

# 2019 World GreenMech & Taiwan GreenMech Contest Regulations



Hosts: National Chung Hsing University  
World Forum For GreenMech Promotion

Co-Organizers: Genius Toy Taiwan Co., Ltd

World GreenMech Official Website: [www.worldgreenmech.com](http://www.worldgreenmech.com)

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## World GreenMech & Taiwan GreenMech Contest Regulations

### 1. Contest Purpose

The 2019 World GreenMech Contest is an engineering-for-fun challenge, run by the World Forum for GreenMech Promotion. Using scientific principles, this competition combines Science, Technology, Engineering, Art, and Mathematics (STEAM) to promote learning and growing. There are three contests: (i) GreenMech (ii) R4M and (iii) GreenMech Jr.. Each seeks to inspire contestants in their own way to engage in scientific study, creative problem solving, and better understand the use of scarce resources when project planning. Contestants can enjoy pitting their different skills, abilities and creativity against each other in a fun and friendly environment. There is ample opportunity for all contestants to make their contribution count.

#### 1. 1. Notes on the Regulations:

“Organizer” refers to the GreenMech (hereafter GM) and the Robot for Mission (hereafter R4M) competition Organizers.

All times and dates use the standard US system, mm/dd/yyyy and the 24 hour clock.

## 2. General Contest Information

### 2.1. Summary of Events

	2019 World GreenMech Contest		
	GreenMech	R4M	Remarks
Participant Selection	Full time students in grades 1-12.	Full time students in grades 1-12.	Students in education until June 4, 2019
Team Size	3 to 4 person	3 to 4 person	For rules governing replacement of team-mates see in section 2.2
No. of Instructors	1 to 3person	1 to 3 person	The instructor can be a teacher or parent

### 2.2. Player Replacement

If a player should be unexpectedly absent from the contest for any reason the team leader can apply for two players replacement prior to July 19<sup>th</sup> 2019.

### 2.3. Enrollment & Qualification

Notes	County/city level regional contests.	In the event of no regional contest.	Overseas Competitors
Enrollment through regional contest is strongly recommended	<p>Number of eligible regional competitors for a region with:</p> <p>0~20 teams, 3 may qualify.</p> <p>21 to 25 teams, 4 may qualify.</p> <p>25 to 30 teams, 5 may qualify.</p> <p>31 to 35 teams, 6 may qualify</p> <p>36 to 40 teams, 7 may qualify</p> <p>41teams or more, 8 may qualify</p> <p>The maximum number of teams from any region is 8.</p> <p>(The number of teams must be reported to the organizers before May 31, 2019.)</p>	<p>There can only be 2 teams recommended for each county/city region.</p> <p>(The number of teams must be reported to the organizers before April 30, 2019.)</p>	<p>Recommended by Organizers in overseas regions</p>

Independents & Self-Enrolment	Competitors can enroll as an independent if they do not fall under a given region. For more information see the section 2. 4. Organizers will announce the number for independents & Self-Enrolment on the World GreenMech website on May 4, 2019.	Competitors can enroll as an independent if they do not fall under a given region. For more information see in section 2. 4. .	
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#### 2. 4. Self-Registration & Independents

The self-registration process follows the same vetting requirements as local and regional heats. If insufficient participant information or incorrect participant information is supplied, the Organizers reserve the right to cancel the team registration.

#### 2. 5. Event Schedule

As Chung Hsing University may have to cooperate with Taichung City Government activities, the date and place of the competition will be tentatively fixed, and the time and place will be announced by the end of February 2019, at the latest.

	Online Registration Date	Admission Announcements	Contest Date	Contest Location	Remarks
Regional Contests	<p>1. Regional contests will be decided by county/city qualifiers and before April 30, 2019 report the number of teams to the Organizers for retain the recommended number, the remaining number will keep for self-registration.</p> <p>2. County/city contests should submit a list of their recommendations to the Organizers before May 31, 2019. Overdue submissions will result in lost registration quota.</p>				

2019 GM World & GM Taiwan Contests	2019.6.04~ 2019.6.14 (all teams must complete registration online)	2019.7.1	2019.8.1	National Chung Hsing University	1.Rainy day back-up plan, please refer to Section 2.6. 2.Overseas team registration, please refer to in section 3. 4.
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#### 2. 6. Force Majeure & Unforeseen Circumstances

In case of force majeure, the content will be postponed until August 2, 2019. Schedule amendments will be subject to Taichung City Government announcements regarding working-days due to dangerous weather or other natural phenomena. The location will remain the same (National Chung Hsing University) unless specified. For up to date information please visit the World GreenMech website.

#### 2. 7. Registration Deadlines

Registration for the World GreenMech and Taiwan GreenMech Contest must be completed within the time limits specified by online registration, there will be no flexibility in this regard. Deadlines remain the same for independent applications and regional qualifying.



### 3. Notes for Applicants

#### 3. 1. Registration information

Contestants in the World GreenMech and Taiwan GreenMech Contest must complete registration on the official website: [www.worldgreenmech.com](http://www.worldgreenmech.com).

#### 3. 2. Team Names

Team names: If the name is duplicated, the name will be granted on a first come, first served basis. The second applicant will be required to change their team name. The Chinese team name is limited to a maximum of 7 characters. The English team name is limited to 30 letters (including spaces) and there must be no indecency or innuendo. The Organizer has the right to ask the team to change its name.

#### 3. 3. TW Independent Teams (GreenMech & R4M)

Independent registrations are required to pay a deposit of NTD \$1,000 and register online. After the competition the deposit will be returned.

#### 3. 4. Overseas Competitors (GreenMech & R4M)

Teams must pay NTD \$3,000 (or USD \$100) registration fee, this is not a returnable deposit. Please pay online to complete registration.

#### 3. 5. Up-to-date Information

For up to date information and announcements, please check the event website regularly. Contestants are expected to take personal responsibility in this regard.

#### 4. Venue Regulations

##### 4. 1. Identity Check

Please fill in the Certificate of Student Enrollment shown in 10. 2. Submit appropriate identity documents at the time of contest. If you have not submitted the required information, contestants will need to take a photo for future reference.

##### 4. 2. Access Restrictions

During the contest team leaders or parents are not allowed to enter the contest area or pass anything to the contestants. Any violations will result in a 5-point deduction from the team score.

##### 4. 3. Power Source Regulations

This competition forbids the use of lead batteries, uninterruptible power systems (UPS) or other large, potentially dangerous batteries. Any violation in this regard will result in a 5-point deduction from the team score. If bodily injuries occur as a result of rule breach the team shall be disqualified and should be expected to make recompense for the situation.

##### 4. 4. Causing Unwanted Disturbances

During the contest no person or team is allowed to disturb the work of other persons, teams or judges in any way. This includes running around or making loud noises. If this rule is violated and a warning has already been given, violators will receive a 5-point deduction.

##### 4. 5. On-site Facilities

This contest only provides the contestants with display tables. Competing teams can bring their own chairs if required. Any extra furniture should not obstruct the main passages.

##### 4. 6. Communications & Communication Devices

During the contest contestants shall not speak to or exchange information with any non-contestant. This ban includes team leaders or parents, and all means of communication including phones or written notes. Upon confirming such communication has taken place, the offending team will suffer a 5-point deduction from their score. In the event of distress contestants should contact event services for help.

##### 4. 7. Theft or Sabotage

In the highly unlikely event of any theft, between group sabotage, robbery or fraudulent seeking of another's possessions, event Organizers will verify the claim. If the claim is verified, the offending team will receive a 5-point deduction as a minimum punishment.

#### 4. 8. Permitted Materials

Contestants are allowed to carry written materials, pictures and other printed data into the contest area.

#### 4. 9. Video Records for Evidence

To avoid any unwanted controversy after the contest, each contesting team should cooperate with the Organizer to record their project in operation for future reference.

#### 4. 10. Dispute Handling

Contestants should respect the final decision of the Organizer at all times. If there is any doubt about a decision during production or appraisal, the contestants should object to the assessment immediately. If a consensus cannot be reached, the staff present will take contestants to the information counter to fill out an official complaint (see section 10. 3. ) and then invite the chief judge to make a final ruling. Contestants shall sign and confirm details regarding the complaint after chief judge has explained the outcome of the appeal. After the contest, no further objections can be raised or heard.

## 5. Awards

### 5.1. Taiwanese Contest Awards- GM & R4M Contest Award

Position	Prizes	Number of Awards
Gold Medal (1 <sup>st</sup> place)	Award certificate for contestants and team leader.	One team for each division
Silver Medal (2 <sup>nd</sup> place)		Two teams for each division
Bronze Medal (3 <sup>rd</sup> place)		Three teams for each division
Honorable Mention Award		For top 50 <sup>th</sup> percentile in each division

### 5.2. World GreenMech Awards- GM & R4M Contest Award

Position	Prizes	Number of Awards
Gold Medal (1 <sup>st</sup> place)	1. Award certificate for contestants and team leader. 2. Cash NTD \$20,000.	One team for each division
Silver Medal (2 <sup>nd</sup> place)	1. Award certificate for contestants and team leader. 2. Cash NTD \$10,000.	Two teams for each division
Bronze Medal (3 <sup>rd</sup> place)	1. Award Certificate for Contestant and team leader 2. Cash NTD\$5,000.	Three teams for each division

Honorable Mention Award	Award certificate for contestants and team leader.	For top 50 <sup>th</sup> percentile in each division
STEAM Overseas Educational Contribution Award	For overseas countries	

### 5. 3. Award Revision

The Contest Organizers hold the right to adjust the above prize schedules for any reason, which may mean increasing or decreasing them. The total number of teams entered in the competition may be a factor in deciding final prizes if the number of contestants' changes.

### 5. 4. Award Reporting

The winners list will be reported to the educational authorities by the Organizer after the contest.

### 5. 5. Award Distribution

The Gold Medal, Silver Medal, Bronze Medal winners will be announced on the day of the contest. All the Certificates will be received the day after the award ceremony to team leader.

### 5. 6. Competition Certificates

All contestants will be presented with certificates as a gesture of encouragement. These certificates will be offered to both contestants and team leaders on the contest day.

### 5. 7. Awards Delivered by Mail

Merit certificates for winning teams will be sent out within one month of the completed contest. Please pay attention to official website announcements. Winning teams that have not received awards should contact the Organizer for replacements. In the event of incorrect personal information being submitted during registration (i.e. wrong name, mail or email address) postage and other costs for replacement will be borne by the contestant.

### 5. 8. Winning Team Obligations

Winning teams must cooperate with the Organizer to display and preserve their works. The Golden Medal and the Silver Medal winners of the world-series are required to provide their model for filming within one month of the competition, to facilitate promotion and further education.

## 6. Legal Policy

### 6. 1. Contestant Insurance

The Organizer shall buy group insurance for all the contestants. This covers the day of the contest only. The contestants and the team leaders shall fill out their correct personal information in the Registration Information Form online. Without this the Organizer will not be able to buy group insurance and cannot be held liable for payment of any damages.

### 6. 2. Intellectual Property Rights

During the online registration, team leaders must sign to confirm the contestants' original production statement and to ensure their works do not infringe known patent or intellectual property rights of others. If the contestants need to use another person's IPR, they must submit a letter of authorization from the copyright owner at the time of registration to prove legitimate use.

### 6. 3. Organizer's IPR

All competing teams shall grant their project's IPR to the Organizer, who for the need of publicity, is entitled to revision, photography, publishing, book-compilation, exhibition, production and plate display of the created works, with no objection from the winners. In case the Organizer needs to carry out derivative designs of the award-winning work, the winners should cooperate in supplying pictures and the documents.

## 7. GreenMech (GM) Contest

### 7. 1. Theme & Purpose:

Integrate the concepts of regeneration and recycling into your work and life. Whether you work in the humanities, society, science or other fields, you can learn to connect with your projects in a new way using self-reflection and discussion, making sure your own efforts benefit society.

### 7. 2. 2019 GreenMech (GM) Contest Information

#### 7. 2. 1 Event Schedule

GreenMech Schedule		
Time	Item	Remarks
07:40 - 08:20	Registration	<p>Time to enter the venue and find your own team table. Please put all the contest material under the table in order. Contestant can start to assemble the Jumbo Base Grid (60*180 cm) on table.</p> <p>Only contestants may be in the competition area after 08:00am. Team leaders and parents/guardians are not permitted after this time.</p>
08:00 - 08:50	Materials check and registration check.	<p>The team leaders shall not enter the competition venue after 8:00 AM.</p> <p>Judges will carry out a building materials inspection. Except for the chain, no blocks may be assembled in advance.</p> <p>After a brief inspection, teams will be given a “qualified” label, whereupon contestants should sit at the table and may not touch the materials.</p> <p>Personal items can be brought into the venue but must be placed on the table in conjunction with the inspection records.</p> <p>Contestants need to present their Certificate of Student Enrollment at this time, see section 10. 2. for more information.</p>

08:50 - 09:00	Opening Ceremony/ Clarification of Rules	Due to site restrictions, contestants will not attend the opening ceremony.
09:00 - 11:40	Production & Testing time.	Please observe all competition rules. When leaving, do not run, be careful not to touch another group's work. There will be 160 minutes between commencement and lunch. Before leaving the venue at noon. Contestants must remember to organize the venue, personal items can be placed under the table. By 11:00am the Scientific Principles reference table will be collected by the Organizer.
11:30 - 12:30	Lunch.	Remember to assist in sorting the trash.
12:30 - 12:40	Announcements.	Contestants should wait for the Organizer's announcements and then be prepared to continue. If Contestants are not present at this time, they may not continue with the competition.
12:40 - 12:50	Fine-tuning.	Wait for the Organizers instruction to begin.
12:50 - 16:30	Appraisals.	Please refer to section 7. 2. 7.
16:30 - 17:00	Feedback and Communications.	Parents, teachers and peers may enter and discuss the projects.
17:00	Award Ceremony.	Organizers make every effort to finish on time, but patience may be required depending on announcements and other possible delays.

### 7. 2. 2 Dimensions

All work must be constructed on a table 180cm long and 60cm wide. The work is not limited in terms of height, but calculated from the bottom area of 100cm high shall not exceed the



area of the bottom area and must be steady. If the constructions do not meet the requirements and have not changed after a warning, 5 points will be deducted.

### 7. 2. 3 Material Specifications

The team is required to carry the unassembled GreenMech parts themselves. All parts are certified non-toxic to state-level thresholds, CE (European), ASTM (US), ST (Taiwan), CCC (China). Any uncertified materials brought in to the contest may lead to a point penalty or the disqualification. Lost, broken, damaged parts cannot be replaced.

### 7. 2. 4 Additional Materials

Teams may carry un-processed materials and recycled materials to augment their designs, such as cardboard, wood, cans, and bottles. Remote or electronic control devices are not permitted. Violation of this rule will result in a 5-point penalty. All electronic products including mobile phones, tablets, laptops, etc., are not recommended for use in projects. Teams using such devices will not be granted any bonus for including them. This contest allows the use of 3D printed parts and laser-cut parts. Each piece must not exceed 4cm x 4cm x 4cm and no components may be assembled in advance. Violation of this rule will result in a 5 point penalty.

### 7. 2. 5 Safety of Materials

Dangerous materials are strictly prohibited. Anything inflammable, corrosive, electronically dangerous, or biologically discomfort causing will be sufficient cause for disqualification.

### 7. 2. 6 Power Source Regulations

There is no power supply available in the contest venue for safety reasons. All contestants need to bring their own batteries. Battery voltages must 5V or less. Multiple batteries in series must be 15V or less, for safety reasons. Any violation in this regard will result in a 5-point deduction from the team score. The competition prohibits the use of lead batteries, uninterruptible power systems (UPS) or other large, potentially dangerous batteries. Violation of this rule will result in a 5-point penalty. If bodily injuries occur as a result of rule breach the team shall be disqualified and are expected to make recompense for the situation.

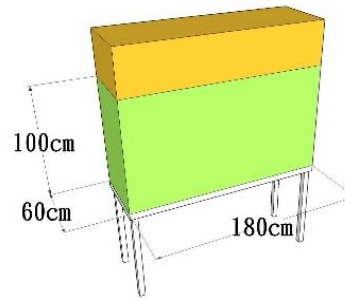


Figure 1. Diagram showing space area for each team. When the model is within the specified dimensional criteria (60 x 100 x 180 cm) no penalty is applied. If the model exceeds the dimensions below a height of 100 cm a point deduction will be applied. If the model exceeds the dimensions, but above 100 cm, no deduction will be made.

7. 2. 7 Scoring Criteria

Scoring	Weighting	Standards
Total Number of devices	10%	<ul style="list-style-type: none"> <li>(i) The number of devices is calculated by the the main path of devices. Branch devices are not included in the scoring process. Clearly specify the first pass to the last pass (for mission devices) and the order of operation.</li> <li>(ii) The project should contain 10 devices and achieve one over-arching, specific goal. Specified checkpoints lead to the last area of the team work.</li> <li>(iii) The device number assigned only applies to the device itself, not to any specified objectives. 1 point will be given for correctly tagging labels for each device and 0 points for unlabeled devices. See section 8. 2. for device labels.</li> </ul>
Scientific Principle Applications	20%	<ul style="list-style-type: none"> <li>(i) The application of scientific concepts includes scientific principles, laws, phenomena and structures as set out in section 8. 1.</li> <li>(ii) Each device must prove 2 scientific concepts. The scientific concepts between the 10 devices should not be duplicated. A total of 20 scientific concepts, each earning contestants 1 point will maximally yield 20 points.</li> <li>(iii) At the time of examination, the empty list of scientific concepts will be released. Contestants should refer to the list as they work to ensure they are fulfilling the required objectives. At 11:00, the Scientific Principles Reference Table will be collected by the</li> </ul>

		<p>Organizer. Submission of an incomplete table will not score points.</p> <p>(iv) If there are more than two scientific concept designs for a device, contestants are invited to tick the scientific concepts to be presented in the self-assessment form. Only 20 scientific concepts can be checked on the self-assessment form, with no score exceeding 2 points within a device. Please refer to section 7.5 for more information.</p>
Green Energy Source Applications	10%	<p>(i) The green energy sources include five kinds energy: wind, hydro, solar, magnetic and chemical. Each green energy-driven mechanical contraption successfully completing the objectives will be awarded 5 points.</p> <p>(ii) To use green energy, the objective must be fulfilled within the second to tenth devices. The two green energy applications may not be repeated. The highest score available from this part of the contest is 10 points.</p> <p>(iii) The green energy device must be labeled using the labels in Section 8. 2.</p> <p>(iv) If a team uses a green energy sources for the first device, they will not be awarded a green energy score. For more information on Green energy use, refer to section 7.6.</p>
Smoothness	15%	<p>(i) Smoothness is the ability of the project to complete all specified checkpoints without assistance. Contestants should be able to brief the judges on the objectives they have completed for devices 1-10. Contestants should also be prepared to discuss the concepts of</p>

		<p>science, green energy design and the scientific principles on any of the devices.</p> <p>(ii) When the device is in operation, points will be deducted if anything falls off the device. If the ball is dropped, points will be deducted. If several objects fall together at one time, points will only be deducted once. If the same item falls multiple times, points will be deducted multiple times.</p> <p>(iii) No points will be deducted if powder or liquid are dropped, within reason. Contestants should remember, however, that negatively affecting the cleanliness of the contest area may be cause for point deduction.</p> <p>(iv) If there is a problem with the functioning of a device after it has been put in the arena and it requires manual intervention to be restarted the team will receive a 1-point deduction.</p> <p>(v) If the scientific principle of applications or green energy design in the device fails, but the overall operation continues a manual intervention penalty is still applied.</p> <p>(vi) Smoothness score contains the basic path in the specified task device once, please refer to 7.3 &amp; 7.4.</p> <p>(vii) The smoothness score will be multiplied by the score for the devices exhibited. For example, if the score from the number of working devices is 9 points, with one manual intervention, and one ball drop, the Smoothness score will be calculated as follows:  <math>(15-1-1)*9/10=11.7</math> points.</p>
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Creativity	15%	<p>(i) Creativity in design (9 points) and the overall design concept of the work (6 points). Creativity points are awarded on scale of three, for a maximum of 9 points. Points are awarded for device structure and creativity of appearance. Up to 3 points can be awarded for each device.</p> <p>(ii) One of the Creativity devices needs to be set on the platform of the specified checkpoint area, please refer to 7. 3. &amp; 7. 4. Points for performance of the device and overall design concept are awarded separately, making a total of 6 points for each device.</p>
Specified Tasks	30%	<p>(i) A specified checkpoint is the last area of the contest. A ball is automatically put into the circular mechanism and must be moved to complete the task. For further details, refer to 7. 3. &amp; 7. 4.</p> <p>(ii) It is necessary to design a circular mechanism to allow the one ball to run in an infinite loop.</p> <p>(iii) The ball starts from the area marked S (start), passes through the areas marked A and B (or B then A), and then completes the task in the area marked E (end). The ball then returns to S to continue the cycle, and the tasks will be considered completed.</p>
Rule violations	On-site points deduction	<p>The following situations are deemed to be a violation of the rules:</p> <p>(i) No devices shall employ any program language, or remote controls for operation. Violations shall result in a 5-point deduction.</p> <p>(ii) Size violations will result in a 5 point deduction.</p>

		<p>(iii) Untidy work areas or poor “housekeeping” (e.g.: unruly scattered materials, wet and slippery floor), with no improvement after warning, will result in a 5-point deduction.</p> <p>(iv) Failure to observe the contest rules, disturb the project work of others, with no correction after a yellow card warning, shall result in a 5-point deduction. Repeated severe infractions will lead to the disqualification.</p> <p>(v) Violation of power usage regulations, shall result in a 5-point deduction.</p> <p>(vi) Violation of regulations governing 3D printing parts and laser cutting parts will result in a 5 point deduction.</p>
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7. 2. 8 Work Configuration Chart

Green energy sources may be used within devices 2 to 10. They cannot be used in the first device.

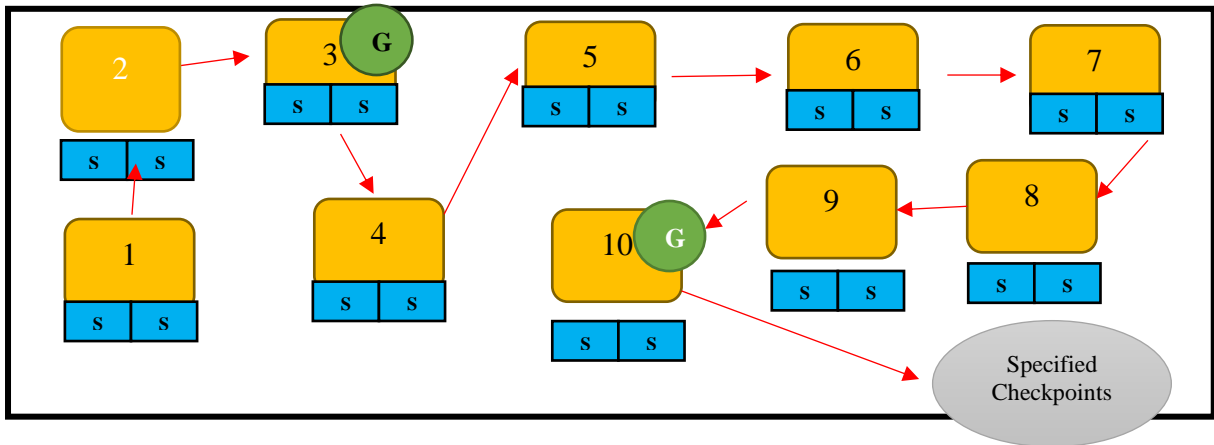


Figure 2. Work configuration chart showing checkpoints and labels.

### 7. 2. 9 Grading Method

Grading preparation	<p>(i) During the grading time contestants should sit near their work. Contestants should not frolic or run around. If behavior does not improve after a warning, 5 points may be deducted. Before grading, please cooperate patiently with staff instructions.</p> <p>(ii) During grading, contestants are required to stand in the specified position according to staff instructions and should not touch the work unless instructed.</p>	
Criteria for Grading	Total number of devices	<p>(i) Please choose the main path of devices and the contestants need to confirm that the device labels 1 to 10 are attached.</p> <p>(ii) Contestants should sign to say they have received a score after grading.</p>
	Scientific principle applications	<p>(i) Contestants should follow the order of the devices and give a briefing on the operation of their device.</p> <p>(ii) The judge requires the effect of the operation of the scientific concept to facilitate the evaluation.</p> <p>(iii) Contestants should sign to say they have received their score after grading.</p>
	Green energy source applications	<p>(i) Contestants should make sure that their labels are properly affixed.</p> <p>(ii) Green energy application is for devices 2-10 only.</p> <p>(iii) Contestants need to describe in detail, the operation and process for green energy use before proceeding.</p> <p>(iv) The review requires the effect of green energy operation to facilitate evaluation.</p> <p>(v) Contestants should sign to say they have received their score after grading.</p>
	Smoothness	<p>(i) Contestants should simply introduce the operation and science concepts for their devices.</p> <p>(ii) Main-line devices and branch devices, need to be included in the score.</p>

		<p>(iii) If anything falls or need to be manually operated during operation, contestants must wait for the judge's permission to intervene.</p> <p>(iv) There is only one opportunity to complete the task and the score must be multiplied by the number of devices.</p> <p>(v) Contestants should sign to say they have received their score after grading.</p>
	Specified Checkpoints	<p>Role of judges:</p> <p>(i) Contestants should be able to give judges a simple introduction to the operation of their devices.</p> <p>(ii) Start from device 10 and go through all the devices.</p> <p>(iii) There is only one opportunity to complete the task.</p> <p>(iv) Contestants should sign to say they have received their score after grading.</p>
	Creativity	<p>(i) Describe the concept behind the design or theme.</p> <p>(ii) Choose three creative devices, one of which needs to be set on the platform of the Specified Checkpoints area, and explain to the judges about the characteristics and functionality of the design.</p> <p>(iii) This contest is graded by a number of judges; it does not require a contestant's signature.</p>
Grade Groups	<p>After the number of enrolled teams is confirmed, the criteria for grading and grading times will be announced on the official website one week before the competition, contestants are responsible for being aware of this information.</p>	



### 7.3. Specific Requirements for Junior and Senior High Teams

Task: The Endless Cycle (30 points)

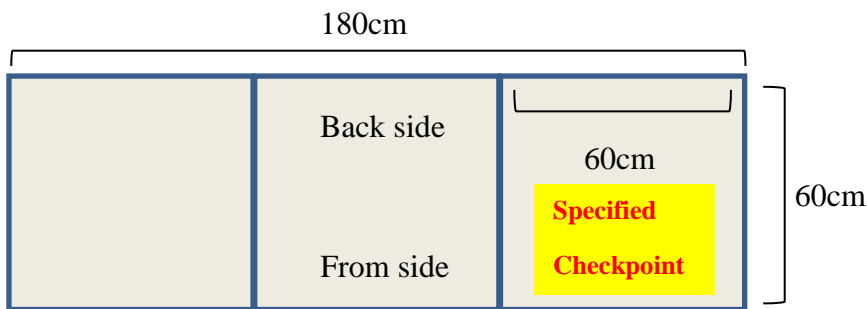


Figure 3. Plan view of work area sections.

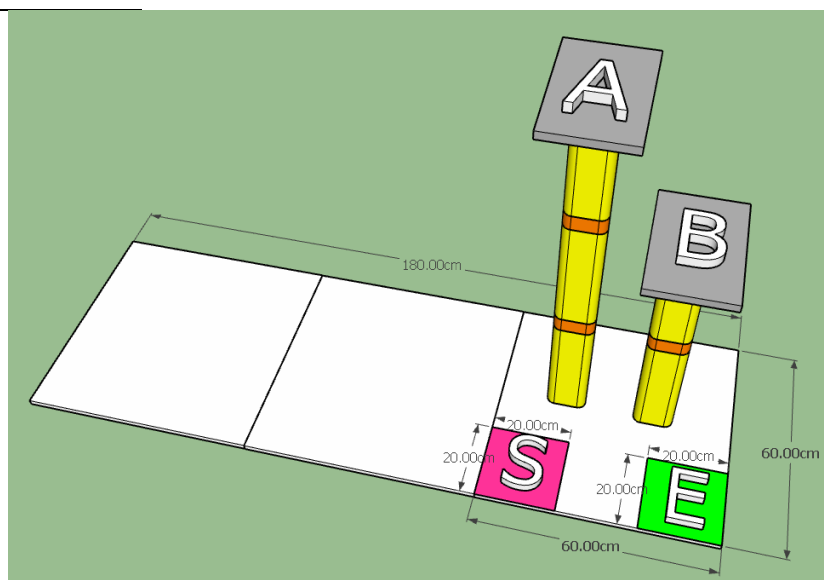


Figure 4. 3D projection of work area showing areas S, E, A & B.

Design a circular mechanism so that one ball can proceed infinitely around a loop. The ball starts from area marked S (start) and passes through the high platform areas marked A and B (or B and A). The ball must then complete a task in the area marked E (end) and return to S to begin again.

Notes:

- (i) The A and B high platforms and pillars should be placed within 60 cm x 60 cm of the right block of the work area. Product design is self-adjusting.
- (ii) Areas S and E are both 20 cm x 20 cm and are in the lower left and right corners of the right block of the work area. These positions are set and cannot be changed.

(iii) The circulation mechanism includes the whole scope of the work. The ball can be moved to any area of the work area, but it must start from the area S, pass through A and B high platform in either order, and then to E, on its way back to S.

(iv) The basic circulation path is S-A-B-E-(repeat) or S-B-A-E (repeat).

Item	Aspect	Criteria
Task One	Circulatory Design (6 points)	<p>(i) 6 points can be obtained by designing the circulatory mechanism and using Gigo blocks to assemble correctly on site. Other decorative items may not be used, and rule violations will result in point deductions.</p> <p>(ii) The circulation mechanism consists of a device for lifting the ball up, and a path device for rolling the ball. It must be assembled using Gigo blocks and the Gigo motor. Do not use any decoration or other processed items except for the front-list items (refer to (v)). Rule violations will receive a 2-point deduction, up to a maximum of 6 points.</p> <p>(iii) The position of the cycle mechanism is set to include the entire range of work (60*180 cm), and the power can be turned on before the rating to operate the device.</p> <p>(iv) The mechanism triggered by the small ball is not restricted by this material, and it can be assembled using a combination of everyday objects and building blocks.</p> <p>(v) The following front-list items can be used for cycle construction: rubber bands, cotton threads, drawstrings, 3D printed parts, laser cut parts, adhesives (eg tape, glue, hot melt adhesive)</p>

		<p>(vi) 3D printing parts and laser cut parts should not exceed a space <math>4\text{cm} \times 4\text{cm} \times 4\text{cm}</math>, and need to be disassembled when the competition begins. Rule violations will result in a 5 point deduction.</p> <p>(vii) Teams that fail to successfully move the ball between areas will receive a 2 point deduction for each failure, up to a maximum of 6 points.</p>
Task Two	AB High Platform (4 points)	<p>(i) According to the Specified Checkpoints diagram, use the Gigo blocks to assemble the A and B high platforms on site, and place the high platform position in the correct place to obtain 4 points.</p> <p>(ii) The height of Area A is equal to three Gigo 6 Hole Tracks, and two Track Connect as a pillar, with a base grid on top. The height of Area B is equal to two Gigo 6 Hole Tracks and one Track Connect as a pillar, with a base grid on top. If the platform does not meet this criteria team will receive a 2 points deduction.</p> <p>(iii) Consider the stability of the mechanisms on the high platform, contestant can add other building blocks or everyday objects reinforcement under the high platform.</p> <p>(iv) The two high platforms and pillars should be placed within the right area (60 x 60 cm) of the overall work area. If the position does not meet the requirements, teams will receive a 2 points deduction.</p>

		(v) Both the high platform and the pillars can be decorated or combined with everyday objects.
Task Three	High Platform Mechanisms (4 points)	<p>(i) Please set up the mechanisms of optical phenomena and creativity in areas A and B.</p> <p>(ii) Optical phenomena mechanisms and creative mechanisms in areas A and B are the effect display mechanisms and only need to continue running without activating the next mechanism. If the mechanism cannot make continuous operation, teams will receive a 1-point deduction.</p> <p>(iii) Continuous operation is determined by a mechanism still operating when the ball passes through the mechanism for the second time.</p> <p>(iv) For mechanisms on the high platform, we encourage the use of Gigo blocks or everyday objects in combination. If the ball cannot automatically activate the mechanism, teams will receive a 1-point deduction.</p> <p>(v) Optical phenomena mechanisms must display the effects of optical principles such as reflection, refraction, and diffraction of light. If the light source is only lit, it will not meet the specifications required and failure to complete the task will result in a 2-point deduction.</p>
Task Four	Ball Circulation (6 points)	(i) It is necessary to use the Gigo 40 mm ball to operate the mechanisms. Starting from area S, the same ball completing two cycles will earn a team 6 points.

		<p>(ii) Only a Gigo 40mm ball may be used. No decoration or augmentation of the ball is permitted. Violation of this rule will result in a 4-point deduction.</p> <p>(iii) During the cycle, no matter whether you drop the ball or the machine stops working, if there is a manual intervention required a team will receive a 1-point deduction for each case, subject to a maximum of 6 points.</p> <p>(iv) To begin the exercise, the ball must be placed in area S. If the requirements are not met, then teams will receive a 2-point deduction.</p> <p>(v) The ball must move automatically from the last action of the tenth device to the start area S. If it cannot automatically start the process, teams will receive a 1-point deduction.</p> <p>(vi) The ball must pass over the top of the A and B high platforms. If the requirements are not met, teams will receive a 2-point deduction, subject to a maximum of 4 points.</p>
Task Five	Rising Diversity (6 points)	<p>(i) In the circulatory mechanism, a number of different mechanisms must be used to raise the ball. The more types of ascending mechanisms there are, the higher the diversity score, subject to a maximum of 6 points.</p> <p>(ii) Design three different mechanisms to raise the ball. Each type of lifting mechanism needs to be able to raise the ball to a vertical height of 15 cm or more. Compliant</p>

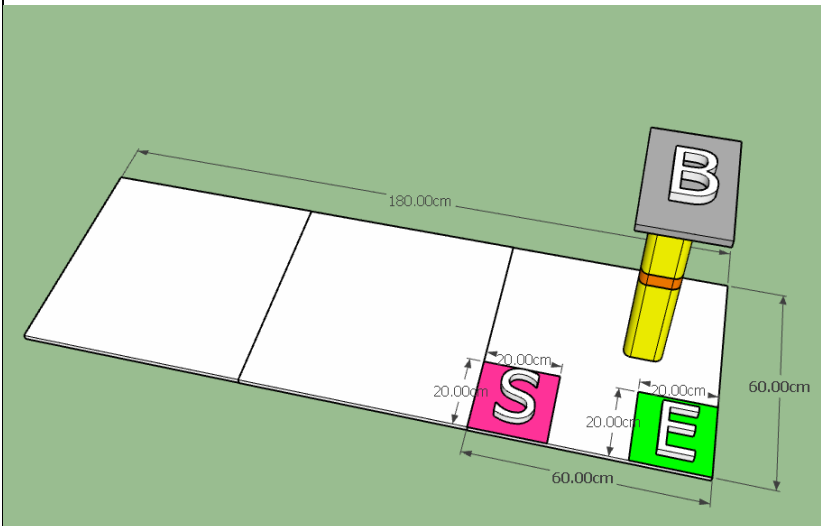
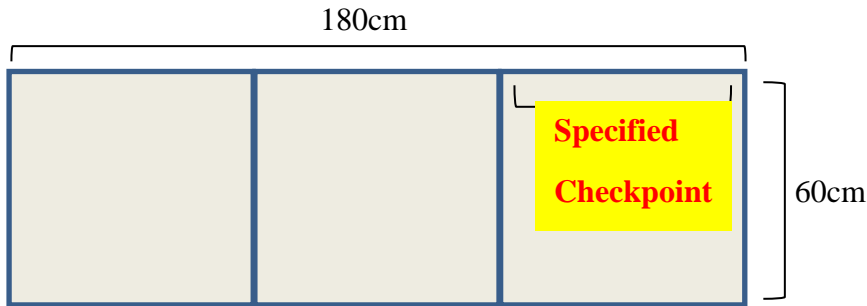
		<p>mechanisms are awarded 2 points, subject to a maximum of 6 points.</p> <p>(iii) If the diversity operation cannot be automatically completed, it can be manually opened after approval by judges. If it can be operated successfully under these secondary conditions, the diversity points can still be obtained but manual control will result in a 1-point deduction.</p>						
Task six	Mission Objectives (4 points)	<p>(i) According to the specified checkpoint diagram, the task device is installed in the area E.</p> <p>(ii) The task should be automatically started by the small ball in the circulation mechanism and only needs to be started once to earn teams 4 points.</p> <p>(iii) If the ball cannot automatically start the assigned task, it must wait for two cycles and the judge's permission before being manually enabled. Manual control will result in a 1-point deduction.</p> <p>(iv) Action organization should be completed as far as possible to operate in the area E, which may be partially out of range. If the device is obviously out of compliance, 2 points will be deducted. If any part of the mission is failed, 2 points will be deducted.</p> <table border="1" data-bbox="746 1720 1385 1937"> <thead> <tr> <th data-bbox="746 1720 879 1776">Team</th> <th data-bbox="879 1720 1050 1776">Name</th> <th data-bbox="1050 1720 1385 1776">Rules</th> </tr> </thead> <tbody> <tr> <td data-bbox="746 1776 879 1937">Junior High</td> <td data-bbox="879 1776 1050 1937">Wonderful Sound</td> <td data-bbox="1050 1776 1385 1937">Contestants activate the sound device (“nice sound”) for more than</td> </tr> </tbody> </table>	Team	Name	Rules	Junior High	Wonderful Sound	Contestants activate the sound device (“nice sound”) for more than
Team	Name	Rules						
Junior High	Wonderful Sound	Contestants activate the sound device (“nice sound”) for more than						

				3 seconds using the principle of impact.
		High school	Declare Victory	Contestants activate the device to pop up more than three signs separately, in order, by using the principle of elasticity.

#### 7. 4. Specific Requirements for Elementary School Teams

##### Task: The Endless Cycle (30 points)

Design a circular mechanism so that one ball can proceed infinitely around a loop. The ball starts from area marked S (start) and passes through the high platform area marked B. The ball must then complete a task in the area marked E (end) and return to S to begin again.



- (i) The B high platform and pillar should be placed within 60 cm x 60 cm of the right block of the work area. Product design is self-adjusting.
- (ii) Areas S and E are both 20 cm x 20 cm and are in the lower left and right corners of the right block of the work area. These positions are set and cannot be changed.
- (iii) The circulation mechanism includes the whole scope of the work. The ball can be moved to any area of the work area, but it must start from the area S, pass through B high platform, and then to E, on its way back to S.
- (iv) The basic circulation path is S-B-E-S (repeat).



Item	Aspect	Criteria
Task One	Circulatory Design (6 points)	<ul style="list-style-type: none"> <li data-bbox="715 259 1391 517">(i) 6 points can be obtained by designing the circulatory mechanism and using Gigo blocks to assemble correctly on site. Other decorative items may not be used, and rule violations will result in point deductions.</li> <li data-bbox="715 528 1391 954">(ii) The circulation mechanism consists of a device for lifting the ball up, and a path device for rolling the ball. It must be assembled using Gigo blocks and the Gigo motor. Do not use any decoration or other processed items except for the front-list items (refer to (v)). Rule violations will receive a 2-point deduction, up to a maximum of 6 points.</li> <li data-bbox="715 965 1391 1178">(iii) The position of the cycle mechanism is set to include the entire range of work (60*180 cm), and the power can be turned on before the rating to operate the device.</li> <li data-bbox="715 1189 1391 1402">(iv) The mechanism triggered by the small ball is not restricted by this material, and it can be assembled using a combination of everyday objects and building blocks.</li> <li data-bbox="715 1413 1391 1671">(v) The following front-list items can be used for cycle construction: rubber bands, cotton threads, drawstrings, 3D printed parts, laser cut parts, adhesives (eg tape, glue, hot melt adhesive).</li> <li data-bbox="715 1682 1391 1939">(vi) 3D printing parts and laser cut parts should not exceed a space 4cm × 4cm × 4cm, and need to be disassembled when the competition begins. Rule violations will result in a 5-point deduction.</li> </ul>

		(vii) Teams that fail to successfully move the ball between areas will receive a 2-point deduction for each failure, up to a maximum of 6 points.
Task Two	B High Platform (4 points)	<p>(i) According to the Specified Checkpoints diagram, use the Gigo blocks to assemble the B high platforms on site, and place the high platform position in the correct place to obtain 4 points.</p> <p>(ii) The height of Area B is equal to two Gigo 6 Hole Tracks and one Track Connect as a pillar, with a base grid on top. If the platform does not meet this criteria team will receive a 2 points deduction.</p> <p>(iii) Consider the stability of the mechanisms on the high platform, contestant can add other building blocks or everyday objects reinforcement under the high platform.</p> <p>(iv) The two high platforms and pillars should be placed within the right area (60 x 60 cm) of the overall work area. If the position does not meet the requirements, teams will receive a 2-point deduction.</p> <p>(v) Both the high platform and the pillars can be decorated or combined with everyday objects.</p>
Task Three	High Platform Mechanisms (4 points)	<p>(i) Please set up the mechanisms of optical phenomena and creativity in area B.</p> <p>(ii) Optical phenomena mechanisms and creative mechanisms in areas A and B are the effect display mechanisms and only need to continue running without activating the next mechanism. If the mechanism cannot make continuous operation, teams will receive a 1-point deduction.</p>

		<p>(iii) Continuous operation is determined by a mechanism still operating when the ball passes through the mechanism for the second time.</p> <p>(iv) For mechanisms on the high platform, we encourage the use of Gigo blocks or everyday objects in combination. If the ball cannot automatically activate the mechanism, teams will receive a 1-point deduction.</p>
<p>Task Four</p>	<p>Ball Circulation (6 points)</p>	<p>(i) It is necessary to use the Gigo 40 mm ball to operate the mechanisms. Starting from area S, the same ball completing two cycles will earn a team 6 points.</p> <p>(ii) Only one Gigo 40mm ball may be used. No decoration or augmentation of the ball is permitted. Violation of this rule will result in a 4-point deduction.</p> <p>(iii) During the cycle, no matter whether you drop the ball or the machine stops working, if there is a manual intervention required a team will receive a 1-point deduction for each case, subject to a maximum of 6 points.</p> <p>(iv) To begin the exercise, the ball must be placed in area S. If the requirements are not met, then teams will receive a 2-point deduction.</p> <p>(v) The ball must move automatically from the last action of the tenth device to the start area S. If it cannot automatically start the process, teams will receive a 1-point deduction.</p>

		(vi) The ball must pass over the top of the B high platform. If the requirements are not met, teams will receive a 2-point deduction.
Task Five	Rising Diversity (6 points)	<p>(i) In the circulatory mechanism, a number of different mechanisms must be used to raise the ball. The more types of ascending mechanisms there are, the higher the diversity score, subject to a maximum of 6 points.</p> <p>(ii) Design two different mechanisms to raise the ball. Each type of lifting mechanism needs to be able to raise the ball to a vertical height of 15 cm or more. Compliant mechanisms are awarded 3 points, subject to a maximum of 6 points.</p> <p>(iii) If the diversity operation cannot be automatically completed, it can be manually opened after approval by judges. If it can be operated successfully under these secondary conditions, the diversity points can still be obtained but manual control will result in a 1-point deduction.</p>
Task Six	Mission Objectives (4 points)	<p>(i) According to the specified checkpoint diagram, the task device is installed in the area E.</p> <p>(ii) The task should be automatically started by the small ball in the circulation mechanism and only needs to be started once to earn teams 4 points.</p> <p>(iii) If the ball cannot automatically start the assigned task, it must wait for two cycles and the judge's permission before being manually enabled. Manual control will result in a 1-point deduction.</p>

		<p>(iv) Action organization should be completed as far as possible to operate in the area E, which</p> <table border="1" data-bbox="722 297 1386 629"> <thead> <tr> <th data-bbox="722 297 900 349">Team</th> <th data-bbox="900 297 1070 349">Name</th> <th data-bbox="1070 297 1386 349">Rules</th> </tr> </thead> <tbody> <tr> <td data-bbox="722 349 900 629">Elementary School</td> <td data-bbox="900 349 1070 629">Raise the Flag</td> <td data-bbox="1070 349 1386 629">Contestants raise a homemade flag more than 30cm by using the principle of gravity.</td> </tr> </tbody> </table> <p>may be partially out of range. If the device is obviously out of compliance, 2 points will be deducted. If any part of the mission is failed, 2 points will be deducted.</p>	Team	Name	Rules	Elementary School	Raise the Flag	Contestants raise a homemade flag more than 30cm by using the principle of gravity.
Team	Name	Rules						
Elementary School	Raise the Flag	Contestants raise a homemade flag more than 30cm by using the principle of gravity.						

### 7.5. Scientific Concepts

Scientific concepts must meet the basic principles and be self-assembled and self-designed. Contestants should be able to understand the principles and contents of their devices and be able to explain the functions to judges.

- (i.) Scoring of scientific concepts occurs after the devices are assembled. If a commercially available product or other finished product is used, no scientific concept score will be granted.
- (ii.) 20 scientific concepts are needed, teams must be able to make adequate explanation to reviewers and judges.
- (iii.) From the Science Principle Concept Table, only 20 concepts can be checked for rating. Contestants should choose the scientific concepts they are most confident with. After the self-assessment form is submitted at around 11 am, no further changes may be made.
- (iv.) Each device needs to contain two scientific concepts for scoring. If there are multiple scientific concepts to choose from, contestants should still check only the scientific concepts that require judgment.
- (v.) There are also five self-rating items on the self-rating form. Players may fill in up to five items according to their design, but may not duplicate the items in the self-evaluation form.

The following are examples of judgments of scientific concepts:

- (i.) Start the light source, the light source illuminates resulting in reflection, refraction, diffraction and other optical phenomena. Teams then receive the optical concept score. If you turn on the power only to turn on the LED light, teams will only receive the electrical score.
- (ii.) The ball rolls down and collides with a bell or other object to produce a regular or irregular sound for an acoustic score. If you turn the power on and the buzzer sounds, teams only receive the electrical score. If you hit a connecting rod to open a commercial music box and produce music, because the music box design is “finished, only the connecting-rod score is valid.

#### 7. 6. Green Energy Requirements

- (i) The contest's green energy component includes five types of wind, hydro, solar, magnetic and chemical energy. There should be a green energy-driven mechanism in the device area and successful starting of the next device will earn teams 5 points. In total teams should submit two devices from the second to the tenth devices to use green energy. The energy application for each of the two devices should not be duplicated. The highest score for this category is 10 points.
- (ii) Many green energy applications previously did not meet the standards of the judges and reviewers. The competition aims to emphasize the concept of energy conservation, and so Green devices must also be able to start the next device in the chain.
- (iii) Green energy devices may not be presented in combination with batteries.

## 7.7. Green Energy Examples

### 7.7.1 Wind energy

Must be started by the previous device. Must also be able to use wind power only, and through operation, be able to start the following device in the chain.

### 7.7.2 Water energy

Must be started by the previous device. Must also be able to use water power only, and through operation, be able to start the following device in the chain.

Use of drive mechanisms to promote water flow exploiting potential-energy differences or pressure differences is permitted. Hydraulics, connecting rods, buoyancy, are part of the science concepts and not included in the green energy score for water.

### 7.7.3 Solar Energy

Must be started by the previous device. Must also be able to use (simulated) solar power only, and through operation, be able to start the following device in the chain.

Simulated solar light source should be shone on to the solar panel. Only lighting the LED light up but being unable to drive the next device will be counted as failure.

### 7.7.4 Magnetic energy

Must be started by the previous device. Must also be able to use magnetic power only, and through operation, be able to start the following device in the chain.

Magnetic energy can be converted into electrical energy or kinetic energy such as electromagnetic induction. For example, a Gaussian slingshot will accelerate the ball impact, leading to the next mechanism starting. Using only magnetic attraction and repulsion is a science concept, not a Green concept.

### 7.7.5 Chemical energy

Must be started by the previous device. Must also be able to use chemical power only, and through operation, be able to start the following device in the chain. Chemical green applications are usually more difficult to configure successfully. For example, the fruit battery required to drive the LED may require at least three or more groups of fruit in series or parallel and it is often insufficient for motors or other mechanical functions.



8. Appendix

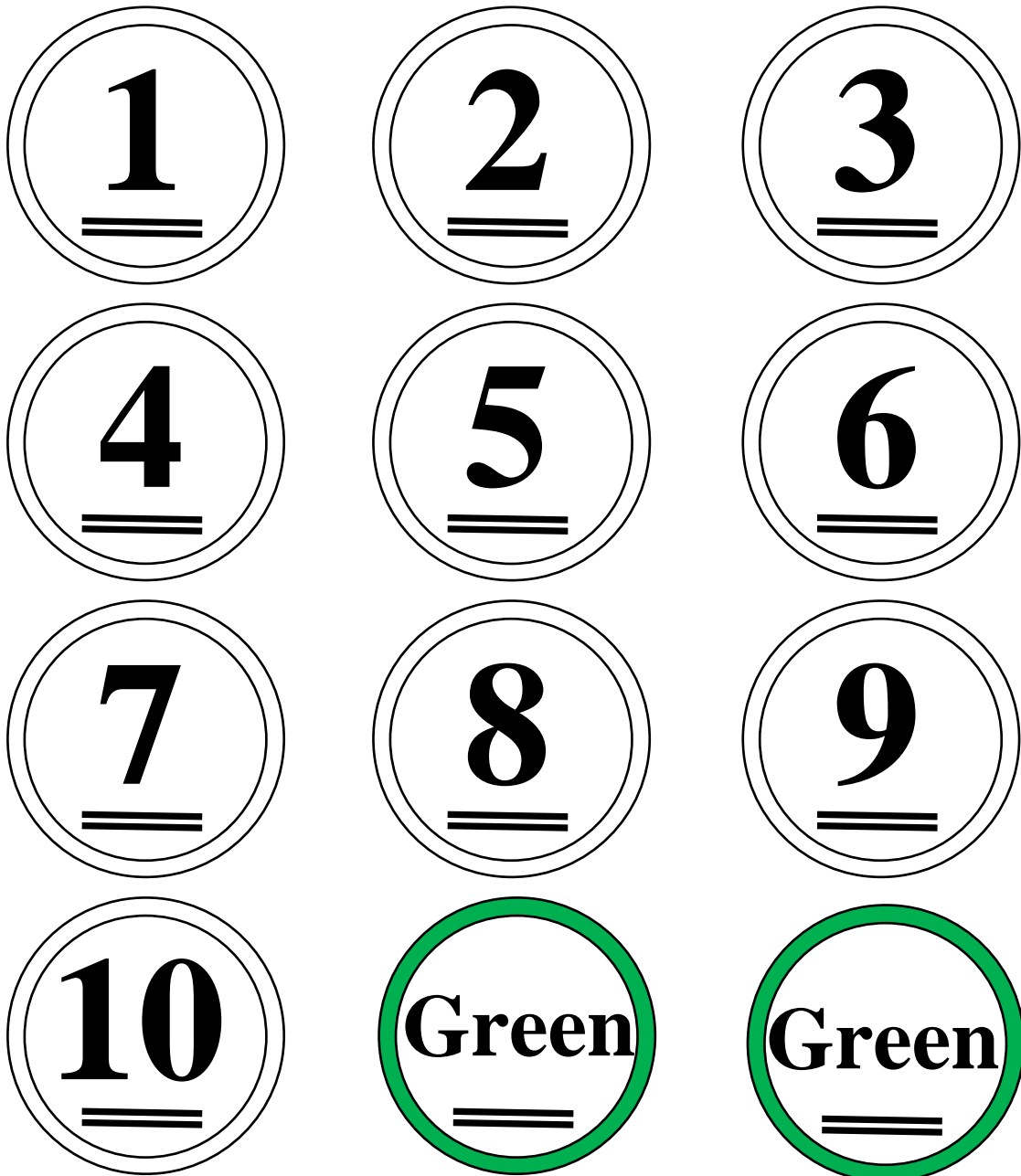
8. 1. Scientific Principles Reference Table

Scientific Principles Reference Table							
Item	Device	Contestant Self-Evaluation	Referee Evaluation	Item	Device	Contestant Self-Evaluation	Referee Evaluation
Law of Inertia				Connecting Rod			
Force & Acceleration (Gravity Potential)				Truss			
Action and reaction				Chain Gear/ Pulley drive			
Center of Mass / Domino Effect				Track			
Leverage				Ratchet & Pawl			
Circular Motion & Centripetal Forces				Acoustics			
Pascal's Principle				Electricity			
Communicating vessels				Thermology			

Bernoulli's principle				Magnetism			
Axle				Elasticity			
Pendulum				Friction			
Static electricity				Buoyancy			
Worm Screw Worm Gear				Other (to be completed by contestant)			
Capillary Action / Siphon				Other			
Pulley device				Other			
Cam				Other			
Gear or Rack				Other			

## 8.2. Device Labels & Green Labels

Contestants must print their own device labels and green energy stickers. The size should be such that all information can be seen clearly, black and white printing is acceptable.



9. Robot for Mission (R4M)

9. 1. Contest Theme: Smart Farm

9. 1. 1 Competition schedule

R4M Schedule		
Time	Item	Remarks
07:40 - 08:20	Registration	<ol style="list-style-type: none"> <li>1. After registration contestants should enter the venue and not leave until the event has concluded.</li> <li>2. After 08:00am, only contestants may be in the competition area. Team leaders and parents/guardians are not permitted after this time.</li> </ol>
08:00 ~ 08:40	Materials Inspection	<ol style="list-style-type: none"> <li>1. Team leaders shall stay in their assigned areas after 08:00 and shall not enter the competition venue.</li> <li>2. Referees will carry out a materials inspection. Blocks are not allowed to be assembled in advance. Chains are the only exception to this rule.</li> <li>3. After passing the materials examination a label will be applied, students should then sit at the table and wait without touching the materials.</li> <li>4. Personal items like bags can be brought into the venue but must be placed on the table in keeping with the inspection record.</li> <li>5. Contestants need to submit their Certificate of Student Enrollment, see Section 10. 2. .</li> </ol>
08:40 ~ 09:00	Clarification of Rules	<ol style="list-style-type: none"> <li>1. Clarification of the rules and precautions of the competition</li> <li>2. The omnivorous feed color is randomly chosen by lottery by the Organizer.</li> </ol>

09:00 ~ 09:15	Opening Ceremony	Participants attend the opening ceremony.
09:15 ~ 11:15	Assembly & Practice Time	
09:40 ~ 11:30	Work Submission Period	<ol style="list-style-type: none"> <li>1. Check to confirm the robot does not contain metal parts.</li> <li>2. The robot and any spare car or other additions shall be weighed.</li> <li>3. Participating robots(including spare one) need to be verified by the judges and retained until after the contest.</li> <li>4. 5-Points may be deducted for messy or untidy work areas.</li> <li>5. For robot size regulations please see Section 9. 2. 1.</li> <li>6. After Submitting their work, contestants need to put all items (such as notebook, blocks, unused electronic control equipment, etc.) away from the competition area.</li> </ol>
11:30 ~ 12:30	Lunch	After lunch contestants are expected to assist with sorting trash and keeping the competition area clean.
12:30 ~ 12:50	Announcements	When entering the venue, contestants may only carry a notebook, tablet or mobile phone, other items are not permitted.
13:00 ~ 17 : 00	Competition Time	
17 : 00	Awards Ceremony	Organizers make every effort to finish on time, but some patience may be required depending on announcements and other possible delays.

## 9. 2. Project Requirements & Restrictions

### 9. 2. 1 Size Restrictions

A and B robots shall not exceed 30cm long × 20cm wide. C robot shall not exceed 26cm long × 20cm wide. There is no limit on height. Mechanical extensions are excluded from these limits but must be extended by remote control or servo motor, not manually.

### 9. 2. 2 Number of Robots

Teams can prepare no more than 4 robots, of which 3 can be selected for the contest. If there are less than 2 robots, the team is considered to have withdrawn from the contest. Remaining spare robots can be used to immediately replace malfunctioning robots. Spare robots can only be used after one robot has become disabled and with the judge's permission. Disability is defined by structural damage preventing operation, replacement time is included in the competition time. Replacements start from the beginning of the area.

### 9. 2. 3 Building Materials

Each team is required to carry any unassembled Gigo blocks. Robot components cannot be used metal materials, any uncertified materials brought into the contest may lead to a point penalty or disqualification. Lost or broken, damaged parts cannot be replaced.

### 9. 2. 4 3D Printed Components

For the fairness, all robots must be assembled with Gigo blocks. 3D printed, laser cut, CNC parts, PP board pieces are not allowed.

### 9. 2. 5 Operation Devices (Smart Phones / Tablets)

Contestants are free to choose their own operation method (e.g. smart phones, tablets, laptops or remote-control handles or related equipment) to operate their robot. The devices should all be prepared ahead of time by the teams, contestants should remember that there is no electricity available on site. The program version is not limited. In addition to the public Bluetooth remote control provided by the Organizer, contestant can also choose to use infrared remote control. Contestants should remember that because other players may use infrared with the same frequency, interference may occur. Any intentional interference will result in disqualification.

### 9. 2. 6 Power Supplies & Restrictions

The contest site does not provide any power. All contestants need to bring their own batteries rated 9V or less for each of the A and B robots. 9V does not refer to the total voltage of the

circuit. All batteries must be marked with their correct voltage. Carbon zinc batteries of 1.5 volts are limited to 6 pieces, 18650 batteries 3.7 volts are limited to 2 pieces, square 9 volts batteries are limited to 1 piece.

Robot C uses a micro:bit main control box (1269-W85-A). Voltage must comply with the safety regulations of the main control box, so 6 number 3 (AA) carbon zinc batteries, number 3 alkaline batteries or number 3 rechargeable batteries are permitted. The rated total voltage of a battery must be 5 volts or less. Do not use number 3 lithium ion batteries and “empty” batteries. Batteries must be marked with their relevant voltage, covered and insulated correctly, they must not be exposed. Batteries should not cause any pollution or harm due to poor quality or age. If any players are hurt, the team will be disqualified and the team leader will be deemed responsible. Lead-acid batteries and other large dangerous batteries are strictly prohibited.

#### 9. 2. 7 Motor Usage Restrictions

Robots A and B may have up to 4 servo motors and C robot may have up to 2 servo motors. The motors and all robots for the competition can only be connected by means of Gigo pieces. It is not possible to connect them with glue, belts, foam, double-sided tape or other methods.

#### 9. 2. 8 Contest Motor Models

To create a level playing field for all contestants, everyone must use motor models selected from the following parts list. 7328-W85-A1-1, 7392-W85-B3, 7392-W85-B1, 7400-W85-A1, 7400-W85-A, 1247-W85-D1-1, 1247-W85-D2, 7447, W85-C, 7412-W85-A, 1247-W85-D3. For more information see please refer to 10. 1. If a contestant using the above-mentioned motors installs a different Bluetooth control box; whether it connects the modified motor and the Bluetooth box or automatically, or links the motor to other control devices, contestants must confirm that they have complete control over the robot’s functions. If any problems arise during the contest, contestants are required to resolve the problem themselves and ensure completion of the mission.

#### 9. 2. 9 Material Safety

Dangerous or hazardous materials are strictly prohibited, including but not limited to: fire, corrosive chemicals, dangerous power components, bios, or anything that may potentially cause harm to people. If such items or hazards are brought into the contest site unauthorized, the team will result in disqualification.

### 9. 3. Contest Instructions

#### 9. 3. 1 Site Specifications

The contest arena size is limited to a space not exceeding 160 cm x180cm. The competition venue is divided into upper and lower sections. The lower arena is 160 x180cm (width x length); the upper smart farm is 80 x 90cm (width x length) and is tiled with matte PP photo paper. Each competition venue only accommodates one team, A, B, and C robots are placed in the departure area of the upper smart farm.



Figure 5. Competition venue image.

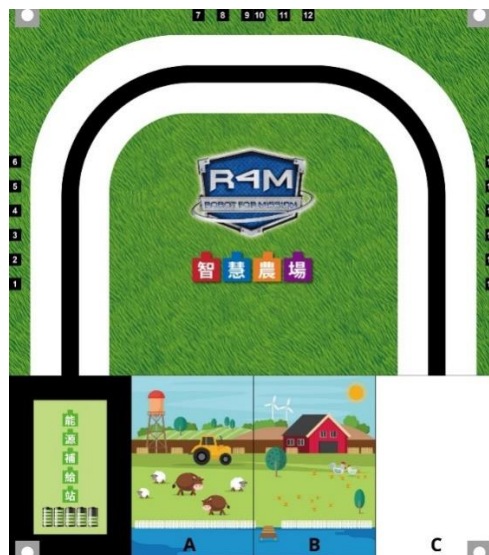


Figure 6. PP photo paper map.



### 9.3.2 R4M Tasks

Before the start of the mission, the animals, giraffe feed and one worker will be placed.

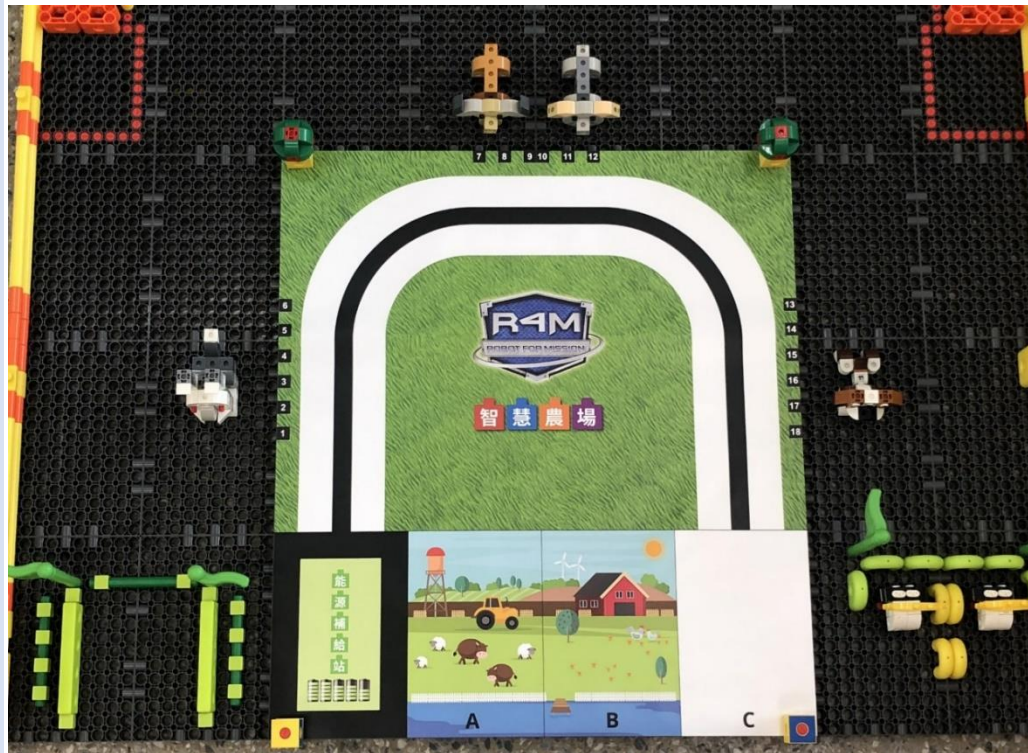
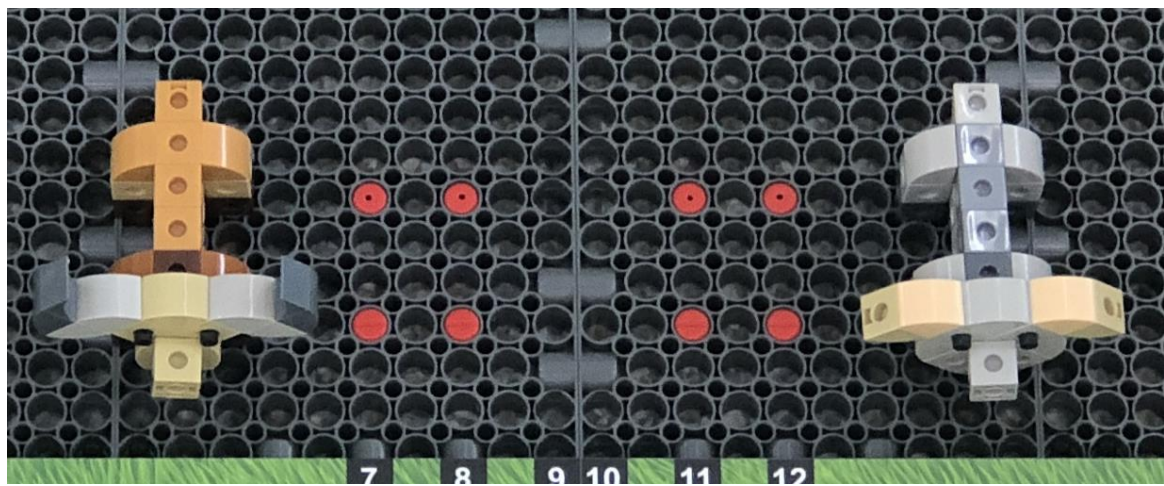
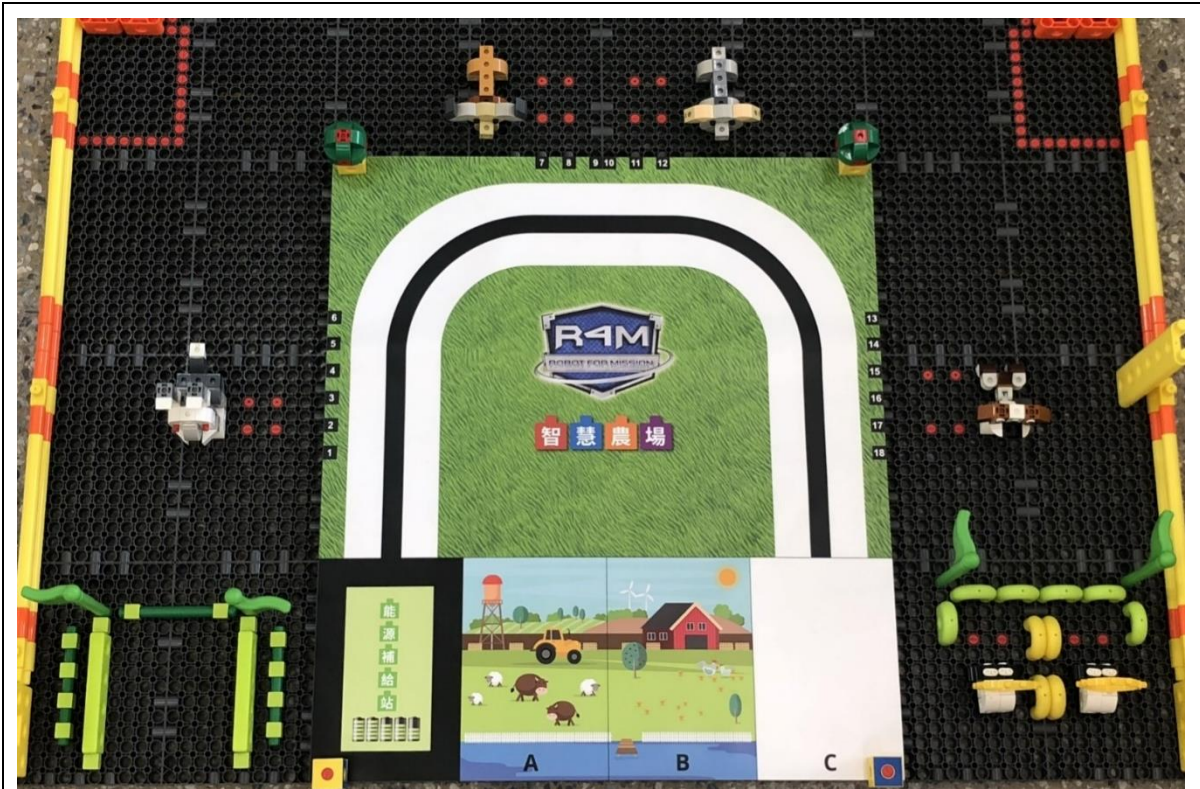


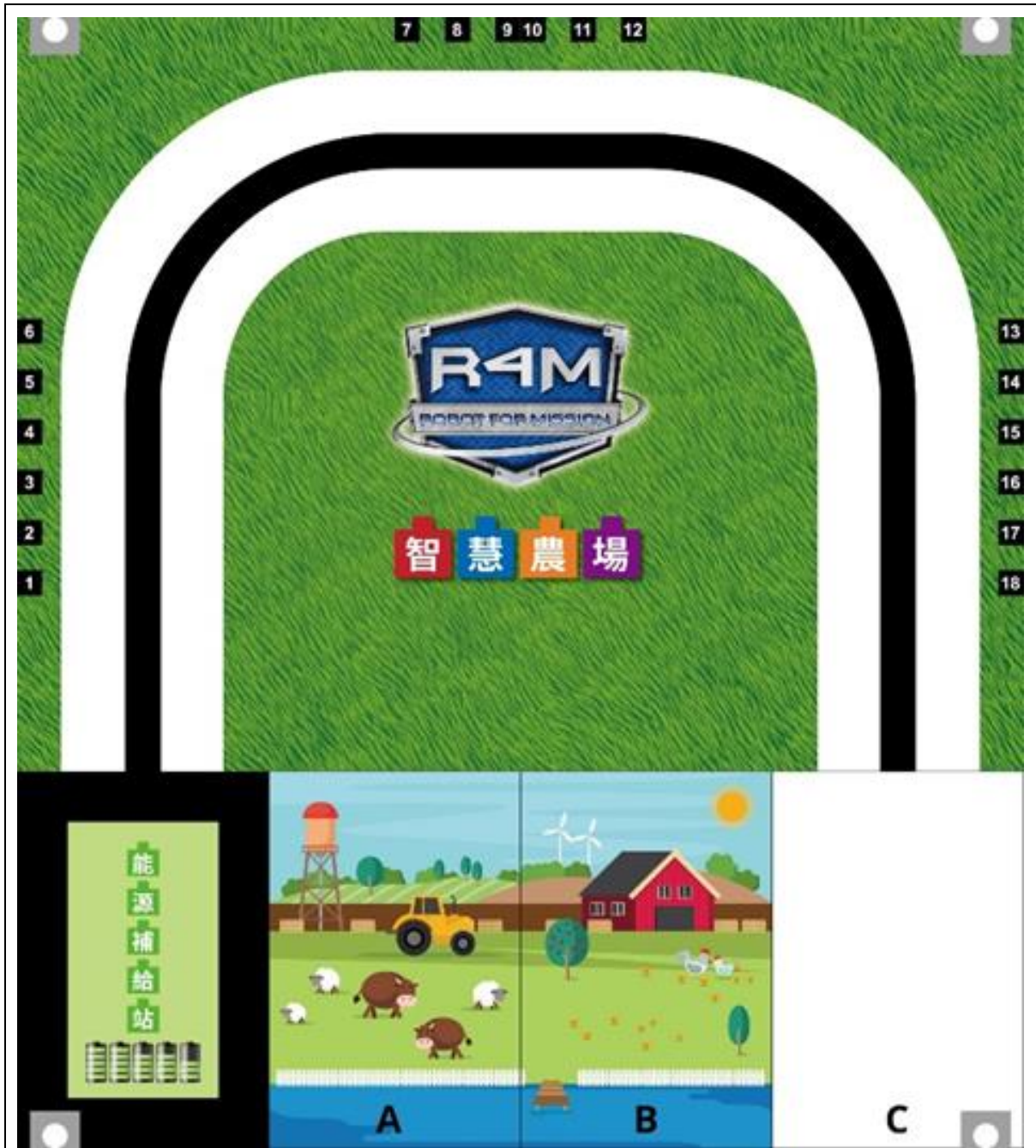
Figure 7. Positioning points for rabbit, cow, pig, dog, sheep giraffe and large feed.



Figure 8. Positioning points for giraffe, small feed and one worker.



Red connectors in the above picture show the animal placement area, the red connector flathead-side is where the animal's forefoot is placed, the red connector hole-side is for the animal's hind foot.



Smart farm robot distribution area:

Before the mission, robots A, B and C will be in non-remote controller modes and should be placed in the zones marked A, B and C respectively. Contestants may begin after the judge's whistle.

Smart farm Feed stacking area:

There are four types of feed in the feed area of the smart farm. There are three kinds of omnivorous feed, with six pieces in each color, red, green and yellow. Each one is a two-centimeter square block with one peg and five holes. See Figure 1. In addition, there are 2 large green balls that represent giraffe feed.

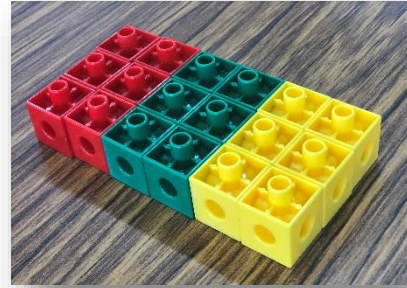


Figure 1

Before the start of the mission, the contestants must place the four types of feed into the upper area of the smart farm feeder. The omnivorous feed is divided into 18 sections, each 2 cm x 2 cm.



Figure 2

For the world contest, the colors of the omnivorous feed will be selected by lottery according to a serial number ranging from 1-18. For example, number 13 may be the red feed, number 14 may be the green feed, number 15 may be the red feed, number 16 may be the red feed, number 17 may be the yellow feed, and number 18 may be the red feed. The order is shown in Figure 2.



Figure 3

For regional contests, the color of the omnivorous feed areas numbered 1 to 6 and 13 to 18 are randomly selected. Numbers 7 to 12 are preset in the order: red, red, green, green, yellow and yellow, see Figure 3.

Two large green giraffe feed balls will be placed on the top of a 4 x 4 block, as shown below.



	Zone Number 1 to 6	Zone Number 7 to 12	Zone Number 13 to 18
World and Taiwan Contest	Random lottery	Random lottery	Random lottery
Regional Contest	Random lottery	Preset order color: red, red, green, green, yellow, yellow.	Random lottery

<b>Task Start</b>
The competition winner is decided based on a task/point system. The sum of the team points for individual aspects of the tasks becomes the total score of the team.
<p>Task 1:</p> <p>When robot A successfully leaves the sterilization zone A, and successfully arrives at the smart feed stacking zone, the team will be awarded 5 points.</p> <p>When robot B successfully leaves the sterilization zone B, and successfully arrives at the smart feed stacking zone, the team will be awarded 5 points.</p>
<p>Task 2:</p> <p>A FORCE SENSOR (1246-W85-C), two light bulbs (red and green) and a light FOLLOW SENSOR (1247-W5-B3) must be installed on robot C. The relevant specifications are shown in Appendix 10. 1. The program can be written, corrected or uploaded during the contest by contestants. Robot C's starting mechanism must be initiated by either Robot A or B touching the FORCE SENSOR (1246-W85-C). If robots A or B start robot C, and robot C successfully and fully leaves the starting area, 10 points are awarded. To score points, no part of Robot C may remain in the starting area. Robot C follows the black line and pushes 18 pieces of feed away from the feed area to the lower playground to earn 20 points. Finally, robot C must return to the energy supply station when its mission is complete. Returning successfully to the black frame earns a team 10 points; returning successfully means that the entire robot is within the energy supply station, no part may extend beyond the black frame. If robot C enters the energy supply station, the red light and the green light will come on until the end of the contest and the team will be awarded</p>

10 points. If the above four tasks are completed, teams are awarded a total score of 80 points.

Note 1: After robot C starts, if there is a programming error, the contestants can make corrections in programming or modification, however this time is counted as competition time.

Note 2: Robot C uses a micro:bit software and uses the Gigo micro:bit control box (1269-W85-A). See Appendix 10. 1. for more information.

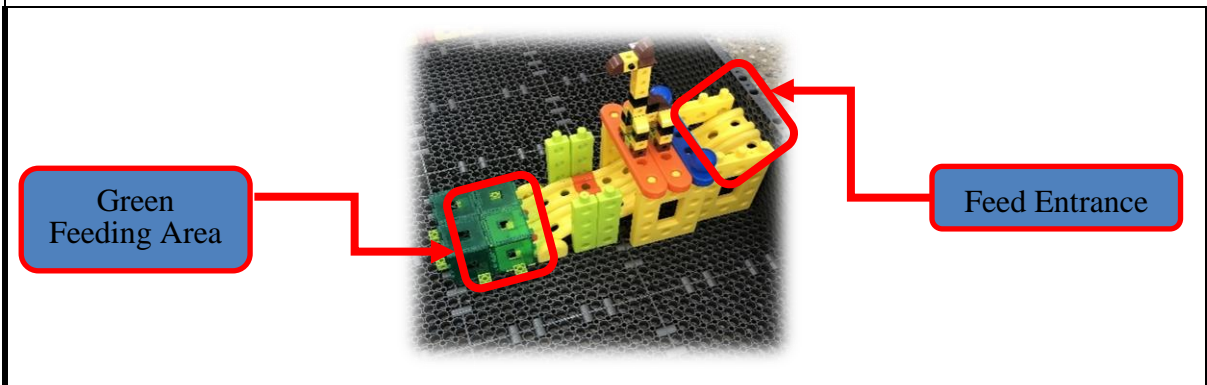
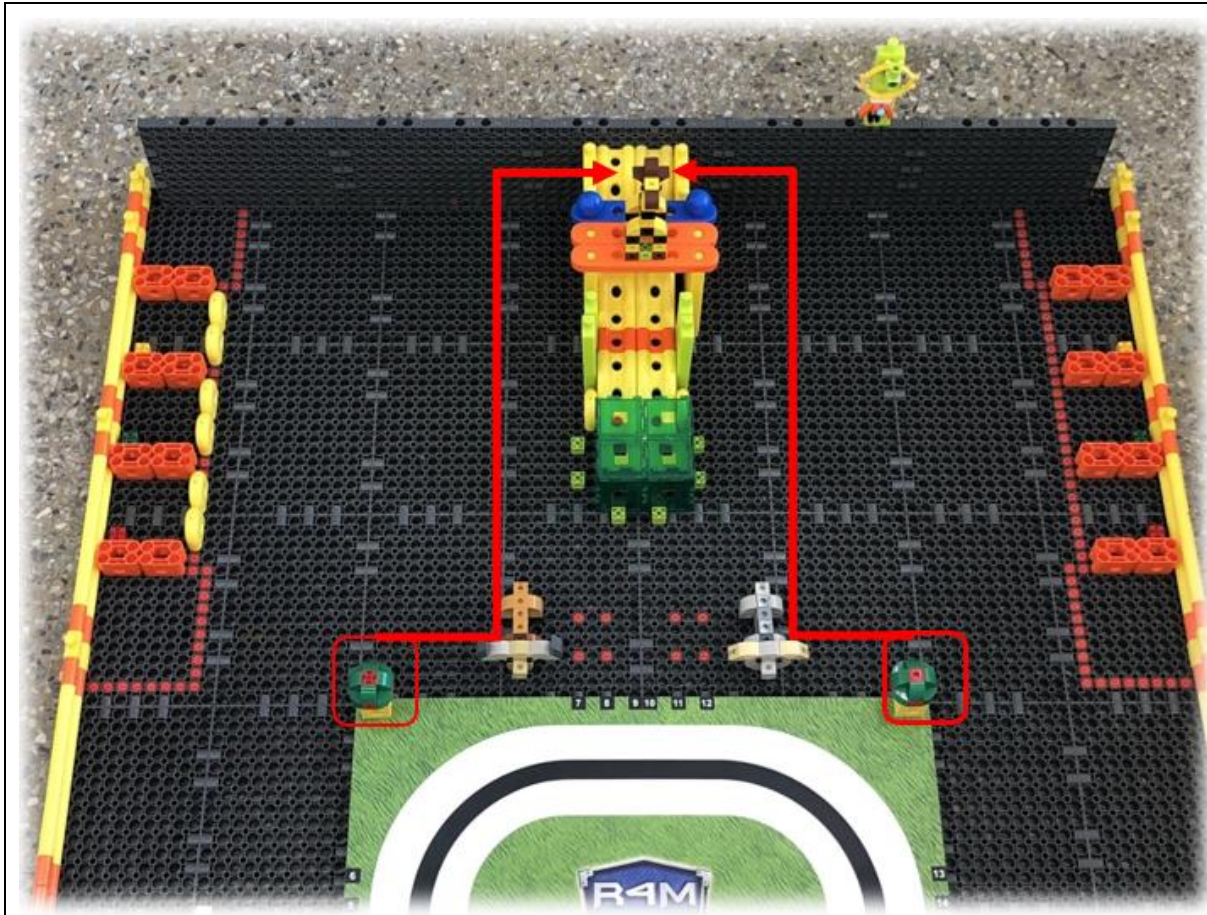
Note 3: Robots A, B, and C must be assembled by the contestants themselves. Robot C uses a programming device (notebook, tablet and cable) and the micro:bit program. If contestants need to connect to the internet, they must prepare for this themselves.

Note 4: Robot C has three chances to re-operate in the R4M World Contest. Regional competitions may make unlimited attempts.

Task 3:

Robot A or B puts the feed (two large green balls) into the giraffe feed container. Each giraffe fed earns 20 points. If both are fed then teams earn 50 points.

Note 1: The Giraffe feed should be fed into the giraffe farm by sliding it down into the feeding zone via the transport ramp. The feed should be completely within the green feed zone, no part of it should extend outside.

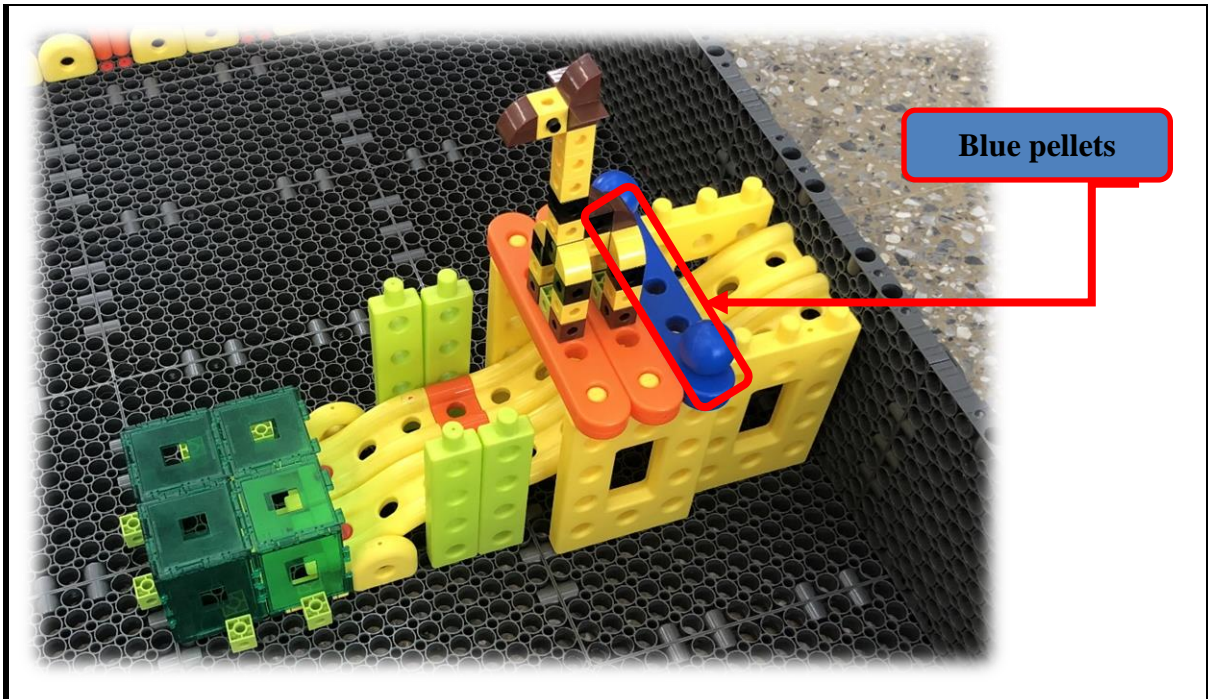


**Task 4:**

Robots A and B put the two blue pellets into the green feeding area via the transport ramp. Each blue pellet earns 5 points and the maximum is 10 points.

Note 1: Robots A and B need to wait for robot C to move the feed before taking it away.

Note 2: The two blue pellets need to enter the feed zone through the giraffe farm entrance. The blue feed should be completely within the green feed zone, no part of it should extend outside.



Task 5

Robot A or B must take the feed into the left and right feed areas in the lower playground zone to score. The scoring table is shown below:

Zone \ Quantity Score	One Piece	Two Pieces	Three Pieces	Four Pieces	Five Pieces	Six Pieces
	Red First Zone \ Green First Zone \ Yellow First Zone	Two points	Five points	Eight points	Eleven points	Fourteen points
Red Second Zone, Green Second Zone, Yellow Second Zone	Four points	Ten points	Sixteen points	Twenty-two points	Twenty-eight points	Forty points

(1) Robot A or B putting the red omnivorous feed into the red first zone gets 2 points. For each additional unit of feed, contestants can receive 3 additional points etc. (see above chart). If all 6 are successfully transported teams score 20 points.



- (2) Robot A or B putting each green omnivorous feed into the green first zone gets 2 points. For each additional feed unit, contestants receive an extra 3 points etc. (see above chart). If all 6 are all successfully transported, teams score 20 points.
- (3) Robot A or B putting each yellow omnivorous feed into the yellow first zone gets 2 points. For each additional feed unit, contestants receive an extra 3 points etc. (see above chart). If all 6 are all successfully transported, teams score 20 points.
- (4) Robot A or B putting the red omnivorous feed into the red second zone gets 4 points. For each additional feed unit, contestants receive an extra 6 points, etc. (see above chart) if all 6 are all successfully transported, teams score 40 points.
- (5) Robot A or B putting the green omnivorous feed into the green second zone gets 4 points. For each additional feed unit, contestants can receive an extra 6 points, etc. (see above chart) if all 6 are all successfully transported, score 40 points
- (6) Robot A or B putting the yellow omnivorous feed into the yellow second zone gets 4 points. For each additional feed unit, contestants can receive an extra 6 points, a etc. (see above chart) if all 6 are all successfully transported, score 40 point.

Note 1: Robots A and B must wait for robot C to move the feed from the upper smart farm, to the lower playground before beginning processing.

Note 2: Feed must pass the red line completely no part of the feed may extend past the red connector line. If any part of the feed is on the red connector line it will not score.

Note 3: Feed color errors will not score, i.e. red omnivorous feed in the green zone will not be counted.



Task 6: Robot A or B can score points when they ship the Gigo sheep and worker to the wool factory.

1. Send a Gigo sheep to the wool factory, if it remains standing, the team scores 15 points.
2. Send a Gigo sheep to the wool factory, if the sheep falls over, the team scores 10 points.
3. Send the worker to the wool factory will get 15 points, regardless of whether the worker is standing or not.
4. If a contestant sends two Gigo sheep and one worker to the wool factory, and both the Gigo sheep stay standing then can get 60 points.



Task 7:

Four animals in the farm will be transported to the designated resting area by robots A or B.

If the cow or pig is put completely in the designated resting area and remains standing, teams will score 10 points per animal, for a maximum of 20 points.

If the dog or rabbit is put completely in the designated resting area and remain standing,

teams will score 15 points per animal, for a maximum of 30 points.

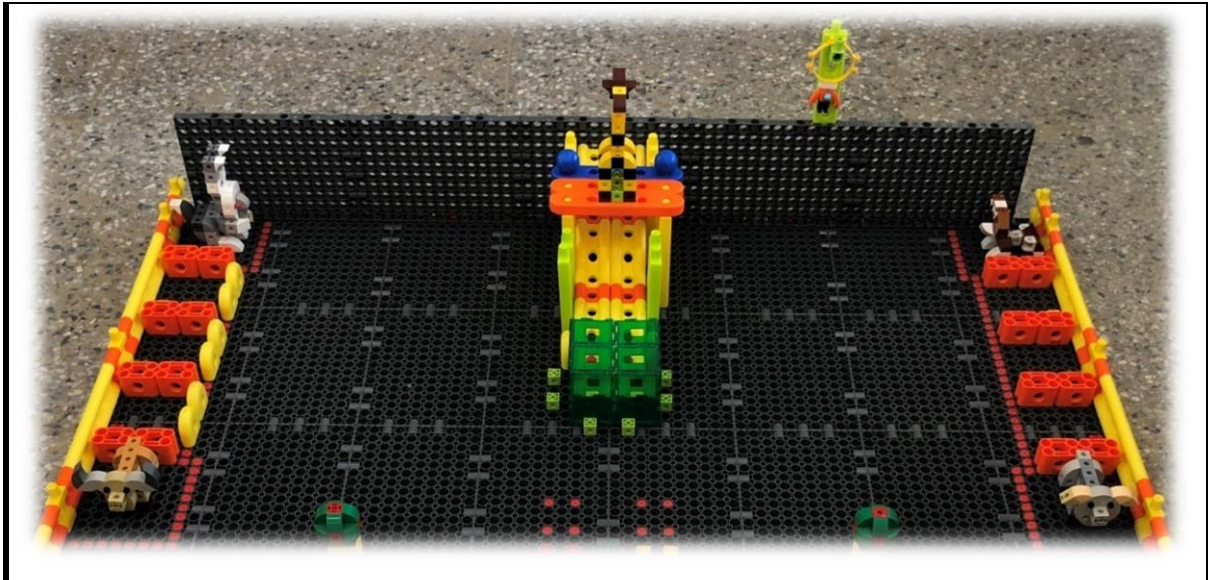
If the cow or pig is put completely in the designated resting area and falls over, teams will score 5 points per animal, for a maximum of 10 points.

If the dog or rabbit is put completely in the designated resting area and falls over, teams will score 10 points per animal, for a maximum of 20 points.

If all four animals are put completely in the designated resting area and remain standing, teams score 70 points total.

Note 1: Animals must pass the red line completely; no part of the animal may extend past the red connector line. If any part of the animal is on the red connector line it will not score points.





#### 9. 4. Scoring Criteria

3 minutes is given to complete the task, the highest scoring team wins. The total weight of the robot also affects the score; lower weight robots receive higher scores.

##### 9. 4. 1 Scoring Sequence

Awards will be based on scores. In the event that teams have the same score, the final result will be determined by the following order of decisions.

Sequence order	Sequence item
1	The number of tasks completed.
2	The number of tasks with a full score.
3	Score of task two
4	Score of task five.
5	Score of task seven.
6	Score of task six.
7	Score of task three.
8	Score of task four.
9	Score of task one.
10	Total weight.

##### 9. 4. 2 Competition Time

The total time of the contest is 3 minutes. After 3 minutes, contestants are not allowed to continue.

#### 9. 4. 3 Damage to the Contest Area

Any damage to the contest site during the mission will result in a 5-point deduction. This contains damage to all props and animals in the testing area. Additionally the feed in 1 to 18 feed stacking zones are not be pushed away from the platform by the robot C.

#### 9. 4. 4 Competition Order:

Before the competition begins, teams should proceed to their designated area as specified by the map provided by the Organizer.

#### 9. 4. 5 Work Submission

Teams that have finished their round must return their robots to the work display area until the end of the contest.

### 9. 5. Contest Site Rules

#### 9. 5. 1 Checking Items

After registration contestants should enter the contest site directly. Toolboxes, personal bags, use of tools (including ornament props), and other potentially dangerous objects will be actively checked on site. If any signs of fraud or cheating are discovered, the team will be disqualified.

#### 9. 5. 2 Assembly Time:

The assembly time, including practice time, is 2 hours.

#### 9. 5. 3 Missions

Contesting teams build their robots on site during the contest. After building and follow the contest schedule undertake the missions. No assembled components are allowed into the contest site. Violators of this rule will be disqualified.

#### 9. 5. 4 Allowance for Practice

During assembly time, some limited opportunities for practice may arise. As practice spaces are limited, please follow the instructions of the staff regarding these opportunities.

#### 9. 5. 5 Access Restrictions.

During the contest, team leaders or parents are not allowed to enter the contest area or pass anything to the contestants. Any violations will result in a 5-point deduction from the team score.

#### 9. 5. 6 Interference with Others

During the contest, no person or team is allowed to disturb the work of other persons, teams or the judges in any way. This includes running around or making loud noises. If this rule is violated and a warning has already been given, violators will suffer a 5-point deduction.

#### 9. 5. 7 Communications & Communication Devices

Contestants are not allowed to talk, communicate or text non-contestants (eg, team leaders, parents). Violators of this rule will be disqualified. In an emergency situation, contestants should seek help from the Service Center.

Note: Contestants may bring mobile phones, tablets and laptops as controllers, however, to avoid any unwanted or unjustified punishment, such devices should be on airplane mode and have the SIM card removed.

#### 9. 5. 8 Private Property

Any deliberate destruction, theft, robbery or attempts to cheat other people of their possessions will lead to a 5-point deduction and probably more serious measures.

#### 9. 5. 9 Portable Data:

Contestants may bring writing, pictures, video file and other printed data.

#### 9. 5. 10 Video Recording

To avoid post-match disputes, each team shall record its performance during the competition as evidence of its performance.

#### 9. 5. 11 Motor Inspection

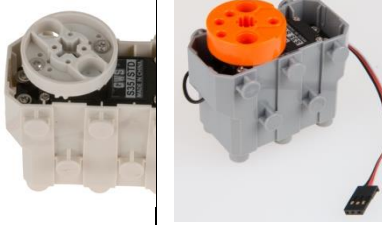
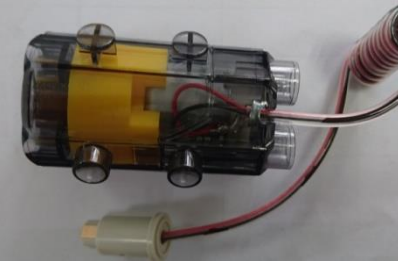

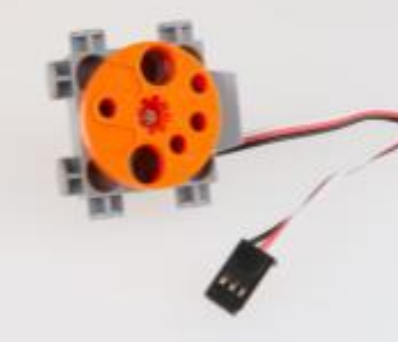
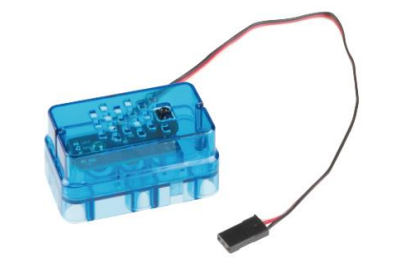

Winning teams must accept a motor inspection, if the motor does not meet the specifications in Section 10. 1. “Race Motor Model List”, the team’s award will be withdrawn and the next team in line will be promoted.

10. Appendix & Forms




10. 1. List of Race Contest Motor Models

2019 World Robot for Mission Contest R4M Competition Motor Model List

1		C-30X MOTOR WITH WIRE CONNECTOR	7328-W85-A1-1
2		C-32X PLANETARY GEARBOX(DDM)	7392-W85-B3
		C-CAR MOTOR	7392-W85-B1
3		C-40X MOTOR WITH WIRE CONNECTOR (DDM)	7400-W85-A1
		C-40X MOTOR WITH WIRE CONNECTOR	7400-W85-A
4		C-180° SERVO MOTOR	1247-W85-D1-1

5		C-CONTINUOUS ROTATION SERVO MOTOR	1247-W85-D2
6		C-50X PLANETARY GEARBOX	7447-W85-C
7		C-50X PLANETARY GEARBOX (DDM)	7412-W85-A
8		C-180 SERVO MOTOR (METAL GEAR)	1247-W85-D3
9		C-LINE FOLLOWER SENSOR	1247-W85-B3
10		C-FORCE SENSOR	1246-W85-C



11		Red light bulb	
12		Green light bulb	
13		C-Gigo micro:bit CONTROL BOX	1269-W85-A

10. 2. Student Enrollment Certificate

2019 World GreenMech World and Taiwan Cup - Certificate of Student Enrollment

Team Name				
Contest		<input type="checkbox"/> GreenMech <input type="checkbox"/> R4M		
Category		<input type="checkbox"/> Elementary School <input type="checkbox"/> Junior High School <input type="checkbox"/> High School		
Photo	Clear photo of the face.	Clear photo of the face.	Clear photo of the face.	Clear photo of the face.
Student Name				
School & Grade				
Date of Birth:.				

I certify that the above students are still studying in our school and that the above information is correct.

Signed: \_\_\_\_\_

Director of Academic Affairs:\_\_\_\_\_

Principal: \_\_\_\_\_

Date: \_\_\_\_\_ (dd/mm/yyyy)

### 10. 3. Complaint Form

#### 2019 World GreenMech World and Taiwan Cup- Complaint Mediation Form

Plaintive Team	
Plaintiff	
Complaint Details	
Case Officer	
Resolution	
Plaintiff Signature	

#### Notes:

Those who have not filled out this appeal will not be accepted; the overseas team and the GreenMech Junior teams may be sent by Organizers to file the complaint, however they must still sign it personally to confirm that the details of the complaint are correct.

After the judge has made understood the situation and made a ruling they must complete the section marked “Resolution” and explain the remaining process to the plaintiff.

If the plaintiff is still dissatisfied with the result of the treatment and refuses to sign, the judge may add a “refusal” in the “Plaintiff Signature” field.