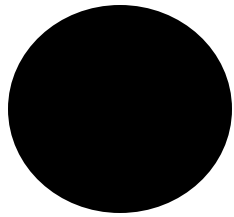
Half-circle



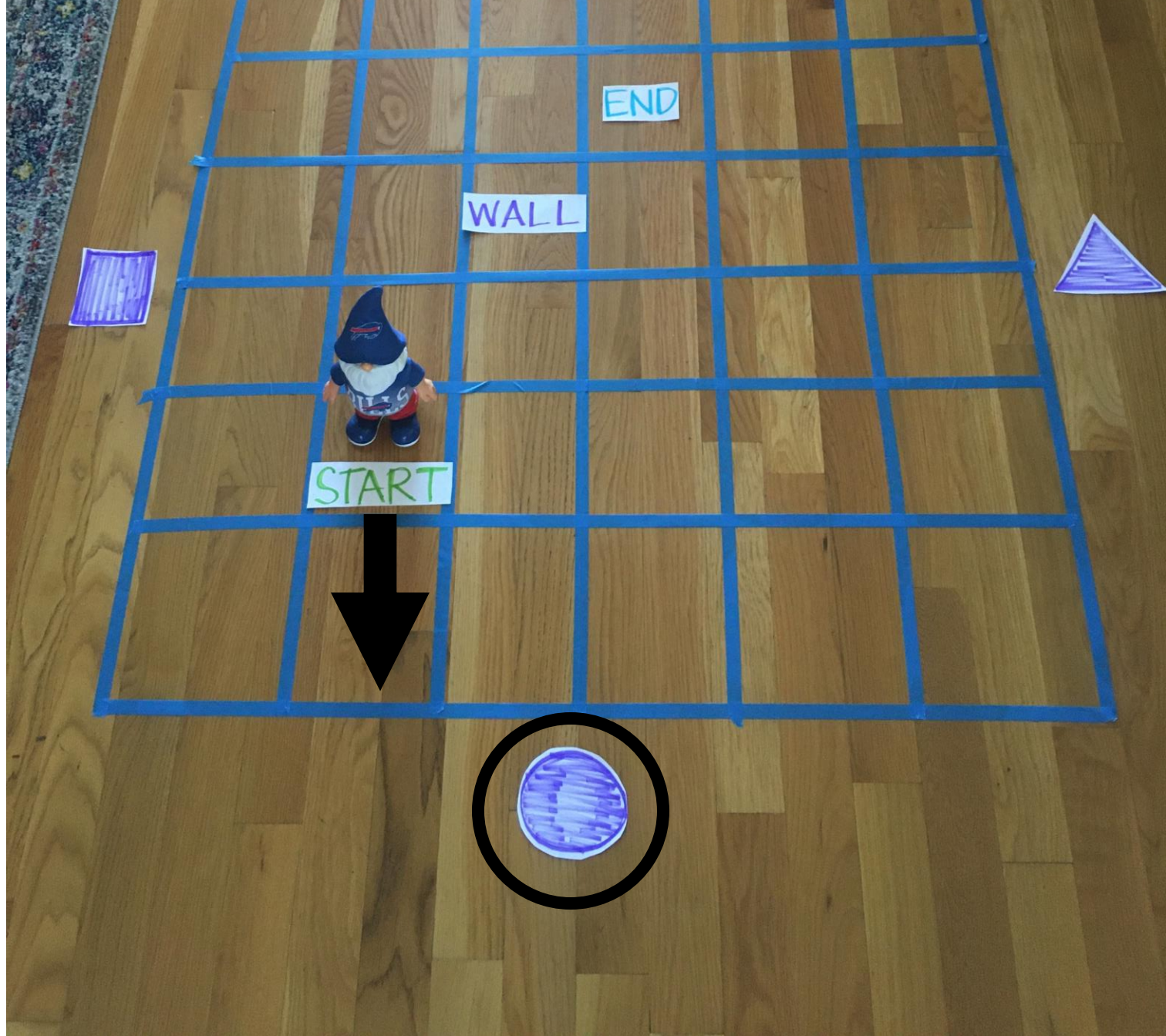


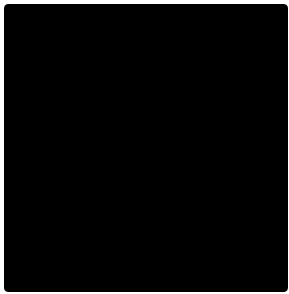
Triangle



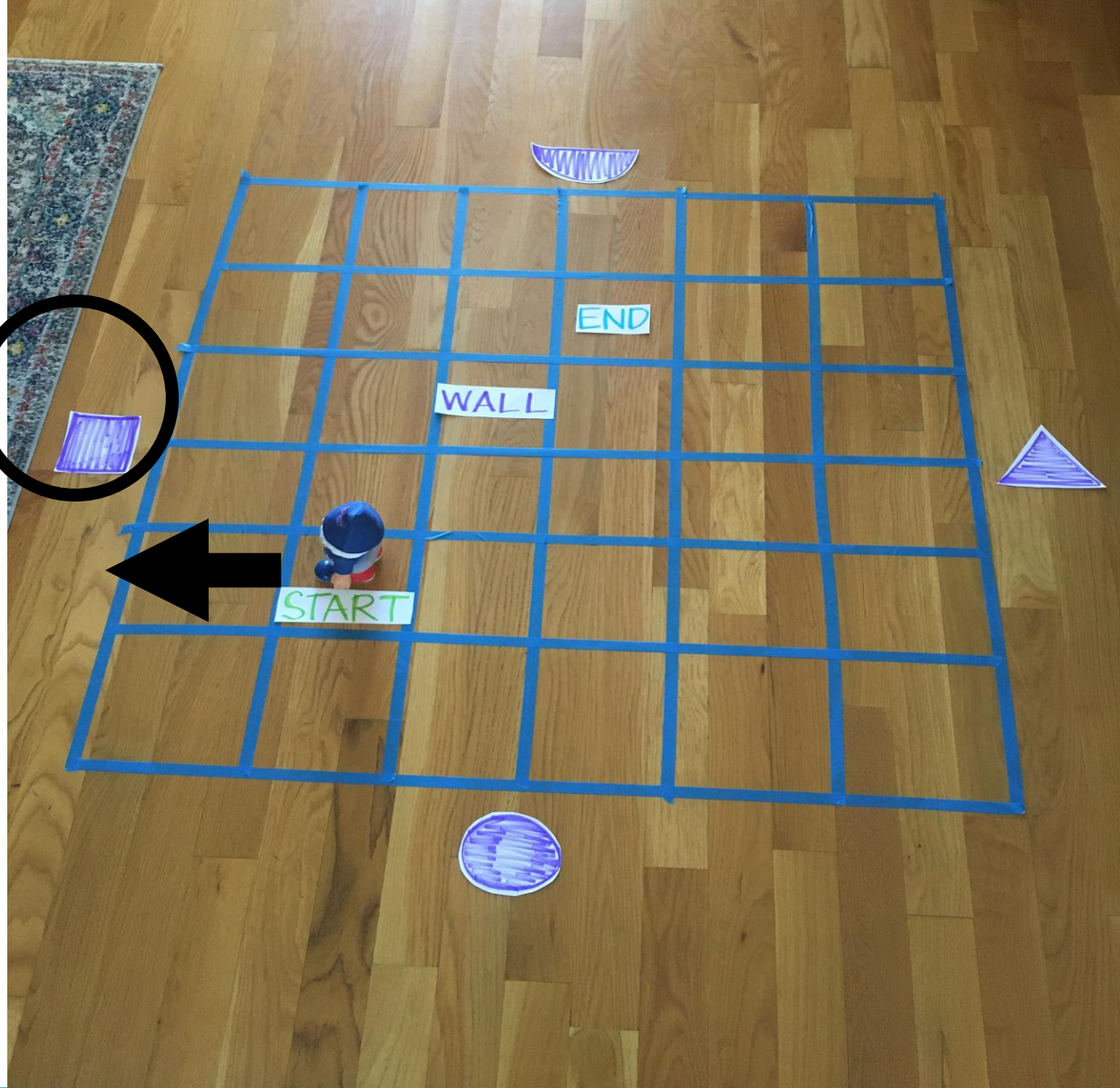
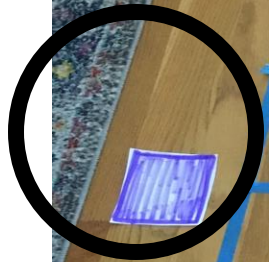


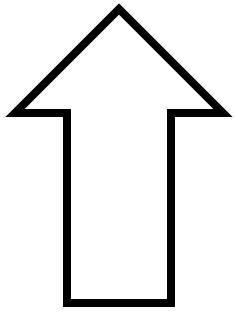
Circle



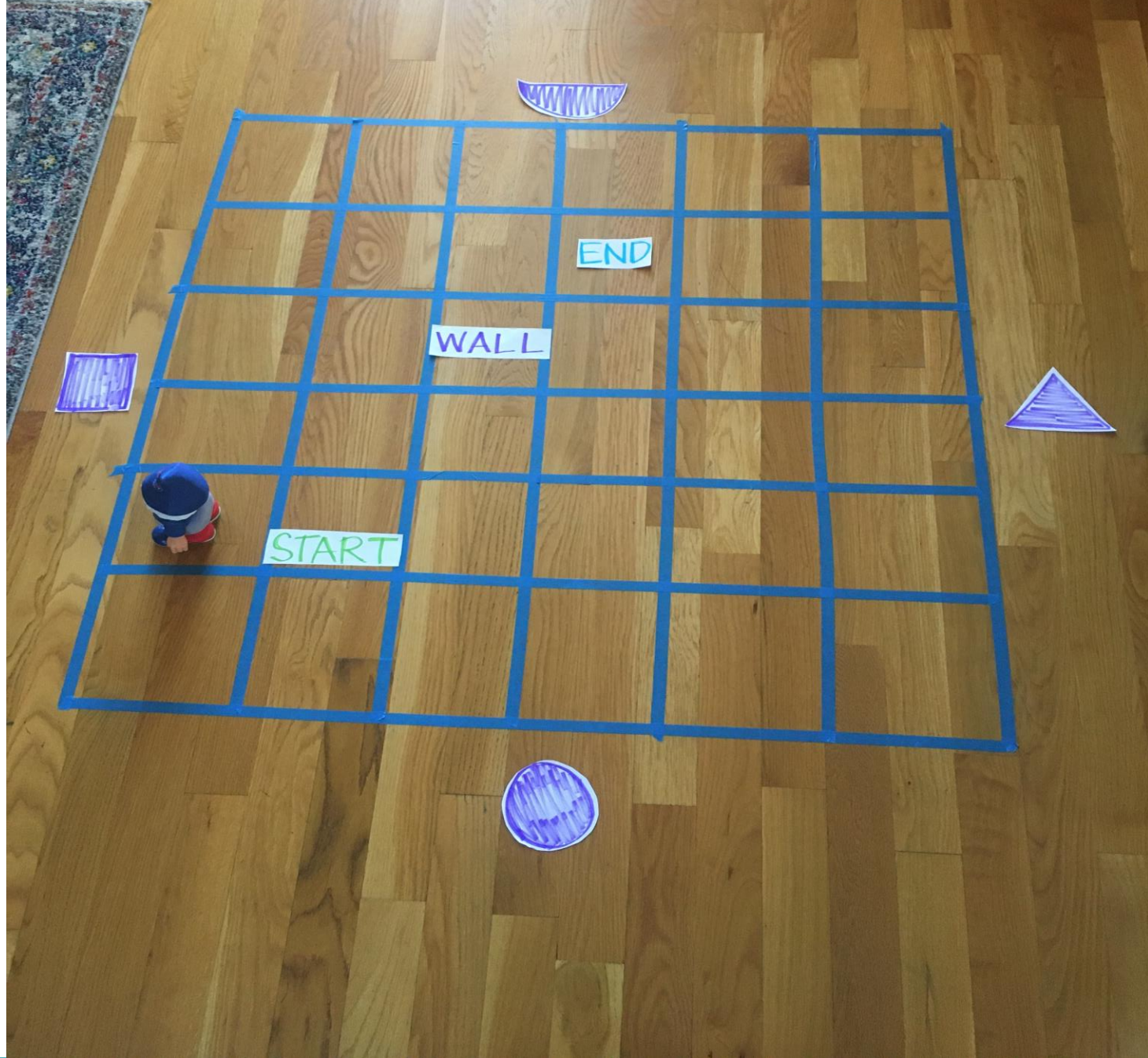


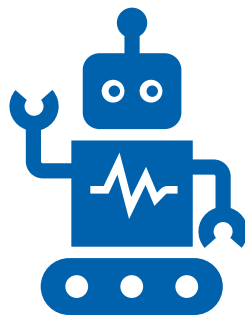
Square





Arrow





Robot Code



“Turn your body to face the shape.”



“Take one step forward.”



**Computers do
exactly what they
are told to do —
nothing more and
nothing less!**



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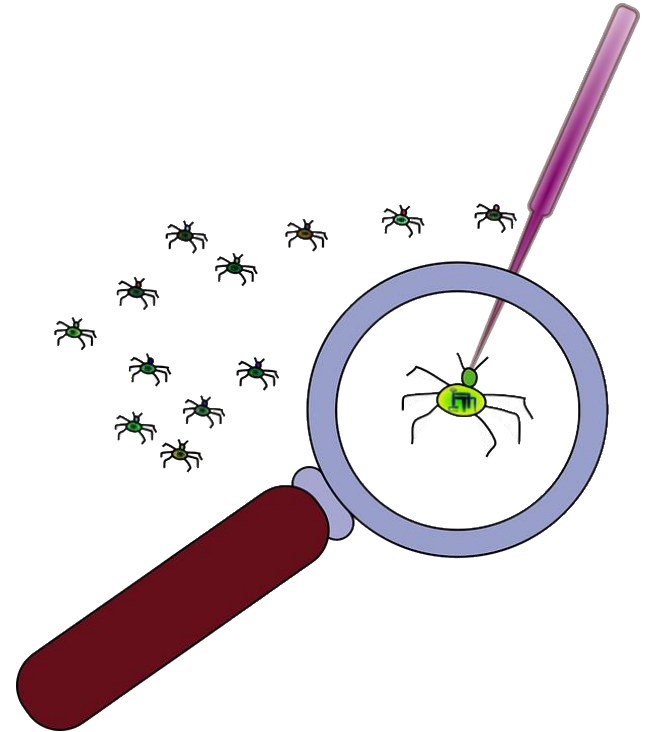
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debug

**To find and fix errors
(bugs) in programs or
algorithms**



Rules for the Programmer

1. Write on the Algorithm Sheet.

Record each step by circling one code symbol per row on the the Robot Algorithm Sheet.



Step 1:	☐ ☐ ☐ ☐ ☐ ☐	START
Step 2:	☐ ☐ ☐ ☐ ☐ ☐	
Step 3:	☐ ☐ ☐ ☐ ☐ ☐	
Step 4:	☐ ☐ ☐ ☐ ☐ ☐	
Step 5:	☐ ☐ ☐ ☐ ☐ ☐	
Step 6:	☐ ☐ ☐ ☐ ☐ ☐	
Step 7:	☐ ☐ ☐ ☐ ☐ ☐	

2. Read the code instructions when using:

the **Mini Map** to the person moving Robot playing piece

OR

the **Floor Grid** to the person playing the Robot.



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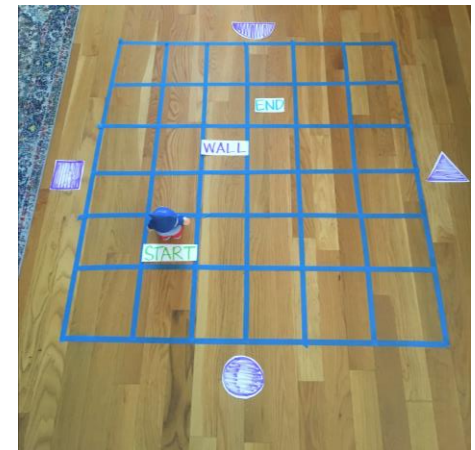
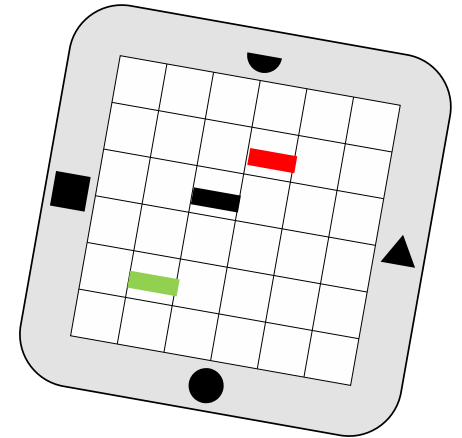
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Rules for the Robot

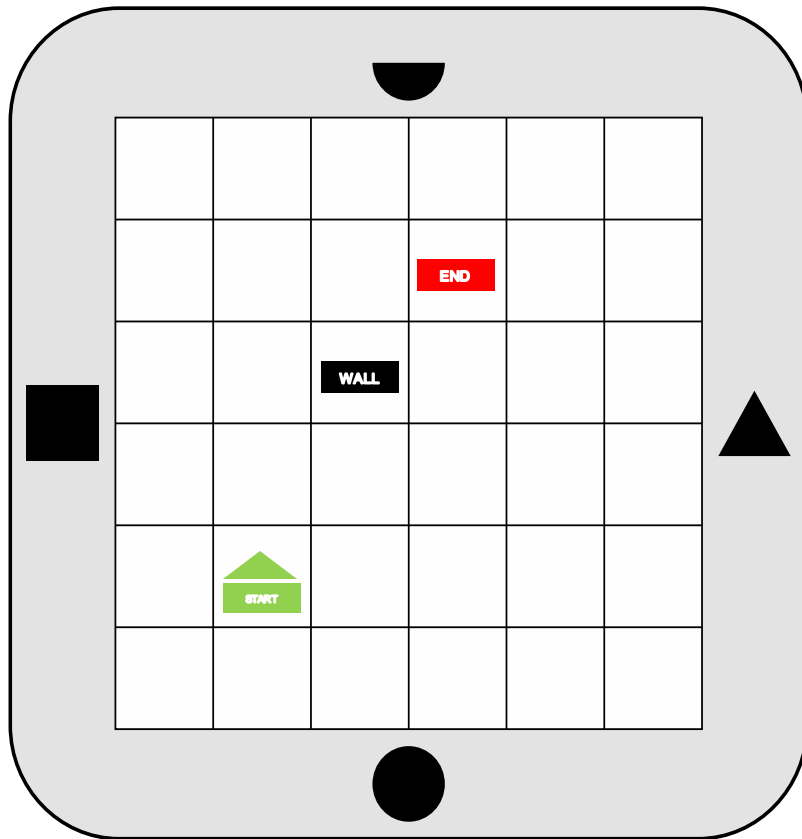
- On the **Mini Map**: Move the robot playing piece around the Mini Map according to the instructions on the Algorithm Sheet.
- On the **Floor Grid**: Wear the robot costume. Move around the grid like a robot, doing exactly what the Programmer says to do. Stay on the map. You may not move diagonally.



Program Your Robot



What would you do first?



Step 1:



START

Step 2:



Step 3:



Step 4:



Step 5:



Step 6:



Step 7:



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The diagram shows a 6x6 grid world environment. The robot starts at the cell (2, 2). A wall is located at the cell (3, 3). The goal, labeled 'END', is at the cell (4, 2). The environment is surrounded by a gray border with four black shapes: a semi-circle at the top, a square on the left, a triangle on the right, and a circle at the bottom.

START



The environment is a 6x6 grid world. The robot is located at the intersection of the 3rd row and 2nd column. The start point is a green triangle at the intersection of the 4th row and 2nd column. The end point is a red rectangle at the intersection of the 2nd row and 4th column. A black wall is located at the intersection of the 3rd row and 3rd column. There is a black square obstacle at the intersection of the 4th row and 1st column, and a black triangle obstacle at the intersection of the 3rd row and 6th column. The grid is surrounded by a gray border with a semi-circle at the top, a semi-circle at the bottom, a square on the left, and a triangle on the right.

START

□ △ ○ ◐ **⬆**

□ △ ○ ◐ ↑

□ △ ○ ◐ ↑

□ △ ○ ◐ ↑

□ △ ○ ◐ ↑

□ △ ○ ◐ ↑

The diagram shows a 6x6 grid world environment. The grid is surrounded by a gray border with four black shapes: a semi-circle at the top, a circle at the bottom, a square on the left, and a triangle on the right. Inside the grid:

- A robot (black icon with a red heart) is located at row 3, column 2.
- A wall (black rectangle labeled "WALL") is located at row 3, column 3.
- A start point (green house icon labeled "START") is located at row 4, column 2.
- An end point (red rectangle labeled "END") is located at row 2, column 4.

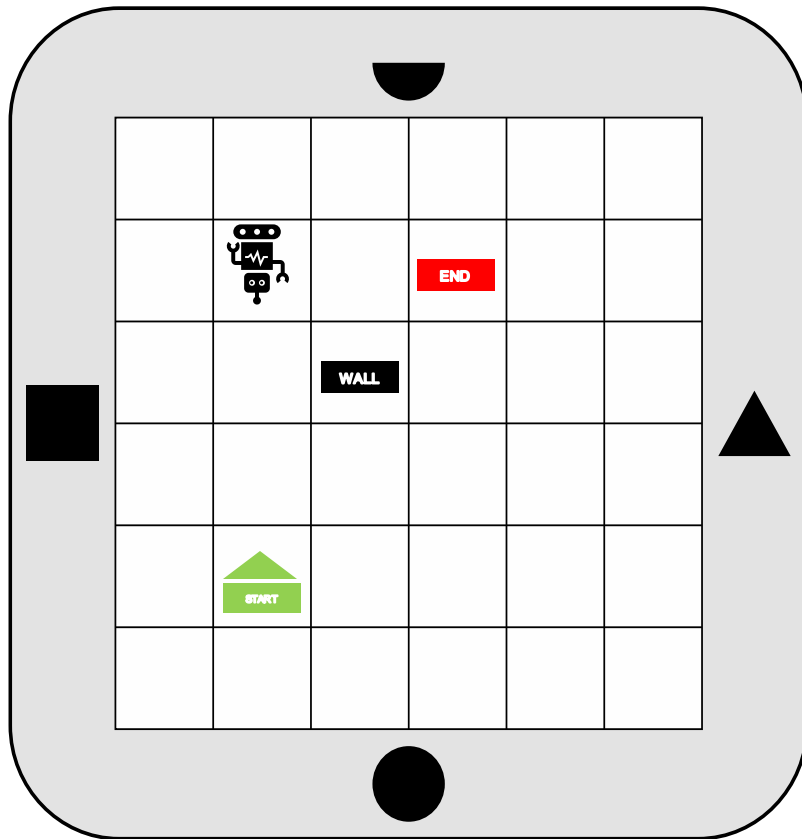
START



Program Your Robot



Next step?

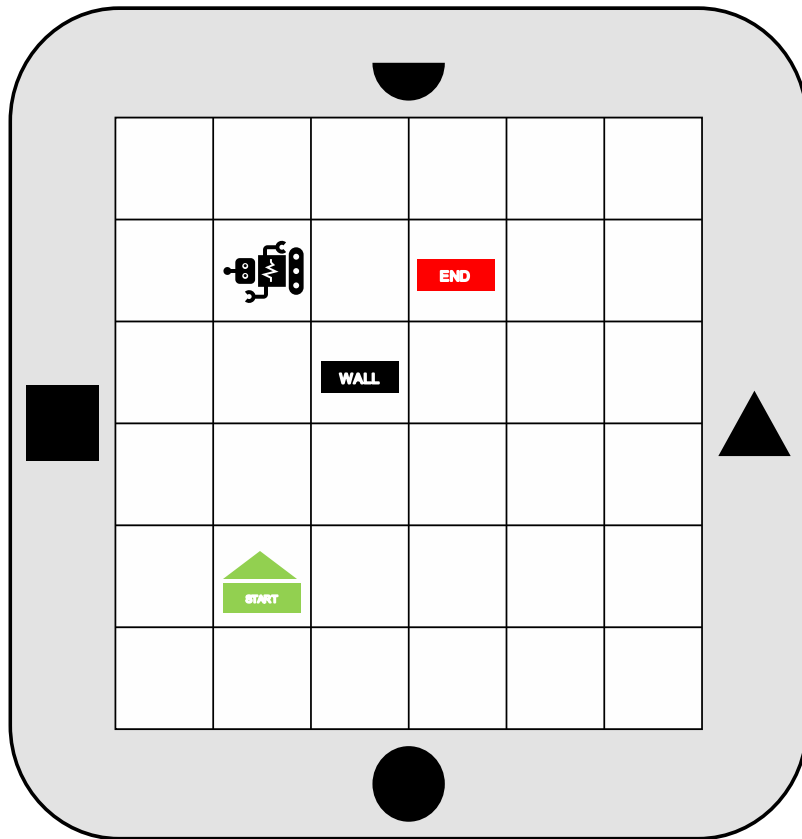


Step 1:	     
Step 2:	    
Step 3:	    
Step 4:	    
Step 5:	    
Step 6:	    
Step 7:	    

Program Your Robot



Next step?



Step 1: □ △ ○ ◐ ↑ **START**

Step 2: □ △ ○ ◐ **↑**

Step 3: □ △ ○ ◐ **↑**

Step 4: □ △ ○ ◐ **↑**

Step 5: □ **△** ○ ◐ ↑

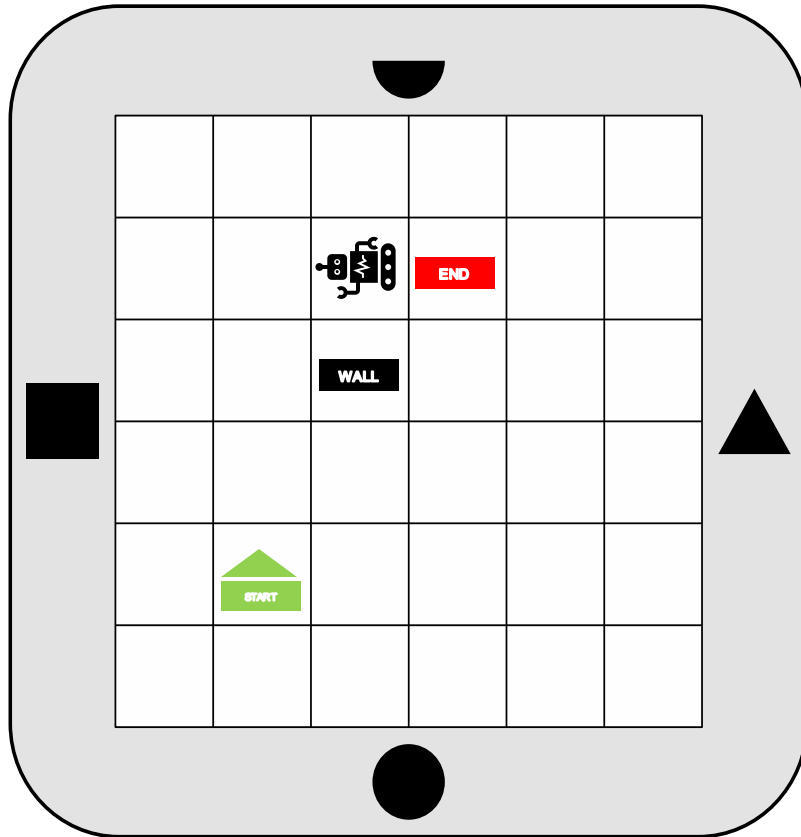
Step 6: □ △ ○ ◐ ↑

Step 7: □ △ ○ ◐ ↑

Program Your Robot



Next step?



Step 1: □ △ ○ ◐ ↑ **START**

Step 2: □ △ ○ ◐ **↑**

Step 3: □ △ ○ ◐ **↑**

Step 4: □ △ ○ ◐ **↑**

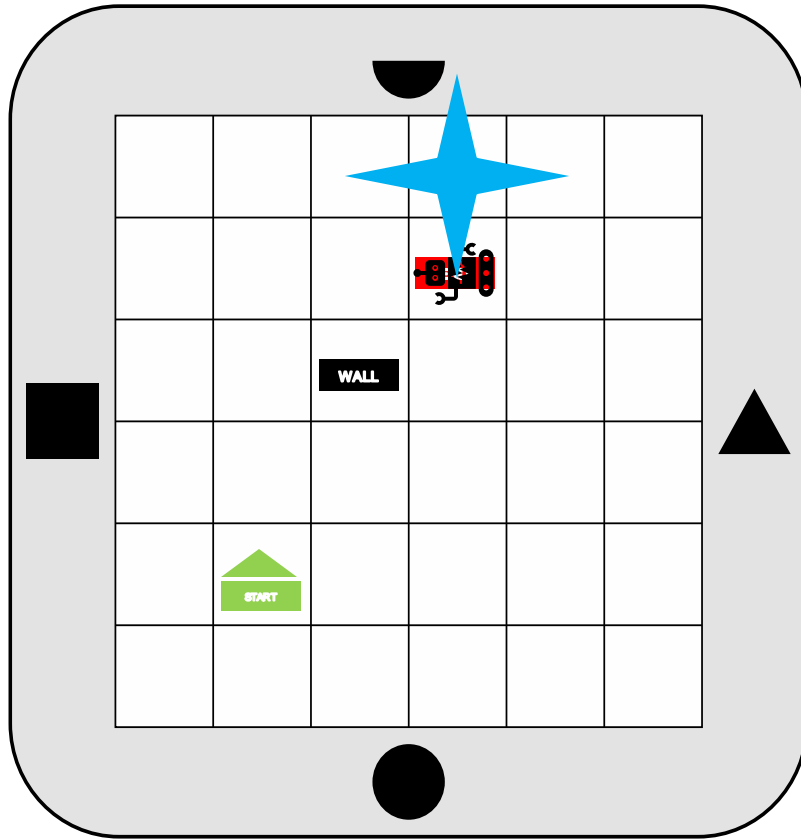
Step 5: □ **△** ○ ◐ ↑

Step 6: □ △ ○ ◐ **↑**

Step 7: □ △ ○ ◐ ↑

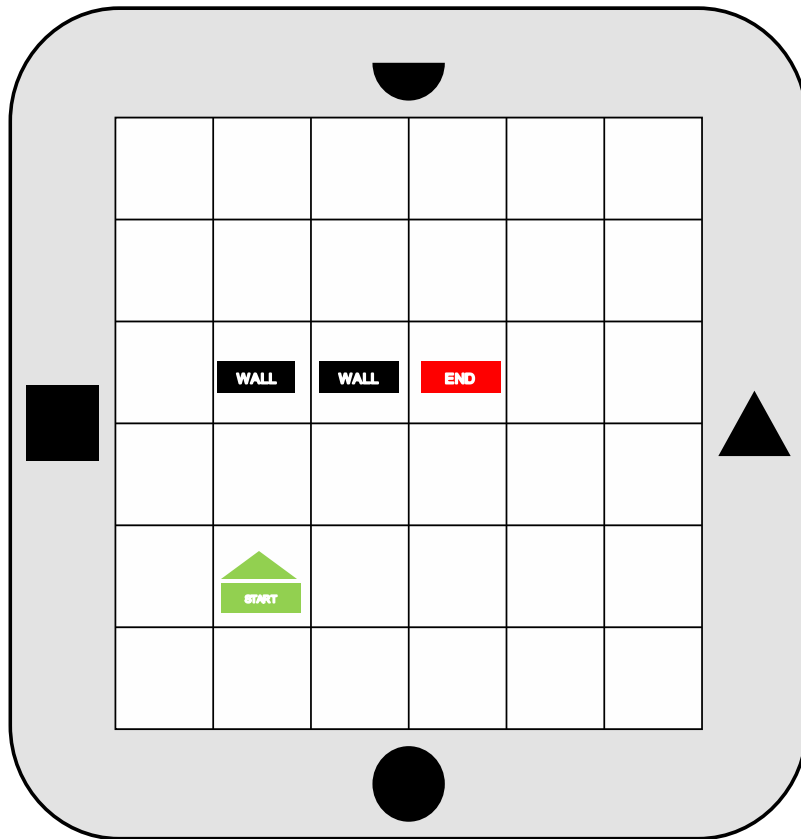
Program Your Robot

Next step?



Step 1:	     
Step 2:	    
Step 3:	    
Step 4:	    
Step 5:	    
Step 6:	    
Step 7:	    

Create an algorithm for this new map.



Step 1:



START

Step 2:



Step 3:



Step 4:



Step 5:



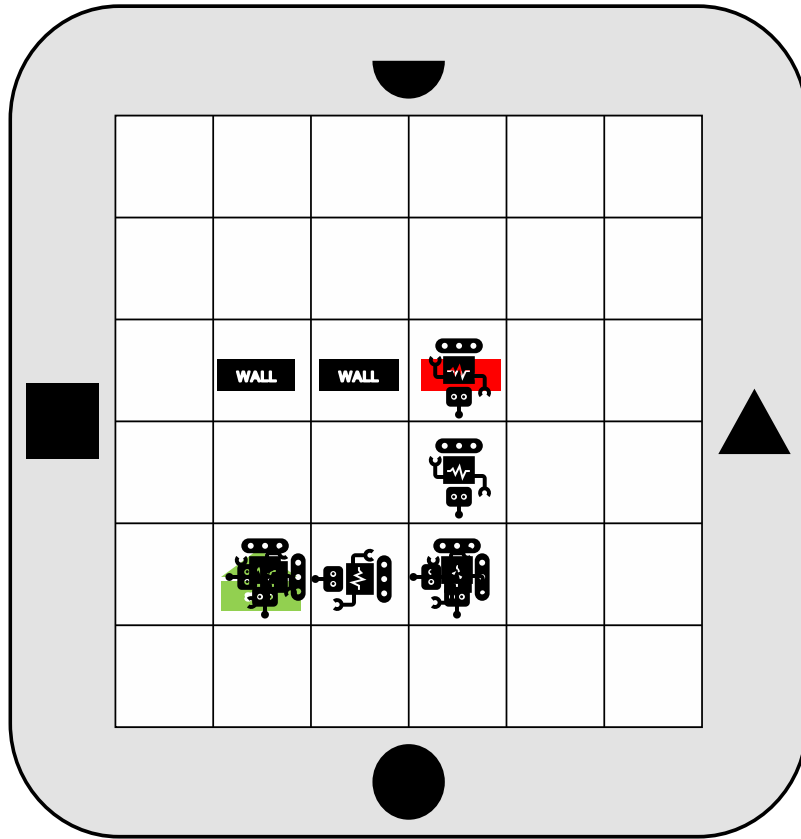
Step 6:



Step 7:



Test your algorithm.



Step 1: □ △ ○ ◐ ↑ **START**

Step 2: □ **△** ○ ◐ ↑

Step 3: □ △ ○ ◐ **↑**

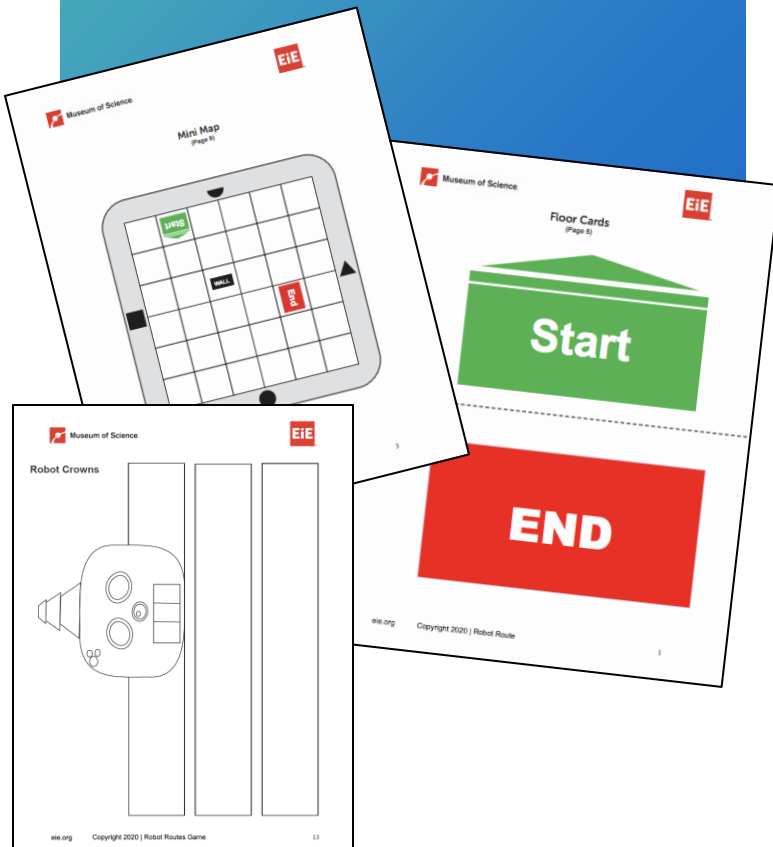
Step 4: □ △ ○ ◐ **↑**

Step 5: □ △ ○ **◐** ↑

Step 6: □ △ ○ ◐ **↑**

Step 7: □ △ ○ ◐ **↑**

Now It's Your Turn



Set up instructions

1. **Create a life-sized Floor Grid.** Use masking tape, floor tiles, or chalk to set up grid as shown on the Mini Map.
2. **Assign Robot and Programmer roles.** Have fun making robot crowns!
3. **Create robot algorithms.** Use the Mini Map, robot playing piece, and the Algorithm Sheet to create an algorithm that directs the robot from start to end.
4. **Test the algorithm.** Test the algorithm while wearing the robot crown on the life size map.
5. **Improve it.** Try to create an algorithm with fewer steps.

Extension Ideas

Change the criteria and constraints:

- Get to the End using the shortest algorithm
- Get to the End using the longest algorithm
- Get to the End using only two directional changes

Change the scenario:

- Create an algorithm to put away a toy
- Create an algorithm for your favorite dance
- Create an algorithm to walk to a chair



Ready for Resources?

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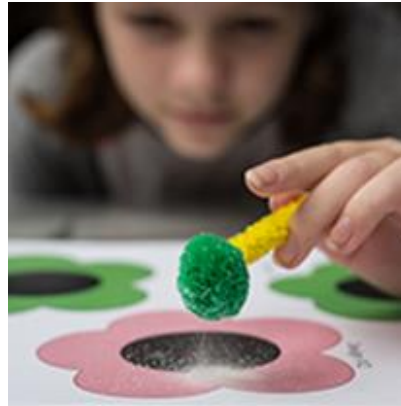
Coming Soon

New! Engineering and Computer Science Curricula

EiE is releasing new integrated engineering and computer science units!

*Engineering and
Computer Science
Essentials*

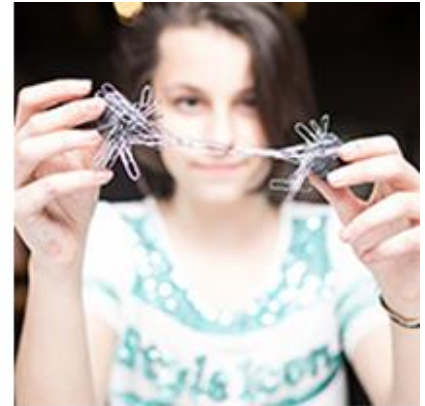
Available now!



Grade 2 Unit Bundle

Engineering Unit: Designing
Hand Pollinators

Computer Science Unit:
Creating Animations



Grade 3 Unit Bundle

Engineering Unit: Designing
Maglev Systems

Computer Science Unit:
Building Automated Systems



Thank
You!

Additional Info or Questions?

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