



# RobotChallenge - Unknown Mission Junior Group Rule

Revised on May 16, 2024

**Introduction:** Publish multiple competition tasks in the form of a question bank before the game, and select one of the tasks for use in the competition before debugging for the on-site competition. The known content of each question is announced in the rules, and the unknown content will be released together after the question is extracted.

**Question knowledge points:** including geometry, degree, logic, computational thinking, examination of mechanical structure design, use of robotic arms, combined use of sensors, object detection and manipulation, robot kinetic energy control, etc.

## 1. Venue setting

### 1.1 Site dimensions

- A. Venue size: 180cm long and 80cm wide.
- B. The competition venue is made of wood, and the surface will be covered with matte car stickers. The lines on the venue are laid out with insulating tape (width is about 1.7cm). The corners of the platform are at right angles, the height of the platform is about 10cm, and there is a black stage below the platform

## 2. Robot requirements

### 2.1 Robot specifications

- A. The size of the robot is 25cm\*25cm, with no height limit. It can be expanded after the robot is started.
- B. Robots are not limited to equipment, such as LEGO NXT, EV3, Spike, VEX IQ, Zhongming, Whale, Ability Storm, etc.
- C. The robot is limited to using one controller, and visual sensors are not allowed. There are no restrictions on other sensors and motors, as long as they are harmless to the human body.
- D. Robots cannot destroy venues and props.
- E. Robot program ideas, no limit on quantity. All programs need to be downloaded to the robot in advance.

### 2.2 Competition robot requirements

- A. During the competition, the team will bring the complete machine and the mechanical structure required for the task.
- B. According to the tasks issued by the competition venue, on-site debugging and modification of the complete machine.



### 3. Detailed rules of the competition

#### 3.1 Game times and times

- A. Each round is 2 minutes long.
- B. The competition consists of two rounds, which are conducted continuously. The best results from the two rounds will be used for ranking.
- C. If the two teams' best scores are the same, they will be ranked according to the remaining time corresponding to their best scores, with the team with more remaining time ranked higher.
- D. If the best score and the corresponding remaining time are the same, the ranking will be based on the second best score and the corresponding remaining time.

#### 3.2 The game starts

The participating teams take the field, and the players place the robot in the starting area to signal to the referee that they are ready. The referee announces the start of the game, and the players start the robot.

#### 3.3 End of game

- A. During the competition, if the robot falls off the field, drops parts, or the robot does not perform any action for a long time, the competition will end, the remaining time will be 0, and the score will be calculated.
- B. When the game termination task is completed, the referee stops timing and records the score and remaining time.
- C. If the team gives up the termination task, the robot will stop after completing the basic task, and the team members will raise their hands to signal the referee, who will stop the timing and record the score and remaining time.

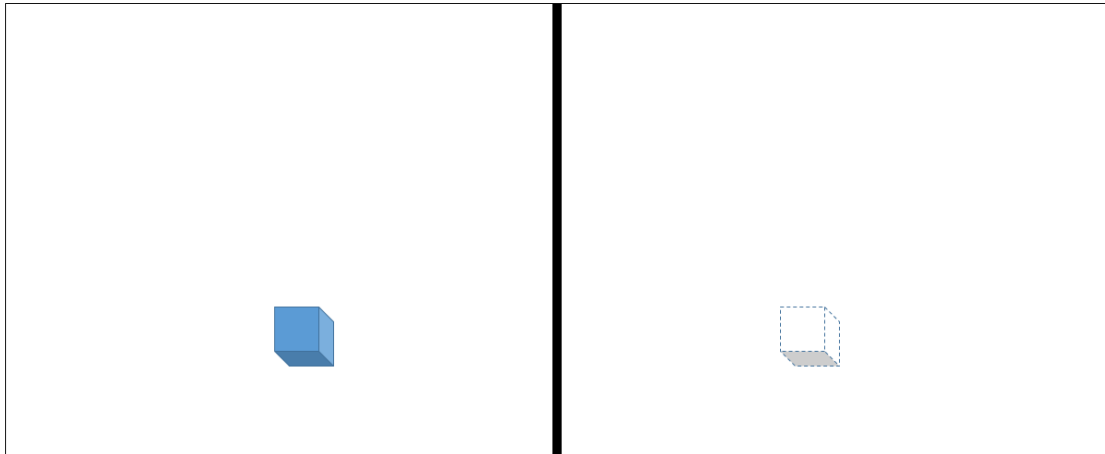
### 4. Precautions for competition

- A. The competition debugging time is 120 minutes. At the end of the debugging, inspection and isolation will be carried out.
- B. Before the robot sets off, the size cannot be larger than 25cm\*25cm.
- C. Before the game starts (the robot has not started), if there is a problem with the robot, you can apply to the referee for adjustment. Adjustment time is 5 minutes. Failure to play after the adjustment time will be deemed as a forfeit.
- D. After the game starts, if the robot fails to start (it does not leave the starting area), the team members can adjust the robot and start again, but the timer will not stop. If the robot completely exits the starting area and touches the robot with your hand, the game will be deemed to be over.
- E. After the game starts, the team can request a full reset (10-point penalty) at any time. If you choose to reset, the time will continue to count and the referee will reset the stage props.
- F. All tasks must be completed autonomously without any outside assistance.
- G. Final scoring occurs at the end of the game.



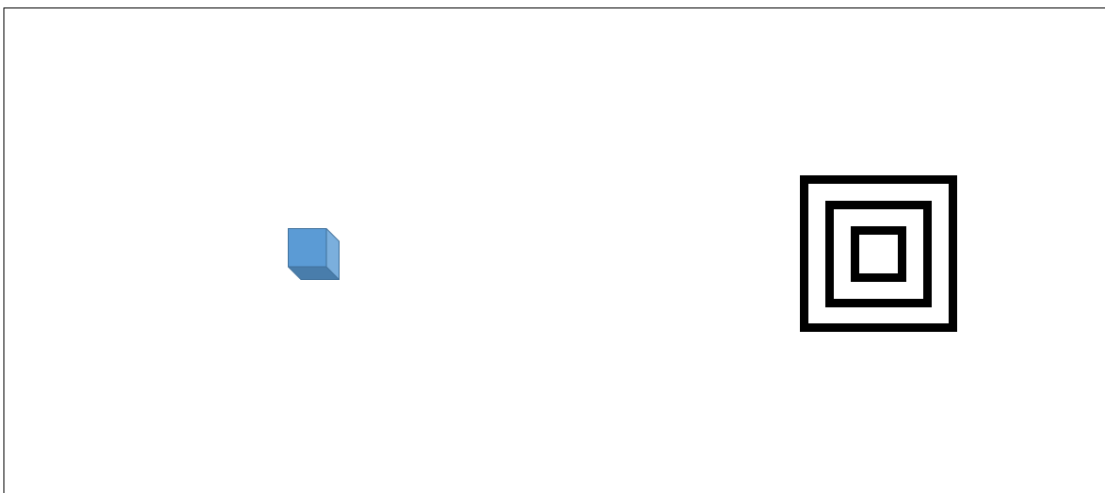
## 5. Question Bank for Junior Group

- A. Mirror placement: A line in the middle divides the field into two equal parts, and the starting area is any area on the line. Detect the strategic object placed on one side, and then move the strategic object to the mirror position. The initial position of the strategic object is random on both sides. (The starting area, the termination task, and the initial position, quantity, size, and shape of the strategic objects will be announced when the question is released).



Question A drawing example

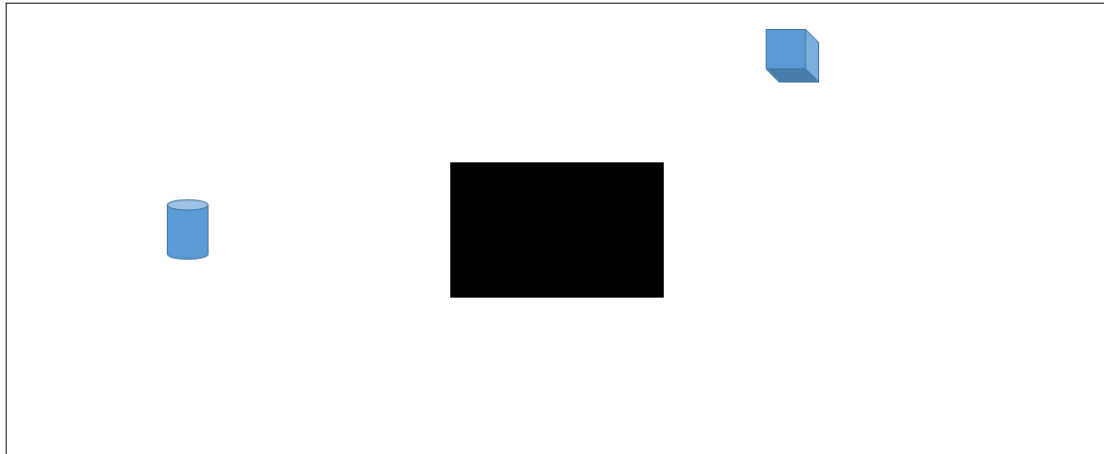
- B. Accurate placement: Detect strategic objects and then transport them to the scoring area. The scoring area is three squares with side lengths of 10cm, 20cm, and 30cm (including the width of the black line). The scores in the three areas from small to large are 20 Points, 10 points, 5 points. Strategic objects are completely determined in the scoring area: vertically projected within the square, they can press the line but cannot exit the line. Strategic objects can be stacked. (The starting area, the end of the task, the location of the scoring area, the number, location, and size of strategic objects will be announced when the question is released).



Question B drawing example

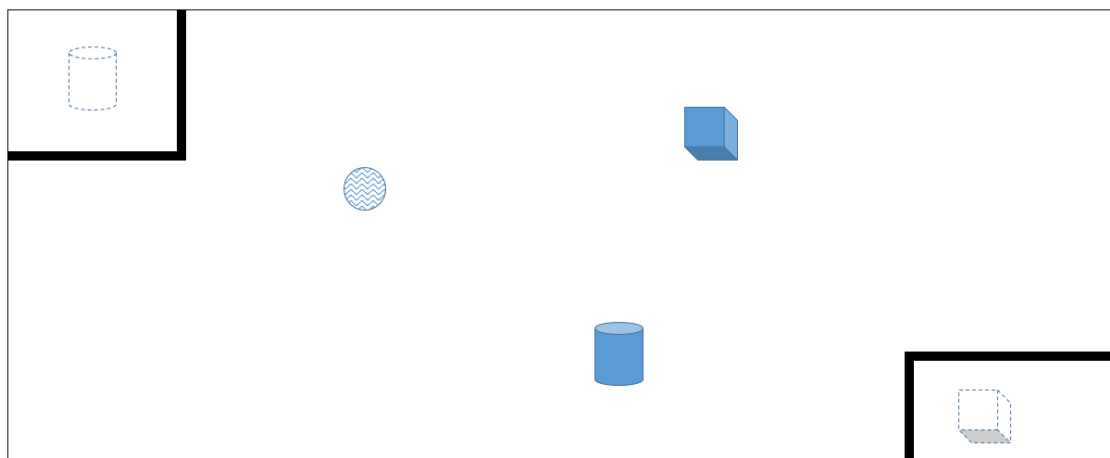


- C. Centralized transportation: Concentrate the strategic objects in the venue to the black area. The black area is arranged in the center of the venue and is about the size of an A4 paper. (The starting area, the end of the task, the number, location, size, and shape of strategic objects will be announced when the question is released).



Question C drawing example

- D. Classification processing: Classify and transport the three types of strategic objects in the venue to different areas. The strategic objects are divided into three categories: a (balls), b (three-dimensional objects), and c (nearly cylindrical objects). Push a to the ground, b, and c. Transported to respective areas. (Starting area, terminating task, location of scoring areas b and c, number, location and size of strategic objects will be announced when the question is released).

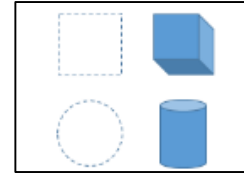


Question D drawing example



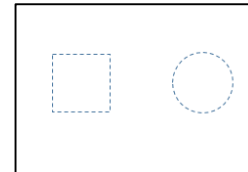
### 6. Scoring rules

- A. The strategic object completely leaves its initial position and scores 3 points (scores are recorded when it does not enter the scoring area). As shown below:
- B. If the vertical projection of the strategic object enters the correct scoring area, 20 points will be awarded.
- C. The vertical projection of the strategic object in Question B will score 20, 10, and 5 points in different scoring areas.
- D. 10 points will be awarded if part of the strategic object is projected in the correct scoring area.
- E. The robot gets 20 points for completing the termination task.
- F. Strategic objects falling outside the field will result in minus 3 points (except strategic objects that need to be pushed to the ground).
- G. A team that requests a reset during the game will lose 10 points.
- H. The robot will be awarded 5 points if it remains intact during operation.



### 7. Supplementary rules

- A. Once the unknown factors of the question are announced, they will not change.
- B. The X and Y axis parameters of the strategic objects on the site will be announced on site.
- C. The initial position of the strategic object will be marked on the field. As shown on the right:
- D. The types of strategic objects include: balls (such as Debao balls, table tennis balls, tennis balls, etc.), nearly cylindrical objects (such as water bottles, batteries, paper cups, etc.), three-dimensional objects (paper boxes, plastic blocks, building blocks, etc.) . The weight of strategic objects should be as light as possible to avoid affecting fairness.
- E. If special strategic items are used, they will be explained in advance.
- F. After the termination task is completed, the robot must be in a stationary state. If the robot is not stationary, the termination task is not completed.
- G. Question range for termination tasks: areas where the robot is stationary, mysterious tasks, etc.





Unknown competition junior group score table

project			numerical value	Point Value	Score Earned/Lost
#1	Strategic object location	The strategic object completely moves away from its initial position		3	
		The vertical projection of the strategic object enters the correct scoring area		20	
		The strategic object is partially projected in the correct scoring area		10	
#2	Question B strategic object location	Strategic objects are within 20 partitions		20	
		Strategic objects are within 10 partitions		10	
		Strategic objects are within 5 partitions		5	
#3	strategic object	Strategic objects fell off the stage		-3	
#4	Bonus points tasks	Complete the termination task	0 1 (no) (yes)	20	
#5	The robot remains intact throughout its operation		0 1 (no) (yes)	5	
#6	Reset (reset penalty)		0 1 (no) (yes)	-10	
			Total Score		
			time left:		