In-House Challenge 2: Tending to the Plants

Game Rules

IN-HOUSE CHALLENGE

EARTH ALLIES

WORLD ROBOT OLYMPIAD ™

WRO®

SOUTH AFRICA

Date: 03 June 2024

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PART ONE – GAME DESCRIPTION

1. Introduction

Robotics is a wonderful platform for learning 21st century skills. Solving robotic challenges encourages innovation and develops creativity and problem-solving skills in students. Because robotics crosses multiple curricular subjects, students must learn and apply their knowledge of science, technology, engineering, math, and computer programming.

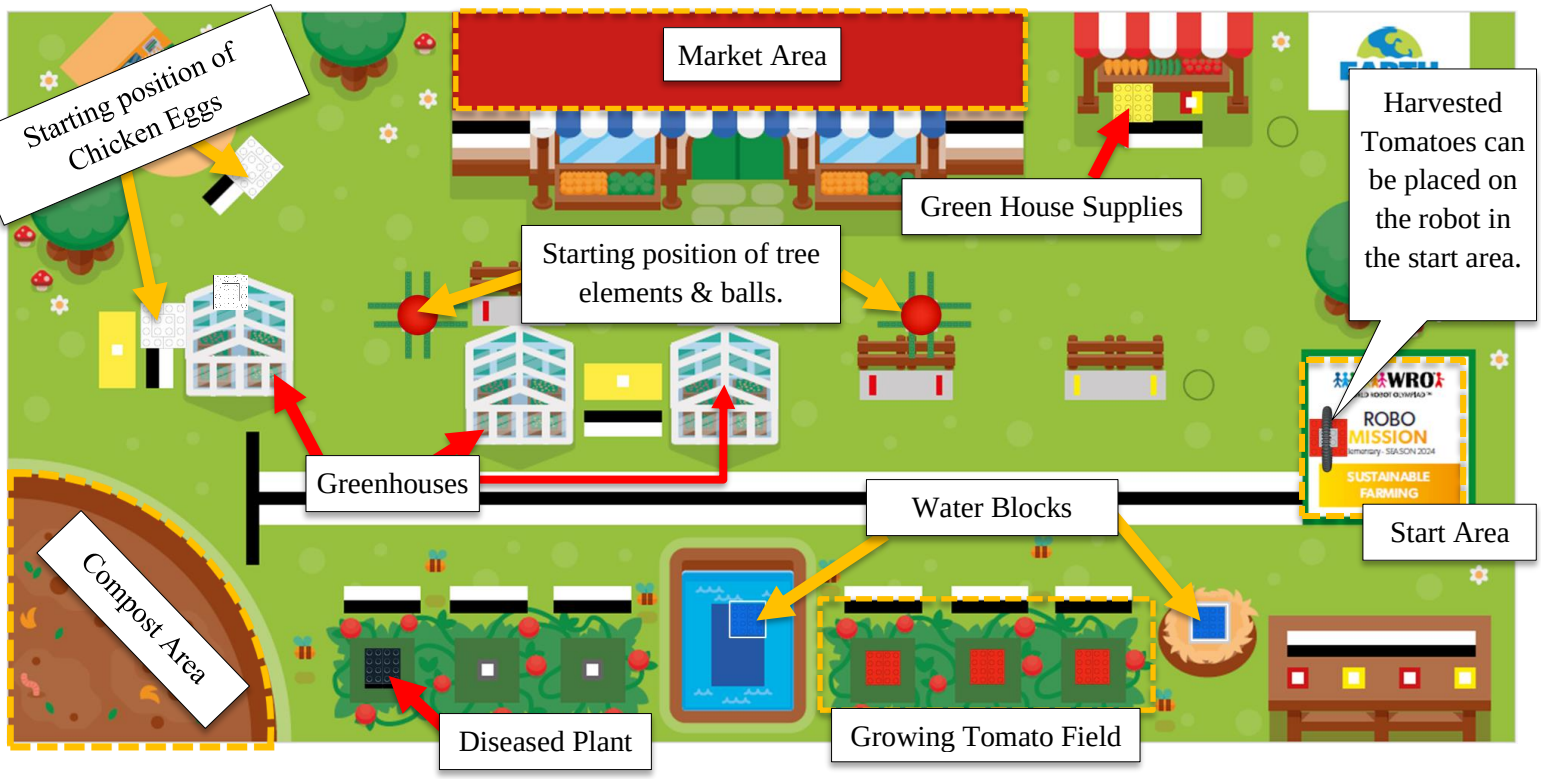
The most rewarding part of designing robots is that students have fun. They work together as a team, discovering their own solutions. Coaches guide them along the way, then step back to allow them their own victories and losses. Students thrive in this supportive and immersive environment, and learning occurs as naturally as breathing air.
At the end of the day, at the end of a fair competition, students can say they did their best, they learned, and they had fun.

There is no international component for the In-House challenge.
The In-House challenge is run by coaches in their own capacity.
Score submission takes place between the 10th and 21st of October

2. Game Field

The following graphic shows the game field with the different areas.

If the table is larger than the game mat, place the mat on the wall with the start area side touching the table wall.



Tasks:

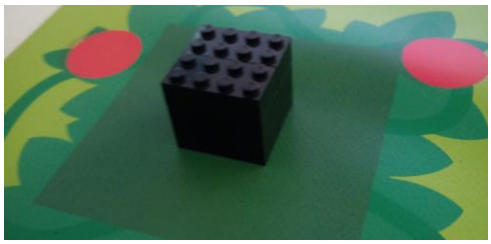
1. Use the Ultrasonic/Distance sensor to start the robot moving.
2. Follow a line with a light/colour sensor.
3. Deliver the harvested tomatoes to the market area.
4. Deliver the blue water blocks to the growing tomato plants.
5. Deliver the diseased plant element to the compost area.
6. Deliver the yellow greenhouse supplies to any greenhouse.
7. Deliver the white eggs to the market area.
8. Touch the robot and say STOP to show you have ended your scoring run.

Bonus: Don't move the red balls off of the tree elements.
Bonus: The growing tomato plants have not been moved or damaged.

3. Game Objects & Positioning

Diseased tomato plant (x1)

There is one (1) diseased tomato plant which starts in the tomato field closest to the compost area. The element is placed completely inside the white square on the game mat.

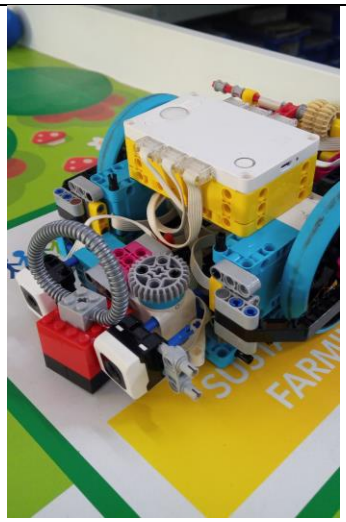


Diseased Tomato Plant

Placement of diseased tomato plant

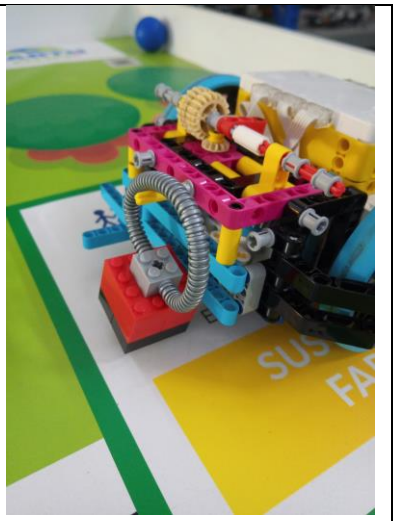
Harvested Tomatoes (x1)

The harvested tomatoes element starts inside of the start area. The element can be placed on the robot before the robot begins moving.



Harvested tomatoes element starting positioned in the robot.

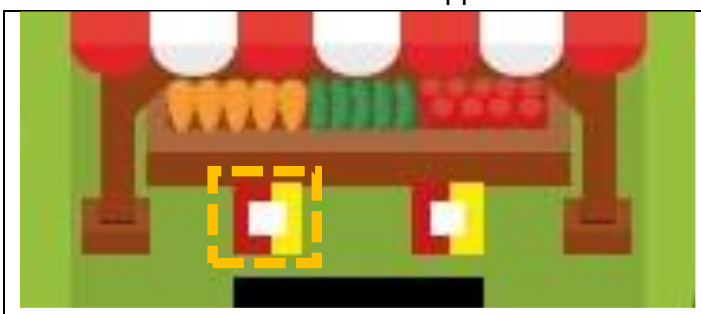
Harvested tomatoes element starting positioned on top of the robot.

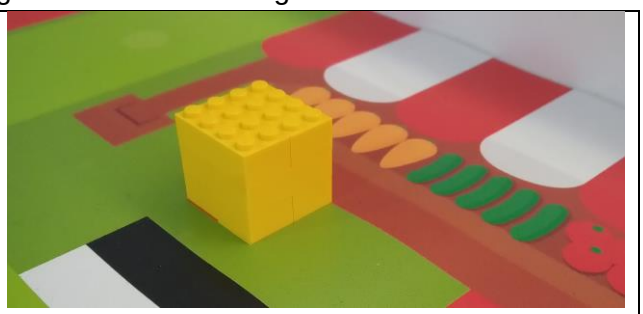


Harvested tomatoes element starts being carried by the robot.

Yellow Green House Supplies (x1)

The Yellow Green House Supplies start on the vegetable stand to the right of the market area.

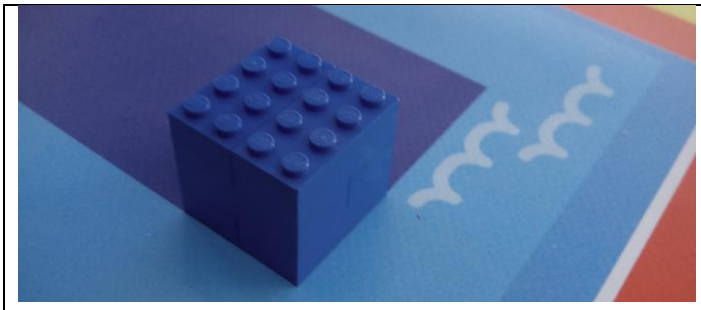




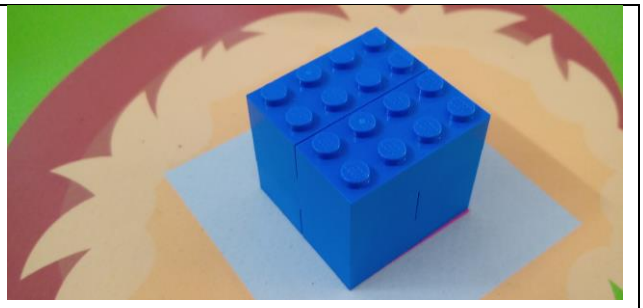
Starting position of the Yellow Green House Supplies On the vegetable stand.

Blue Water Blocks (x2)

Two (2) Blue Water Blocks are positioned to the left and right of the growing tomato field. One in the swimming pool image and the other inside of the chicken nest.



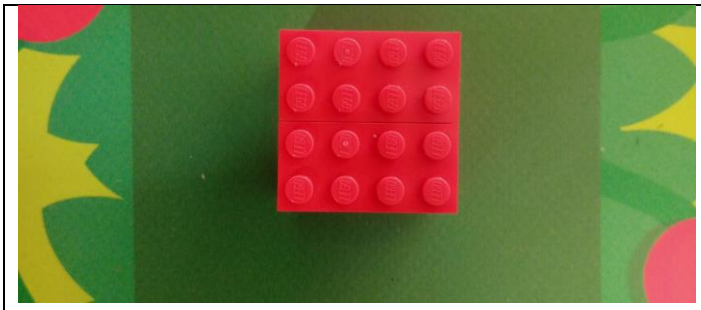
Starting position of the blue water block inside the swimming pool.



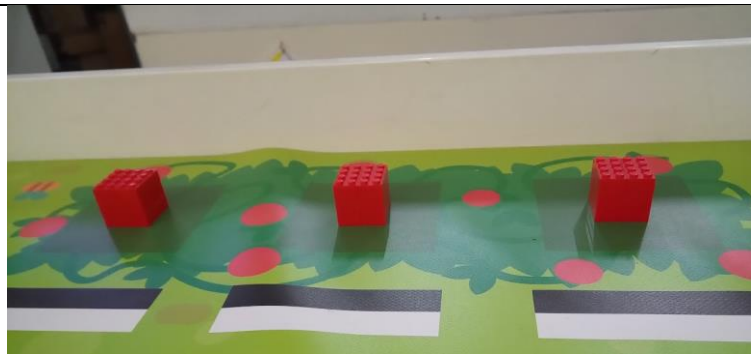
Starting position of the blue water block inside the chicken nest.

Growing Tomato Plants (x3)

Three growing tomato plants start in the growing tomato field to the right of the swimming pool. Each growing tomato element is placed inside one of the three white squares.



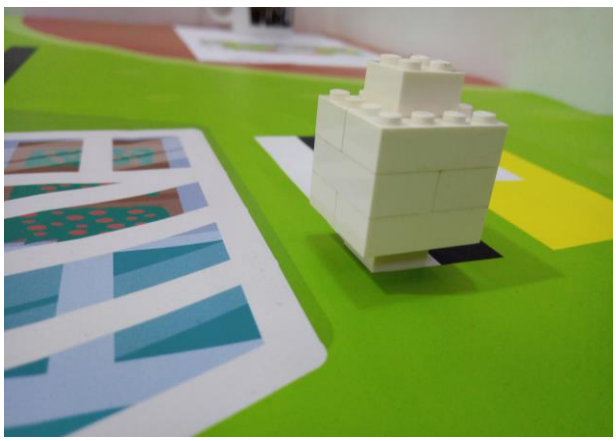
Starting position of a growing red tomato plant inside of the growing tomato field.



Placement of the three Growing Tomato Plants. Inside th tomato growing field.

Chicken Eggs (x2)

There are two chicken eggs placed on the game mat. One egg element is placed in the black and white line area near the furthest greenhouse. One egg element is placed in the black and white line area near the orange circle on the game mat.

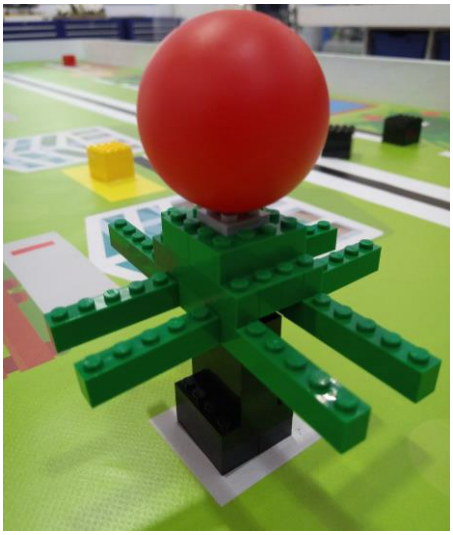


Egg element placed in its starting position.

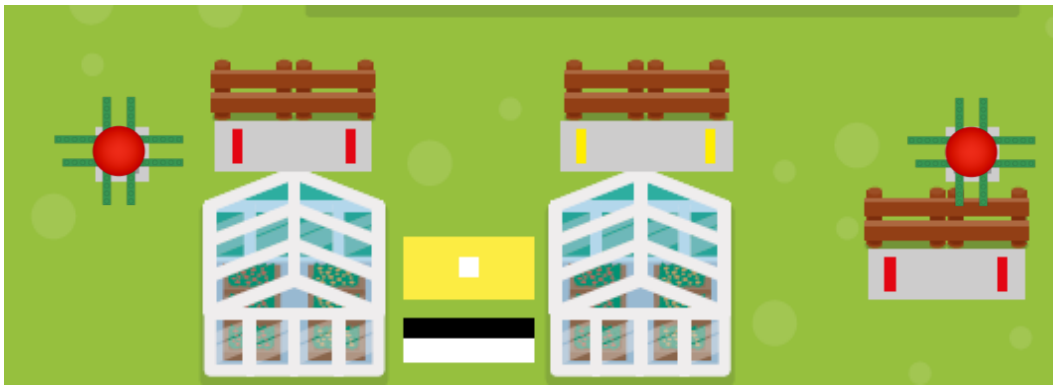
Egg elements shown in their starting positions.

Trees & Balls (x2)

Two tree elements are placed on the game mat on the dark grey squares near the green houses.



Tree element starting position.



Starting position of the trees on the game mat.

4. Robot Missions

4.1 Points for use of sensors

Teams should program the robot so that when a team member or judge breaks the ultrasonic/distance sensors beam the robot waits for 1 second and then begins moving out of the start area before completing any of the missions on the game table. (if a judge can't verify this on the game mat, they must check the team's program)

Teams should program the colour/light sensor, so the robot follows a line of any colour anywhere on the game mat. (if a judge can't verify this on the game mat, they must check the team's program)

4.2 Clear the Diseased tomato plant.

The Black Diseased tomato plant must be removed and placed completely inside the compost area. The plant can be placed in any orientation.

4.3 Sell the Harvested Tomatoes.

The robot must deliver the harvested tomatoes element to the Market Area. The harvested tomatoes element can be placed in any orientation but must be completely inside of the market area.

4.4 Deliver the yellow greenhouse supplies.

The robot must deliver the yellow greenhouse supplies to one greenhouse area. The supplies must be placed completely inside of a greenhouse area.

4.5 Water the growing tomatoes.

The robot must collect and deliver the two (2) water blocks to the growing tomato field. The water blocks only need to touch the growing tomato field.

4.6 Collect and deliver the chicken eggs.

The robot must collect the chicken eggs and deliver them to the Market Area. The eggs must be placed completely inside the Market Area. The eggs can be placed in any orientation.

4.7 Don't touch the trees.

The red balls must not have been moved from the top of the two trees.

4.8 Don't move the growing tomato plants.

The growing tomato plants must not be moved. These elements must remain in their starting position and only be touching their white starting square.

4.9 Stop the robot.

One team member must **touch** the robot while saying "STOP" and **end the program** to indicate their run has finished. The robot should remain in the position the team stopped it in and not have been moved anywhere else on the game table.

In-House rule adaptions:

The In-House challenge is designed for teams to have fun, test their abilities and to encourage robotics in schools and clubs.

NB: Coaches may alter the rules to assist their teams if the coach deems it necessary. For example, where elements must be completely inside to score a coach may determine that elements only need to touch the scoring areas to score full points. All teams should be judged fairly and in the same way with the same rules.

Changes or adaptions of these rules do not need to be checked by WRO SA or agreed upon by WRO SA for teams to have scores submitted during the challenge week.

5. Scoresheet

Challenge 2 - Tending to the Plants

Team Name: _____

Task	Each	Points	1st Score	2nd Score	3rd Score	4th Score
Ultrasonic/Distance Sensor Used to start the robot.	Yes / No	20				
Used a light sensor to follow a line	Yes / No	20				
Delivered the red harvested tomatoes to the market area.	Yes / No	20				
Delivered blue water blocks to the growing tomato fields.	0 1 2	25 each (Max 50)				
Cleared the diseased tomato field and delivered diseased plant to the composting area	Yes / No	25				
Delivered yellow greenhouse supplies to a greenhouse.	Yes / No	50				
Delivered the white eggs to the market area.	0 1 2	20 each (Max 40)				
Team touched robot, ended program and said STOP to indicate the run is over.	Yes / No	20				
Bonus Points:						
Growing tomato plants not moved or damaged.	Yes / No	5 each (Max 15)				
Red Ball still on top of tree.	0 1 2	20 each (Max 40)				
Surprise rule:	Yes / No					
Teams should be given a maximum of 3 hours to program, test and score.	Total:	**300 Max:**				

Diamond 300+ points

Gold 226 - 299 points

Silver 151 - 225 points

Bronze 76 - 150 points

Participation 0 - 75 points

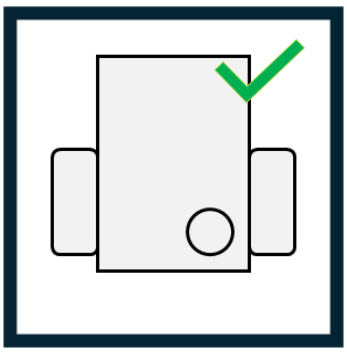
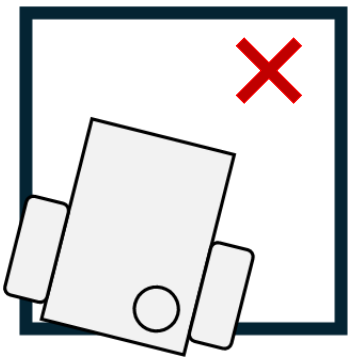
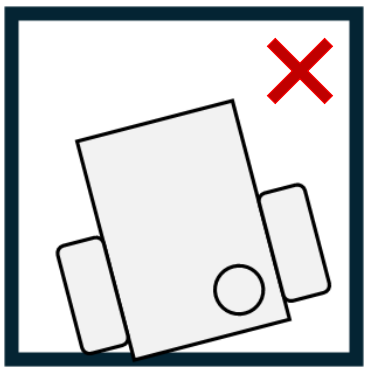
Judge Name: _____ **Team Member Signature:** _____

6. Scoring Interpretation

The images in this section will help to explain the scoring options available to teams. In cases where scoring is unsure the judge must bias their decision to the best possible outcome of the team.

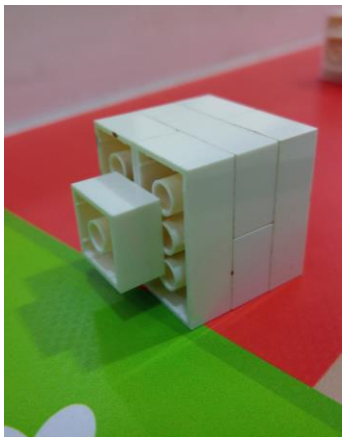
Robot start area

The robot must start completely inside the start/finish area. All parts of the robot must fit into this area **including robot cables**. No part of the robot is allowed to project outside of the start/finish area or into the surrounding line. The start/finish area is defined as the white area only and not the surrounding different colour line/square.

		
Robot completely inside the start/finish area. No part overhanging or touching the surrounding line.	Robot outside of the start/finish area. Robot will not be allowed to start.	Robot projecting out of the start/finish area. Robot will not be allowed to start

Chicken Eggs:

The below images apply to the chicken egg elements in the market area.

		
Chicken eggs completely inside the market area. 20 points each Max 40 points	Chicken egg completely inside the market area. 20 points	Chicken egg not completely inside the market area. 0 points

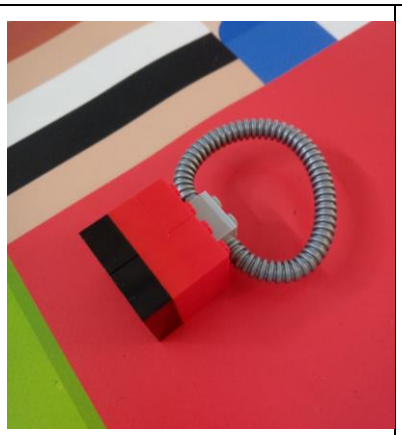
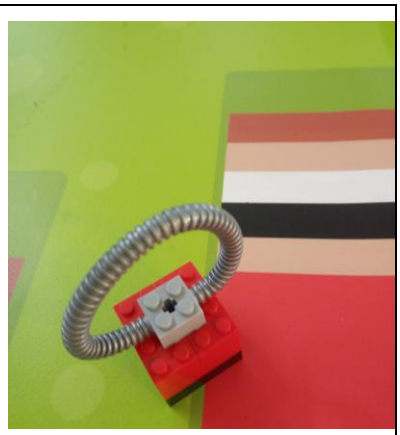
Diseased Tomato Plant:

The below images apply to the diseased tomato plant in the compost area.

Diseased tomato plant completely inside the compost area. 25 points	Diseased tomato plant touching outside of the compost area. 0 points	Diseased tomato plant touching outside of the compost area. 0 points

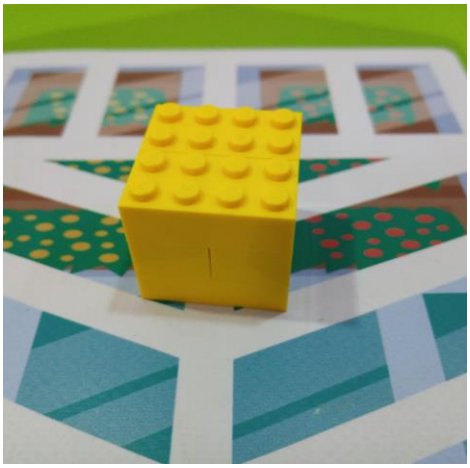
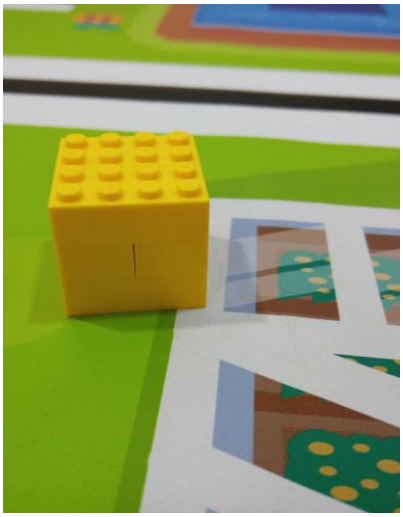
Harvested Tomatoes:

The below images apply to the harvested tomatoes inside the market area.

Harvested tomatoes completely inside of the market area. 20 points	 Harvested tomatoes completely inside of the market area but fallen over. 20 points	 Harvested tomatoes touching the market area. 0 points

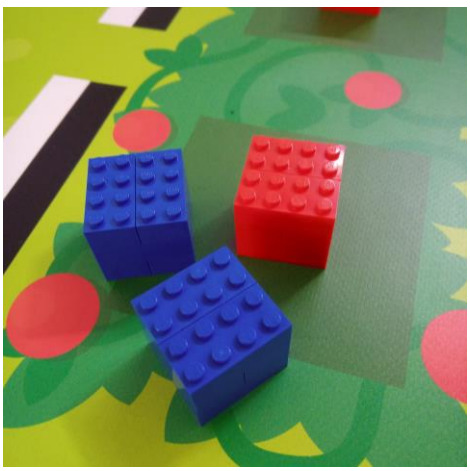
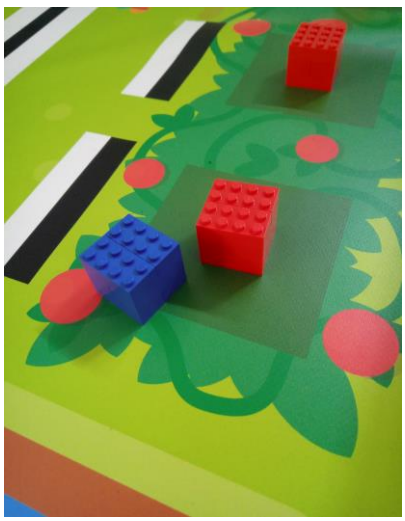
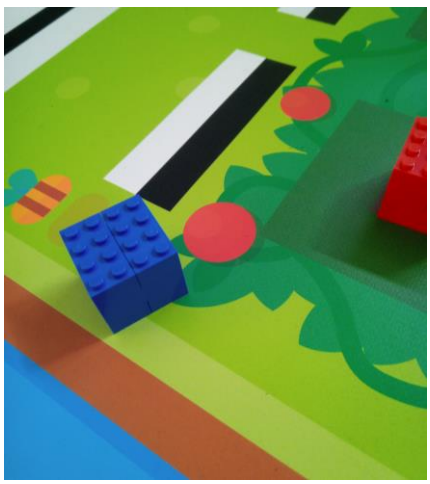
Yellow greenhouse supplies

The below images apply to the yellow greenhouse supplies and the greenhouse areas.

 Yellow greenhouse supplies completely inside of a greenhouse area. 50 points	 Yellow greenhouse supplies touching a greenhouse area. 0 points	Yellow greenhouse supplies not toucing or inside of a greenhouse area. 0 points

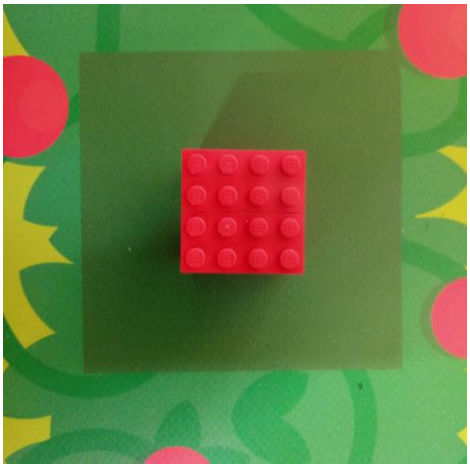
Water Blocks

The below images apply to the two water block elements.

 Both water blocks completely inside the growing tomato area. 25 points each, 50 points total	 Water block completely inside the growing tomato area. 25 points	 Water blocks touching the growing tomato area. 25 points

Growing Tomato Elements

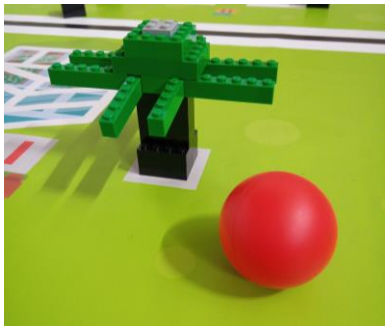
The below images apply to the growing tomato elements in the growing tomato area.

		
Growing tomato not moved, remains in original start position. 5 points	Growing tomato moved, no longer in its original starting position. 0 points	Growing tomato moved, no longer in its original starting position. 0 points

Trees & Balls

The below images apply to the tree and red ball elements.

Red ball on top of the tree element, tree element is unmoved. 20 points	Red ball on top of tree element. Tree element has moved and is touching outside of the grey start area. 0 points

 Red ball has moved and is not on top of the tree element. 0 points	 Red ball has moved, not in original start position. 0 points

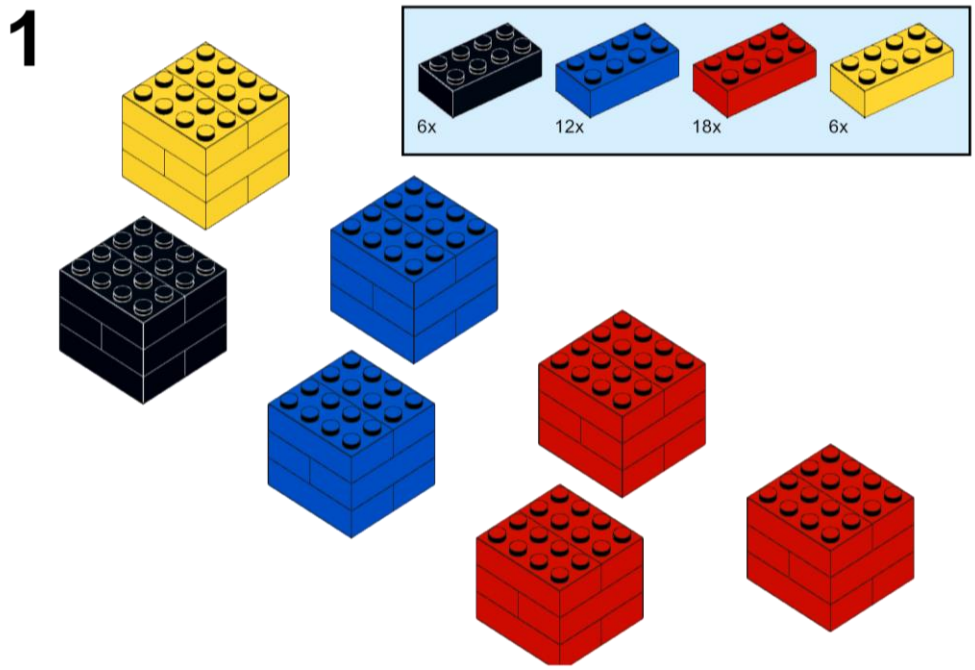
Robot finishing points

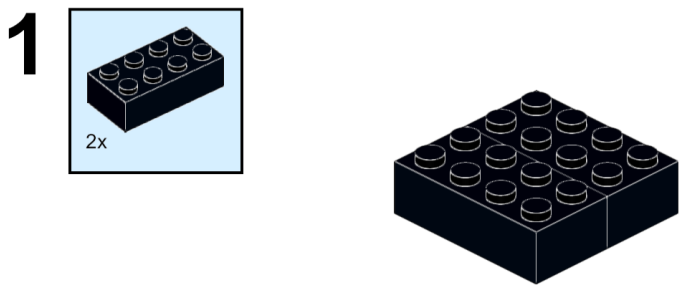
The team must touch the robot and say stop to indicate the robot has finished its run.

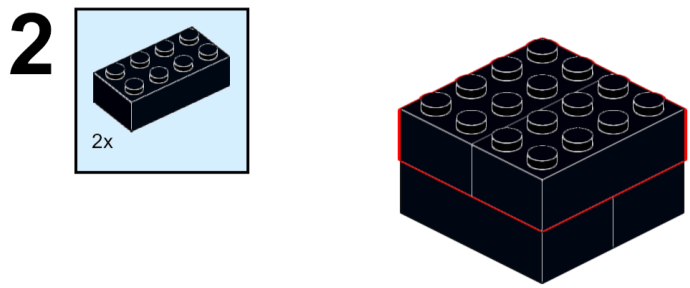
The robot program must be ended, and the robot must no longer move. The robot must remain on the game table until the judge requests the robot to be removed.

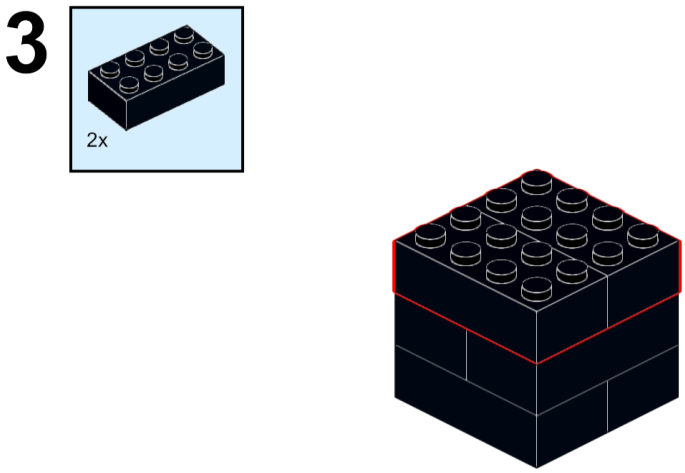
7. Assembly of Game Objects

Blocks: Red (x3), Yellow (x1), Black (x1), Blue (x2)

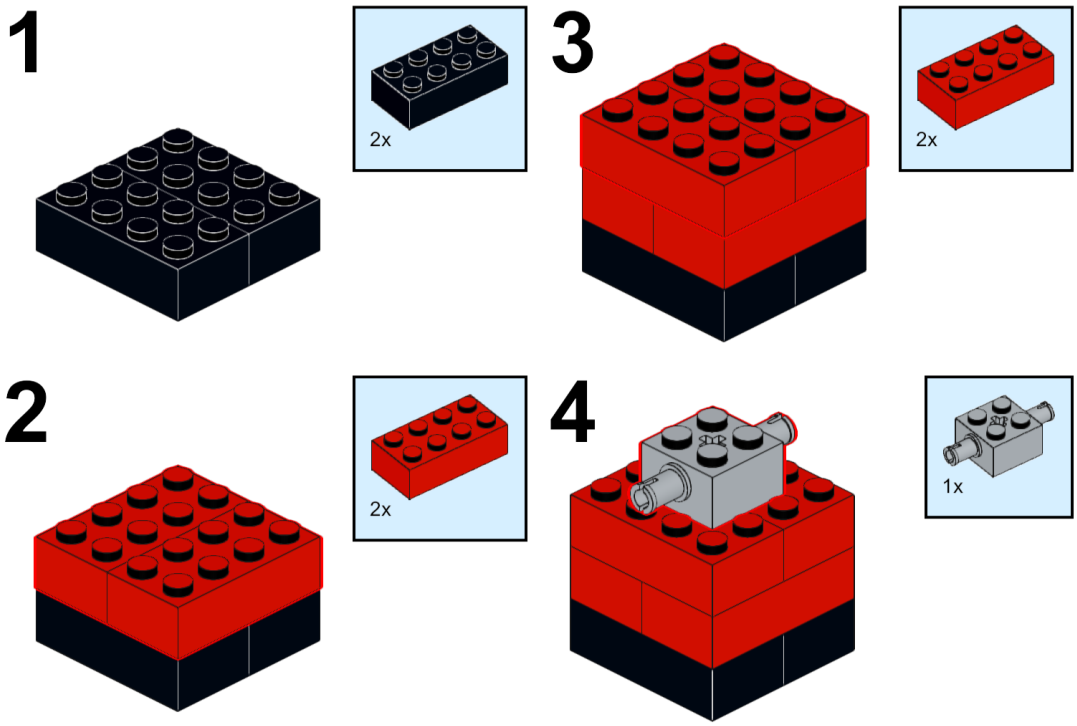


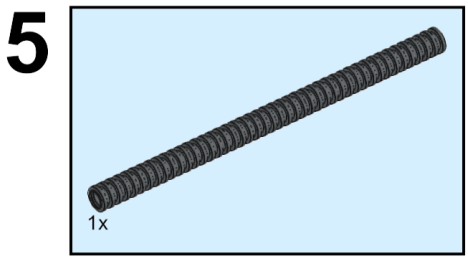


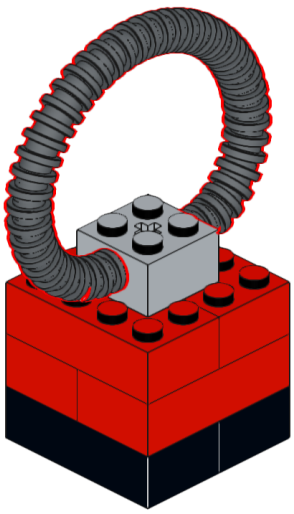




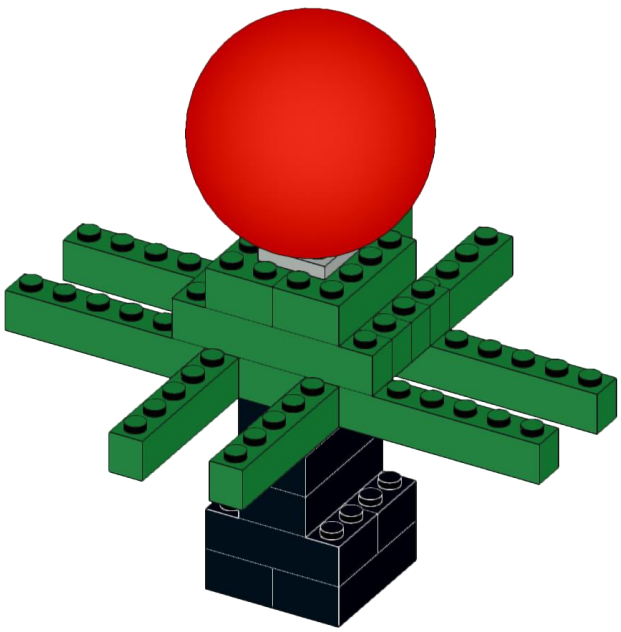
Harvested Tomato Element (x1)



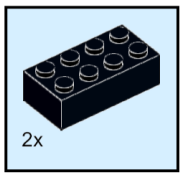


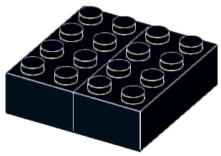


Tree Element (x3)

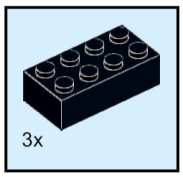


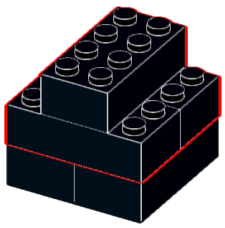
1





2





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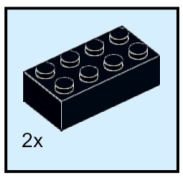

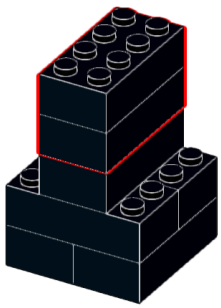

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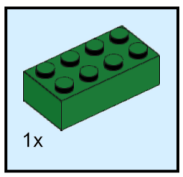
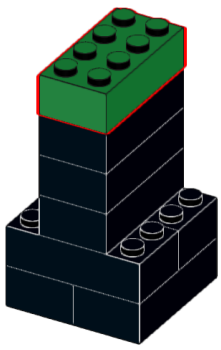
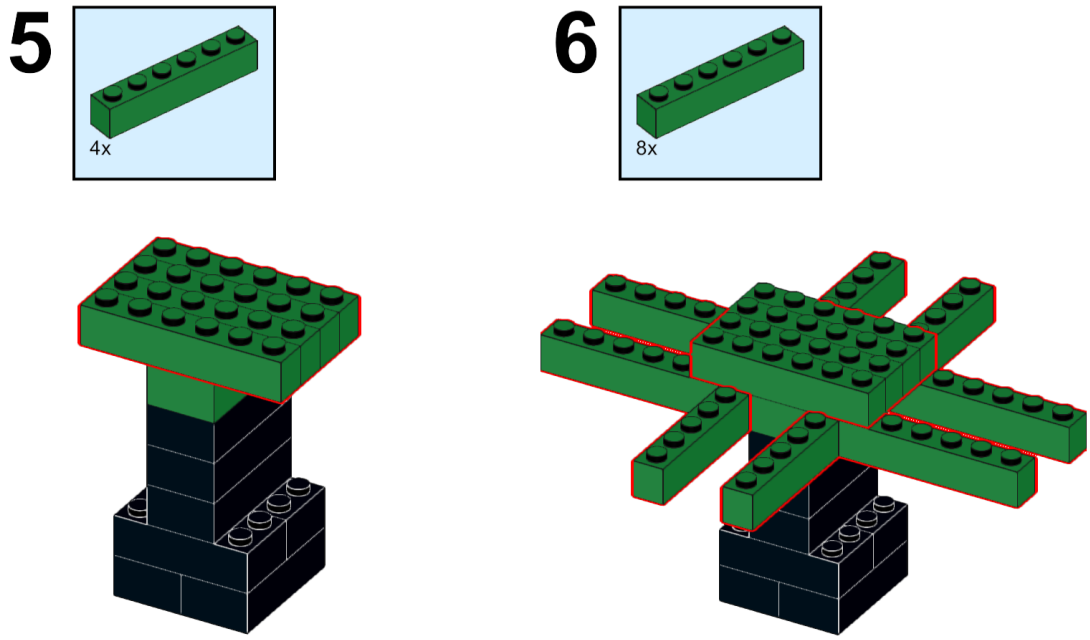
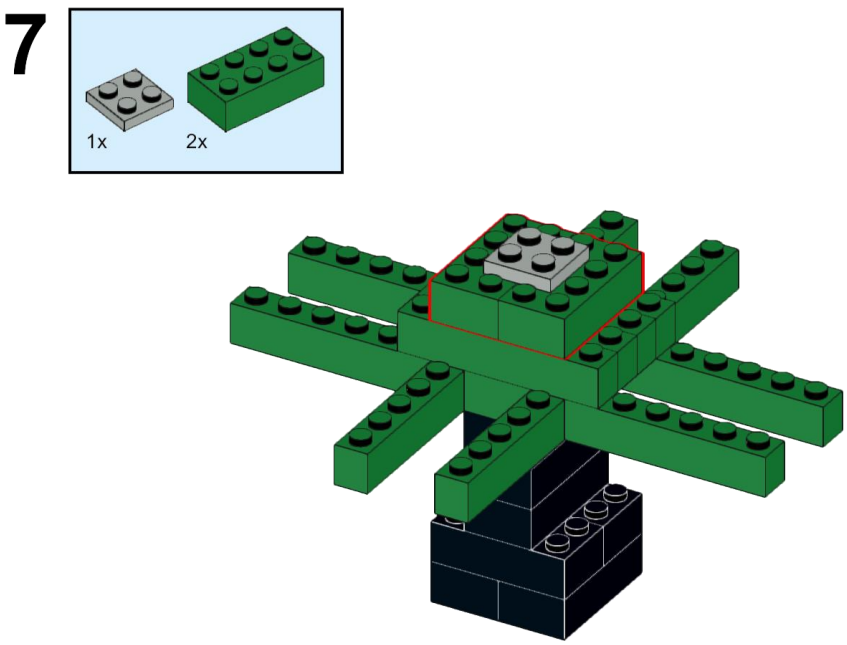
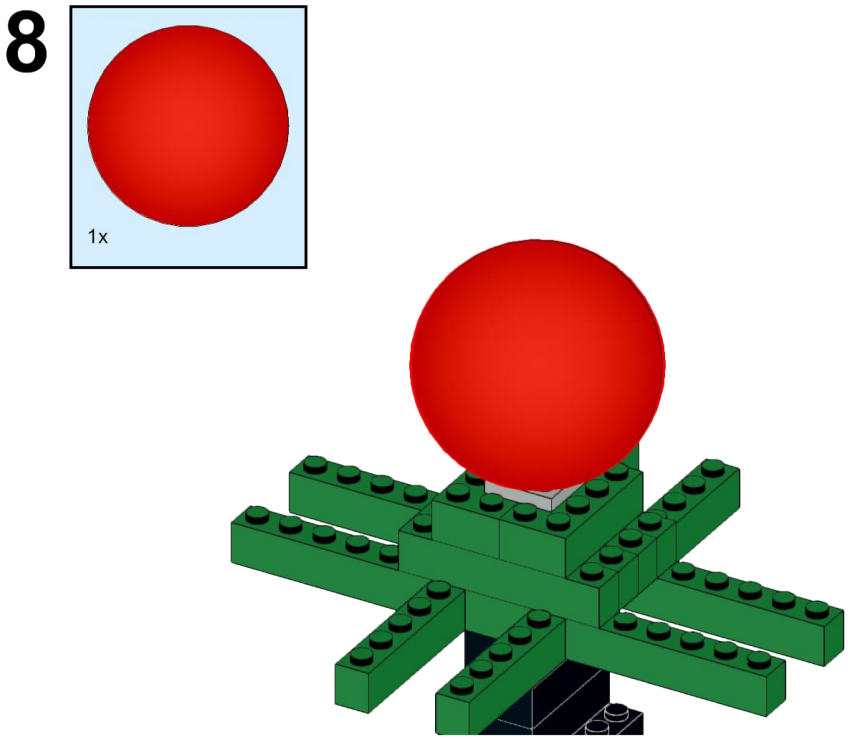


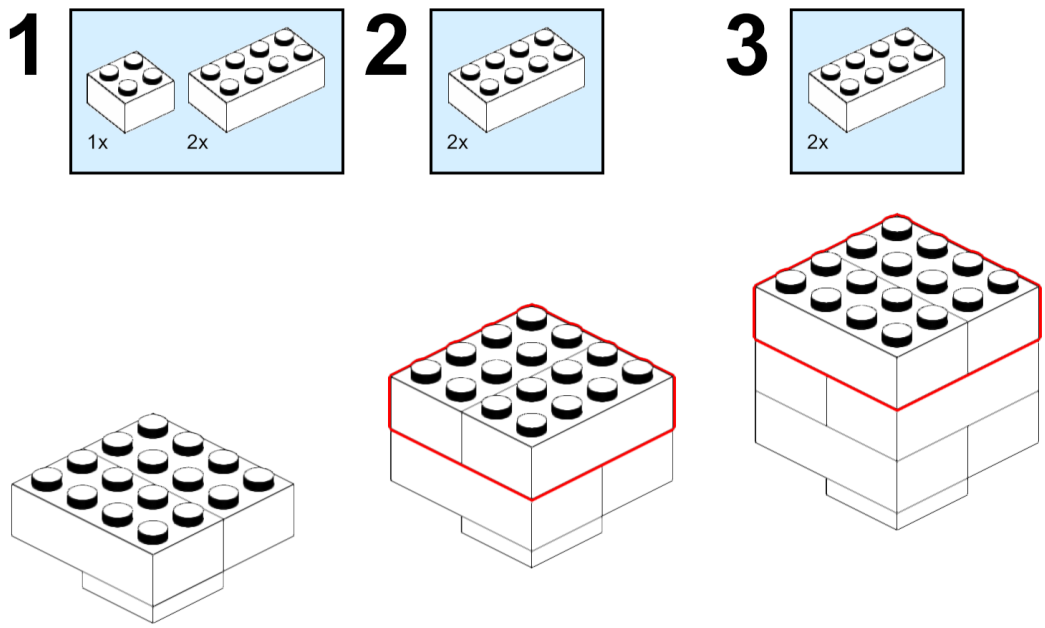


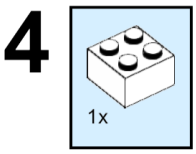
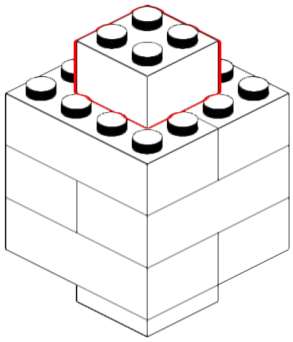

5
4x
6
8x


7
1x
2x



Chicken Eggs (x2)




4
1x