World Robot Olympiad 2018

Regular Category

Elementary

Game Description, Rules and Scoring

FOOD MATTERS

REDUCE FOOD WASTE
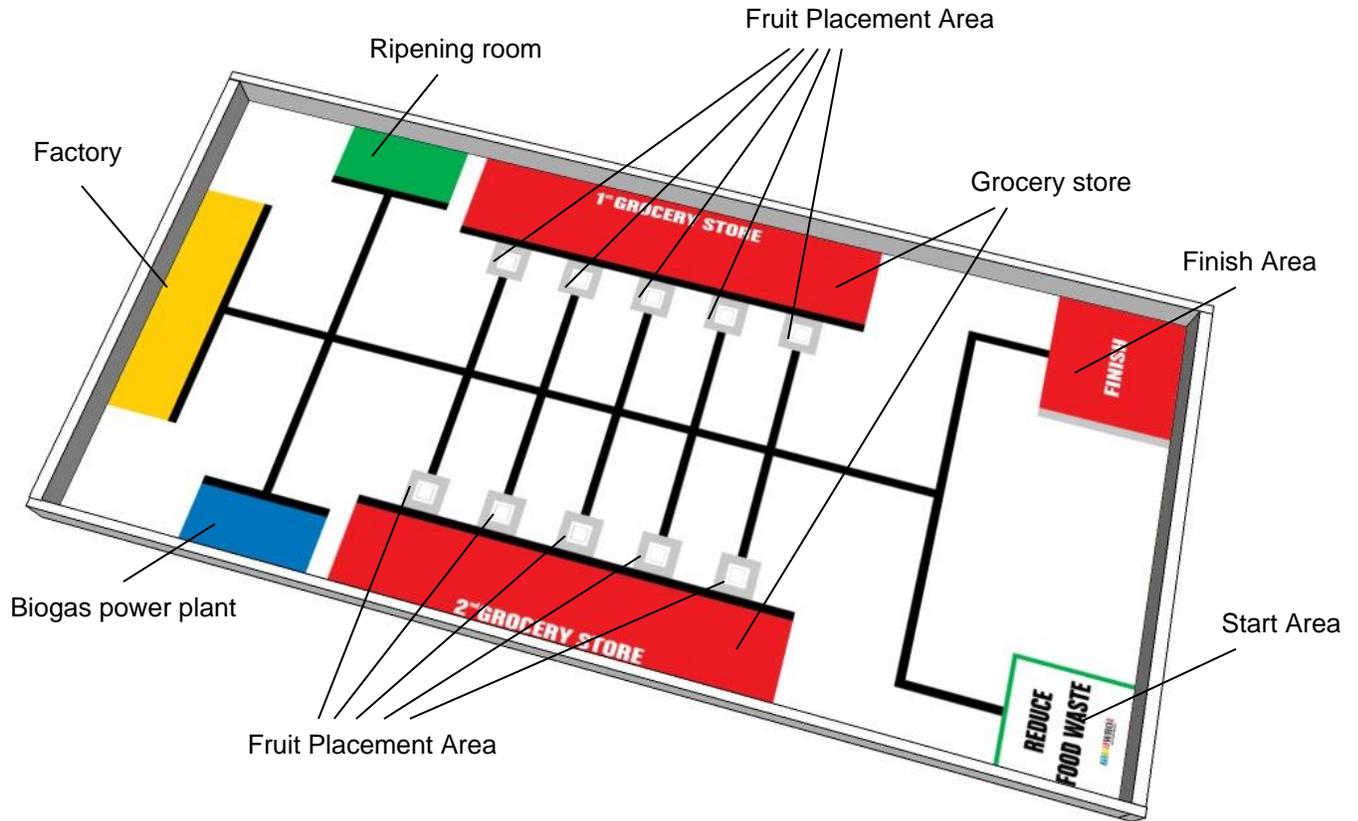
Version: Final Version January 15th

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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. It goes to waste.

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

This year, the mission is to make a robot that can help reduce food waste. The task of the robot is to sort food products according to their looks and expiration dates and transport the sorted food to places that can make use of the food instead wasting it; i.e. dumping the non-sellable food to a landfill.

1. Game Description

Factory — Ripening room — Fruit Placement Area — Grocery store — Finish Area — Biogas power plant — Fruit Placement Area — Start Area
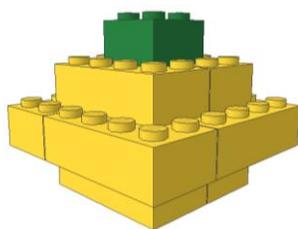
The Elementary Challenge is to make a robot that can sort the fruit products from a farm according to their quality, or appearance. There are four kinds of qualities: fresh fruit, unripe fruit, imperfect or "ugly" fruit, and rotten fruit.
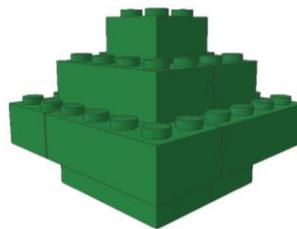
In the game arena, four different LEGO fruit blocks represent the four different qualities of fruit:
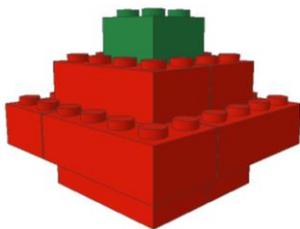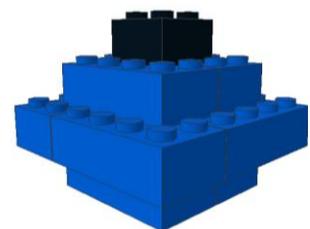

Fresh Fruit (4)   Ugly Fruit (2)   Unripe Fruit (2)   Rotten Fruit (2)

Ten LEGO fruit blocks are placed on the ten grey squares of the Fruit Placement Area.

After sorting the fruit, the robot must transport the fruit from the farm to locations that match the quality of the fruit: fresh fruit to the grocery store, unripe fruit to a ripening room, ugly fruit to a factory to be processed into juice, fruit salad or smoothies, and rotten fruit to a biogas power plant.

In the game arena, the two red areas are the grocery stores, the blue area is the biogas power plant, the green area is the ripening room, and the yellow area is the ugly-food processing factory.

The robot must start from within the Start Area, inside the green line and should finish in the red area with the White Wall:
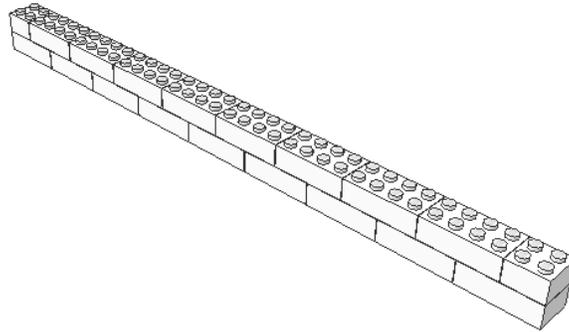
White Wall

2. Game Rules

1. Before each round 4 red fruit, 2 yellow fruit, 2 green fruit, and 2 blue fruit are randomly placed on the 10 grey squares of the Fruit Placement Area as shown in the figure 2.1

The random placement of the fruits may be accomplished manually as follows:

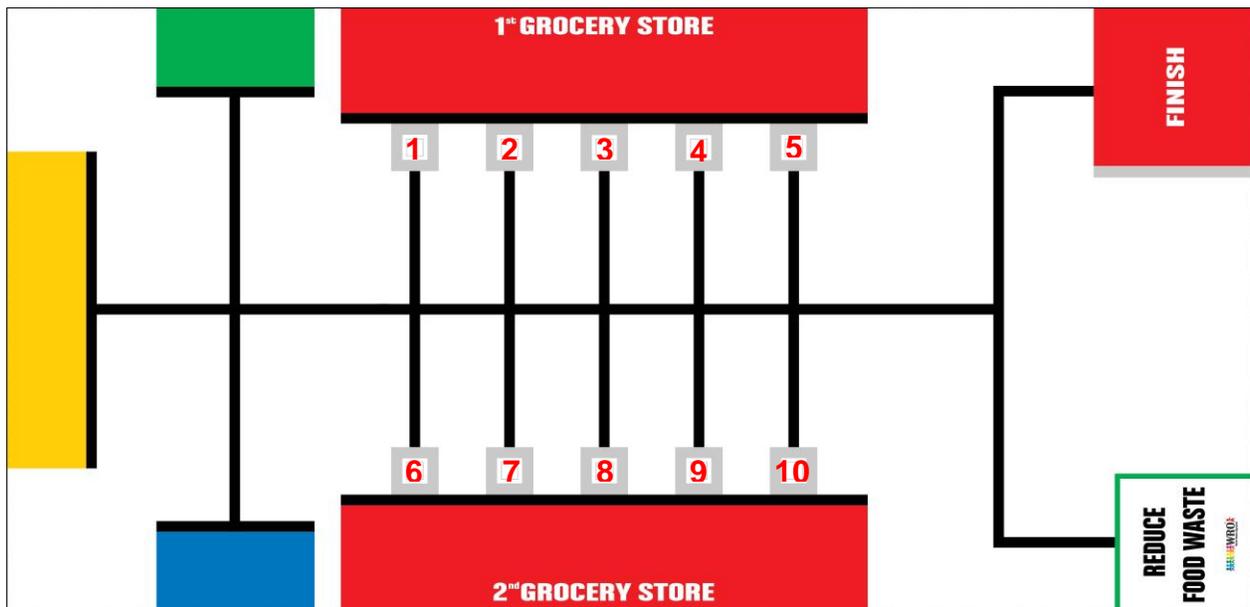   a. The fruit placement locations are numbered 1 to 10 as shown in the figure 2.1


Figure 2.1

    b. Put 4 red cards, 2 yellow cards, 2 green cards, and 2 blue cards into a non-transparent box.

    c. Shake the box to mix the 10 cards.

    d. Take the cards one by one from the box and put a fruit model of the corresponding color on the grey squares starting from the square #1.

2. The 10 fruit blocks must be moved by the robot from the Fruit Placement Area to the destination areas for the four different kinds of fruits: The Red Fruit to one of the two red areas (Grocery Stores), Yellow Fruit to yellow area, Green Fruit to green area, and Blue Fruit to blue area. A fruit block is correctly placed in an area if it is undamaged and is completely within the area that matches its color. A fruit block is considered completely within an area if the base of a block is touching the area.

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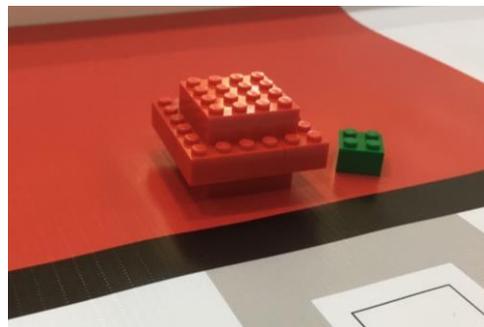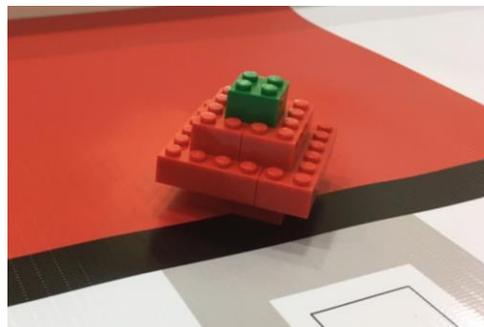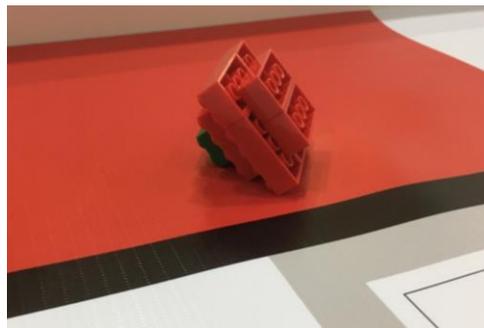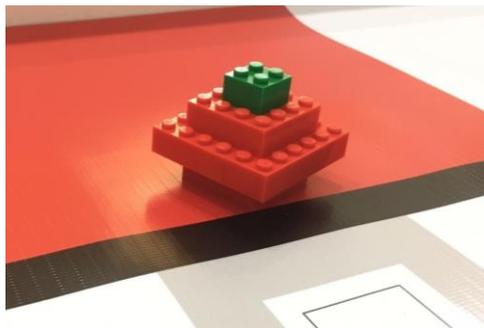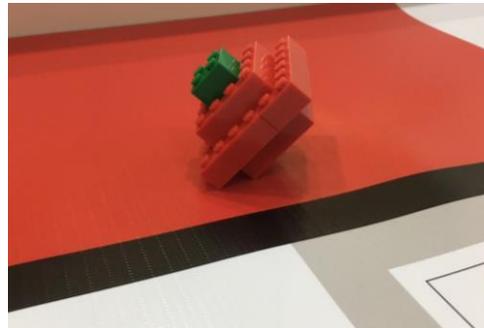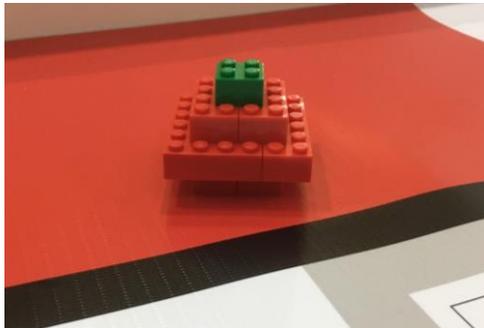
3. Before the start of the mission, the robot must start completely within Start Area (the green line around the area not included). The mission is completed when the robot returns to the Finish Area, stops, and the chassis of the robot is completely within the red area (cables are allowed to be outside of the finish area).

4. The white wall next to the Finish Area must not be damaged or moved from its initial location area. If the White Wall is damaged or moved, a penalty is given, provided it does not result in a negative score (see General Rules 5.15).
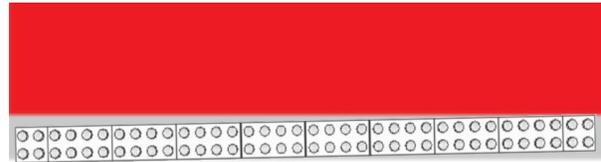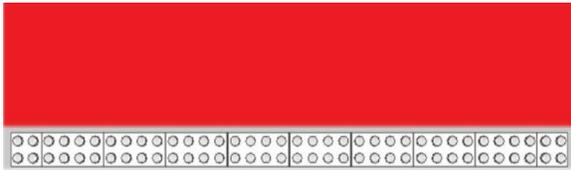
3. Scoring

Maximum score = 170 points

Scoring Table:

Tasks	Points Each	Total
Fresh fruit (Red Fruit) completely within a red area (Grocery Store).	**10**	**40**
Fresh fruit (Red Fruit) partly within a red area (Grocery Store).	5	20
Unripe fruit (Green Fruit) completely within the green area.	**20**	**40**
Unripe fruit (Green Fruit) partly within the green area.	5	10
Ugly fruit (Yellow Fruit) completely within the yellow area.	**20**	**40**
Ugly fruit (Yellow Fruit) partly within the yellow area.	5	10
Rotten fruit (Blue Fruit) completely within the blue area.	**20**	**40**
Rotten fruit (Blue Fruit) partly within the blue area.	5	10
Robot damages or displaces the wall from its initial position		-10
Robot completely stops within Finish Area. (only gets these points if other points are assigned)		**10**
Maximum Score		**170**

4. Table Specifications

a. The internal dimensions of a game table are 2362 mm x 1143 mm.

b. The external dimensions of the table are 2438 mm x 1219 mm.

c. The primary color of a table surface is white.

d. Height of the borders: 70 ± 20 mm

5. Game Mat Specifications
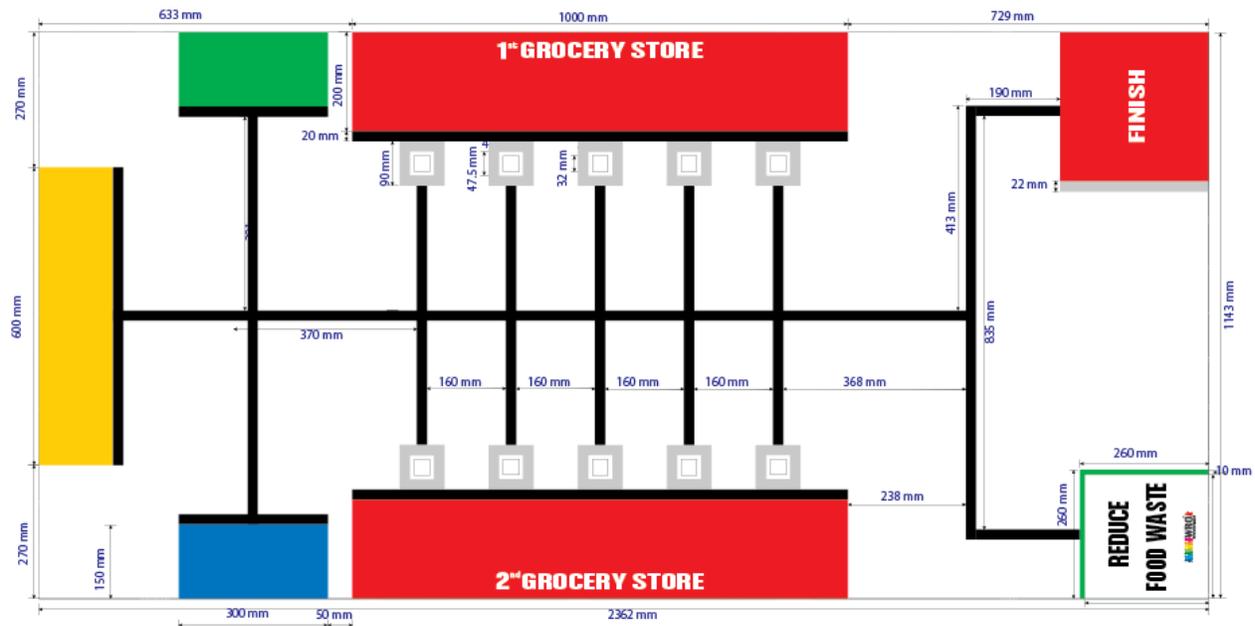
a. All black lines are 20 ± 1 mm.

b. Dimensions may vary within ± 5 mm.

c. If the table is larger than the game mat, use the starting area as a guide and then place the starting area at the edge of the wall to set up the game mat.

d. We recommend to print 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	
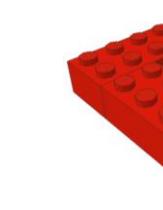
6. Game Object Specifications

Each Fresh Fruit has 8 red 2x4 LEGO bricks, 1 red 2x2 LEGO brick and 1 green 2x2 LEGO brick.
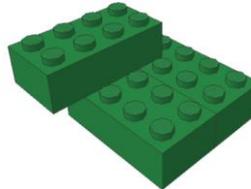**4 Fresh Fruit are needed.**
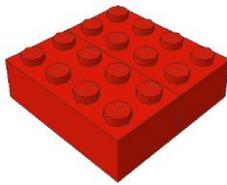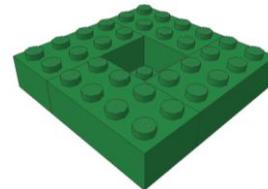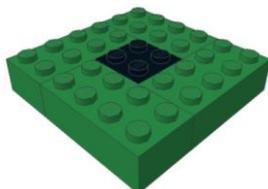
Step 1
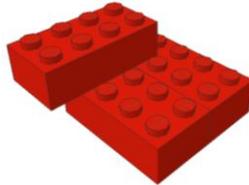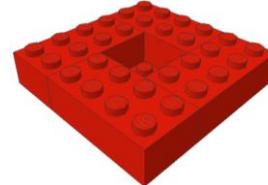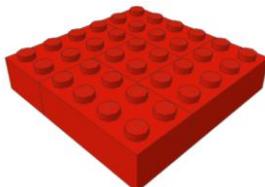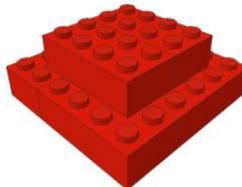
Step 2
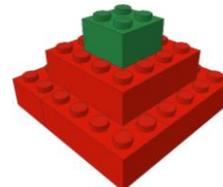
Step 3

Step 4

Step 5

Step 6

Each Ugly Fruit has 8 yellow 2x4 LEGO bricks, 1 yellow 2x2 LEGO brick and 1 green 2x2 LEGO brick. **2 Ugly Fruit are needed.**
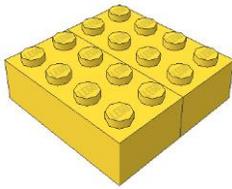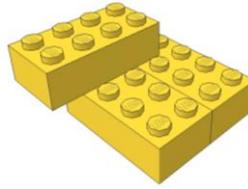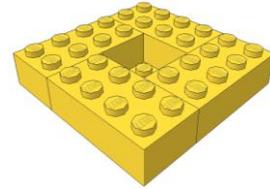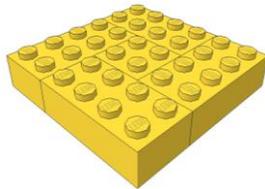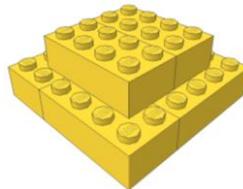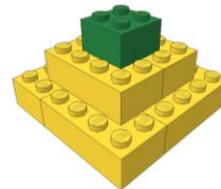
| **Step 1** | **Step 2** | **Step 3** |

| **Step 4** | **Step 5** | **Step 6** |

Each Unripe Fruit has 8 green 2x4 LEGO bricks, 1 black 2x2 LEGO brick and 1 green 2x2 LEGO brick. **2 Unripe Fruit are needed.**
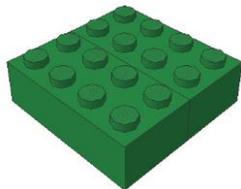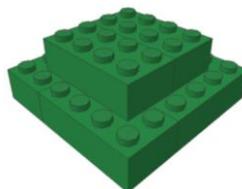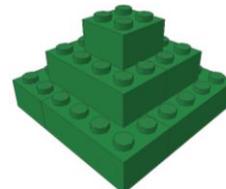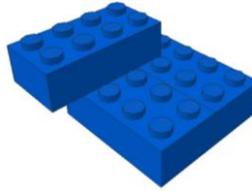

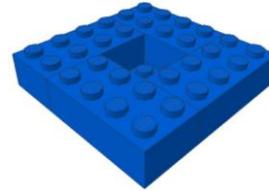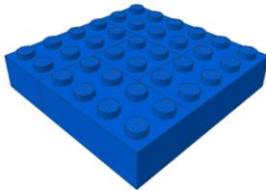| **Step 1** | **Step 2** | **Step 3** |

| **Step 4** | **Step 5** | **Step 6** |

Each Rotten Fruit has 8 blue 2x4 LEGO bricks, 1 blue 2x2 LEGO brick and 1 black 2x2 LEGO brick. **2 Rotten Fruit are needed.**
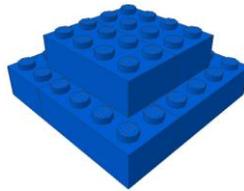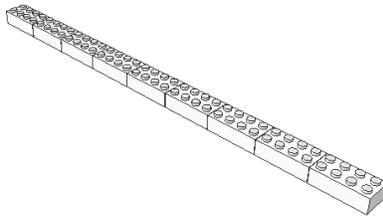
Step 1

Step 2

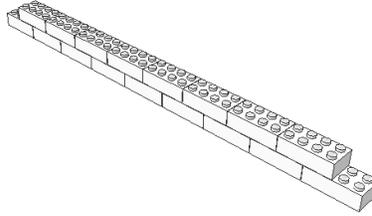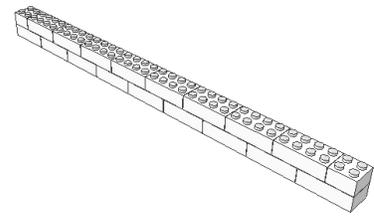**Step 3**

Step 4

Step 5

Step 6

The White Wall has 17 white 2x4 LEGO bricks and 2 white 2x2 LEGO bricks.

Step 1

Step 2

Step 3