



World Robot Olympiad 2017

Regular Category

Elementary

Game Description, Rules and Scoring

Sustainabots [Robots for sustainability]

Sustainable Tourism

Version: Final Version January 15th



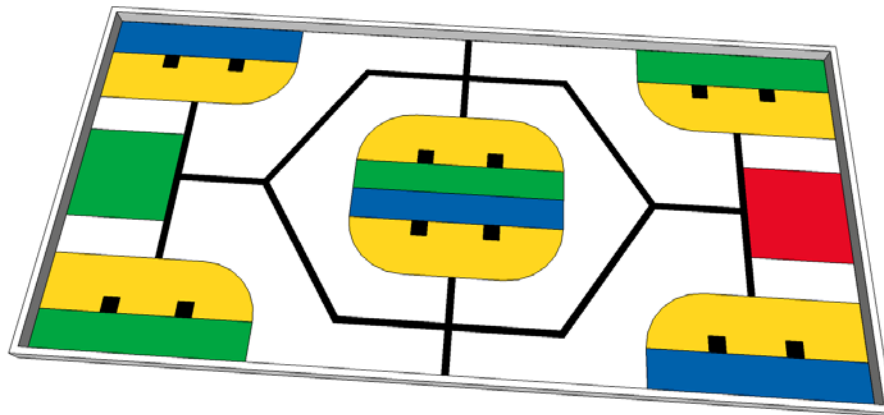
Table of Contents

Introduction	2
1. Game Description.....	3
2. Game Rules.....	5
3. Scoring	11
4. Table Specifications.....	11
5. Game Mat Specifications.....	12
6. Game Object Specifications.....	13

Introduction

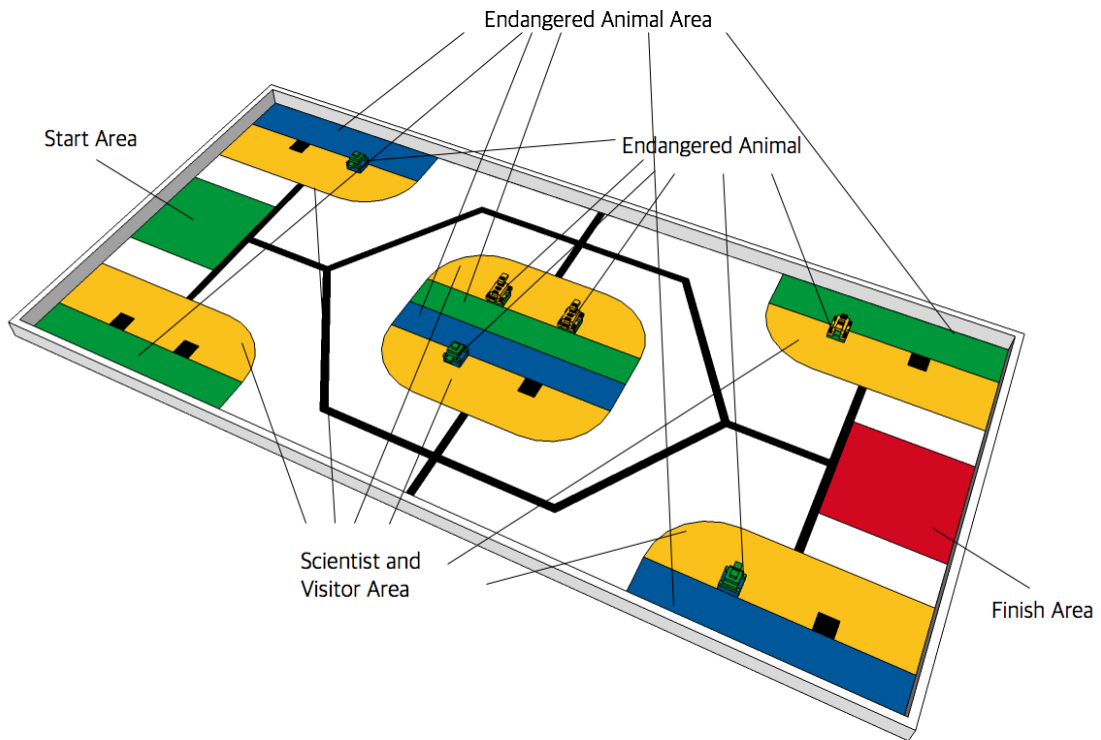
As one of the richest countries in biodiversity, a lot of different ecosystems can be found in Costa Rica. There are areas open to the public, national parks and protected reservoirs that have been established to protect our natural resources. For a country with green rainforests in the mountains and blue oceans on the Pacific and Caribbean coasts, many endangered species are found. It is important to preserve the habitats of the jaguars and turtles, and other endangered species, to prevent them from becoming extinct.

The Elementary Challenge is to make a robot that can promote sustainable tourism and help Scientists and Visitors explore and investigate the wonders of nature without disturbing it. The robot takes Scientists and Visitors into areas they are allowed to visit. The route is dependent on the number of endangered animals found in the different areas. On the tour, the robot must also return endangered animals that have wandered into the tourist areas to their proper habitat...the rainforest or the ocean.

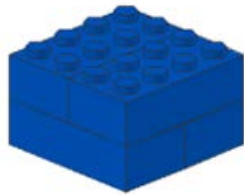


1. Game Description

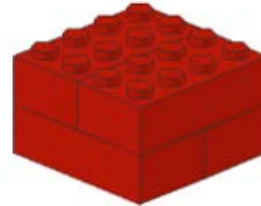
The mission of the robot is to bring Scientists and Visitors from the Start Area to the Scientist and Visitor Areas (S&V's). The robot must also move an endangered animal discovered in a S&V to the adjacent rainforest (the green Endangered Species Areas) or to the adjacent ocean (the blue Endangered Species Areas). The mission is completed when the robot is within the Finish Area.



The robot will start from within the Start Area (the green square) carrying 4 blue LEGO blocks representing 4 Visitors and 4 red LEGO blocks representing 4 Scientists.

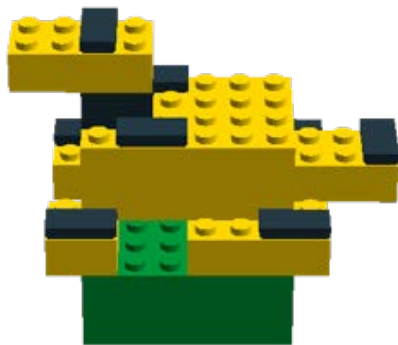


Blue Block: Visitors

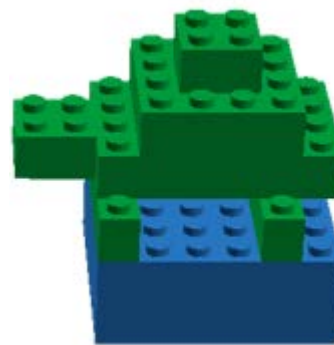


Red Block: Scientists

There are two kinds of endangered animals...jaguars and turtles.



Jaguar



Turtle

There are 3 jaguars and 3 turtles. The 3 jaguars will be randomly placed each round on 6 black squares of the 3 S&V's next to the rainforest areas (the 3 green Endangered Species Areas). The 3 turtles will be randomly placed each round on 6 black squares of the 3 S&V's next to the ocean areas (the 3 blue Endangered Species Areas). The remaining 6 black squares are empty.

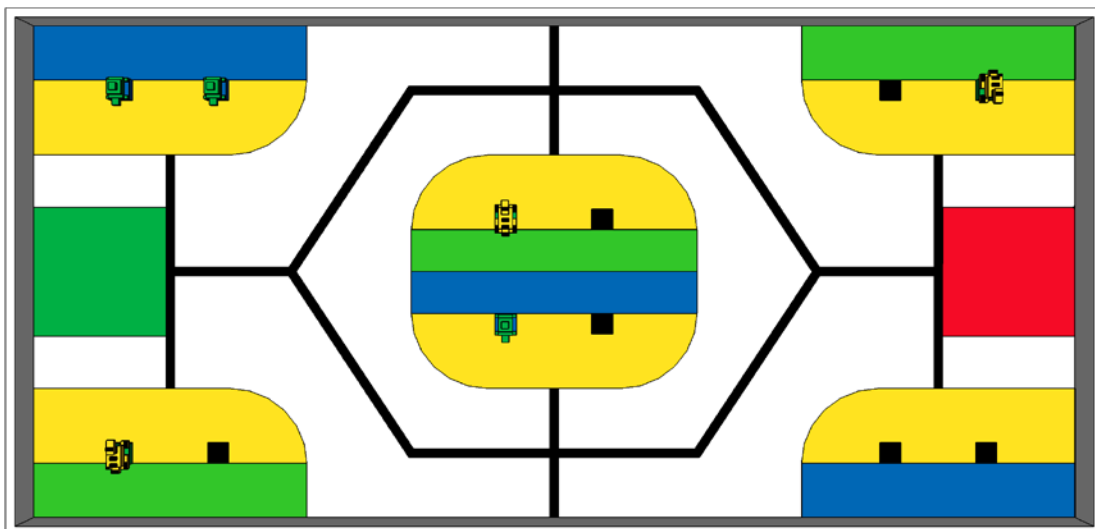
There are 0, 1, or 2 endangered animals for each S&V. The mission of the robot is to move these animals from the black squares in the S&V's to the adjacent rainforest or ocean. The mission of the robot is also to allow a Visitor (a blue block), a Scientist (a red block), or both, to visit a S&V depending on the number of endangered animals in the area.

- If there are no endangered animal blocks in a S&V, a Visitor (a blue block) is allowed to enter the area and the robot may place a blue block completely inside the area.
- If there is 1 endangered animal block in a S&V, both a Visitor (a blue block) and a Scientist (a red block) are allowed to enter...the robot may leave 1 blue and/or 1 red block completely inside the area.
- If there are 2 endangered animal blocks in a S&V, only a Scientist is allowed to enter, and the robot may place a red block completely inside the area.

The time period for the Challenge is two minutes.

2. Game Rules

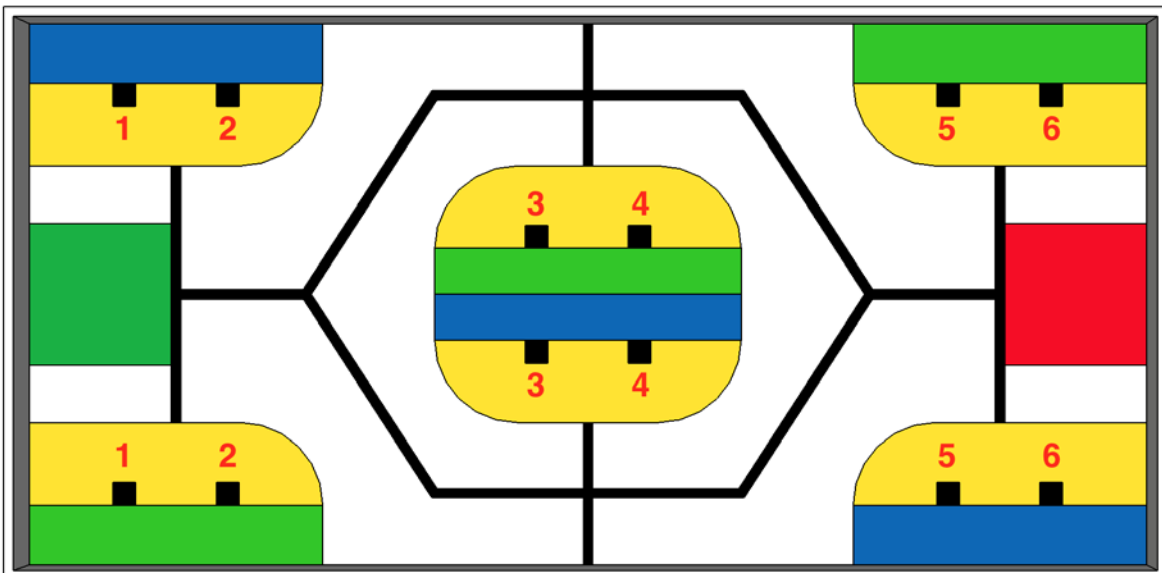
1. Before the robot is placed in the quarantine area the team can place a maximum of 4 blue blocks and 4 red blocks in the robot as so the robot is still within the size allowed by rules. As part of the inspection during the quarantine, the robot will be checked to ensure it does not have elements that are similar to game objects besides the 4 blue blocks and the 4 red blocks. No changes are allowed in the construction of the robot after the quarantine time. Each team should bring their own blue and red blocks to the competition.
2. Before each round the 3 jaguar blocks and the 3 turtle blocks are placed randomly on 6 of the 12 black squares of the S&V's with their "heads" facing the respective yellow area as shown in the figure below.



The random placement of the jaguars should be accomplished manually as follows:

- a. The 6 jaguar locations (the 6 black squares in the 3 S&V's adjacent to the green rainforest areas) are numbered 1 to 6. Put the numbers 1 to 6 on six small pieces of paper, fold them once, and place them in a non-transparent box.
- b. Shake the box to mix the folded papers.
- c. Draw 3 pieces of paper from the box and place the jaguar blocks on those numbered jaguar locations. The random placement could lead to two possible situations:
 - o Three S&V's contain one jaguar block each;
 - o One S&V contains two jaguar blocks and one S&V contains one jaguar block.

The random placement of the 3 turtle blocks should be done similarly. The chosen placements of the endangered animal blocks are kept constant through a one round. The numbering of the black squares for each random drawing can, for example, be as follows:

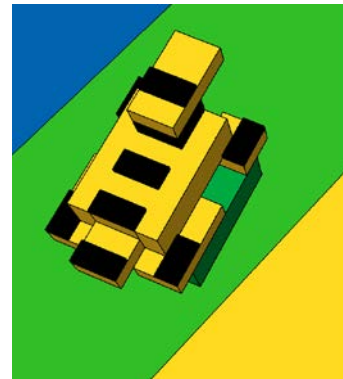
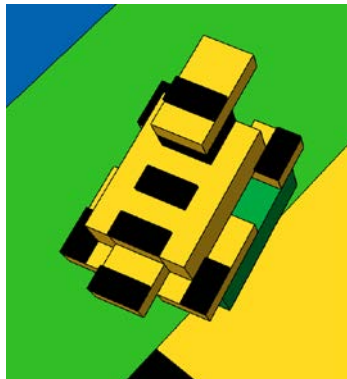
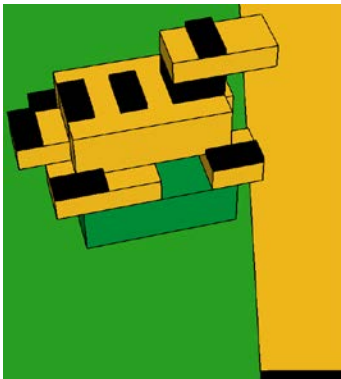


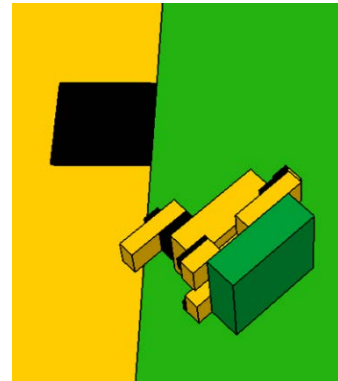
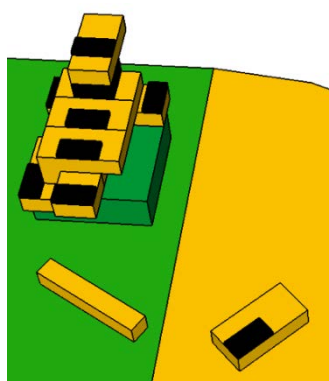
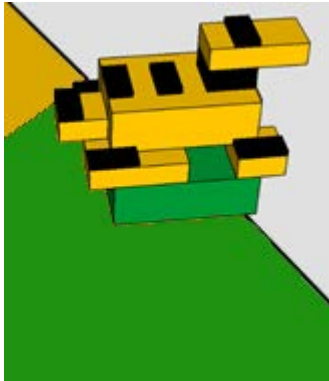
3. The endangered animal blocks on the black squares of the S&V's must be moved by the robot to be completely within the adjacent rainforest or ocean area. A turtle block is correctly moved if it is in an upright position, undamaged(*), and is completely within the adjacent ocean area. This means that all parts of the blue base of the block touching the mat are within the area. Green bricks representing the turtle are not considered to be part of the turtle block when the block position within the ocean area

is assessed and may “overhang” the line. A jaguar block is correctly moved if it is in an upright position, undamaged, and completely within the adjacent rainforest. This means that all parts of the green base of the block touching the mat are within the area. Black/yellow bricks representing the jaguar are not considered to be part of the jaguar block when the block position within the rainforest area is assessed and may “overhang” the line.

(*) *Definition of damaged for this document: A game object is damaged if at least one brick is completely detached from the position it was attached in the initial buildup.*

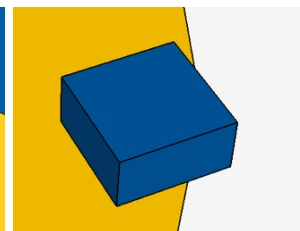
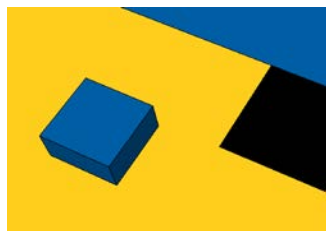
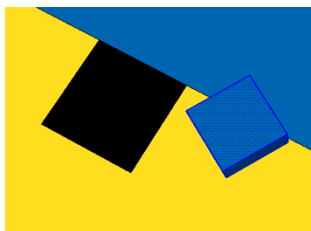
- Jaguar blocks must be moved to the corresponding rainforest area located adjacent to the S&V where the jaguar was originally positioned before the robot started. No points will be awarded to the jaguar block, even if it is within another rainforest area, if it is not placed in the area adjacent to the original S&V. Similarly, for a turtle block not moved to an ocean area located adjacent to the corresponding S&V where the turtle was positioned before the robot started, no points will be awarded.





5. The 4 Visitor blocks and the 4 Scientist blocks must be placed, undamaged, completely within the 6 S&V's according to the number of endangered animals on the black squares in the area before the robot started:

- If there is no endangered animal, one Visitor block can be placed;
- If there is one endangered animal, one Visitor block, one Scientist block, or one of each block can be placed;
- If there are two endangered animals, one Scientist block can be placed.



The random placement of the 6 endangered animals blocks can lead to situations where there is more than one way to place the Visitor and Scientist blocks correctly in the 6 S&V's.

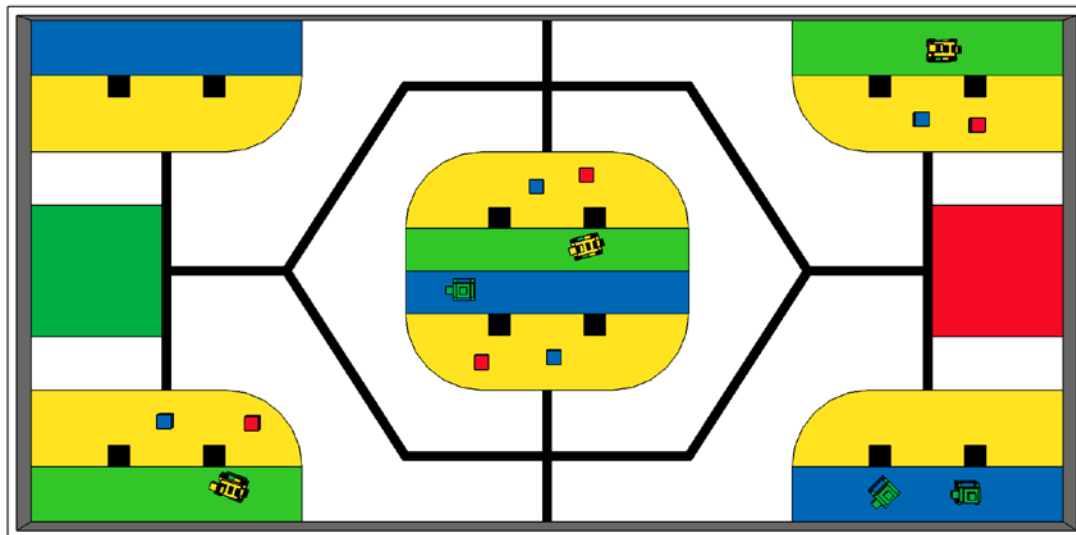
EXAMPLE

Three Scientist and Visitor Areas contain 1 jaguar block each;

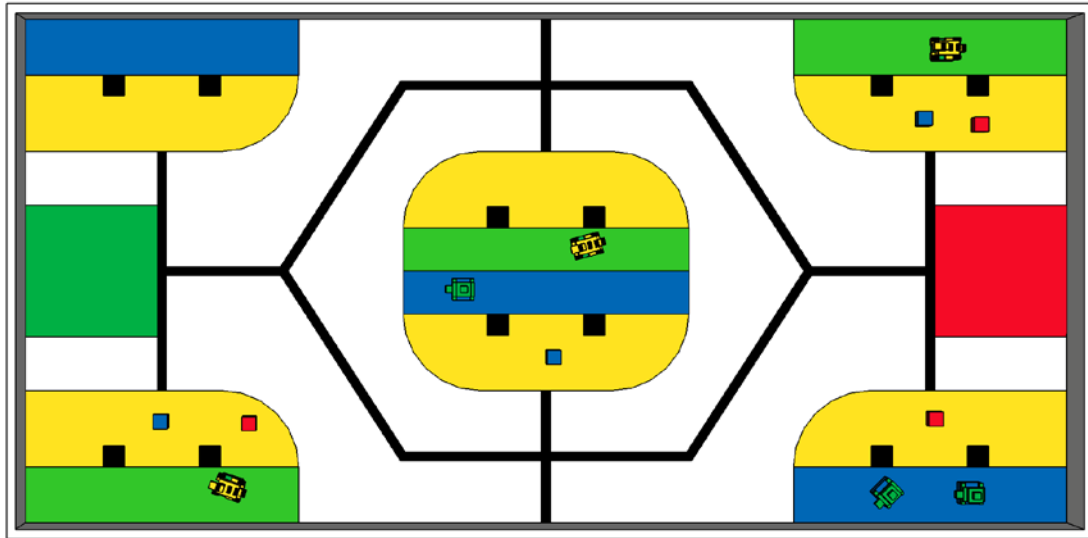
One Scientist and Visitor Area contains 2 turtle blocks;

One Scientist and Visitor Area contains 1 turtle block;

There are at least two possible ways to place the visitor and scientist blocks correctly:



Possibility 1



Possibility 2

6. At most, one Visitor and one Scientist can be placed in each S&V. If there is more than one Visitor block or more than one Scientist block in an area, no points will be awarded for the extra blocks.
7. The mission is completed when the robot stops and the entire robot is completely within the Finish Area (cables are allowed to be outside of the finish area).

3. Scoring

- a. Score will be determined when the Challenge is completed or when time expires.
- b. Maximum score = 160 points
- c. If teams have the same score, ranking is decided by the shortest time recorded.

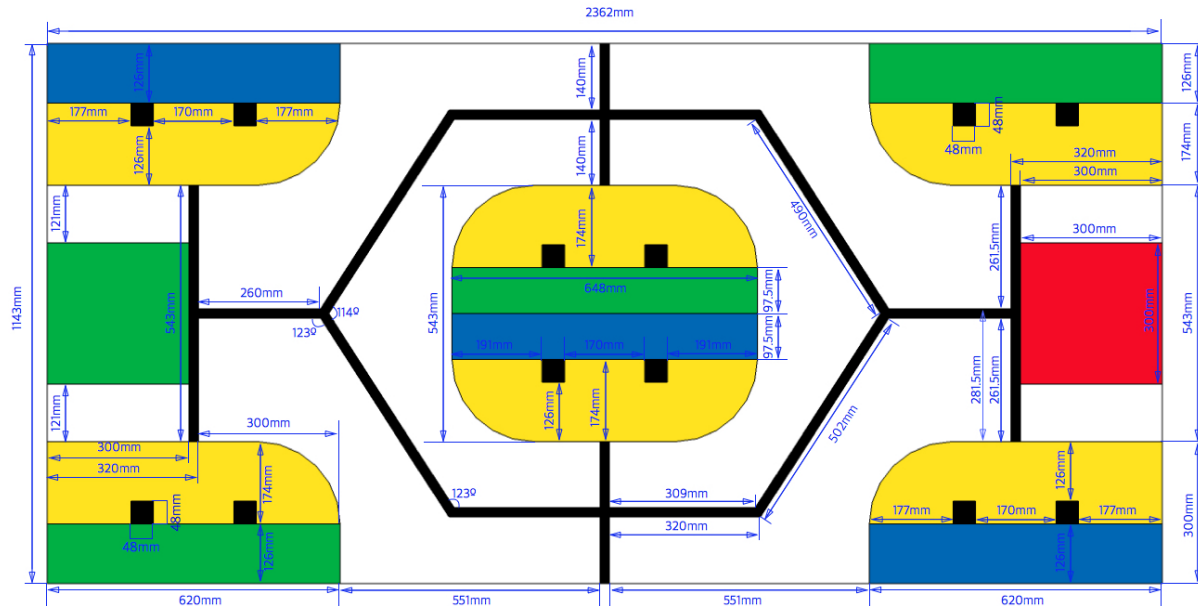
Scoring Table:

Tasks	Points Each	Total
A Scientist (red block) is correctly placed completely within a Scientist and Visitor Area that contained at least 1 endangered animal before the robot started.	15	60
A Visitor (blue block) is correctly placed completely within a Scientist and Visitor Area that contained at most 1 endangered animal before the robot started.	15	60
A Turtle block is correctly placed completely within a blue area adjacent to the Scientist and Visitor Area where it was before the robot started.	5	15
A Jaguar block is correctly placed completely within a green area adjacent to the Scientist and Visitor Area where it was before the robot started.	5	15
The Robot ends completely within the Finish Area.		10
Maximum Score		160

4. Table Specifications





- a. The internal dimensions of a game table are 2362 mm x 1143 mm.
- b. The external dimensions of the table are 2438 mm x 1219 mm.
- c. The primary color of a table surface is white.
- d. Height of the borders: 70 ± 20 mm

5. Game Mat Specifications



- All black lines are 20 ± 1 mm.
- Dimensions may vary within ± 5 mm.
- If the table is larger than the game mat, the top edge and the right edge of the game mat should align with the top and right walls of the table.

Color Specification

Color Name	Lego Color ID	Pantone	CMYK				RGB			RGB Sample
			C	M	Y	K	R	G	B	
Bright Red	21	032C	0	100	100	0	237	28	36	
Bright Blue	23	293C	100	47	0	0	0	117	191	
Bright Yellow	24	116C	0	19	100	0	255	205	3	
Bright Green	37	355C	88	0	100	0	0	172	70	

6. Game Object Specifications

There will be 8 blocks:

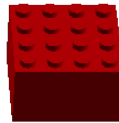
- a. 4 red blocks with 4 red 2x4 LEGO bricks
- b. 4 blue blocks with 4 blue 2x4 LEGO bricks



Step 1



Step 2



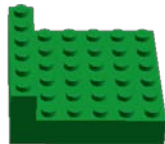
Step 3

There will be 3 jaguars:

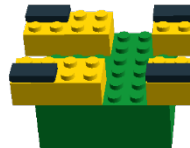
Each jaguar has 12 green 1x6 LEGO bricks, 4 yellow 1x6 LEGO bricks, 6 yellow 2x4 LEGO bricks, 2 yellow 2x2 LEGO brick, 1 black 2x2 LEGO brick, and 8 black 1x2 LEGO plates.



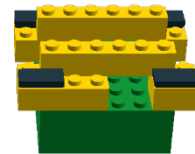
Step 1



Step 2



Step 3



Step 4



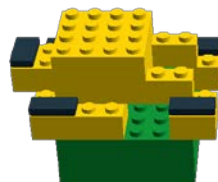
Step 5



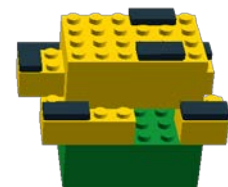
Step 6



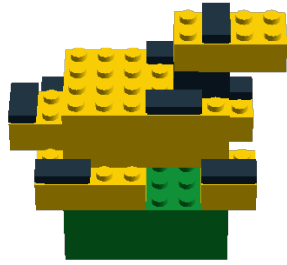
Step 7



Step 8



Step 9



Step 10

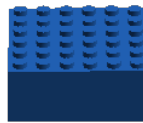
There will be 3 turtles:

Each turtle has 12 blue 1x6 LEGO bricks, 6 green 1x6 LEGO bricks, 2 green 2x4 LEGO bricks, and 2 green 2x2 LEGO brick.

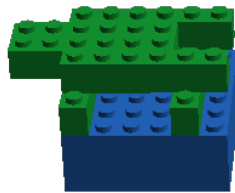
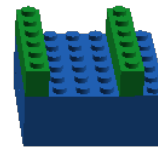
Step 1



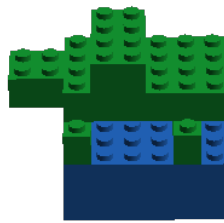
Step 2



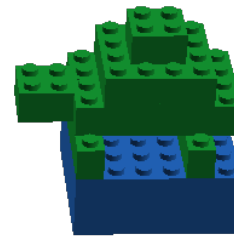
Step 3



Step 4



Step 5



Step 6