

Robot Arm, Assemble!

Name: _____

Lesson 8

Date: _____

Assembly Line - a manufacturing process that uses a series of workstations to assemble a product in a set order

Assembly- the process of combining individual components into a finished product during manufacturing

Component - a part or element of a larger whole, especially a part of a machine or vehicle.

Chassis - the base frame of a motor vehicle

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

Engage

How are assembly lines different than other manufacturing methods (what makes an assembly line unique/useful)?

Answers may vary based on each student's prior knowledge. However, an assembly line relies on specialization for each specific duty.

How can robotic arms be used to increase the efficiency of assembly lines?

Answers may vary, but the general idea is that a robotic arm can be programmed to perform these specialized duties repeatedly without error.

Explore

While robotic arms have a key role in today's lesson, we will explore the related career of Automated Manufacturing Technician. After watching the video, find the following information about Automated Manufacturing Technicians:

Education needed to be an Automated Manufacturing Technician	Although a high school diploma is enough for most jobs, experience and training are needed for advanced assembly work.
Skills Needed to be an Automated Manufacturing Technician	Automation technicians should be able to program and configure automation systems, and have a basic to advanced understanding of programmable logic controls.
Duties of an Automated Manufacturing Technician	Their duties may involve long periods of standing or sitting. Most work full-time, including some evenings and weekends.
What kind of work environment does an Automated Manufacturing Technician work in?	Most assemblers and fabricators work in manufacturing plants.
Average Salary in your state	Answers will vary based on location, The average is \$62,711/year
What is the job outlook for this career?	The career outlook is positive, with a growing demand for these professionals as the world becomes more automated.

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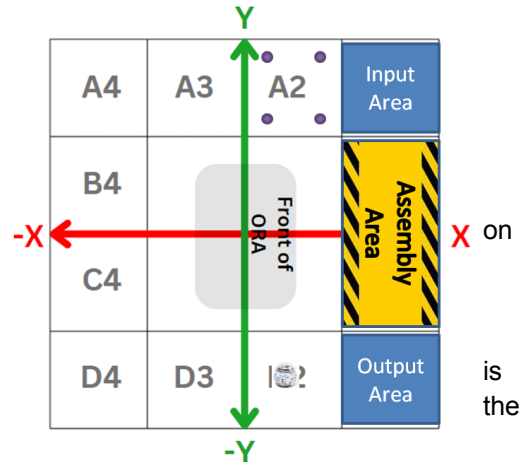
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Elaborate

In this challenge, students will build a fixture to hold a model car in place while ORA puts on the wheels. ORA will return to the initial position and wait while a human adds the hub caps to the axles. ORA will then move the car over and repeat the process with the second car. Students will also program Evo to concurrently notify the human worker when it is safe to enter the workspace to attach the hubs.

Task Requirements:

1. ORA must start in the initial position.
2. ORA must use the finger grippers to pick up a car chassis from the Input Area and move it to the Assembly Area.
3. ORA will pick up two wheels from A2 and place them on the top axles of the car.
4. ORA will return to the initial position while the human coworker places the hubs on the axles.
5. After the hubs are installed and the human technician out of the way, ORA will move the wheeled chassis to output area.
6. ORA will then move the second chassis into the assembly area and repeat the wheel-adding process.
7. ORA will return to the initial position while the human coworker places the hubs on the axles.
8. ORA must wait at least 60 seconds for the technician to add the hubs and move to safety.
9. After the hubs are installed and the human technician is out of the way, ORA will move the wheeled chassis to the output area.
10. Evo must illuminate red when humans must be out of the ORA workspace, green when humans may enter, and audibly notify humans when ORA is ready to commence work again.
11. ORA must finish in the Initial Position.



Pseudocode	Code Blocks
	Example solution code.

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Evaluate

Please answer the following prompts.

Remember to include your **name** and **date** on this paper!

1. Before this lesson, did you know about how robotic arms were used in the automotive industry? Which of the roles we learned about would ORA be best suited for? Which would ORA be least suited for? Why?

Answers may vary based on student prior knowledge. ORA would be best suited for assembling or palletizing. ORA is least suited for painting as the overcast would not be good for ORA's joints.

2. After testing your code in the Elaborate section, what was the most difficult part? What about that process made it most difficult?

Answers may vary, but precisely putting the wheels on the car is likely the most difficult part.

3. In the Elaborate section, Evo was used as a safety notification. What other safety features would be necessary for a full-sized cobot to work alongside humans in an assembly line?

Answers may vary, but one interesting idea is the use of sensors to shut down the machines when humans enter an active workspace.