ขอเชิญเข้าร่วมการแข่งขันระดับนานาชาติ ในรายการแข่งขัน

WORLD GREENMECH CONTEST 2022

ในรูปแบบออนไลน์

คณะครุศาสตร์อุตสาหกรรม มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าพระนครเหนือ
โดยการสนับสนุนจาก บริษัท ภาดา เอ็ดดูเคชั่น จำกัด
จัดทำโครงการวิจัยเรื่อง
การเรียนรู้แบบปัญหาเป็นฐานผ่านกิจกรรมการสร้างโครงงานด้านวิศวกรรมและพลังงานสะอาด
สำหรับนักเรียนระดับประถมศึกษา และมัธยมศึกษา
จัดการแข่งขันการเรียนรู้แบบปัญหาเป็นฐาน ผ่านกิจกรรมการสร้างโครงงาน
(Problem-based learning หรือ PBL)
ประจำปี 2022
ในระดับชั้นประถมศึกษา ระดับชั้นมัธยมศึกษาตอนต้น และระดับชั้นมัธยมศึกษาตอนปลาย

	ประกาศรับสมัคร	**ระยะเวลา/การพิจารณา**	**ประกาศผลการคัดเลือก**
การแข่งขันการเรียนรู้แบบปัญหาเป็นฐาน	**ส่งใบสมัคร** 1-30 มิถุนายน 2022	**กำหนดส่งผลงาน** 15 กรกฎาคม 2022 **การส่งผลงานประกอบด้วย** 1.Video การทำงาน ไม่เกิน 6 นาที 2.Video format: 1920 * 1080 MP4 3.Video ประกอบด้วย Contest Name, Team Name and English subtitle	สิงหาคม 2022

ข้อมูลการลงทะเบียน

การสมัครเข้าร่วมจะต้องลงทะเบียนเสร็จสิ้นภายในเวลาที่กำหนด 1-30 มิถุนายน 2022 ข้อมูลเพิ่มเติมสามารถดูได้ที่ Facebook แฟนเพจ Thailand Green Mech และ Line official: @thailandgreenmech หรือหากมีข้อสงสัย E-mail: gogreenmech@hotmail.com โทร 084-5360161 , 089-9535552, 062-4464096

ใบรับรองสถานภาพการเป็นนักเรียน

ชื่อทีม				
ประเภทการแข่งขัน				
ระดับชั้น	☐ ประถมศึกษา ☐ มัธยมศึกษาตอนต้น ☐ มัธยมศึกษาตอนปลาย			
รูปถ่าย	สมาชิก 1	สมาชิก 2	สมาชิก 3	สมาชิก 4
ชื่อ-สกุล				
โรงเรียน				
วันเดือนปี เกิด				
ที่ปรึกษาทีม: กรุณากรอกข้อมูลให้ถูกต้อง				
	ที่ปรึกษา 1	**ที่ปรึกษา 2**	**ที่ปรึกษา 3**	
ชื่อ-สกุล				
โรงเรียน				
โทรศัพท์มือถือ				
อีเมล				

ใบรับรองสถานภาพการเป็นนักเรียน การแข่งขันการเรียนรู้แบบปัญหาเป็นฐานผ่านกิจกรรมการสร้างโครงงาน ขอรับรองว่านักเรียนคนดังกล่าวมีสถานะเป็นนักเรียน และข้อมูลดังกล่าวเป็นข้อมูลที่ถูกต้อง

ลายมือชื่อ _____

หัวหน้าฝ่ายวิชาการ _____

ผู้อำนวยการ _____

วันที่ _____

2022 World GreenMech World Cup

Team Name				
Contest	☐GreenMech ☐R4M			
Category	☐Elementary School ☐Junior High School ☐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)

2022 World 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
Contact:	Ms. Wu conniewu@mail.gigo.com.tw

World GreenMech Contest Regulations

1. Purpose

The 2022 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 growth. There are three contests: (i) GreenMech (ii) R4M and Each seeks to inspire contestants in their own way, and to engage in scientific study, creative problem solving, and help contestants understand the use of scarce resources when project planning. Contestants will 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), 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 Information

2. 1. Summary of Events

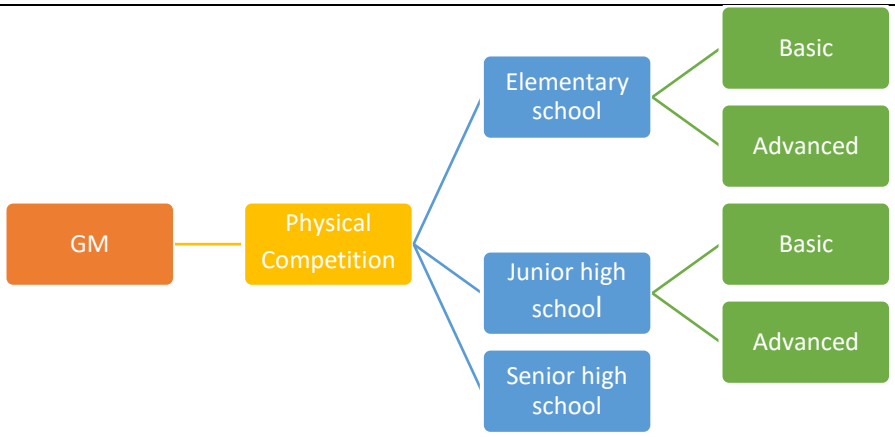
		2022 World GreenMech Contest	
	GreenMech	R4M	Remarks
Participant Selection	Full time students in grades 1-12. Three groups: (i) elementary school (ii) junior high school (iii) senior high school	Full time students in grades 1-12. Three groups: (i) elementary school (ii) junior high school (iii) senior high school	Students in education until June 6, 2022
Team Size	3 to 4 people	3 people	For rules governing replacement of team-mates see in section 2.2
No. of Instructors	1 to 3 people	1 to 3 people	The instructor can be a teacher or parent

3. **GreenMech (GM) Contest**

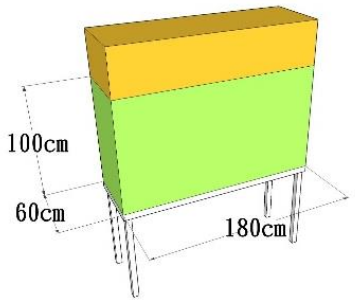
Theme & Purpose: Coexist with Water and Soil

Our current age is dependent on technology and innovative R&D. Such progress is a benefit for all people, but engineers and designers must be aware of the impact they have on the environment. Recently, there have been environmental concerns over soil and water conservation. Because of this, there are now several soil and water conservation projects that are intended to protect water sources, conserve the land, and prevent ground subsidence. Problems like these are important all around the world and we can be part of the solution.

3. 1. Notice

1. Elementary and junior high schools have two contest levels, basic and advanced. Participating teams can join either competition, but the total number of recommended teams from each country is limited due to the limit on the number of total overseas teams.


3.2 Dimensions

Groups	Space Limits	
(i) Elementary school (ii) Junior high school	All work must be constructed on a table 180cm long and 60cm wide. A virtual rectangular space shown in Figure 1 extends upwards for 100cm. Work is not limited in height, but projects may only extend outward beyond the horizontal boundaries above 100cm. Projects extending must be safe and steady. If the constructions do not	 Figure 1. Green shows the allowable building area. Within the green area (60 x 100 x 180 cm) no penalty is applied. If the model exceeds the

	meet these requirements and have not been modified after a warning, 5 points will be deducted.	horizontal limits below 100 cm, a 5 point deduction will be applied. Models may exceed the horizontal space limit, but only above 100 cm, and where it is safe and stable.
(iii) Senior high school	The horizontal dimensions of the lowest part of the project is 60 x 60cm. The height of the work is not limited.	

3. 2. Basic Elementary & Junior High School

3.2.1 Criteria: The number and order of tasks will be randomly selected on the day of the competition, and contestants must complete the tasks and devices assigned.

Groups	Basic Tasks	Advanced Tasks
Elementary school	5	Advanced 1, Advanced 2, Advanced 3
Junior high school	5	Advanced 1~ Advanced 6

3.2.1.1 Diagram of device arrangement (Elementary school, Junior high school)

Elementary school: The figure below is a diagram of the arrangement of 8 devices. On the day of the competition, three devices will be assigned randomly to the three categories Advanced 1, 2, and 3. These Advanced devices (red) must be placed in order with the other devices (blue) as shown below. 
Junior high school: The figure below is a diagram of the arrangement of 8 devices. On the day of the competition, we will randomly draw out 3 tasks out of Advanced 1~6, and place them into the positions of the pending devices as red part in the order of drawing. 

3. 3. Tasks

Types of Tasks	Devices	Contents
Basic Tasks	Basic 1	Construct a set of three-layer descending or ascending tracks with different heights.
	Basic 2	Device must release more than 3 marbles onto the slope.
	Basic 3	Device must raise the flag vertically more than 30 cm.
	Basic 4	Construct a device that demonstrates the domino effect.
	Basic 5	Construct a device that demonstrates the simple pendulum principle.
Advanced Tasks	Advanced 1	Design bifurcation track(s), which must be triggered by the previous device. The balls must be sent into the bifurcation track in sequence. When the balls come to rest, the final distance between the four balls must be greater than 15cm, as measured from the center of each ball. One ball must be used to trigger the next device. Remarks: The bifurcation track needs to be able to move the balls in two different directions.
	Advanced 2	Design an elastic powered launching device that can push or launch a ball a horizontal distance of more than 30 cm and trigger the next device.
	Advanced 3	Design a device that can vertically raise a ball more than 30 cm, and trigger the next device.
	Advanced 4	Design an elastic powered vehicle which is triggered by the previous device. The vehicle must move horizontally more than 30 cm using elastic power and trigger the next device.
	Advanced 5	Design a device to release one ball. The initial ball must cause two other balls to move, and they must both be collected in a paper cup. The paper cup must then trigger the next device.
	Advanced 6	Design a cable car device to raise a ball up to a high platform. The same ball must then trigger the next device.
NOTES	The size and material of the balls and marbles for basic and advanced devices is not limited to Gigo components.	

3. 4. Scoring (Basic)

<table>
<tr><th>Scoring</th><th>Weighting</th><th>Standards</th></tr>
<tr><td>1. Basic Rules for Devices</td><td>44%</td><td>1. Total number of devices must be correct. Each device must be labeled clearly as “Device 1” to “Device 8”. Each correct label will earn 2 points.
2. The order of advanced devices must be correct according to the order in which they are drawn before the contest begins. Each functional advanced device will earn 4 points.
3. The content of the devices must be correct according to the task description (7.4.). Each functioning device earns 2 points.</td></tr>
<tr><td>2. Smoothness</td><td>20%</td><td>1. When the device is in operation, 2 points will be deducted if anything falls out of the device area.
2. 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 resume operation, the team will receive a 2-point deduction.
3. The smoothness score will be multiplied by the score for devices used.</td></tr>
<tr><td>3.Device Design of Advanced Tasks</td><td>36%</td><td>Scoring is based on the sophistication and functionality of the device design. Each task has 12 points. There are total 3 tasks.
<table>
<tr><th>Scoring</th><th>Content</th></tr>
<tr><td>1.Sophistication</td><td>The precision and ingenuity of the device design.</td></tr>
<tr><td>2.Diversity of action</td><td>During fulfillment of the advanced task, contestants must use an effect to trigger an action, such as activating another device.</td></tr>
<tr><td>3.Operational stability</td><td>Stability during repeated operations includes the time required to restart a mechanism</td></tr>
</table></td></tr>
</table>

			and the success rate of the operation. Remarks: Secondary attempts to complete a task must started within one minute. Judges will score the second operation.
		4.Connectivity	Includes the activation of advanced devices and the manner in which two devices are connected.

3.3 Criteria

Work Configuration Chart

Green energy sources may be used between devices on the way to the specified devices. They cannot be used in the first device.

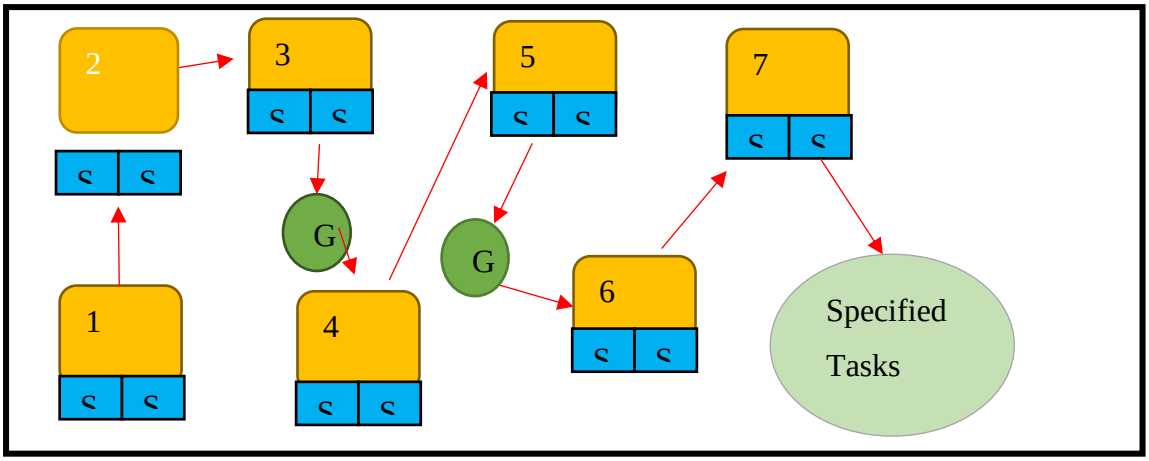


Figure 1. Work configuration chart showing devices and labels.

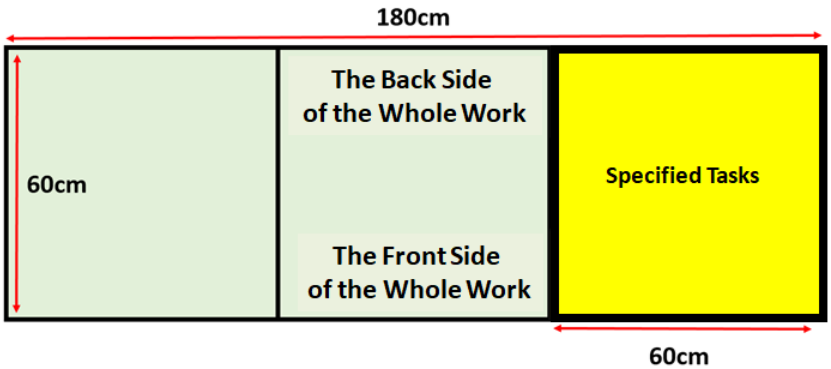


Figure 2. Plan view of the project and specified task area.

Scoring	Weighting	Standards
1. Total Number of Devices	18%	(i) The number of devices is calculated by the main path of the projects. Branch devices are not included in the scoring process. Teams must clearly specify the first and last stages as well as the order of operations. (ii) The project should contain 7 regular devices, 2 green energy source devices, and 1 specified device. (iii) The device number assigned only applies to the device itself, not to any specified objective. 2 points will be given for correctly tagging each device and 0 point for unlabeled devices. See section 3.9 for device labels.
2. Green Energy Source Applications	10%	(i) There are five kinds of green energy sources: wind, hydro, solar, magnetic and chemical. Teams earn 3 points for compliance with green energy specifications. Each green energy-driven device that successfully completes its objective will earn 2 points. (ii) Green energy devices can only be used after the first device and before the specified tasks. Green energy applications may not be repeated or combined with regular devices. The highest score available from this part is 10 points. (iii) If a team uses green energy sources for the first device, they will not be awarded any green energy score. For more information on Green energy use, refer to section 7.11
3. Smoothness	20%	(i) The smoothness score is based on the operation of the 7 general devices, 2 green energy devices, and how well the specified task are completed, from beginning to the end. (ii) Contestants should be able to brief judges on the objectives they have completed for all devices including green energy. Contestants should be prepared to discuss the scientific concepts, green energy design and the scientific principles of any devices they have, and explain how they fulfill the requirement of the device.

		(iii) When the device is in operation, 2 points will be deducted if anything falls out of the device (60cm x 180cm). 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. (iv) 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. (v) 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 resume operation, the team will receive a 2-point deduction. (vi) If a scientific principle or green energy application fails in a device, but overall operation continues, the manual intervention penalty is applied. (vii) The Smoothness score includes 7 regulars devices, 2 green energy devices, and the action to activate the feeding mechanism of specified tasks. (viii) The smoothness score will be multiplied by the score for devices used, e.g. if the score from the number of working devices is 14 points, with one manual intervention, and one ball drop, the Smoothness score will be calculated as: (20 - 2 - 2) x 14/18 = 12.44 points.
4. Creativity	12%	For 2 creative tasks in the design category (4 points), overall design concept of the work (4 points), and specific task design (4 points). (i) Two creative devices must be included among devices 1 - 7. Creativity points are awarded in two categories: structure, and creativity of appearance. Up to 2 points can be awarded for each creative device in each category (for 4 points total).

		(ii) Points are also awarded for describing the performance of the device and overall design aesthetics. The total score for each device from this category is 4 points. (iii) 4 points are awarded for the overall performance of the specified tasks and design concept.
5. Scientific Principle Applications	28%	(i) The application of scientific concepts includes scientific principles, laws, phenomena and structures as set out in section 7.9.1. (ii) Each device must prove 2 scientific concepts. Scientific concepts (1 action counts as a scientific concept) should not be duplicated between devices. A total of 14 scientific concepts, each earning contestants 2 point each can yield a maximum of 28 points. (iii) At the time of examination, the empty list of scientific concepts will be released. Contestants should refer to the list as their work to ensure they are fulfilling the required objectives. At 11:00, the Scientific Principles Reference Table will be collected by the Organizer. Submission of an incomplete table will not score points. (iv) If there are more than two scientific concept designs for a device, contestants should tick only two scientific concepts to be presented for that device. Only 14 scientific concepts can be checked on the self-assessment form, with no score exceeding 2 points per device. Please refer to section 7.10 for more information.
6. Specified Tasks	12%	Design a project following the theme: Coexist with Water and Soil. The content must include the following: A. Concept Development: climate change, water or air pollution, soil erosion, extreme weather etc. B. Life Impact: How to prevent these problems. C. Problem Solving: How to improve or prevent the situation. Mitigating the effects of harmful pollution, or reducing the ecological impact of industry.

<table>
<tr>
<td></td>
<td></td>
<td>(i) Use Gigo building blocks and everyday objects to construct the project. Contestants can use programming to control the device.
(ii) The main program control and motors must be Gigo components. Other circuit components, such as switches, wires, sensors can be from other sources, but must be safe.
(iii) The entire scope of the specified task area (including vertical space above the 60 x 60cm base) should not contain any general or green energy devices. Violations of this rule earn a 2 point deduction for each item.
(iv) The number of devices used in the specified task area is up to the teams, but they must meet the scoring criteria and not exceed the specified area boundaries.
(v) When scoring, contestants need to start from the previous device and show a functioning connection. Scoring occurs when the entire set of operations has been completed. Contestants can earn a maximum of 3 points for each dimension according to the scoring table.
<table>
<tr><th>Scoring Dimension</th><th>Points</th></tr>
<tr><td>1. Specified task is fully automated with no errors.</td><td></td></tr>
<tr><td>2. In the specified task, there is light or sound effect for one device.</td><td></td></tr>
<tr><td>3. The device operational distance must exceed 30 cm horizontally.</td><td></td></tr>
<tr><td>4. The device operational distance must exceed 30 cm vertically.</td><td></td></tr>
</table>
</td>
</tr>
<tr>
<td>7. Rule violations</td>
<td>On-site points deduction</td>
<td>(i) Programming can only be used for automatic control devices on specified devices. Devices 1 -7 and Green Energy cannot use programming or remote control. Violations of this rule will result in a 5-point deduction.</td>
</tr>
</table>

		(ii) Size violations will result in a 5-point deduction. (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. (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 disqualification. (v) Violation of power usage regulations will result in a 5-point deduction. (vi) Violation of regulations governing 3D printing parts and laser cutting parts will result in a 5-point deduction.

3.4 Senior High School Scoring

Scoring Details (Senior High School)

<table>
<tr><th>Scoring</th><th>Score Weight</th><th>Standards</th></tr>
<tr><td>1. Theme</td><td>25%</td><td>The content of the project must be in line with the theme, and show ingenuity. The following scoring table is used by judges to provide scores on a scale of 1-10.
<table>
<tr><td>Scoring Dimension</td><td>1~10</td></tr>
<tr><td>1.Theme content clarity.</td><td></td></tr>
<tr><td>2. Overall poster design.</td><td></td></tr>
<tr><td>3. Work manual content.</td><td></td></tr>
<tr><td>4.Team work collaboration.</td><td></td></tr>
<tr><td>5. Other advantages</td><td></td></tr>
</table></td></tr>
</table>

<table>
<tr>
<td>2. Explanation</td>
<td>25%</td>
<td>Projects must be explained clearly and accurately. The following scoring table is used by judges to provide scores on a scale of 1-10.
<table>
<tr><td>Scoring Dimension</td><td>1~10</td></tr>
<tr><td>1. Stage manner & Performance</td><td></td></tr>
<tr><td>2.Time management</td><td></td></tr>
<tr><td>3. Q&A</td><td></td></tr>
<tr><td>4. Other advantages</td><td></td></tr>
</table>
</td>
</tr>
<tr>
<td>3. Operation</td>
<td>50%</td>
<td>The operation of the project is assessed by the judges using the following scoring table, on a scale of 1-10.
<table>
<tr><td>Scoring Dimension</td><td>1~10</td></tr>
<tr><td>1.Overall operation</td><td></td></tr>
<tr><td>2. One device demonstrates either a sound or light effect</td><td></td></tr>
<tr><td>3. The operating range of one device exceeds 30 cm.</td><td></td></tr>
<tr><td>4. One device in the work can uses programming to automatically deliver object(s) to another place. The distance covered exceeds 30 cm.</td><td></td></tr>
<tr><td>5. Other advantages</td><td></td></tr>
</table>
</td>
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3.5 Scientific Concepts

These only apply to the advanced elementary school and junior high school teams. 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 and have been demonstrated. If a commercially available product or other finished product is used, no scientific concept score will be granted.

(ii.)14 scientific concepts are needed, teams must be able to make an adequate explanation to reviewers and judges.

(iii.) From the Science Principle Concept Table, only 14 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.

3.6 Green Energy Requirements

These only apply to the advanced elementary school and junior high school teams. The contest's green energy component includes five types of wind, hydro, solar, magnetic and chemical energy.

3.6.1 There should be a green energy-driven mechanism in the device area and the successful starting of the next device will earn teams 5 points.

3.6.2 In total teams should submit two green energy devices and implement them somewhere between the first device and the Specified device.

3.6.3 The energy application for each of the two devices should not be duplicated. The highest score for this category is 10 points.

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. Green energy devices may not use batteries.

3.7 Green Energy Examples

3.7.1 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.

3.7.2 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. Hydraulic linkages and buoyancy, are part of the science concepts and not included in the green energy score for water.

3.7.3 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.

Because the current generated by the solar panel is too small to start the motor, the general method is to use a series battery as a backup. At this time, the solar panel is only regarded as the circuit switch operation, and cannot be regarded as the main energy driving mechanism. It will be regarded as the failure of the green energy level.

3.7.4 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.

3.7.5 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. The fruit battery device is only an on-off device, it does not really use chemical energy.

◎Rechargeable batteries are not recognized as an application of chemical energy for Green Energy devices.

3.8 Scientific Principles Reference Table

Scientific Principles Reference Table					
Item	Device Number (Contestant Evaluation)	Judge Evaluation	Item	Device Number (Contestant Evaluation)	Judge Evaluation
Law of Inertia			Connecting Rod		
Force & Acceleration (Gravity Potential)			Truss		
Action and Reaction			Chain Gear/ Transmission		
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		
Wheel and Axle			Elasticity		
Pendulum			Friction		
Static Electricity			Buoyancy		
Worm Screw Worm Gear			Other (to be completed by contestant)		

Capillary Action / Siphon			Other		
Pulley			Other		
Cam			Other		
Gear or Rack			Other		

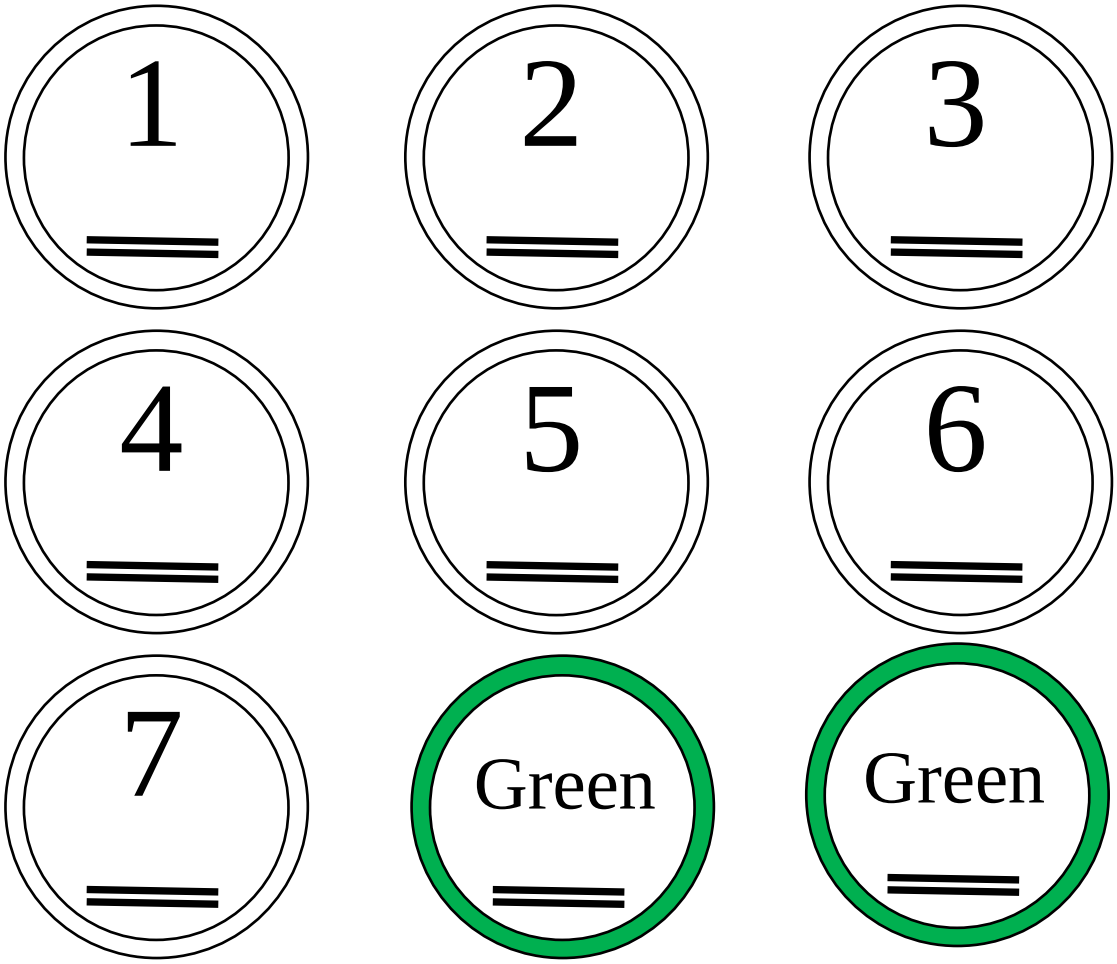
Note 1: The form cannot be arbitrarily added or modified. Only the scientific principles of self-design can be filled in other parts.

Note 2: Scientific principles and green energy cannot be double-counted. Only 14 scientific principles can be selected. If you choose more than 14, please delete more.

Note 3: The device number field can only be filled in with one single option. Do not fill in multiple device numbers, otherwise please delete for judge grading.

3.9 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.



4. Robot for Mission (R4M)

Contest Schedule

4. 1. Scenario & Site Specifications

4. 2 Size Restrictions

A and B robots must individually not exceed 30 × 20cm, the C robot must not exceed 30 × 20cm. There is no height limit. Mechanical extensions are excluded from these limits but these must be extended by remote control or servo motor, not manually. The size of each automation platform is limited to one jumbo base grid (JUMBO BASE GRID) 30 x 20 cm. The height (vertical size) of projects is not limited. The automation platform must be made and fixed to a single jumbo base grid. During the competition, the automation platform can only be fixed to the BASE GRID with four 30mm red round connectors (30mm CONNECTOR). No other pegs can be used.

4.3 Number of Robots

Teams may only prepare 2 robots. If there are less than 2 robots, the team is considered to have withdrawn from the contest. Teams can decide whether they want to use the automation platform. If the robot needs to be repaired, the contestant must receive permission to intervene from a judge. Repair time is included in competition time, and the process must be re-started from the area specified by the judge. If contestants manually intervene without permission from the judge, the first violation will result in a verbal warning; the second will result in a 5-point deduction. Multiple violations accumulate additional points.

4.4 Building Materials

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

4.5 3D Printed Components

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

4.6 Operation Devices (Smart Phones / Tablets)

Contestants are free to choose their own operation method (e.g. smart phones, tablets, laptops or remote-controllers or related equipment) to operate their robot. Devices should all be prepared ahead of time by the teams, and 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, contestants may 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.

4.7 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 refers to the total voltage across 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 of 3.7 volts are limited to 2 pieces, and square 9-volt batteries are limited to 1 piece.

Robot B uses a micro:bit main control box (1269-W85-A). Voltages 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 correct 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 held responsible. Lead-acid batteries and other large dangerous batteries are strictly prohibited. The automation platform can use remote control, program control or AI automatic identification to operate; but the voltage of the main control board is limited to 9V, the same as Robot A.

4.8 Motor Usage Restrictions

Robots A may have up to 4 servo motors and B robot may have up to 2 servo motors. The automation platform may have up to 6 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, s, foam, double-sided tape or other methods. After the competition, the winners will be asked to dissemble their robots on the spot. If the judges find that a team violates the regulation, this team will be disqualified from winning the prize. And the prize goes to the next team on the score list.

4.9 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-D3,7447-W85-C1. For more information see please refer to Section 8.9. If a contestant using the above-mentioned motors installs a different Bluetooth control box; whether it connects a modified motor and the Bluetooth box, or automatically 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.

4.10 Material Safety

Dangerous or hazardous materials are strictly prohibited, including but not limited to: fire, corrosive chemicals, dangerous power components, alternate 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 be disqualified.

4. 2. Contest: “Gigo Automated Warehouse”

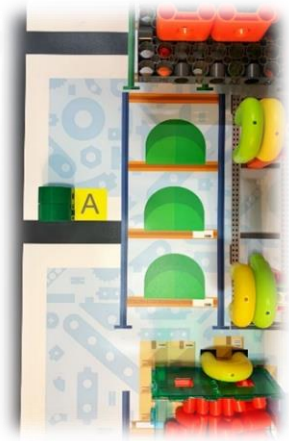
4. 3. Scenario & Site Specifications

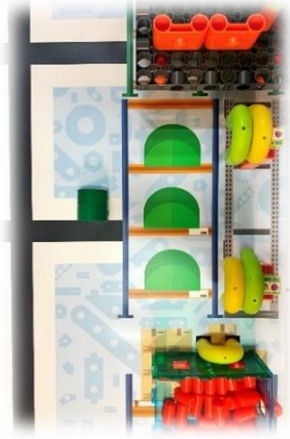
The contest area is limited to a space not exceeding 100 x 210cm and is covered by matte PP photo paper. Each competition area accommodates one team only. The A robot, B robot, and automation platform should be placed in the departure or designated areas.

Figure 1. Competition venue image.

4. 4. R4M Tasks

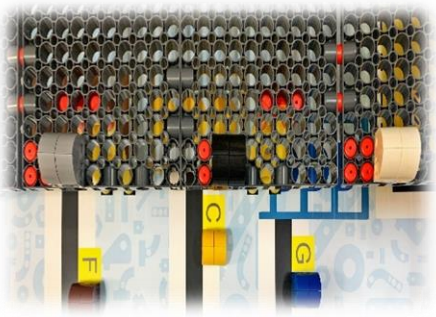
<table>
<tr><td colspan="4">Venue Setting: Positioning points and example images of storage objects
(before the competition begins)</td></tr>
<tr><td colspan="2"> 

The picture above shows the place markers for the orange, brown, yellow and blue pieces.</td><td colspan="2"> 
The picture above shows the default starting places for the orange, brown, yellow and blue pieces.</td></tr>
<tr><td> 

The picture above shows the place marker for the green piece.</td><td> 
The picture above shows the default starting position of the green piece.</td><td> 

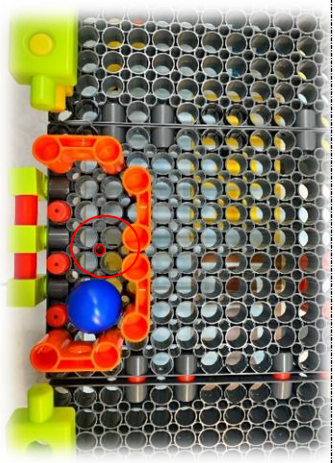
The picture above shows the place marker for the purple and red pieces.</td><td> 
The picture above shows the default starting places for the purple and red pieces.</td></tr>
<tr><td> 
The picture above shows the default starting place for the red connectors for the elementary school teams.</td><td> 
The picture above shows the default starting place of the red connectors and 20-tooth gears for the junior high school teams.</td><td colspan="2"> 
The picture above shows the red connectors, 20-tooth gears and 40-tooth gears for the senior high school teams.</td></tr>
</table>

The picture above shows the default starting place of the horseshoe rings.

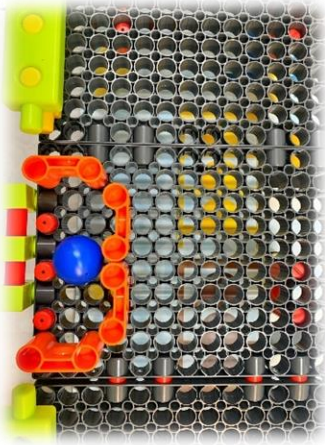


The picture above shows the place markers of the grey, black, and white pieces.

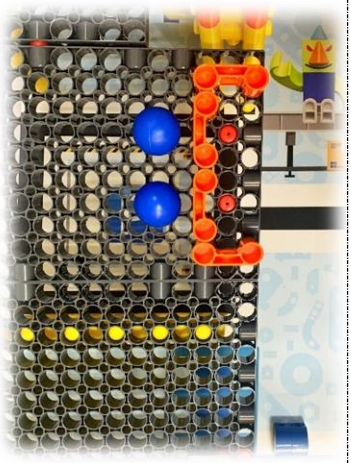
The picture above shows the default starting places of the grey, black and white pieces.



The picture above shows the place marker of the blue ball on the left side of the platform area on the second floor.



The picture above shows the default place for the blue ball on the left side of the platform area on the second floor, it is inside the orange fence.

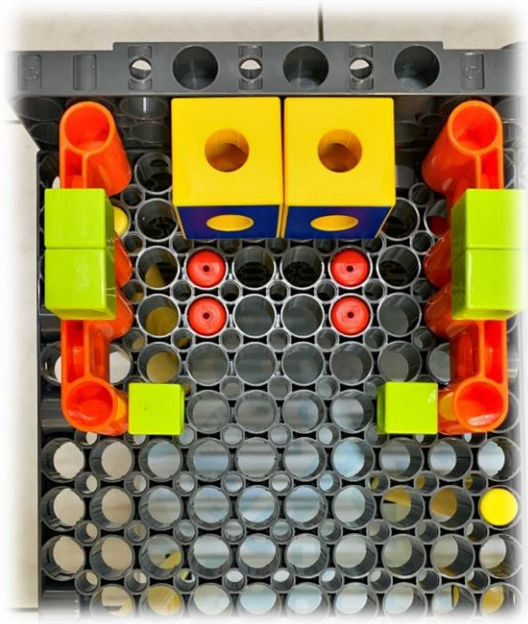


The picture above shows the place markers of the two blue balls on the right side of the platform area on the second floor.

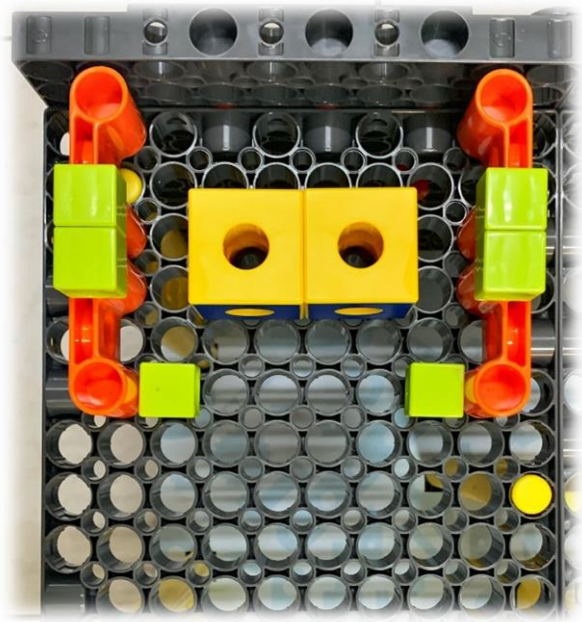
The picture above shows the default starting place for the blue ball on the right side of the platform area on the second floor, it is inside the orange fence.

The picture above shows the place markers for the 4 cm cubes on the first floor.

The picture above shows the default starting places of the 4 cm cubes on the first floor.



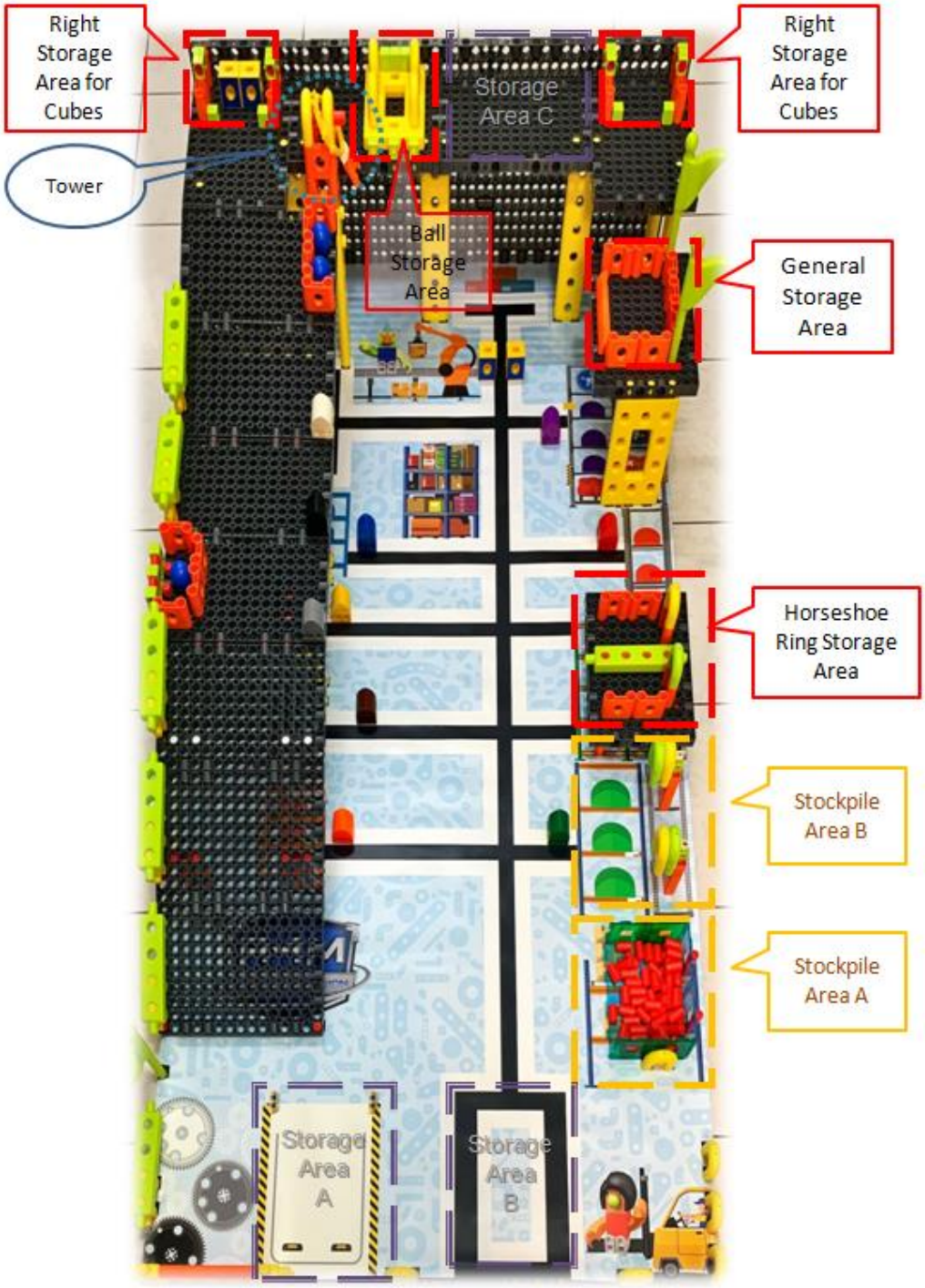
The picture above shows the place markers for the cubes on the left side of the second floor platform.



The picture above shows the default starting places of the cubes on the left side of the second floor platform.

Gigo Automated Warehouse & Factory – Area Definitions

Before each task starts, Robot A, Robot B (in programmed autonomous mode, not remote control), and the automation platform must be placed in the storage areas A, B, and C, respectively. Teams may begin the contest after the referee blows the whistle.



Competition Tasks

The contest uses a points based task system. The team score is awarded after the contestants have completed the task. The total score from all tasks is used to calculate the total team score.

Task One:

Robot A earns 5 points when the whole robot body has left Storage Area A.

Robot B earns 5 points when the whole robot body has left Storage Area B.

Teams earn 10 points when the platform is operated by remote control and successfully delivers at least one object.

Teams earn 20 points when the platform is fully automated and uses AI to identify at least one object.

Task Two:

Robot B must be equipped with a FORCE SENSOR (1246-W85-C) and an IR LINE FOLLOWER SENSOR (1247-W85-B3). The relevant specifications are provided in Appendix 8.9. Robot B must be programmed, not remote control. The program can be written, modified or uploaded by the contestants on the spot during the competition. Robot B can be triggered by Robot A, for example, by using the FORCE SENSOR on Robot B. The contestant may also activate the FORCE SENSOR by hand.

(Task 2.1.) Robot B must follow the black line and transport goods of each color to the correct storage area to score points.

(i) Elementary school teams need to move the green, red and yellow pieces to the green, red and yellow storage areas, respectively. Each correctly placed object scores 35 points;

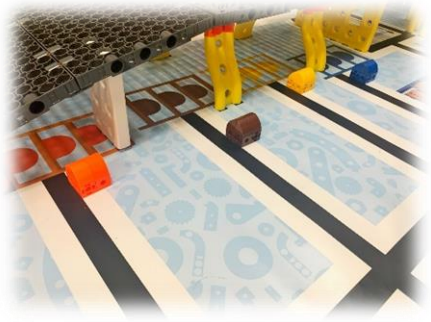
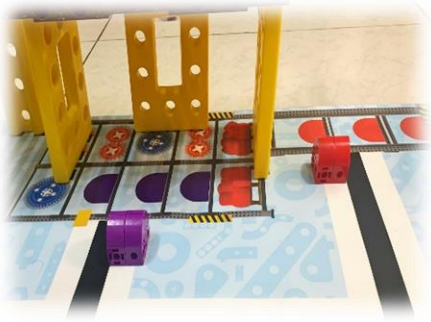
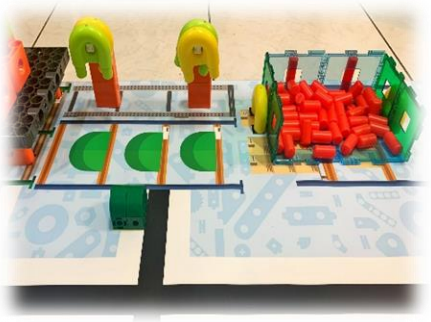
(ii) Junior school teams needs to move green, red, yellow, orange, and purple pieces to the green, red, yellow, orange, and purple storage areas, respectively. Each correctly placed object scores 21 points;

(iii) Senior high school teams needs to move green, red, yellow, orange, purple, brown, and blue pieces to the green, red, yellow, orange, purple, brown and blue storage areas, respectively. Each correctly placed object scores 15 points;

(Task 2.2.) When Robot B autonomously returns to the designated parking lot under the bridge, and is wholly within the black frame, the team scores 30 points.

Completion of tasks 2.1 and 2.2 earns 25 bonus points. The highest possible score for this event is 160 points.

	Elementary School	Junior High School	Senior High School
Task 2.1. Robot B must follow the black line and transport goods of each color to the correct storage area to score points.	35 x 3 = 105	21 x 5 = 105	15 x 7 = 105
Task 2.2. Robot B autonomously returns to the designated parking lot under the bridge, and must be wholly within the black frame.	30	30	30
Completion of tasks 2.1 and 2.2 earns 25 bonus points.	25	25	25
	160	160	160

The above three images show the storage areas for each color. Teams must move goods of the same color inside the black line of the corresponding color areas.

NOTES:

Note 1: After the Robot B starts operation, if a programming error is discovered, then contestants may make corrections so that the robot can continue working. However, time taken to correct the program, or make other modifications including reading and performing the task is all included in the total task time.

Note 2: The software used by Robot B is micro:bit, and the main control box is Gigo's C-micro:bit main control box (1269-W85-A). Please refer to Appendix 8.9. for exact specifications.

Note 3: The head of Robot B should be facing forward when it begins operation. It should not be aiming directly at the black line.

Note 4: Equipment used to program Robot B such as laptops, tablets, and cables, the micro:bit mainboard, and an internet connection should be prepared by the contestants.

Task Three:

The constants may use Robot A, Robot B or the automated platform to transport the goods from Stockpile Area A to the General Storage Area. The corresponding scoring table is shown in Note 3. A full score is 120 points.

(i) The goods in Stockpile Area A for the elementary school groups are 50 red connectors.

(ii) The goods in Stockpile Area A for the junior high school groups are: 50 red connectors; and 10, 40-tooth blue gears.

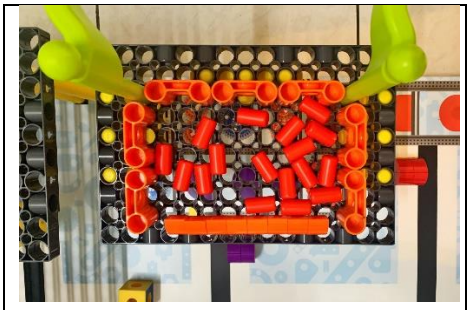
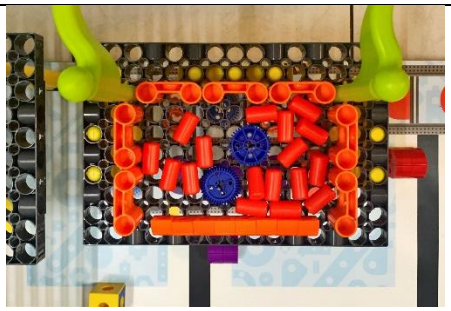
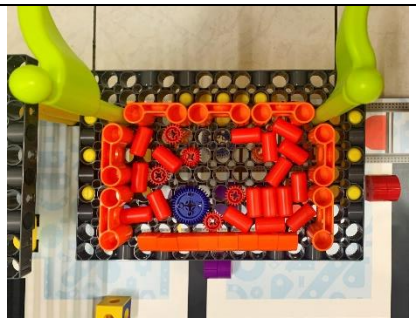
(iii) The goods in Stockpile Area A for the senior high school groups are: 50 red connectors; 10, 40-tooth blue gears; and 15, 20-tooth red gears.

Note 1: If the automation platform is operated by remote control, Robot A must be used to transport the Operator on the Control Tower to any area on the second floor before the automation platform can be used. However, if the automation platform is pre-programmed or uses an AI sorting method to deliver goods, the contestants do not need to transport the operator.

Note 2: Any extended conveyor belt, arm or slide on the automation platform can only reach to the Storage Area, it cannot bridge directly to the Stockpile Area. Any violation of this rule results in accumulating 50 point team deductions. (e.g. four violations results in a 200 point deduction.)

Note 3:

Number of objects	Elementary school	Junior high school	Senior high school
6~10 Red Connectors			10 points
11~15 Red Connectors		40 points	30 points
16~20 Red Connectors	30 points	60 points	60 points
21~25 Red Connectors	60 points	80 points	30 points
26~30 Red Connectors	90 points	60 points	60 points
31~35 Red Connectors	120 points	80 points	
36~40 Red Connectors	90 points		
41~45 Red Connectors	60 points		
46~50 Red Connectors	120 points		
1~5 40T Blue Gears		20 points	15 points
6~10 40T Blue Gears		40 points	30 points
5~10 20T Red Gears			15 points
11~15 20T Red Gears			30 points

		
The picture above shows the 17 red connectors, scoring 30 points (Elementary school).	The picture above shows 17 red connectors and 2, 40T blue gears, scoring 80 points (Junior high school).	The picture above shows 17 red connectors; 1, 40T blue gear; and 5, 20T red gears, scoring 90 points (Senior high school).

Task Four:

Robot A, Robot B or the automated platform must be used to transport the horseshoe rings from Stockpile Area B to the horseshoe ring storage area. Points are awarded to teams based on the following system.

If all the colors of the four horseshoe rings match the storage area, 60 points are awarded.

If the color of a horseshoe rings is different from the color of the horseshoe ring storage area, each ring scores 5 points.

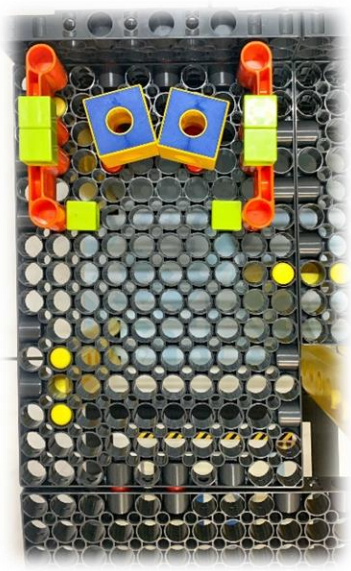
If the color of the horseshoe ring is the same as the color of the horseshoe ring storage area, each ring scores 10 points.

			
The picture above is awarded 20 points.	The picture above is awarded 30 points	The picture above is awarded 60 points.	The picture above is awarded 20 points

Task Five:

Use Robot A, Robot B or the automated platform to move the three blue balls on the second floor and move the two cubes in the front of the general storage area on the first floor to the designated location, and turn the left two cubes by the blue side up in the left storage area. The team will get the corresponding points. If all tasks are completed, the team can get a full score of 110 points.

Quantity / Task/Area Points	One piece	Two pieces	Three pieces
Move the three blue balls on the bridge to the Ball Storage Area on the second floor	10	20	30
Move the two cubes from the front of the general storage area on the first floor to the right storage area on the second floor	10	20	
Turn the two cubes by the blue side up in the left storage area	10	20	

		
The picture shows the goal of three balls put in the Ball Storage Area.	The picture shows the goal of two cubes moved from the front of the general storage area to the right storage area on the second floor.	The picture shows the goal of two cubes turned as blue side up in the right storage area on the second floor.

Task Six:

Use Robot A, Robot B or the automation platform to move the gray, black and white pieces on the second floor platform to the designated location. Points are awarded for pieces moved correctly. If all pieces are moved successfully, teams earn a full score of 70 points.

If the color of the piece is different from the color of the circular storage area, each piece earns 10 points.

If the color of the piece is the same as the color of the circular storage area, each piece earns 20 points.

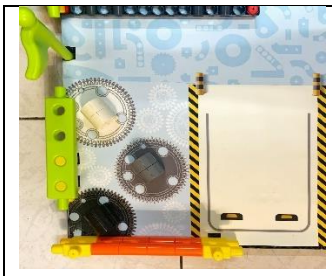
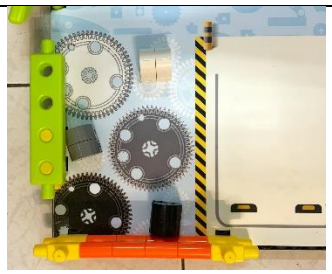
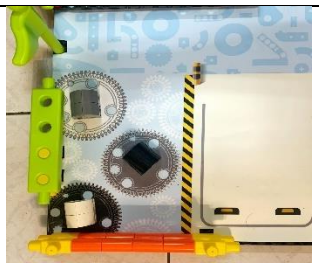
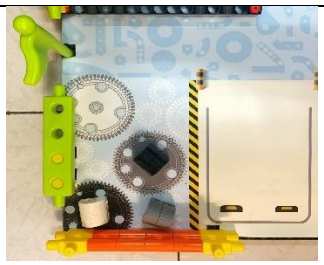
			

Image scores 70 points.	Image scores zero points.	Image scores 30 points.	Image scores 20 points.

4. 5. Scoring Criteria

3 minutes are given to complete the task, and the highest scoring team wins. The total weight of the robot also affects the score. Lower weight robots receive higher scores. Awards are 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 three.
5	Score of task five.
6	Score of task six.
7	Score of task four.
8	Score of task one.
9	Total weight.

8.5.4 Competition Time

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

8.5.5 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-in the testing area.

8.5.6. Competition Order:

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

8.5.7. Work Submission

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

4. 6. Contest Site Rules

8.6.1. 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.

8.6.2. Assembly Time:

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

8.6.3. Missions

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

8.6.4. 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.

8.6.5 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.

8.6.6. 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.

8.6.7. 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 unwarranted or unjustified punishment, such devices should be on airplane mode or have the SIM card removed.

8.6.8 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.

8.6.9 Portable Data:

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

4. 7. Video Recording

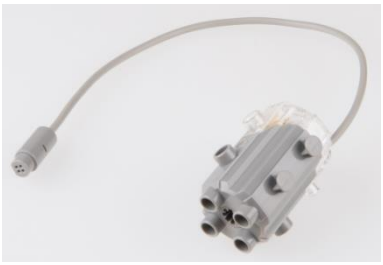
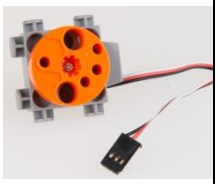
To avoid post-match disputes, each team shall record its performance during the competition as evidence of its performance.

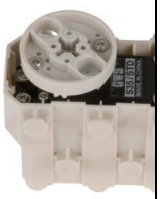
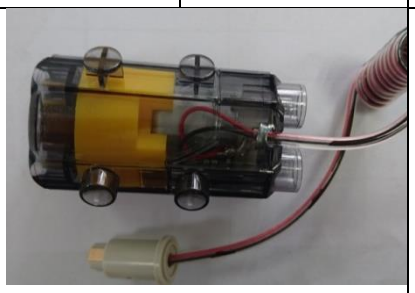
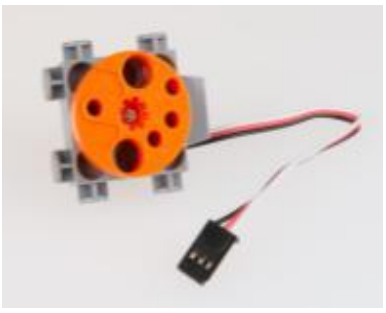
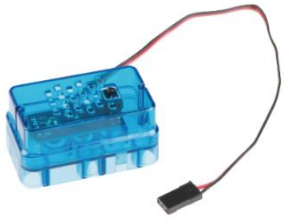
4. 8. Motor Inspection

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

4. 9. List of Motor Types

2022 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		C-Gigo micro:bit CONTROL BOX	1269-W85-A
12		C-50X PLANETARY GEARBOX II(New)	7447-W85-C1