

# Future Burger

## ***Created by***

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## ***Topics***

Programming

Mathematics

Science

## ***Ages***

Grades 9-12

## ***Duration***

2 hours

# **Standards**

## **Iowa Agriculture Education**

CRP.06.01. Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.

CRP.06.02. Assess a variety of workplace and community situations to identify ways to add value and improve the efficiency of processes and procedures.

CRP.07.01. Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

CRP.08.02. Investigate, prioritize and select solutions to solve problems in the workplace and community

FPP.01.01. Analyze and manage operational and safety procedures in food products processing facilities

FPP.01.02. Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.

## **Iowa Family and Consumer Sciences**

STANDARD 8: Integrate knowledge, skills, and practices required for careers in food production and services.

8.2.5 Practice good personal hygiene/health procedures, including dental health and weight management, and report symptoms of illness.

8.2.6 Demonstrate proper purchasing, receiving, storage, and handling of both raw and prepared foods.

8.2.7 Demonstrate safe food handling and preparation techniques that prevent cross contamination from potentially hazardous foods, between raw and ready-to-eat foods, and between animal and fish sources and other food products.

8.6.10 Apply principles of inventory management, labor cost and control techniques, production planning and control, and facilities management to front and back of the house operations.

## **Iowa Common Core Mathematics**

7.NS.A.1.d Apply properties of operations as strategies to add and subtract rational numbers.

7.RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

7.G.B.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

High School Modeling - Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods.

### Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
4. Model with mathematics
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

## **Iowa Common Core Science**

HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS–ETS1–4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Burger Icon – Aha Soft, Free for non commercial Use, retrieved from <http://www.iconarchive.com/show/food-icons-by-aha-soft/burger-icon.html>

## ***Instructor Notes***

### **Challenge 1**

Google Sheets is a good option for the spreadsheet. Keep the spreadsheet up on the projector. When everyone has entered their scores, brainstorm as a group how to determine the average and range using a formula.

Identify the fastest group(s). Put the fastest code on the screen for the entire class to see. As a class, examine the code of that group and check that all requirements were met. Why was it the fastest? Did they miss a requirement?

### **Challenge 2**

Have the groups share out their results. What worked, and what didn't? Why?

# Future Burger

You are a production engineer at Future Burger, a chain hamburger restaurant that prides itself on innovation and speed. You came up with the great idea of using robots to prepare the burgers of the future. In order to test out the robots in one of the stores, you need to provide the store with a layout of the hamburger production line. Keeping in line with their *Fast and Fresh* motto, you will need to come up with the most efficient production line possible.



**Problem: What is the most efficient production line for the Future Burger products?**

## Requirements:

- As a company that values safe food practices, make sure to include a hand washing station for the robots. The hand washing station is specifically formatted for sterilization of robots and require only 1/10<sup>th</sup> of the CDC recommended hand washing time.
- Hands must be washed after handling raw meat.
- The cooking station is very hot. Cold food sitting one foot away from the hot station maintains a temperature of 45°. Every one foot away lowers the temperature two degrees.
- Burgers must be cooked to safe minimum temperatures according to [foodsafety.gov](http://foodsafety.gov).
  - 1 seconds – 140°
  - 2 seconds – 150°
  - 3 seconds – 160°
  - 4 seconds – 170°
- Each topping takes one second to complete.
- Getting the raw burgers and buns doesn't need wait time.
- All and any condiments on top of the burger take 1 second to complete.
- Toppings must go on top of the burger.
- Buns can be kept at room temperature.

## Stations:

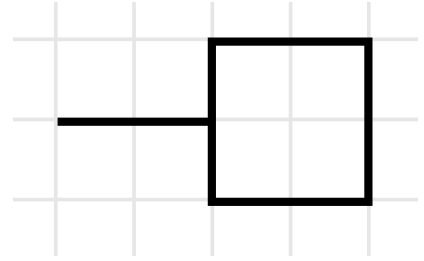
- Buns (top and bottom - must get one at a time)
- Raw burgers (cold station)
- Cooking station (hot station)
- Two topping can be at one station (cold stations, see image)
- All condiments are together on one station (cold station, see image)

## The Future Burger Toppings

*Lettuce*  
*Tomato*  
*Pickles*  
*Bacon*  
*Ketchup*  
*Mustard*  
*Mayonnaise*  
*BBQ sauce*

# Challenge 1

- You will need to do some online research to make sure you are meeting each requirement for the production line.
- Using the Ozoblocky editor and the grid sheet, design a production line that includes all food stations. Coding Tips:
  - Each stations should have the same size and shape, 16 sq ft with a 8 ft line.
  - Because the Ozobot will be traveling on a straight line, your coding will use mainly the “line navigation” blocks. Make sure to explore the “function” features!
  - Use a pencil to mark out your stations before going over them with a thick marker.
- Time your Ozobot completing the following two burgers, from when the ozobot start moving until it stops moving. Do not change the layout of the stations between burgers.
- Add your times for each burger on the chart below and the classroom spreadsheet.



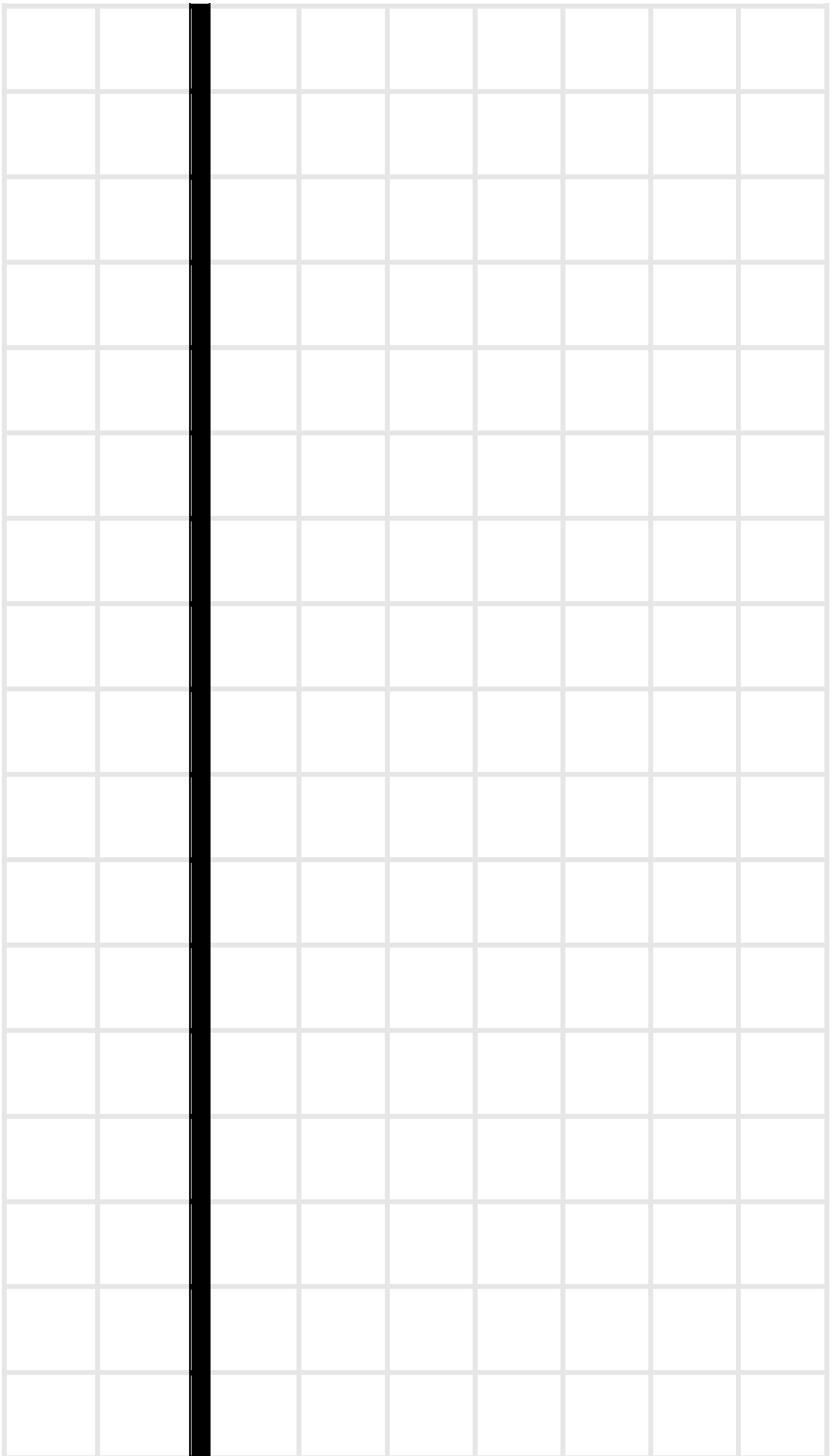
Burger	Time from start to finish
Top bun, bottom bun, burger, lettuce, tomato, ketchup	
Top bun, bottom bun, burger, lettuce, pickles, bacon, mayo	

# Challenge 2

It is time to think outside the box. Currently, the production line is exactly that, a line! Is there a different shape or layout that would be more efficient?

- Brainstorm new layouts for the production line. Create two new layouts within your group.
- Using the two burgers from the last challenge, time your Ozobot again.
- Add your new times to the chart below and the classroom spreadsheet.

Burger	Time from start to finish
Top bun, bottom bun, burger, lettuce, tomato, ketchup	
Top bun, bottom bun, burger, lettuce, pickles, bacon, mayo	



1 block = 4 sq ft