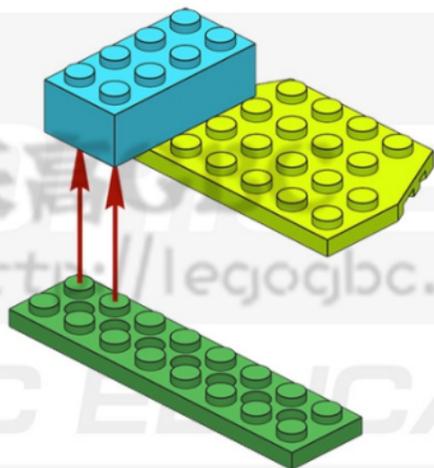
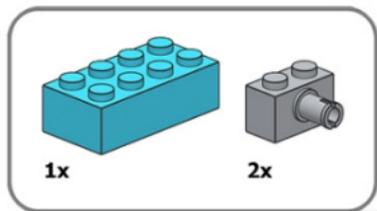


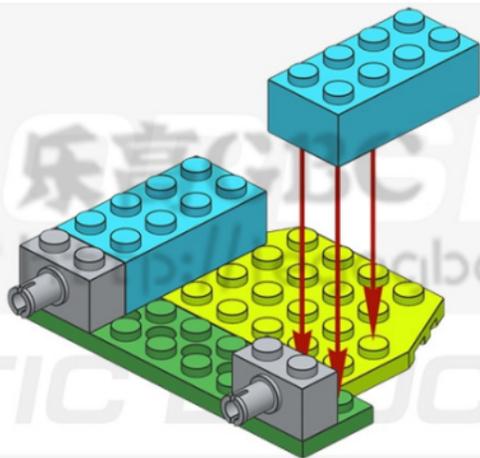
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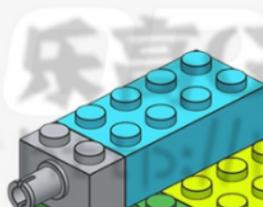
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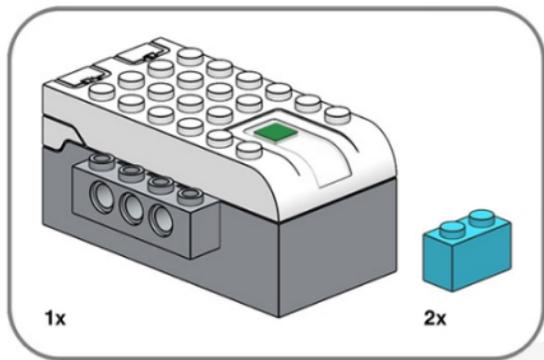


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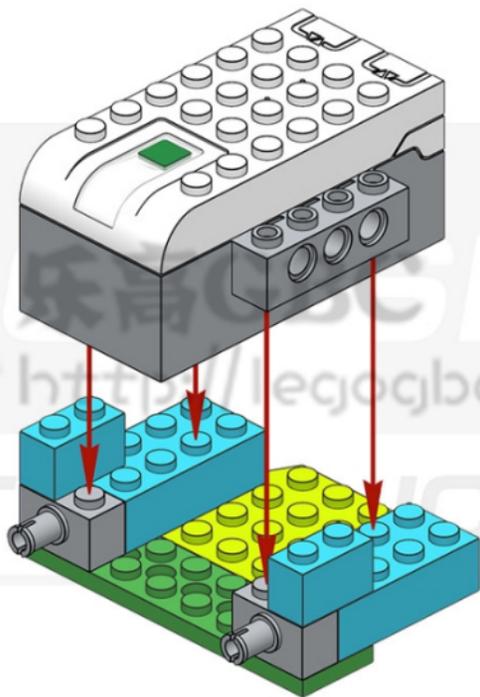


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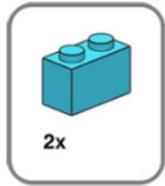
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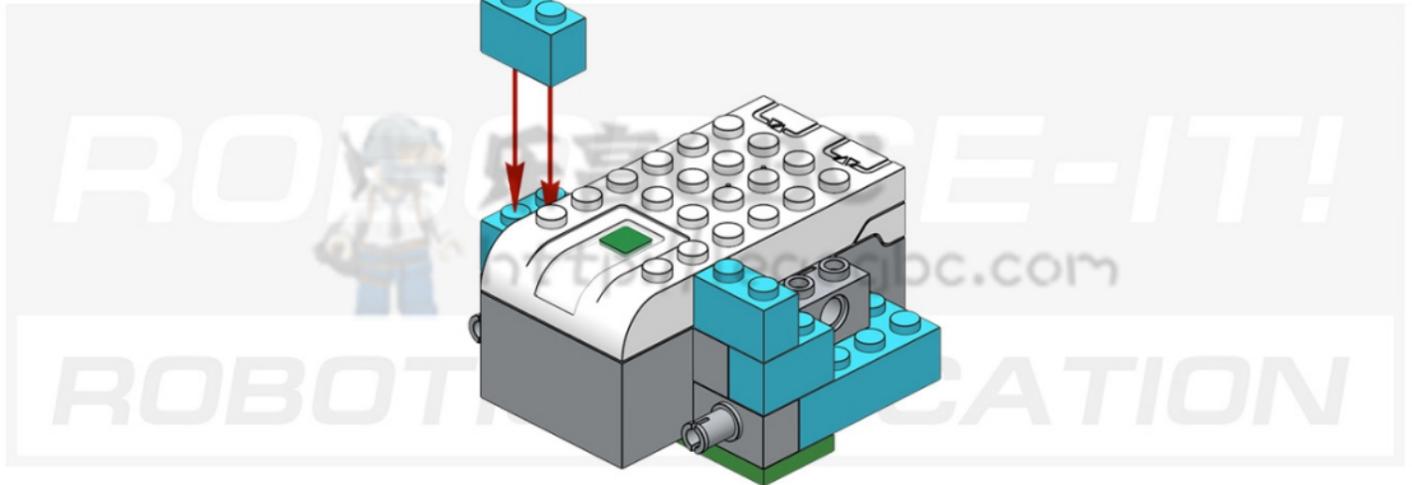
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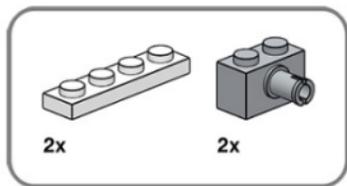


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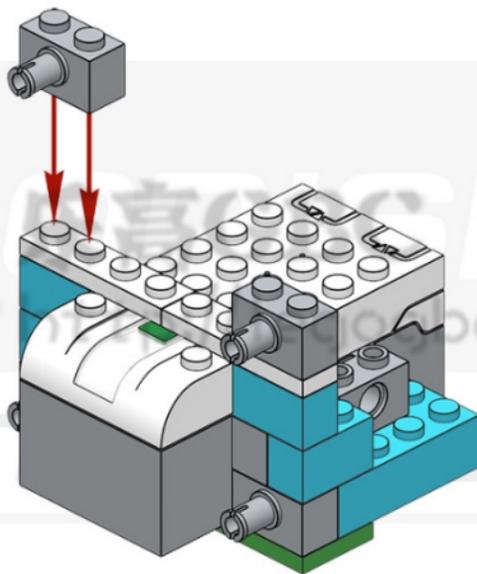


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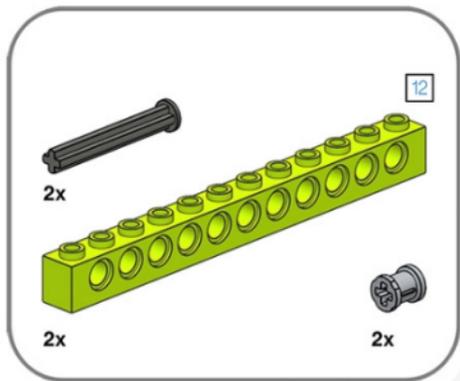
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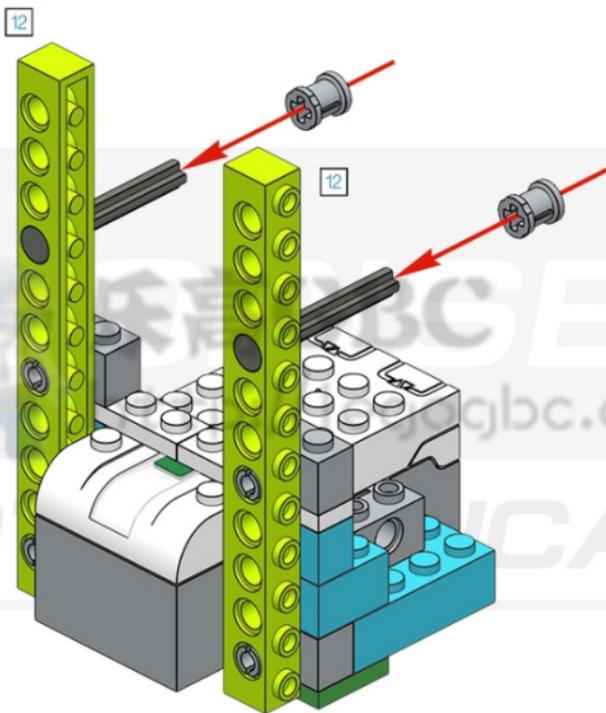
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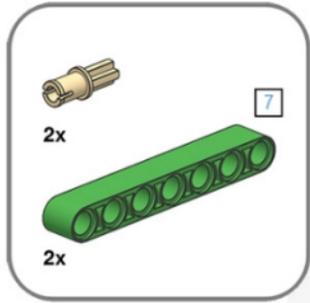
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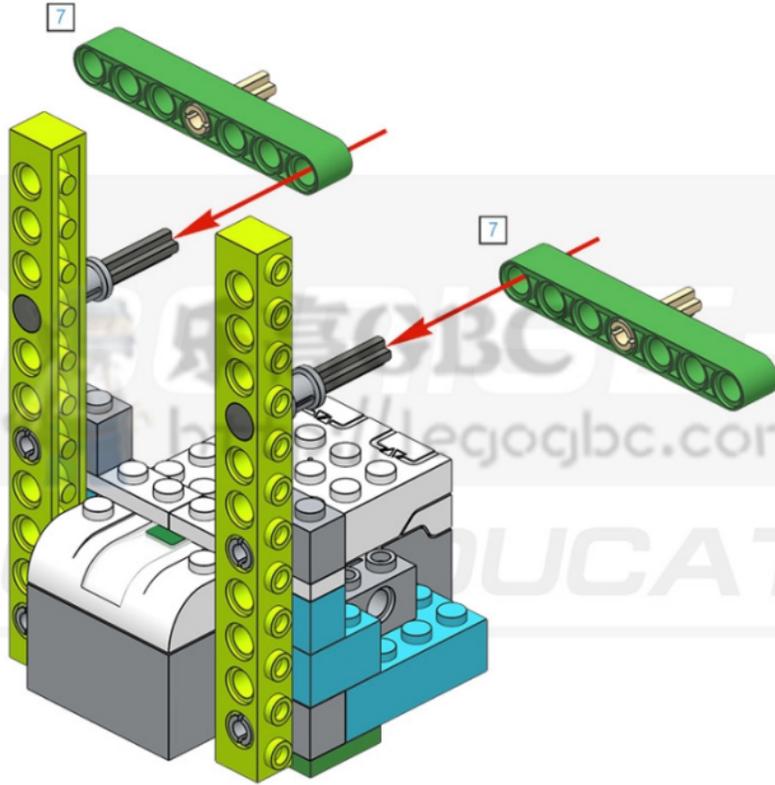
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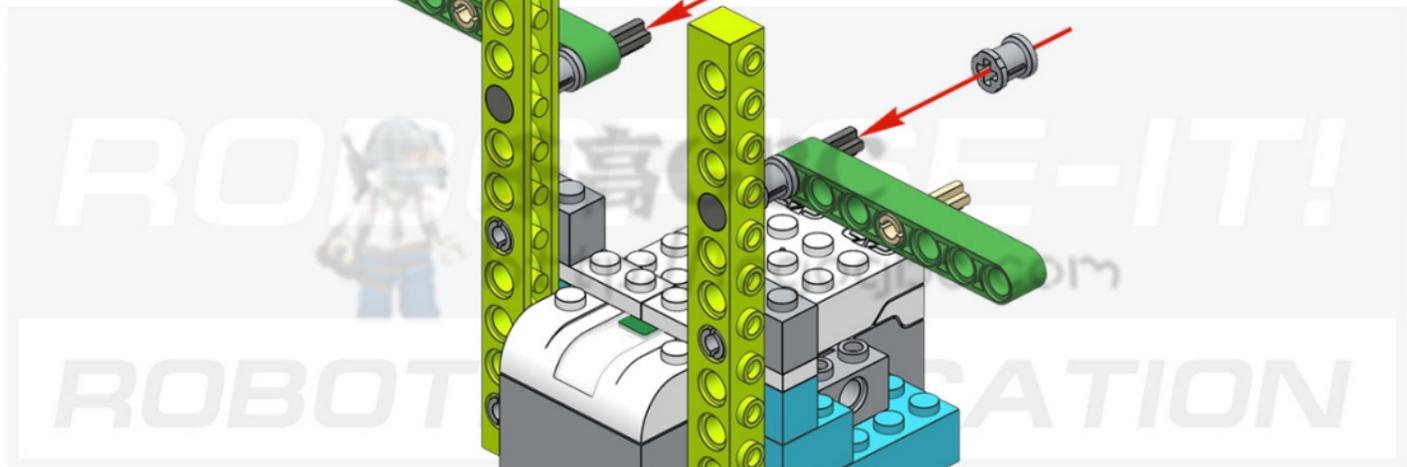
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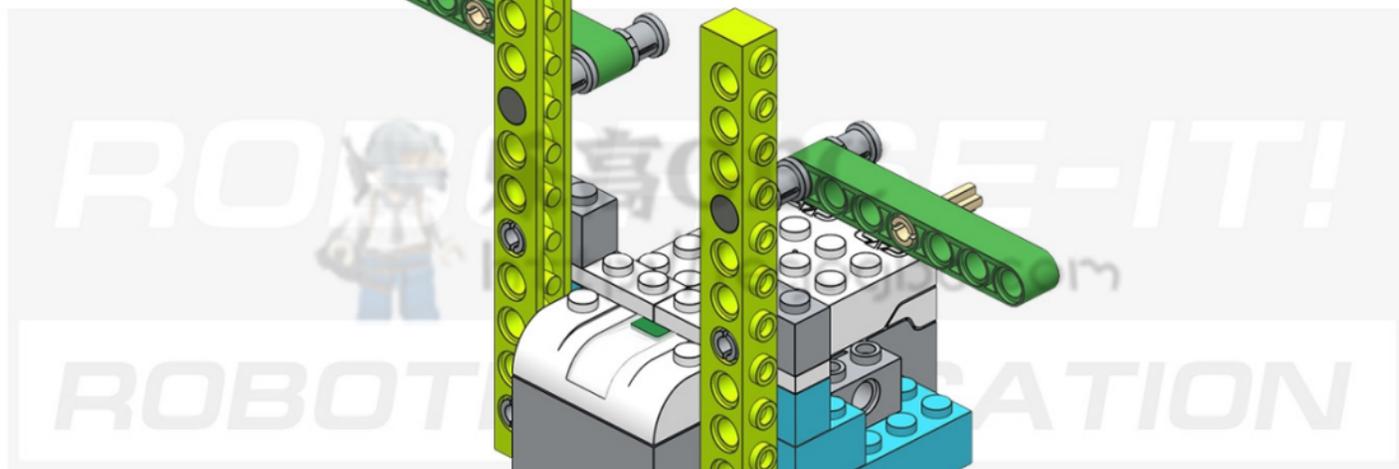
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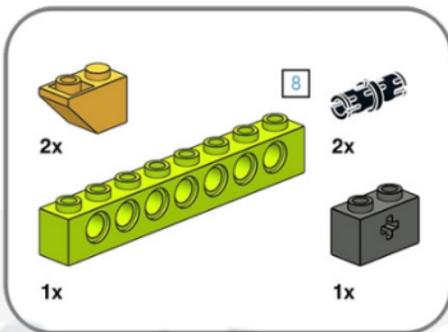
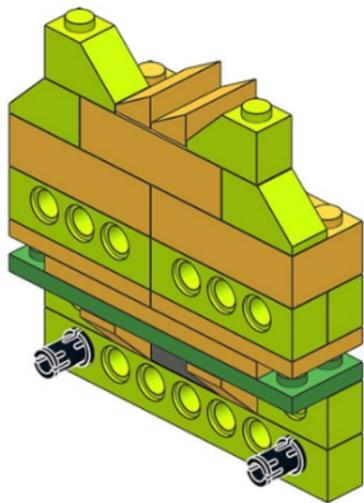


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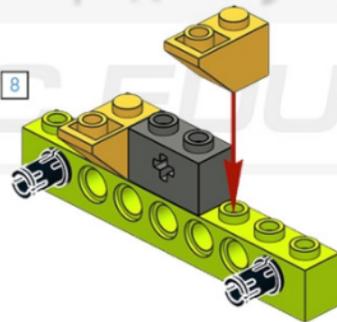




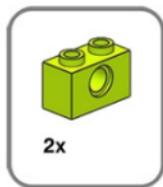
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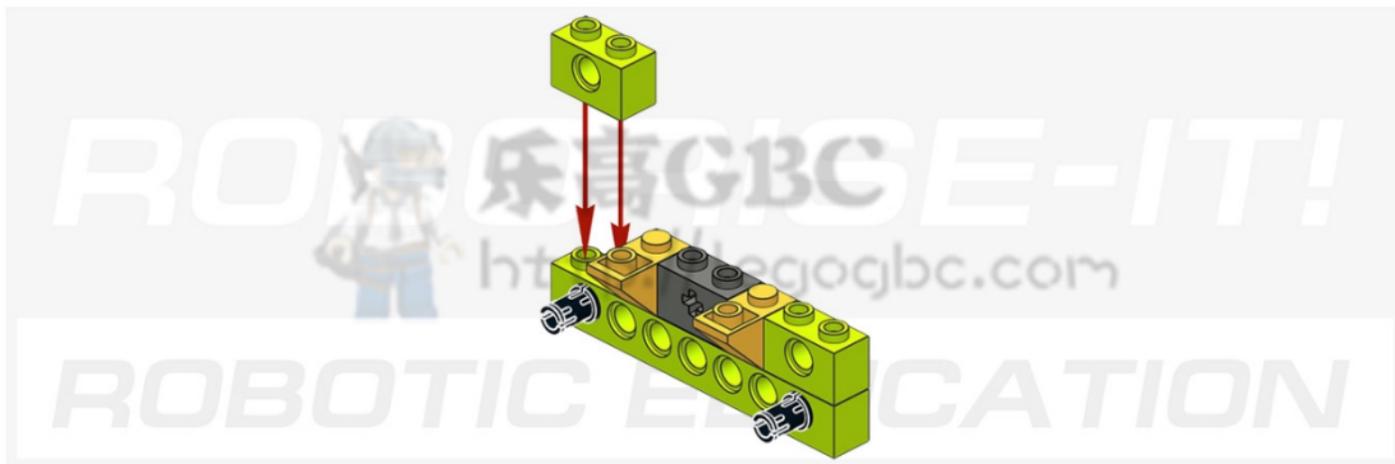
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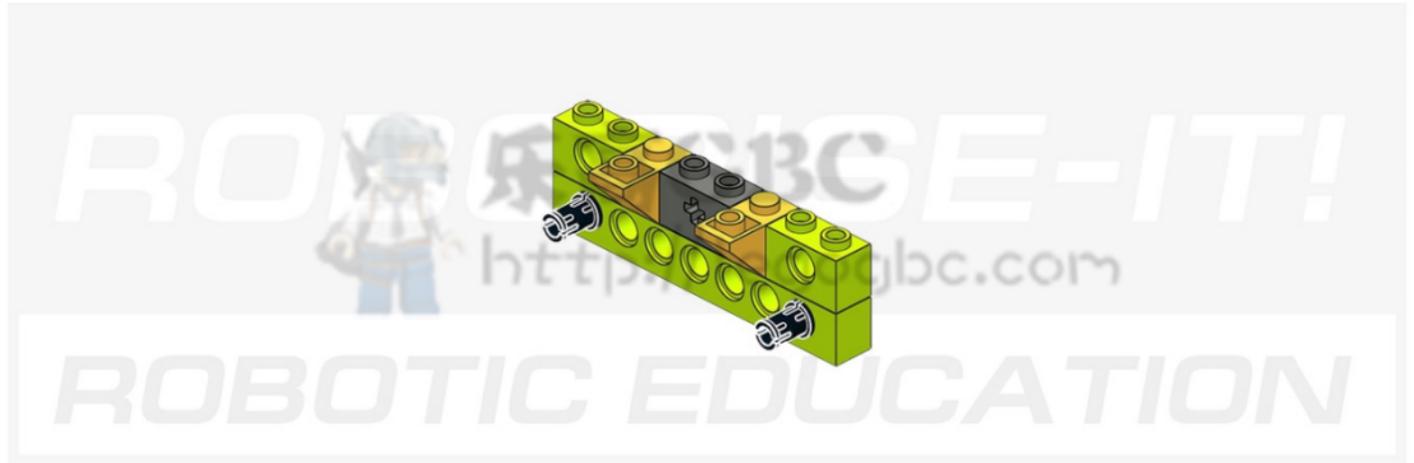


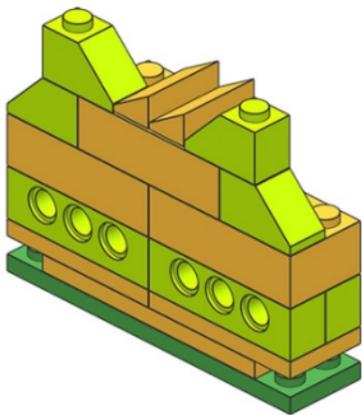
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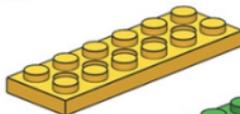
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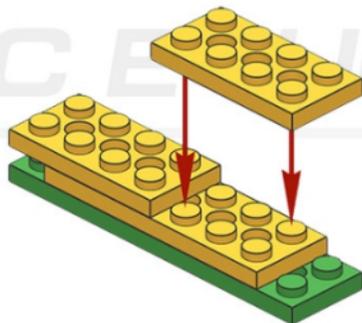


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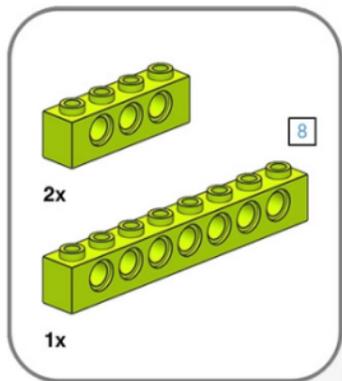


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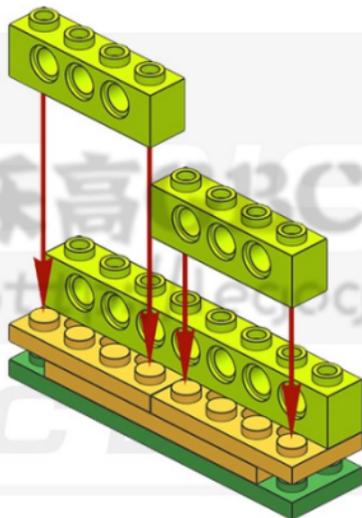
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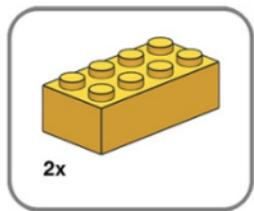
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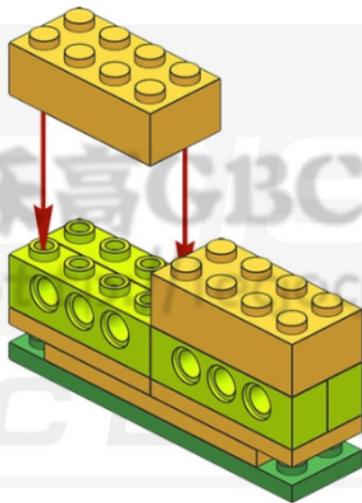
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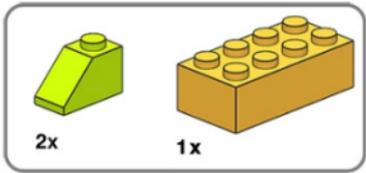
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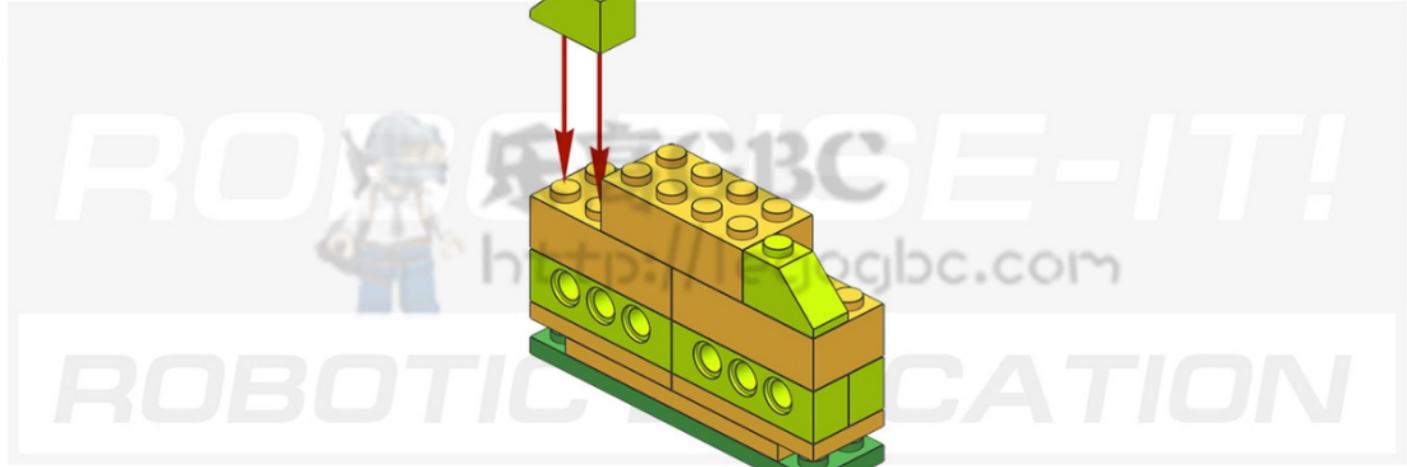
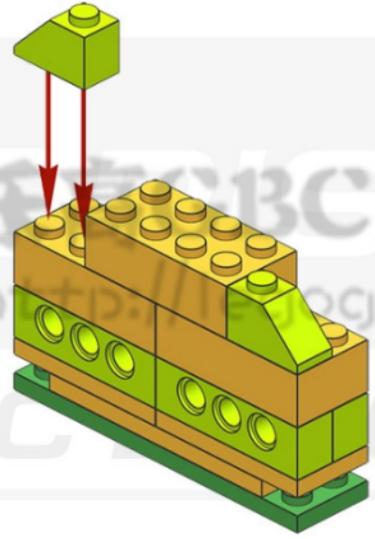
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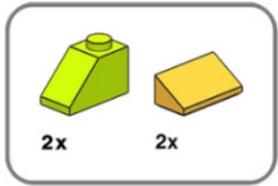
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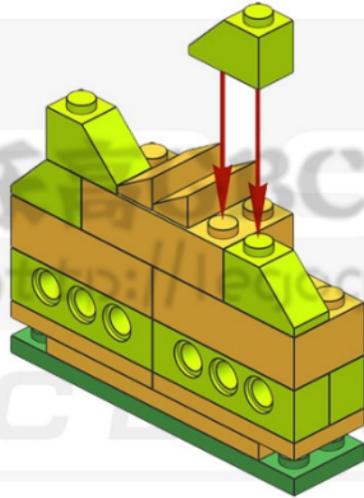


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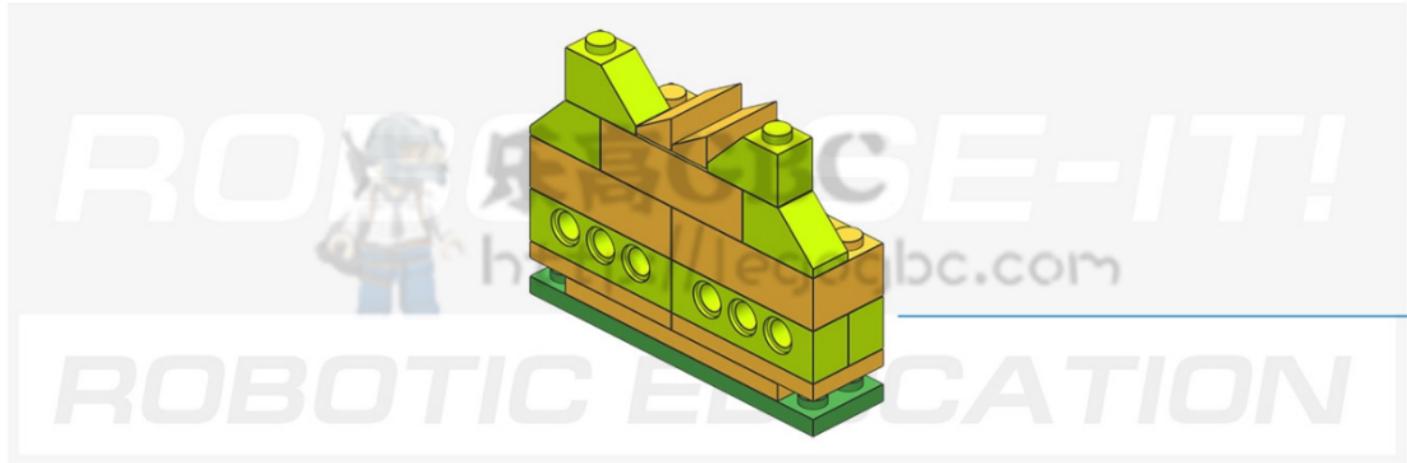
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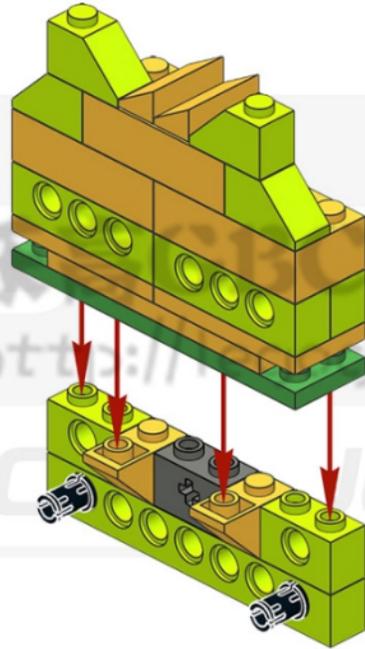
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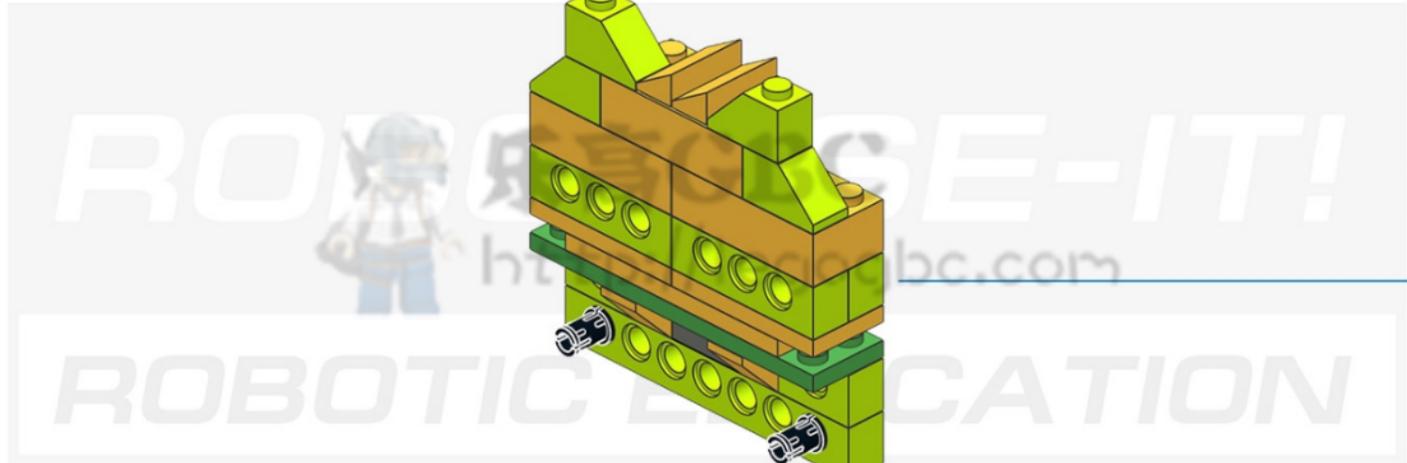
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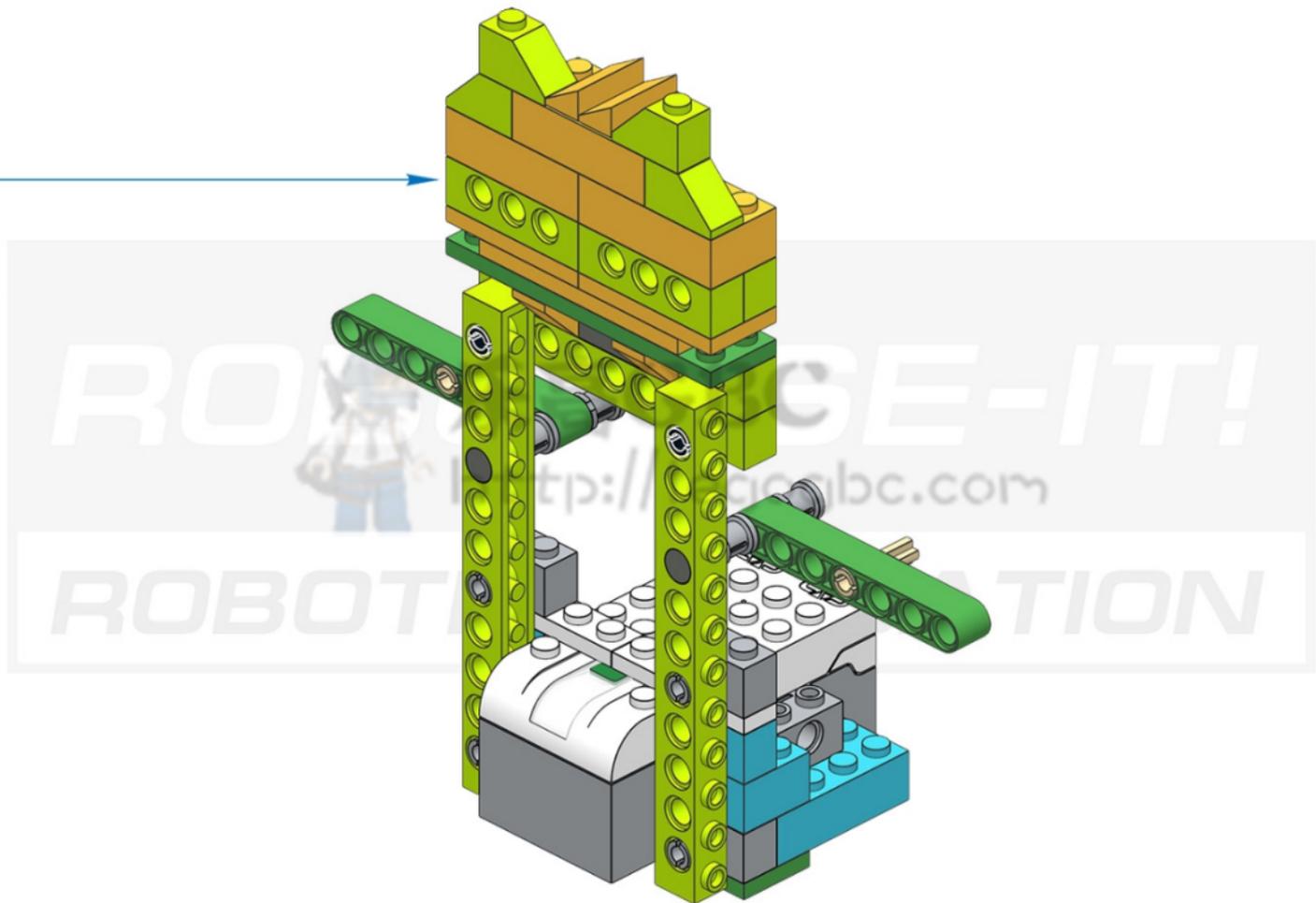


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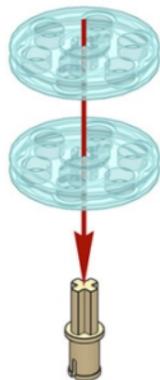


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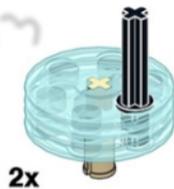
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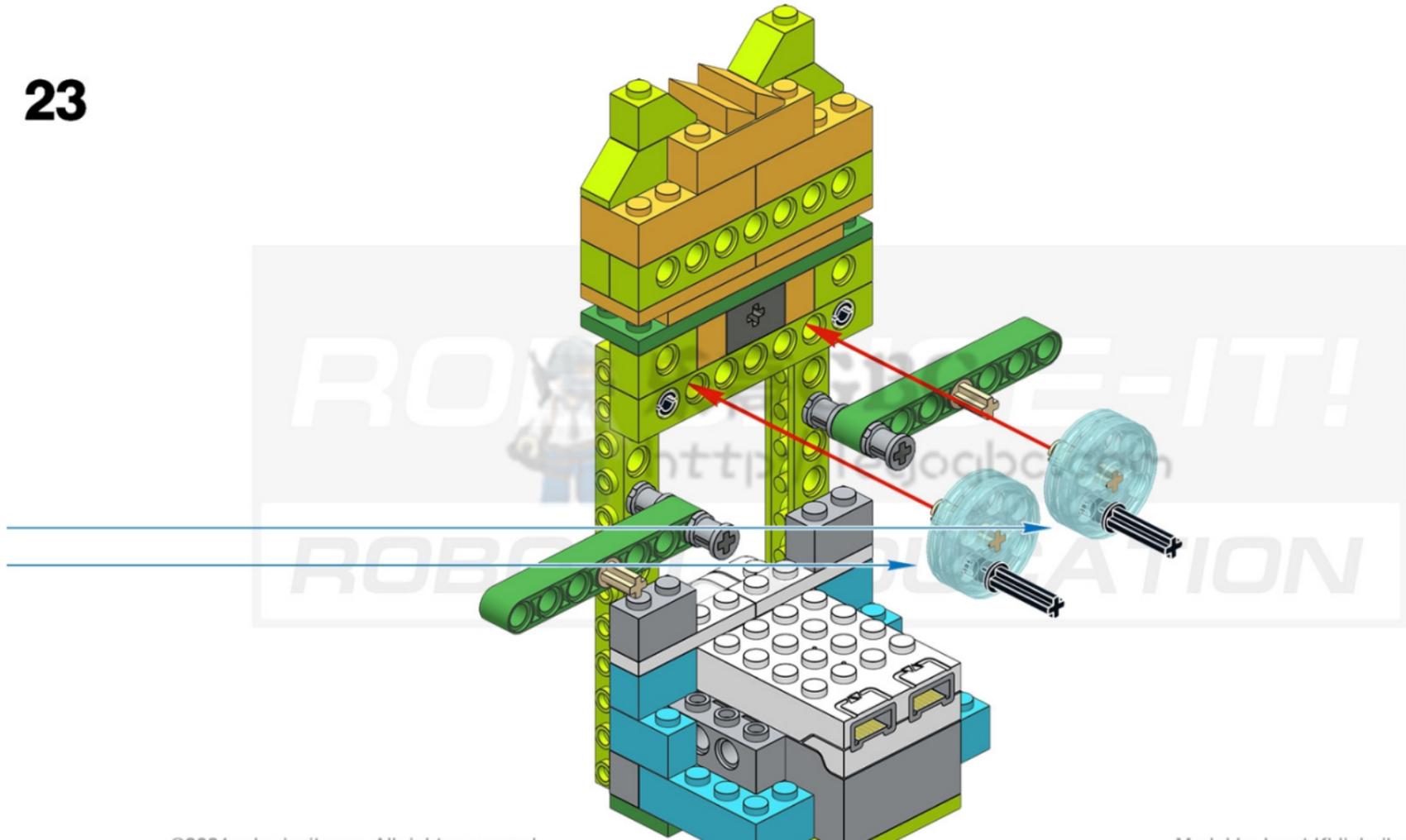
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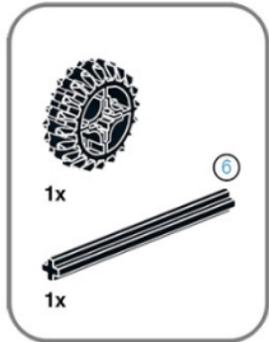


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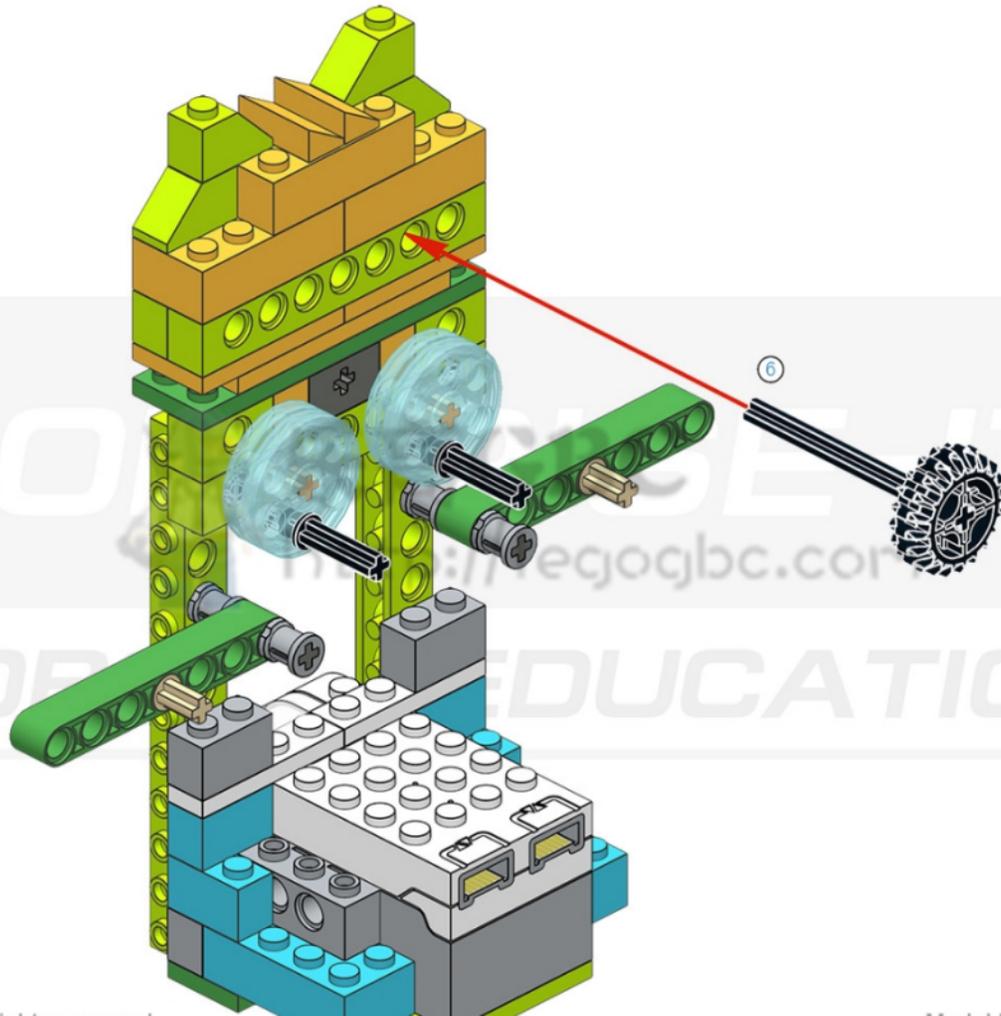
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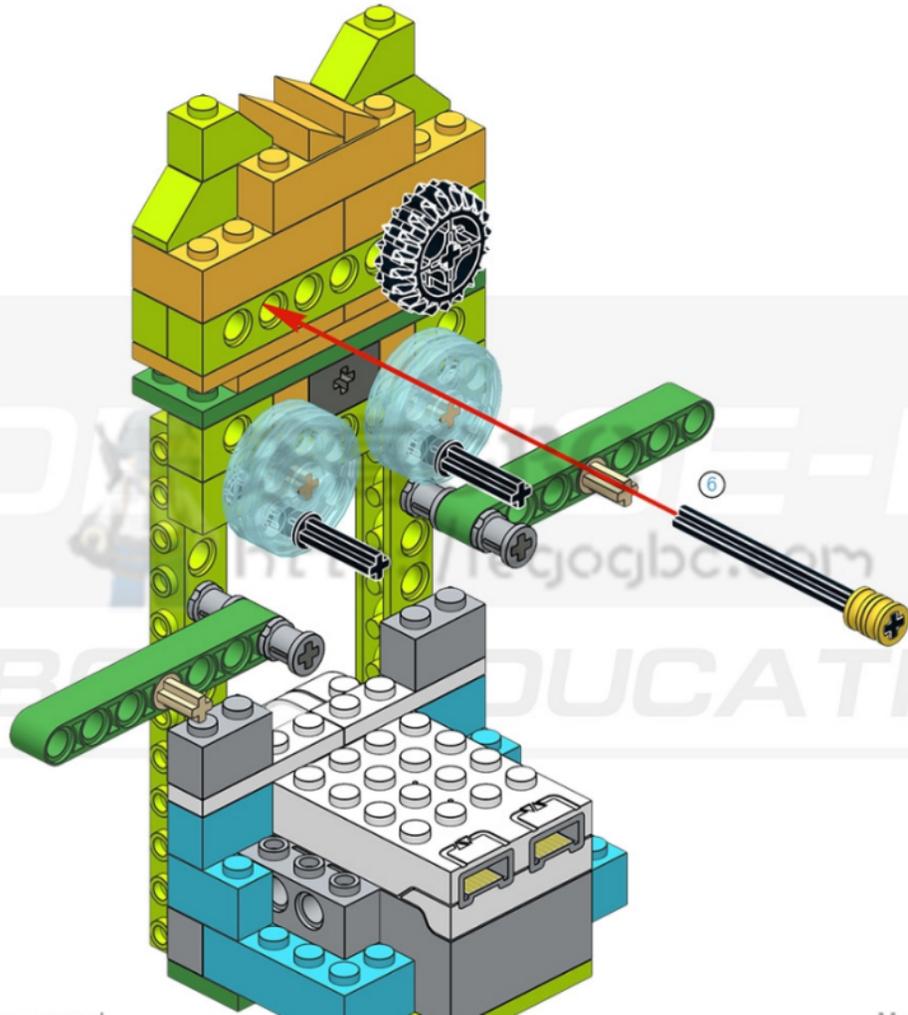


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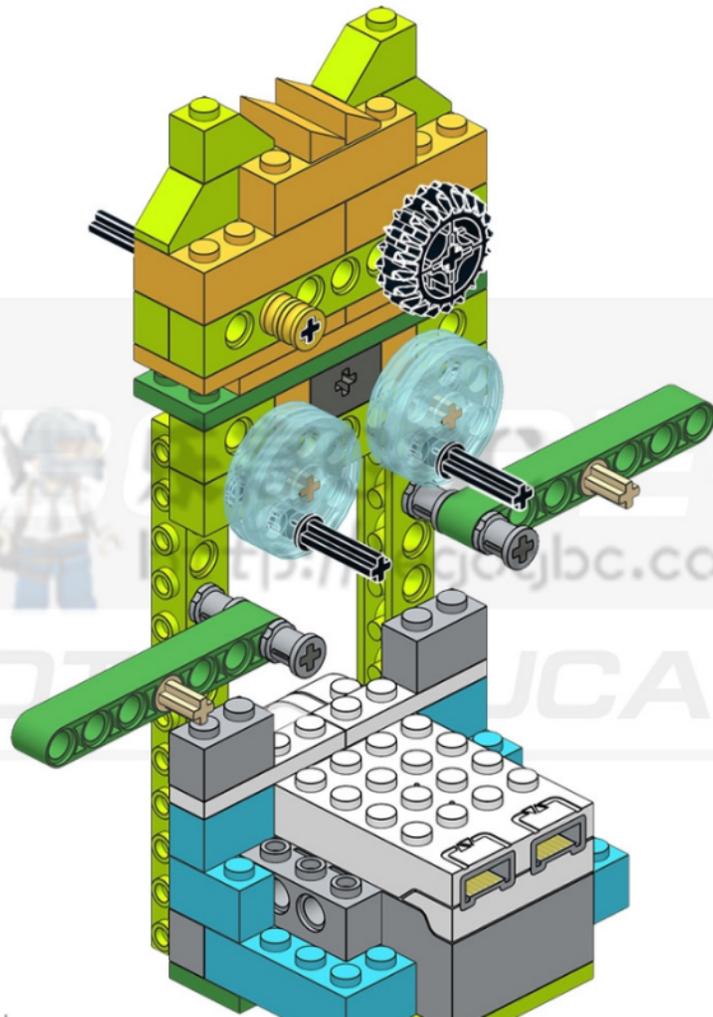


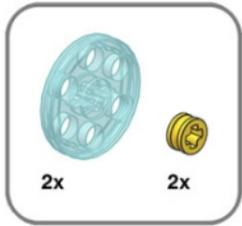
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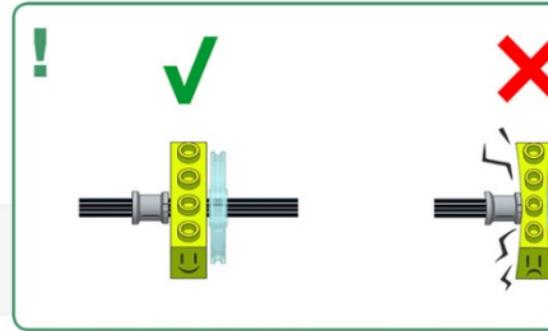
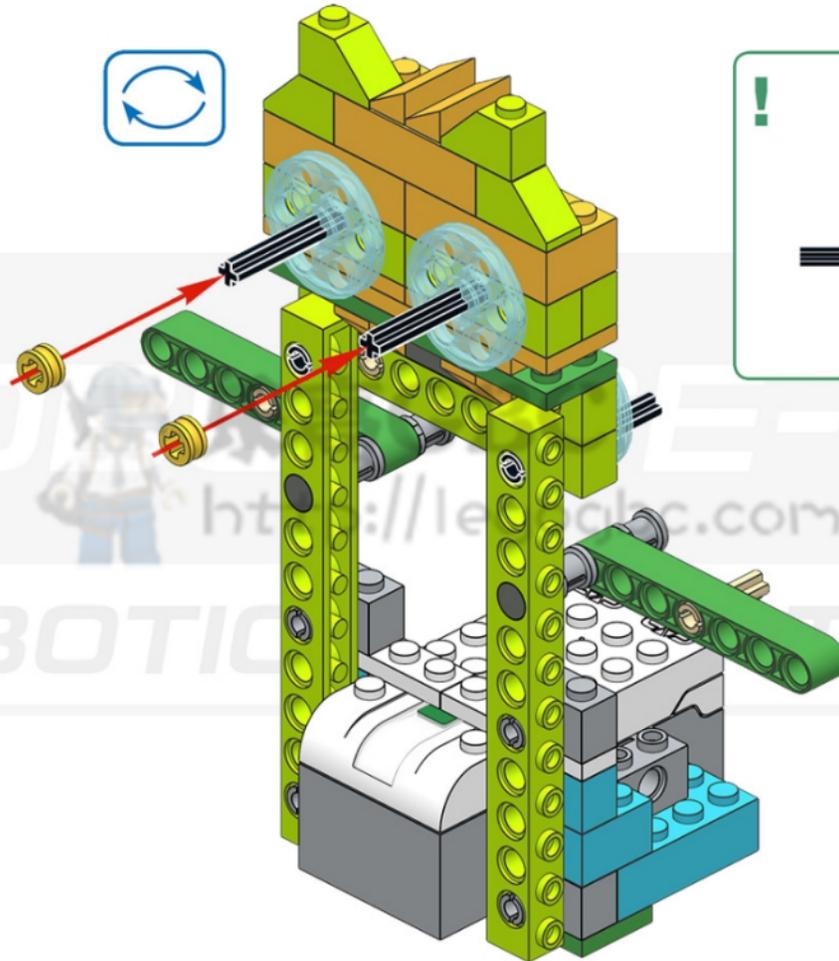
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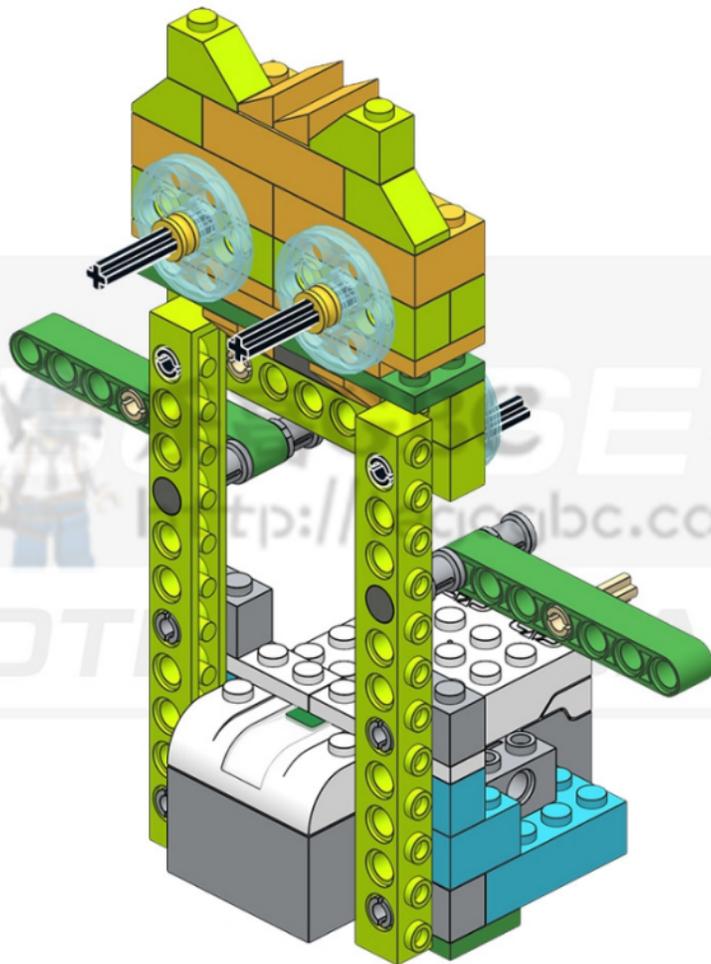
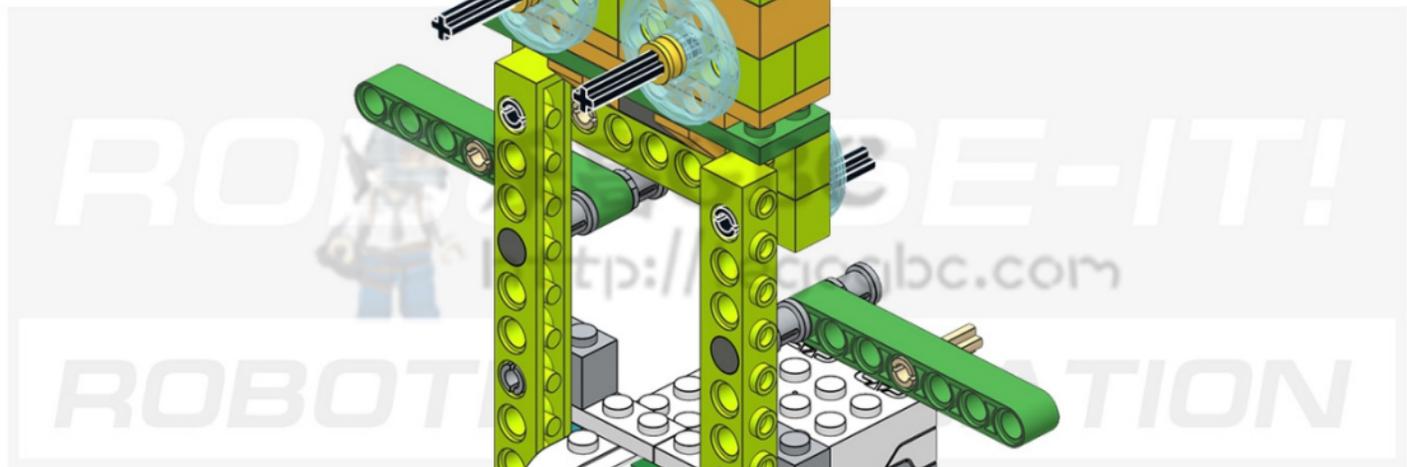
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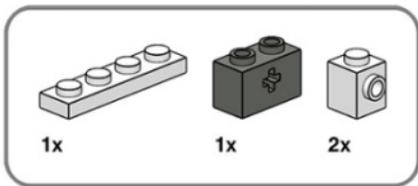
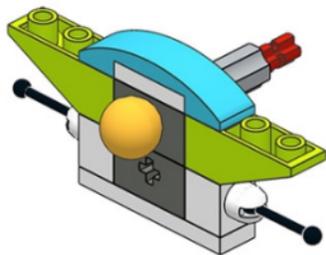


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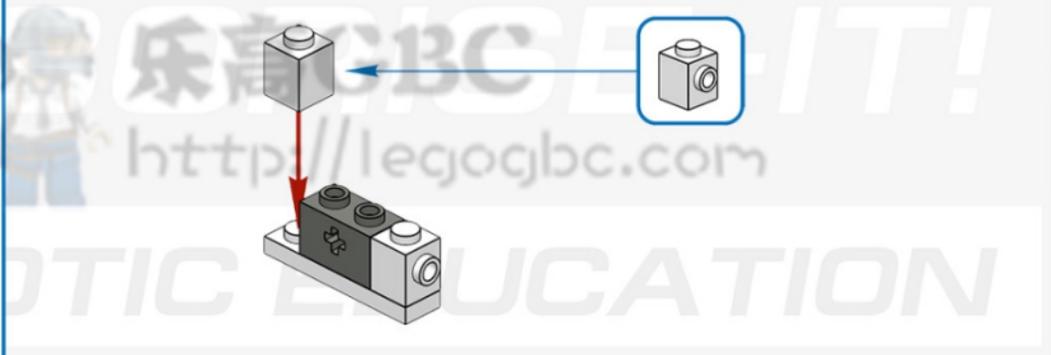
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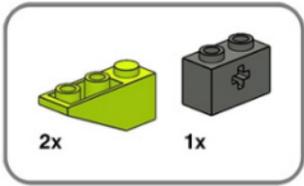
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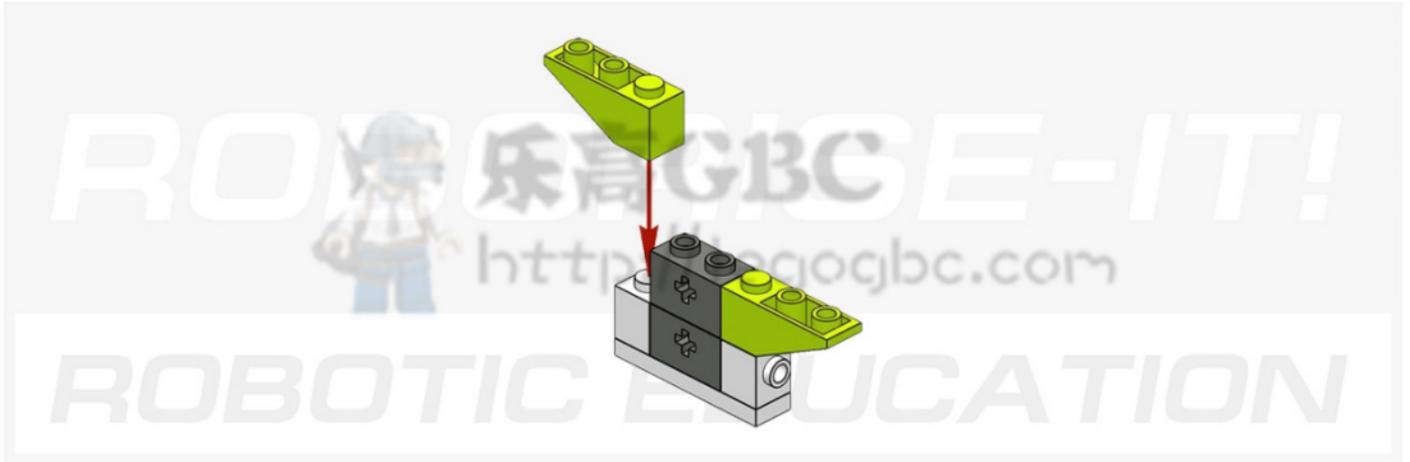


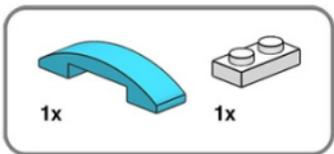
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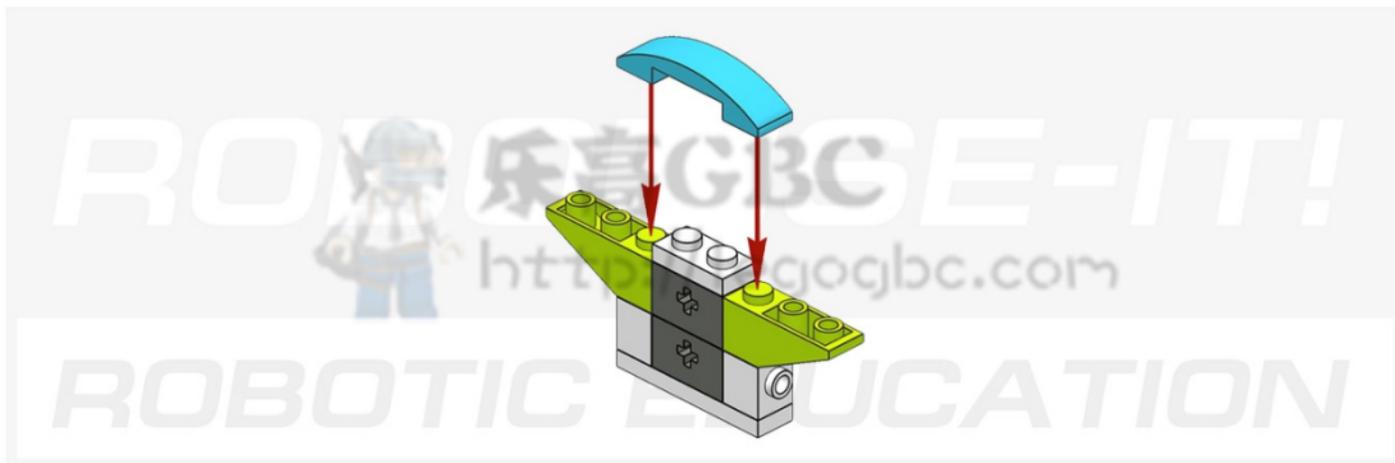


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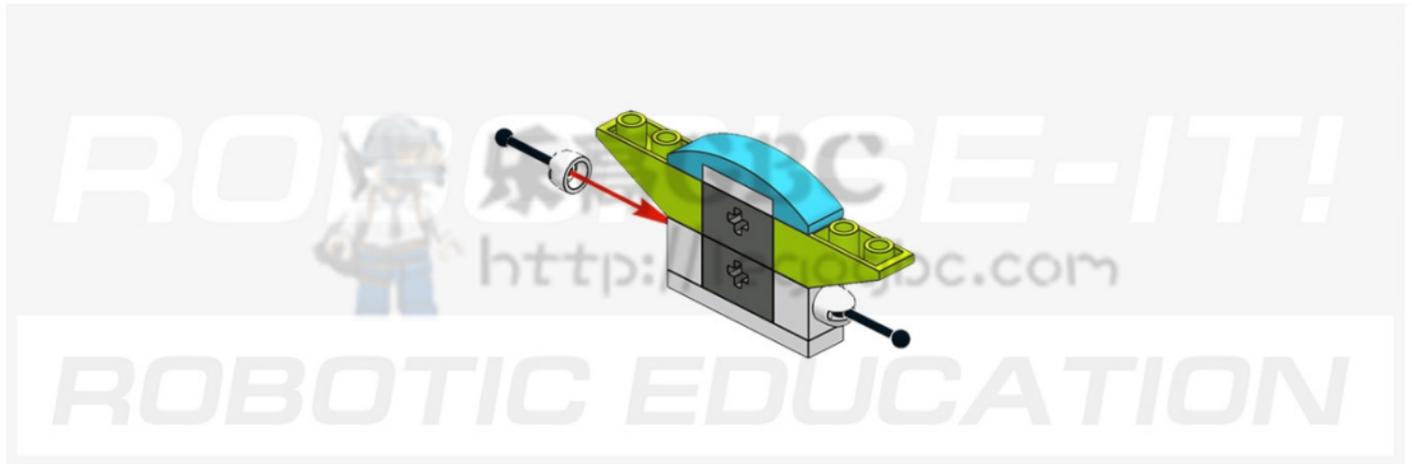


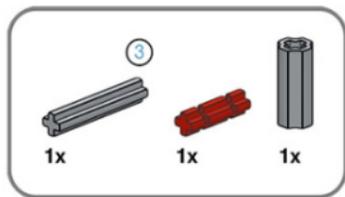
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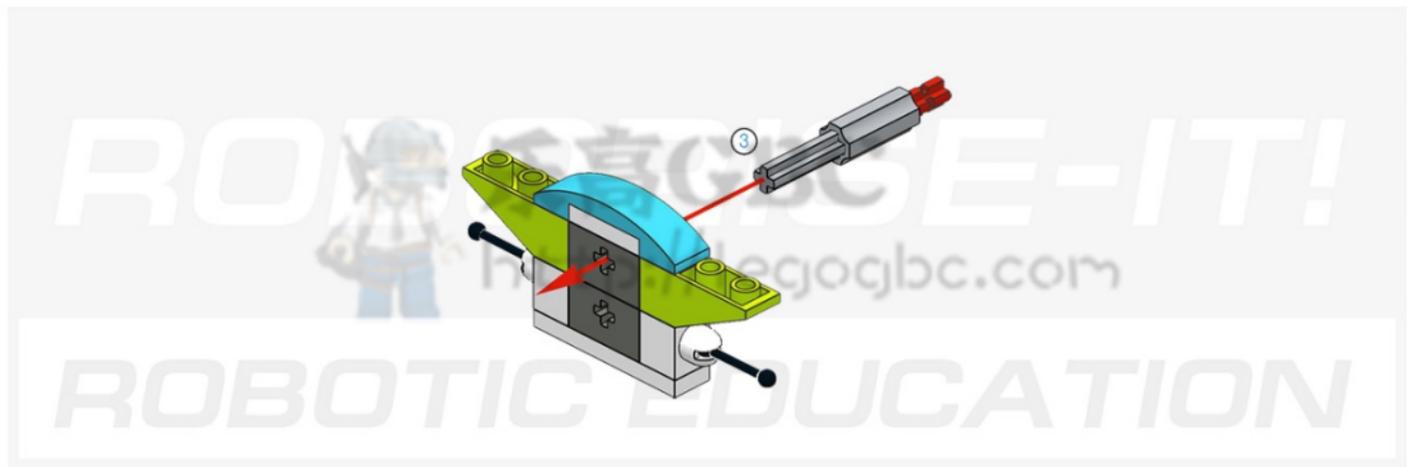


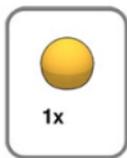
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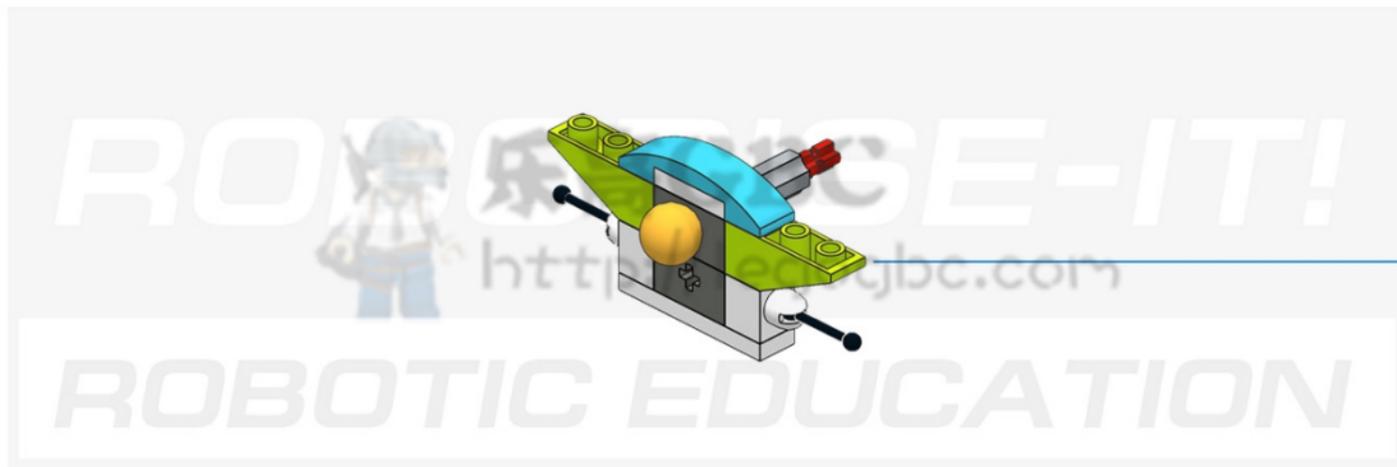


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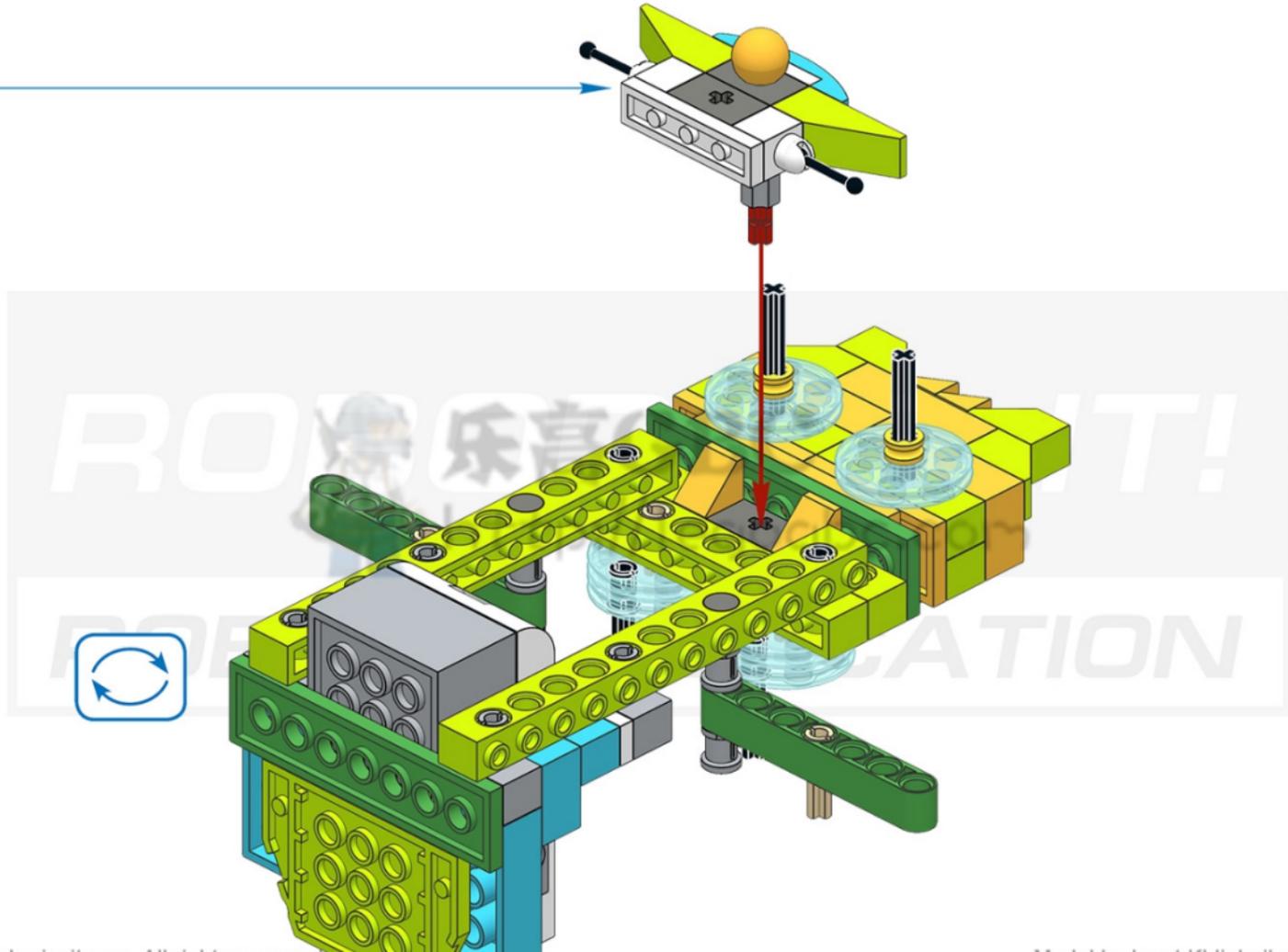




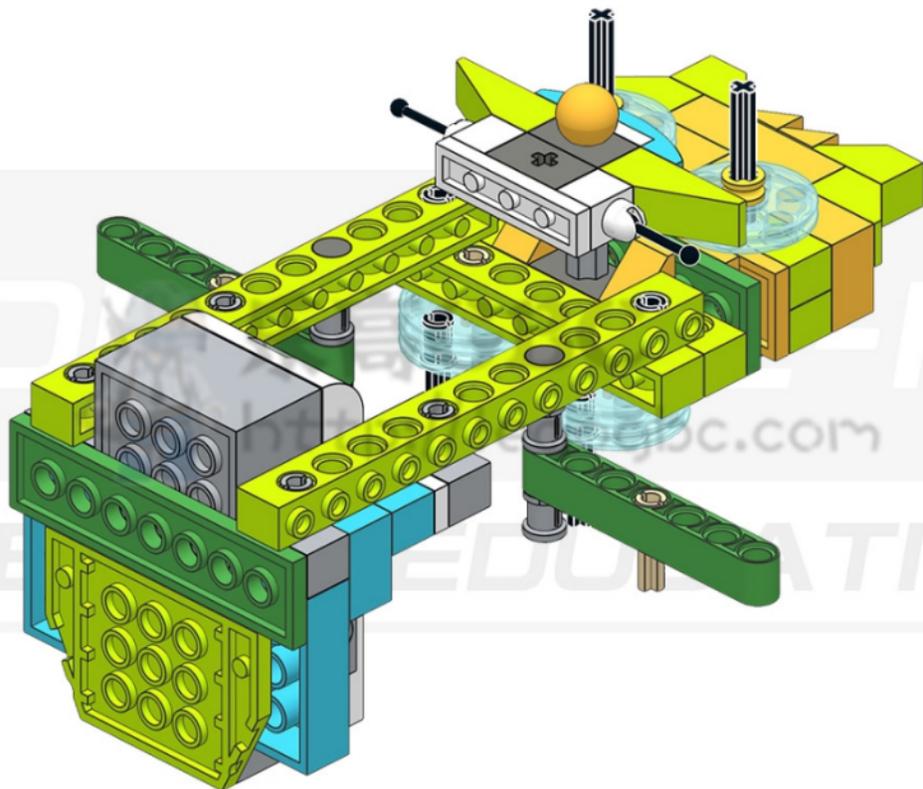
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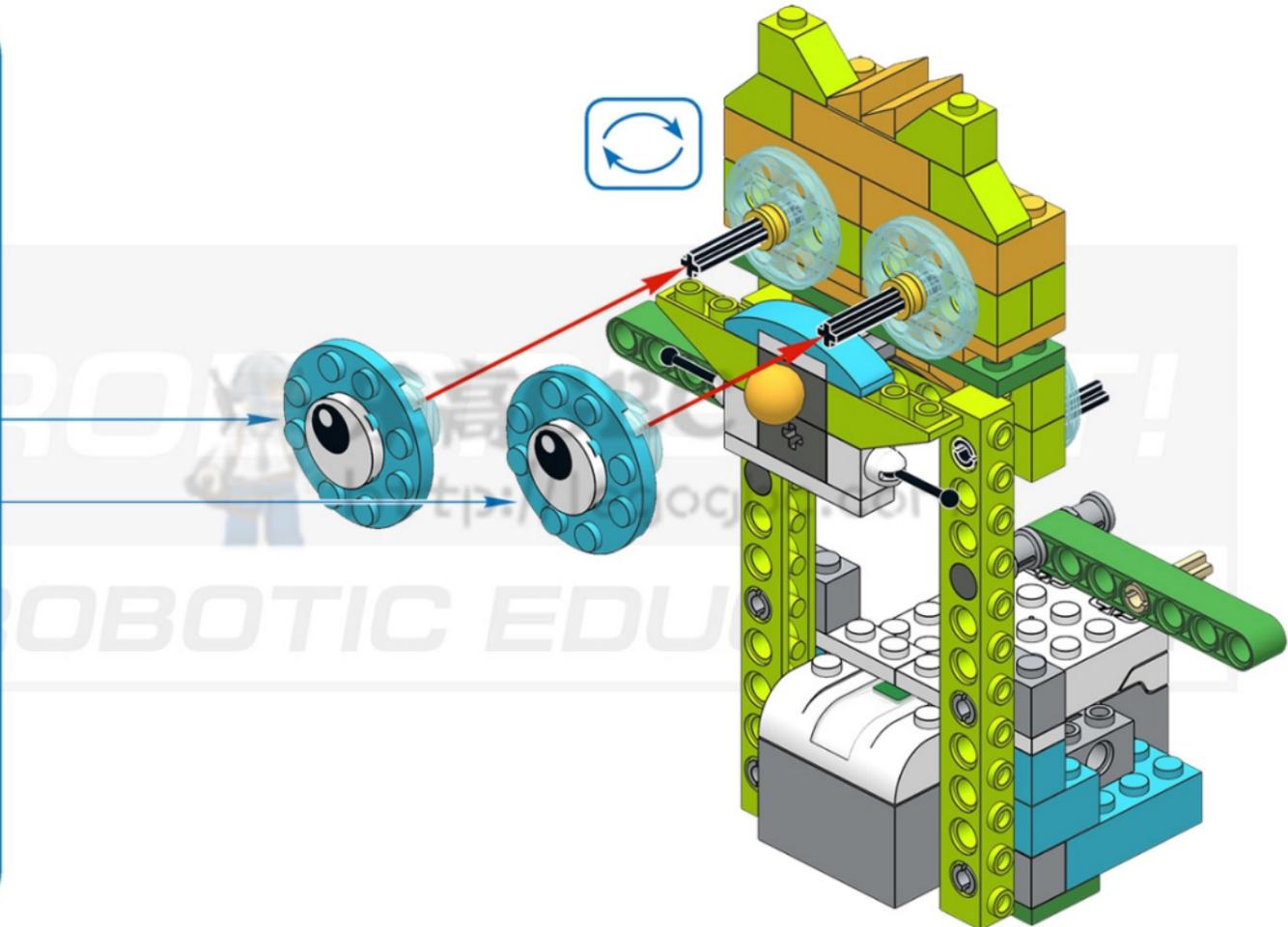
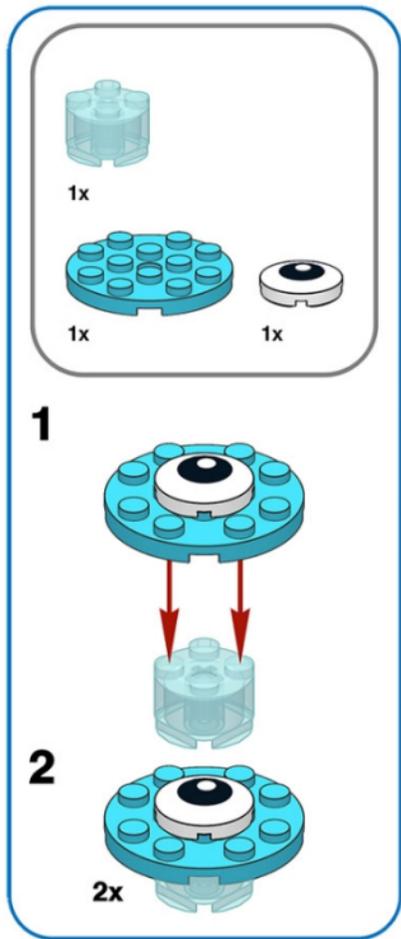


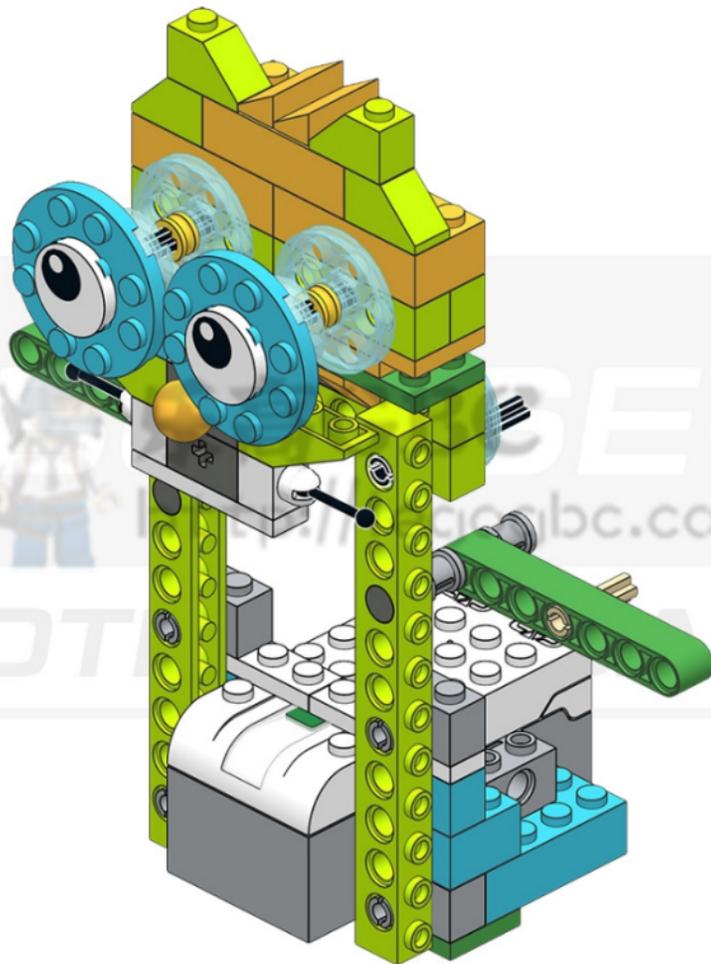
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Extended version



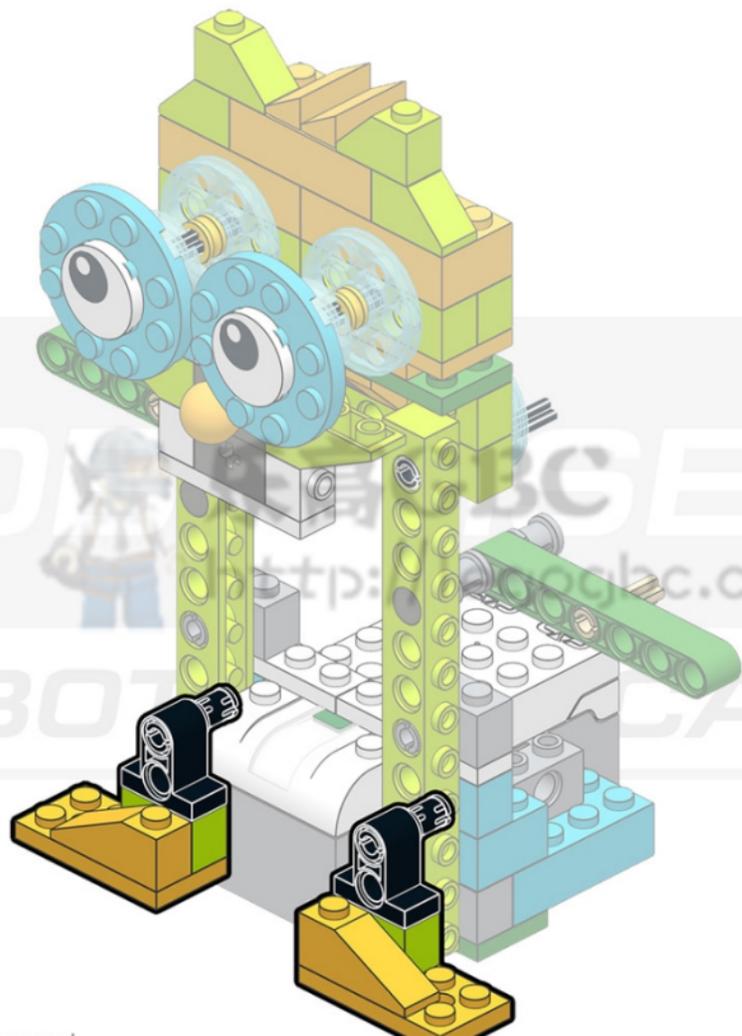
Finish the robot's legs



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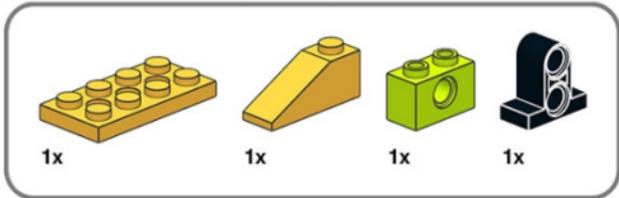
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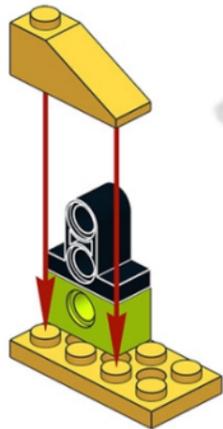
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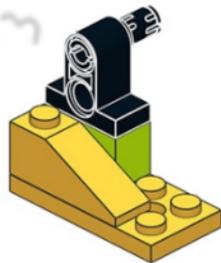
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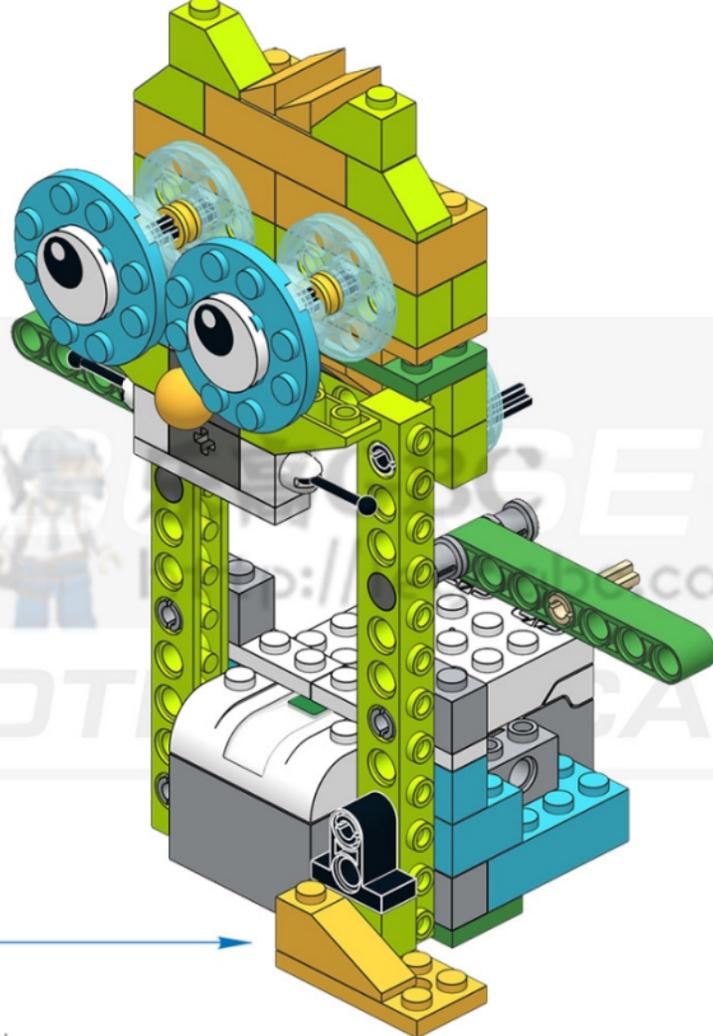
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41



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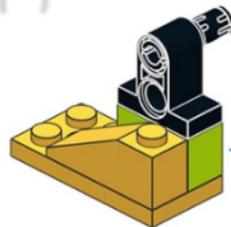
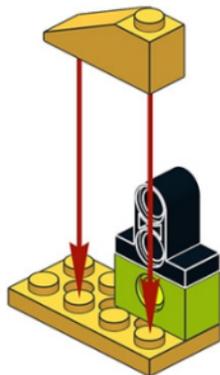
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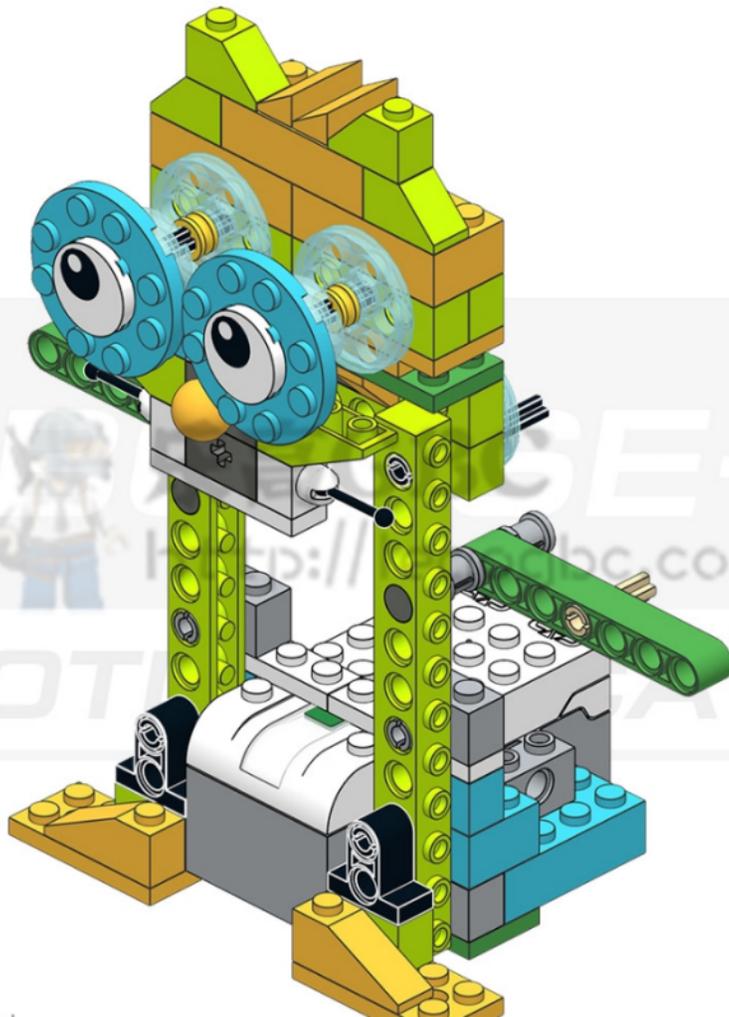
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43





Task 1



Use a belt drive to transfer rotation to the axis of the robot's left eye.

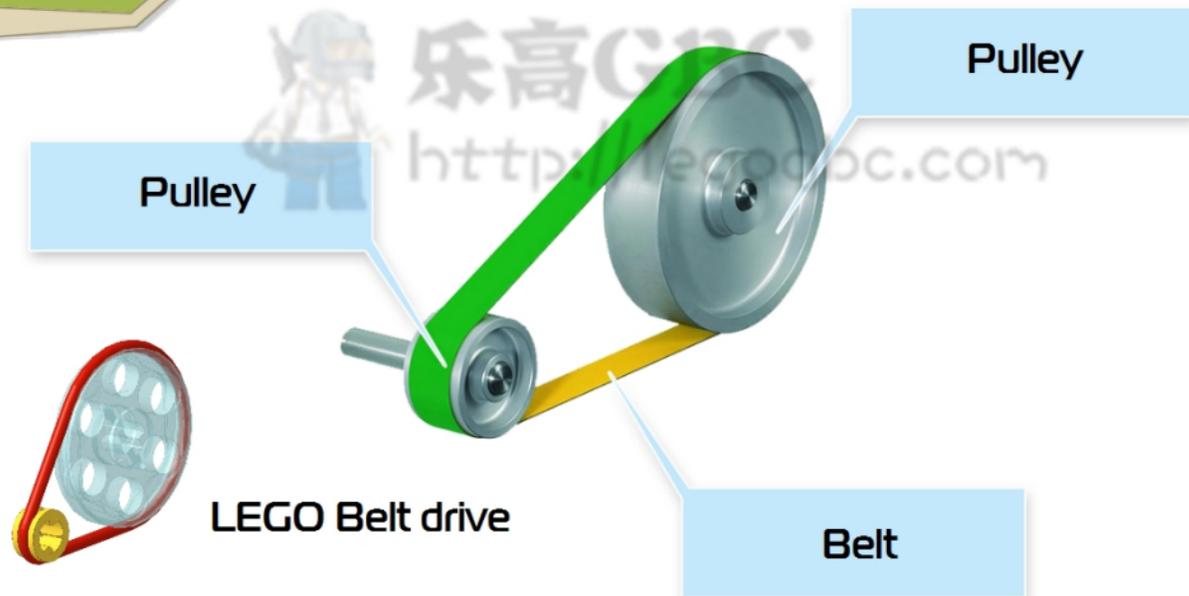




Belt drive



Belt drive is widely used for transmission of rotation. It consists of at least two pulleys and a belt. This transmission has minimal vibration and noise, but cannot transmit much power. The speed of rotation of the pulley depends on the ratio of the pulley diameters.



LEGO Belt drive

Belt



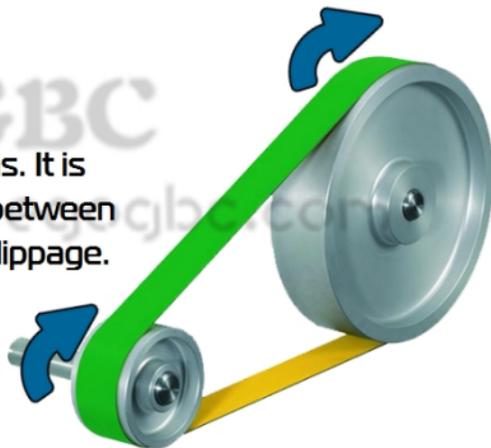
Belt drive



Note! Because the belt may slip, the original axle may not always rotate as you would expect. For example, a heavy robot may not move at all, although if it is lifted, the wheels will rotate.

The pulley has a recess in which the belt runs. It is made in order to increase the contact area between the belt and the pulley and thereby reduce slippage.

When using a belt drive, keep in mind that the direction of rotation of the input and output axles is the same.





Drive of the robot eyes



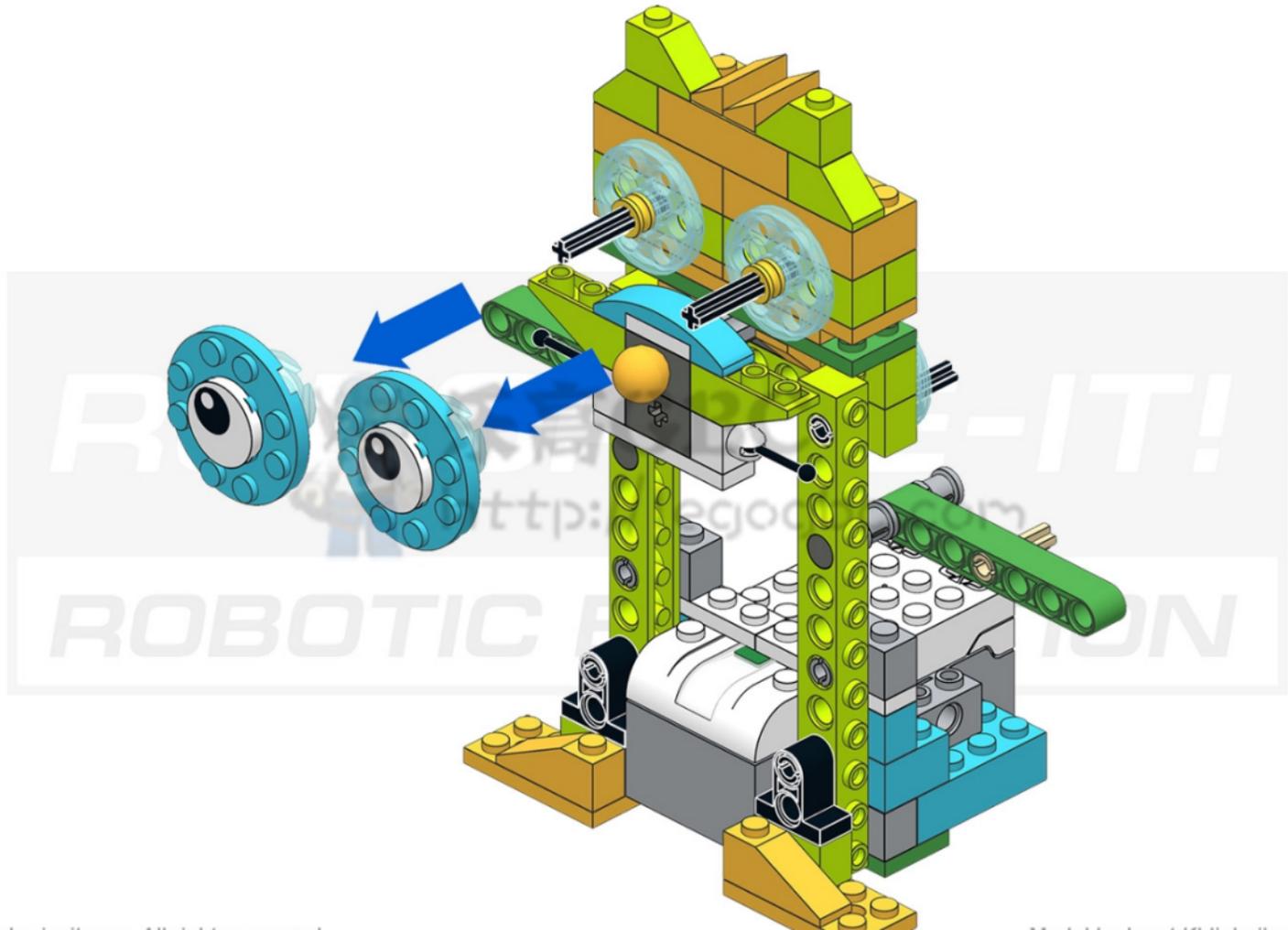
Implement rotation transfer from one robot eye to another



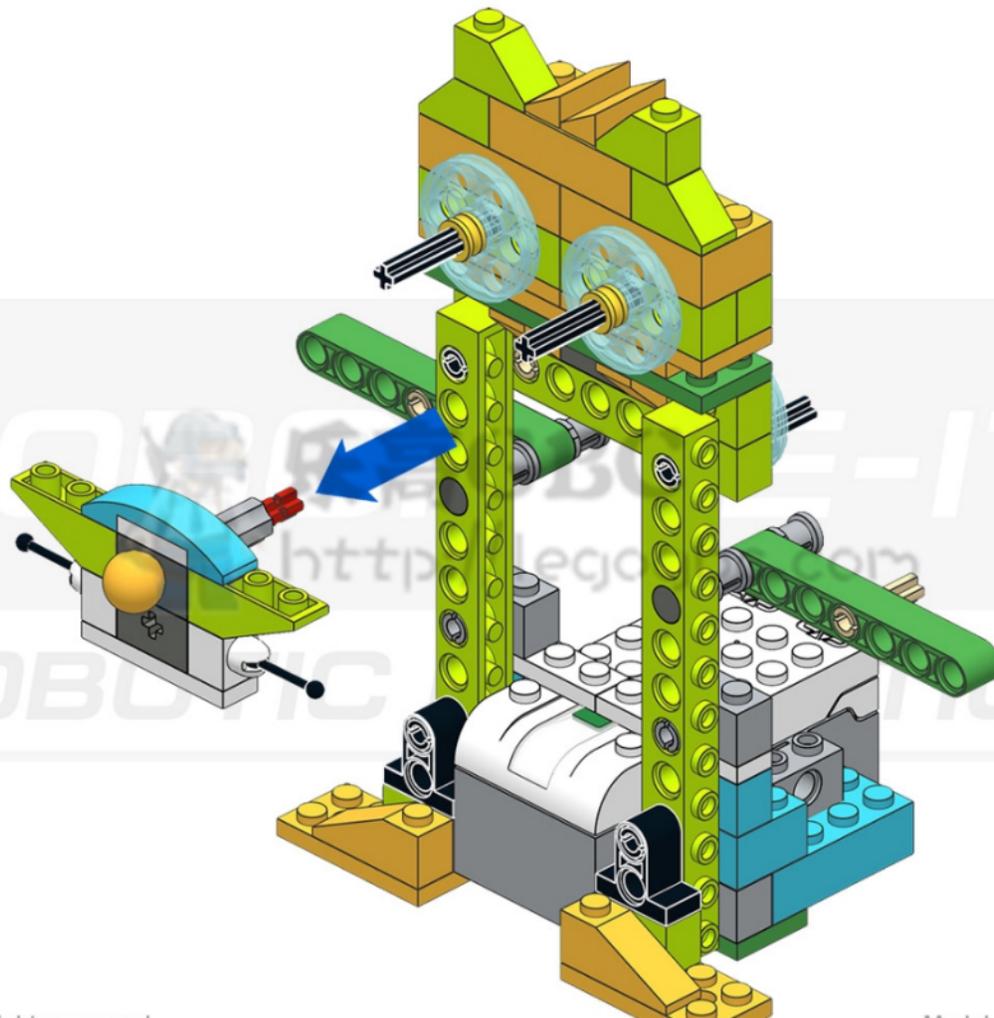
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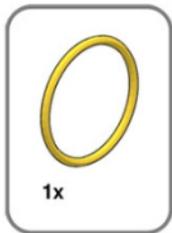


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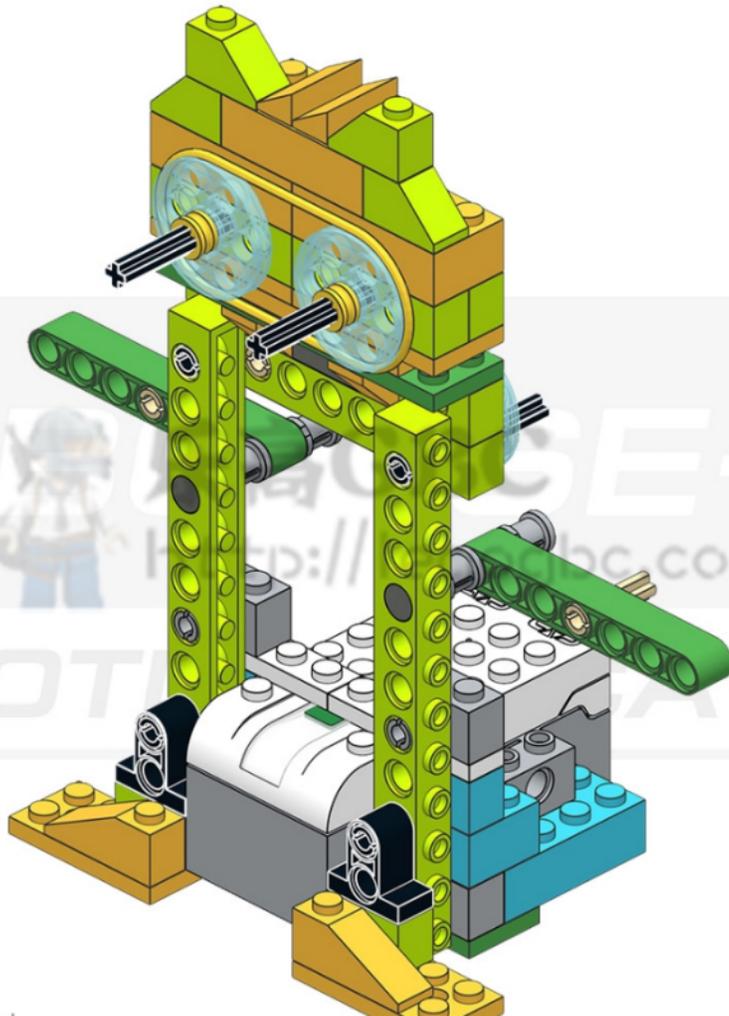


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46



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Task 2



Test eyes rotation. As you can see, they rotate in the same direction. How can the rotation of the eyes be realized in opposite directions?





Belt drive



The crossed belt drive, in contrast to the direct one, changes the direction of rotation of the driven axle.





Task 3



Change the direct belt drive to a crisscross.

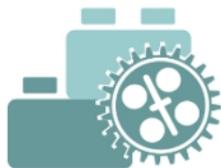




Drive of the robot eyes



Experiment with belt drive. Change the direction of rotation of the driven axis

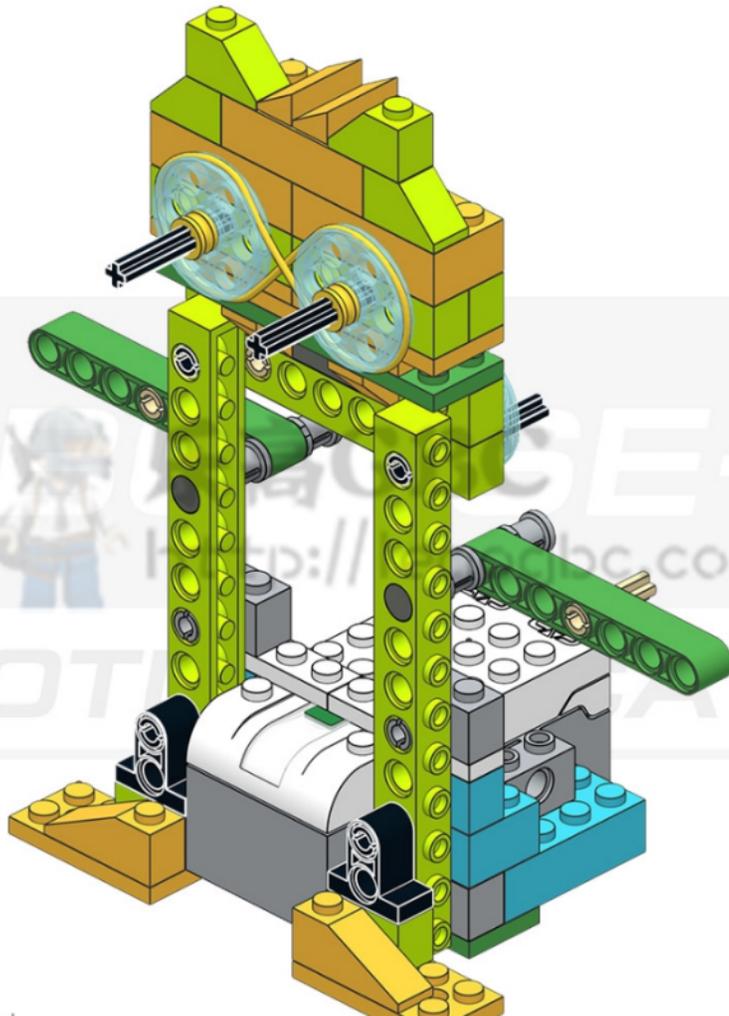


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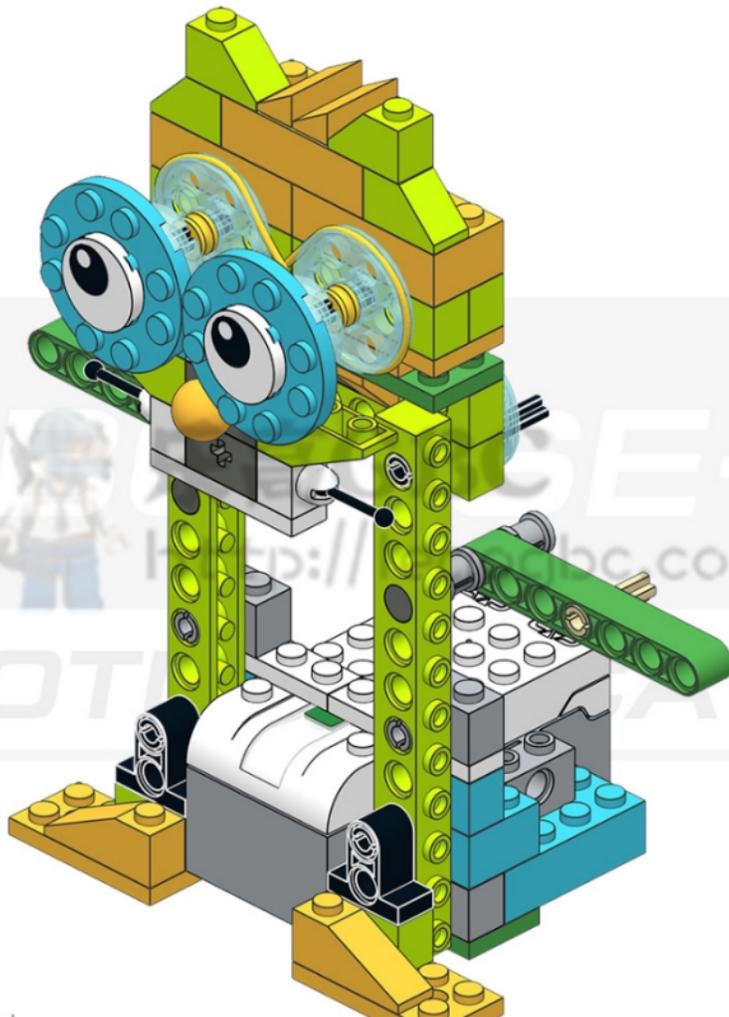


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47



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ROBOTIC INNOVATION



Task 4



Test eyes rotation. They must rotate in opposite directions.





Task 5



Use a step-down belt drive to drive the left arm of the robot.





Belt drive



By using pulleys of different diameters, it is possible to get step-down and step-up gear transmission.





Task 6



Test the shoulder drive. Notice how slower it rotates than the gear knob. The threefold decrease in speed was due to the use of pulleys, the diameters of which differ threefold.





Task 7



Move the robot's right shoulder as well. In general, the arms should move at the same speed, so pulleys of the same diameter will be used here.





Drive of the robot shoulders



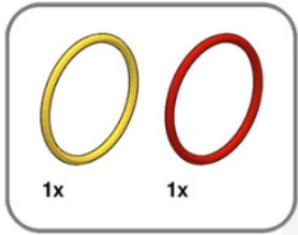
Implement the drive of robot shoulders



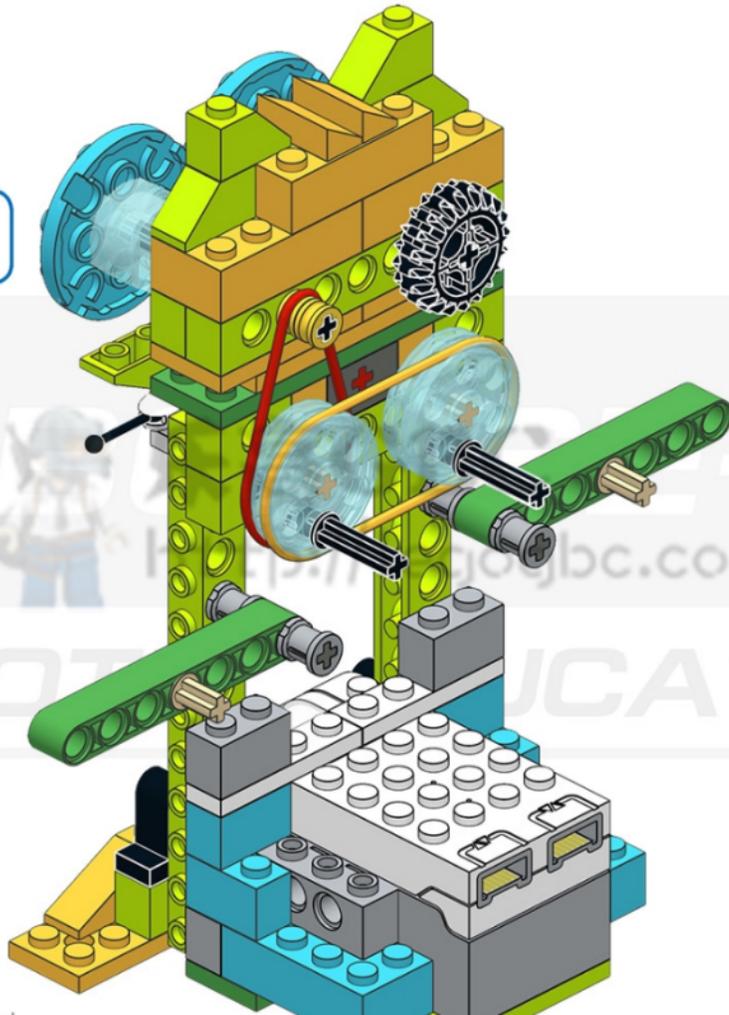
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49



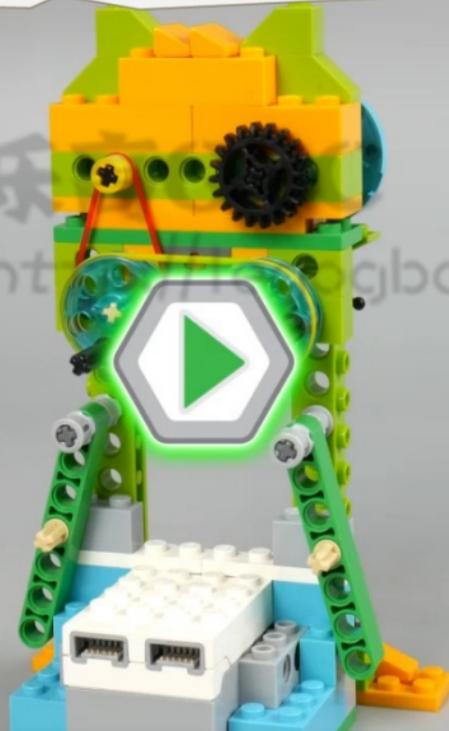
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Task 8



To ensure the movement of the robot's arms, tractions are used, attached to the shoulders. Fix them at the robot





Hand connection



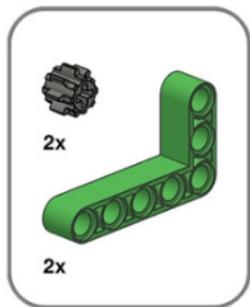
Convert shoulder rotations to up and down movement using cams



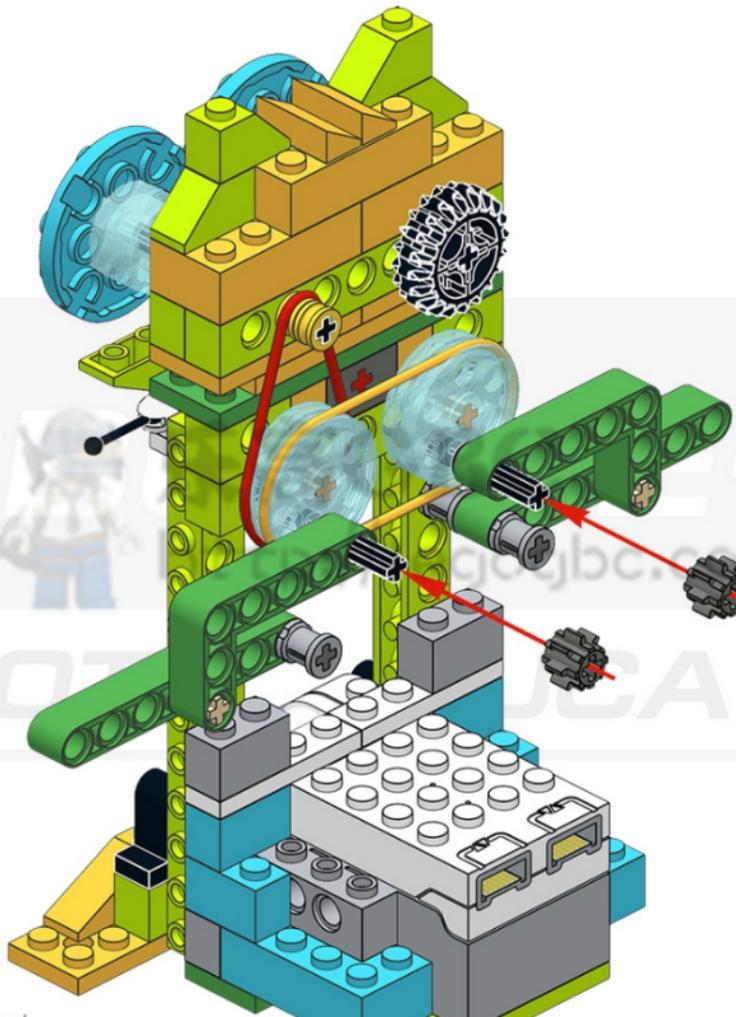
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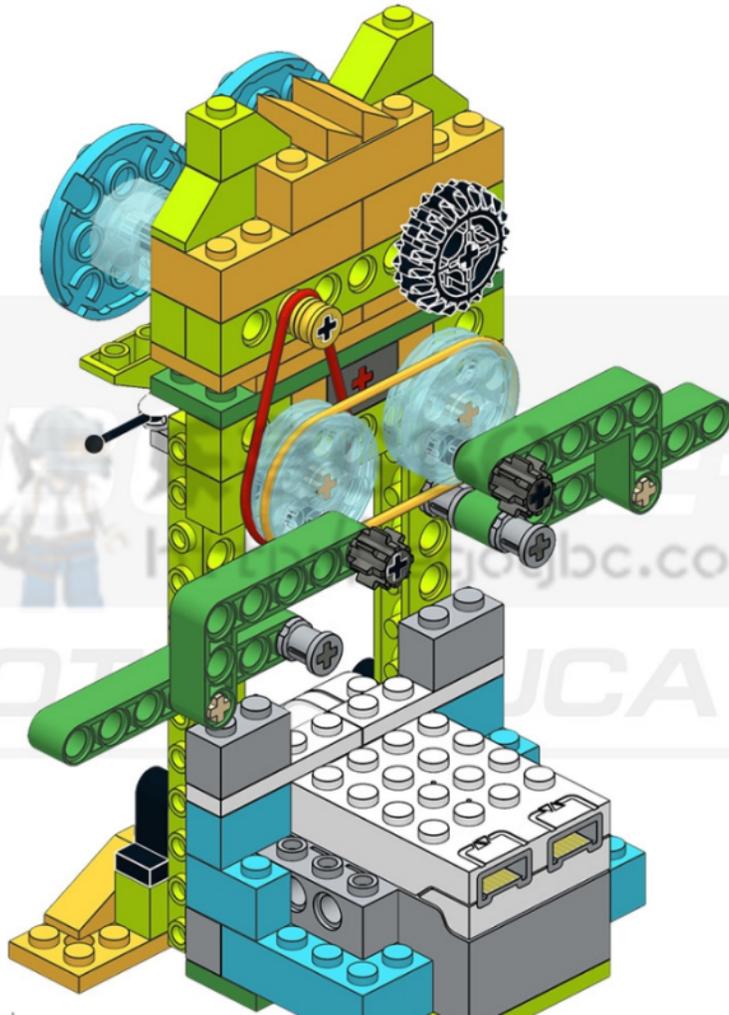
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the instruction



50



51



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Task 9



Test the operation of all constructed belt drives. If at any of the stages the rotation is not transmitted, check whether the pulleys are too tightly clamped and whether the axles rotate freely.





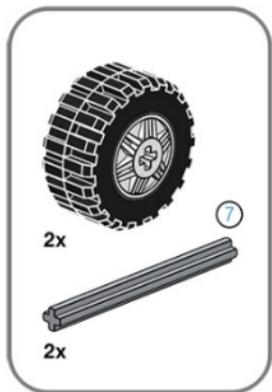
Dumbbells



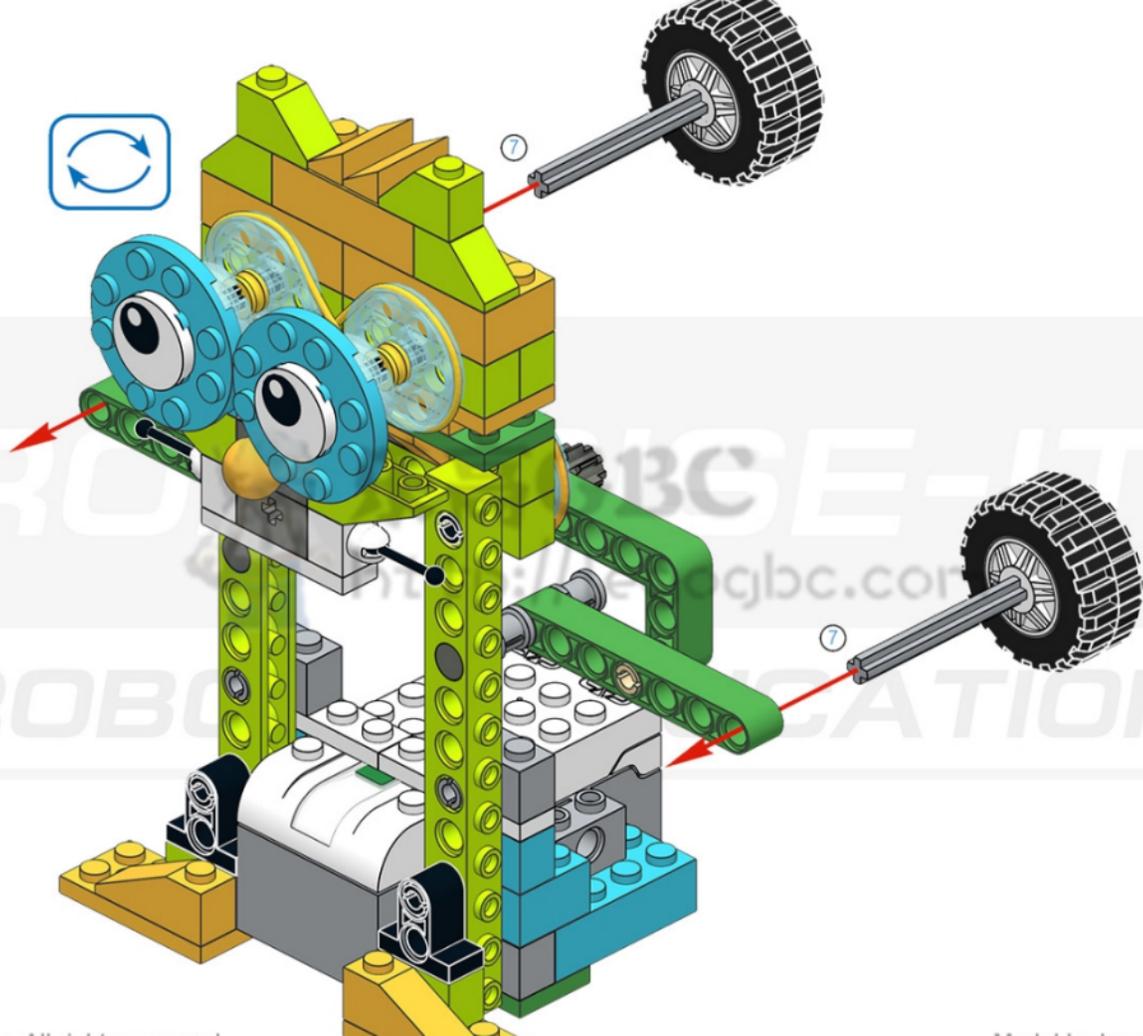
Build fitness dumbbells

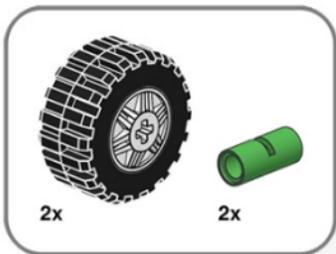


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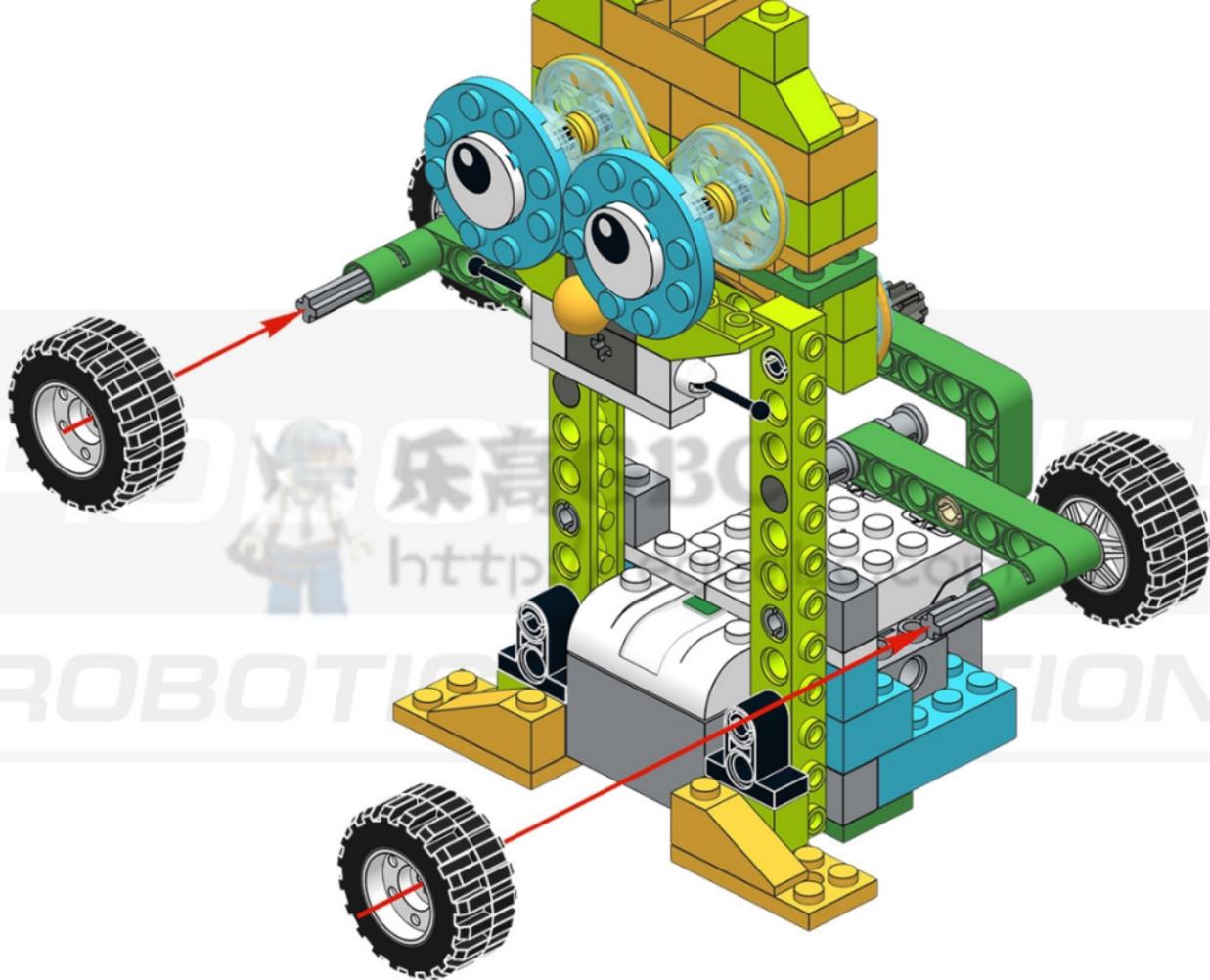


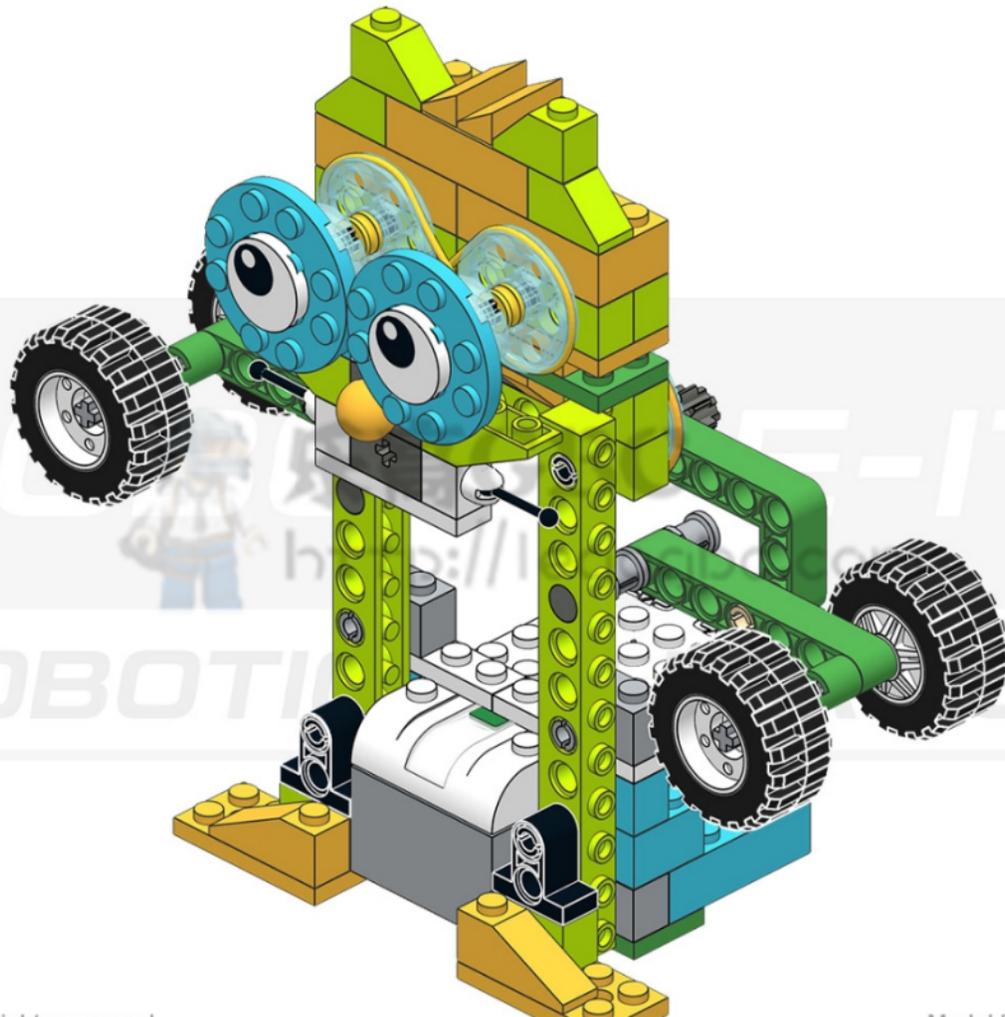
52





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Task 10



Test the robot with dumbbell. Is it ready to connect the motor?





Task 11



Replace gear to test robot with a motor.





Task 12



Add a tail with a tilt sensor to control the intensity of your workout.





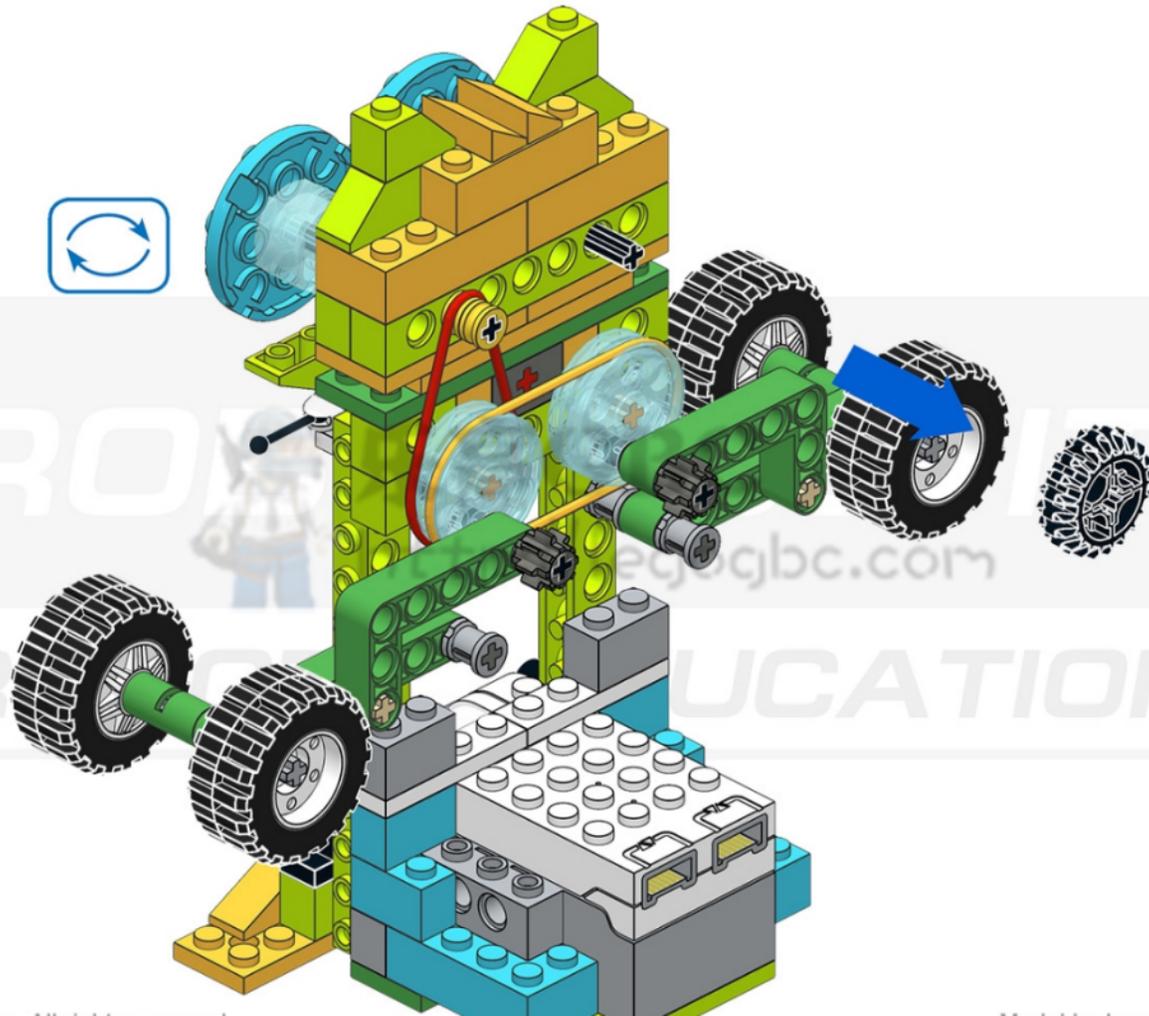
Motor and sensor

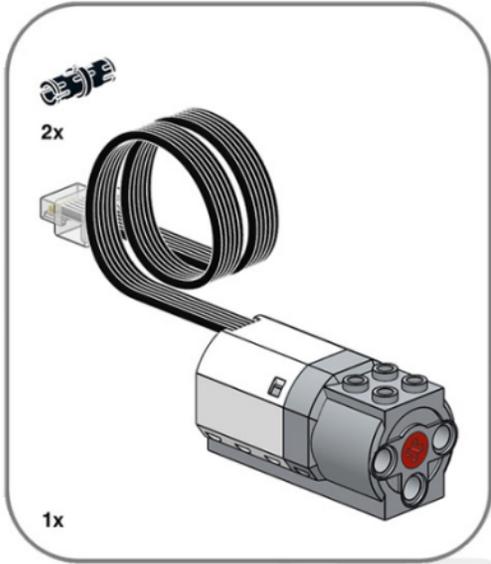


Motorize your robot and use the tilt sensor to control your exercise speed

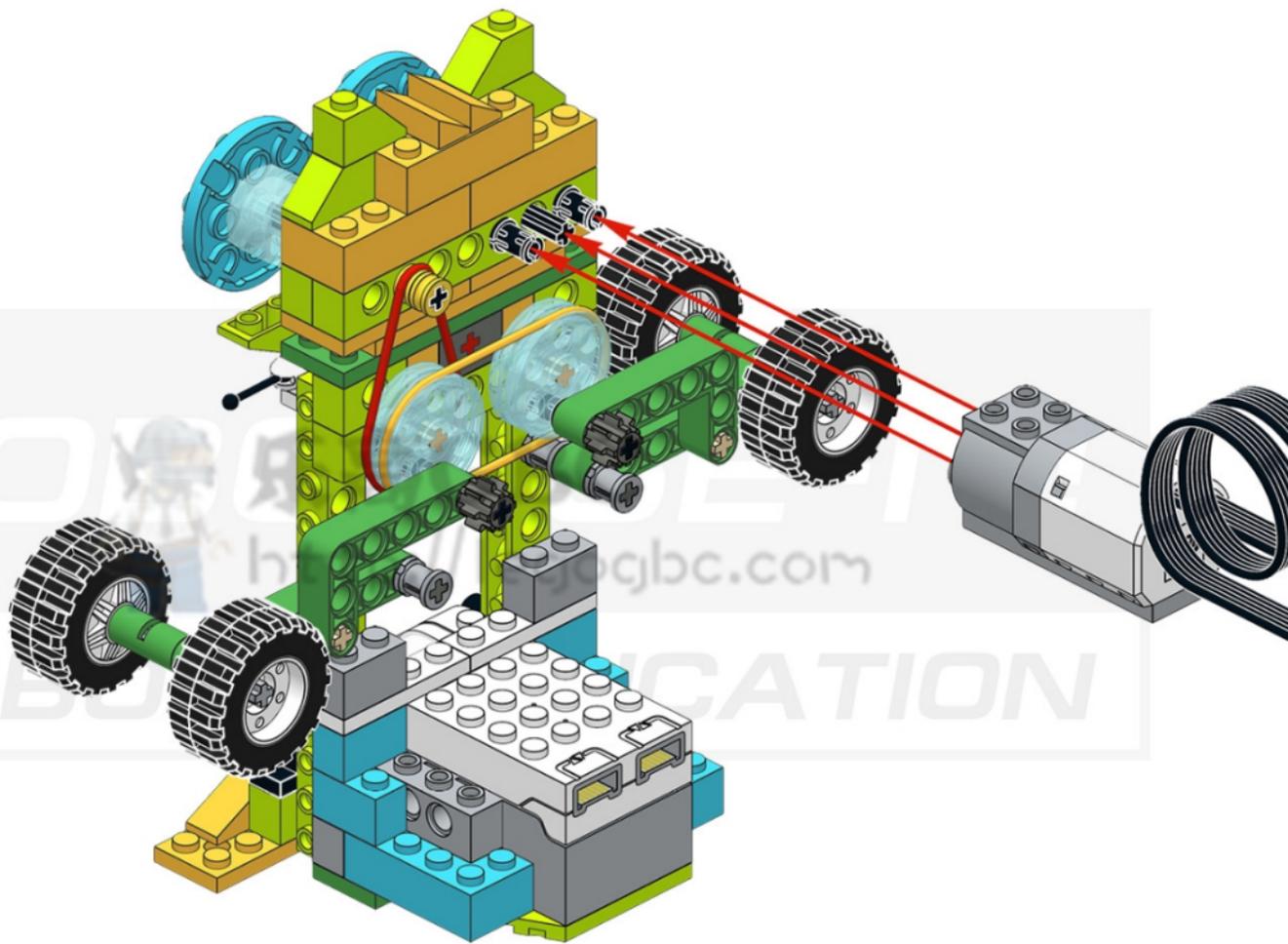


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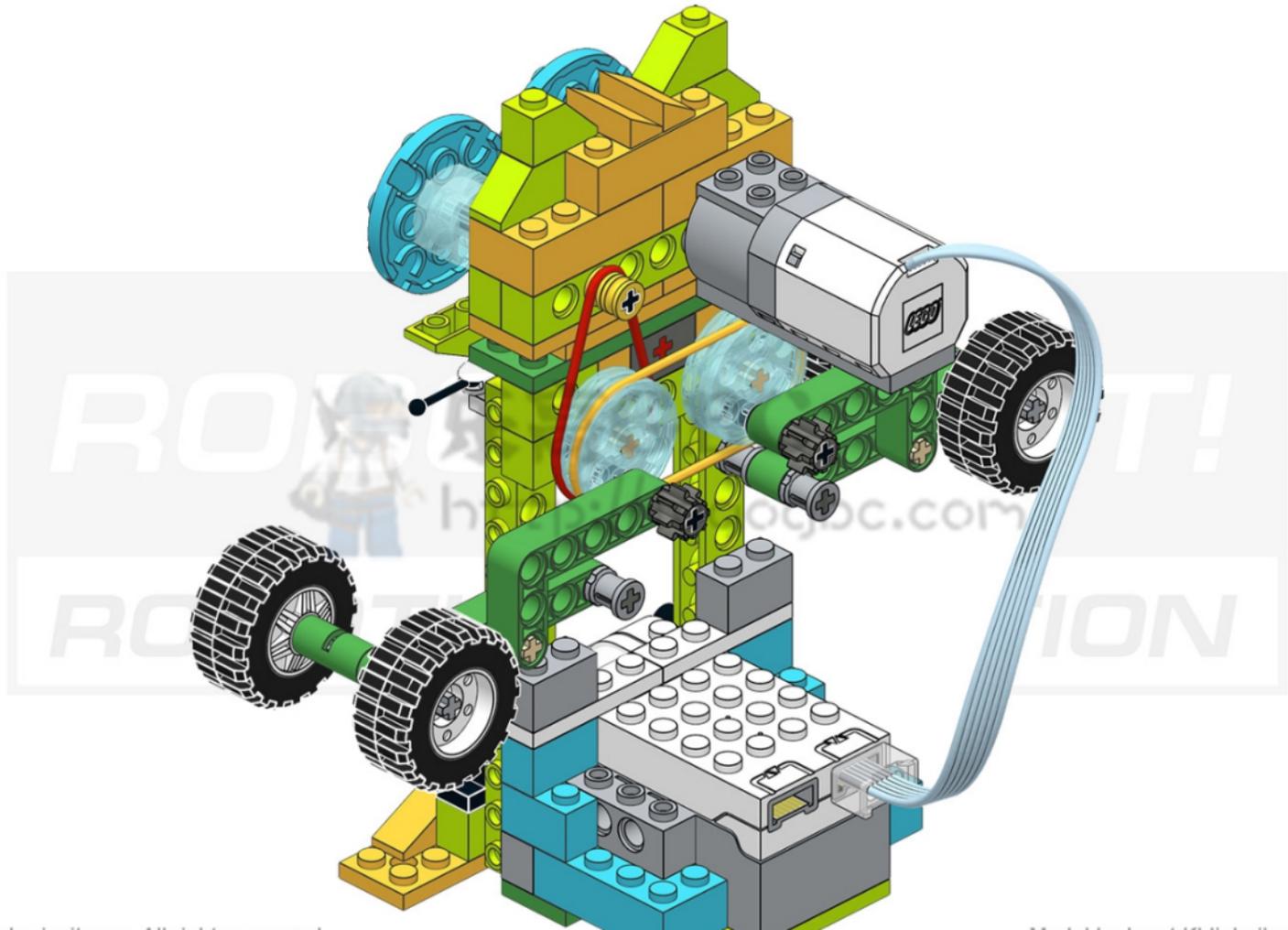




56

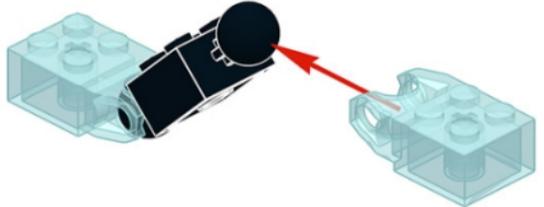


57

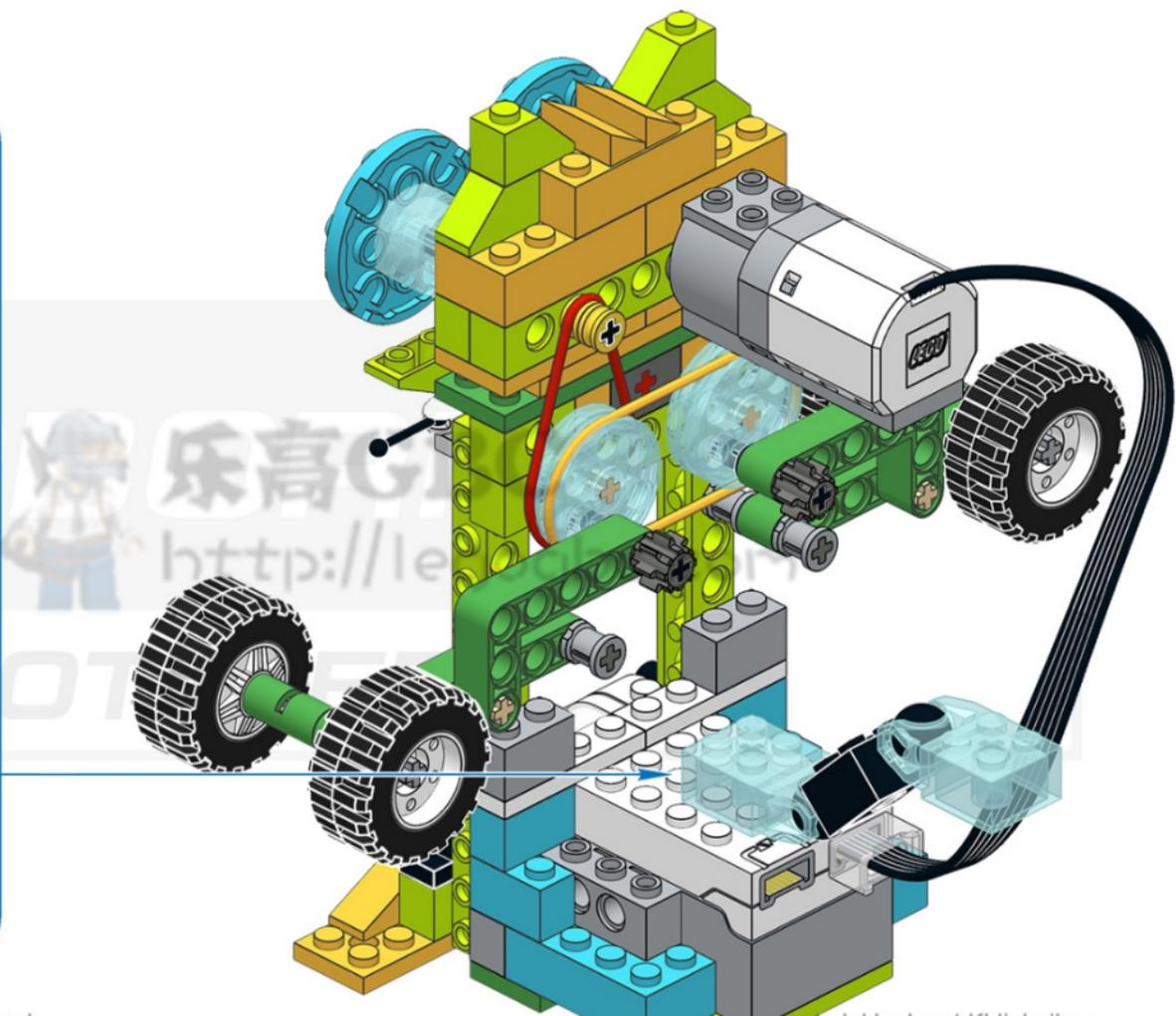
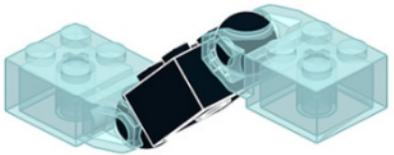


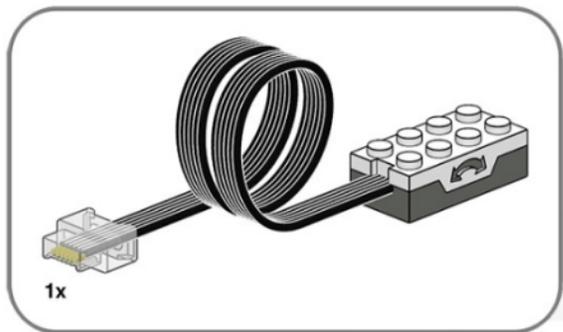
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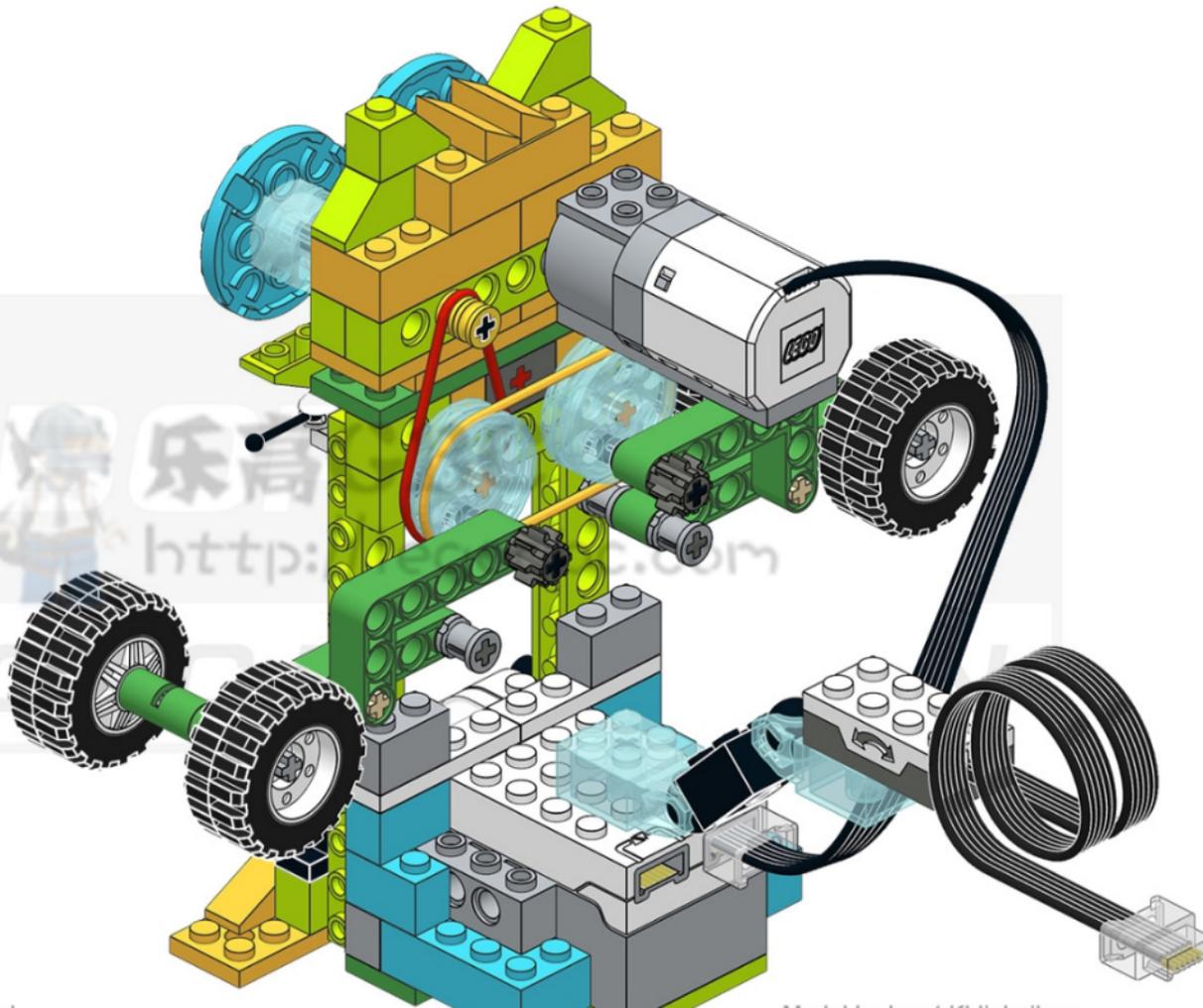


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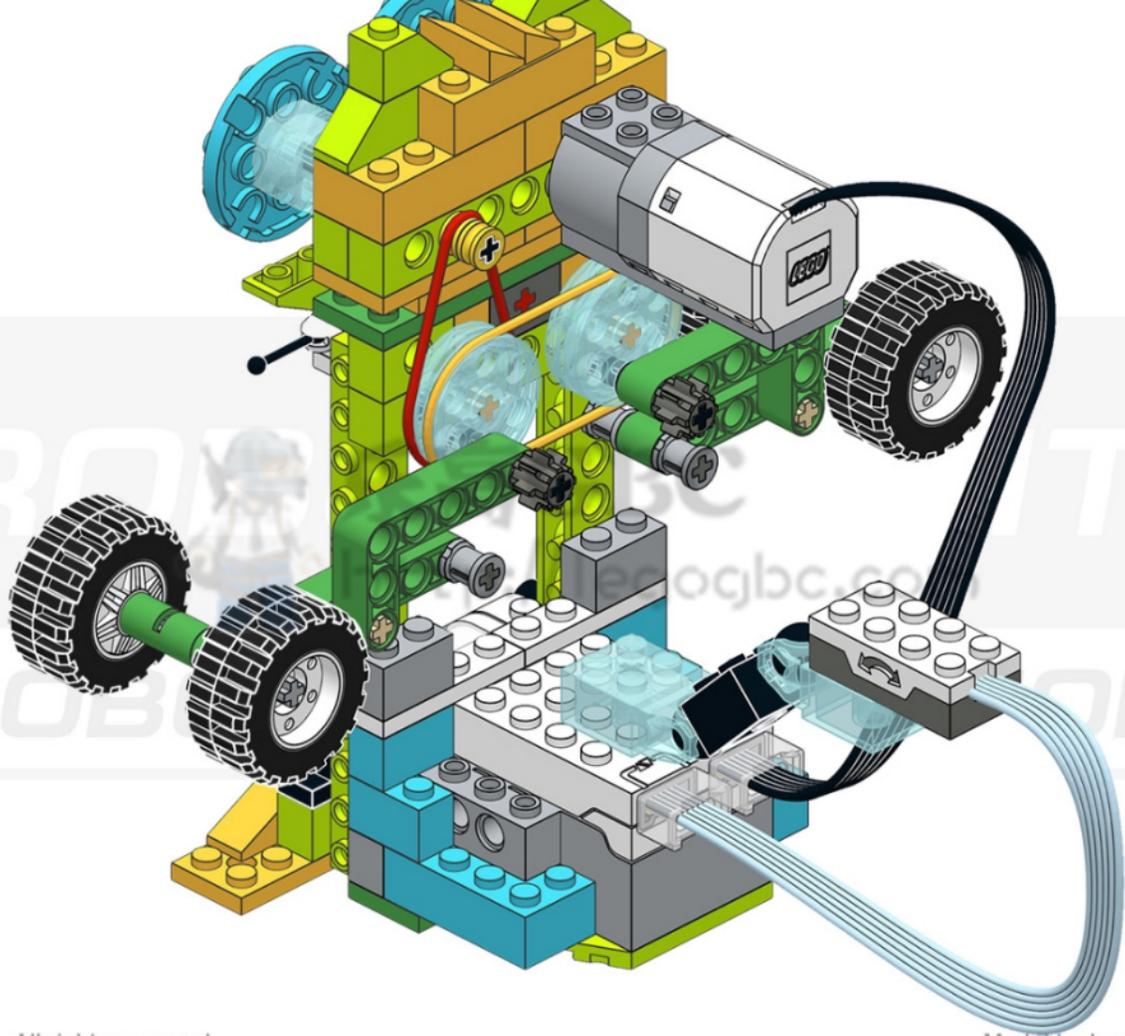


59

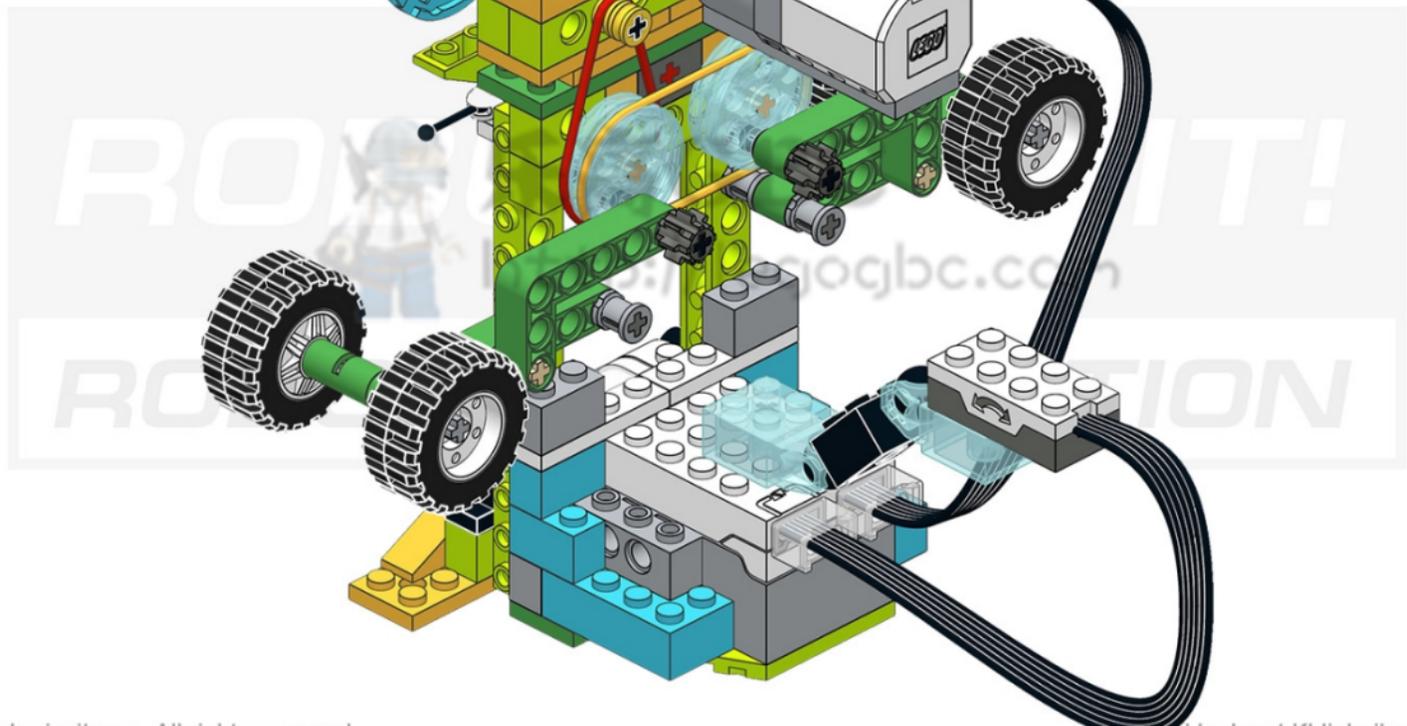


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61





Note!



The cables must not rub while the robot is moving!

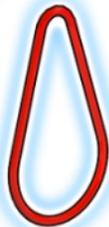


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Tasks

Place the robot parts in the correct places



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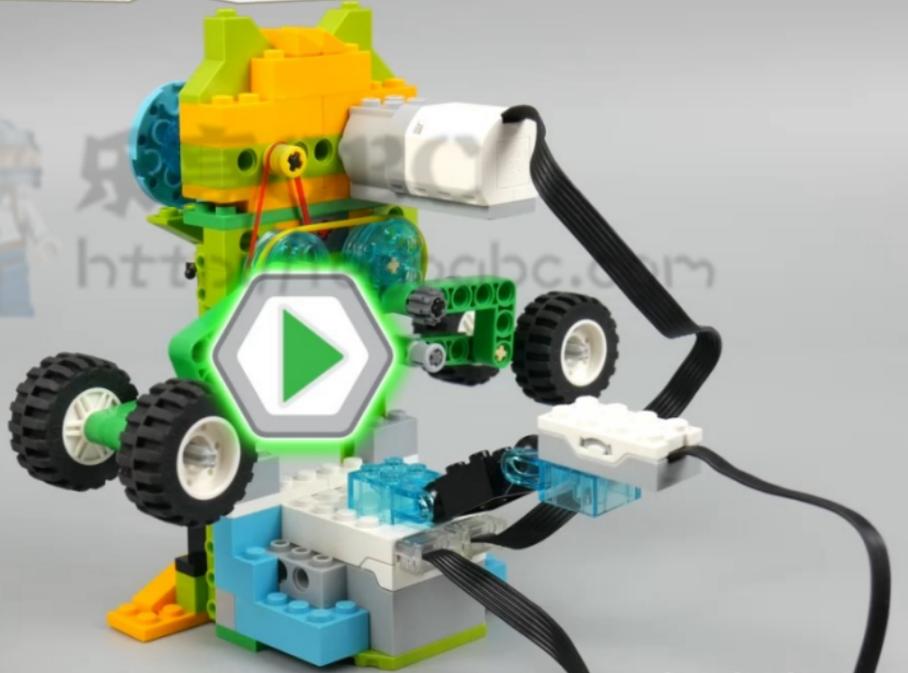
<http://legogbc.com>



Task 13



Write and test a program to control the speed of rotation of the motor depending on the position of the tilt sensor





Task 13. Program



Scratch



WeDo Software



Write and test the following program:



```
when green flag clicked
  forever loop
    if tilted up then
      set motor power to 30
    else
      if tilted down then
        set motor power to 90
      else
        turn motor off
```



Task 13. Program



Scratch



WeDo Software



Write and test the following program:





Task 14 *



Add a robot mode indication to your program. Change the color of the center button according to the position of the tilt sensor.





Task *. Program



Scratch



WeDo Software



Update your program as follows:

```
when clicked
  forever
    if tilted up ? then
      set motor power to 30
      set light color to 30
    else
      if tilted down ? then
        set motor power to 90
        set light color to 90
      else
        turn motor off
        set light color to 0
```





Task *. Program



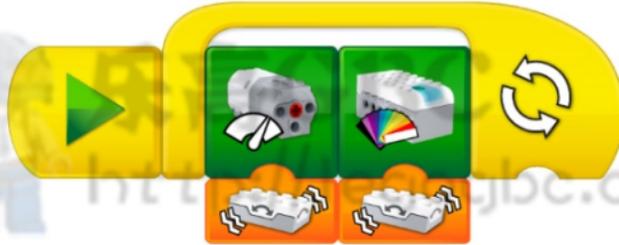
Scratch



WeDo Software



Update your program as follows:





Task 15 *



Decorate your robot. Draw, cut and fasten the T-shirt





T-shirt



Attach a T-shirt to the robot and paint it with your own ornament

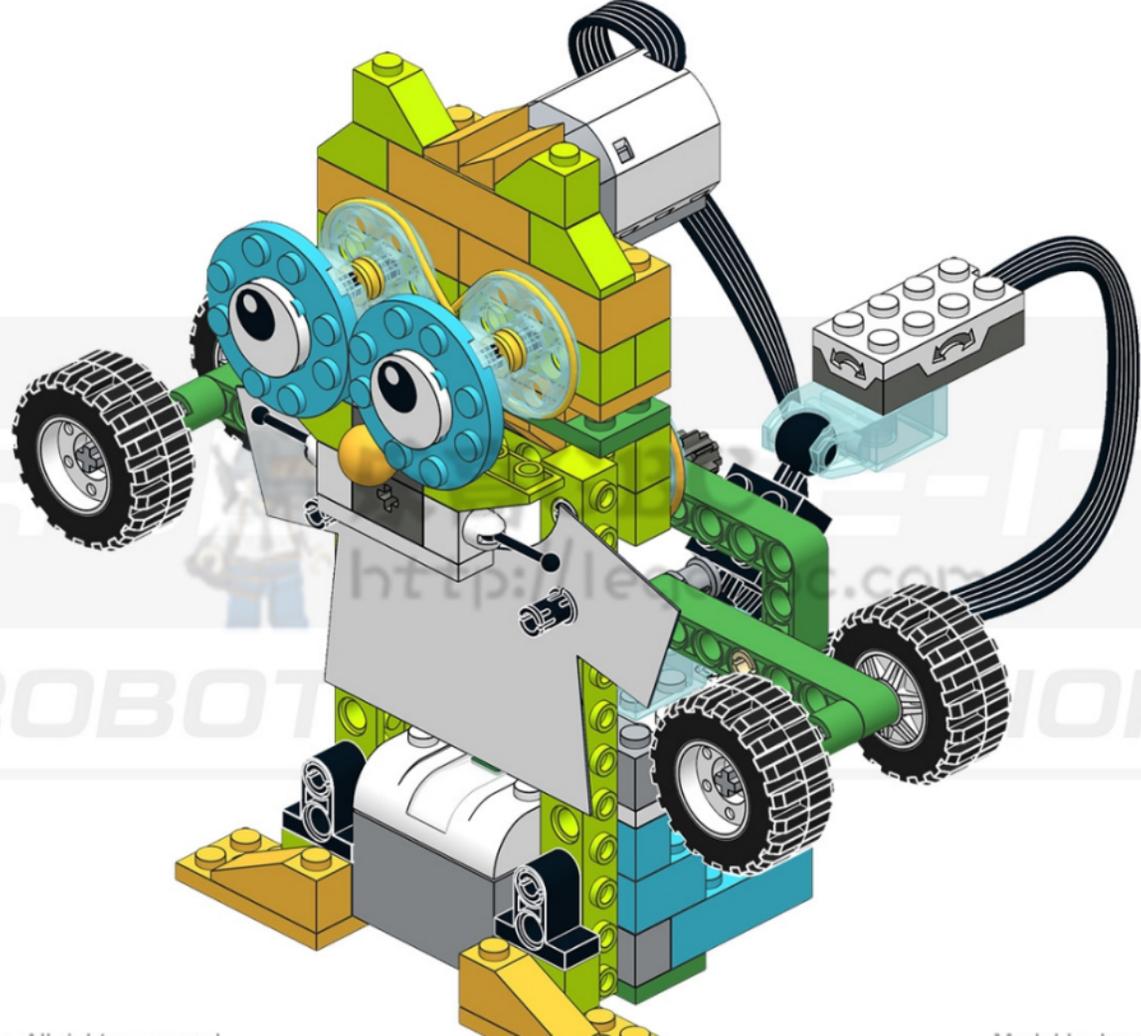


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62

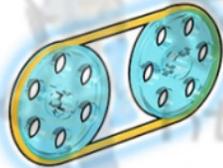




Question



Which of these mechanisms can convert rotations into translational motion?



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Question



Scratch



WeDo Software



Which program block is used to receive data from the tilt sensor?



```
when clicked
  forever
    if [tilted up?] then
      set motor power to 30
    else
      if [tilted down?] then
        set motor power to 90
      else
        turn motor off
```



Question



Scratch



WeDo Software



Which program block is used to receive data from the tilt sensor?





Discuss!

- ▶ What do you think, what professions specialists in the near future can be replaced by robots?
- ▶ What gears did you use to connect the mechanisms of the robot?
- ▶ How to change the direction of rotation of the driven shaft in a belt drive without changing the direction of rotation of the motor?
- ▶ What can the tilt sensor detect? How did you use it?





Your achievements

Total:

0

