

WRO 2015

Regular Category

Elementary School

Game description, rules and scoring

PEARL DIVING

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Game Description

The name of this year's elementary school regular category challenge is "Pearl Diving".

This year's theme, "Robot Explorers", encourages students to build robots that can investigate and explore different environments, some of them hostile to humans.

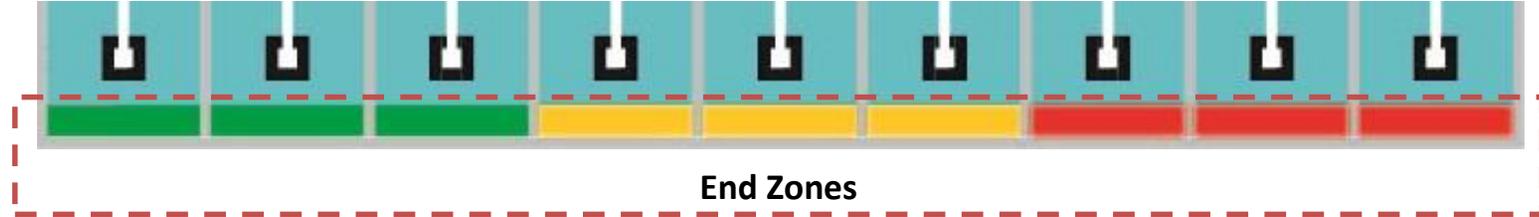
This game challenges you to build a robot that can dive and explore under the sea for pearls. For each dive you will only have 30 seconds before the robot needs to come back up for air.



Rules & Regulations

1. All participants must be seated at their designated competition areas for check time which is prior to assembly time. Only participants are allowed in the competition areas from this point forward.
2. The competition format for this challenge is:
 - a. Qualifying rounds (best score taken).
 - b. Quarterfinals (1 round).
 - c. Semifinals (1 round).
 - d. Finals (1 round).
3. Assembly time for this challenge is 150 minutes and will occur before qualifying round 1.
4. Maintenance time for each subsequent round is as follows:
 - a. For qualifying round 2, 45 minutes.
 - b. For qualifying round 3, 30 minutes.
 - c. For quarterfinals round, 15 minutes.
 - d. For semifinals round, 15 minutes.
 - e. For finals round, 10 minutes.
5. The robot will have 2 minutes to complete the challenge. Time begins at the point when the judge gives the signal to start. The robot must be placed in the large green area. Once physical changes have been made to the satisfaction of the participants, the judge will give the signal for a program to be selected (**but not run**). Participants must wait for the judge's signal to start before setting the robot into motion (run the program).
6. The maximum dimensions of the robot before it starts must not be more than 250mm x 250mm x 250mm. After it starts, the dimensions of the robot are not restricted.
7. The robot must start in the large green area. No part of the robot is allowed outside the large green area before it starts.
8. At the start of each round (post-quarantine), 9 colored LEGO cubes will be randomly selected and placed on the white squares. This will show the number of pearls found at each location. The positions of the colored cubes will be set for all participants in that particular round. The total sum of the cube color values will never exceed 12.

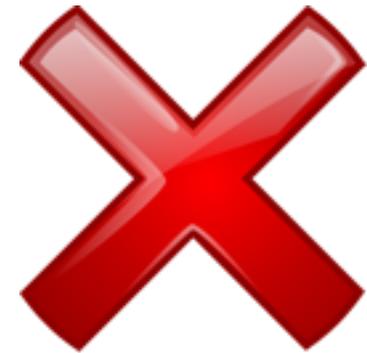
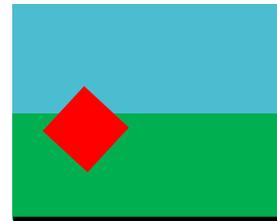
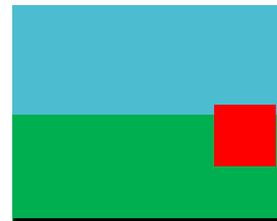
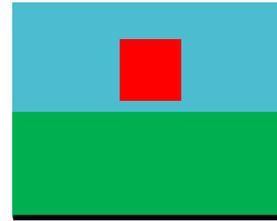
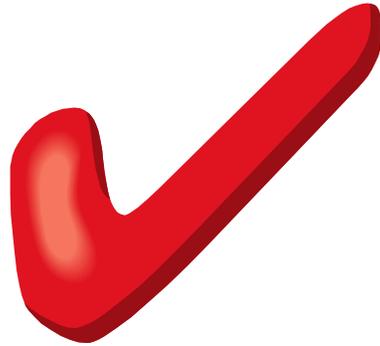
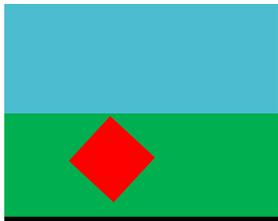
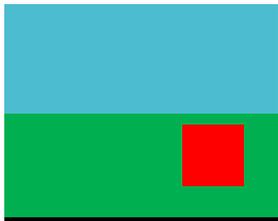
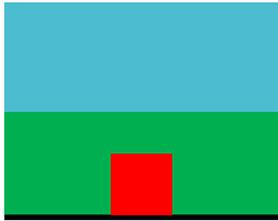
9. The robot's mission is to 'dive' into the water and determine the number of 'pearls' found in each of the three colored zones. The robot must determine the number of 'pearls' that each cube represents by its color. Each 'pearl' found is represented by one Ping-Pong ball. The sum of the 'pearls' found in a colored zone gives the total number of Ping-Pong balls the robot should deposit into the large colored area associated with that zone.
10. The color of each LEGO cube represents the following number of pearls:
- Blue Cube = 0 pearls
 - Green Cube = 1 pearl
 - Yellow Cube = 2 pearls
 - Red Cube = 3 pearls
11. The colored LEGO blocks must be pushed into the small colored end zone below the white square where the block is found.



12. To make sure the diver does not run out of air, the touch-pad in the large colored zones must be pressed to reset the 'oxygen' timer. If the timer goes to zero the attempt is immediately ended and the time for the attempt is recorded as 120s.
13. Up to 12 Ping-Pong balls are allowed to be loaded onto the robot by participants before the robot starts. Ping-Pong balls are not allowed to be loaded after the robot has started.
14. If there is any uncertainty during the task, the judge makes the final decision. They will bias their decision to the worst outcome available for the context of the situation.
15. Your attempt and time will end if:
- Any team member touches the robot after it starts
 - Challenge time (2 minutes) has ended.
 - The robot has completely left the game table.
 - The 30 second timer expires (the robot runs out of air).
 - Violation of the rules and regulations within.

Scoring

- Score will only be calculated at the end of the challenge or when time stops.
- Every colored LEGO block pushed into the small colored end zone below = 5 points.



- For each of the large colored areas, the correct number of ping pong balls present in the area = 15 points.
- Robot finishes in the large red area = 10 points.
- Maximum score = 100 points. Breakdown:
 - 45 points (9 colored LEGO cubes pushed to their end zones x 5 points).
 - 45 points (3 large colored areas with correct number of Ping-Pong balls x 15 points)
 - 10 points (robot finishes in large red zone)
- If teams have the same score, ranking is decided by the fastest time recorded.

Game Table in 3D

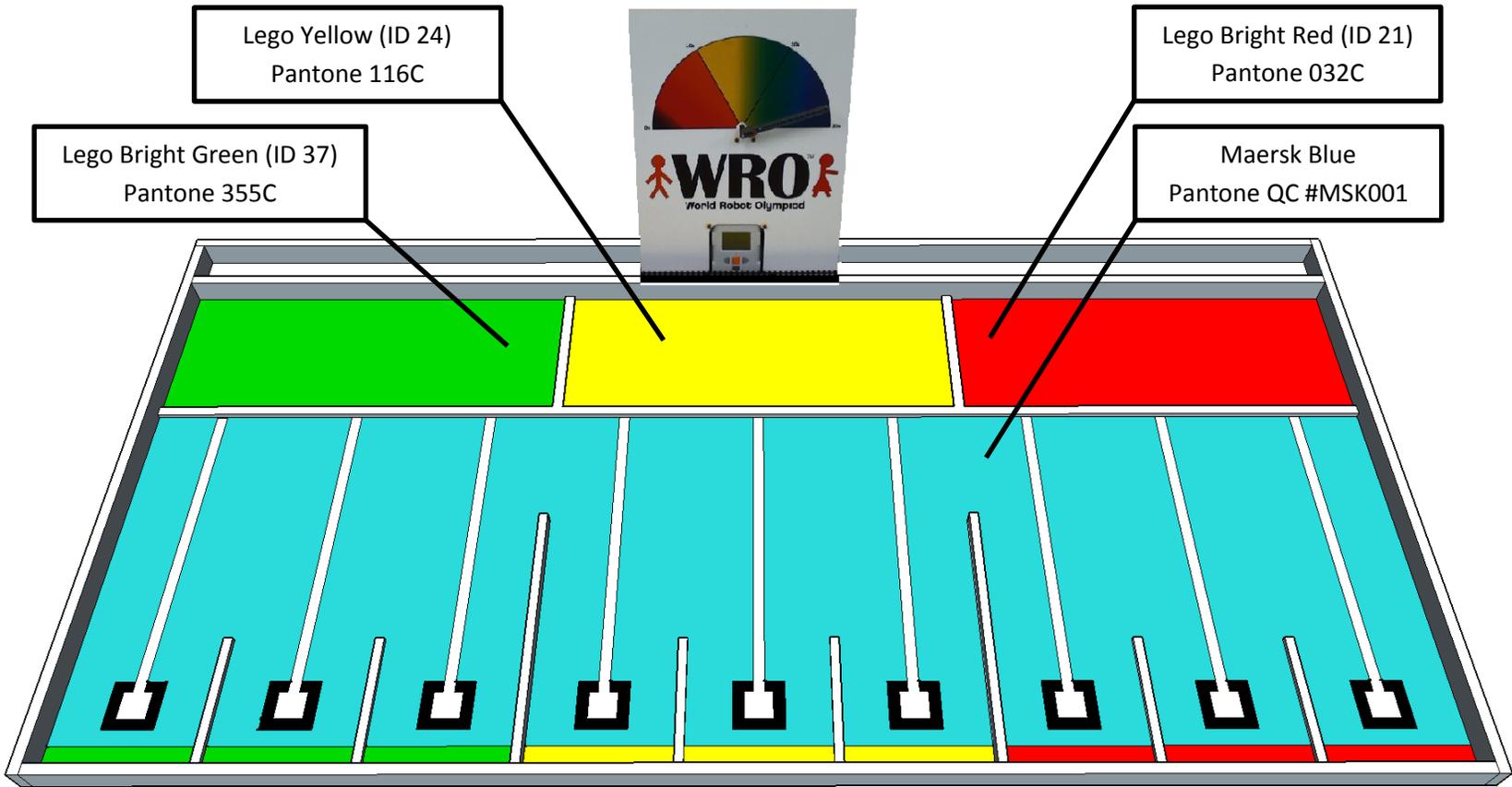
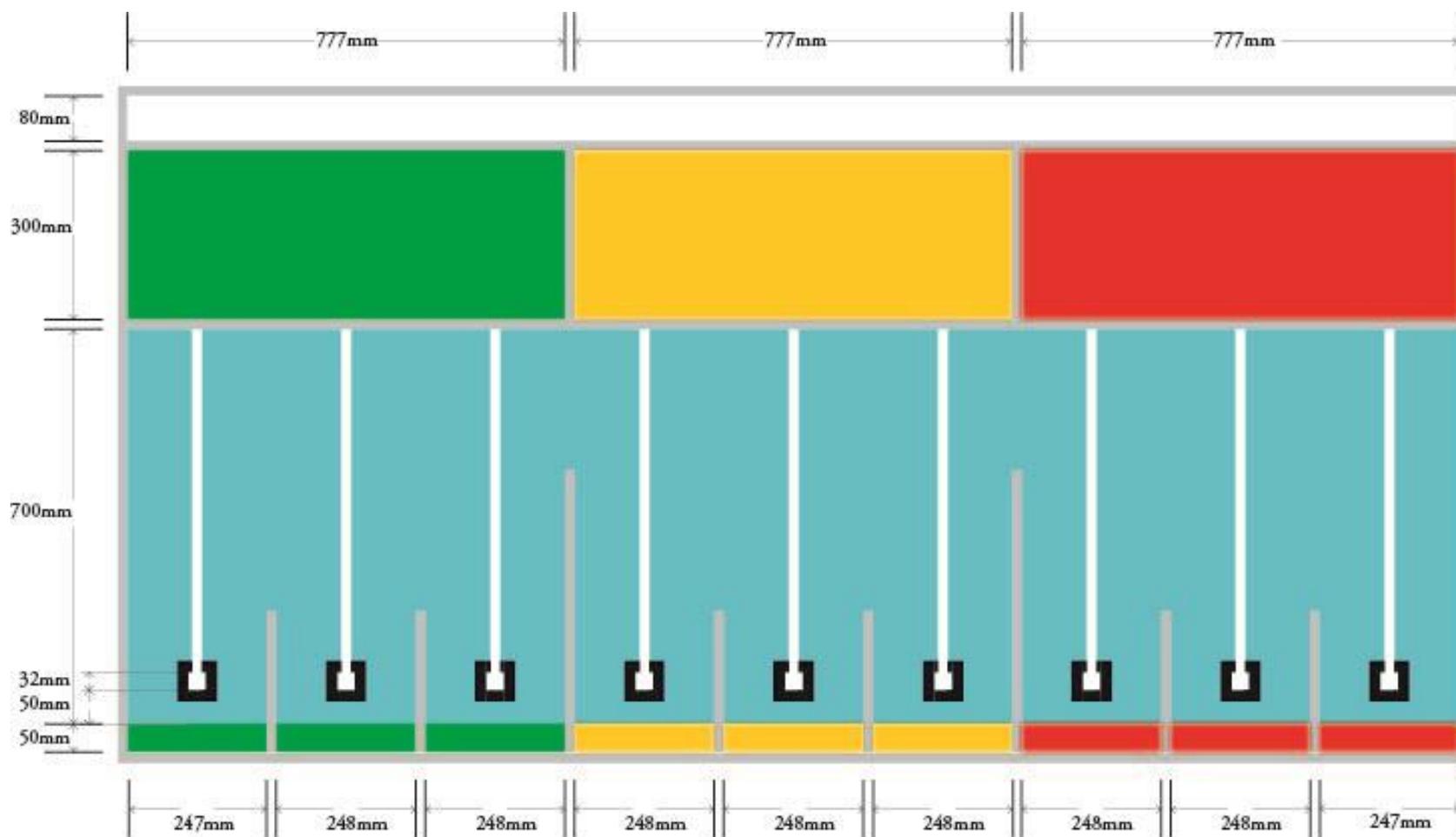
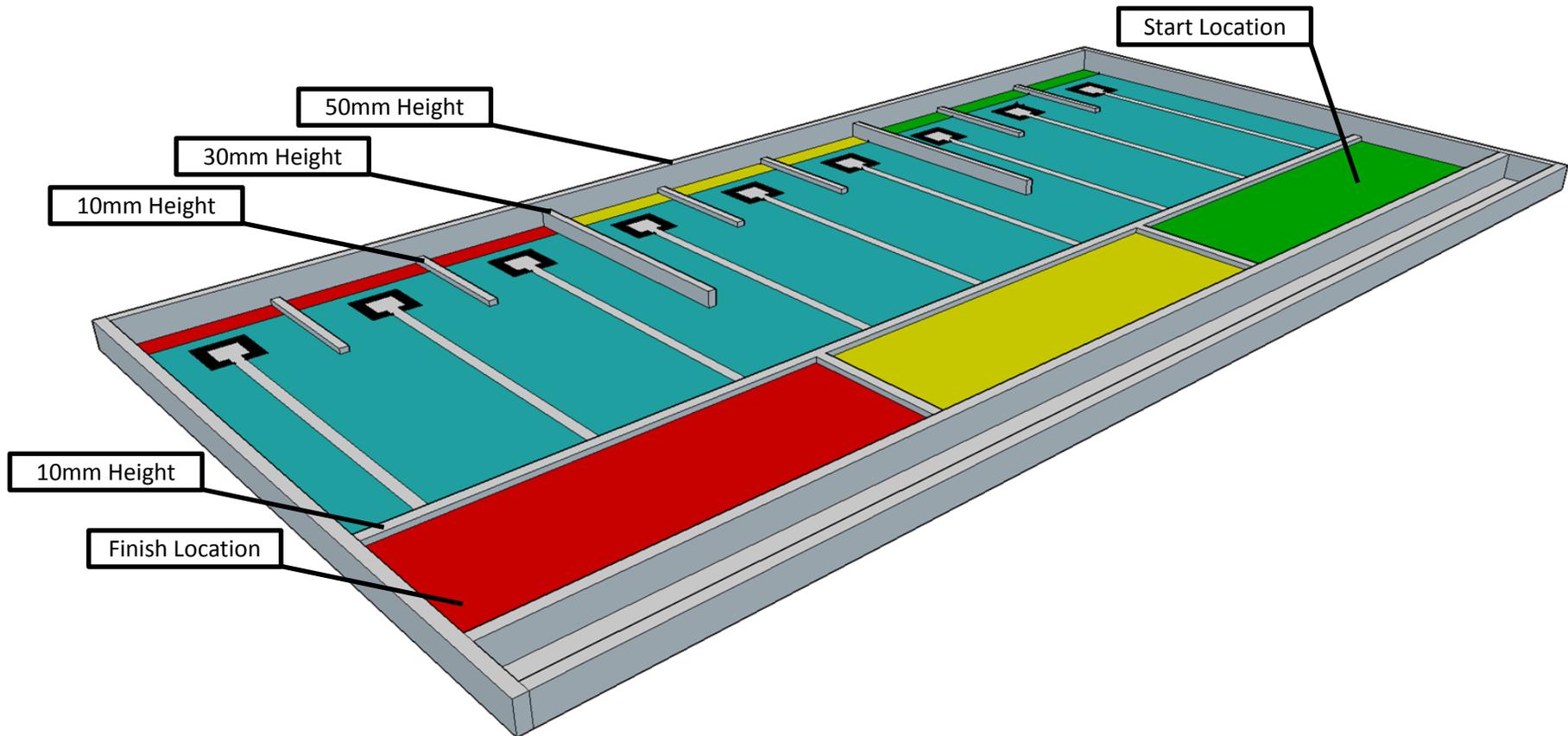


Table specifications I



All grey walls 17mm, All white and black lines 20mm
 Outside dimensions 2400mm x 1200mm

Table Specifications II

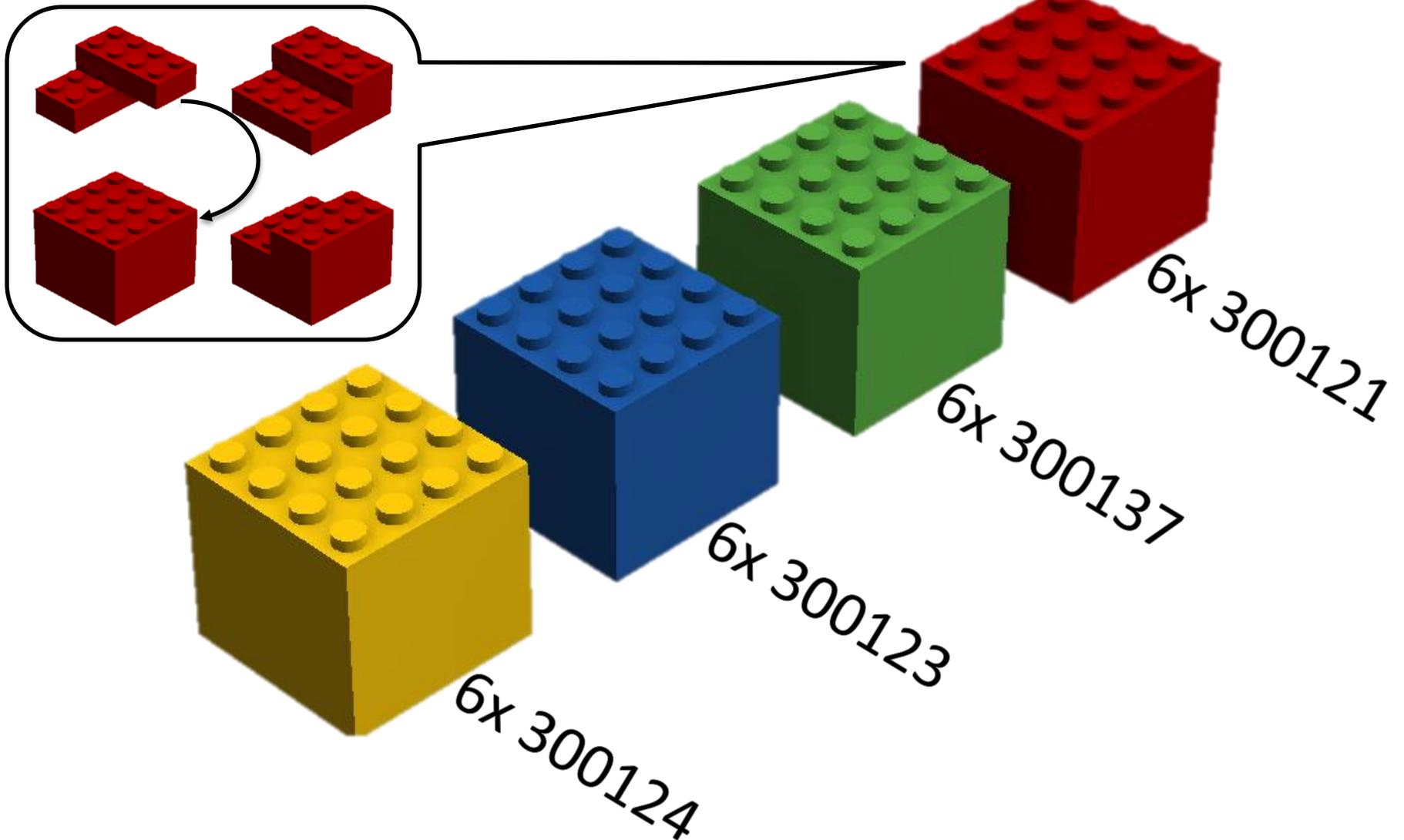


The edges of the table and the divider beside the timer are 50mm in height. The large 'underwater' dividers that separate the colors are 30mm in height. The small 'underwater' dividers and the dividers around the large colored areas are 10mm in height.

Table Specification III

1. The size of the game table is 2400mm x 1200mm.
2. The game table has a closed off area 80mm x 2400mm. This area is used for the timer mechanism.
3. The walls around the three large colored areas are 10mm high and 17mm thick.
4. The walls separating small colored areas of the same color are 10mm high and 17mm thick.
5. The walls separating the small colored areas of different colors are 30mm high and 17mm thick.
6. The small colored areas are 248mm x 50mm, except the two end blocks which are 247mm x 50mm.
7. The white lines extending from the large colored blocks to the small colored blocks are 20mm x 650mm.
8. The white box along the white line is 32mm x 32mm, and is positioned 100mm from the wall (50mm from the colored block).
9. For challenge objects, 12 Ping-Pong balls with a diameter of 40mm each will be used to represent pearls.
10. Blocks made of regular 2X4 LEGO bricks will be placed on the white squares. These represent the number of pearls found in a given location.

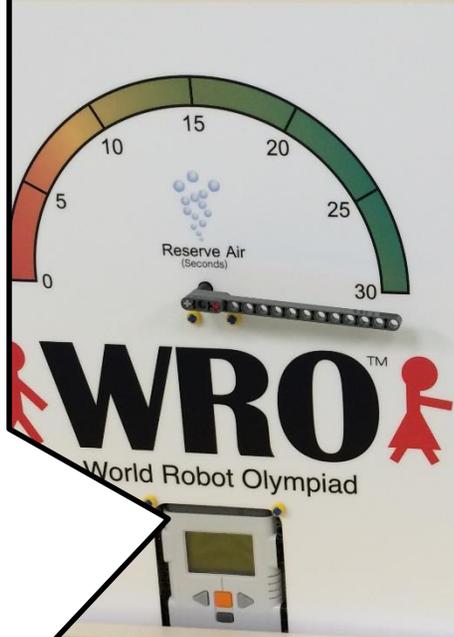
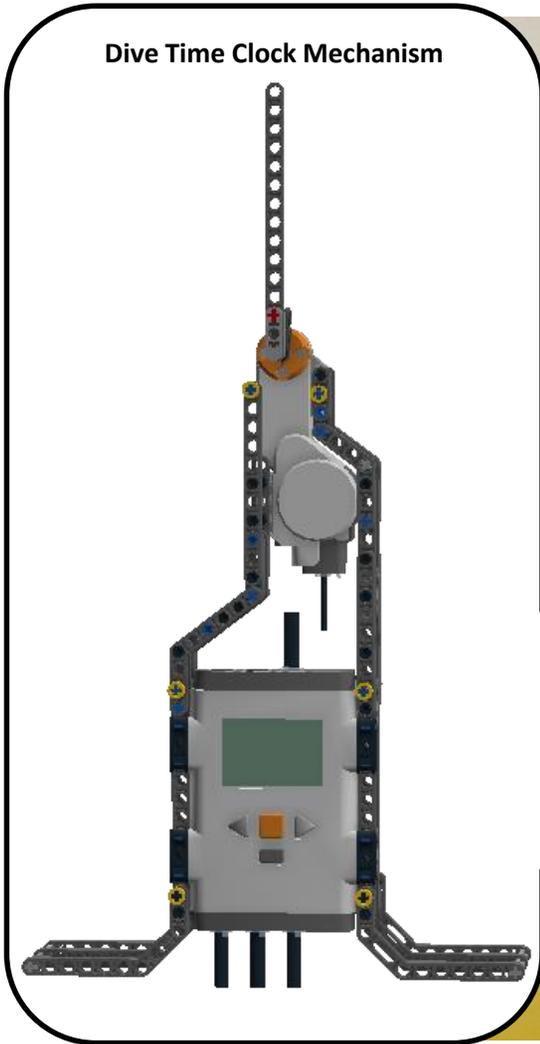
Table Object Specifications



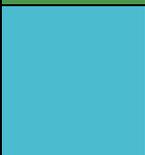
NOTE: A maximum of 4 Red, 7 Green, 5 Blue, and 5 Yellow cubes may be required.

(It's recommended that 4 Red, 7 Green, 5 blue, 5 Yellow of each color be made per table)

Dive Time Clock Specifications



Color Specifications

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	190	
Bright Yellow	24	116C	0	19	100	0	255	204	2	
Bright Green	37	355C	88	0	100	0	0	172	77	
Maersk Blue		QC #MSK001	62	2	15	2	75	187	207	

More Accurate  Less Accurate

Appendix A – Alternative rules suggestions

Some country organizers may wish to modify the game rules to simplify table construction or to eliminate the automatic air timer. Here are a few suggestions.

- 1) Instead of using the timer mechanism described, an assistant judge can be tasked with monitoring the time that a robot is under the water using a stopwatch. We recommend that the timer should be reset when the robot touches the edge of the game table, which will be as similar as possible to the world finals game table where the judge must press the timer mechanism to reset the clock.
- 2) If a flat printed mat is desired with no walls (to simplify table construction), the balls will likely not stay in the area where they are dropped as they will be free to roll around the table. We recommend that the number of balls placed in a zone is calculated based on where the ball first touches the table surface. An assistant judge could be responsible for recording the number of balls that land in each zone instead of counting the number in each zone at the end of the mission.