

Robot Barista

The lesson challenge will involve several cups and some cardboard-simulated barista tools. You can choose to have students make their own devices, or you can provide pre-made materials for them. The ORA finger grippers cannot grab smaller/thinner devices, so a few examples are shown below with the attached wooden cylinders



Example Grinder Cup

Vocabulary

Barista- a person whose job involves preparing and serving different types of coffee.

Pour Over - a type of extraction where water is poured over a filter filled with ground coffee.

Extraction - the process of using water to draw flavor and color out of the coffee grounds.

Job Outlook - the likelihood that the selected occupation will be available and hiring in the future



Example Mug

Engage with Robotic Coffee Making!

Start the Engage section by presenting the students with the lesson challenge. Tell students:

"For this challenge, you will assume the role of Robotic Barista Engineers at ORA Mechatronics. 4 Paw Cat Cafe, a local coffee shop, is experiencing a staffing shortage. They have hired your team to program ORA as an on-demand, pour-over-preparing robot. This is a very common drink request and automating the process would free up baristas to perform other jobs at the coffee shop.



Example Cardboard Pour-Over Device

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Have the students spend a few minutes thinking about their coffee-related experiences and answering the questions in the Engage section of the Student Activity Sheet. Then tell the students:

“Before we can solve this challenge, we need to learn more about robotic arms in the coffee industry and the careers related to them!”

Next, show the Lesson 5 video.

Explore Barista Career Connections

Students will do a brief guided virtual scavenger hunt related to Barista Jobs. Individually or in small groups, have them complete the Explore section on the Student Activity Sheet. If students are struggling with the job outlook section, have them go to the [US Department of Labor and Statistics Occupational Outlook Handbook](#). In this tool, you can find information about thousands of jobs. On the Index page, search for your career (Use Ctrl+F on a Windows machine or Chromebook). When you click on the career of your choice, there is a short video about the career as well as several key pieces of information. On the website, Barista is combined with Food and Beverage Serving and Related Workers.

Explain the uses of robotic arms in the coffee industry.

Start the Explain section by asking the students, “How are robotic arms used in the coffee industry?” Students should be able to recall from the video different aspects of the robotic coffee-making process, including grinding, extracting, steaming milk, doing fancy latte art, as well as serving the customer.

As discussed in the video, coffee-making robotics is a newer field for robotic arms. The novelty of having your coffee made by a robot arm will initially be a draw for tech-savvy individuals who would not mind paying a little extra for the experience.

Besides being a fun gimmick, the robot arm can be used to make consistent drinks. One advantage of going to a big, chain coffee shop is that whether you’re in New York City or rural Nebraska, every barista is trained to the same standard. So when you order a frappe, you will get a very similar drink no matter where you are!

Robotic arms can increase the consistency of the drinks from location to location. With humans, when you order steamed milk, there is some variance in



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time and consistency between baristas. The milk is still steamed, but the foam may be thicker between different baristas. Robotic arms can be programmed to make the same steamed milk and even compensate for environmental changes that may affect the milk steaming process.

Ask the students, "In today's lesson, we will be programming ORA to make pour-over coffee. Has anyone had a pour-over?" If any students have drunk one before, ask them how it is made. If no one can answer, tell the class a pour-over is when you grind whole beans, put them in a special funnel, and then pour water over the beans to extract the flavors.

Since the class likely does not have a grinder or pour-over funnel, we will rely on cardboard and tape to simulate these machines. Students will create a grinder and pour-over funnel to be used in the Elaborate challenge.

Elaborate: One Robotic Pour-over...To Go!

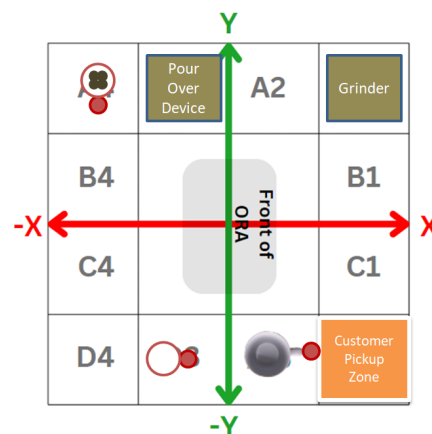
In this challenge, students will be programming ORA to act as a robot barista and simulate making a pour-over style coffee.

Setup:

Have students place the cardboard pour-over device and grinder in A3 and A1, respectively. Place a cup of newspaper 'coffee beans' in A4. Place a coffee mug in D2 (note wooden cylinder). Place an empty cup in D3.

Task Requirements:

1. ORA must start in the initial position.
2. ORA must make a pour-over by:
 - a. Grinding the coffee beans.
 - b. Place the pour-over device on top of the coffee mug.
 - c. Place coffee grounds in the pour-over device.
 - d. Simulate pouring water over the coffee grounds in the pour-over device.
3. ORA must then move the coffee cup to the customer pickup zone
4. ORA must finish in the Initial Position.



Direct students to plan this code in the Elaborate section of their Student Activity Sheet. After writing the pseudocode, and drawing the code blocks, direct students to create the code on their devices in the Ozobot Editor. Ensure students are connected to your shared workspace.

As students complete their code, they will test their code. Click on a given student's or student group's tab on the Ozobot Editor. Click "Run" to execute their

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code. Reset the materials between each code run. Remember to follow the Safety Protocol established in ORA Essentials. [Example solution code.](#)

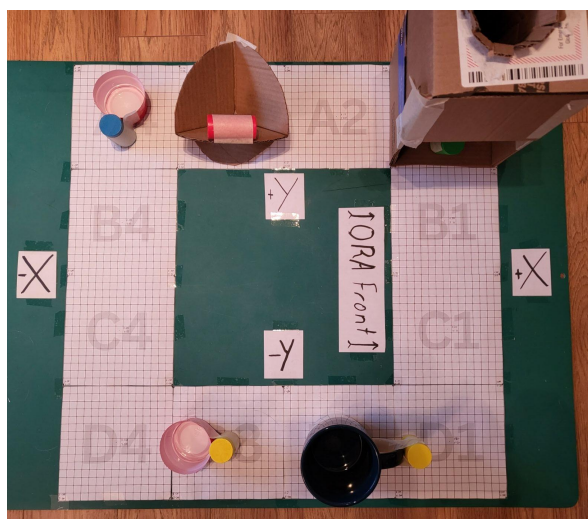
If students are waiting for the ORA, they could:

- Complete the Evaluate section of the activity sheets as an exit ticket.

Elaborate: Example solution

1. Setup

- Left is a top-down view of the setup for the lesson challenge.
- Right is a top-side view of the setup for the lesson challenge.



2. Designed Materials

For this challenge, the teacher has the option to have students create their own cardboard materials (see Explain section); otherwise, a teacher-created set of materials can be provided.

3. Sample Code

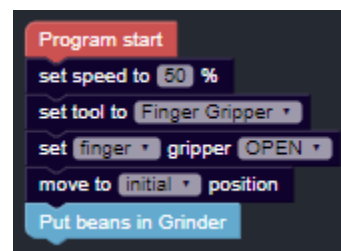
[Example Solution Code](#)

4. Code Description

The program is broken up into six distinct functions, any of which can be called. To call a function, go to the top of the code and, from the Functions Tab, drag over and attach the corresponding block to the desired function.

1. Put Beans in Grinder

- This function will have ORA pick up the cup of 'whole beans' in A4 and pour them into the hopper of the grinder device. The beans will fall through the grinder into the collection cup and will be considered



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'ground coffee.' ORA will then place the cup in A4 and return to its initial position.

2. Place Pour-Over Device on Mug
 - a. This function will have ORA pick up the pour-over device in A3 by the wooden cylinder and place it on top of the mug in D2. ORA will then return to its initial position.
3. Place Grounds in Pour-Over Device
 - a. This function will have ORA pick up the collection cup from the bottom of the grinder. This will involve sliding out the collection cup and then lifting it to pour the ground coffee into the pour-over device. ORA will then place the collection cup back in the grinder and then return to its initial position.
4. Pour Water over Pour-Over
 - a. This function will have ORA grab the water cup from D3 and tip it to mimic pouring water over the grounds in the pour-over device. ORA will then place the water cup back in D3 and then return to its initial position.
5. Remove Pour-Over Device
 - a. This function will have ORA grab the pour-over device from atop the mug and move it back to A3. ORA will then return to its initial position.
6. Move Mug
 - a. This function will have ORA grab the mug by the wooden cylinder attachment and slide it from D2 to D1 (the customer collection area). ORA will then return to its initial position.

Evaluate: Exit Ticket

Students will fill out and submit their Exit Tickets (The last page of the Student Activity Sheet).

Optional Extension: Logic and Random Coffee Permutations

Have you ever heard someone order a “tall white mocha, quad shot, almond milk, extra hot, caramel drizzle, and extra whipped cream?” It is baffling the number of possible combinations possible when making coffee! But, random coffee combinations help baristas create new and exciting drink options to add to the menu.

In this activity, students will use ORA's logic code blocks to randomly call functions to create random coffee combinations!

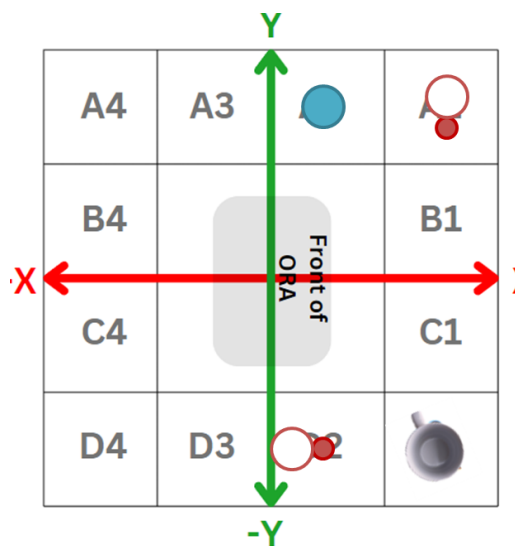


Source: Canva

Setup: Place a ‘creamer jug’ (an empty cup with an attached red cylinder in D2). Place an empty mug in D1. Place a cup representing a flavoring syrup dispenser in A1, and an empty salt shaker (sprinkles or a powder topping) in A2.

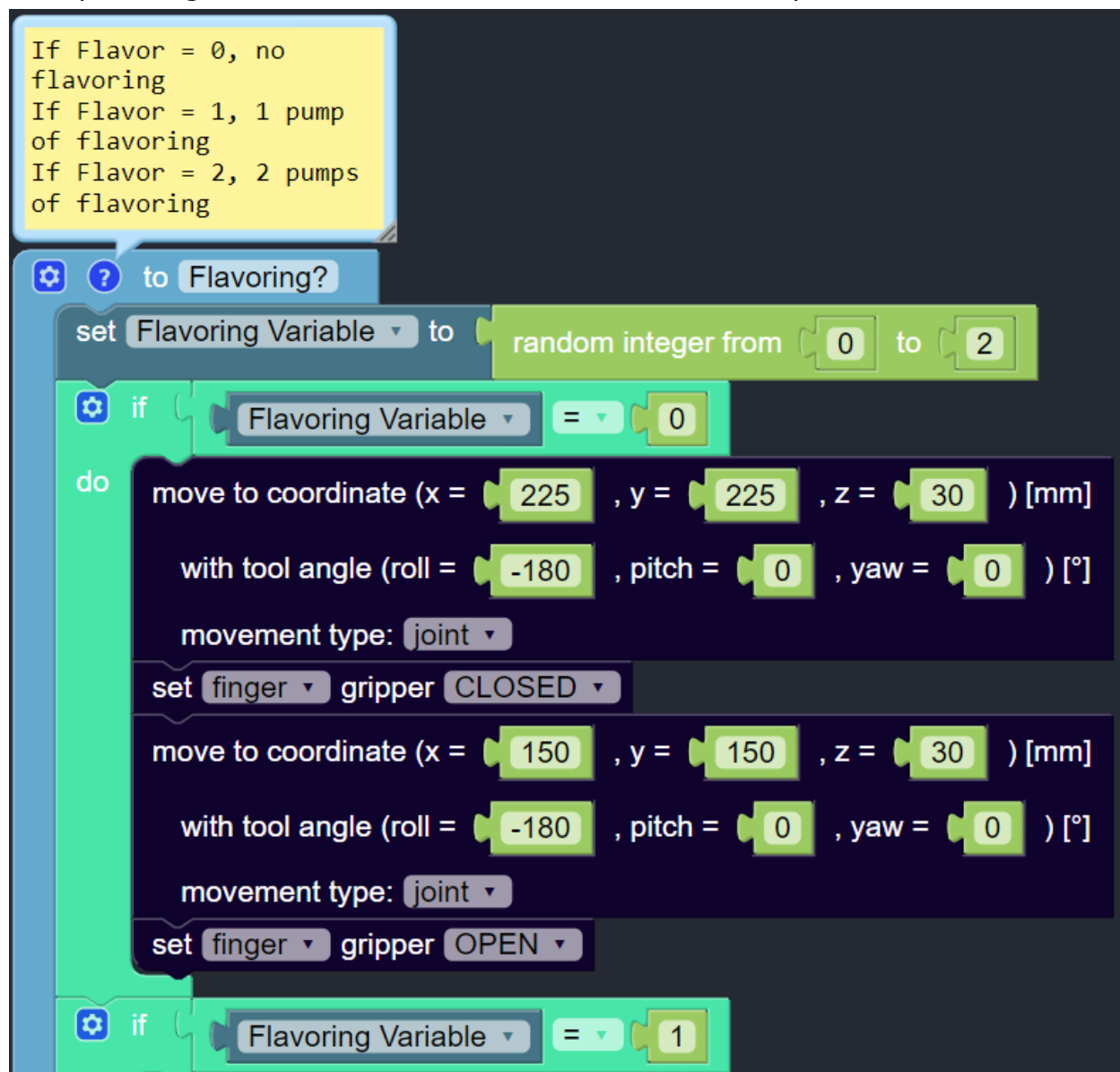
Task Requirements:

1. ORA must start in the initial position.
2. Students must program ORA to use random number generators and logic to determine if cream, sprinkles, or flavor syrup will be used and, if so, how much.
3. Random numbers generation and outputs need to be used for each of the three ‘extras’ that could be added to the coffee in D1.
4. ORA must finish in the Initial Position.



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Example of logic that could be used in the Extension Activity.



This logic discusses flavoring as “number of pumps,” which is often used in coffee shops as a recognized measurement. Since this extension uses a cup of flavoring, the students could program ORA to pick up the flavoring syrup cup, and then, based on how long the cup is tilted, that could relate to a number of pumps. Alternatively, students could make the syrup addition a binary include or exclude option in their logic structure.