



SITUATION

Pyrotechnics is the science behind fireworks. The many colours of fireworks are produced through the burning of oxygen-free metal powders.

Pyrotechnics comes from China where it started nearly 1000 years ago. The pyrotechnic parts (or rockets) used for fireworks were formerly called “rochettes” in French, then “roquettes” before being translated in English by the word “rocket”.

You are being asked to help install rockets for the national holiday fireworks. Your robot must handle the rockets carefully, to prevent them from exploding, by placing them in the intended locations.

Be careful. Rockets can explode if they are hit or if they fall.



OVERALL FUNCTION OF THE ROBOT:

You will need to design a pyrotechnic robot that can move fireworks rockets to the launching platform circles. The rockets can be pushed or pulled. They can also be lifted, **but only by their transport ring**. They must then be placed in a standing position. If a rocket falls on its side or a part of it becomes detached, the rocket is considered destroyed.

The rockets are not all of the same height but the location for each is known in advance.

One of the rockets is damaged (the black rocket). The robot will have to retrieve it and place it standing upright inside the walls of the repair area to be repaired or recycled.

Spectators have been seen in a dangerous area. Your robot will have to move them to a safer area near the robot's arrival area.

The level of difficulty for this mission is WHITE. For the BLACK level (more difficult), the following elements are added:

Launch tubes are placed on the platform circles. The rockets must be deposited inside the launch tubes. This requires raising the rockets higher and depositing them with more accuracy. The height of the tubes corresponds to the height of the nearby rockets.

SURPRISE RULE:

On the morning of the competition, a surprise rule will be announced to the teams allowing them to accumulate additional points.

DESCRIPTION OF THE ROBOT:

Robots participating in this challenge must respect the following constraints:

- A. The robot must be able to enter a **30 cm X 30 cm** square while having all its wheels on the ground
- B. Motors allowed: 2 large motors and 1 medium motor
- C. Sensors allowed: 1 colour/brightness sensor, 1 distance sensor, 1 touch sensor



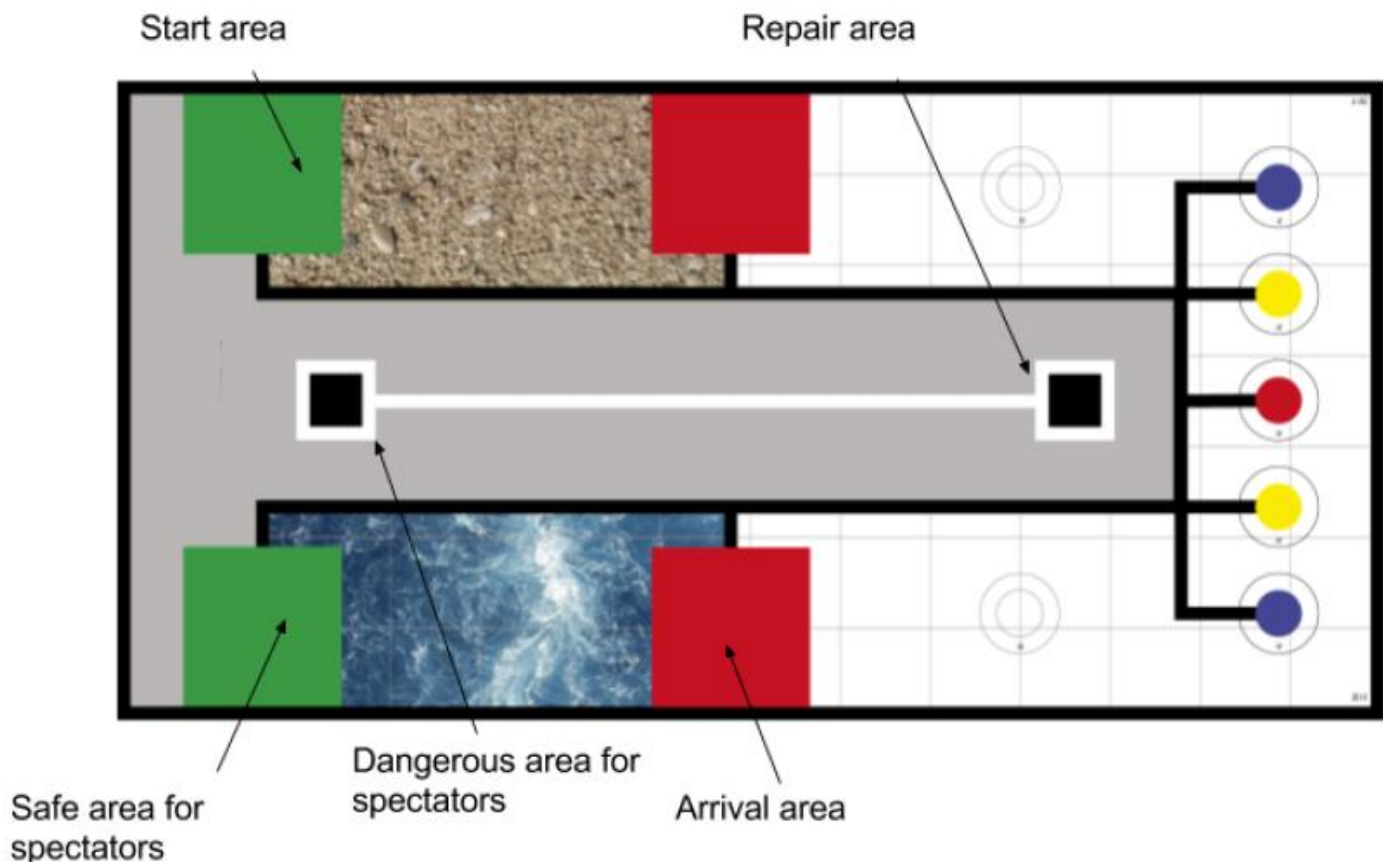
After the start, the robot can be deployed and can exceed the starting dimensions.

For teams wishing to perform the challenge using an NXT kit:

- A. The robot must be able to enter a **30 cm X 30 cm** square while having all its wheels on the ground
- B. Motors allowed: 3 large motors
- C. Sensors allowed: 1 colour/brightness sensor, 1 distance sensor, 1 touch sensor

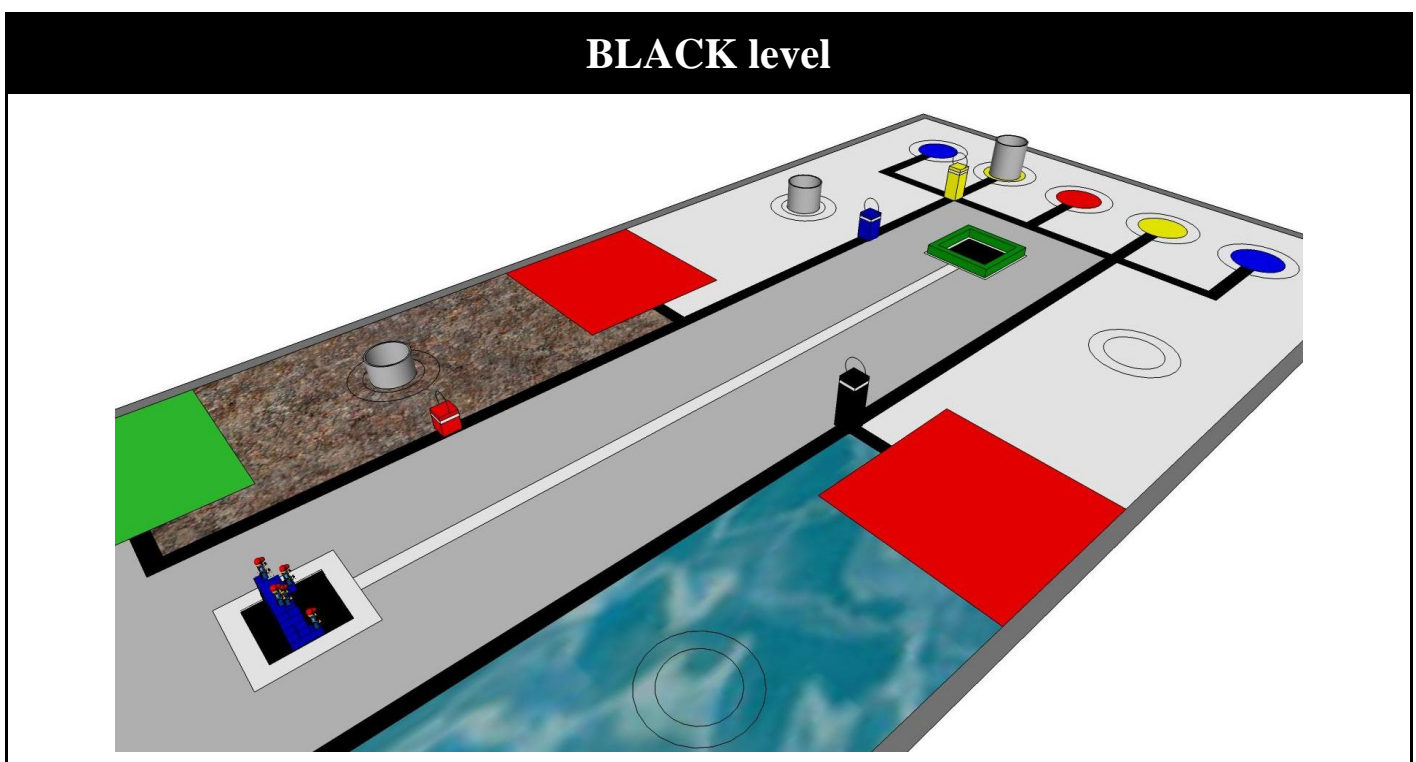
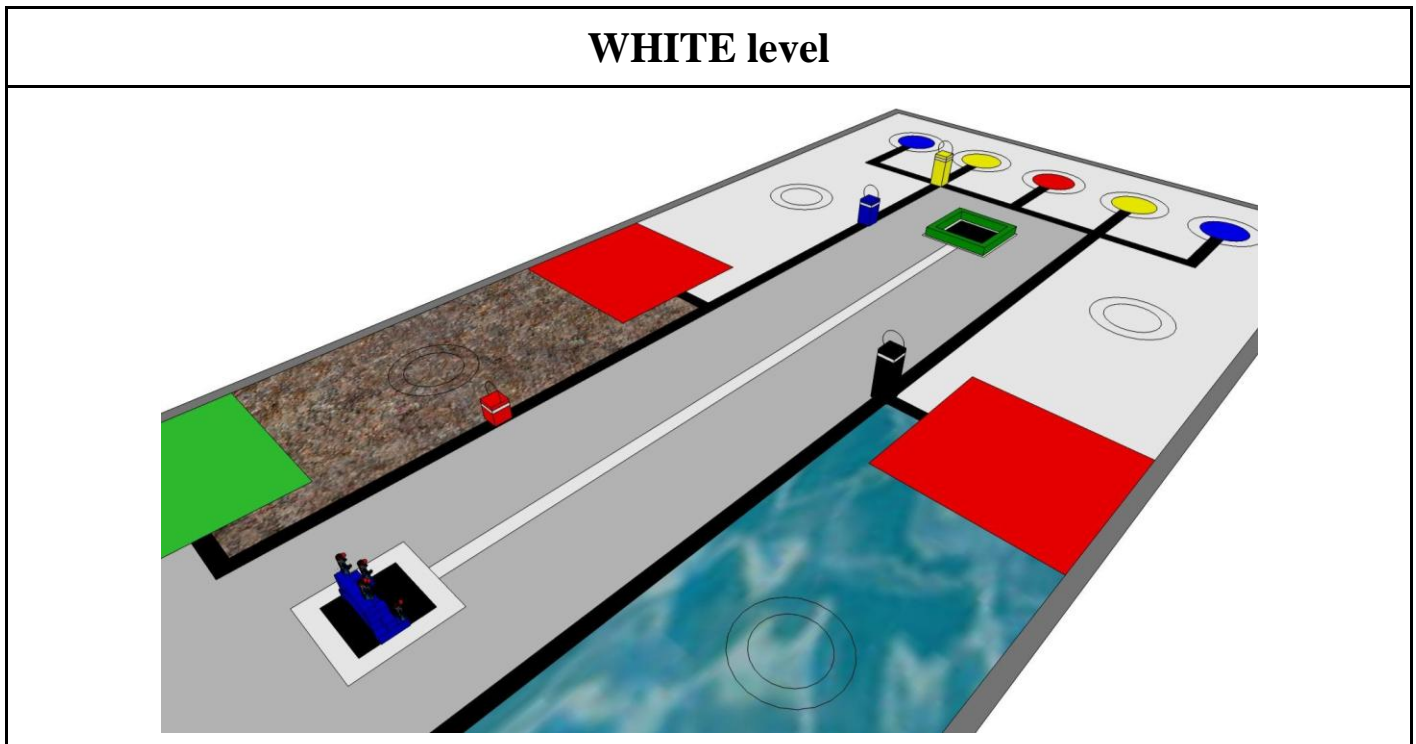
DESCRIPTION OF THE PLAY AREA:

Surface used: Z01-F mat





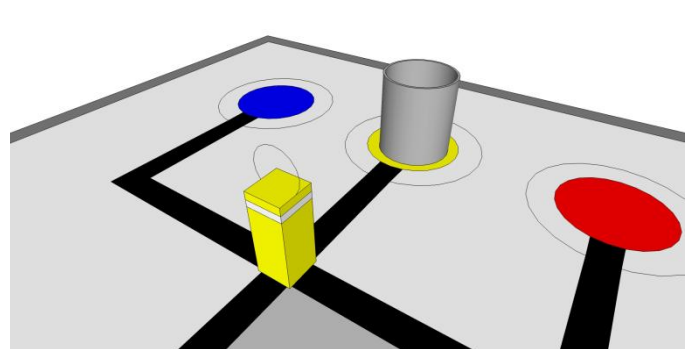
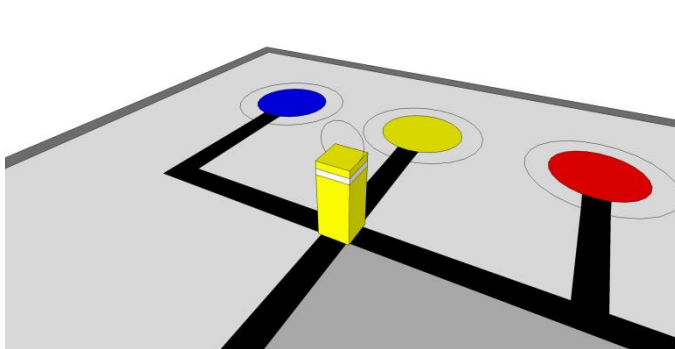
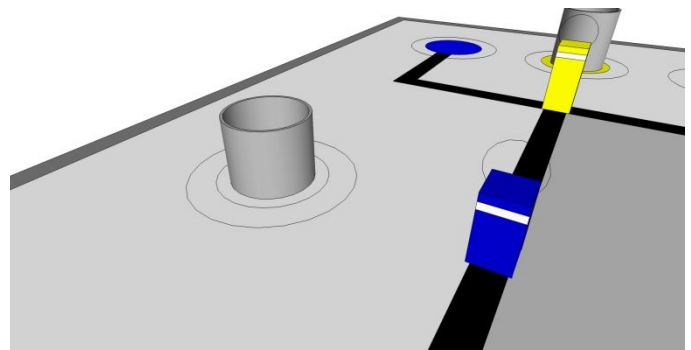
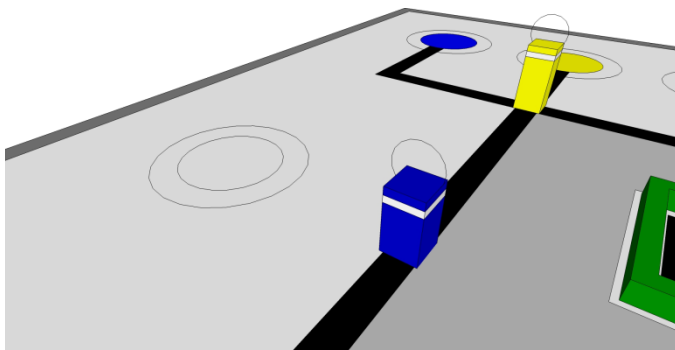
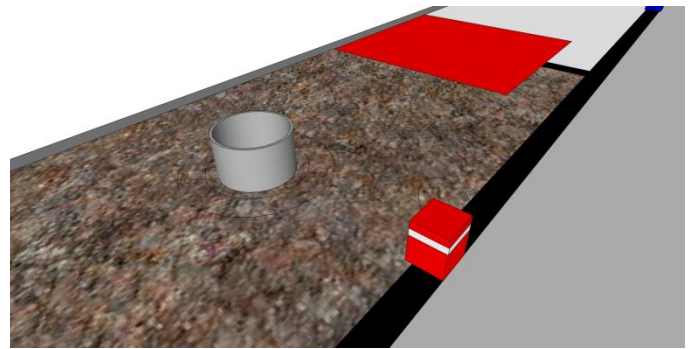
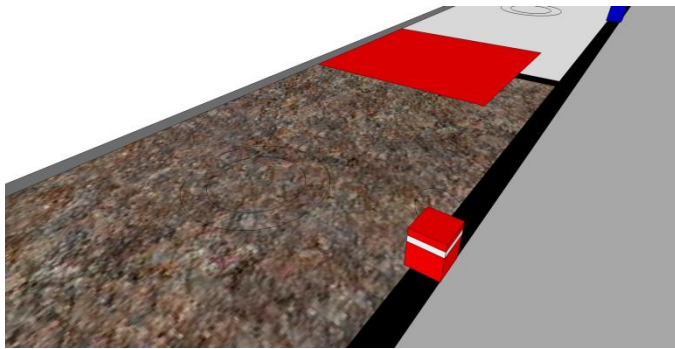
View of surface and accessories in 3D:





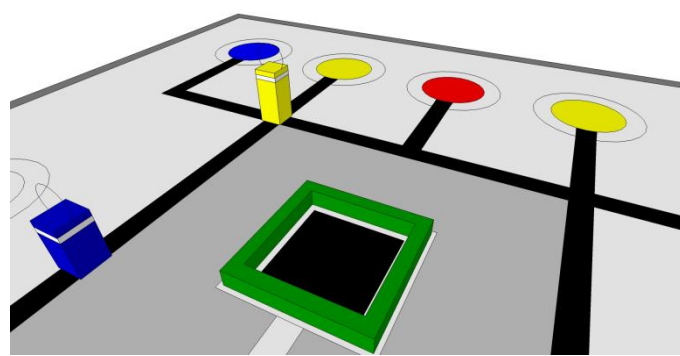
WHITE level

BLACK level

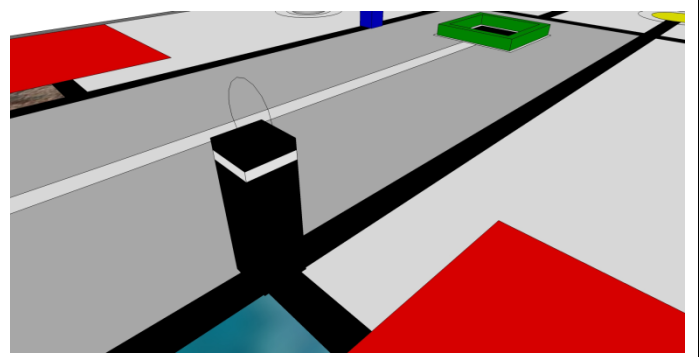
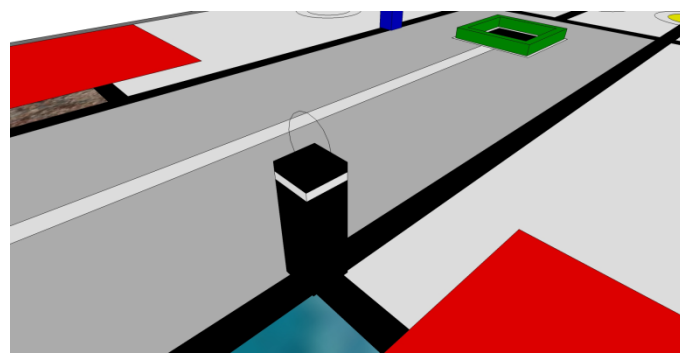
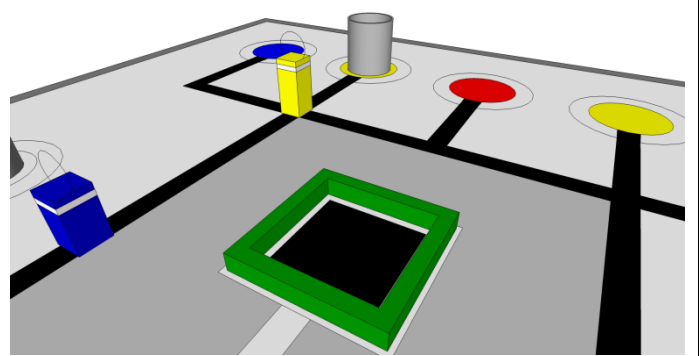




WHITE level



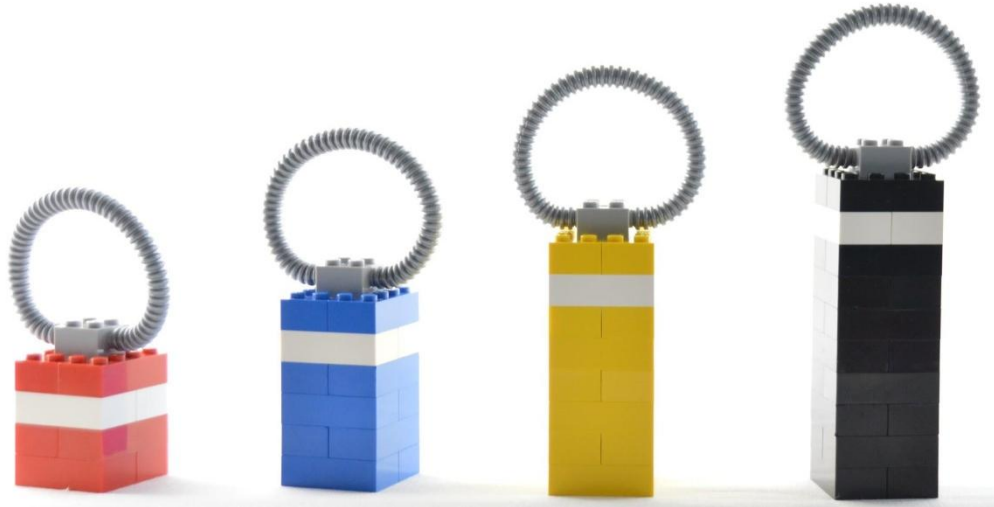
BLACK level





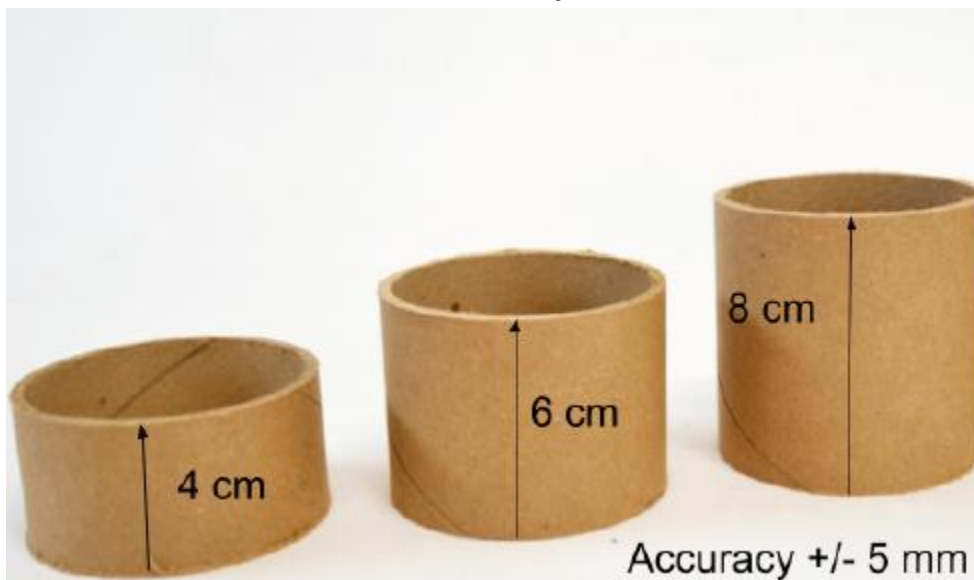
Description of accessories:

a. Fireworks rockets



There are four rockets; one red, one blue, one yellow and one black. They are made from LEGO blocks, which can be found in the WRO accessory kit.

b. Launch tubes (BLACK level only)



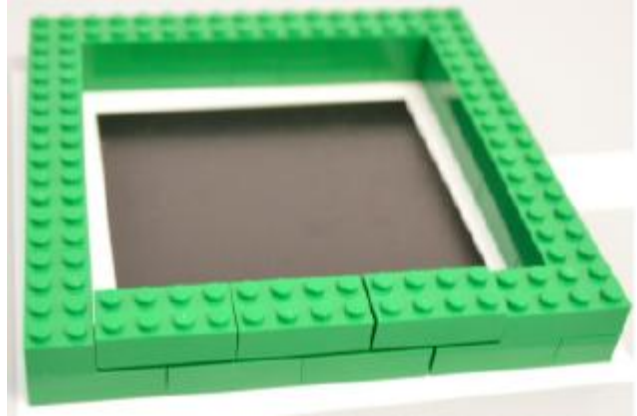
There are 3 launch tubes placed on circles C1, B1 and A2. They will be opposite the rockets of the same size. **The black rocket does not have a launch tube. It must be placed upright in the area surrounded by the green wall.** The tubes are made from a 7.6 cm (3 inch) diameter tube available in stores such as Bureau En Gros. Colour may vary.



http://www.staples.ca/fr/NCR-Tube-d-exp-dition-et-d-entreposage-3-po-x-30-po-blanc/product_35660_2-CA_2_20001

c. Repair area square

The square of the repair area is designed using 32 green LEGO 2x4 bricks.



d. Bench

The bench is a structure built from 12 2x4 LEGO bricks and 4 1x6 bricks. 5 minifigures rest on it. The layout plan will be available on the ORC challenges webpage.





DETAILED DESCRIPTION OF THE CHALLENGE

WHITE level	BLACK level
The White level of this challenge is for teams of beginners. For teams that complete the challenge by following the Zone01 course, this level is recommended if you have about 8 periods of one hour. If some teams are advanced or if the time allocated to the project is more than 8 periods, the Black level is recommended.	The Black level of this challenge is for teams with more experience or more time to carry it out.
Time allowed	
2 minutes	
WHITE level of difficulty	BLACK level of difficulty
Programming: □□□ Design: □□□ Strategy: □□□	Programming: □□□ Design: □□□ Strategy: □□□
Recommended material	
1 Colour sensor 1 Distance sensor 1 Touch sensor	
The challenge step by step	
WHITE level	BLACK level
1. The team puts its robot in the start area.	
2. The judge places the rockets at pre-established locations.	The judge places the rockets at pre-established locations. He then places the launch tubes on circles C1, B1 and A2.
3. At the signal, the judge starts the timer and the team starts its robot.	



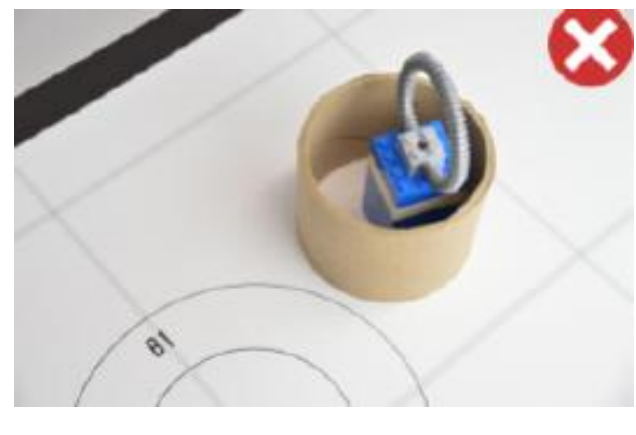
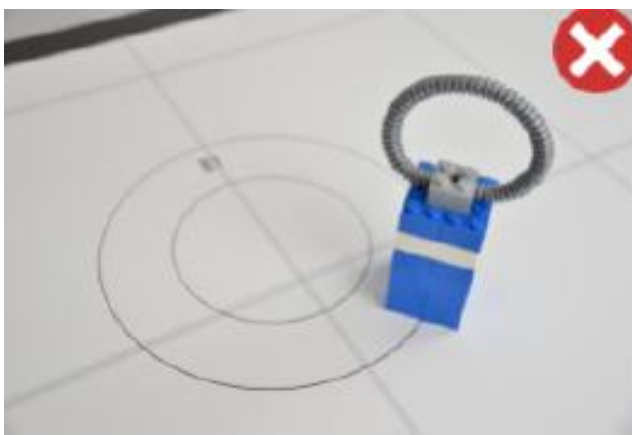
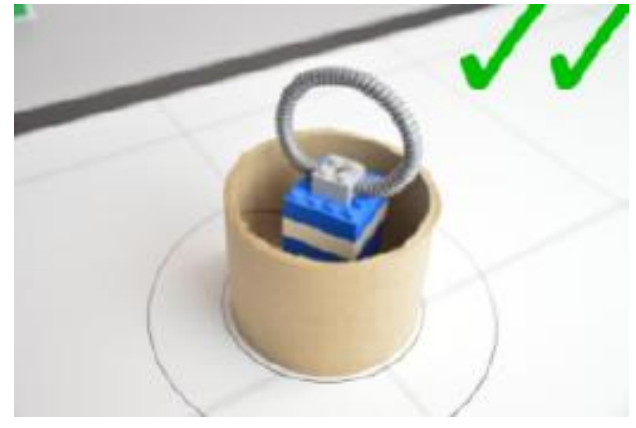
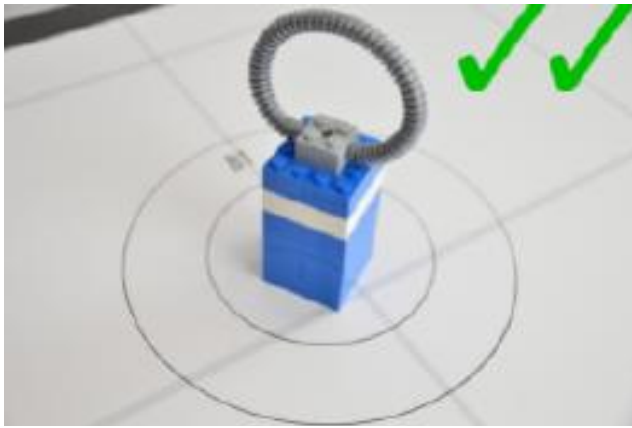
<p>4. The robot then performs its mission in the order determined by the team. The red rocket must be placed upright and completely in the large circle at its side (C1). The same must be done for the blue and yellow rockets. The robot must retrieve the black rocket, lift it and place it in the black area surrounded by a green square. The bench must be removed from the danger area and placed in the safe area.</p>	<p>4. The robot then performs its mission in the order determined by the team. The red rocket must be placed upright in the tube situated at its side (C1). The same must be done for the blue and yellow rockets. The robot must retrieve the black rocket, lift it and place it in the black area surrounded by a green square. The bench must be removed from the danger area and placed in the safe area.</p>
<p>5. The robot must finally move toward the red arrival area. The robot is considered completely in the finish area if all its wheels are in the finish area and no other part touches the mat outside the red zone.</p>	
<p>8. The timer is stopped when the robot is completely in the arrival area or when the team says STOP. If the robot leaves the surface before the end of the course, the stopwatch will be stopped and the points accumulated up to that point counted.</p>	

SCORING IN IMAGES	
2 hooks	Perfect, maximum score
1 hook	Good, base score
X	Incorrect, no points



WHITE level

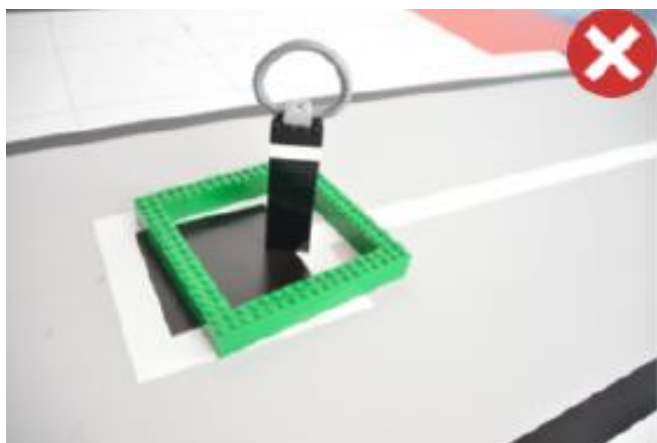
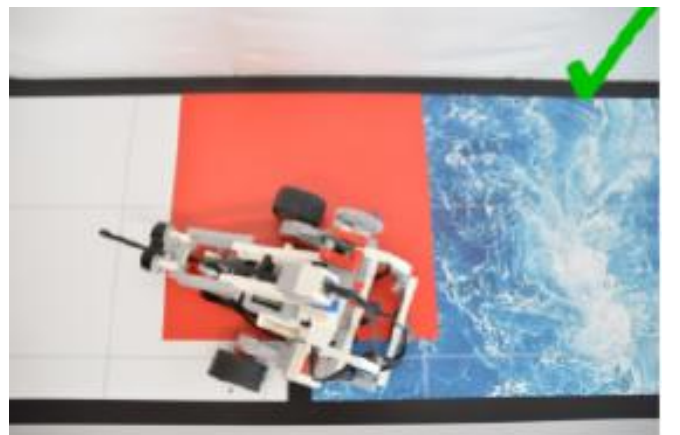
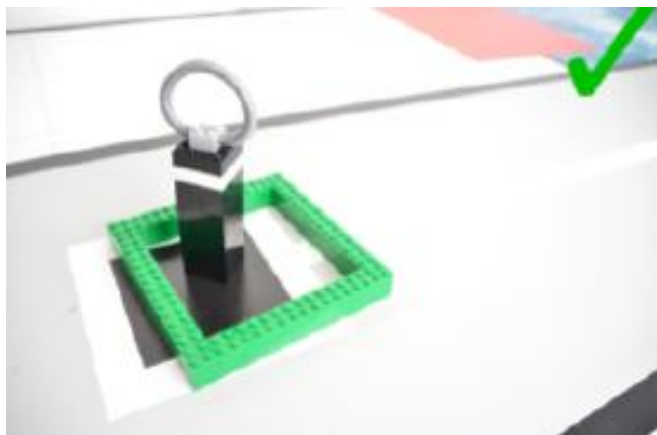
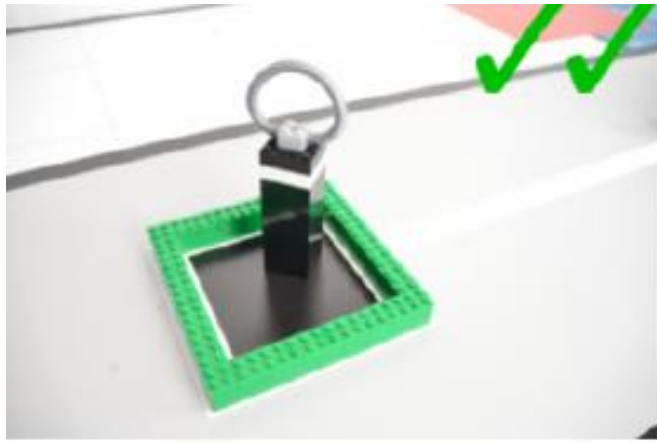
BLACK level

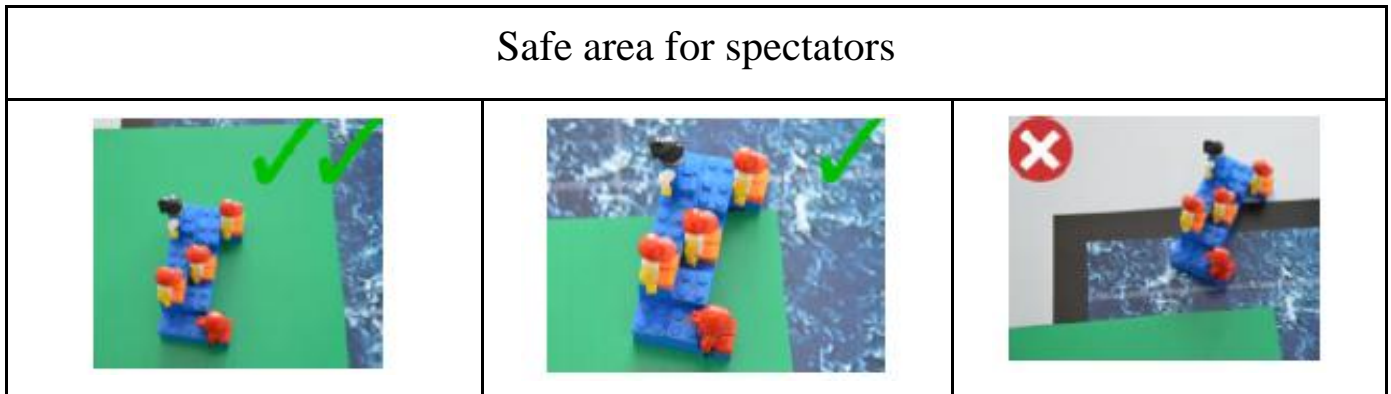




Inspection area

Arrival area





POINT CHART

	MAX PTS WHITE	MAX PTS BLACK
10 points per rocket placed completely in its big circle (White level) and at the same time in its tube (Black level) (3)	30	30
5 additional points per rocket completely in its small circle (White level) and in its tube (Black level) (3)	15	15
20 points for the black rocket standing upright in its black square with the green square not moved from its original location	20	20
<i>10 points for the black rocket placed standing in its black square with the green square moved from its original location</i>	10	10
10 points for finishing completely in the finish area after accumulating points in the challenge	10	10
<i>5 points for finishing partially in the finish area after accumulating points in the challenge</i>	5	5
15 points for moving the bench completely into the safe area	15	15
<i>5 points for moving the bench partially into the safe area</i>	5	5
10 points for taking advantage of the surprise rule (1)!!!	10	10
Total	100	100



PENALTIES

If a rocket falls to the side or breaks	-2
If a part of the bench breaks or if a minifigure falls	-5

STRATEGY SUGGESTIONS

WHITE level	BLACK level
1. Follow the black line, detect rockets, detect lines and control robot rotations	1. Follow the black line, detect rockets, detect lines and control robot rotations and be accurate in your movements

Frequently Asked Questions

As the season progresses, questions and clarifications are made to the challenge. Do not forget to check out the FAQ below

Q1:

Answer: