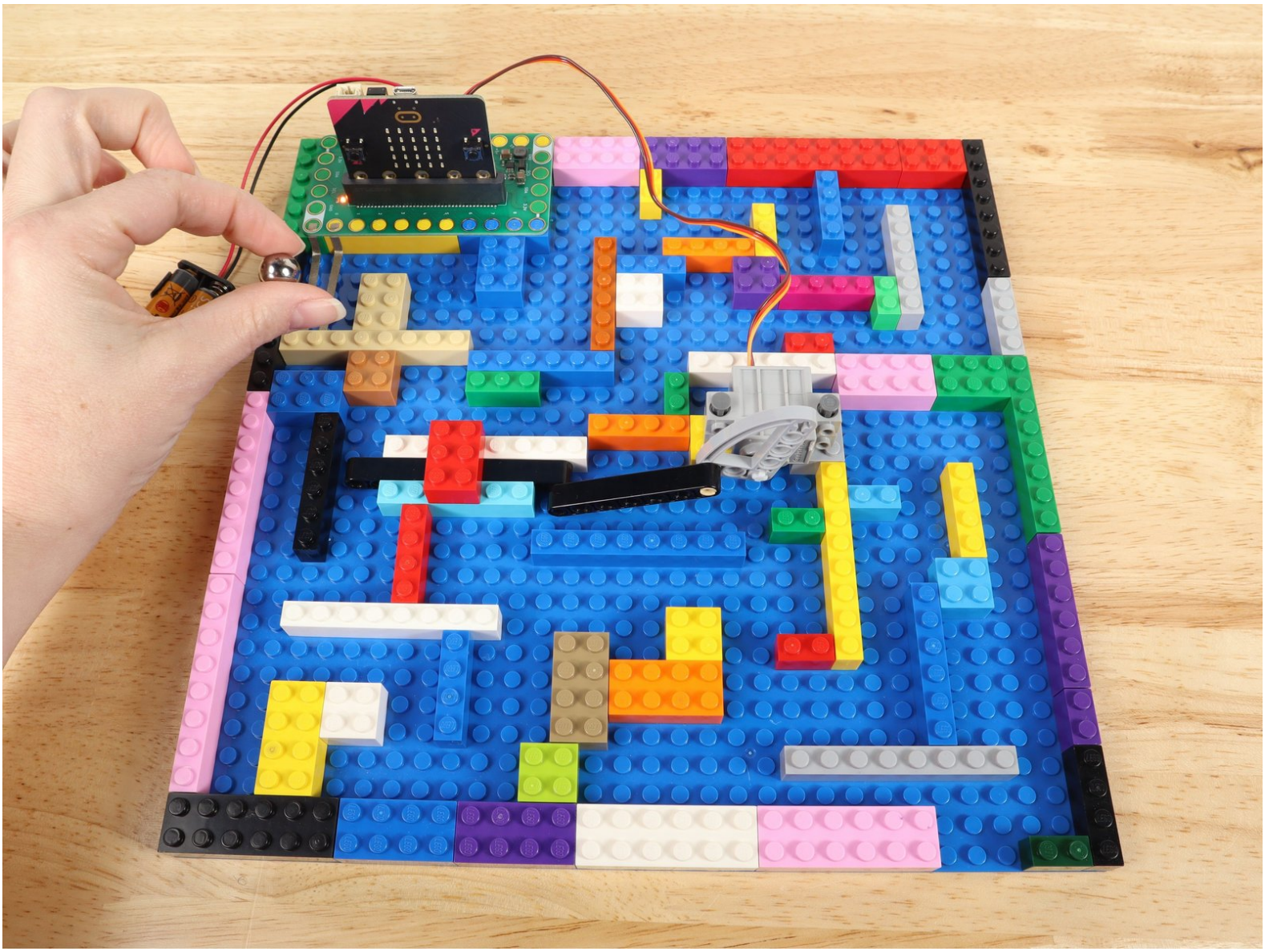
LEGO Maze

Build a LEGO Maze with a gate that opens when you complete the circuit with a ball bearing.

Written By: Benjamin J Nelson



INTRODUCTION

Build a LEGO Maze with a gate that opens when you complete the circuit with a ball bearing.

The ball we use to navigate the maze completes a circuit which will cause a servo to rotate and open the gate. The project is complete with a timer and musical count-down.

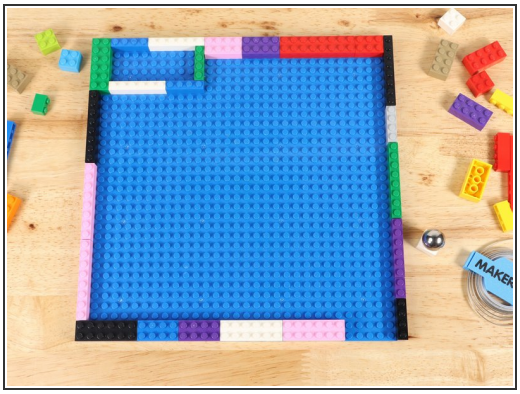
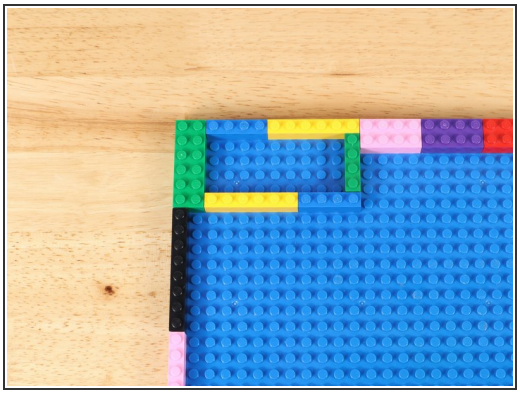
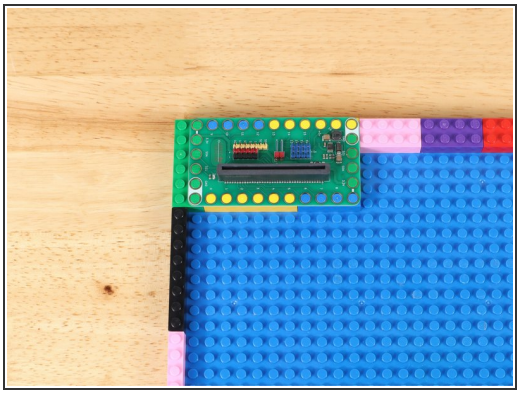
TOOLS:

- Computer (1)
- Scissors (1)

PARTS:

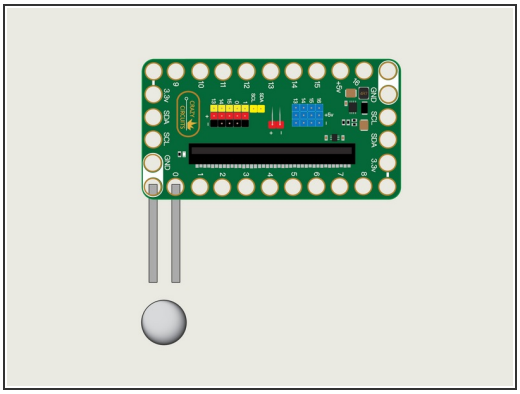
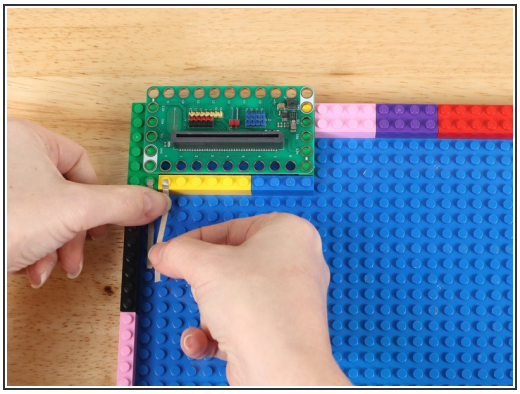
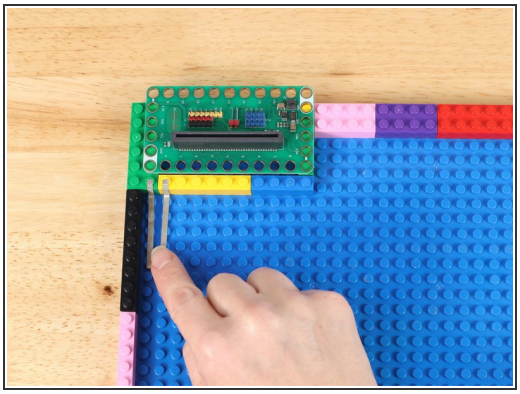
- Crazy Circuits Bit Board (1)
- micro:bit (1)
  V2
- Brick Compatible 270 Degree Servo (1)
- Maker Tape (1)
  1/8" Wide
- LEGO Baseplate (1)
- Misc LEGO Parts (1)
- LEGO Beam 3 x 5 x 0.5 Bent 90 Degrees Quarter Ellipse (32250 / 65714) (1)
- LEGO Beam 7 (16615 / 32524) (1)
- LEGO Beam 9 (40490 / 64289) (1)
- LEGO Axle to Pin Connector (3749 / 6562) (1)
- LEGO Pin without Friction Ridges (3673) (1)
- LEGO Brick 2 x 2 with Pin and Axlehole (6232 / 42929) (2)
- LEGO Axle 4 with End Stop (87083) (2)
- Metal Pinball Ball (1)

Step 1 — LEGO Border and Support

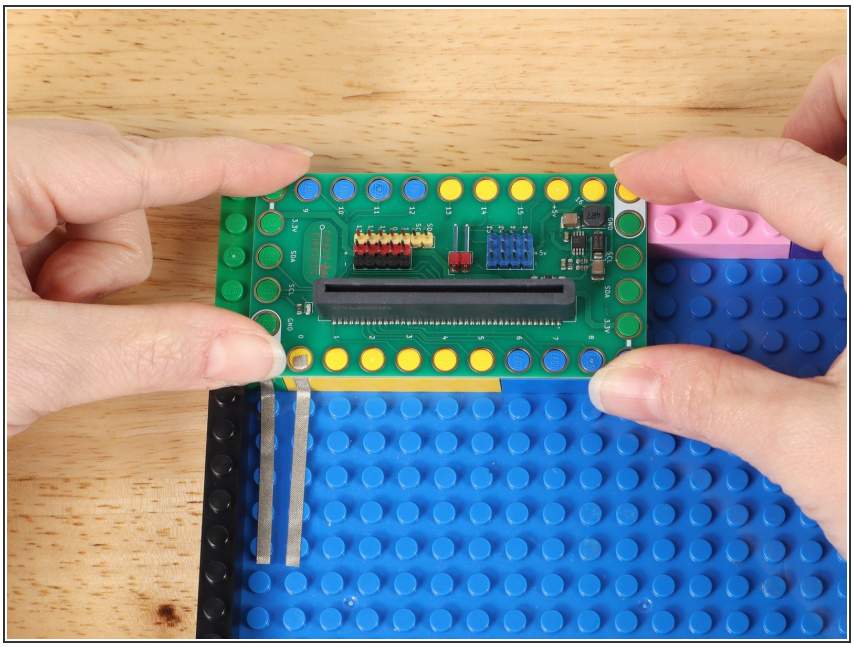
- Use LEGO bricks to build a border around the outside edge of a 32x32 LEGO baseplate.
- Arrange LEGO bricks in one corner to support a Crazy Circuits Bit Board.

Step 2 — Conductive Tape Switch

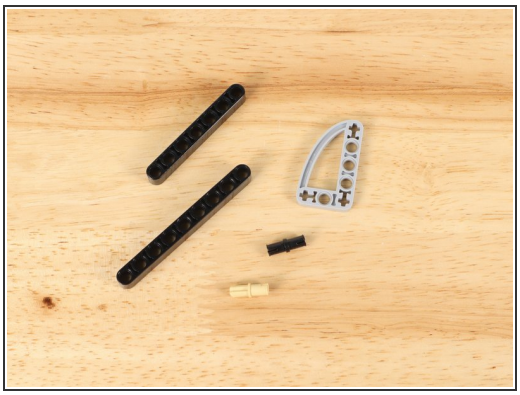
- Cut two pieces of 1/8" Maker Tape about 5 LEGO studs long.
- Stick Maker Tape on to LEGO baseplate with the ends going to **Pin 0** and the **GND Pin** right next to it.

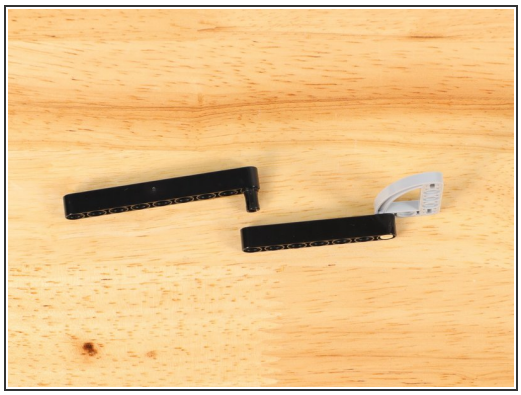
Step 3 — Snap down Bit Board



- Press the Bit Board onto LEGO bricks over the Maker Tape.
- Make sure the Bit Board is firmly attached to the LEGO bricks and that Maker Tape makes a solid connection to the holes.

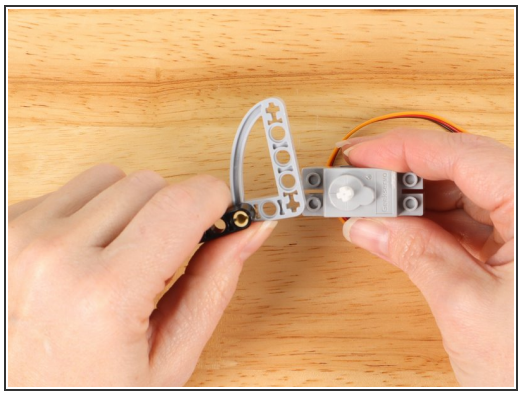
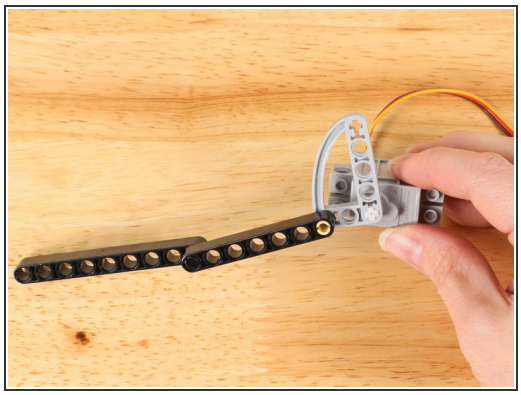
Step 4 — Build the Gate Arm





- Assemble the LEGO parts to build the gate arm.
- The parts are connected with swivels to allow them to easily rotate.
- Parts used:
  - LEGO Beam 3 x 5 x 0.5 Bent 90 Degrees Quarter Ellipse (32250 / 65714)
  - LEGO Beam 7 (16615 / 32524)
  - LEGO Beam 9 (40490 / 64289)
  - LEGO Axle to Pin Connector (3749 / 6562)
  - LEGO Pin without Friction Ridges (3673)

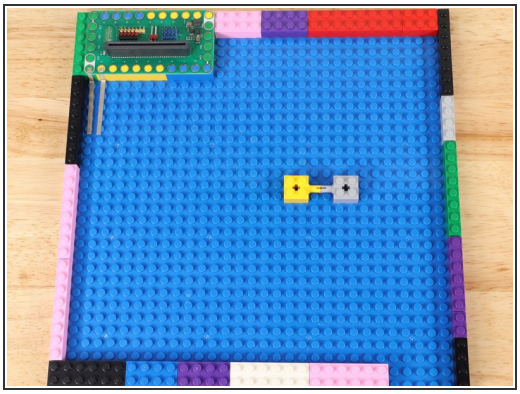
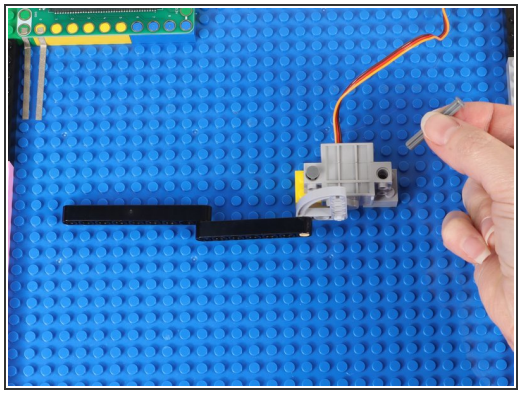
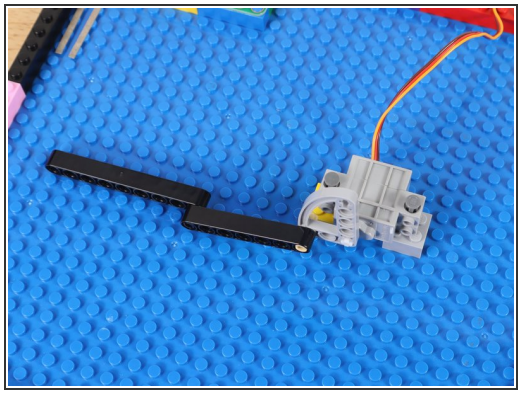
Step 5 — Connect Gate Arm to Servo

- Slide the end of the gate arm onto the shaft of the servo.

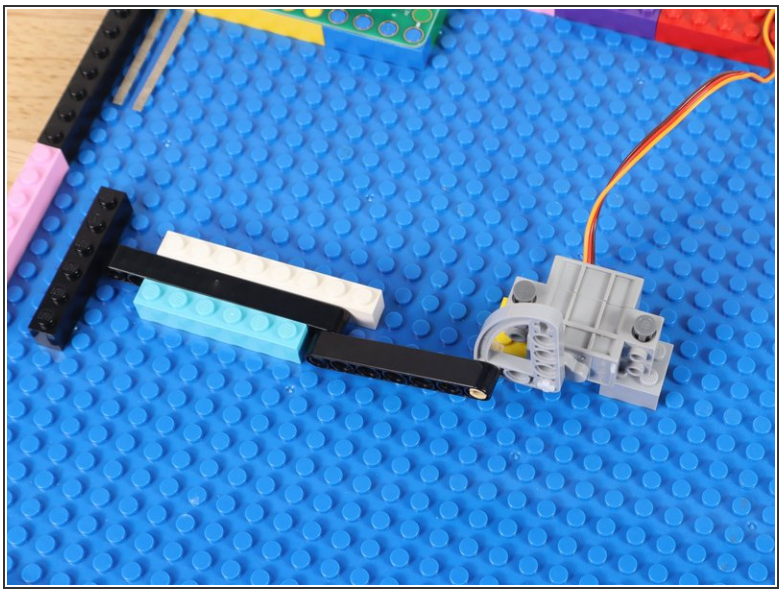
- Remember that you can adjust the LEGO piece attached to the servo shaft. Rotate it 90 degrees clockwise or anticlockwise, or a full 180 degrees.

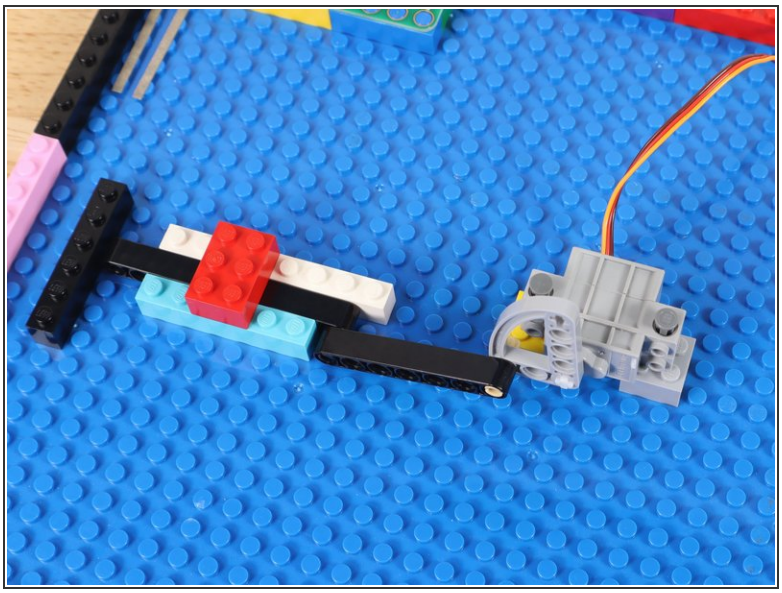
Step 6 — Mount Servo to LEGO Plate

- Mount the servo to some LEGO bricks attached to the baseplate.
- We used two LEGO Brick 2 x 2 with Pin and Axlehole (6232 / 42929)
  - You could also use two LEGO Brick 2 x 2 Round (3941 / 6143) or any other method of mounting the servo on its side.

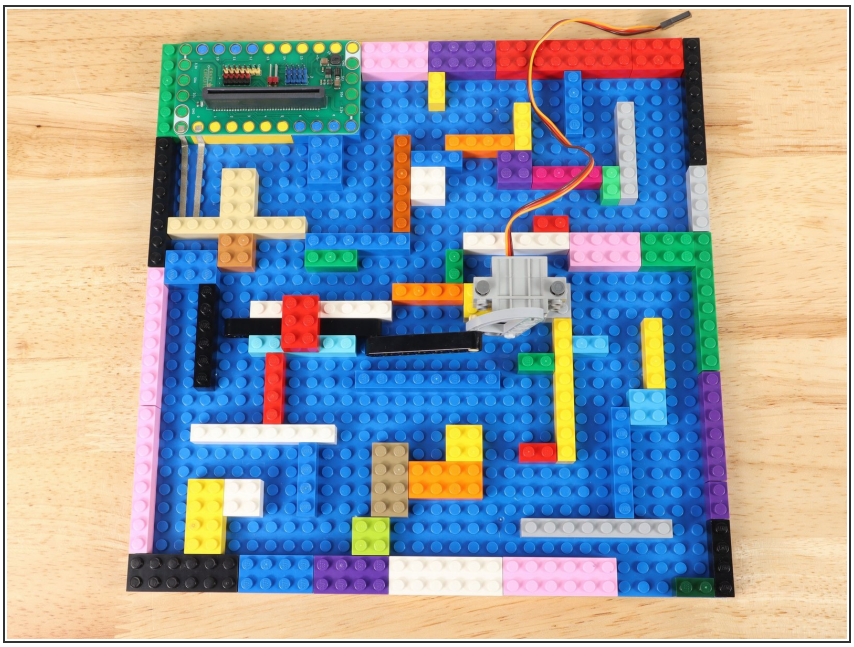
Step 7 — Add LEGO Bricks





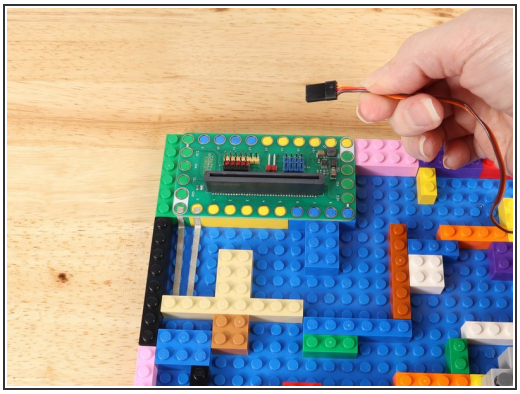
- Surround the end of the LEGO Gate with LEGO bricks. This creates a track in which the gate can slide.
- Add one LEGO brick over the top of the other bricks making the track. This prevents the gate from being able to pop up out of the track.

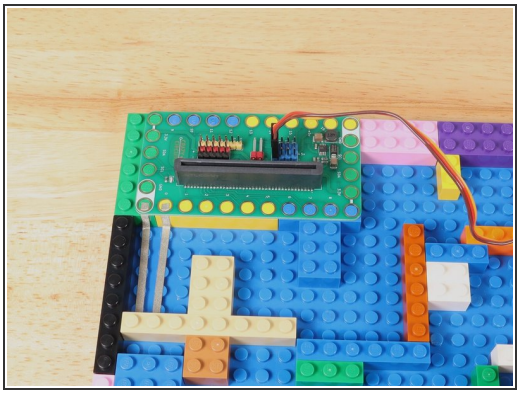
Step 8 — Fill in the Maze!

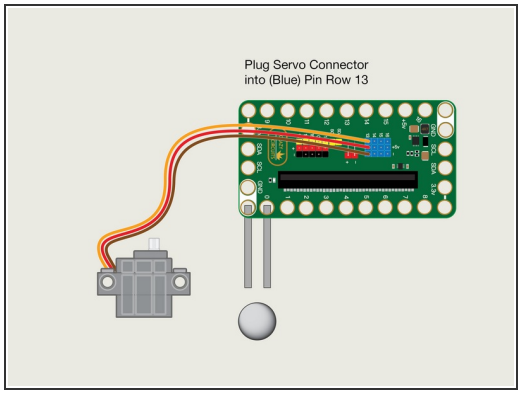


- Fill the LEGO baseplate with bricks to create a maze.
  - Make sure there is a clear path from the start with the Maker Tape switch to the Gate.
  - Make sure there is a clear path from the Gate to the Exit.
  - You should ONLY be able to complete the maze by passing through the gate, once it is open.
  - Use the space completely. FILL it with a complex maze. Don't be afraid to spend some time on this.

Step 9 — Plug in the Servo

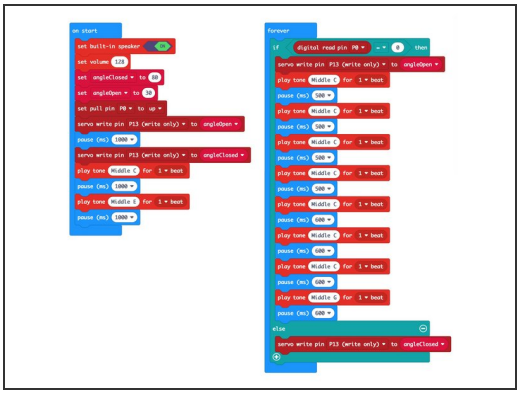


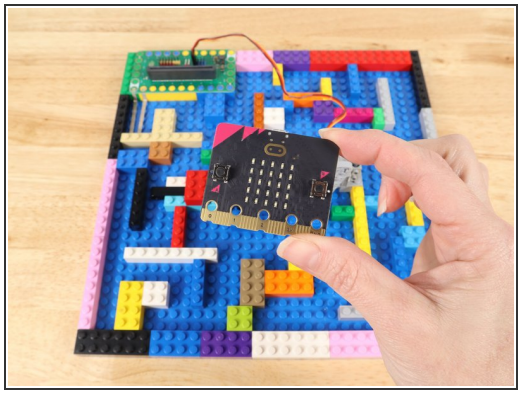


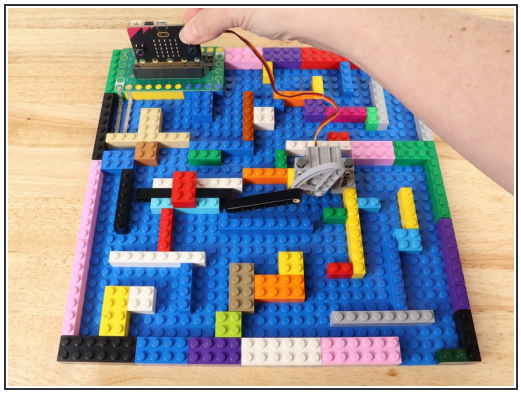


- Plug the servo wires into the Bit Board row **Pin 13** of the blue pins.
- Make sure the ORANGE wire is connected to closest to the label for **Pin 13**.

Step 10 — Load the Code

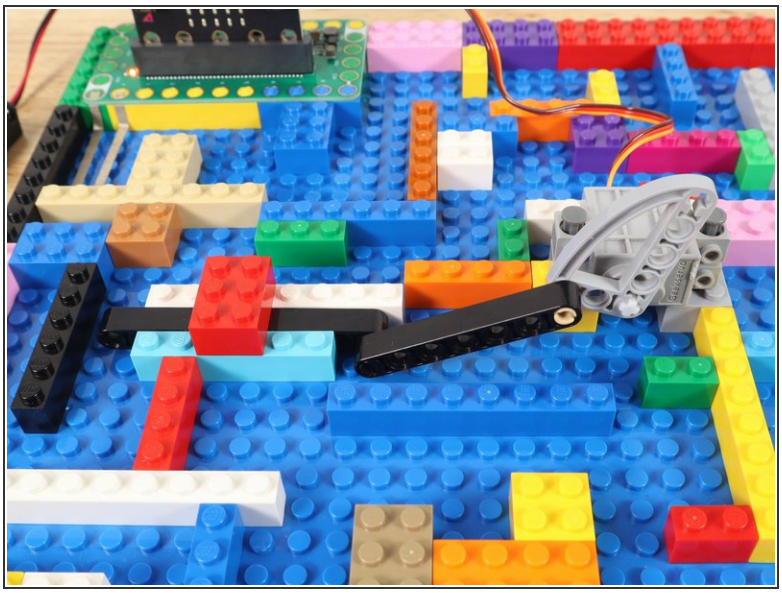


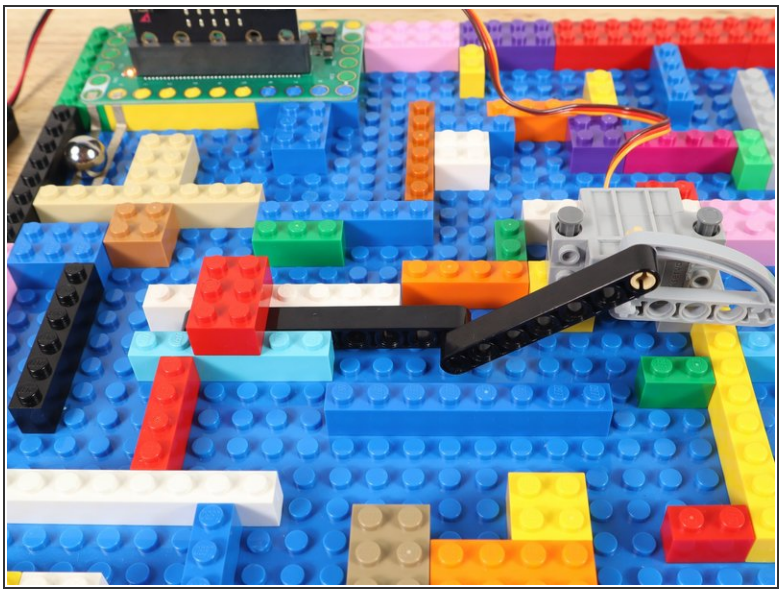




- Connect a USB cable to the micro:bit and then plug it into your computer.
- We'll be using makecode.microbit.org to program our board. It uses a simple drag and drop block interface.
- We're going to load the following code for our **LEGO Maze** program: https://makecode.microbit.org/_bp20qxUvL...

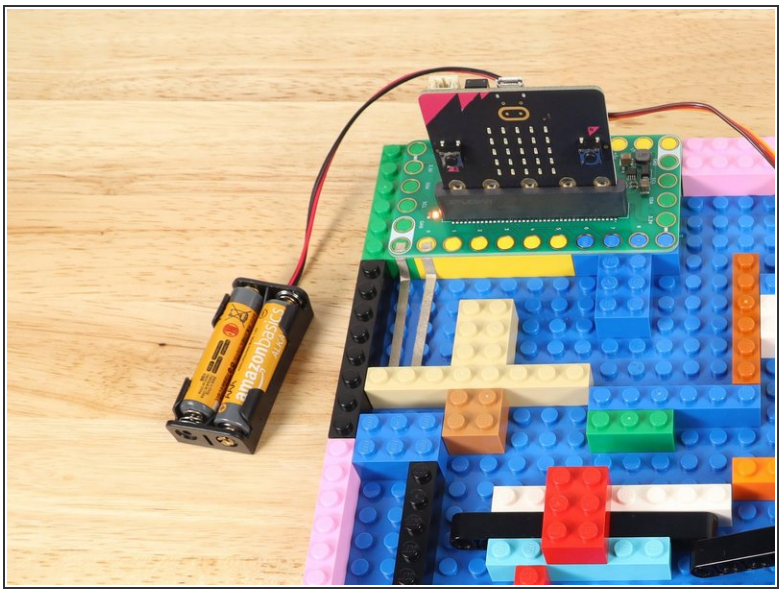
Step 11 — Test the Gate

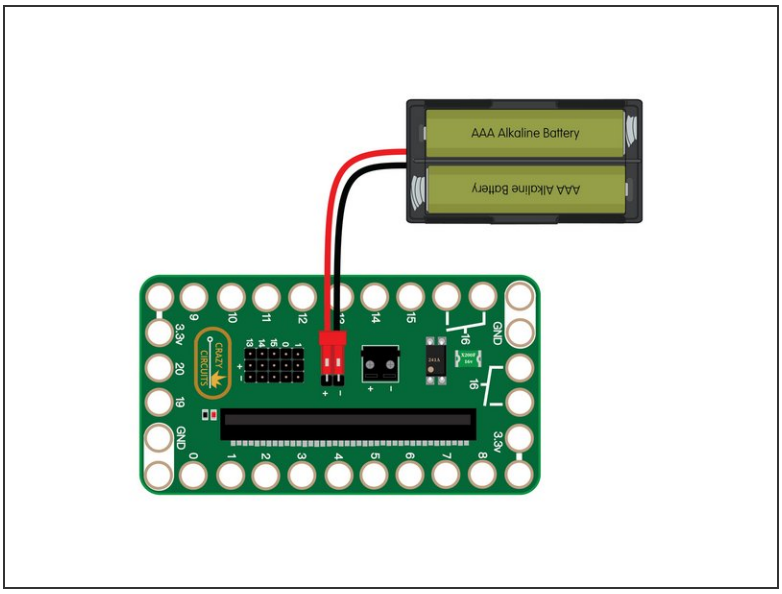




- Test the gate by moving the ball bearing onto the two pieces of Maker Tape.
- When the ball bearing touches both pieces of tape, the servo will rotate to open the gate and a musical countdown will begin.
- When the musical countdown ends, the gate will close.

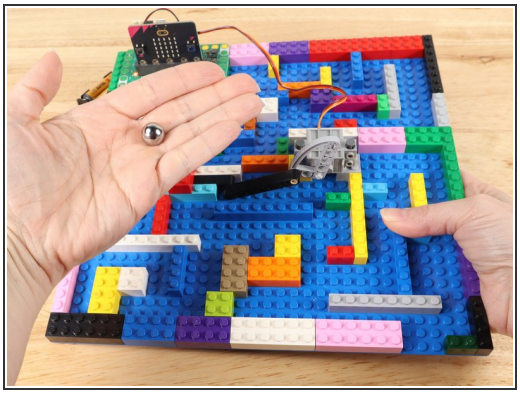
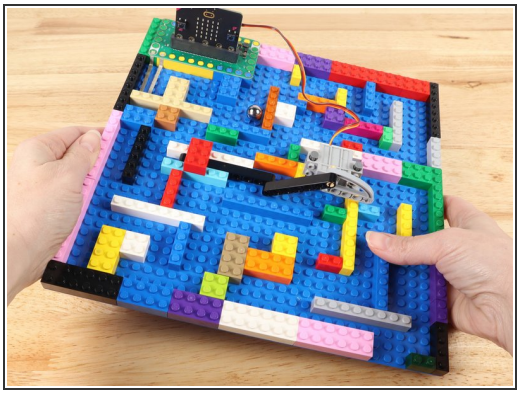
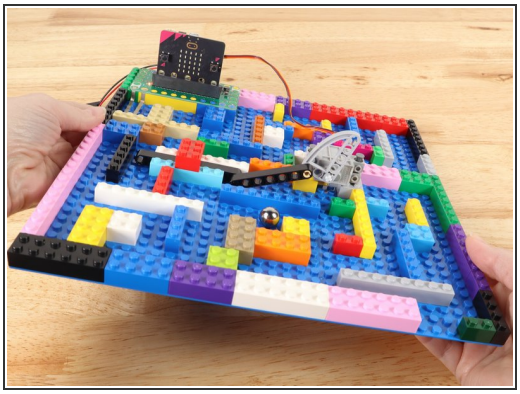
Step 12 — Add a Battery Pack





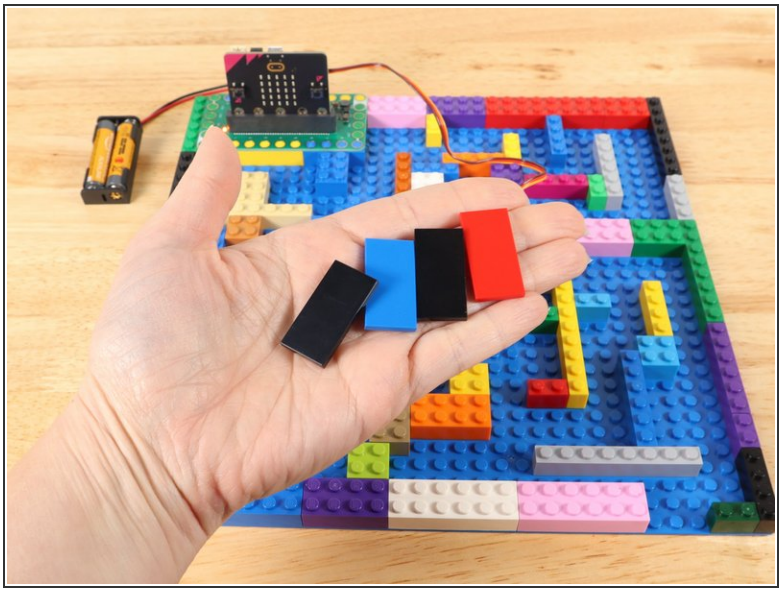
- To make the LEGO Maze portable, you can add a battery pack.
- Use double-sided tape to attach the 2 AAA Battery Pack that comes with the Bit Board.

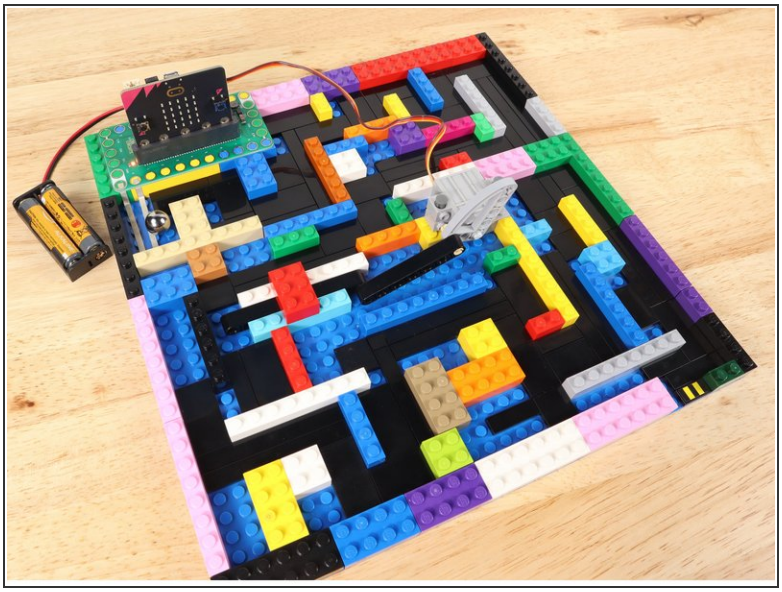
Step 13 — Run the Maze!

- You are all set to run the maze!
- Tilt the LEGO baseplate to roll the ball bearing through the maze.
- Get the ball bearing to the conductive tape to open the gate. Get the ball through the gate BEFORE the time runs out!
- Get through the rest of the maze to the exit.
- Challenge yourself by changing the code so that there is less time to get to the gate.
- Re-arrange the LEGO Maze for a whole new experience!
- Play against your friends. Make them run the maze you build. You can run the maze they make for you!

Step 14 — Add Tiles (Optional)





- If you want to create a smoother pathway that the ball doesn't get stuck on, you can use LEGO tiles to line the base of your pathway.
- You can line as much or as little of the pathway as you'd like. Intentionally not lining parts can cause an obstacle that can make gameplay more interesting.

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