

# Welcome to National Robotics Competition 2023

Organiser:

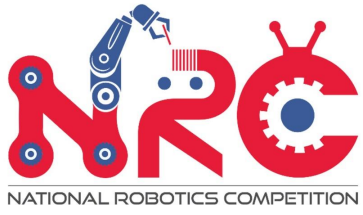


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# NRC Moving Forward

- Remains the only robotic competition in Singapore supported by the Ministry of Education (MOE)
- Celebrating the process of learning through interactive and meaningful experiences



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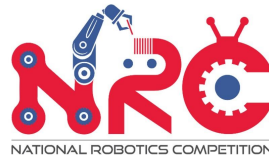


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## **NRC Regular Category**

Lower Primary: 7-9 years old | Upper Primary: 10-12 years old  
Secondary: 13-16 years old | Tertiary: 16-19 years old

## **NRC Open Category**

Primary: 8-12 years old | Secondary: 13-16 years old | Tertiary: 16-19 years old

## **NRC AI Maker Series**

Primary: 8-12 years old | Secondary: 13-16 years old

## **NRC Pre-School (Kubo and ARtec Challenge)**

5-6 years old

## **NRC CoderZ Coding Challenge (Online)**

Primary: 8-12 years old | Secondary: 13-16 years old

## **NRC RoboCup Singapore CoSpace Coding Challenge \*NEW\***

Primary: 8-12 years old | Secondary: 13-16 years old | Tertiary: 16-19 years old

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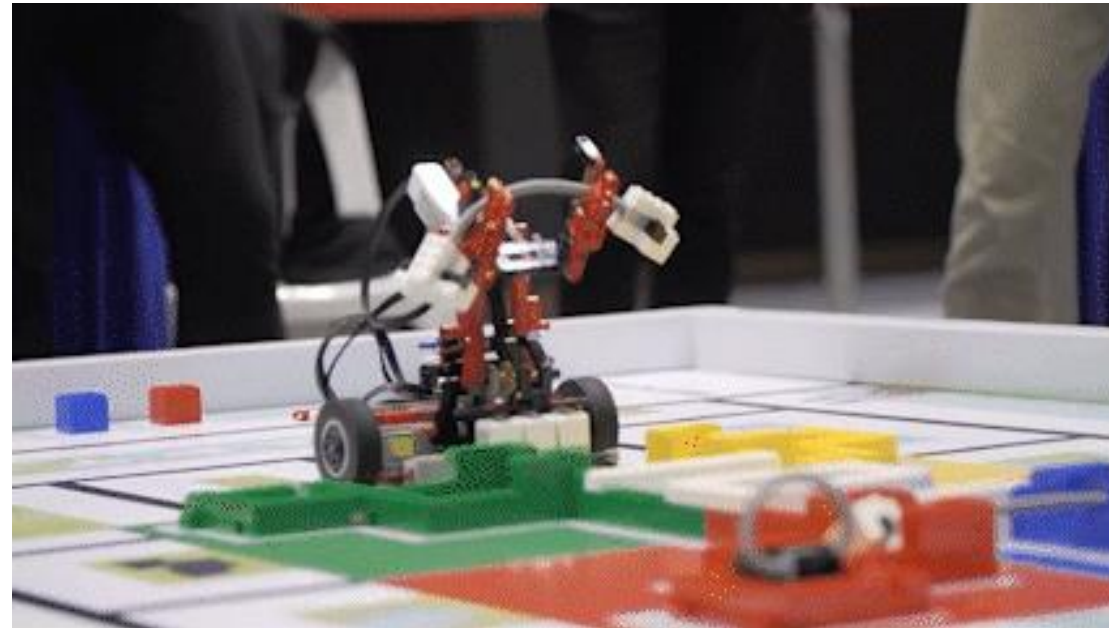


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# Held live on-site at Science Centre Singapore from 21 August to 9 September 2023



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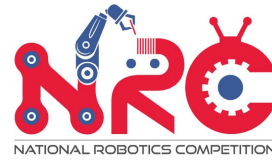


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# NRC Regular Category 2023

## Upper Primary | Secondary

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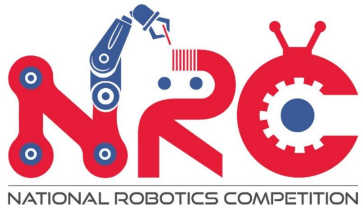


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# Agenda for the Webinar

- Introduction to the NRC Regular Category
- Introduction to the NRC Upper Primary and Secondary Regular Category 2023
- Introduction to Gameplay
- Scoring
- Qualifiers and Finals
- Important Dates

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# NRC Regular Category 2023



## Presentation and Robot Runs

- Presentation based on themes of individual categories
- Robot Runs based on scores from solving missions

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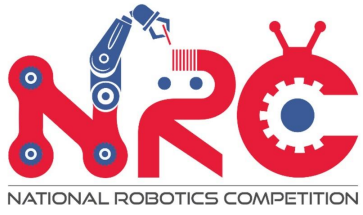


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# Introduction to NRC Regular Category 2023

## General rules

- Teams
  - 2 to 3 team members per team
- Age groups
  - Lower Primary: 7 to 9 years old (born in 2014 to 2016)
  - Upper Primary: 10 to 12 years old (born in 2011 to 2013)
  - Secondary: 13 to 16 years old (born in 2007 to 2010)
  - Tertiary: 16 to 19 years old (born in 2004 to 2007)



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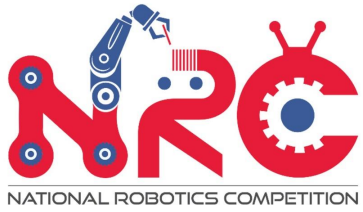
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# Introduction to Upper Primary / Secondary Theme

- This year theme is “Green City”
- A Green City is a city designed with consideration for social, economic and environment impact, and resilient habitat for existing populations, without compromising the ability of future generations to experience the same.
- Robots can support in the transportation of clean energy infrastructure such as solar panel and transportation of human. Robots can also support the construction of buildings to reduce the need of manpower and carbon footprint.
- In this category, team’ s robot is task to ferry human, segregate potable and non-potable water, replanting trees and constructing green building. At the same time, they have to work with existing construction equipment to aid with the construction of green building.

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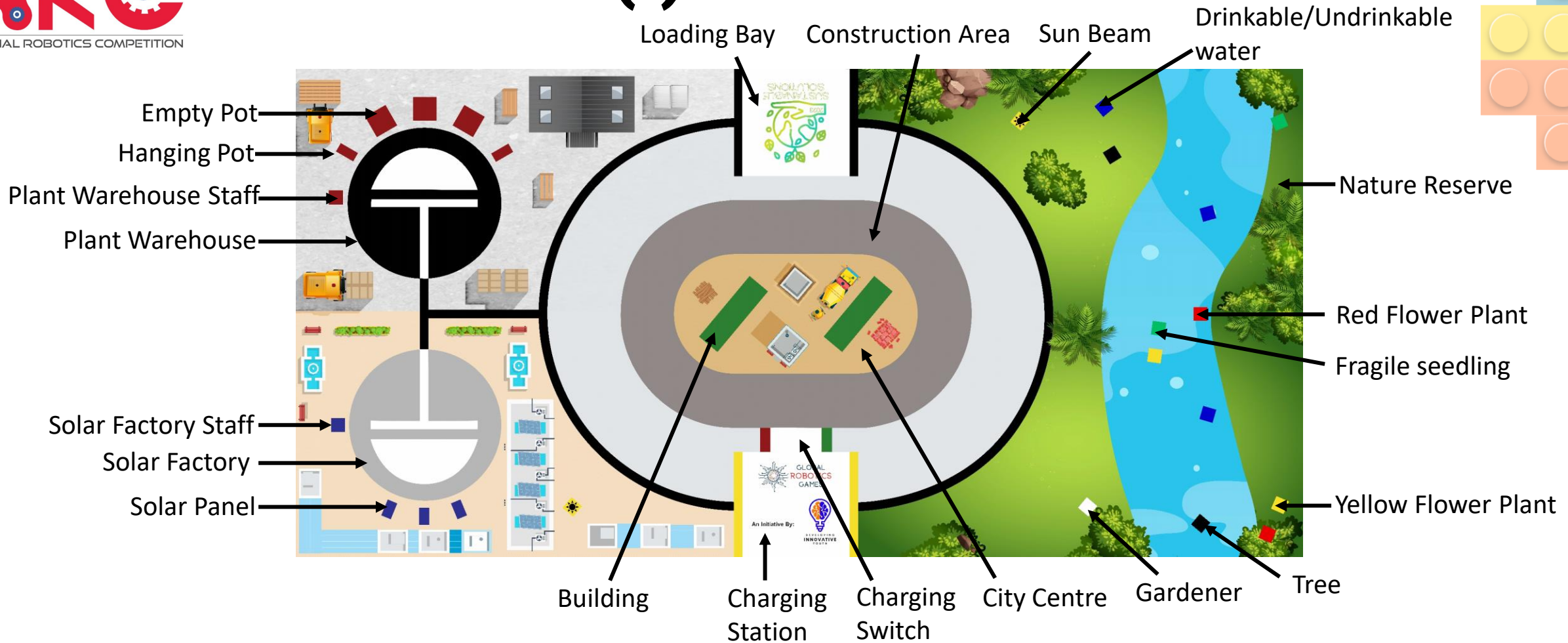
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# Game Mat (I)



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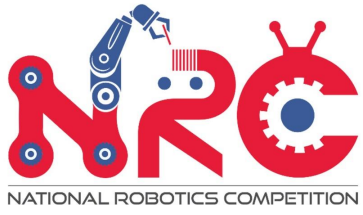


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# Game Mat (II)

- The playfield design has to be printed on a mat that is pasted onto the game table.
- The game mat must be printed with a matt finish/overlay on a PVC tarp.
- The dimension of the mat is 2362 mm x 1143 mm.
- Game tables should have the same size or max +/- 5mm in each dimension.
- The official height of the borders of a game table is 50mm.

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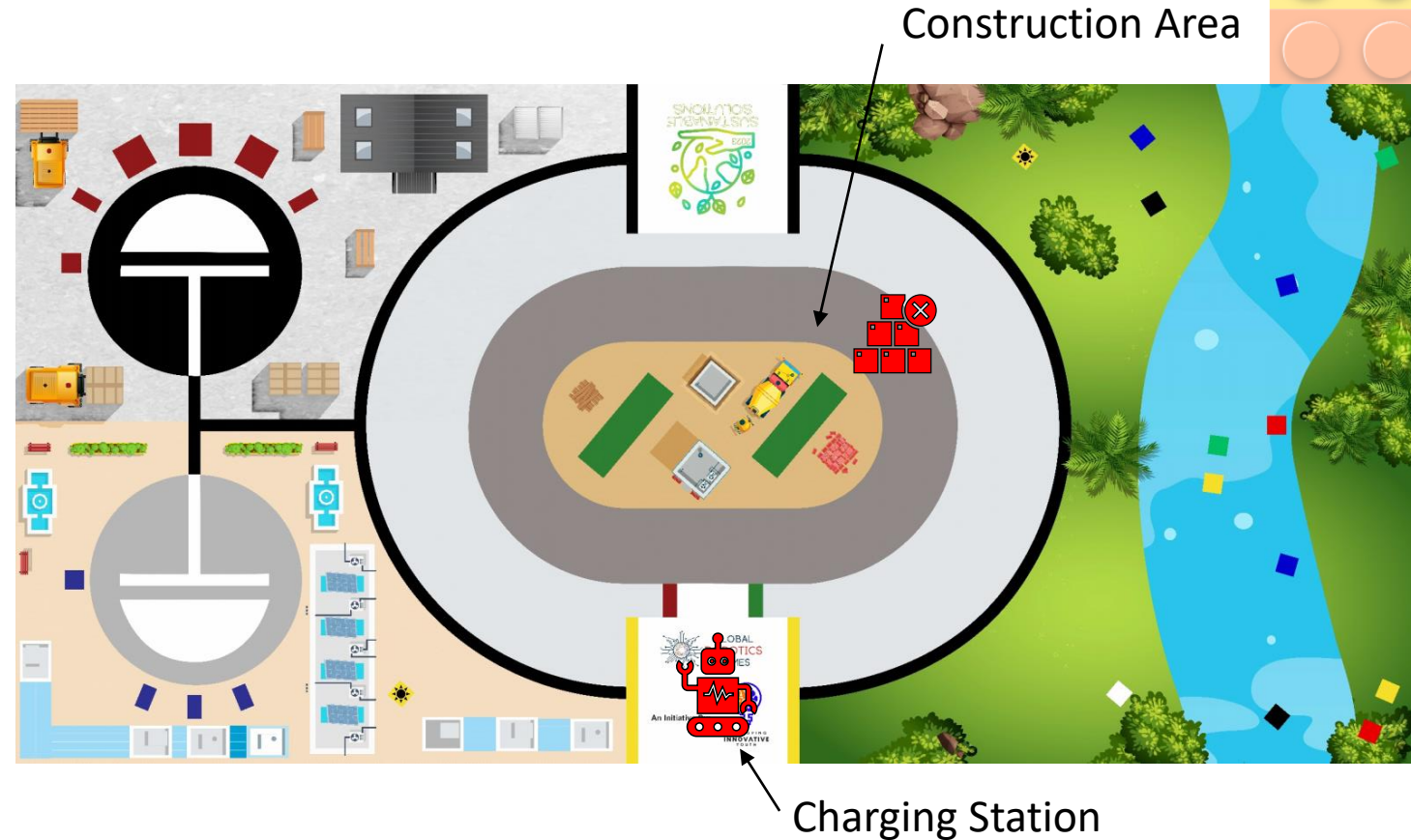
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# Sub-Category Game Rules (I)

## Pre-Run

- Robot and construction equipment will be inspected by referees according to the requirements prior to quarantine
- Robot and Construction Equipment must be placed in the respective starting area so the projection of the robot on the game mat is completely within the start area (Robot in Charging Station and Construction Equipment at Construction Area)
- Teams are allowed to make physical adjustments to the robot in the starting area.
- Teams are not allowed to enter data to a program by changing positions or orientation of the robot parts or to make any sensor calibrations of the robot.
- Referees are to inspect the placement of the Robot and Construction Equipment
- No wireless communication (Wifi, Bluetooth etc) is allowed.



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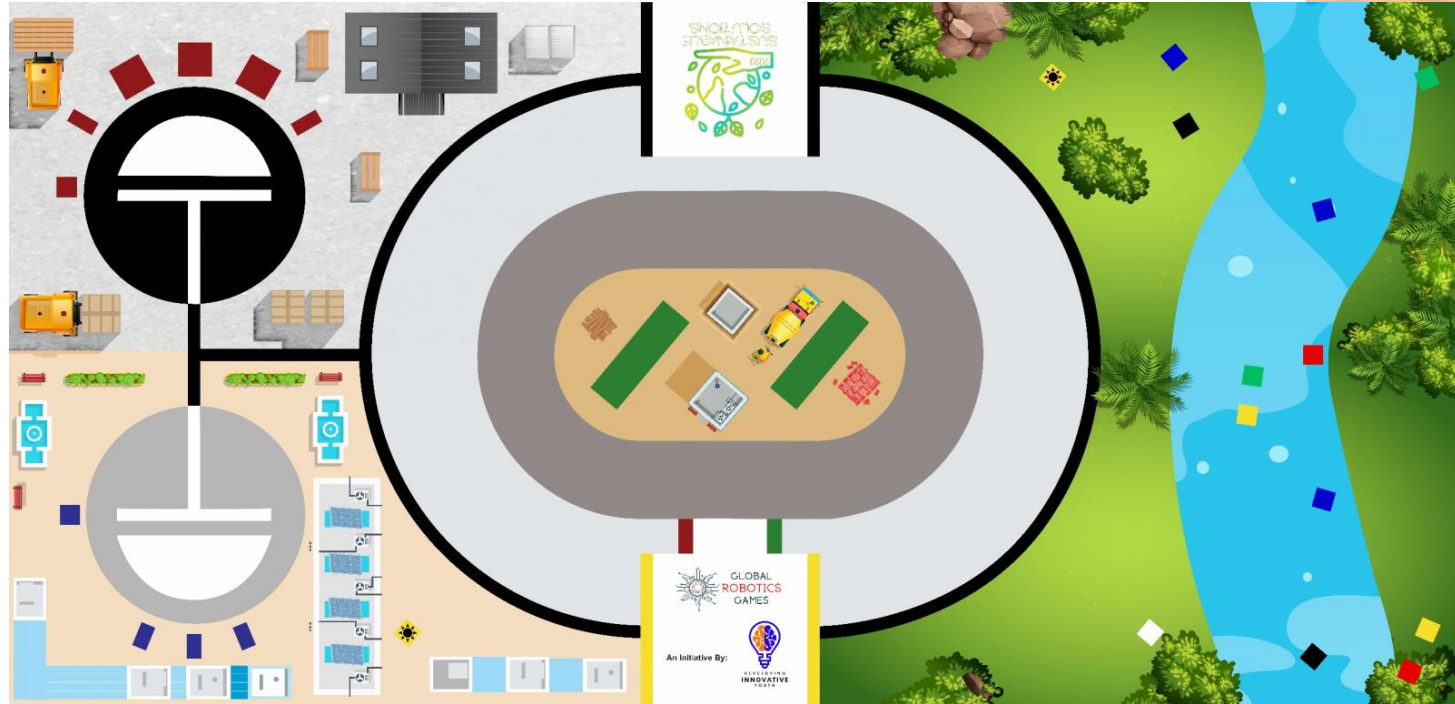
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# Sub-Category Game Rules (II)

## Start of Robot Run

- Time begins when the judge gives the signal to start.
- Each robot attempt is 2 minutes run (120 seconds)



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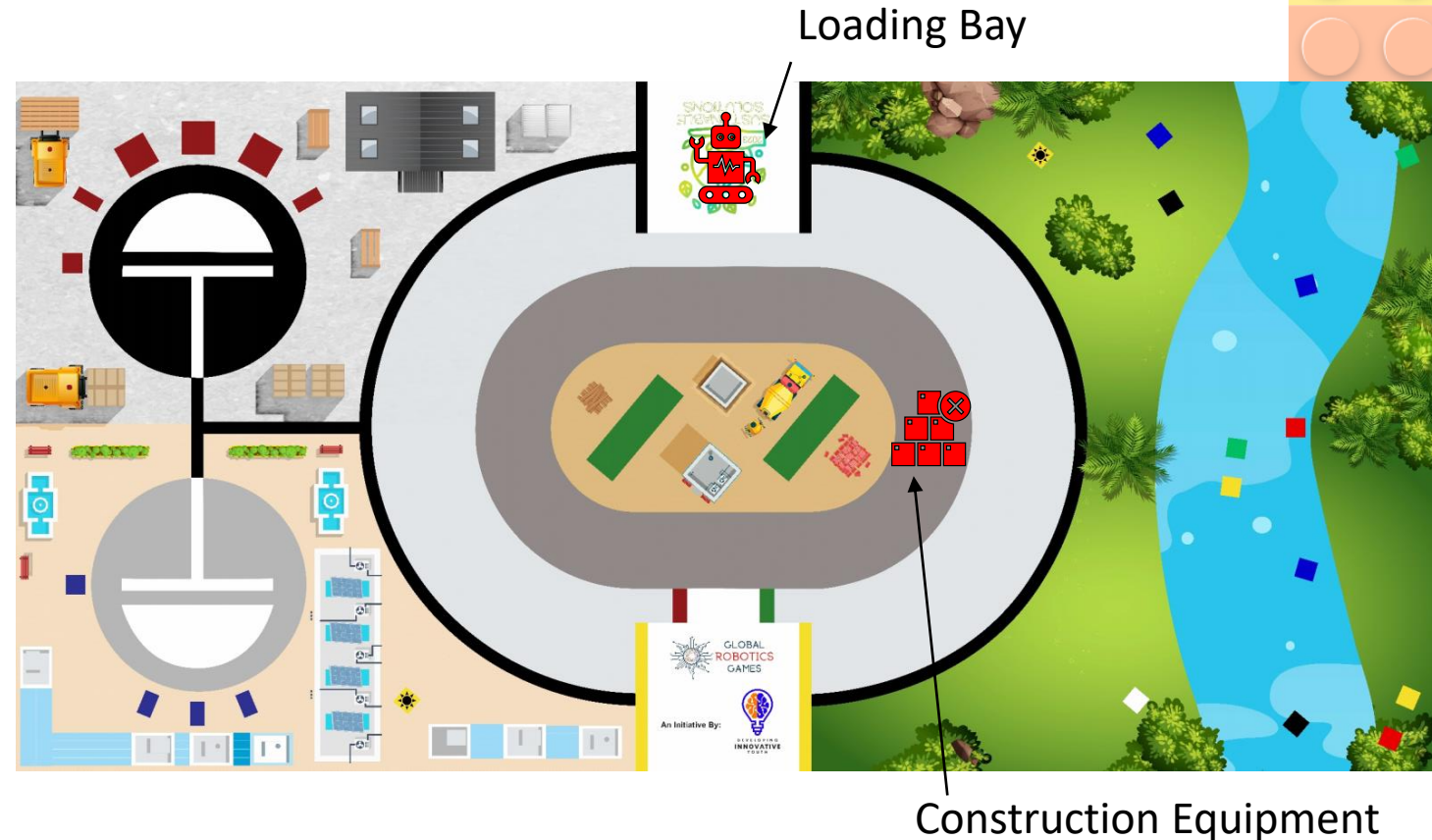
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# Sub-Category Game Rules (III)

## During Robot Run

- Teams are allowed:
  - a) To touch or switch program after their robot comes to a complete stop and it is partially in the Loading Bay
  - b) To unload props from the robot after the robot comes to a complete stop and it is partially in the Loading Bay
  - c) To physically load the props from the Loading Bay onto the construction equipment
  - d) To resume their Robot run only after the teams are done with the load/unloading of props
- Teams are not allowed:
  - a) To touch the robot when the robot is moving.
  - b) To reprogram and enter data into the robot during robot run.
  - c) To physically move the Construction Equipment during robot run



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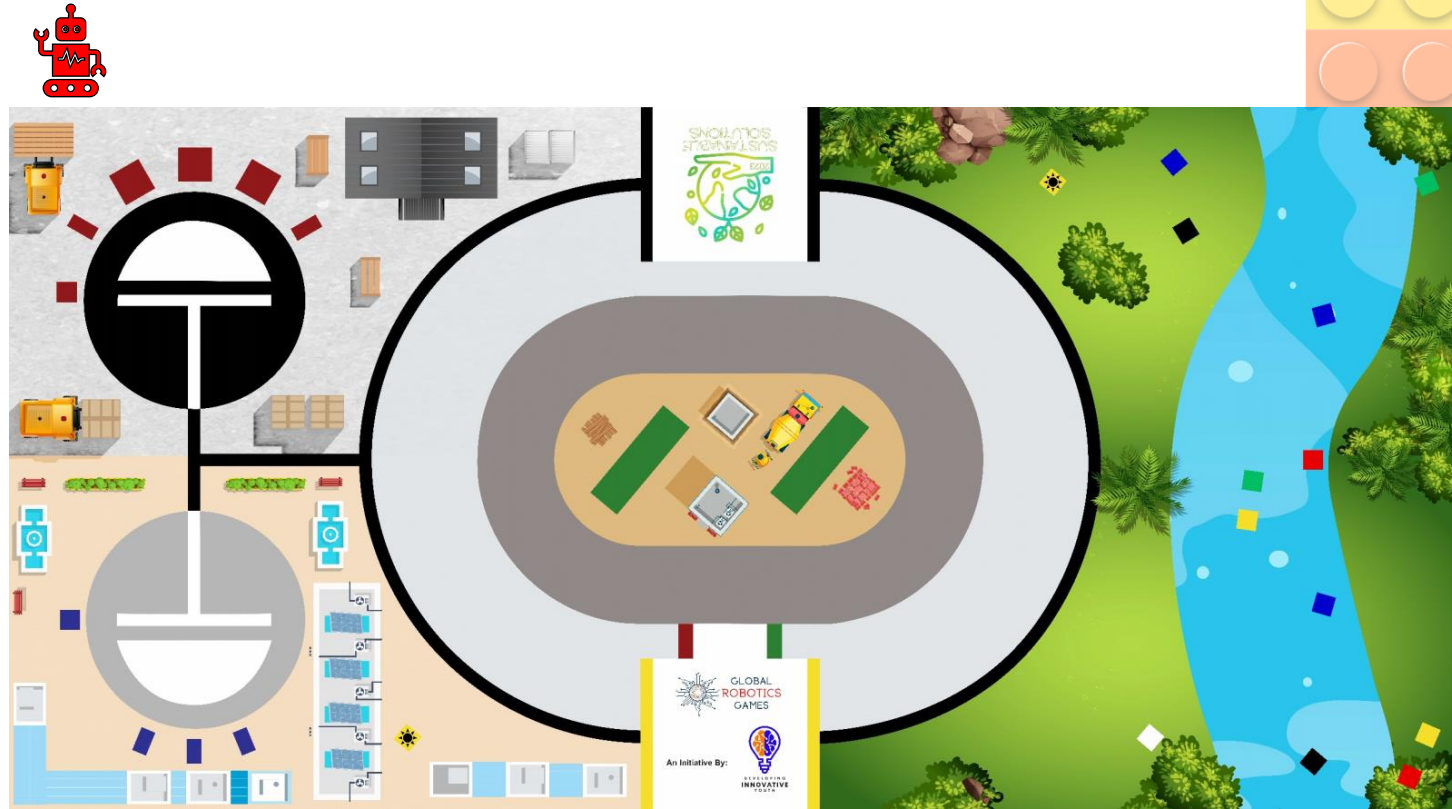


# Sub-Category Game Rules (III)

## Ending of Robot Run

A robot attempt will end if...

- The 2 minutes mark is up (120 seconds).
- The robot has completely left the game table.
- The robot or team has violated the rules or regulations.
- A team member shouts "STOP", and the robot does not move anymore. If the robot is still moving, the robot attempt will only end once the robot stops by itself or is stopped by the team or judge.



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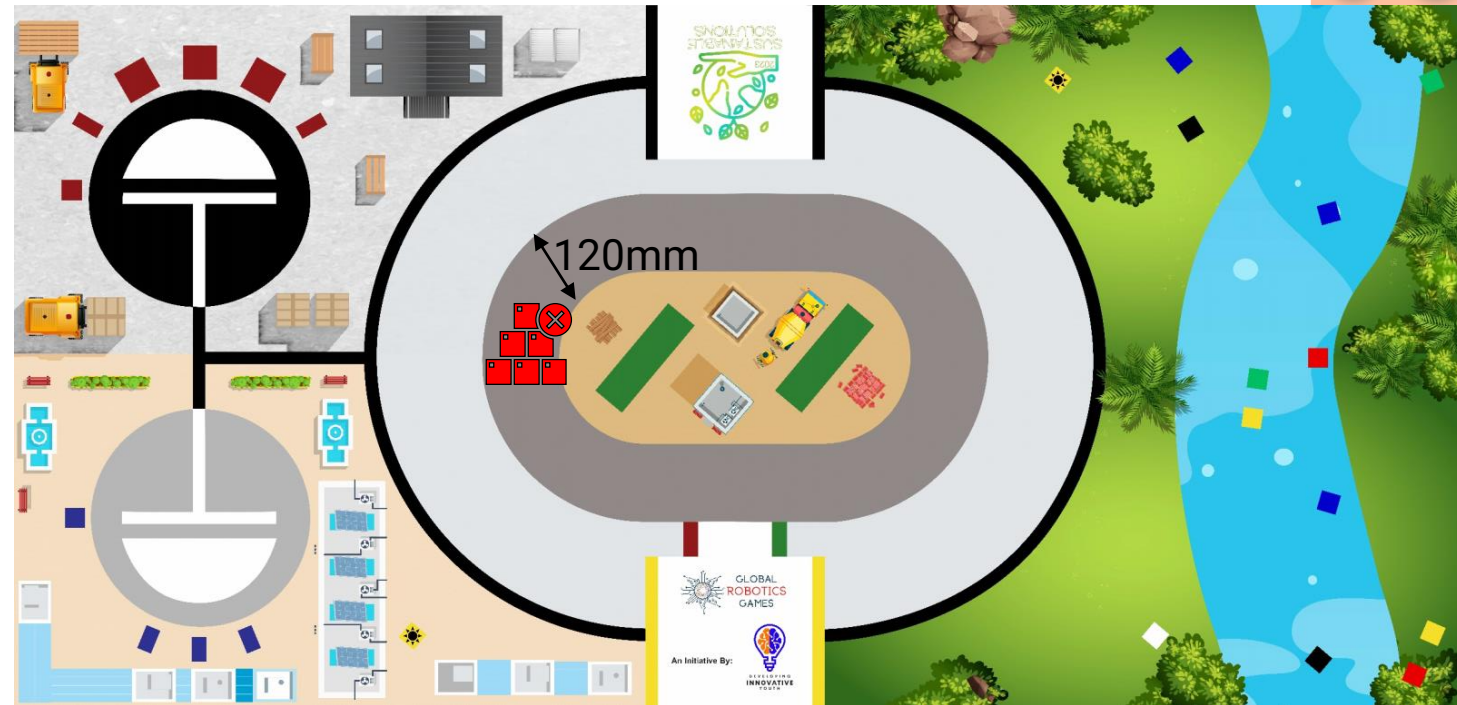
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# Sub-Category Game Rules (IV)

## Construction equipment:

- Construction equipment will be used to aid the team in placing the props into the building in the City Centre
- Each team can place multiple construction equipment in the construction area
- The construction equipment can extend into the city centre as long as the base of the construction equipment fits fully within the construction area (track of width 120mm) at start of run.
- During the robot run, the construction equipment can only move beyond the boundaries of the construction area with the action from the Robot
- During the run, teams are not allowed to physically move the position of the construction equipment
- Teams can only use non-motorize LEGO branded elements to build their construction equipment

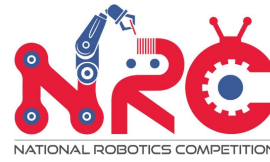


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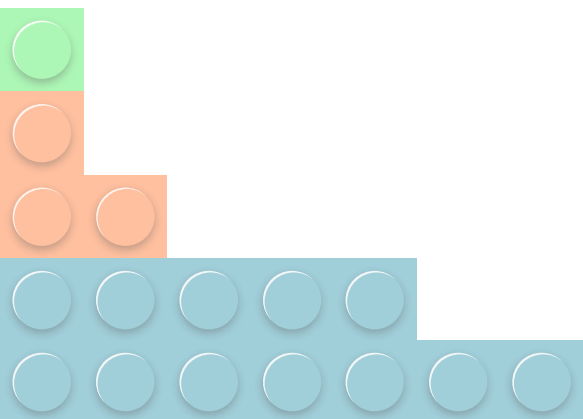
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# Introduction to Gameplay



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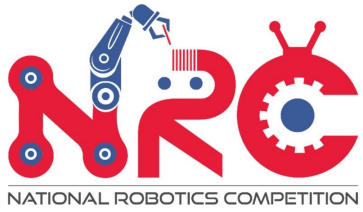


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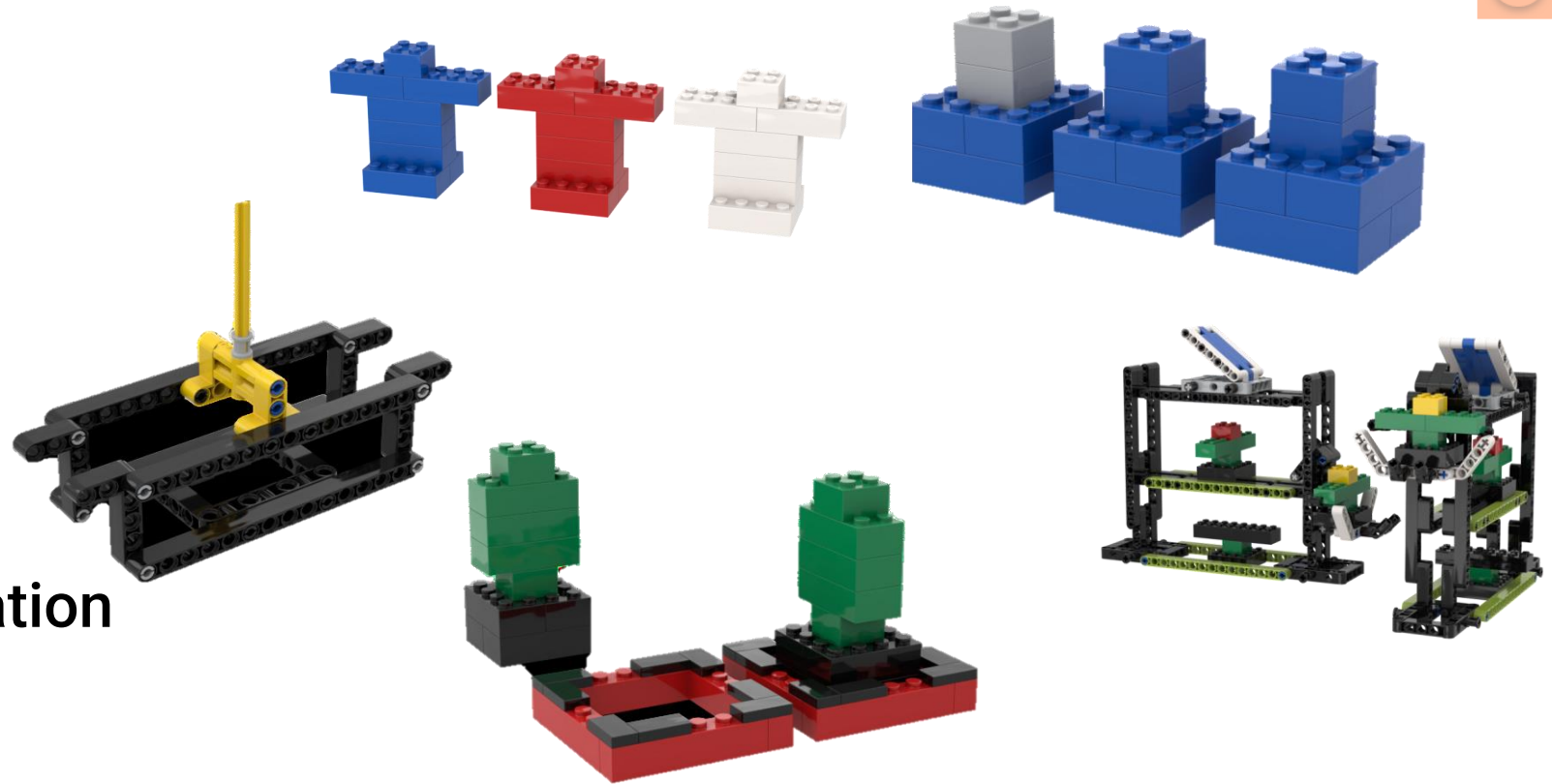




# Upper Primary & Secondary Category: Green City

## Robot Missions:

- Public Shuttle Service
- Water Management
- Tree Management
- City Management
- Return to Charging Station
- Bonus Points



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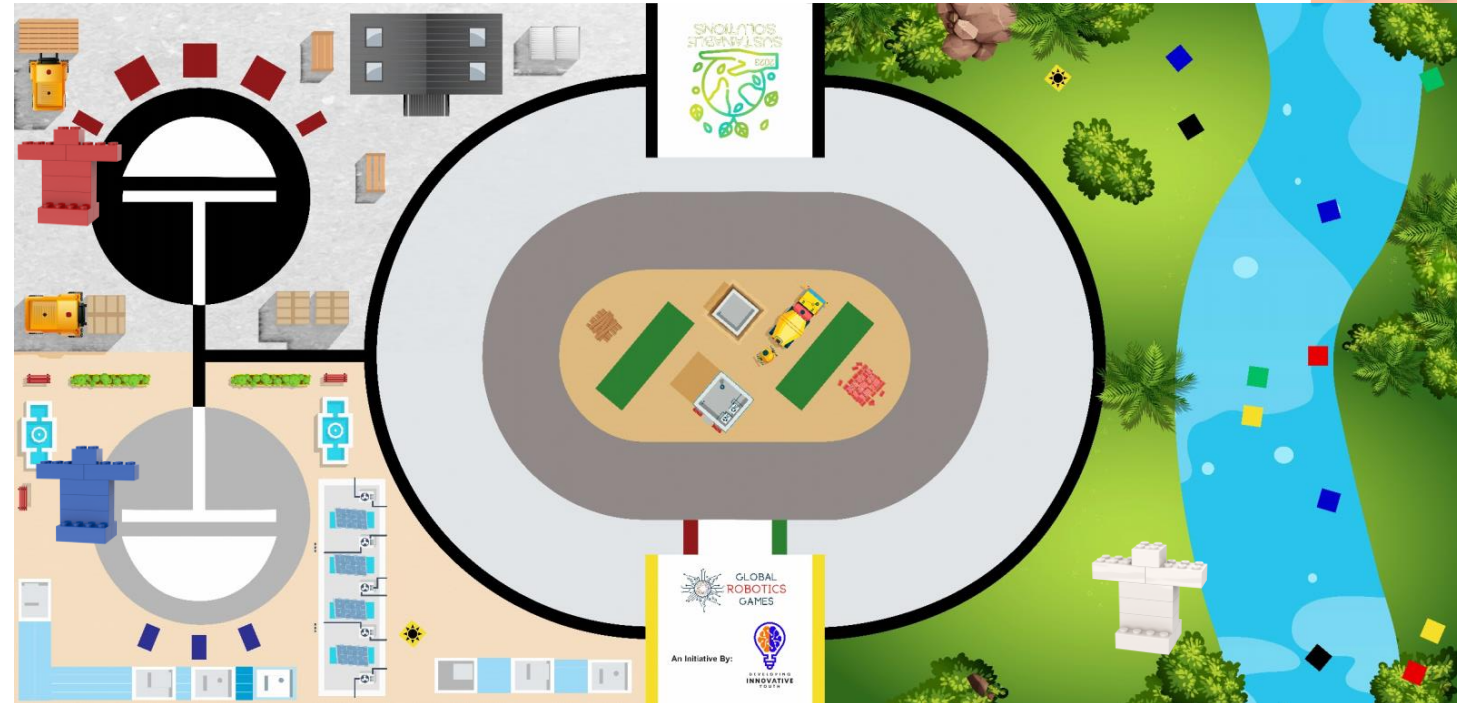
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# Mission (I) – Public Shuttle Service

## Task

- Shuttle Gardener, Plant Warehouse Staff and Solar Factory to City Centre
- They have to be remained upright



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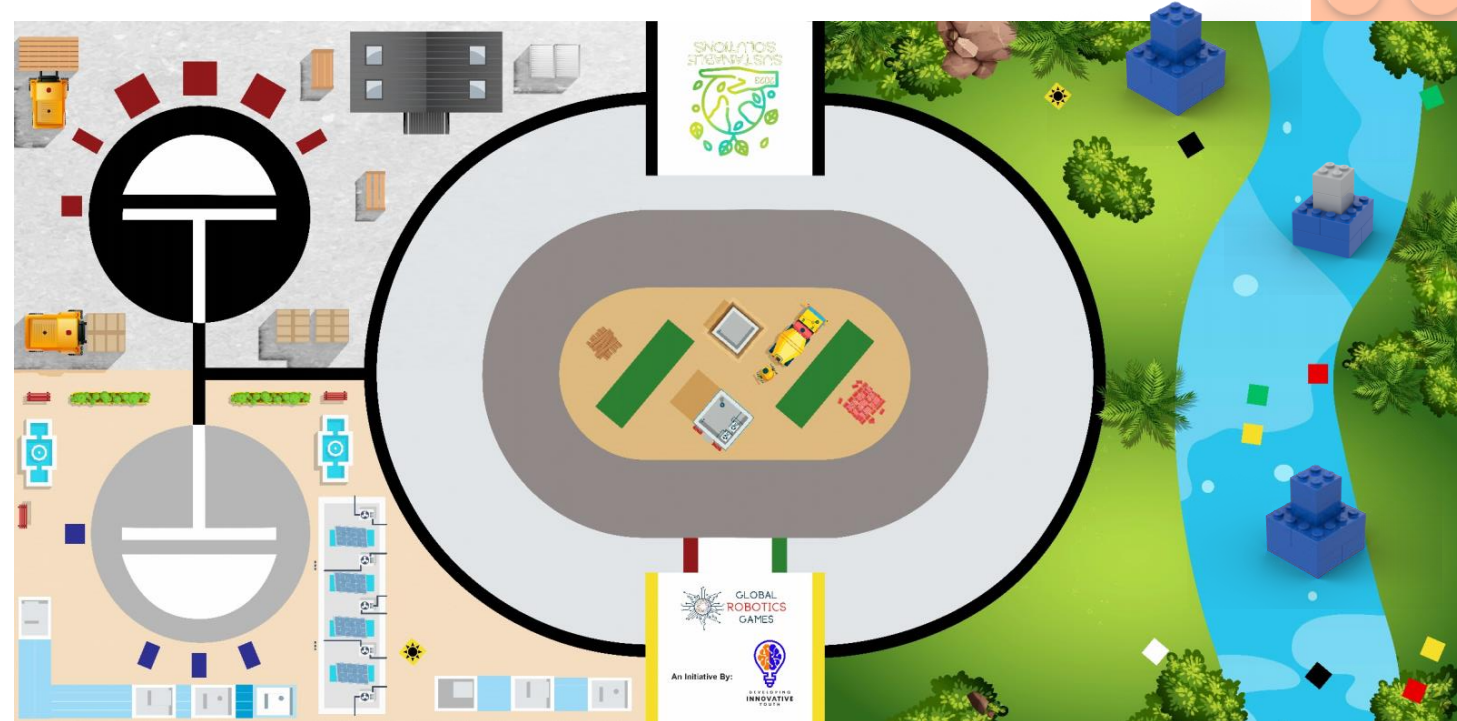
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# Mission (II) – Water Management

## Task

- Identify drinkable and undrinkable water
- Transport drinkable water to City Centre



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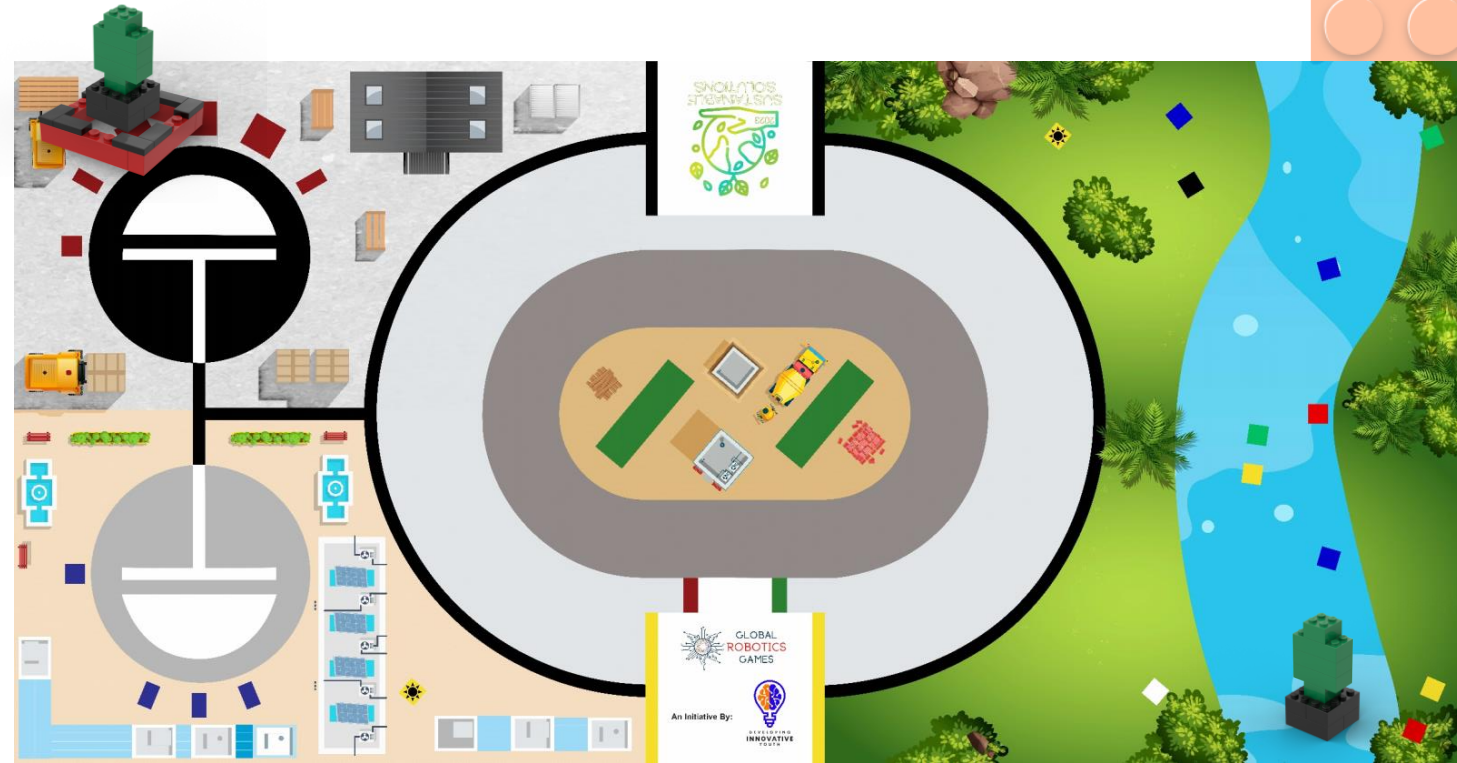
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# Mission (III) – Tree Management

## Task

- Transport Trees and placed in Empty Pots in the Warehouse
- Transport Tree-Pots to City Centre



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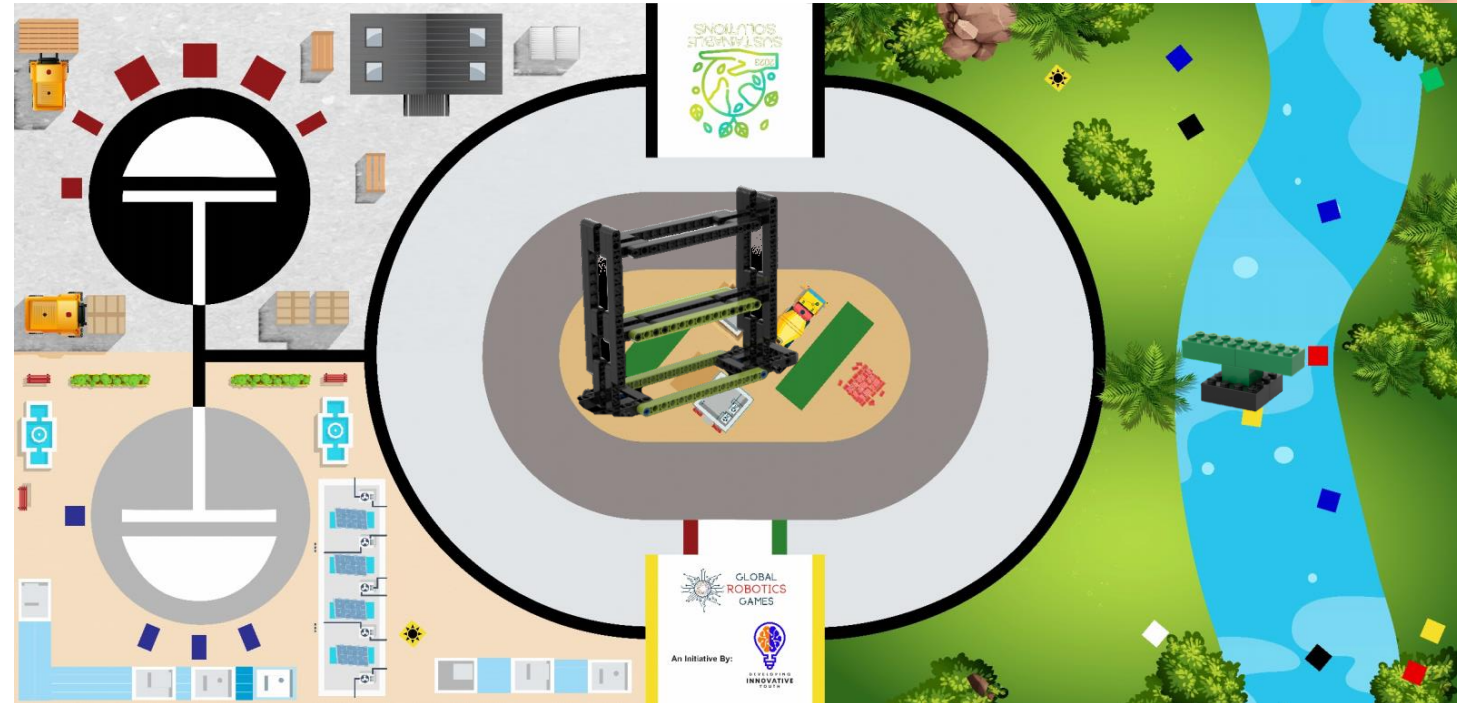




# Mission (IV) – City Management

## Task 2

- Collect Fragile Seedling from Nature Reserve
- Place Fragile Seedling on the ground floor of building



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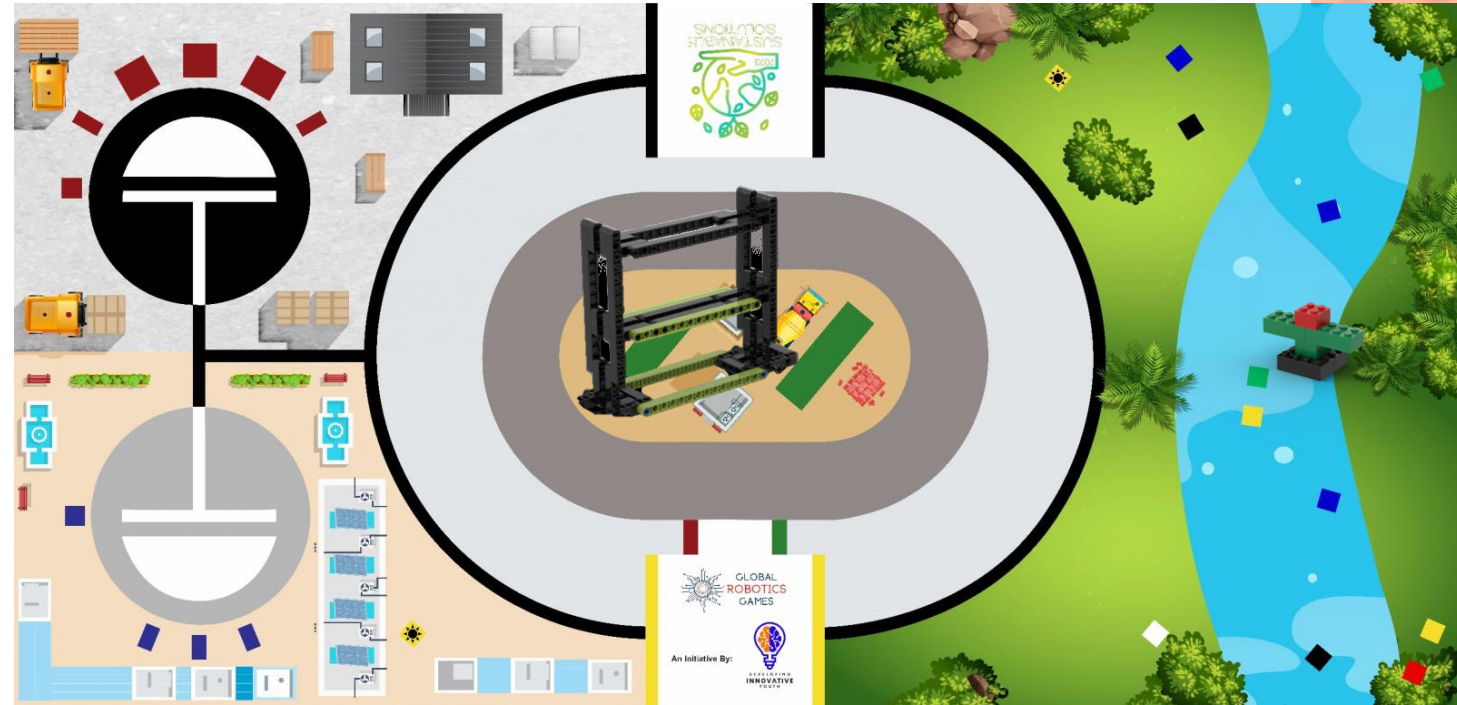
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# Mission (IV) – City Management

## Task 3

- Collect Red Flower Plant from Nature Reserve
- Place Red Flower Plant in mid-tier of building



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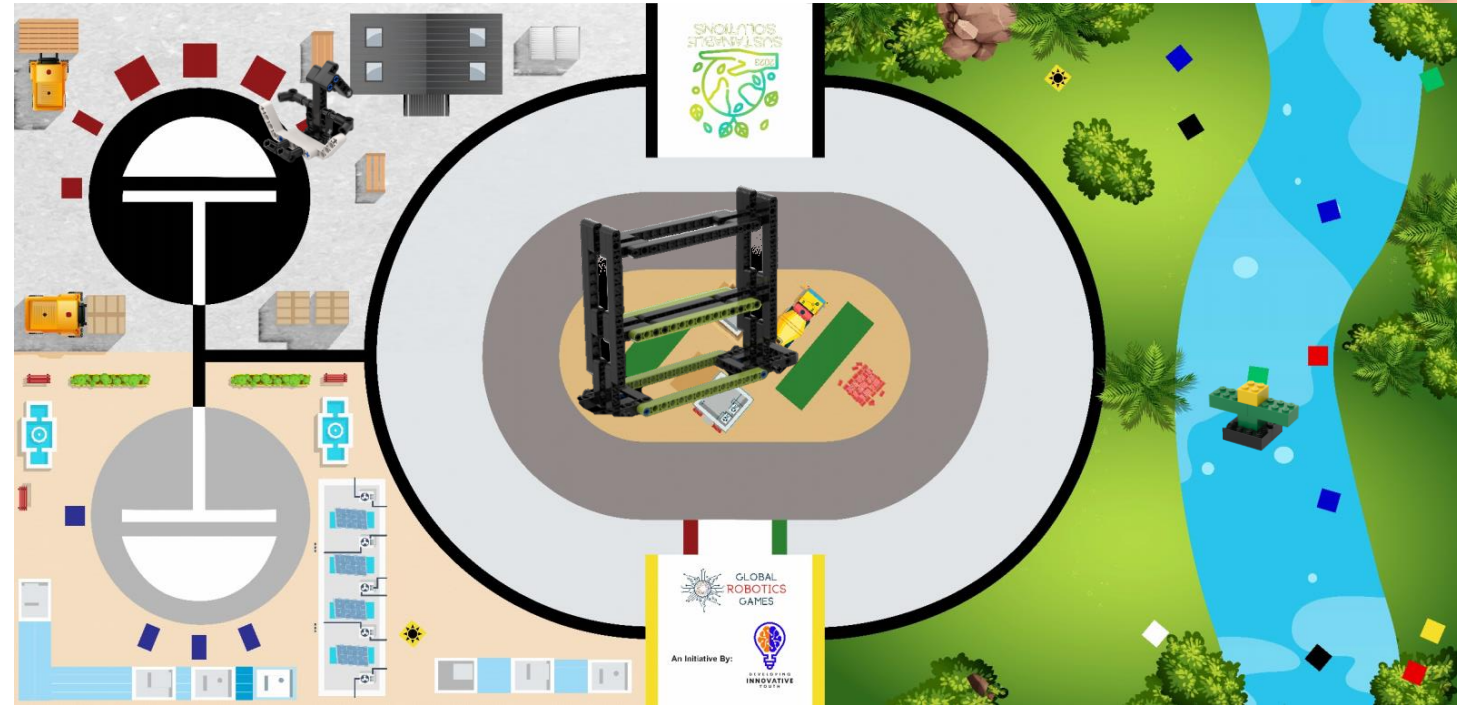




# Mission (IV) – City Management

## Task 4

- Collect Yellow Flower Plant from Nature Reserve
- Combine Hanging Pot with Yellow Flower Plant
- Place Yellow Plant with Hanging Pot on building's plant wall



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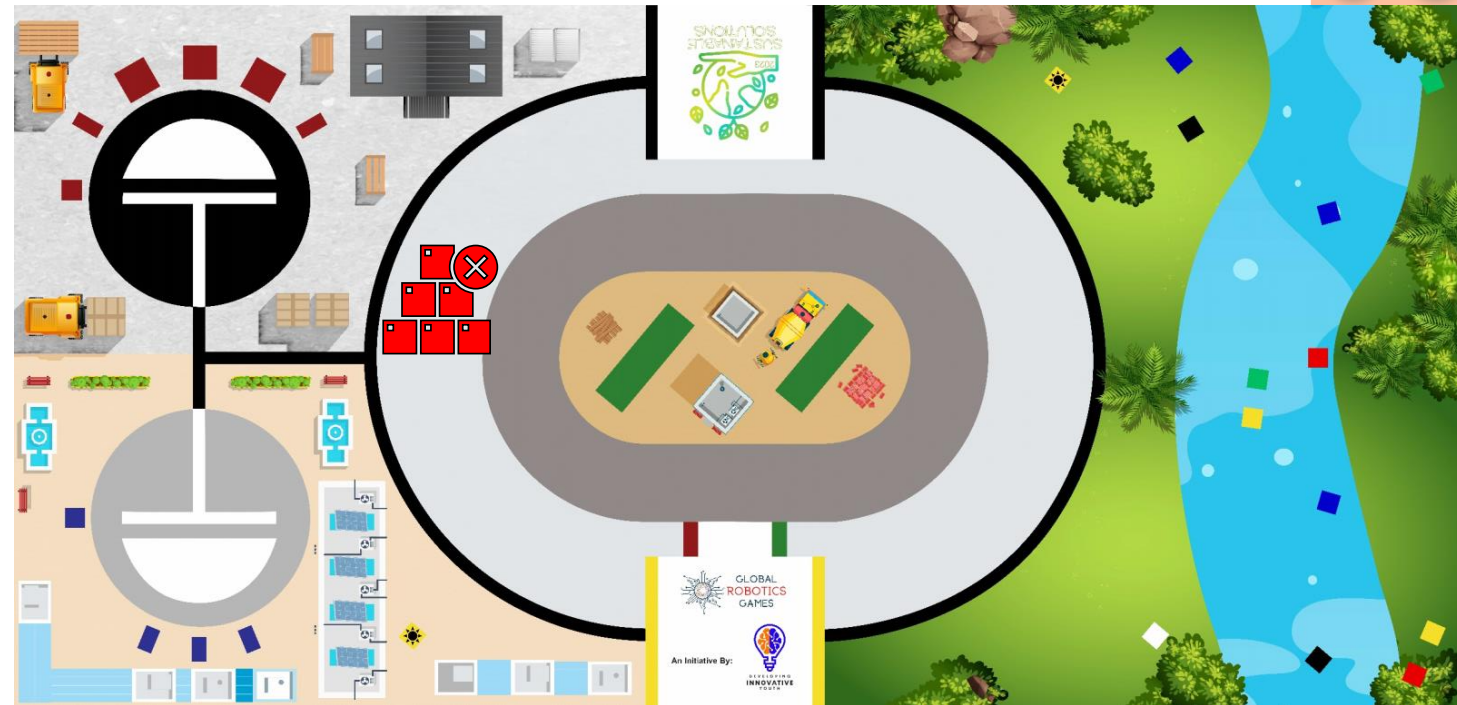
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# Mission (IV) – City Management

**Construction Equipment:**

- Teams can use it to aid in the loading of props onto the building in City Centre



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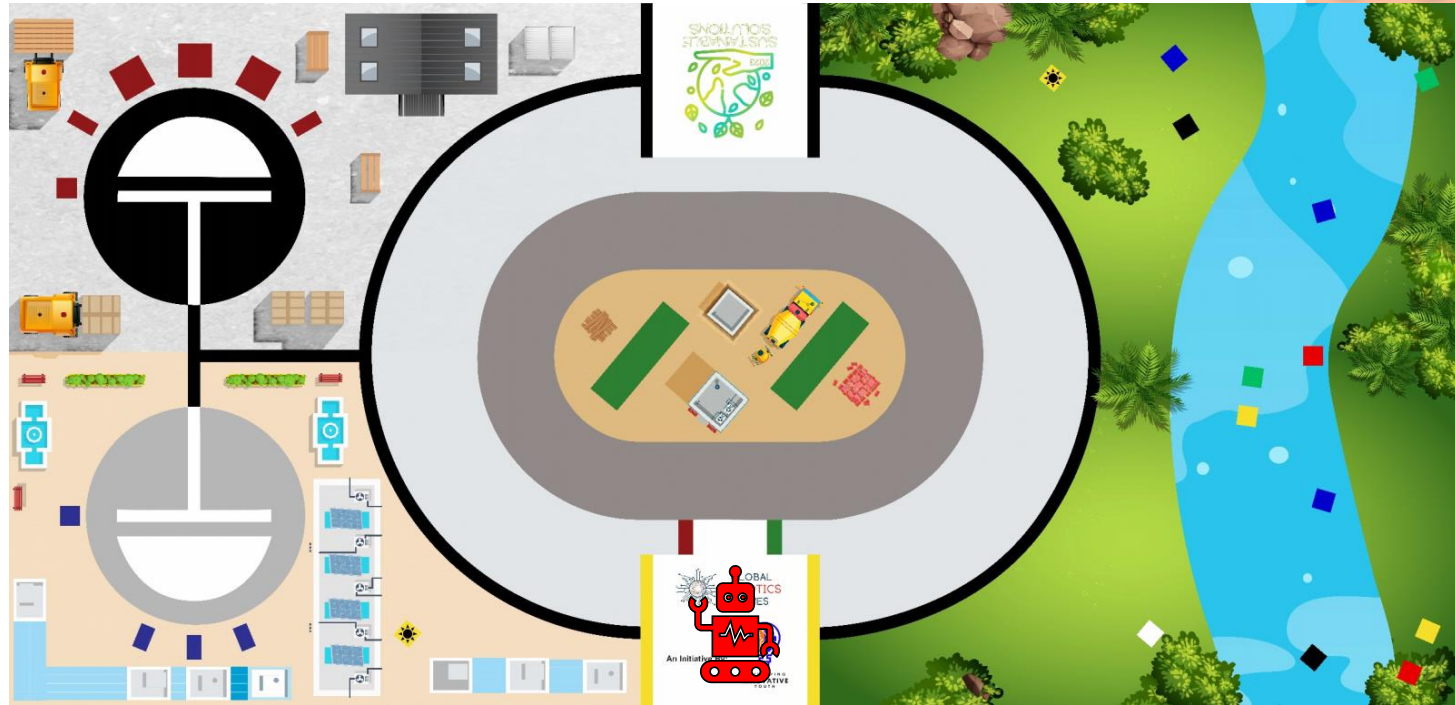
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# Mission (V) – Return to Charging Station

## Task

- Park Robot at Charging Station
- Activate charging switch with at least 1 Solar Panel installed



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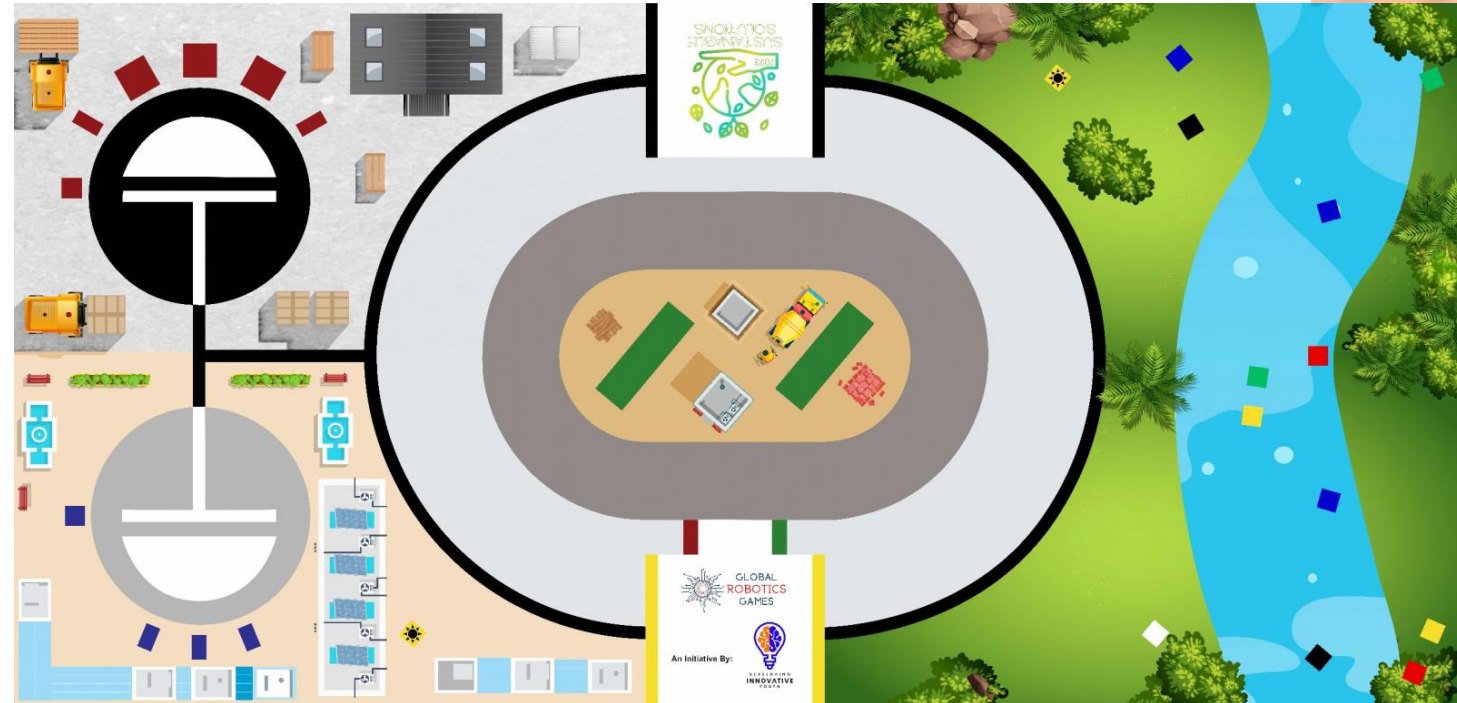
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# Mission (VI) – Bonus Points

## Task

- Building in City Centre is not move or damage



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# Allowed robot systems

Teams are allowed to use only the following materials to build the robot:

Controller	LEGO® Education MINDSTORMS® NXT or EV3; LEGO® Education SPIKE™ PRIME; LEGO® MINDSTORMS® NXT, and EV3.
Motors	Only motors from the platforms/sets mentioned at “Controller”.
Sensors	From the platforms/sets mentioned at “Controller”. In addition, it is allowed to use the following materials: • HiTechnic Color Sensor
Batteries	Only official LEGO rechargeable batteries (no. 9798 or 9693 for NXT, no. 45501 for EV3, no. 45610 or no. 6299315 for SPIKE).
Building Materials	For the construction of the robot only LEGO® branded elements are allowed.



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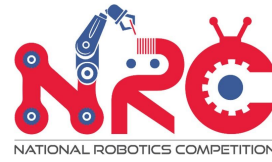


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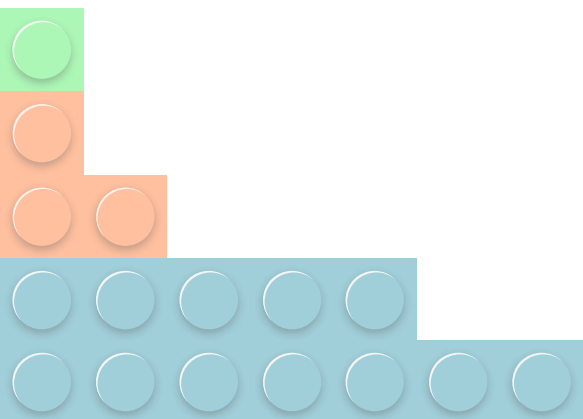


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# Scoring



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# Judging for Presentations

- Page 12 of General Rules
- 10 mins to present
- 5 mins for Q&A
- Best Presentation Award
- Best Research Award
- Best Programming Award
- Best Engineering Award
- Best Robot Performance Award

Category	Criteria	Points
Programming (Total Points: 50)	<b>Automation Level</b> The project uses appropriate inputs from sensors to run specific routines and clearly demonstrates automation in the completing of the tasks.	15
	<b>Good Logic</b> The programming options used make sense, work reliably, are relevant in terms of their use, complexity and design.	15
	<b>Strategy</b> Use of sub-routines and sub-functions, how the team complete mission objectives, coming up with different strategies to see what works.	20
Engineering Design (Total Points: 50)	<b>Engineering Concepts</b> The project shows evidence and good use of engineering concepts and team members are able to explain the concepts and need for use. Designer / Builder applications.	15
	<b>Mechanical Efficiency and Structural Stability</b> Parts and energy have been used efficiently – evidence of proper use of mechanical concepts / principles (gears/pulleys/levers/wheels & axles). The project (robots and structures) is strong, sturdy and the demonstration can be run repeatedly – parts don't detach – little need for repairs.	20
	<b>Overall design &amp; aesthetic</b> The Robot design is functional yet unique and aesthetically appealing.	15
Presentation (Total Points: 50)	<b>Successful Demonstration</b> Using unique, interesting and aesthetic method to convey the project and Theme.	20
	<b>Communication &amp; Reasoning Skills</b> The team is able to present their project idea in clear, concise and engaging way.	20
	<b>Quick Thinking</b> The team is able to easily answer questions about their project. They are also able to deal with any problems that arose during the presentation.	10
Research (Total Points: 50)	<b>Research contents quality and relevancy</b> There is evidence that team members explain their research and content relevant to the theme.	15
	<b>Research methodology</b> The team is to share how they conduct their research & the method on how they obtained their information. E.g. Internet, survey.	15
	<b>Learning outcome &amp; teamwork</b> The team is able to explain the research journey and give an insight to what they have learnt.	20
<b>Total Points</b>		<b>200</b>

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# Scoring for Robot Runs

- Page 18 of Upper Primary and Secondary Regular Category booklet

Tasks	Each	Total
<b>1. Public Shuttle Service</b>		
Staff (Blue, Red and White) standing upright and completely in City Centre	5	15
<b>2. Water Management</b>		
Potable water extracted from river	5	10
Potable water extracted from river and in the City Centre	10	20
Undrinkable water in the City Centre	-20	-20
<b>3. Tree Management</b>		
Only Tree in City Centre	5	10
Tree in Pot but not in the City Centre	10	20
Tree-Pot in the City Centre	15	30

Example for Upper Primary and Secondary Category

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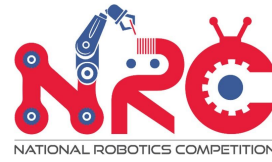
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# Qualifiers and Finals

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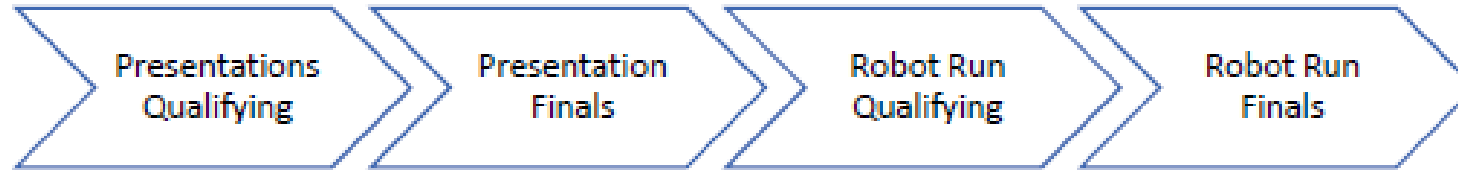
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# Qualifiers



- Everybody takes part
- Presentation
- Robot Run
- Requirements listed in General Rules Document
- Top teams selected for Finals

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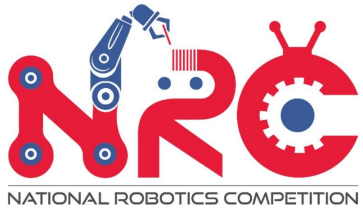


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# Finals

- Presentation Finals
- Robot Challenge Finals
  - Surprise rule may be added
- Best Robot Performance Award
- Championship Awards
  - 60% Robot Performance (based on Robot Run Finals)
  - 40% Presentation Score (based on Presentation Week)

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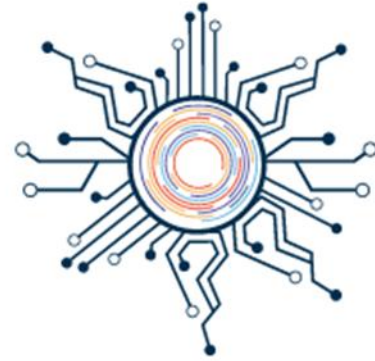
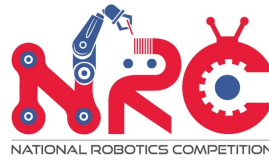


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# GLOBAL ROBOTICS GAMES

# Introduction

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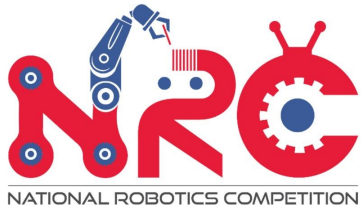


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# About Developing Innovative Youth Ltd. (DIY)

DIY is a non-profit organisation based in Singapore which aims to:

- encourage and develop innovation amongst youth to become builders of a better future.
- Develop ecosystems for educators to build capacity to develop 21<sup>st</sup> century competencies in youth.
- Promote STEAM education amongst youth as a platform to innovate and solve mankind's problems.

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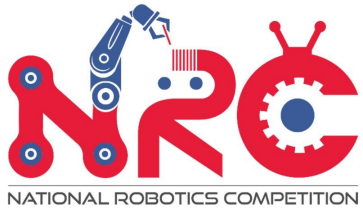


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# What are the Global Robotics Games (GRG)?

Global Robotics Games (GRG) is an international robotics competition, comprising of various tournaments, organised by DIY.

We aim for the competition to be organised in each country by one or more operational partners culminating in an international competition that will be held in Singapore every year.

The competition will be based on a socially relevant theme each year upon which the tournaments will be designed.

GRG aims to:

- Equip youth with relevant skills in order to be future-ready
- Develop creative thinking, problem solving and independent learning skills amongst youth
- Encourage youth to take an active interest in STEAM to use it as a platform to build the future

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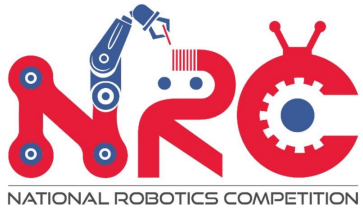


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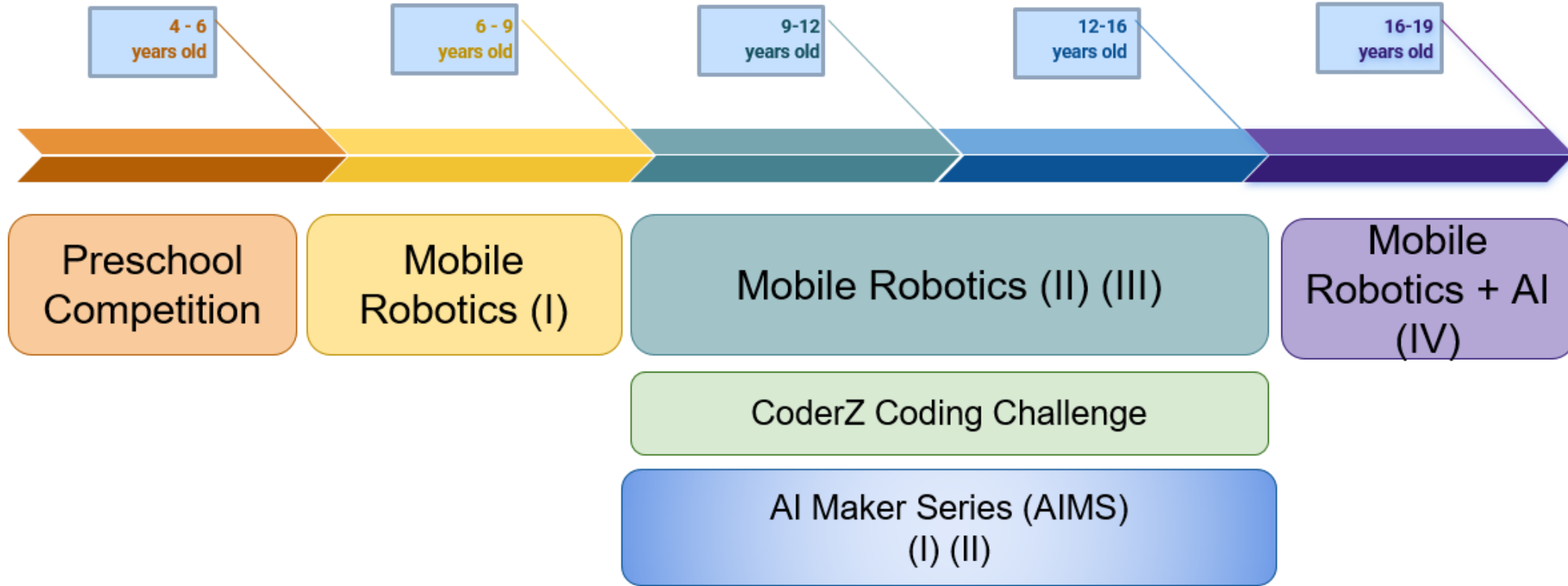


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# GRG Tournaments



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# Important Dates

		Dates	Time	Remarks
	Trial playfield	June onwards		Look out for NRC EDM
Upper Primary	Onsite Presentation	22 <sup>nd</sup> , 23 <sup>rd</sup> & 24 <sup>th</sup> Aug 2023	9am – 5pm	Subjected to changes
	Onsite Competition	5 <sup>th</sup> & 6 <sup>th</sup> Sept 2023	9am – 5pm	
Secondary	Onsite Presentation	28 <sup>th</sup> & 29 <sup>th</sup> Aug 2023	9am – 5pm	
	Onsite Competition	6 <sup>th</sup> & 7 <sup>th</sup> Sept 2023	9am – 5pm	
	Finals & Award Ceremony	9 <sup>th</sup> Sept 2023	9am – 5pm	

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# Contact us/Updates/FAQ

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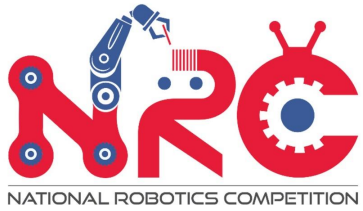


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# FAQ – Regular Category

1. Can the participants bring robots pre-assembled? Will there be dismantling of robots?

**Ans:** We do not require robots to be assembled on the spot during competition. You may bring pre-assembled robots

2. Apart from showcasing their physical robot for robot game, is the team expected to present on their robot game strategy, robot design, build and coding process?

**Ans:** Yes. The processes are important for judges to gauge participants' learning journey. It also helps to demonstrate originality of work i.e. not just a solution given by mentor.

3. How will the presentations be conducted? Judges go from table to table for each team?

**Ans:** Presentations are conducted in rooms, with judges and students in the room. Screens and VGA/HDMI cables will be provided for presentation projections.

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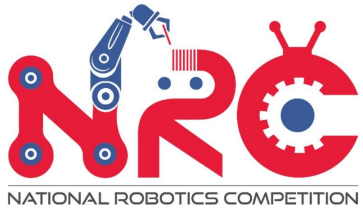


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# FAQ - Registration

1. Can I register for more than one category?

Is there a maximum no. of teams each school can register for?

Ans: **Yes, if the dates are not overlapped. There is no maximum no. of teams a school can register.**

2. If we are registering as a private team, what do we put under school name?

Ans: **You can indicate as “independent” or “private”.**

3. Can we pay the registration fee by e-invoice? Is there any other method of payment?

Ans: **We only accept credit card payment through our registration platform.**

4. Can a coach/mentor be repeated for multiple teams?

Ans: **Yes.**

5. When is the latest cut off for registration?

Ans: **Registration opens from 24 Feb to 1<sup>st</sup> July 2023**

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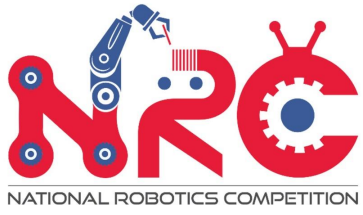


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# FAQ -Others

1. Can I get tickets as a bystander to view the competition?

Ans: There is no need of bystander tickets to view the competition, walk-in is allowed. There will be a designated zone for the audience to sit and view the competition.

2. Is there any preparation class from Science Centre?

Ans: There is no preparatory classes from SCS.



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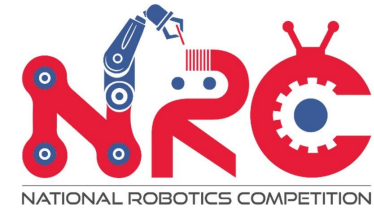


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