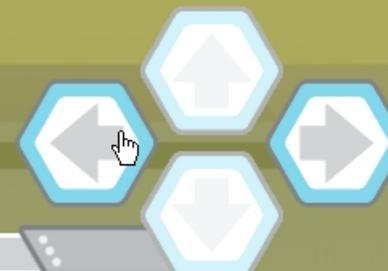
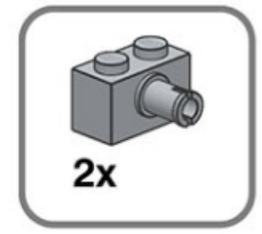
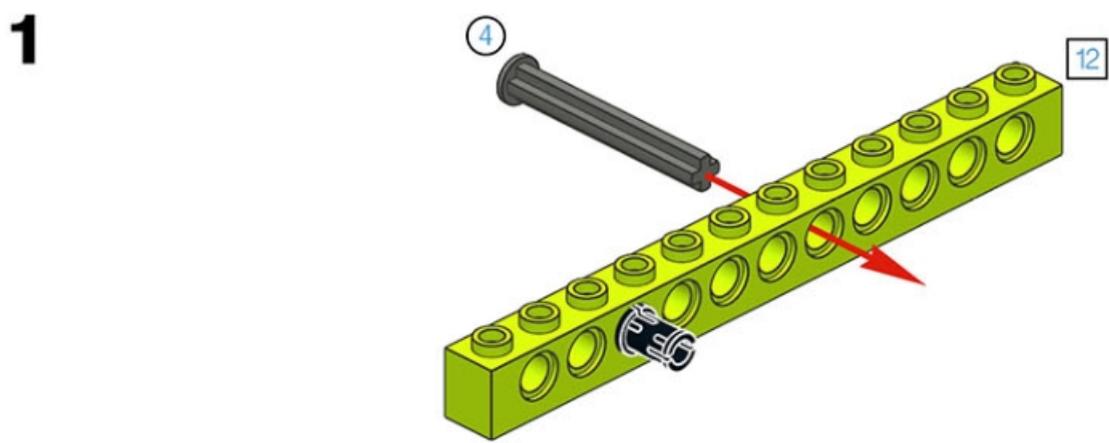
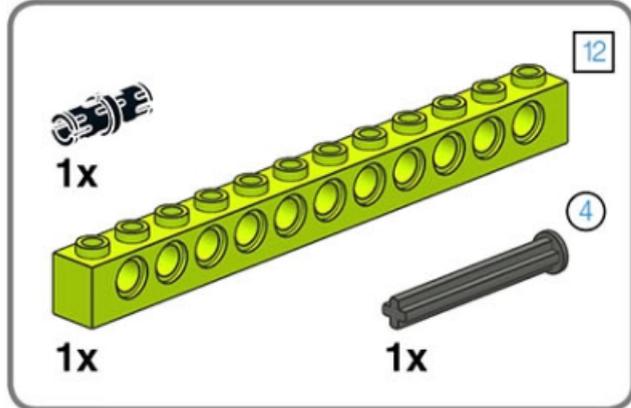




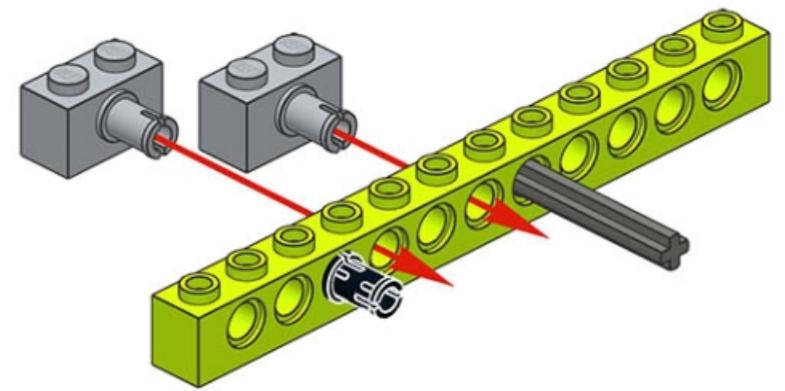
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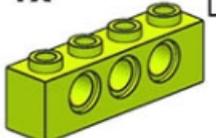
**ROBORISE-IT!**  
ROBOTIC EDUCATION

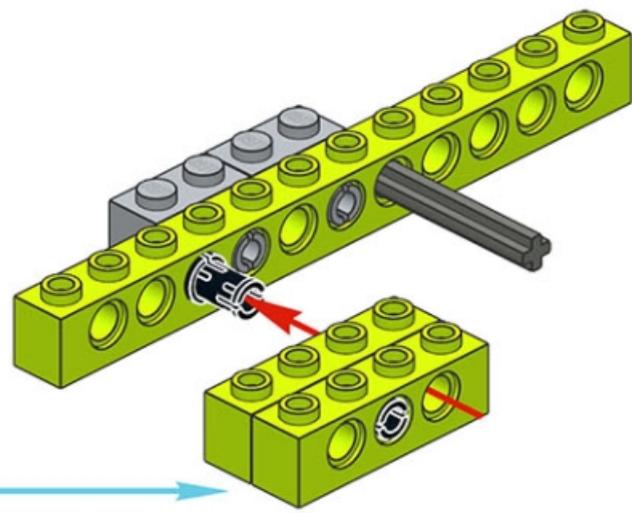
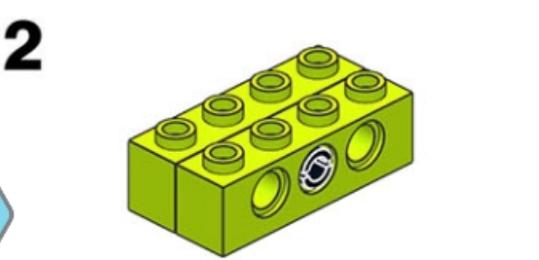
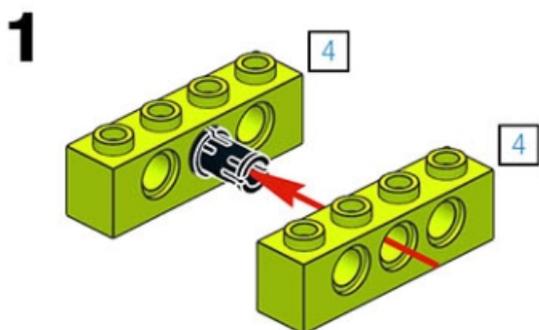


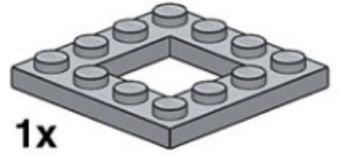


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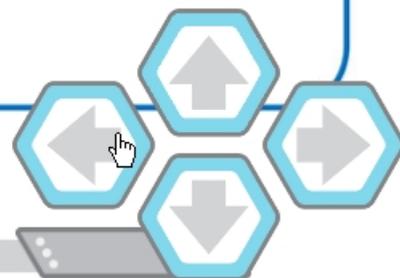
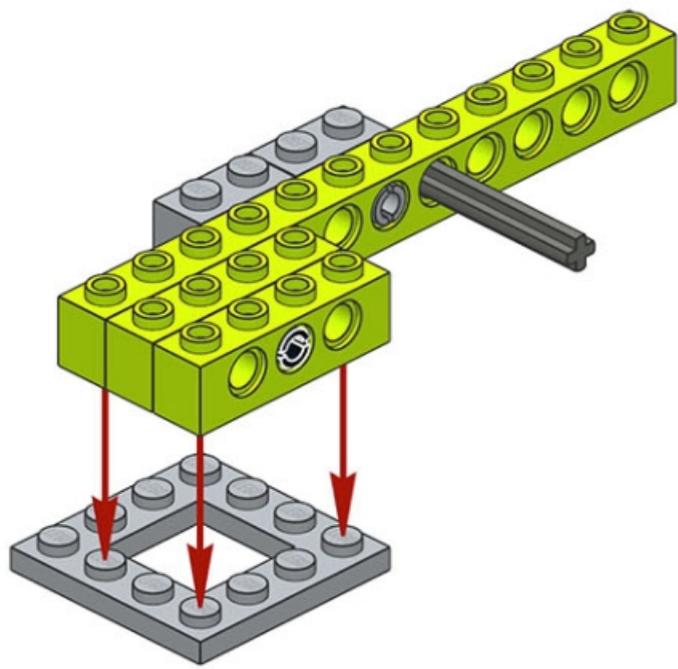
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- 2x 



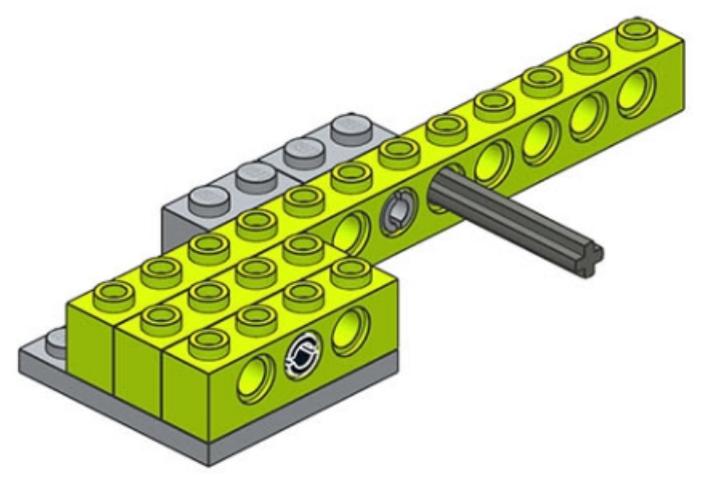
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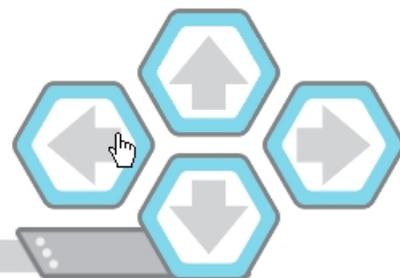
nerrka@gmail.com

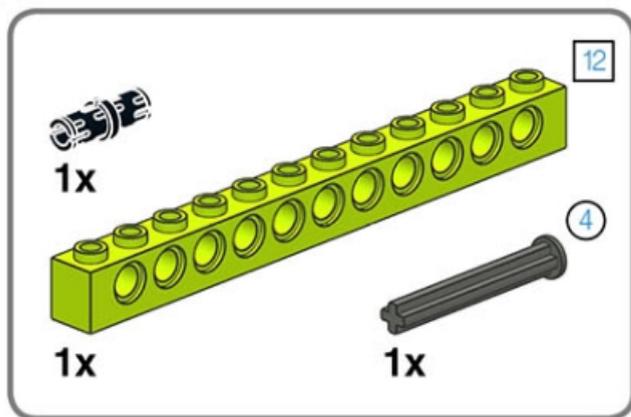


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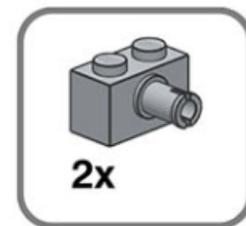
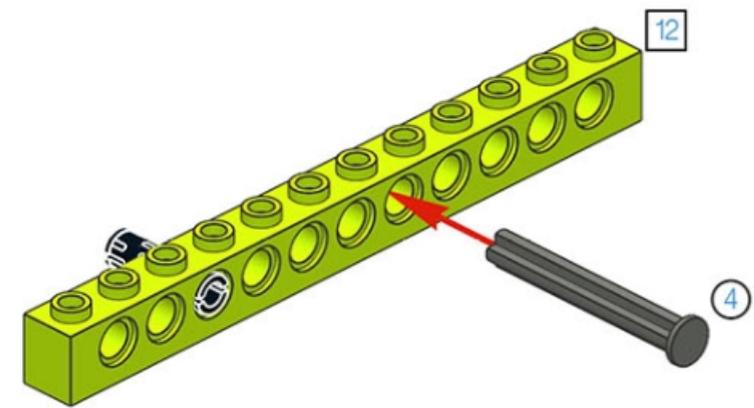


nerrha@gmail.com

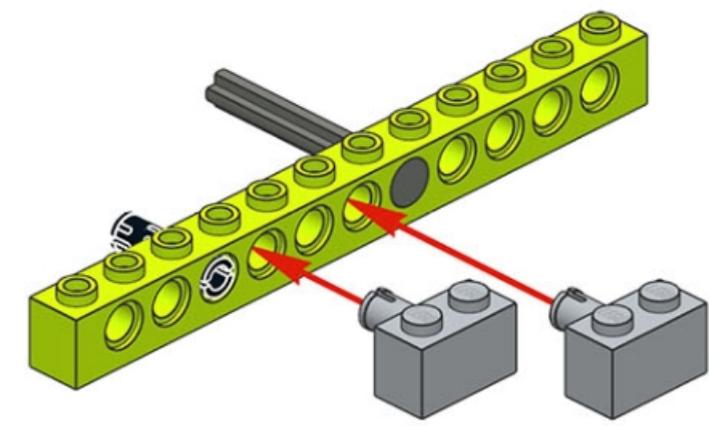


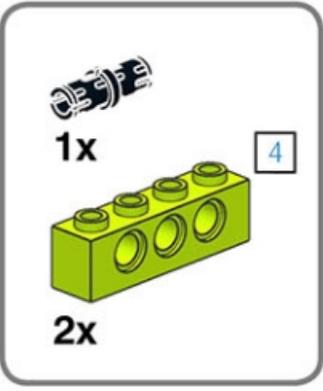


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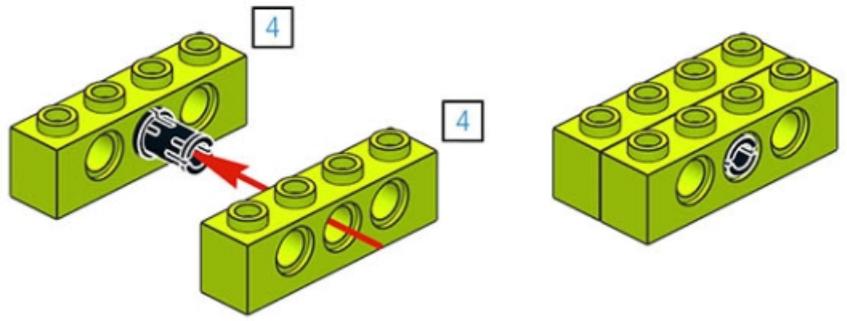


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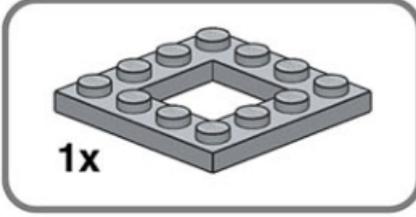
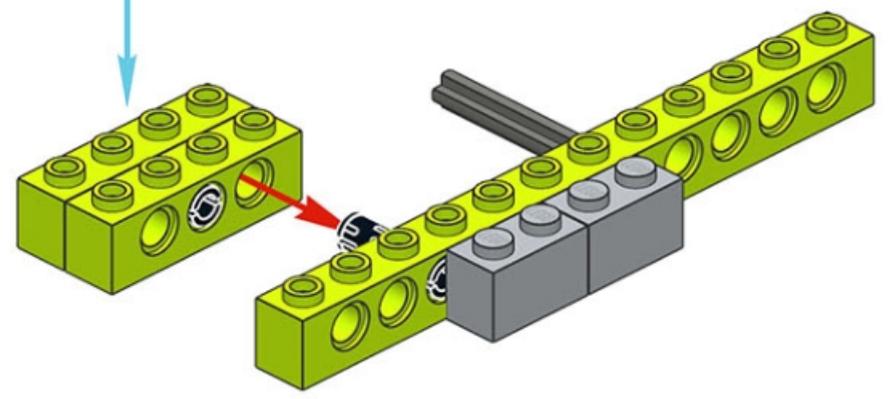




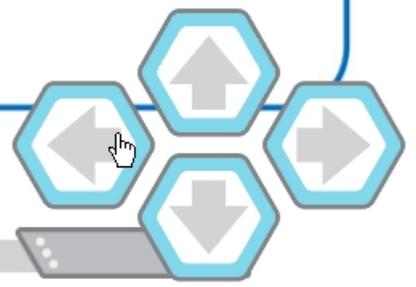
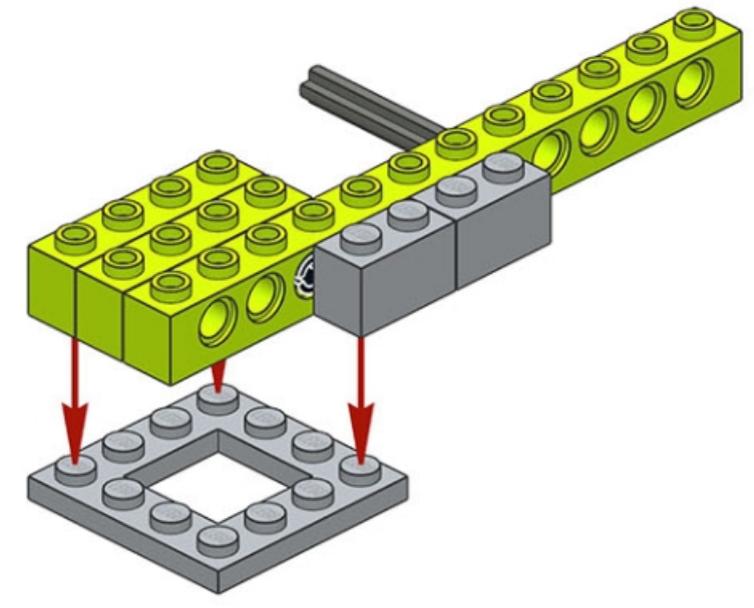
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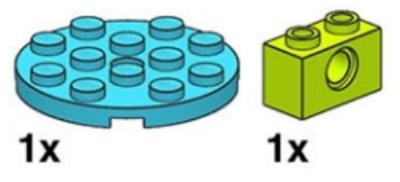


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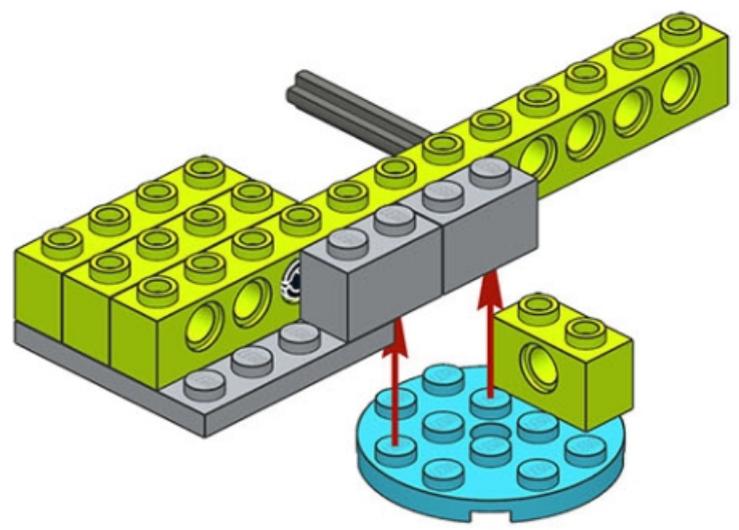


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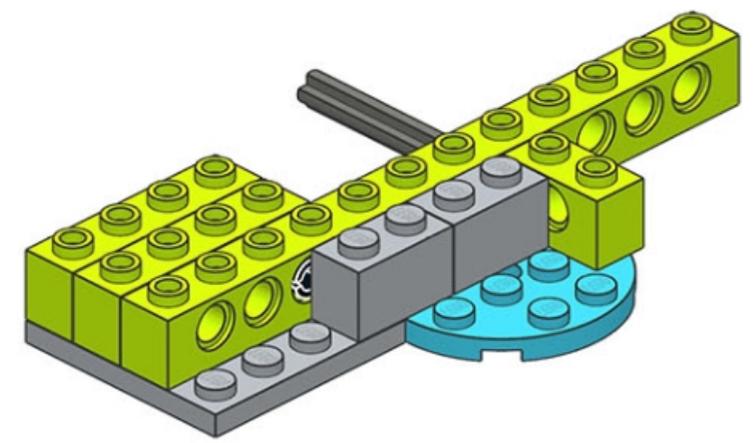




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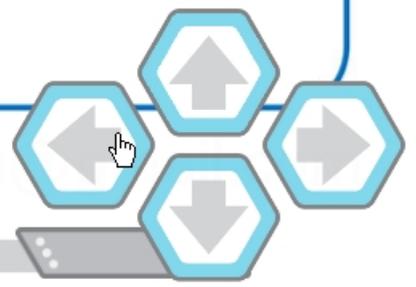
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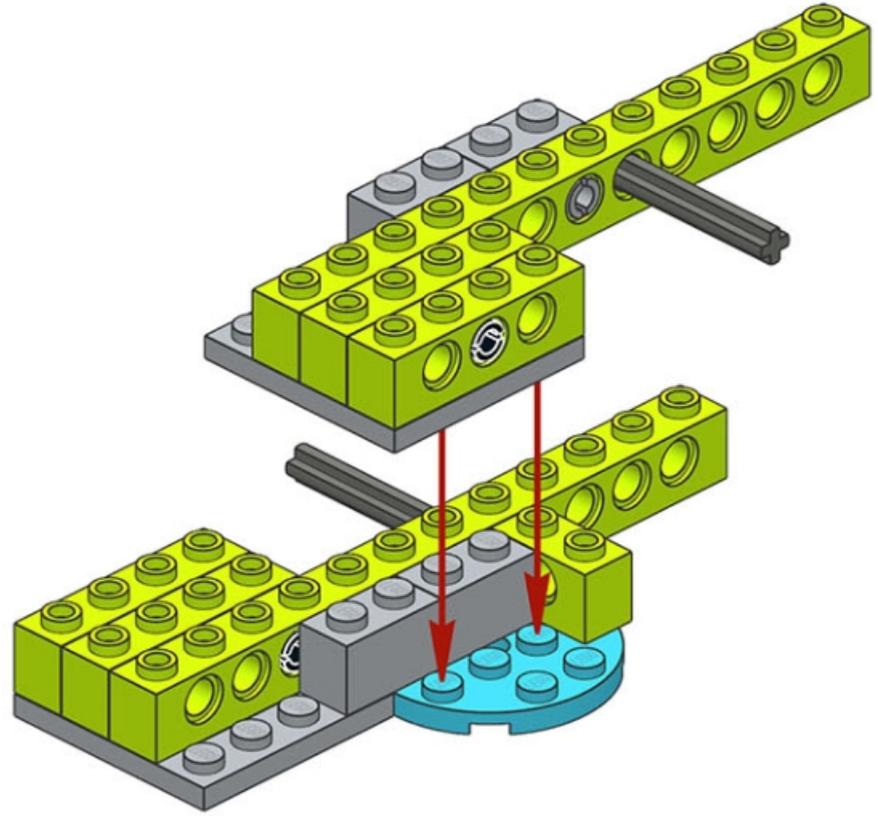
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31



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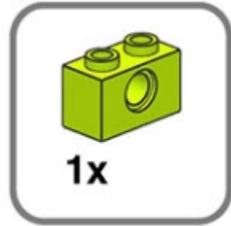
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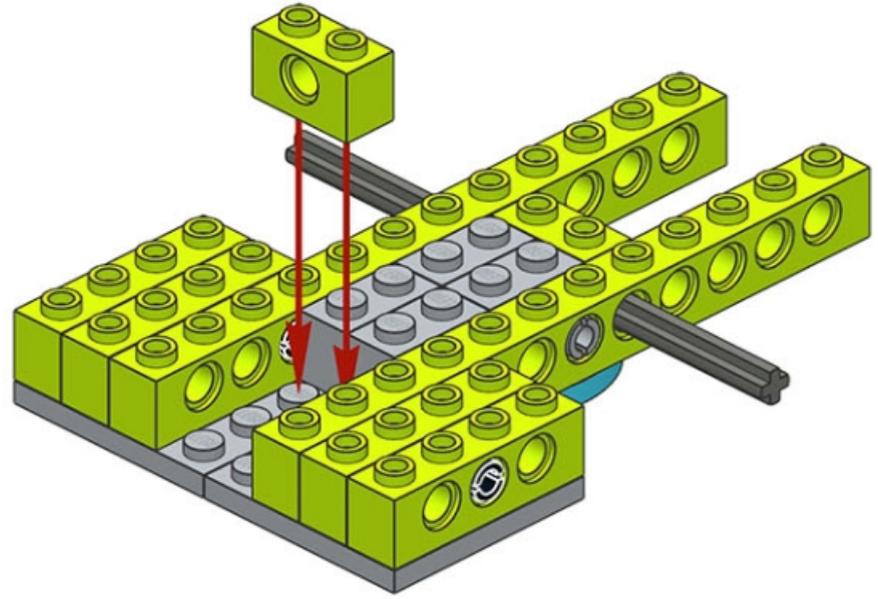
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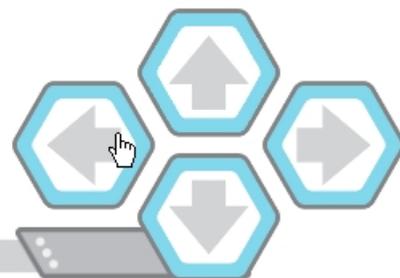
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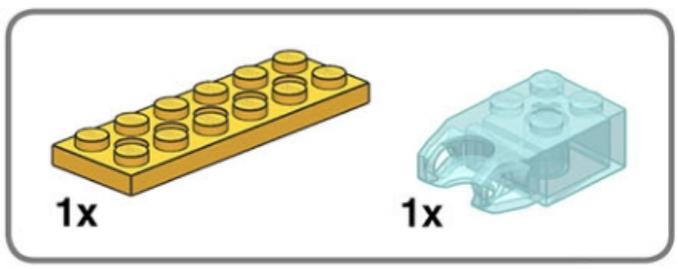
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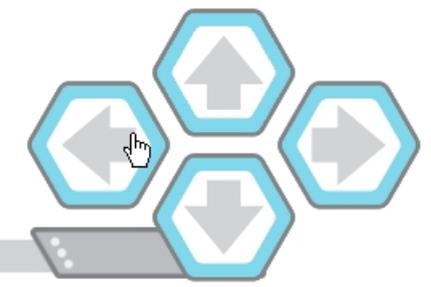
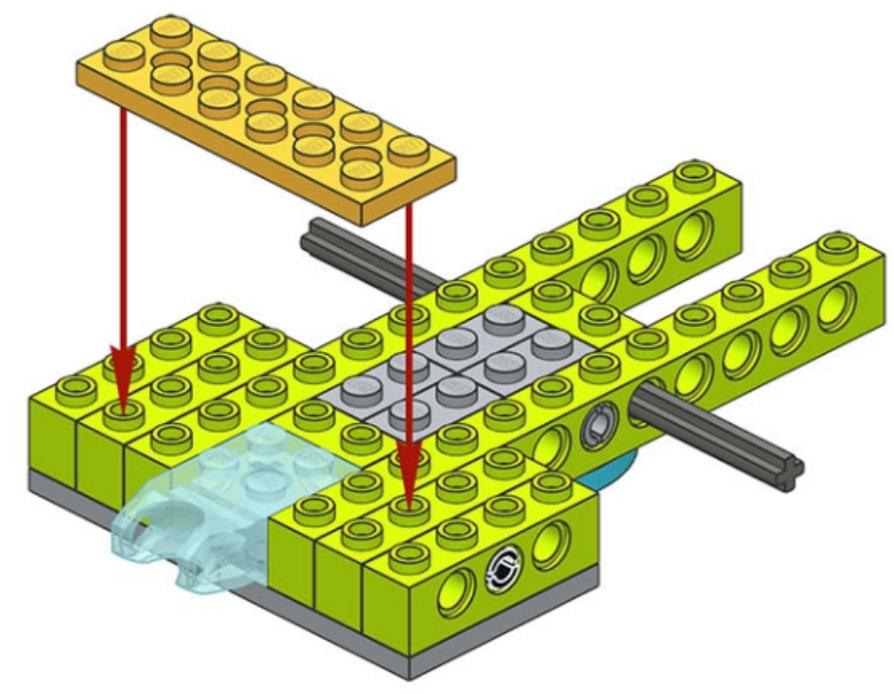
nerka@gmail.com



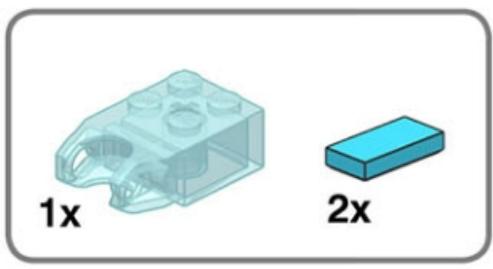
nerrka@gmail.com



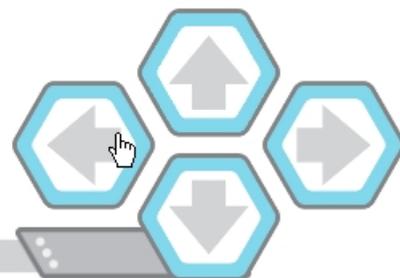
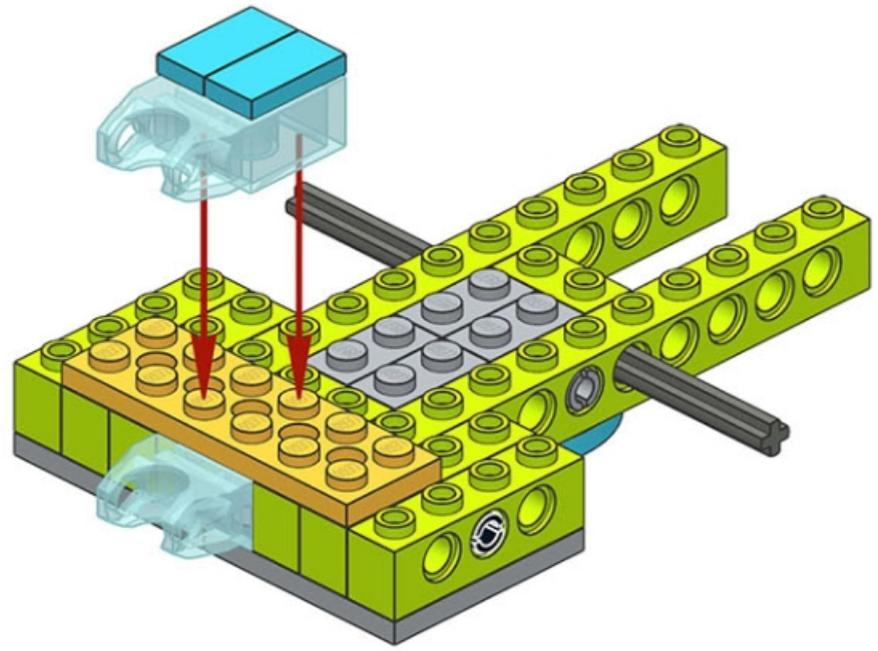
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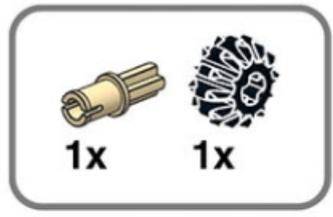


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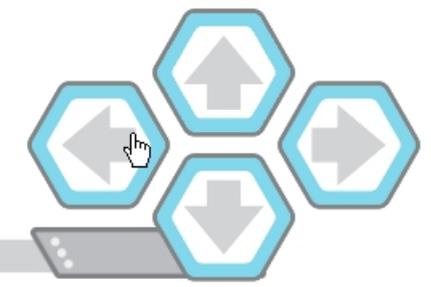
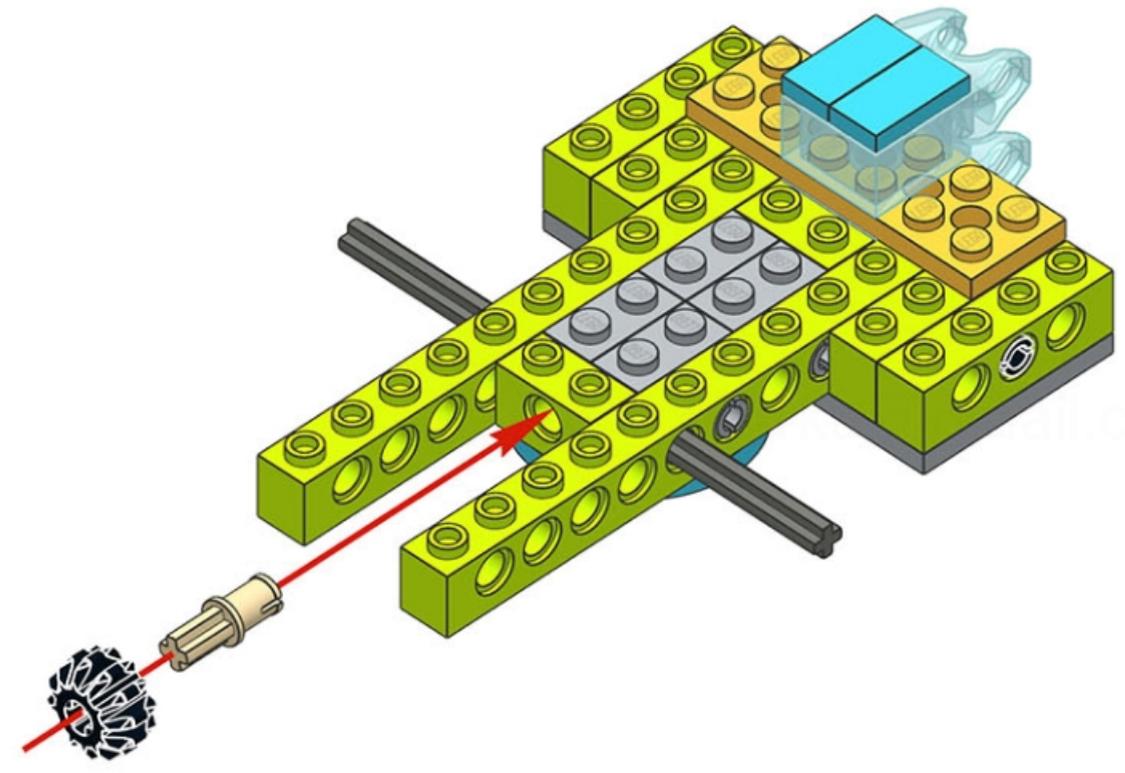


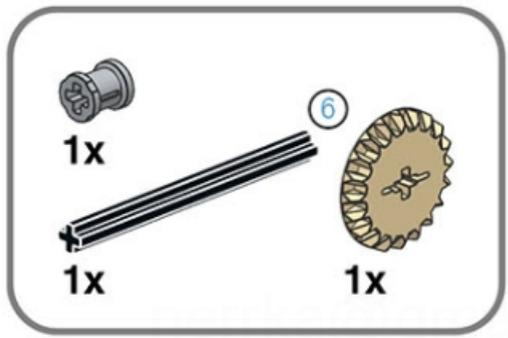
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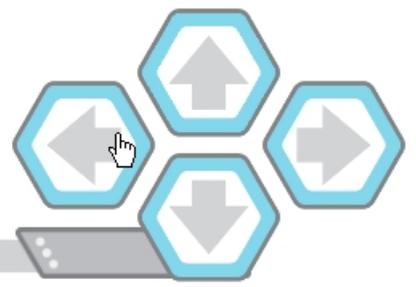
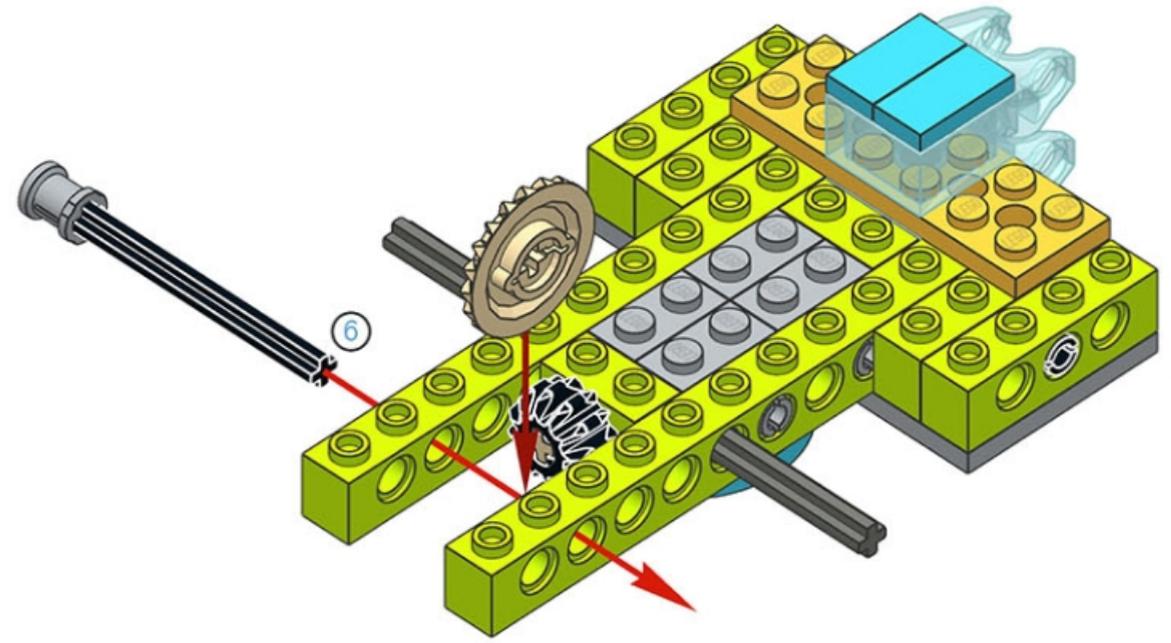


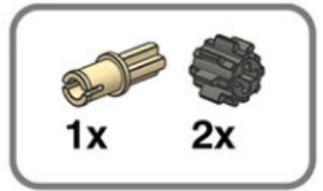
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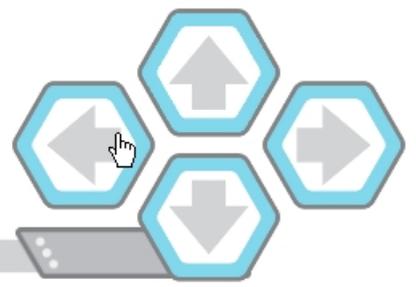
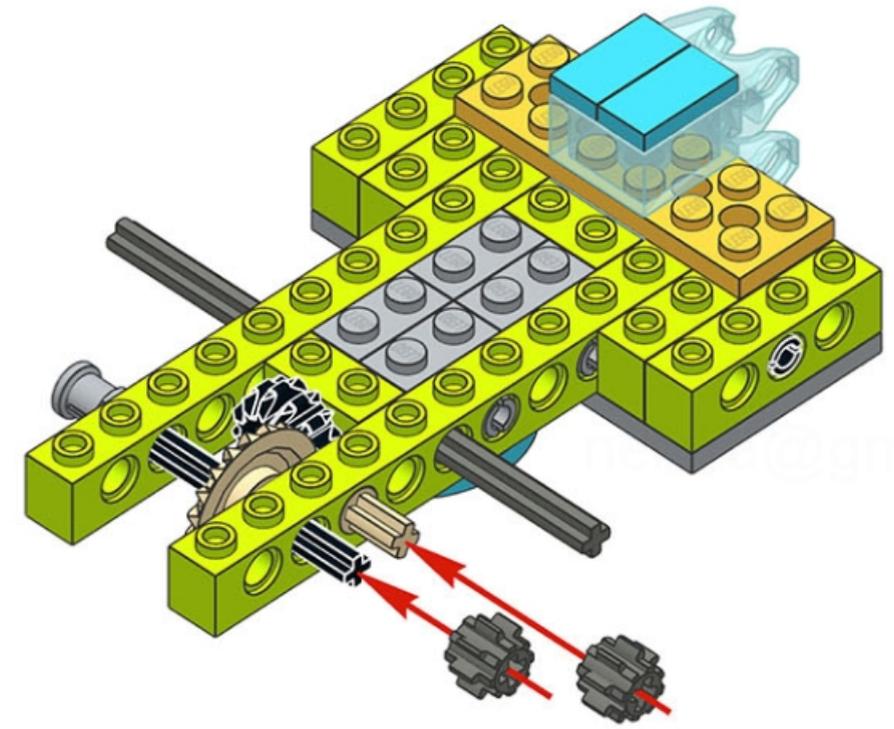


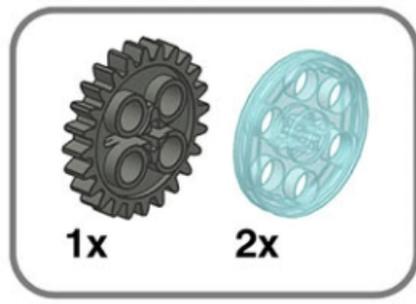
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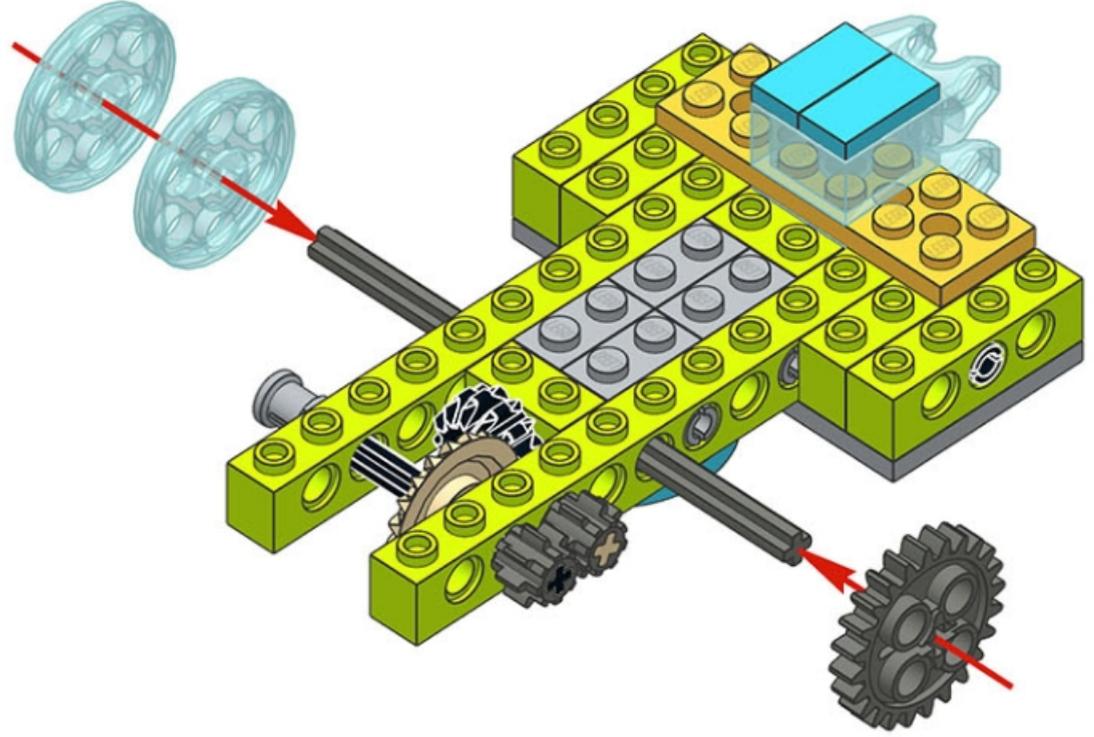
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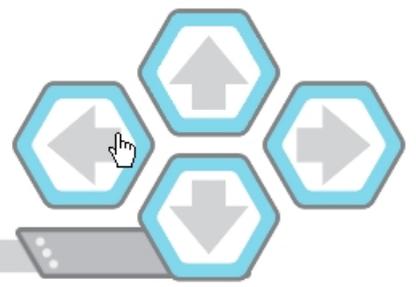
nerrka@gmail.com



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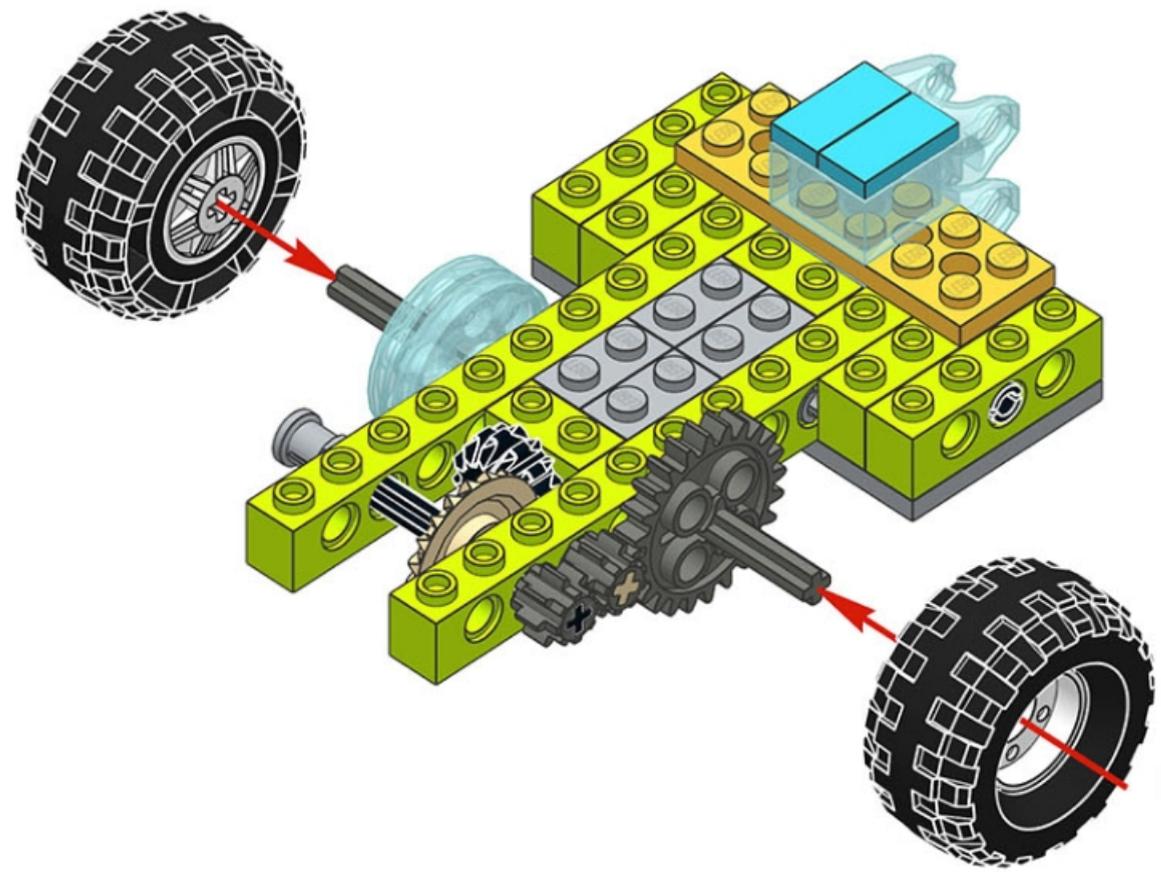
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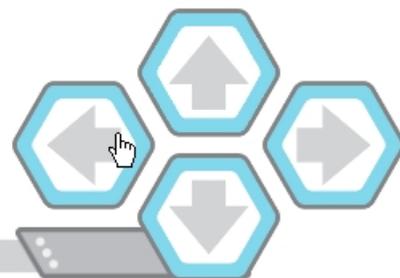




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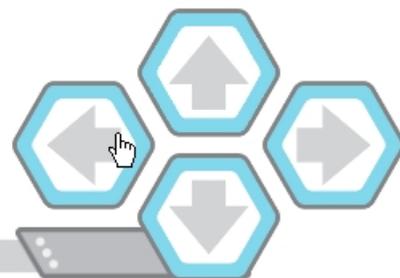
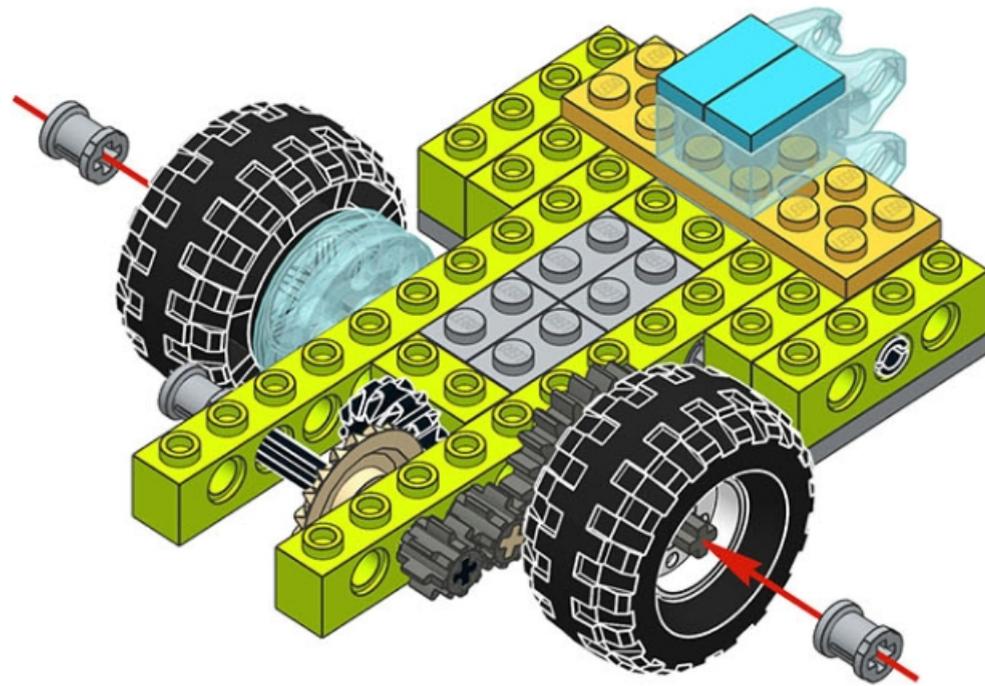
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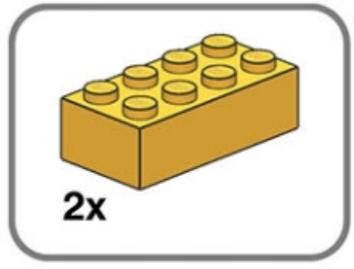




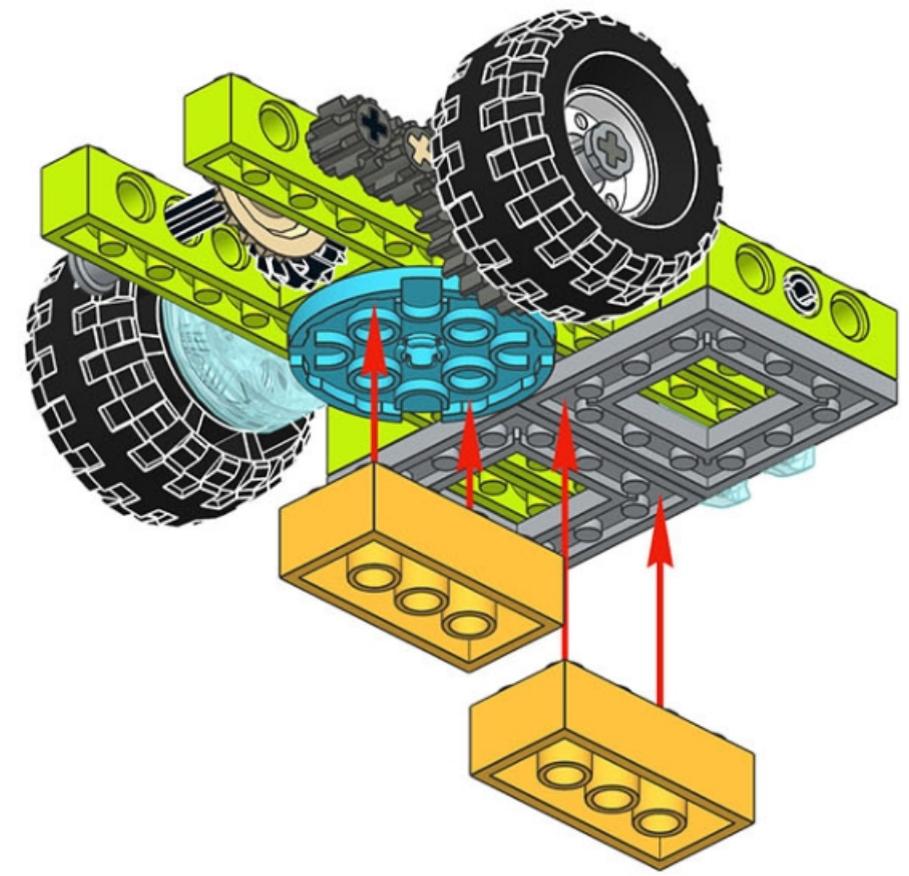
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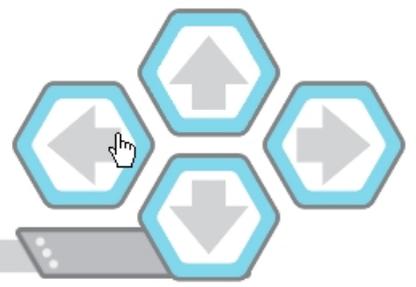




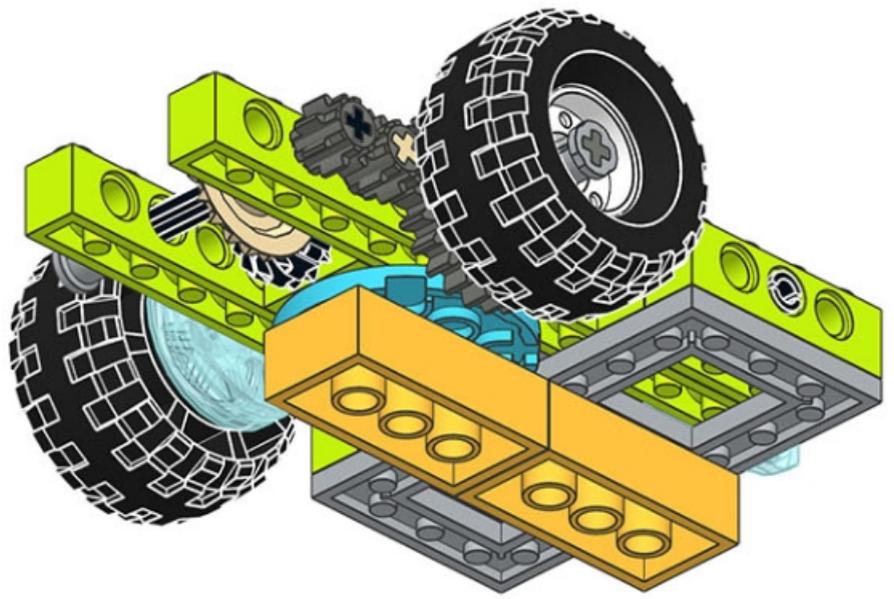
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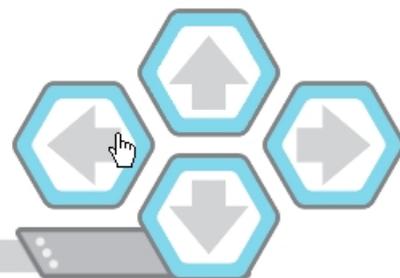
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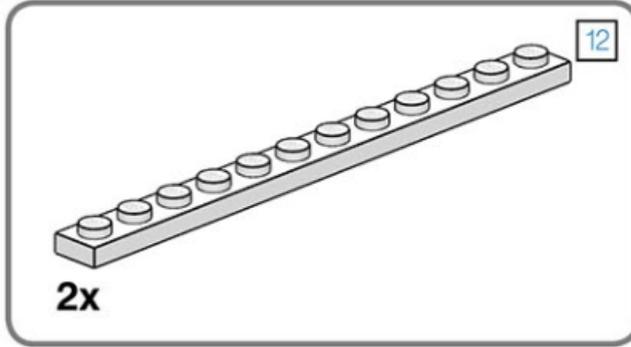


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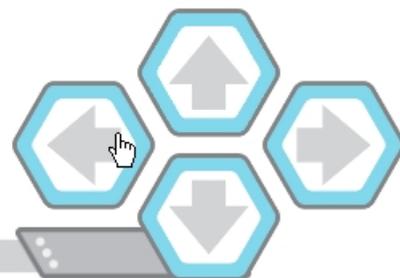
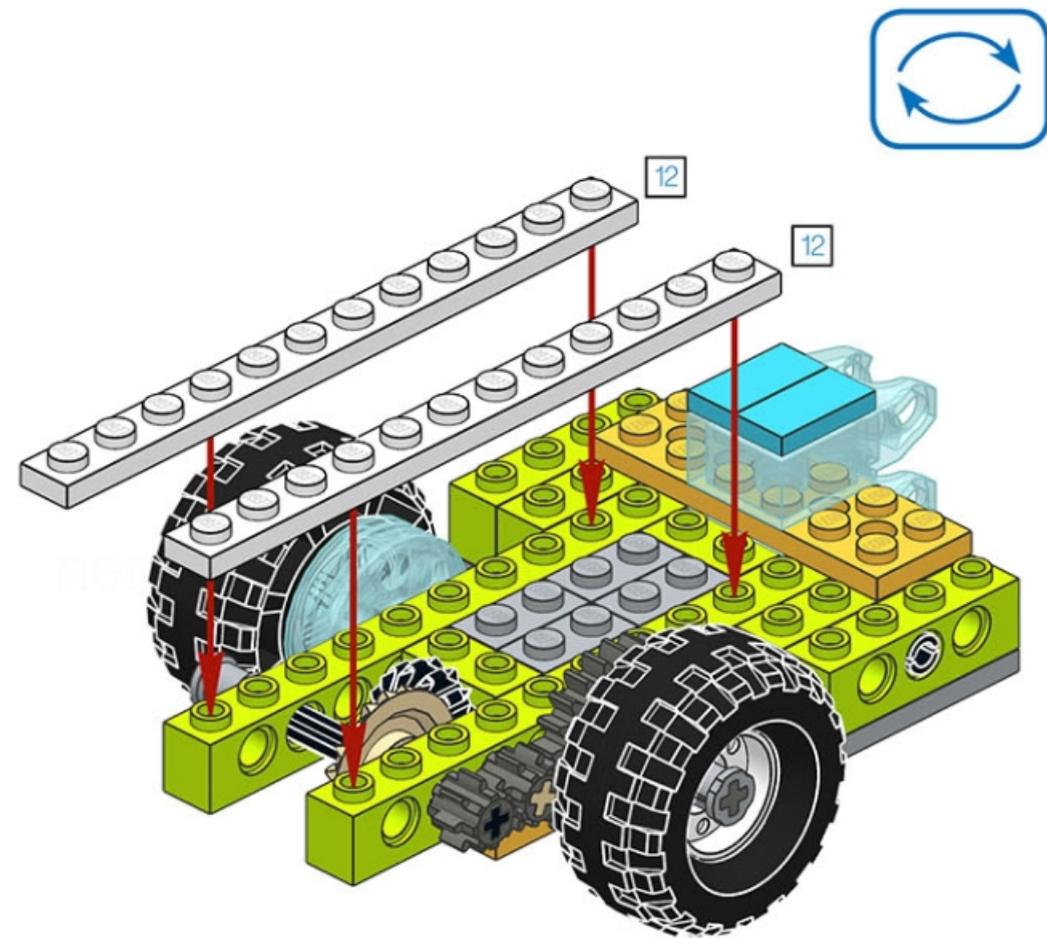


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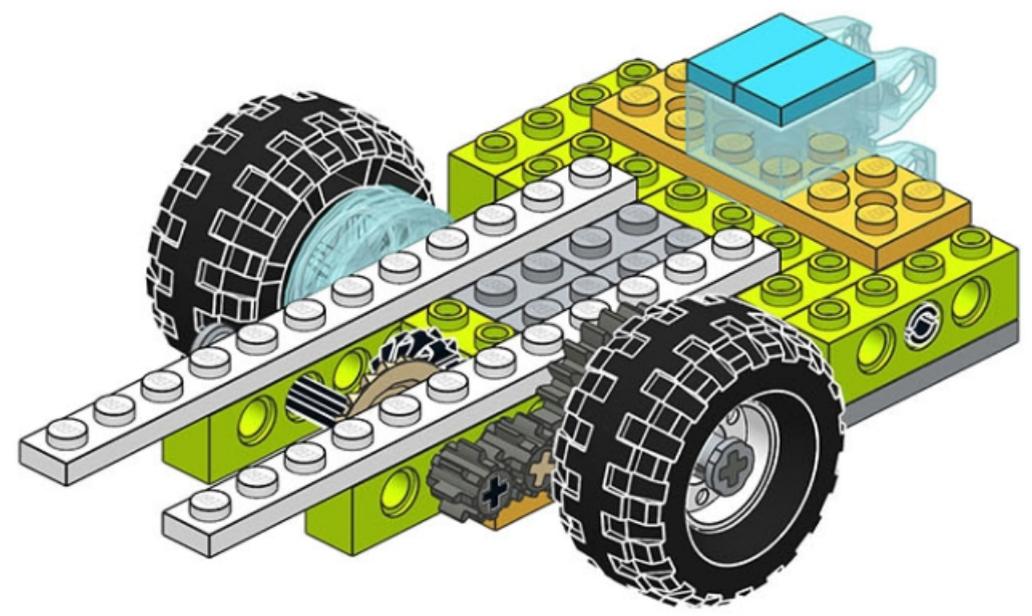




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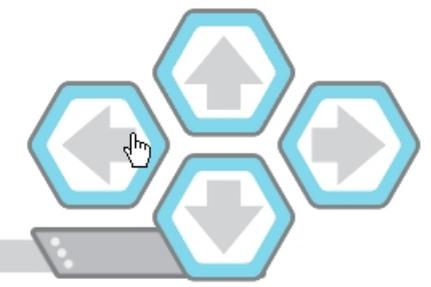


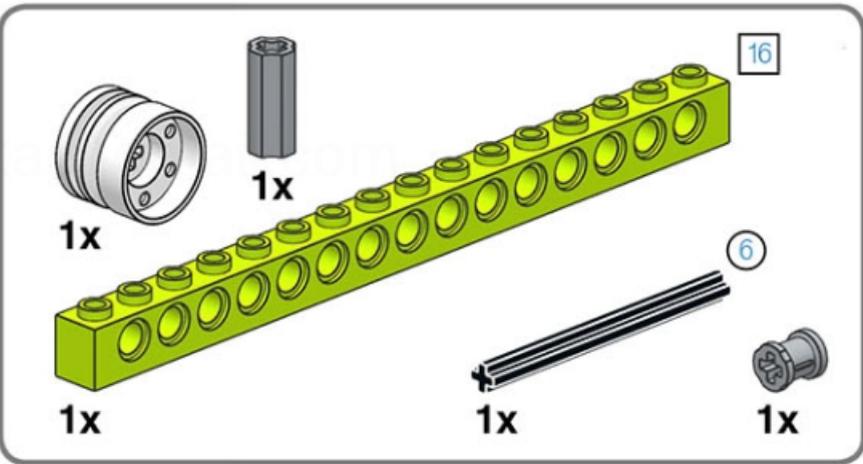
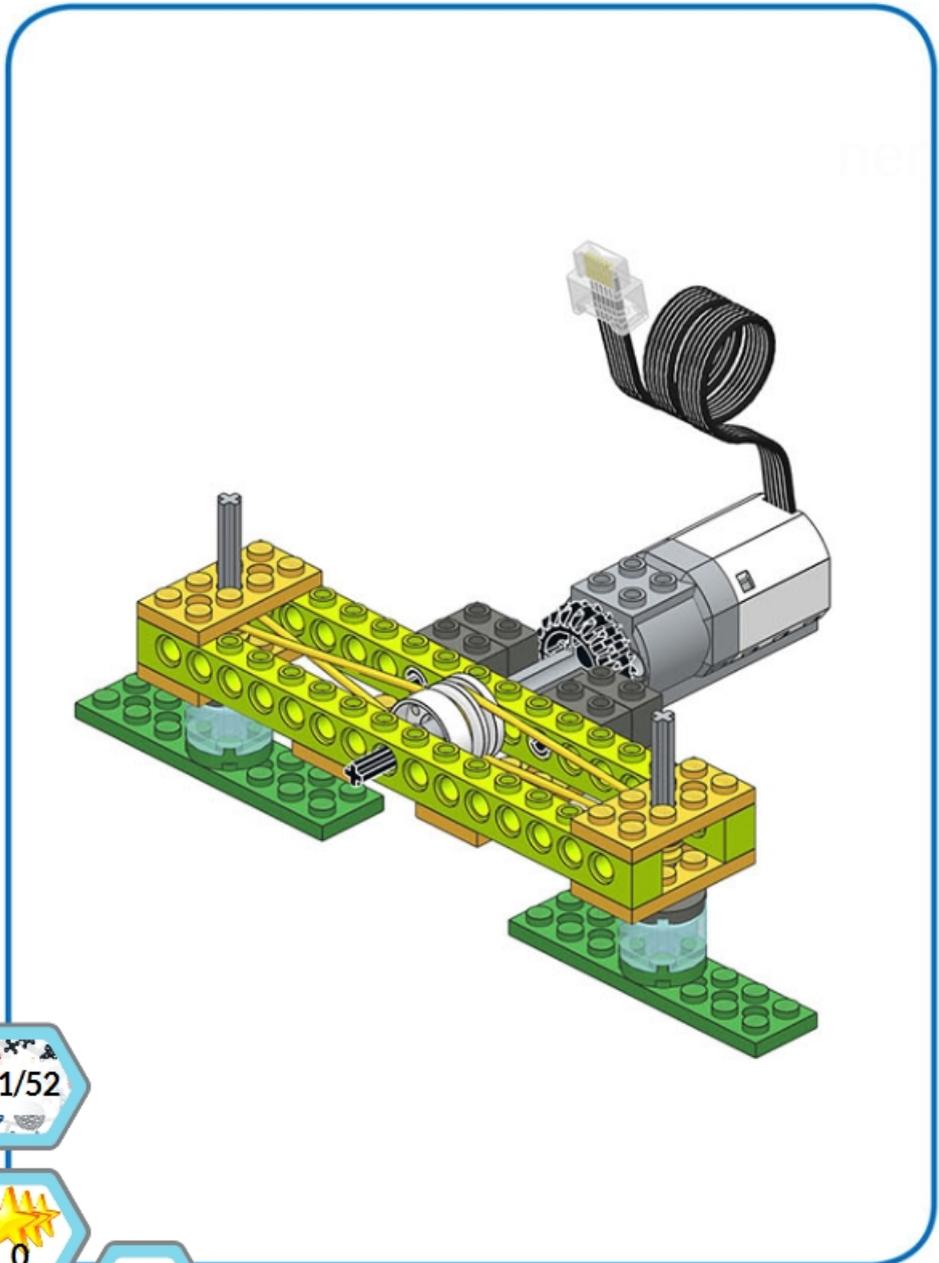
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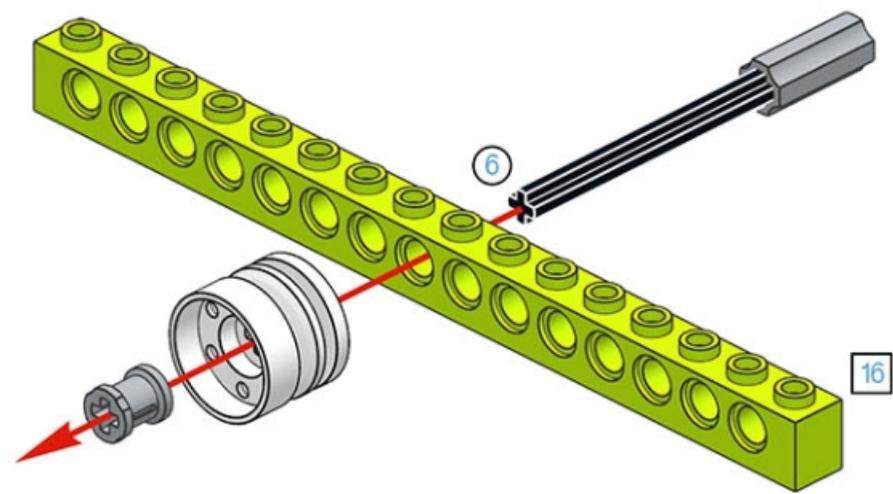


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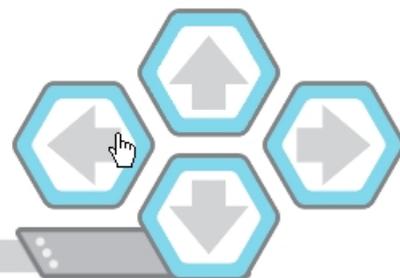
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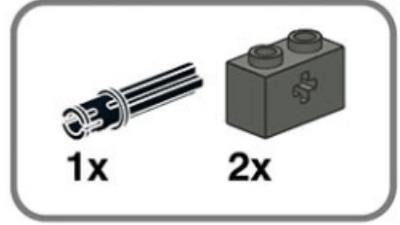


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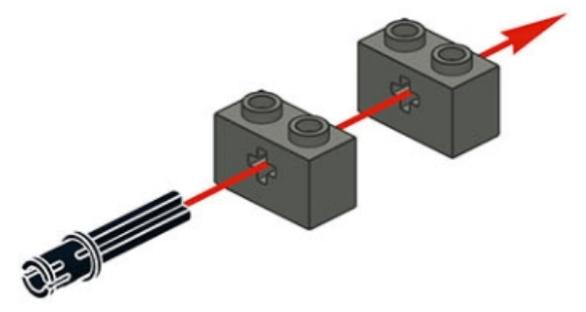
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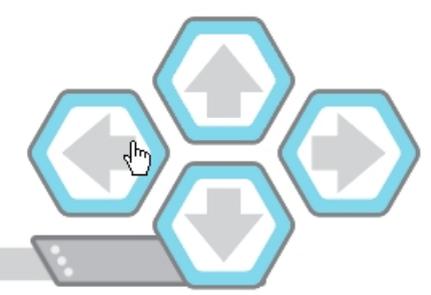
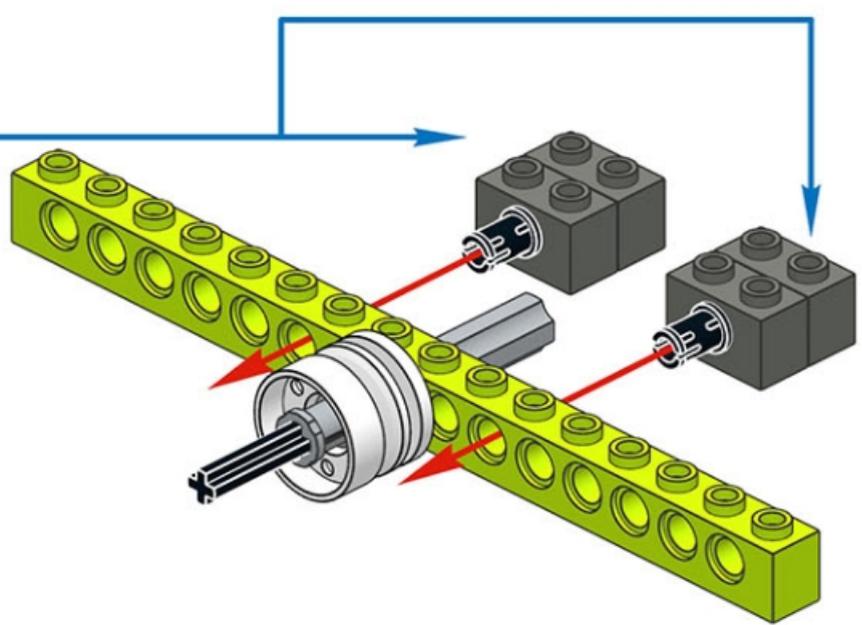
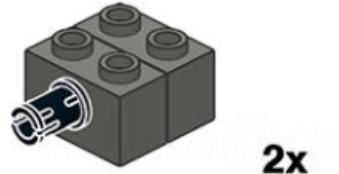


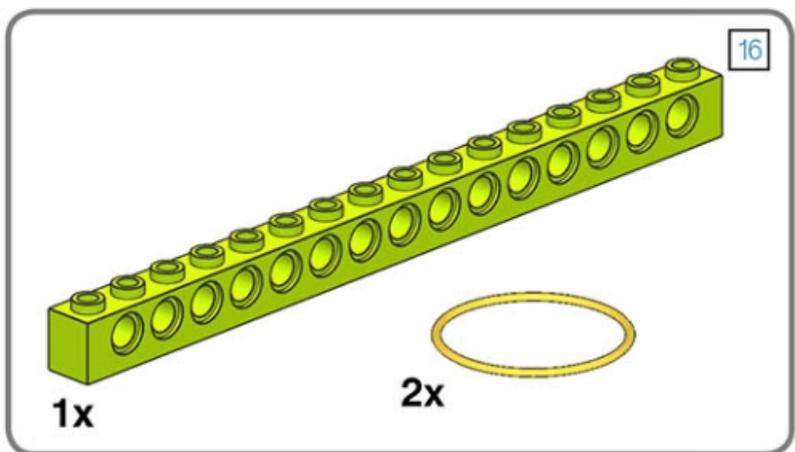


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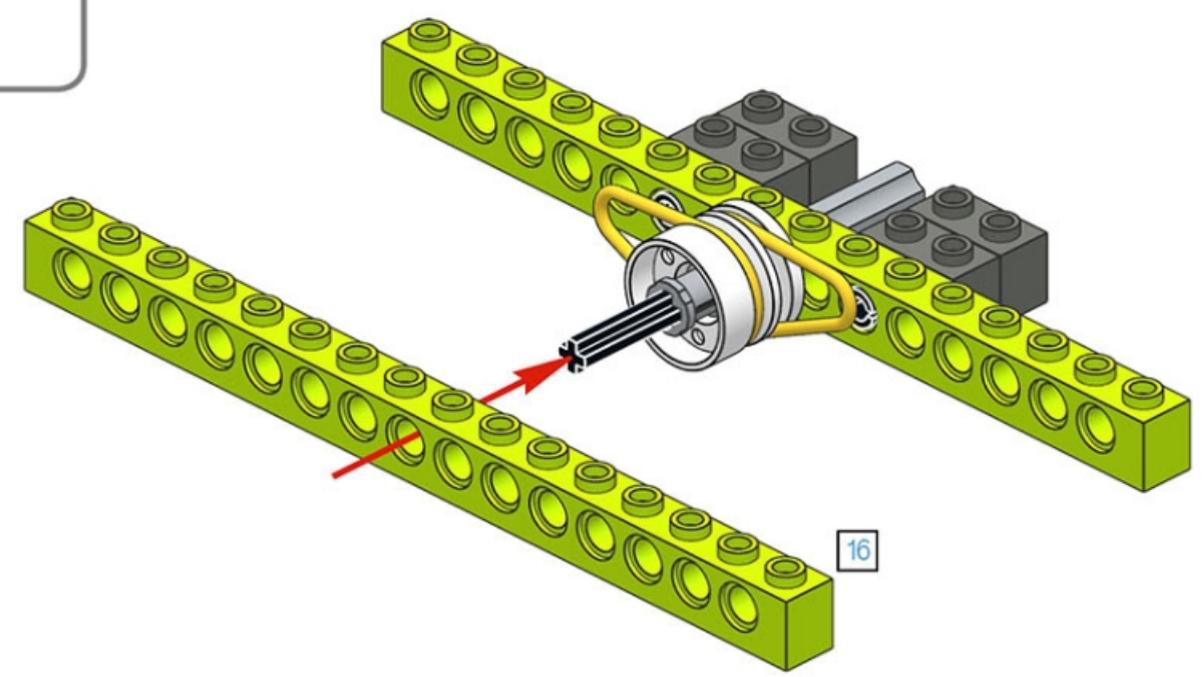


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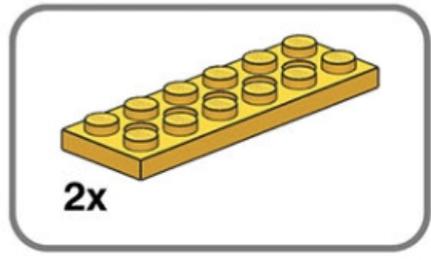
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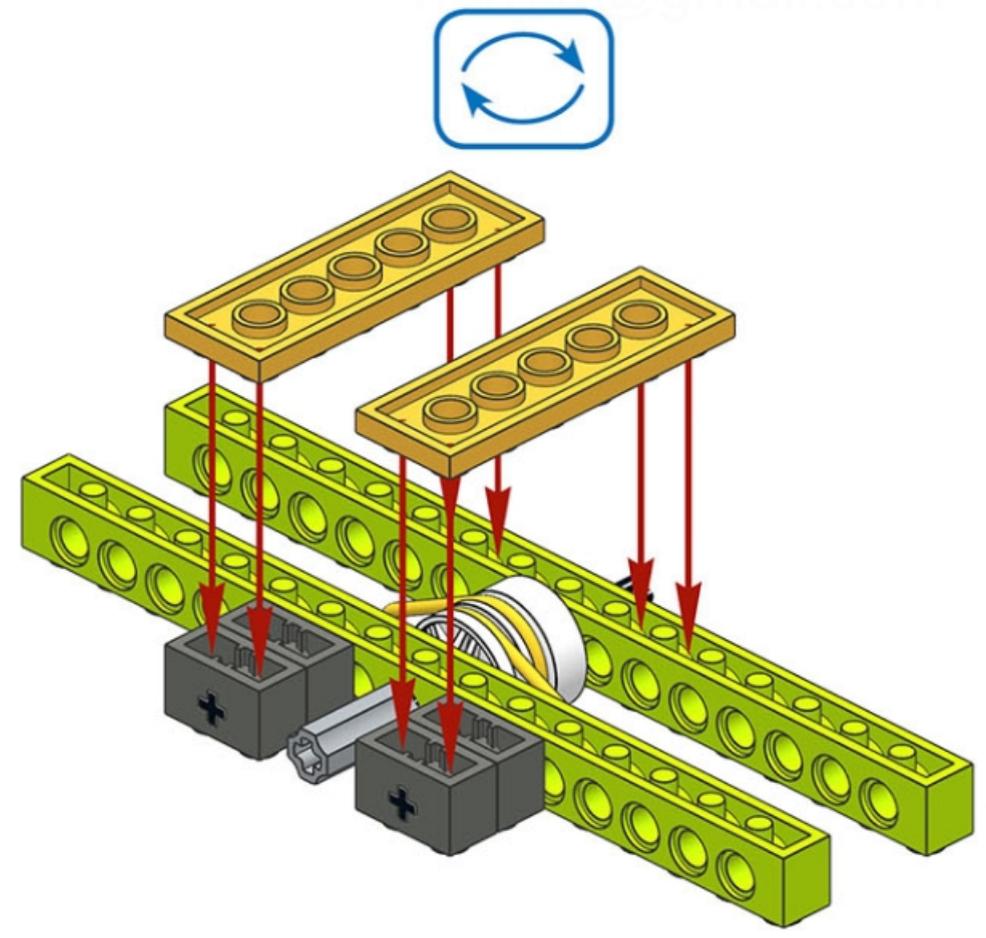
23/52

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48



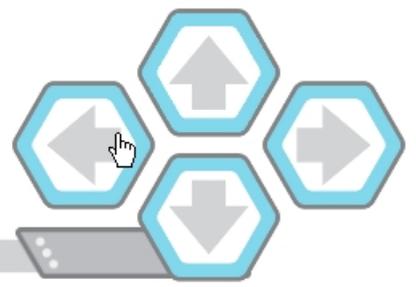
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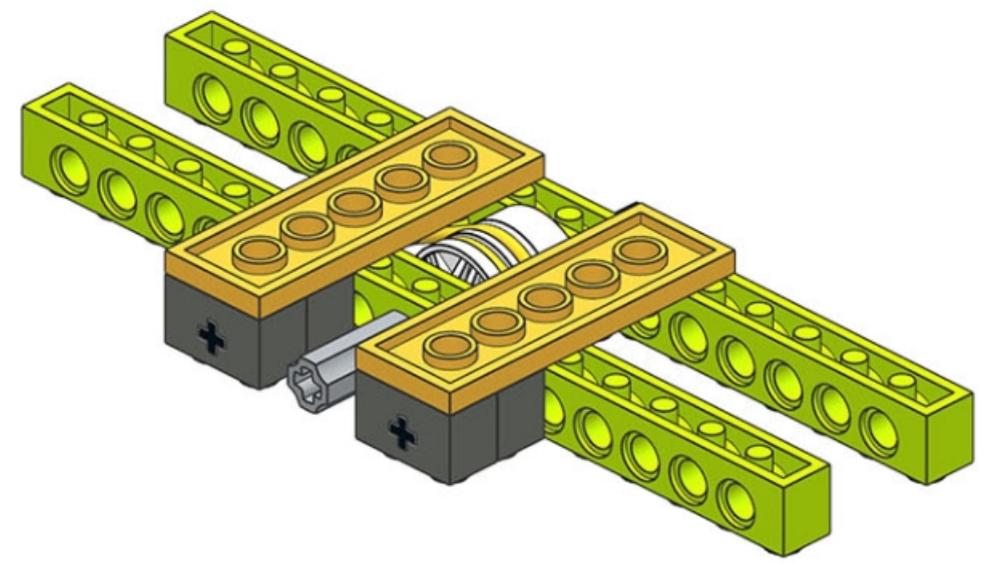
24/52

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49



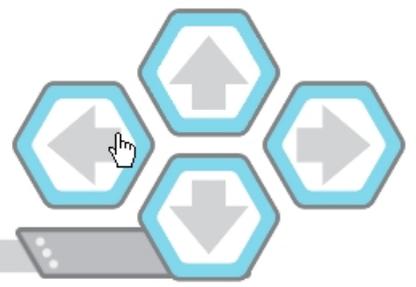
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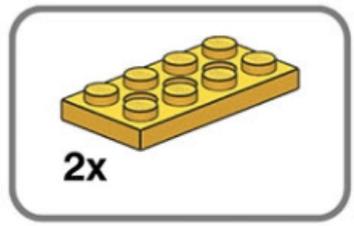


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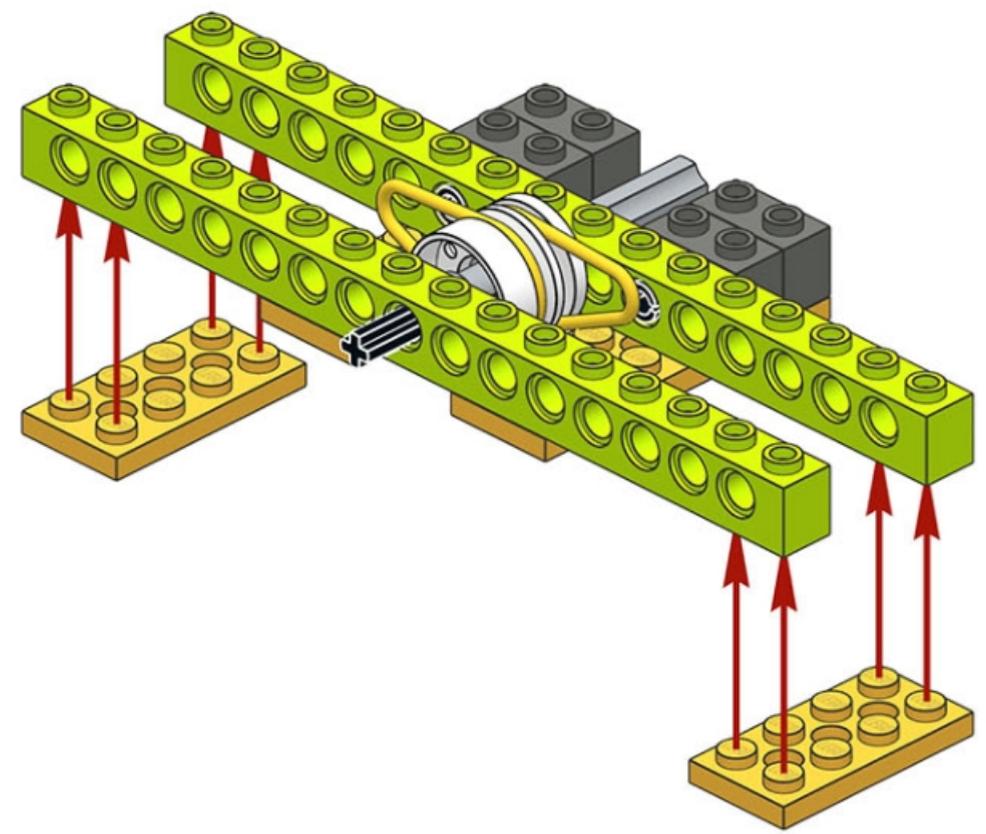
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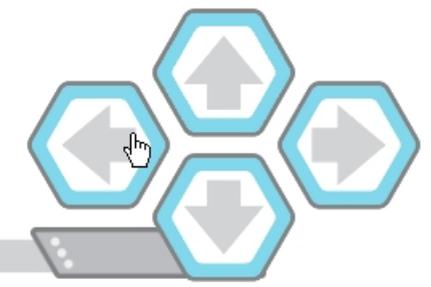




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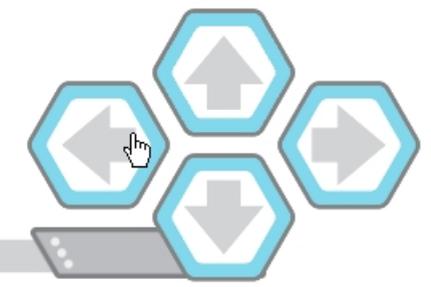
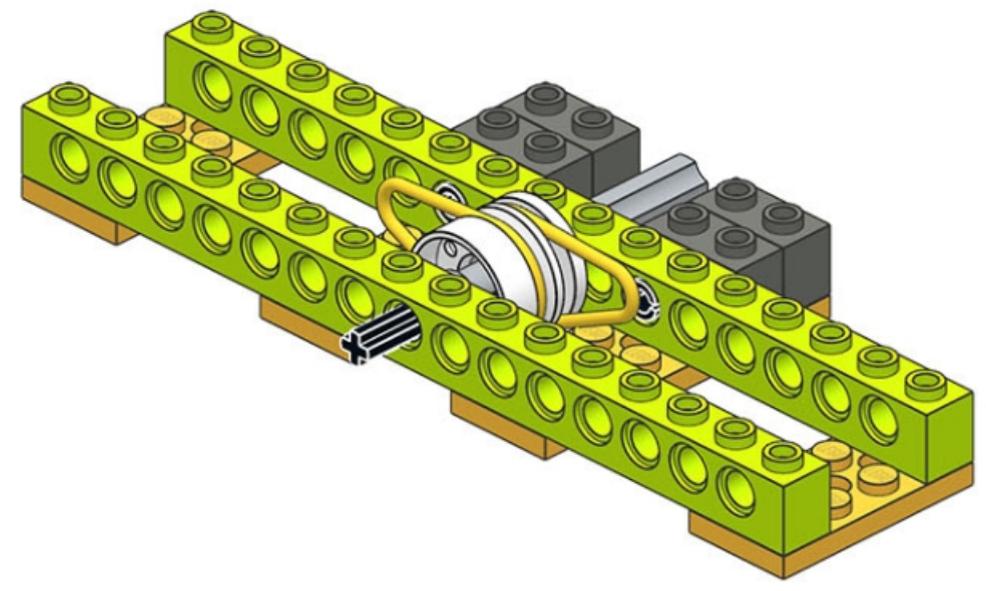


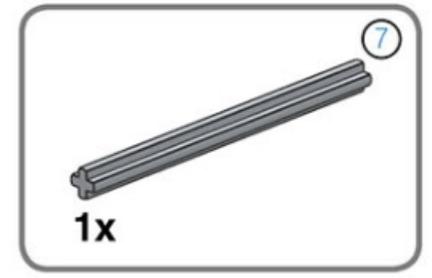
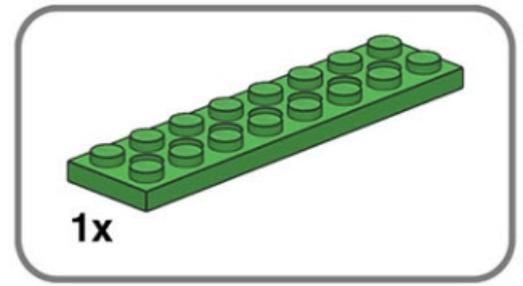
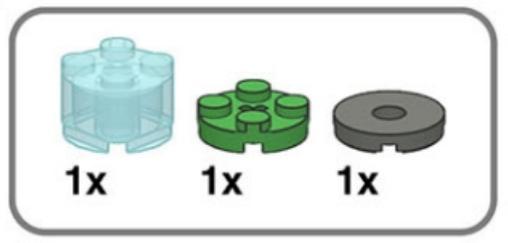
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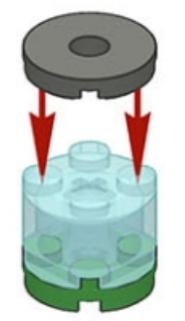
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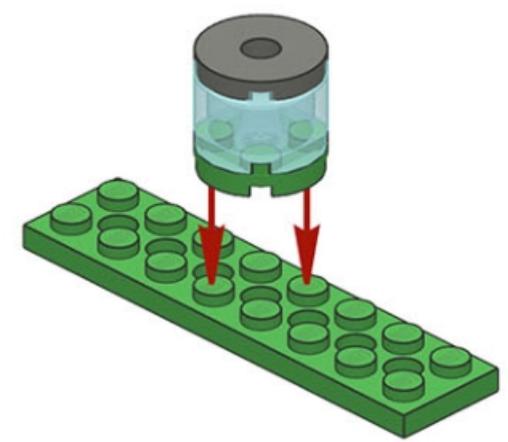




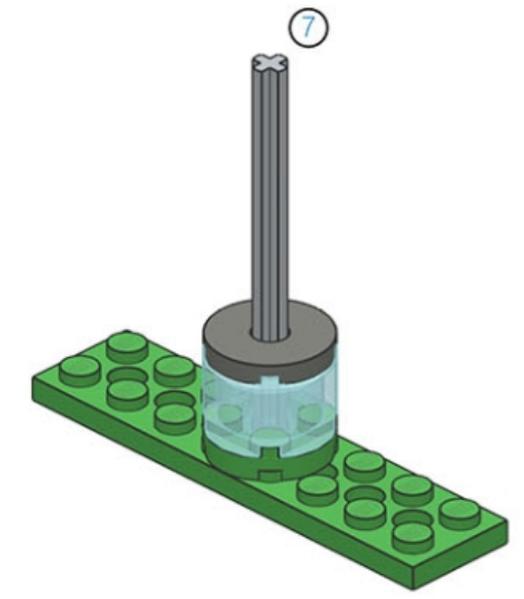
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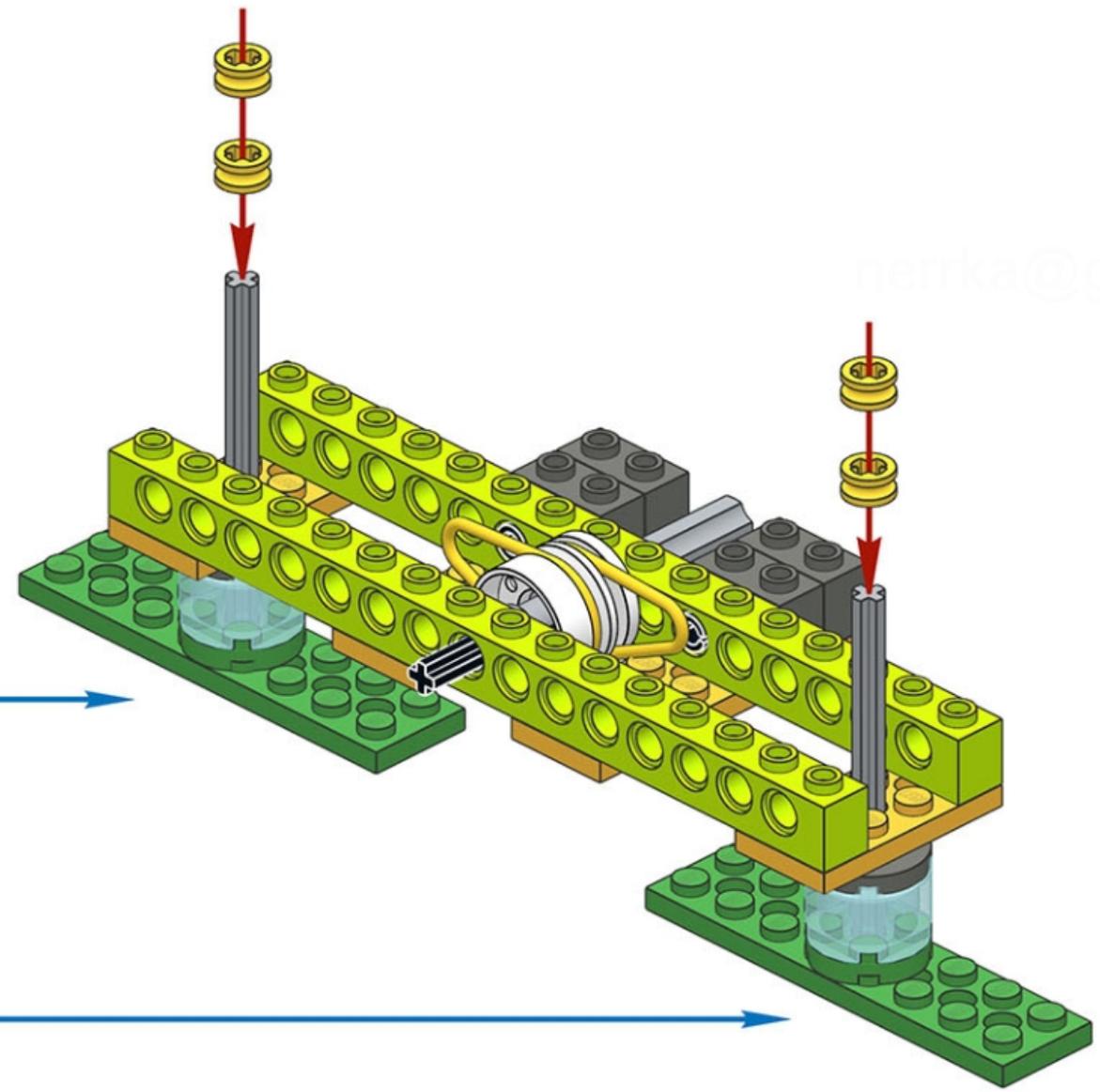
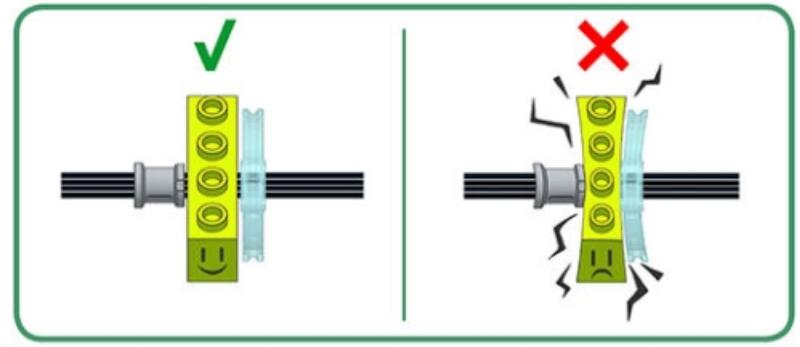
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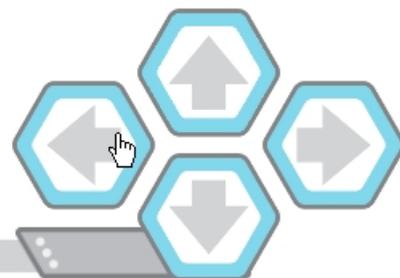


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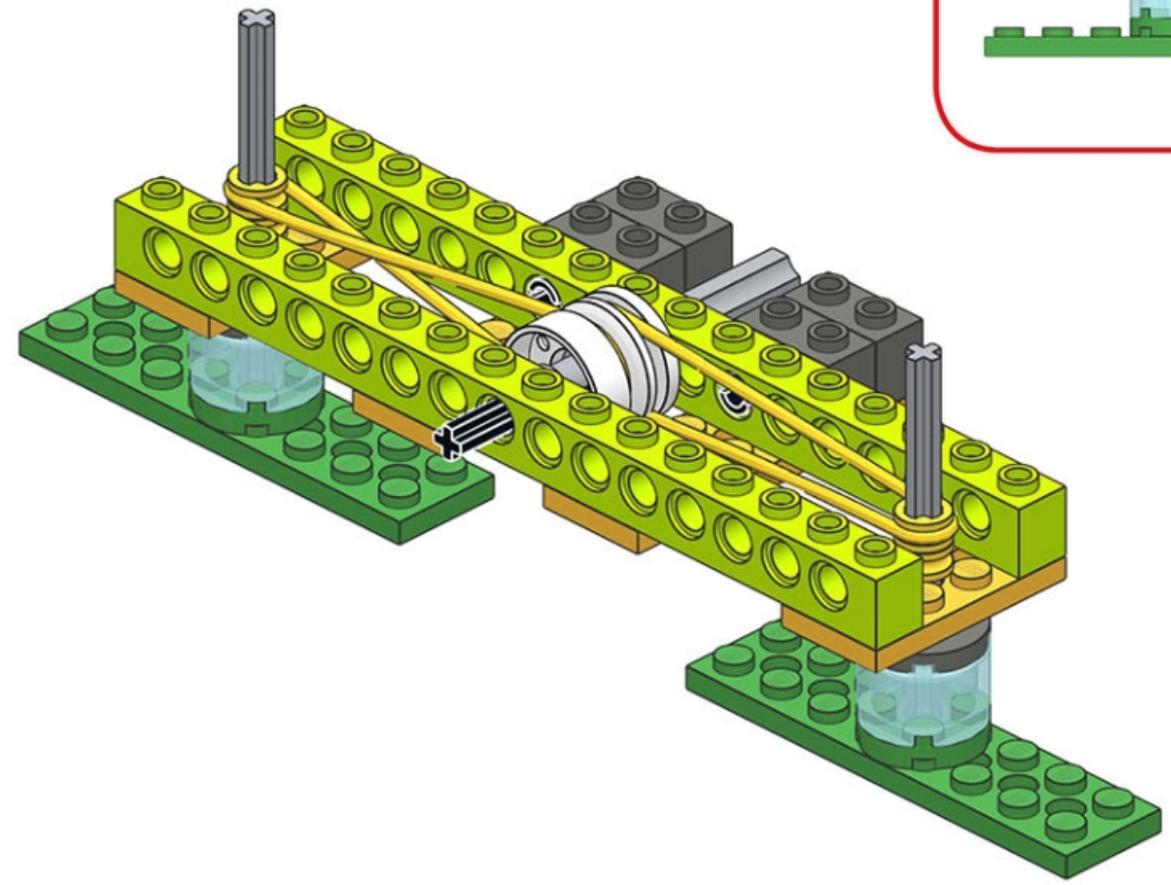
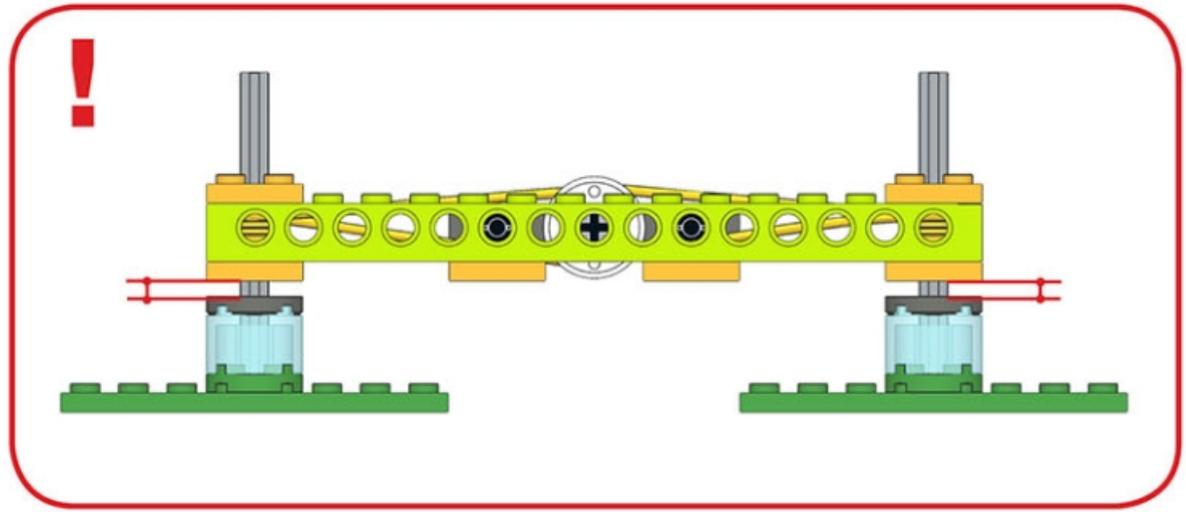
  
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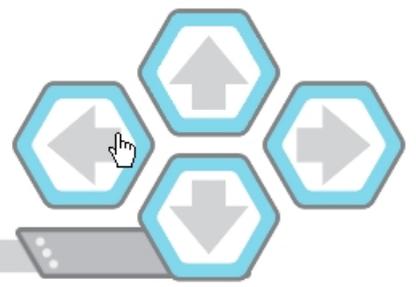


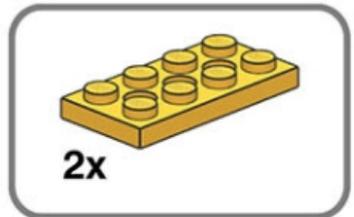
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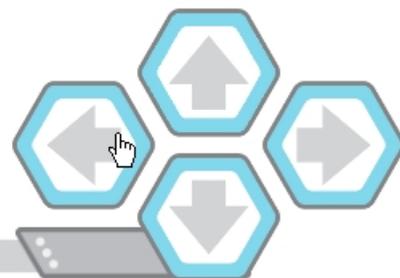
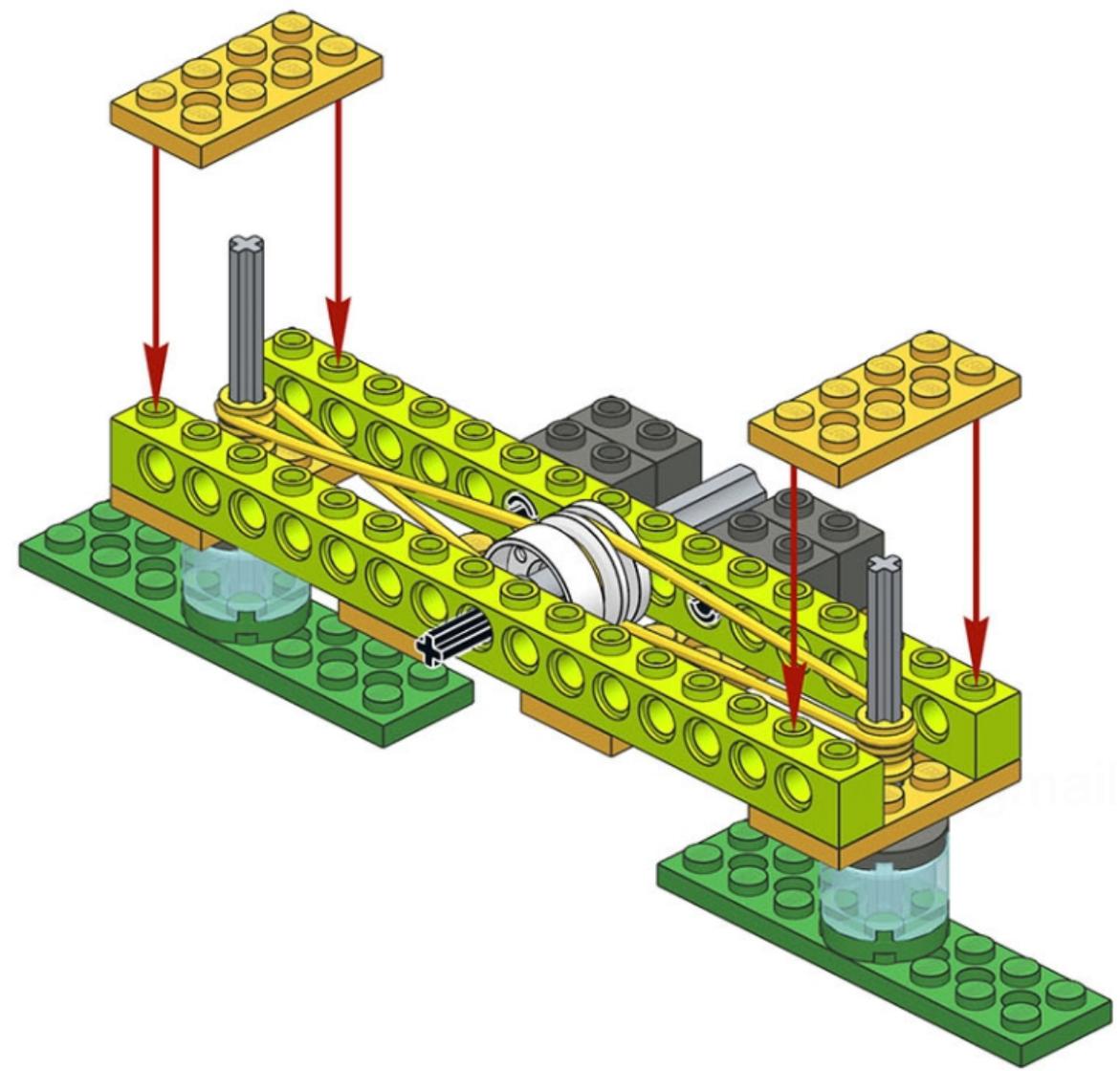
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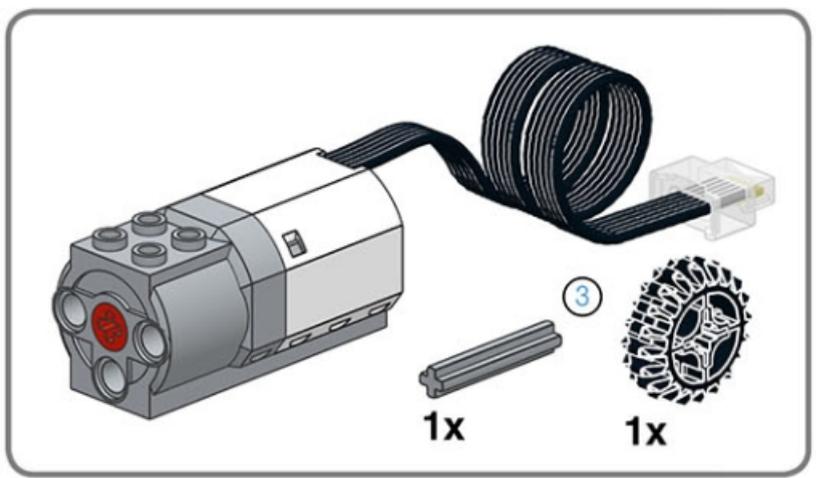
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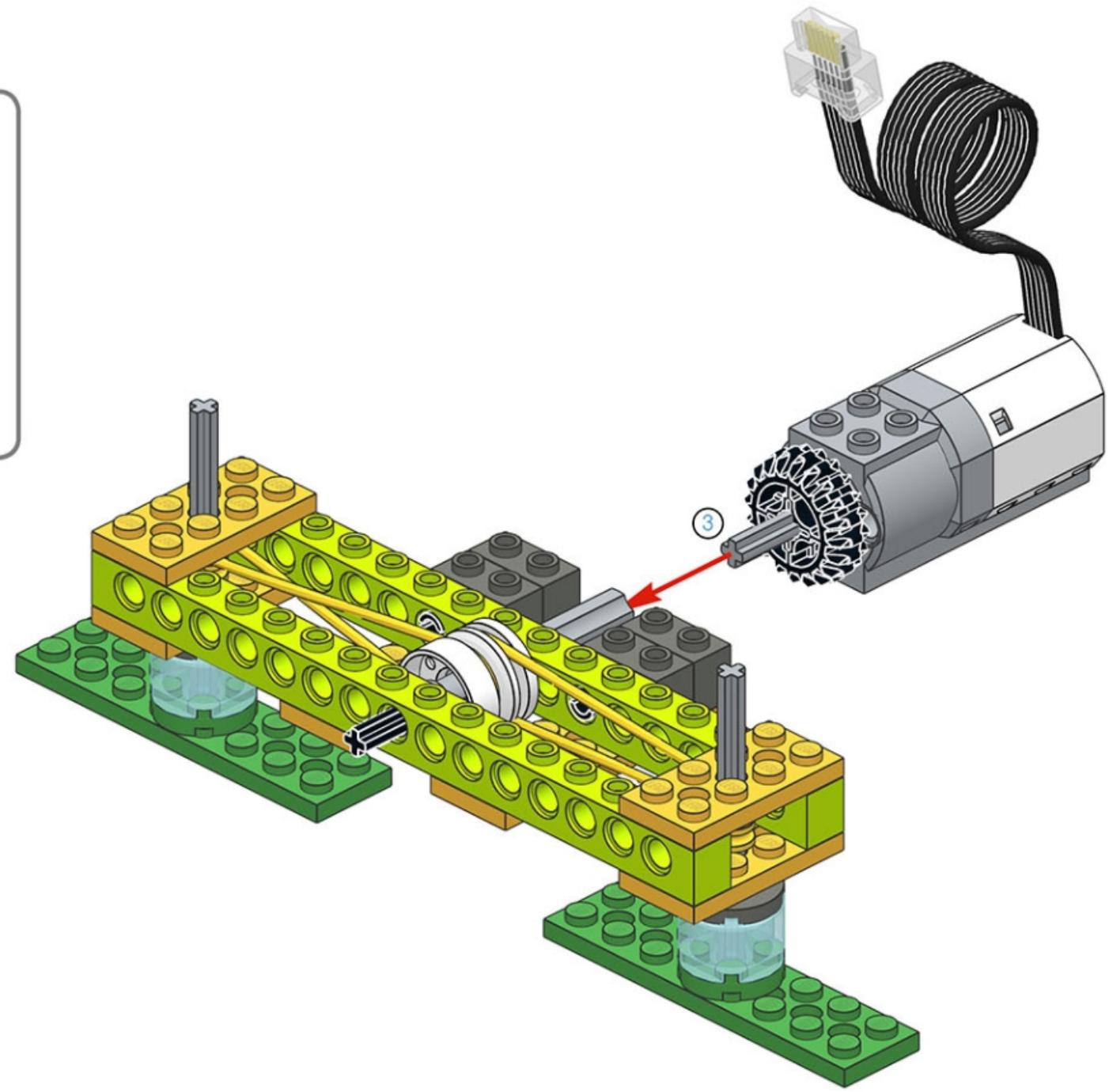


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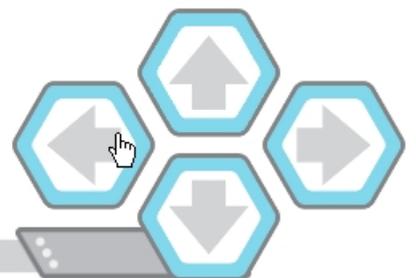


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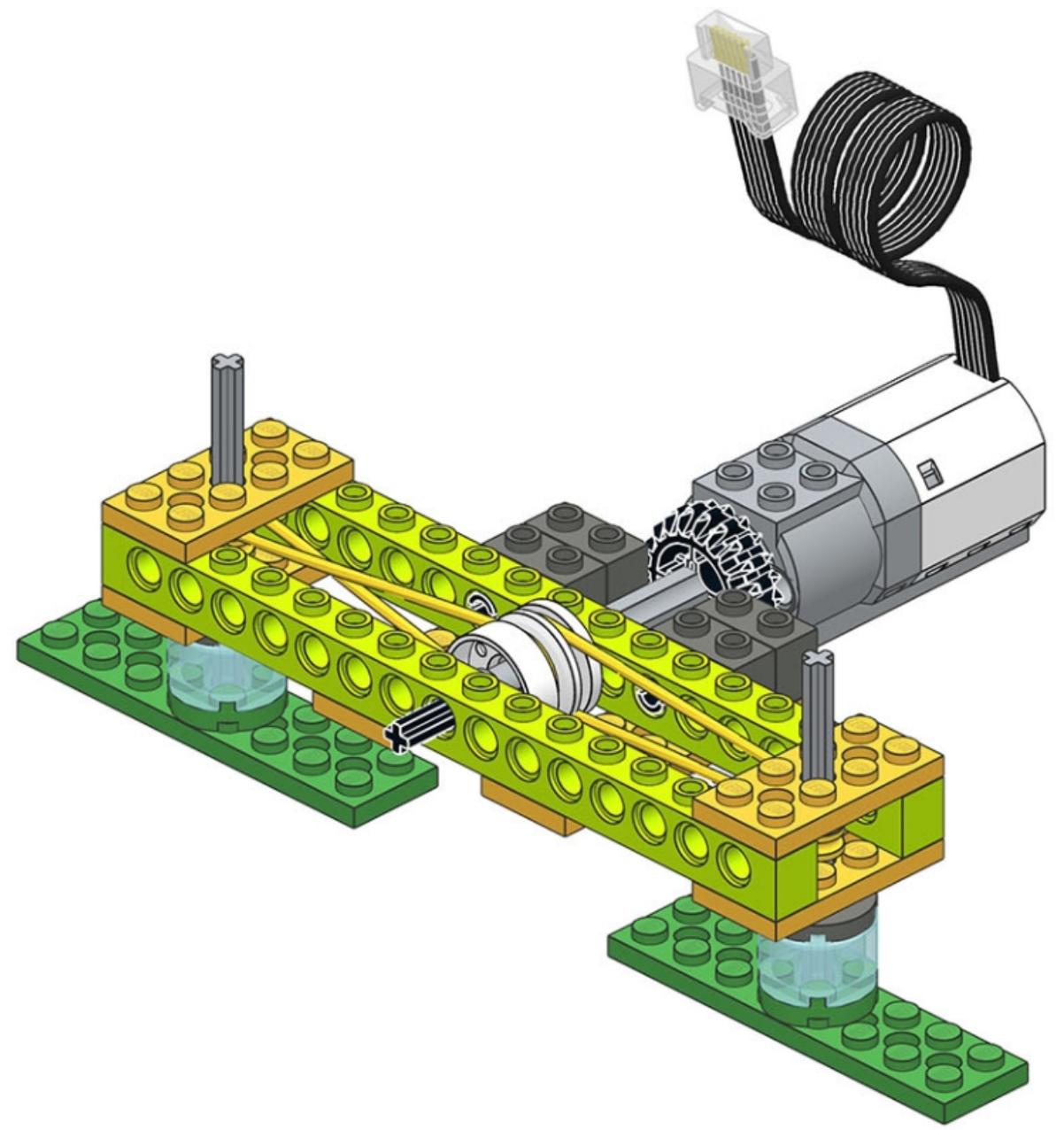
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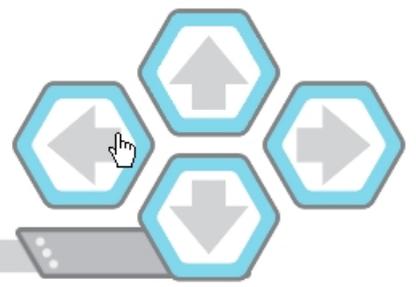


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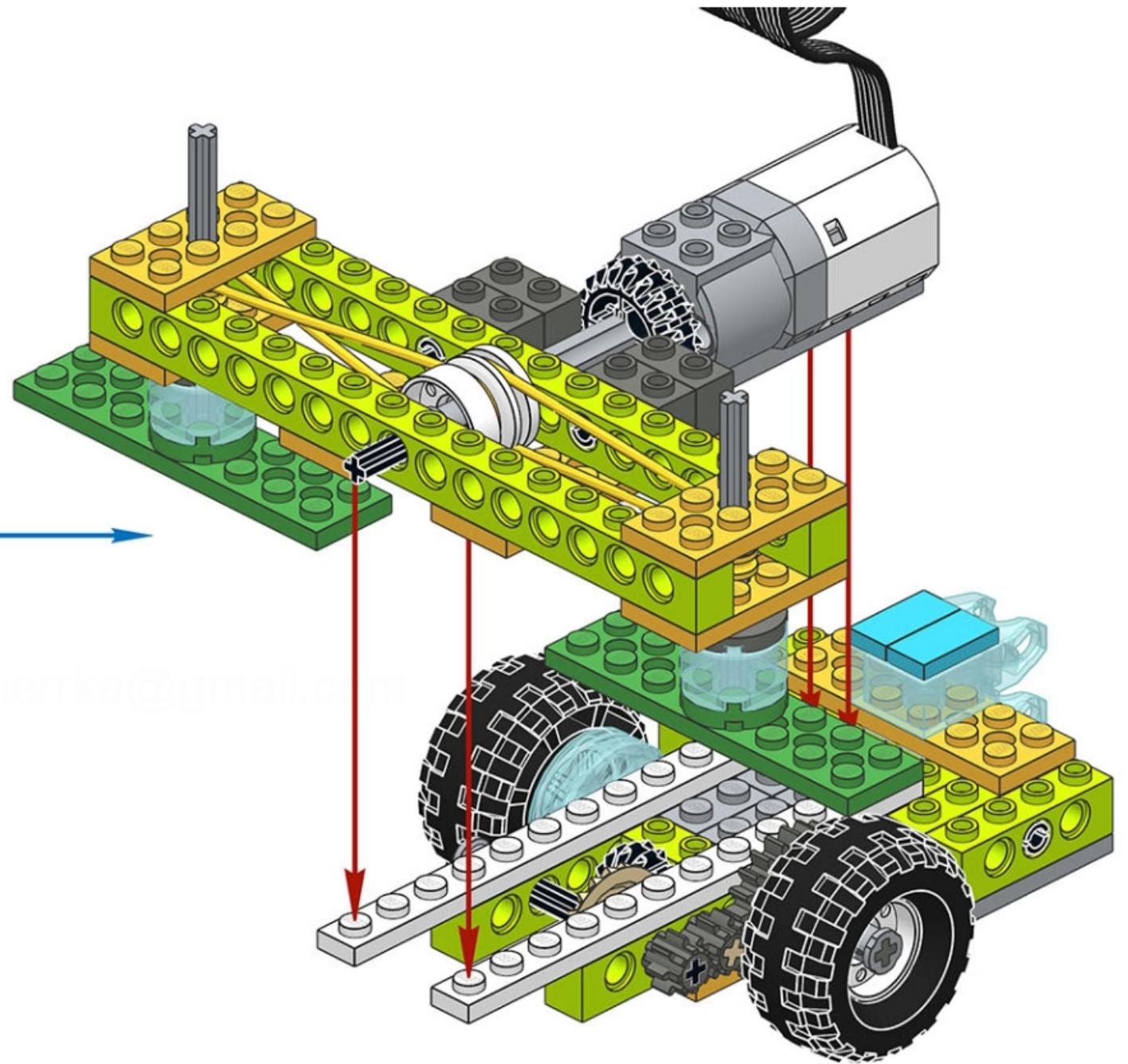
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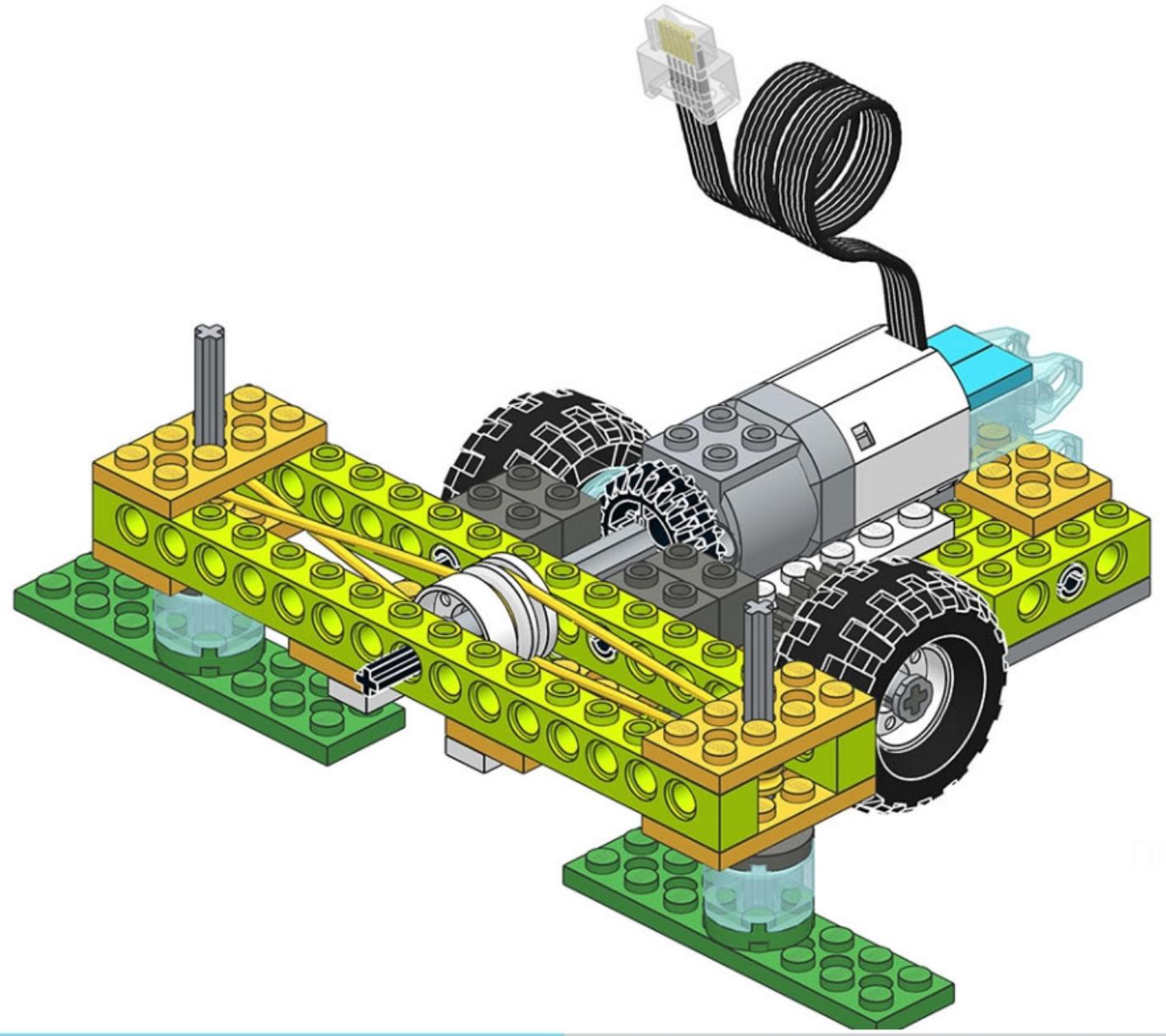
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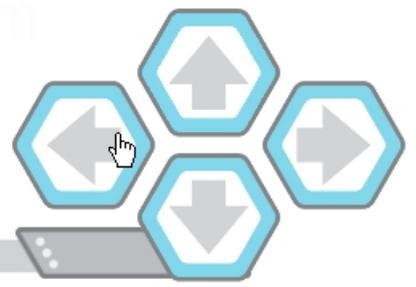


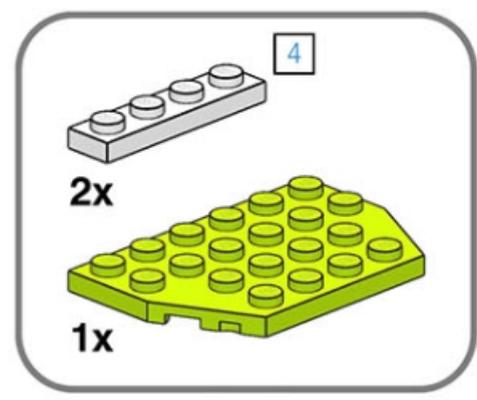
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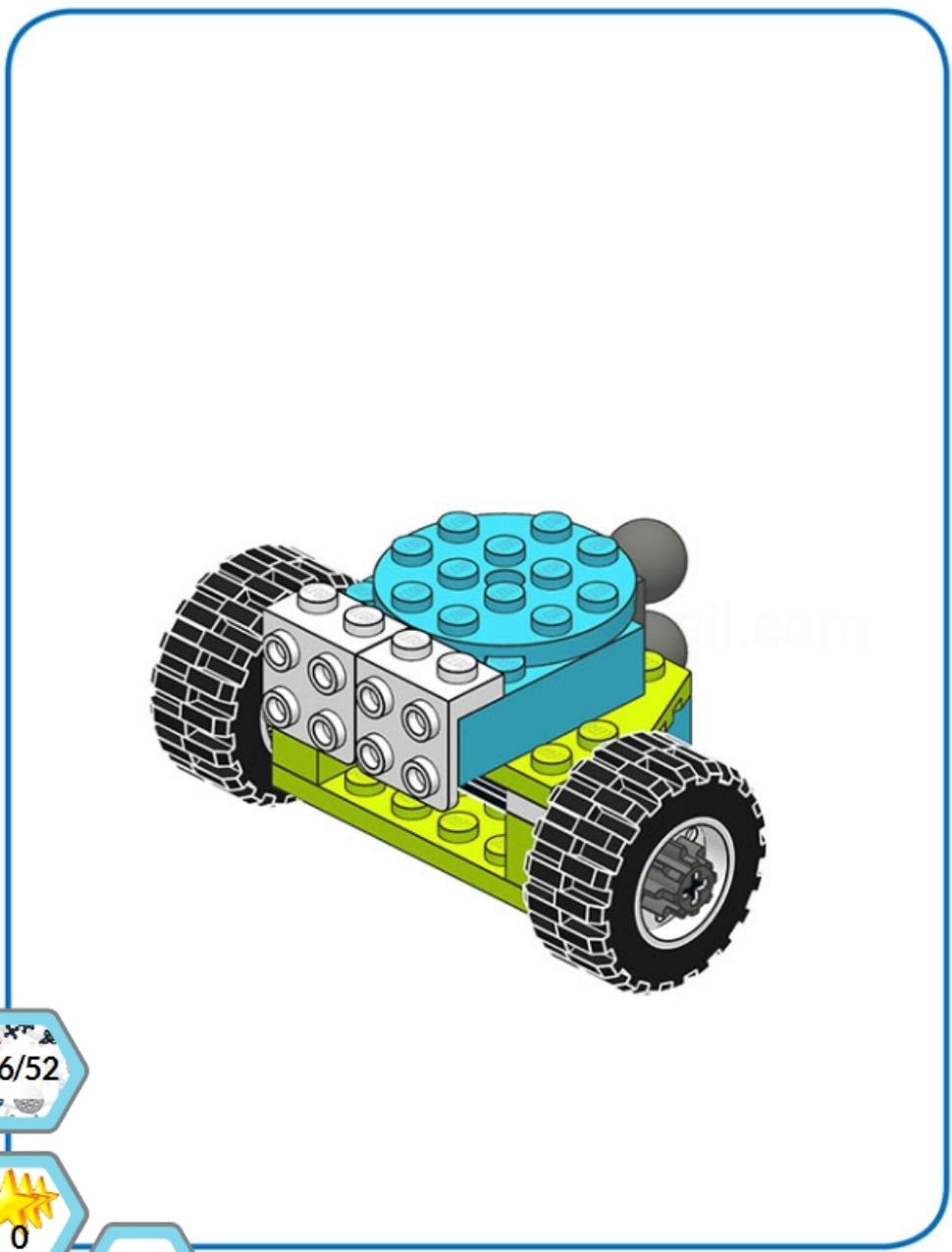
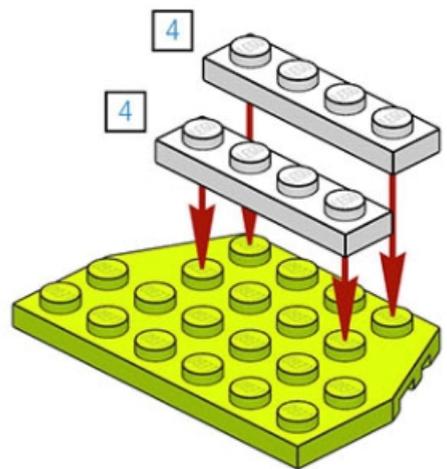
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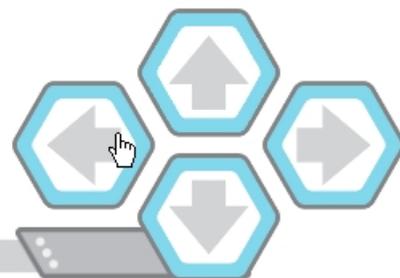
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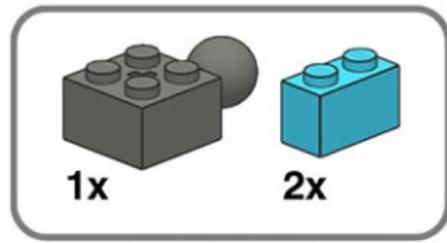


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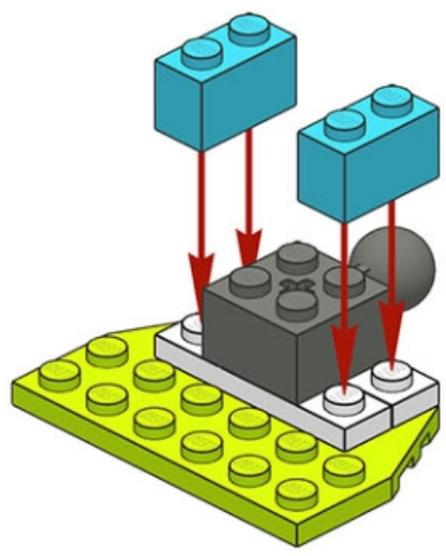
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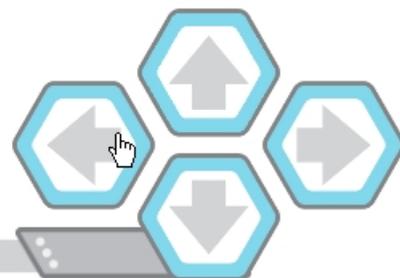


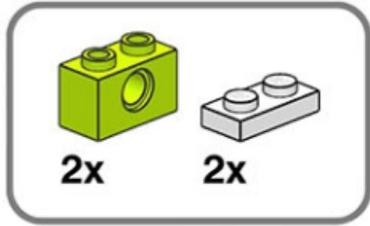


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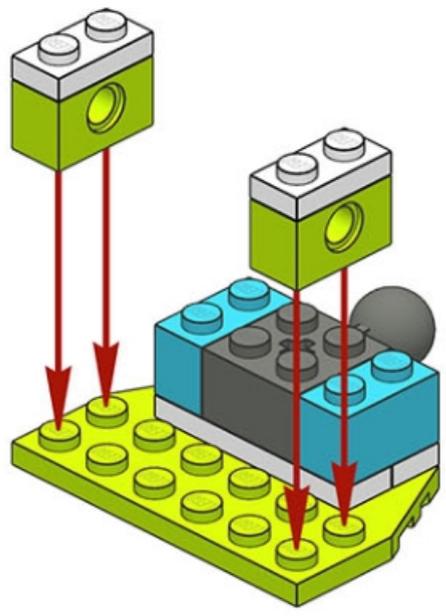


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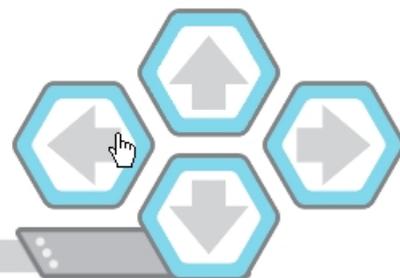


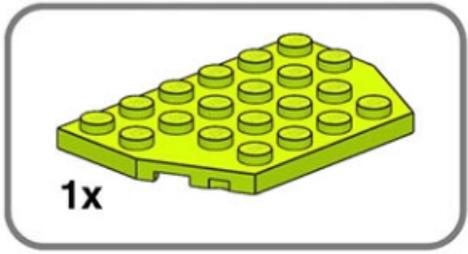


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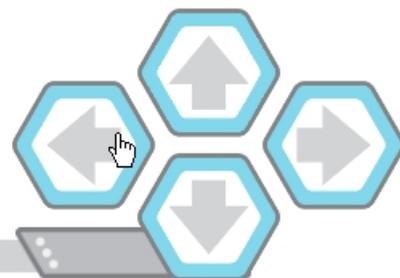
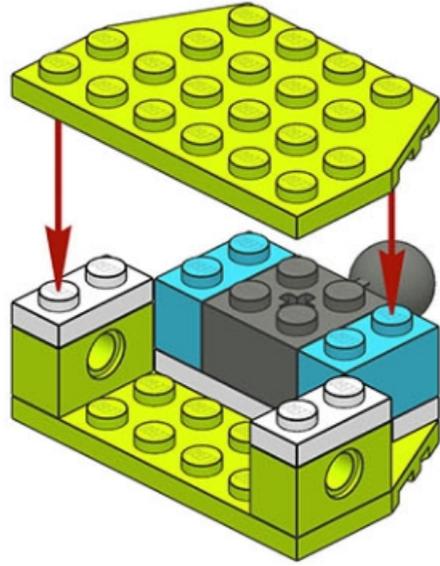
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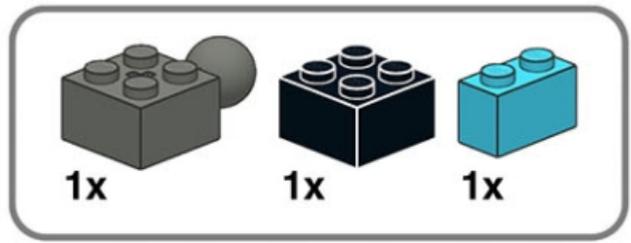




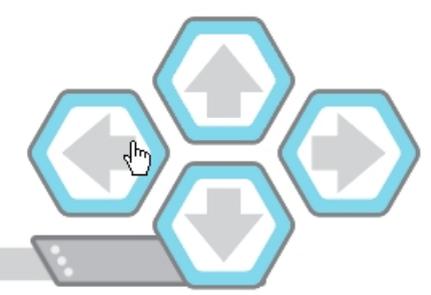
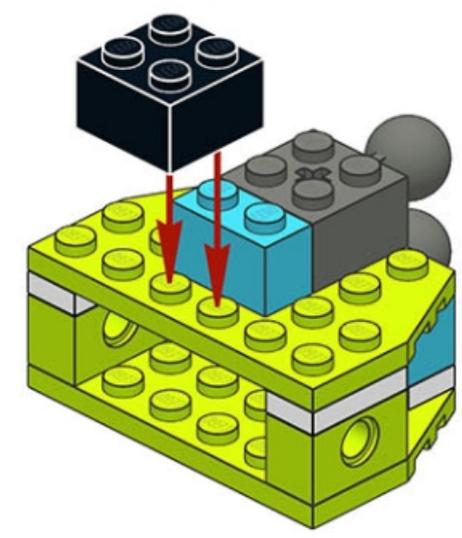
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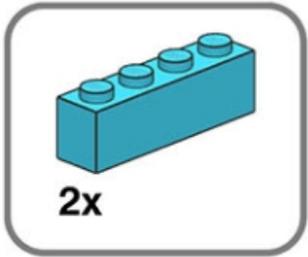




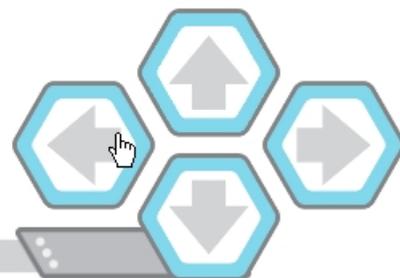
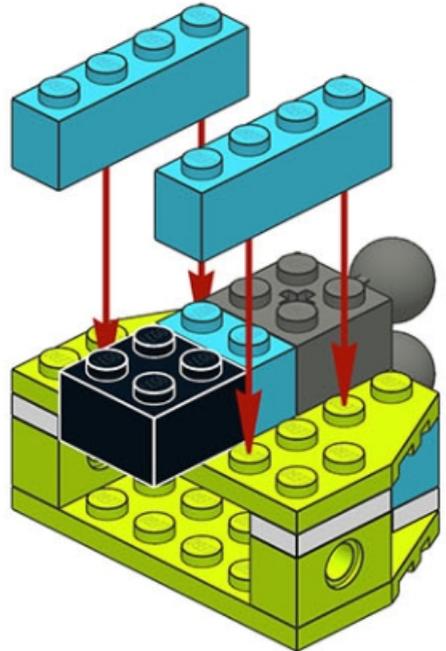
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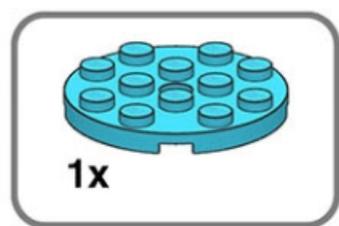


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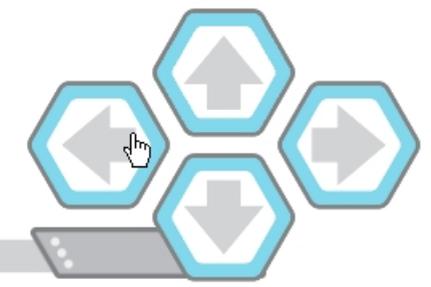
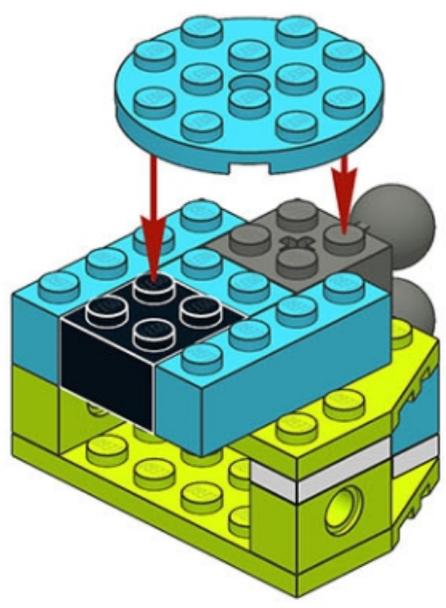
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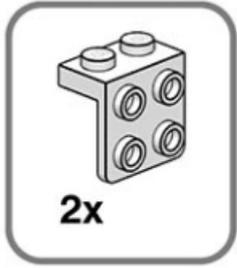




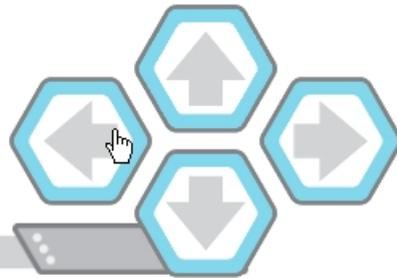
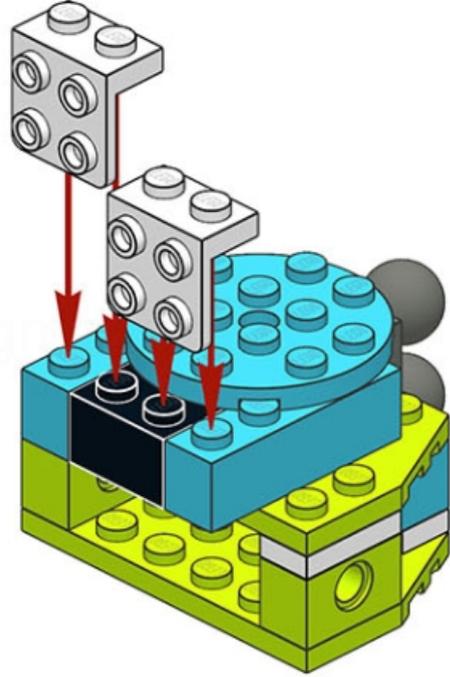
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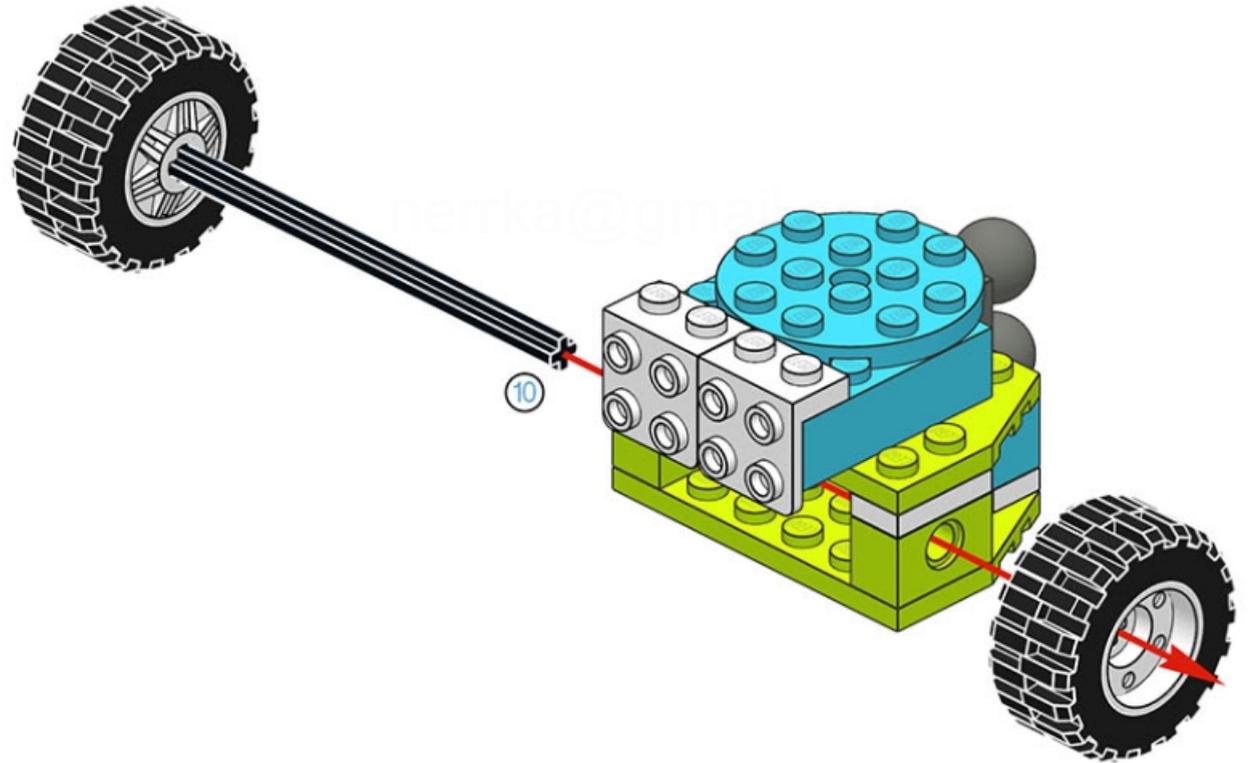
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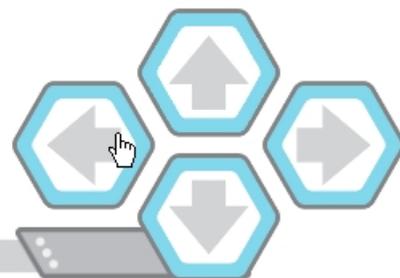


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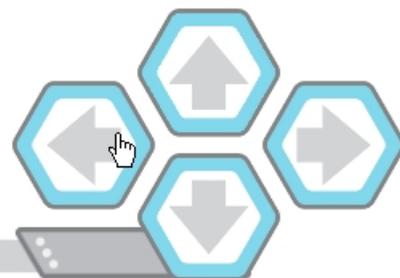
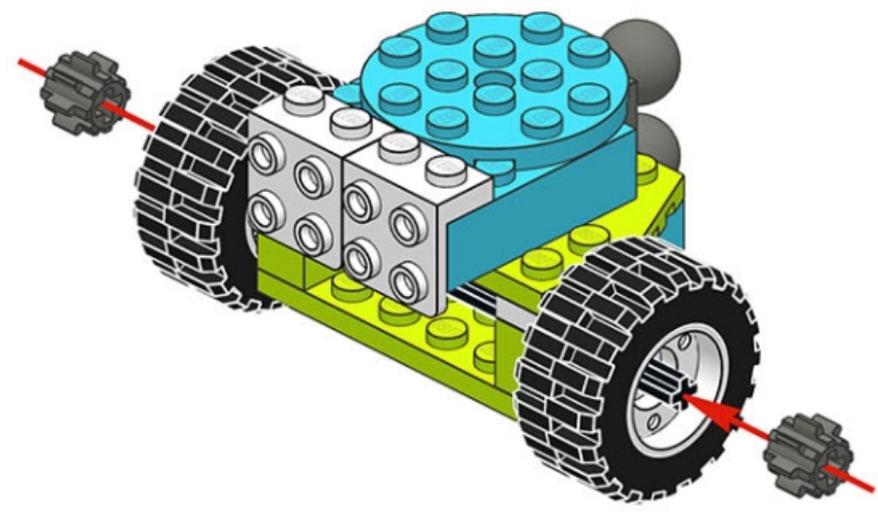
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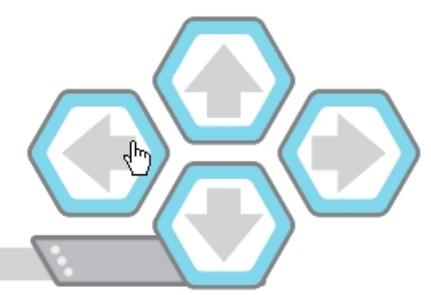
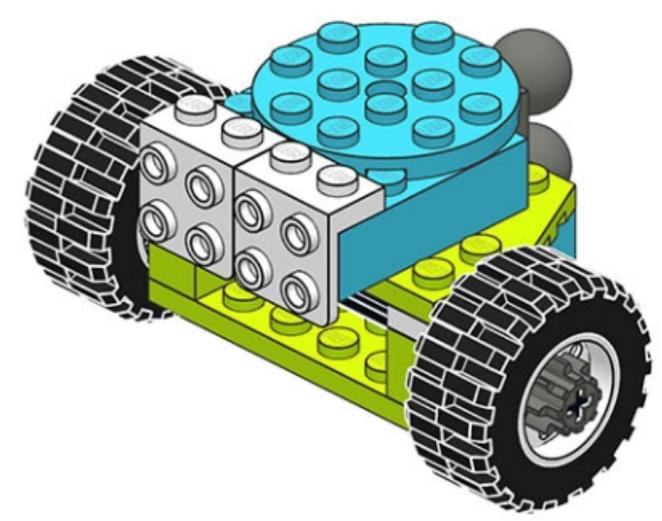


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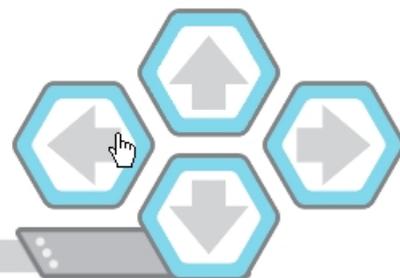
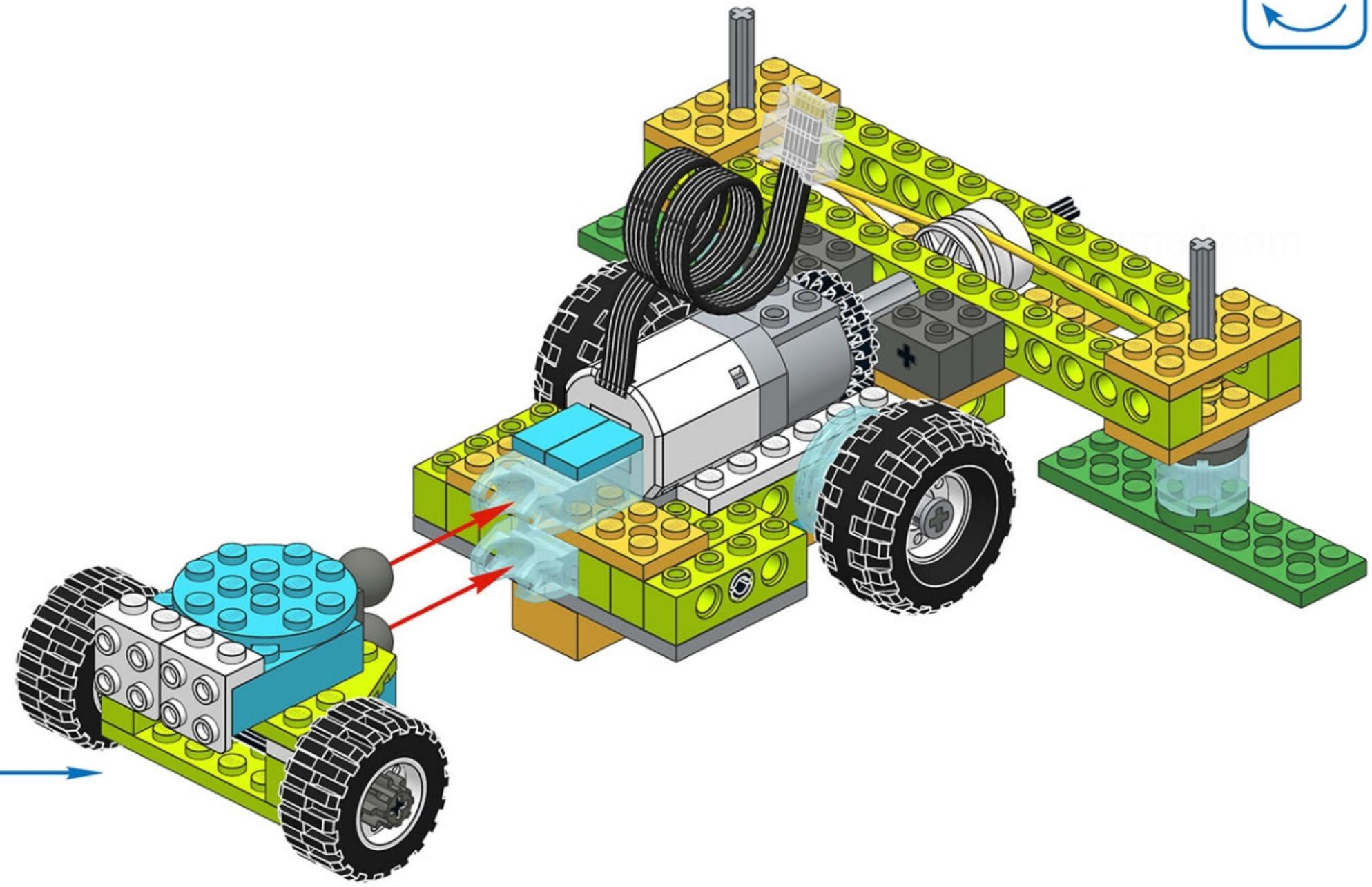
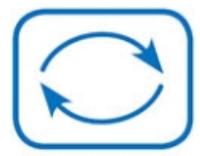


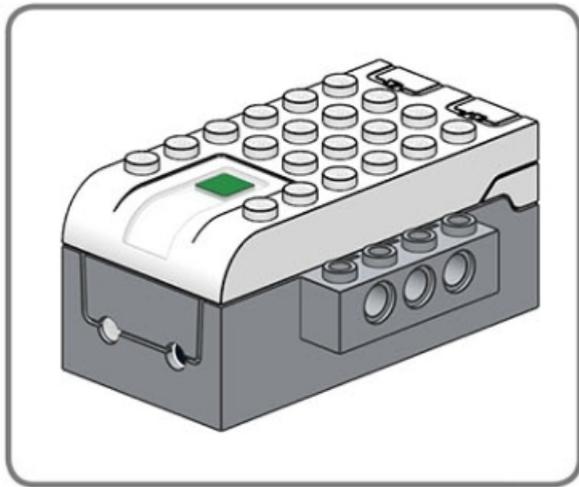
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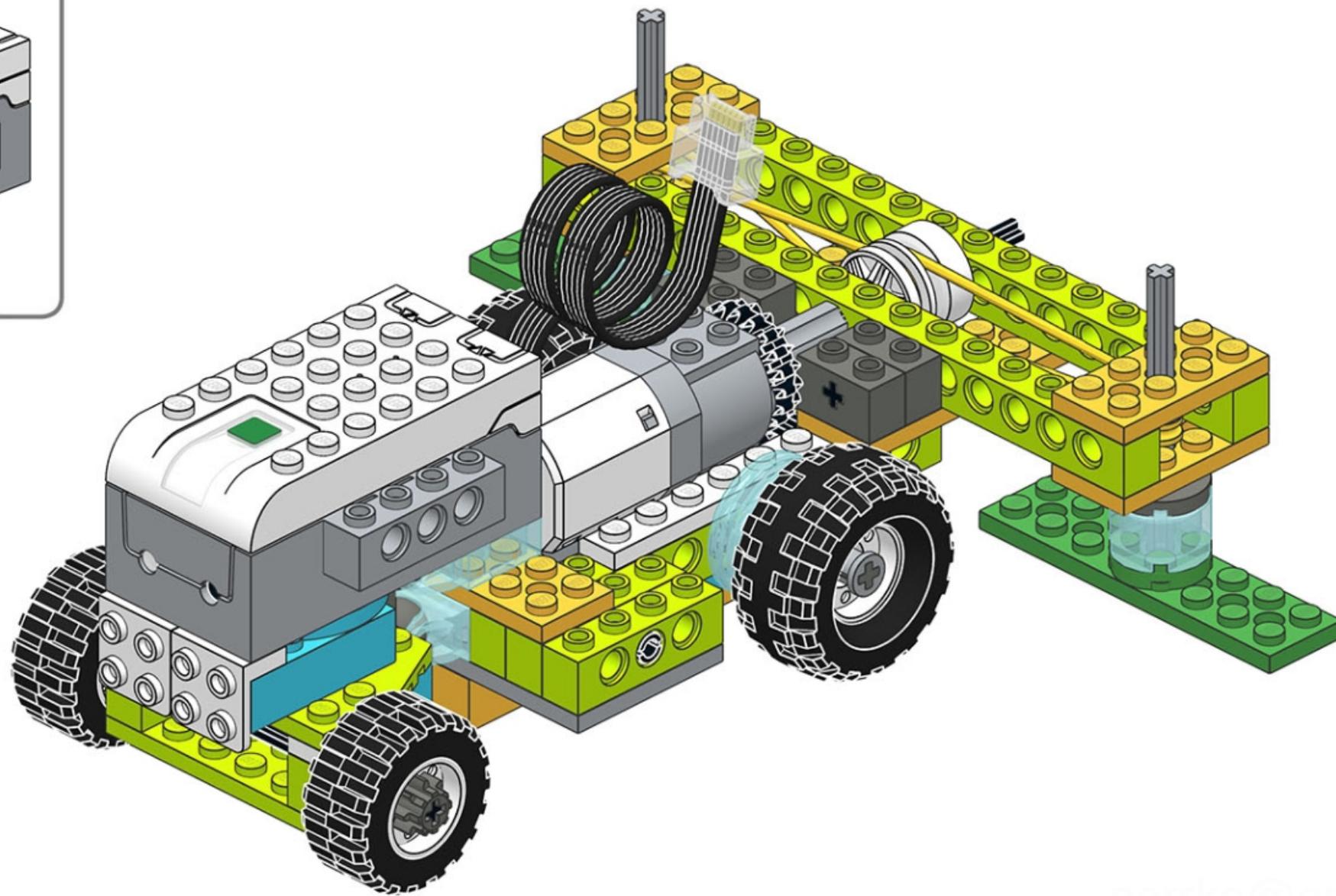


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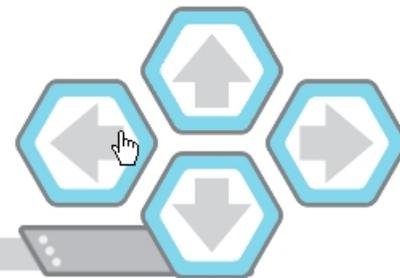


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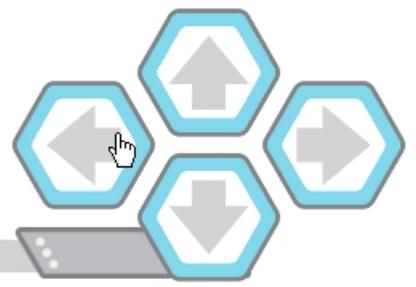
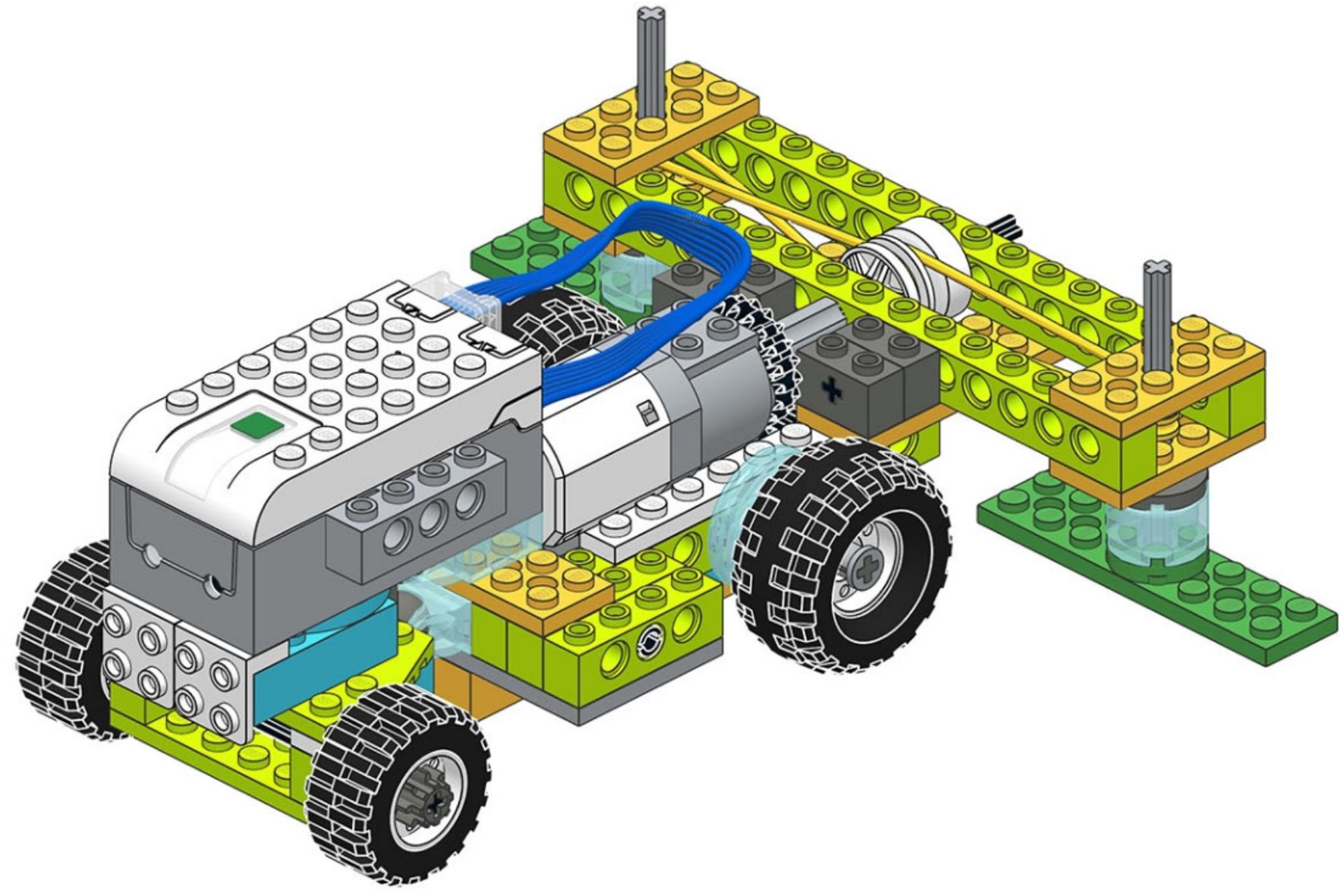
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73

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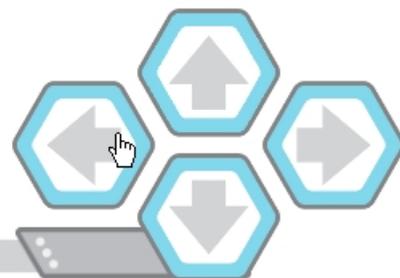
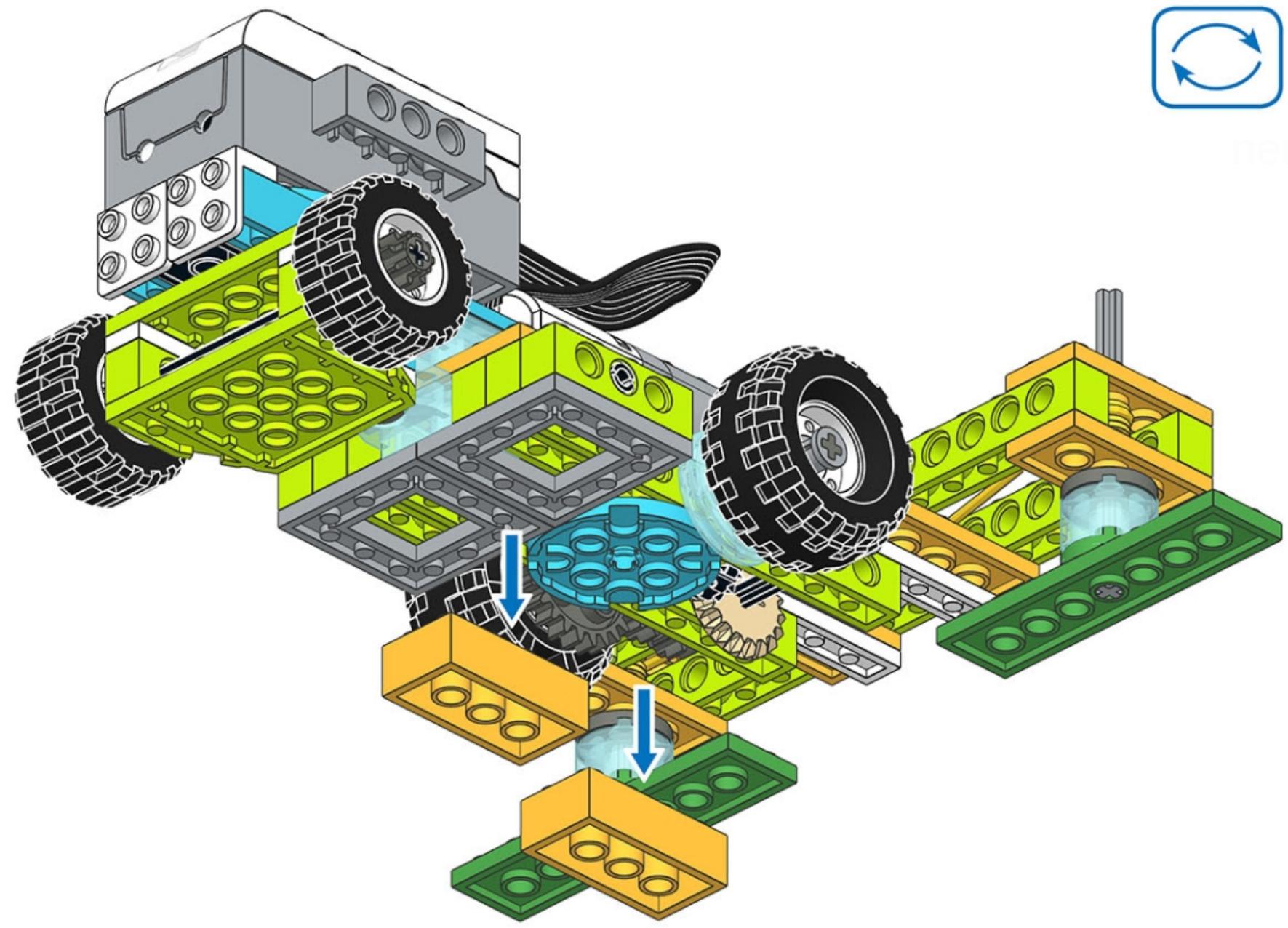
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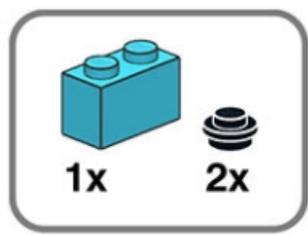


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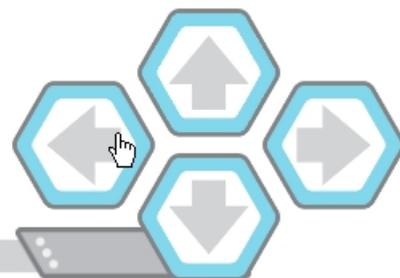
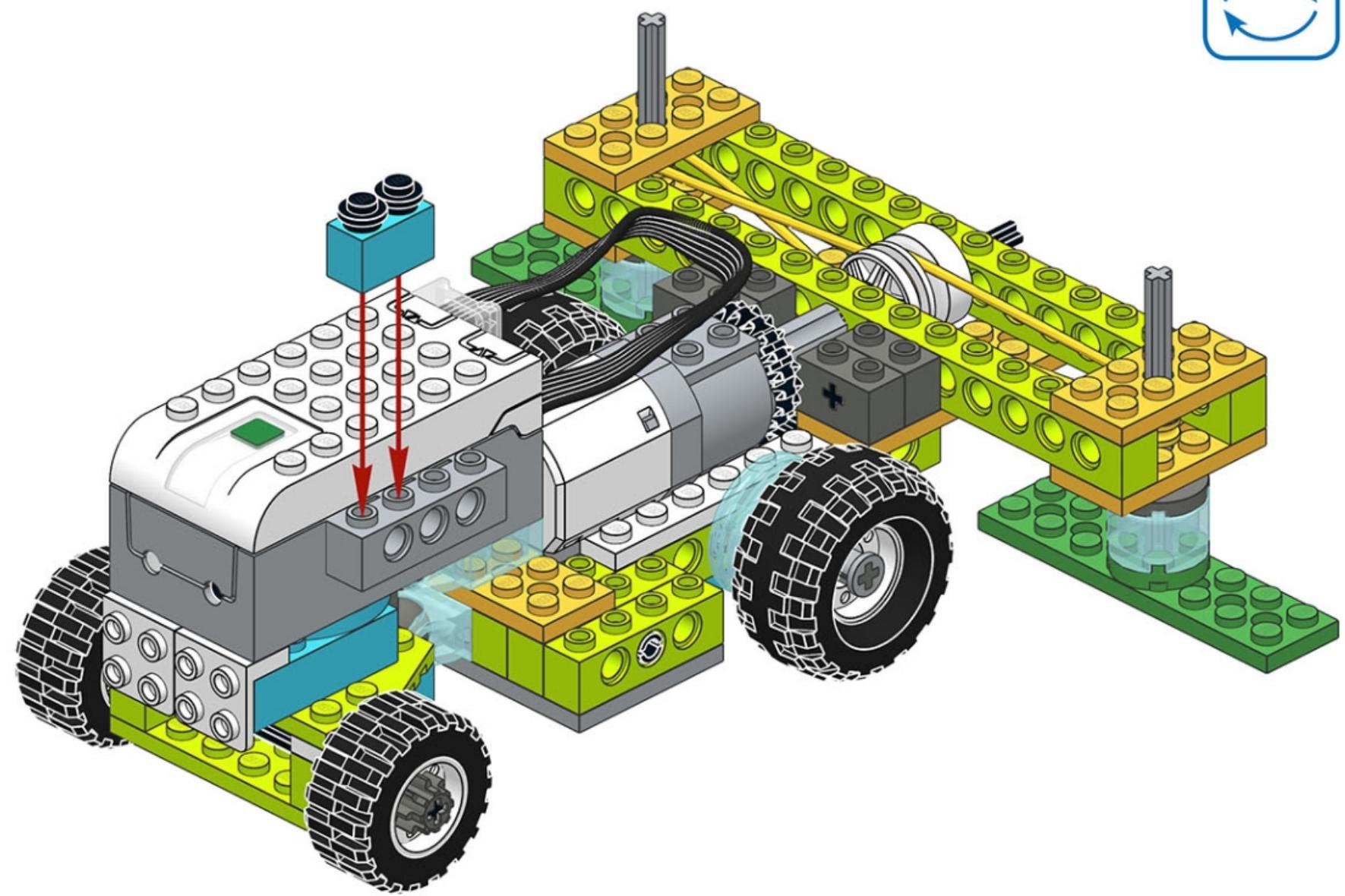


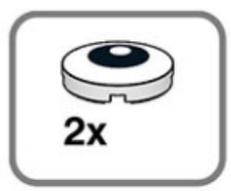
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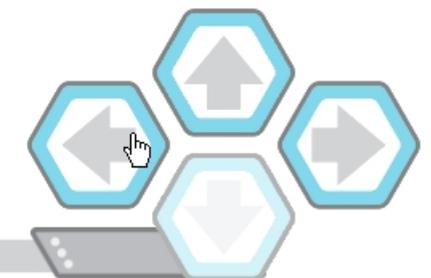
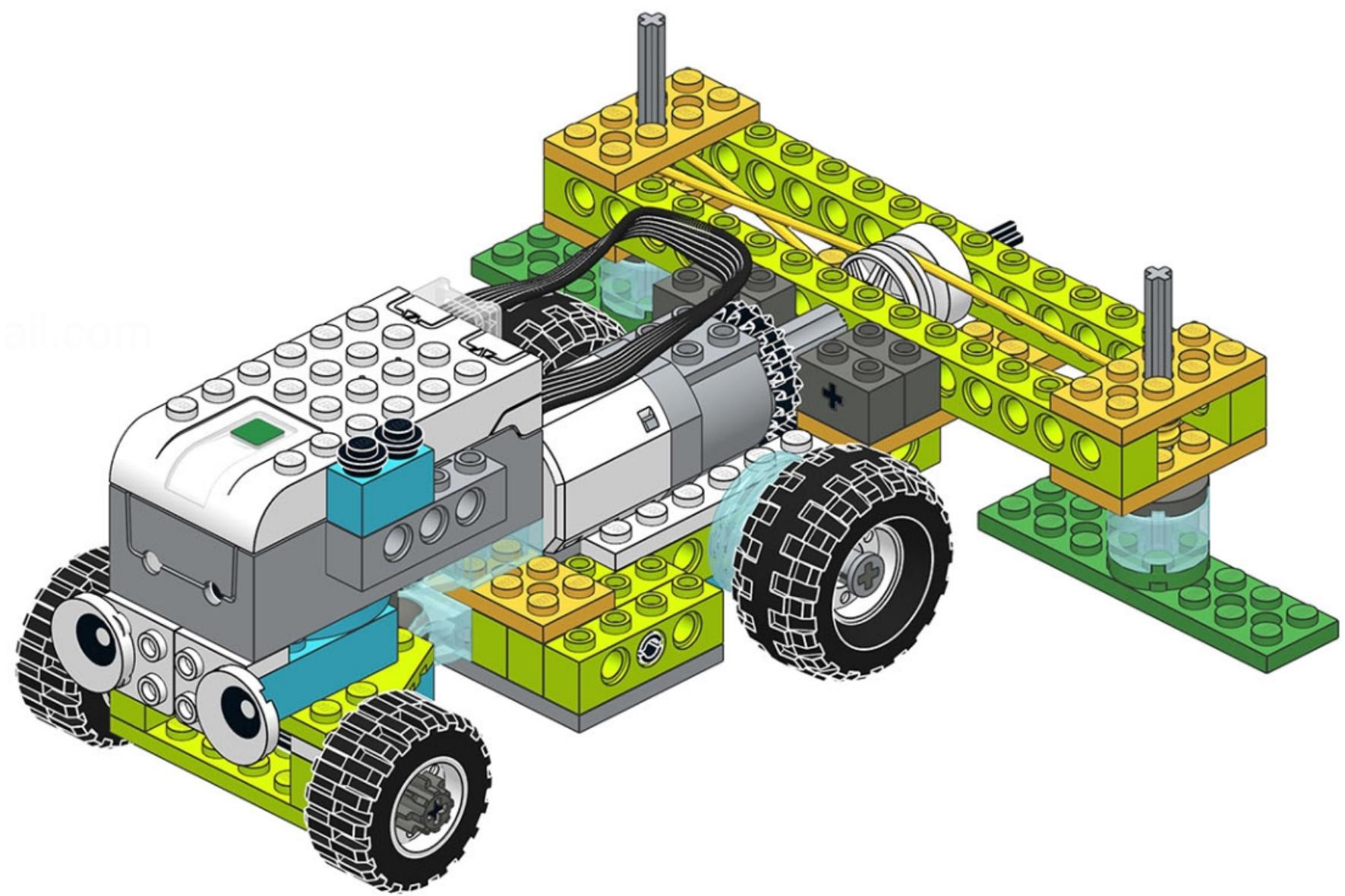
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**52**

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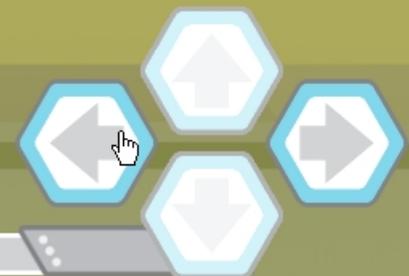
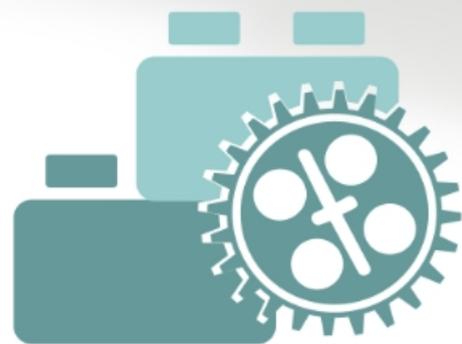


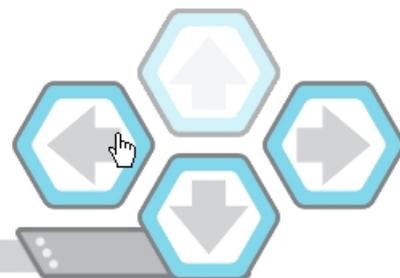
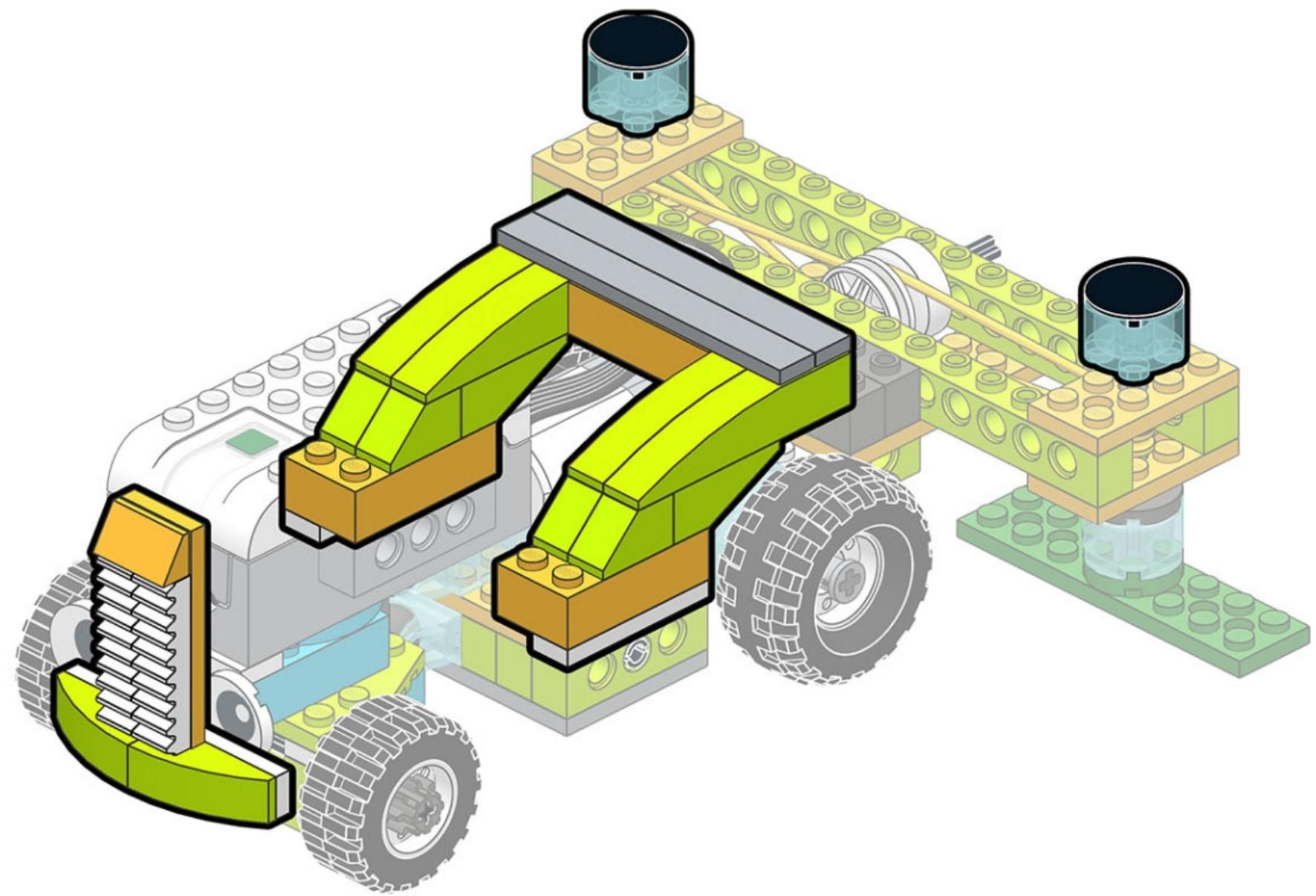


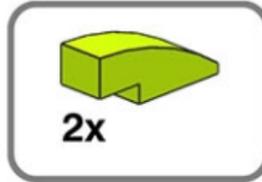
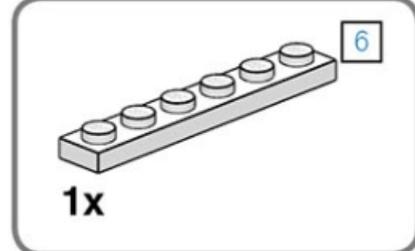
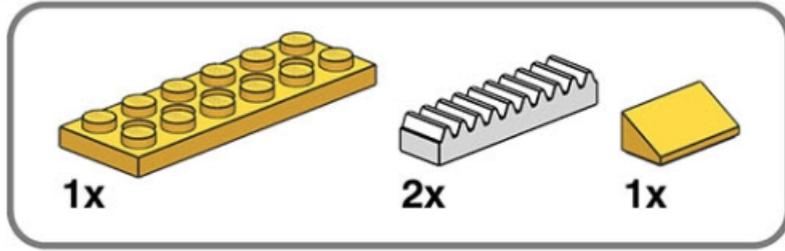
# Enhanced version

**ROBORISE-IT!**  
ROBOTIC EDUCATION

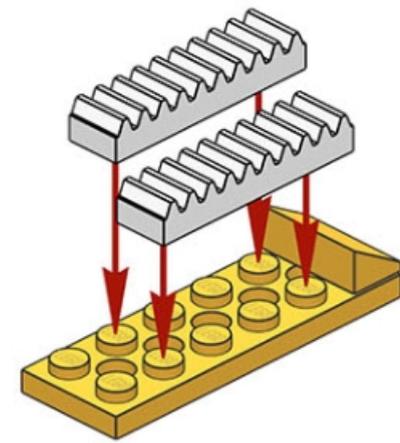
Add some external equipment to your robot!



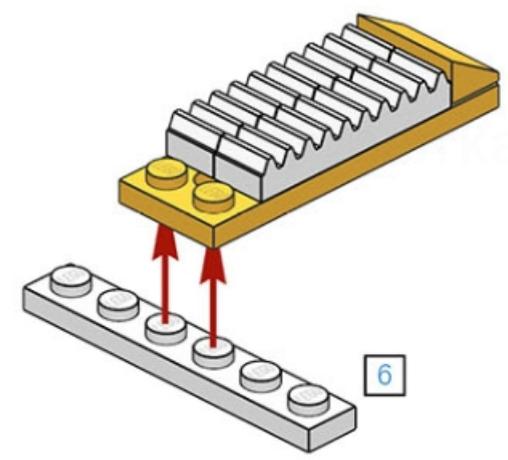




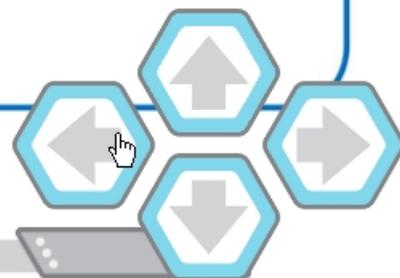
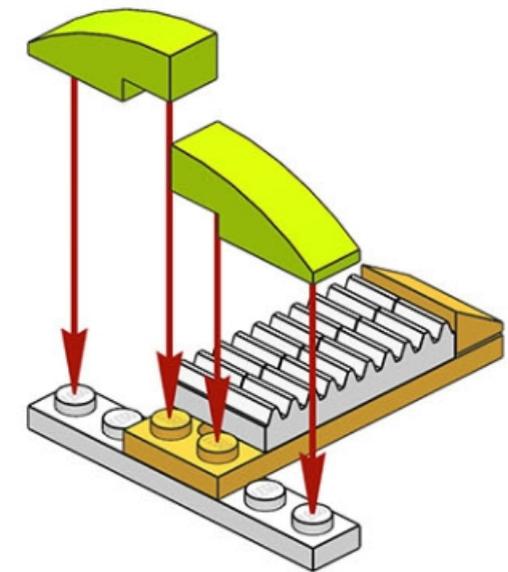
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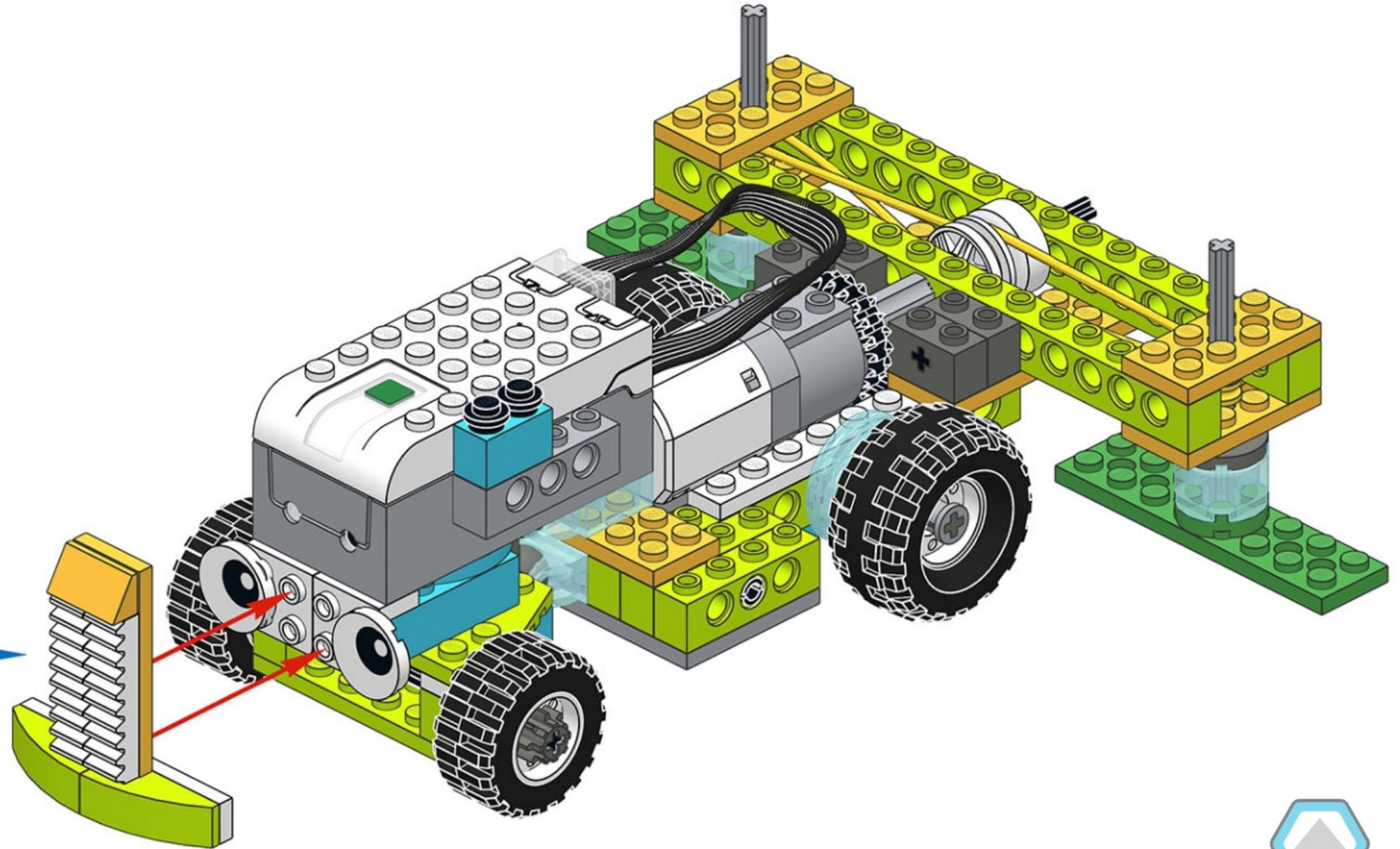
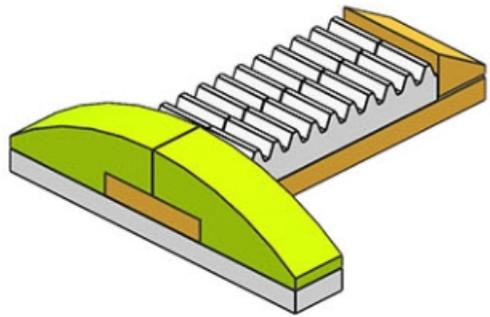
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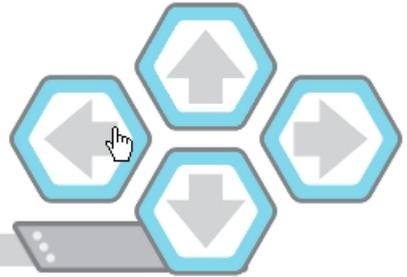


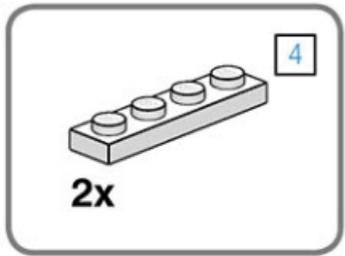
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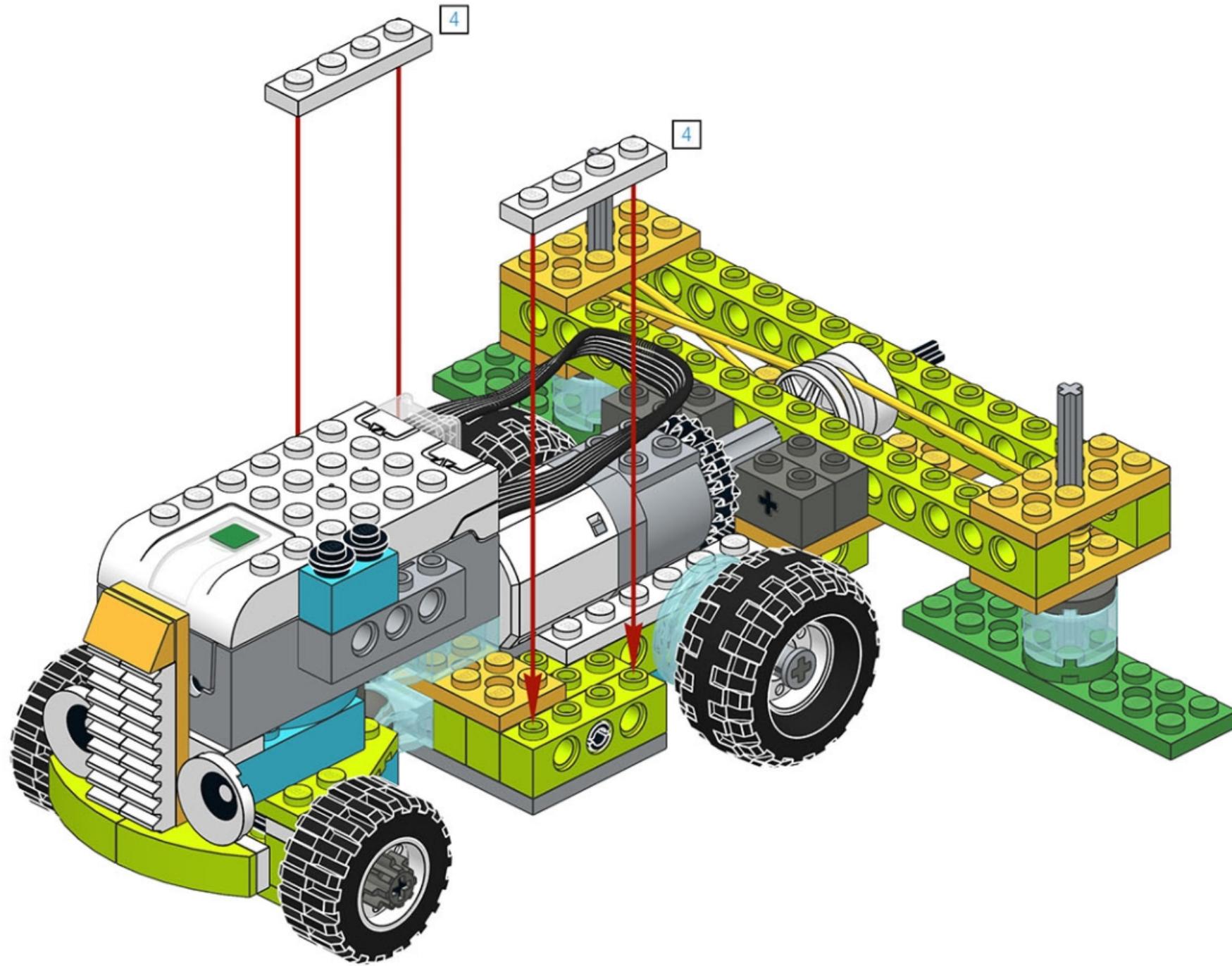
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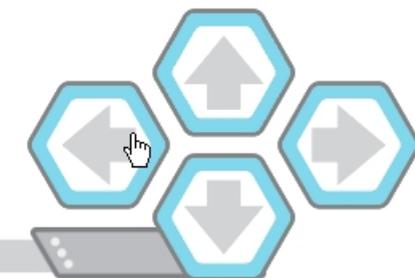




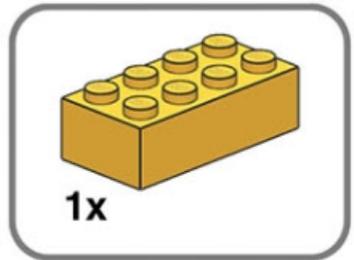
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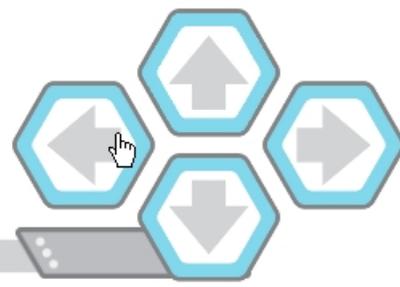
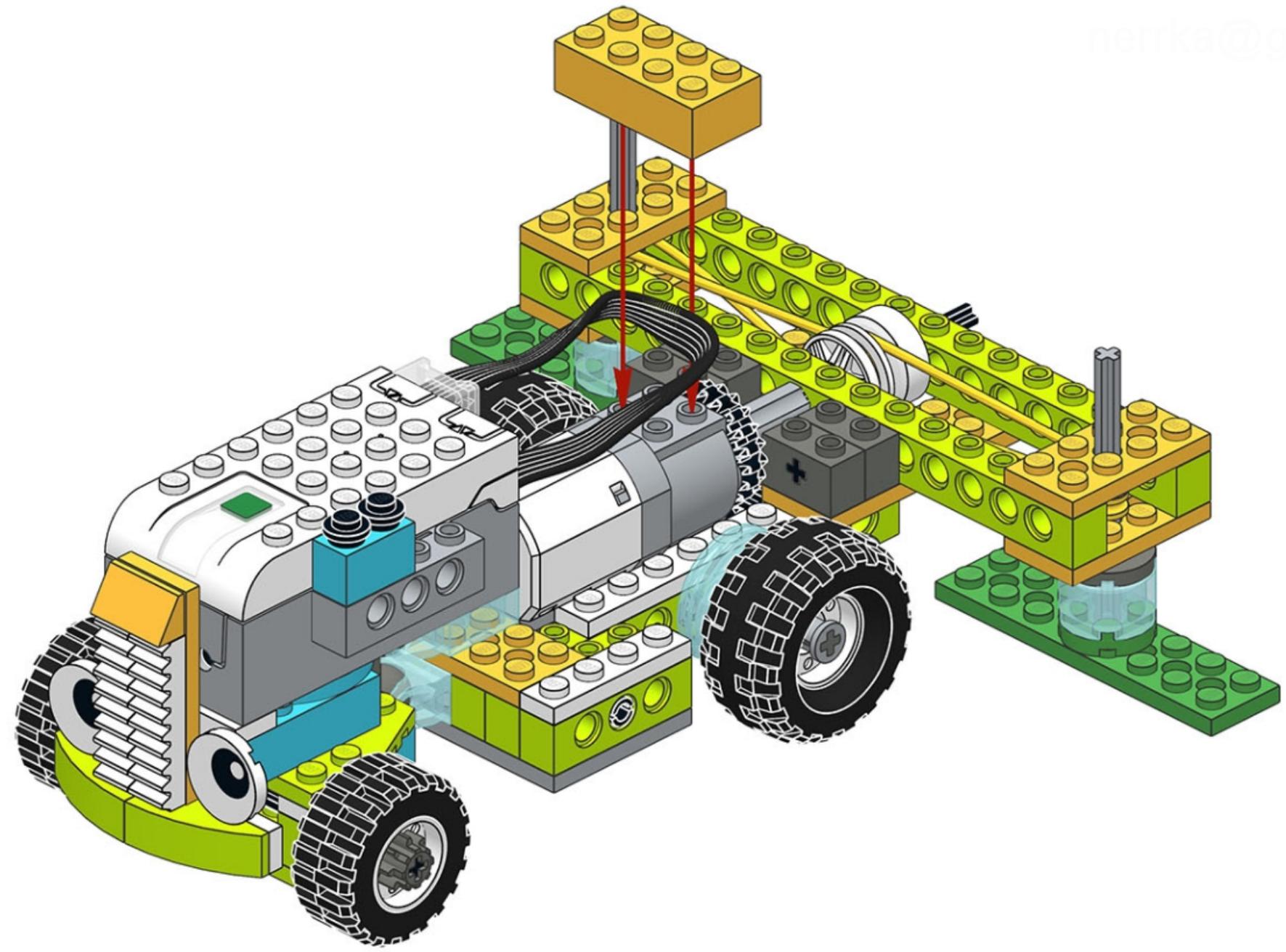
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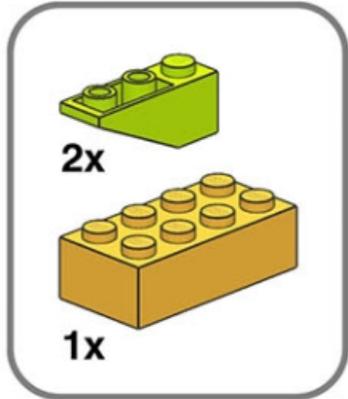


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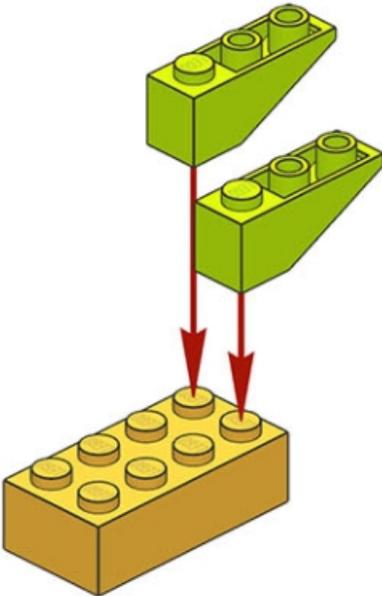


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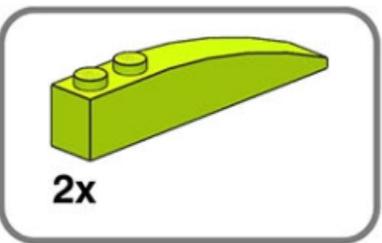
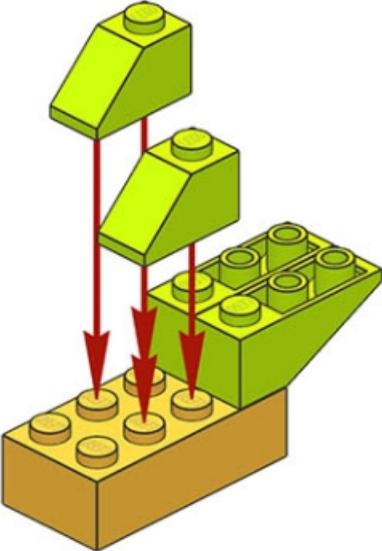




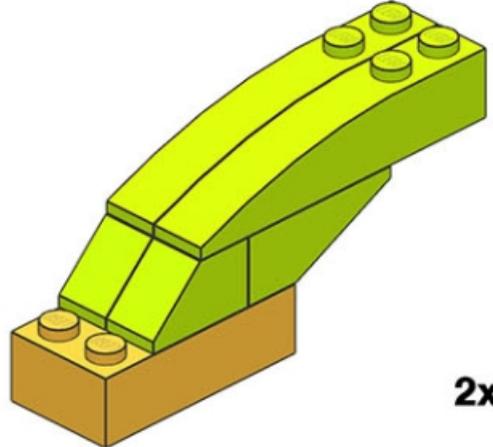
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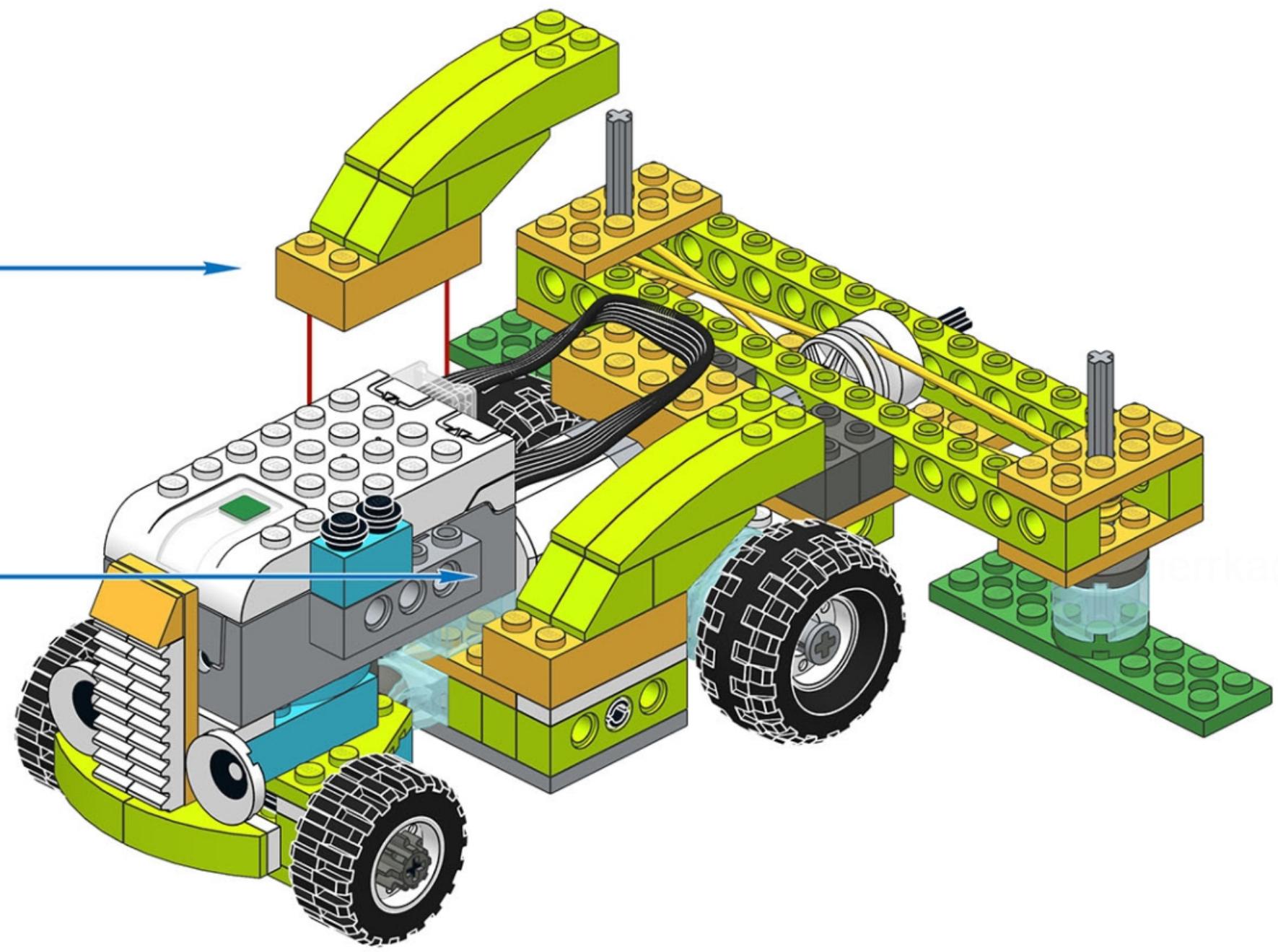


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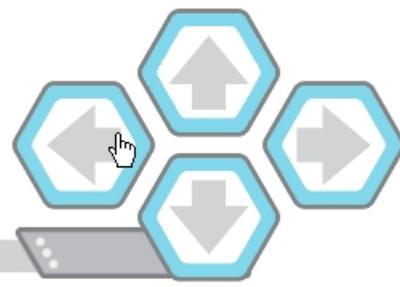
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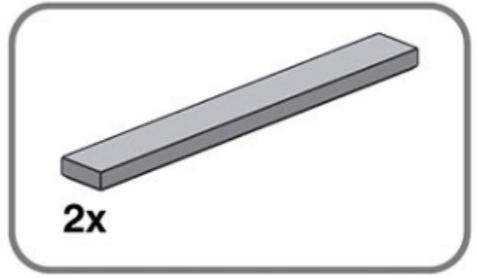


7/10

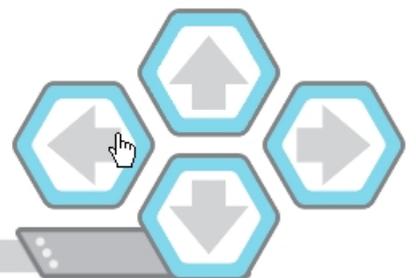
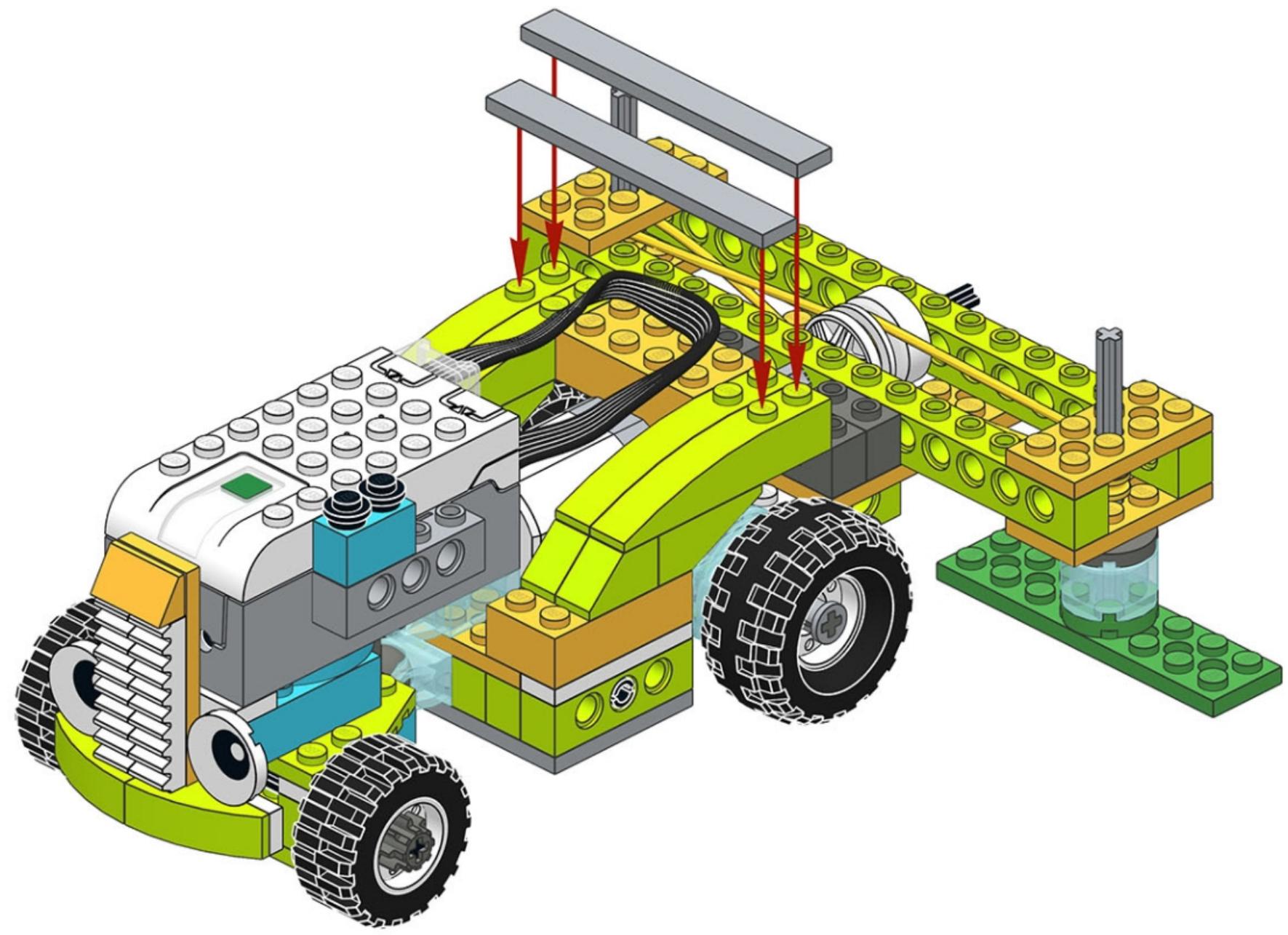
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85



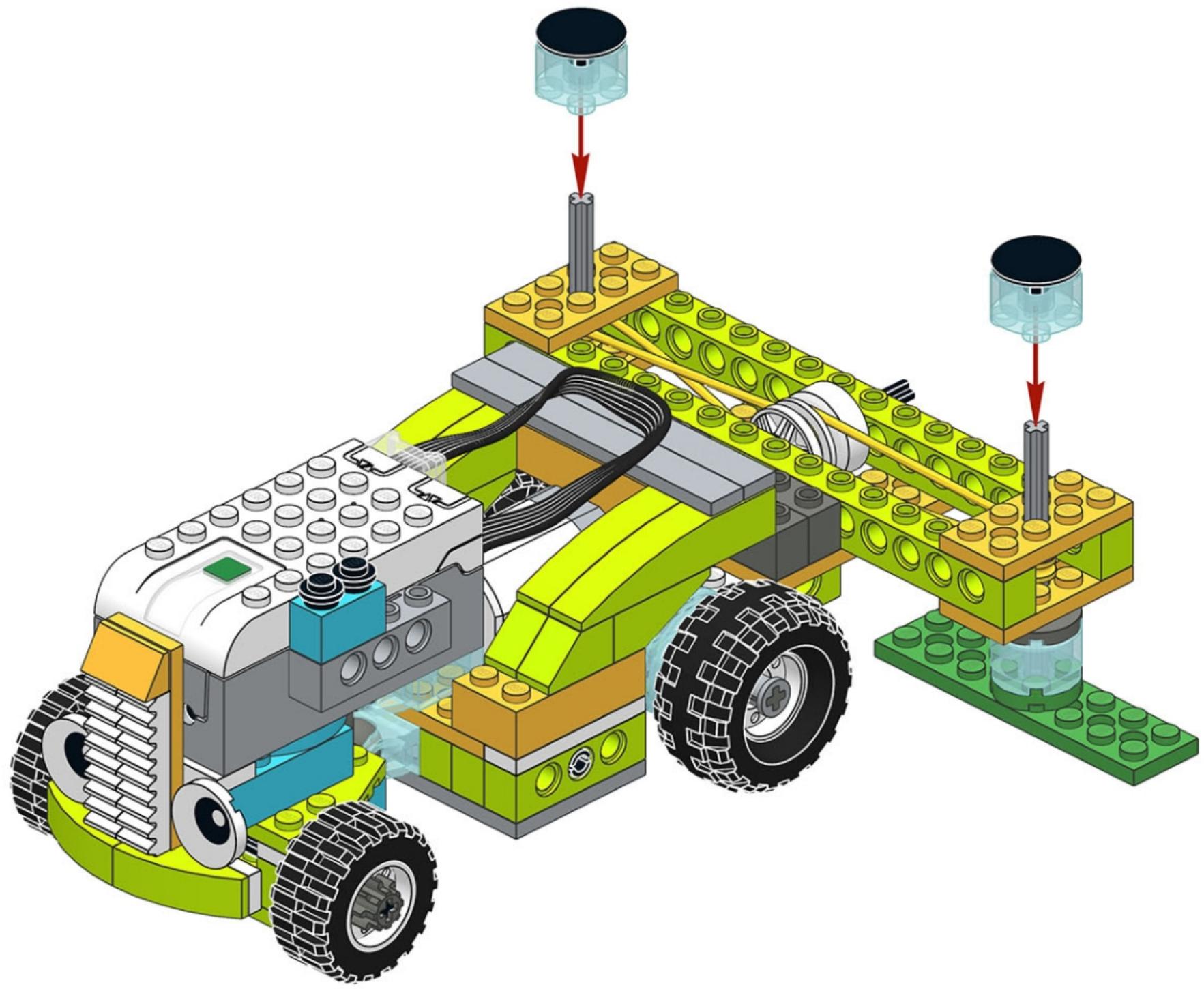


**59**



2x 2x

# 60



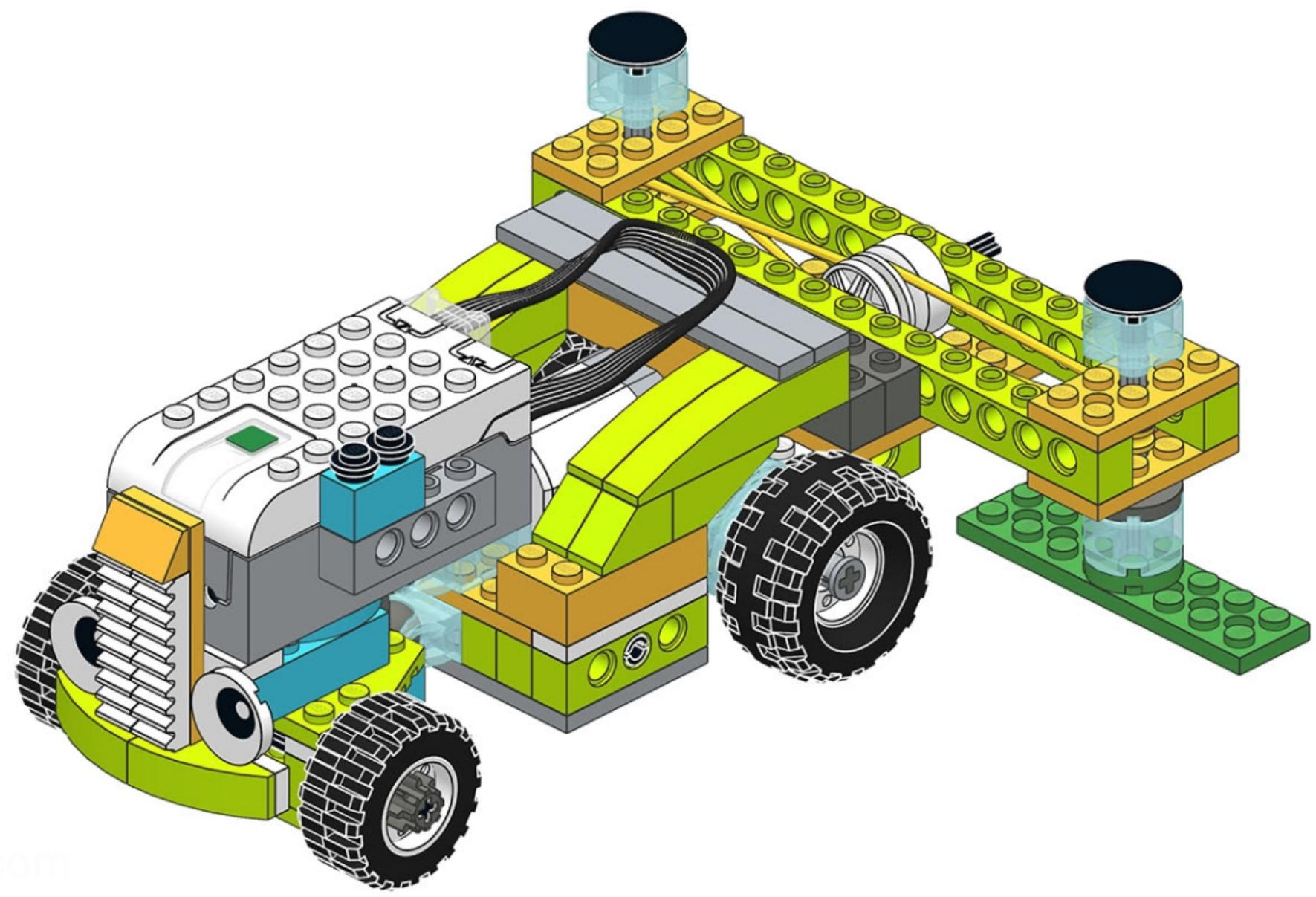
9/10

0

87

Navigation controls: four arrows (up, down, left, right) and a hand cursor.

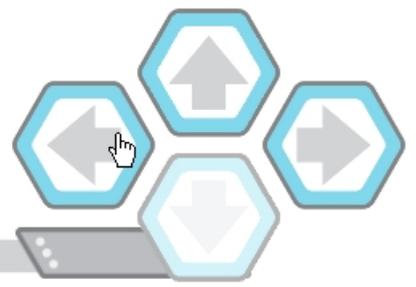
# 61



10/10

0

88

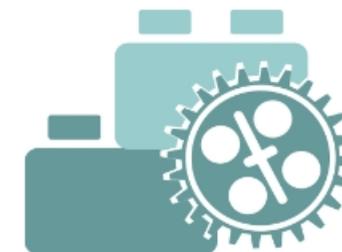


...@gmail.com

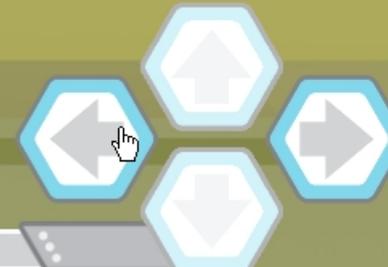


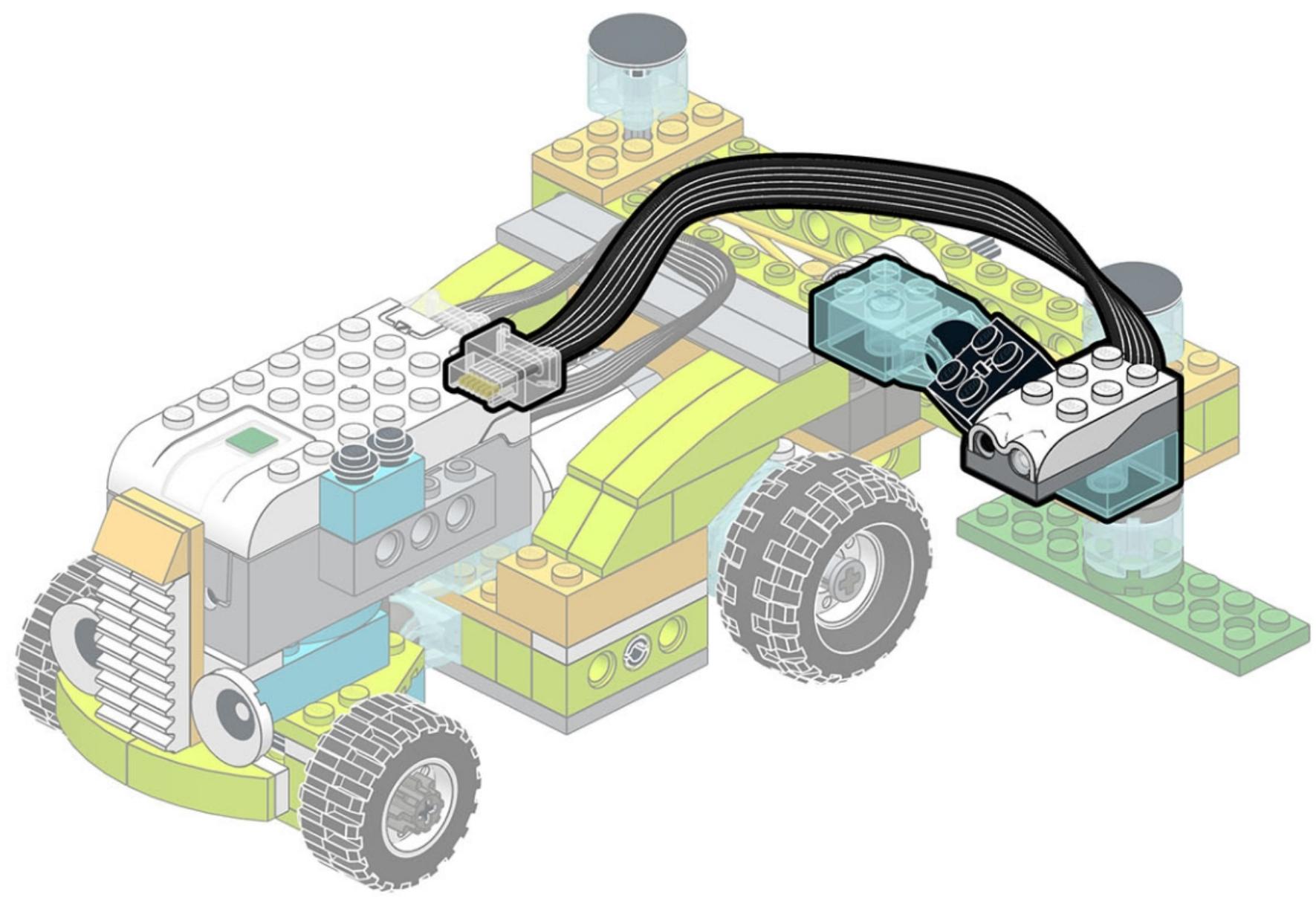
# Motion sensor

Build and mount the Motion sensor!



nerrka@gmail.com





1/5

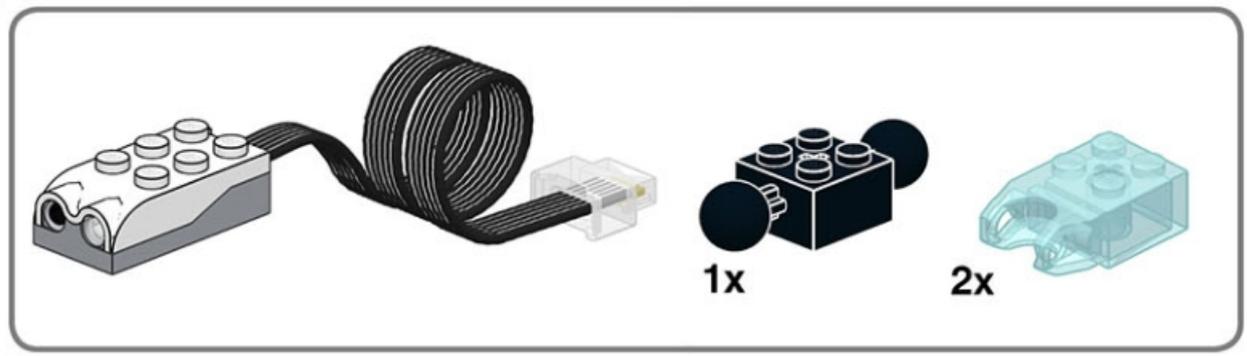
0

90

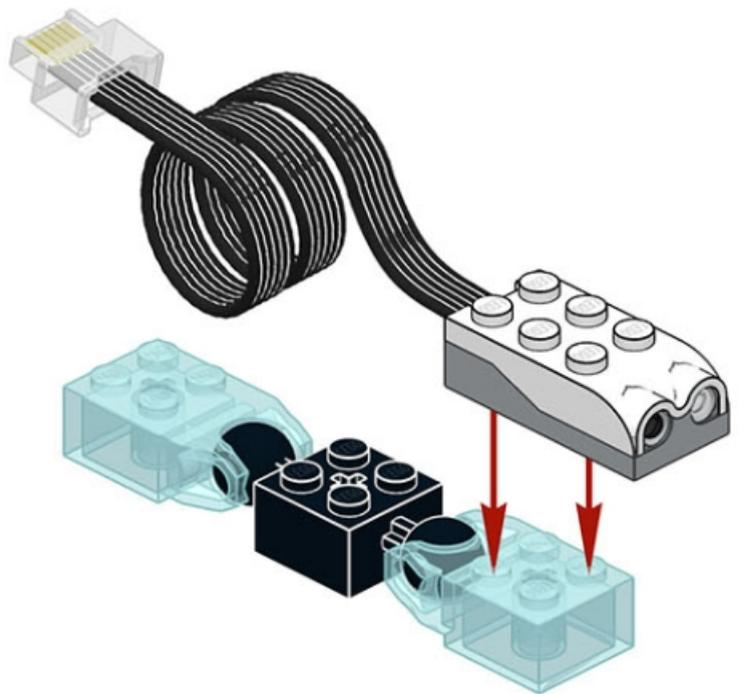
A vertical stack of three hexagonal icons. The top one contains the fraction '1/5'. The middle one contains a yellow starburst icon and the number '0'. The bottom one contains a play button icon and the number '90'. To the right of these icons are two more hexagonal icons: a play button and a stop button.

rorrka@gmail

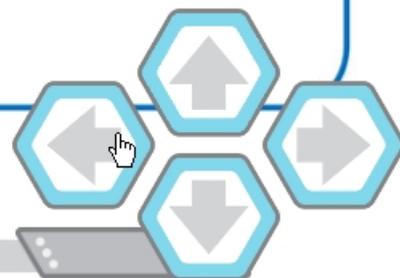
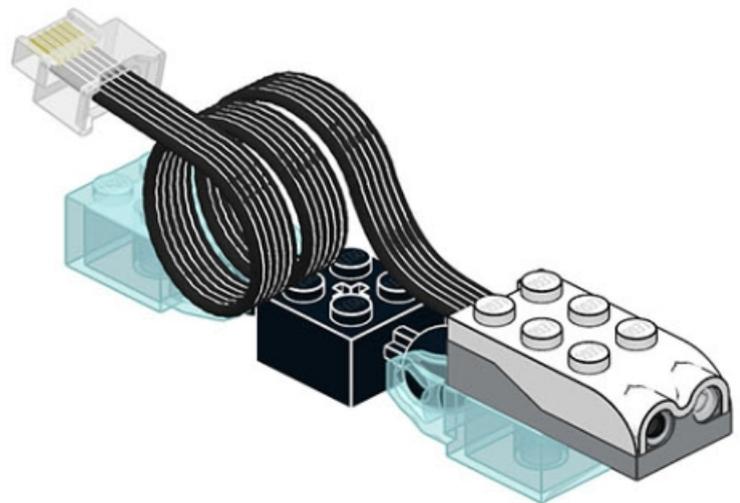
A set of four hexagonal navigation icons arranged in a cross pattern: up, down, left, and right arrows. A mouse cursor is pointing at the left arrow. Above these icons is the text 'rorrka@gmail'.



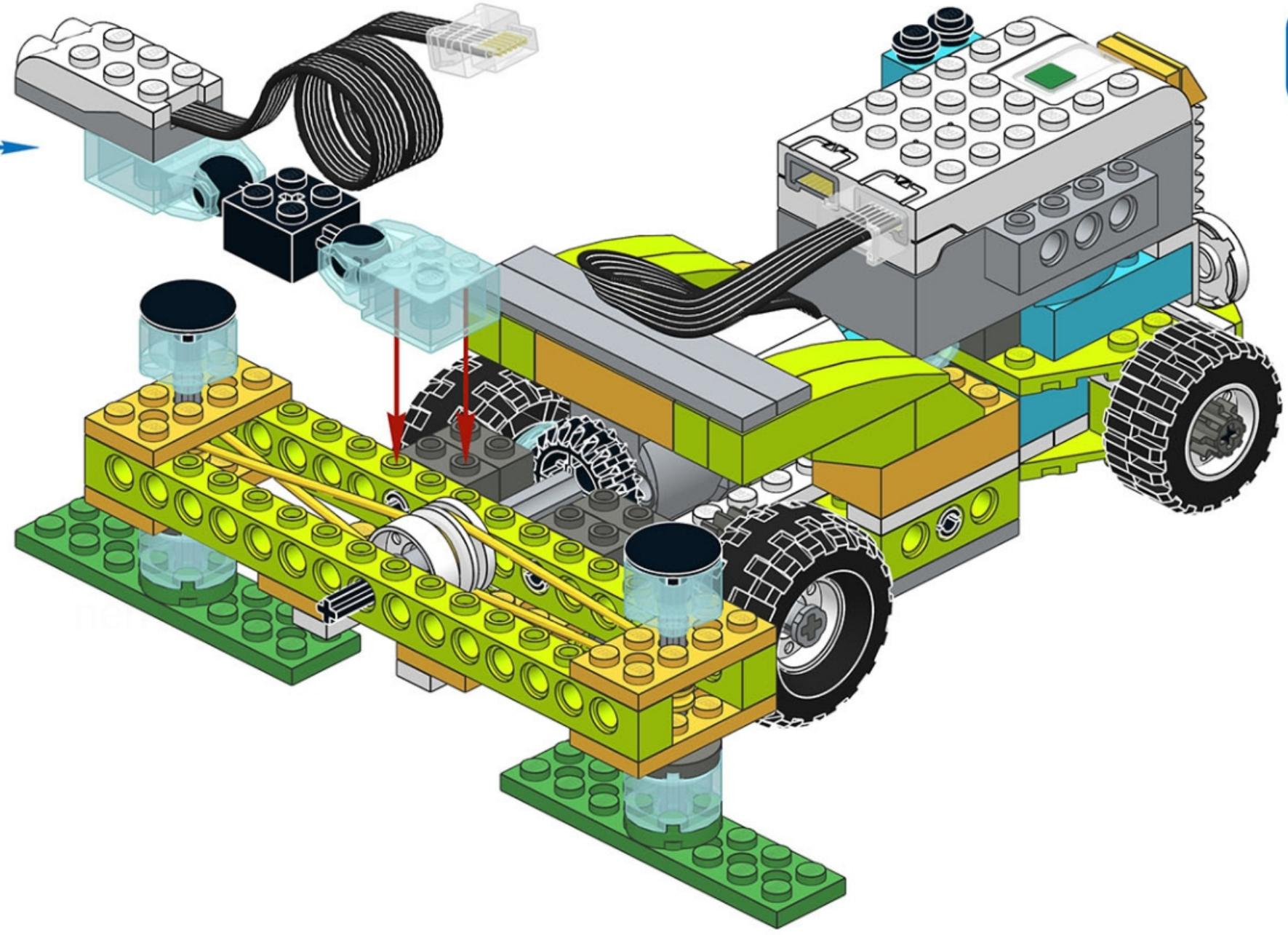
1



2



63

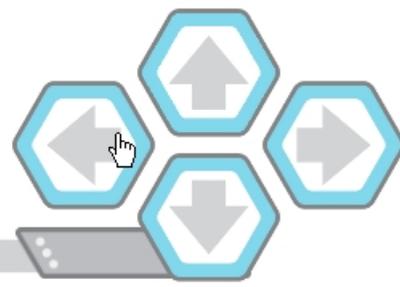
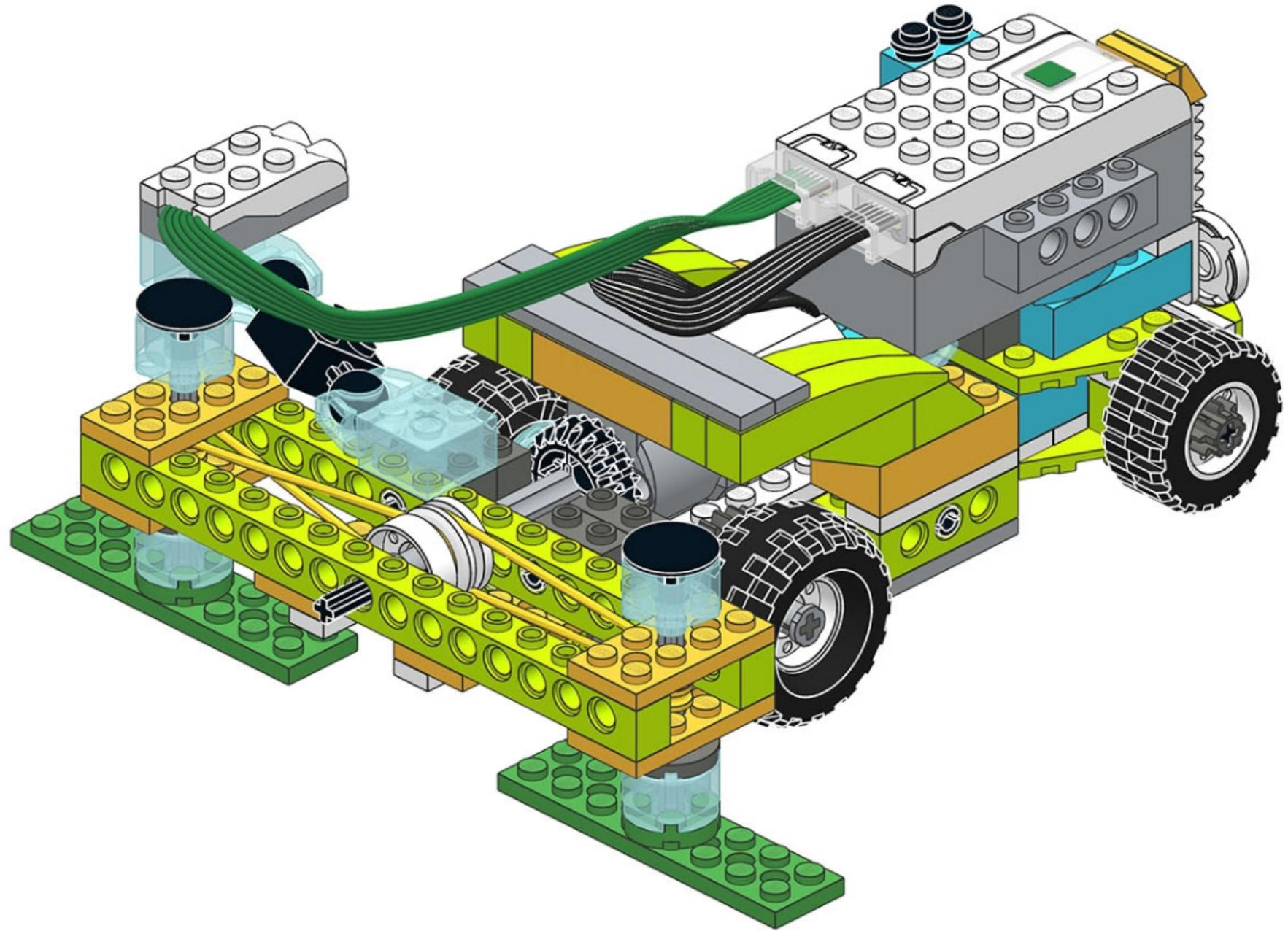


3/5

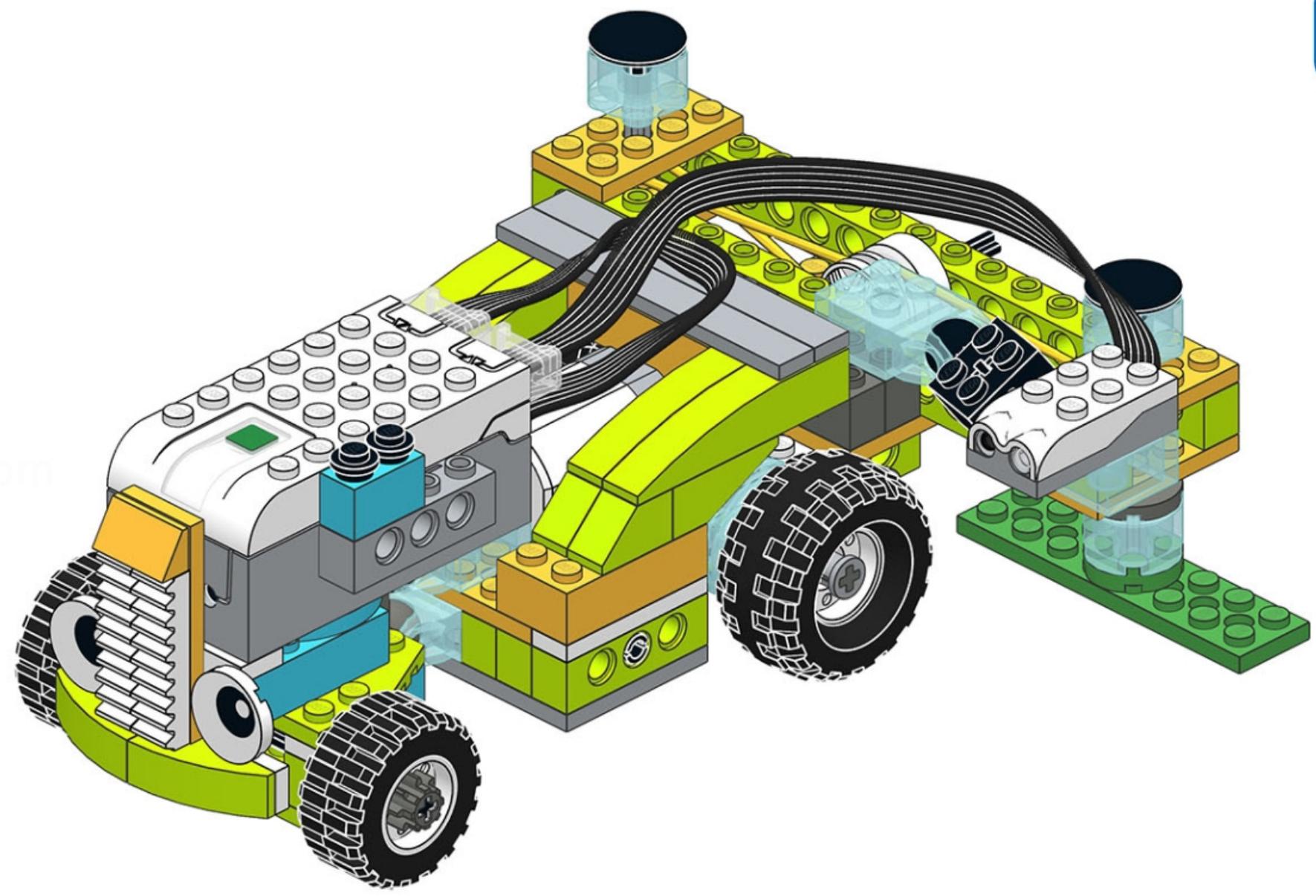
0

92

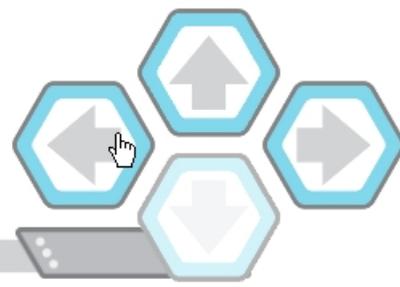
64



65



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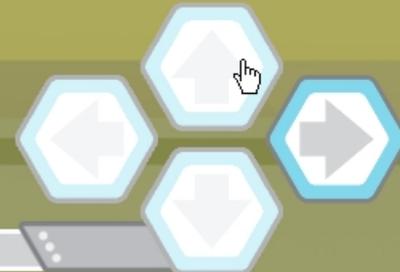
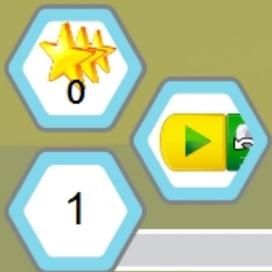


# PowerUp

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## PowerUp



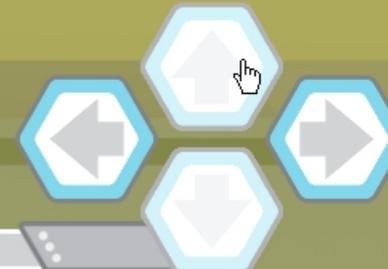


# New day at the robots` factory

ROBORISE-IT!  
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Hello!  
Due to the tsunami, the fields outside the town were affected. The restoring of the agriculture may be started from the creating the universal tractors. They will help to prepare the fields to the growing the plants and to harvest.





# TASK



## TASK

- to develop the universal tractor for working in the field



## Steps

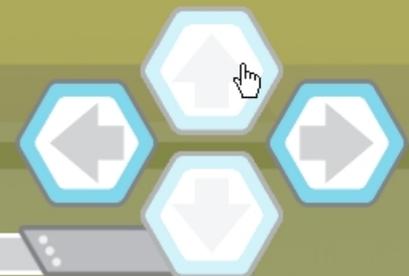
- to know more about the types of the tractors
- to define the features of the tractors
- to make the choice of the tractor design and create it



0

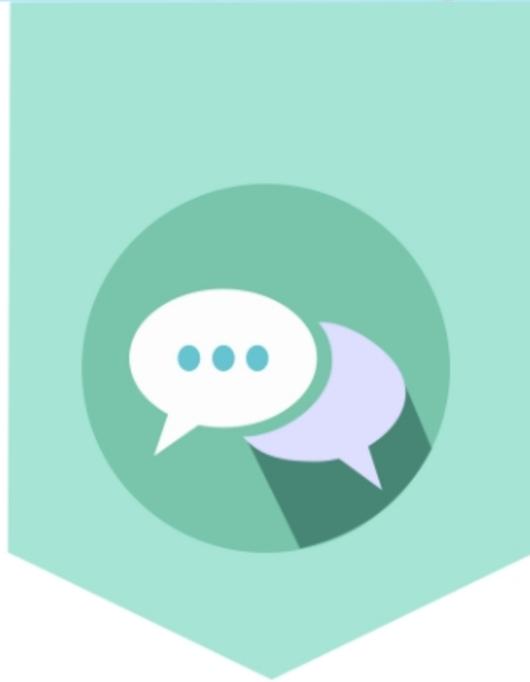


4





# Discussion of the task



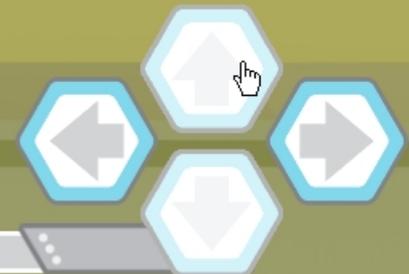
What do you know about the machines that are used in the agriculture? What tasks they are performed?



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5





# Agricultural machines

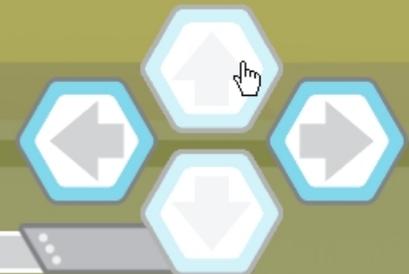
There are the lot of different machines that are used on the farm fields. The tractors and harvesters, soil cultivators and planters, sprayers and sorters works everyday on the fields.



0



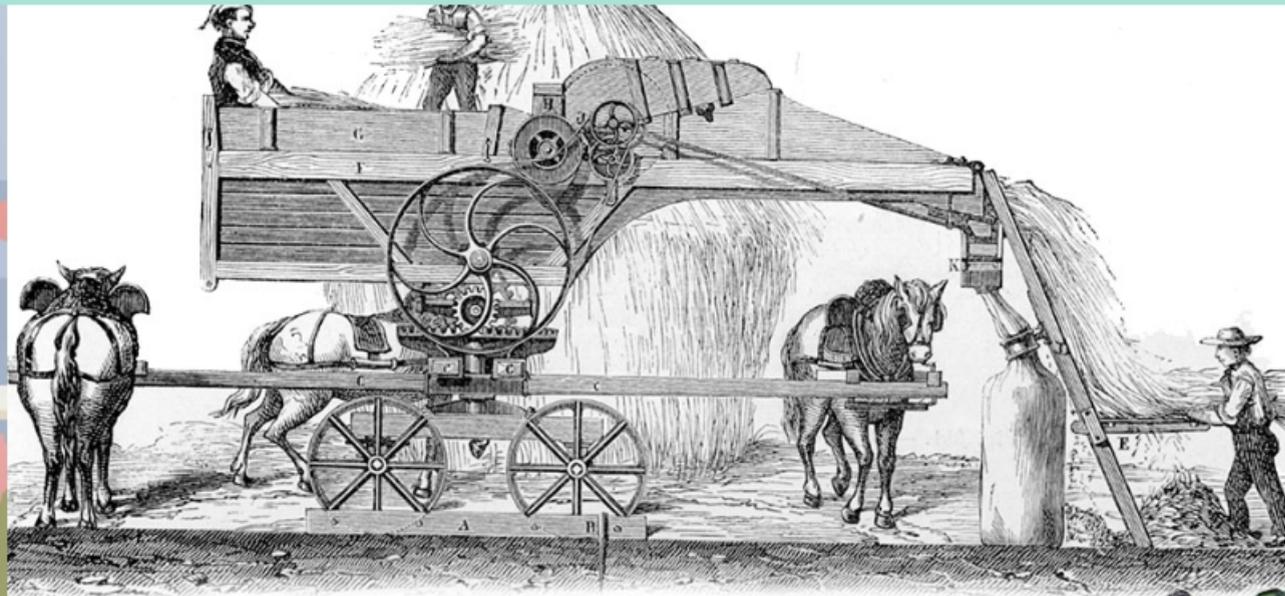
6





# Agricultural machines

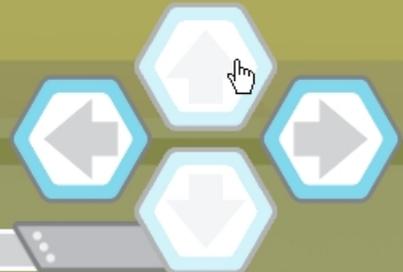
During the hundreds years of the developing the agricultural machines have turned from the hand tools into the electric-powered robots.



0



7





# Discuss!



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**How do you think, what type of the Agricultural machines is most universal and needed at any farm?**

0

8

A set of navigation icons in the bottom-left corner, including a yellow star icon, a play button icon, and a number '8' icon, all within hexagonal frames.

A set of navigation icons in the bottom-right corner, including four directional arrow icons (up, down, left, right) and a hand cursor icon, all within hexagonal frames.



# The tractors

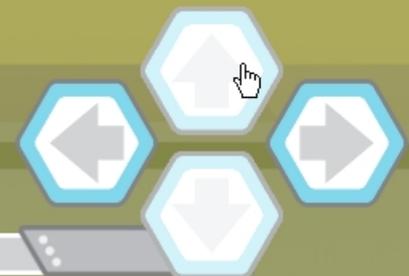
The tractors are very popular due to the universality. It never stay without the work. The dozens of the different attachments makes the tractor ultra-widely used.



0



9





# The tractors

Tractor may to pull different agricultural equipment, to dig, to load, to level the ground and and very many others. One of the main feature of the tractors is a high thrust at the low speed.

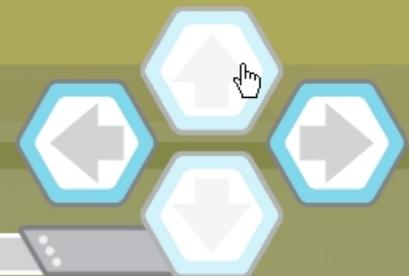
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0



10





# The Tractors

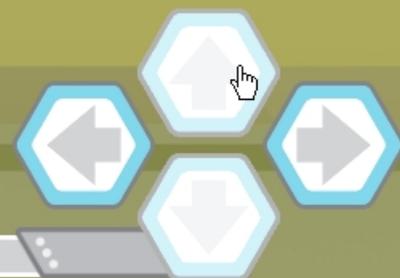
Tractors have high maneuverability and passability.  
High passability is achieved by providing low pressure on the ground.  
It is also good for the fields, since the soil is not compressed.



0



11





# The Tractors

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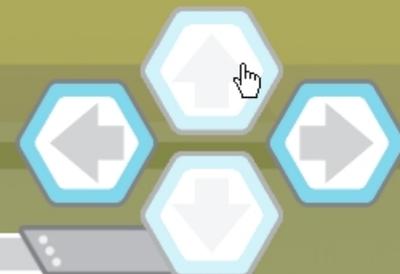
High maneuverability is may be achieved by using the articulated chassis.



0



12





# Autonomous tractors

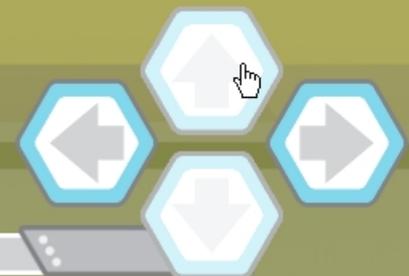
The work of such machines may be pre-programmed. But if the sensors of the robot detects an obstacles, robot may decide how to avoid it.



0



13

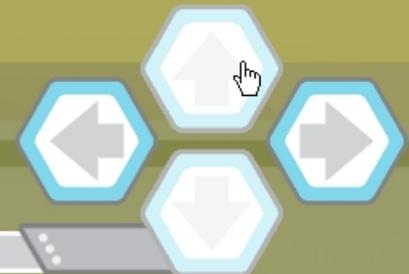




# Let's summaries

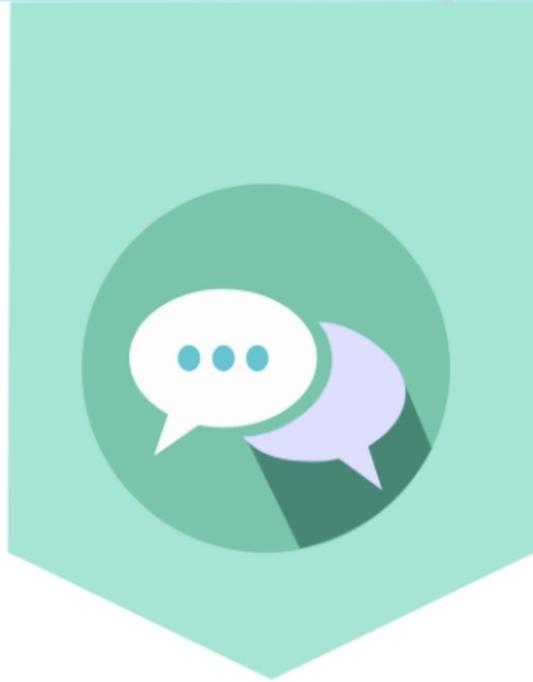
We'll create the universal tractor that:

- Has a sensors for safety operating.
- Ready to different attachments.
- Has the high maneuverability.



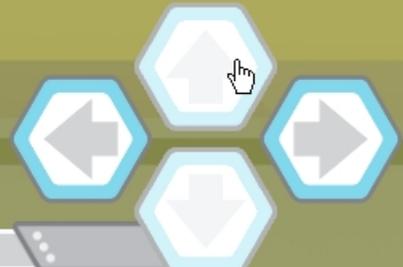


# Discussion of the task



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What do you think, which type of the tractors is better for our needs?





# Meet PowerUp!

ROBORISE-IT!  
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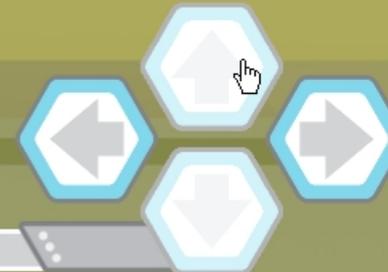
The the multifunctional tractor that will work in the fields.



**PowerUp**

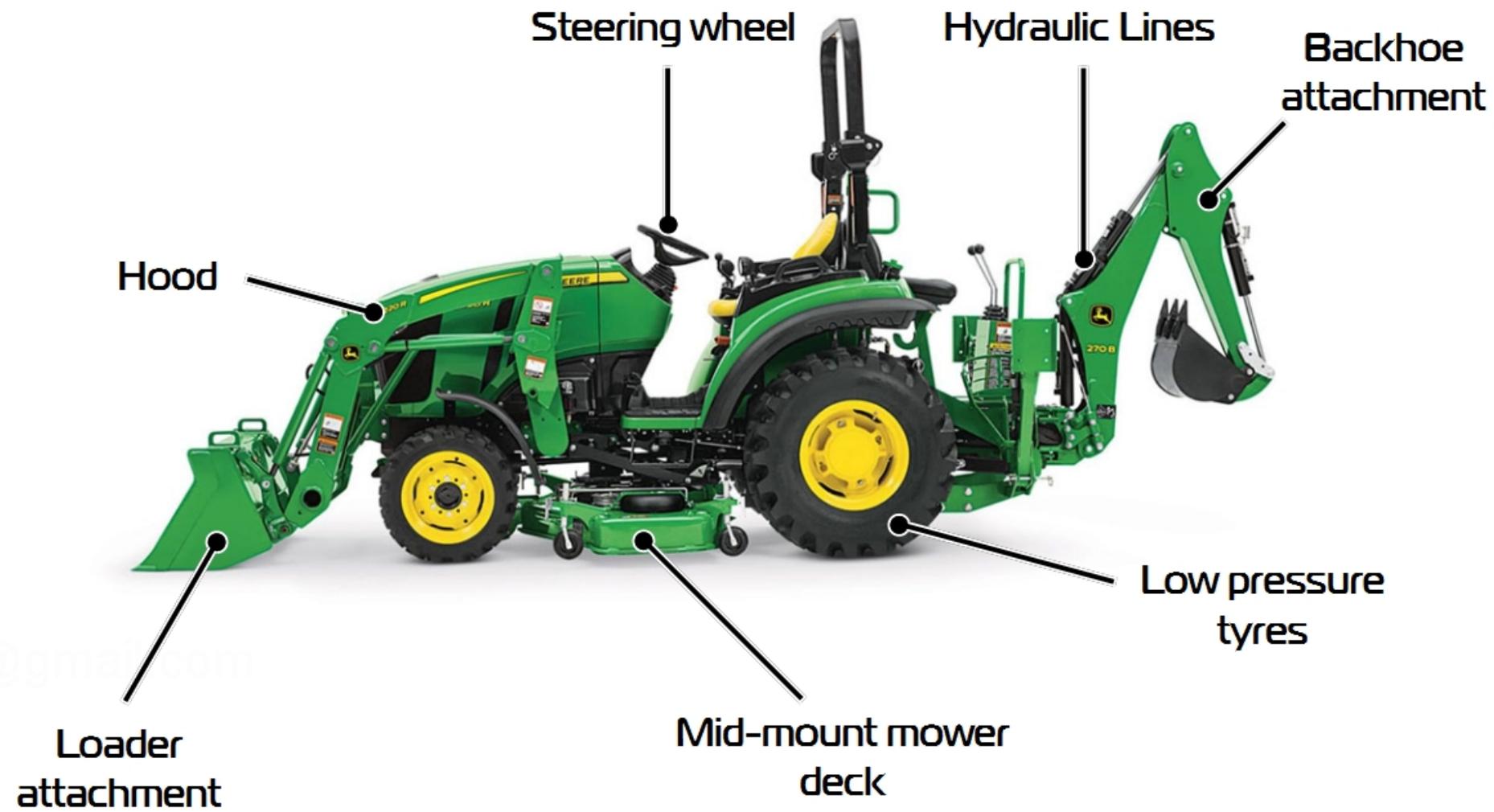


16





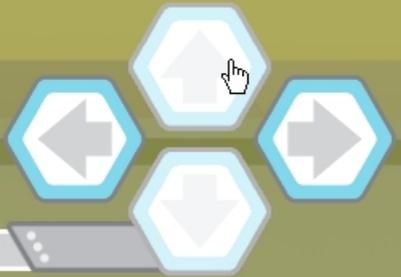
# Tractor's elements



0



17





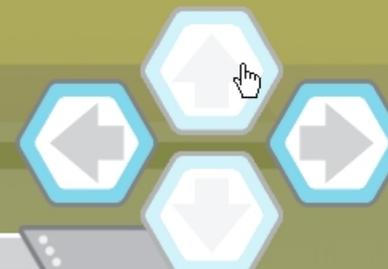
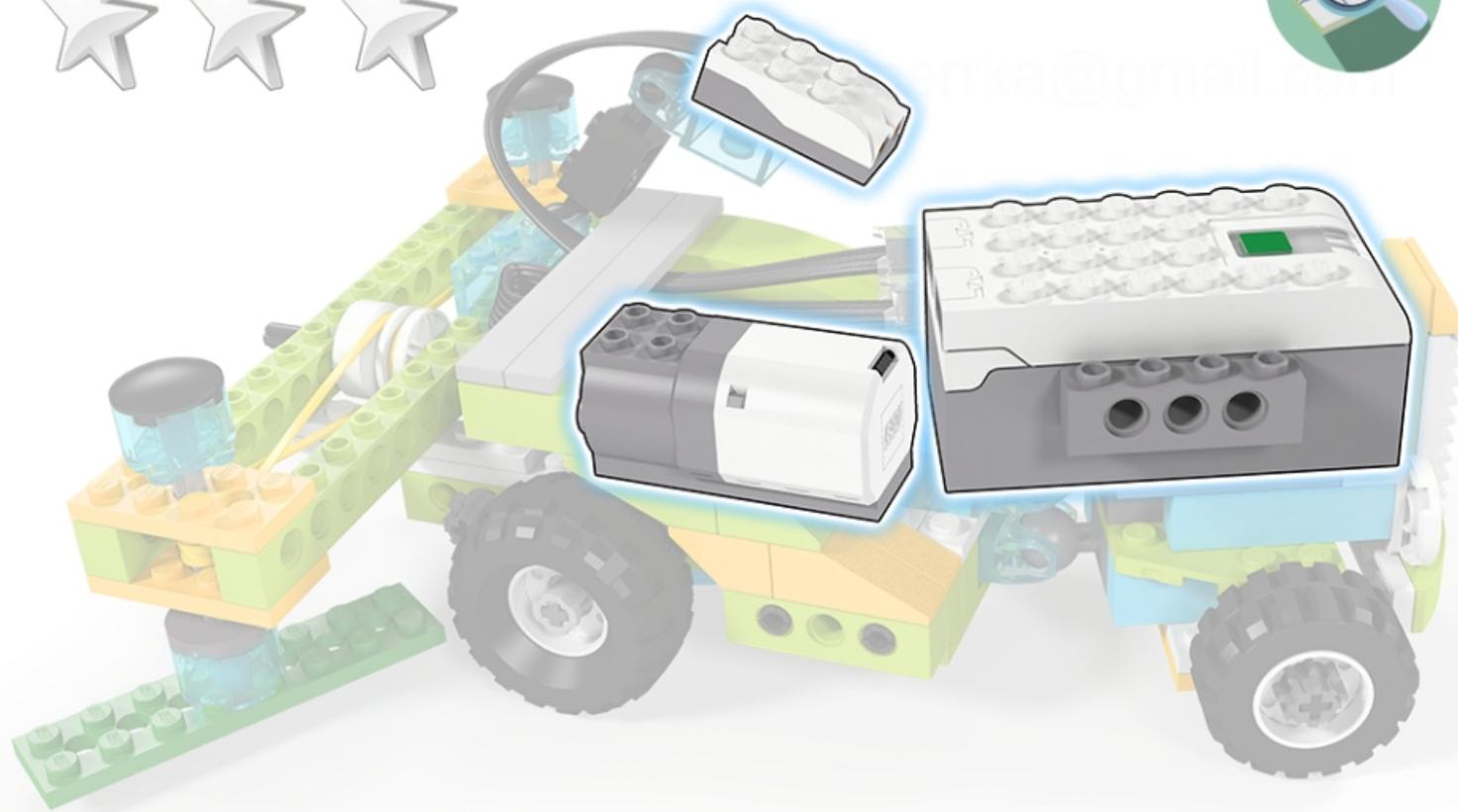
# Features

The motor is used for moving. The motion sensor can be used in the autopilot to detect objects near the robot and to follow behind another robot.



Find:

- ▶ smarthub
- ▶ motor
- ▶ sensor



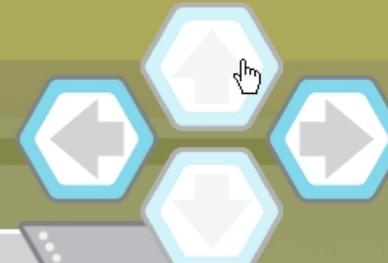
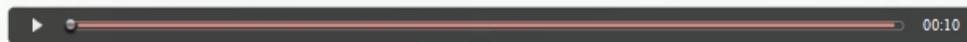


# Features

PowerUp is builded on the articulated chassis. Also it has the movable Motion sensor that may be easily adjusted for different conditions.



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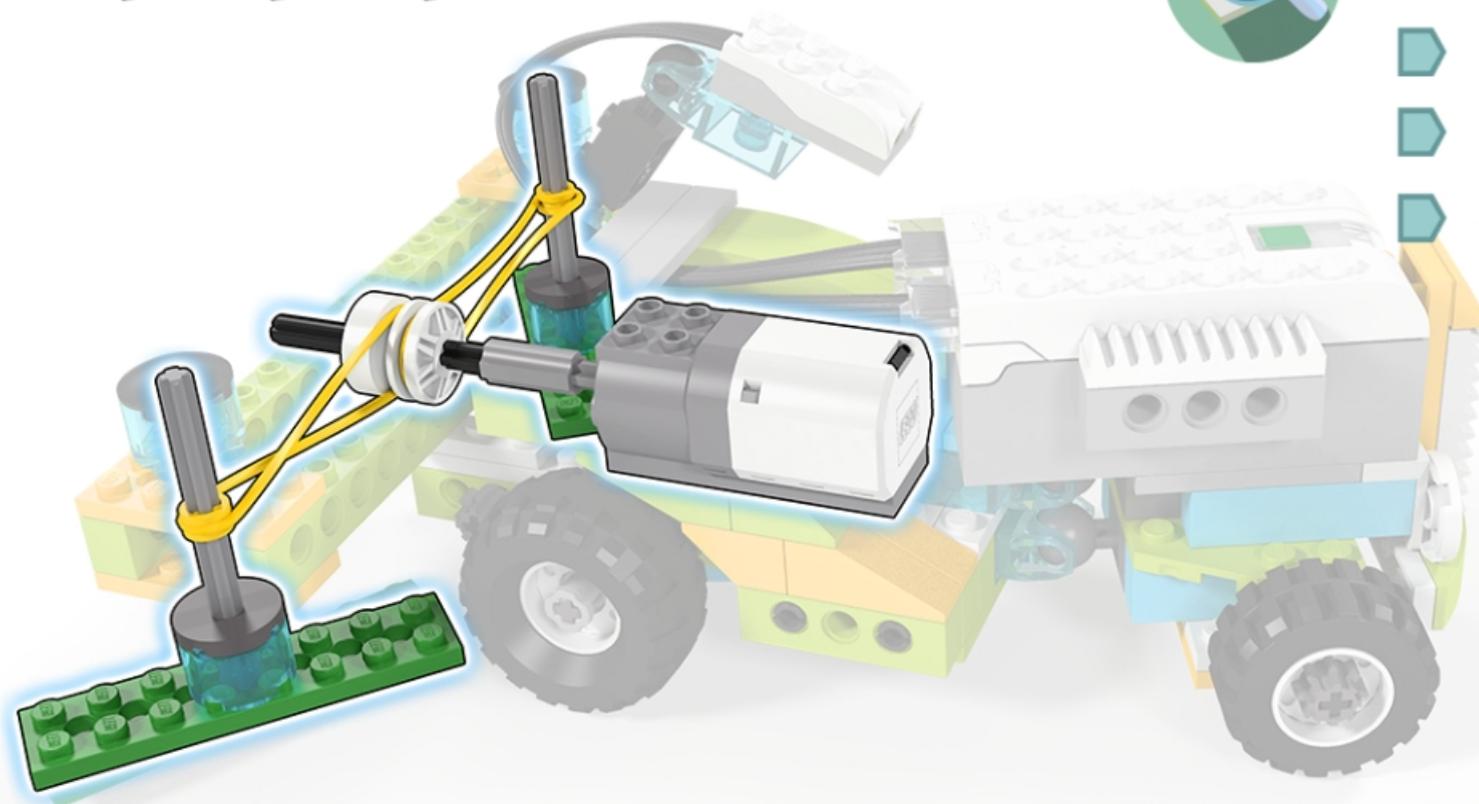
# Features

The one Motor is used to provide motion to the drive wheel and to the PowerUp's equipment such as Grass cutter.



Find:

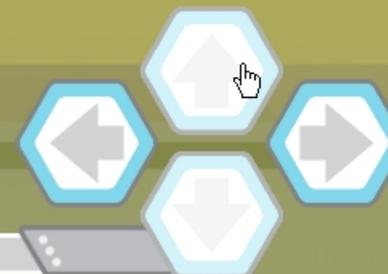
- Motor
- Belt drive
- Grass cutter



0



20





# Features

Rotation to the cutting attachment is transmitted through a Belt Drive. Note that the Belt Drive allows you to transfer the rotation at an angle.



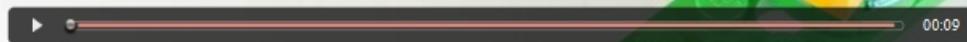
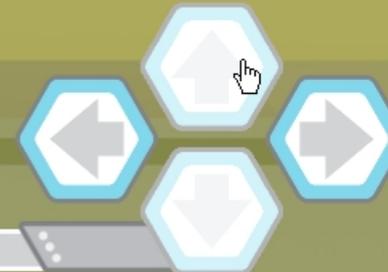
roboriseit.com



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21





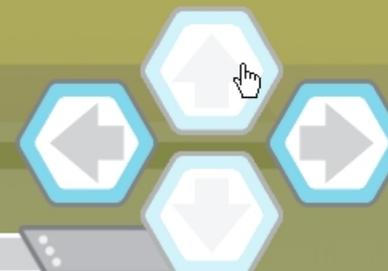
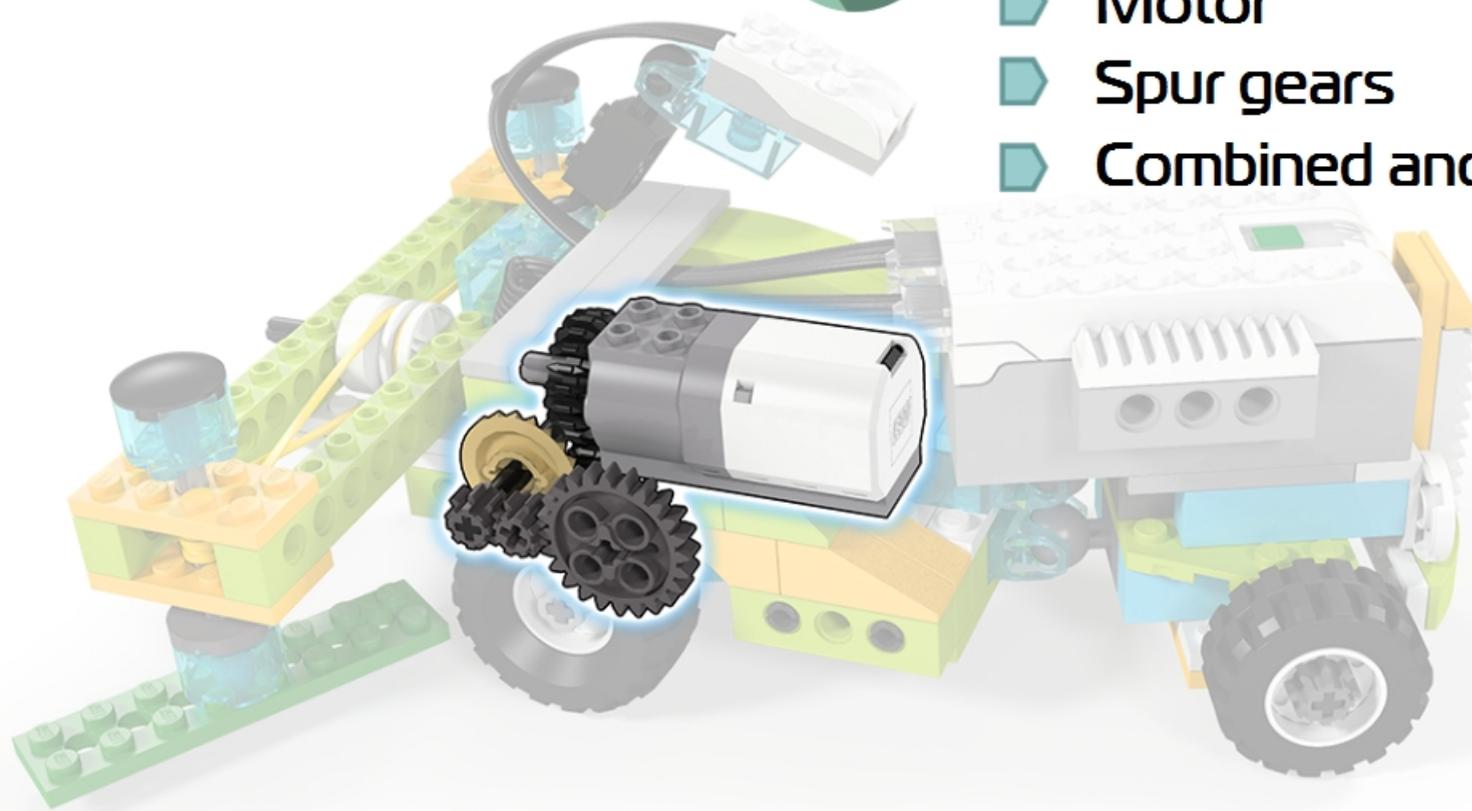
# Features

The Combined, Angular and Spur Gears are used for transmit the rotation to the Drive wheel.



Find:

- Motor
- Spur gears
- Combined and Angular gears





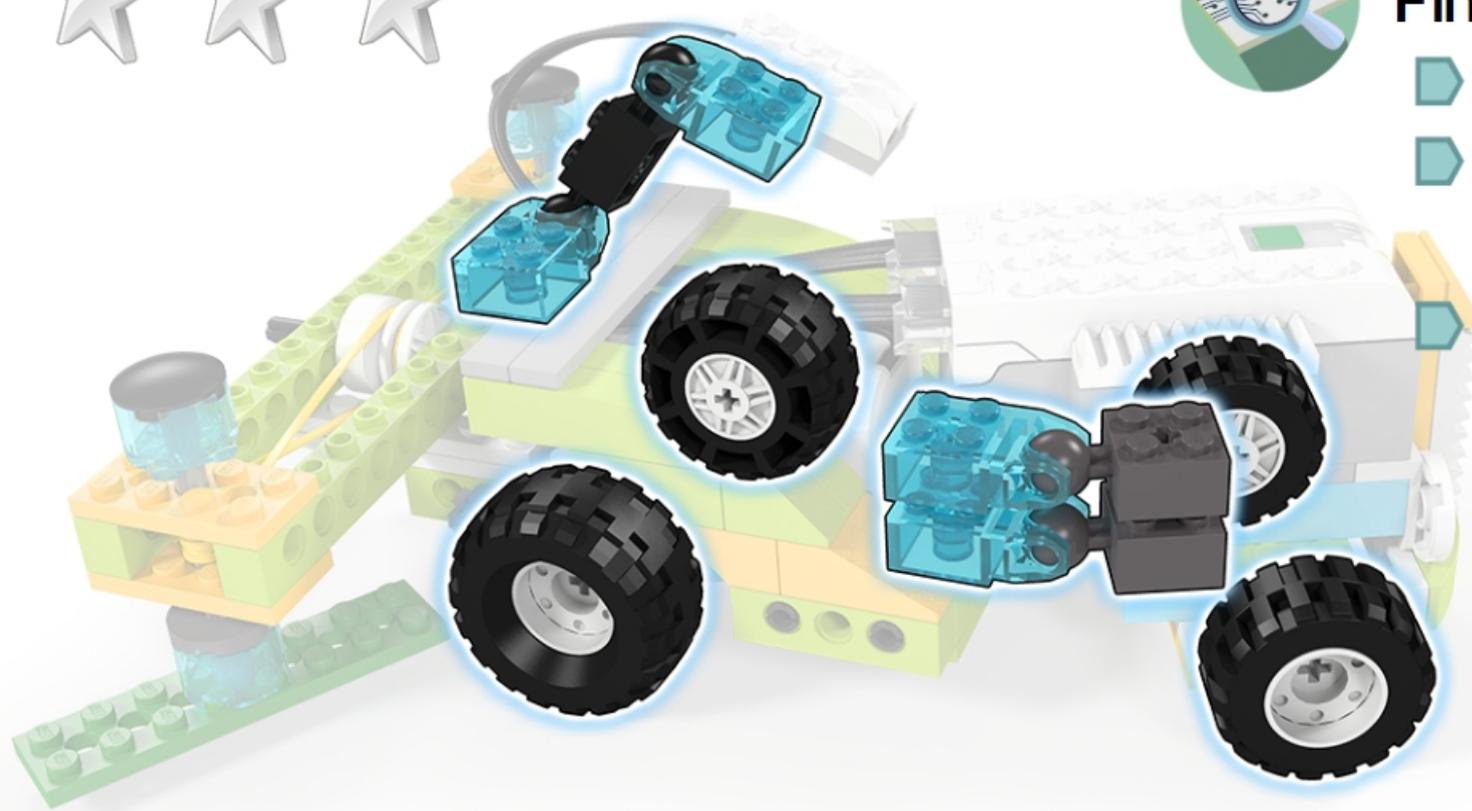
# Features

PowerUp is built on the articulated chassis. It provides high maneuverability. The Hinges are used in the design to create the movable joining. The motion sensor also has adjustable mounting.

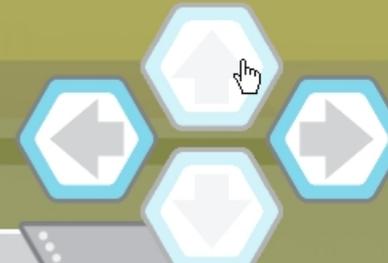


Find:

- Wheels
- Sensor mounting
- Articulation joint



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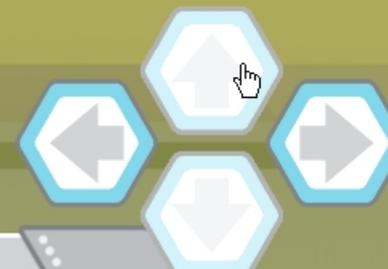




# Features

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Only the one of the wheels of the robot is Drive wheel. It makes the turns to the left and to the right different.





# Build the robot!

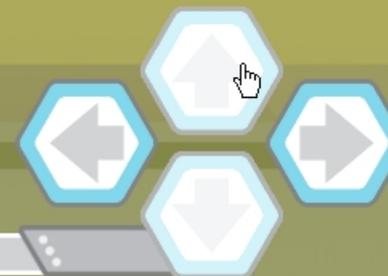
**ROBORISE-IT!**  
ROBOTIC EDUCATION

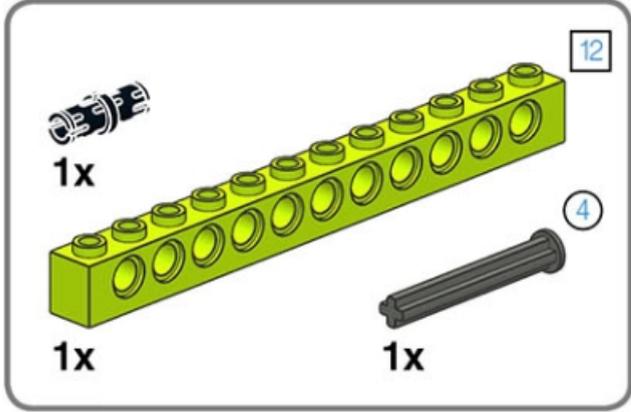


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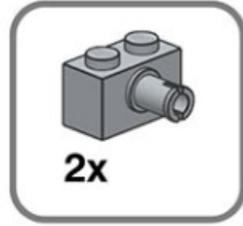
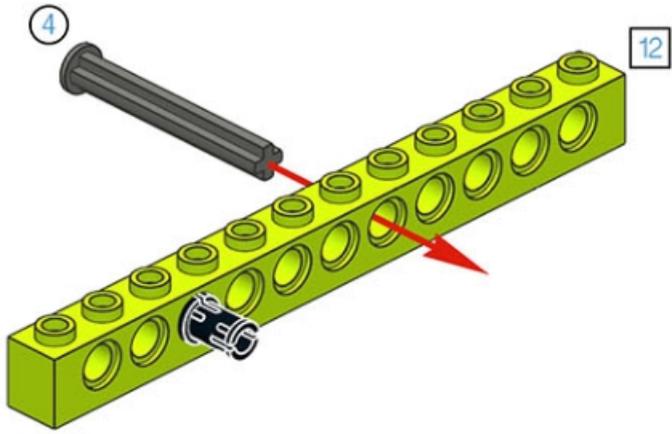


25

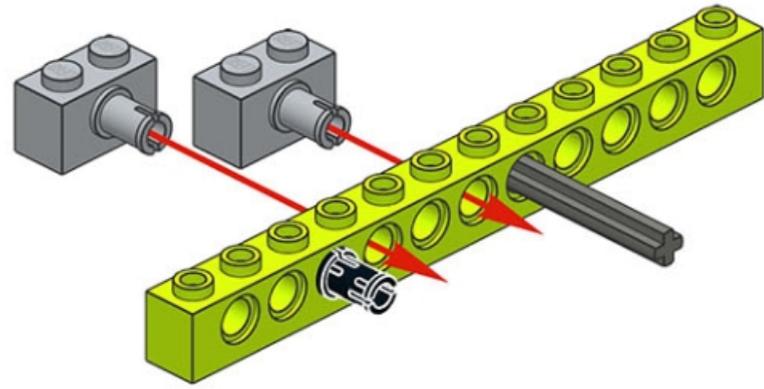




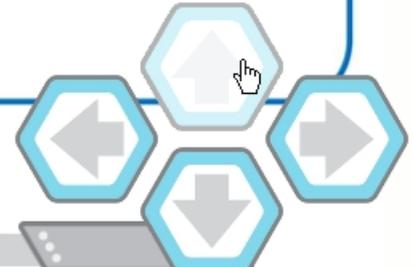
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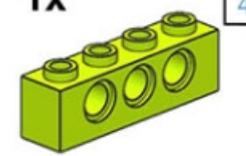


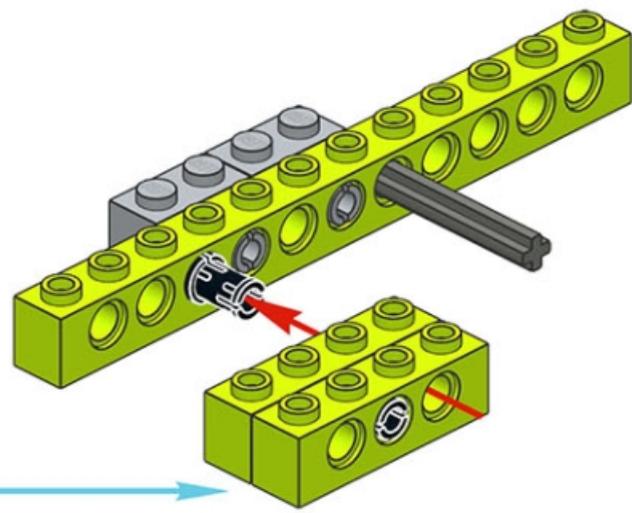
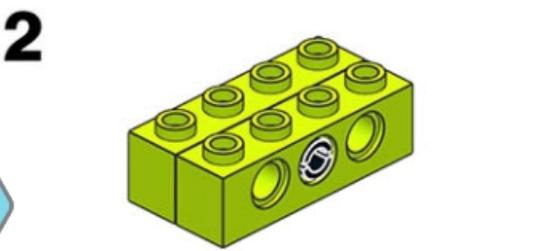
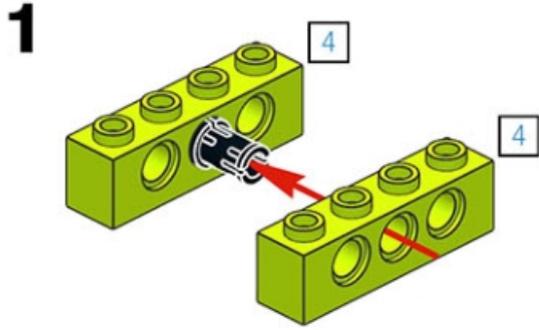
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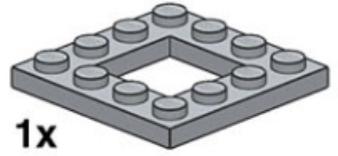


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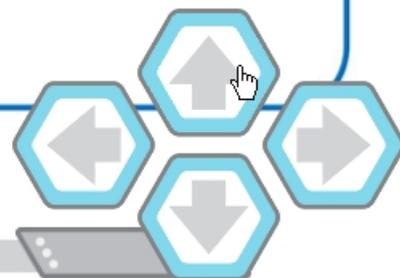
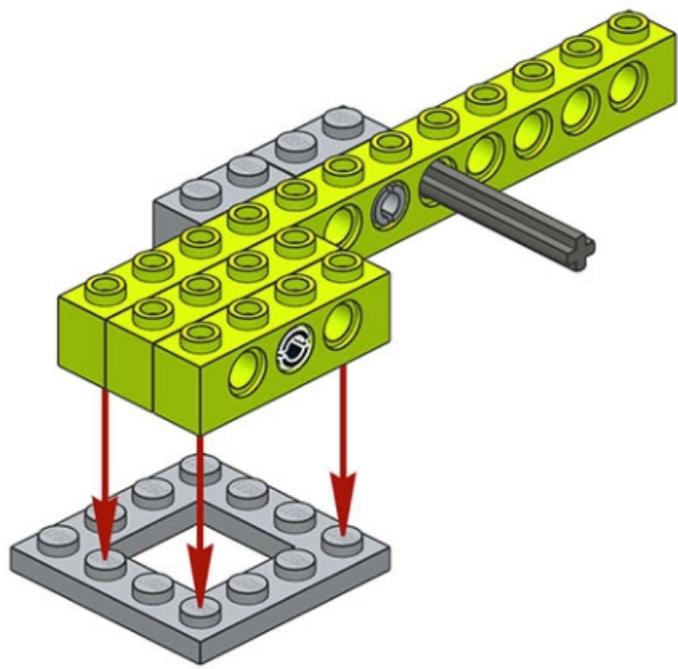


- 1x 
- 2x 
- 4 



- 1x 

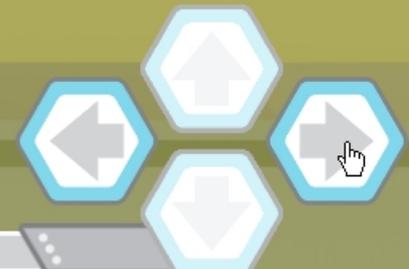
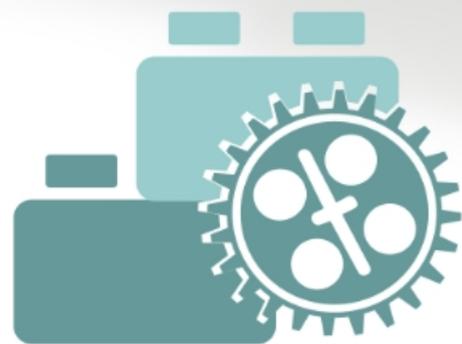
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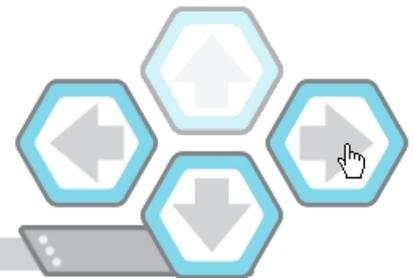
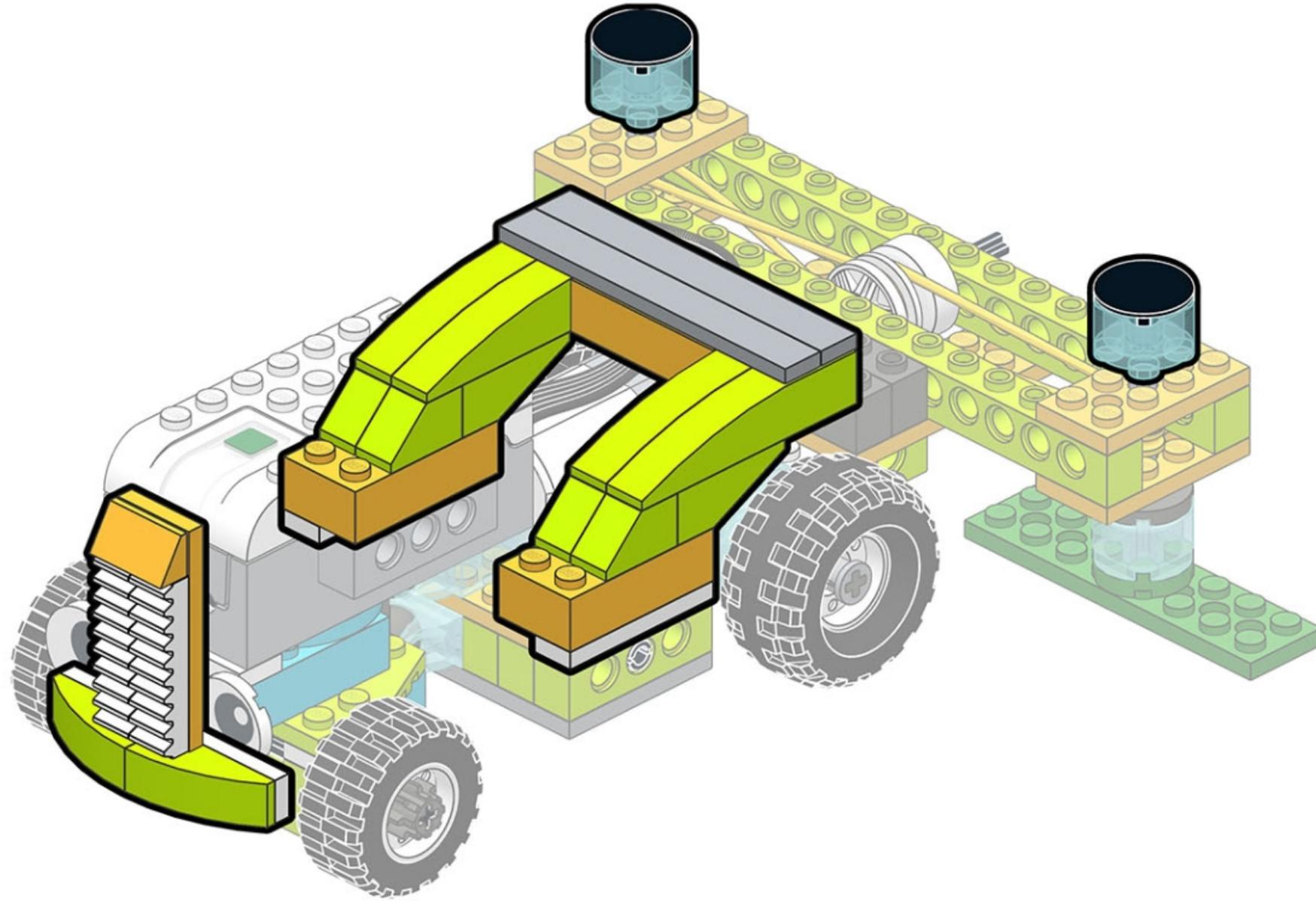




# Enhanced version

Add some external equipment to your robot!

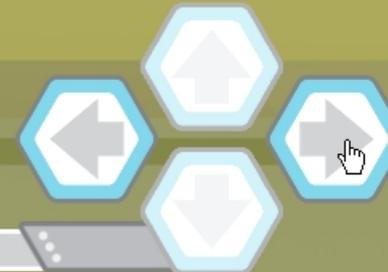
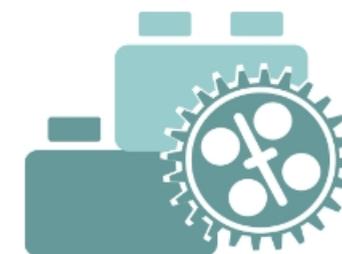


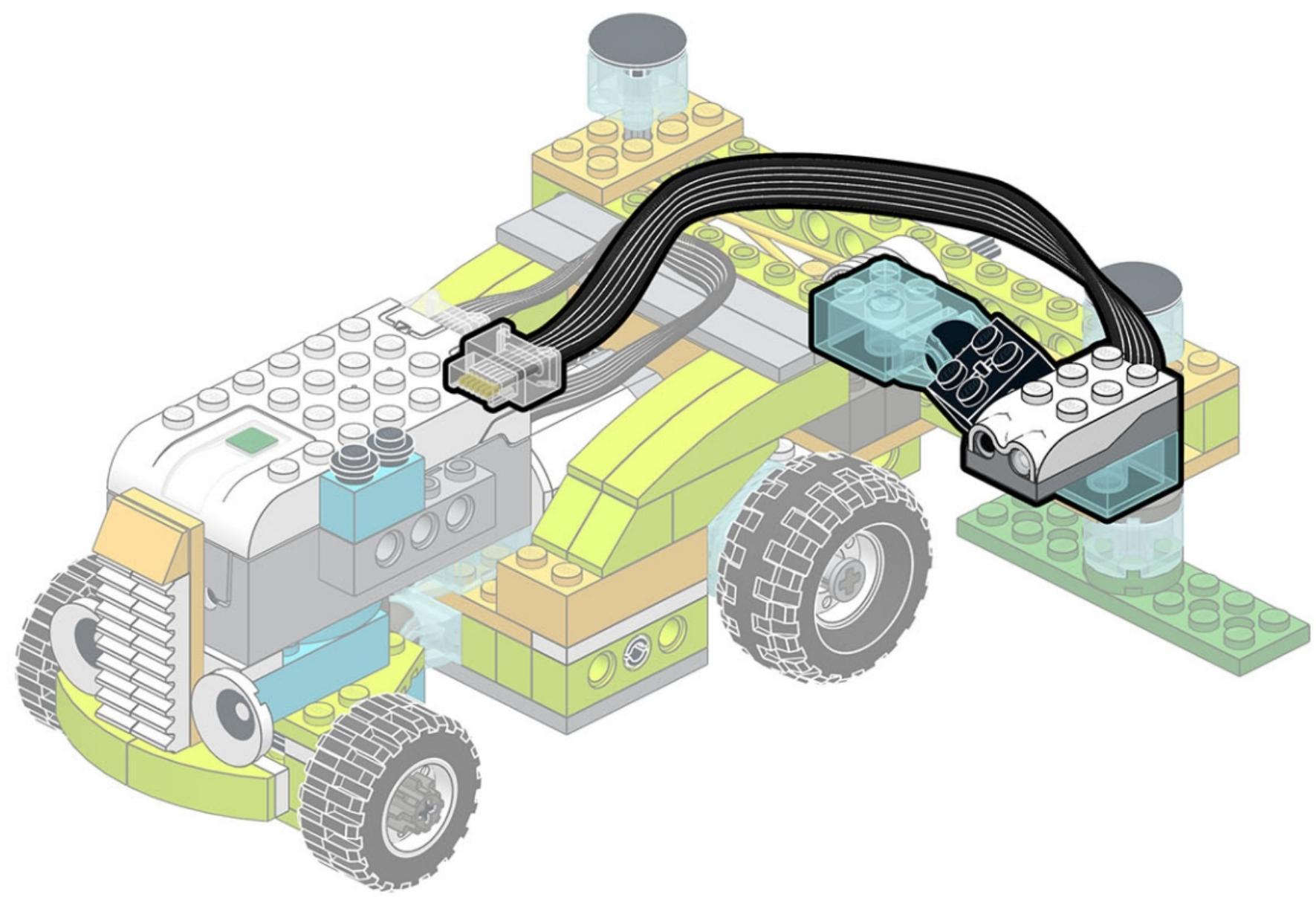




# Motion sensor

Build and mount the Motion sensor!





1/5

0

90

henk@gmail



# Check it out!

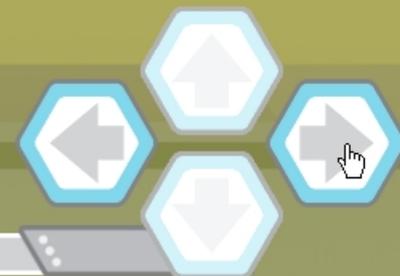
Avoid any friction between the cables while robot is moving.



0



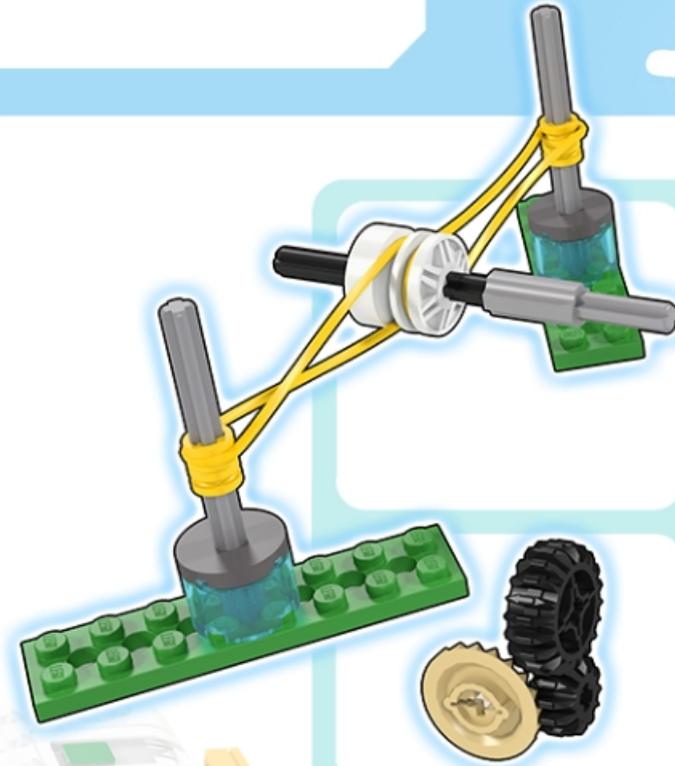
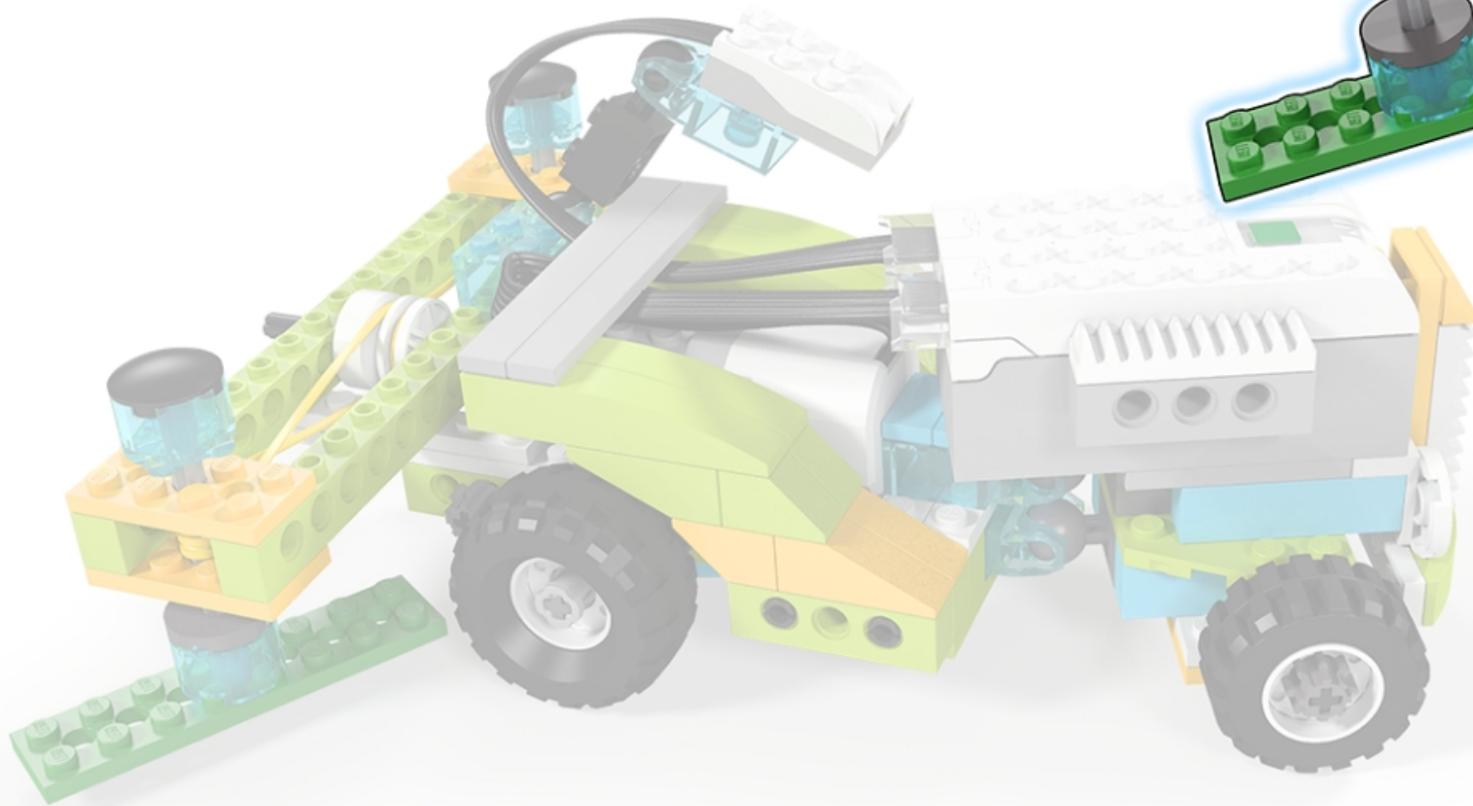
95





# TASK

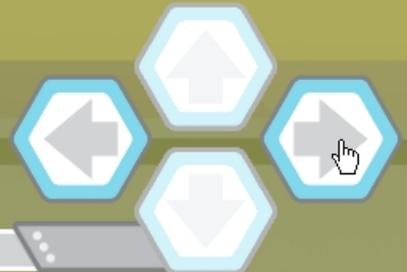
Place parts of the robot in the right places.



0



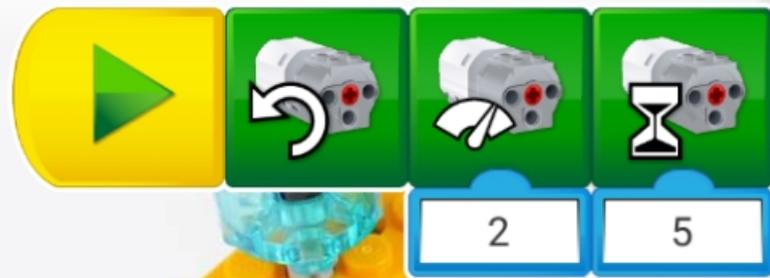
96



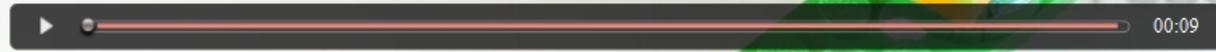


# Task

Check the robot's mechanism. The cutting attachment and the drive wheel must rotate in the same time.



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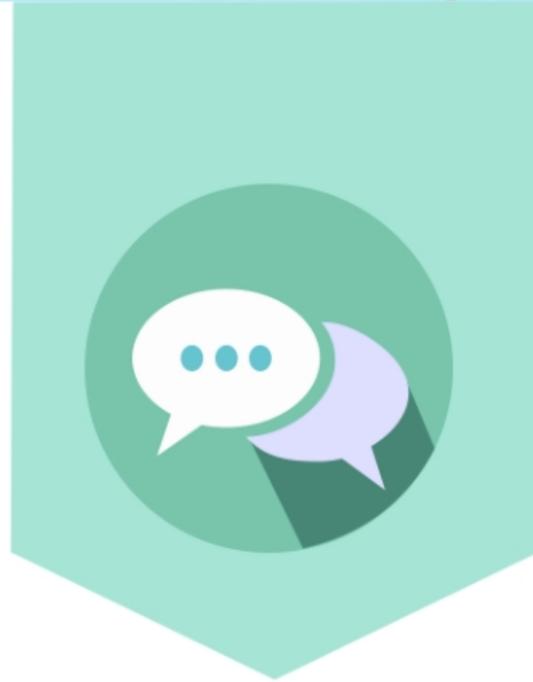


97





# Question



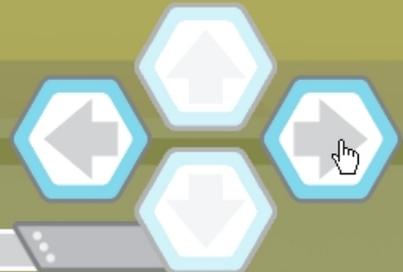
Which sensor should be used to allow the robot to detect obstacles (people, animals) on the way and stop?



0



98





# Cutting of the grass

The grass-cutting attachments is widely used. It makes this operation very simple. After the cutting the Rotor Rakes attachment is used.





# Task 1

Program the automatic stop of the robot when the obstacle is detected.



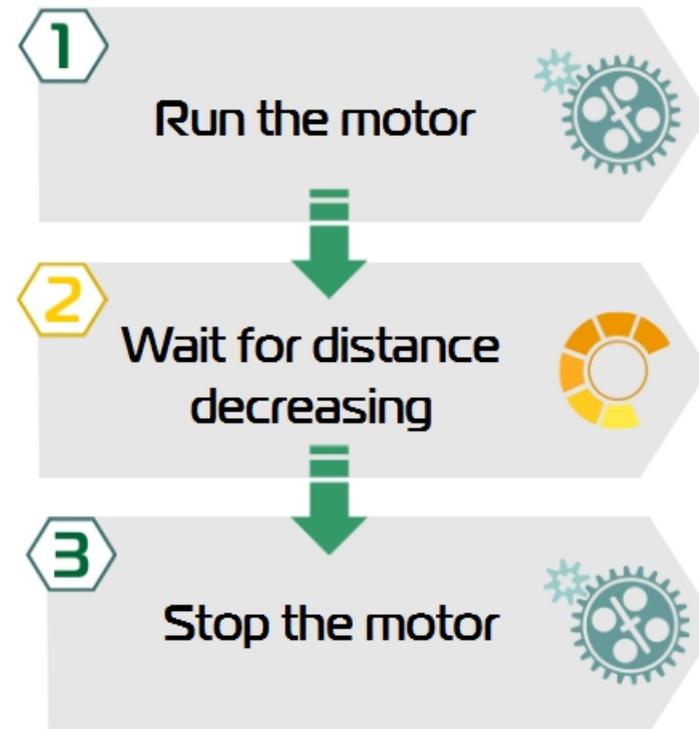
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# Task 1. Algorithm

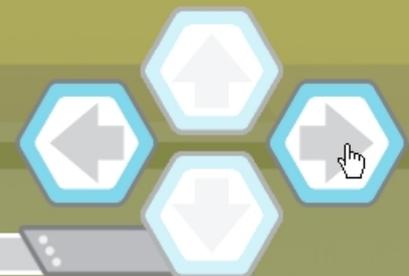
The program should run by the following algorithm:



0



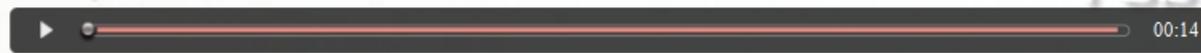
101





# Task 2

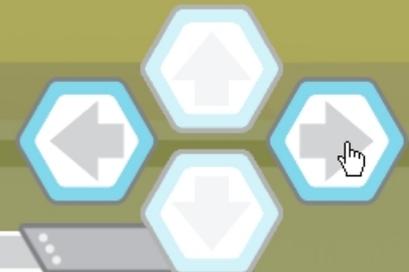
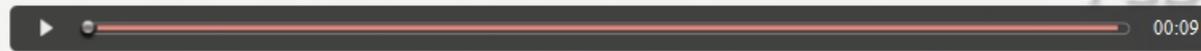
For make the work faster, the few tractors may be used. Usually they follows one each other. Use the Motion sensor for measure the distance to the nearest tractor.





# Task 3

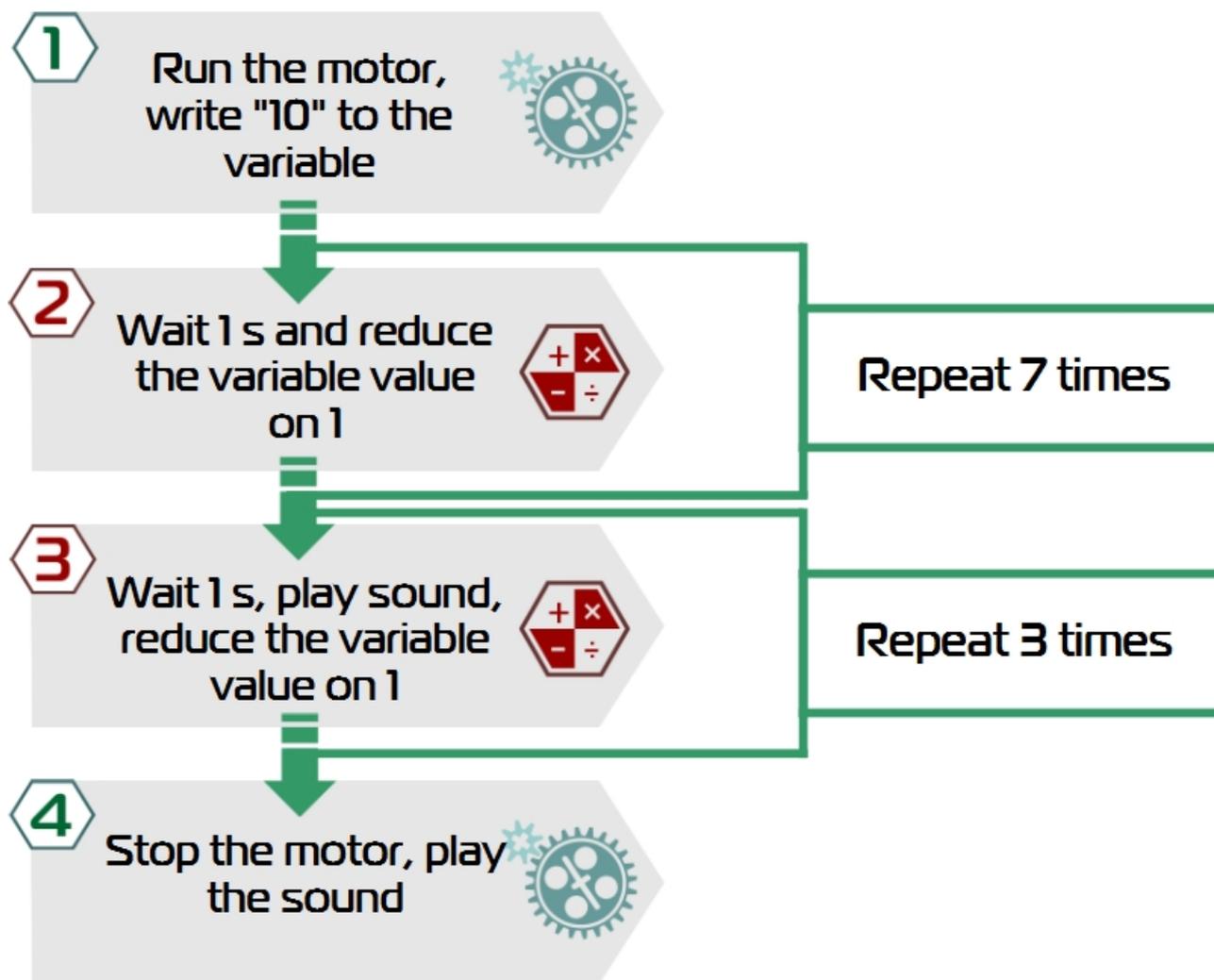
Robot has the battery that may be used during 10 seconds. Let's program the sound notification about the low energy level! Robot must play the sound last 3 seconds. Measure the distance covered by the robot.





# Task 3. Algorithm

The program is run by the following algorithm:



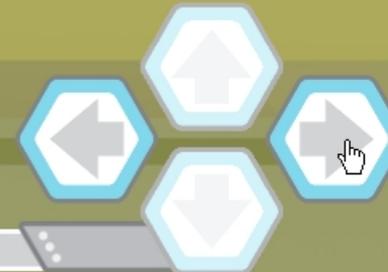
.com



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# Task 3. Program

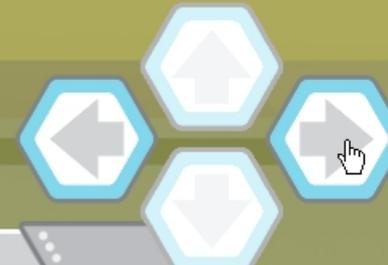
1

Run the motor,  
write "10" to the  
variable



nerrka@gmail.com

Step:



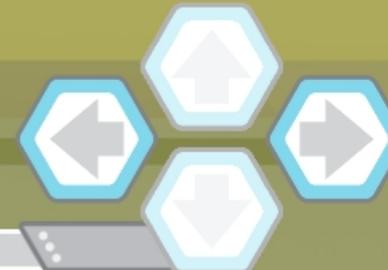


# Task 3. Program

- 1 Run the program and write "10" in the variable
- 2 Wait 1 s and reduce the variable value on 1



Step:



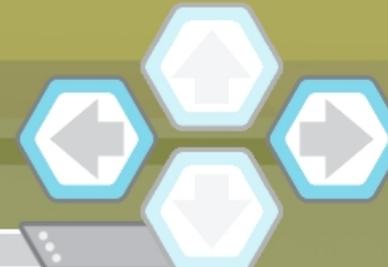


# Task 3. Program

- 1 Run the program and write "10" in the variable
- 2 Wait 1 s and play sound
- 3 Wait 1 s, play sound, reduce the variable value on 1



Step:





# Task 3. Program

- 1 Run the program, write "10" in the variable
- 2 Wait 1 s and increase the variable
- 3 Wait 1 s, play the sound, reduce the variable
- 4 Stop the motor, play the sound



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Step:

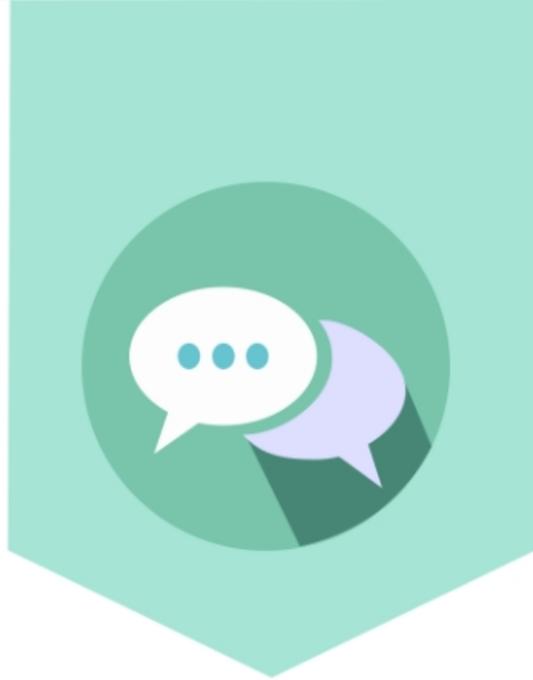


0

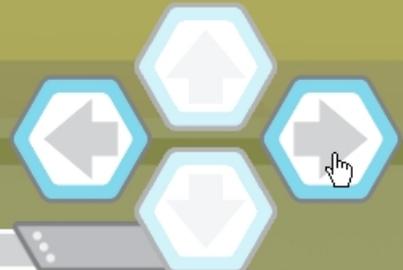
105



# Question



How to increase the operating range of the robot?



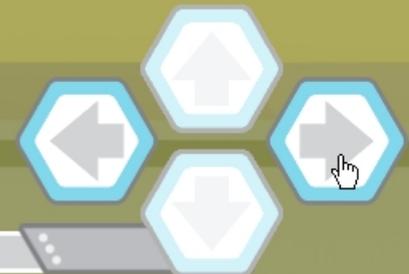


# Batteries

The modern batteries consist of the small single elements, connected together.



The current battery of your robot may include two elements:





# Batteries

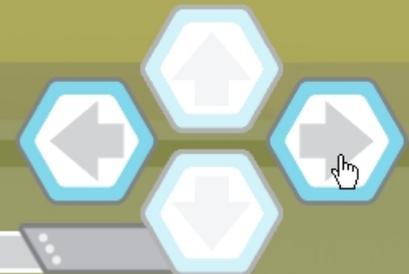
The battery of the Tesla Model S electrocar consist of thousands of small identical elements. On the picture below you may see the single element. The 85 kWh battery pack weighs 1,200 lb (540 kg) and contains 7,104 lithium-ion battery cells.



0



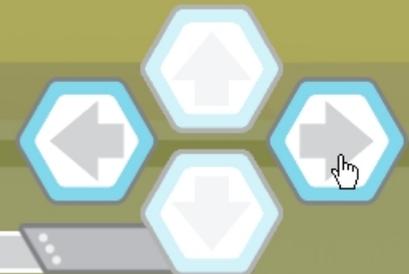
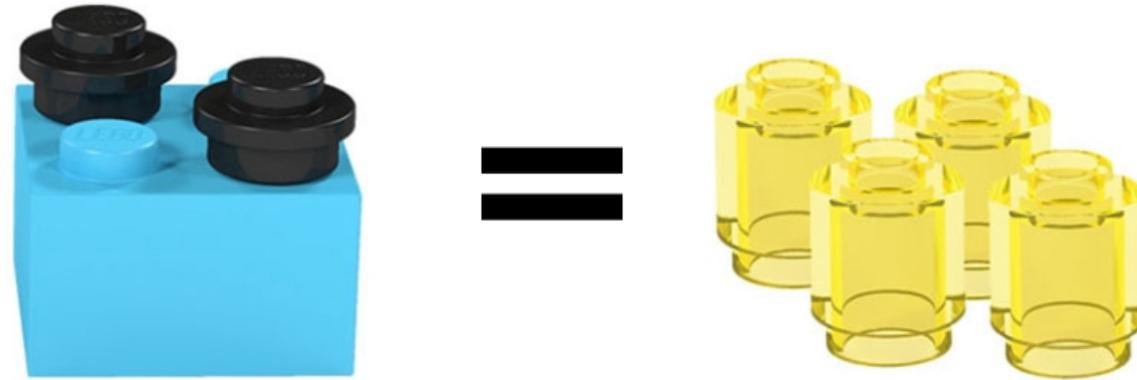
108





# Batteries

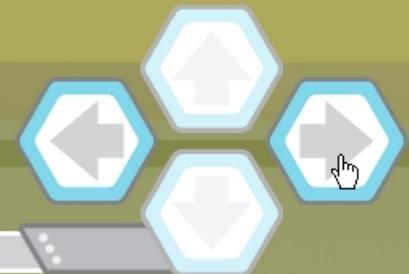
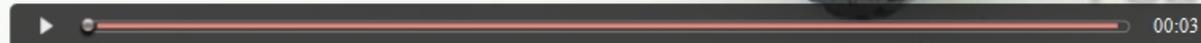
For increase the capacity of the whole battery you need to increase the number of this single elements. For example, the shown below battery for your robot includes 4 single elements. This is twice bigger, then the default battery:





## Task 4

The additional battery has been installed together with the existing default battery. Calculate the capacity of the additional battery and the total capacity of the robot's batteries. What distance may be covered by the robot with this increased battery?





# Task 5

Fill the table with the calculated and measured data:

In the "# of elements" column write the number of the smallest yellow elements that may be included in the pictured batterie.

In the "Distance" column write the measured (for the first batterie) and the expected distances that may be covered by the robot with each batterie.

Name	Picture	 # of elements	Distance
Standart batterie 2x1		2	
Additional batterie 2x2			
Additional batterie 2x4			





## Task 6\*

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Create the most powerful battery and calculate its capacity. Use only blue bricks from your set.



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# Discuss!

- Why the multifunctional tractors are widely used? What advantages they has?
- How rotation transmitted between the perpendicular axes?
- What sensor did you use and why?
- How to increase the capacity of the battery?





# Your achievements

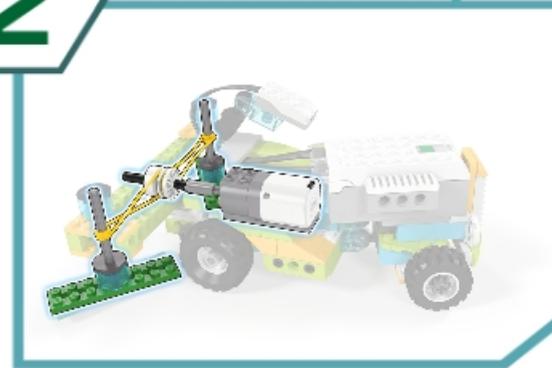
Total count: 0



1



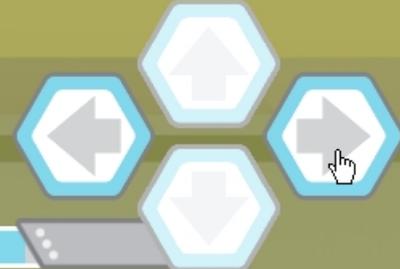
2



3



4



# Mission complete!

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