

17. Logistic Robot	Team	Robot building
Level : Junior / Senior	1-2 persons	Fully assembled (Ready-built)

Robot Specifications

1. The robot must not exceed 300 mm in length, 300 mm in width, and must weigh no more than 2 kilograms, including the battery and control equipment.
2. The robot used in the competition must move using wheels only.
3. A maximum of 6 motor/gearbox units may be used.
4. Servo motors are not allowed.
5. The robot must use TT gear motors only (yellow/blue or any color, as long as it is a TT gear motor). Gear ratio is not limited.
6. The robot must be controlled via a wired remote control (either self-built or pre-made). The remote control cable must be suspended at least 240 mm above the ground and must not touch the ground during the competition.
7. The battery used must not exceed 12 volts, and Li-Po batteries are not allowed.
8. Robots may be pre-assembled before the competition.
9. There is no restriction on the materials used to construct the robot.

Competition Field and Equipment Specifications

1. The competition field is 2400 mm long and 1200 mm wide, elevated no more than 15 cm above the ground, and has no border walls.
2. The START and FINISH zones each measure 300 x 300 mm.
3. The 3x3 Rubik's Cube is approximately between 50 x 50 x 50 mm and 60 x 60 x 60 mm in size, and weighs no more than 80 grams.

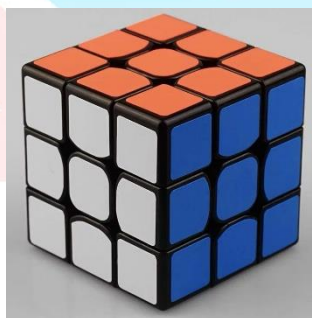


Figure 1: A cube-shaped Rubik's cube with dimensions 60 x 60 x 60 mm.

4. There are 24 Rubik's cubes in total, divided into 4 colors with 6 pieces of each color. The colors are red, blue, yellow, and pink, and they are placed at the delivery zone.
5. Warehouse is the area for placing the Rubik's cubes before the competition begins, outlined with a red border.
6. The delivery area consists of a 6x4 grid, totaling 24 cells.

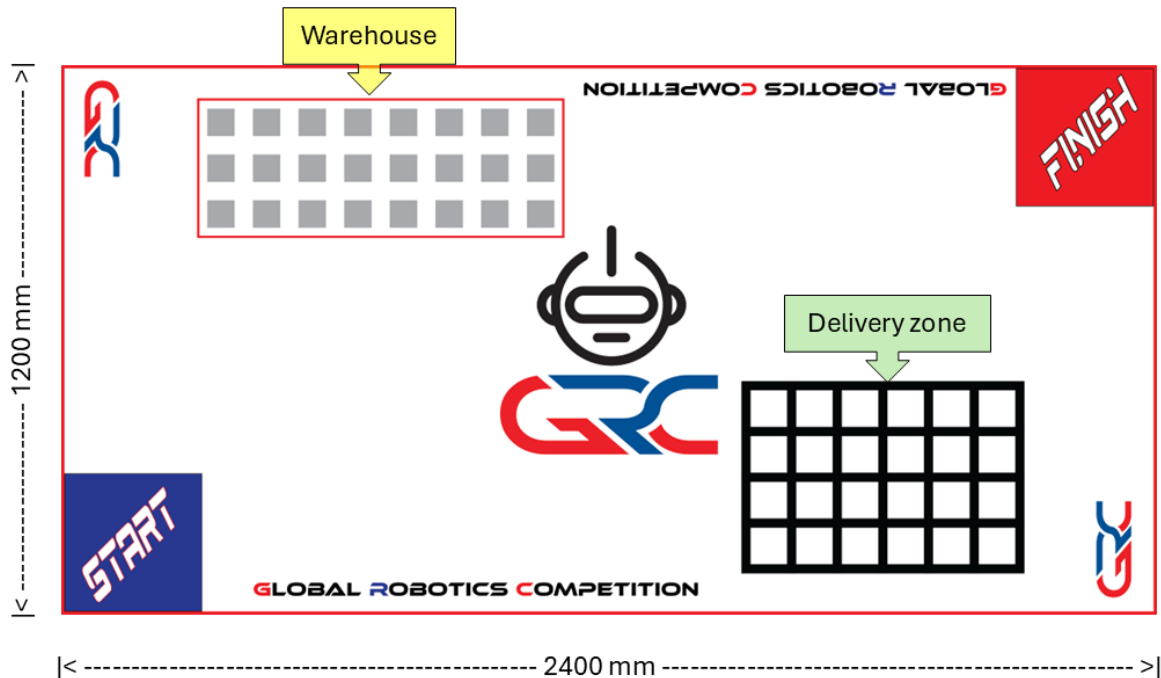


Figure 2 shows the dimensions of the competition field.

Competition Rules

1. Before the competition begins, referees will distribute a Mission Card to each team. This card details the arrangement of the Rubik's cubes and specifies the target placement positions of objects in the delivery zone and the correct color positions in the delivery area.
2. Each match lasts 180 seconds (3 minutes). Each team is given 2 rounds of competition, and the total score from both rounds will be used for ranking.
3. The robot may carry no more than 2 Rubik's cubes at a time by gripping and lifting them. Dragging, pushing, or sweeping is not allowed.
4. The robot may lift, grip, place, drag, or push Rubik's cubes only within the Warehouse zone outlined with a red border and the delivery zone. The Rubik's cube must remain within these designated areas.

5. While transporting, the Rubik's cubes must not touch the ground under any circumstances. If the cube is dropped or falls and touches the ground, points will be deducted, and the robot must be returned to the START position (Retired) immediately. Any dropped Rubik's cube will remain in place and cannot be reused.
6. Any Rubik's cube that falls outside the delivery zone or the warehouse will not be removed by referees. These cubes are considered obstacles until the round ends.
7. Rubik's cubes must be delivered to the exact positions specified on the Mission Card. Misplaced cubes will result in point deductions.
8. Delivered cubes must be fully within the grid square in the delivery area. Cubes touching the black lines will not be counted for points.
9. Teams may request to retire an unlimited number of times, but the number of retirements will be recorded and used as a tie-breaking criterion if the total scores from both rounds are equal.
10. After each retirement, competitors must return the robot to the START position.
11. If the robot becomes damaged or malfunctions during the match, the team may request a retirement for repairs, but time will not be paused.
12. If a team decides to terminate the competition prematurely, only the score achieved up to that point will be recorded, and no time will be recorded.
13. If the robot breaks down and cannot resume competition within the allotted time or fails to return to the FINISH point, only the score earned before the incident will be recorded, and no time will be recorded.
14. Teams may choose to move to the FINISH point at any time, at which point the score and time will be recorded.
15. Any interference with other teams is strictly prohibited. First offense results in a 20-point deduction. Second offense results in disqualification.
16. For any situations not covered by these rules, the judges' decision will be final and binding.

Competition Procedure

1. Before the match begins, competitors place both the robot and the remote control at the START point.
2. When the referee gives the start signal, the operator must manually press the timer and begin transporting the Rubik's cubes to the delivery zone, and may move the Rubik's cubes in any order.
3. During the match, the remote control cable must not touch the field surface. If it does, the robot will be forced to retire.

- When the task is complete or the team is satisfied with their performance, the robot must be driven into the FINISH zone, with at least 50% of its body inside. Then, the operator must place the remote down and press the stop timer button themselves. Referees will then check and record the score and time.

Scoring Rules

- A Rubik's cube must be placed in the correct target cell as specified in the Mission Card, and must not touch any of the black border lines.
- Scoring is only calculated at the end of each match round.

Mission	Score
Correct Delivery (per item)	10
Misplaced Delivery	-5
Rubik's cube touching the ground during transport	-10
The Rubik's cube touches the black border.	0

Judging

- If the best total scores of Team A and Team B are equal, **the time from the round with the best score** of each team will be used to decide the winner, with the team that used the least time winning the competition.

Example	Team A		Team B	
	score	time/minute	score	time/minute
round 1	3	2.1	7	2.25
round 2	7	2.3	3	2.15

Team A's total score = 10, Team B's total score = 10.

From the above, it can be seen that:

Team B's time in the round where they achieved their best score, with Team B using the least time to complete the mission(2.25 minutes).

Therefore, **Team B will be the winner of the competition.**

- If the times from the round with the best score for both Team A and Team B are still equal, the total number of retries from both rounds for each team will be counted. The team with fewer total retries will be the winner of the competition.

Example	Team A			Team B		
	score	time/minute	Retry	score	time/minute	Retry
round 1	3	2.1	0	7	2.25	1
round 2	7	2.25	2	3	2.15	5

Team A's total score = 10 and Team B's total score = 10 (equal).

The best-round times for Team A (2.25 minutes) and Team B (2.25 minutes) are also equal.

From the above, it can be seen that the total retries across both rounds for each team are:

Team A retries = 2 and Team B retries = 6

Therefore, **Team A will be the winner of the competition** (having fewer total retries across both rounds compared to Team B).

- If the total number of retries for both teams is still equal, a tie-breaker match will be held specifically for the teams that cannot yet be resolved