NATIONAL ROBOTICS COMPETITION

WRO RoboMission 2022

Primary Game Rules

MY ROBOT MY FRIEND

THE GARDEN ROBOT

Version: 25 May 2022

Main Organiser:

SCIENCE CENTRE singapore

Sponsored by:

Ministry of Education
SINGAPORE

Co-Organiser:

Supported by:

WRO®

NRC 2022 WRO ROBOMISSION CATEGORY

CHALLENGE BOOKLET CHANGE LOG

Version	Release Date	Description
1.0	25 May 2022	Official Challenge Booklet release

Contents

PART ONE – GAME DESCRIPTION

1. Introduction 4

2. Game Field 4

3. Game Objects, Positioning, Randomization 5

4. Robot Missions 7

4.1 Save ladybugs 7

4.2 Cut high grass 7

4.3 Collect bad weeds 7

4.4 Activate service point 7

4.5 Park the robot 7

4.6 Get bonus points 7

5. Scoring 8

PART TWO – ASSEMBLY OF GAME OBJECTS

6. Grass (3x) 13

7. Bad Weeds (3x) 14

8. Ladybug (3x) 15

9. Service point (1x) 19

10. Fence (11x) 24

PART ONE – GAME DESCRIPTION

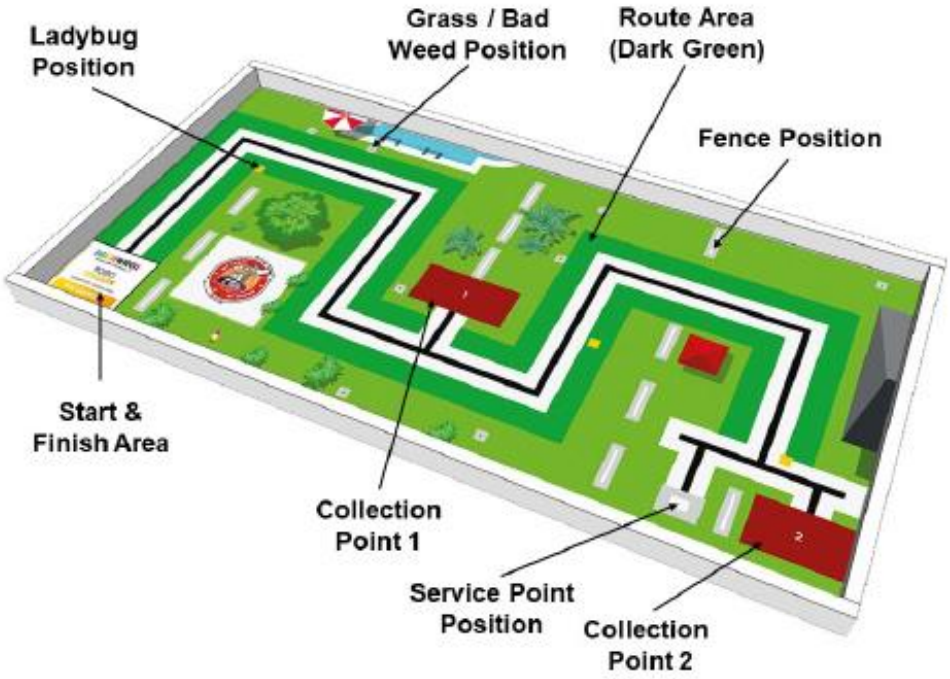
1. Introduction

There are numerous applications of robots at home and in the daily household. One example is robots that can perform various tasks in our garden. There are robots that clean pools, sow plants, or water flowers.

On the Elementary game field, the robot takes on the task of cutting the grass and collecting bad weeds. At the same time, the robot has to watch out for ladybugs that are on the robot's path and bring them to safety.

2. Game Field

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



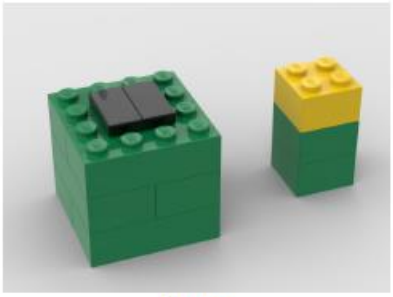
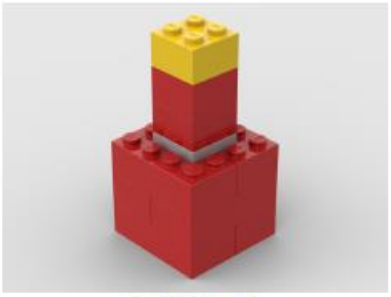
If the table is larger than the game mat, the mat will be placed on the wall with the two sides of the start area.

For more information about the table and game mat specifications, please refer to at WRO RoboMission General Rules, Rule 4. The printable file of the mat and a PDF with the exact measurements are available on www.wro-association.org.

3. Game Objects, Positioning, Randomization

Grass (3x) & Bad weeds (3x)

Three grass elements and three bad weed elements are **randomly placed in each round** on six of the eight grey positions on the game field. Two grey positions stay empty.

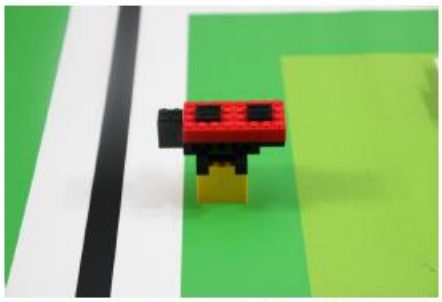
 Grass The grass element consists of a base (left) and a top (right).	 Bad Weeds The bad weed is only one element. Base and top are stuck together.
 Start position of object on the field *(on grey area)*	 Start position of object on the field *(on grey area)*

One possible randomization you can see here (green X for grass, red X for bad weed):

Ladybugs (3x)

Three ladybugs are always placed on the yellow areas on the field. The ladybugs always look left towards the start area.

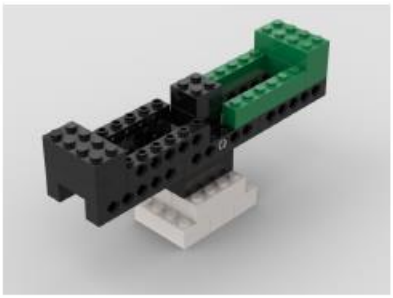
Ladybug (3)



Start position of object on the field

Service point (1x)

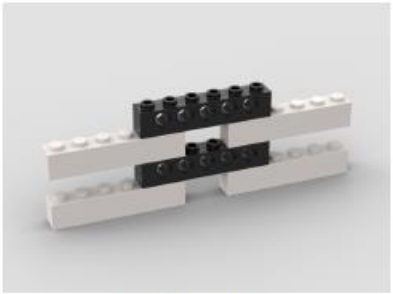
The service point is placed on the white rectangle inside the grey area. It is always placed so that the green part is on the left side and on the bottom. The green side needs to be lifted during the missions.



Start position of object on the field

Fences (11x)

There are 11 fences on the field that should not be moved or damaged. A fence is placed on the white line inside a grey area.



Fence (11)

Object on the field

4. Robot Missions

For a better understanding, the missions will be explained in multiple sections.
The team can decide in which order they will do the missions.

4.1 Save ladybugs

The robot wants to cut the grass and collect bad weeds. Therefore, the robot should push the ladybugs away from the route of the gardening robot.

Full points are awarded if the base of a ladybug is outside of the route area (the dark green area and the black line with white surrounding) and standing in the upright position.

4.2 Cut high grass

One task of a gardening robot is to cut the grass. The robot should identify the grass elements on the grey positions and then cut the grass (removing the top of the grass).

Full points are awarded if the top of the grass is no longer on top of the base and the base of the grass element is still touching the grey area.

4.3 Collect bad weeds

Another task of the gardening robot is to collect bad weeds. The robot should identify the bad weed elements on the grey positions and then bring these elements to a collection point.

There are two collection points (brown areas) on the field. Points are awarded if a bad weed element is completely inside one of the collection points. More points are awarded if the robot brings the weeds to collection point 2 - at the end of the game field.

4.4 Activate service point

Once the gardening robot has successfully done the route through the garden it should activate the service point. Then the user of the gardening robot will get a message on a smartphone that the robot has successfully done the gardening.

Points are awarded if the service point element is switched from black to green (green needs to be on top), at least 9 fences are not moved / damaged on the field and the service point is still completely in the grey area.

4.5 Park the robot

The mission is complete when the robot returns to the Start & Finish area, stops, and the chassis of the robot is entirely (top-view) within the Start & Finish area (cables are allowed to be outside of the Start & Finish area).

4.6 Get bonus points

Bonus points will be awarded for not moving or damaging the fences.

5. Scoring

Definitions for the scoring

"Completely" means that the game object is only touching the corresponding area (not including the black lines).

Tasks	**Each**	**Total**
Save ladybugs		
Ladybug completely outside route area & standing in an upright position.	**5**	**15**
Cut high grass		
Top of the grass is no longer touching the grass element and the base of the grass element is still touching the grey area	**7**	**21**
Collect bad weeds		
Bad weed element is completely inside the collection point 1	9	27
OR		
Bad weed element is completely inside the collection point 2	**12**	**36**
Activate service point		
Service point correctly set up, at least 9 fences standing and base of service point completely in grey area		**17**
Park the robot		
Robot stops in the Start & Finish Area *(only if other points, not bonus, are assigned)*		**14**
Get bonus points		
Fence that is not moved or damaged	**2**	**22**
Maximum Score		**125**

Scoring Interpretation

<u>Ladybug completely outside route area & standing in an upright position → 5 points each</u>

5 points

0 points (partly outside)

0 points (not standing)

5 points (base outside)

<u>Top of the grass is no longer on top of the base and the base of the grass element is still touching the grey area → 7 points each</u>

7 points

7 points

7 points (only touching from the side not on top)

0 points (lying on top)

0 points (base not touching)

Bad weed element is completely inside the collection point 1 → 9 points each

9 points

9 points (OK if not standing)

0 points
(not completely inside)

0 points
(not inside)

Bad weed element is completely inside the collection point 2 → 12 points each

12 points

All other situations shown for collection point 1 above apply for collection point 2 as well.

Service point correctly set up, at least 9 fences standing and base of service point completely in grey area → 17 points

<table>
<tr>
<td>
17 points</td>
<td>
17 points (moved inside grey area is OK)</td>
<td>
17 points, the base of the service point is still inside</td>
</tr>
<tr>
<td colspan="2">
0 points (9 fences must be OK,
here are 3 already outside of their areas)</td>
<td>
0 points (moved outside grey area)</td>
</tr>
<tr>
<td>
0 points (object turned around, green is not on top)</td>
<td></td>
<td></td>
</tr>
</table>

Robot stops in the Start & Finish Area (only if other points, not bonus, are assigned) → 14 points

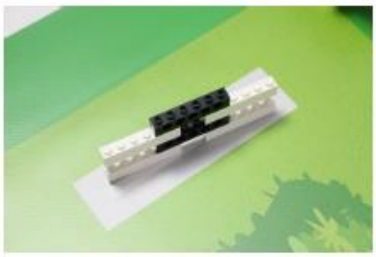
The projection of the robot is completely inside the start/finish area.

The projection of the robot is completely inside, and cables are out. That is still OK.

No points if the projection of the robot is not in the start/finish area.

Fence not moved or damaged → 2 points each

2 points, not moved.



2 points, only moved inside the grey area.

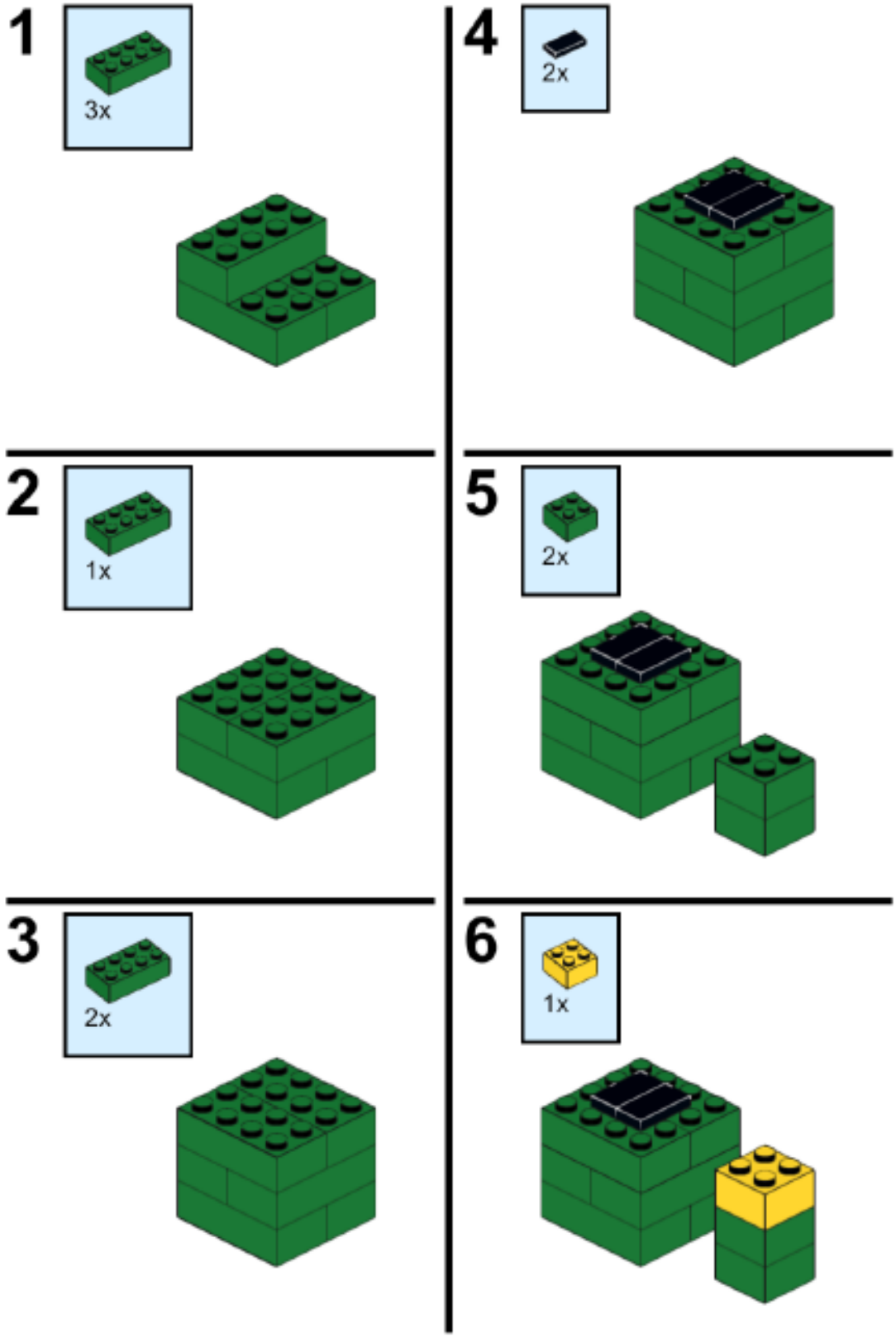
0 points, moved outside of grey area.

0 points, moved outside of grey area.

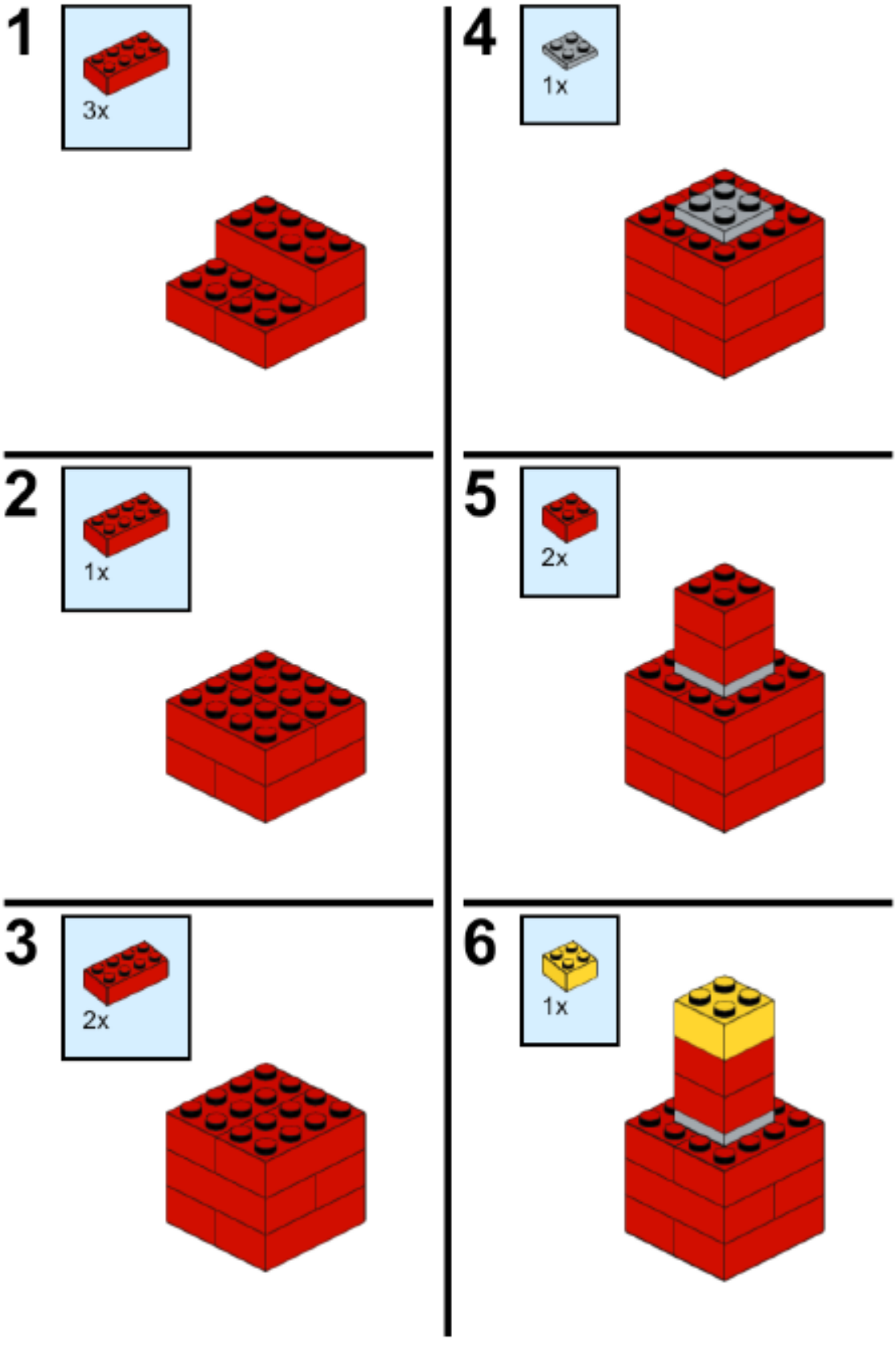
0 points, damaged.

PART TWO – ASSEMBLY OF GAME OBJECTS

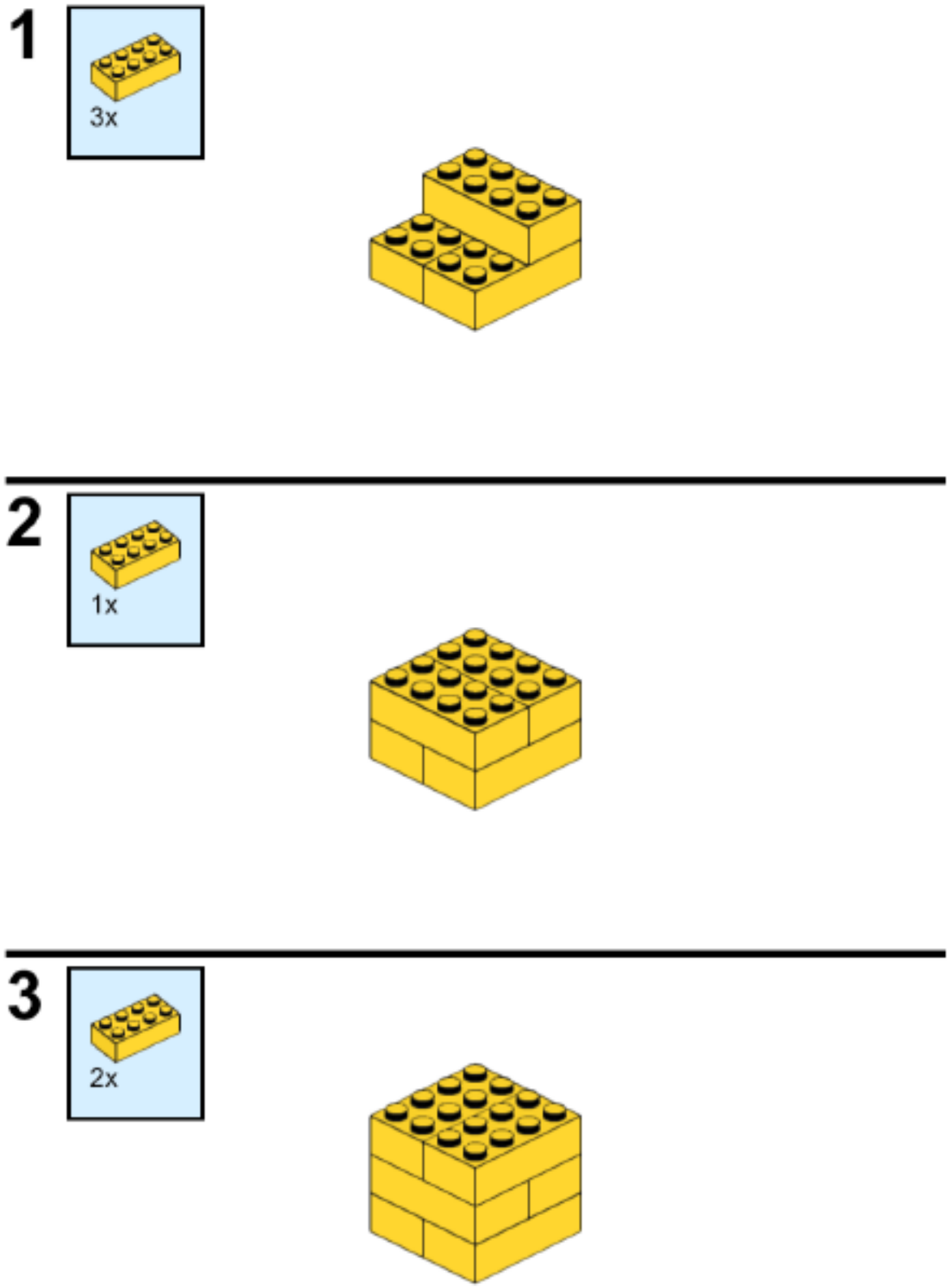
6. Grass (3x)

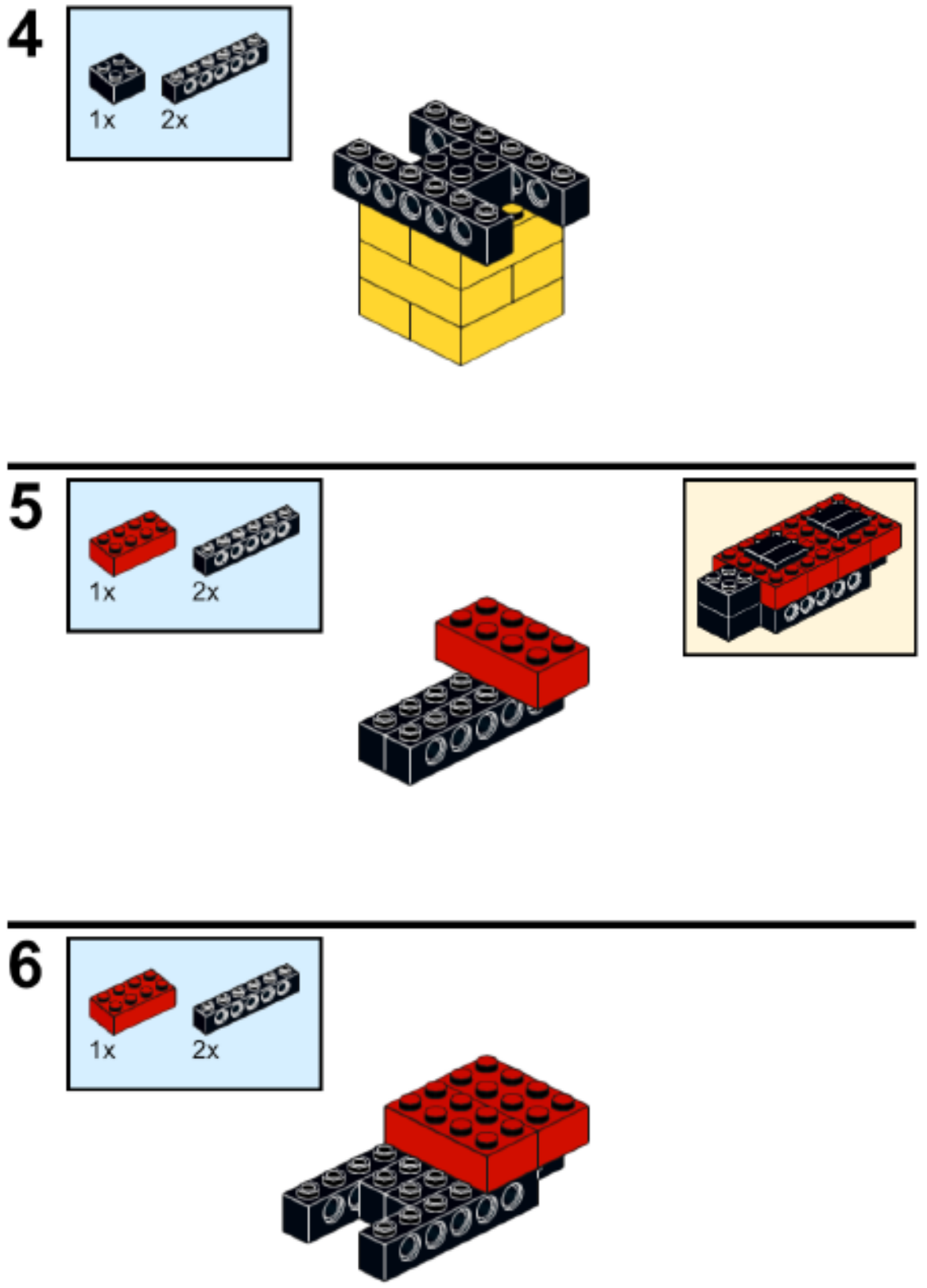


7. Bad Weeds (3x)

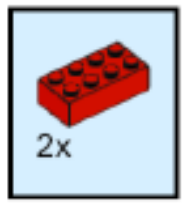


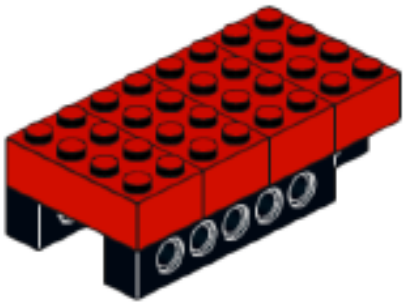
8. Ladybug (3x)



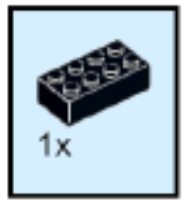

4
1x
2x
5
1x
2x
6
1x
2x

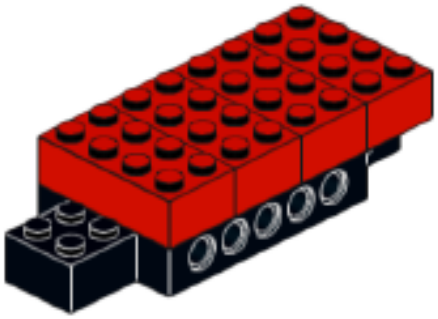
7



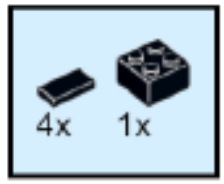


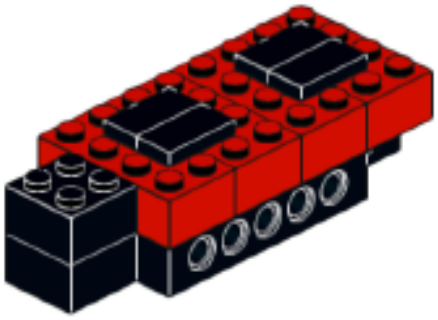
8



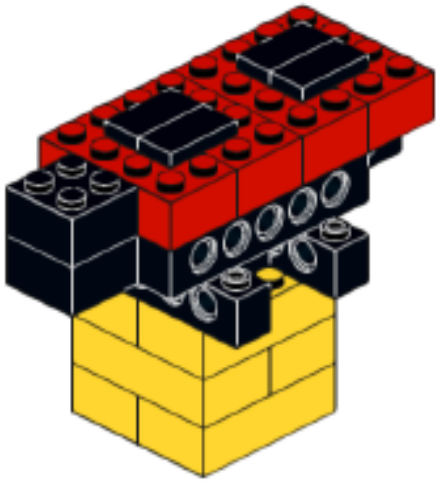


9

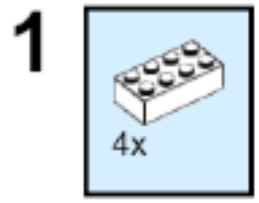


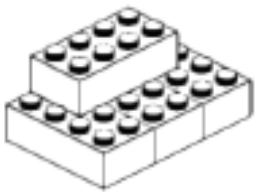


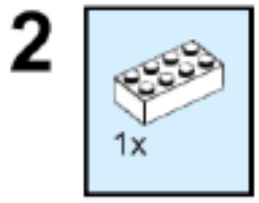
10

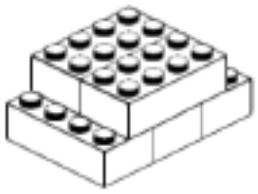


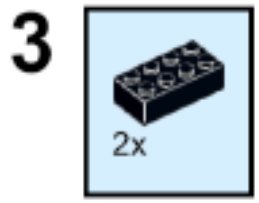
9. Service point (1x)

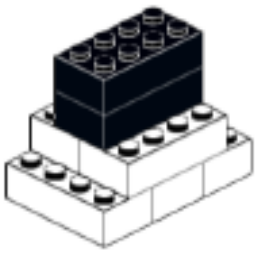






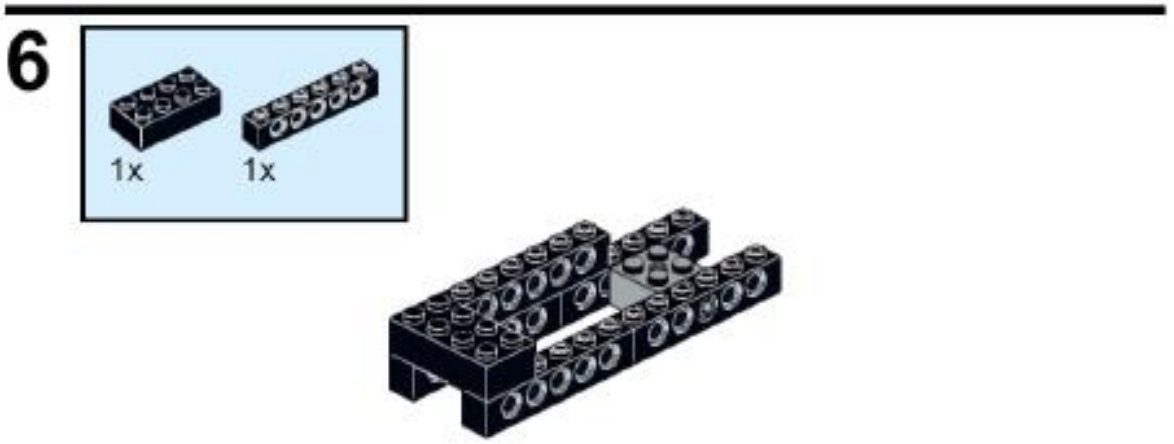


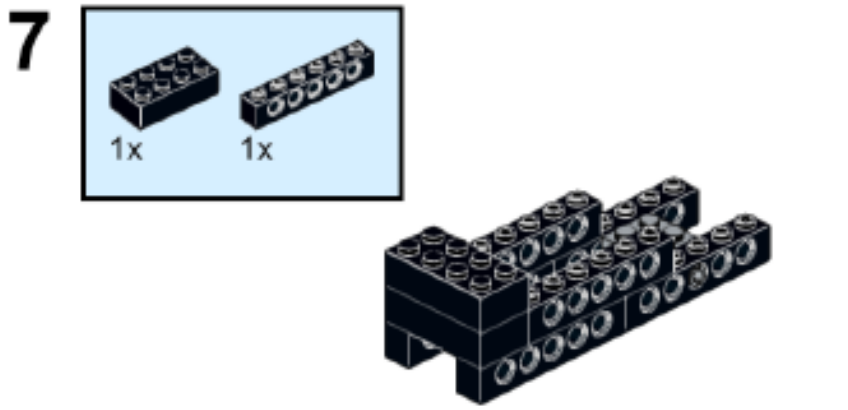


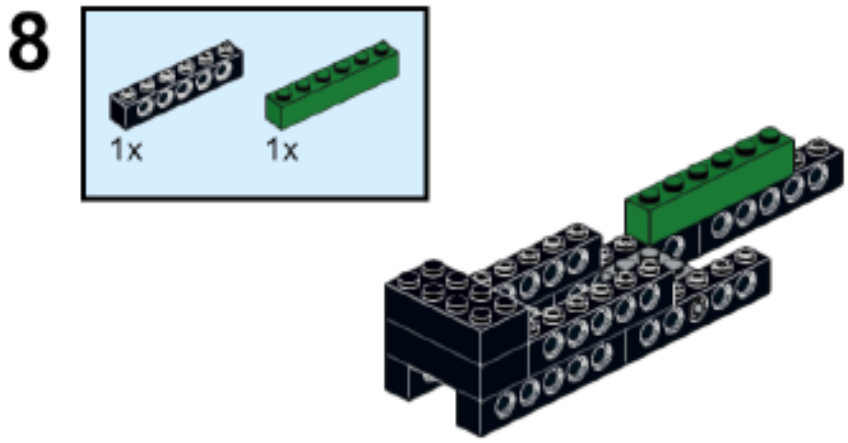


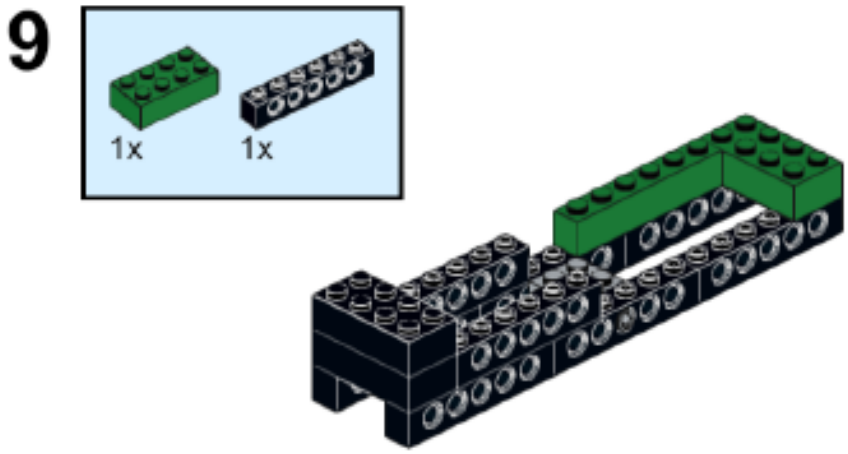
4
1x
2x

5
2x

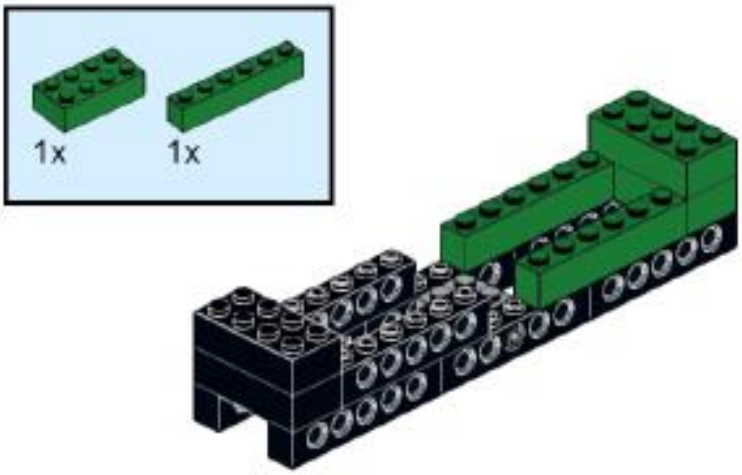

6
1x
1x


7
1x
1x

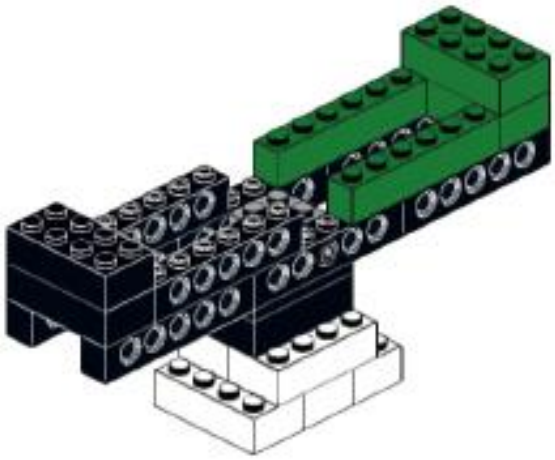

8
1x
1x


9
1x
1x

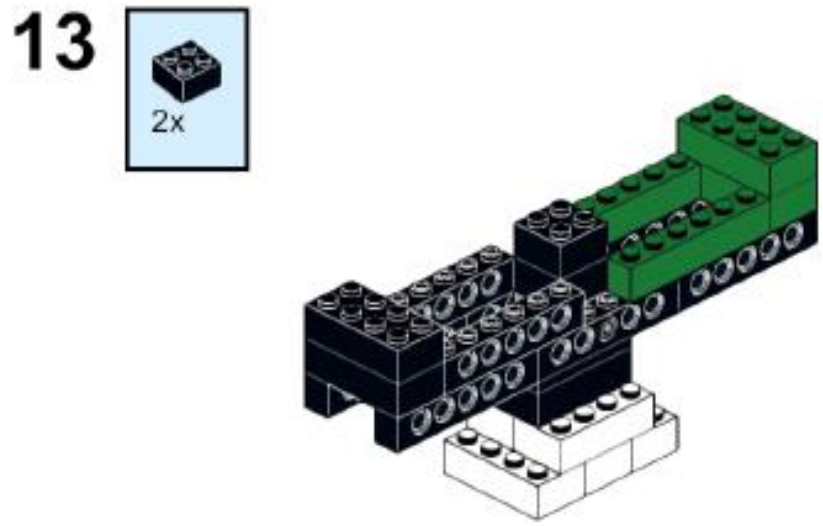
10



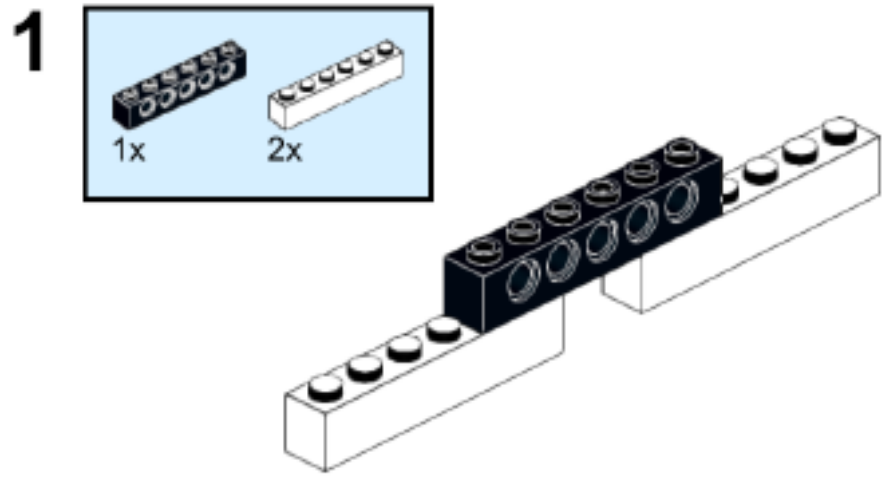
11

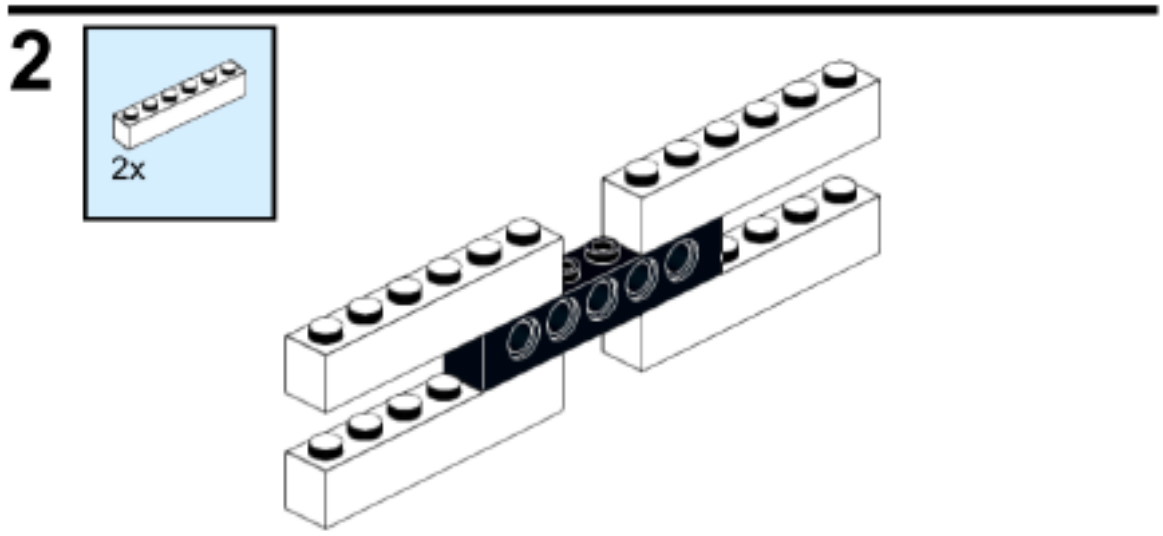


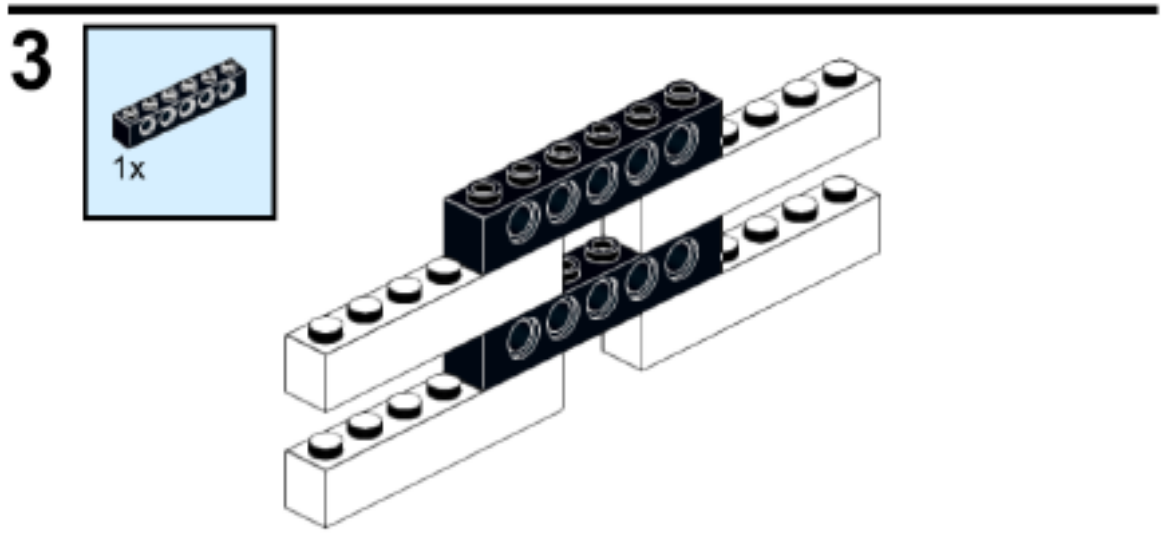
12


13
2x

10. Fence (11x)







END