GAR Mars Immigration-Survival Challenge

GAR Version A

1. Scope of competition

(I) Competition groups: primary school group, junior high school group, senior high school group (including technical secondary school and vocational high school).

(II) Number of participants: 2-3 contestants/team.

(III) Instructor: 1 person (optional).

(IV) Each person is limited to participating in 1 event and 1 team.

(V) Group determination: based on the level of study of the contestants as determined by the local education administrative department (education committee, education department, education bureau).

2. Competition Theme

Mars, the red neighbor planet, has always carried the infinite imagination and hope of exploration of mankind. The first batch of immigrants will face this isolated and desolate planet. They will use the intelligence and technology of robots to explore, build and lay the foundation for future Mars immigrants to achieve sustainable survival and prosperity of mankind on this distant planet.

The theme of this robot competition is "GAR Mars Immigration-Survival Challenge". It provides an opportunity for participating teams to explore the potential of mankind in the future in space. The participating teams will show their skills and imagination under this fascinating theme in a passionate and creative way. In addition to the design and construction

of robots, the participating teams also need to demonstrate their problem-solving skills and teamwork spirit. They must develop strategies, follow time plans, maximize the use of resources, and take innovative approaches to solve various problems. Inspire the interest of the younger generation in space exploration and encourage them to show creativity and problem-solving skills. Through this competition, they have the opportunity to experience the fun of scientific discovery and technological innovation, and inspire their passion to explore the unknown and promote human progress.

3. Competition Environment

(I) Programming System: Primary school, junior high school and high school groups use AIcode computer programming software.

(II) Programming Computer: Participants must bring their own laptops for the competition and ensure that the laptops are fully charged during the competition (mobile charging devices can be provided).

(III) Prohibited Devices: USB flash drives, mobile phones, tablet computers, walkie-talkies, etc.

(IV) Competition venue:

Map

1. The venue size is 240cm long × 120cm wide.

2. The venue material is scraped cloth, and the black guide line is 2.5cm wide.

3. There are 2 starting bases: A is the Earth base and B is the Mars base. The size is 30cm long × 30cm wide.

4. The specific size of the actual competition venue, marking points, and props material, size, and weight shall be subject to the on-site provision.

Earth base Mars base

Base map

The robot can start from any base. During the competition, the participating team can adjust the structure and program of the equipment in any base, or temporarily store the prop modules of certain tasks; if the participating team members touch the robot outside any base, it will be recorded as a restart. The robot can return to any base autonomously, which is not counted as a restart.

Restart means that the robot is manually returned to the base during the competition; there is no limit to the number of restarts within a single round of competition; the scores of the tasks completed before the restart are still valid. If there is no score but the task model has changed its initial state, it cannot be manually restored.

4. Competition Equipment

(i) Each team is limited to one robot. The maximum length, width and height of the overall vertical projection of the robot before starting is limited to 30*30*30cm. After the robot starts, the size is not limited.

(ii) Only one controller is allowed. The controller must contain 2 PH-6PIN bus interfaces, 1 3PIN digital servo interface, and 1 module expansion interface (supporting bus series connection). The total number of motor interfaces on a single controller is 2, the total number of servo interfaces is 2, and the total number of sensor interfaces is not more than 5.

(iii) When the motor is used to drive the wheel, only a single motor can independently drive a single wheel on the ground.

(iv) The robot structure must be built with plastic building blocks, and the building blocks must use the design size based on the standard 8mm building system.

(v) 3D printing or laser cutting shall not be used to make structural parts, transmission parts, and minimum unit housings. Auxiliary connection materials such as screws, screws, rivets, glue, and tape shall not be used.

(vi) The robot must have its own independent battery. The battery is not allowed to be fixed by screws or electric welding. The battery voltage shall not exceed 8.4V.

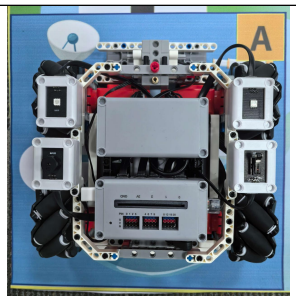
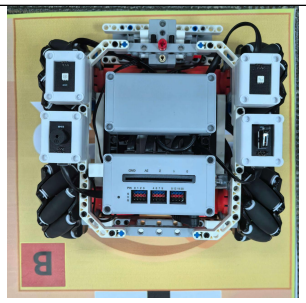
5. Competition Tasks

The tasks are divided into 7 basic tasks and 2 challenge tasks. In the trials (city, district and county competitions), only basic tasks need to be completed, while in the finals (provincial competitions), both basic tasks and challenge tasks need to be completed.

Basic tasks

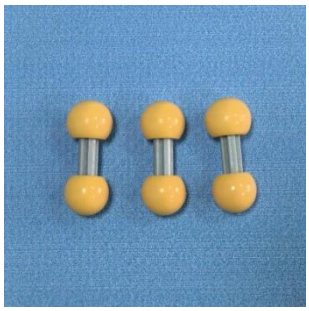
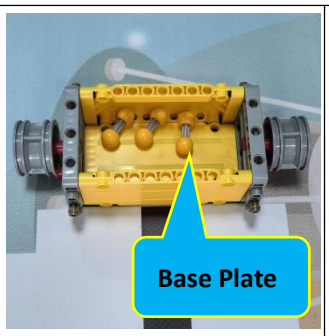
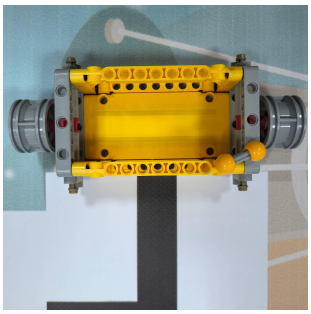
Task 1: Landing on Mars

It takes several months to land on Mars from Earth until the distance between the two becomes closer. The robot moves from Earth Base A to the vertical projection touching Mars Base B and emits three beeps to be considered successful. This mission is worth 20 points.

	
Task initial status	Task success status

Task 2: Oxygen preparation

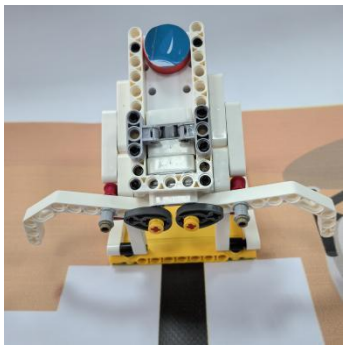
The oxygen on Mars accounts for about 0.15% of the Martian atmosphere. More oxygen needs to be prepared for human survival. The robot can start from any base and carry chemical substances to the oxygen preparation device in Area C. There are three chemical substances in total. Each successful placement will score 10 points. The chemical substance model must touch the bottom plate of the oxygen preparation device. The chemical substance model that has been taken out of the base cannot be manually brought back to the base. The maximum score for this task is 30 points.

			
Chemical substances diagram	Task initial status	Task success status	Task unsuccessful status

Task 3: Water Purification

There are underground liquid water lakes and water ice on Mars, which need to be purified to become usable water resources. The robot triggers the purification device in Area G to obtain the water model, and brings it back and makes the vertical projection completely enter the Mars base to be successful. Each one brought back will be awarded 15 points, and the maximum score for this task is 30 points.

Water model diagram



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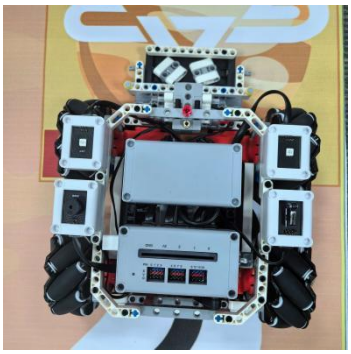

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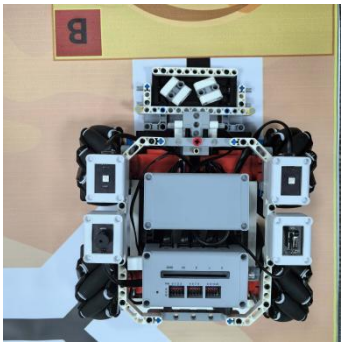
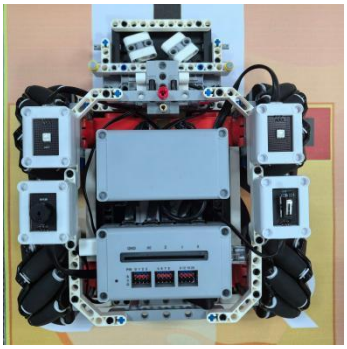




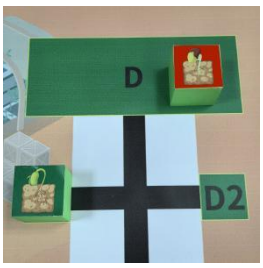
Task unsuccessful status

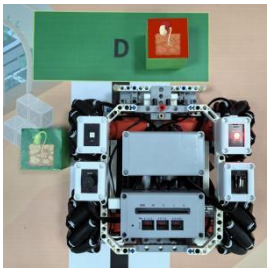
Task 4: Space Planting

To survive on Mars, nutrients are necessary. Space seed models are fixed in the D1 and D2 areas of the site (D1 is green, D2 is red). The robot needs to transport the space seeds to the space planting room in area D, and the vertical projection is completely in area D to be successful. This task is 30 points.

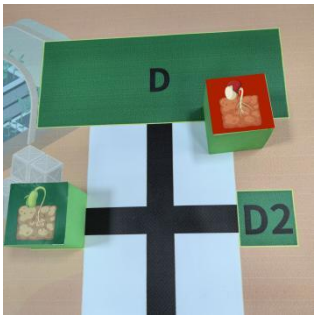
Seed diagram (left corresponds to green light, right corresponds to red light)

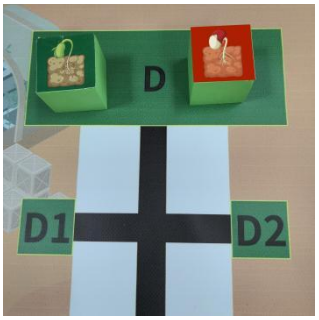
Task initial status





Task success status





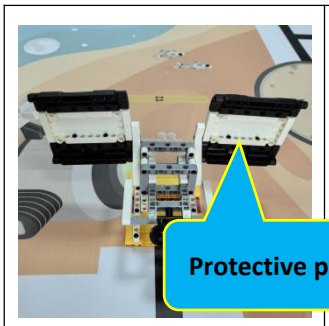
Task unsuccessful status

- The primary school group only needs to deliver any kind of seed to be successful;
- The designated space seed position is drawn by the referee from D1 and D2 before the game, and the junior middle school group needs to deliver the designated space seed to be successful;
- The designated space seed position is drawn by the referee from D1 and D2 before the game. The senior middle school team needs to transport the designated space seed and light up the light of the corresponding seed color for at least three seconds to be successful. No points will be awarded for transporting the wrong seed, and no points will be awarded for transporting both seeds.

Task 5: Radiation protection

Since the atmosphere on Mars is thin, it cannot effectively block harmful radiation, so a shield is needed to isolate radiation. A radiation shield model is fixed at the F1 or F2 position in the venue. The robot needs to trigger the shield switch, and the shield panel will be closed and two green lights will be lit. Successful opening will score 20 points, and correct lighting

will score 10 points. The maximum score for this task is 30 points.



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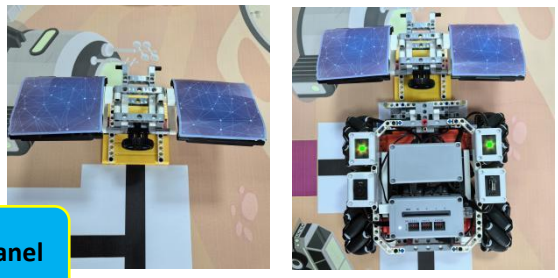
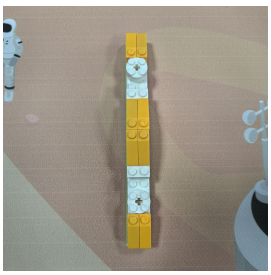


Task success status

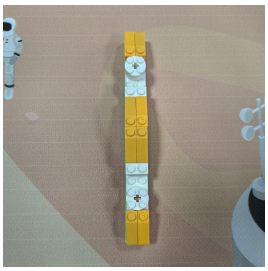
- The model position of the primary school group is fixed in the F1 area;
- The model position of the junior and senior middle school group is selected by the referee in the F1 or F2 area before debugging.

Task 6: Avoid rocks

There are many rocks on Mars that make the ground uneven. Rock models are placed in areas I1, I2, and I3 of the venue. After the robot finishes the game, if the rock model is not moved or damaged and the vertical projection is completely in area I, the mission is successful. Each rock model is 10 points, and the maximum score for this mission is 30 points.



Task initial status



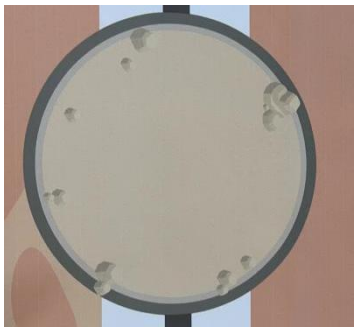
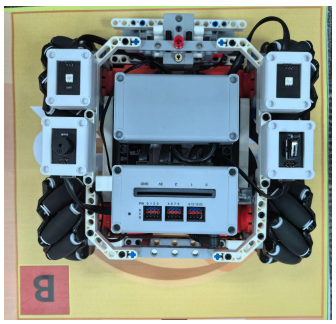
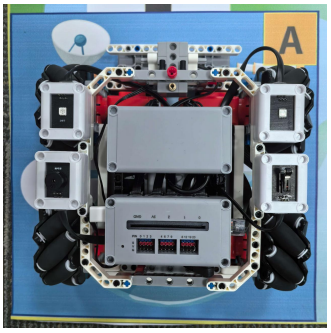
Task success status

Task unsuccessful status

Task 7: Return to Earth

Mars approaches the Earth once every two years, so the robot can only return after two years of arriving at Mars. After departing from the Mars base, the robot successfully passes through the spacecraft landing area and makes its vertical projection completely enter the

Earth base A. This task must be performed continuously and is the last task performed by the robot. The task score is 30 points.

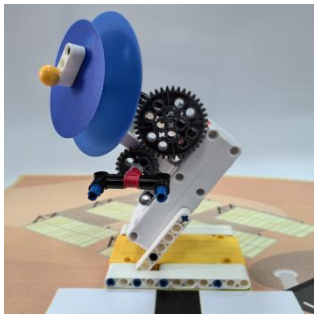
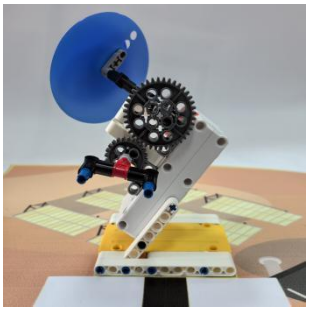
		
Spacecraft landing area	Task initial status	Task success status

- The primary school group robot is considered to have successfully passed the spacecraft landing zone if its vertical projection touches the spacecraft landing zone;
- The junior and senior middle school group robot is considered to have successfully passed the spacecraft landing zone if its vertical projection touches the spacecraft landing zone and rotates in place for no less than two circles without leaving the landing zone.

Challenge tasks

Task 8: Communication repair

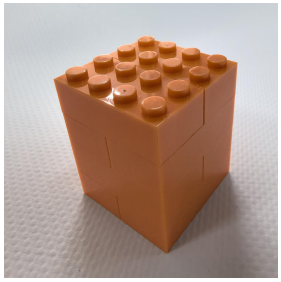
The communication between Mars and Earth needs to be wireless, and there is a signal receiving device on Mars. The robot needs to change the direction of the signal receiving device in area H, with a rotation angle of no less than 90°. The maximum score for this task is 20 points.

	
Task initial status	Task success status

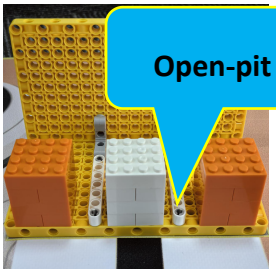
Task 9: Urban Construction

The construction of a city on Mars requires local materials, and the materials collected on Mars are made into bricks to build houses. An open-pit mine model is fixed in the E1 or E2 area of the site, and two orange brick models and a white dust model are placed in the model. The robot must separate the brick model in the open-pit mine and make the vertical projection completely detach from the base, while the vertical projection of the dust model does not detach from the open-pit mine base to be successful. If the vertical projection of the dust model detaches from the open-pit mine base, no points will be awarded. The maximum score for this task is 30 points.

- The location of the open pit for the **primary school group** was fixed in the E1 area. Success was achieved if any masonry model was successfully separated and the vertical projection of the dust model did not leave the base of the open pit.



Brick model diagram



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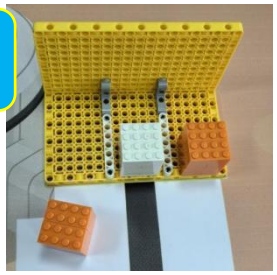

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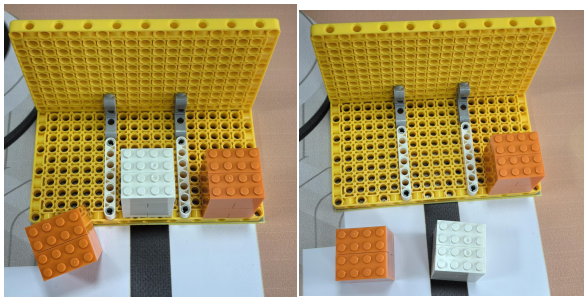

Task unsuccessful status

- Before the open pit location adjustment for the **junior middle school group**, the referee will randomly select from the E1 and E2 areas. Two masonry models need to be

separated, and 15 points will be awarded for each successful separation of a soil model. If the vertical projection of the dust model is off the open pit base, no points will be awarded.

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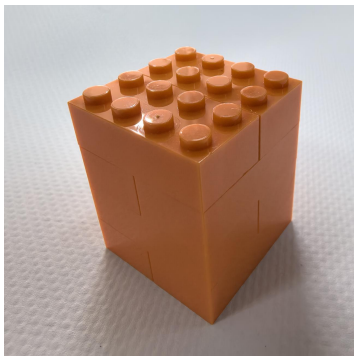
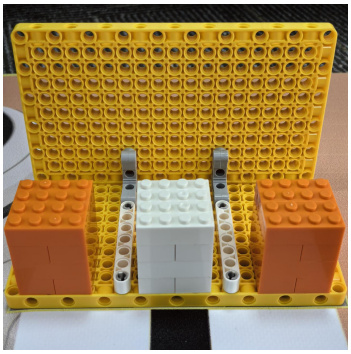
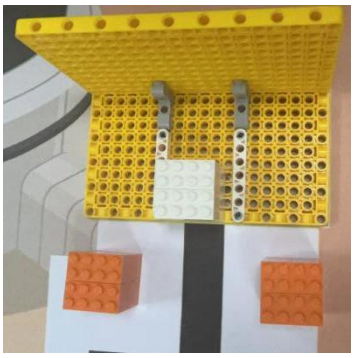
<tr><td> 
Brick model diagram</td><td> 
Task initial status</td><td> 
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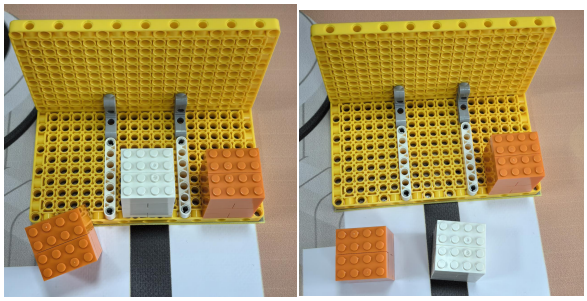
<tr><td colspan="3"> 
Task unsuccessful status</td></tr>
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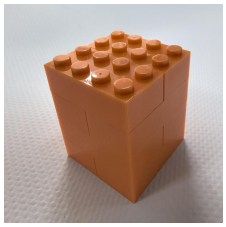
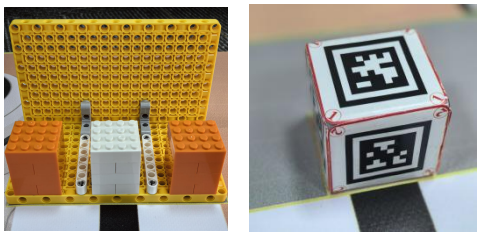
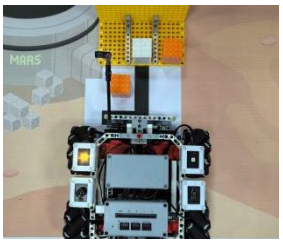
- Before debugging the position of the open pit for **senior middle school group**, the referee will randomly select from the E1 and E2 areas. The tag code module is fixed in the remaining position in E1 and E2. Before each round of competition, the referee randomly places the tag code module. The robot needs to identify the tag code directly above, and according to the recognition result, if it is 1, light a yellow light for at least three seconds to separate the masonry model on the left; if it is 2, light two yellow lights for at least three seconds to separate the masonry model on the right. 15 points are awarded for successfully separating the corresponding model, and 15 points for correctly lighting the light. If the vertical projection of the dust model is separated from the base of the open pit, no points will be awarded.



Brick model diagram



Task initial status



Task success status

6. Time and frequency

Group	On-site programming and debugging time	Task duration	Task frequency
Primary	60 mins	180s/times	2 times
Junior middle	60 mins	180s/times	2 times
Senior middle	60 mins	180s/times	2 times

1. On-site programming and debugging time: During this time, all participating teams in each group will perform programming and debugging uniformly.
2. Specified task time: The start and end time specified by the robot to complete the competition. If the competition is not completed within the specified time, the competition will be forced to end.

7. Competition Process

(I) Check-in

1. Each team should enter the designated venue at the time specified in the competition schedule and check-in at the entrance of the competition venue. During the check-in, the referee will check the equipment and devices (such as laptops) carried by each team according to regulations. It is strictly forbidden to bring USB flash drives, mobile phones, walkie-talkies, telephone watches and other communication equipment into the venue.

2. During the check-in, the participating teams can bring the entire robot into the venue, but they must pass a comprehensive inspection to ensure that they comply with relevant regulations. The contestants should make repairs and improvements to the parts that do not

meet the regulations, and can only participate in the competition after passing the re-inspection.

3. The participating teams that pass the check-in can enter the preparation area.

4. Within the specified time, the participating teams that fail to check-in will lose the qualification to compete.

(II) Drawing and debugging

1. The referee summons the representatives sent by the participating teams entering the preparation area to draw lots to determine the location of the task model, etc. The results of the draw will be announced to all participating teams immediately.

2. The participating teams have at least 60 minutes to build the robot and debug the program before the start of the first round. After the first round, there is at least 30 minutes for the second round of debugging. The specific duration of the competition debugging will be adjusted by the referee team according to the actual situation and announced to all participating teams before each round of debugging.

3. Participants need to line up in an orderly manner according to the order of the competition venue for programming and debugging. Participants who do not follow the order may be disqualified.

4. After the programming and debugging, all participating teams must place the robots in the designated location of the referee for storage. Participants are not allowed to touch the robots without permission, otherwise they will be disqualified.

5. After the referee signals the start of the game, the participating teams that are still not ready will lose the opportunity to compete in this round, but will not affect the next round.

(III) Pre-match preparation

1. After receiving the notification to enter the competition area, the participating teams should pick up their robots in the robot storage area and then enter the competition area under the guidance of volunteers.

2. At the designated competition venue, the participating teams have 1 minute of pre-match preparation time.

3. Before the end of the pre-match preparation time, the participating teams should put their robots in place in the starting area. The robots can be powered on, but no visible movements are allowed.

8. Run and End

(I) Robot operation

1. Robot startup and operation mode: The robot must be stationary before the base is started. It is allowed to start by "pressing a button". The robot must run autonomously after starting. Once the robot is started, the team members are not allowed to touch the robot (except for restarting).

2. No pause within the time limit for completing the task.

3. Within the time limit for completing the task, if the structure of the participating robot falls off, the contestant can retrieve the fallen parts by himself without affecting the normal operation of the robot.

4. The robot cannot be replaced during the competition (it is allowed to replace the functional structural parts required for the task), and the robot software cannot be changed.

5. The referee determines the order of the contestants on site.

(II) End of the game

1. Complete all tasks within the specified time.

2. The total duration of a single round of competition is 180 seconds. When the time is up, the referee blows the whistle to end the game.

9. Evaluation Standards

(I) Score calculation

1. After the competition, the score is calculated based on the final completion status of the task.

2. If only part of the task is completed within the specified time, the score is calculated based on the task actually completed.

3. The final total score of the participating team is the sum of the scores of two rounds.

4. The highest score of the two times is taken. The one with the higher score ranks higher. If the scores are the same, the one with less time ranks higher; if the scores and time are the same, the one with fewer restarts ranks higher.

(II) No awards

1. The contestant is more than 10 minutes late.

2. The contestant deliberately damages the competition venue.

3. The contestant does not follow the instructions of the referee (judge).

4. Multiple teams share a robot.

5. The contestant's competition score is zero.

6. The contestant is complained and the complaint is established.

7. The contestant participates in multiple events.

8. The robot is remotely controlled after it is started.

10. Related instructions

1) Each contestant is limited to one event. Duplicate or false registration is strictly prohibited. Once discovered or reported, the contestant will be disqualified.
2) Contestants can form teams from the same school or from other schools within a prefecture-level city. Teams from other provinces or prefecture-level cities are not allowed to register for the competition. Once discovered or reported, the contestant will be disqualified.
3) These rules are the basis for the implementation of refereeing work. During the competition, the referee (judge) has the final decision. All matters not stated in the rules shall be decided by the referee team.

GAR Mars Immigration (Survival Challenge) Competition Score Sheet

GAR Mars Immigration (Survival Challenge) Primary School Group, Junior Middle School Group, Senior Middle School Group Competition Score Sheet

Name: Contestant 1: Contestant 2: Contestant 3:			Group: Primary School Group ☐ Junior Middle Group ☐ Senior Middle Group ☐	
	Basic tasks	Score	Round 1 Scoring	Round 2 Scoring
1	Landing on Mars	20		
2	Oxygen preparation	10*3		
3	Water Purification	15*2		
4	Space Planting	30		
5	Radiation protection	20+10		
6	Avoid rocks	10*3		
7	Return to Earth	30		
	Challenge tasks	Score	Round 1 Scoring	Round 2 Scoring
1	Communication repair	20		
2	Urban Construction	15+15		
	Time	180 seconds		
	Total score			
	Restart times			
Team signature			**Referee Signature**	