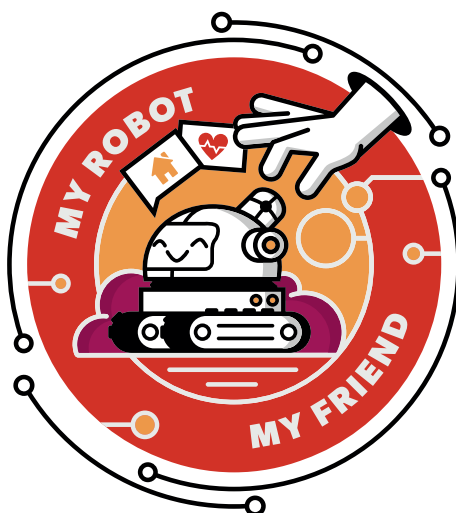




# RoboMission

## Senior Game Rules

Season 2022



# MY ROBOT MY FRIEND

## THE CARE ROBOT

Official Game Rules for the WRO International Final. Version: January 15th 2022

*(Note: Rules for local WRO events may vary!)*

WRO International Premium Partner



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## PART ONE – GAME DESCRIPTION

### 1. Introduction

There are numerous activities in which robots can support us in our daily life or enrich it. Robots can guide us through a museum in a creative way or can support us in tedious or strenuous tasks.

On the senior playing field, the robot takes on the role of a care and transport robot in a hospital. It is supposed to take laundry to the hospital's own laundry shop, bring water to different rooms, and play with the patients. At the same time, the robot has to pay attention to the nurses and visitors as it makes its way through the hospital corridors.

## 2. Game Field

The following graphic shows the game field with the different areas.



Some areas are marked with numbers to identify them. Take a look at the game mat to understand which areas are referred to. For every room, five areas are marked with the following numbers:

- 1: Position of laundry block
- 2: Position of game ball
- 3: Position of game net
- 4: Position of table
- 5: Position of marking block

If the table is larger than the game mat, centre the mat to all sides inside the table.

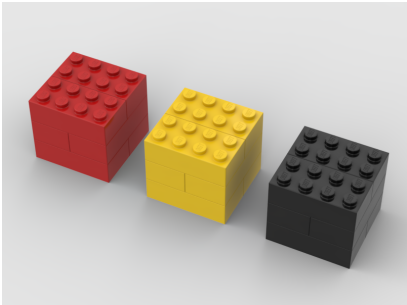
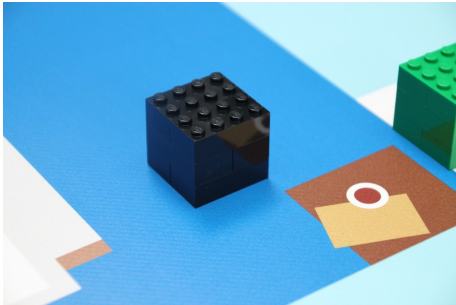
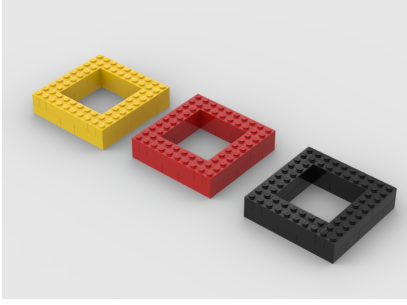

**For more information about the table and game mat specifications, please take a look at WRO RoboMission General Rules Rule 6. The printable file of the mat and a PDF with the exact measurements are available on [www.wro-association.org](http://www.wro-association.org).**

### 3. Game Objects, Positioning, Randomization

#### Laundry blocks & container

There are 3 laundry blocks (one black, one red, one yellow) and 3 laundry containers (one black, one red, one yellow). These objects will be placed as follows:

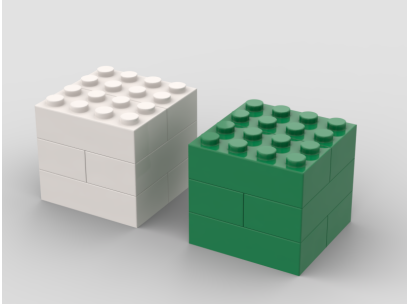
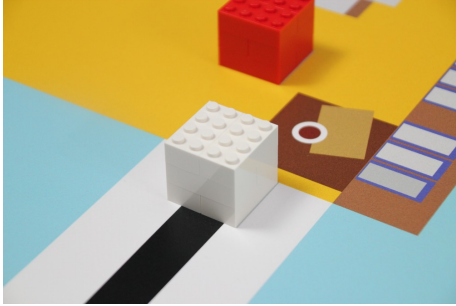
- The 3 laundry blocks will be **randomly** placed in each round on the 4 areas marked with “1” in the different rooms.
- The 3 laundry containers will be **randomly** placed in each round on the grey squares in the laundry area.

 <p>Laundry Block</p>	 <p>Black laundry block in blue room</p>
 <p>Laundry container</p>	 <p>Possible starting configuration of the laundry container</p>

#### Marking blocks

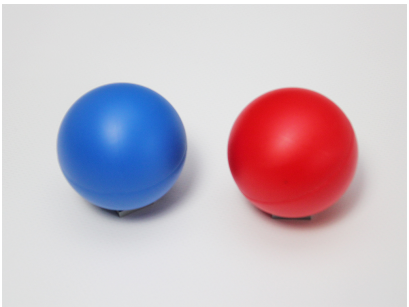
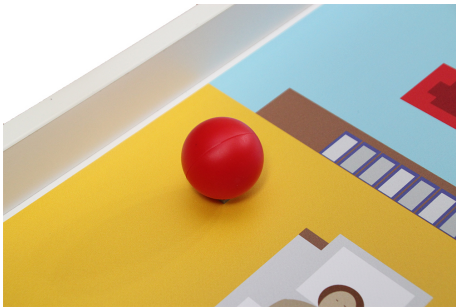
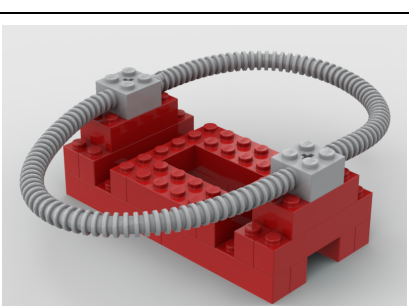
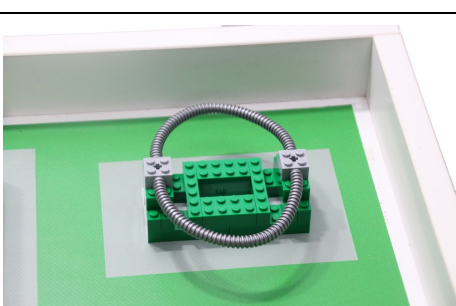
There are 4 marking blocks (two white, two green) on the field. The marking blocks are **randomly** placed in each round in front of a room on the areas marked with “5”. The marking blocks are used to determine in which rooms which tasks needs to be done (see game description).



 <p>Marking Blocks</p>	 <p>Marking block in front of the yellow room</p>
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## Game ball & game net

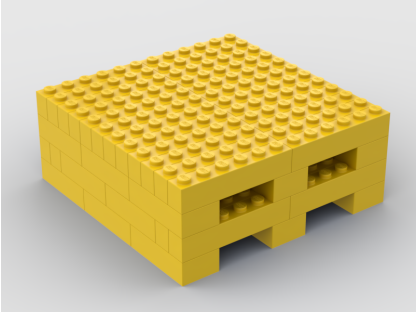
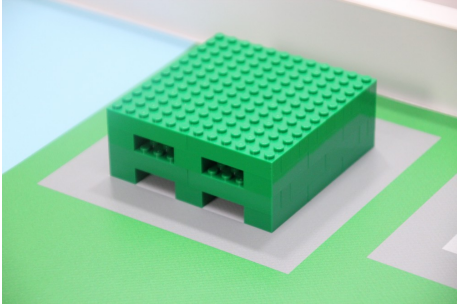
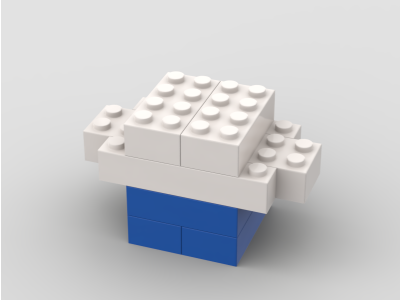
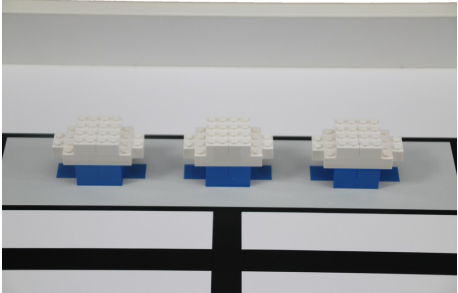
There are two objects that are used to play a game. The ball and the game net. The game net is available in red, yellow, blue, and green and is placed in the corresponding-coloured room. There are two blue and two red balls, red balls are placed in the yellow and green room, blue balls are placed in the blue and red room. Each ball is placed on a 2x2 LEGO plate on area marked with “2” in each room, the game net is placed on area marked with “3” in each room of the corresponding colour.

 <p>Balls</p>	 <p>Ball in yellow room</p>
 <p>Game Net</p>	 <p>Green game net in green room</p>
<p>Please note that balls, nets, and tables must be placed in all rooms in every round even if not all objects are used in all rounds.</p>	

## Table & Water

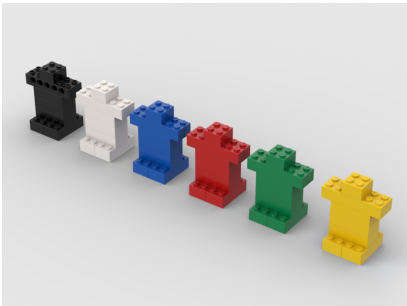
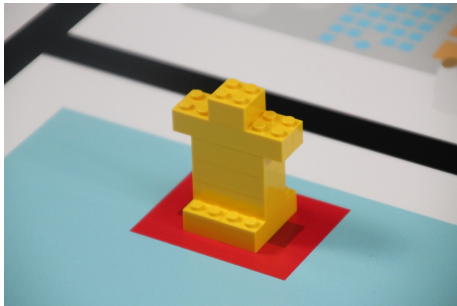
There are 4 tables on the field (one red, one blue, one green, one yellow). Every table is placed in the room of the corresponding colour on area marked with “4”.

In addition, there are 3 water bottles on the field. The water bottles are placed on the intended positions in the equipment area.

 <p>Table</p>	 <p>Green table in the green room</p>
 <p>Water Bottle</p>	 <p>Water elements in the equipment area, every water element is placed in the orientation the shape on the field shows.</p>

## People

We have 6 people (symbolized as six figures in yellow, green, red, blue, white, and black) on the field. The 6 people are **randomly** placed in each round on the 8 available red squares.

 <p>People</p>	 <p>Yellow figure on the field, every person is placed in the orientation the shape on the field shows.</p>
---	---

## Summary randomization

The following game objects are **randomly placed on the game field each round**:

- Laundry blocks on area marked with “1”.
- Laundry container on the three squares in the laundry area.
- Marking blocks on area marked with “5”.
- People on the 8 different red squares.

All other objects (water, table, game net and ball) are also placed on the game field in each round, but are not randomized

## 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.**

### 4.1 Doing the laundry

One task of a service robot is to help the humans transport materials. In a hospital, robots can help transport the laundry from every room to a central laundry area. This is the task of the robot on the field. The robot should collect the 3 laundry blocks from the different rooms and bring them to the laundry area. Maximum points are awarded if the laundry blocks are placed inside the laundry container of the corresponding color (e.g. red laundry block in red laundry container).

The laundry containers do not need to stay on their start areas (meaning: The robot can move them a bit to place the laundry blocks inside the containers). However, it is important that the laundry containers are completely inside the laundry area at the end.

### 4.2 Information: Marking blocks

For the next two tasks it is important to consider the **placement of the marking blocks at the beginning of a round** in front of each room (it is allowed to move the blocks once they are scanned). The position of the marking blocks determines the following situations:

- **White block in front of a room:** In this room a water bottle should be placed on the table. Please note that penalty points are awarded if the robot brings water to the wrong room.
- **Green block in front of a room:** In this room the robot should play a game with the resident of this room. Points are only awarded if the robot plays the game in the correct room.

### 4.3 Bring water to the rooms

In a hospital it is important that every patient in each room has enough water to drink. Therefore, it is one task of the service robot to bring water to the different rooms every day. But the robot should be careful and bring only water to those rooms that need new water.

The robot should take the water bottles from the equipment area and bring these to the correct rooms (rooms marked with a white block in front). Points are awarded if the water bottle is in the correct room, maximum points are awarded if the water bottle is standing correctly on the table. Maximum one water bottle per room counts, in the equipment area there is one spare water bottle.

Please note that there are 3 water bottles on the field, the robot only needs 2 bottles. The third bottle is just a spare part.

#### **4.4 Play a game**

Another task of a service robot could be to play with people who are in a hospital. But of course, there are just not enough robots to play a game with everyone every day. That is why the robot should only play a game in the rooms that are marked with a green marking block.

To play a game inside the correct room (rooms marked with a green block in front), the robot should lift a ball inside the game net. (It is not important which colour the ball has.) Full points are awarded if the ball is only touching the game net and not touching the game field.

#### **4.5 Park the robot**

At the end, the robot should return to the start & finish area. The mission is complete when the robot returns to the Start & Finish area, stops, and the chassis of the robot is entirely (top-view) within the Start & Finish area (cables are allowed to be outside of the Start & Finish area).

#### **4.6 Get bonus points**

While driving through a hospital, it is important that the robot pays attention to everything that is around. Doors, stairs, corners and of course to us – the humans. Therefore, the robot should take care to avoid the people on the game field.

Bonus points will be awarded for not moving or damaging the figures of the people on the game field. In addition, bonus points will be awarded for not moving or damaging the game nets and tables in the rooms.

## 5. Scoring

### Definitions for the scoring

**“Completely”** means that the game object is only touching the corresponding area (not including the black lines).

Tasks	Each	Total
<b>Doing the laundry</b>		
Laundry block completely in laundry area but not in a container or on top of a container	6	18
Laundry block inside the laundry container of the <b>non-matching color</b> and the laundry container is still completely inside the laundry area	10	30
Laundry block inside the laundry container of the <b>matching color</b> and the laundry container is still completely inside the laundry area	16	48
<b>Bring water to the rooms (white block in front of the room, max. one per room counts)</b>		
Water is completely in the correct room but not on the table	6	12
Water element partly or completely in a wrong room indicated by the marking blocks	-6	-12
Water is on the table in the correct room, <b>not standing</b> , not damaged and the table is still inside the dark grey area.	10	20
Water is on the table in the correct room, <b>standing</b> , not damaged and the table is still inside the dark grey area.	14	28
<b>Play a game (green block in front of the room)</b>		
Ball inside the game net (only one ball per net counts)	13	26
<b>Park the robot</b>		
Robot stops in the start & finish area (only if other points, not bonus, are assigned)		13
<b>Get bonus points</b>		
Per person that is not moved or damaged	4	24
Per game net that is not moved or damaged	2	8
Per table that is not moved or damaged	2	8
<b>Maximum Score</b>		<b>155</b>

## Scoring Sheet

Team name: \_\_\_\_\_

Round: \_\_\_\_\_

Tasks	Each	Total	#	Total
<b>Doing the laundry</b>				
Laundry block completely in laundry area but not in a container or on top of a container	6	18		
Laundry block inside the laundry container of the <b>non-matching color</b> and the laundry container is still completely inside the laundry area	10	30		
Laundry block inside the laundry container of the <b>matching color</b> and the laundry container is still completely inside the laundry area	16	48		
<b>Bring water to the rooms (white block in front of the room, max. one per room counts)</b>				
Water is completely in the correct room but not on the table	6	12		
Water element partly or completely in a wrong room indicated by the marking blocks	-6	-12		
Water is on the table in the correct room, <b>not standing</b> , not damaged and the table is still inside the dark grey area	10	20		
Water is completely in the correct room, <b>standing</b> , not damaged and the table is still inside the dark grey area	14	28		
<b>Play a game (black block in front of the room)</b>				
Ball inside the game net (only one ball per net counts)	13	26		
<b>Park the robot</b>				
Robot stops in the start & finish area (only if other points, not bonus, are assigned)		13		
<b>Get bonus points</b>				
Per person that is not moved or damaged	4	24		
Per game net that is not moved or damaged	2	8		
Per table that is not moved or damaged	2	8		
<b>Maximum Score</b>		155		
<b>Surprise Rule</b>				
<b>Total Score in this run</b>				
<b>Time in full seconds</b>				

Signature Team

Signature Judge

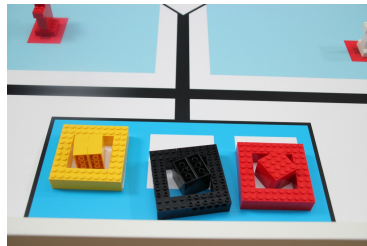


## Scoring Interpretation

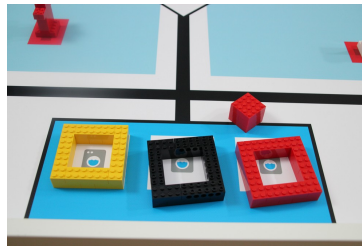
Laundry block completely in laundry area but not in a container or on top of a container → 6 points each

Laundry block inside the laundry container of the non-matching color and the laundry container is still completely inside the laundry area → 10 points each

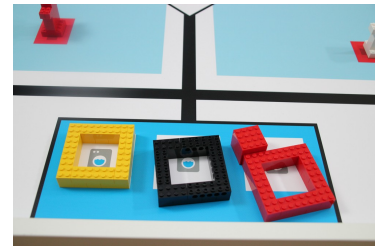
Laundry block inside the laundry container of the matching color and the laundry container is still completely inside the laundry area → 16 points each



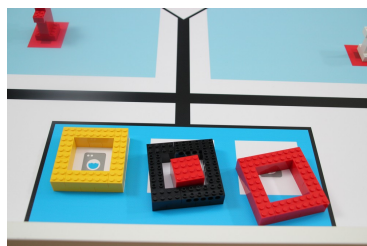
48 points (3x16 points), every laundry block in correct laundry container, it is OK if the container is moved inside the laundry area.



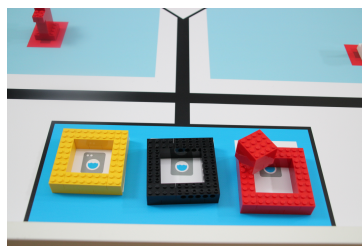
0 points, block is not completely inside the laundry area.



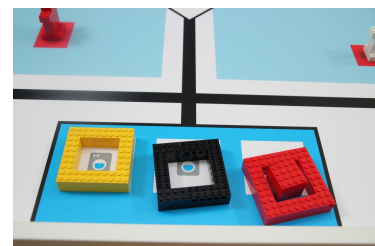
6 points, block is inside the laundry area but not in a container (does not matter if the container is in or out of the laundry area).



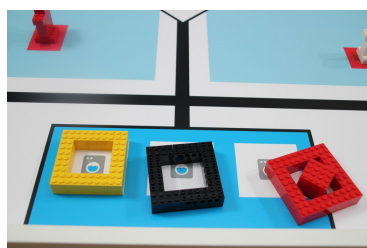
10 points, block is inside the area but in a non-matching color laundry container.



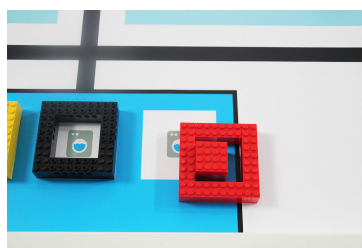
6 points, block in the laundry area but not inside a container.



16 points, block in the matching color laundry container.



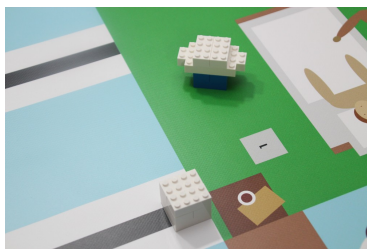
0 points, laundry container & block are no longer inside the laundry area.



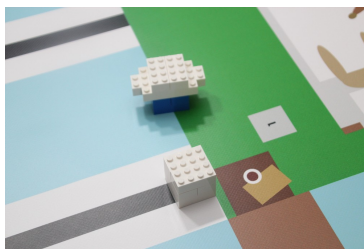
0 points, even if the block is inside, it is important that the laundry container is outside in this situation.



Water is completely in the correct room but not on the table → 6 points each

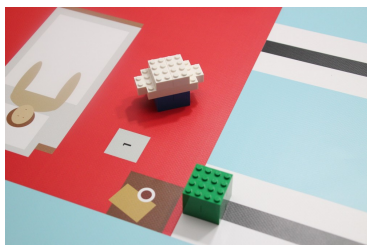


6 points, in a room with a white marking block.

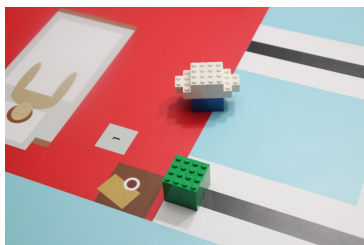


0 points, not completely inside the room.

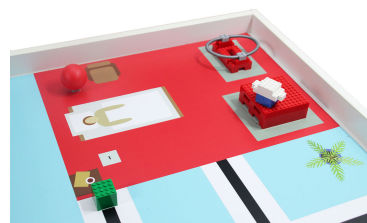
Water element partly or completely in a wrong room indicated by the marking blocks → - 6 points each



-6 points, water element in wrong room (room with green marking block)

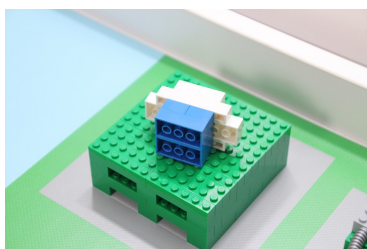


-6 points, water element partly in wrong room.

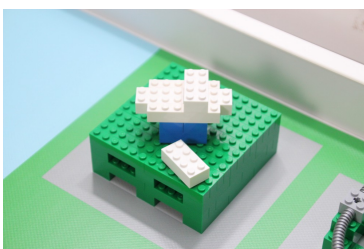


-6 points, water element in wrong room on the table.

Water is on the table in the correct room, not standing, not damaged and the table is still inside the dark grey area → 10 points each



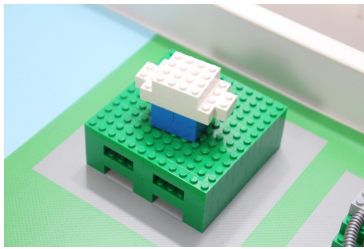
10 points



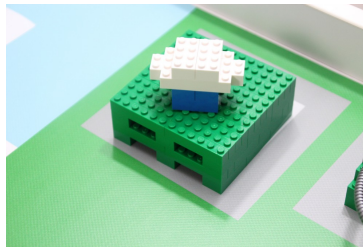
0 points

*Please take a look at the photos of the correct table position below. These situations apply here as well.*

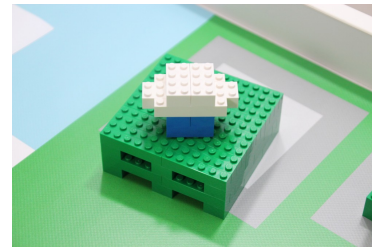
Water is on the table in the correct room, standing, not damaged and the table is still inside the dark grey area → 14 points each



14 points

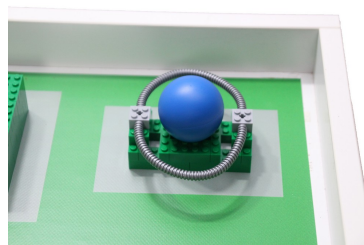


14 points, table moved inside the dark grey area.

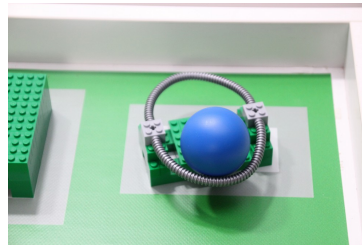


0 points, table moved outside dark grey area.

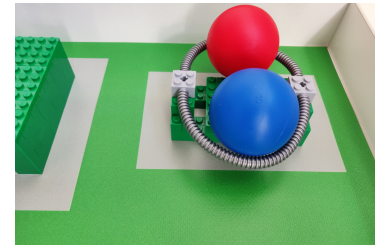
Ball inside the game net (only one ball per net counts) → 13 points each



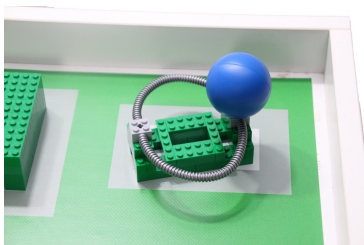
13 points



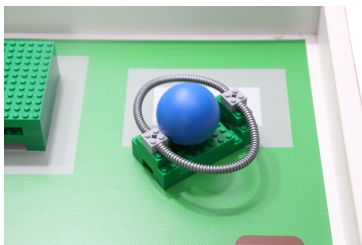
13 points, game net moved inside the grey area.



13 points, only one ball per net counts.

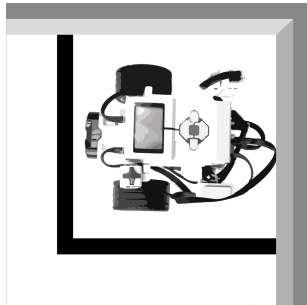


0 points, ball not inside the game net.

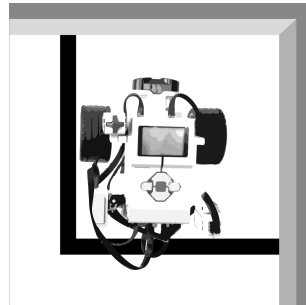


0 points, game net moved outside the grey area.

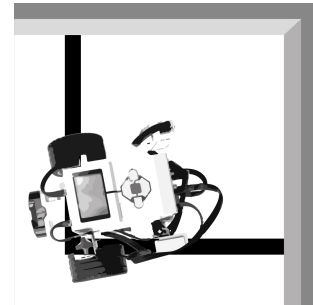
Robot stops in the start & finish area (only if other points, not bonus, are assigned)  
→ 13 points



The projection of the robot is completely inside the start/finish area.

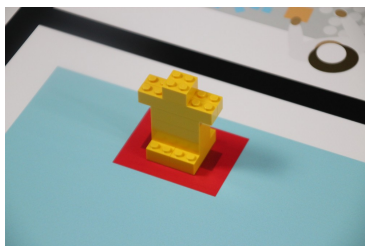


The projection of the robot is completely inside, and cables are out. That is still OK.

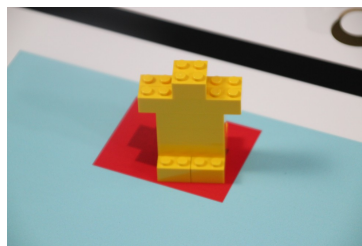


**No points** if the projection of the robot is not in the start/finish area.

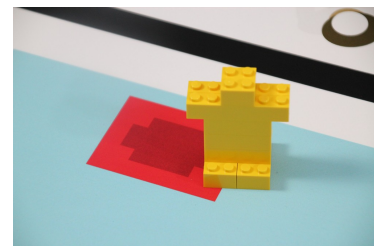
Person that is not moved or damaged → 4 points each



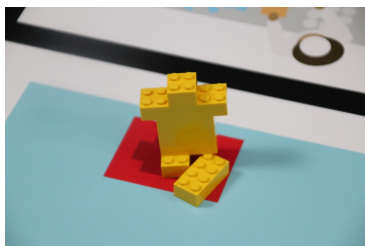
4 points



4 points, only moved inside the area.



0 points, moved outside the area



0 points, damaged.

**For the bonus points for the game net and the table, the same scoring interpretations apply as shown in the photos for the persons.**

## 6. Local, regional, and international events

WRO competitions take place in around 90 countries, and we know that teams in each country expect a different level of complexity. The challenge as described in this document will be used for international WRO events. This is the last stage of the competition, where the teams with the best solutions participate. That is why the game rules are challenging.

WRO feels that all participants need to be able to have a good experience in the competition. Teams with less experience should also be able to score points and succeed. This builds confidence in their ability to master technical skills, which is important for their future choices in education.

**This is why WRO Association recommends our National Organizers decide if they want to adapt the rules for events in their country. They can make the challenges easier for local, regional, and national events, so that all participants have a positive experience. Our National Organizers can make their own choices, so each competition fits their specific situation and ideas. Here we provide some ideas to make the challenges easier.**

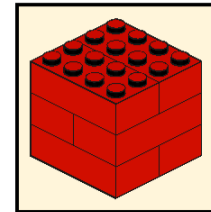
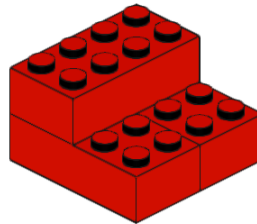
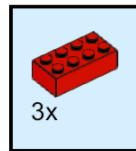
### Ideas for simplifications:

- No randomization of the laundry container
- No randomization of the marking blocks
- No randomization of the people and / or less people on the field
- Water bottles could be placed on the robot before the game starts

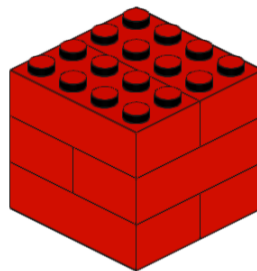
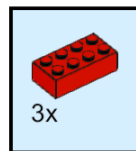
## PART TWO – ASSEMBLY OF GAME OBJECTS

Laundry Block (1x per colour, 3 in total)

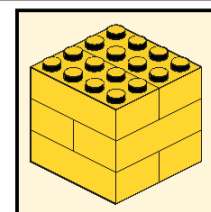
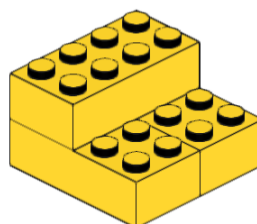
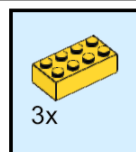
1



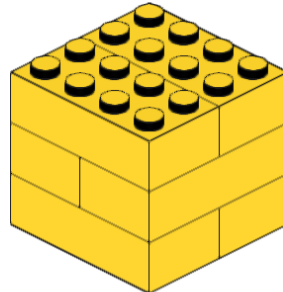
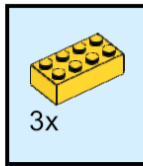
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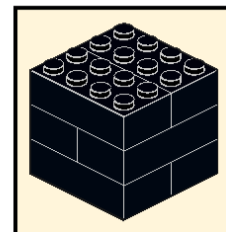
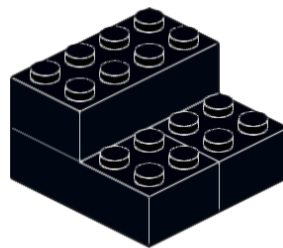
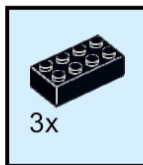
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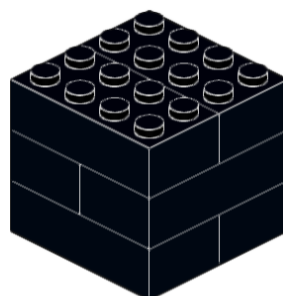
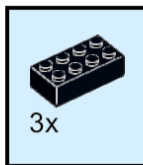
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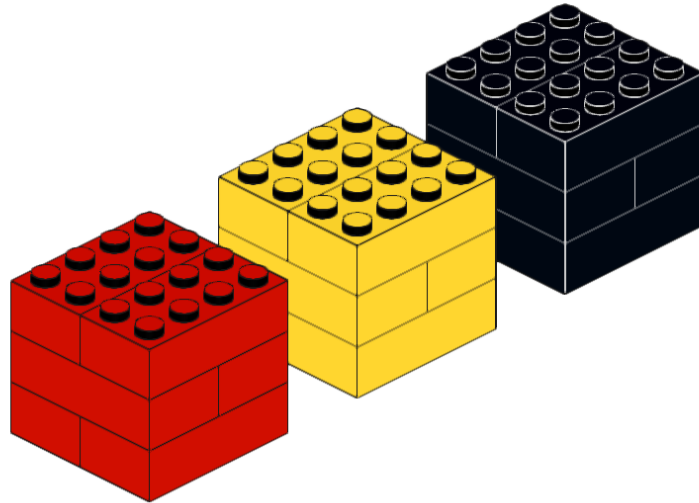
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6

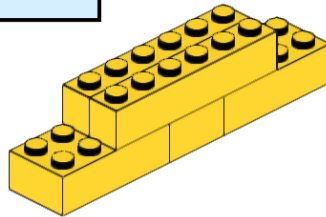
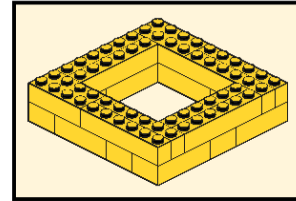


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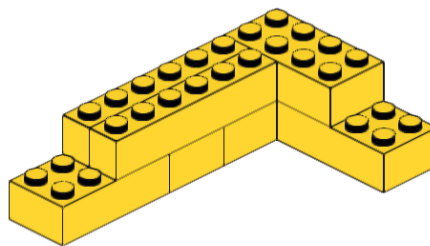
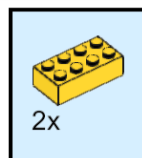




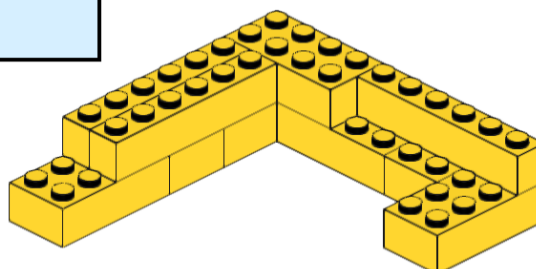
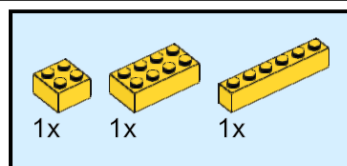
# 1



# 2

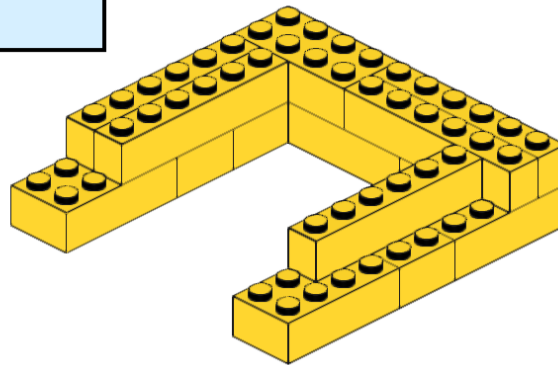
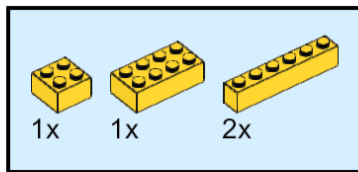


# 3

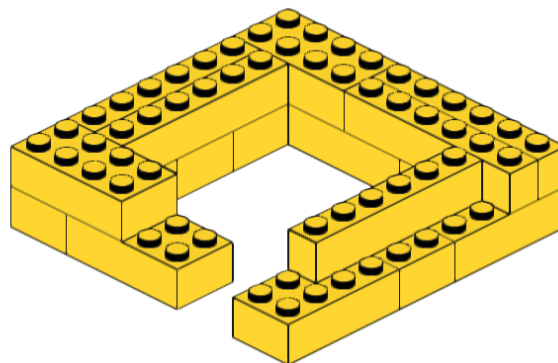
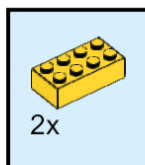




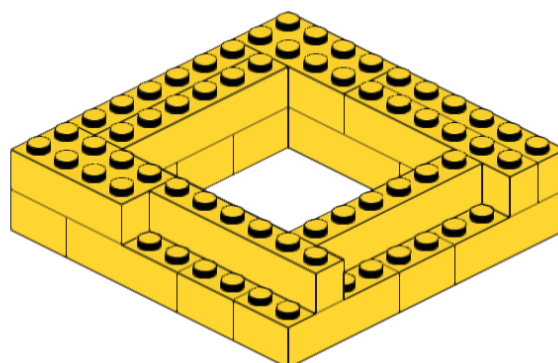
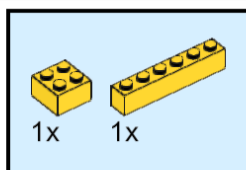
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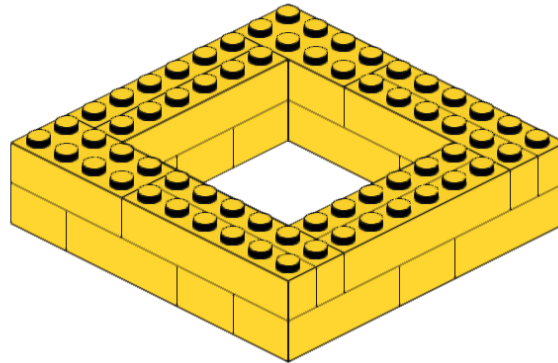
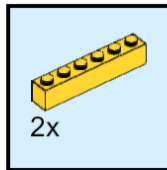
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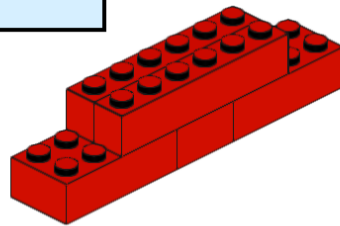
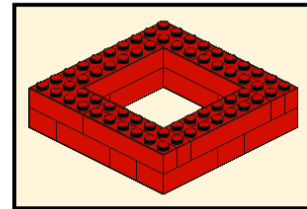
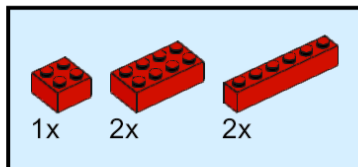
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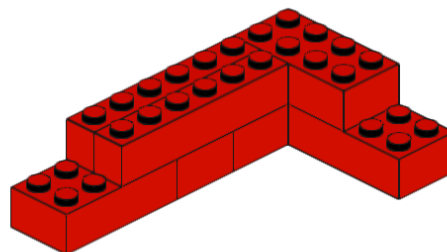
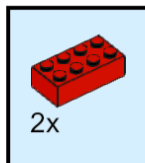
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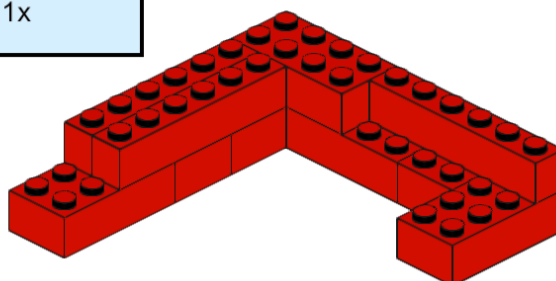
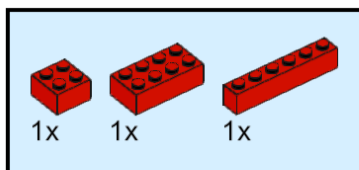
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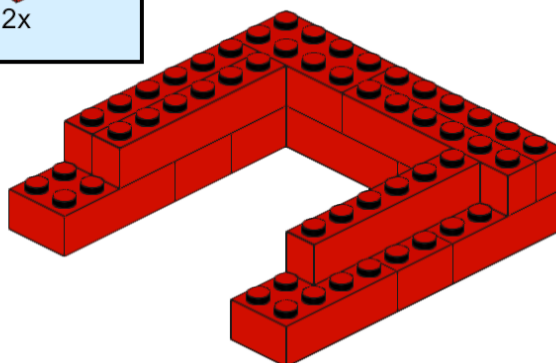
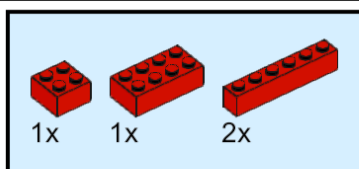
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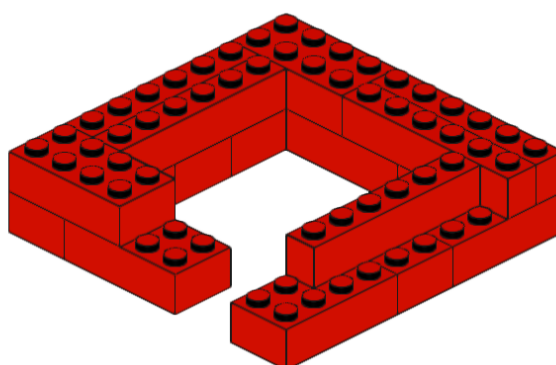
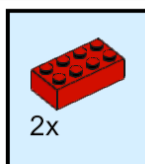
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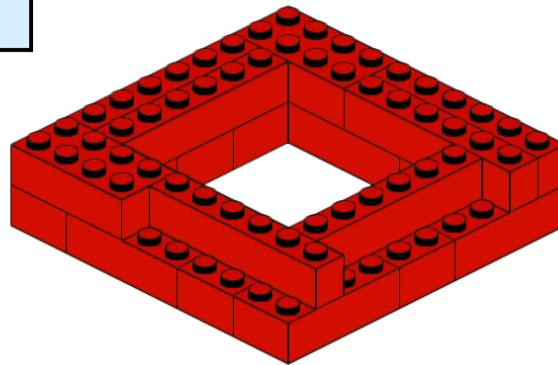
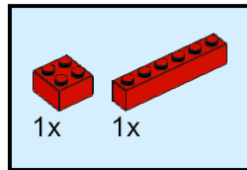
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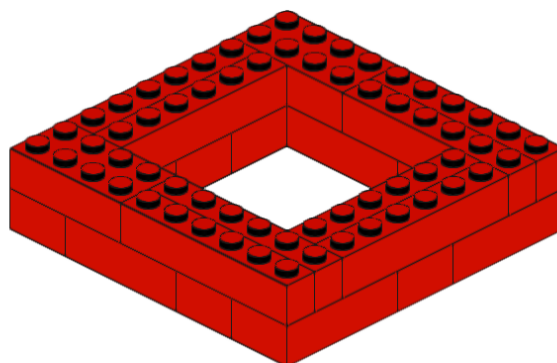
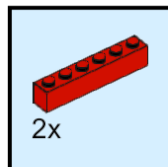
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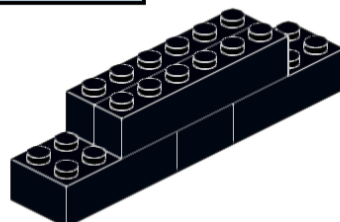
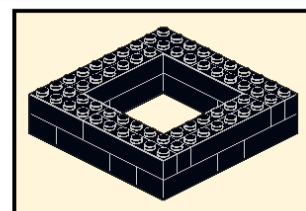
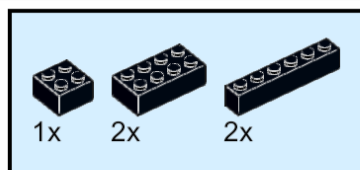
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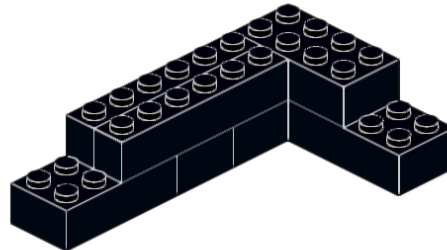
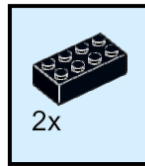
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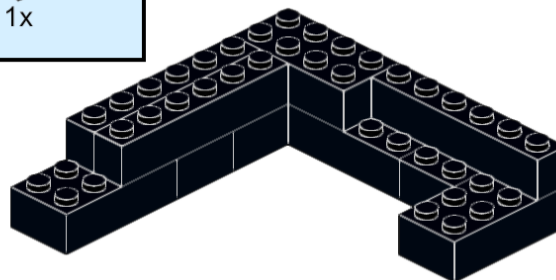
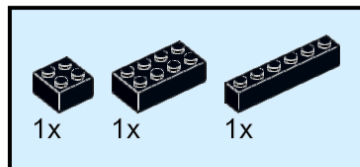
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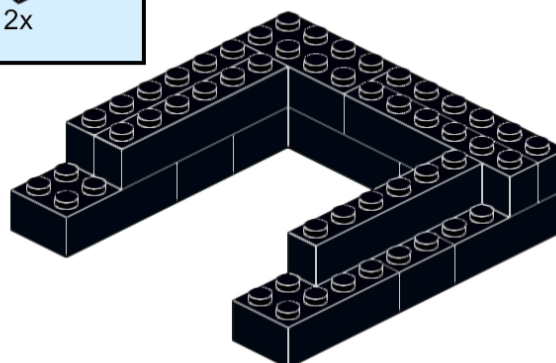
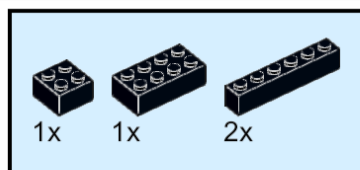
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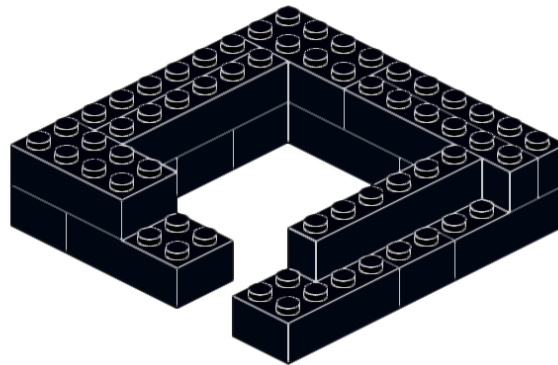
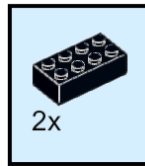
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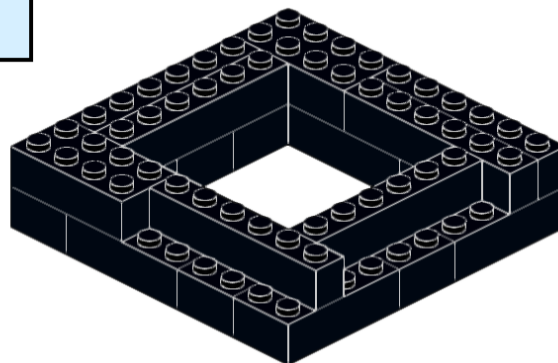
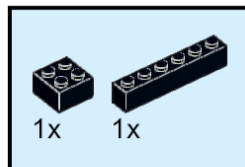
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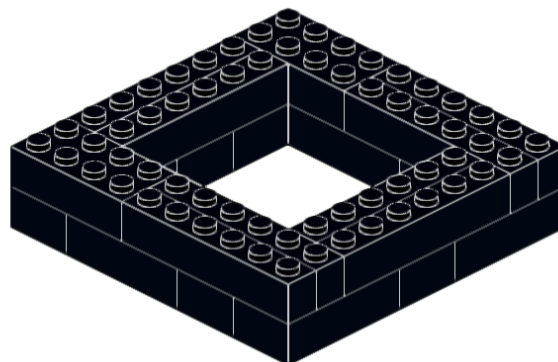
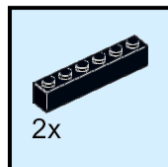
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20

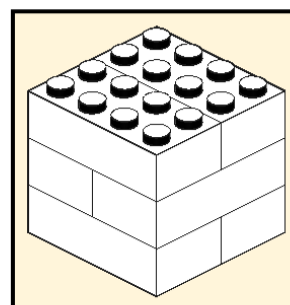
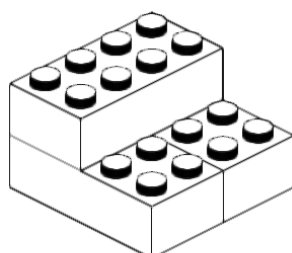
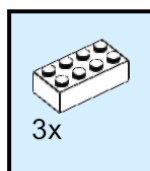


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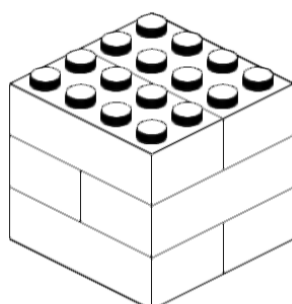
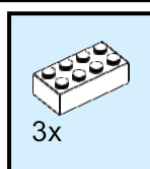


## Marking blocks (2x white, 2x green)

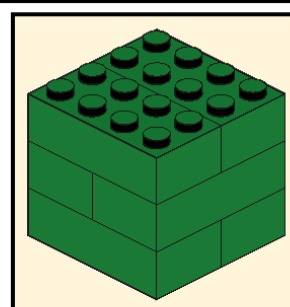
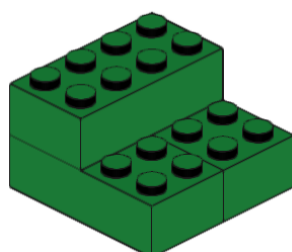
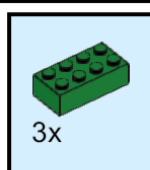
1



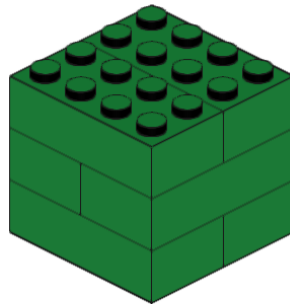
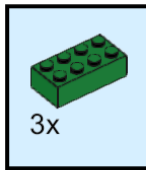
2



3

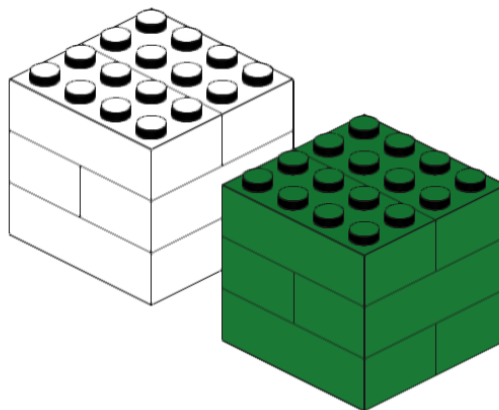


4



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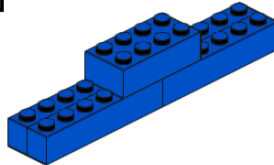
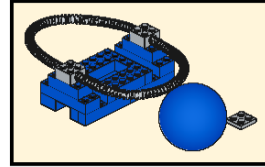
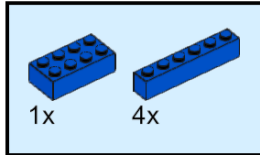
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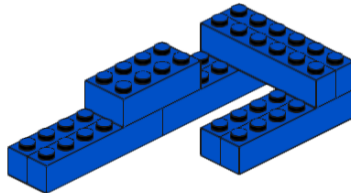
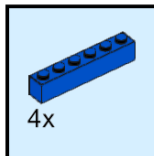


## Game net & game ball (1x per colour, 4 in total)

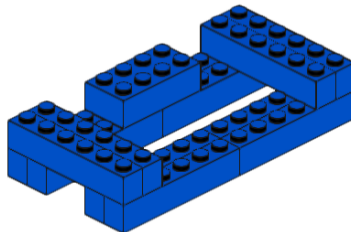
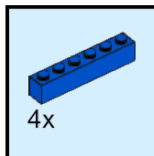
1

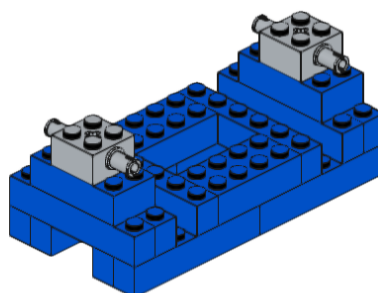
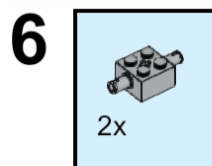
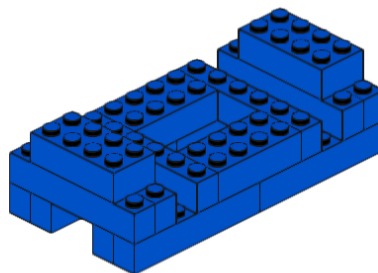
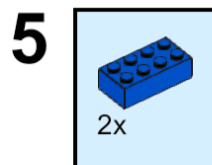
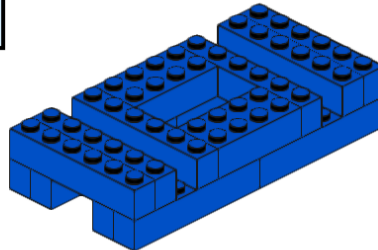
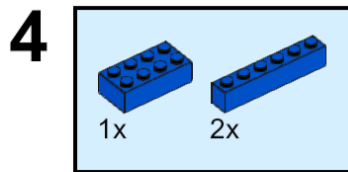


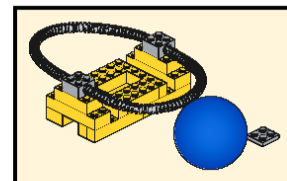
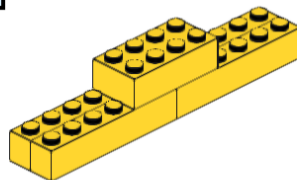
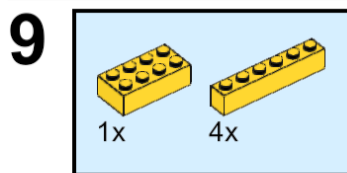
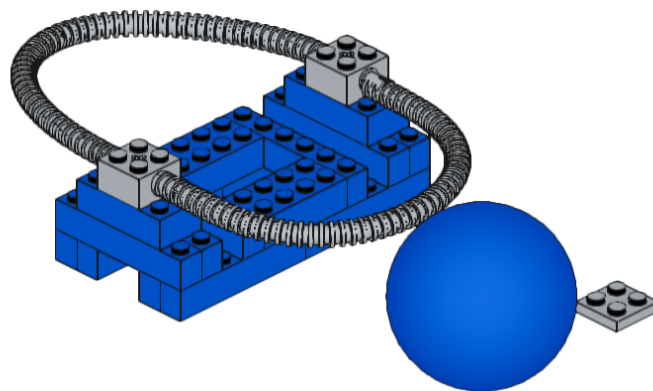
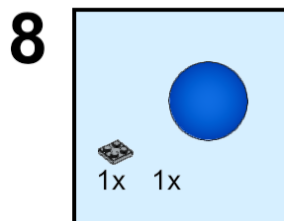
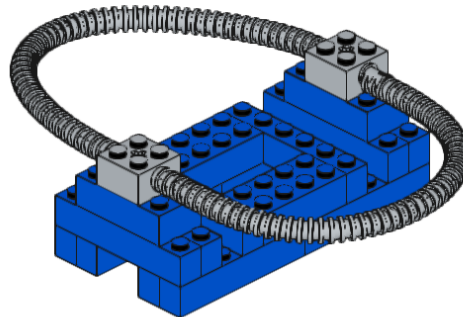
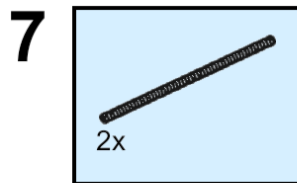
2



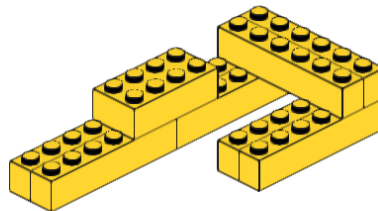
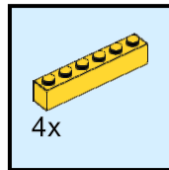
3



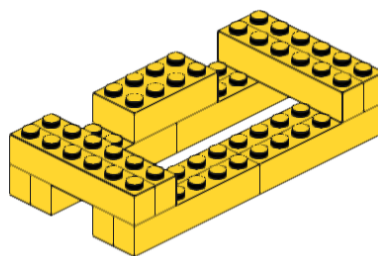
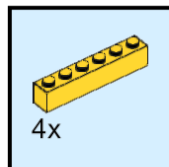




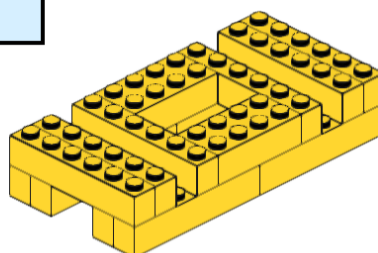
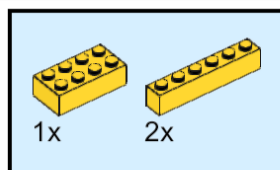
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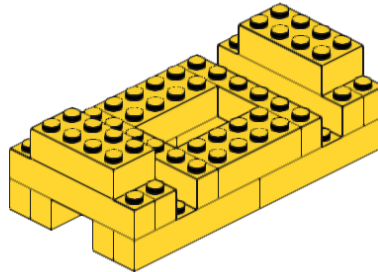
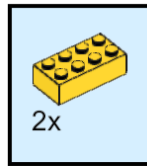
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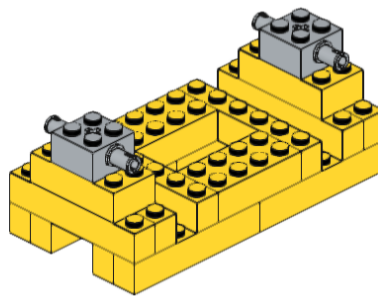
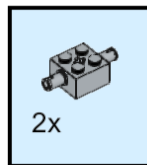
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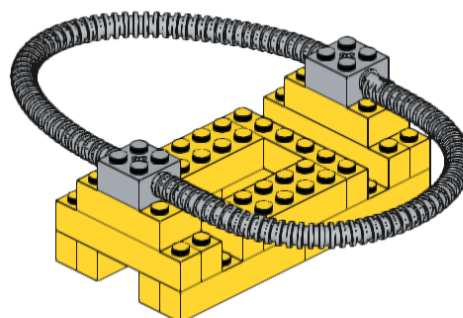
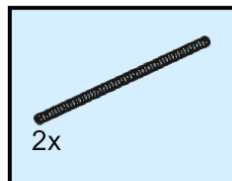
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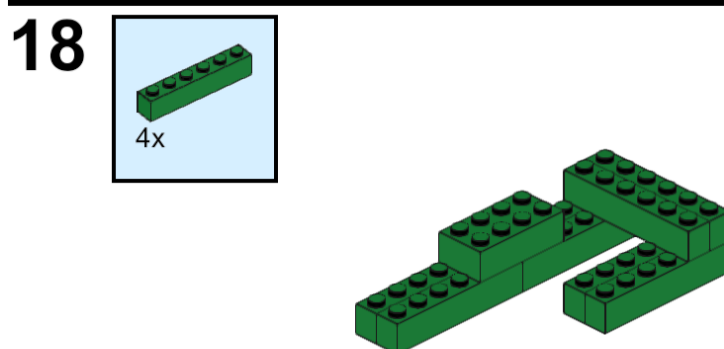
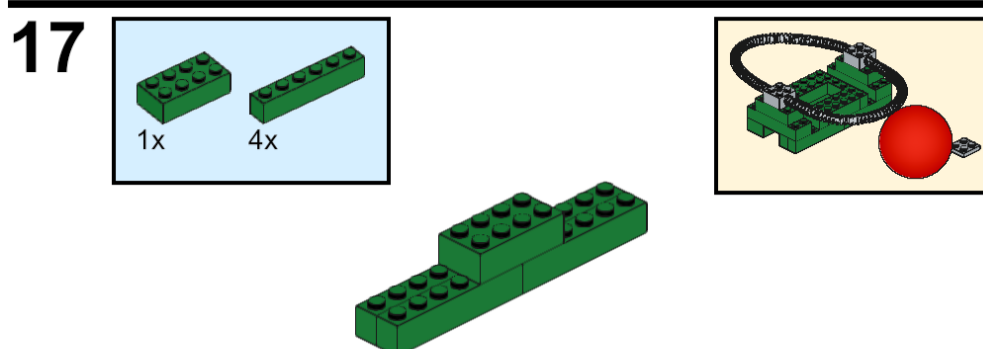
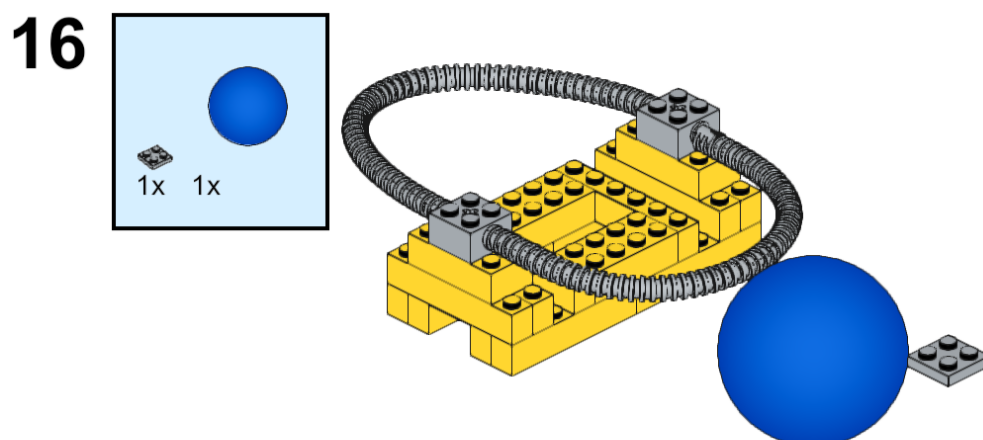


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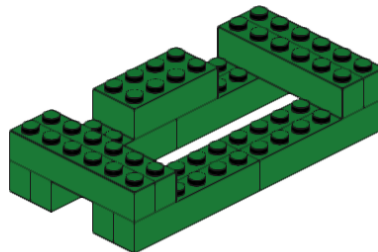
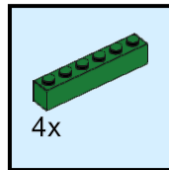


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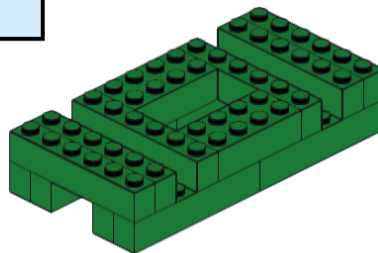
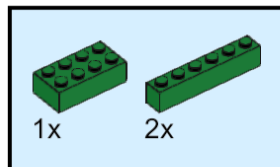




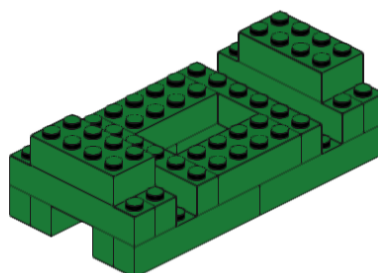
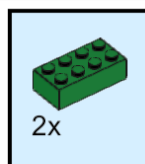
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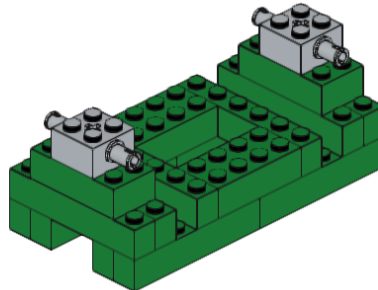
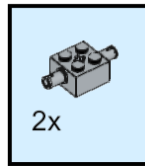
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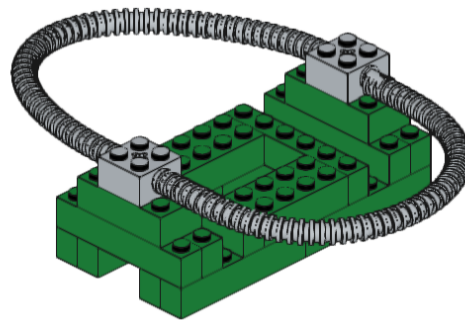
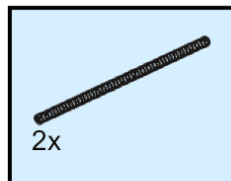
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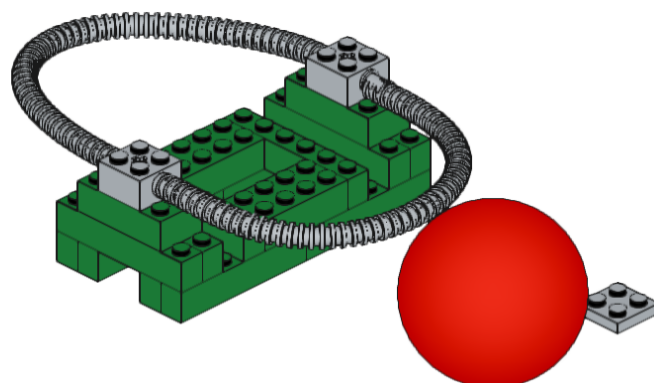
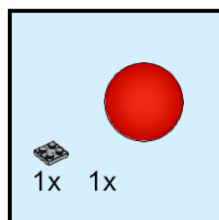
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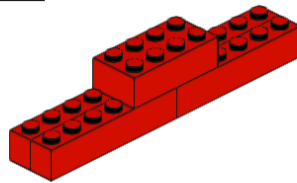
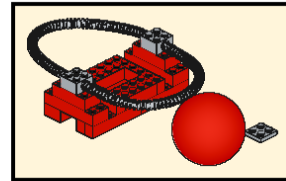
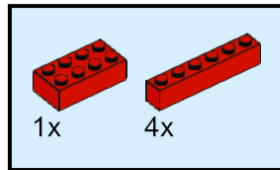


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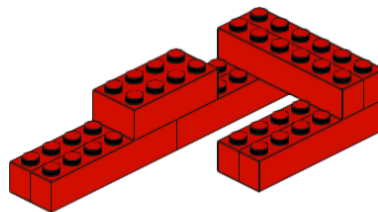
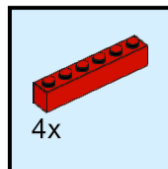




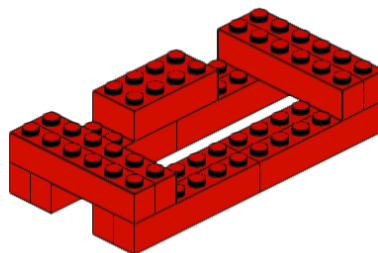
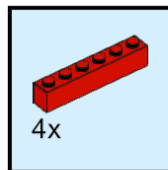
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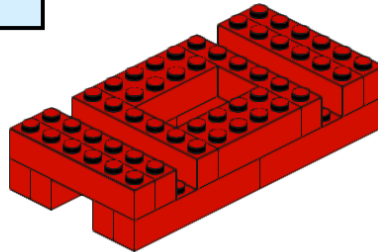
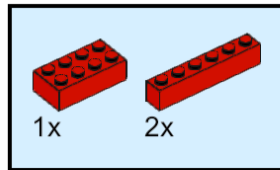
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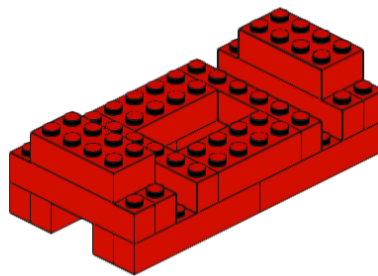
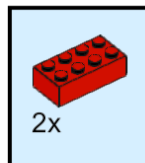
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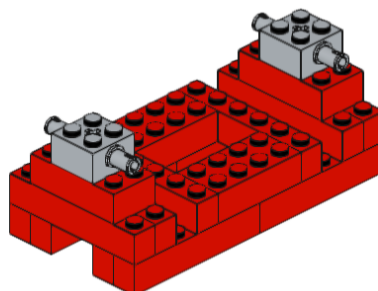
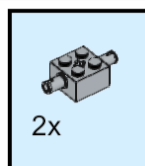
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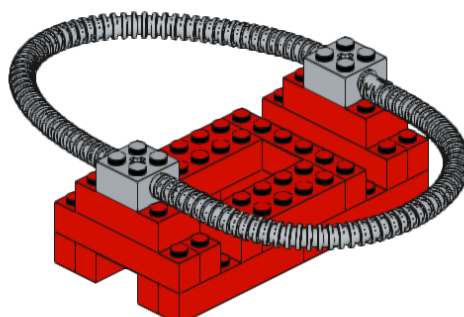
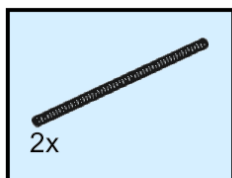
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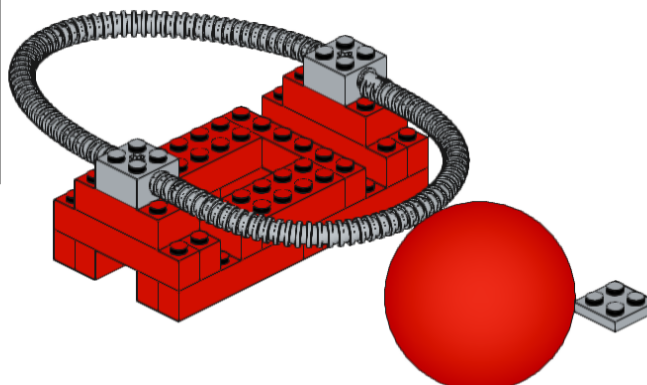
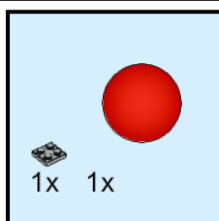
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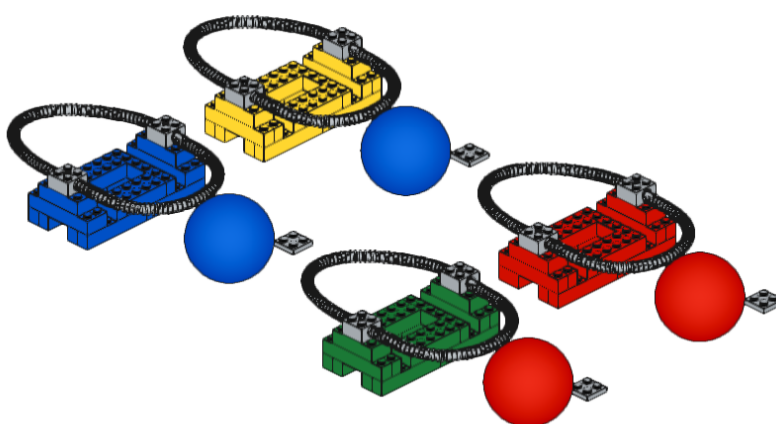
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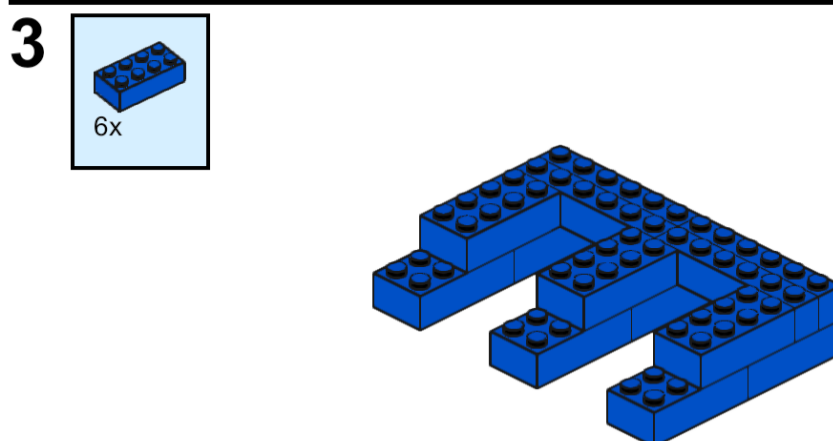
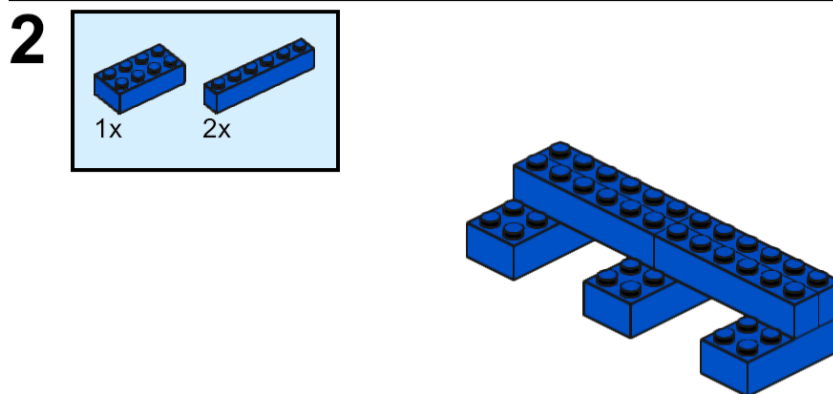
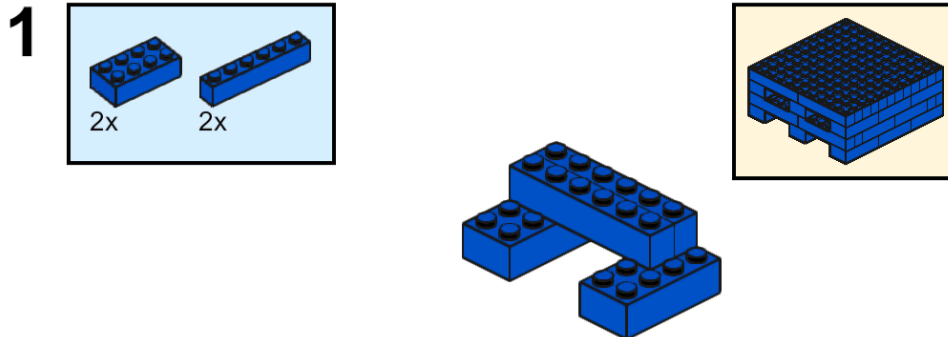
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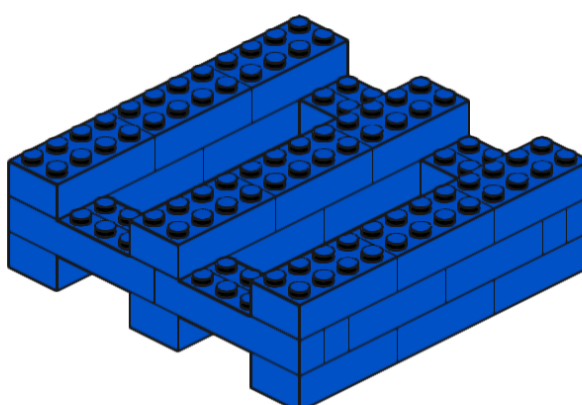
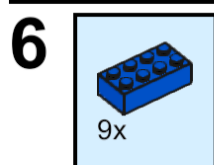
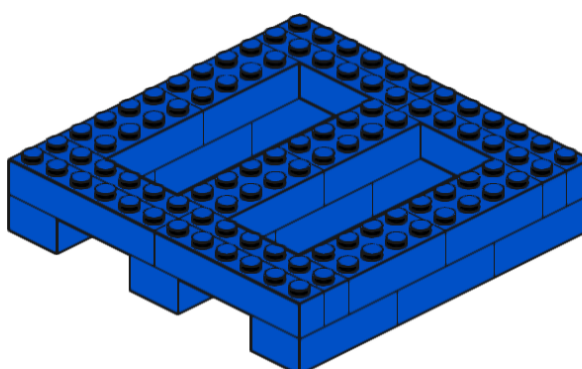
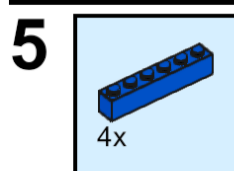
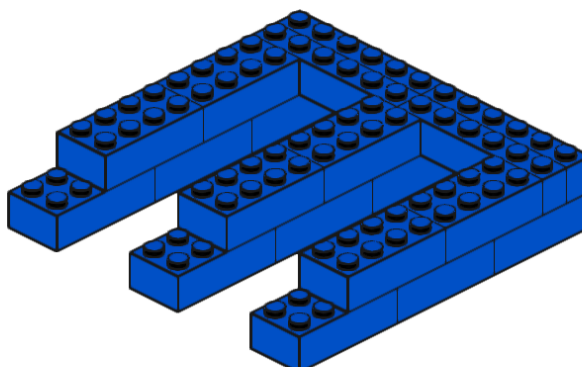
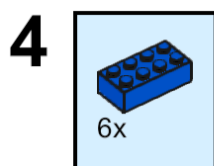


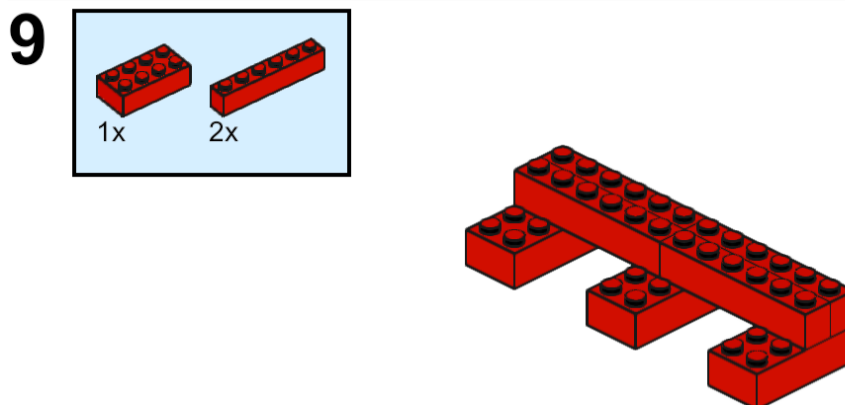
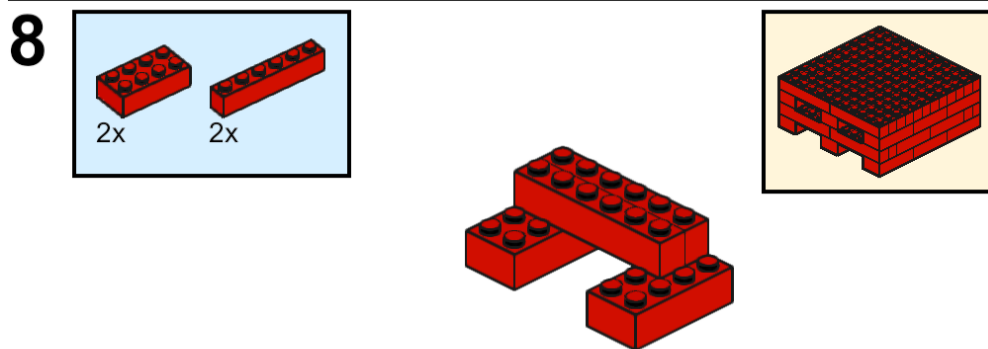
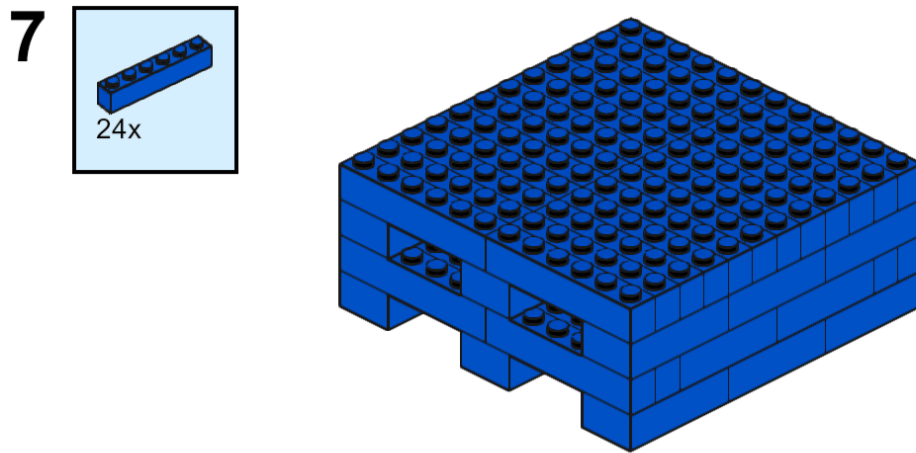
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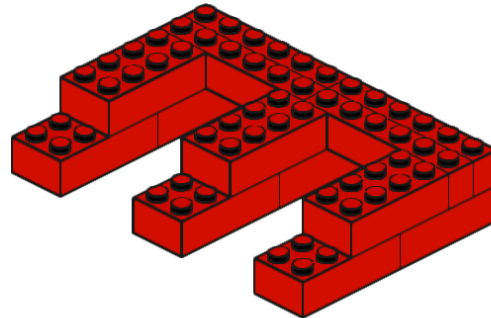
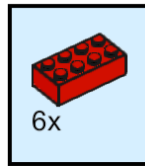
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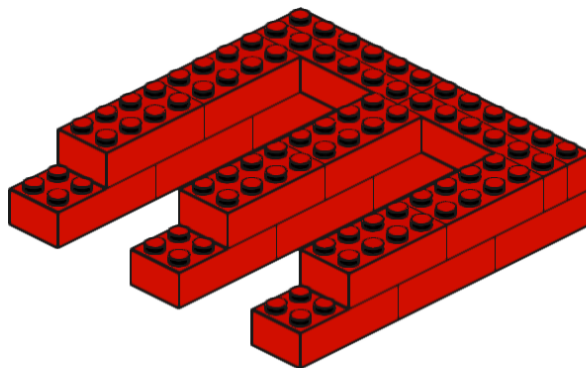
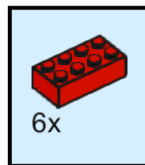




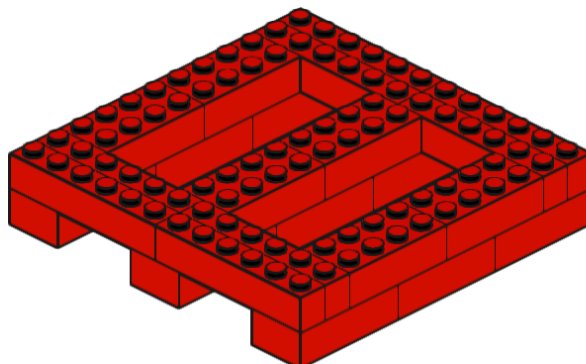
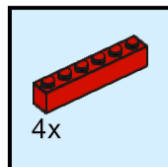
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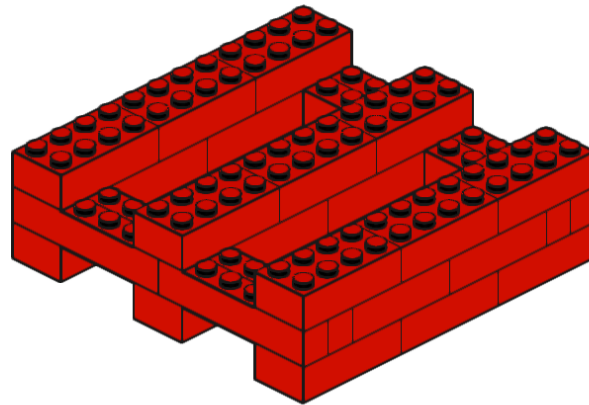
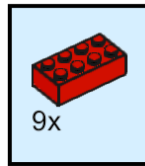
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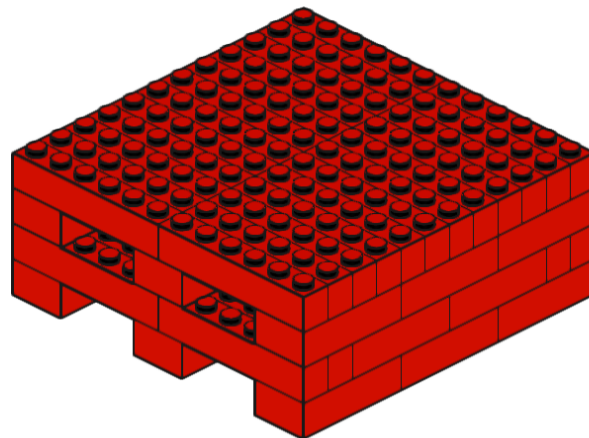
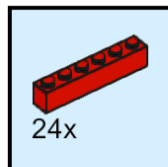
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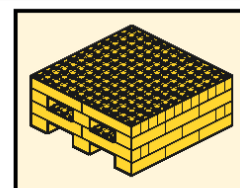
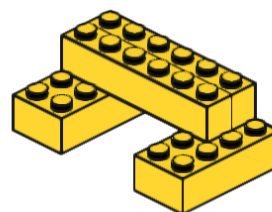
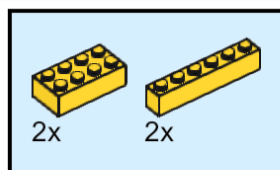
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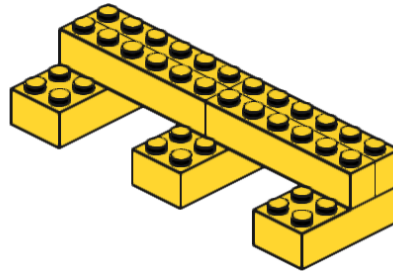
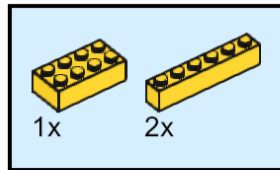


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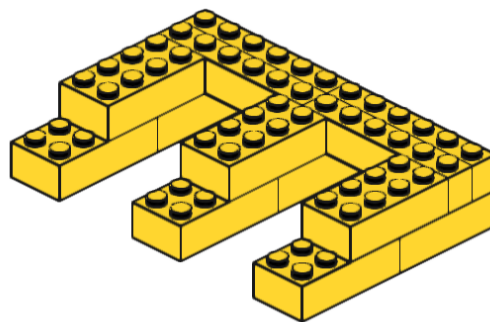
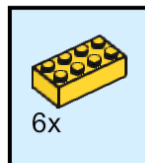




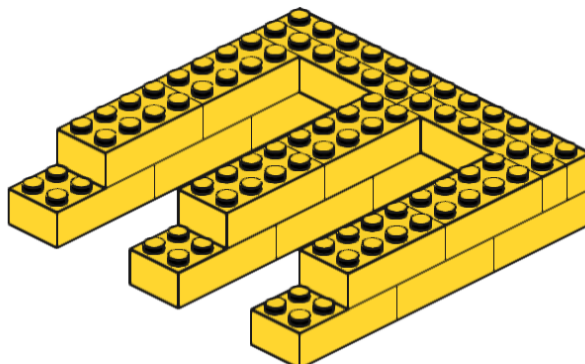
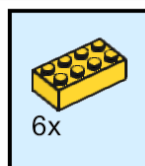
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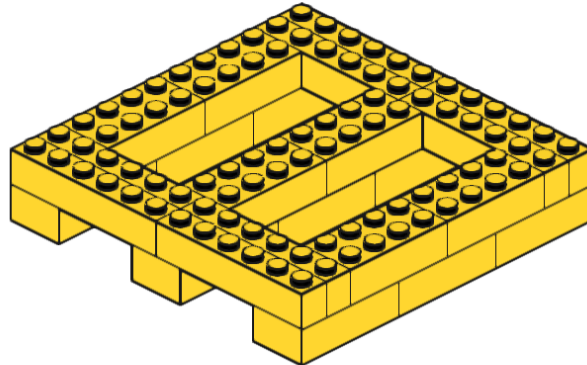
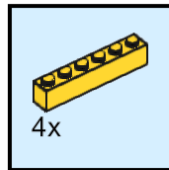
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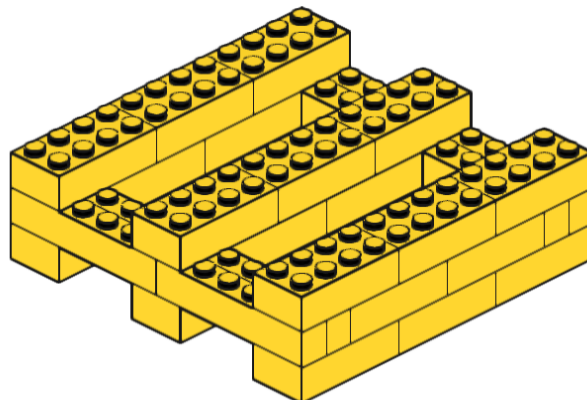
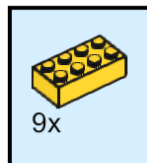
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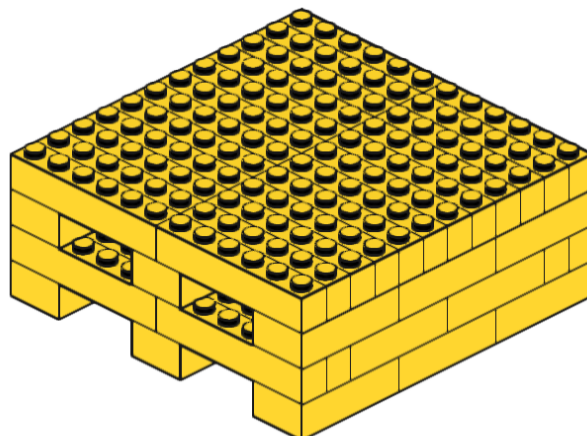
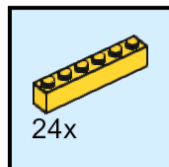
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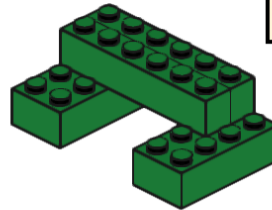
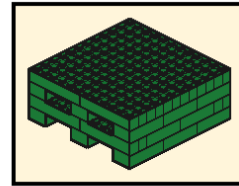
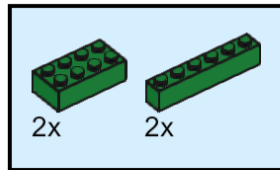
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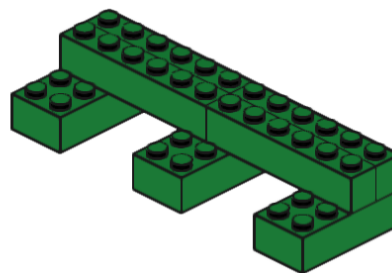
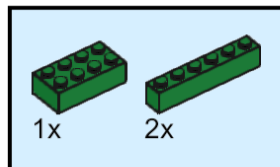
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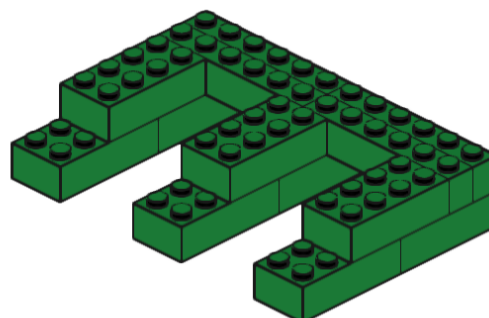
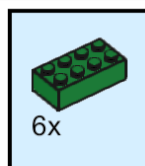
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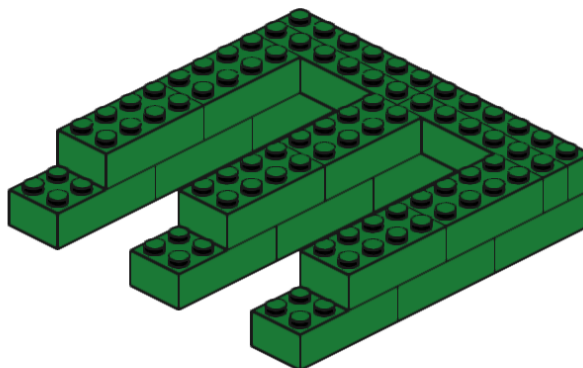
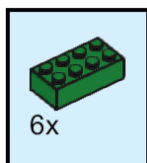
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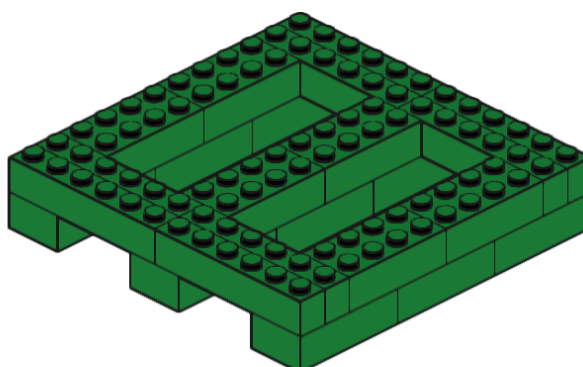
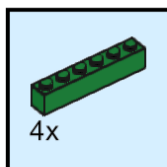
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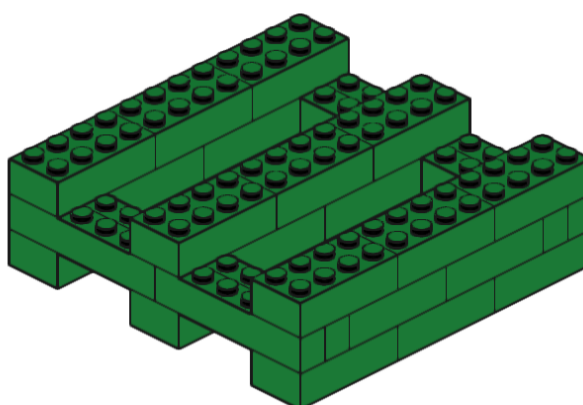
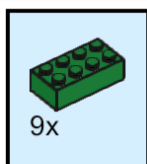
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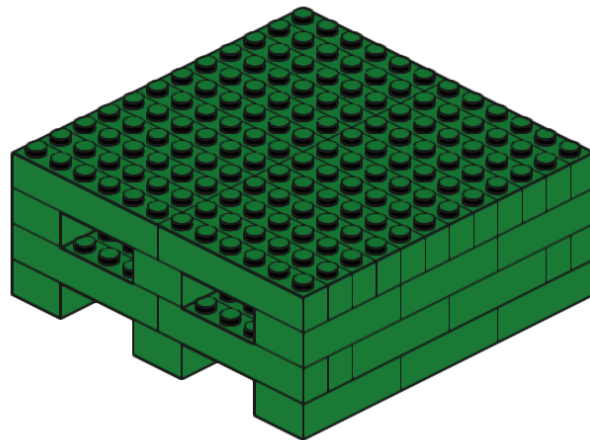
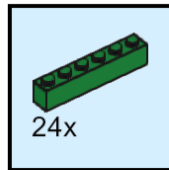
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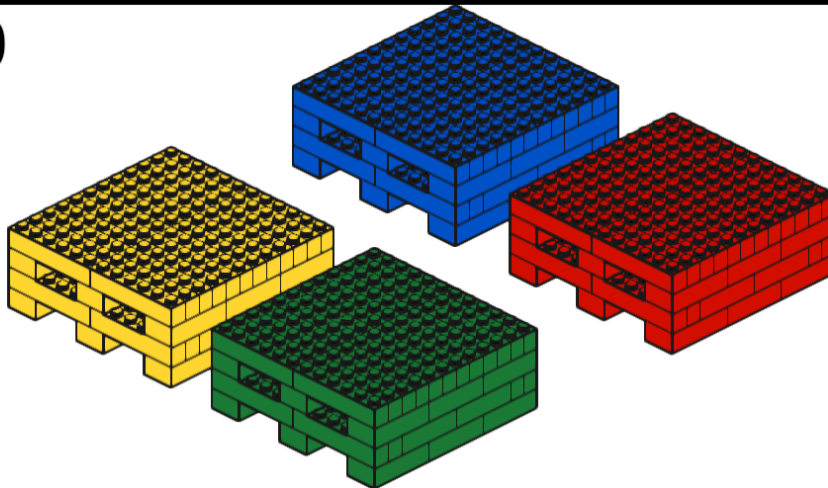
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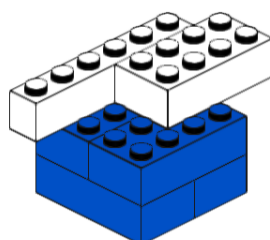
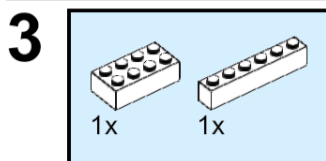
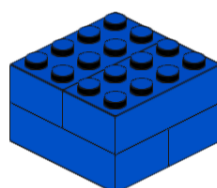
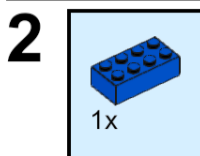
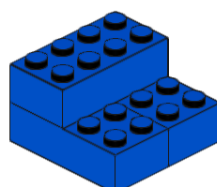
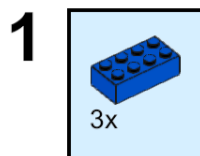
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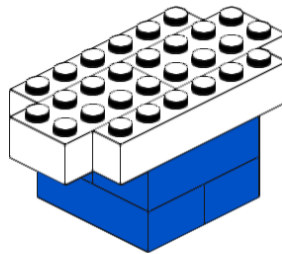
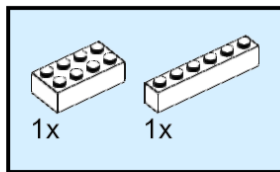
29



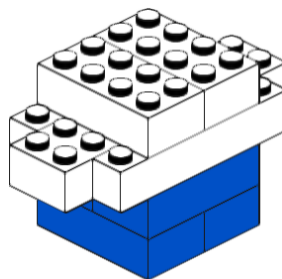
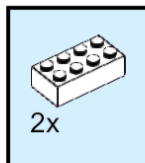
## Water Bottle (3x)



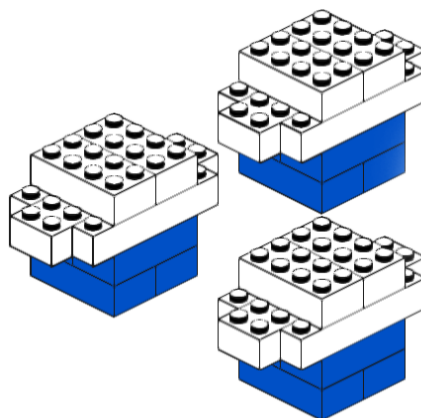
4



5

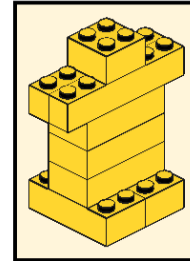
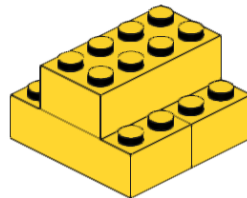
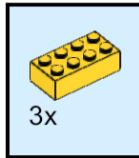


6

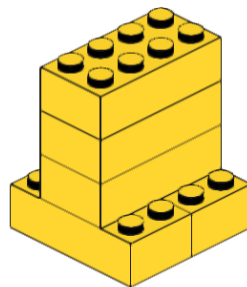
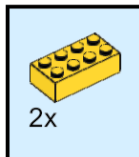


## People (1x per colour, 6 in total)

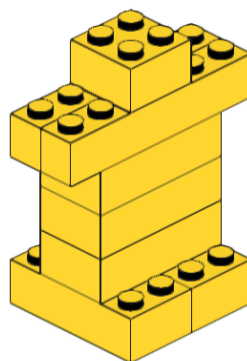
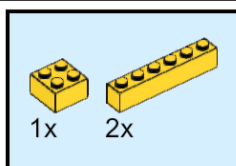
1



2

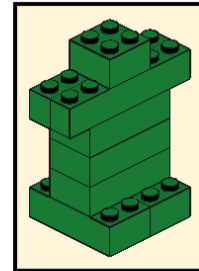
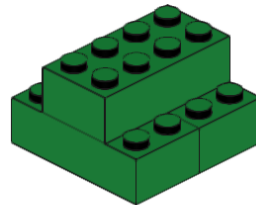
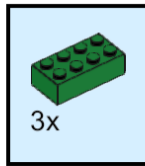


3

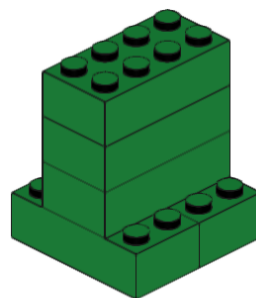
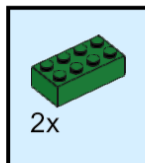




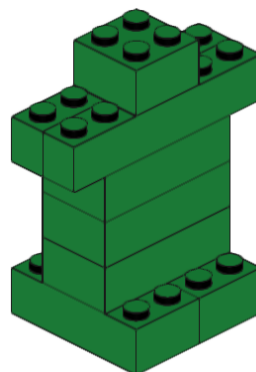
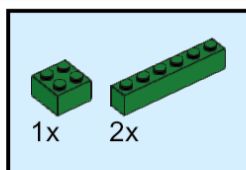
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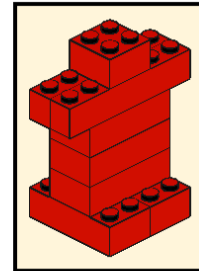
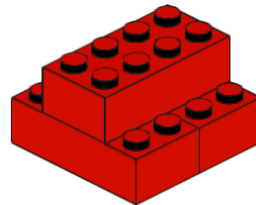
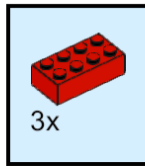
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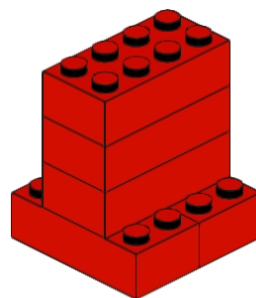
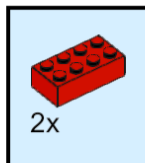
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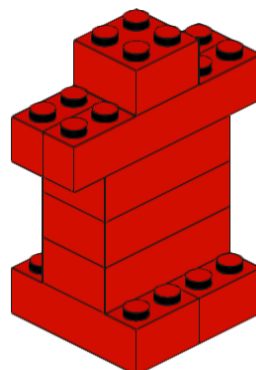
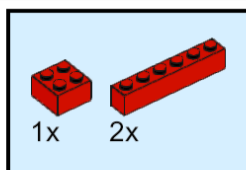
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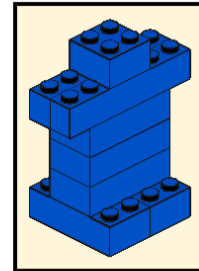
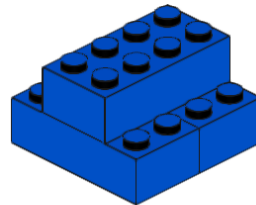
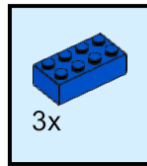
8



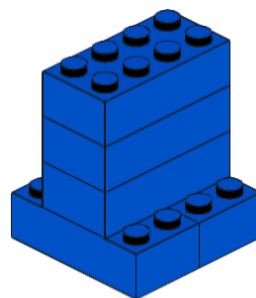
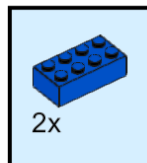
9



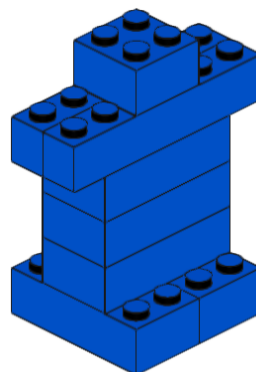
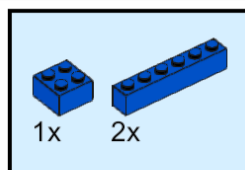
10



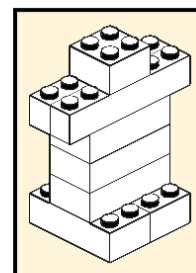
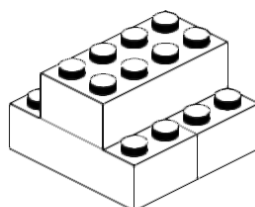
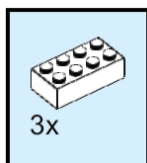
11



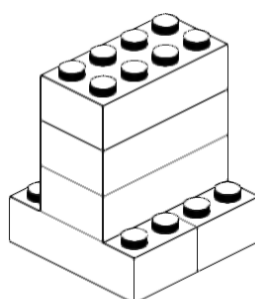
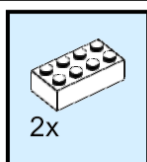
12



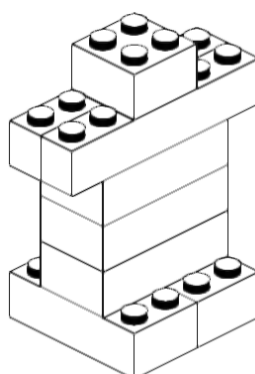
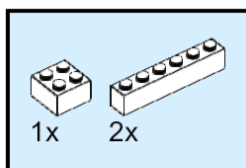
13



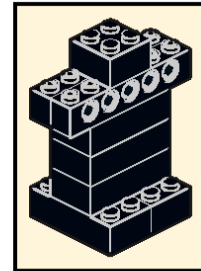
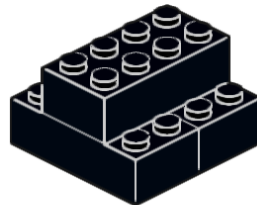
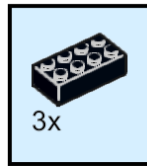
14



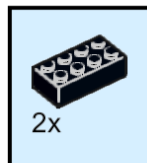
15



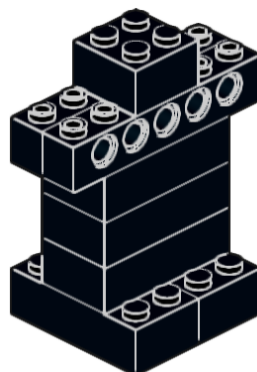
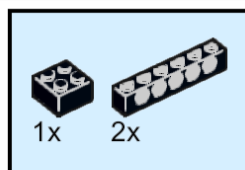
16



17



18



19

