



## **World Robot Olympiad 2018**

WeDo Regular Category  
*(Age up to 10 years)*

Game Description, Rules and Scoring

### **FOOD MATTERS**

## **COLLECT AND SORT FRUIT**

Version: January 15<sup>th</sup>



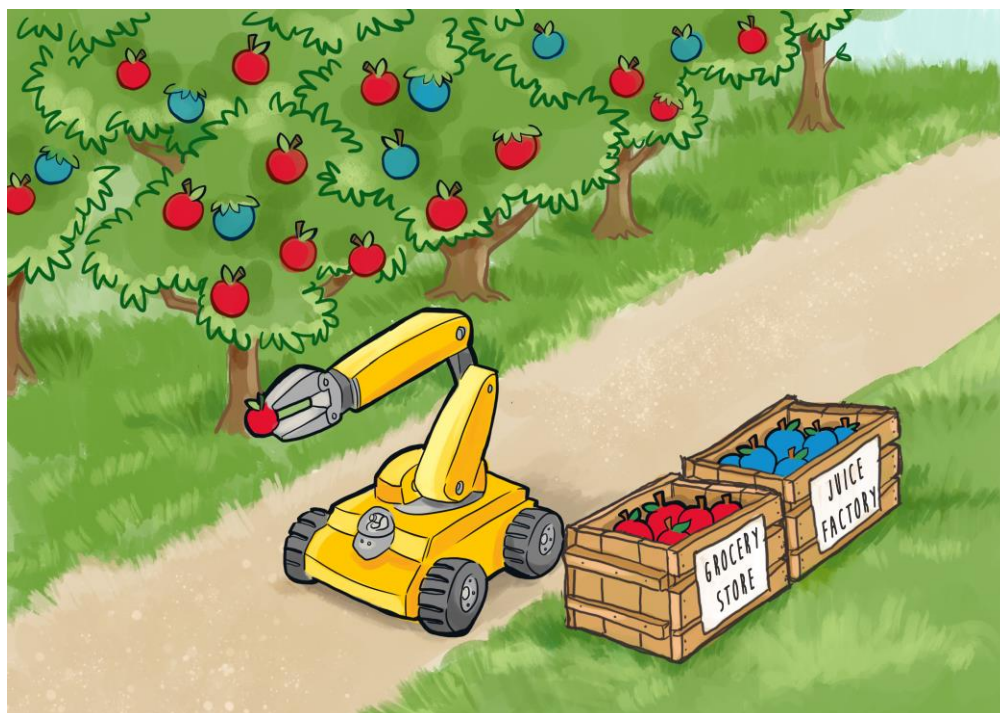
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## Introduction

Nearly 800 million people worldwide suffer from hunger. Still, about a third of the world's food production is never eaten. E.g. apples are not collected on farms because the apples look odd or imperfect. But such apples could be used to produce apple juice.

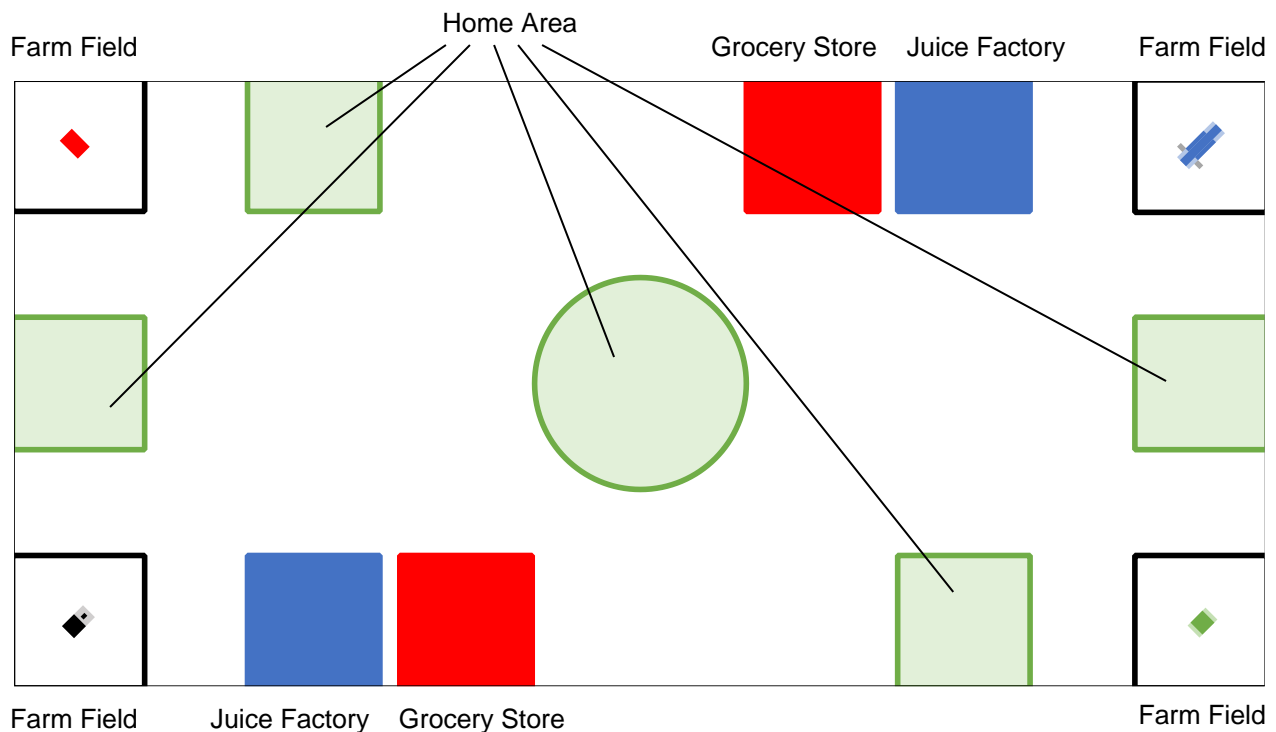
This year, the challenge is to make a robot that can help collect and sort fruit and bring the “perfect” fruit (shown as red apples) to a grocery store and the “ugly” fruit (shown as blue apples) to a juice factory:



# 1. Game Description

The WeDo Regular Challenge is for each team to build and program a WeDo 2.0 robot that the team can use to complete a series of tasks within a Game Table. The tasks are to collect and sort four pieces of fruit placed on a Game Mat and transport the fruits to different locations depending on their appearance. Each team will use their robot to perform the tasks within 2 minutes.

## Game Field:

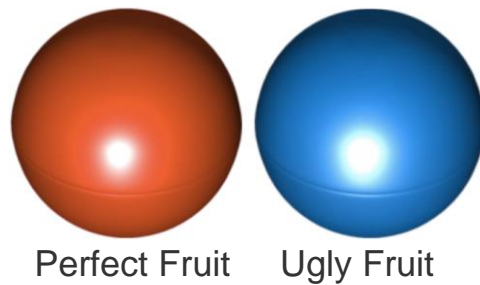


On the game field:

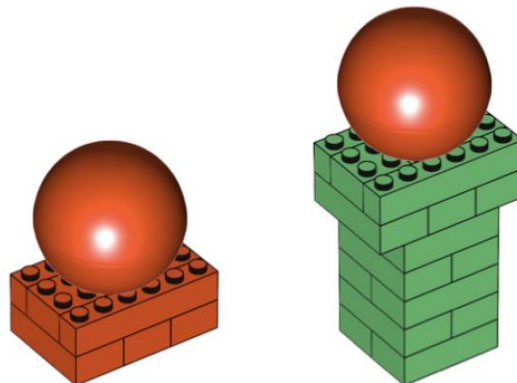
- The four green squares and the green circle are the Home Areas.
- The four white squares surrounded by black lines are the Farm Fields where the fruits are grown.
- The two red squares are the two Grocery Stores.
- The two blue squares are the two Juice Factories.

## Game Objects:

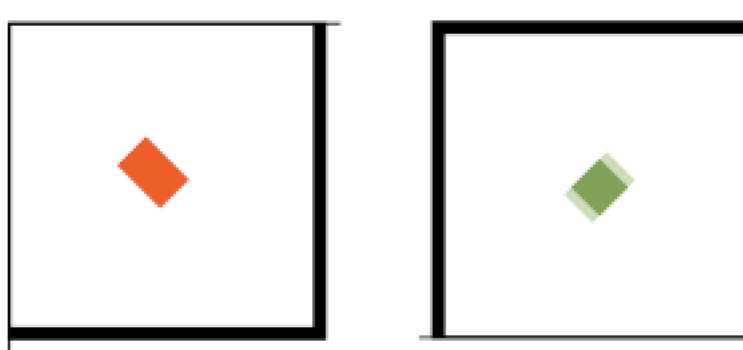
On the game field, there are two kinds of fruit: “perfect” fruit and ugly” fruit. The two different kinds of fruit are represented by two different kinds of LEGO balls:



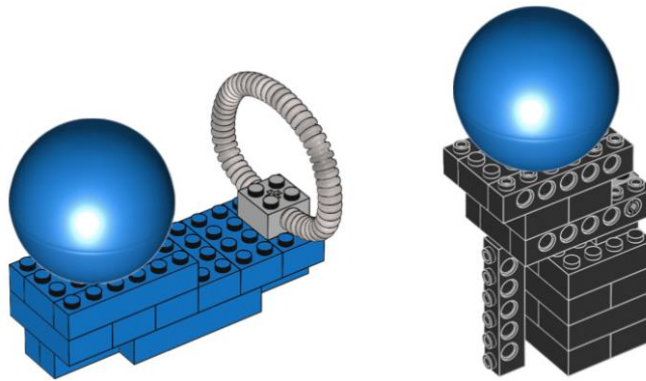
There are two pieces of perfect fruit and two pieces of ugly fruit on the game field. The two pieces of perfect fruit is placed on top of a red and a green fruit-supporting device:



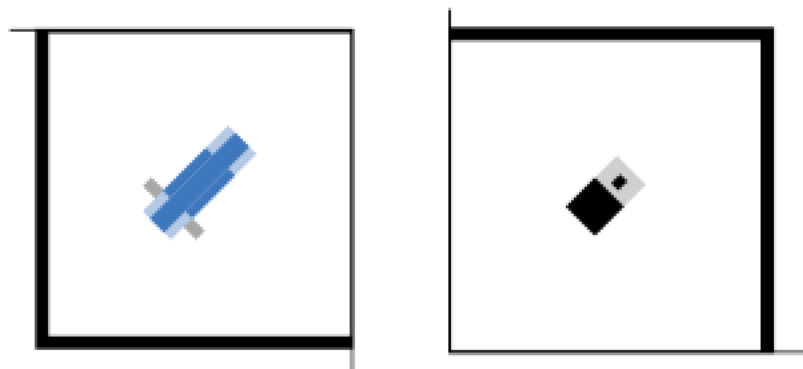
The red fruit-supporting device is placed on the red square of the upper left Farm Field and the green fruit-supporting device is placed oriented as shown in the green figure of the lower right Farm Field:



The two pieces of ugly fruit is placed on top of a blue and a black fruit-supporting device:



The blue fruit-supporting device is placed oriented as shown in the blue figure of the upper right Farm Field and the black fruit-supporting device is placed oriented as shown in the black figure of the lower left Farm Field:



## Game Tasks:

The robot must start from within one of the Home Areas, inside the green line and should finish in the circular Home Area in the middle of the game field.

During the competition, each team will use their robot to:

- Collect the four pieces of fruit from the four fruit-supporting devices in the Farm Fields.
- Transport the two pieces of perfect fruit to either of the two Grocery Stores.
- Transport the two pieces of ugly fruit to either of the two Juice Factories.

## 2. Game Rules

1. Each team has two or three team members and a team coach. The age of the team members is up to 10 years old.

### Material

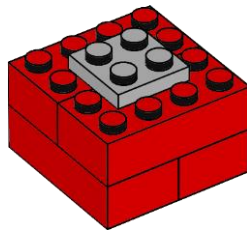
2. The controllers, motors and sensors used to assemble the WeDo robot must be from the LEGO Education WeDo 2.0 Core Set. Any number and combination of controllers, motors and sensors are allowed. Any LEGO branded non-electrical/non-digital elements can be used in the construction of the robot.
3. Only one WeDo robot is allowed at the Game Table during an attempt to solve the challenge.
4. The maximum dimensions of the robot before it starts must be within 250mm×250mm×250mm. After the robot starts, the dimensions of the robot are not restricted.

### Competition

5. All the teams in a competition each have the same number of attempts to solve the challenge. The National Organizers decide the format of the competition: when to schedule the competition, the number of attempts for each team and the way the score for each attempt is used to get the overall score for each team and hence how the winning team is found.

## Rules of the challenge

6. Before each attempt, the four fruit-supporting devices (with the four pieces of fruit) are placed in the four Farm Areas.
7. The robot must start an attempt from within one of the Home Areas, inside the green line.
8. During the attempt, the robot may be moved/operated under programmed control autonomously or under remote control, or using a combination of the two methods. The robot can be controlled by any compatible device using the WeDo 2.0 software or with a remote controller build from WeDo 2.0 elements.
9. The four pieces of fruit must be moved away from their fruit-supporting device by the robot. There is no restriction on the way a piece of fruit is removed from its fruit-supporting device.
10. Once a piece of fruit is removed from its fruit-supporting device it must be moved to a location dependent on its appearance: perfect fruit must be transported to either of the two red squares (Grocery Stores) and ugly fruit to either of the two blue squares (Juice Factories). A piece of fruit is correctly placed in a red or blue square if it is completely within the square that matches its color.
11. When a piece of fruit is *either* completely within an area that matches its color, *or* is completely within a Home Area a team member is allowed to pick up the fruit *manually* and place it in a red or blue square on a team designed fruit-supporting device e.g. like this:



This will prevent the LEGO ball from rolling out of the square and interfering with the maneuverings of the robot.

12. During an attempt, it is allowed to touch the robot when the robot is completely within a Home Area. A team may do this *either* to reposition the robot within the area *or* to attach or detach appendages.

13. During an attempt, a team is:

- Not allowed to touch fruit-supporting devices.
- Not allowed to touch the robot unless the robot is within a Home Area.
- Not allowed to touch pieces of fruit unless they are *either* within a red or a blue square *or* within a Home Area.

14. The mission is completed when either:

- The robot moves to the circular Home Area, stops, the chassis of the robot is completely within the Home Area (cables are allowed to be outside of the Home Area) and the team communicates to the judge that the robot has finished.
- The 2-minute time limit has expired.
- A team touched:
  1. A fruit-supporting device.
  2. A robot outside of Home Areas.
  3. A piece of fruit outside of Home Areas, red or blue areas.



### 3. Scoring

Maximum score = 120 points

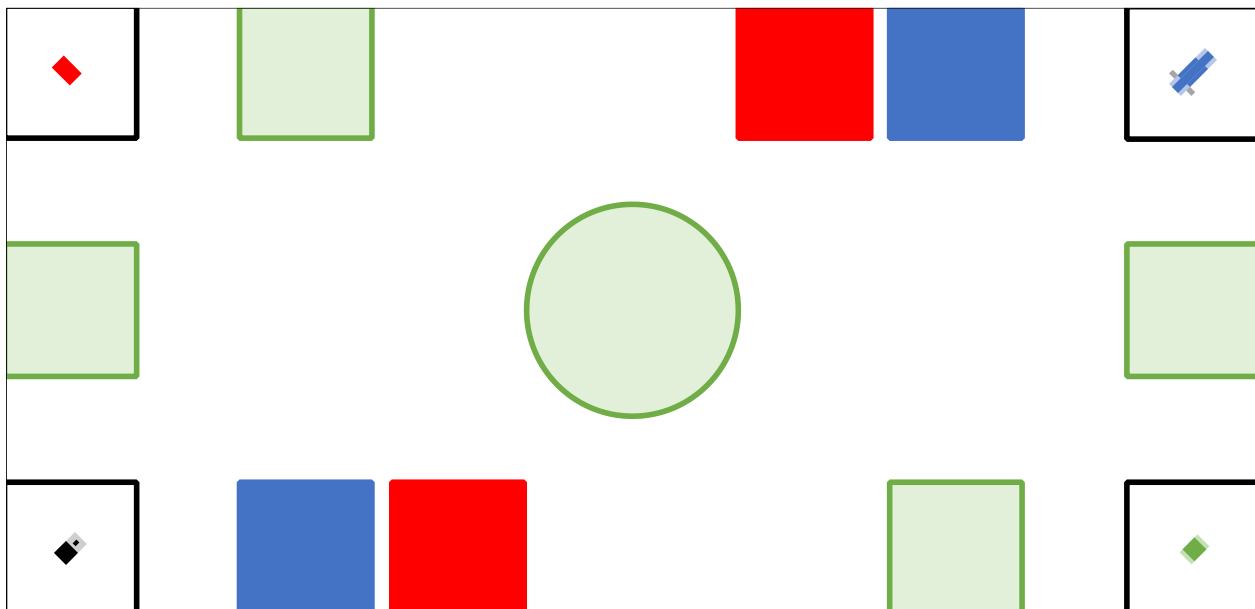
**Scoring Table:**

Tasks	Points Each	Total
A piece of fruit completely removed from its supporting device.	10	40
A piece of perfect fruit completely within a red area (Grocery Store). The robot transported the piece of fruit into the red area.	10	20
A piece of perfect fruit completely within a red area (Grocery Store). The piece of fruit was manually transported into the red area from a Home Area.	5	10
A piece of ugly fruit completely within a blue area (Juice Factory). The robot transported the piece of fruit into the blue area.	10	20
A piece of ugly fruit completely within a blue area (Juice Factory). The piece of fruit was manually transported into the blue area from a Home Area.	5	10
Each fruit-supporting device not moved completely outside the Farm Area where it was located initially. (Only gets these points if other points are assigned)	5	20
Robot completely stops within the circular Home Area. (Only gets these points if other points are assigned)		20
<b>Maximum Score</b>		<b>120</b>

## 4. Table Specifications






- The internal dimensions of a game table are 2362 mm x 1143 mm.
- The external dimensions of the table are 2438 mm x 1219 mm.
- The primary color of a table surface is white.
- Height of the borders:  $70 \pm 20$  mm

## 5. Game Mat Specifications



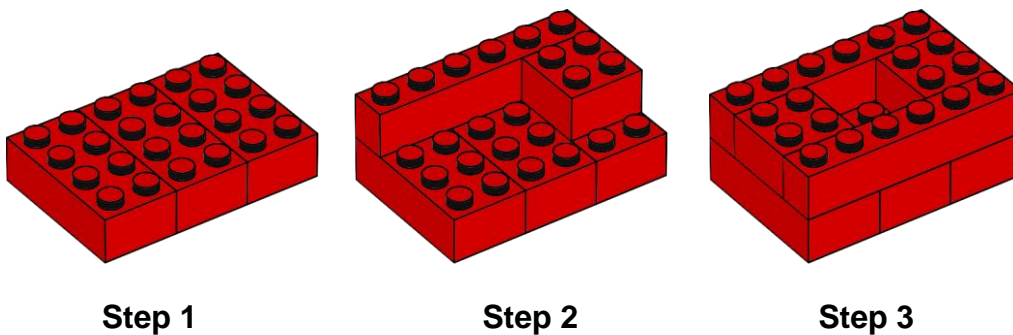
- Dimensions may vary within  $\pm 5$  mm. A graphic with measurements will be uploaded soon.
- If the table is larger than the game mat, use the Farm Field in the lower right corner as a guide and then place the Farm Field at the edges of the corner walls to set up the game mat.
- We recommend printing the game mat with matt finish without reflecting colors.

## Color Specification

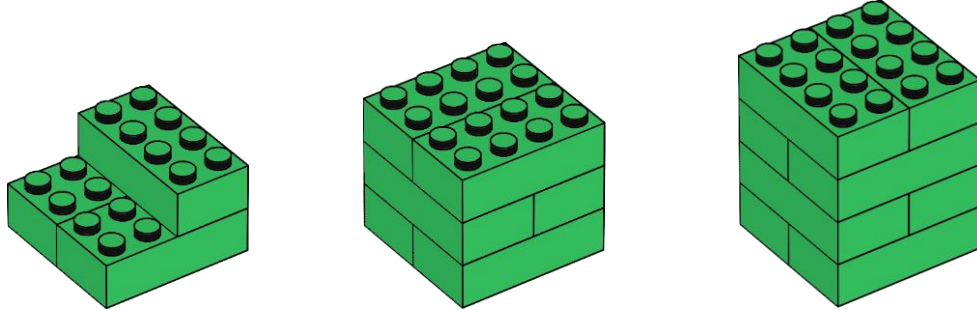
Color Name	CMYK				RGB			RGB Sample
	C	M	Y	K	R	G	B	
Red	0	100	100	0	237	28	36	
Bright Blue	100	47	0	0	0	117	191	
Yellow	1	18	100	0	255	205	3	
Green	88	0	100	0	0	172	70	
Grey	21	16	17	0	201	200	200	

## 6. Game Object Specifications

The red fruit-supporting device has 3 red 2x4 LEGO bricks, 2 red 2x2 LEGO bricks and 2 red 1x6 LEGO bricks:



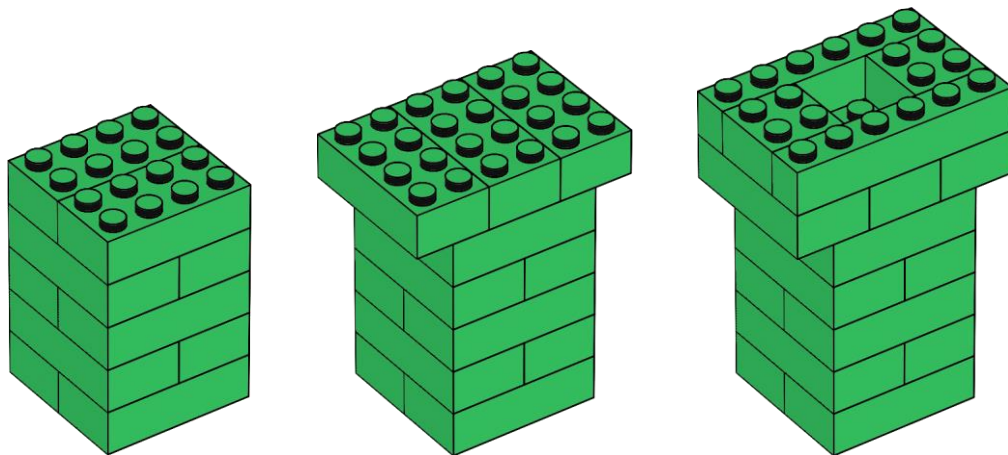
The green fruit-supporting device has 13 green 2x4 LEGO bricks, 2 green 2x2 LEGO bricks and 2 green 1x6 LEGO bricks:



**Step 1**

**Step 2**

**Step 3**

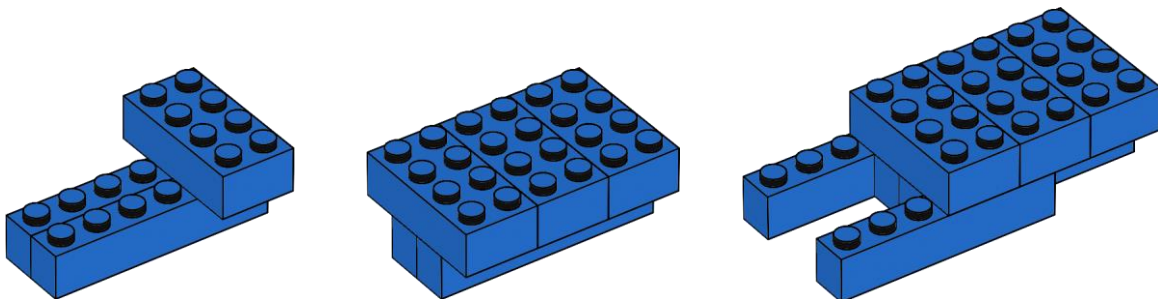


**Step 4**

**Step 5**

**Step 6**

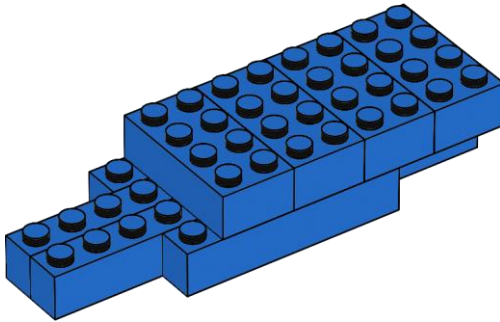
The blue fruit-supporting device has 6 blue 2x4 LEGO bricks, 2 blue 2x2 LEGO bricks, 8 blue 1x6 LEGO bricks, 1 modified 2 x 2 with pins and axle hole and 1 grey corrugated pipe:



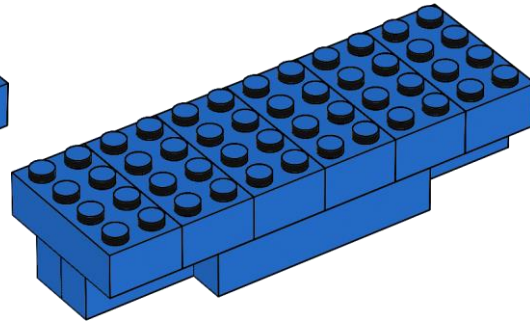
**Step 1**

**Step 2**

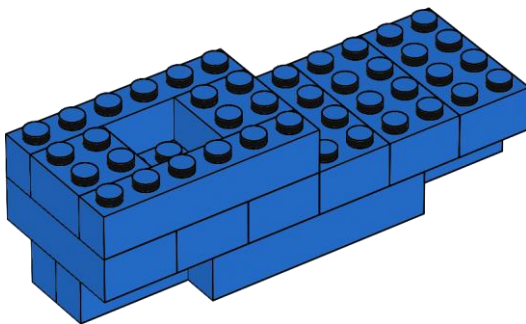
**Step 3**



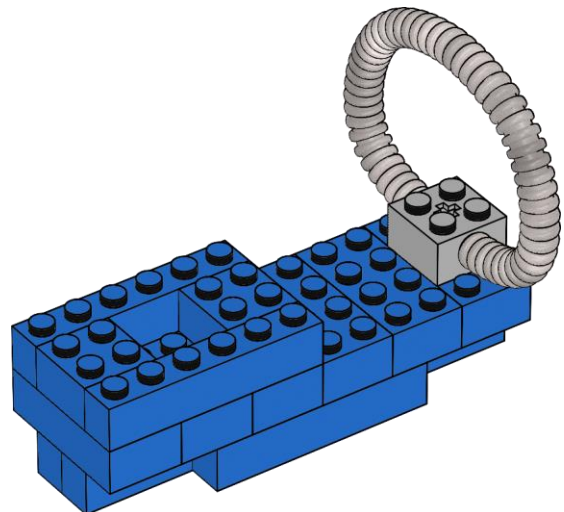
**Step 4**



**Step 5**

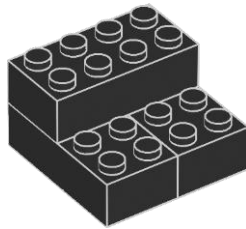


**Step 6**

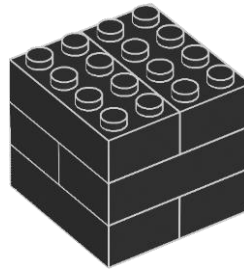


**Step 7**

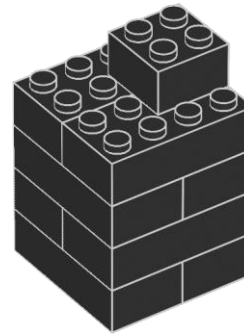
The black fruit-supporting device has 10 black 2x4 LEGO bricks, 4 black 2x2 LEGO bricks, 5 black 1x6 LEGO technic bricks with holes and 1 modified 2 x 2 with pins and axle hole. The vertical 1x6 LEGO technic brick shown in step 8 is placed to support the upper part of the model without being attached to the rest of the model:



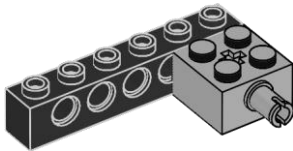
**Step 1**



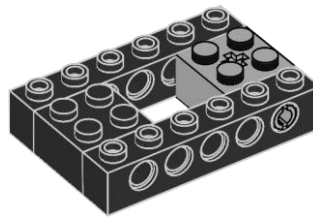
**Step 2**



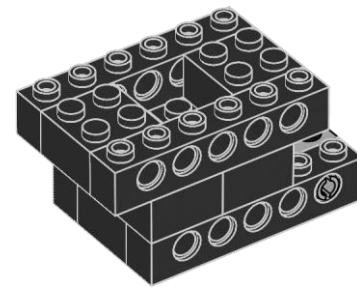
**Step 3**



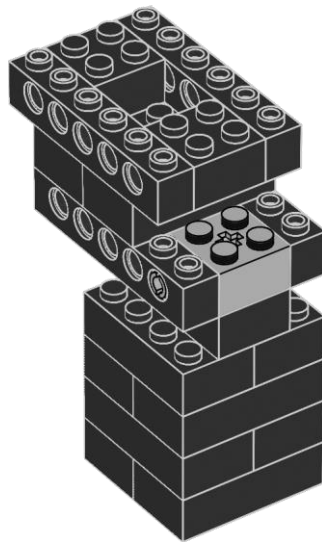
**Step 4**



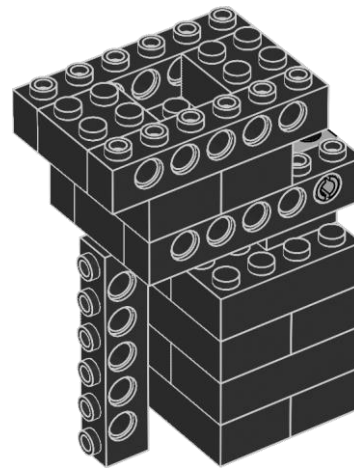
**Step 5**



**Step 6**



**Step 7**



**Step 8**