



World Robot Olympiad 2018

Regular Category

Senior

Game Description, Rules and Scoring

FOOD MATTERS

FOOD DISTRIBUTION



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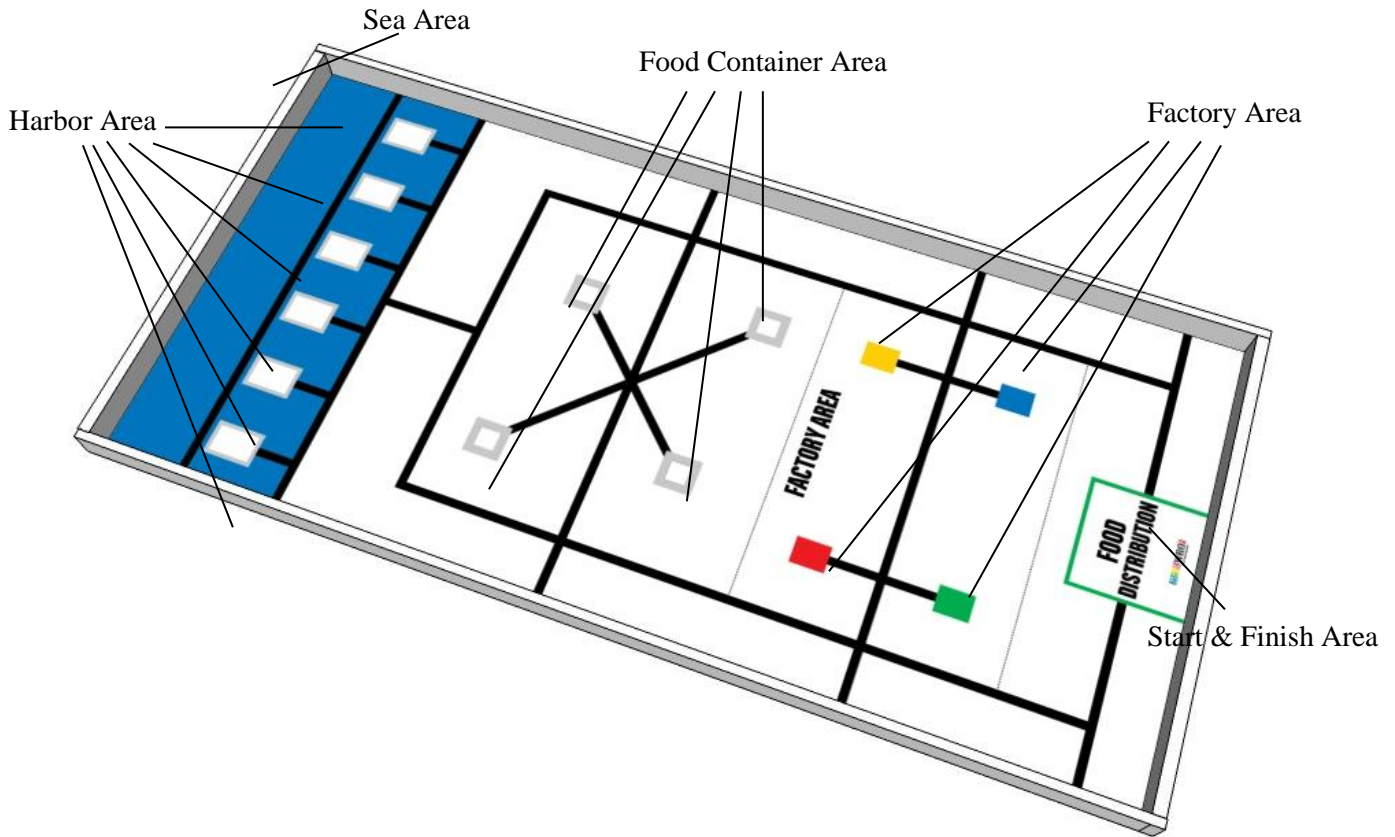
Introduction

One way to increase the amount of food available worldwide for the consumers is to improve the way food is distributed from the producers to the costumers.

This means that the primary goal of food distribution is to make sure that the consumers get the kinds of foods they demand from the producers. The secondary goal is to make sure as little food as possible is wasted during transportation.

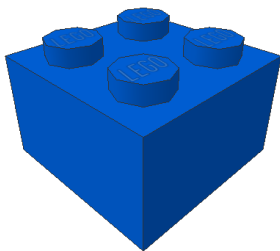
The Senior Challenge is to make a robot that can bring different kinds of food to the right destinations by appropriate ships and a robot that can equip the ships with temperature controllers that keep the different kinds of perishable food on board the ships in the desired temperature range during transportation.

1. Game Description

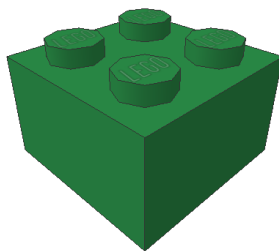


The Senior Challenge is to make a robot that can bring different kinds of food from food containers to appropriate ships in the harbor and make sure the food is transported with as little waste as possible.

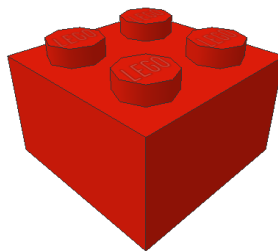
There are four kinds of foods represented by **four** colored LEGO bricks:



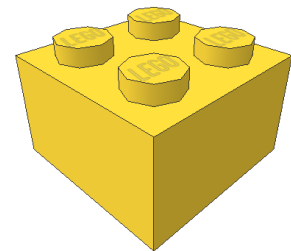
Blue Food



Green Food

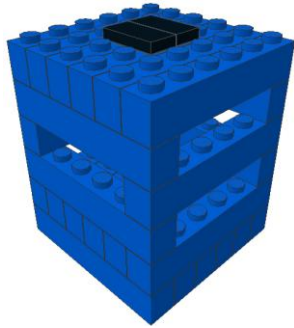


Red Food

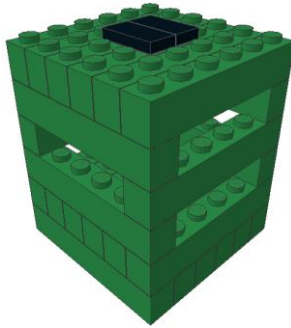


Yellow Food

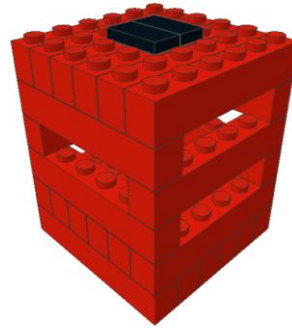
There are **four** food containers:



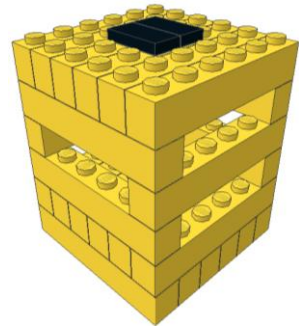
Blue Container



Green Container



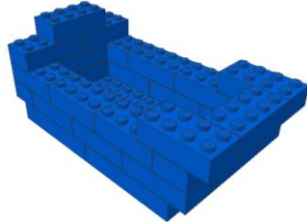
Red Container



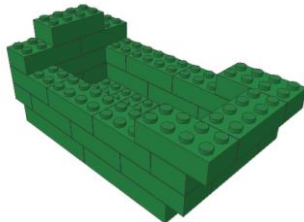
Yellow Container

The food bricks are placed on top of the four containers in the Food Container Area: Blue Food is placed on top of the Blue Container on the black square, Green Food on the Green Container, etc.

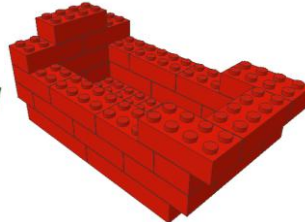
There are **four** ships in the Harbor Area.



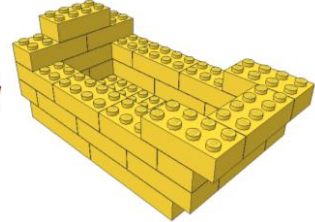
Blue Ship



Green Ship



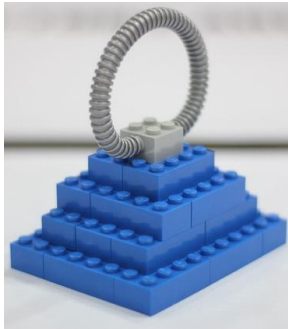
Red Ship



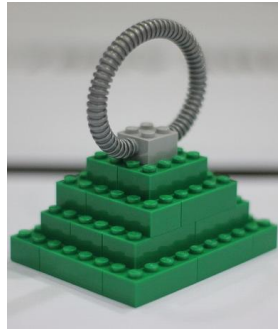
Yellow Ship

The different kinds of food must be brought on board the ships: The Blue Food on board the Blue Ship, the Green Food on board the Green Ship, etc.

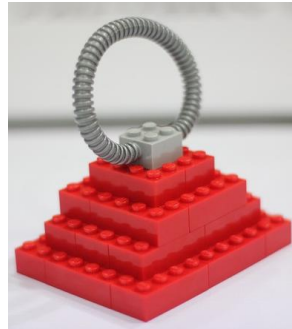
There are **four** different temperature controllers:



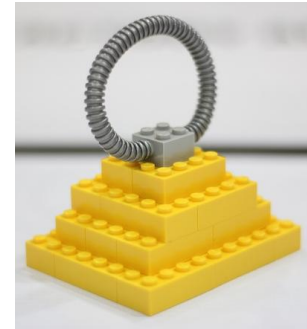
Blue Controller



Green Controller



Red Controller



Yellow Controller

The temperature controllers must be placed on top of the ships: The Blue Controller on top of the Blue Ship, etc.

Furthermore, the robot must bring the ships to sea and bring the used food containers to the Factory Area for cleaning and maintenance: The Blue Container must be placed in the Blue Square, etc.

Only objects of three colors are used in one round. Both the food container (including the food brick) and the temperature controller of one color will not be used in one round (see Game Rules 2 for randomization information).

The robot must start from within the Start & Finish Area. After the mission, the robot must return to the Start & Finish Area.

2. Game Rules

1. Before each round the 4 food containers are randomly placed on the 4 grey squares in the Food Container Area.

The random placement of the food containers may be accomplished manually as follows:

- a. The locations for the container placement are numbered 1 to 4 as in figure 2.1

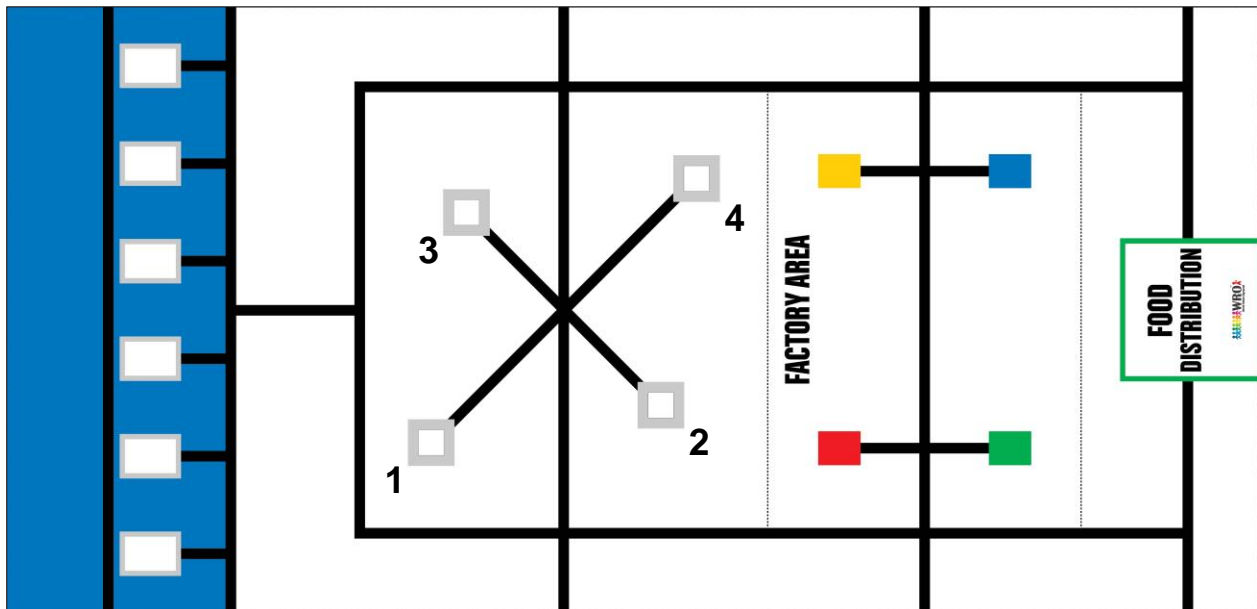


Figure 2.1

- b. Put the four colored food bricks (1 red 2x2 LEGO brick, 1 blue 2x2 LEGO brick, 1 green 2x2 LEGO brick and 1 yellow 2x2 LEGO brick) into a non-transparent box.
- c. Shake the box to mix the 4 food bricks.
- d. Take the food bricks one by one from the box and put a food container of the corresponding color on a grey square starting from the square number 1, then put the food brick on the top of the food container.

2. Before each round 3 of the 4 ships are randomly placed on the white squares in the Harbor Area as shown in figure 2.2

The random placement of the 3 ships may be accomplished manually as follows:

- a. The ship locations are numbered 1 to 6 as in figure 2.2

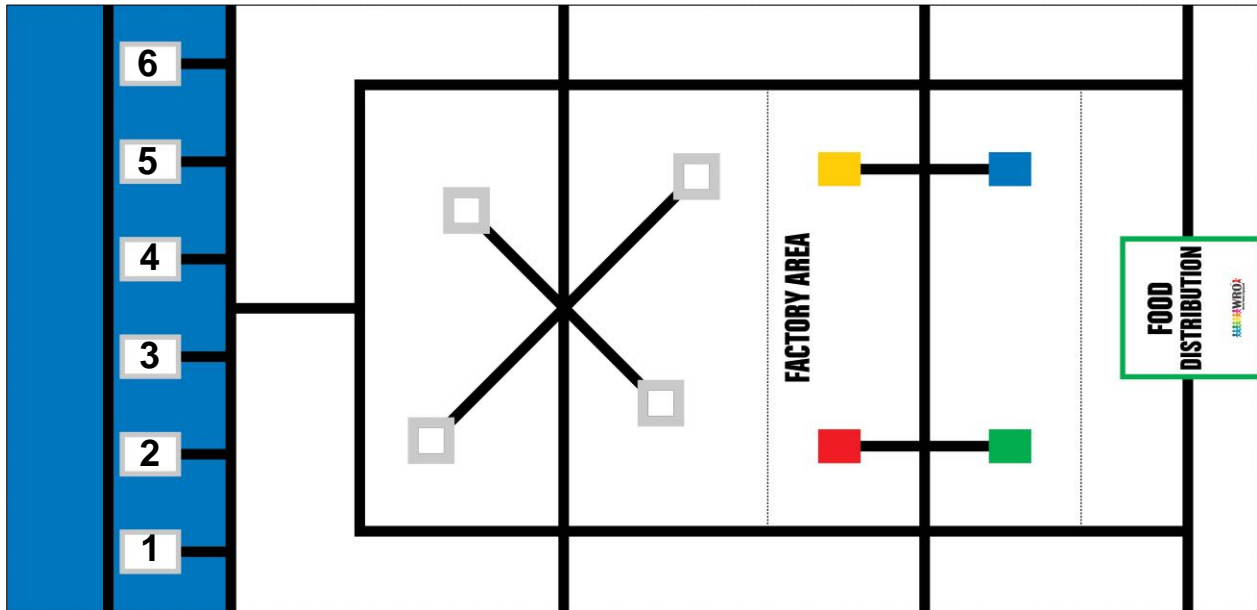
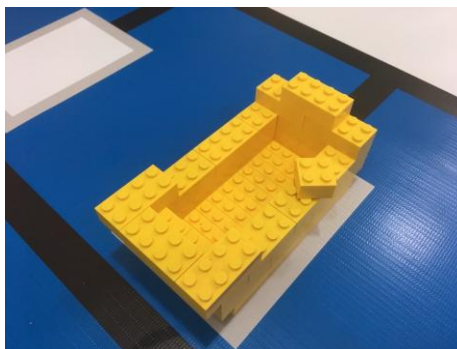
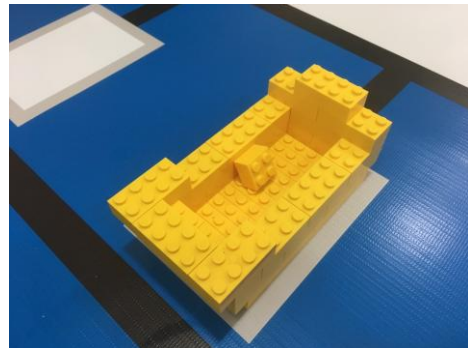
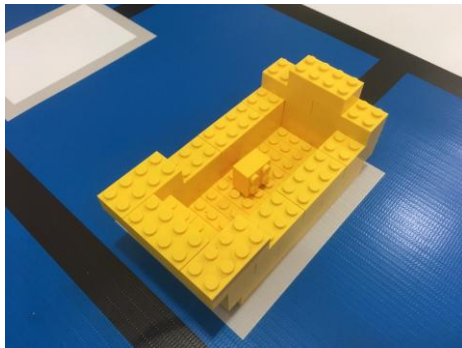
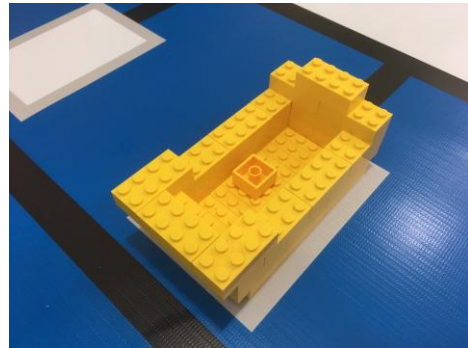
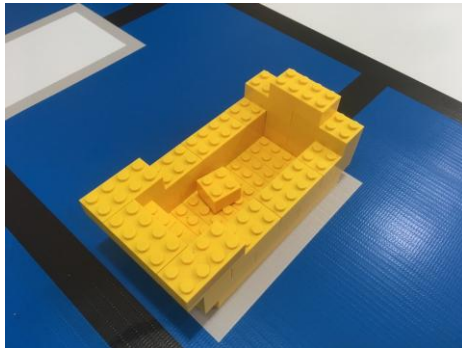


Figure 2.2

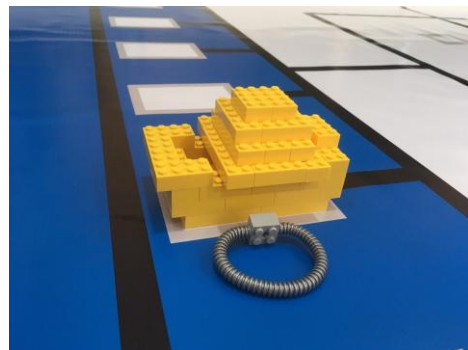
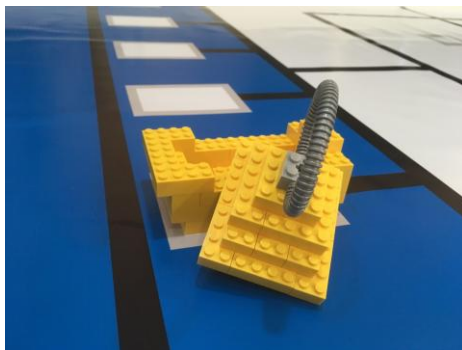
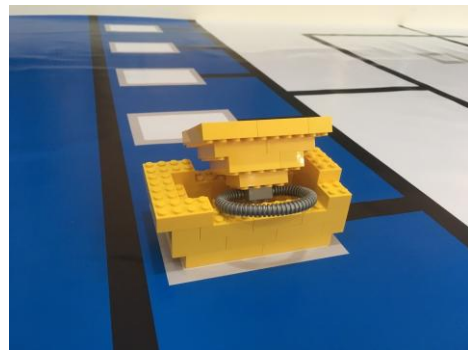
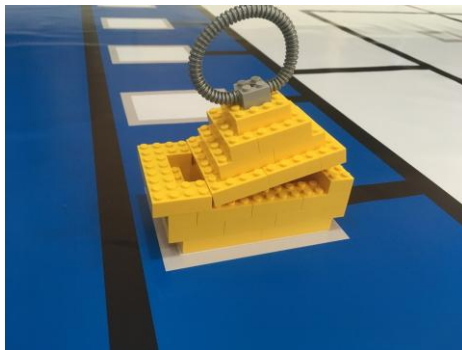
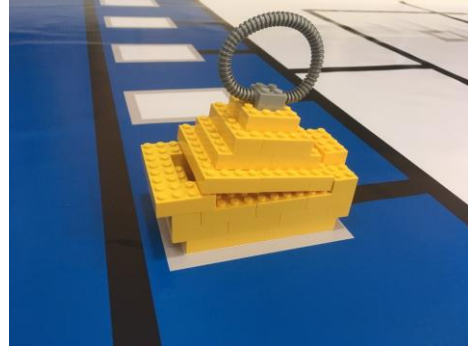
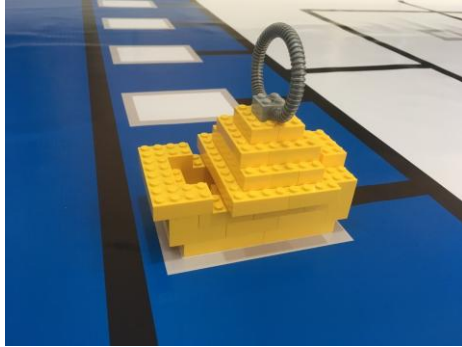
- b. Put 1 red card, 1 blue card, 1 green card, and 1 yellow card into a non-transparent box.
- c. Shake the box to mix the 4 cards.
- d. Take 1 card out of the box. **This is the color not to be used in this round. Both the food container (including the food brick) and the temperature controller of the color not to be used are removed from the game mat.**
- e. Then put 3 white cards into the box with the 3 remaining colored cards.
- f. Shake the box to mix the 6 cards.
- g. Take the cards one by one from the box. If a colored card is drawn, put a ship model of the corresponding color on a white square starting from

square number 1. If a white card is drawn, no ship is placed on the white square.

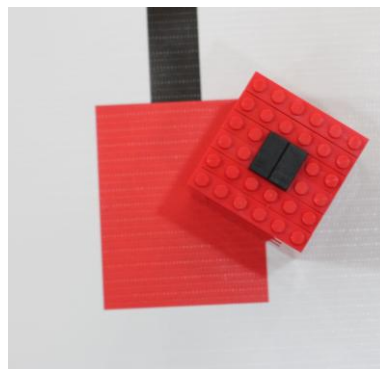
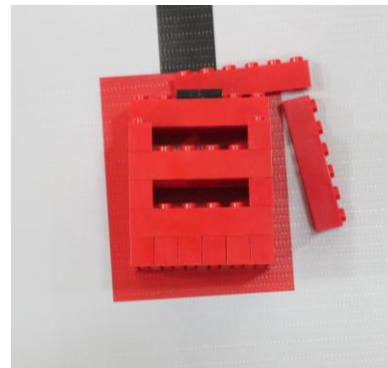
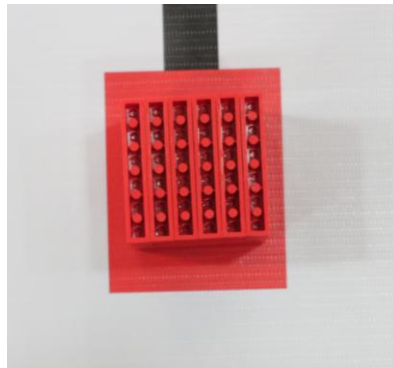
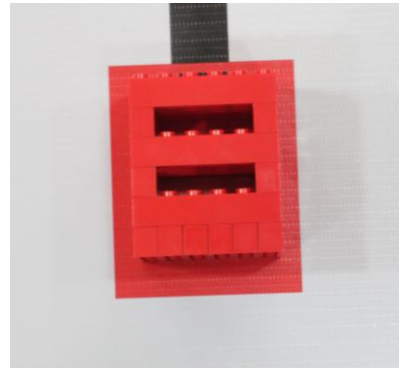
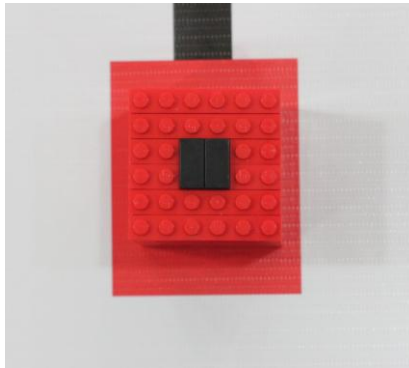
3. The robot must move each food brick from a food container completely into a ship of the corresponding color. The food can be placed in any orientation inside the ship. See the figure below for examples of proper and improper placement.



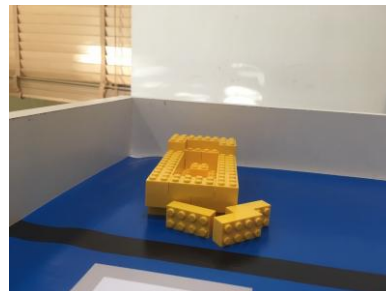
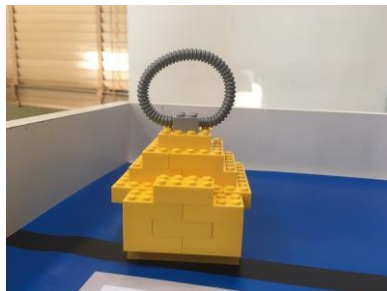
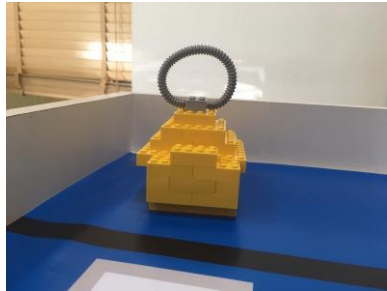
4. The robot must move each temperature controller and place it on top of a ship of the corresponding color. The controller must be placed in an upright position (studs up) and must be undamaged. See the figure below for examples of proper and improper placement.



5. The robot must move each food container to be completely inside the square that matches its color in the Factory Area. The food containers can be placed in any orientation but must not be damaged.



6. The robot must move each ship to be completely inside the Sea Area. The ship must not be damaged.



7. Before the start of the mission the robot must start completely within the Start & Finish Area (the green line around the area not included). The mission is completed when the robot returns to the Start & Finish Area, stops, and the chassis of the robot is completely within the area (green line included). Cables are allowed to be outside of the area.

3. Scoring

Maximum score = 190 points

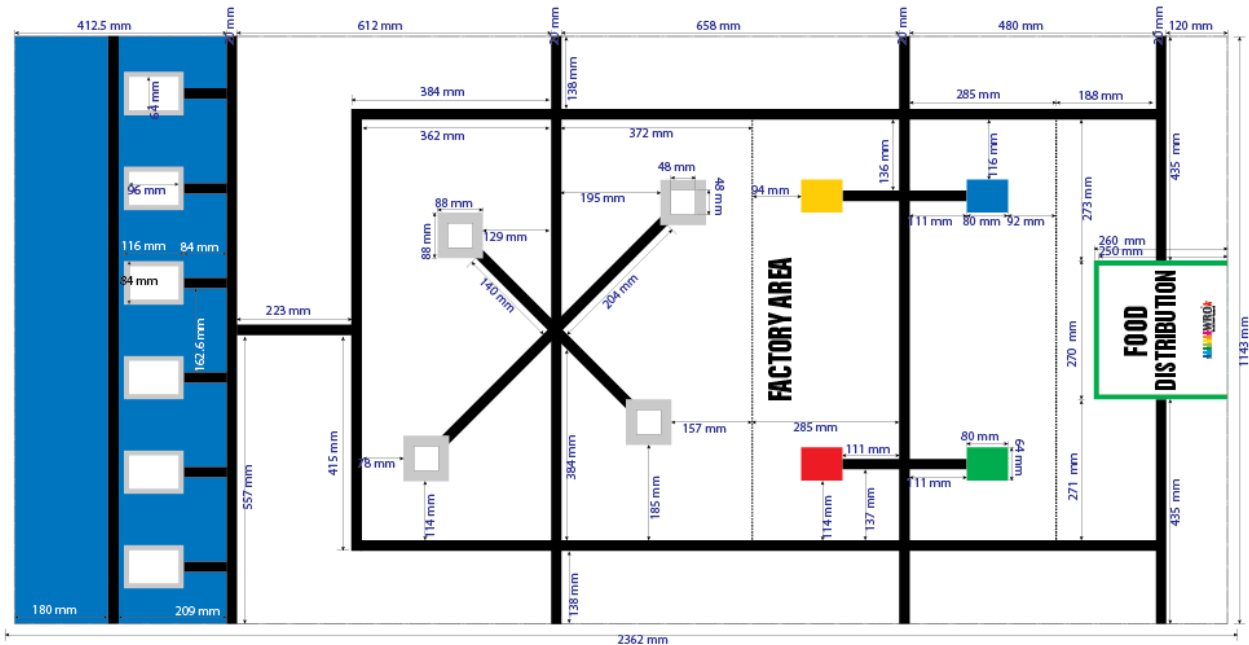
Scoring Table:

Tasks	Points Each	Total
Food brick away from the corresponding food container, not touching the container anymore, and the food brick is somewhere else on the game mat.	5	15
Food brick completely in a ship that matches the color of the food brick.	15	45
Food brick completely in a ship but color does not match.	5	15
Temperature controller undamaged and completely placed on top of a ship that matches the color of the controller.	20	60
Temperature controller undamaged and completely placed on top of a ship but color does not match.	5	15
Ship undamaged and completely in the Sea Area.	10	30
Food container completely in a square in the Factory Area that matches the color of the container.	10	30
Food container completely in a square in the Factory Area but color does not match.	5	15
Robot completely stops within the Start & Finish Area (Only gets these points if other points are assigned)		10
Maximum Score		190

4. Table Specifications





- The internal dimensions of a game table are 2362 mm x 1143 mm.
- The external dimensions of the table are 2438 mm x 1219 mm.
- The primary color of a table surface is white.
- Height of the borders: 70 ± 20 mm

5. Game Mat Specifications



- All black lines are 20 ± 1 mm.
- Dimensions may vary within ± 5 mm.
- If the table is larger than the game mat, put the starting area to the wall and center the mat to the other sites.
- We recommend to print the game mat with matt finish without reflecting colors.

Color Specification

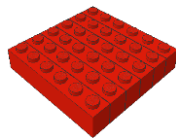
Color Name	CMYK				RGB			RGB Sample
	C	M	Y	K	R	G	B	
Red	0	100	100	0	237	28	36	
Blue	100	47	0	0	0	117	191	
Yellow	0	19	100	0	255	205	3	
Green	88	0	100	0	0	172	70	

6. Game Object Specifications

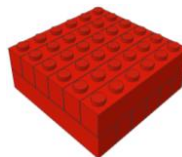
4 Food containers are needed: 1 red, 1 green, 1 yellow and 1 blue.

Each Food container has twenty-four 1x6 LEGO bricks and two black 1x2 LEGO plates.

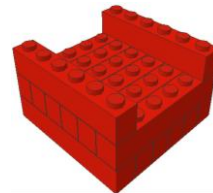
In addition, you need one 2x2 LEGO brick in each color (red, green, yellow, blue). These bricks are placed on top of the Food container.



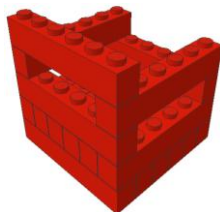
Step 1



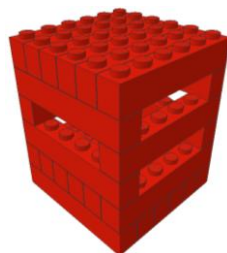
Step 2



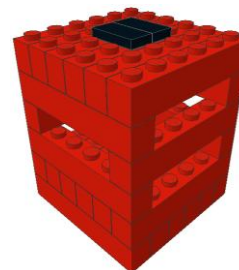
Step 3



Step 4



Step 5



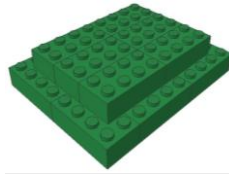
Step 6

4 Food engines are needed: 1 red, 1 green, 1 yellow and 1 blue.

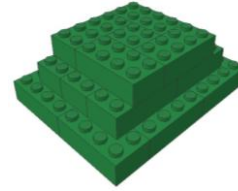
Each Food engine has twenty-two 2x4 LEGO Bricks, one 2x2 LEGO Brick, one 2x2 with pins and axlehole LEGO Brick and one Technic ribbed hose.



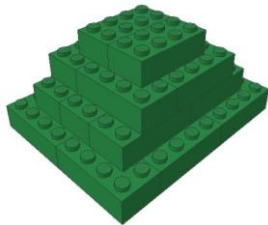
Step 1



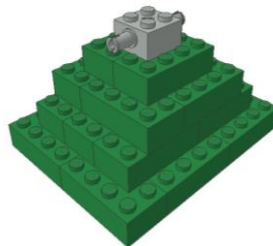
Step 2



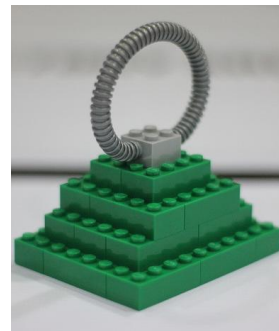
Step 3



Step 4



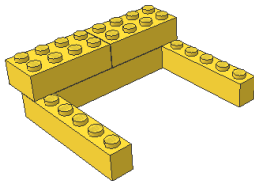
Step 5



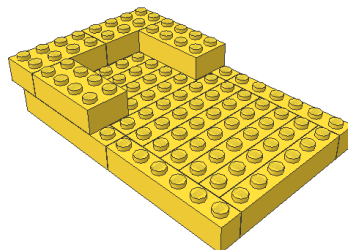
Step 6

4 ships are needed: 1 red, 1 green, 1 yellow and 1 blue.

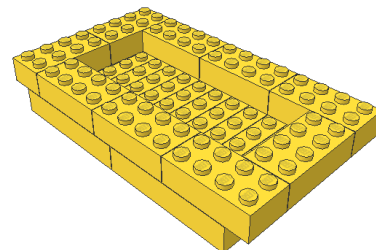
Each Ship has sixteen 1x6 LEGO Bricks and twenty-four 2x4 LEGO Bricks.



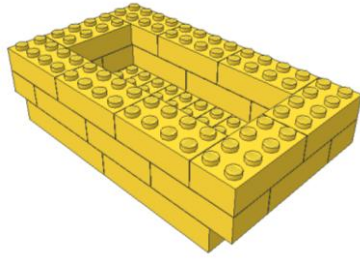
Step 1



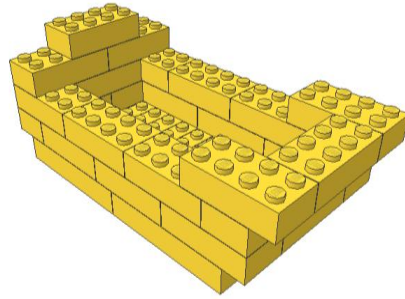
Step 2



Step 3



Step 4



Step 5