

NATIONAL ROBOTICS COMPETITION

## NRC PRESCHOOL CATEGORY (KUBO Challenge)

# H<sub>2</sub>O Heroes: Clean water for All

Version: 6 April 2024

Organised by:



Sponsored by:



Ministry of Education  
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### NRC 2024 PRESCHOOL CATEGORY

## CHALLENGE BOOKLET CHANGE LOG

Version	Release Date	Description
1.0	28 March 2024	Official Challenge Booklet release
2.0	5 April 2024	Update of Section 5 and 7
3.0	15 August 2024	Update of Section 7.2

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# 1. General Information

## 1.1 National Robotics Competition (NRC) 2024

[National Robotics Competition \(NRC\)](#) has been an ongoing competition organised annually by Science Centre Singapore for the past 25 years with support from the Ministry of Education, various partners and sponsors. NRC has attracted more than 60,000 team members and 240,000 supporters to date. It is the only robotics competition in Singapore supported by the Ministry of Education.

NRC spurs students' interest and innovation in Science, Technology, Engineering and Mathematics (STEM). Students will be able to put their knowledge to practice and engage in hands-on STEM learning. With NRC as a stage for students to develop kinaesthetic learning and collaboration, it encourages students to develop problem-solving skills, entrepreneurial skills, creative thinking skills and team spirit among the team members. This is in line with Science Centre Singapore's mission "To promote interest, learning and creativity in science and technology, through imaginative and enjoyable experience and contribute to the nation's development of its human resource".

NRC 2024 tournaments comprise of:

- NRC Regular Category
- NRC Open Category
- NRC AI Maker Series
- NRC Preschool
  - **KUBO Challenge**
  - ARTec Challenge
- NRC Smorphi
- NRC RoboCup Singapore CoSpace Coding Challenges
  - Autonomous Driving Category
  - Rescue Category

Registration for these category challenges will be via <https://www.gevme.com/NRC24>. Competition registration opens from **1<sup>st</sup> March 2024 till 1<sup>st</sup> July 2024**.

*Note: Registration will be on a first come, first serve basis. If the category is full, your registration will be rejected and refunded.*

## 1.2 Theme for NRC 2024

Every year, NRC revolves around a specific theme and this year, the theme for NRC is "Water (**H<sub>2</sub>O**) Heroes". Safe drinking water refers to water that is free from harmful contaminants and is suitable for human consumption without any risk to health. It is essential for maintaining public health and preventing waterborne diseases. Access to safe drinking water is a fundamental human right and is crucial for sustaining life and promoting overall well-being. As a H<sub>2</sub>O Hero, what can we do to ensure availability and sustainable management of water and sanitation for all?

## 2. Team and Age Group Definition

### 2.1 Team Definition

Each team will have a minimum of 2 members and up to 5 members, accompanied by 1 to 2 coaches.

The age group in NRC Preschool (KUBO) Category is:

- 5 - 6 years old (as of 31 Dec 2024)

### 2.2 Expectations on Teams

Teams should behave fairly and be respectful towards other teams, coaches, judges, referees, chief referees and competition organisers. Teams are to adhere to the competition rules to ensure fair competition.

The construction and coding of the robot may be done only by the team. The task of the coach is to accompany them, help them with organisational and logistical matters and support the team in the case of questions or problems. The coach cannot be involved in the construction and programming of the robot.

**On the competition day, during mission runs, coaches may offer students advice and guidance. However, all work related to the preparation and submission, and the actual competition must be performed by the student members of the team.**

If any of the rules mentioned in this document are broken or violated, the judges, referees or chief referees can decide on one or more of the following consequences. Before a decision is reached, a team or individual team members may be interviewed to find out more about the possible violation of the rules. The interview can include questions about the robot or the program.

- A team may get up to a 50% reduced score for one or more judging rounds.
- A team may be disqualified completely from the competition immediately.

### 2.3 Rules Hierarchy

On the competition day, the following rule hierarchy applies:

- General Rules for NRC Preschool Category provides the basis for rules in this category.
- Questions & Answers (Q&As) can override rules in the general rules document.
- **The Chief Referees have the final say in any decision.**

### 3. Tournament Format and Procedure

In this category, there are 2 rounds:

- An onsite presentation round (including a Q&A session with each team) on **19<sup>th</sup> or 20<sup>th</sup> August 2024**.
- An onsite competition round on **26<sup>th</sup> or 27<sup>th</sup> August 2024**.

#### 3.1 Competition Format

Presentations and Q&A sessions will be conducted on the same day for the participants. These will be held onsite at Party Room, KidsSTOP™ on **19<sup>th</sup> or 20<sup>th</sup> August 2024**.

The Competition Round will be conducted on **26<sup>th</sup> or 27<sup>th</sup> August 2024** for all participants. This will be held at Annexe Hall 1, 2 & 3, Science Centre Singapore.

Scores from the Presentation (30%) and Competition Round (70%) will be combined for the Overall Championship.

#### 3.2 Competition Schedule

Dates	Components	Mode
19 <sup>th</sup> - 20 <sup>th</sup> August (Monday - Tuesday)	NRC Preschool Presentation	Onsite KidsSTOP™ (Party Room & Train Station)
26 <sup>th</sup> - 27 <sup>th</sup> August (Monday - Tuesday)	NRC Preschool Competition	Onsite Science Centre Singapore (Annexe Hall 1, 2 & 3)

\*Teams will be notified of their scheduled presentation date and time

\*\*The Organiser reserves the right to amend the competition schedule and mode of the competition. Participants will be notified of any changes via email.

### 3.3 Presentation Format

Presentations and Q&A sessions will be conducted on the same day for the participants. These will be held onsite at Party Room, KidsSTOP™ on **19<sup>th</sup> or 20<sup>th</sup> August 2024**.

A soft copy of the E-storybook '*Clean Water for All*' can be found [here](#).

- Each presentation shall not exceed a duration of 5 minutes (excluding Q&A).
- Each Q&A session will take approximately 3 minutes.
- Presentation format shall not exceed 10 PowerPoint Slides.
- Pre-recorded video presentations are not allowed.
- Slides may include photos and/or short videos to showcase the students' learning process.
- Students are to present their prototype based on the introductory story during the presentation.
- Students are encouraged to take an active role during the presentation.

<b>Evaluation Criteria</b>	<b>Maximum Score</b>
References made to concepts in 'Clean Water for All' E-Storybook	5
Design and fabrication of KUBO's personal flotation device	5
Overall Reflections and Learnings	10
Presentation	10

More details on the scoring can be found at Section 7.



## 3.4 Robot Run

The competition will be held onsite on **26<sup>th</sup> or 27<sup>th</sup> August 2024**.

- Teams will get 1 practice run (20 minutes) before the actual attempt.
- Teams will only get 1 attempt (60 minutes) to complete all KUBO Missions on the day of the Competition Round.
- For game field 1, there will be 4 missions to complete, each mission run is 12 minutes.
- For game field 2, there will be 1 mission to complete. The mission run is 15 minutes.
- Teams will be given a 3-minute preparation time before each mission.
- All teams will begin the same mission simultaneously.

<b>Missions</b>	<b>Maximum Score</b>
Mission 1: Clearing the River Waste	14
Mission 2: Watering the Gardens	15
Mission 3: Testing and Saving Water	15
Mission 4: Fixing the Water Pipe	16
Collaborative Mission: Keeping Our Reservoir Clean	10

### Points to note about the Competition:

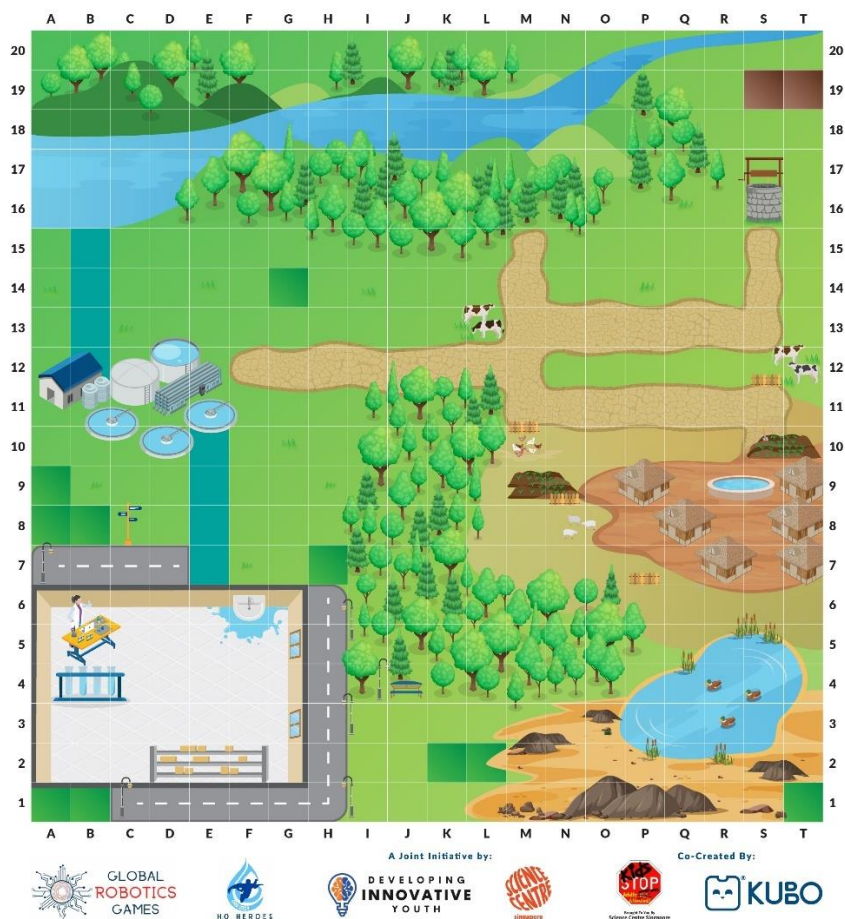
- A softcopy of game field 1 (Missions 1 to 4) will be made available to each participating team should teams wish to fabricate their own game field.
- A set of game field objects will be provided to each participating team prior to the competition.
- **Participating teams must bring along their own KUBO Coding Starter Set and KUBO Coding+ Set on the day of the Competition Round on 26<sup>th</sup> or 27<sup>th</sup> August 2024.**
- In the event that overall scores are tied, the team with the shortest overall time (during the competition) wins the Competition Round.
- Scoring for the Competition Round can be found in Section 7.

## 4. Game Table and Equipment

### 4.1 Game Field 1

A softcopy of game field 1 (Missions 1 to 4) will be made accessible to each participating team ahead of the competition, together with a set of game field objects.

Download game field 1 [here](#).



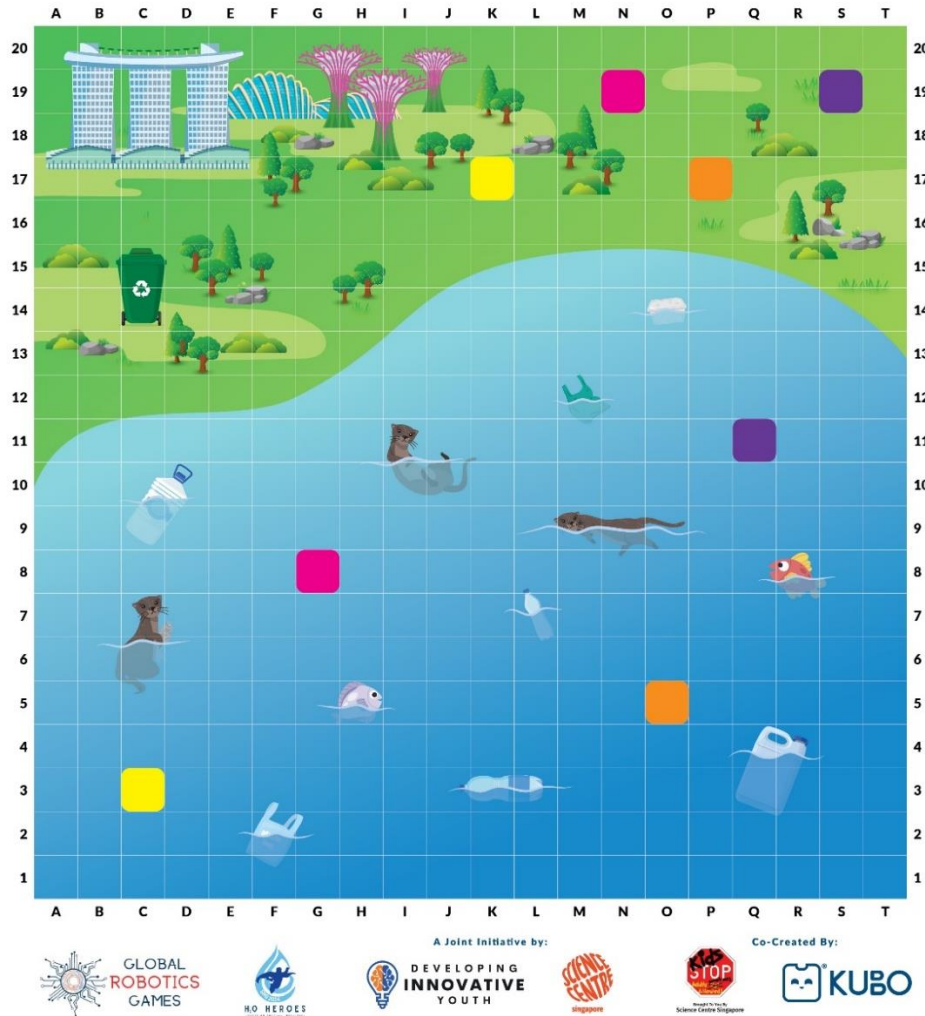
Participating teams are required to bring along their own KUBO Coding Starter Set and KUBO Coding+ Set on the day of the Competition Round on 26<sup>th</sup> or 27<sup>th</sup> August 2024.

The dimensions of game field 1 are as follows:

- 1 m (Length) x 1 m (Breadth)
- The game field will be divided into grids of 4cm x 4cm each. There will be a total of 400 playable grids.

## 4.2 Game Field 2

Game field 2 (Collaborative Mission) **will only be provided on the day of the competition held onsite on 26<sup>th</sup> or 27<sup>th</sup> August 2024.**





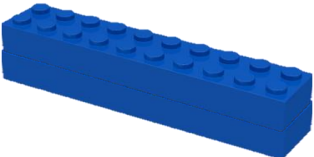


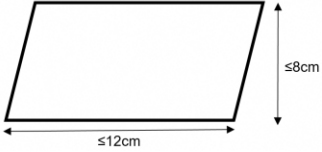

The dimensions of game field 2 (Collaborative Mission) are as follows:

- 1 m (Length) x 1 m (Breadth)
- The game field will be divided into grids of 4cm x 4cm each. There will be a total of 400 playable grids.

## 4.3 Game Field Objects, Positioning, Randomisation

The KUBO robot must start from the playable area of Game Field 1 (Grid A20).

<p><b>10 Obstacles</b></p> <p>There will be 10 obstacles placed upright on the game field 1.</p> <p>Obstacles will be in dark green Grids A1, A8, A9, B1, B8, G14, H7, K2, L2, T1.</p> <p>Obstacles will be placed upright, horizontally, and in the middle of the grid.</p>	
<p><b>3 River Waste</b></p> <p>There will be 3 river wastes that KUBO needs to transport while on game field 1.</p> <p>River wastes will be in Grids B16, B17, B18.</p> <p>River wastes will be placed upright and in the middle of the grid.</p>	
<p><b>1 Bucket of Water</b></p> <p>There is 1 bucket of water that KUBO needs to transport while on game field 1.</p> <p>Bucket of water will be in Grid S16.</p> <p>Bucket of water will be placed upright and in the middle of the grid.</p>	
<p><b>1 Water Sample</b></p> <p>There is 1 water sample that KUBO needs to transport while on game field 1.</p> <p>Water sample will be in Grid P3.</p> <p>Water sample will be placed upright and in the middle of the grid.</p>	
<p><b>1 Water Pipe</b></p> <p>There is 1 water pipe that KUBO needs to transport while on game field 1.</p> <p>A hidden task will be revealed on the day of competition. The hidden task is compulsory to complete the mission.</p>	

<p><b>1 Personal Flotation Device</b></p> <p>There is 1 personal flotation device that KUBO needs to carry on while on game field 2.</p> <p>Teams will have to fabricate and decorate their own personal flotation device using recyclable or reuseable materials.</p> <p>The personal flotation device should not exceed 8cm (width) x 12cm (length)</p> <p>A hidden task will be revealed on the day of competition. Completion of the collaborative mission is compulsory.</p>	
<p><b>1 Litter</b></p> <p>There is 1 litter that KUBO needs to transport while on the game field 2.</p> <p>A hidden task will be revealed on the day of competition. Completion of the collaborative mission is compulsory.</p>	

## 5. KUBO Missions

The missions will be explained in multiple sections.

**The order of the missions is fixed, and every team will start simultaneously.**

**Each mission will be given a maximum duration for completion as follows:**

<b>Mission</b>	<b>Maximum Duration (mins)</b>
Clearing the River Waste	<b>12</b>
Watering the Gardens	<b>12</b>
Testing and Saving Water	<b>12</b>
Fixing the Water Pipe	<b>12</b>
Keeping Our Reservoir Clean	<b>15</b>

For scoring rubrics please refer to Section 7.

### 5.1 Clearing the River Waste

KUBO robot wants to help remove waste in the river by bringing it to the riverbank, thus allowing water to flow to the treatment plant.

From Grid A20, KUBO robot is tasked to go to the river where the 3 river wastes are at (Grid B16, B17 and B18) and transport them to the riverbank (Grid S19 – T19).

Teams can fabricate their own method of transport to be attached to the KUBO robot to aid in transporting the river waste to the riverbank.

Participants can only use their hands to transfer the waste into or onto their transportation device when KUBO reaches the grid which the waste is on, and the code has stopped running.

Additional points will be awarded if teams are able to transport the 3 river wastes to the riverbank (Grid S19 – T19) hands-free (i.e. no physical contact with the game field objects throughout the run).

## 5.2 Watering the Gardens

KUBO robot wants to help water the plants in the village.

From the riverbank (Grid T19), KUBO robot travels to the well to collect a bucket of water (Grid S16). KUBO robot then follows the dirt path to bring the bucket of water to garden A (Grid S10 – T10) and waters the plants by pivoting left and right on the spot (Grid S11). KUBO robot then brings the bucket of water to garden B (Grid M9 – N9) and waters the plants by pivoting left and right on the spot (Grid O9).

Teams can fabricate their own method of transport to be attached to the KUBO robot to aid in transporting the bucket of water to the gardens.

Participants can only use their hands to transfer the bucket of water into or onto their transportation device when KUBO reaches the grid which the bucket of water is on, and the code has stopped running.

Additional points will be awarded if teams are able to transport the bucket of water to the gardens (Grid S10 – T10, Grid M9 – N9) hands-free (i.e. no physical contact with the game object throughout the run).

## 5.3 Testing and Saving Water

KUBO robot stops to admire some ducks in the nearby pond while collecting water samples to bring it to the laboratory. While at the laboratory, KUBO spots a leaking tap and helps to turn it off.

From garden B (Grid N9), KUBO travels to the edge of the pond (Grid O3) and pauses for 5 seconds to look at the ducks before bringing water sample from the pond (Grid P3) to the Scientist (Grid B5 – B6). In the laboratory, KUBO robot is tasked to help turn off the leaking tap (Grid F6) by rotating 1 full round (360°) on the spot.

Participants can only use their hands to transfer the water sample into or onto their transportation device when KUBO reaches the grid which the water sample is on, and the code has stopped running.

Additional points will be awarded if teams are able to transport the water sample to the Scientist (Grid B5 – B6) hands-free (i.e. no physical contact with the game object throughout the run).

Additional points will be awarded if teams are able to use the 'U-Turn' TagTile® at least once throughout the run.

## 5.4 Fixing the Water Pipe

KUBO robot is tasked to help fix the water pipe to ensure water flows smoothly to the water treatment plant.

From the tap (Grid F6), KUBO travels to the water pipe (Grid\*) and transports it to the water treatment plant (Grid\*).

Teams can fabricate their own method of transport to be attached to the KUBO robot to aid in transporting the water pipe to the water treatment plant.

However, there is a catch to fixing the water pipe. Find out more on the day of the Competition.

**\*The hidden task will only be made known to participating teams on the day of the Competition, after the first 3 missions have been completed.**

## 5.5 Keeping Our Reservoir Clean

KUBO robot wants to help keep our reservoir clean with some friends by removing the litter.

Teams will have to fabricate and decorate their own personal flotation device to be attached to the KUBO robot to keep it safe while removing litter from the reservoir.

However, there is a catch to keeping our reservoir clean. Find out more on the day of the Competition.

**\*The hidden task will only be made known to participating teams on the day of the Competition, after the first 4 missions have been completed.**



## 6. Specific Game Rules

For this competition, there are some specific rules as mentioned below:

### 6.1 Specific Rules about Materials

- The KUBO robot must be assembled using the team's own complete KUBO Coding Starter Set and KUBO Coding+ Set.
- Any number and combination of KUBO TagTile® pieces can be used to programme the KUBO robot.
- Only KUBO branded TagTile® pieces can be used in the programming of the KUBO robot.
- Teams are highly encouraged to use recyclable materials in the fabrication of carriers or equipment to assist their KUBO robot in completing the various missions.

### 6.2 Specific Rules about the Missions

Prior to each mission attempt, teams will have 3 minutes to set aside the items and materials for the selected mission. These include any carriers to dress or equip KUBO, and TagTile® pieces from the KUBO Coding Starter Set and KUBO Coding+ Set.

Teams are not allowed to touch the KUBO robot, game field objects, and arrange any TagTile® pieces in a readable manner for coding.

During the mission attempt, teams may touch the KUBO robot to dress or equip it for the selected mission. The design of KUBO, including any carriers, should be unique to each mission and should not be reutilised for multiple missions. The KUBO robot may only be operated under KUBO's TagTile® programme control.

Teams are only allowed to move the KUBO robot, not the game field objects.

During a mission attempt, while the KUBO robot is running its program, members of the team are:

- *Not allowed to touch any game object.* If a participant touches a game object, the referee will give a verbal warning to the team and reset the game object to its original position and orientation. A total of 2 verbal warnings will be given. After which, the referee reserves the right to not score for that mission.
- *Not allowed to touch the game field while the KUBO robot is completing its mission.* If a participant touches the game field while the KUBO robot is running its programme, the referee will give a verbal warning to the team. A total of 2 verbal warnings will be given. After which, the referee reserves the right to not score for that mission.

## 6.3 Specific Rules about the Competition

### **Each mission is completed when either:**

The KUBO robot completes its coded programme for the mission and the team communicates to the referee that the robot has finished.

OR

The time limit has expired for the mission.

Missions will be considered successful if either KUBO robot or its transported game field objects fall within the designated grids.

## 7. Scoring

The overall scoring of the teams is based on the sum of two scores:

**Presentation Score:** Up to 30 points scored as described in the table below.

**Competition Score:** Up to 70 points scored as described in the table below.

### 7.1 Presentation Score

Evaluation Criteria	Maximum Score
References made to concepts in 'Clean Water for All' E-Storybook <ul style="list-style-type: none"> <li>● What is the importance of having clean water?</li> <li>● What are some ways the team can help keep our waters clean and save water?</li> <li>● What has the team learnt from the E-storybook?</li> <li>● How did the team use the E-storybook to create the various KUBO robot designs?</li> </ul>	5
Design and fabrication of KUBO's personal flotation device <ul style="list-style-type: none"> <li>● What materials did the team use to build the personal flotation device?</li> <li>● How did the team come up with the design of the personal flotation device?</li> <li>● What is the main function of the personal flotation device? Why is it important for KUBO?</li> </ul>	5
Overall reflection and learning <ul style="list-style-type: none"> <li>● What has the team learnt during the process?</li> <li>● What was the team's favourite part of the process?</li> <li>● What was the most difficult part of the process?</li> </ul>	10
Presentation <ul style="list-style-type: none"> <li>● Clarity of presentation</li> <li>● Creativity of presentation</li> <li>● Q&amp;A</li> </ul>	10

For a list of potential Q&A questions, please refer to Appendix A.

## 7.2 Competition Score

<b>Missions</b>	<b>Score</b>	<b>Total</b>
<b>1. Clearing the River Waste</b>		
Travel from Grid A20 to the river where the 3 wastes are at (Grid B16 – B18) - Any part of KUBO within the river waste grids indicated	1	<b>14</b>
Transport 1 river waste from river (Grid B16 – B18) to riverbank (Grid S19 – T19) - Any part of river waste within the grids of the indicated riverbank	1	
Transport 1 river waste from river (Grid B16 – B18) to riverbank (Grid S19 – T19) - Any part of river waste within the grids of the indicated riverbank	1	
Transport 1 river waste from river (Grid B16 – B18) to riverbank (Grid S19 – T19) - Any part of river waste within the grids of the indicated riverbank	1	
Transport all 3 river waste (hands-free)* throughout mission	2	
Time left: <2 minutes: 1 pts 2 - 5 minutes: 2 pts >5 - 8 minutes: 3 pts >8 - 10 minutes: 4 pts >10 - 12 minutes: 5 pts	5	
All 10 obstacles are still within respective grids - Any part of each obstacle within the grids of the indicated obstacle	1	
Use at least 1 set of KUBO function tile (at least 3 TagTile® pieces, excluding function tiles)	1	
No interference from coaches#	1	
<b>2. Watering the Gardens</b>		
Travel from the riverbank (Grid T19) to bucket of water at the well (Grid S16) - Any part of KUBO touches the well grid indicated	1	<b>15</b>
Travel along the dirt path from the well to the village - Any part of KUBO touches the dirt path	1	
Transport bucket of water to garden A (Grid S10 - T10) - Any part of bucket of water within the grids of garden A (Grid S10 - T10)	1	
Pivot left and right on the spot at Grid S11 with the bucket of water	1	
Transport bucket of water from garden A (Grid S10 - T10) to garden B (Grid M9 - N9) - Any part of bucket of water within the grids of garden B (Grid M9 - N9)	1	
Pivot left and right on the spot at Grid O9 with the bucket of water	1	
Transport bucket of water (hands-free)* throughout mission	1	
Time left: <2 minutes: 1 pts 2 - 5 minutes: 2 pts >5 - 8 minutes: 3 pts >8 - 10 minutes: 4 pts	5	

>10 - 12 minutes: 5 pts			
All 10 obstacles are still within respective grids - Any part of each obstacle within the grids of the indicated obstacle	1		
Use at least 1 set of KUBO function tile (at least 3 TagTile® pieces, excluding function tiles)	1		
No interference from coaches#	1		
<b>3. Testing and Saving Water</b>			
Travel from garden B (Grid N9) to the edge of the pond (Grid O3) - Any part of KUBO touches the edge of the pond grid indicated	1	<b>15</b>	
Pause for 5 seconds at the edge of the pond (Grid O3)	1		
Transport water sample (Grid P3) to Scientist (Grid B5 - B6) - Any part of water sample within the grids of Scientist (Grid B5 - B6)	1		
Leave the water sample with the Scientist (Grid B5 - B6) and travel to leaking tap (Grid F6)	1		
Rotate 1 full round on the spot at the leaking tap (Grid F6)	1		
Transport water sample (hands-free)* throughout mission	1		
Time left: <2 minutes: 1 pts 2 - 5 minutes: 2 pts >5 - 8 minutes: 3 pts >8 - 10 minutes: 4 pts >10 - 12 minutes: 5 pts	5		
Use at least 1 'U-Turn' TagTile® piece	1		
All 10 obstacles are still within respective grids - Any part of each obstacle within the grids of the indicated obstacle	1		
Use at least 1 set of KUBO function tile (at least 3 TagTile® pieces, excluding function tiles)	1		
No interference from coaches#	1		
<b>4. Fixing the Water Treatment Plant</b>			
Starting from the tap (Grid F6), transport water pipe from ___^ to water treatment plant at ___^ - Any part of water pipe within the grids of the indicated water treatment plant	4	<b>16</b>	
Transport water pipe (hands-free)* throughout mission	2		
Time left: <2 minutes: 1 pts 2 - 5 minutes: 2 pts >5 - 8 minutes: 3 pts >8 - 10 minutes: 4 pts >10 - 12 minutes: 5 pts	5		
All 10 obstacles are still within respective grids - Any part of each obstacle within the grids of the indicated obstacle	2		
Use at least 1 set of KUBO function tile (at least 3 TagTile® pieces, excluding function tiles)	1		
No interference from coaches#	2		
<b>5. Keeping Our Reservoir Clean</b>			

From starting position at ____, transport litter from ____ to ____ - Any part of litter within the indicated grids	-	<b>10</b>
Transport litter (hands-free)* throughout mission	1	
Use at least 1 set of KUBO function tile (at least 3 TagTile® pieces, excluding function tiles)	1	
No interference from teachers#	2	
All teams on game field complete the mission together ( <b>compulsory task</b> )	6	
<b>Maximum Score</b>		<b>70</b>

\*No physical contact with any game field objects **throughout the mission**

# Teachers or coaches may offer students advice and guidance during the competition.

However, all work during the competition must be performed by the student members of the team.

^Bonus missions will be announced on the day of the Onsite Competition. Participants are required to complete the bonus mission to qualify for task completion.

### 7.3 Best KUBO Robot Design (Additional Prize)

Scoring for the Best KUBO Robot Design will be based on the following:

<b>Evaluation Criteria</b>	<b>Score</b>
Creativity <ul style="list-style-type: none"> <li>Imagination used to develop and create the robot design</li> </ul>	5
Innovation <ul style="list-style-type: none"> <li>Original solution and application to add significant value to the robot</li> </ul>	5

\* Note that the Best KUBO Robot Design score is an additional prize category, and the scores will not be counted towards the overall championship score.

### 7.4 Best Teamwork Score (Additional Prize)

Scoring for the Best Teamwork will be based on the following:

<b>Evaluation Criteria</b>	<b>Score</b>
Team Play <ul style="list-style-type: none"> <li>Organise teammates toward a positive common goal with teamwork</li> </ul>	5
Attitude <ul style="list-style-type: none"> <li>Demonstrate participation and show enthusiasm throughout the competition</li> </ul>	5

\* Note that the Best Teamwork score is an additional prize category, and the scores will not be counted towards the overall championship score.

## 8. Awards

### Overall Championship

Teams are considered for the Overall Championship Award based on the total scores of their Presentation and Competition Rounds.

Score tables can be found in Section 7.

The top team will receive the following:

\$500, trophy, banner, and one medal for each participant.

### Best Presentation

Awards will be based on scores given during the Presentation Round.

The top 3 teams will receive one medal for each participant.

### Best Robot Performance

Awards will be based on scores given during the Competition Round.

1<sup>st</sup> Place: Trophy, medals (per participant)

2<sup>nd</sup> Place: Medals (per participant)

3<sup>rd</sup> Place: Medals (per participant)

### Best KUBO Robot Design

Award will be based on scores given during the Competition Round.

The best team will receive one medal for each participant.

### Best Teamwork

Award will be based on scores given during the Competition Round.

The best team will receive one medal for each participant.



**Certificate of Participation**

All participants will also be presented with a Certificate of Participation for taking part in the competition.

**The Organiser reserves the right to amend the prizes without prior notice.**

## 9. Appendix

### 9.1 Appendix A

There will be a Q&A segment at the end of the onsite presentation round. Teams may refer to the following for a list of potential questions:

1. Which is the most challenging mission to solve? Why?
2. Were there disagreements within the team? What did you do to solve the problem?
3. Which is your favourite TagTile® piece? Why?
4. How did you work together with your coach?
5. What did you do when you ran into a problem that you could not solve?
6. Why did you join this competition?
7. Has this competition changed any of your water usage habits? How?
8. If you had a superpower, how would you make the world cleaner and greener?
9. What other sources of water supply would you like to see in Singapore? Why?
10. How will you encourage your family and friends to be more careful with how they use water?
11. How will you make your home more water-friendly?
12. Which was your favourite KUBO add-on (costume)? Why?

## 9.2 Appendix B

Teams may refer to the following for a list of frequently asked questions:

Question	Answer
<b>Team Registration</b>	
1. Is there a minimum team size?	Yes, a minimum of 2 participants and 1 coach is required to register for the NRC Preschool (KUBO Challenge) category.
2. Can there be a mixed team (K1 and K2) in a team?	Yes, each team can consist of members aged 5 – 6 (as of 31 Dec 2024).
3. How many teams can I send per school?	There is no limit to the number of teams that each school can send. However, the competition can accommodate a maximum of 60 teams this year and the registration fee for each team will remain at \$30.
4. Where will the on-site competition be held?	It will be held at Annexe Hall 1, 2 & 3, Science Centre Singapore.
5. Can I drop out of the competition halfway? Are there any penalties involved?	Yes, kindly drop us an email at <a href="mailto:kidsstop@science.edu.sg">kidsstop@science.edu.sg</a> to indicate your withdrawal. However, the \$30 registration fee is not refundable, and teams will not be eligible for the Certificate of Participation.
<b>KUBO-related</b>	
1. Will there be KUBO Coding Starter Sets and KUBO Coding+ Sets for loan?	No, there will not be any loaning of the KUBO Coding Starter Sets and KUBO Coding+ Sets for NRC 2024.
2. How can we purchase the KUBO Coding Starter Set and KUBO Coding+ Set?	Teams may contact Dorothy from Duck Learning at <b>97710584</b> or <a href="mailto:dorothy@ducklearning.com">dorothy@ducklearning.com</a> for an exclusive 20% discount for purchases.
3. If I have lost some of the tagtiles in my kits, where can I get replacements?	Teams may contact Dorothy from Duck Learning to enquire about getting replacements.
4. What is the dimension of the mat? When can we purchase the mat?	The actual game field measures 100cm*100cm, with a playable area of 80cm*80cm, each grid being 4cm*4cm.  A softcopy of the 2024 NRC Preschool (KUBO Challenge) category game field 1 (Missions 1 to 4) can be accessed <a href="#">here</a> .  Teams may print it out for your own training and practice sessions.

5. Can I use more than 1 robot to complete the missions?	The entire competition round can only be completed using 1 set of KUBO Coding Starter Set and 1 set of KUBO Coding+ set.
6. Who can go for the KUBO training?	The training is reserved for interested and registered team coaches only. Each team can send up to 2 coaches to attend the training.
7. Who can I contact if I have questions regarding KUBO and its coding functionality?	Duck Learning ( <a href="mailto:competitions@ducklearning.com">competitions@ducklearning.com</a> )
8. How long can the KUBO robot work after it is fully charged?	Depending on the intensity of the usage, the KUBO robot can run for approximately 1 hour.  All teams are reminded to charge their KUBO robots fully for the onsite competition. Teams may bring along their own portable chargers during the onsite competition if needed.
<b>Game Objects-related</b>	
1. Where can we get the game field objects?	The game objects will be given to each registered team to practice with. Teams will be contacted on when and where to collect the game objects.
2. Can we purchase the game field objects?	Teams will be given one set of game objects for this competition and there will not be sales of extra sets.  Instead, teams can choose to procure more game objects on their own. Refer to section 4.3 for information regarding the dimensions for each object.
3. Will the game field obstacles be fixed onto the game field mats with adhesive?	No, they will not be fixed onto the mats. The game field obstacles are intentionally placed without being fixed onto the mat to challenge the participants in this competition.
<b>Carrier-related</b>	
1. What kind of materials can we use to create the carrier for the KUBO robot?	Teams can use any materials to create their carriers as long as the adhesives do not impede the movement of the robot. Adhesives such as masking tape, scotch tape and blue tag are suitable.  Teams are <b>highly encouraged</b> to use recyclable materials to fabricate their carriers to assist the KUBO robot in completing the missions.

2. Does each carrier need to be different for each mission?	Each design/carrier of the KUBO robot <b>needs to be unique for each mission</b> and should not be reused for any other missions. This is to encourage teams to express their creativity. There is an additional award for the Best KUBO Robot Design.
3. How much time are teams given to change their robot carriers for each mission?	Prior to each mission attempt, teams will have 3 minutes to set aside the items and materials for the selected mission. These includes any carriers to dress or equip KUBO. However, teams may only touch the KUBO robot to dress or equip it for the selected mission during the <b>12 minutes</b> mission run for Mission 1 – 4, or <b>15 minutes</b> for Mission 5.
4. Can students design items to be attached to KUBO to help move things?	Yes, teams can design things/carriers/items that can be attached physically to KUBO to help move the game objects to the destinations. A gentle reminder to bring these items for the actual competition.
5. What is the maximum size of the carrier for the KUBO robot?	There is no maximum size so long as KUBO can complete Missions 1 – 4.  For Mission 5 (Keeping Our Reservoir Clean), the personal flotation device fabricated by teams should <b>not exceed</b> 8cm (width) x 12cm (length).
<b>Onsite Presentation Round (19/20 August 2024)</b>	
1. What do the teams need to present during the onsite presentation?	Please refer to Section 7.1 of the Challenge Booklet to find more information and the rubrics of the onsite presentation.  The presentation is meant to showcase their learning process, share coding & design of KUBO, reflection and Q&A. Teams may use various presentation aids such as slides, props, scripts etc. to showcase their ideas.  A maximum of 3 questions will be asked during the Q&A, and these questions are found in the challenge booklet (refer to Section 9, Appendix A).  Teams will be notified of their allocation timeslot through email closer to the date.
2. How long is the presentation?	Actual presentation is approximately 5 minutes plus 3 minutes of Q&A. Teams will be directed to a holding room to wait for their team to be called for the presentation.
3. Can parents or other staff from the school sit in for the presentation?	No, parents/caregivers will not be allowed to sit in for the presentation onsite.  Only competing teams and their coaches will be allowed into the presentation venue.
4. We are given a group number; do we need to remember it?	Yes, please take note of your allocated group number as we will be using the group numbers for the onsite presentation and onsite competition.

<p>5. What is the room set-up like? How far will the teams be from the judges? Will the teams be using microphones?</p>	<p>Microphones will not be provided on the day of the presentation given that the size of KidsSTOP™'s Party Room is not big and teams will not be standing too far from the judges. However, teams are allowed to bring their own microphones if they wish to use it.</p> <p>The room is equipped with a projector to display any slides, pictures, or short videos which teams wish to show. Teams may use to connect their laptops directly using a HDMI cable, or use the laptop provided to access their slides from a thumb drive.</p> <p>A picture of the room set-up will be sent to registered teams closer to the date of the presentation.</p>
<p>6. How many judges will teams be presenting to?</p>	<p>There will be a total of 3 judges who will be accessing the participants.</p>
<p><b>Onsite Competition Round (26/27 August 2024)</b></p>	
<p>1. What do teams need to prepare before the onsite mission?</p>	<p>Teams are to bring their own KUBO Coding Starter set, KUBO Coding+ set, and all other materials such as carriers you will need them to complete the missions.</p>
<p>2. How long is the onsite mission?</p>	<p>The onsite competition round will be approximately 100 minutes (including 20 minutes practice time). Teams will be notified of their allocated date and time slot.</p> <p>Participants will be ushered to the allocated playfield/practice areas upon arrival and during competition.</p>
<p>3. Can teams bring notes to the competition venue?</p>	<p>As the competition is meant to encourage preschoolers to code while having fun in the process, physical notes and verbal help are allowed.</p> <p>However, points will be deducted for physical interference(s) from the coaches. For example, when coaches touch the game objects, TagTile® pieces, game field and KUBO etc. Coaches are only allowed to touch the game objects, TagTile® pieces and game field during the 3-minute buffer time in between missions.</p>
<p>4. During the practice time, do the students get to see the playfield and test out their robots prior to the actual competition?</p>	<p>All teams will be given a 20-minutes practice run to test out the items that they have prepared for the competition. Teams can try out Missions 1-4 in the practice area.</p>
<p>5. Before the start of the actual competition, will the game objects be set on the playing field?</p>	<p>Yes, game objects for each mission will be set up on the game field by the referees prior to the start of each mission run.</p>
<p>6. Do the game time for each mission include the</p>	<p>The game time is inclusive of dressing up KUBO, including any carriers, arranging and laying down of TagTile® pieces in a</p>

time required to code KUBO?	readable manner, and coding time. The timing will start when the host says, "Start of Mission x".
7. If KUBO turns purple and gets stuck while reading the code outside of game field, will students be able to move and realign KUBO to re-read the TagTiles?	<p>If there is an error while KUBO is reading the code outside the playfield, students are allowed to move KUBO and read the code again.</p> <p>If KUBO is inside the playfield and encounters an error while the code is running, the students will need to inform the referee to determine if the team can reset the code. Otherwise, no interference is allowed.</p> <p>Do note that time will continue to run in both instances.</p>
8. KUBO starting position of each mission is indicated in the challenge booklet – scoring rubric. Can students change the orientation of KUBO prior to the start of the mission?	<p>KUBO is to be placed at a 90-degree angle within the starting grid and can only face either of the 4 sides of the grid. No diagonal placement of KUBO is allowed on the playing field and KUBO should not be oriented to travel diagonally across any grids.</p> <p>Students are allowed to change the starting orientation of KUBO before the mission starts. However, teams are reminded that they are not allowed to change the starting grid position of KUBO. The starting grid position of KUBO for each mission has been indicated in the scoring rubrics in the Challenge Booklet Section 7.2.</p>
9. Students are not allowed to touch KUBO when it is executing its command. What if I realized the KUBO code is wrong or stuck, can I stop KUBO, remove the head and reset it?	<p>When KUBO is inside the game field and the code is running, no interference is allowed. In the event that KUBO is stuck, or a wrong code has been entered, students must inform the referee and will be allowed to make changes to the code and continue with the mission. However, do note that time will continue to run in this instance.</p>
10. Points are given if coaches do not interfere. Does verbal advice from coaches count as interference or only physical help?	<p>Interference from coaches refers to physical help only. For example, the touching of any of the game materials KUBO, TagTile® pieces, coding sets, game field, game objects etc.</p> <p>Verbal guidance is allowed.</p>
11. Will all props be placed on the mat at the start or only the ones relevant to the mission?	<p>Only game objects related to the ongoing mission will be placed on the mat by the referee. After each mission, these game objects will be cleared from the mat.</p> <p>For example, Mission 1: only the 10 obstacles and 3 river wastes will be placed on the mat.</p>
12. Are all starting positions random or fixed?	<p>All starting positions are fixed. Please refer to Section 7.2 of the Challenge Booklet for more details.</p>

<p>13. Why is there a 3-minute break between each mission?</p>	<p>Referees will be taking the time to reset the game objects for the next game mission.</p> <p>Teams can take this time to set aside the items and materials for the selected mission. These includes any carriers to dress or equip KUBO, and TagTile® pieces from the KUBO Coding Starter Set and KUBO Coding+ Set.</p> <p>However, do note that teams are <b>not allowed to touch the KUBO robot, game field objects, and arrange any TagTile® pieces in a readable manner for coding</b> during this time. Referees may request teams to re-arrange the TagTile® pieces should they find it not adhering to the stipulated rules.</p>
<p>14. If any of the game objects falls, can students touch it? Who sets it back again properly?</p>	<p>Students are not allowed to touch the KUBO robot or the game objects when the code is running for the robot. However, students may inform the referee to reset the game objects. Do note that the time will continue to run.</p>
<p>15. Can the game objects on the game mat be moved?</p>	<p>The game objects will be placed at their respective positions prior to the start of each mission by the referees. Teams are not allowed to touch the game objects during the mission run when KUBO is still running its code.</p> <p>Teams may only touch and transport the game object onto KUBO's carrier when KUBO has stopped running its code. Points will be awarded if game objects are transported hands-free during the mission (Refer to Section 7.2).</p>
<p>16. Can teams touch KUBO?</p>	<p>Teams are not allowed to touch the KUBO robot when it is moving on the game field or when the code is still running (inclusive of pauses in the codes).</p> <p>Teams may move KUBO after the code has stopped running to read another set of code if required.</p>
<p>17. Does KUBO need to stay within the game field grids?</p>	<p>It is alright for KUBO to veer slightly off the grids. As long as KUBO reaches the destination and touches the grid of any game objects for all missions, the point will be awarded to the team.</p>
<p>18. Can KUBO move on the trees or anywhere on the game field grids?</p>	<p>KUBO does not have to strictly follow the pathway printed on the map. It can take any route on the grid of the mat as long as it completes the mission.</p> <p>Additional points will only be awarded for Mission 2 if KUBO travels along the dirt path (Refer to Section 7.2).</p>
<p>19. Can KUBO move diagonally?</p>	<p>TagTile® pieces from the KUBO Coding Starter set and KUBO Coding+ set will only allow KUBO to turn 90-degrees or 180-degrees. No diagonal travel or positioning is allowed for this competition.</p>
<p>20. KUBO is not always aligned; how do we know if we scored the point?</p>	<p>The team will score the point when KUBO reaches the grid of the destination. For example, if KUBO's wheel touches any of the</p>



	grids where the 3 wastes are at (Grid B16 – B18), the point will be awarded to the team.
21. If KUBO goes off course due to placement issue, can the team reset KUBO before the game continues?	<p>Teams can inform the referee to correct KUBO's orientation by placing KUBO at the original starting position before continuing with the mission. Time continues to run.</p> <p>It is recommended to split the codes into shorter portions to better control KUBO to complete the mission.</p>
22. Is it alright if the game objects fall down when KUBO reaches the grid where the game object is placed?	Yes, it is alright. The orientation of the objects do not matter as long as the objects reach the intended grid.
23. When KUBO starts moving on the game field, will the referee remove the play tile or the play tile will remain on the mat until the mission ends?	<p>The play tiles will remain on the mat until the mission finishes. Teams are to inform the referee to stop KUBO and rearrange the play tiles if needed.</p> <p>When KUBO comes to a complete stop (i.e. KUBO finishes executing the sequence/code), teams can pick up KUBO to place a tile underneath or pick up the play tile to lay out a new sequence or code. Teams will have to replace KUBO in the orientation it had stopped at. No points will be deducted in this scenario.</p>
24. Are participants allowed to add things to the game objects?	No alterations and adjustments can be made to all game objects. On the day of competition, teams will be using a new set of game objects for the actual competition.
25. Do we need to follow the scoring rubric in order?	You will need to follow the missions in order. The host will announce the missions in order as stated in the Scoring Rubrics.
26. How is the final score counted?	<p>The final scores will be based on the scoring rubrics shared in Section 7.1 and 7.2. This is made up of the score from the Onsite Presentation Round and the score from the Onsite Competition Round.</p> <p>Points gained from the additional prize categories (Best KUBO Robot Design &amp; Best Teamwork) will not be counted to the final score. Separate awards will be given to teams based on the scoring rubrics shared in Section 7.3 and 7.4.</p>
27. When will I know my team's result for the onsite mission?	Teams will be notified by 2 September 2024 so that they can make arrangements to come for the awards ceremony on 7 September 2024.
28. Can I get tickets to watch the competition? Can parents watch the onsite mission?	<p>No tickets are required, and audiences can walk-in. There will be a designated space for the audience to view the competition.</p> <p>Parents are to inform the organising team upon arrival onsite that their child is participating in the competition and will be ushered to the audience area. Staff members reserve the right to</p>

	<p>confirm the identity of the parents with the teachers, to protect the students.</p> <p>The audience area will be demarcated, and members of the audience are not allowed entry into the competition and practice area.</p>
29. Is there a limit to the number of audiences watching the competition onsite?	There are 100 audience chairs available on a first come first serve basis. No reservation of seats will be taken or allowed at the venue.
30. Does the KUBO robot have to complete each mission in 1 continuous run?	<p>KUBO robot does not have to execute all the movements at the same time to complete the mission. Teams can break down into smaller segments.</p> <p>However, teams are not allowed to touch the game field or any items on it while the KUBO robot's programme is running. The referee will give a verbal warning to the team and after 2 verbal warnings, the referee reserves the right to not score for the mission.</p>
31. Can we bring 2 sets of the KUBO Coding Starter Sets and KUBO Coding+ Sets on the competition day?	<p>Teams are allowed to bring extra sets as backup in the event that there is a malfunction in the set used. Therefore, teams must inform and seek permission from the referee to use them.</p> <p>However, teams must be using only one KUBO Coding Starter Set and one KUBO Coding+ Set at any point in the competition.</p>
32. During the 3 minutes buffer time between missions, are coaches allowed to help teams undress KUBO's costumes?	<p>No, coaches are not allowed to help or touch KUBO during the competition. The referee will give a verbal warning to the coach and a total of 2 verbal warnings will be given. After which, the referee and chief referees reserve the right to apply penalties for the following mission. Therefore, teams should consider the ease of removing the costumes when designing them.</p> <p>However, coaches are allowed to give verbal instructions on how to take off and put on their costumes.</p>
33. What happens if a team member falls sick on the day of the competition?	<p>Kindly drop us an email at <a href="mailto:kidsstop@science.edu.sg">kidsstop@science.edu.sg</a> to inform us the details of the child who will not be able to participate beforehand.</p> <p>The rest of the teammates will be allowed to proceed with the competition as scheduled.</p>
34.	