WRO 2015

Regular Category

High School

Game description, rules and scoring

Mountaineering

Contents

Game Description

The name of this year's high school regular category challenge is "Mountaineering".

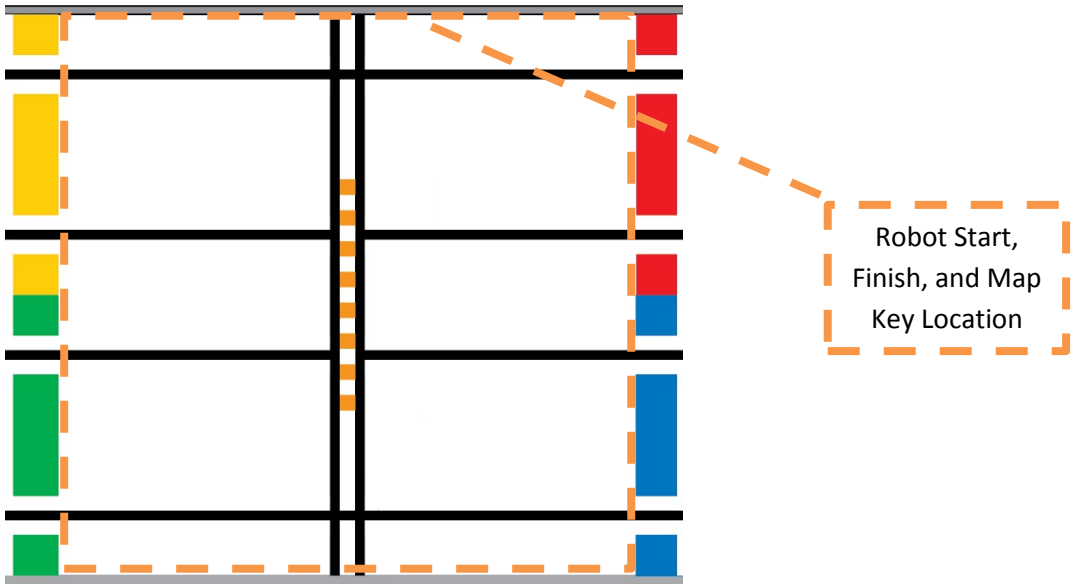
This year's theme, "Robot Explorers", encourages students to build robots that can investigate and explore different environments, some of them hostile to humans. Often explorers may rely on clues to guide their exploration throughout the unknown terrain. Other times, explorers may wander around while attempting to find what they are looking for. Explorers must also take care on their expeditions. The environment may pose a real risk to them.

The high school level game challenges you to build a robot that is tasked with collecting supplies and delivering them to outposts high in the mountains. Clues are available regarding the environment and the location of each of the supplies to collect. The closer you get the supplies to the drop location, the higher the points. But proceed with caution so that your robot doesn't slip and fall off of the mountain.

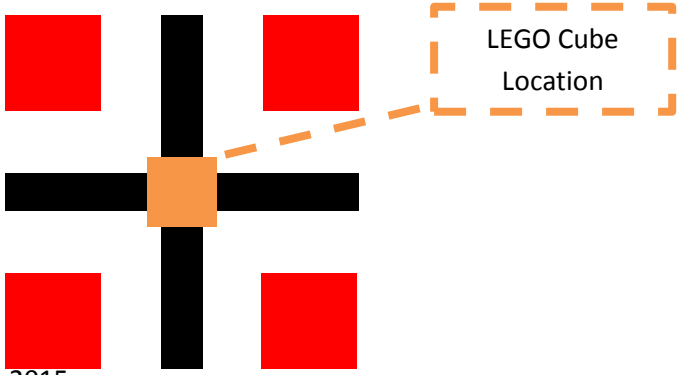
Rules & Regulations

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 starting 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.

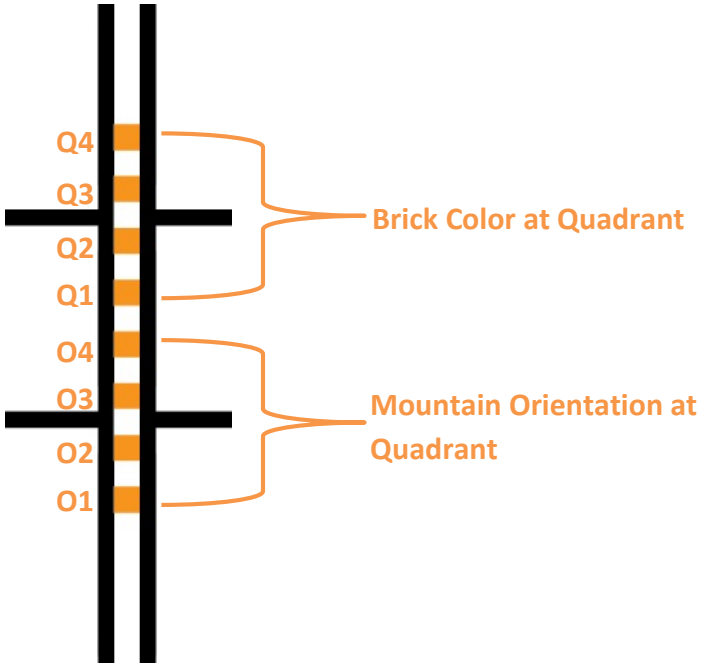
7. The robot must start at ground level. No part of the robot is allowed to touch the mountains or a colored area at the base of a mountain.

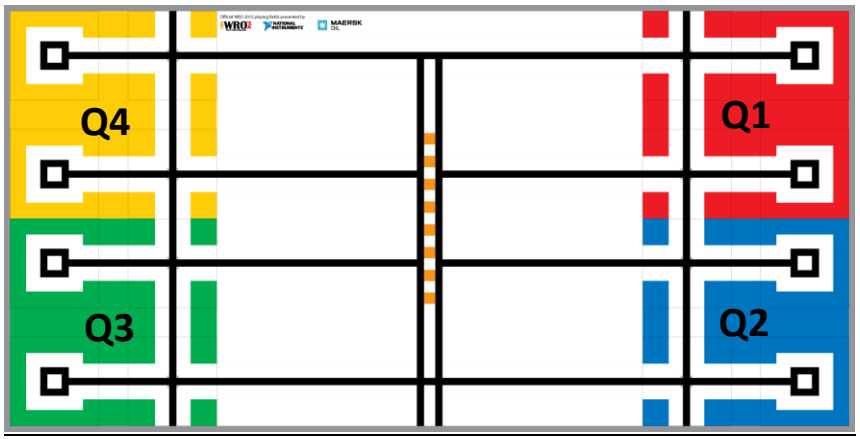


8. Each of the mountains can be placed at one of two orientations. At the start of each round the orientation of each mountain will be randomly selected. 4 colored LEGO cubes (Red, Green, Blue and Yellow) will be randomly placed, one at the intersection of the exposed black lines at the base of each mountain. A LEGO block will never start on the mountain of the same color. The orientation of each mountain and the position of each colored cube will be set for all participants in that particular round.

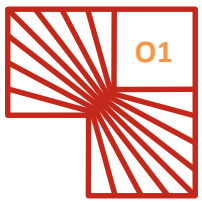


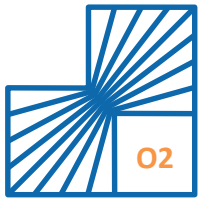
9. The orientation of each mountain and the location of each colored cube will be encoded using 8 colored tiles that will be placed in sequence in the center of the table. This is known as the map key.

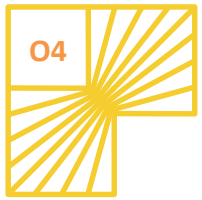




10. The colored mountains, in clockwise order, are Red (top right), Blue (bottom right), Green (bottom left), and Yellow (top left). The 'natural' orientation of each mountain is to have the peak on the mountain in the corner of the table. The first four colored tiles indicate the orientation of the corresponding mountain. The color of the tile corresponds to the 'natural' orientation of the mountain of the same color. Mountains will always be placed in one of two orientations – their 'natural' orientation (the peak is in the corner of the table), or their 'alternative' orientation (rotated 90 degrees with the peak near the adjacent mountain). The first four colored tiles indicate the orientation of the Red, Blue, Green, and Yellow mountains, respectively.





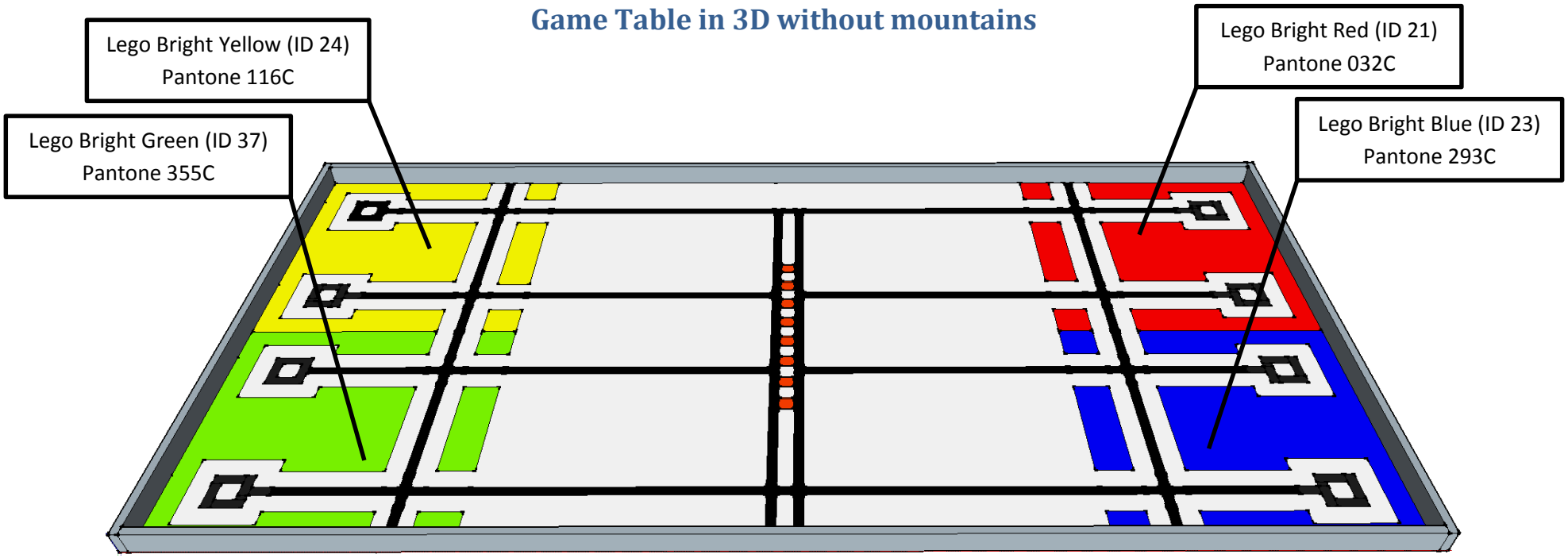


11. The locations of the Red, Blue, Green, and Yellow LEGO blocks will be indicated by tiles five through eight, such that the color of the fifth tile will match the color of the of the object placed at the base of the mountain at quadrant 1 (the Red mountain), the color of the sixth tile will match the color of the object placed at the base of the mountain in quadrant 2 (the Blue mountain), the color of the seventh tile will match the color of the object placed at the base of the mountain in quadrant 3 (the Green mountain), and the color of the last tile will match the color of the object placed at the base of the mountain in quadrant 4 (the Yellow mountain).
12. The robot's mission is to place each colored LEGO block as high up on the mountain of the same color as possible, with maximum points given for placing a LEGO block in the hole at the center of the top of the mountain.
13. 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.
14. Your attempt and time will end if:
    a. Any team member touches the robot after it starts
    b. Challenge time (2 minutes) has ended.
    c. The robot has completely left the game table.
    d. Violation of the rules and regulations within.

Scoring

1. Score will only be calculated at the end of the challenge or when time stops.
2. Each colored LEGO block placed in the base area of the same colored mountain = 10 points.
3. Each colored LEGO block placed on the 'slope' of the same colored mountain (above the base but not at the top) = 25 points.
4. Each colored LEGO block placed on the top of the same colored mountain (but not in the hole at the top) = 50 points.
5. Each colored LEGO block placed in the hole at the top of the same colored mountain = 100 points.
6. Maximum score = 400 points. Breakdown:
    a. 400 points (4 colored LEGO cubes placed in the holes of their corresponding mountain tops x 100 points).
7. If teams have the same score, ranking is decided by the fastest time recorded.

Game Table in 3D without mountains



Game Table in 3D with mountains

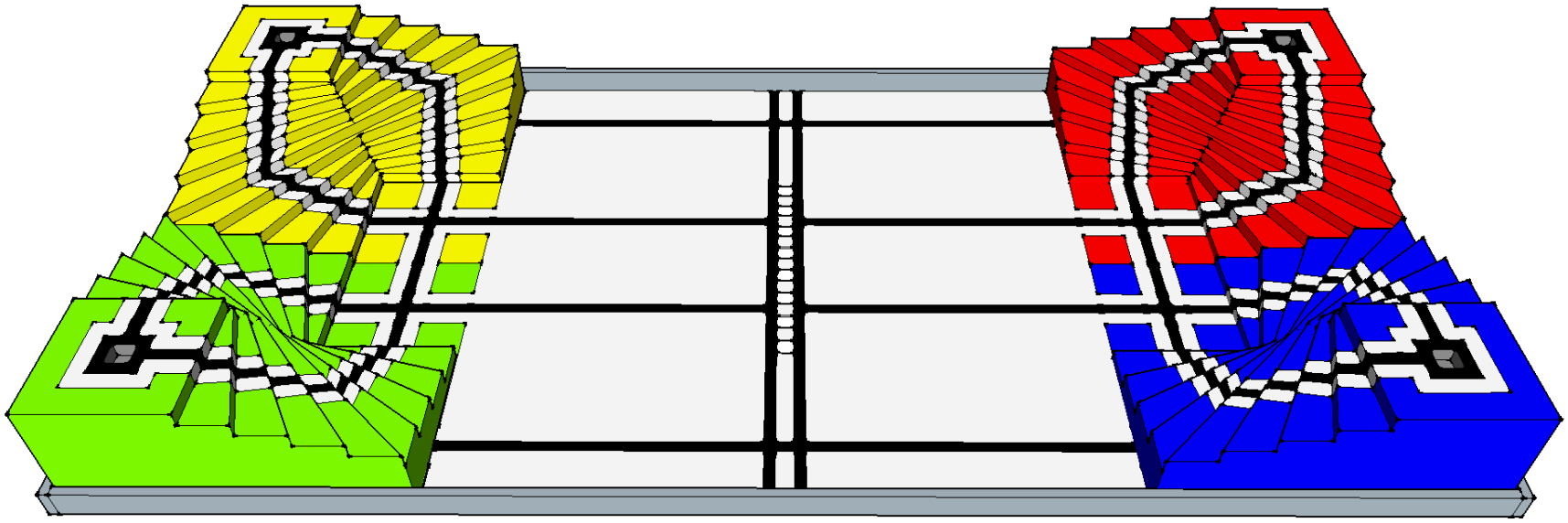
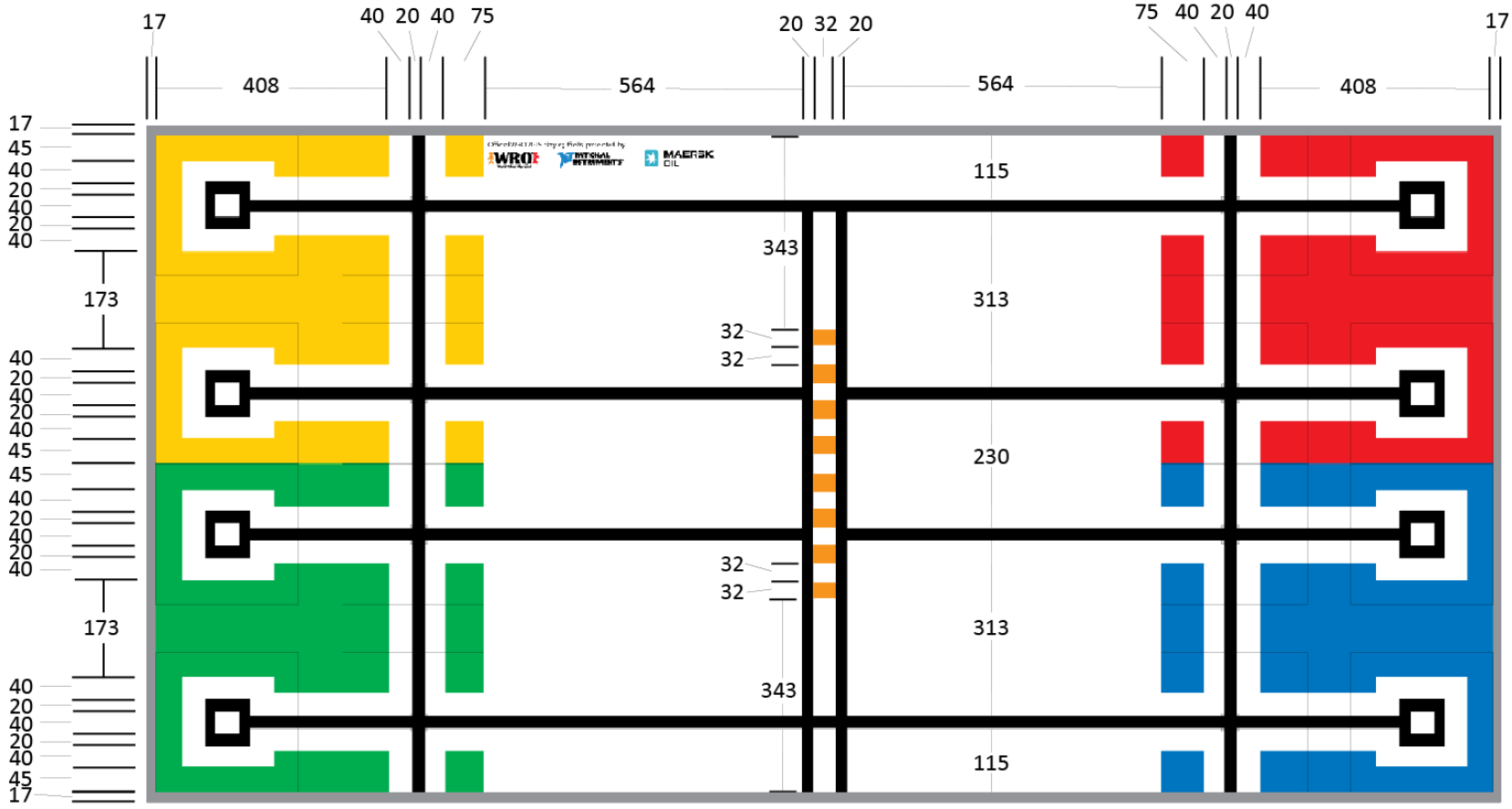


Table specifications I



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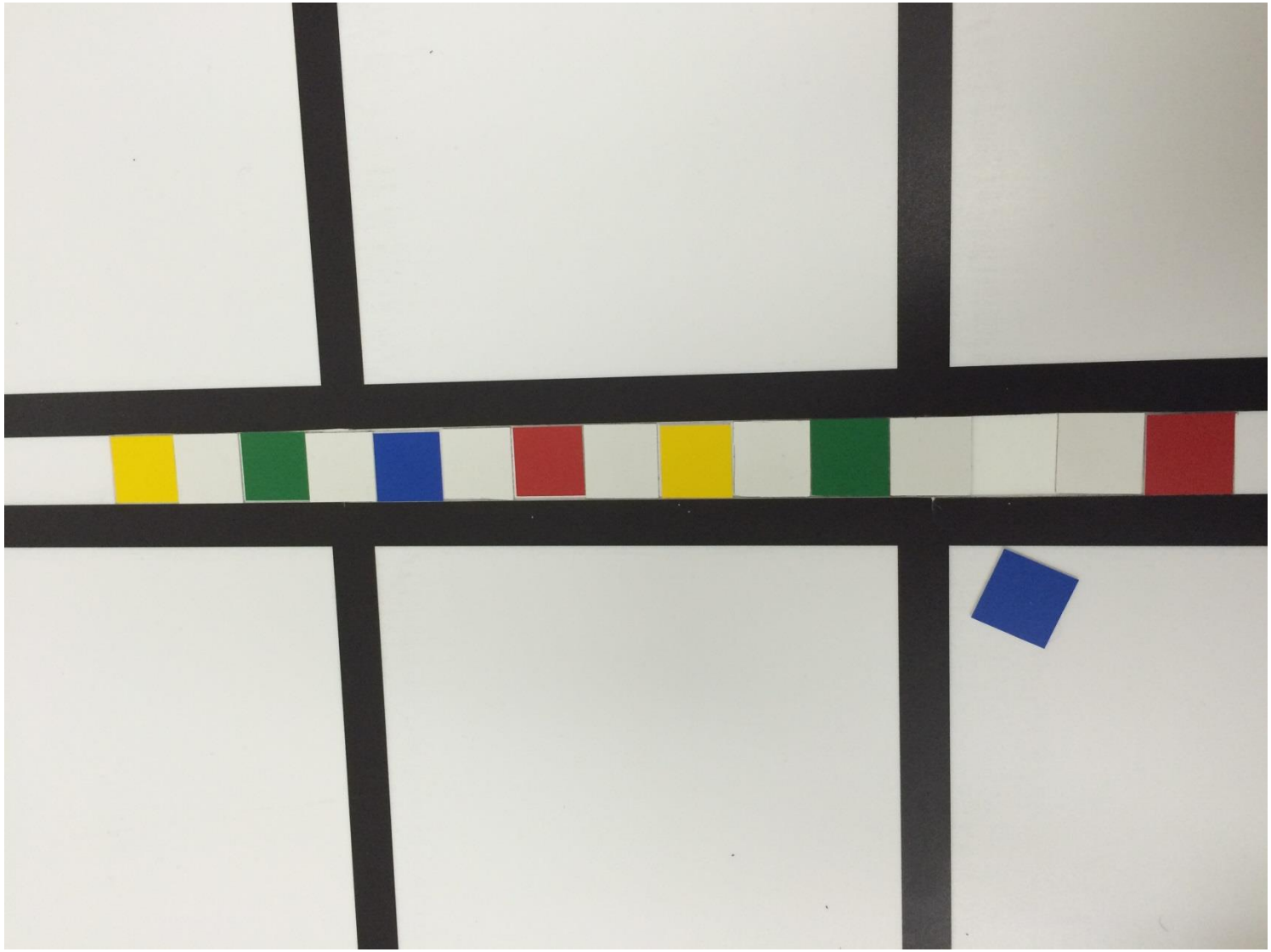
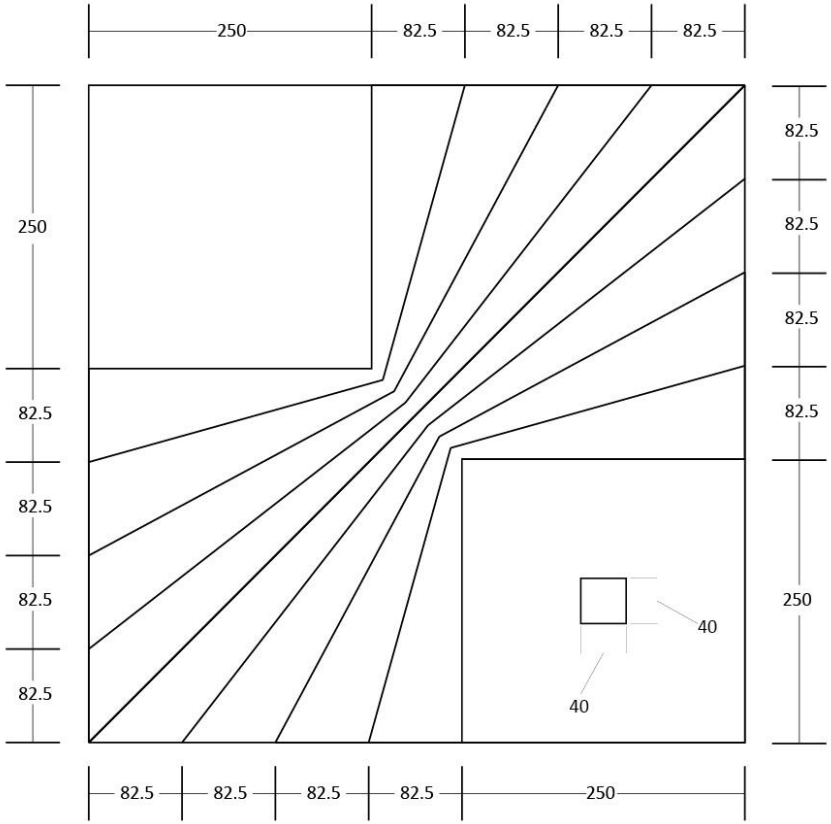


The table surface is printed on thick cardstock. All of the 32mm x 32mm squares are cut out of this layer, so that the colored tiles fit into the cutout.

Table Specifications II – Mountain Template Specifications (Top View)



Each layer of the mountain is 25mm in height.

The top of the mountain is 250mm x 250mm.

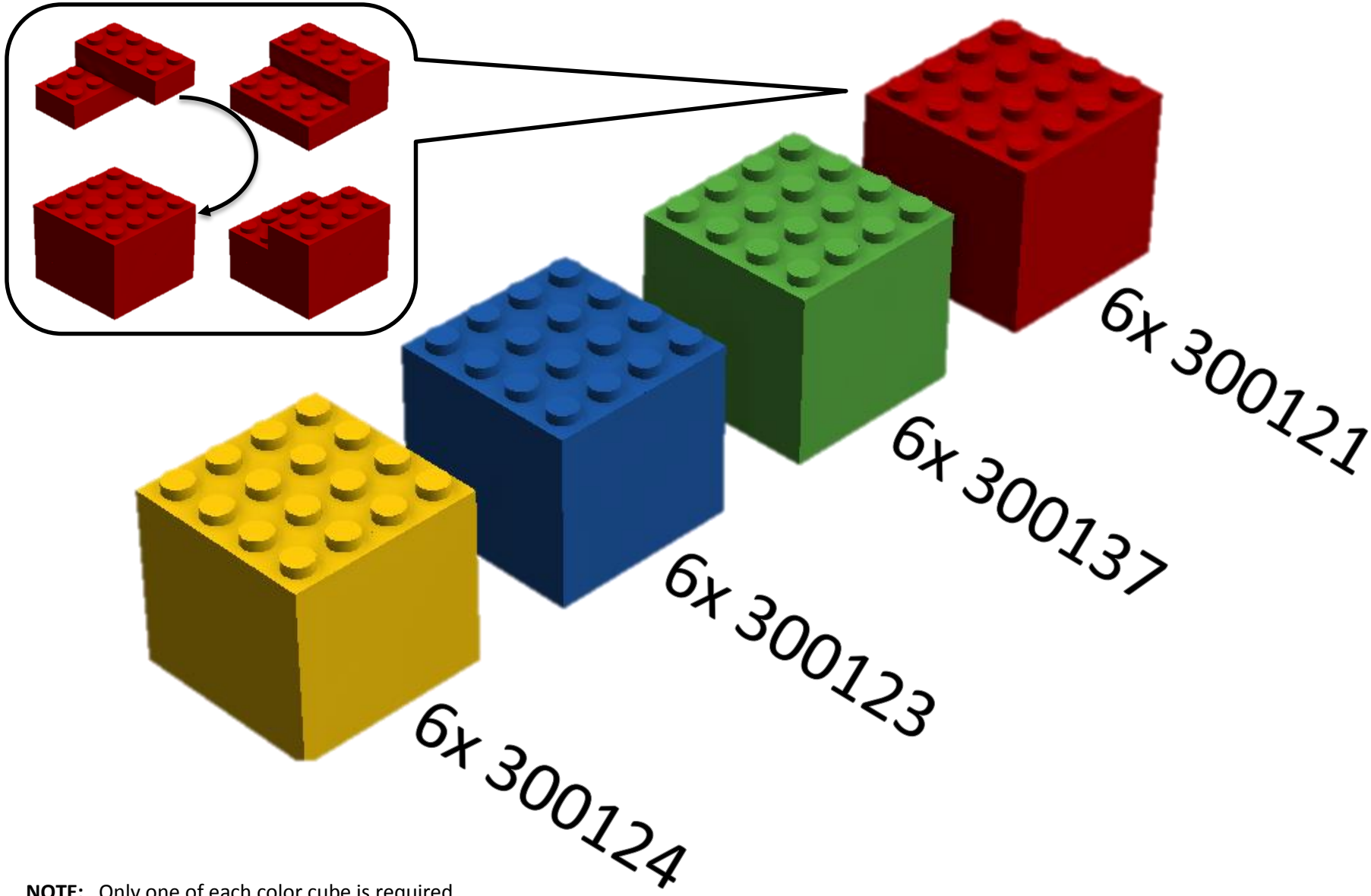
The hole in the center of the top of the mountain is 40mm x 40mm.

The smallest distance between each layer is approximately 14mm.

Table Specification IV

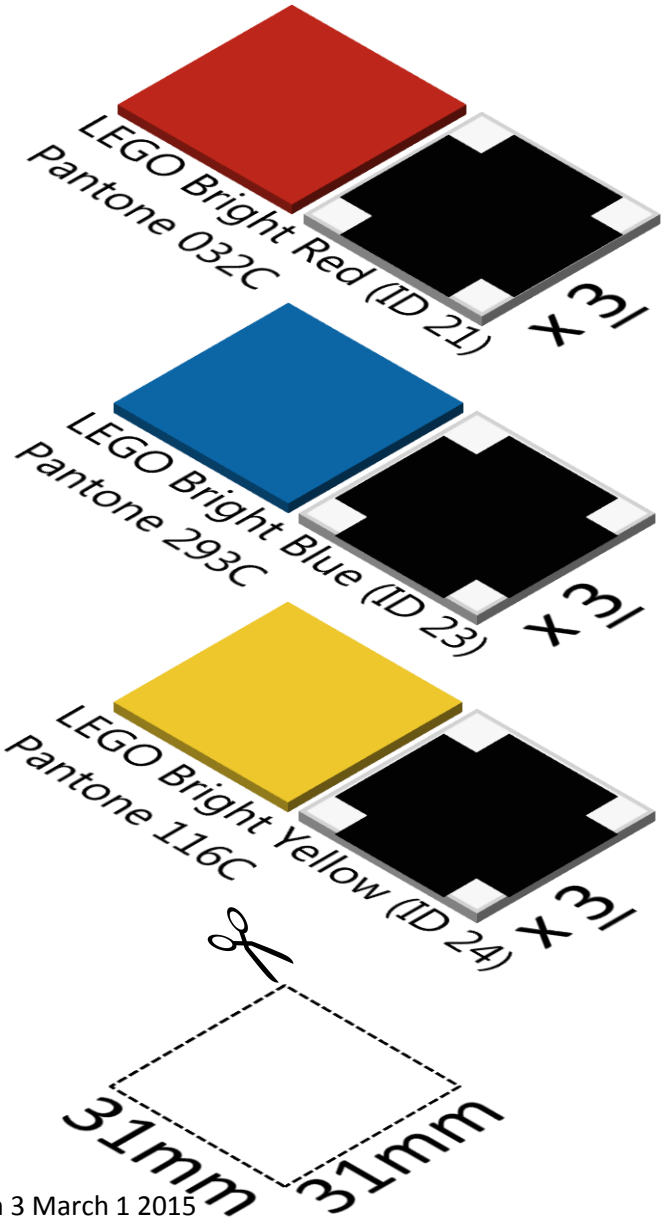
1) The table is 2400mm x 1200mm in exterior dimension.
2) The walls at each edge of the table are 17mm in thickness and 50mm in height. Fall guards are attached to the walls to provide a total height of 300mm from the table surface. They may be constructed from a clear plastic, cardboard, painted or unpainted wood.
3) The lines and colors are printed on a thin surface, and 32mm x 32mm squares are cut out of the surface at the map key.
4) Tiles 32mm x 32mm of the same thickness as this material are printed on one side containing a solid color.
5) The challenge objects include the tiles mentioned in rule 9. Also blocks made of regular 2x4 LEGO bricks mentioned in rule 11.
6) The line of 8 orange squares, known as the map key, need to have solid color tiles placed in the openings.
7) Cubes made of regular 2x4 LEGO bricks will be placed on the intersection at the base of the mountain.

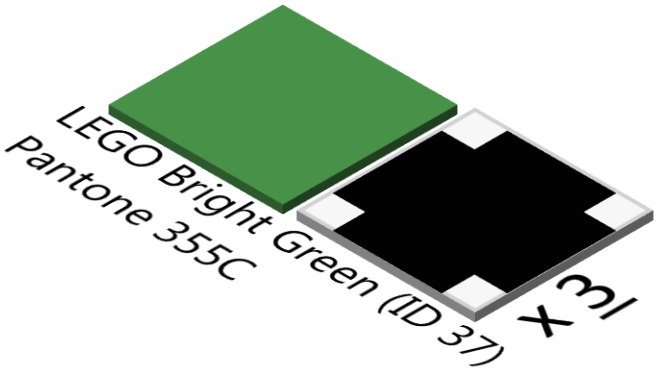
Table Object Specifications I



NOTE: Only one of each color cube is required

Table Object Specifications II





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	191	
Bright Yellow	24	116C	0	19	100	0	255	205	3	
Bright Green	37	355C	88	0	100	0	0	172	70	
Redish Brown	192	499C	32	80	95	50	105	46	20	
Maersk Blue		QC #MSK001	62	2	15	2	76	187	208	

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 mountains from the challenge. Here are a few suggestions.

1. If a country organizer wishes to use a flat printed mat with no mountains, the rules can be adapted by having the objects delivered to the 40mm x 40mm squares on the printed mat. These squares would be directly under the holes in the top of each mountain if mountains were used. The same color keys can be used to determine which white square should be used in each quadrant and to provide information on the starting position of each colored cube. The challenge can still be solved without consulting the key information, since the placement of each LEGO cube on the table indicates the mountain orientation. This removes the engineering aspects of climbing the mountain while maintaining the programming complexity of the challenge.

2. Some organizers may want an alternative to the card stock cutout and tile approach. We have attempted using alternative materials (two-sided tape, Velcro, etc.) to fasten the colored tiles and these were not successful. One approach would be to print several different versions of the game with different game scenarios. The entire table mat would be replaced instead of replacing the tiles. A limited number of game scenarios could be sent to participants for practice, with the understanding that different scenarios would be used in the actual competition that those used for practice.

3. Since the key information is contained in a line of eight cutouts, another approach to simplify table construction would be to cut out the entire key as one piece. Various keys can then be printed and used to represent different game scenarios. In this case, you print and replace the entire key area instead of individual tiles.

4. Please note that the card stock is quite easy to cut and the tiles are quite resilient. The 31mm x 31mm tiles fit easily into the 32mm x 32mm cutouts.