In-House Challenge 3: Harvest Time

Game Rules

WORLD ROBOT OLYMPIAD ™

WRO®

SOUTH AFRICA

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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.
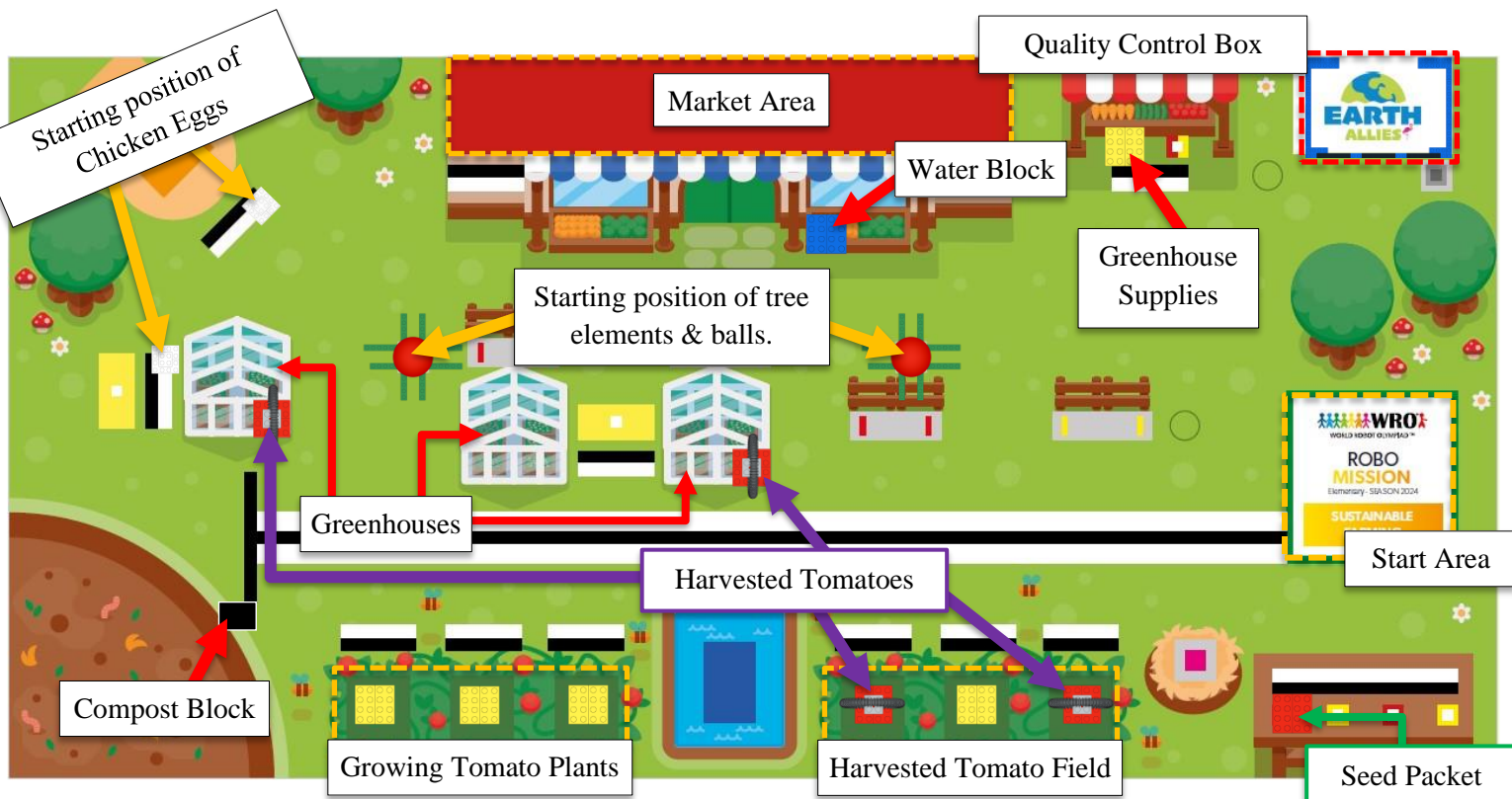
Tasks:

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 block to the growing tomato plants.
5. Deliver the red seed packet to the harvested tomato field.
6. Deliver the yellow greenhouse supplies to any greenhouse.
7. Deliver the black compost block to a greenhouse.
8. Deliver the white eggs to the market area.
9. Place one red harvested tomato into the quality control box.
10. 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

Red harvested tomatoes (x4)

There are 4 red harvested tomato elements on the game mat. Two harvested tomato elements start to the far left and far right of the harvested tomato field. One red harvested tomato element starts in the bottom right of the greenhouse image closest to the start area. One red harvested tomato plant starts in the bottom right of the greenhouse image furthest from the start area.
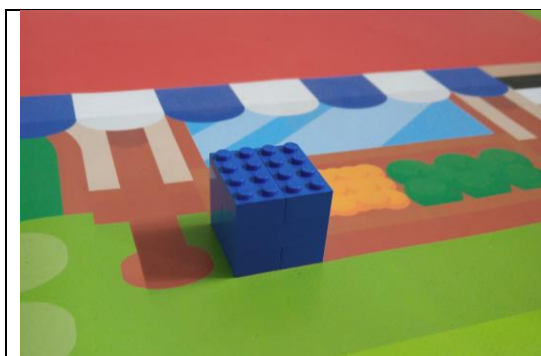

Starting position of 2 of the 4 Red Harvested Tomato Elements.

Starting positions of 2 of 4 Red Harvested Tomato Elements.

Water Block (x1)

The blue water block starts near the market area.

Starting position of the water block.

Water block starts on the right fruit stall image.

Yellow Green House Supplies (x1)

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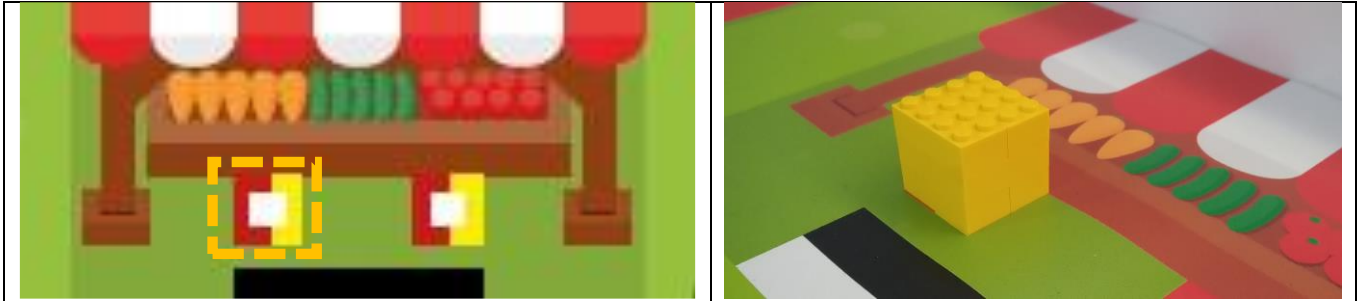
Starting position of the Yellow Green House Supplies On the vegetable stand.

Red Seed Packet (x1)

One red seed packet starts on the red square close to the nest image.
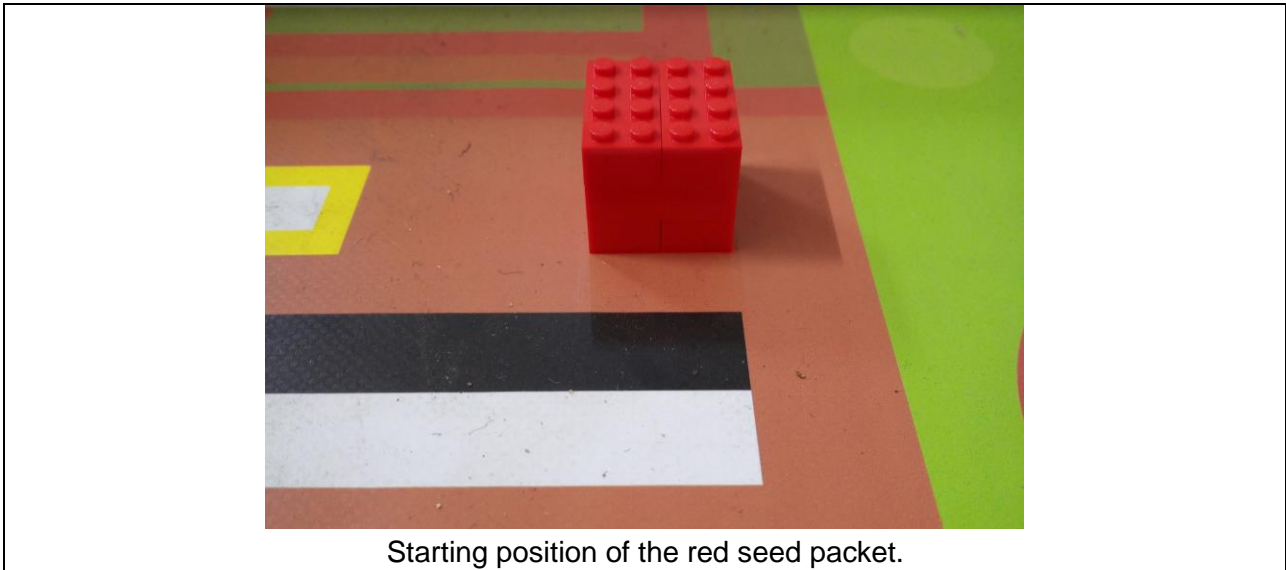
Starting position of the red seed packet.

Black Compost Block (x1)

One black compost block is placed on the edge of the black line closest to the compost area. The short side of the block faces the start area.
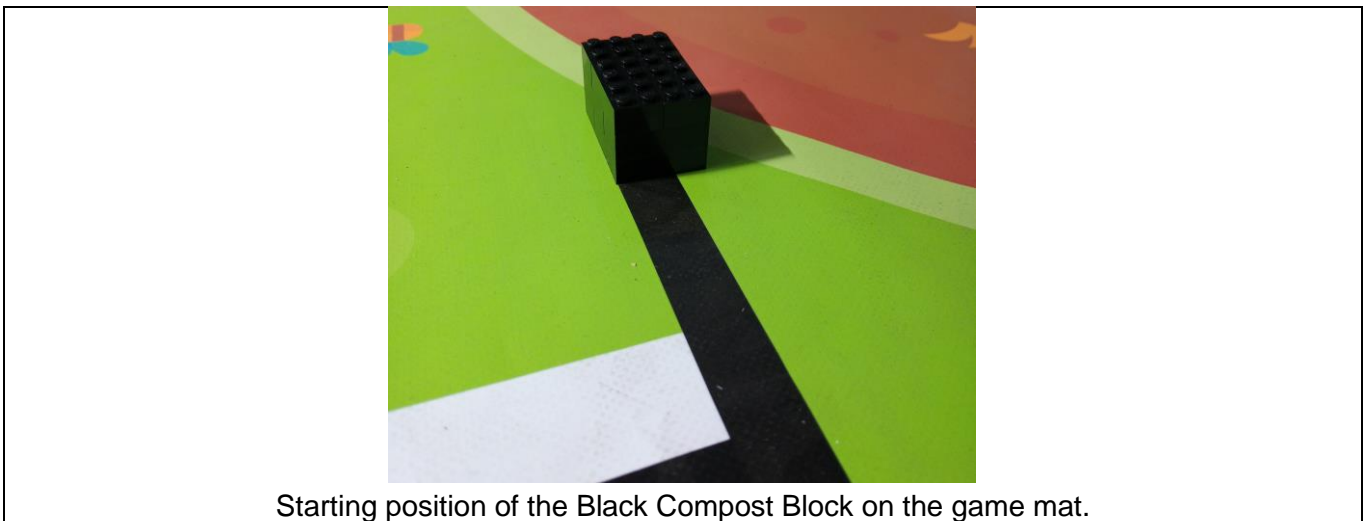
Starting position of the Black Compost Block on the game mat.

Yellow Growing Tomato Plant Blocks (x4)

4 yellow growing tomato plant blocks are placed on the game mat. 3 yellow growing tomato plants are placed in the growing tomato area, one plant on each square. One yellow growing tomato plant is placed in the middle square of the harvested tomato field.

Yellow growing tomato blocks in their starting positions.

Quality Control Box (x1)

One quality control box is placed on the game mat in the earth allies logo area. The box is placed to the far right edge of the earth allies logo.

Staring position of the quality control box.

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.
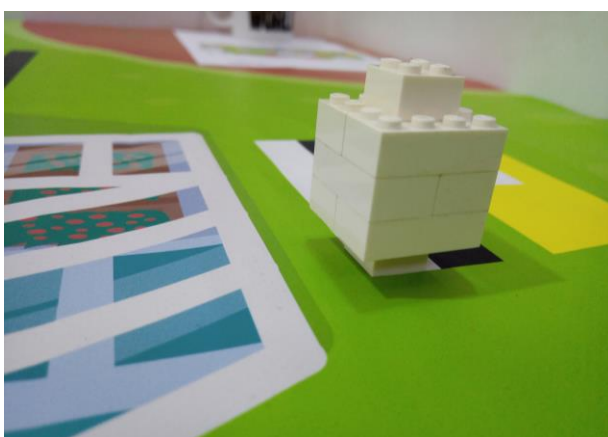
Egg element placed in its starting position.

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.
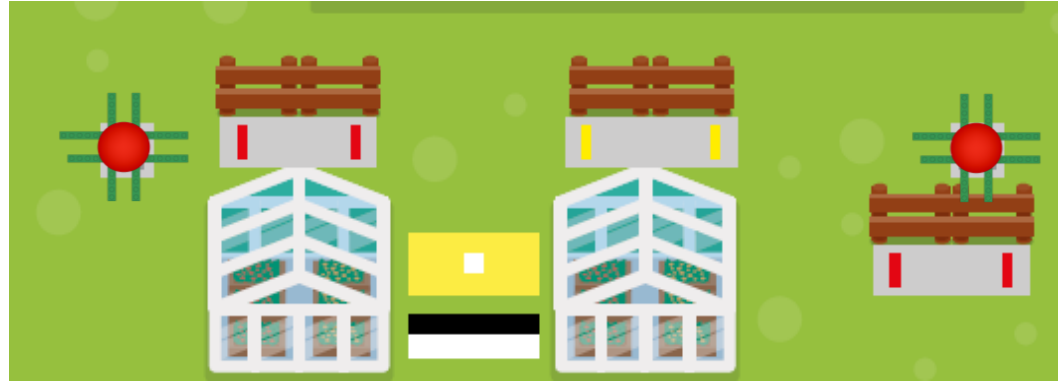
Starting position of the trees on the game mat.

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 Deliver the Red Seed packet.

The red seed packet must be delivered to the harvested tomato field. The element only needs to touch the growing field for points to be scored.

4.3 Sell the Harvested Tomatoes.

The robot must deliver the harvested tomatoes elements 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 water block to the growing tomato field. The water block only needs 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.

4.10   Deliver the Black Compost Block

The black compost block must be placed inside any greenhouse. The element only needs to touch a greenhouse for points to be scored.

4.11   Quality Control Check

Place one red harvested tomato inside of the quality control box. Only one (1) red harvested tomato will score points in this area.

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 3 - Harvesting Crops

Team Name: _____

Task	Each	Points	1st Score	2nd Score	3rd Score	4th Score	
Ultrasonic Sensor Used to start the robot.	Yes / No	20					Diamond 300+ points
Used a light sensor to follow a line	Yes / No	20					Gold 226 - 299 points
Collected and delivered harvested tomatoes to the market area. Placed completely inside the market area.	0 1 2 3 4	20 each (Max 80)					Silver 151 - 225 points
Delivered the blue water block to the still growing yellow tomato field. (touching)	Yes / No	15					Bronze 76 - 150 points
Delivered the red seed packet to the harvested tomato field. (touching)	Yes / No	15					Participation 0 - 75 points
Delivered yellow greenhouse supplies to a greenhouse. Completely inside the greenhouse.	Yes / No	15					
Delivered black compost block to a greenhouse.	Yes / No	15					
Delivered the white eggs to the market area.	0 1 2	20 each (Max 40)					
Placed one red harvested tomato into the quality control box.	Yes / No	40					
Team touched robot, ended program and said STOP to indicate the run is over.	Yes / No	20					
Bonus Points:							
Yellow growing tomato plants not moved or damaged.	Yes / No	5 each (Max 20)					
Red Ball still on top of tree.	0 1 2	10 each (Max 20)					
Surprise rule:	Yes / No						
Teams should be given a maximum of 3 hours to program, test and score.	Total:	300 Max:					
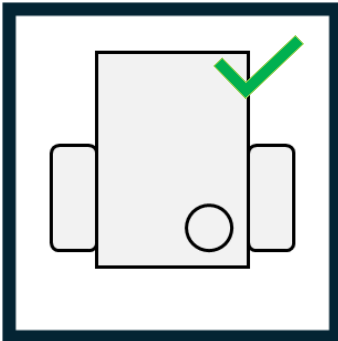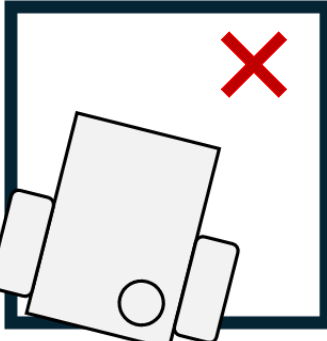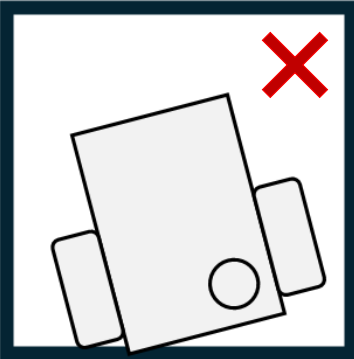
Judge Name: _____ Team Member Signature: _____

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.
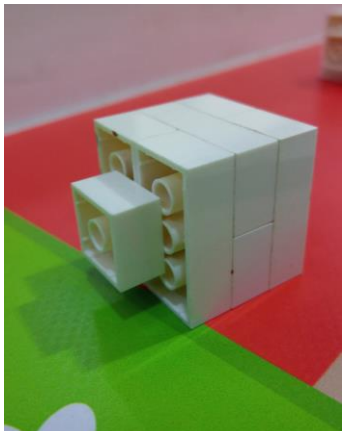
Robot start area

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 |

Red Seed Packet:

The below images apply to the red seed packet in the harvested tomato field.
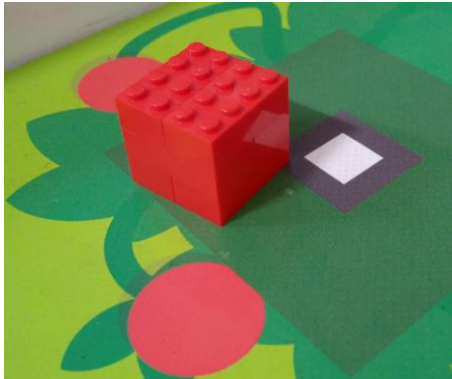
Red seed packet completely inside the harvested tomato field.	Red seed packet touching the harvested tomato field.	Red seed packet not touching the harvested tomato field.
15 points	15 points	0 points

Black Compost Block:

The below images apply to the black compost block in a greenhouse.
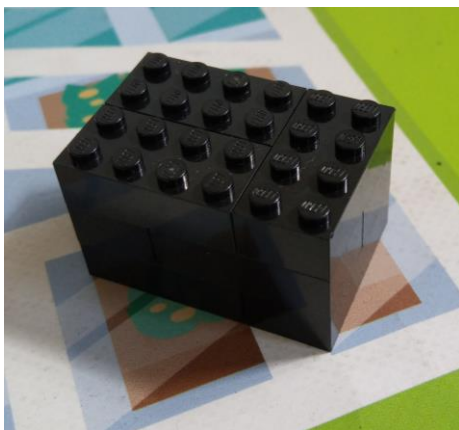
Black compost block completely inside a greenhouse.	Black compost block touching a greenhouse.	Black compost block not touching a greenhouse
15 points	15 points	0 points

Harvested Tomatoes:

The below images apply to the red harvested tomato elements.

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

Harvested tomato completely inside of the quality control box.

40 points

Harvested tomato completely inside of the quality control box but fallen over.

40 points

Red harvested tomato not inside the qulaity control box.

0 points

Yellow greenhouse supplies

The below images apply to the yellow greenhouse supplies and the greenhouse areas.
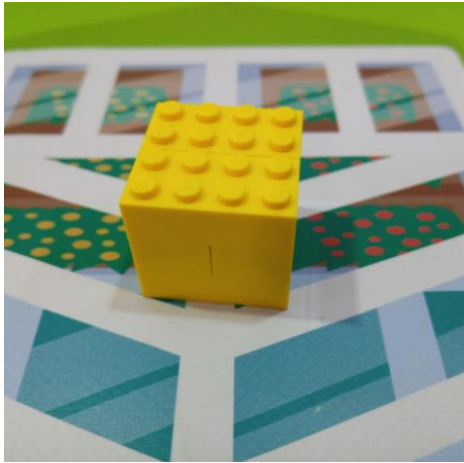
Yellow greenhouse supplies completely inside of a greenhouse area.

15 points
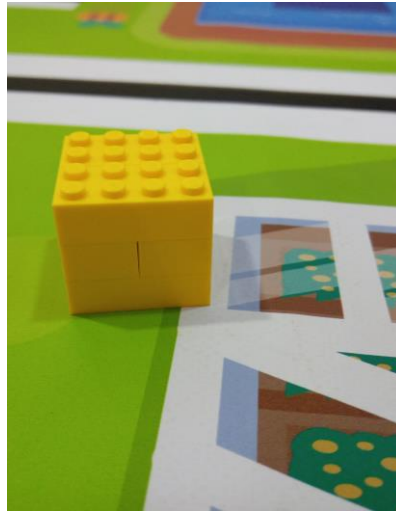
Yellow greenhouse supplies touching a greenhouse area.

0 points

Yellow greenhouse supplies not toucing or inside of a greenhouse area.

0 points

Water Block

The below images apply to the two water block elements.
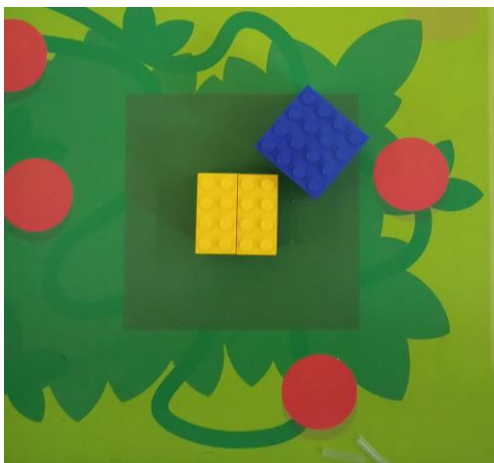
Water block completely inside the growing tomato area.

15 points

Water block touching the growing tomato area.
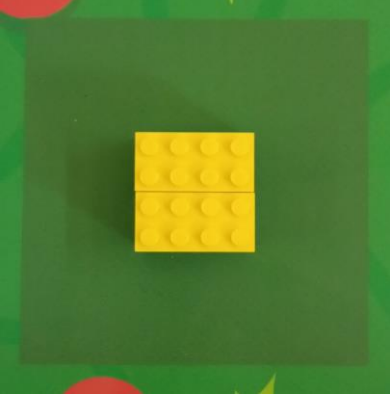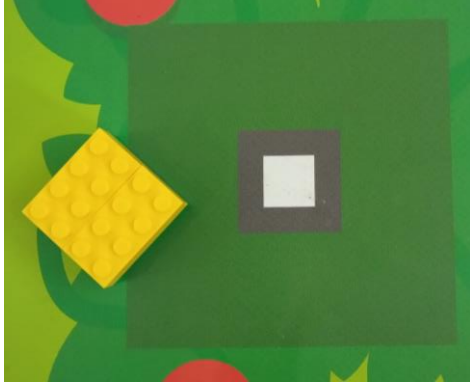
15 points

Water block not touching the growing tomato area.

0 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.	Growing tomato moved, no longer in its original starting position.	Growing tomato moved, no longer in its original starting position.
5 points	0 points	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.

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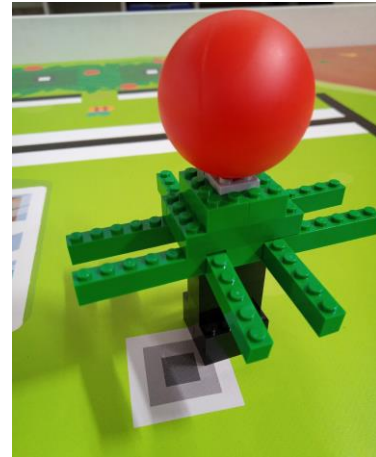
Red ball on top of tree element. Tree element has moved and is touching outside of the grey start area.

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

Harvested Tomato Element (x4)

1

2x

3

2x

2

2x

4

1x

5

1x

Tree Element (x2)

1 2x

2 3x

3 2x

4 1x

5 4x

6 8x

7 1x 2x

8

1x
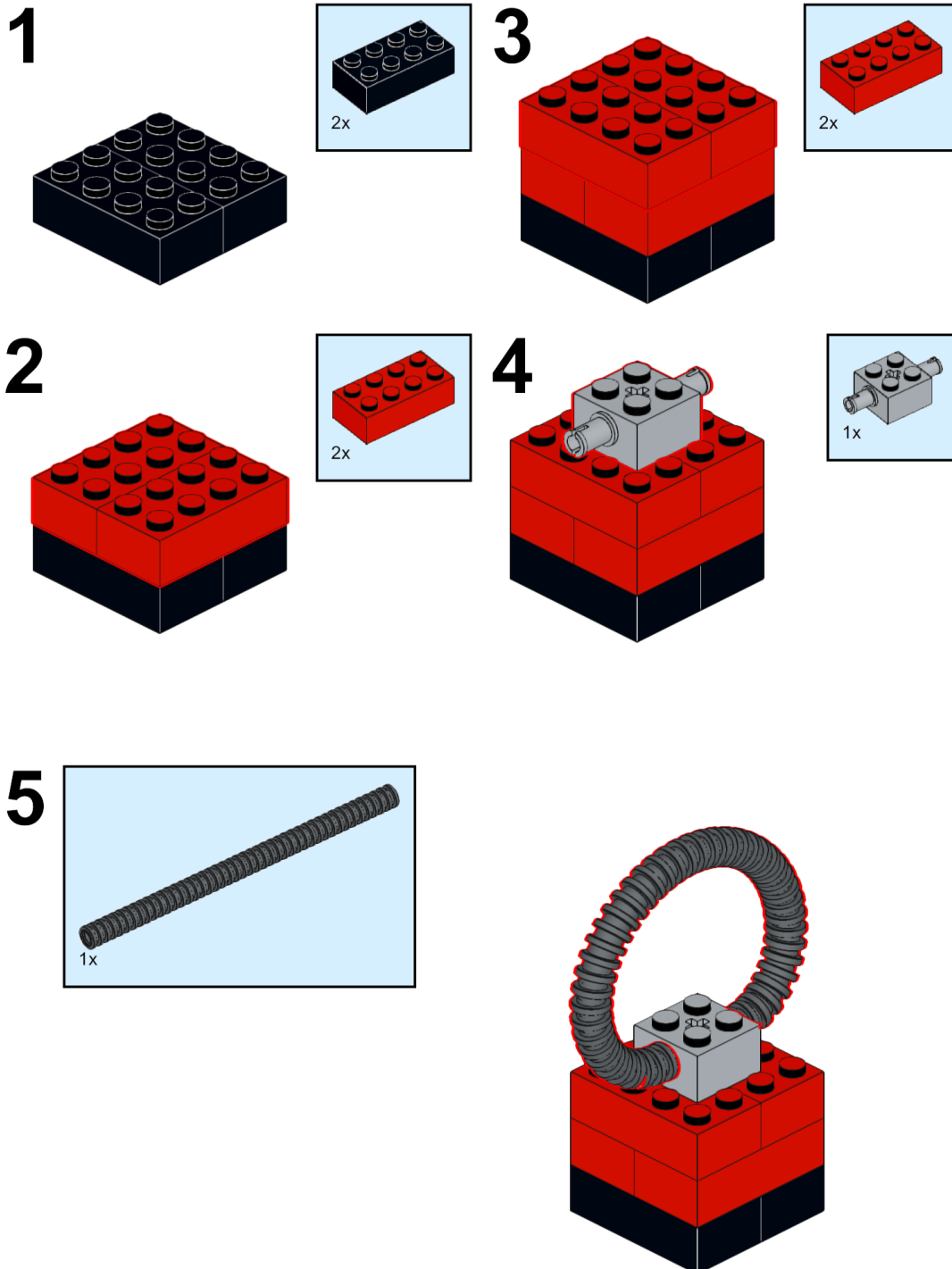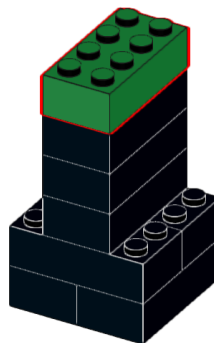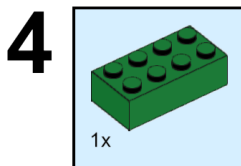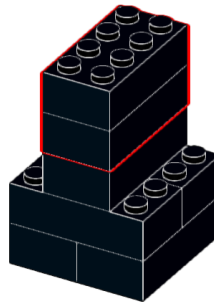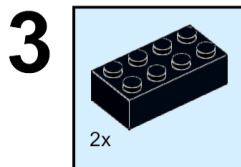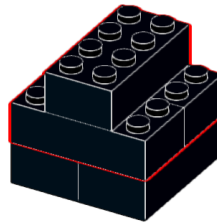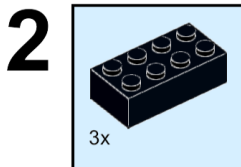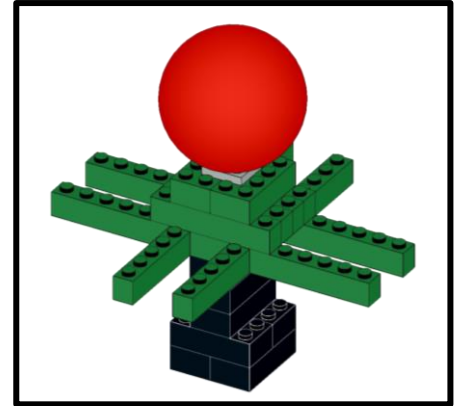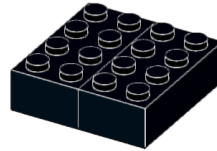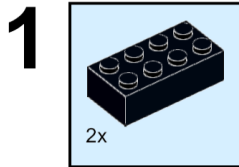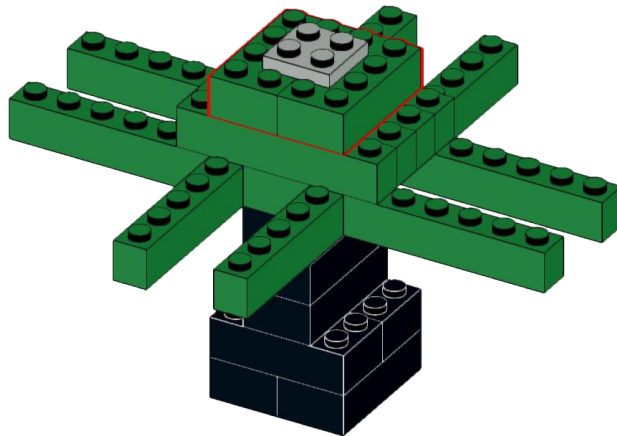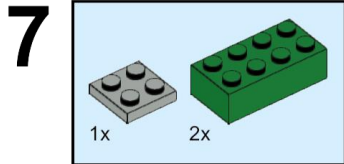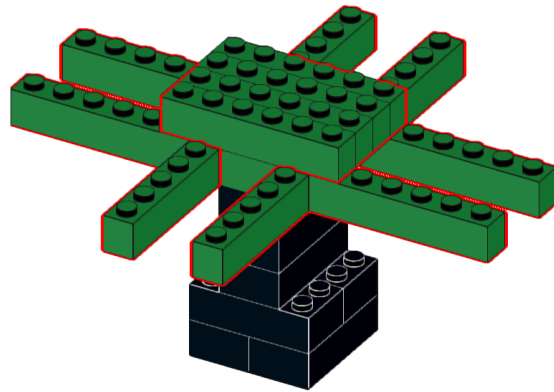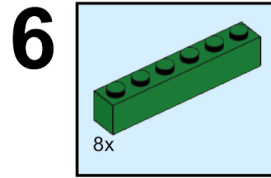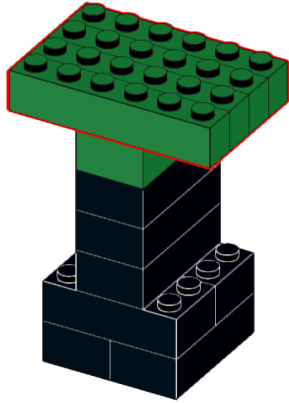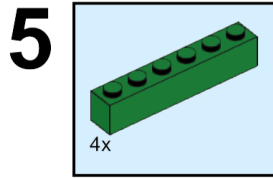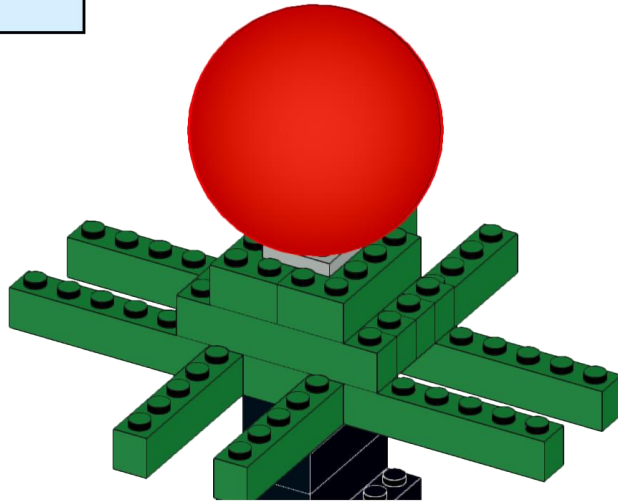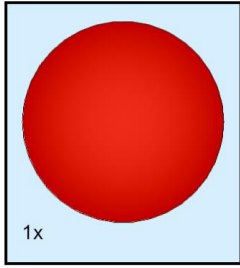
Yellow Growing Tomatoes (x4)

1

2x   2x

Chicken Eggs (x2)

1 1x 2x

2 2x

3 2x

4 1x
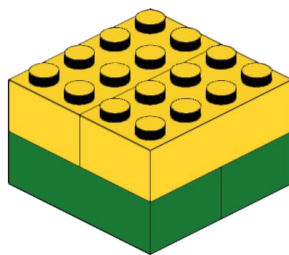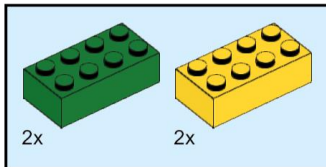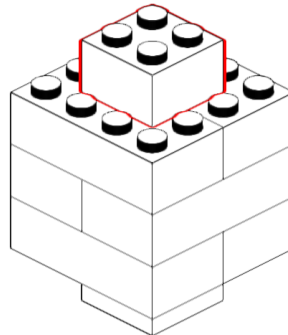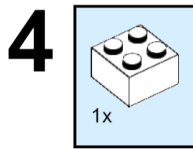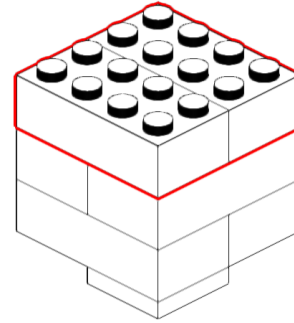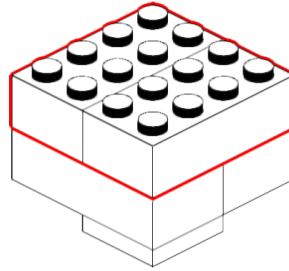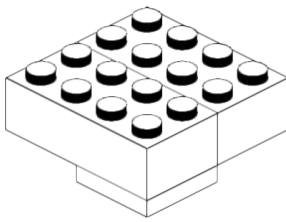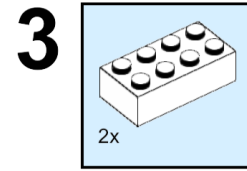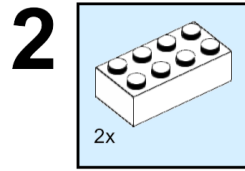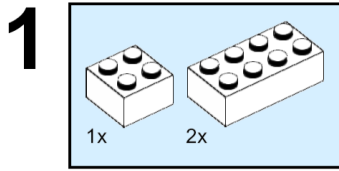
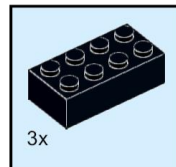## Red Seed Packet (x1), Yellow Greenhouse Supplies (x1) Blue Water Block (x1)
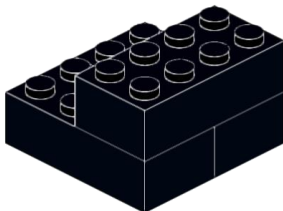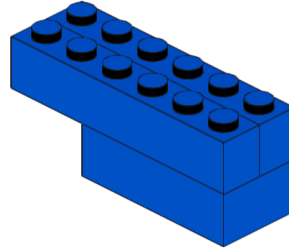
1
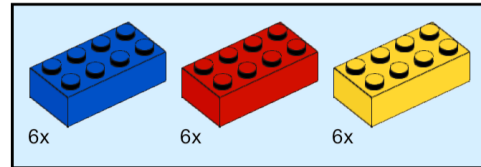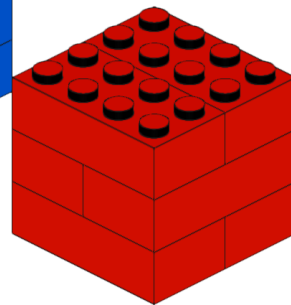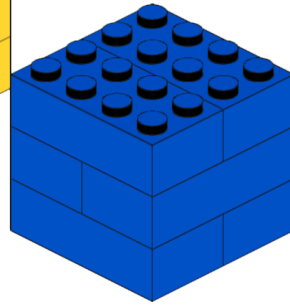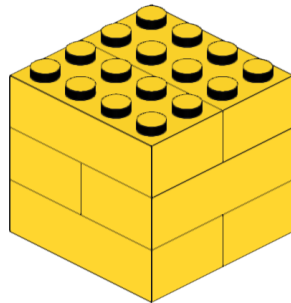
Black Compost Block (x1)

1 **2** **3**

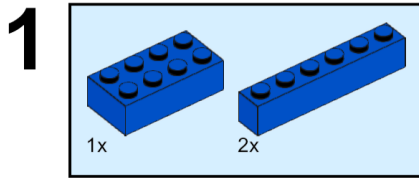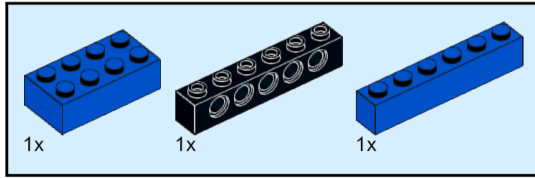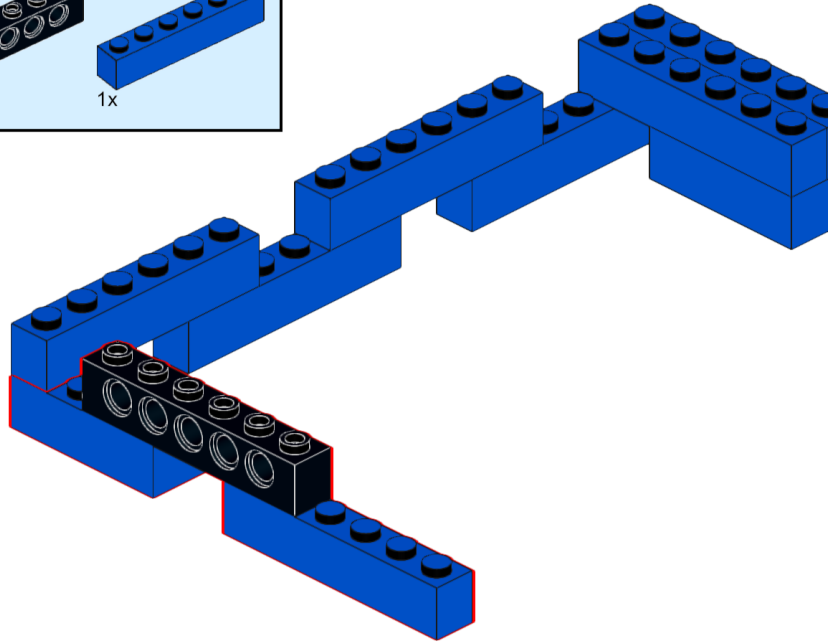## Quality Control Box (x1)

1

1x   2x

2

1x

3

3x

4

1x   1x   1x

5

1x   2x   1x

6

4x

7

1x   2x