GAR Mars Immigration 2024

——Civilization construction

1. Scope of participation

1) Participating groups: lower primary school group (grades 1-3), upper primary school group (grades 4-6), junior high school group, high school group (including technical secondary school and vocational high school).
2) Number of participants: 2 people/team.
3) Instructor: 1 person (can be vacant).
4) Each person is limited to participating in 1 event and 1 team.

2. Competition theme

Mars, the red neighbor planet, has always carried mankind's infinite imagination and hope of exploration. 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 year's robot competition is "GAR Mars Immigration—Civilization Construction". Providing teams with an opportunity to explore the future potential of humanity in space, teams showcase their skills and imagination in a passionate and creative way on this fascinating theme. In addition to the design and construction of robots, participating teams also need to demonstrate their problem-solving skills and teamwork. They must develop strategies, follow timelines, maximize resources, and take innovative approaches to solve various problems. Inspire the younger generation's interest in space exploration and encourage them to display creativity and problem-solving skills. Through this competition, they have the opportunity to experience the fun of scientific discovery and technological innovation, inspiring their enthusiasm for exploring the unknown and pushing mankind forward.

3. Competition process

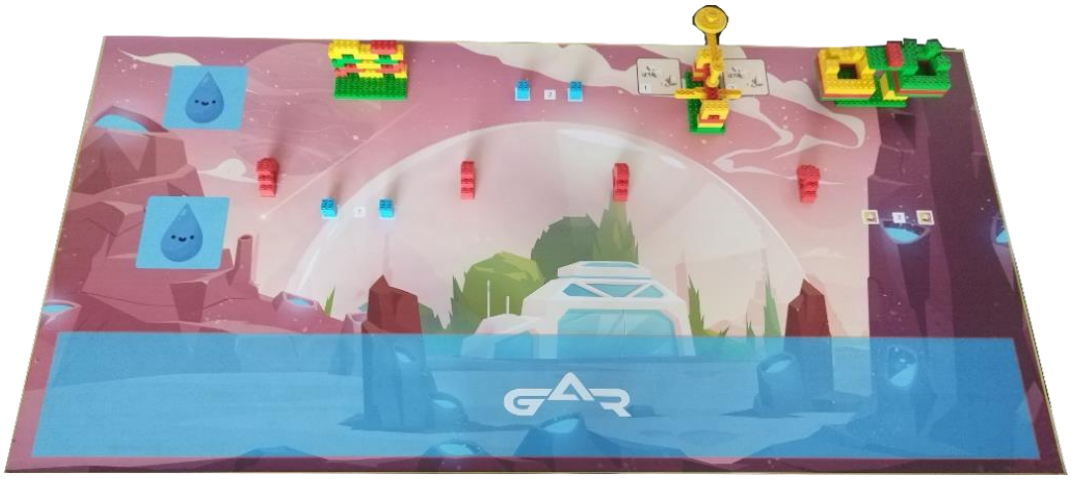
1) Registration: Competitors must register according to the prescribed method and time. Those who successfully register are eligible to participate in the selection competition.
2) Selection competition: According to the method stipulated by the organizing committee, the contestants will be organized to compete within the specified time to select the contestants who advance to the finals.

3) Finals: The finalists compete within the specified time.

4. Competition environment

1) Programming system: Lower primary school students use physical programming systems or computer programming software; upper primary school students, junior high school students, and high school students use computer programming software.
2) Programming computer: Contestants are required to bring their own laptops for competition and ensure that the laptops have sufficient power during the competition (you can bring your own mobile charging equipment).
3) Forbidden equipment: USB flash drives, mobile phones, tablets, walkie-talkies, etc.
4) Competition venue:

A. Lower primary school group



GAR version B map

(1) The venue size is 240cm long x 120cm wide (±5mm).

(2) The size of the departure base is 230cm long x 30cm wide.

(3) The actual size of the competition venue, marking points and material, size and weight of props shall be subject to those provided on site.

Base map

During the competition, the participating teams can adjust the structure and program of the equipment in the base, or temporarily store prop modules for certain tasks; any team members who come into contact with the robot outside the base will be recorded as a restart.

B. Upper primary school students, junior high school group

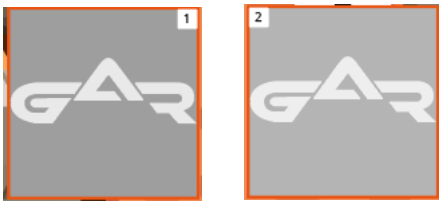
GAR version A map

(1) The venue size is 240cm long x 120cm wide (±5mm).

(2) The venue material is scraped cloth, and the width of the black guide line is 2.5cm (±2mm).

(3) The size of the departure base is 30cm long x 30cm wide.

(4) The actual size of the competition venue, marking points and material, size and weight of props shall be subject to those provided on site.



Base map

There are 2 bases in total, and the robot can start from any base. During the competition debugging process, the participating teams can adjust the structure and program of the equipment in the base; during the competition, a team member who touches the robot outside the base will be recorded as a restart. The robot can return to any base independently and does not count as a restart.

C. Restart

Restart means that during the competition, the robot is manually returned to the base; within a single round of competition, there is no limit to the number of restarts; the scores of tasks completed before the restart are still valid. If no points are scored but the task model has changed the initial state, manual recovery is not allowed; during the competition There is no need to ask the referee for instructions when restarting.

5. Competition equipment

A. Lower grade primary school group

1) Each team uses one robot.
2) The maximum length, width and height before the robot starts is 30cm*30cm*30cm. There is no limit to the size after the robot starts.
3) Each robot is limited to 1 controller. The number of motor ports on a single controller

must be 2, the number of sensor ports must be 2, and the controller body must have no less than 20 programming buttons.

4) The robot structure must be built using plastic building blocks, and the building blocks must use an 8mm building system.

B. Primary school senior group, junior high school group, high school group

1) Each team uses one robot. Before the robot is started, the overall vertical projection is limited to a maximum length, width and height of 30*30*30cm. There is no limit to the size of the robot after it is started.
2) Each robot is limited to 1 controller.
3) When the motor is used to drive the wheel, only a single motor can independently drive a single grounded wheel.
4) The robot structure must be built using plastic building blocks, and the building blocks must use 8mm building systems.
5) 3D printing or laser cutting is not allowed to make structural parts, transmission parts, and minimum unit casings.
6) The robot must provide its own independent battery. The battery is not allowed to be fixed with screws or electric welding. The battery voltage does not exceed 9V.

6. Competition task

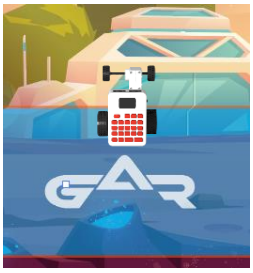
The tasks are divided into 5 basic tasks and 2 challenge tasks. The number of tasks to be completed in the actual competition is determined by the chief referee and announced 2 hours before the competition.

A. Lower grade primary school group

Basic tasks:

1) Departure

When the robot starts running autonomously and the vertical projection completely leaves the base, the task is deemed completed. The schematic diagram is as follows:

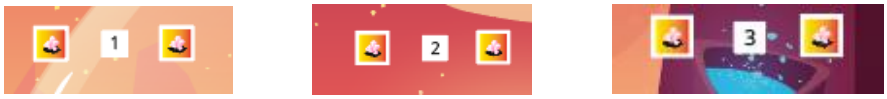
	
Finished status	Unfinished status

1.1 The robot sets off from the base and the vertical projection completely leaves the base. The task is deemed to be completed and 30 points are awarded;

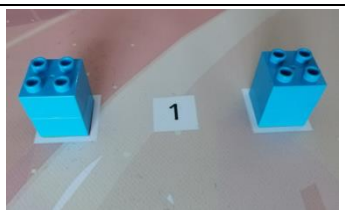
1.2 If you leave the base multiple times, the score will not accumulate. The maximum score for this task is 30 points.

2) Mining minerals

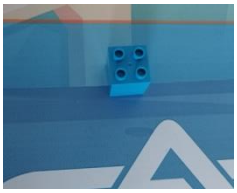
The planet is very rich in mineral resources. A large amount of resources are needed to build Mars. Robots are required to bring the ores from the mining area back to the base. The schematic diagram is as follows:



The placement of ores



Initial placement



Finished status

2.1 There are 4 ores in total, in groups of 2, which are placed in 2 of the 3 positions as shown in the figure;

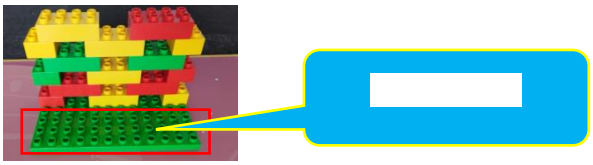
2.2 When the vertical projection of the ore touches the base, the task is deemed completed. One is worth 10 points, and the maximum point for this task is 40 points.

3) Build a protective wall

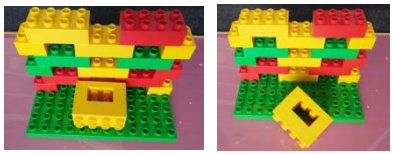
Mars is basically a desert planet, with sand dunes and gravel on the surface, and no stable liquid water. The atmosphere dominated by carbon dioxide is thin and cold, with sand and dust suspended in it, and dust storms often occur every year. Therefore, a protective wall needs to be built to block sandstorms. Now the material model needs to be transported to the construction area as shown below:

Model placement

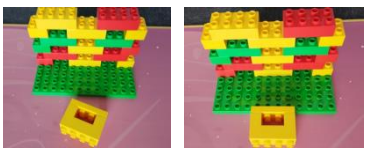
Material model



Initial placement



Finished status



Unfinished status

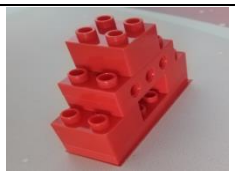
3.1 A total of 3 material models are saved outside the map. They can be placed on the robot or on the map when completing this task. The vertical projection of the material model must not exceed the base initially;

3.2 The green area of the task model base is the task scoring area. The vertical projection of the material model in the green scoring area and keeping it until the end of a single round of competition will score 30 points. See the completed state in the picture above. No points will be scored if it is only attached to the side of the base model or does not touch the base model. , see the unfinished state in the picture above;

3.3 This task has a maximum score of 30 points and can be completed repeatedly. The scores do not accumulate. The material model has been taken out of the base and cannot be brought back to the base manually.

4) Avoid Mars Mountains

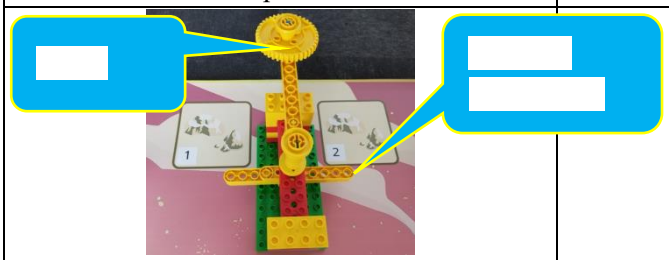
There are many mountains on Mars. In order to better promote the construction of the Mars mission, the robot needs to avoid the Mars mountains when performing the mission. The schematic diagram is as follows:

	
Model placement position (4 in total)	Initial state

At the end of a single round of competition, if the task model does not fall over or be damaged and the vertical projection does not completely leave the display area, the task is deemed to be completed. Each model is worth 5 points, and the maximum point for this task is 20 points.

5) Geological exploration

The geology of Mars is very different from that of the Earth. To analyze one of the two areas of soil on Mars, a robot is required to trigger the exploration instrument. The schematic diagram is as follows:

	
Model placement	Area to be analyzed
	
Initial placement of exploration instruments	Finished status

5.1 The robot triggers the triggering mechanism of the model, causing the probe to rotate to the designated area and maintain it until the end of a single round of competition, and the task is deemed to be completed;

5.2 This task has a maximum score of 30 points. The vertical projection of the detector head touches the designated area and 30 points are awarded.

Challenge tasks:

1) Looking for water

Water is the source of life, and liquid water has also been confirmed to exist on Mars. There are currently two water source areas. The robot needs to move to the first water source area to stop and turn on the lights, and then move to the second water source area to stop and turn on the lights again, the schematic diagram is as follows：

Water source area (2 blocks in total)

1.1 The task is deemed completed when the vertical projection of the robot controller touches the water source area and lights up successfully;

1.2 If the robot stops and lights up in the first water source area, it will score 15 points. If it moves to the second water source area and lights up again, it will score another 15 points;

1.3 This task has a maximum score of 30 points and must be completed consecutively. Points for repeated completions will not be accumulated.

2) Make oxygen

The respiration of living things consumes oxygen. The oxygen content of the Martian atmosphere is low. Iron oxide on Mars is now needed to reduce oxygen for use in the living area. A robot is required to place the iron oxide model in the oxygen generating device, as shown in the diagram below:

Model placement

Initial placement of model

Iron oxide model

Finished task

2.1 A total of 2 iron oxide models are saved outside the map. They can be placed on the robot or on the map when needed to complete this task. The initial vertical projection of the material model must not exceed the base;

2.2 There are 2 drop-in areas. The drop-in area will be determined by drawing lots on site. The robot will drop a model into the groove of the designated drop-in area and keep it until the end of a single round. The task is deemed to be completed. If there are models in both drop-in areas, no points will be scored;

2.3 This task has a maximum score of 30 points and can be completed repeatedly. The scores do not accumulate. The material model has been taken out of the base and cannot be brought back to the base manually.

B. Primary school senior group, junior high school group, high school group

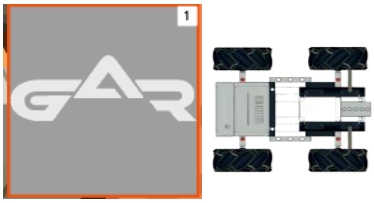
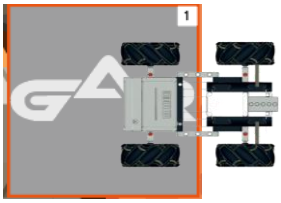
Basic tasks:

1) Departure

After the robot is started, it needs to run autonomously. When the vertical projection of the robot completely leaves the starting base, the task is deemed to be completed:

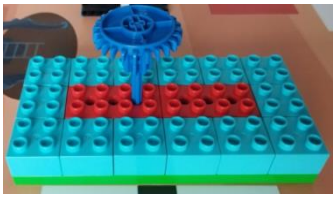
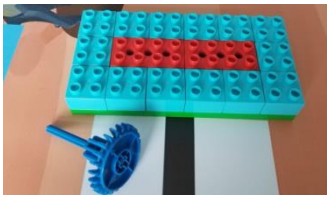
1.1 The robot needs to start from the starting base. When the vertical projection of the robot completely leaves the starting base, the task is deemed to be completed and 30 points are awarded;

1.2 If you leave the base multiple times, the score will not accumulate. The maximum score for this task is 30 points.

 Finished status	 Unfinished status

2) Mining groundwater

Water is the source of life, and liquid water has also been confirmed to exist on Mars. There is a possible water source area fixed in the green area of the site that needs to be mined for groundwater. The schematic diagram is as follows:

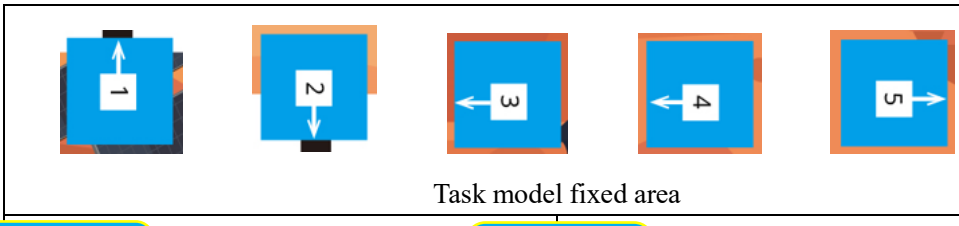
 Task model fixed area	 Water model
 Initial status	 Finished status

2.1 The robot pulls out the water model from the base model as the task is completed;

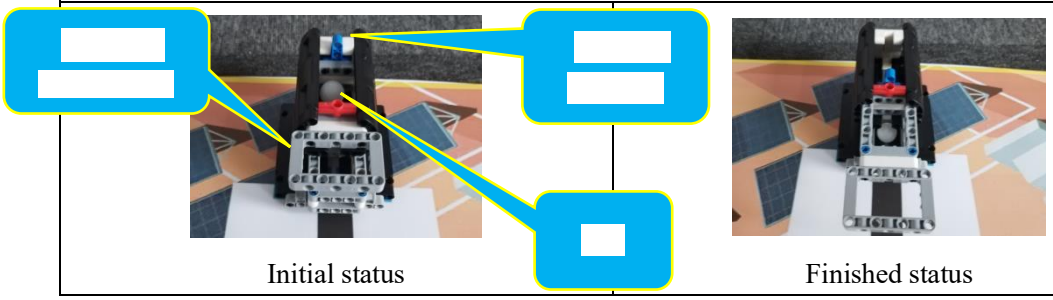
2.2 At the end of a single round of competition, if the water model breaks away from the base model or falls on or on the side of the base model, it will score 30 points. The maximum score for this task is 30 points.

3) Mining minerals

Mars is very rich in mineral resources. A large amount of resources are needed to build Mars. Robots are required to mine the ores in the mineral areas. The schematic diagram is as follows:



Task model fixed area



Initial status Finished status

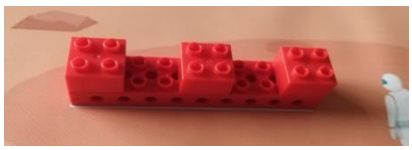
3.1 There are 2 mission models fixed in the blue area (5 in total) in the venue. According to the arrows in the fixed area, the direction of the triggering mechanism of the mission model is consistent with the arrow;

3.2 There is 1 ore on each mining machine. By triggering the triggering mechanism on the mining machine, the robot mines the ore to the receiving basket as the task is completed and scores 30 points. The maximum score for this task is 60 points.

4) Avoid Mars Mountains

There are many mountains on Mars. In order to better promote the construction of Mars missions, 2 Mars mountain models are fixed in the gray area (total 2) of the site. When the robot performs the mission, it needs to avoid the Mars mountains. The schematic diagram is as follows:

Model placement



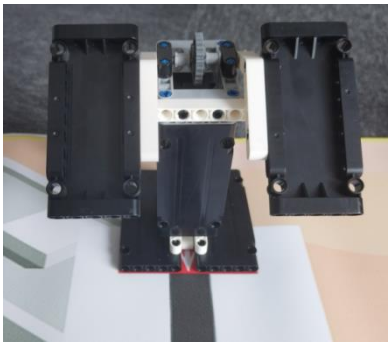
Model initial state

At the end of a single round of competition, if the task model does not fall over or be damaged and the vertical projection does not completely leave the display area, the task is deemed to be completed. Each model is worth 15 points, and the maximum point for this task is 30 points.

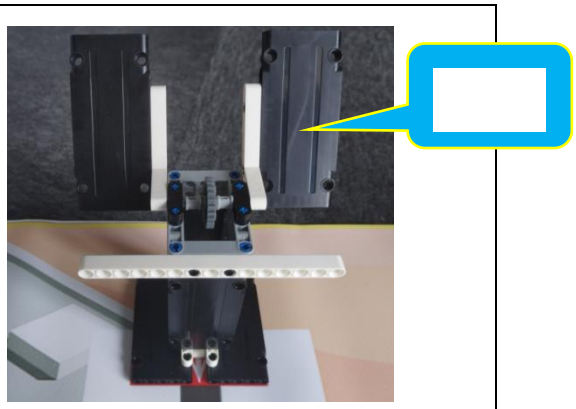
5) Geological exploration

The geology of Mars is very different from that of the Earth. To analyze the geology of Mars now, a robot is required to start the exploration instrument. The schematic diagram is as follows:

Task model fixed area



Initial status



Finished status

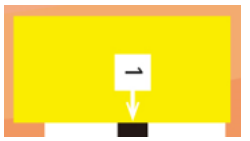
5.1 There are 2 task models fixed in the red area (4 in total) in the venue. According to the arrows in the fixed area, keep the direction of the task models consistent with the arrows;

5.2 The robot starts the exploration instrument by turning up the instrument panel. The instrument panel remains turned up until the end of a single round of competition. The task is deemed to be completed. Each robot is worth 30 points. The maximum score for this task is 60 points.

Challenge task

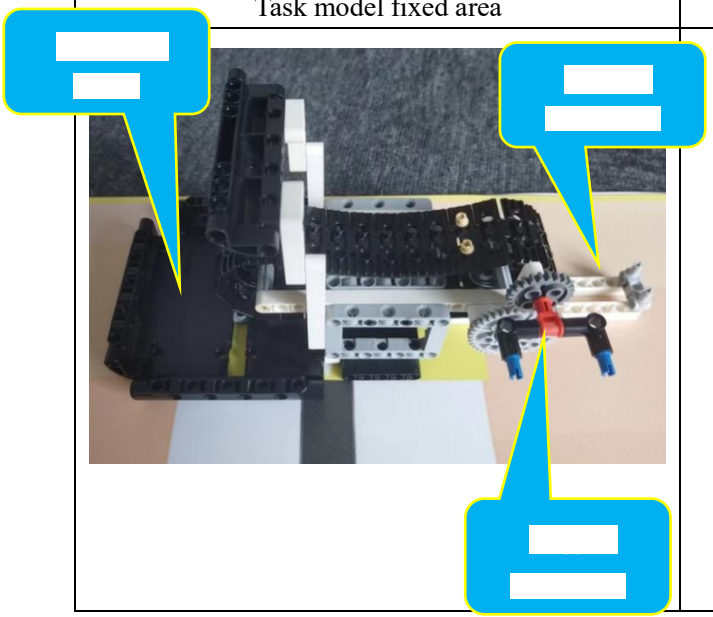
1) Build living area

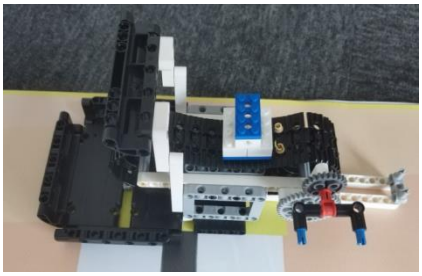
The living area construction materials are in short supply. The robot needs to deliver the building materials to the living area through the conveyor belt. The schematic diagram is as follows:

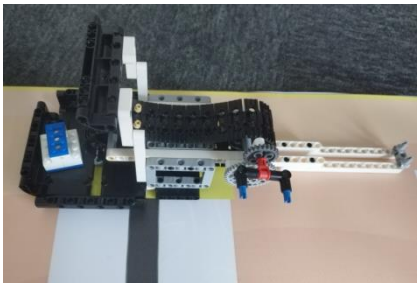


Task model fixed area

Material model







Initial status	Finished status

1.1 There is a task model fixed in the yellow area (2 in total) in the venue. According to the arrow in the fixed area, keep the direction of the task model consistent with the arrow;

1.2 A total of 3 material models are saved outside the map. They can be placed on the robot or on the map when needed to complete this task. The initial vertical projection of the material model must not exceed the base;

1.3 The robot carries the material model from the starting base to the task area. Successfully placing a material model on the track will score 30 points. It can be placed repeatedly, but the score does not accumulate;

1.4 The robot transports the material to the receiving basket through the crawler track through the triggering mechanism of the model. The task is deemed to be completed and another 30 points are awarded;

1.5 No points will be awarded for placing materials directly into the receiving basket. The maximum score for this task is 60 points.

2) Emergency rescue

It is inevitable that unexpected accidents will occur during Mars construction, and rescue signals need to be sent out in time. At the end of the competition, the robot must return to a base that is not used as the starting base and stop. The entire vertical projection of the robot is completely within the base and the light flashes no less than 3 times after stopping. It is considered as If the task is completed, you will get 30 points. If you complete the task halfway, you will get no points.

	
Unfinished status	Finished status

C. Task variables

Lower grade primary school group:

(1) All variables are determined before debugging begins;

(2) Mining minerals: The ores are placed in groups of 2, and you choose two of the three placement areas;

(3) Geological exploration: Choose one of the two areas to be analyzed;

(4) Produce oxygen: Choose one of the yellow release area and the green release area.

Elementary school senior group, junior high school group, high school group:

(1) All variables are determined before debugging begins;

(2) Departure: The departure base is one of the two bases in the venue;

(3) Exploiting groundwater: The initial position of the water model is to choose one of the six holes above the base model;

(4) Mining minerals: The initial position of the model is in two of the five blue areas on the site;

(5) Geological exploration: Choose two of the four red areas in the site as the initial position of the model;

(6) Construction of living area: The initial position of the model is in one of the two yellow areas on the site.

D. Usage time and frequency

Group	On-site programming and debugging time	Specified task duration	Specified number of tasks
Lower grade primary school group	Determined by the on-site organizing committee	180 seconds/time	2 times
Primary school senior group	Determined by the on-site organizing committee	180 seconds/time	2 times
Junior high school group	Determined by the on-site organizing committee	180 seconds/time	2 times
High school group	Determined by the on-site organizing committee	180 seconds/time	2 times
1. On-site programming and debugging time: During this time, all participating teams in each group will perform programming and debugging in a unified manner. 2. Specified task duration: The start and end time specified by the robot to complete the competition. If the robot fails to complete the competition within the specified time, the competition will be forcibly ended.			

7. Run and finish

(1) Robot operation

1. Robot startup and operation mode: The robot must be stationary before starting at the base. It is allowed to start by "pressing the button". The robot must run autonomously after starting.

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

3. If the structure of the participating robot falls off within the time limit for completing the task, the contestant can ask the referee to help retrieve the fallen parts without affecting the normal operation of the robot.

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

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

(2) The end of the game

1. Complete all tasks within the specified time.

2. The specified time ends.

8. Evaluation criteria

(1) Score calculation

1. Only part of the tasks are completed within the specified time, and the score will be calculated based on the actual completed tasks.

2. The result will be the highest score of 2 times.

3. The one with higher scores will be ranked higher. If the scores are the same, the one with less time will be ranked higher. If the scores and time are the same, the one with fewer restarts will be ranked higher.

(2) No awards will be given

1. Contestants are more than 10 minutes late.

2. Competitors deliberately damage the competition venue.

3. Contestants do not follow the instructions of the referee (judge).

4. Not all players from the participating teams attended the competition.

5. The contestant's score is zero.

6. Complaints were filed against contestants and were established.

7. Contestants participate in multiple competitions.

8. After the robot is started, it becomes a human-controlled robot.

9. Related instructions

1. Each player is limited to participating in one event. Repeated and false registrations are strictly prohibited. Once discovered or reported, the competition qualification will be disqualified.

2. Contestants can form teams from the same school, or form teams from across schools within a prefecture-level city; they are not allowed to form teams across provinces or prefecture-level cities. Once discovered or reported, the competition will be disqualified.

3. These rules are the basis for the implementation of referee work. During the competition, the referee (judge) has the final right to make a decision. Any matters not specified in the rules shall be decided by the referee team.

10. Score sheet

GAR Mars Immigration (Civilization Construction)
Lower grade primary school group score table

Team name:			Group:	
	Basic task	Score	Score in 1st round	Score in 2nd round
1	Departure	30		
2	Mining minerals	10*4		
3	Build a protective wall	30		
4	Avoid Mars Mountains	5*4		
5	Geological exploration	30		
	Challenge task	Score	Score in 1st round	Score in 2nd round
1	Looking for water	15+15		
2	Make oxygen	30		
	Time	180s		
	Total score			
	Re-start times			
Participant's signature:			Referee's signature:	

GAR Mars Immigration (Civilization Construction)

Primary school senior group, junior high school group, high school group score table

Team name:			Group:	
	Basic task	Score	Score in 1st round	Score in 2nd round
1	Departure	30		
2	Mining groundwater	30		
3	Avoid Mars Mountains	15*2		
4	mining minerals	30*2		
5	Geological exploration	30*2		
	Challenge task	Score	Score in 1st round	Score in 2nd round
1	Build living area	30+30		
2	Emergency rescue	30		
	Time	180s		
	Total score			
	Re-start times			
Participant's signature:			Referee's signature:	