In-House Challenge 2: Outpost Maintenance

Game Rules

THE FUTURE OF ROBOTS

WORLD ROBOT OLYMPIAD ™

WRO®

SOUTH AFRICA

Date: 06 May 2025

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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.

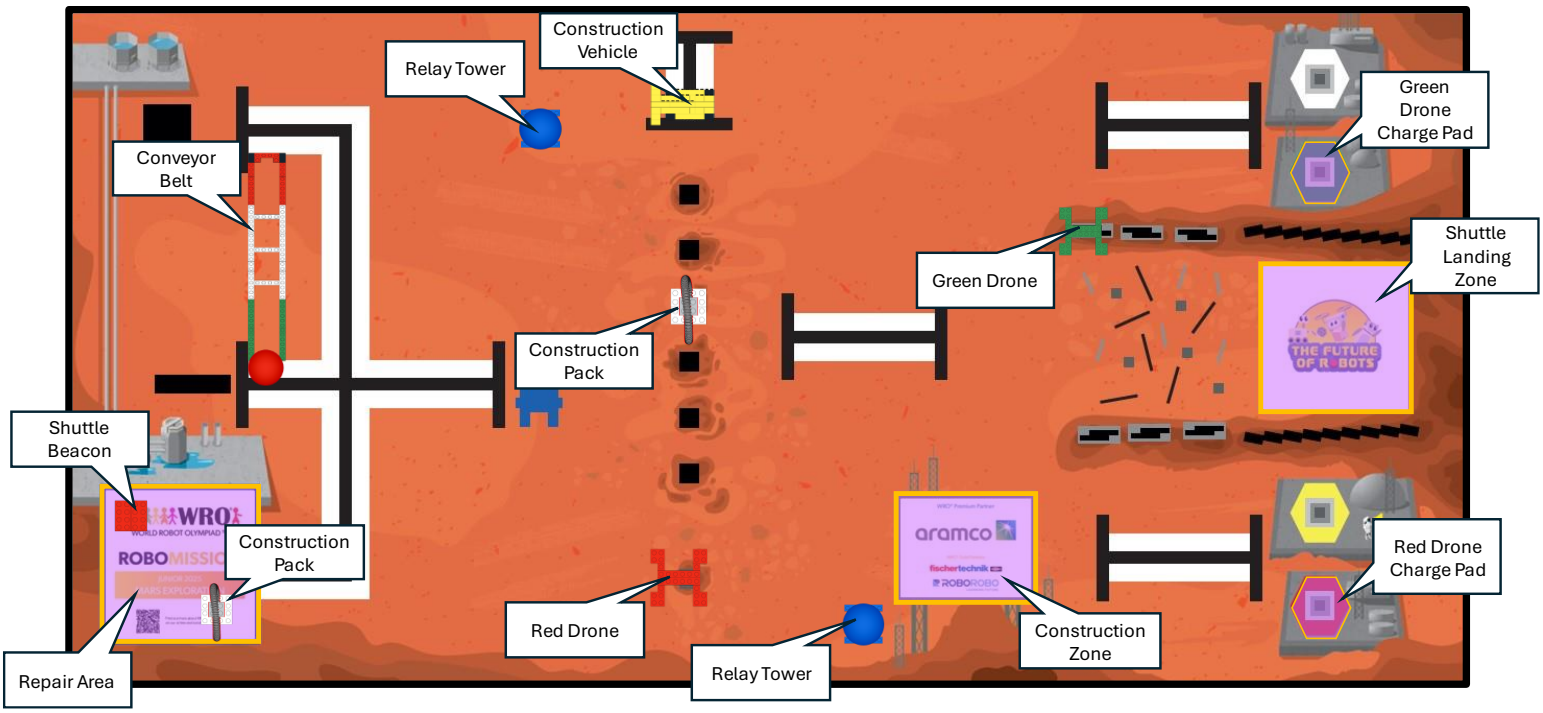
The most rewarding part of designing robots is that students have fun. They work together as a team, discovering their own solutions. Coaches guide them along the way, then step back to allow them their own victories and losses. Students thrive in this supportive and immersive environment, and learning 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 1st and 31st 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.



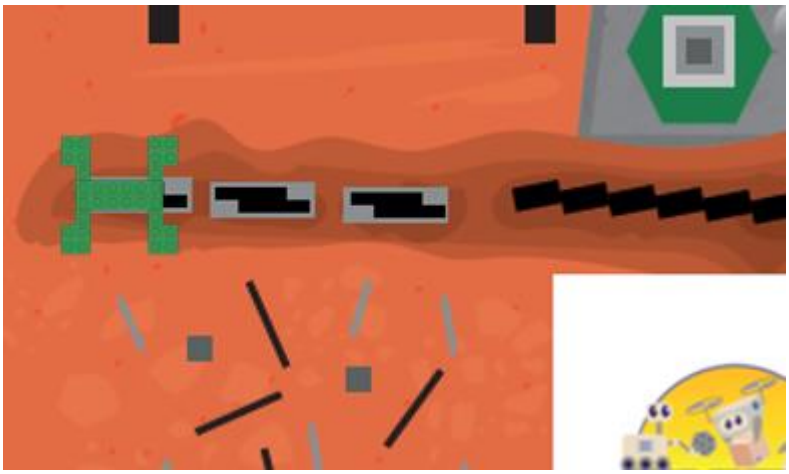
1. Ultrasonic Sensor/button used to start the robot moving.
2. Used a colour/light sensor to follow a line.
3. White construction packs moved completely inside the construction zone.
4. Red drone returned to red charge pad.
5. Green drone returned to green charge pad.
6. Construction vehicle completely inside the repair area.
7. Red shuttle beacon upright and completely inside the shuttle landing zone.
8. Ore (red ball) moved along the conveyor belt.
9. Team touches the robot and says stop at the end of their scoring run.

Bonus: Blue relay balls not touching the game mat.

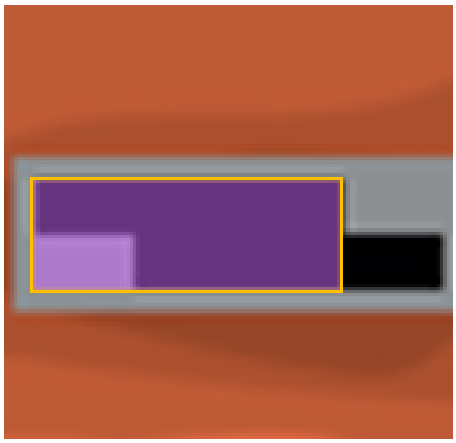
3. Game Objects & Positioning

Drones (x2)

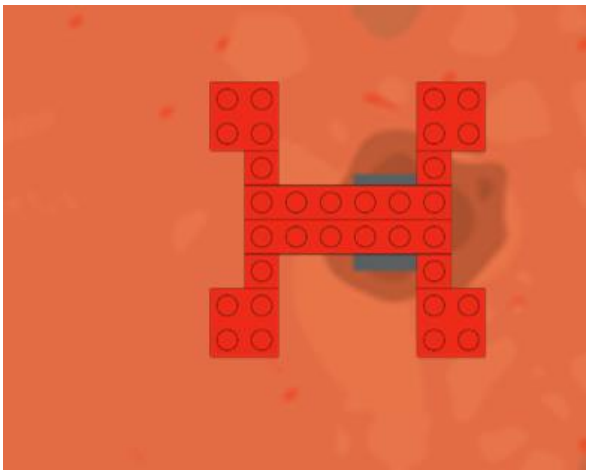
One green drone and one red drone are placed on the game field as per the images below.



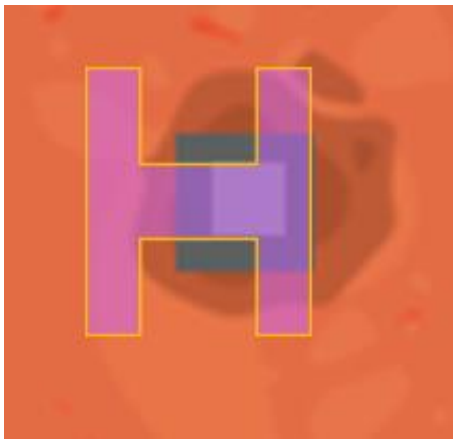
Green Drone starting position in grey/black rectangle far left of the green charge pad.



Green Drone is placed covering the areas marked in the image above.



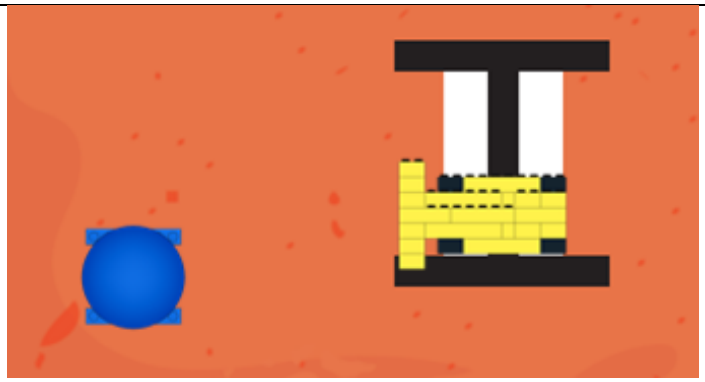
Red Drone starting position in the grey square to the right of the start area.



Red Drone is placed covering the areas marked in the image above.

Construction Vehicle (x1)

One construction vehicle is placed on the game mat near the one relay tower.



Starting position of the construction vehicle. With the dozer blade facing the relay tower.

Starting position of the construction vehicle showing the placement of the base of the construction vehicle.

Starting location of the construction vehicle.

Red Shuttle Beacon (x1)

One red shuttle beacon is placed in the repair area with the robot. The beacon may be placed on/into the robot before the robot starts. The robot is allowed to carry/push the beacon.

Example of a robot with the red shuttle beacon in the repair area.

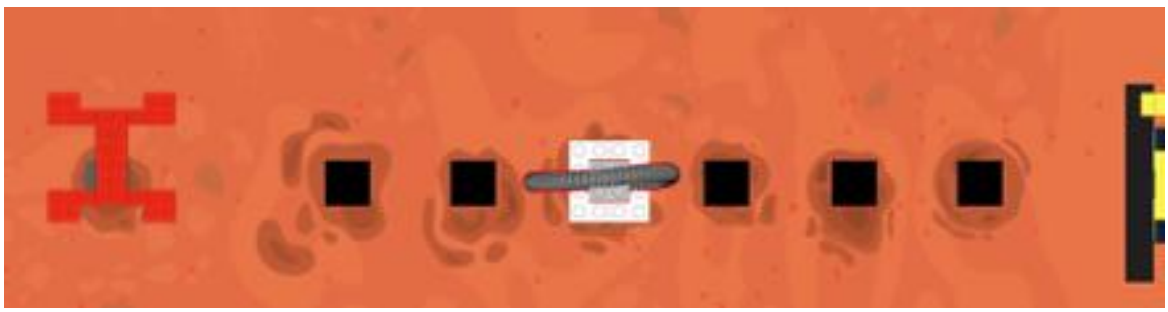
Red shuttle Beacon must start completely inside of the repair area before the robot starts.

White Construction Packs (x2)

Two white construction packs are placed on the game mat one starts with/on the robot in the repair area. The other starts in the third (4th) black square from the start area.

Position of the White Construction pack on the game mat.

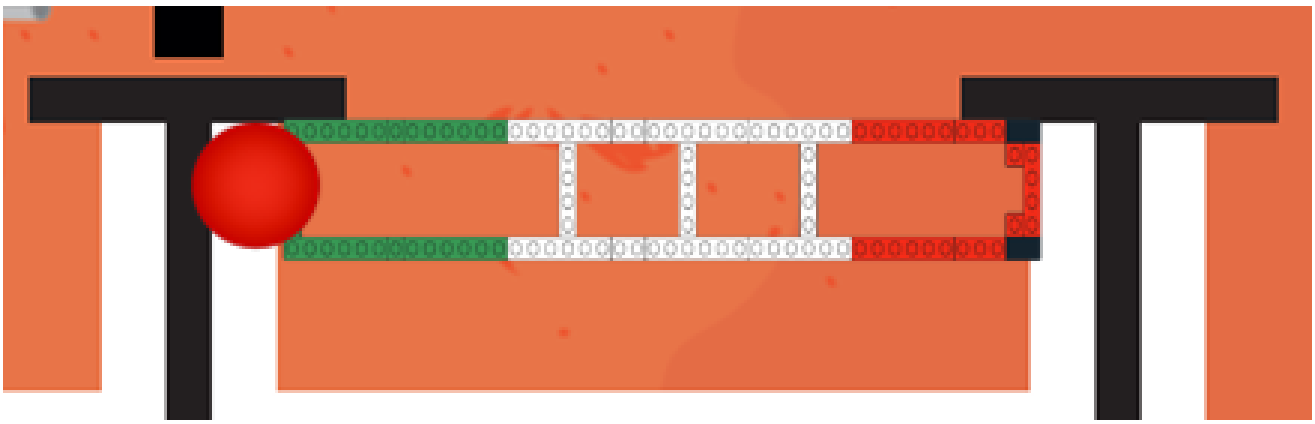
Position of the White Construction pack in the repair area with a robot. Image 1 pushed, Image 2 carried.



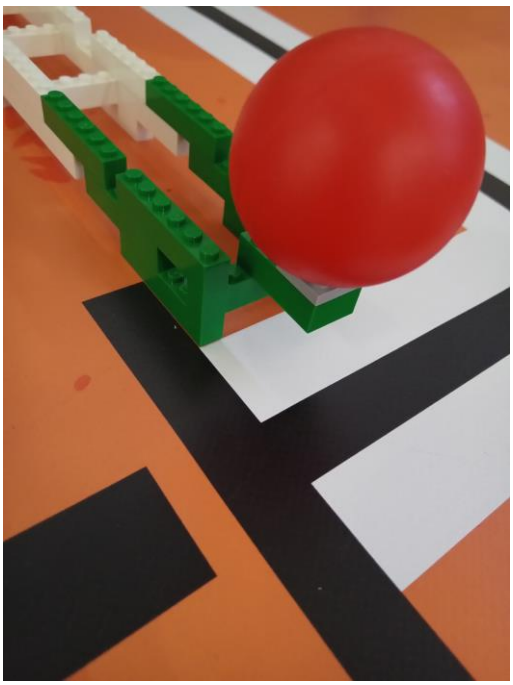
Starting position of the white construction pack placed on the game mat.

Ore and Conveyor Belt.

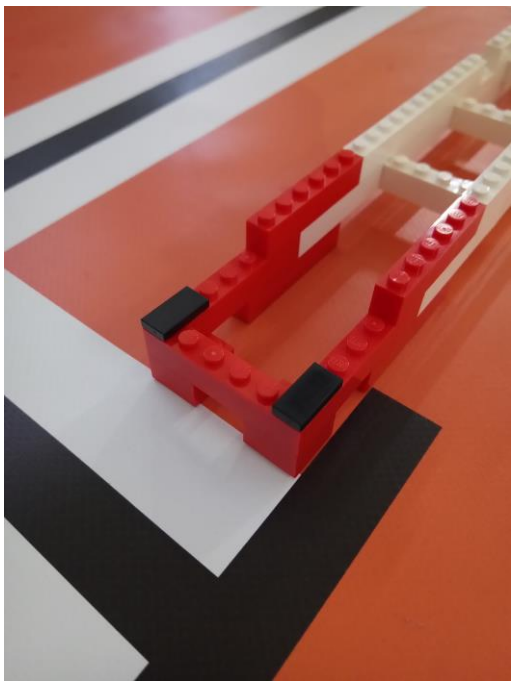
One red shuttle beacon is placed in the repair area with the robot. The beacon may be placed on/into the robot before the robot starts. The robot is allowed to carry/push the beacon.



Starting position of the conveyor belt element and ore (red ball).



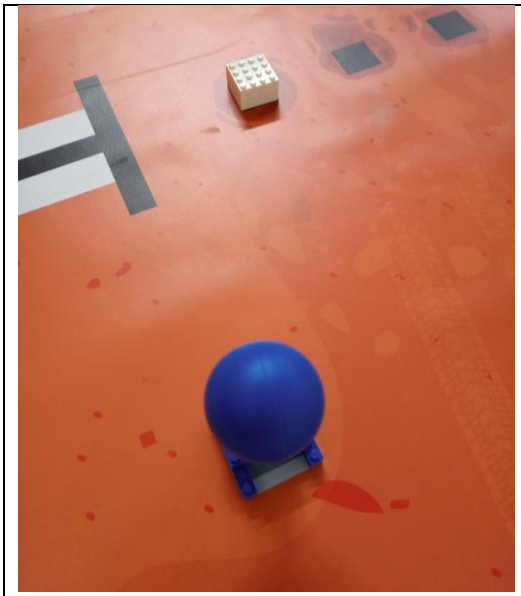
Starting position of the start and ore (red ball) of the conveyor belt.



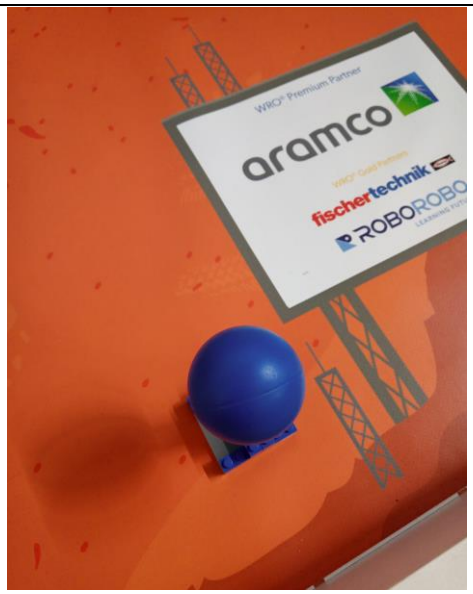
Starting placement of the end of the conveyor belt.

Relay Towers (x2)

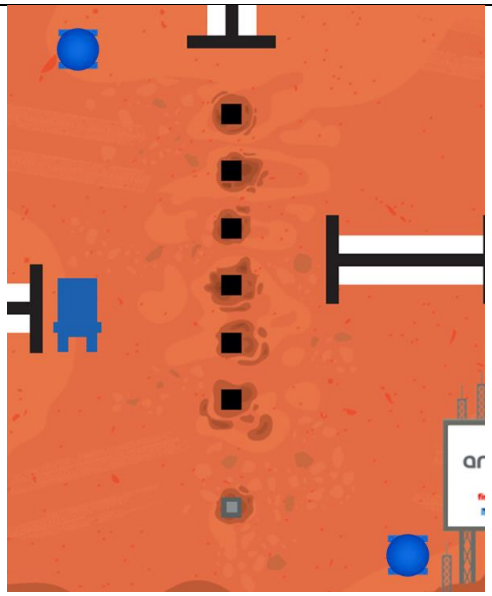
Two relay towers are placed on the game mat. One relay tower in the square to the left of the Aramco logo. One relay tower to the left of the top white construction pack.



Starting position of relay tower.



Starting position of relay tower.



Starting position of relay towers.

4. Robot Missions

4.1 Points for 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 White Construction Packs

The white construction packs must be moved completely inside of the construction zone (Aramco logo area).

4.3 Drones

The two drones (red and green) should be returned to their matching-coloured charge pads. The drone only needs to touch the charge pad area for points to be awarded.

4.4 Construction vehicle repairs

Move the construction vehicle completely inside of the repair area. (robot start area)

4.5 Red Shuttle Beacon

Place the red shuttle beacon completely inside of the shuttle landing zone. The beacon must be placed upright and must touch the game mat.

4.6 Ore (red ball)

The ore (red ball) on the conveyor belt must be moved to the end of the conveyor belt. There are two conditions for points to be awarded for this element. If the ore element is inside of the white area of the conveyor belt a total of 30 points will be awarded. If the ore element is inside of the red catchment area (end of conveyor belt) 60 points will be awarded. This element is scored only on its end condition either inside of the white or red area. Points are not awarded for both.

4.7 Blue relays are undamaged

The blue relay balls are not touching the game mat and still on their towers.

4.8 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 - Outpost Maintenance

Team Name: _____

Task	Each	Points	1st Score	2nd Score	3rd Score	4th Score
Ultrasonic sensor or button used to start the robot moving.	**Yes / No**	**20**				
Used colour/light sensor to follow a line.	**Yes / No**	**20**				
White construction packs moved completely inside the construction zone.	**0 1 2**	**20 each** Max 40				
Red drone touching the red charge pad.	**Yes / No**	**20**				
Green drone touching the green charge pad.	**Yes / No**	**20**				
Construction vehicle completely inside the repair area.	**Yes / No**	**40**				
Red shuttle beacon upright and completely inside the Shuttle Landing Zone.	**Yes / No**	**20**				
Below points are awarded for moving the ore (red ball) along the conveyor belt. **Points are awarded for only one of the two conditions.**						
Ore (red ball) inside the white area of the conveyor belt.	**Yes / No**	**30**				
Or						
Ore (red ball) inside the red catchment area at the end of the conveyor belt.	**Yes / No**	**60**				
Team touched robot, ended program and said STOP to indicate the run is over.	**Yes / No**	**20**				
Bonus Points:						
Blue relay balls not touching the game mat.	**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

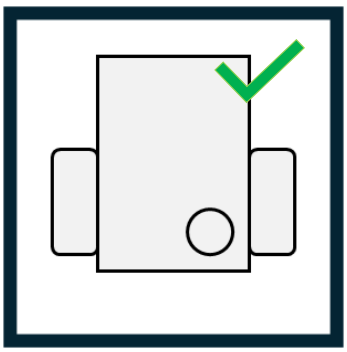
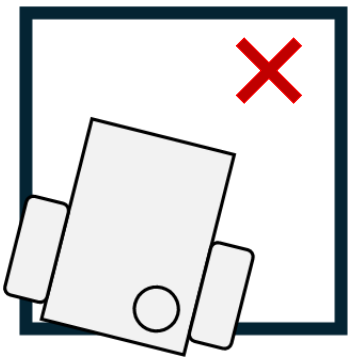
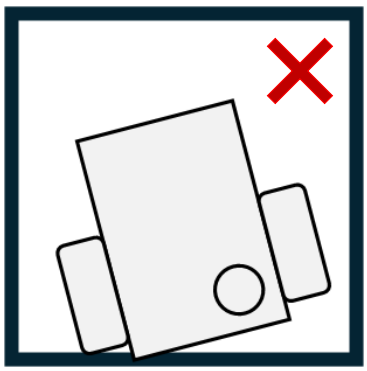
Judge Name: _____ **Team Member Signature:** _____

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.

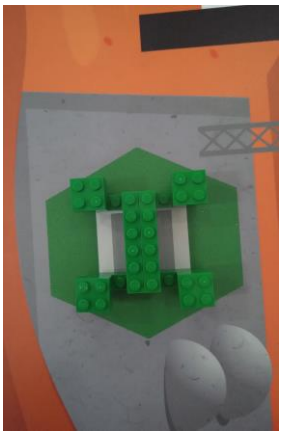
Robot start area

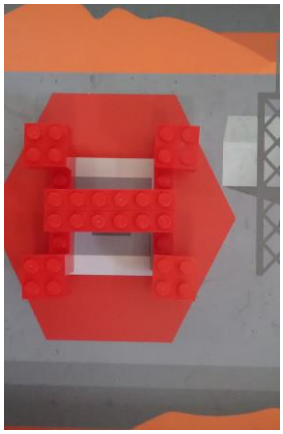
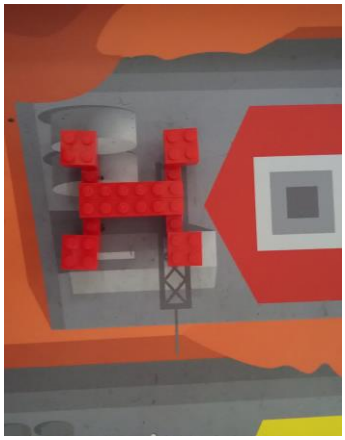
The robot must start completely inside the start/finish area. All parts of the robot must fit into this area **including robot cables**. No part of the robot is allowed to project outside of the start/finish area or into the surrounding line. The start/finish area is defined as the white area only and 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

Drones:

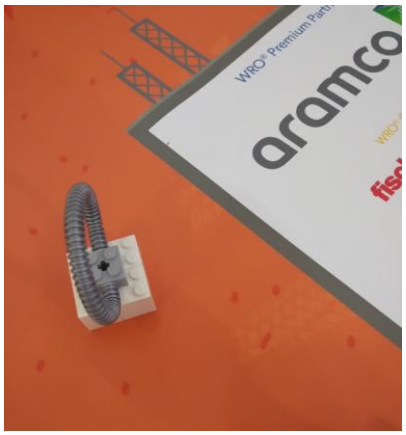
The below images apply to the drone elements and their charge pads.

 Green drone completely inside the charge pad area 20 points	 Green drone touching the charge pad area 20 points	 Green done not touching the charge pad area. 0 points

 Red drone completely inside the charge pad area 20 points	 Red drone touching the charge pad area 20 points	 Red done not touching the charge pad area. 0 points

White Construction Packs:

The below images apply to the white construction packs in the construction area.

 Construction pack completely inside the constriction area. 20 points each	 Construction pack completely inside the constriction area but not upright. 20 points each	 Construction pack not inside of the construction area. 0 points

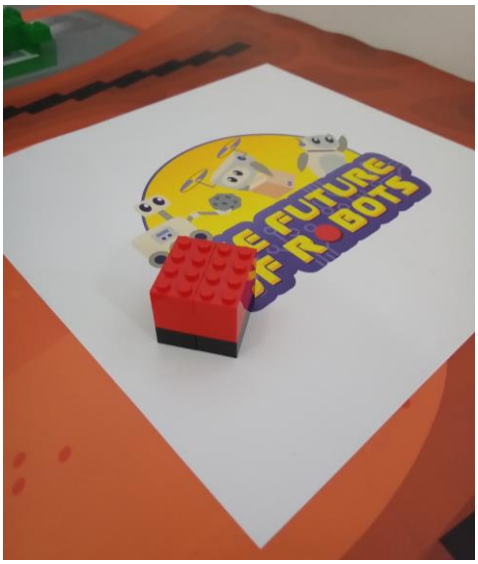
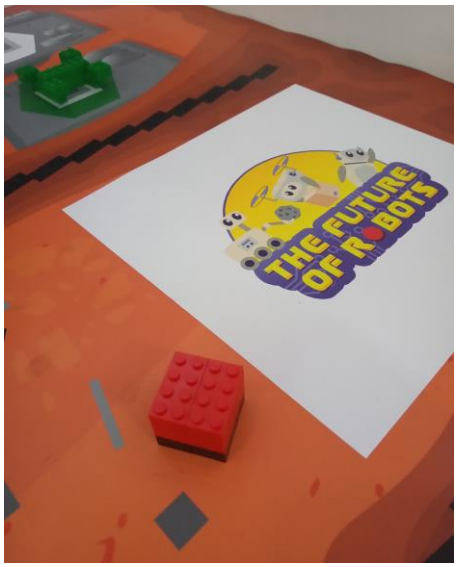
Construction Vehicle

The below images apply to the construction vehicle in the repair area

		
Construction vehicle completely inside the repair area. 40 points	Construction vehicle touching the inside of the repair area. 0 points	Construction vehicle not completley inside the repair area. 0 points

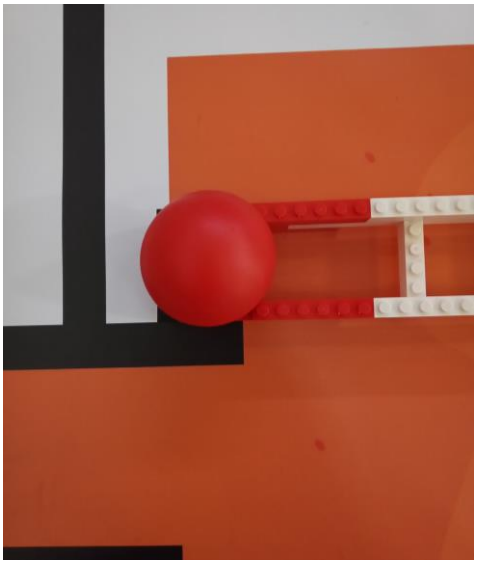
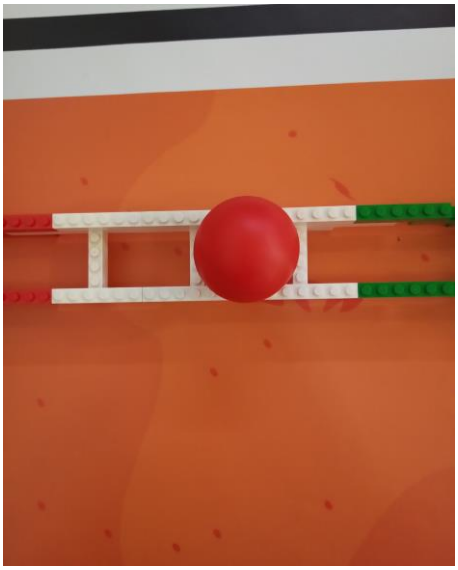
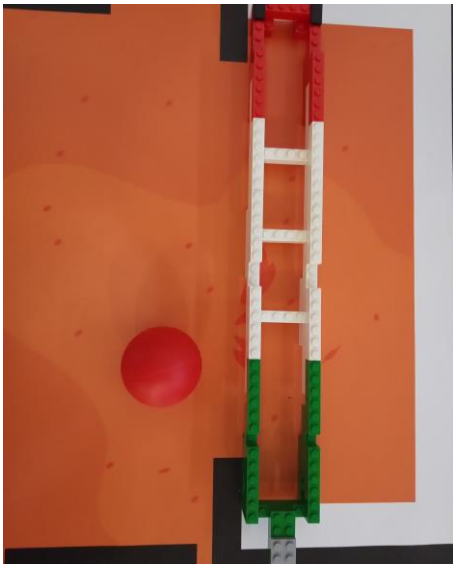
Red Shuttle Beacon

The below images apply to the red shuttle beacon inside of the shuttle landing zone.

		
Red shuttle beacon upright and completely inside the shuttle landing zone. 20 points	Red shuttle beacon completely inside the shuttle landing zone but is not upright. 0 points	Red shuttle beacon not inside the shuttle landing zone. 0 points

Ore and Conveyor Belt

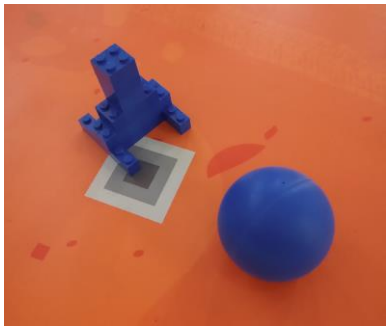
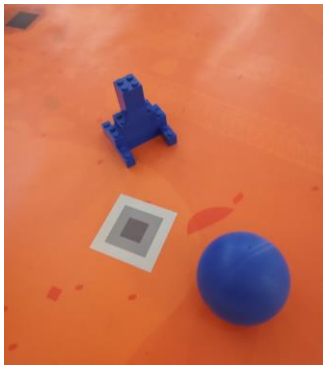
The below images apply to the ore finishing position on the conveyor belt.

		
Ore completely inside the red conveyor belt catchment area. 60 points	Ore completely inside the white conveyor belt area. 30 points	Ore touching the game mat. No longer on the conveyor belt. 0 points

Relay Towers

The below images apply to the relay tower elements.

 Blue ball on top of relay tower. 20 points	 Blue ball touching the game mat. Not on top of relay tower. 0 points

 Blue ball touching the game mat. Relay tower base has moved. 0 points	 Blue ball touching the game mat. Relay tower base has moved. 0 points

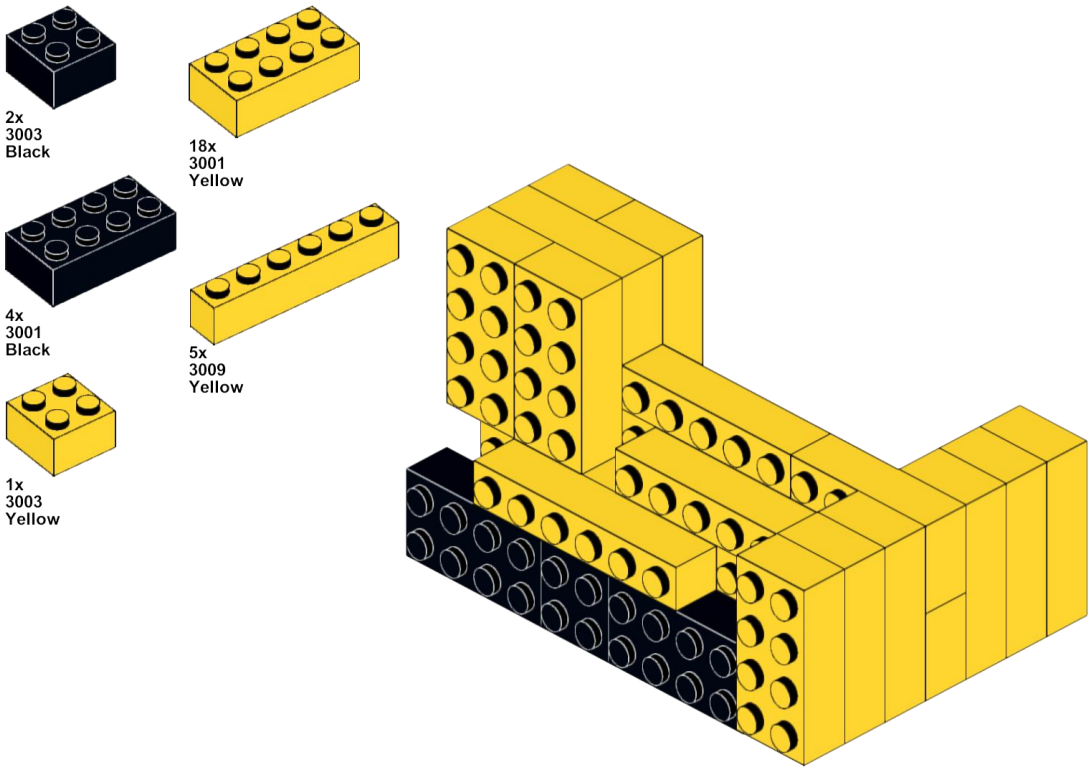
Robot finishing points

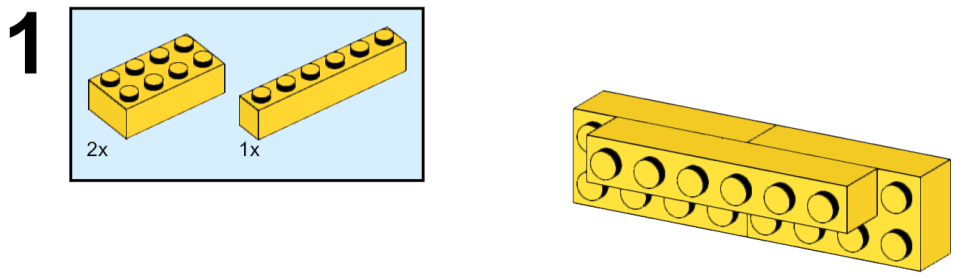
The team must touch the robot and say stop to indicate the robot has finished its run.

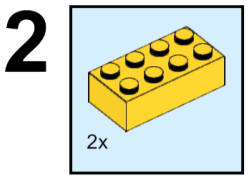
The robot program must be ended, and the robot must no longer move. The robot must remain on the game table until the judge requests the robot to be removed.

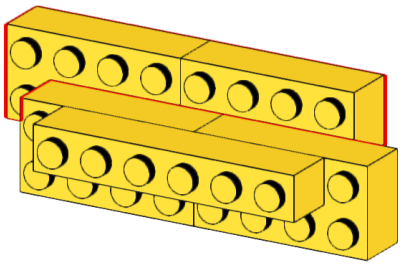
PART TWO – ASSEMBLY OF GAME OBJECTS

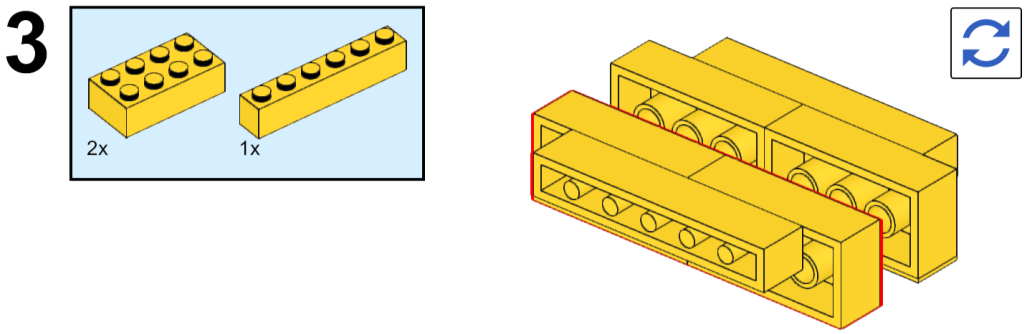
Construction Vehicle (x1)

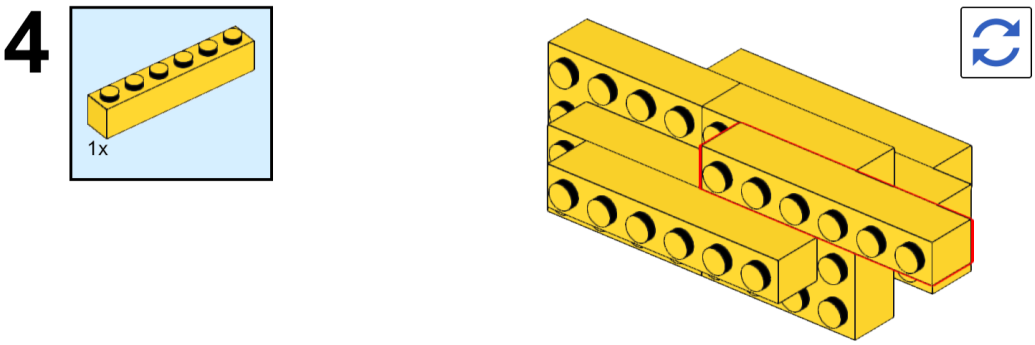









3
2x
1x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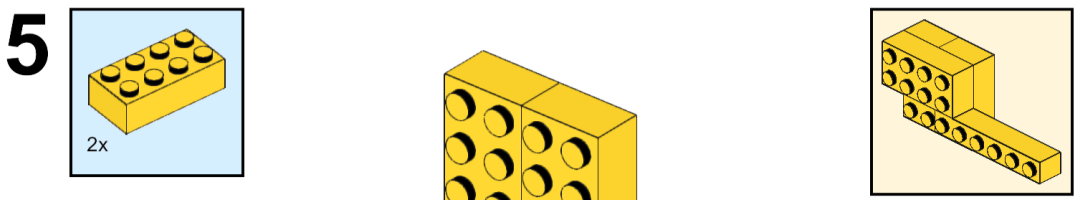
1x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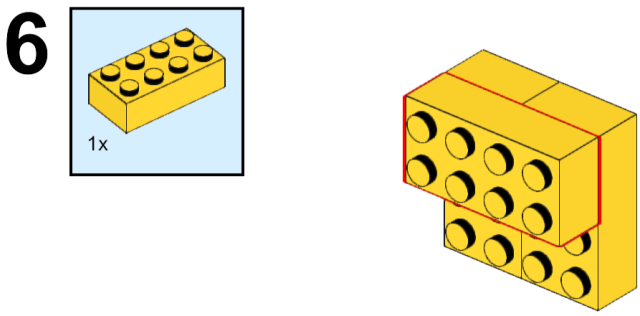
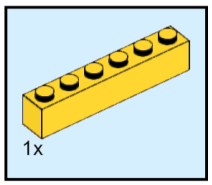
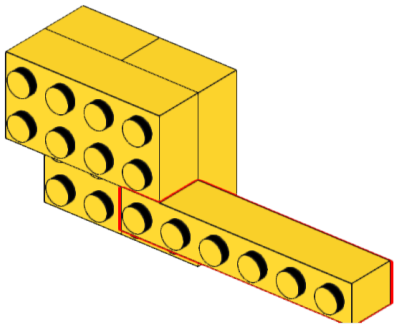
2x


6
1x

7





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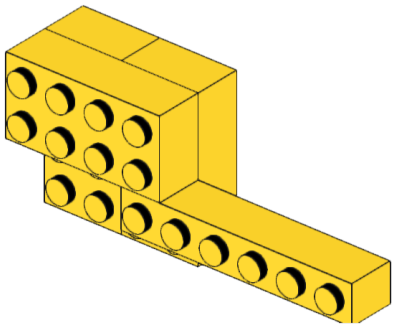

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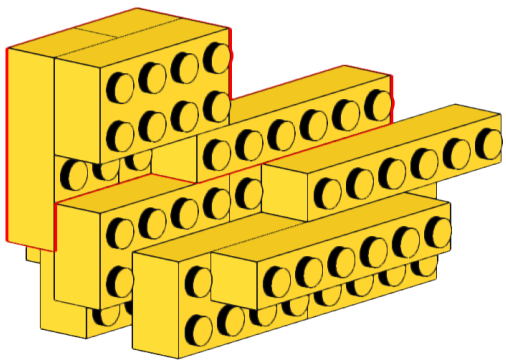

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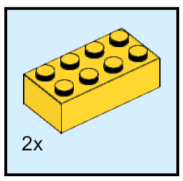

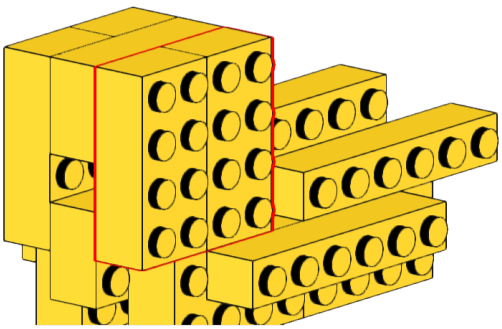

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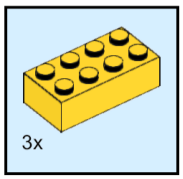

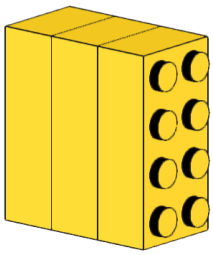

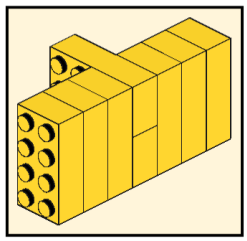

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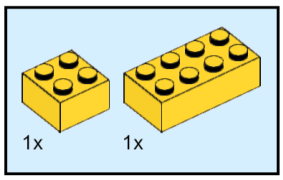

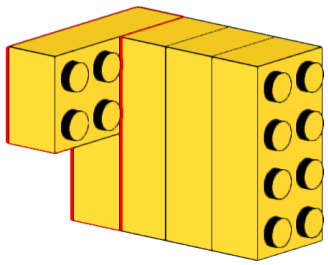

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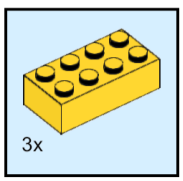

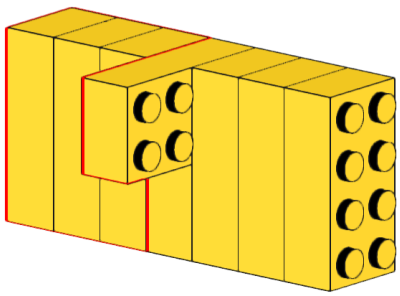

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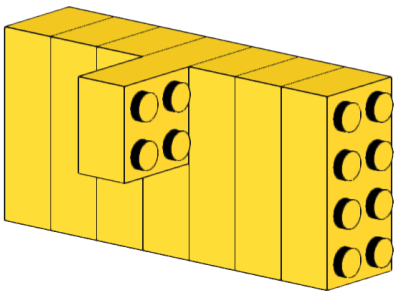

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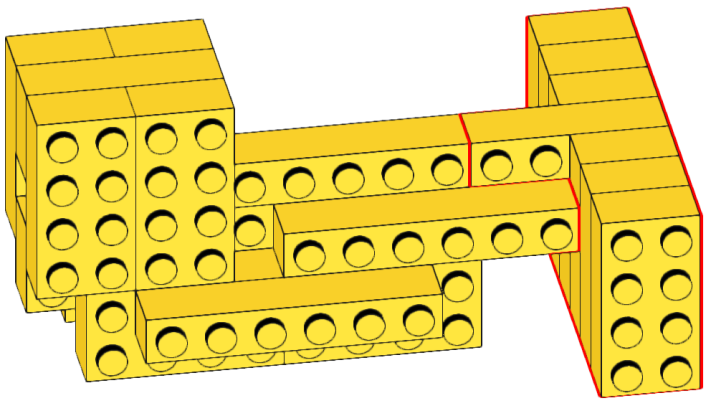

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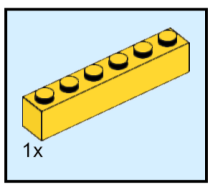

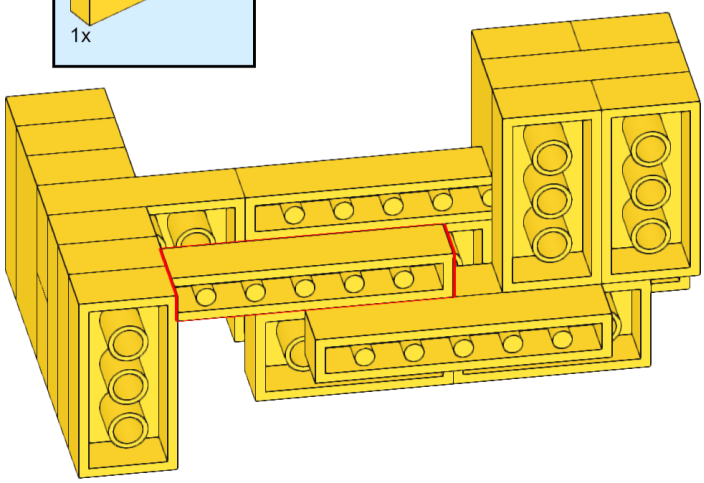

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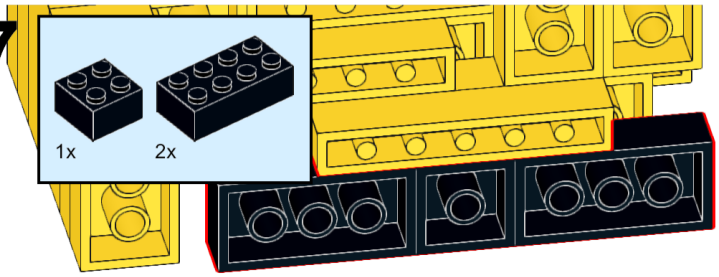

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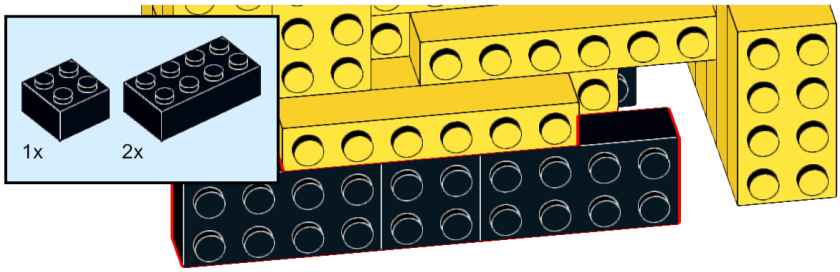

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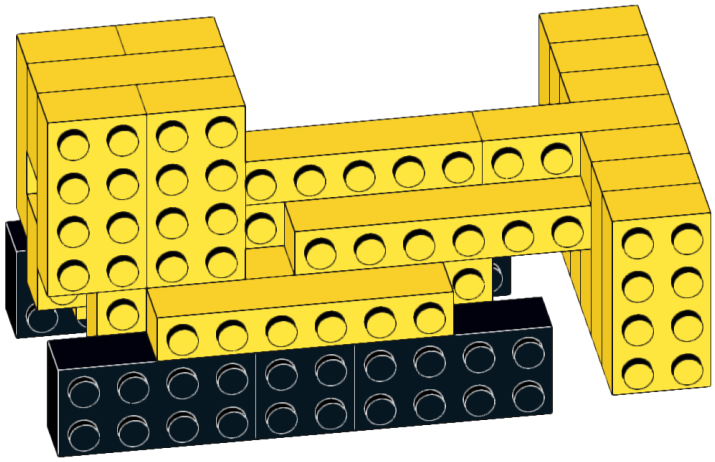
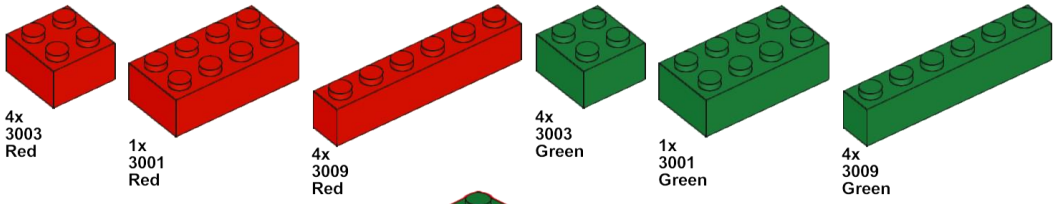
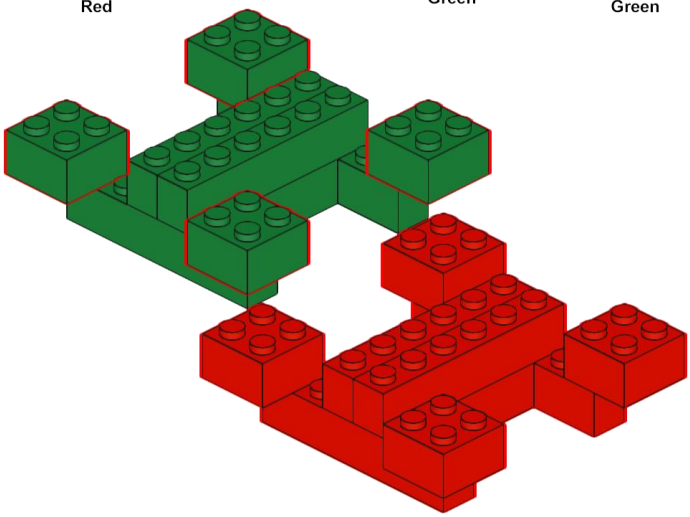
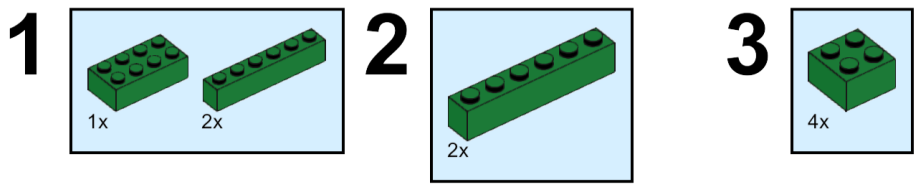
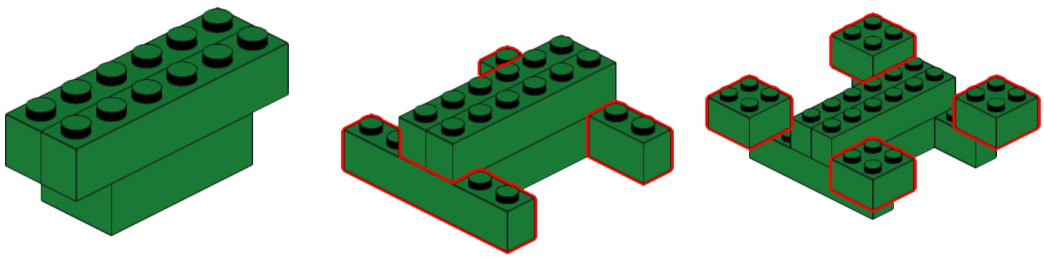


Drone Red (x1) Drone Green (x1)

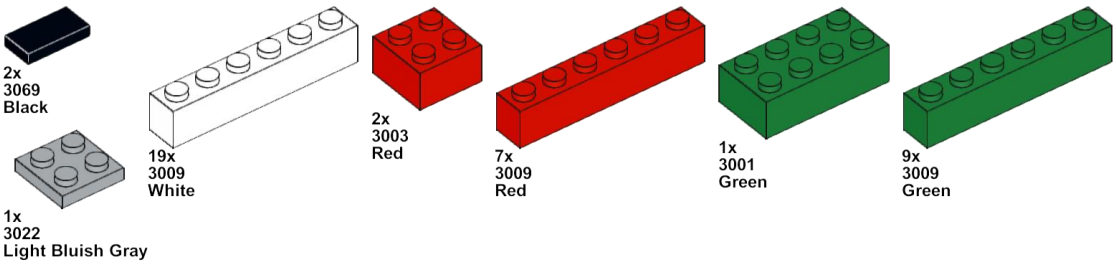


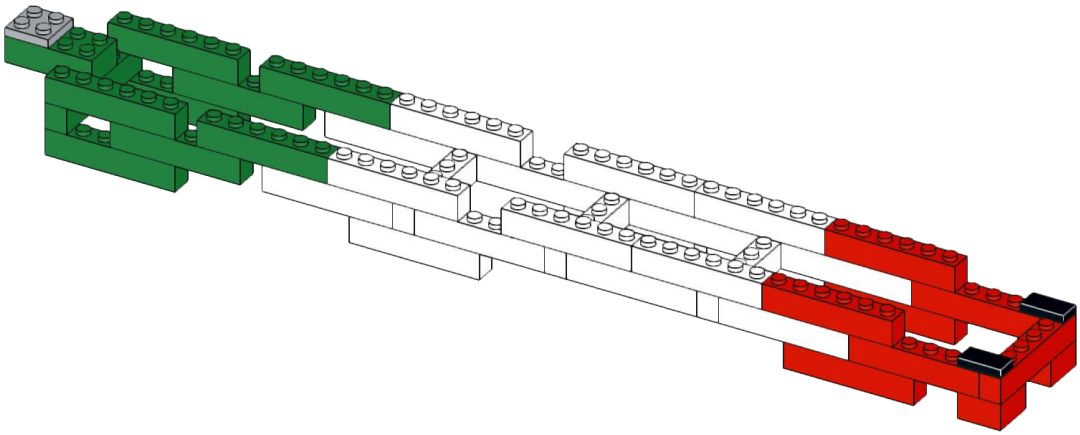


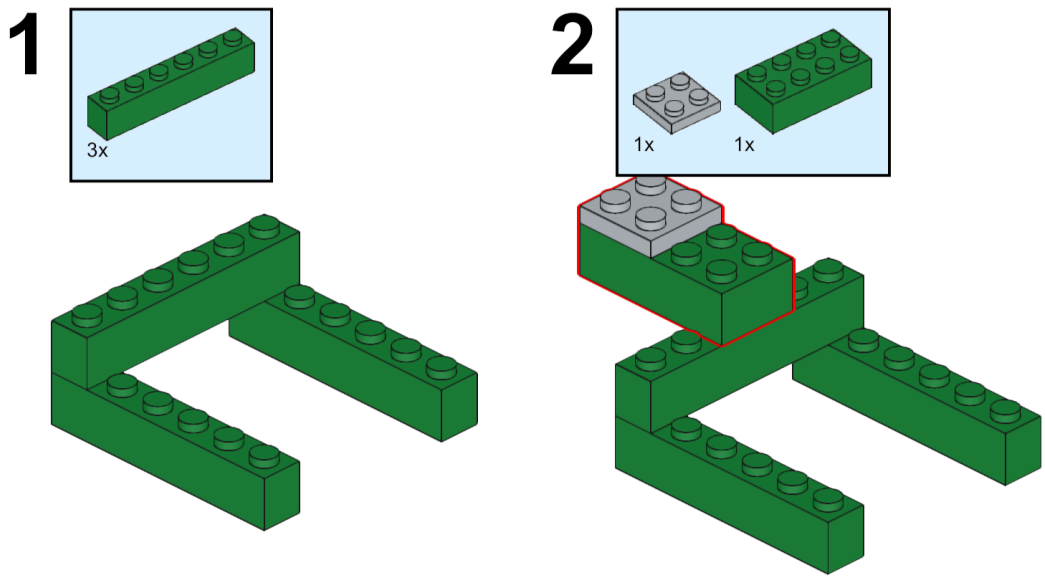


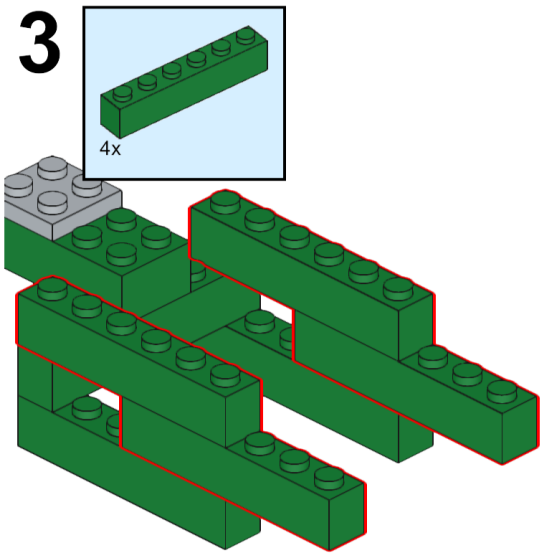


Conveyor Belt (x1)





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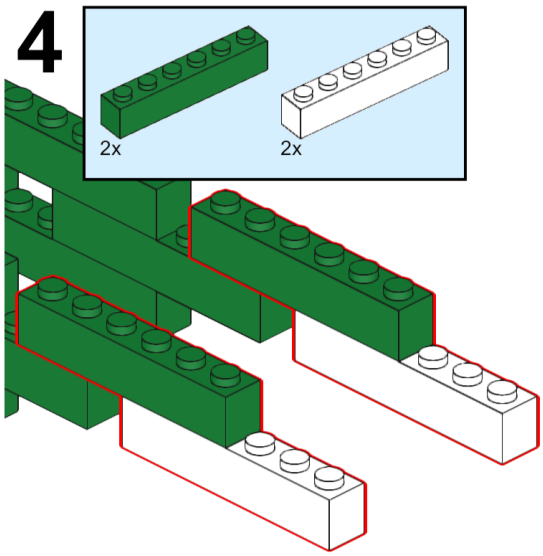
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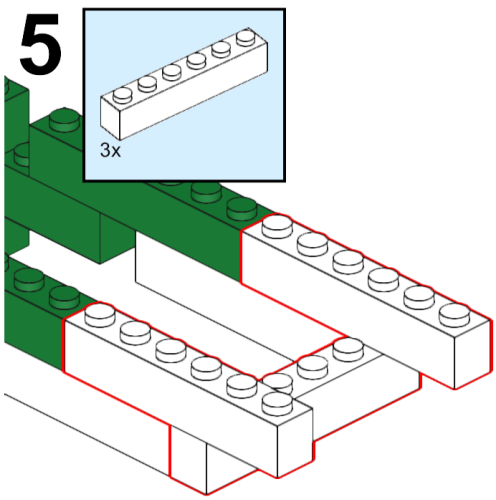
2x
2x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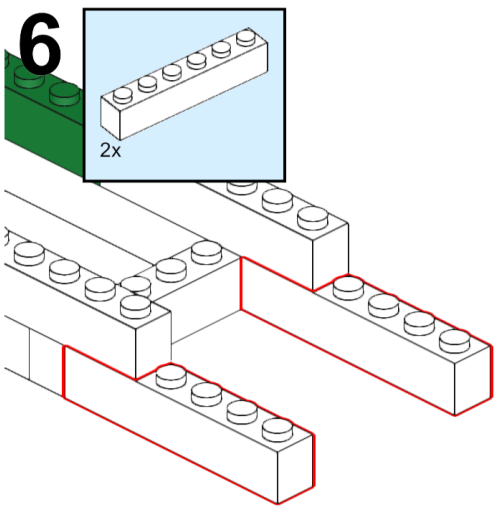
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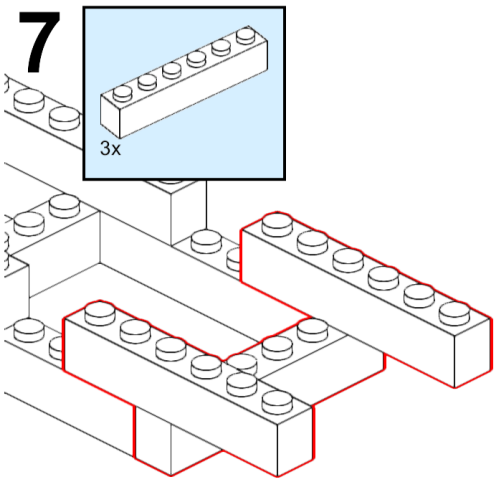
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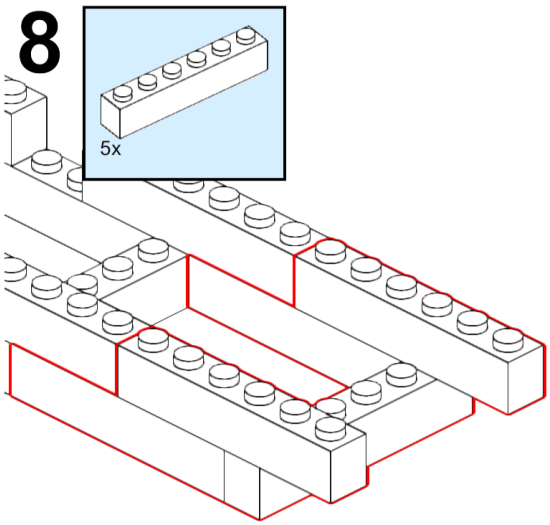
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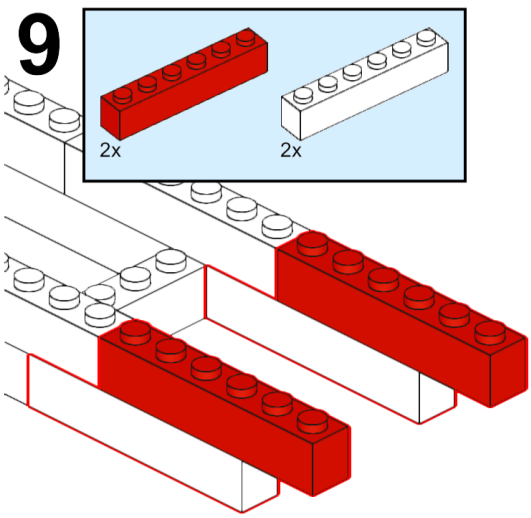
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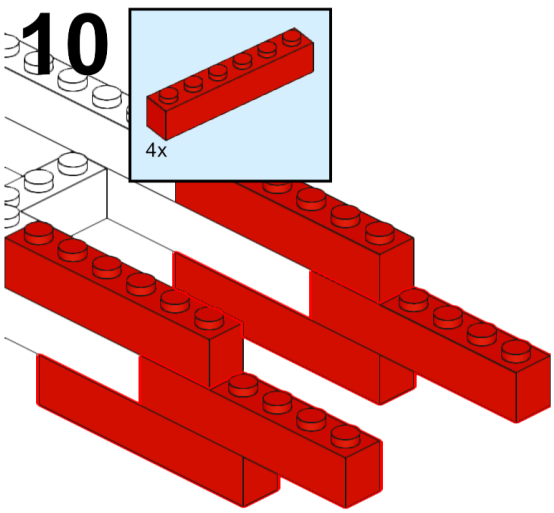
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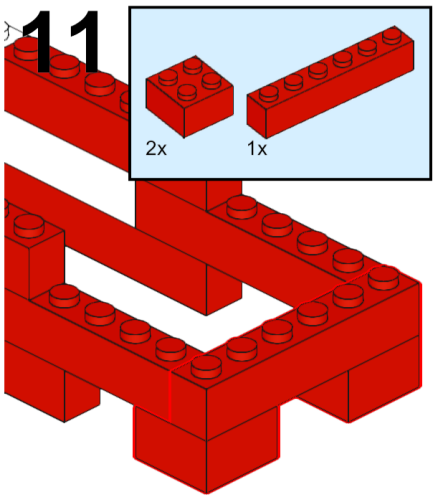
11
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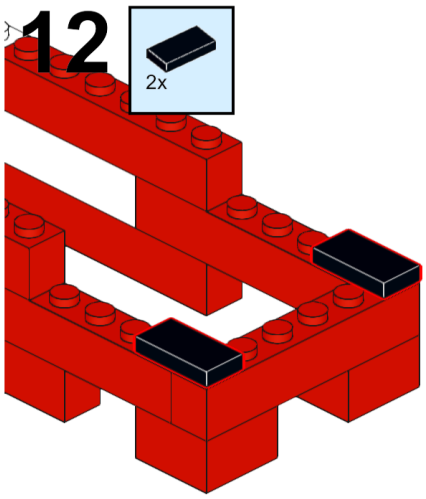
1x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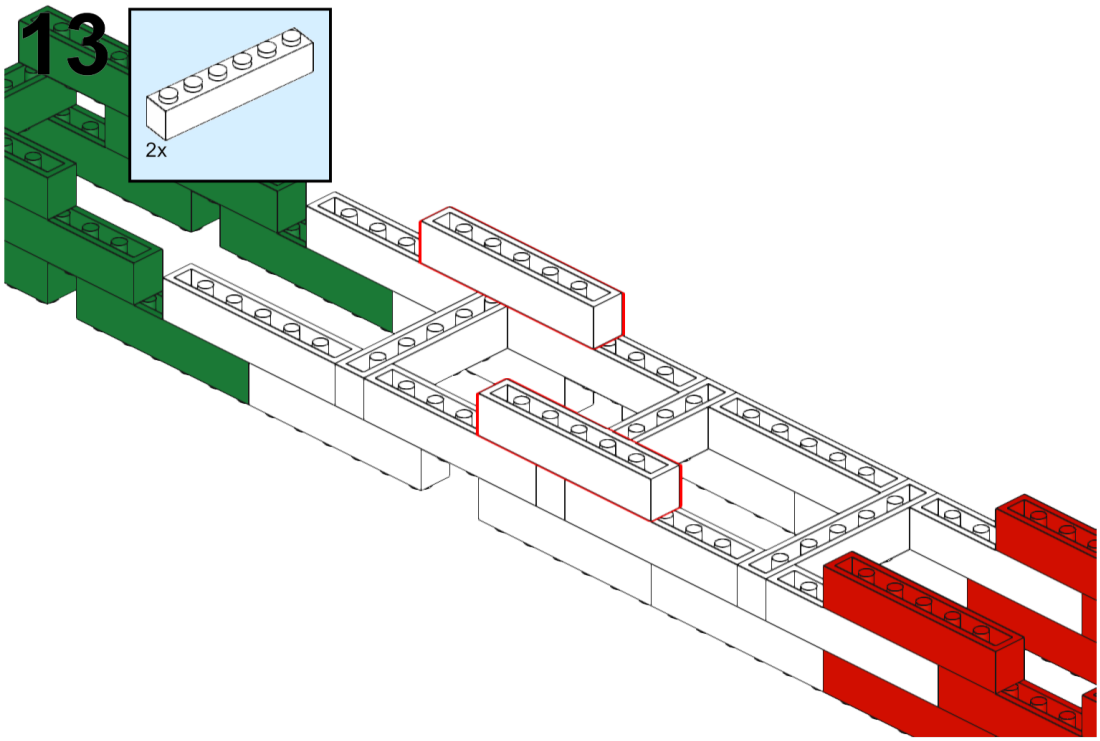
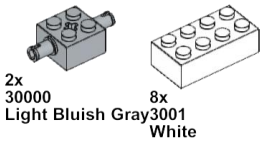
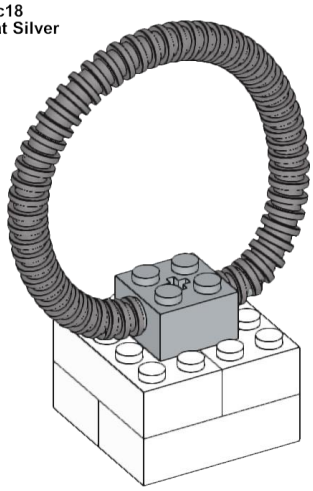
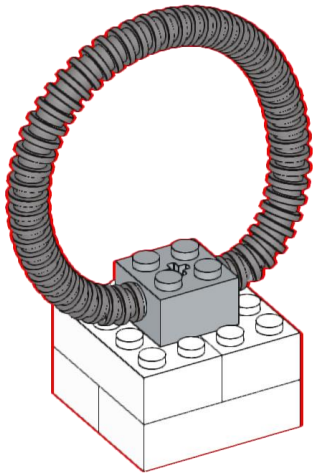
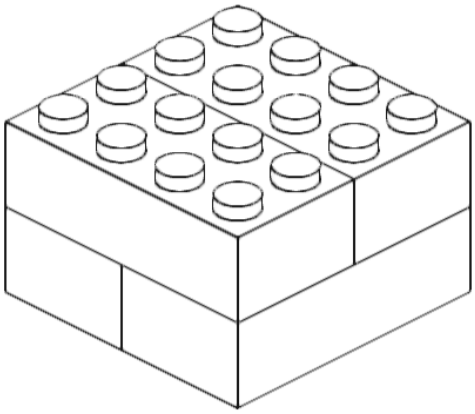

13
2x

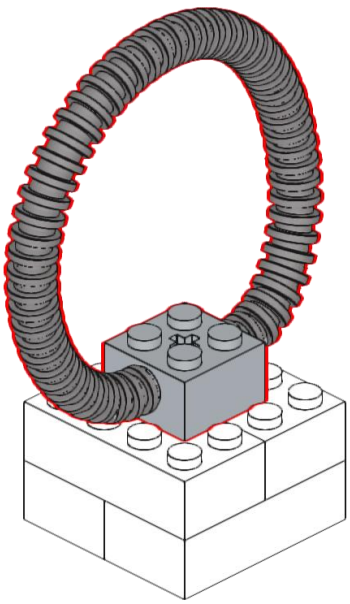
Construction Packs (x2)



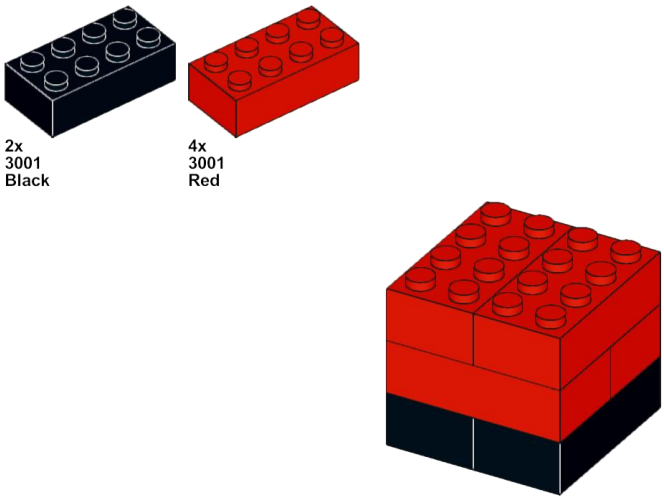




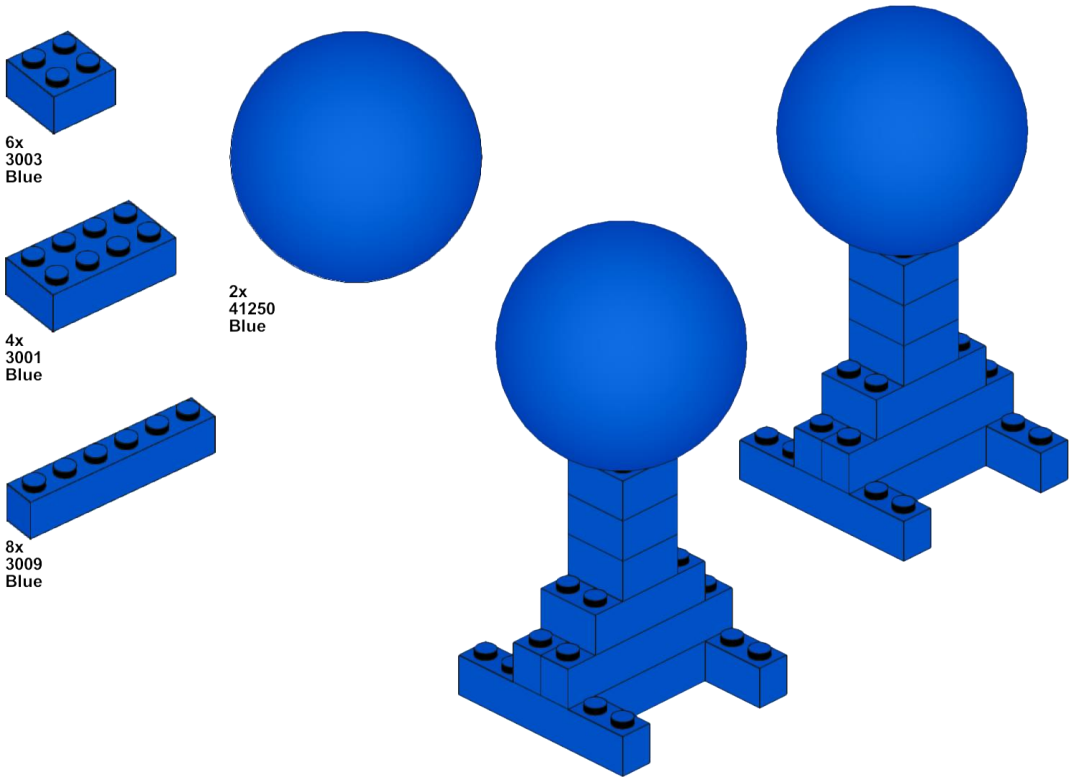




Red Shuttle Beacon (x1)



Relay Towers (x2)



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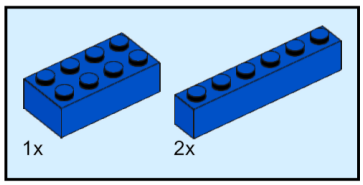

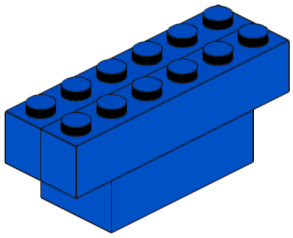

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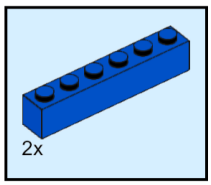

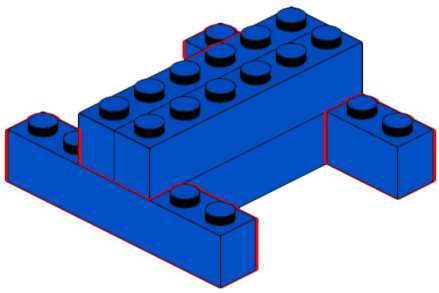

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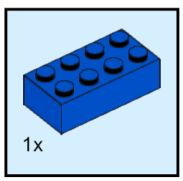

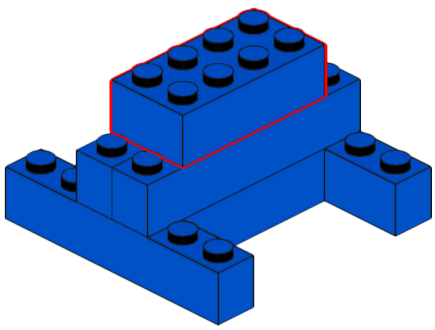

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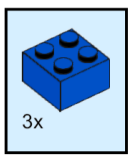

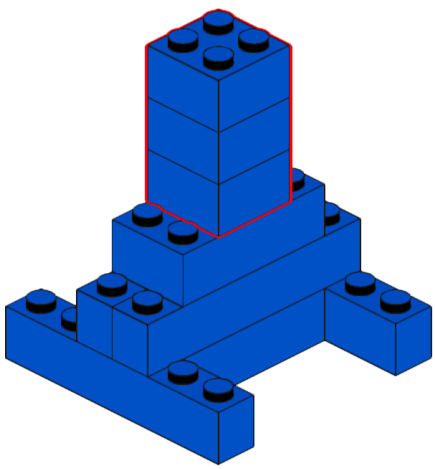

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