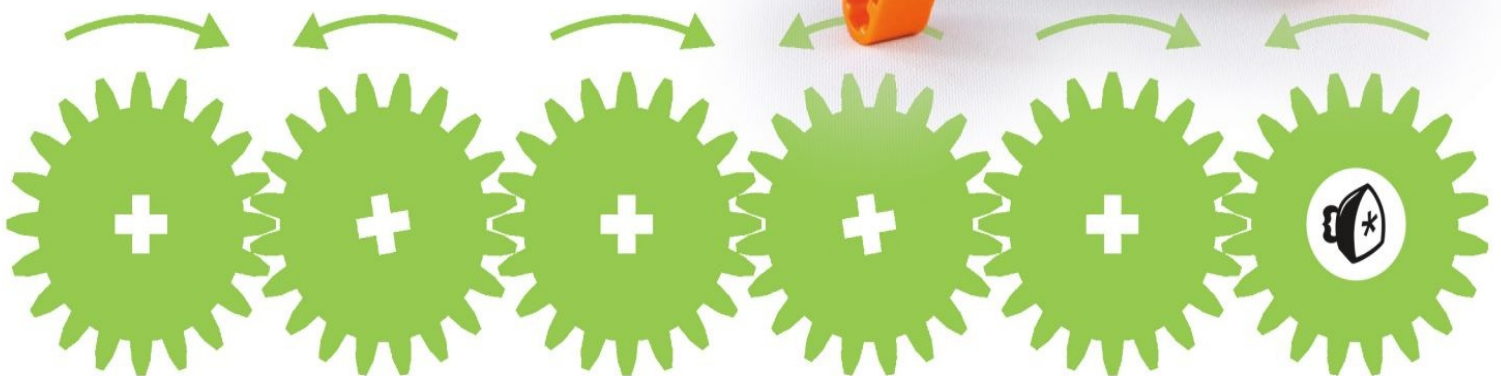


# THE LEGO<sup>®</sup> BOOST IDEA BOOK



YOSHIHITO ISOGAWA



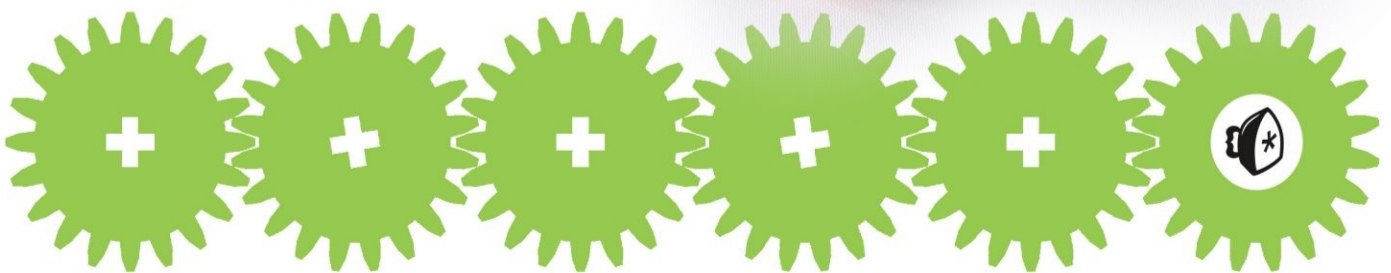
95 Simple Robots and Hints for Making More!



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**YOSHIHITO ISOGAWA**





**The LEGO® BOOST Idea Book.**

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# Introduction

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This book is not a beginner's guide to LEGO BOOST. It's also not a book for building robots like the ones included in the LEGO BOOST Creative Tool app. If you've already tried building and programming with BOOST and you're ready for more ideas to challenge yourself, this book will help you do that.

To build the models in this book, all you need is the LEGO BOOST Creative Toolbox set (#17101).

## How to Use This Book

Most of the models in this book are small, simple mechanisms, and the programs you need to control them are also simple. When you build the models and get them moving, you'll understand those mechanisms and programs that much better. As you develop and evolve them more and more, you might even create your own builds. It would be a good idea to combine some mechanisms as well. Feel free to remodel, reinforce, and decorate. Your creativity has no limits.

You don't have to make these models in the order they appear. Flip through the pages and then try making models you find interesting. You might want to start with relatively simple models first.

## Recommended Books

For a beginner's guide to BOOST, check out *The LEGO BOOST Activity Book* by Daniele Benedettelli.

If you would like to try even more mechanisms, check out two of my other books: *The LEGO Power Functions Idea Book, Vol. 1* and *The LEGO Power Functions Idea Book, Vol. 2*.

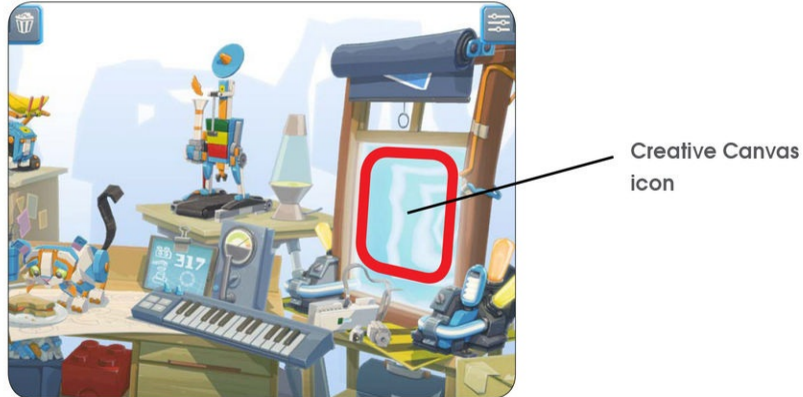
## Acknowledgments

LDraw data and the LPub application were used to create the illustrations in this book. I would like to thank those involved in the development of those programs.



## Programming BOOST

In the LEGO BOOST Creative Toolbox app, you can create the programs shown in this book by tapping the Creative Canvas icon on the right side of the menu. If the screen is rolled down, tap the screen to roll it up and display the project screen. When the project screen opens, tap the **+** icon in the top-left corner. A new screen where you can make programs will be displayed.



Note that this Creative Canvas icon becomes available only after you try making some programs for the robot projects in the LEGO BOOST Creative Toolbox app.

You can set the difficulty level for programming blocks to one of three levels. In this book, we'll use the standard level 2. You can select the right level like this:



The programs in this book were created with the LEGO BOOST Creative Toolbox app version 1.5.0.



## Warm-Up

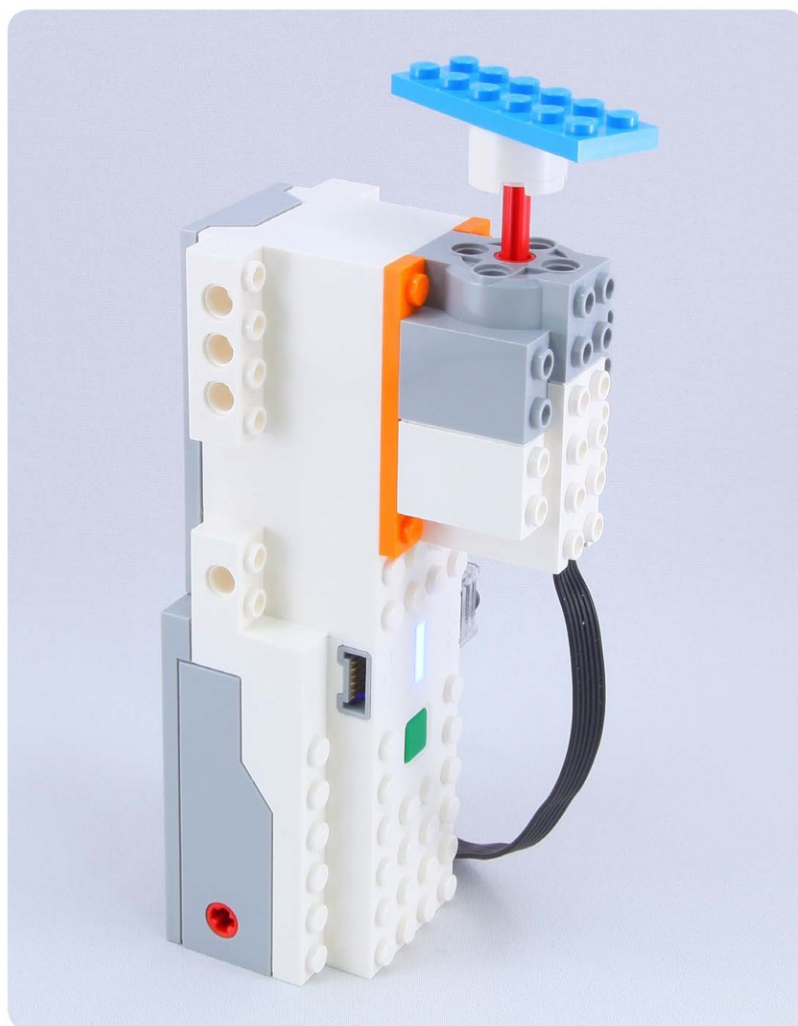
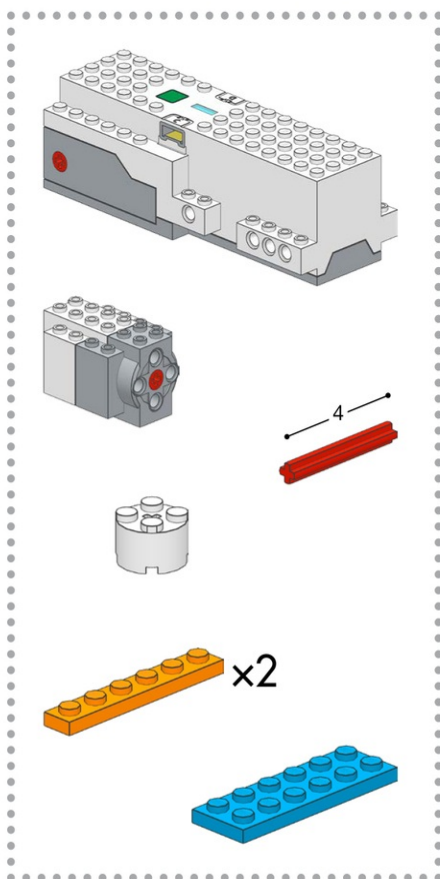
You won't find step-by-step building instructions in this book. Instead, use the photographs taken from various angles to try to reproduce the model. Building in this way is like putting together a puzzle. You'll soon get the hang of this process and learn to enjoy it!

Let's practice first.

# 1

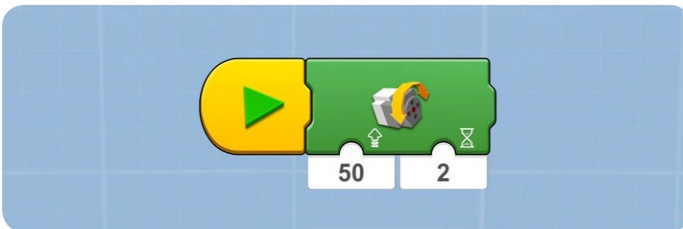
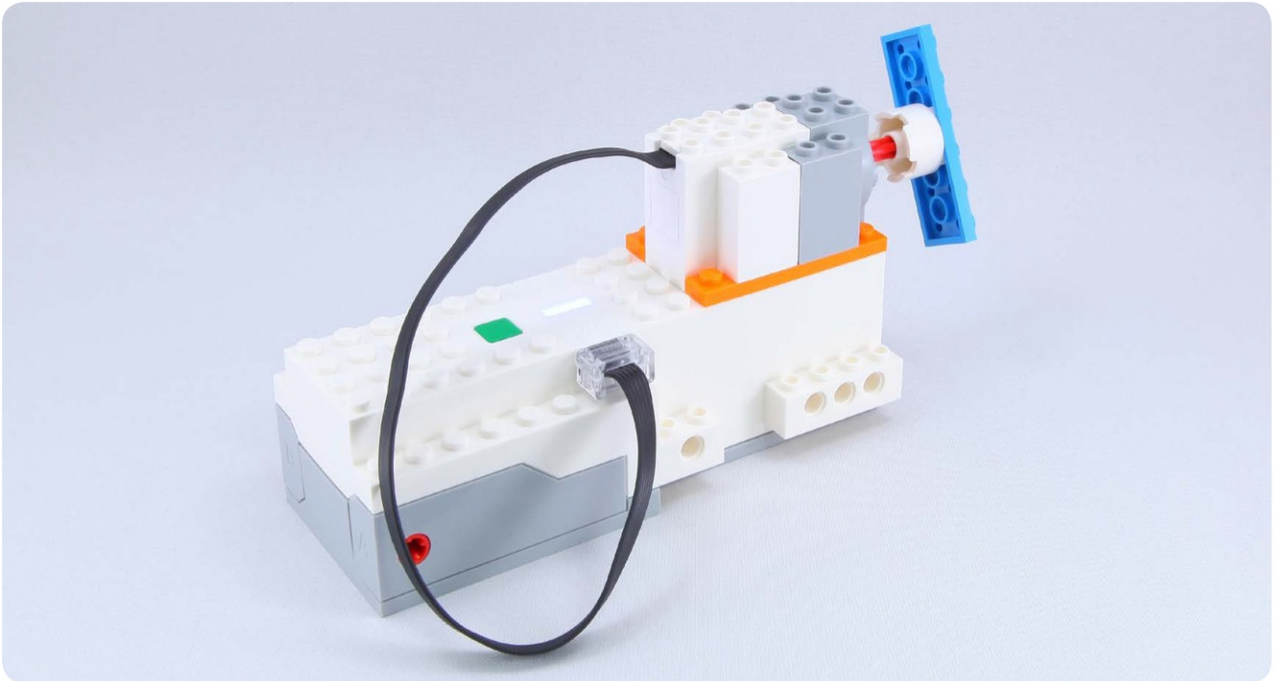
This is the number  
of the model.

All the parts you need for this model are  
shown in the box below. Find them in your  
BOOST set and start building!



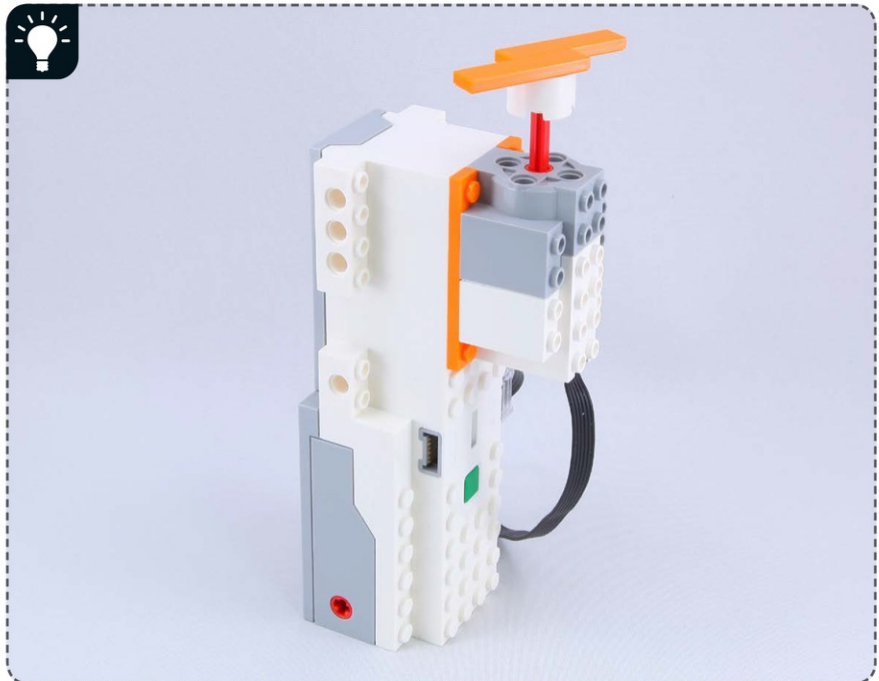
After gathering the parts shown in the box, try reproducing the  
model using the photos on this page and the next.





This is a sample program that you can use to set this model in motion.

This is the “hint” icon, which suggests other ways of building and programming. Try to create your own unique and fun models using these tips.



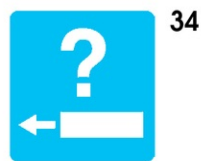
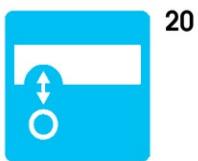
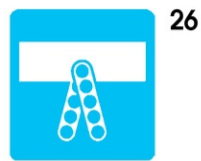




# PART 1



# Moving with the Move Hub

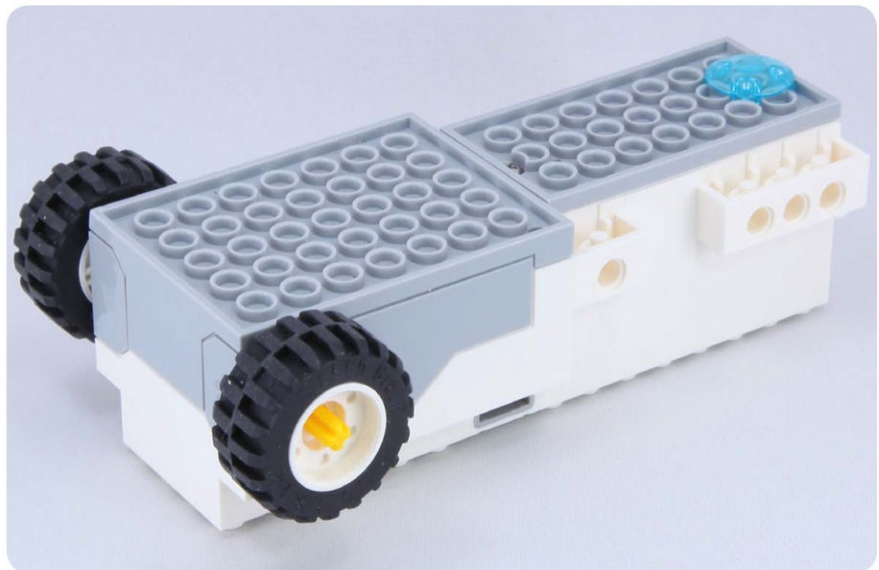
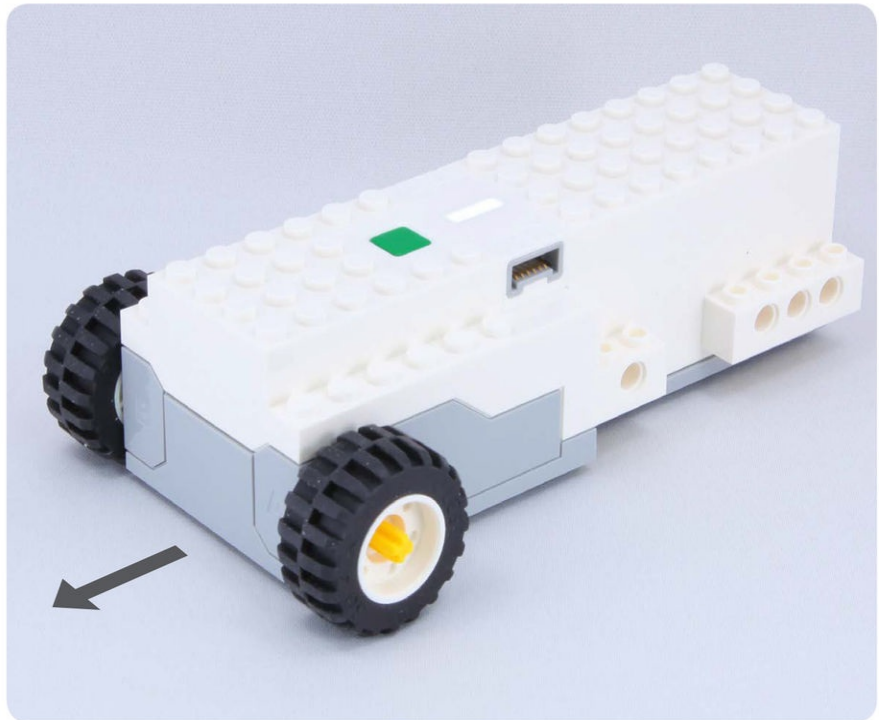
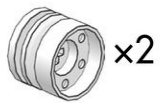
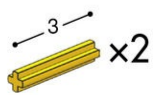
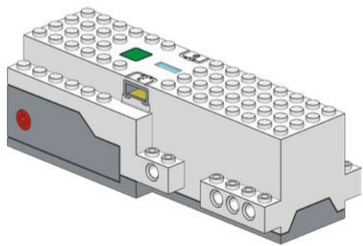






# Moving on wheels

# 1



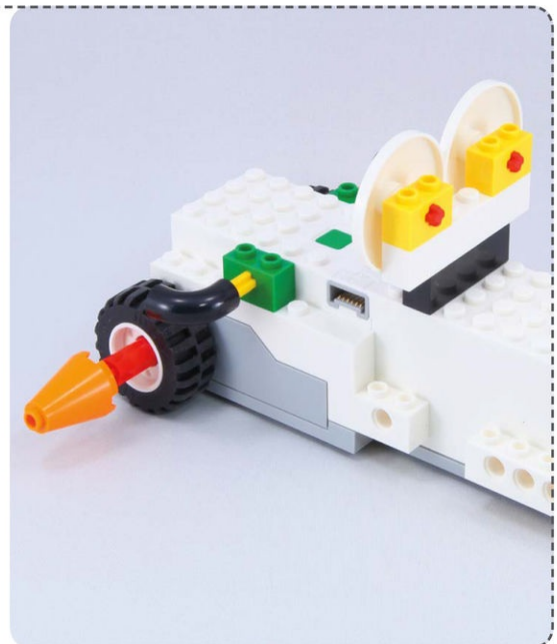
4 Moving on wheels





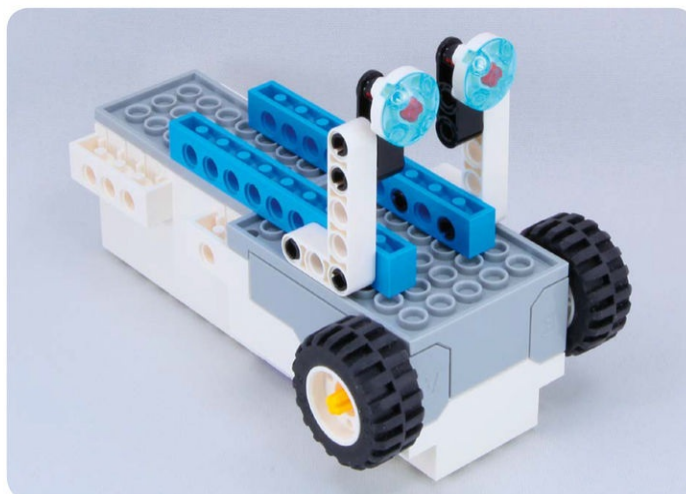
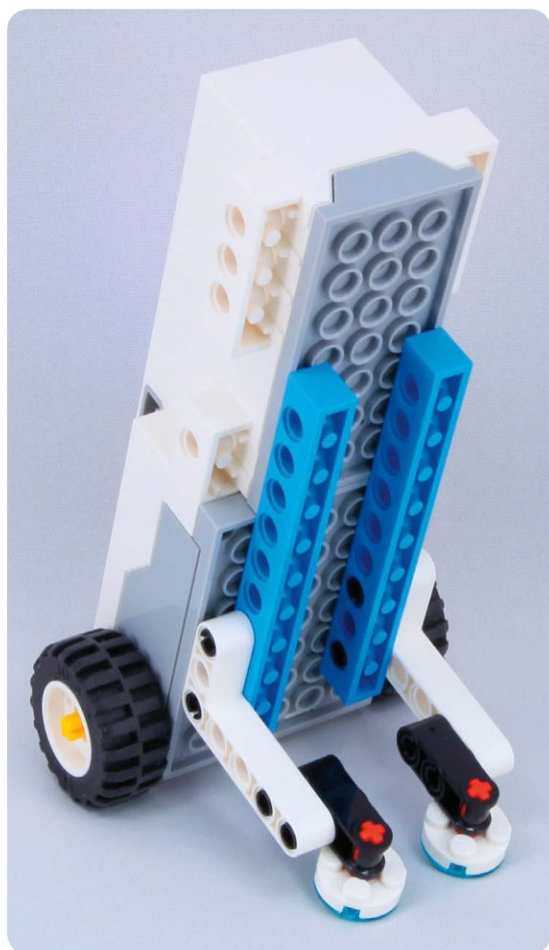
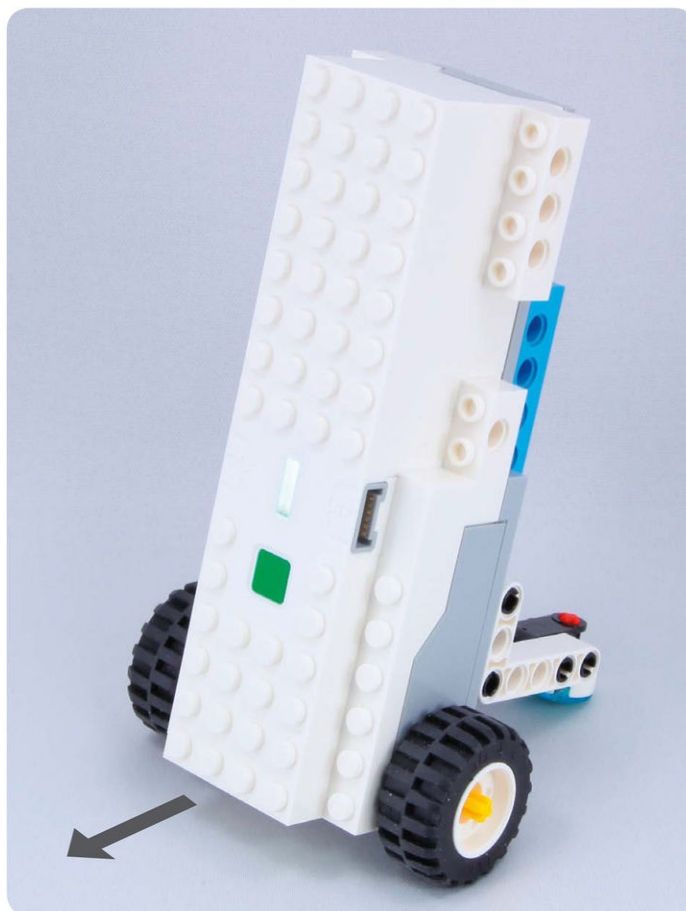
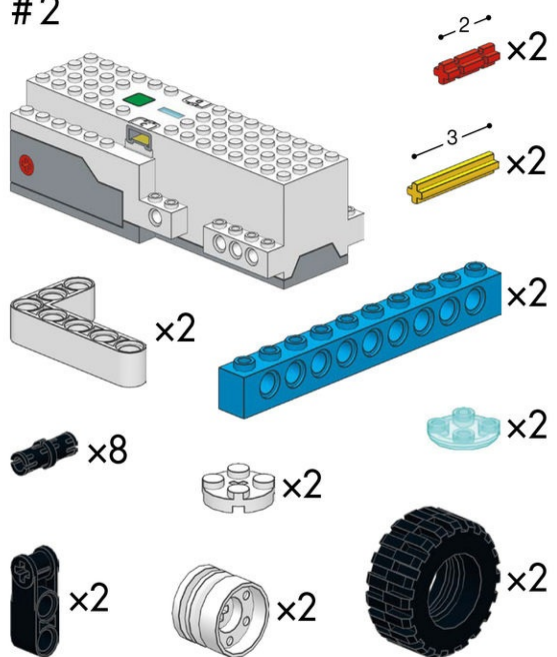
**Joystick Widget**  
You can control your car with this joystick.

This joystick program includes a **Wait** block to introduce a slight delay in the program. Without the delay, the program could get confused since the device would send instructions to your robot continuously—too fast for it to respond!



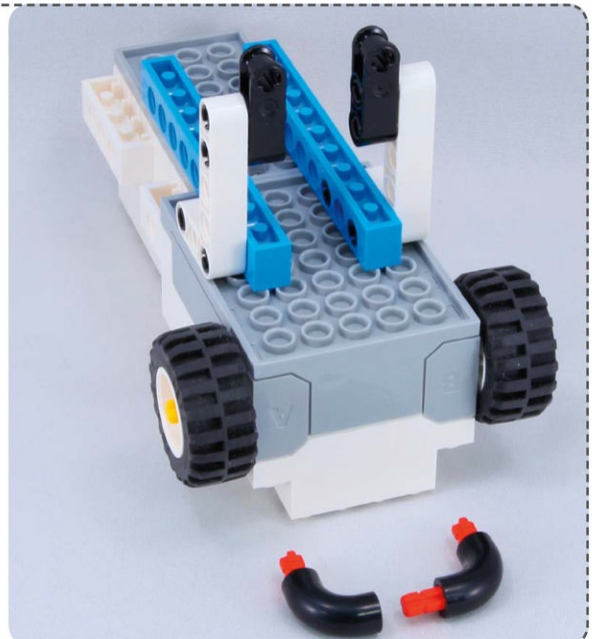
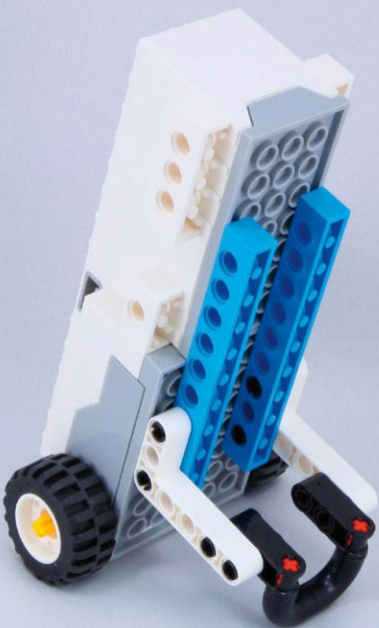
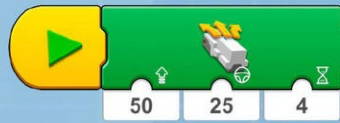


#2



6 Moving on wheels

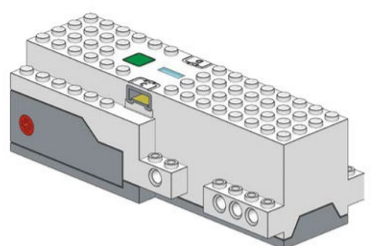




Moving on wheels 7



#3



x8

x4



x2

x2

x2

x2

x2

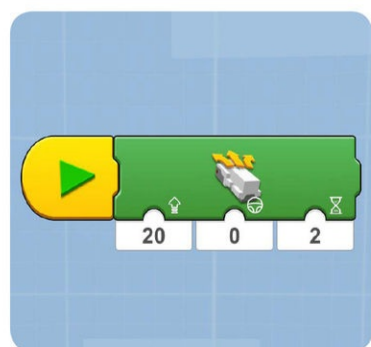
x2

x2

x20

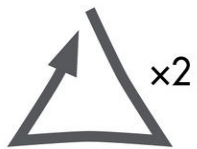
x20

x2



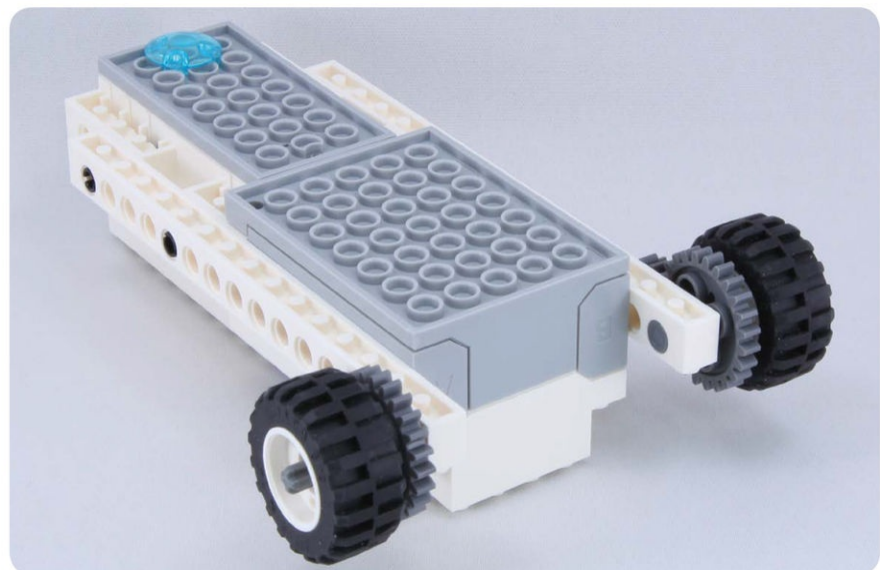
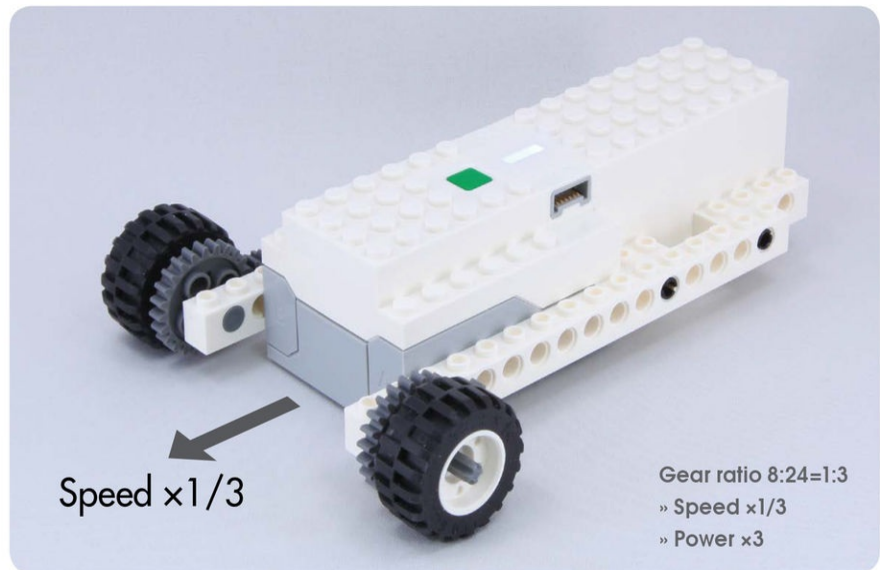
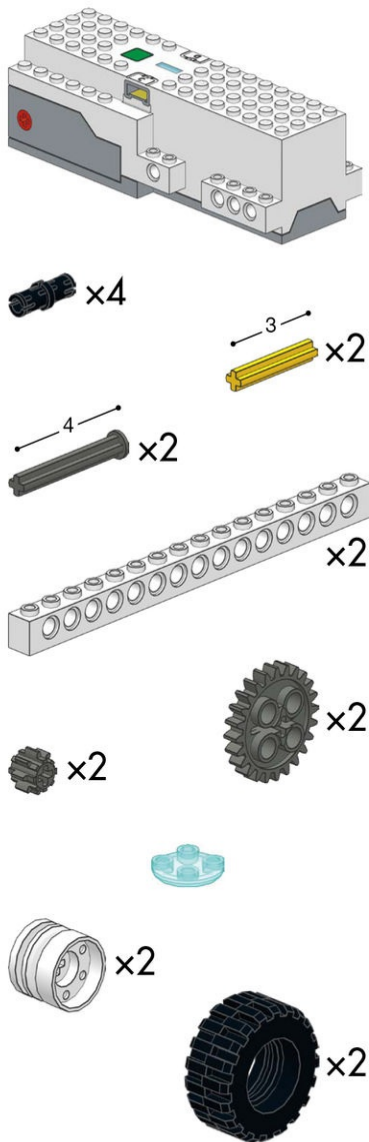
8 Moving on wheels





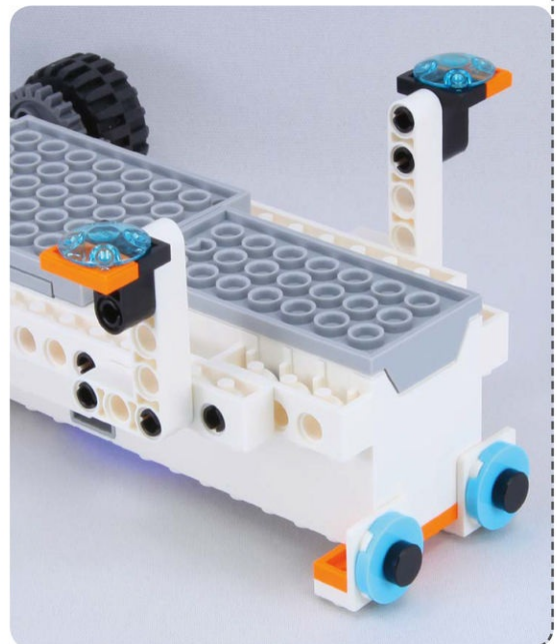
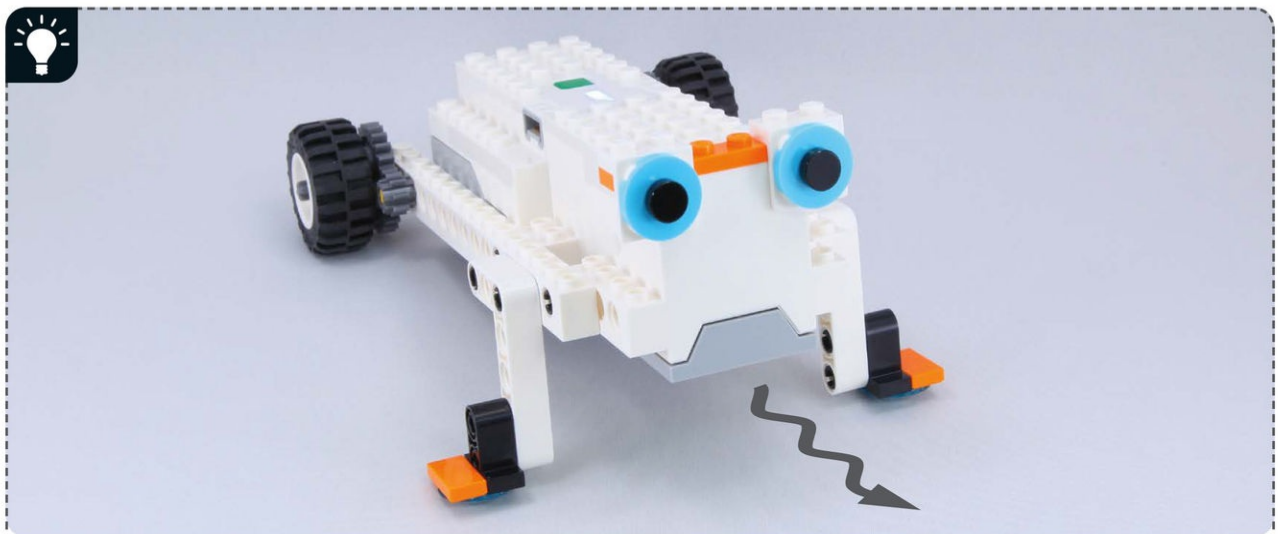
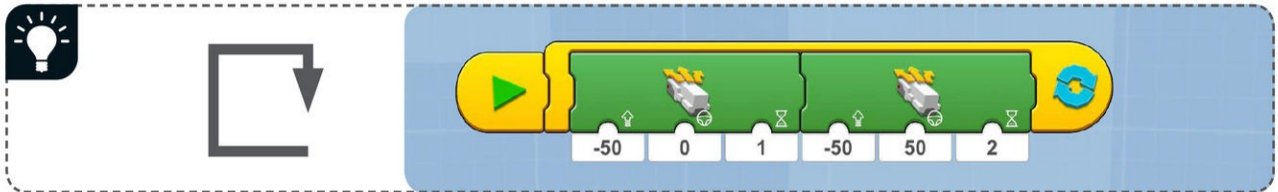
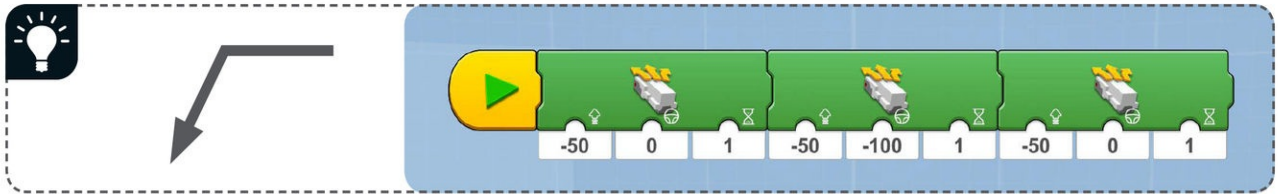


#4



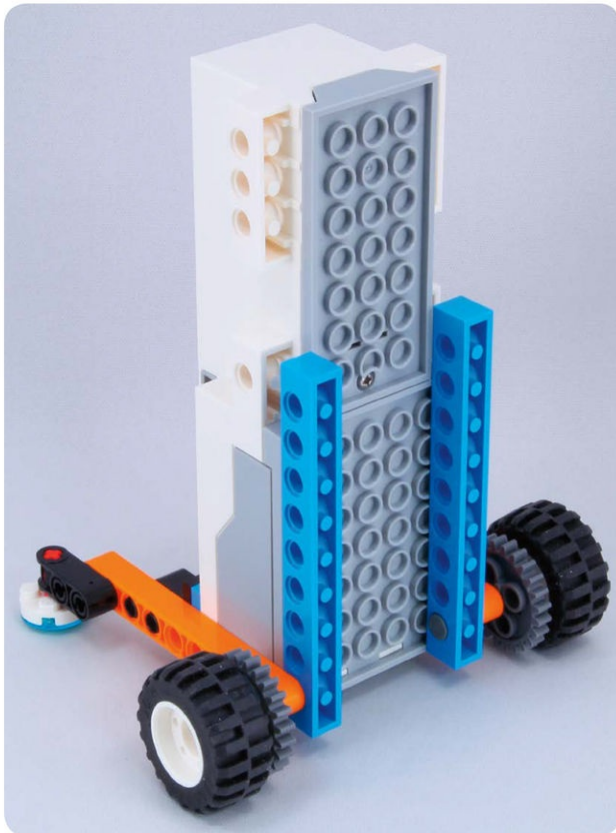
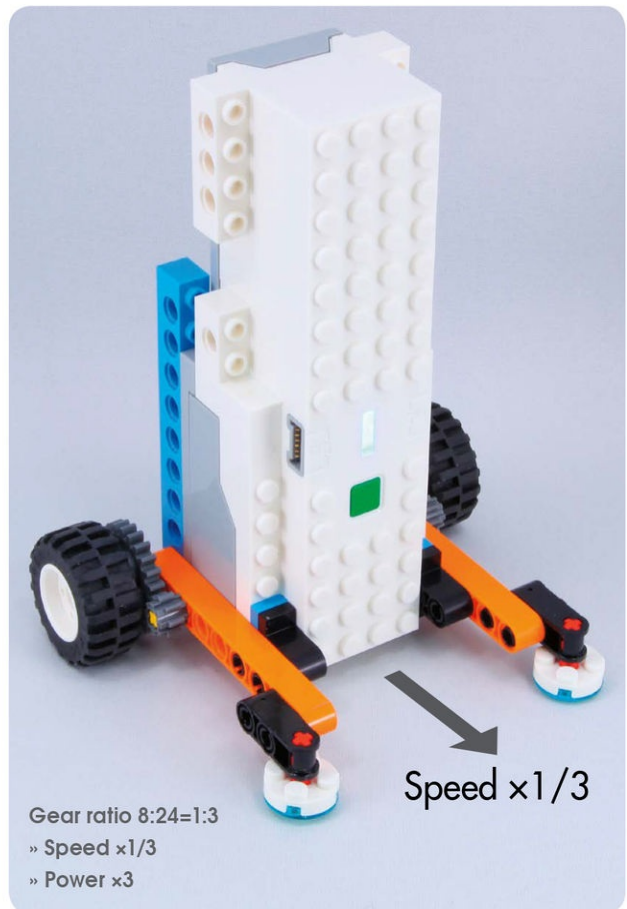
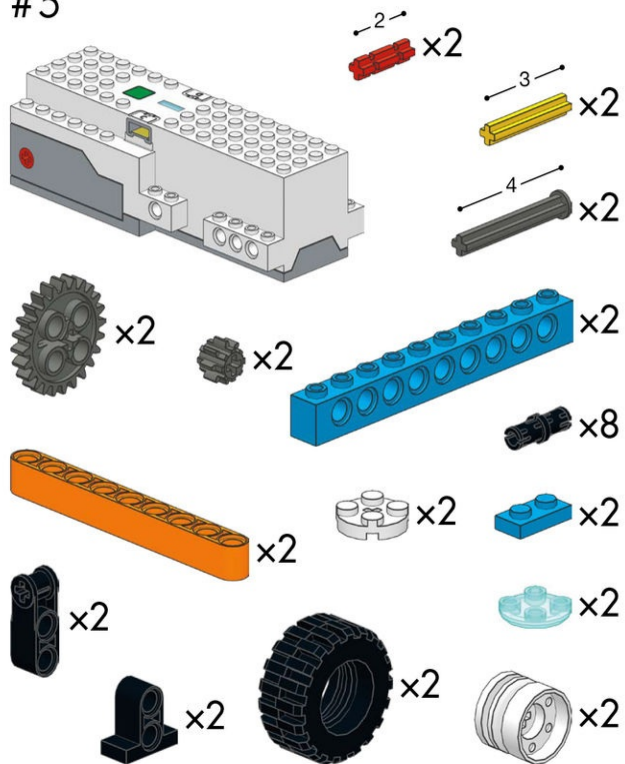
10 Moving on wheels





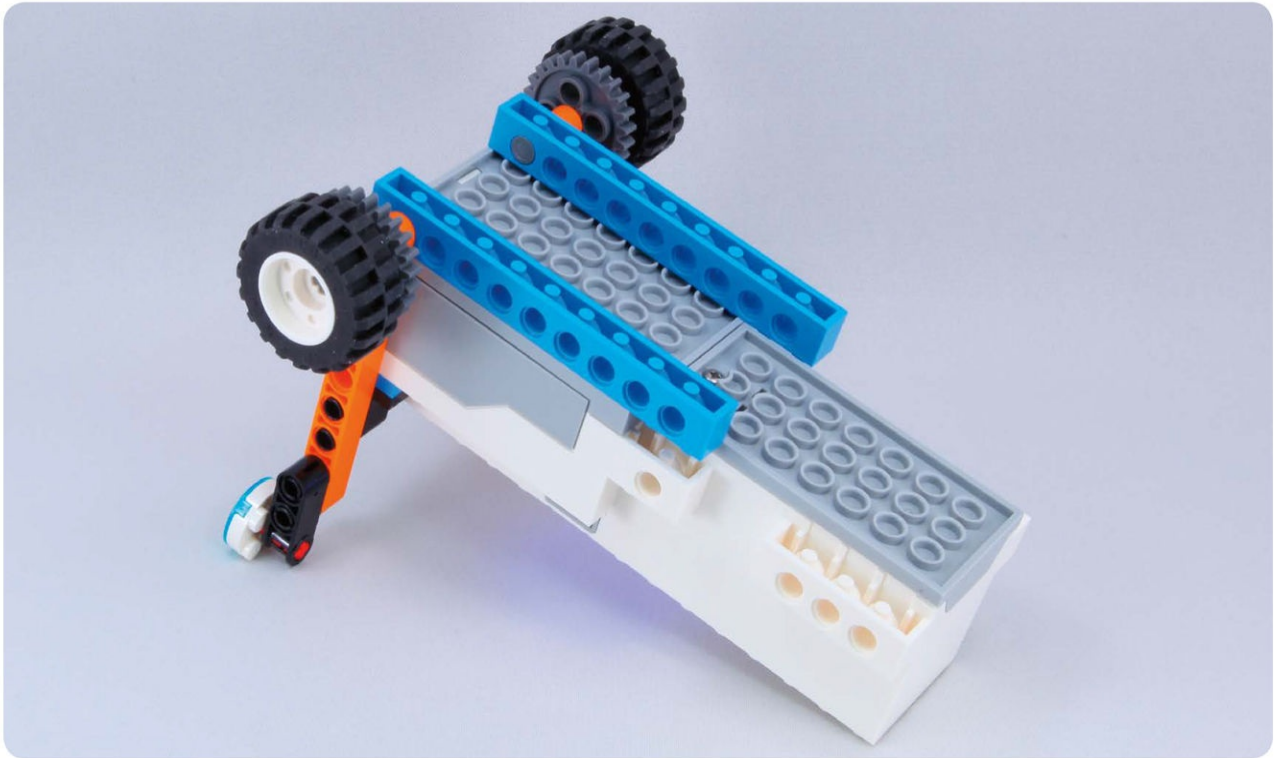
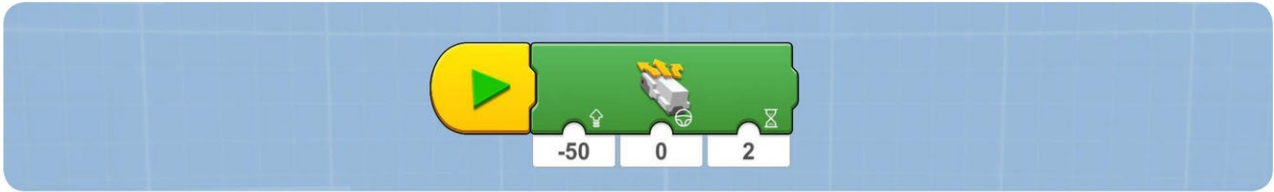


#5



12 Moving on wheels



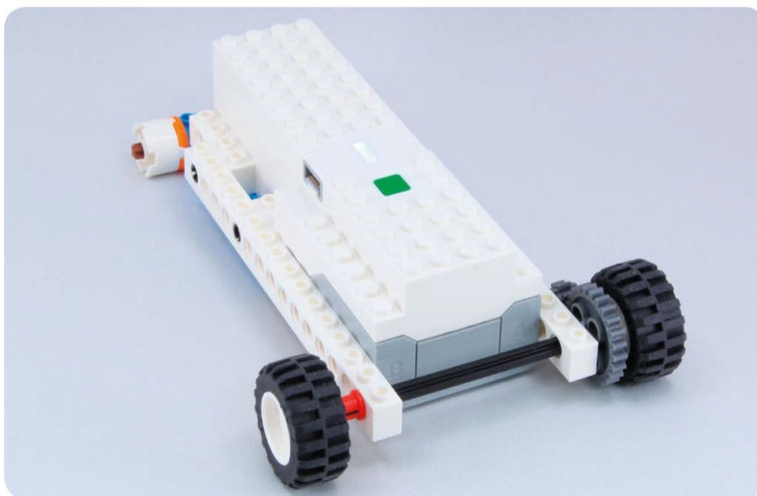
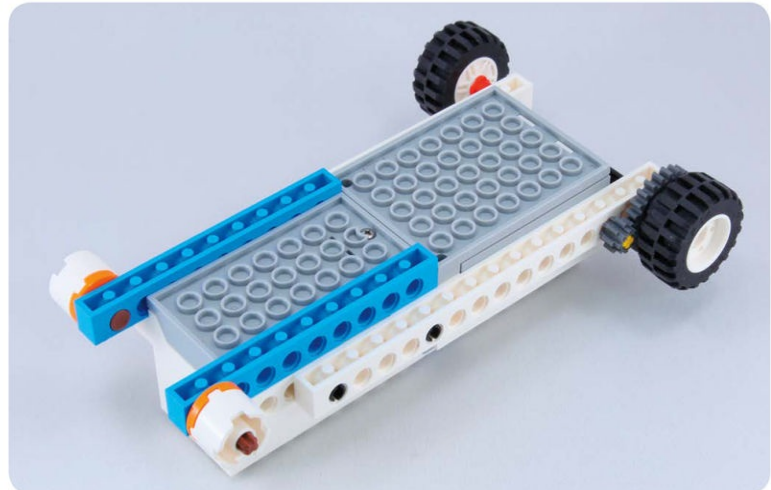
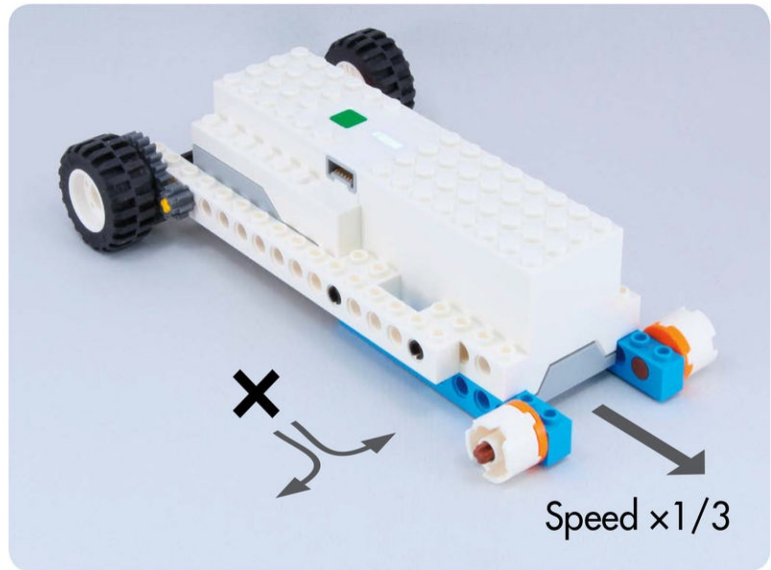
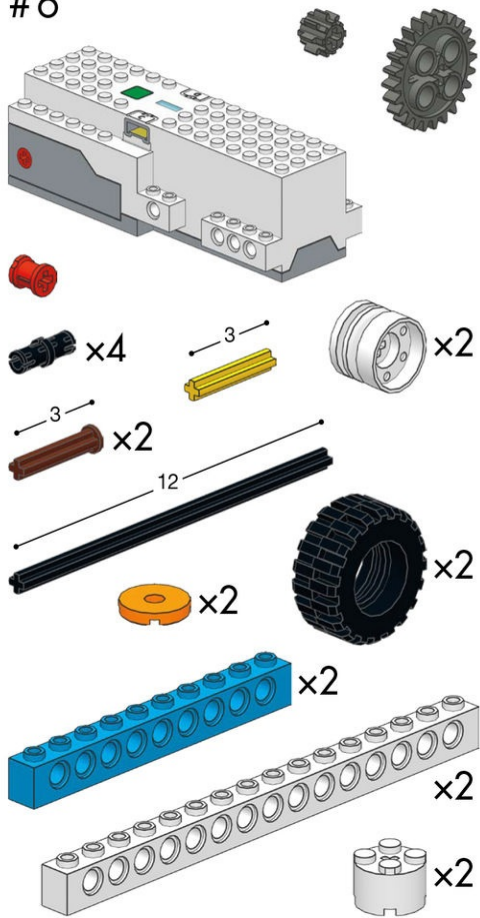


**Joystick Widget**  
You can control your car with this joystick.

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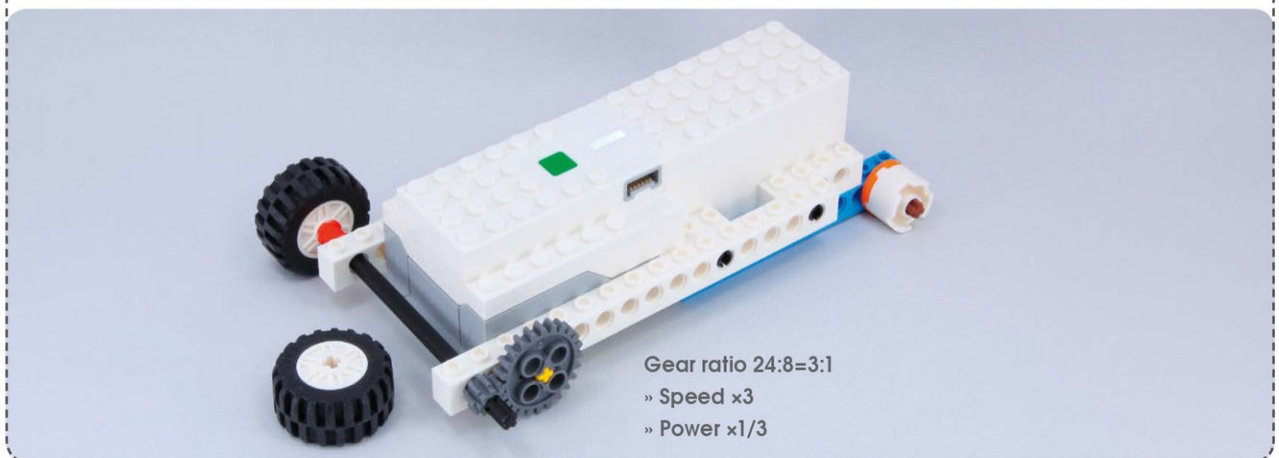
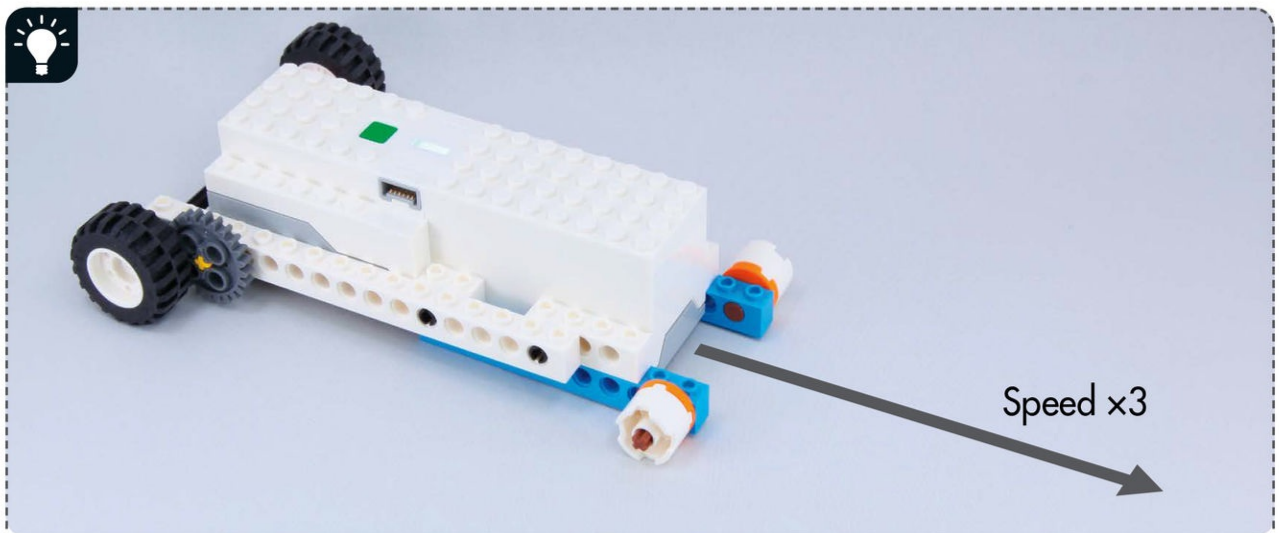


#6



14 Moving on wheels



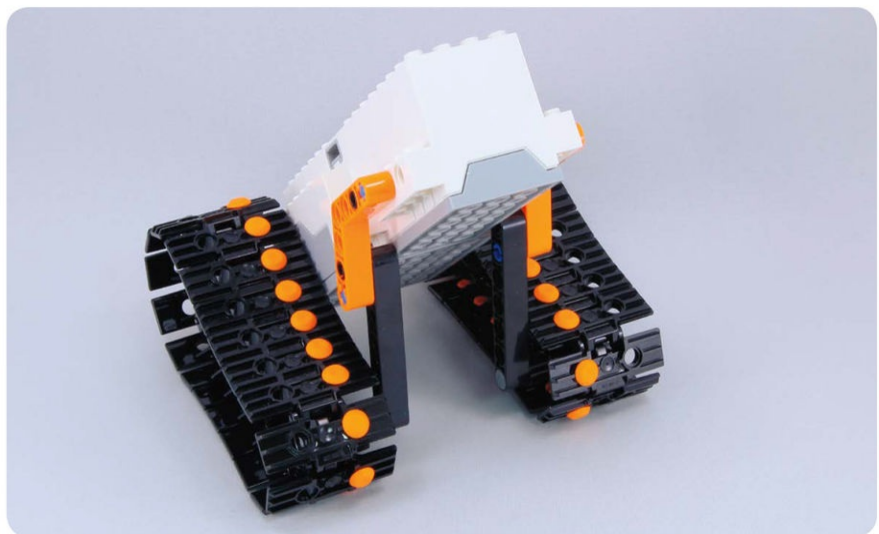






This diagram shows the assembly of the rear chassis. The main component is a grey LEGO Technic beam with various connectors and pins already attached. Below it are the following parts:

- Black axle connector x4
- Blue axle connector x4
- Red axle pin (length 4) x2
- Grey axle pin (length 4) x2
- Black axle connector x4
- Black Technic beam (length 8) x2
- Orange L-shaped Technic beam (length 3) x2
- Yellow Technic bush x38
- Large black rubber tire x2
- Small black rubber tire x2
- Black Technic axle connector x38





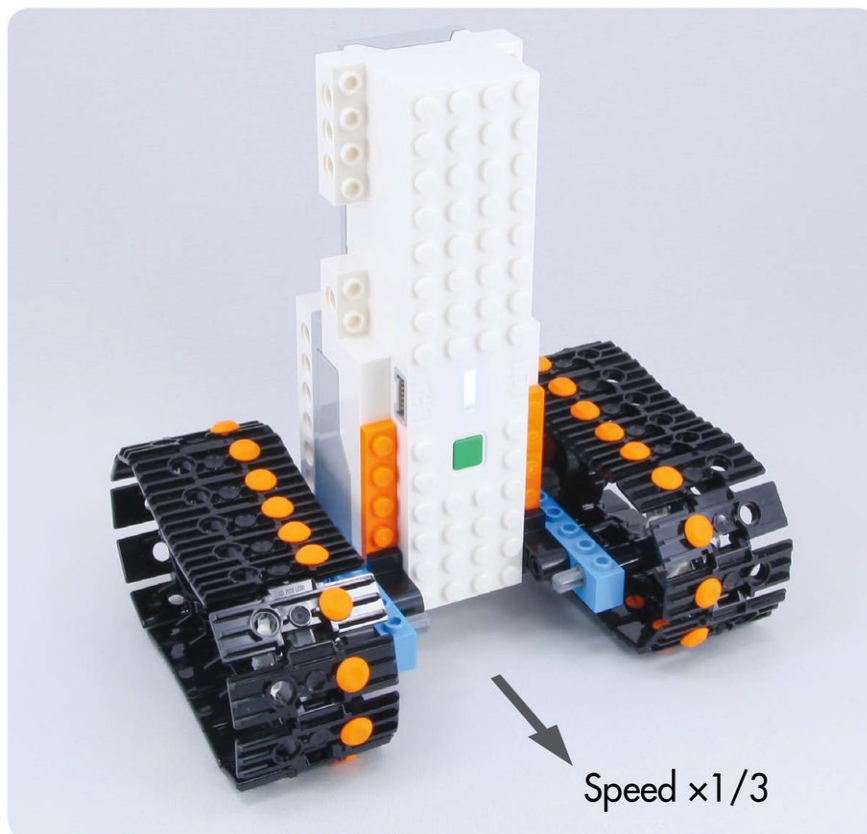
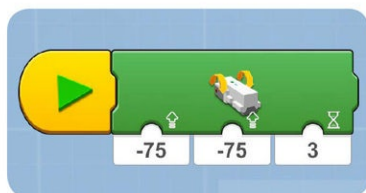


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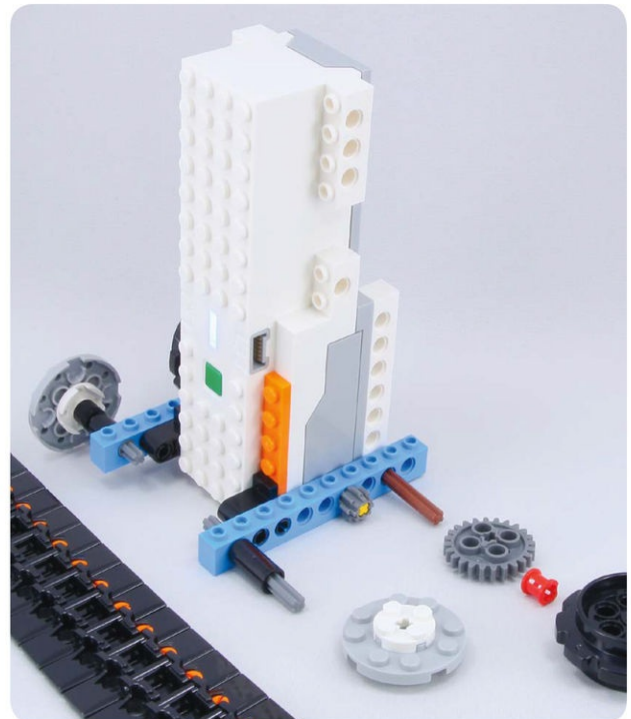


#8



18 Moving with crawler tracks

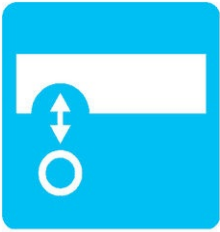




You can control this model by tilting your tablet or smartphone back and forth or left and right. (Warning: This might not work for every device!)

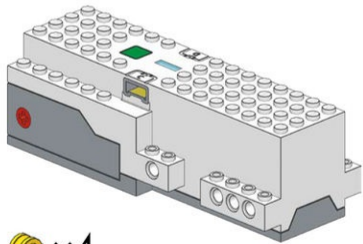






# Suspended vehicles

#9



x4

x2

x2

x2

x2

x2

x2

x2

x2

x2

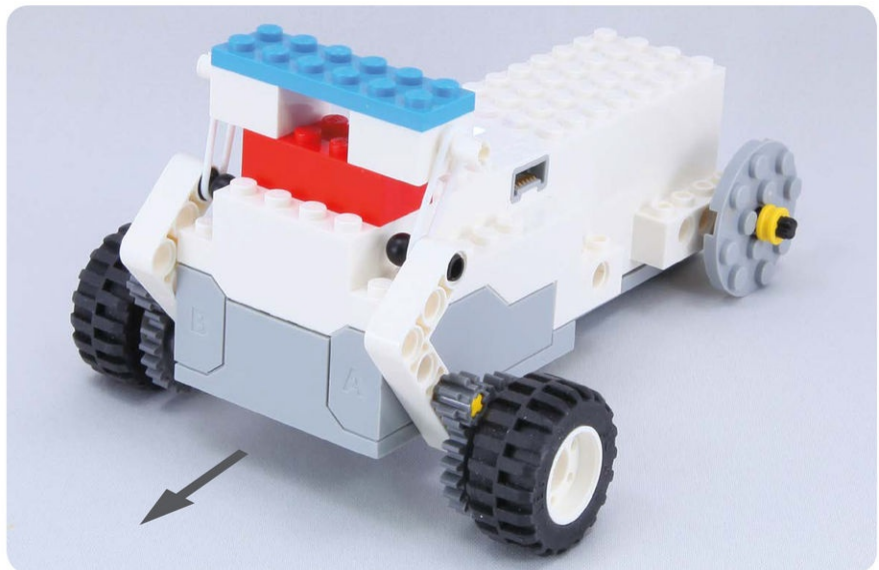
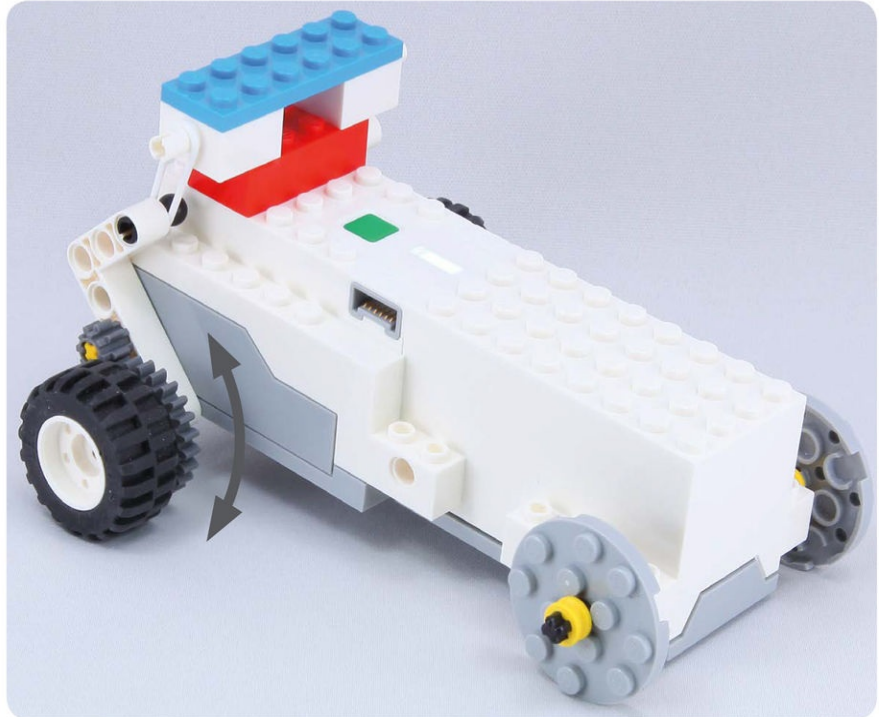
x2

x2

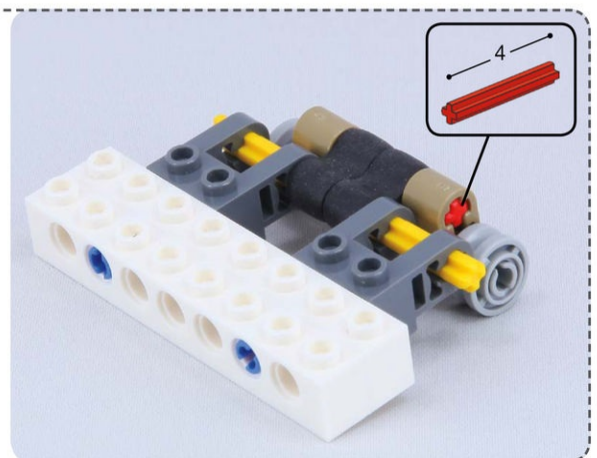
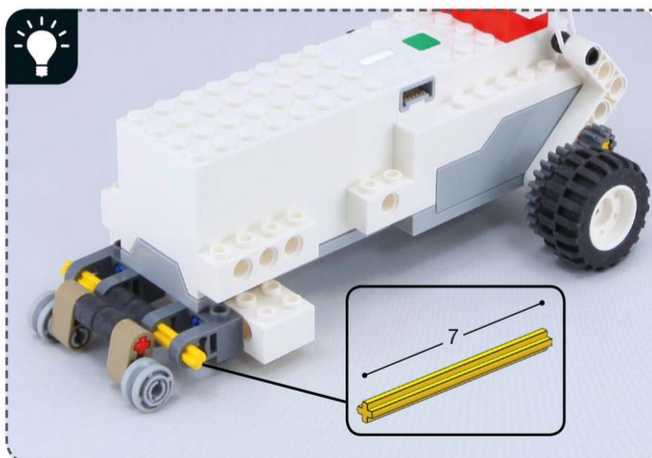
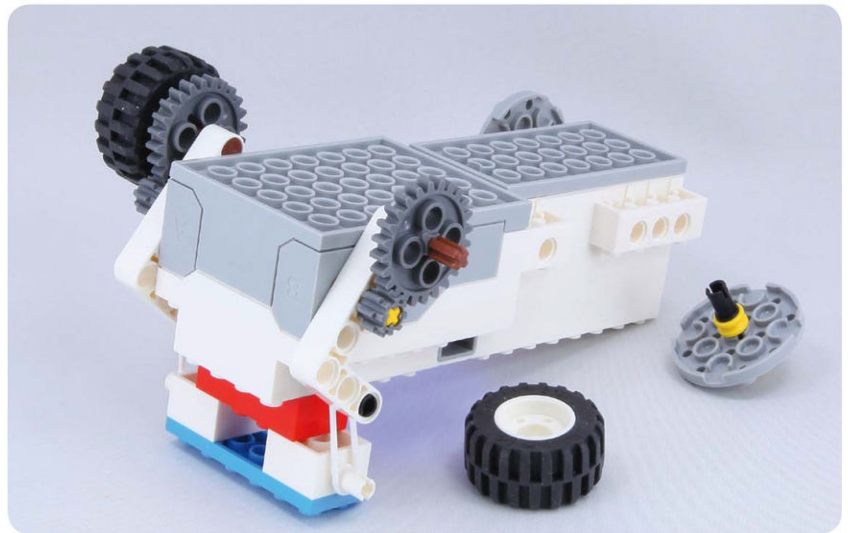
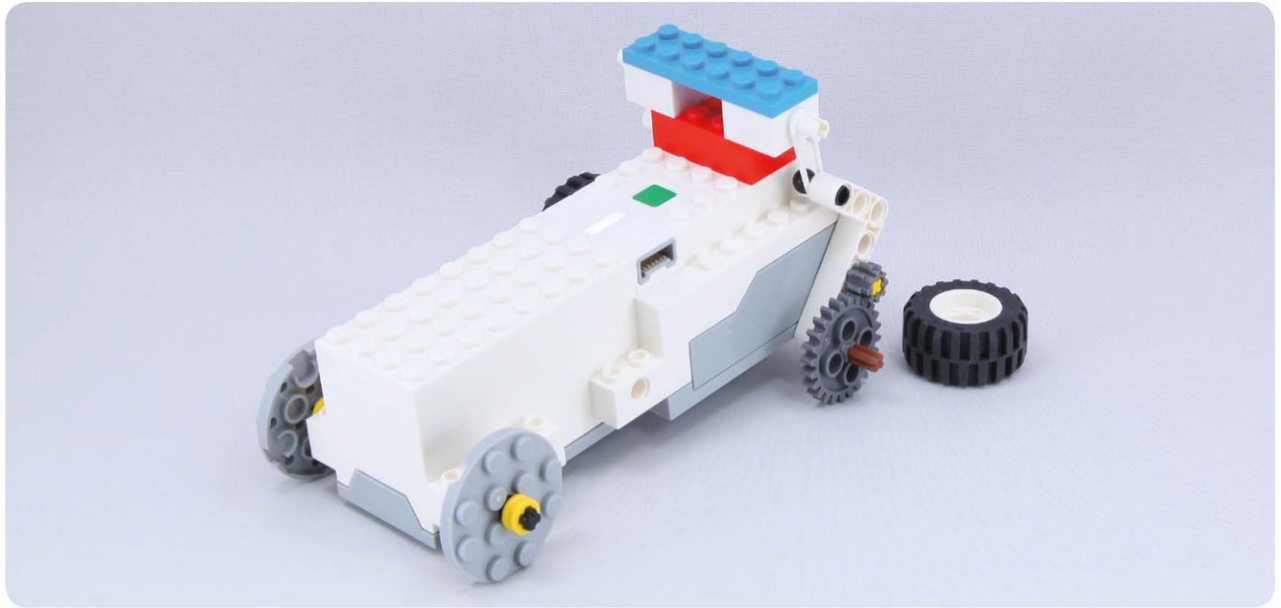
x2

x2

x2

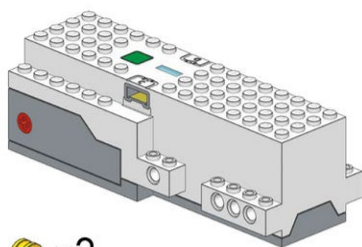








#10



x2

x2

x2

x2

x2

x2

x2

x2

x2

x2

x4

x2

x2

x2

x2

x2

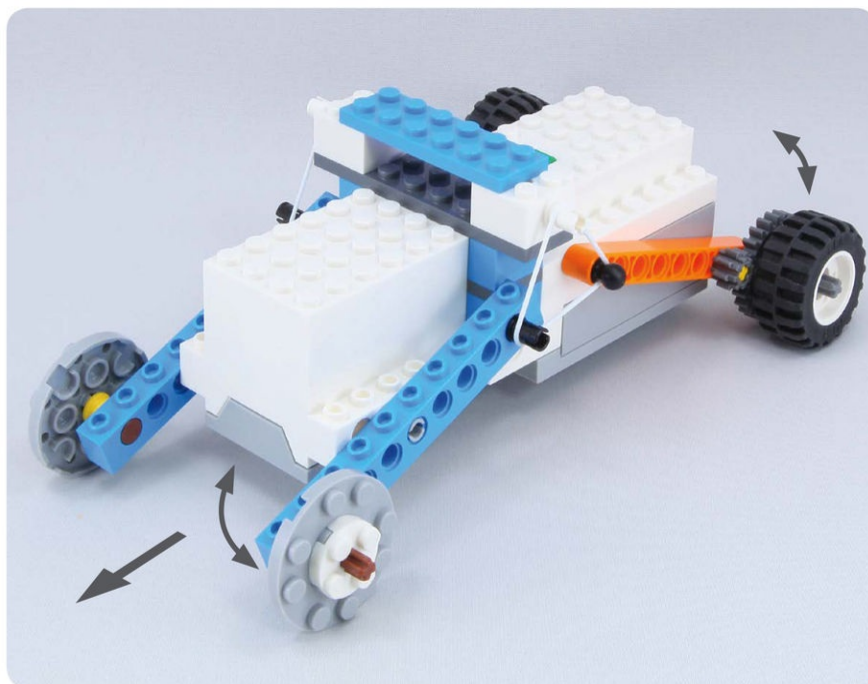
x2

x2

x2

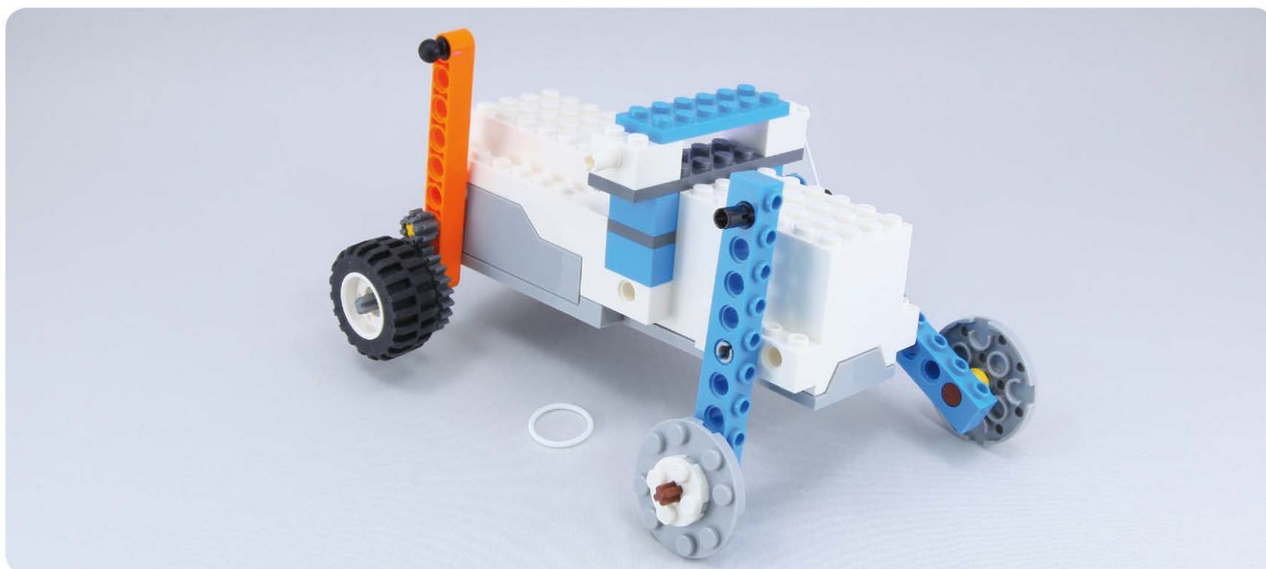
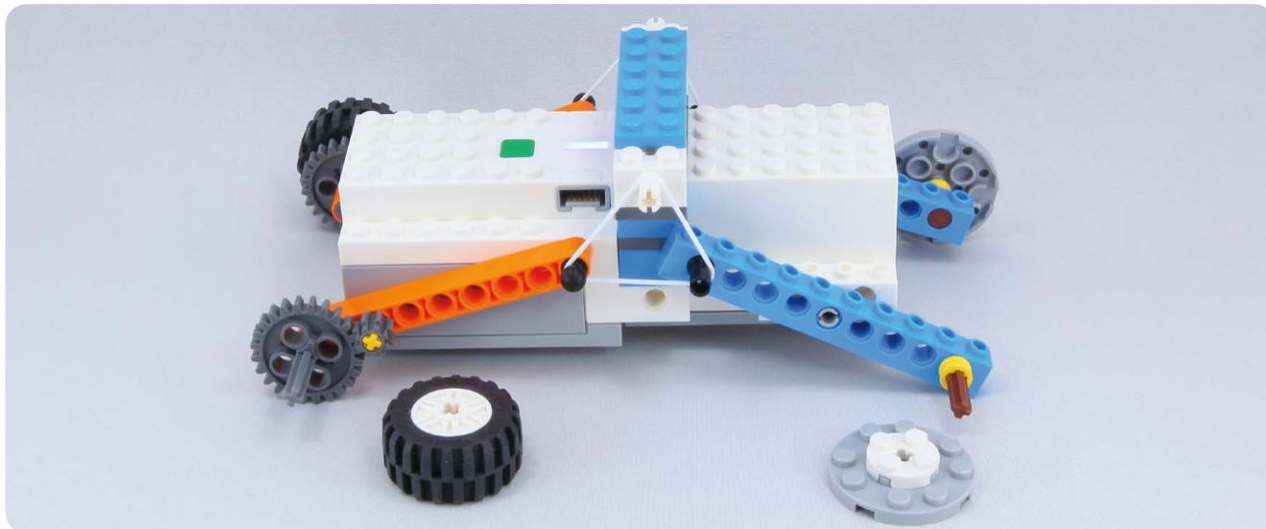
x2

x2



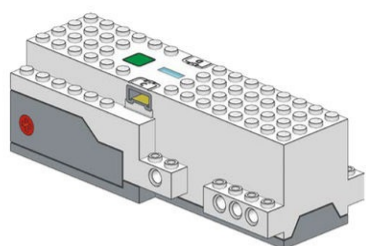
22 Suspended vehicles







# 11



Black pin x2

Black pin x4

Grey pin x2

White ring x2

Black track x38

Grey axle (length 4) x2

Brown axle (length 5) x2

Black pin x4

Orange pin x38



Black wheel x2

Black wheel x2

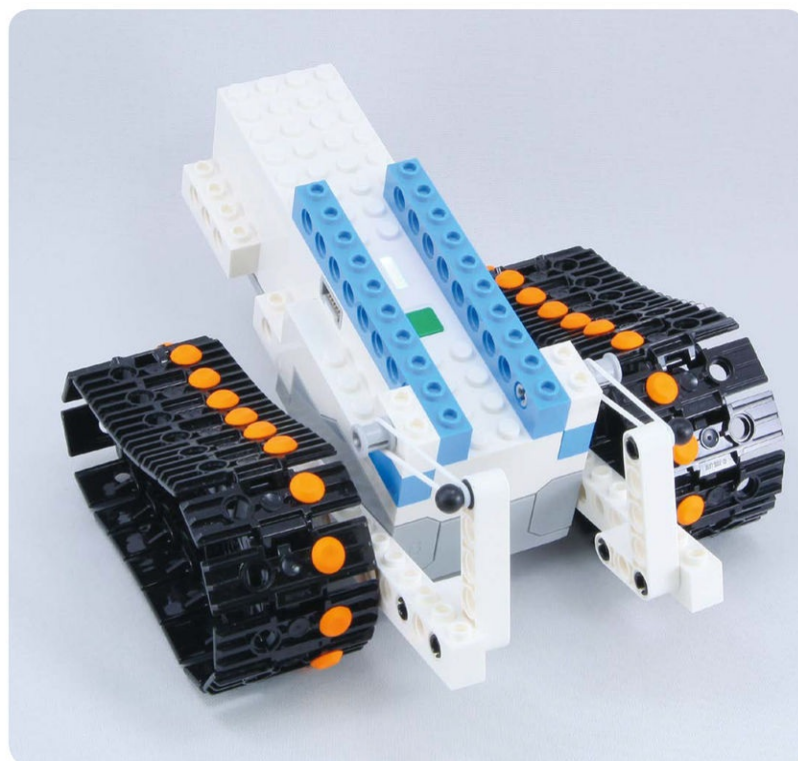
Grey L-shaped beam x2

Grey 1x2 brick x2

Blue 1x2 brick x2

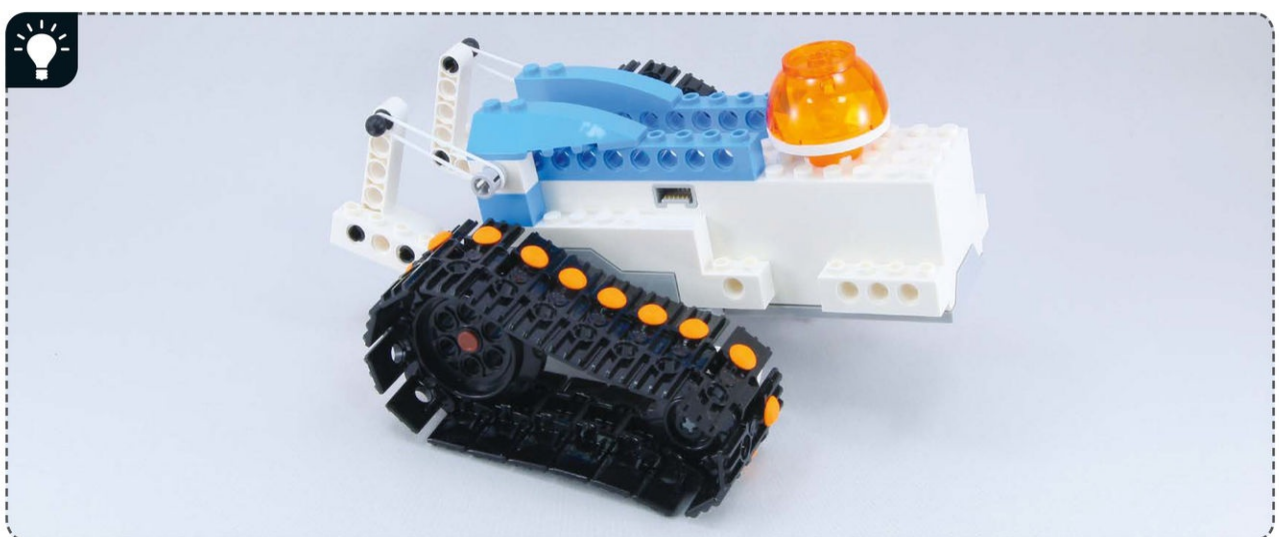
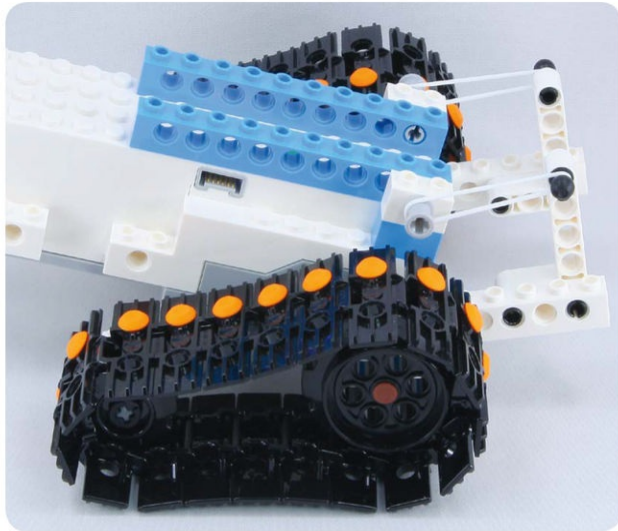
Blue 1x10 beam x2

Grey 1x15 beam x2



24 Suspended vehicles










A detailed view of a LEGO Technic assembly. It features a grey motor block connected to a grey gear block. A black gear is mounted on the motor's axle, which is connected to a grey axle. A red gear is mounted on the end of the grey axle. The assembly is built using various grey and black Technic bricks and connectors.

3  $\times 2$




8 x2

 x2

  $\times 2$ 

x2

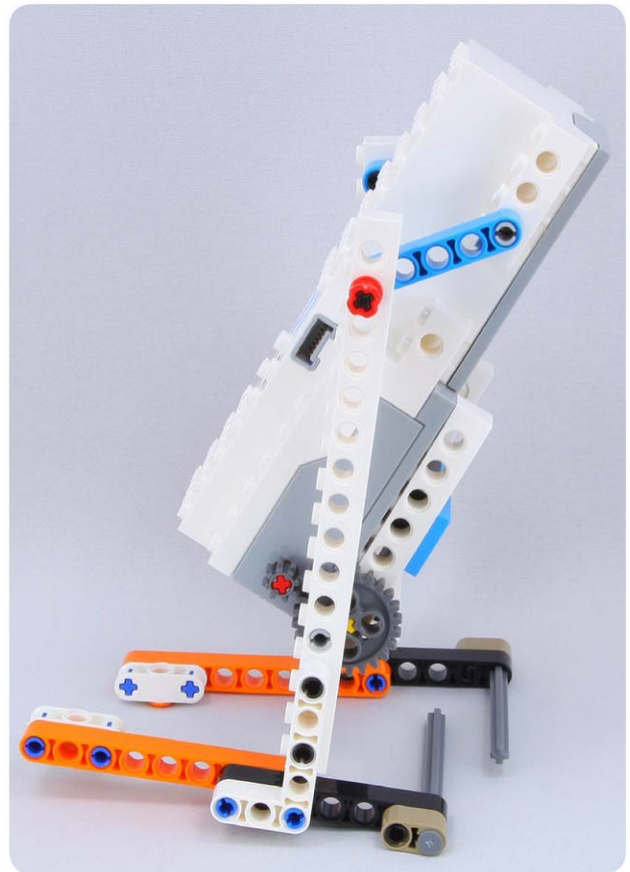


x2

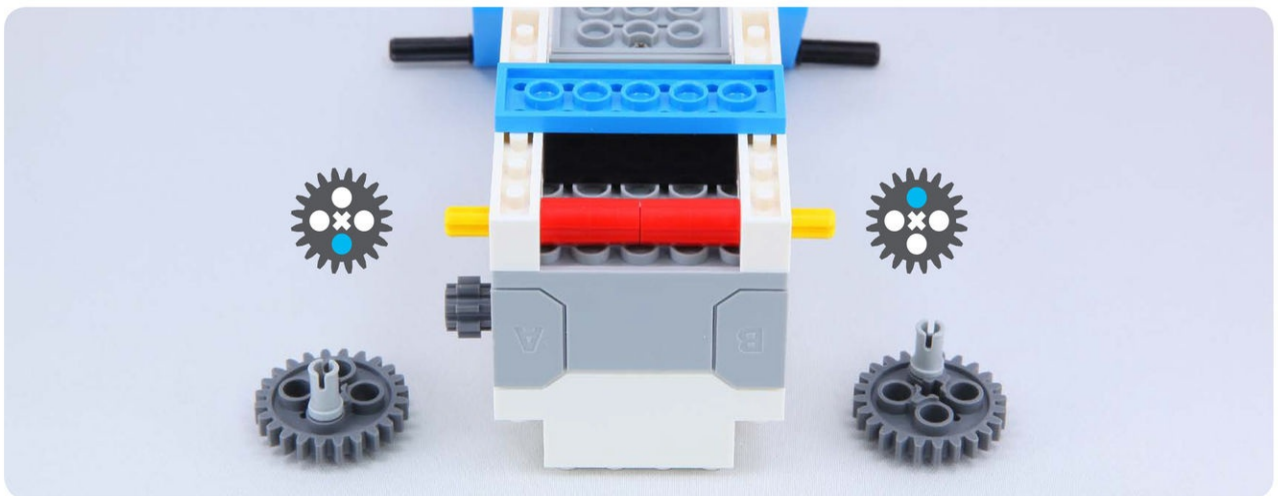
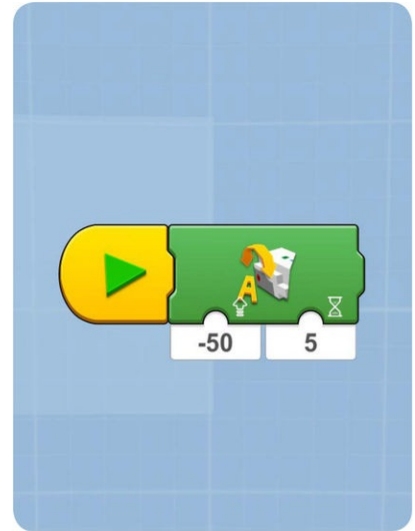
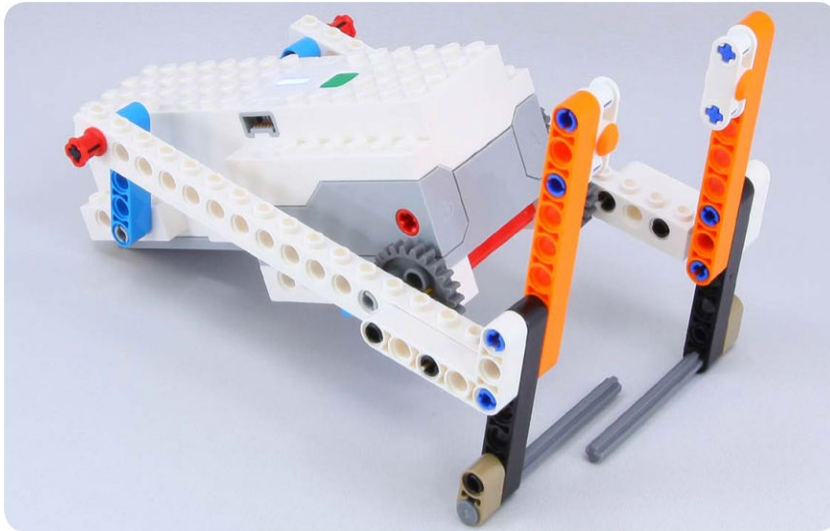
Orange 1x6 Technic beam with 6 holes, labeled x2.



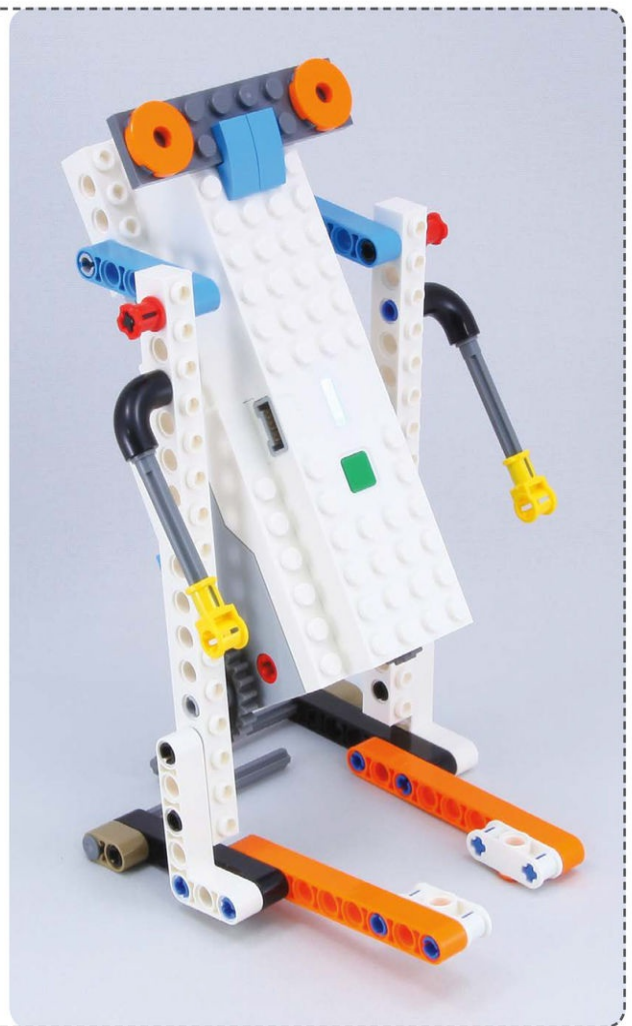
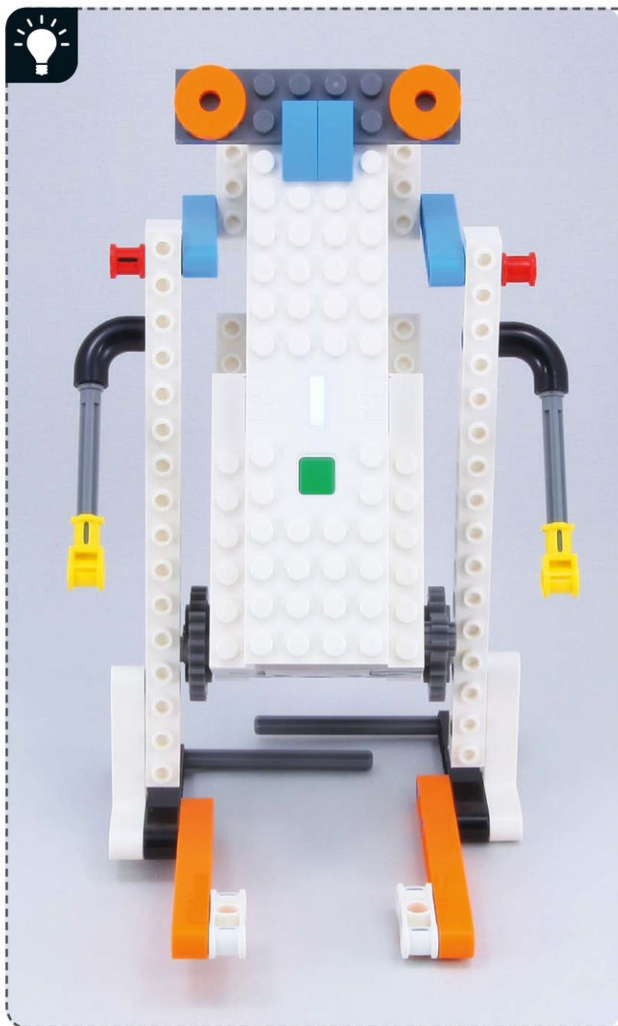
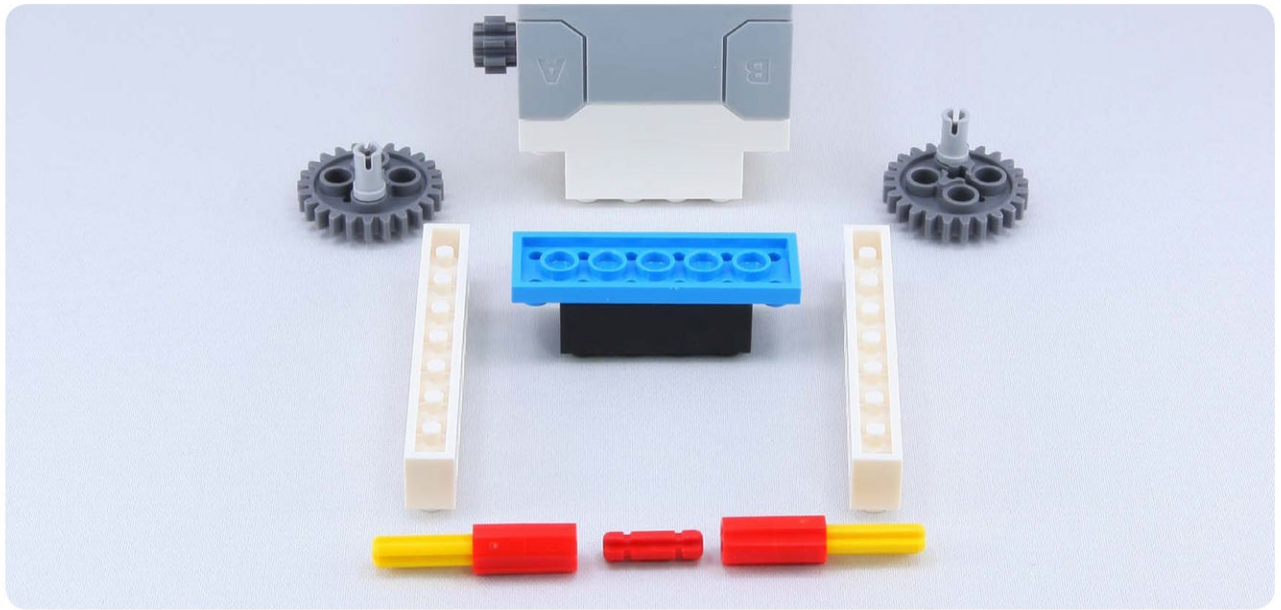








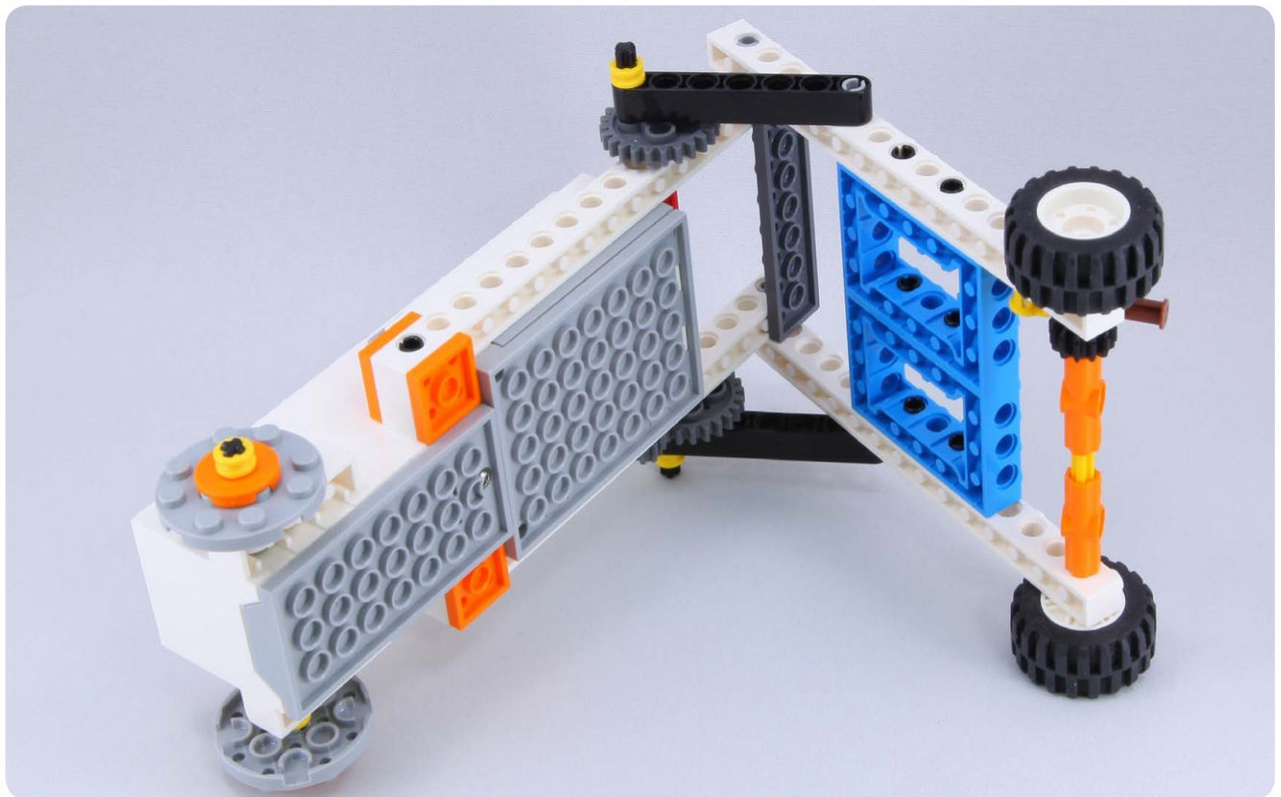






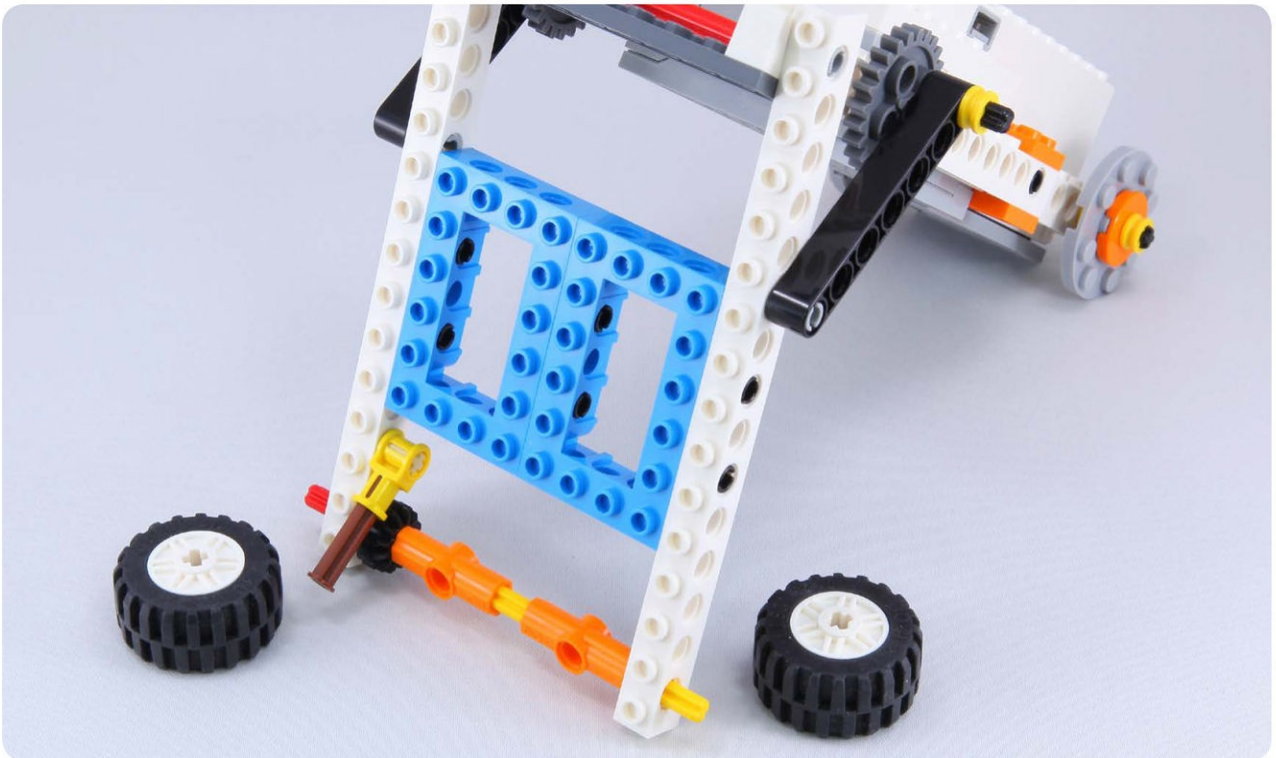






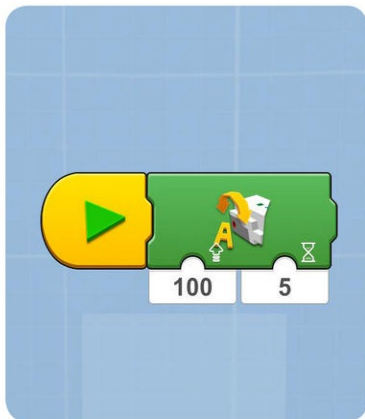
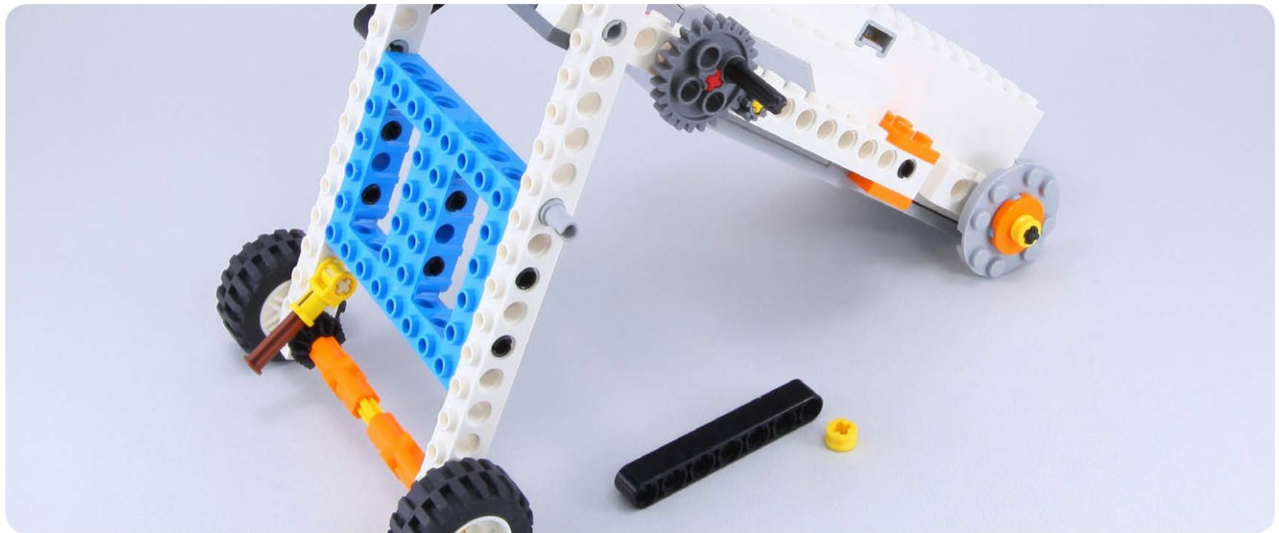
Moving like an inchworm **31**



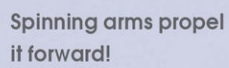


32 Moving like an inchworm

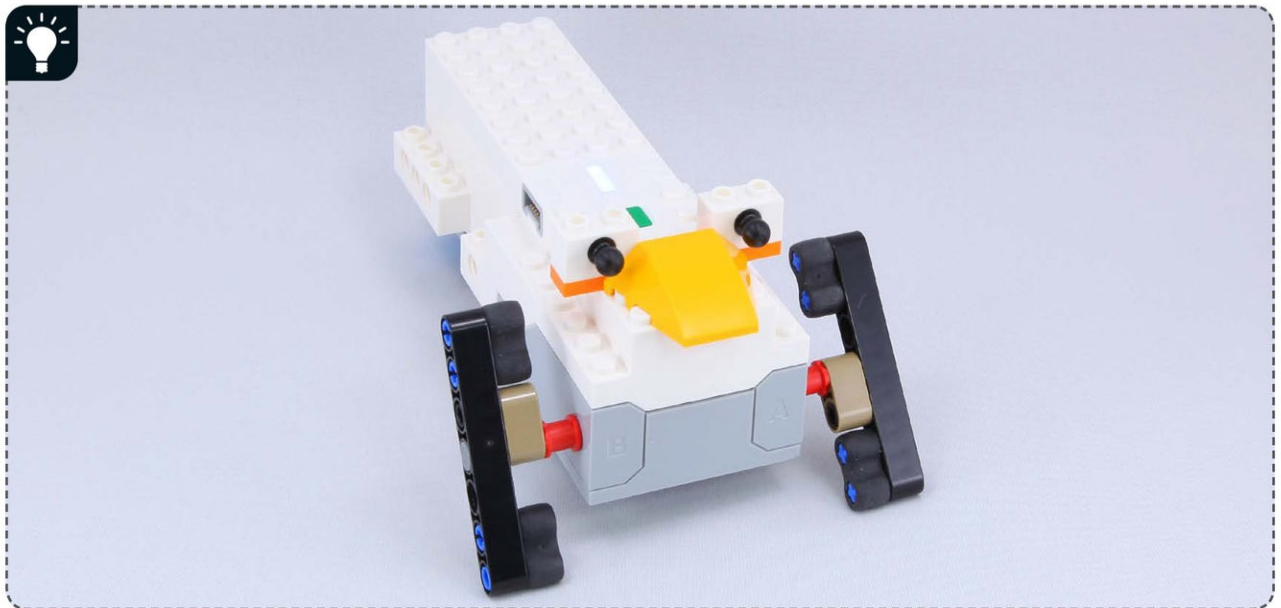
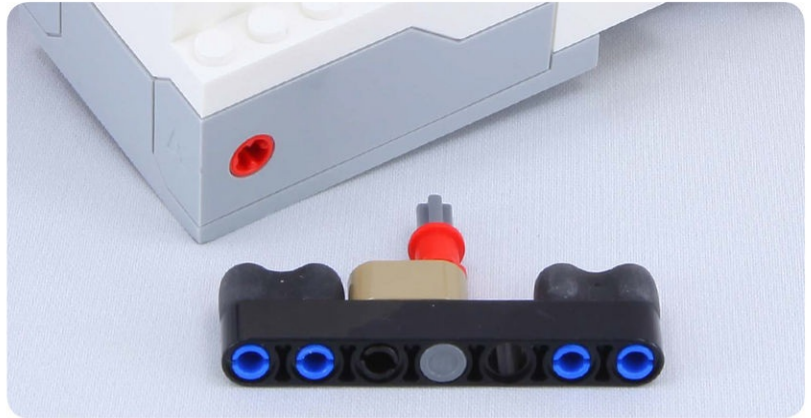
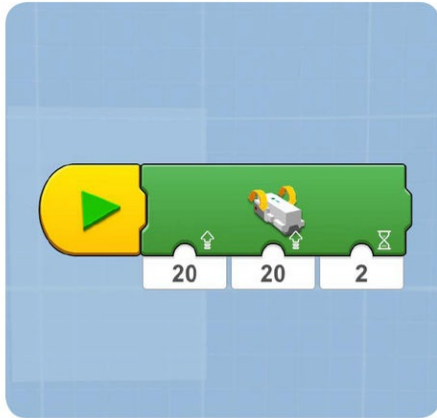




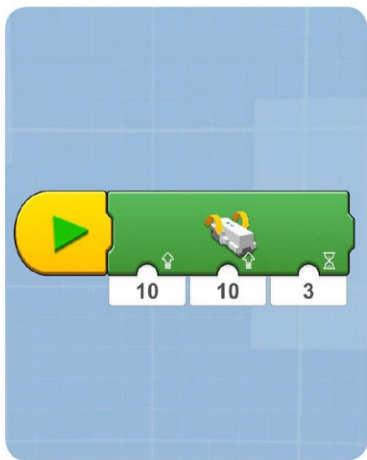


[illegible]

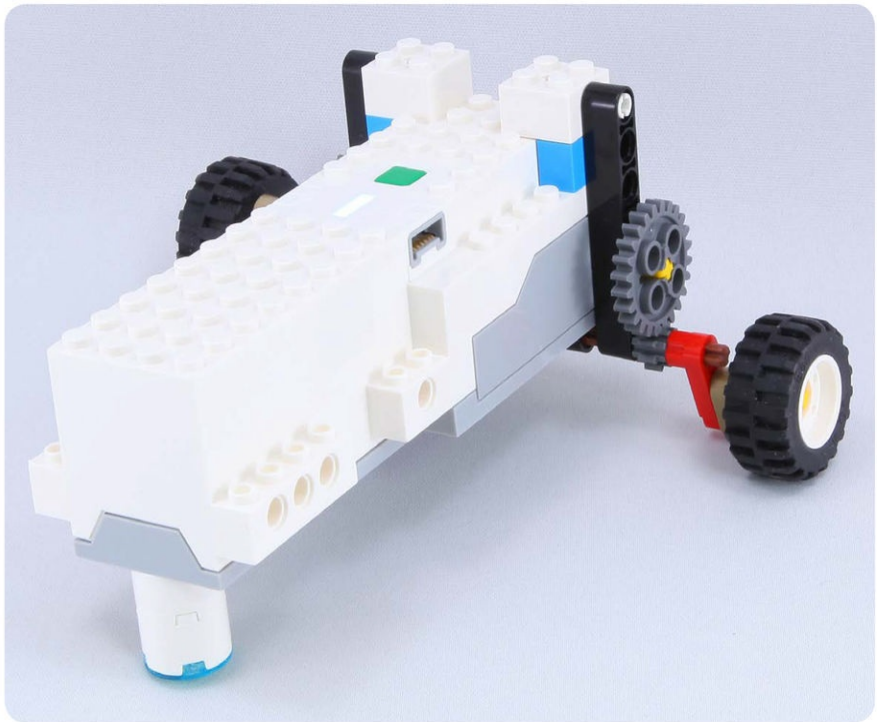




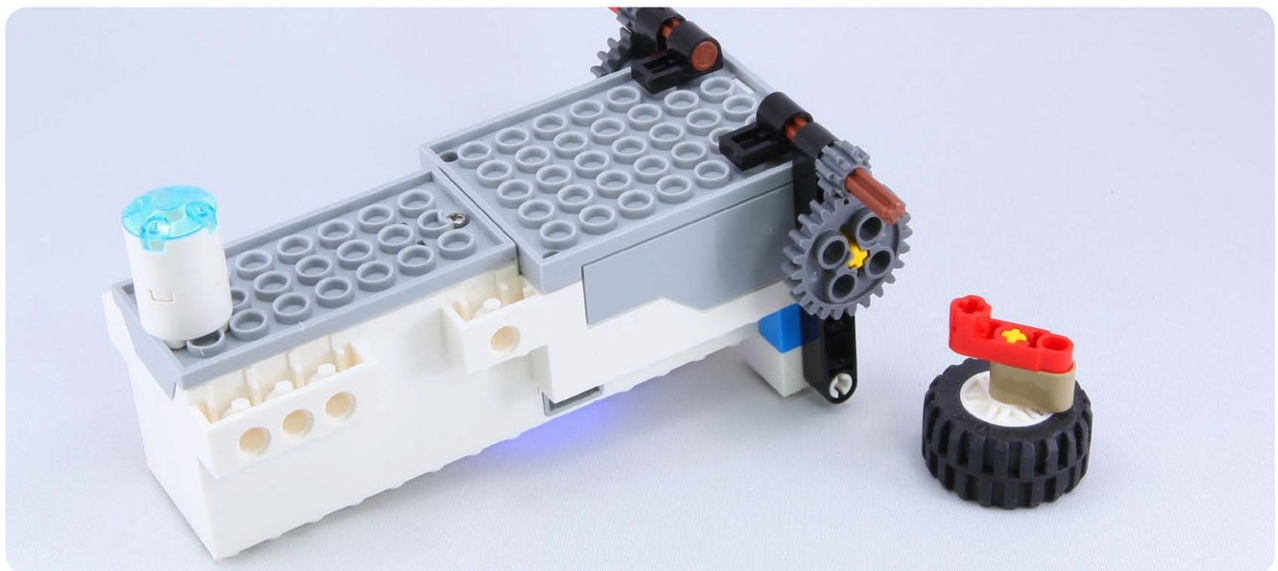
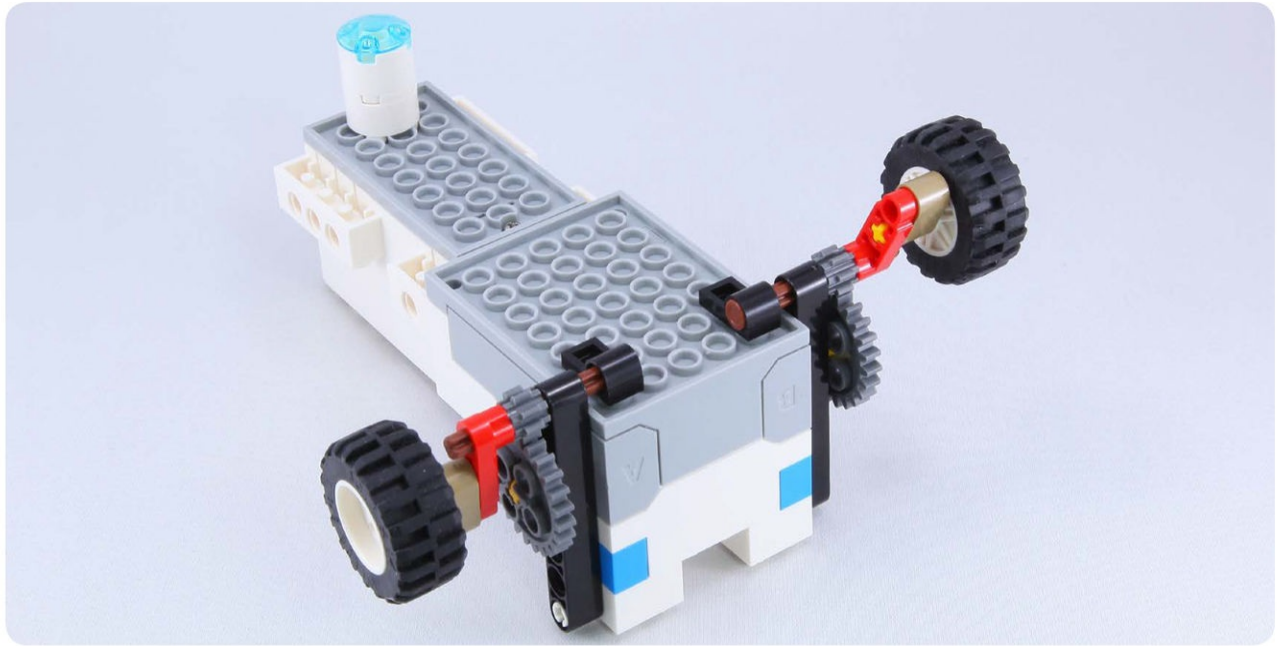




Wheels with an off-center axle create an unusual motion!

A LEGO Technic car is shown from a side-on perspective. The car has a white upper body and a grey lower body. It features two large black wheels with a tread pattern. The axles are off-center, and the wheels are connected to a central mechanism. A black arrow with a wavy line points upwards from the top of the car, indicating an unusual motion. The car is built using various LEGO Technic parts, including beams, pins, and gears.





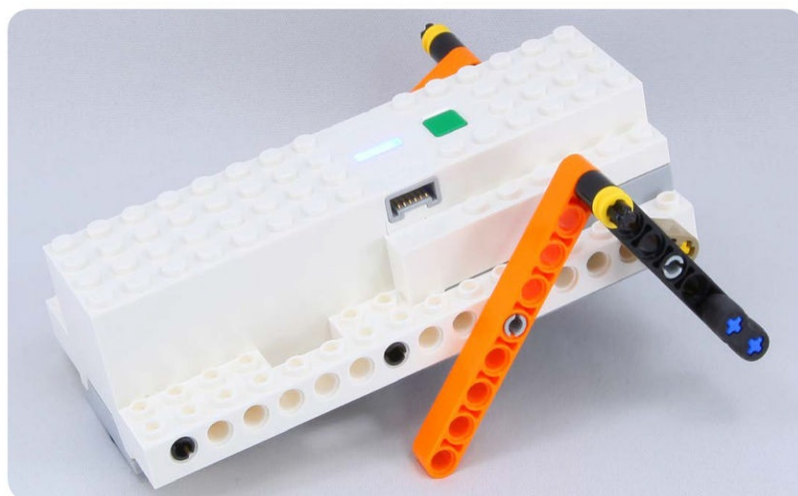
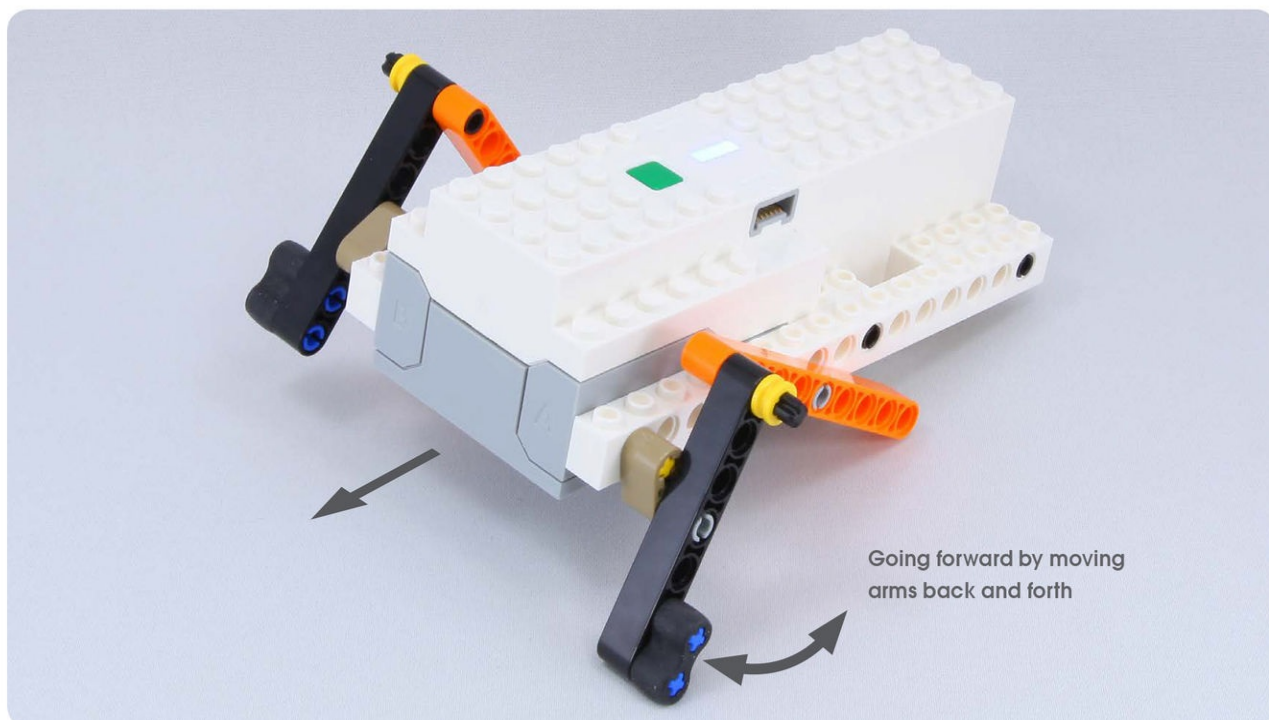
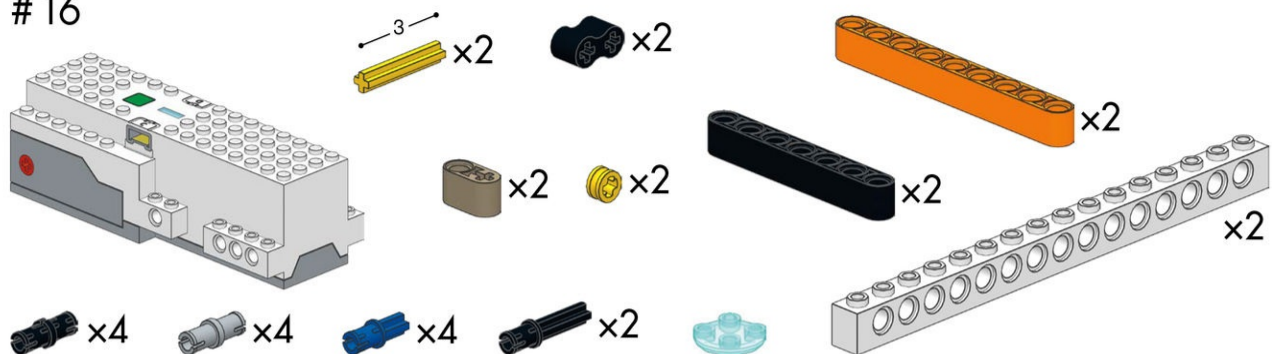
**Joystick Widget**  
You can control your car with this joystick.

The image shows a Scratch-style programming interface for a joystick-controlled car. It includes a joystick widget on the left and a sequence of code blocks on the right: a green flag icon, a motor block, a 'Wait' block set to 0.1 seconds, and a 'Repeat' block. A lightbulb icon is in the top left corner of the interface.

This joystick program includes a **Wait** block to introduce a slight delay in the program. Without the delay, the program could get confused since the device would send instructions to your robot continuously—too fast for it to respond!

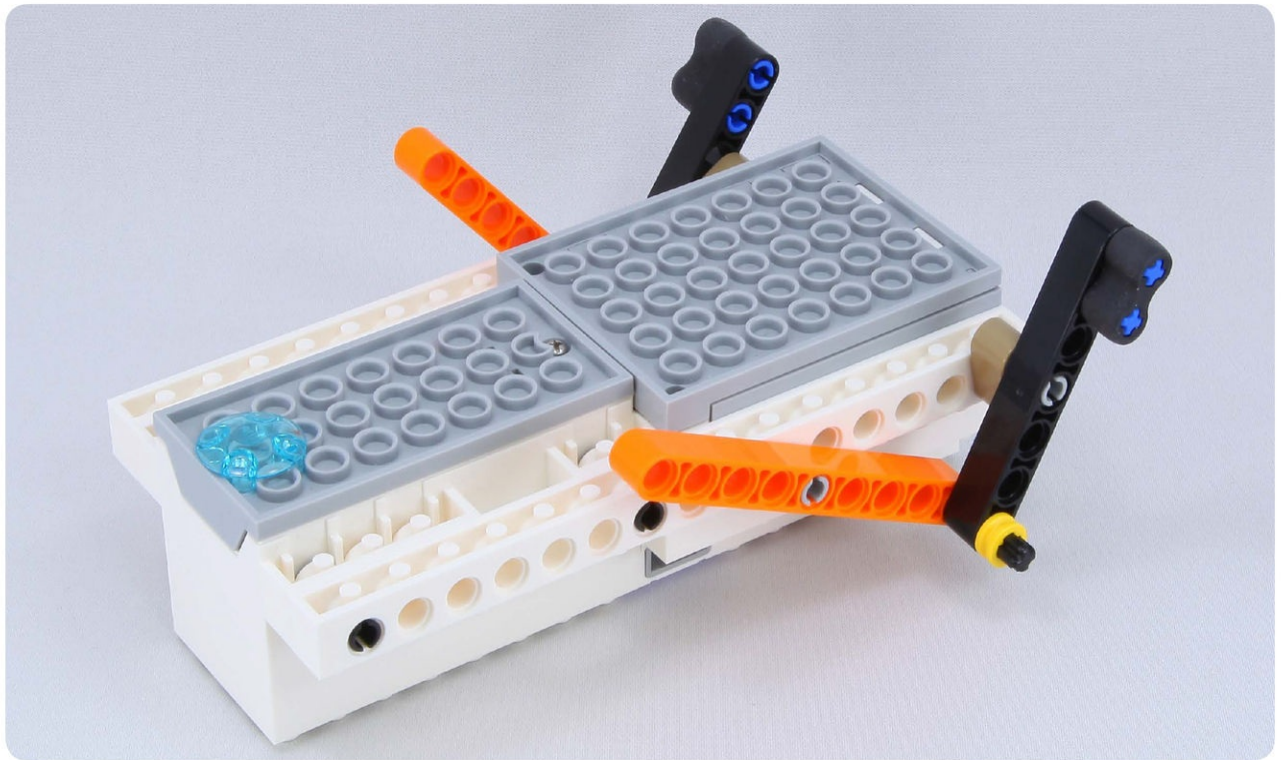


# 16



38 Other ways to move







  $\times 4$ 

x2



x2

A red pushpin with a circular head featuring a stylized 'P' logo.

4 x2


4 x2



Diagram illustrating a shaft with a diameter of 12 units, a pin, and a gear.

 x2 x2

x2



$\times 2$

 **x2**



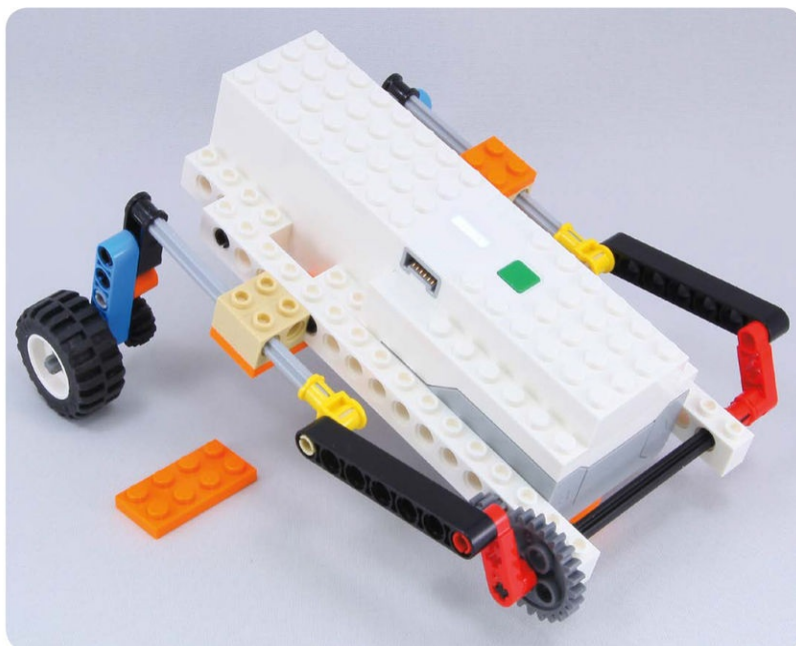
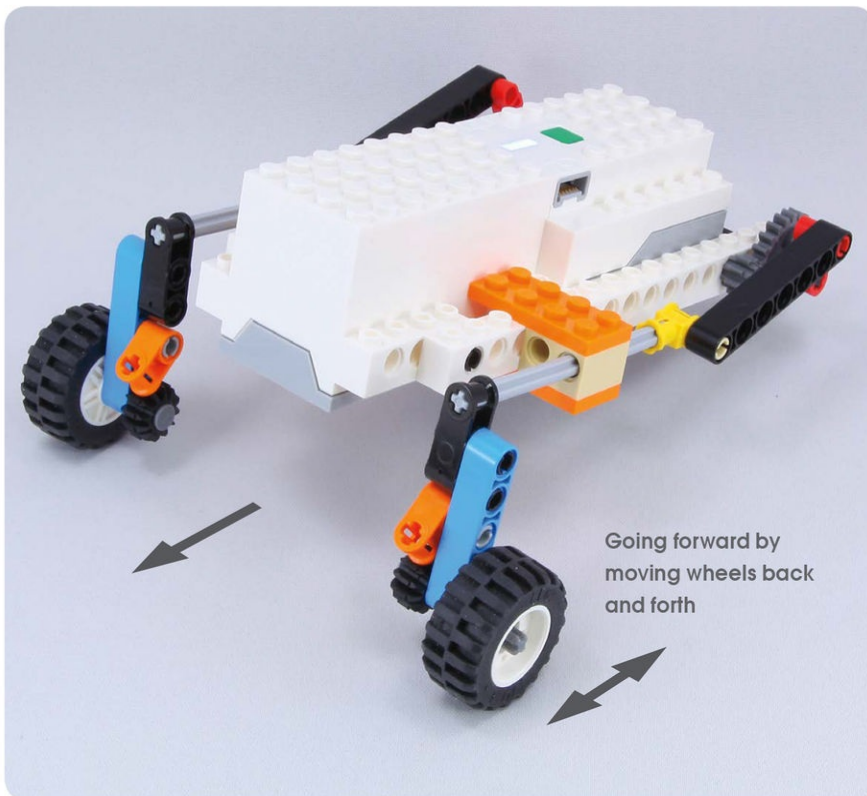
x2



×2

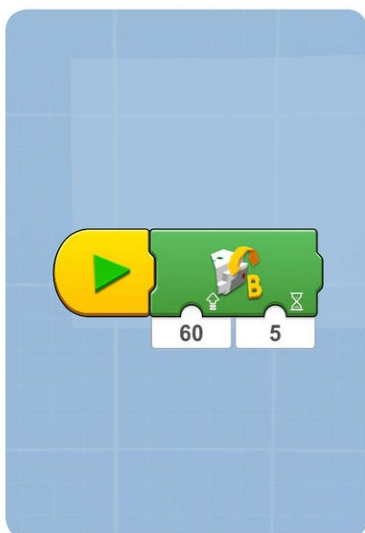


x2



53





Other ways to move 41



# 10




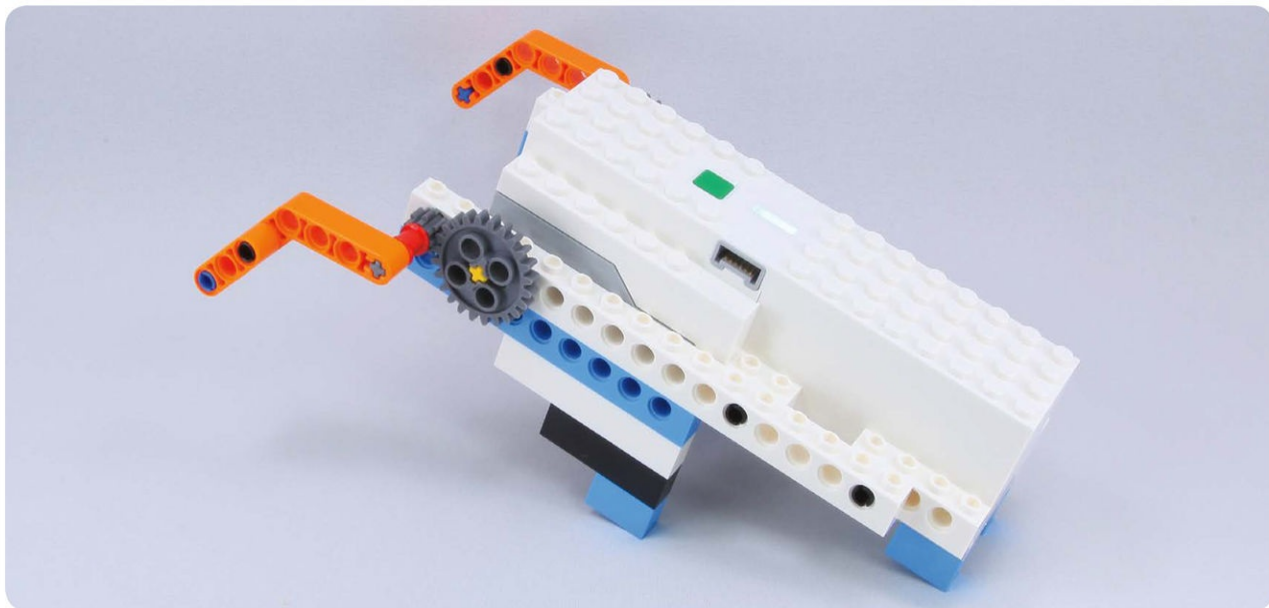


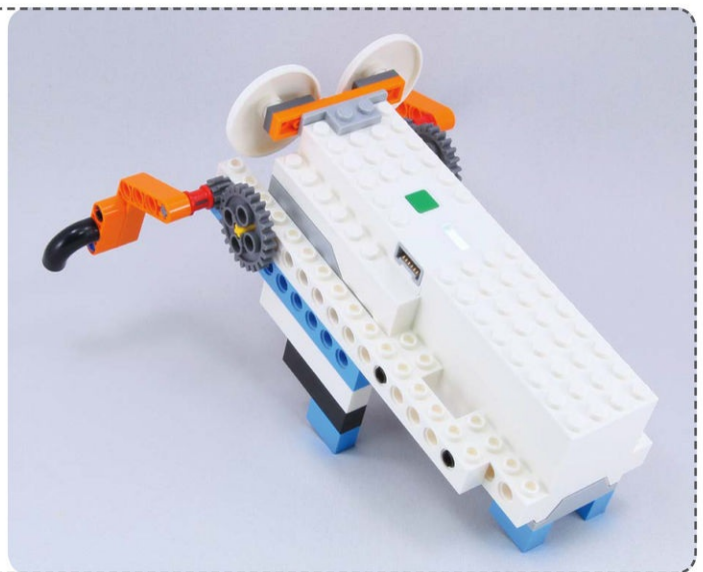
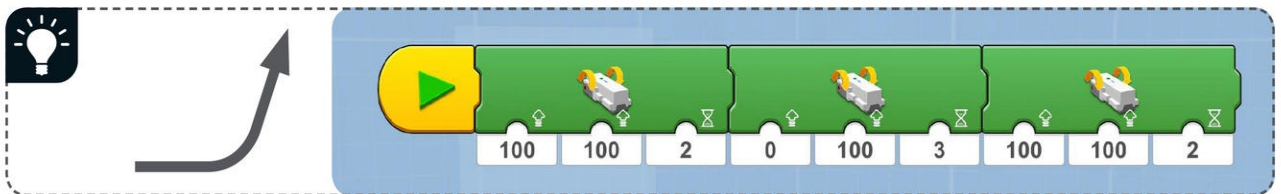
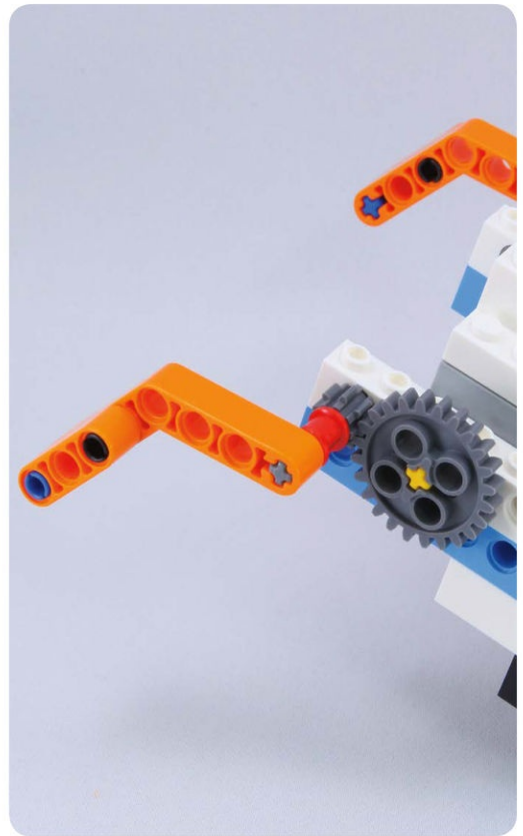
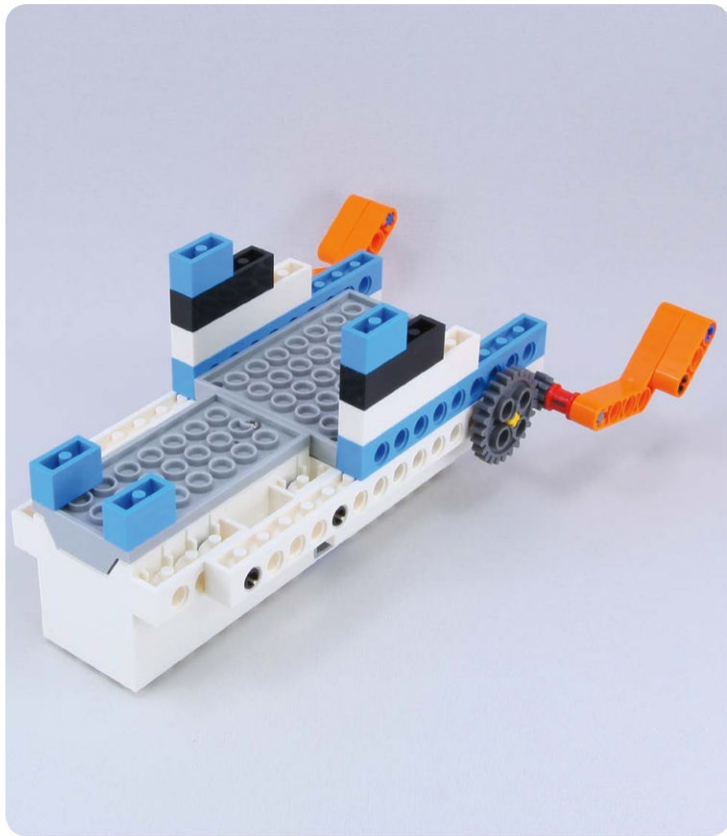
Diagram showing the components for the second row: 2 blue 1x5 Technic bricks, 2 grey 1x10 Technic bricks, and 4 blue 1x2 Technic bricks.



**x2**

 x2





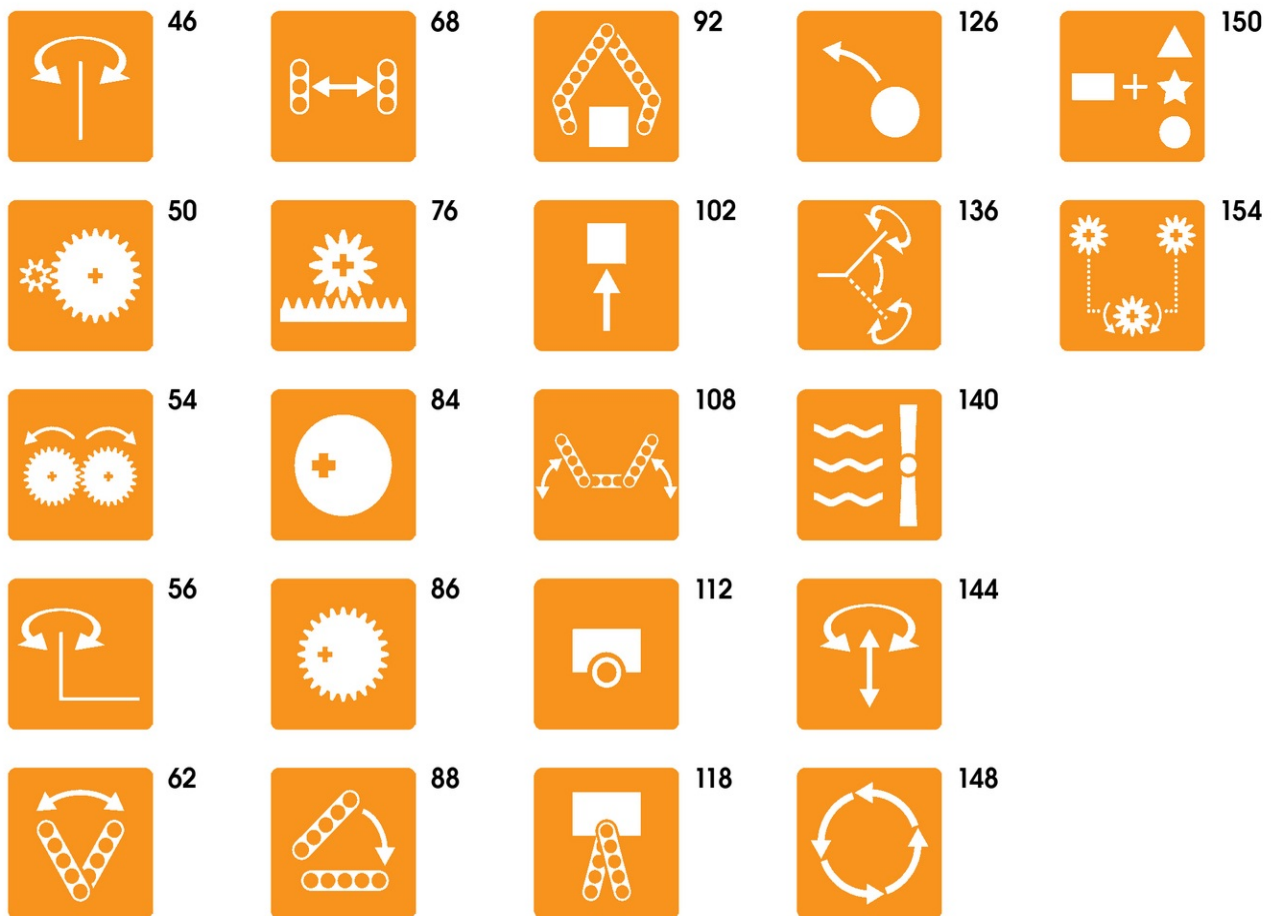




## PART 2



# Using the Interactive Motor

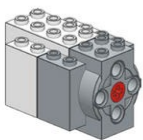
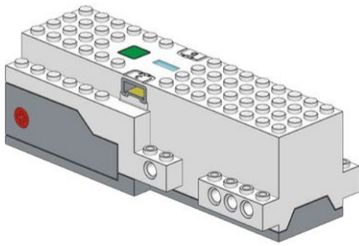






# Spinning things

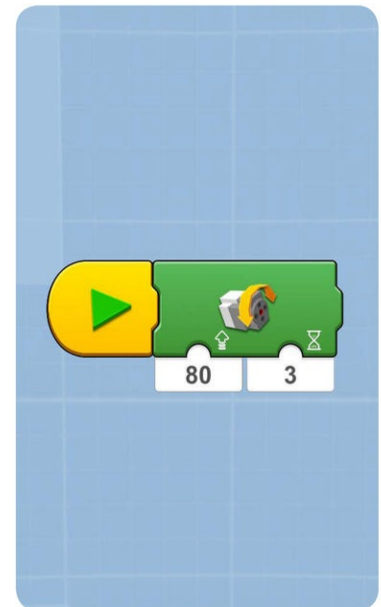
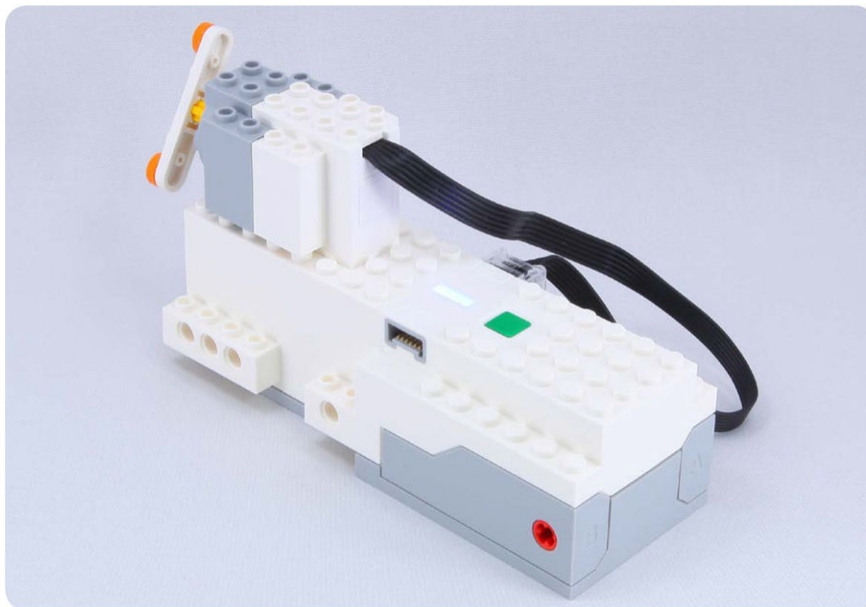
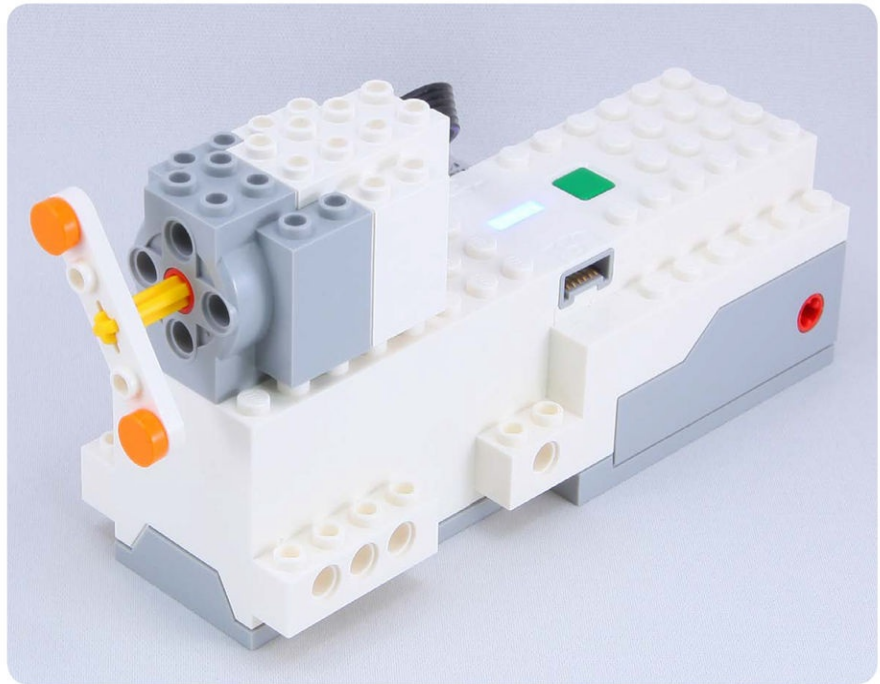
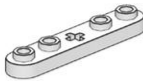
# 19



Interactive  
Motor

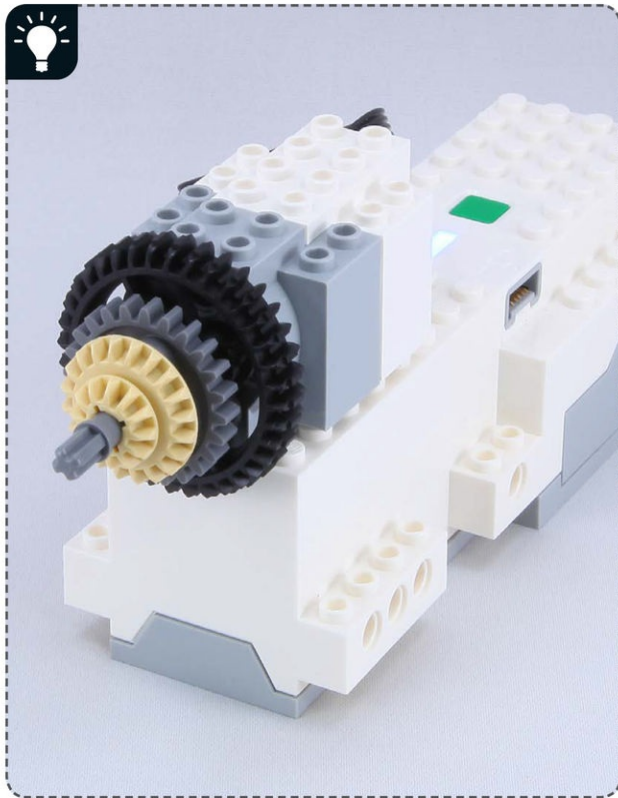


3  
x2



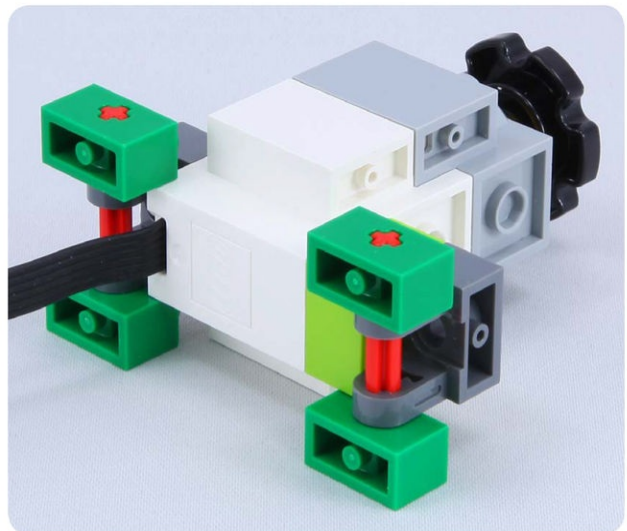
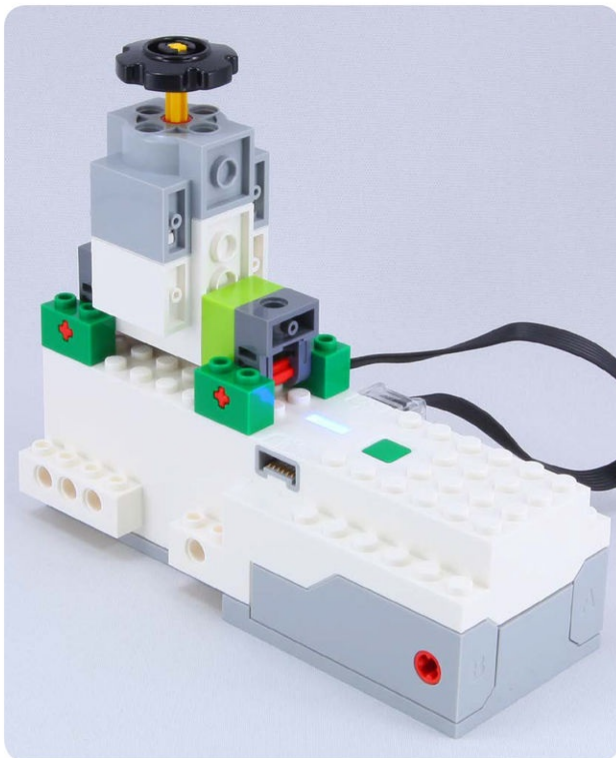
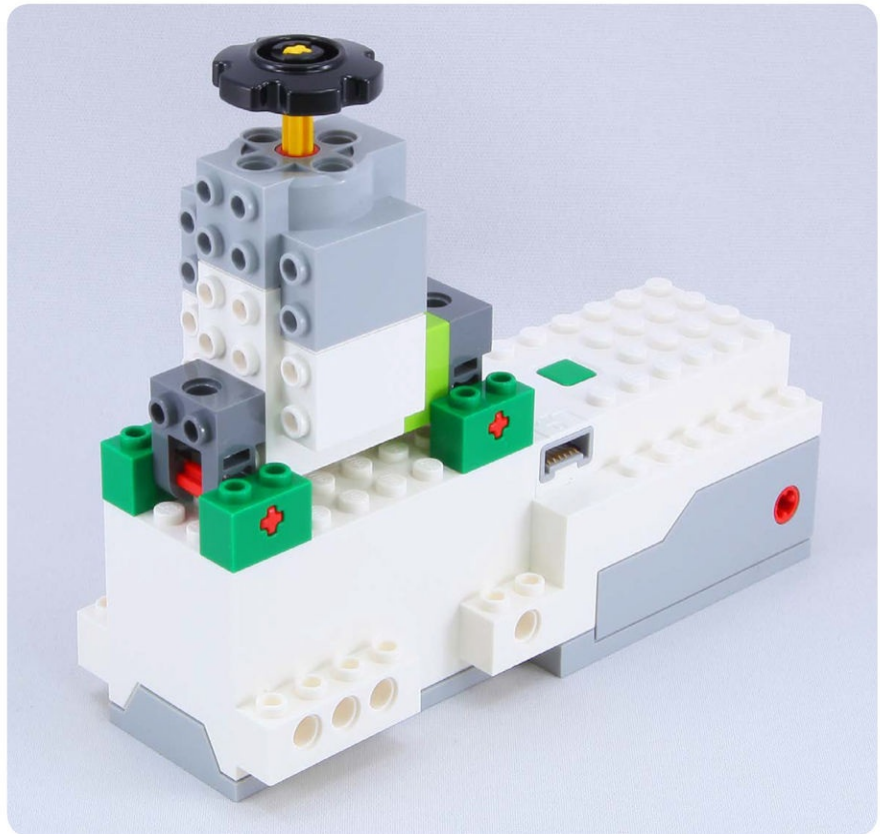
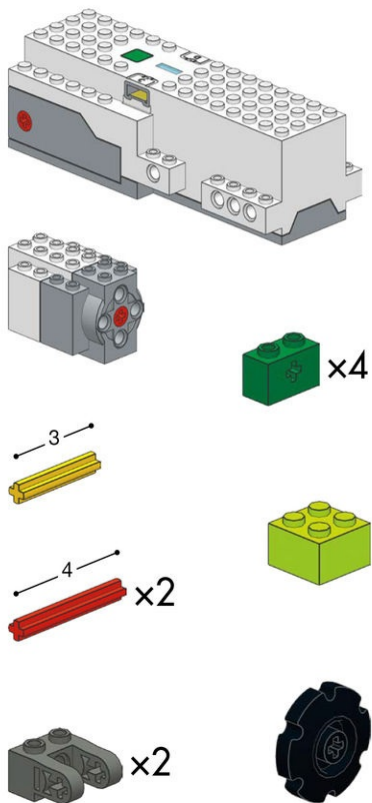
46 Spinning things





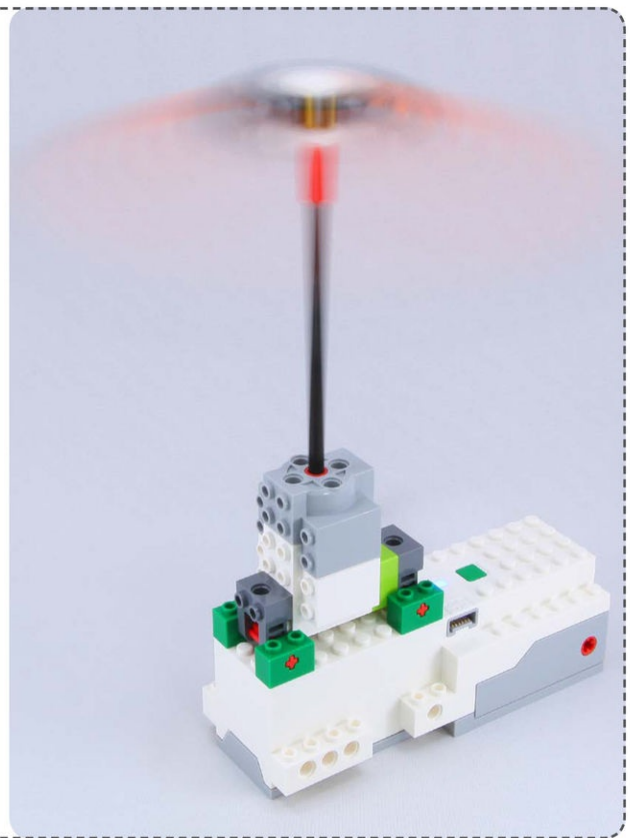
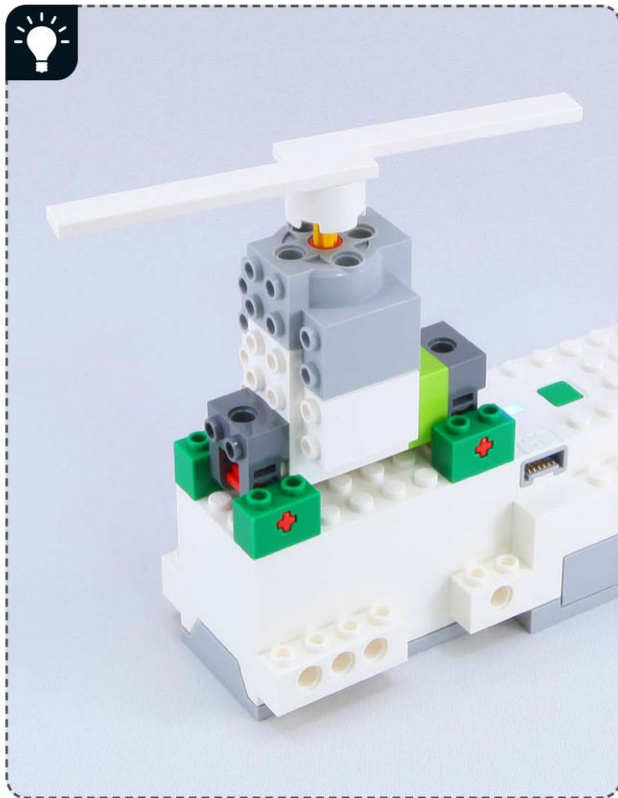


#20



48 Spinning things



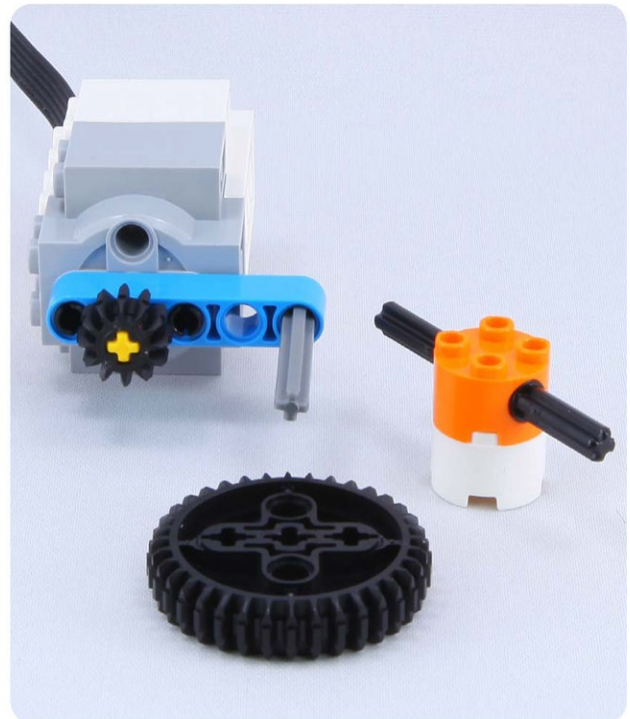
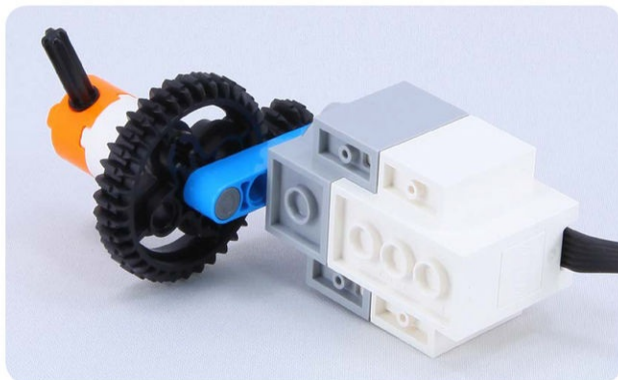
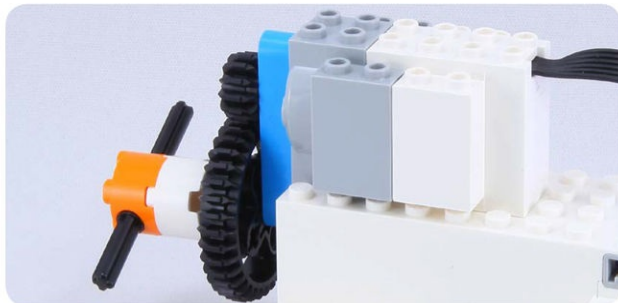
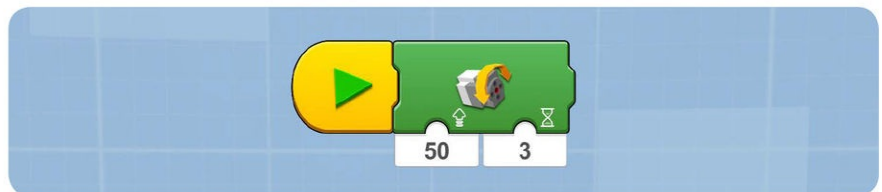
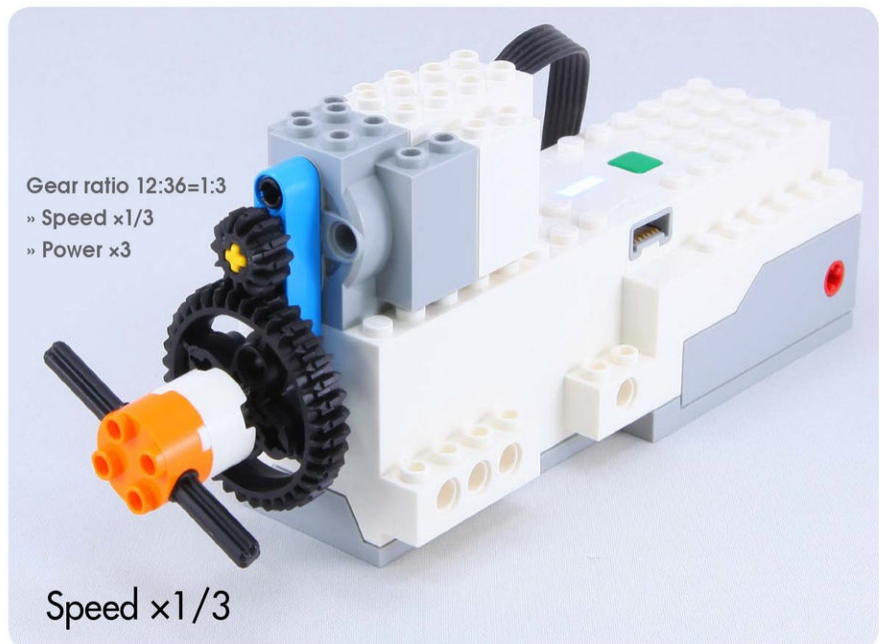
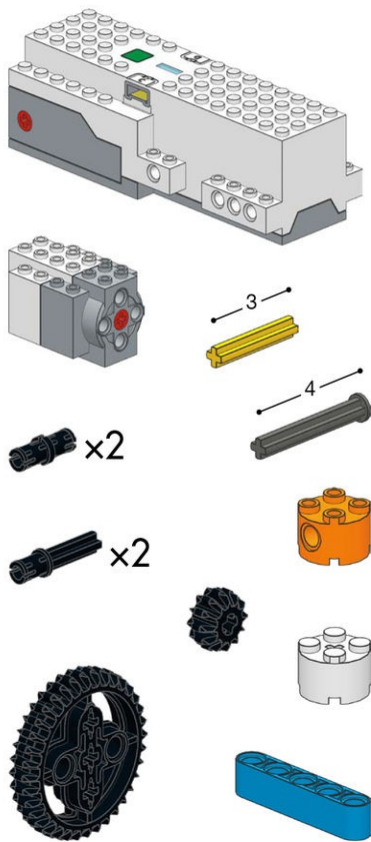






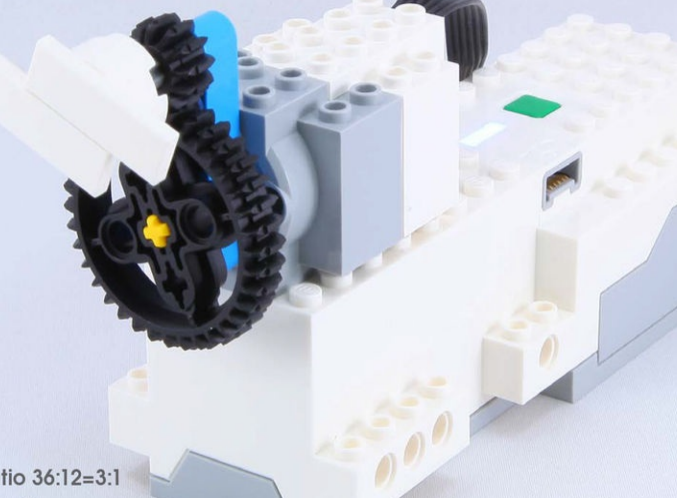


# 22



Changing speed with gears 51



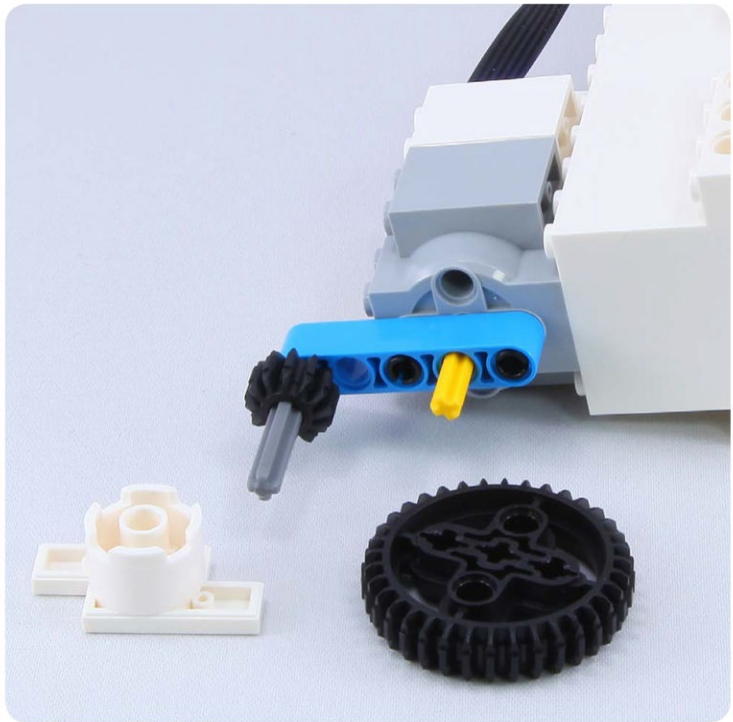
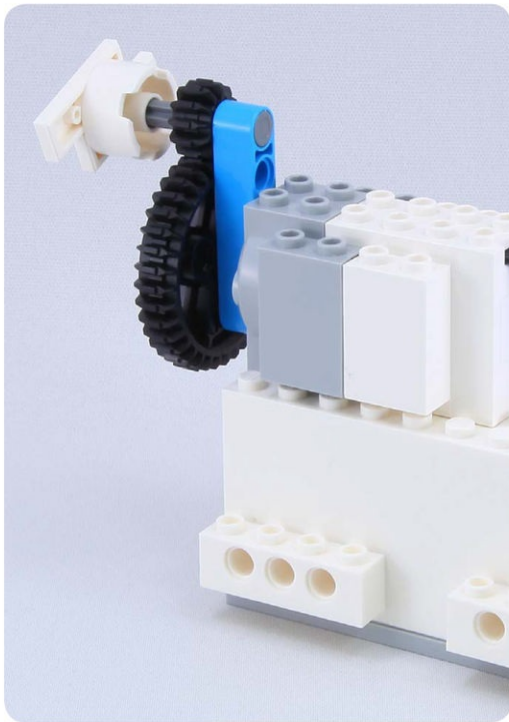
[illegible]

A detailed LEGO Technic assembly of a motor and gear train. The assembly is built using white and grey Technic bricks. A black rubber band is stretched around a small black gear on the motor's output shaft and a larger black gear on a secondary shaft. This secondary shaft is connected to a third, even larger black gear. A blue Technic beam is visible behind the gears. A yellow pin is used to secure the gear train. The assembly is mounted on a grey base. A red LED light is visible on the side of the grey base. The text "Speed x3" is displayed in the top left corner.

Speed x3

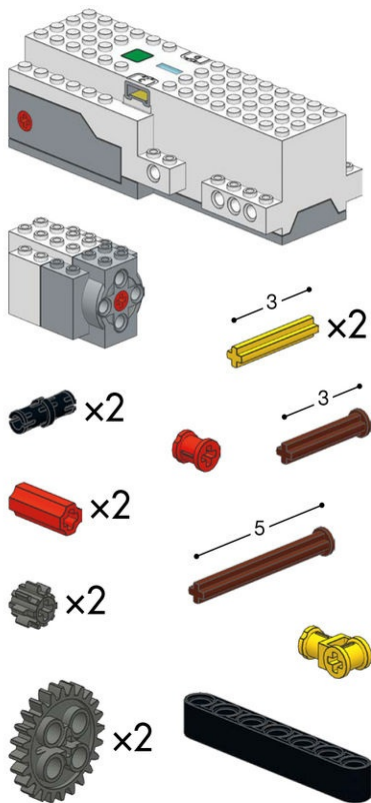
Gear ratio  $36:12=3:1$

- » Speed x3
- » Power  $\times 1/3$

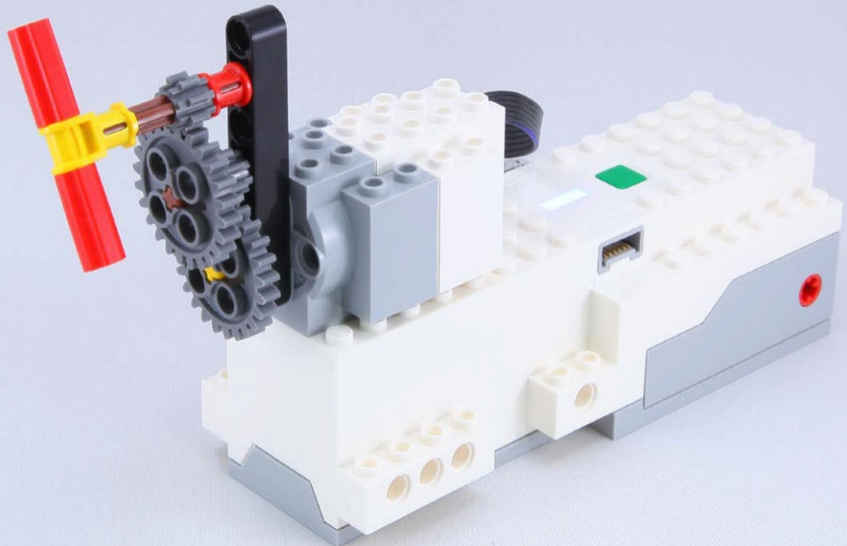




# 24

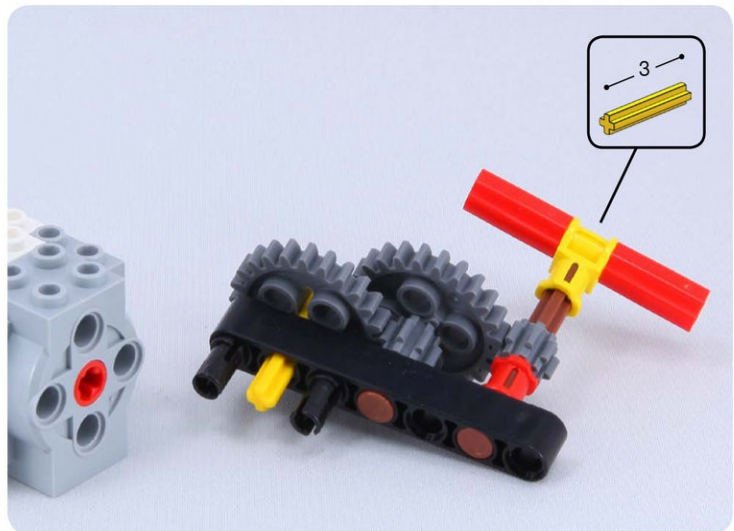


Speed x9



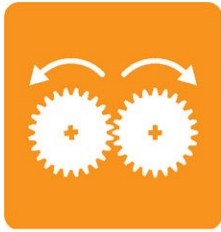
Gear ratio 24:8 = 3:1 = 9:3  
24:8 = 3:1 = 3:1

» Speed x9  
» Power x1/9



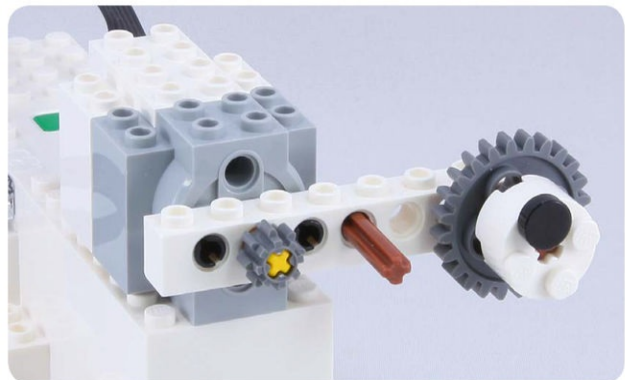
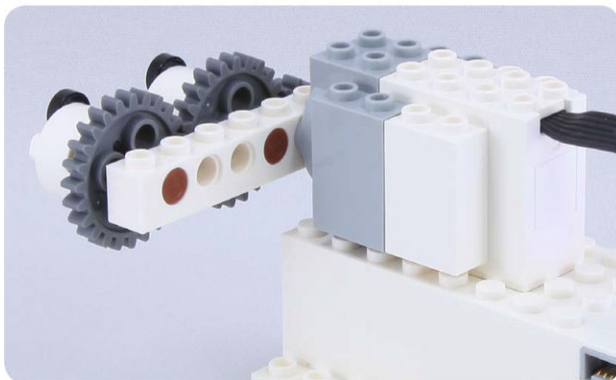
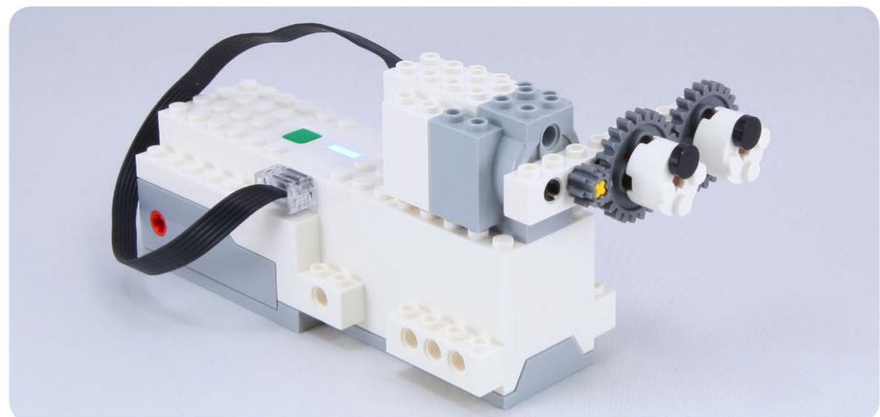
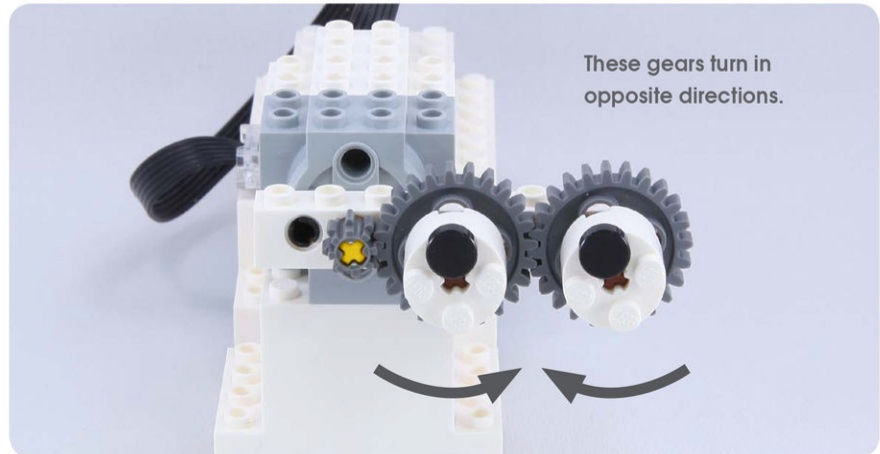
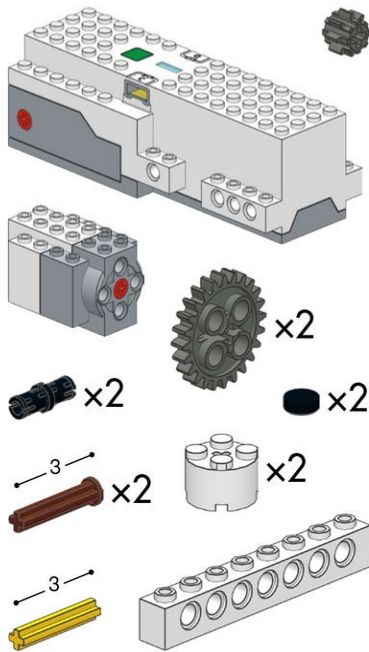
Changing speed with gears 53






# Changing the direction of rotation

#25




54 Changing the direction of rotation



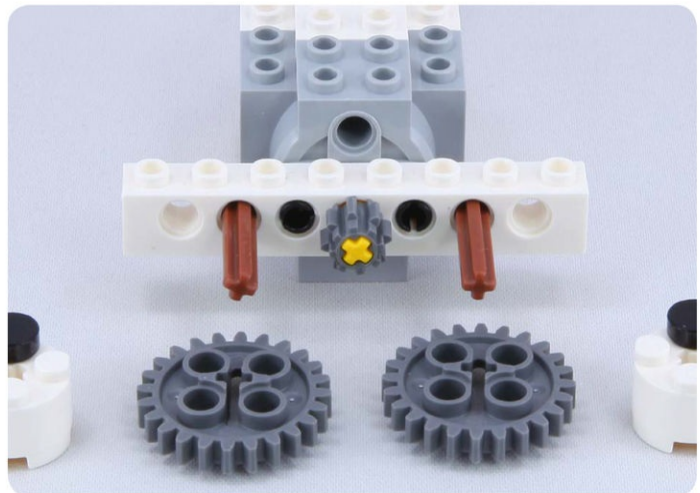
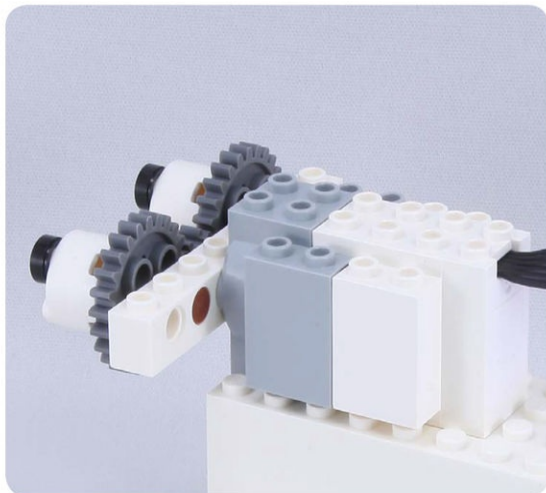
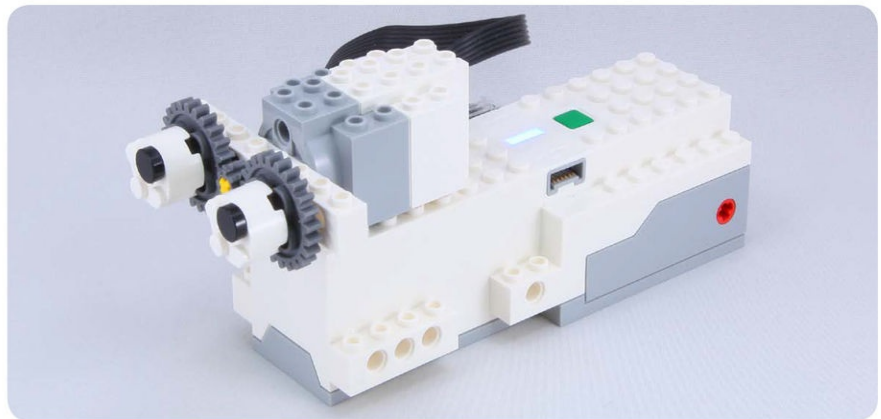
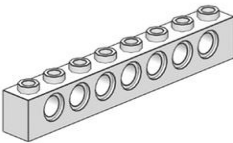


$\times 2$

● x2



$\times 2$



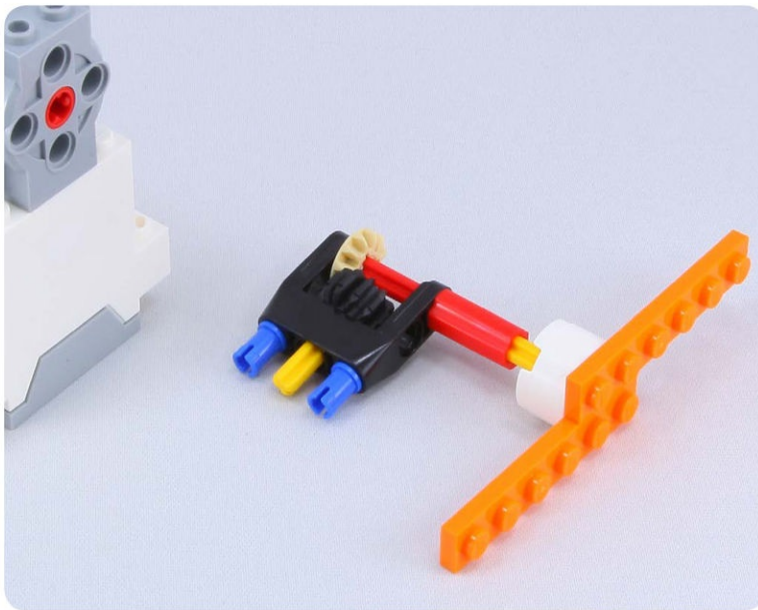
68



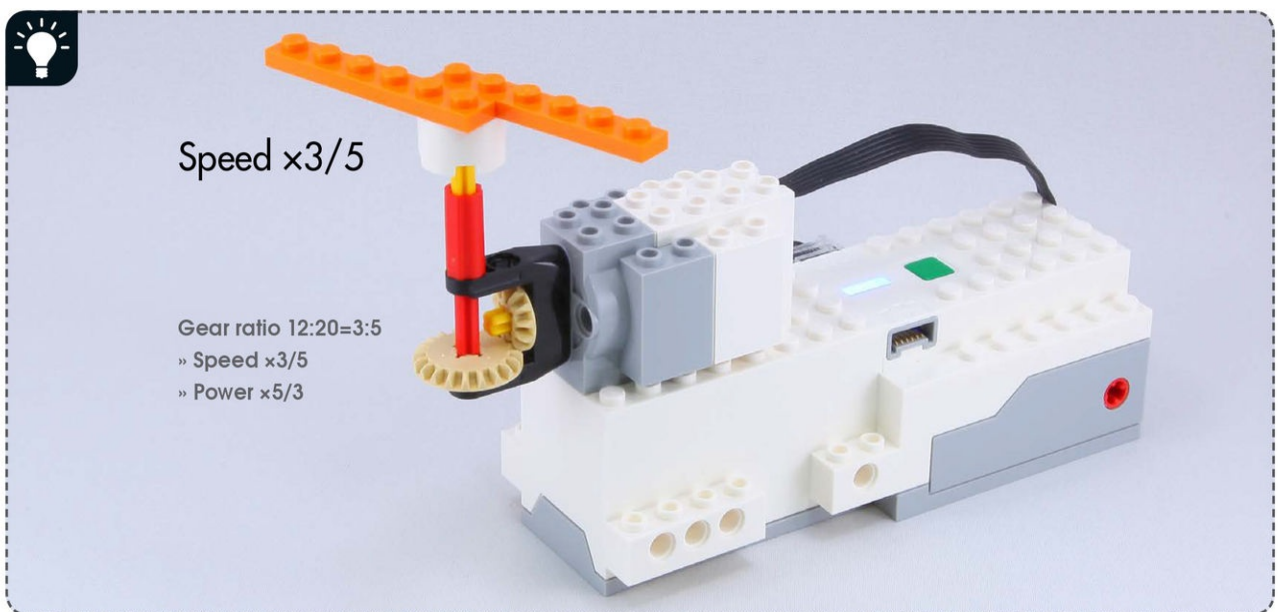
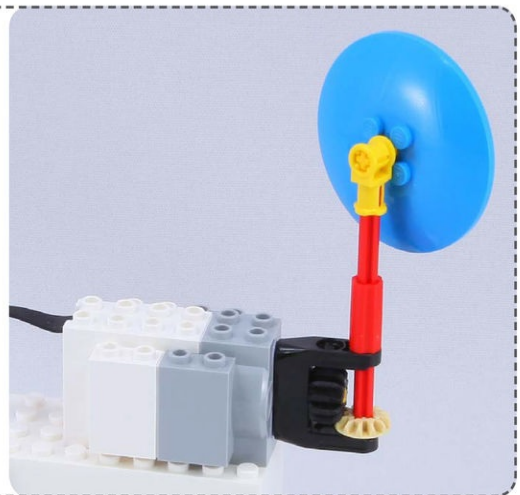
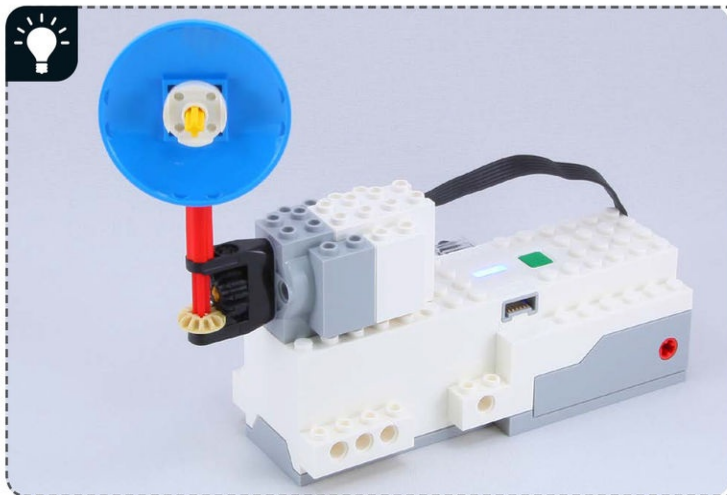
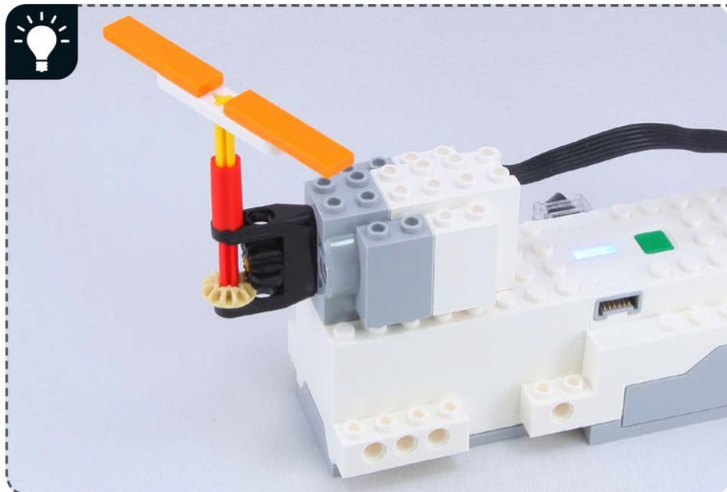


LEGO parts list for step 10:

- 1x Large grey assembly (with red dot)
- 1x Grey motor
- 1x Red axle (4)
- 2x Yellow axles (3)
- 2x Blue pins
- 2x Orange axles
- 1x Red pin
- 1x Gold gear
- 1x Black gear
- 1x White gear
- 1x Black U-shaped piece

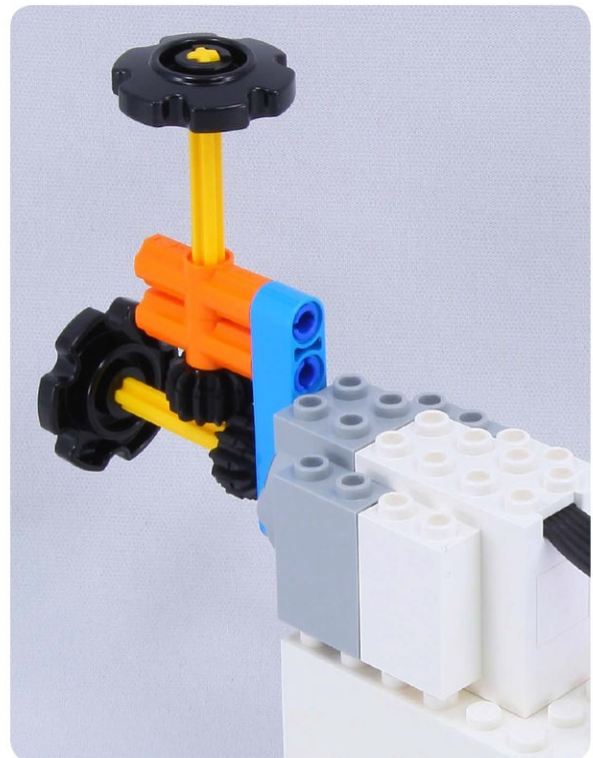
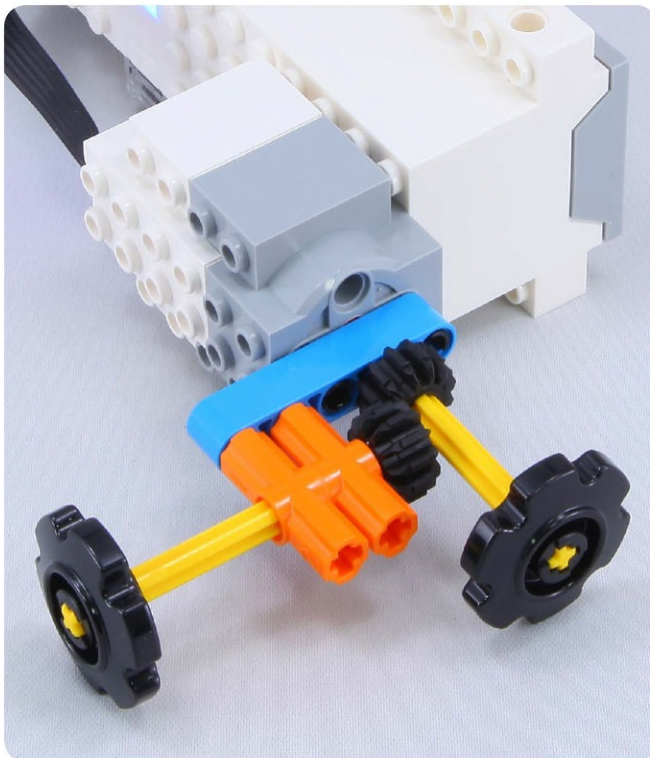
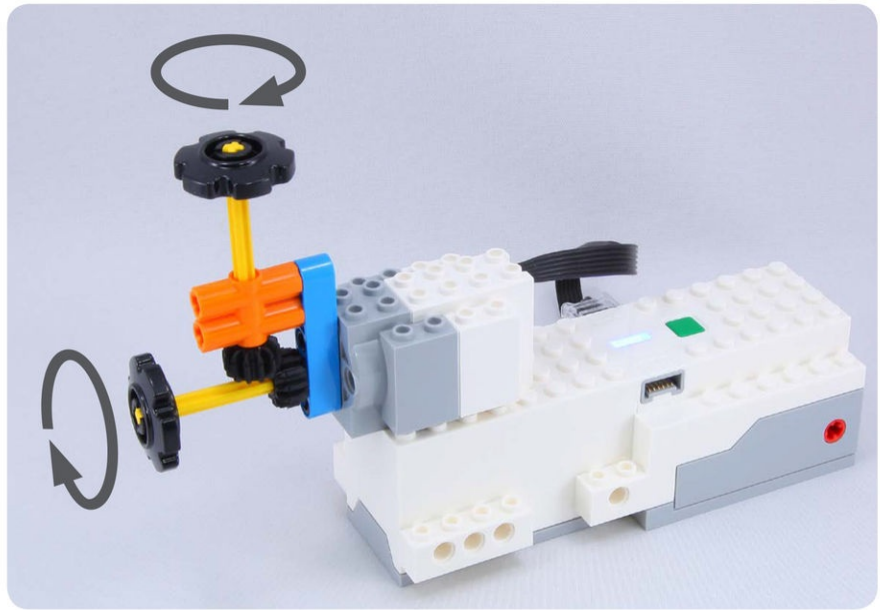
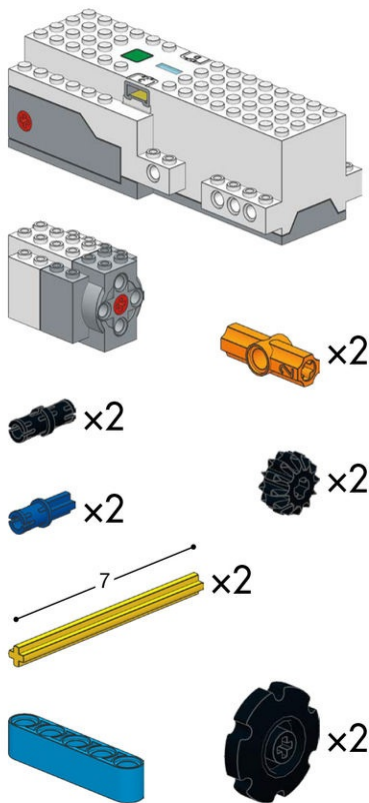








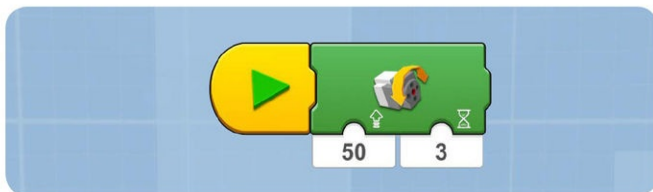
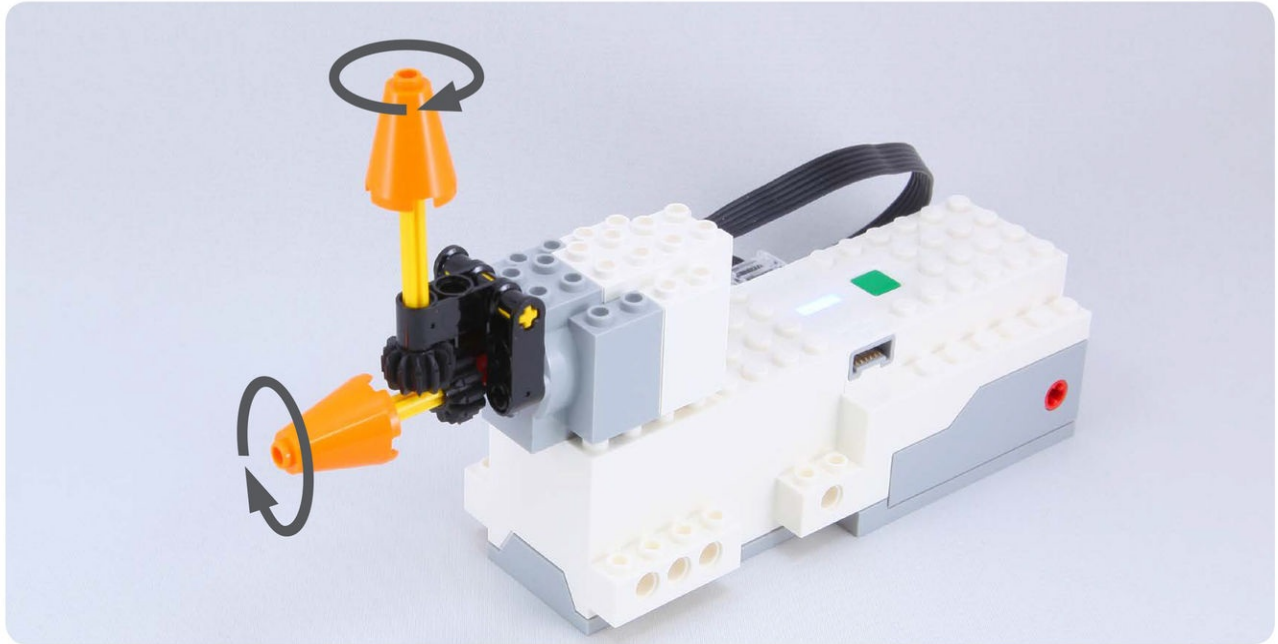
# 28



58 Changing the orientation of rotation



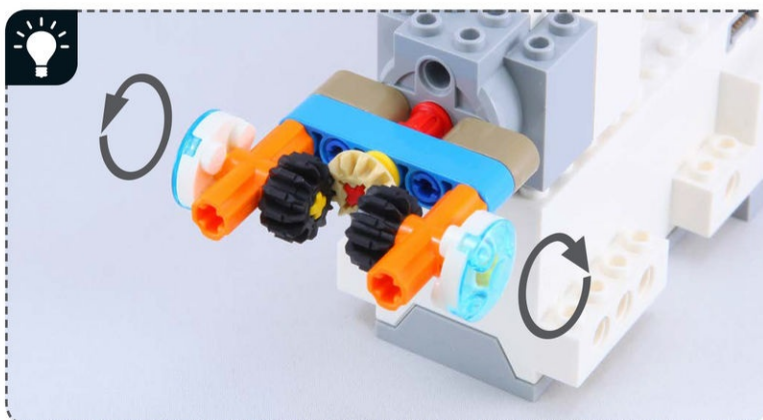
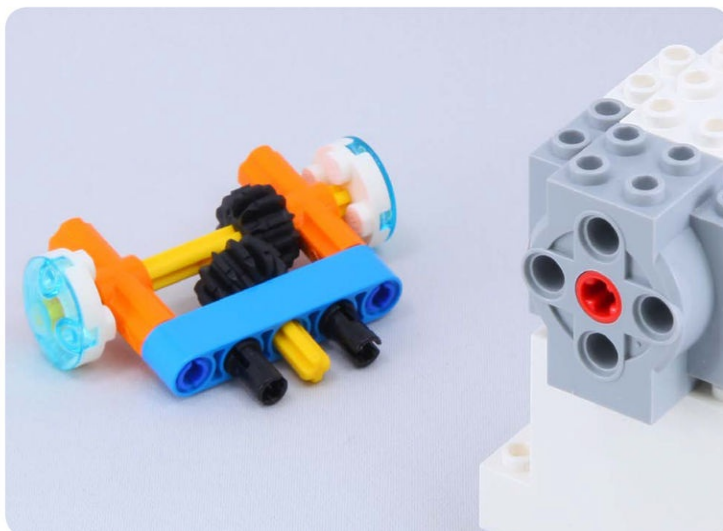
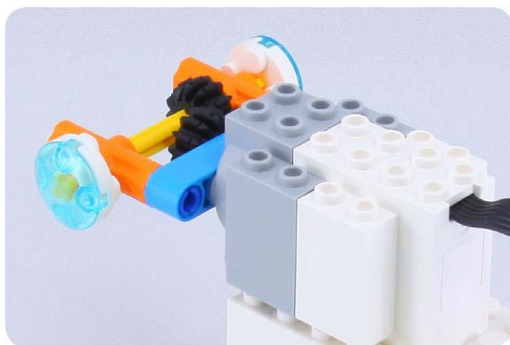
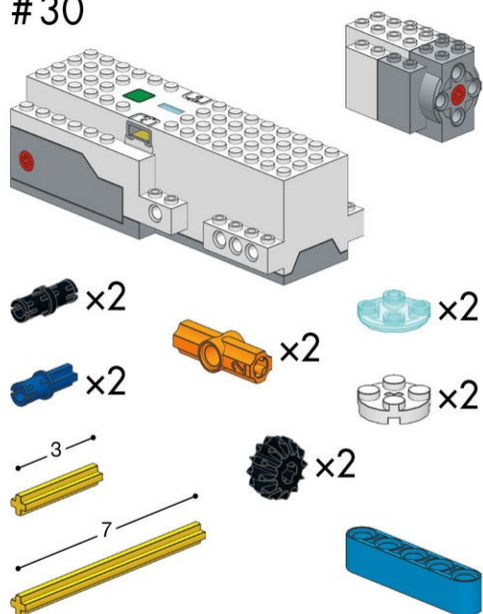
#29



Changing the orientation of rotation **59**



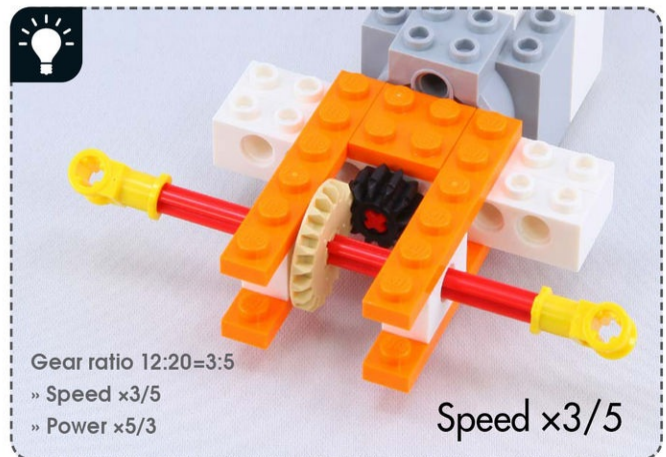
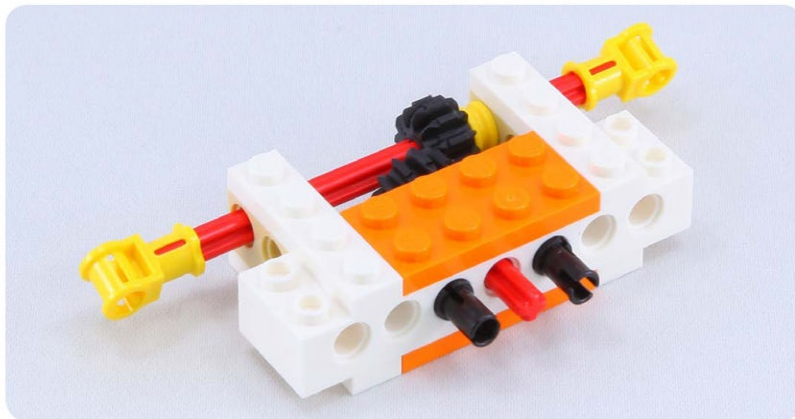
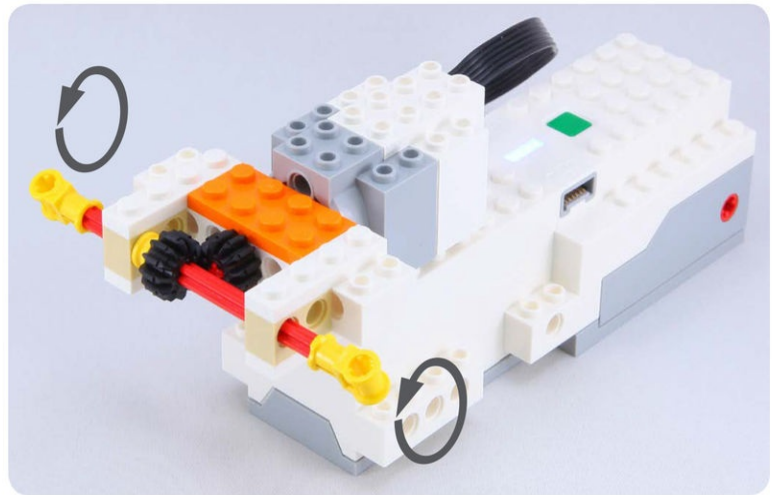
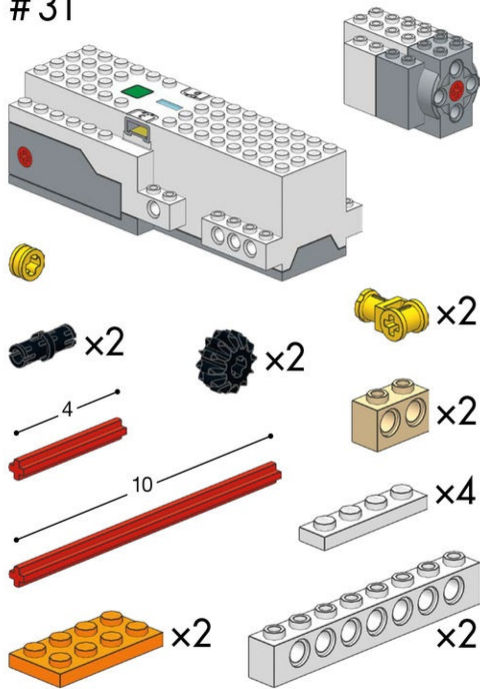
#30



60 Changing the orientation of rotation

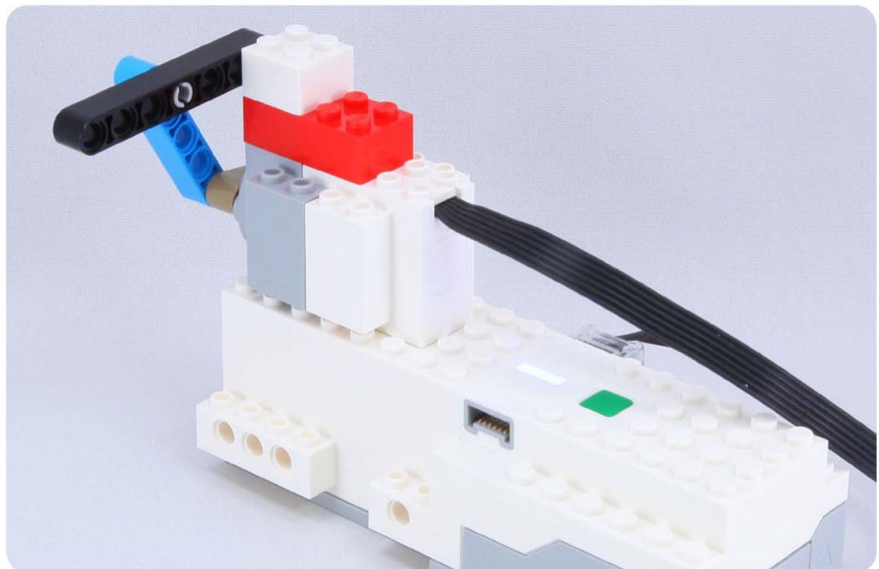


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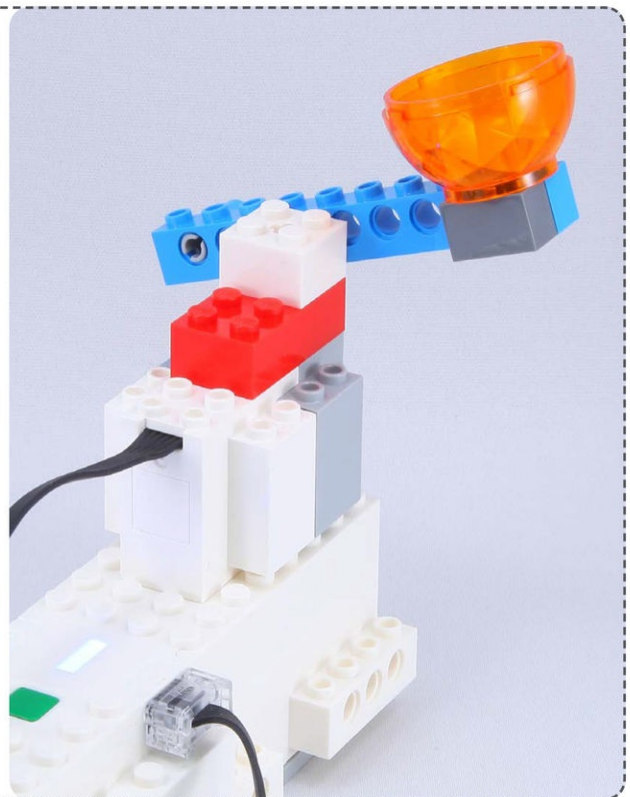
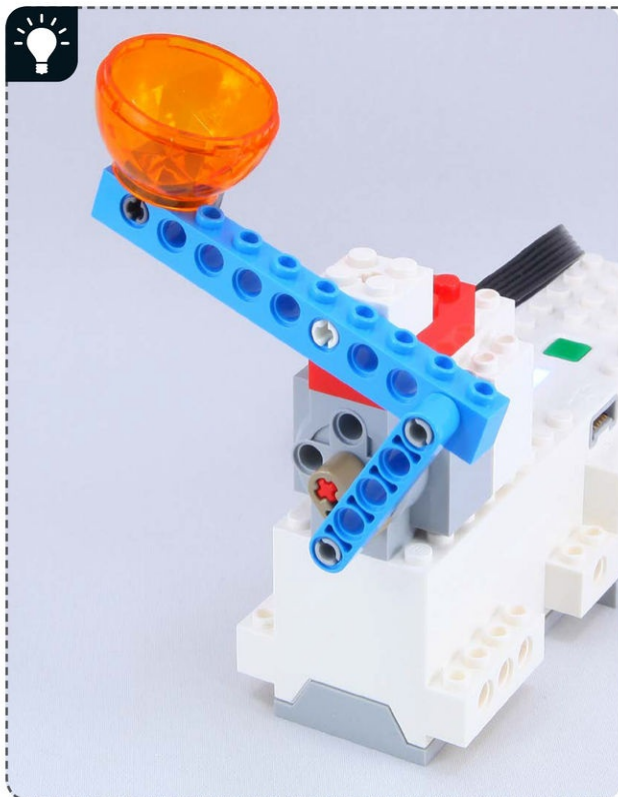


Changing the orientation of rotation 61

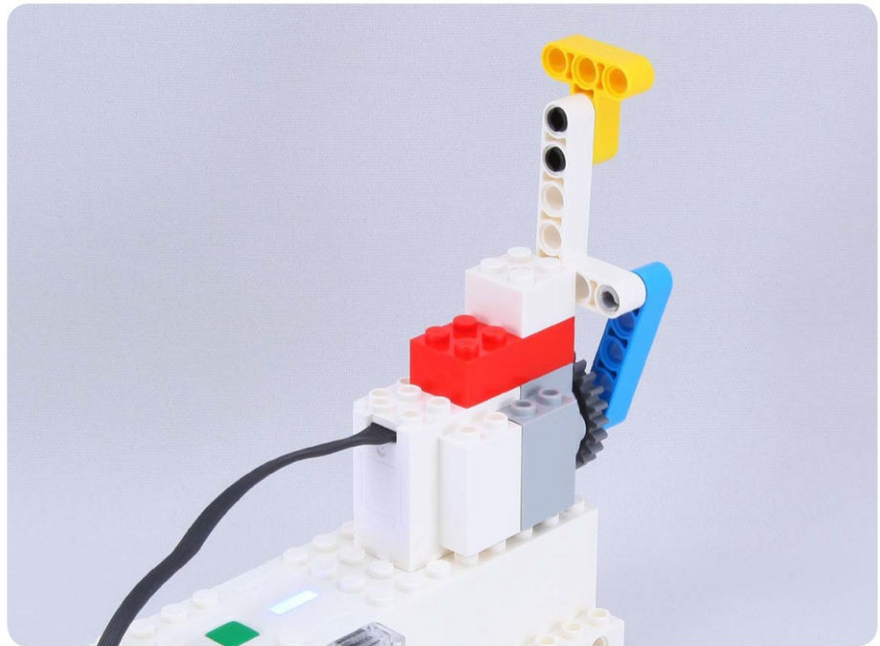


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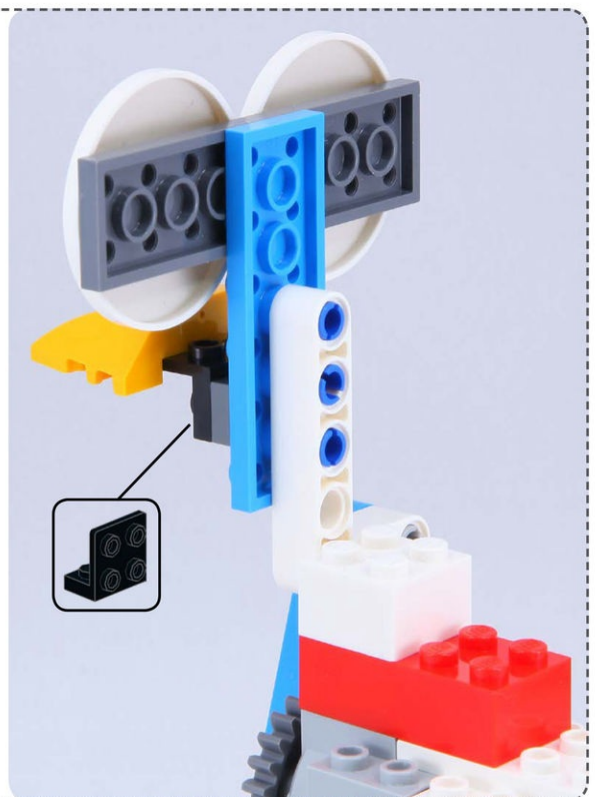
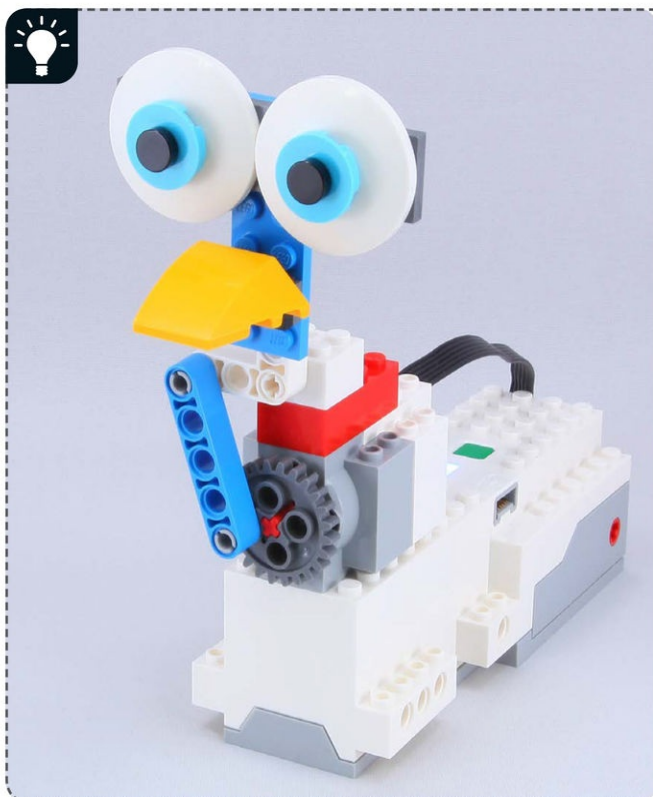






77







1x 1x10 white Technic beam with a grey axle and a red pin

1x 1x4 grey Technic beam

2x 1x2 white Technic beam

4x 1x1 grey Technic pin

1x 1x2 black Technic beam

2x 1x2 red Technic pin

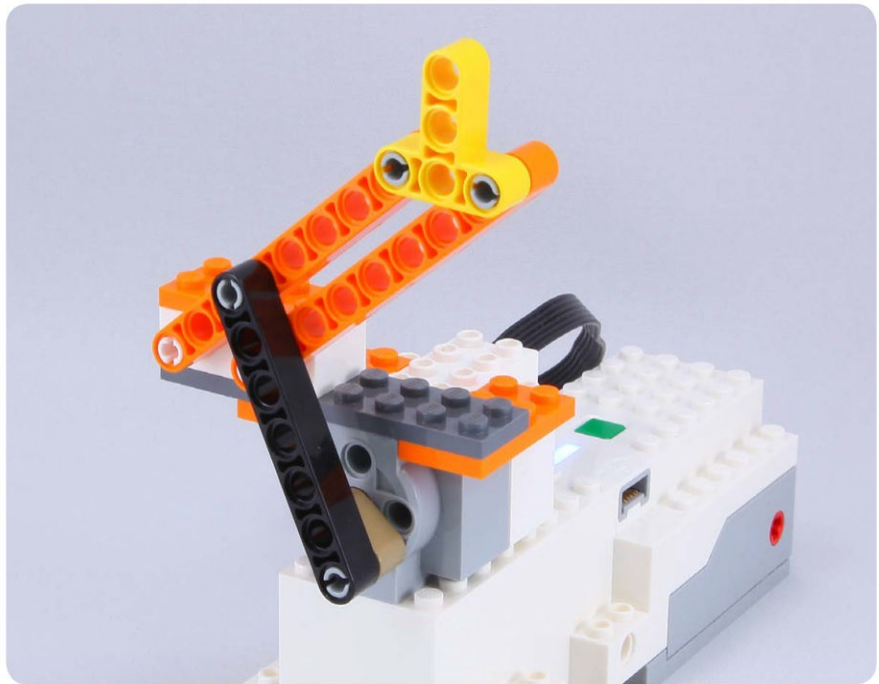
1x 1x2 grey Technic pin

1x 1x2 yellow Technic pin

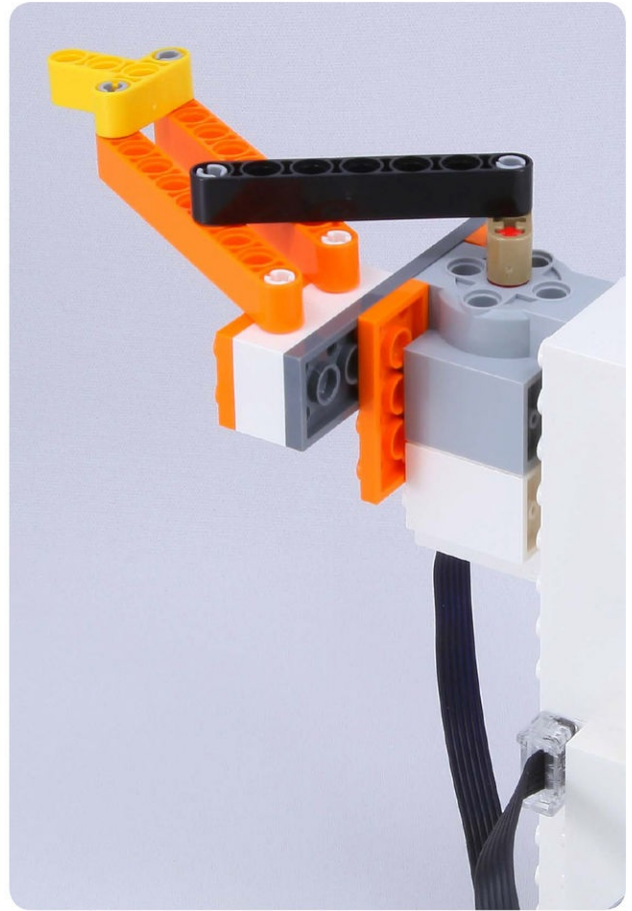
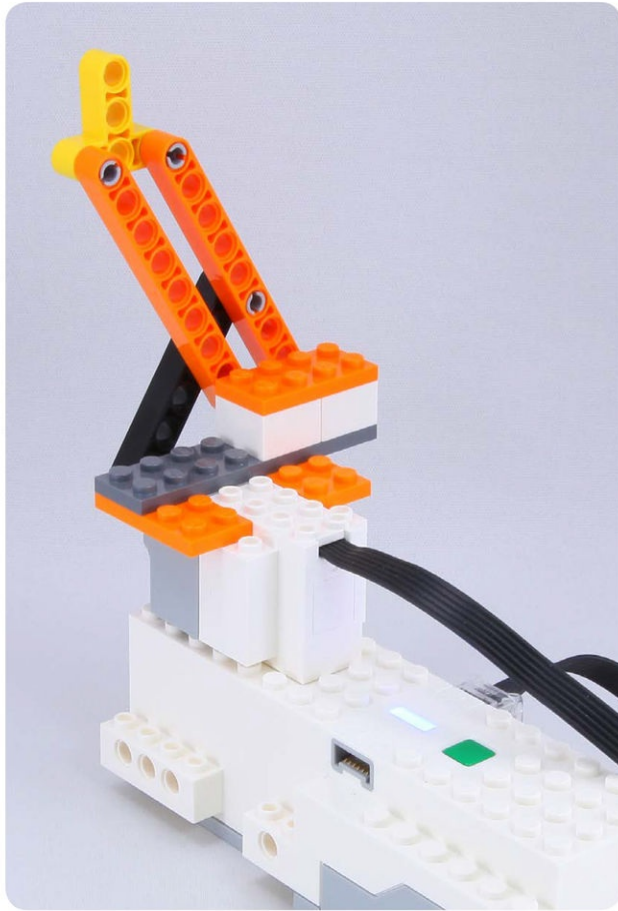
2x 1x10 orange Technic beam

3x 1x4 orange Technic beam

1x 1x10 grey Technic beam







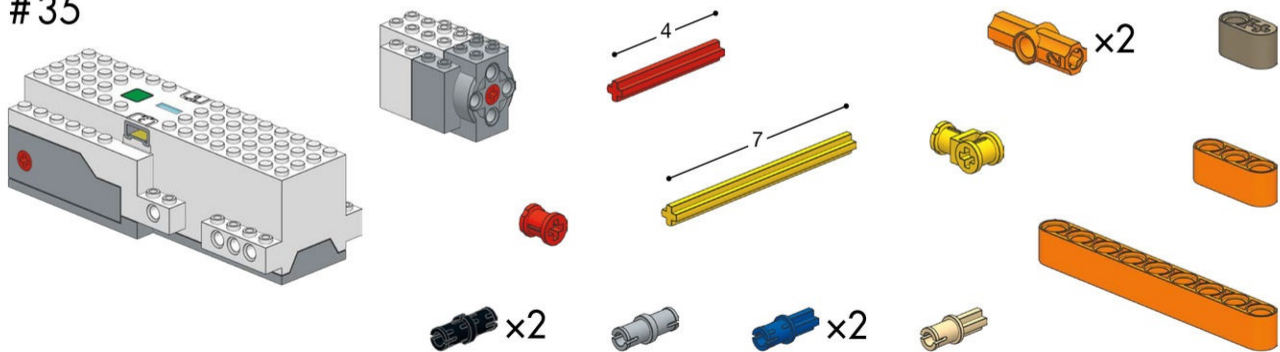
Swinging mechanisms **67**



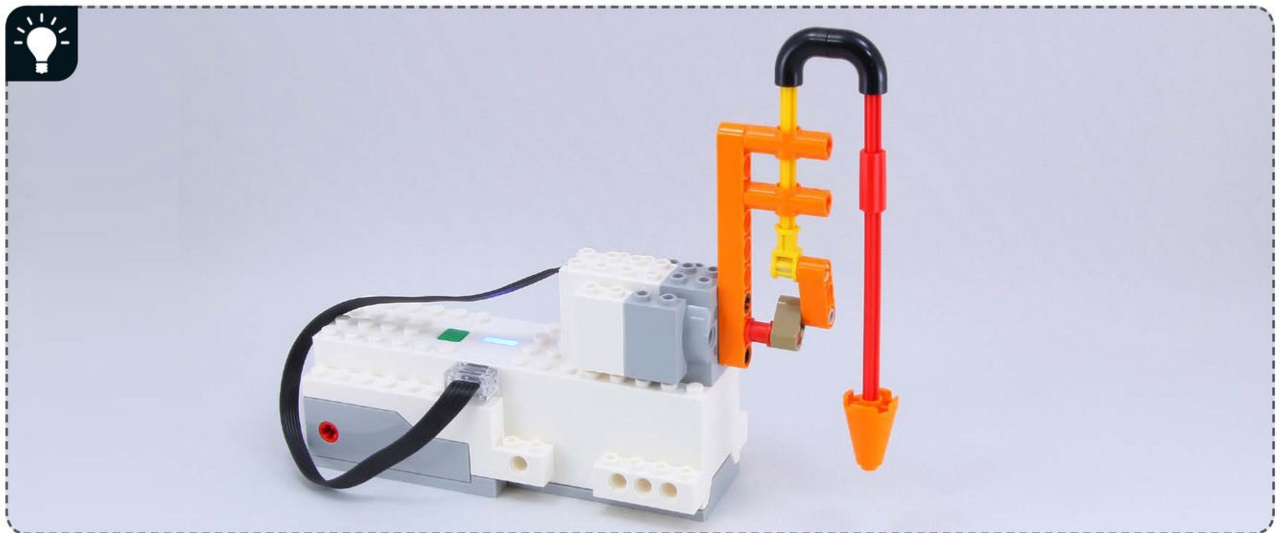
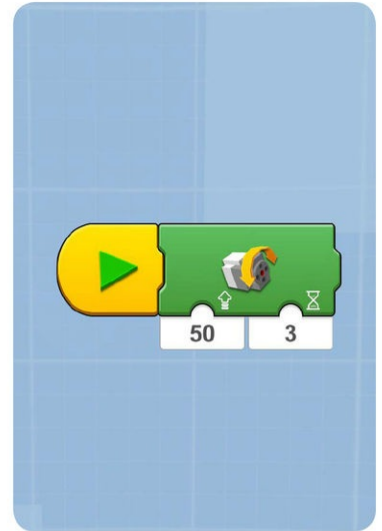
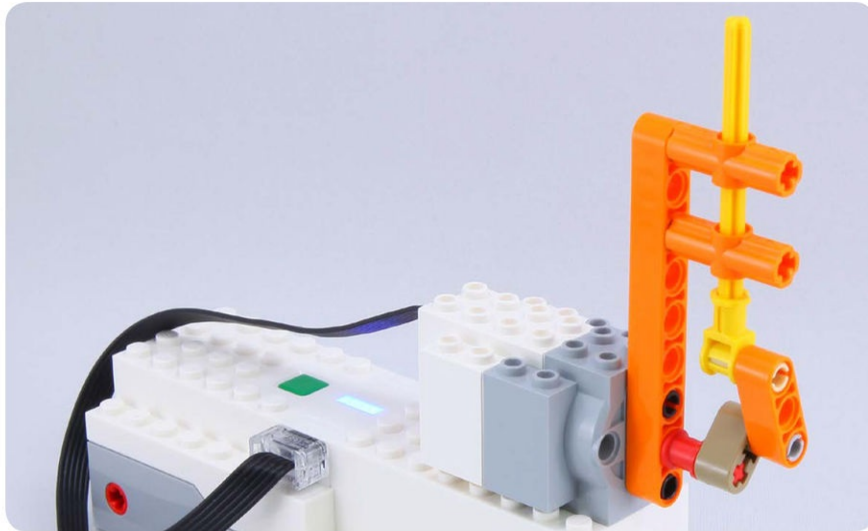


# Reciprocating mechanisms

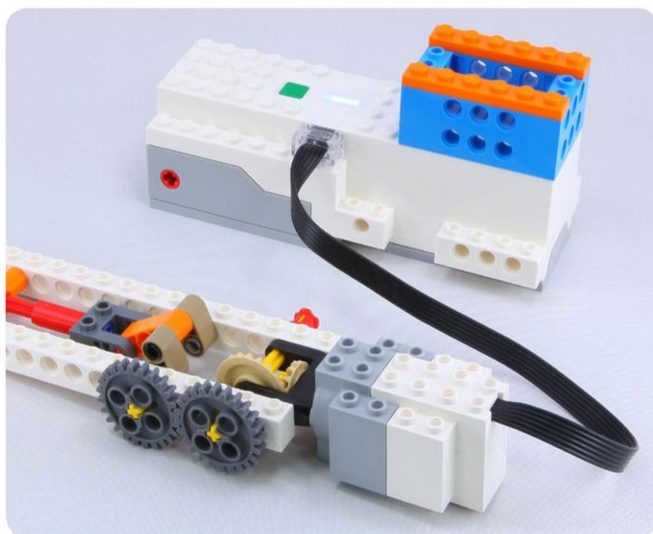
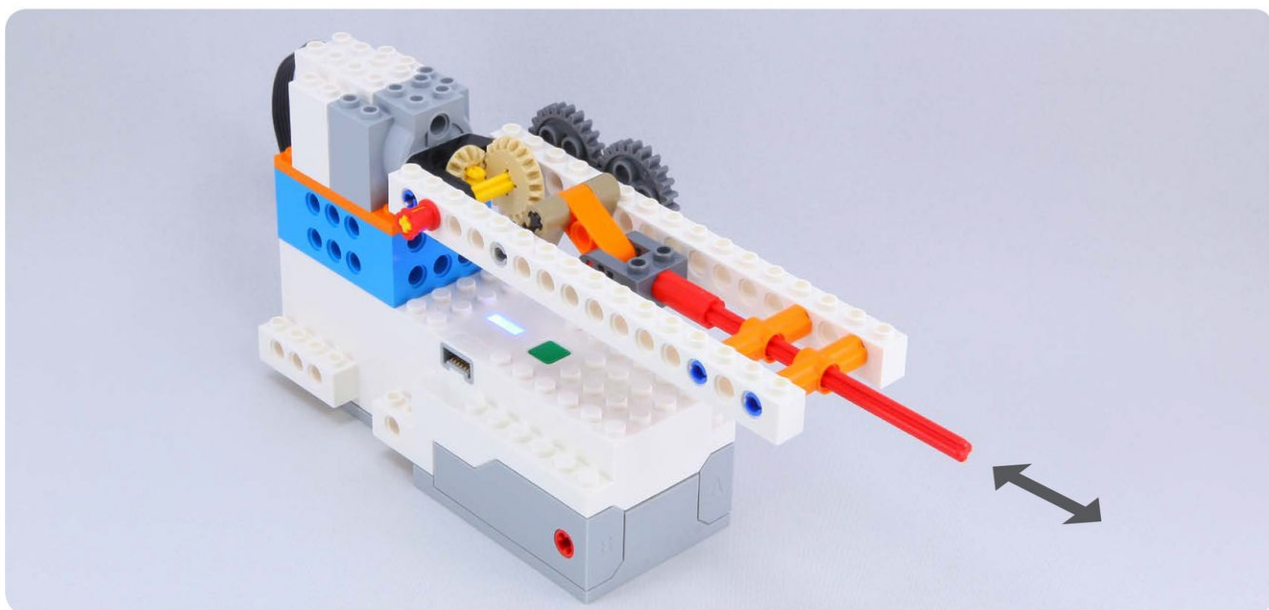
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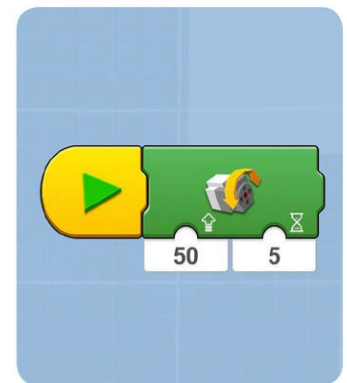
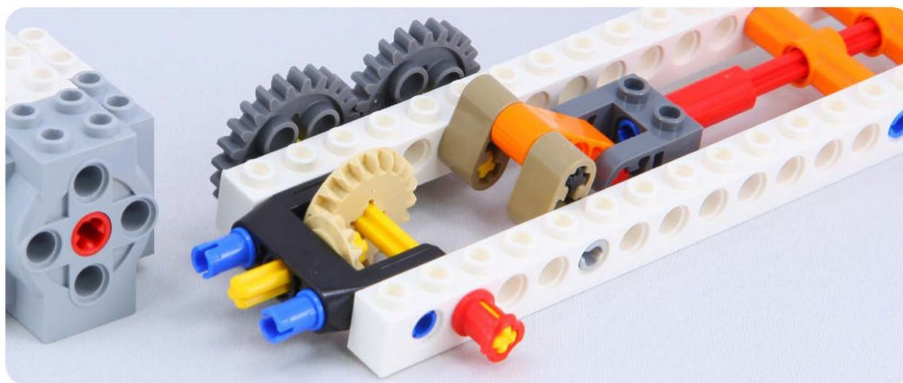
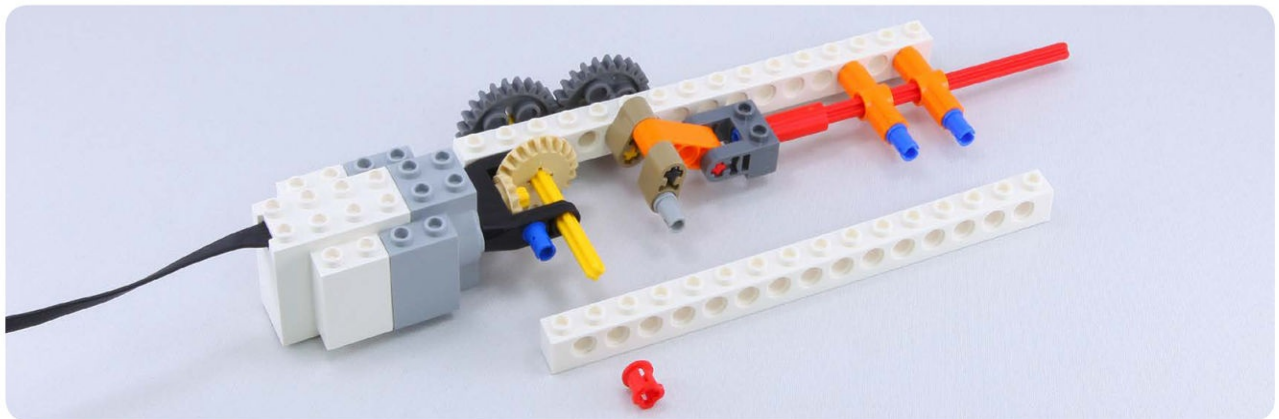
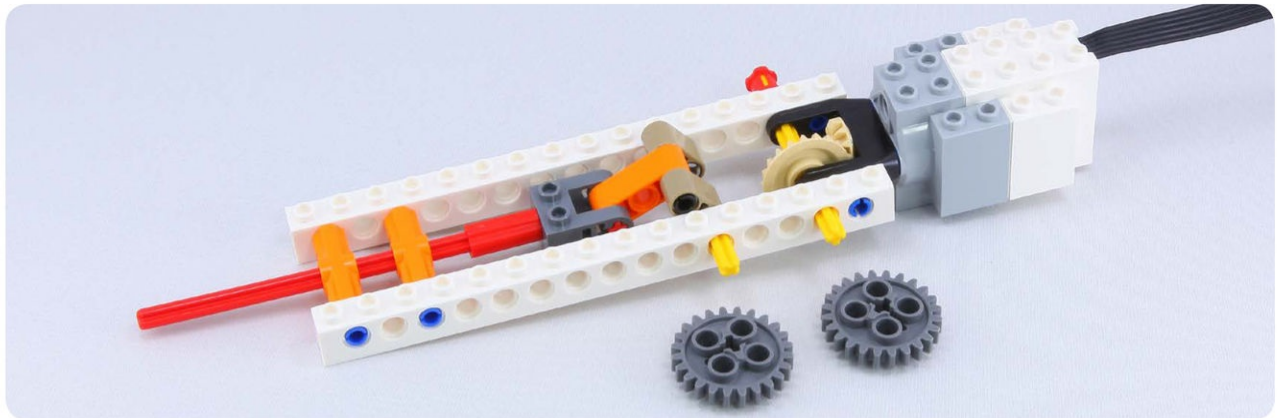






[illegible]

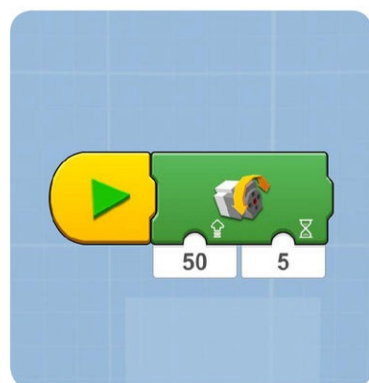
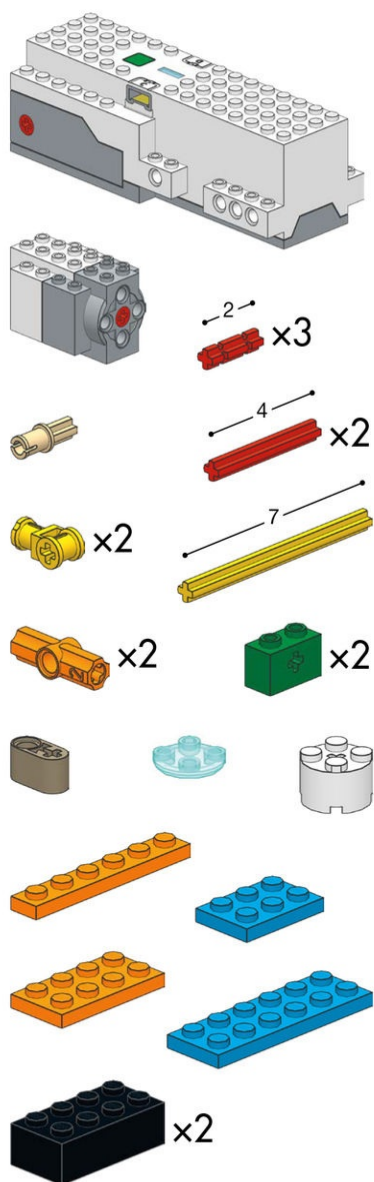




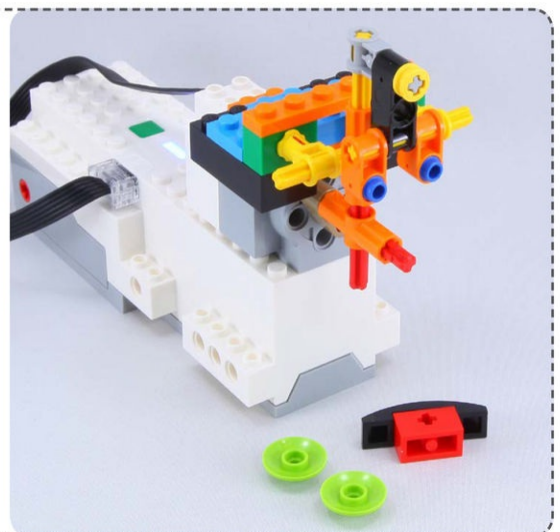
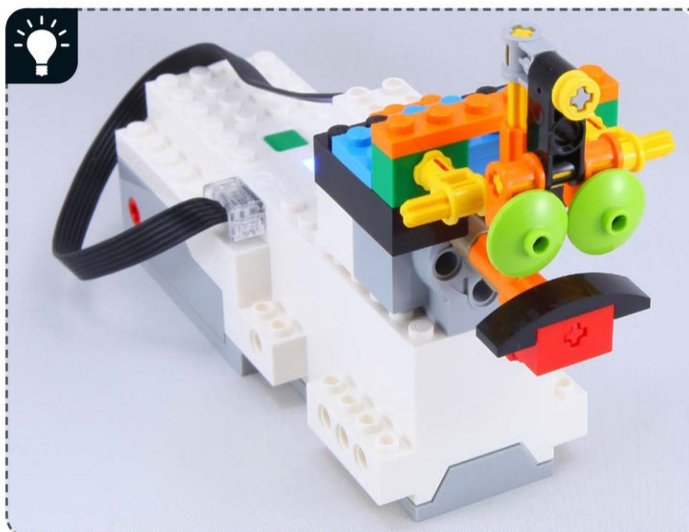
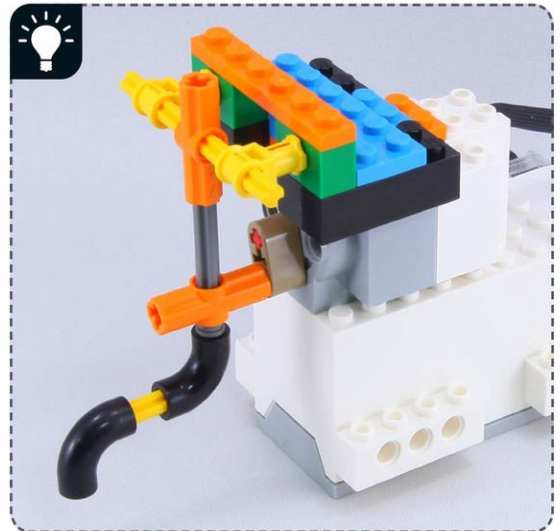
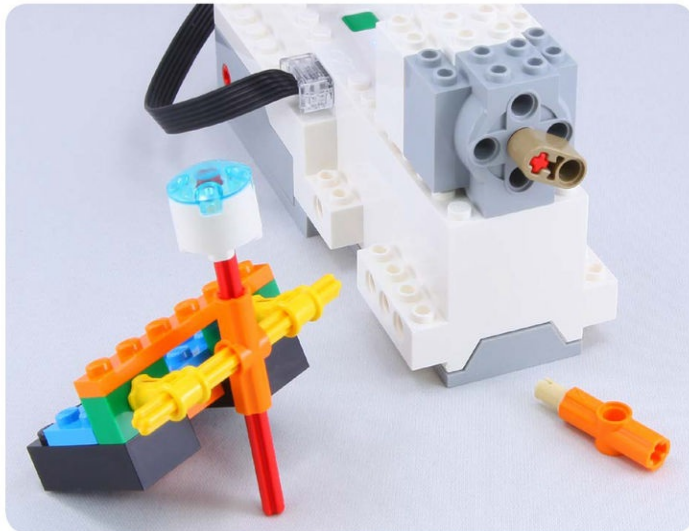
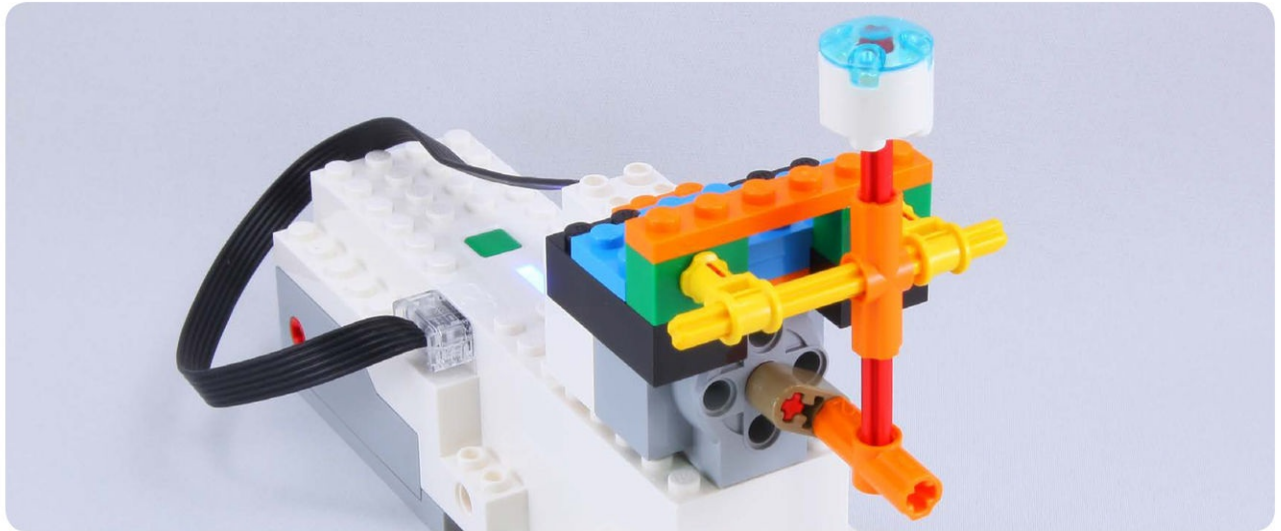
Reciprocating mechanisms 71



# 37

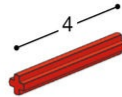




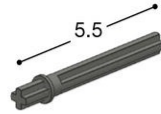




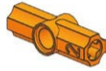
A perspective view of the completed LEGO Technic assembly. The assembly consists of a grey motor block connected to a series of gears. A long grey Technic beam, 11 holes long, is attached to the side of the gear train. At the end of this beam is a pulley made of two grey Technic wheels. The entire assembly is built using various grey and white Technic components, including pins, axles, and connectors. The motor is a grey 1/2 HP motor. The gears are made of grey Technic wheels of different sizes. The long beam is connected to the motor via a series of gears. The pulley at the end of the beam is used to drive a belt. The assembly is shown in a perspective view, highlighting its three-dimensional structure.

  $\times 4$ 

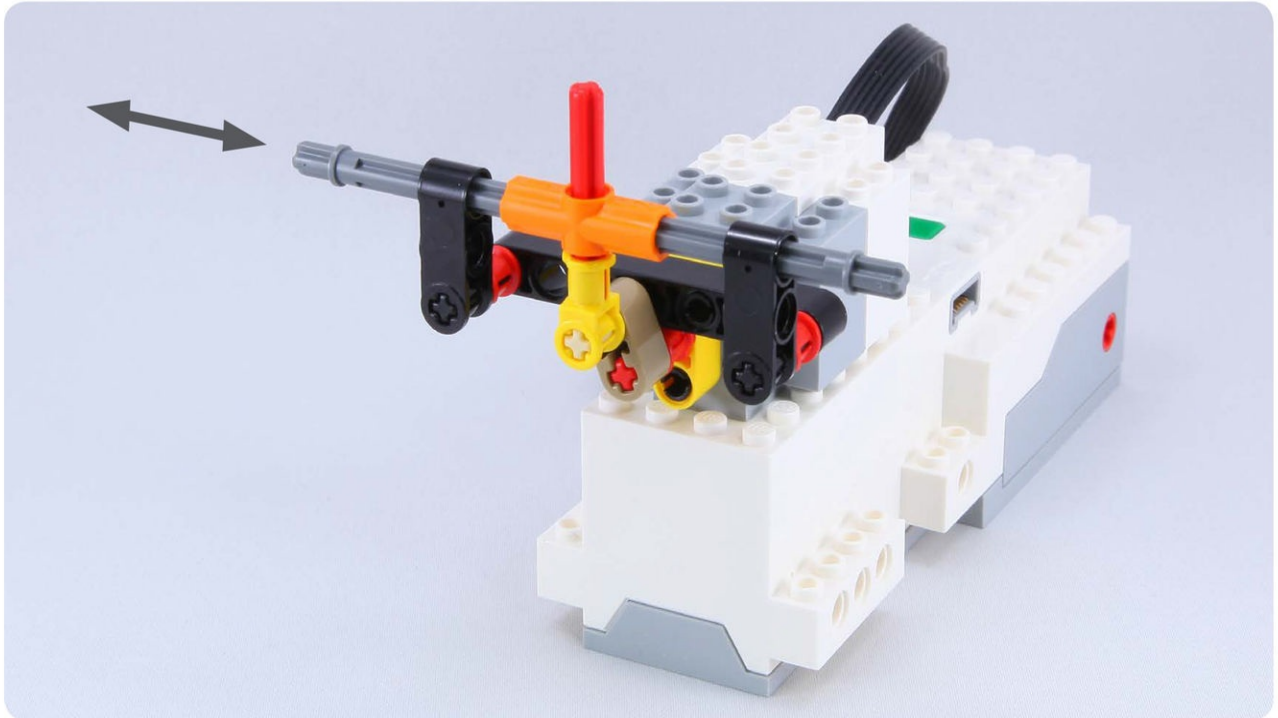
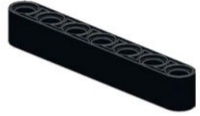
**✚ x2**



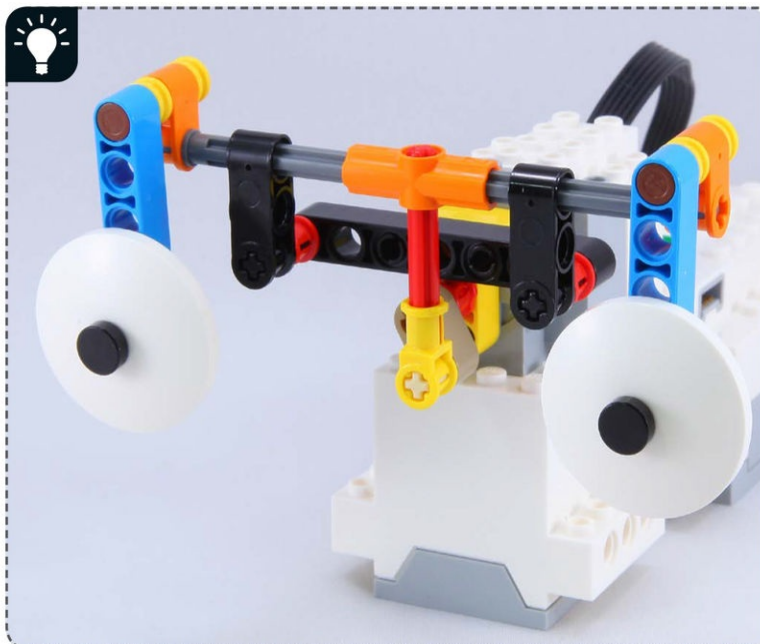
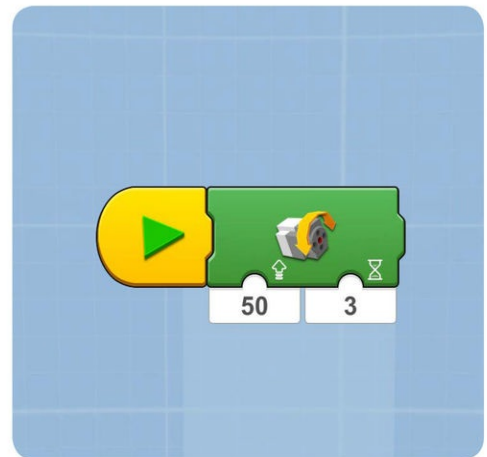
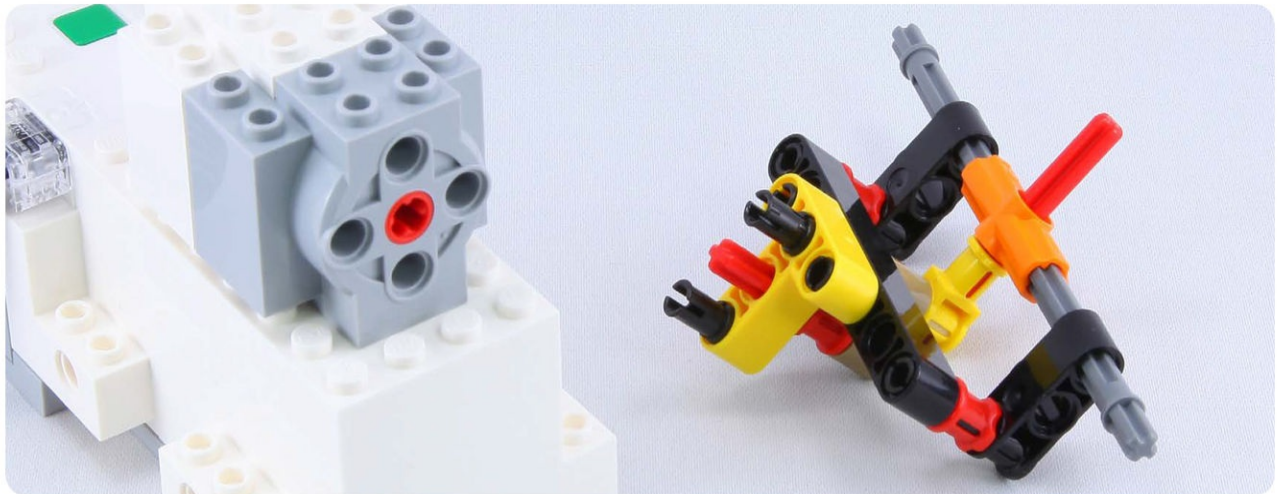
x2



x2



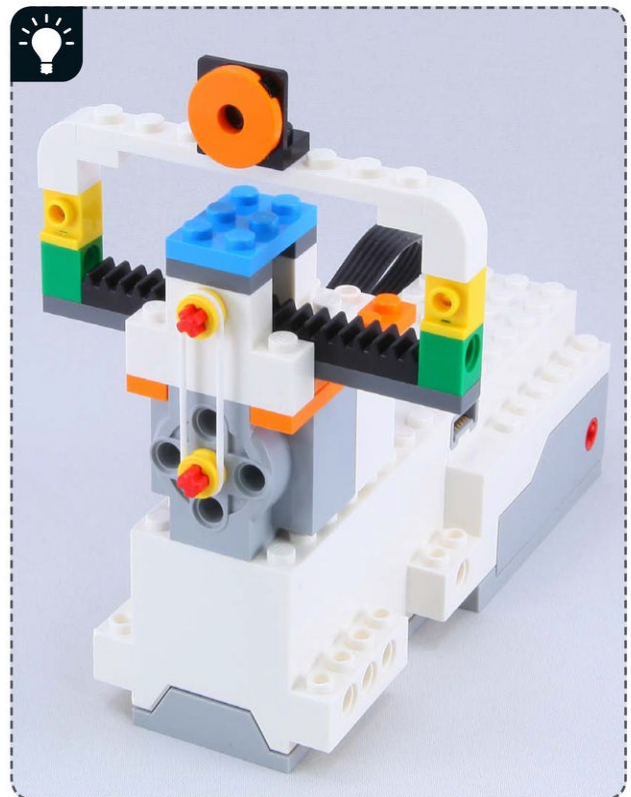
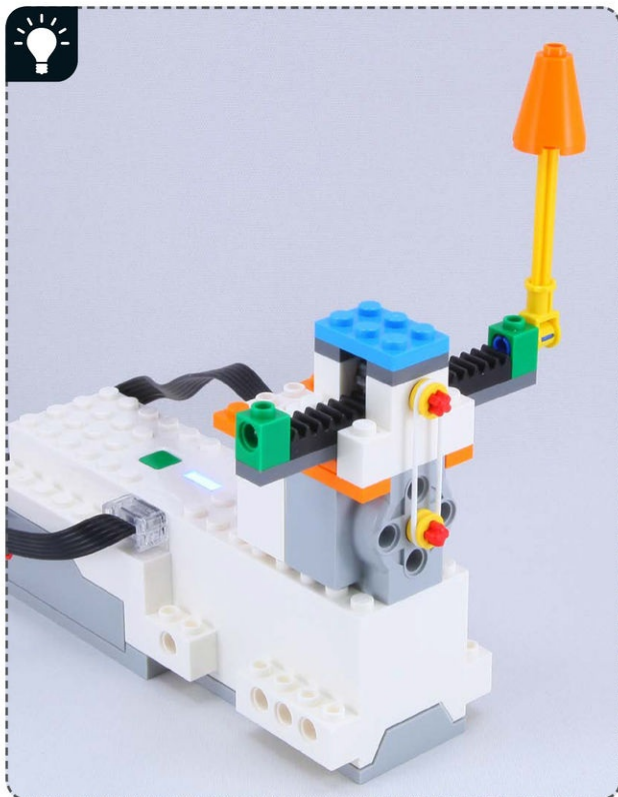
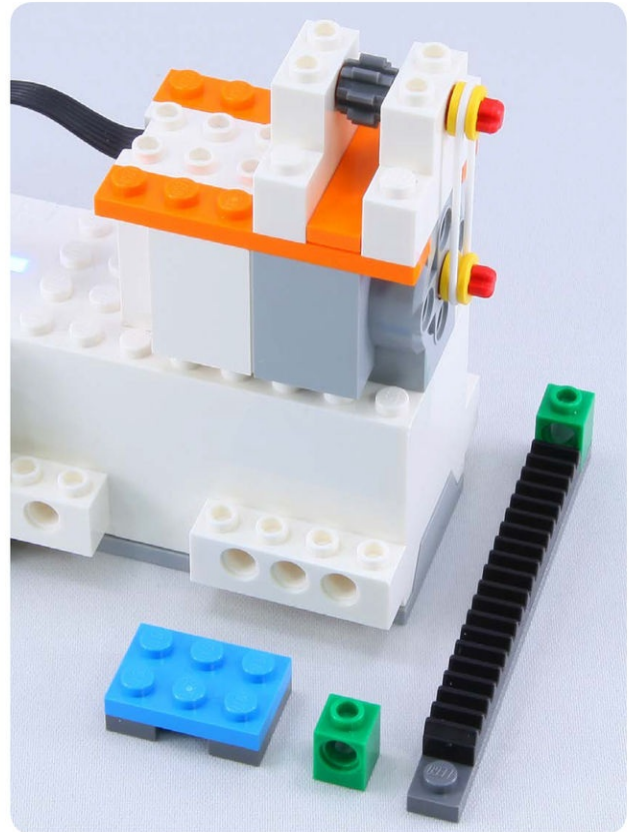
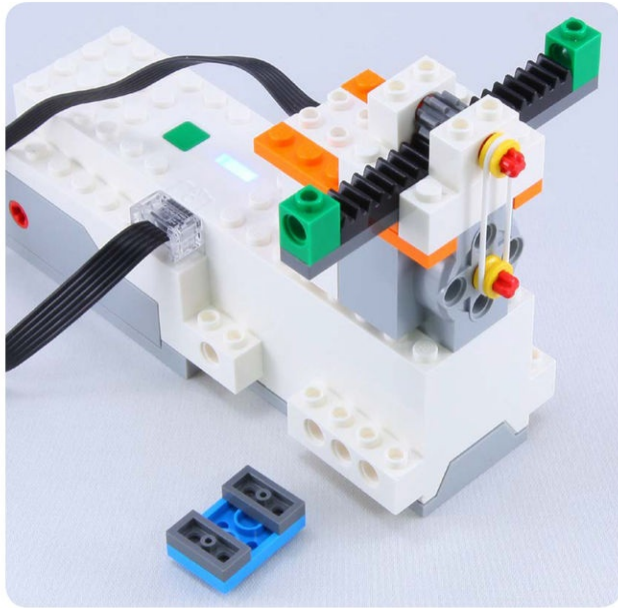






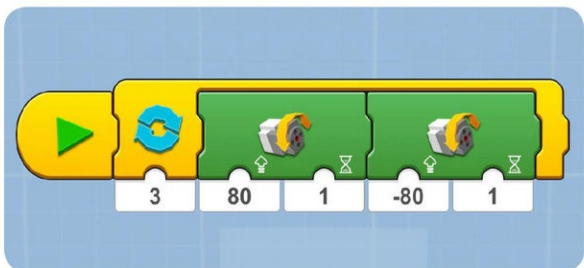
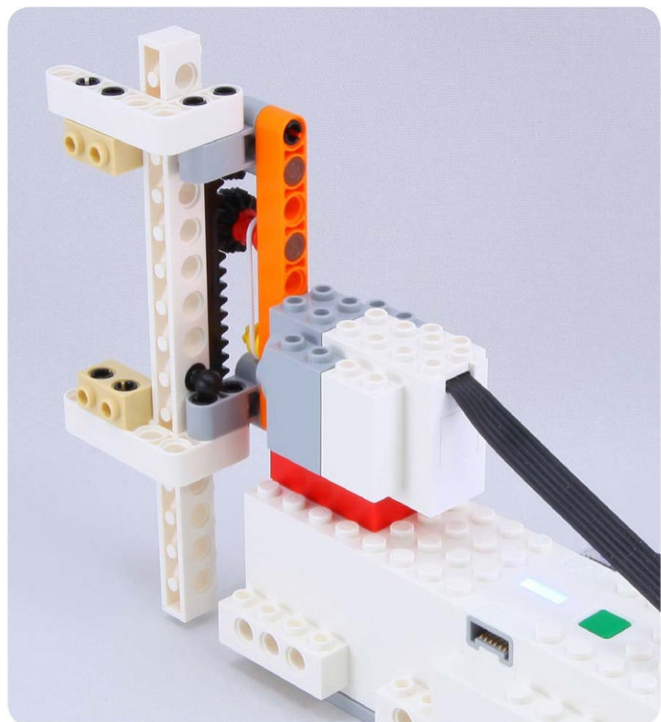
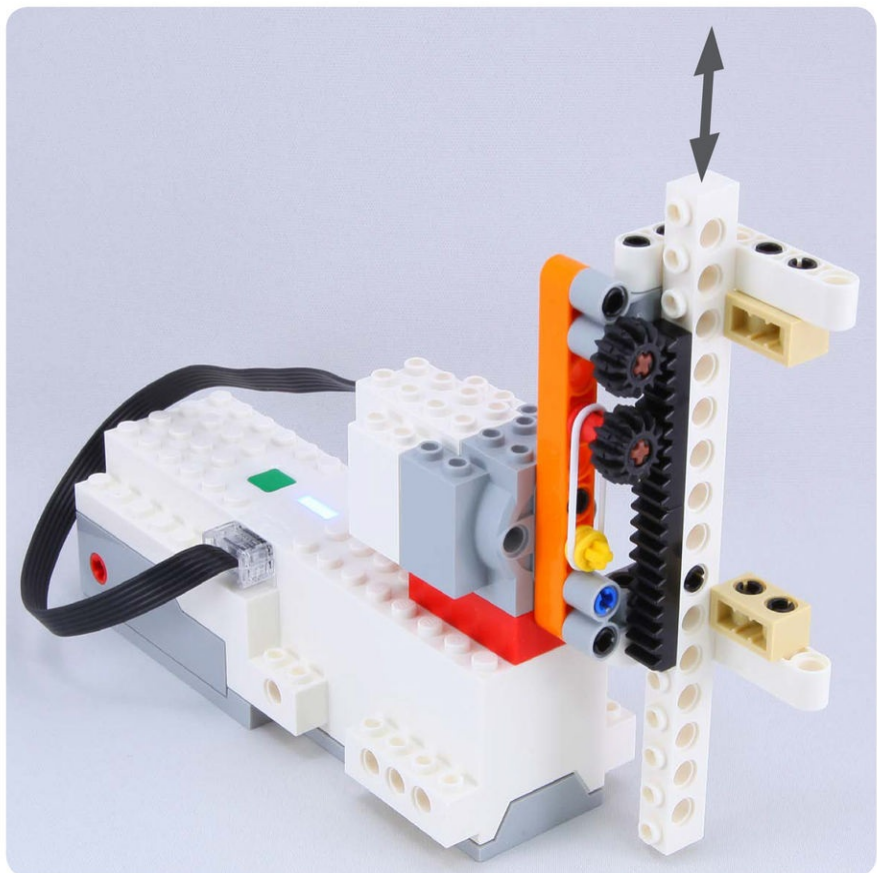
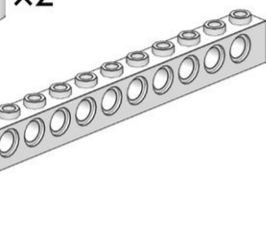
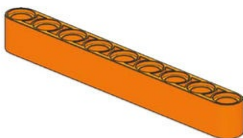
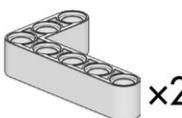
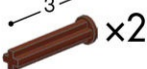
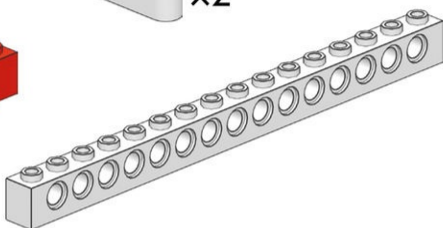
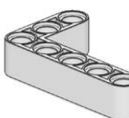
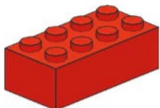






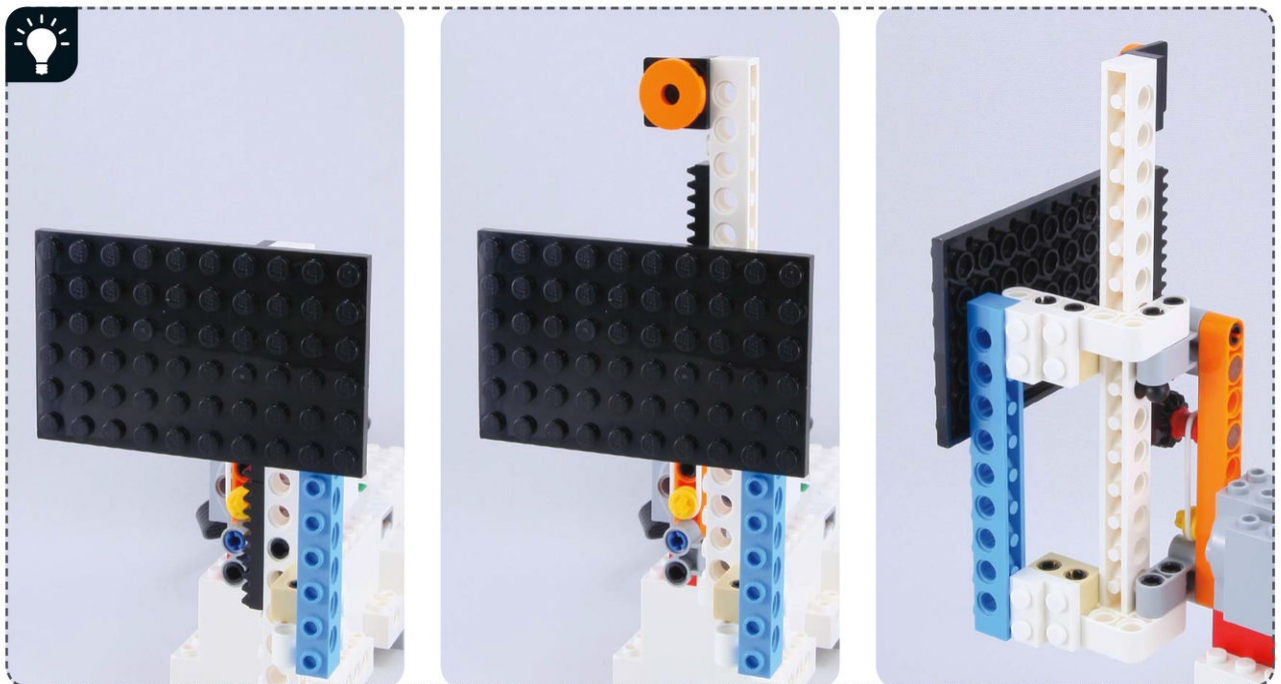
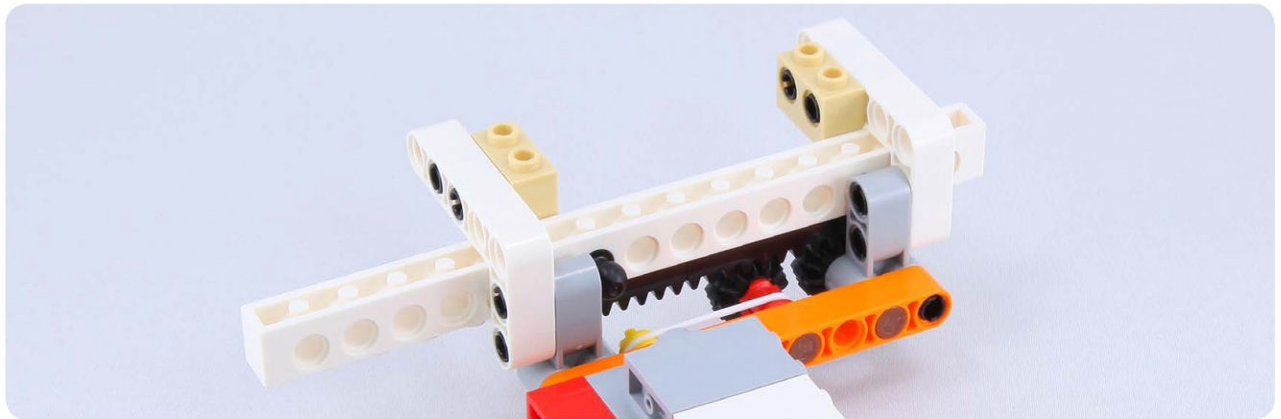
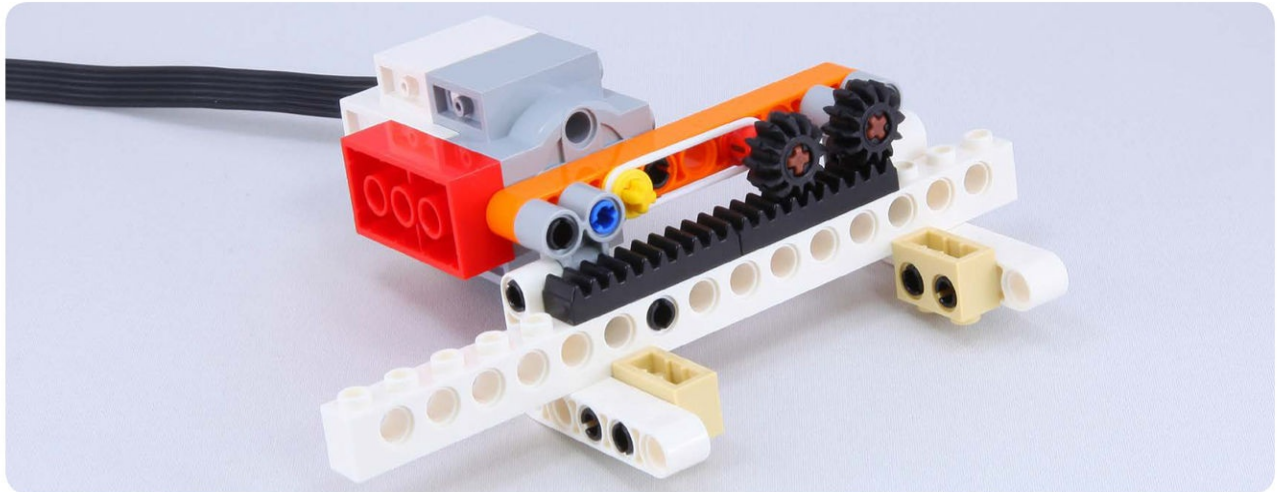


A perspective view of a LEGO Technic assembly. It features a grey base with a red circular piece on the left. A white Technic beam is attached to the top, with a green square piece and a blue rectangular piece visible. The assembly is shown in a 3D perspective.



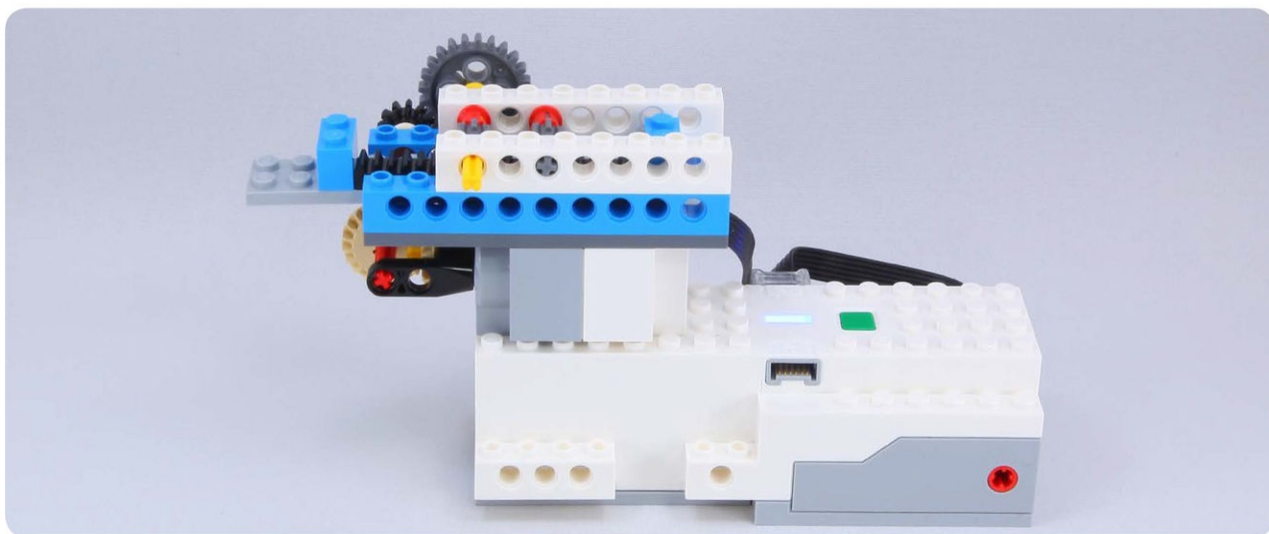
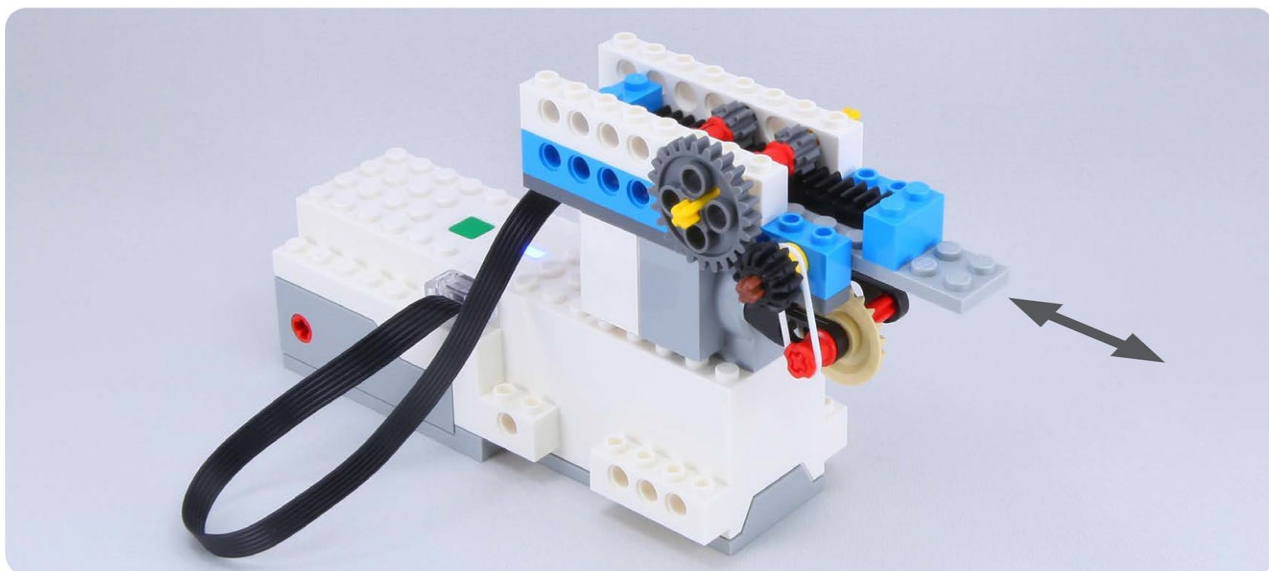
91



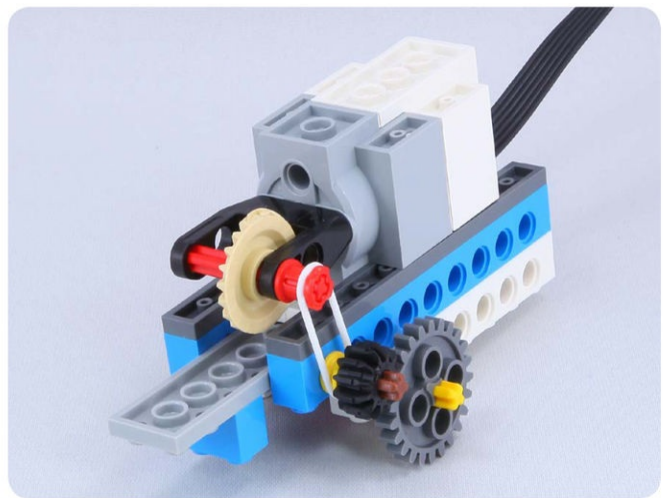
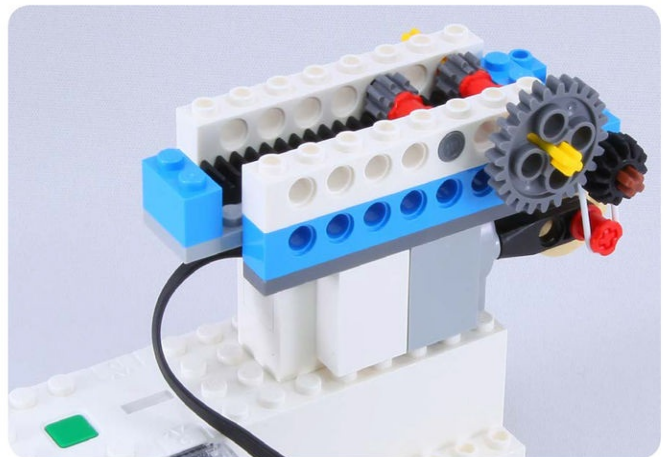
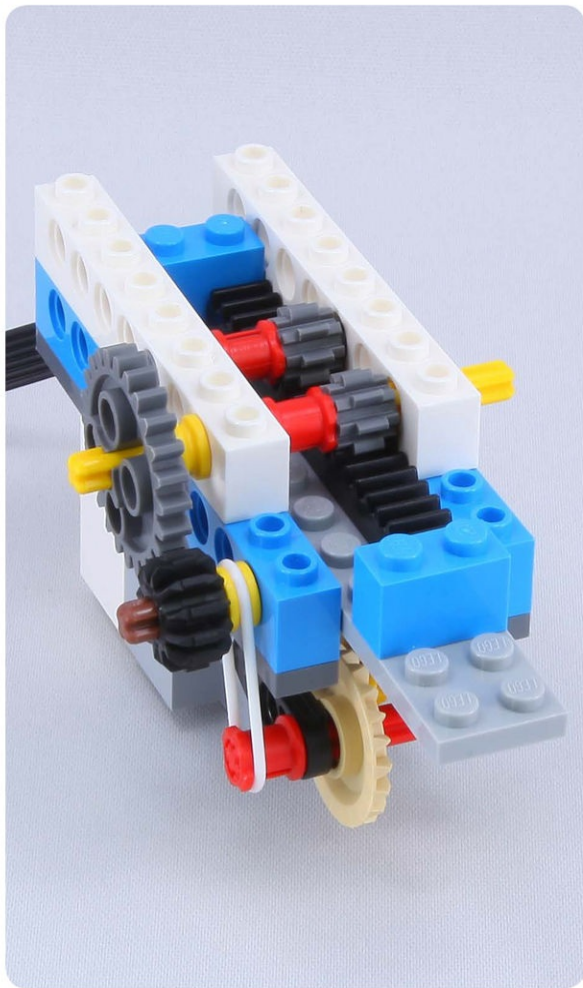
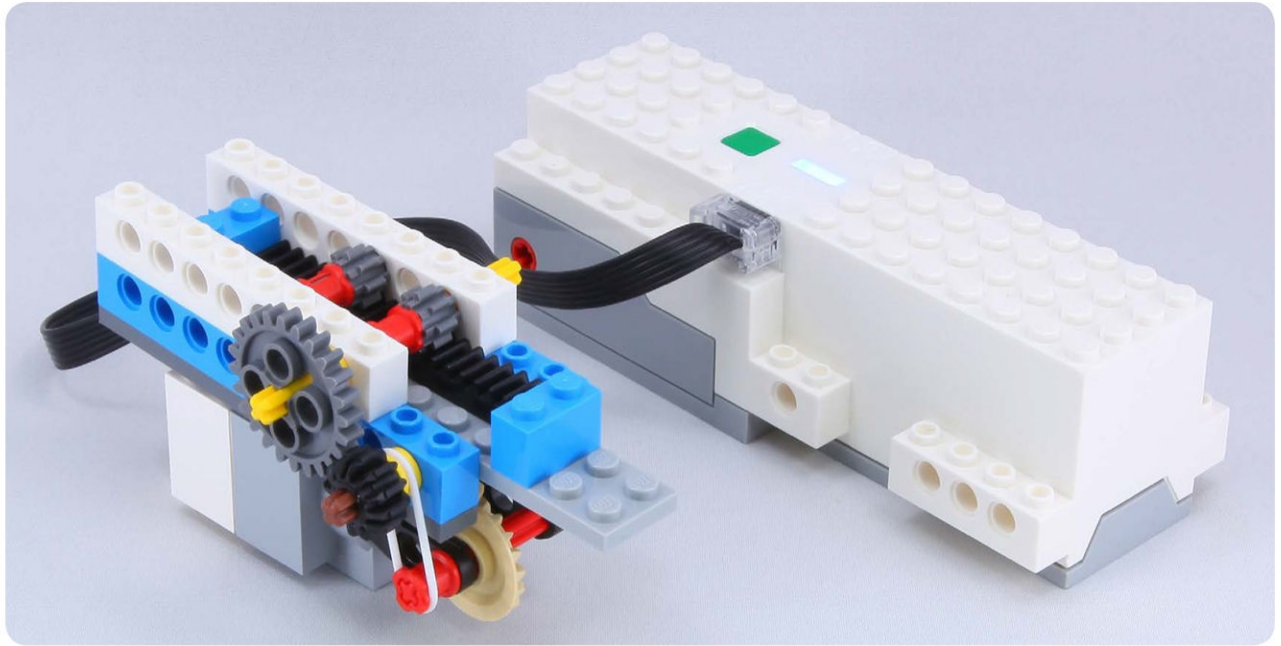


Rack-and-pinion gears 79



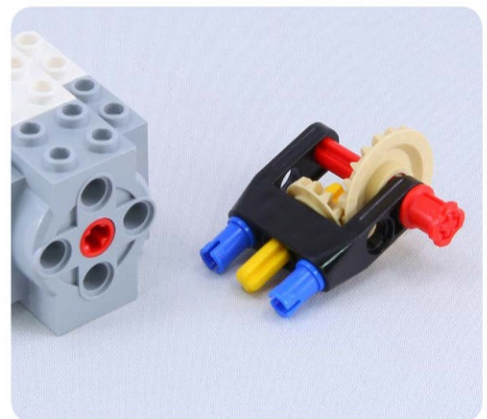
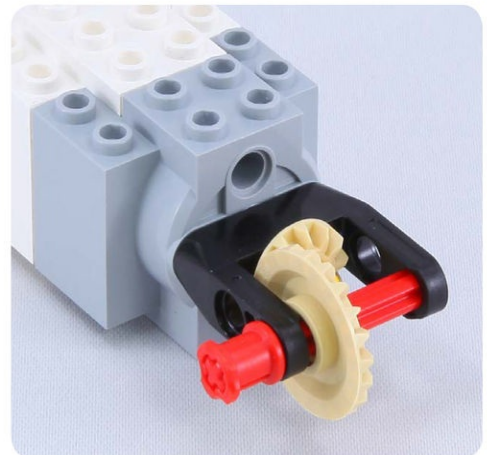
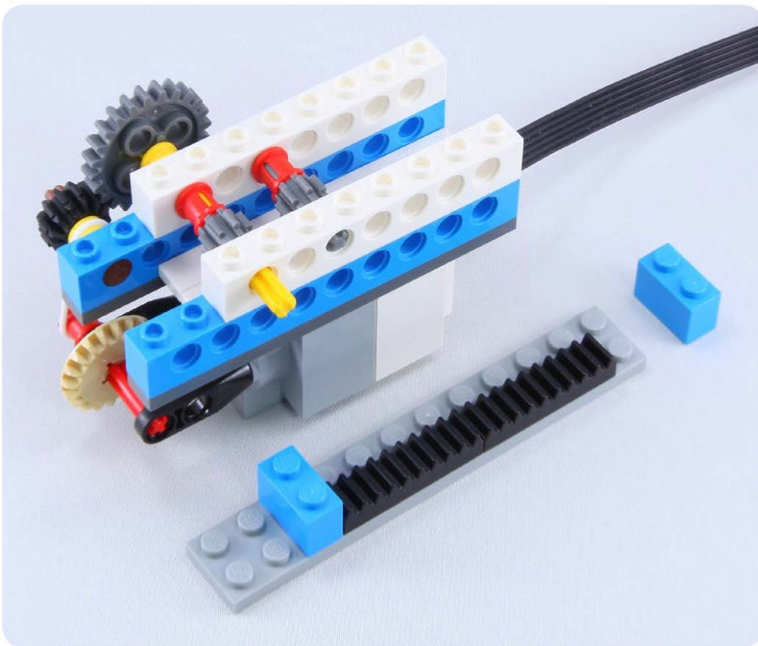
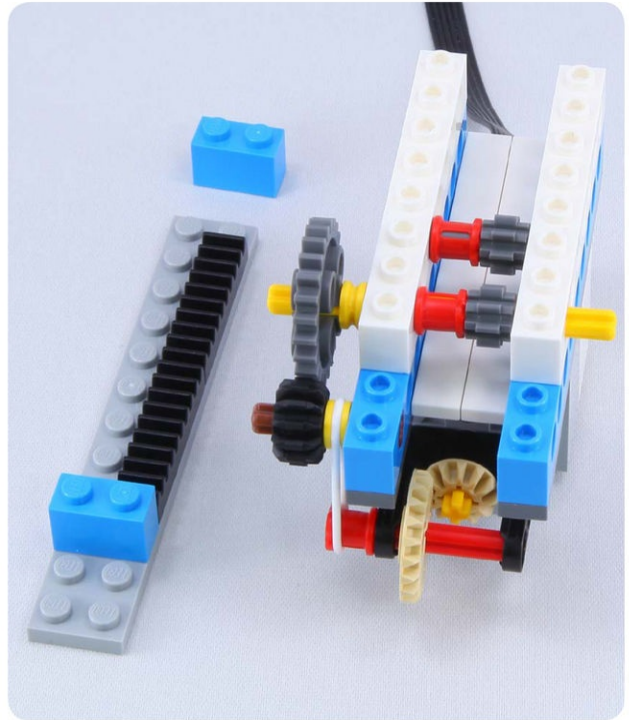
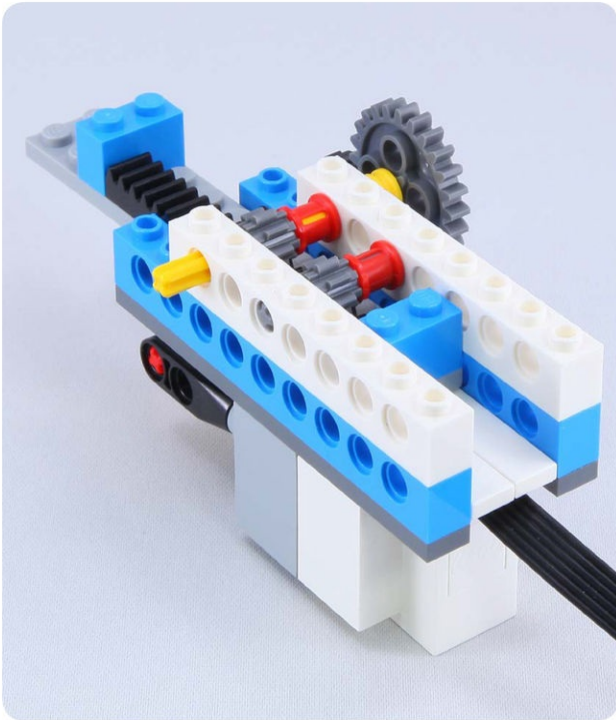
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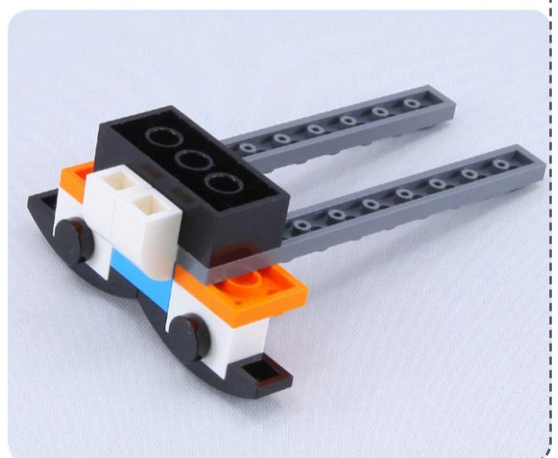
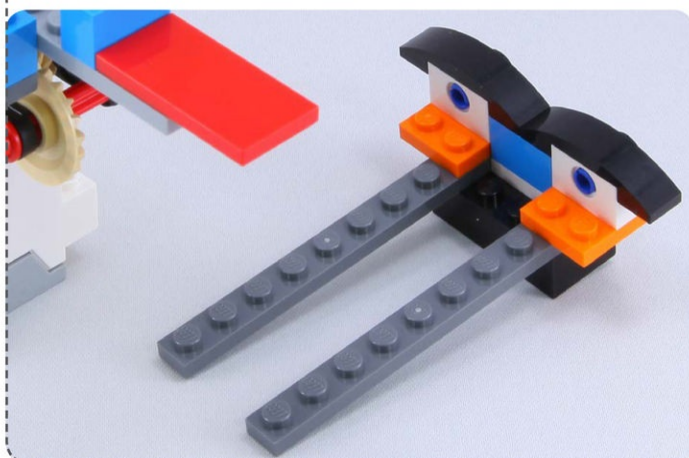
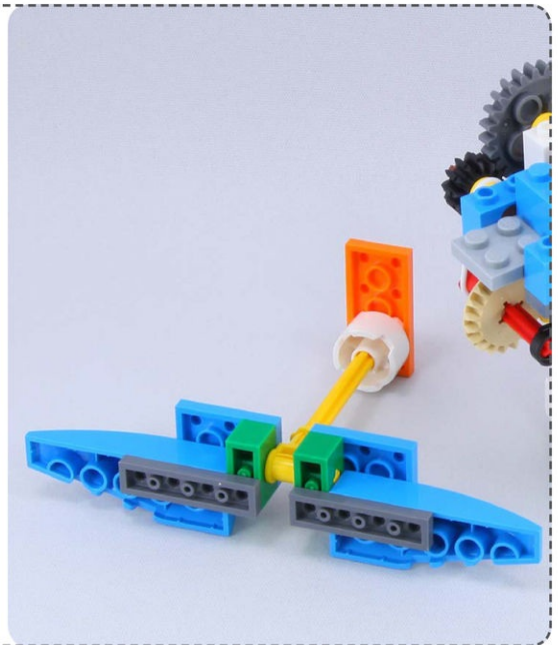
Rack-and-pinion gears 81





82 Rack-and-pinion gears







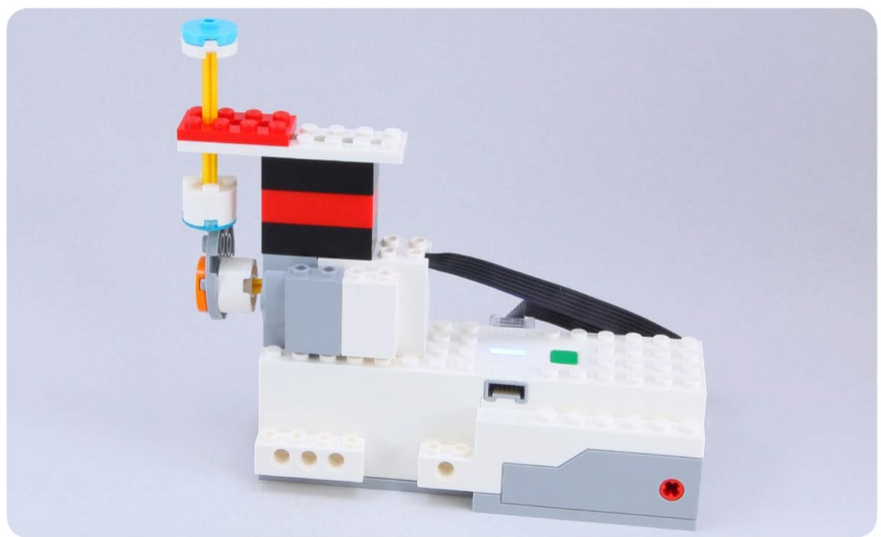


3

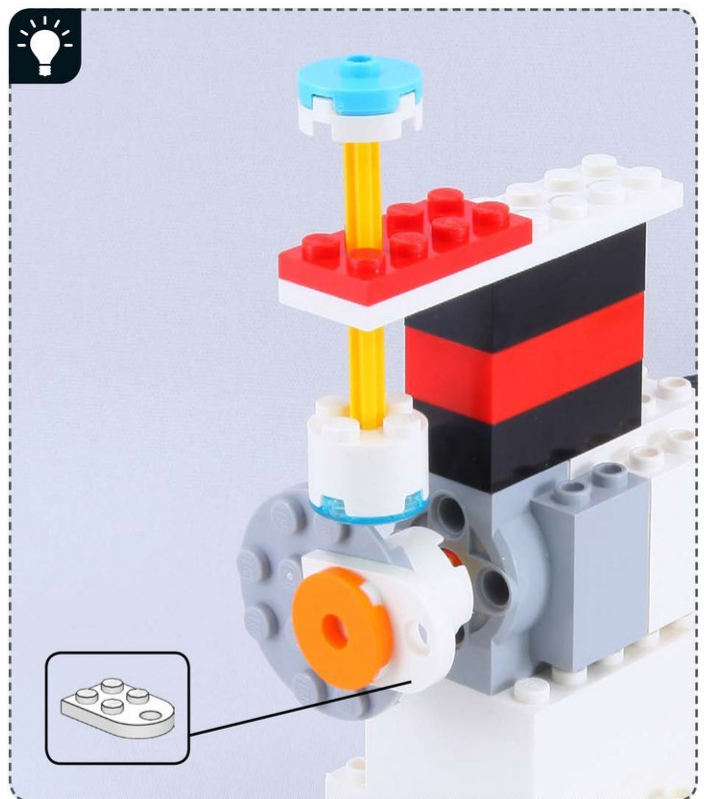
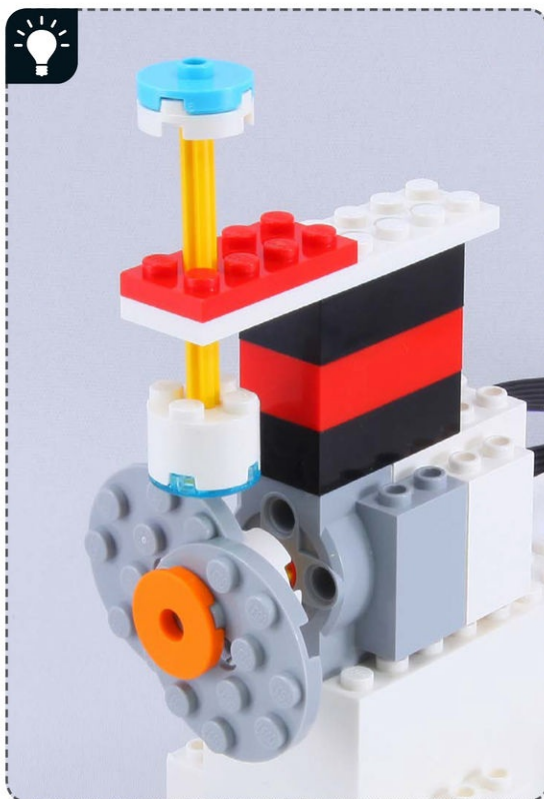
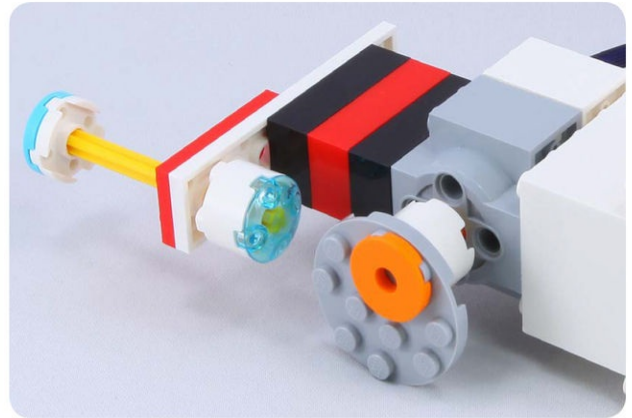
7

x2

x2





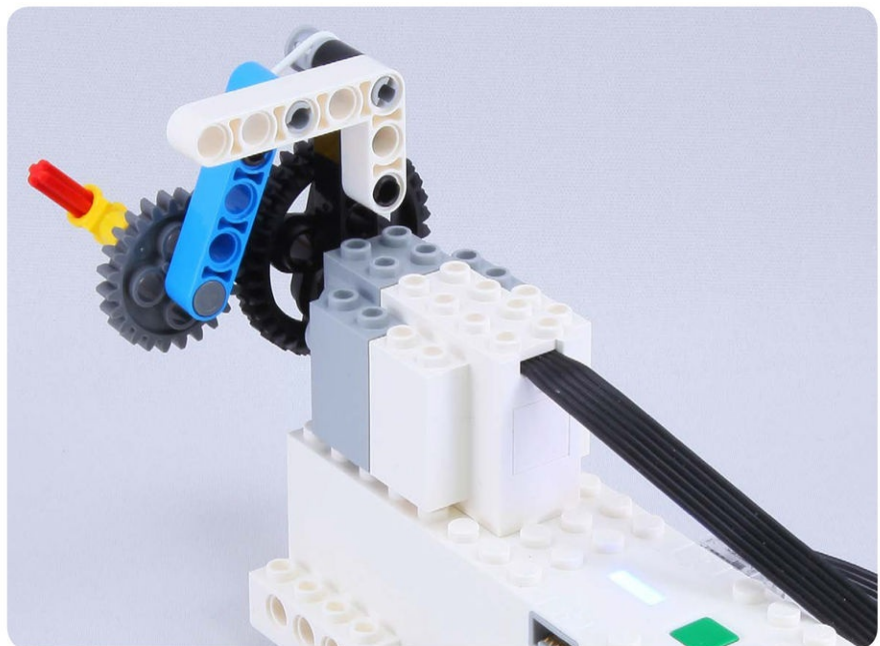
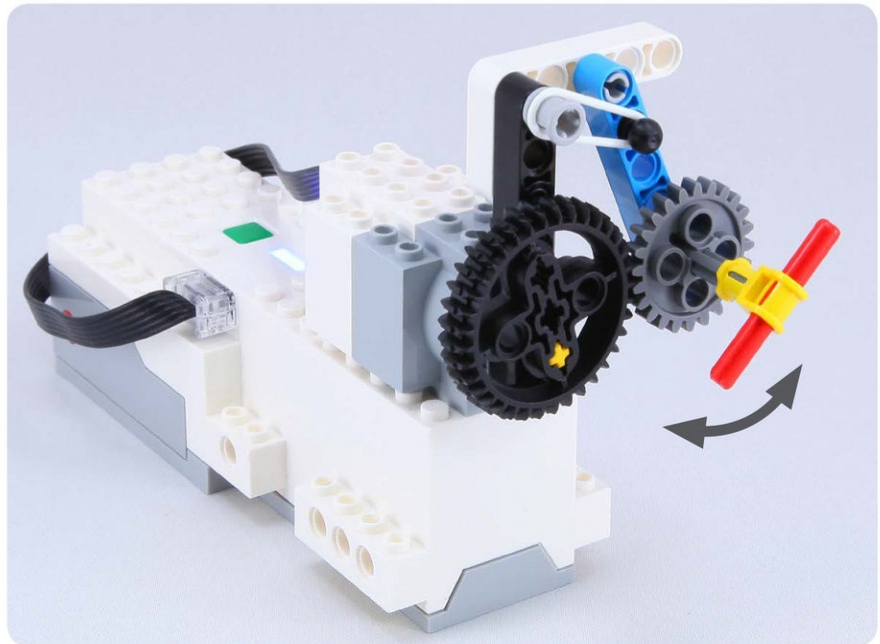
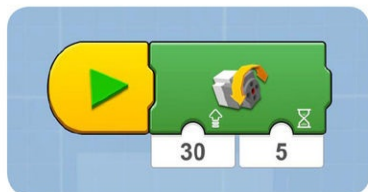
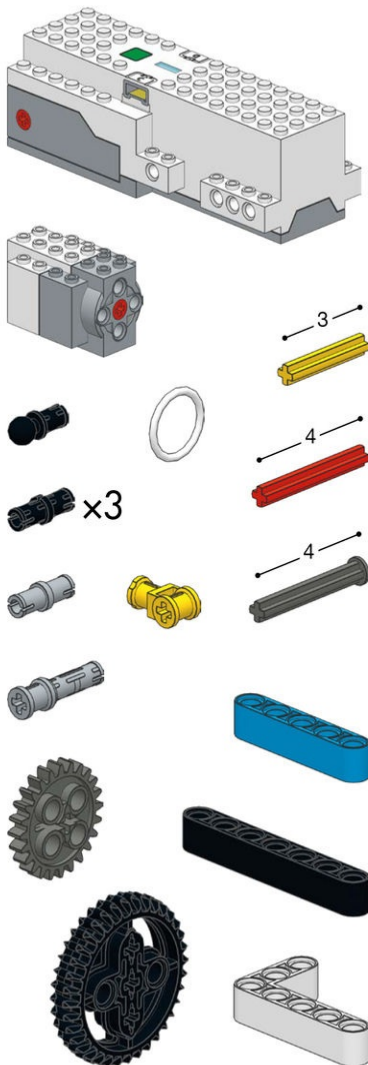






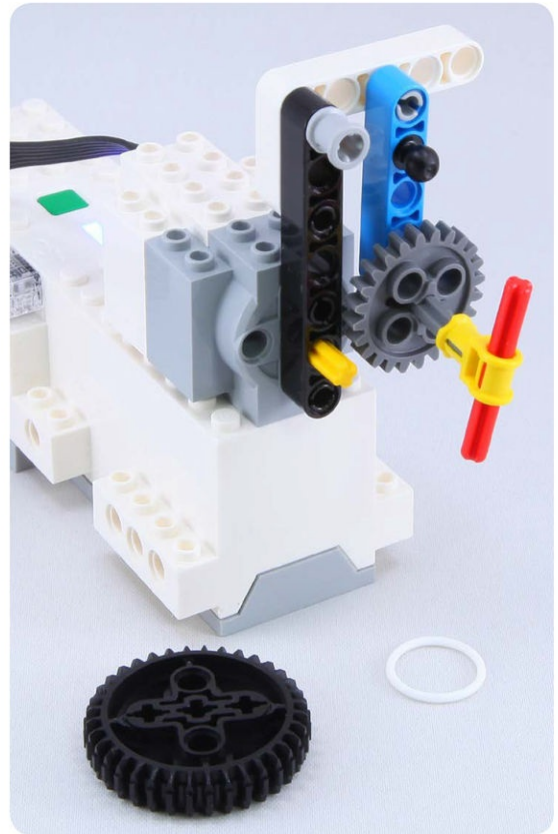
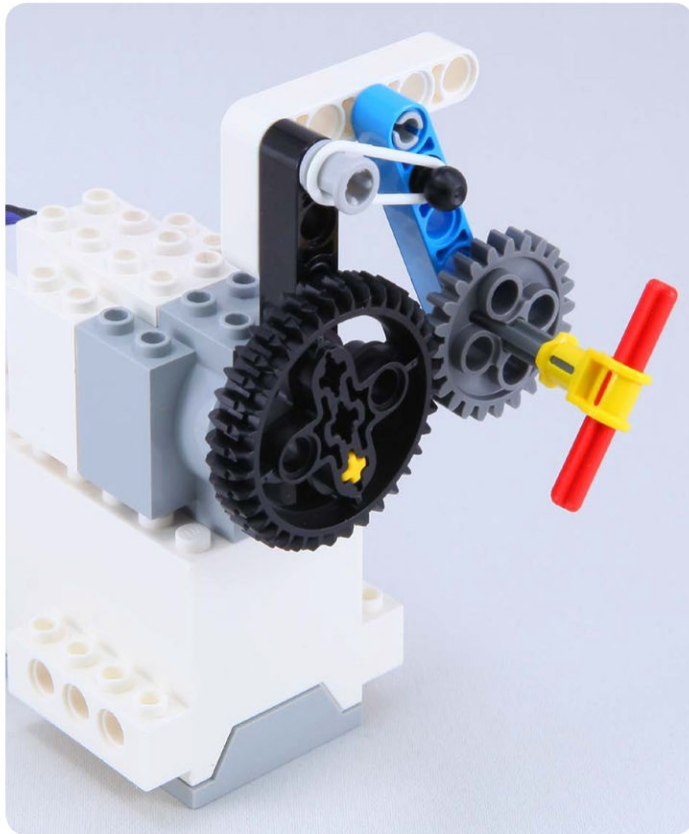
# Off-center axes of rotation

#43



86 Off-center axes of rotation



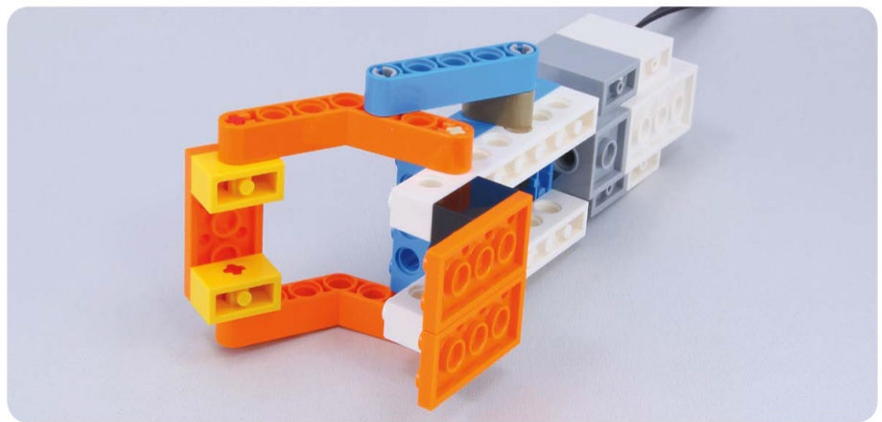


Off-center axes of rotation 87

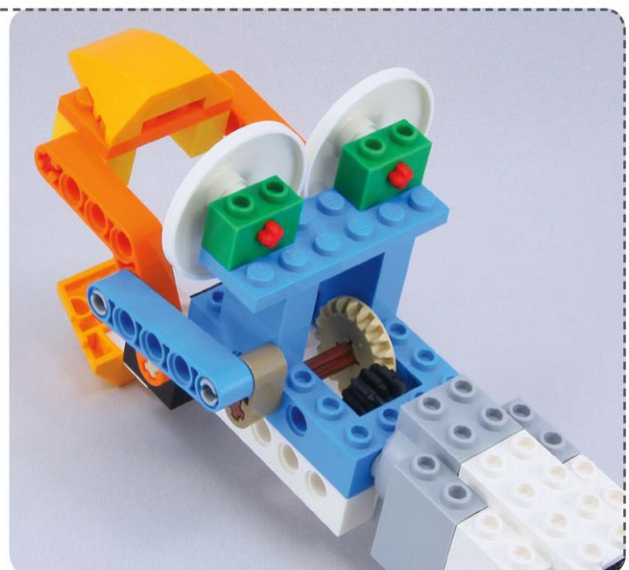
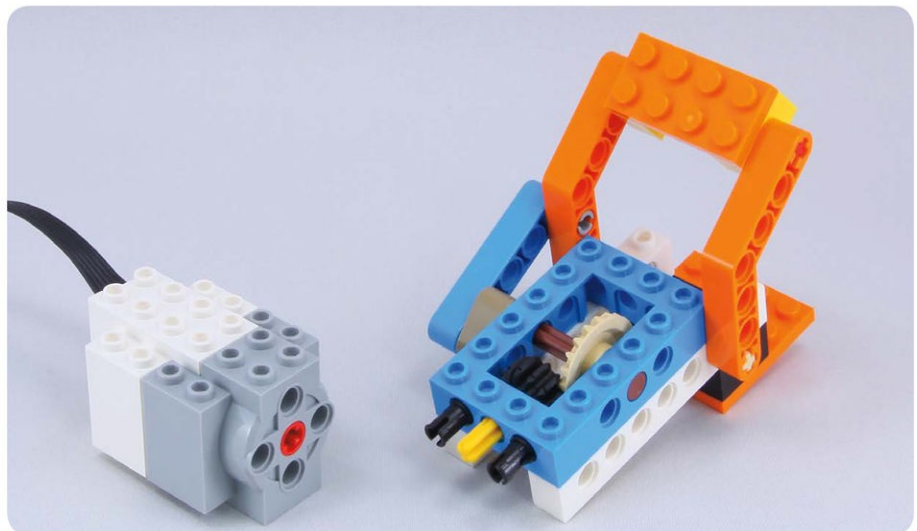
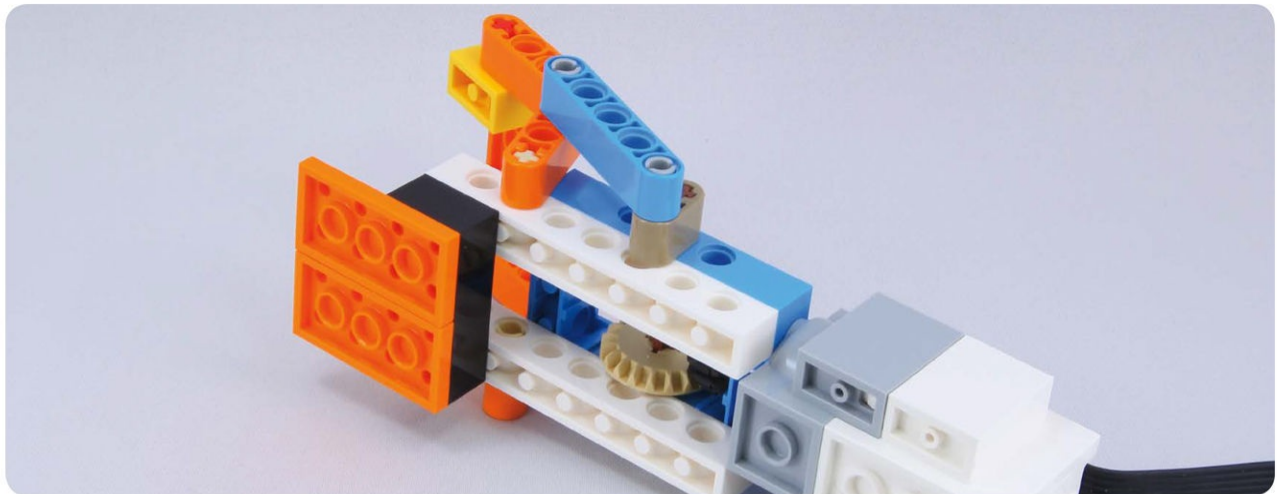




2  
 x2  
 3  
 x2  
 5  
 x2  
 x2  
 x3  
 x2  
 x2  
 x2

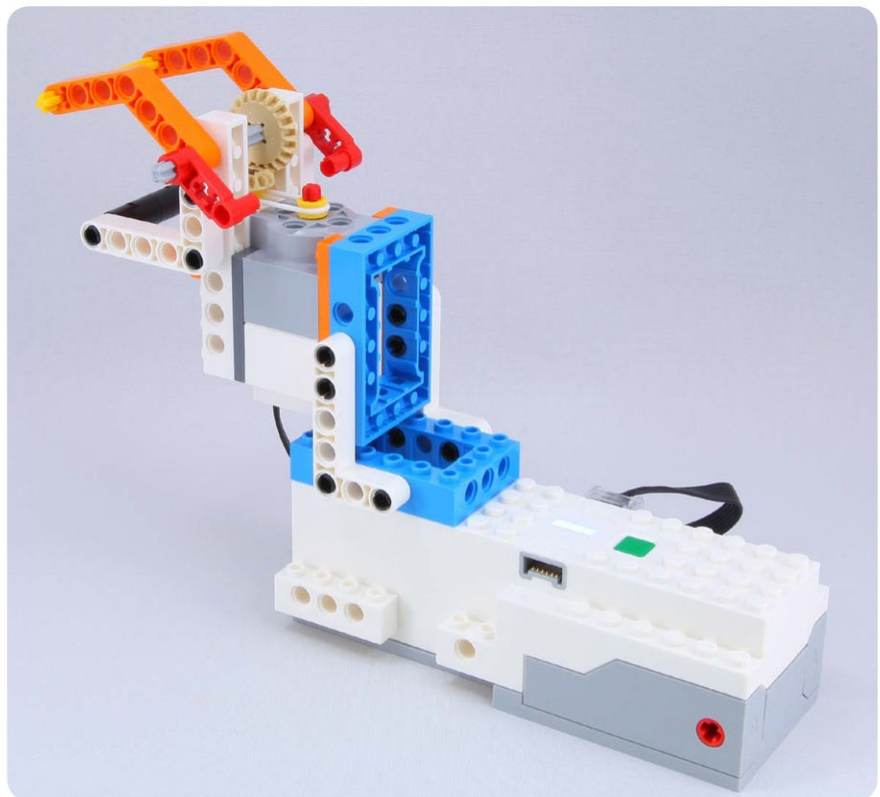
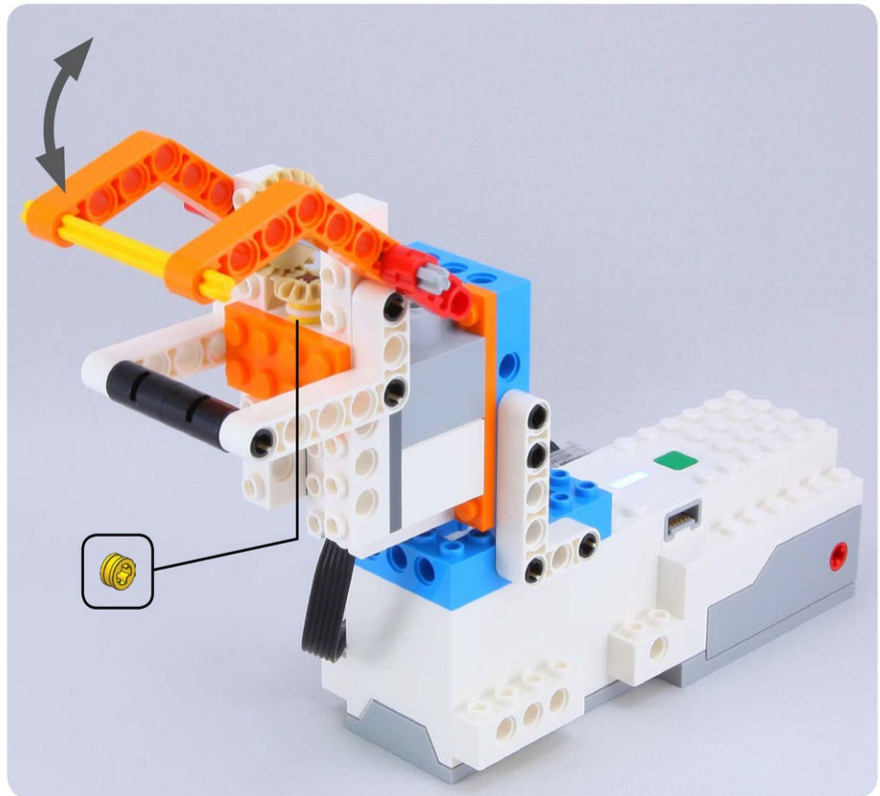
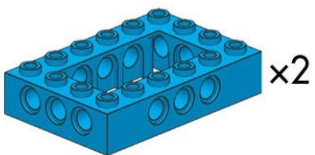
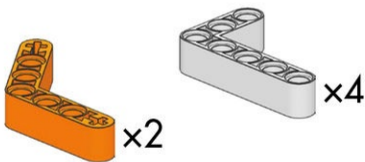
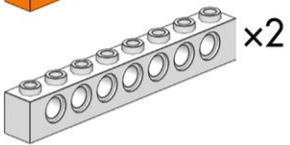
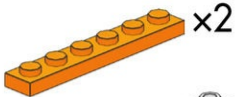
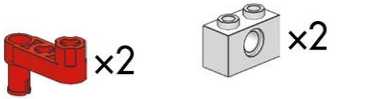






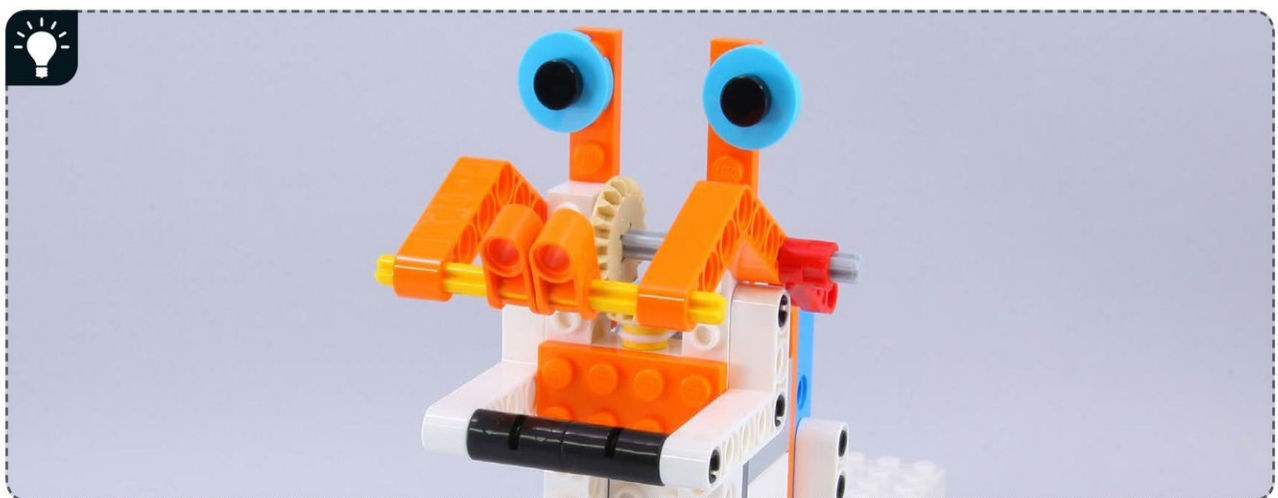
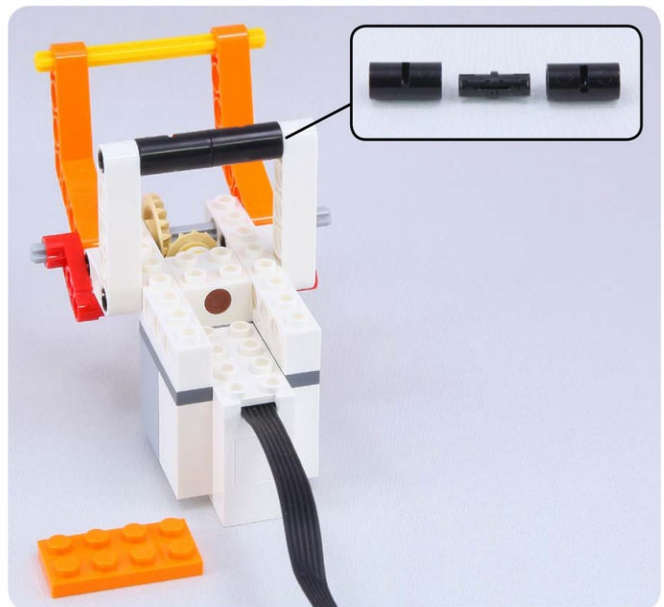
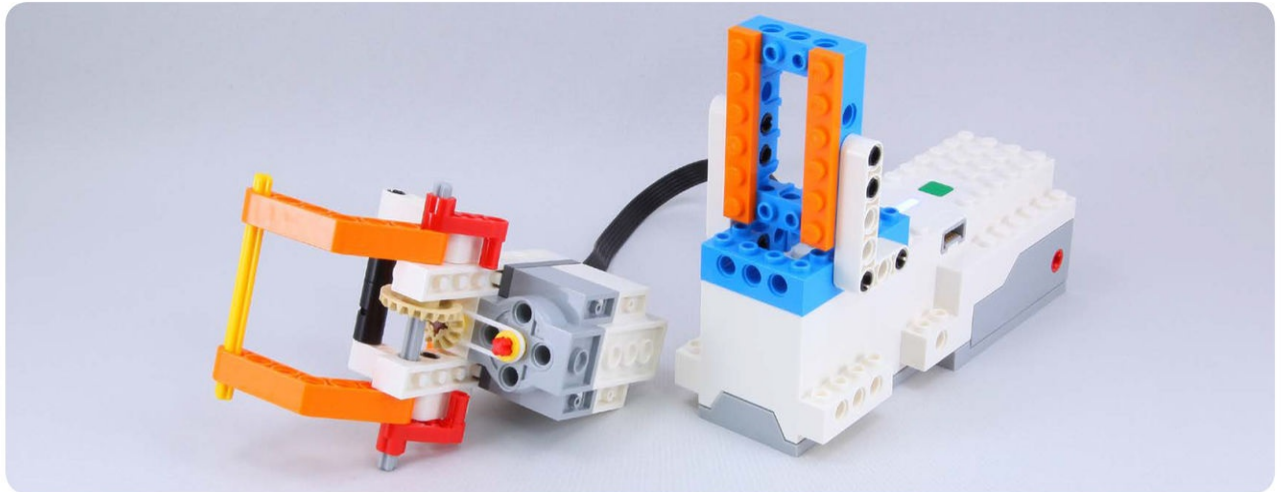


A detailed view of a LEGO Technic assembly. It features a long grey beam with a motor on the left side, indicated by a red circular logo. The beam is connected to various other components, including a yellow connector, a blue pin, and a green pin. The assembly is shown from a perspective view, highlighting the intricate connections and the use of different colored pins and connectors.

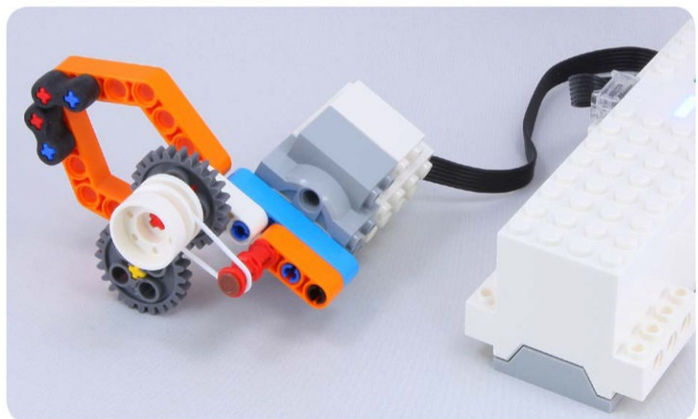
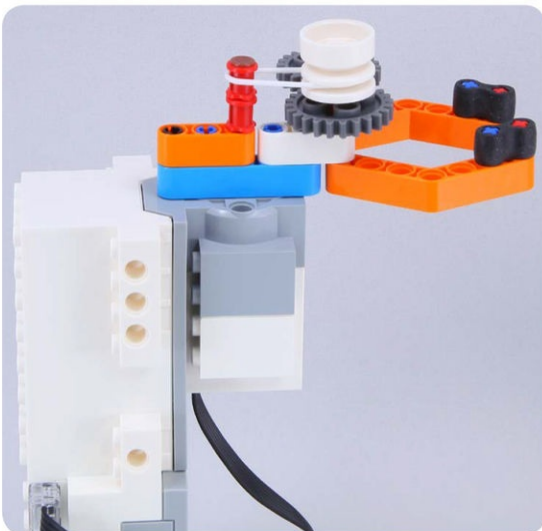


103

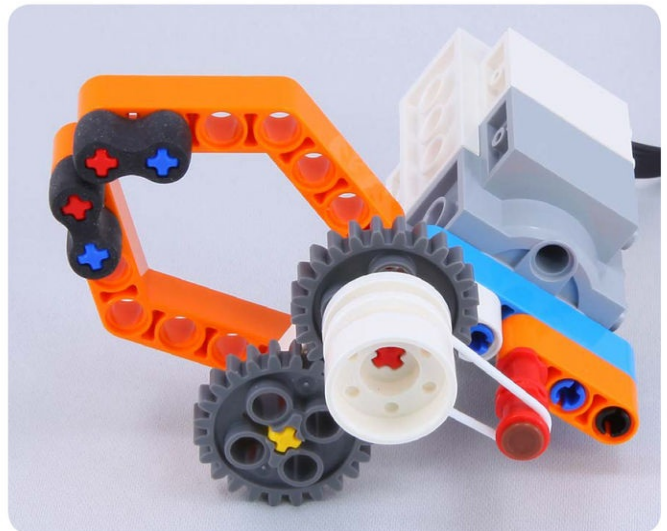
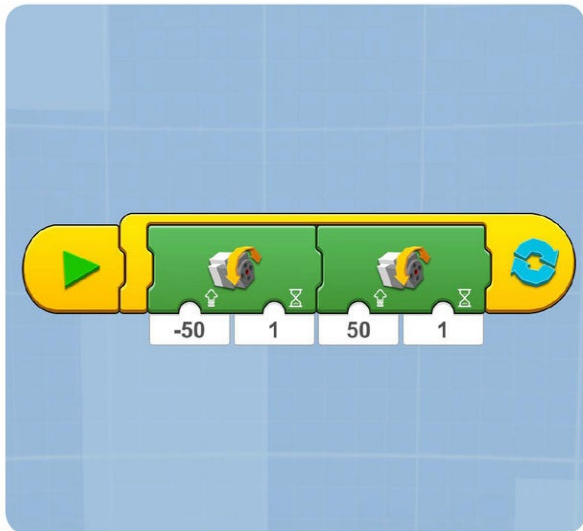







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
# 47




This diagram shows the assembly of a grey Technic beam. A long grey beam with 15 holes is being connected to a shorter grey beam with 5 holes. A red pin is inserted into the 1st hole of the long beam. A blue pin is inserted into the 10th hole of the long beam. A green pin is inserted into the 15th hole of the long beam. A yellow pin is inserted into the 1st hole of the short beam. A red pin is inserted into the 5th hole of the short beam. A blue pin is inserted into the 10th hole of the short beam. A green pin is inserted into the 15th hole of the short beam.



2   $\times 2$



x2



A yellow bar with a cross-section of 3 units wide.





x2

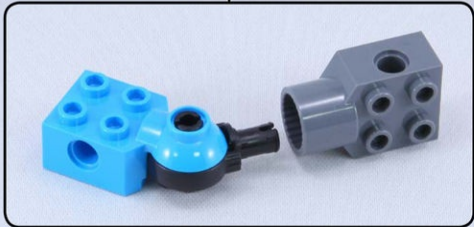
A yellow L-shaped connector, which is a 1x3 Technic brick with a hole in the center of the long side and a hole in the middle of the short side.

 x5

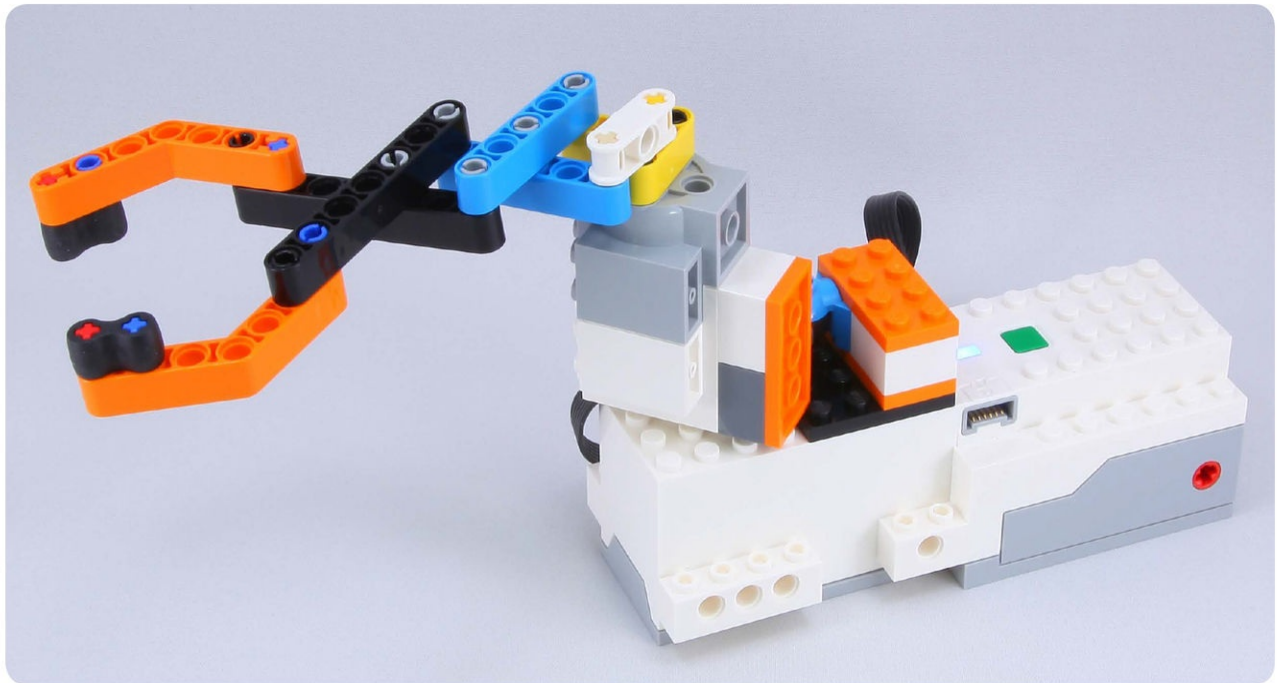
$\times 2$

  $\times 2$ 

$\times 3$

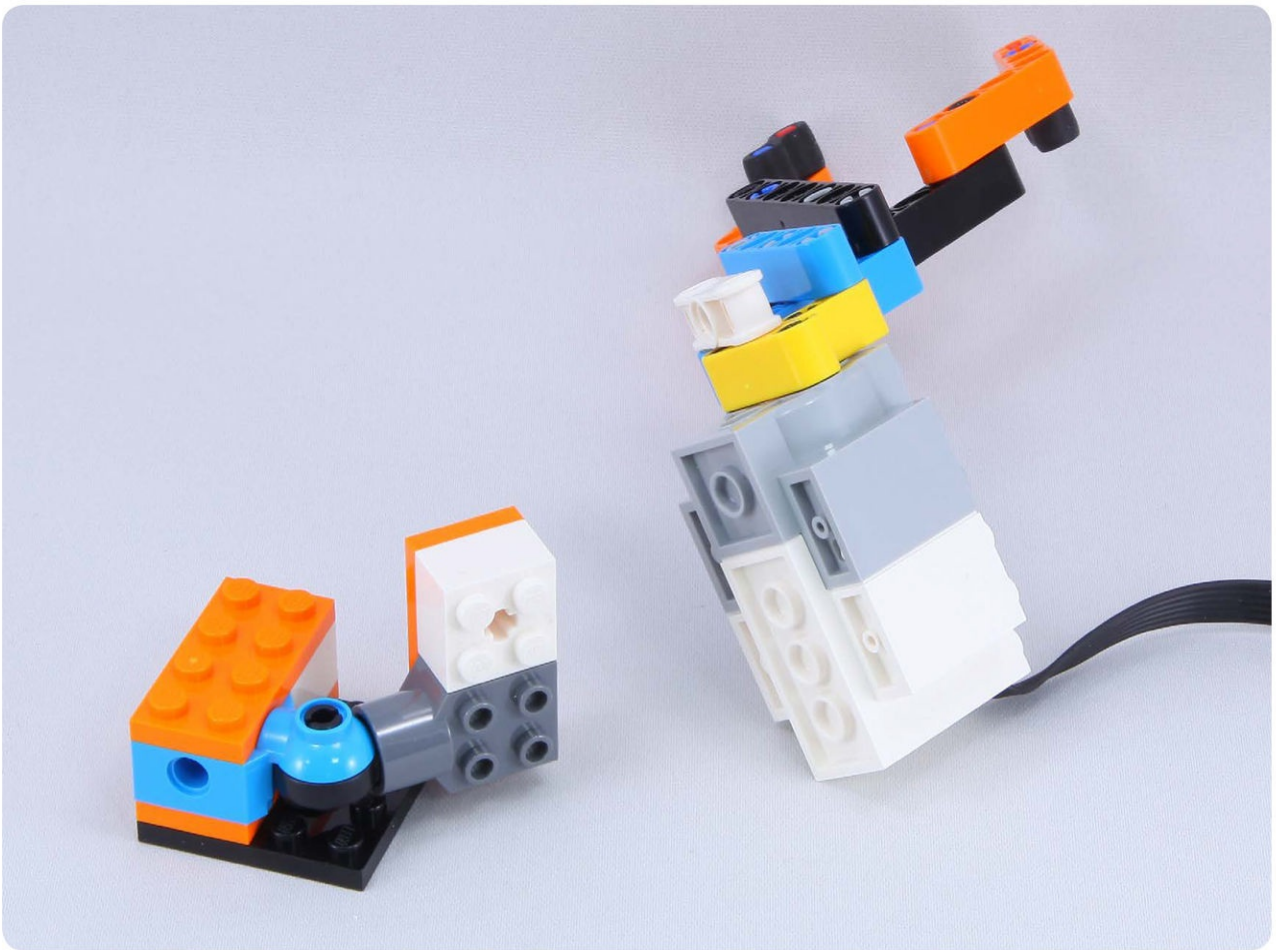
 x5 x4





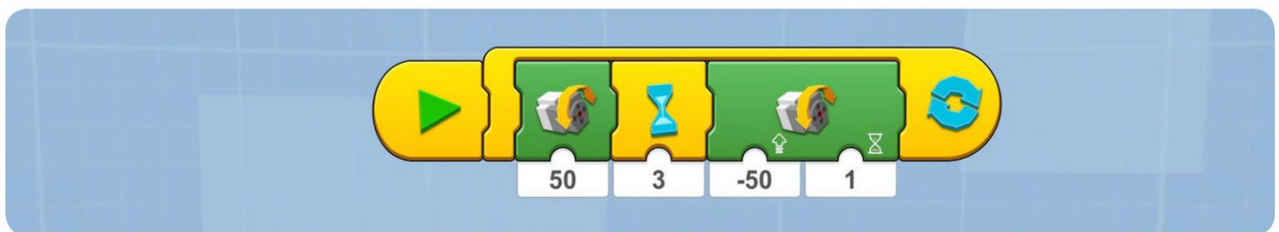
Gripping fingers 95



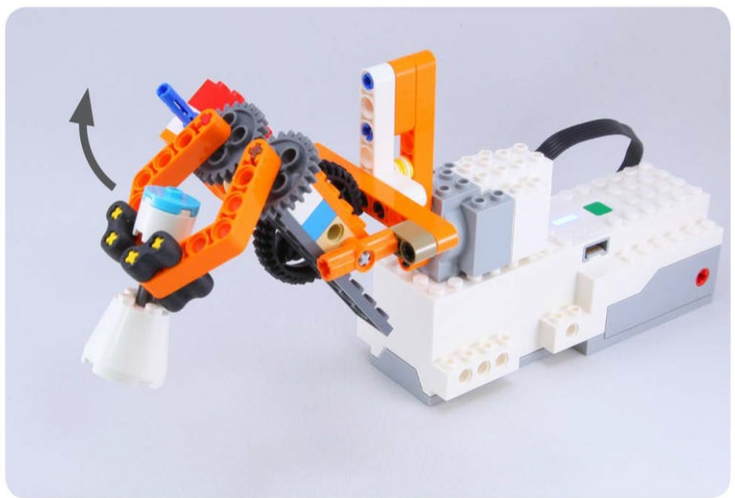
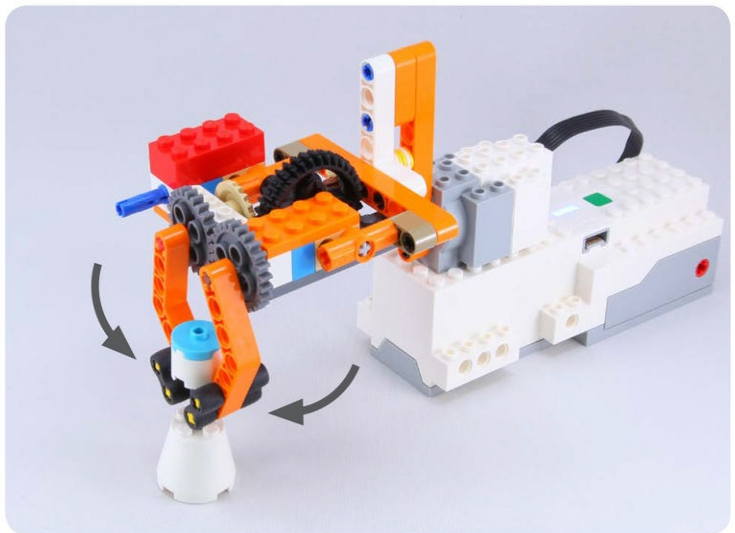
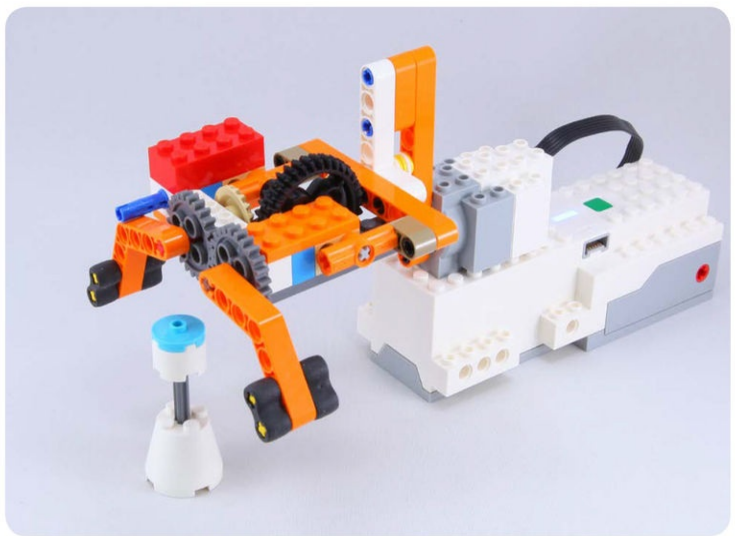


96 Gripping fingers

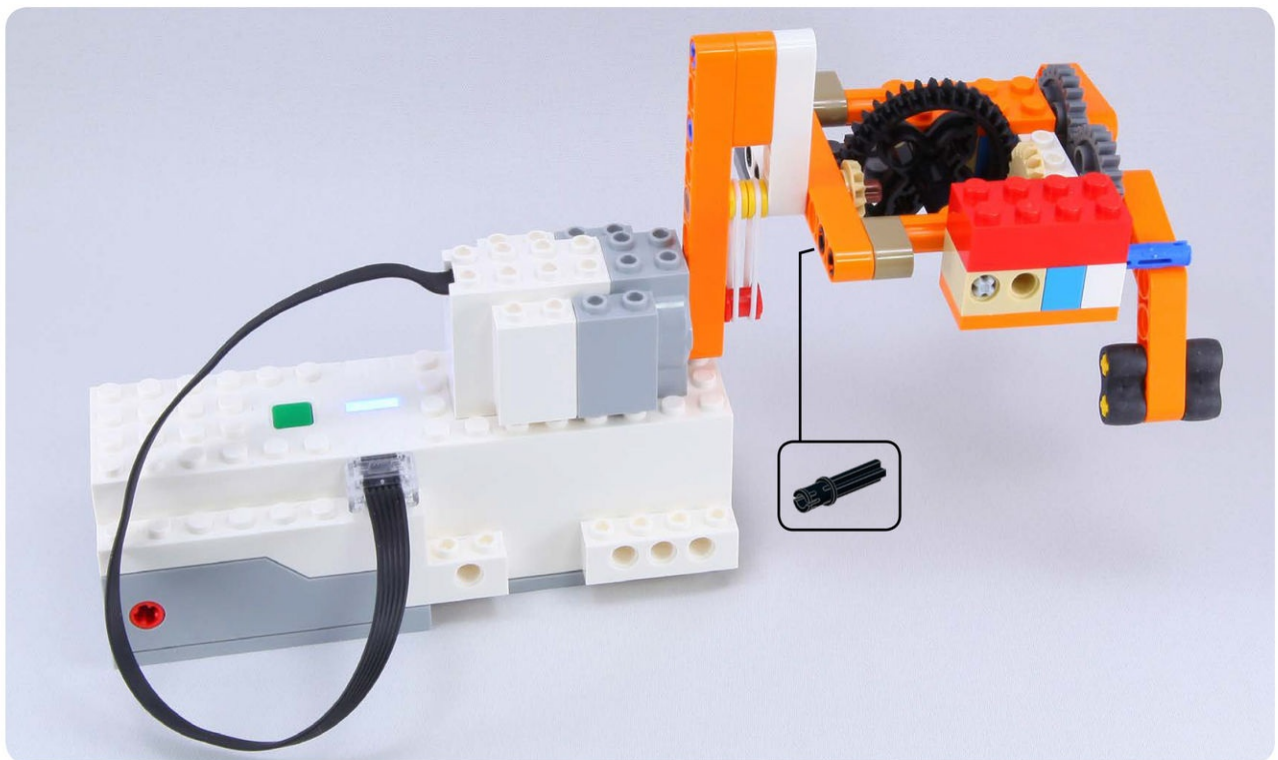
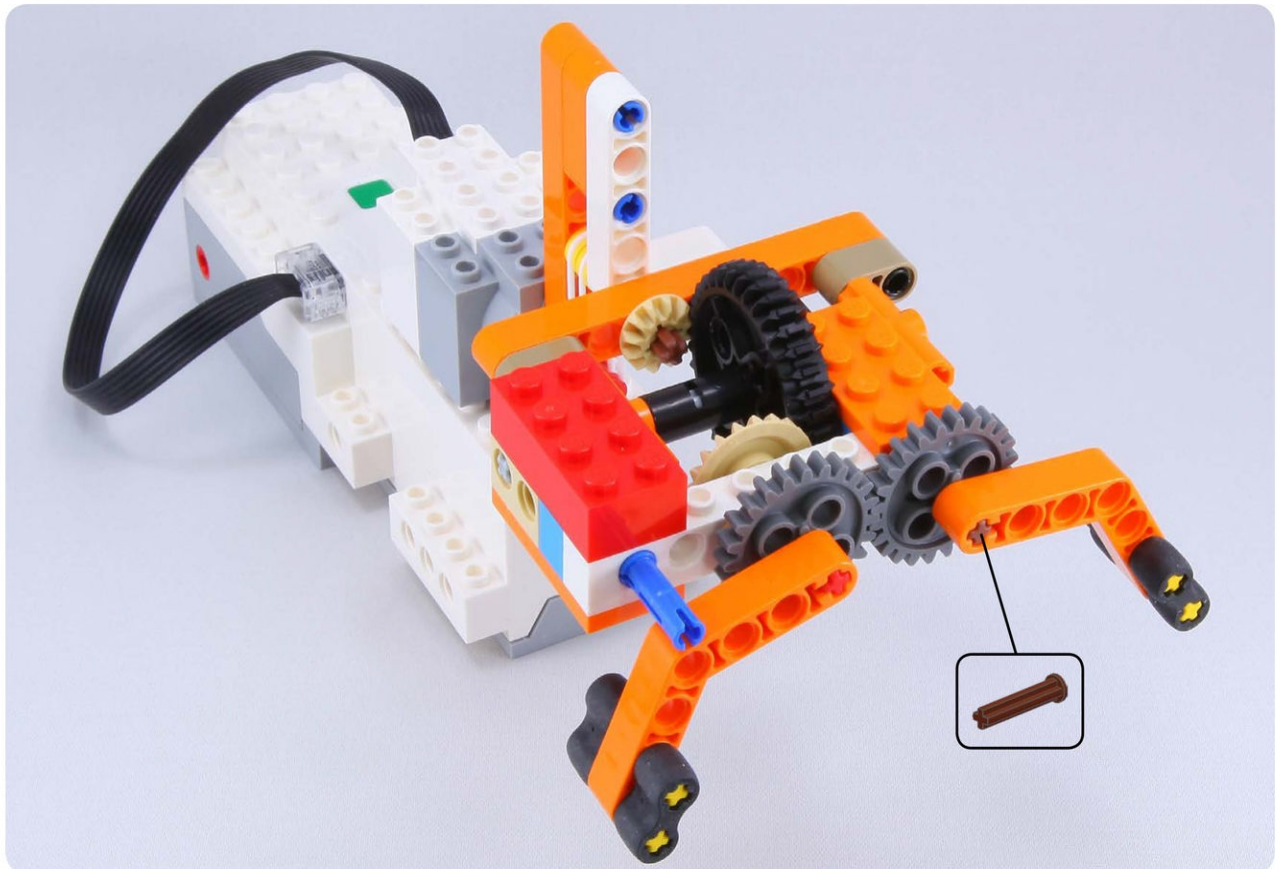




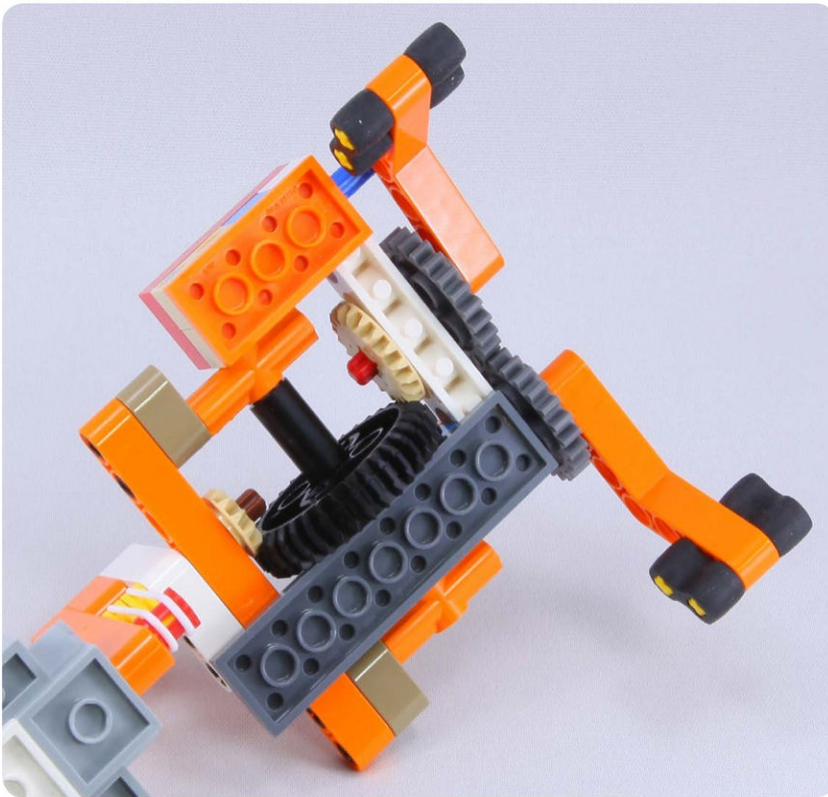
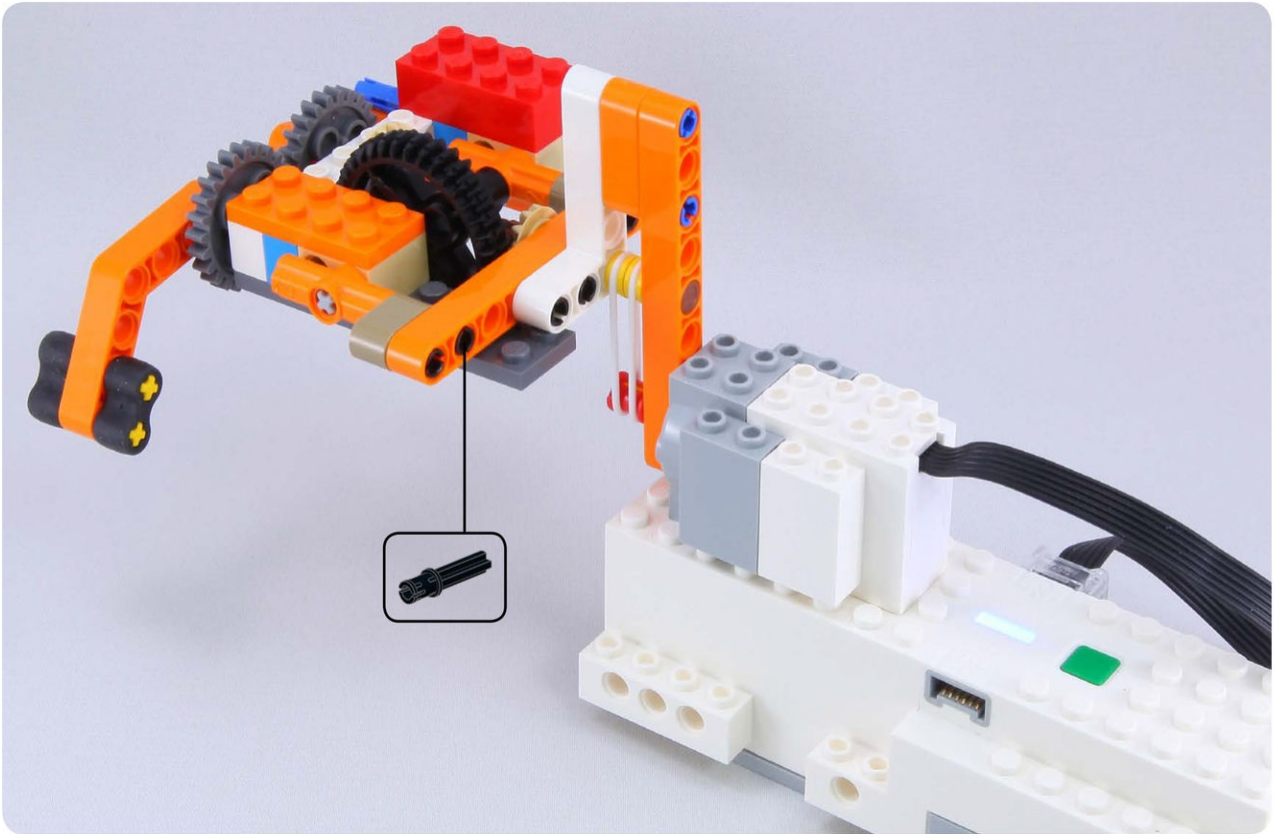


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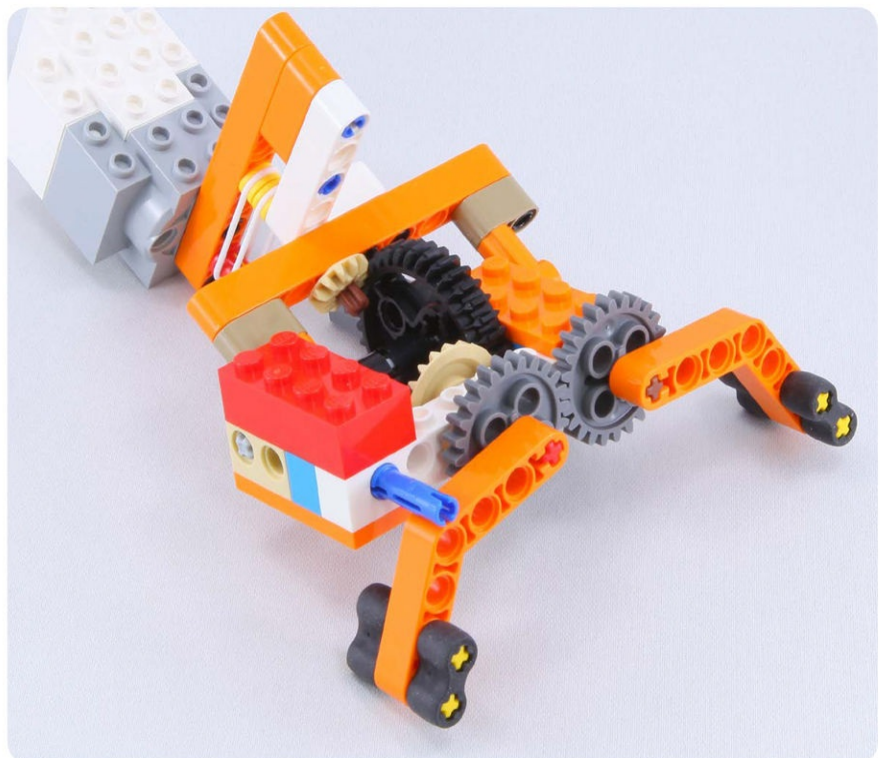
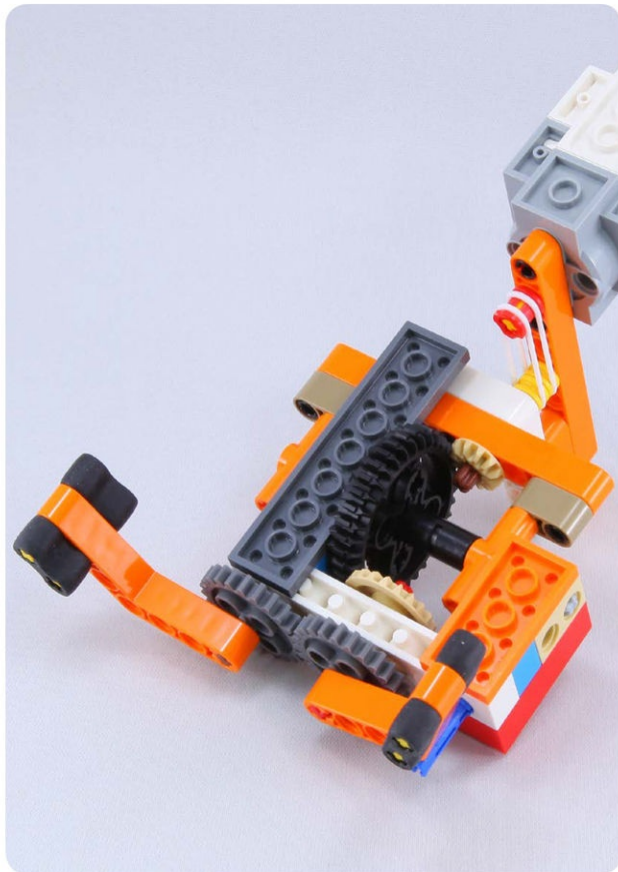




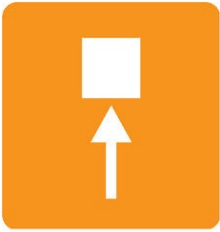


**100** Gripping fingers



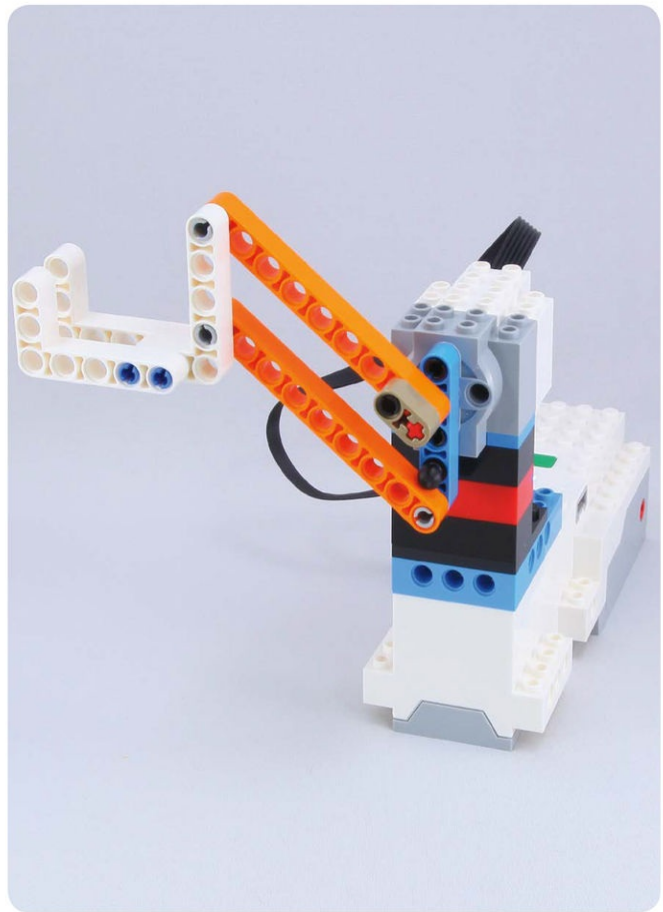
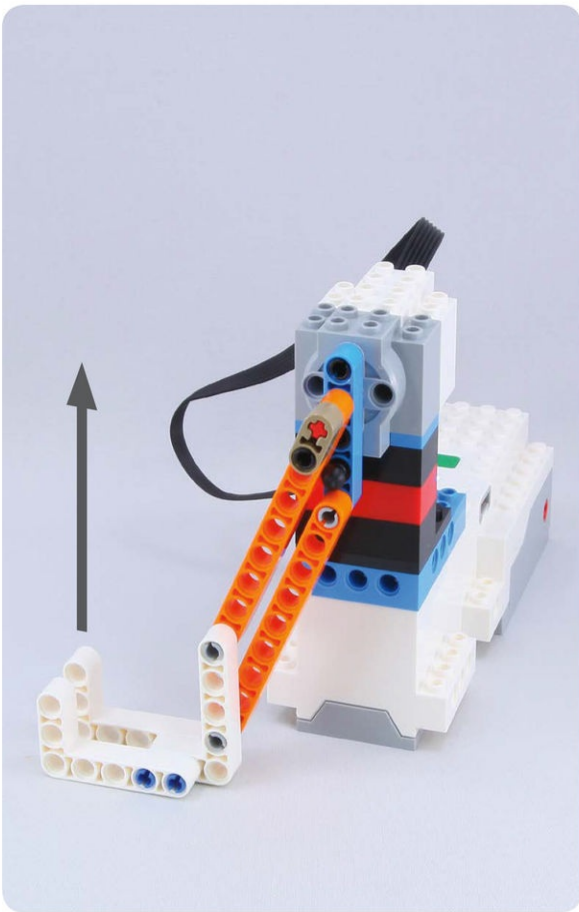
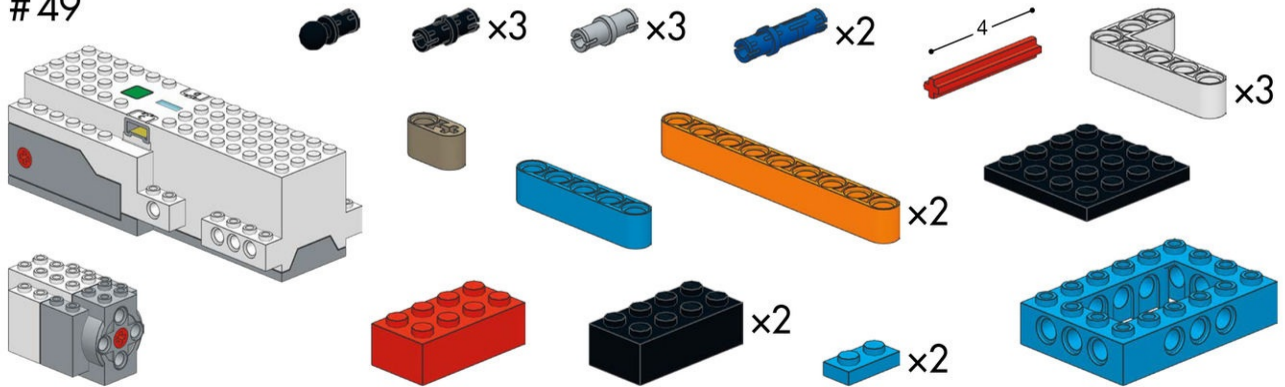






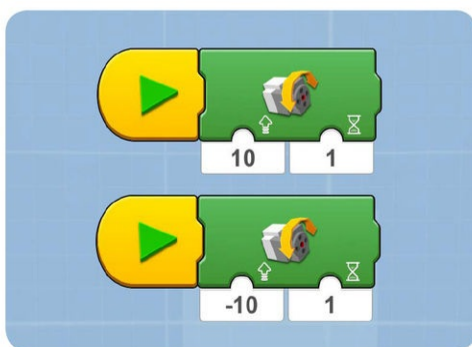
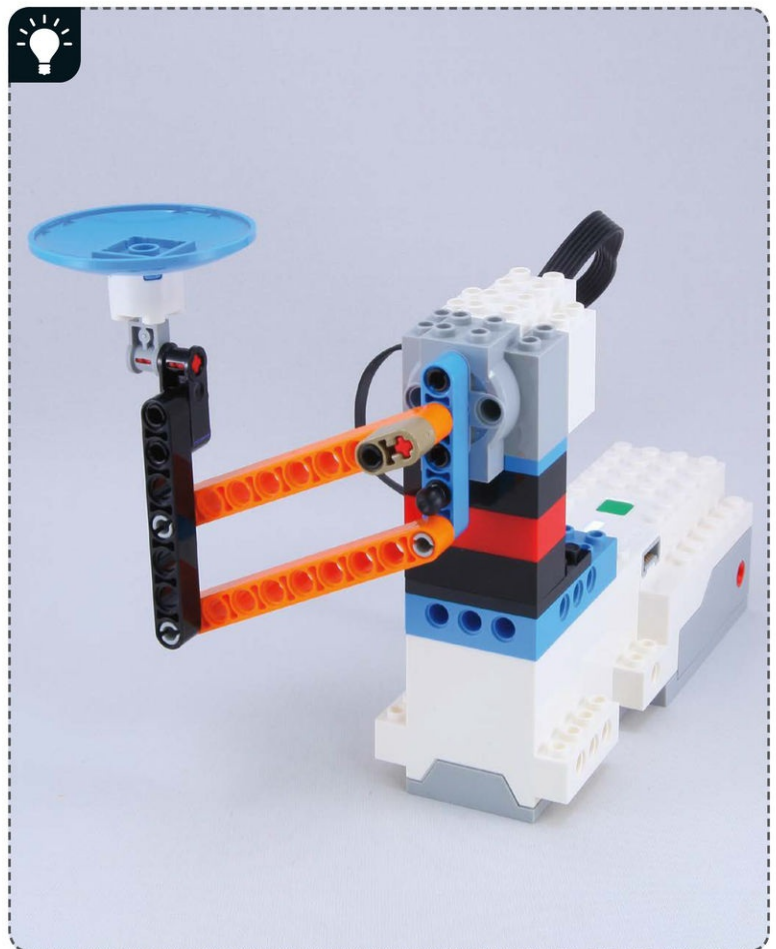
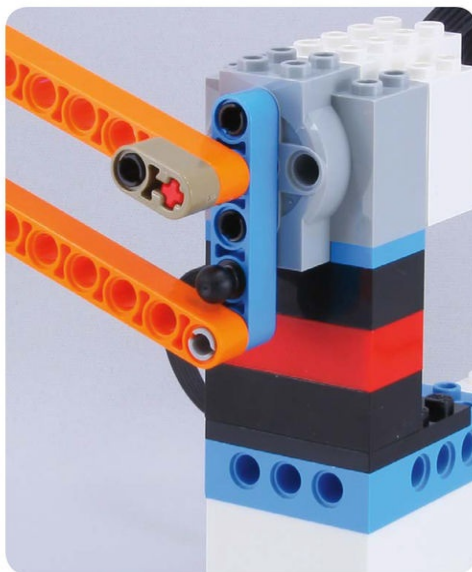
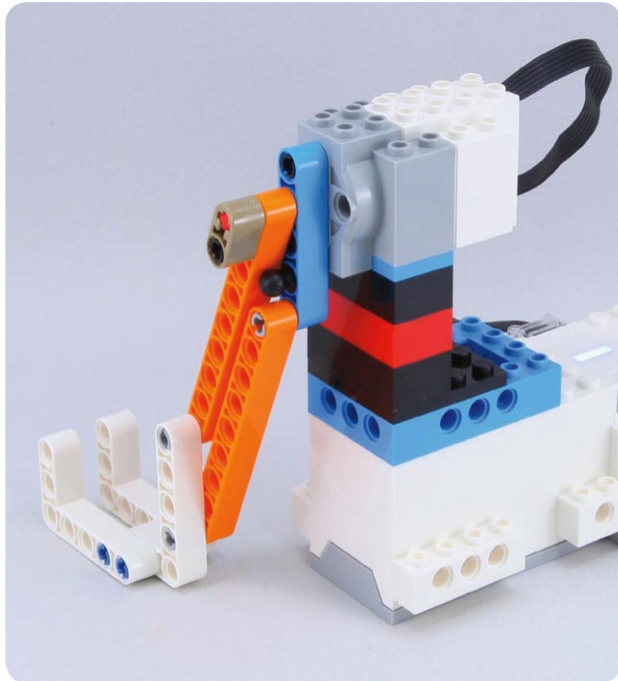
## Lifting things

#49

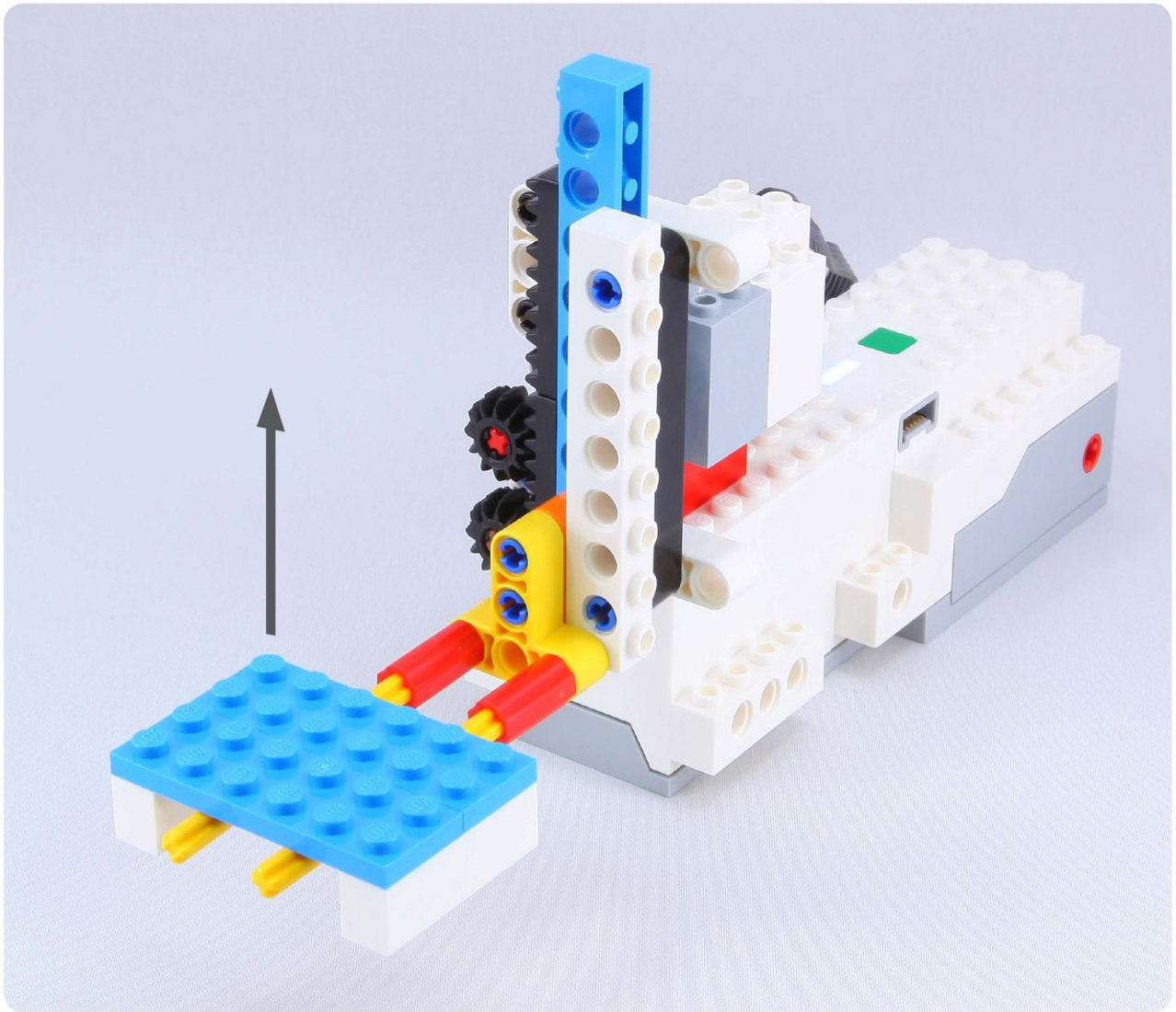


102 Lifting things

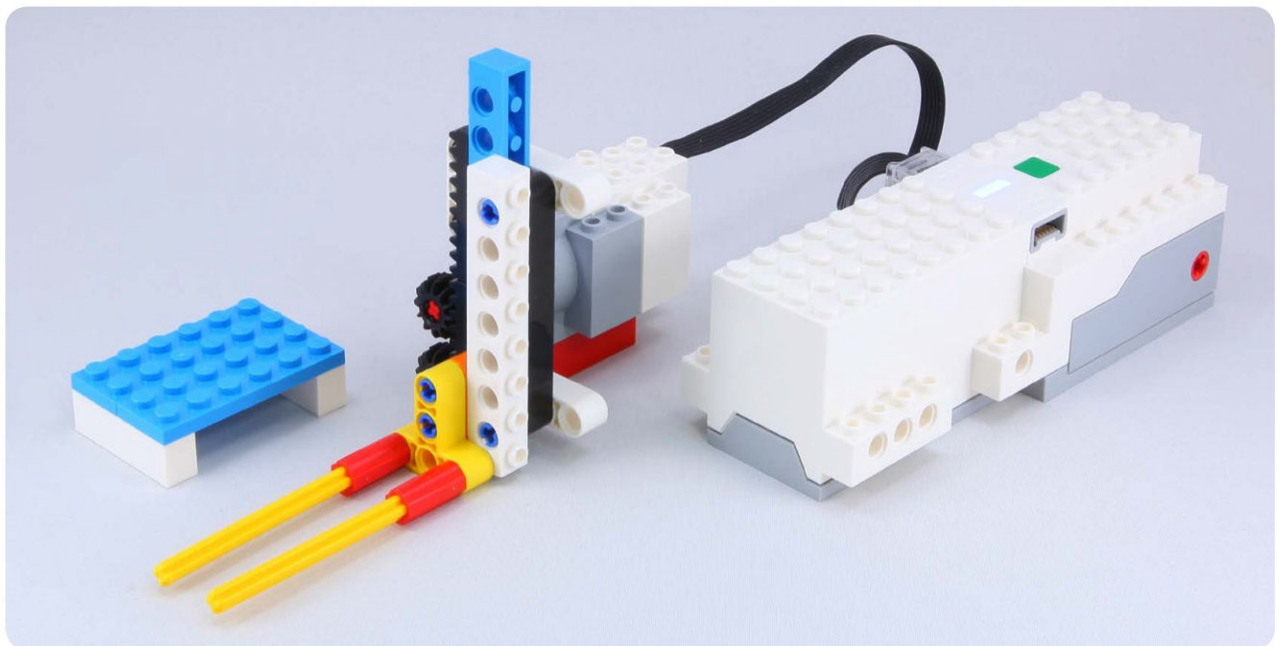
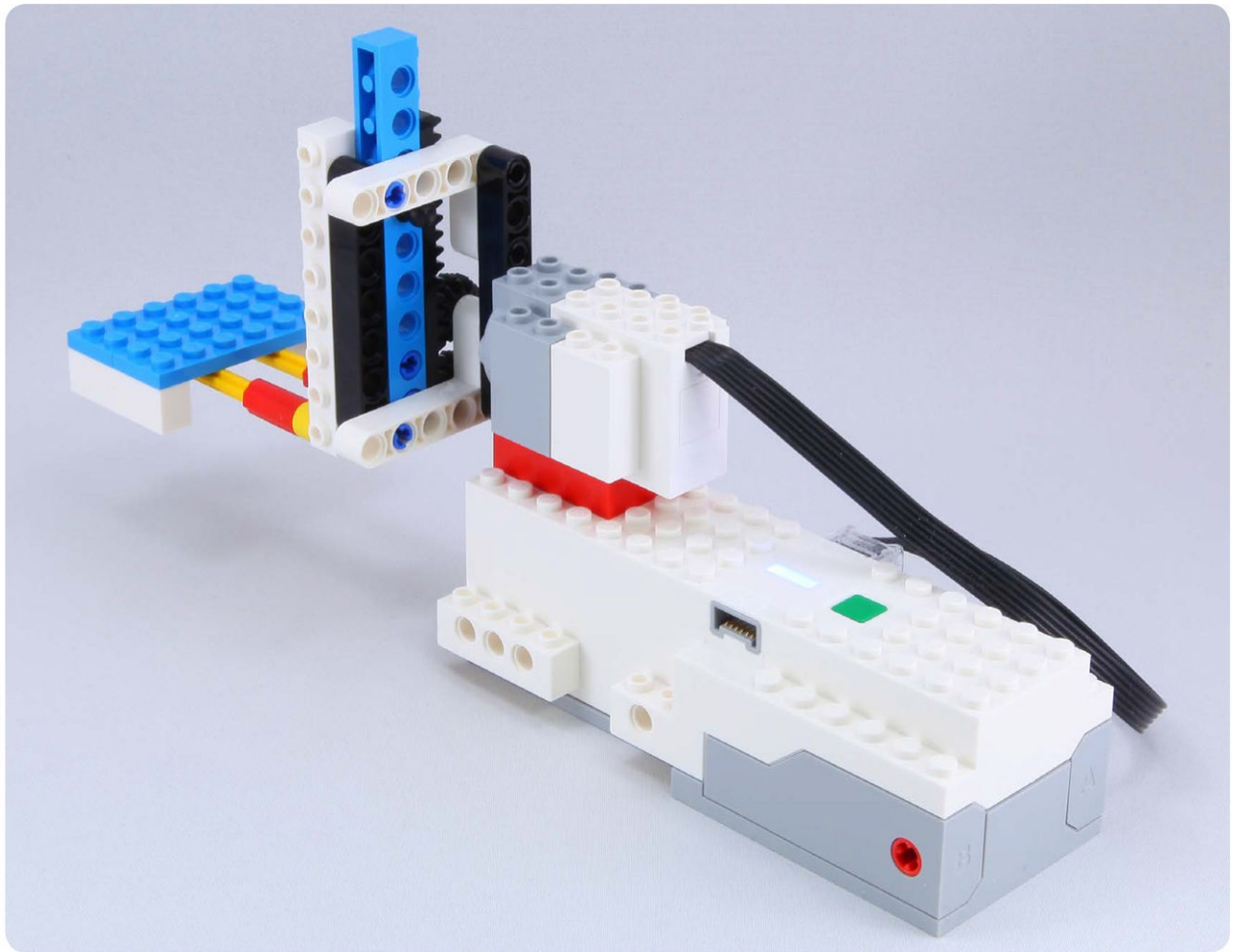




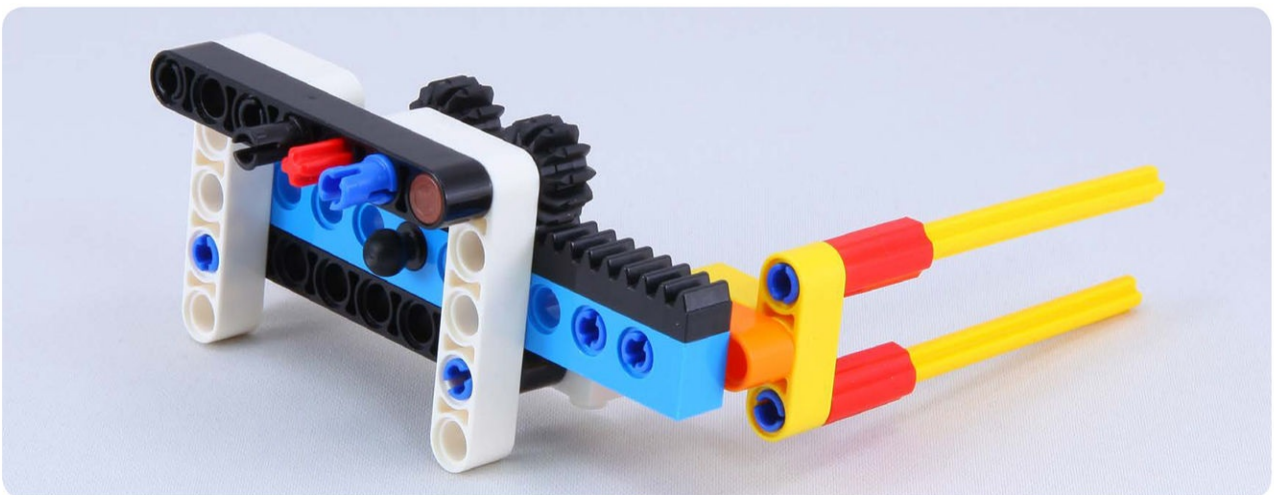
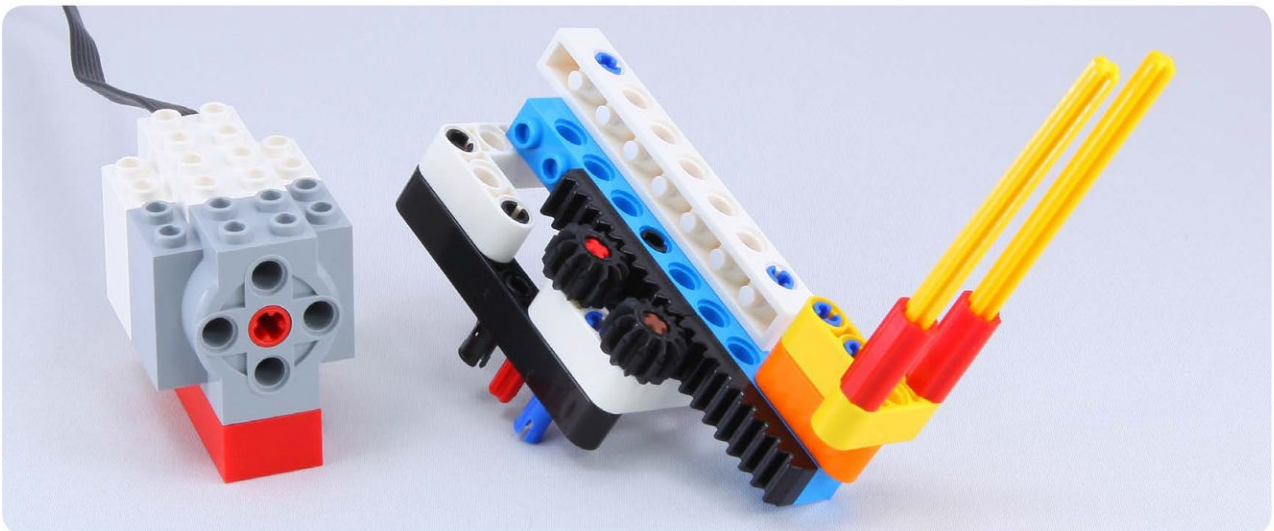
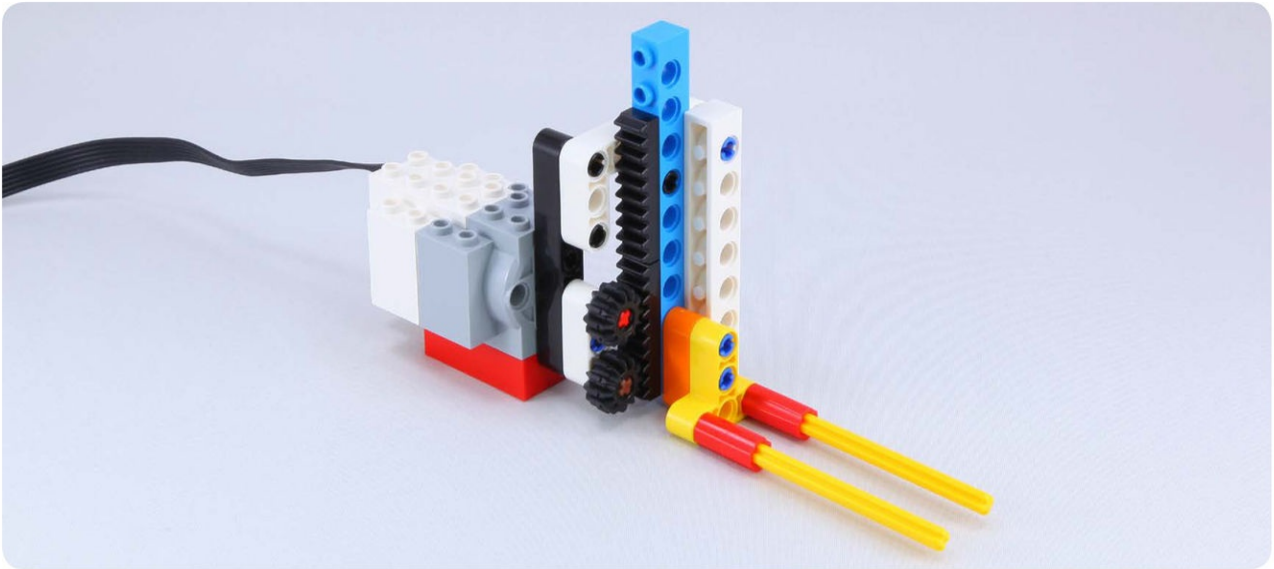


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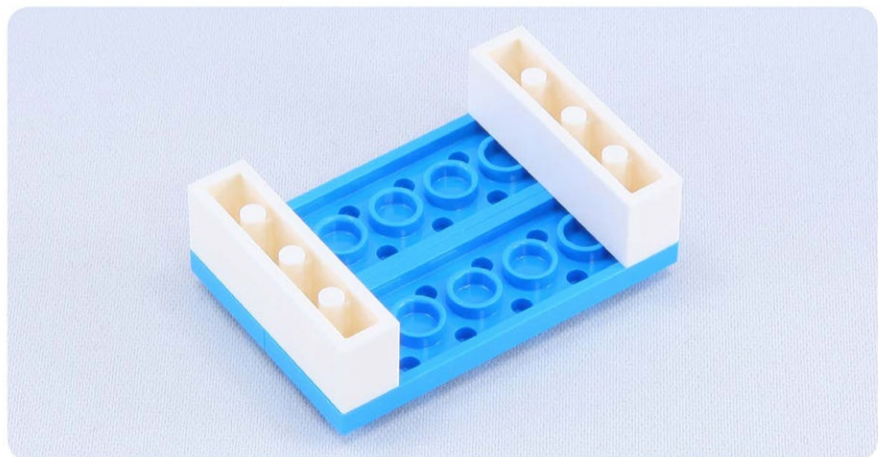
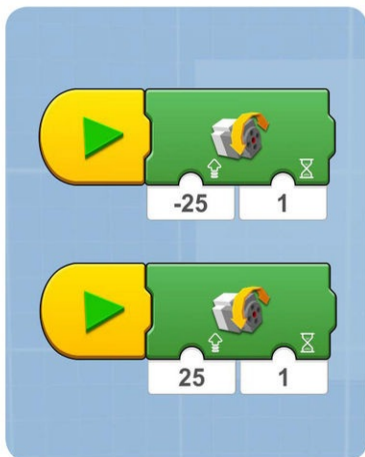
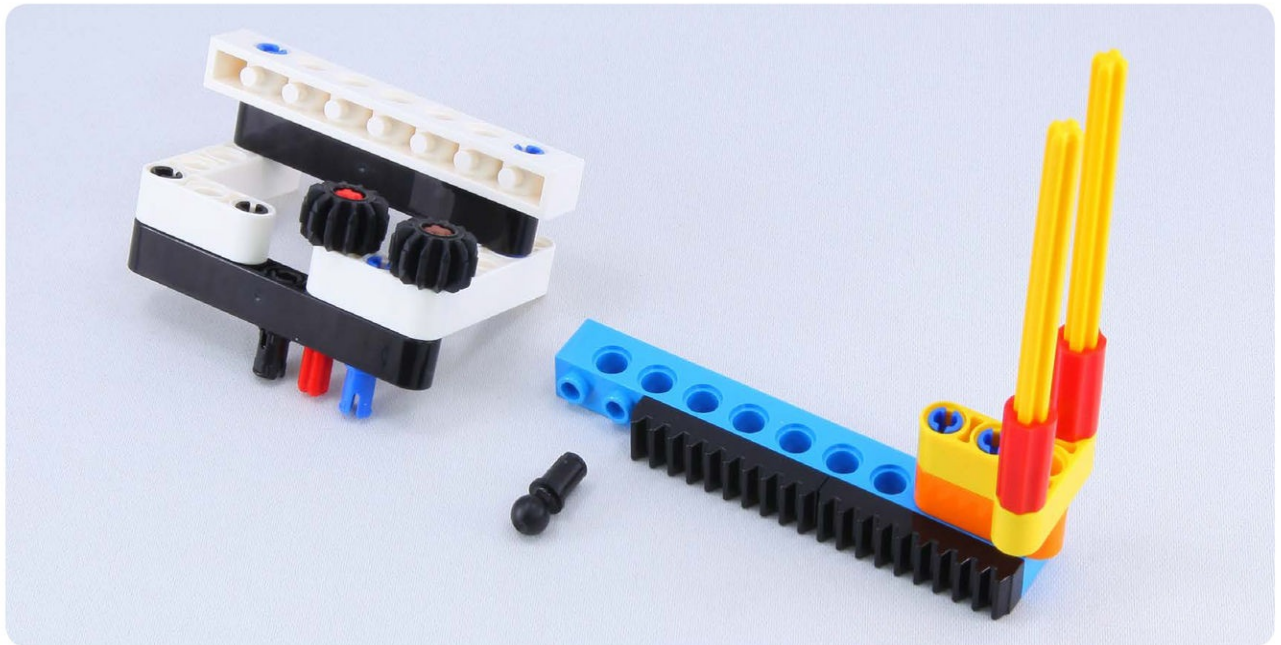
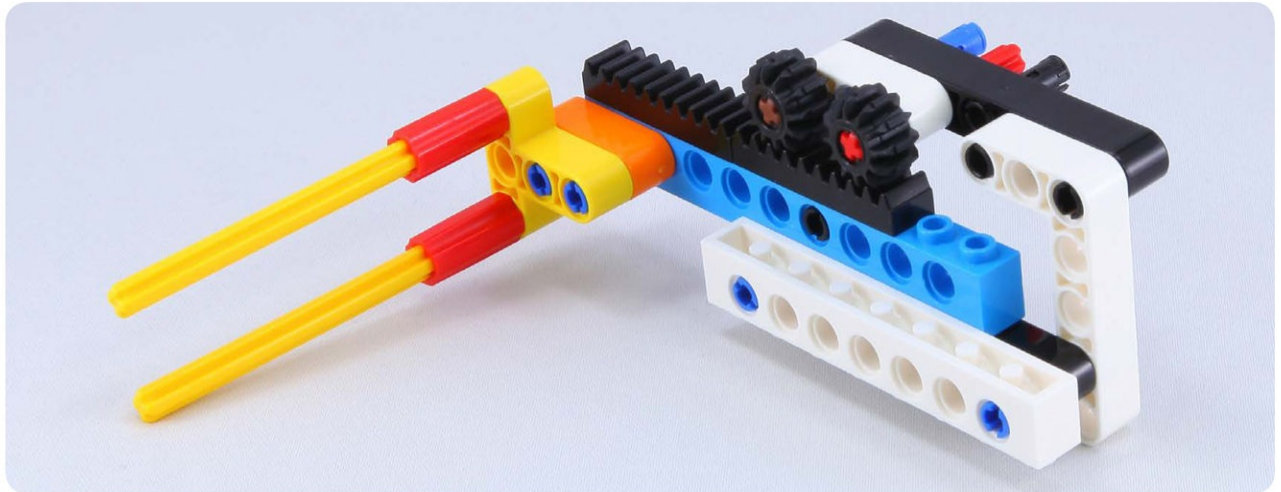




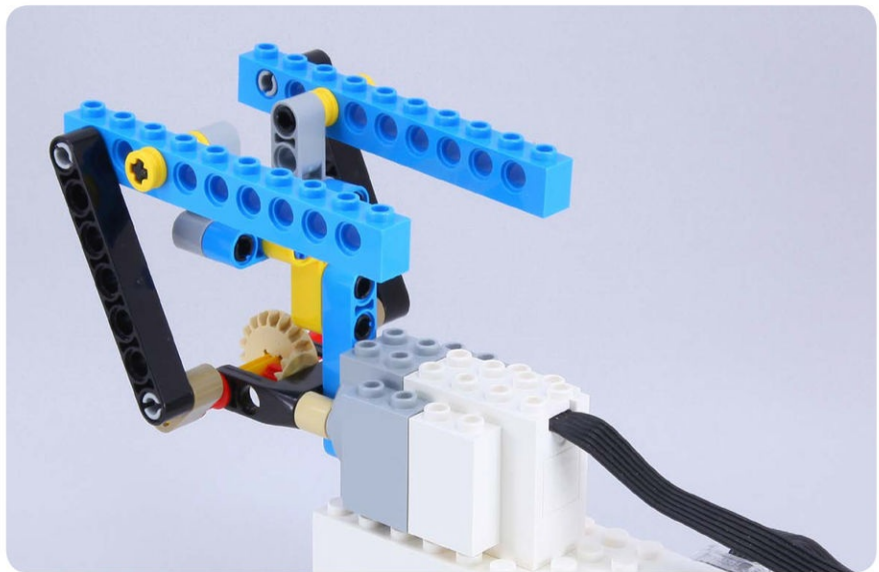




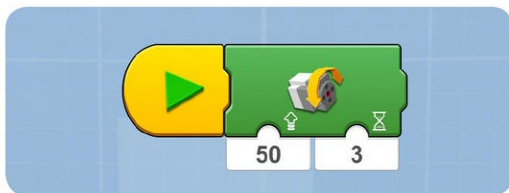
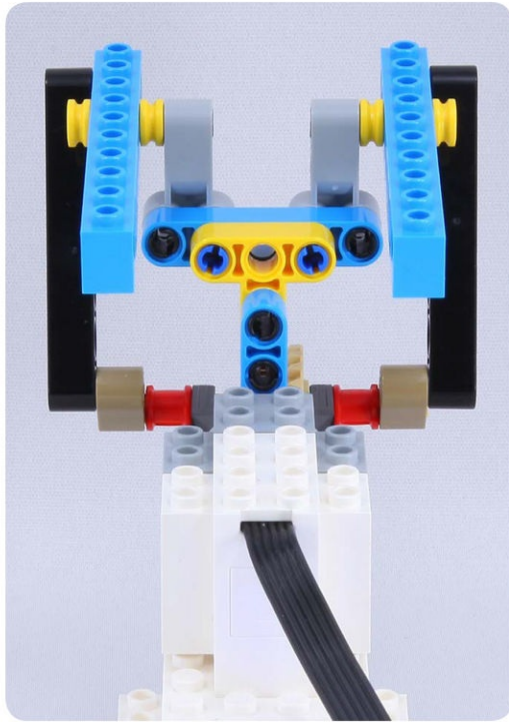






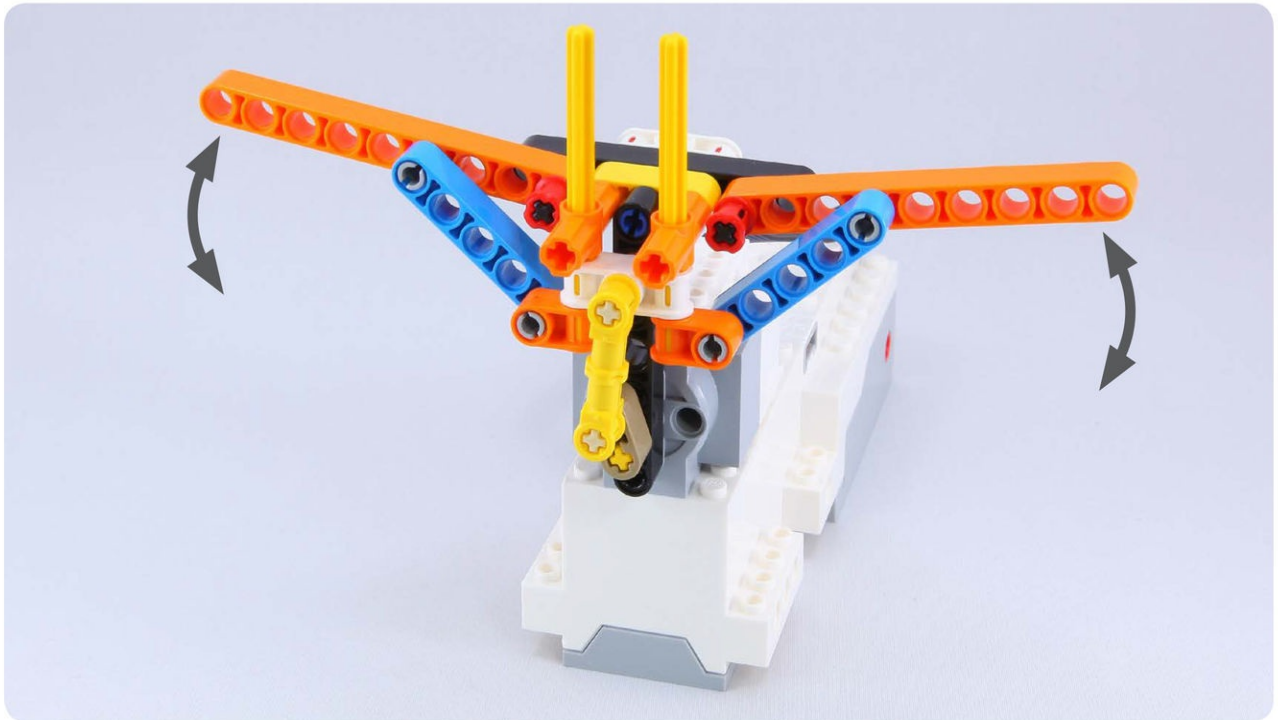
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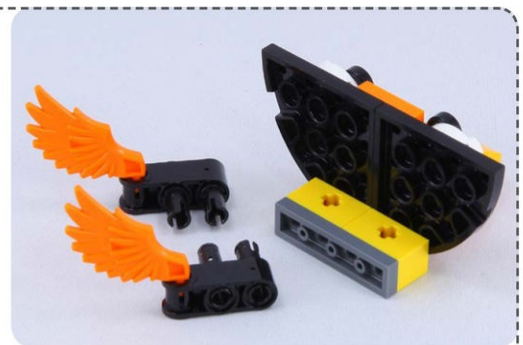
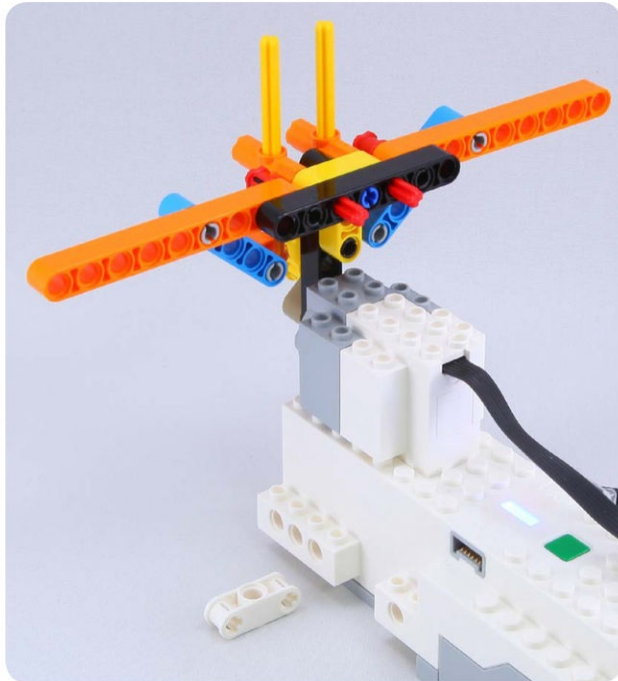


Flapping wings 109



[illegible]

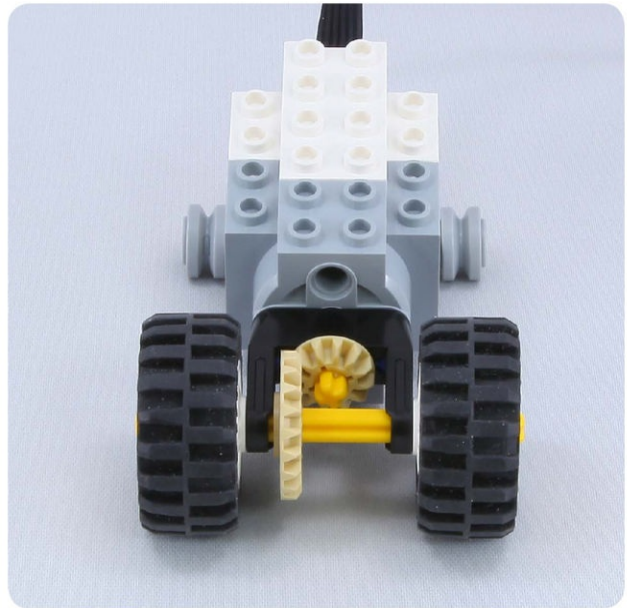




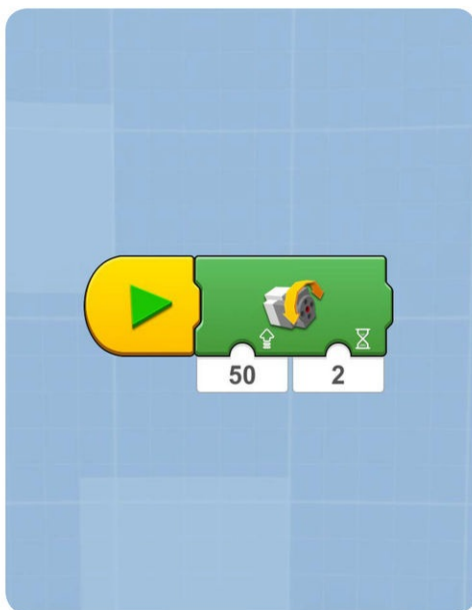
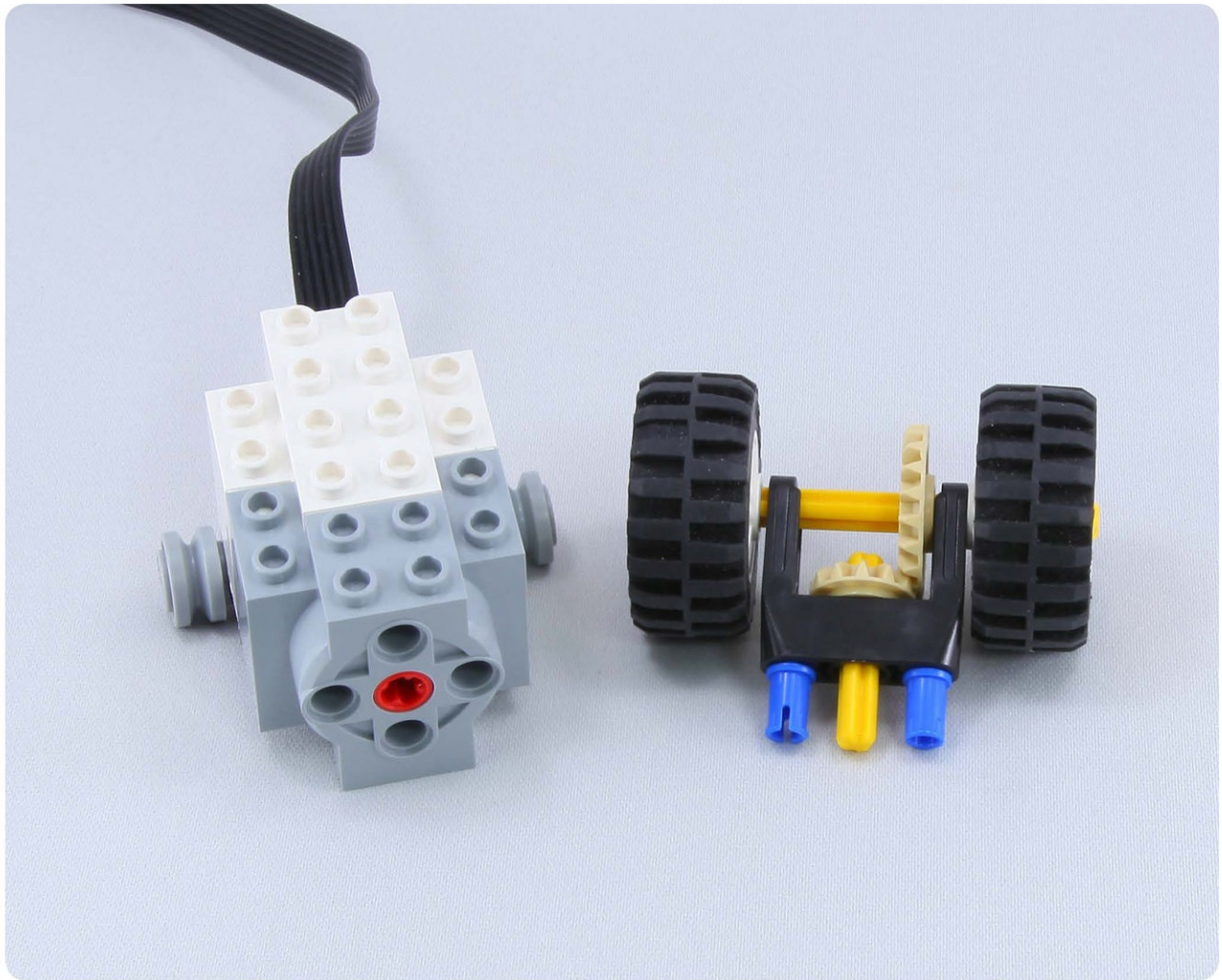




A photograph of a LEGO Technic assembly. On the left, a motor unit is constructed from white and grey Technic bricks, featuring two large black rubber tires mounted on yellow gears. A black cable connects this unit to a larger, more complex assembly on the right. This second assembly is primarily white with grey base plates and includes a green square sensor or light on top, a red circular indicator on the side, and a multi-pin connector port. The entire setup is placed on a plain, light-colored surface.

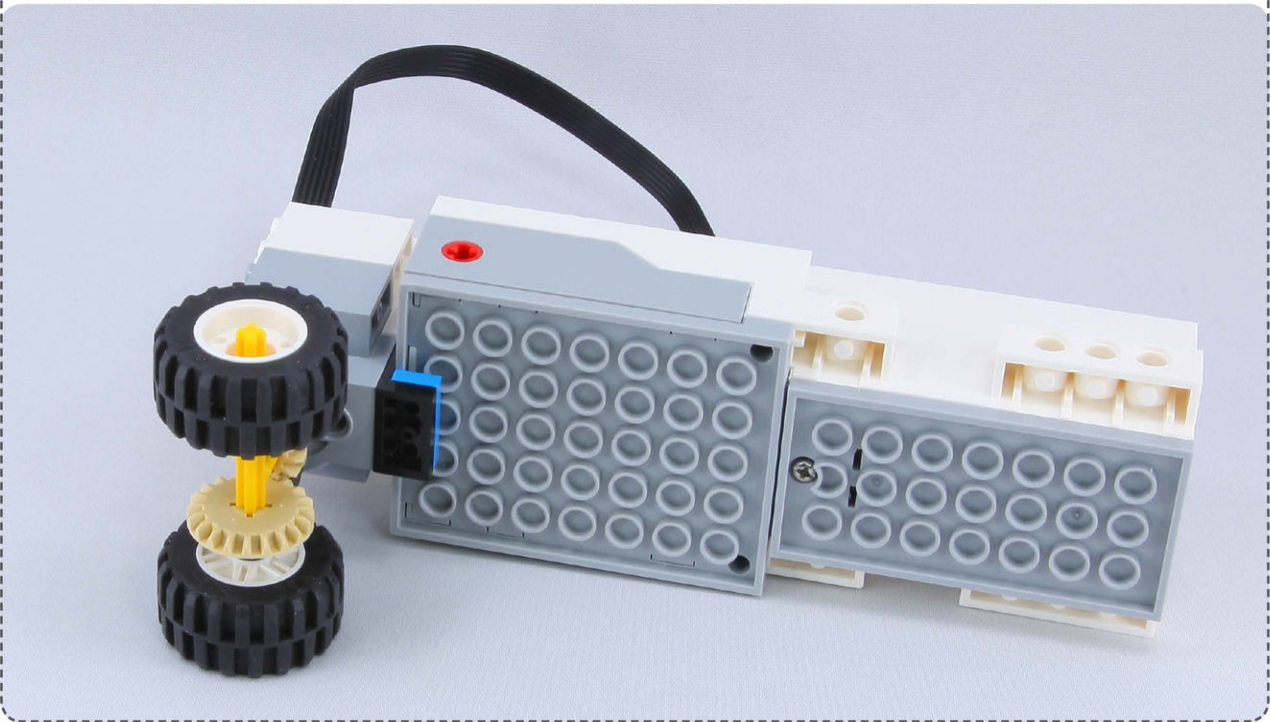
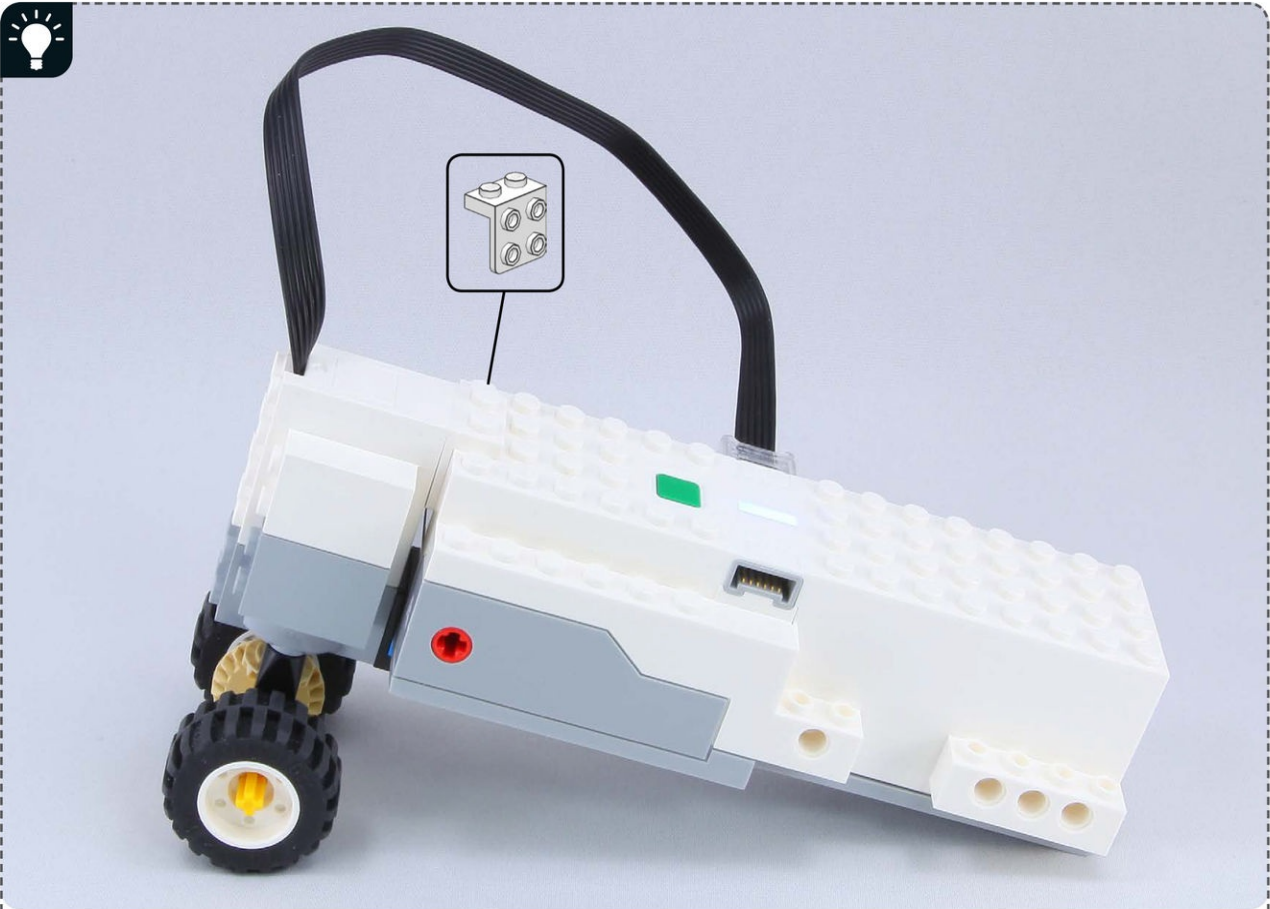






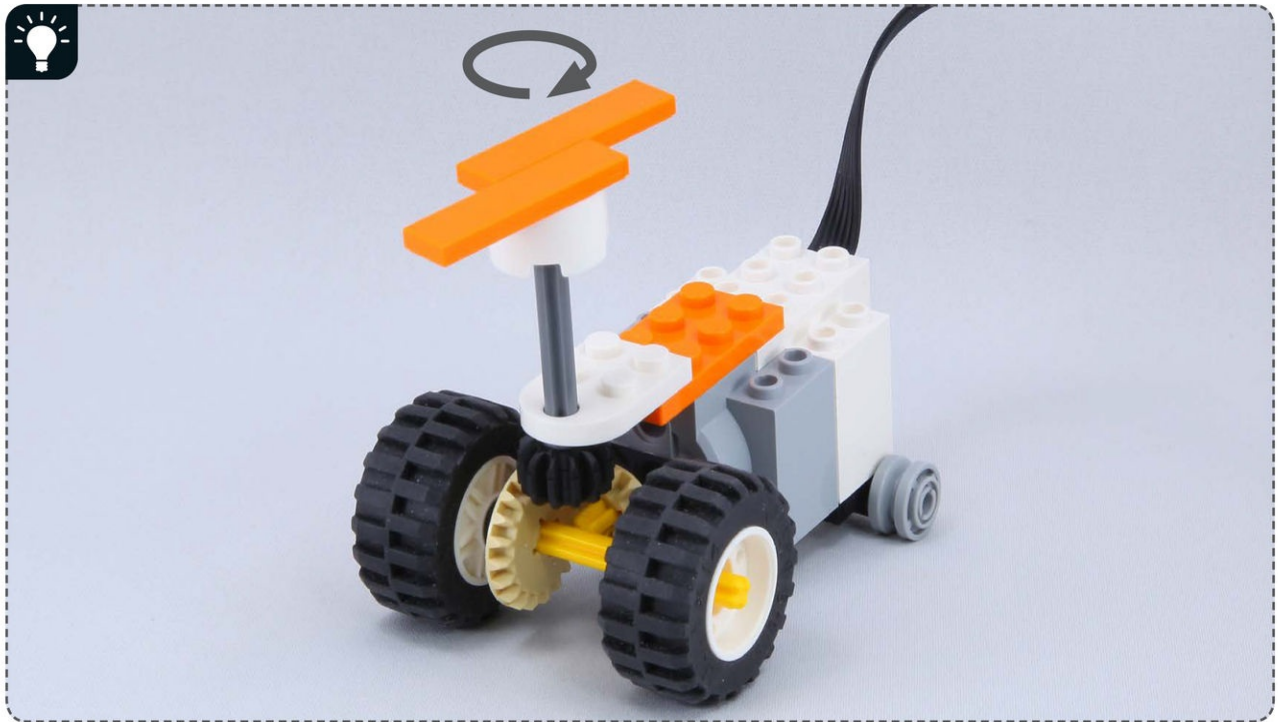
Rotating wheels with the Interactive Motor **113**





**114** Rotating wheels with the Interactive Motor





Rotating wheels with the Interactive Motor 115



# 54





Diagram showing the assembly of a motor component. The main assembly consists of a grey motor with a red dot, connected to a long grey beam with a green square and a yellow piece. A separate sub-assembly shows a grey motor with a red dot and a grey beam with a red dot. A red dot is also shown at the bottom left.

 x6


x2



x2



x2



x2



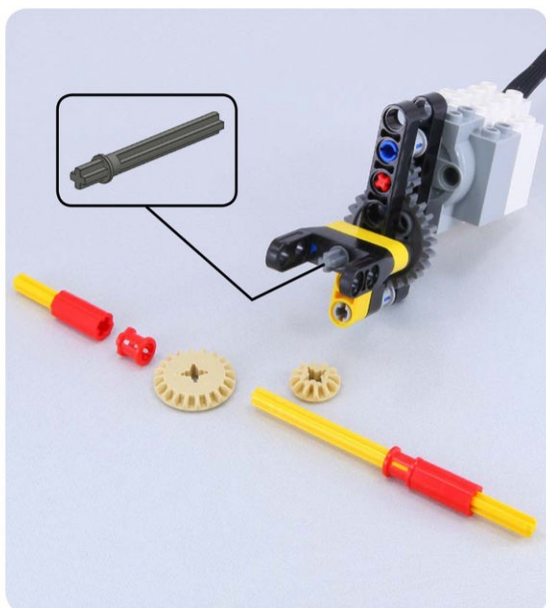
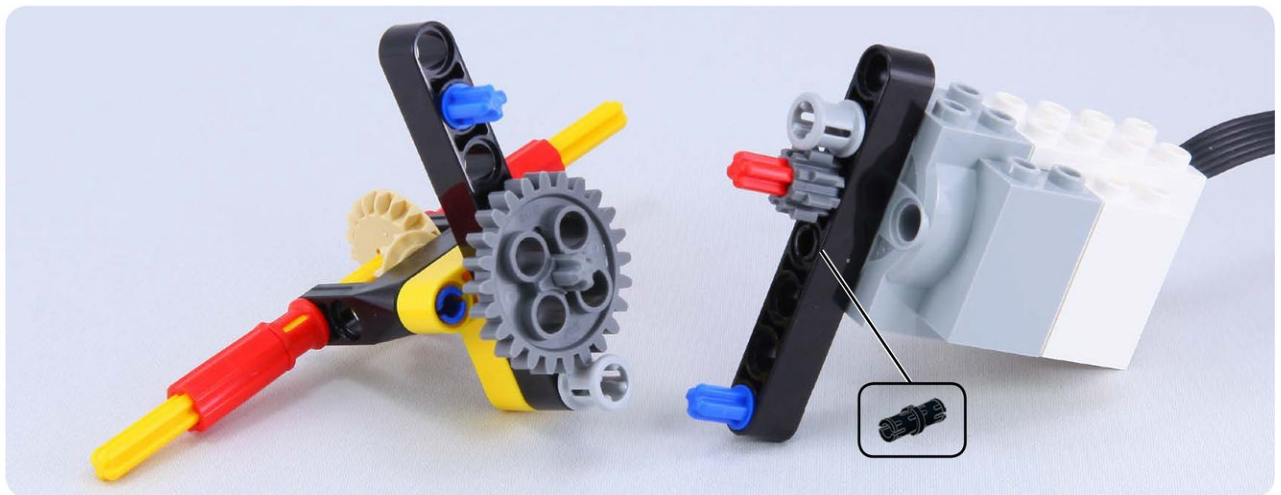
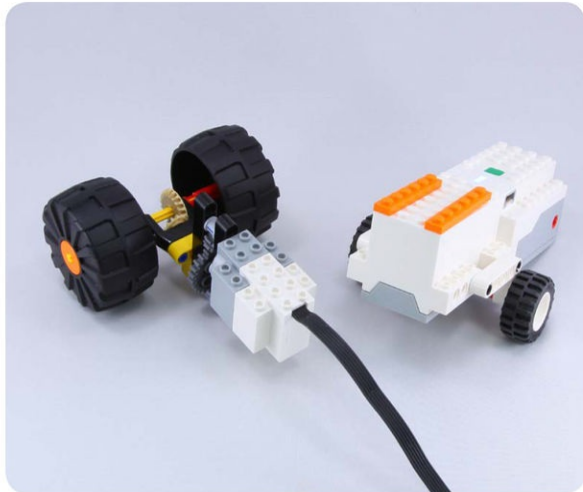
x2

  $\times 2$ 

x2





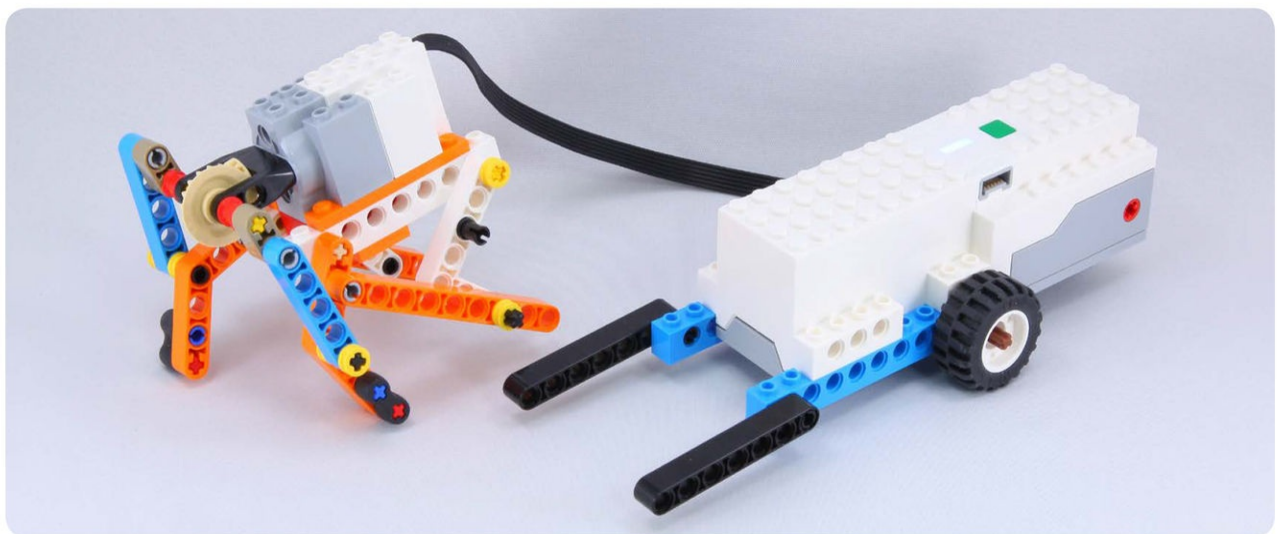
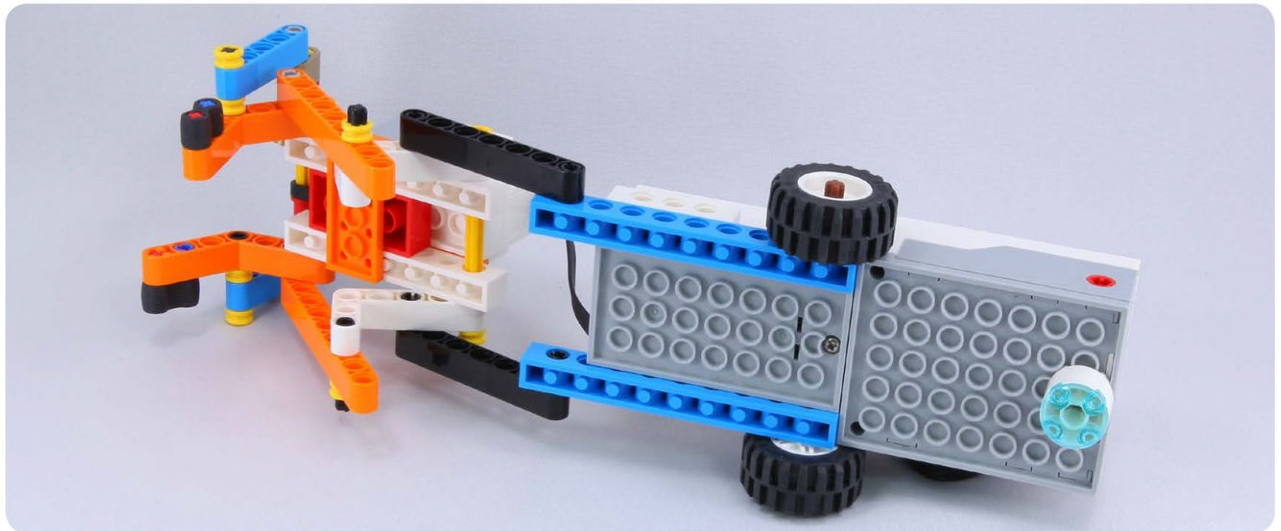
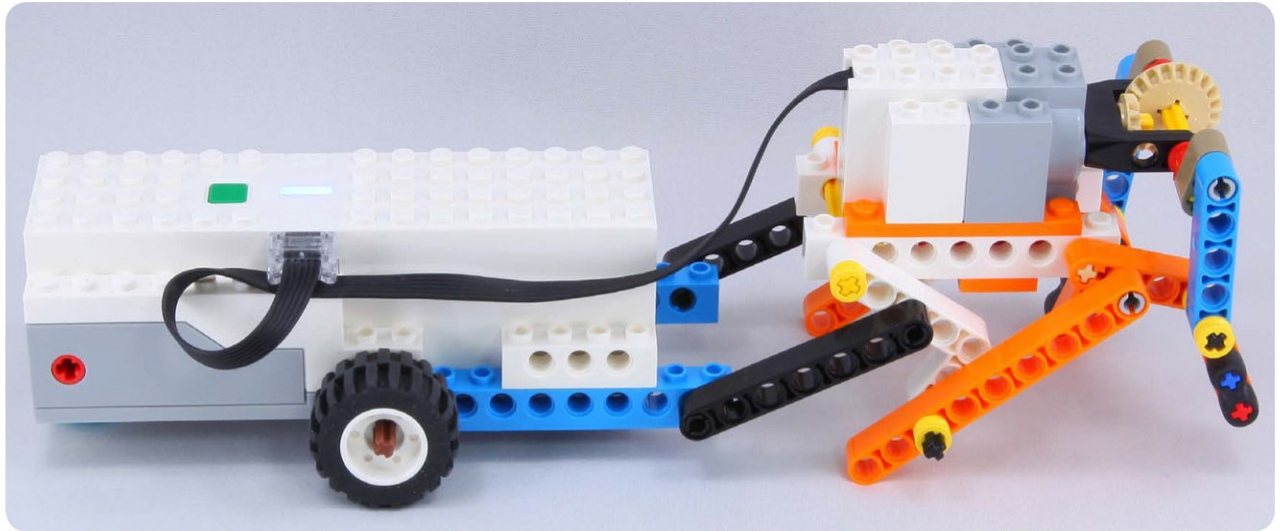


Rotating wheels with the Interactive Motor 117

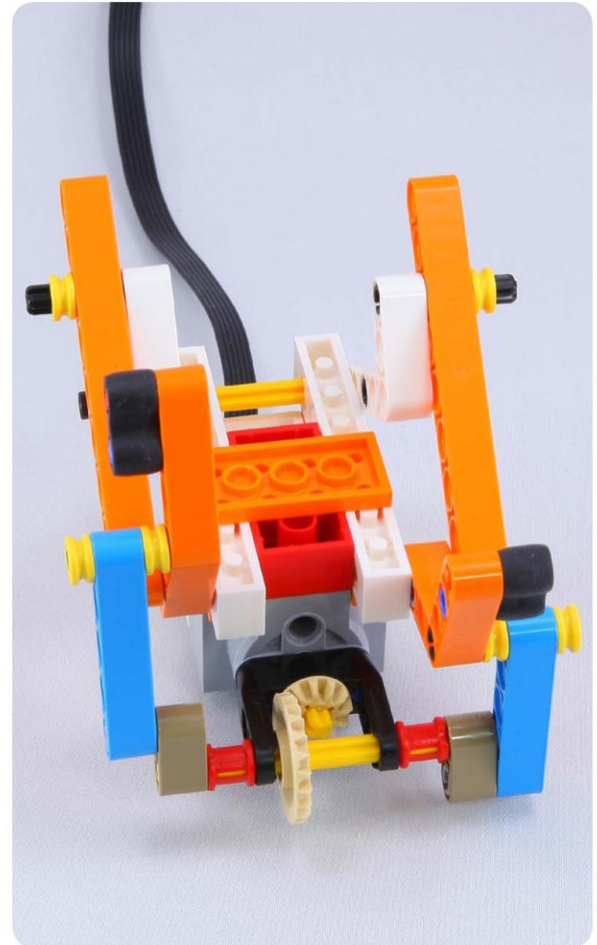
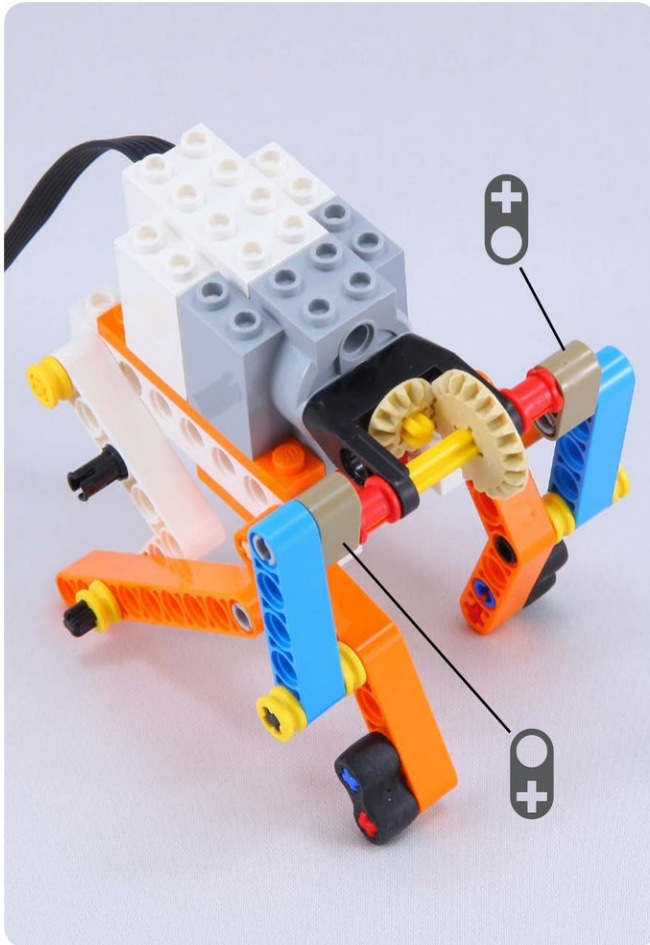






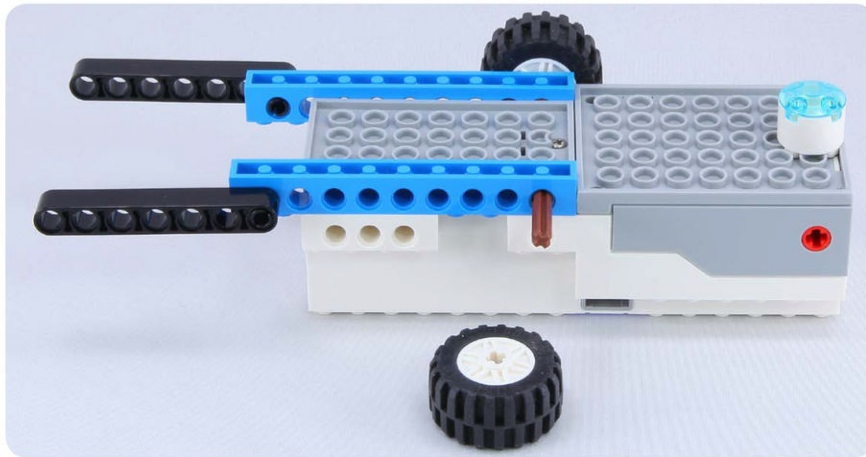
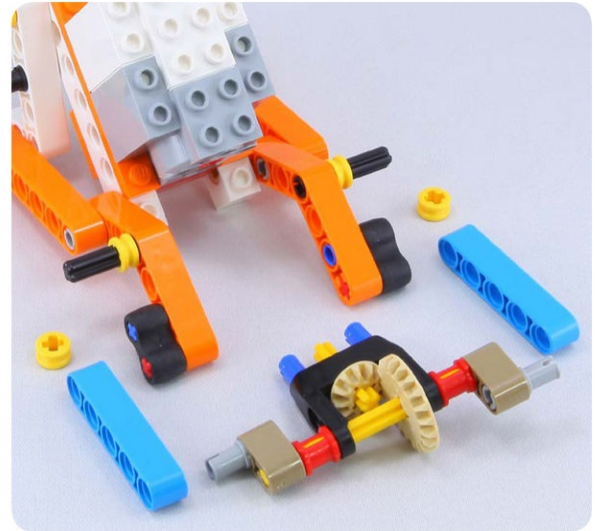






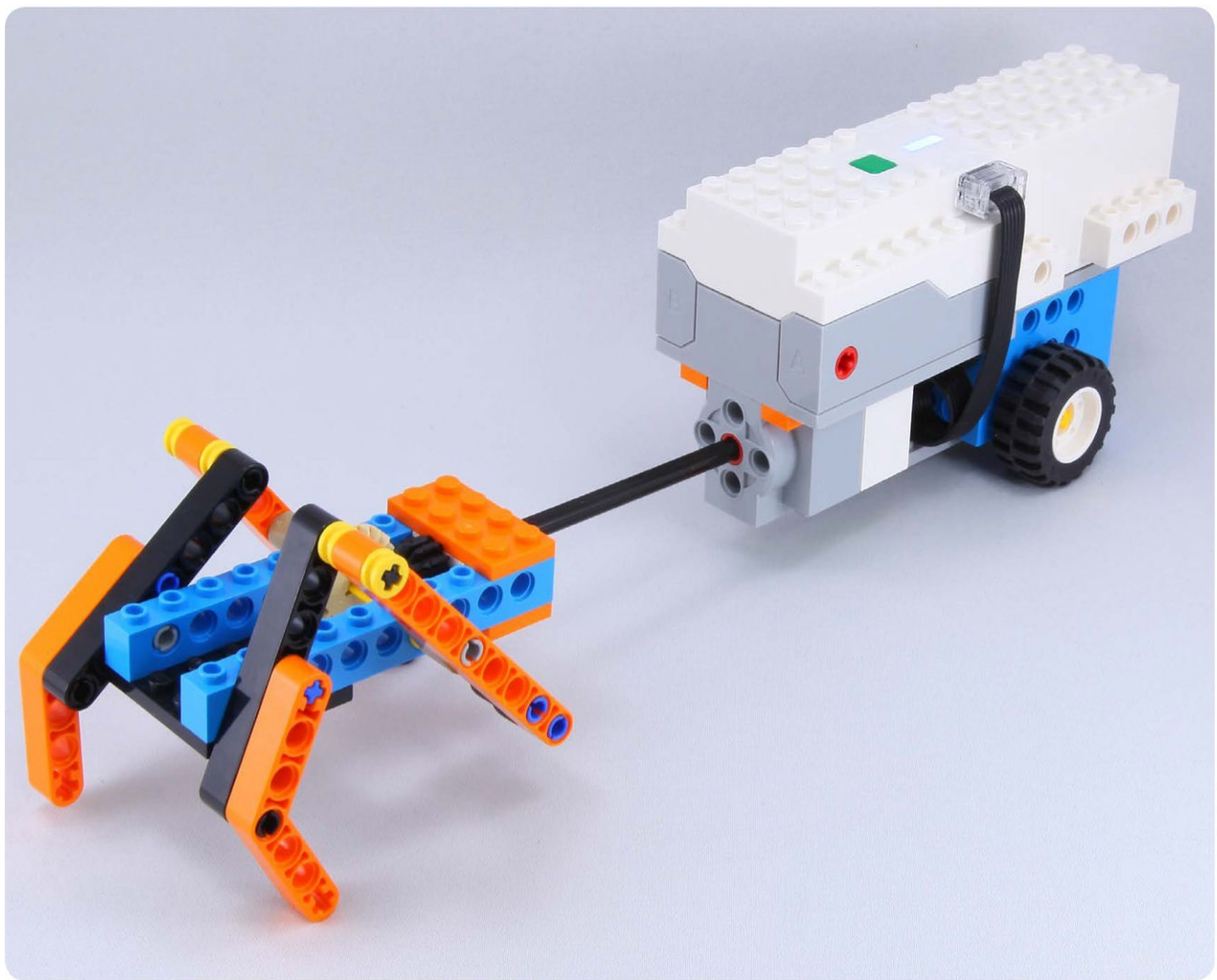
120 Walking with the Interactive Motor



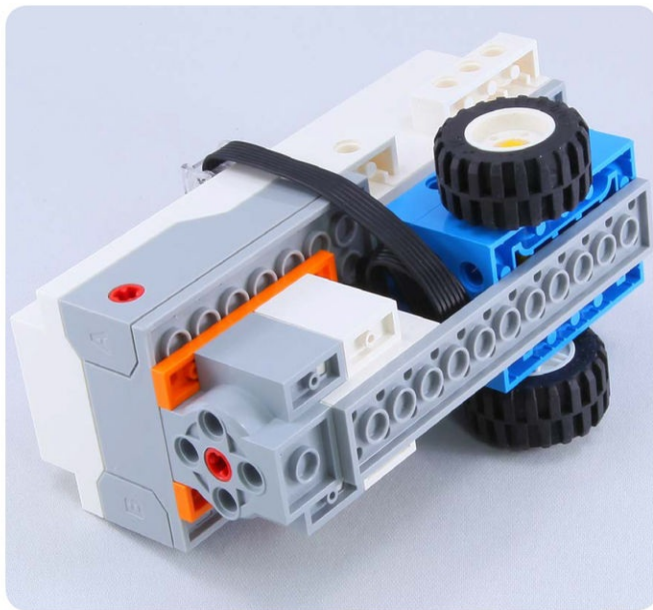
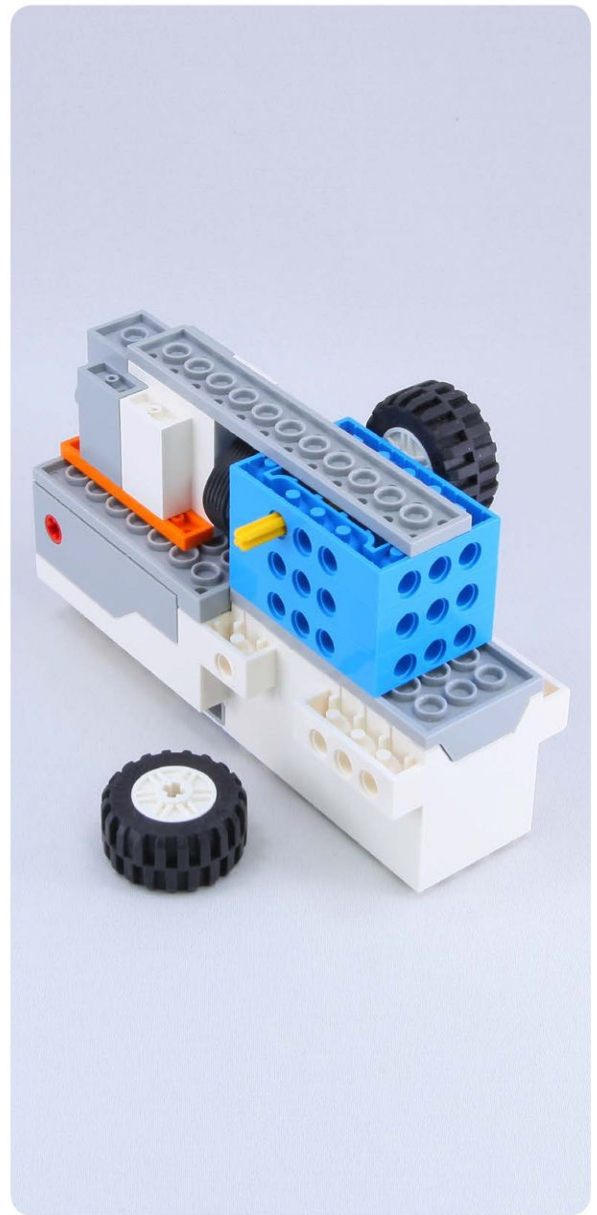
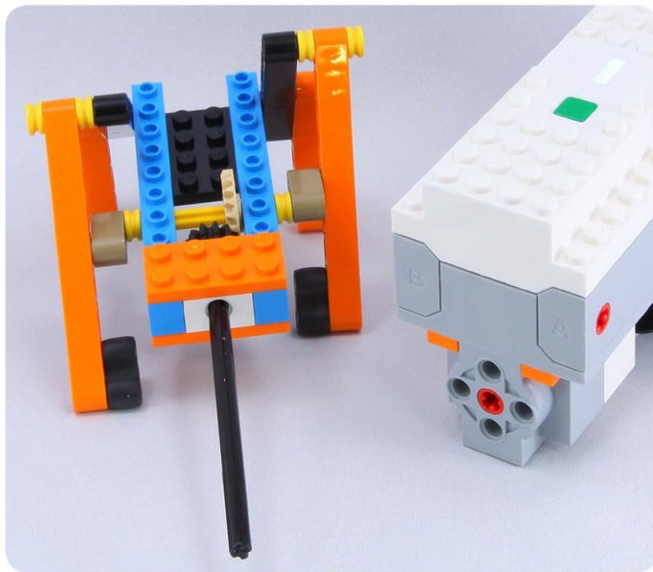
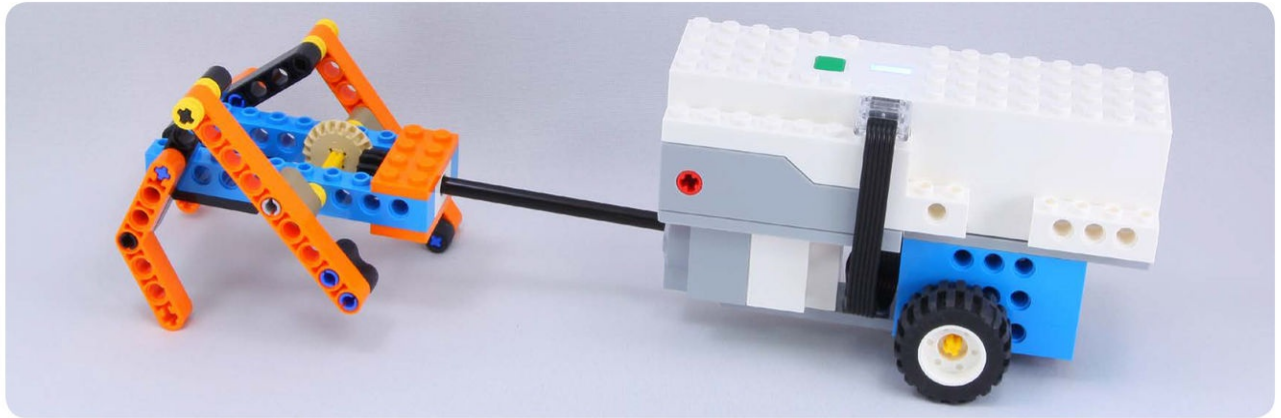


Walking with the Interactive Motor 121

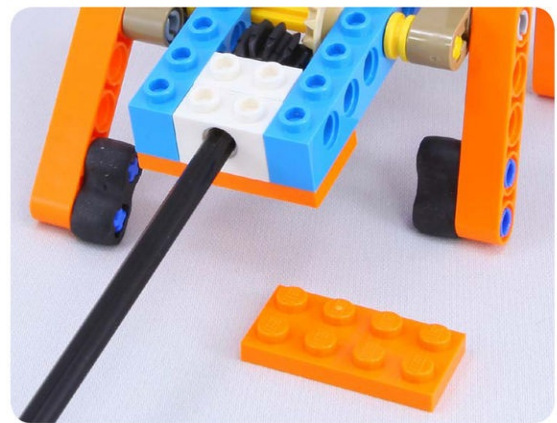
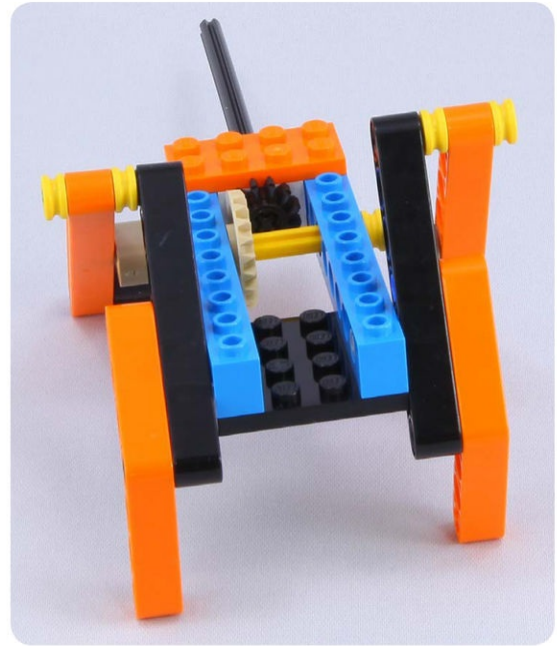
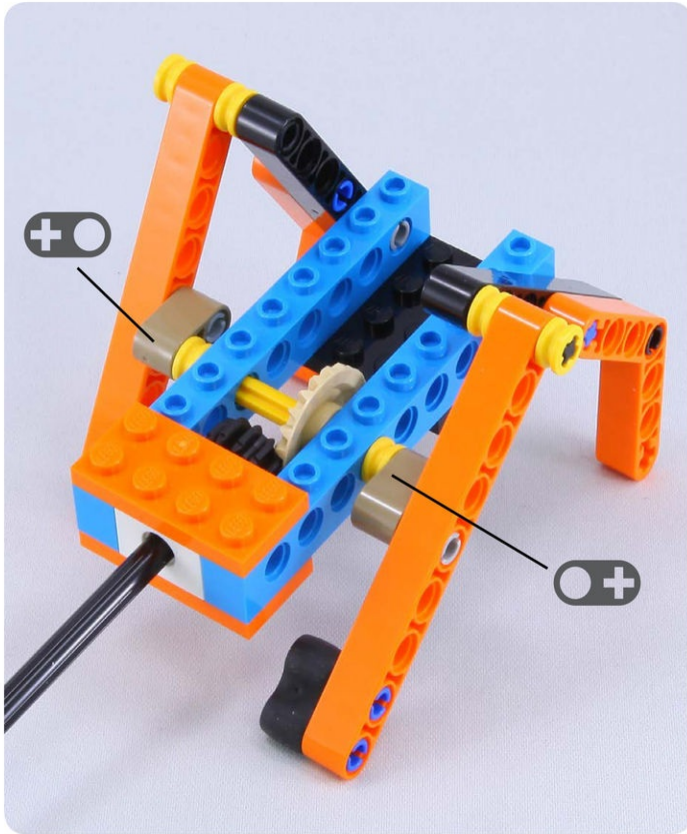


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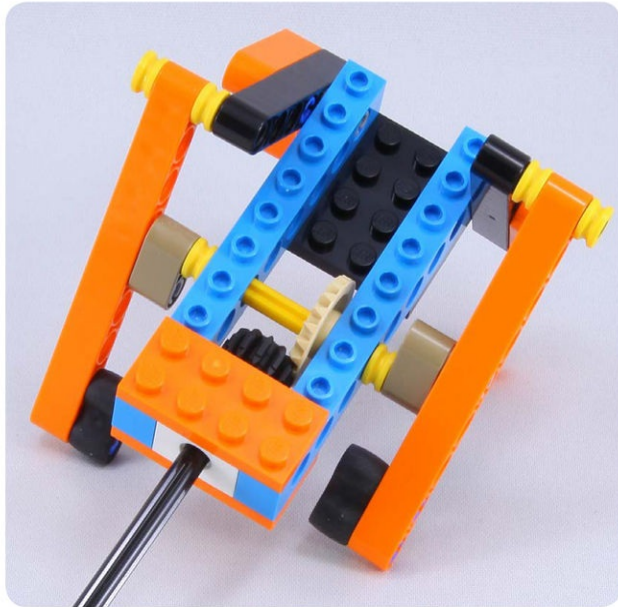
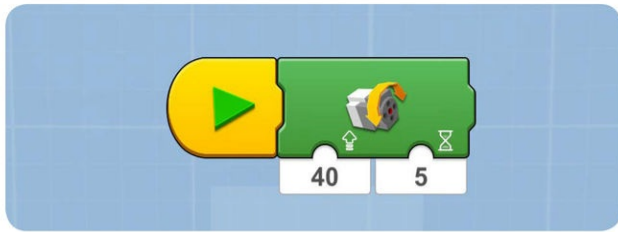






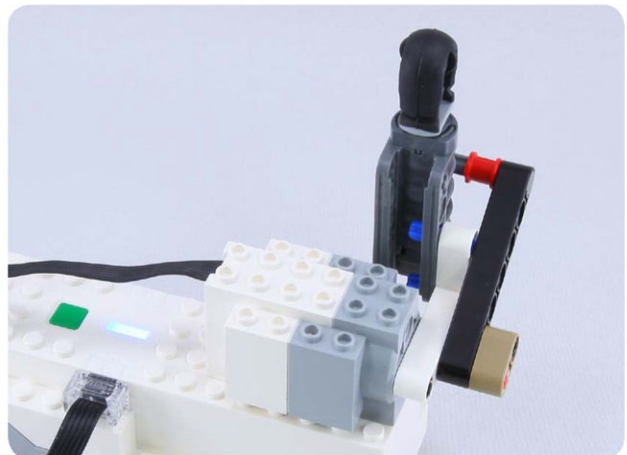
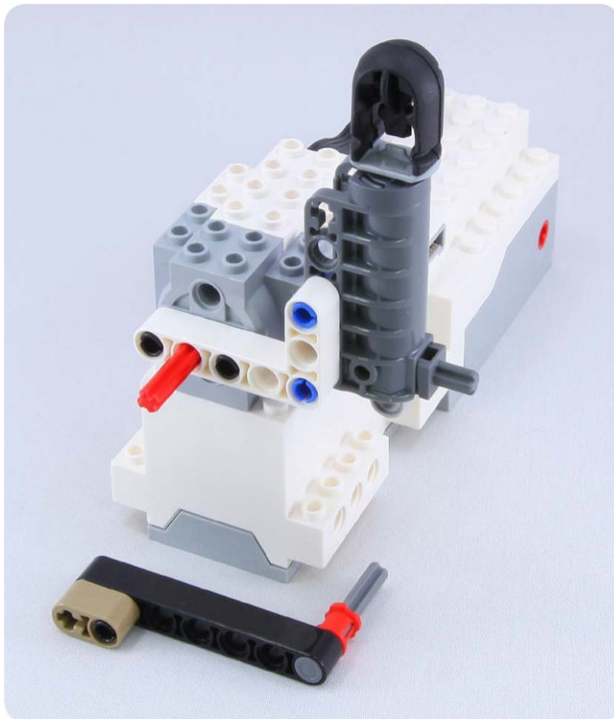
124 Walking with the Interactive Motor





Walking with the Interactive Motor 125

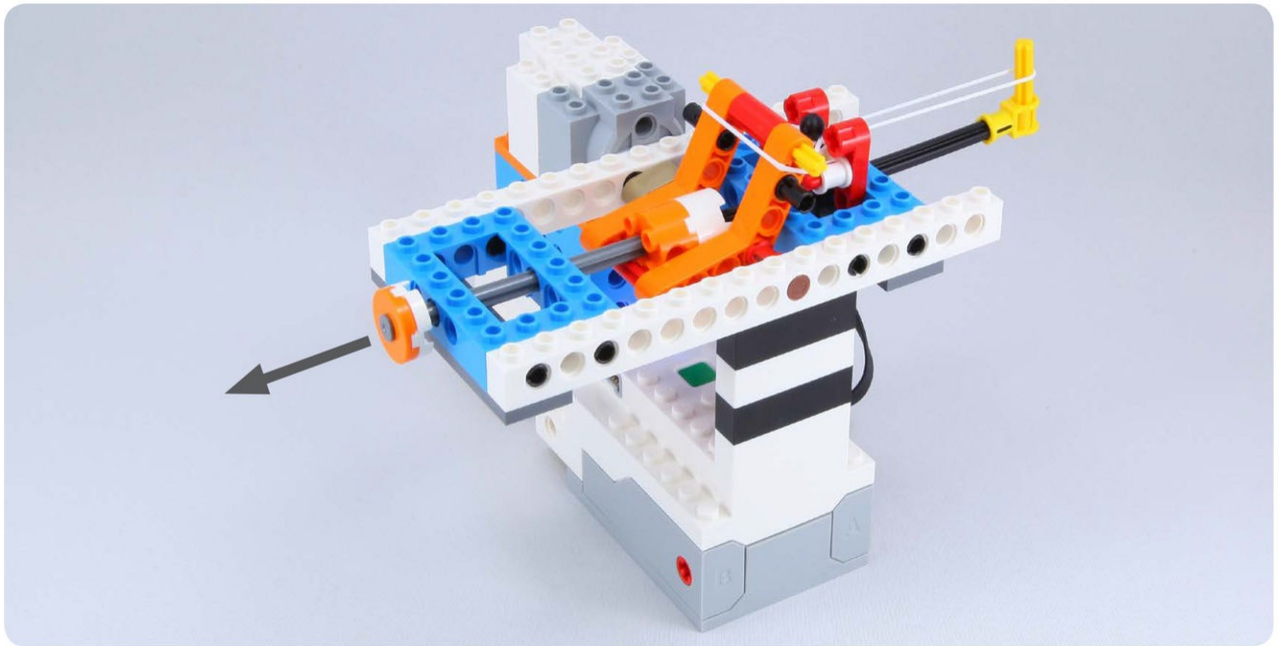
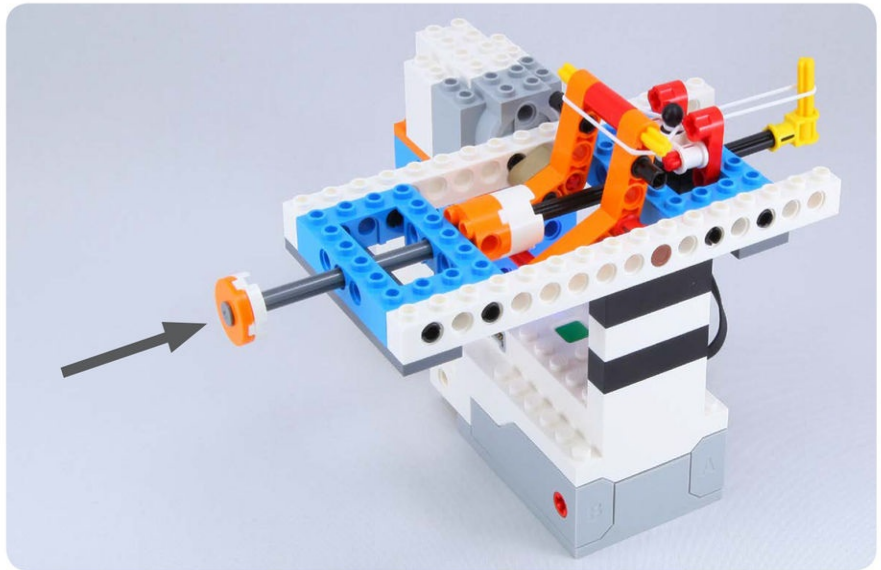


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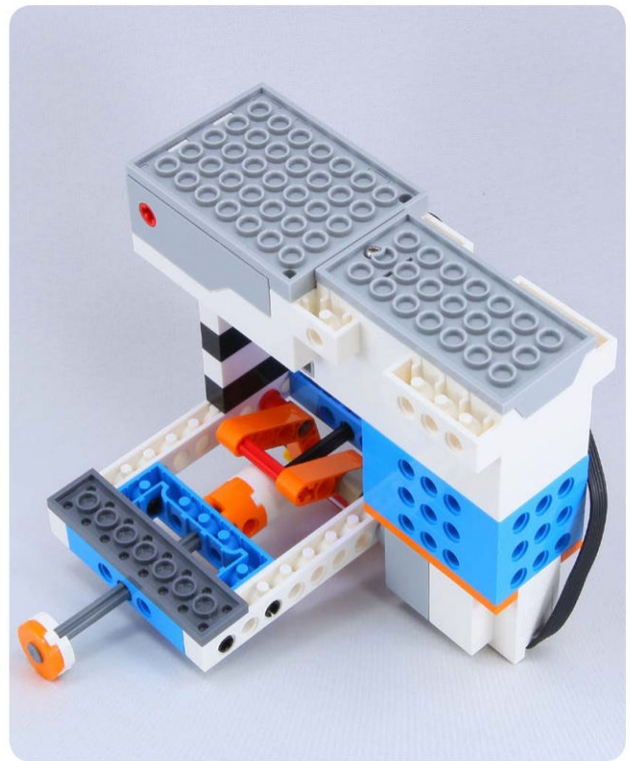
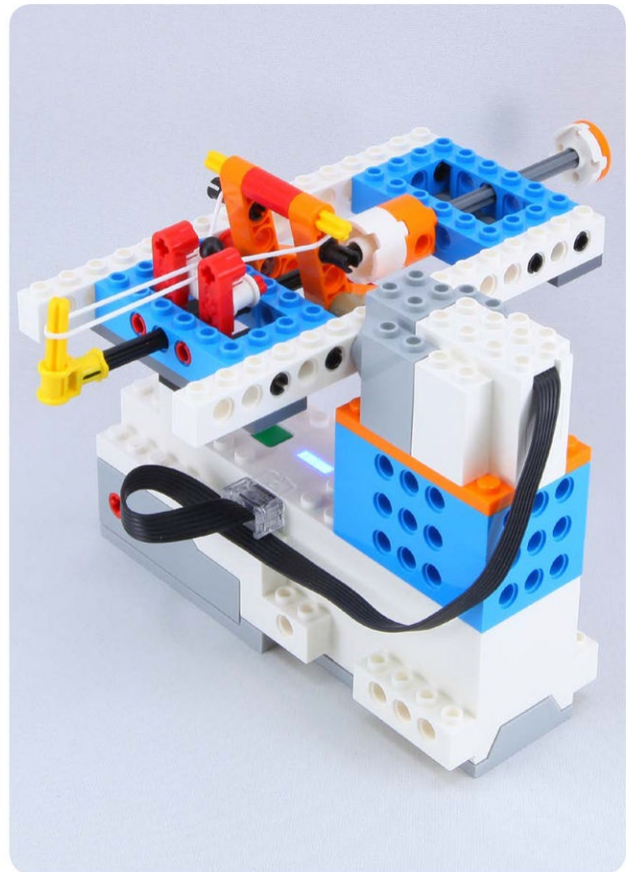
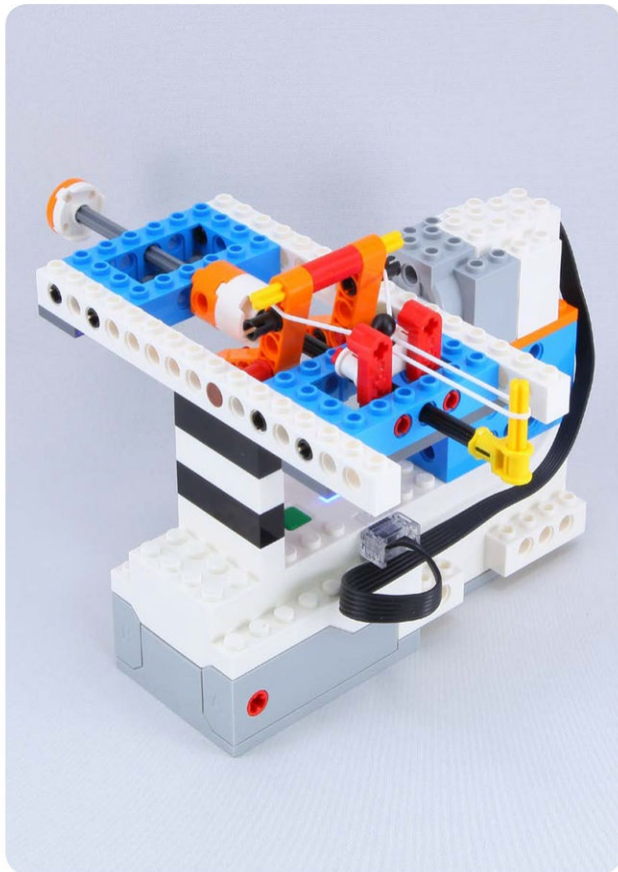




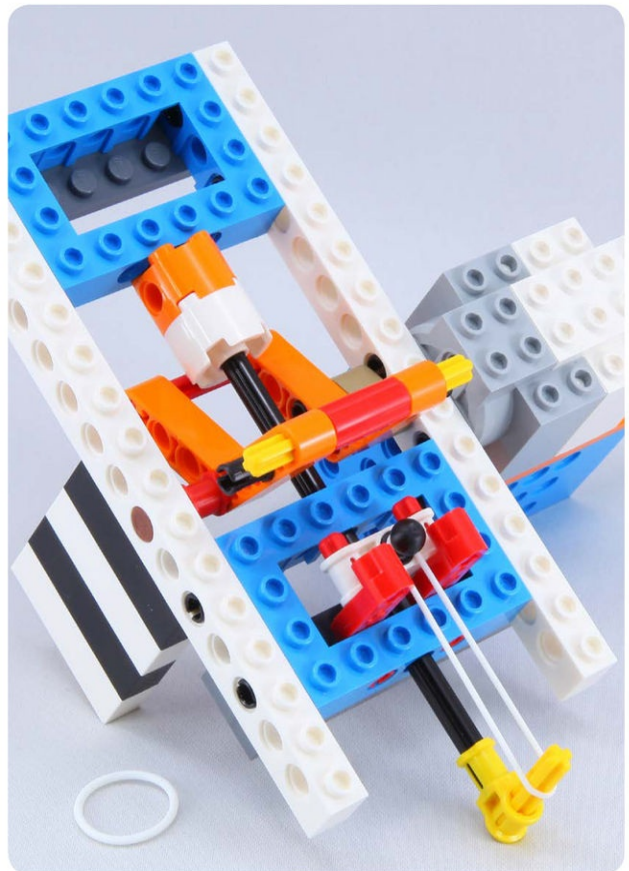
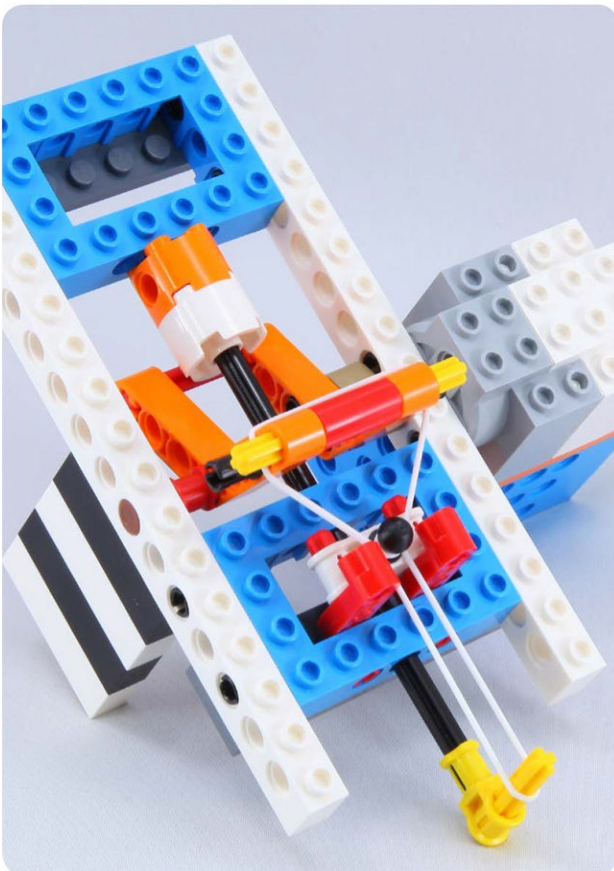
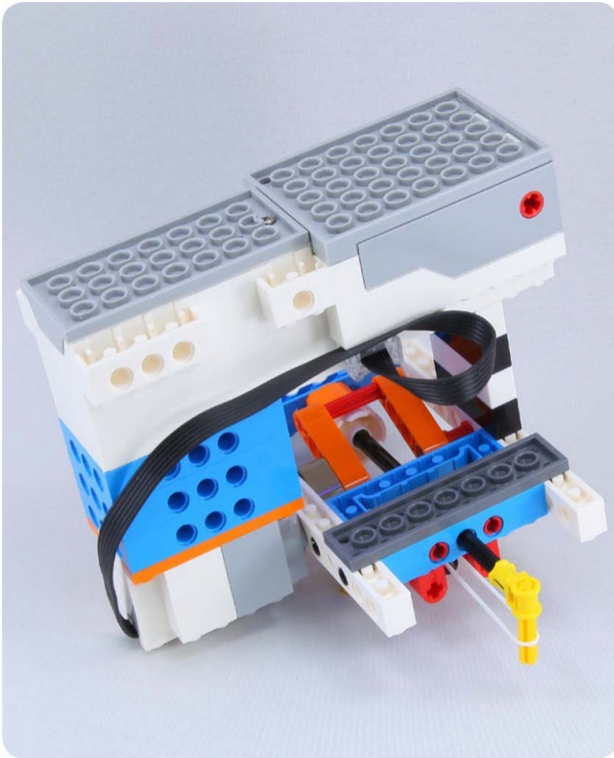


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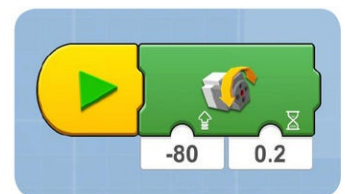
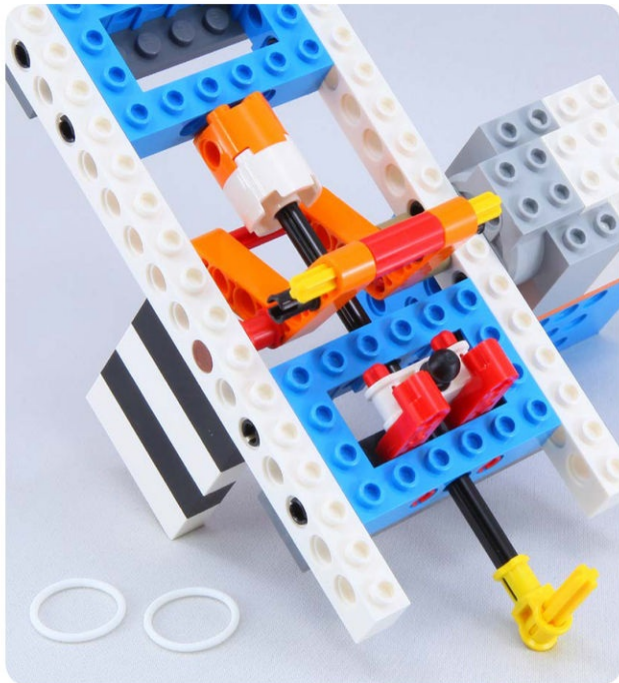















Shooting things 131



  $\times 2$ 

$\times 2$



$\times 2$

  $\times 2$  x2  $\times 2$ 


A LEGO Technic motor, which is a grey rectangular block with a red circular hub in the center of its front face, used for driving gears.

 x7

3  $\times 3$


  $\times 2$  x8 x2

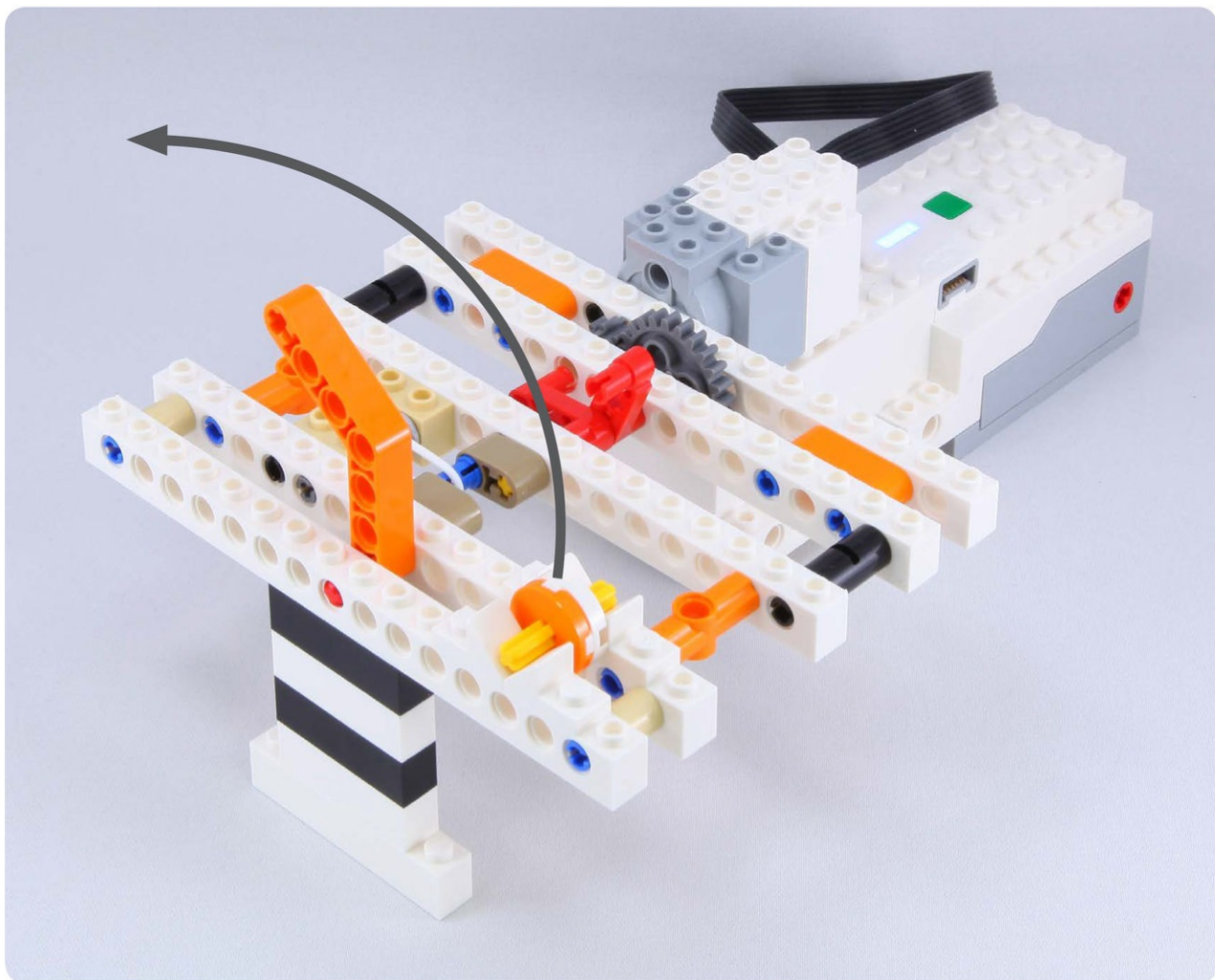
x5

 x4

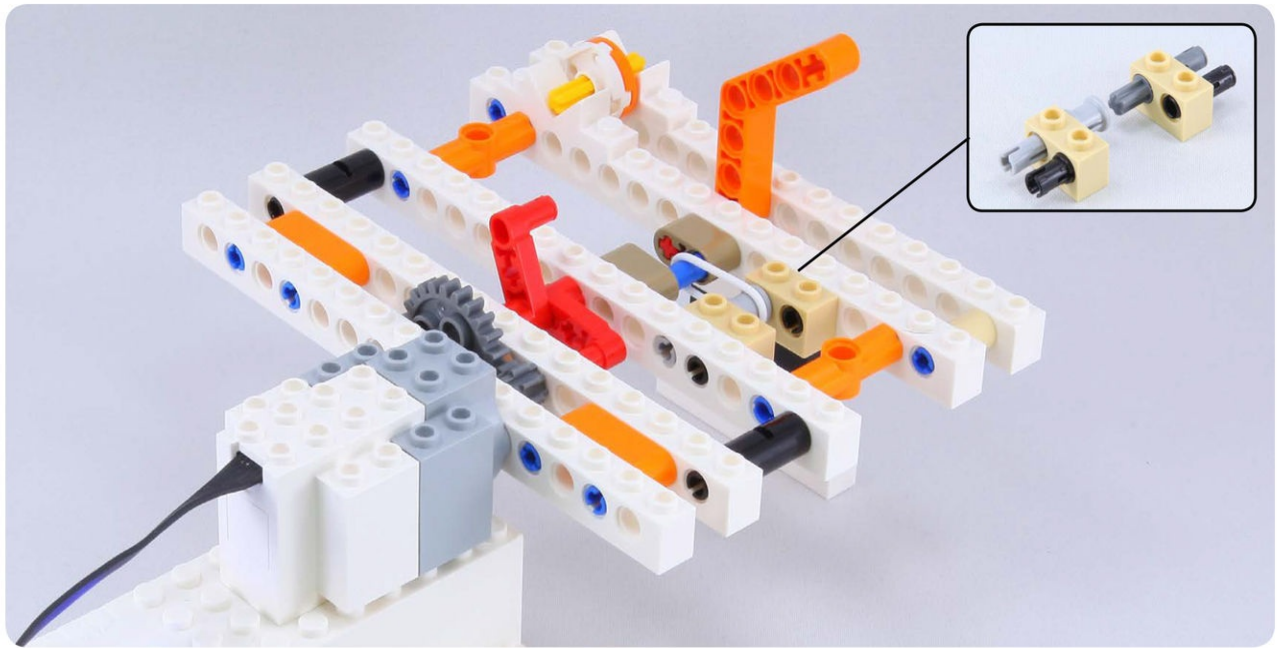
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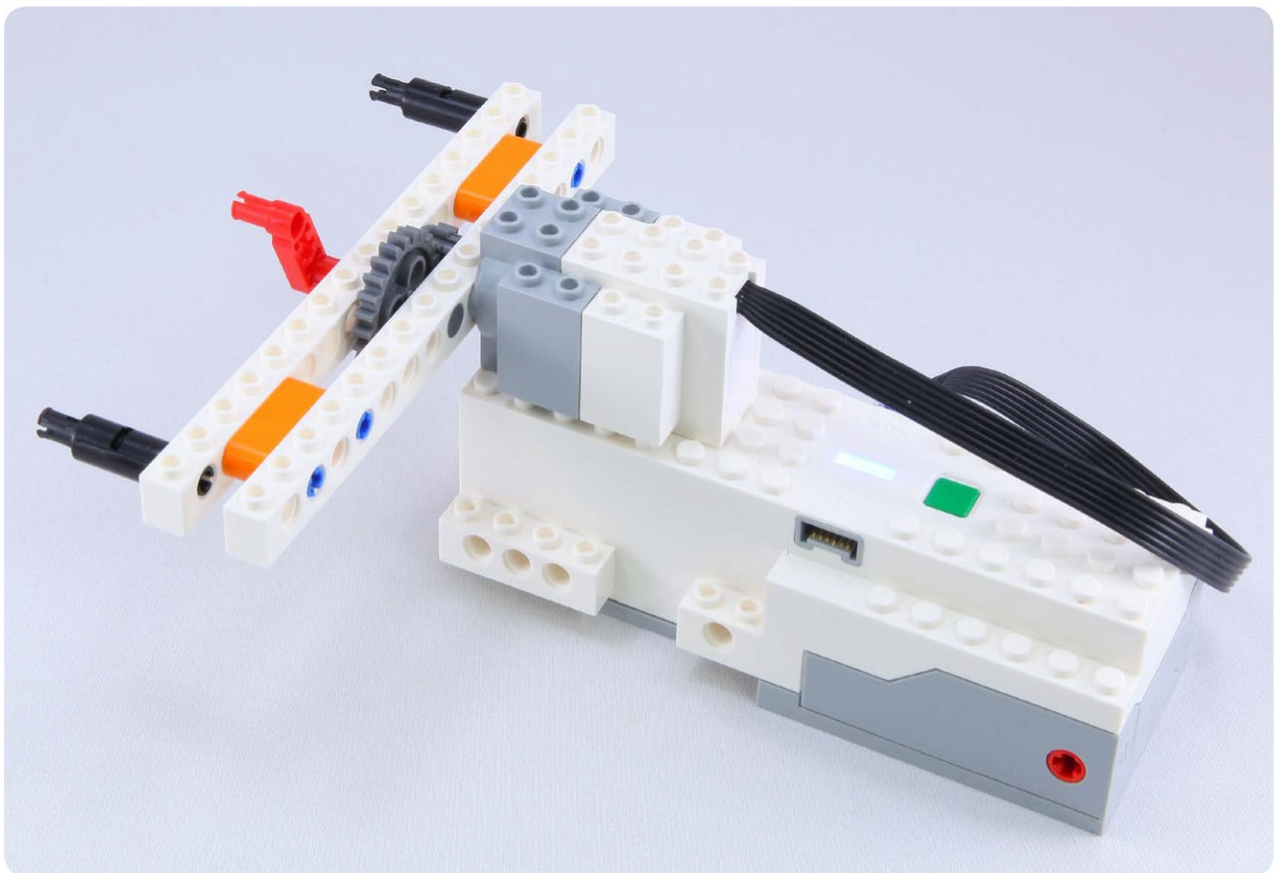
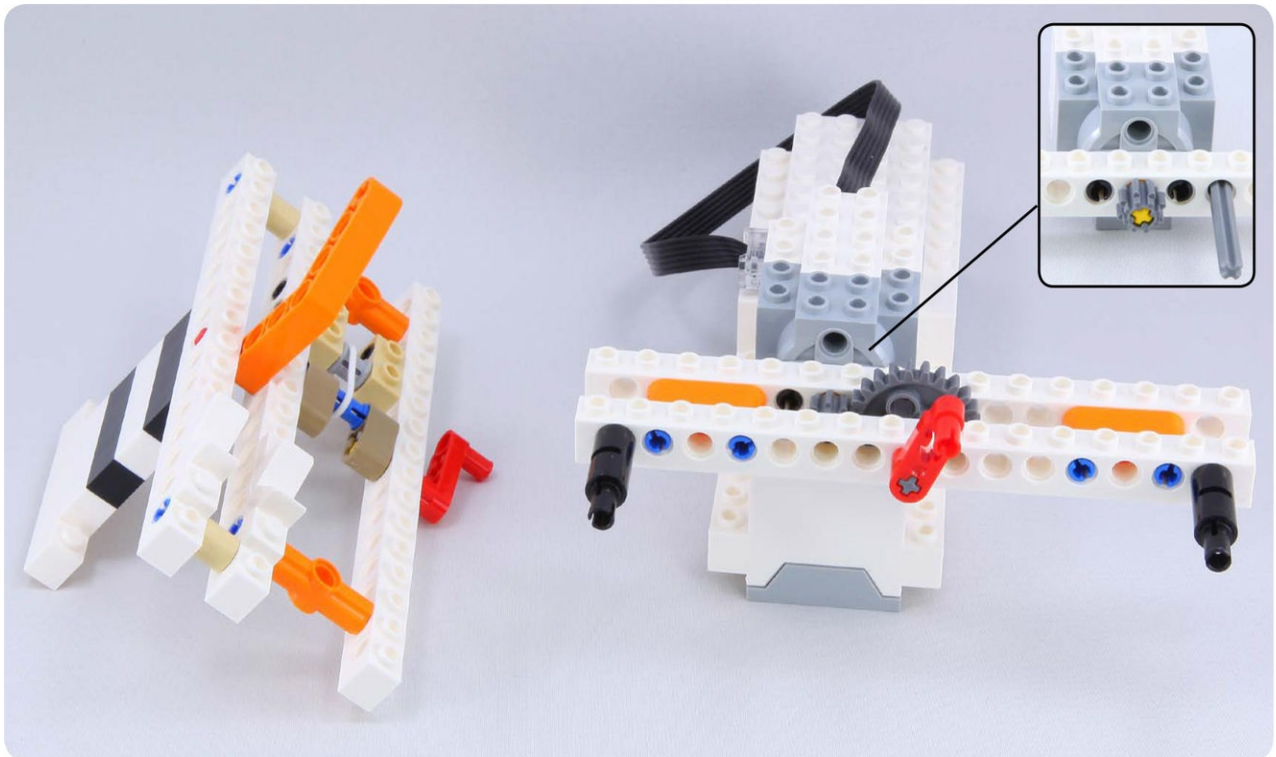
2  x5





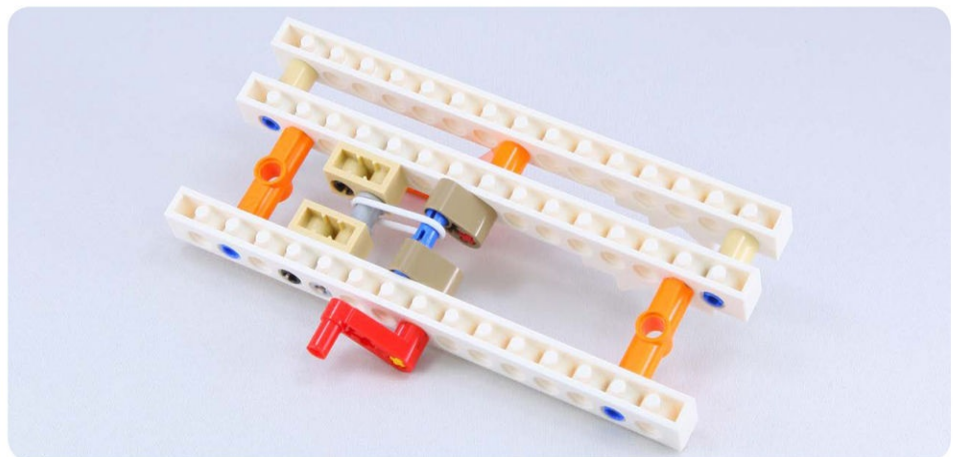
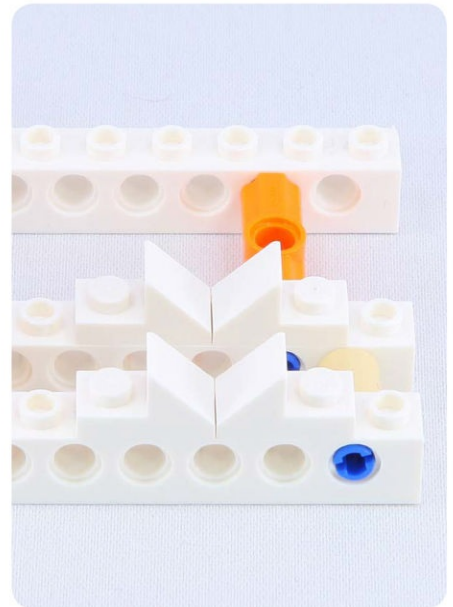
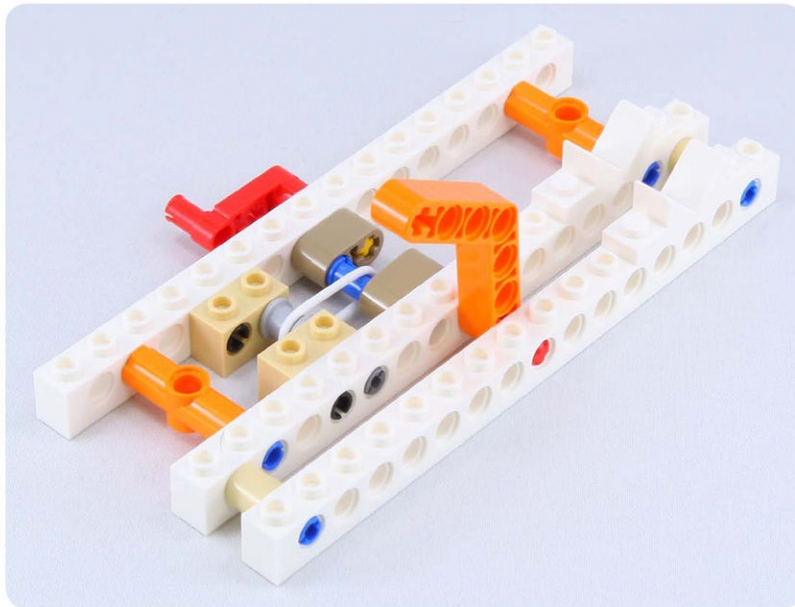
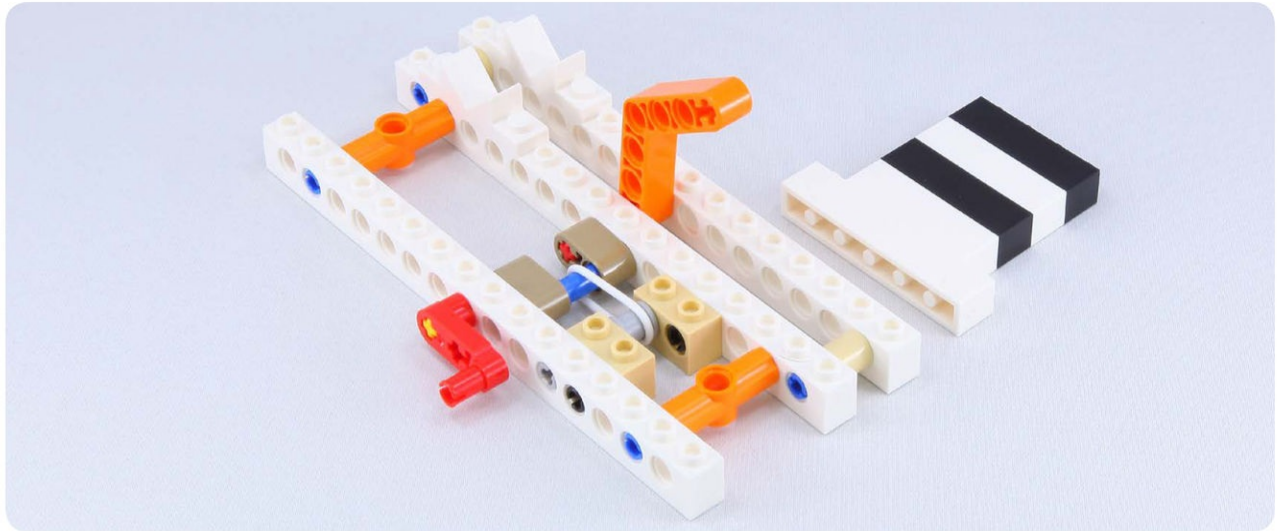




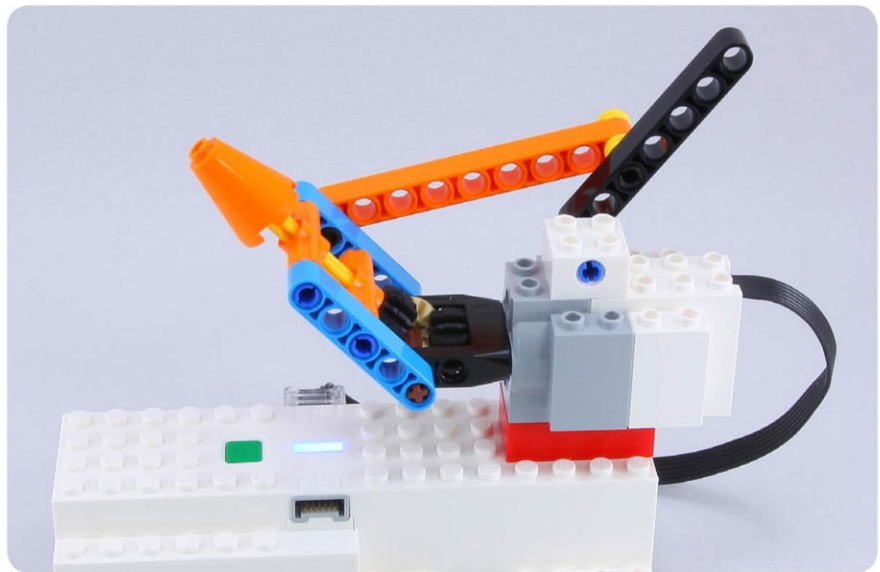


**134** Shooting things

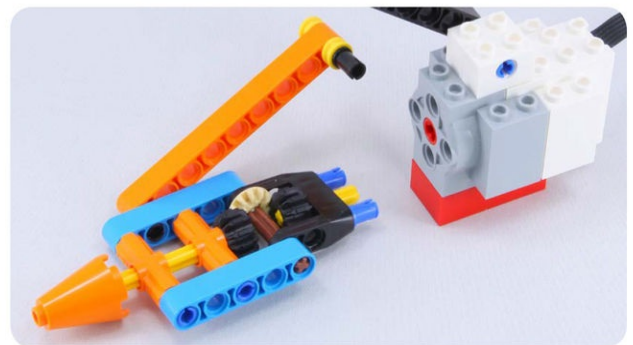
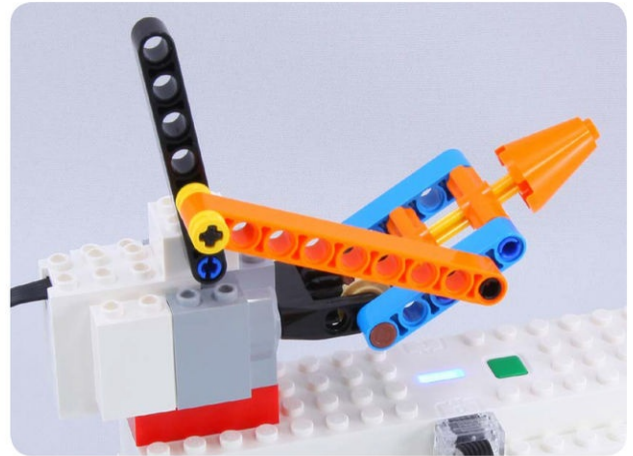
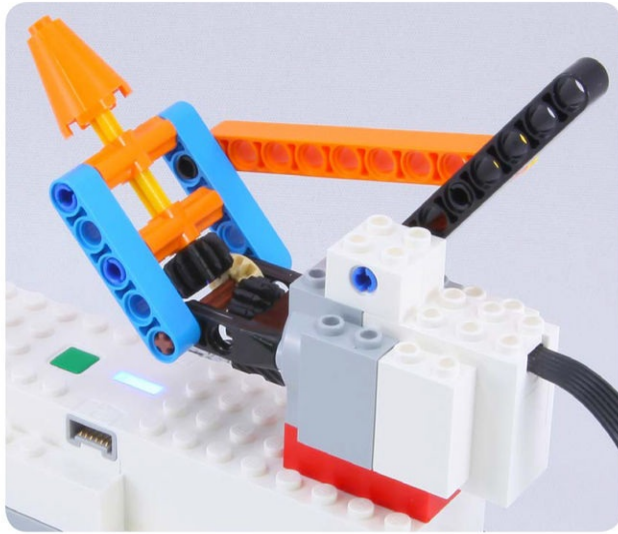






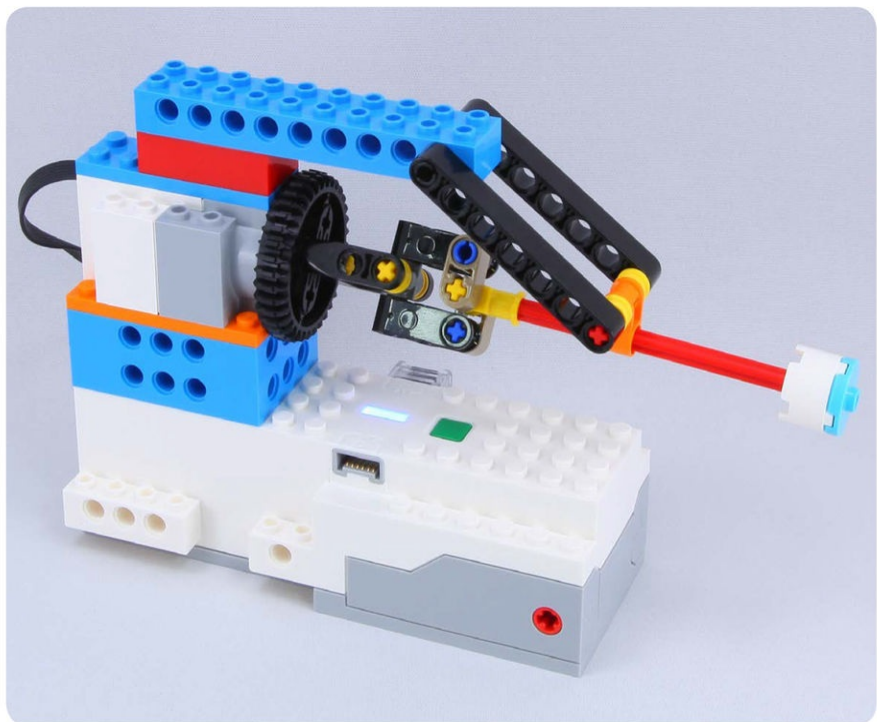
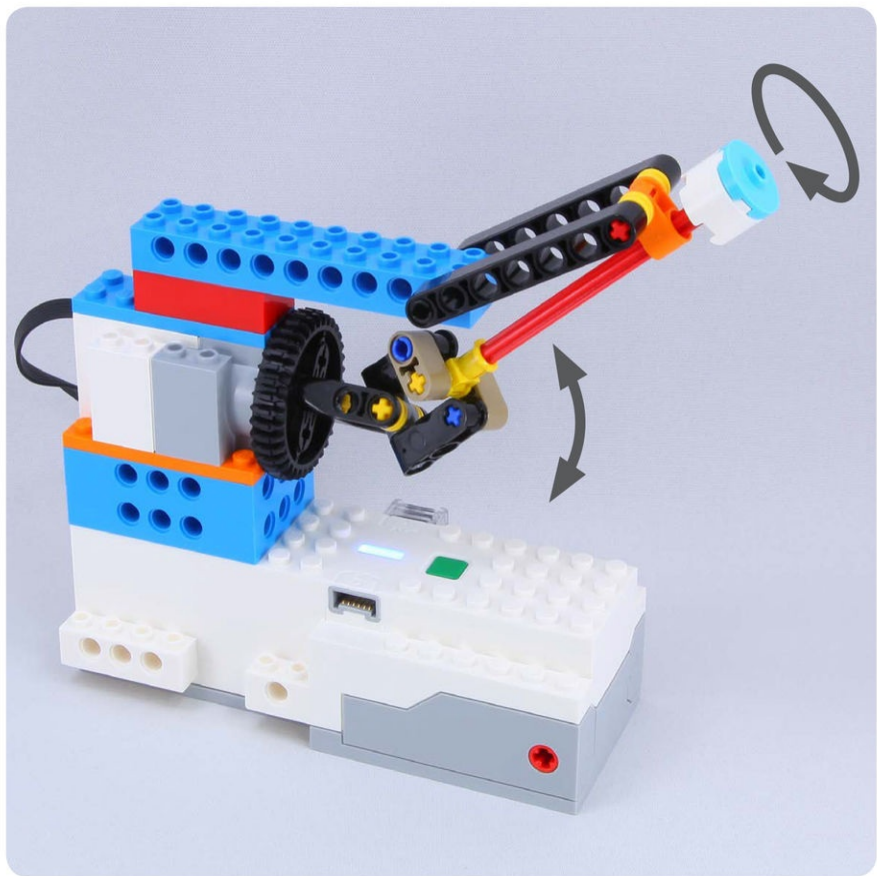
[illegible]





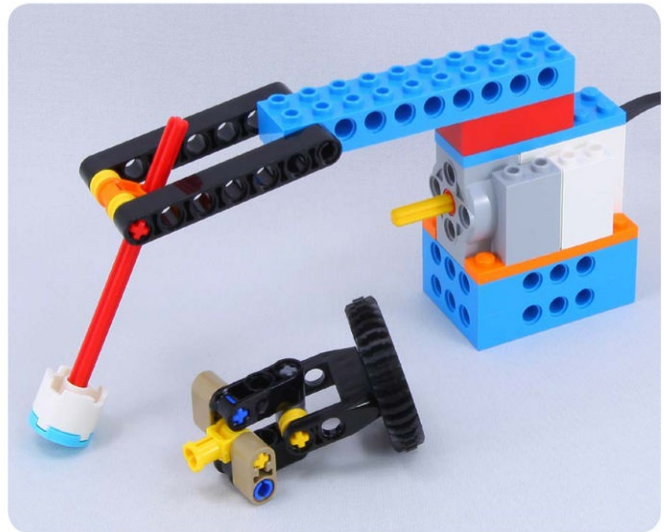
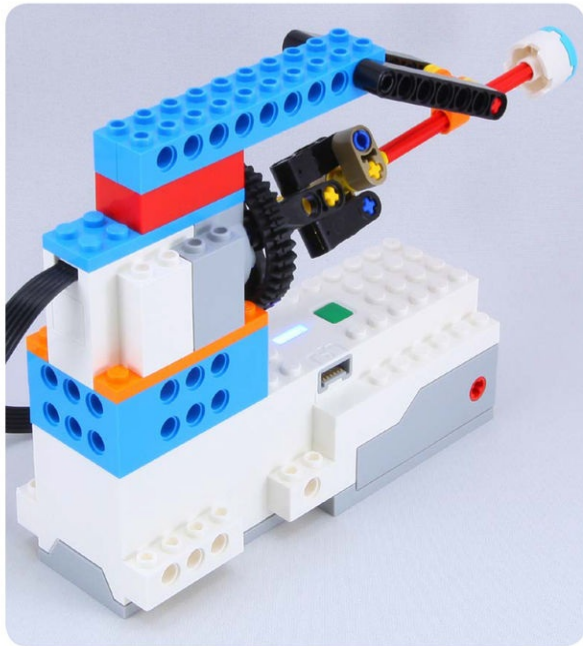
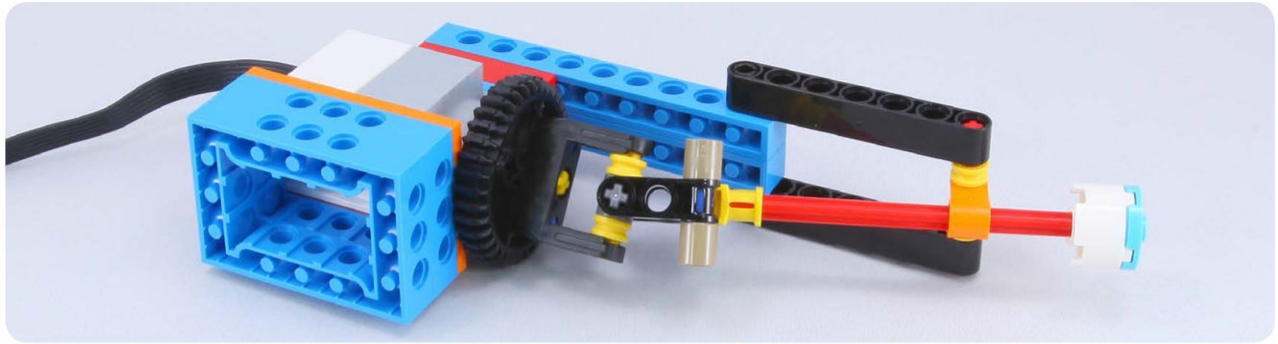
Changing the angle of rotation freely 137



[illegible]

### 138 Changing the angle of rotation freely





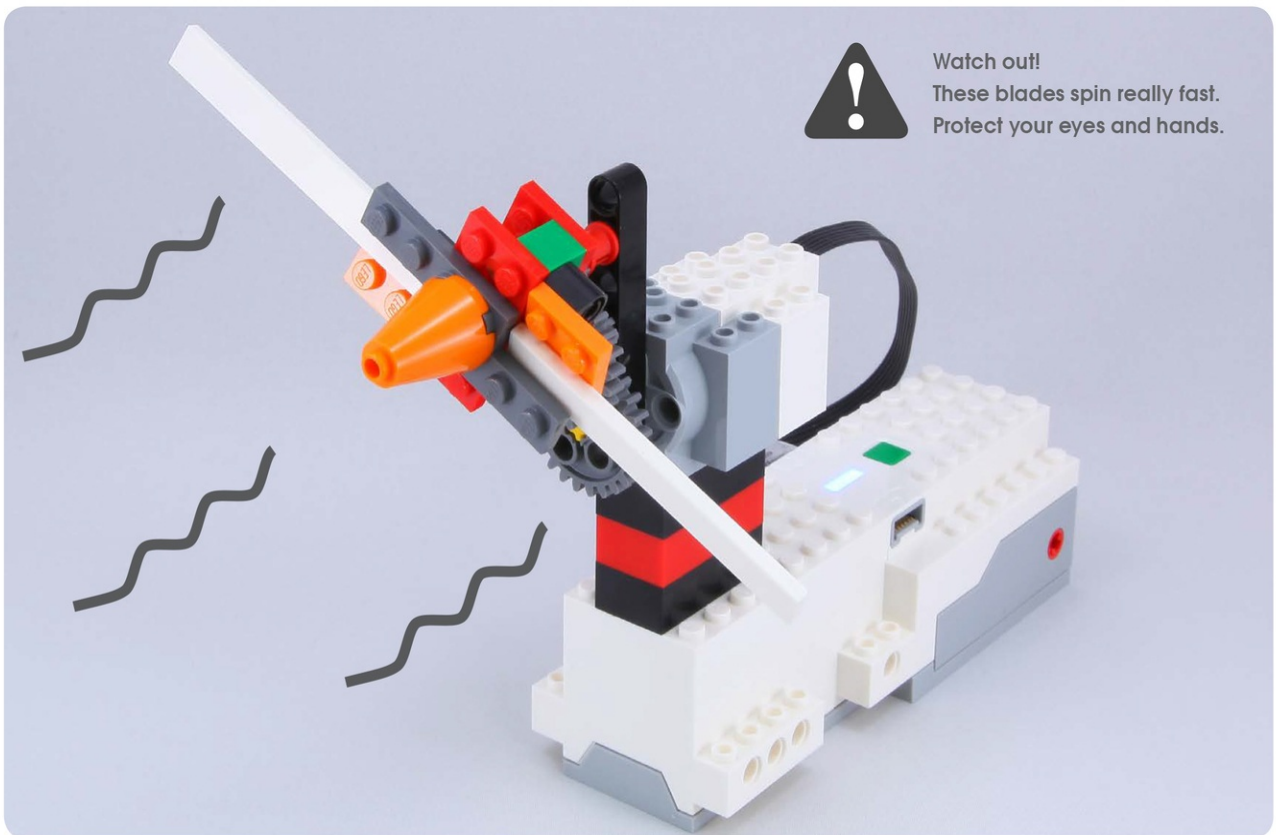
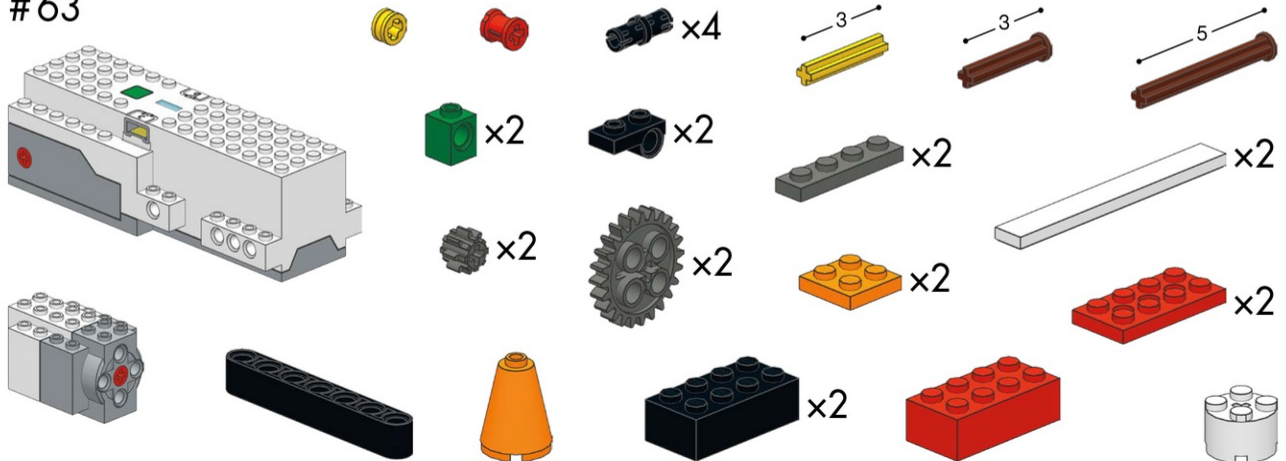
Changing the angle of rotation freely 139



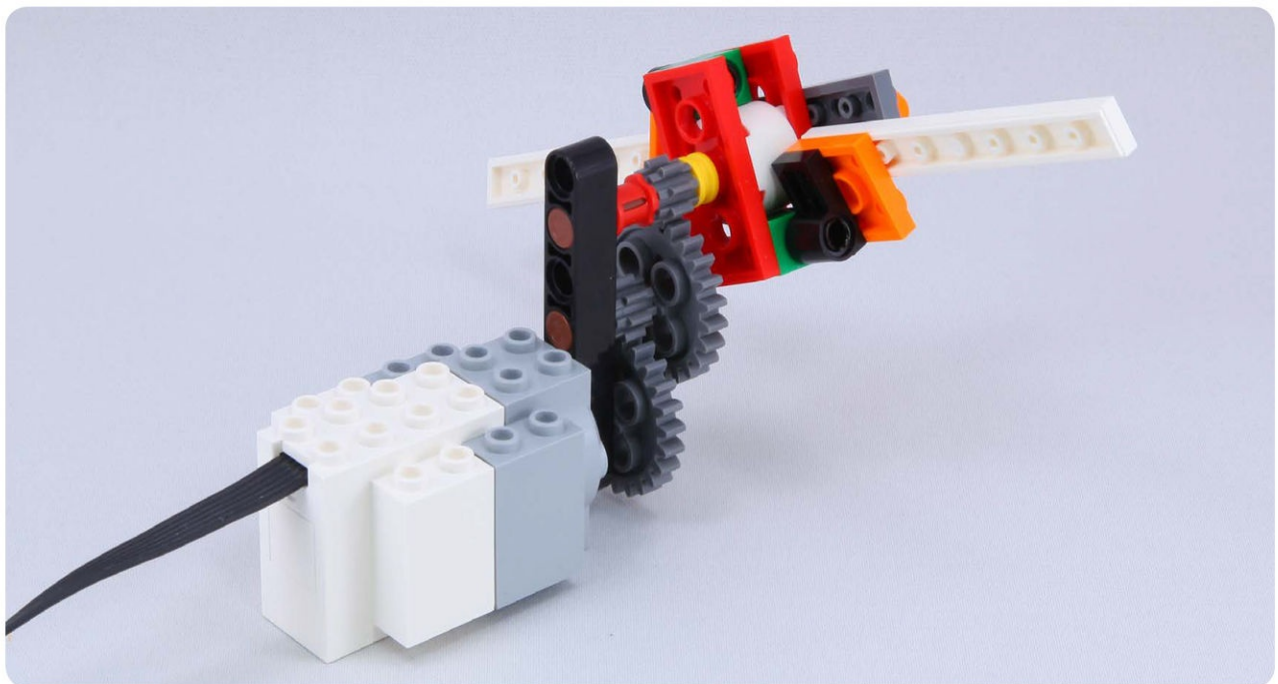


# Creating wind

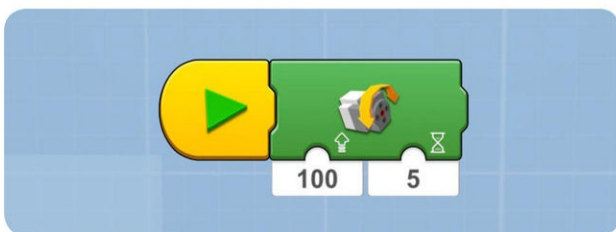
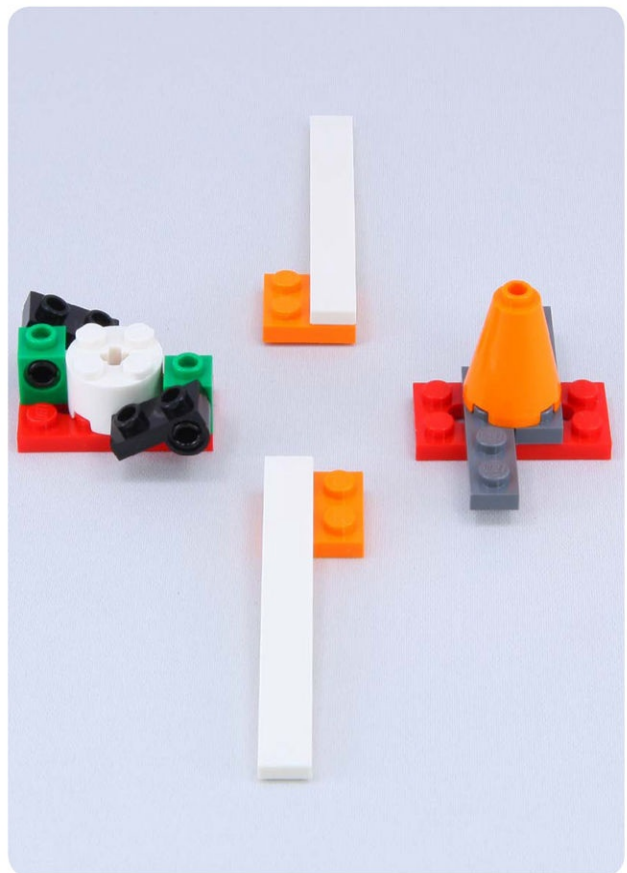
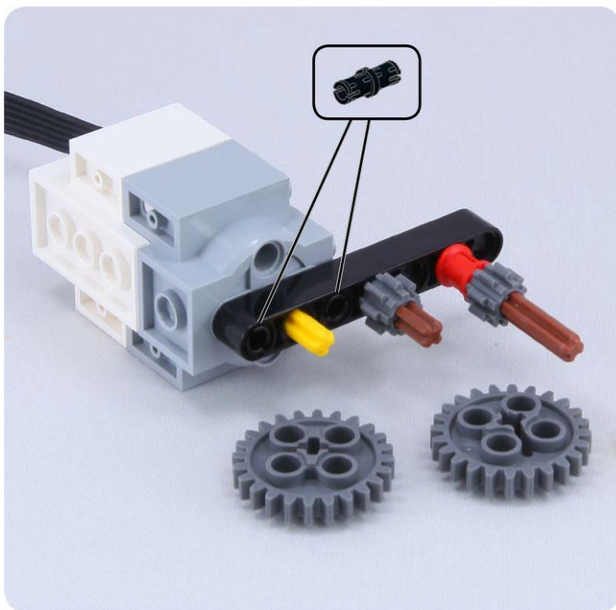
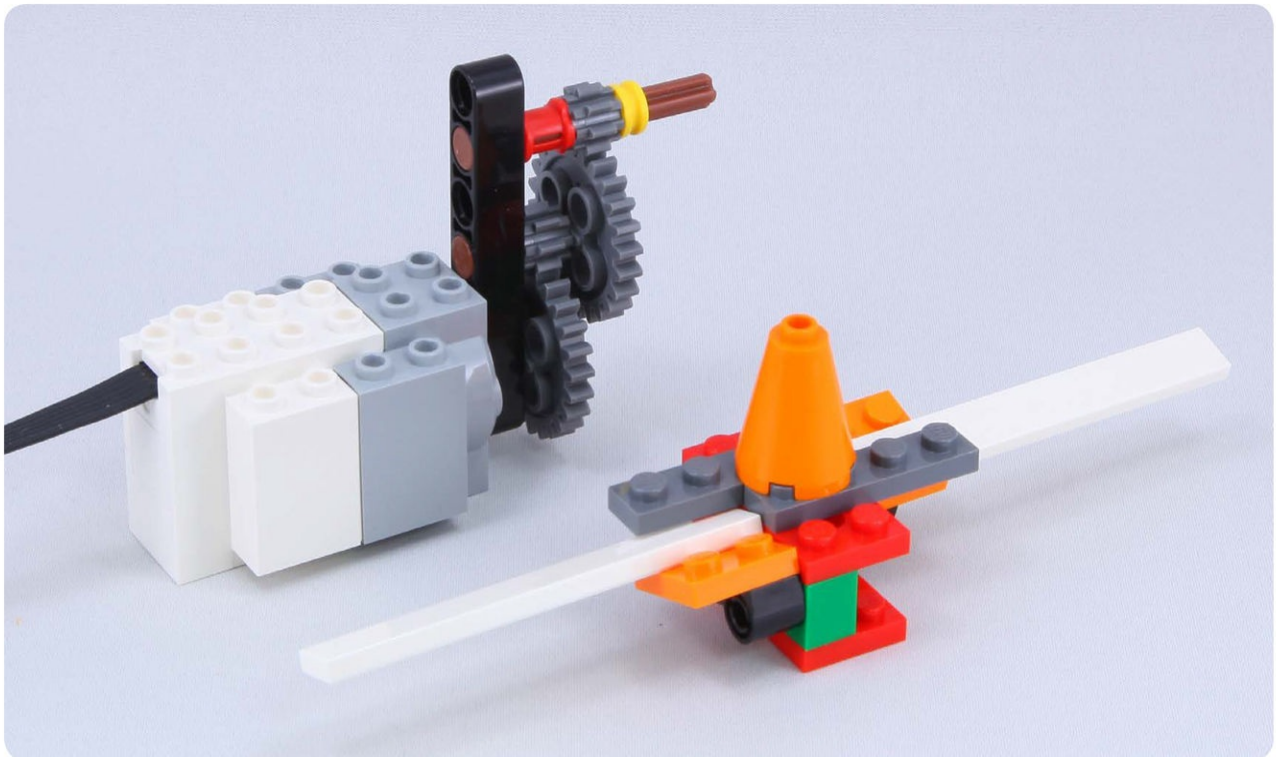
#63



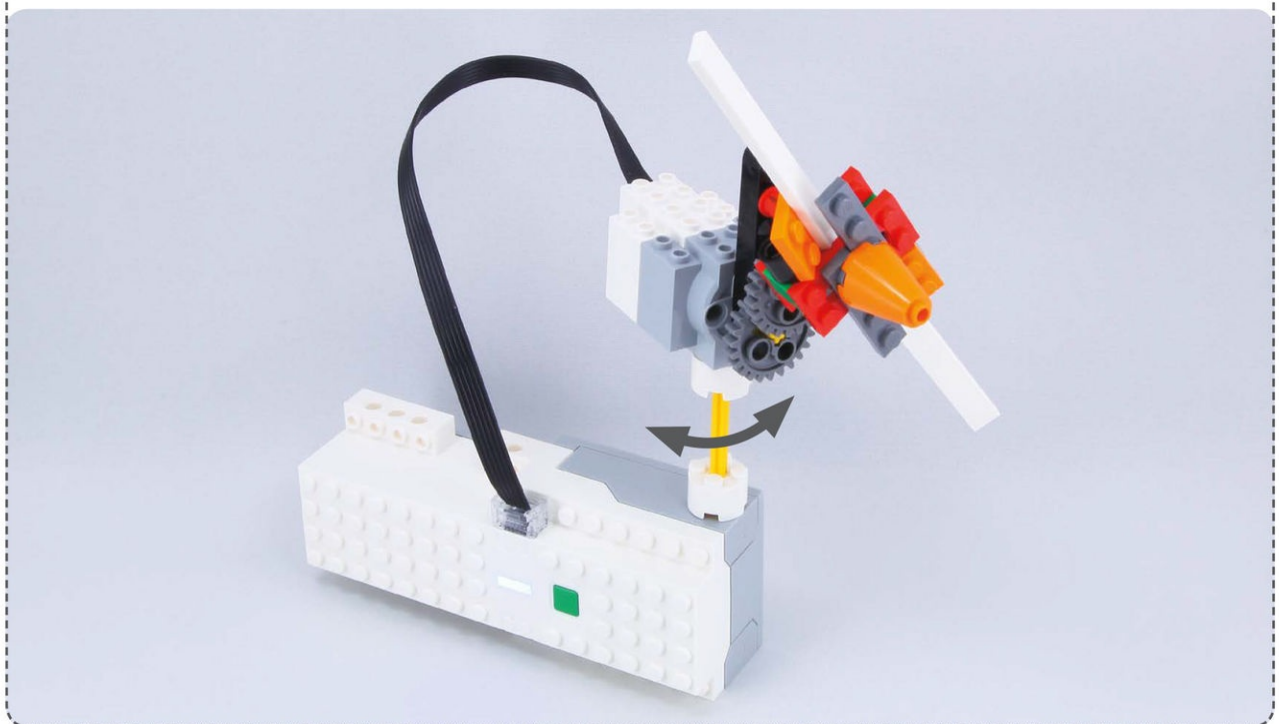
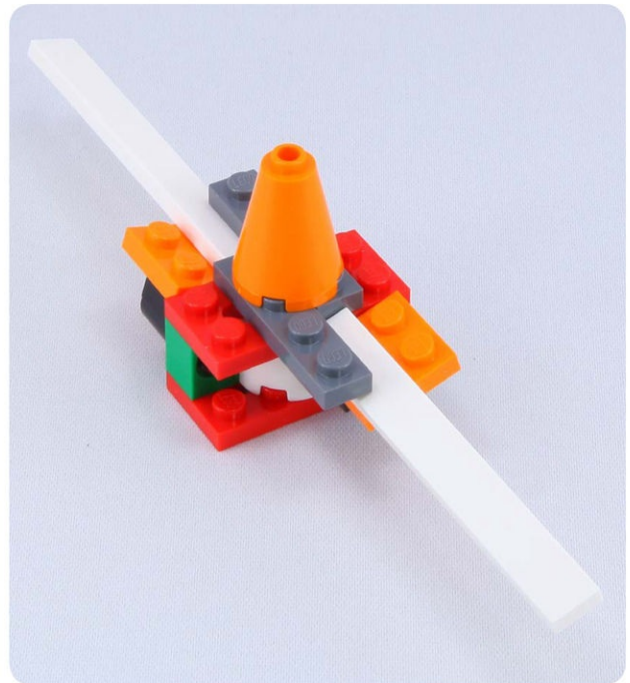
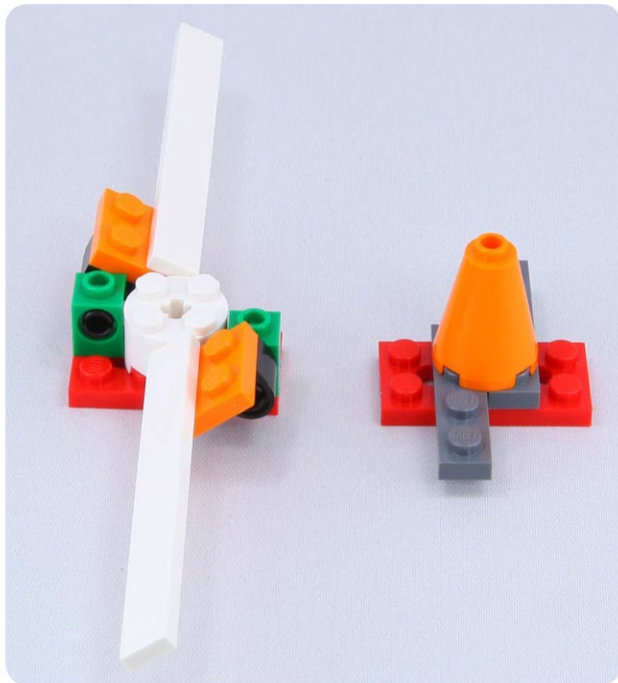








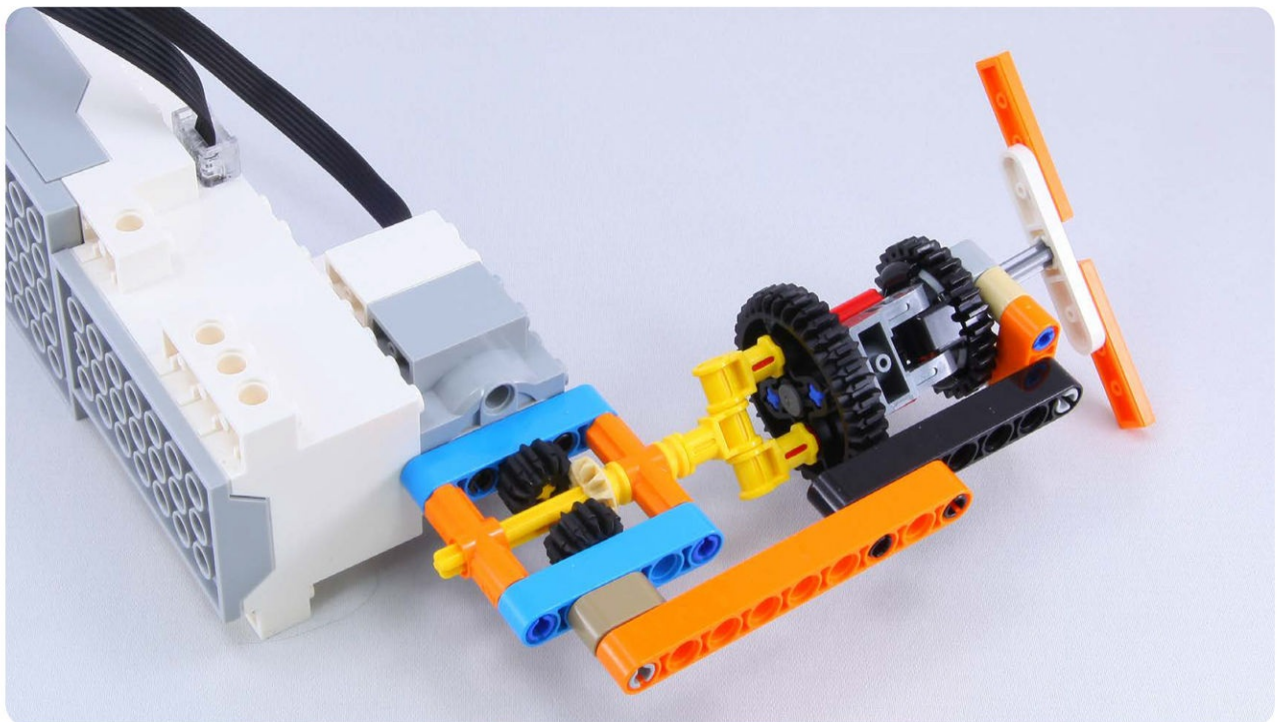
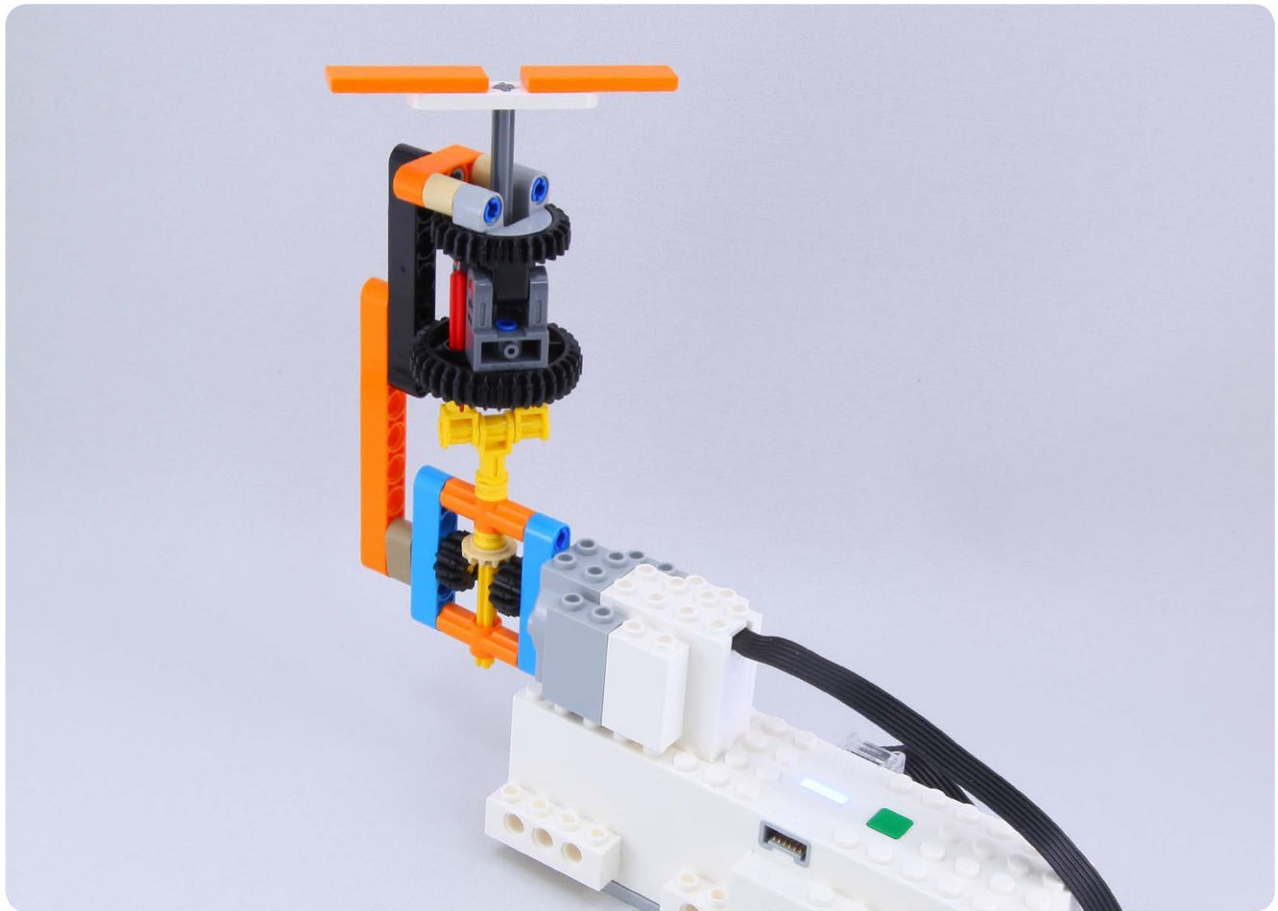






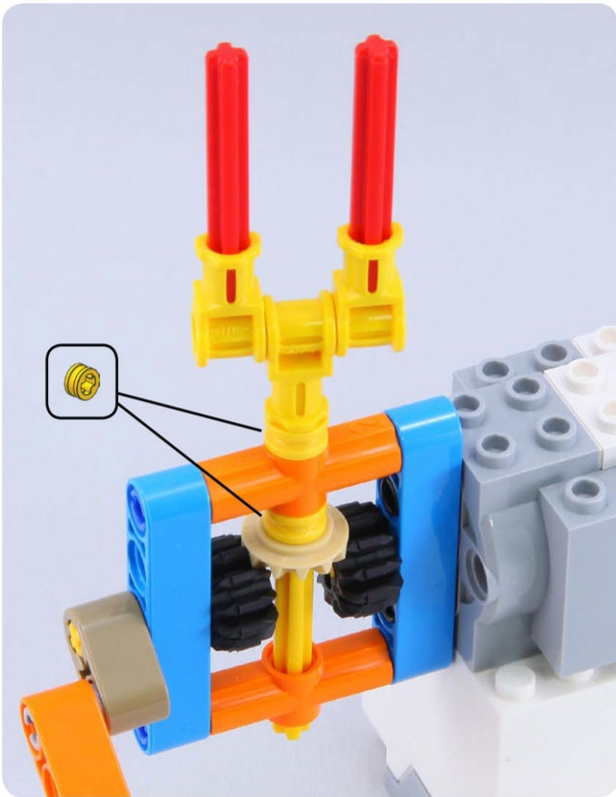
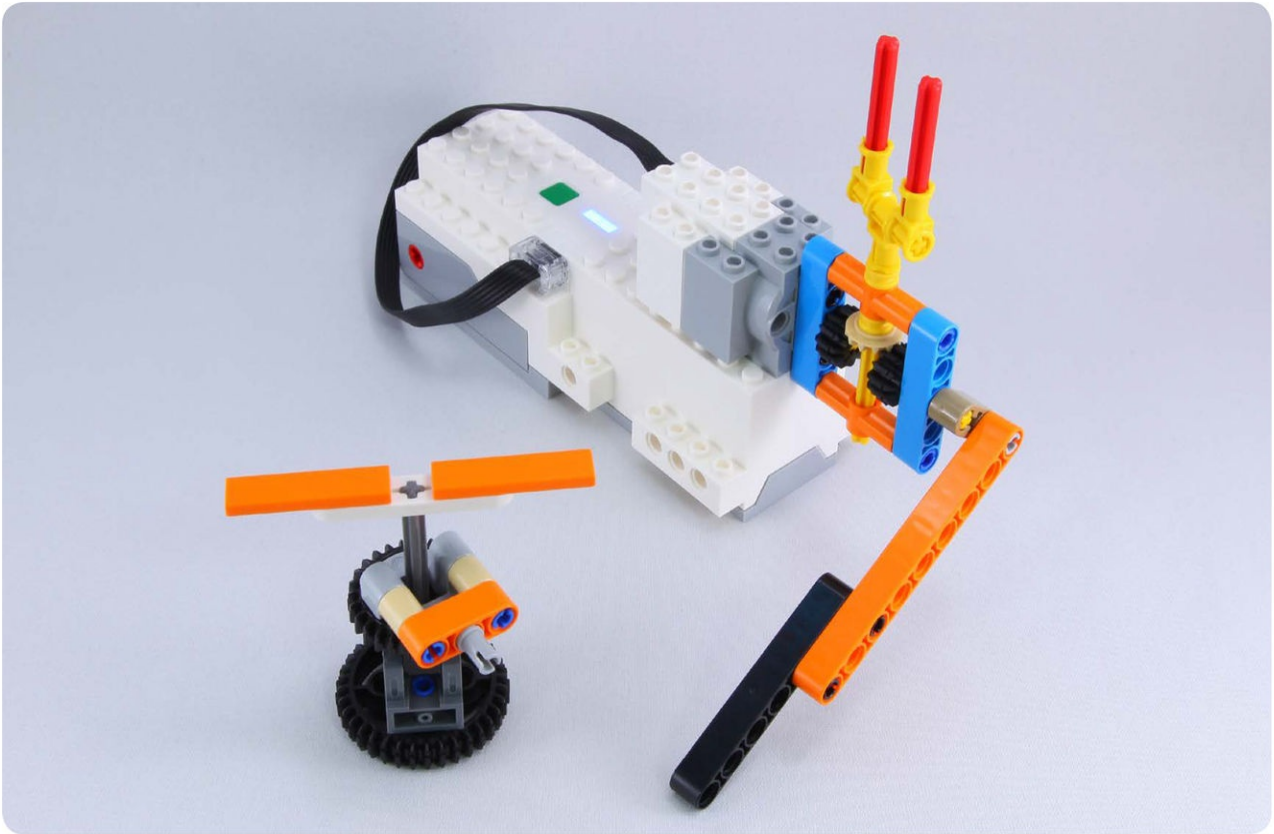






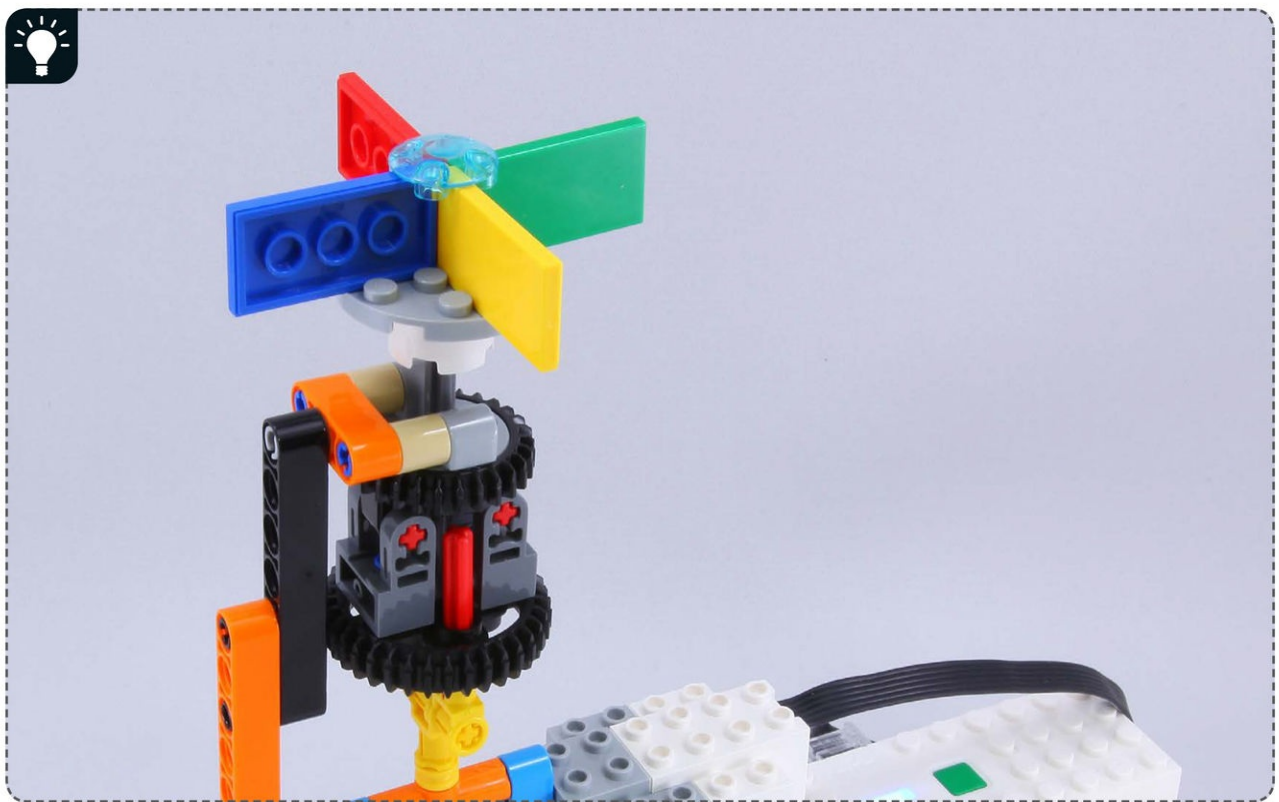
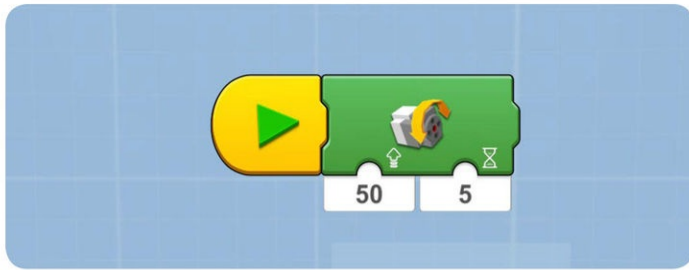
Moving up and down while rotating things **145**





**146** Moving up and down while rotating things



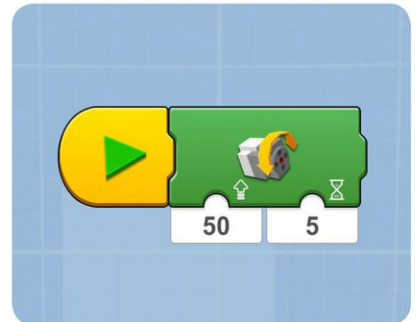
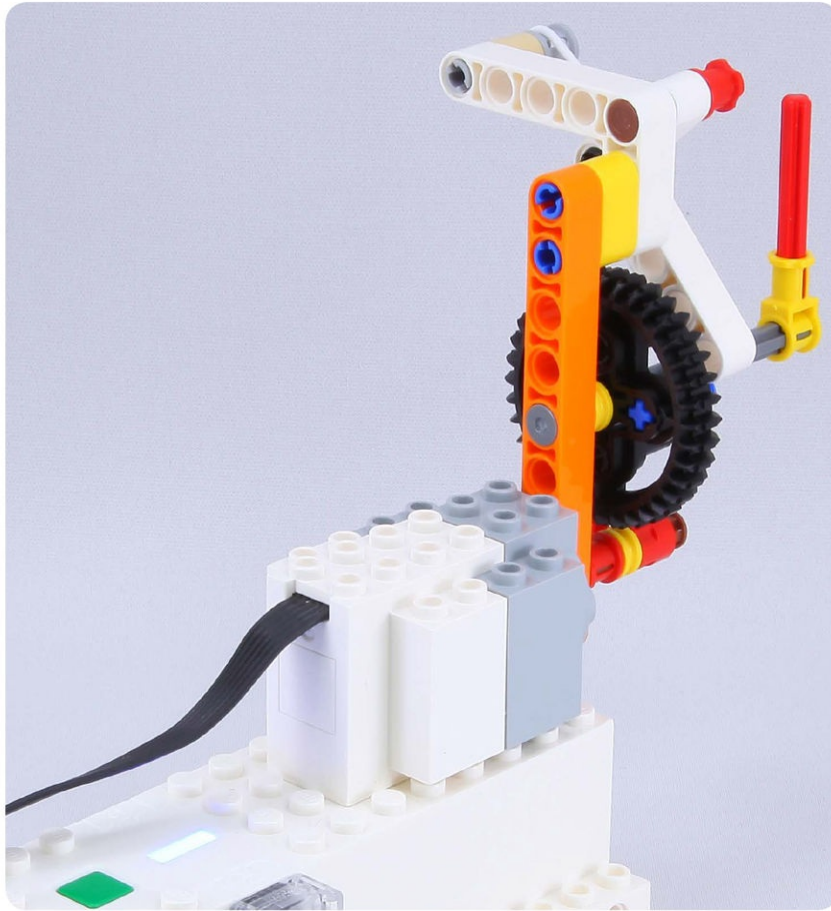


Moving up and down while rotating things 147





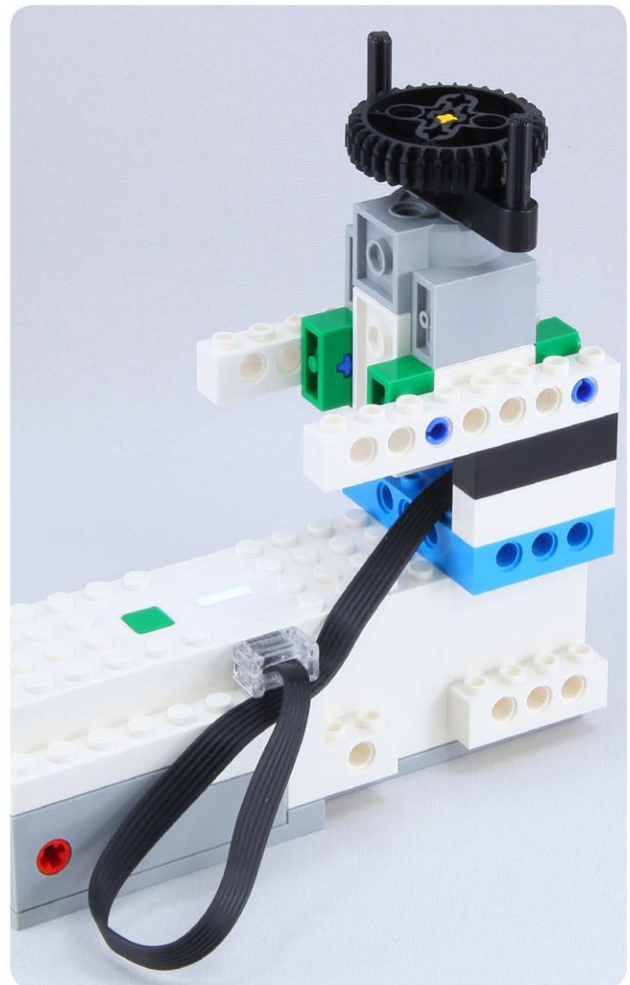
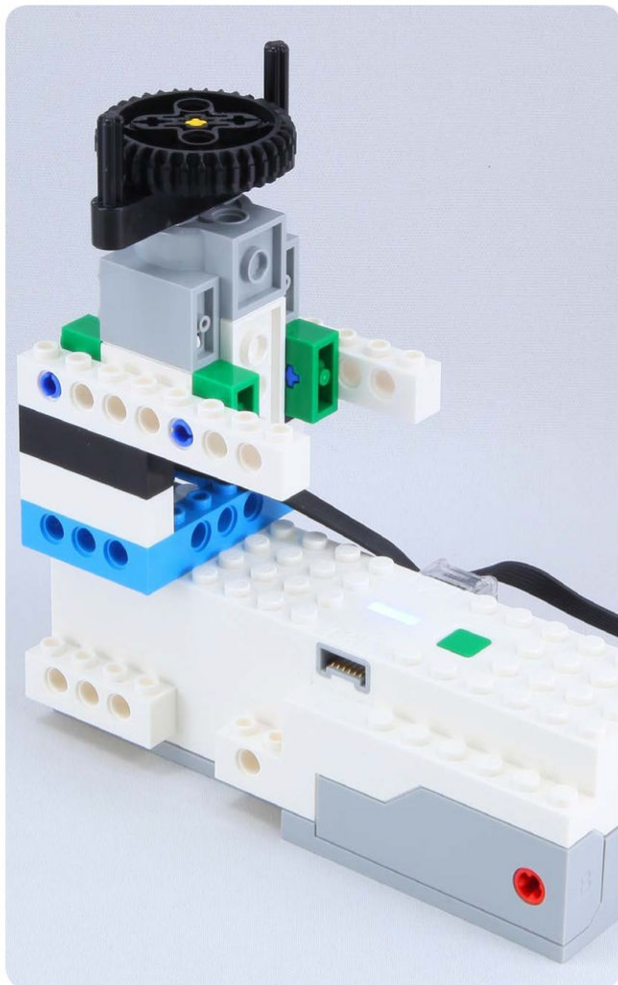
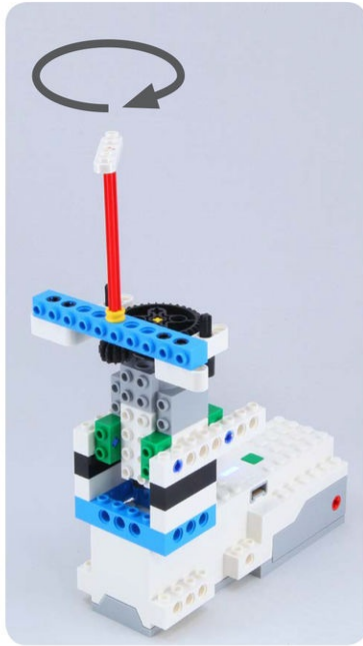






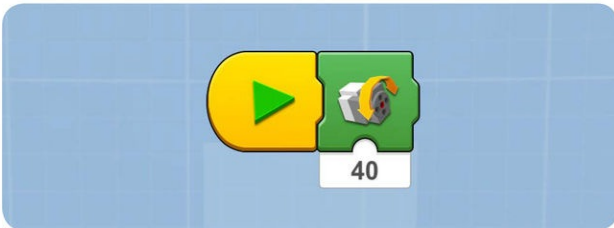
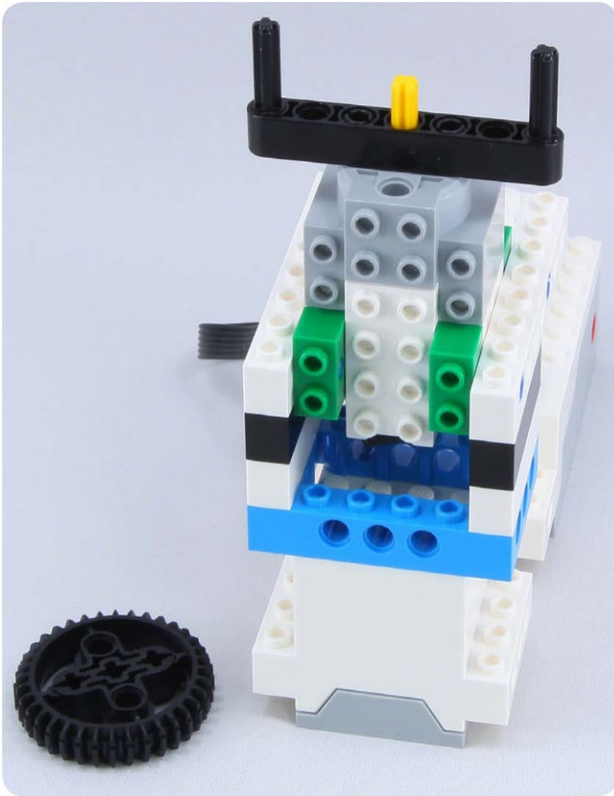
[illegible]





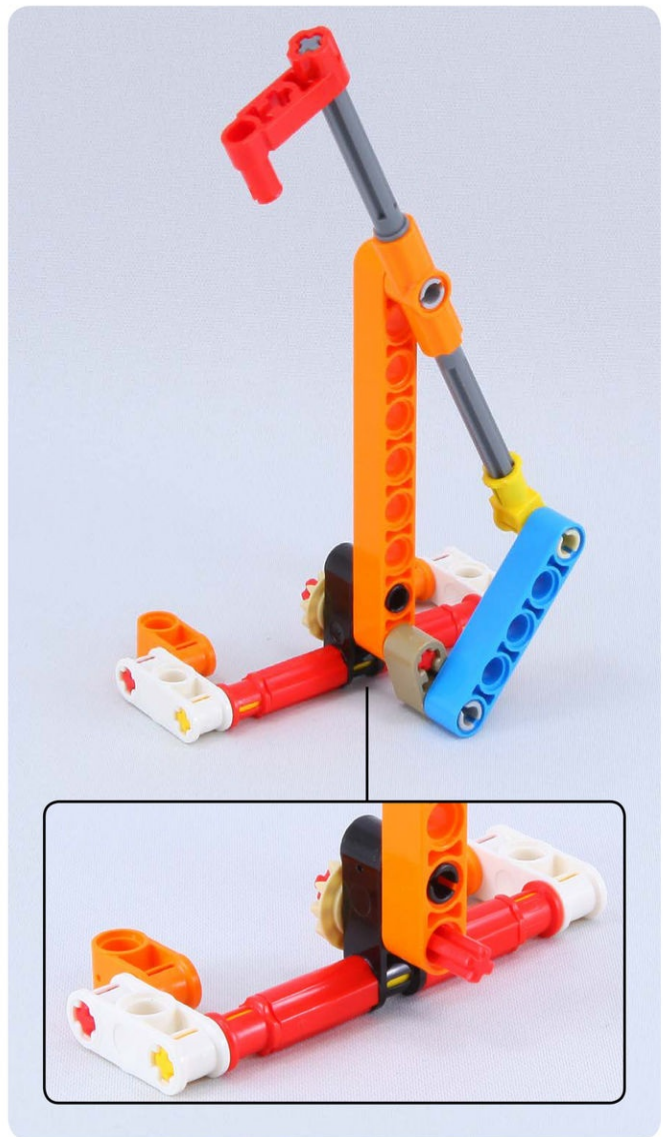
Using attachments to change motion **151**





**152** Using attachments to change motion





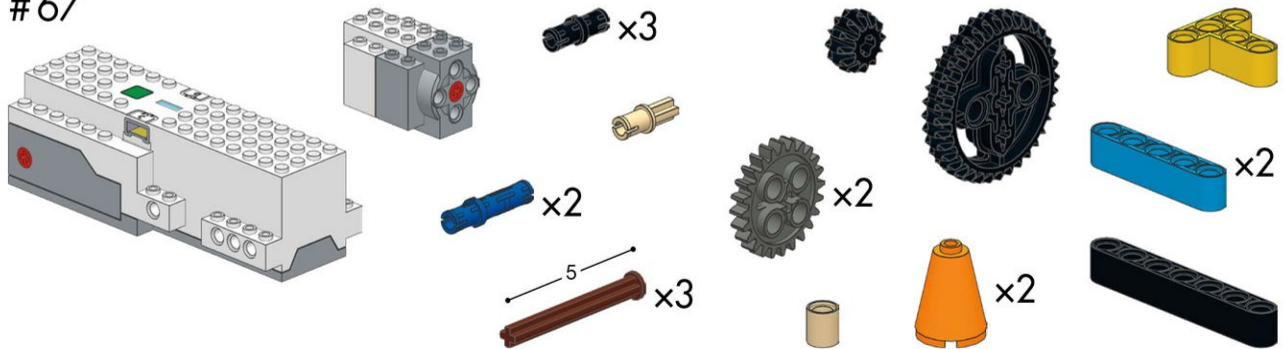
Using attachments to change motion **153**



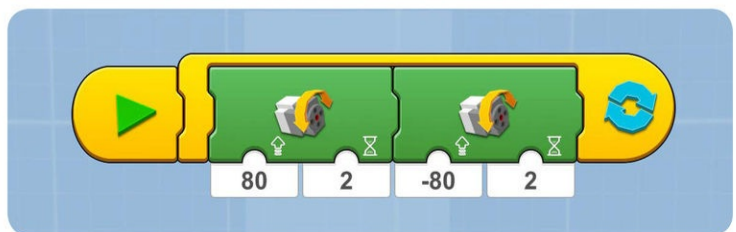
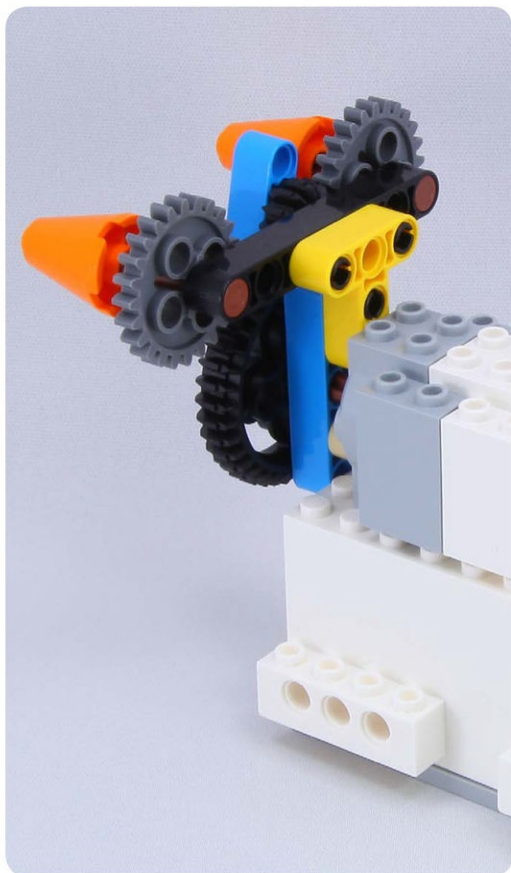
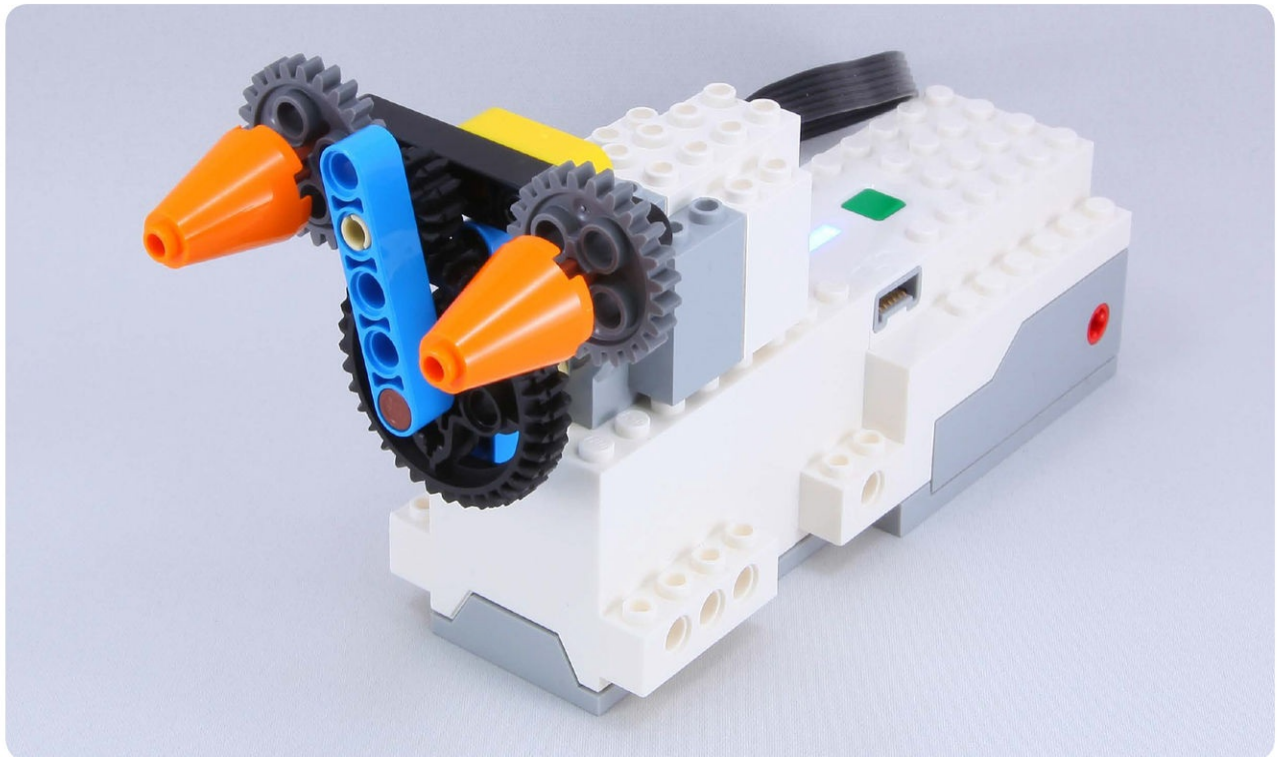


# Changeover mechanisms using rotational direction

#67

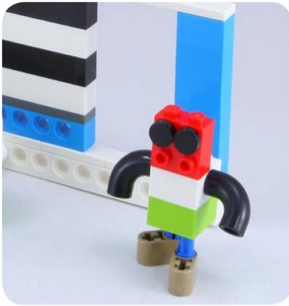






Changeover mechanisms using rotational direction **155**





# PART 3



# More Exciting Ideas!



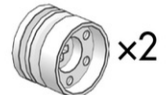
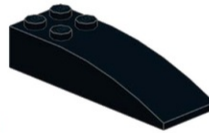
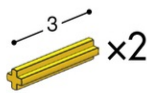
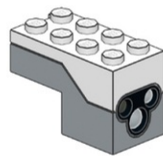
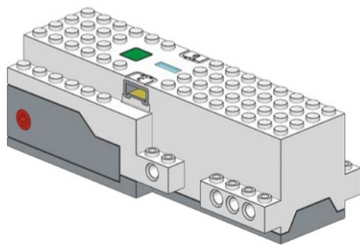




# Using the Color and Distance Sensor

#68

Color and Distance Sensor



x2



x2



x2

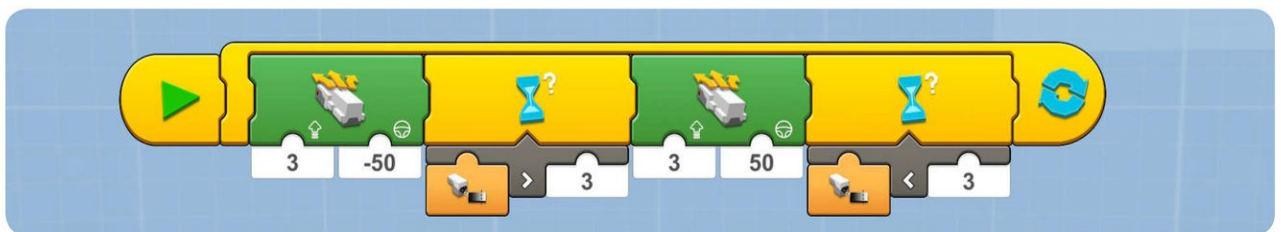
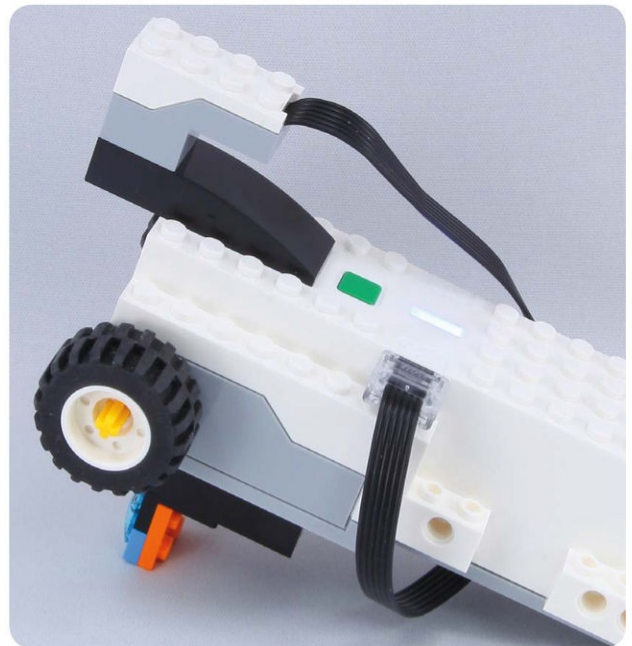
This robot follows a black line.



Place the Color and Distance Sensor above the black line to start.


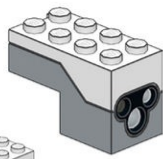
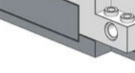
158 Using the Color and Distance Sensor









#09

  $\times 4$ 


$\times 2$



$\times 2$




$\times 2$




x2

 x6


3  x2

4 x2


A LEGO Technic 1 x 3 Pin Connector, which is a grey L-shaped piece. It has three pins on the top edge and four pins on the side edge.



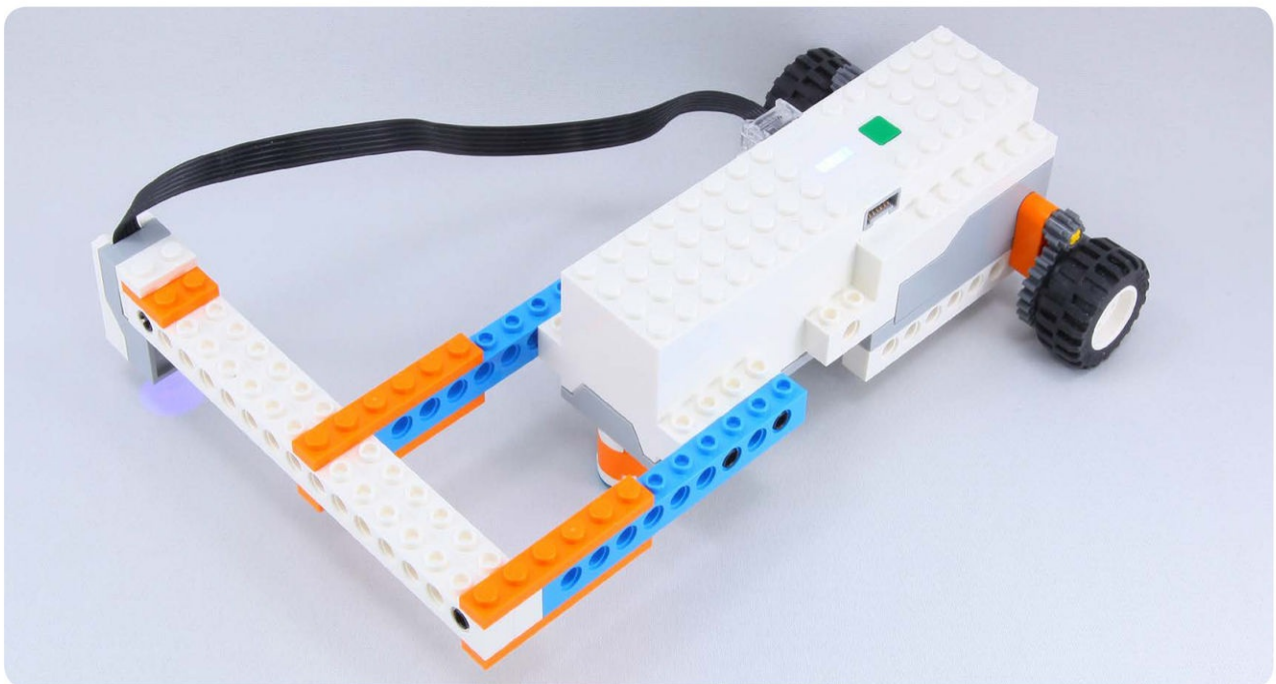
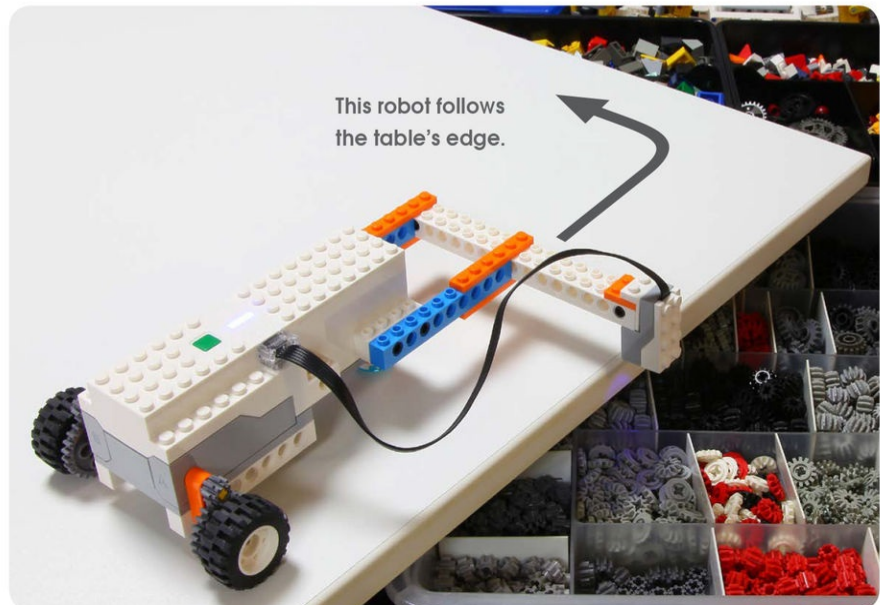
x2

 x2

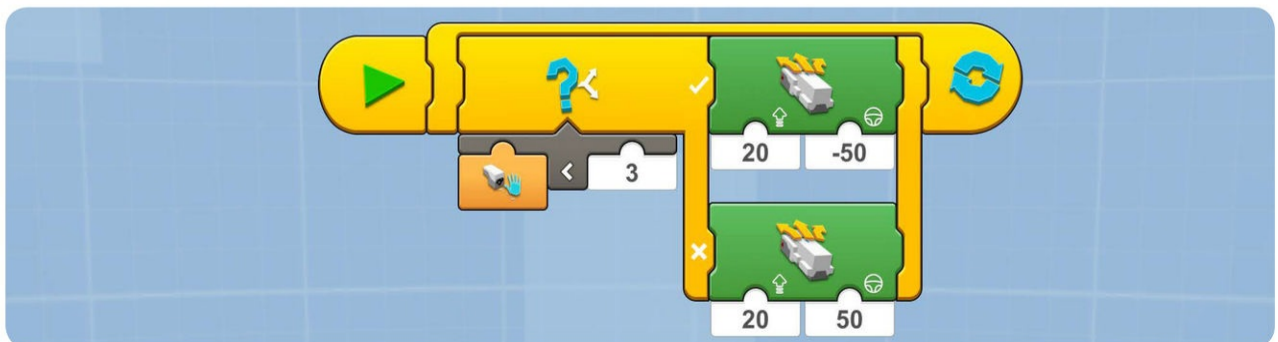
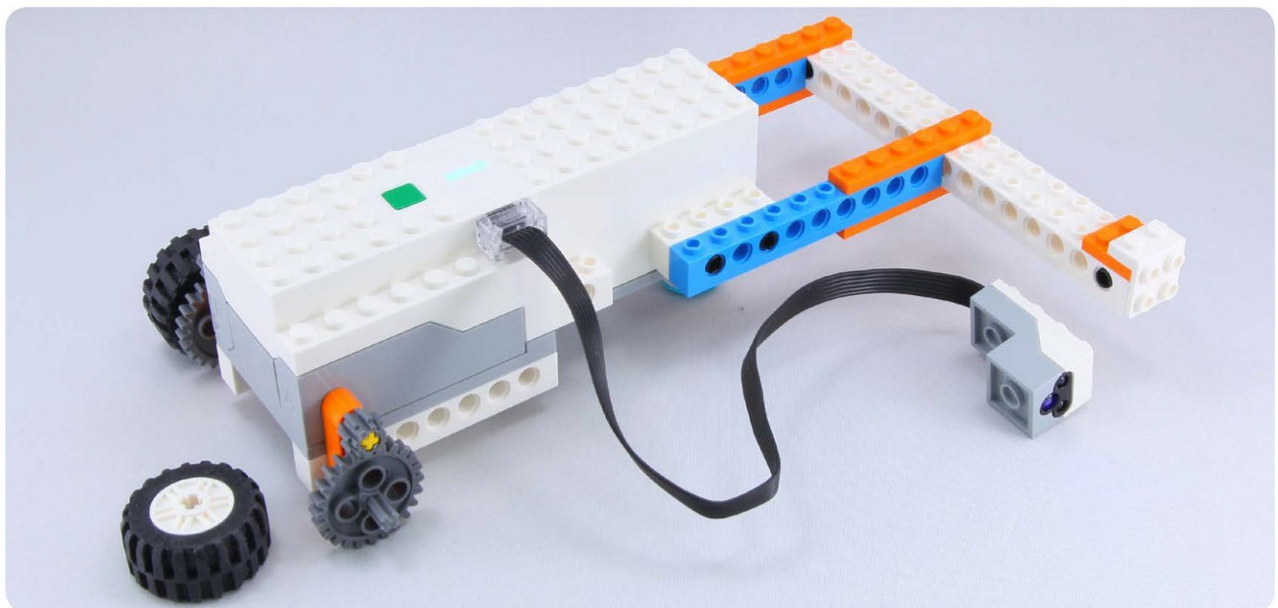
×2

  $\times 2$ 

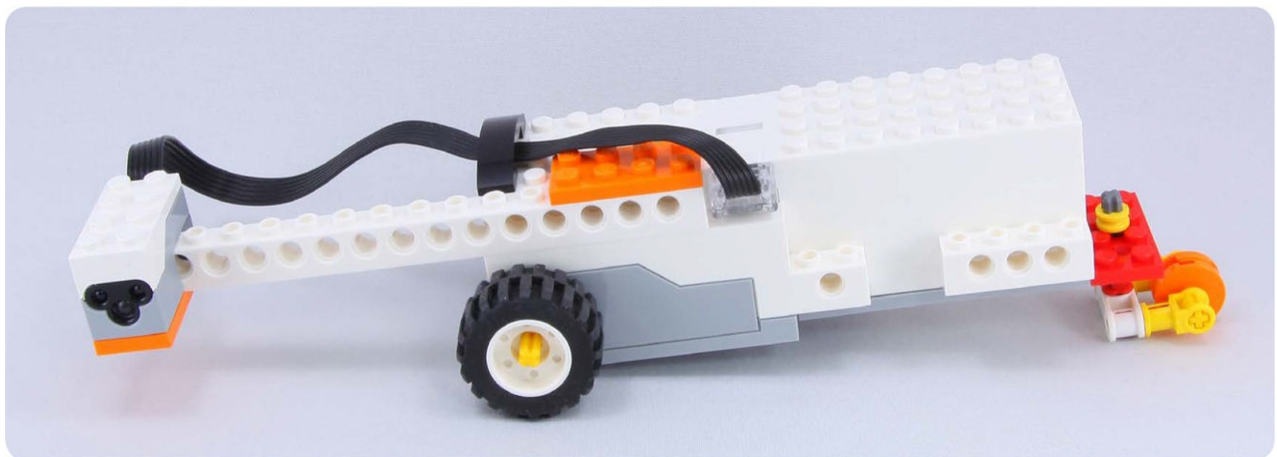
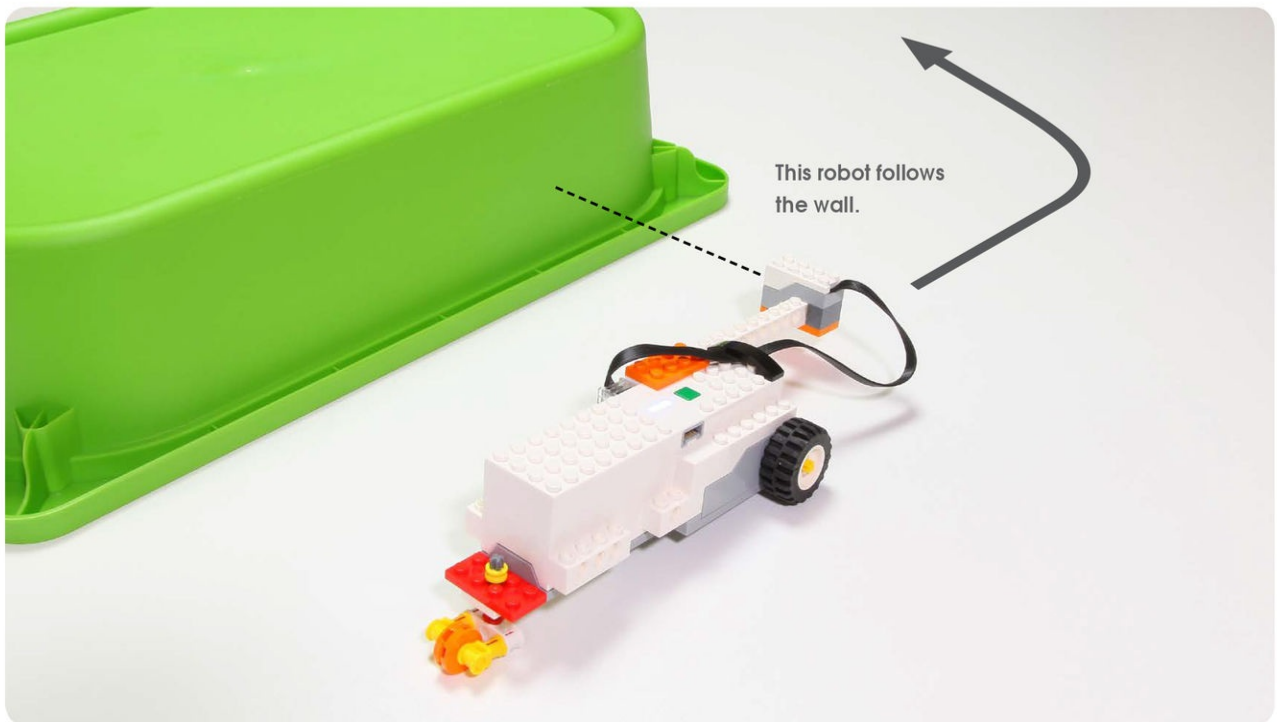
x2



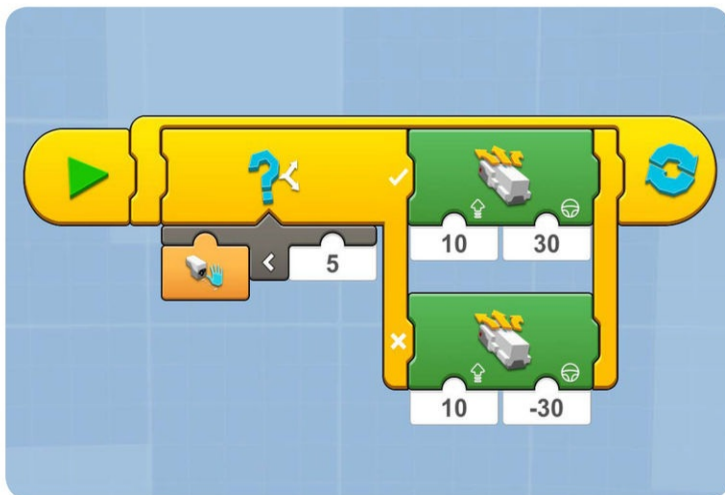
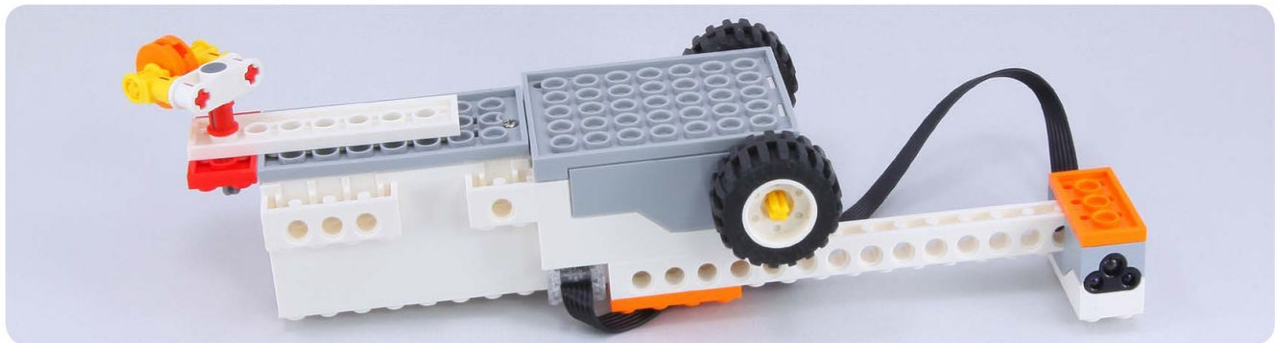
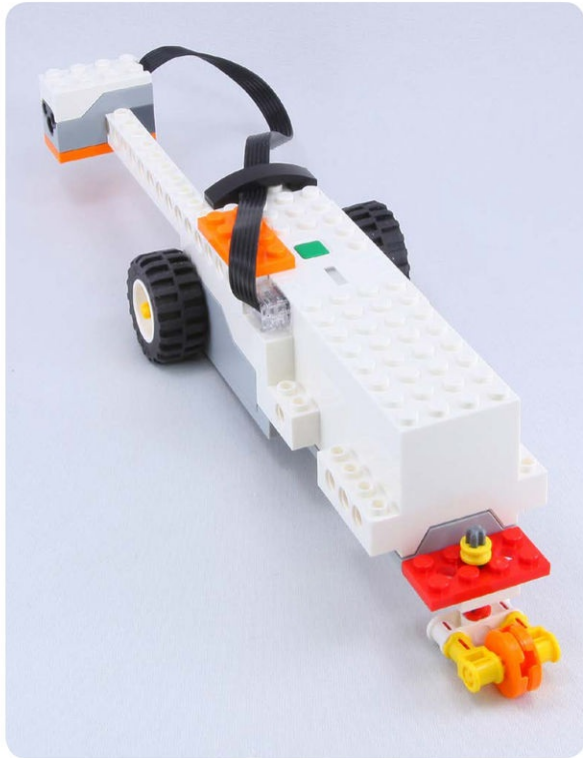






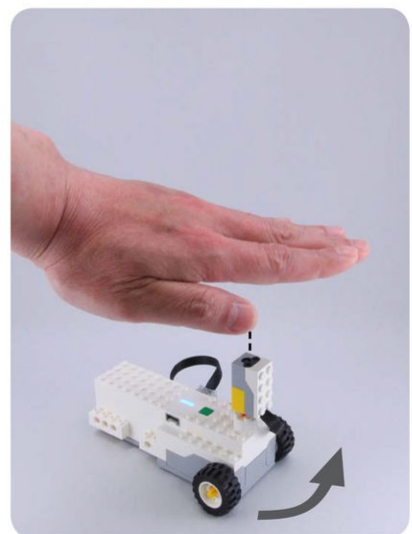
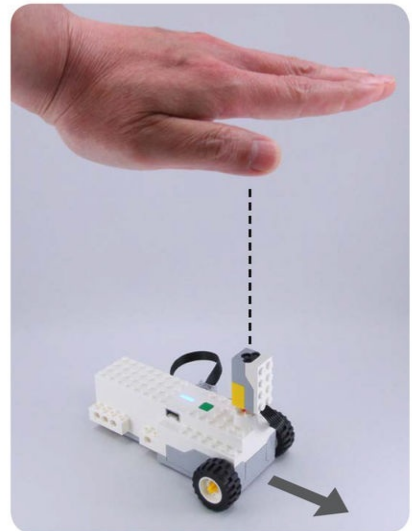
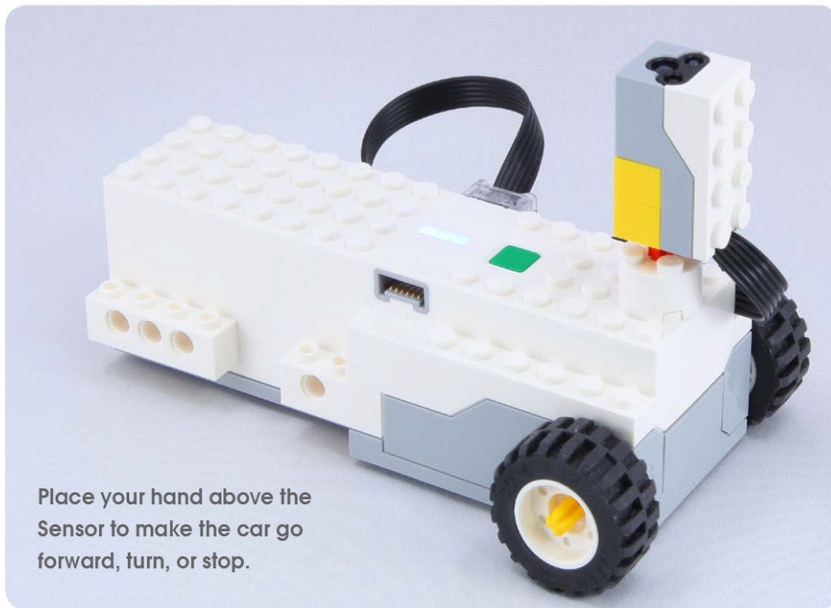
[illegible]





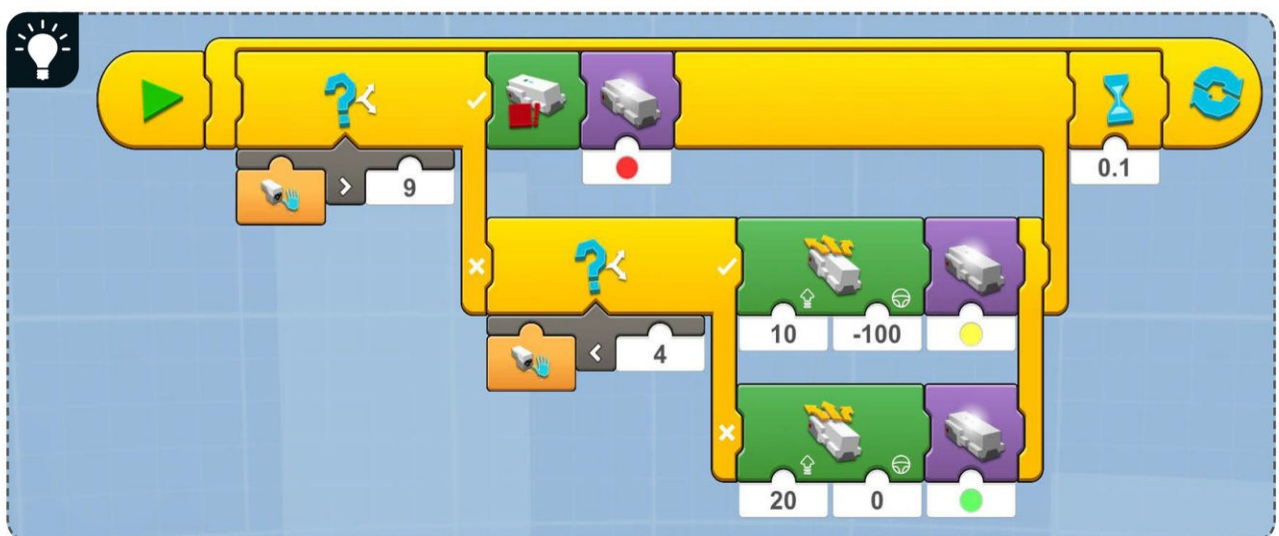
Using the Color and Distance Sensor 163



[illegible]

177

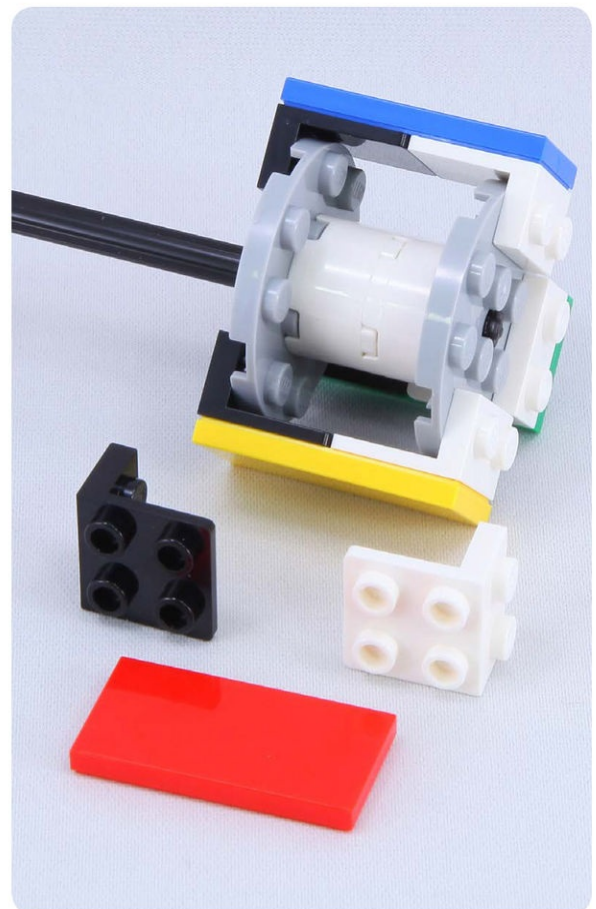
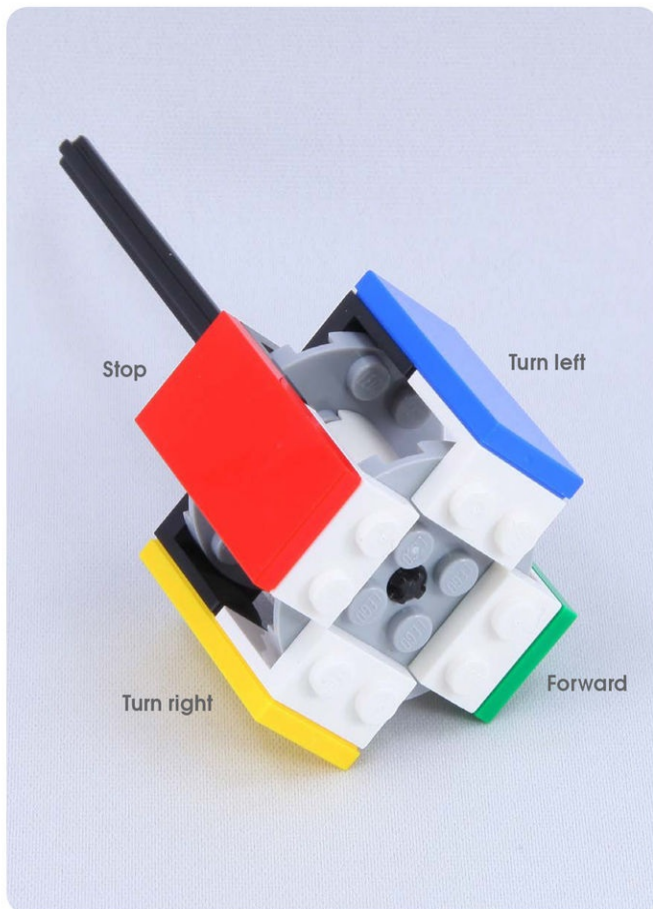
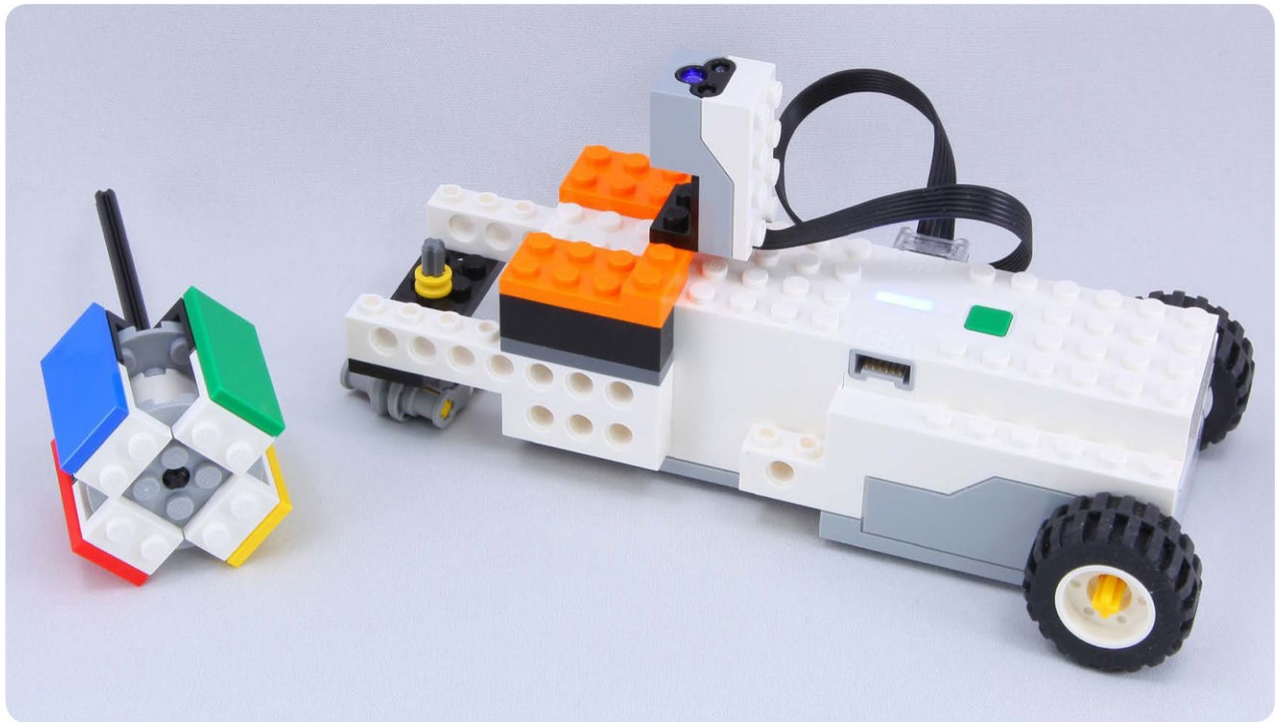




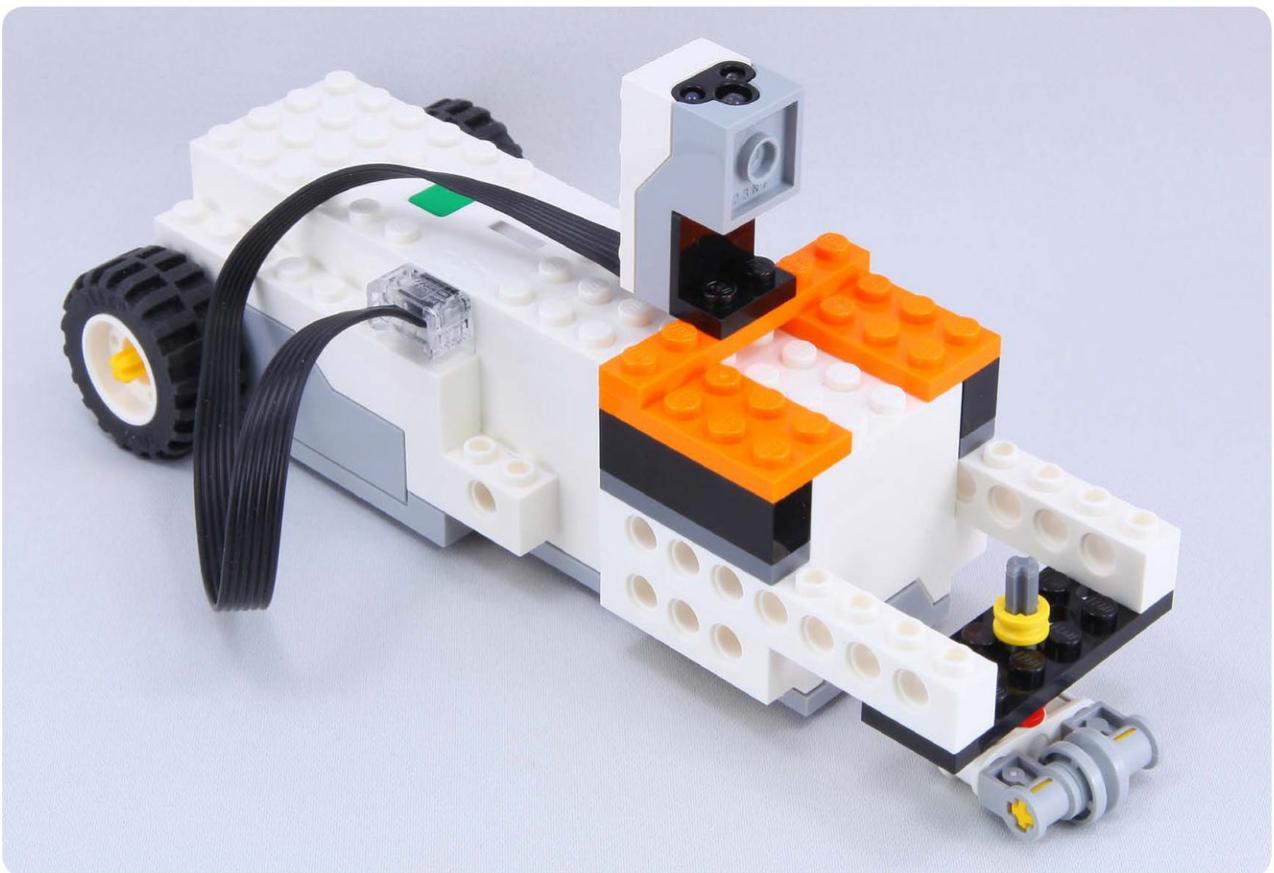
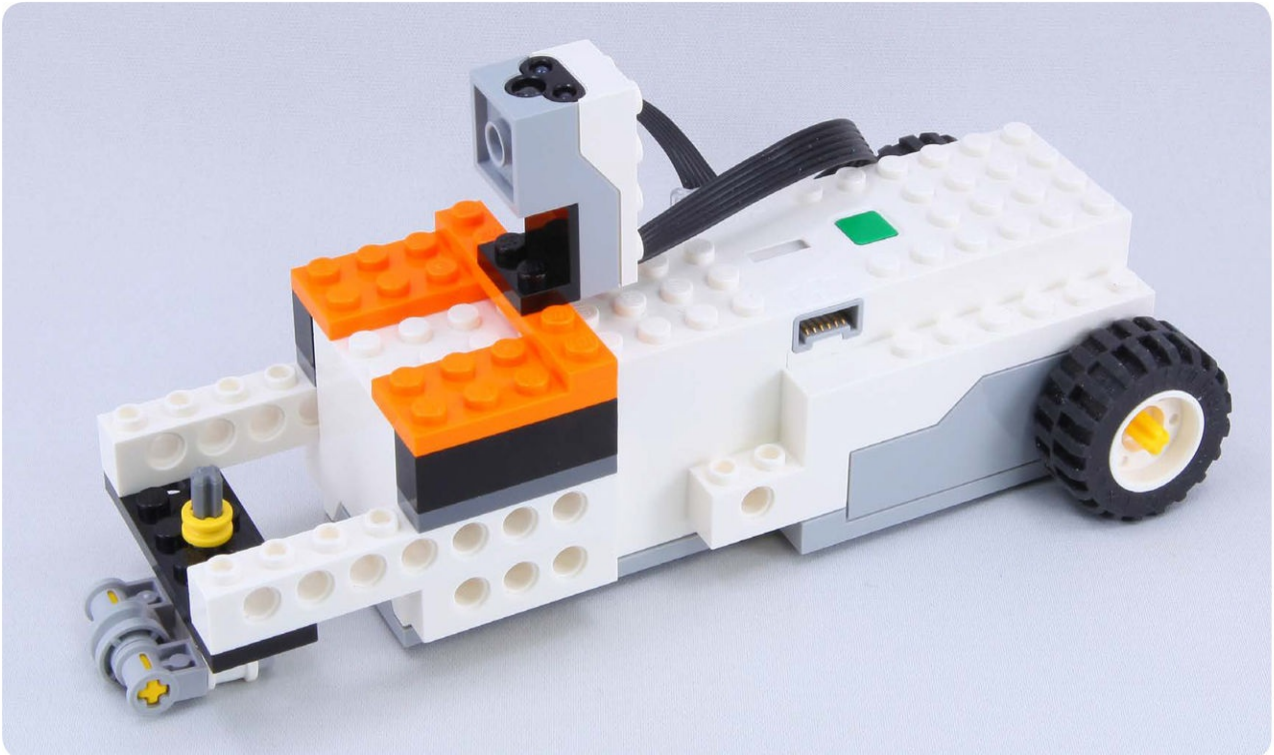


[illegible]



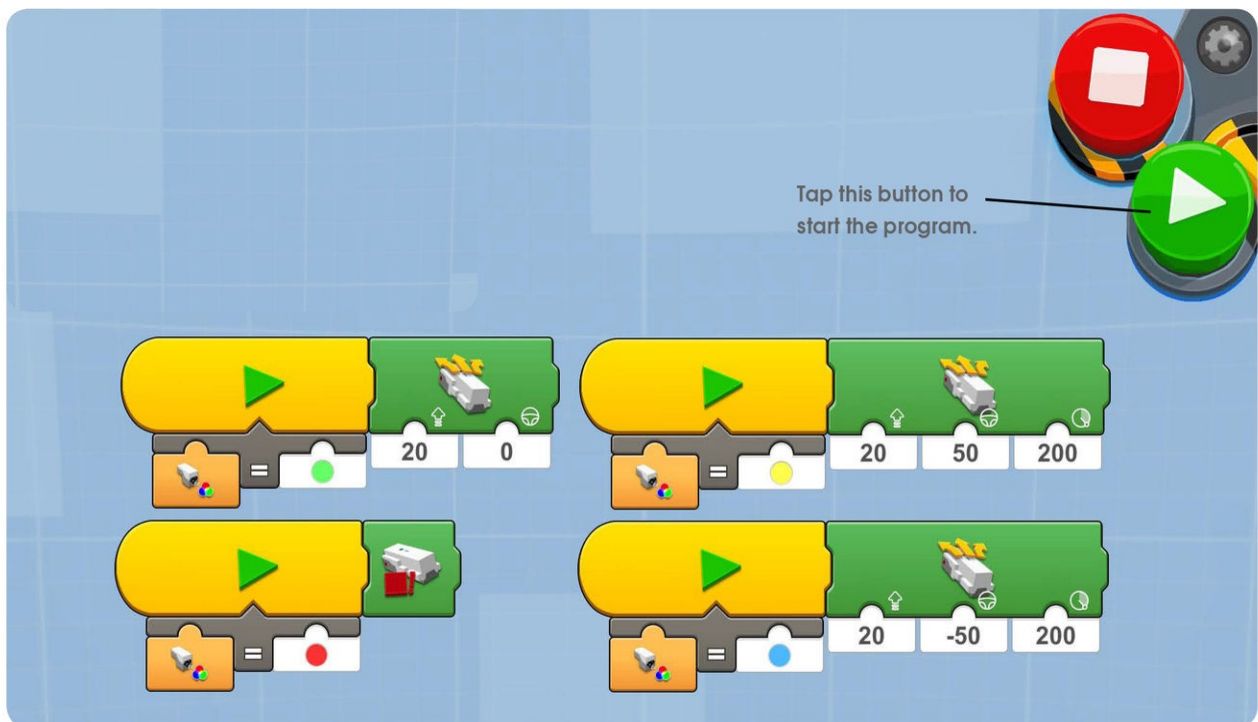
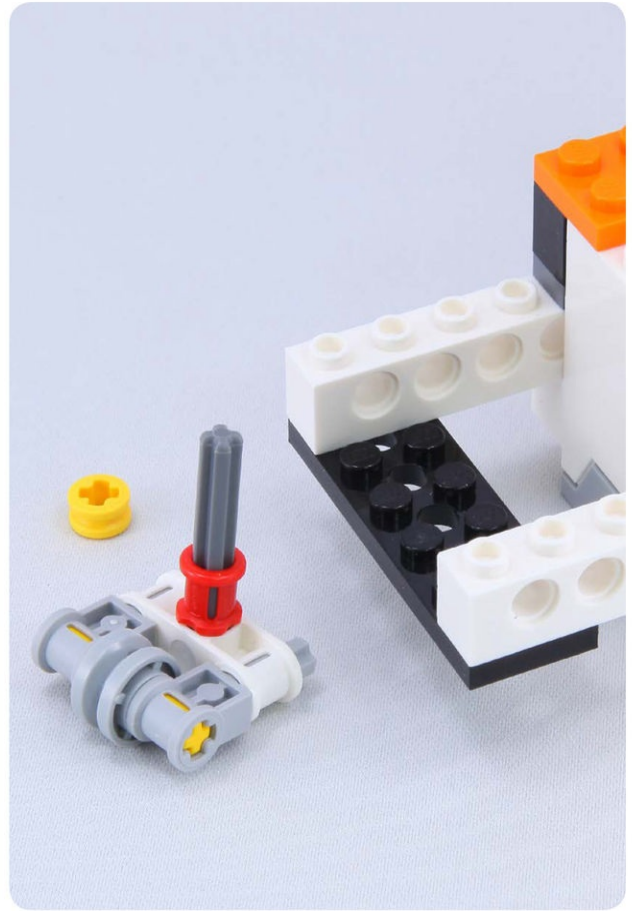
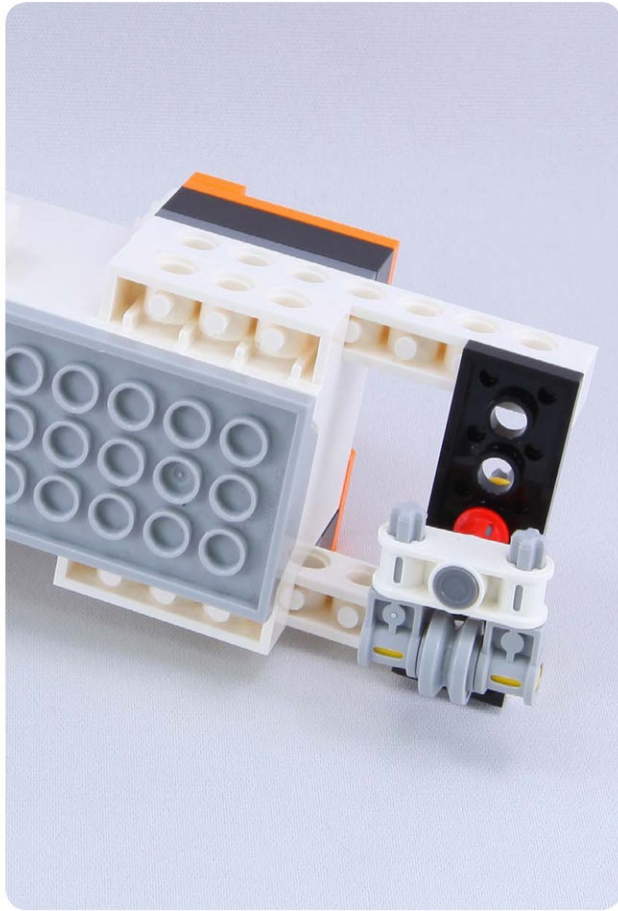




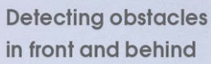


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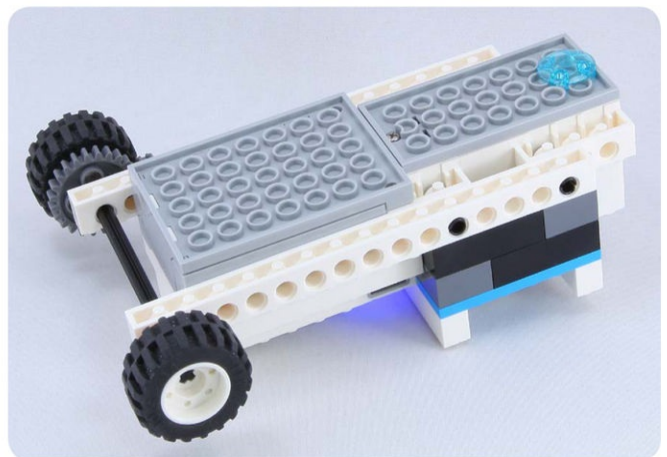
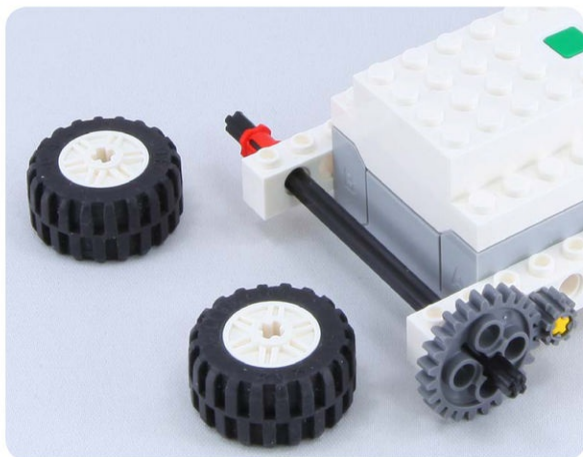
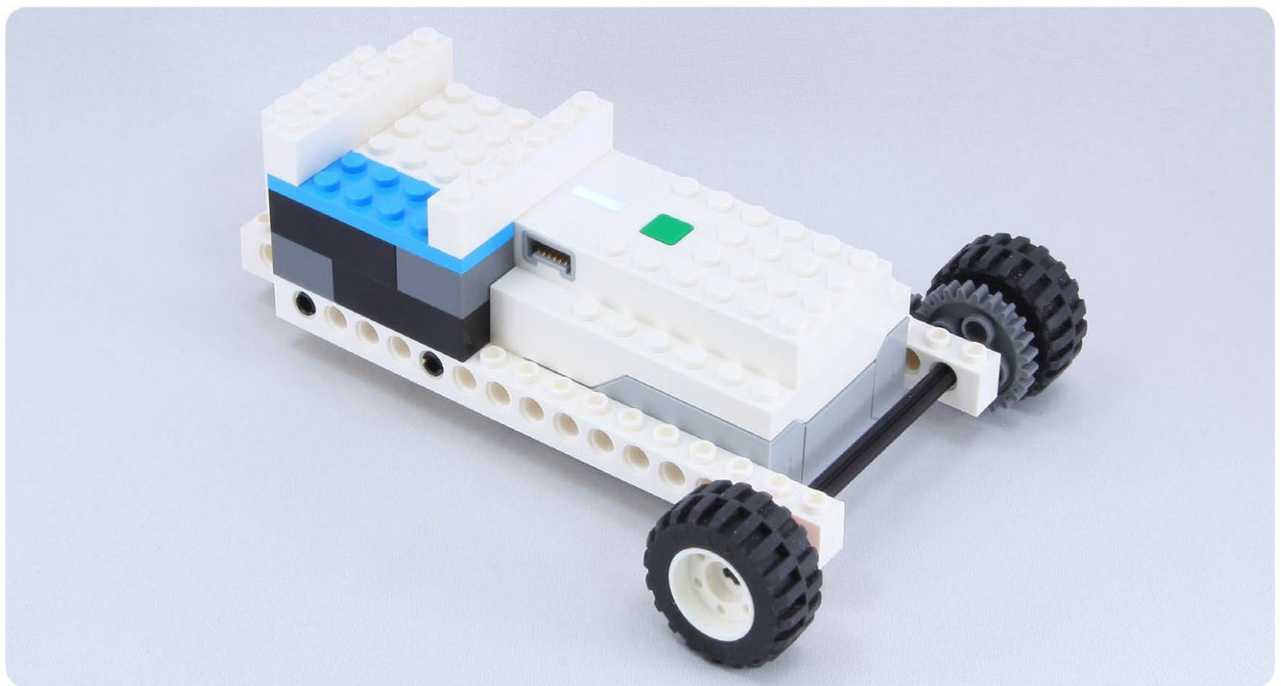
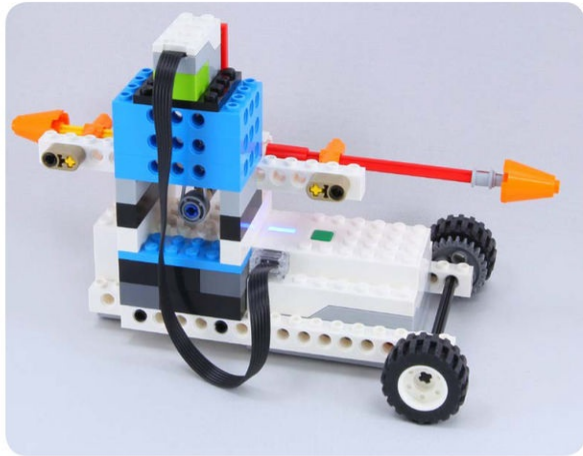




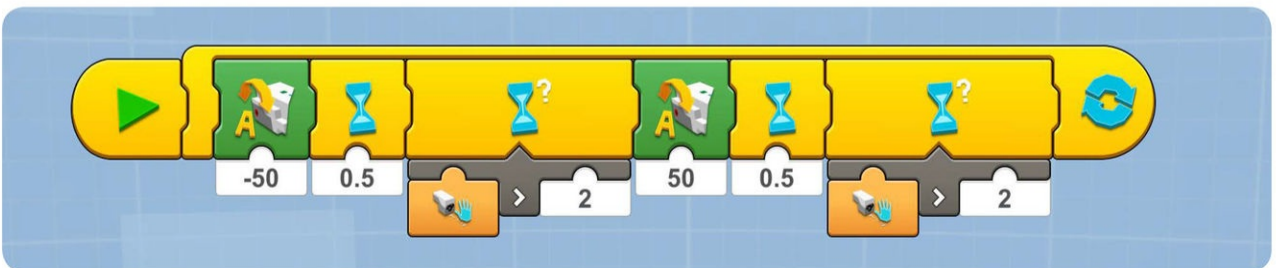
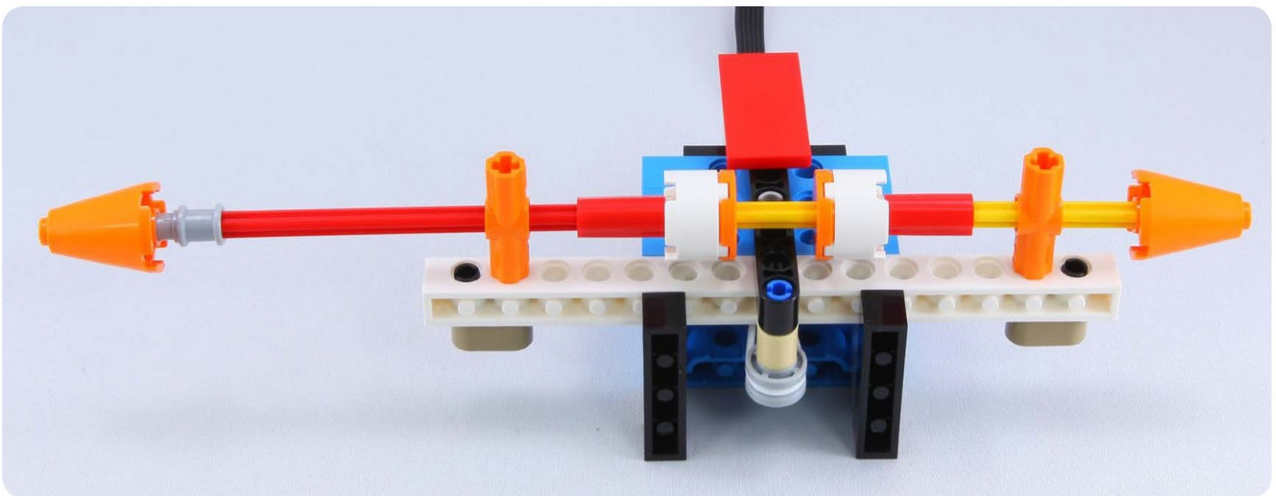


[illegible]



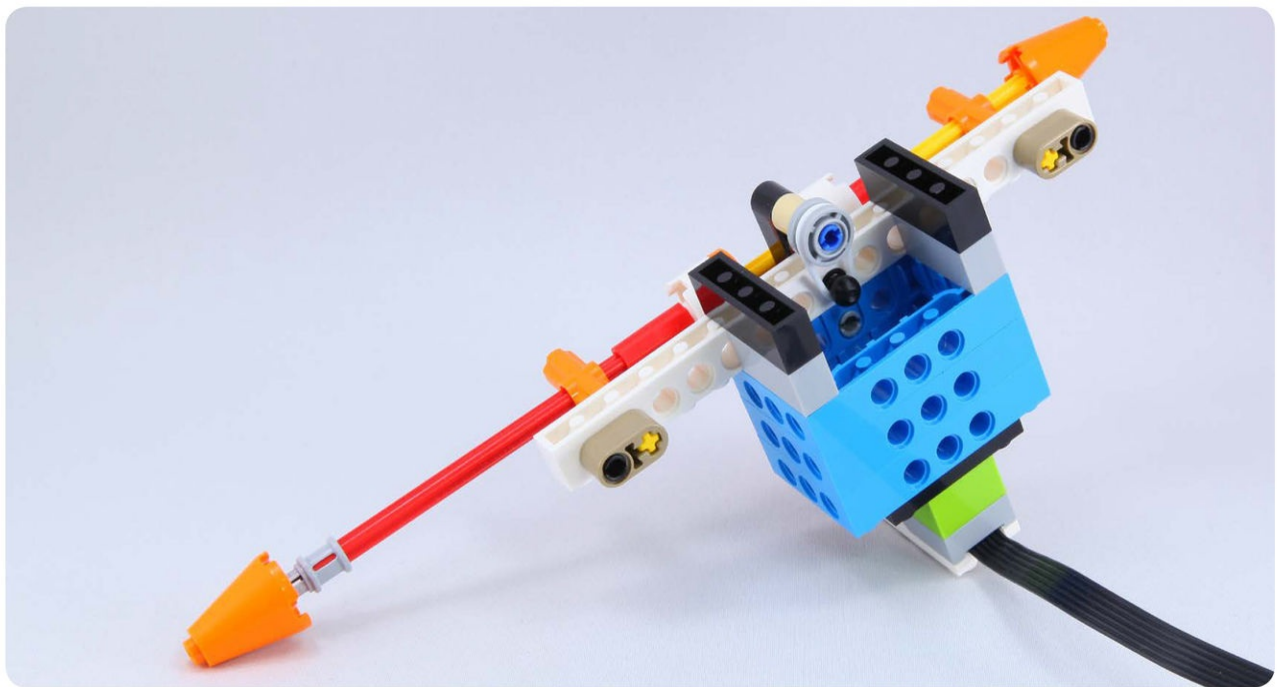
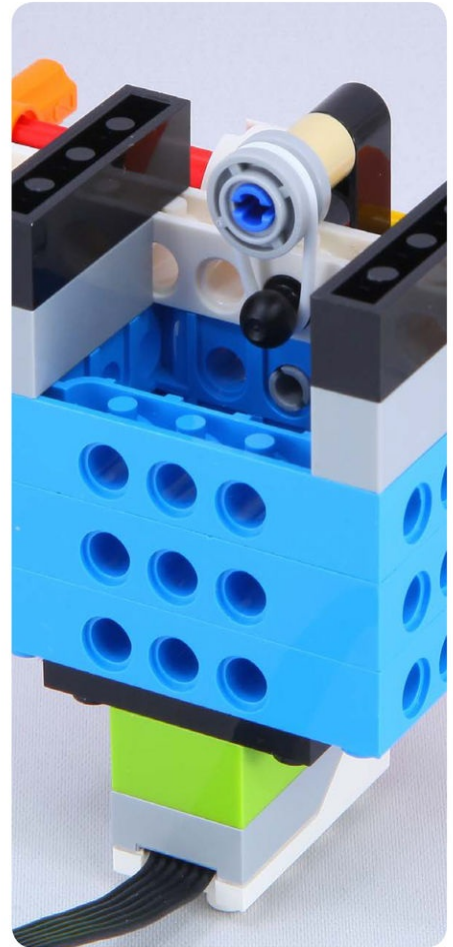
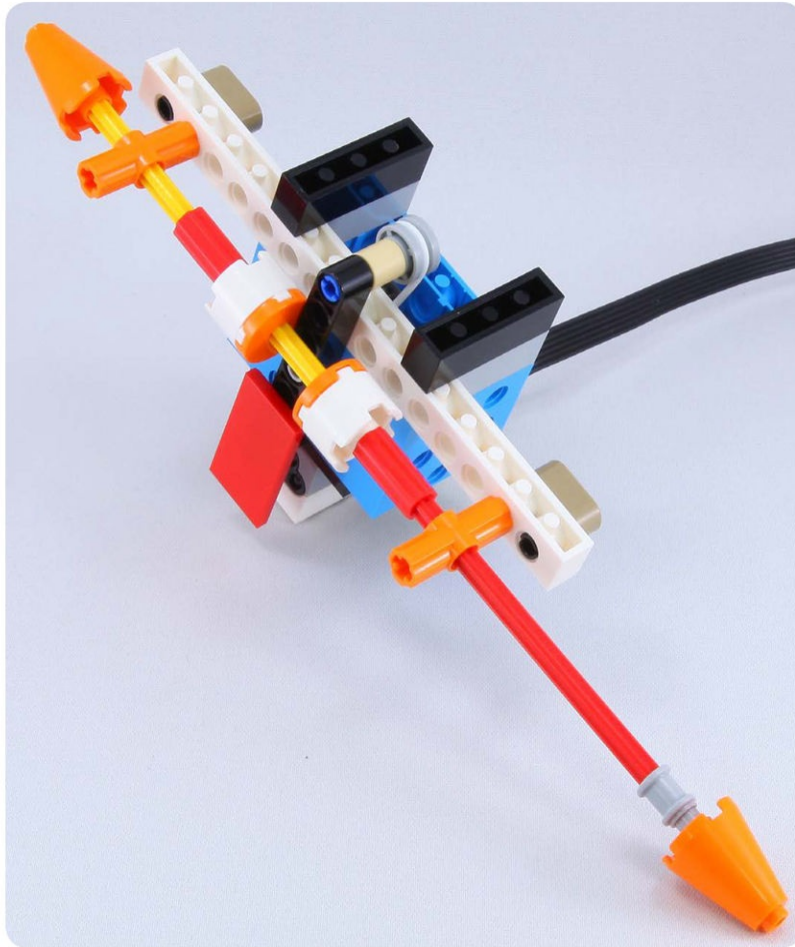




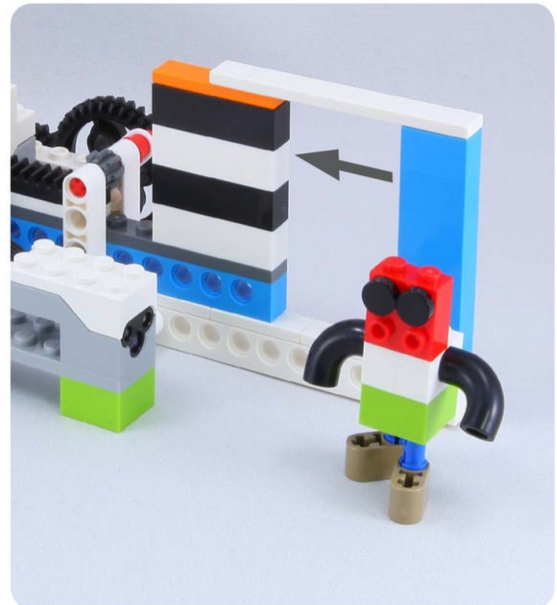


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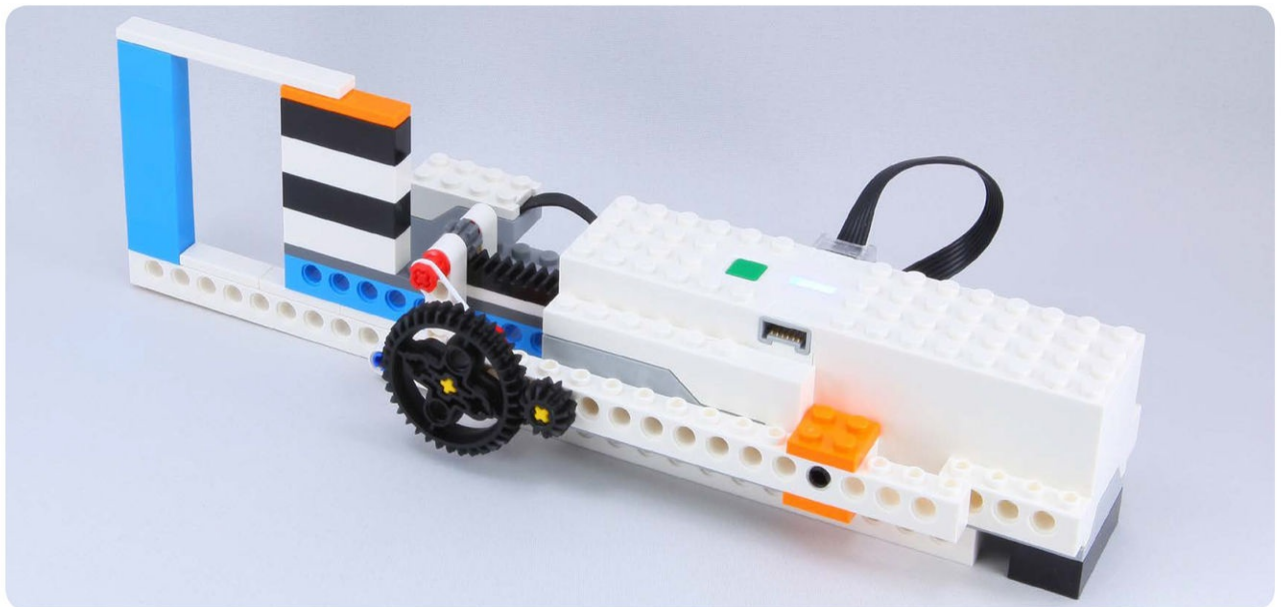
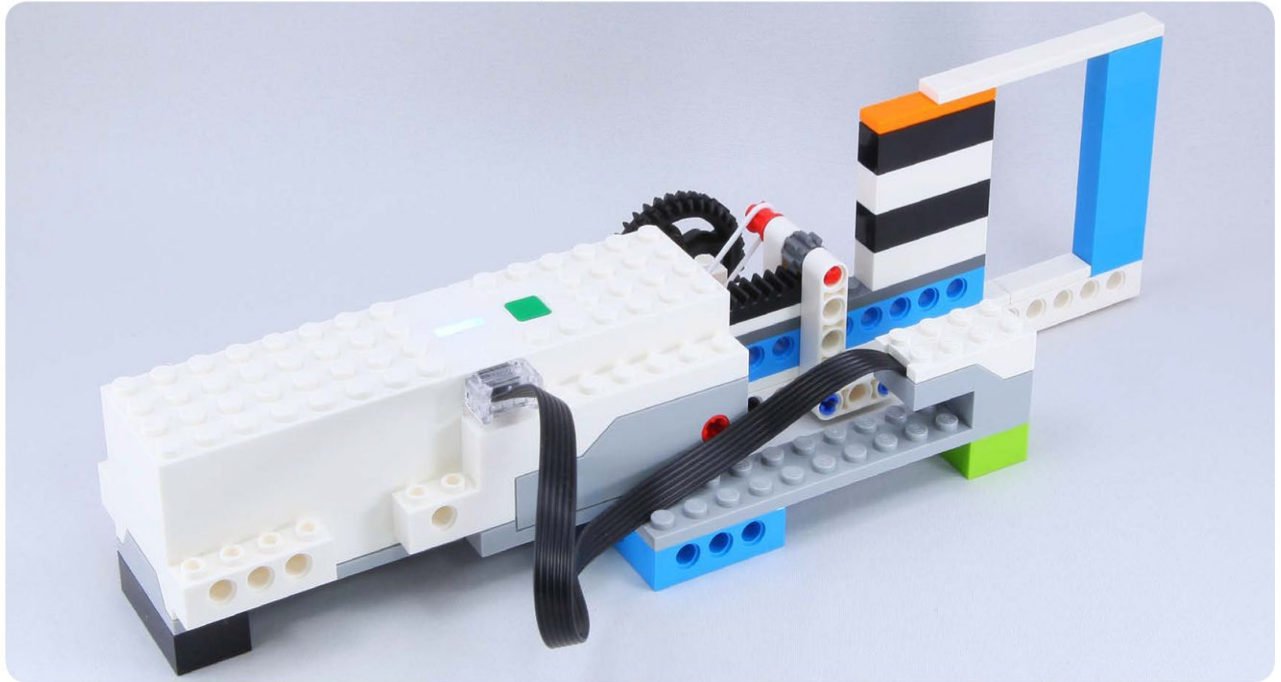
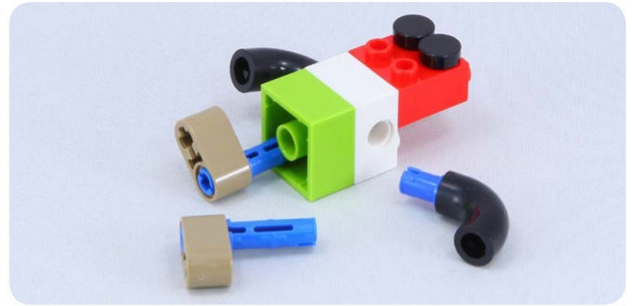
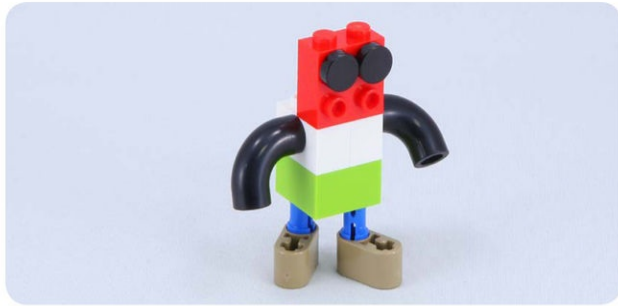






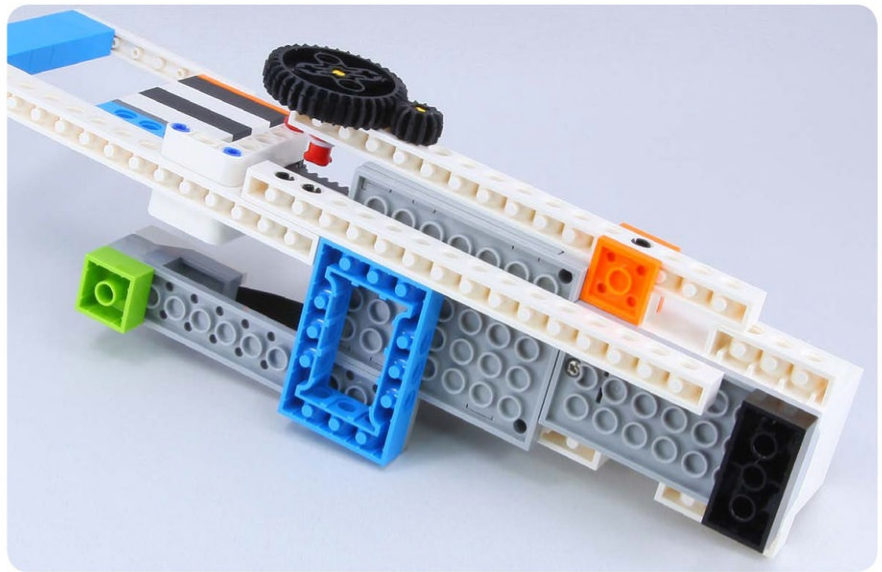
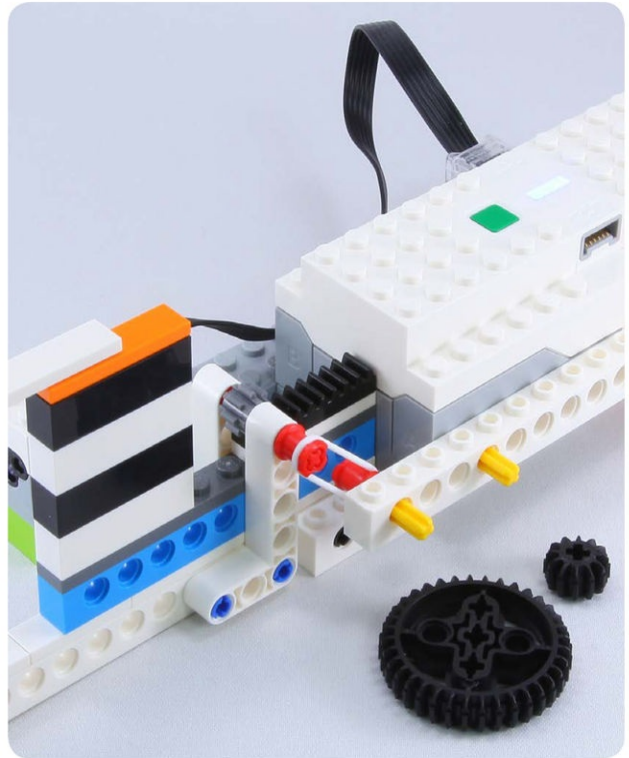
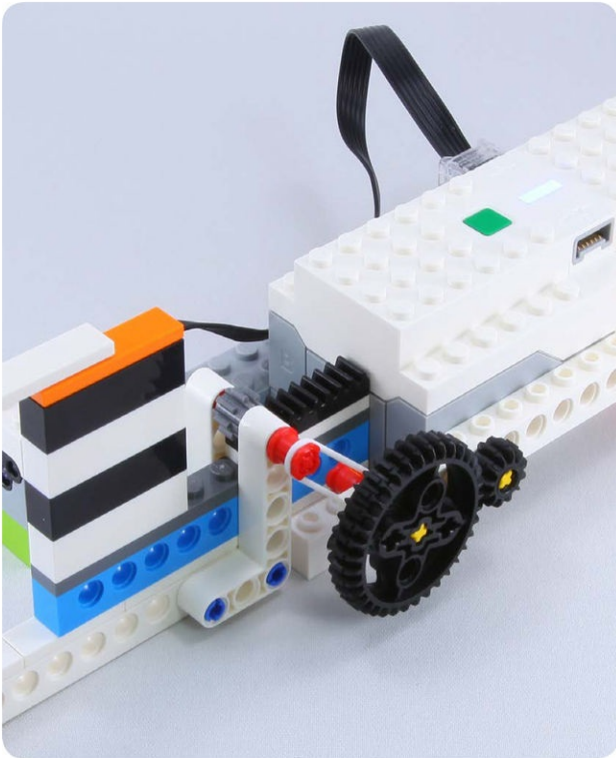
[illegible]



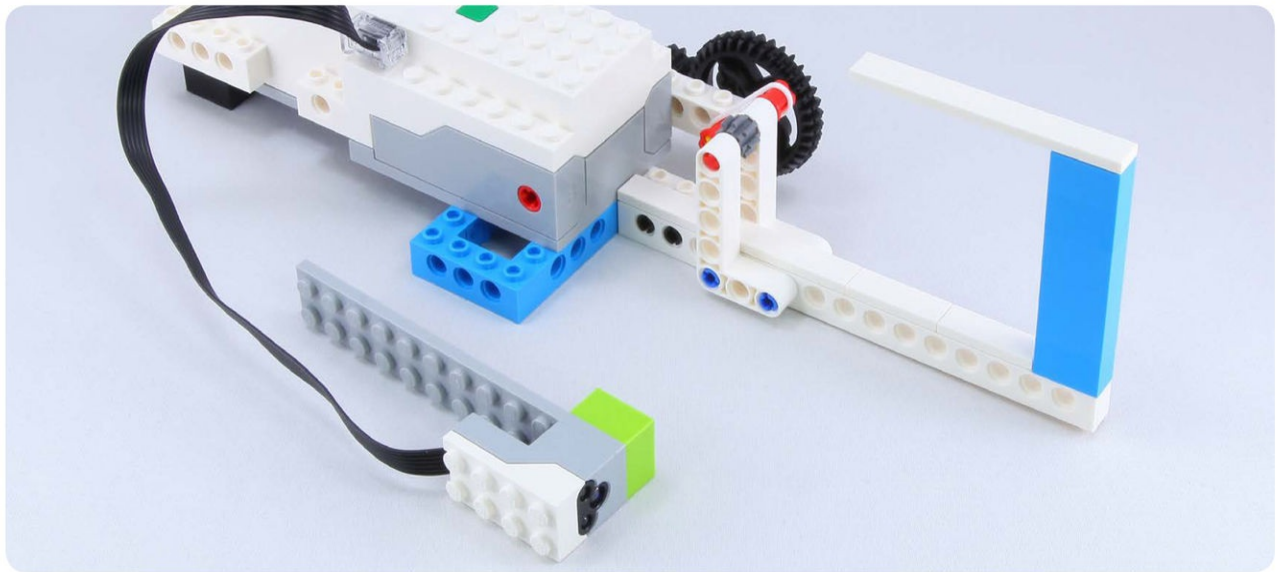
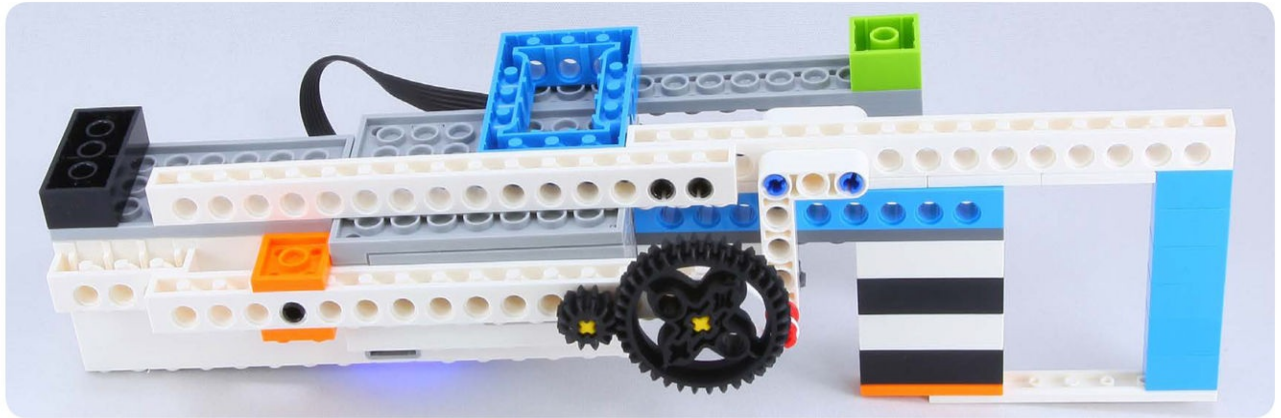


Automatic doors 175





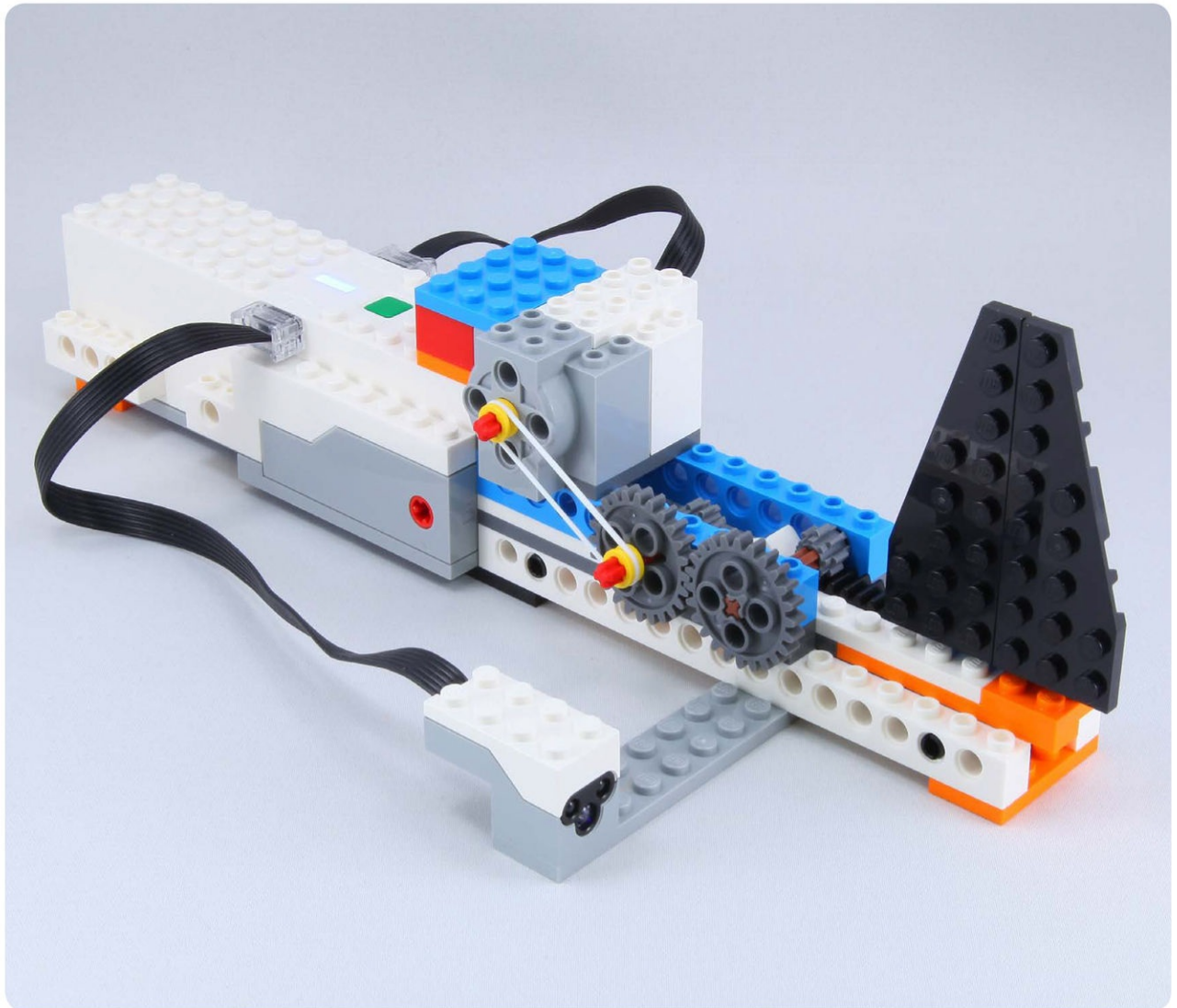
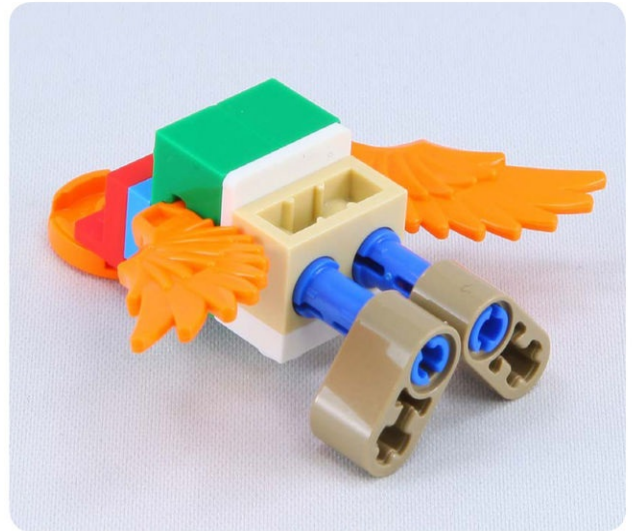
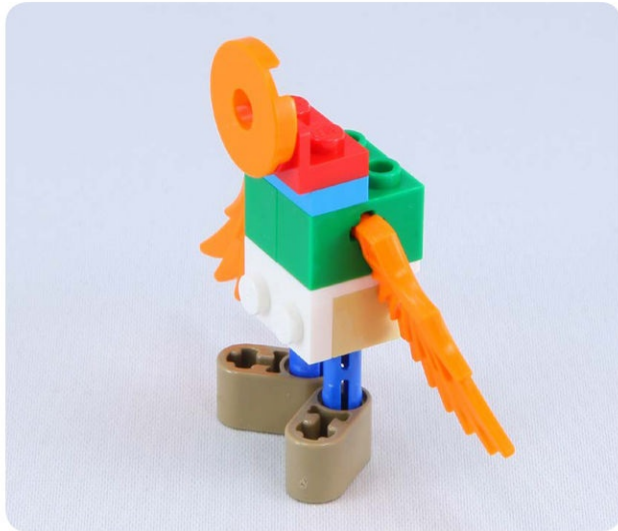






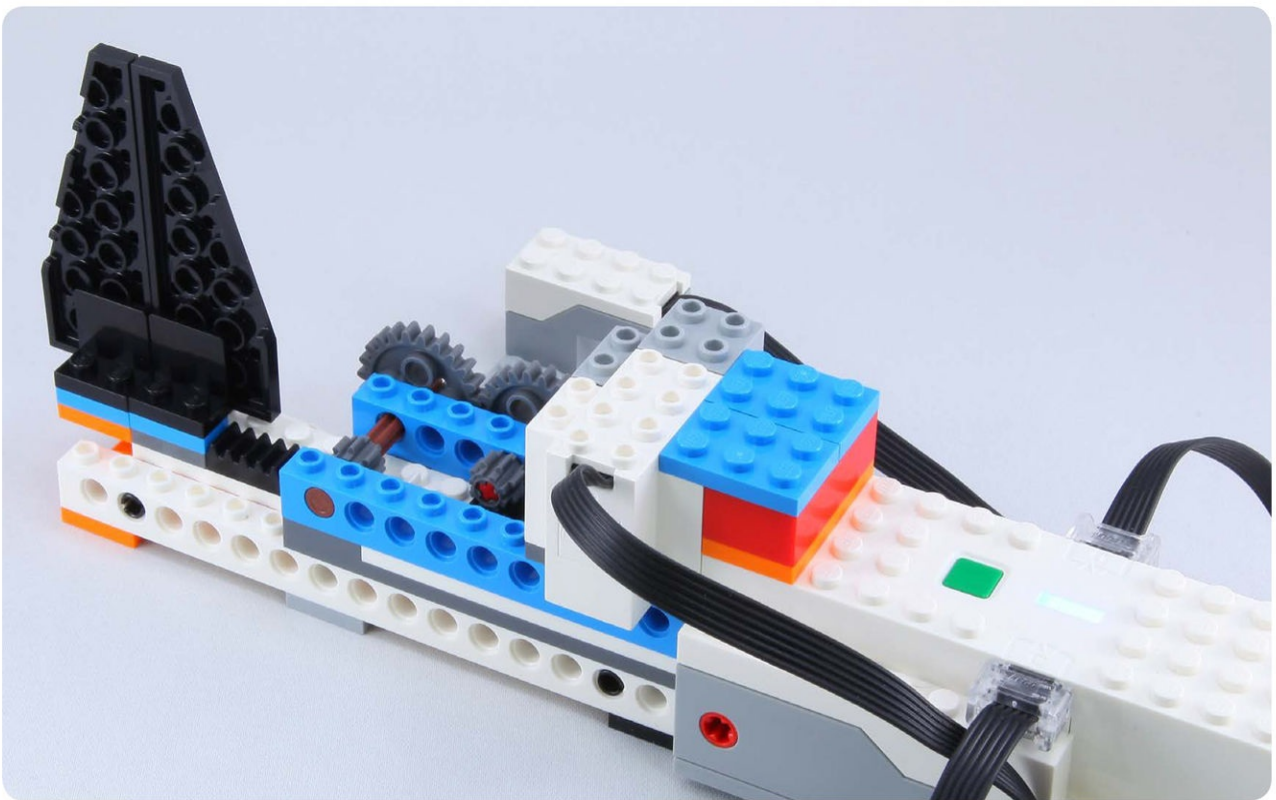
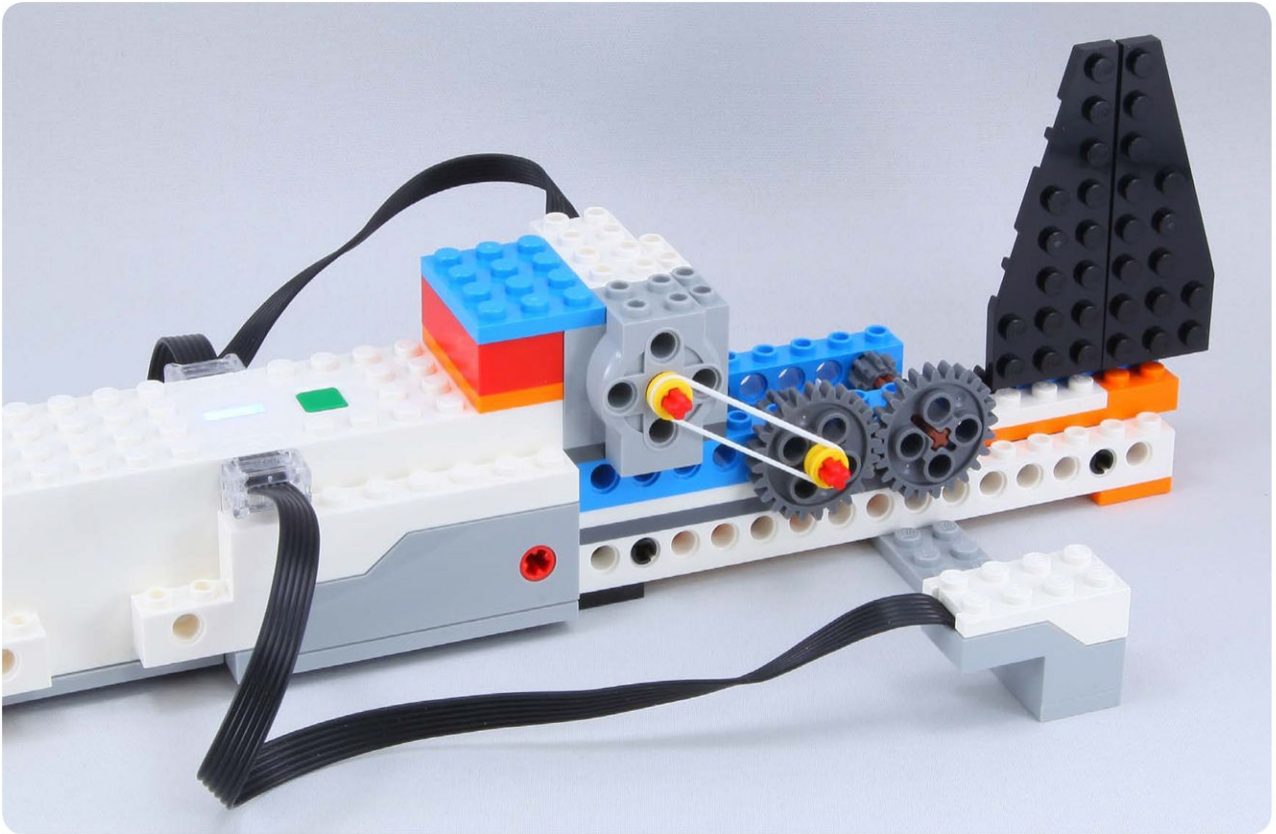
[illegible]





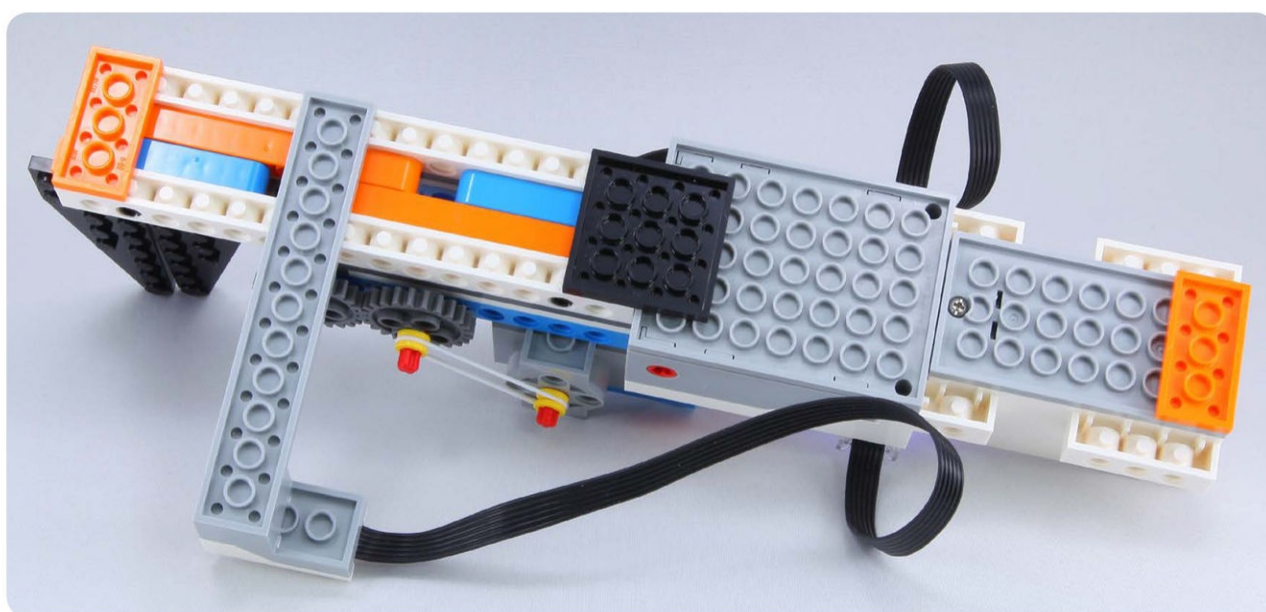
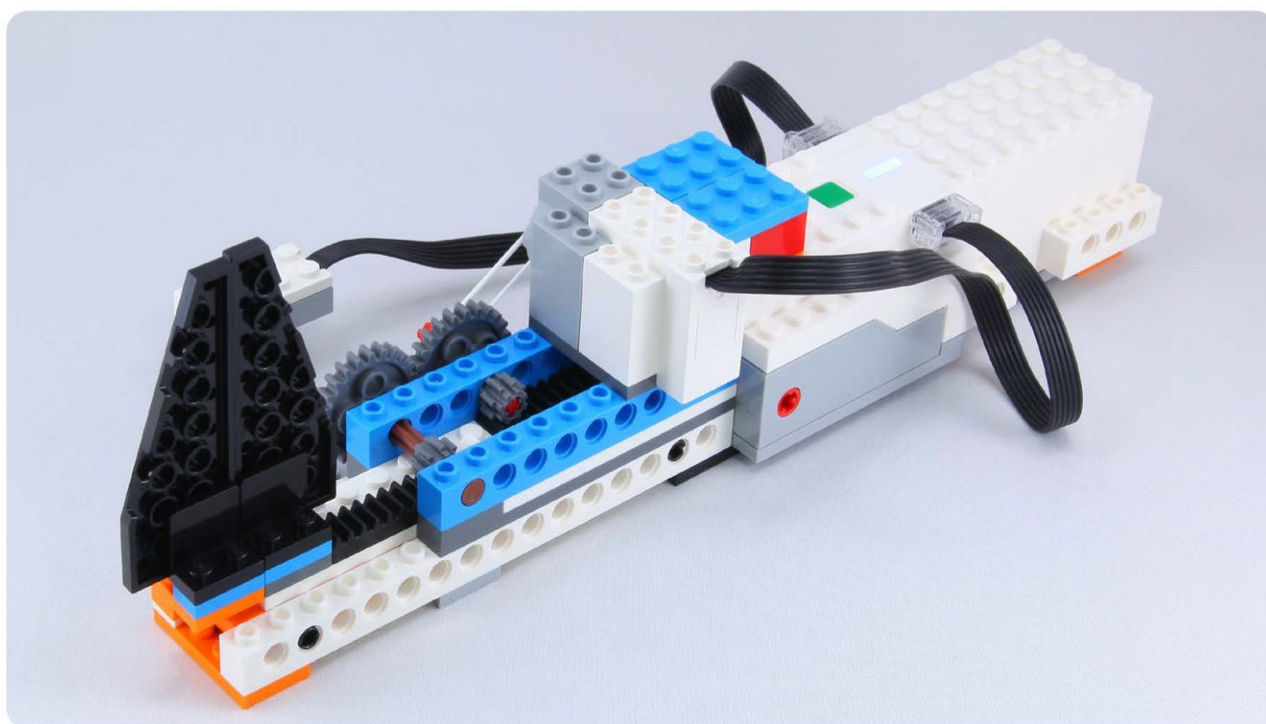
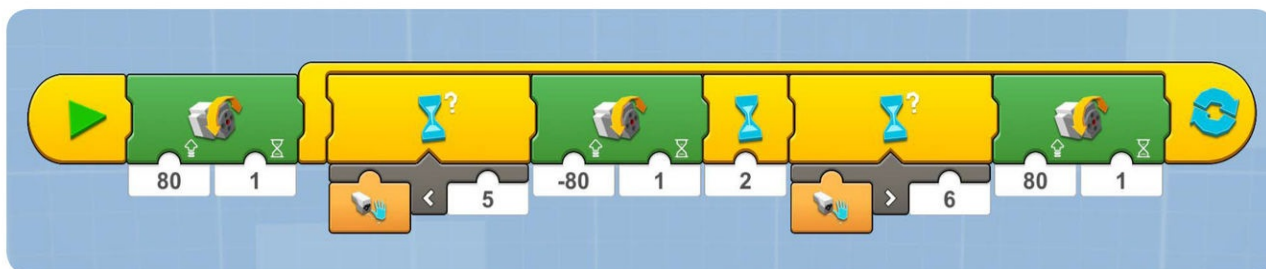
Automatic doors 179



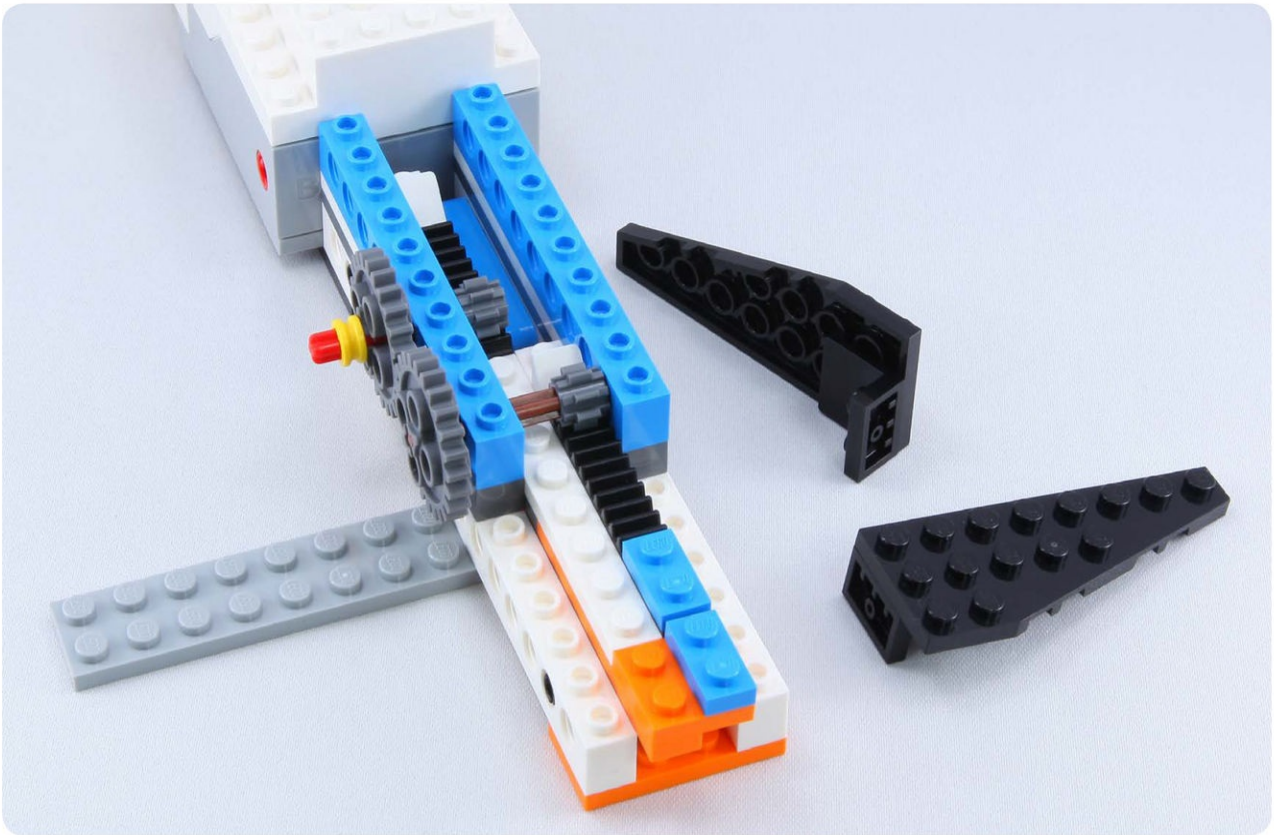
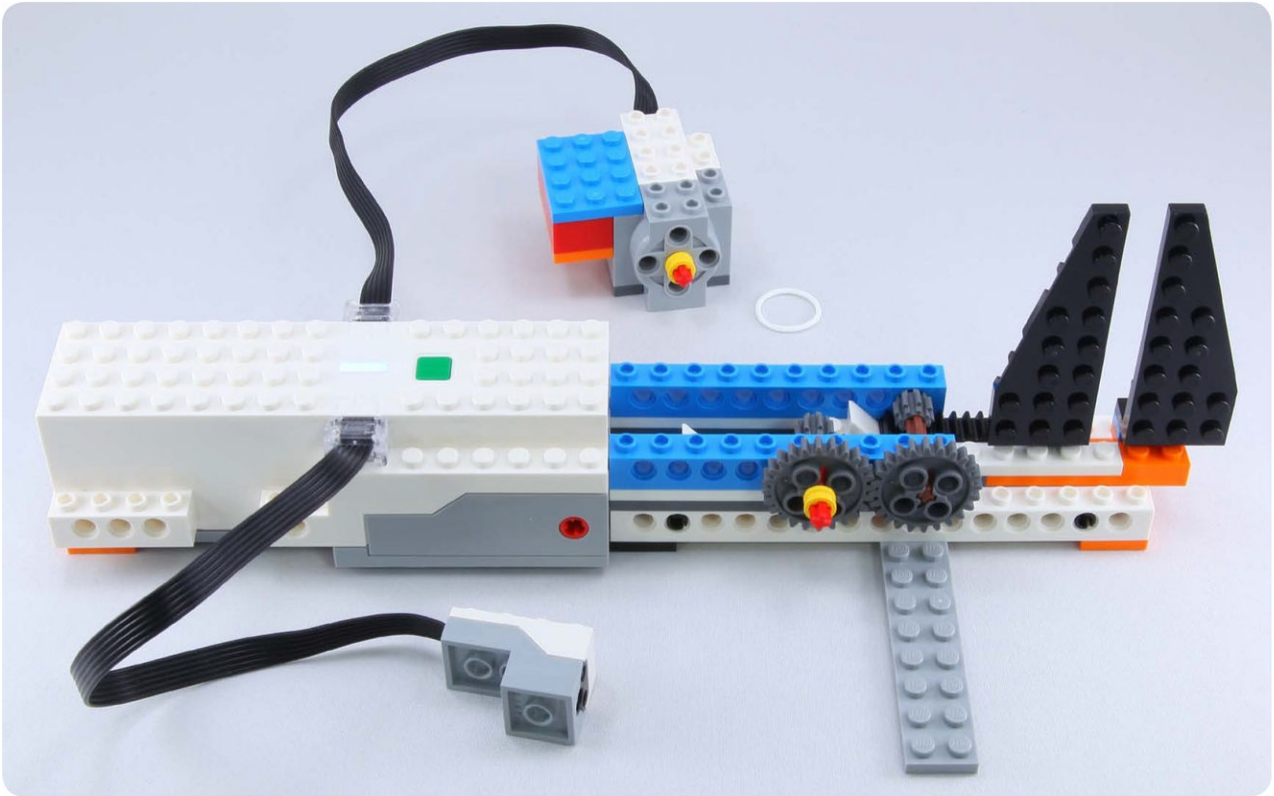


180 Automatic doors



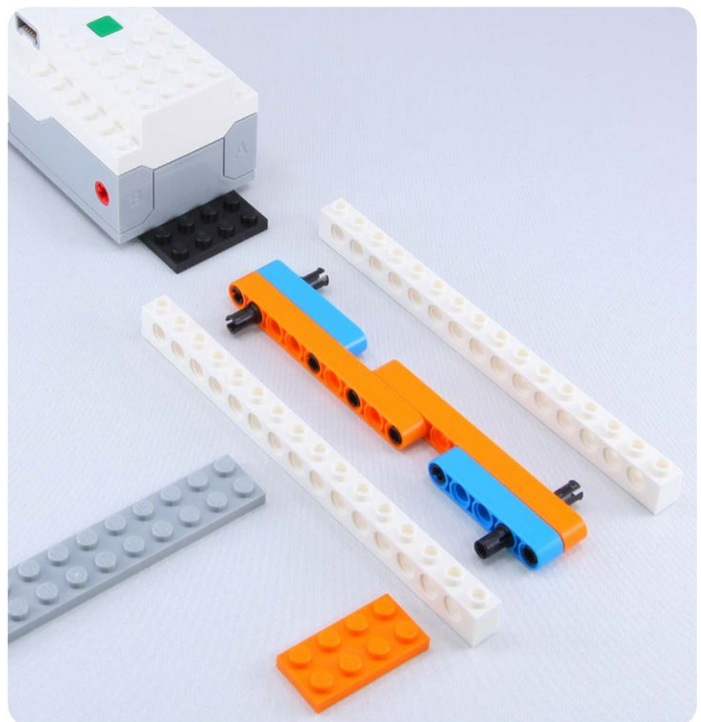
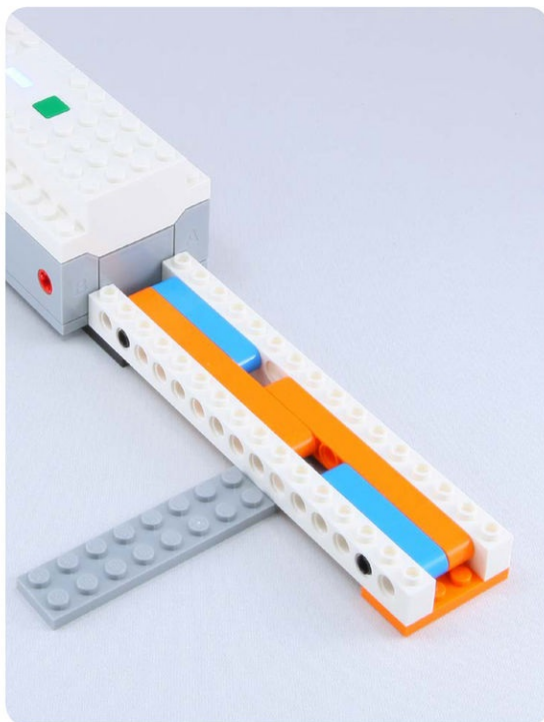
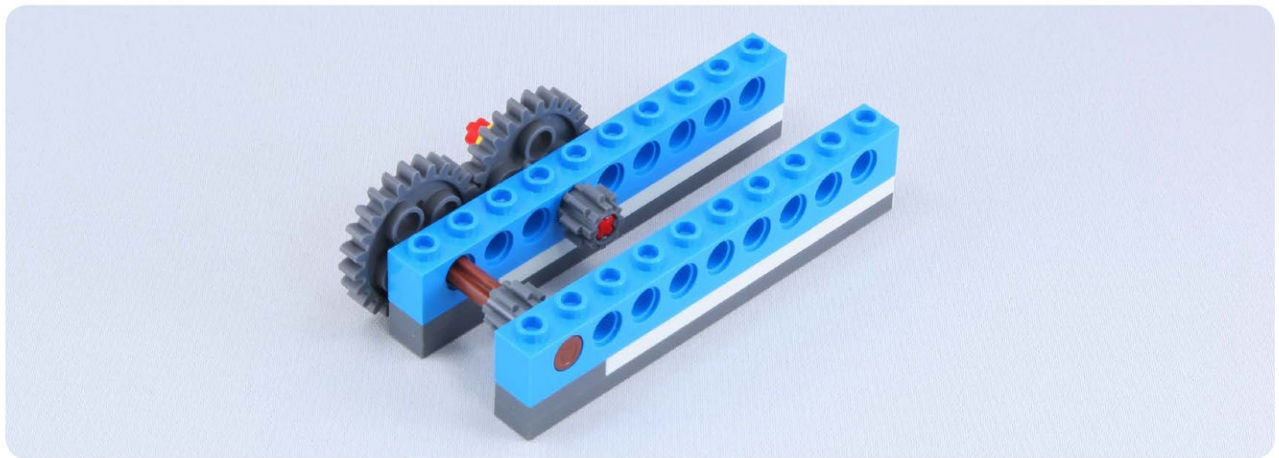
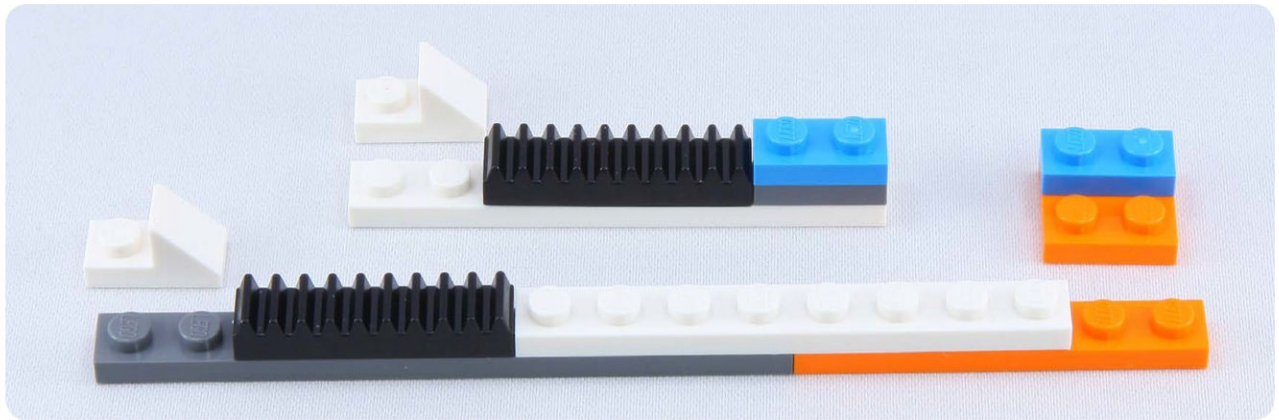






182 Automatic doors



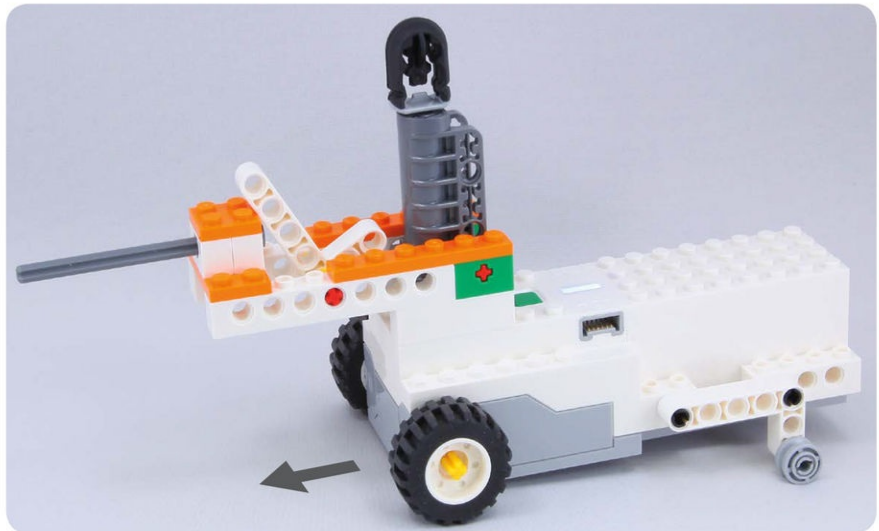
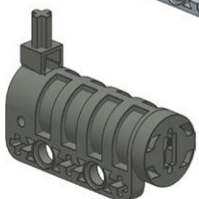
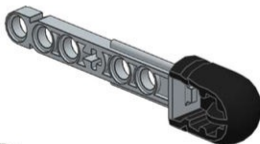
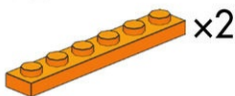
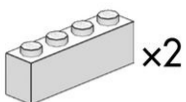
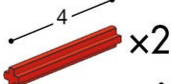
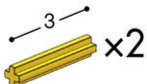
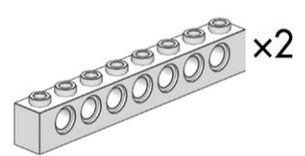
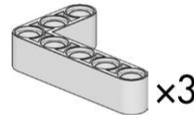
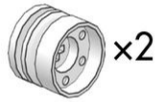
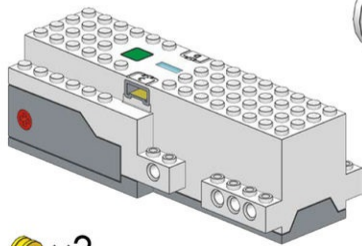






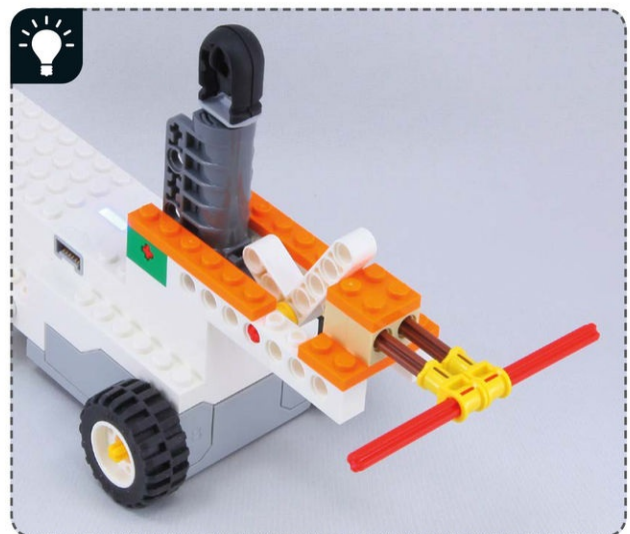
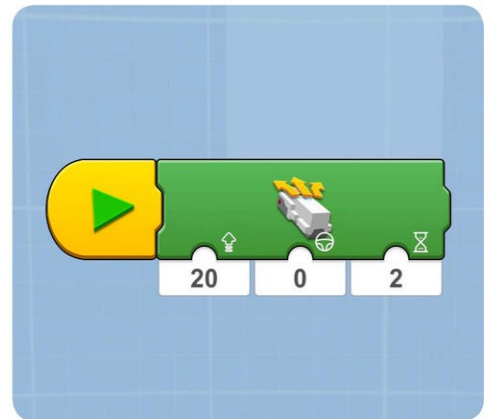
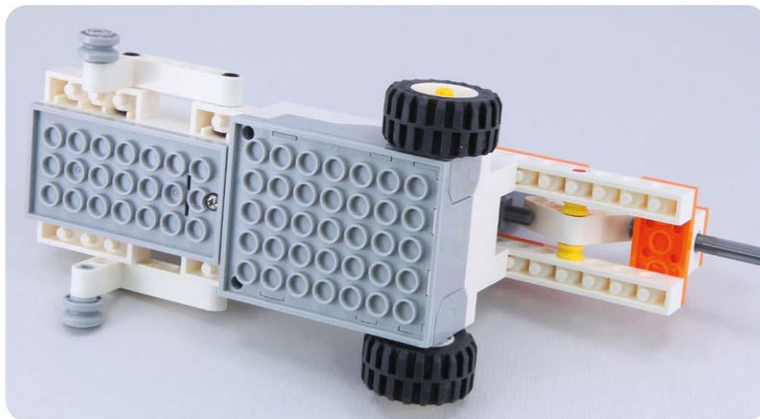
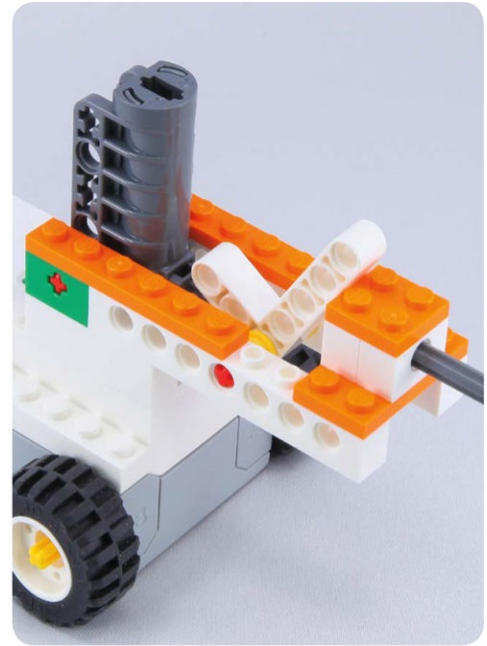
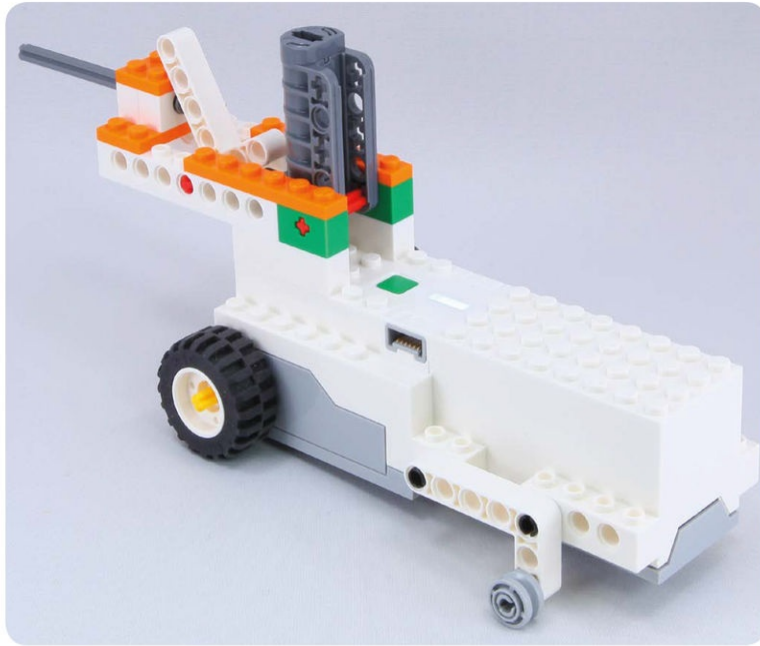
# Launching rockets

#76



184 Launching rockets






Launching rockets 185



3  $\times 2$




A yellow bar with a length of 7 units. The bar is oriented diagonally. A dimension line above it indicates a length of 7.


A diagram of a single rebar, labeled '8' for its length in feet. The rebar is shown at an angle, with a dimension line indicating its length.

  $\times 2$ 

  $\times 4$




$\times 2$



x2



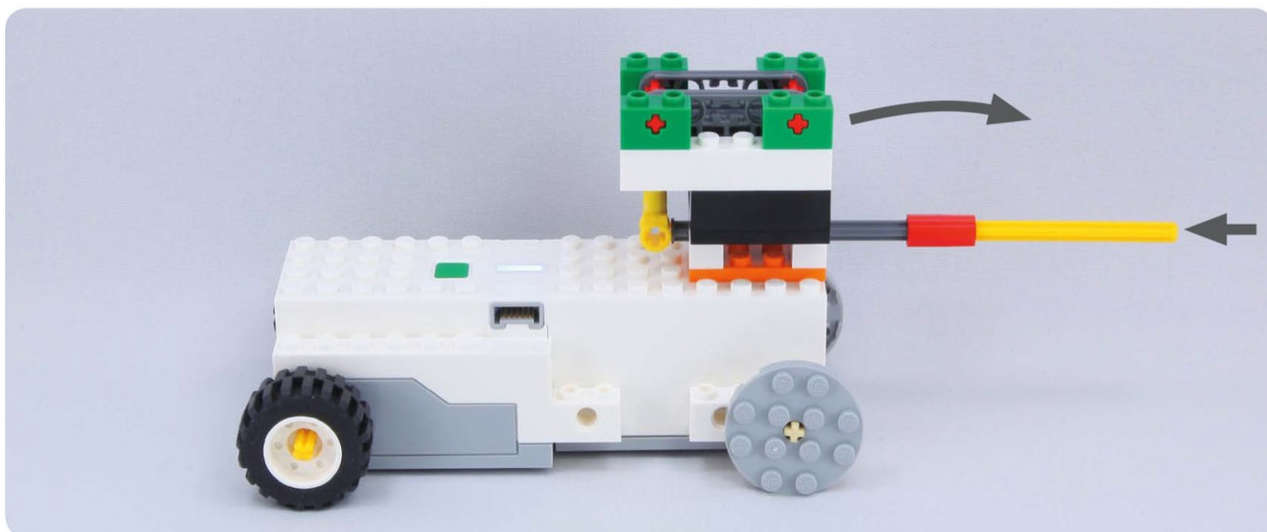
x2



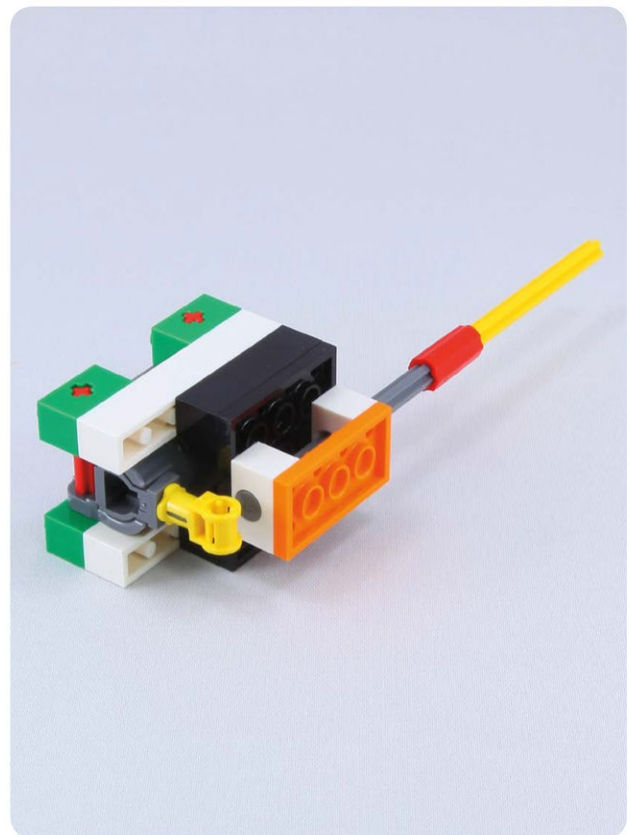
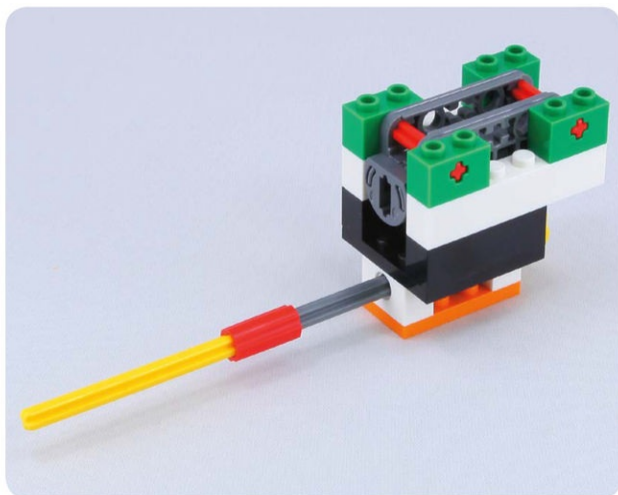
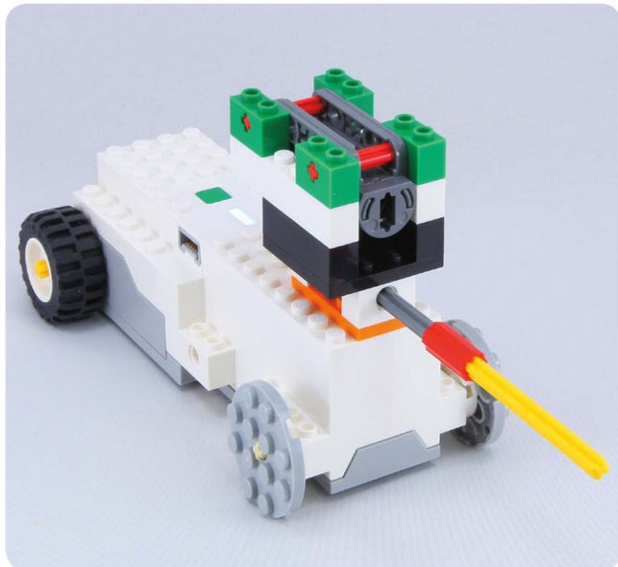
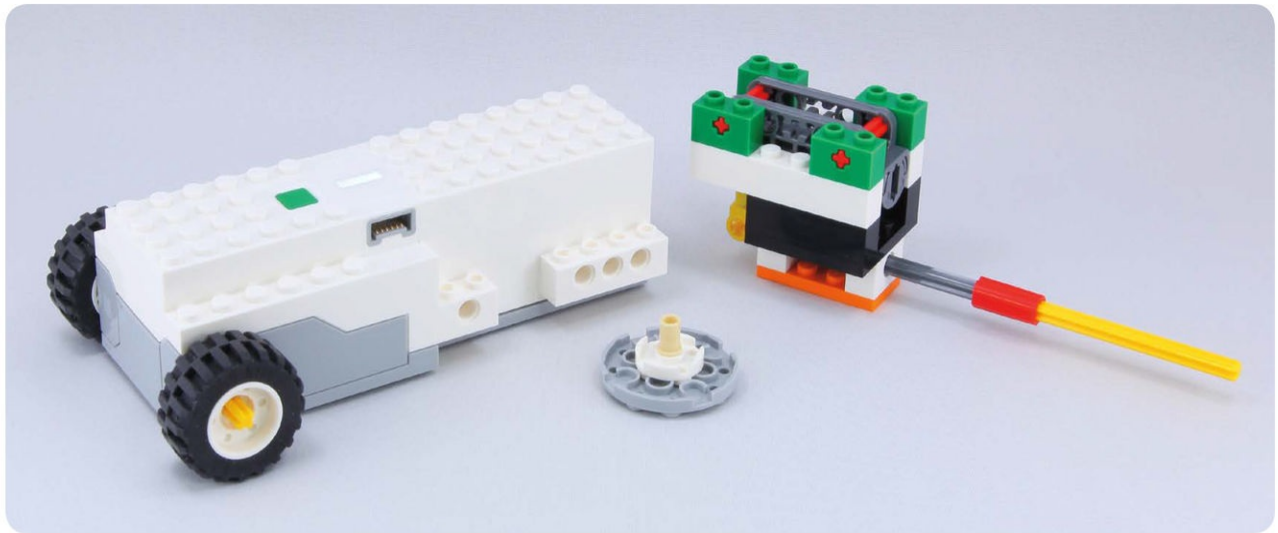
x2

 $\times 2$ 

x2







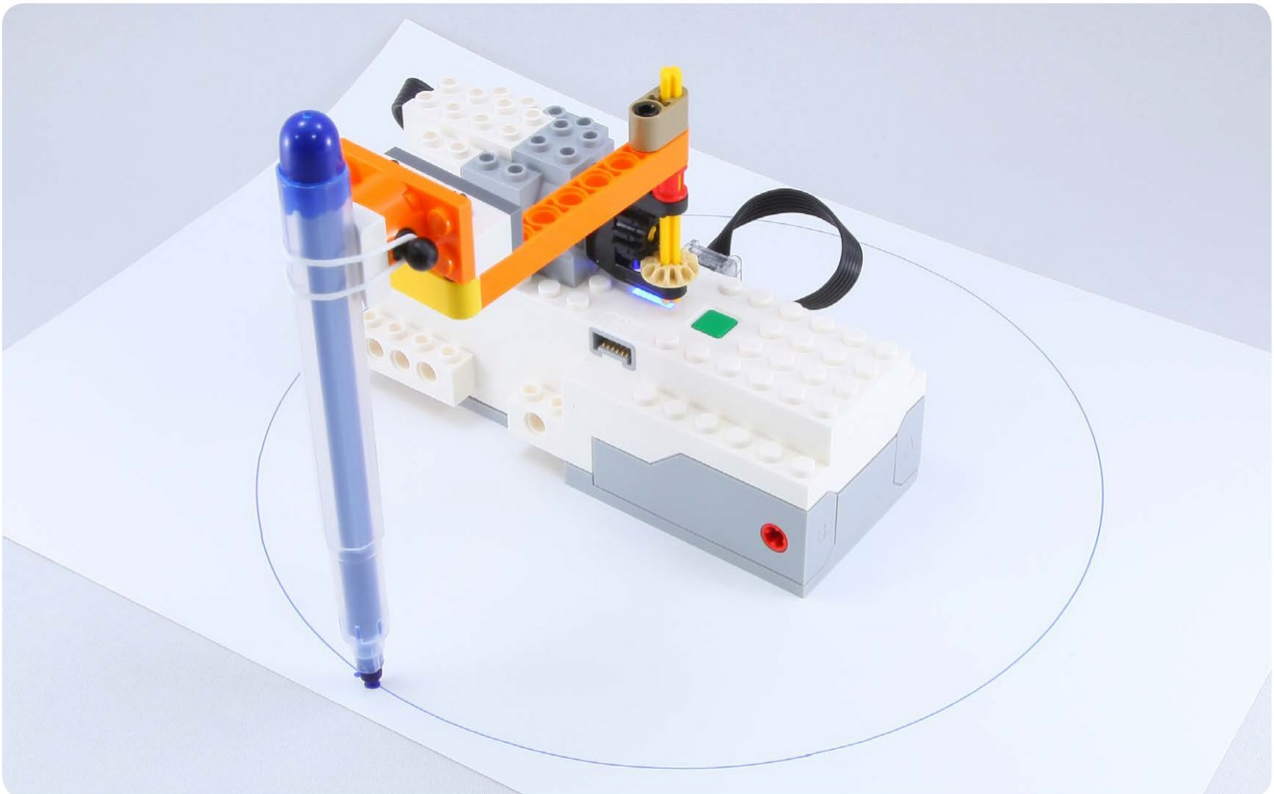
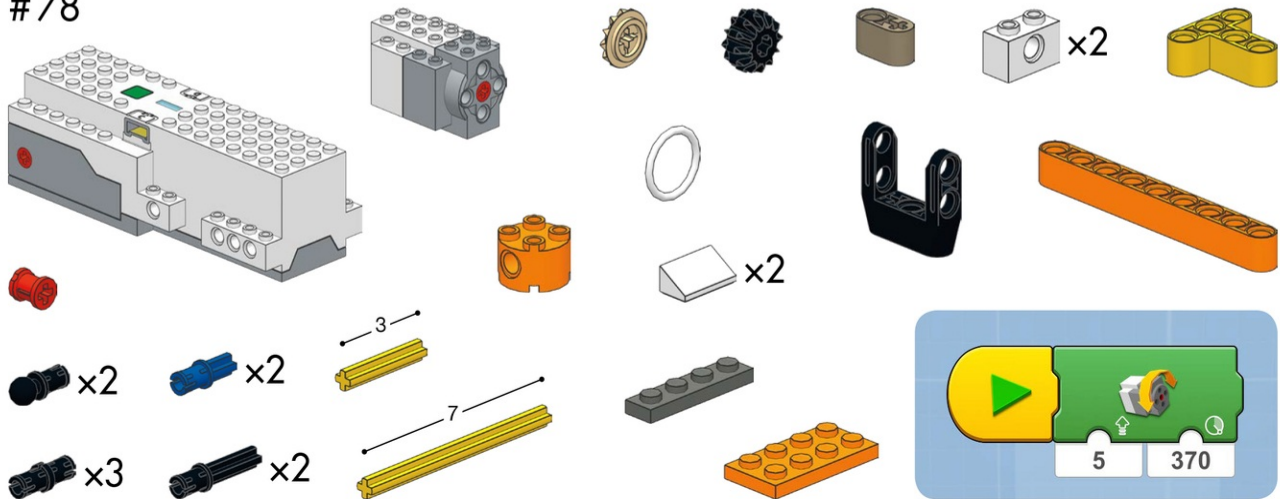




# Drawing with a pen

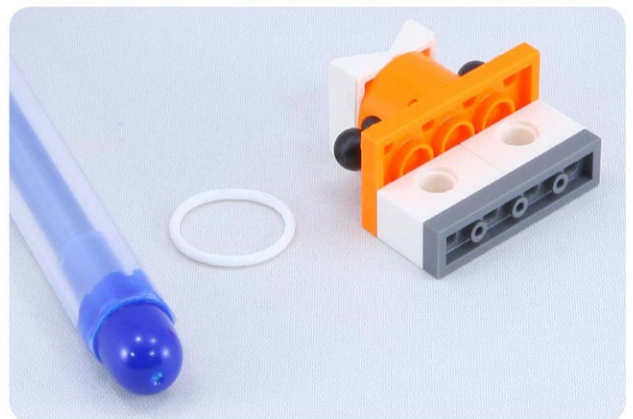
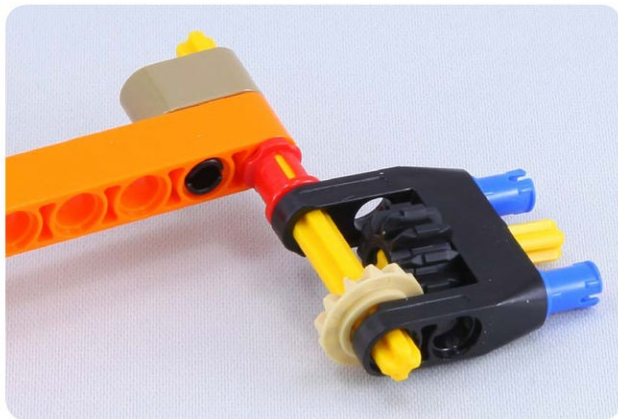
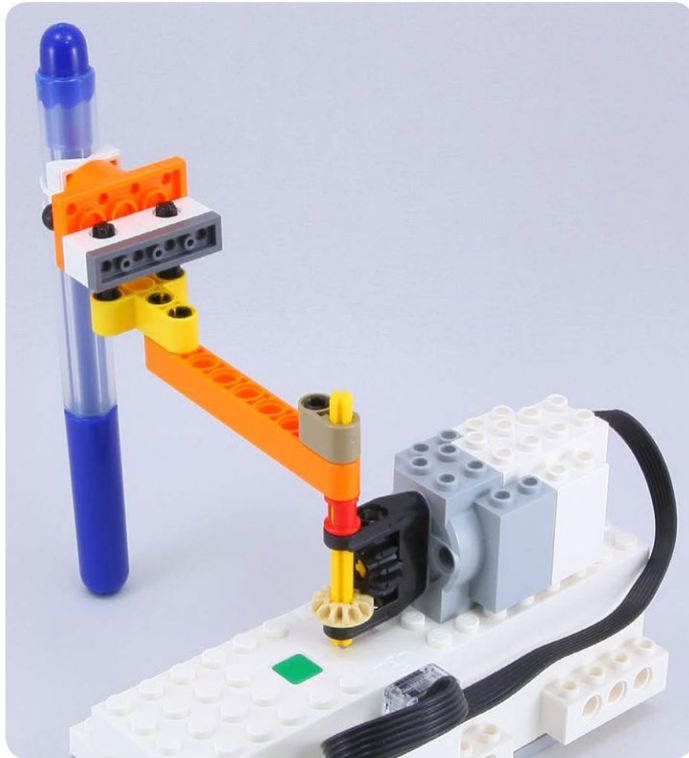
Use any pen you like.

#78

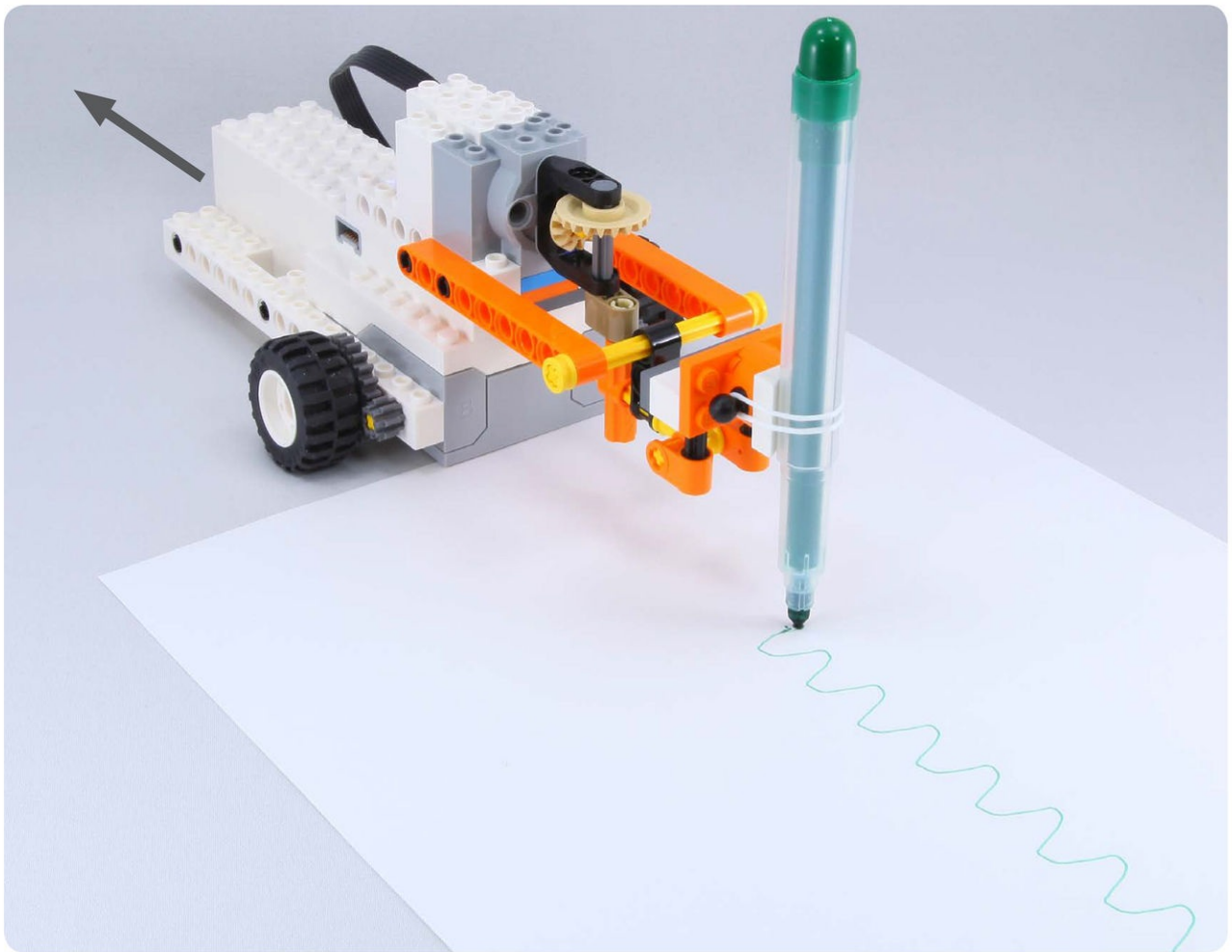


188 Drawing with a pen



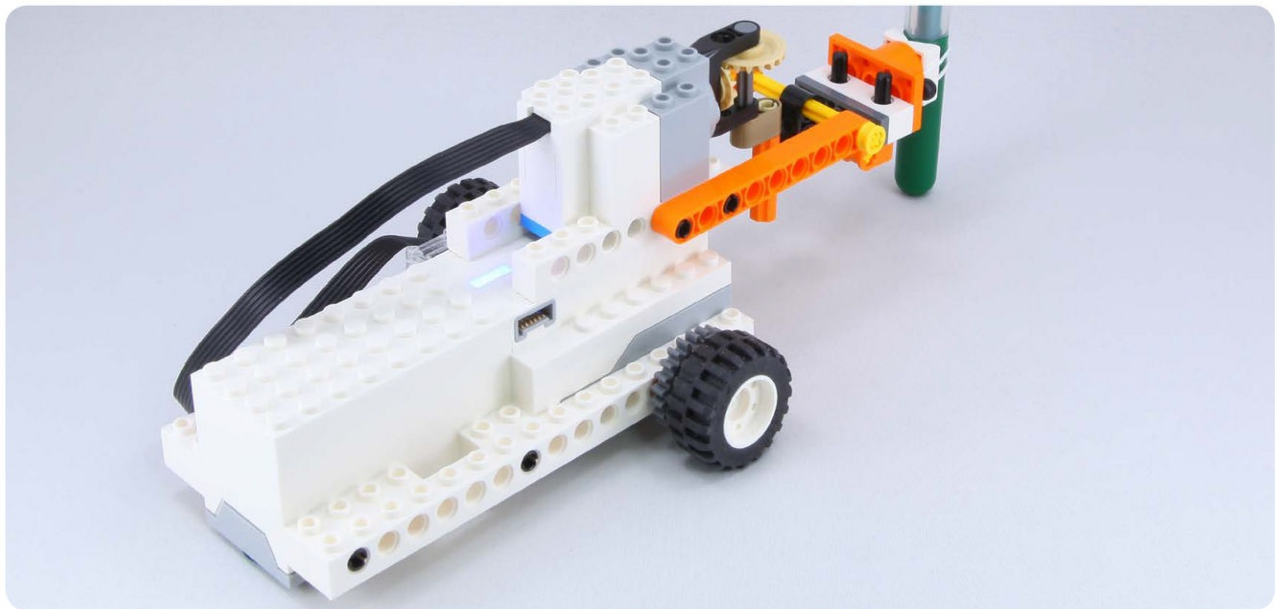
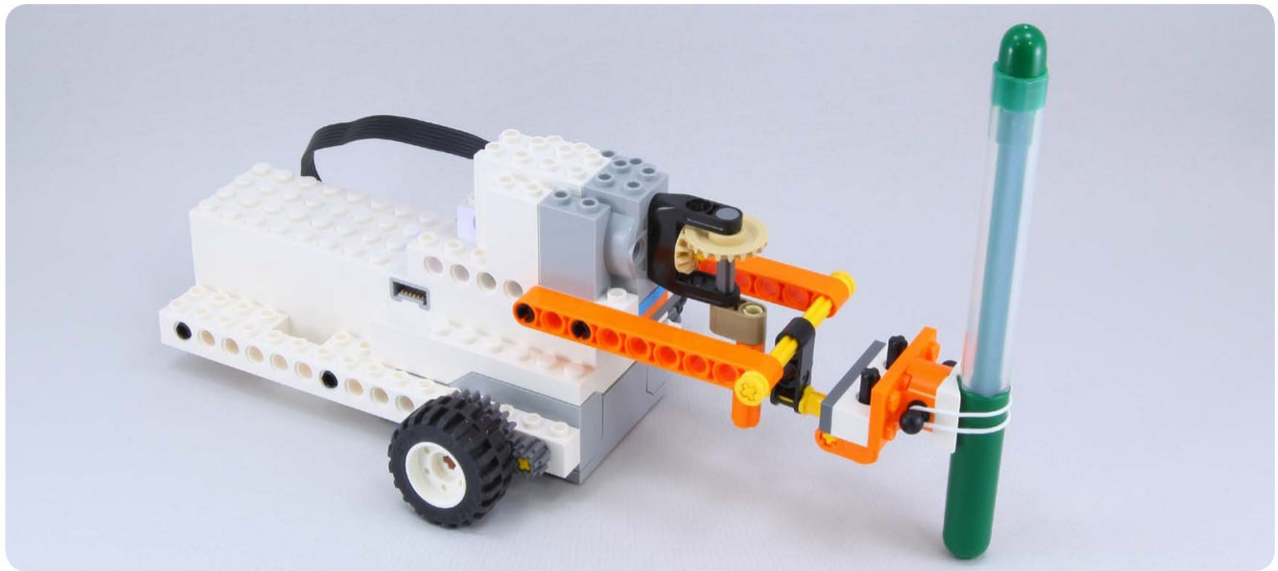




[illegible]

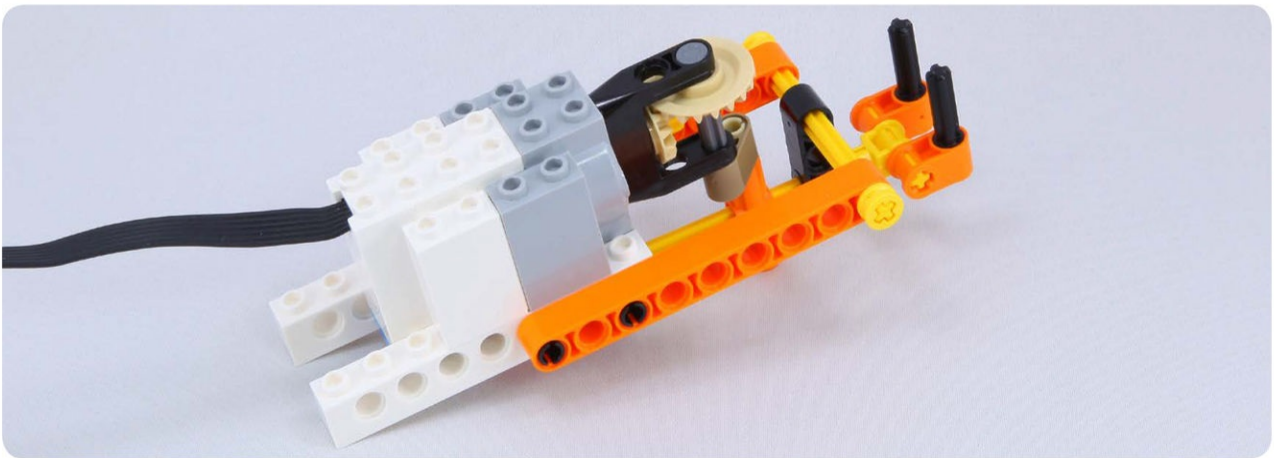
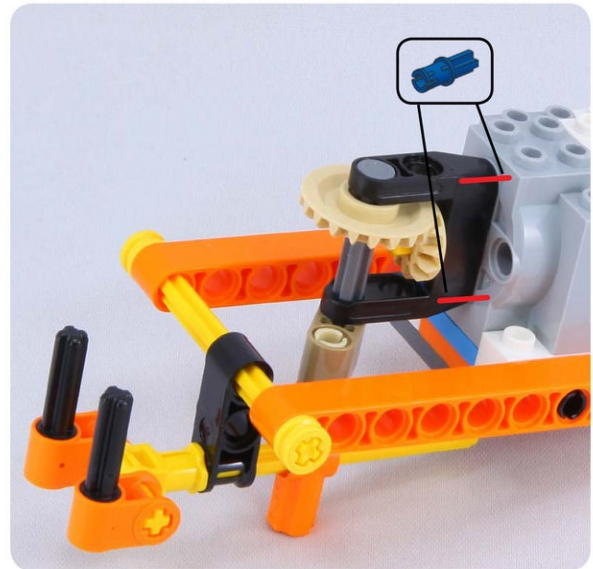
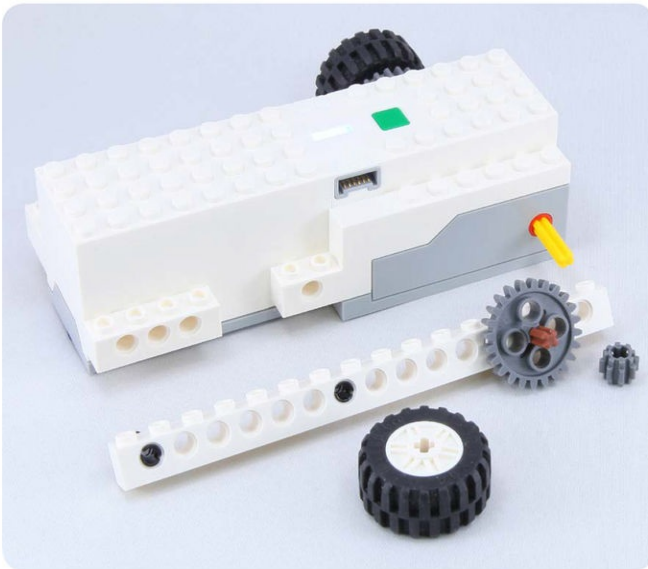
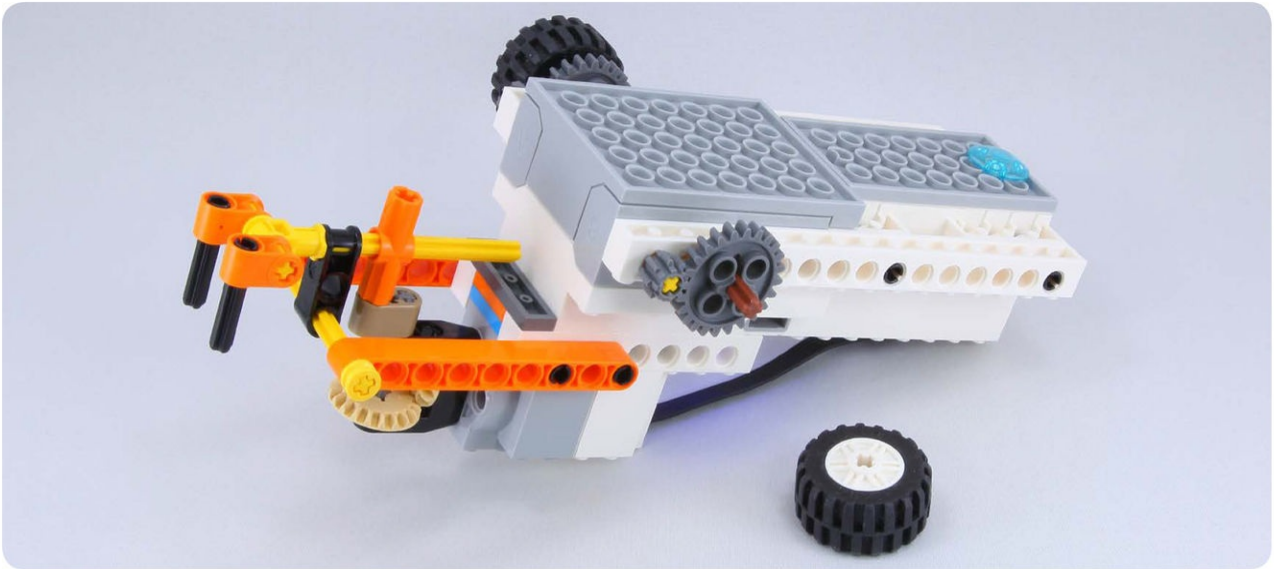
## 190 Drawing with a pen



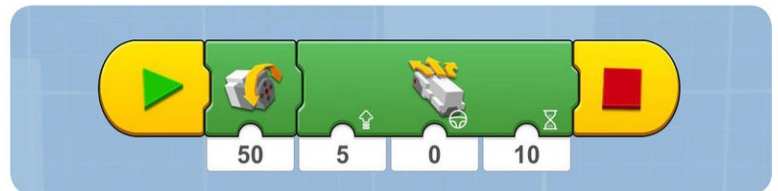
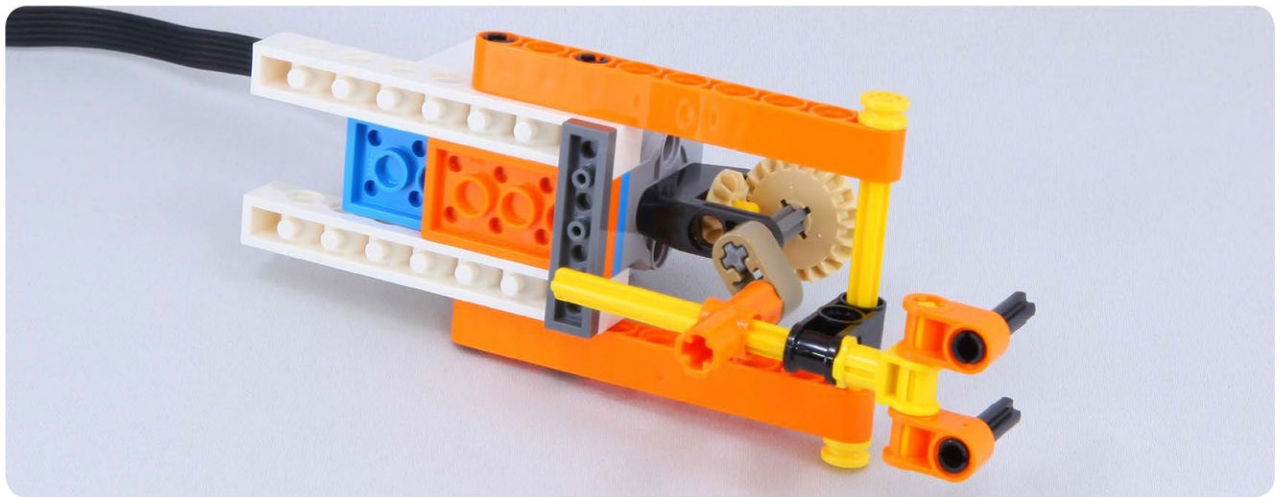
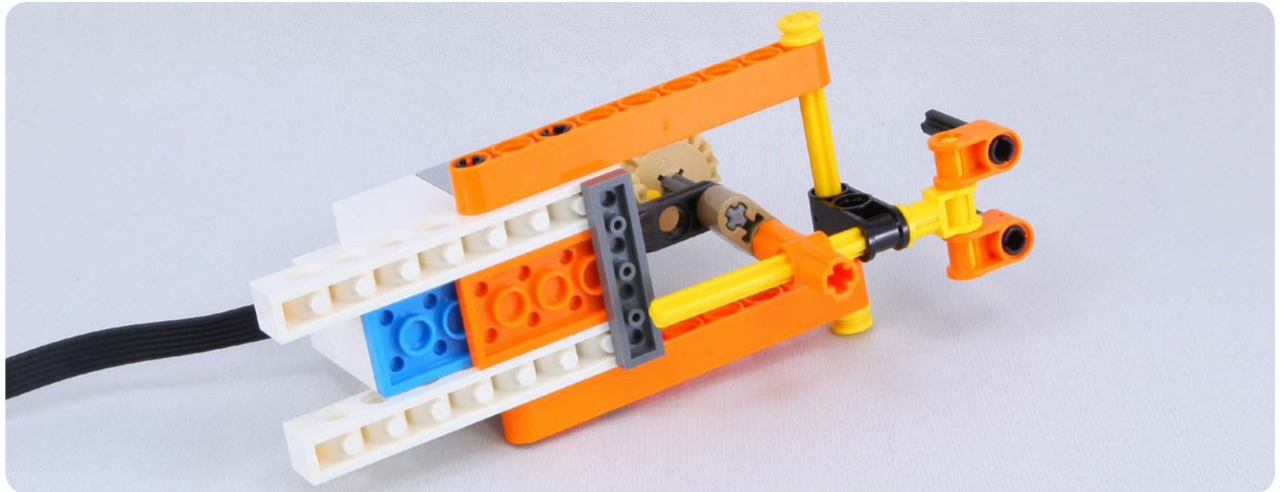


Drawing with a pen 191



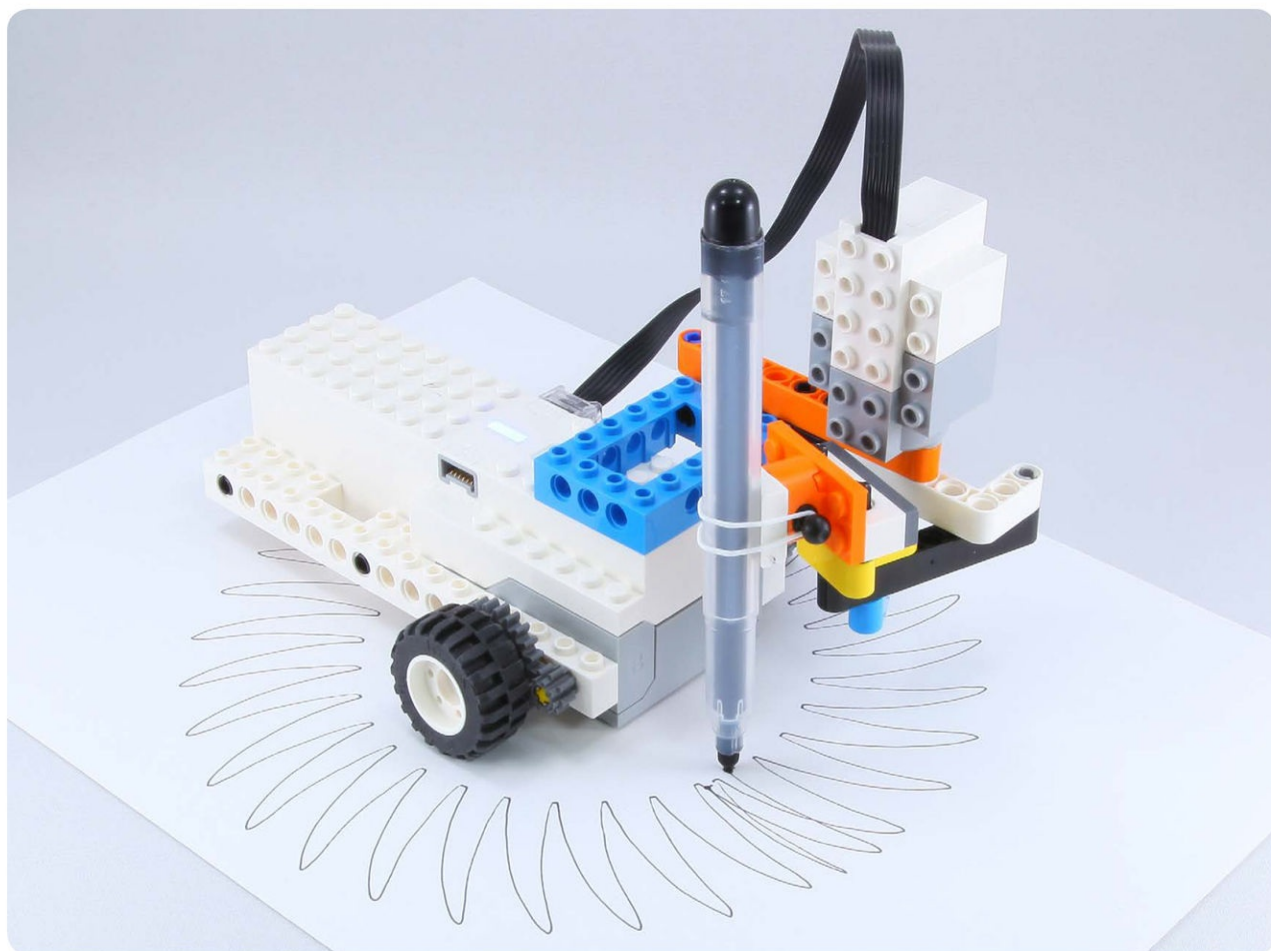






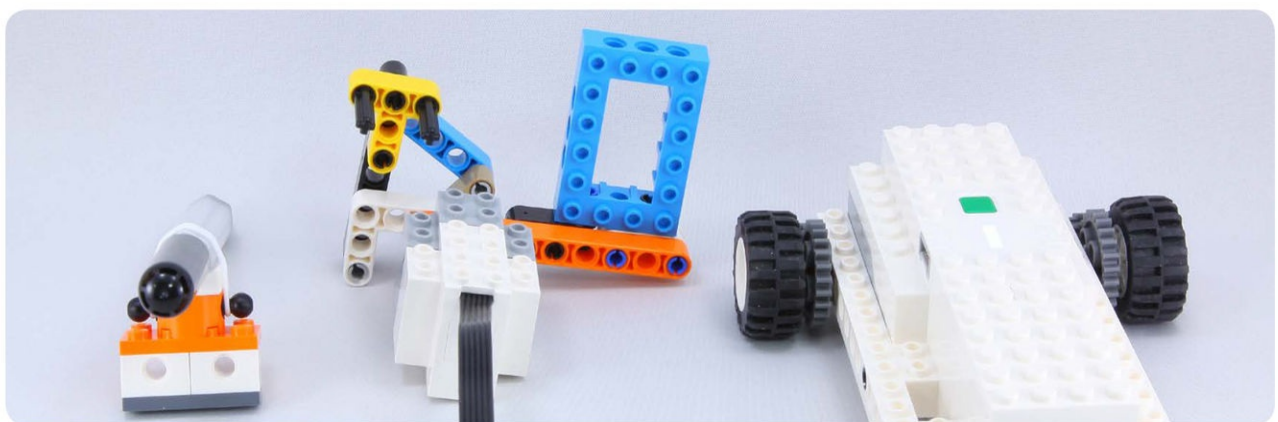
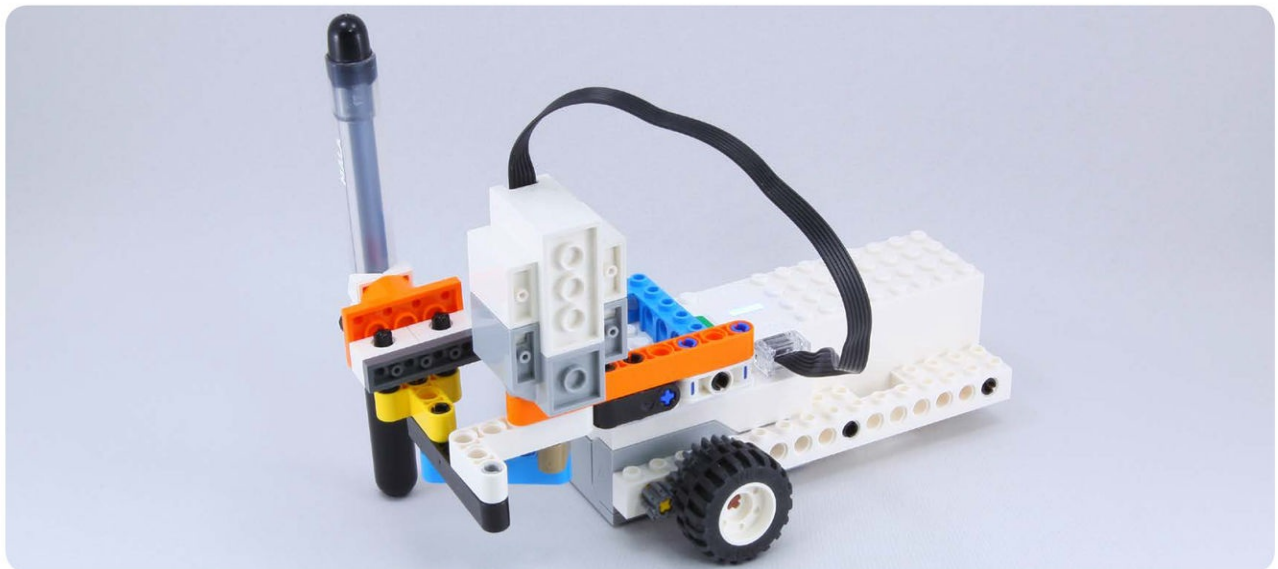
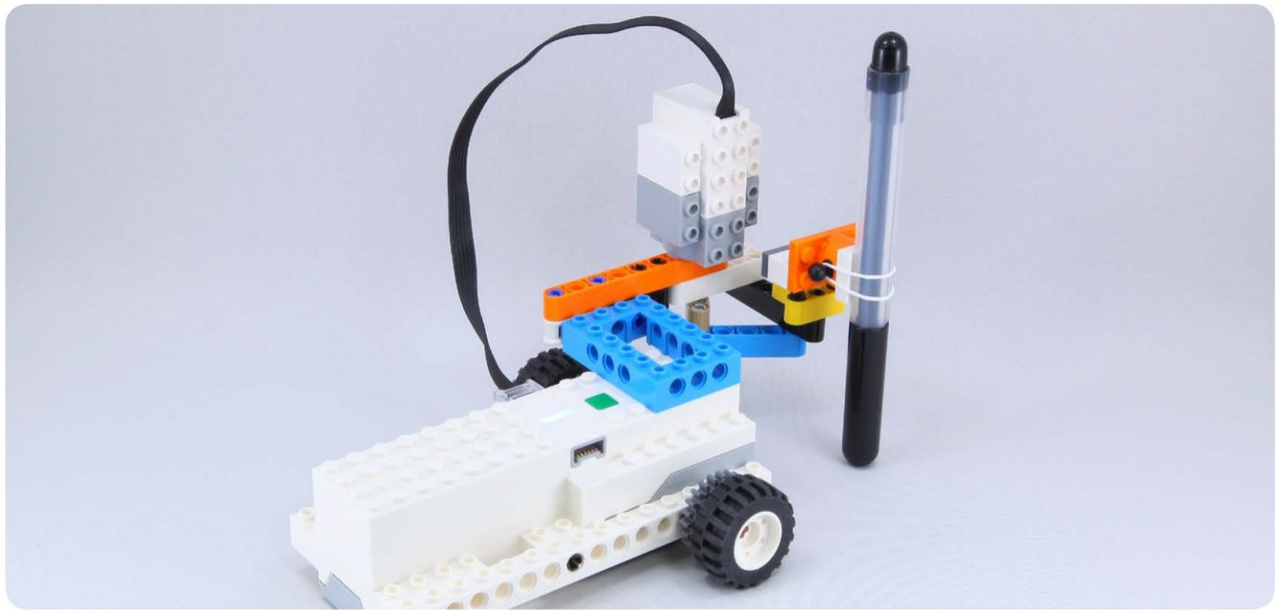
Drawing with a pen 193



[illegible]

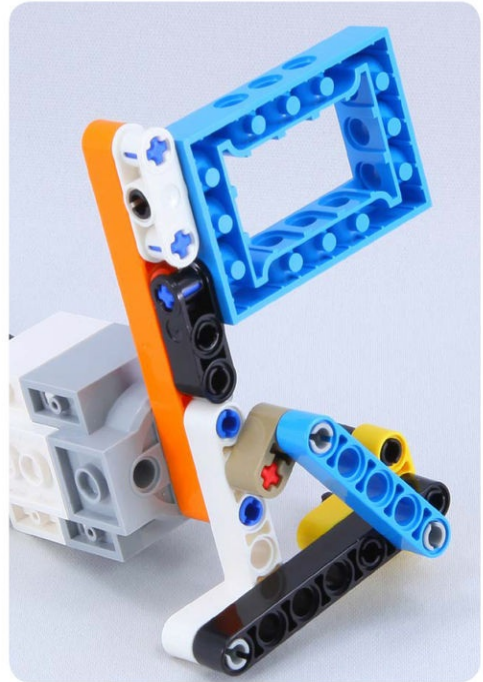
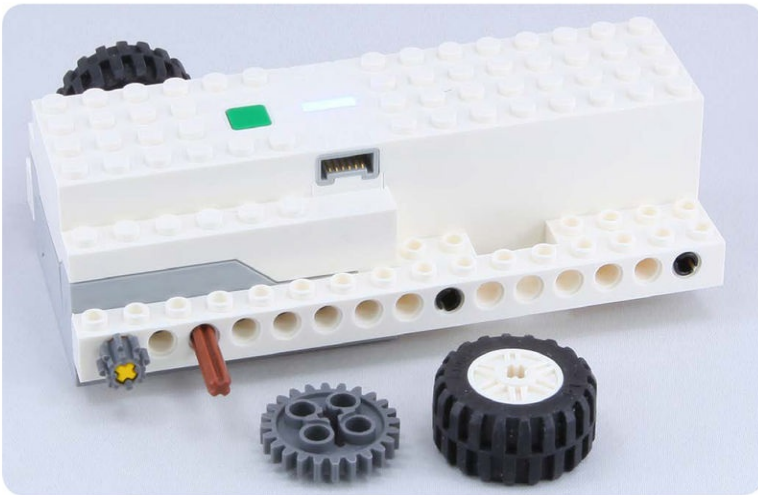
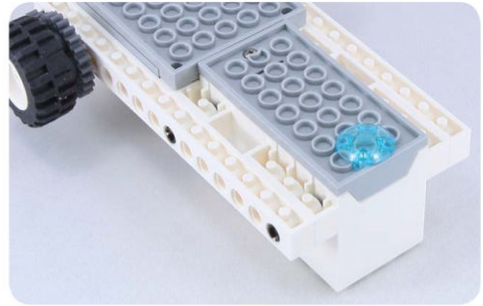
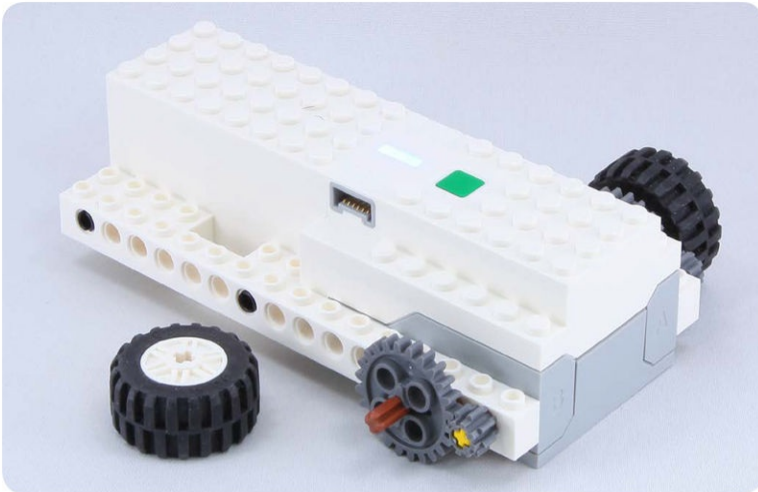
194 Drawing with a pen



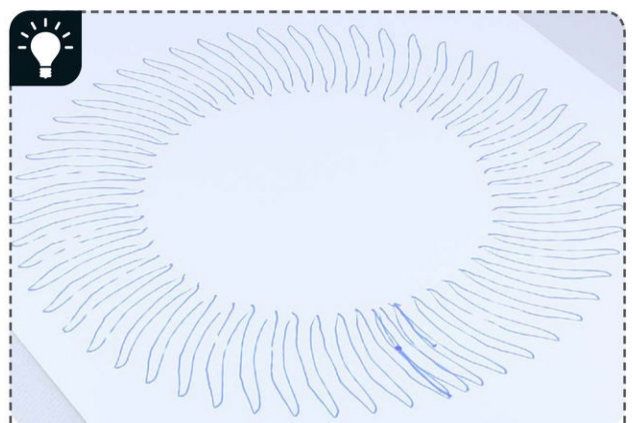
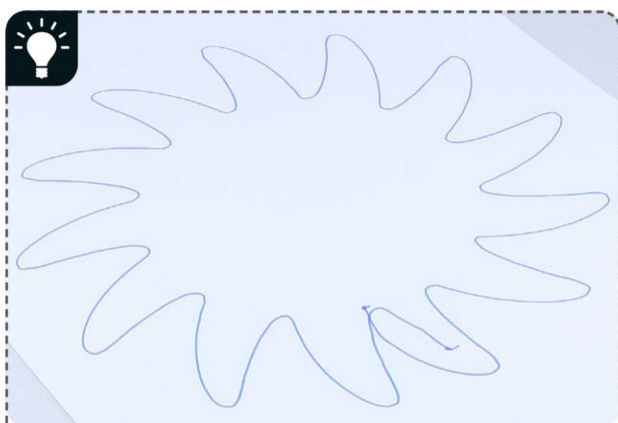
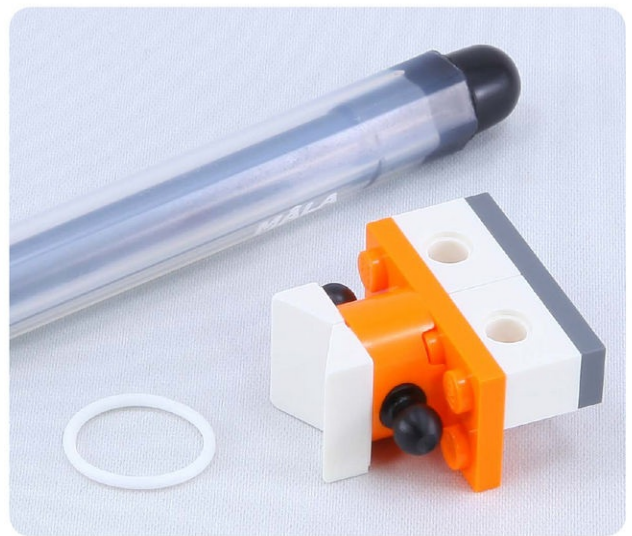
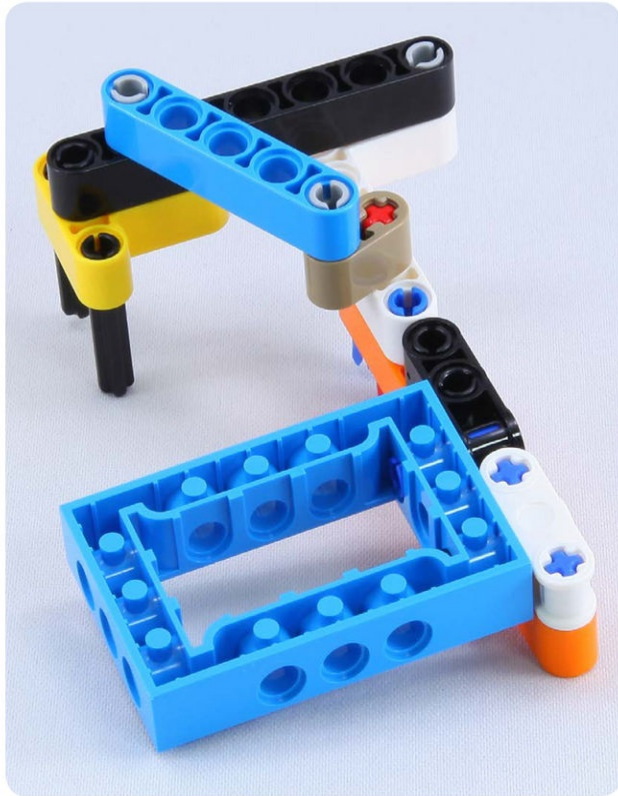


Drawing with a pen 195





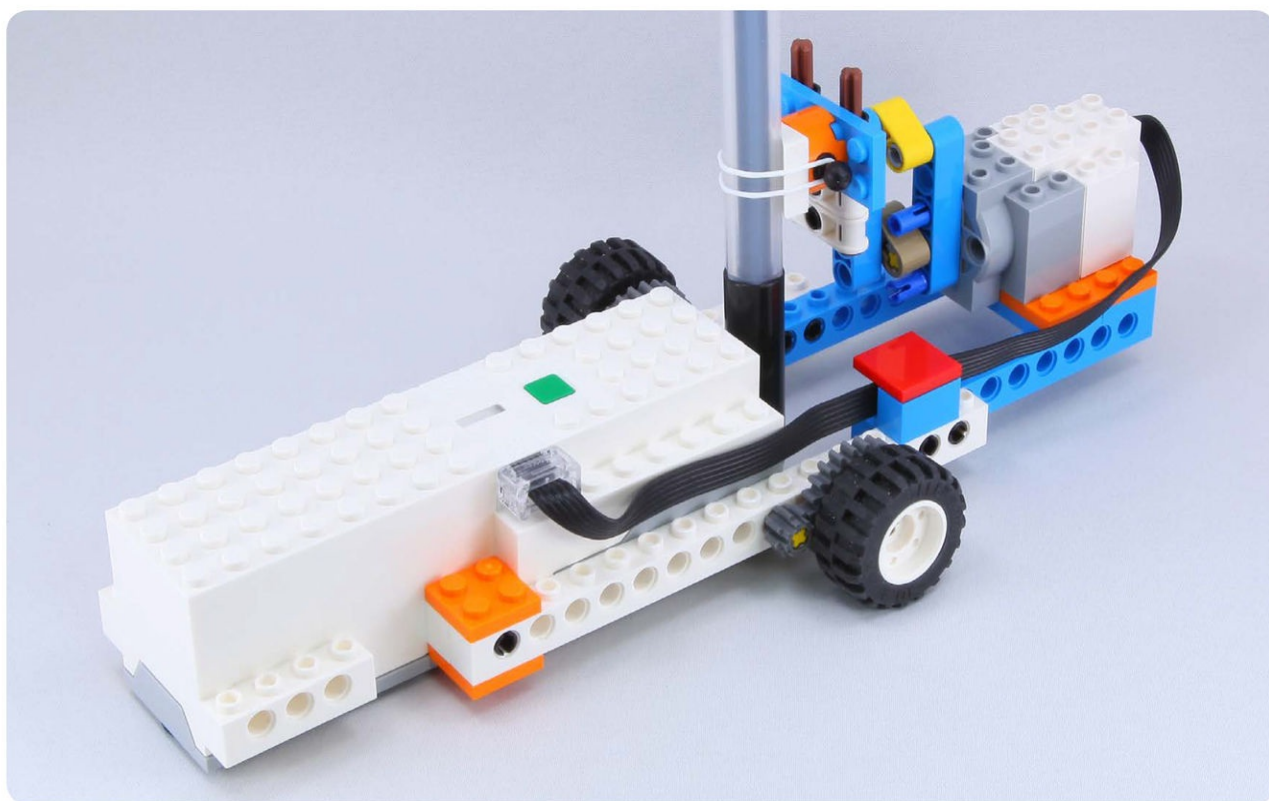






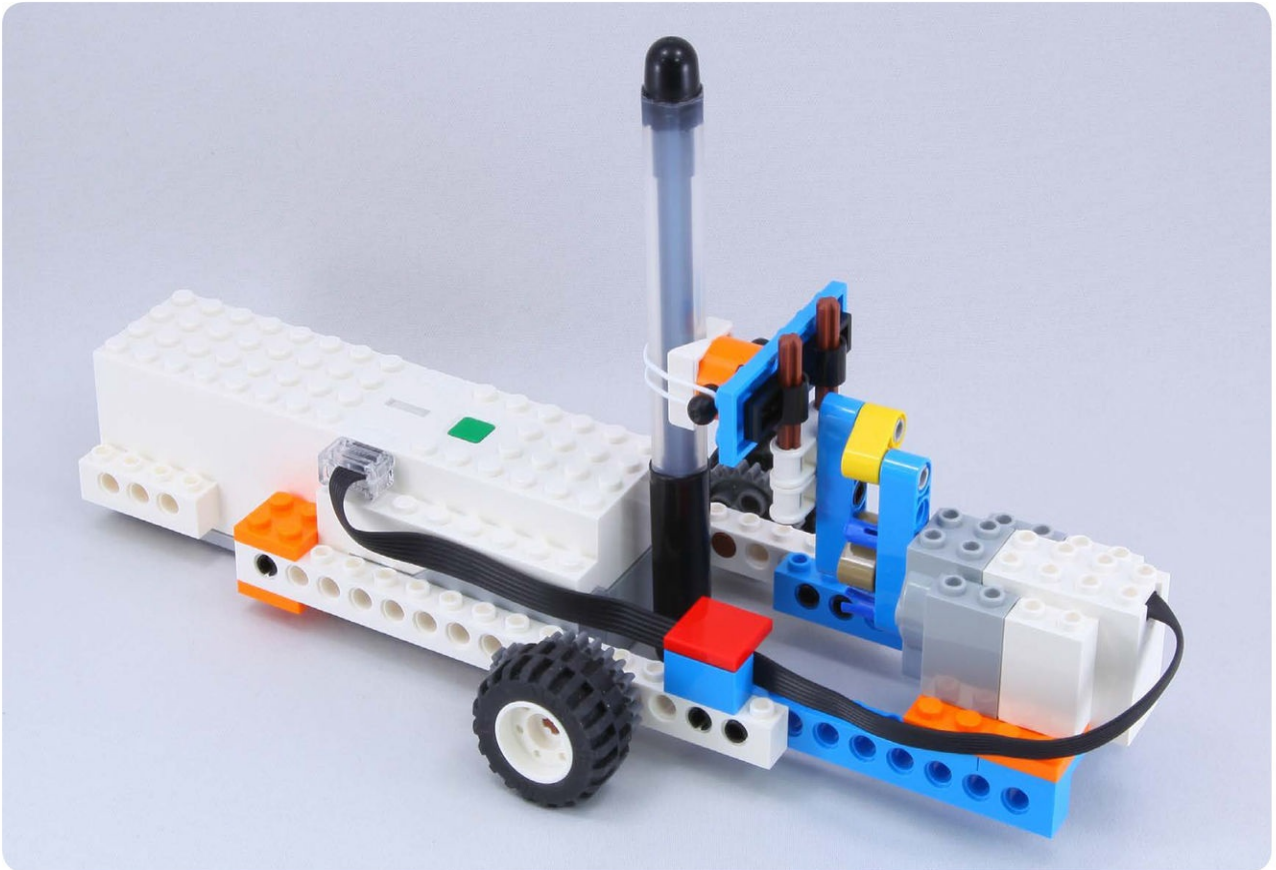




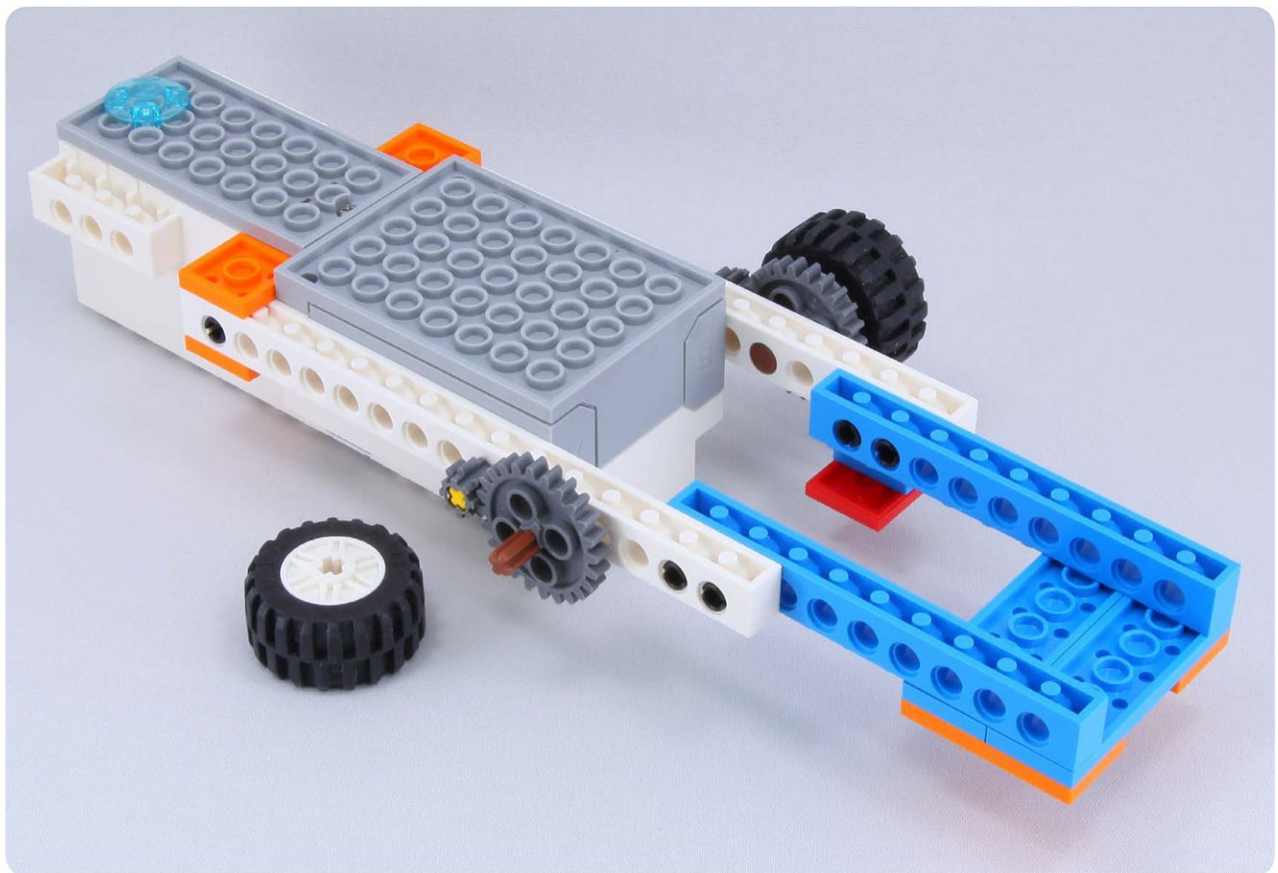
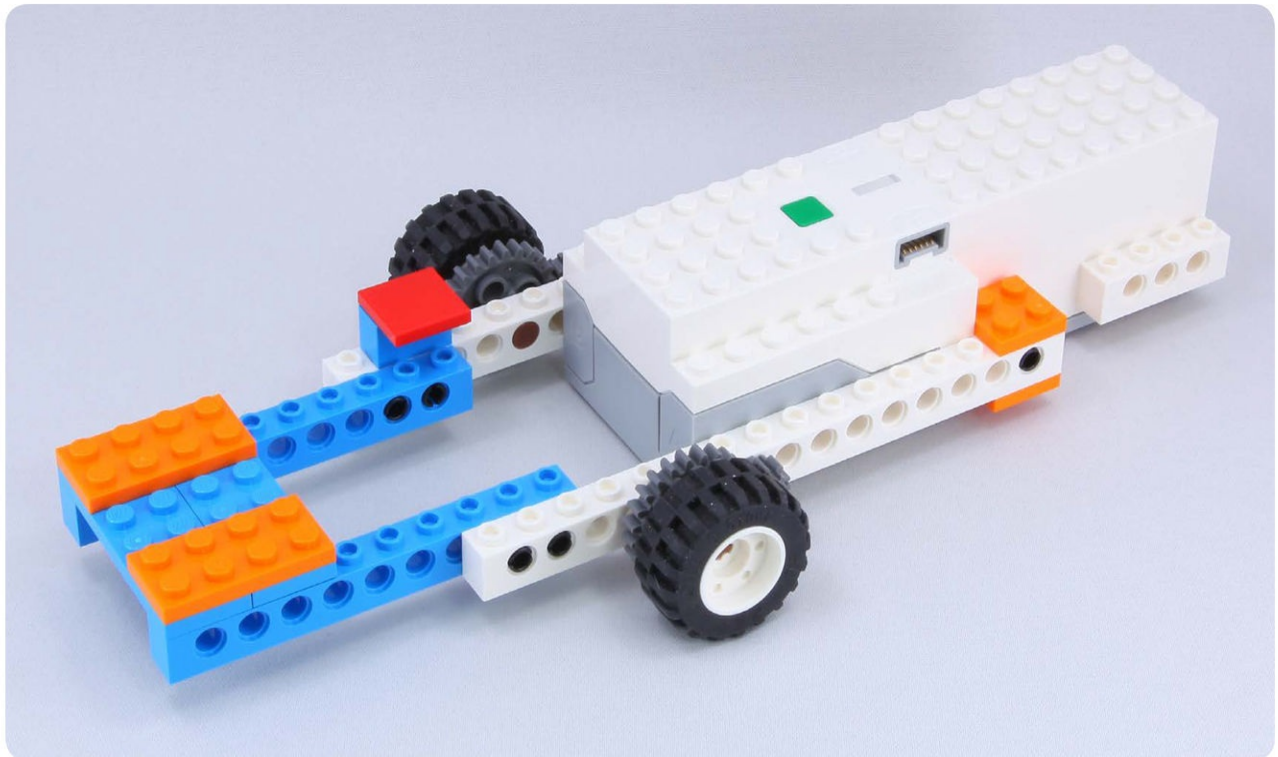


Drawing with a pen 199



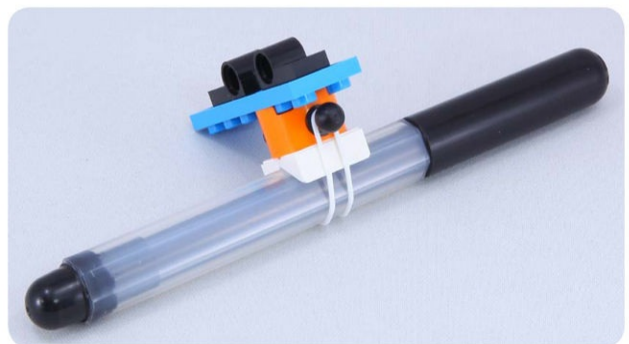
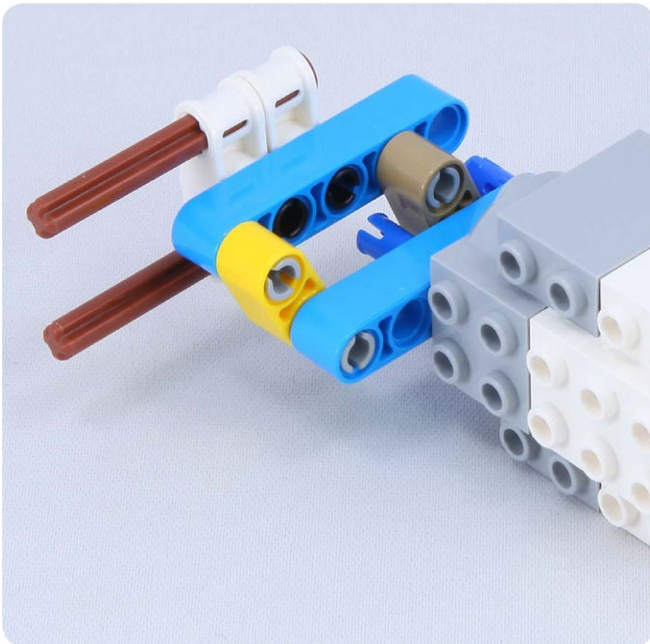
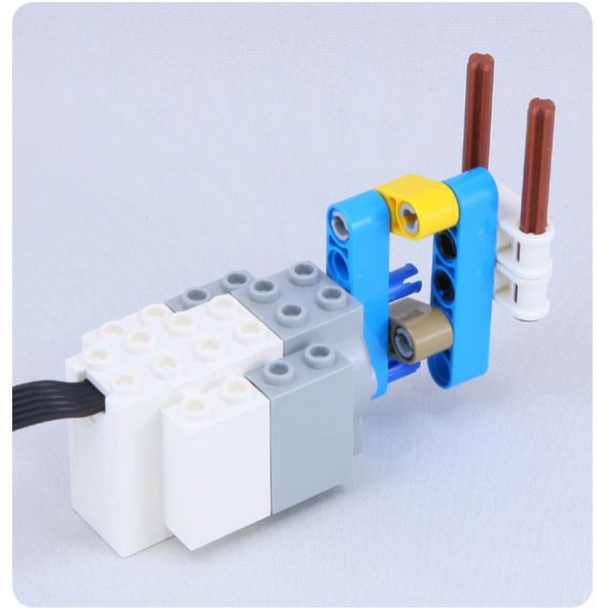
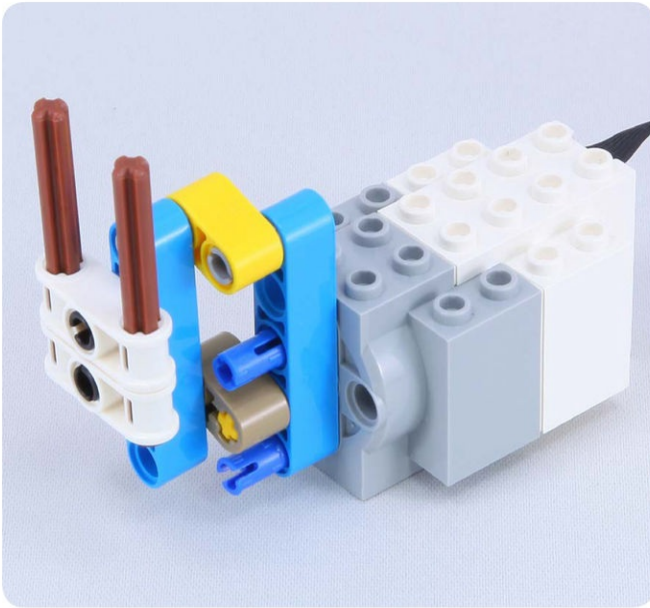






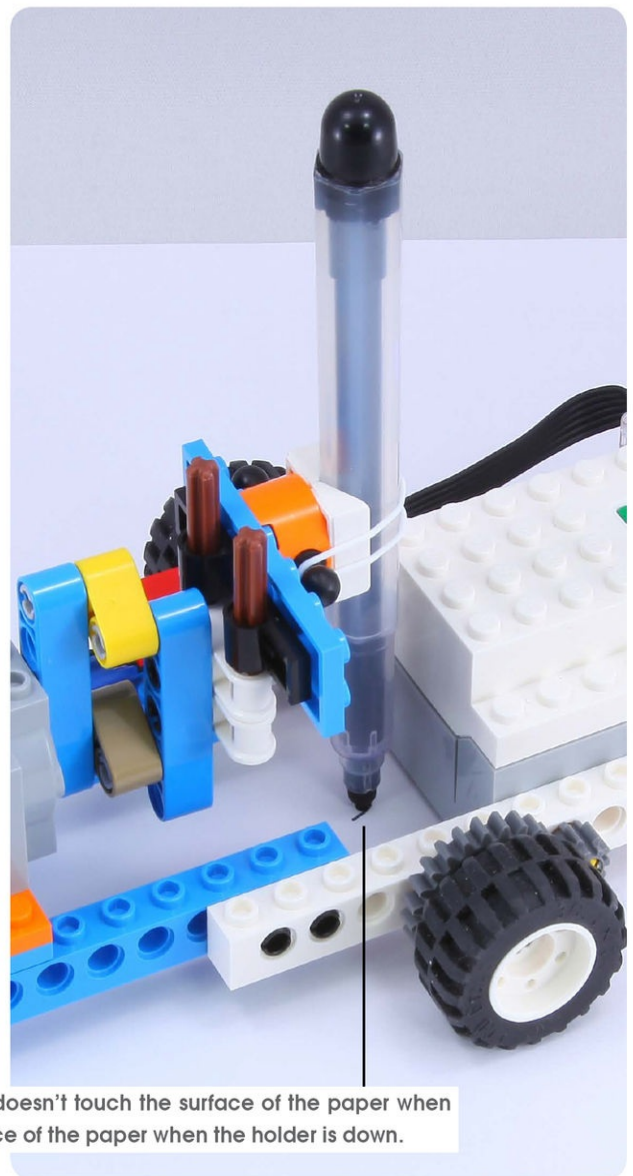
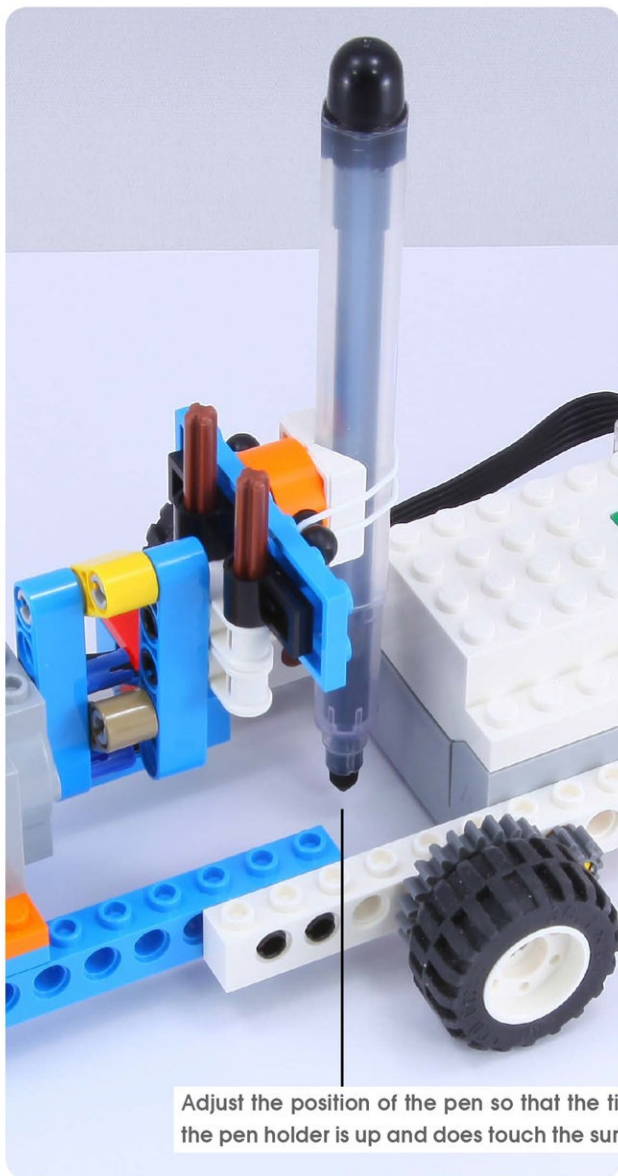
Drawing with a pen 201





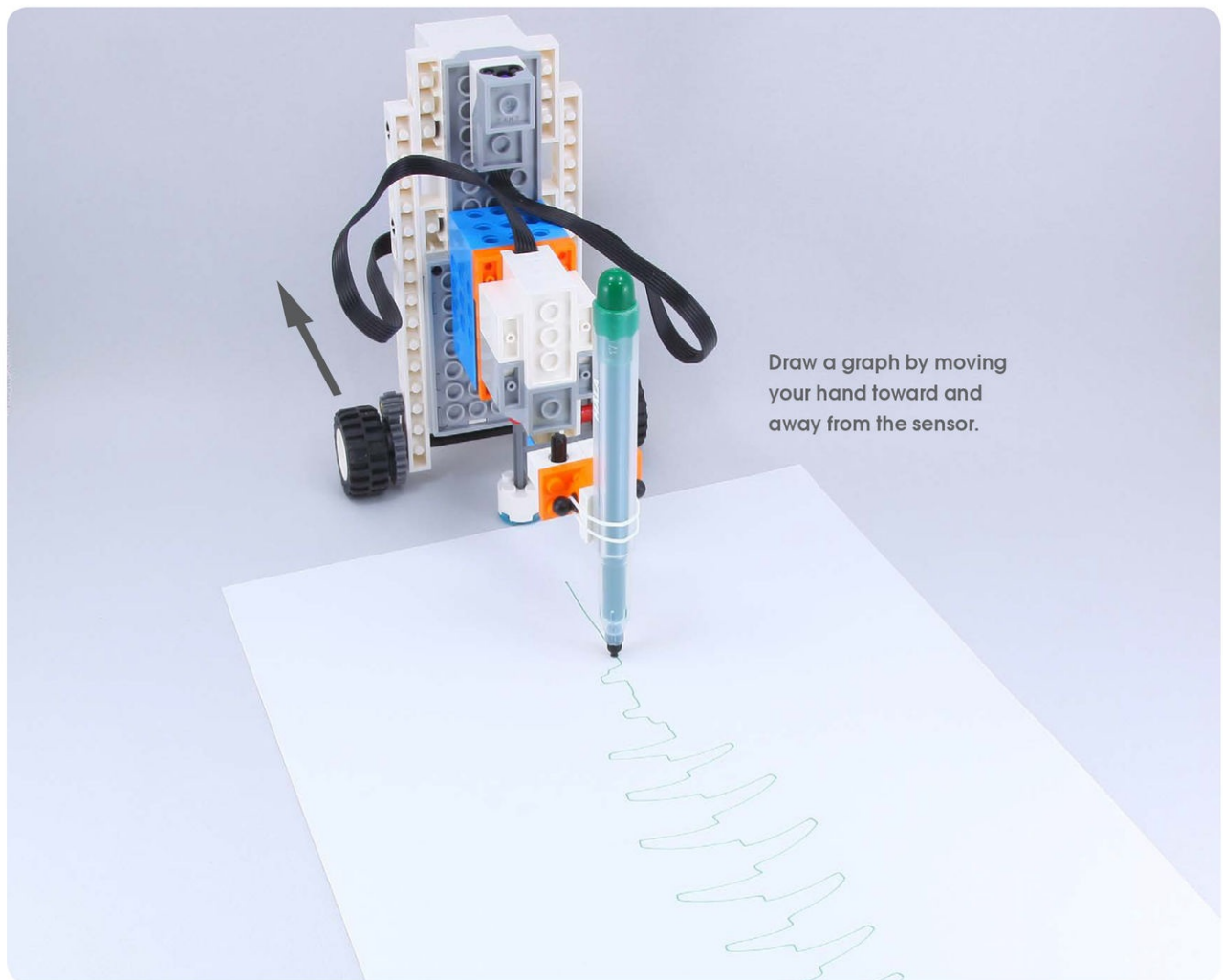
202 Drawing with a pen



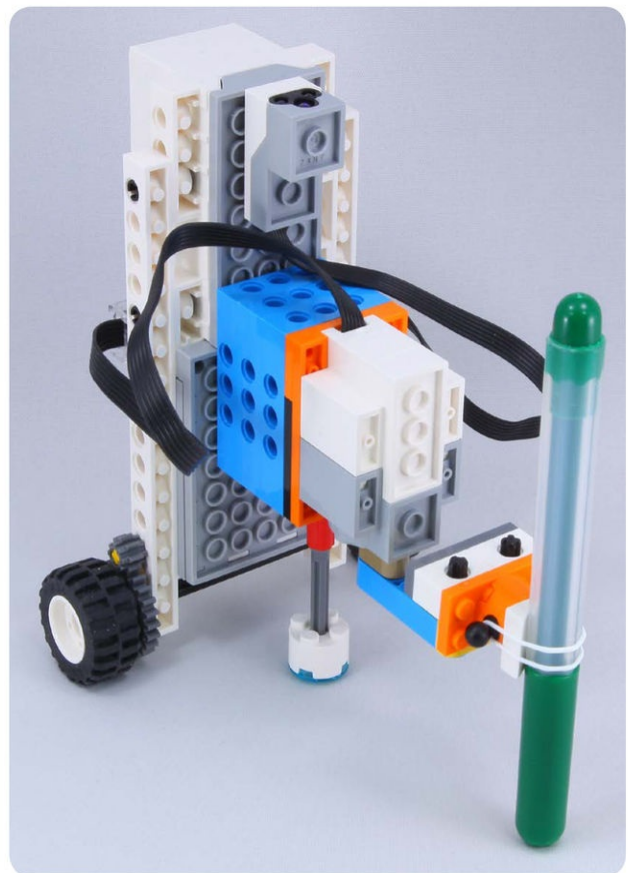
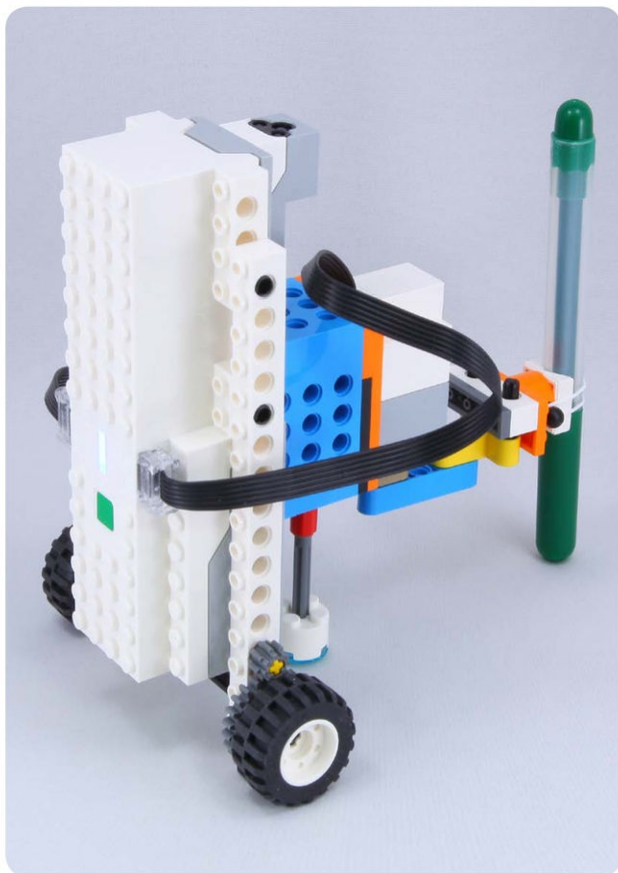
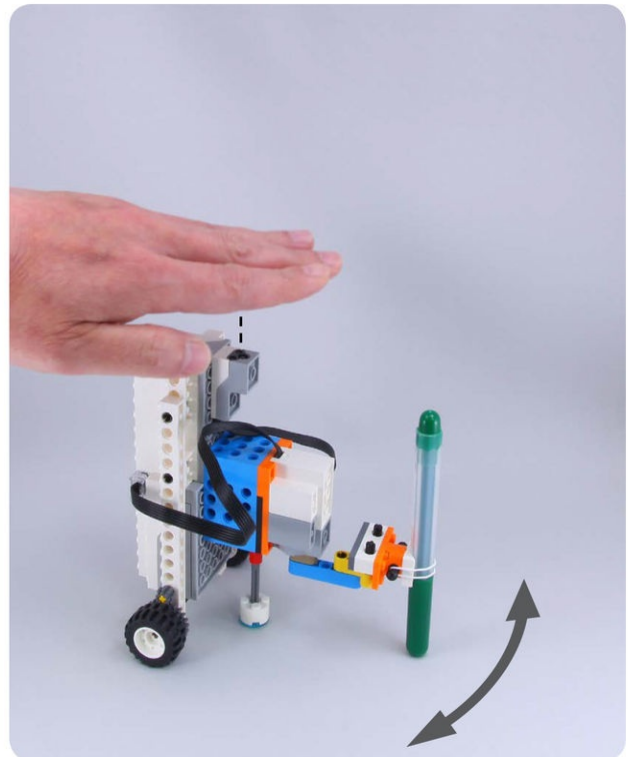
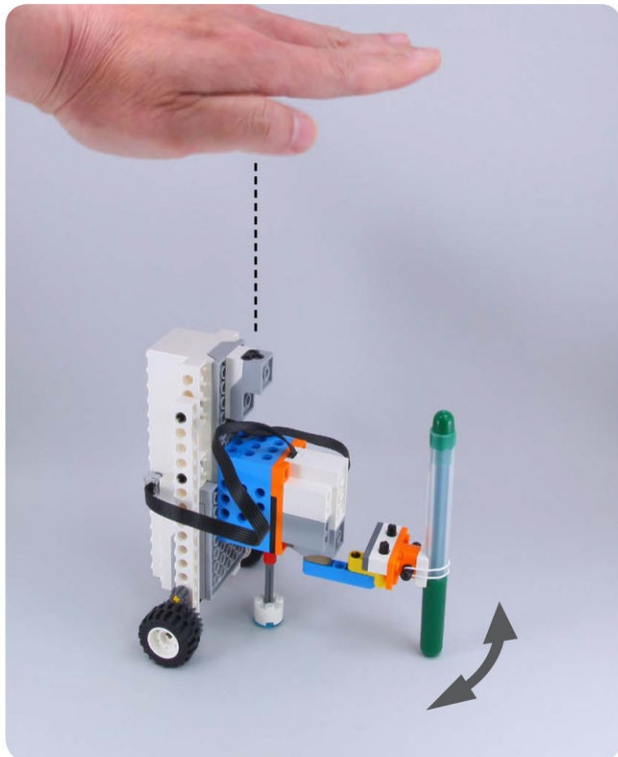


Adjust the position of the pen so that the tip doesn't touch the surface of the paper when the pen holder is up and does touch the surface of the paper when the holder is down.



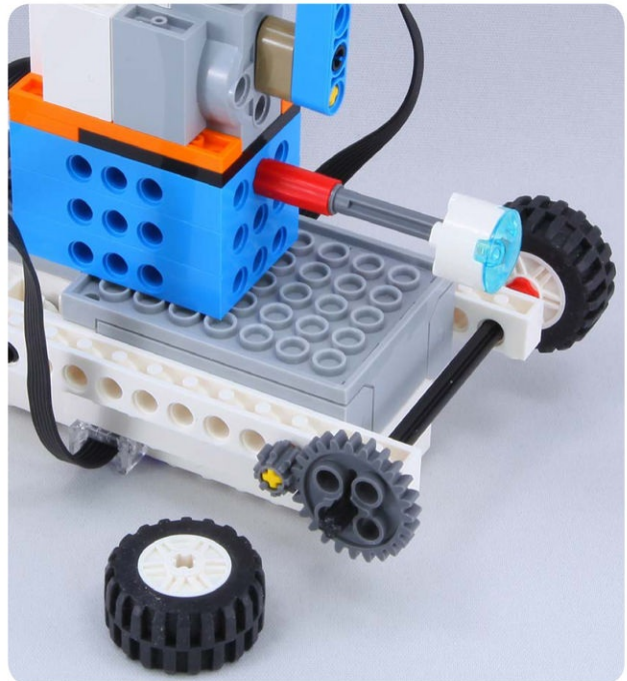
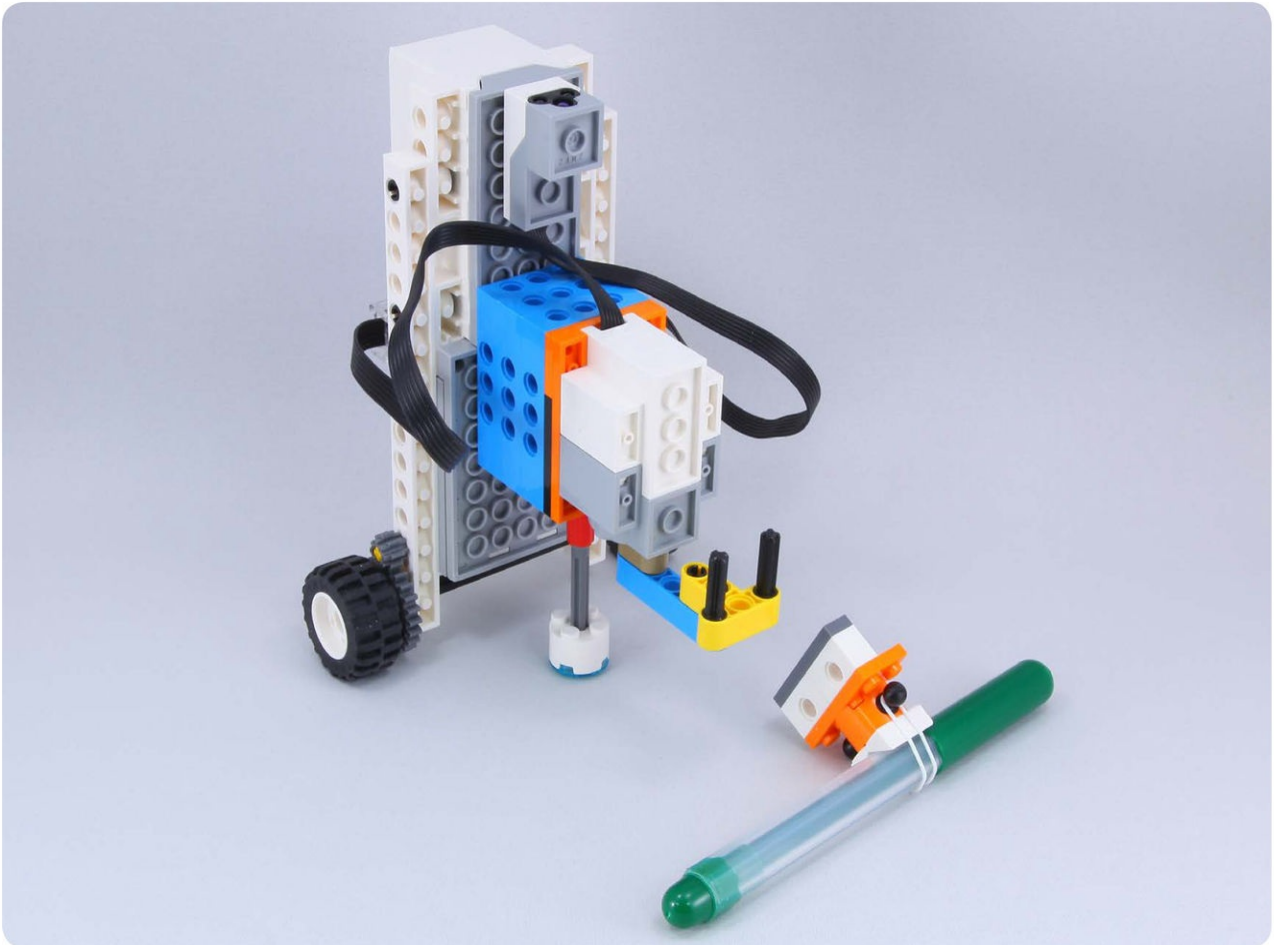
[illegible]





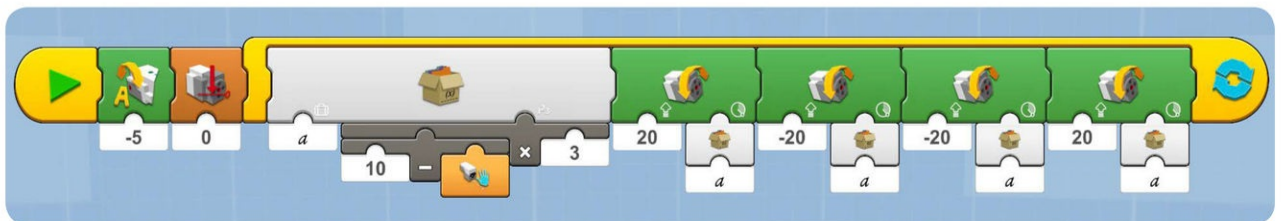
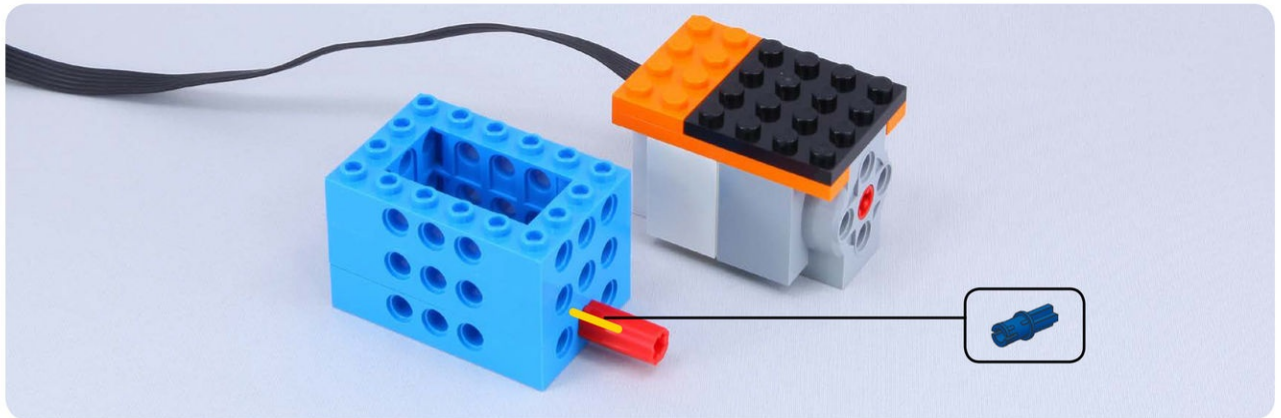
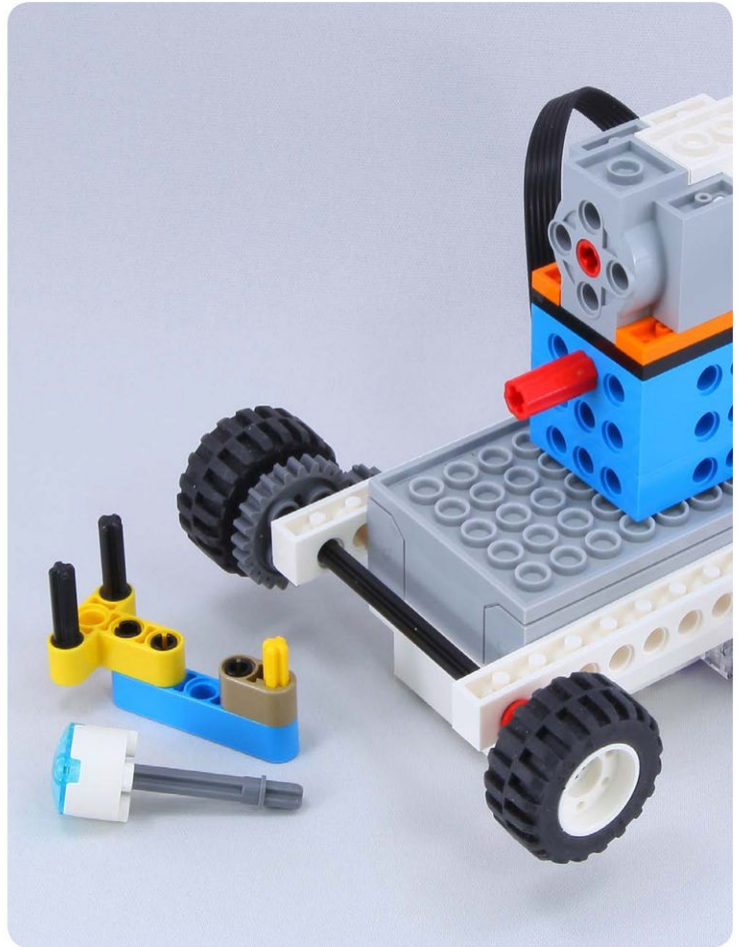
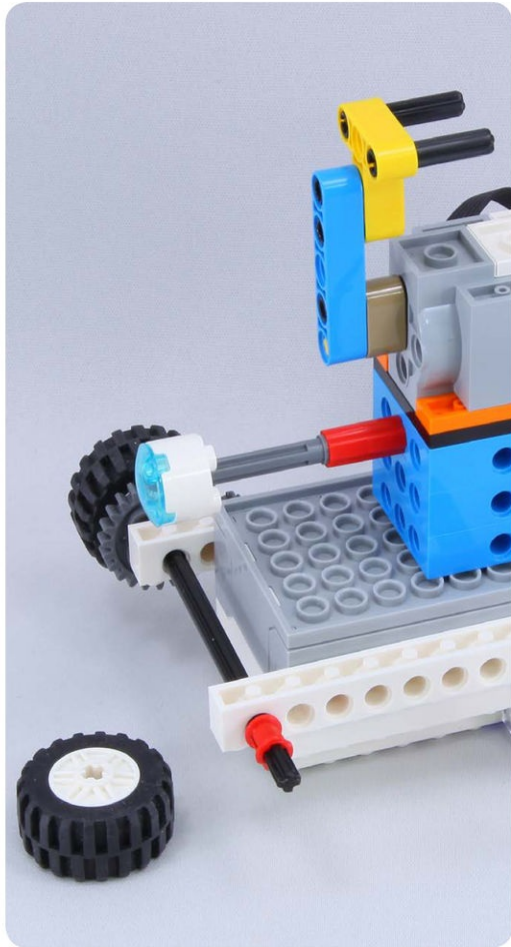
Drawing with a pen 205





**206** Drawing with a pen

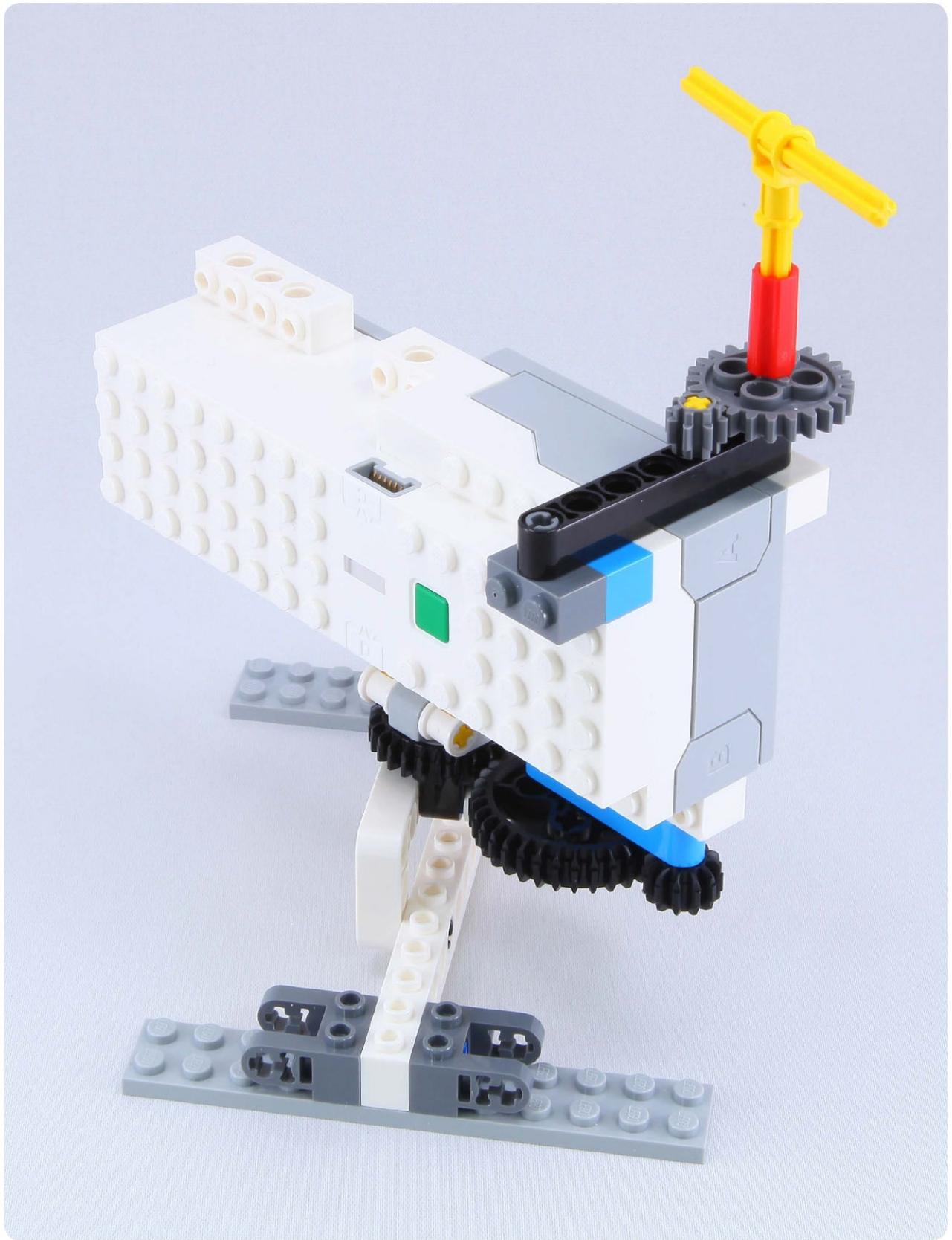






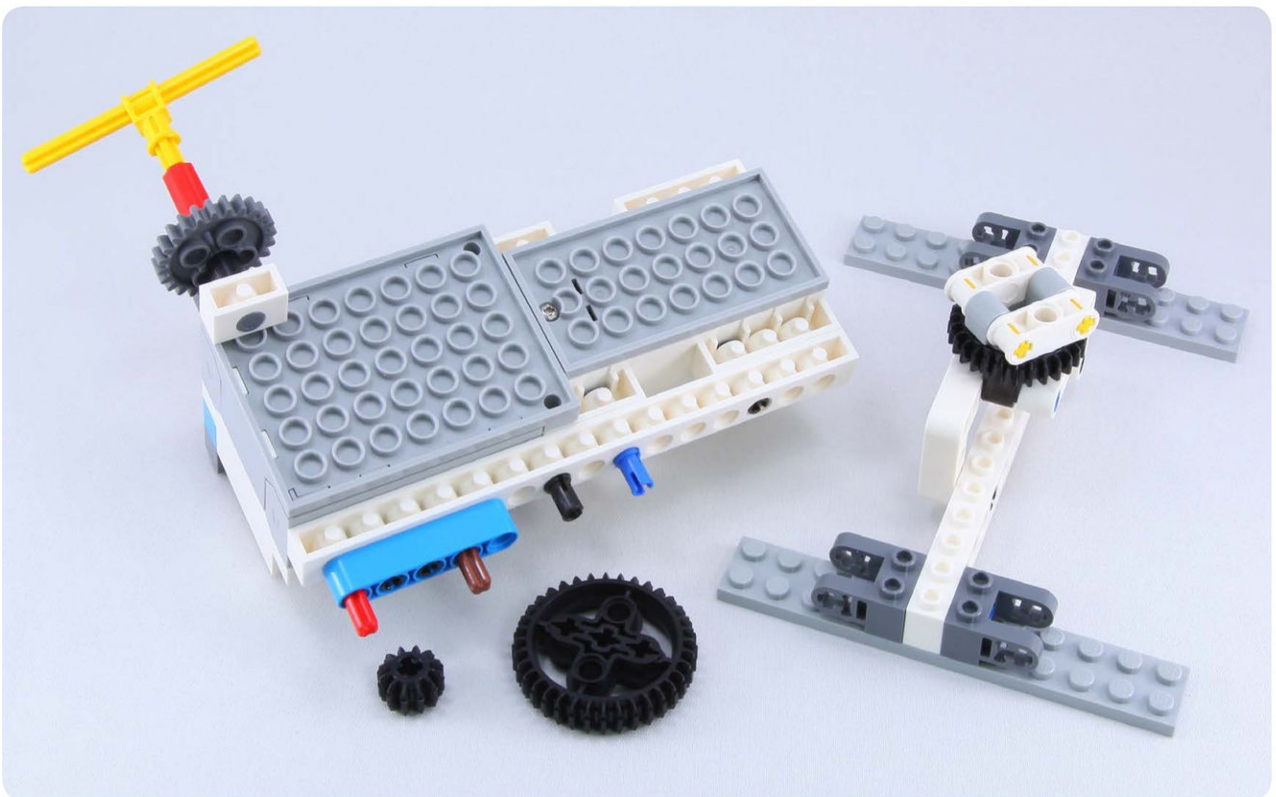
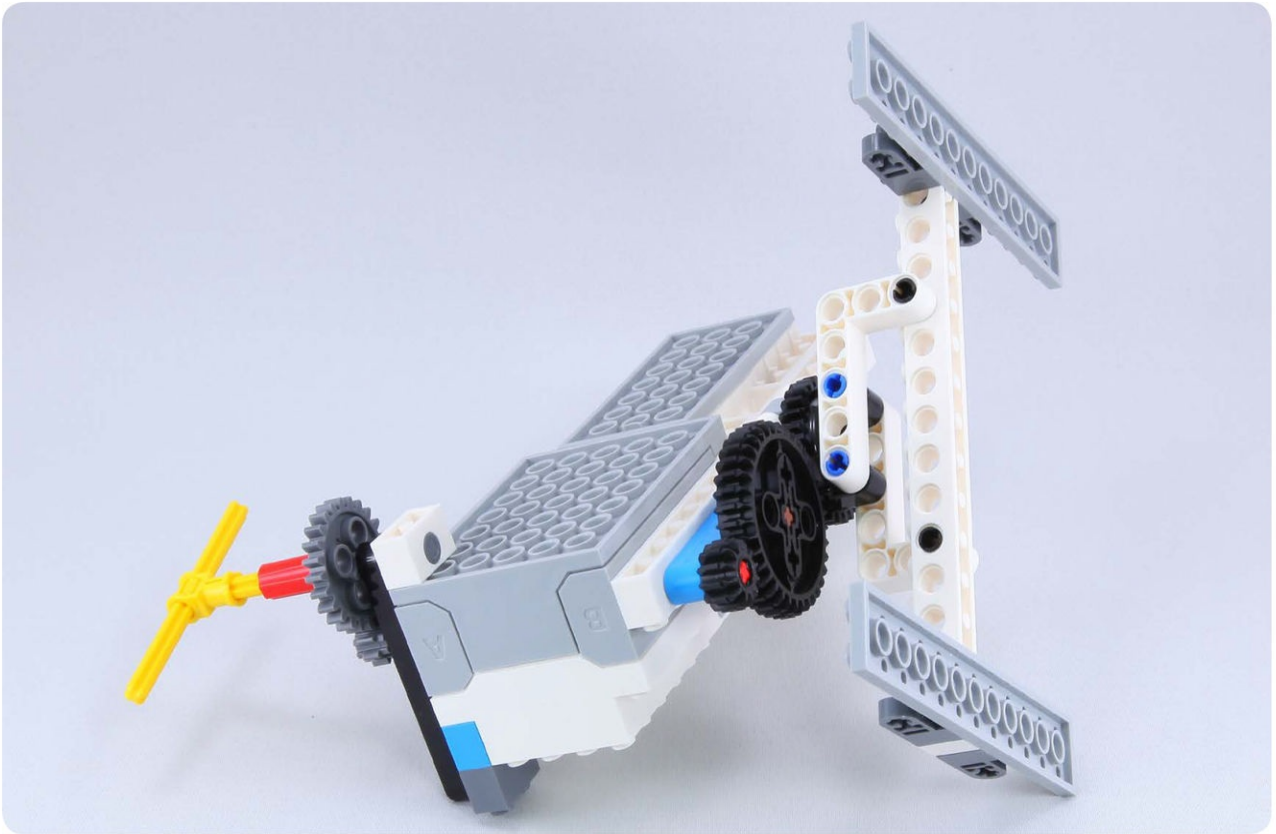






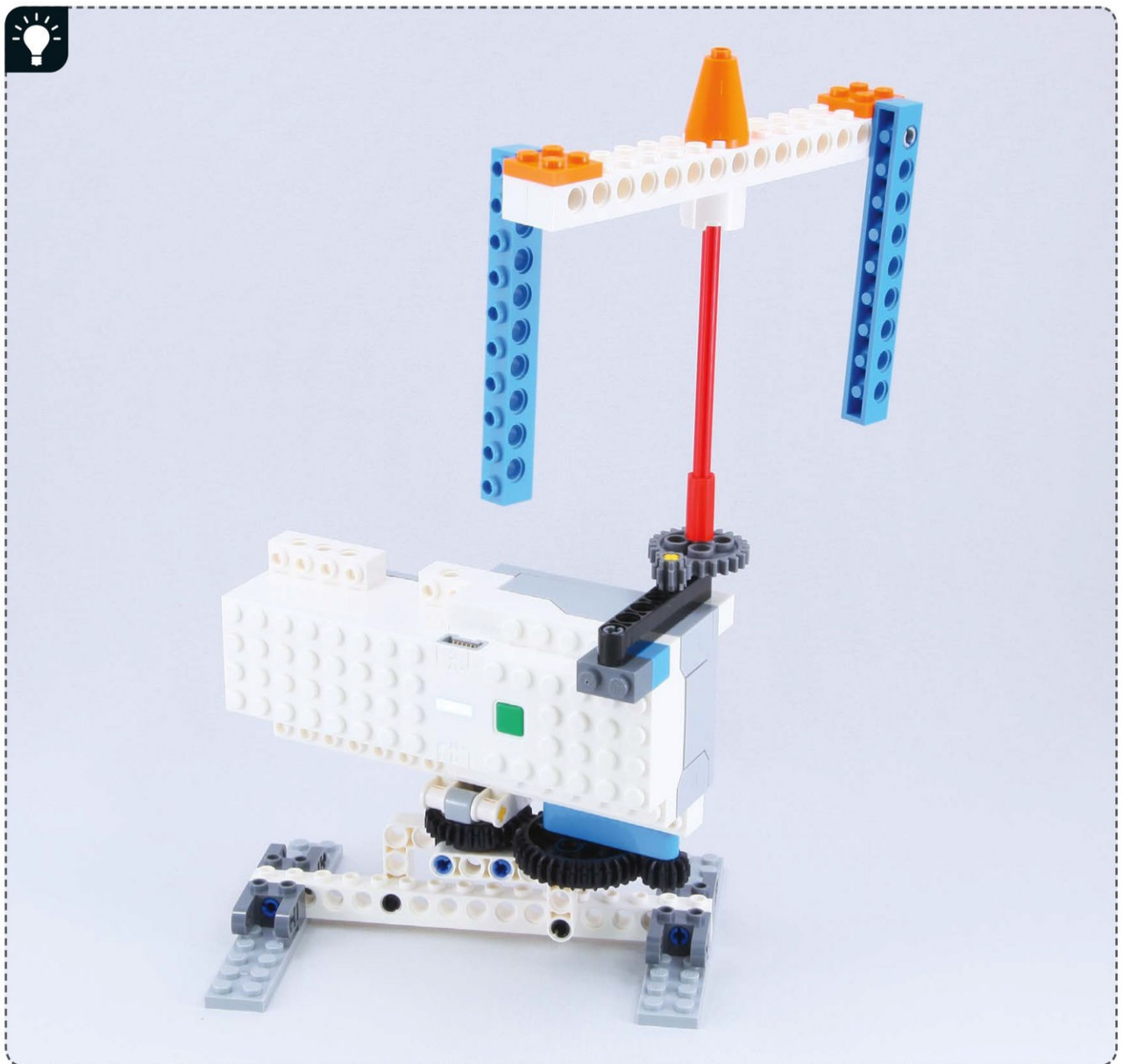
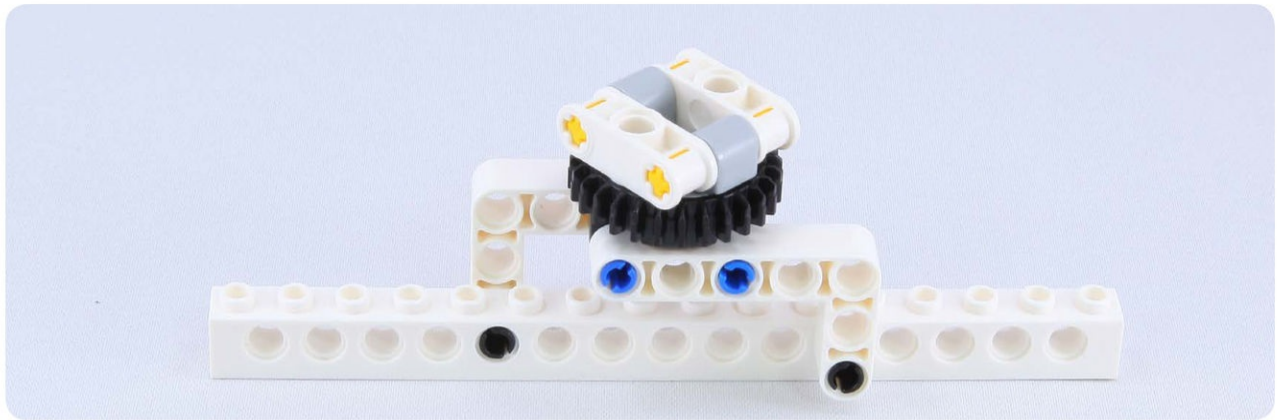
Using turntables **209**






**210** Using turntables






Using turntables 211



 x2

Orange 1x10 Technic beam with 9 holes and a grey pin. **x2**

$\times 2$




×2

x2

[illegible]

**x4**



×4


**x4**

 x4

3 × 4

$\times 4$    $\times 4$

A diagram of a red beam with a length of 10 and a width of 4. The beam is shown in perspective, with a dimension line indicating the length of 10 and another dimension line indicating the width of 4. The beam is labeled with 'x4' at the top left.




x2

 x2

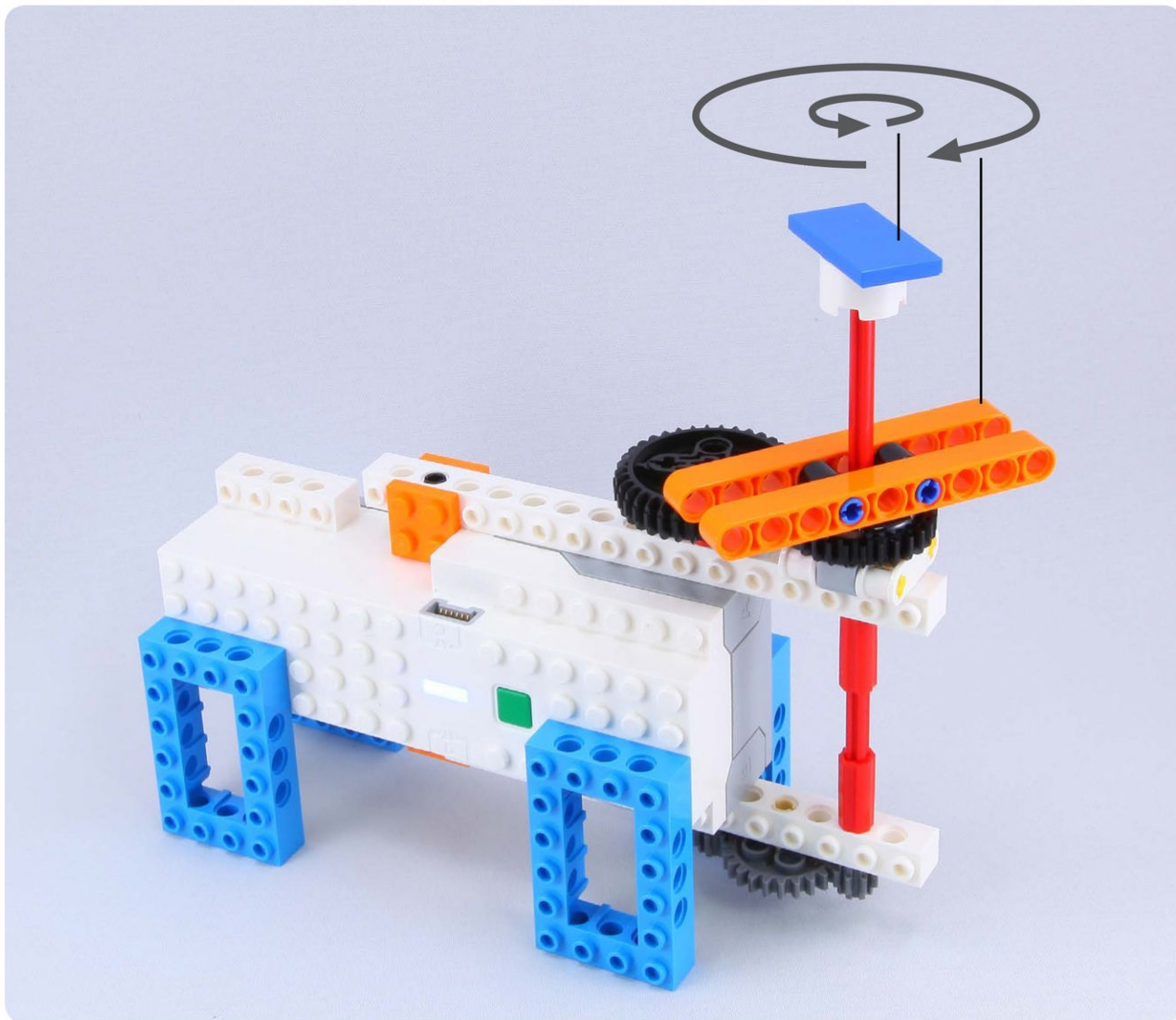
Diagram showing a yellow pin and two red rods. The rods are labeled with a dimension of 4 and a multiplier of  $\times 2$ .

4  $\times 2$

A diagram of a red rod with a length dimension of 10. The rod is shown at an angle, and a dimension line with arrows at both ends indicates the length, with the number 10 written above it.

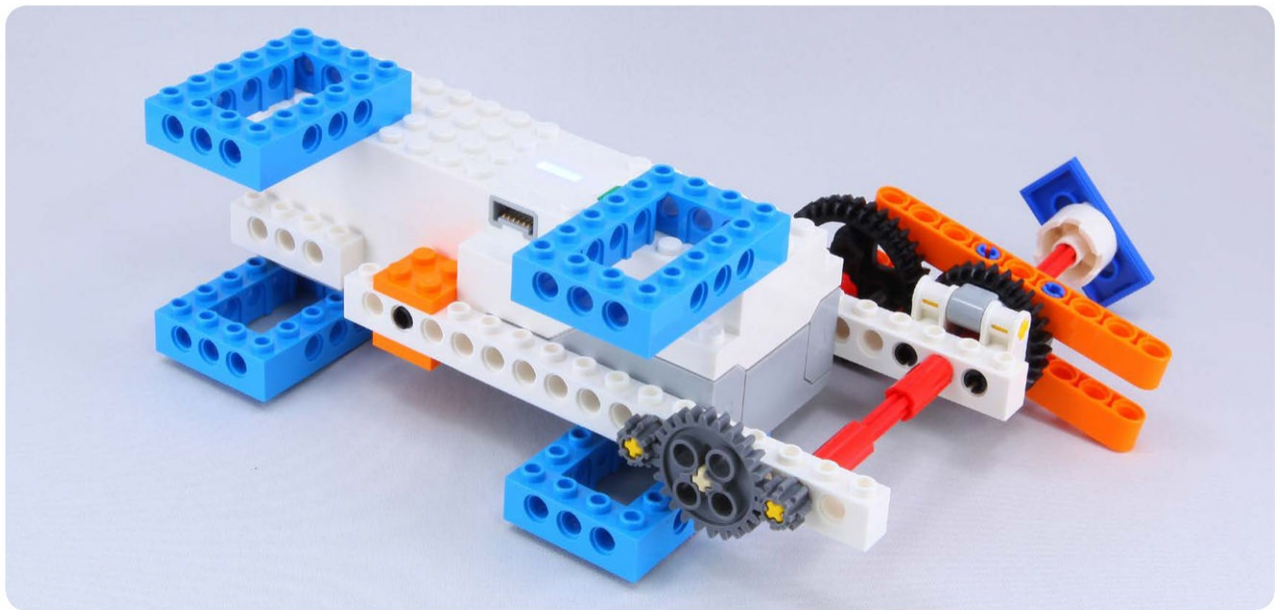
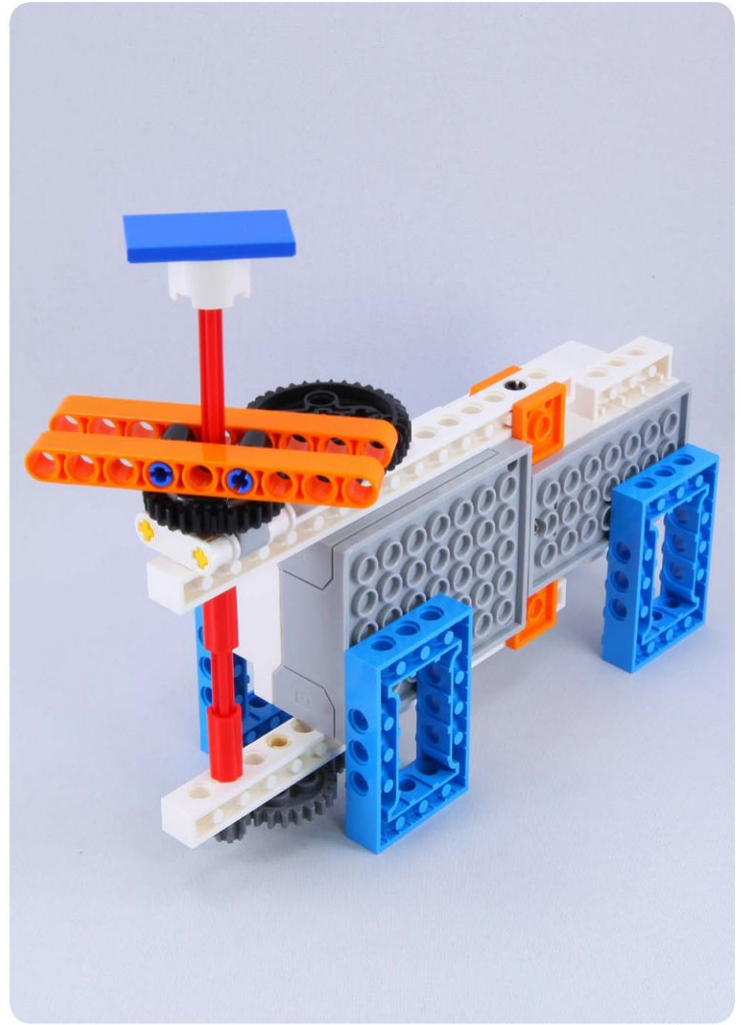
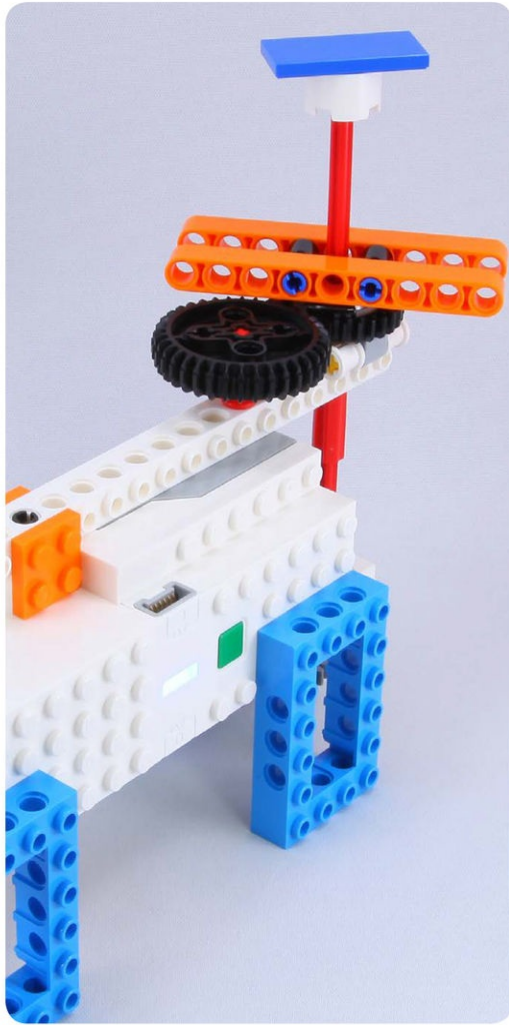


x2

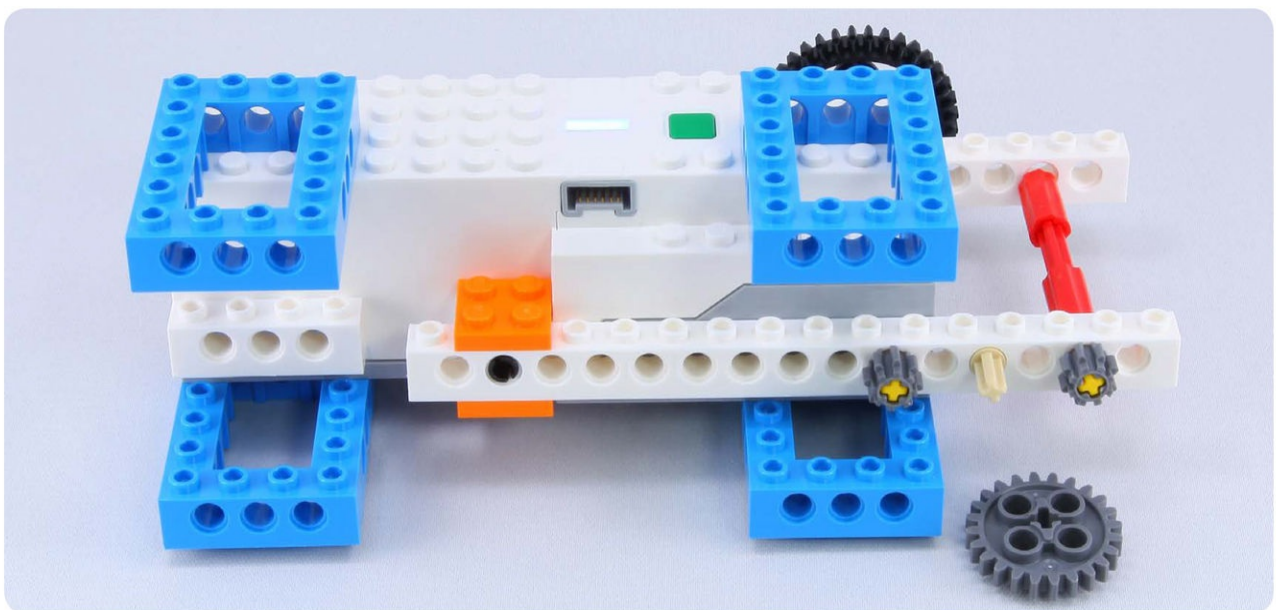
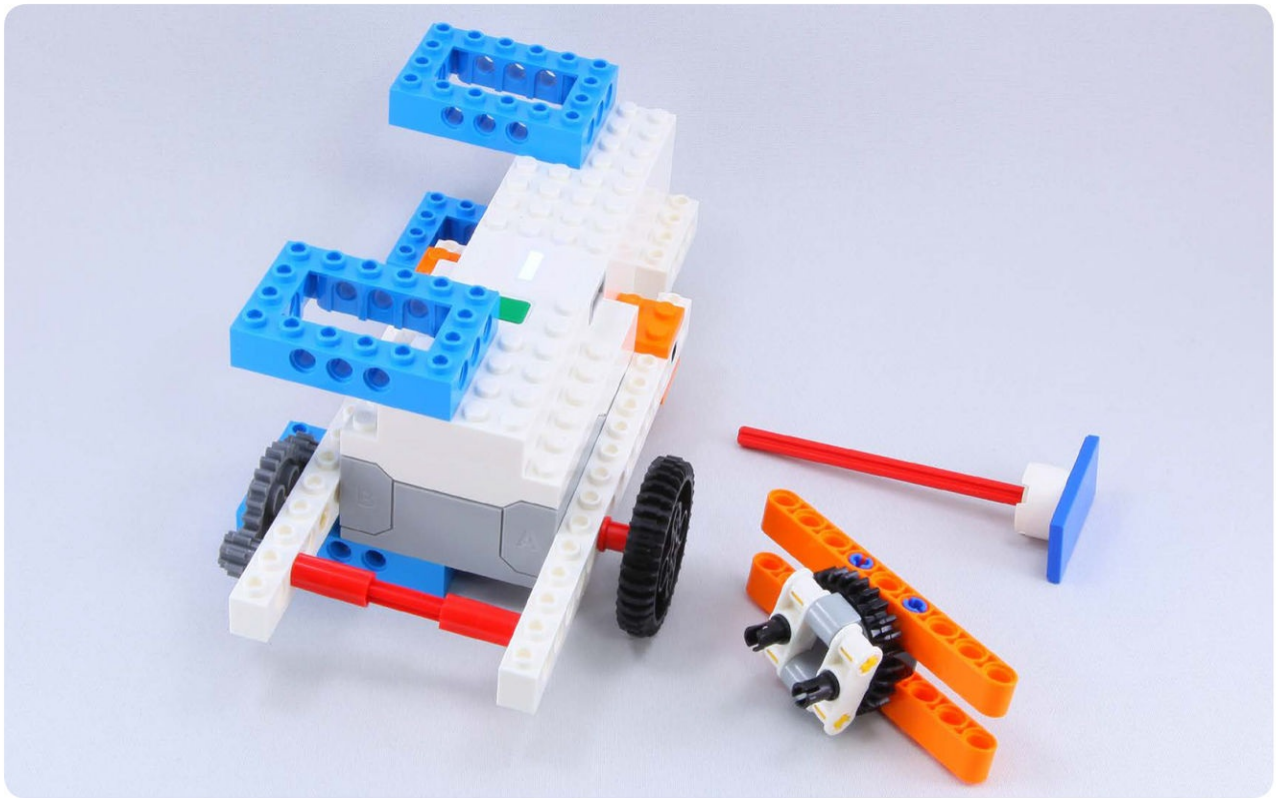


## 212 Using turntables



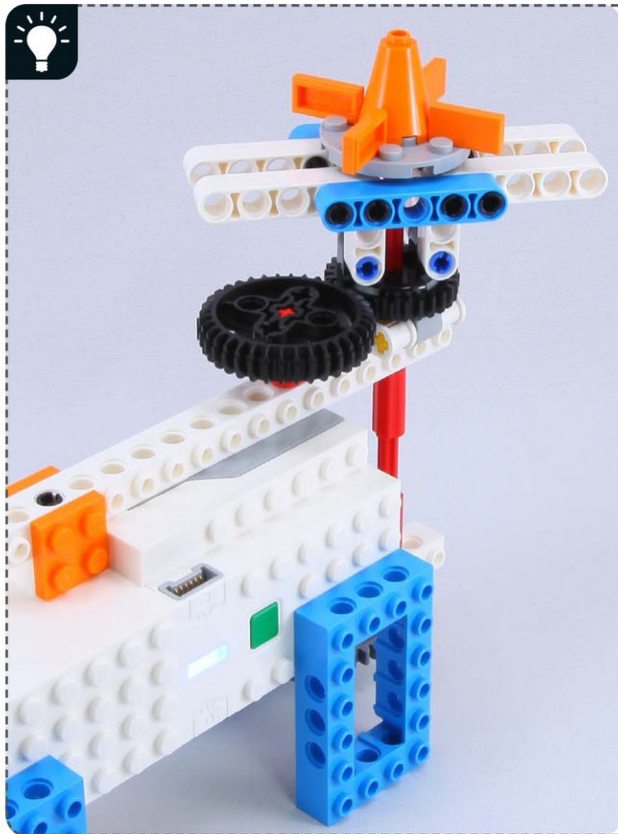






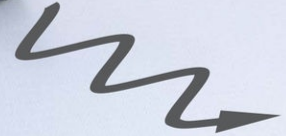
**214** Using turntables



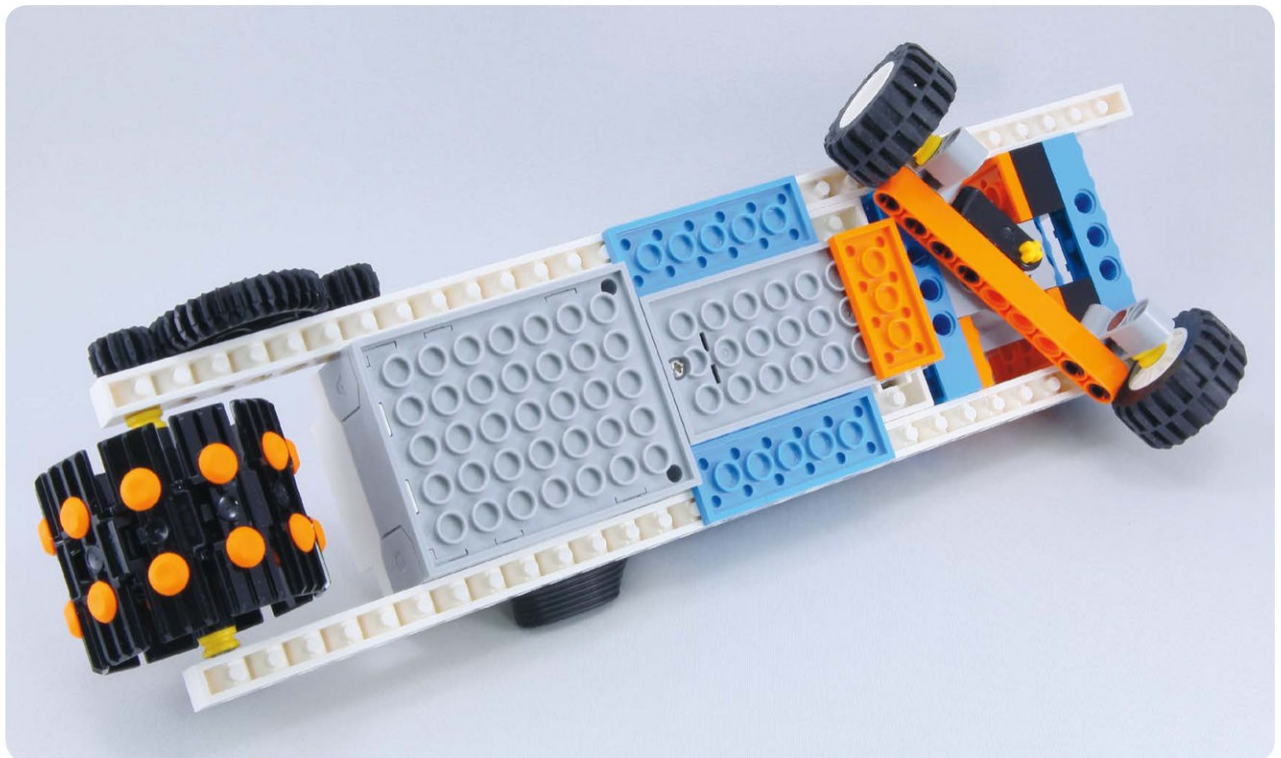


Using turntables 215



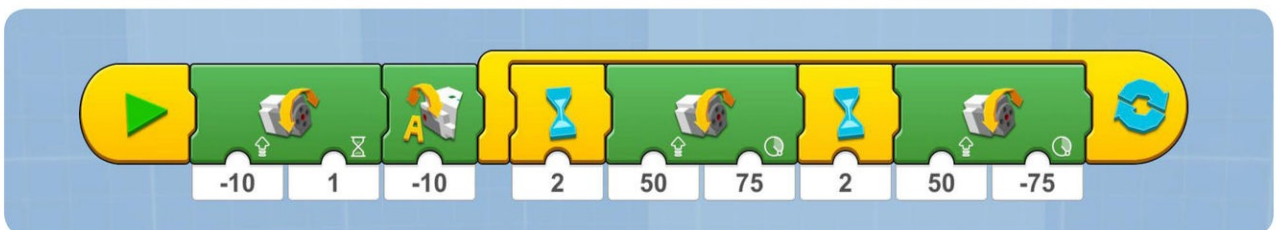
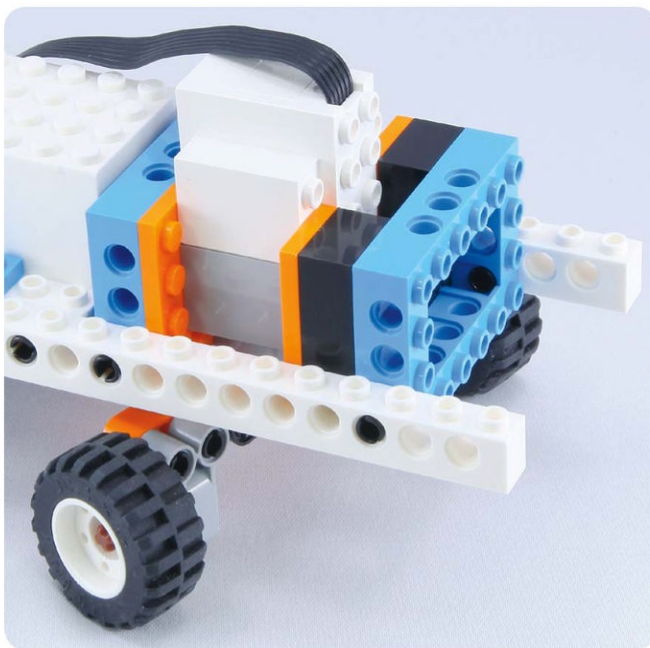
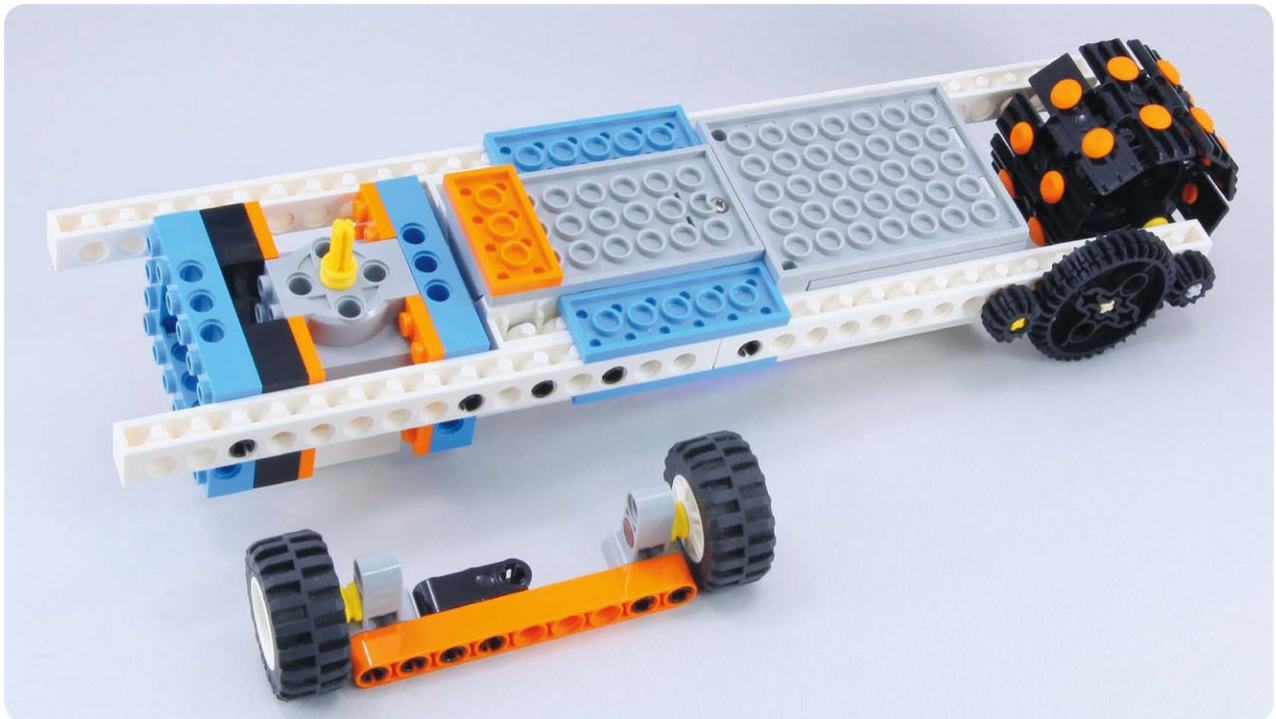
[illegible]





Changing direction by steering 217



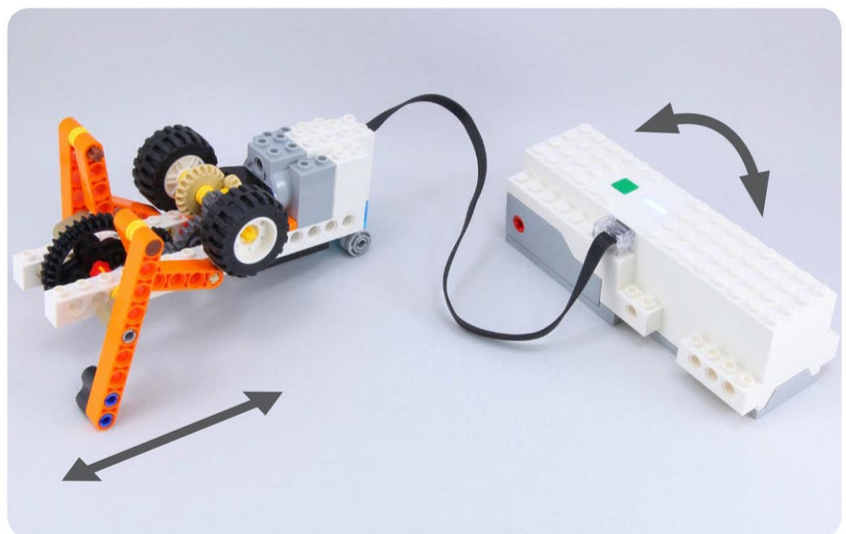
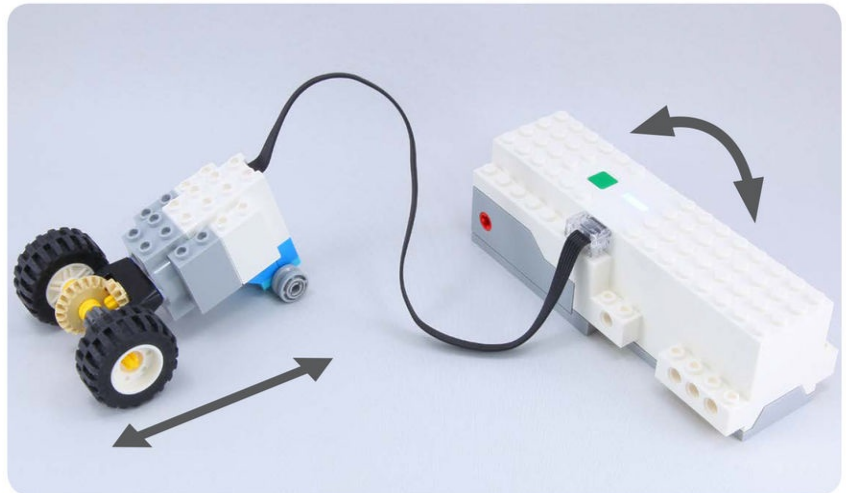


**218** Changing direction by steering

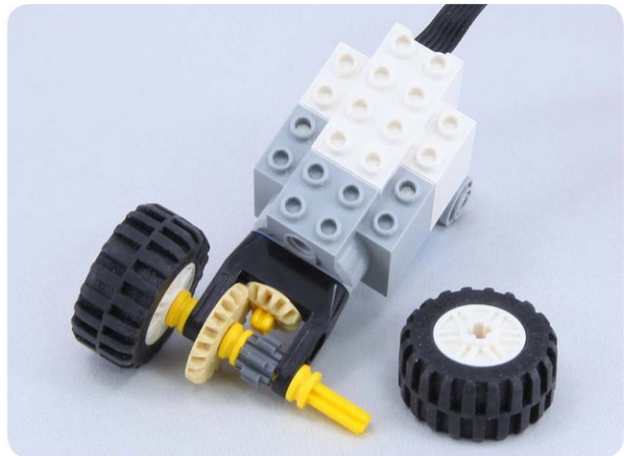
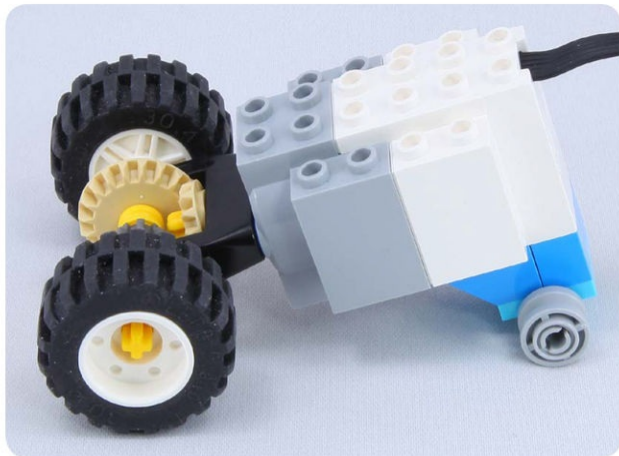




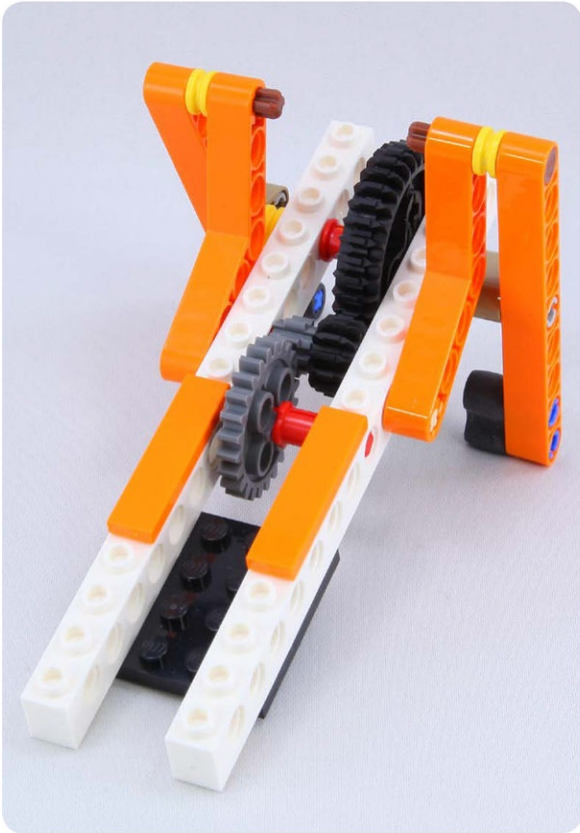


[illegible]

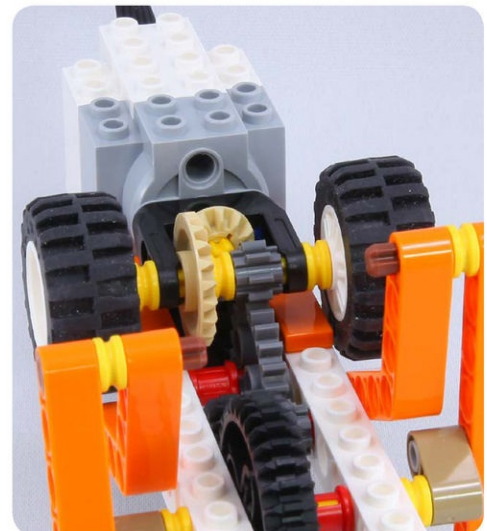
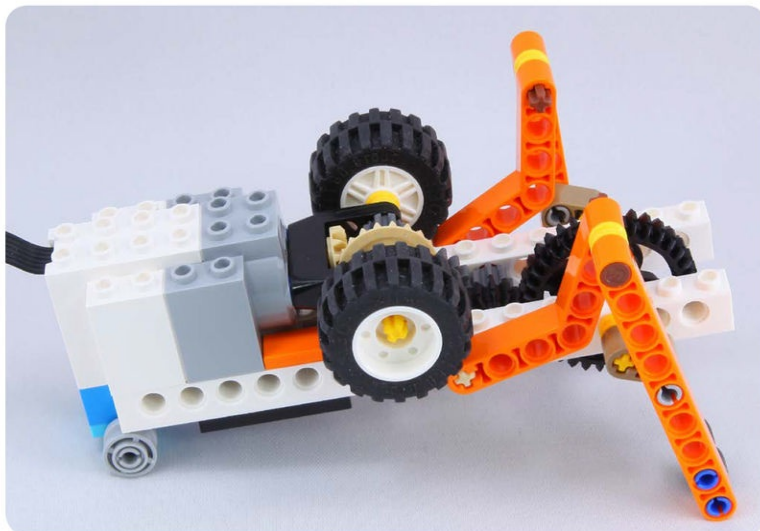
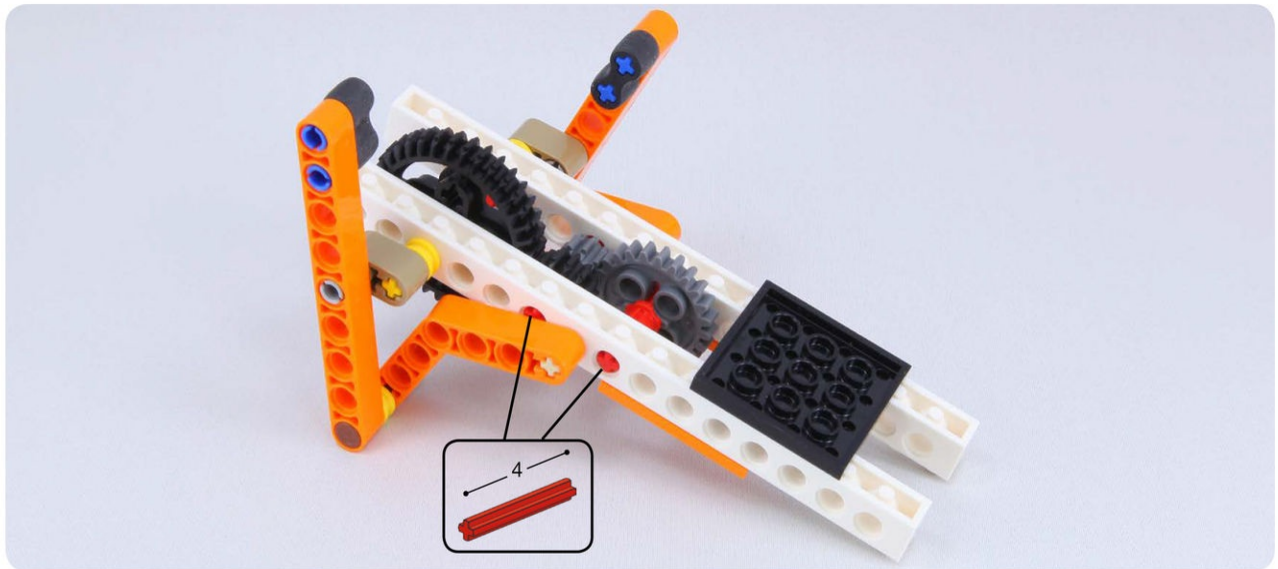




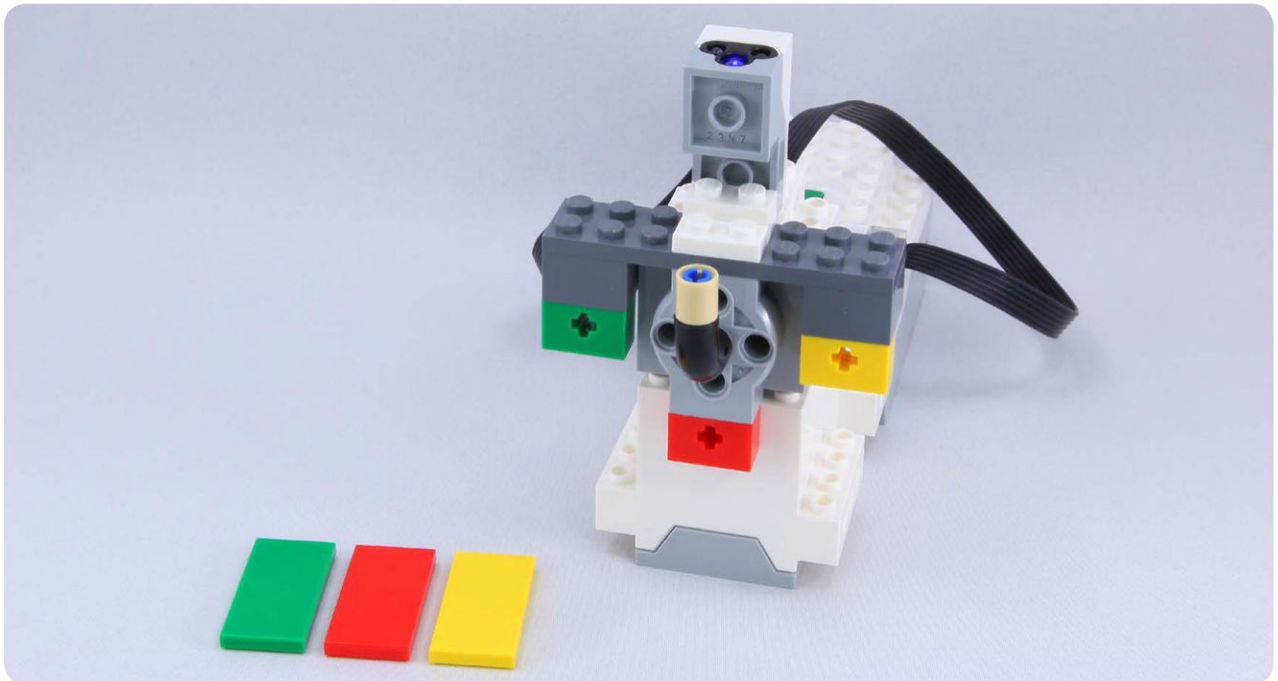




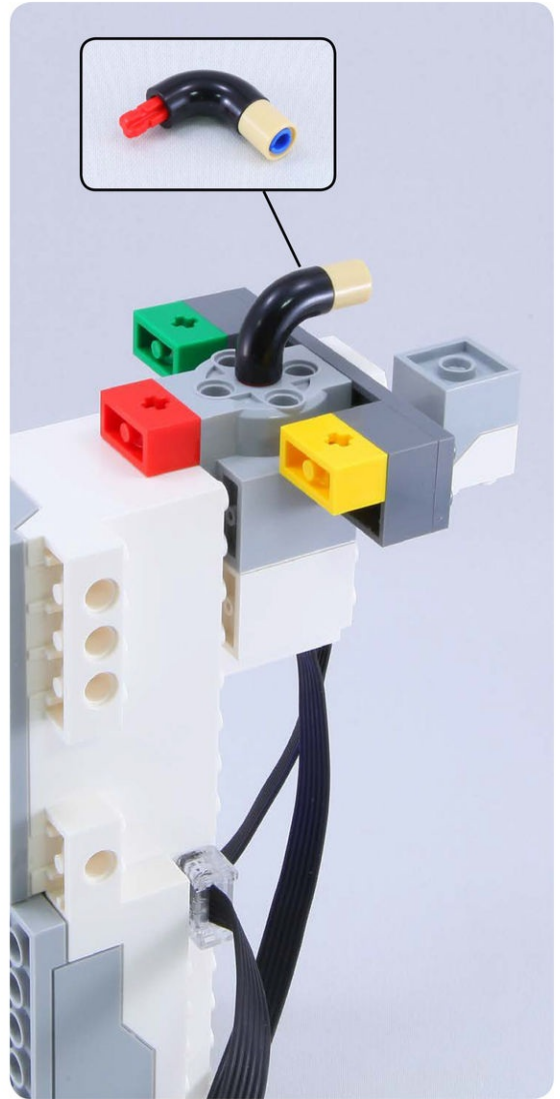
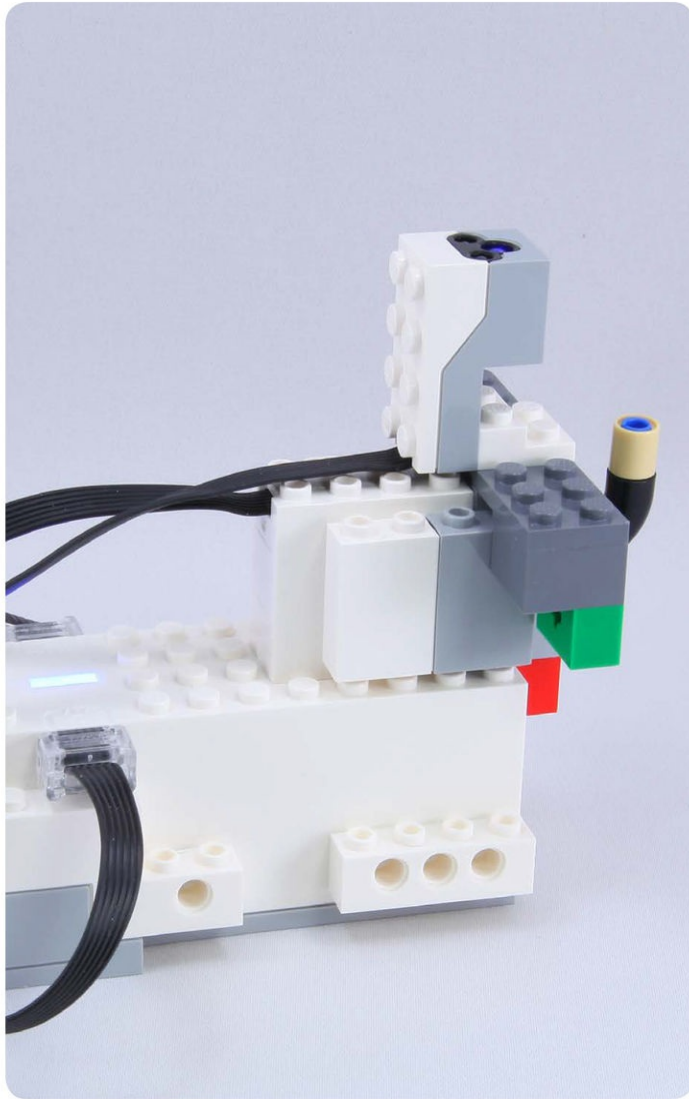






[illegible]



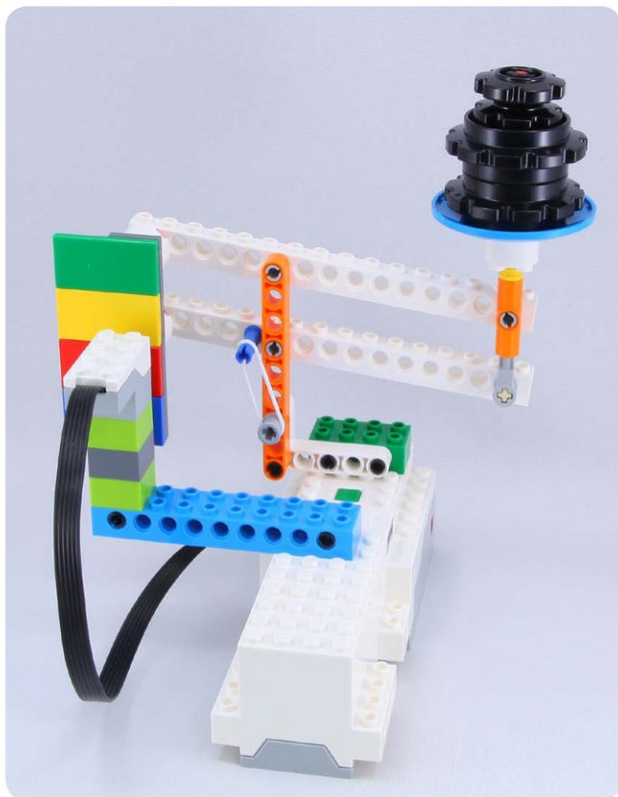
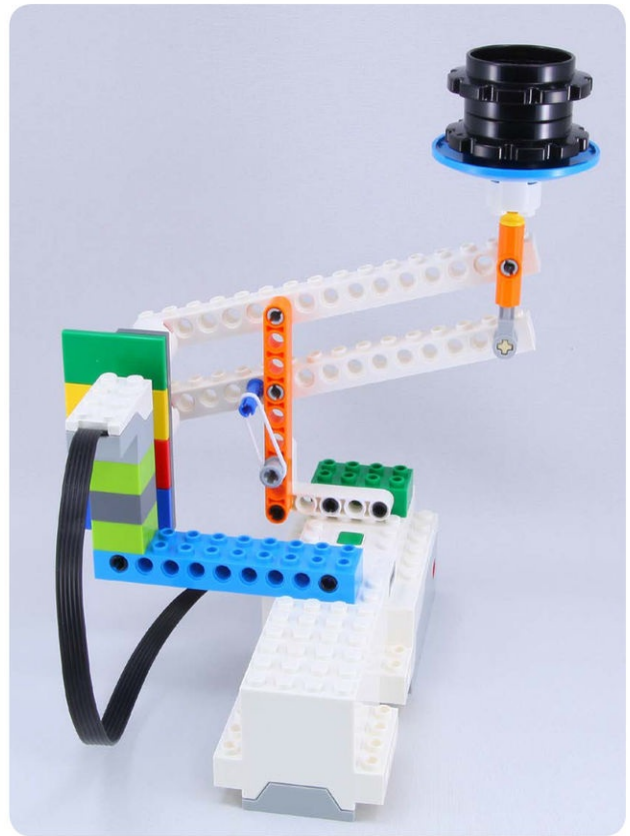
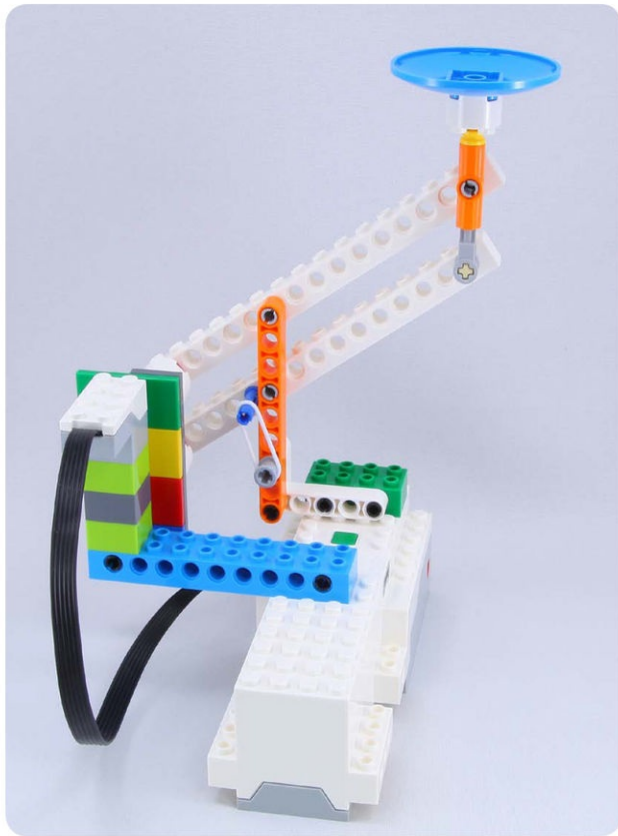


More ways to use the Color and Distance Sensor **225**



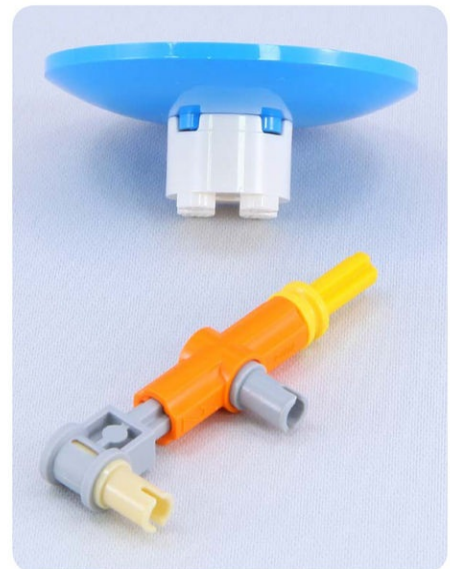
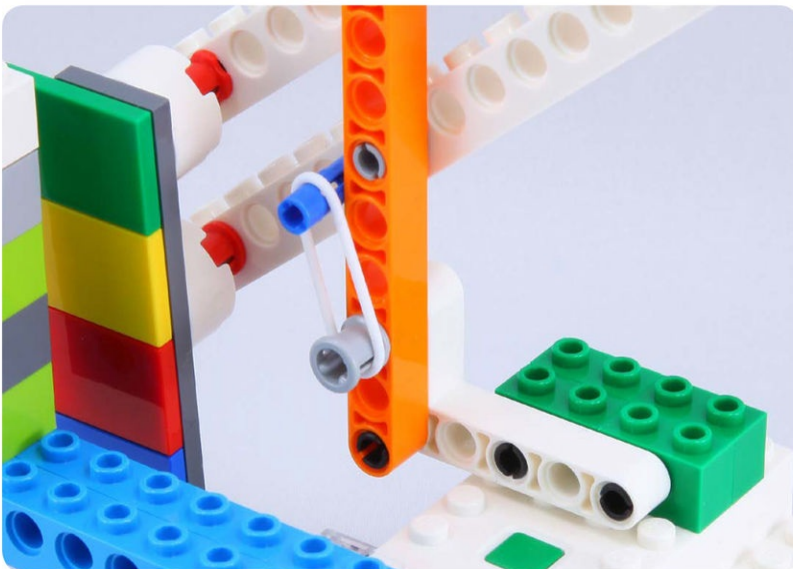
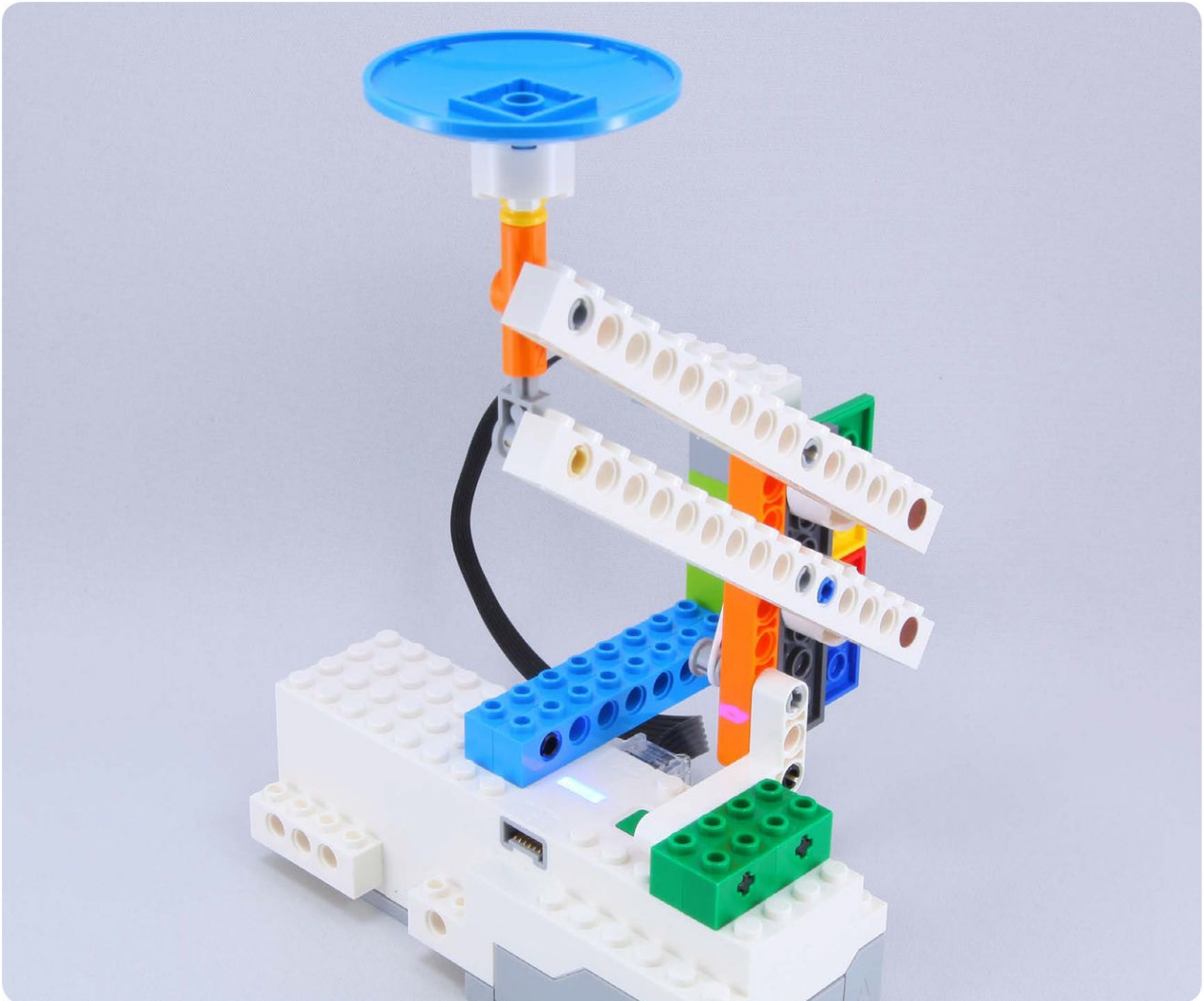
[illegible]





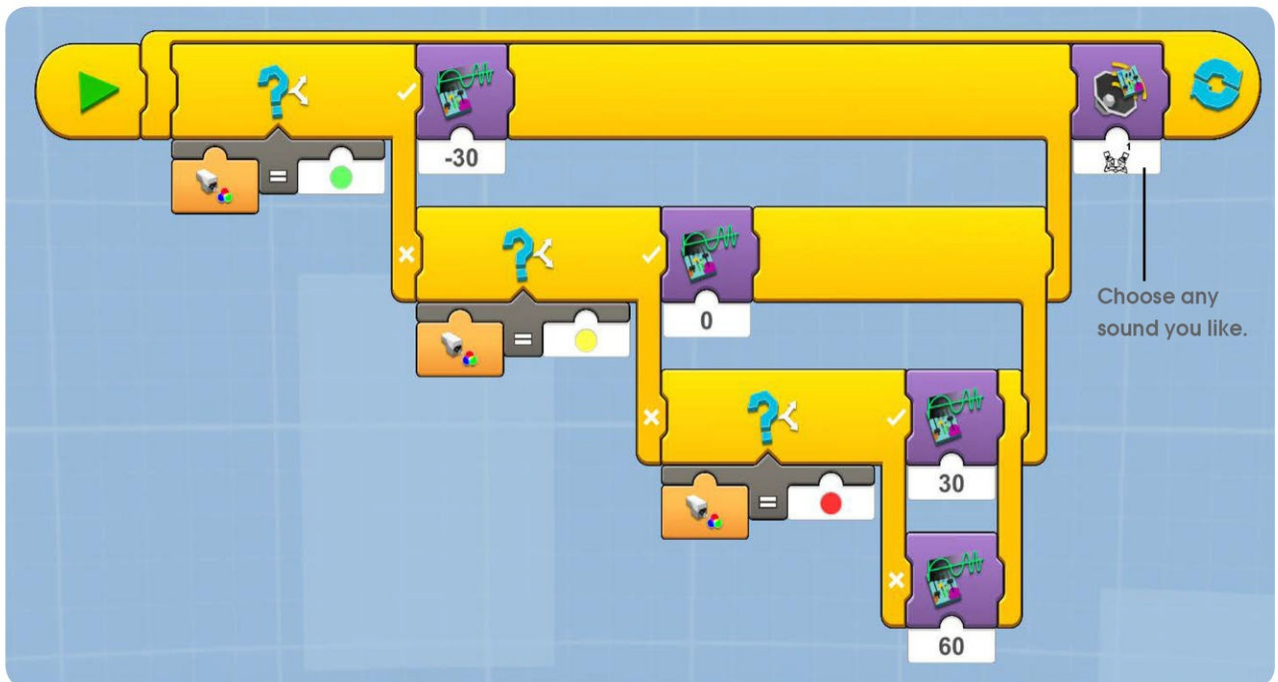
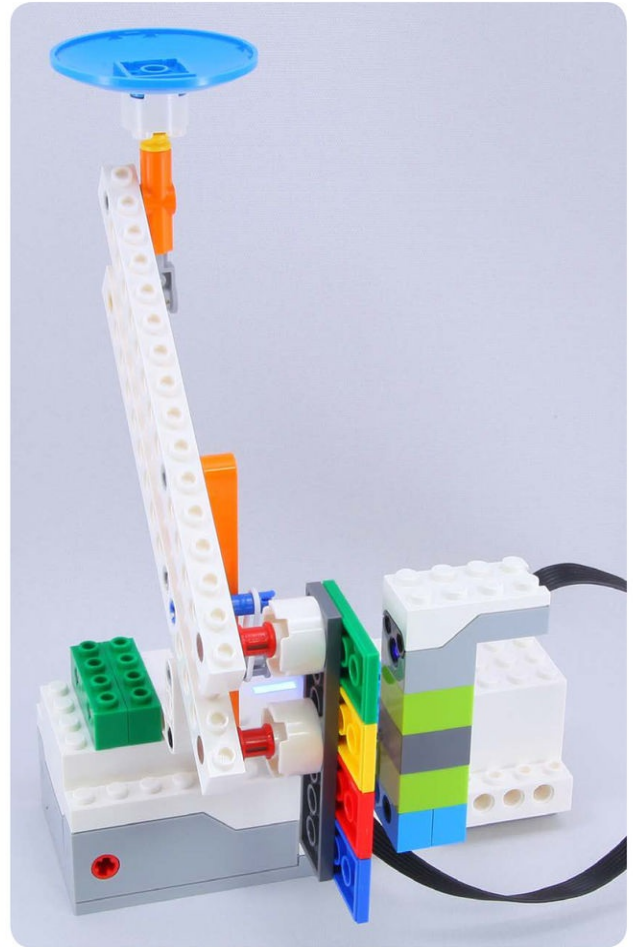
More ways to use the Color and Distance Sensor **227**



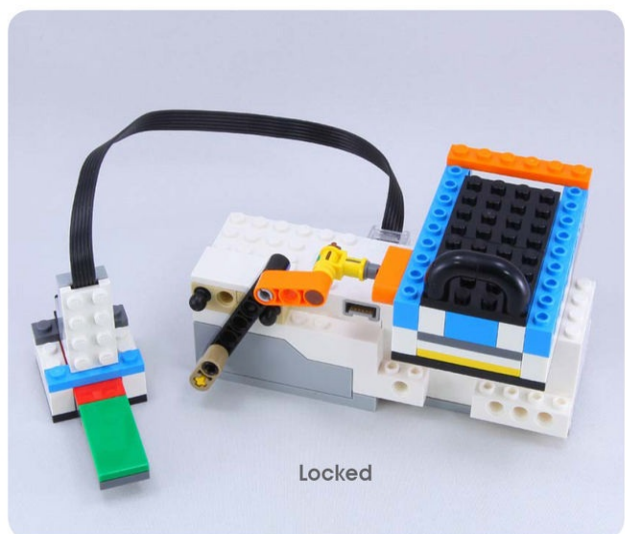
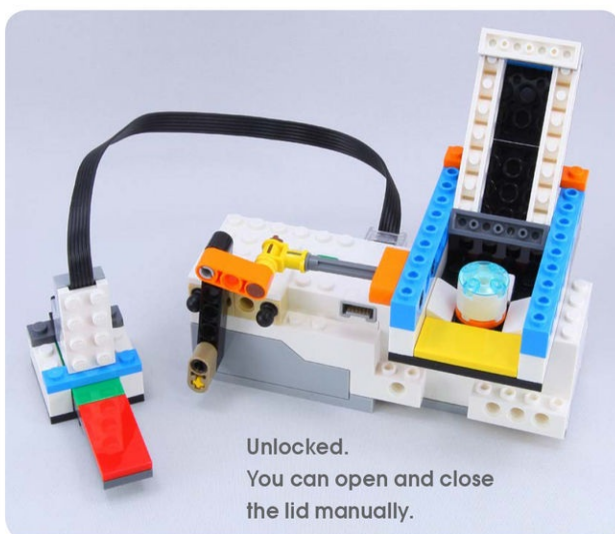
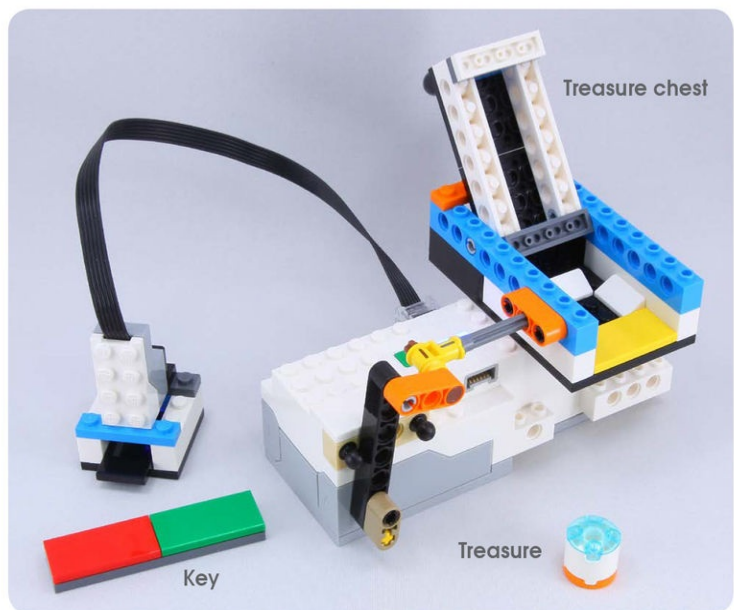


**228** More ways to use the Color and Distance Sensor

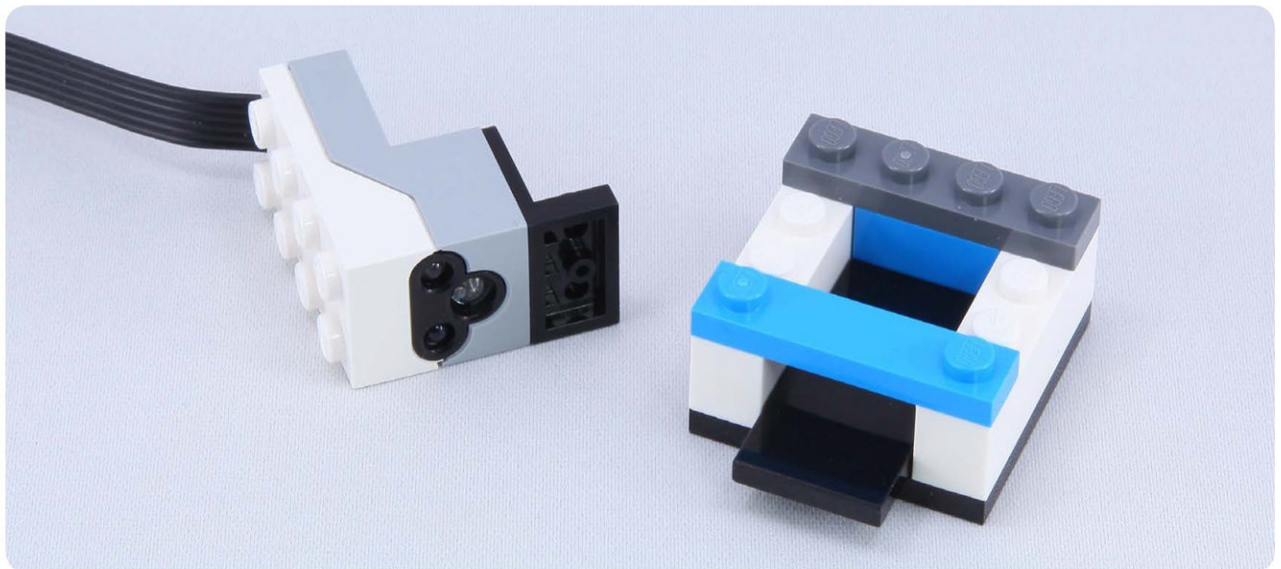
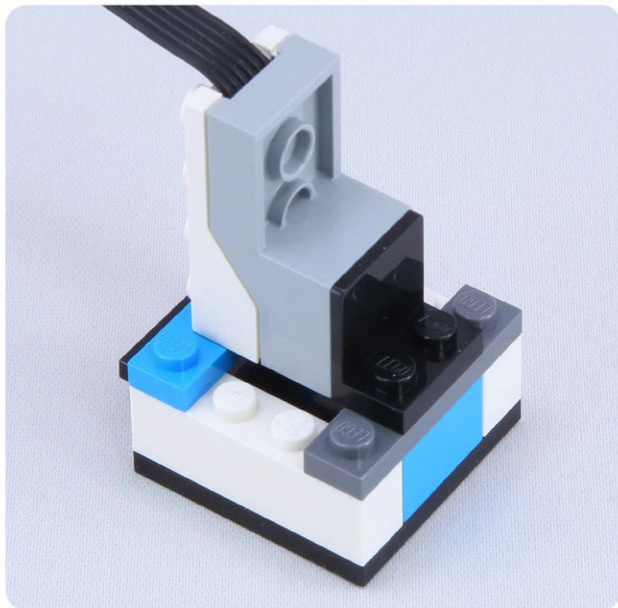
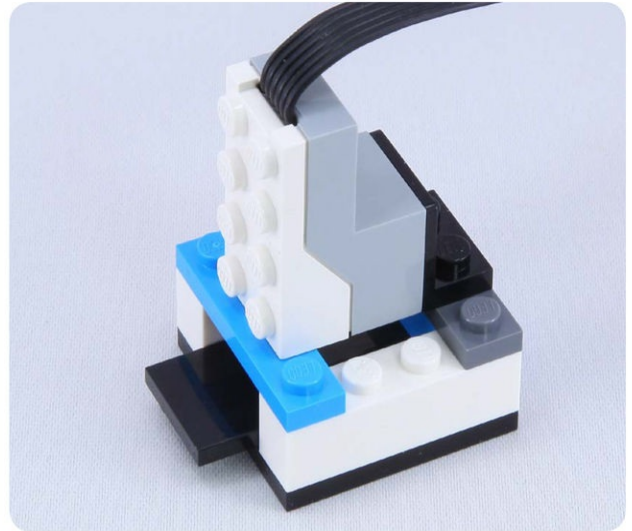
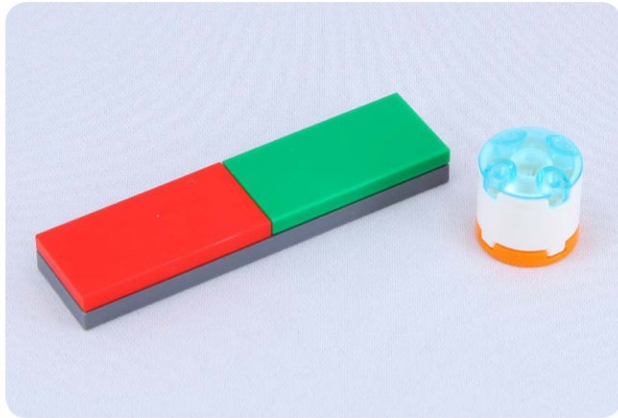






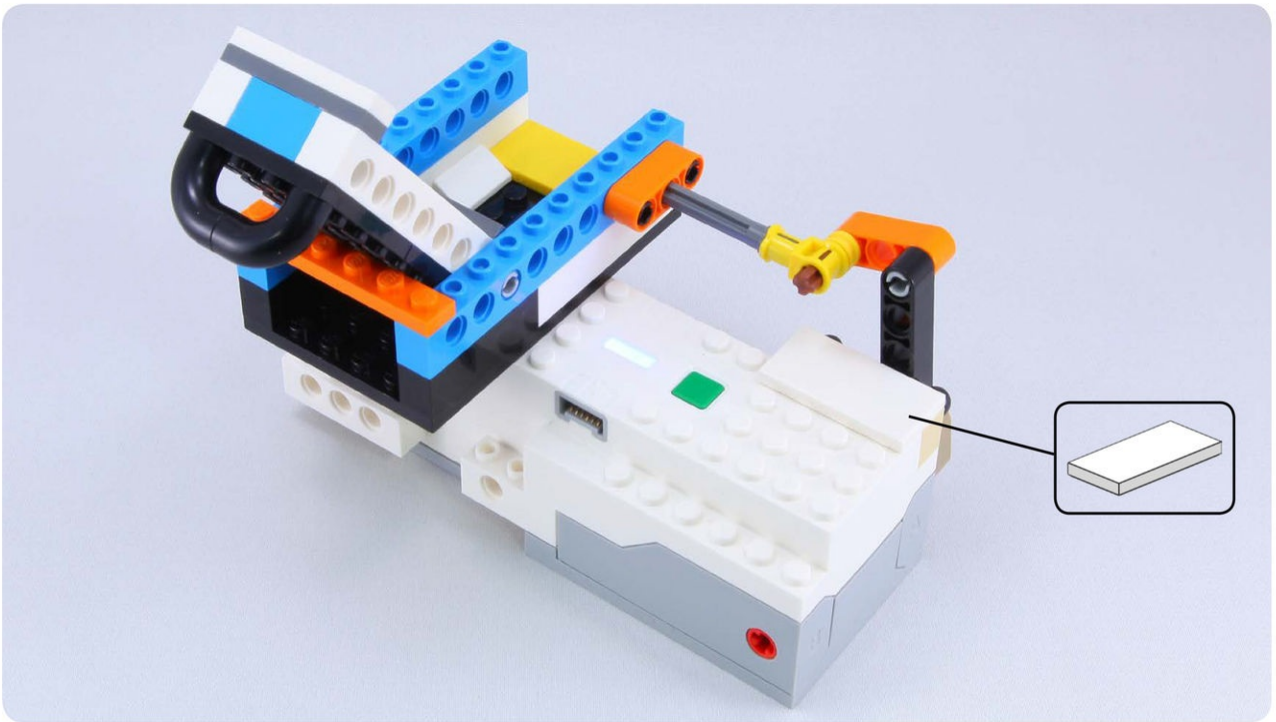
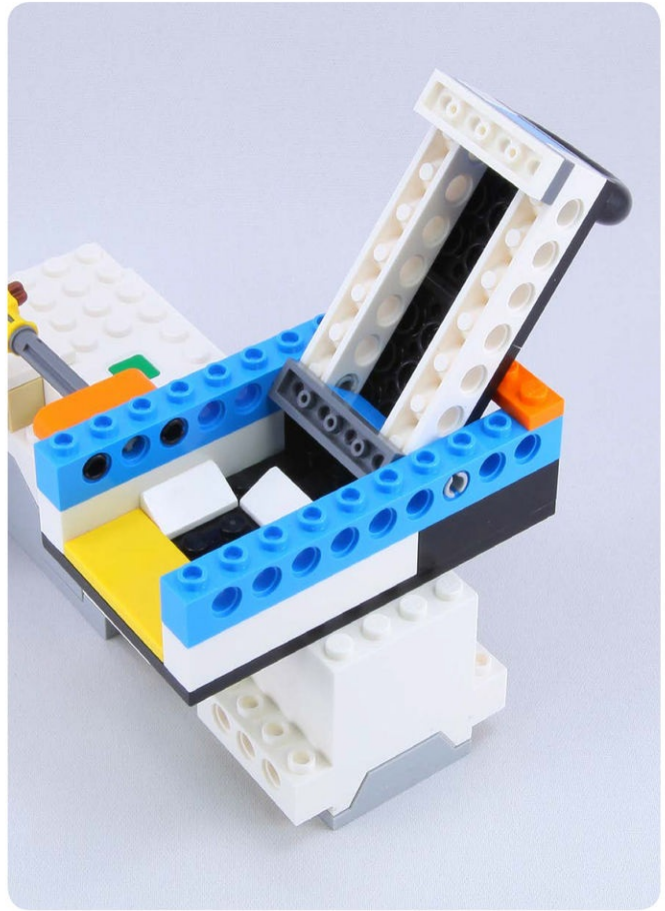
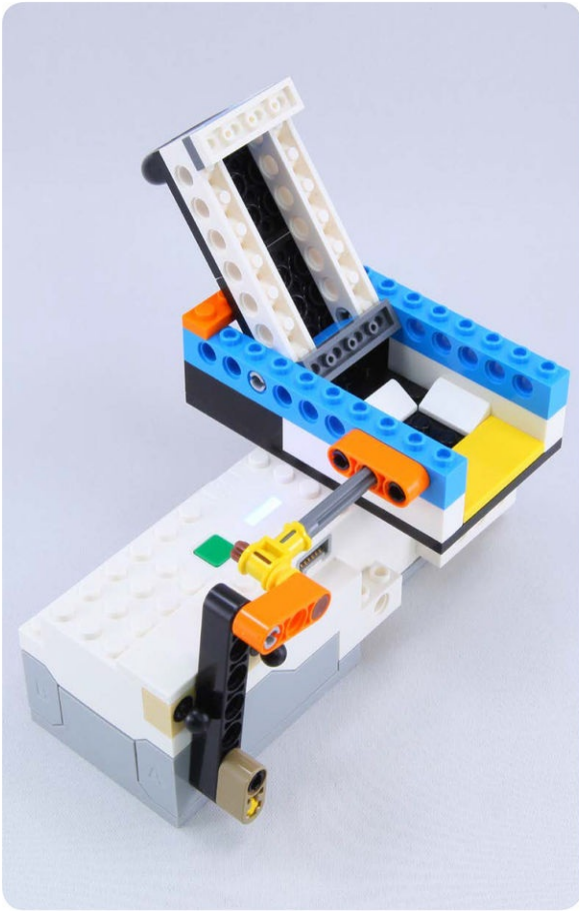
[illegible]





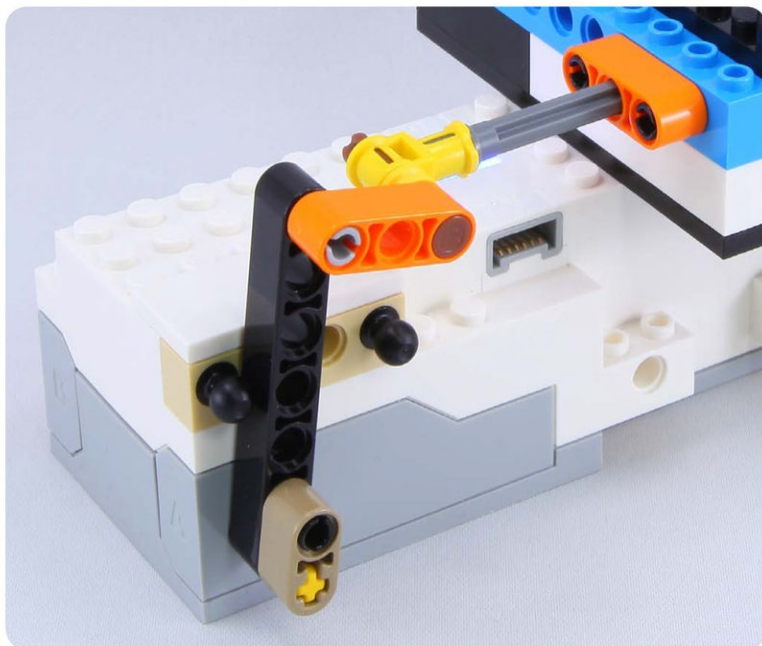
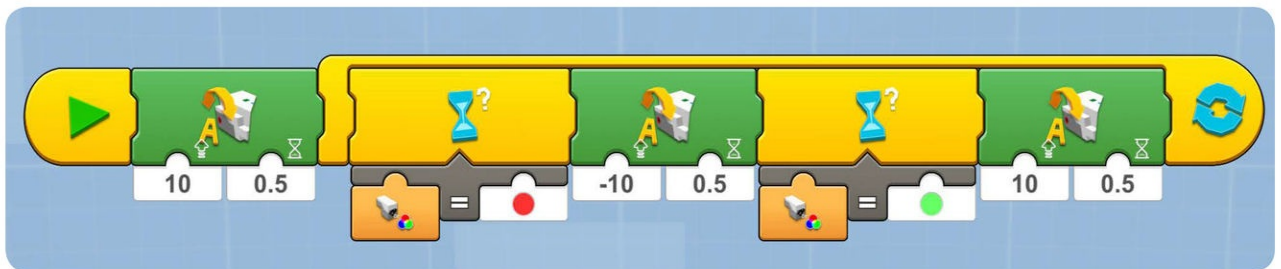
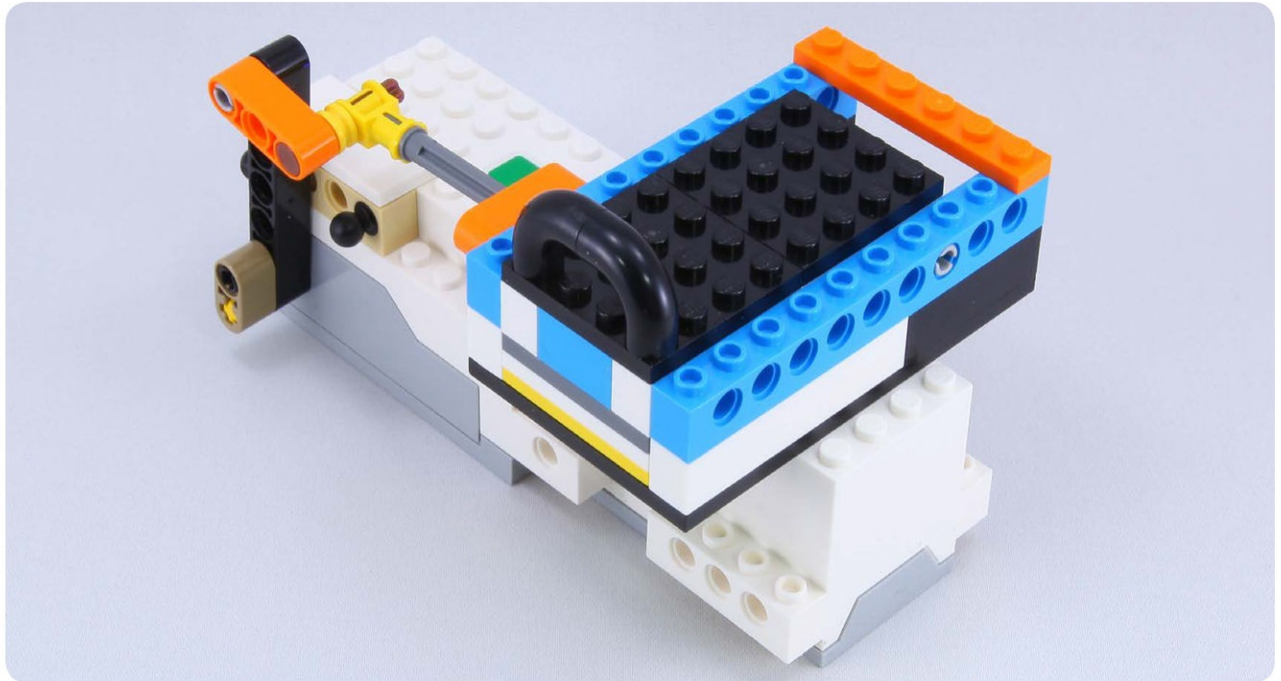
More ways to use the Color and Distance Sensor **231**





**232** More ways to use the Color and Distance Sensor



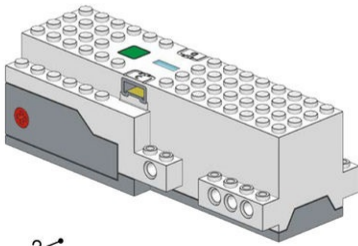




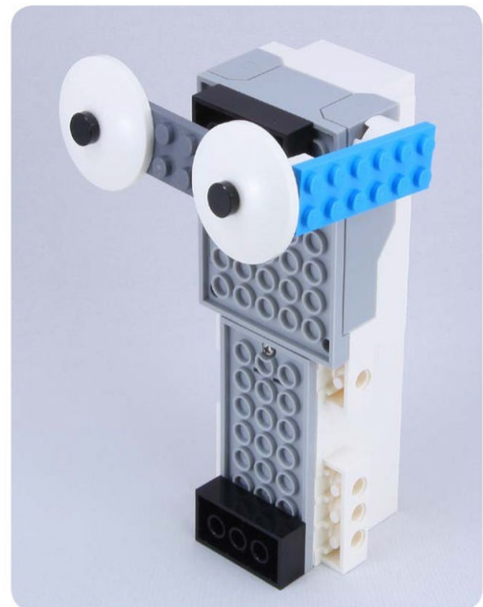
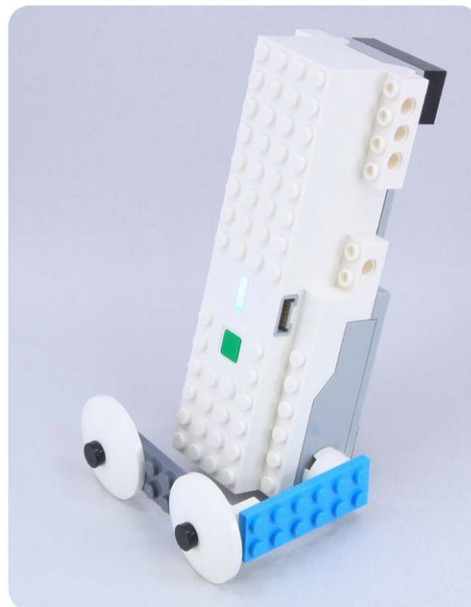
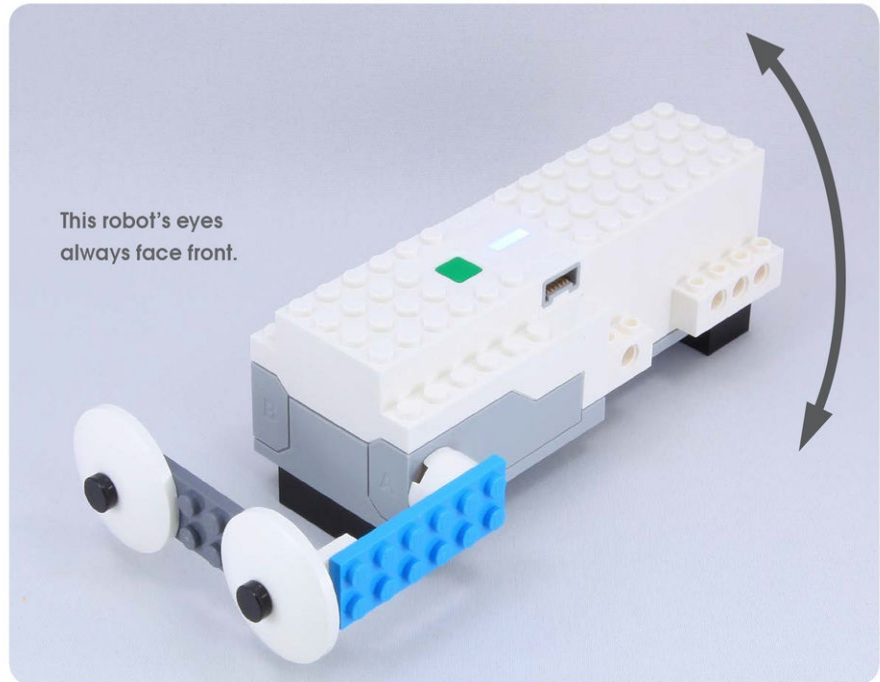
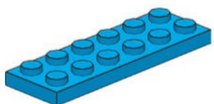
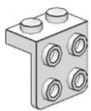
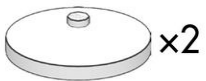


# Using the Move Hub's Tilt Sensor

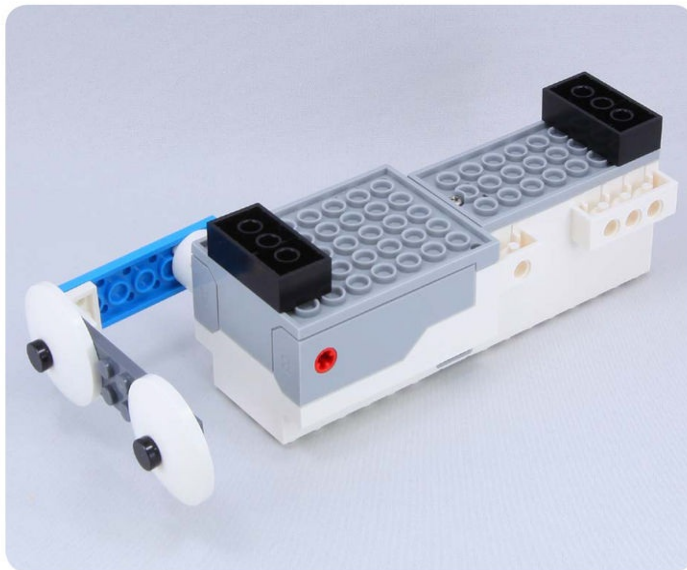
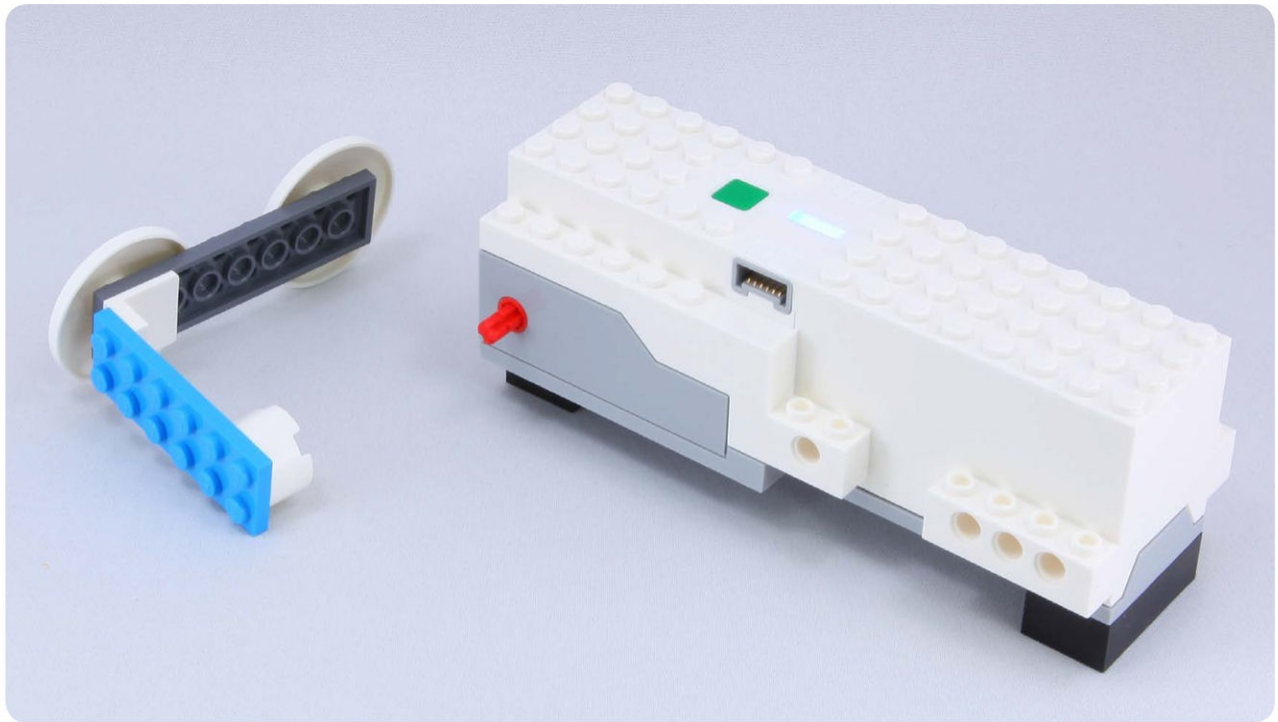
#90



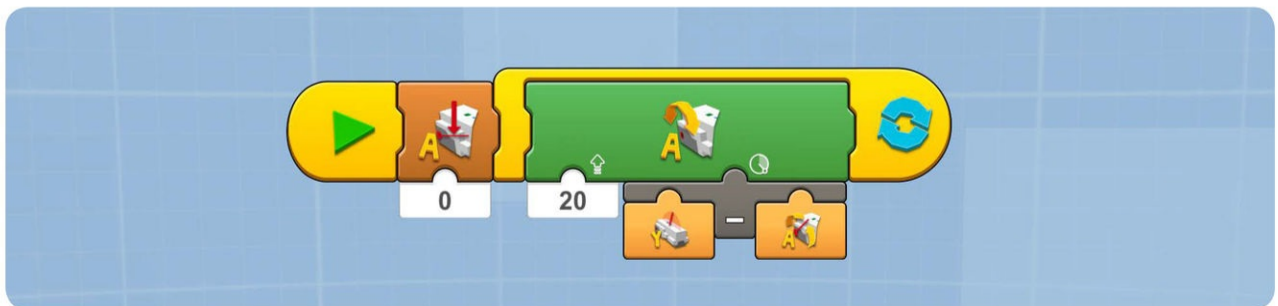
● x2





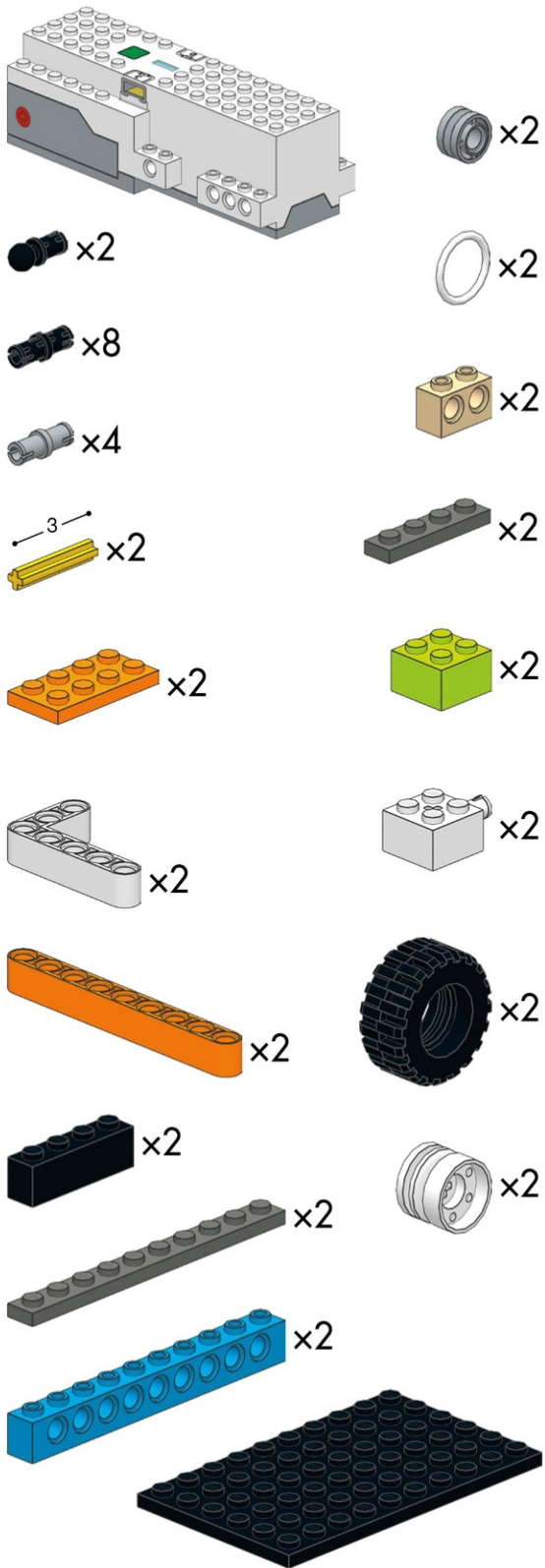


Start the program while the robot is in this position.

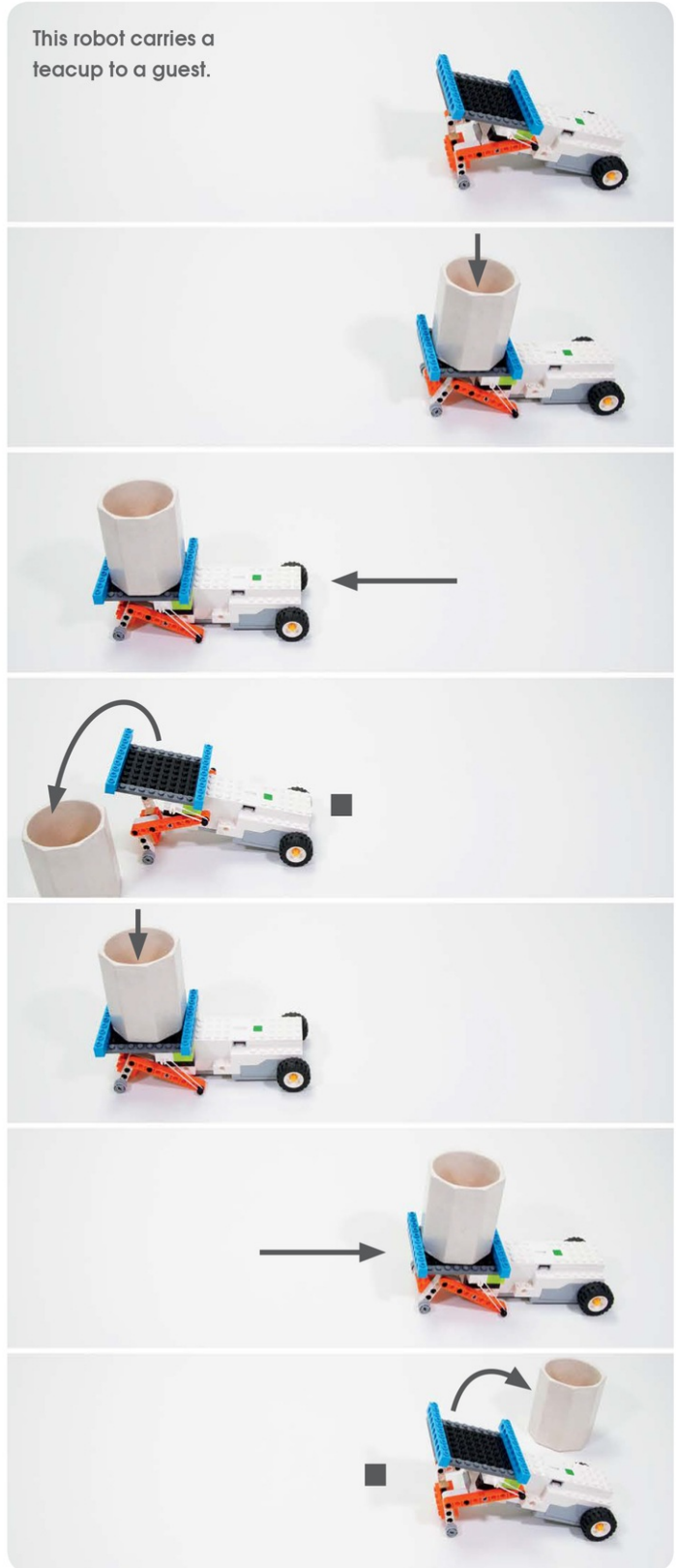




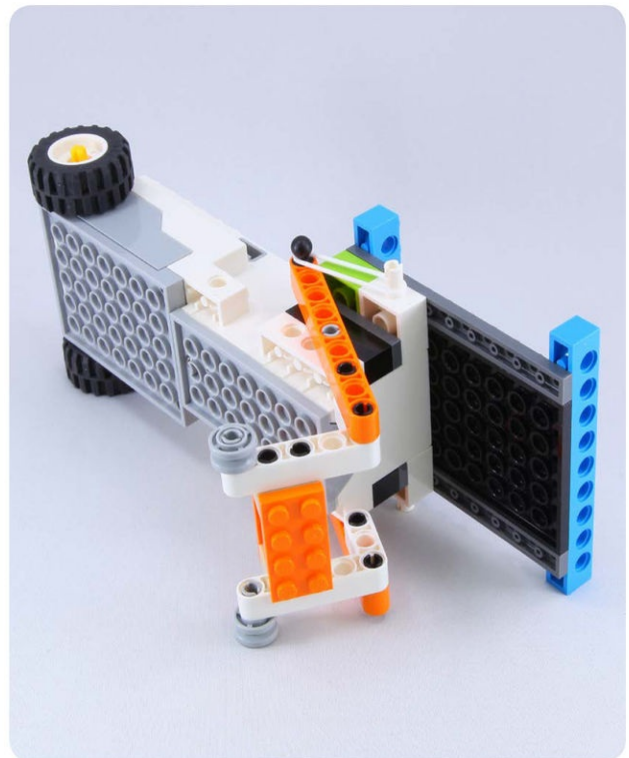
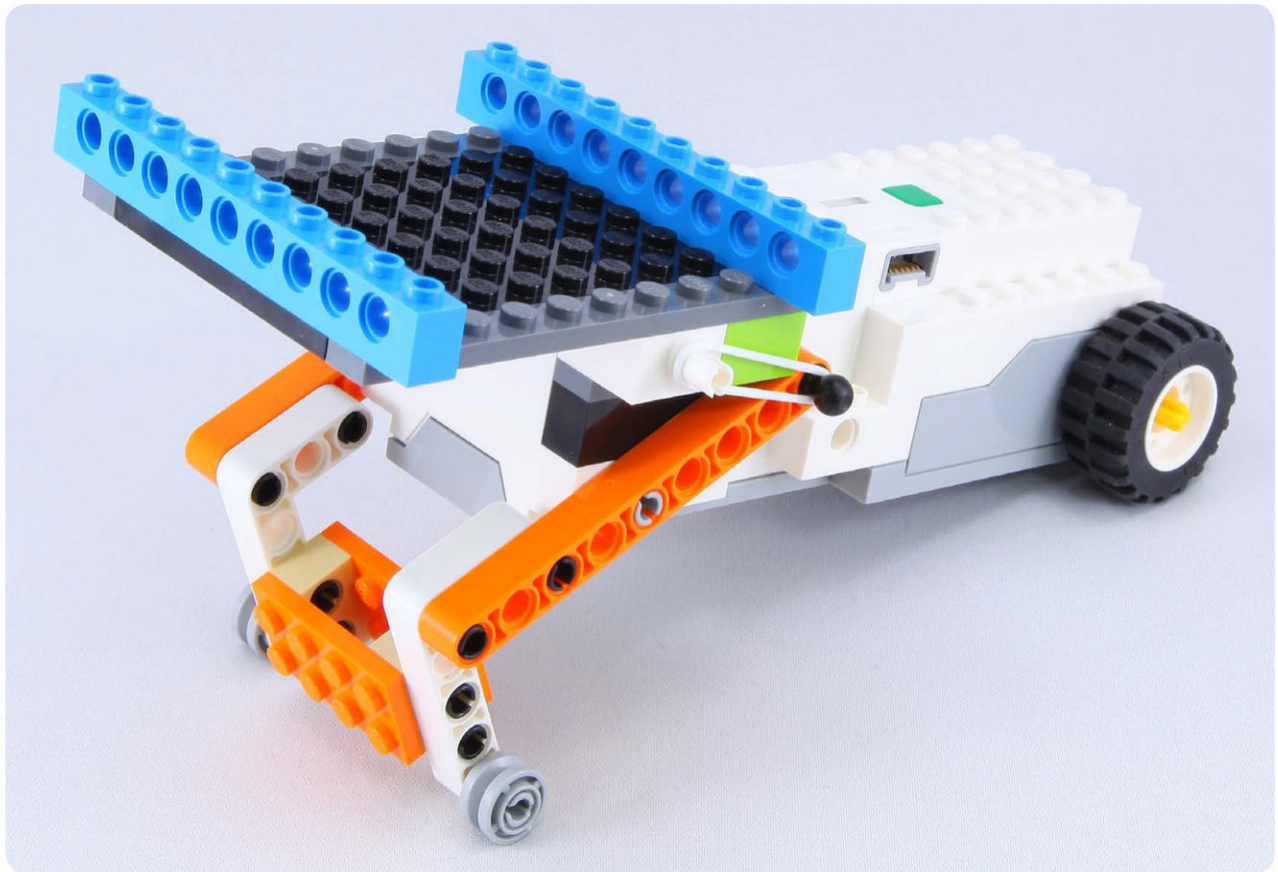
#91



This robot carries a teacup to a guest.

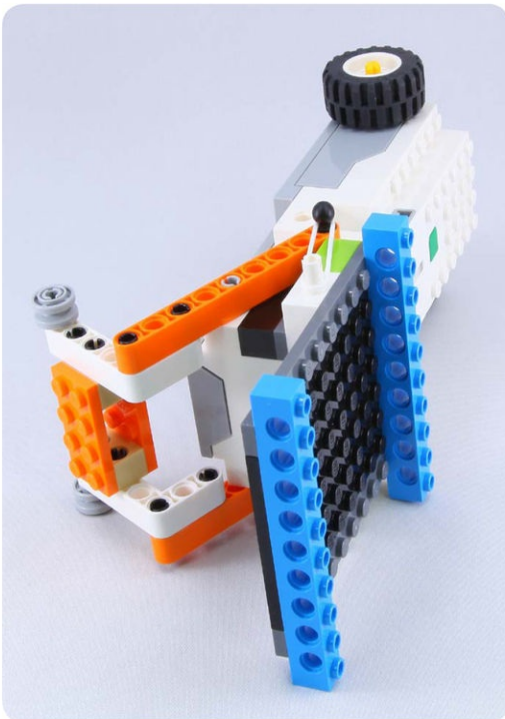
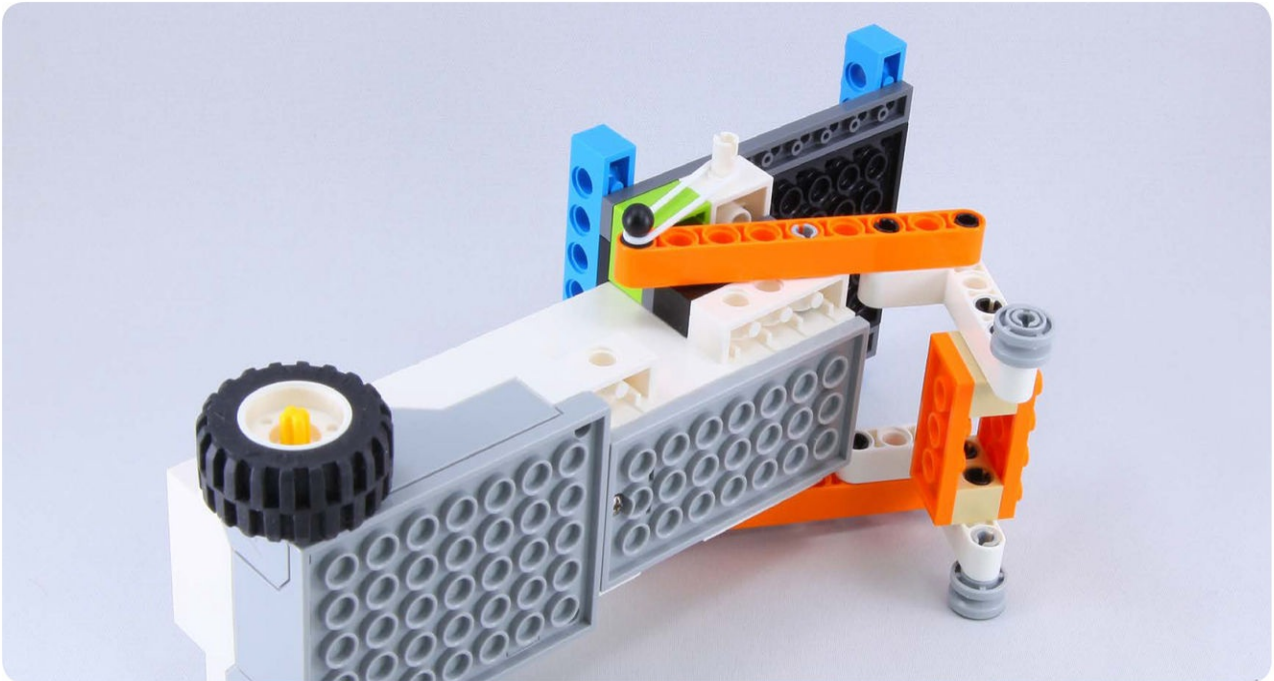






Using the Move Hub's Tilt Sensor **237**





**238** Using the Move Hub's Tilt Sensor



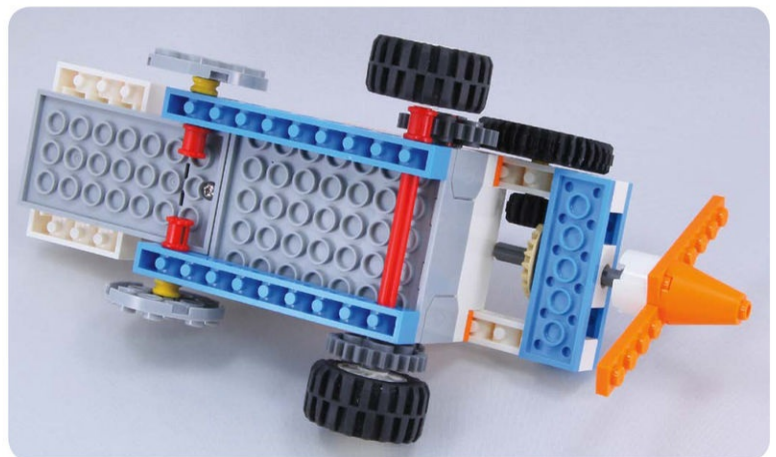
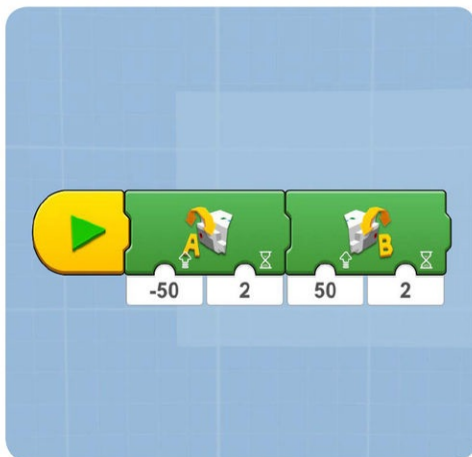
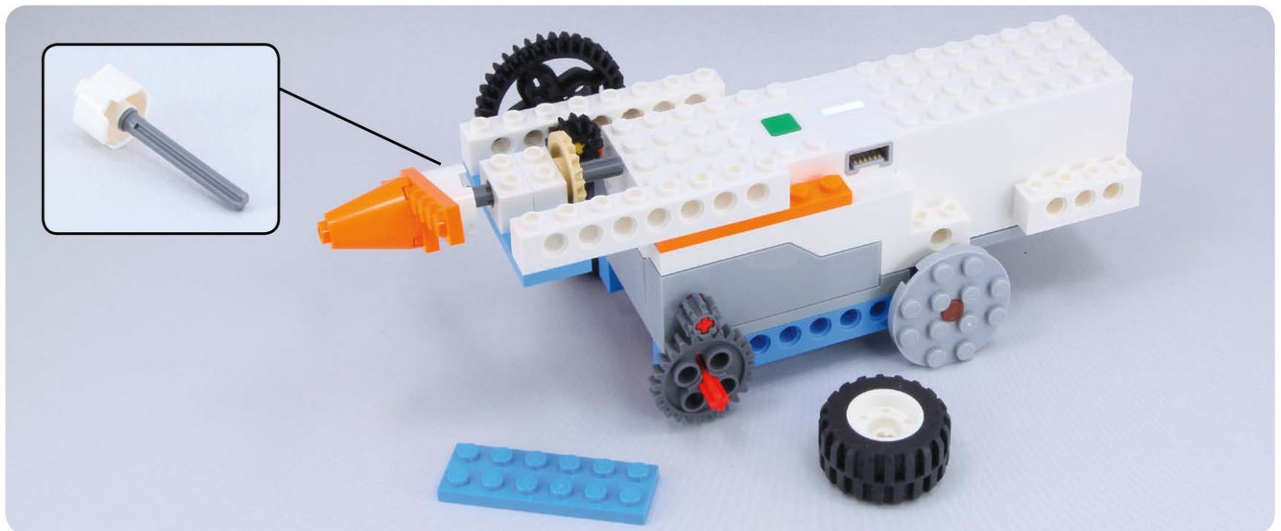
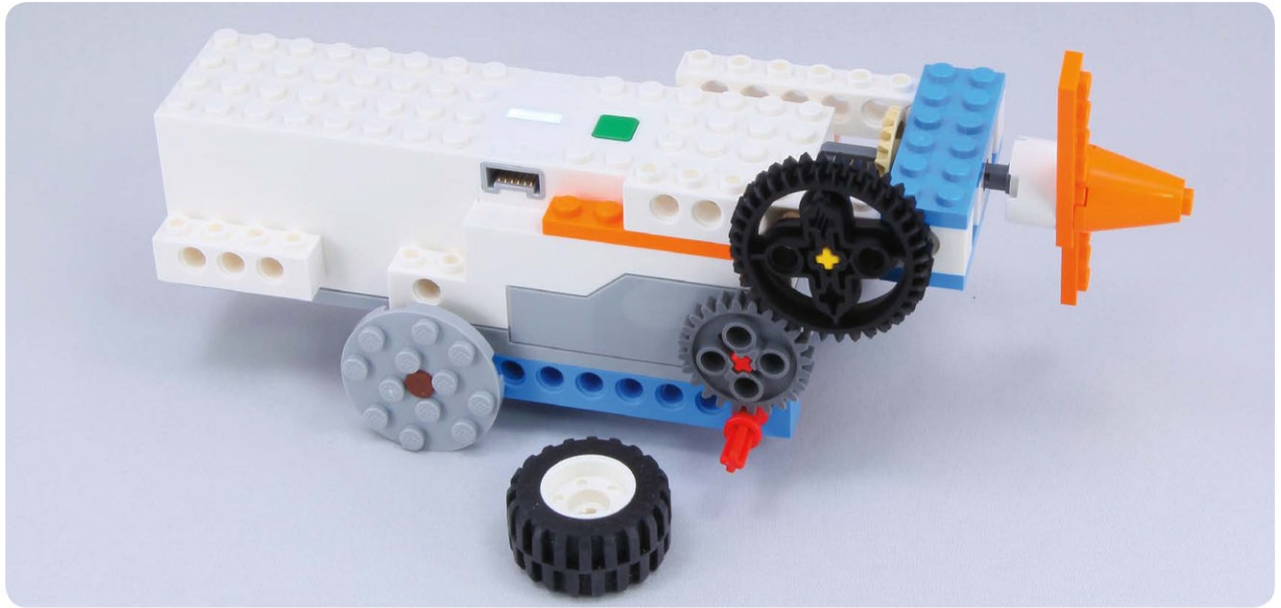


Using the Move Hub's Tilt Sensor **239**



[illegible]





Using Motor A and Motor B for different purposes **241**



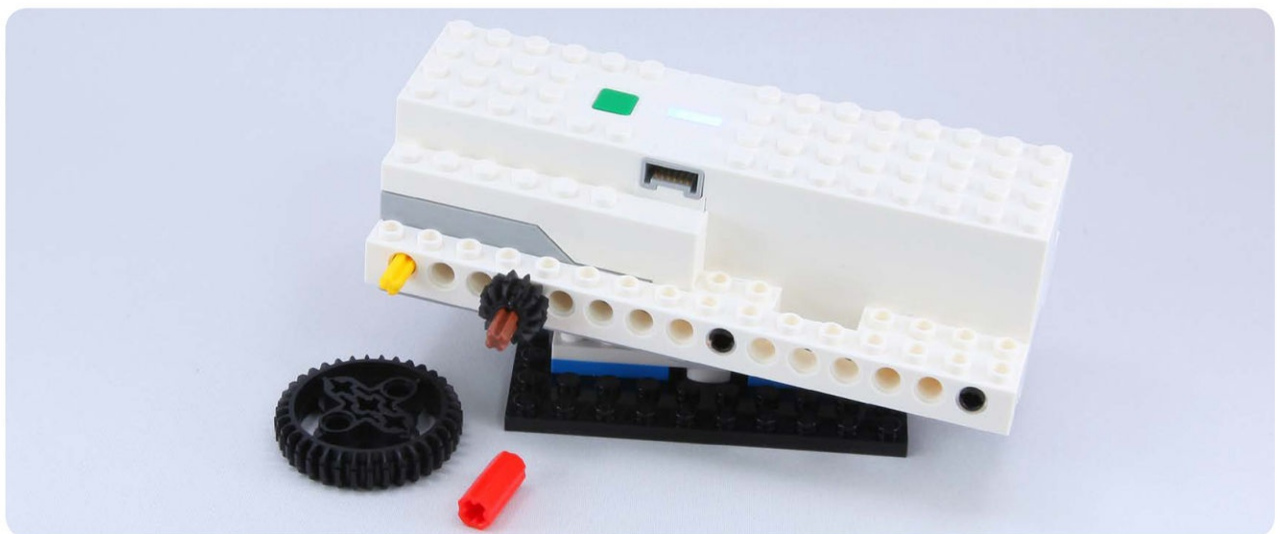
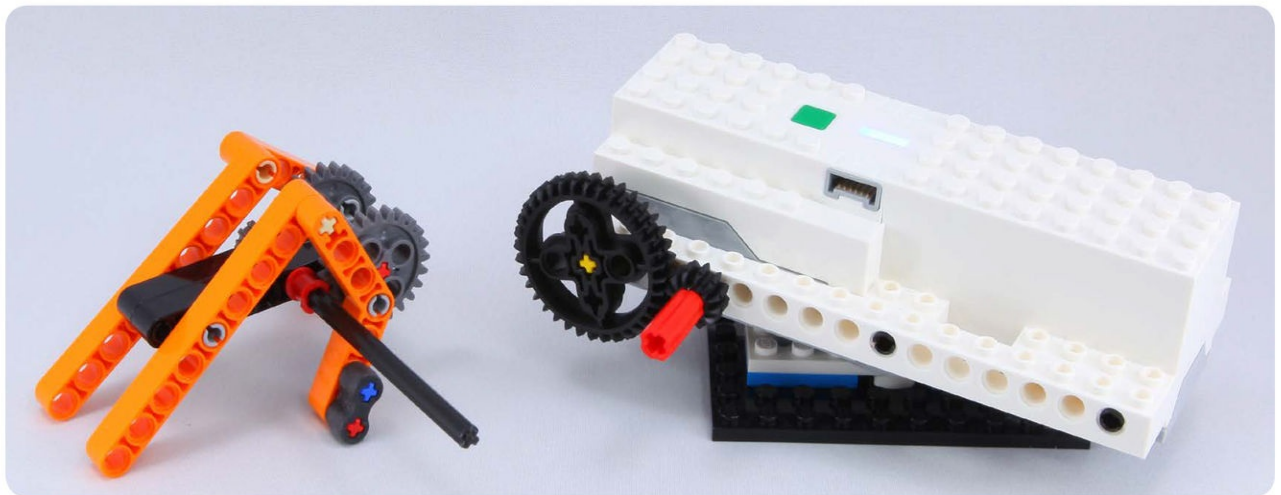
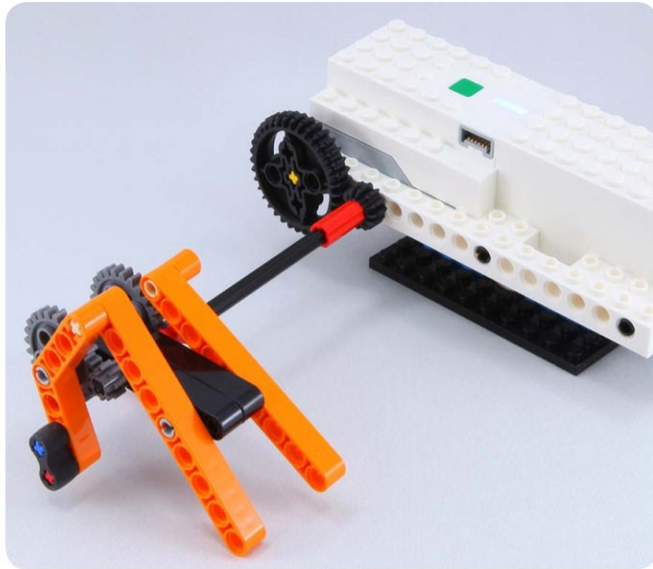


#93

1 white motor  
2 black 1x6 Technic beams  
2 orange 1x3 L-shaped Technic connectors  
2 orange 1x10 Technic beams  
2 white 1x3 Technic connectors  
2 grey 1x5 Technic plates  
1 white 1x10 Technic beam with a green sensor  
2 small black gears  
2 medium black gears  
2 large black gears  
1 white 1x10 Technic beam with a red sensor  
2 blue 1x2 Technic connectors  
1 white 1x10 Technic beam with holes  
1 black 1x10 Technic plate  
4 black 1x2 Technic connectors  
2 tan 1x2 Technic connectors  
3 yellow 1x3 Technic connectors  
1 red 1x2 Technic connector  
2 black 1x2 Technic connectors  
4 grey 1x2 Technic connectors  
2 red 1x2 Technic connectors  
2 blue 1x2 Technic connectors  
2 brown 1x3 Technic connectors  
1 black 1x12 Technic beam  
1 red 1x4 Technic beam  
1 black 1x12 Technic beam  
1 red 1x4 Technic beam  
1 large black gear

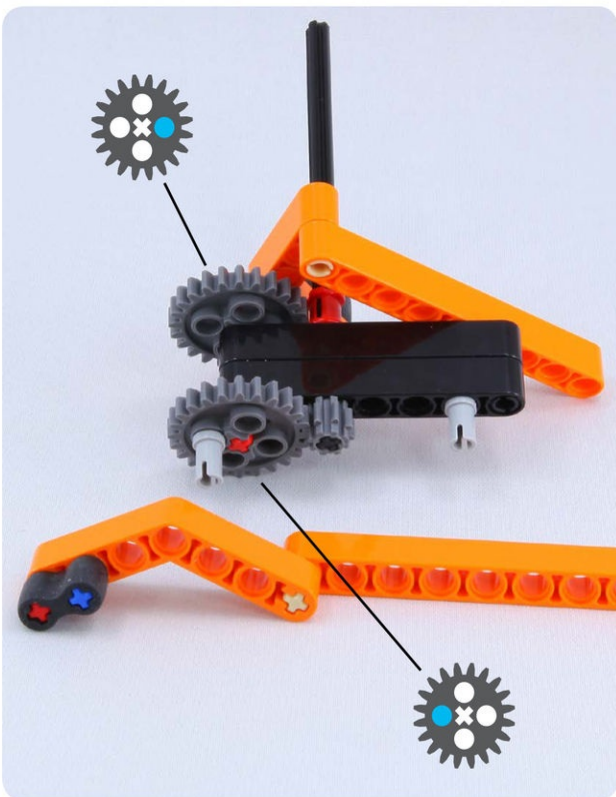
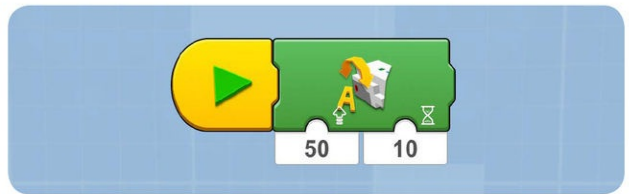
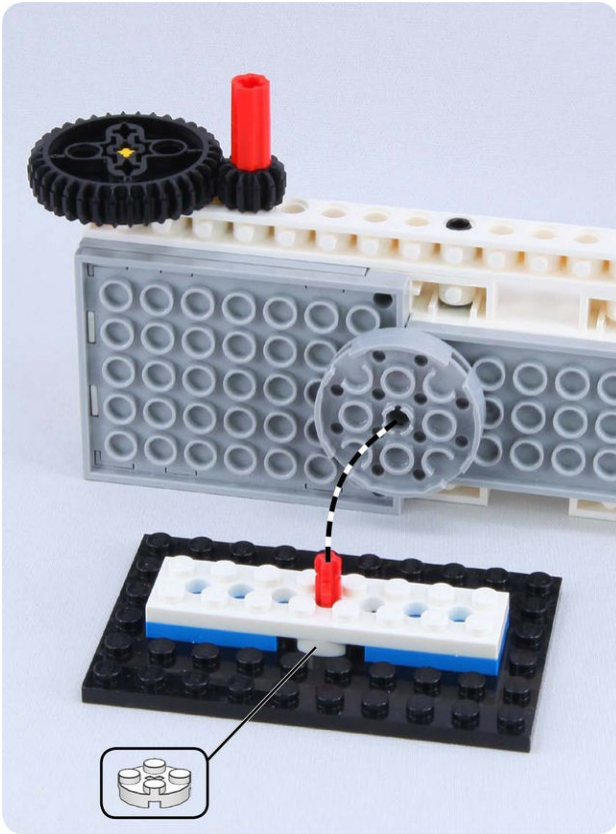




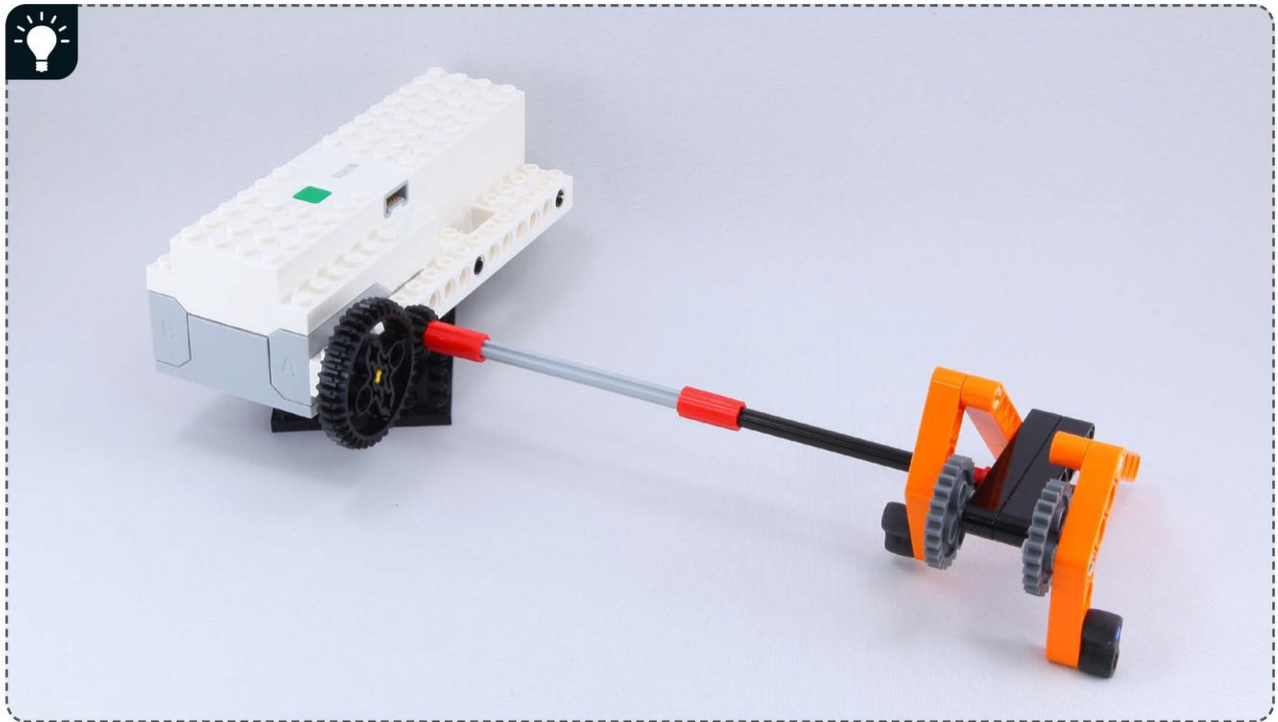


More ideas **243**



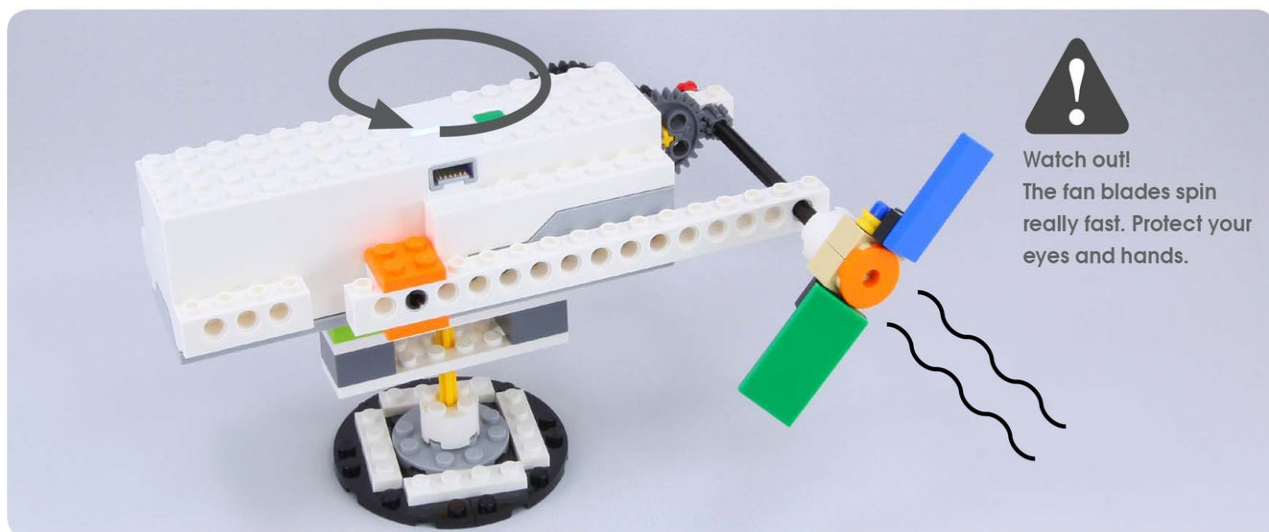




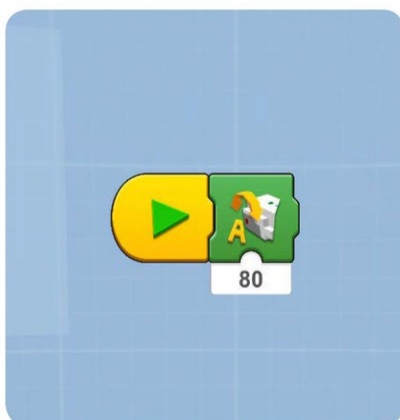
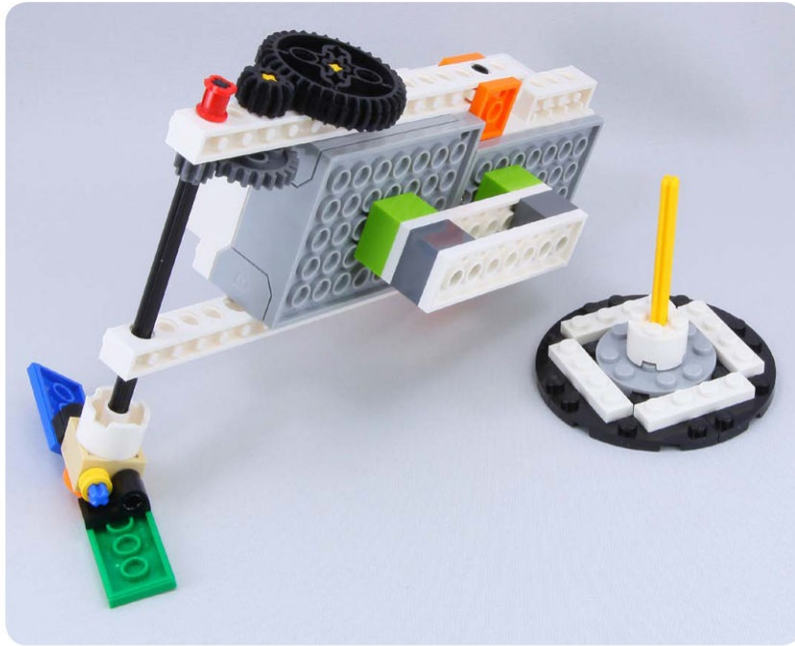


More ideas **245**



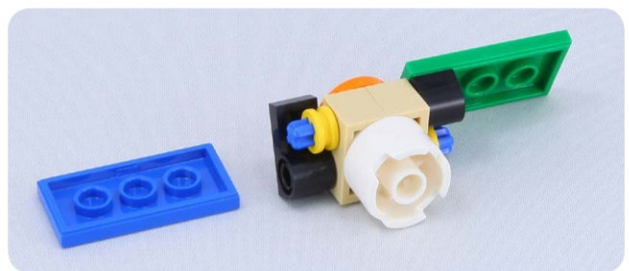
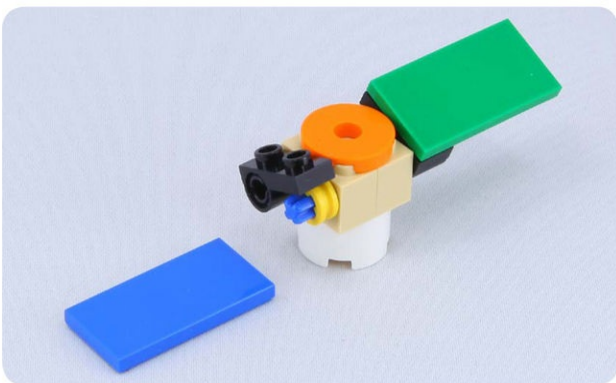
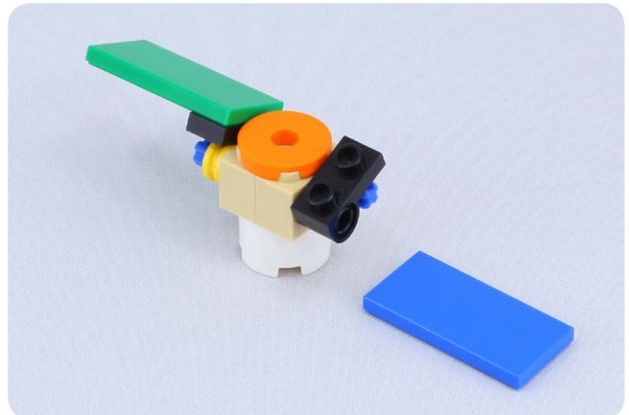
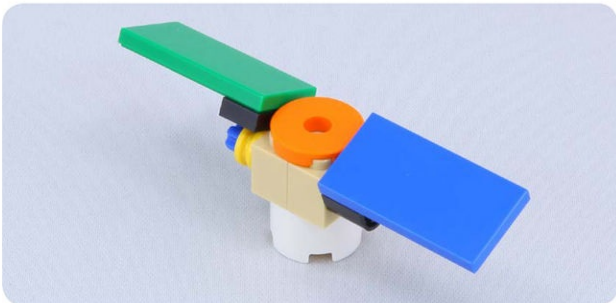
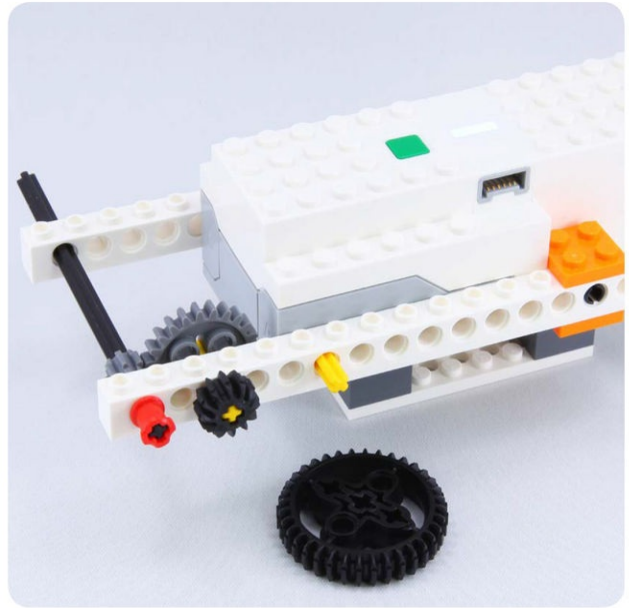
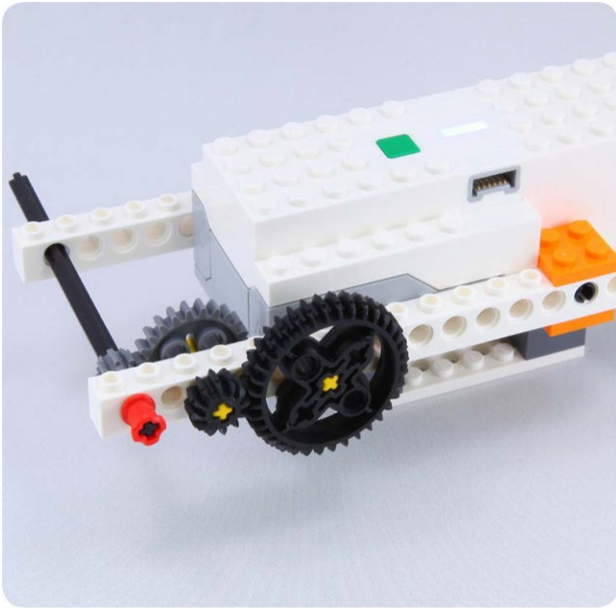
[illegible]



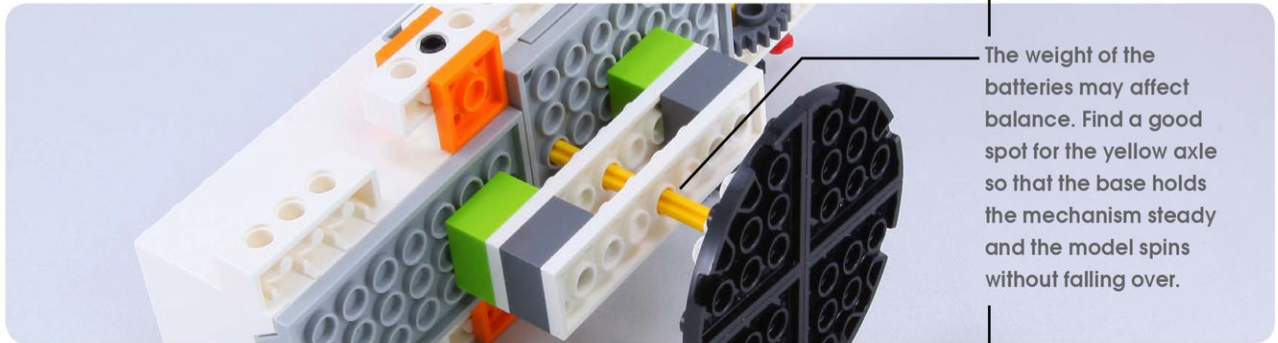
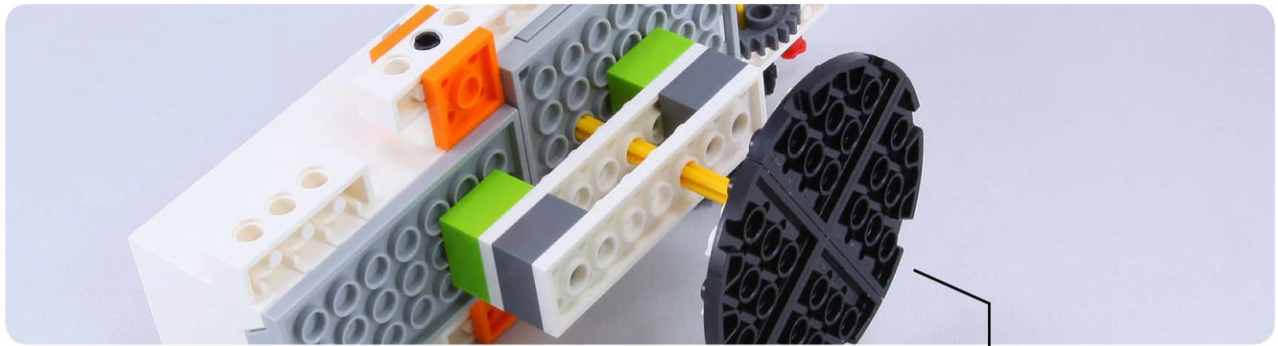


More ideas **247**

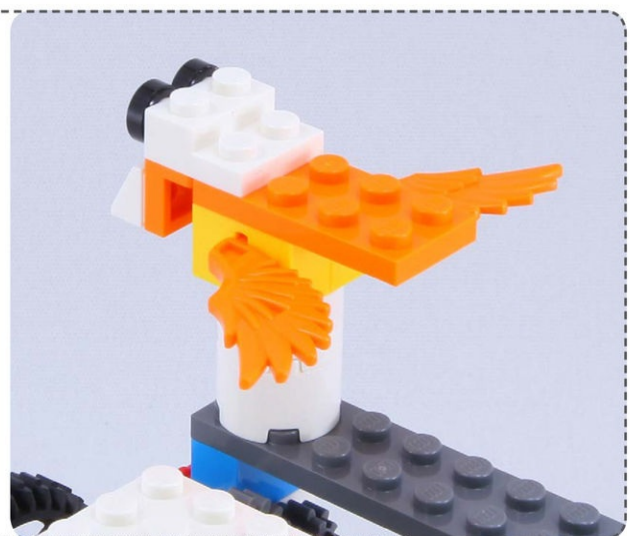
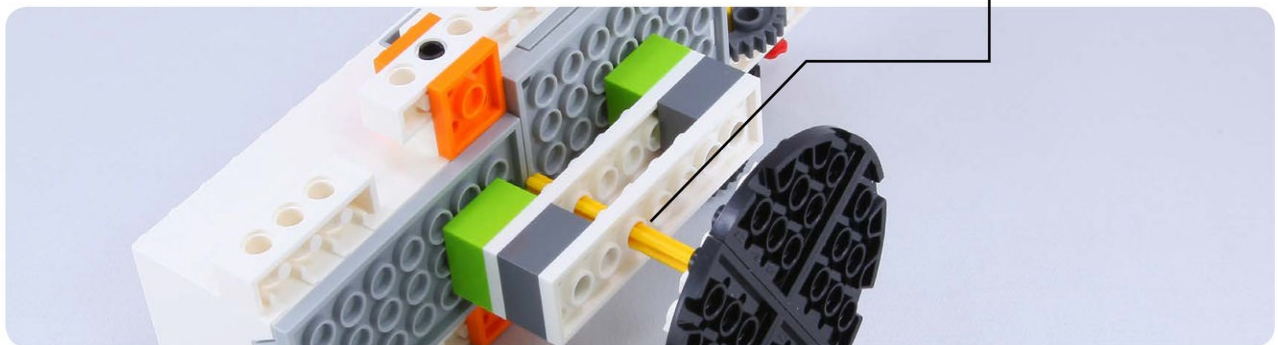








The weight of the batteries may affect balance. Find a good spot for the yellow axle so that the base holds the mechanism steady and the model spins without falling over.



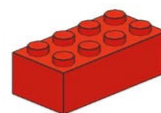
More ideas **249**



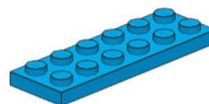
A LEGO Technic assembly featuring a grey motor on the left, connected to a long grey beam. The beam has a green flag and a blue flag attached to it. The assembly is shown from a perspective view.

 x2


x2


 $\times 2$ 

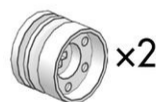
$\times 2$

  $\times 3$ 

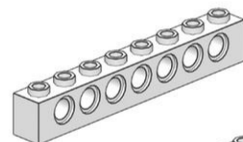
 x8




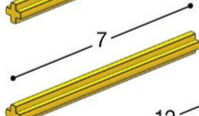
$\times 2$



x2



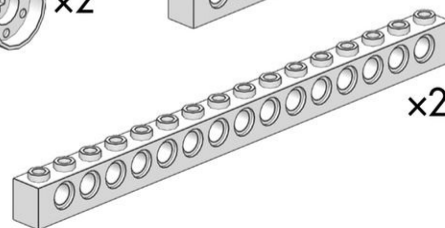
x2



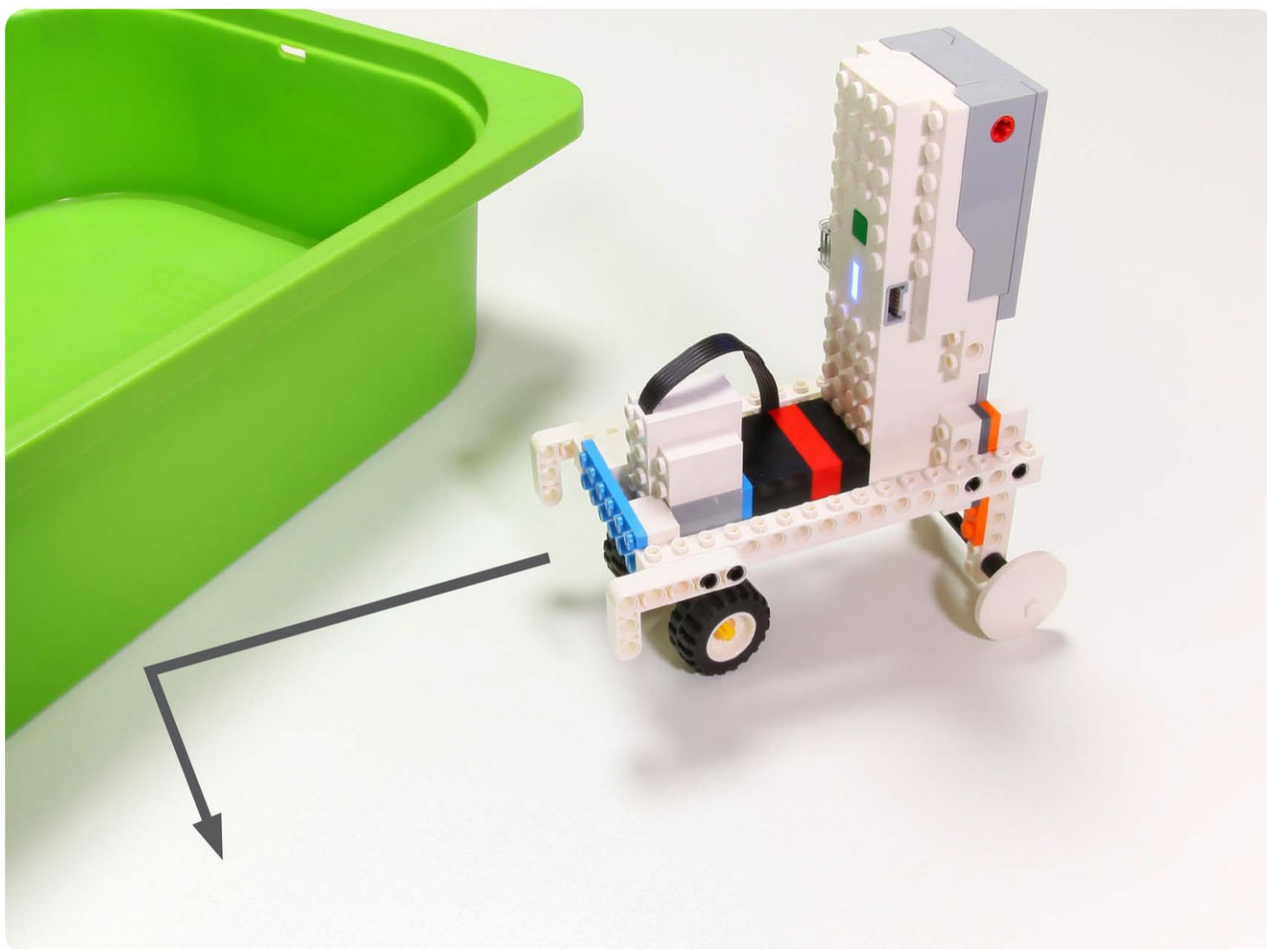
$\times 2$

 $\times 2$ 

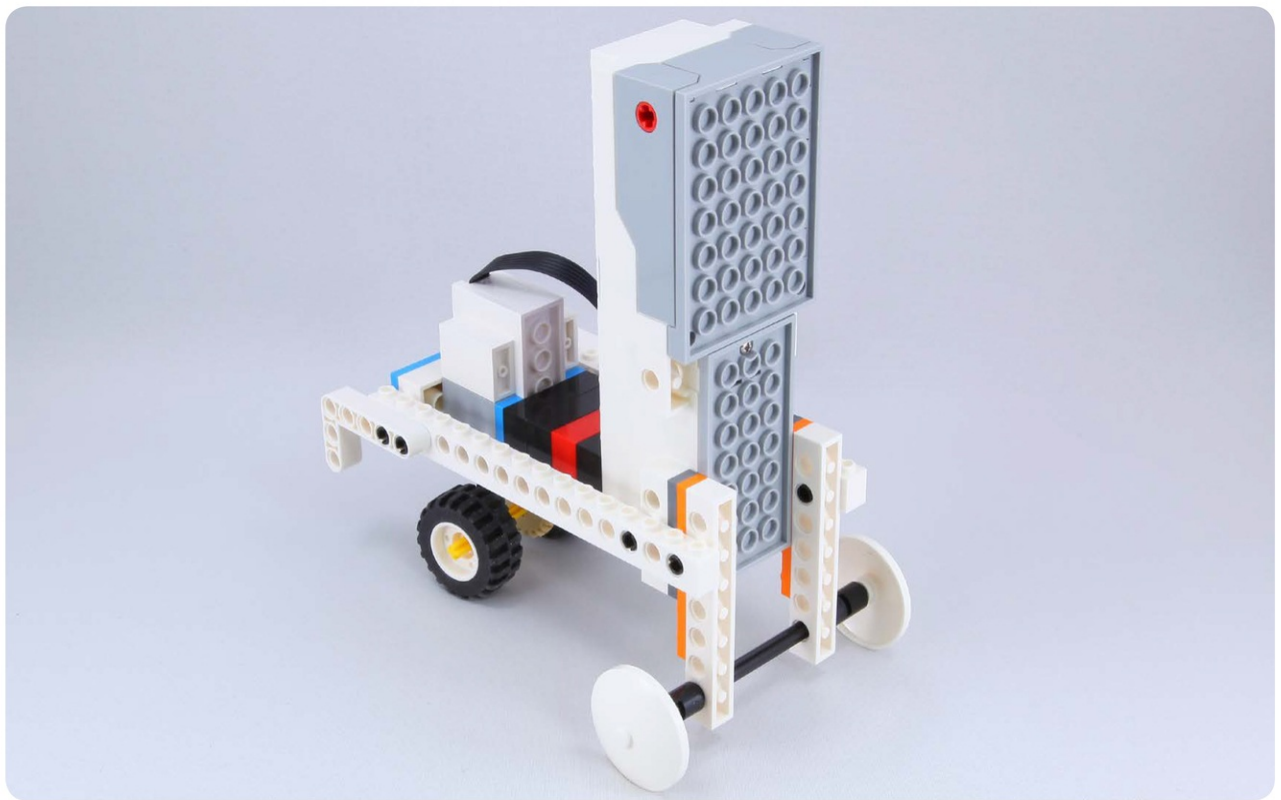
$\times 2$



x2

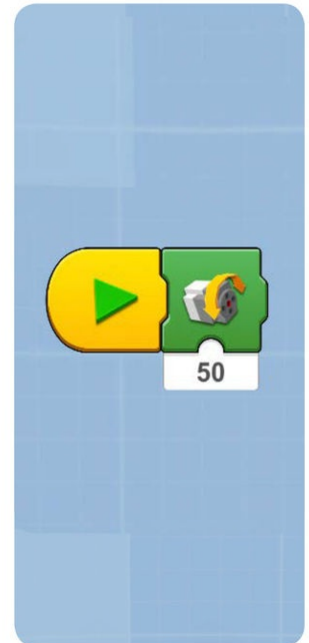
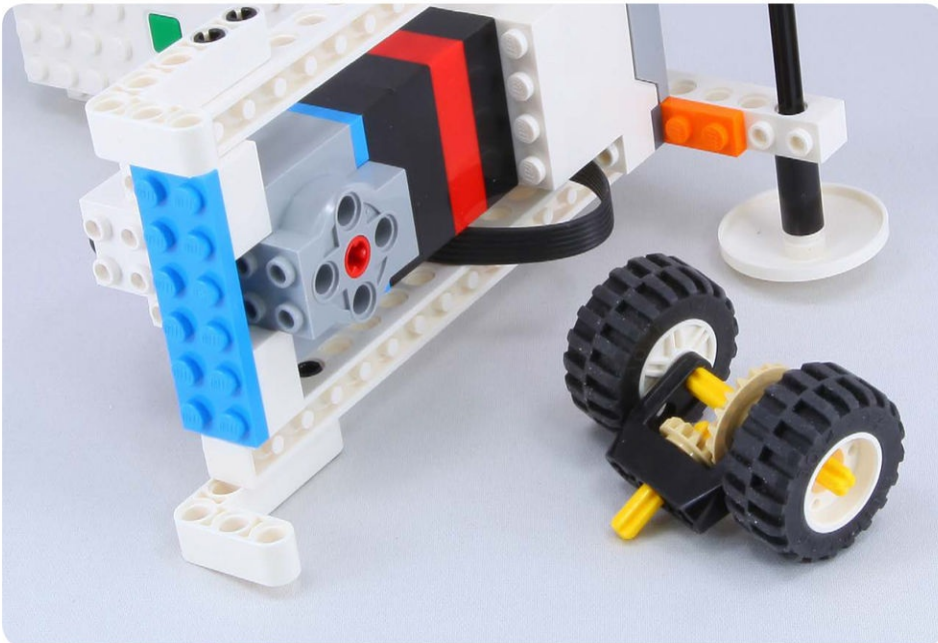
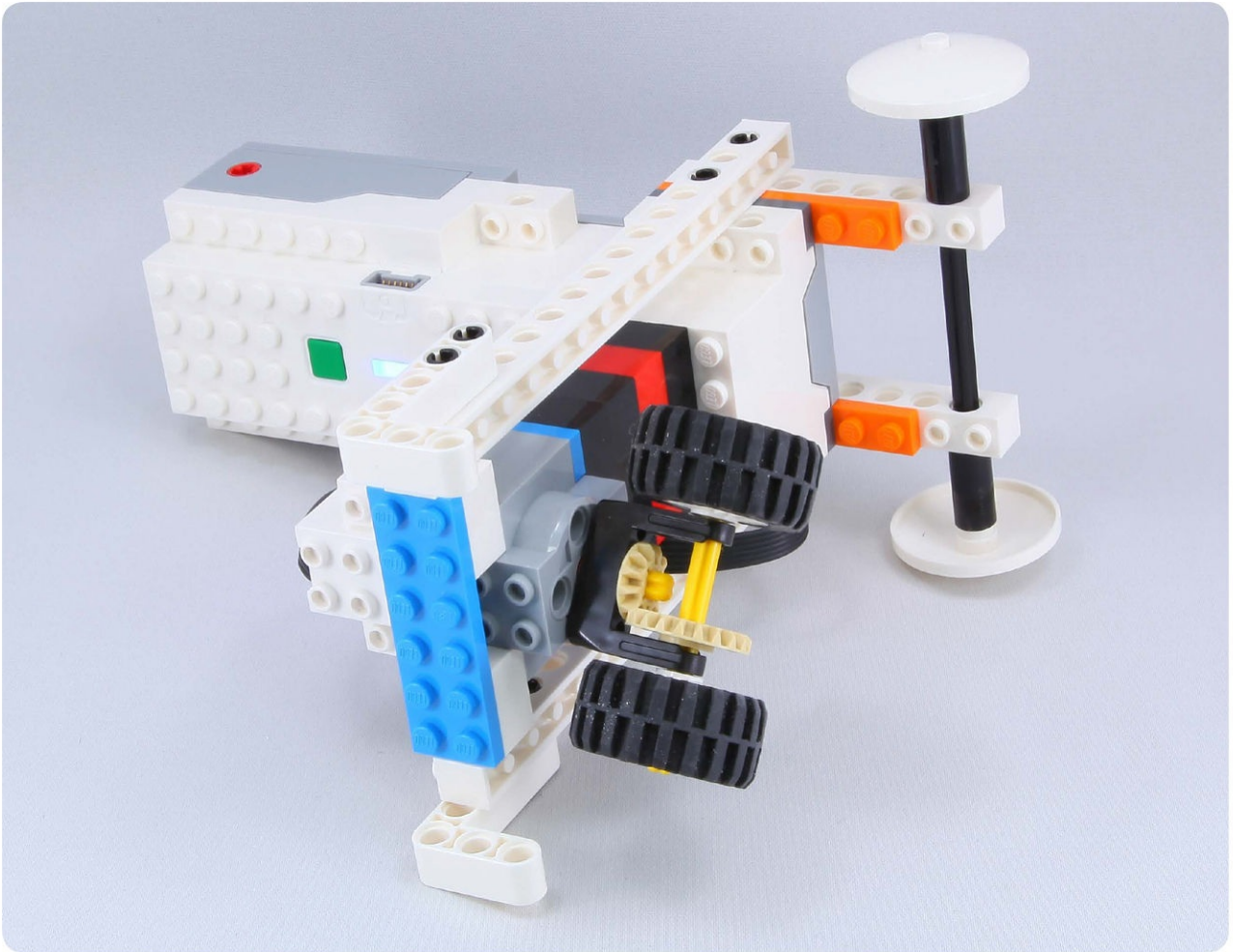




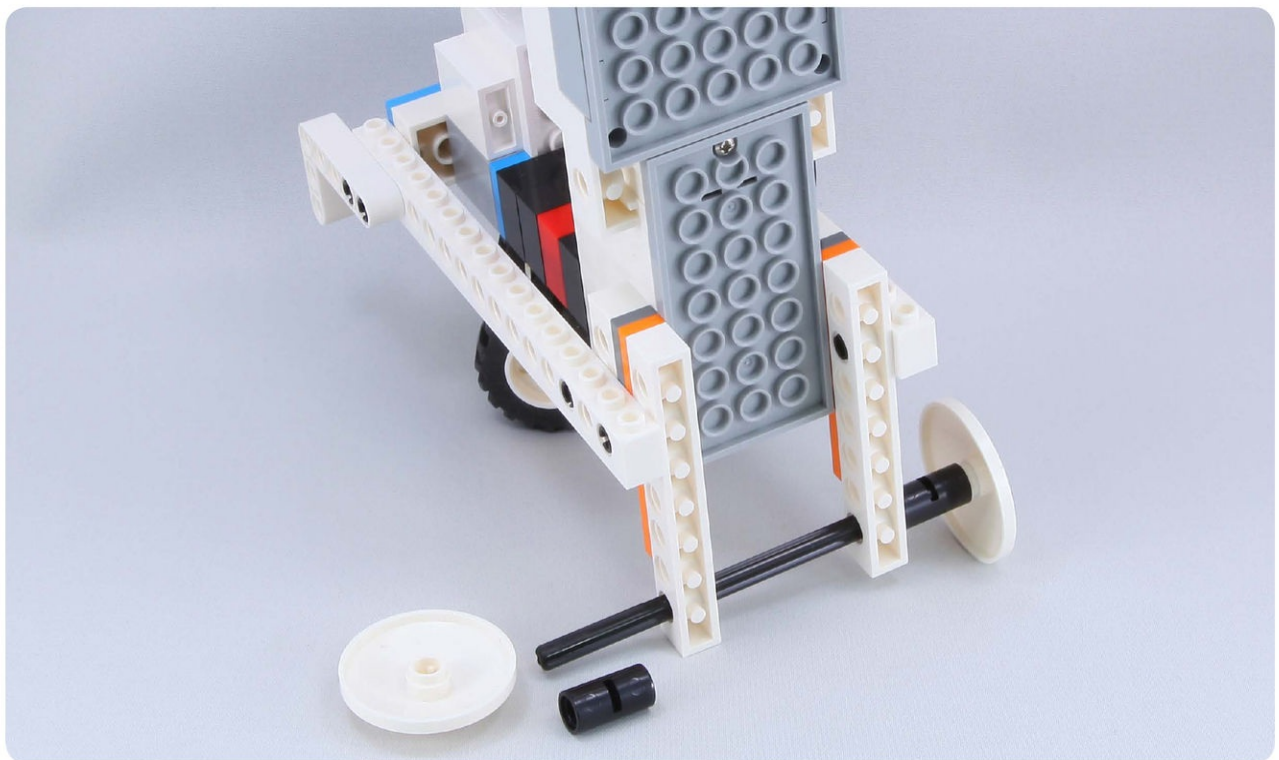
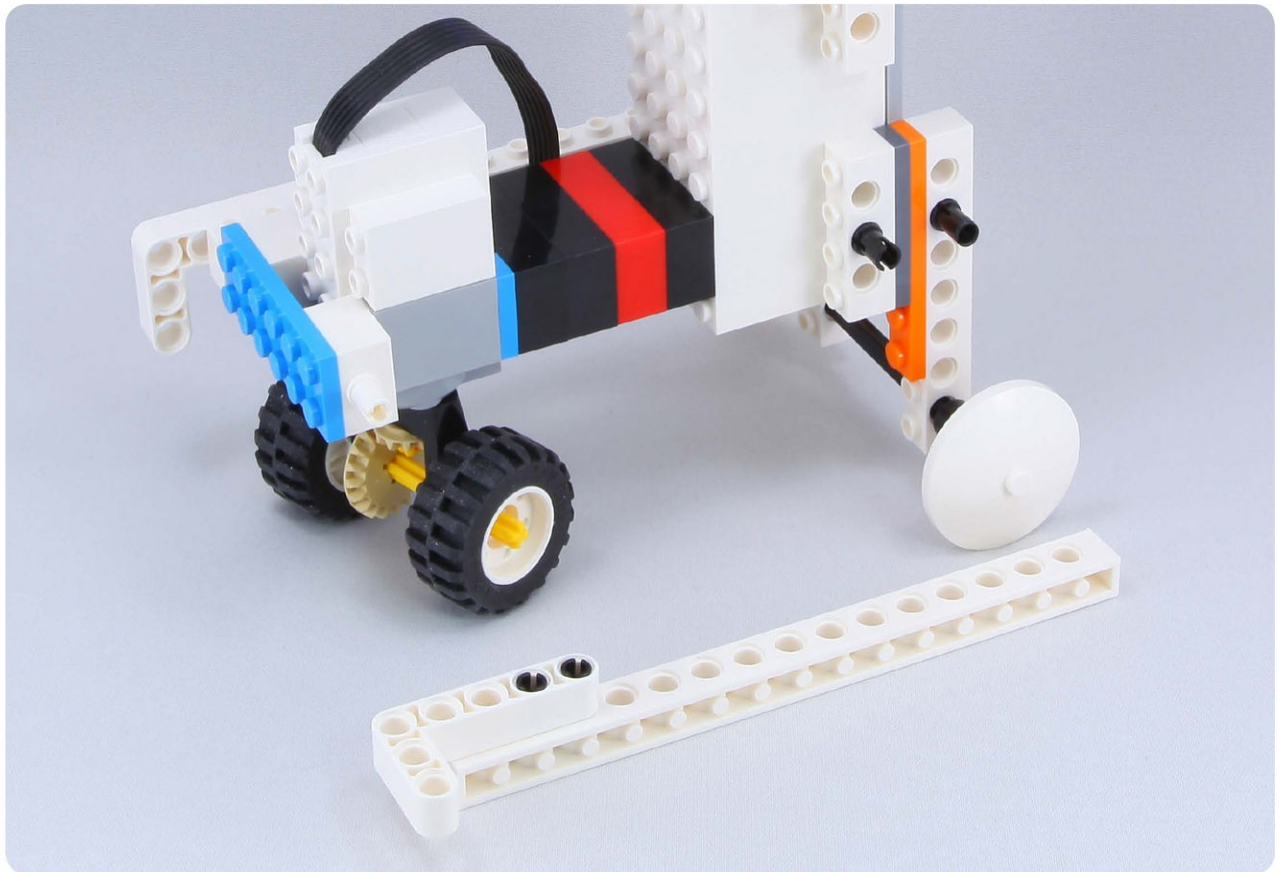


More ideas **251**



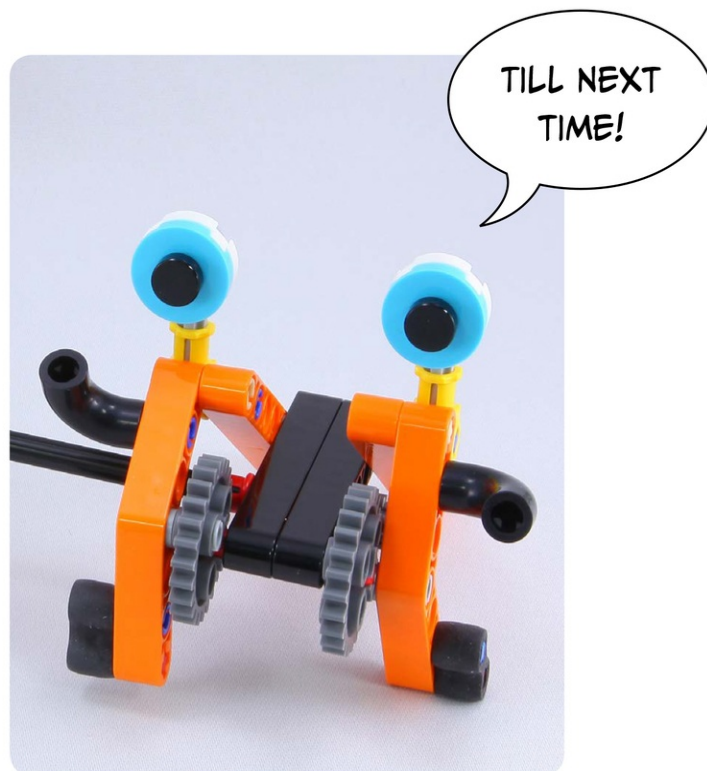






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## What Will You Build Next?

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You'll learn to build robots that can walk and crawl, shoot and grab objects, and even draw using a pen! Building hints and ideas will help you put your own spin on the models.

Best of all, every part you need to build these models comes in the LEGO BOOST Creative Toolbox set (#17101).



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### ABOUT THE AUTHOR

Yoshihito Isogawa is a LEGO luminary with more than half a century of building experience. He is the author of *The LEGO MINDSTORMS EV3 Idea Book* and *The LEGO Power Functions Idea Book* series (all No Starch Press) as well as many other LEGO books.



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