In-House Challenge 3: Big Construction

Game Rules
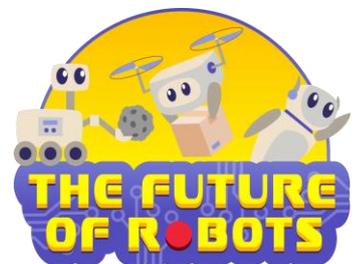
Table of Contents

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.
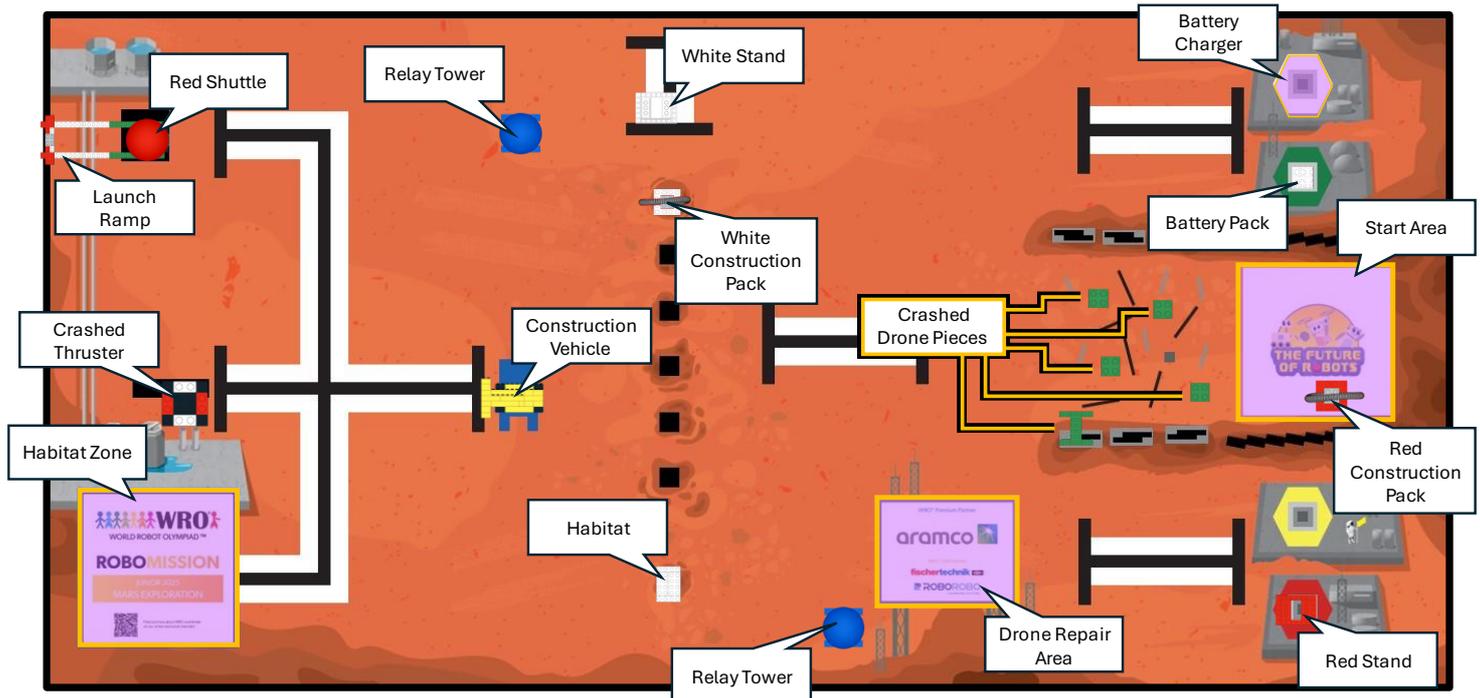

1. Ultrasonic Sensor/button used to start the robot moving.
2. Used a colour/light sensor to follow a line.
3. Battery pack touching the battery charger area.
4. Construction vehicle used to move the crashed thruster completely off of its black starting rectangle.
5. Habitat completely inside the habitat zone.
6. Red shuttle (red ball) completely outside the game mat/table area.
7. Crashed drone pieces completely inside the drone repair area.
8. Red construction pack placed on top of the red stand.
9. White construction pack placed on top of the white stand.
10. Team touches robot, ends the program and says STOP.

Bonus: Blue relay balls not touching the game mat.

3. Game Objects & Positioning

Construction Vehicle (x1)

One construction vehicle is placed on the game mat on the blue image closest to the start area. With the dozer blade facing the crashed thruster element.

Starting position of the construction vehicle. With the dozer blade facing the crashed thruster.

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

Starting location of the construction vehicle. With dozer blade facing towards the crashed thruster.
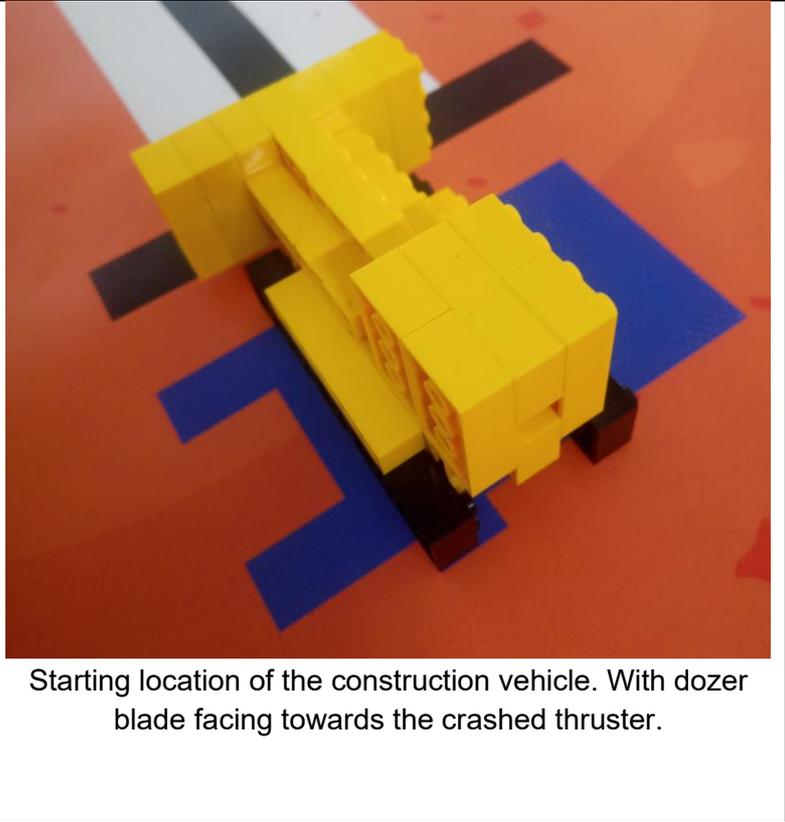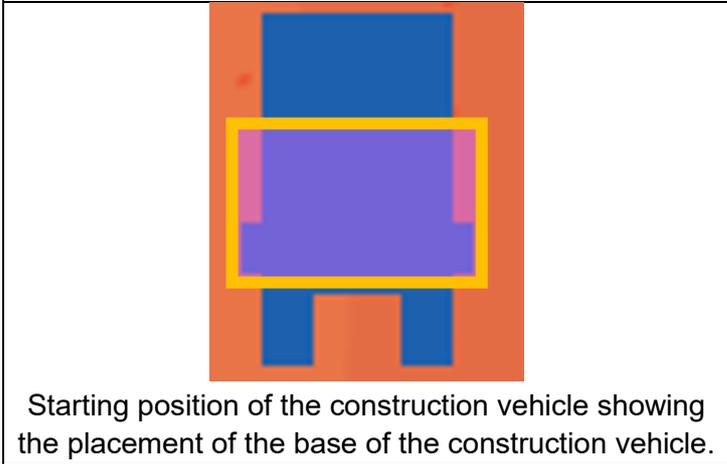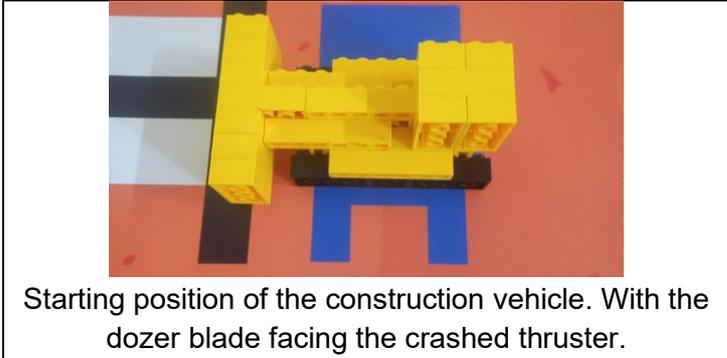
Crashed Thruster (x1)

One crashed thruster element is placed on the game mat to the front of the black triangle. The element is placed with the white brick facing the start area.

Crashed thruster element placed on the game mat.

Starting position of the crashed thruster element.
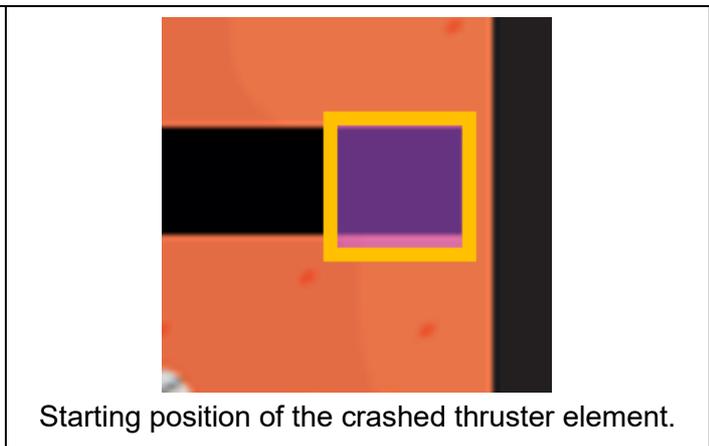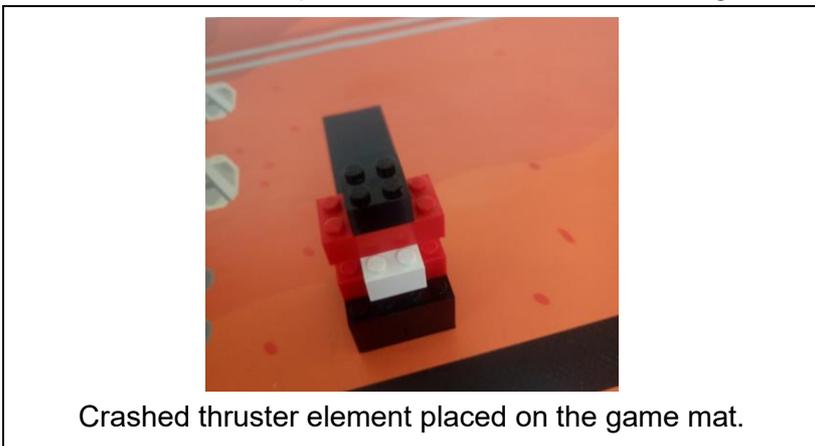
Construction packs and stands (x2)

One red construction pack starts in the start area on or with the robot. One white construction pack starts on the black square furthest from the start area. The red stand starts in the red area in the bottom right of the game mat. The white stand starts to the right of the blue relay tower in the black and white area.

Example of a robot carrying the red construction pack in the start area.
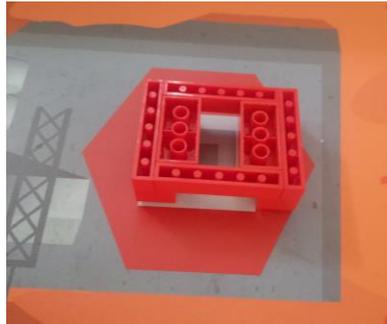
Red stand in its starting position.
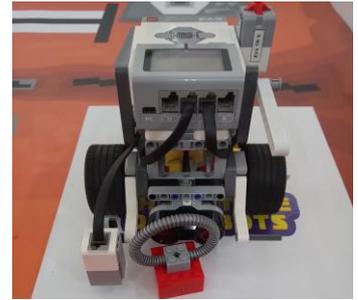
Example of a robot pushing the red construction pack in the start area.

Position of the White Construction pack on the game mat.
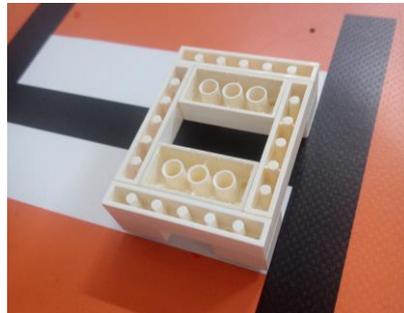
White stand in its starting position.
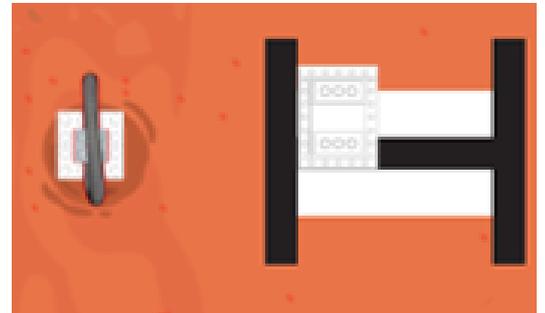
White stand and white construction pack in their starting positions.

Habitat (x1)

One habitat element is placed on the game mat as per the images below.

Habitat element is placed covering the dark grey square with the red brick facing the start habitat zone.

Starting position showing the placement of the habitat element.

Red Shuttle and Launch Ramp (x1)

One red shuttle (red ball) and one launch ramp are placed on the game mat in the black square far above the habitat zone.

Starting placement of the launch ramp facing towards the edge of the game table.

Starting placement of the launch ramp and red shuttle facing towards the edge of the game table.
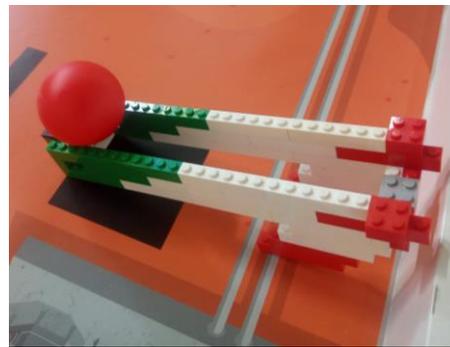
Starting position of the white construction pack placed on the game mat.

Battery Pack (x1)

One battery pack element is placed on the game mat as per the images below.
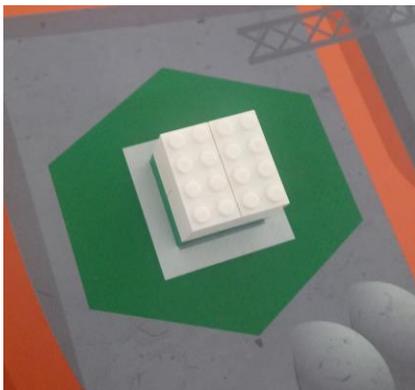
Starting position of the battery pack element.

Starting position of the battery pack element.

Crashed Green Drone (x1)

The green drone has crashed and broken apart on the game mat. Four green drone motors (2x2 bricks) and one green body section are placed on the game mat near the start area.
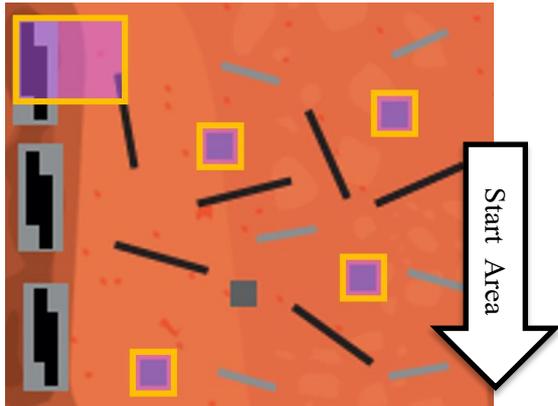
Starting positions of the crashed drone pieces.
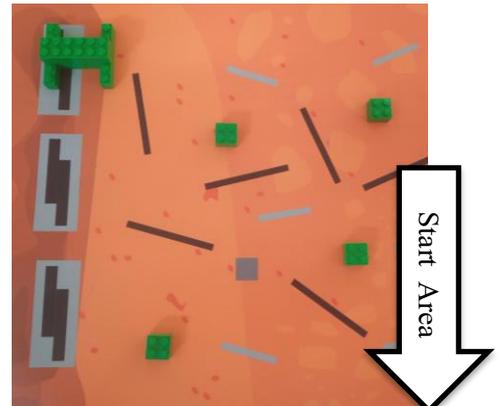
Starting placements of the crashed drone pieces.

Starting position of the green drone body piece.
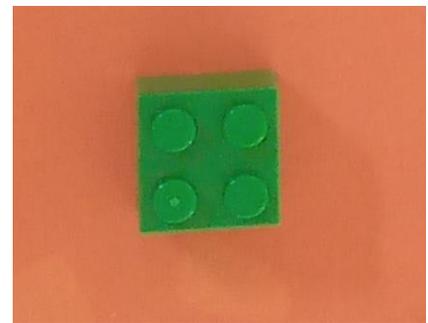
Starting position of one of the 4 drone motors.

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.
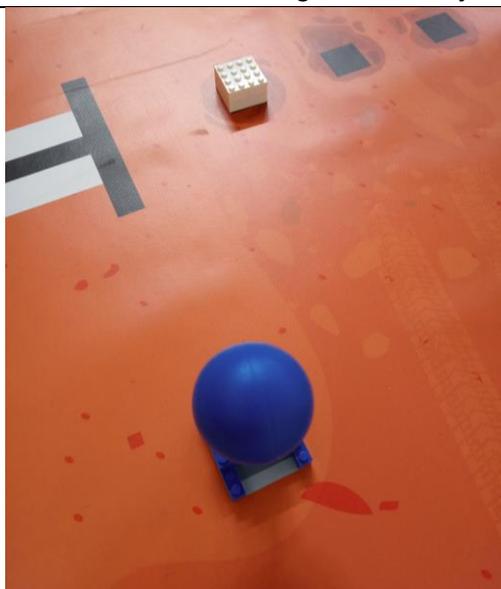
Starting position of relay tower.

Starting position of relay tower.
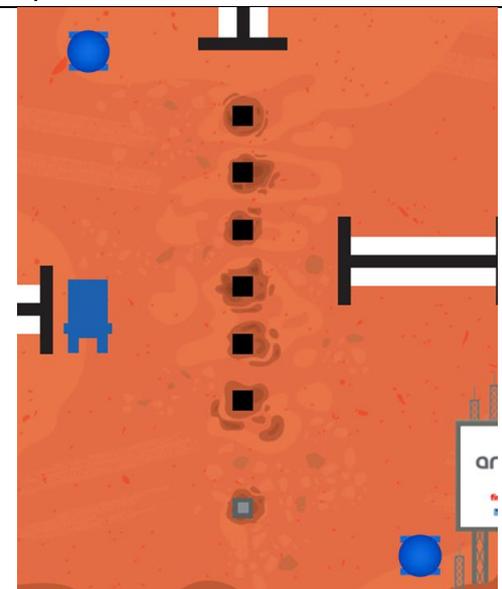
Starting position of relay towers.

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 Construction Packs

The white and red construction packs should be placed on top of their same colour stand.

4.3 Green Crashed Drone

The green drone has crashed and broken into pieces. Collect all 5 pieces of the drone and deliver them to the drome repair area. (Aramco Logo)

4.4 Crashed Thruster

Use the construction vehicle to push the crashed thruster so it no longer touches its starting rectangle.

4.5 Charge the Battery

The white and green battery must be placed completely inside the battery charging area.

4.6 Launch the Red Shuttle

The red shuttle (red ball) which starts on the launch ramp must be placed anywhere outside of the game mat area. The ball should be outside of the game table area. The red shuttle does not need to be pushed up and off of the launch ramp.

4.7 Move the Habitat

The habitat element must be placed completely inside the habitat zone

4.8 Blue relays are undamaged

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

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 3 - Big Construction

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				
Battery pack touching the battery charger area.	Yes / No	20				
Crashed Thruster moved completely off of its starting rectangle by the Construction Vehicle.	Yes / No	20				
Habitat completely inside the habitat zone.	Yes / No	20				
Red Shuttle (red ball) completely outside of the game mat/table area.	Yes / No	60				
Crashed drone pieces completely inside the drone repair area.	0 1 2 3 4 5	5 each (Max 25)				
Team touched robot, ended program and said STOP to indicate the run is over.	Yes / No	15				

Construction Packs and Stands.
Points awarded for either the stand touching or completely on top of the stand of the matching colour.

Task	Each	Points	1st	2nd	3rd	4th
Red construction pack on top of the red stand.	Yes / No	40				
Red construction pack touching the red stand but not on top.	Yes / No	20				
White construction pack on top of the white stand.	Yes / No	40				
White construction pack touching the white stand but not on top.	Yes / No	20				

Bonus Points:

Task	Each	Points				
Blue relay balls not touching the game mat.	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:				

Diamond 300+ points

Gold 226 - 299 points

Silver 151 - 225 points

Bronze 76 - 150 points

Participation 0 - 75 points

Judge Name:

Team Member Signature:

9

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
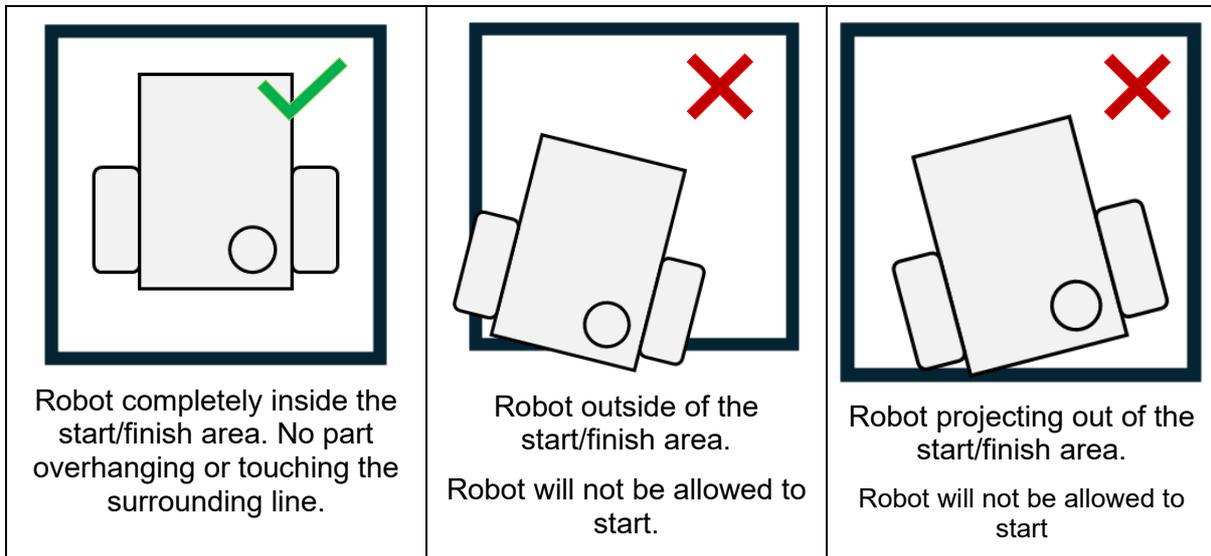
Crashed Green Drone:

The below images apply to the drone elements in the drone repair area.

All drone elements completely inside the drone repair area. 5 x 5 points (25 points total)	4 of 5 drone elements completely inside the drone repair area. 5 x 4 points (20 points total)	Drone element not completely inside the drone repair area. 0 points
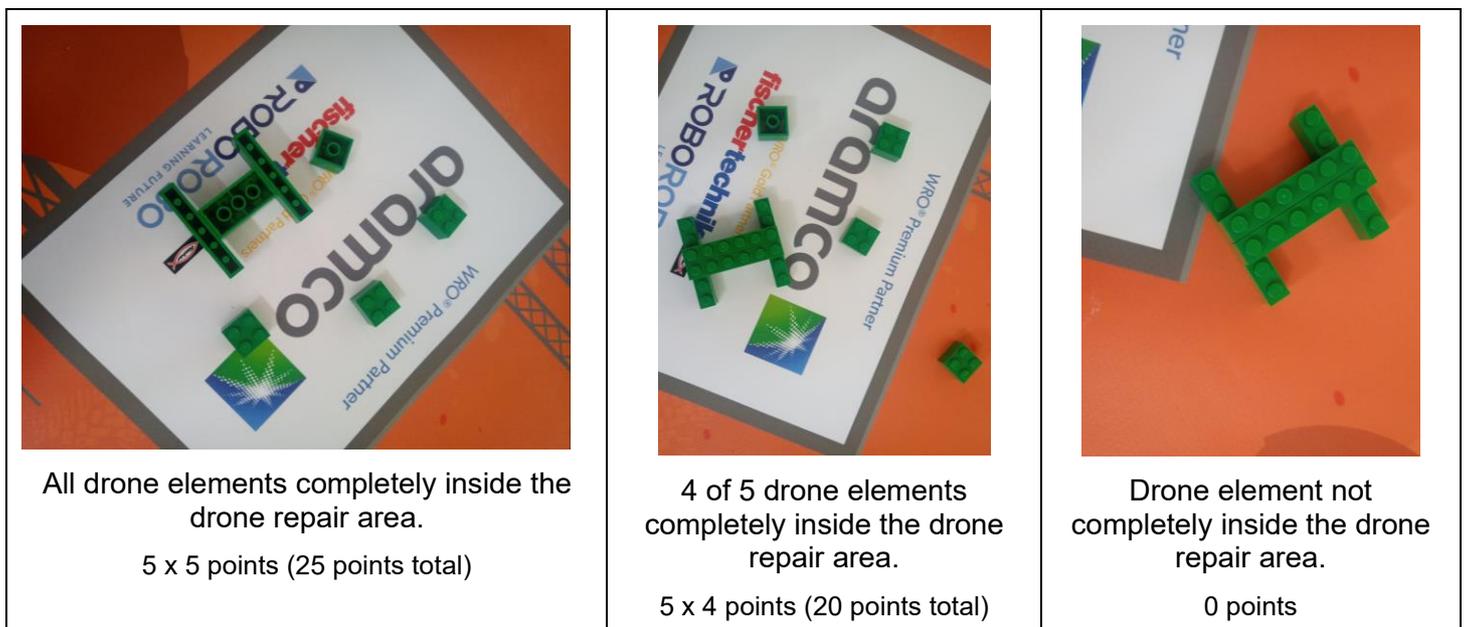
Construction Packs:

The below images apply to the white and red construction packs and their same colour stands.

Red construction pack on top of the red stand. 40 points	White construction pack on top of the white stand. 40 points	Red construction pack touching the red stand. 20 points
White construction pack touching the white stand. 20 points	Red construction pack not touching or on top of the red stand. 0 points	White construction pack not touching or on top of the white stand. 0 points
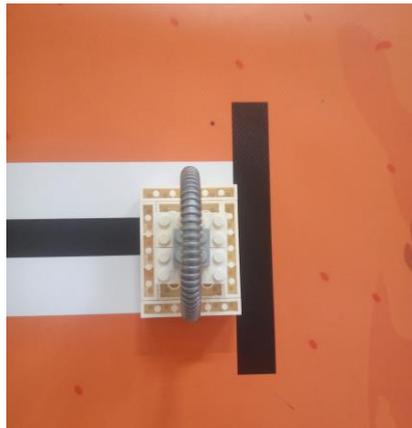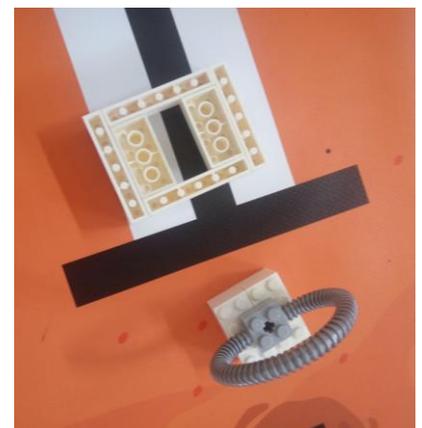
Construction Vehicle and Crashed Thruster

The below images apply to the construction vehicle and the crashed thruster.

Construction vehicle used to push the crashed thruster completely off of its starting rectangle. 20 points	Construction vehicle used to push the crashed thruster completely off of its starting rectangle. The crashed thruster is on its side. 20 points	Construction vehicle used to push the crashed thruster but not off of its starting rectangle 0 points
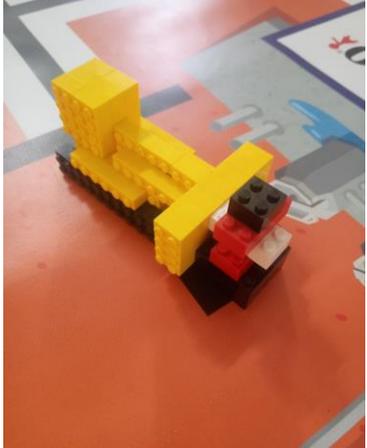
Battery Pack and the Battery Charging Area

The below images apply to the battery pack and battery charging area.

Battery pack completely inside the battery charging area. 20 points	Battery pack touching the battery charging area. 20 points	Battery pack not touching the battery charging area. 0 points

Habitat and the Habitat Zone

The below images apply to the habitat element inside the habitat zone.

Habitat element completely inside the habitat zone.

20 points

Habitat element completely inside the habitat zone but is on its side.

20 points
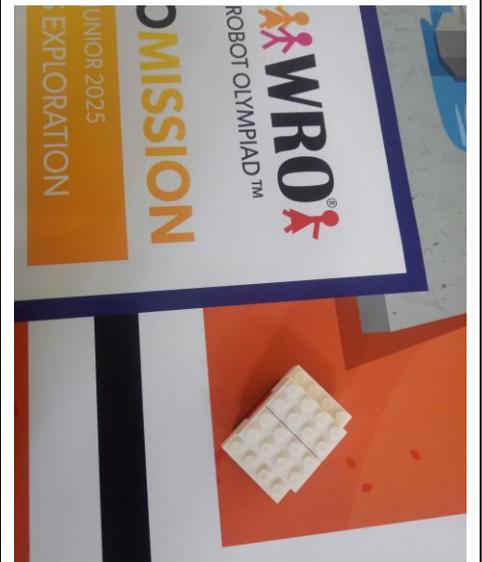
Habitat element not completely inside the habitat zone.

0 points

Red shuttle off of the game table

The below images apply to the red shuttle
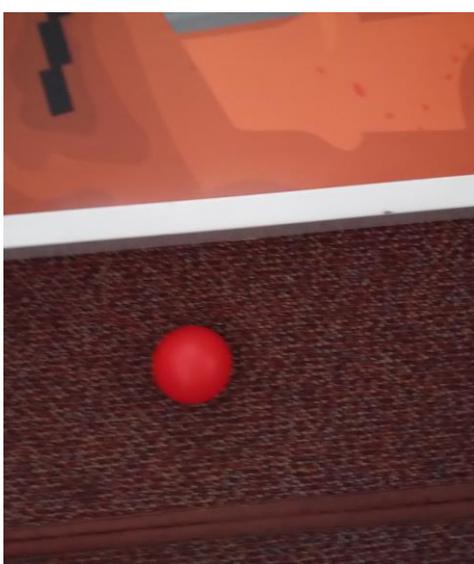
Red shuttle no longer on the game table.

20 points
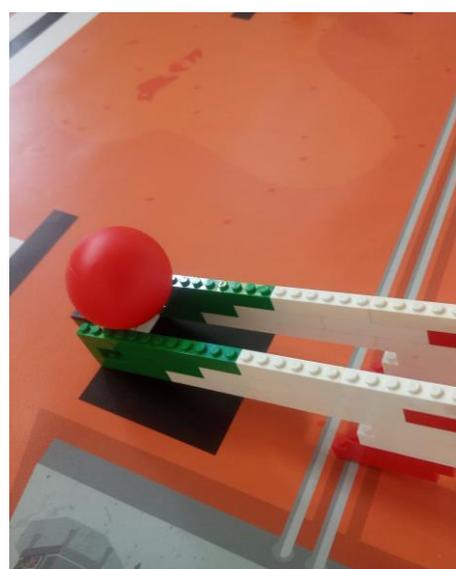
Red shuttle still on the launch ramp.

0 points
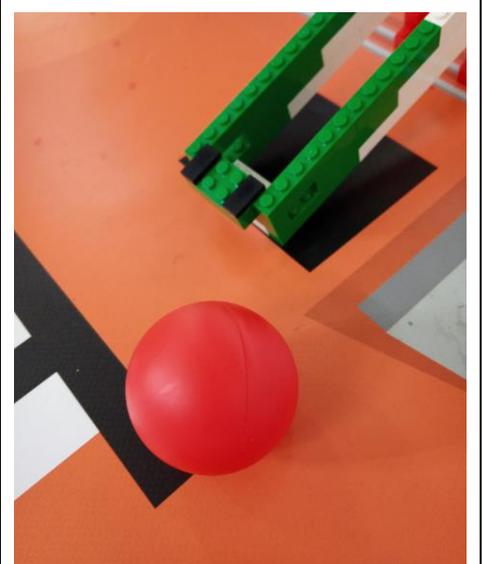
Red shuttle on the game mat, not off of the game table.

0 points

Relay Towers

The below images apply to the relay tower elements.

Blue ball on top of relay tower.

10 points

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

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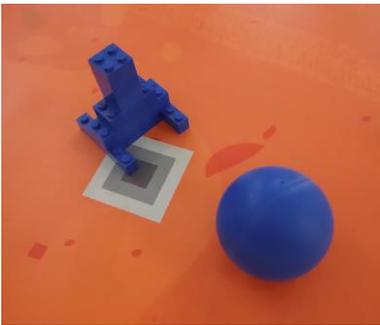
Blue ball touching the game mat. Relay tower base has moved.

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)

2x
3003
Black

18x
3001
Yellow

4x
3001
Black

5x
3009
Yellow

1x
3003
Yellow

1

2x   1x

2

2x

3 2x 1x

4 1x

5 2x

6 1x

7

1x

8

9

10

2x

11

3x

12

1x   1x

13

3x

14

15

16

1x

17

1x 2x

18

1x 2x

19

Crashed Green Drone (x1)

4x
3003
Green

1x
3001
Green

4x
3009
Green

1

1x

2x

2

2x

Conveyor Belt (x1)

1x
3003
Black

2x
3001
Red

4x
3001
Black

1x
3001
White

1

1x   4x

2

1x   1x

3 1x

Battery Pack (x1)

1 2x 4x
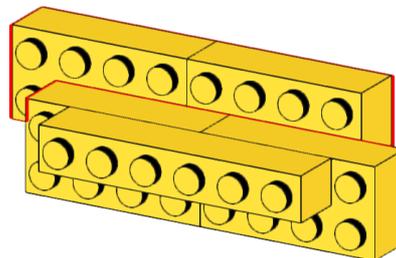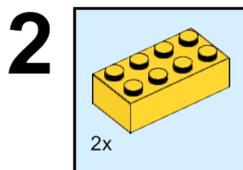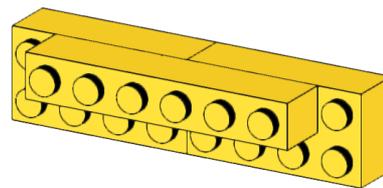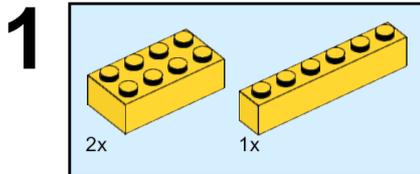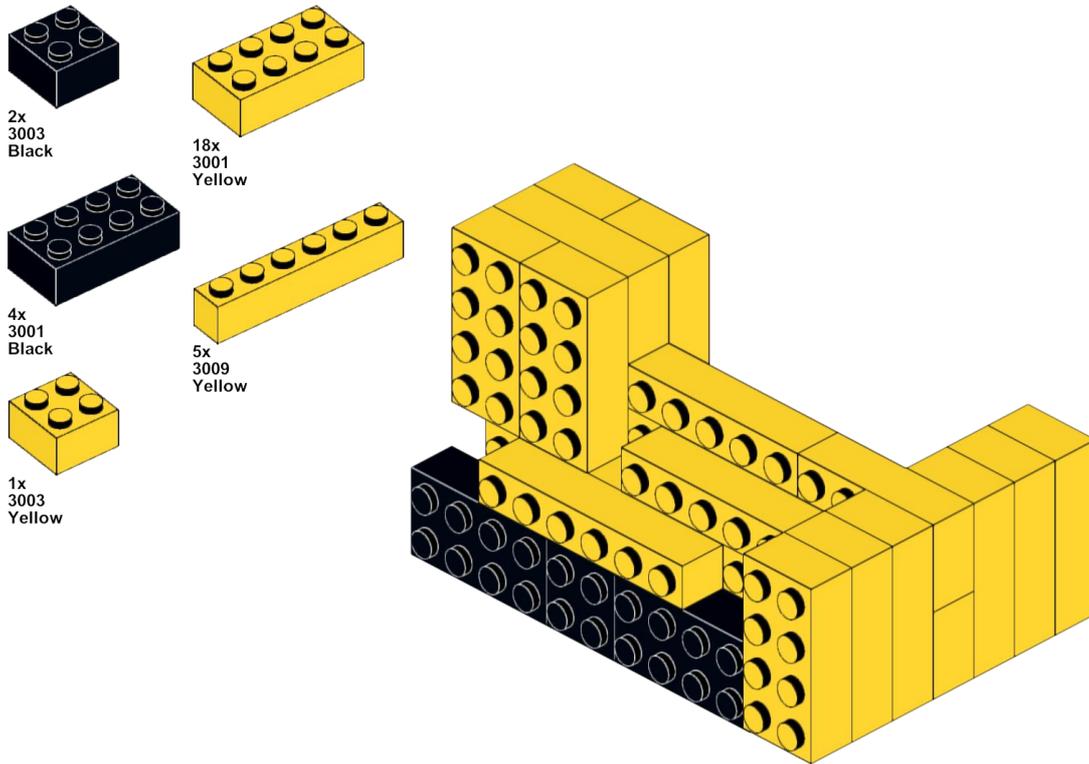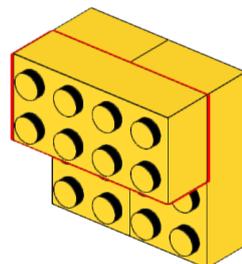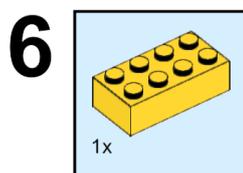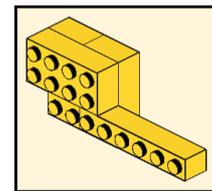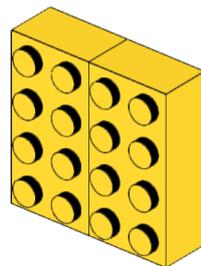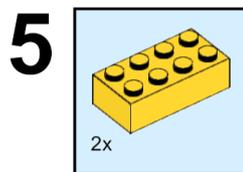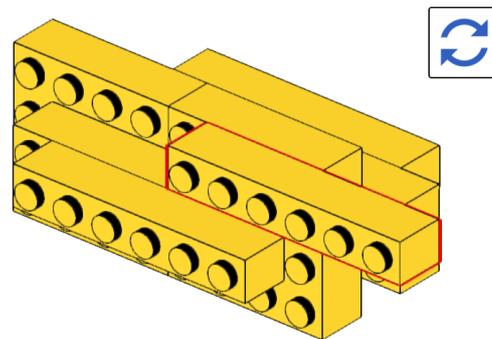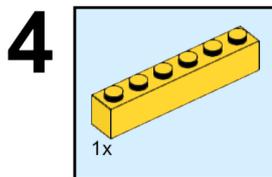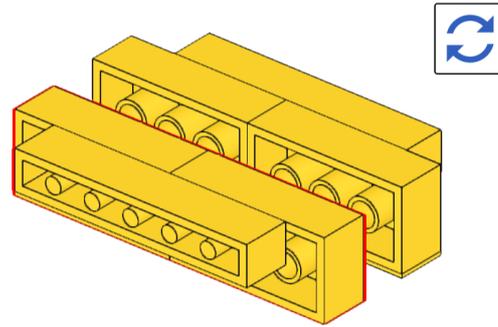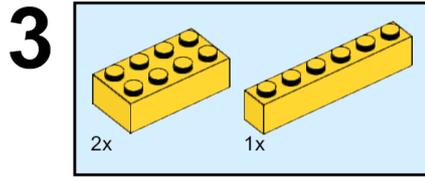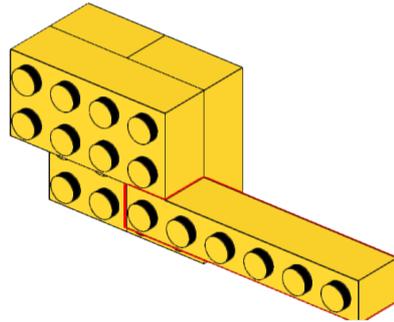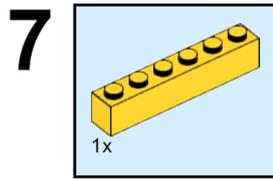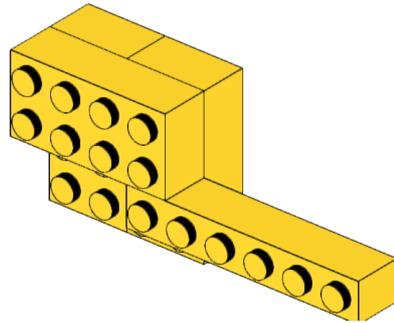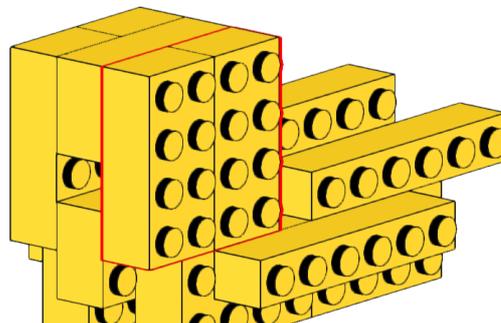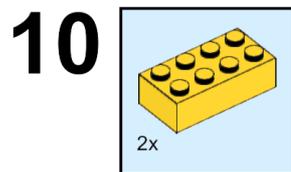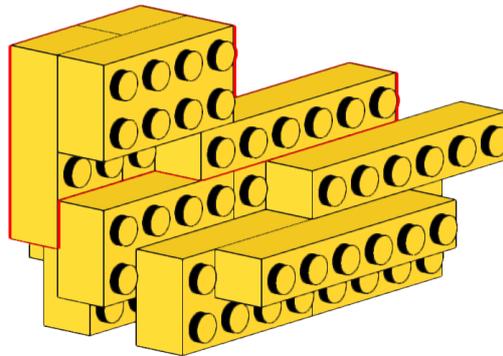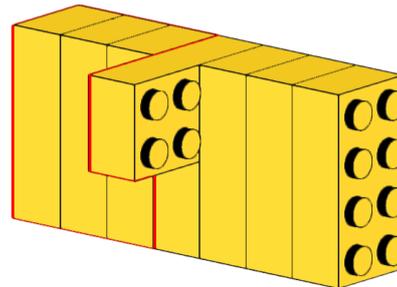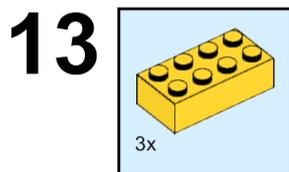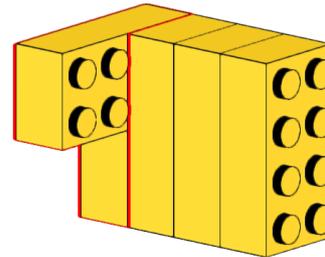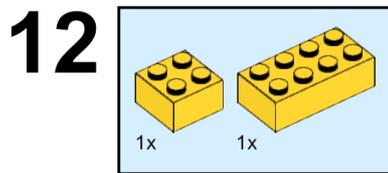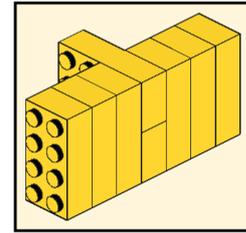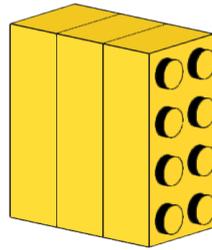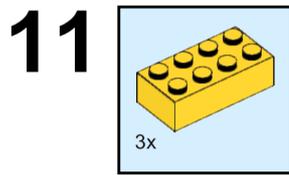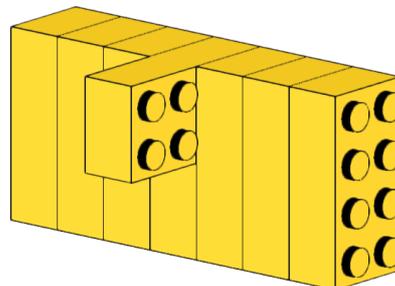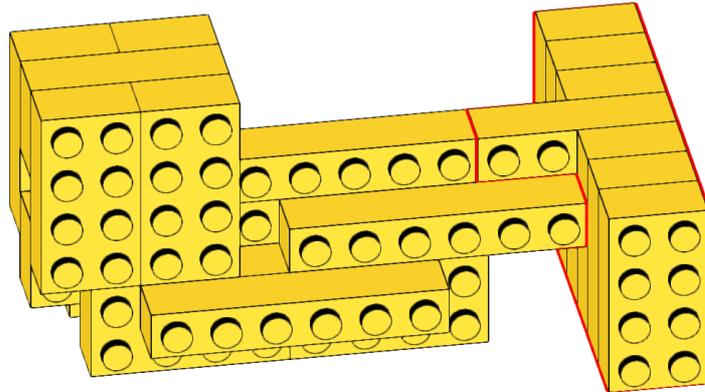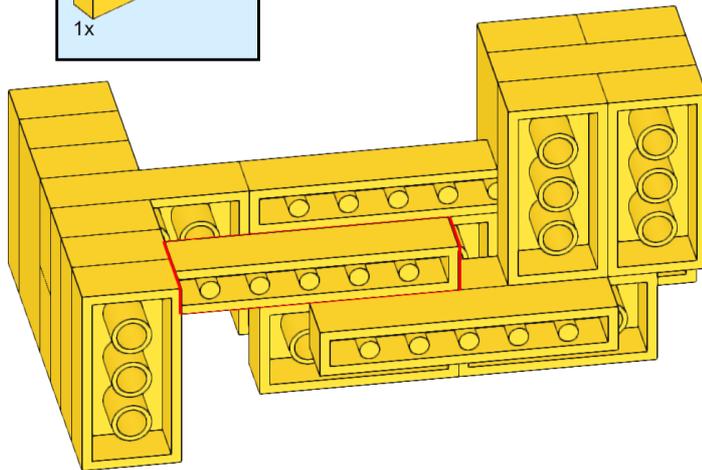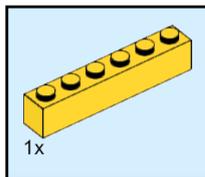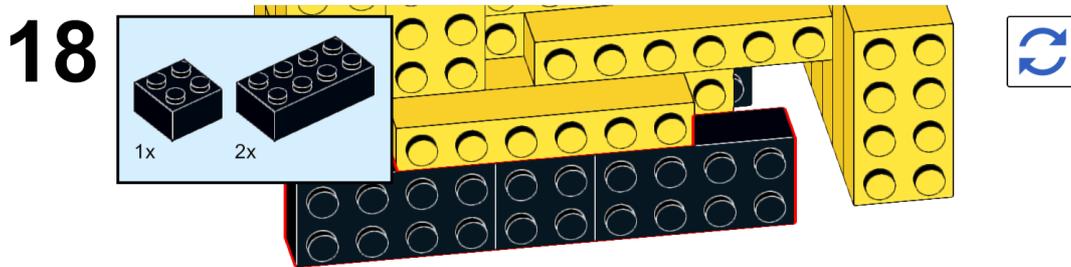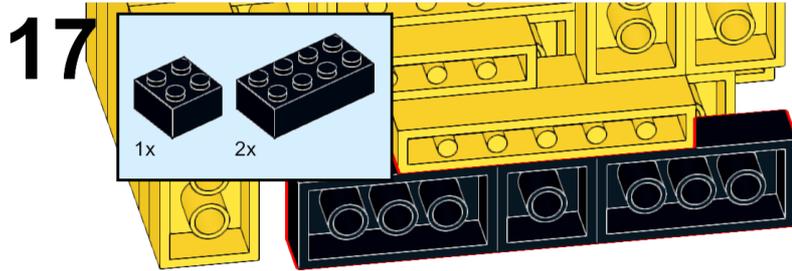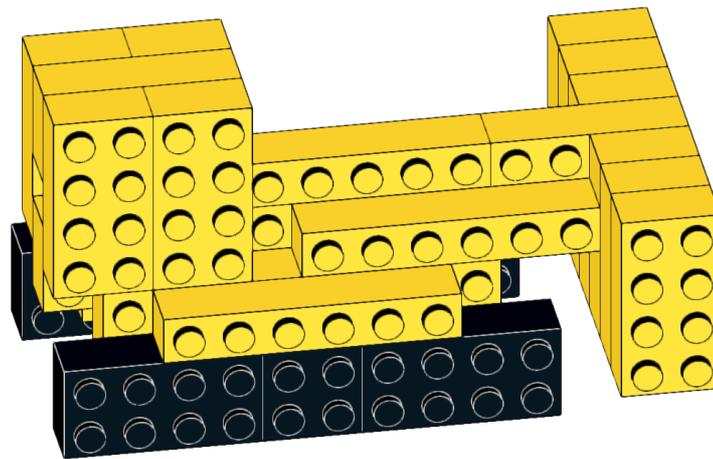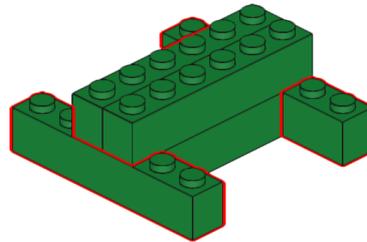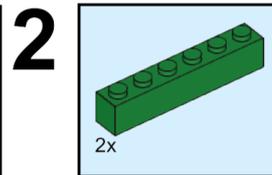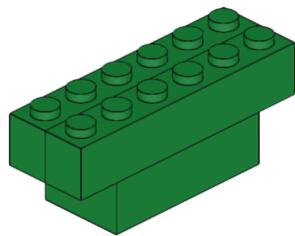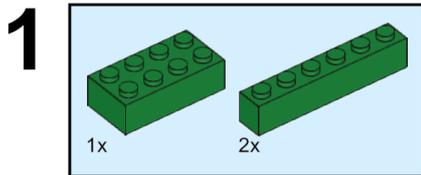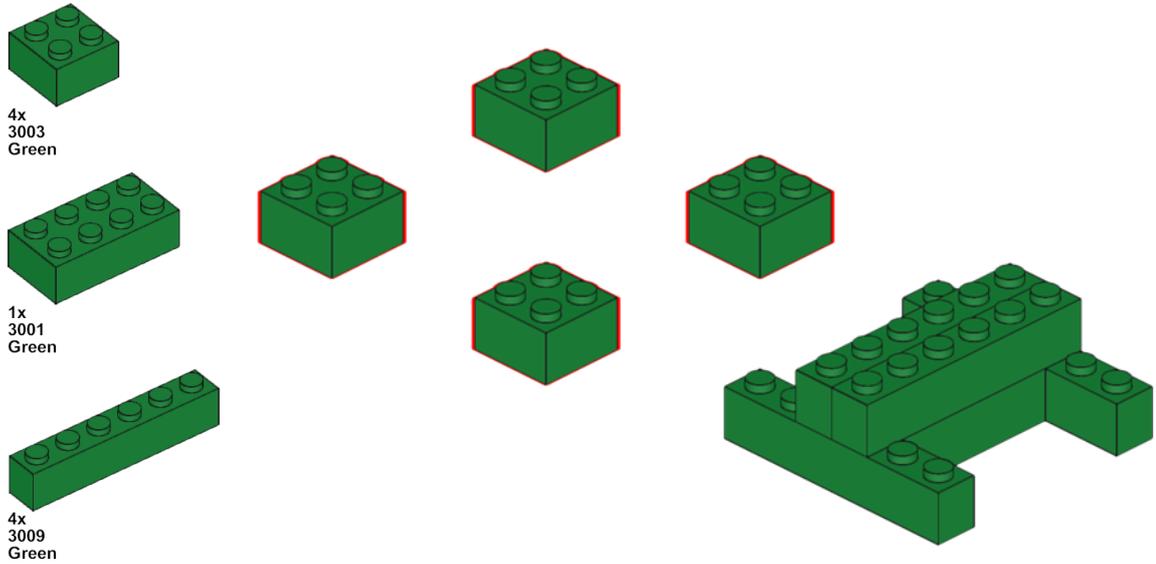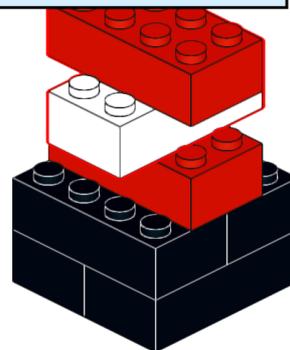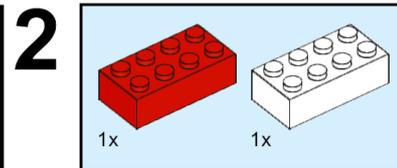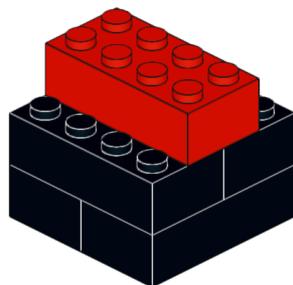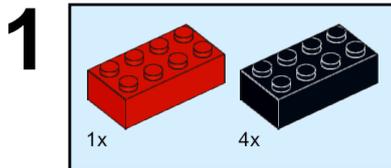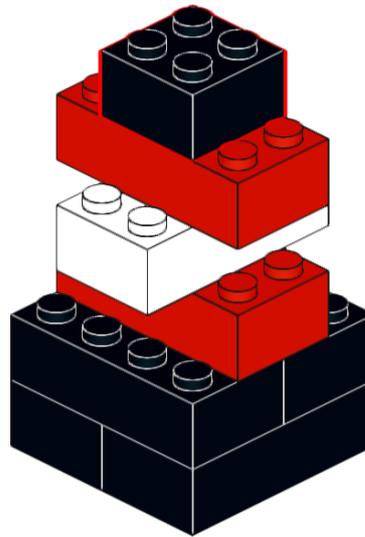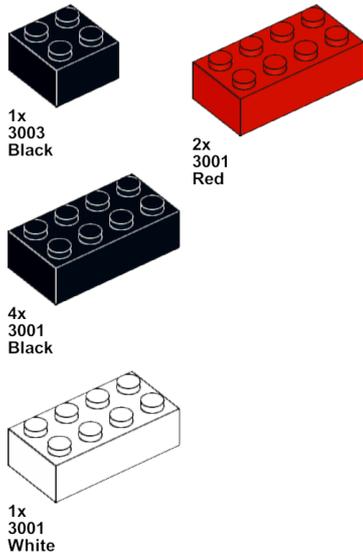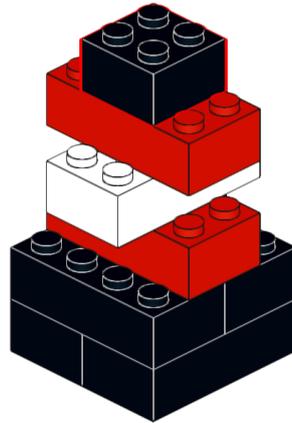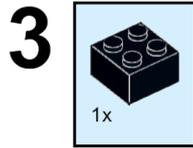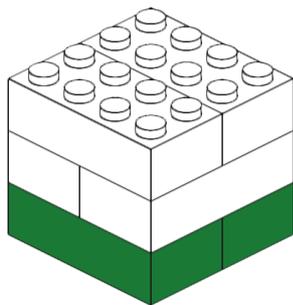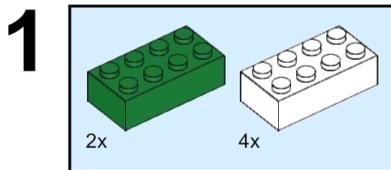
Red Shuttle Beacon (x1)

2x
3001
Black
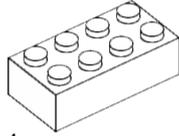
4x
3001
White

1x
3001
Red

1

2x   1x

2

2x

3

2x
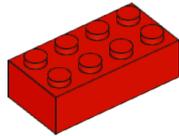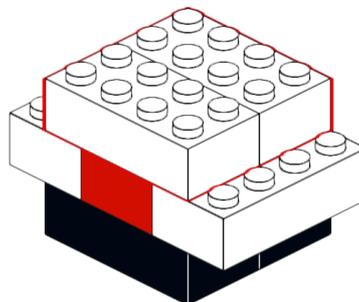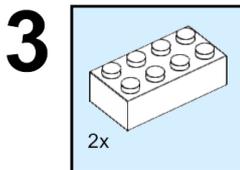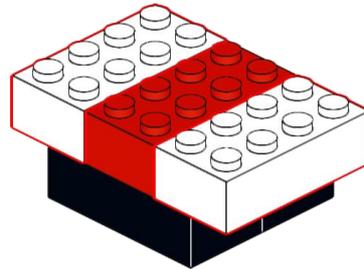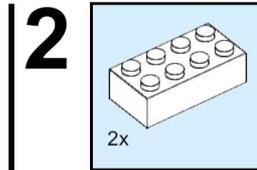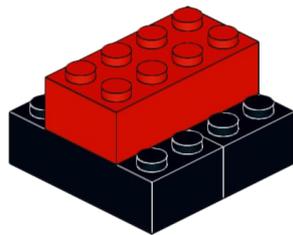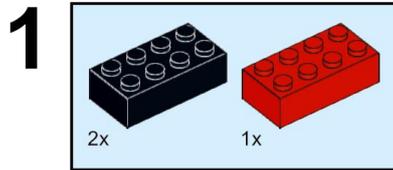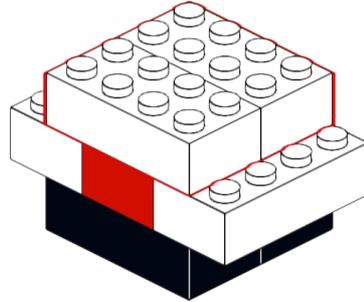
Construction Packs White (x1) Red (x1)

2x
30000
Light Bluish Gray

4x
3001
White

2x
78c18
Flat Silver

4x
3001
Red

1

4x

2

1x   1x
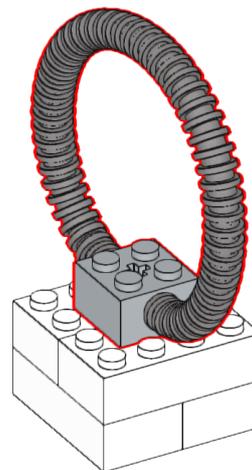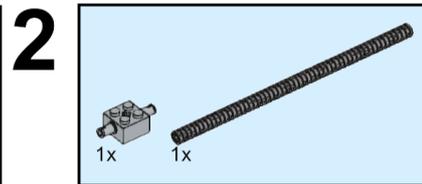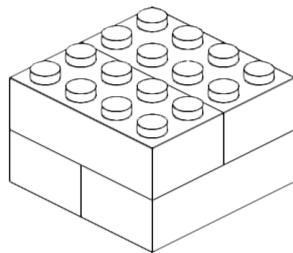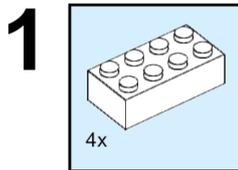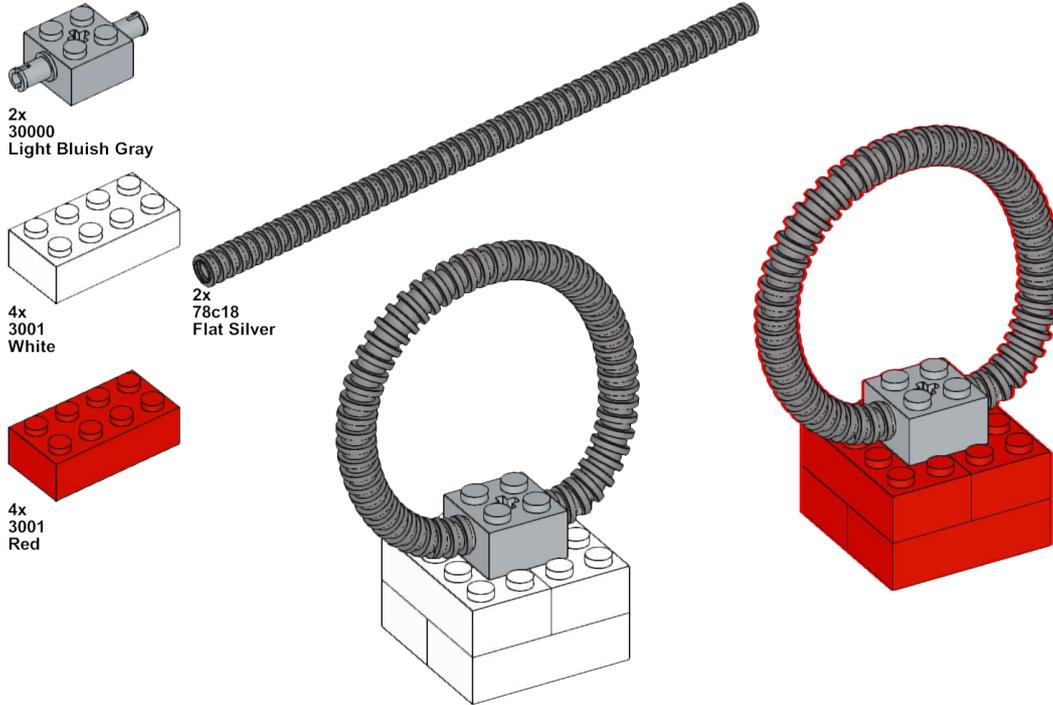
Stands White (x1) Red (x1)
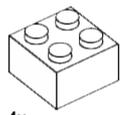
4x
3003
White
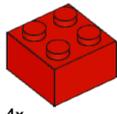
4x
3003
Red
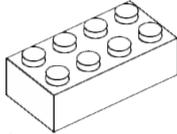
2x
3001
White
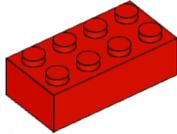
2x
3001
Red
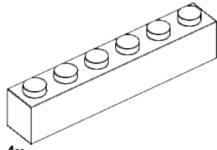
4x
3009
White

4x
3009
Red

1

4x   2x

2

2x

3

2x

4

4x 2x 4x

Relay Towers (x2)

2x
3069
Black

1x
3022
Light Bluish Gray

1x
3001
White

19x
3009
White

2x
3003
Red

7x
3009
Red

1x
3001
Green

9x
3009
Green

1

1x   3x

2

4x

3

2x 6x

4

6x

5

2x 2x

6

1x 1x

7

2x 2x **x2**

8

2x 2x

9

10

2x 1x

11

1x 2x
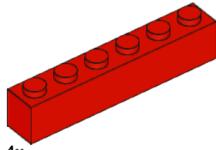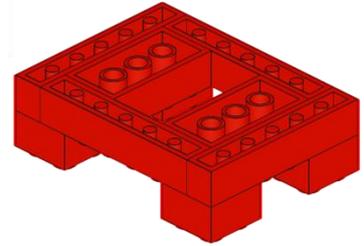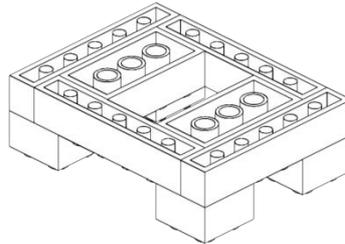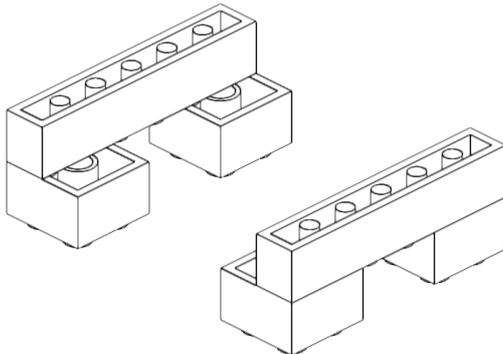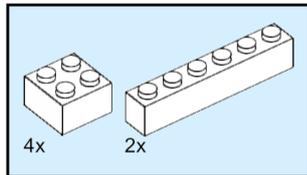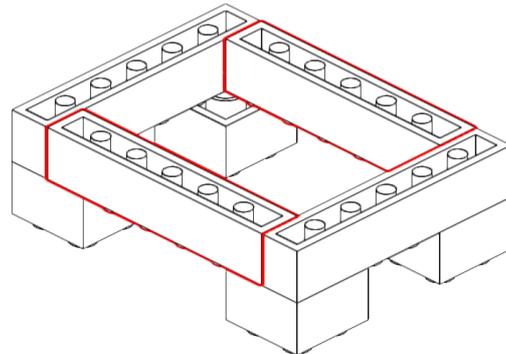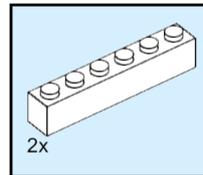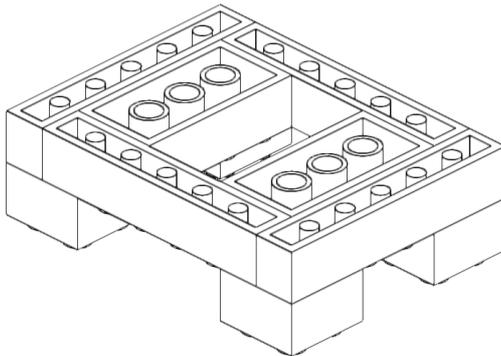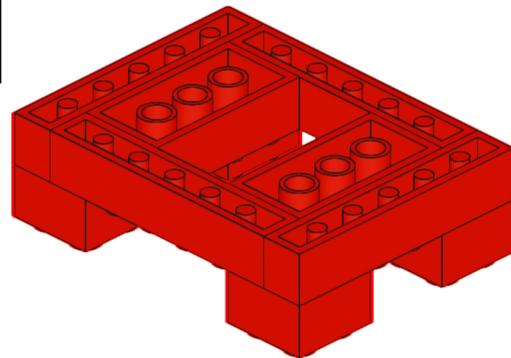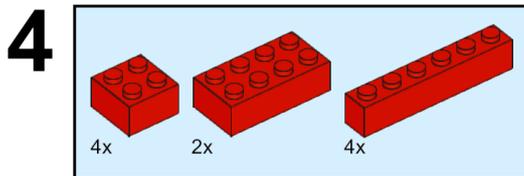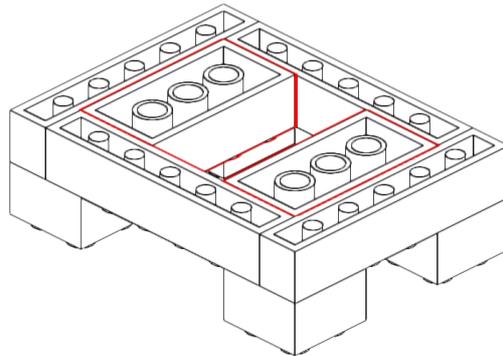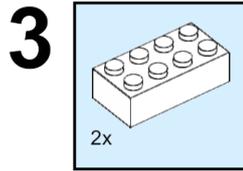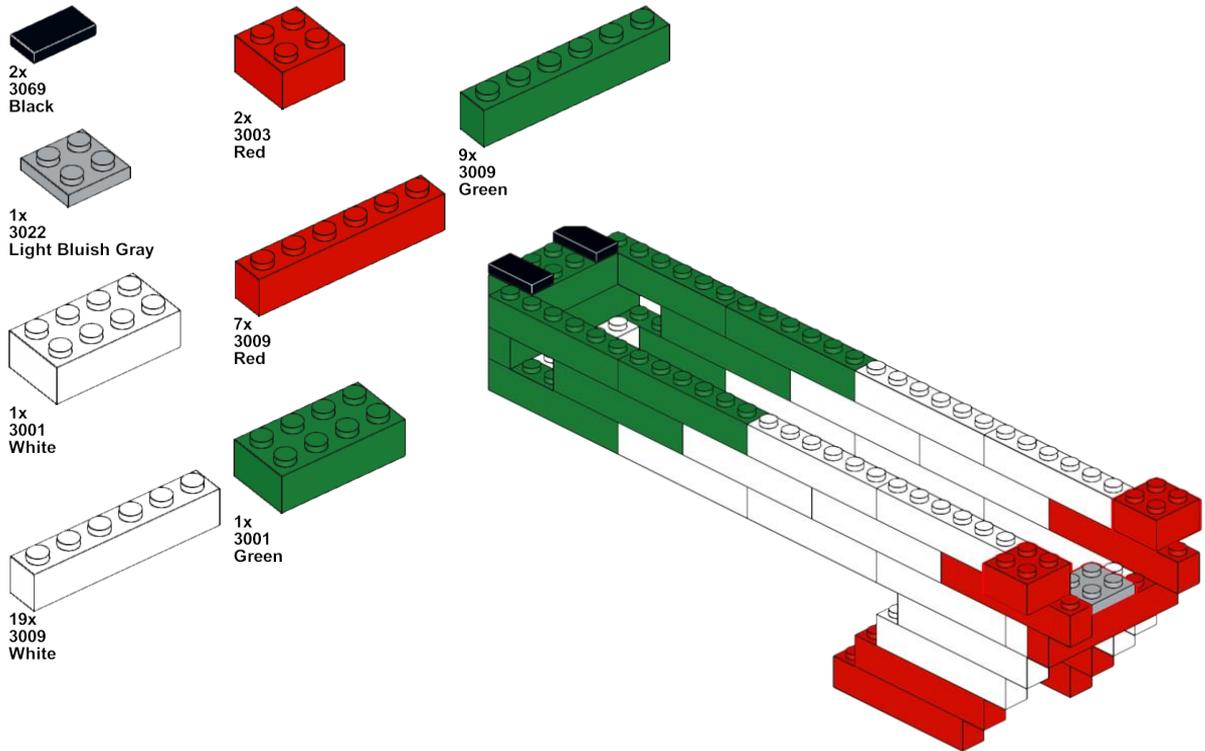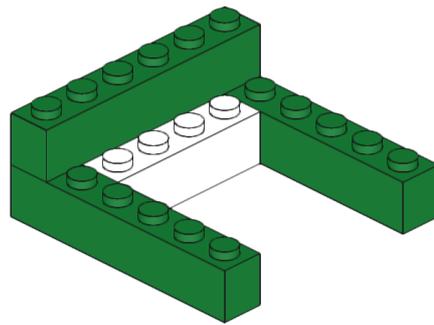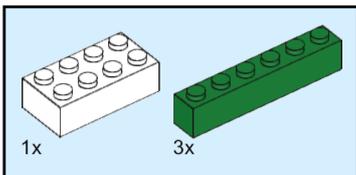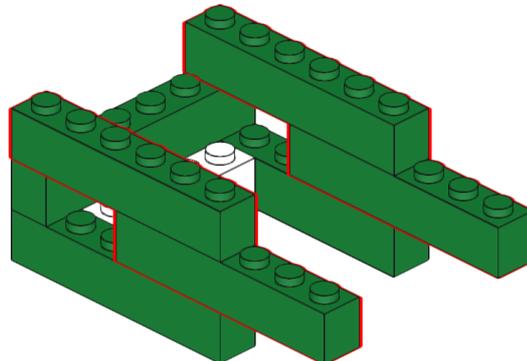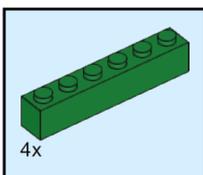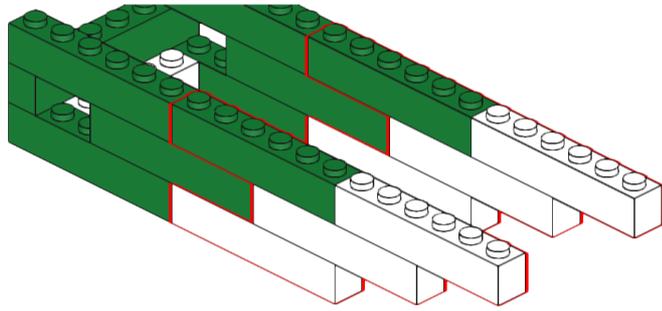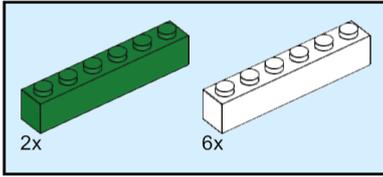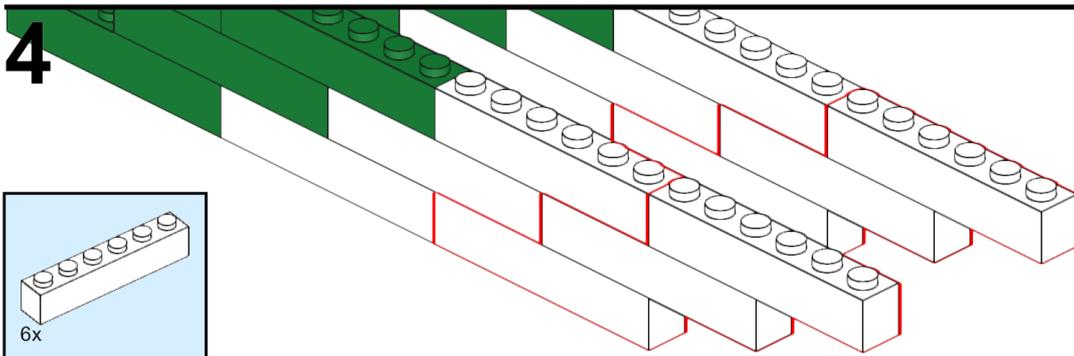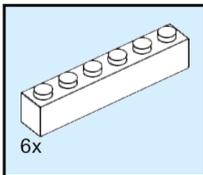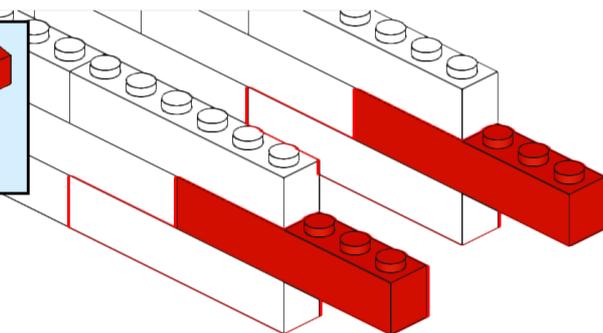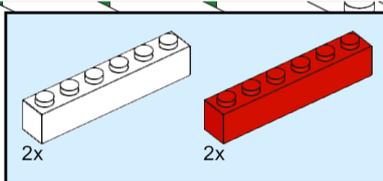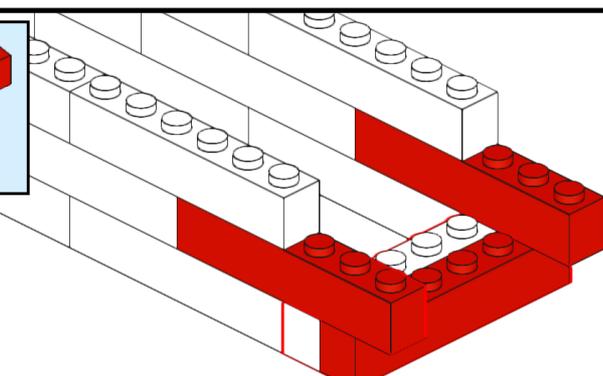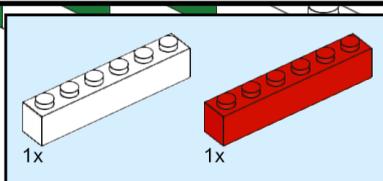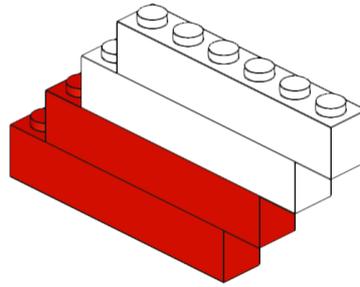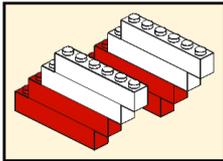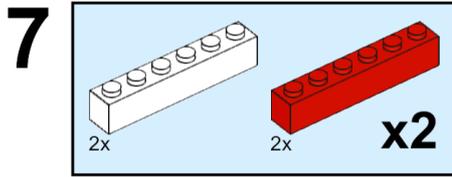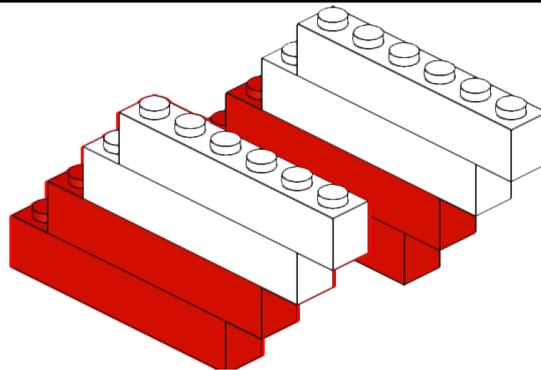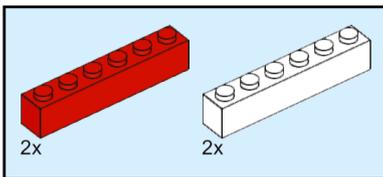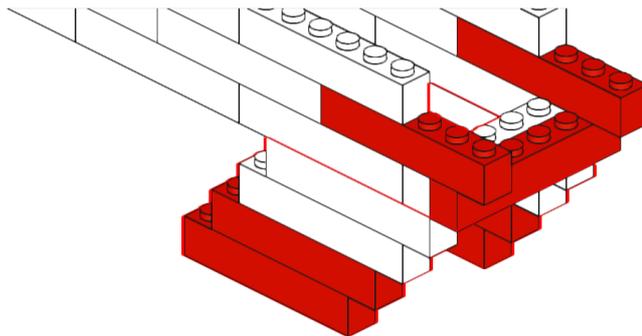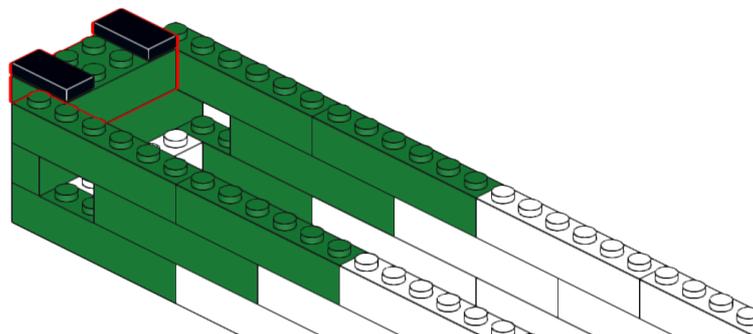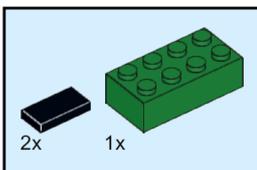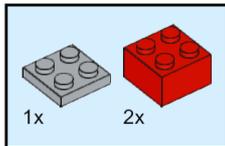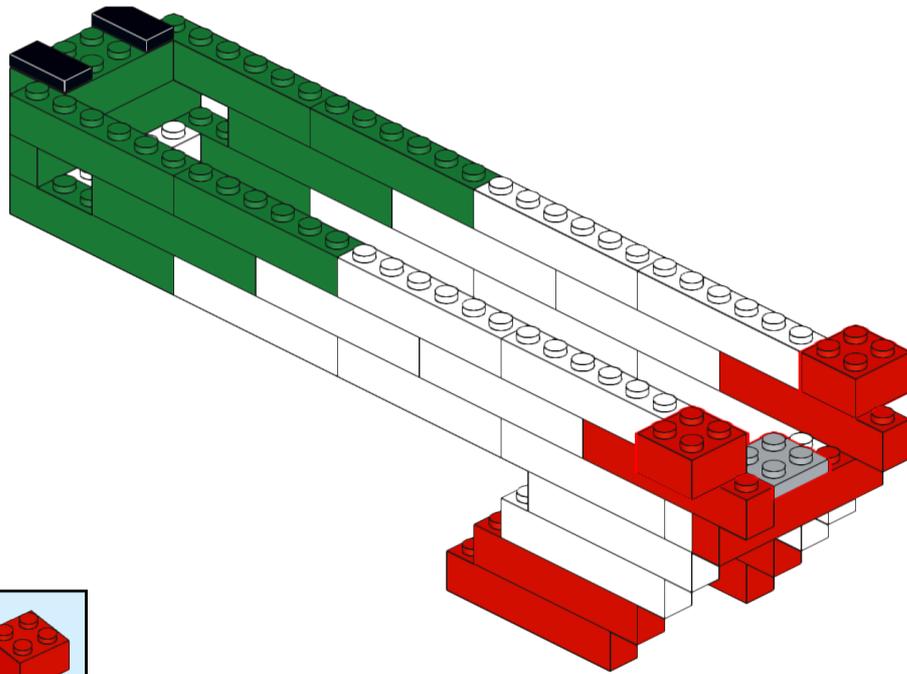
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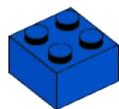
6x
3003
Blue
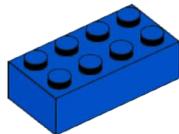
4x
3001
Blue

8x
3009
Blue

2x
41250
Blue

1

1x 2x

2

2x

3

1x

4

3x

5