

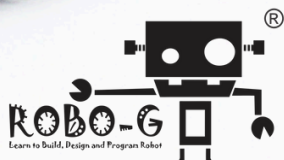
Missions Description

Version: 31 August 2024



ROBO Adventures EXPLORERS | INNOVATORS | TECHIES SEASON 2024

Organized By



Domain Partner



Hosted By



Indian Robotics Olympiad 2024

Missions Description



ROBO Adventures

EXPLORERS | INNOVATORS | TECHIES
SEASON 2024

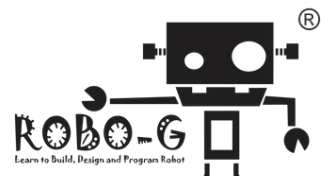


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The **Indian Robotics Olympiad (IRO)** is a prestigious competition that showcases the innovation and technical prowess of young minds across India. It serves as a platform for students to demonstrate their skills in robotics, programming, and problem-solving.

IRO, an initiative pioneered by **ROBO-G**, is exclusively organized by ROBO-G itself. Additionally, ROBO-G serves as the official training partner for IRO.

IRO 2024 Theme – Harvest Heroes

The theme for IRO 2024 is "Harvest Heroes"

In IRO 2024, students will embark on an exploration of the diverse challenges encountered in the farming industry and discover the myriad ways in which robotics can offer solutions. Can robots help deliver farm-fresh products straight to people's homes? Can robots help farmers pull out bad weeds from fields, making farming easier and better for the environment? Can robots help sort out fruits that don't look perfect and send them to places where they can still be used, helping to reduce food waste?



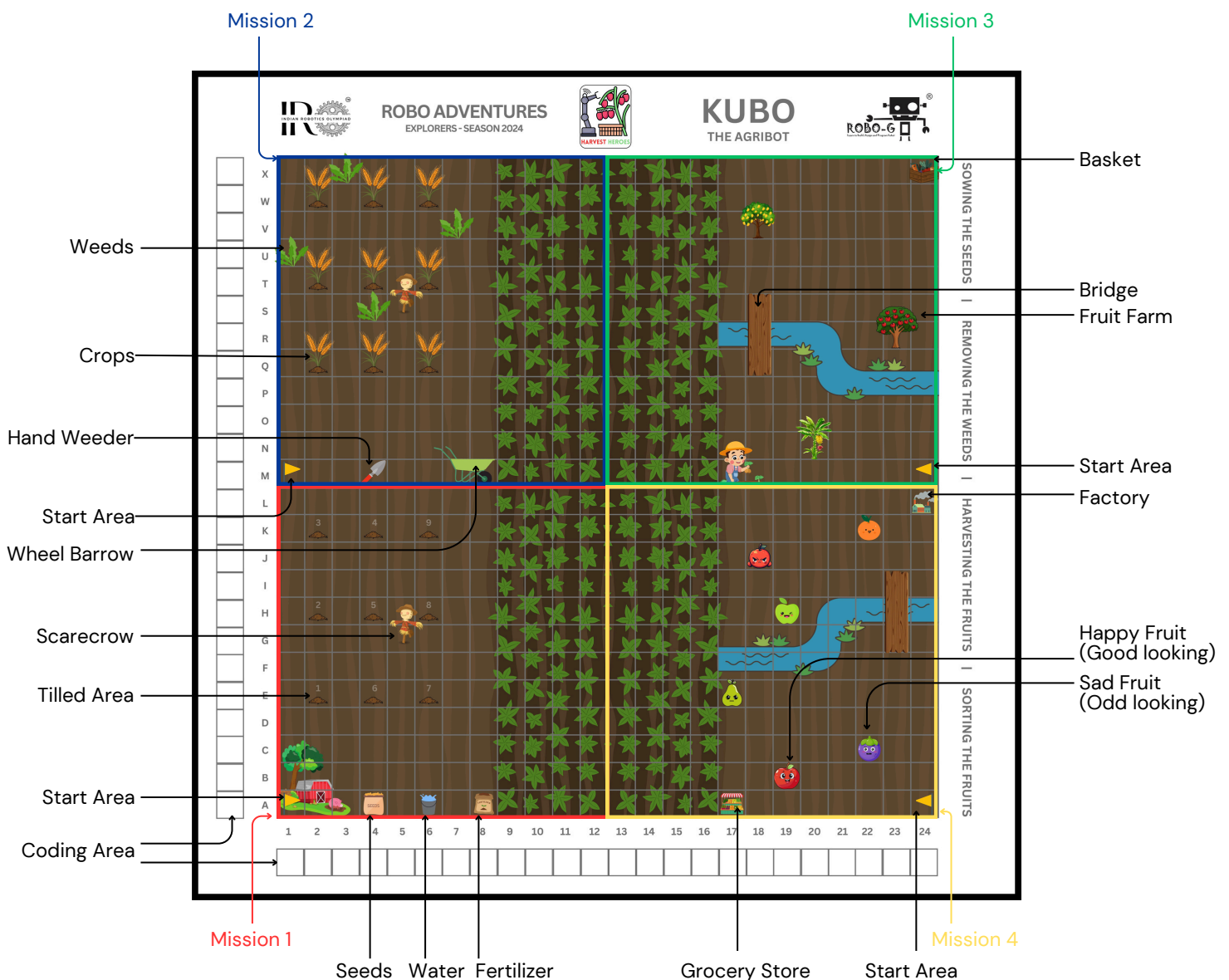
1. Explorers (Aged 5 – 7 Years)

1.1 Challenge Introduction

Kubo the Agribot has started a farm, and he needs your help with various farming tasks. Let's assist Kobo in his farming journey by planting seeds, keeping weeds away, harvesting crops, and sorting fruits and vegetables.

1.2 Challenge Mat

The following graphic shows the challenge mat with the different areas.



1.3 Robot Missions

For a better understanding, the missions will be explained in multiple sections. The team can decide in which order they will do the missions.

1. Sowing the seeds

Kubo the agribot needs to collect seeds, water, and fertilizer, and deliver them to nine tilled areas one by one. The robot must avoid the scarecrow and crops.

2. Removing the weeds

The next task for the robot is to collect the hand weeder and then remove four weeds, avoiding the crops and the scarecrow along the way. After removing the weeds, the robot must drop them in the wheelbarrow so they can be transported to the compost area to create compost from the weeds.

3. Harvesting the fruits

Another task for the agribot is to harvest fruits from the three fruit farms. The robot can use the bridge to cross the river. After harvesting the fruits, it must drop them into the basket.

4. Sorting the fruits

After harvesting the fruits, the robot's final mission is to sort them based on their appearance. The happy (good-looking) fruits will go to the grocery store for people to buy, while the sad or angry (odd-looking) fruits will go to the factory to be used in making other fruit products, such as juice or jam. The robot can use the bridge to cross the river.

Note: If the robot moves over any item printed on the mat, it indicates that the robot has picked up or dropped that item

1.4 Scoring

Tasks (Round _____)	Each	Total	#	Total
Sowing the Seeds				
Collecting the seeds, water and fertilizer	2	6		
Deliver the seeds, water and fertilizer to each tilled areas	2	18		
Completing sowing the seeds successfully		1		
Total Score in this mission				
Time in full seconds				
Removing the weeds				
Collecting the hand weeder	4	4		
Removing the weeds	4	16		
Dropping the weeds to the wheelbarrow	5	5		
Total Score in this mission				
Time in full seconds				
Harvesting the fruits				
Harvesting the fruits from each fruit farm	5	15		
Crossing the river	5	5		
Dropping the harvested fruits to the basket	5	5		
Total Score in this mission				
Time in full seconds				
Sorting the fruits				
Collecting the happy (good-looking) fruits	2	6		
Transporting the happy (good-looking) fruits to the grocery store	4	4		
Collecting the sad or angry (odd-looking) fruits	2	6		
Transporting the sad or angry (odd-looking) fruits to the factory	4	4		
Crossing the river	2.5	5		
Total Score in this mission				
Time in full seconds				
Maximum Score		100		
Total Score (Addition of all four missions)				
Time in full seconds (Addition of all four missions)				

2. Innovators (Aged 7 – 10 Years)

2.1 Challenge Introduction

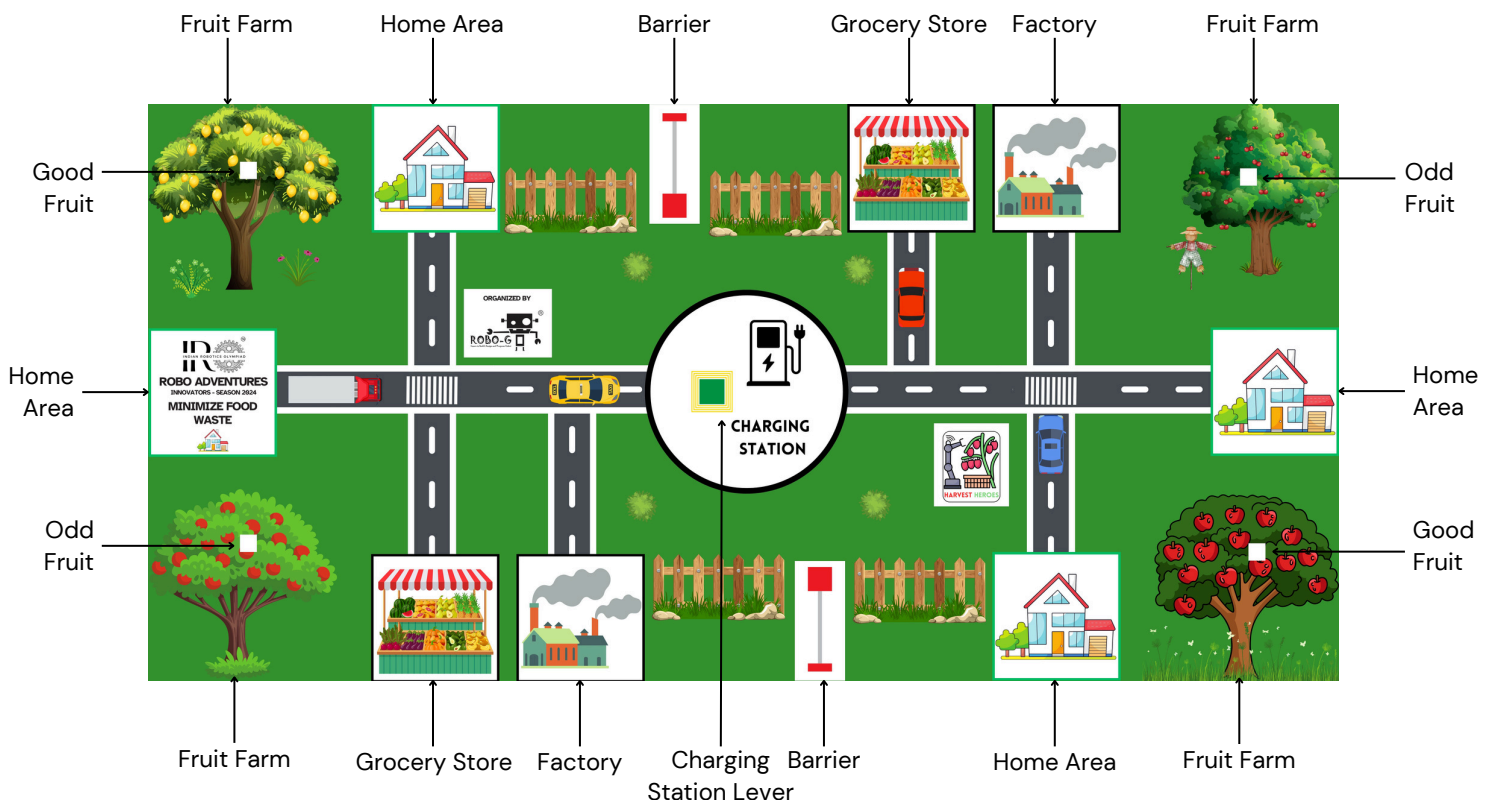
Nearly 800 million people worldwide suffer from hunger. Still, about a third of the world's food production is never eaten. It goes to waste.

A country like India produces many kinds of food products. Unfortunately, much of the food is sent to landfills, discarded, or left unharvested on farms because of its appearance and age. Indian farms, businesses, and consumers spend a large portion of their resources every year growing, processing, transporting, and disposing of food that is never eaten.

The challenge for each team is to design, build, and program a robot capable of completing a series of tasks on a challenge mat. The primary objective is for the robot to collect fruits from designated farm areas and accurately transport them to specific locations. Additionally, the robot must navigate to a garage for maintenance and recharging, demonstrating efficient task management and autonomy.

2.2 Challenge Mat

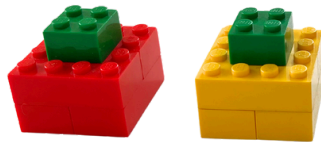
The following graphic shows the challenge mat with the different areas.



2.3 Challenge Objects and Positioning

Good fruits (2×) and odd fruits (2×)

There are two good fruits (red and yellow) and two odd fruits (black) placed on each white squares in the four fruit farms.



Good fruits (2)



Odd fruits (2)



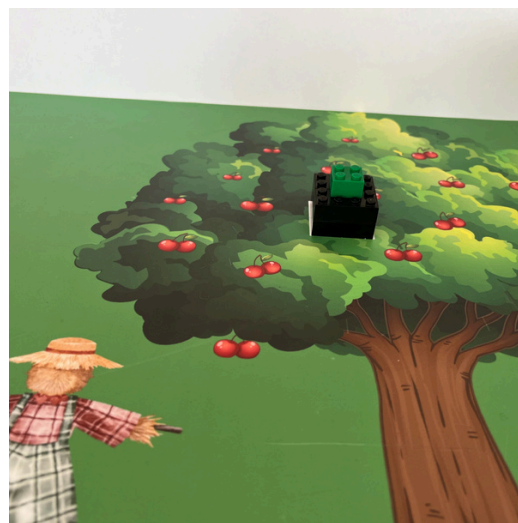
Start position of object on the field (on white square)



Start position of object on the field (on white square)



Start position of object on the field (on white square)



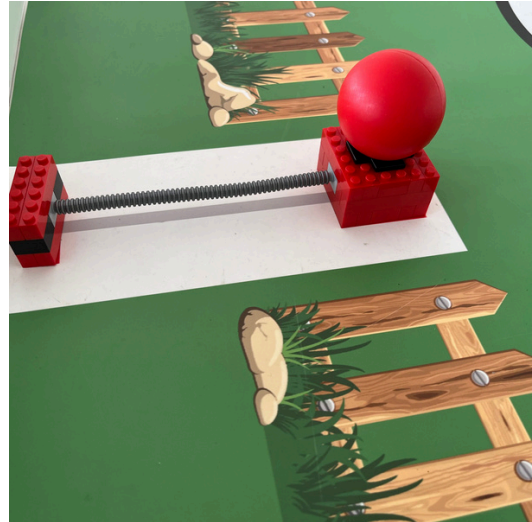
Start position of object on the field (on white square)

Barriers (2×)

There are two barriers on the challenge mat



Barrier (2)



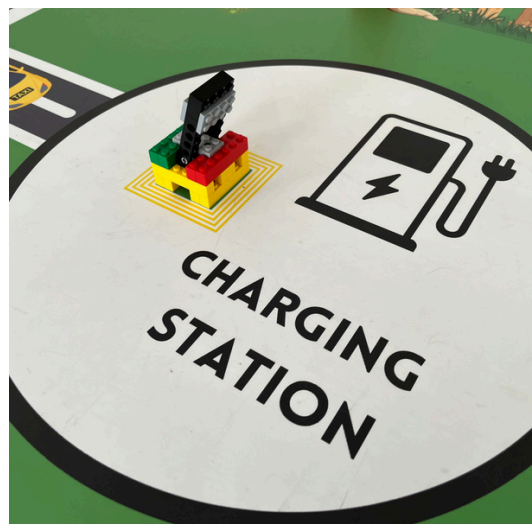
Start position of object on the field

Charging Station Lever (1×)

There is a charging station lever on the challenge mat represented by a LEGO model that can be in two different states: On (Green) and off (Red).



Charging station lever (1)



Start position of object on the field
(Note that the Charging Station lever starts in the off position)

2.4 Robot Missions

For a better understanding, the missions will be explained in multiple sections. The team can decide in which order they will do the missions.

1. Transport the good fruits

The robot has to transport the good fruits from the fruit farm to the grocery store. Make the robot blink and sound a warning signal during the transportation of the fruits to the grocery store. Send the message "Good Fruit" to activate the program for picking up the good fruits and "Grocery Store" to activate the program for dropping the good fruits at the grocery store.

2. Transport the odd fruits

The next task for the robot is to transport the odd fruits from the fruit farm to the factory. Make the robot blink and sound a warning signal during the transportation of the fruits to the factory. Send the message "Odd Fruit" to activate the program for picking up the odd fruits and "Factory" to activate the program for dropping the odd fruits at the factory.

3. Avoid the barriers

Drive safely, avoiding moving the barriers to get the bonus points.

4. Turn the charging station on

The last task for the robot is to park at the charging station and turn on the lever by moving it from the red side to the green side. Tap on the Spike hub to activate this program

2.5 Scoring

Tasks (Round _____)	Each	Total	#	Total
Transport the good fruits				
A fruit is completely removed outside it's Farm by the robot (Not touching the tree)	5	10		
The correct fruit is completely within the grocery store (black box)	10	20		
During the transportation of the fruit to grocery store the robot is blinking and sounding a warning signal		5		
Used the message "Good Fruit" to activate the program		2.5		
Used the message "Grocery Store" to activate the program		2.5		
Transport the odd fruits				
A fruit is completely removed outside it's Farm by the robot (Not touching the tree)	5	10		
The correct fruit is completely within the factory (black box)	10	20		
During the transportation of the fruit to factory the robot is blinking and sounding a warning signal		5		
Used the message "Odd Fruit" to activate the program		2.5		
Used the message "Factory" to activate the program		2.5		
Avoid the barriers				
Each ball not removed from the barrier where it was located initially.	2	4		
Each barrier not moved completely outside its designated grey rectangle where it was located initially	3	6		
Turn the charging station on				
Robot completely stops within the charging station		10		
The lever is not moved completely outside its designated green square where it was located initially and turned on when the robot completely stops within the charging station		20		
Tapped on the Spike hub to activate the program		5		
Maximum Score		125		
Total Challenge Mat Score				
Time in full seconds				

3. Techies (Aged 10 – 15 Years)

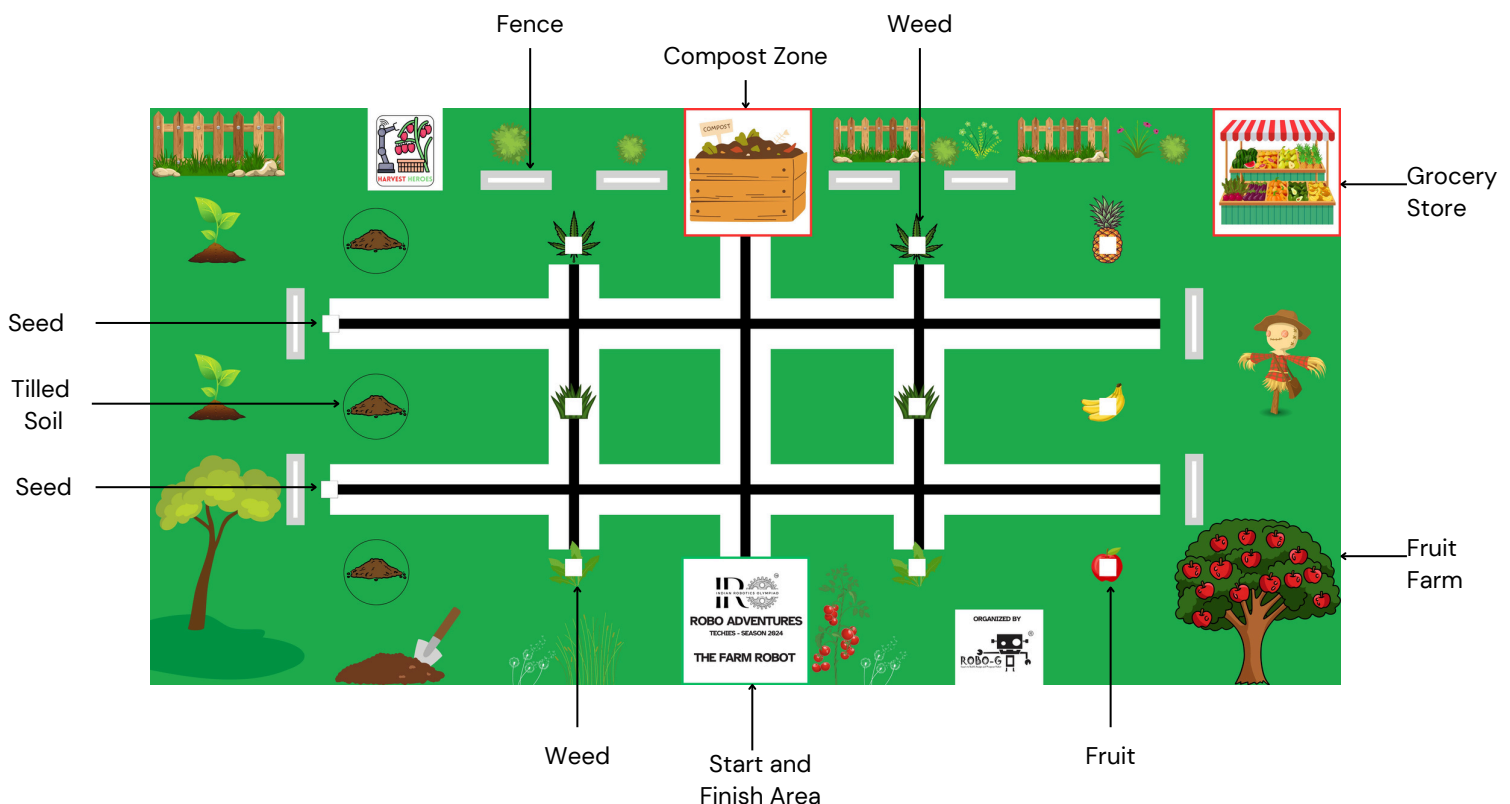
3.1 Challenge Introduction

Robots are revolutionizing farming by performing tasks such as sowing seeds, removing weeds, and harvesting crops with greater precision and efficiency. They enhance productivity by working around the clock, reducing labor costs, and minimizing human error. By automating these labor-intensive processes, robots ensure consistent crop quality and yield. Additionally, they contribute to sustainable farming practices by optimizing resource use and reducing the need for chemical inputs. Overall, robots in agriculture improve both the economic viability and environmental sustainability of farming operations.

The challenge for each team is to design, build, and program a robot capable of completing a series of tasks on a challenge mat. The primary objective is for the robot to efficiently sow seeds, eliminate weeds, harvest fruits, and transport them directly from the farm to the grocery store.

3.2 Challenge Mat

The following graphic shows the challenge mat with the different areas.



3.3 Challenge Objects and Positioning

Seeds (3×)

There are three seeds in total. The robot can carry one seed, while the other two will be placed on the white square near the tilled soil.



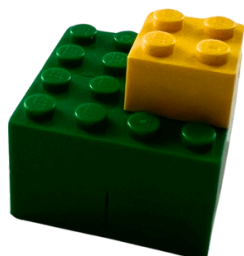
Seed (3)



Start position of object on the field (on white square)

Weeds (4×)

There are four weeds in total. Four weeds will be placed randomly in four of the six weed positions.

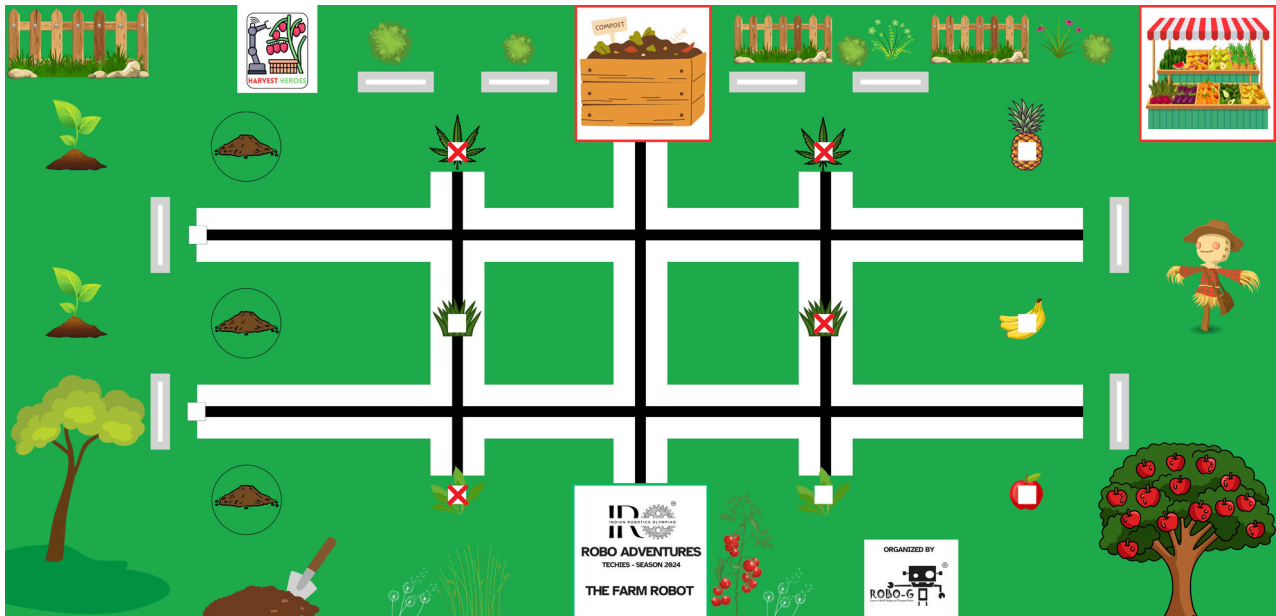


Weed (4)



Start position of object on the field (on white square)

One possible randomization you can see here (red X for weed):

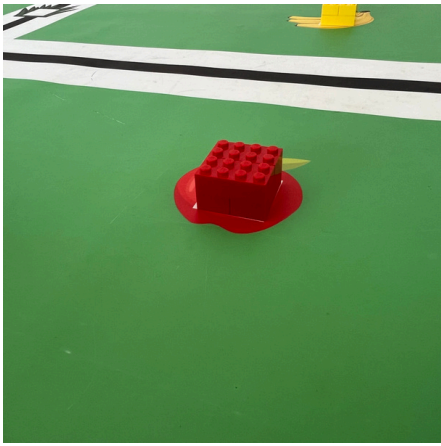


Fruits (3×)

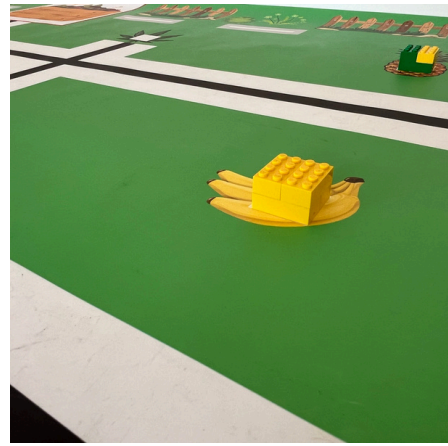
There are three fruits in total. Three fruits will be placed on the white squares in the fruit farm area.



Fruits (3)



Start position of object on the field (on white square)



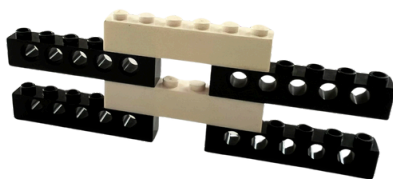
Start position of object on the field (on white square)



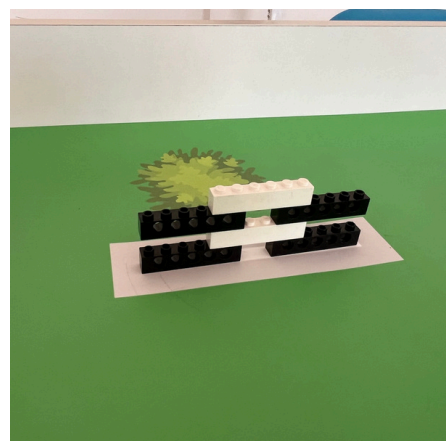
Start position of object on the field (on white square)

Fences (8×)

There are 8 fences on the field that should not be moved or damaged. A fence is placed on the white line inside a grey area.



Fence (8)



Start position of object on the field

3.4 Robot Missions

For a better understanding, the missions will be explained in multiple sections. The team can decide in which order they will do the missions.

1. Sow the seeds

The robot must collect seeds and deliver them to three tilled areas, one by one. There are three seeds in total. The robot can carry one seed, while the other two will be placed on the challenge mat.

Full points will be awarded if the seed is placed entirely within the circle surrounding the tilled soil.

2. Remove the weeds

The next challenge for the robot is to remove the weeds and drop them into the compost zone, where they will be used to create compost. Four weeds will be placed randomly in four of the six weed positions.

Full points will be awarded if the weeds are placed entirely within the compost zone.

3. Transport the fruits

The next challenge for the robot is to harvest all the fruits from the farm and transport them to the grocery store. There are three fruits on the challenge mat.

Full points will be awarded if the fruits are placed entirely within the grocery store.

4. Park the robot

The mission is complete when the robot returns to the Start & Finish area, stops, and the projection of the robot is partly (top-view) within the Start & Finish area.

5. Get bonus points

Bonus points will be awarded for not moving or damaging the fences.

3.5 Scoring

Tasks (Round _____)	Each	Total	#	Total
Sow the seeds				
The seed is completely inside the tilled soil circle	5	15		
The seed is partially inside the tilled soil circle	2.5			
Remove the weeds				
The weed is completely inside the compost zone	6	24		
The weed is partially inside the compost zone	3			
Transport the fruits				
The fruit is completely inside the grocery store	4	12		
The fruit is partially inside the grocery store	2			
Park the robot				
Projection of the robot is partly in the Start & Finish Area		25		
Get bonus points				
Fence that is not moved or damaged	3	24		
Maximum Score		100		
Total Challenge Mat Score				
Time in full seconds				

[illegible]

Indian Robotics Olympiad 2024 Theme

