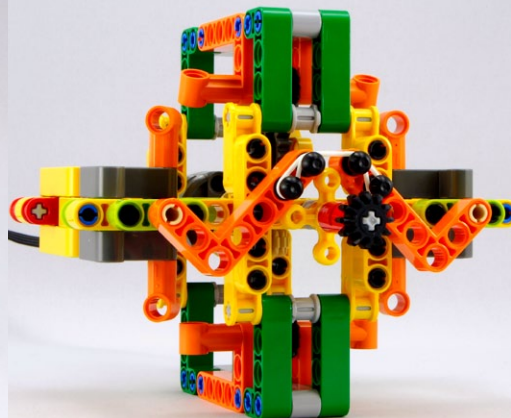
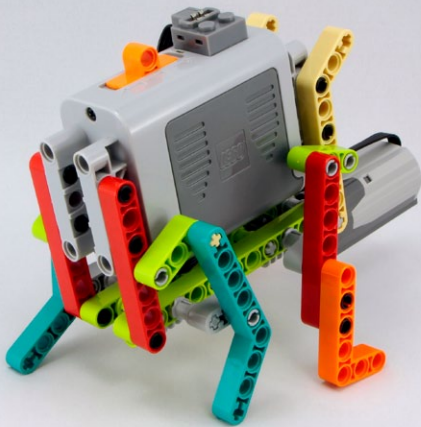




# THE LEGO® POWER FUNCTIONS IDEA BOOK

## CARS AND CONTRAPTIONS

YOSHIHITO ISOGAWA



THE LEGO® POWER FUNCTIONS IDEA BOOK  
CARS AND CONTRAPTIONS



**VOLUME 2**

**THE LEGO®  
POWER  
FUNCTIONS  
IDEA BOOK**

**CARS AND  
CONTRAPTIONS**

**Y O S H I H I T O I S O G A W A**



**The LEGO® Power Functions Idea Book, Volume 2: Cars and Contraptions.**

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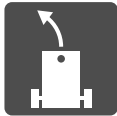
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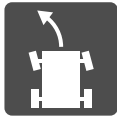
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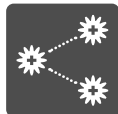
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# Introduction

**This is an idea book, offering hundreds of projects and mechanisms you can build with LEGO Technic parts. The book especially focuses on LEGO Power Functions, which is the latest version of the Technic system of motors, lights, and other electric building elements.**

## Where Are the Words?

Other than this brief introduction and the table of contents, this book has almost no words. Instead, you'll find a series of photographs of increasingly complex models, each designed to demonstrate a mechanical principle or building technique.

While the book lists the pieces needed to build each model, it does not include step-by-step building instructions. Look at the photographs taken from various angles and try to reproduce the model. Building in this way is something like putting together a puzzle. You'll get the hang of it after a little practice.

## The Use of Color

The examples in this book are made with parts of various colors to make it easier for you to see the individual bricks' shapes. But you don't need to use the colors I've chosen in your models; use whichever colors you want to make the projects your own.

## Substituting Parts

The parts used in this book were selected from among the easily obtainable ones as much as possible, but you'll probably still be missing a few.

Try to build as many models as possible using the parts that you already own. If you find that you're missing parts, try to think of ways to substitute other parts for the ones that you're missing.

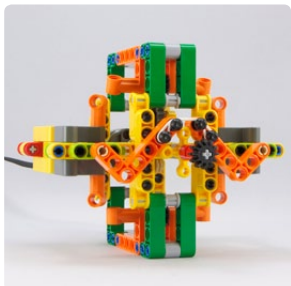
For example, there are many types of LEGO tires. If you don't have the tires shown in a particular project, try using any tires you have that are a similar size. Also, there are several types of Power Functions motors. In this book, the commonly available Medium (M) motors are used most frequently. It's relatively easy to replace the M motor with the Large (L) motor or older motors from earlier systems, so use whatever you have available.

The Parts List in the back of the book will help you find the pieces you need.

## You Are the Creator

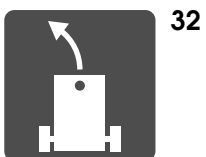
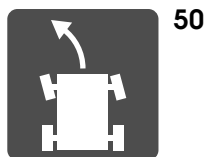
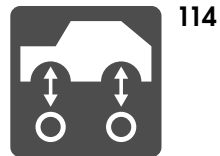
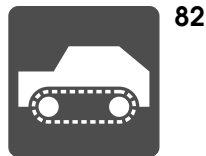
Look at the models you build closely. By thinking about how they move and why they are designed that way, you will greatly improve your building skills.

This is an idea book; it's about imagination. It is my sincere hope that you make these projects your own, combine them, and evolve them into something even better—your own original models.



# PART 1

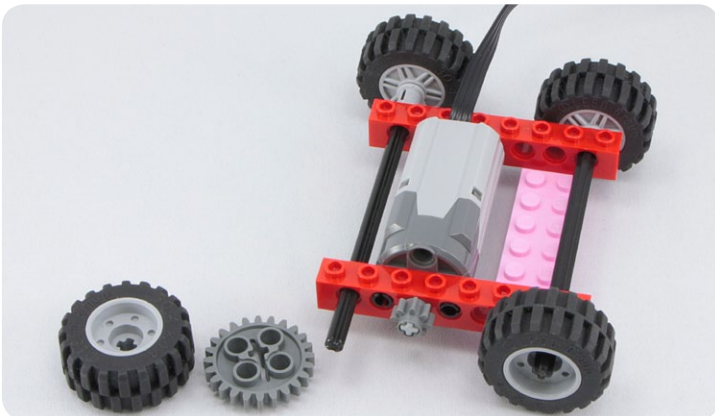
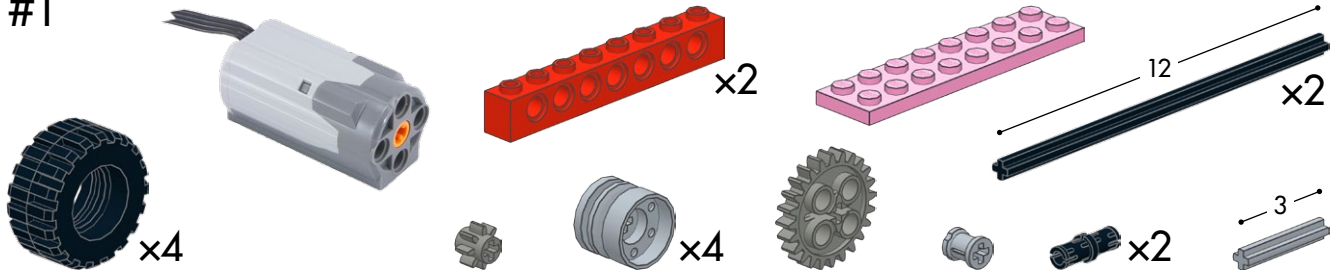
# Vehicles



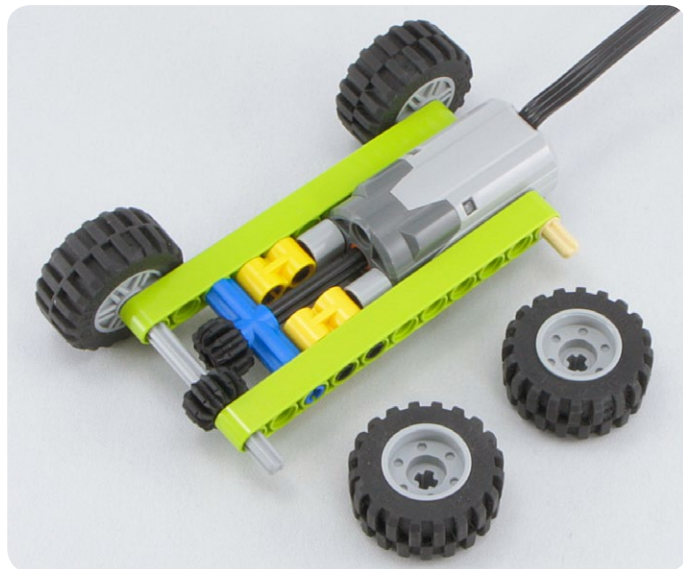
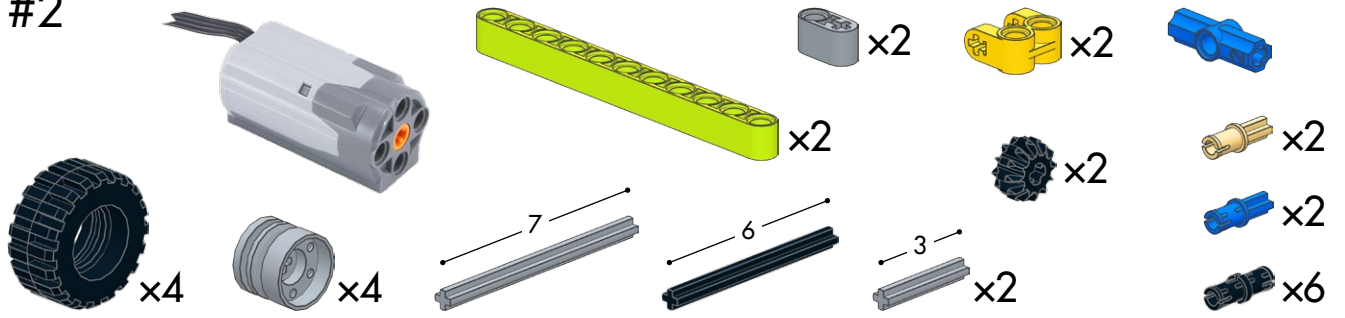


# Driving wheels with a motor

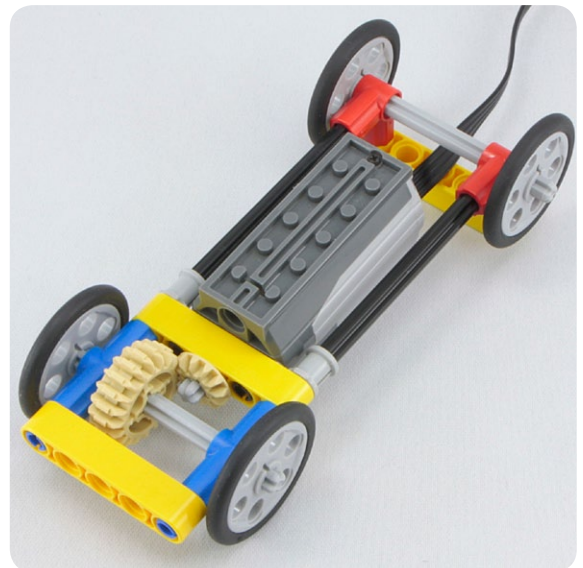
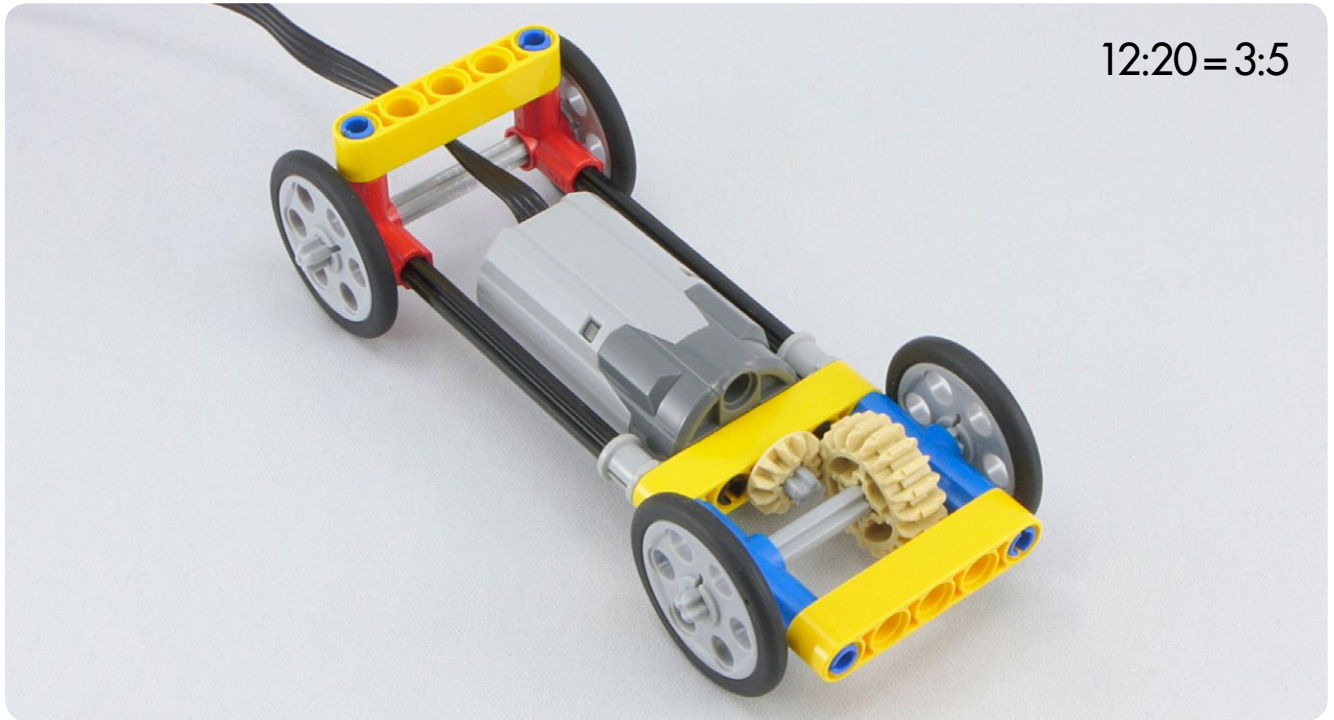
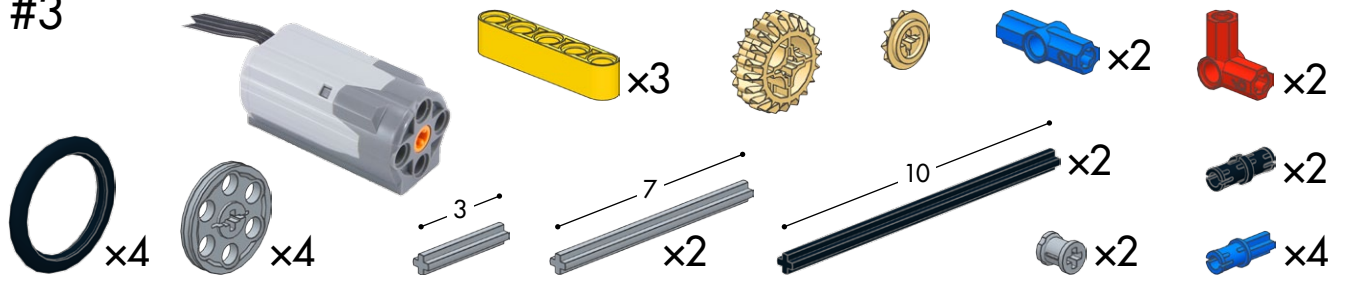
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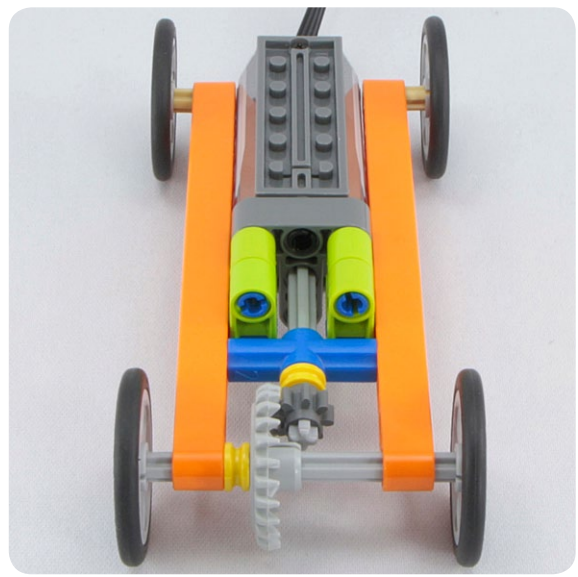
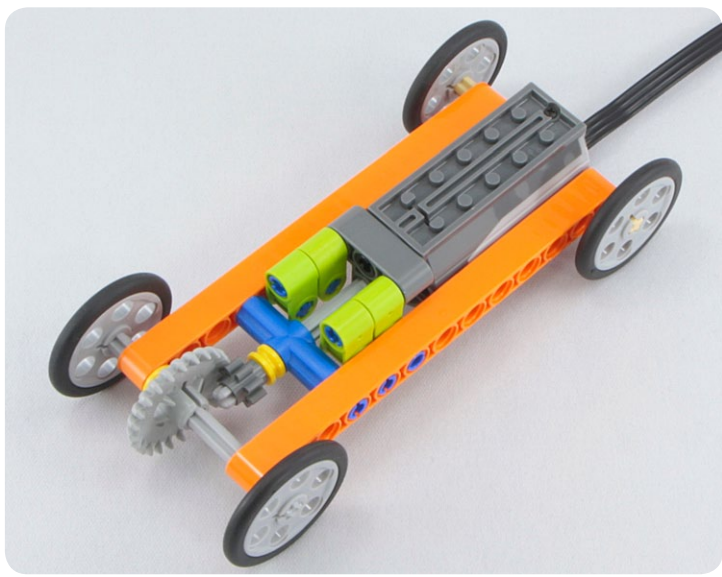
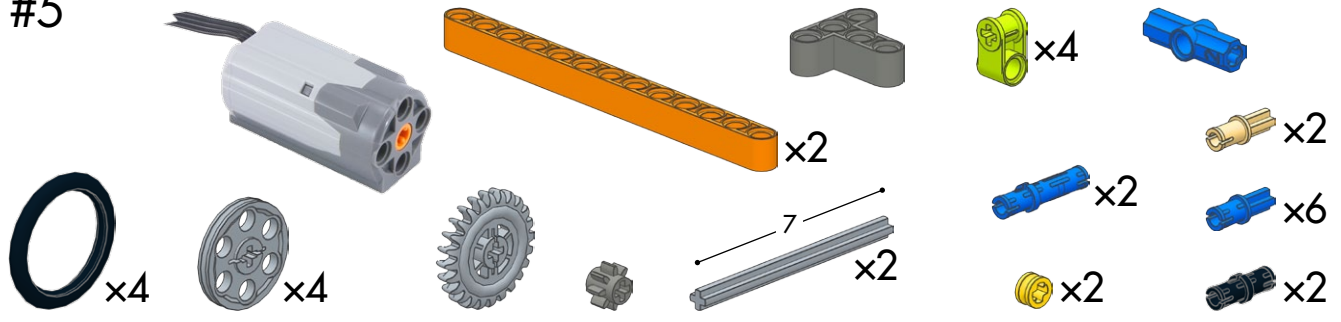
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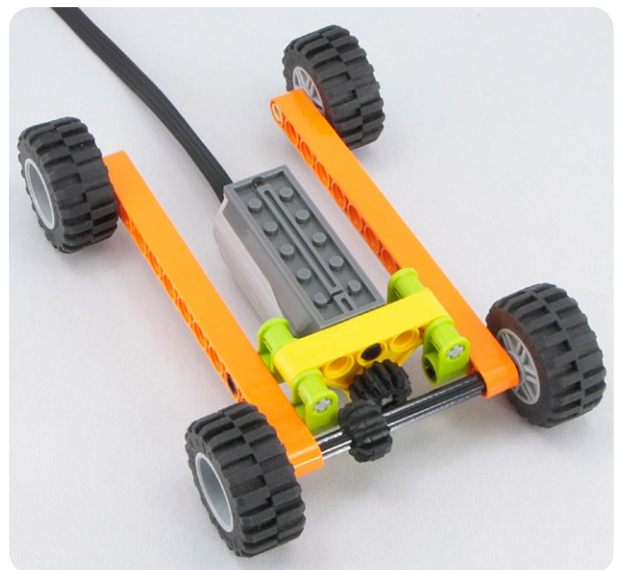
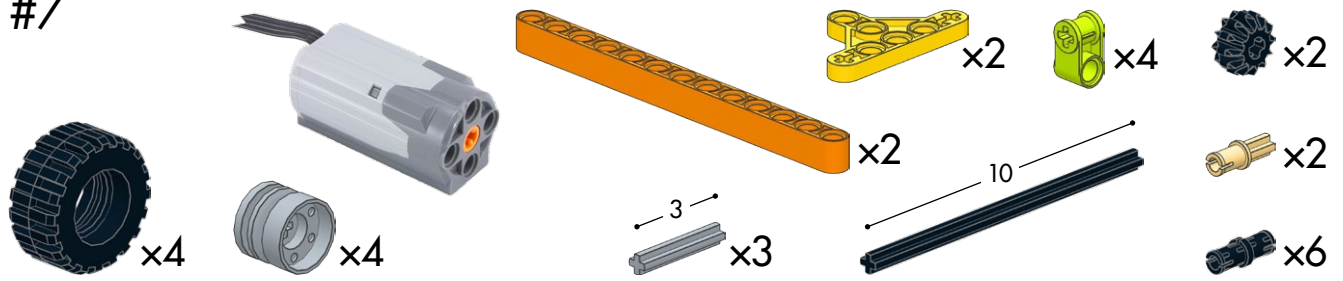


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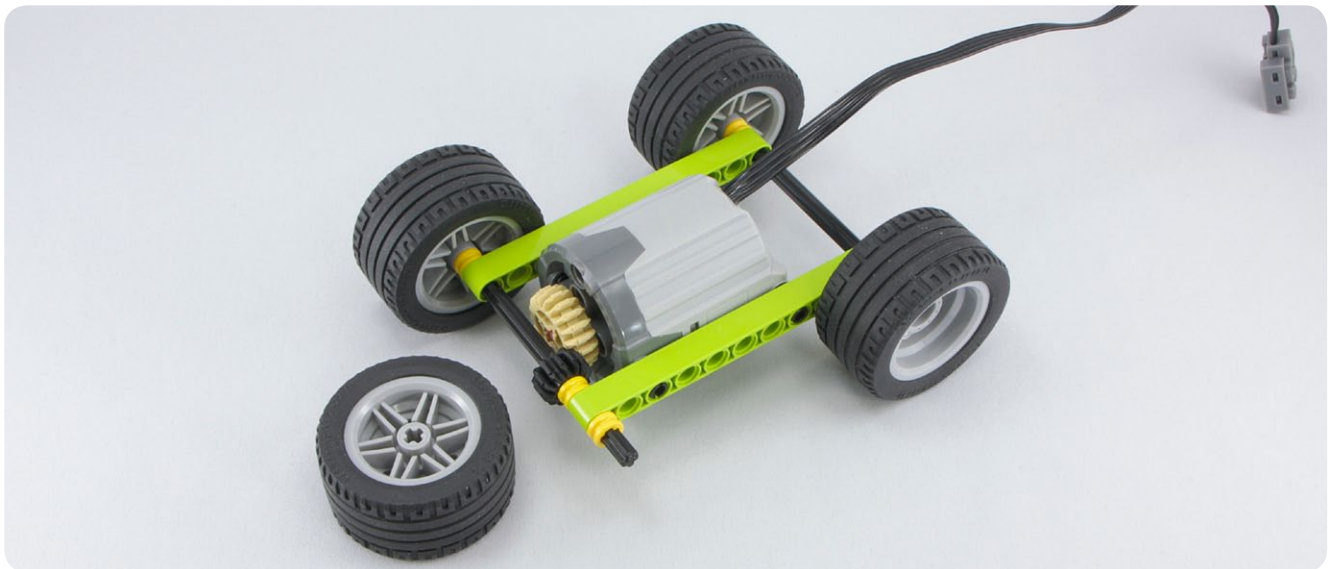




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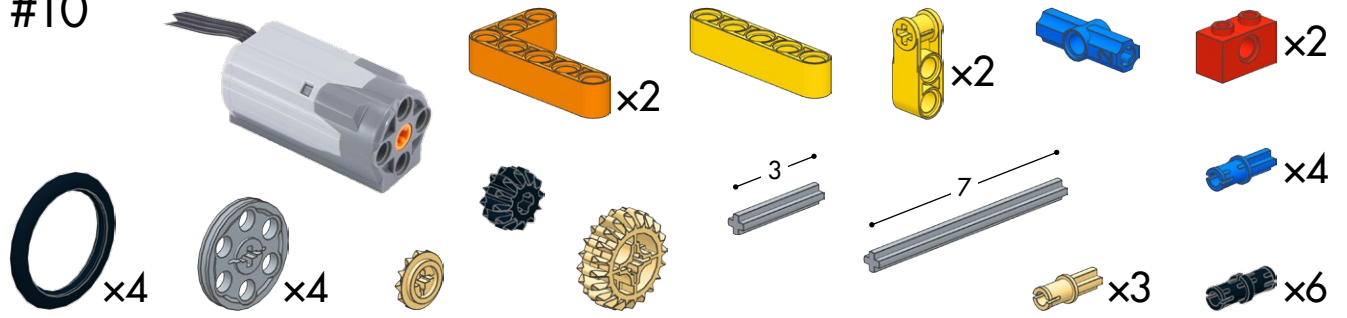


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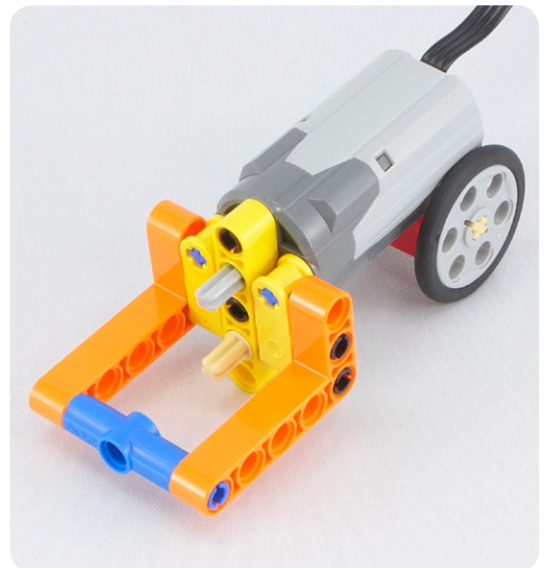
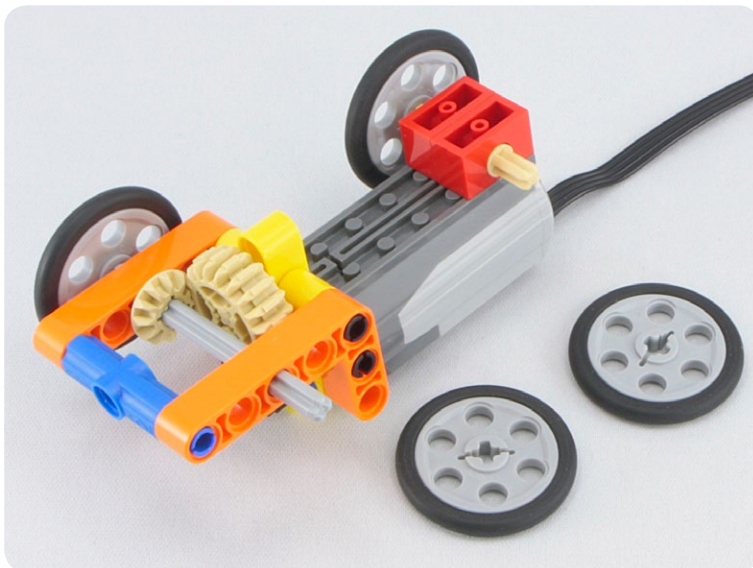




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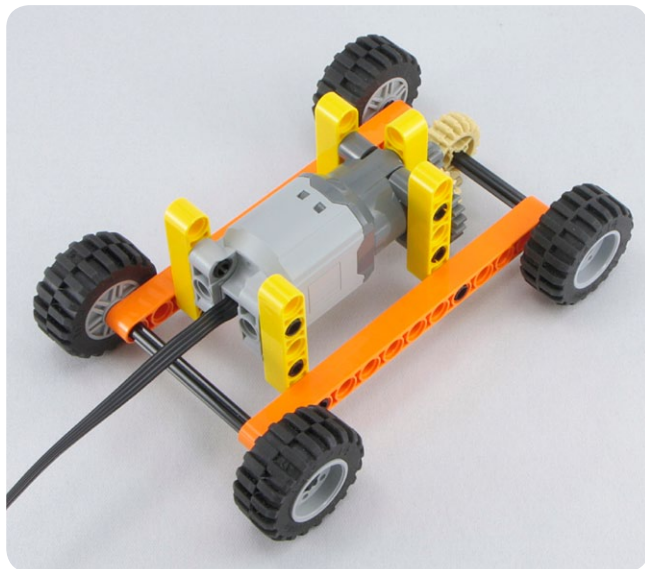
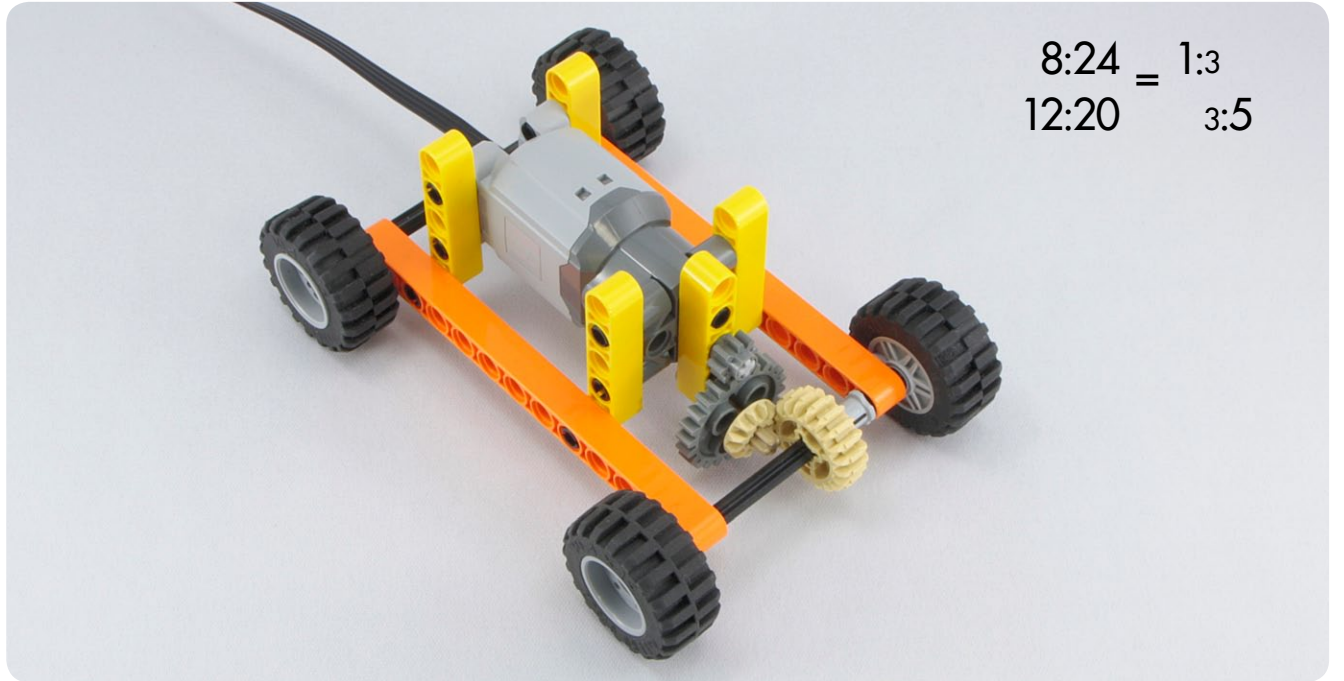
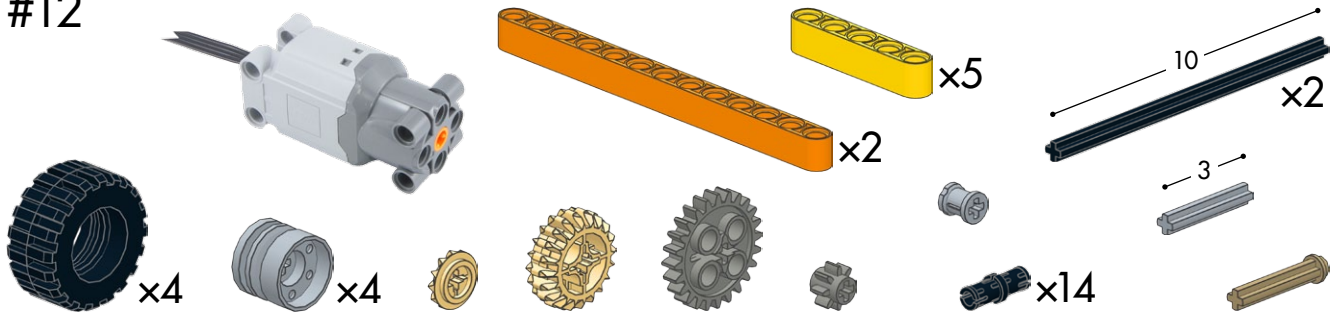


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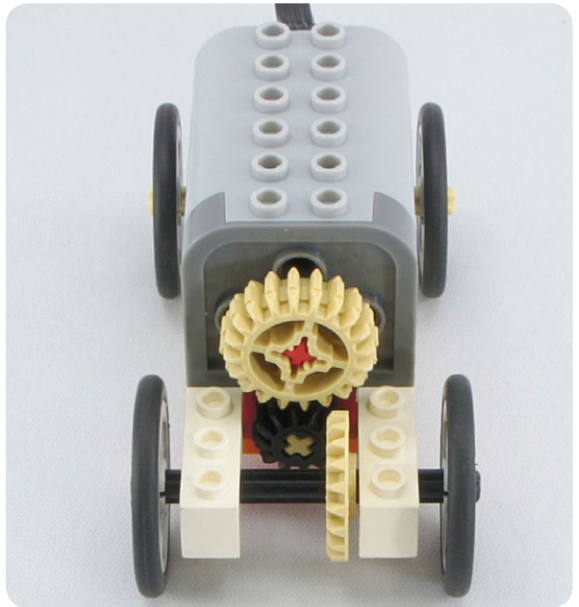
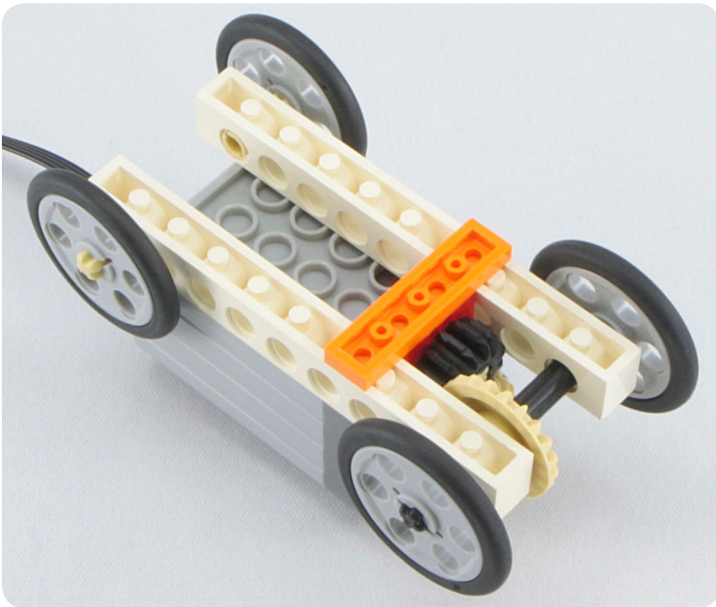
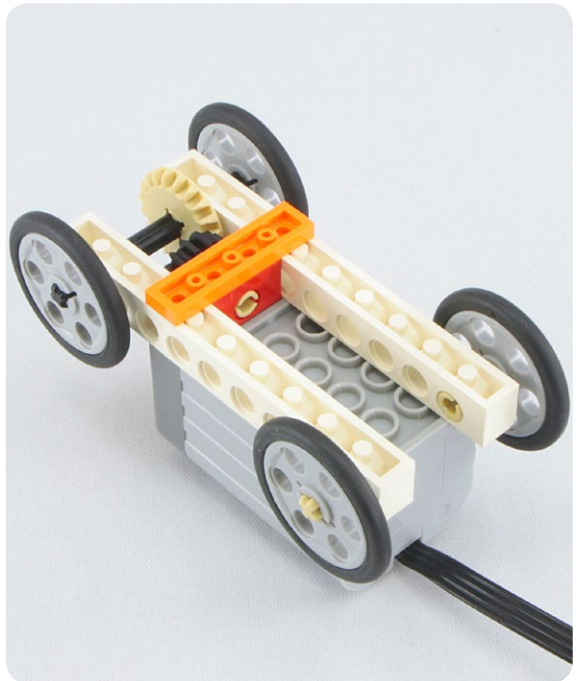
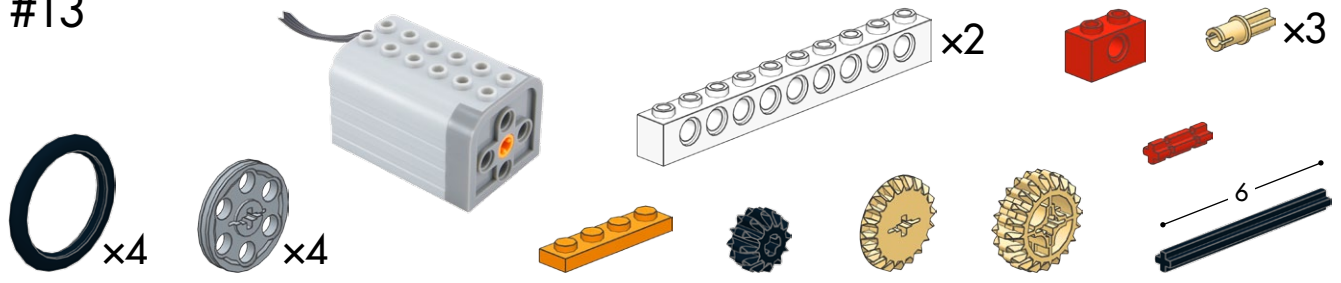


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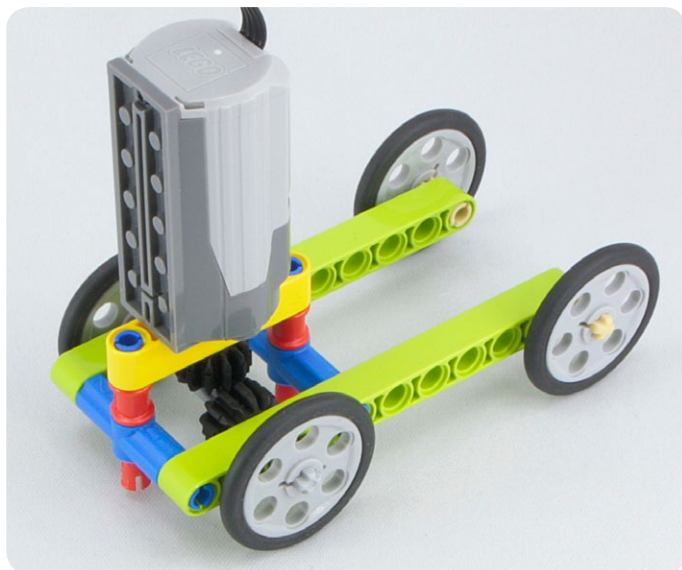
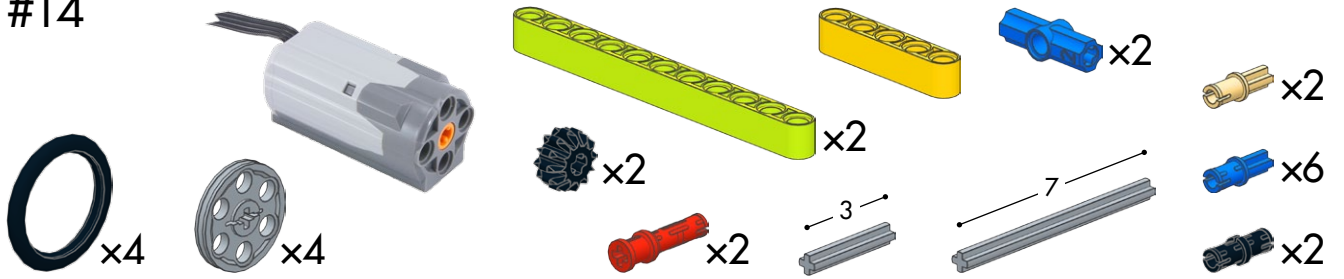




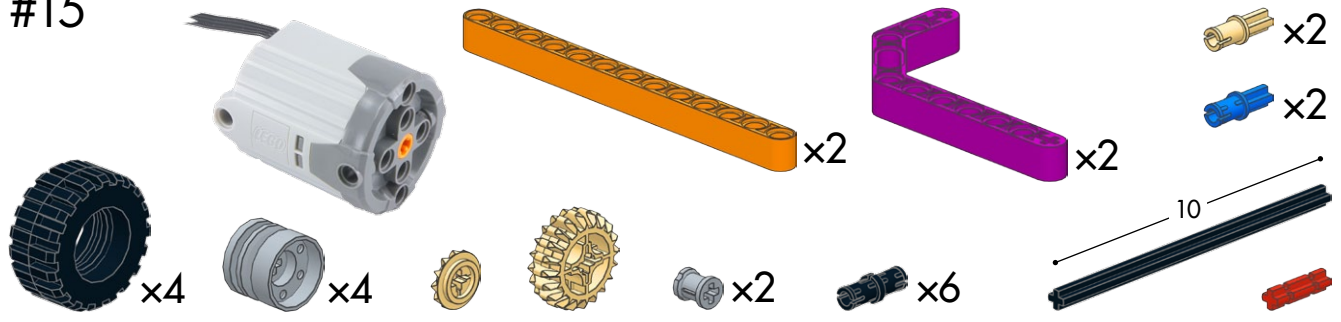
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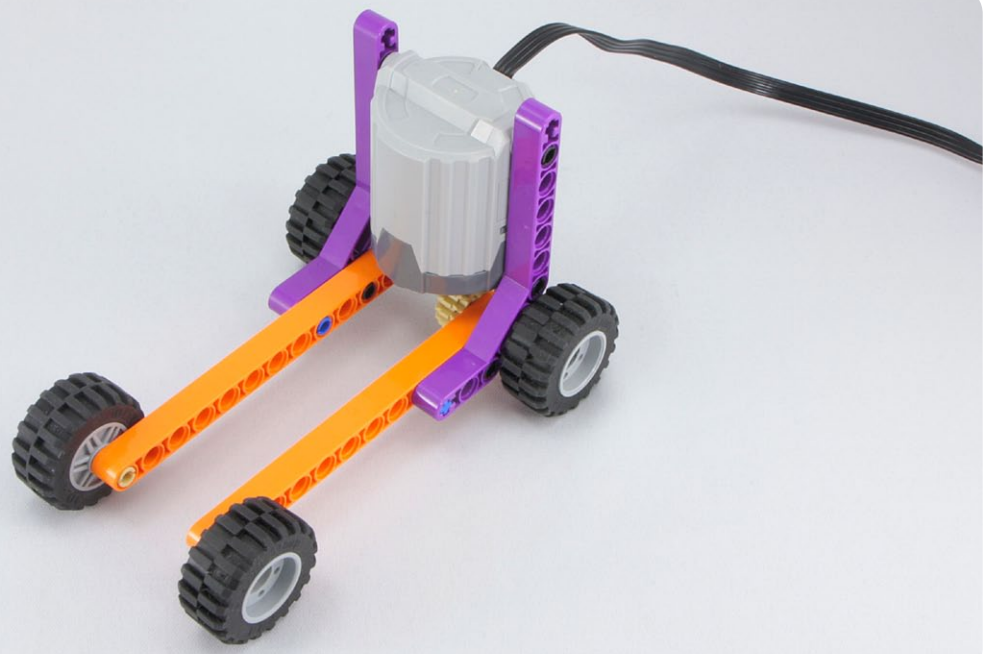
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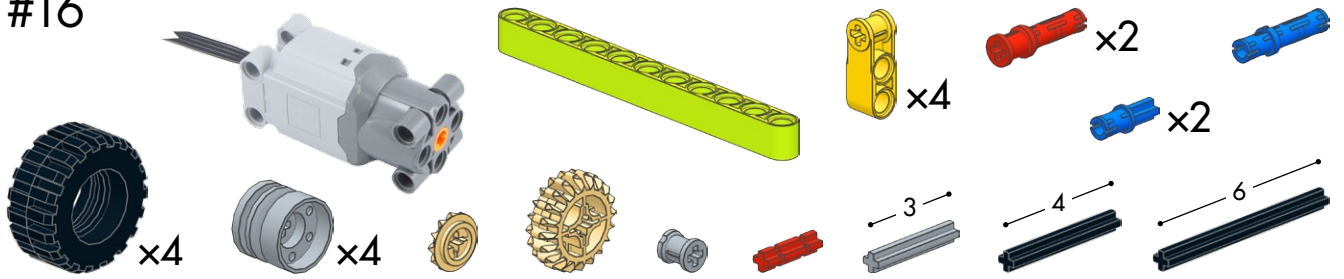
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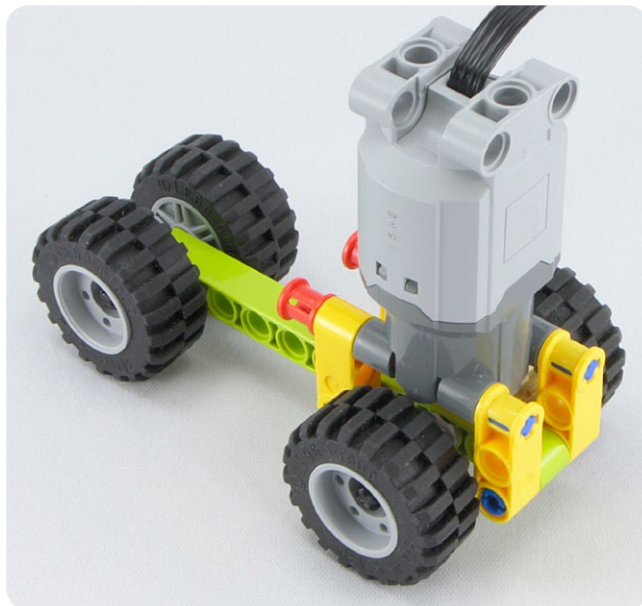
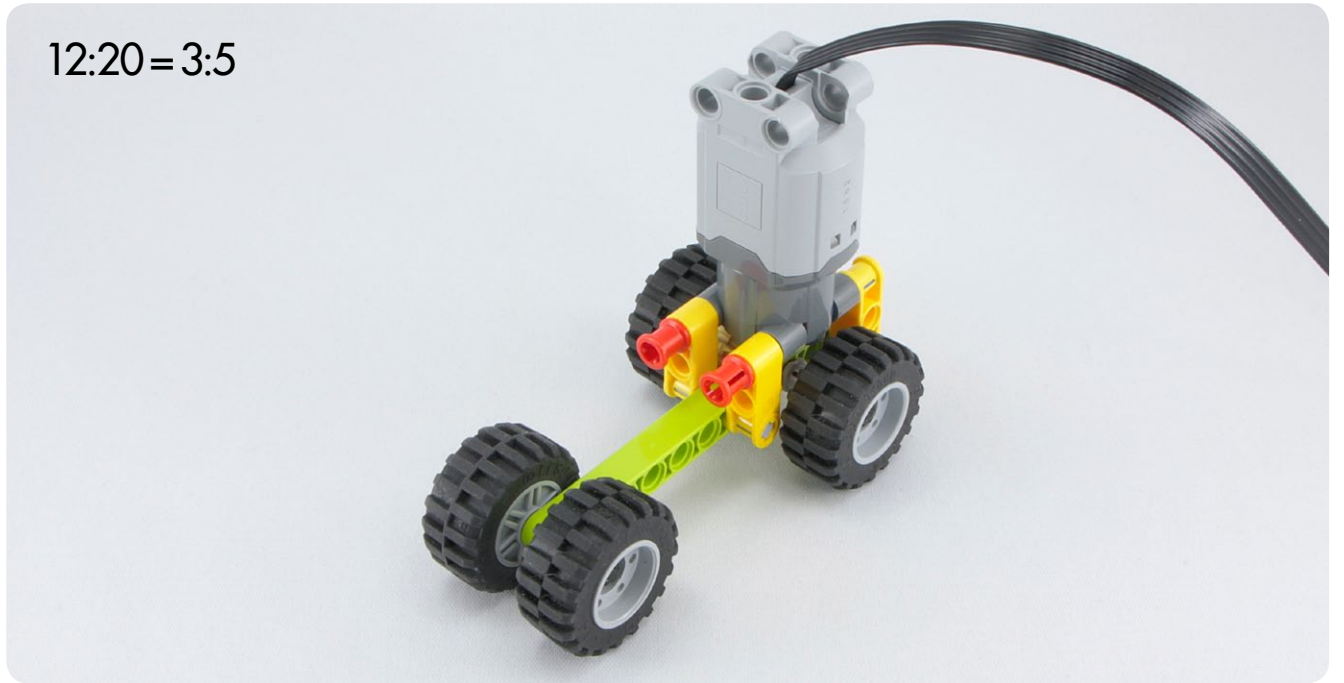
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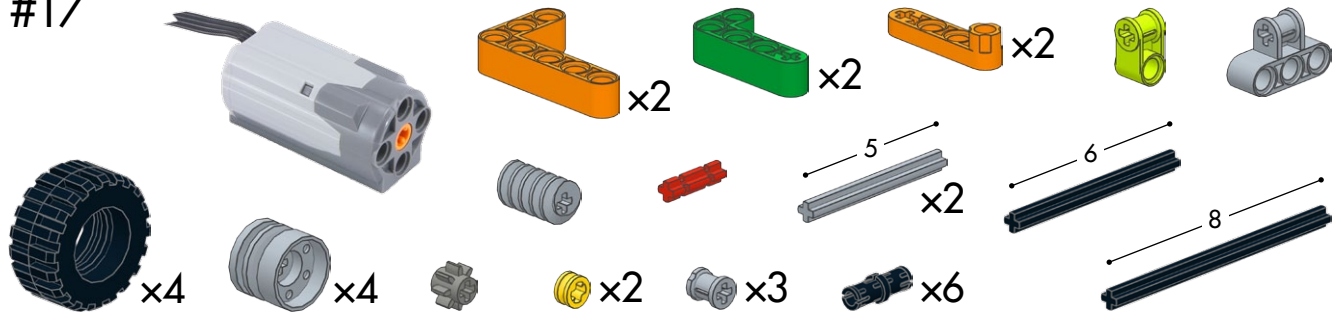
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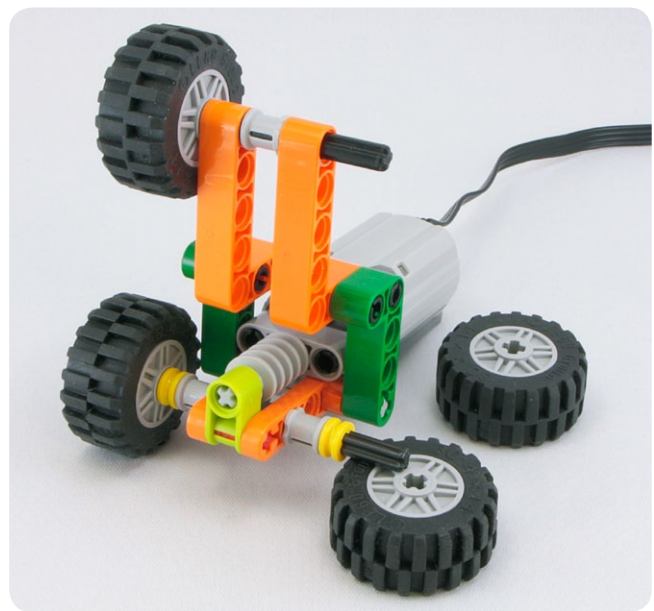
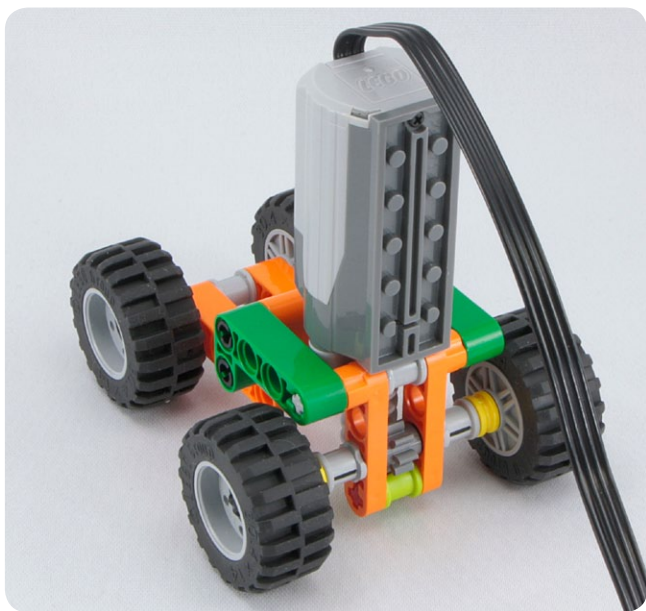
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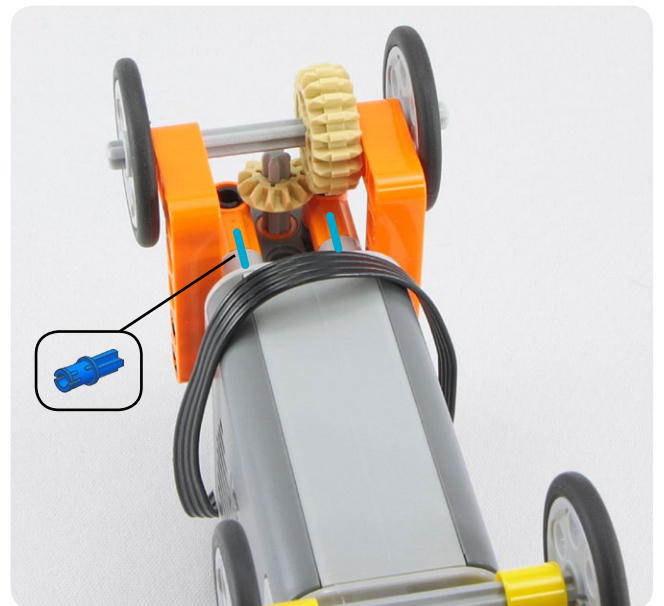
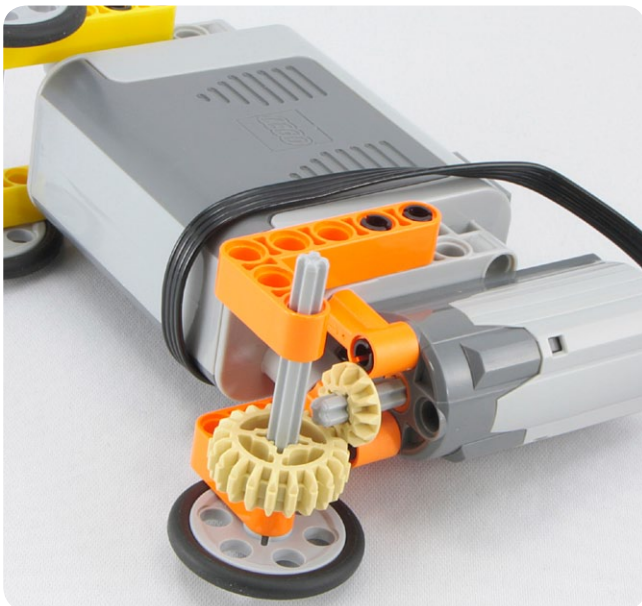
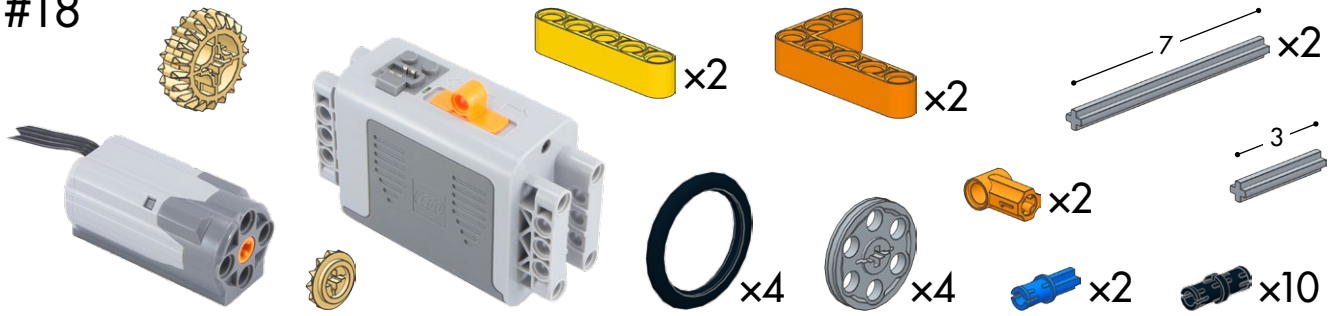
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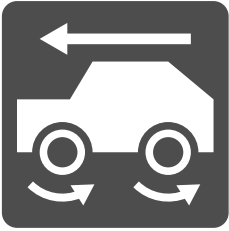


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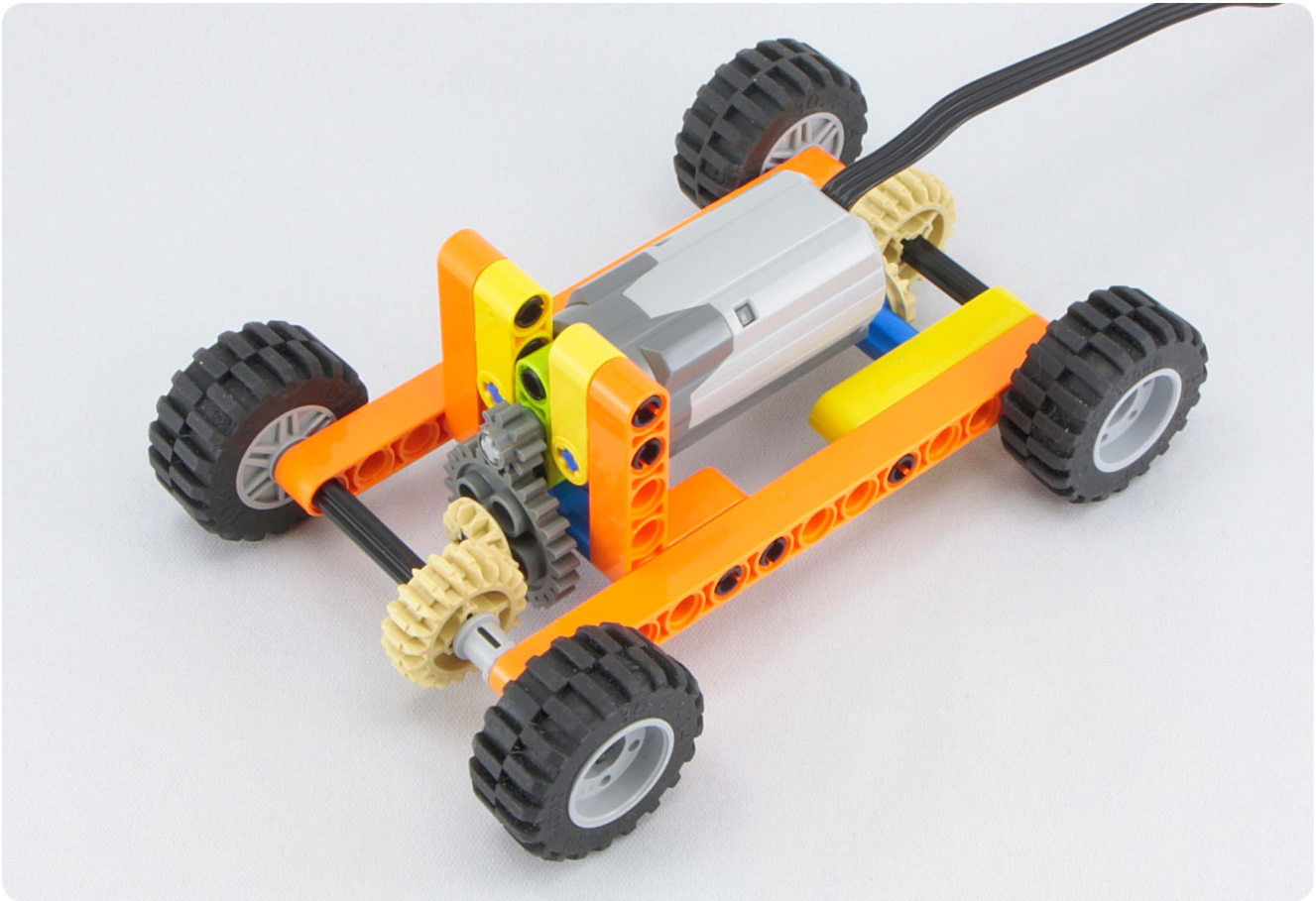
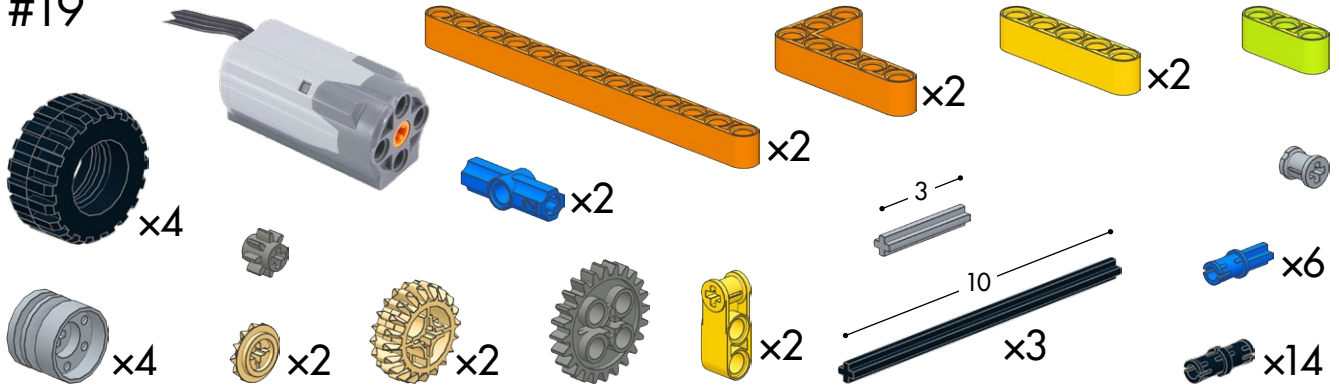
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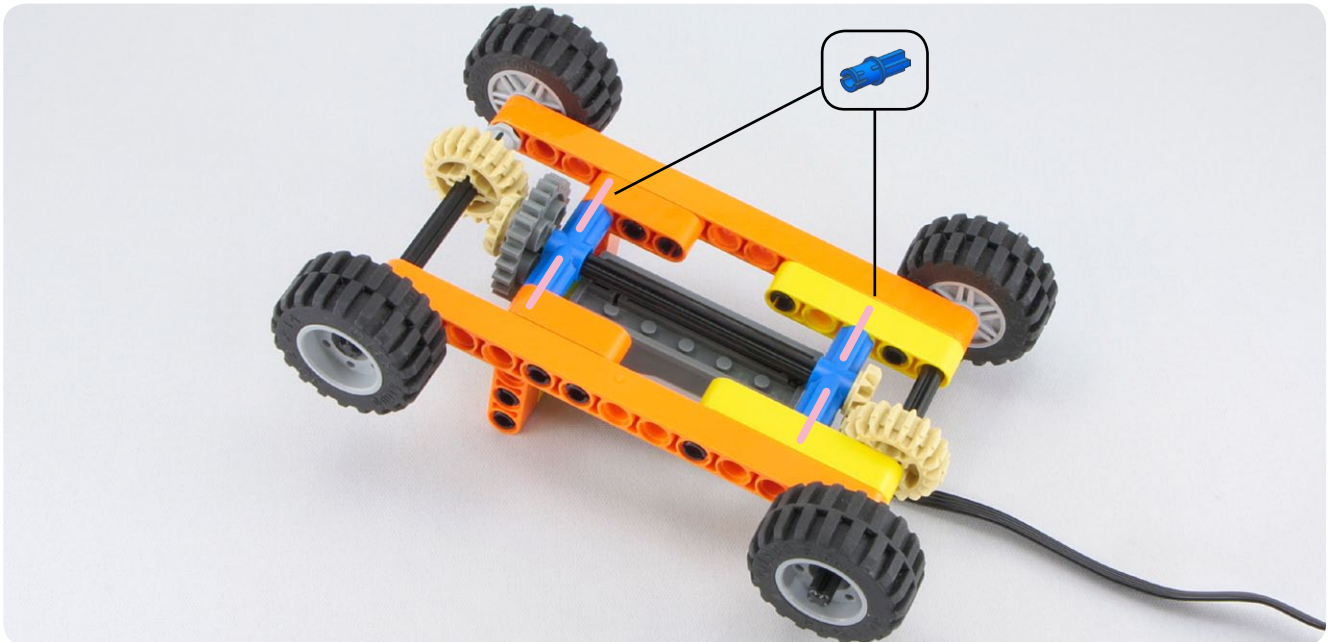
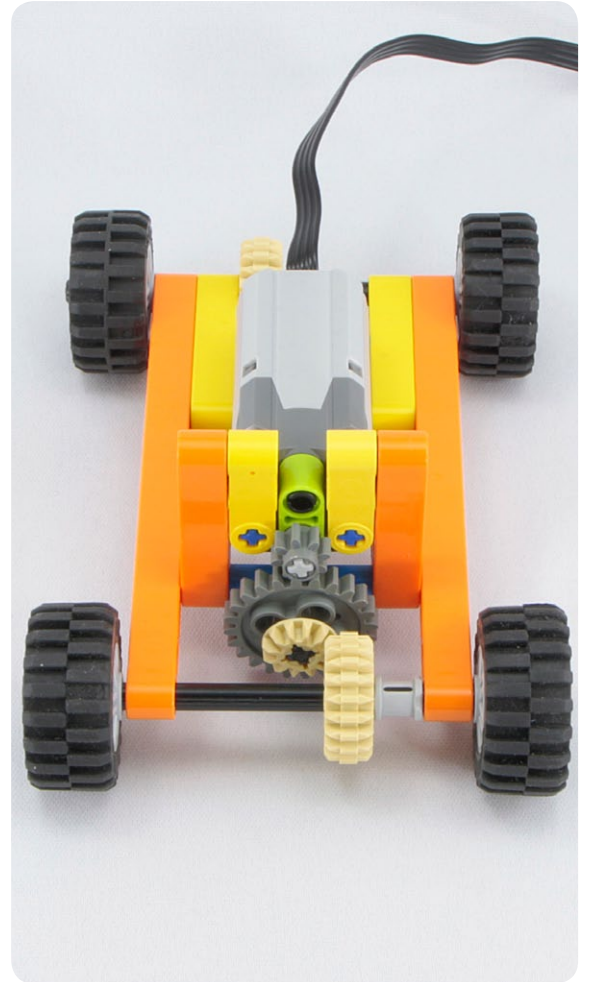




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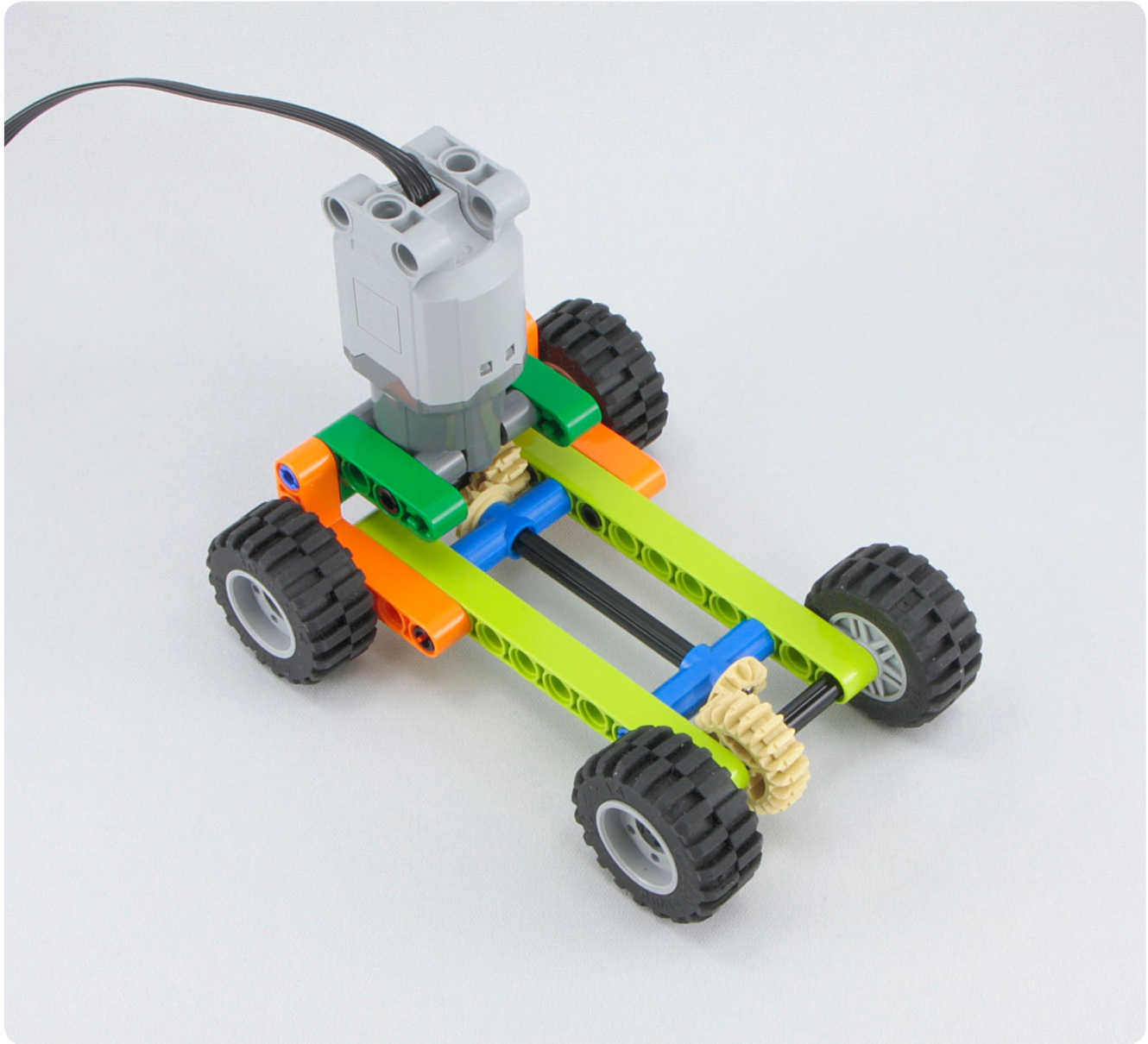
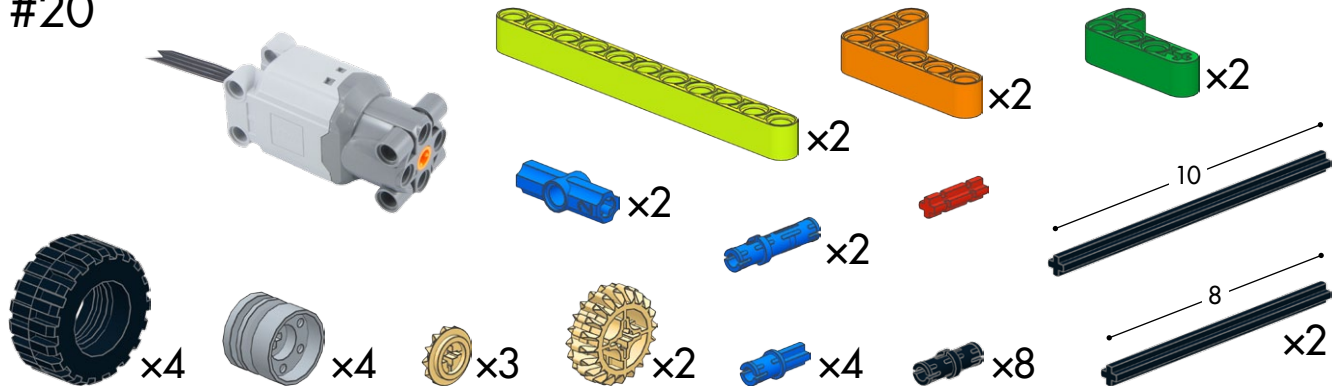
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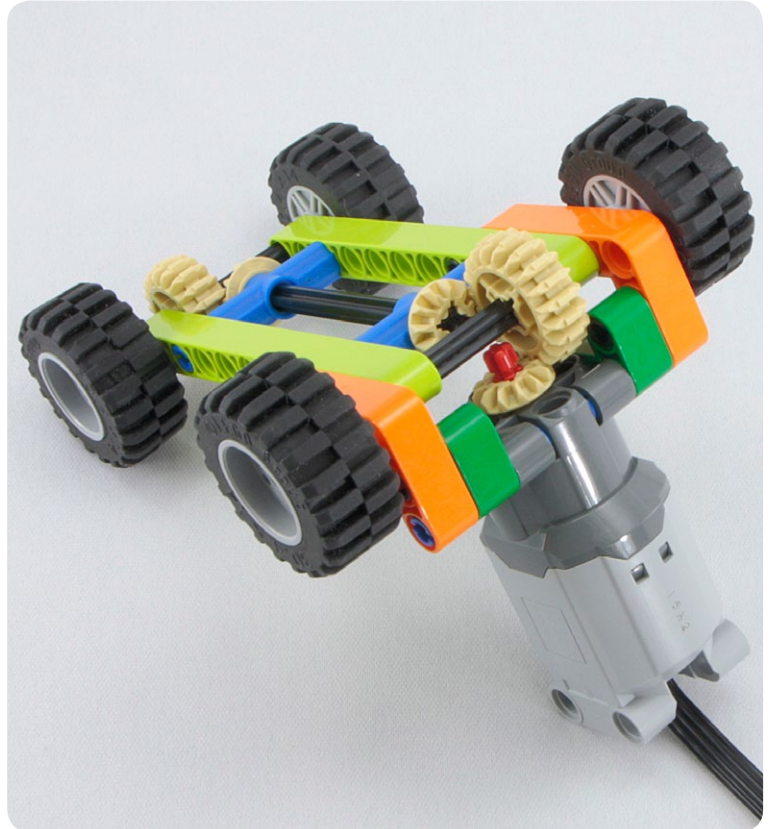
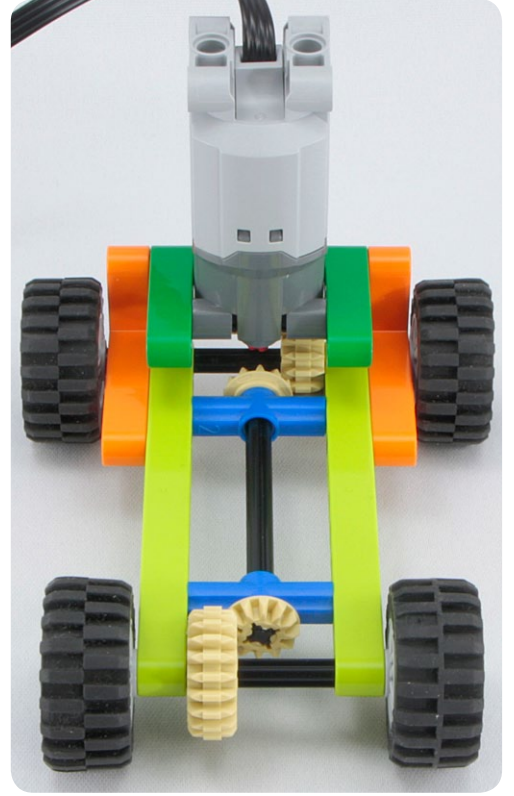




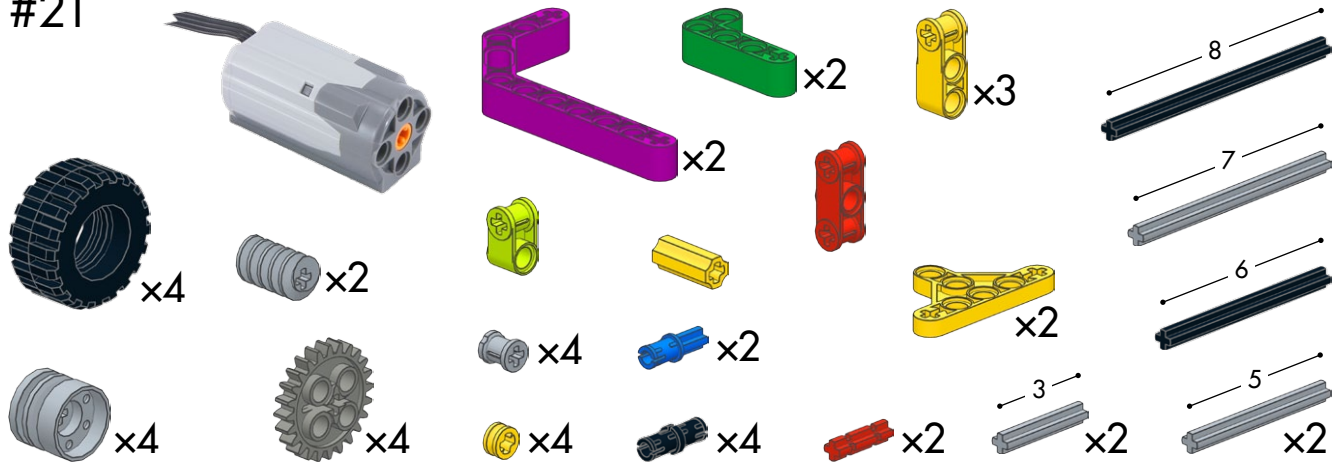


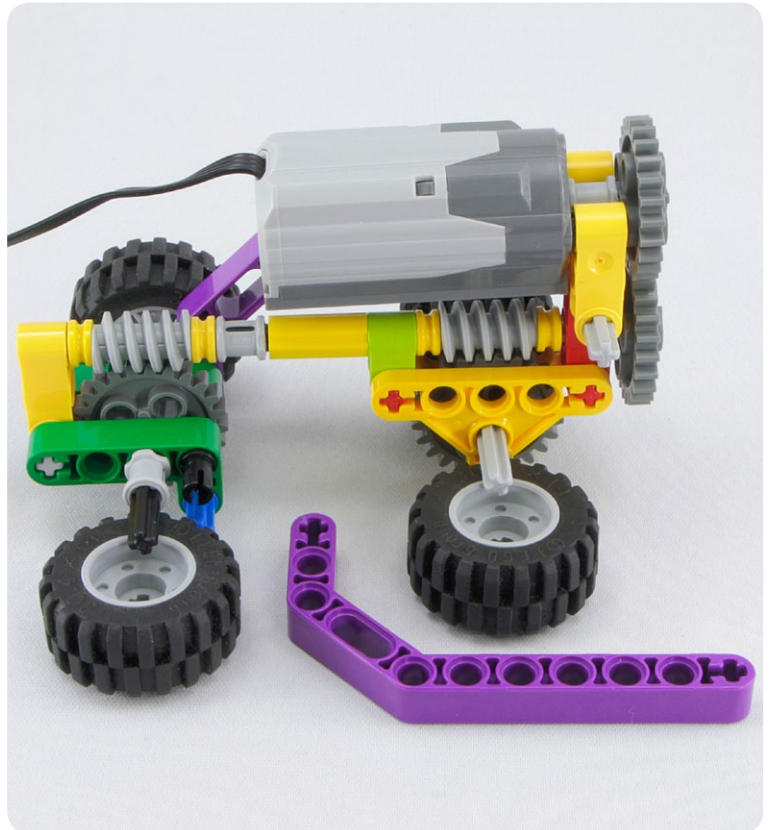
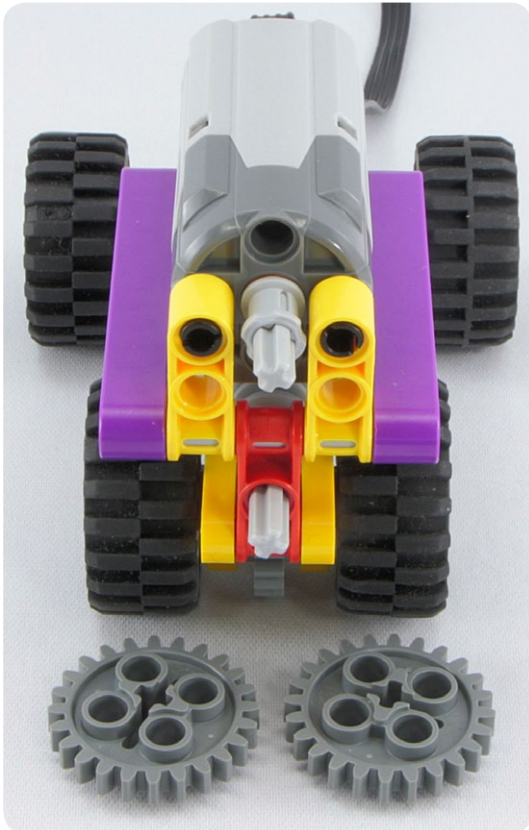
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



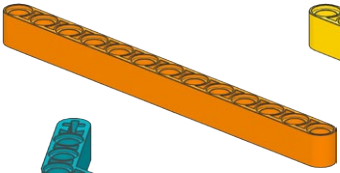
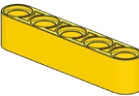
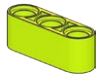
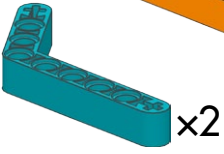



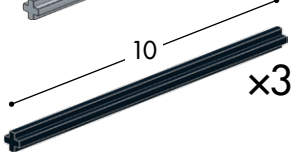



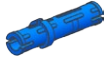


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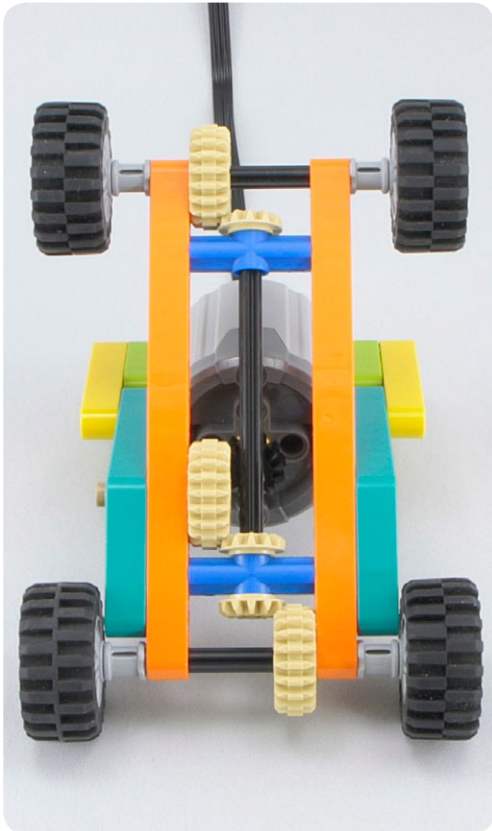




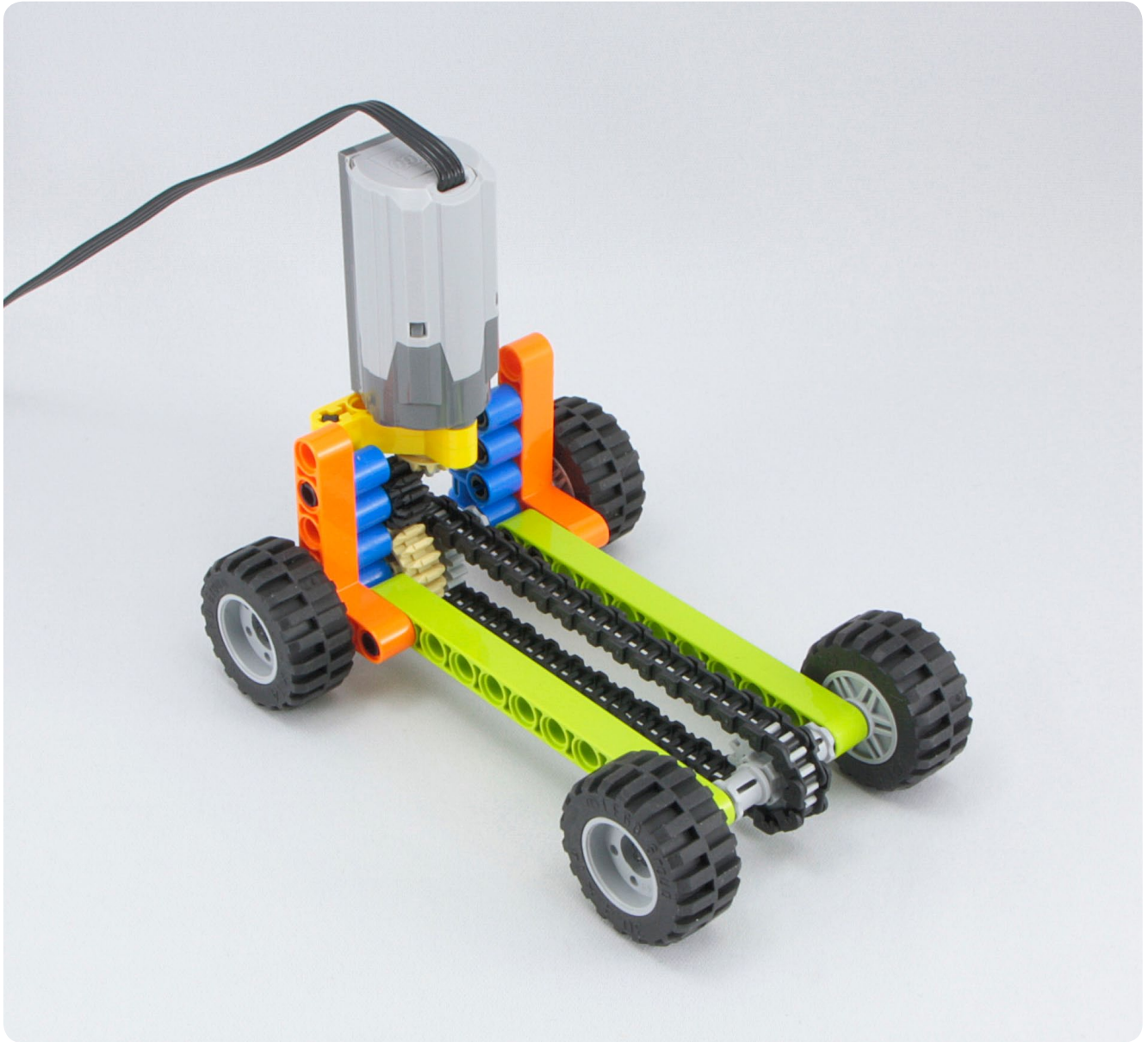
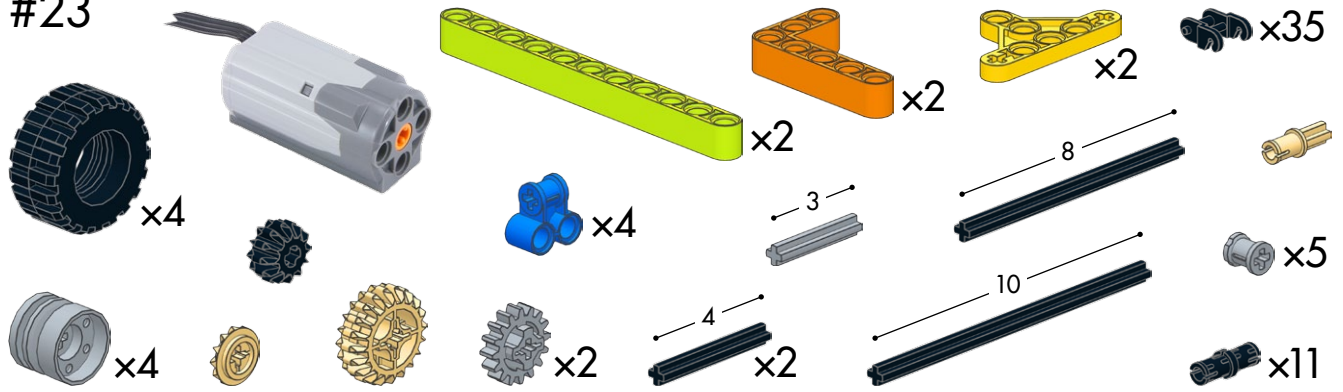
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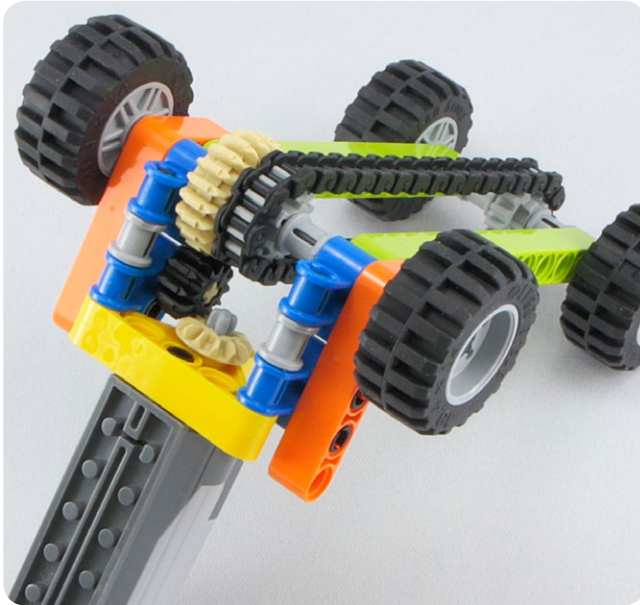
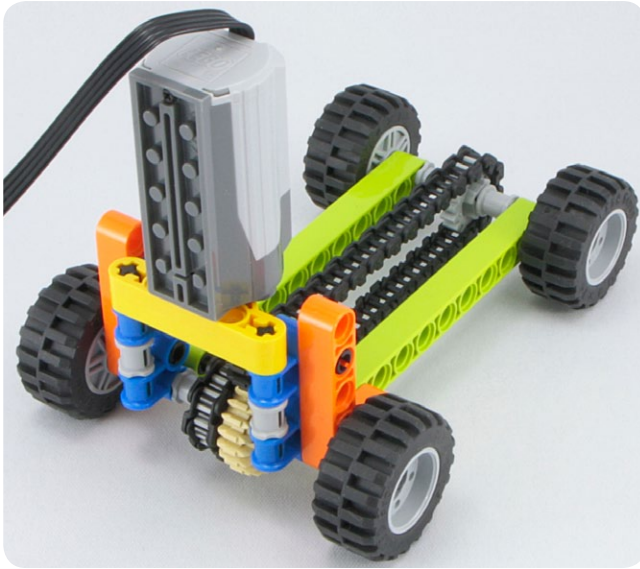
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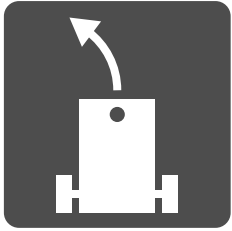


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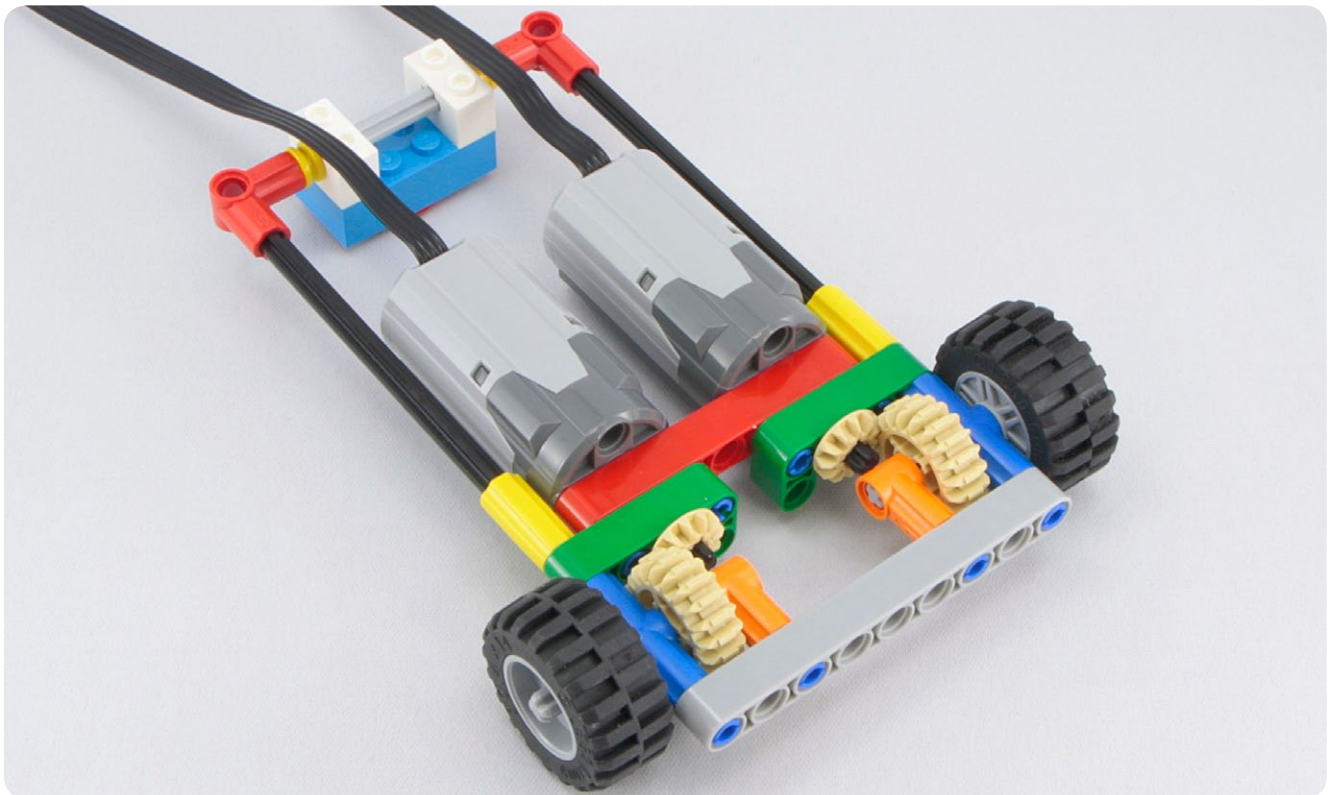
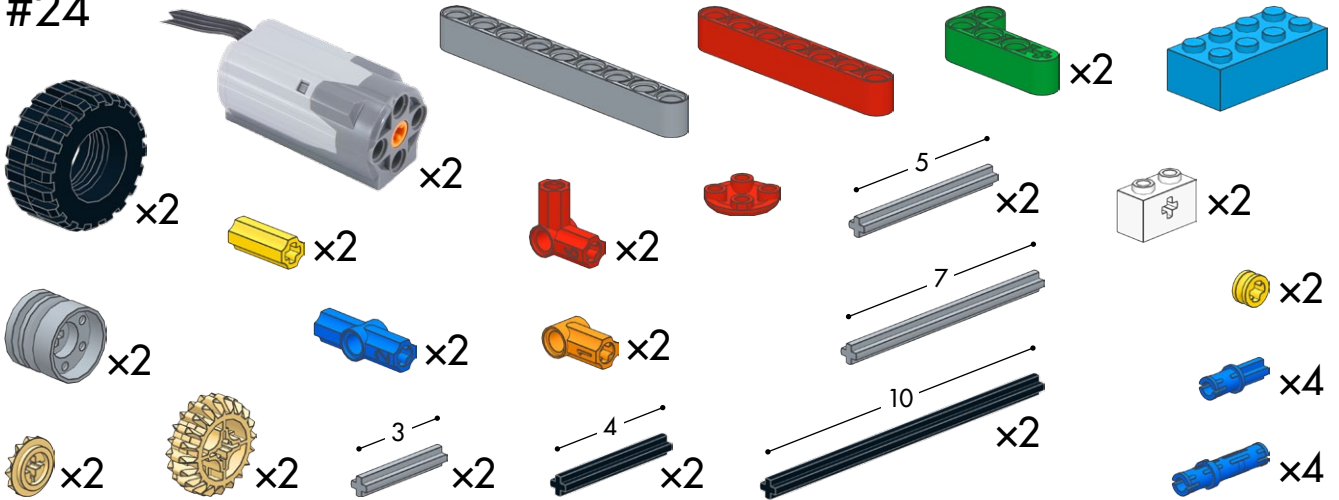


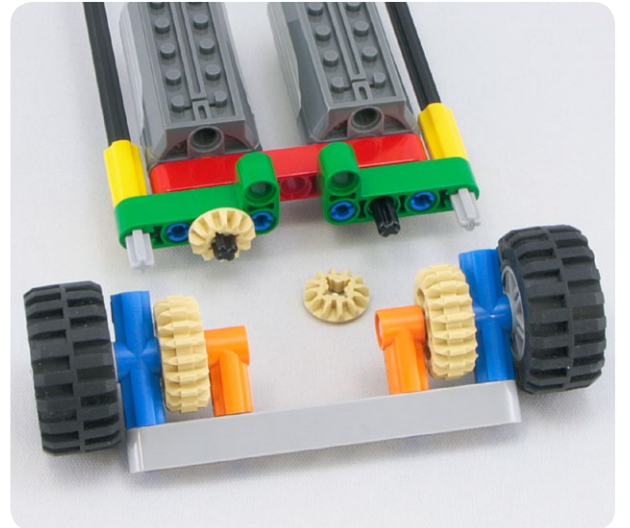
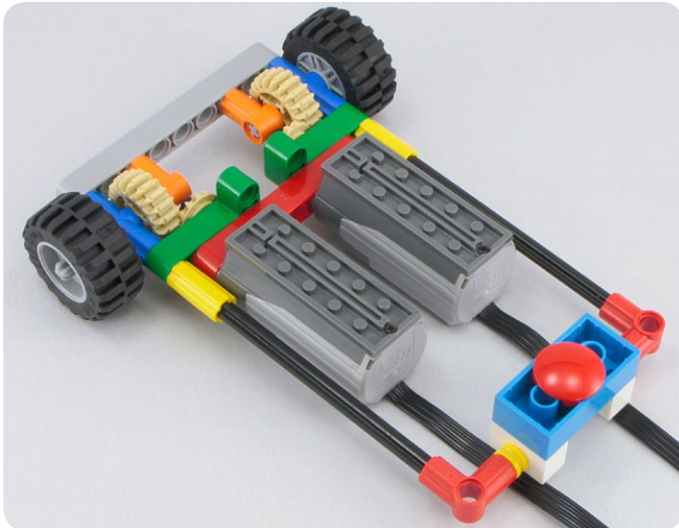
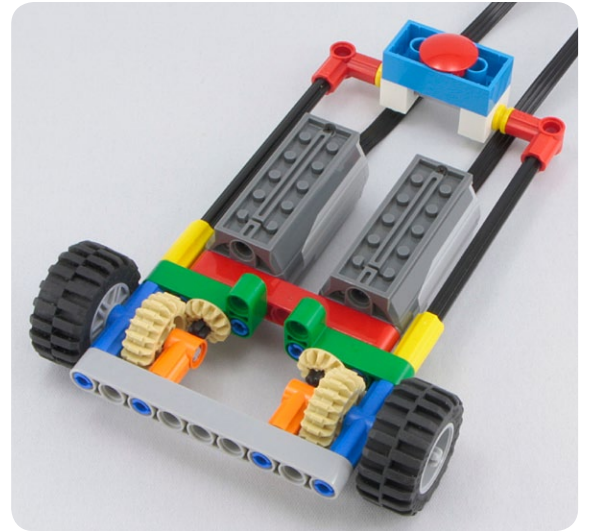
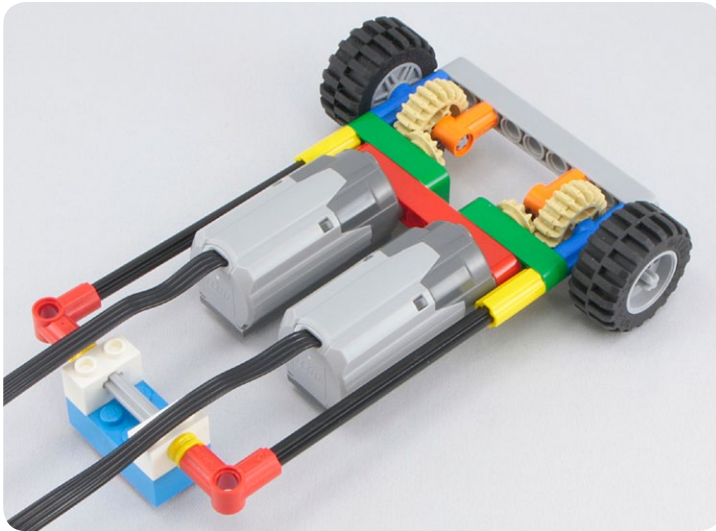
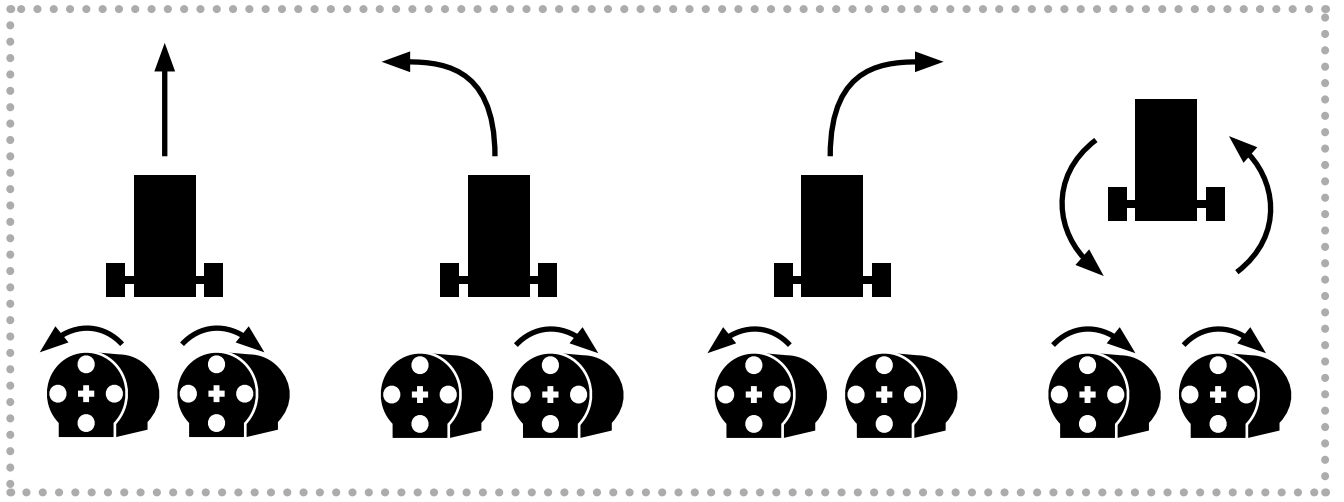
You can build cars that steer by combining these with the models in **Caster wheels** (page 44).



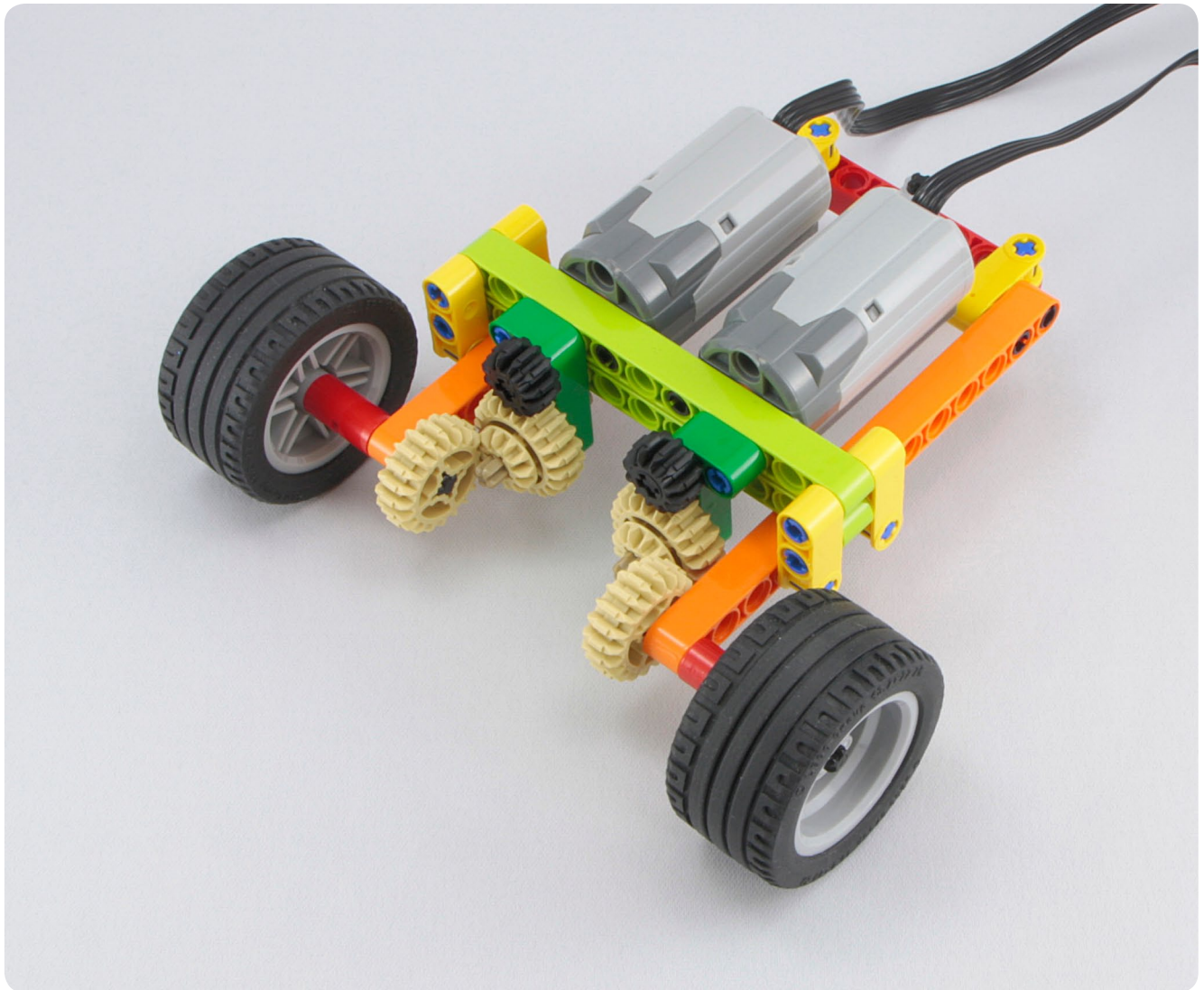
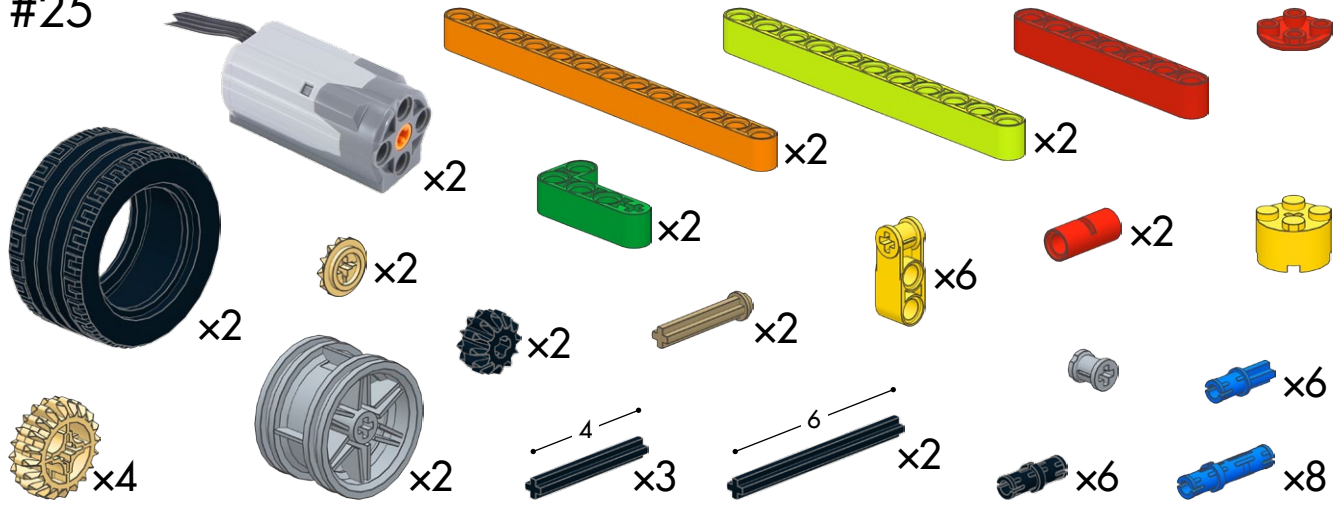
# Each motor turns a wheel

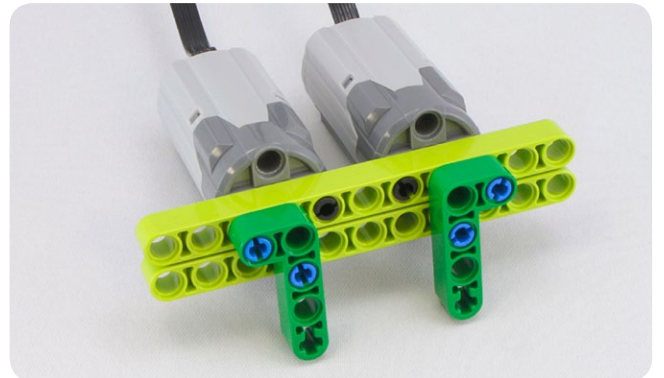
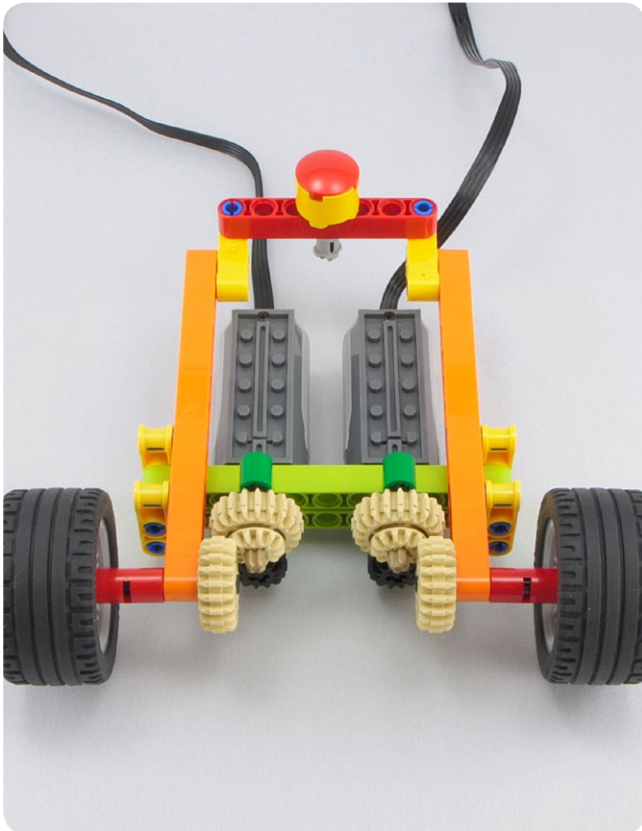
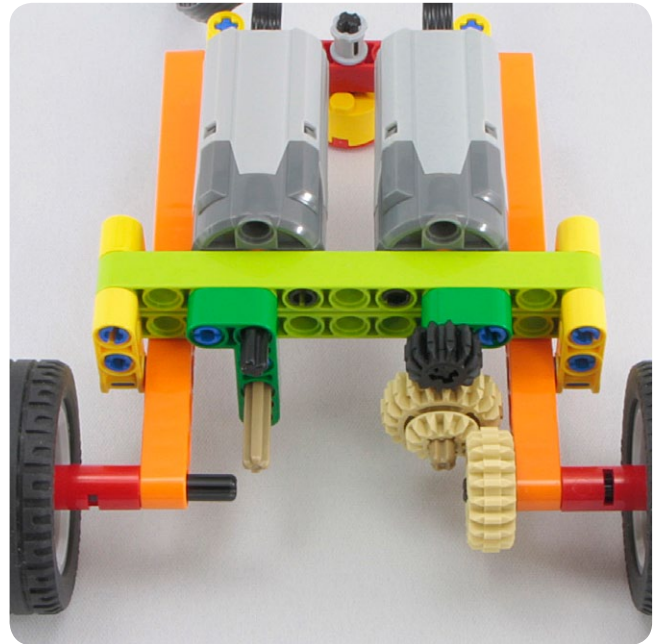
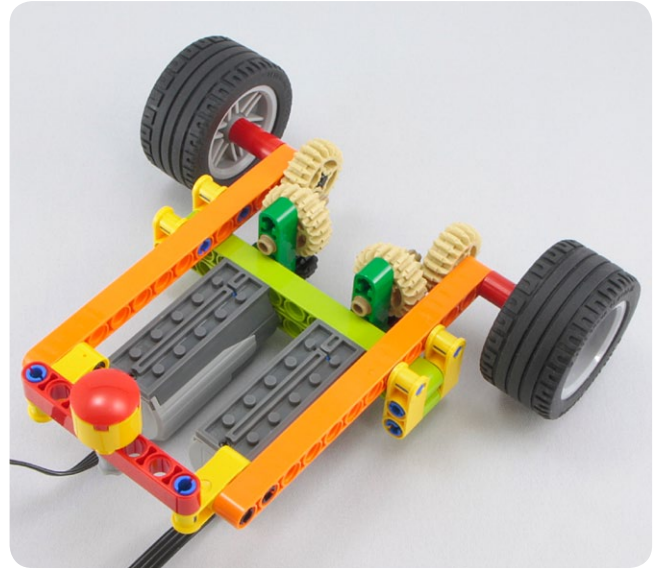
#24



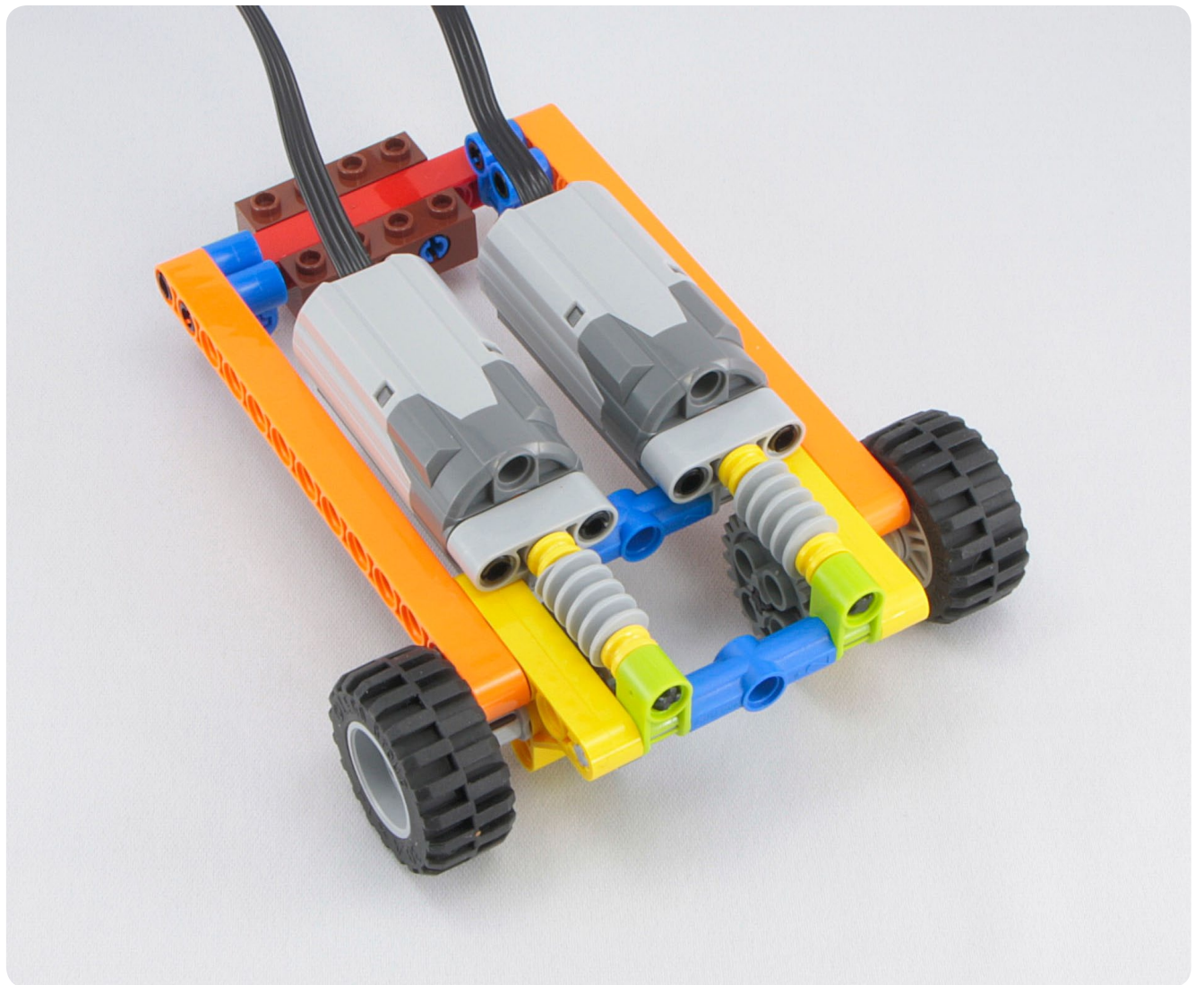
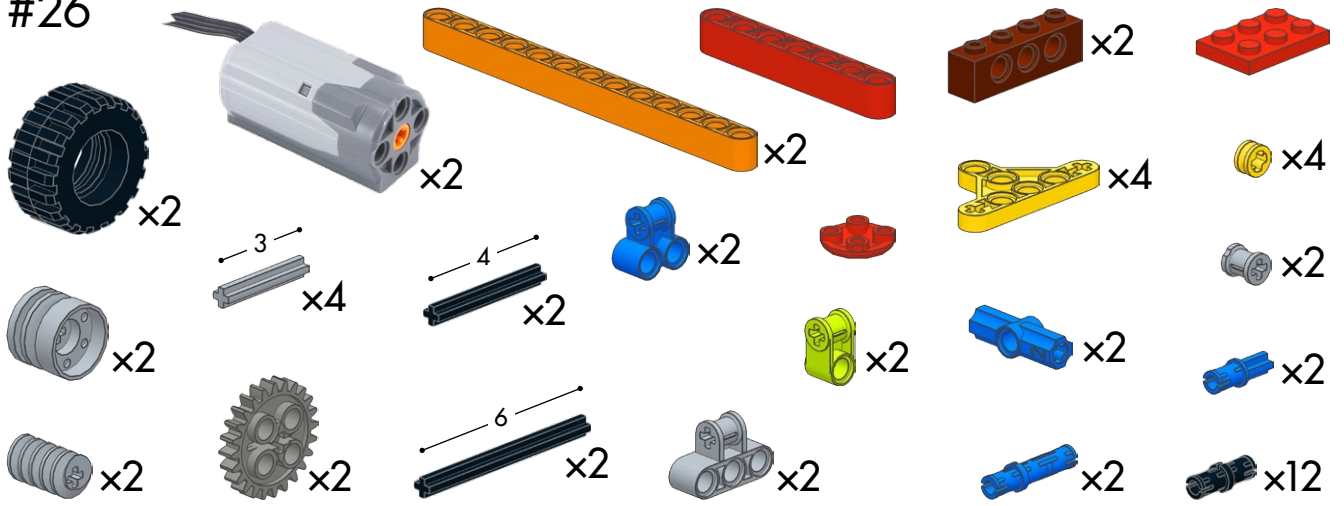


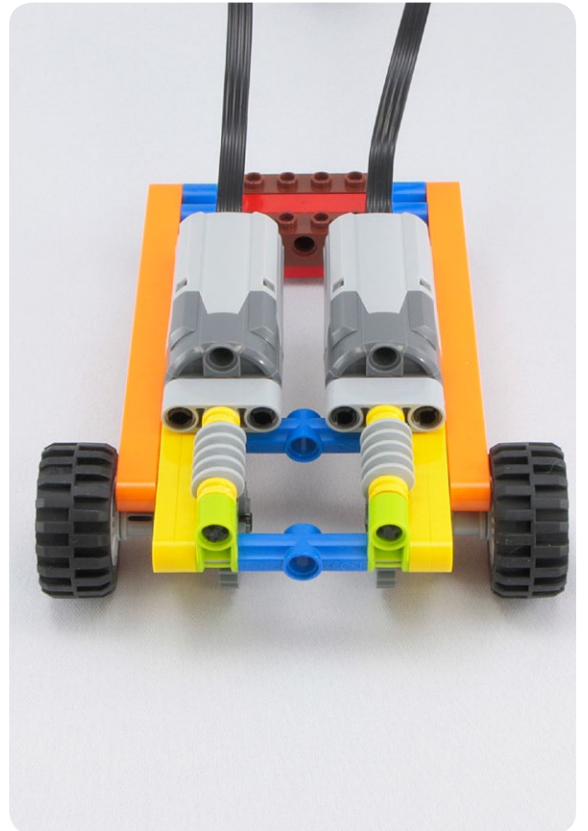
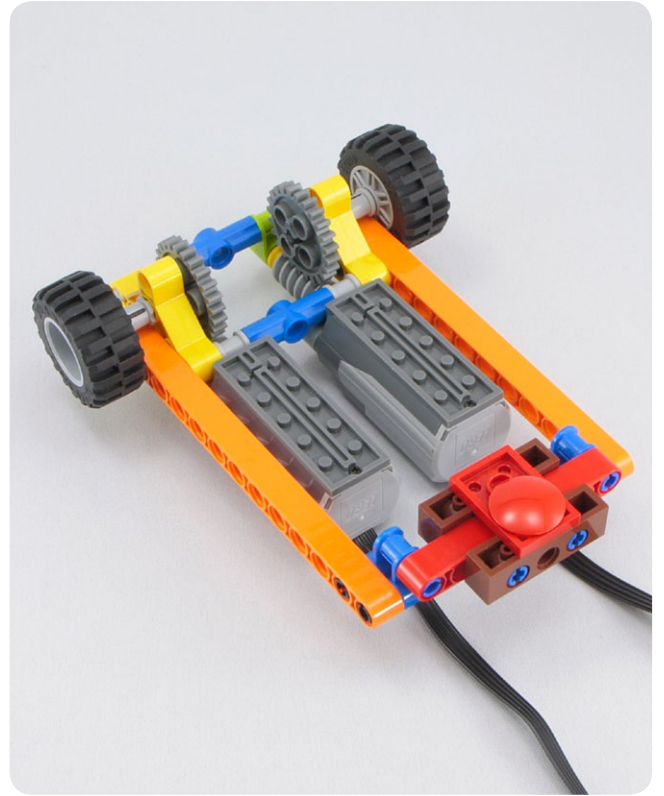
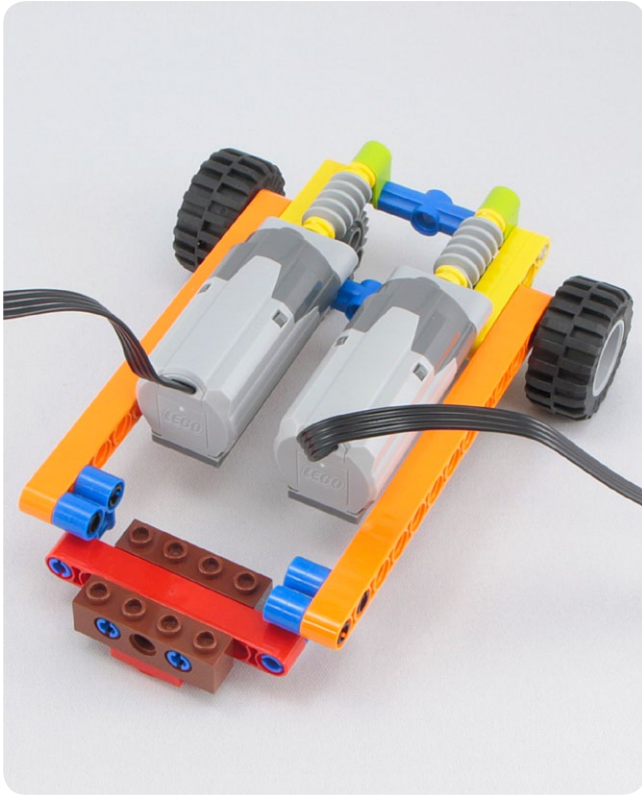
#25



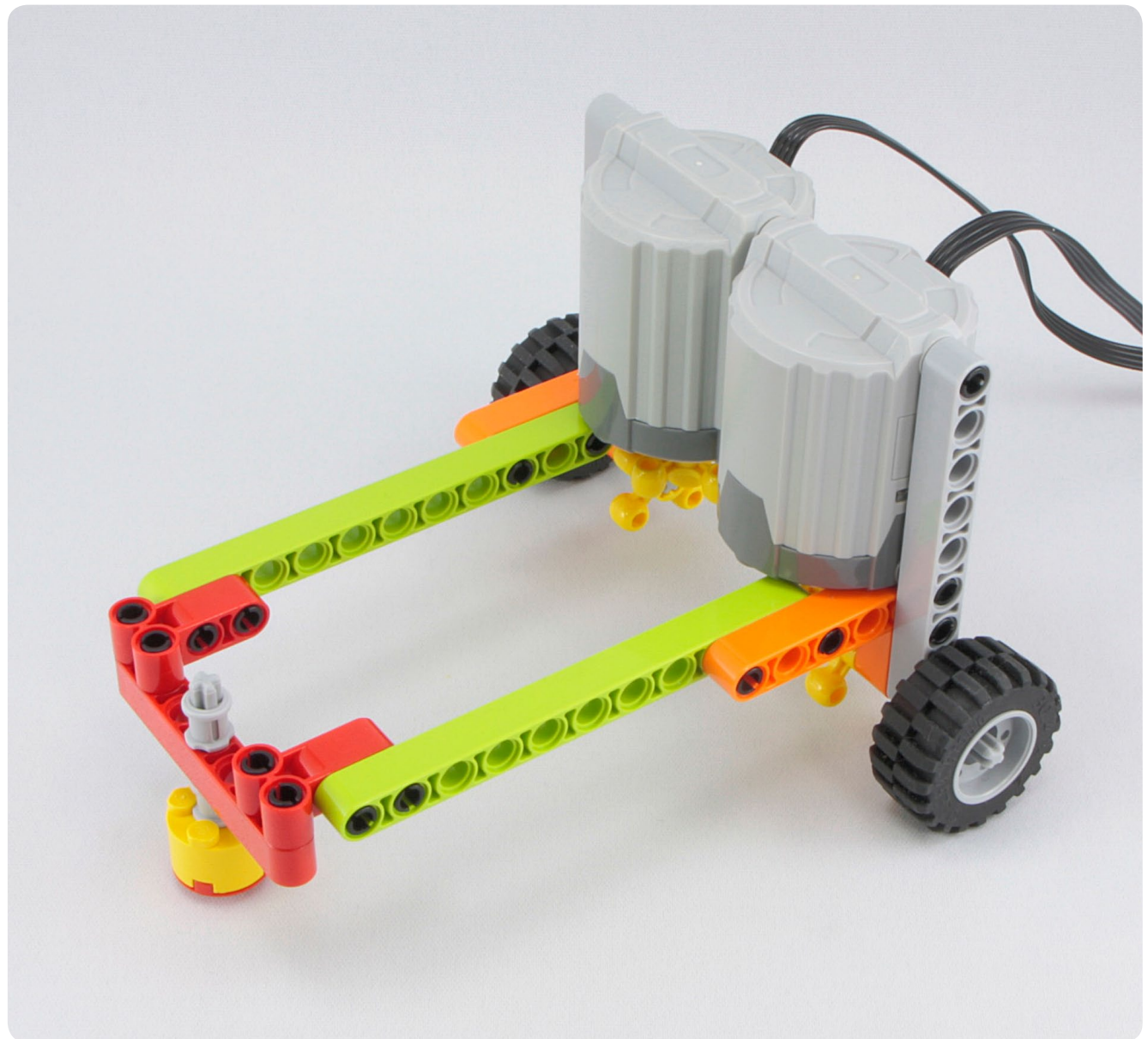
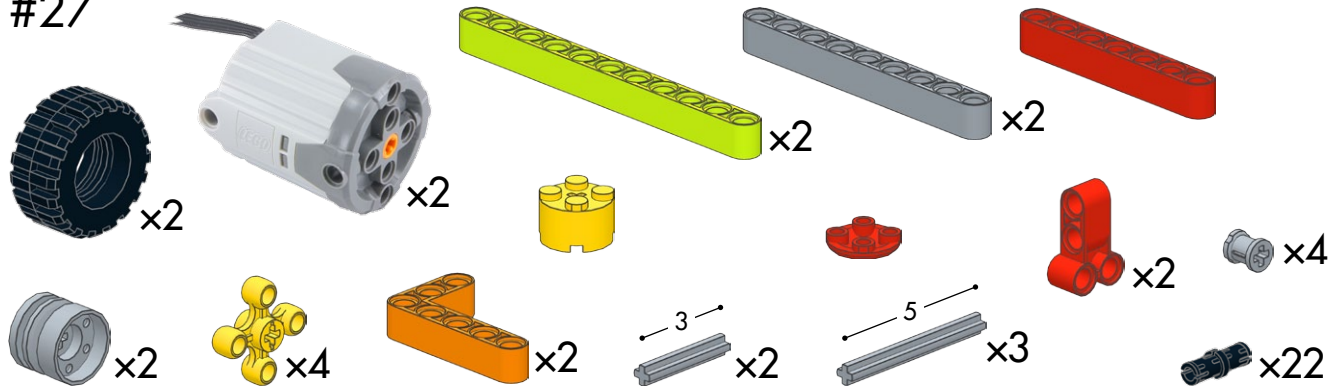


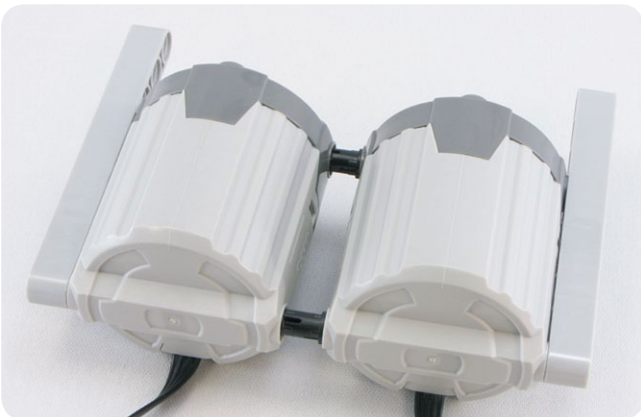
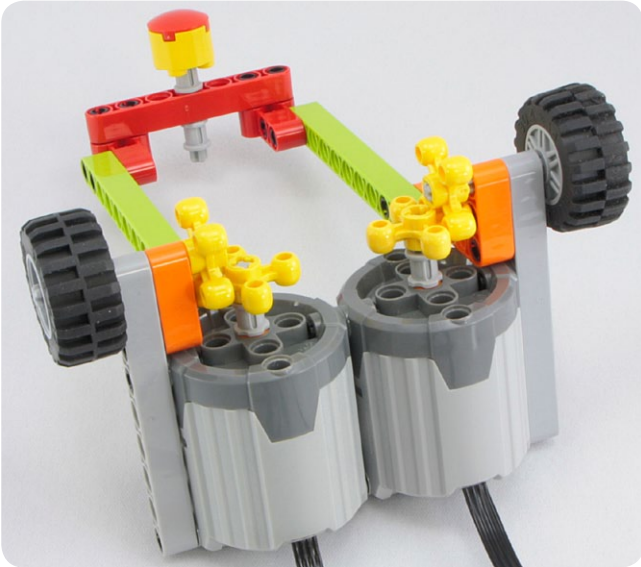
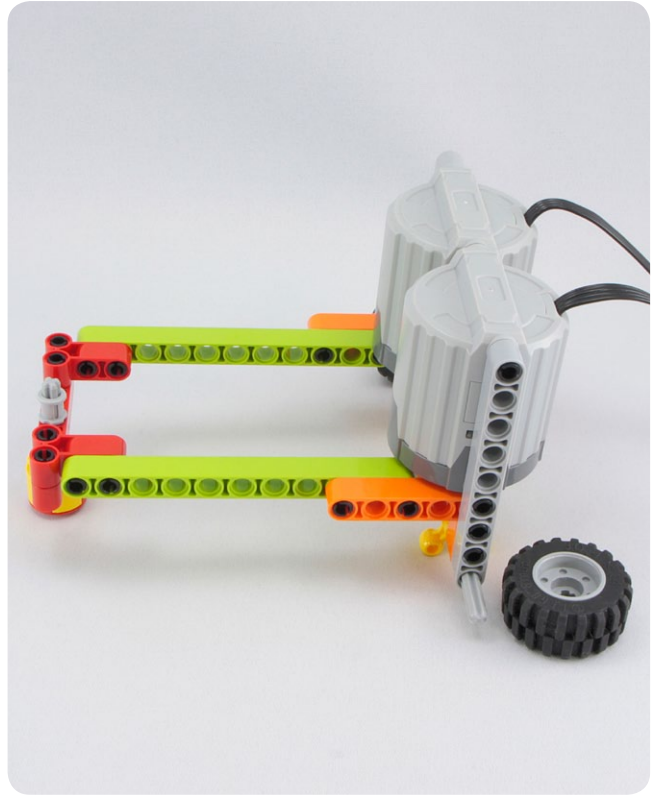
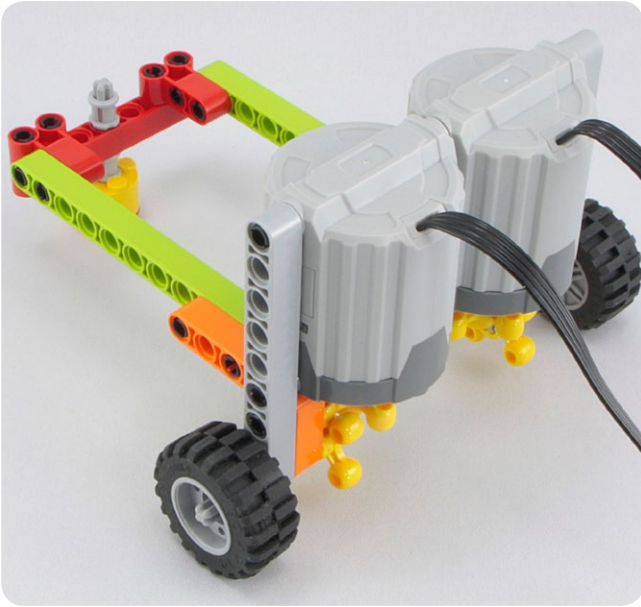
#26





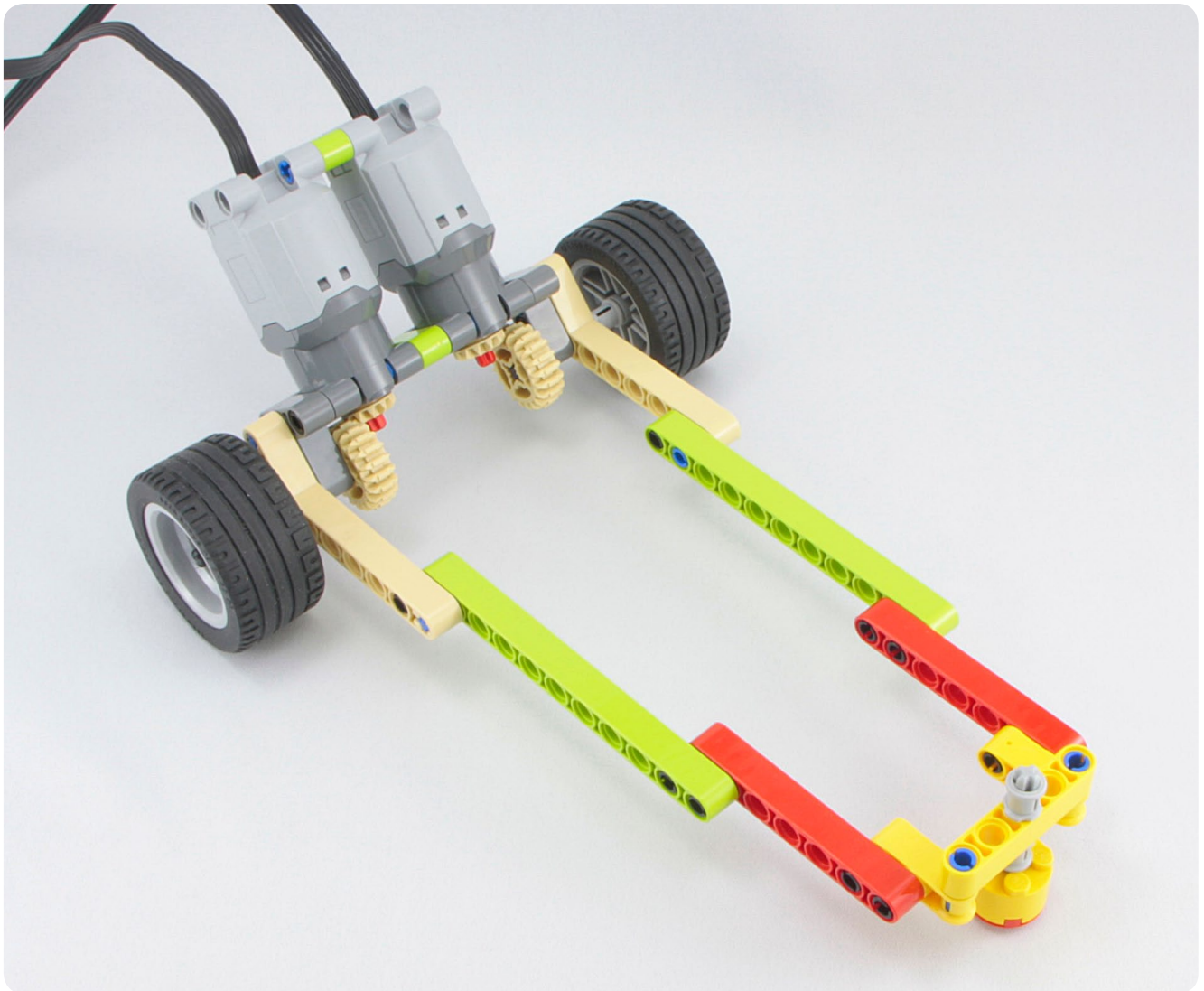
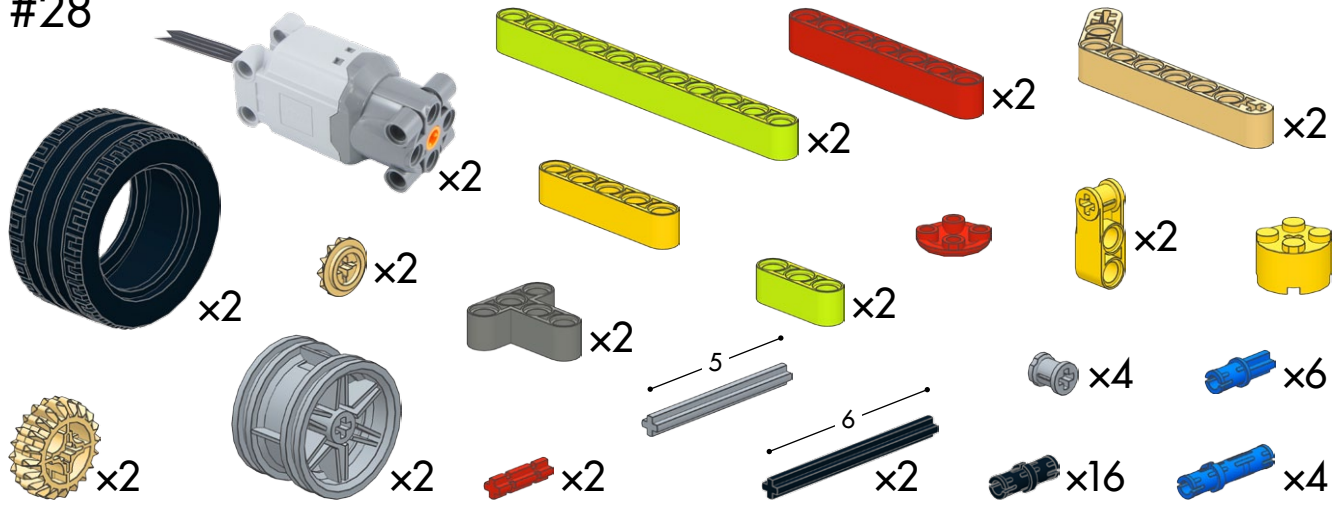
#27

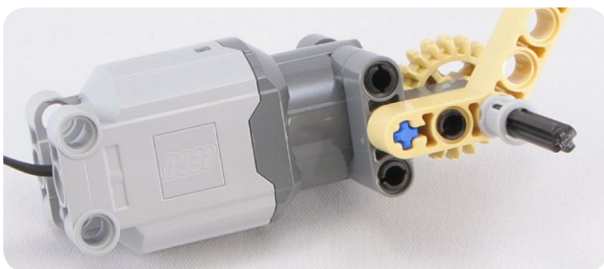
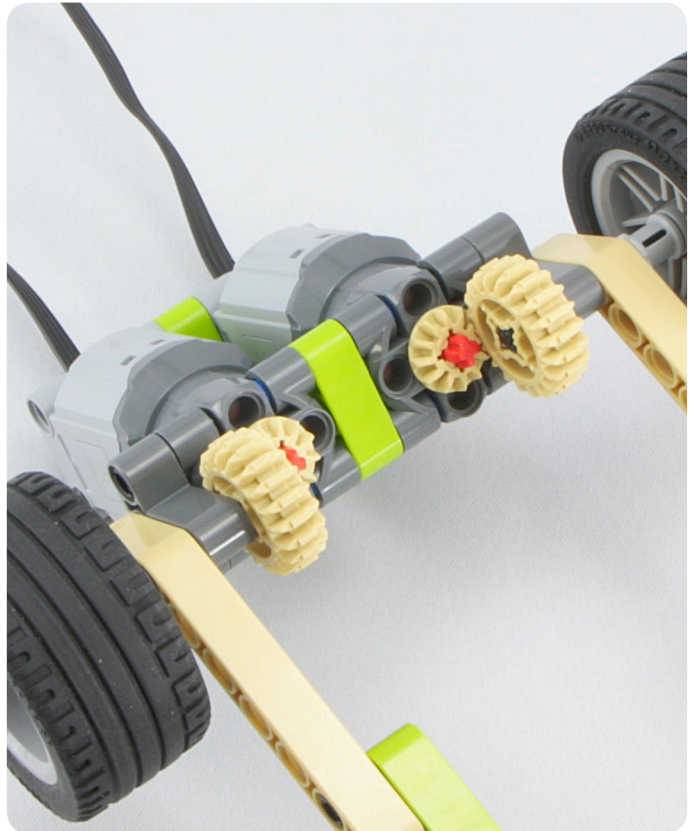
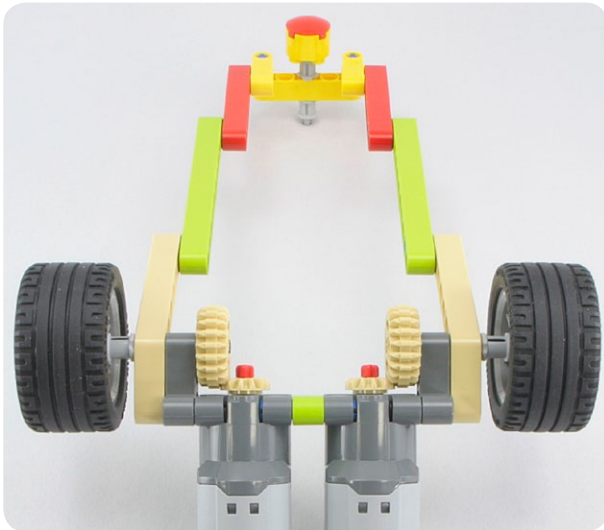
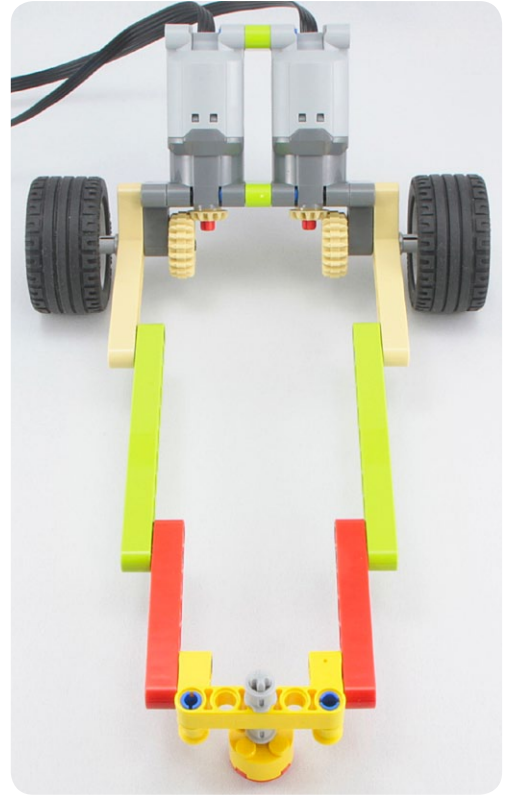




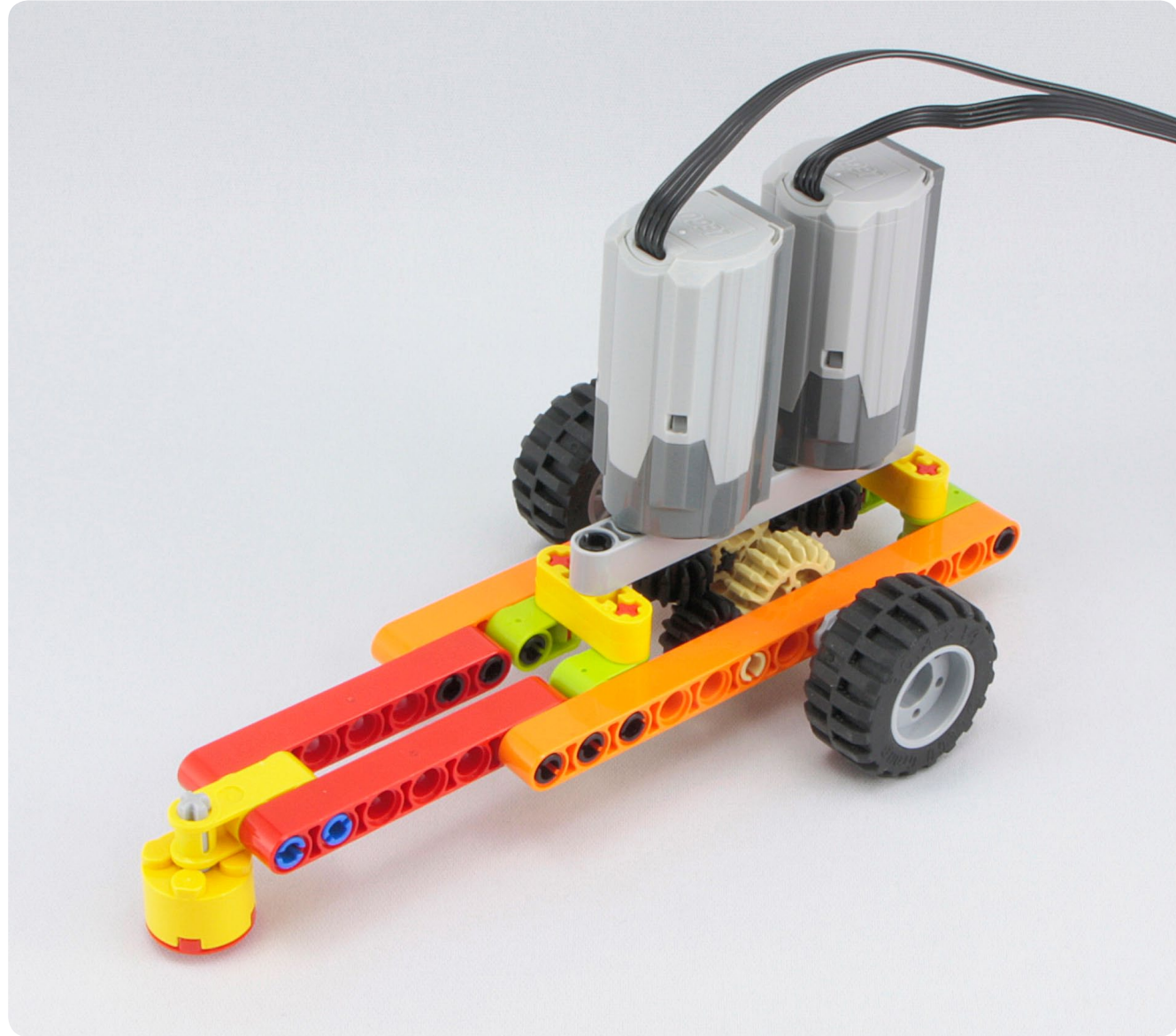
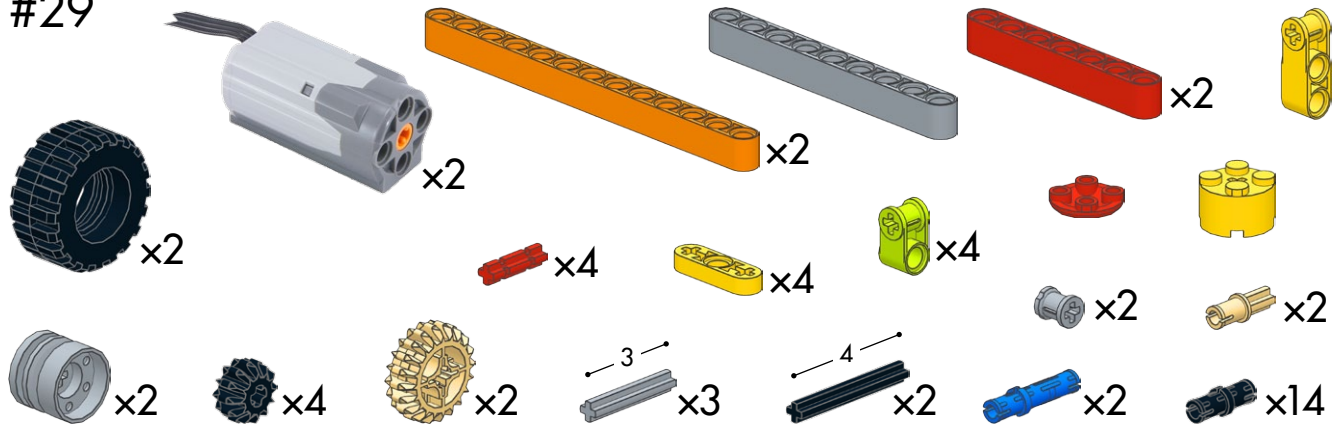


# #28

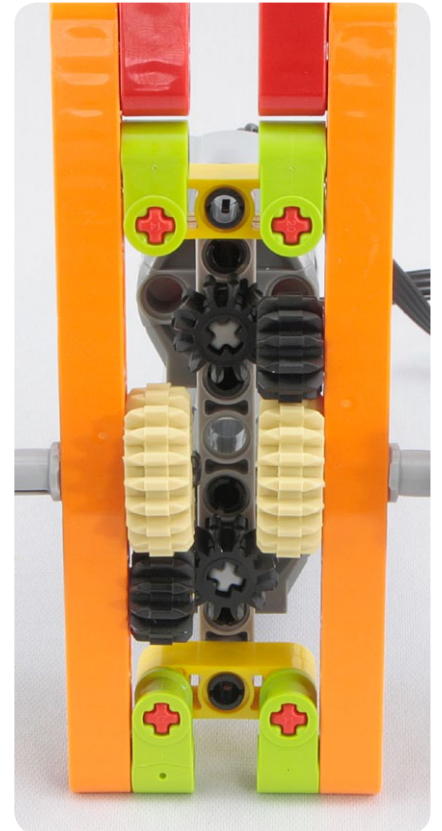
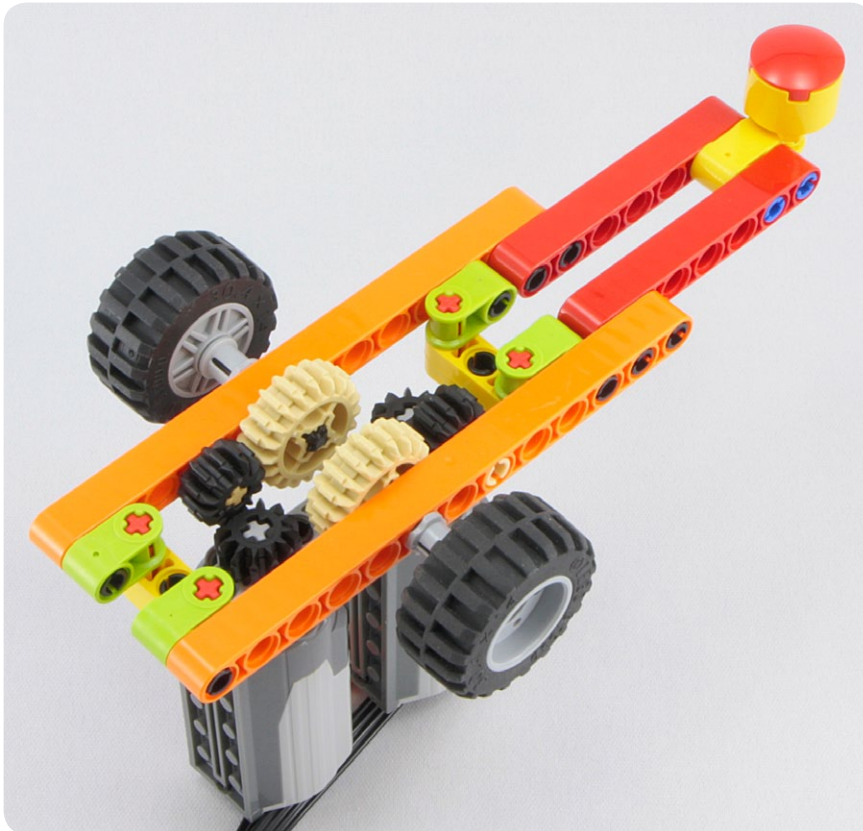


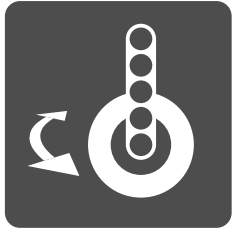


#29

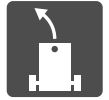


42 Each motor turns a wheel



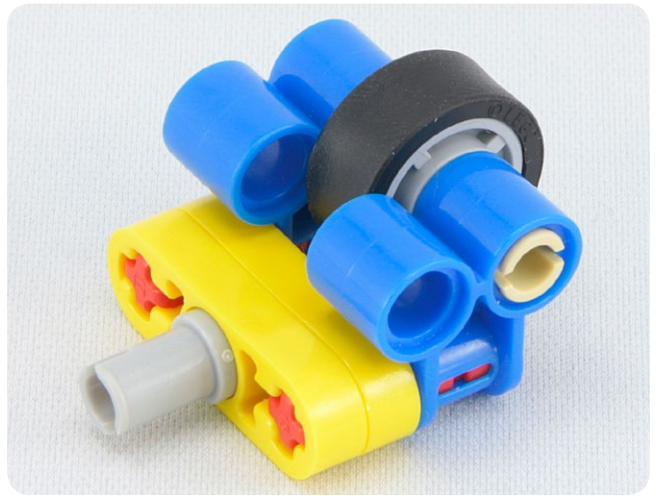
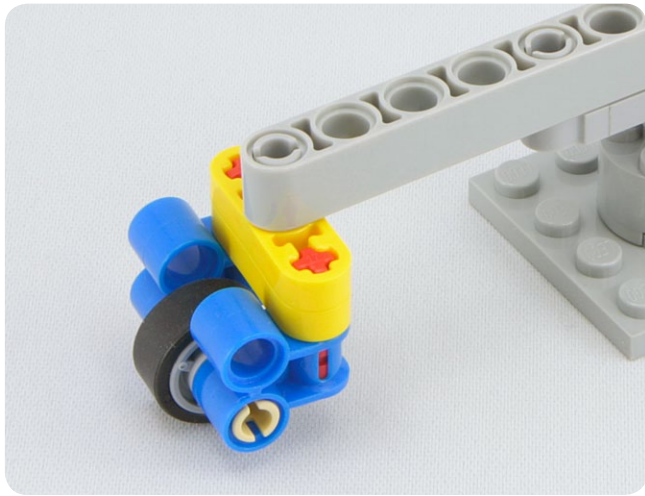


You can build cars that steer by combining these with the models in **Each motor turns a wheel** (page 32).

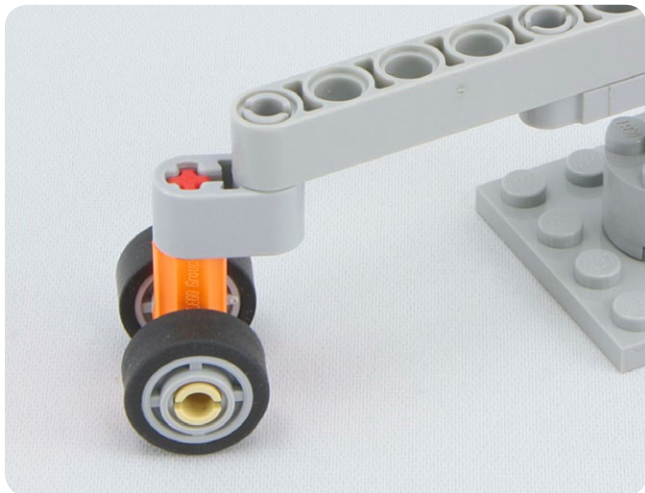


# Caster wheels

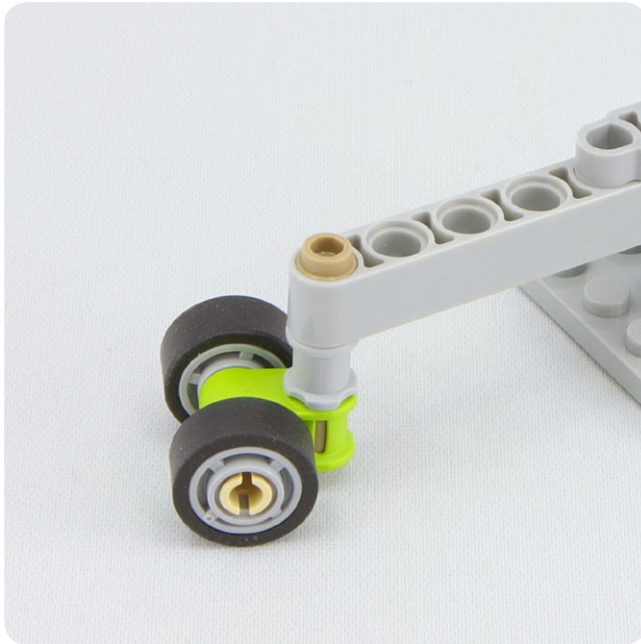
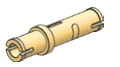
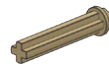
#30



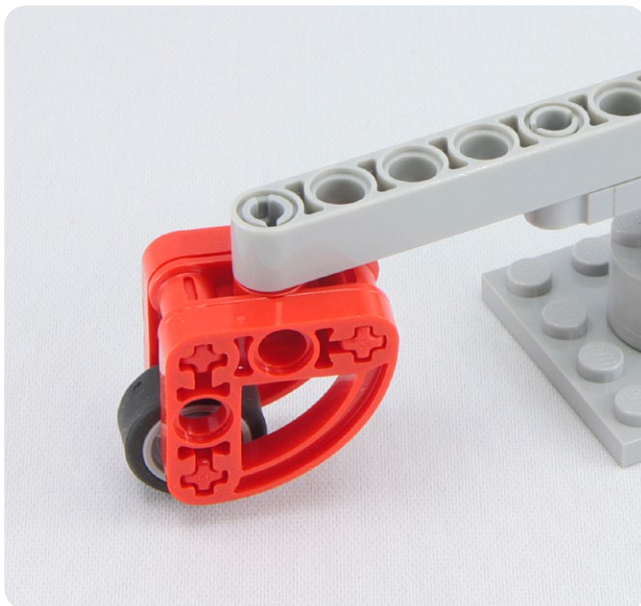
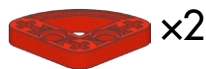
#31



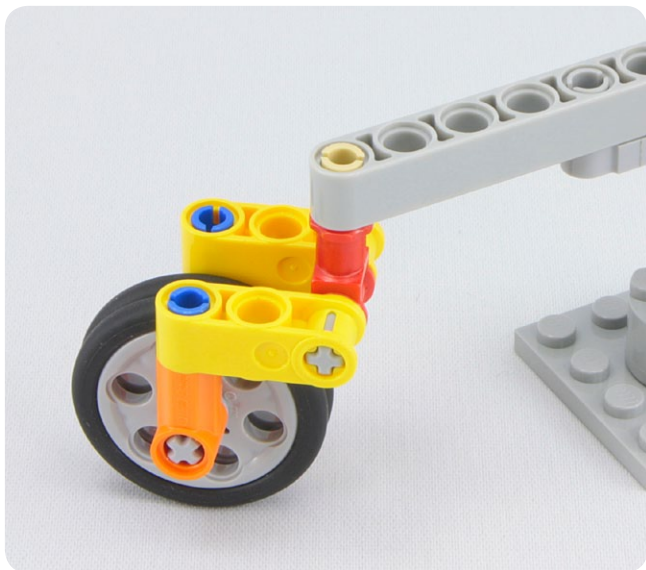
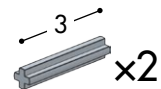
#32



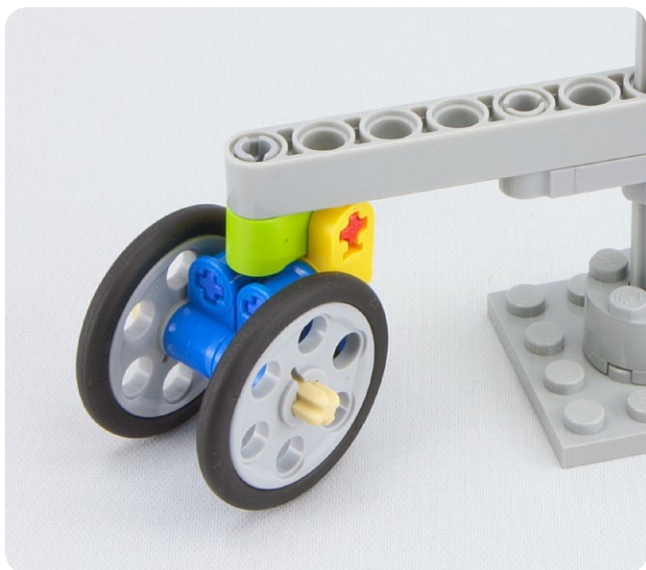
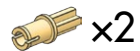
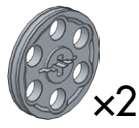
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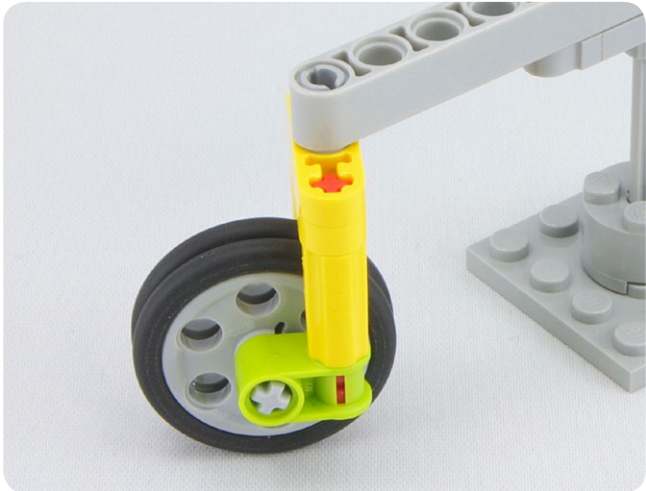
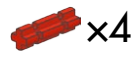
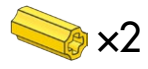
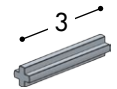
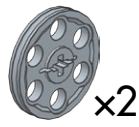
#34



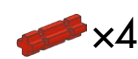
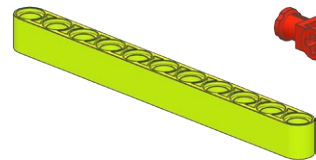
#35



#36

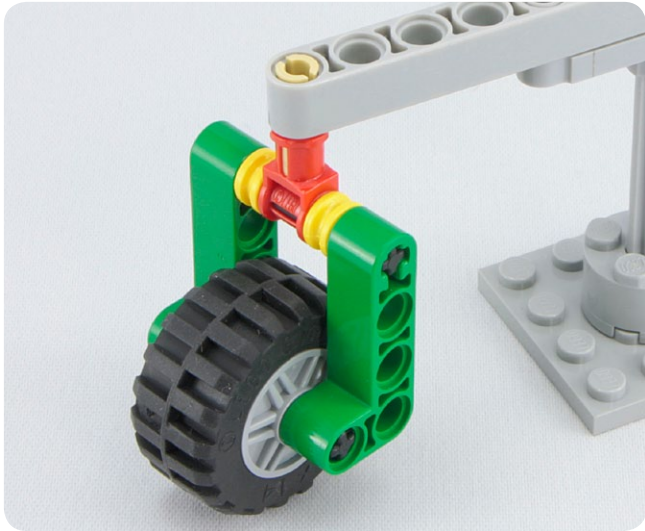
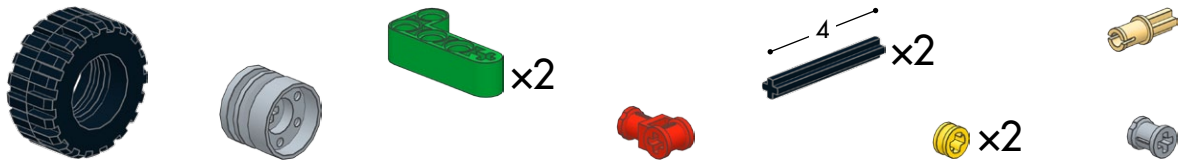


#37

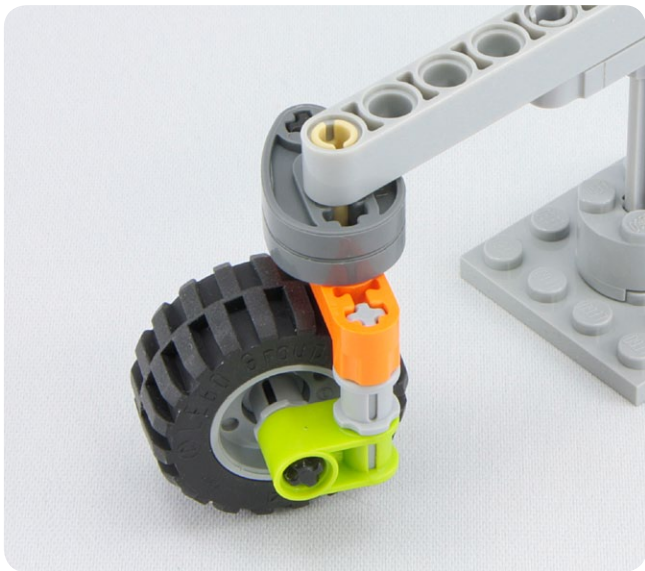
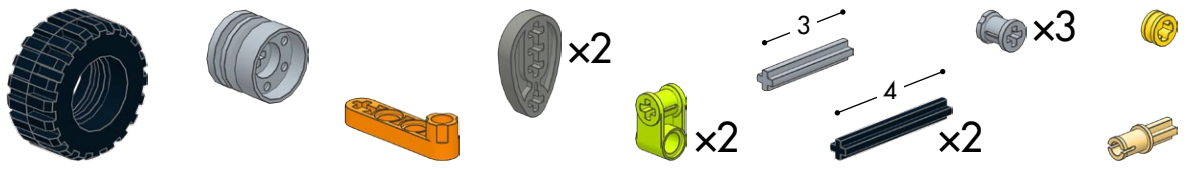




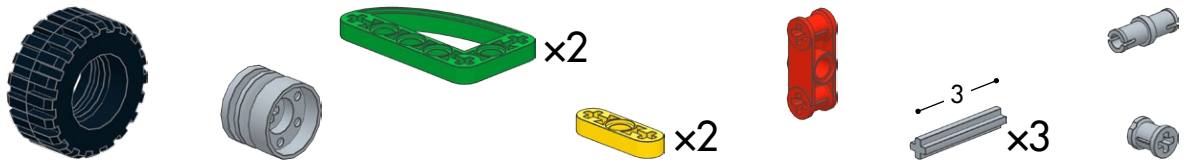
#38



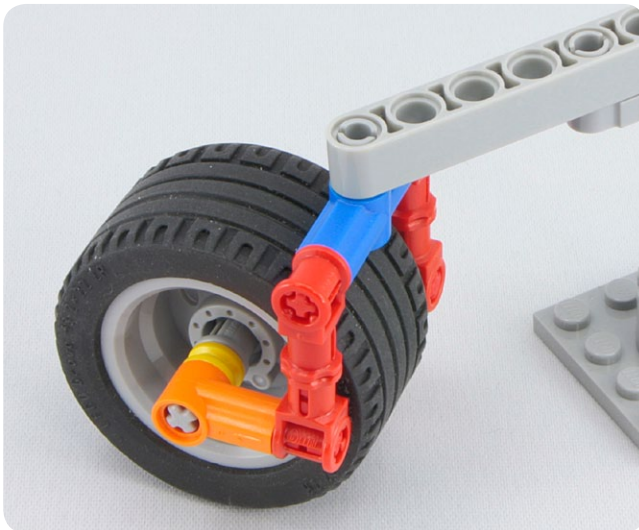
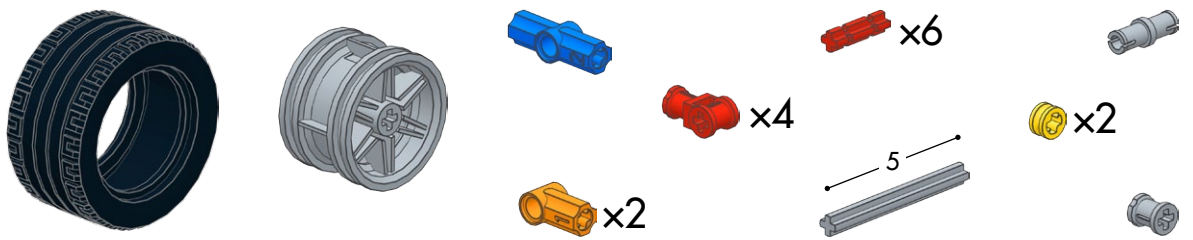
#39

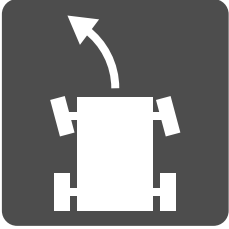


#40



#41





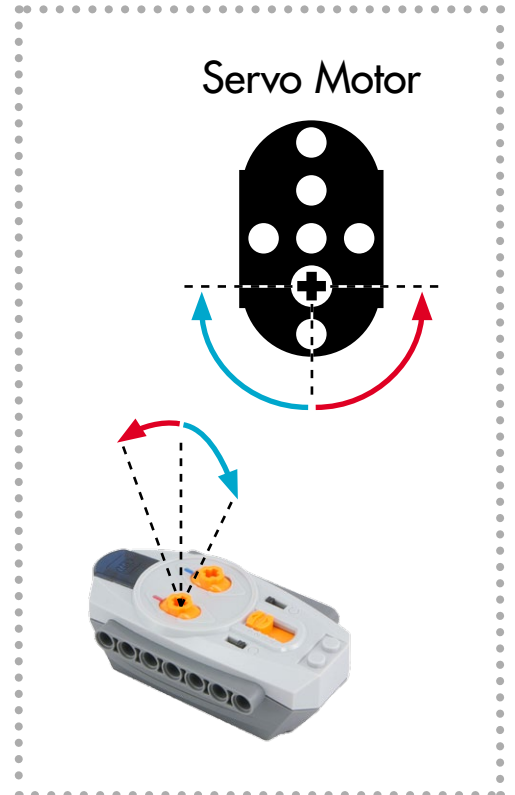
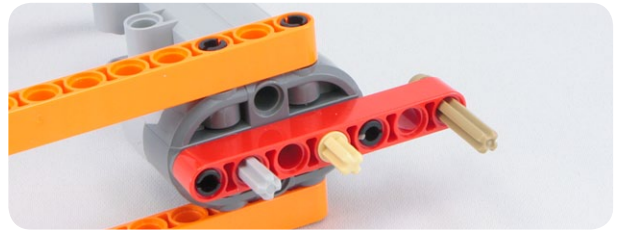
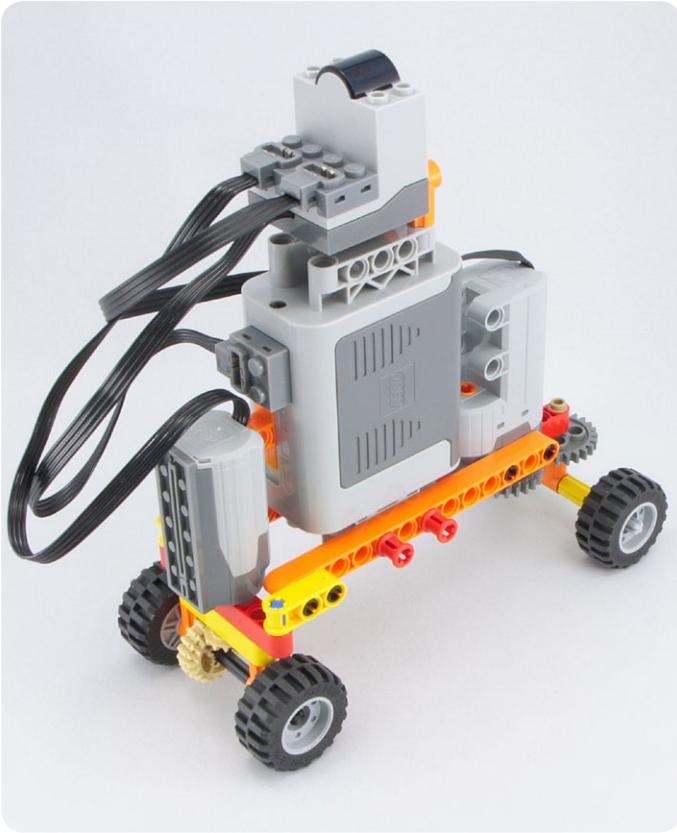
You can combine these models with those in **Differential gears** (page 68).



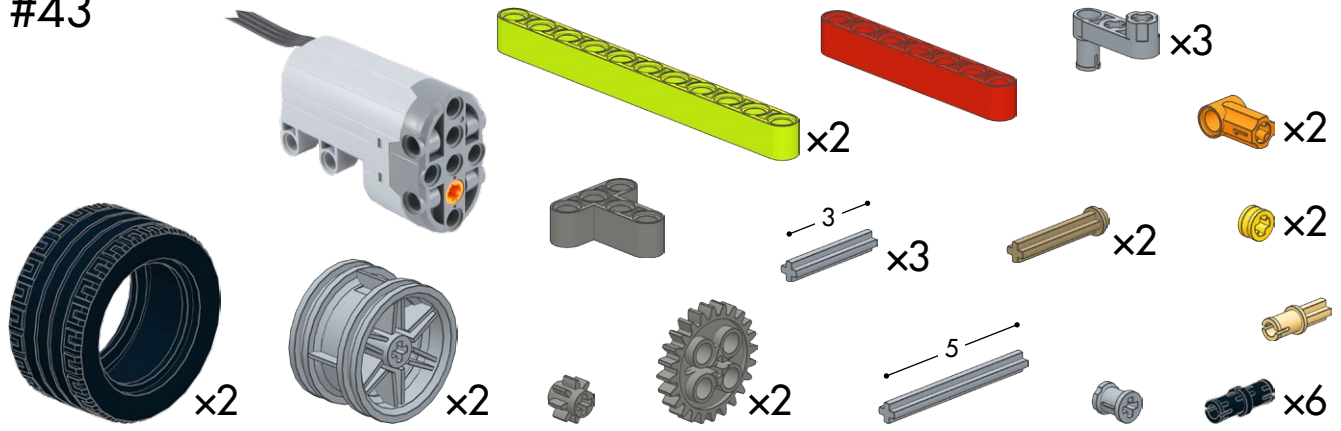
# Steering with the servo motor

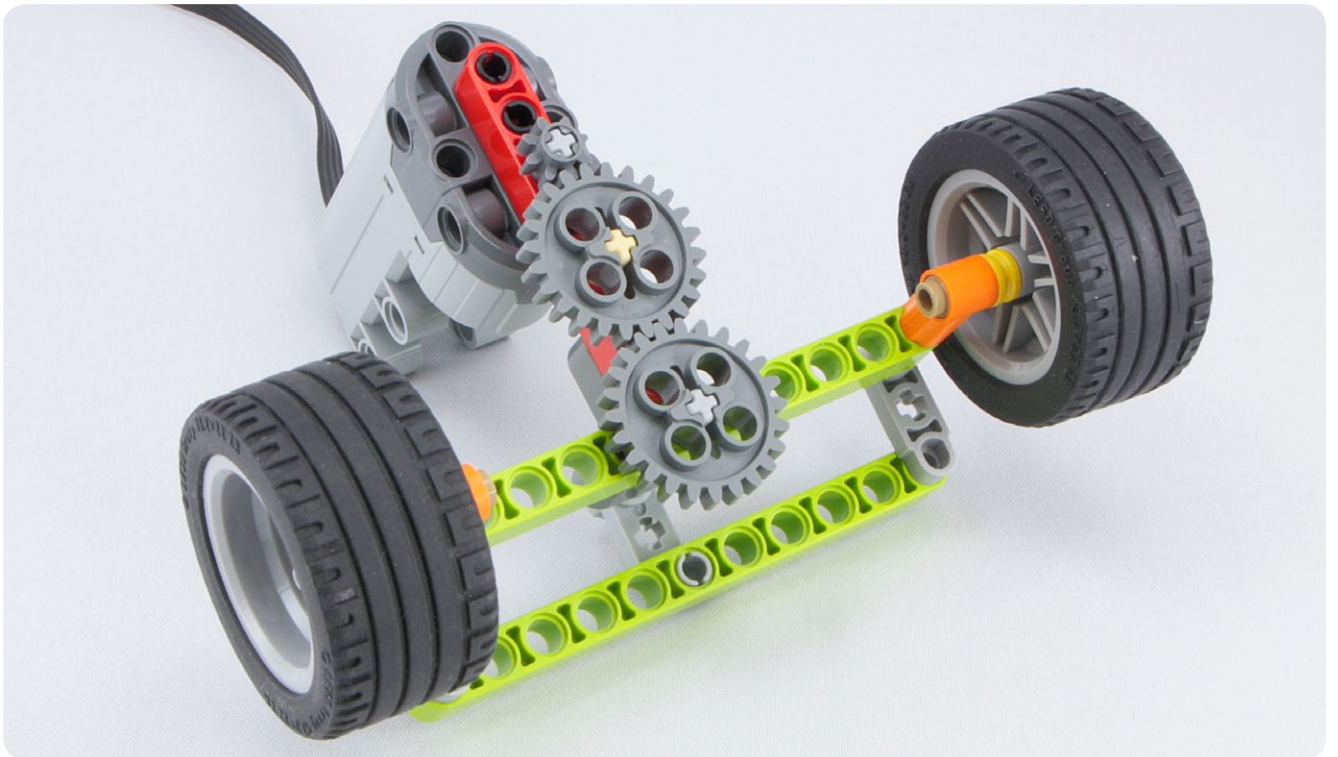
#42



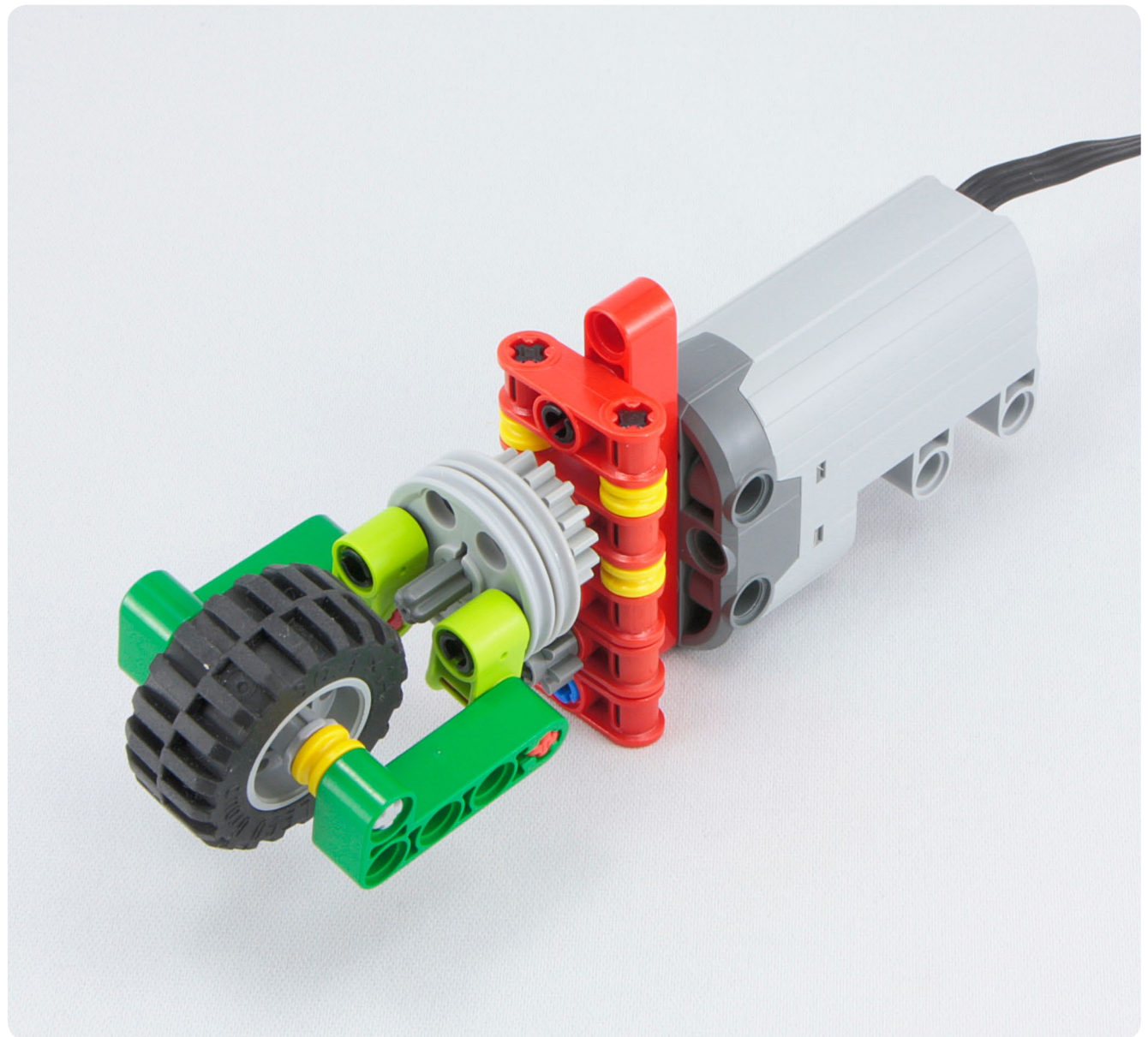
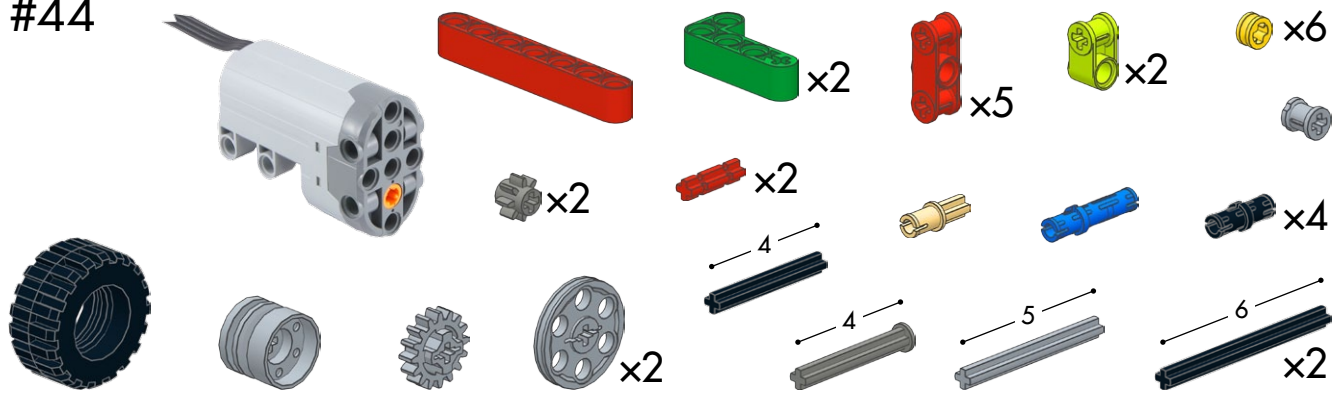


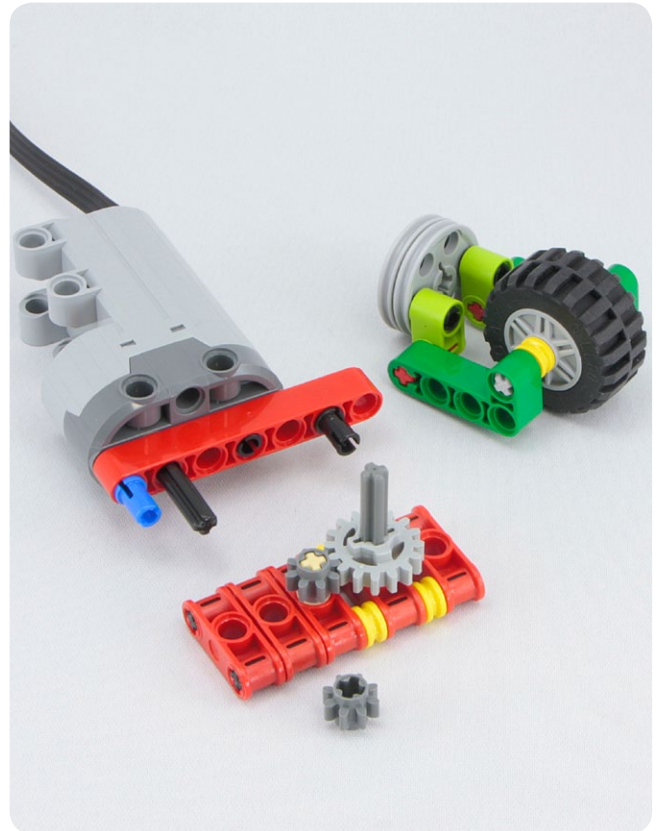
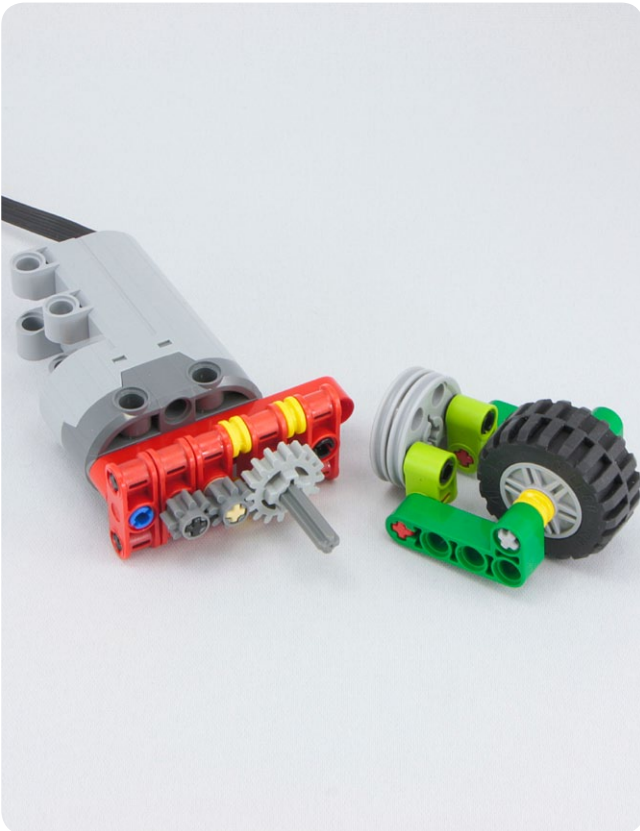
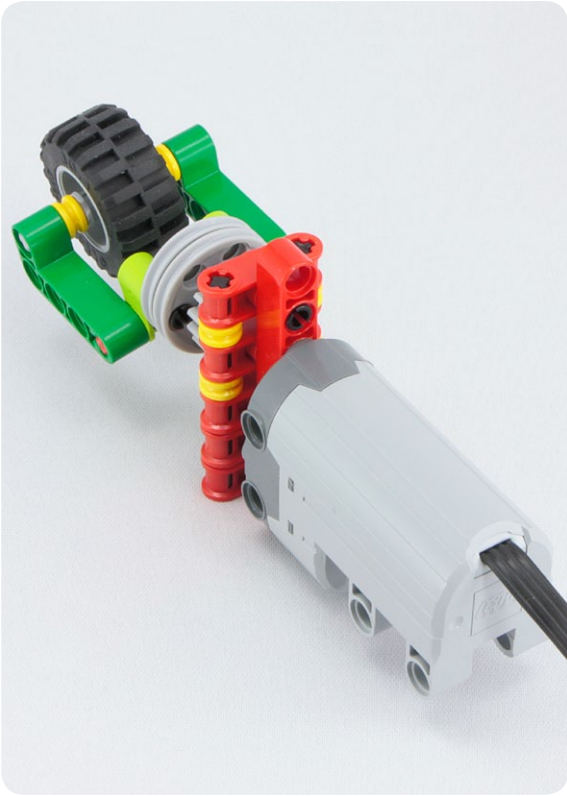
#43





#44



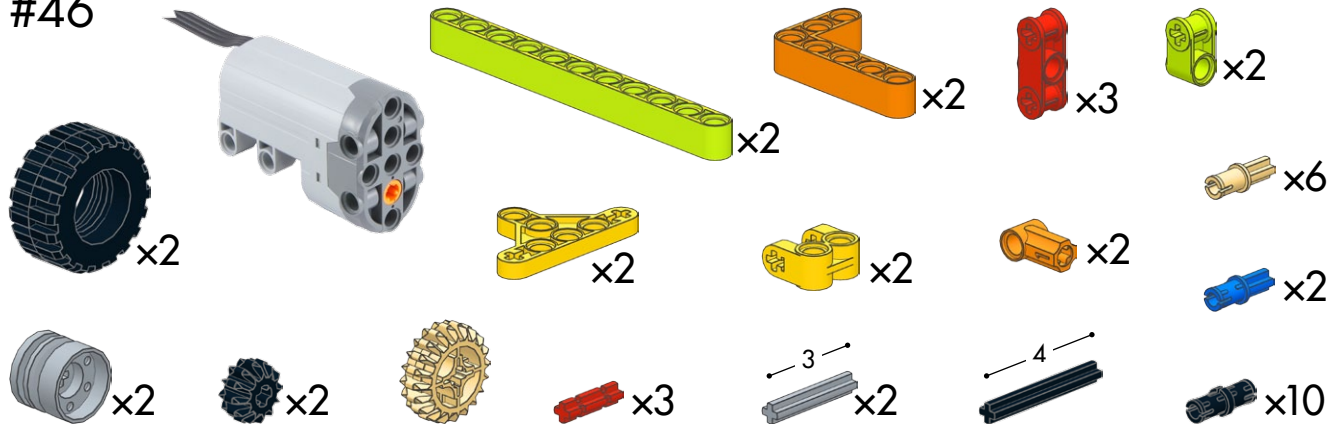






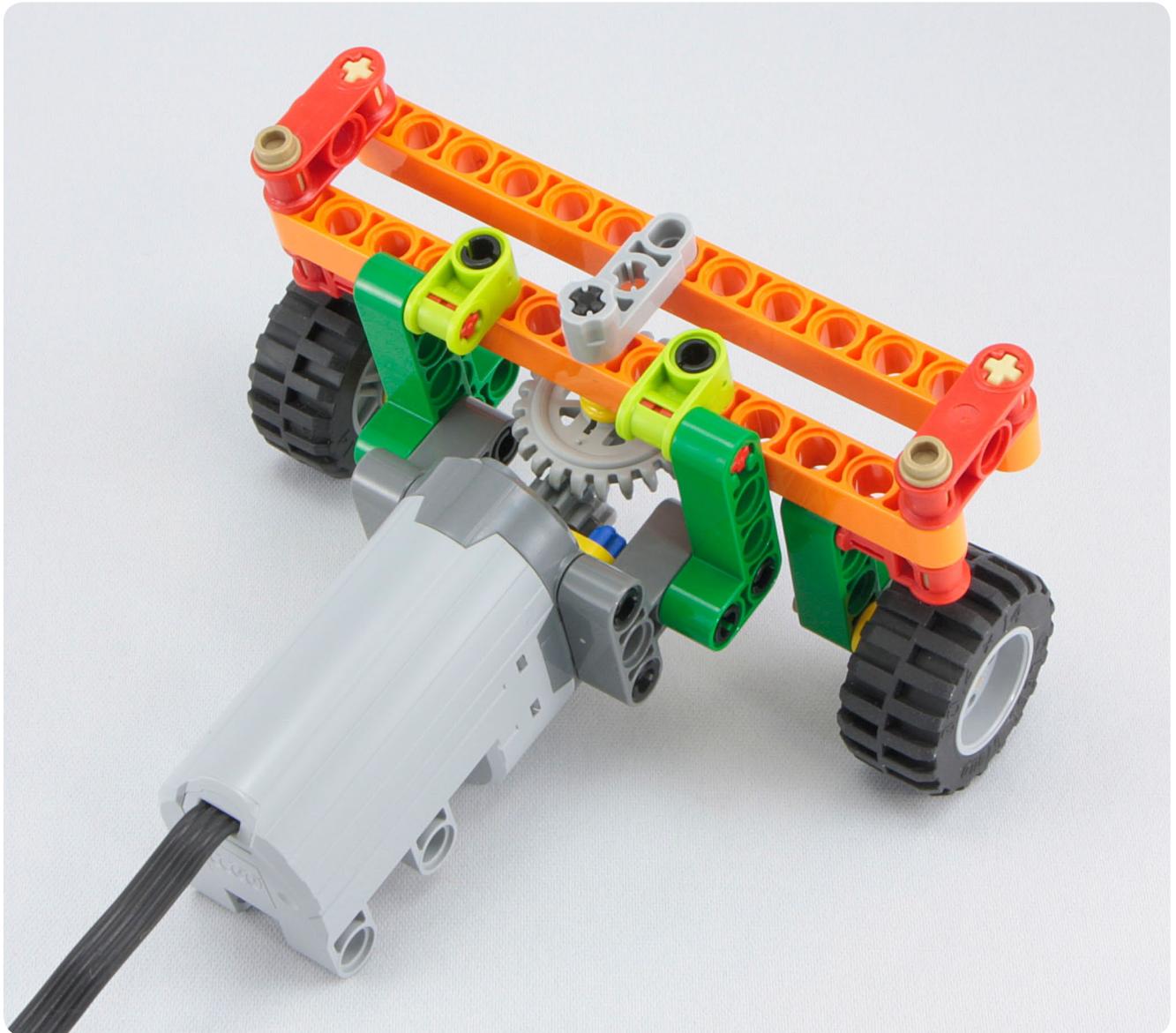
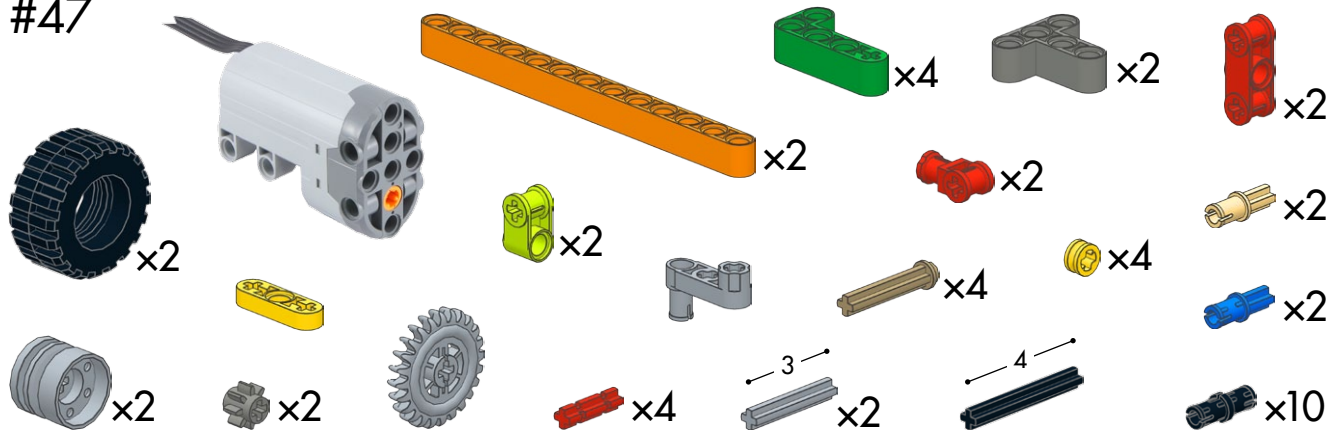


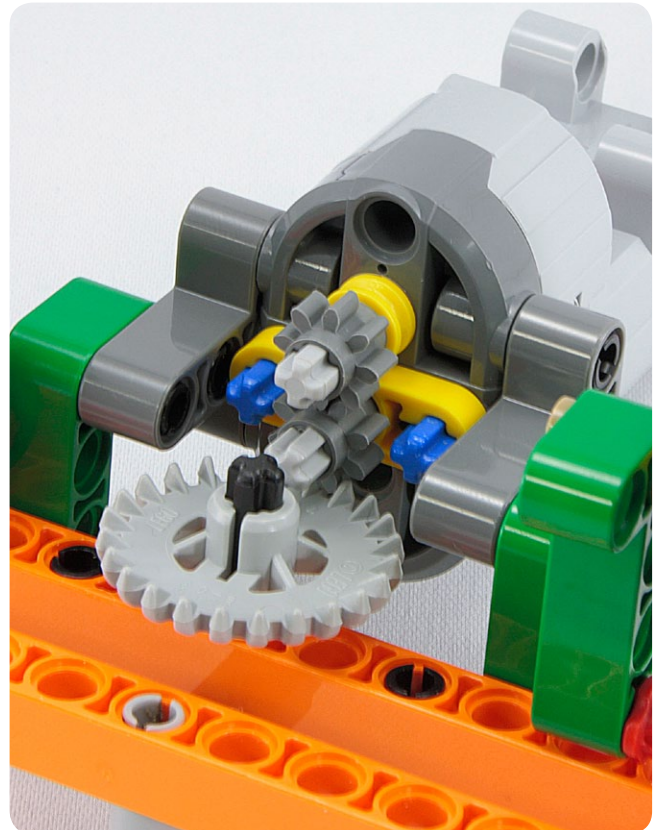
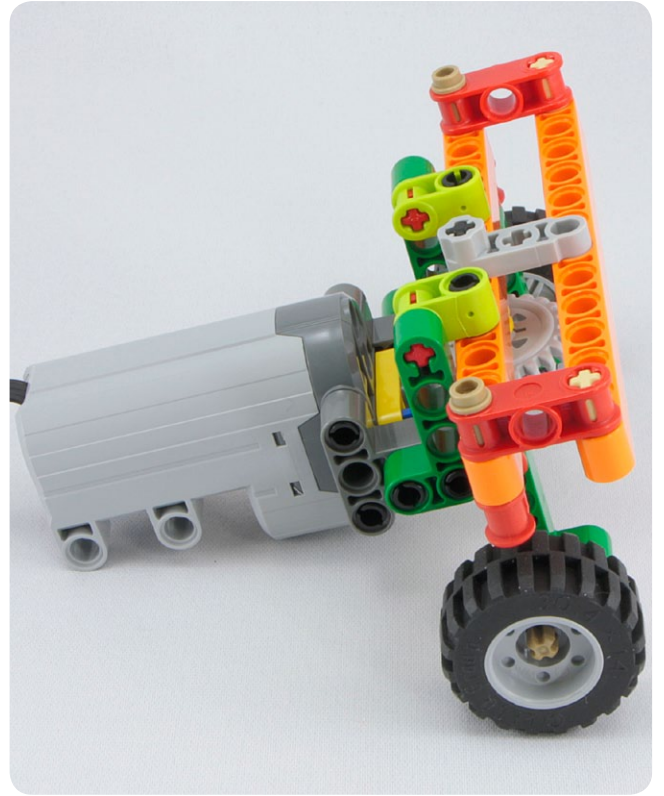
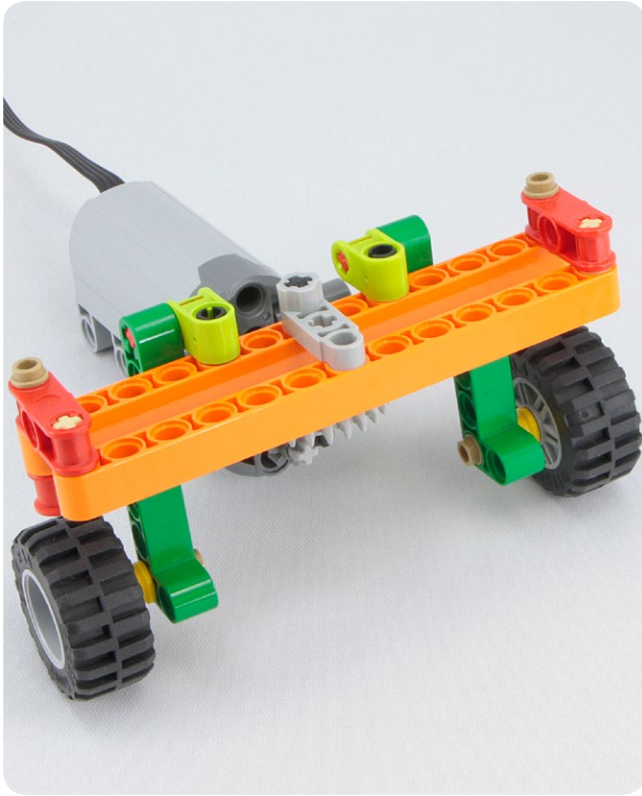
#46



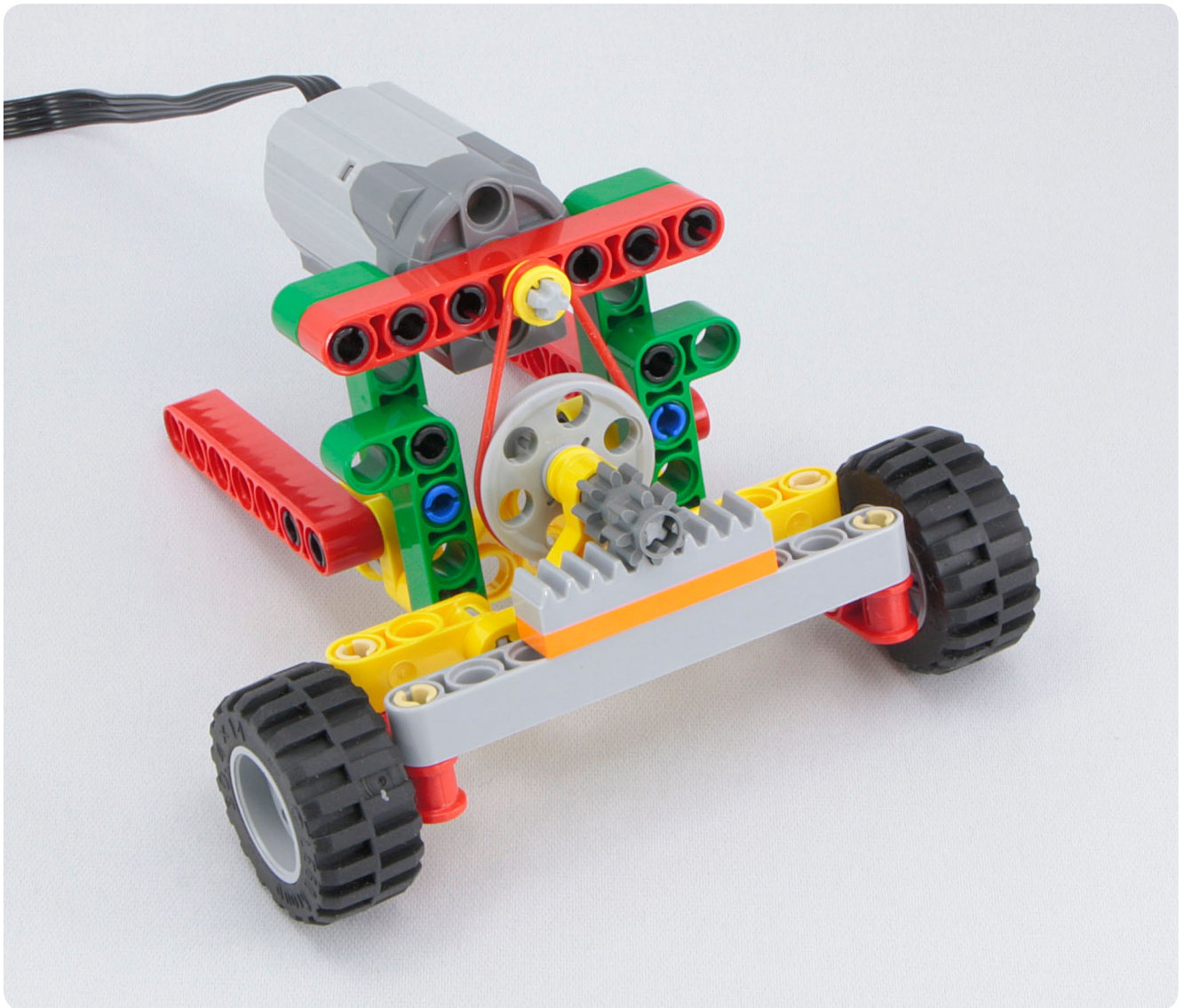
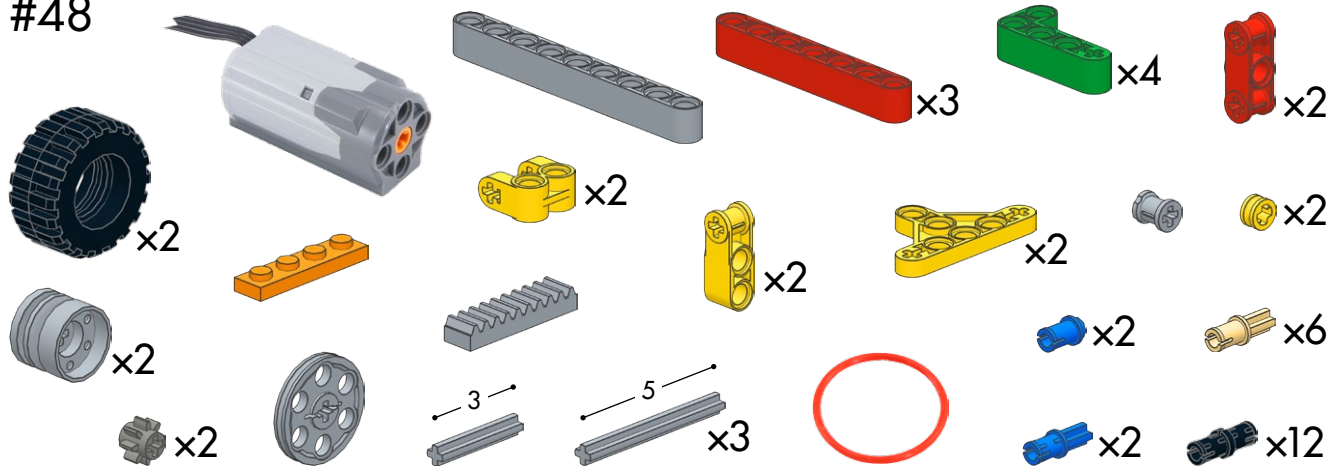


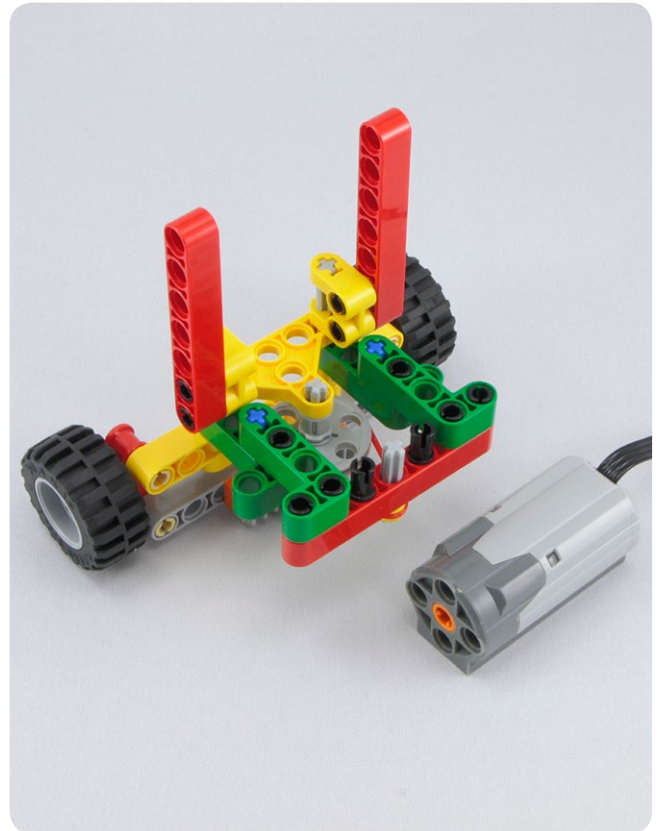
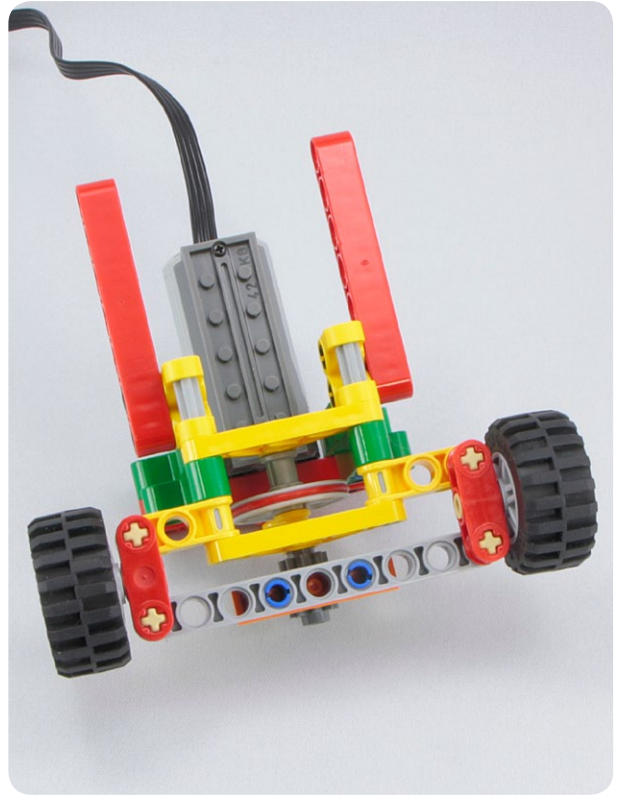
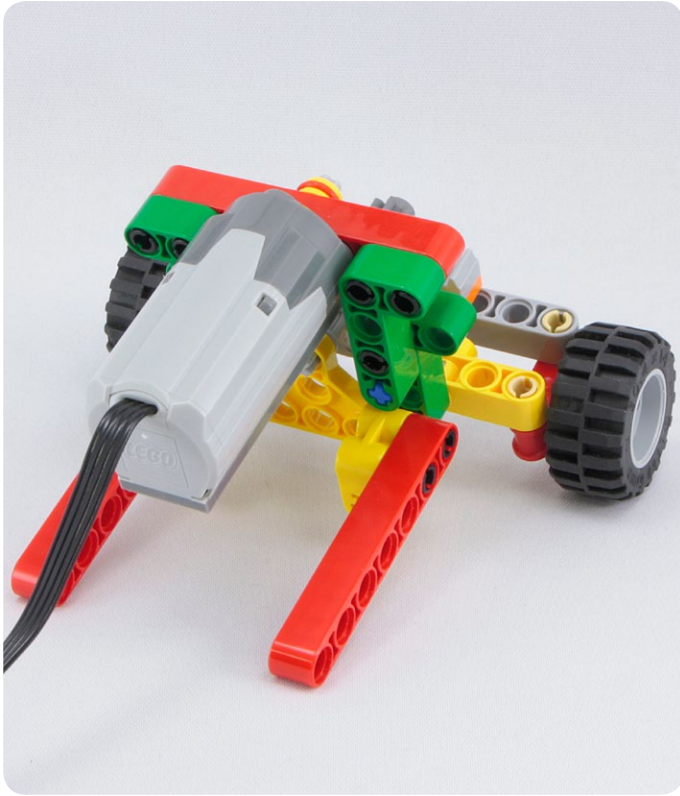
#47





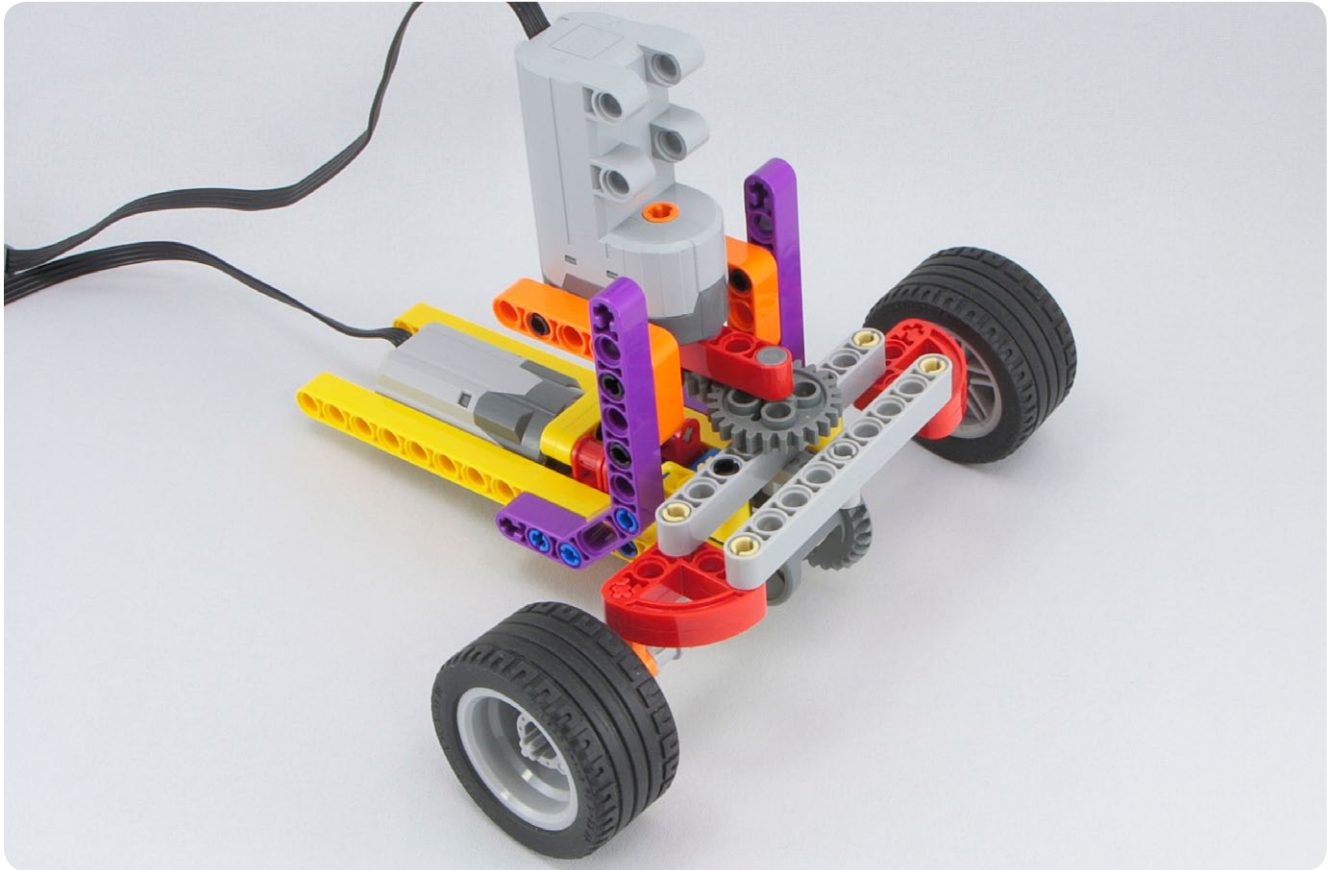
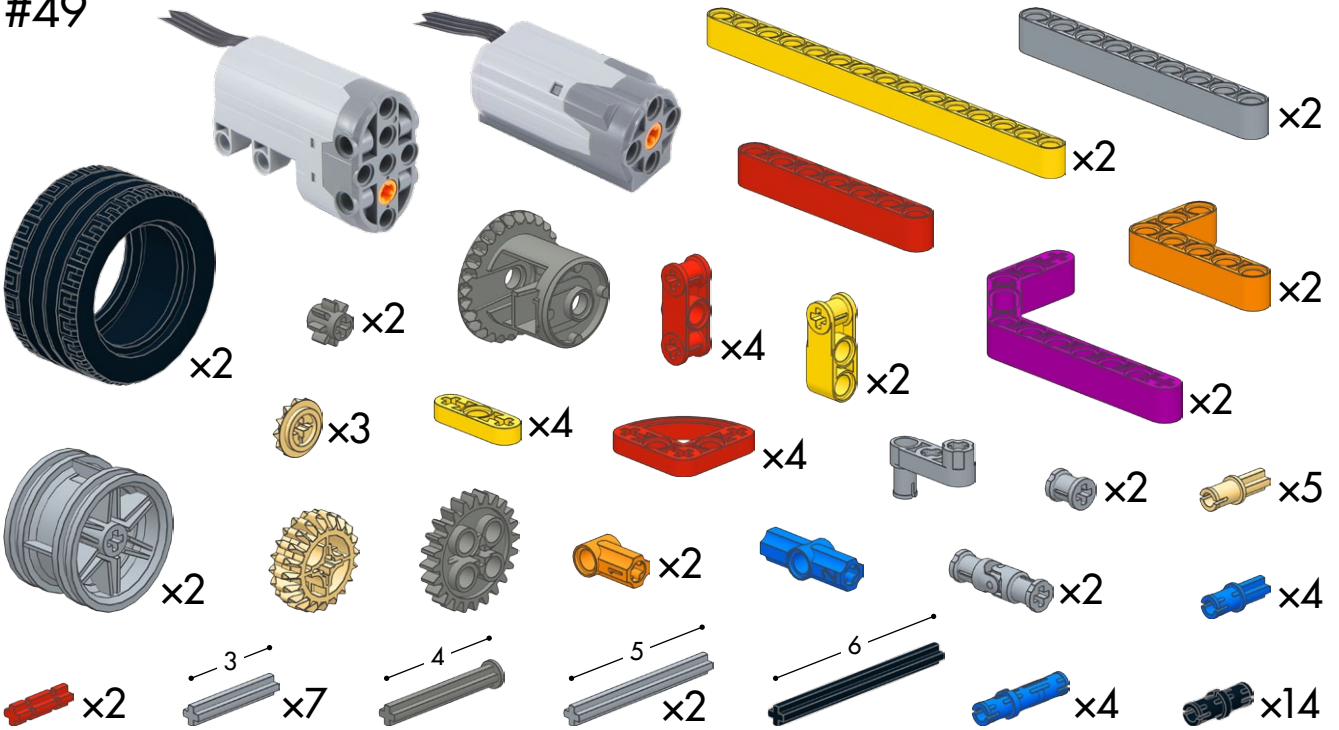
#48

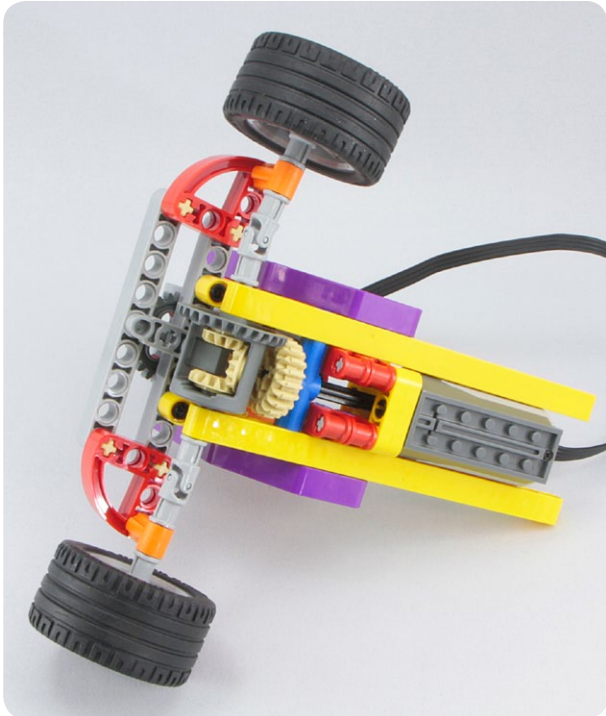
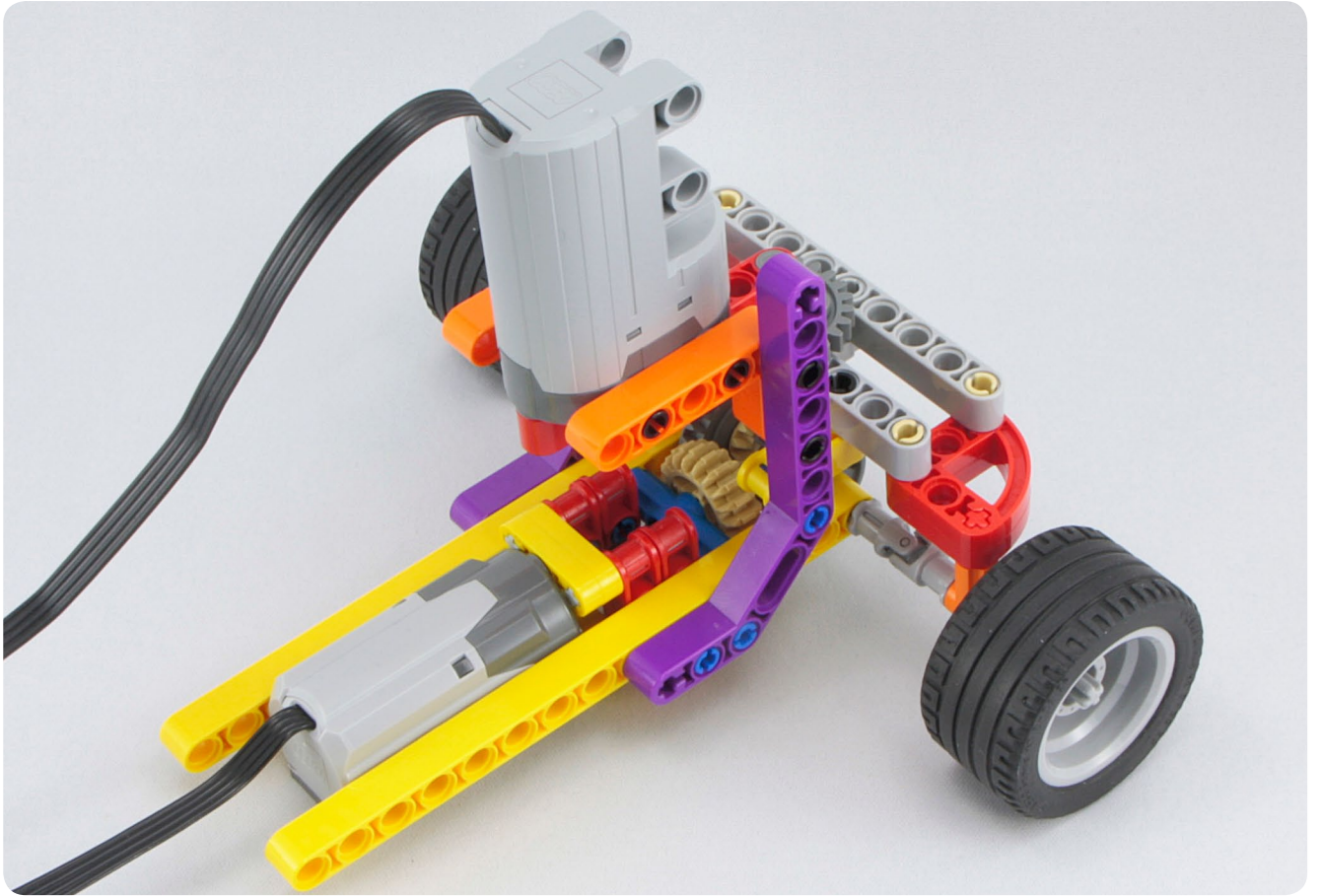


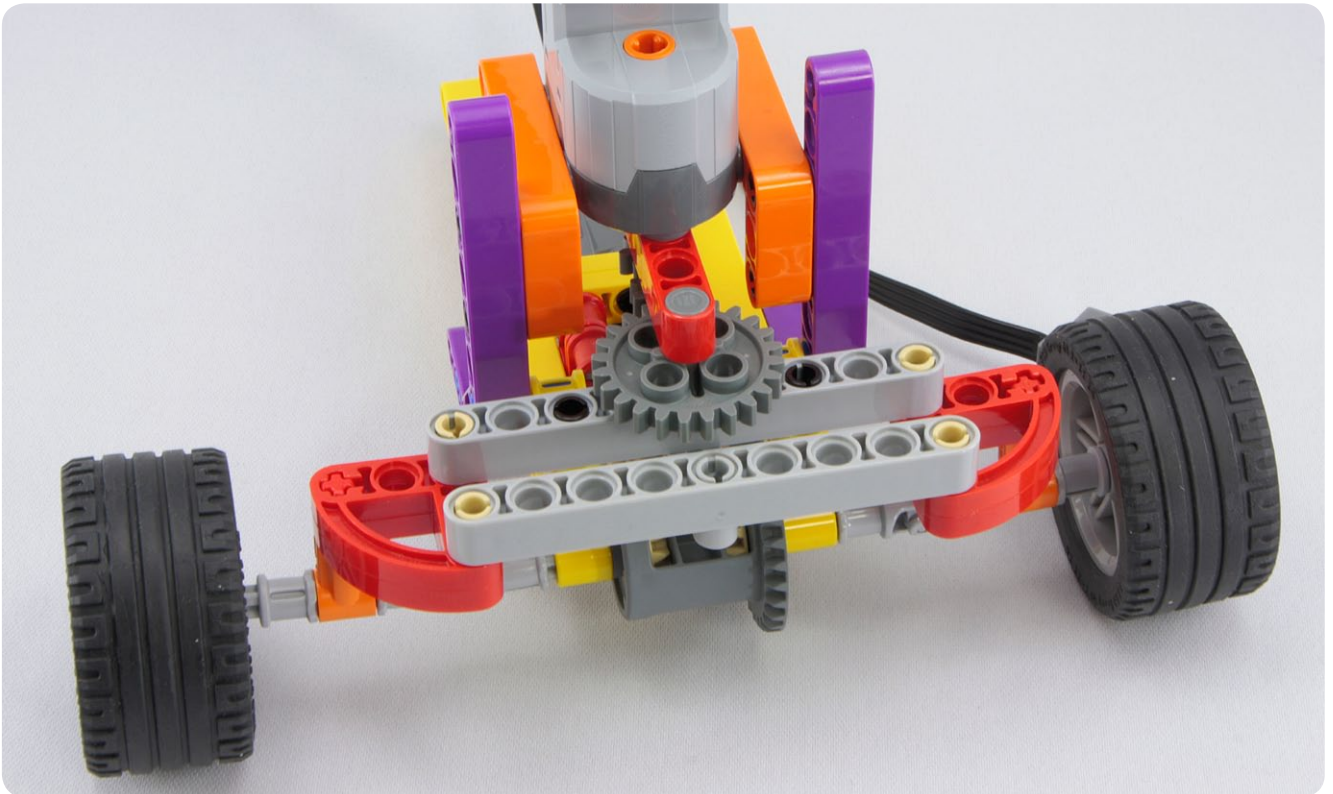
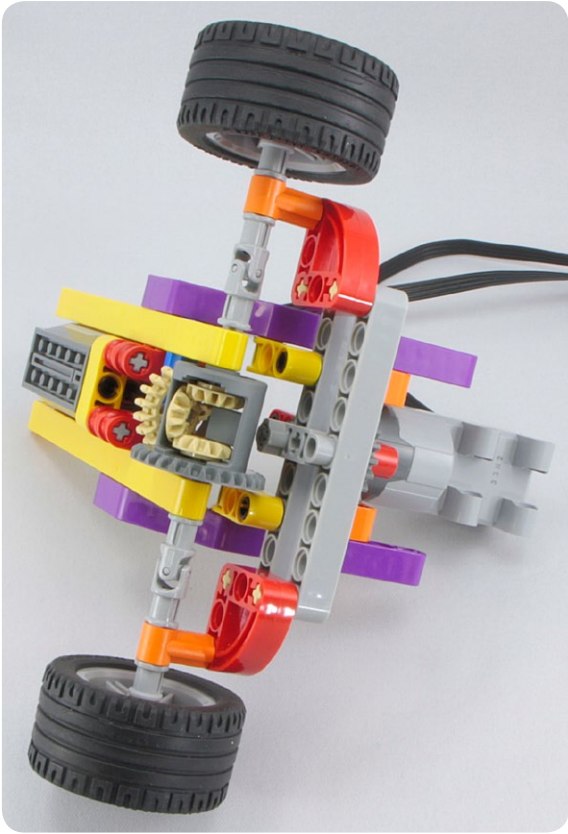


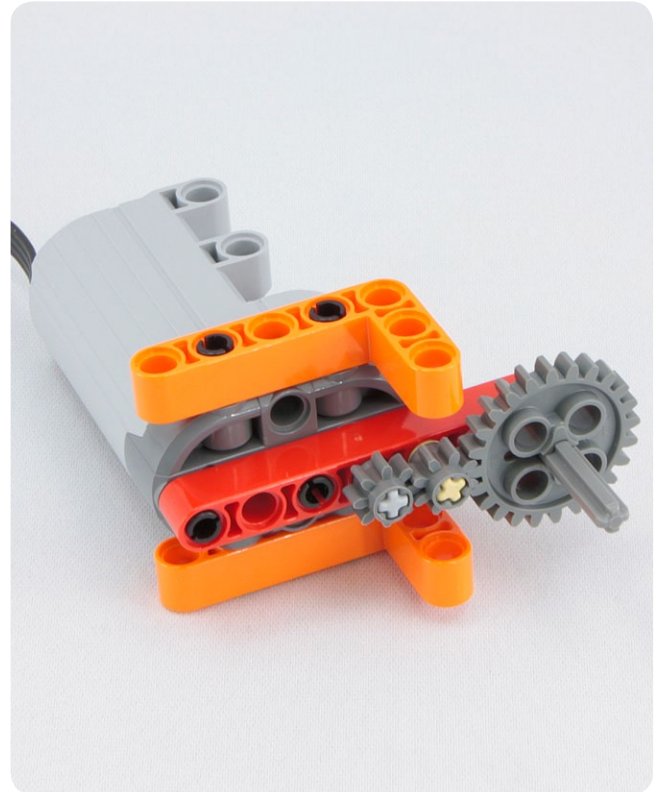
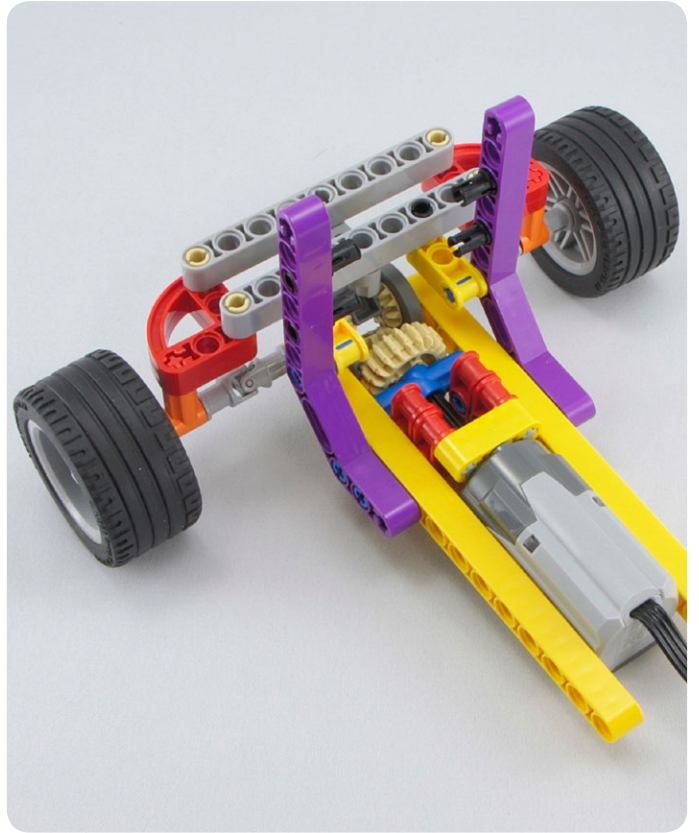
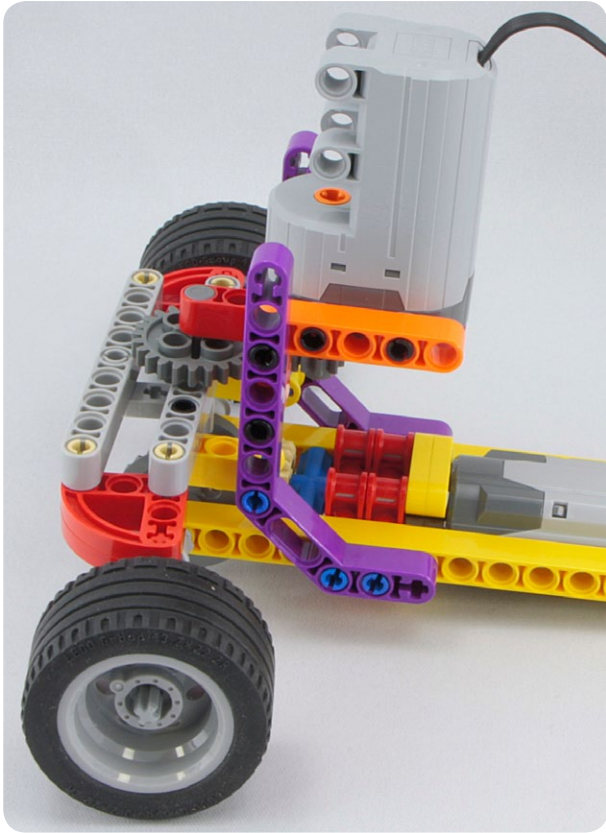


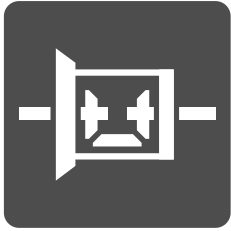
# #49









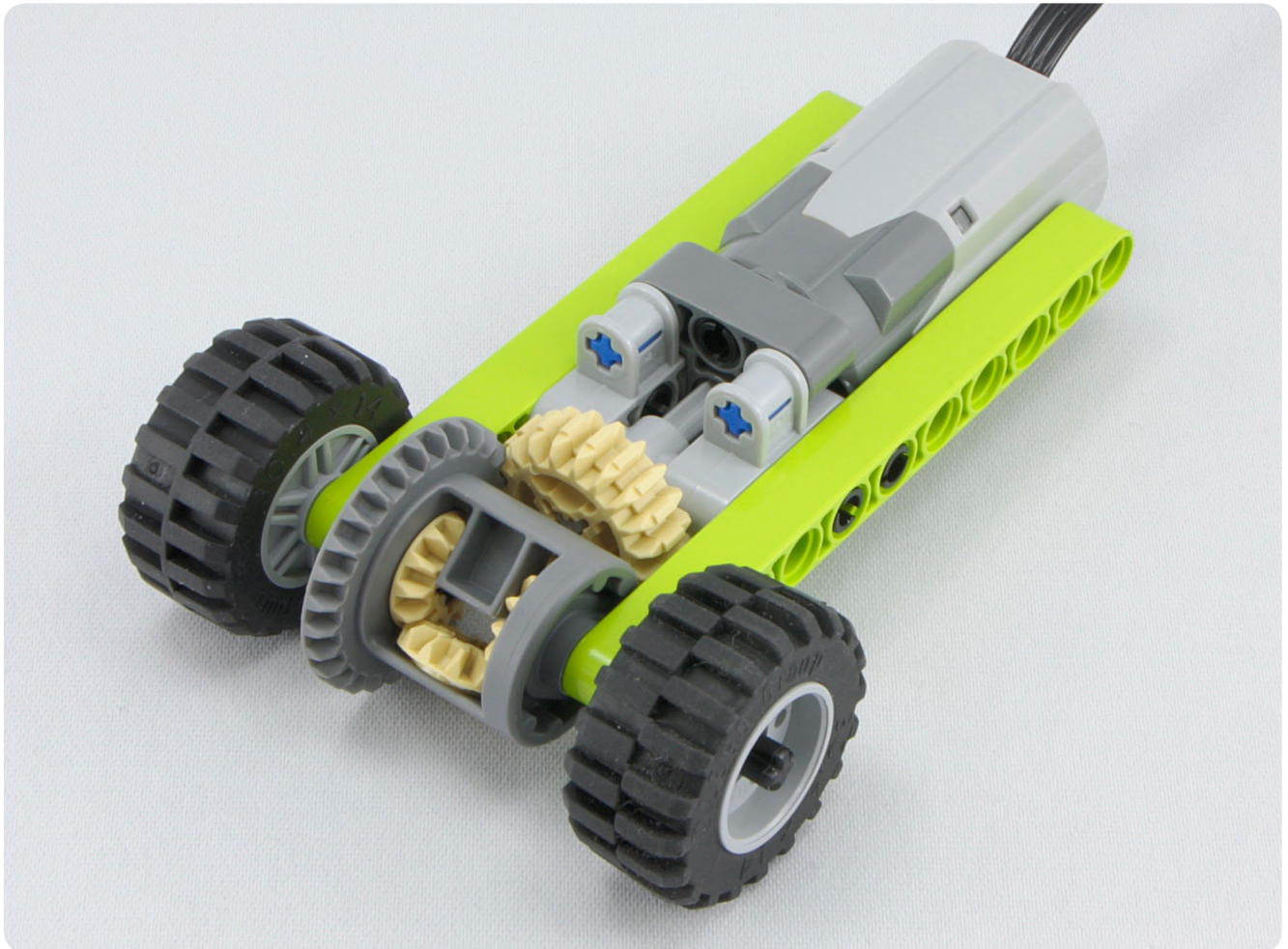
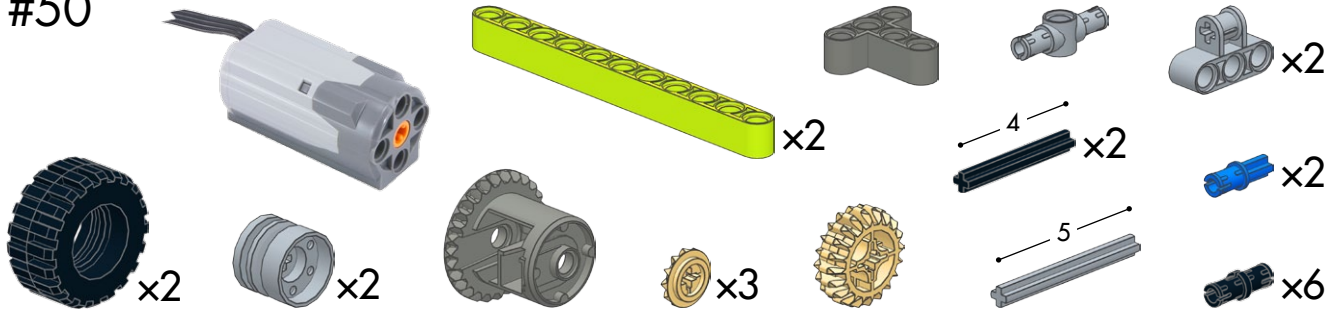


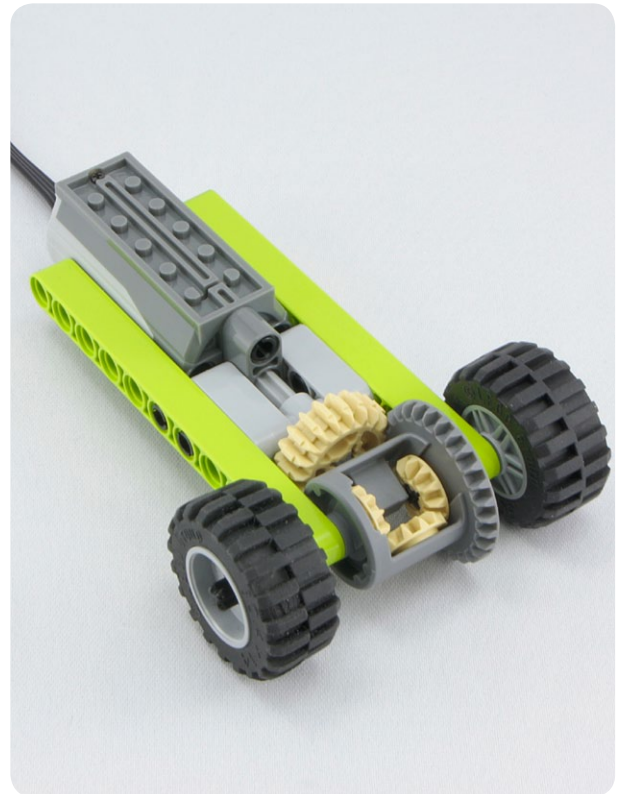
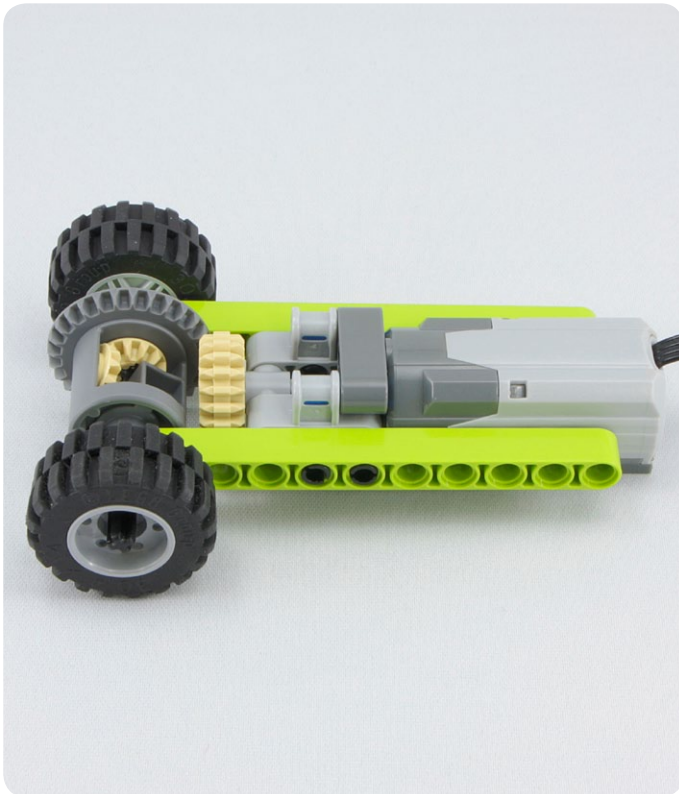
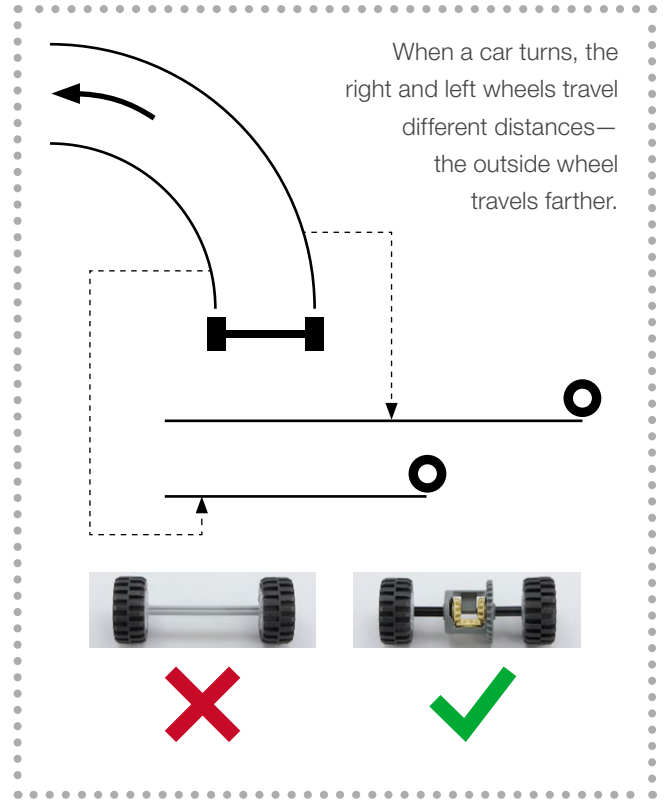
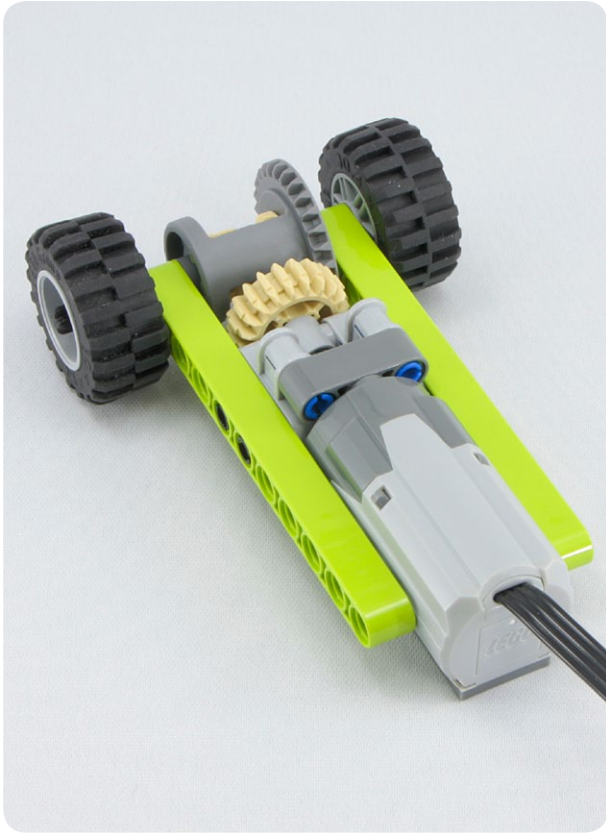
You can combine these models with those in **Steering with the servo motor** (page 50).



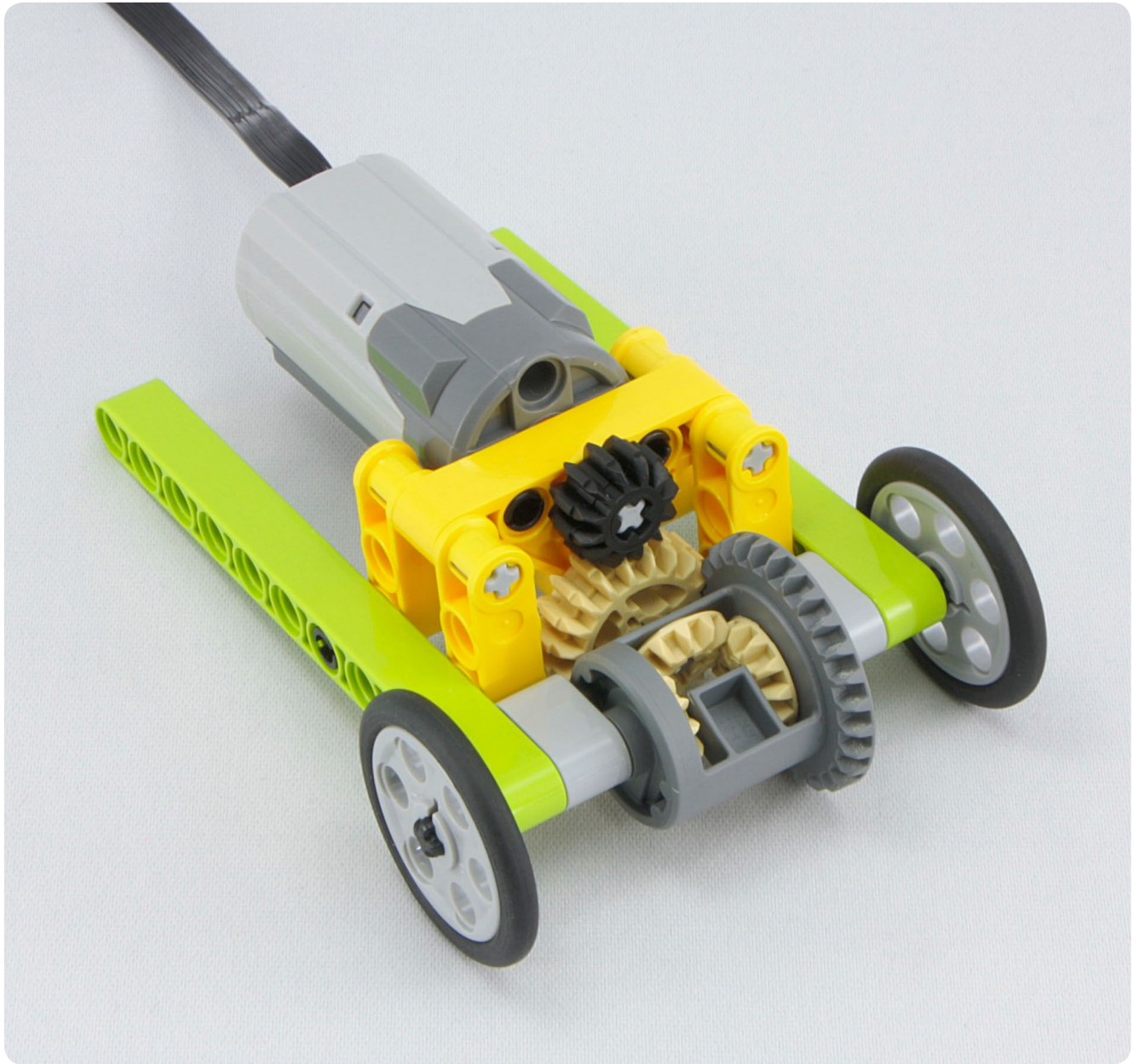
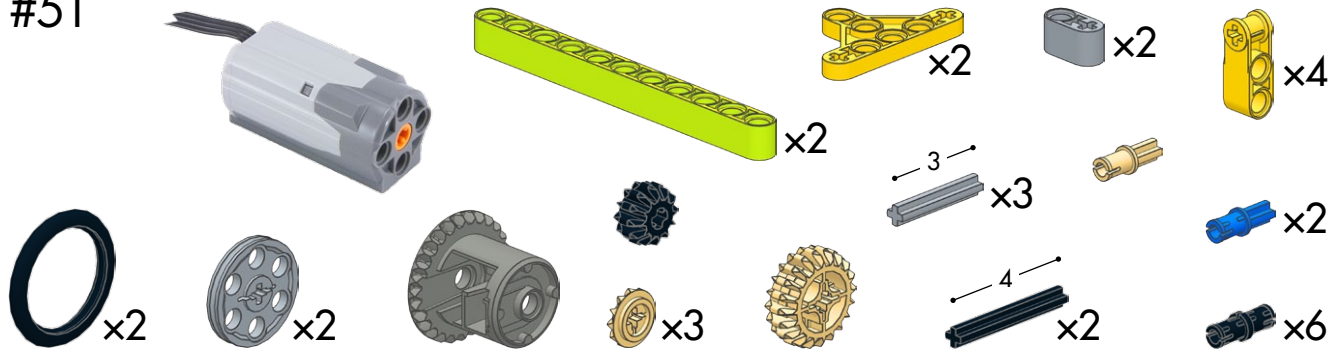
# Differential gears

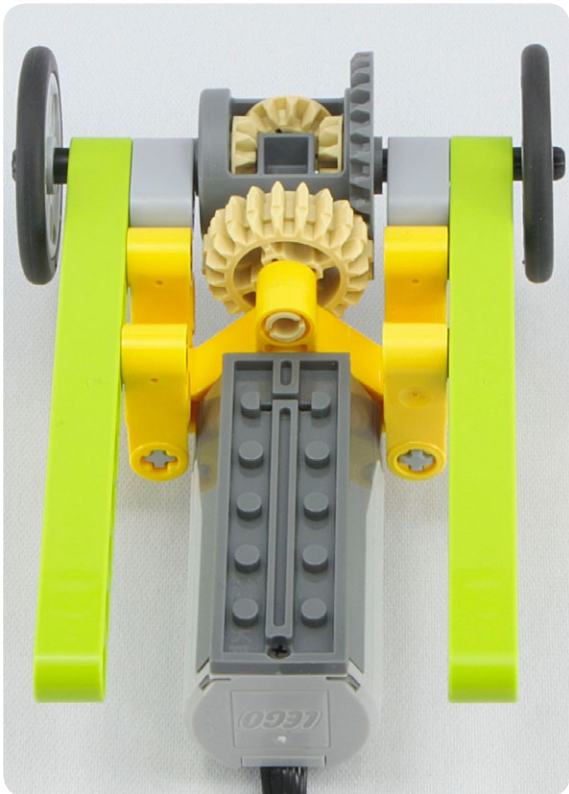
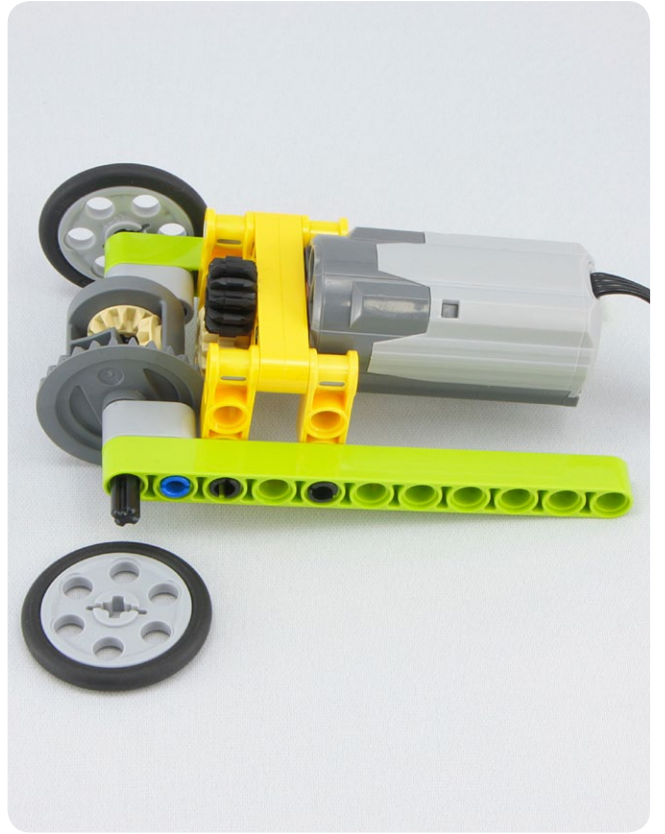
#50





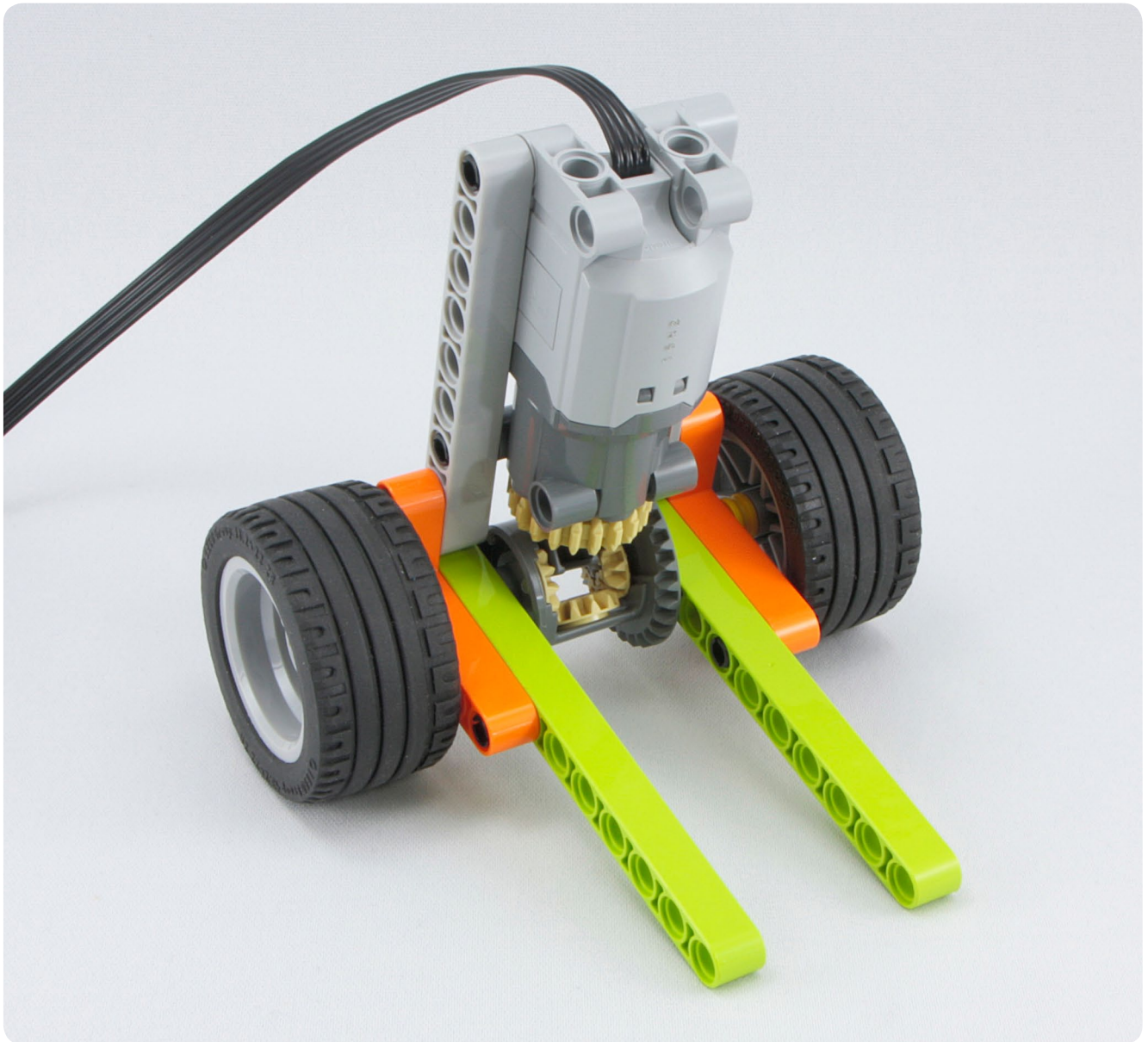
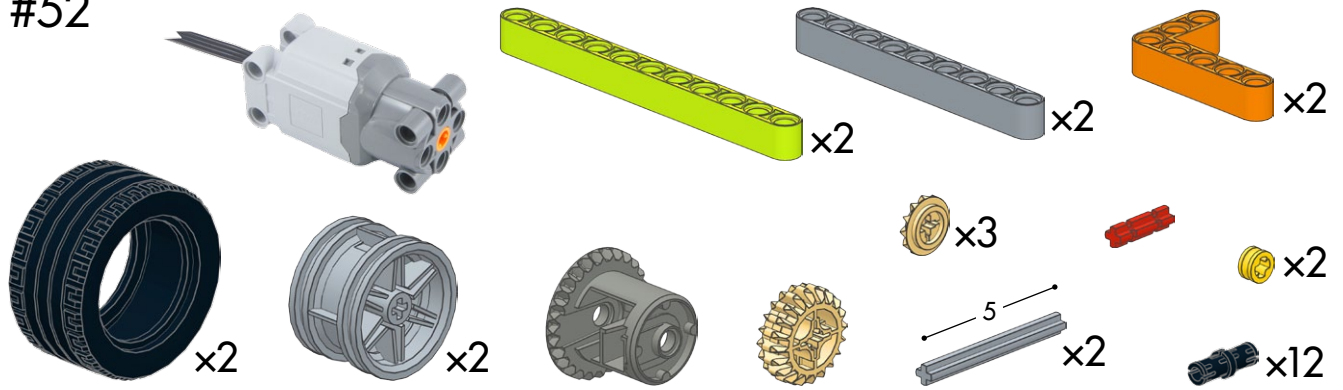
#51

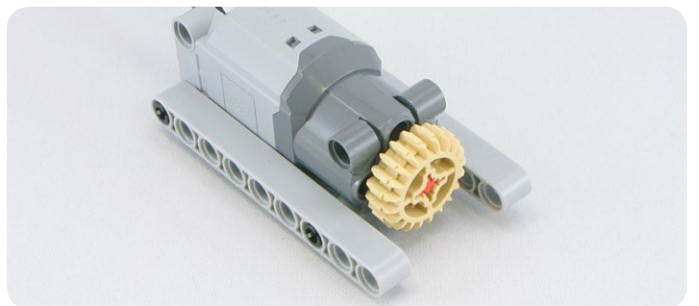
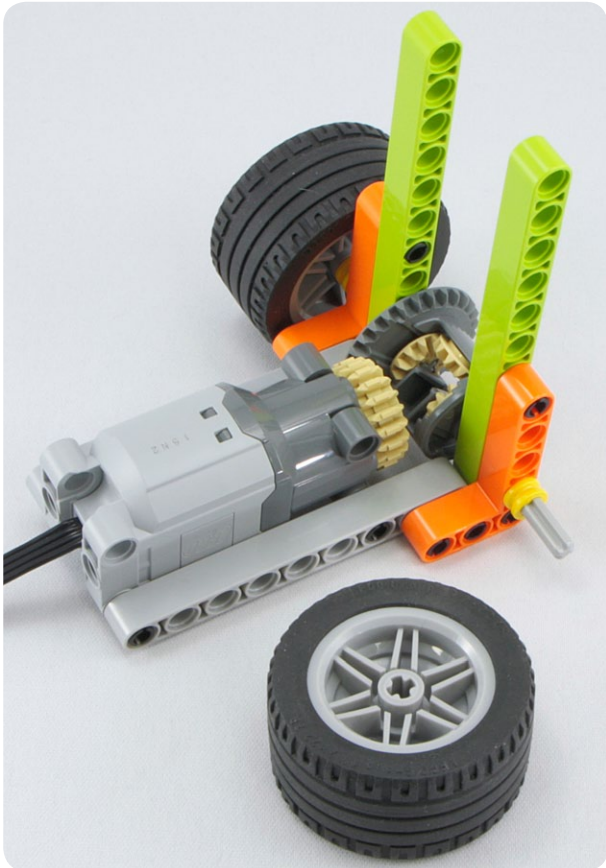
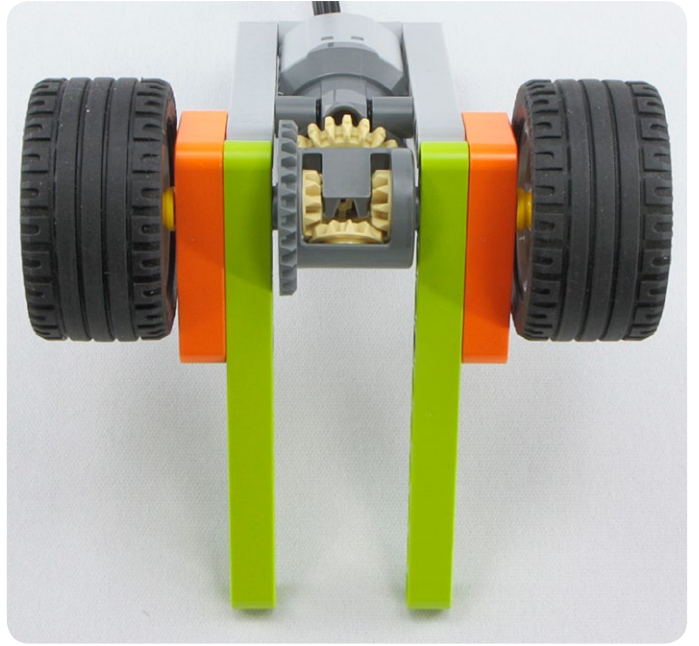
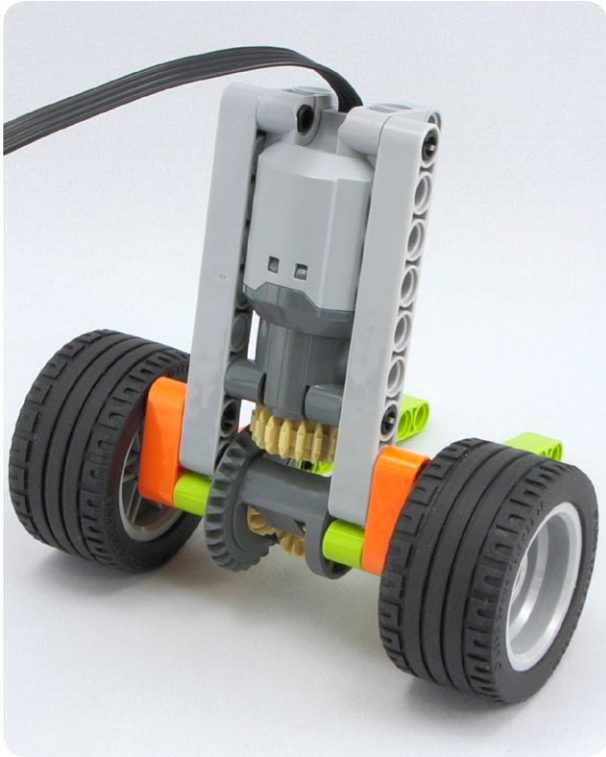




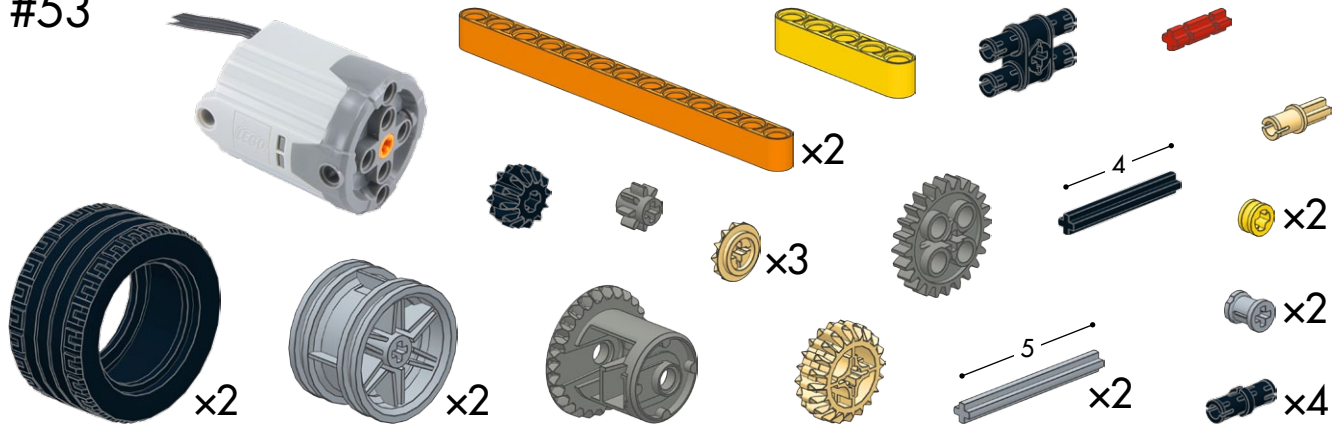


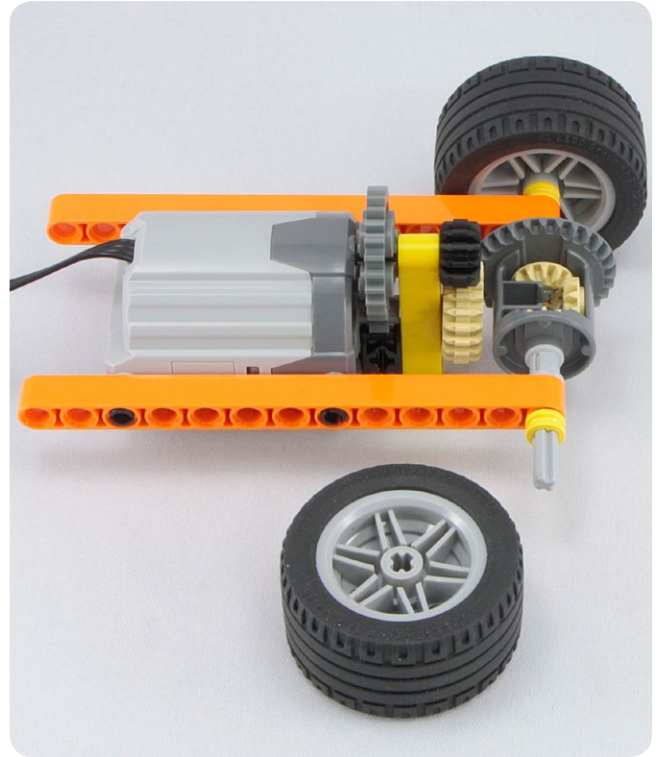
#52



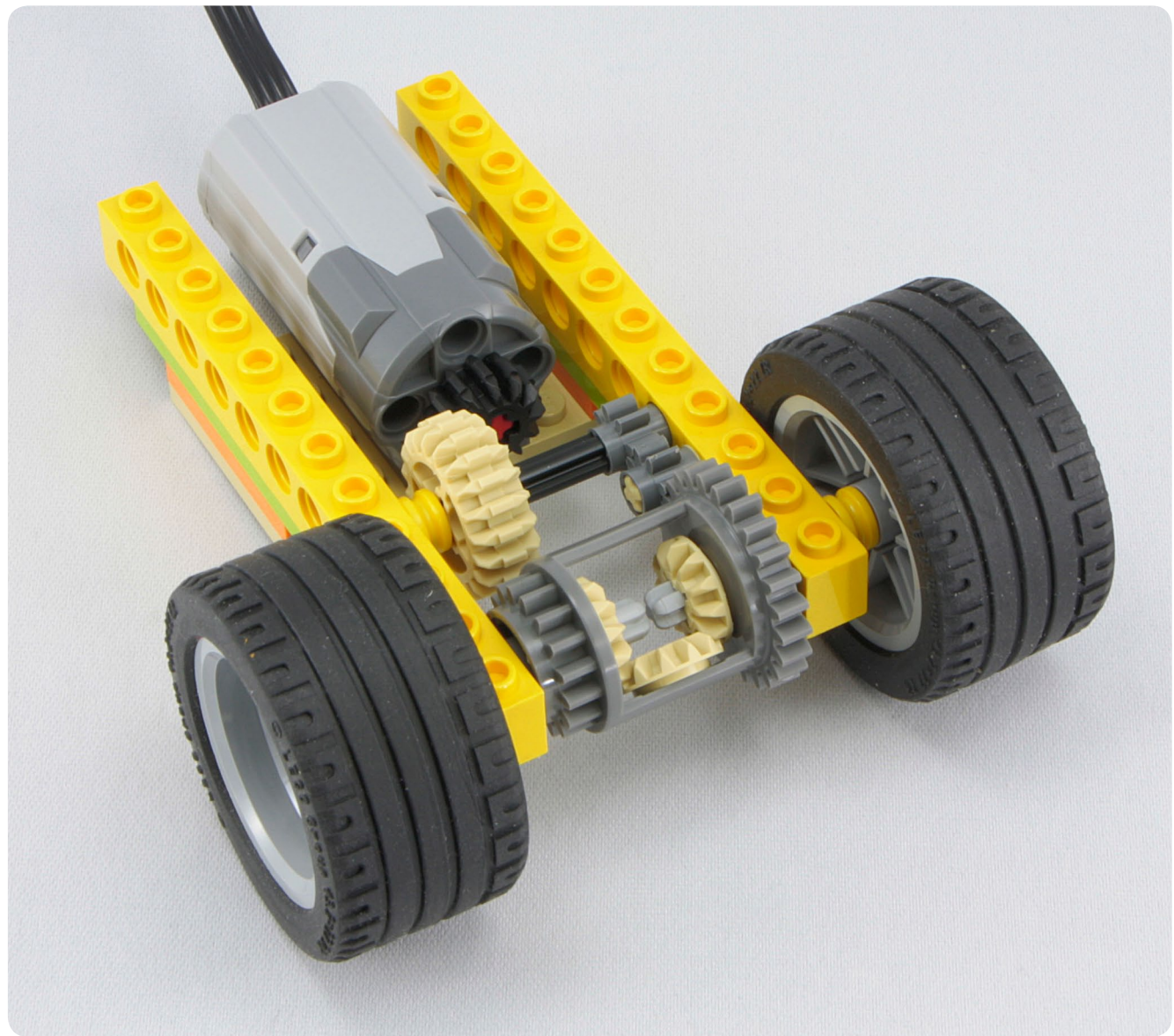
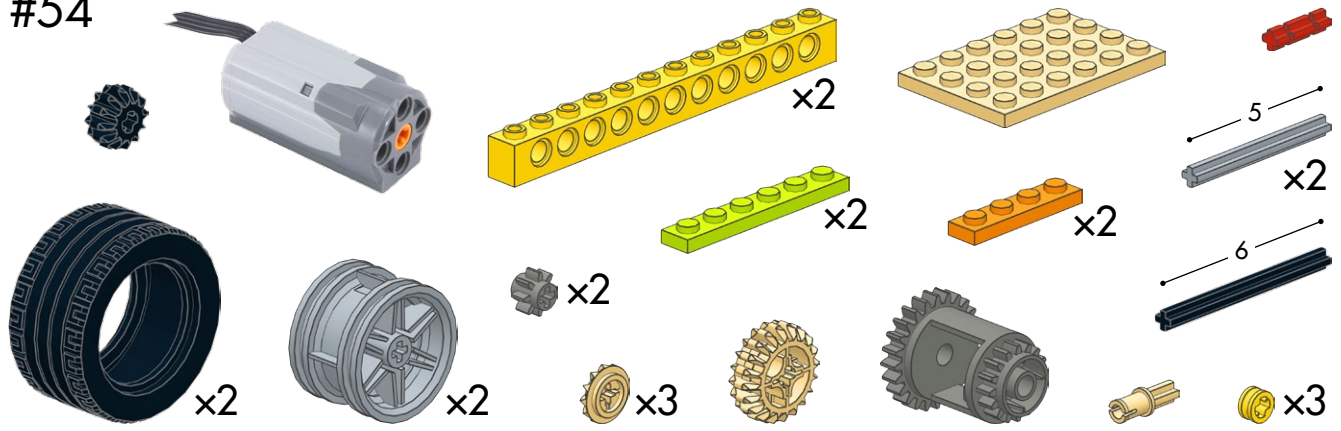


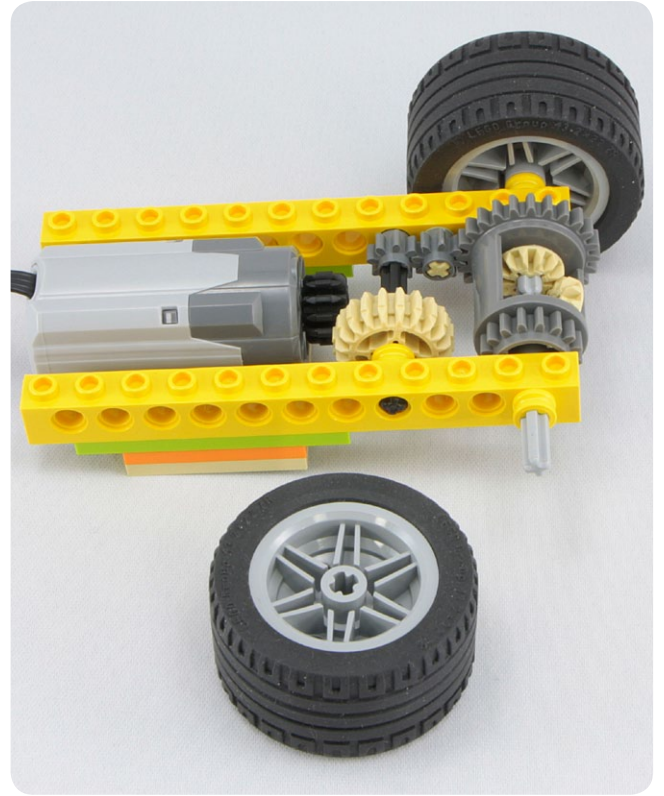
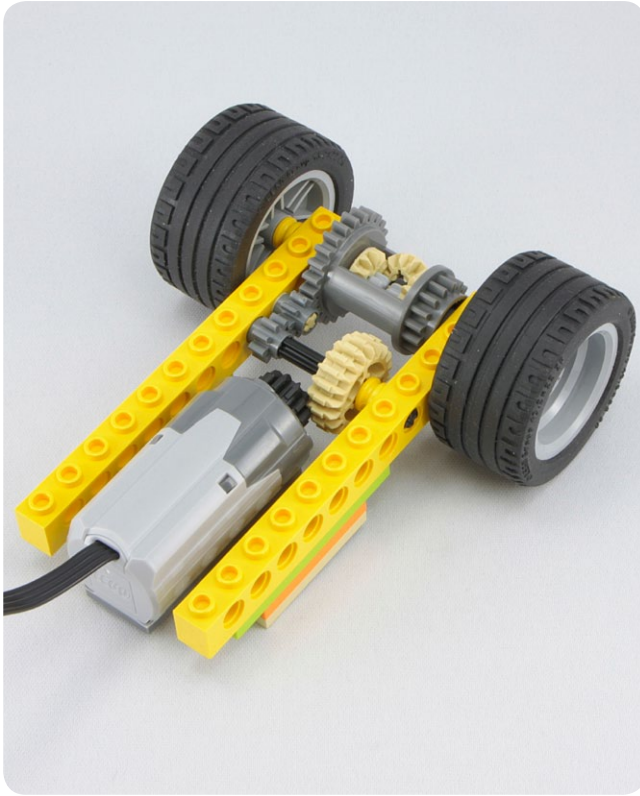
#53





#54



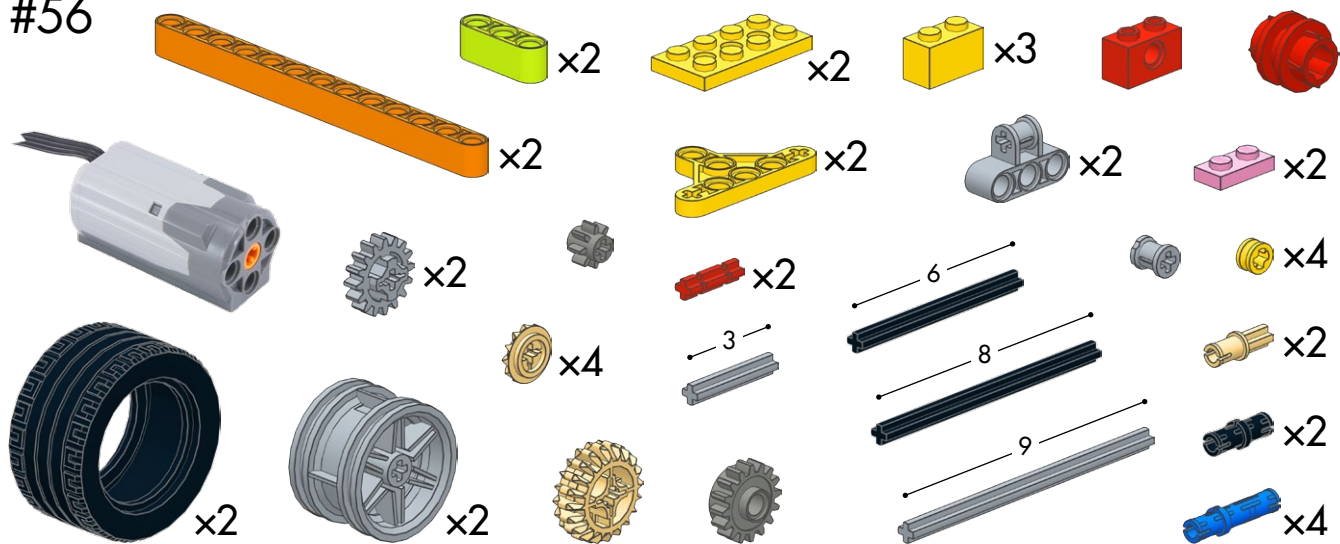


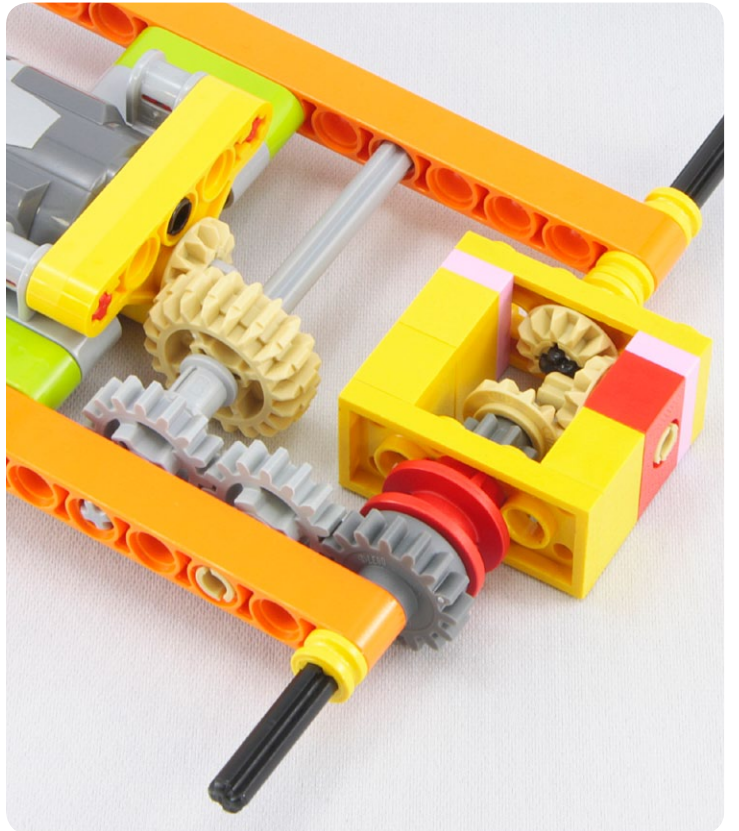
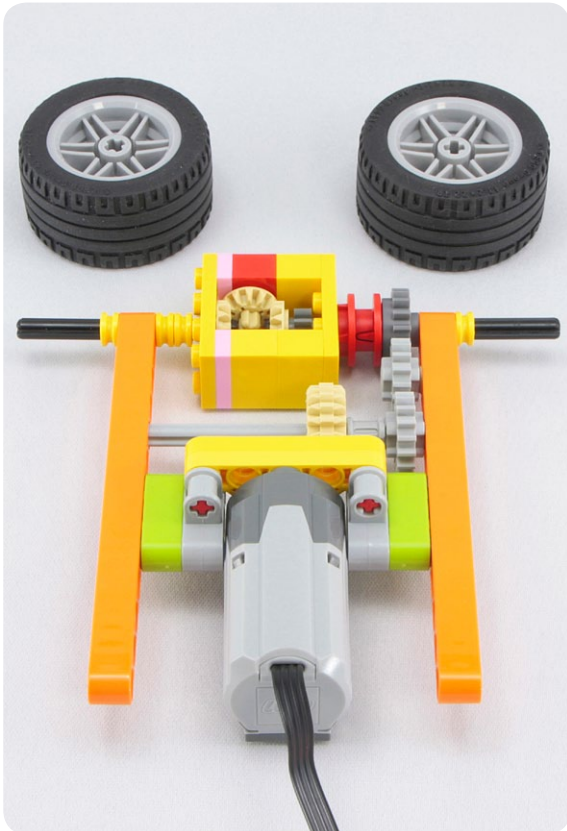


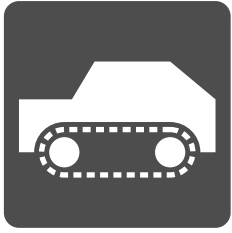




#56

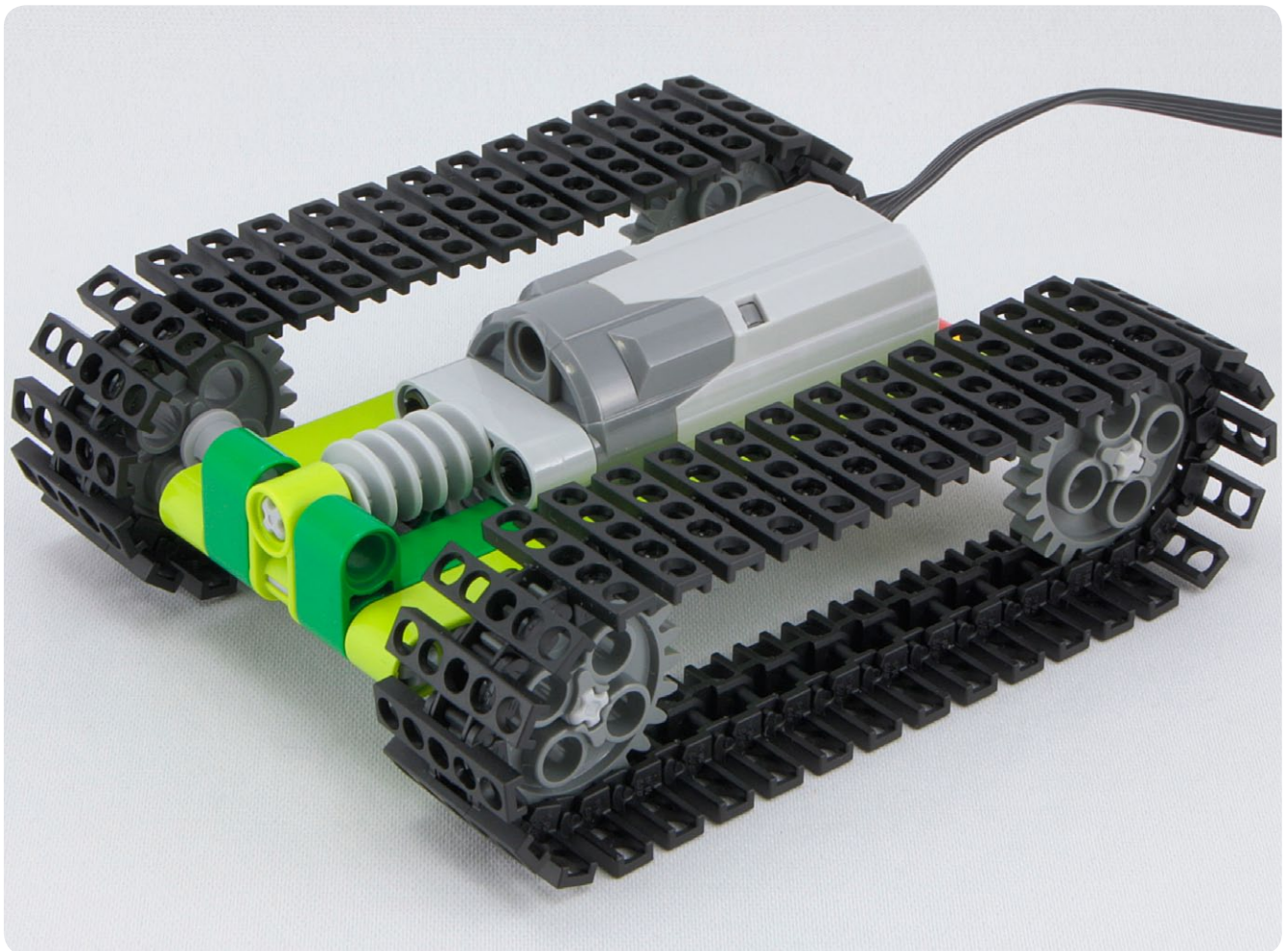
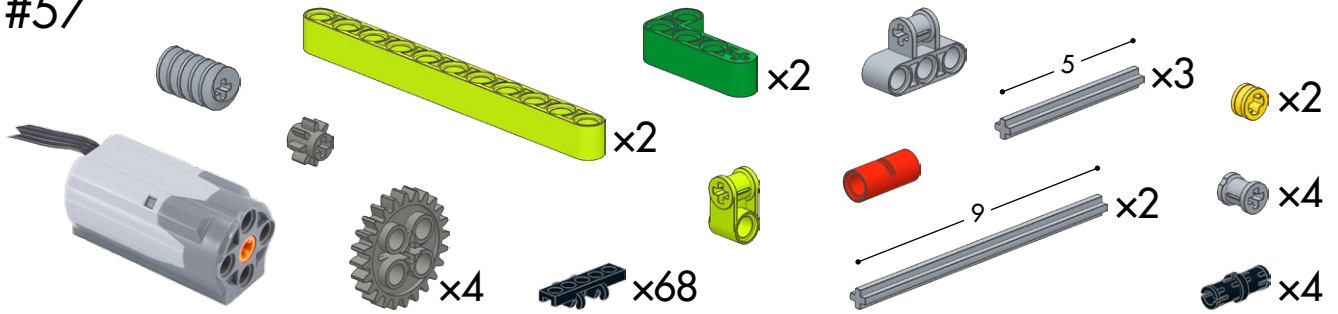


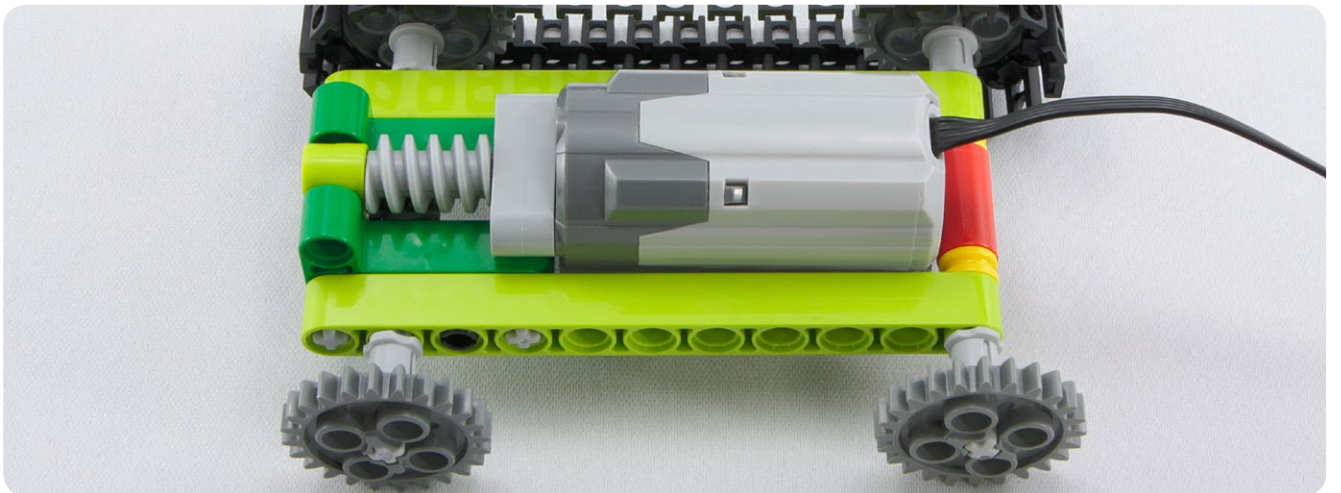
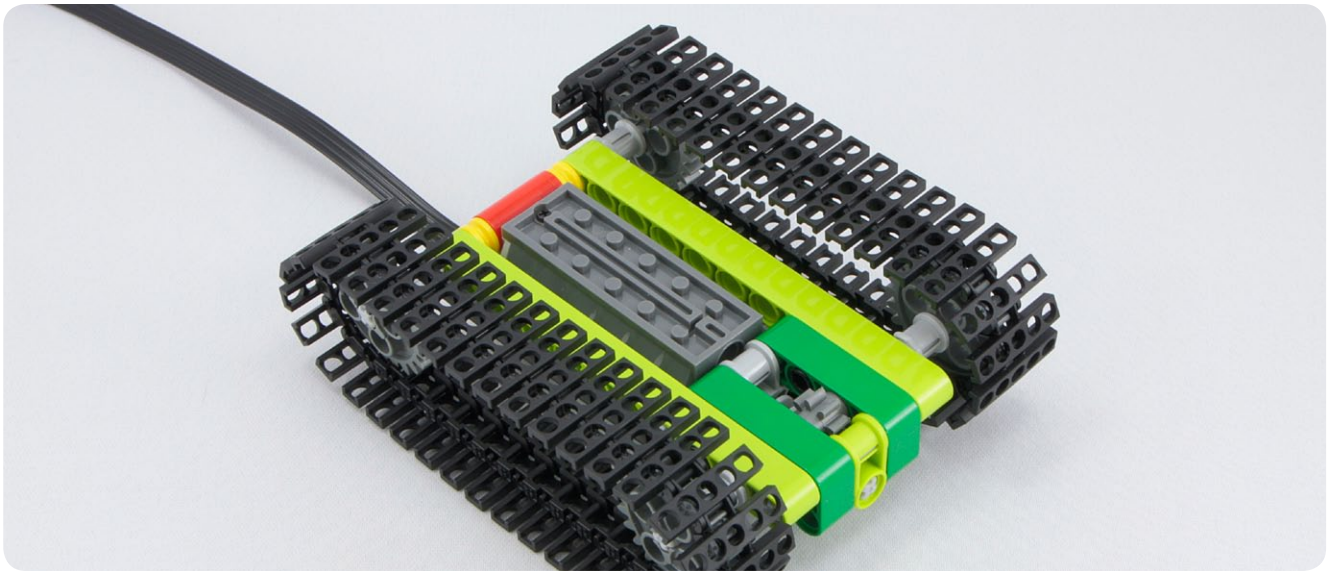
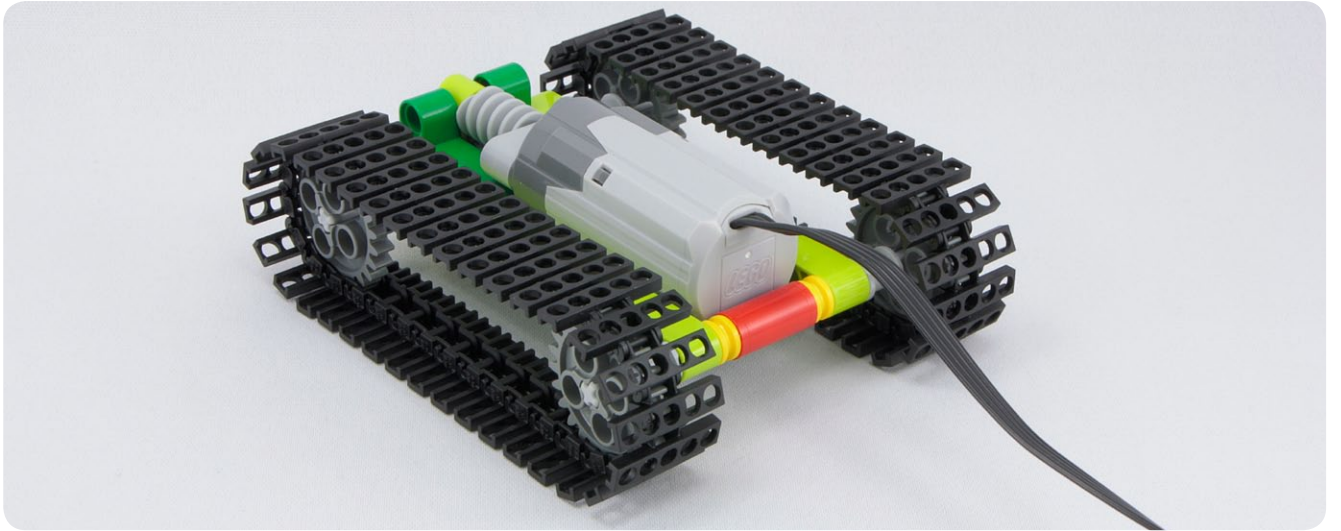




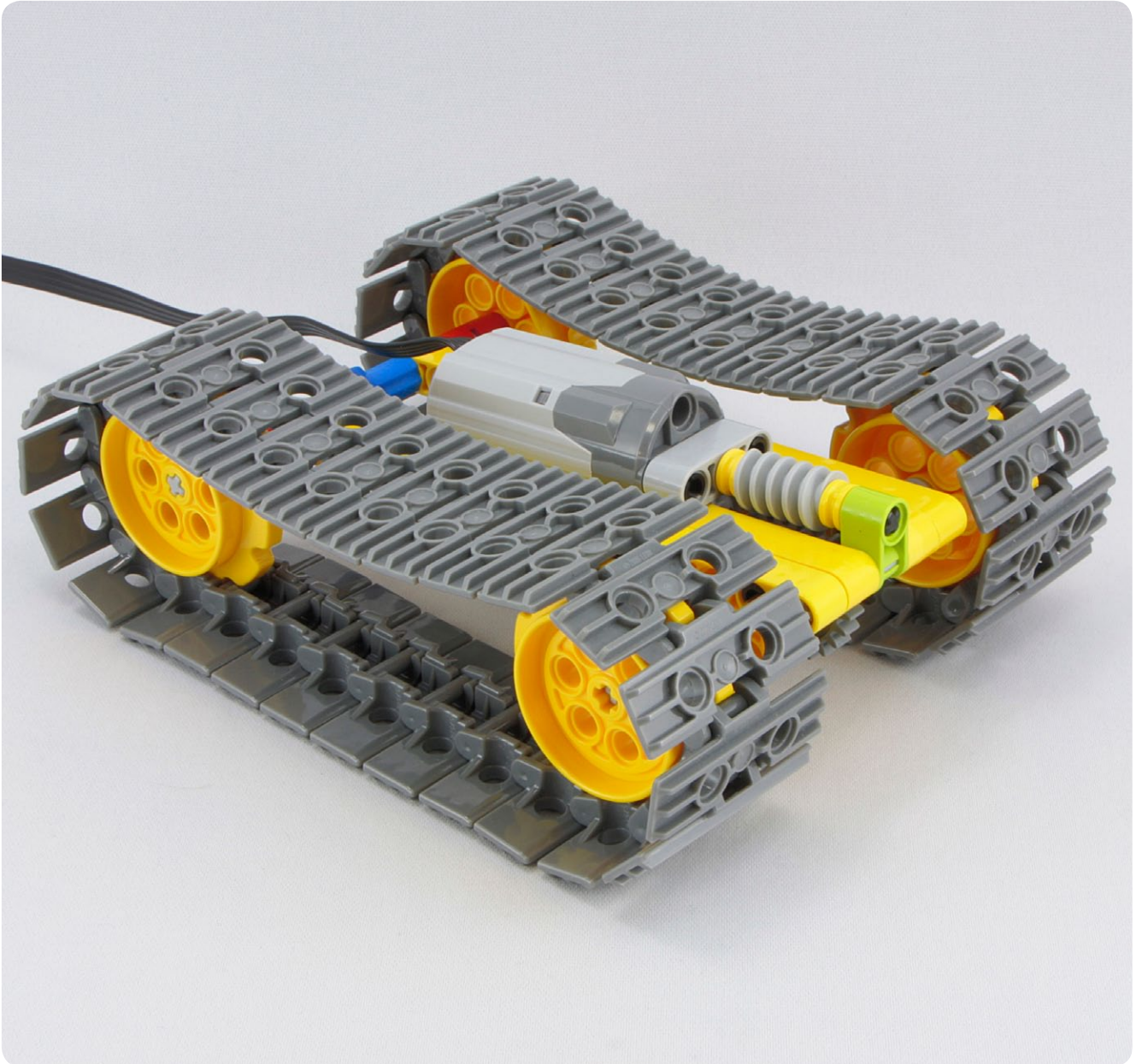
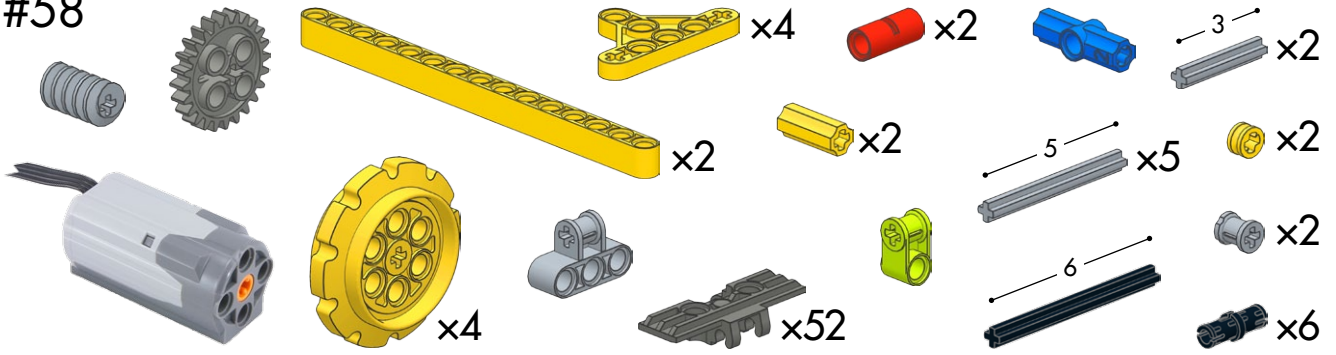
# Crawlers

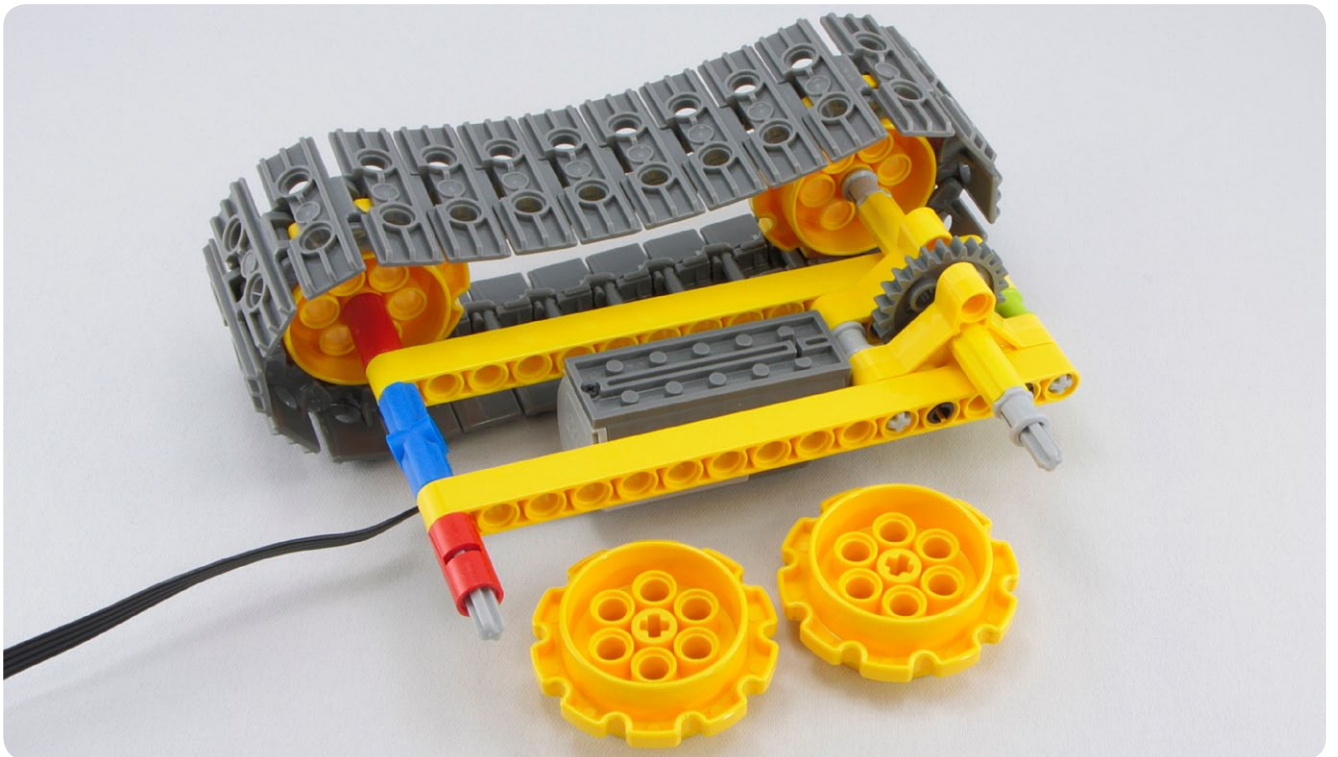
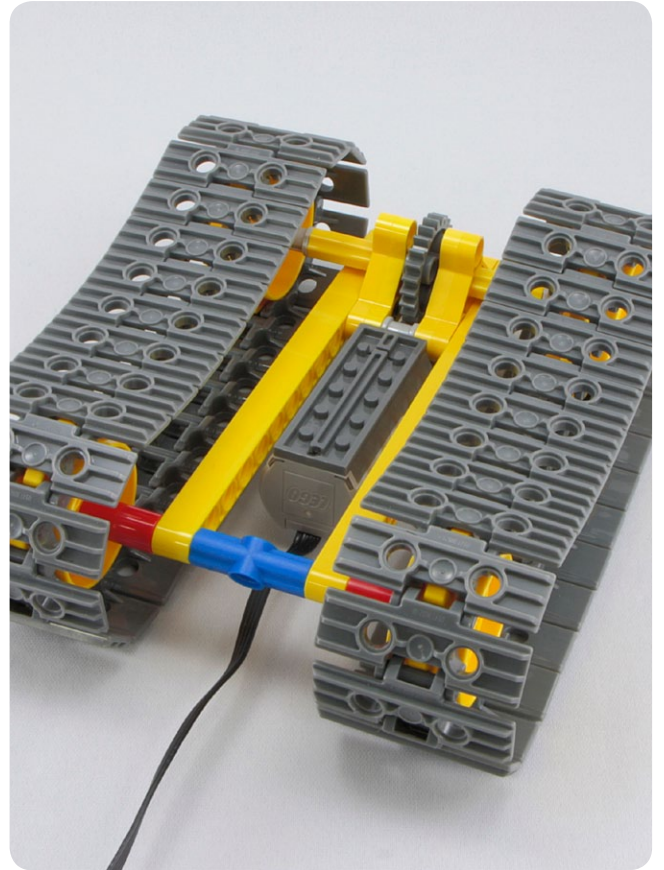
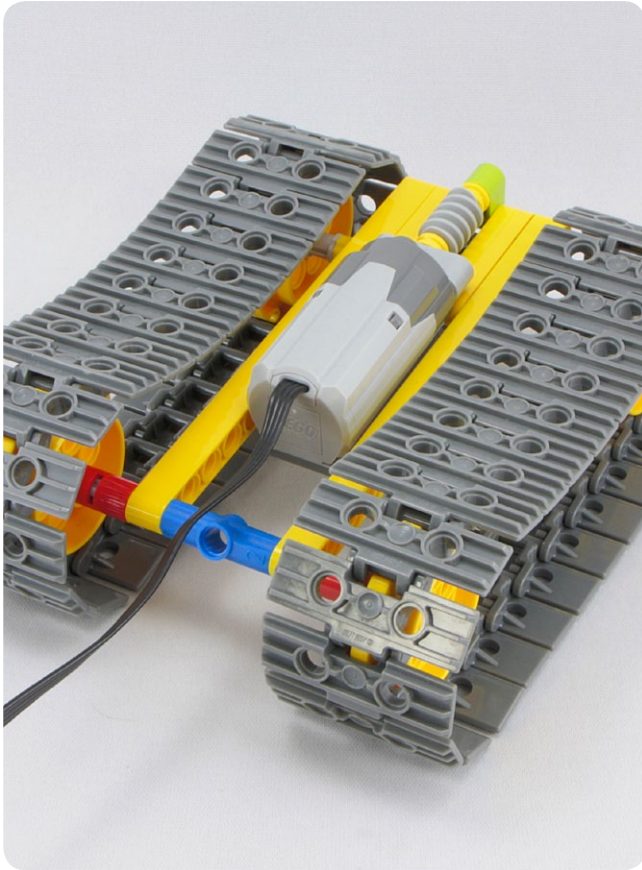
#57






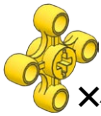





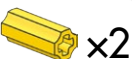

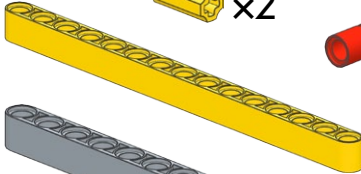
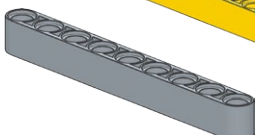



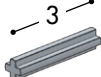
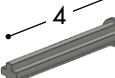

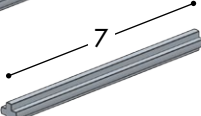
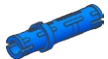





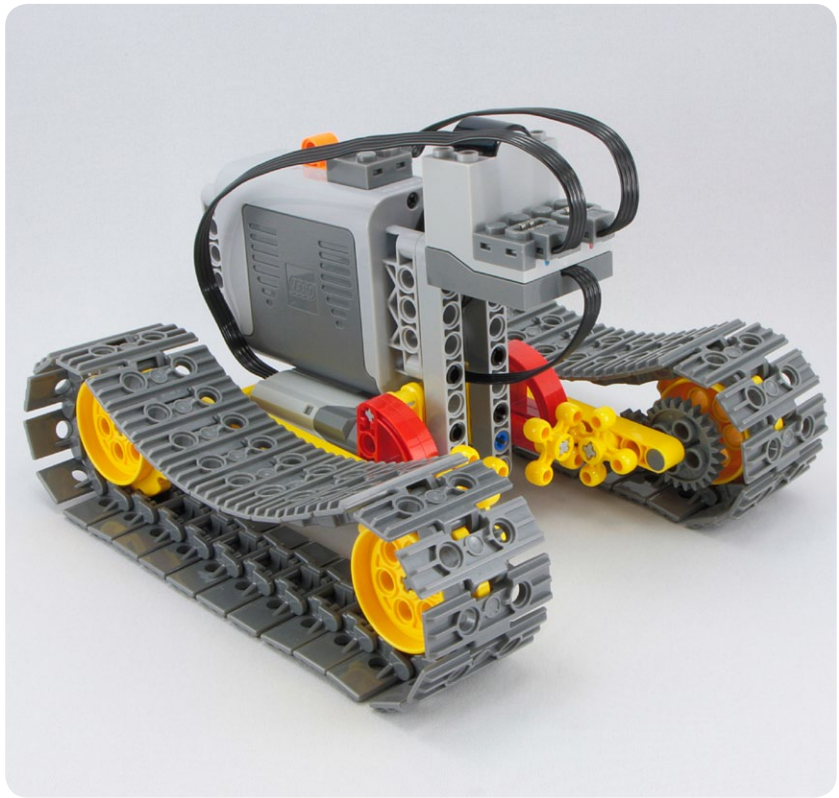
#58

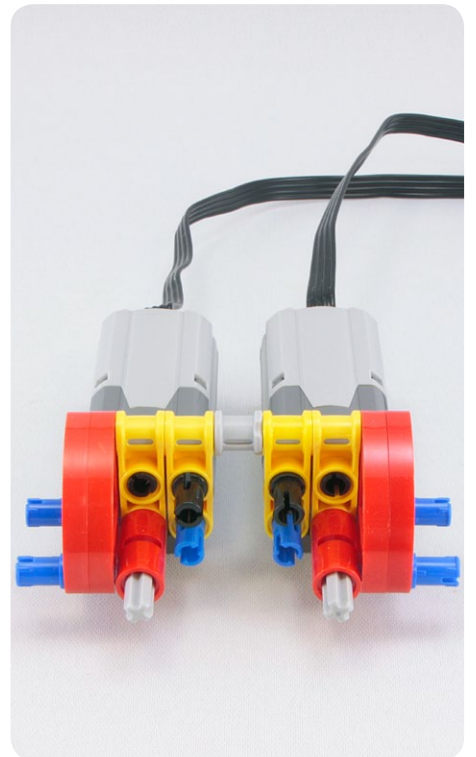
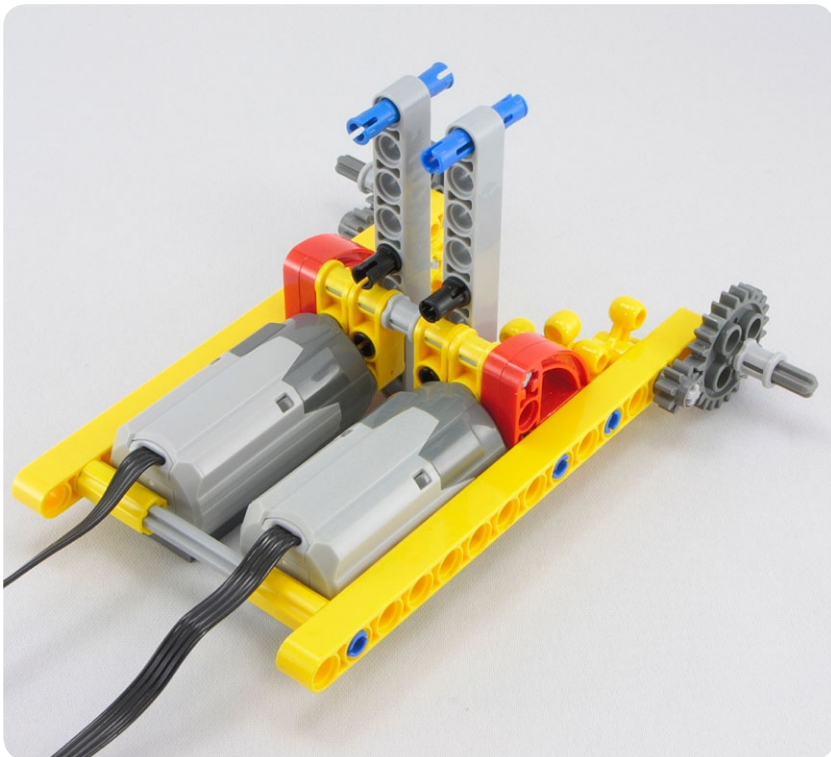




# #59

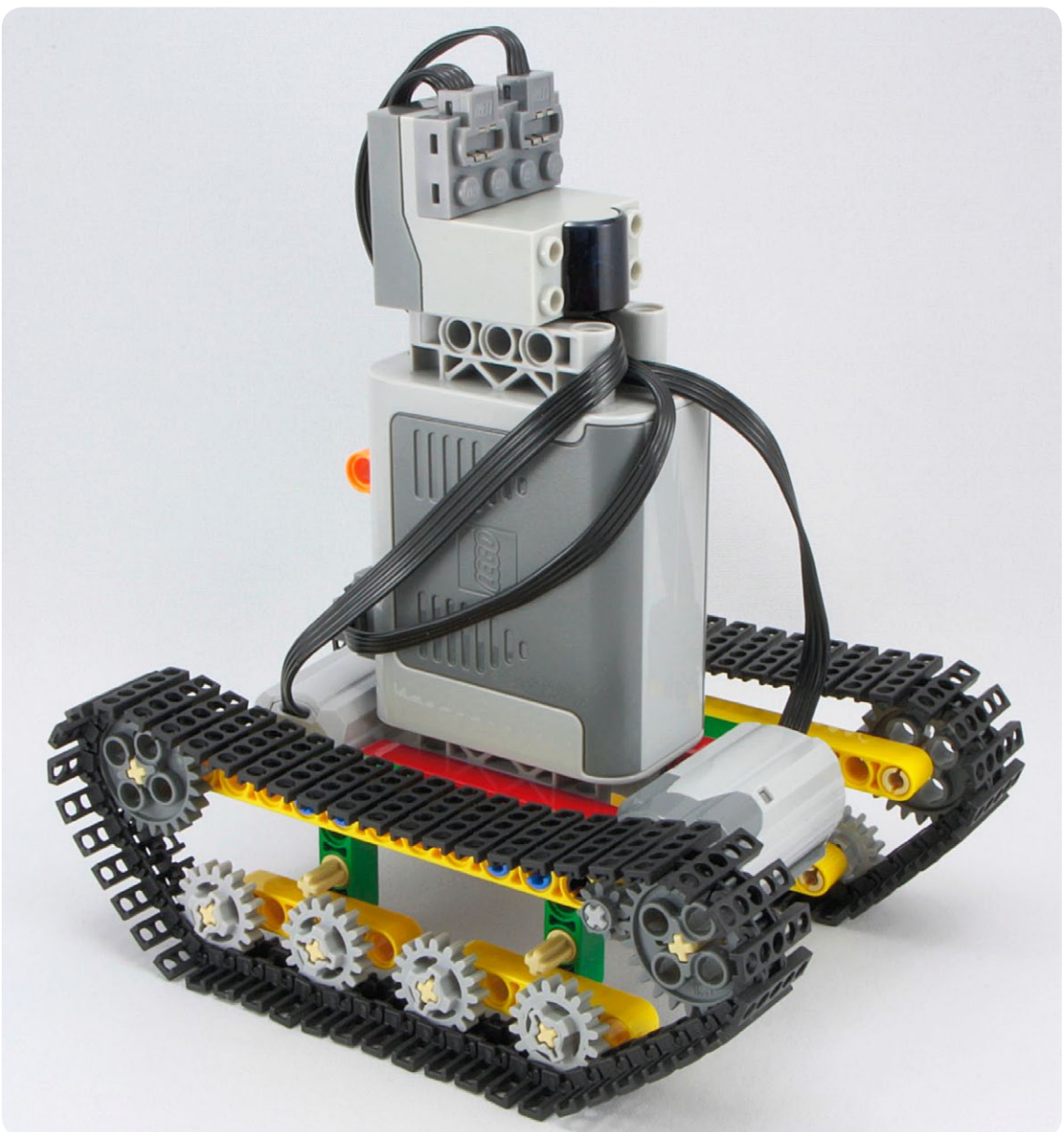
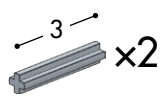
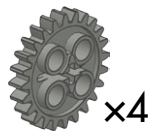
-  x2
- 
-  x2
-  x4
- 
-  x2
- 
-  x4
-  x58
-  x2
-  x4
-  x2
-  x2
-  x2
-  x4
-  x4
-  x2
-  x4
-  x3
-  x4
-  x4
-  x3
-  x6
-  x6

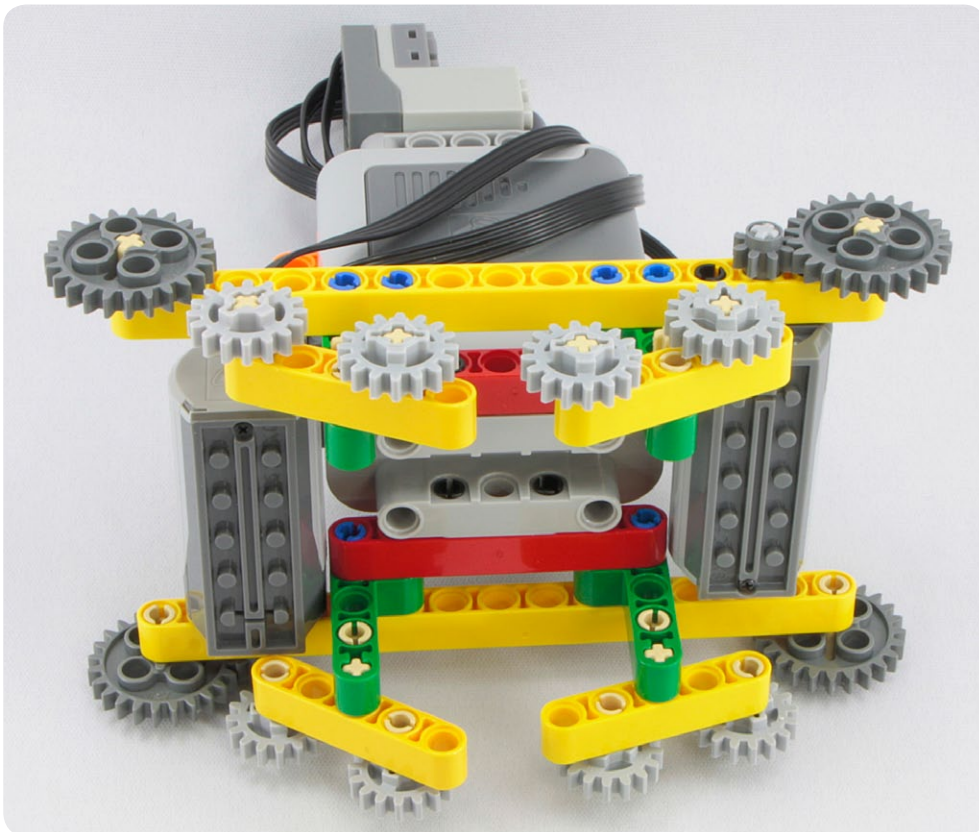
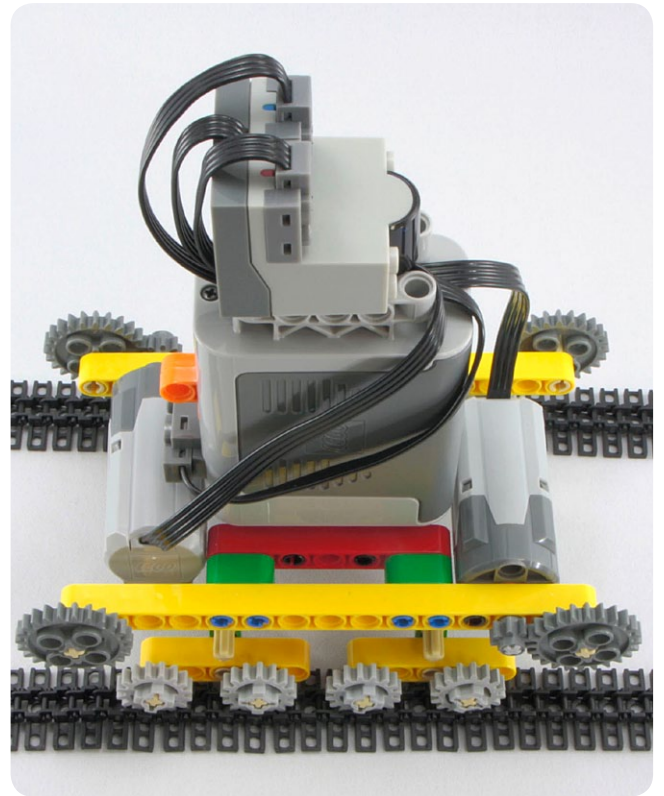
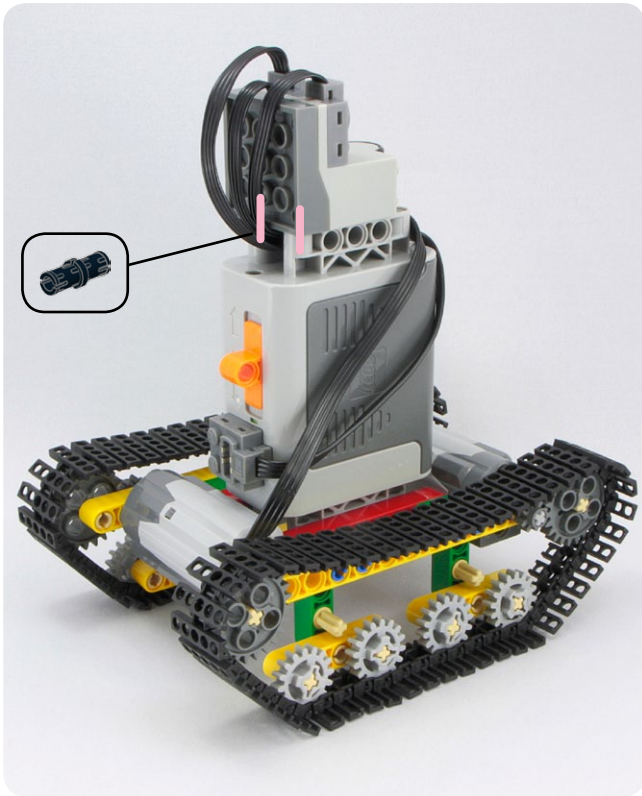




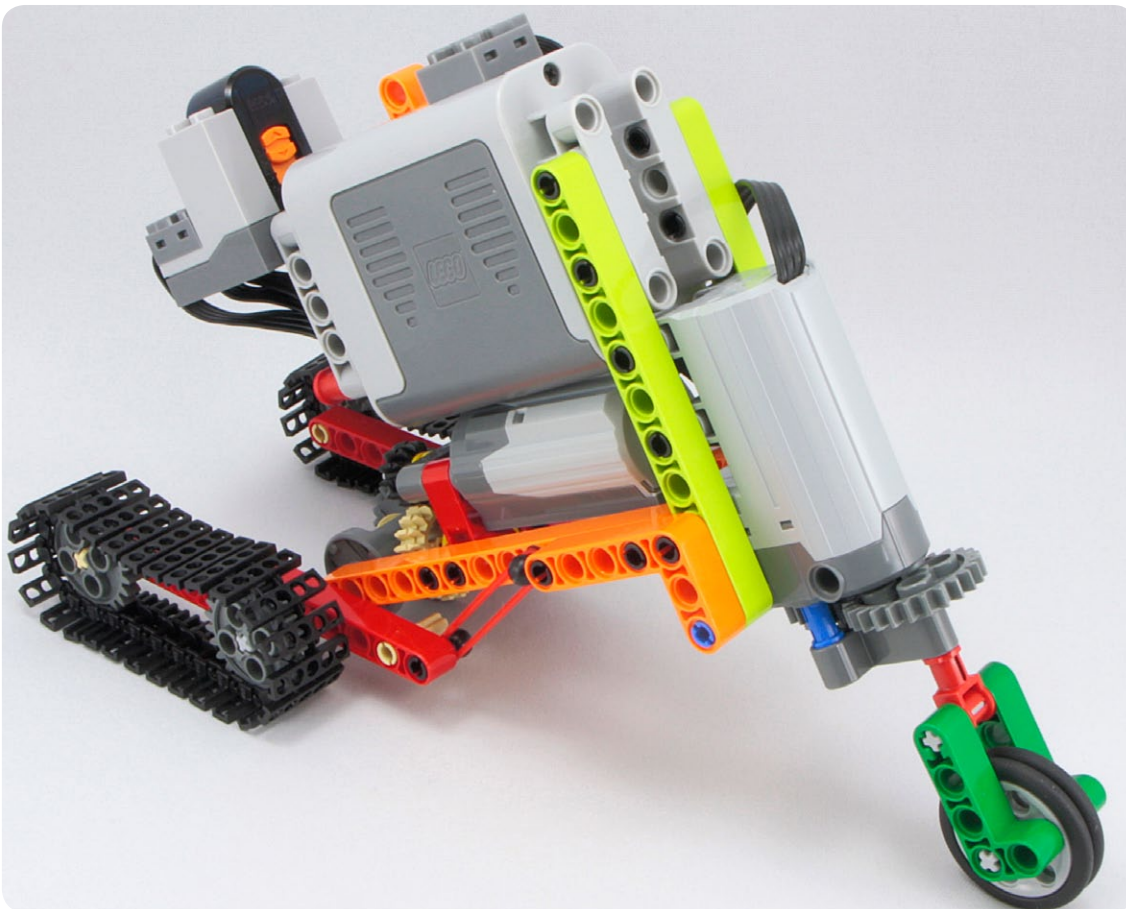
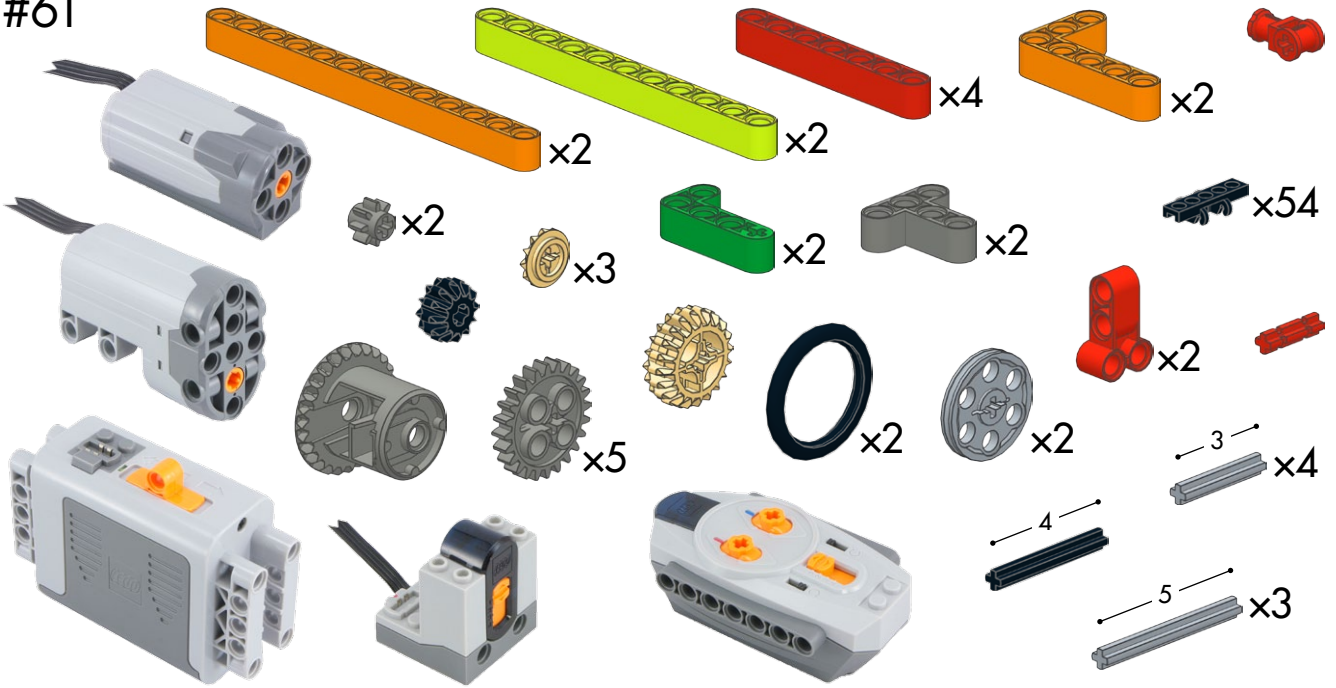


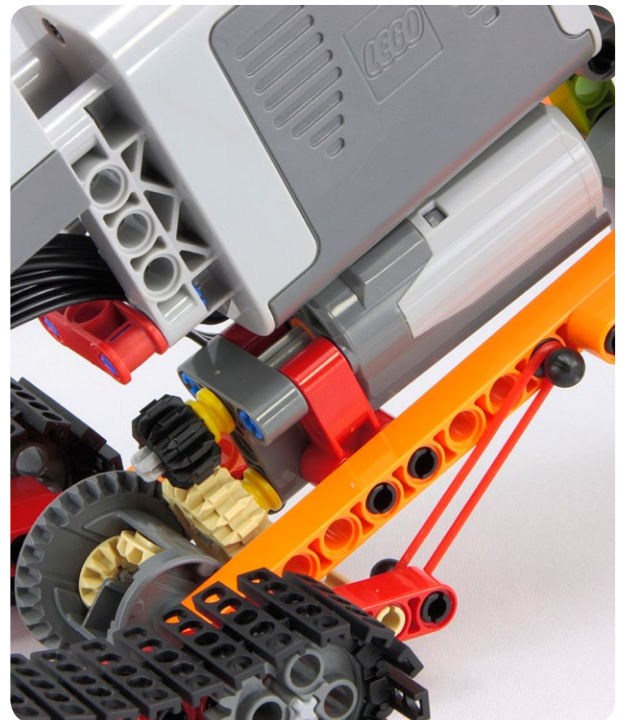
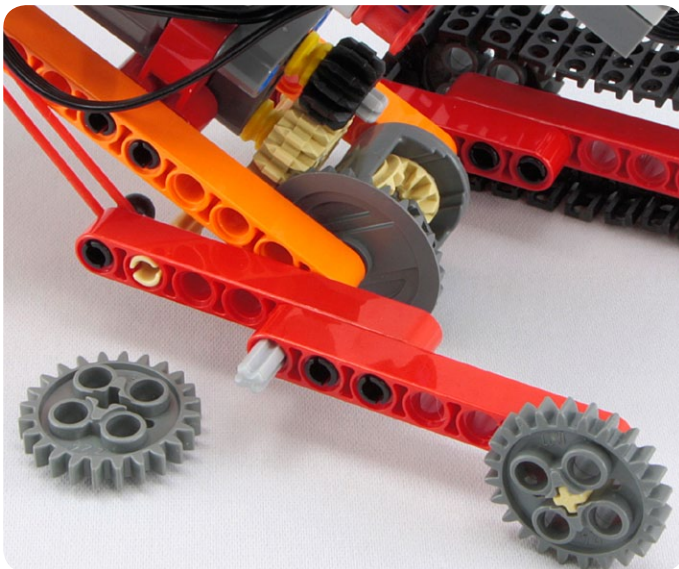
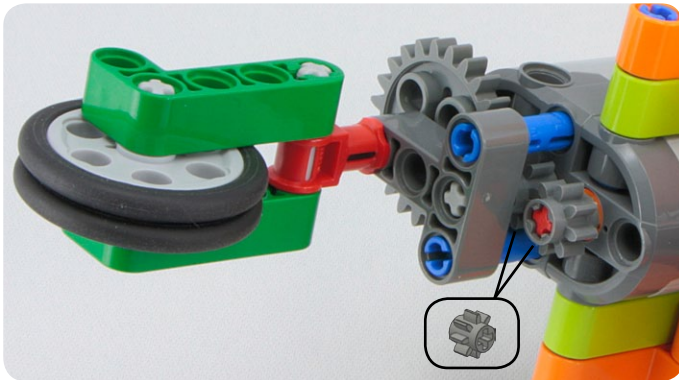
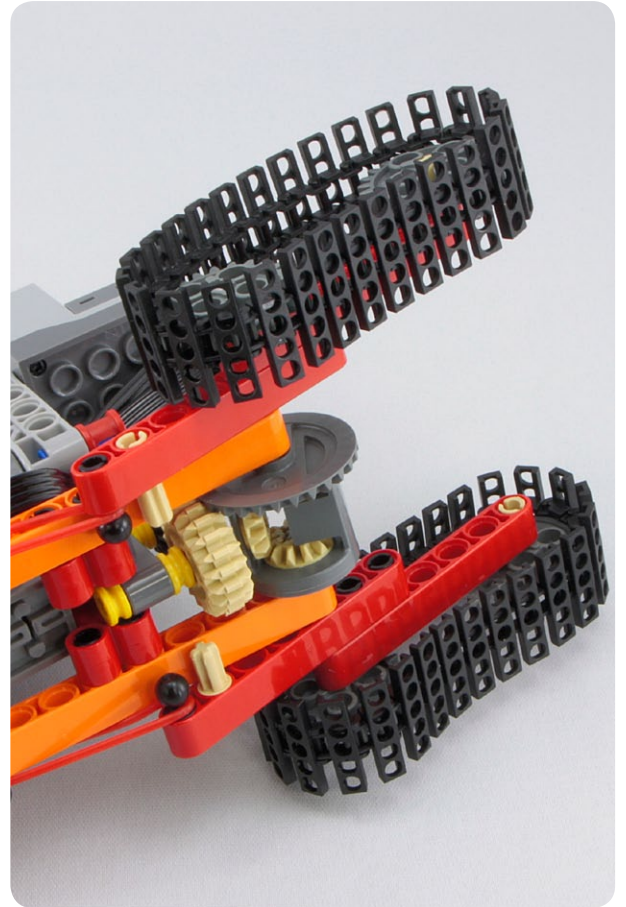
# #60





#61

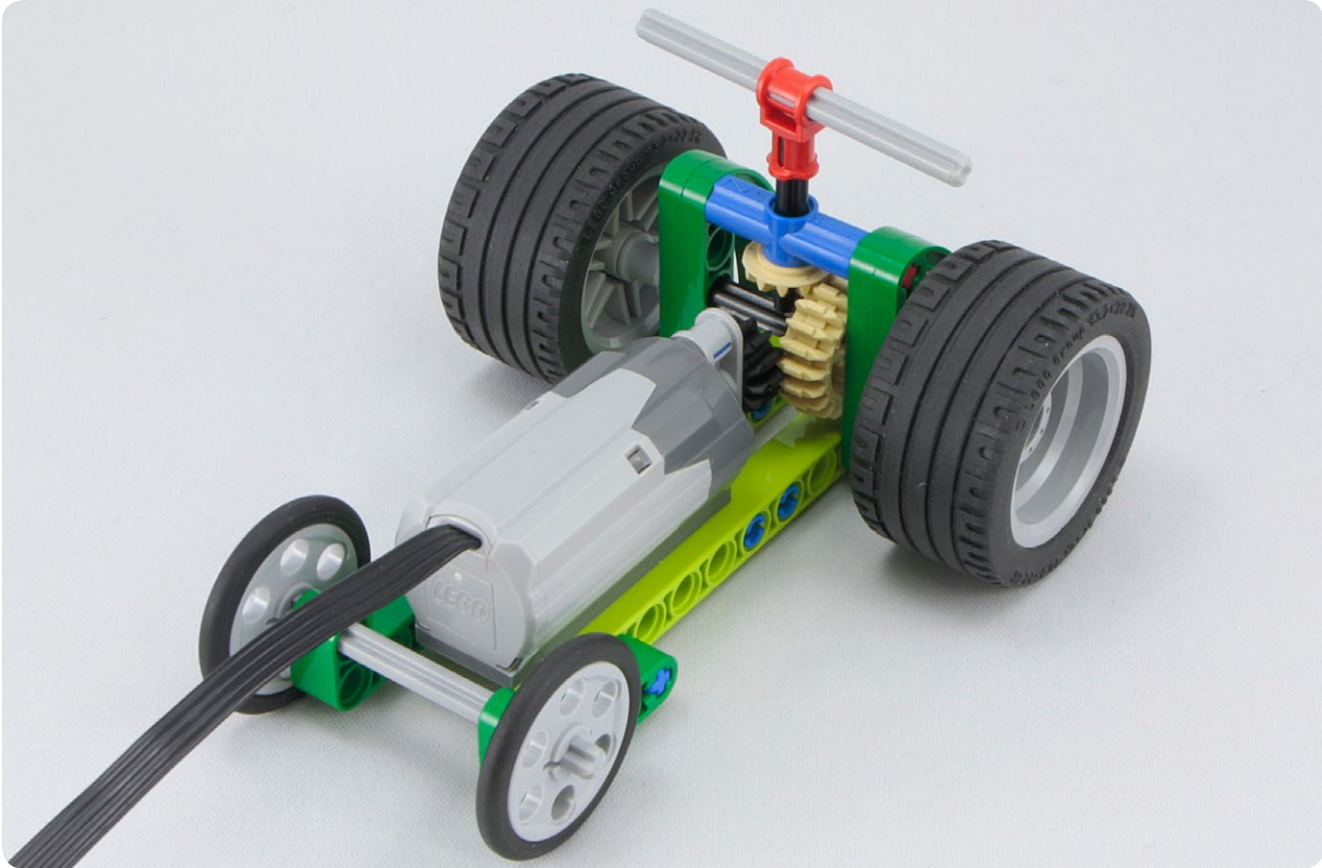
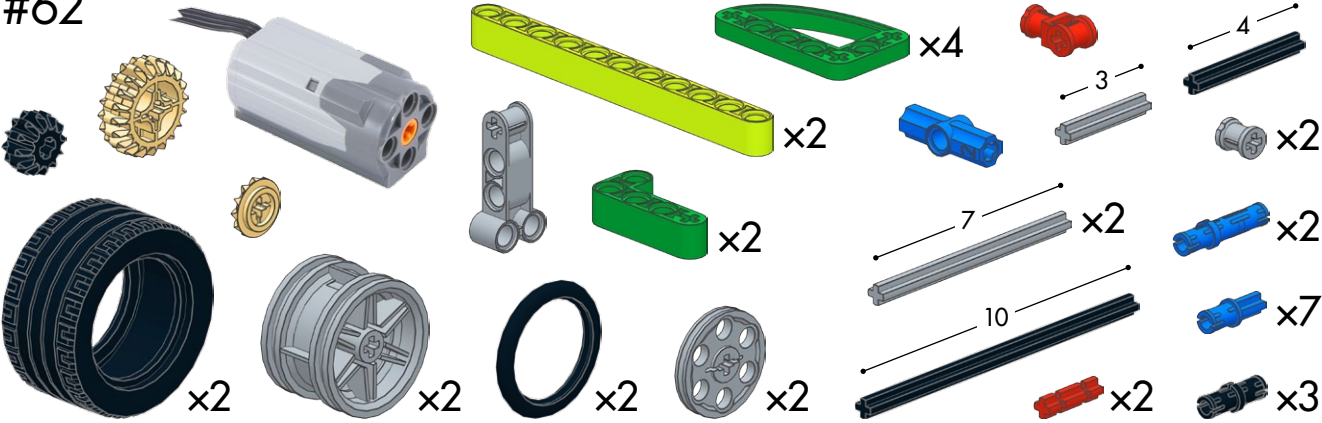


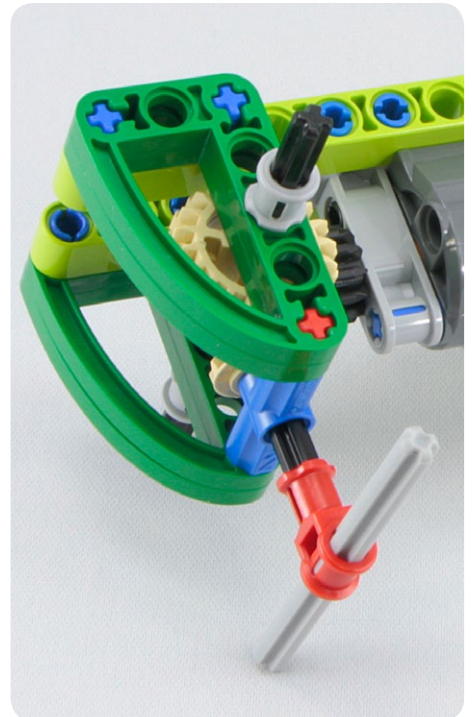
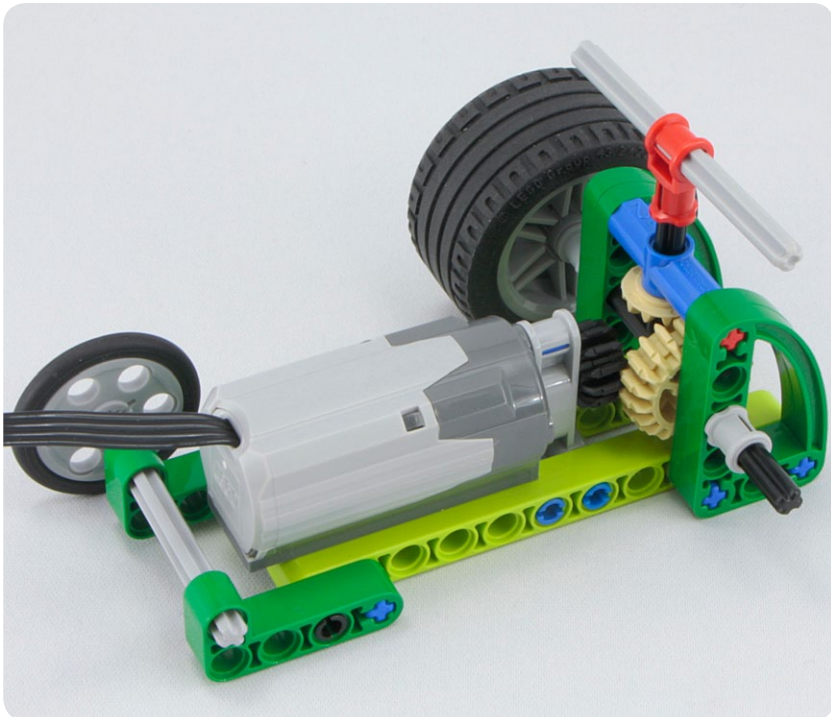
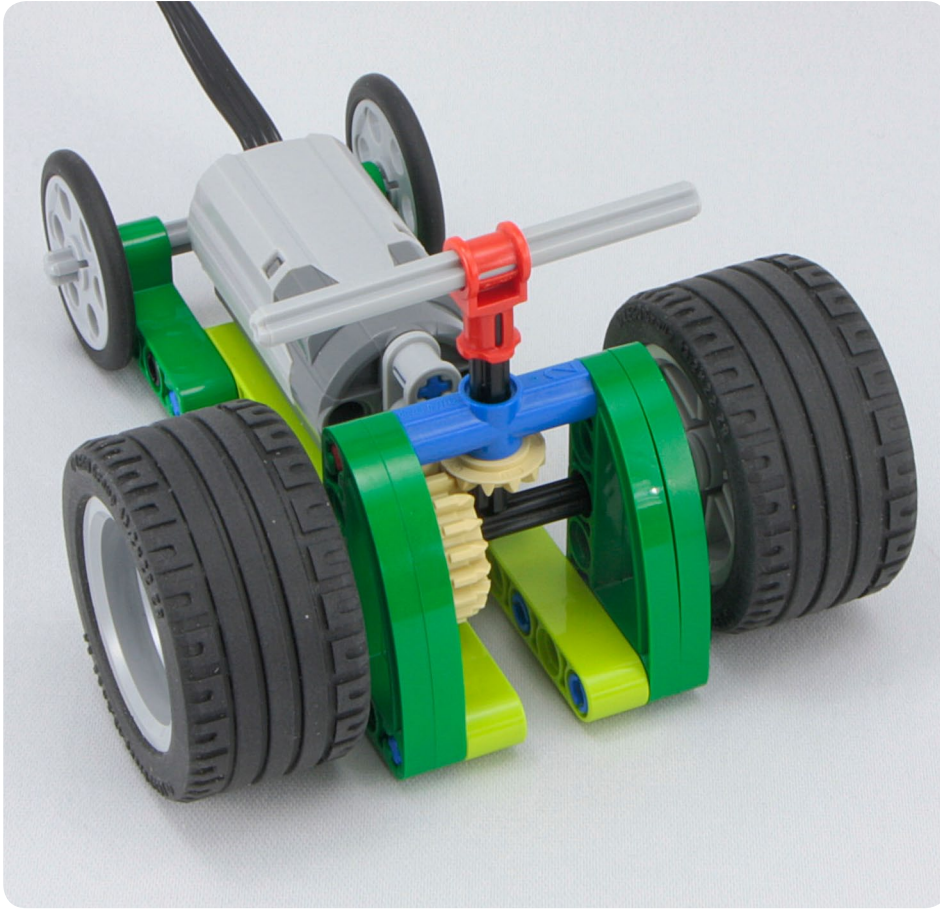




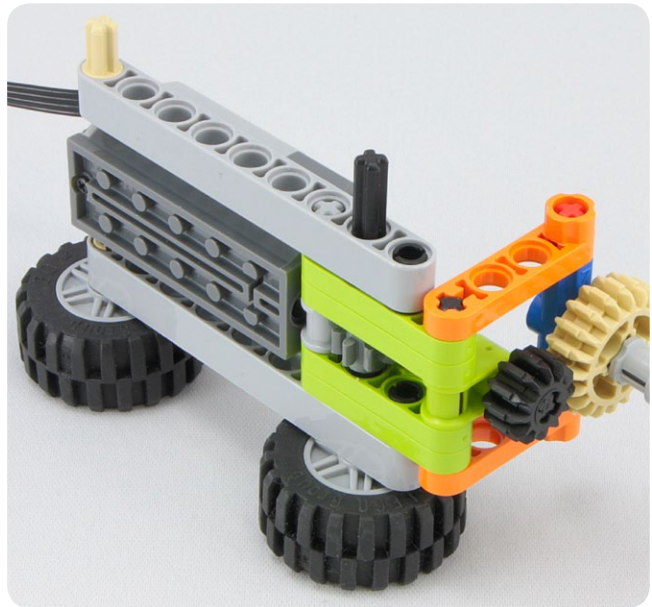
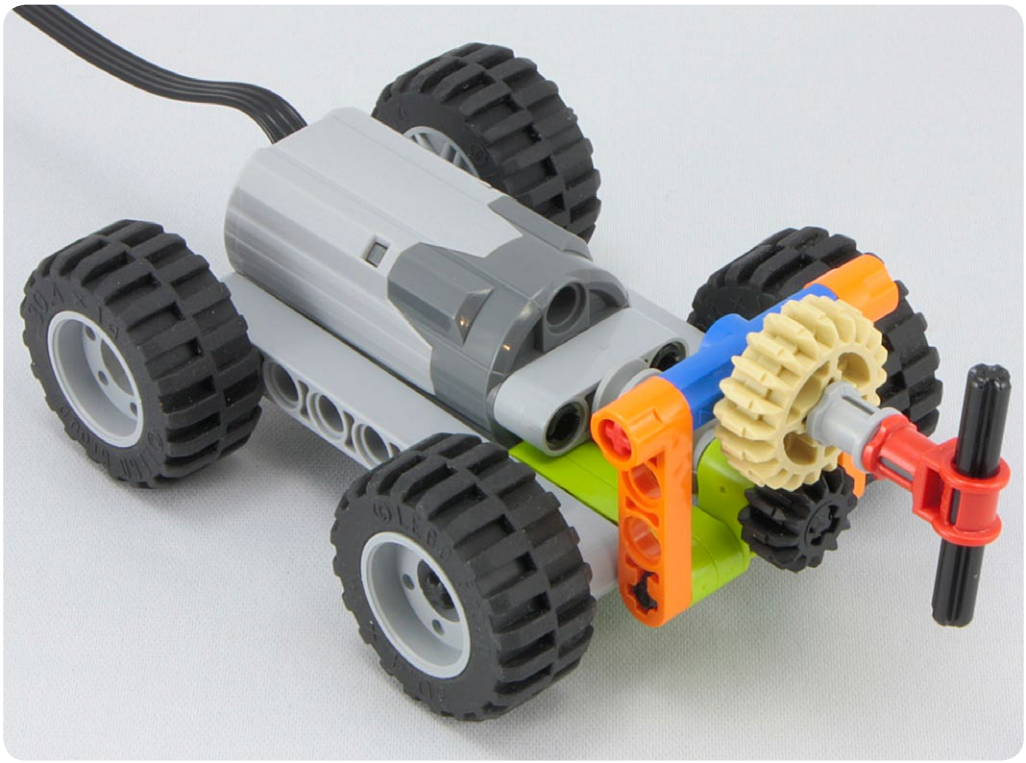
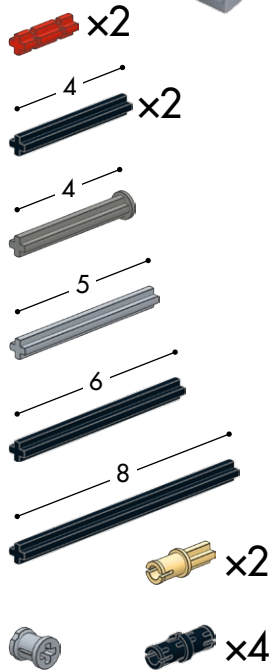
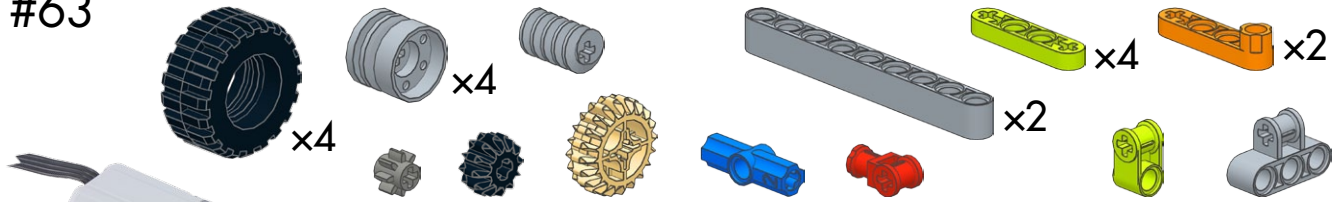
# Cars that spin something

#62



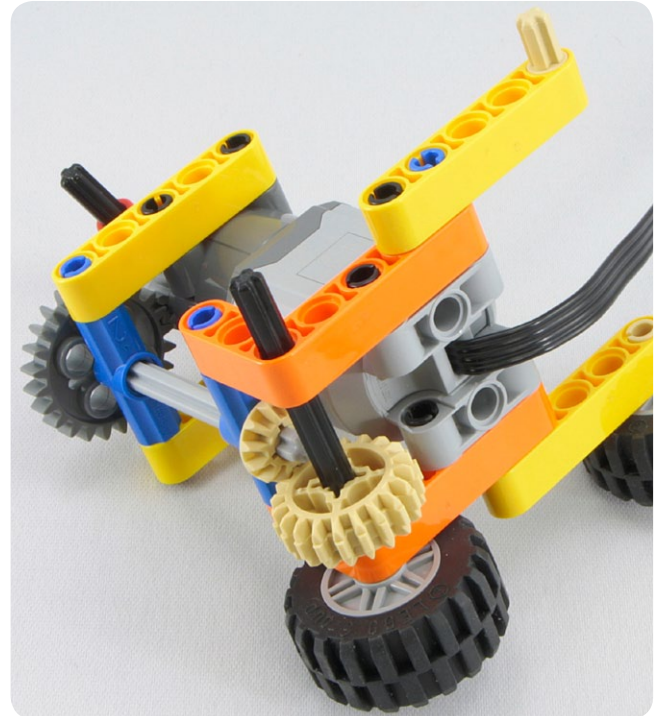
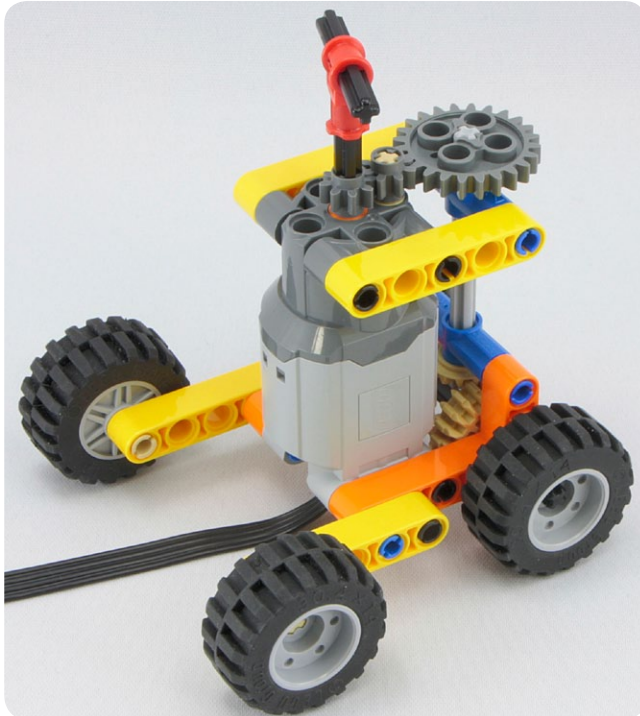


#63









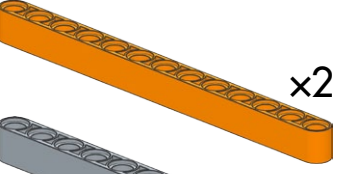
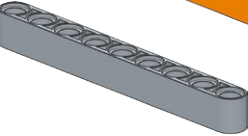






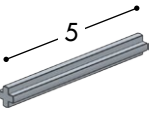
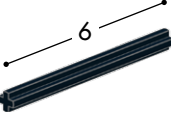
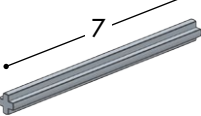


# #64

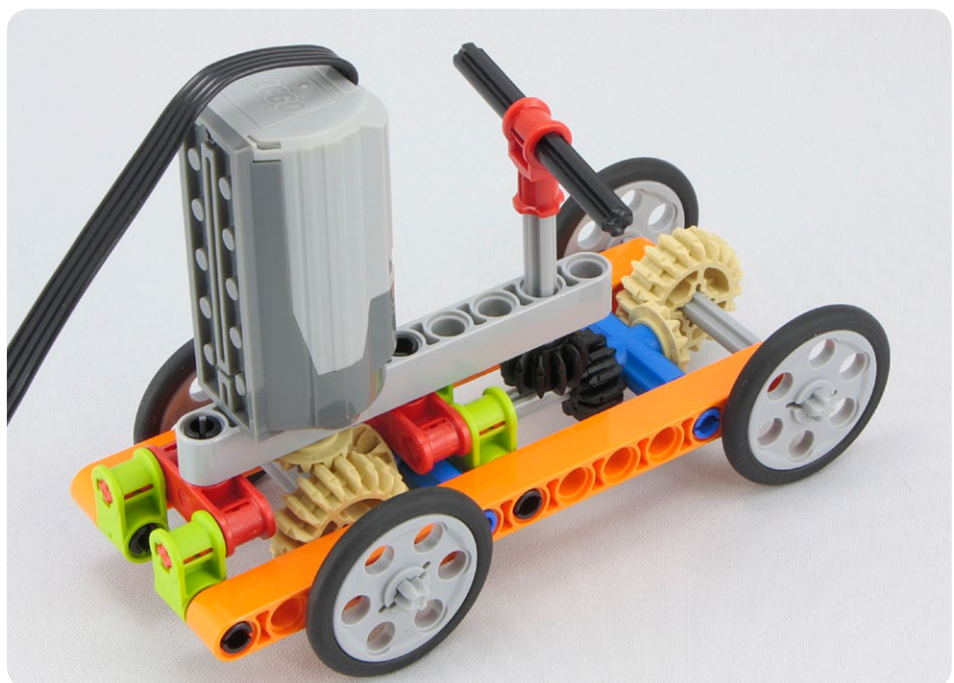
- x4
- x4
- x1
- x1
- x4
- x1
- x2
- x1
- x2
- x2
- x2
- x2
- x2
- x2
- x2
- x3
- x4
- x8

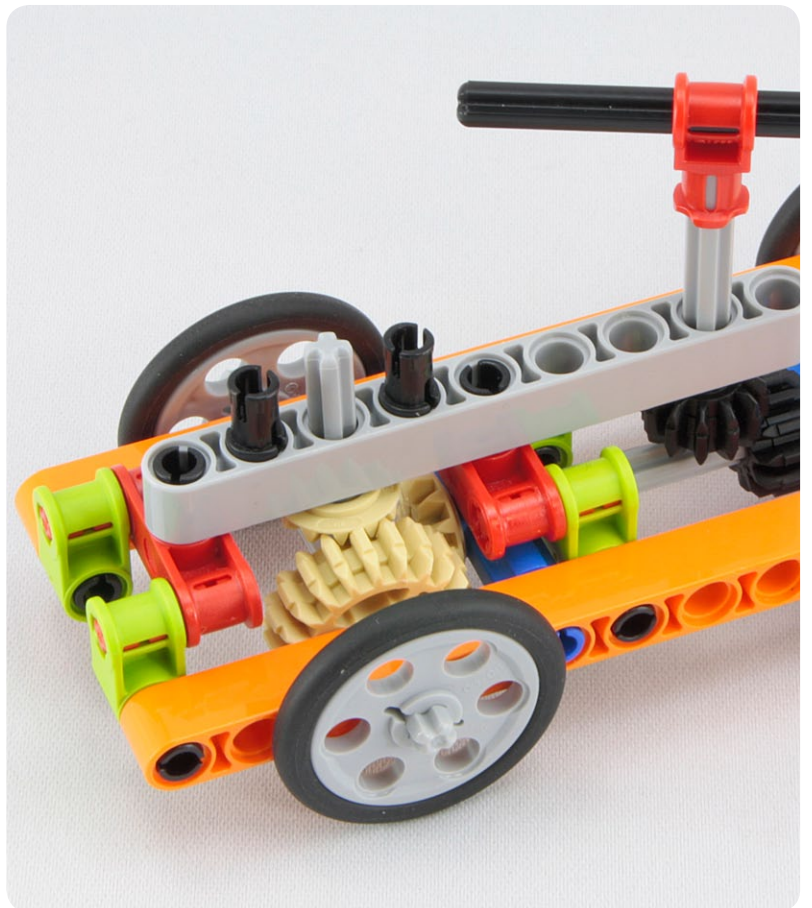
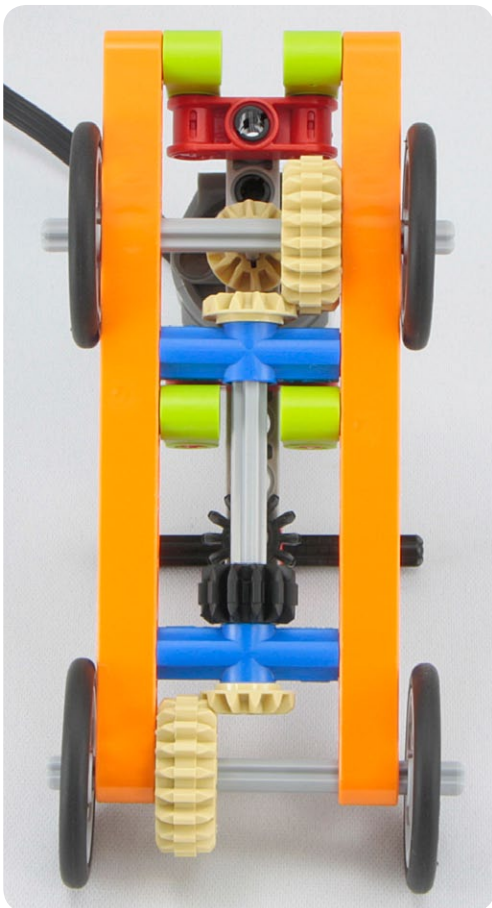
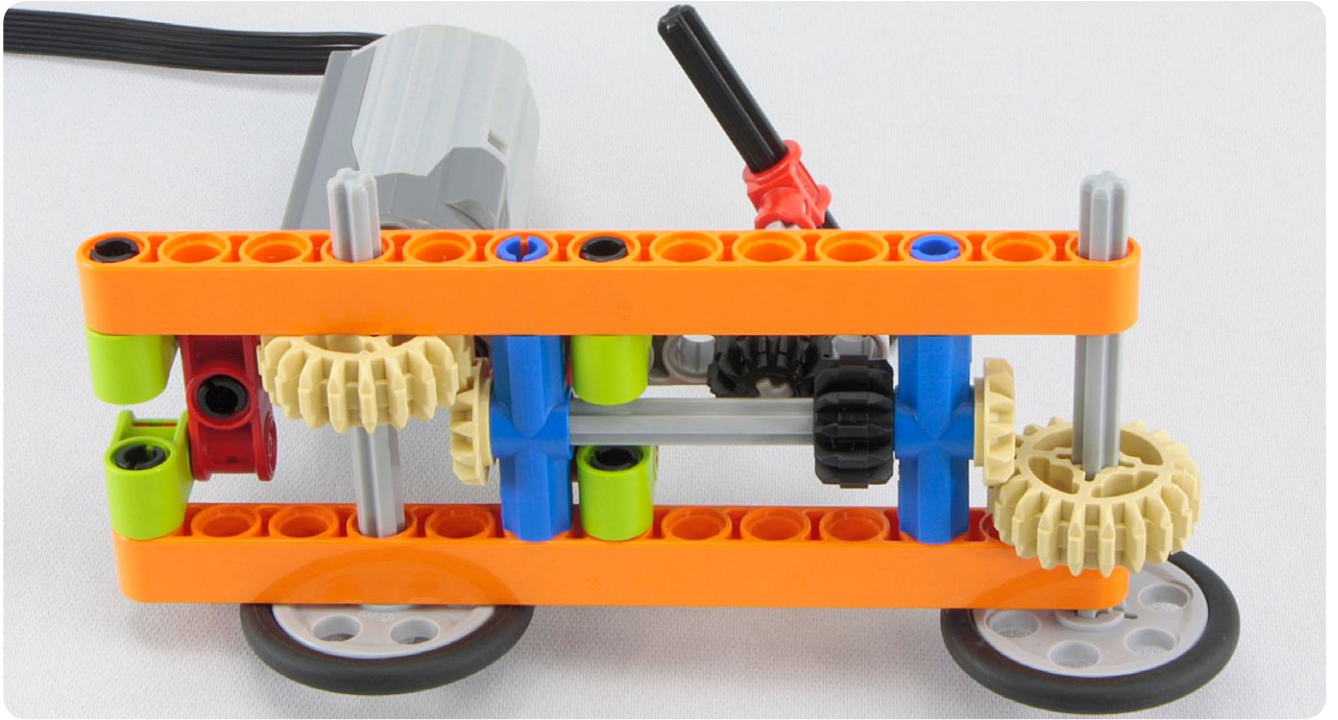








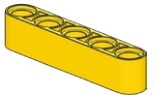
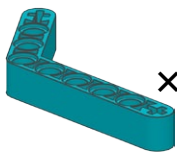

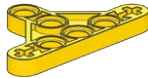






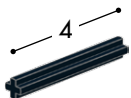
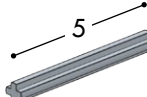
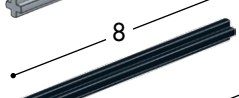





# #65

-   x2
-  x3
-  x2
-  x4
-  x4
-  x2
- 
-  x2
- 
-  x4
-  x2
-  3
-  x4
-  5
-  6
-  7 x3
-  x4
-  x8

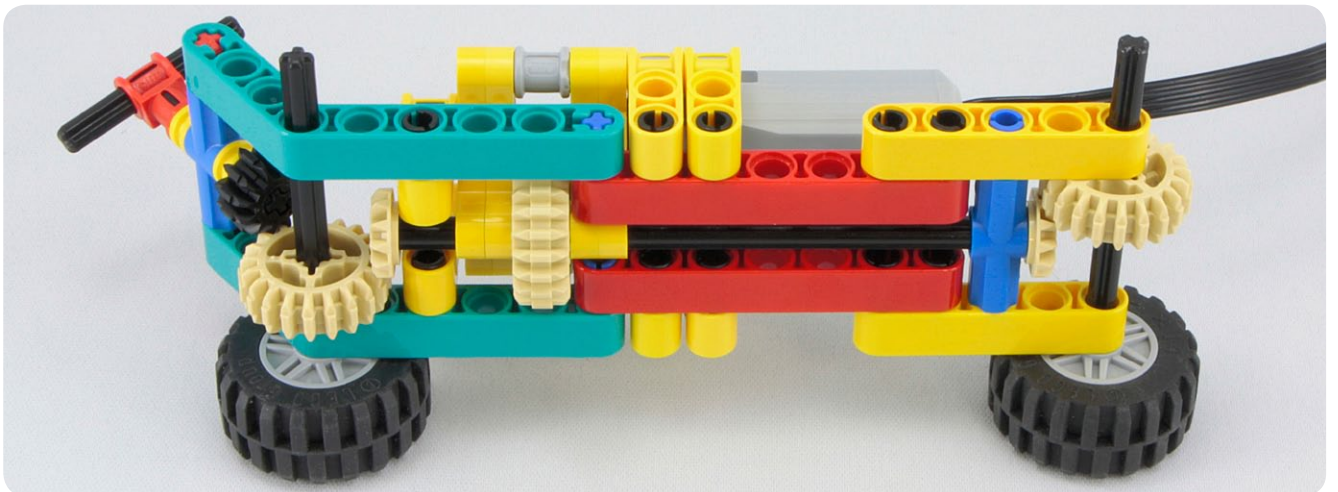
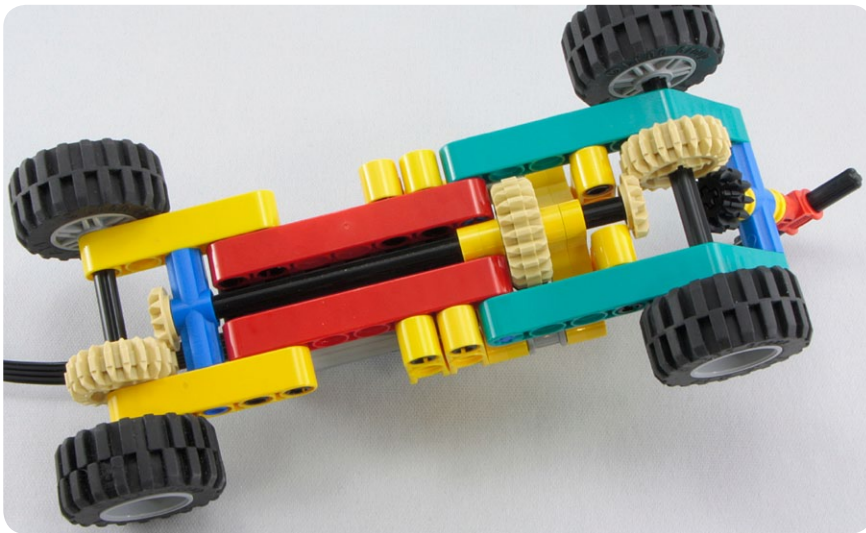
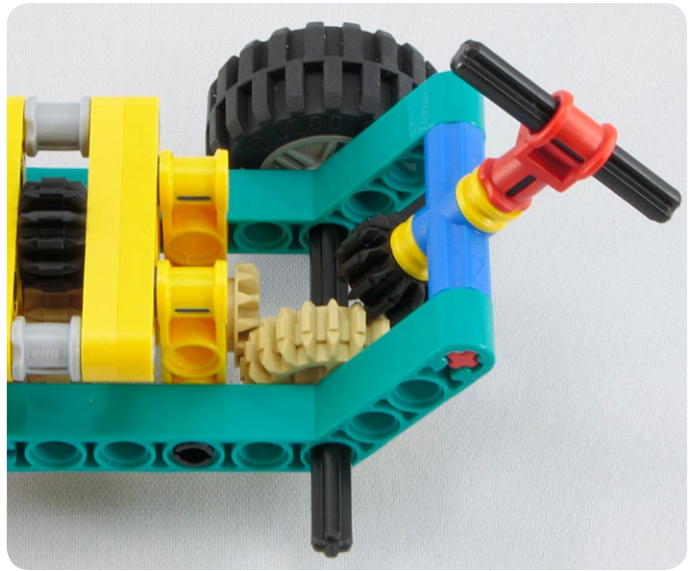
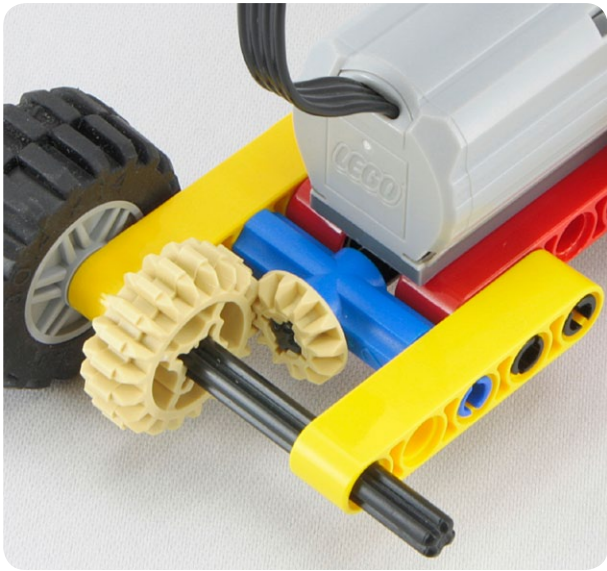




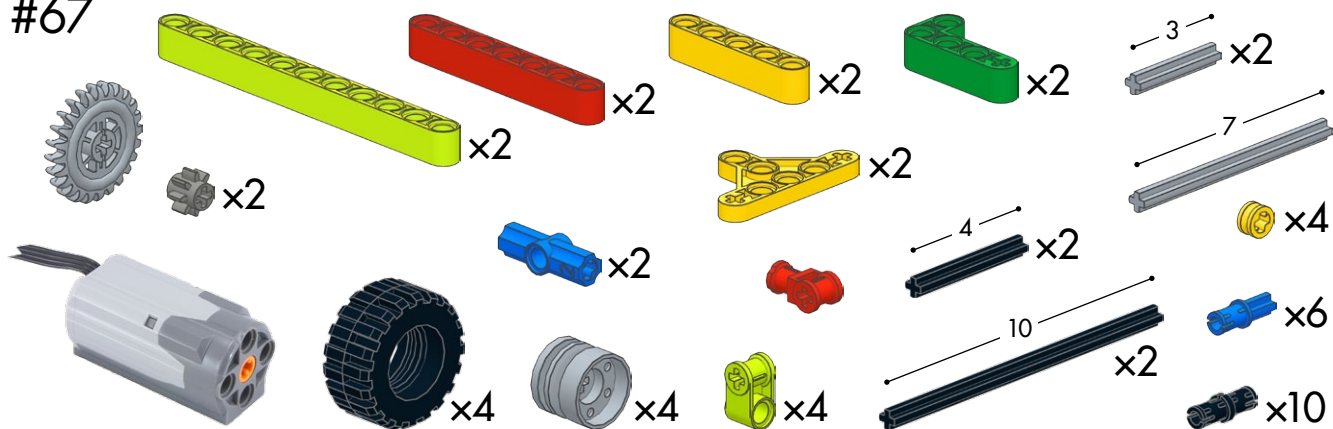
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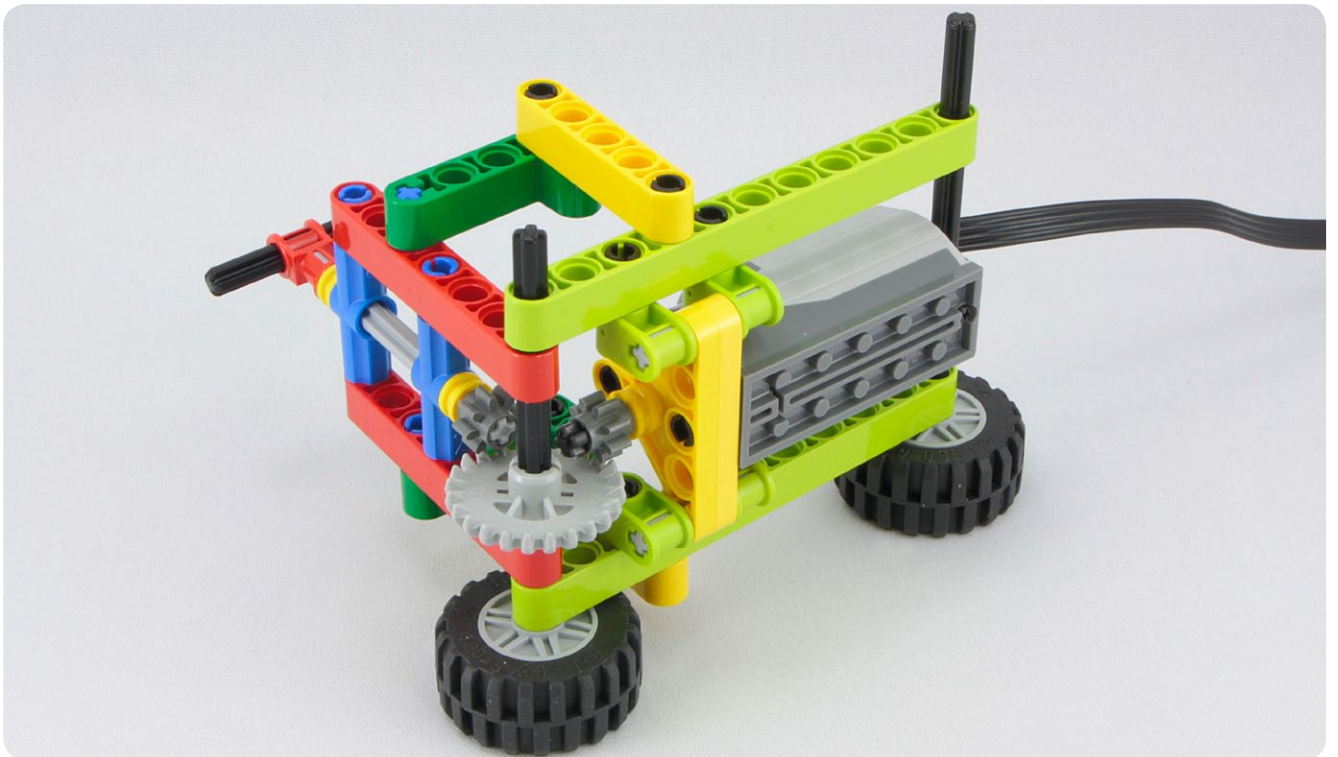
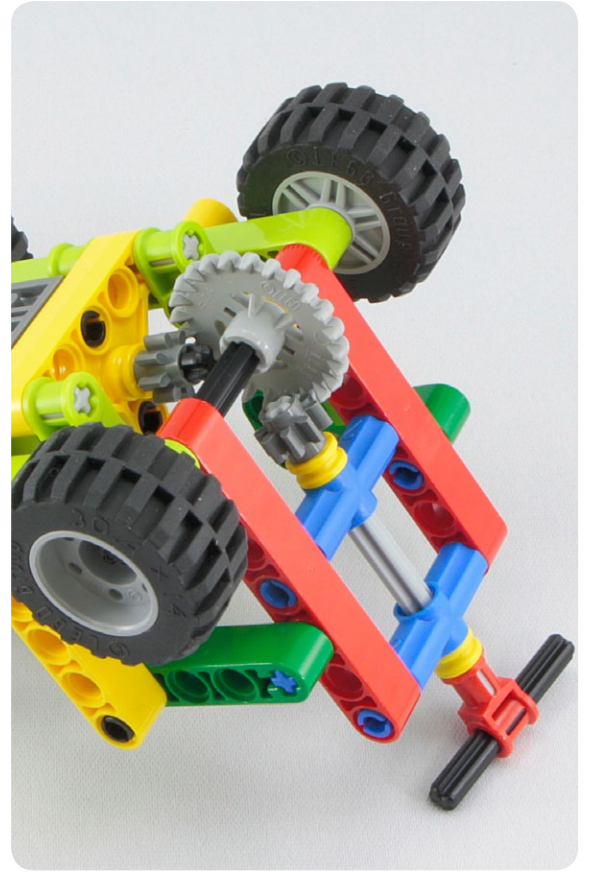
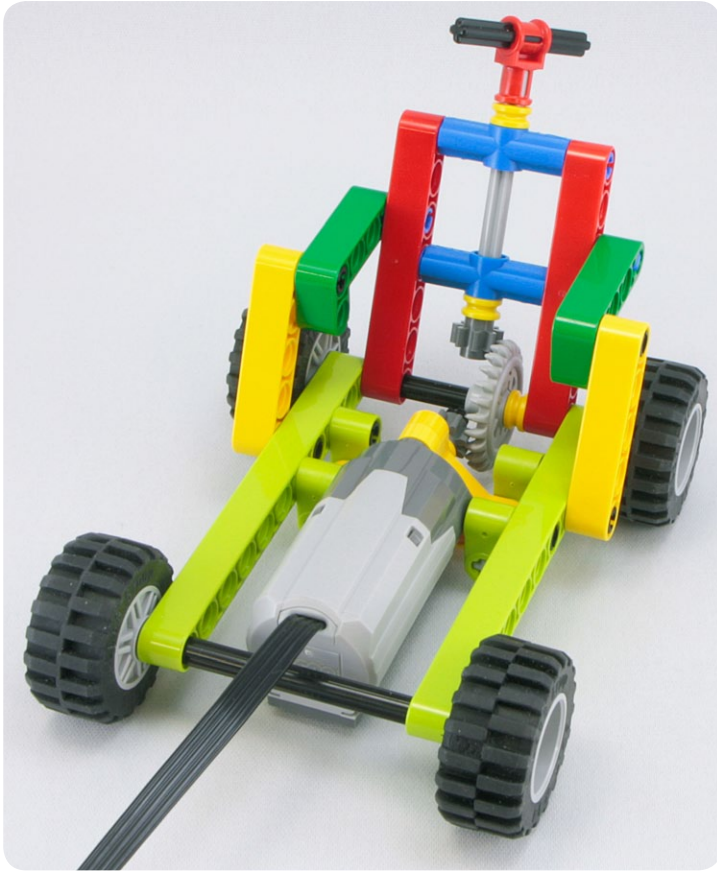
-  x1
-  x4
-  x4
-  x2
-  x2
-  x2
-  x1
-  x4
-  x6
-  x2
-  x3
-  x2
-  x2
-  x2
-  x3
-  x2
-  x2
-  x2
-  x2
-  x2
-  x6
-  x13



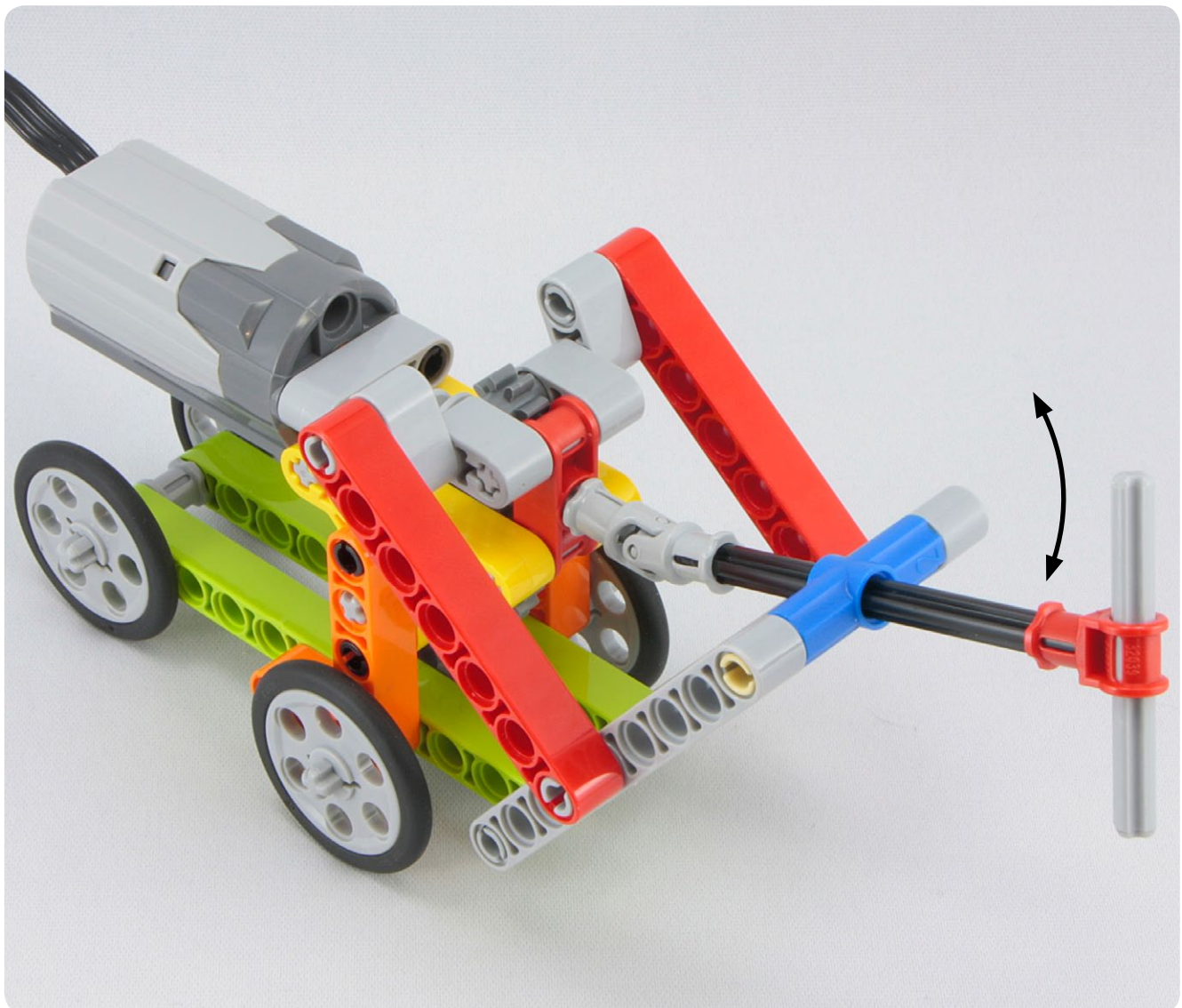
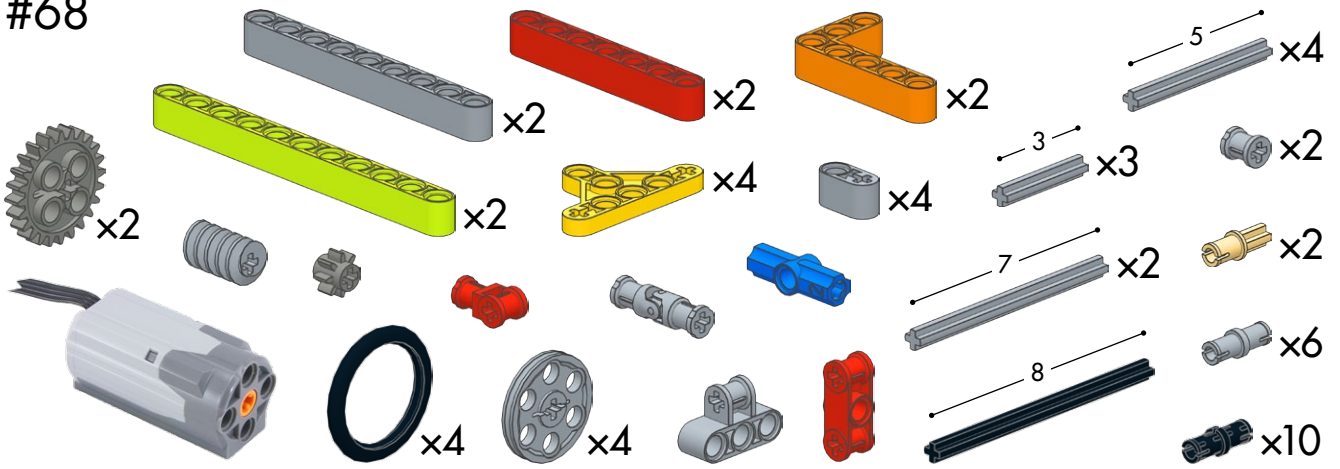


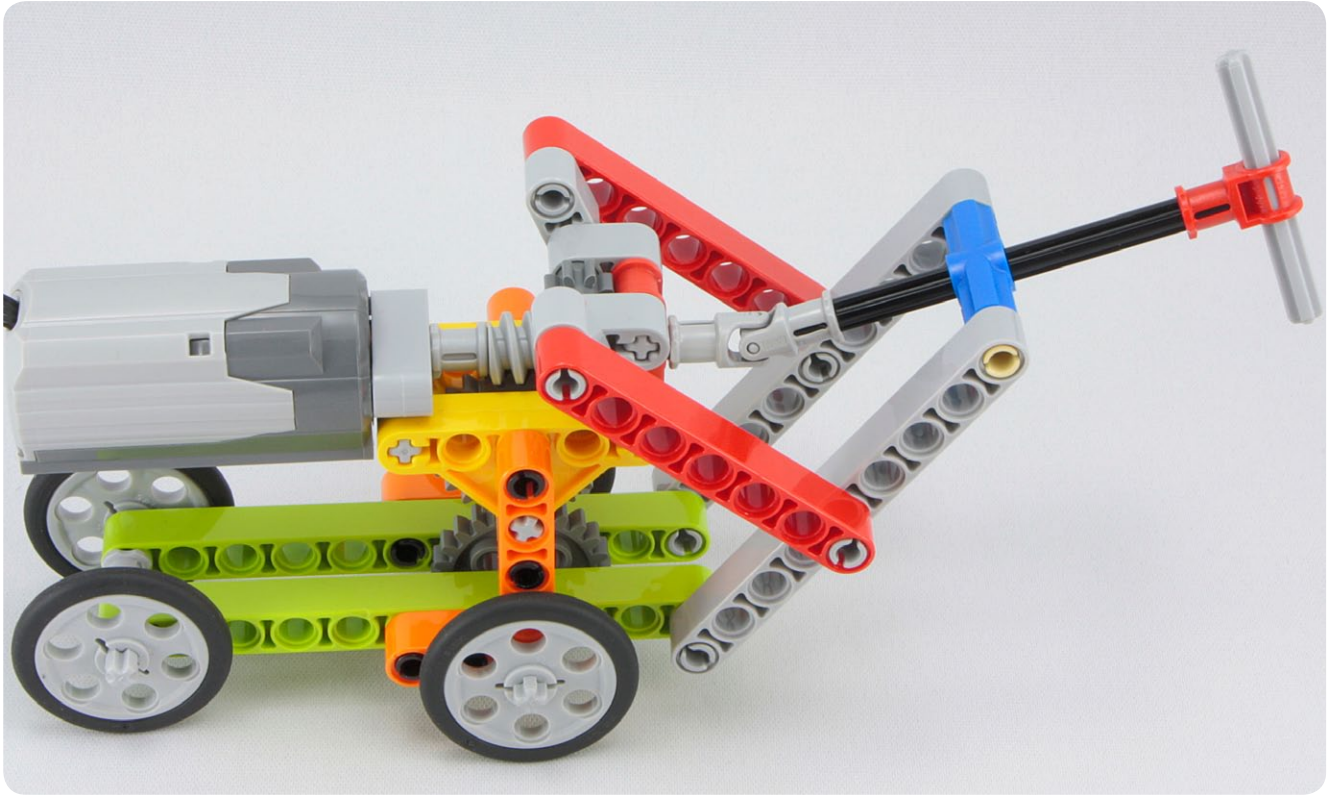
#67





#68



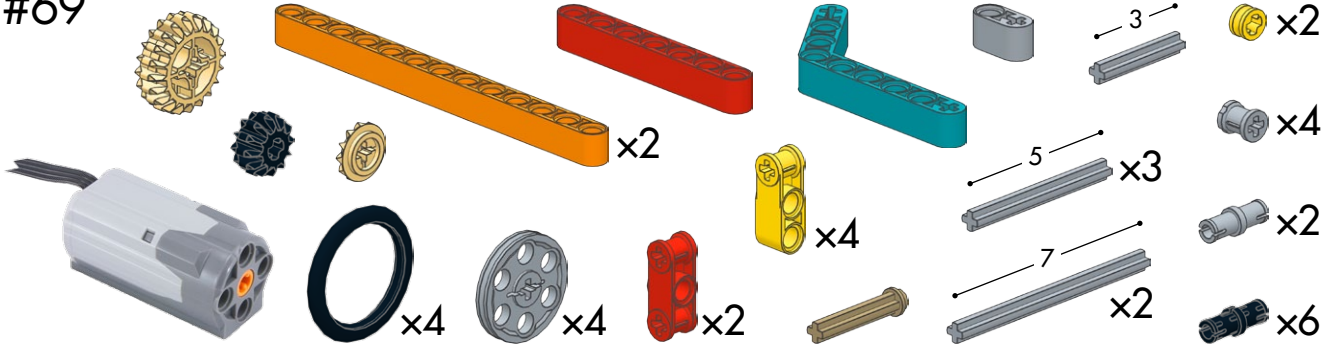


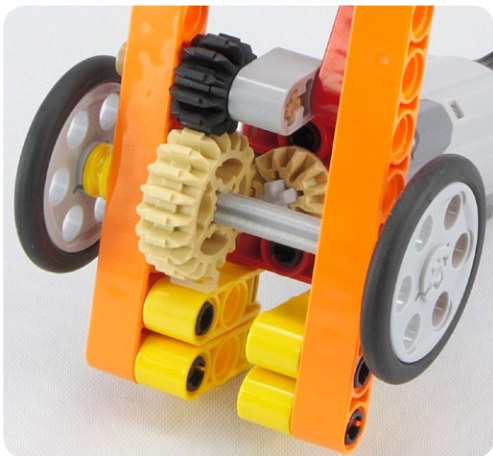
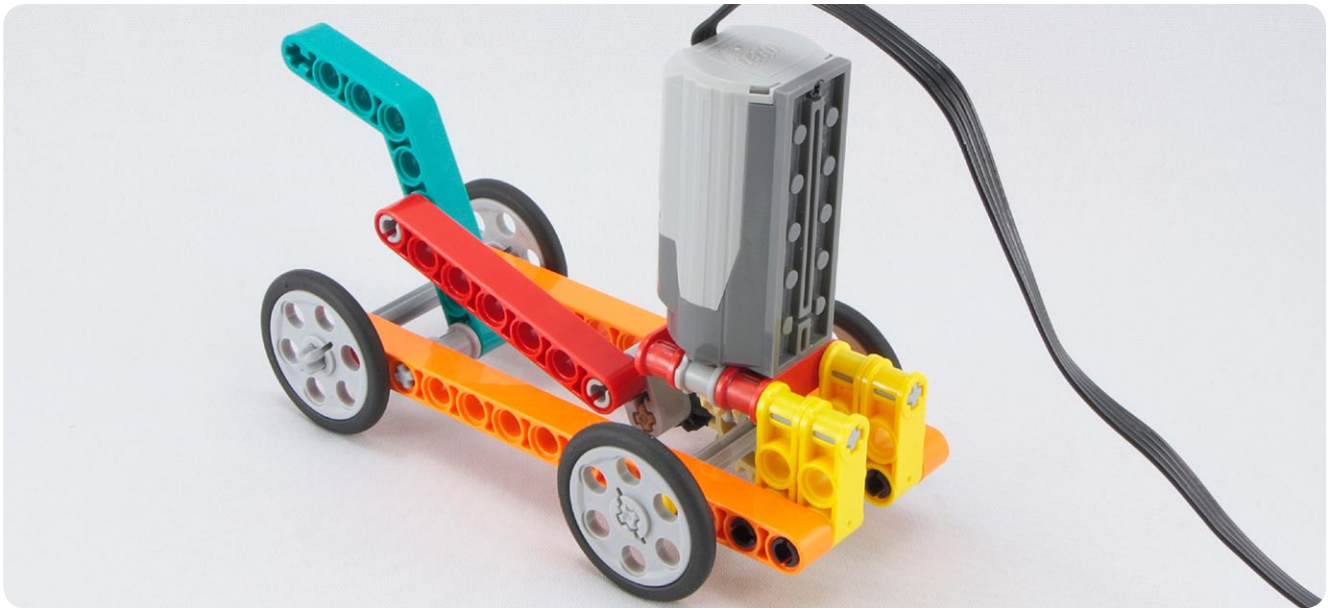




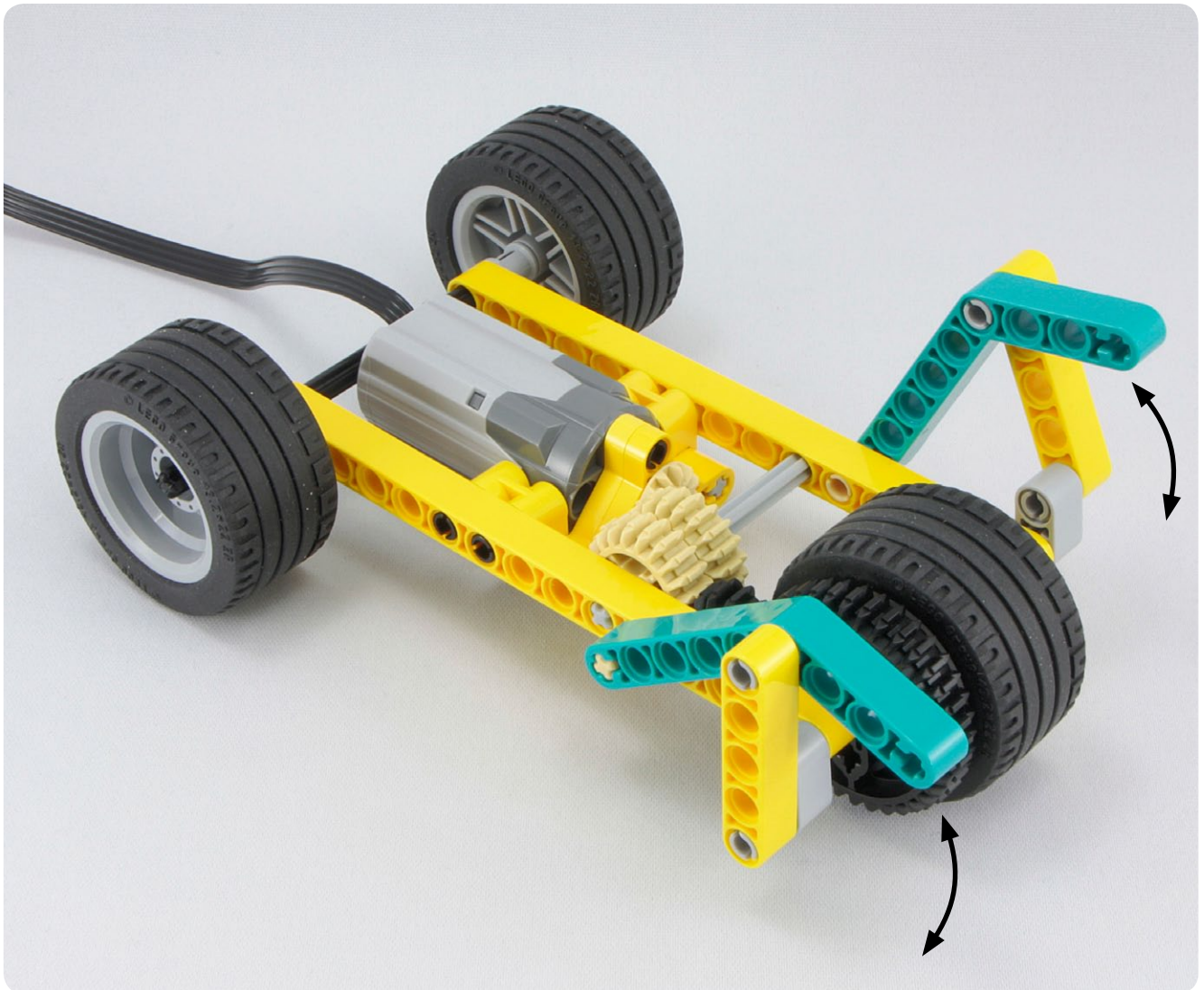
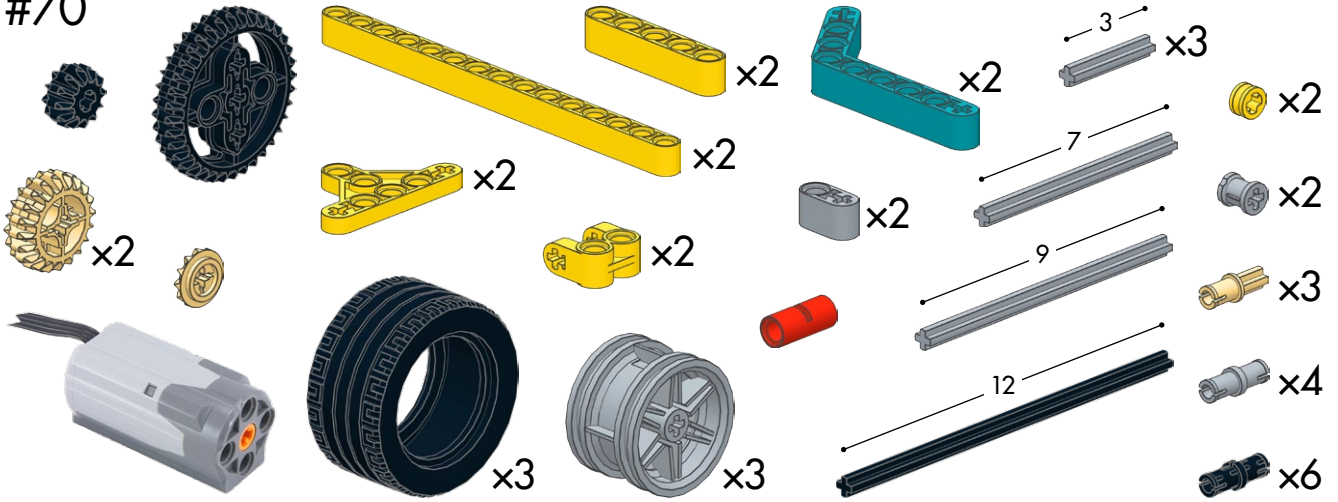
# Cars that move something

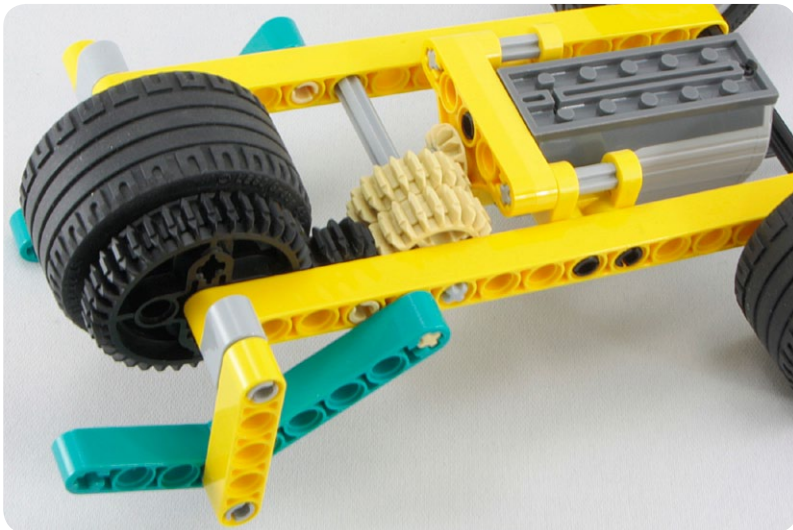
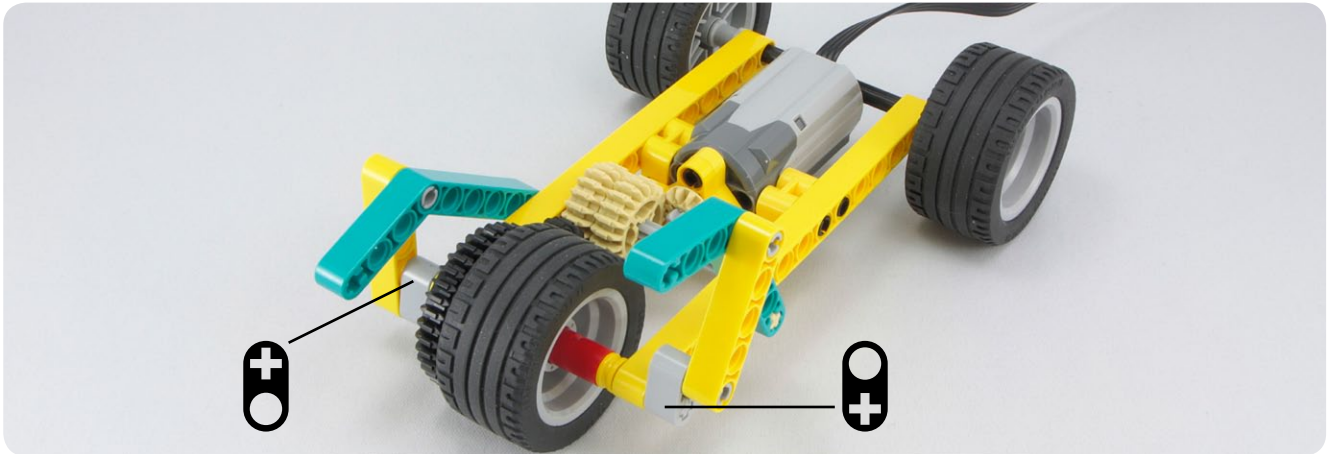
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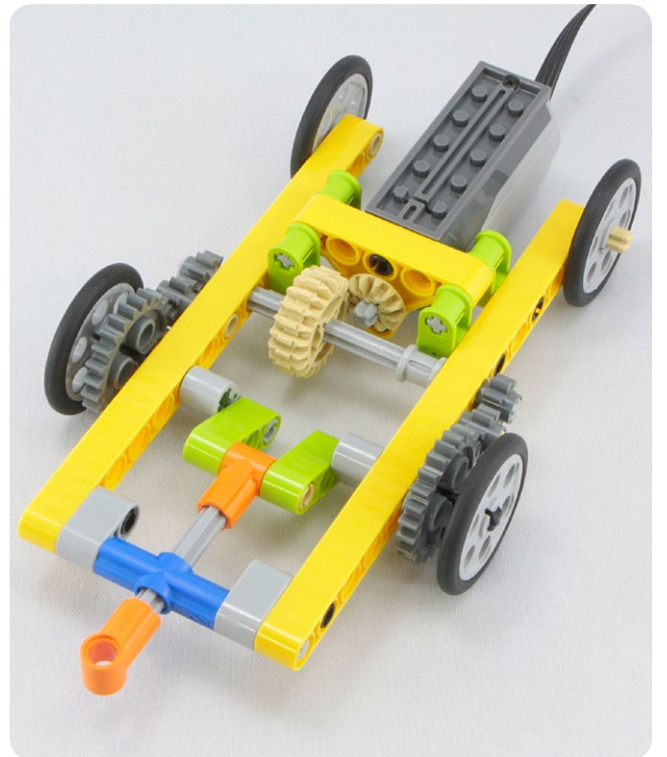
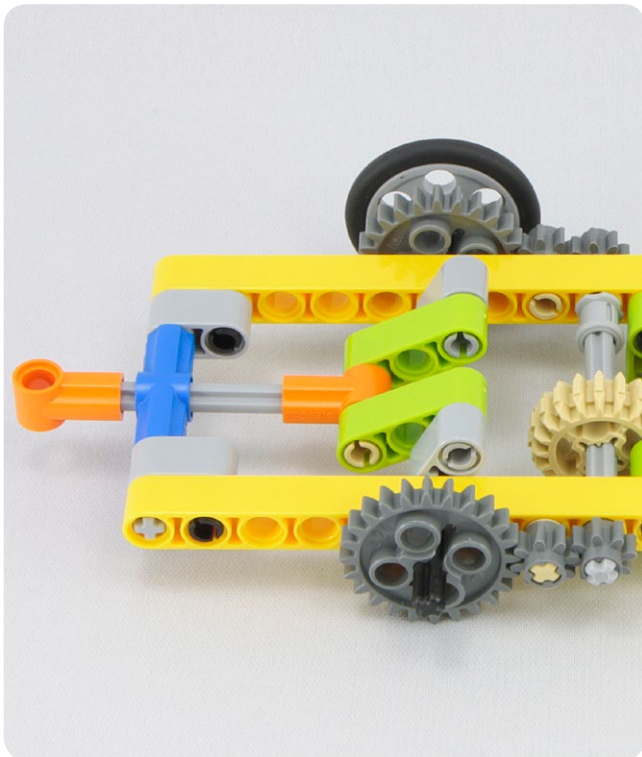


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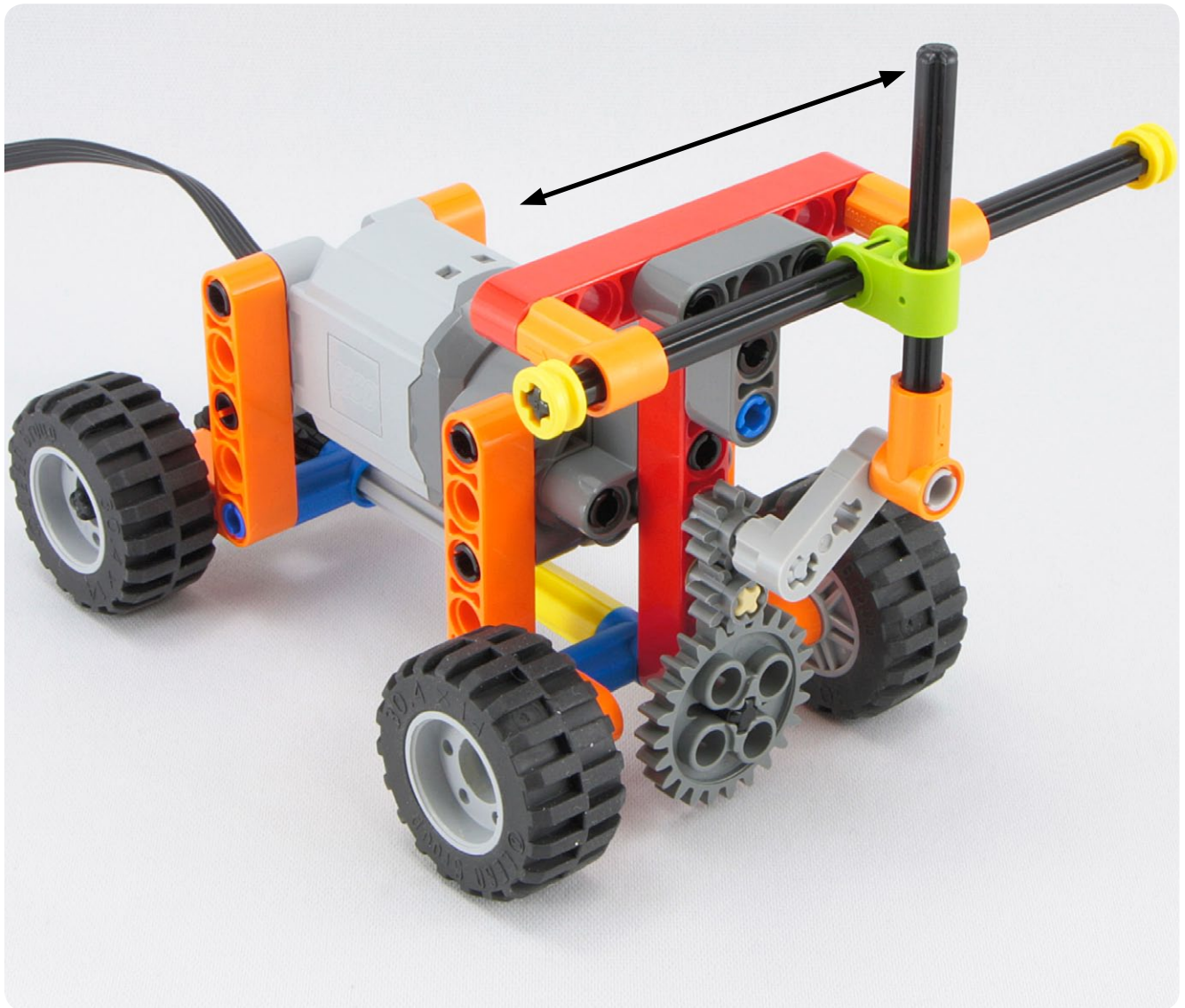
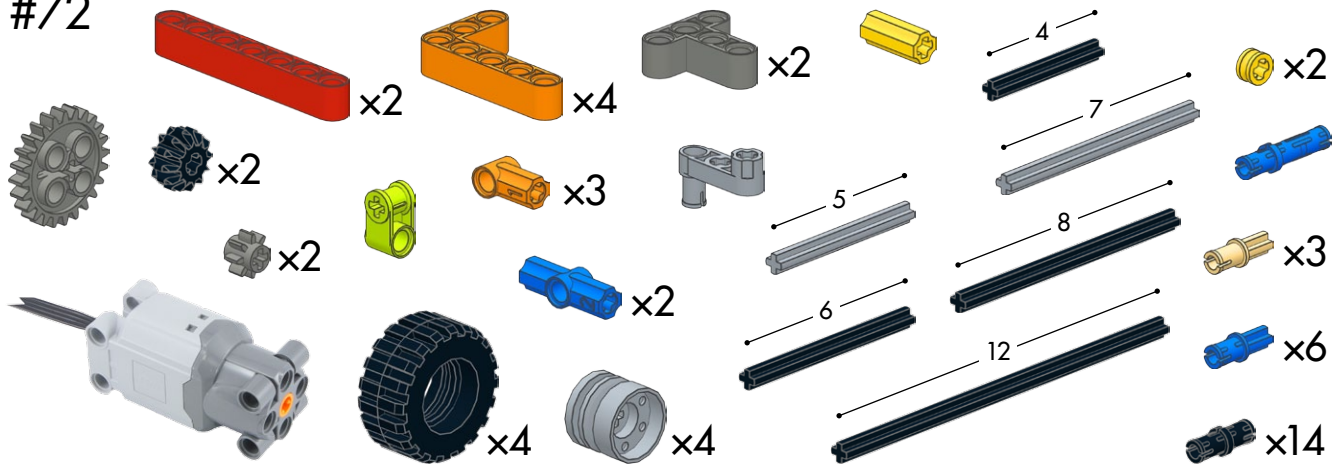


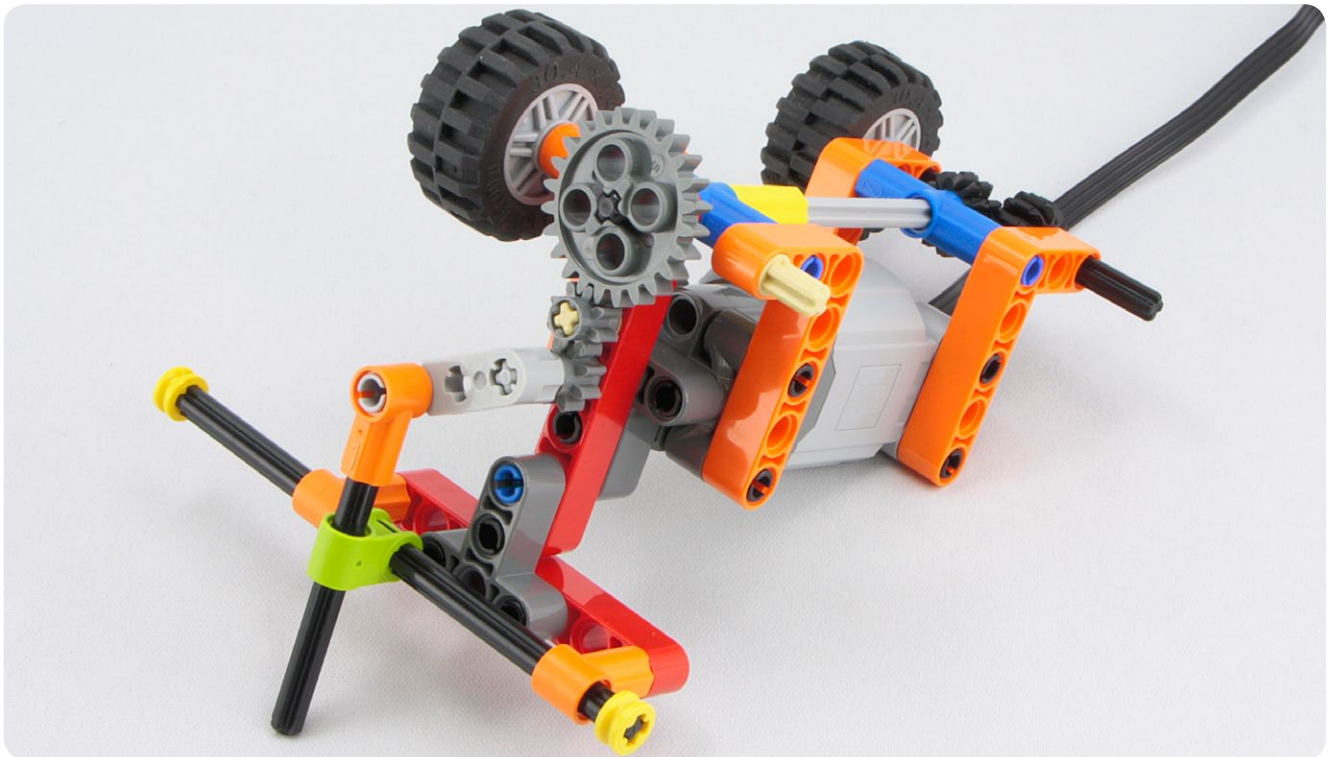






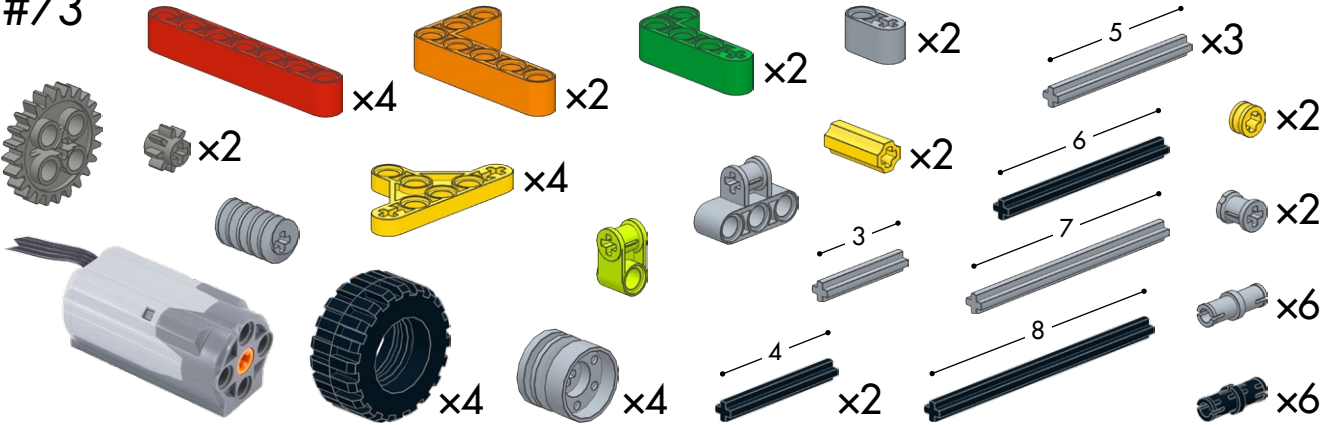
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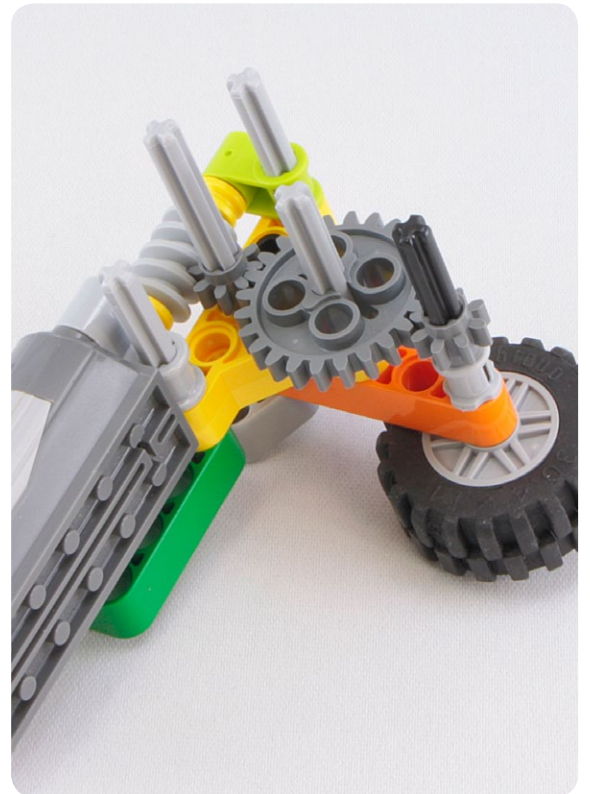
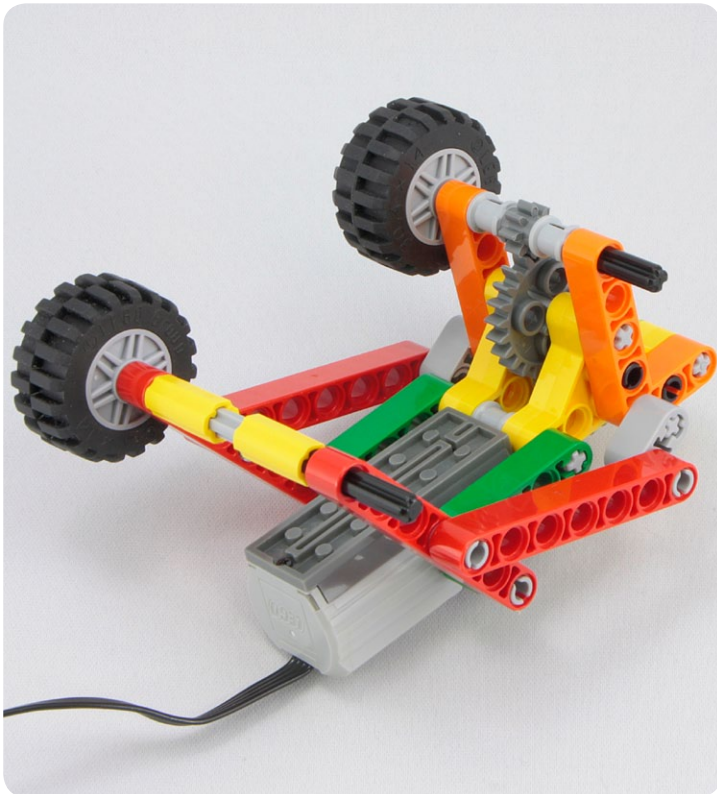


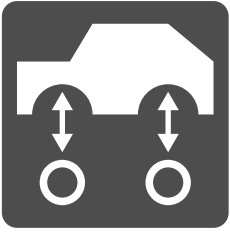




# #73

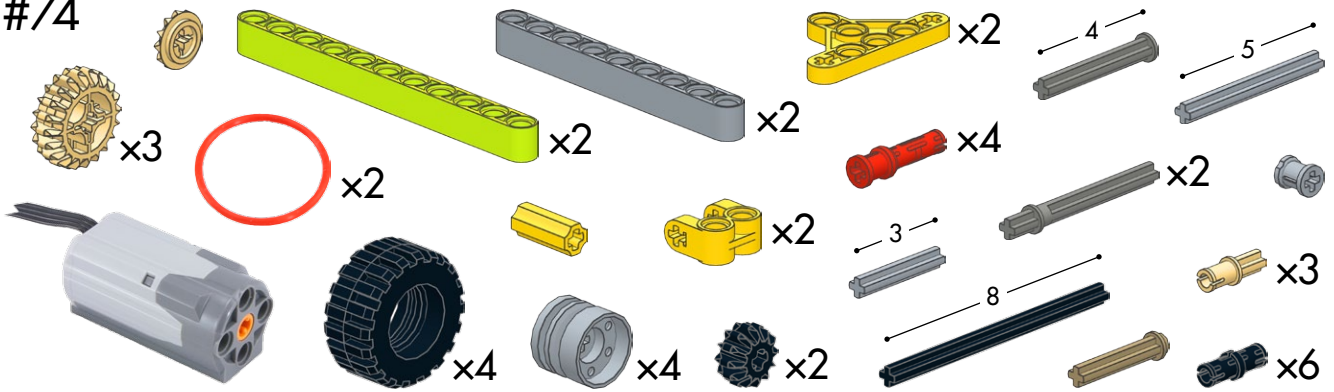


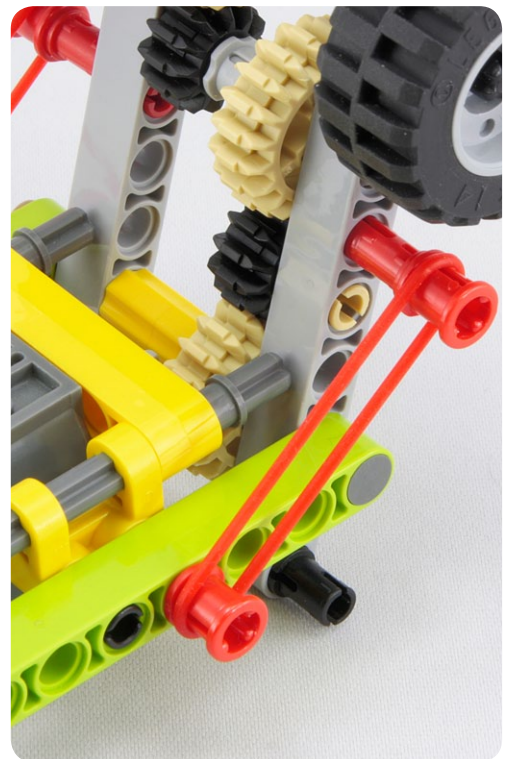
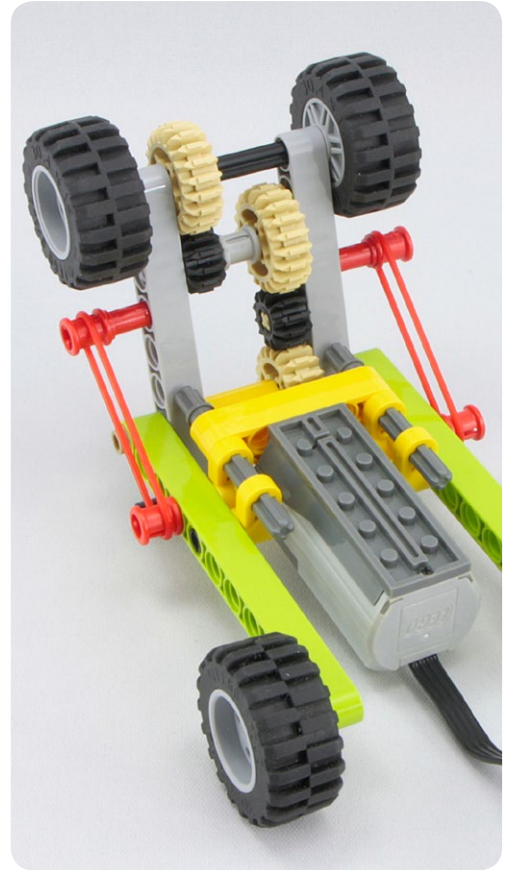




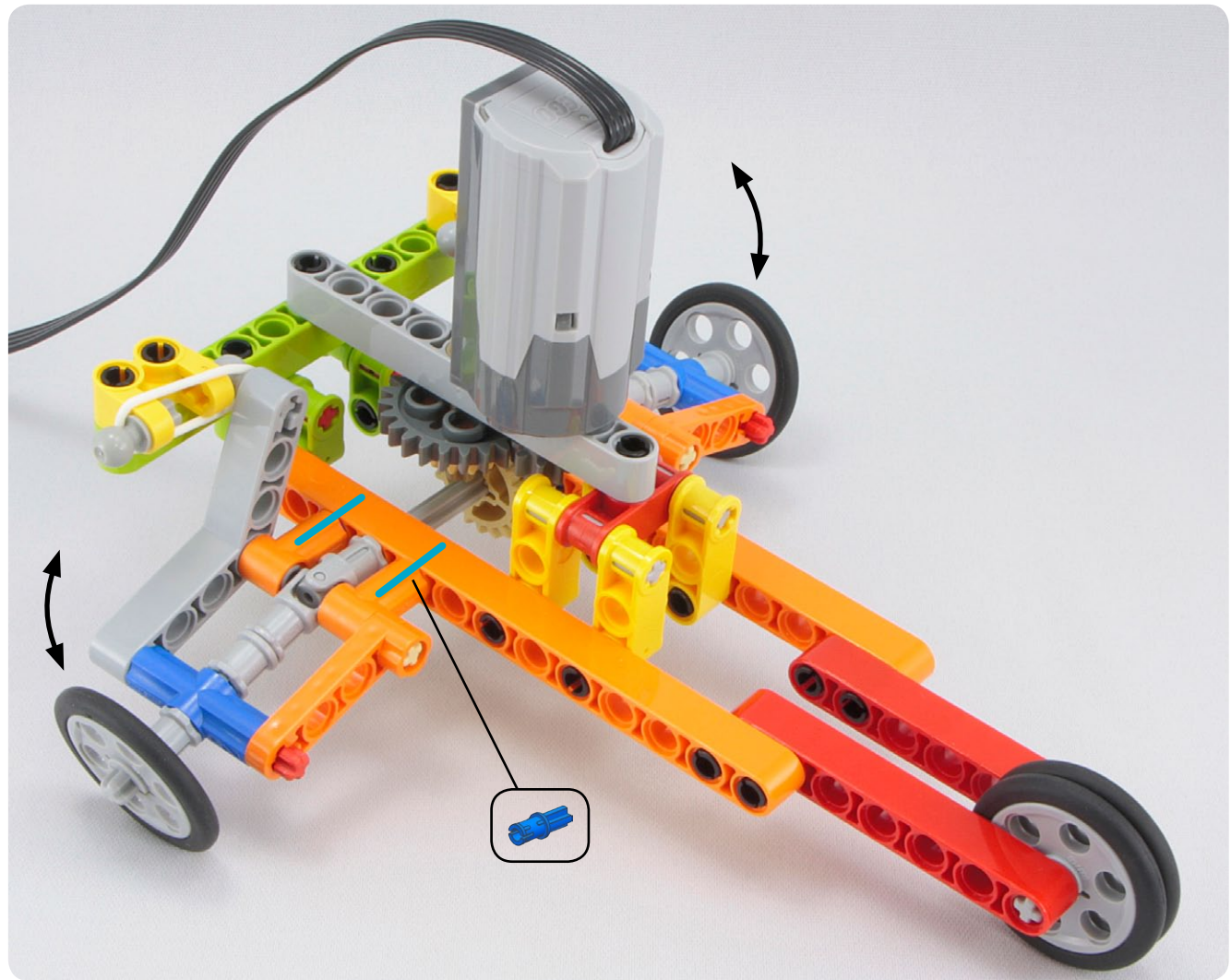
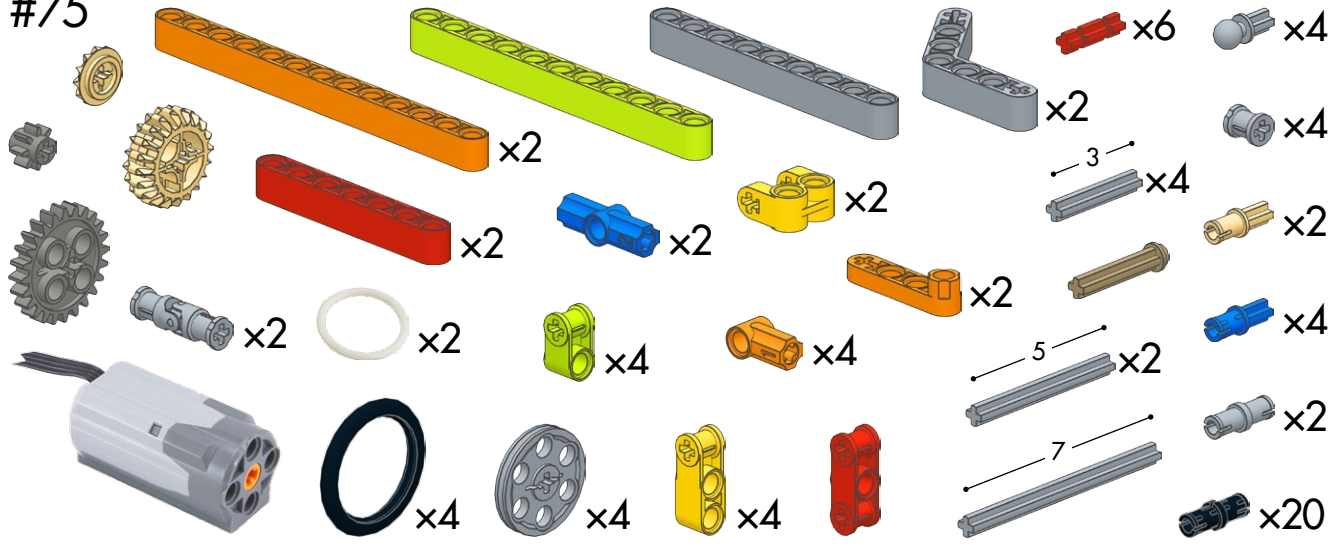
# Cars with suspension

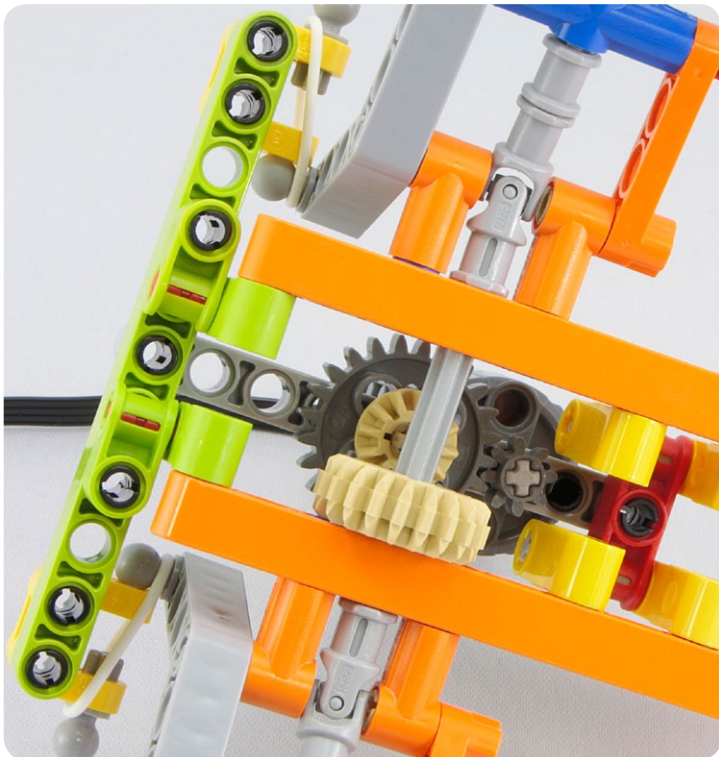
#74



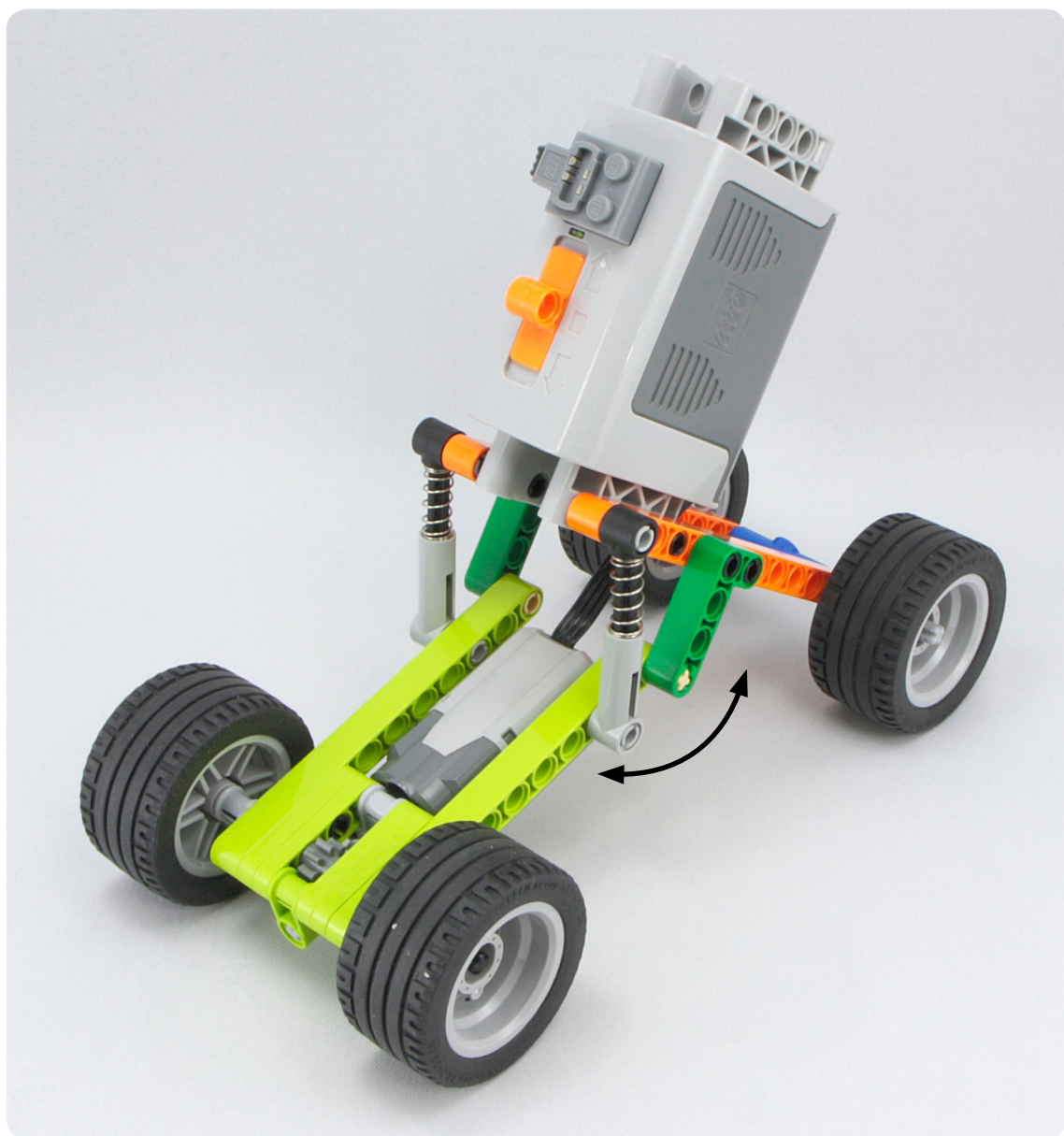
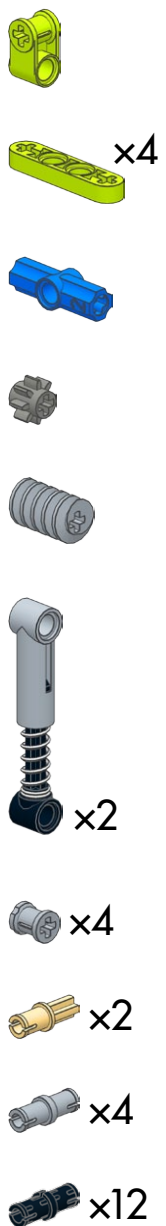
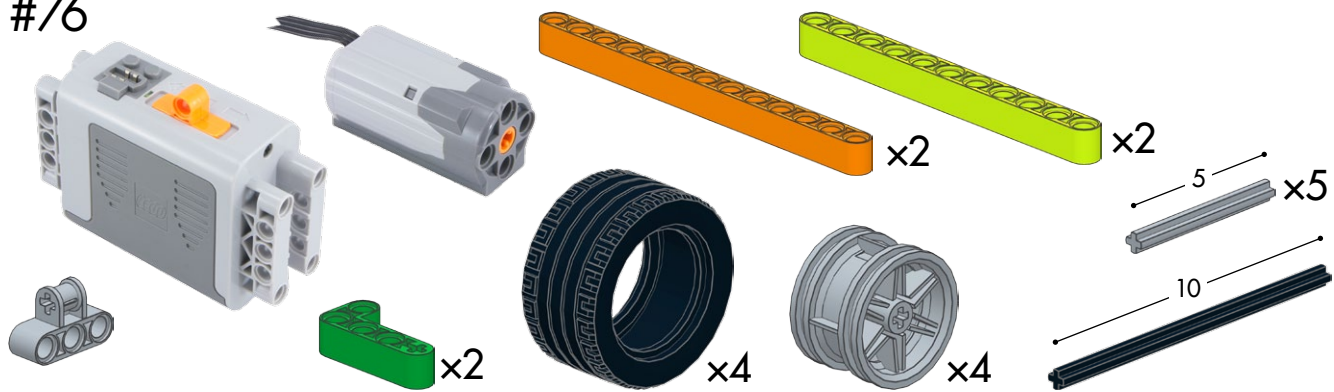


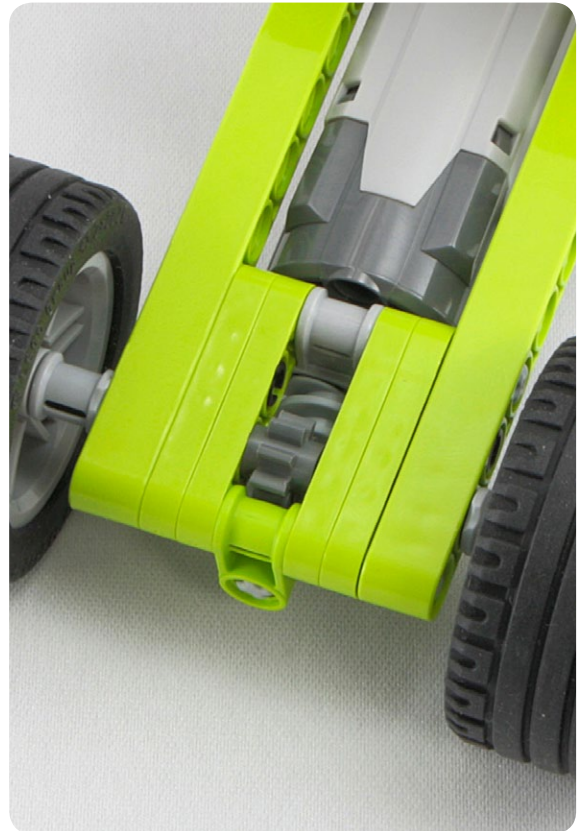
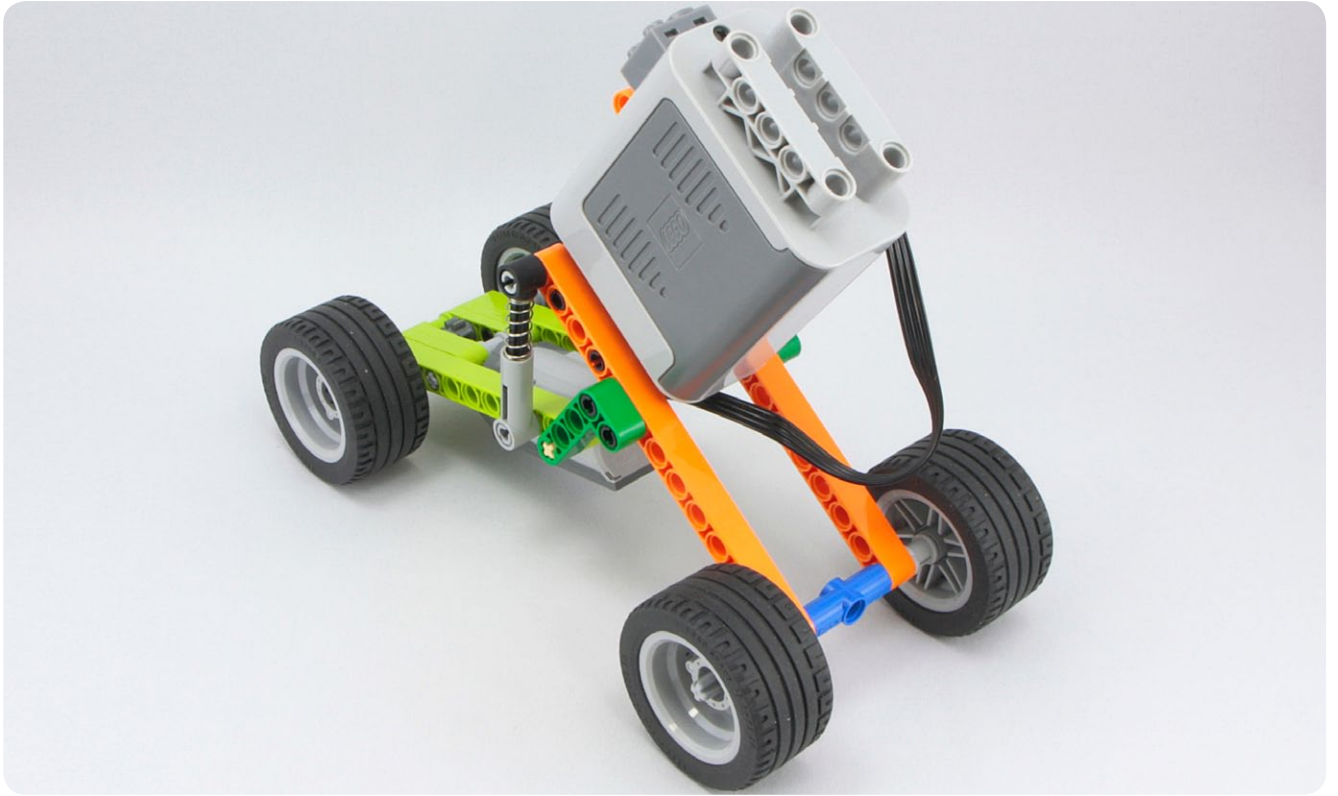
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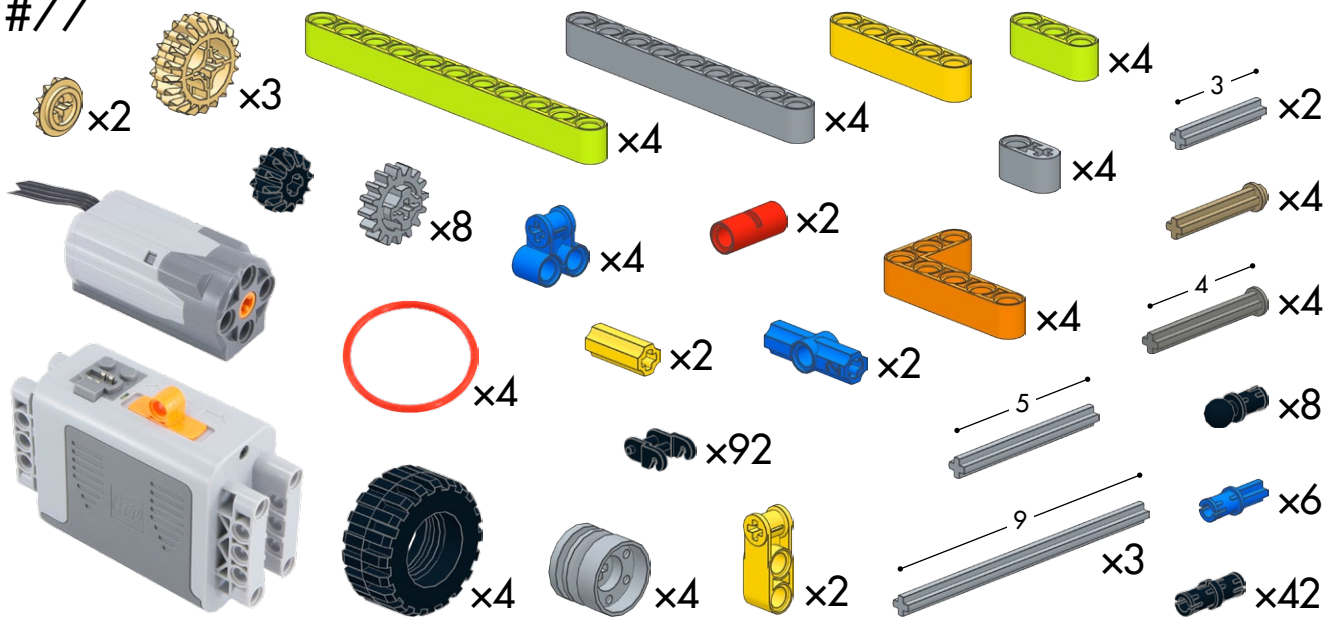
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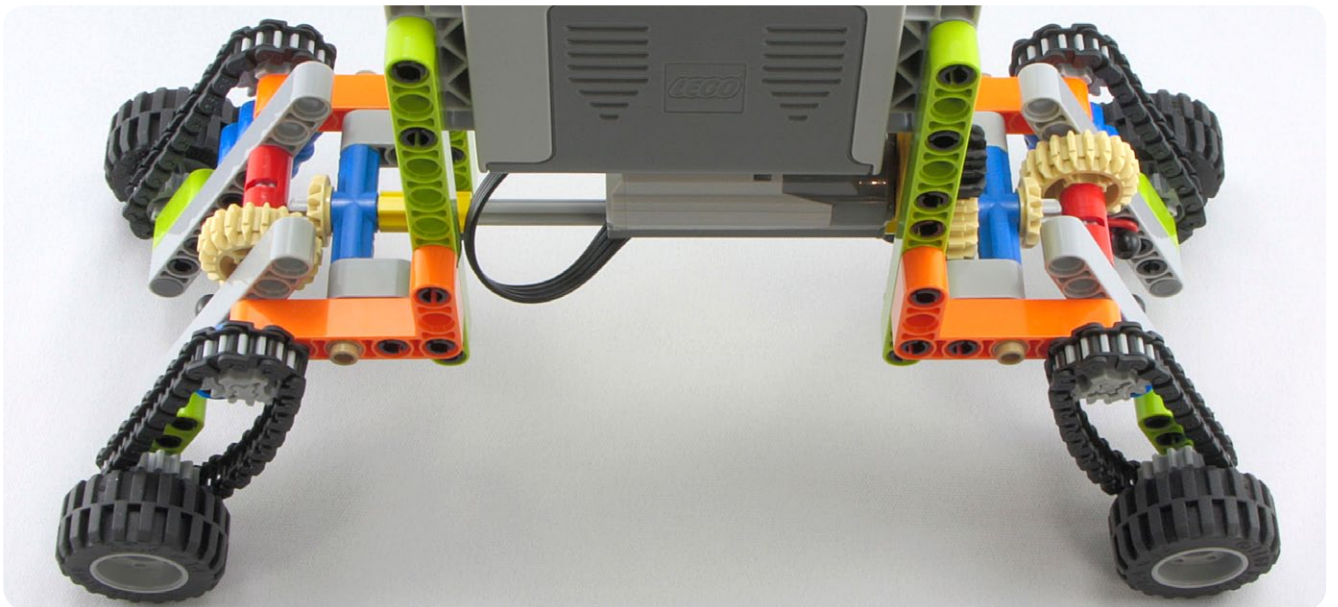
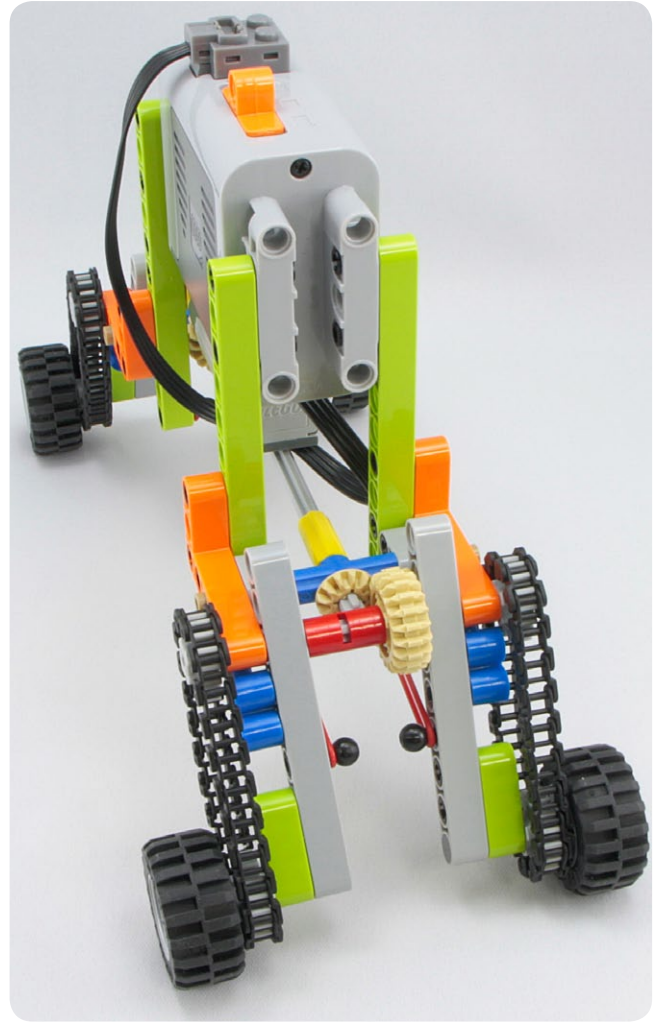
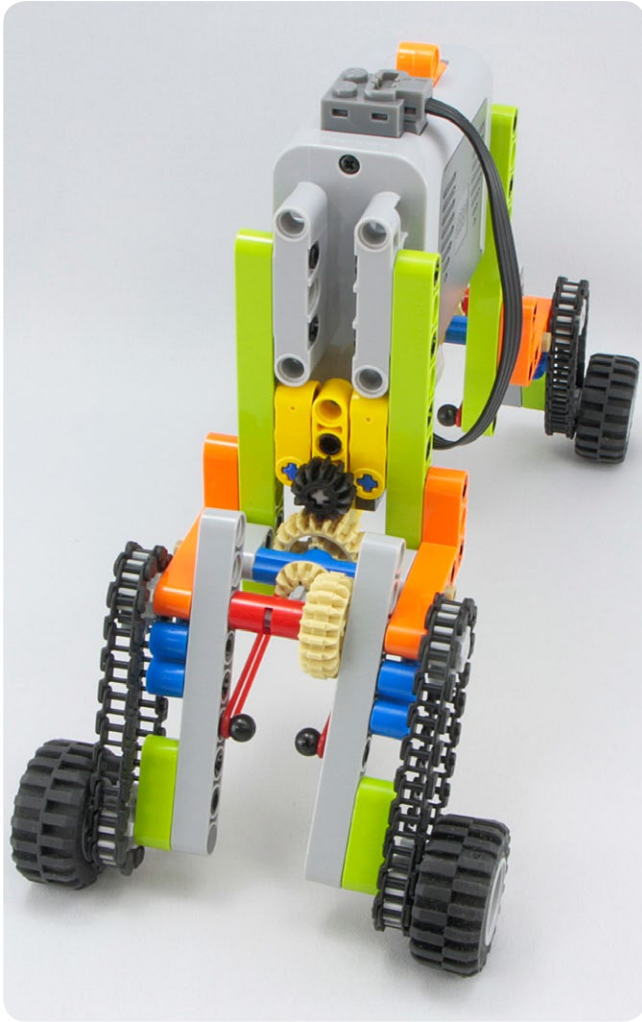


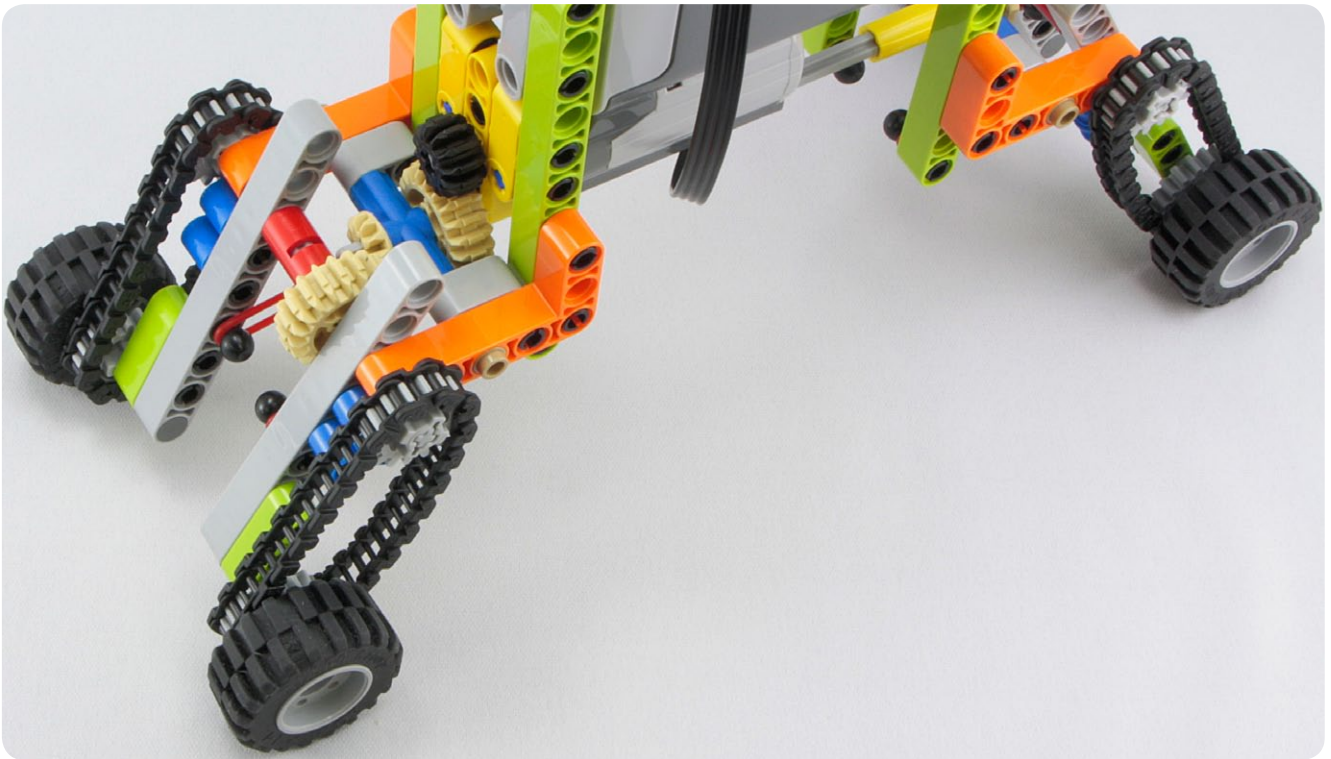


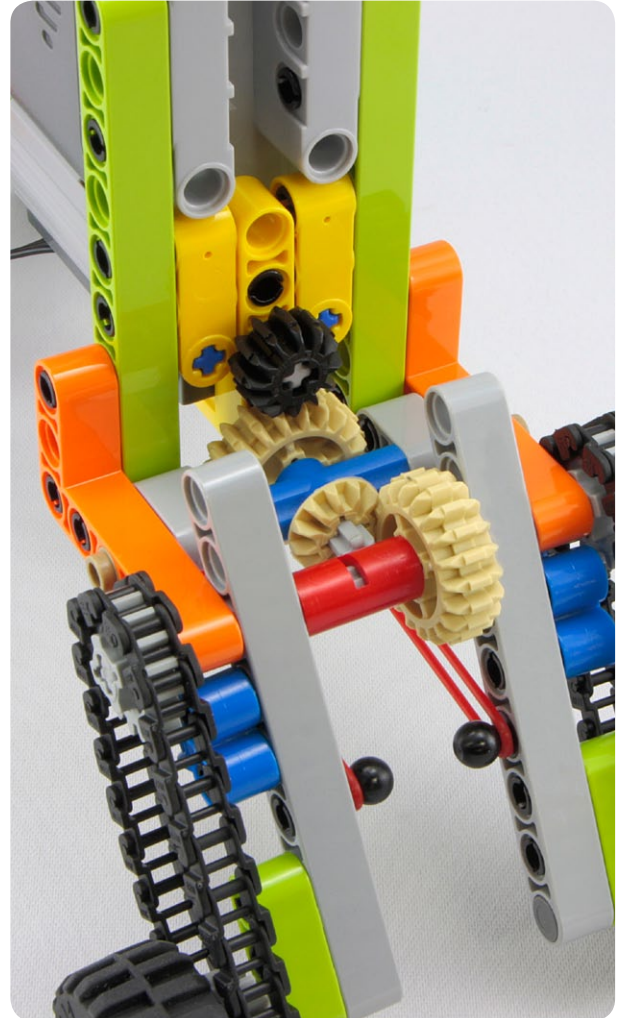
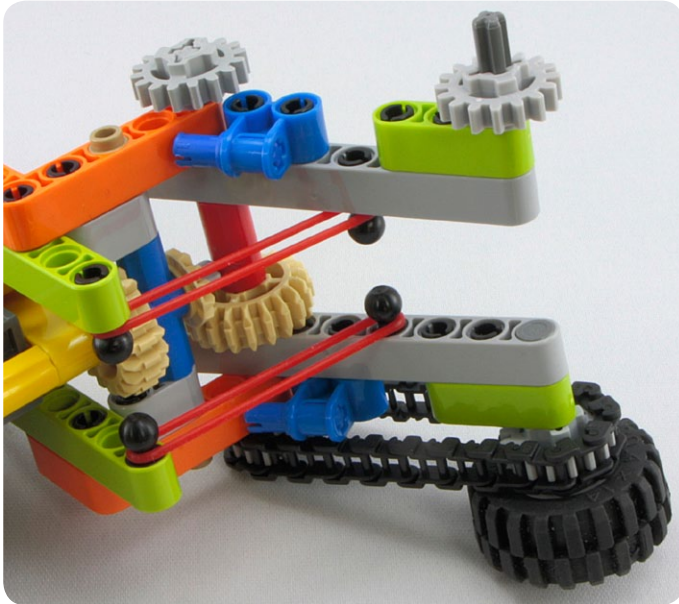
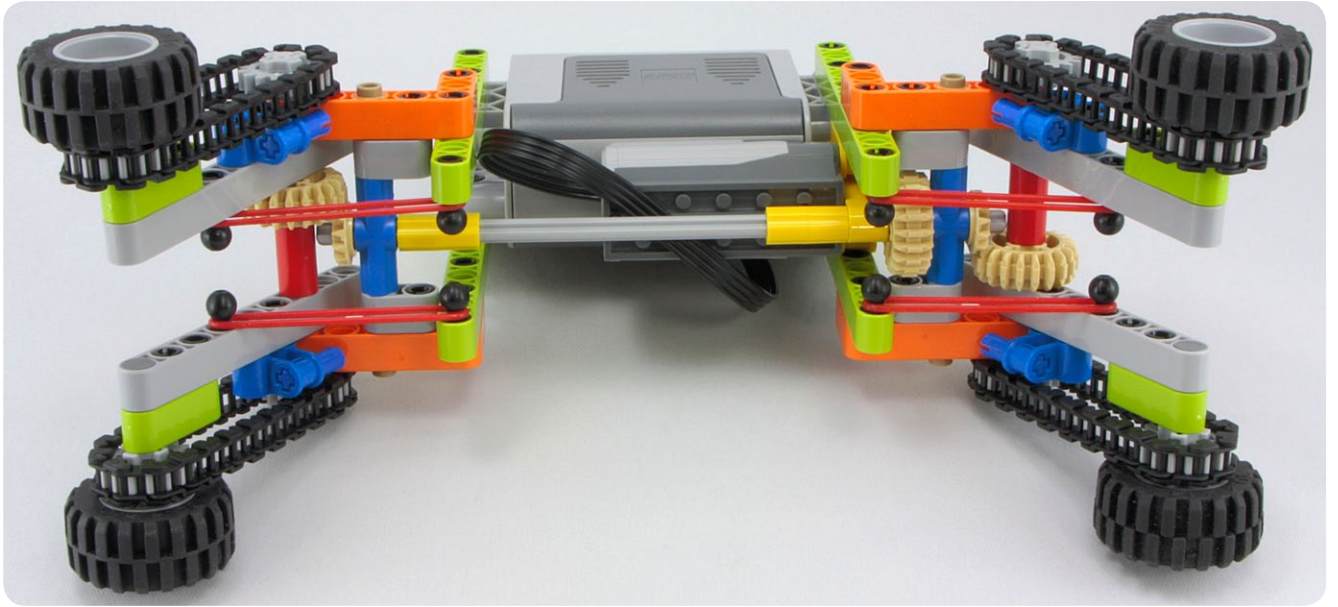


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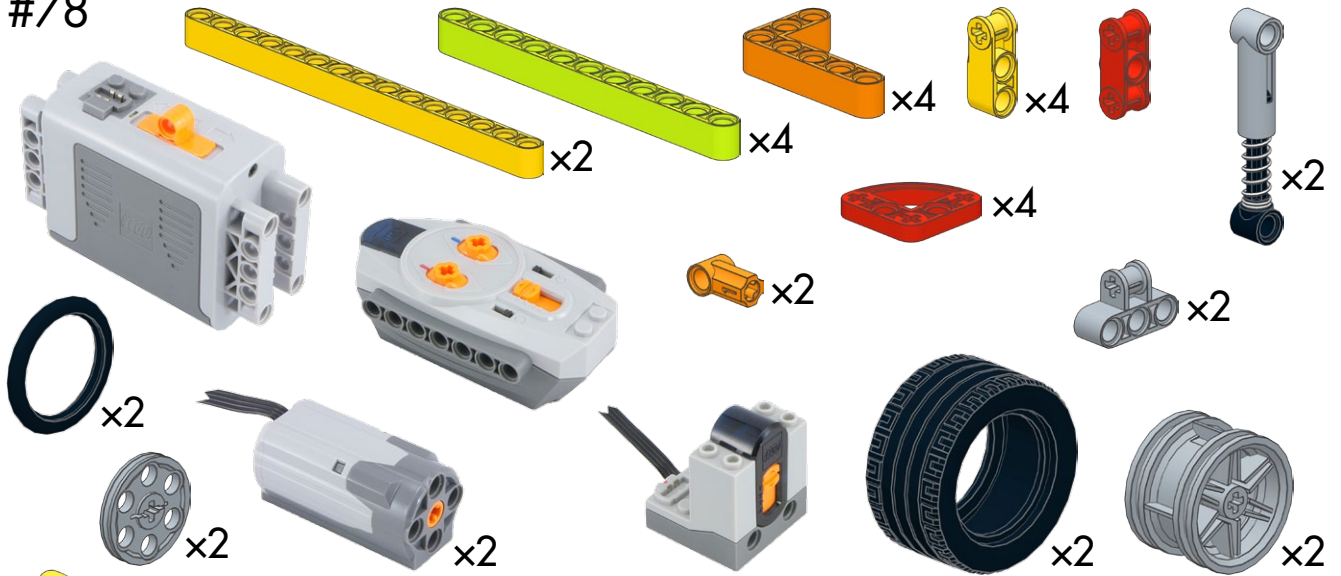


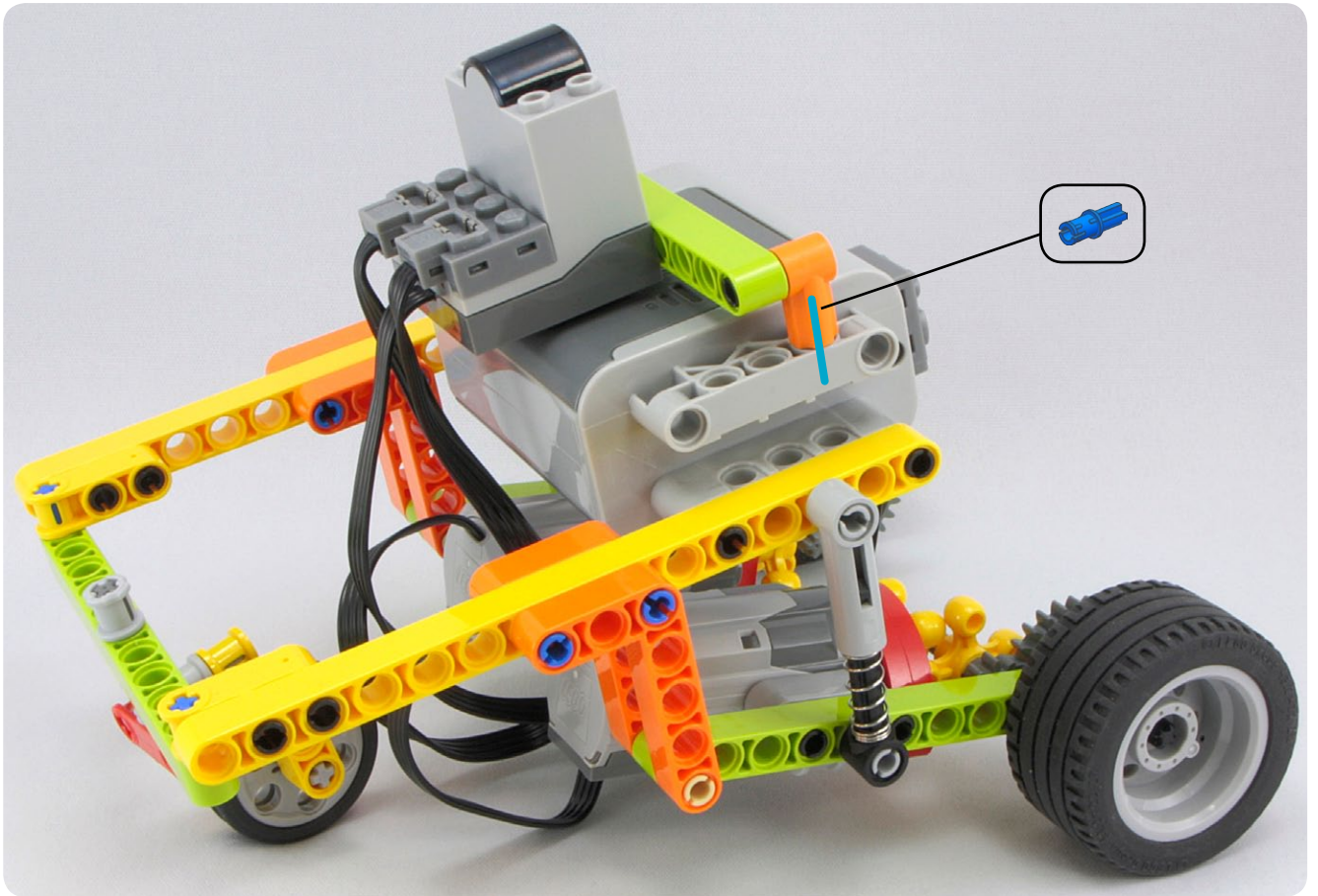


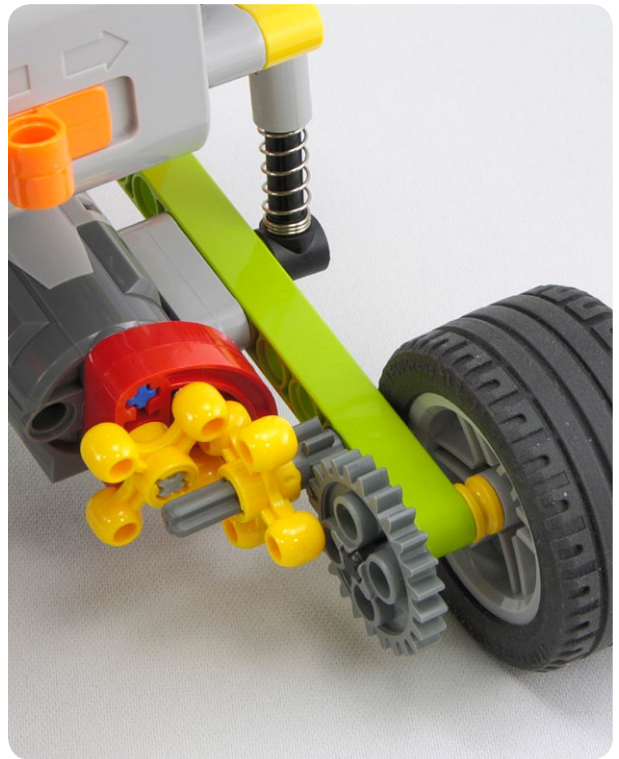
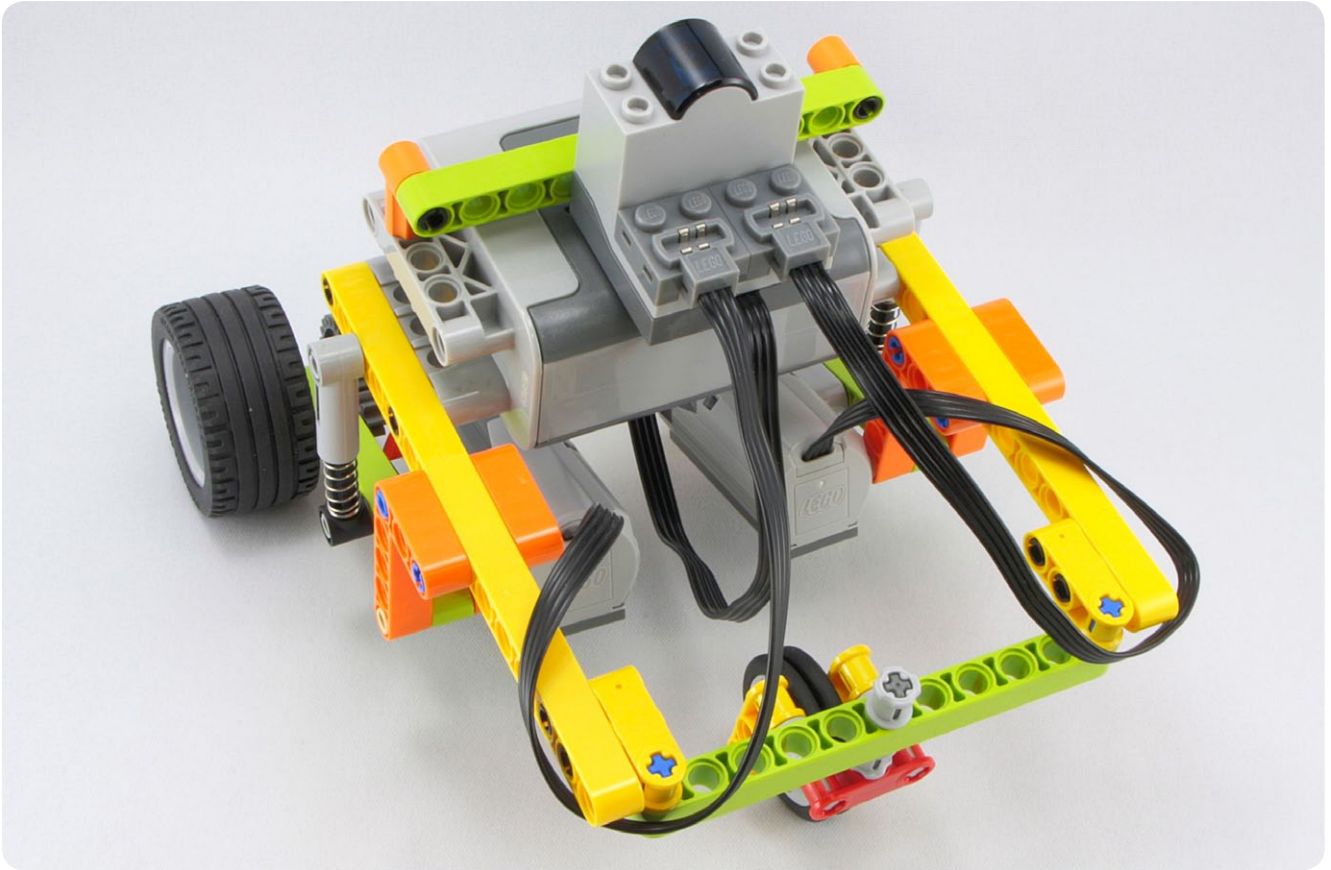




#78



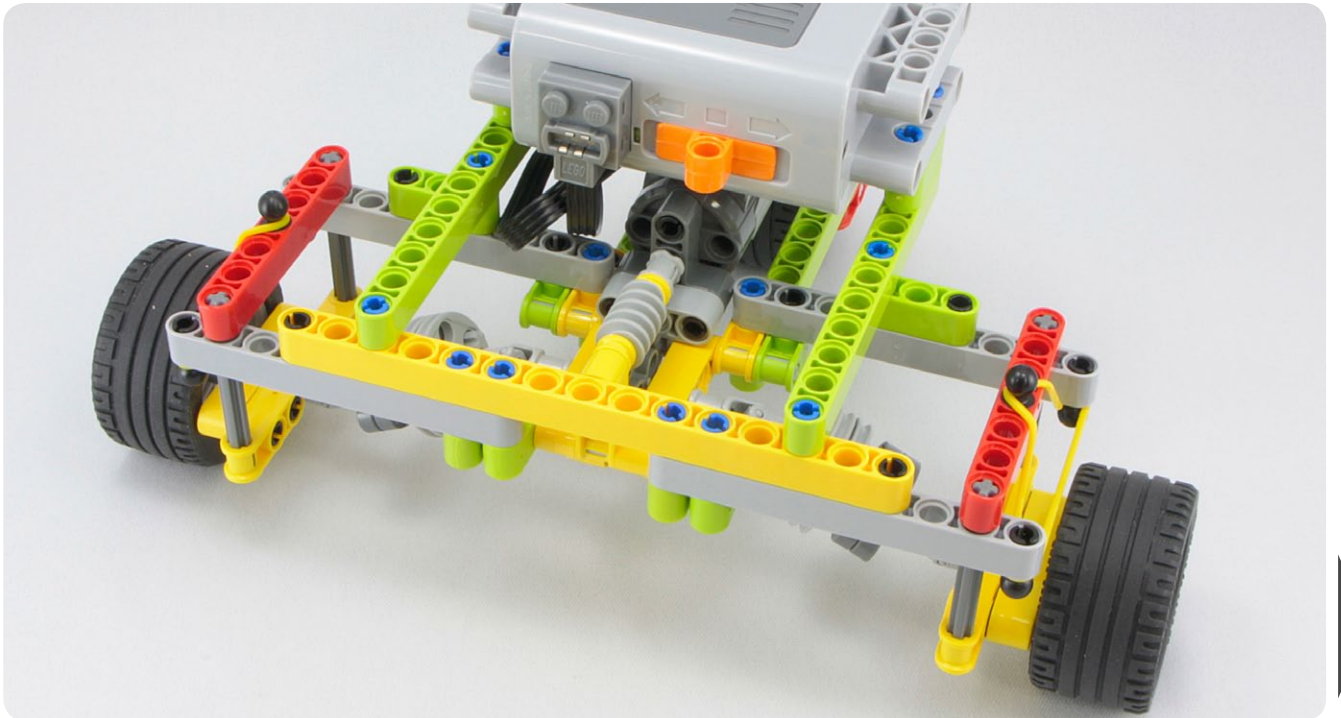


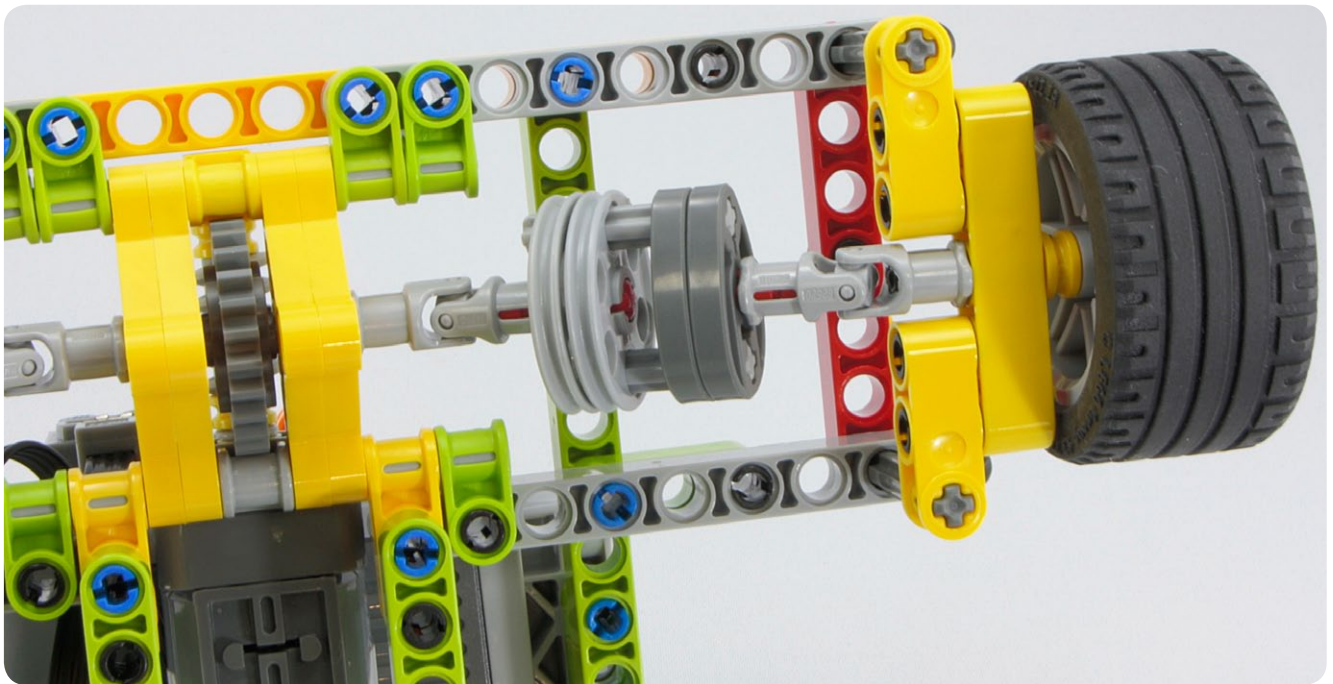
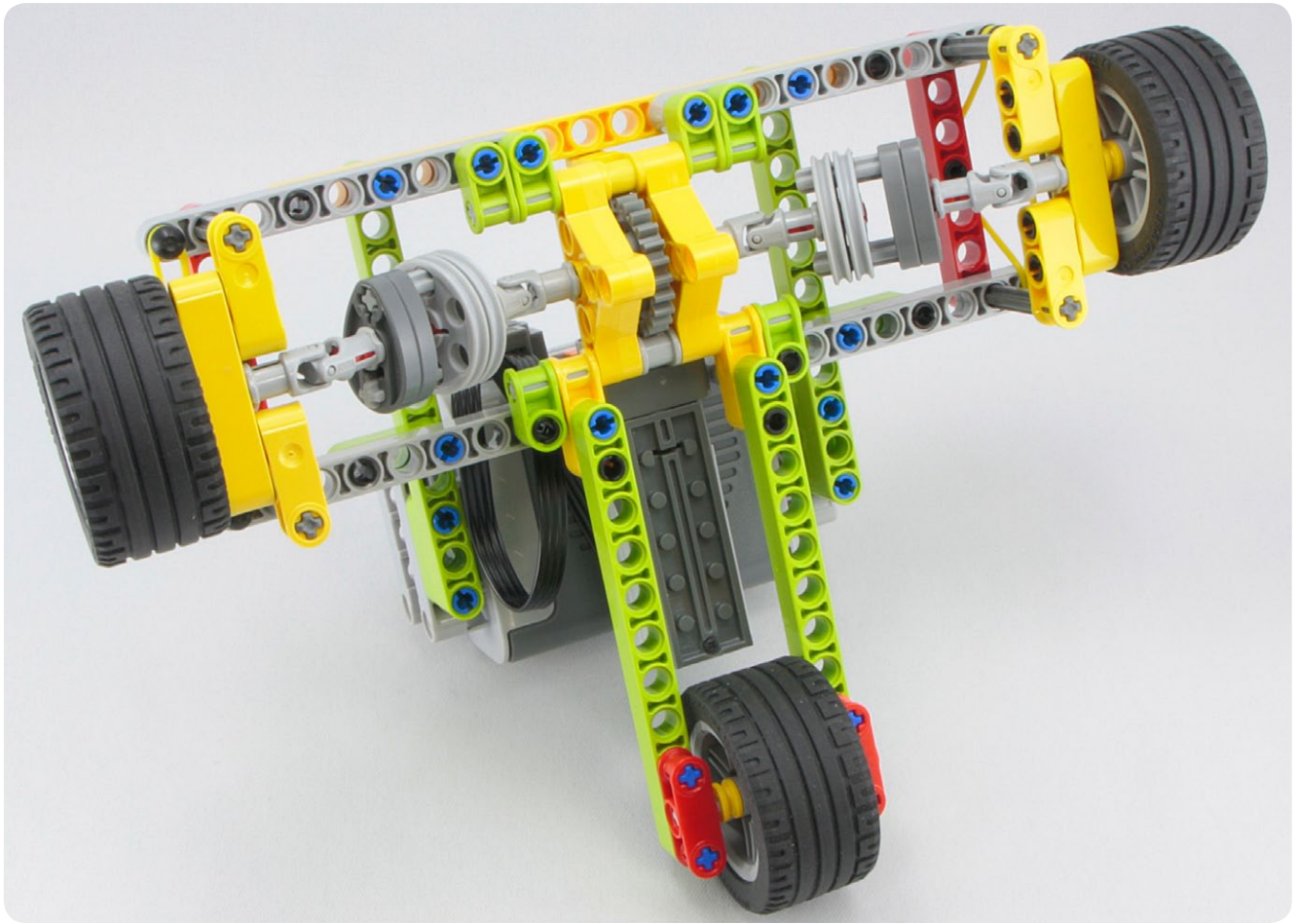


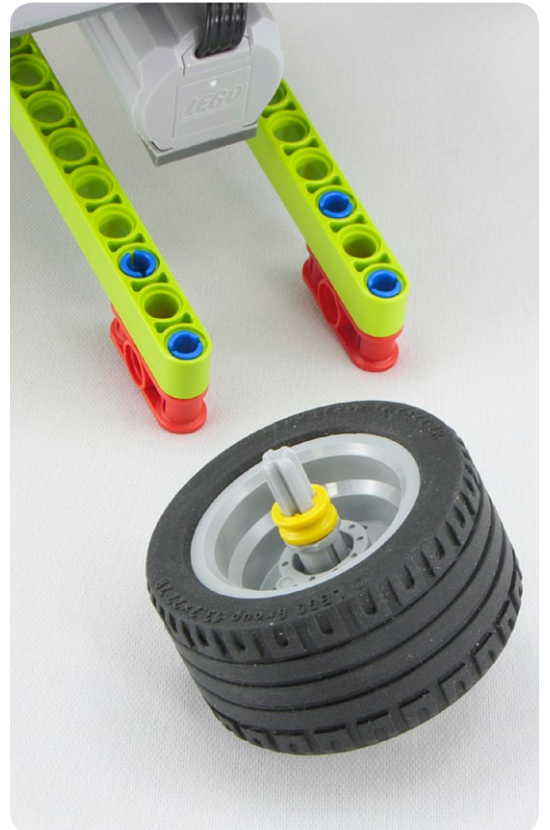
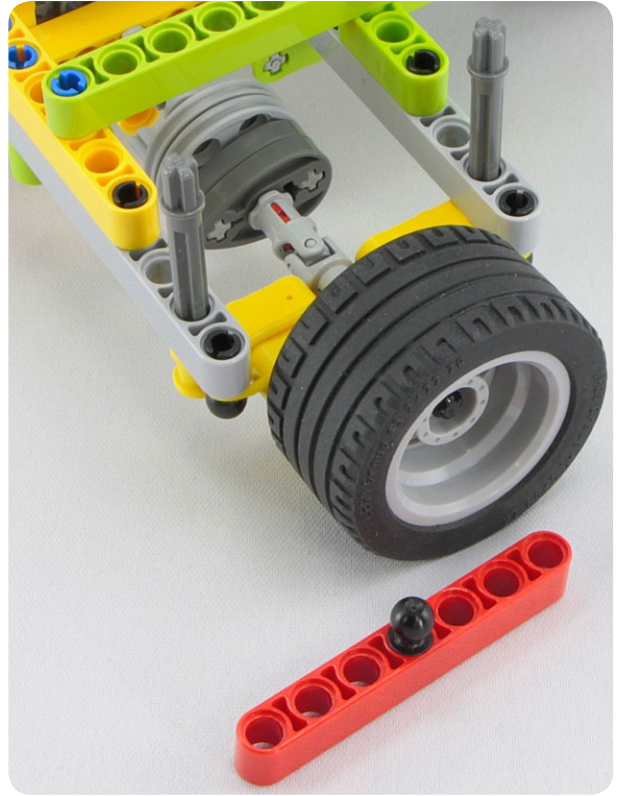






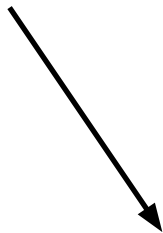
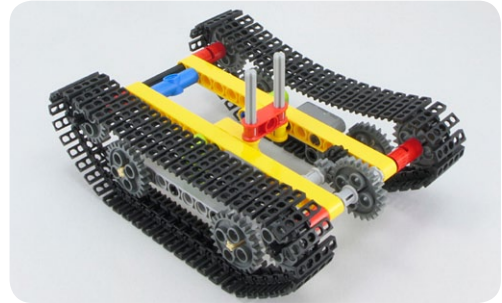


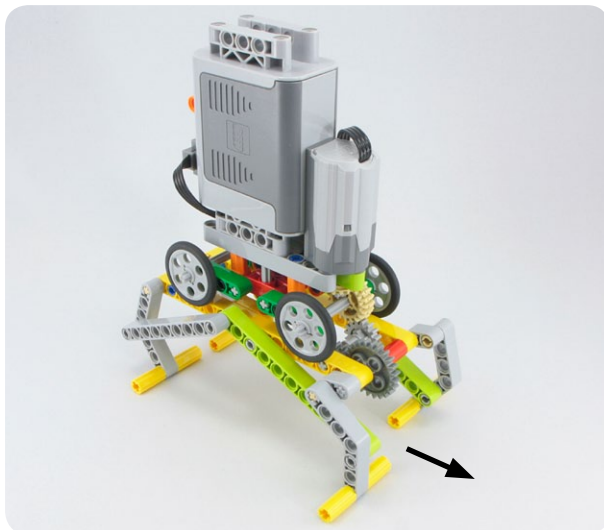
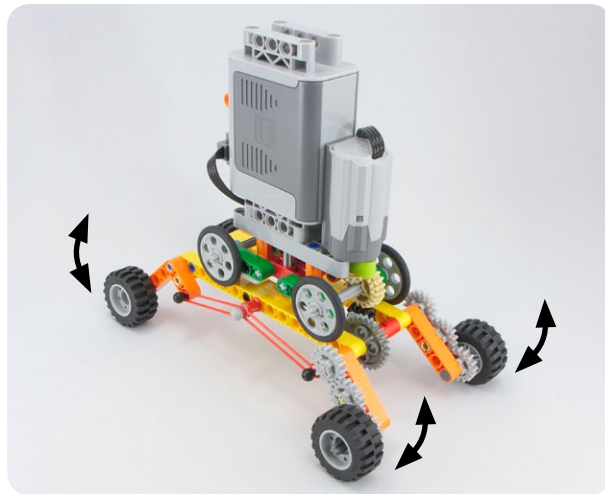
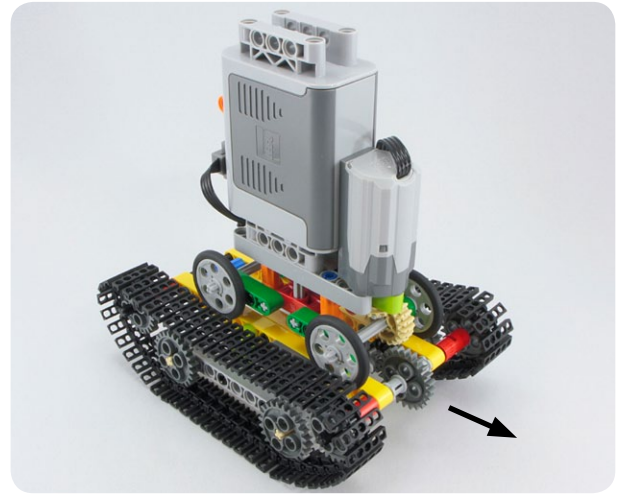




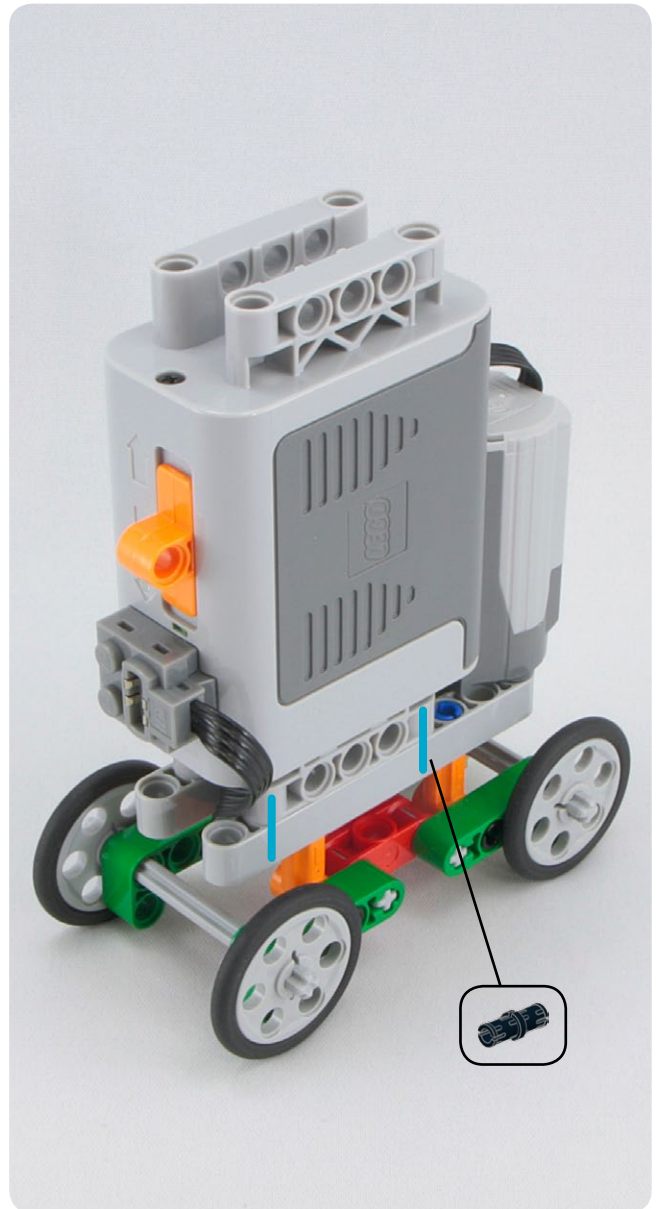
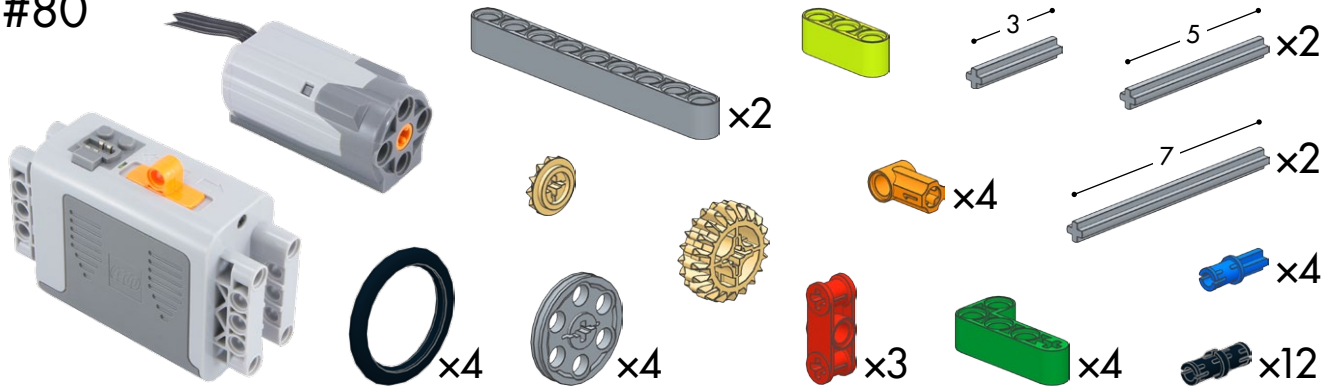


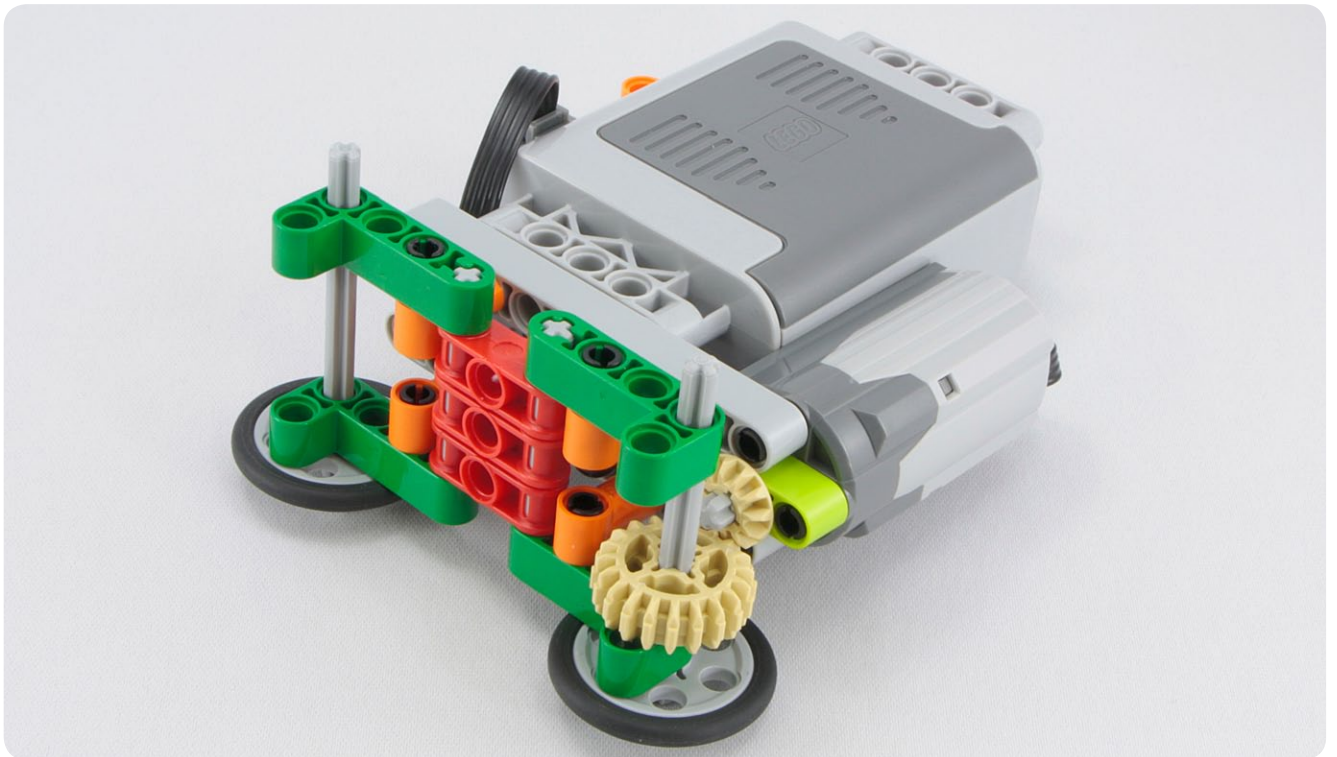
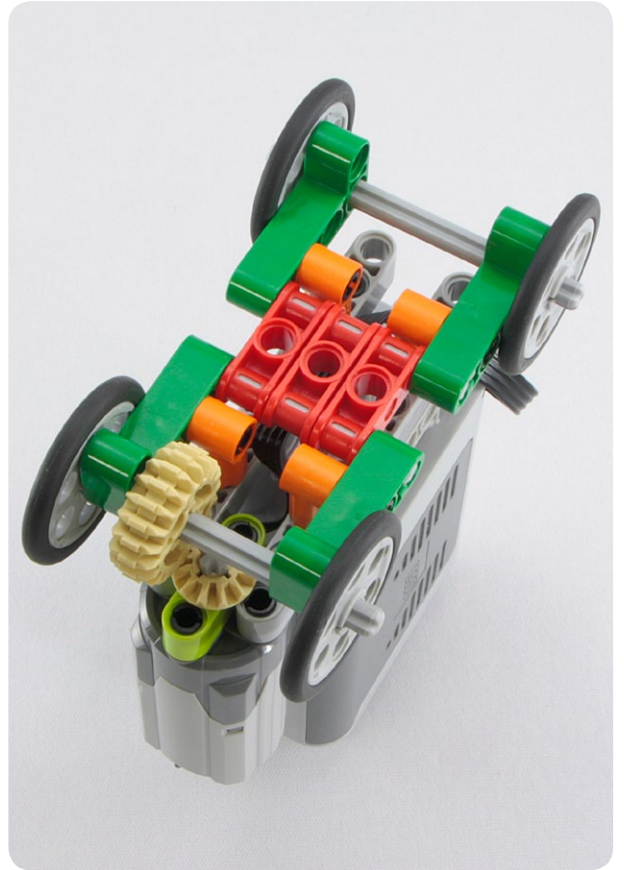
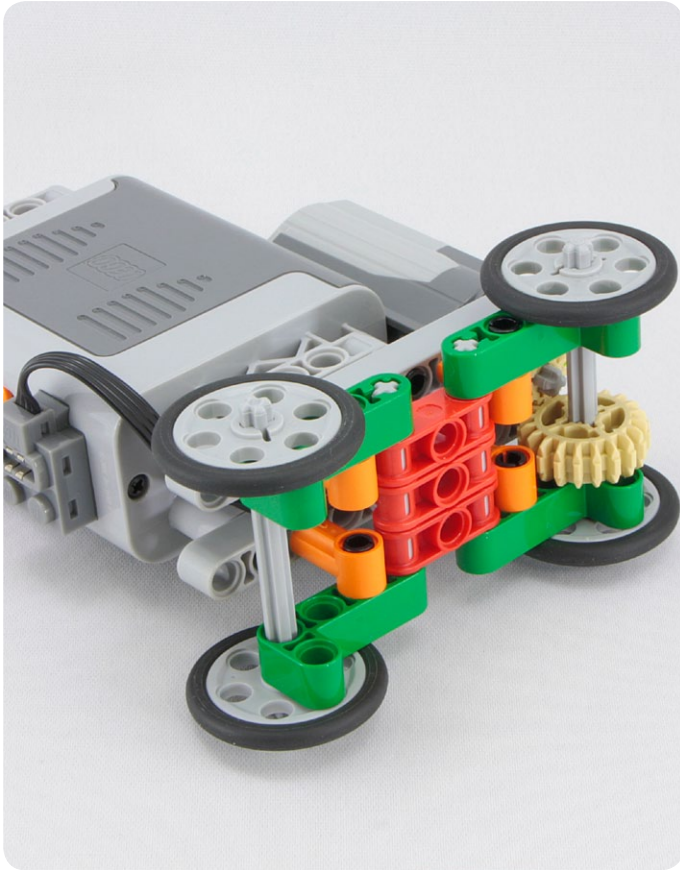
# Five different bases for a small car





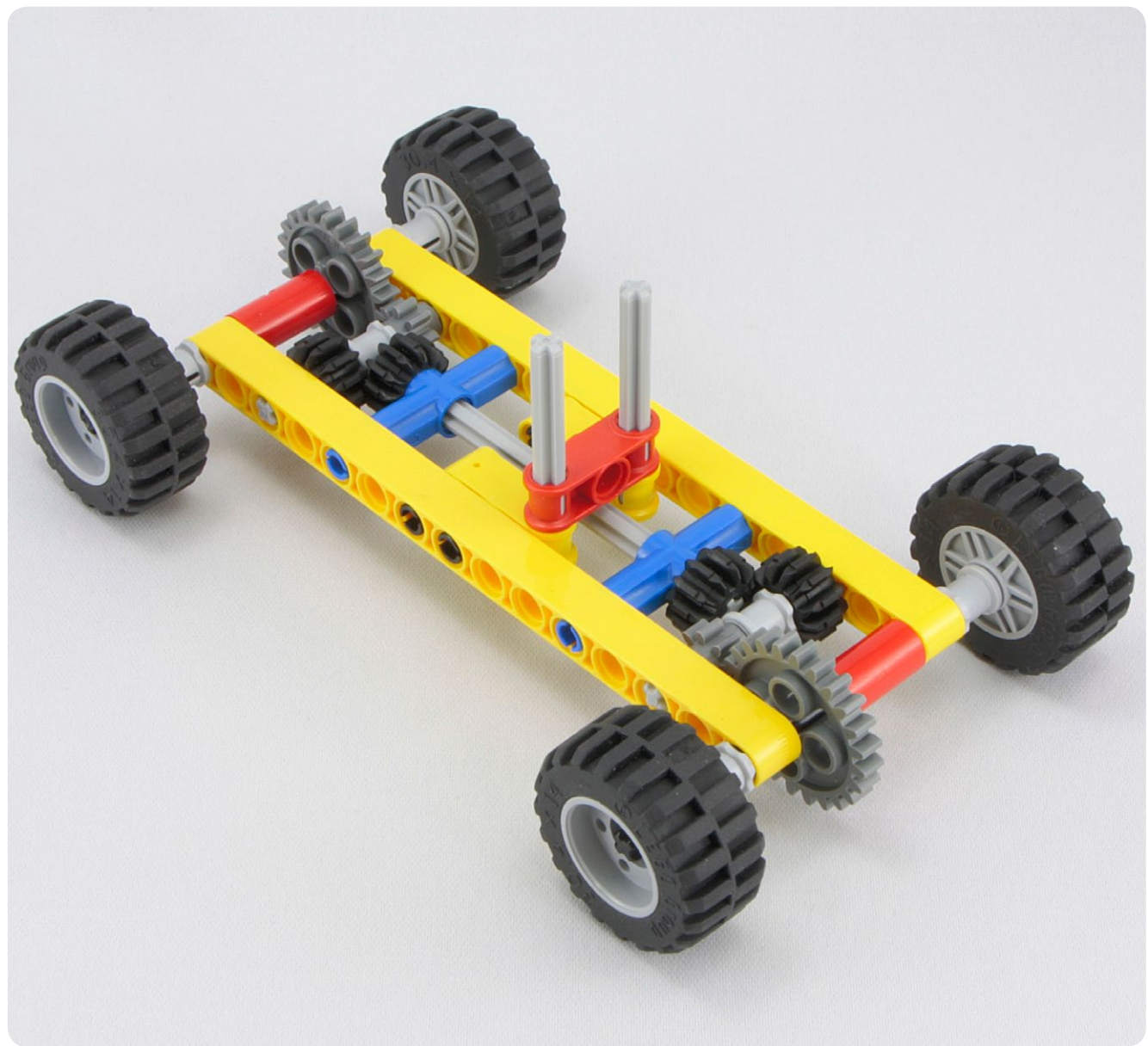
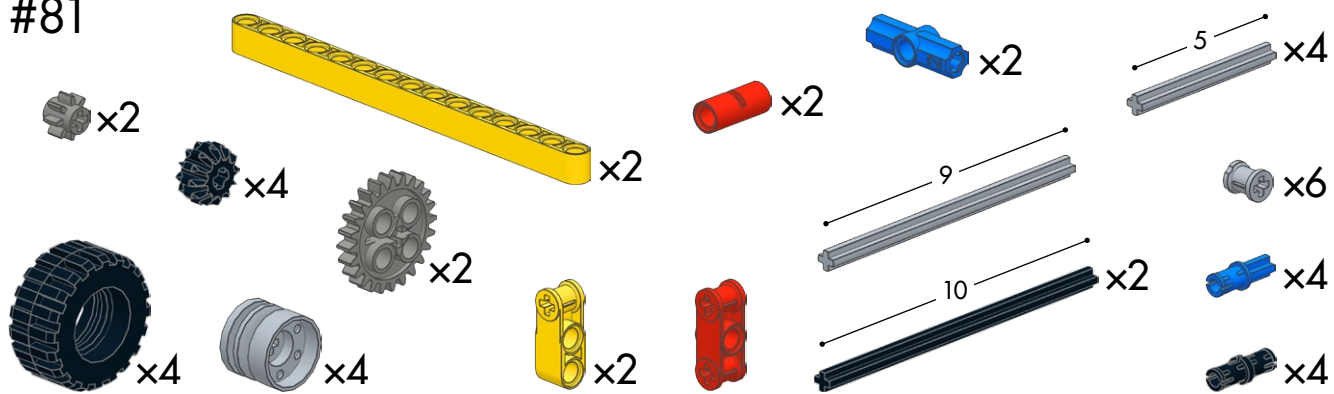
#80

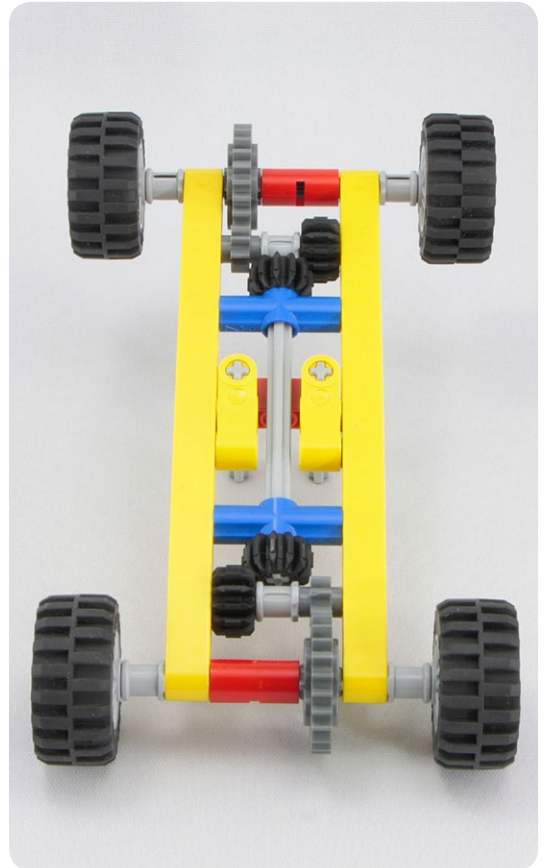
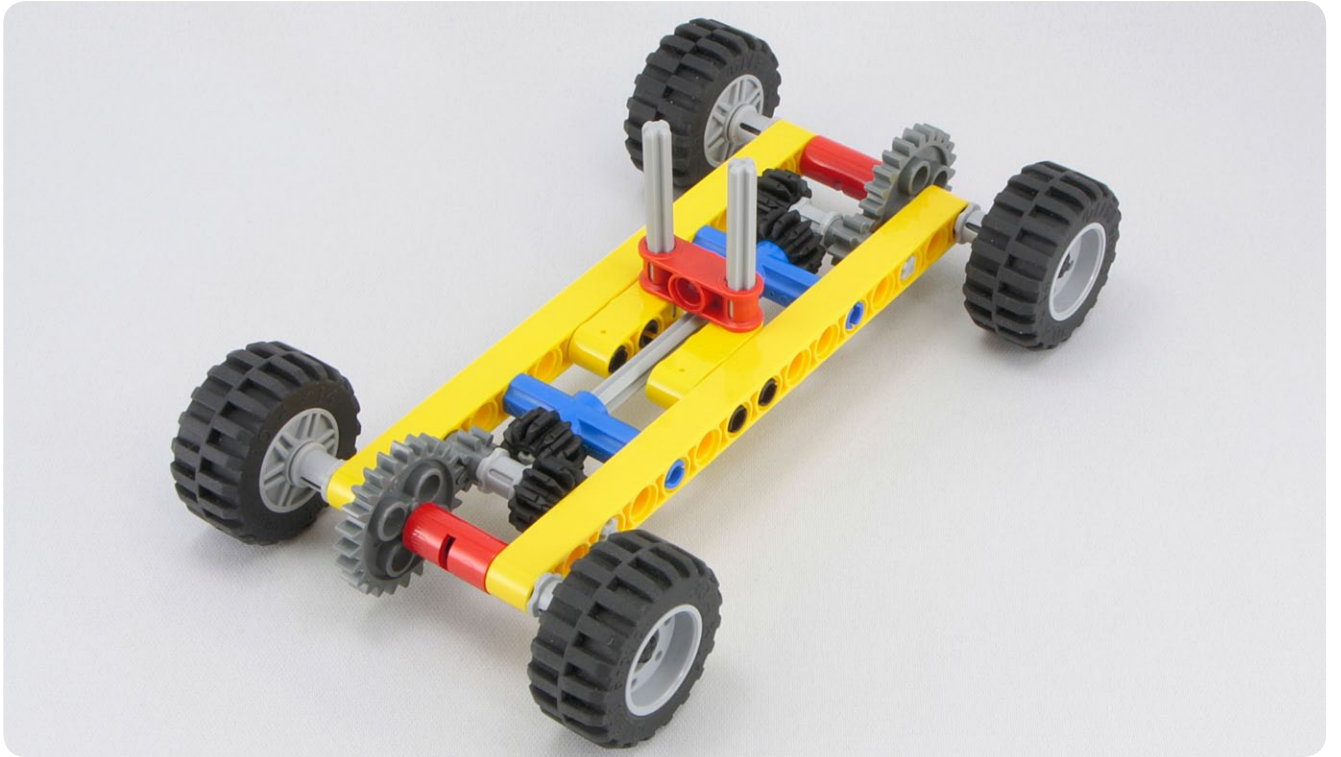




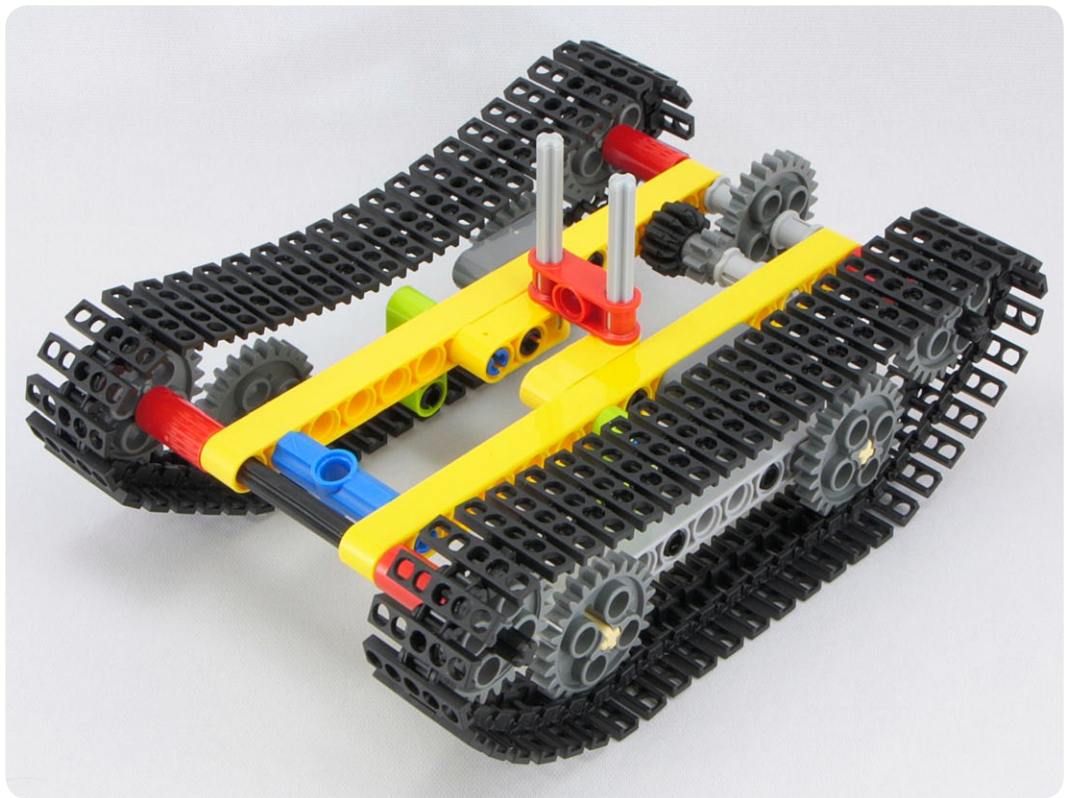
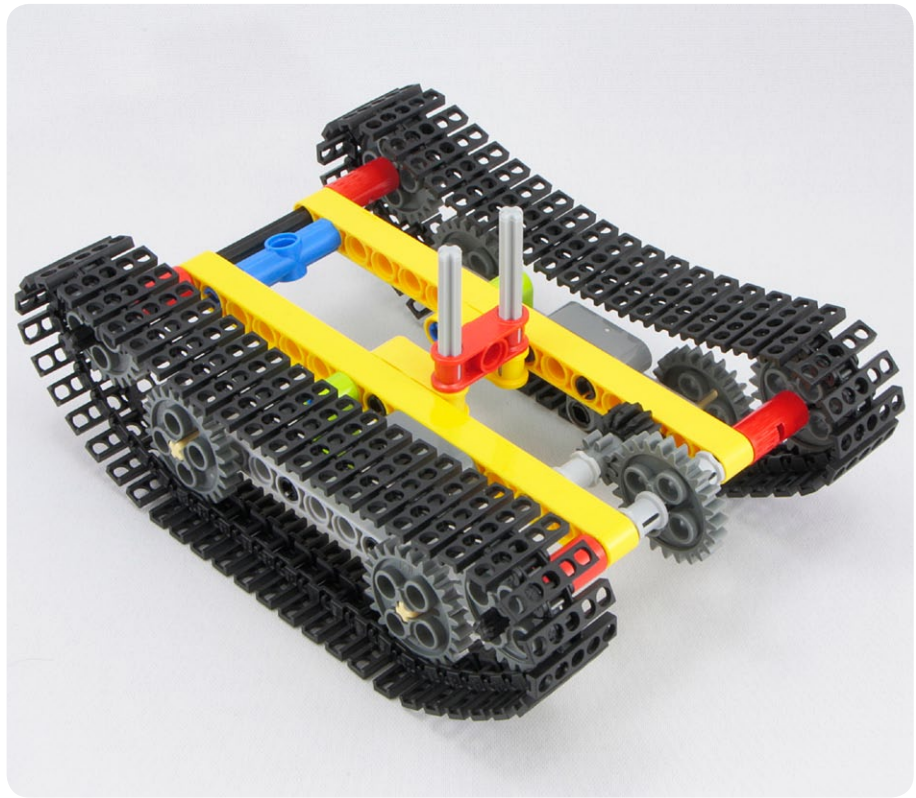
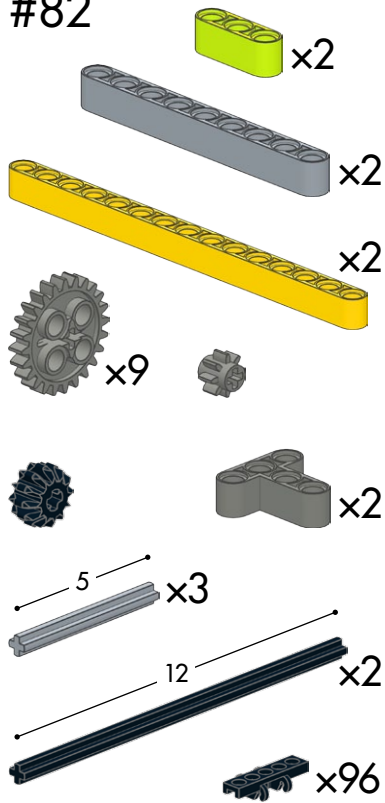


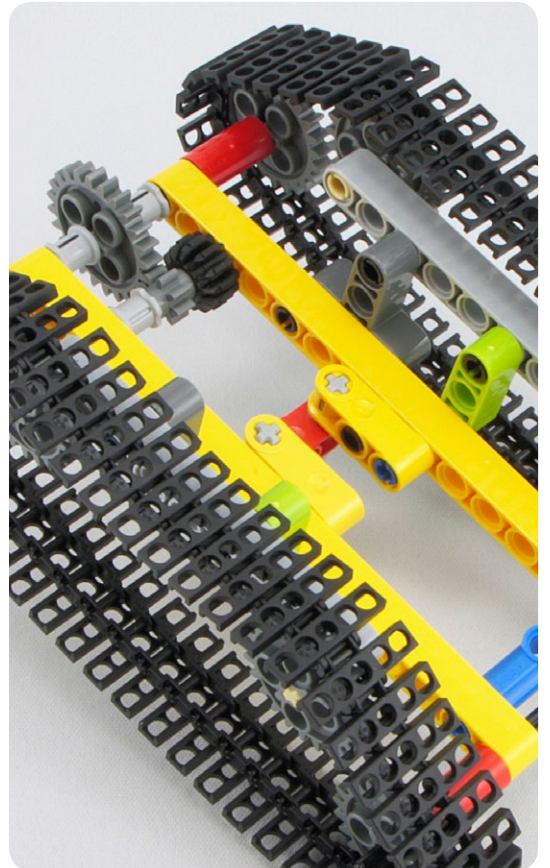
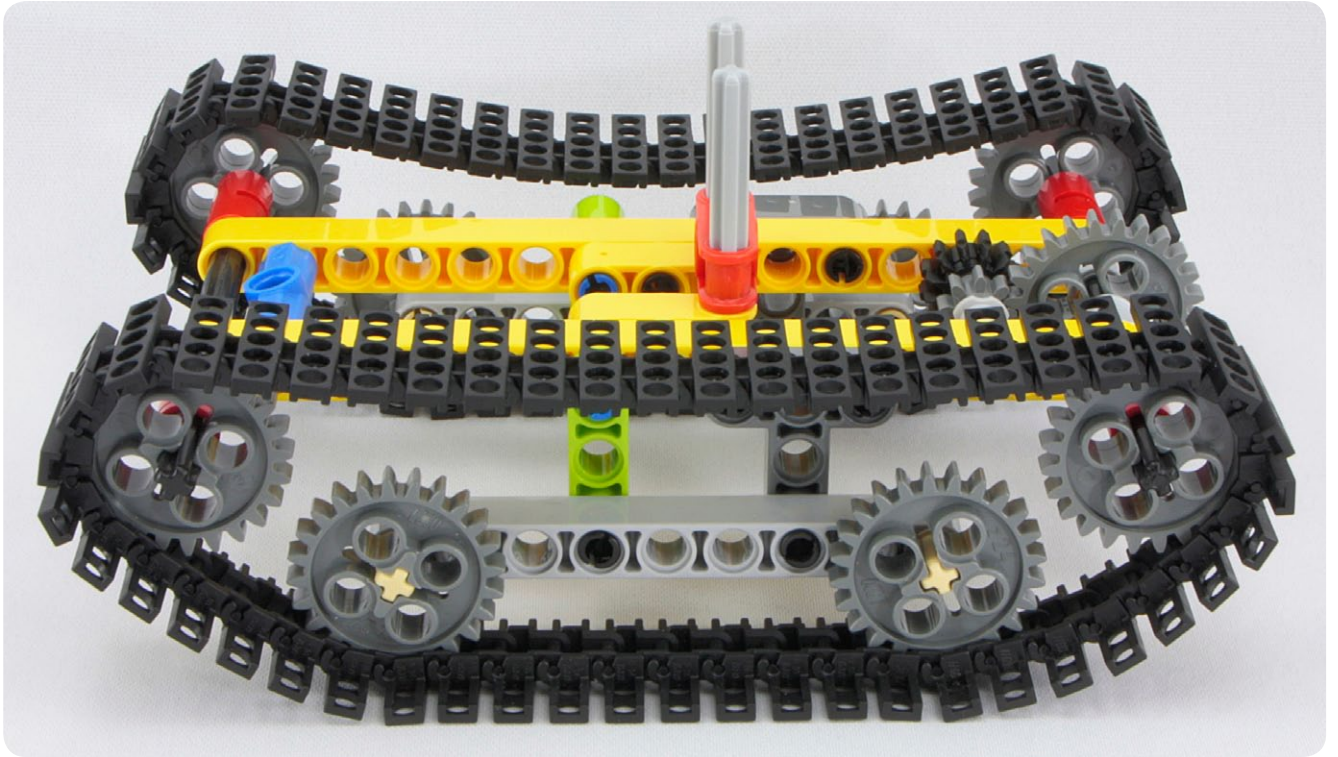
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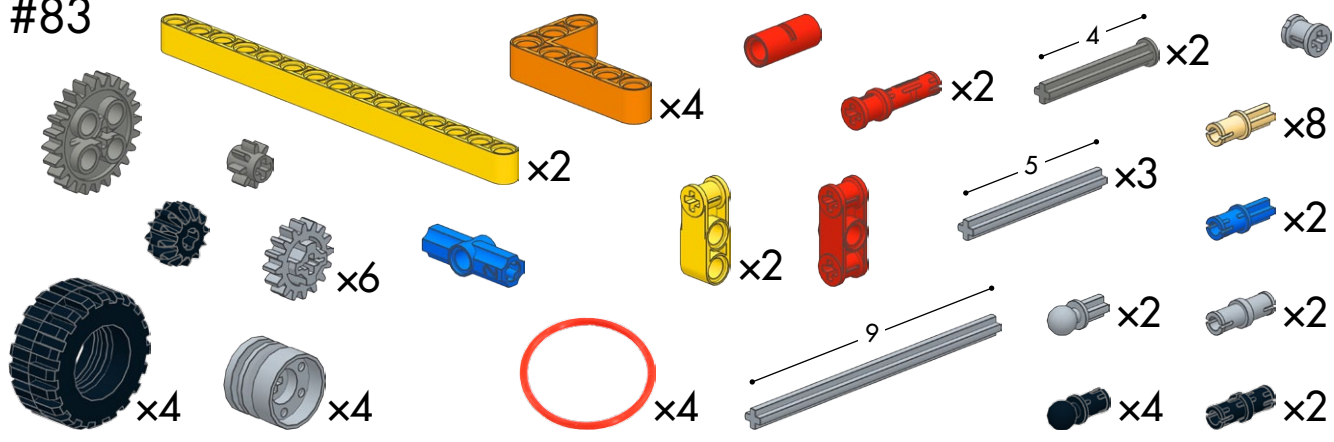


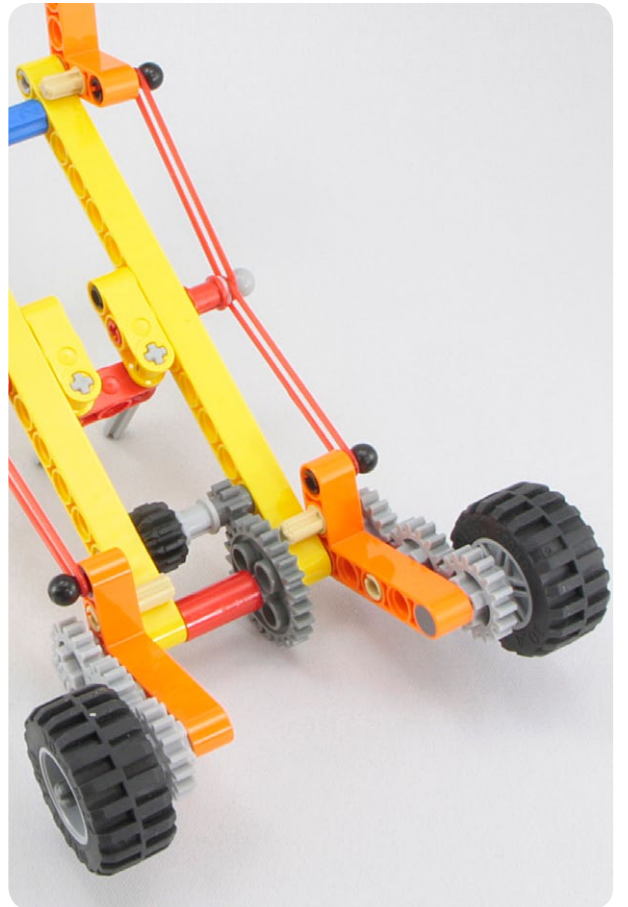
#82



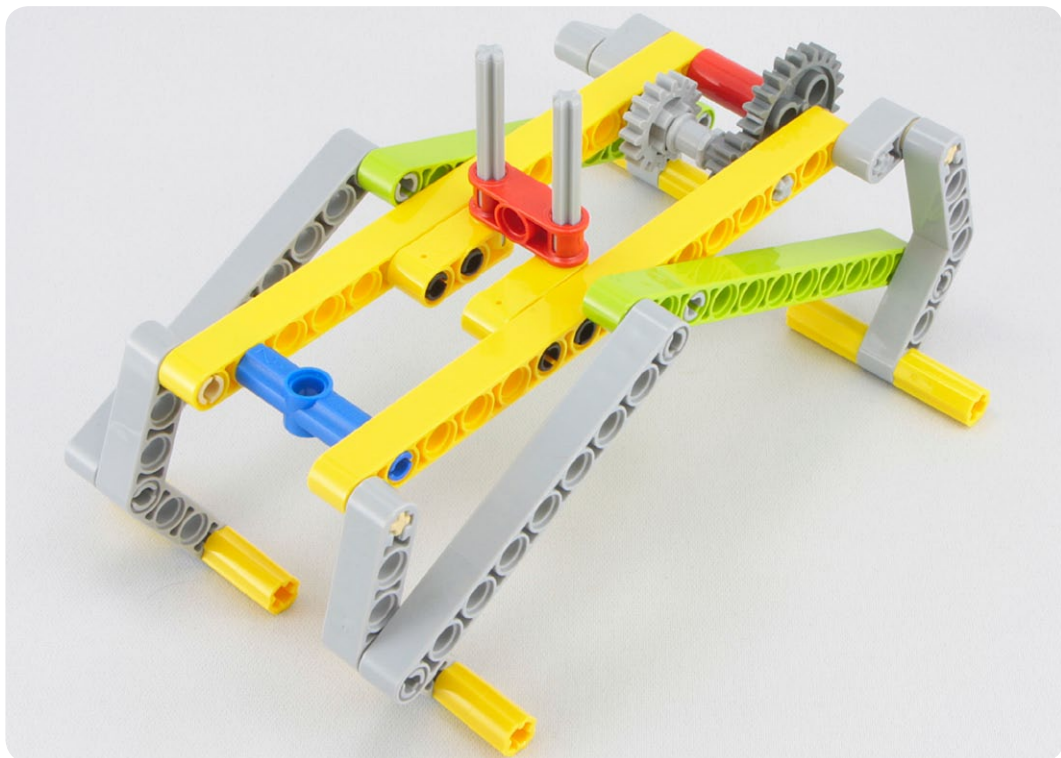
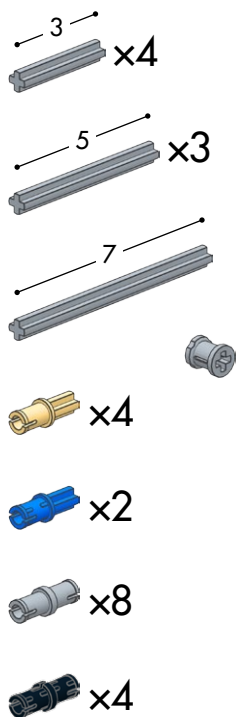
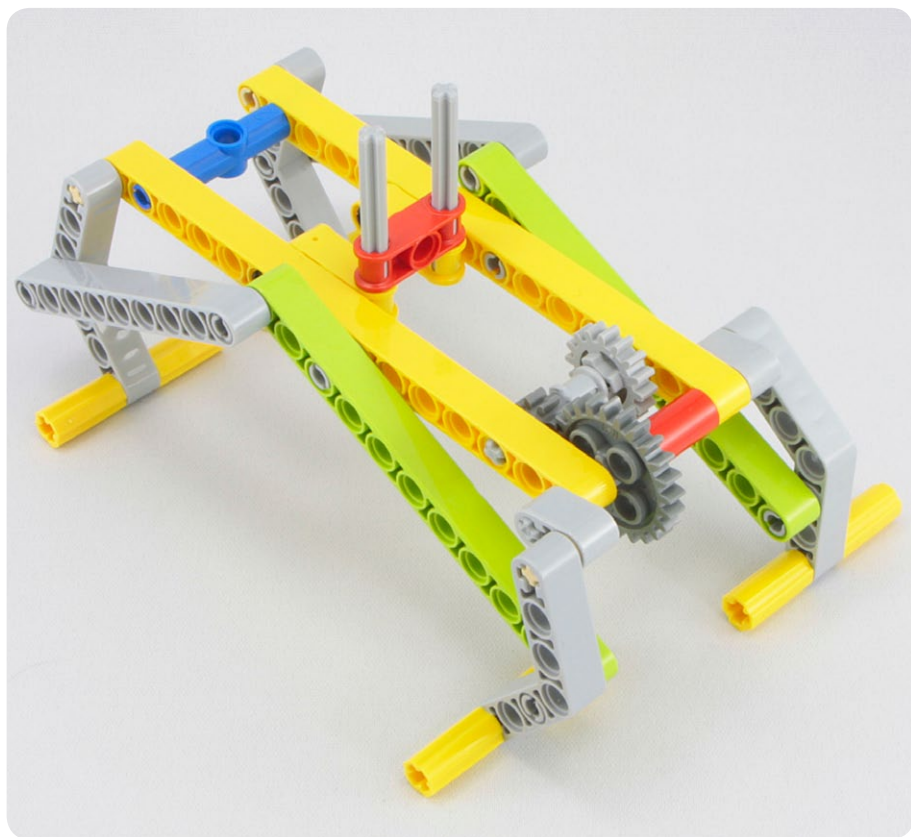
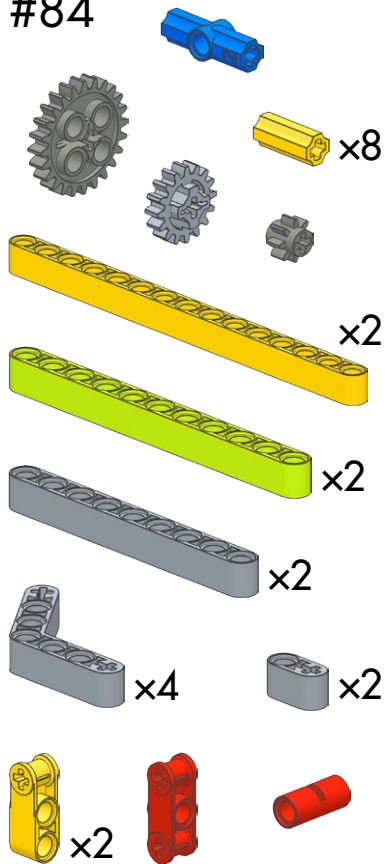


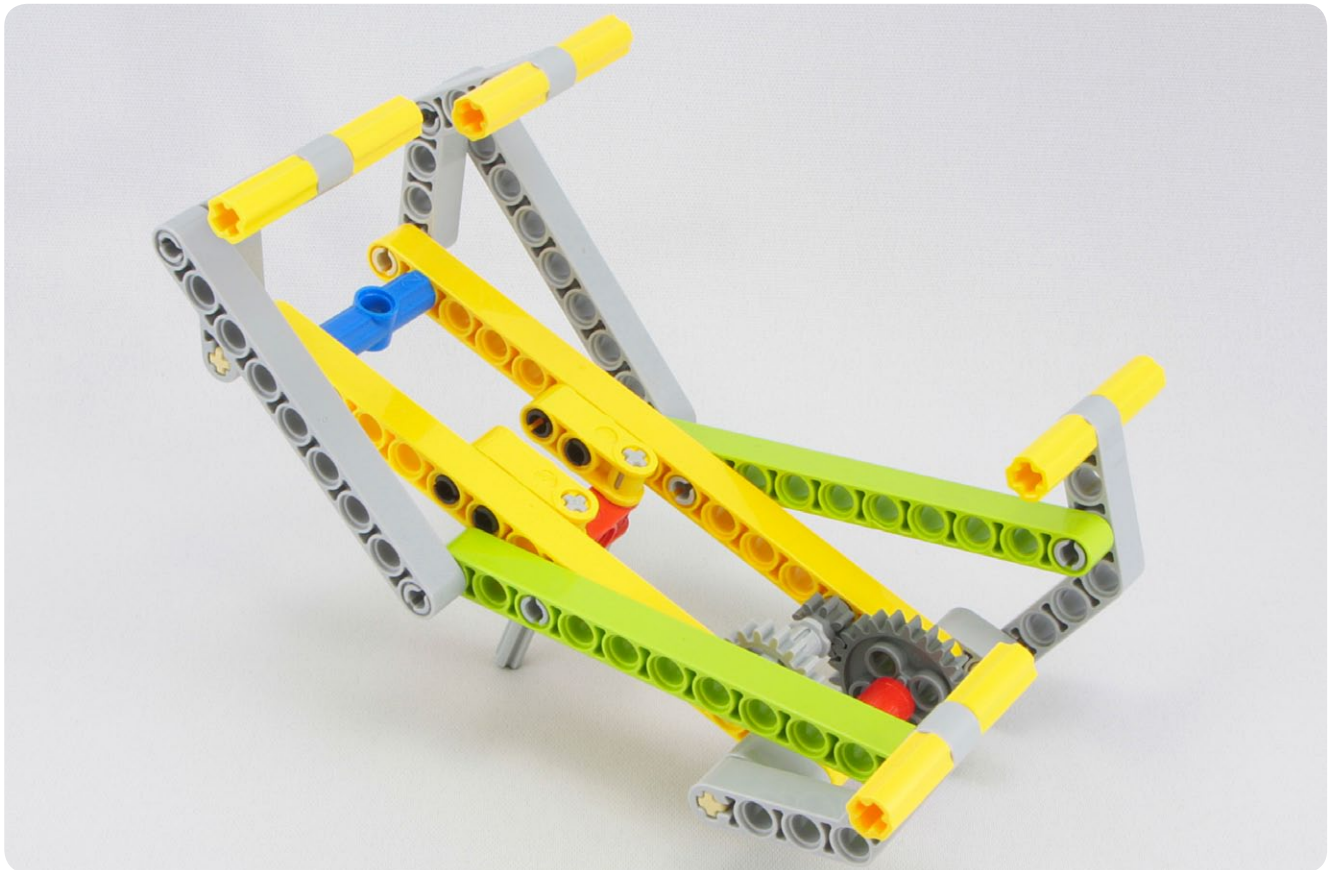
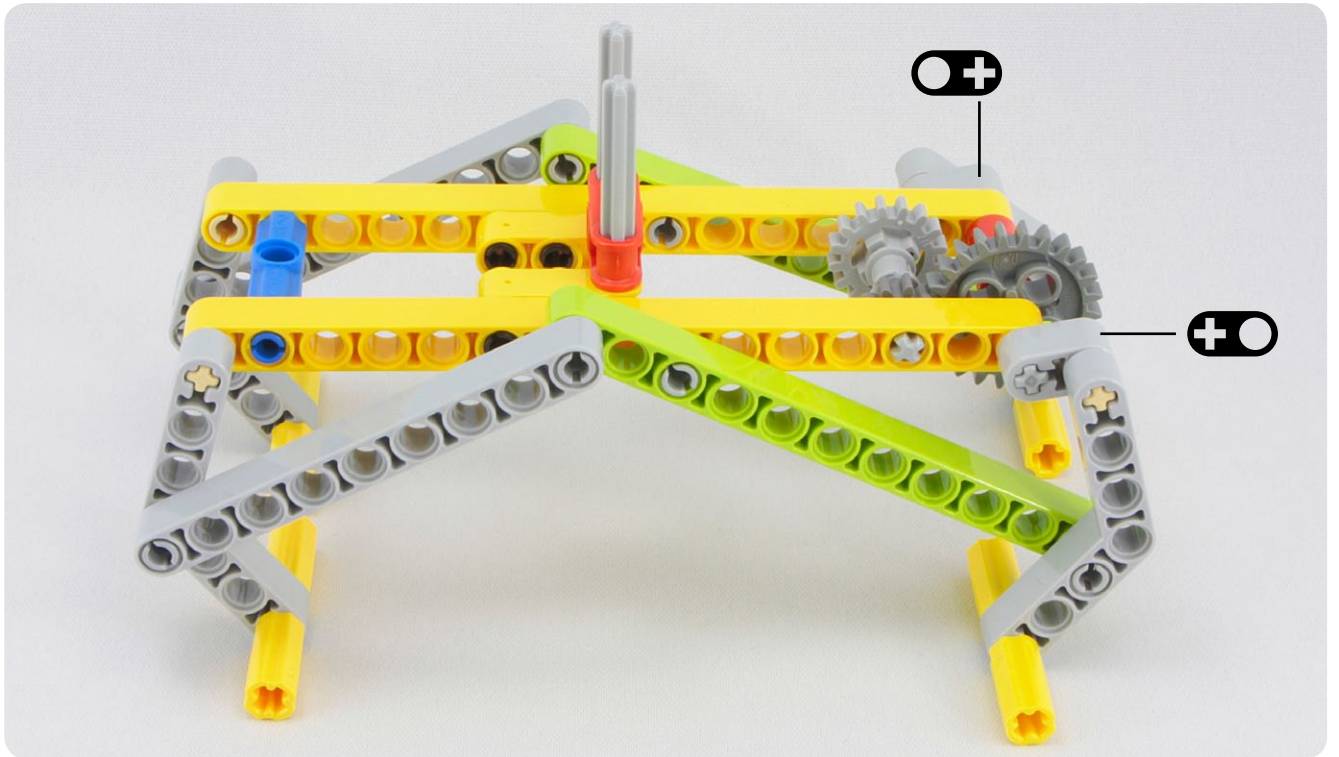
#83





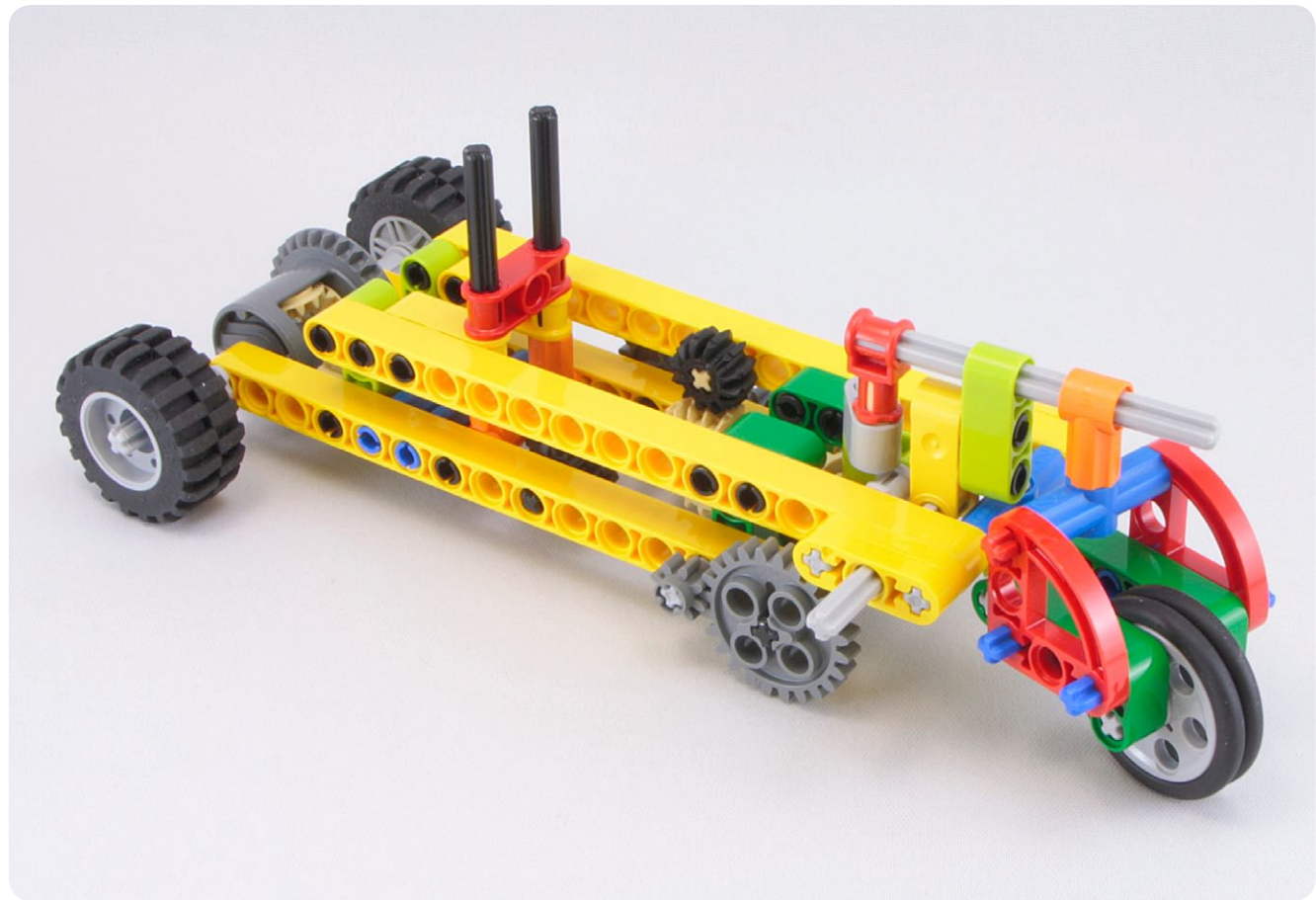
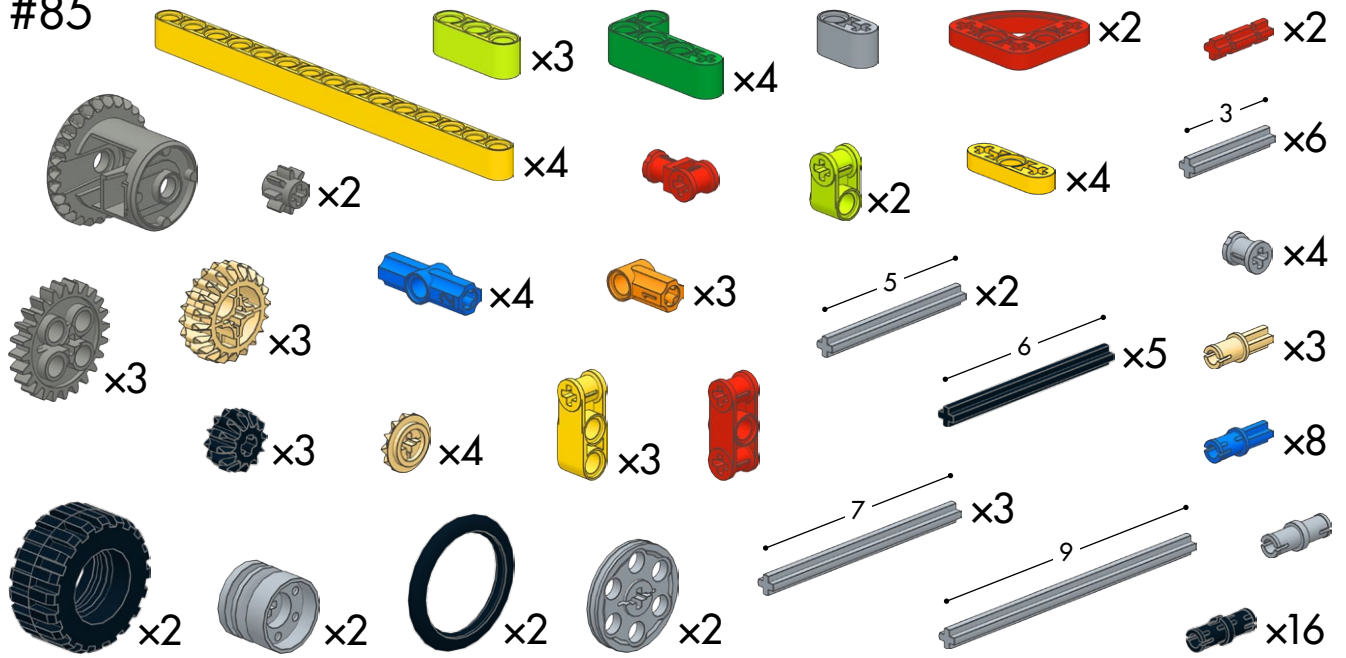
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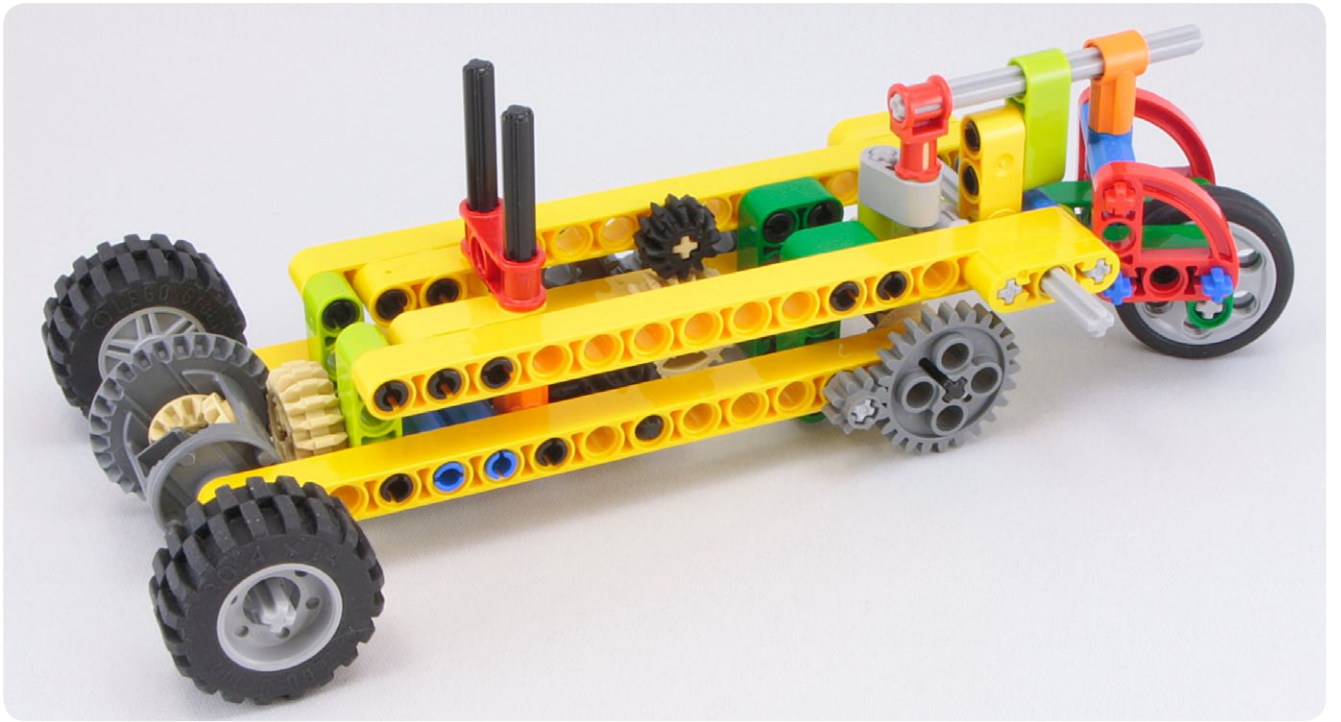


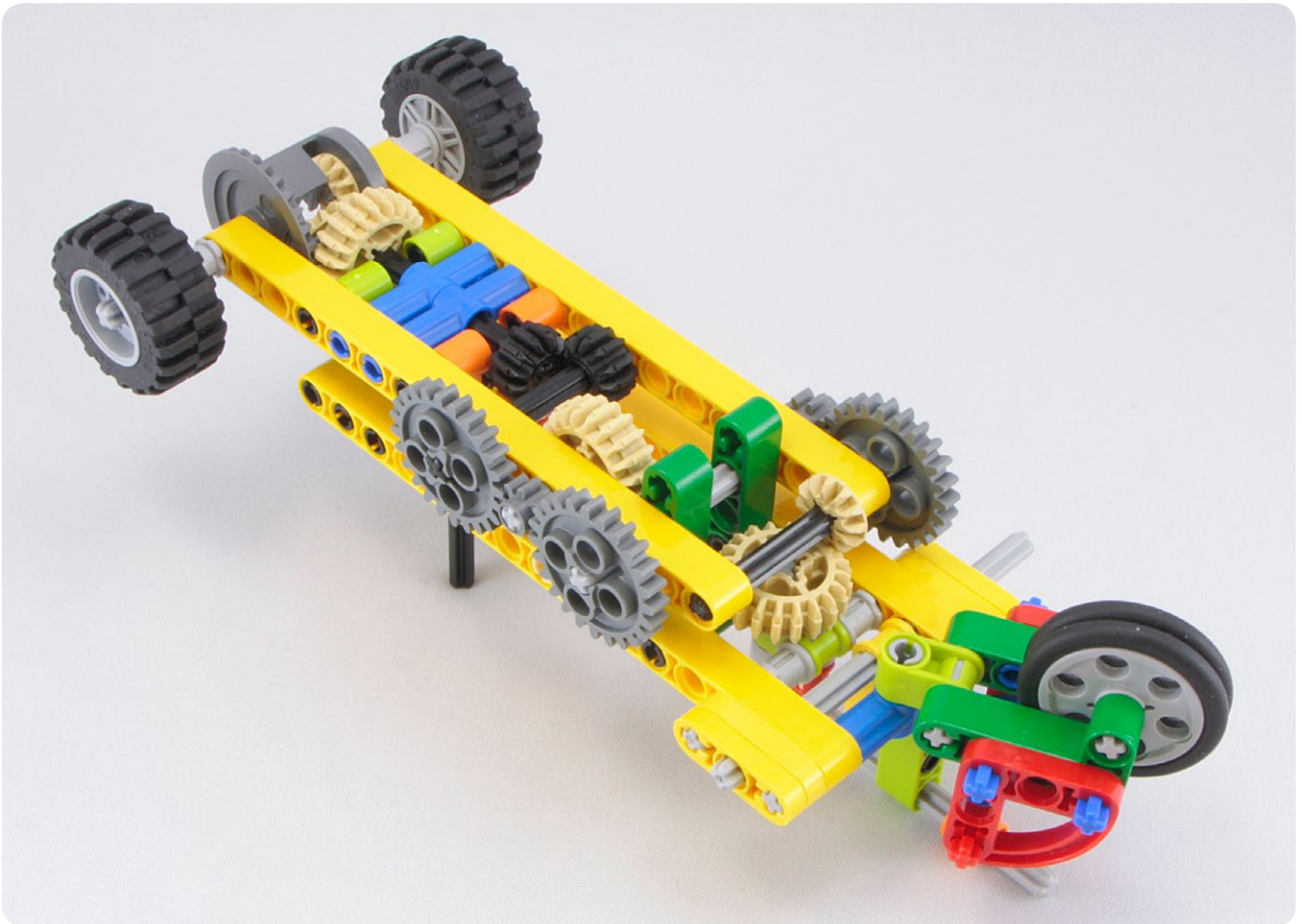
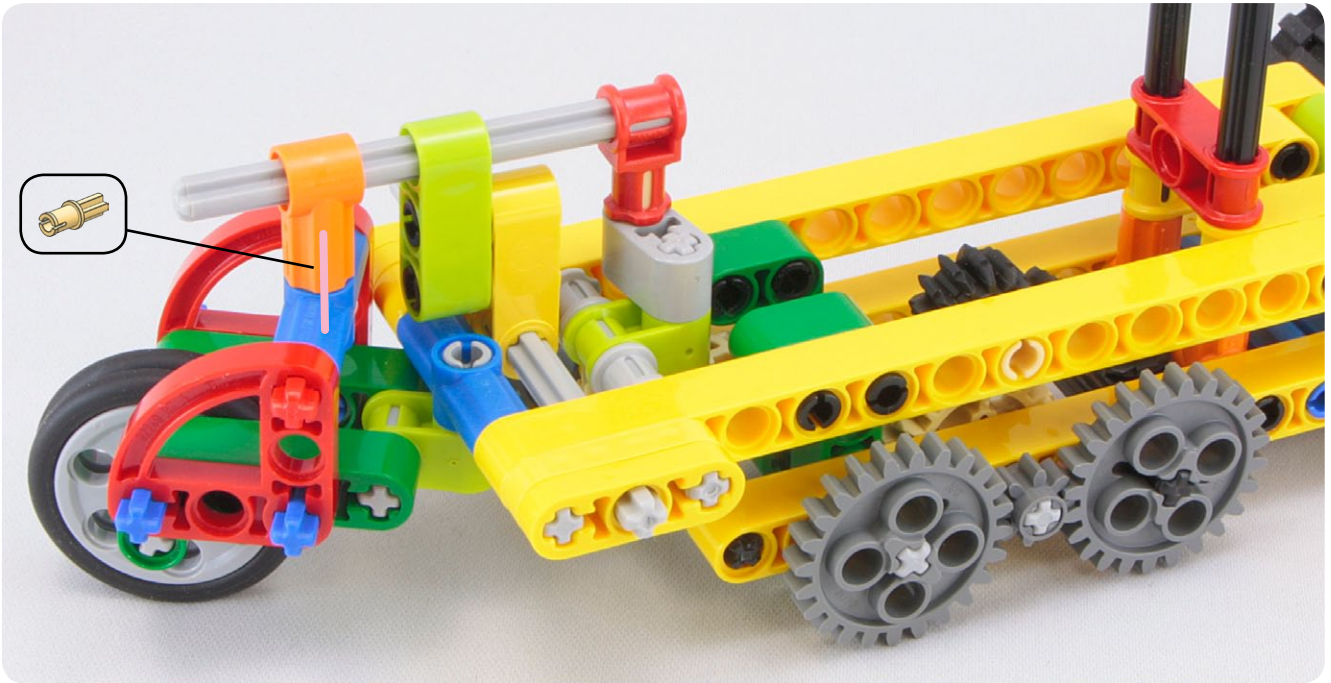


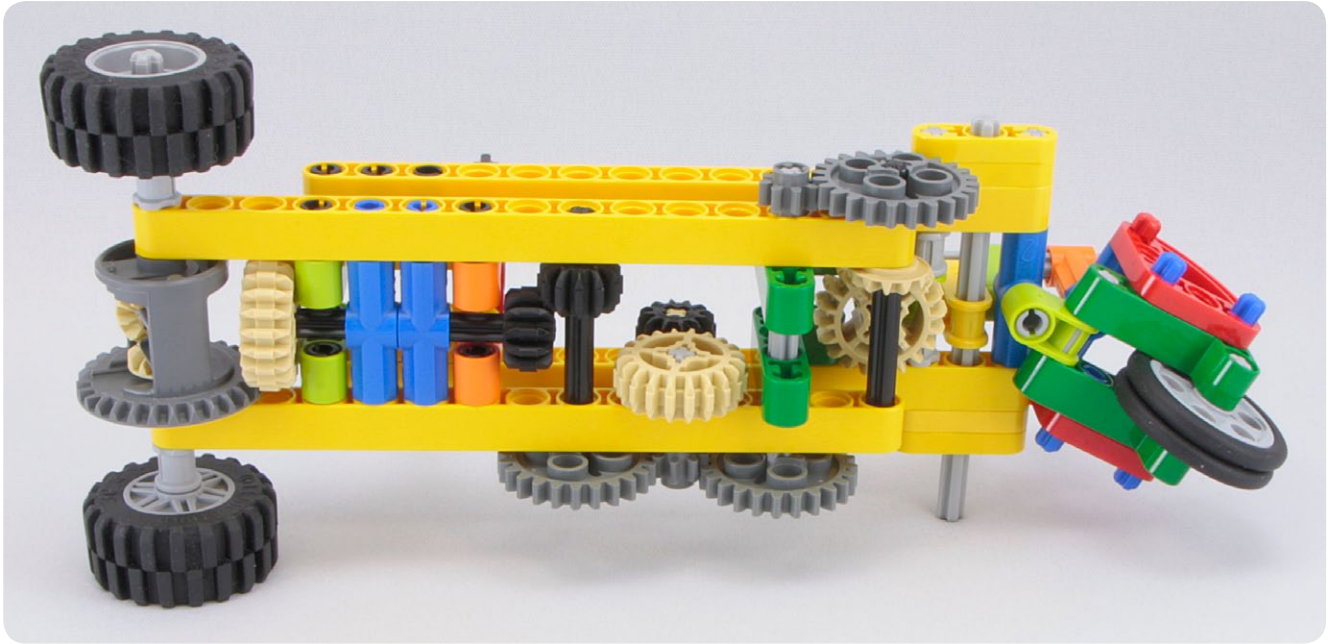


#85





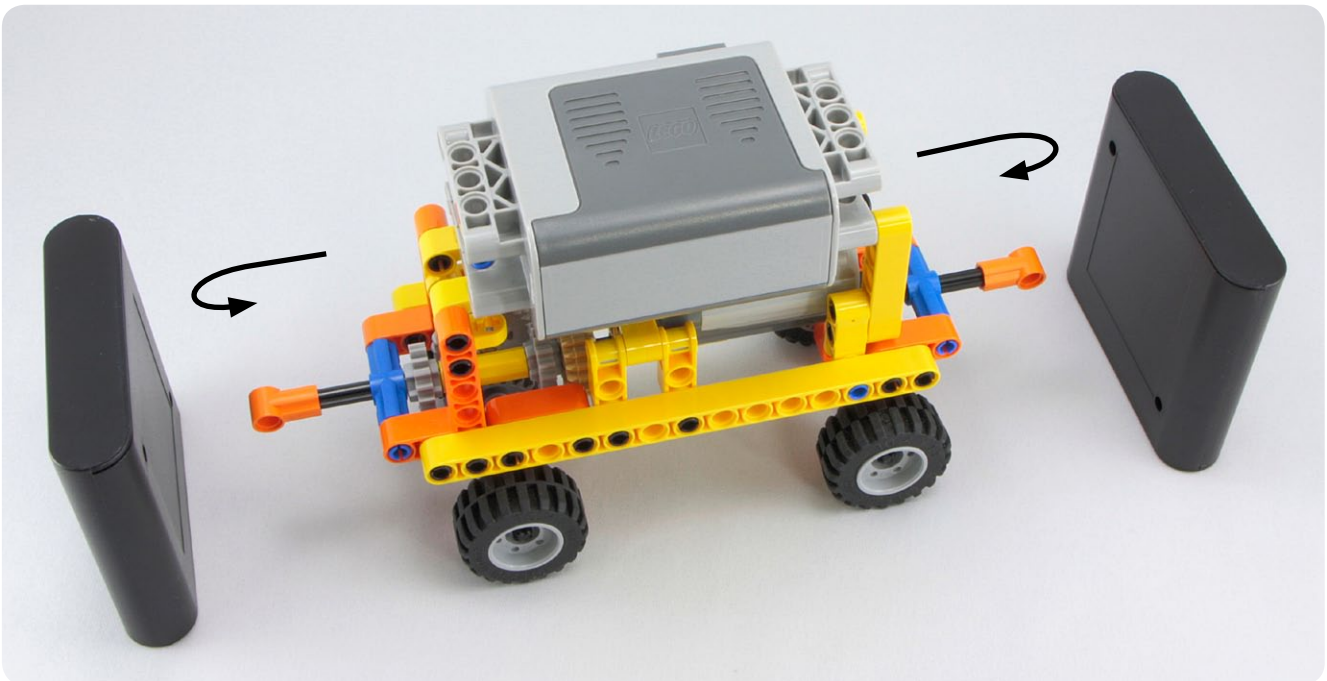
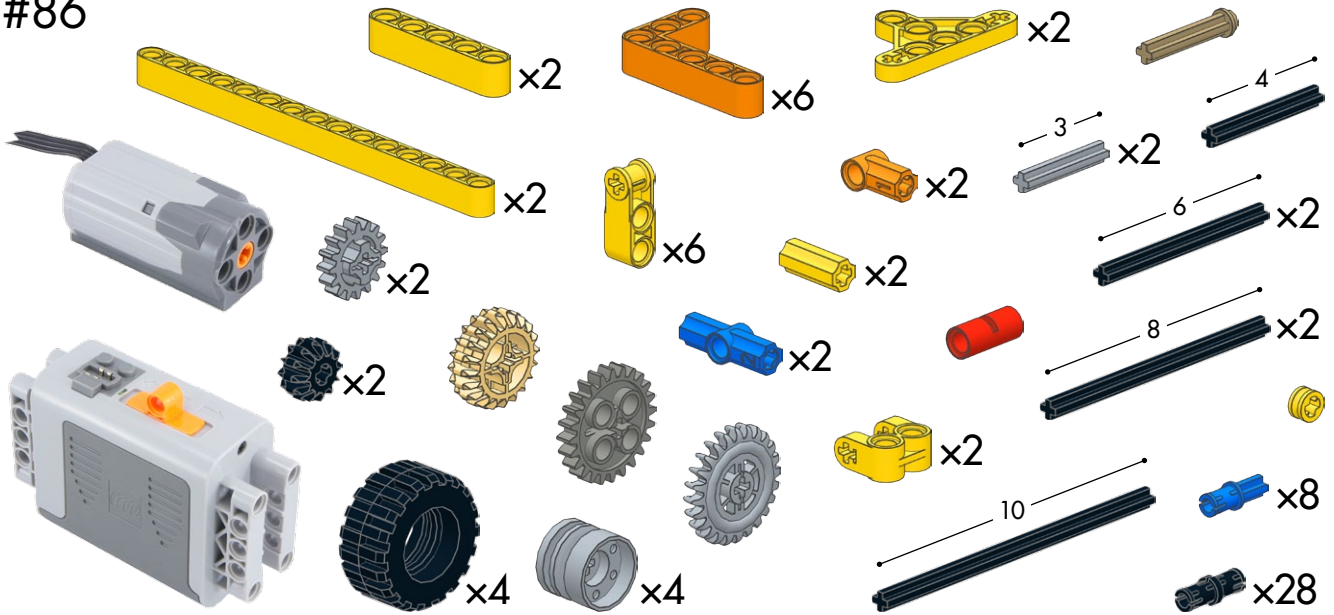




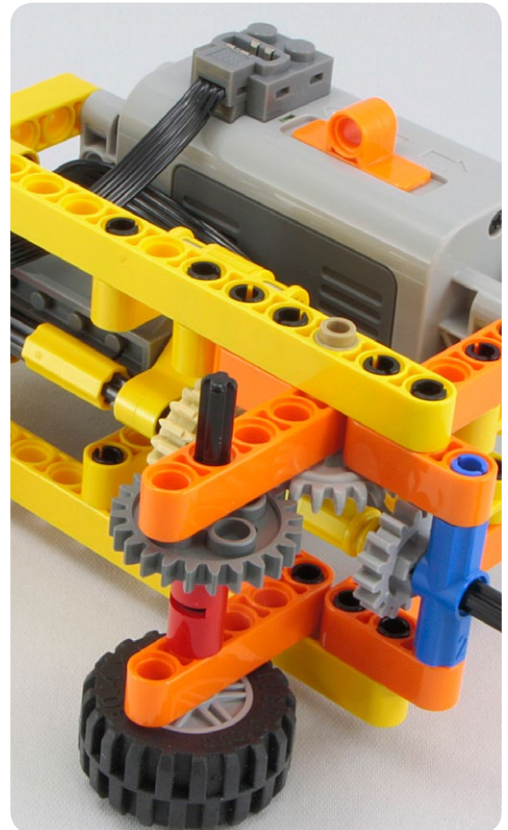
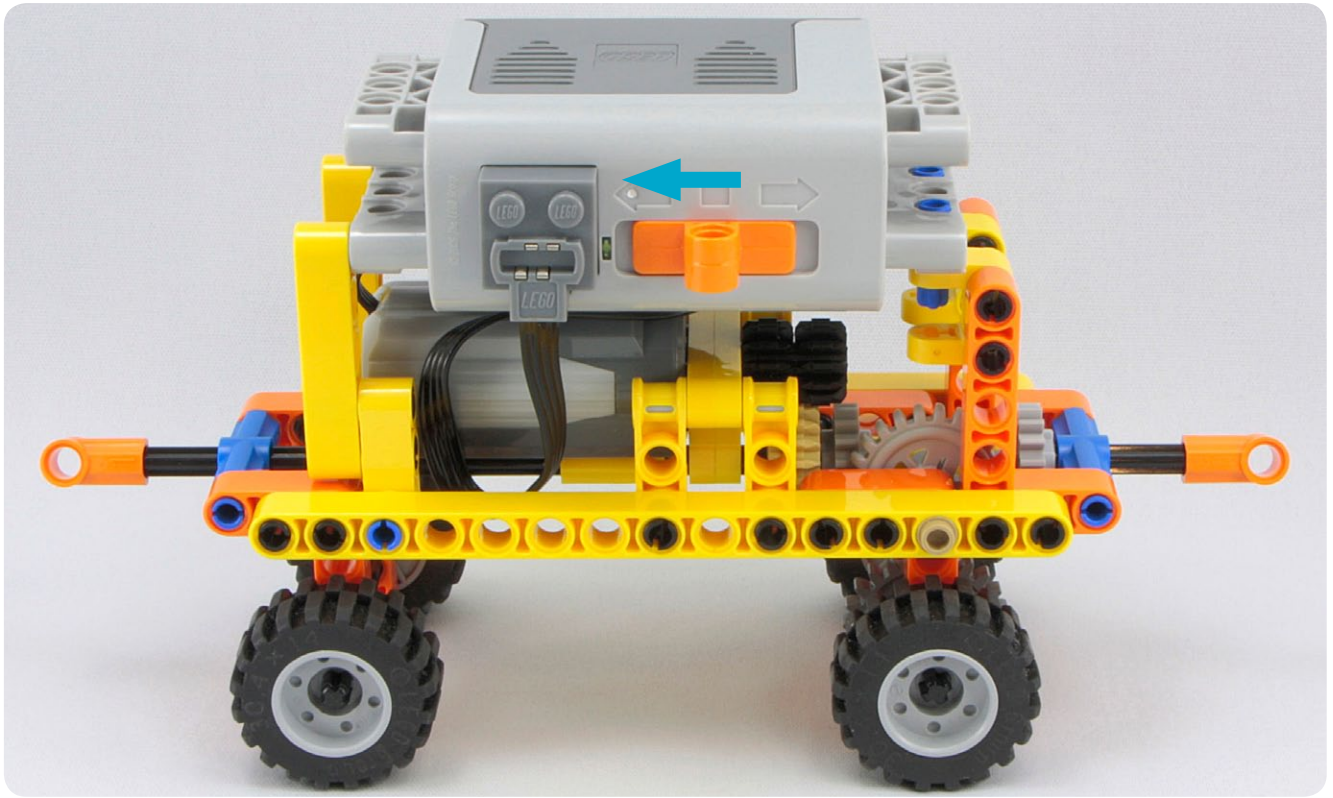


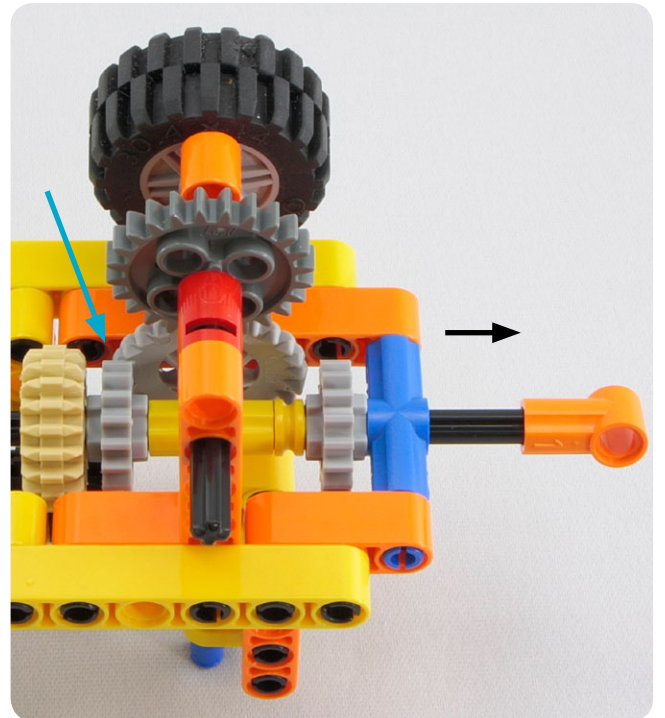
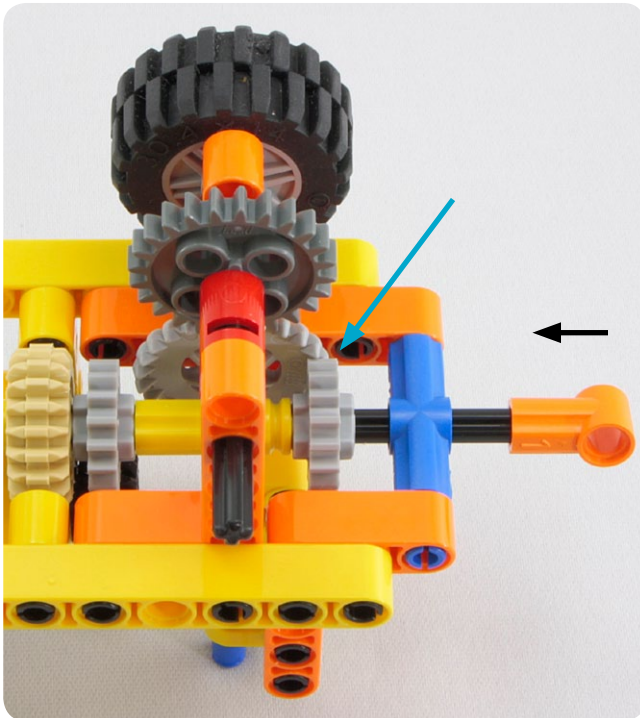
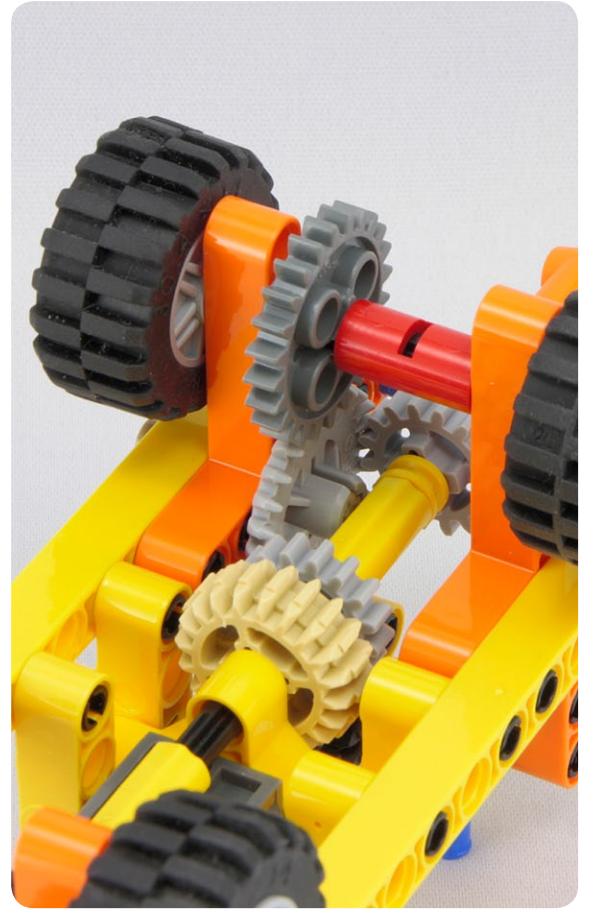
# Cars that react

#86



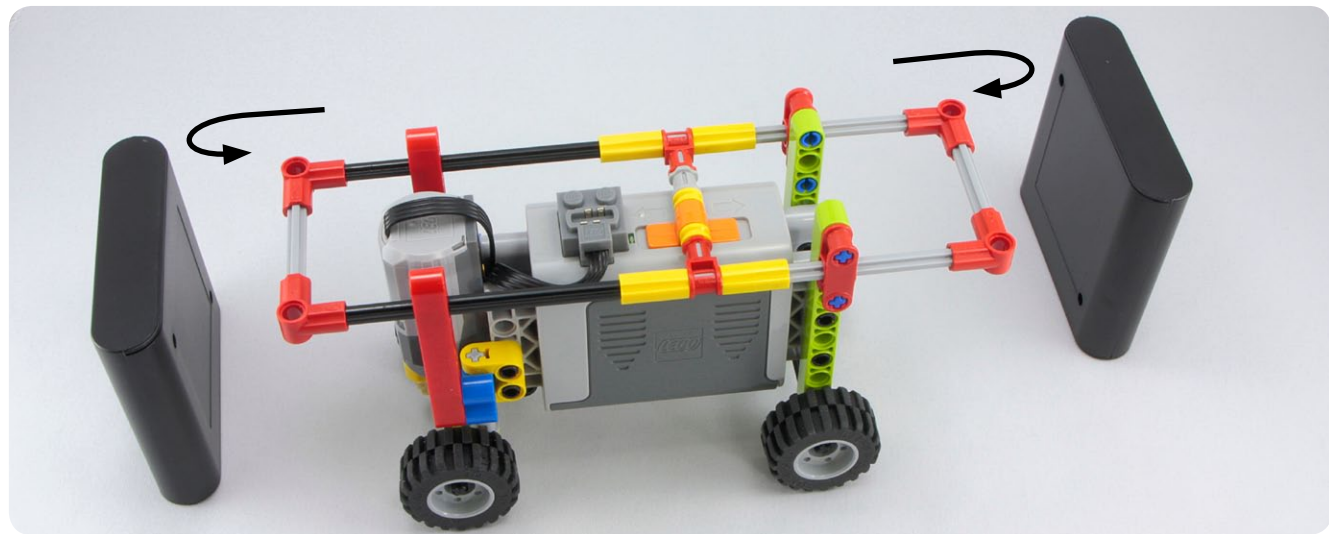
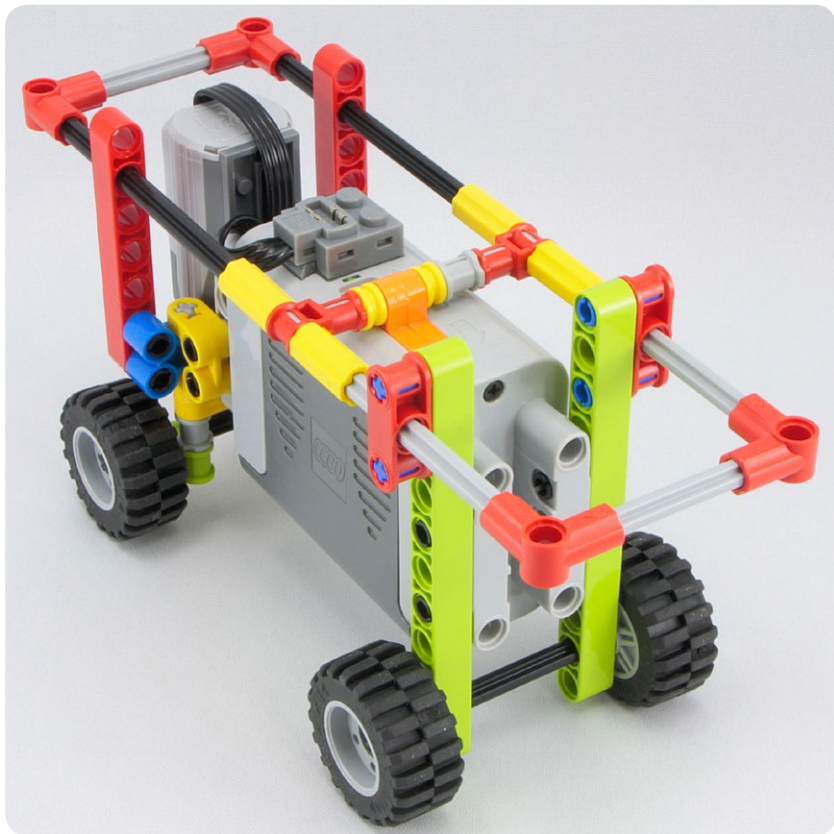
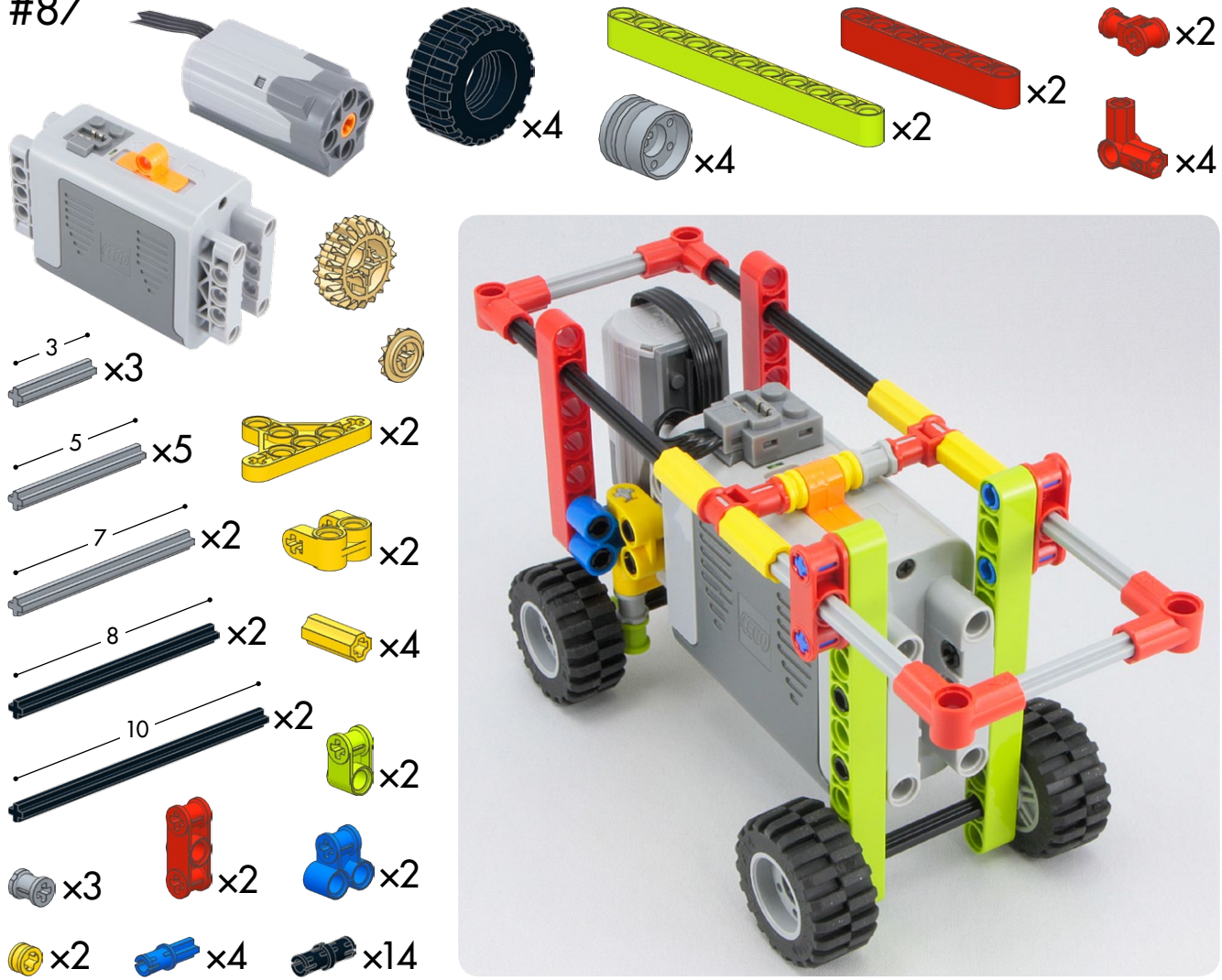


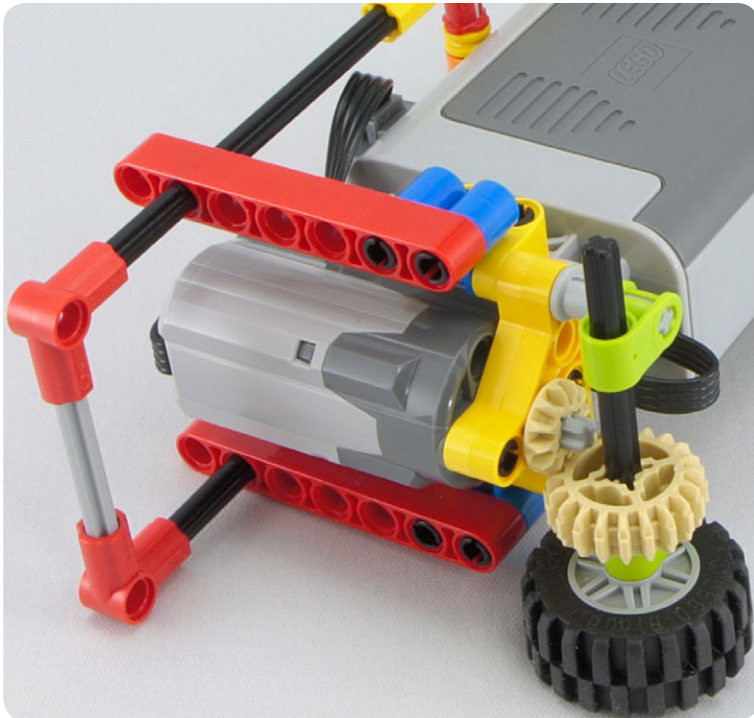




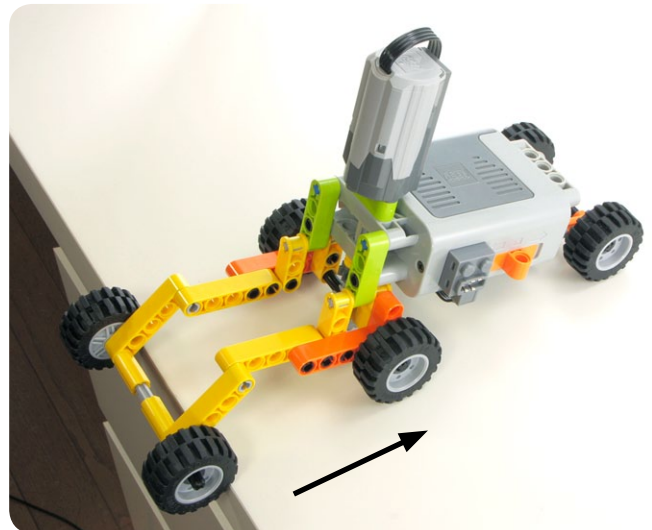
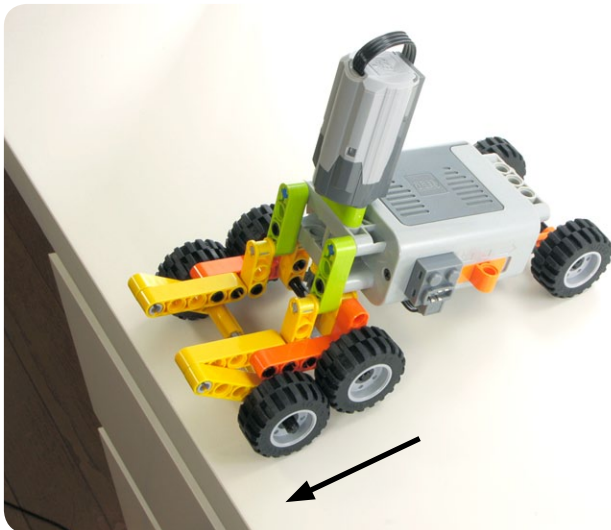
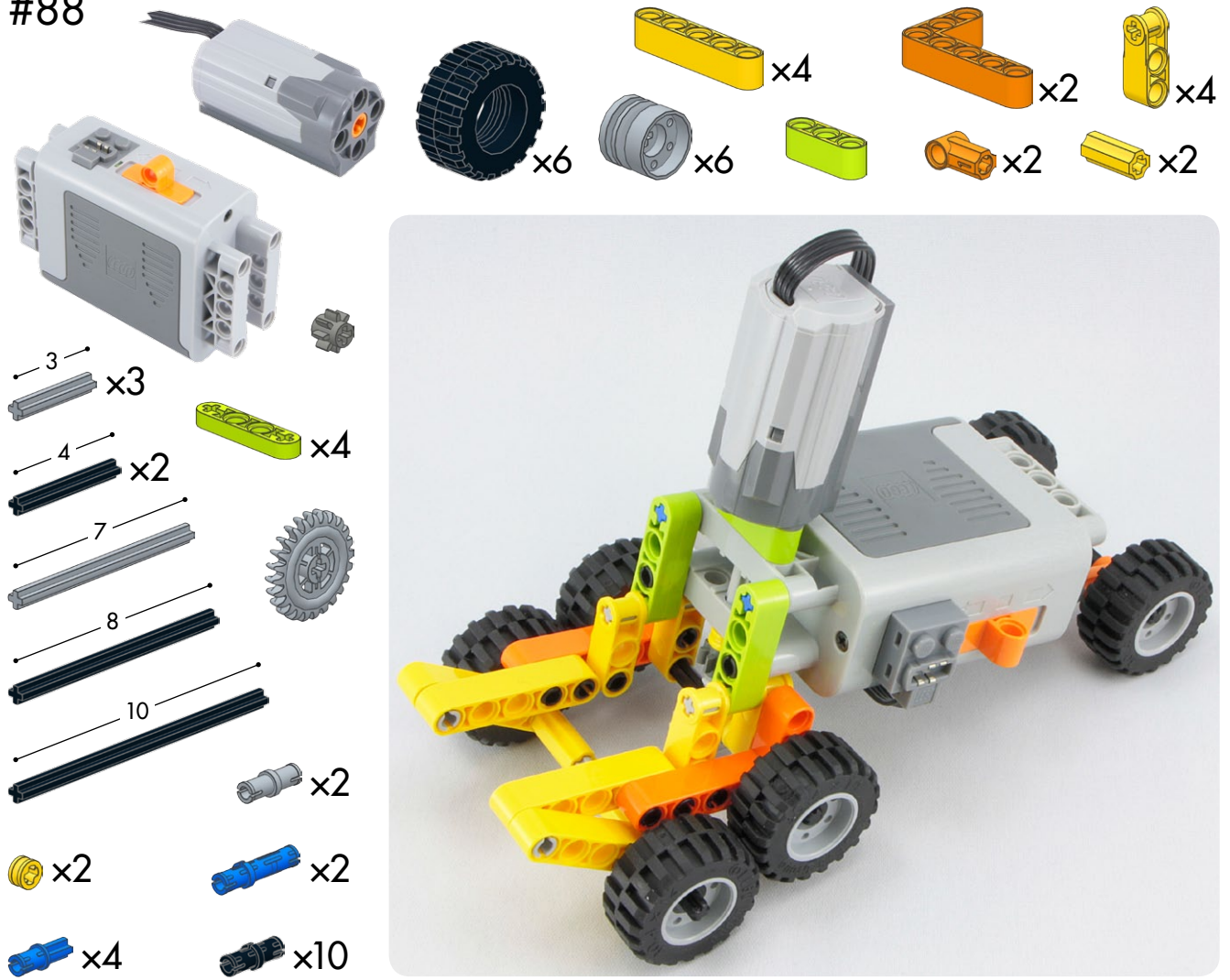


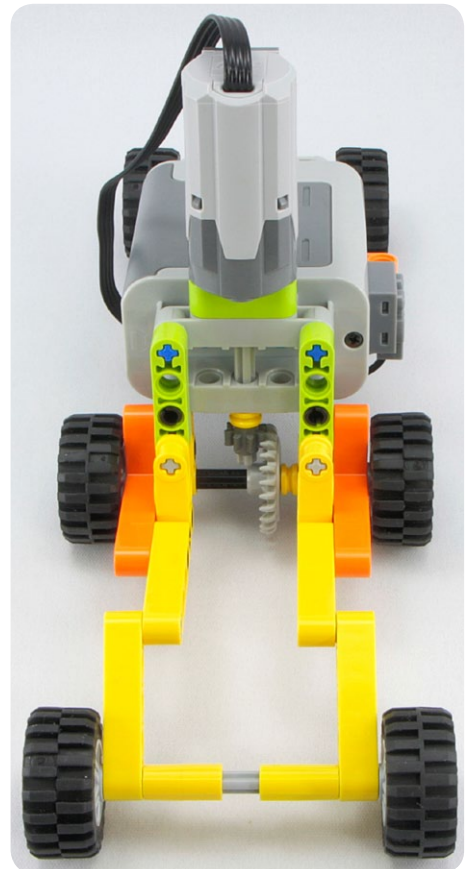
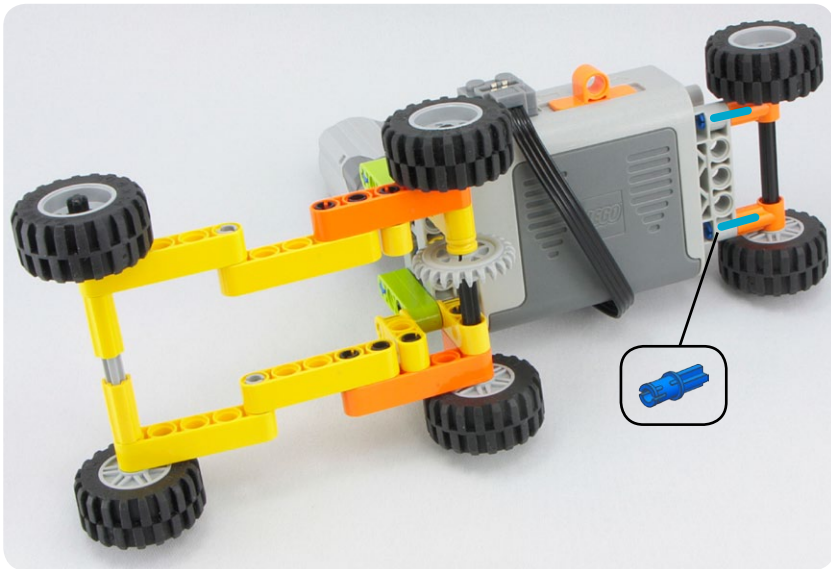
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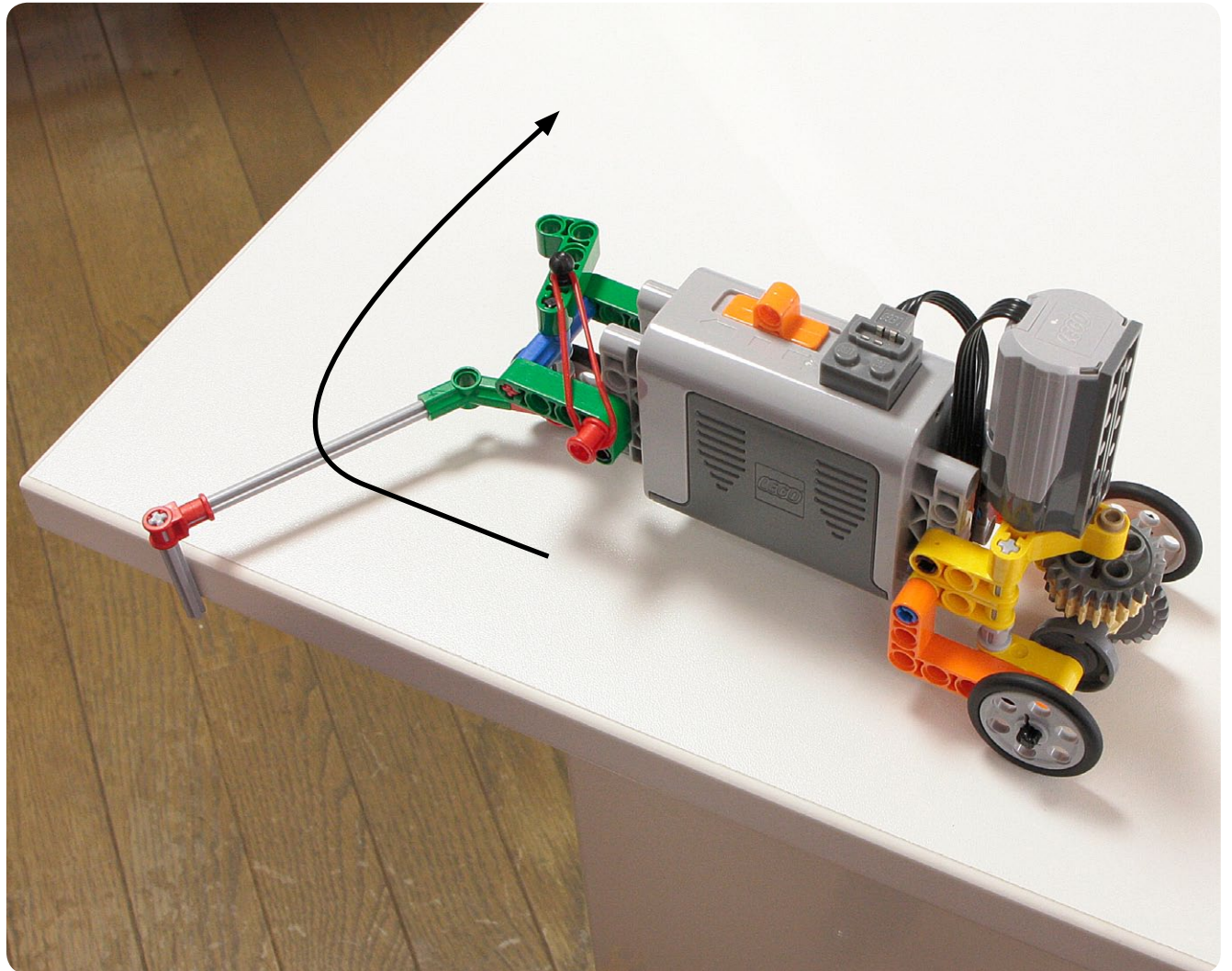
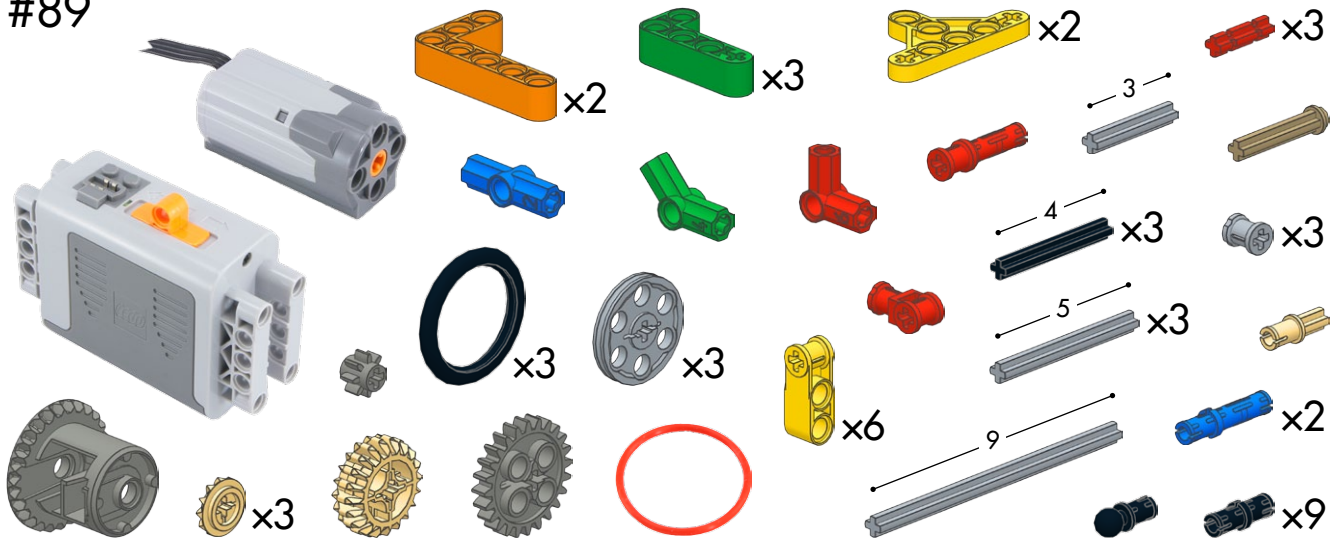


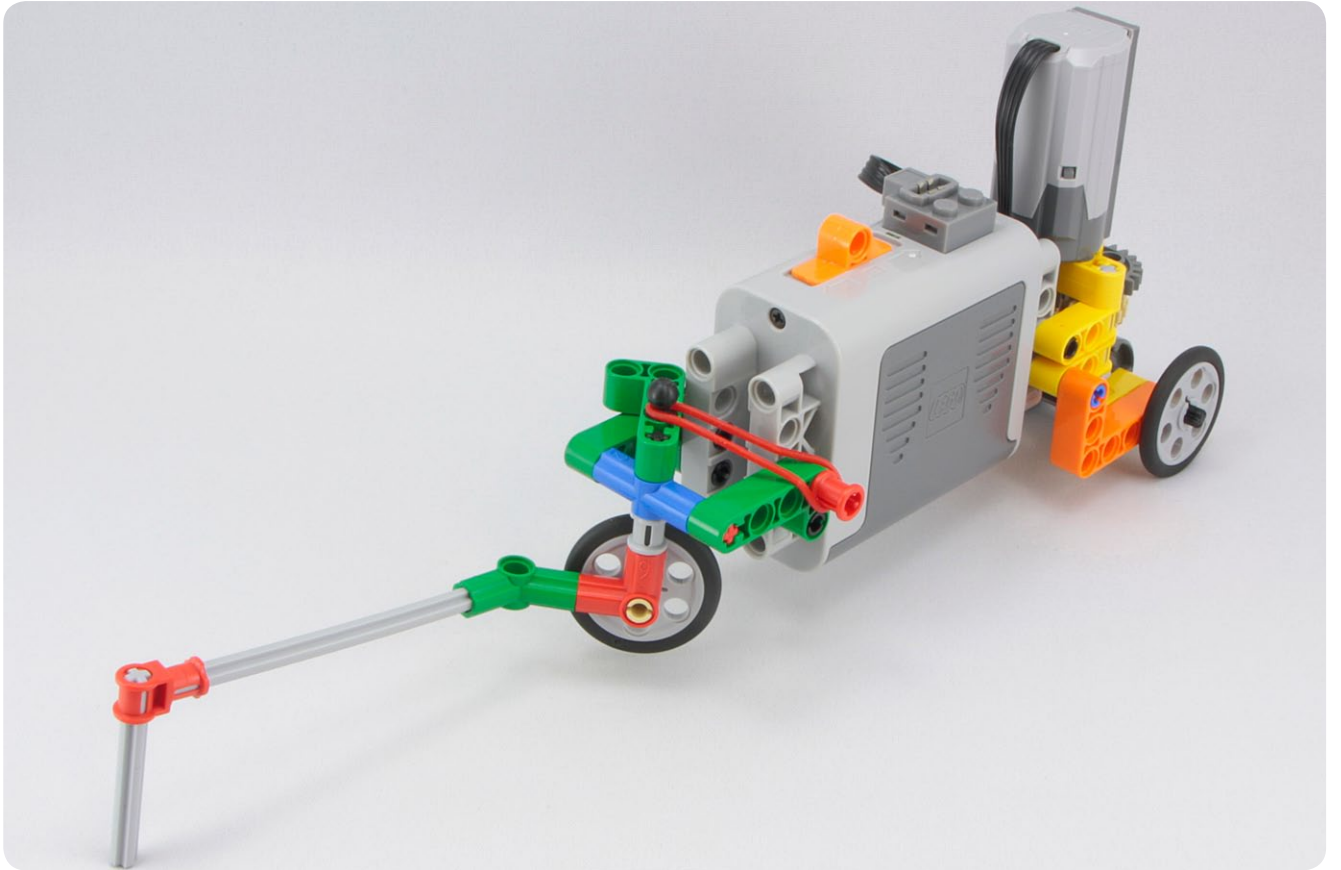
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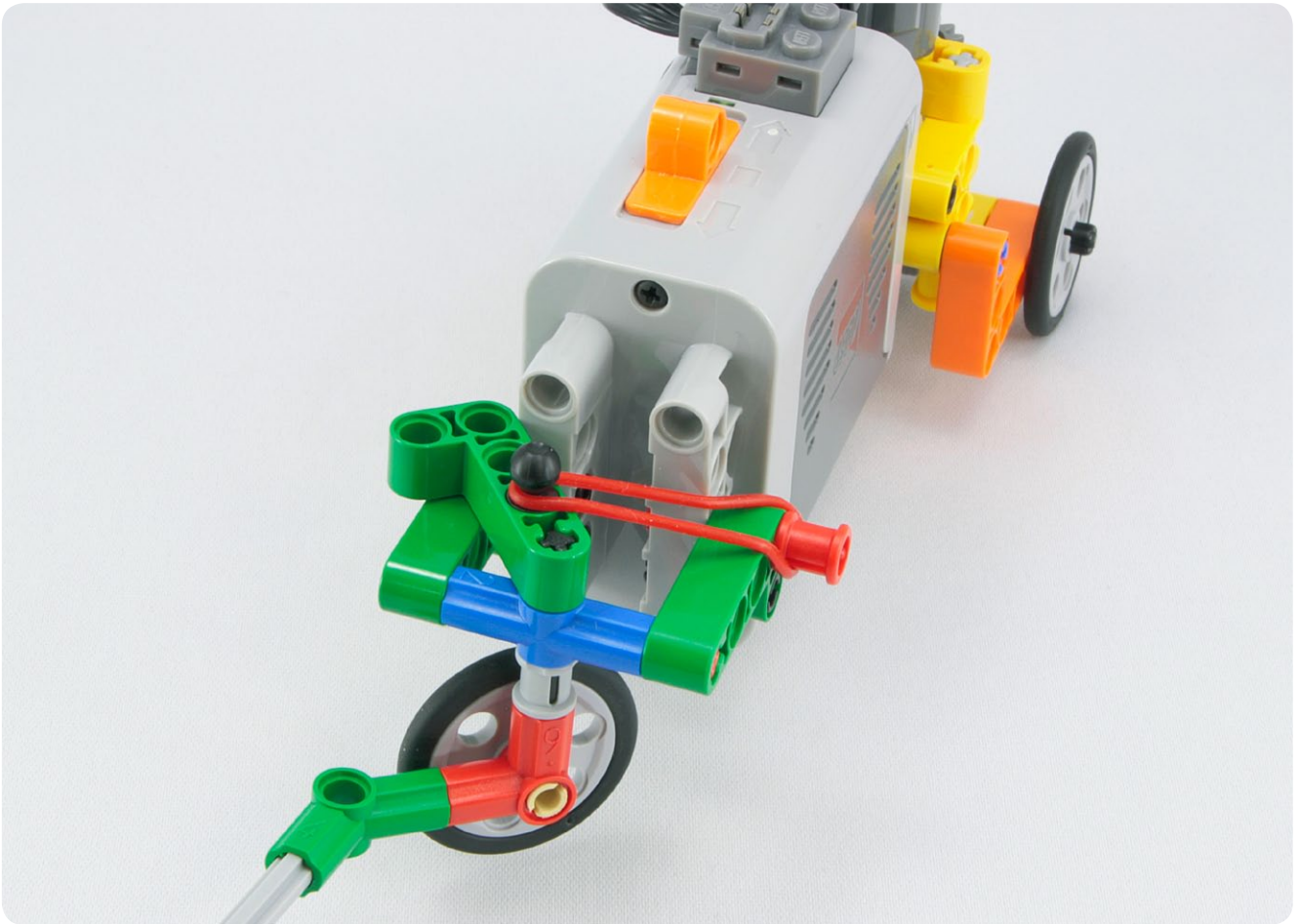
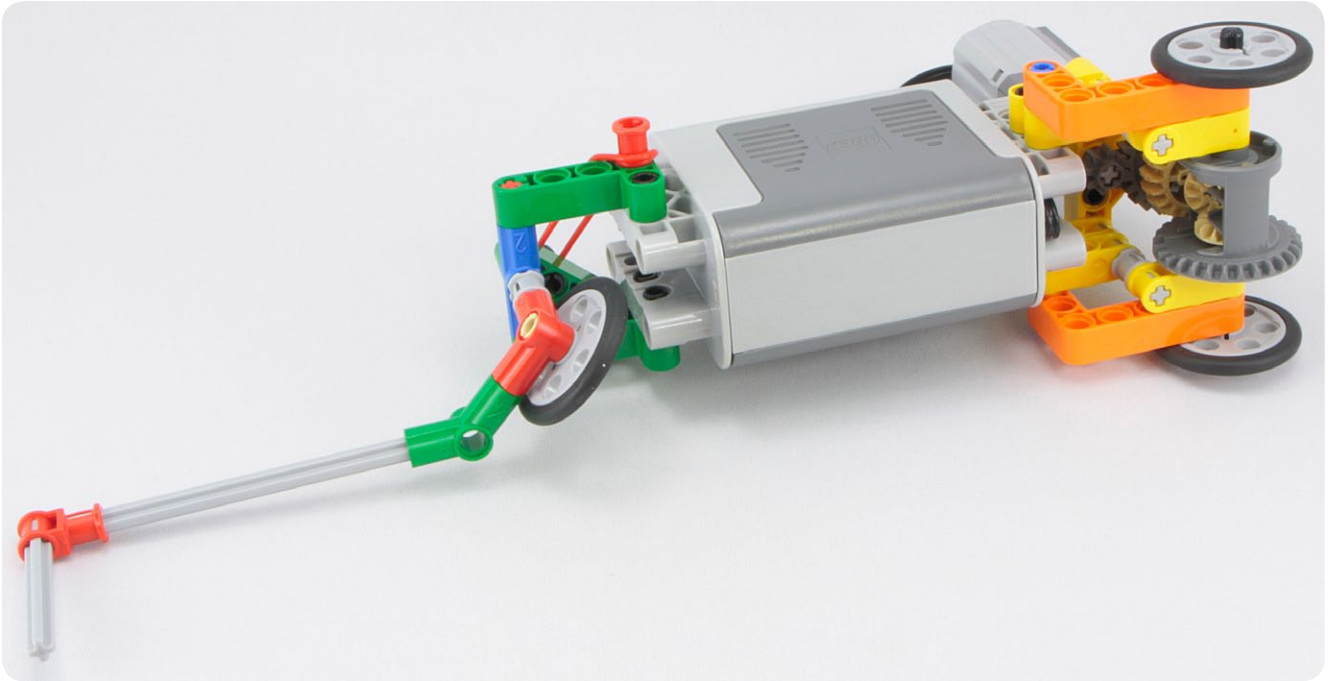


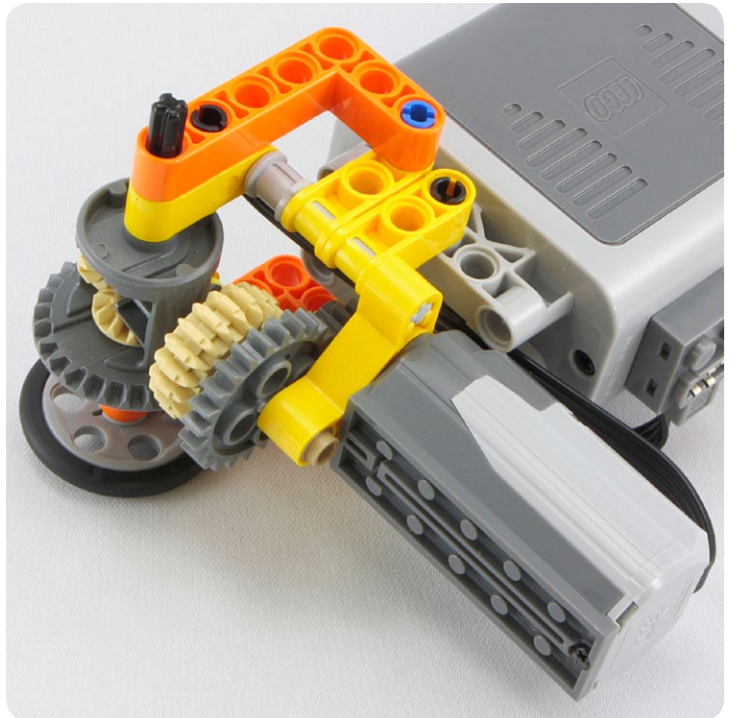
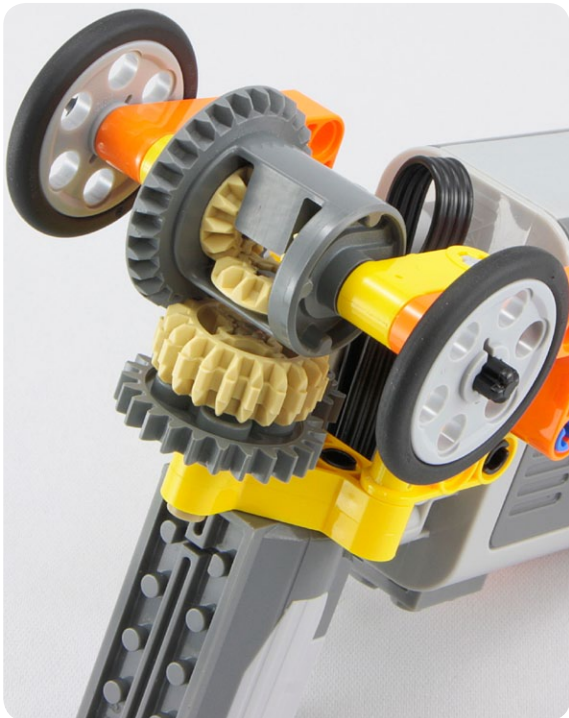
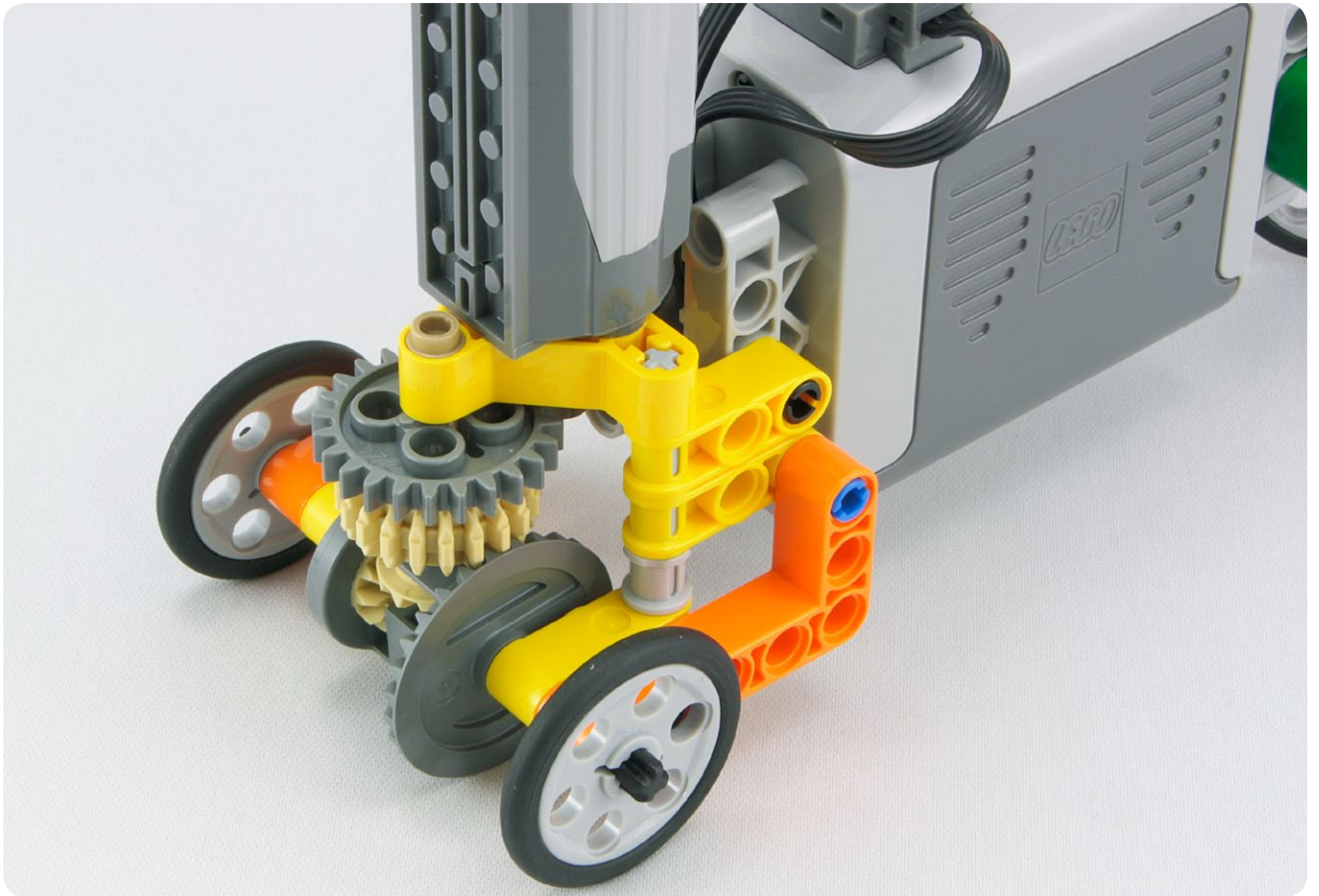


#89



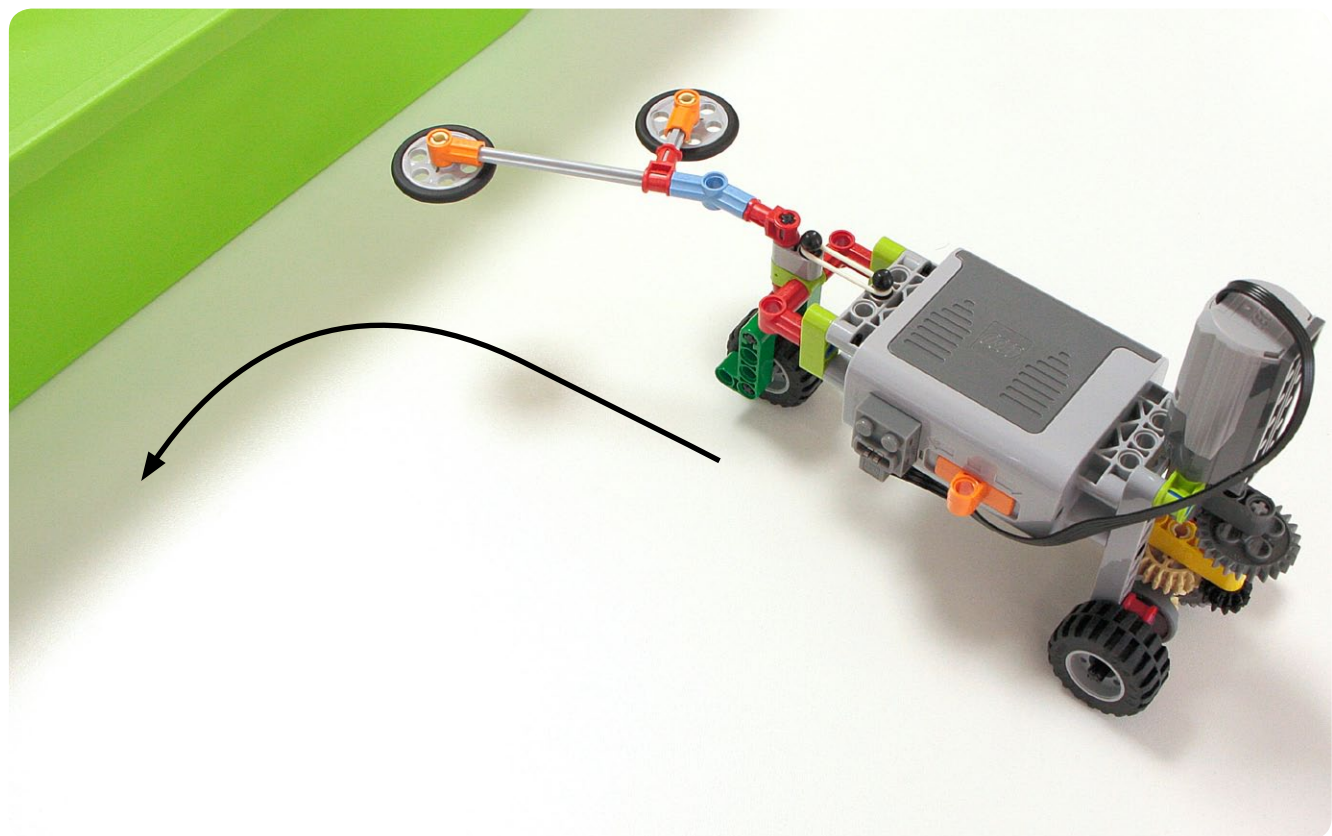
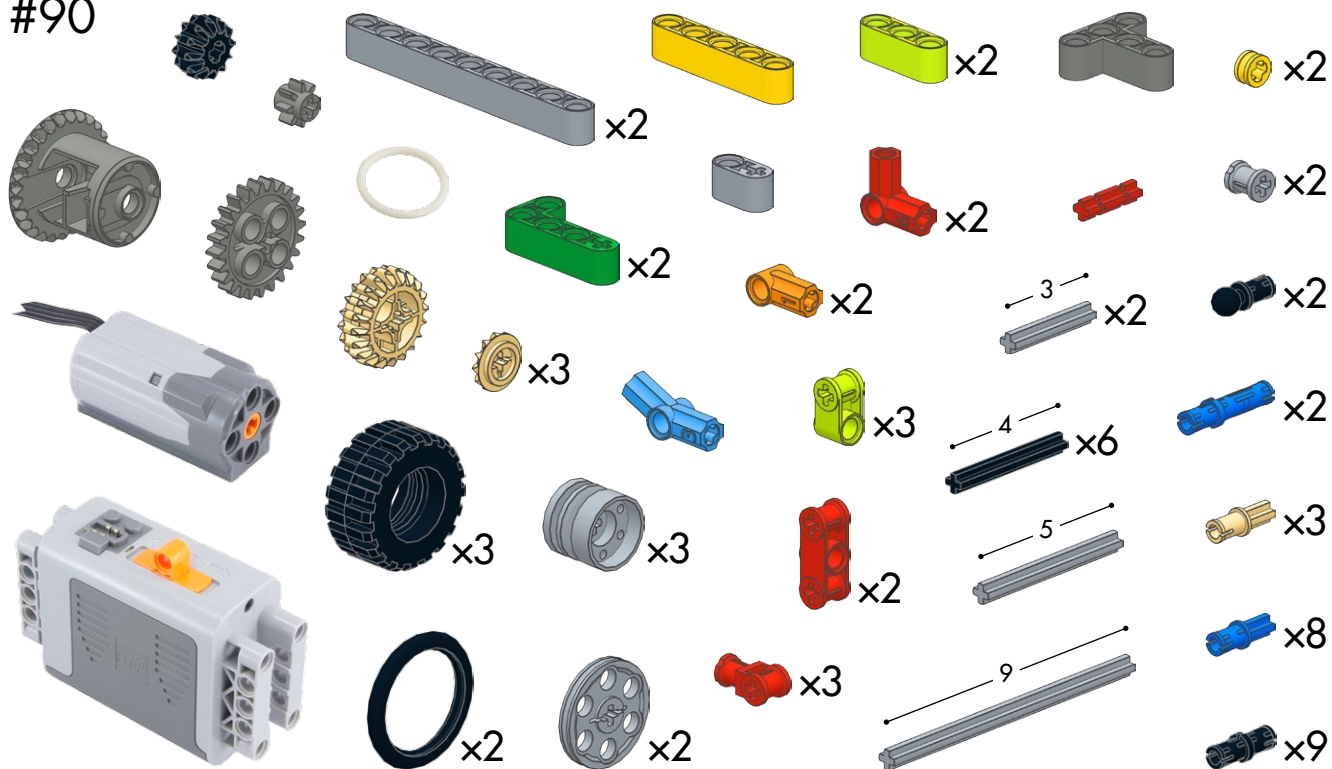


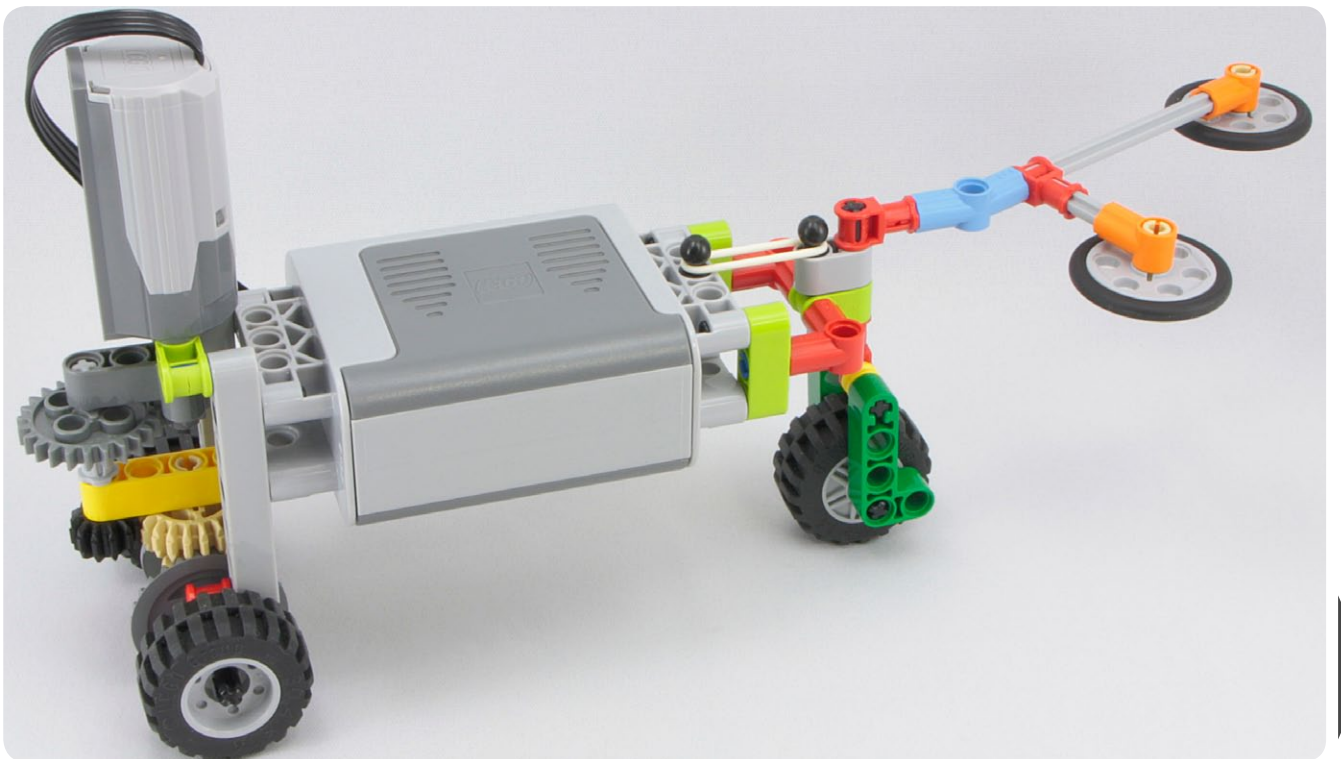
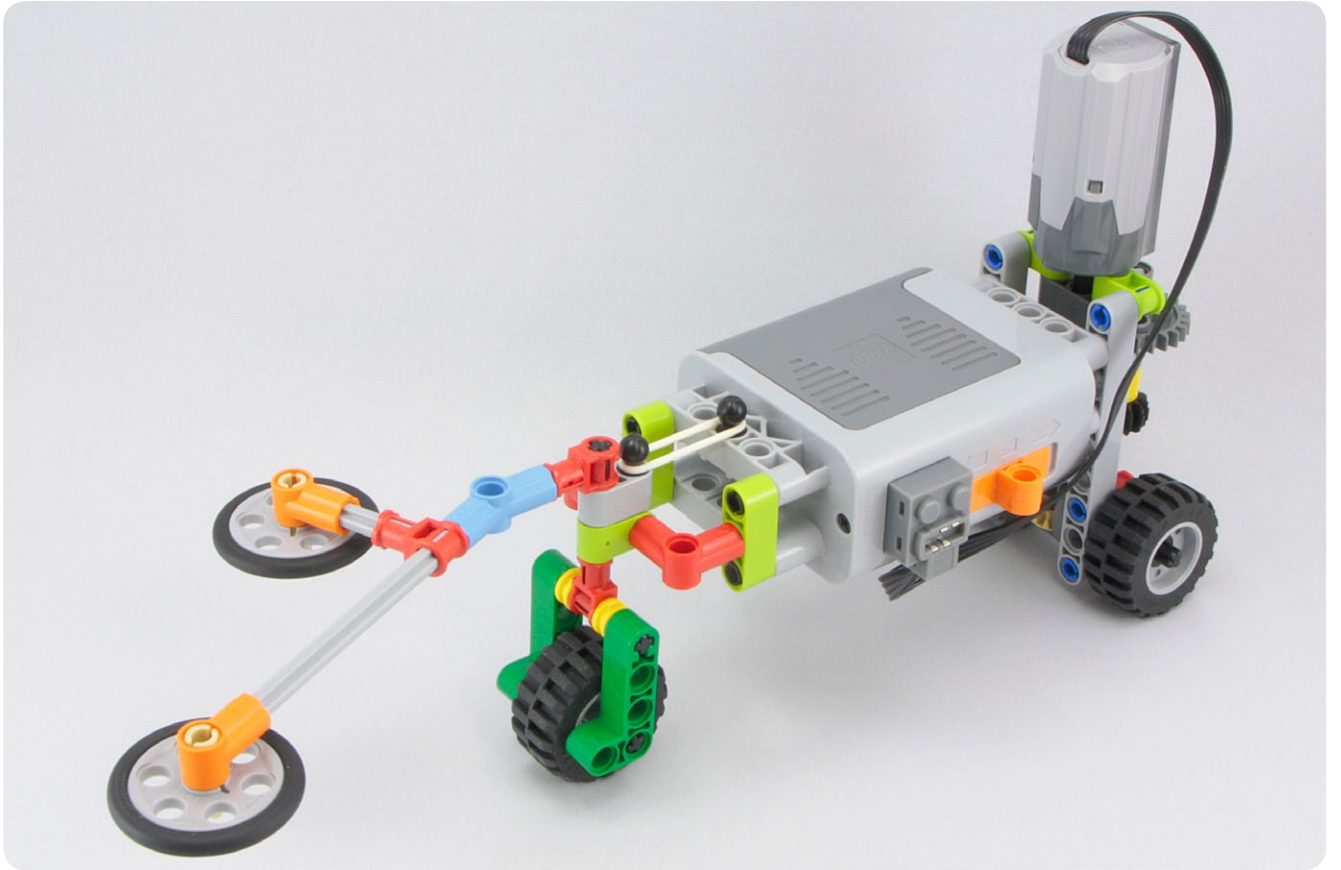


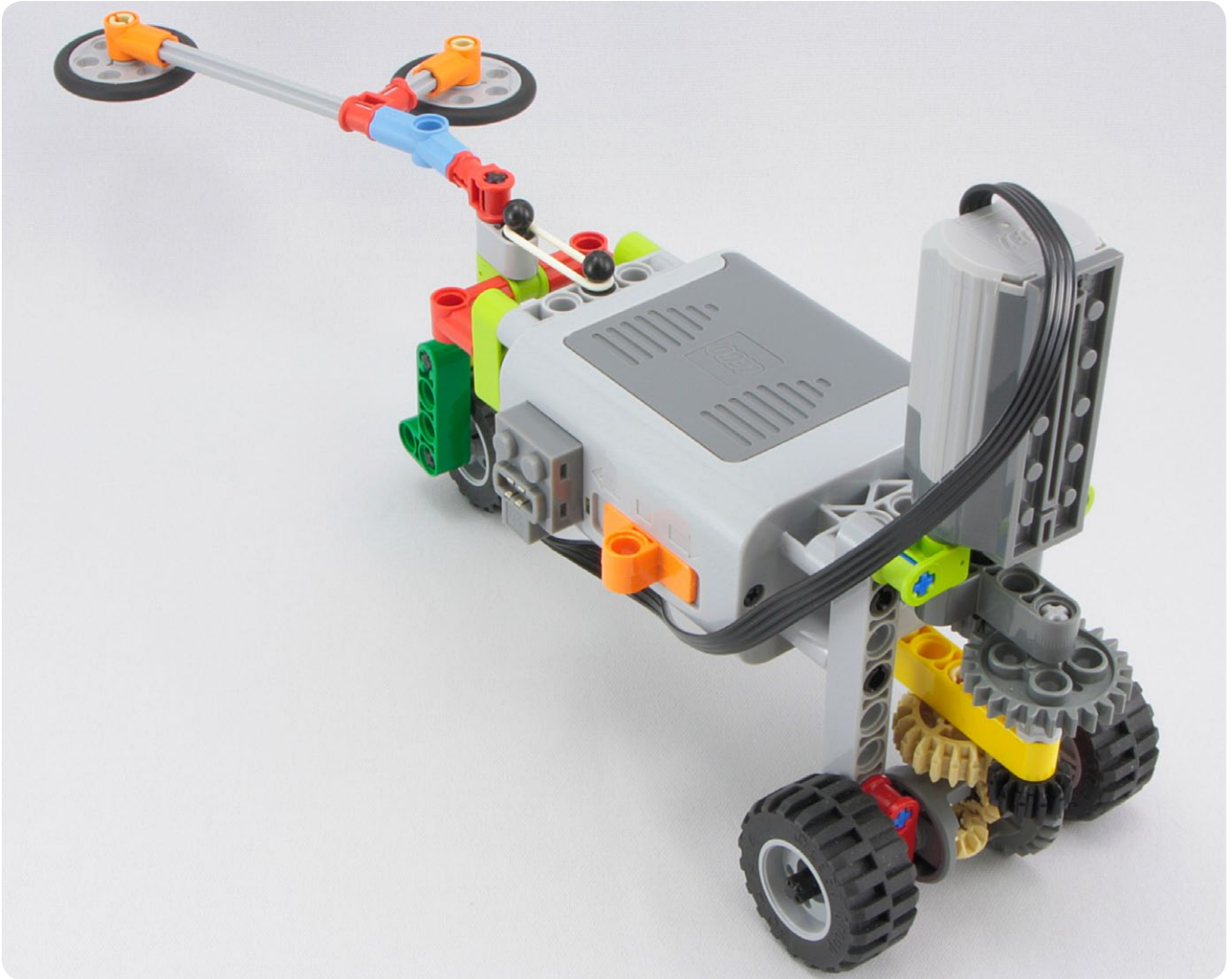


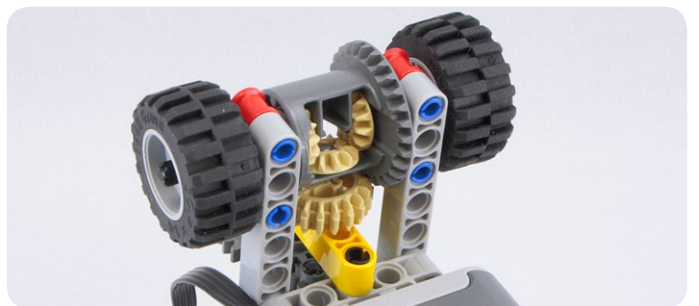
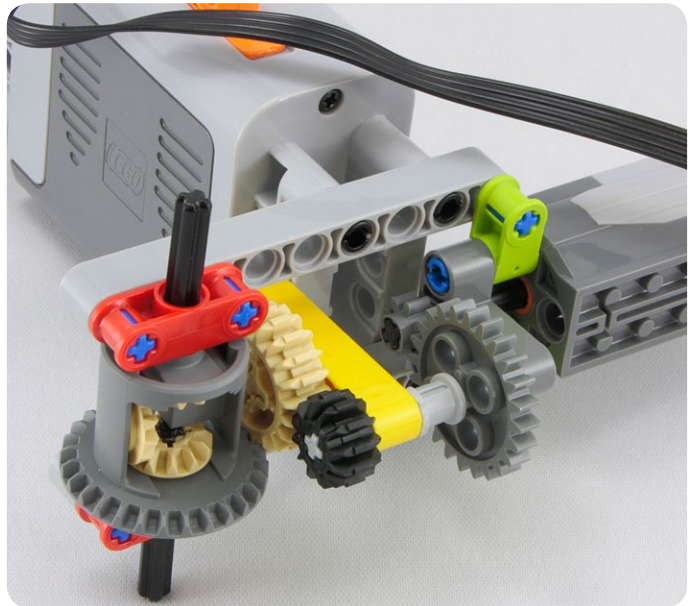
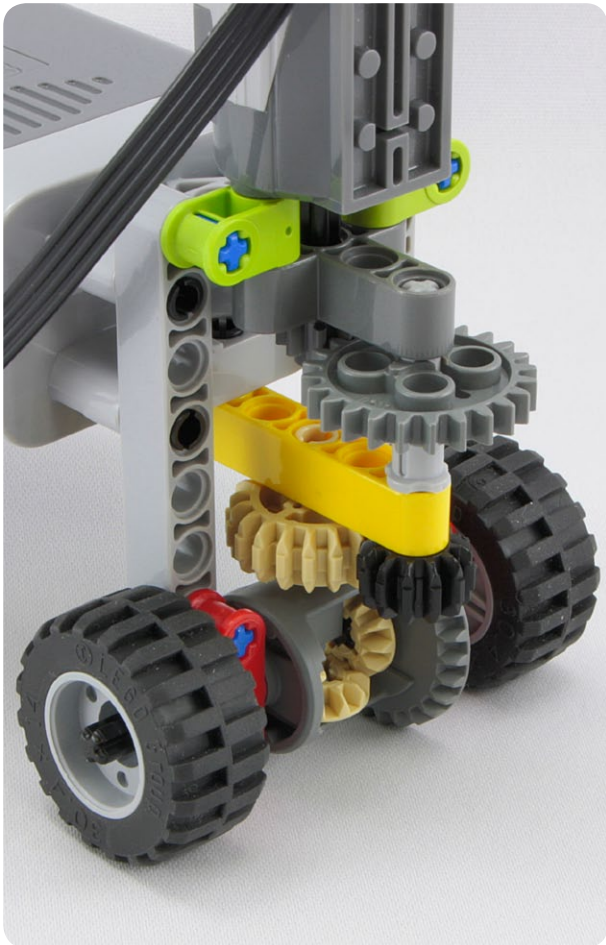
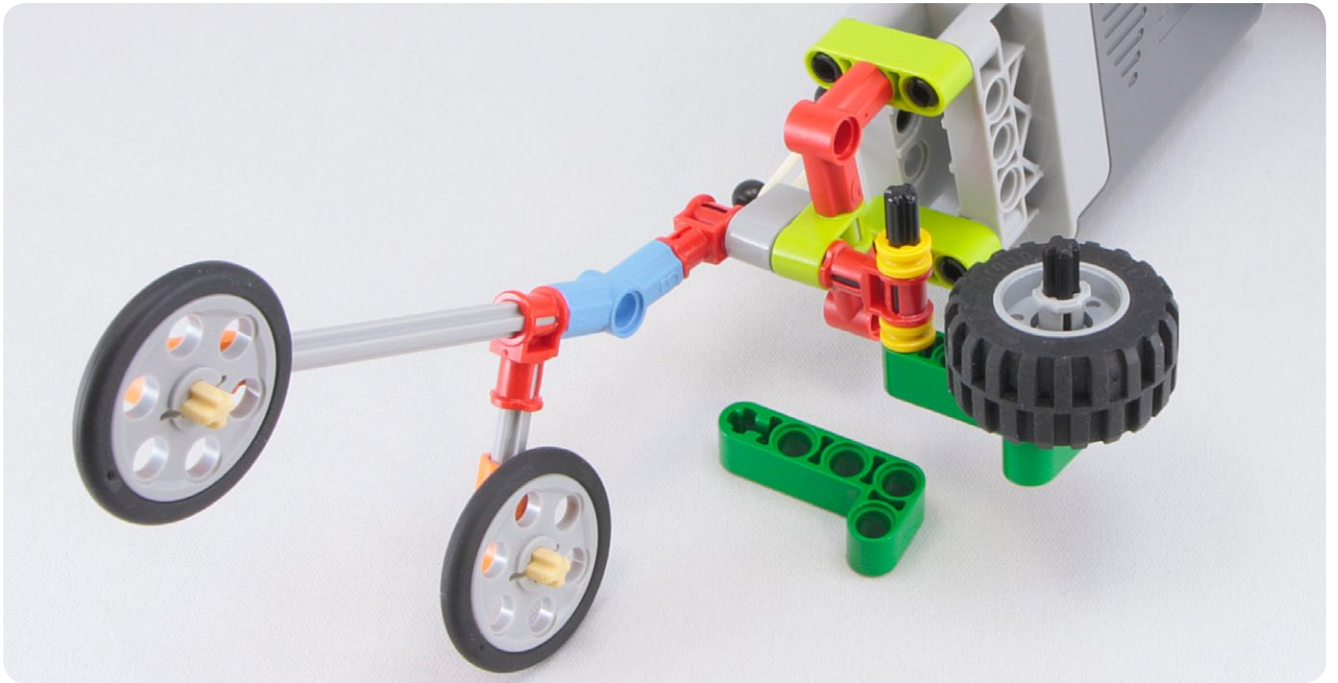


#90

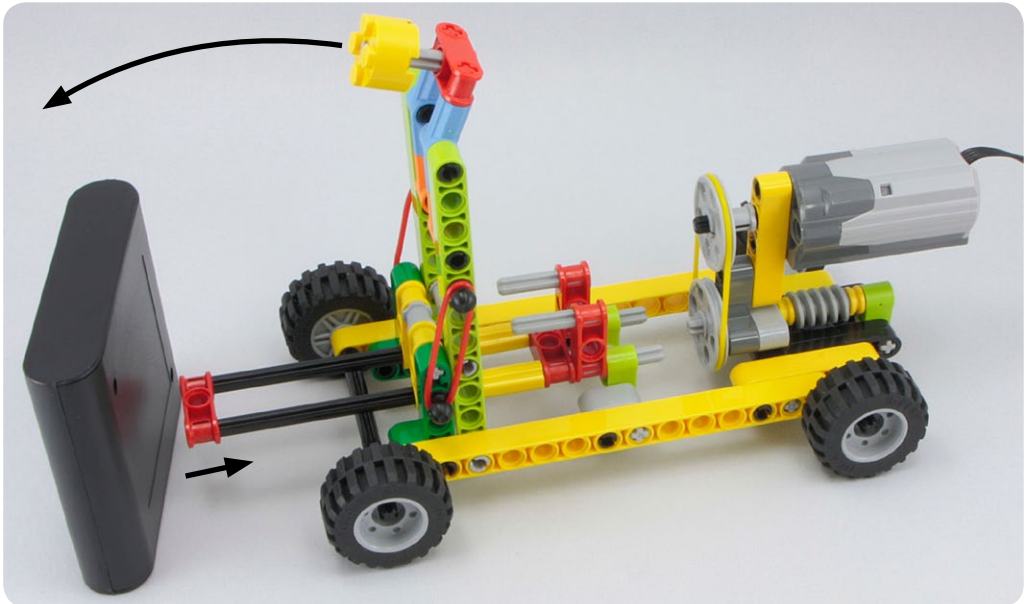
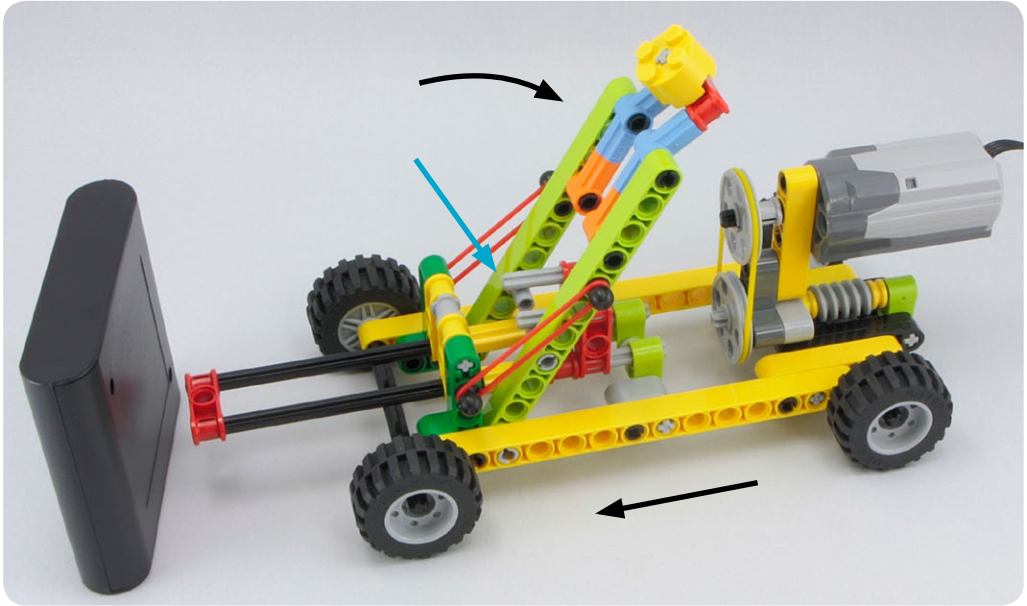
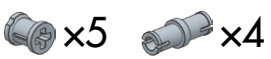
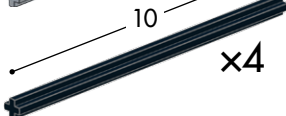
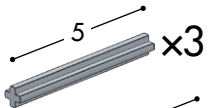
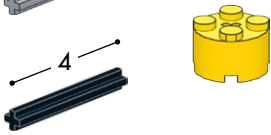
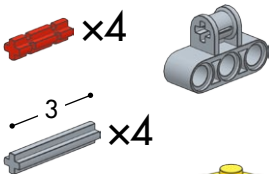
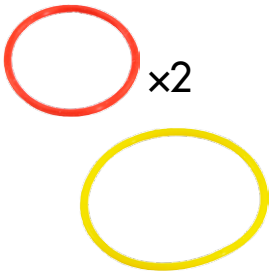
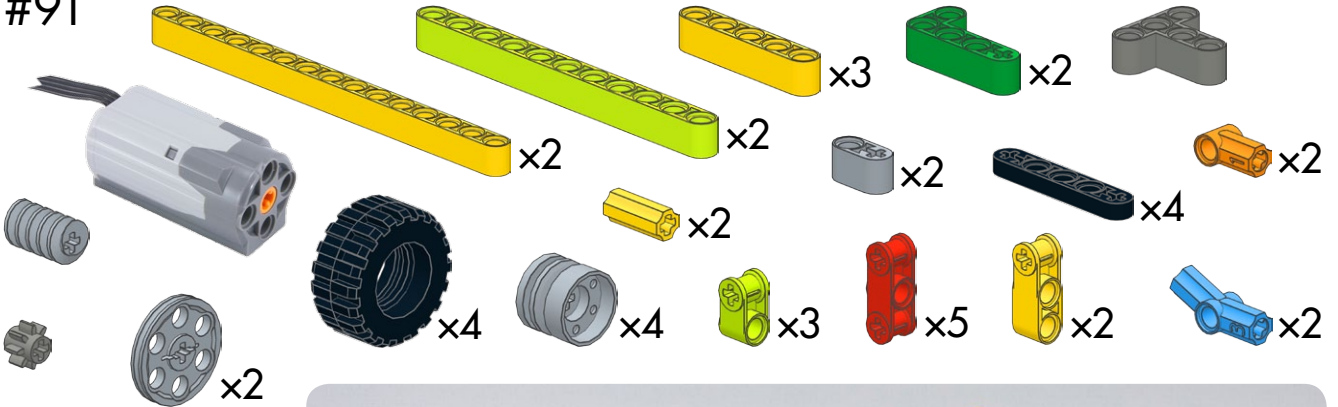




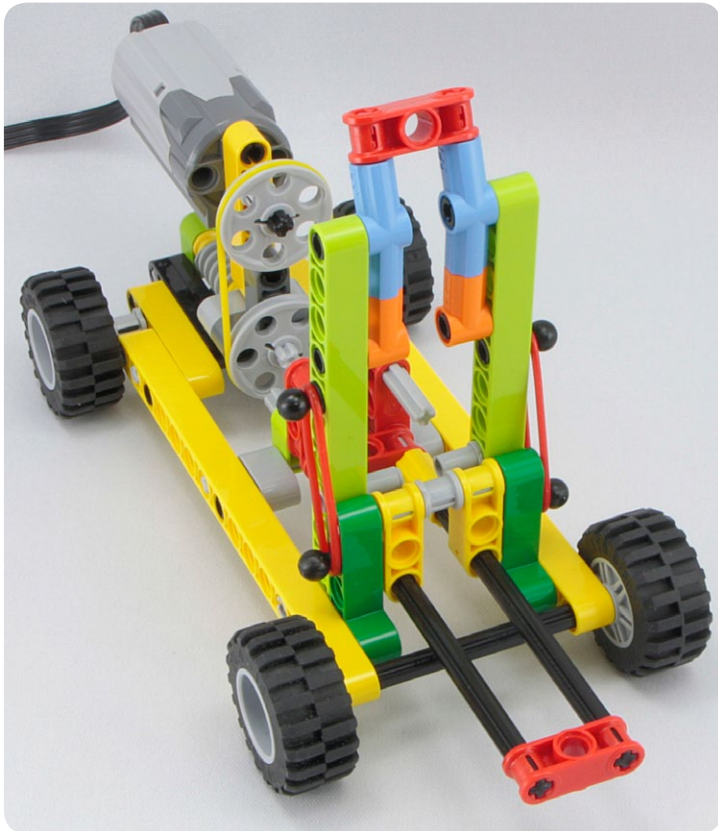
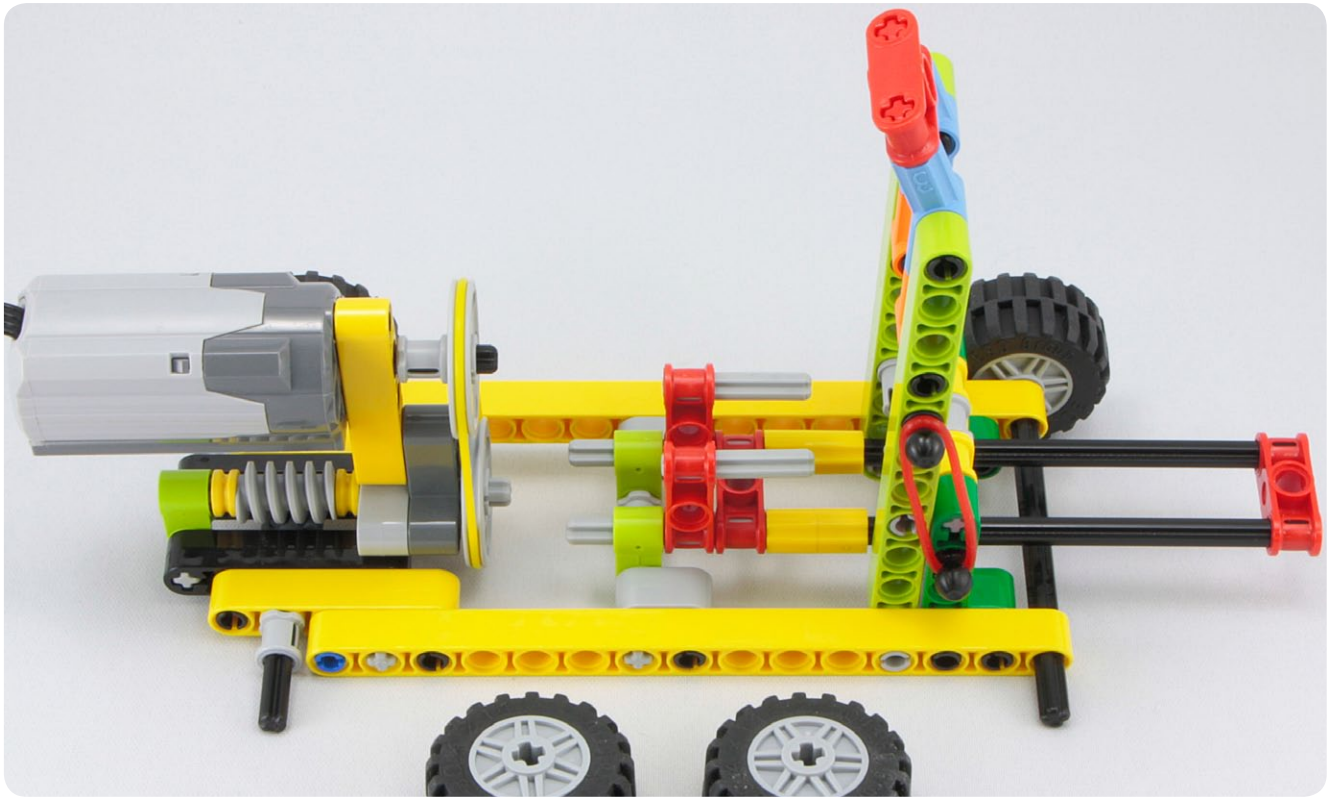


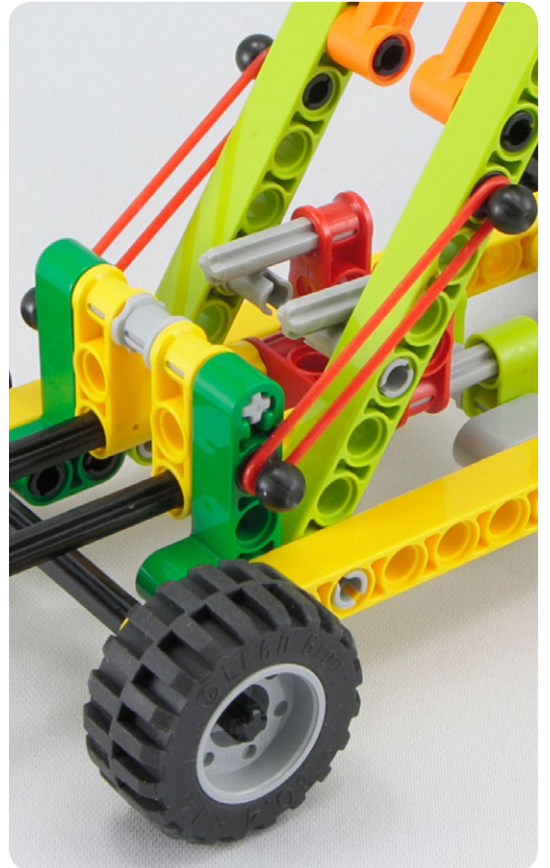
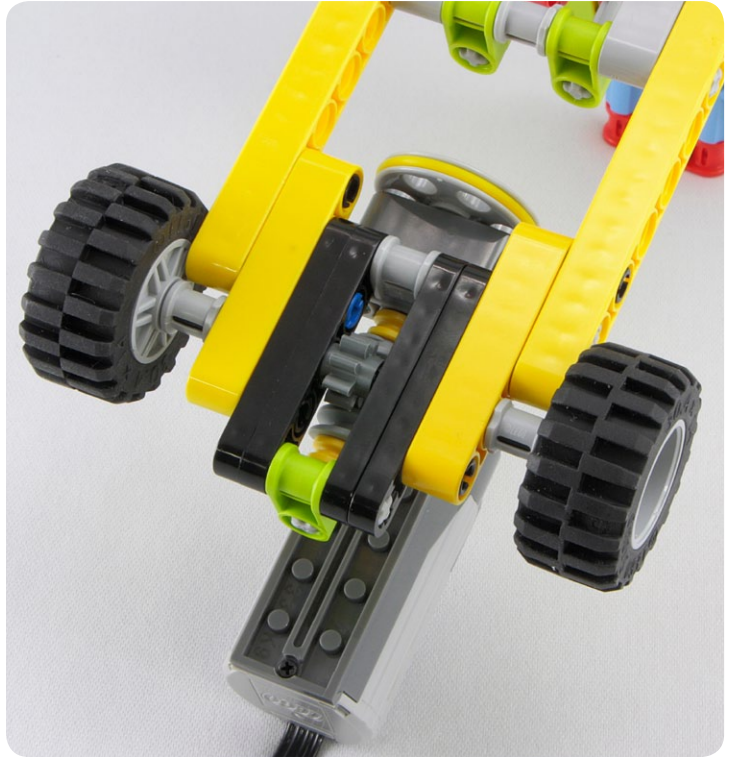
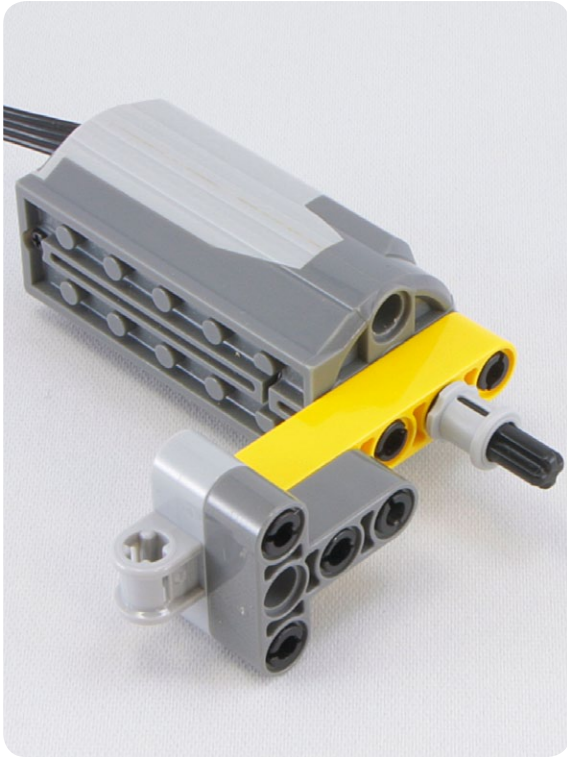


#91



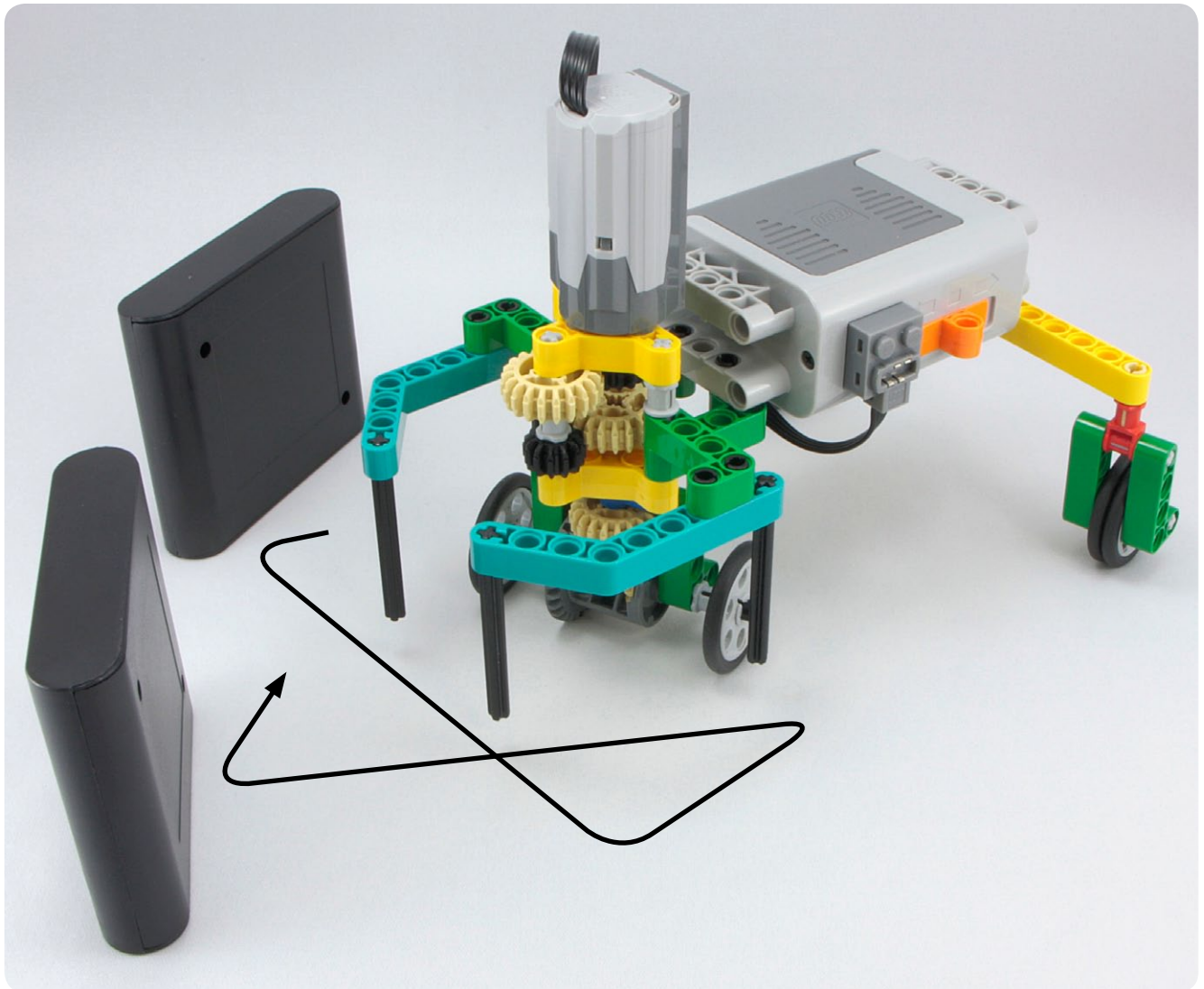
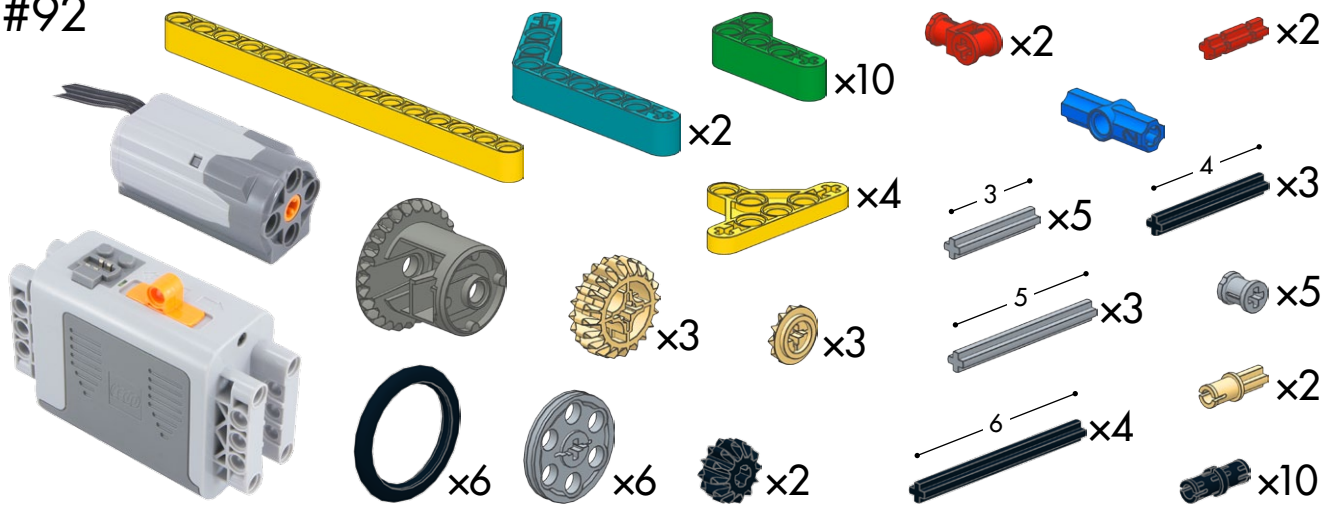


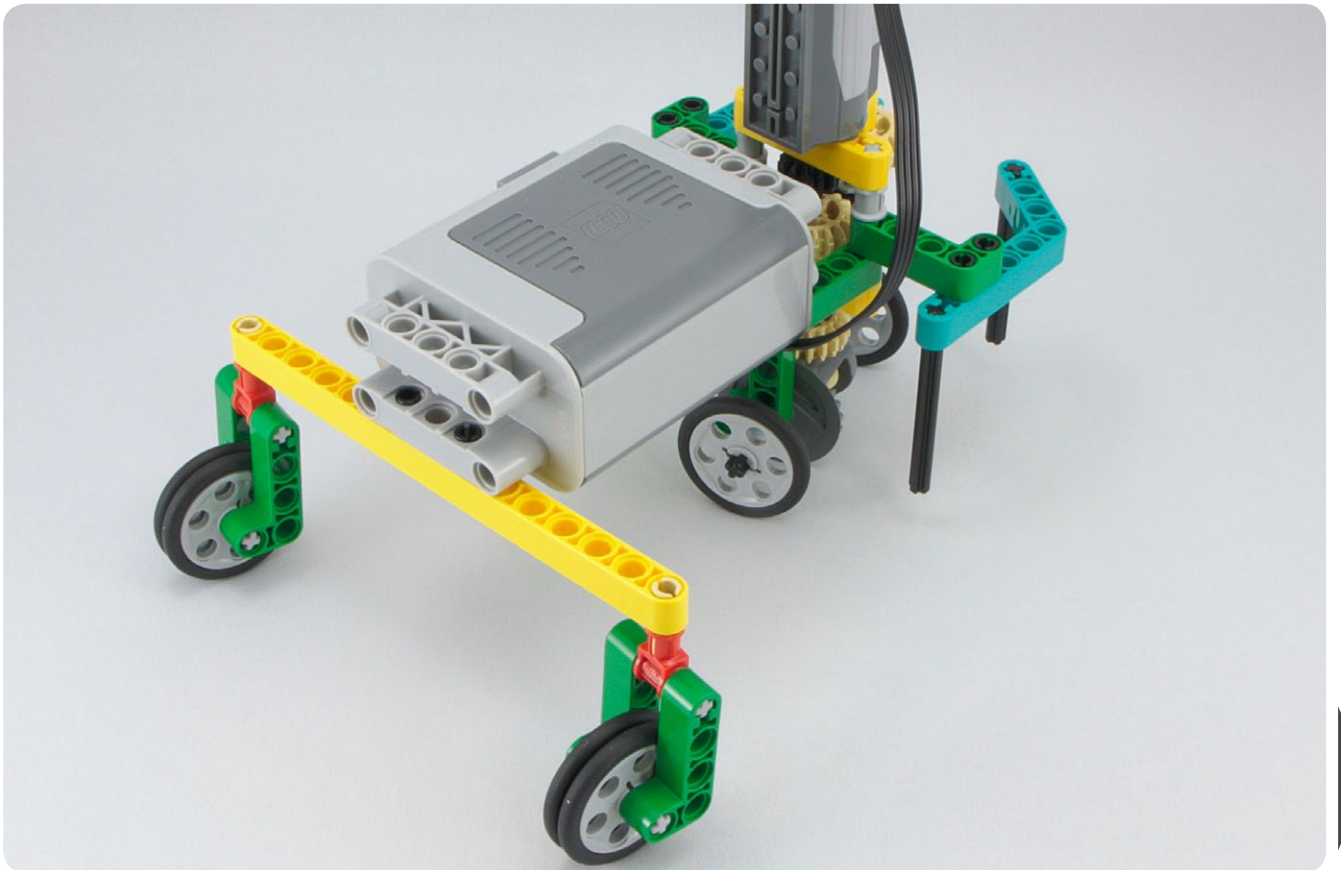
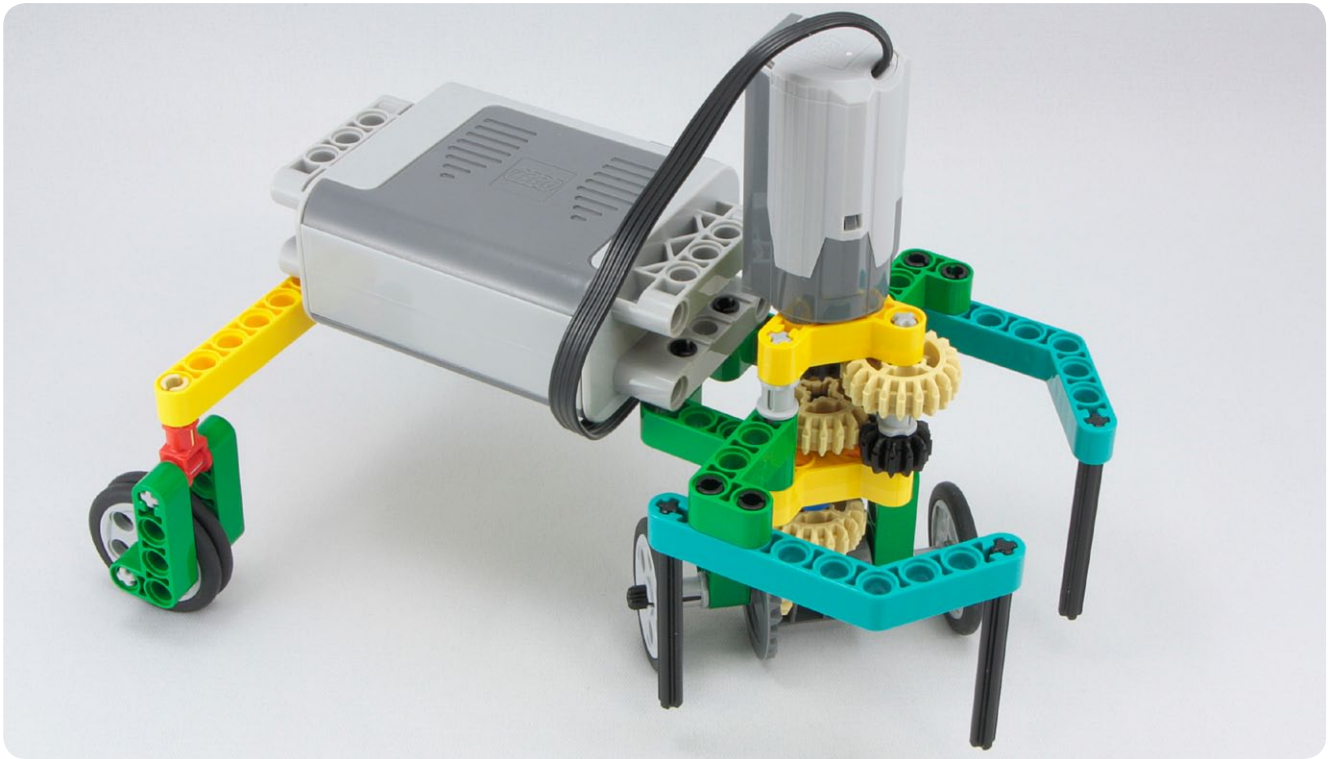


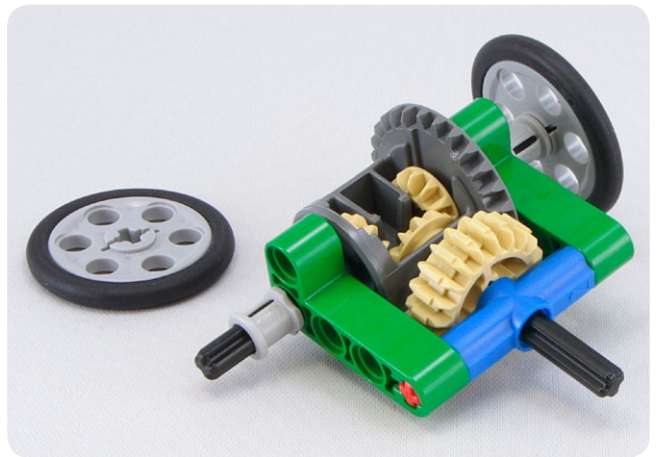
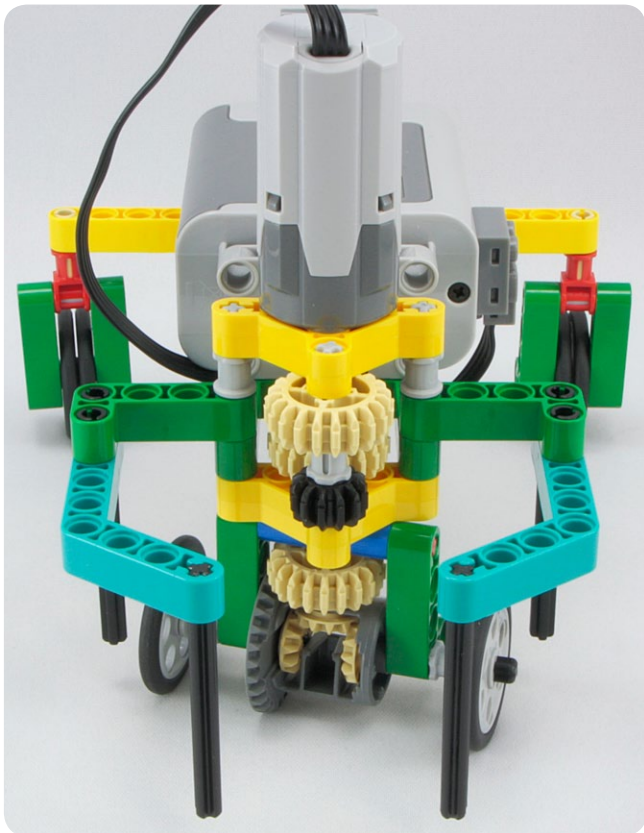
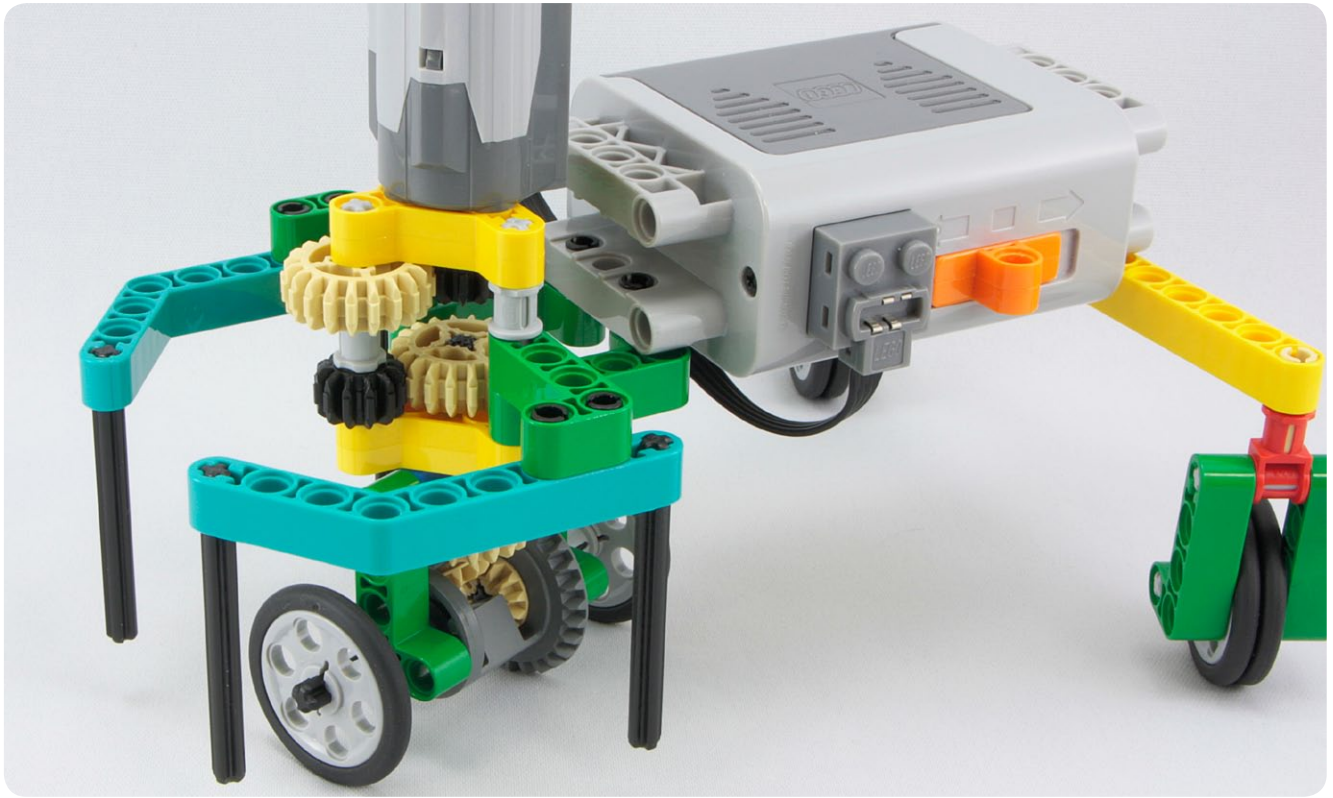


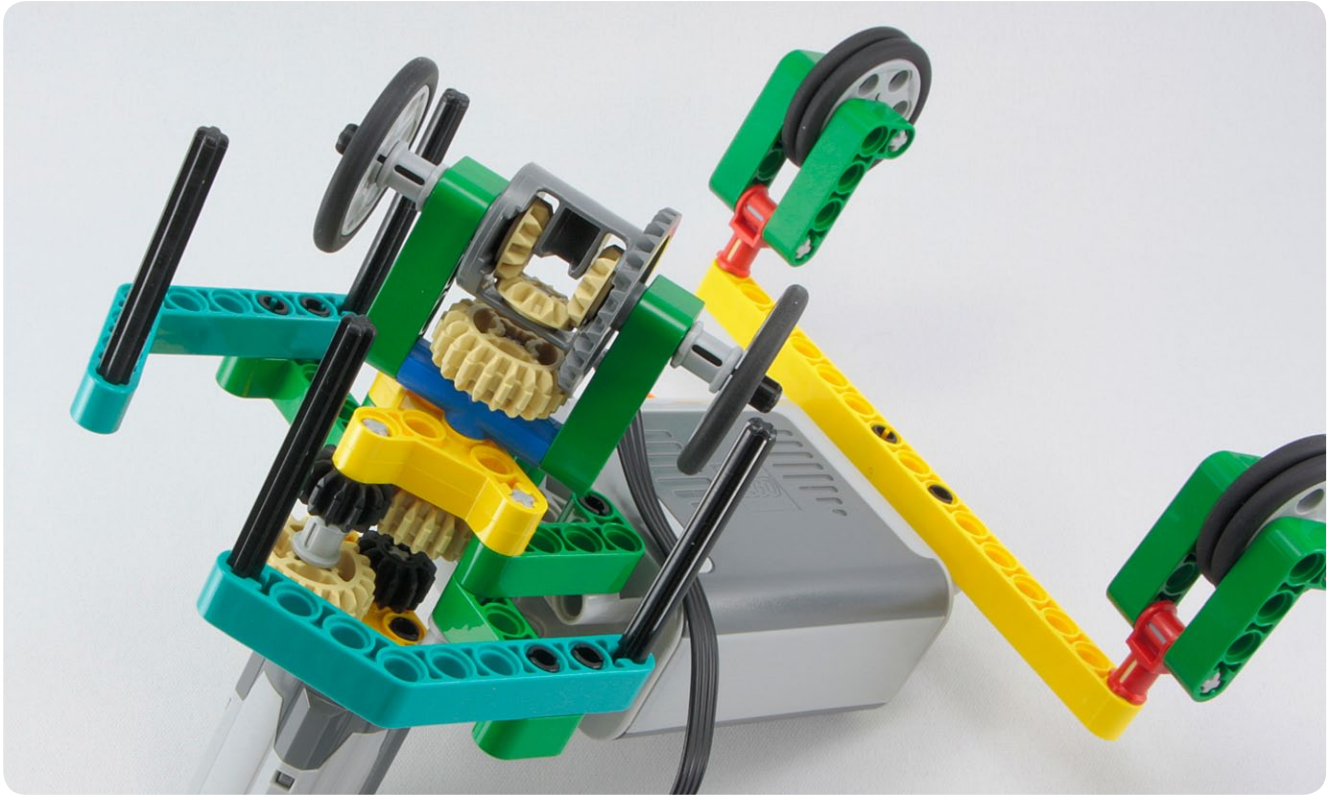


#92





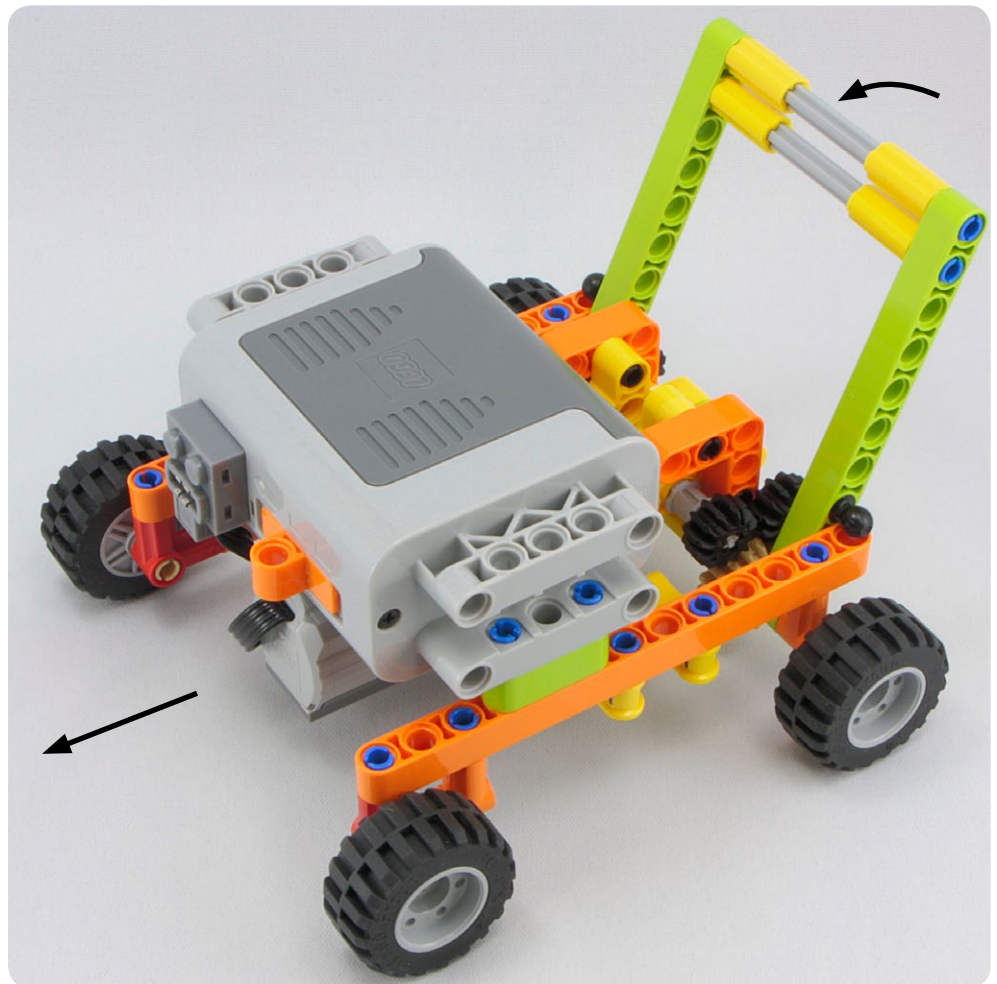
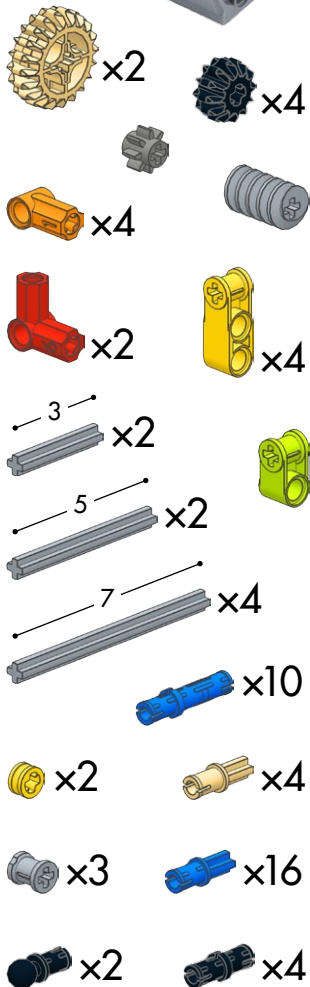
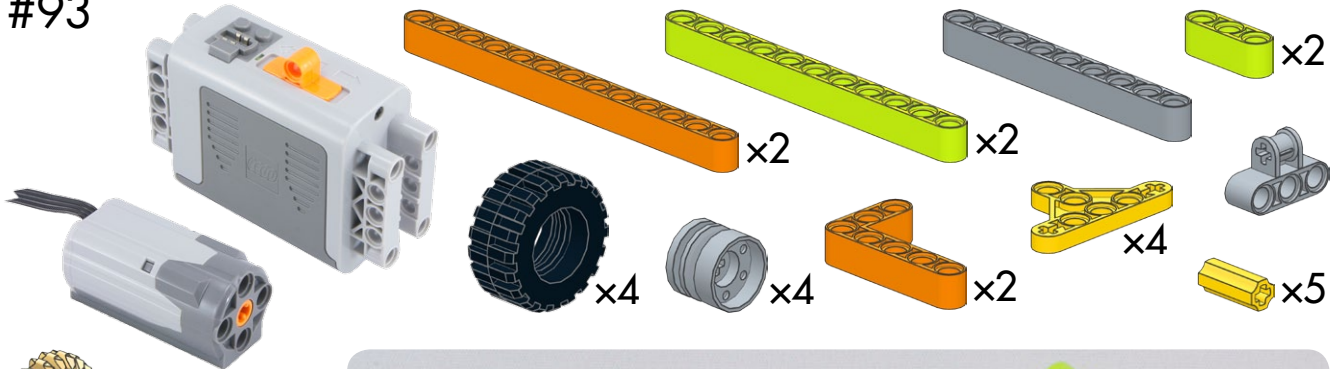


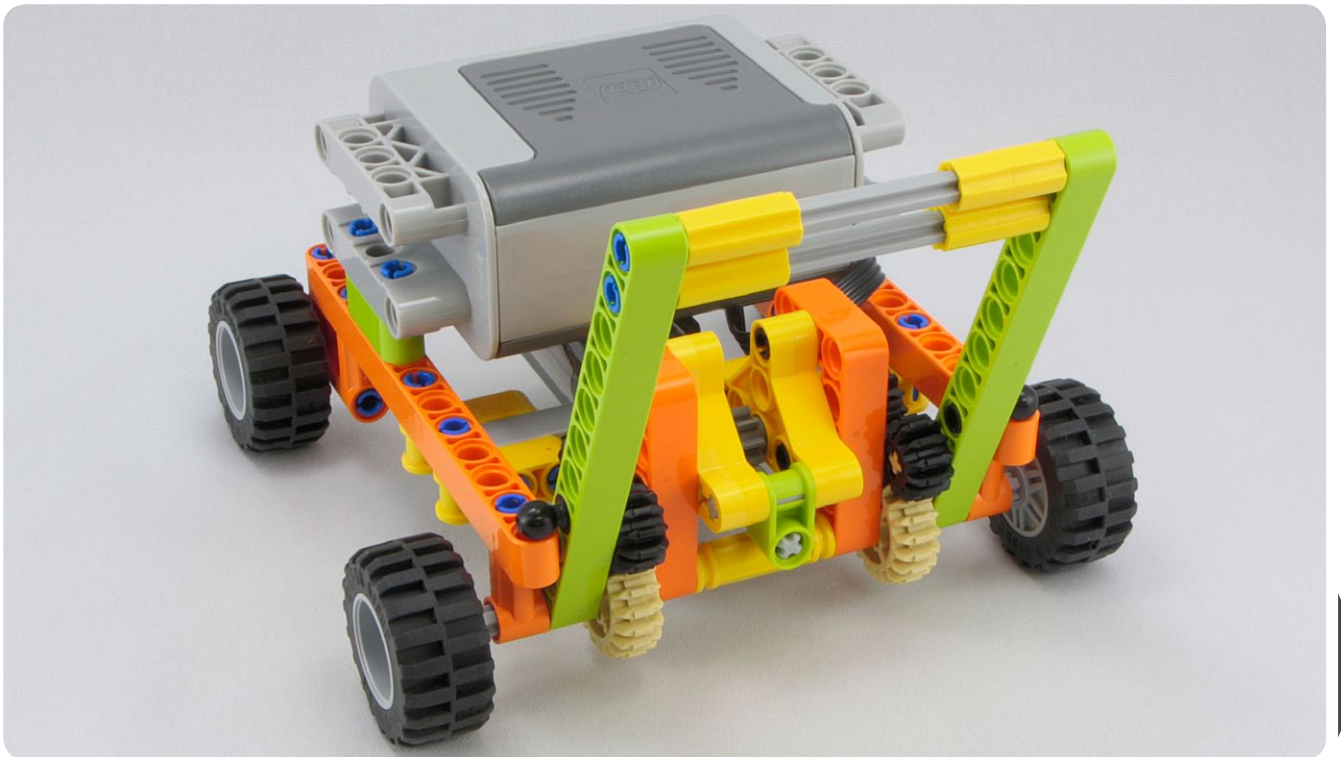


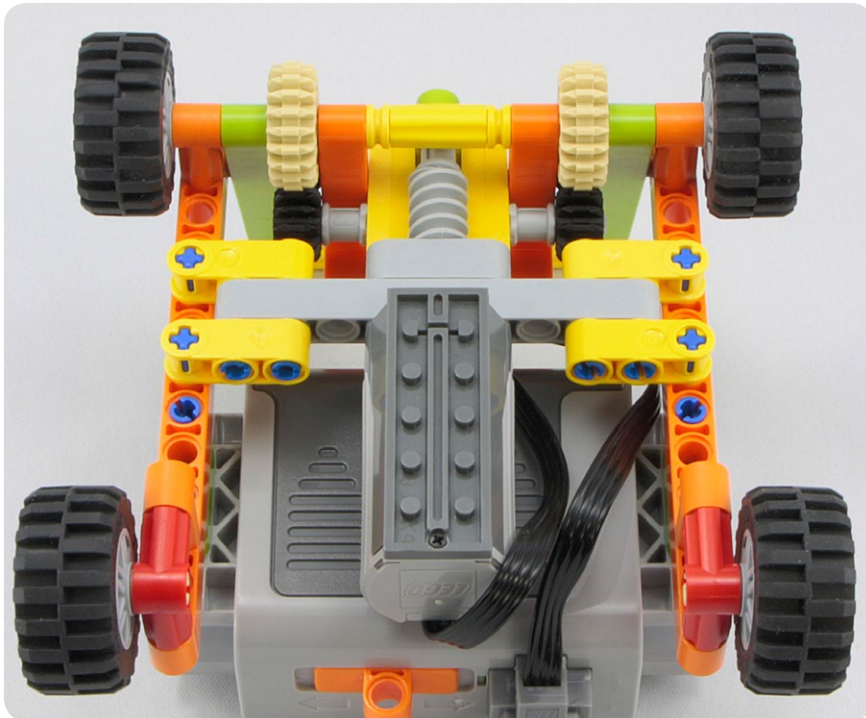
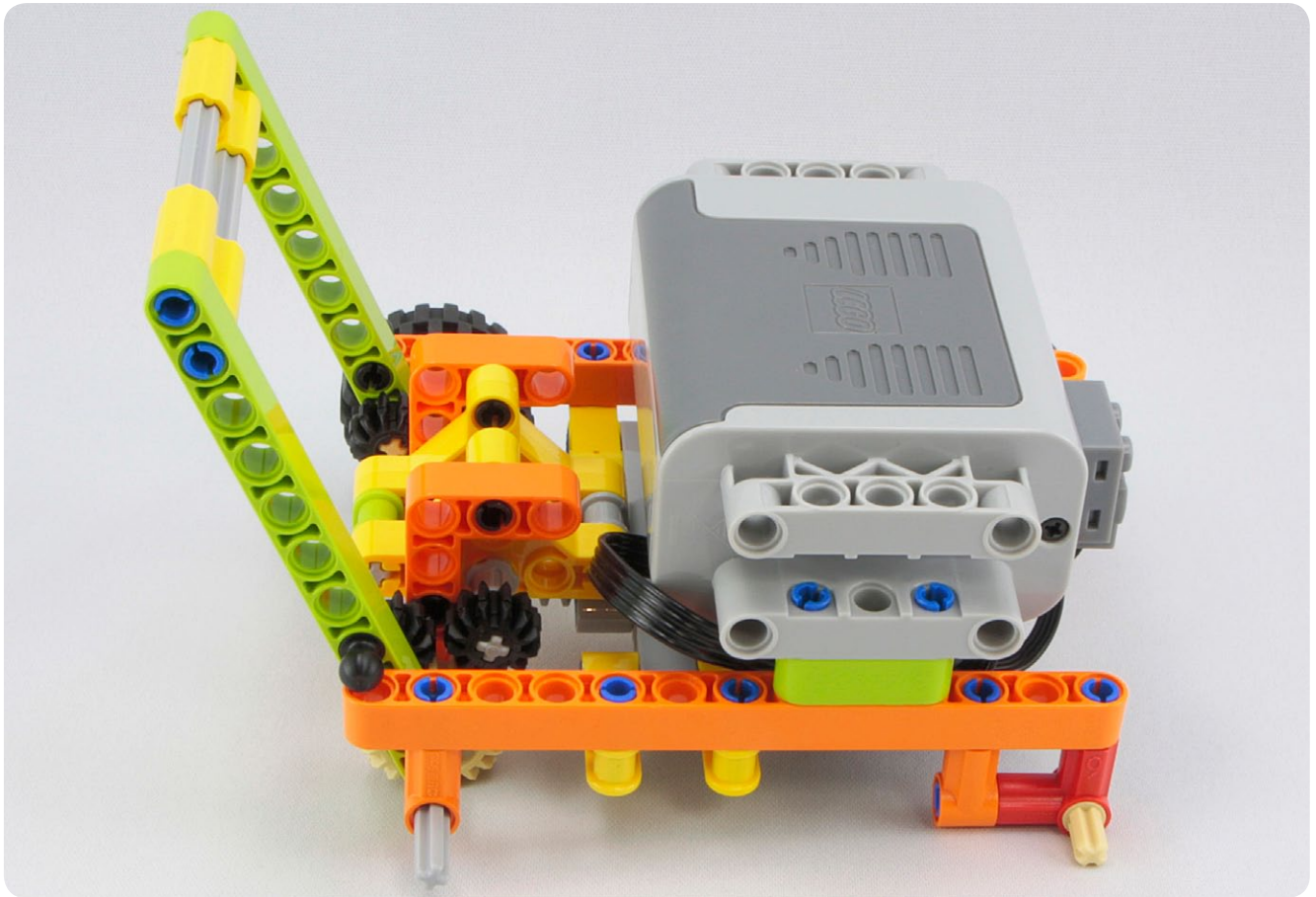


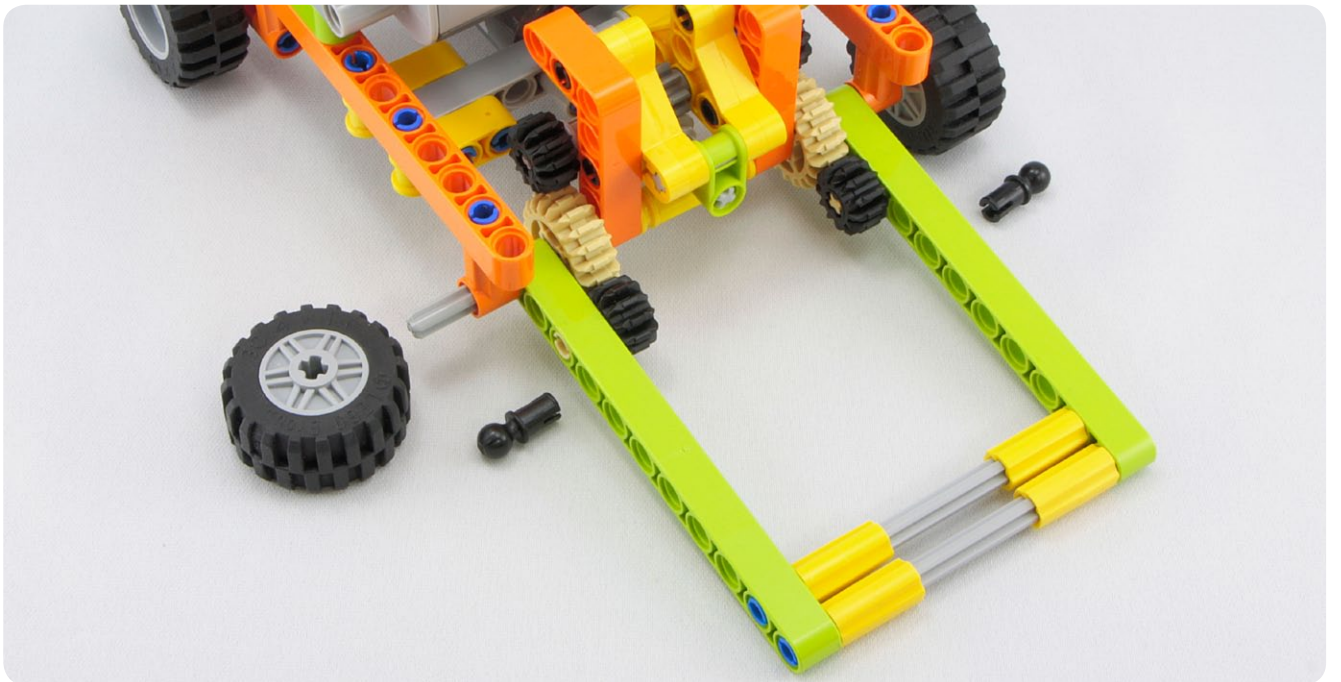
# Cool cars

#93



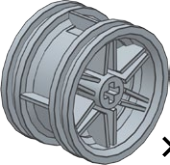





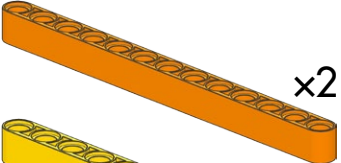
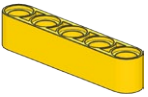
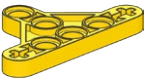




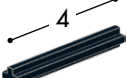

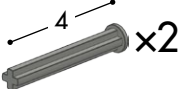



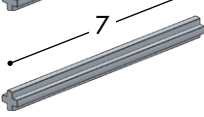



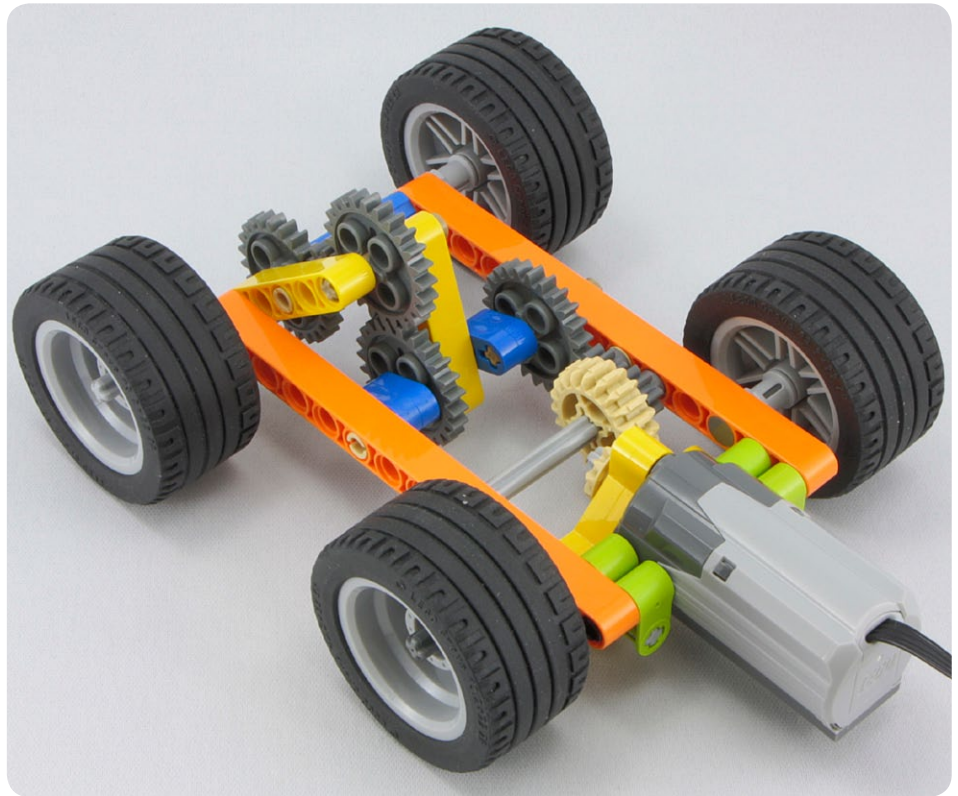
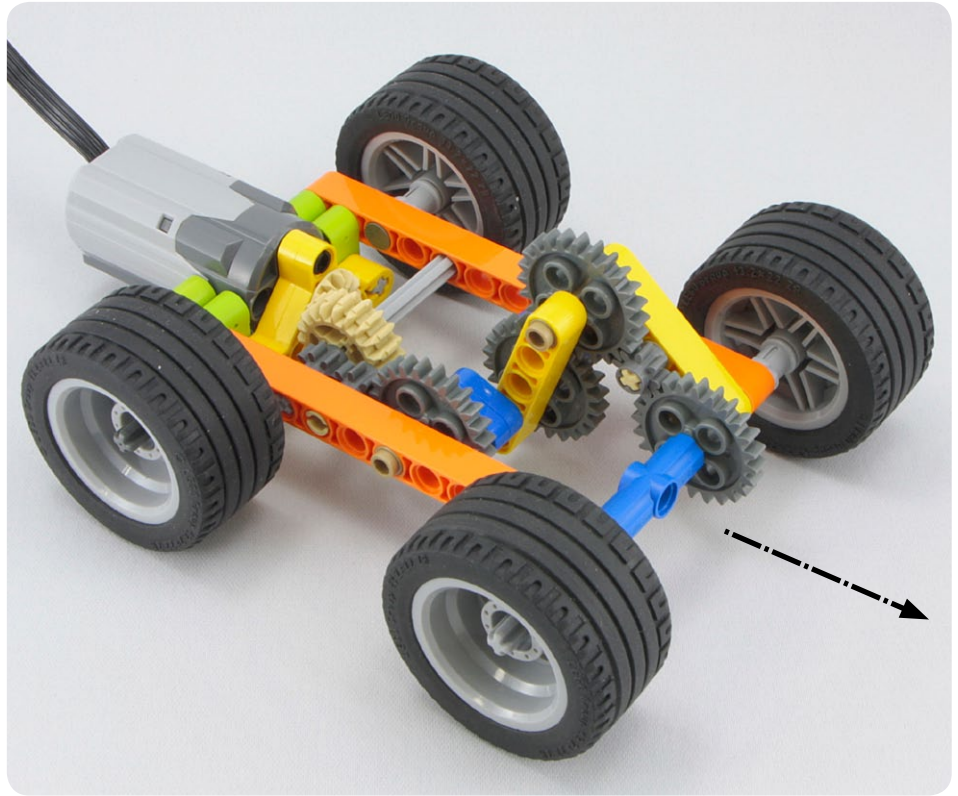


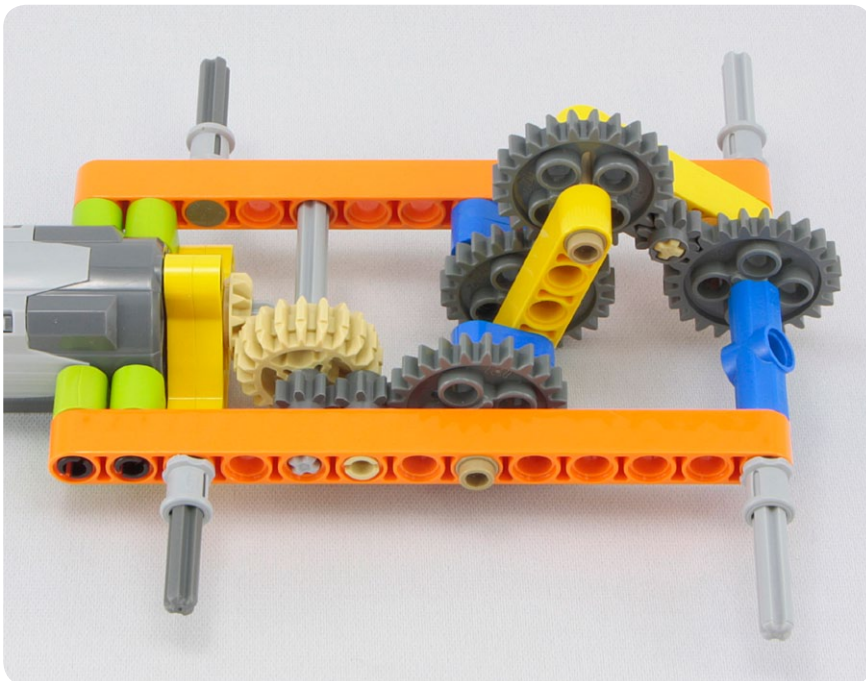
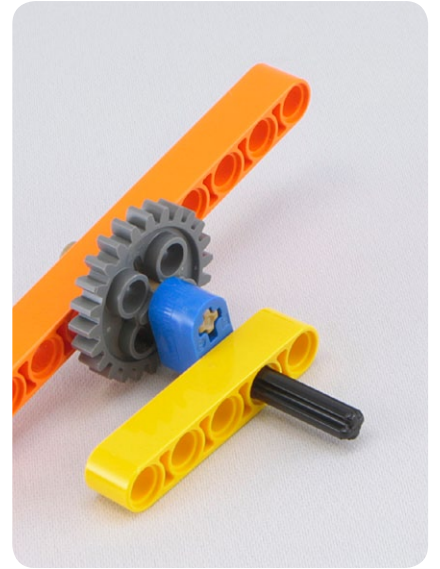
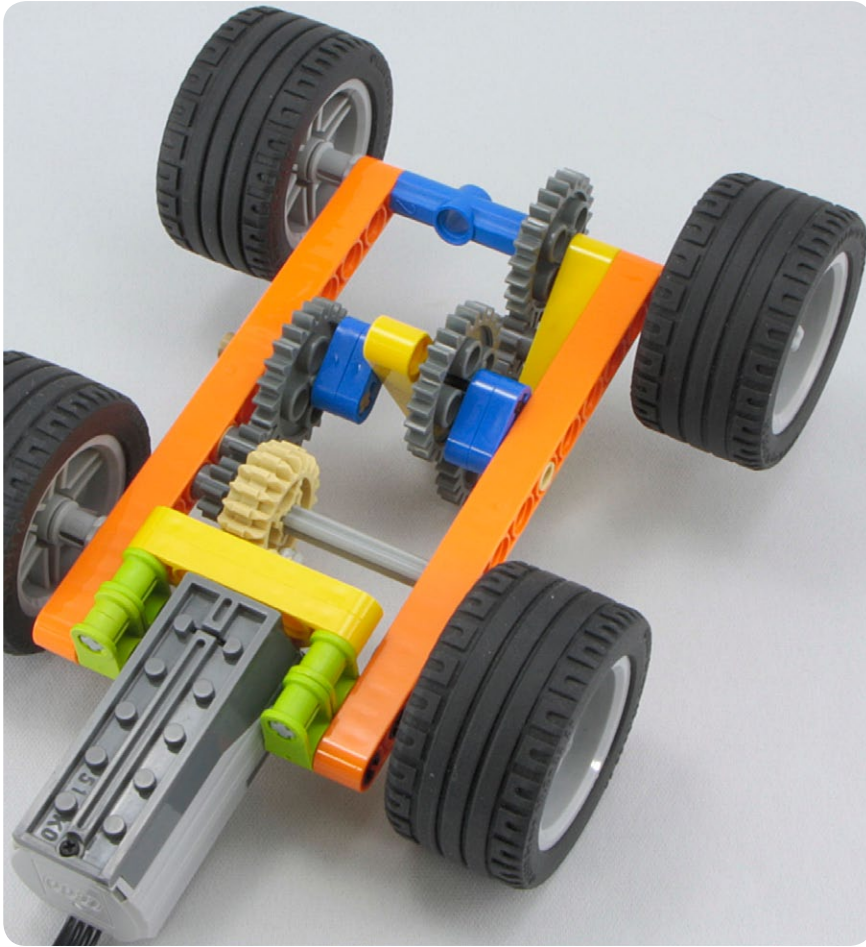













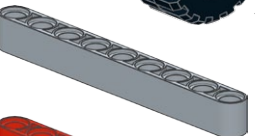

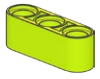
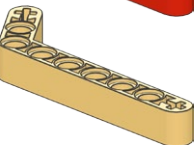
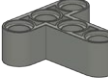
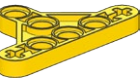

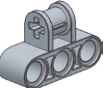







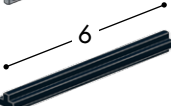
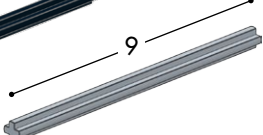
# #94

-  x4
-  x4
- 
-  x3
- 
-  x4
-  x2
-  x2
-  x2
- 
-  x4
-  x4
-  x3
-  x4
-  x2
-  x2
-  x4
-  x5
-  x3
-  x2
-  x6

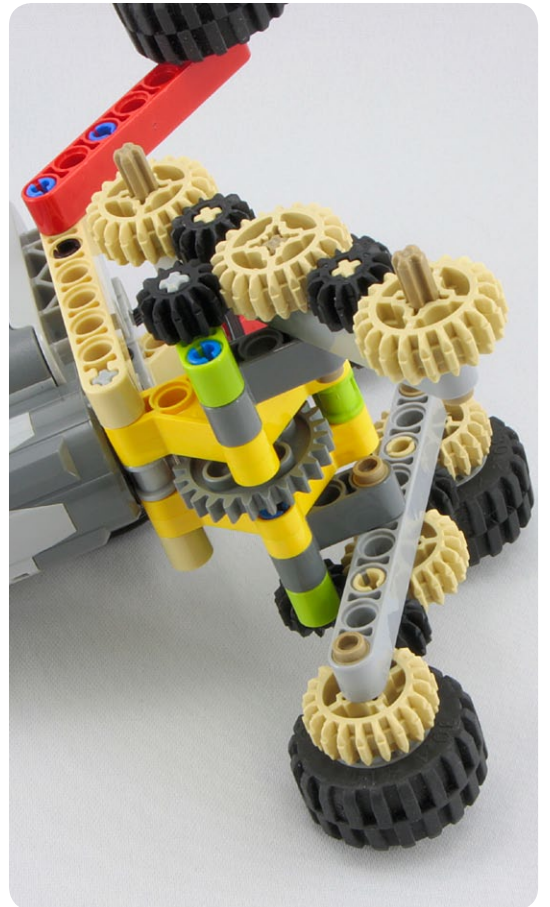
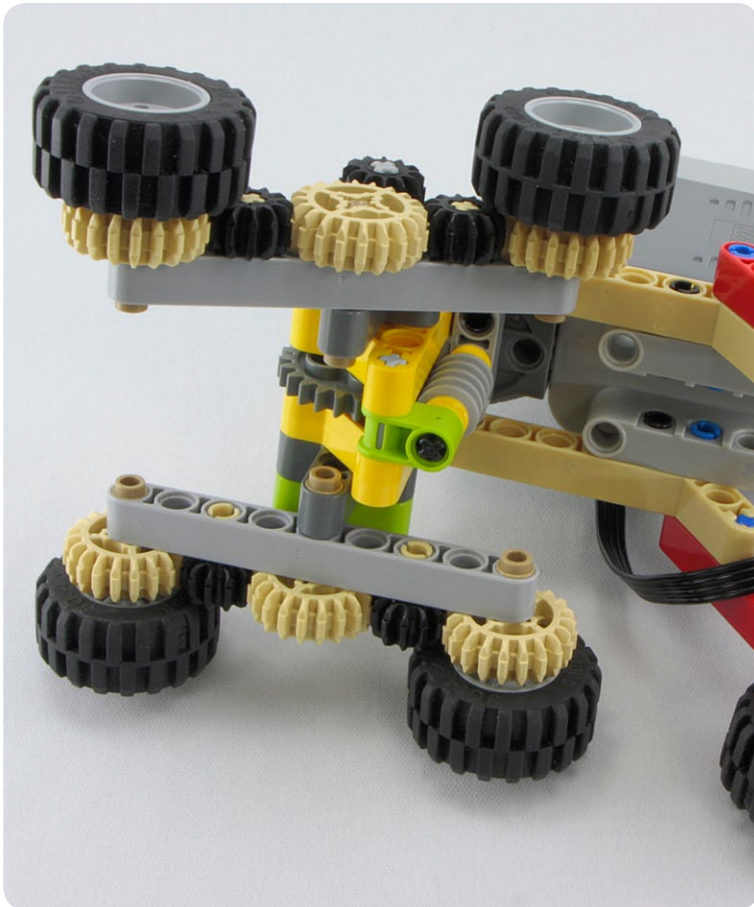
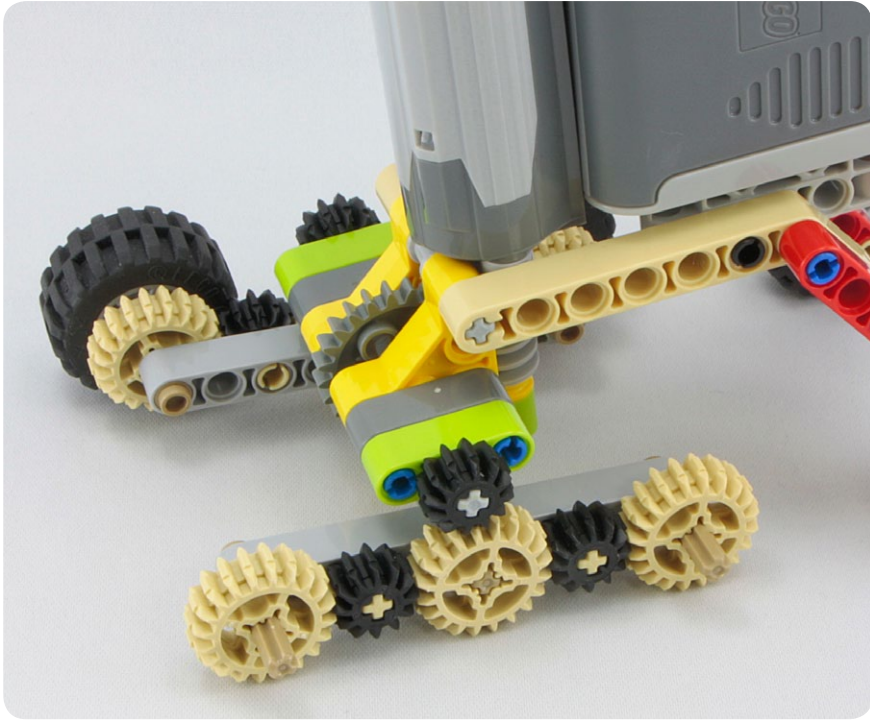




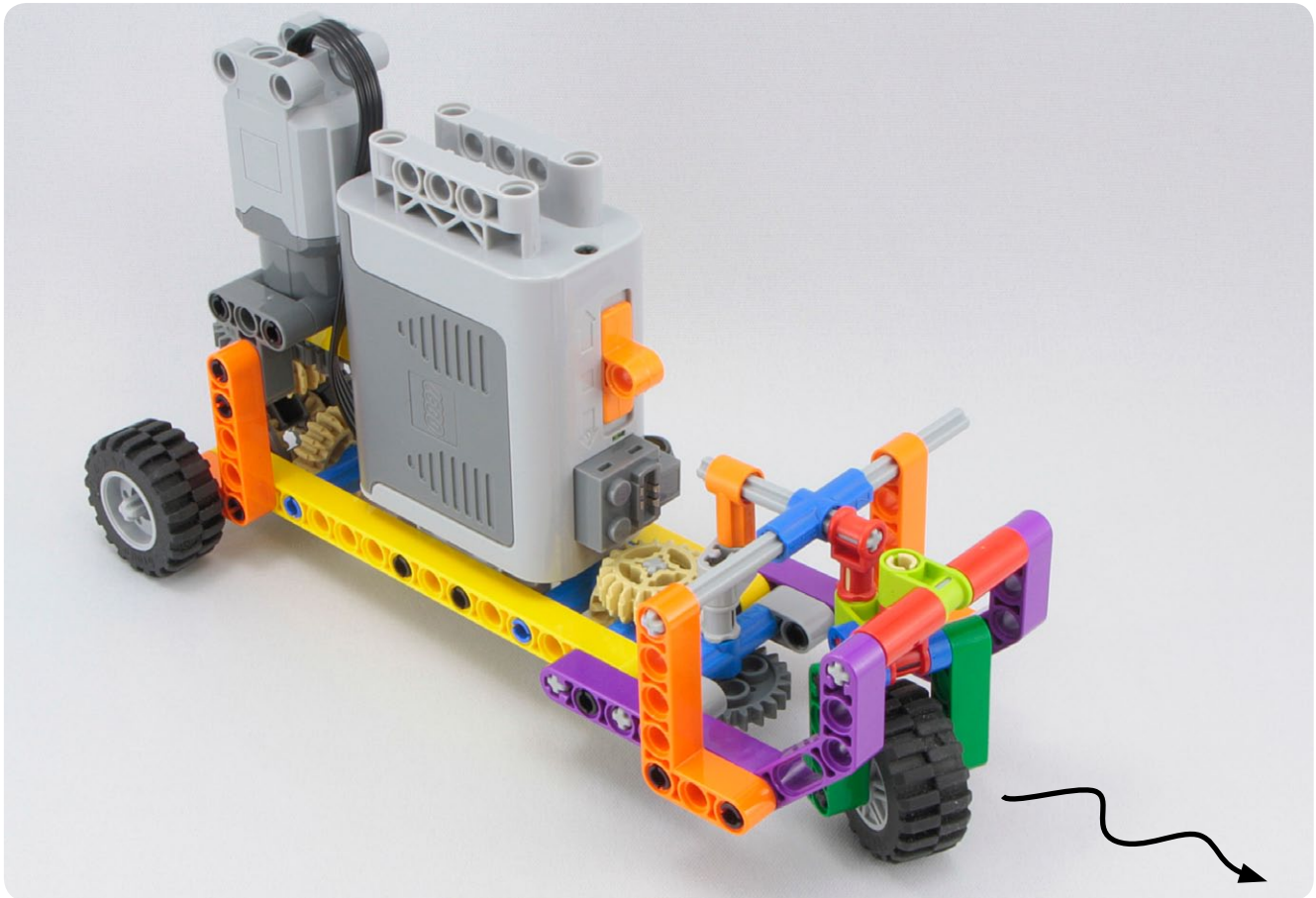
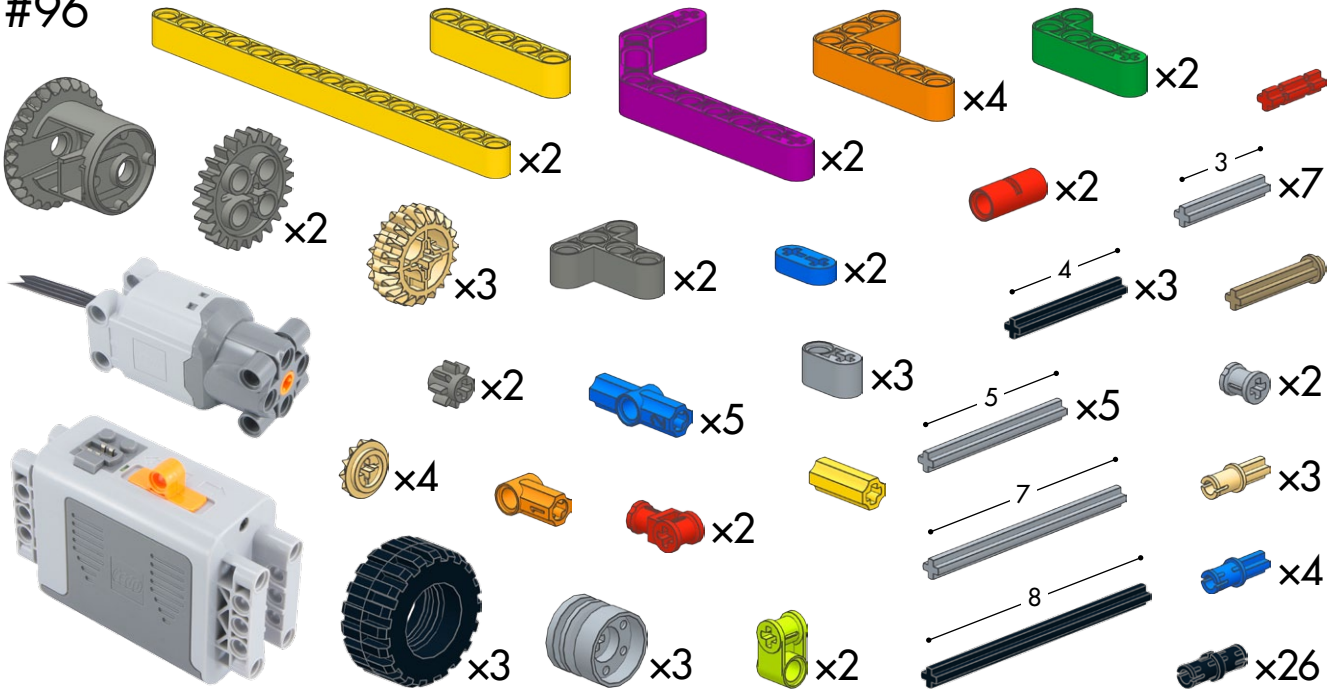
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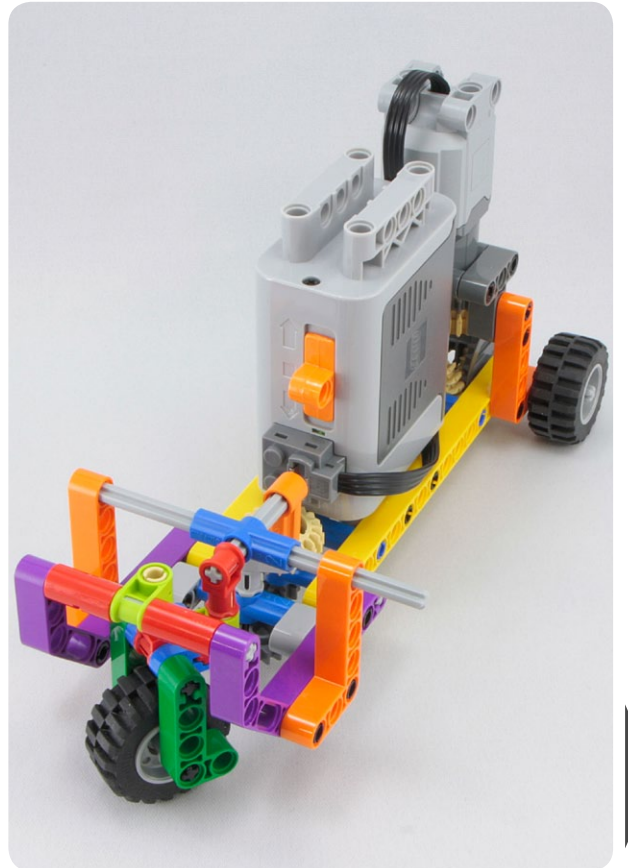
-  x6
- 
- 
-  x6
- 
- 
- 
-  x6
-  x6
-  x2
-  x2
-  x2
-  x2
-  x2
-  x4
-  x2
- 
-  x6
-  x6
-  x6
-  3
-  x2
-  5
-  x4
-  6
-  9

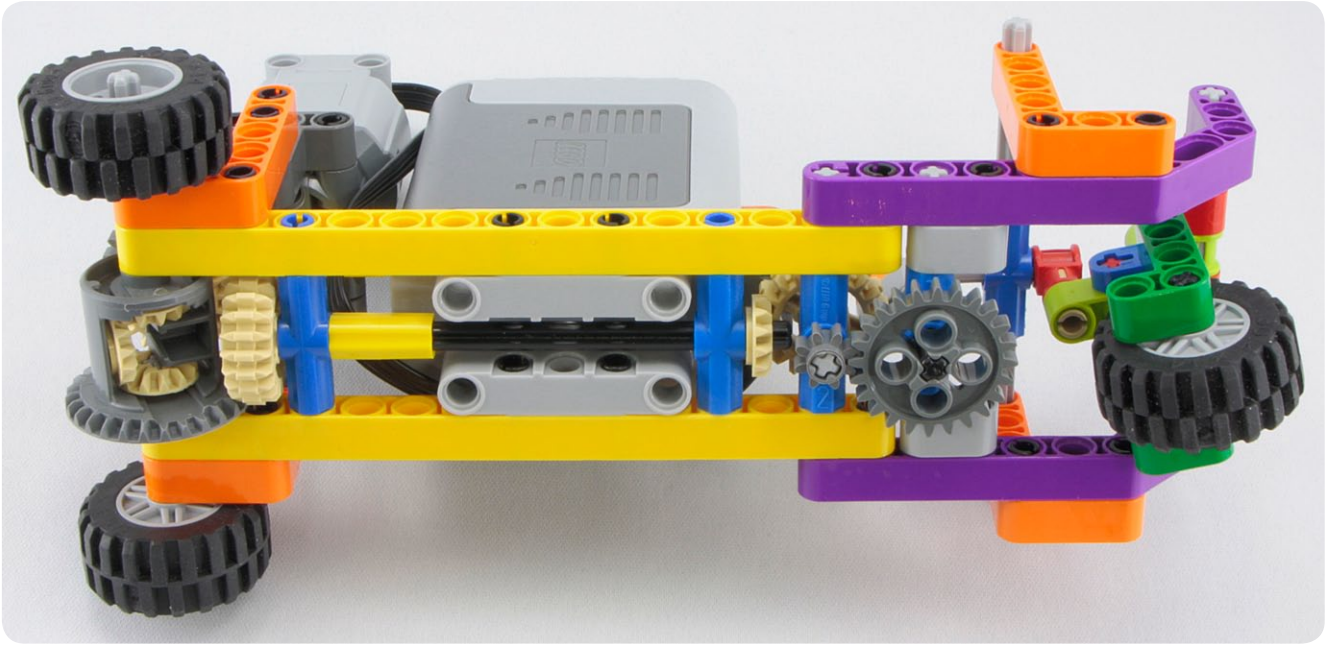


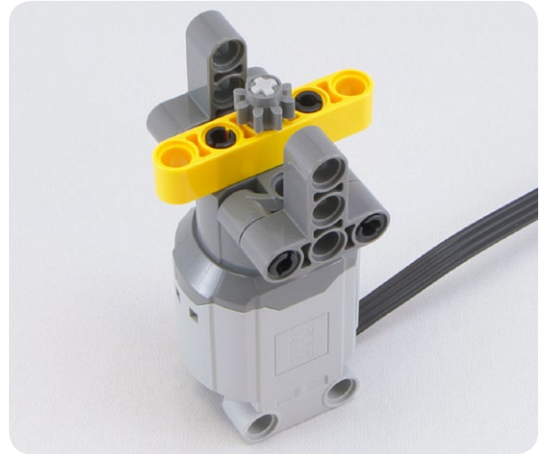
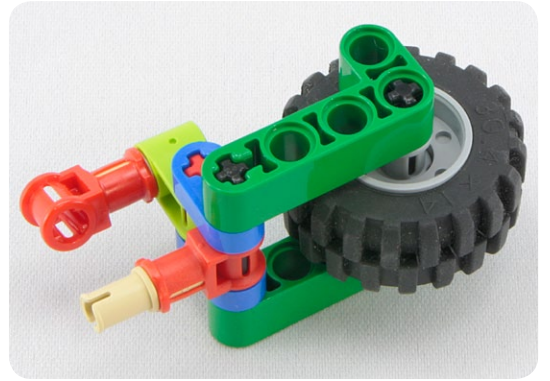
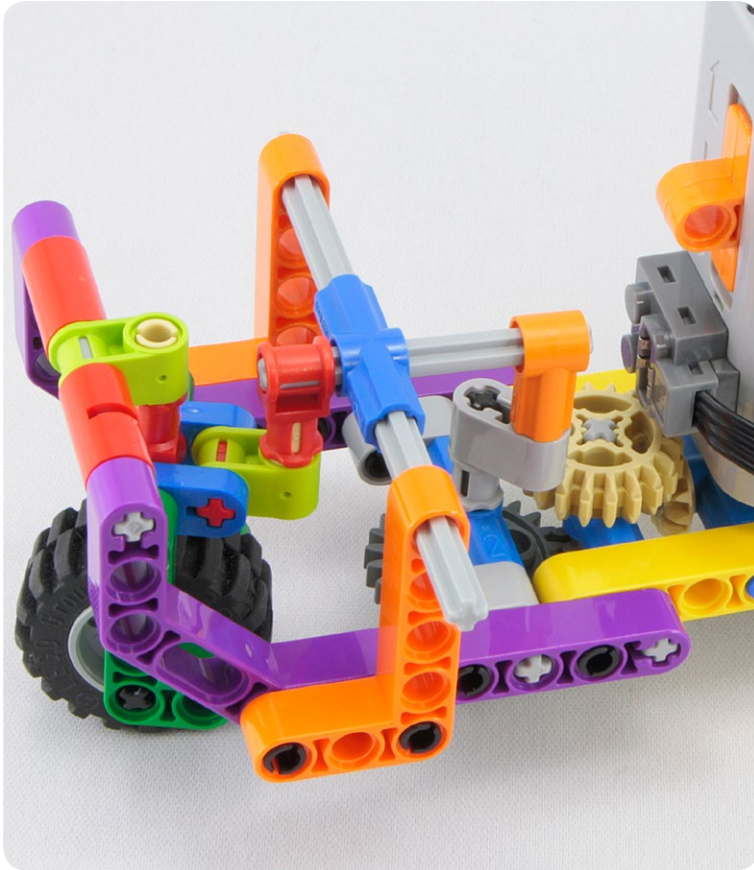


#96



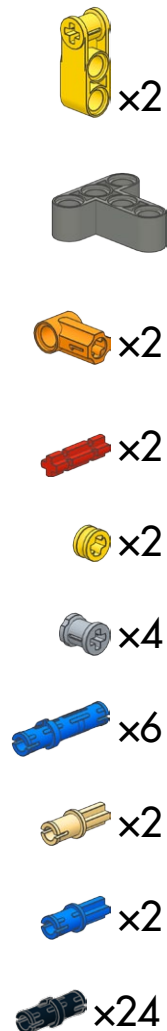
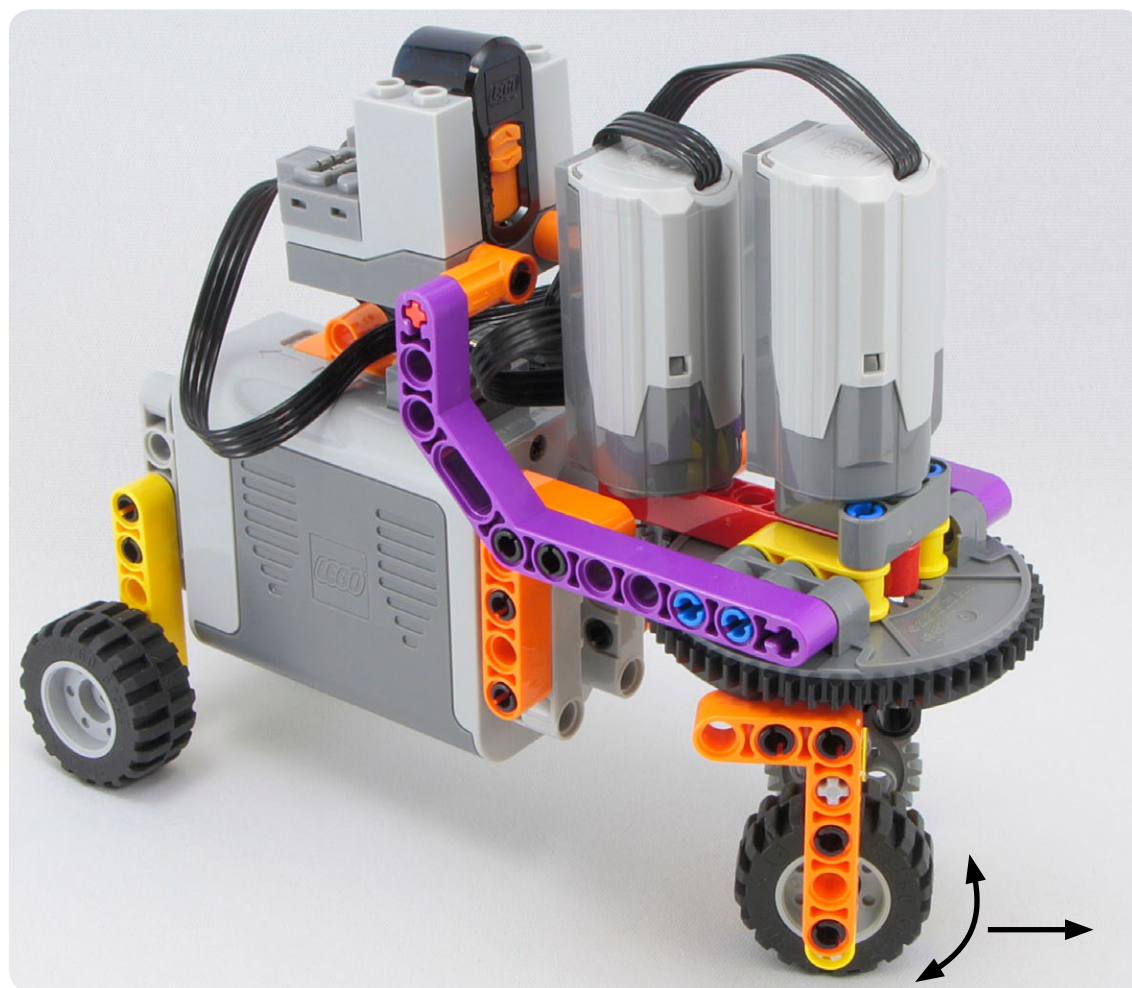
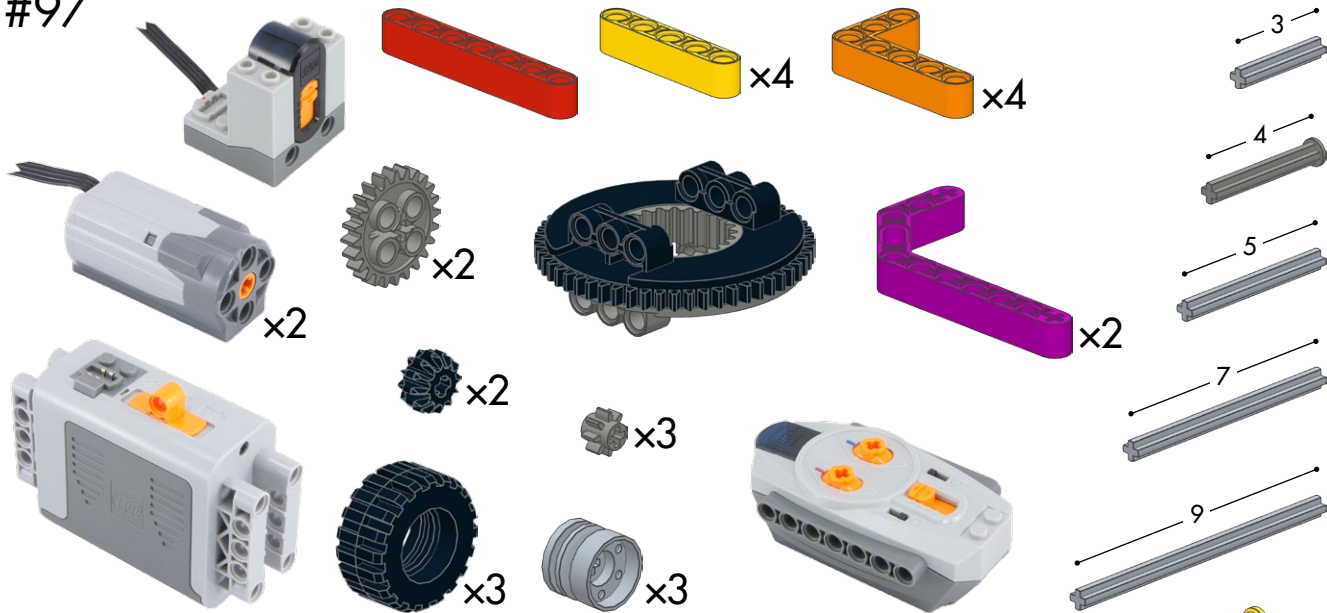




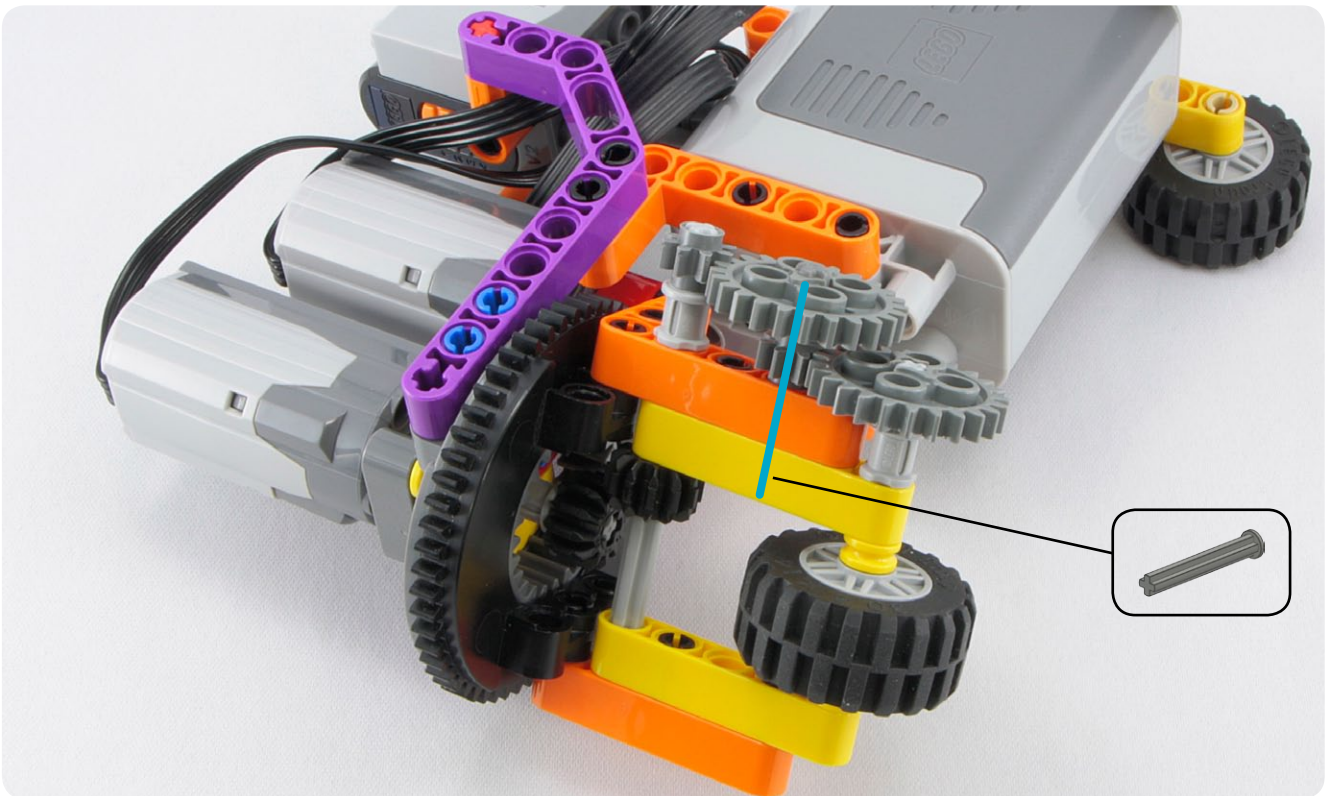
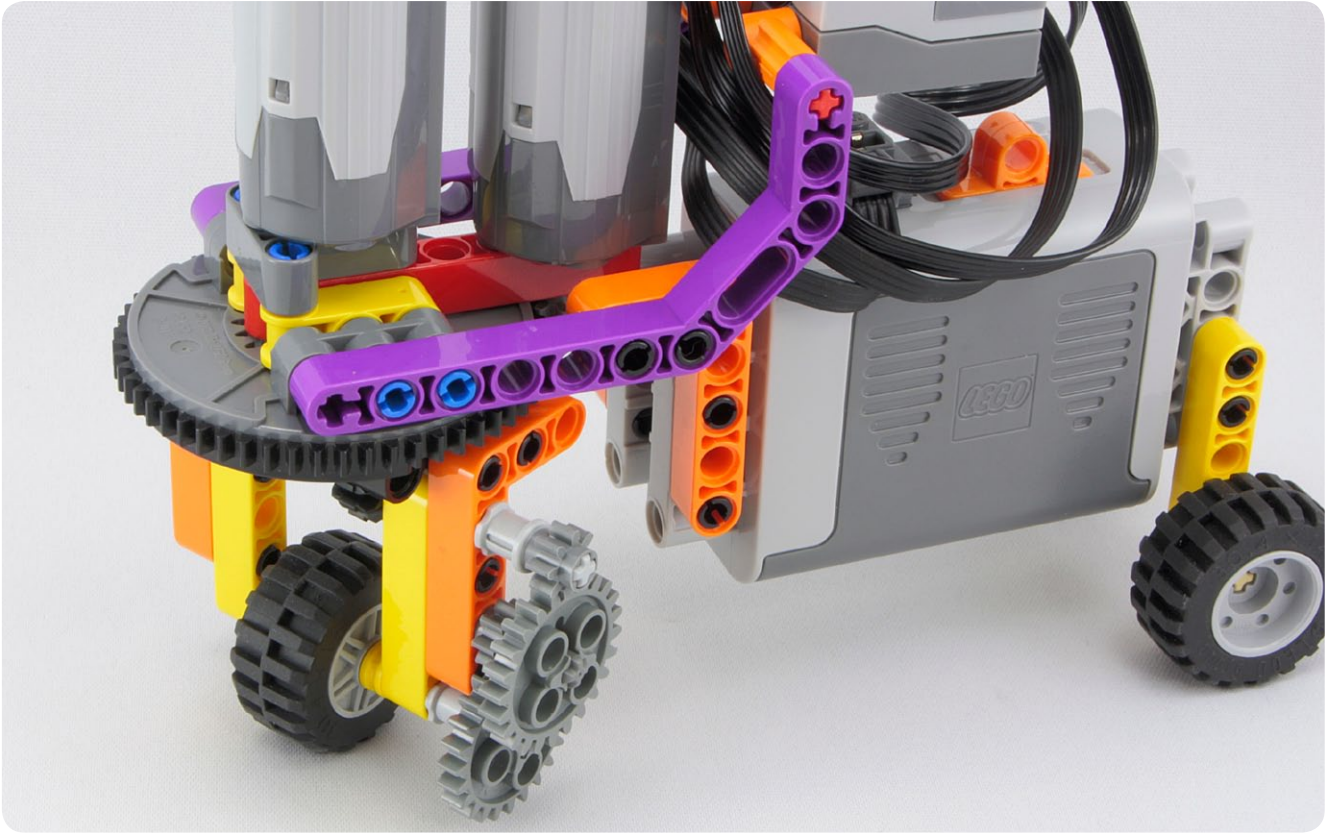


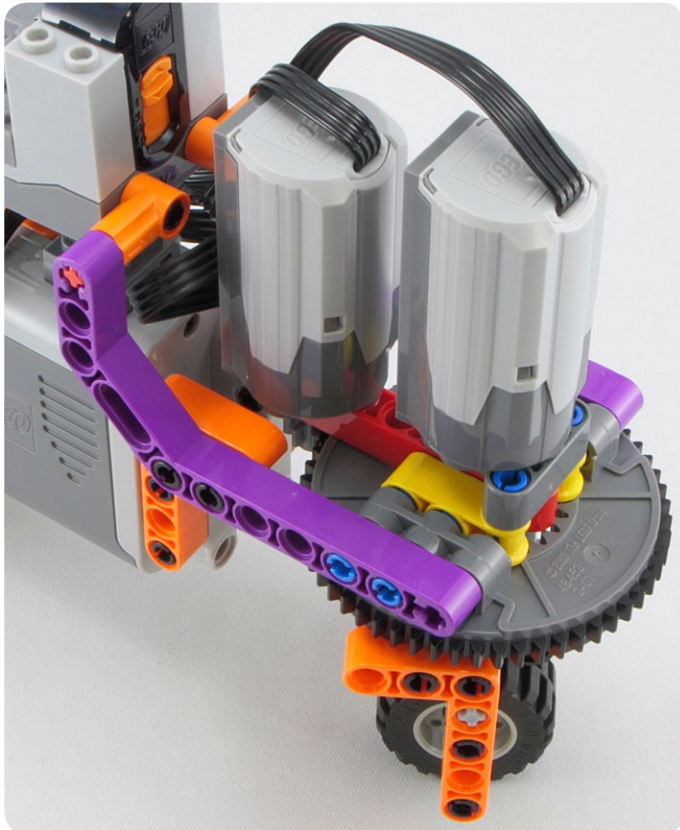
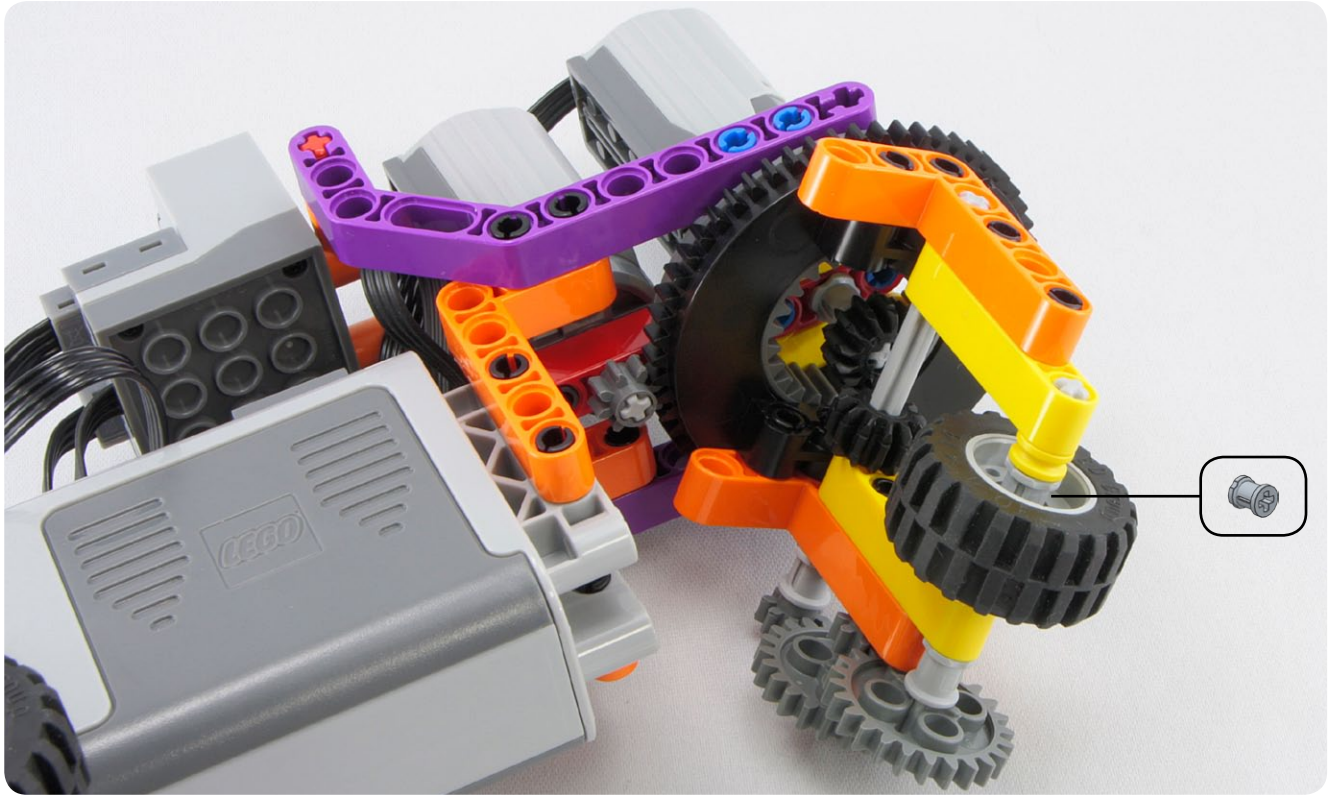


#97

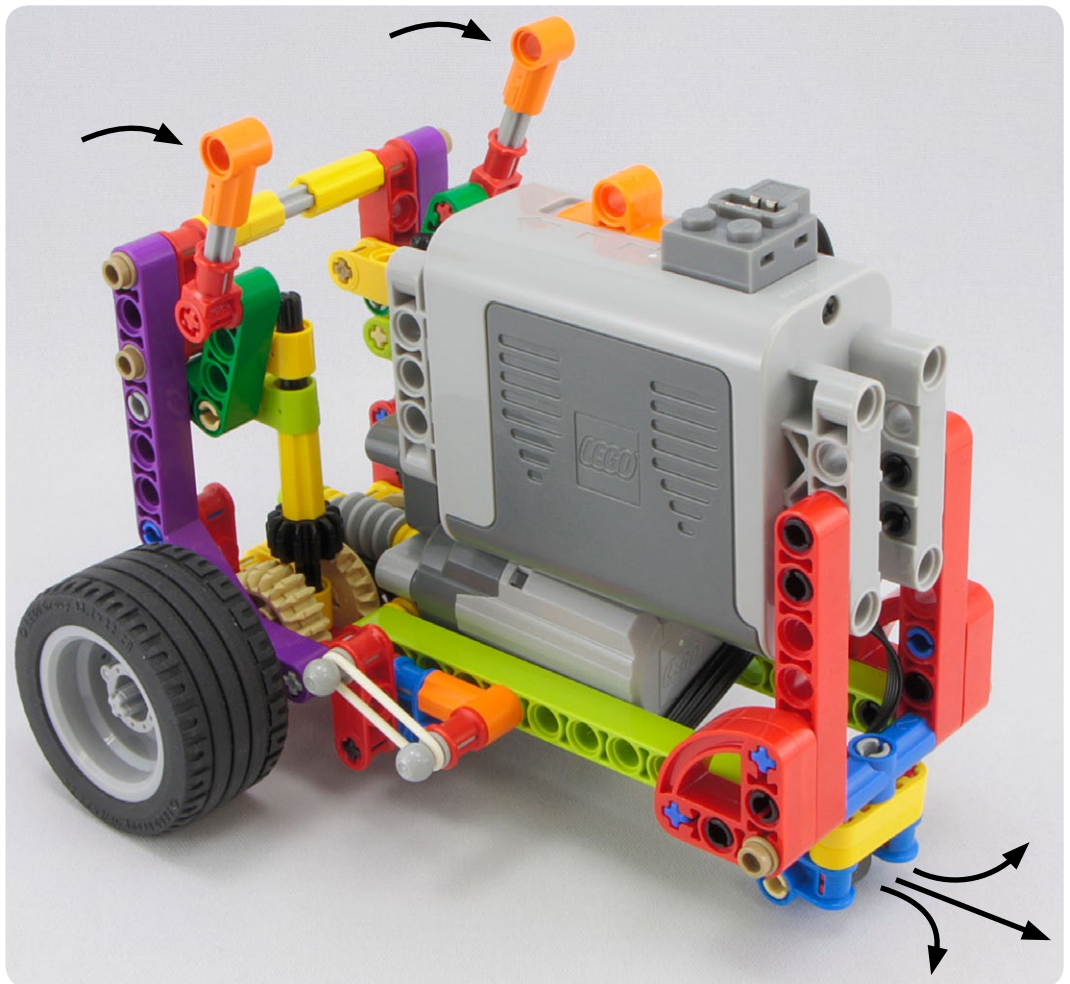
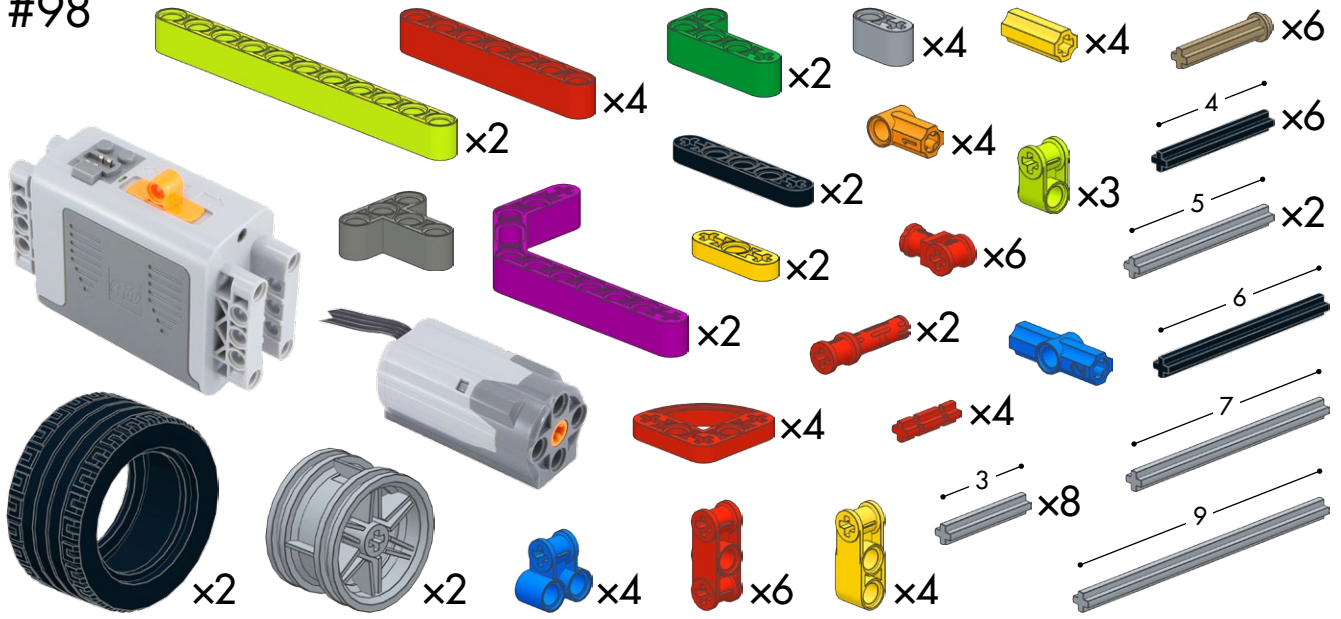


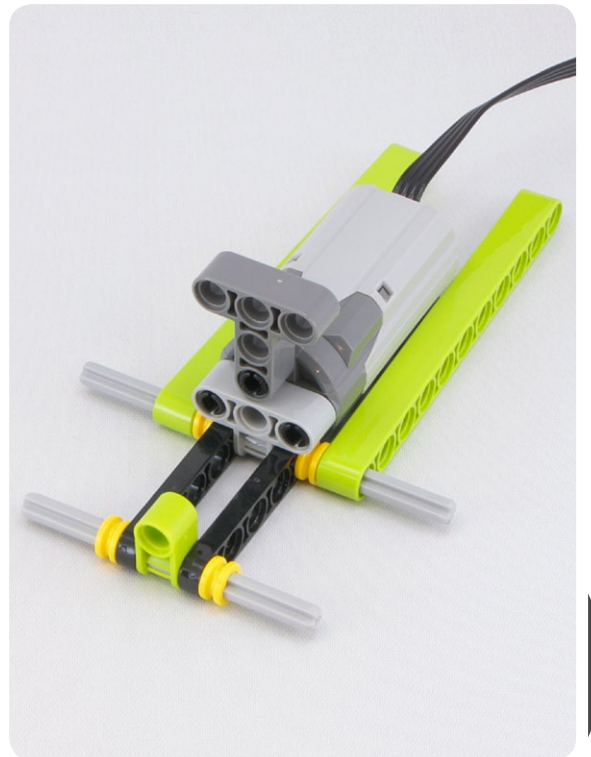
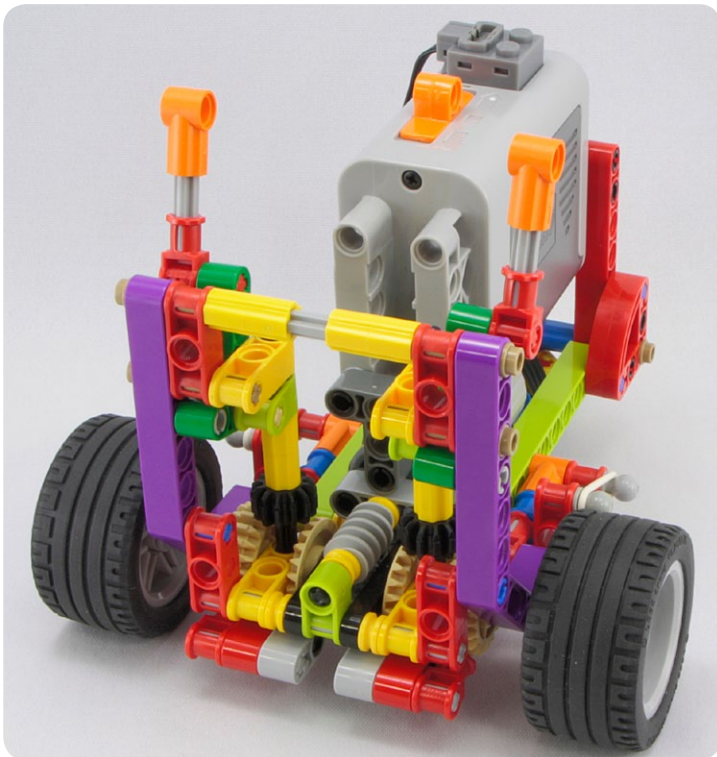




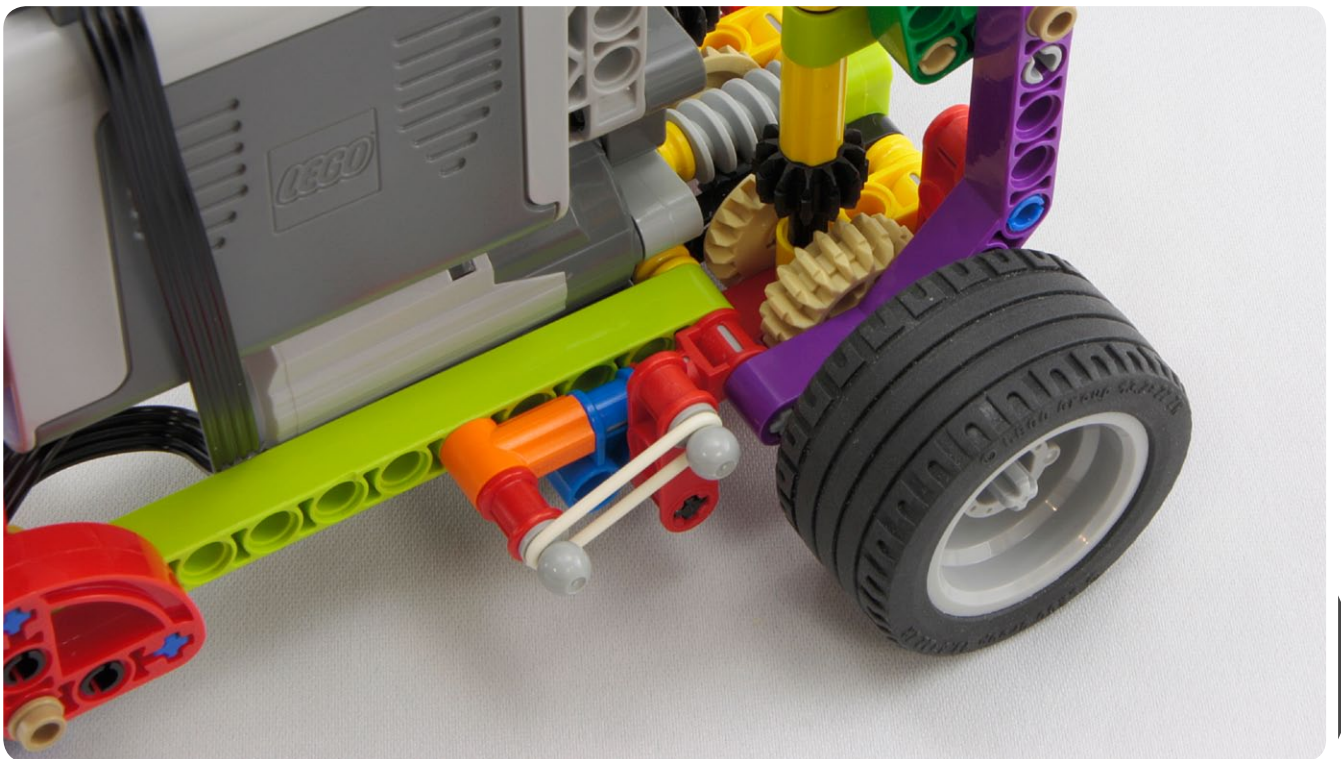
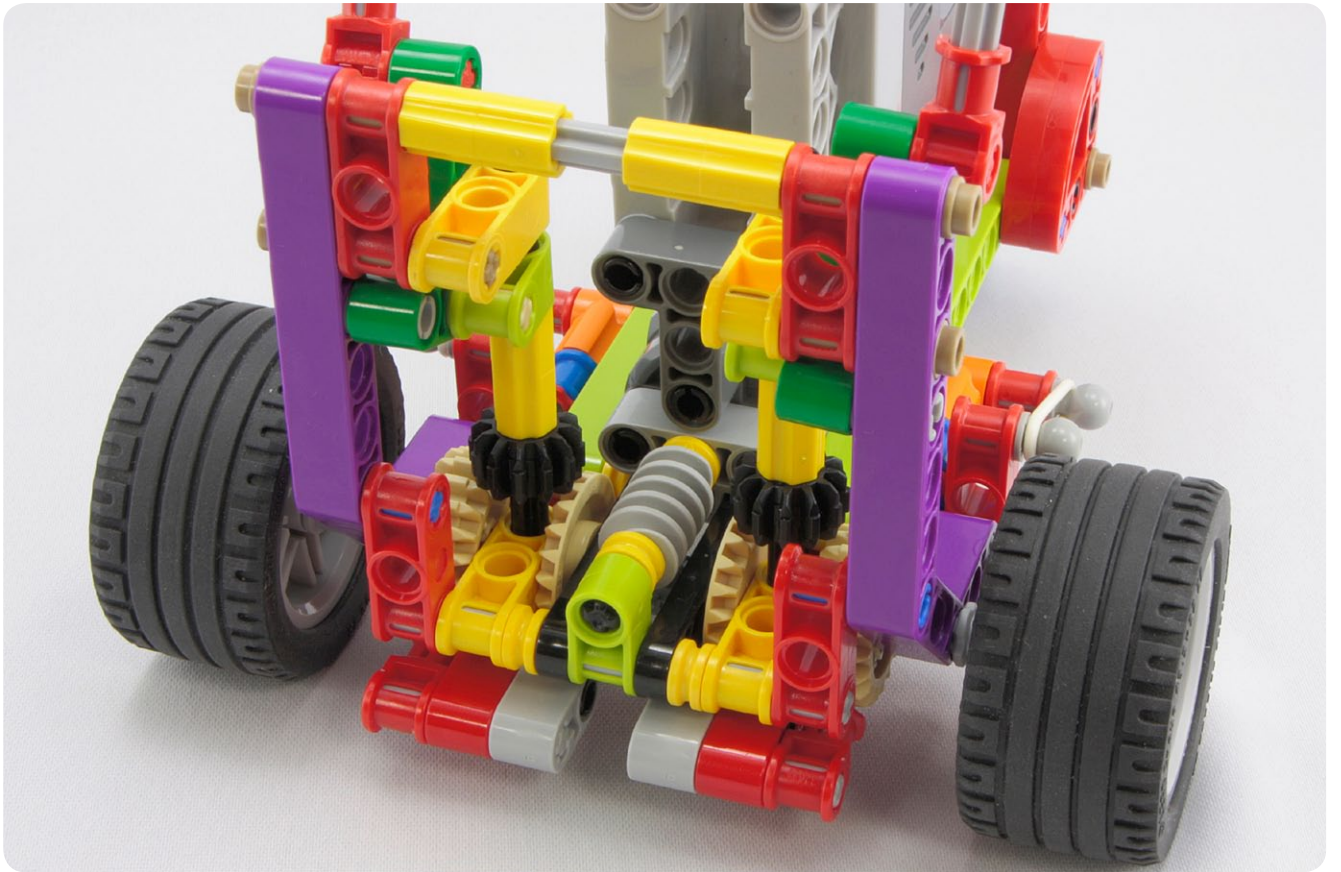


#98

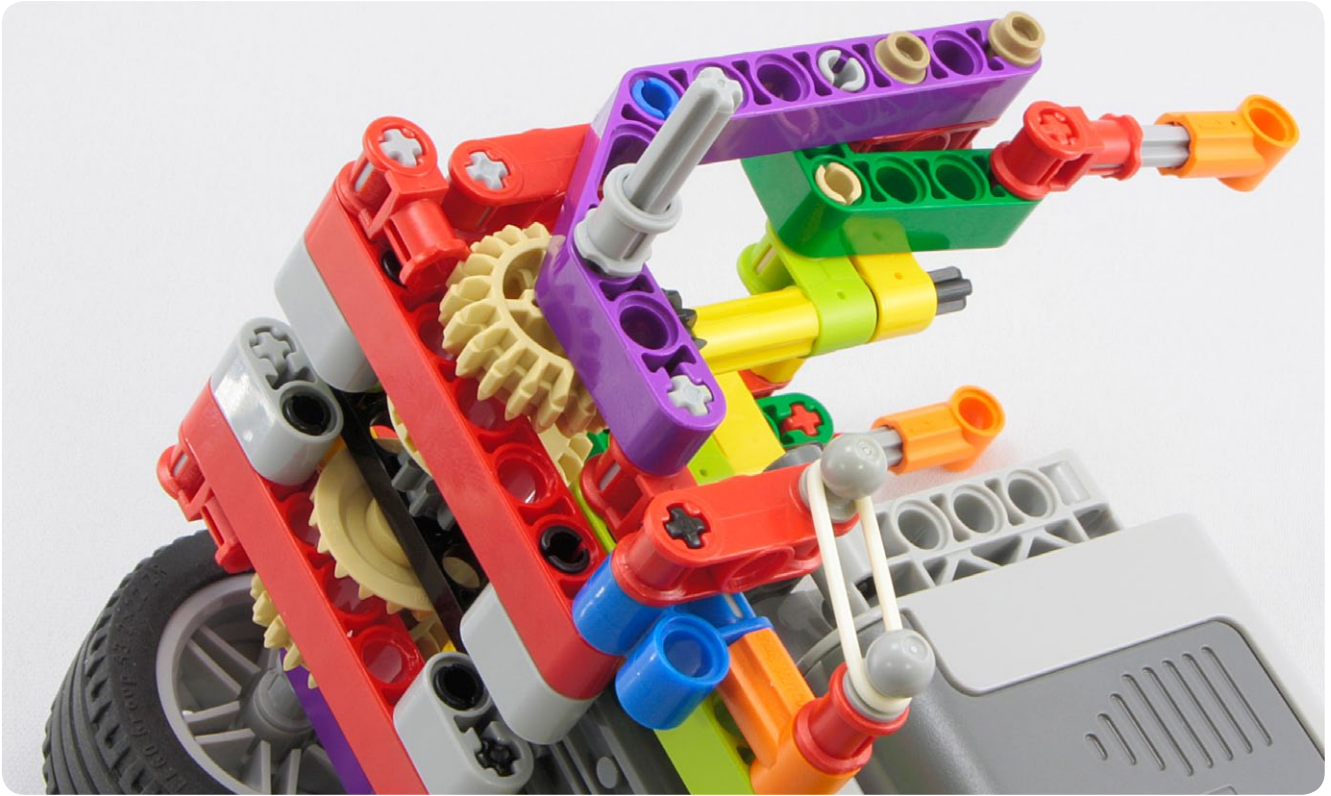


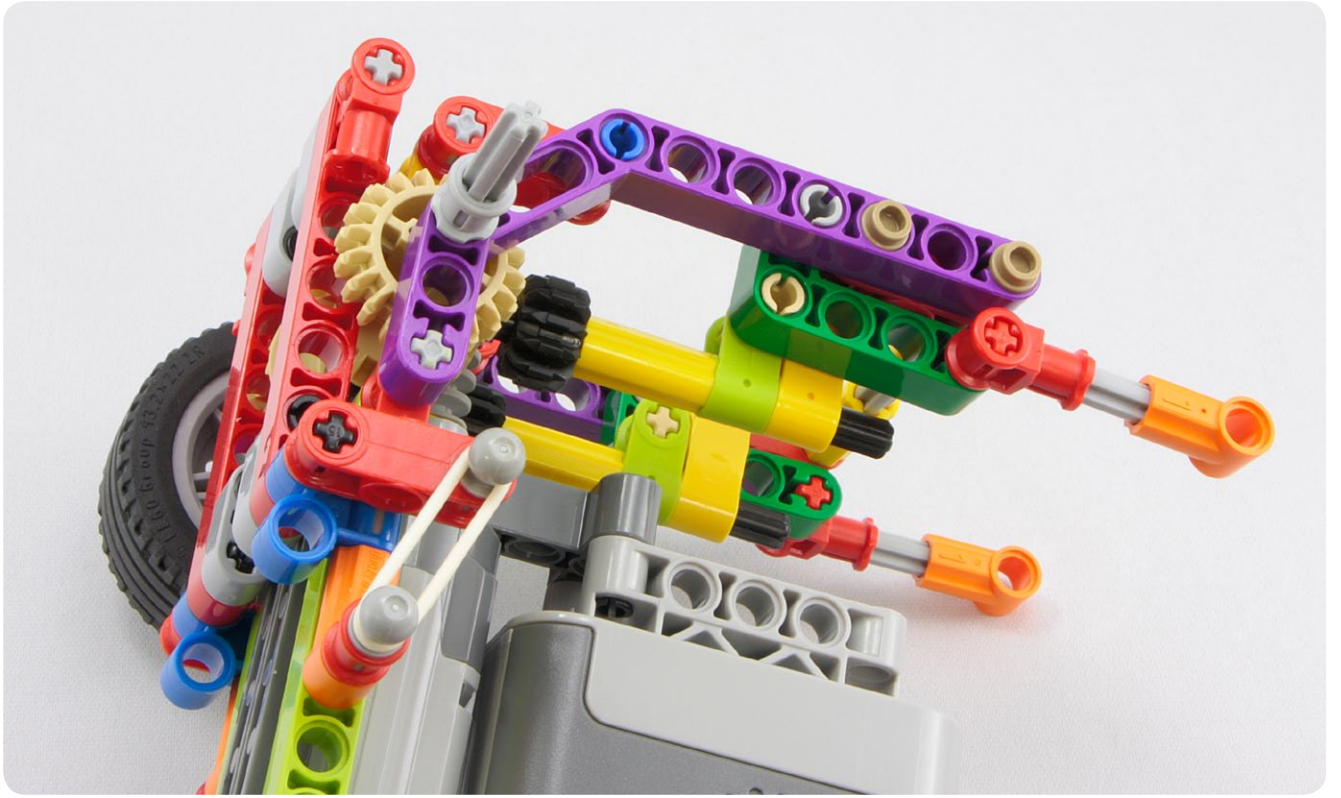














# PART 2

# Moving Without Tires



196



220



234



244



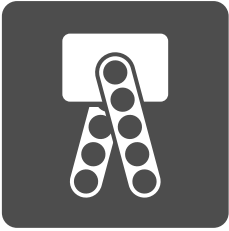
208



224

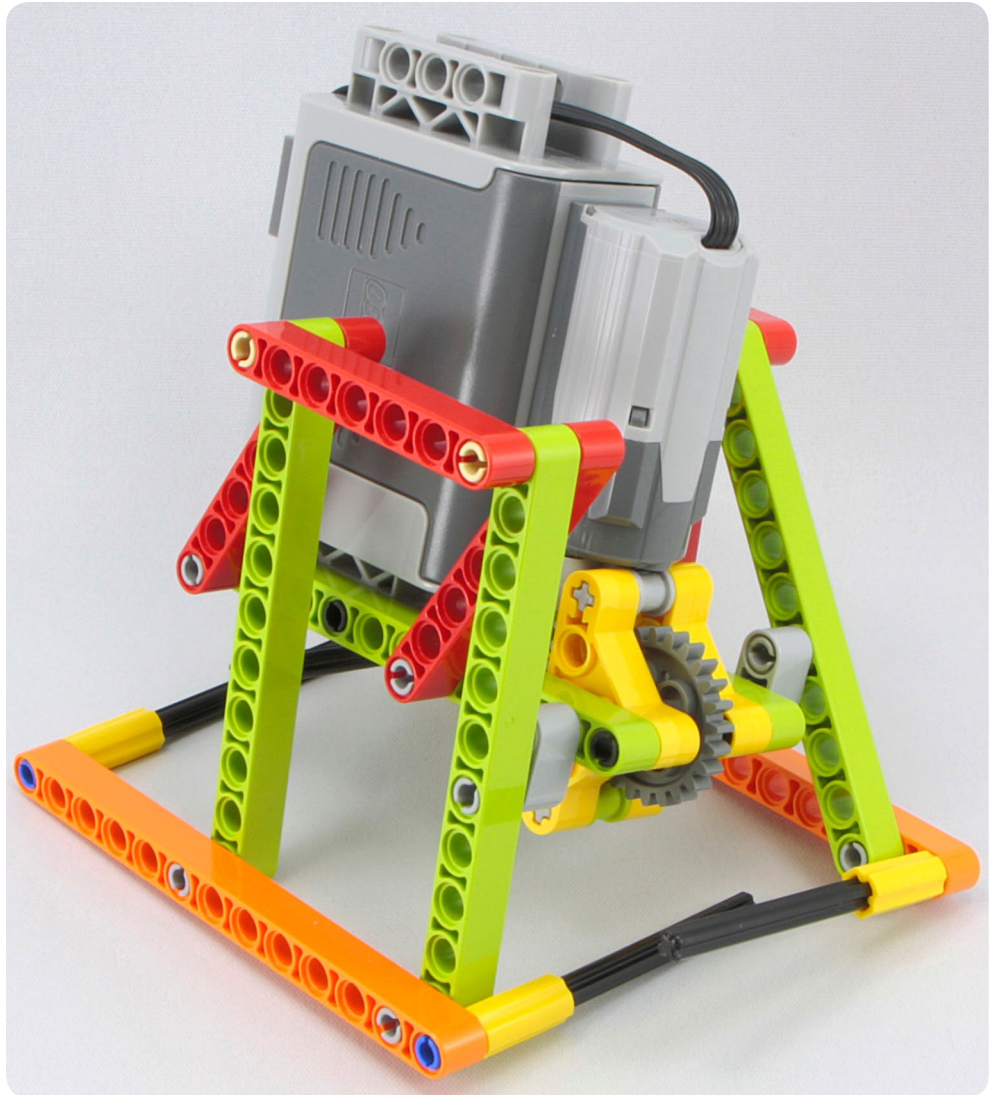
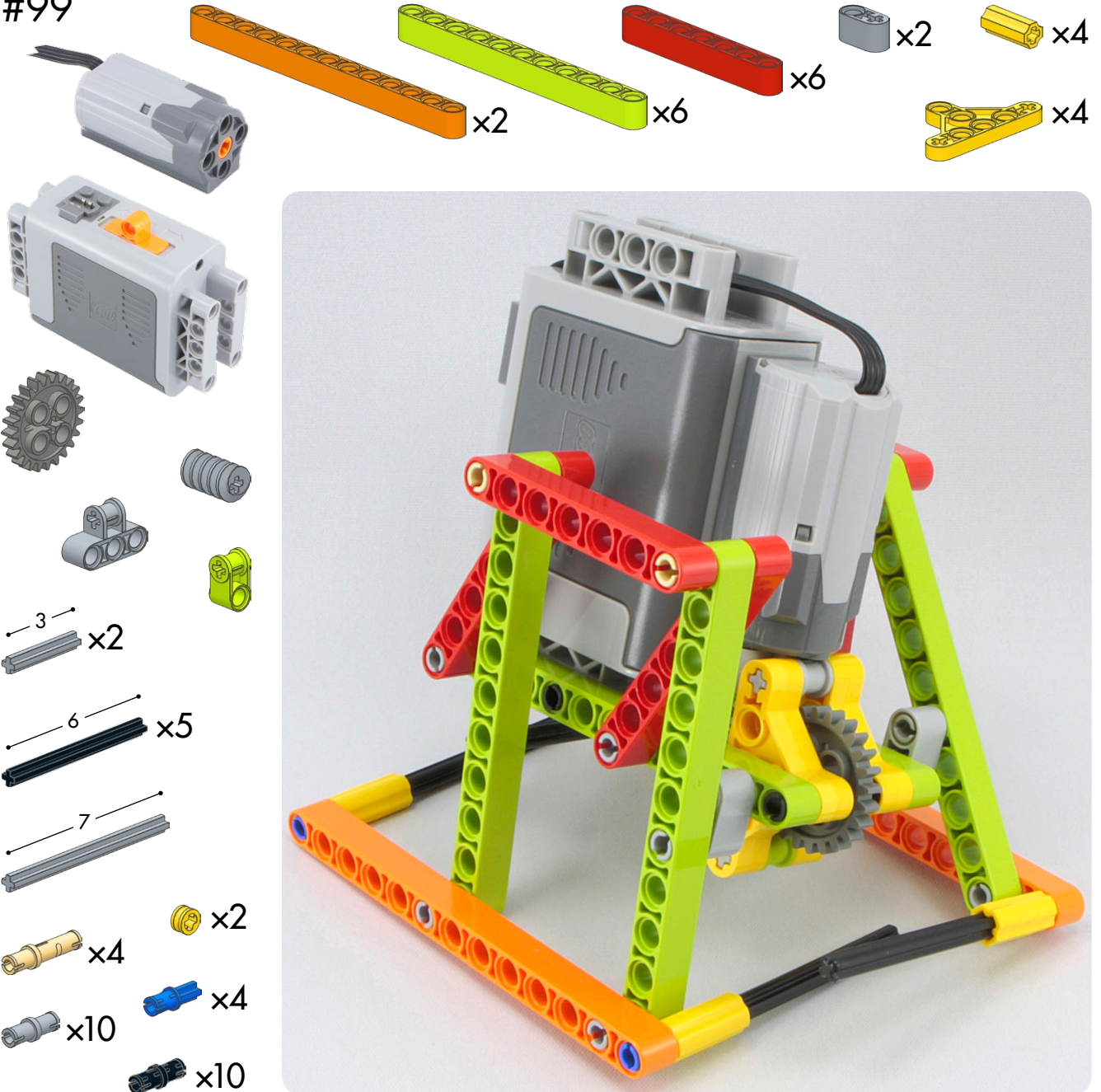


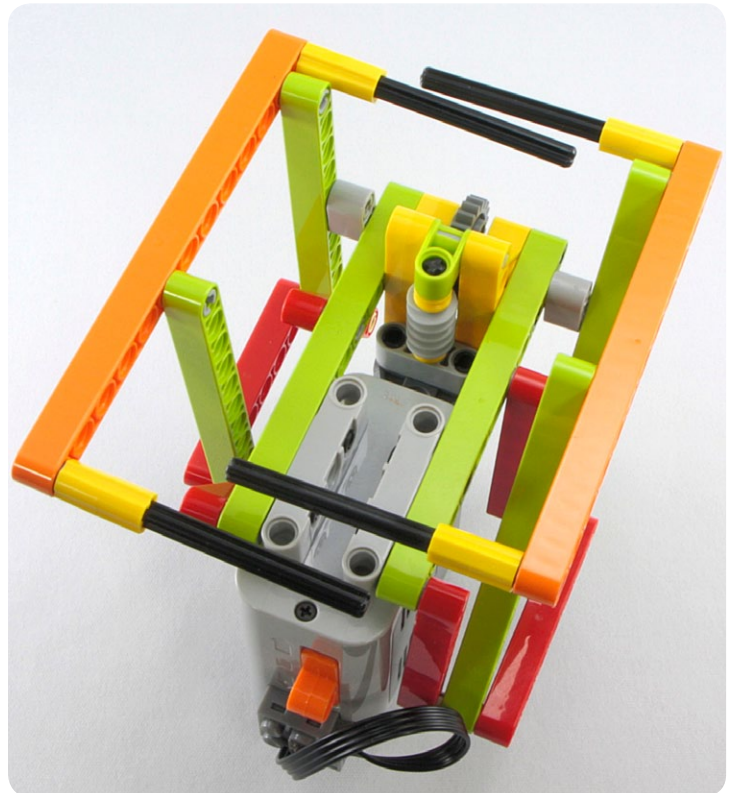
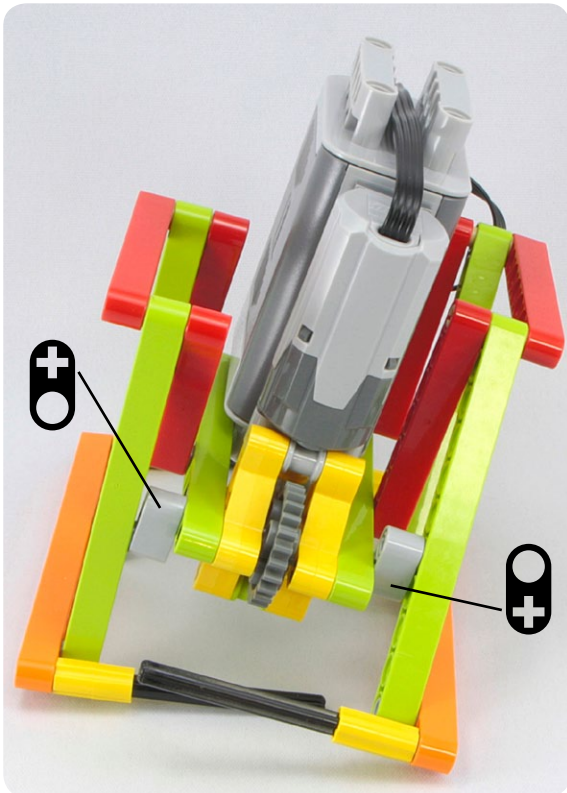
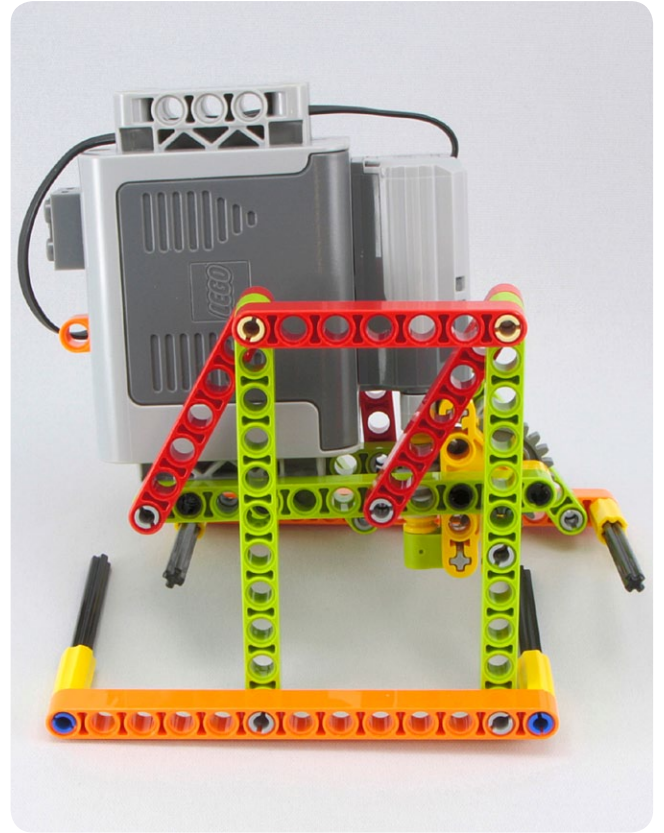
240



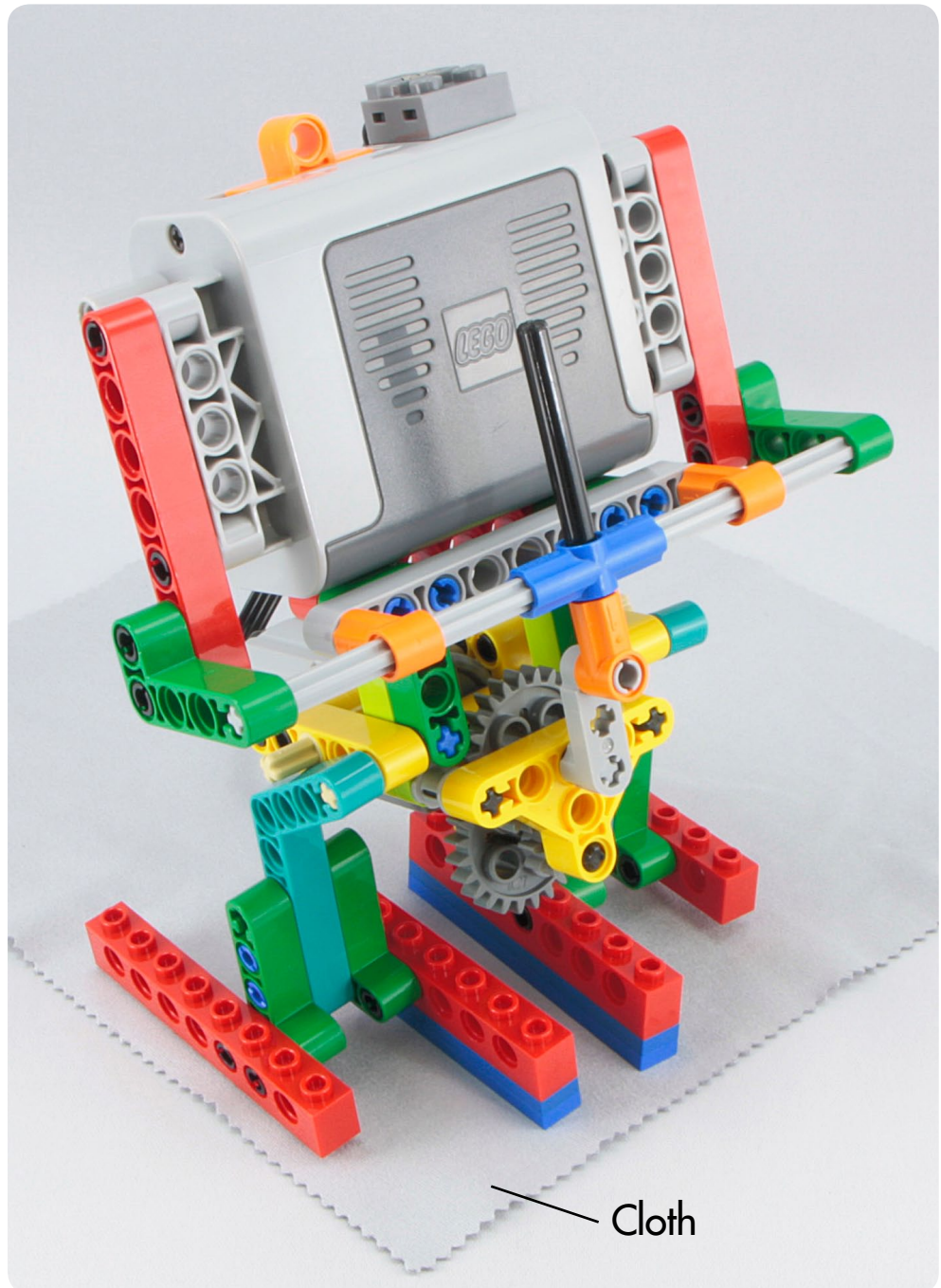
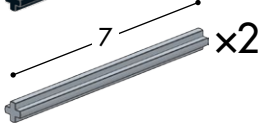
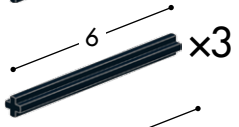
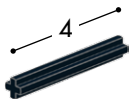
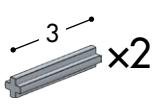
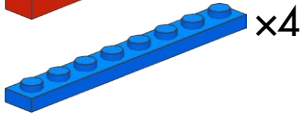
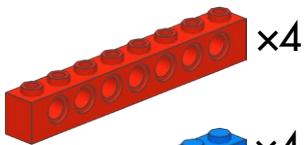
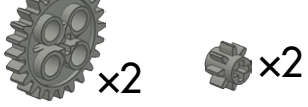
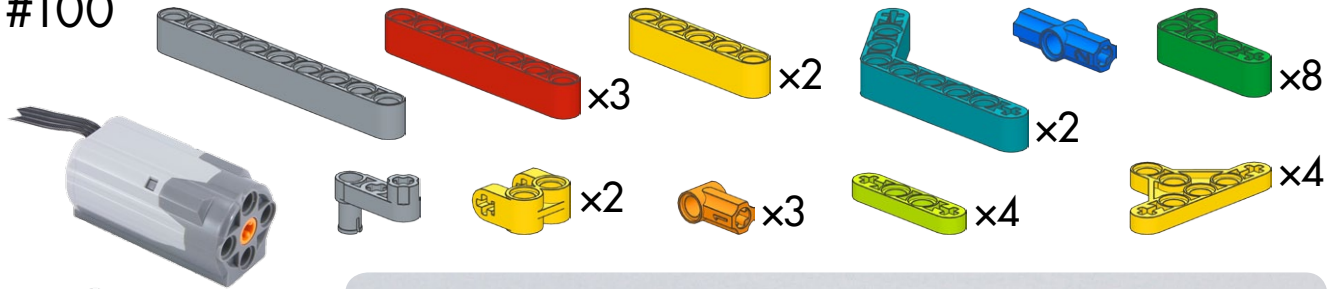
# Two-legged walkers

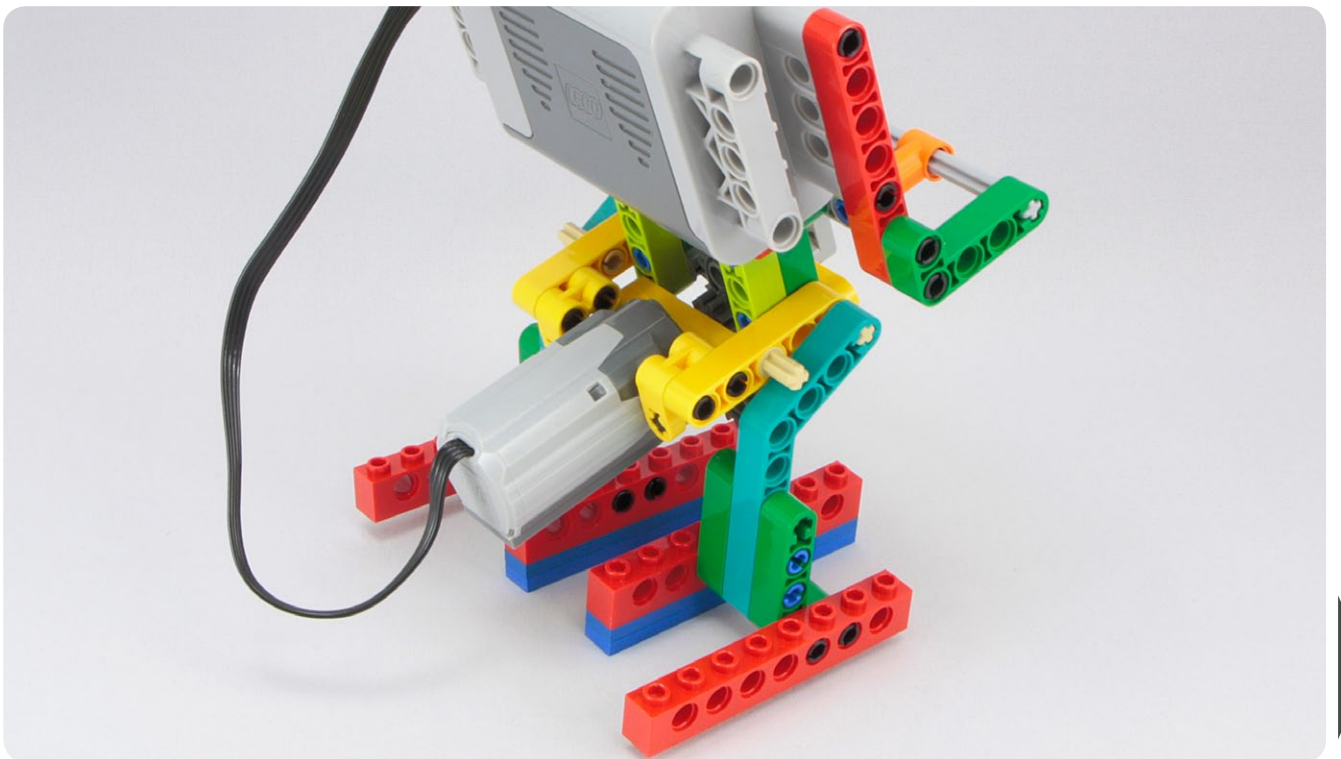
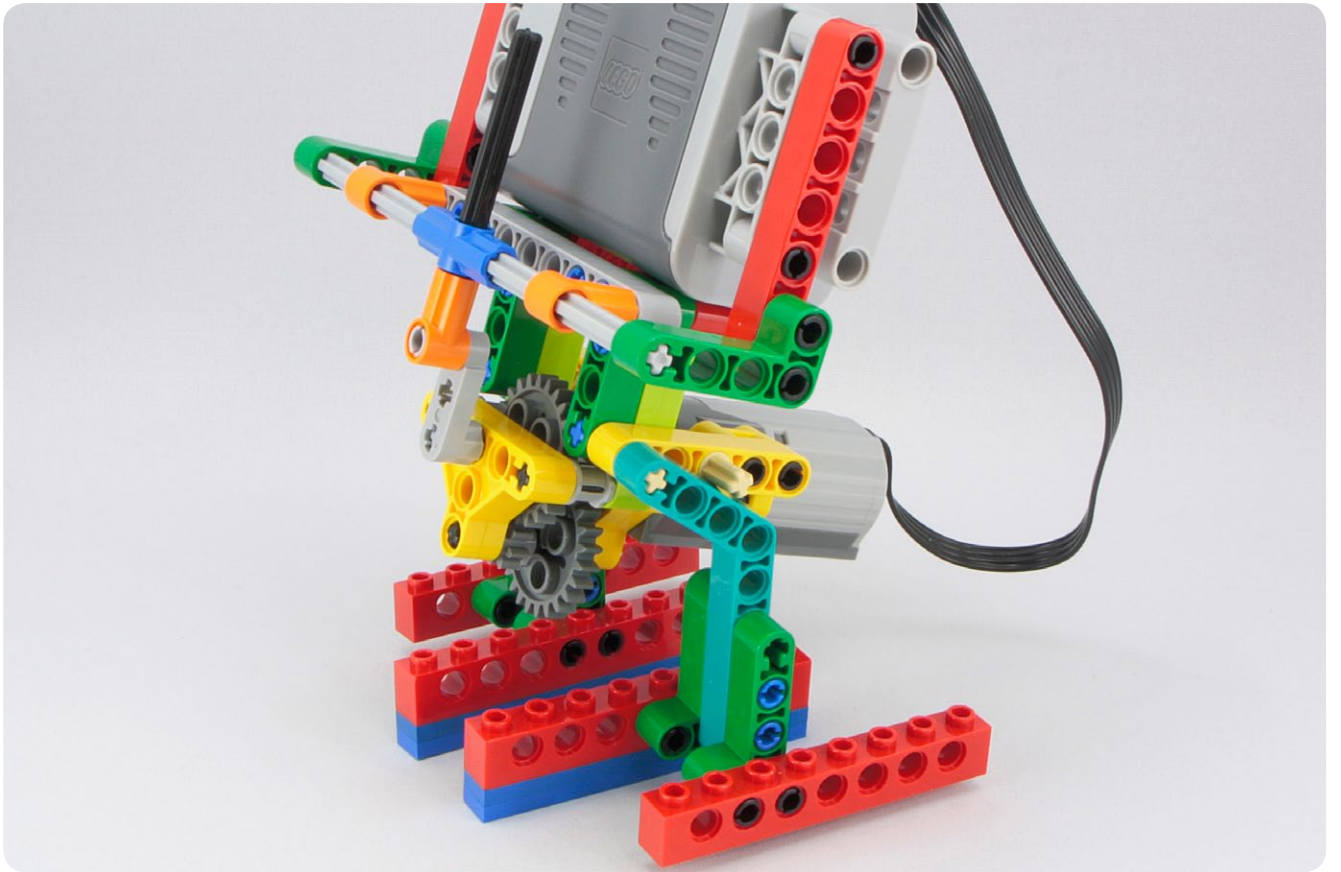
#99



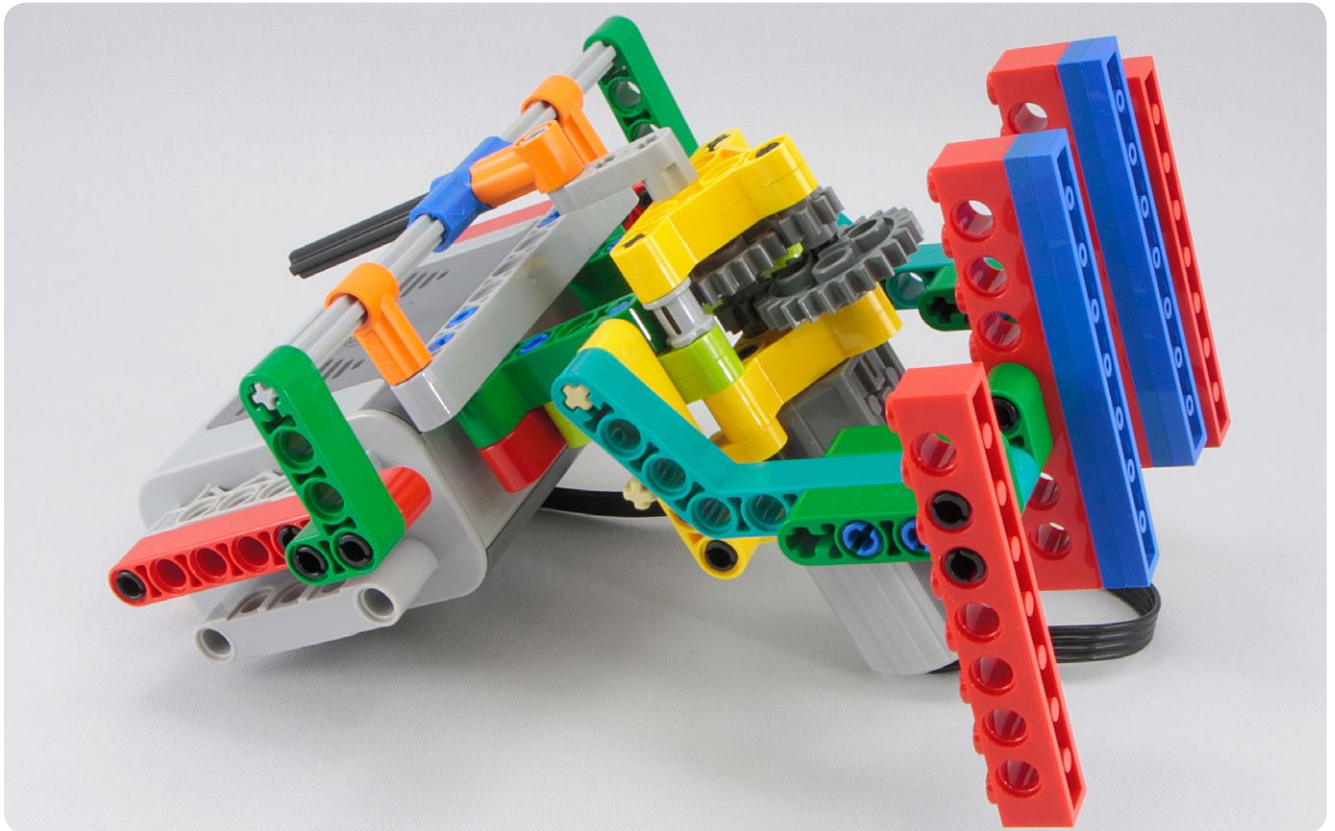
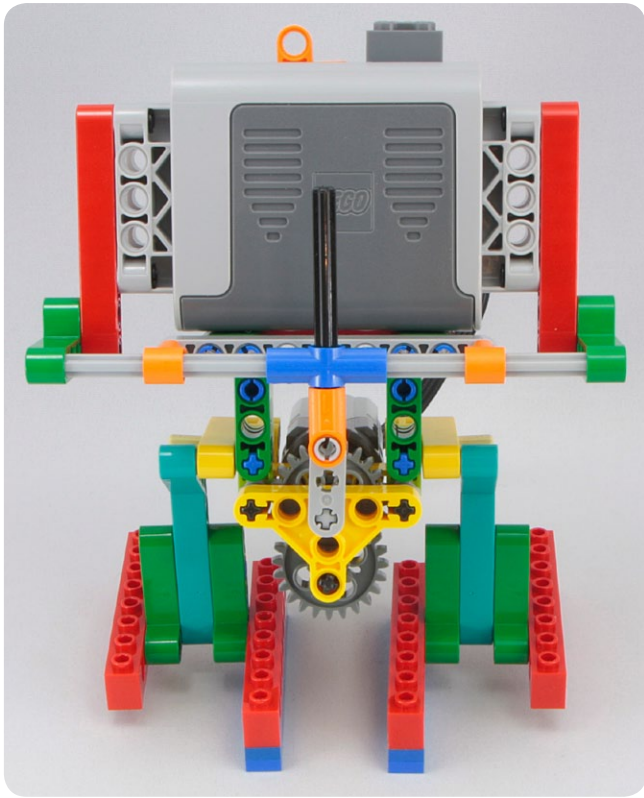


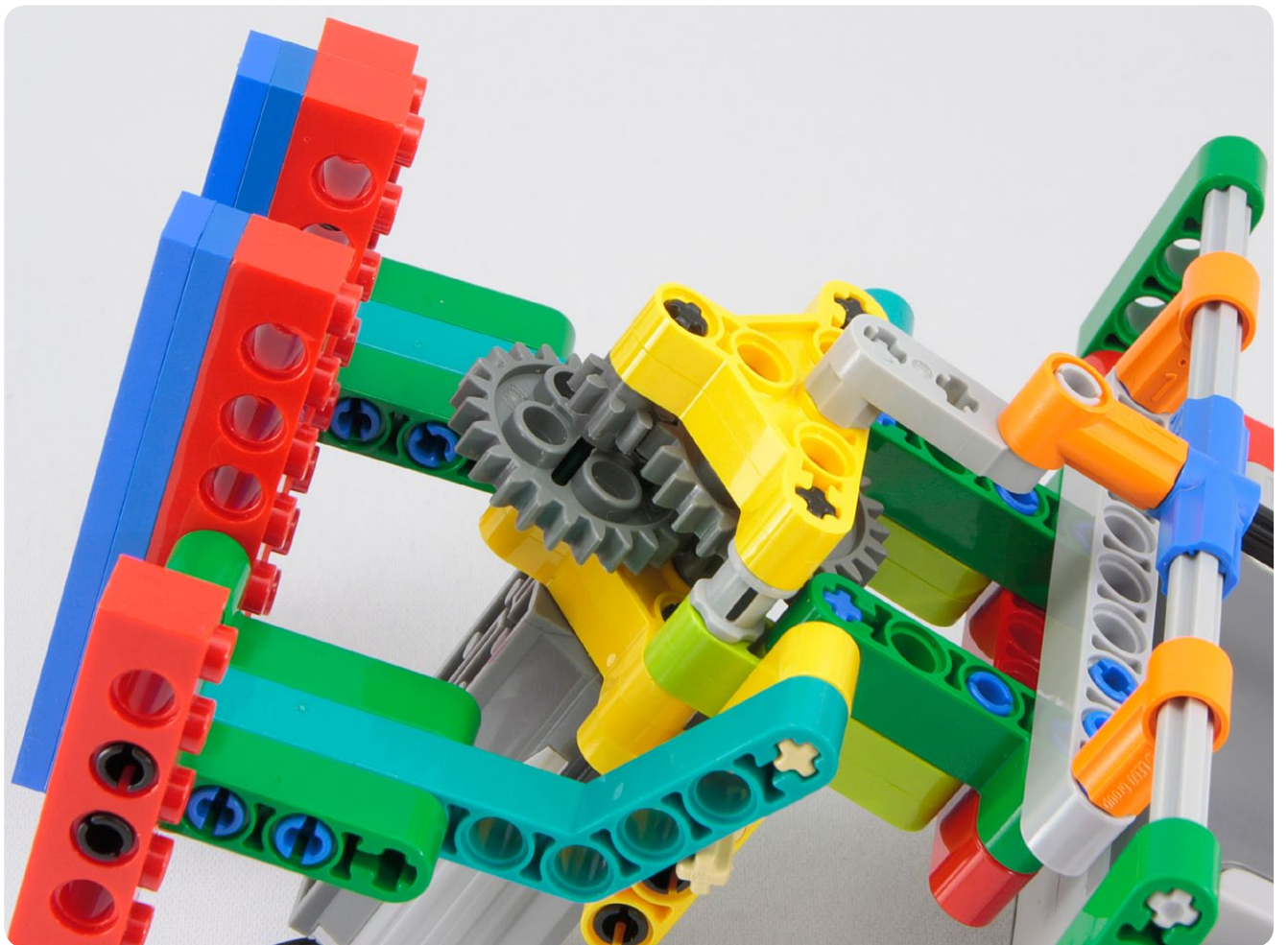
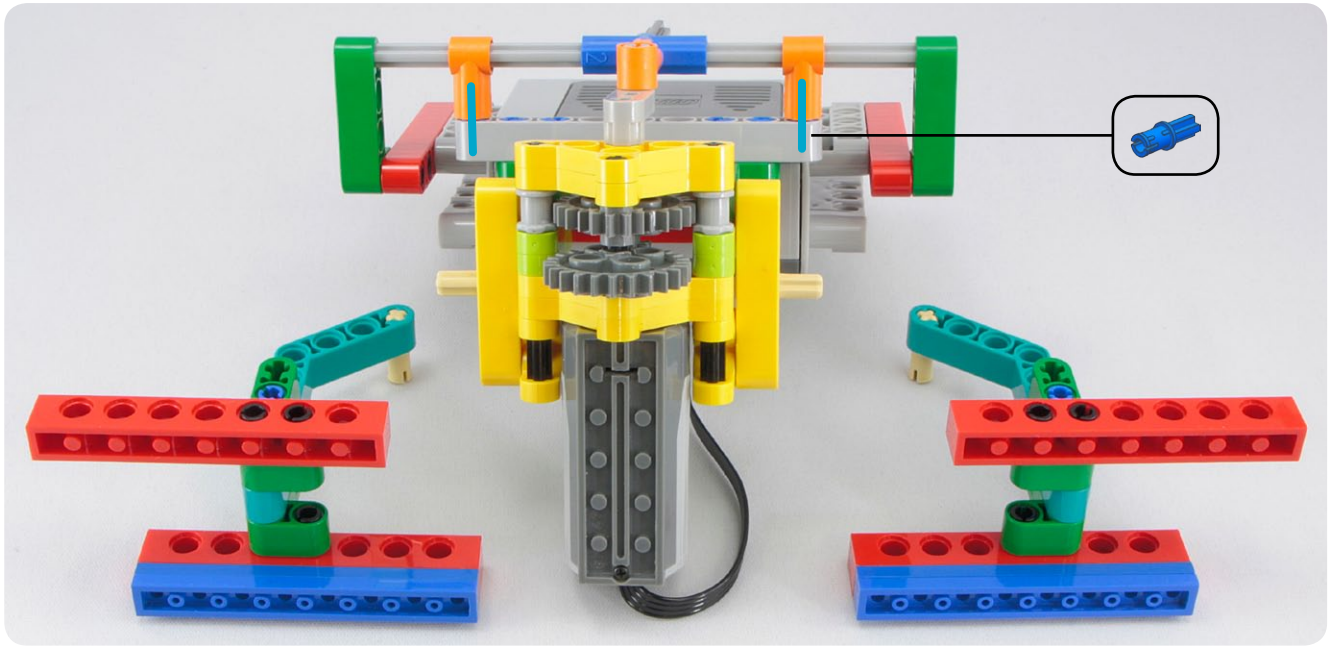
#100



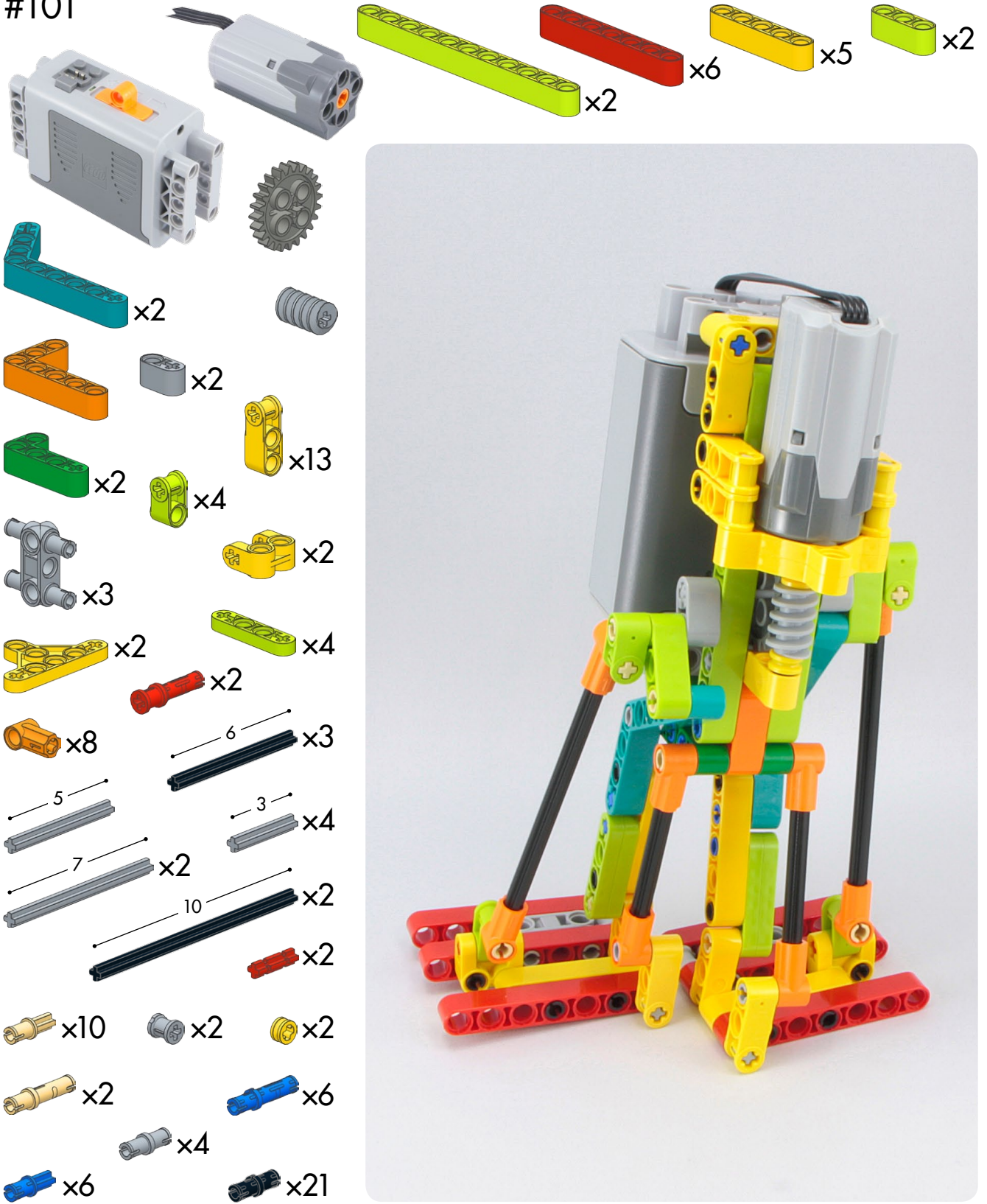


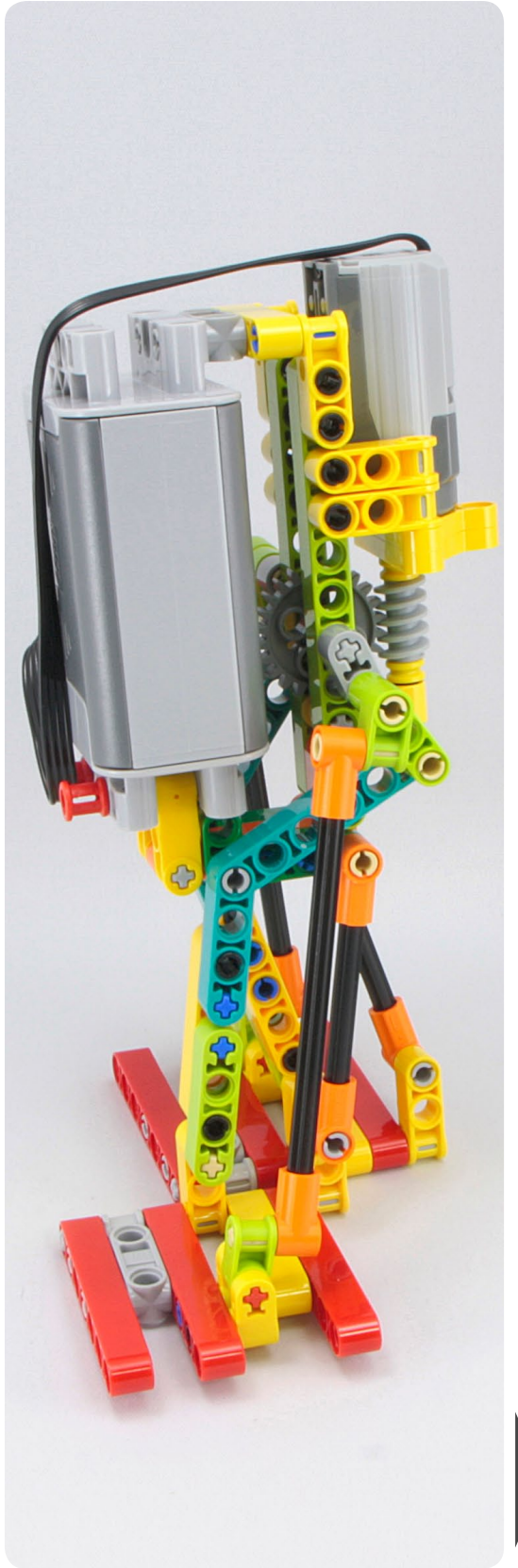
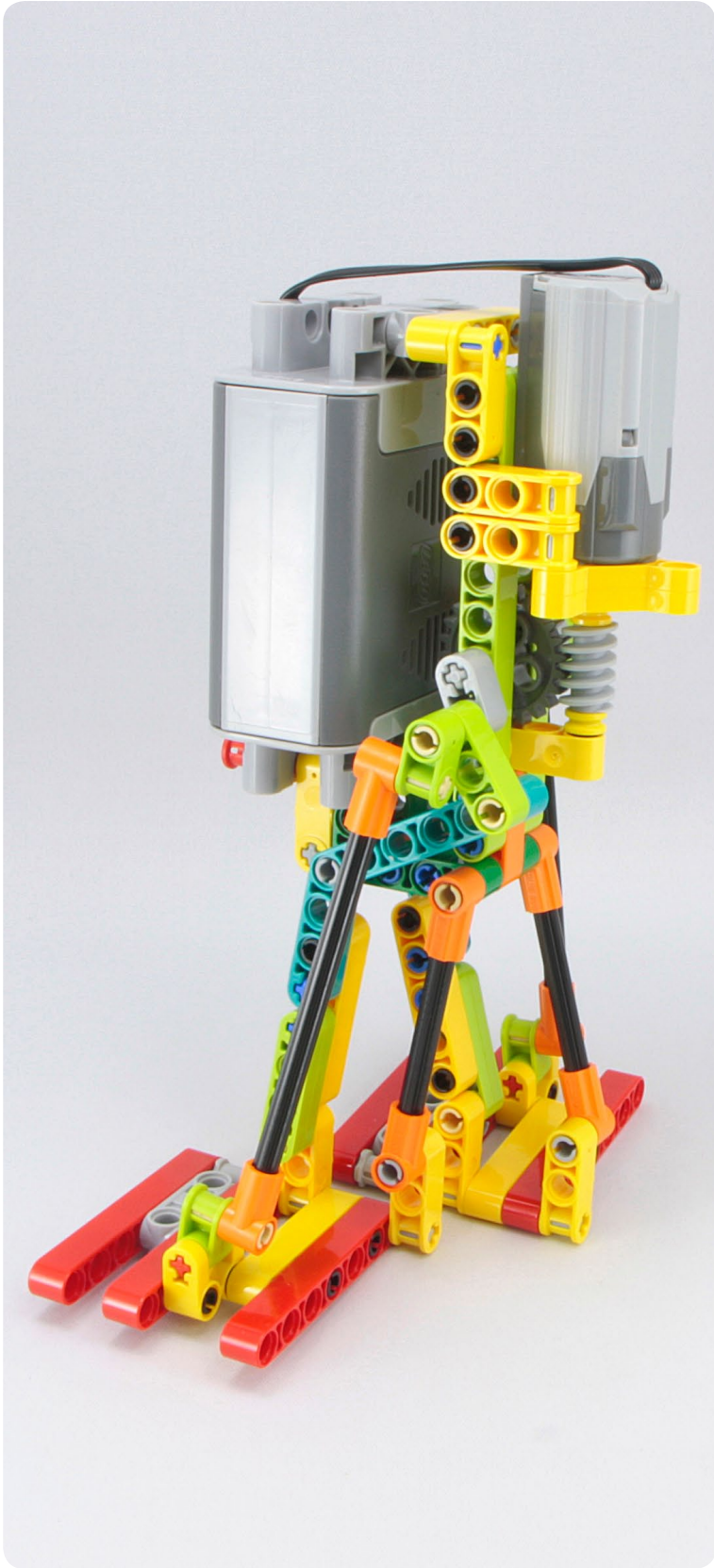


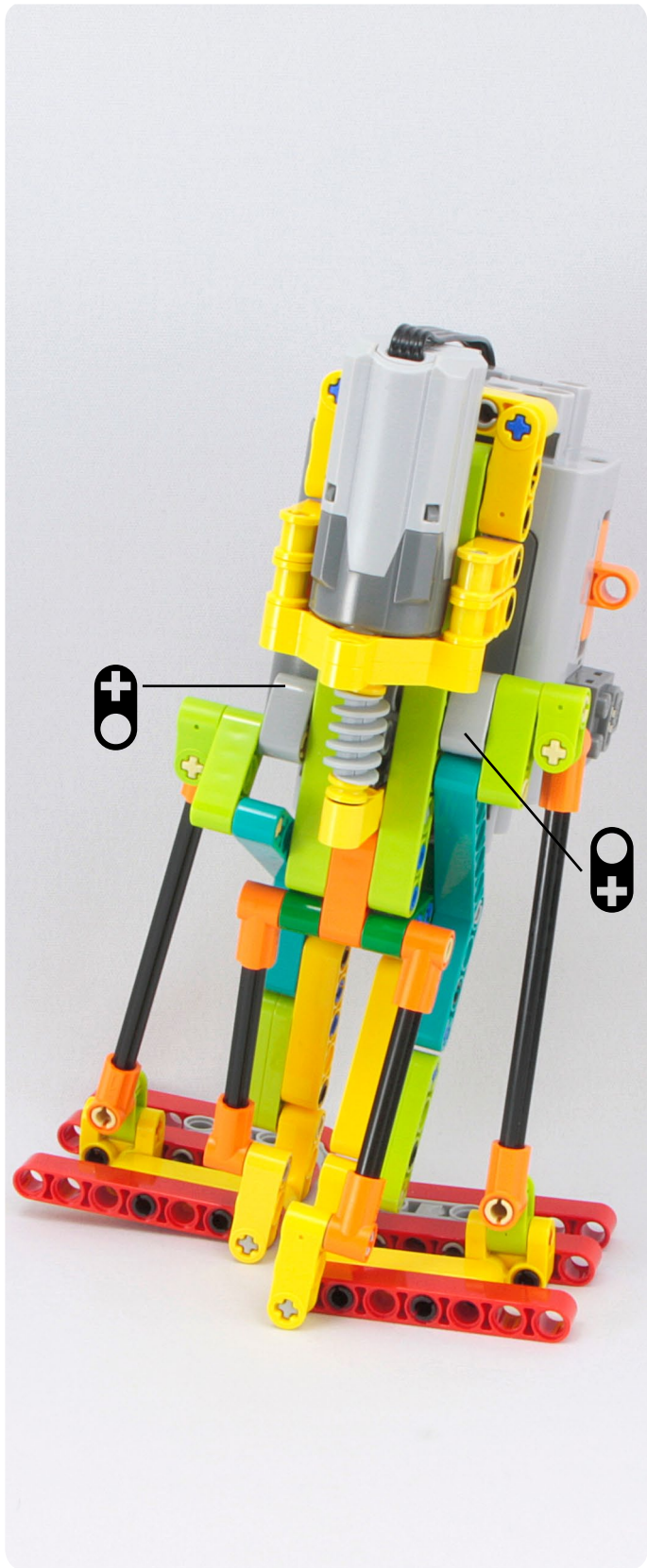


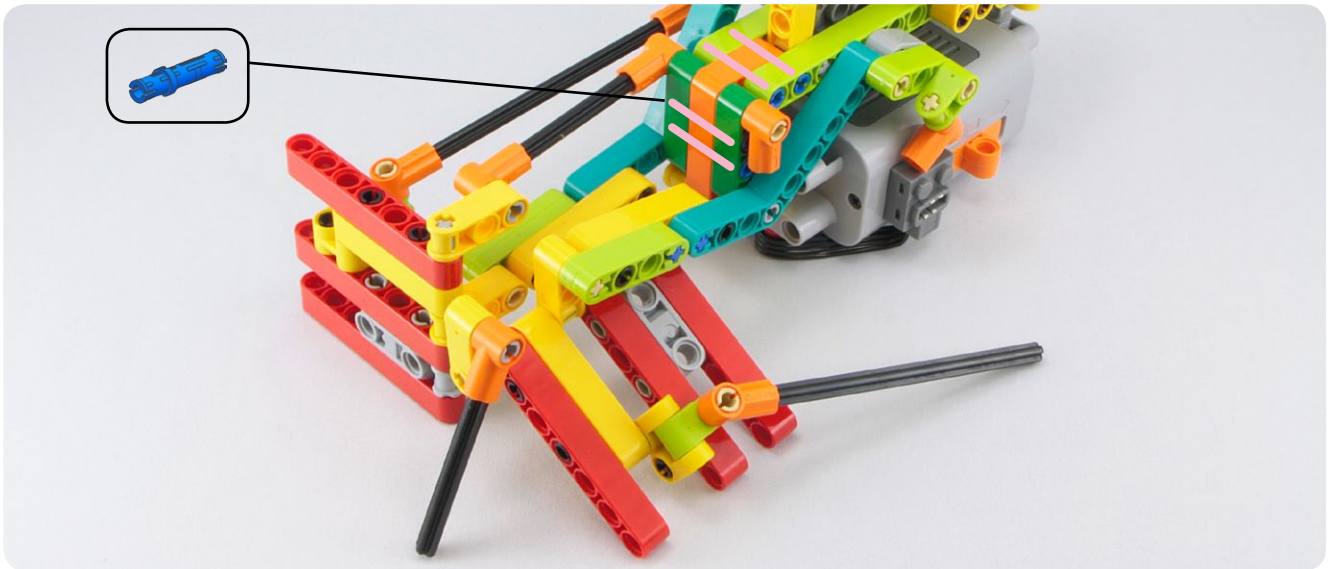
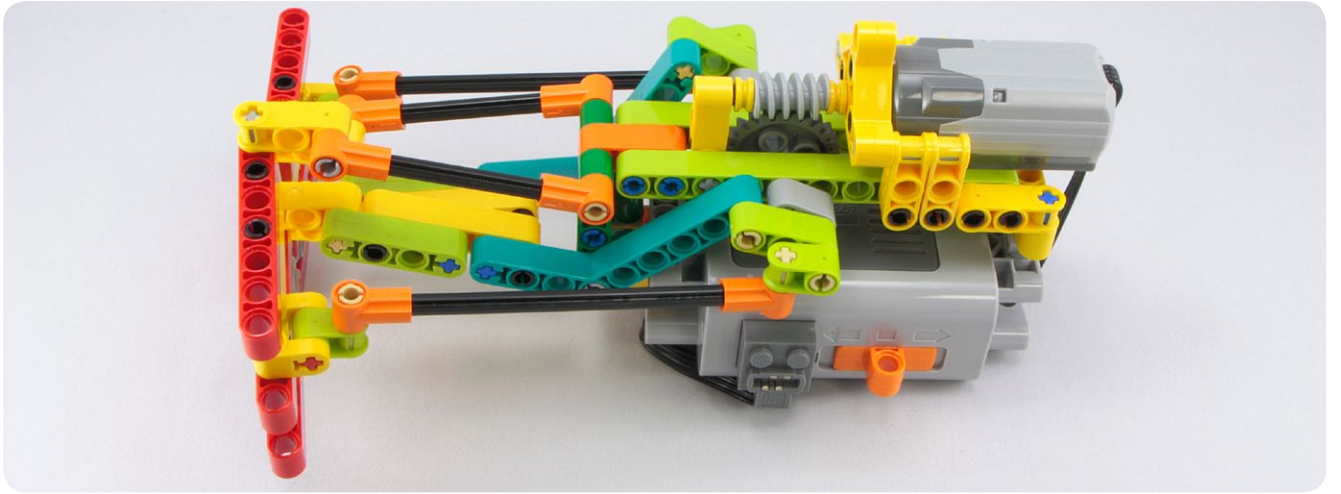


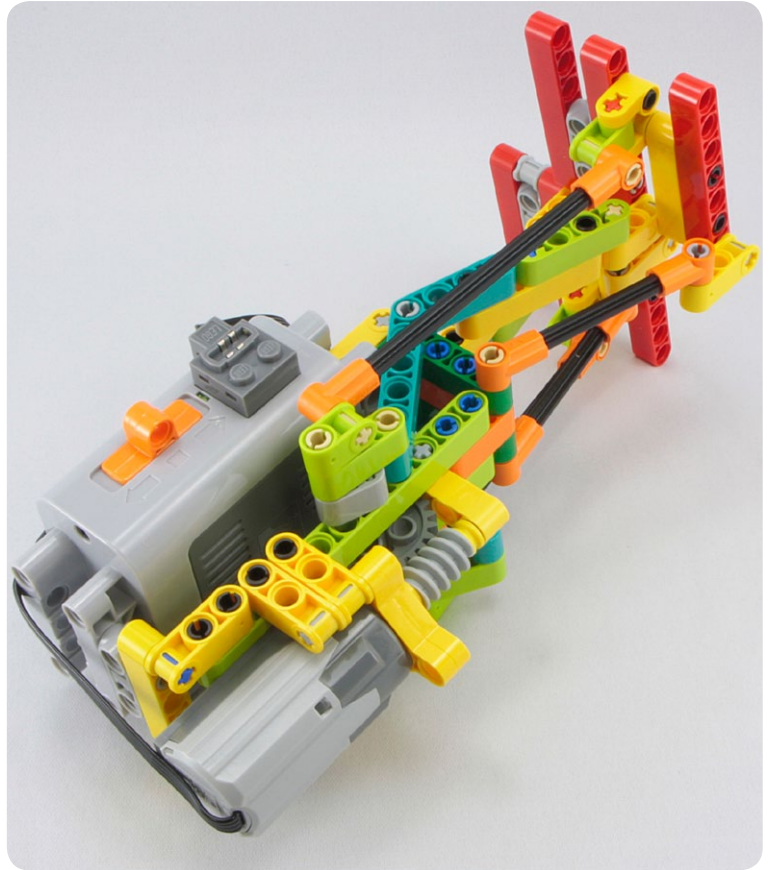
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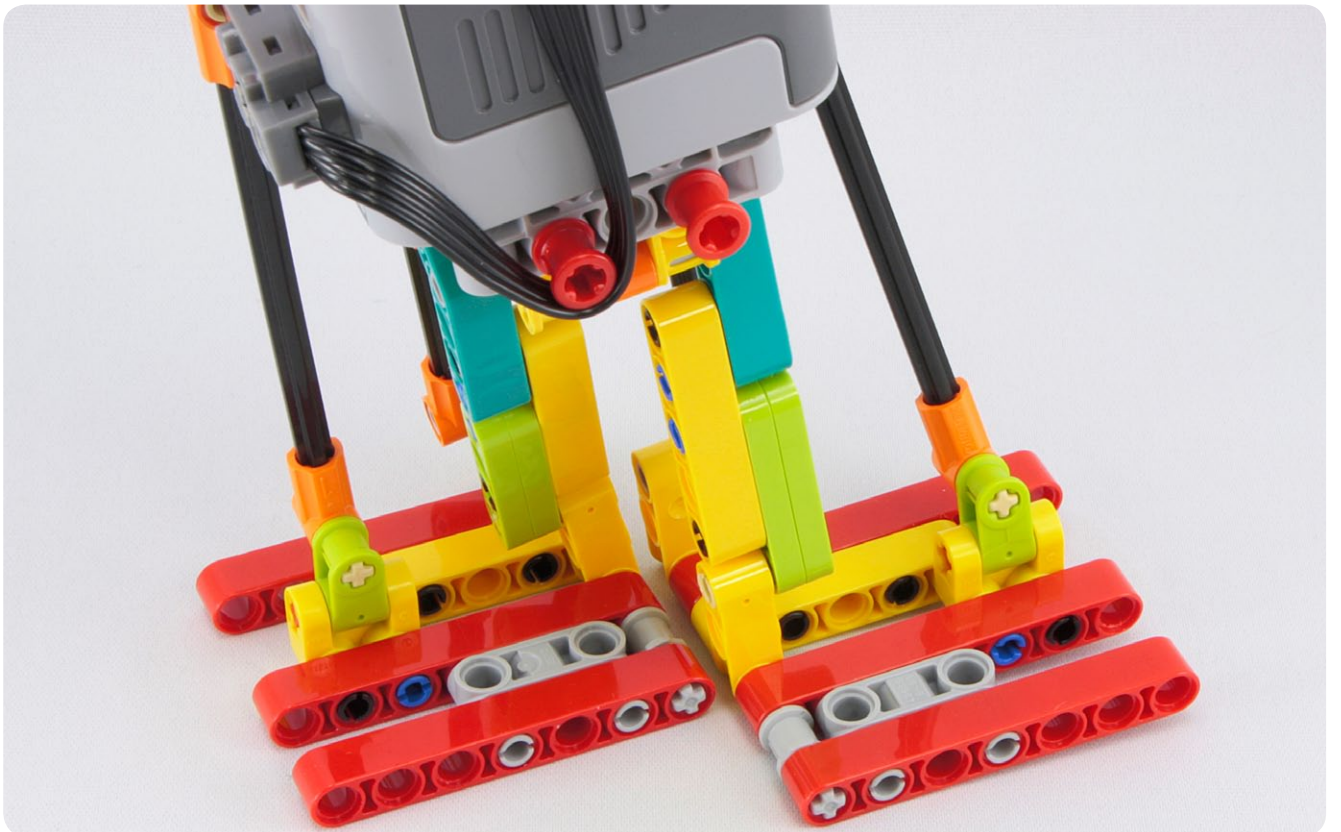
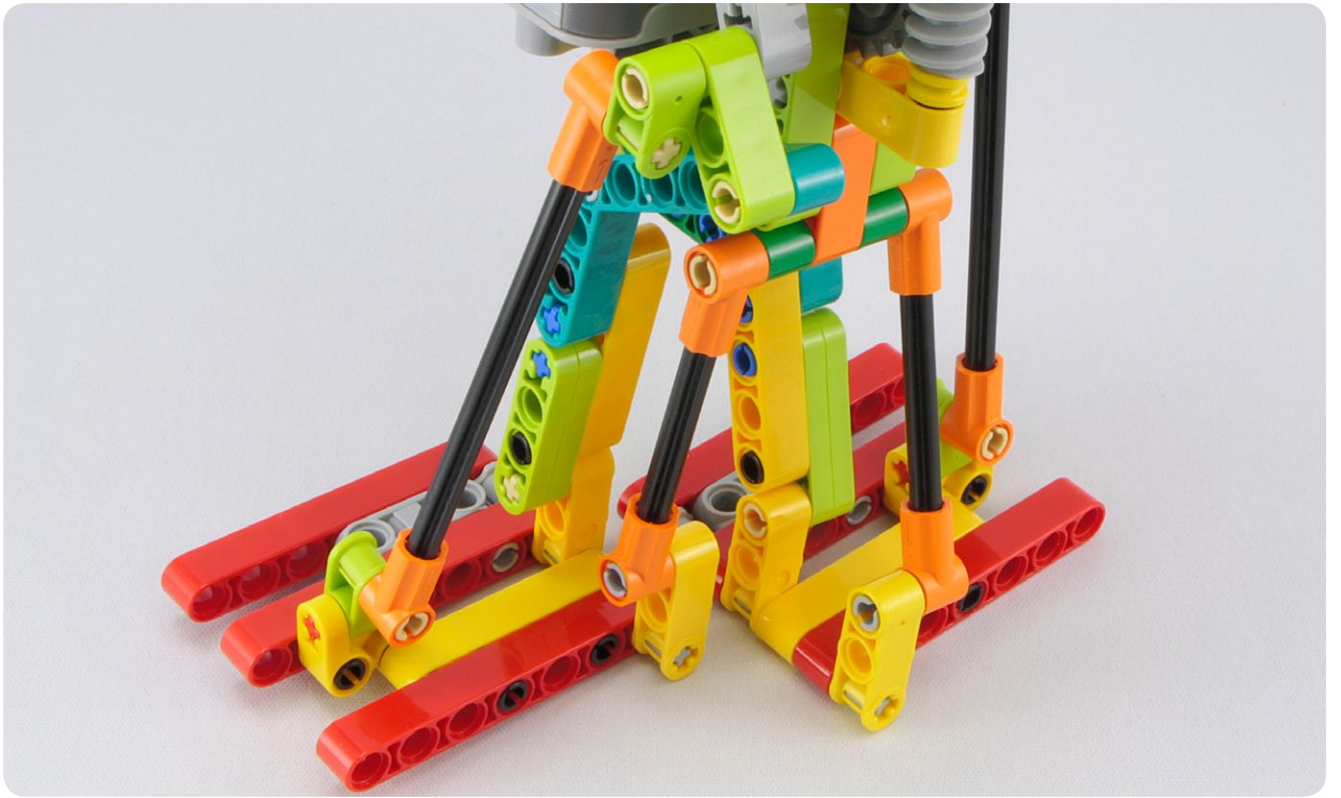






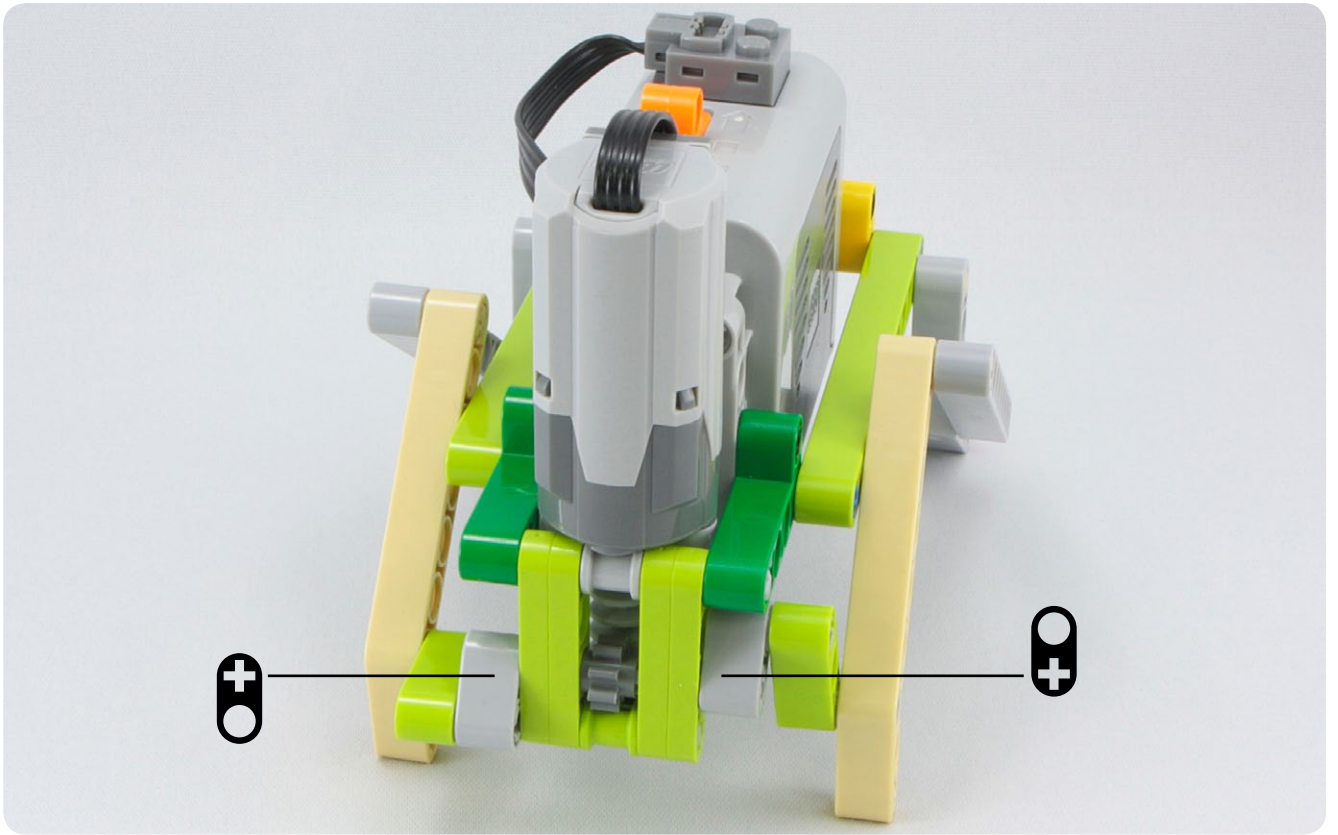








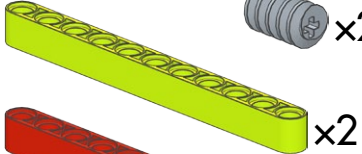
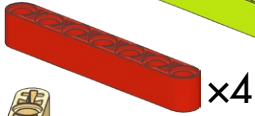
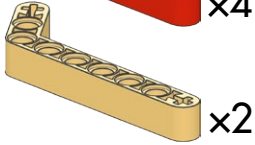

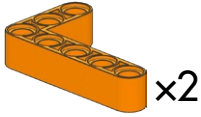
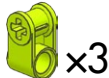
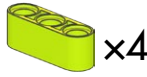
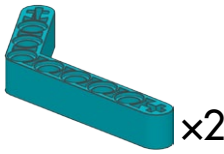
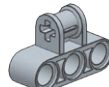

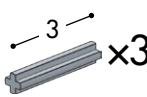
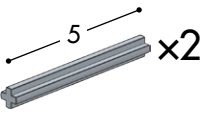
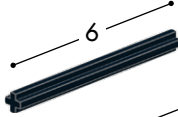
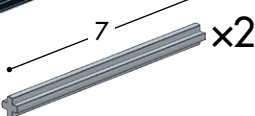






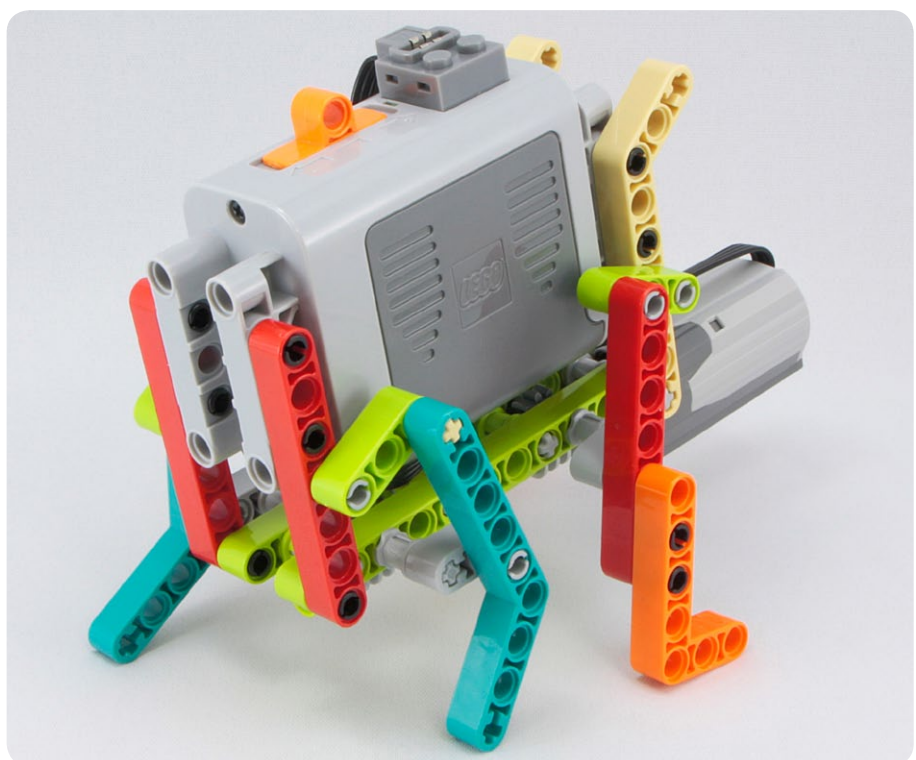
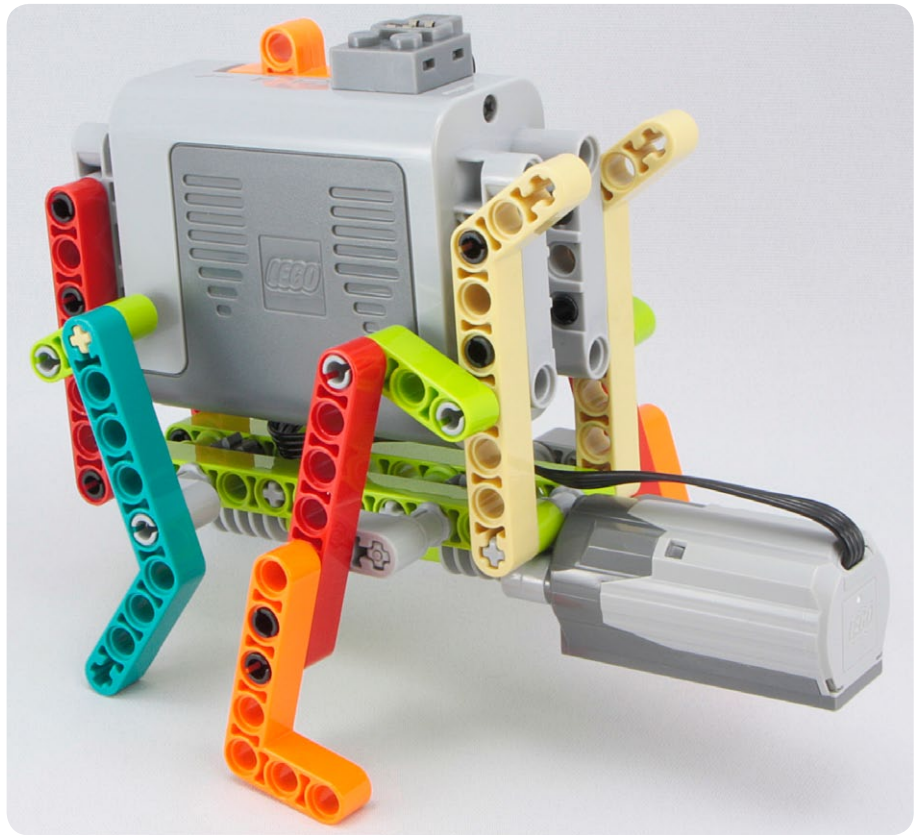


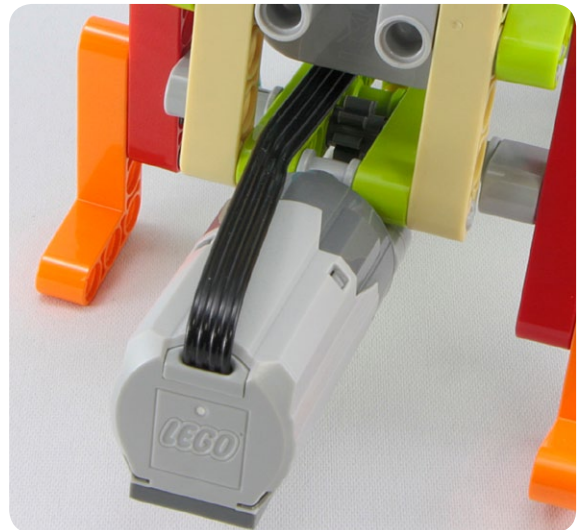
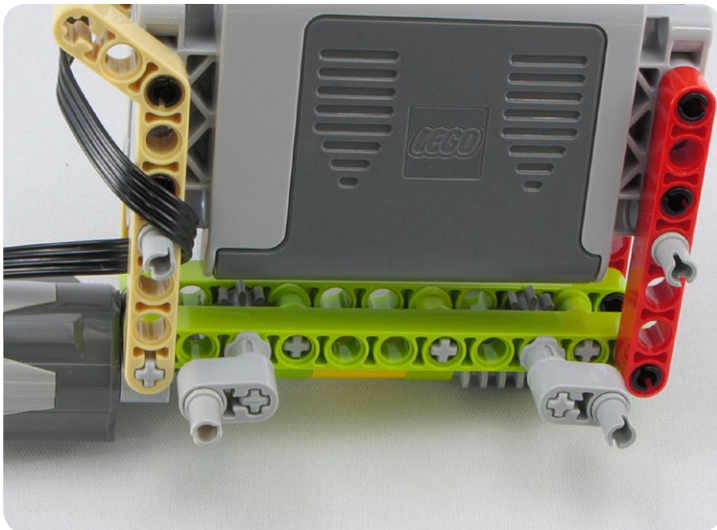
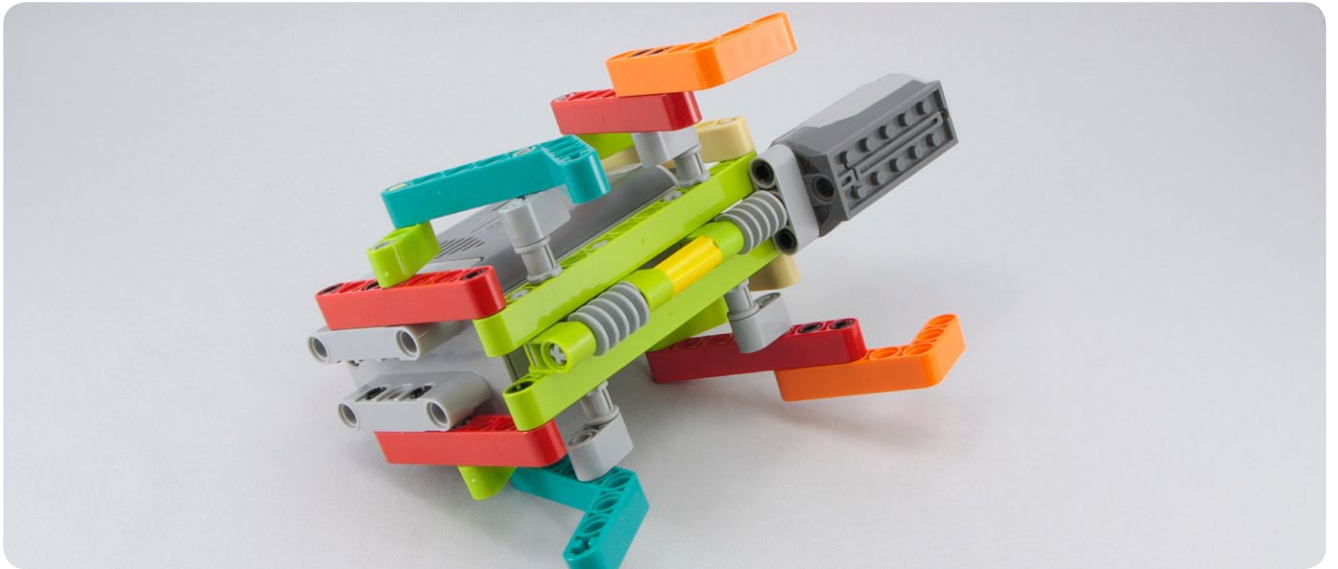
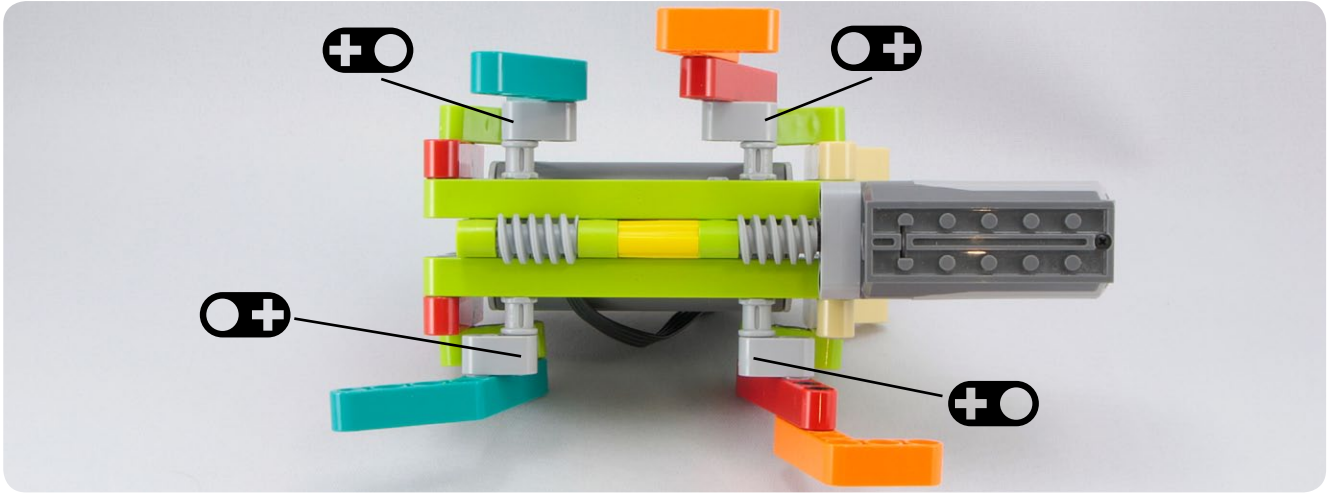




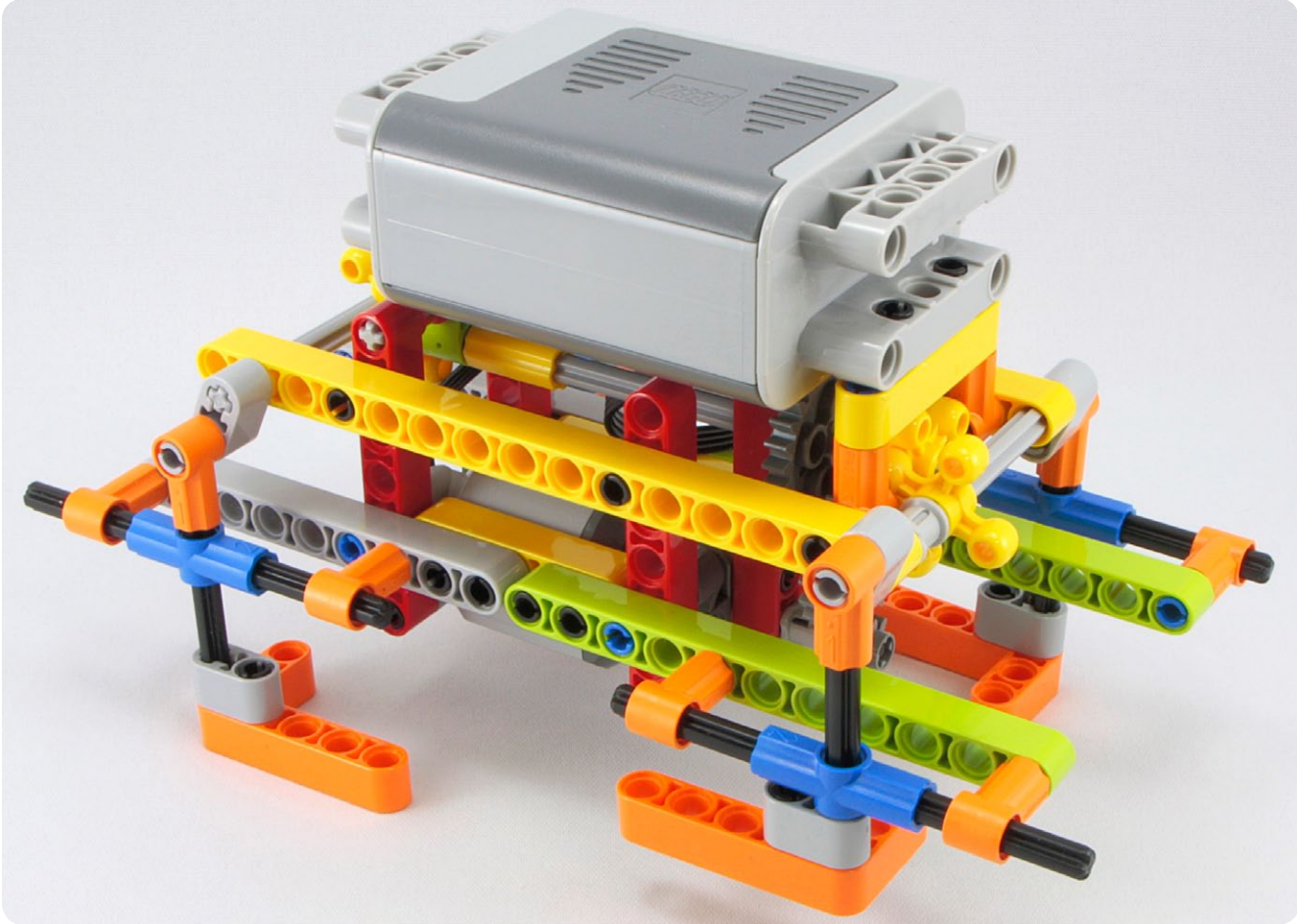
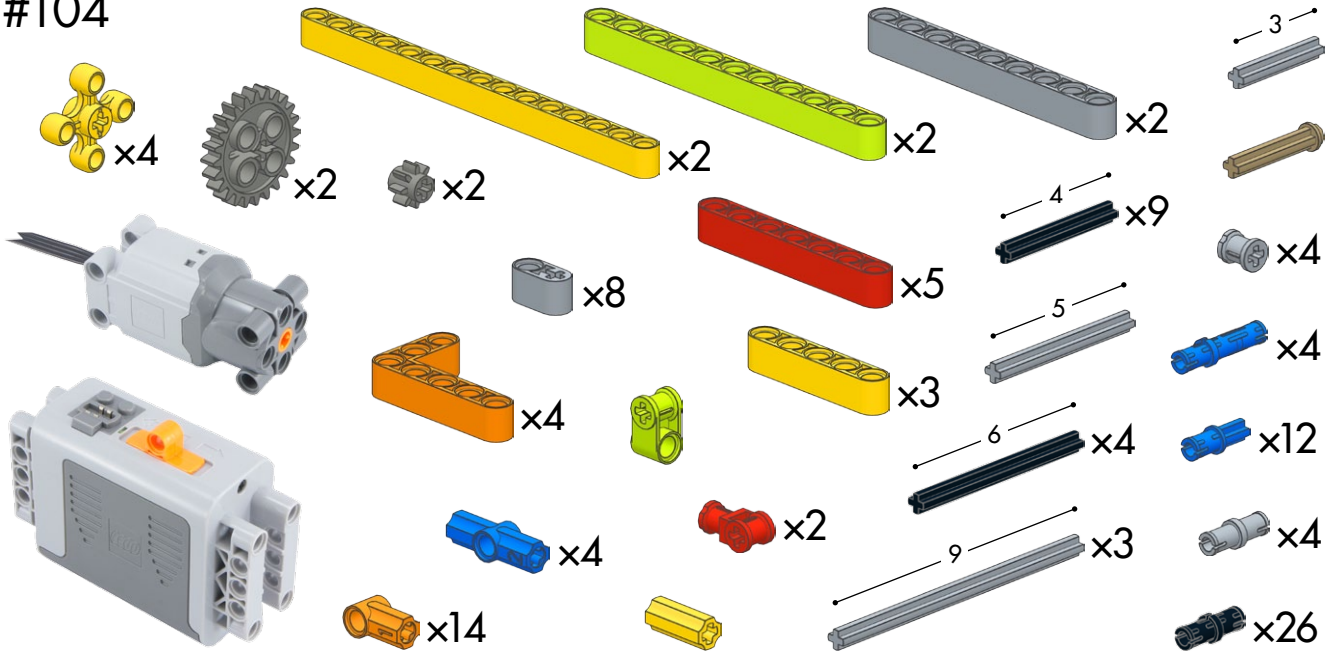
# #103

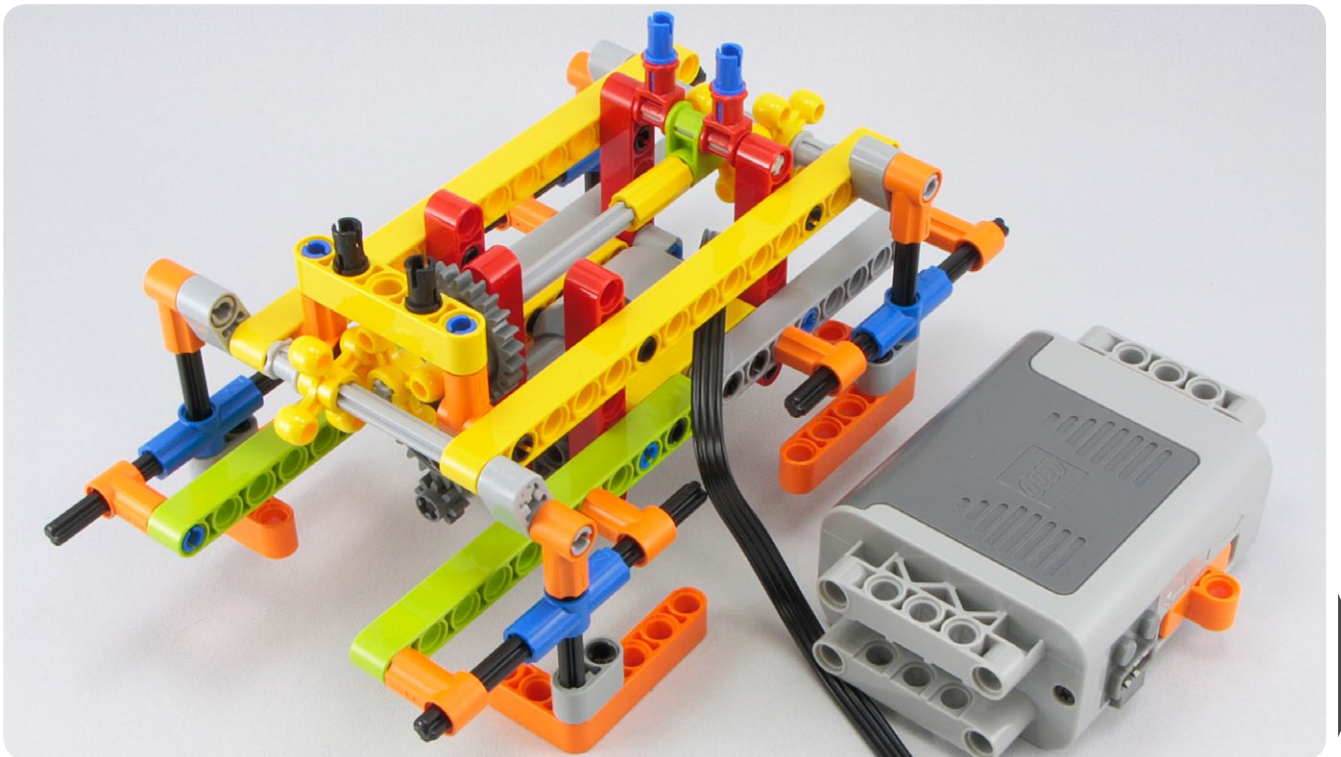
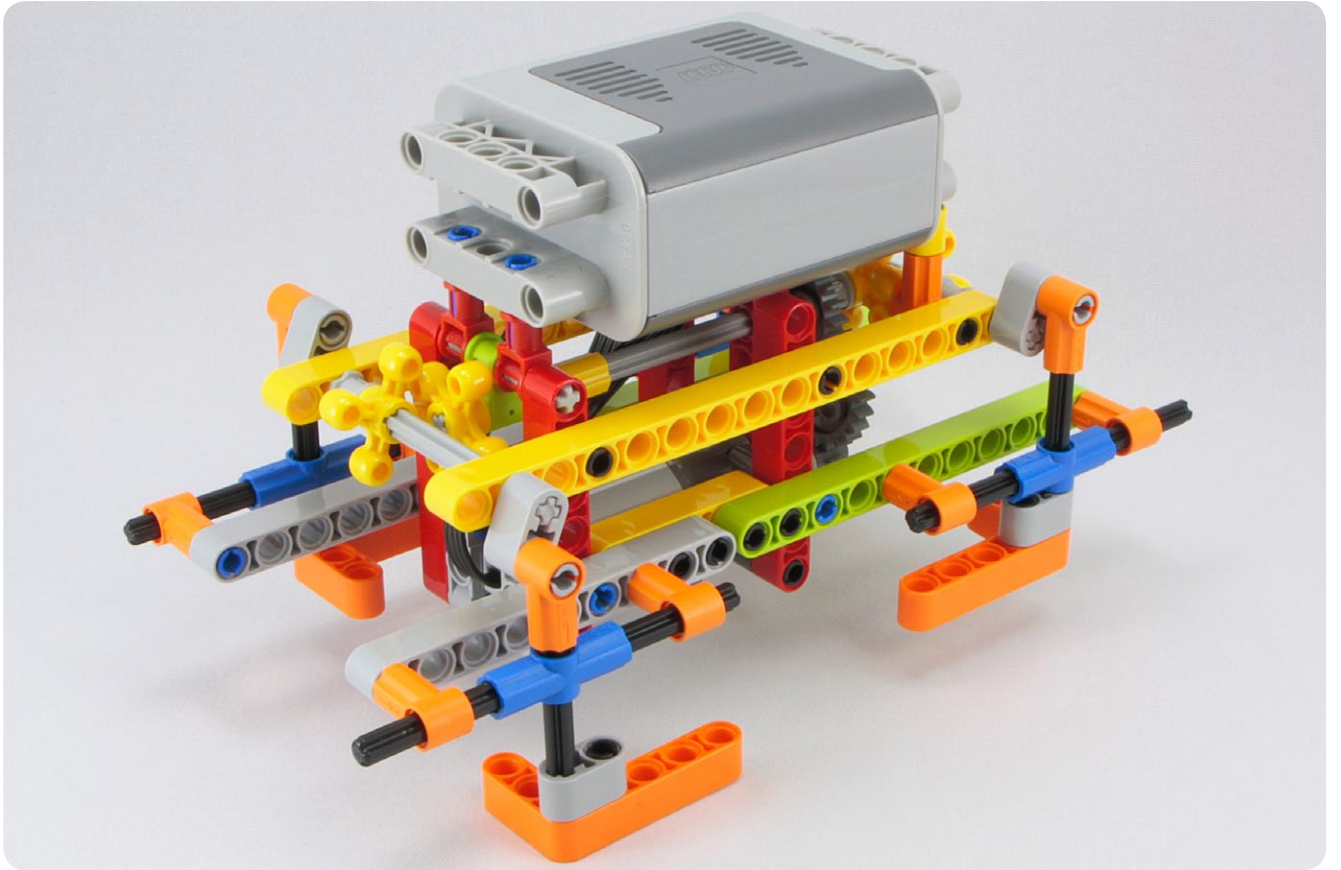
- 
- 
-  x2
-  x2
-  x2
-  x4
-  x2
-  x4
-  x2
-  x3
-  x4
-  x2
-  x2
- 
-  x3
-  x2
-  x2
-  x2
-  x4
-  x2
-  x10
-  x16

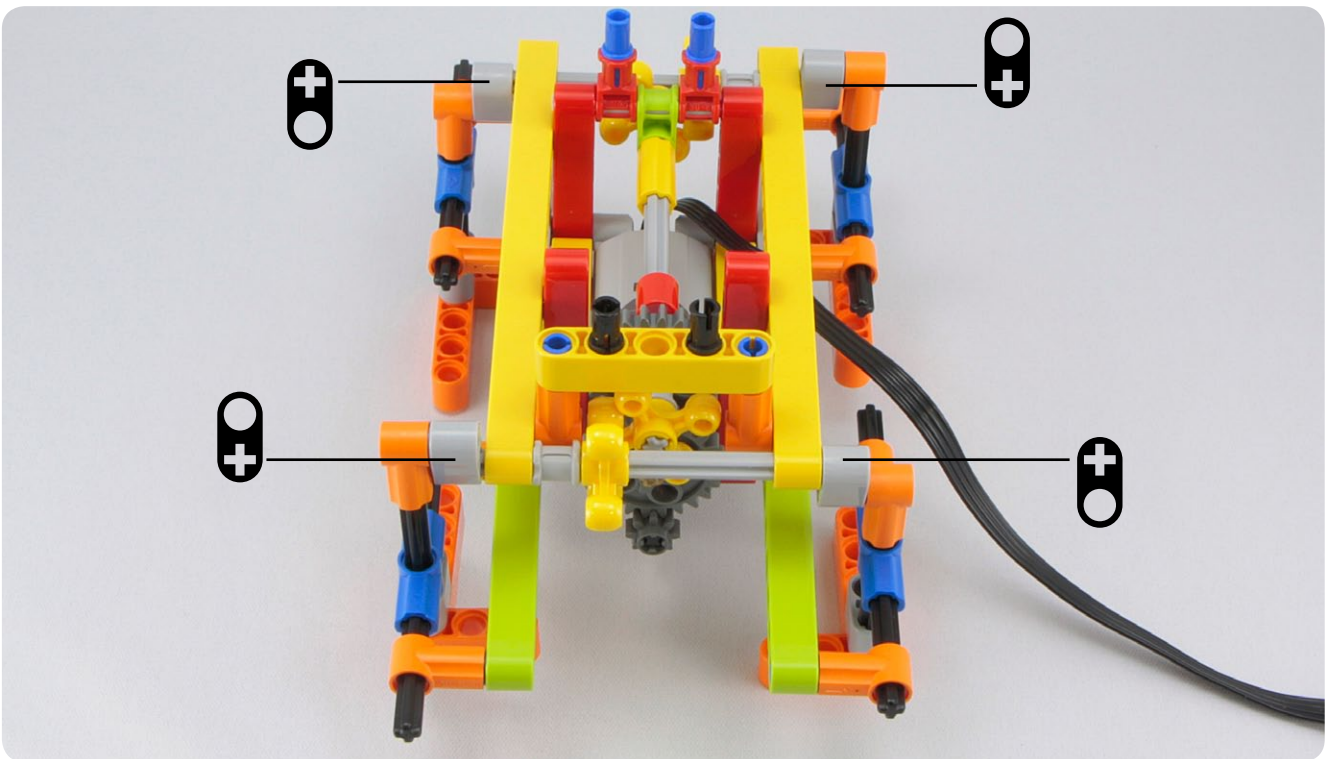
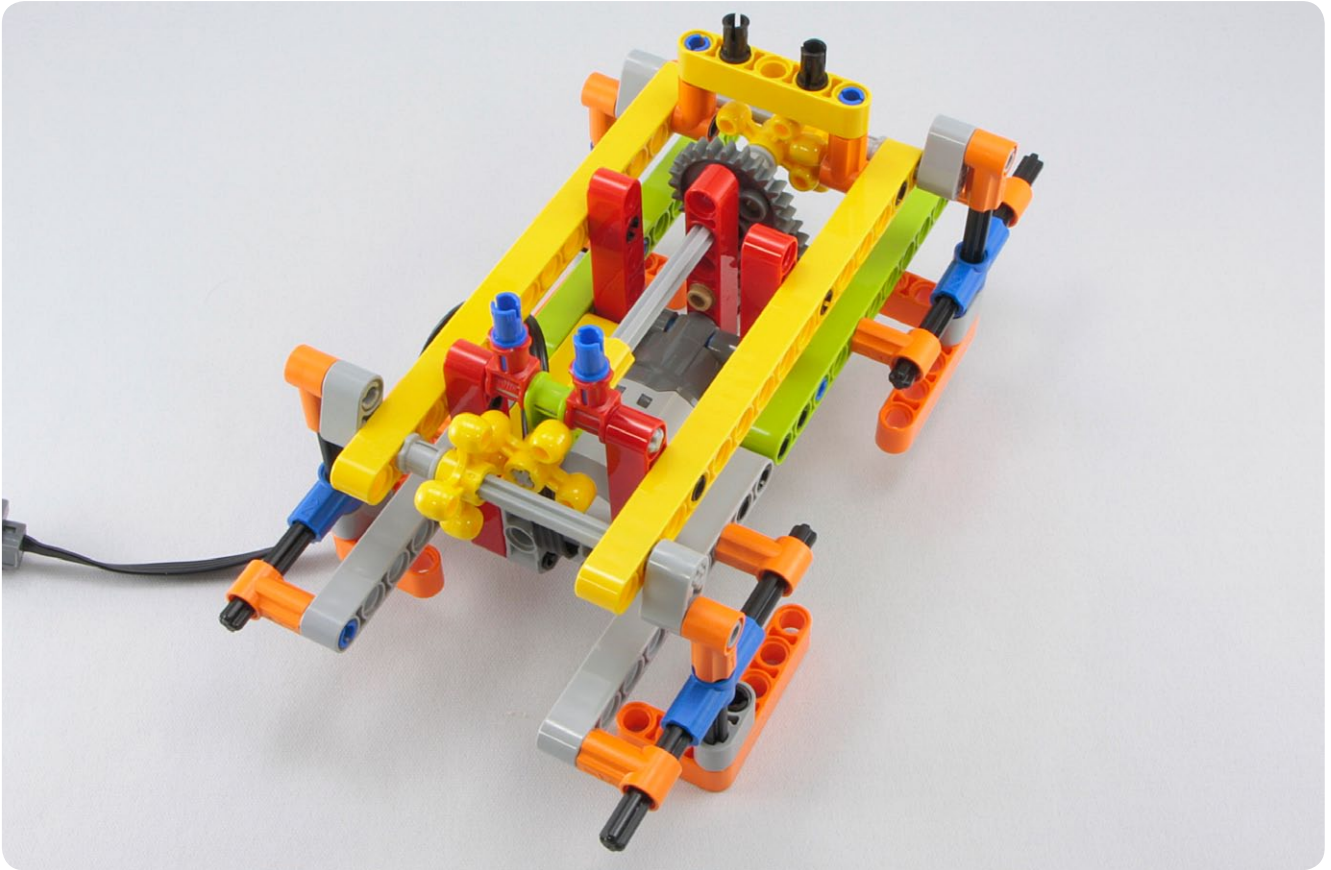


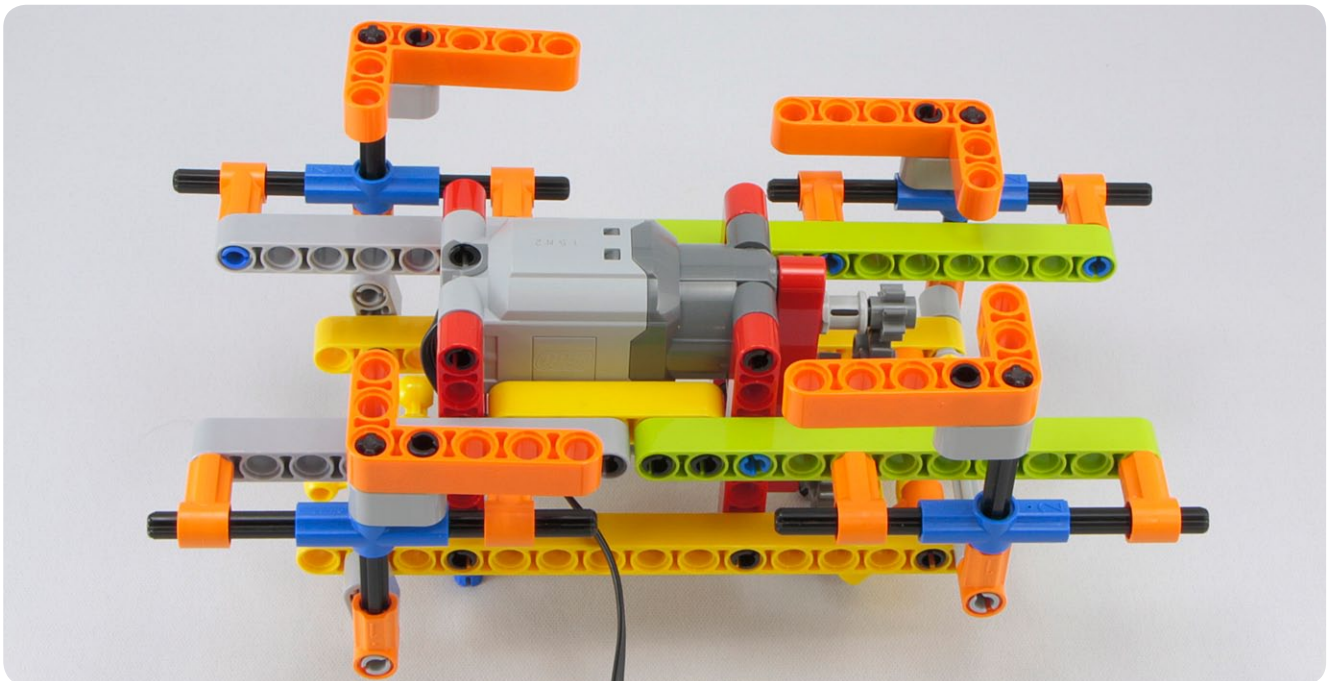
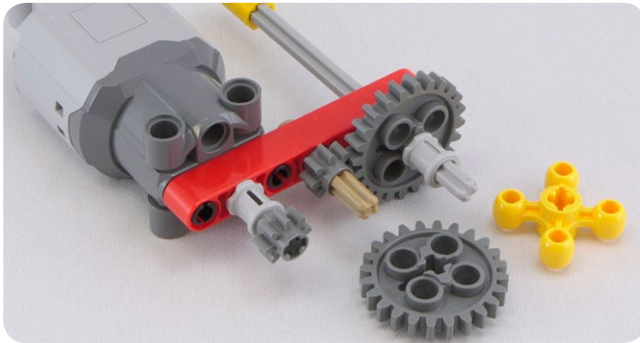
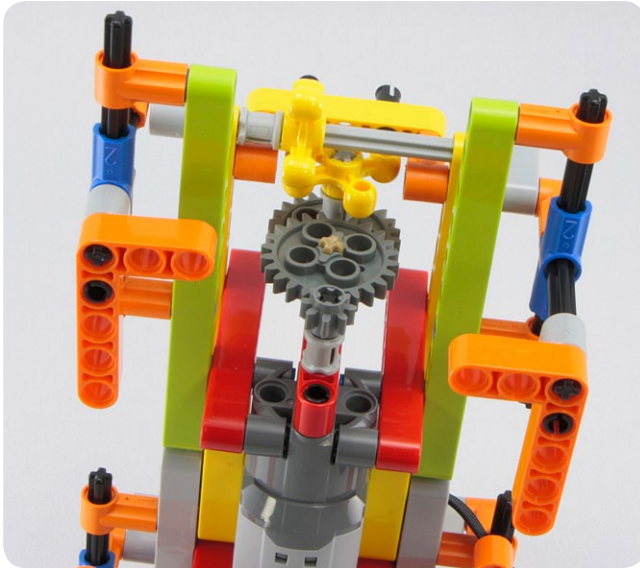


# #104



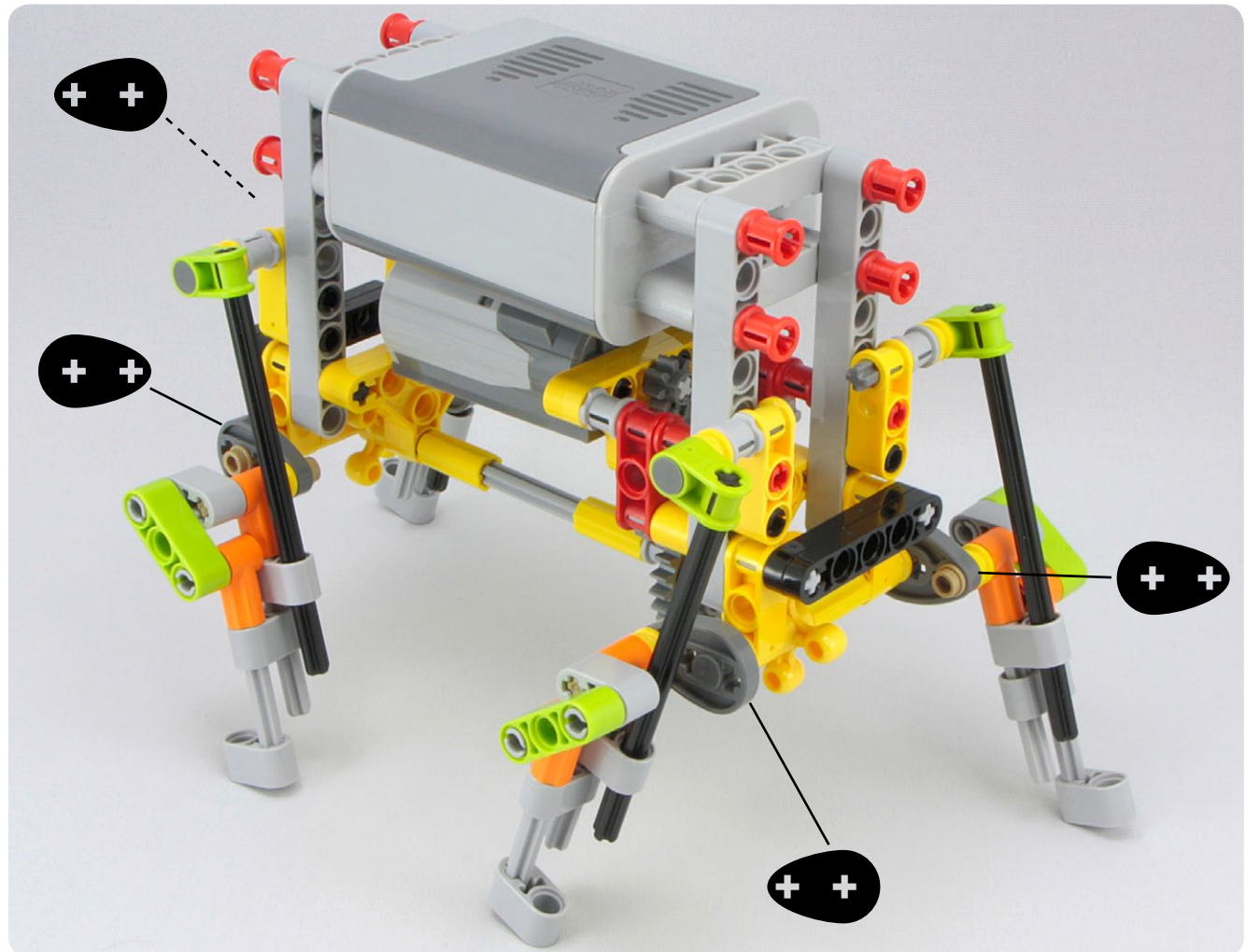
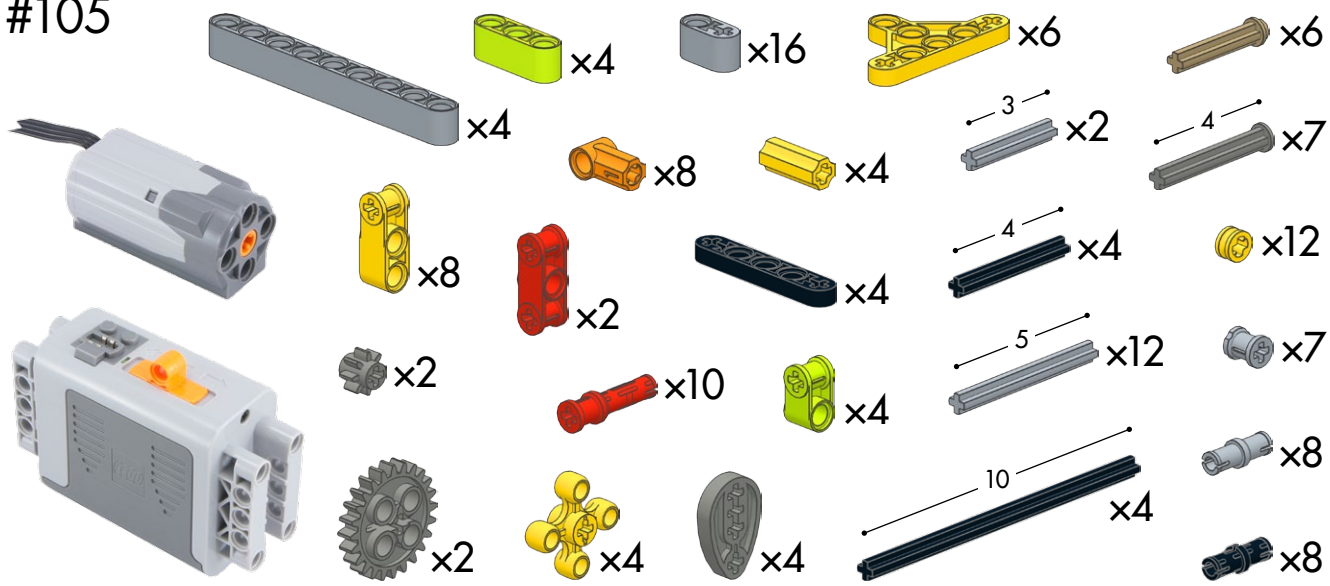


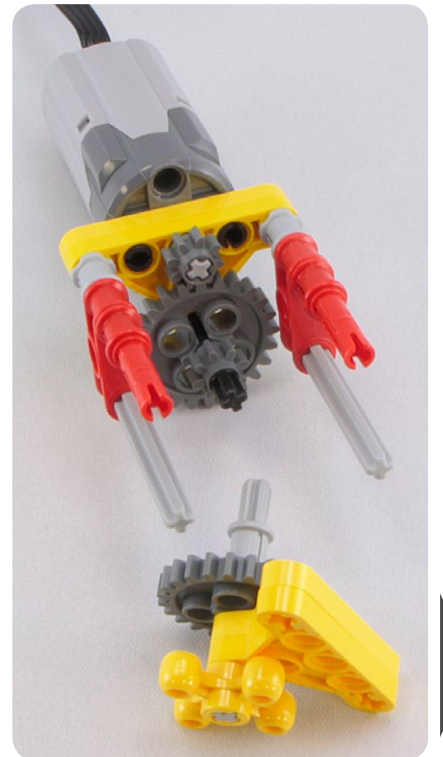
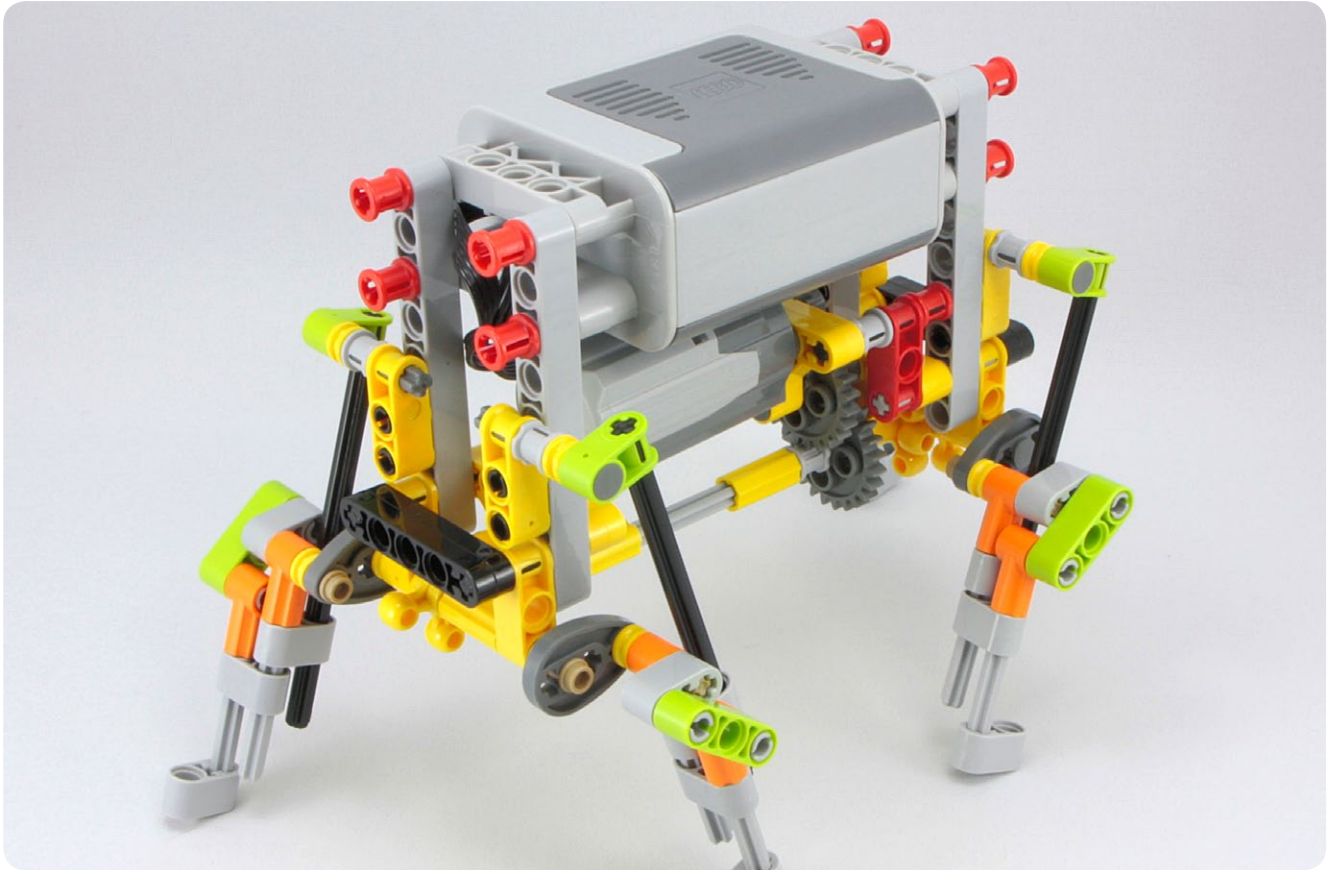


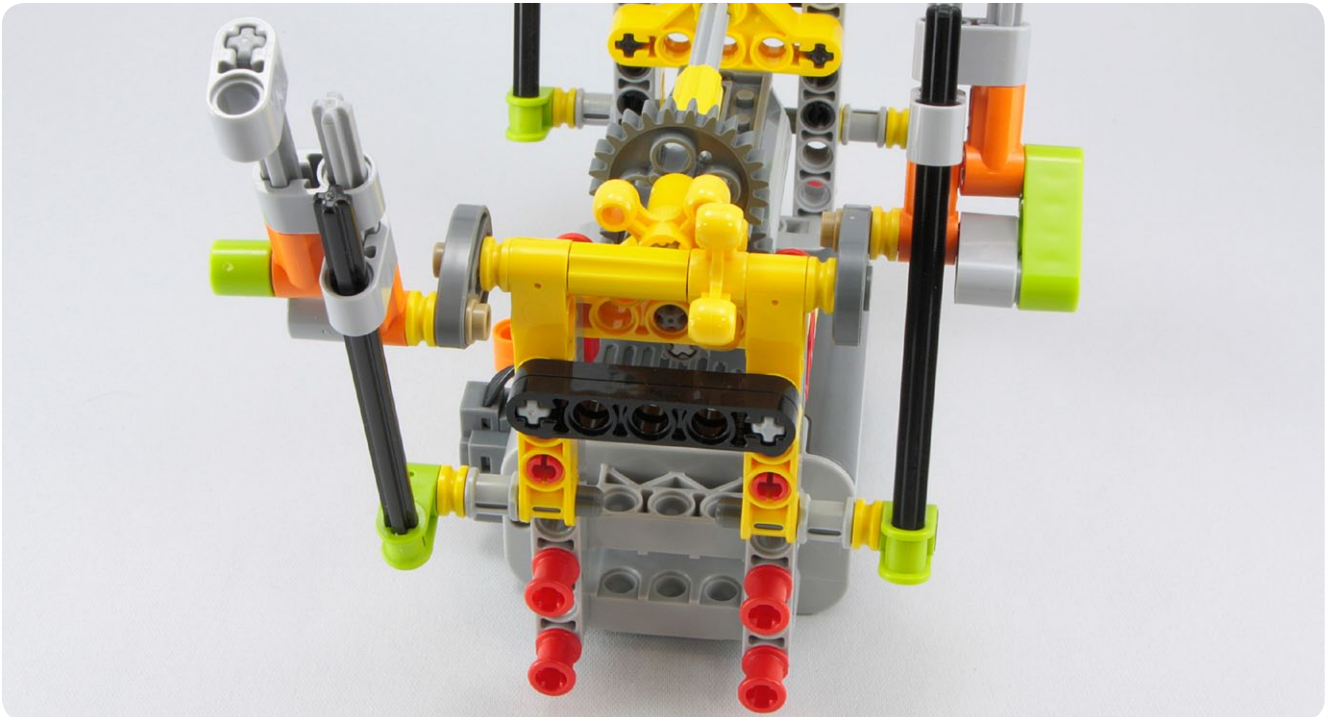
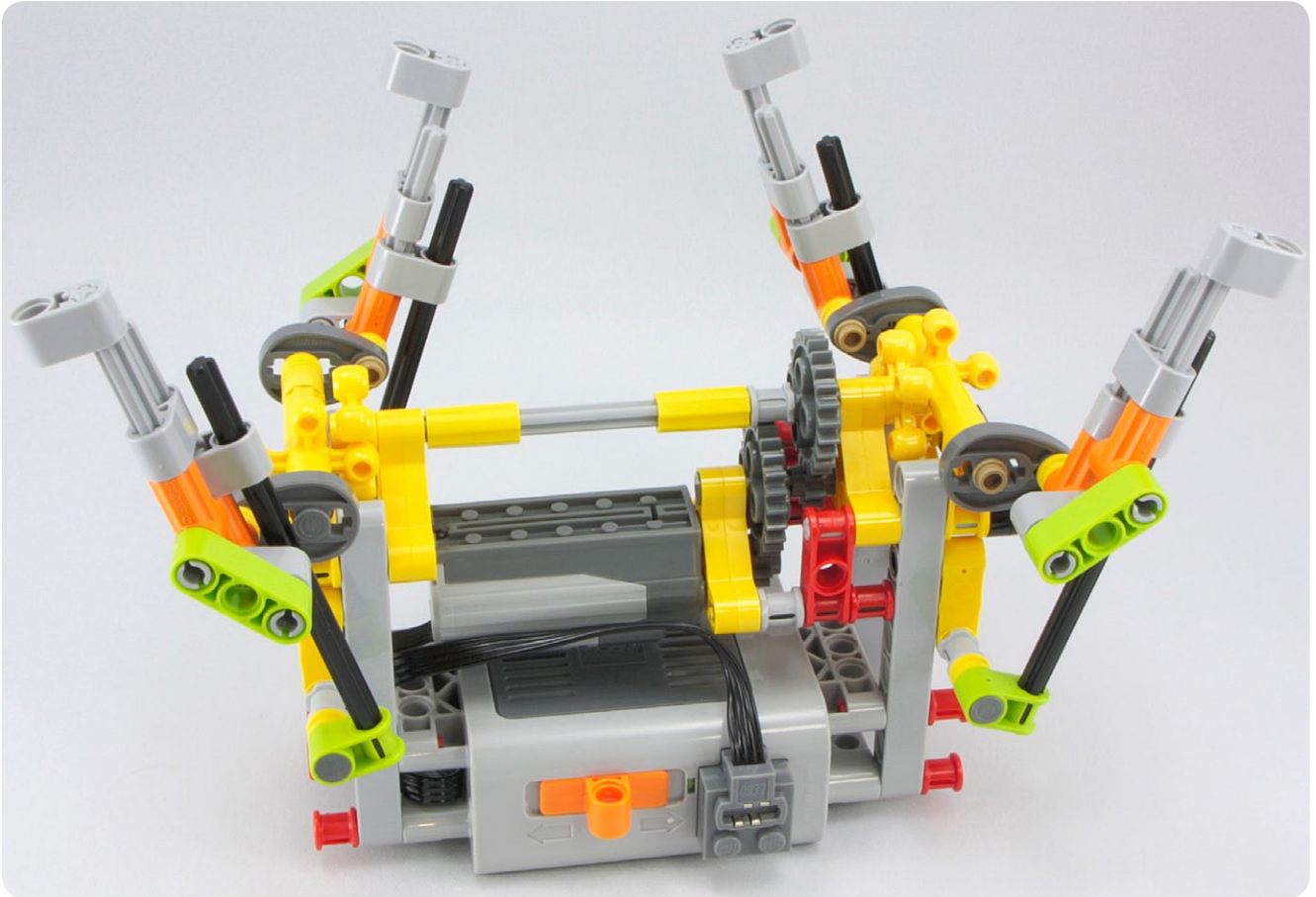


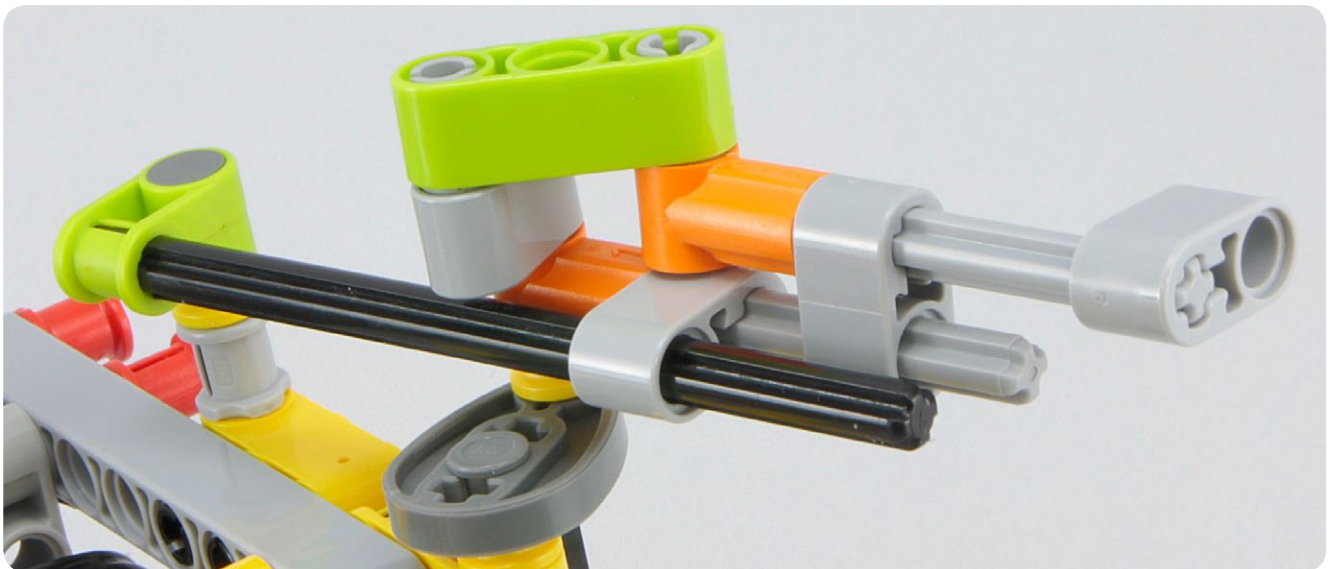
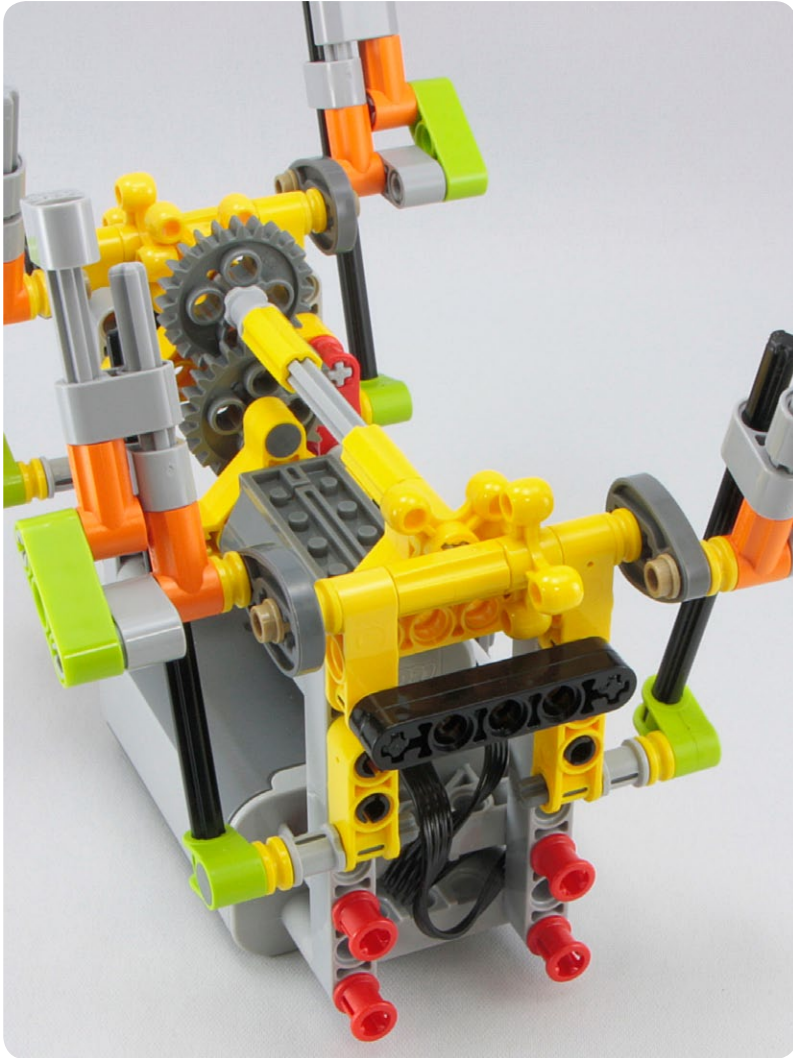


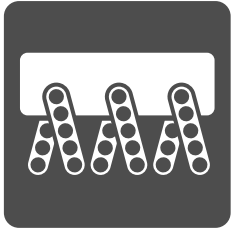
# #105





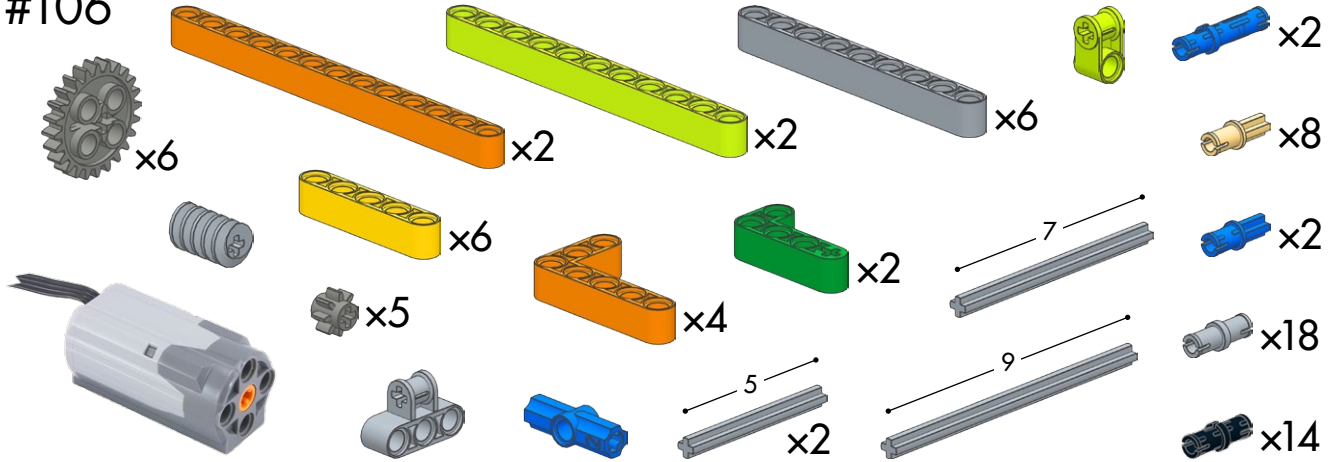


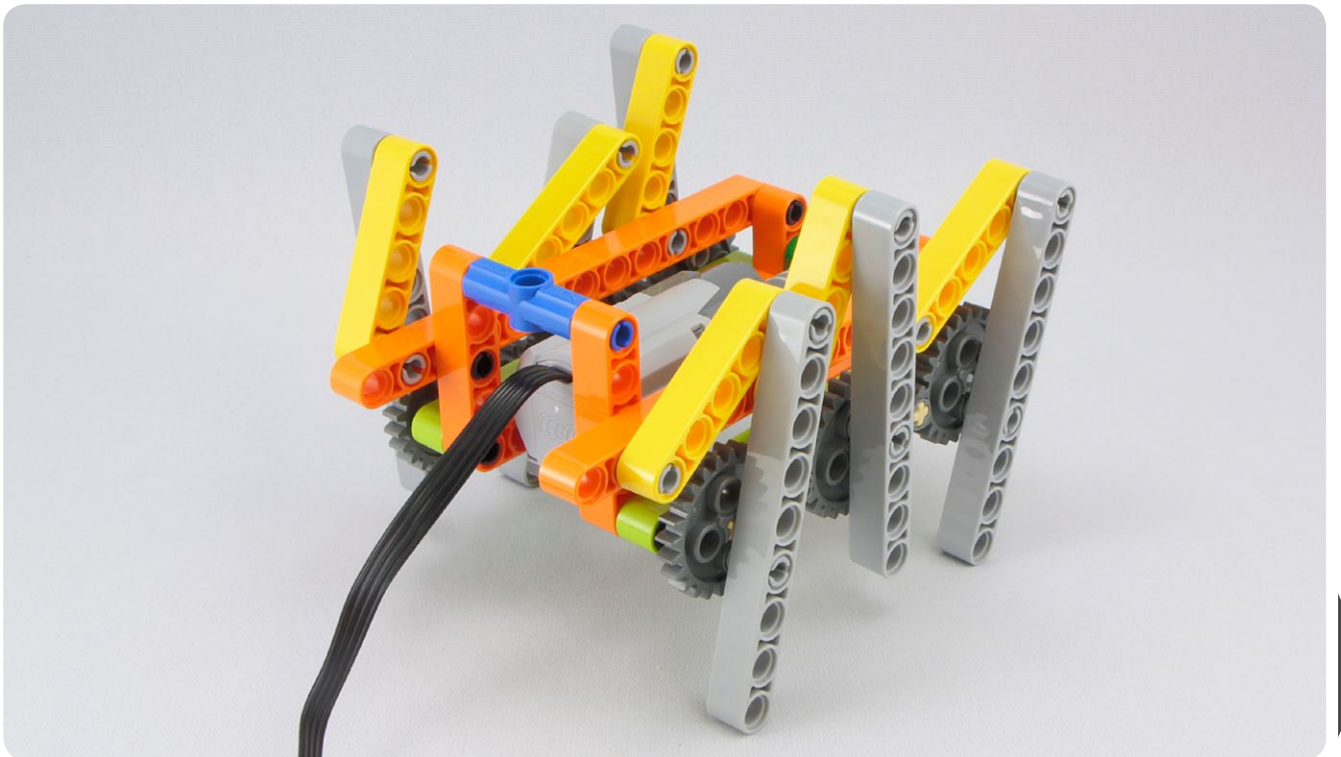
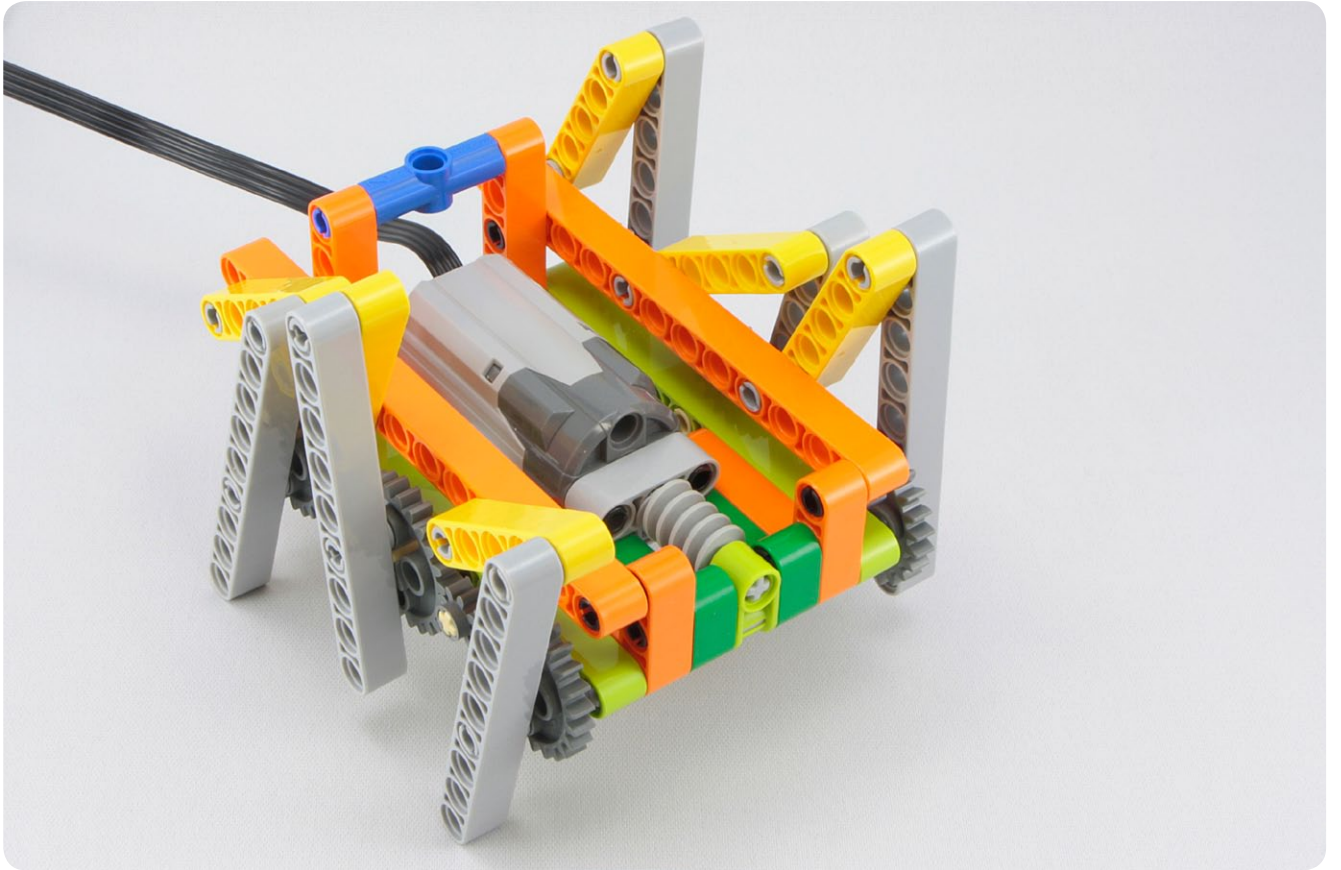


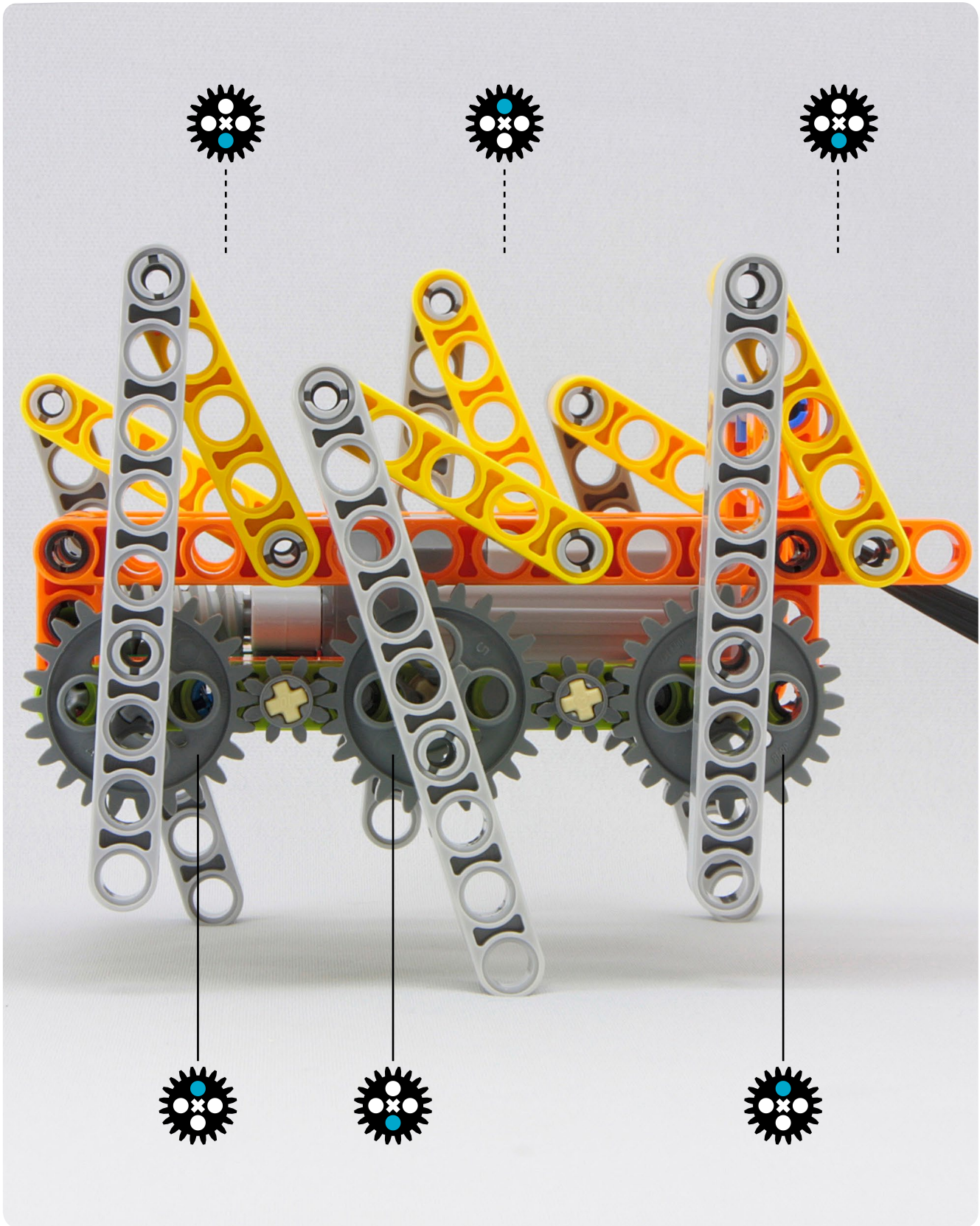


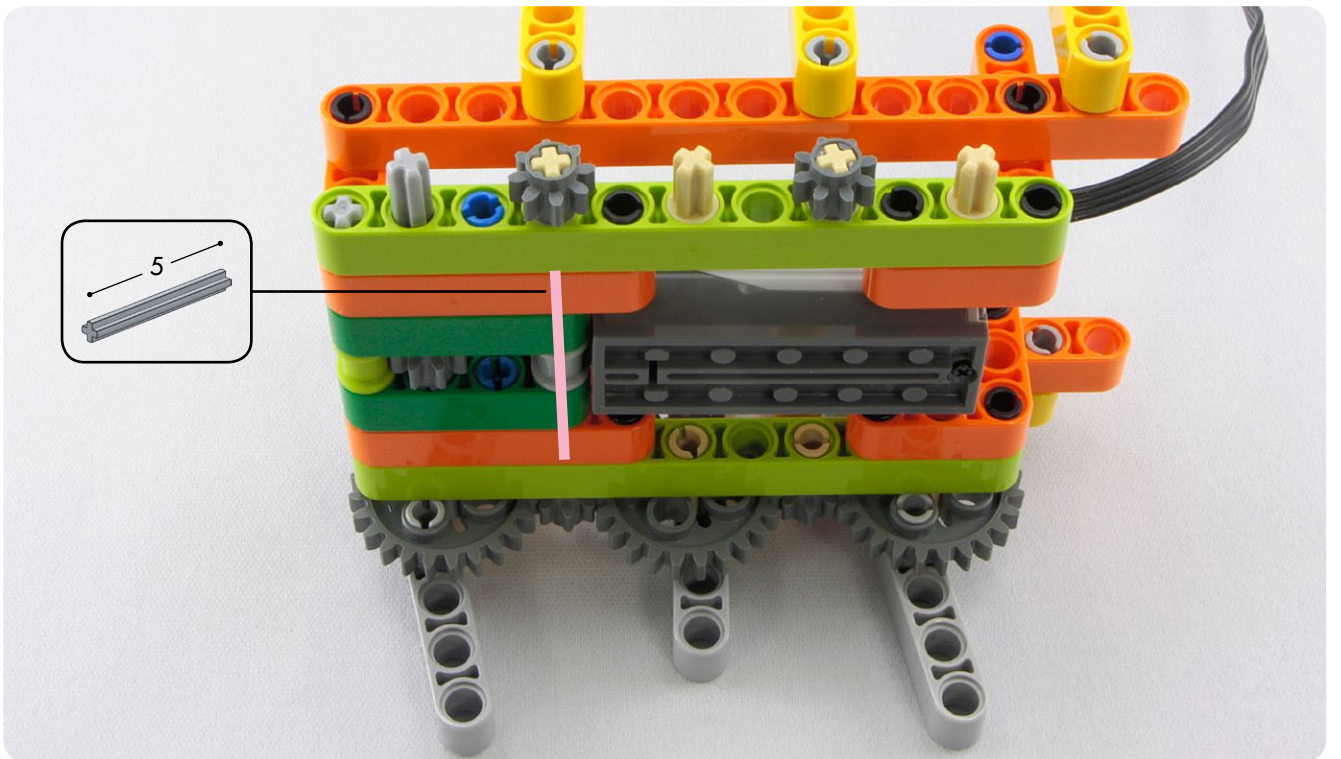
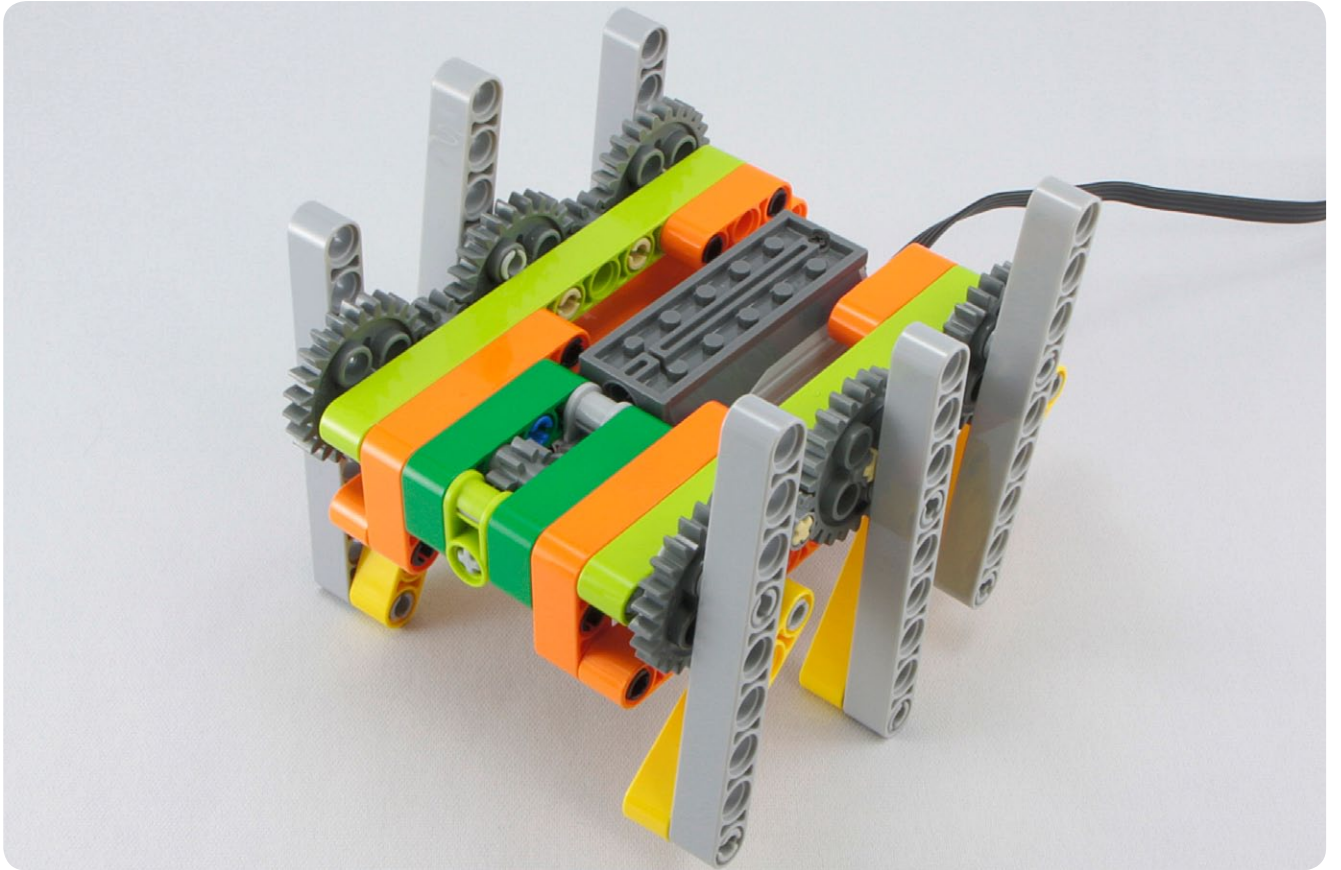
# Six-legged walkers

#106



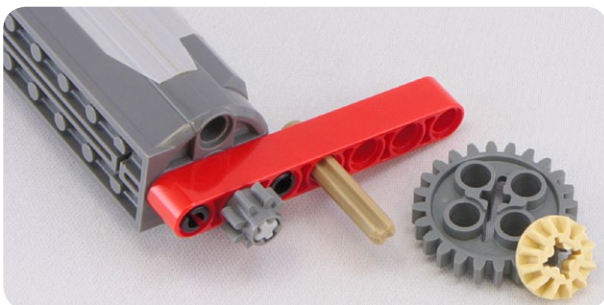
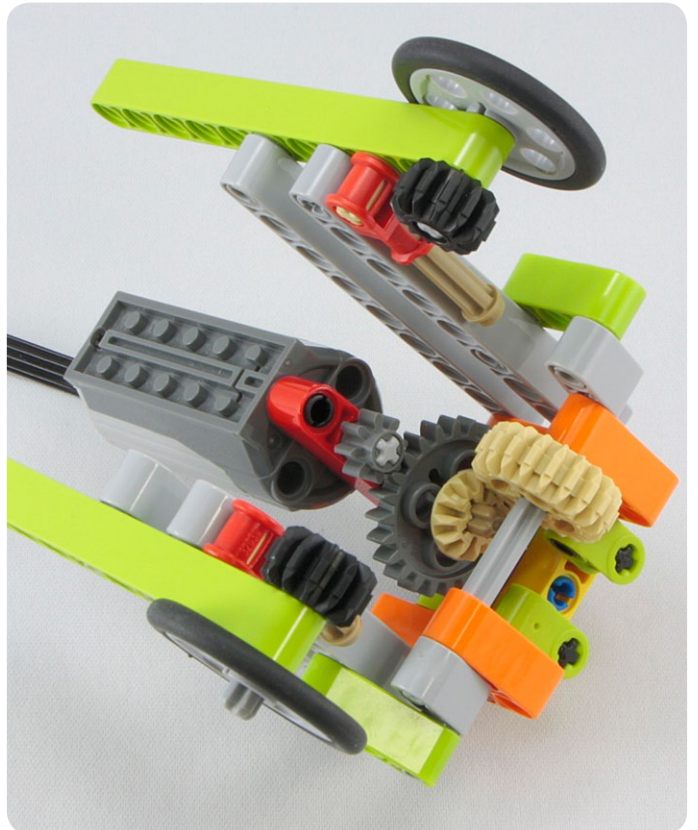
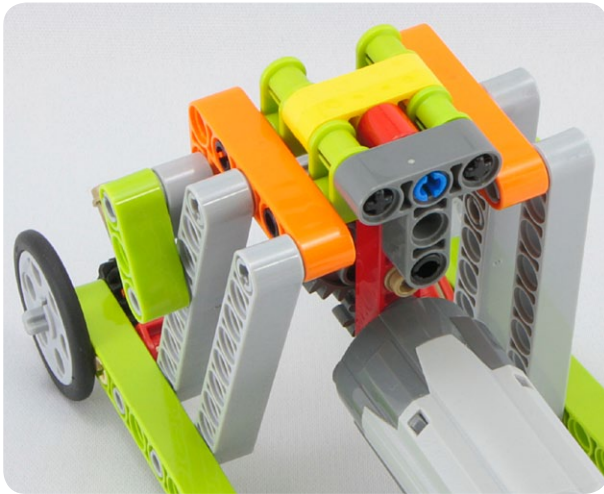
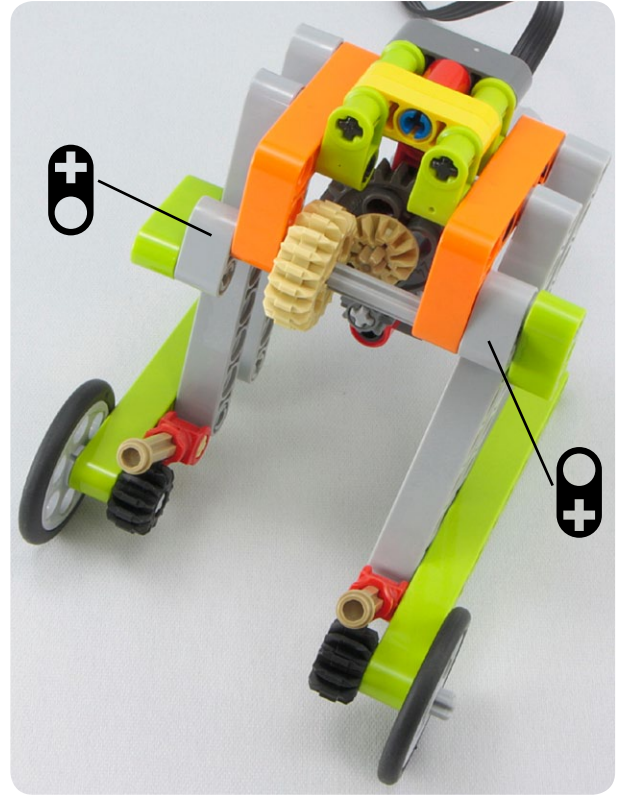
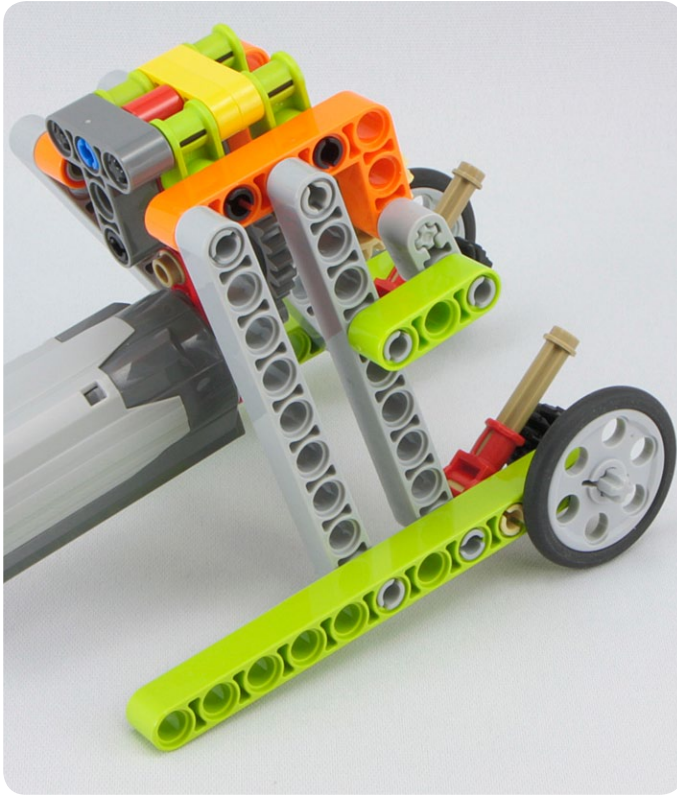




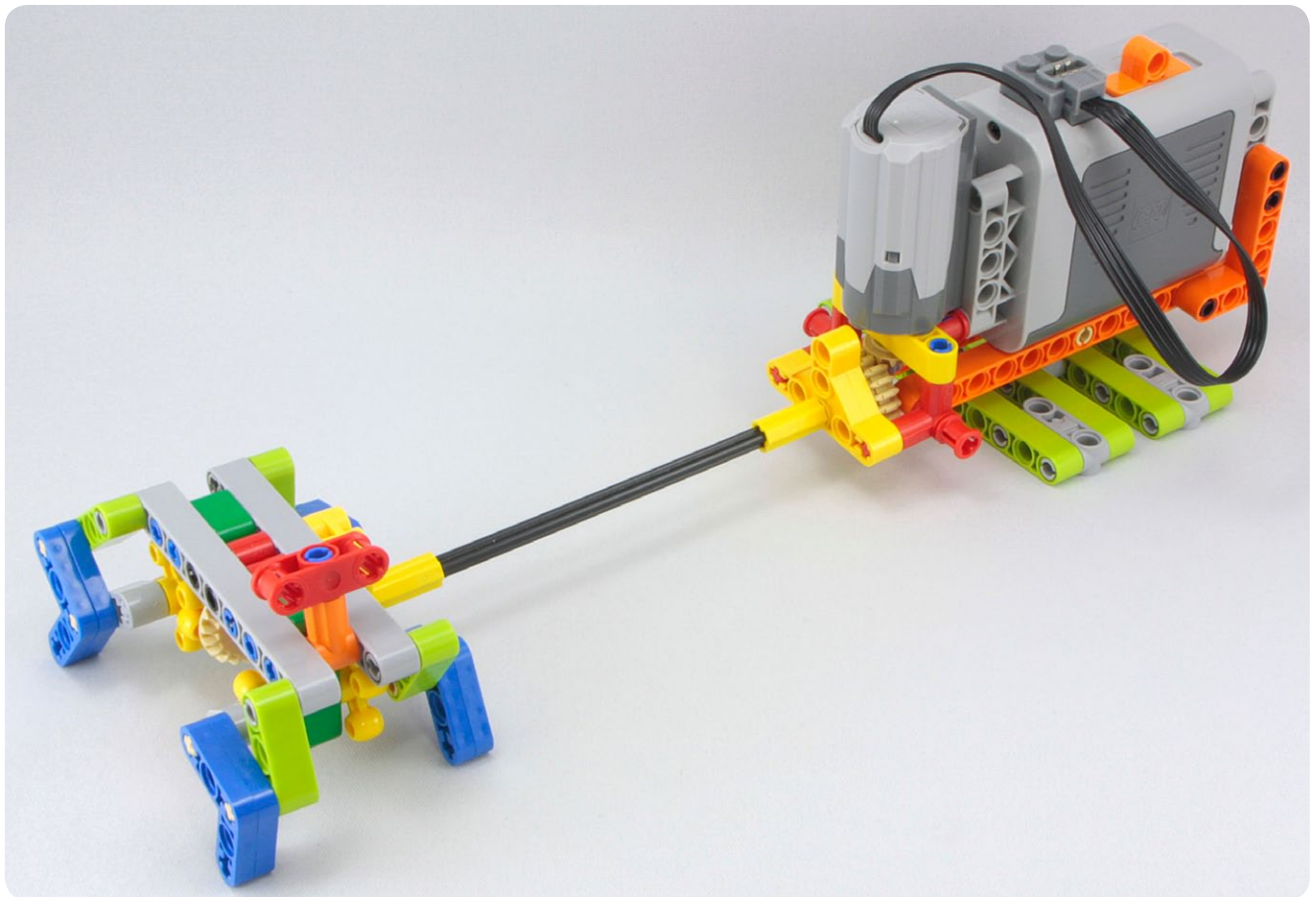
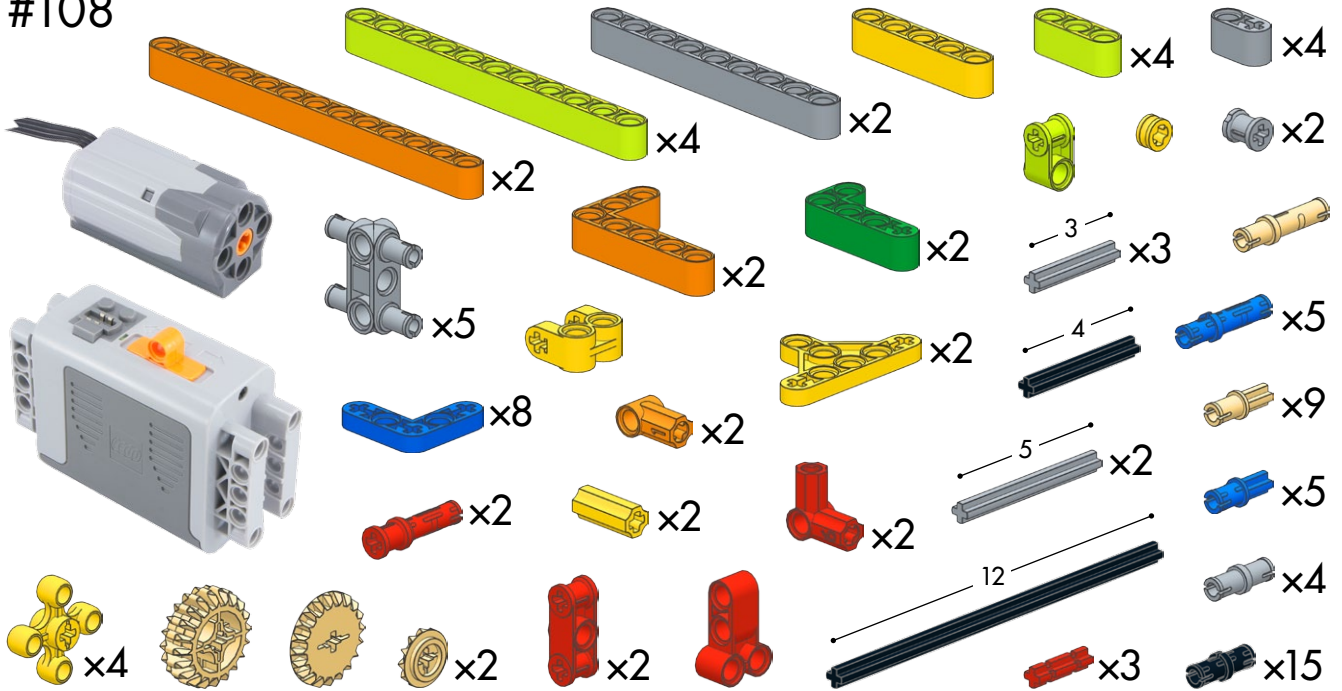


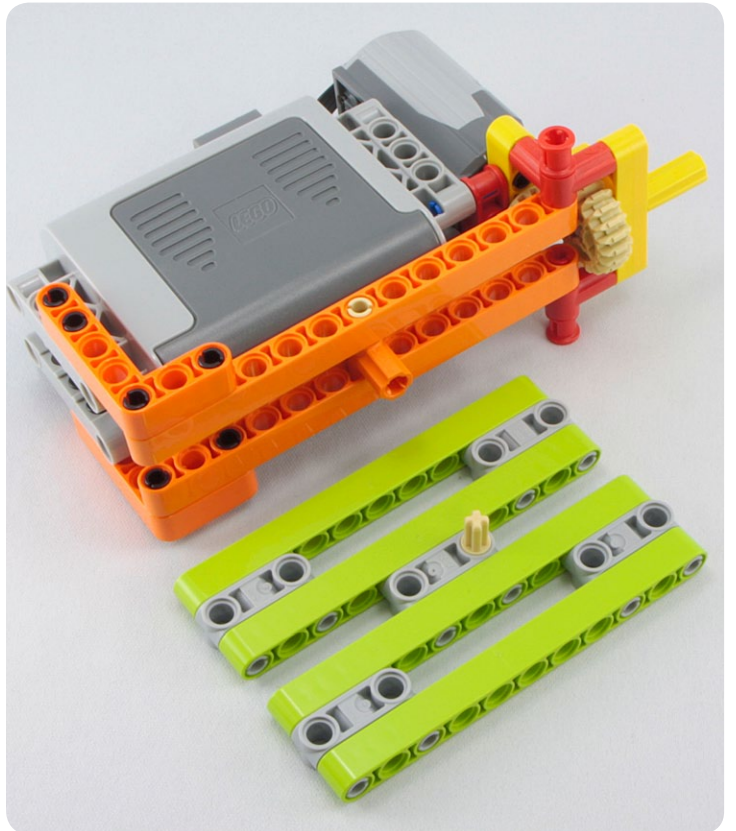
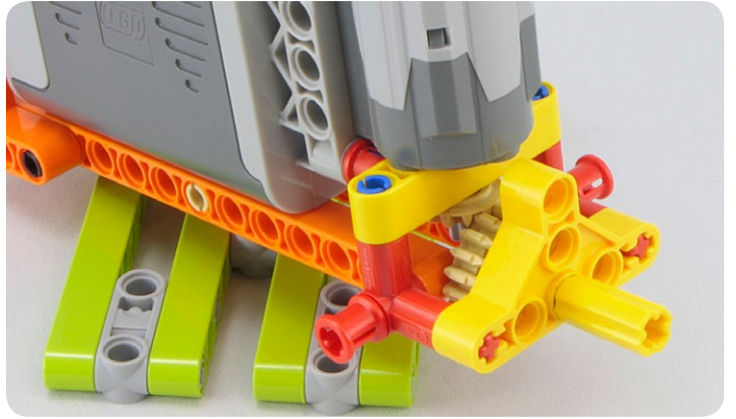
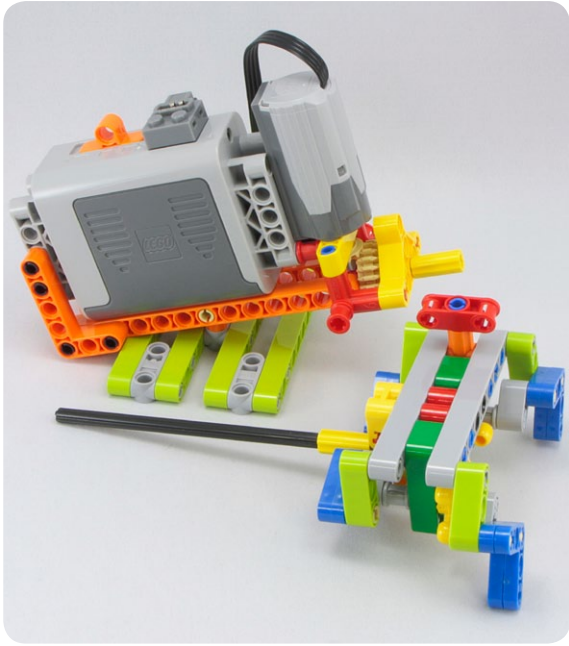


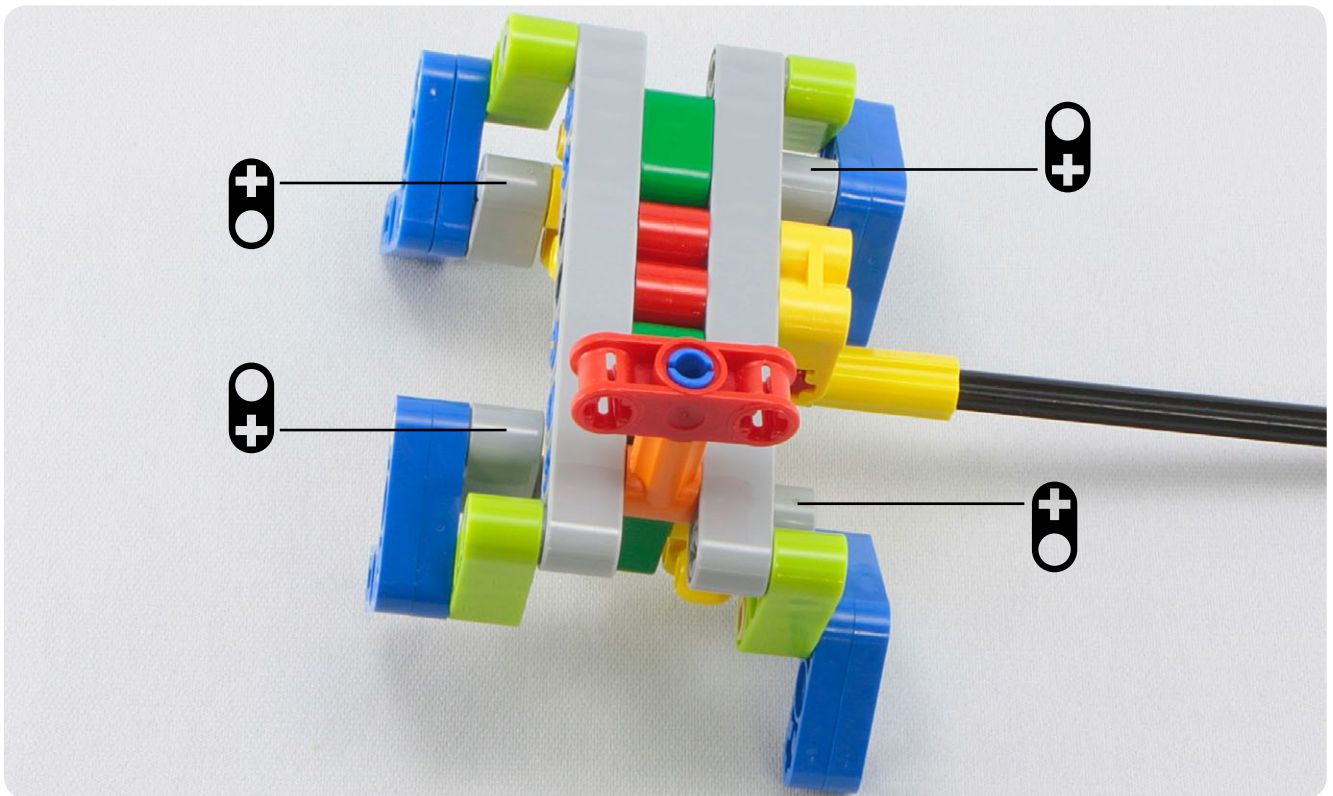
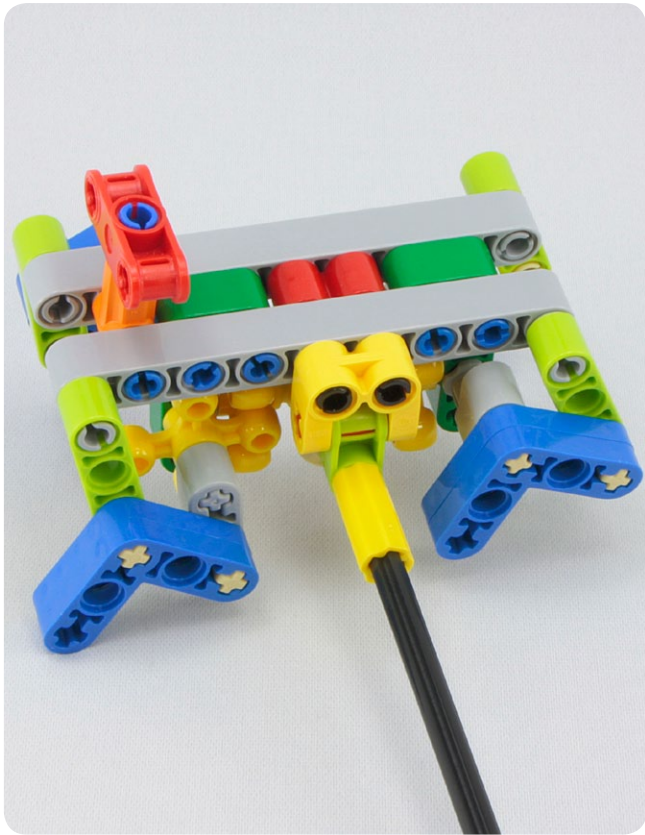


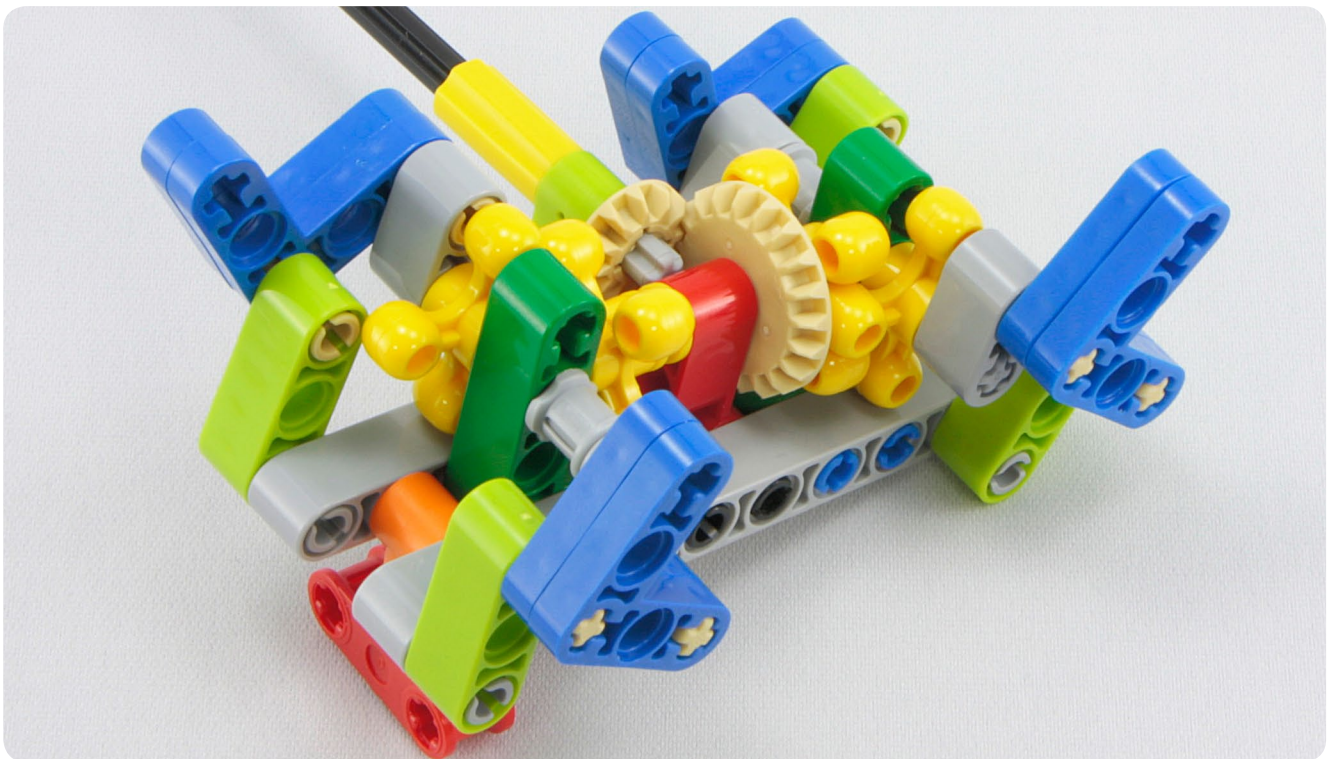
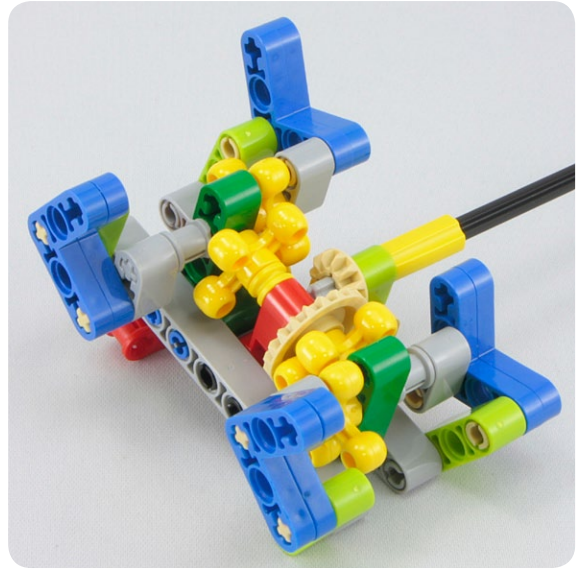
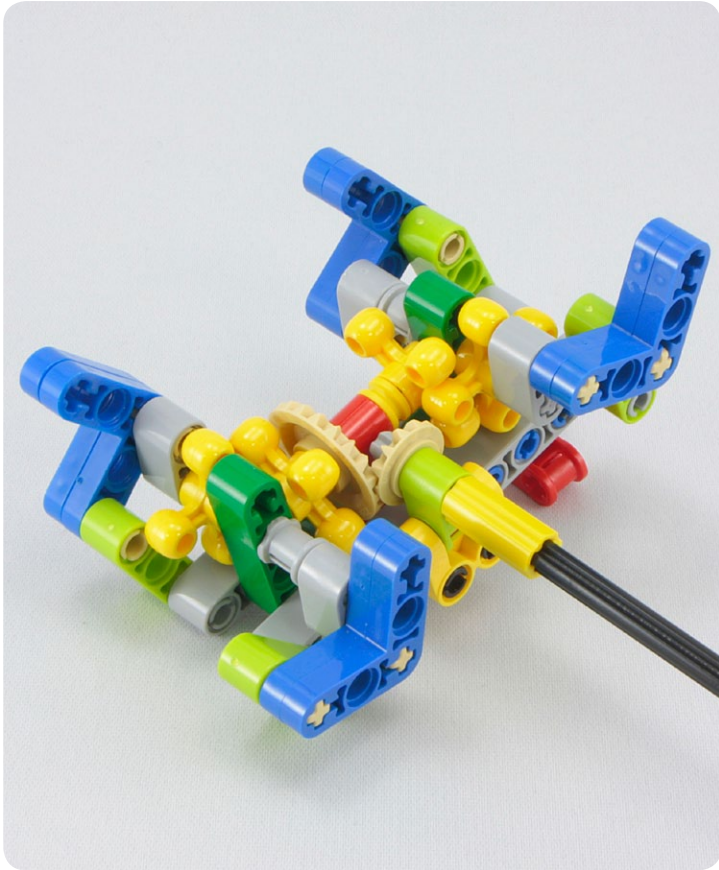


#108

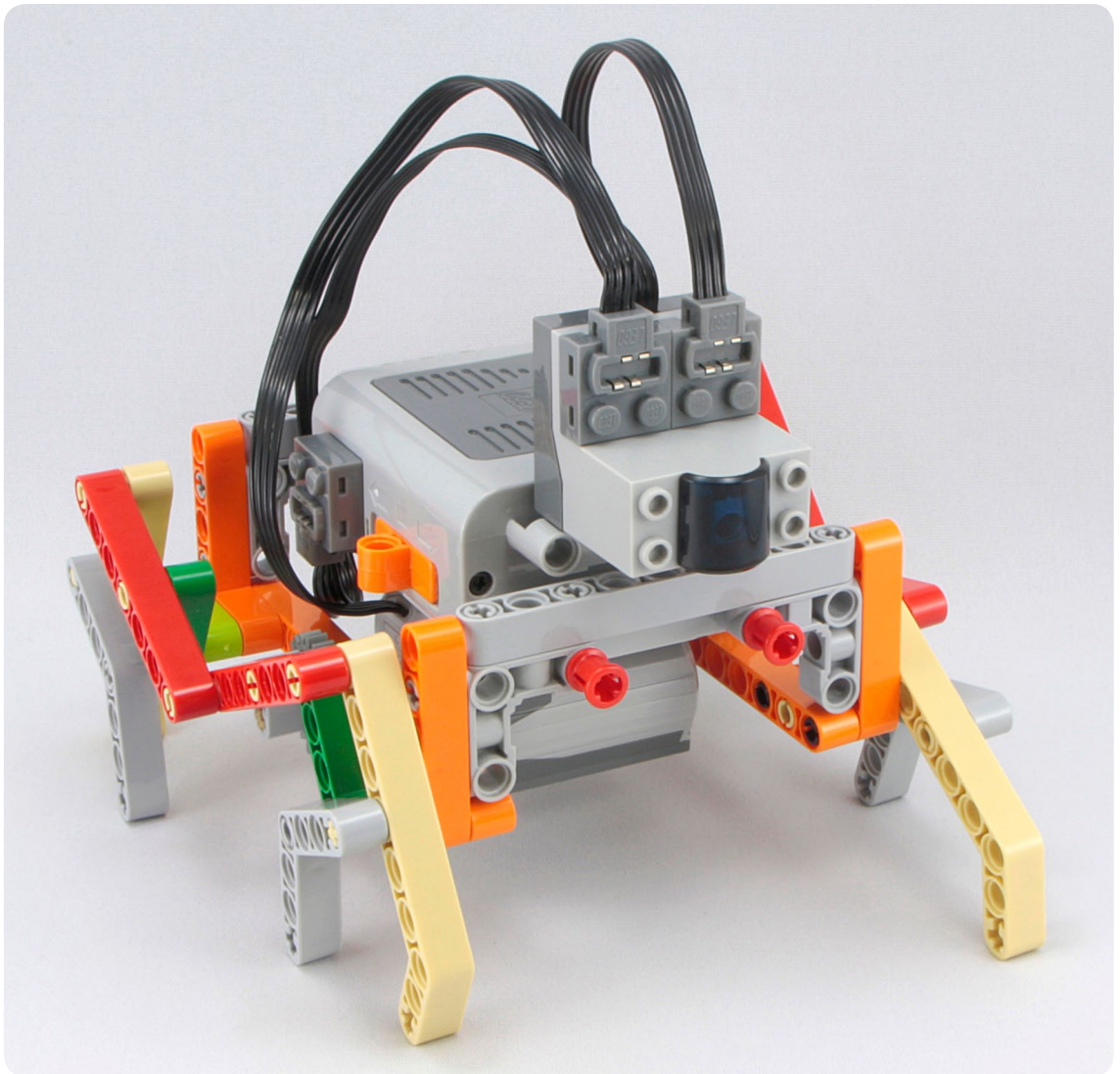
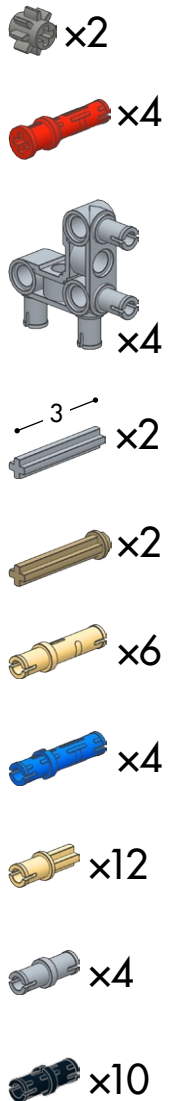


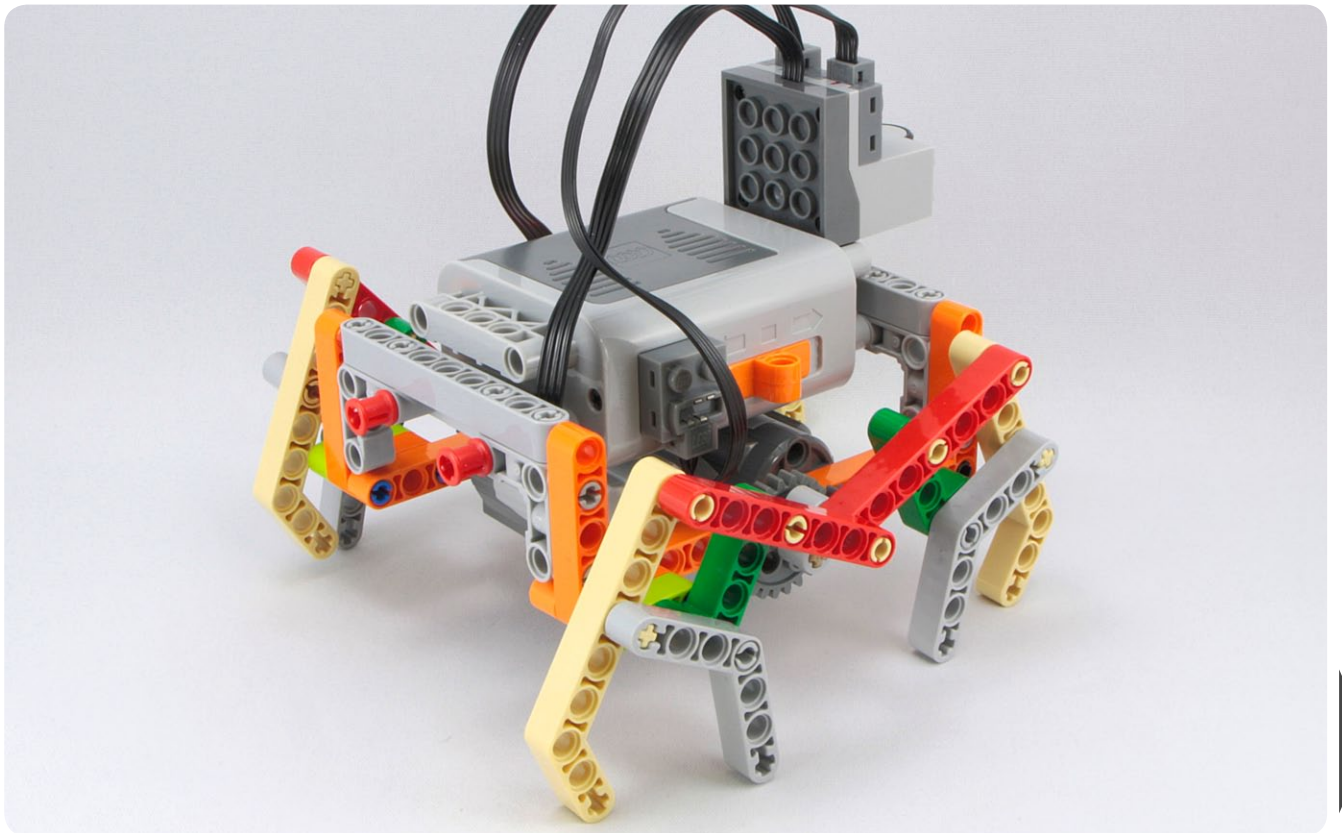
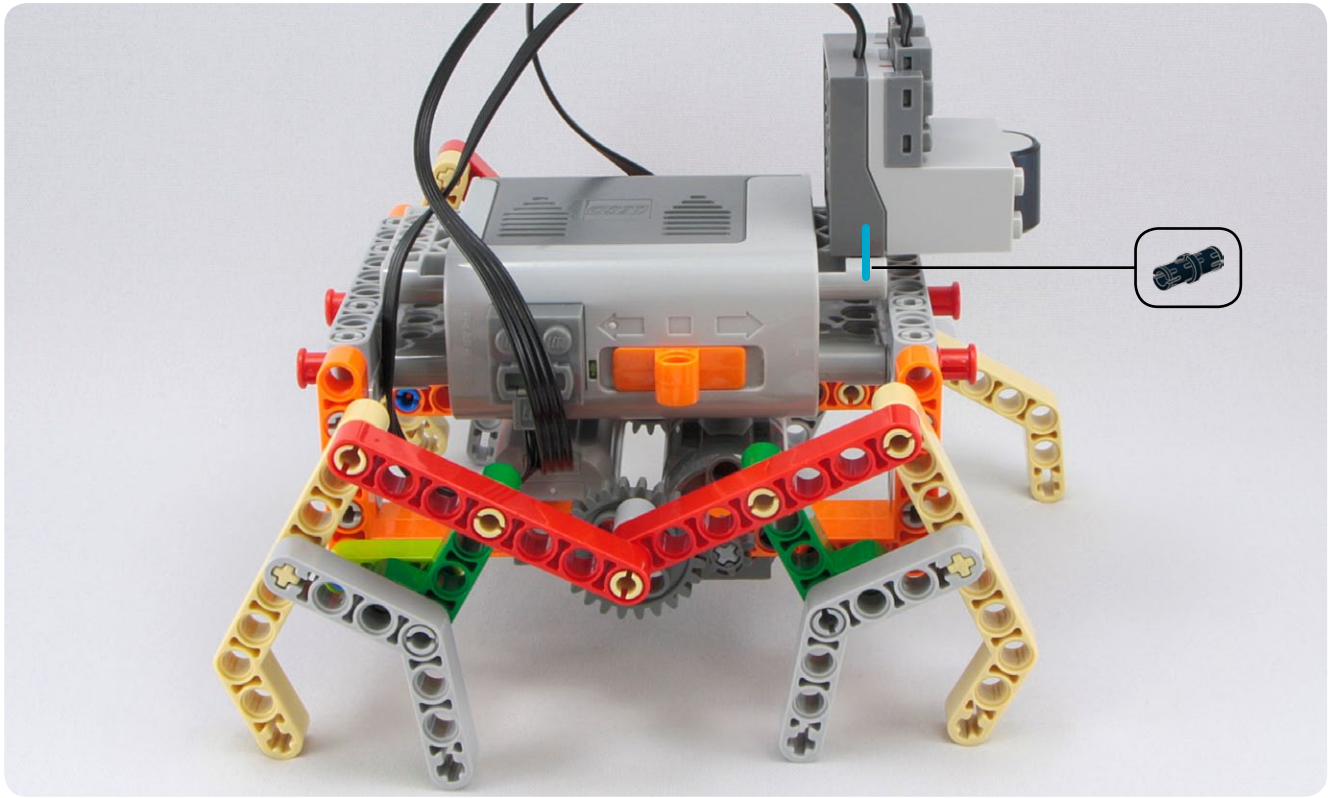




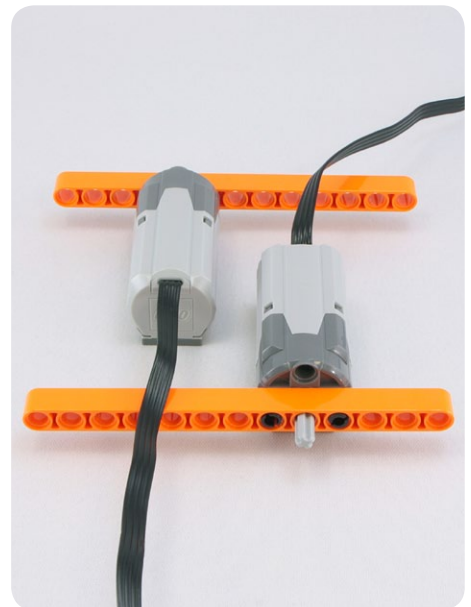
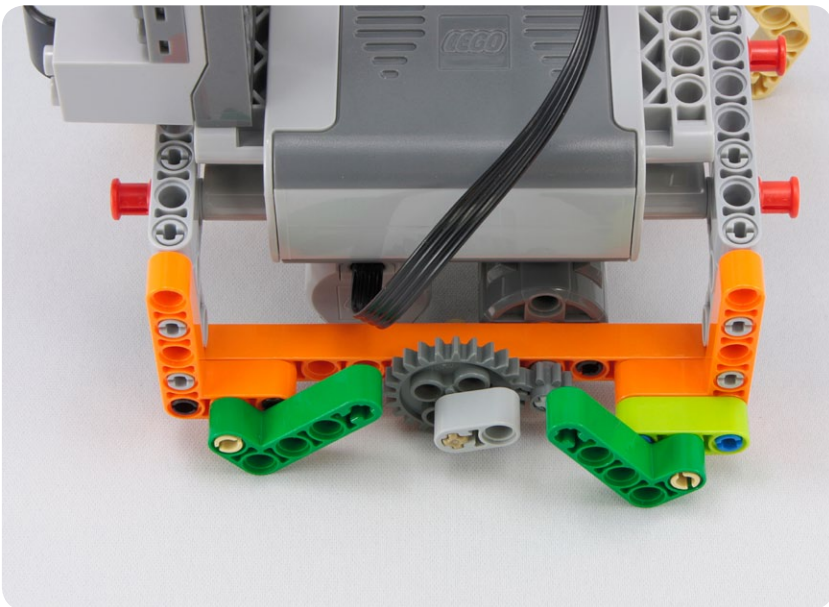
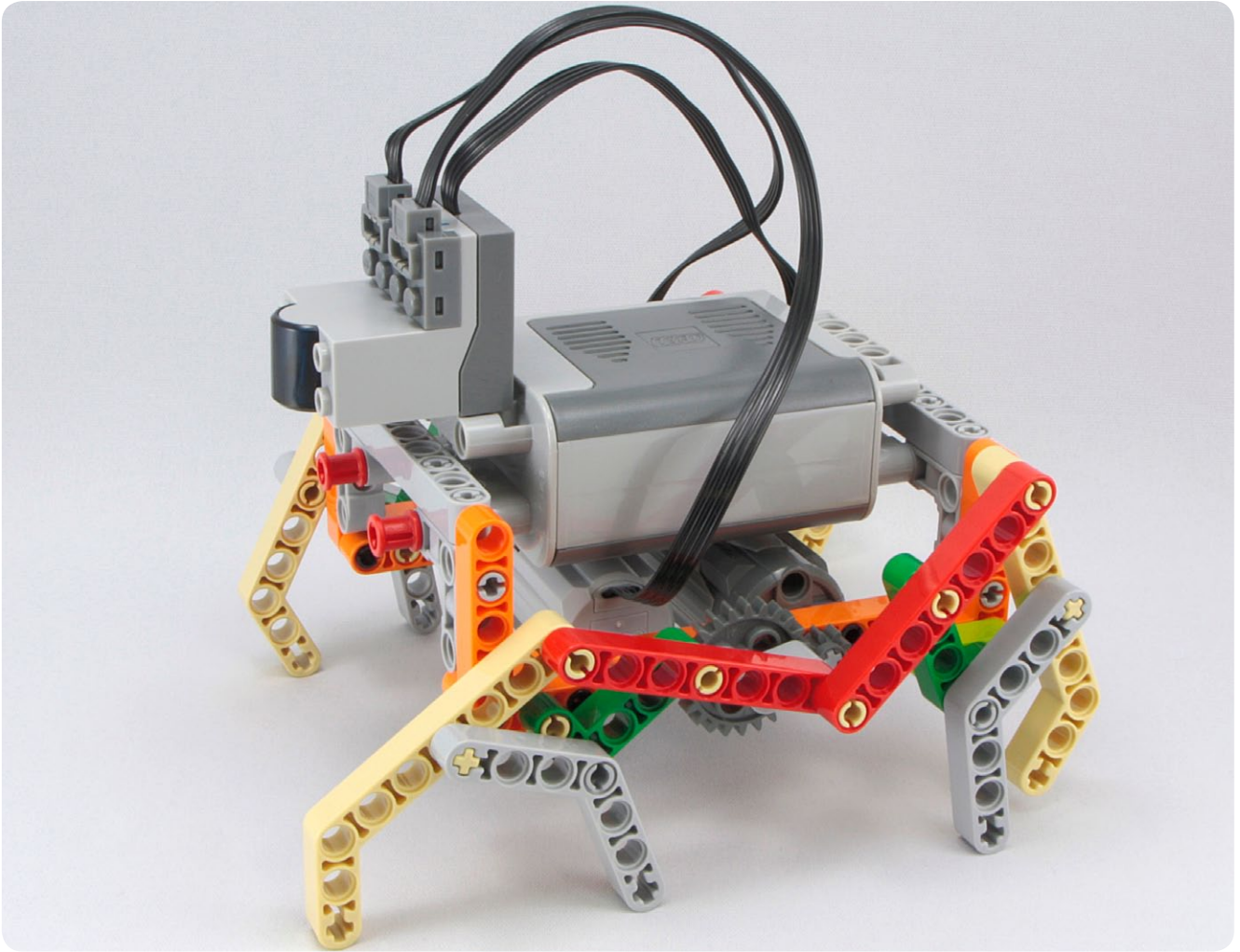


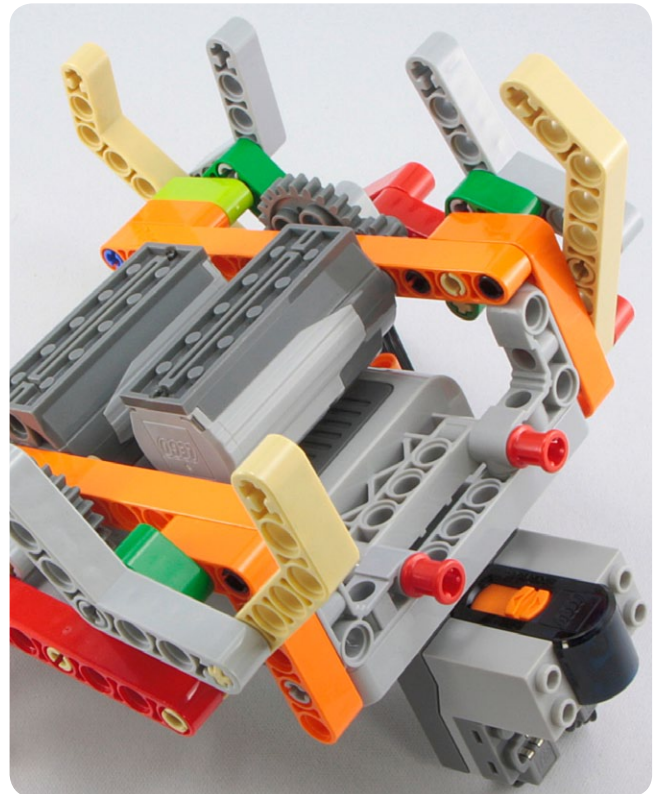
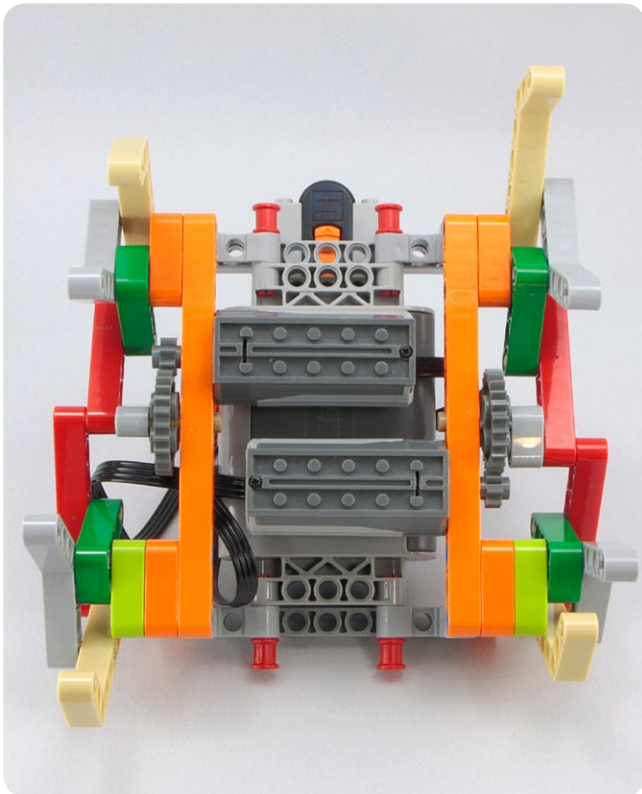
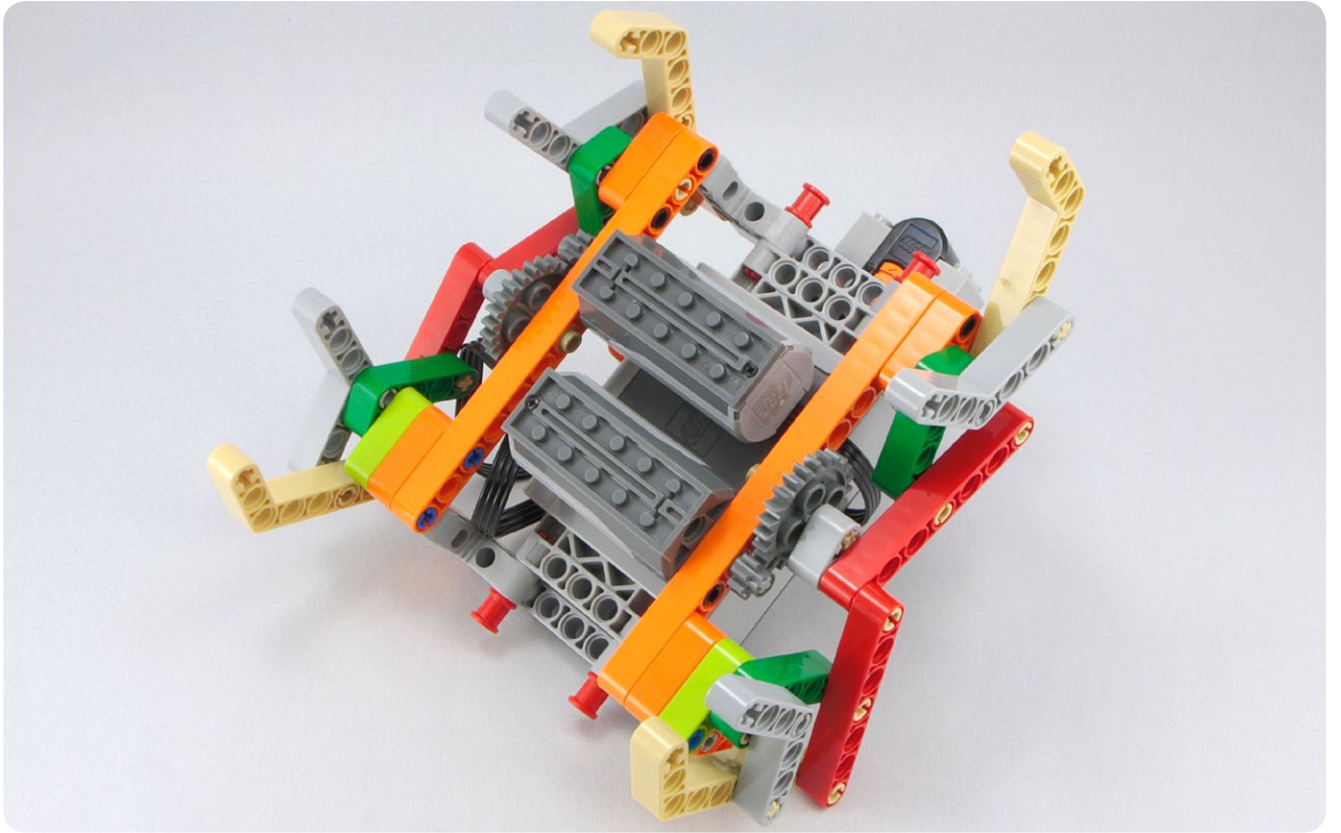
# #109



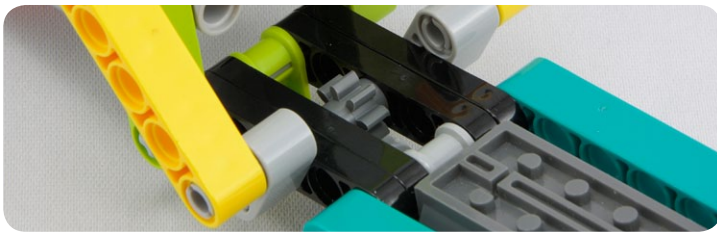
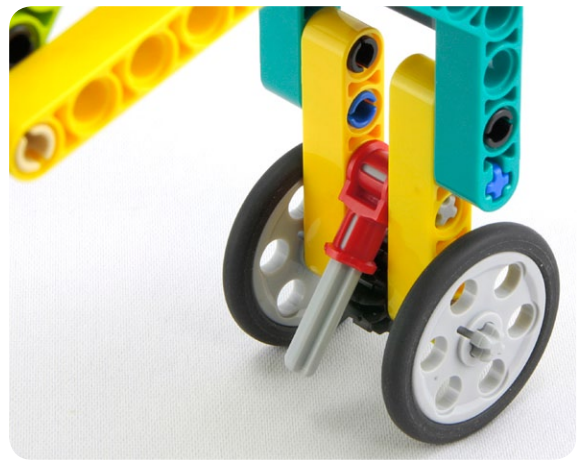
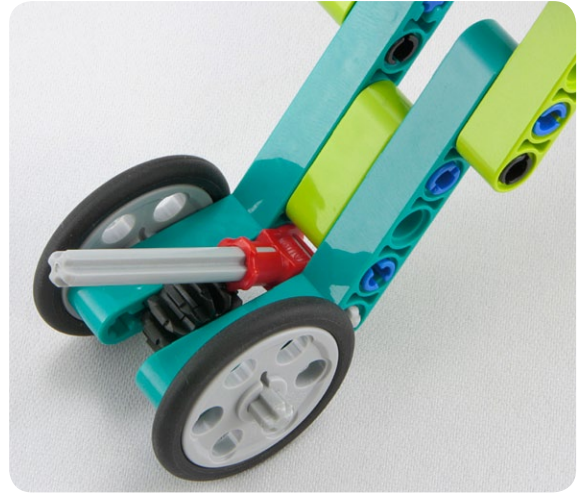




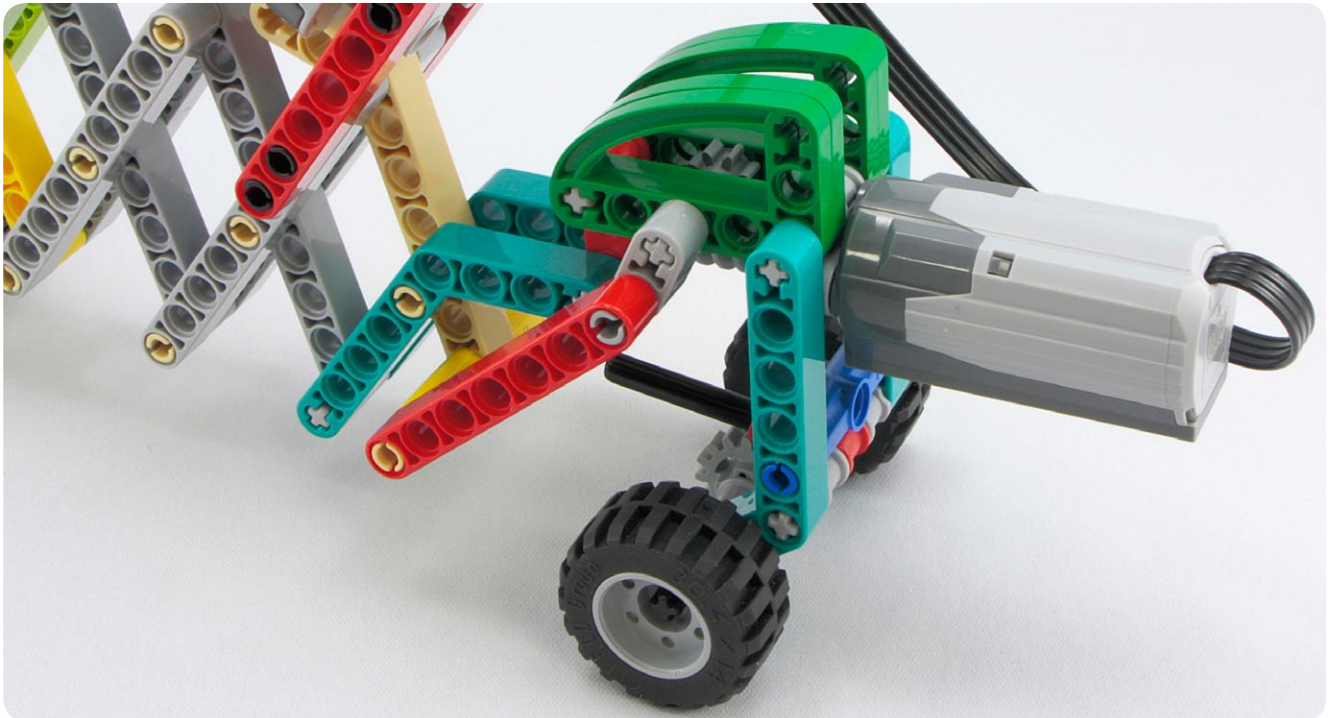
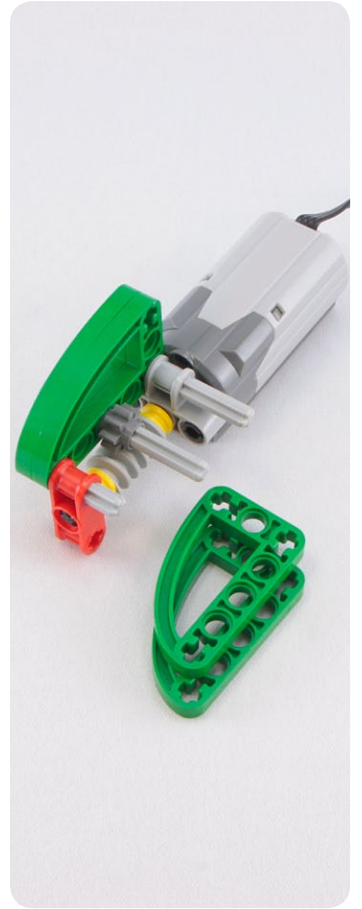
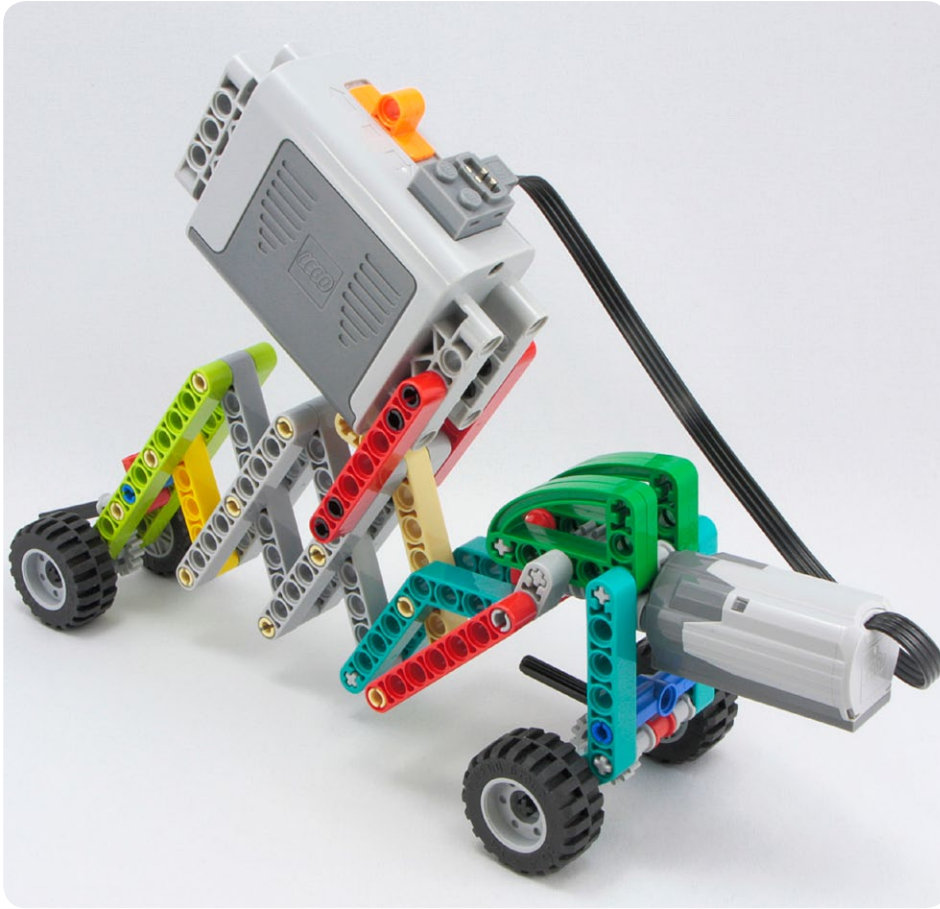


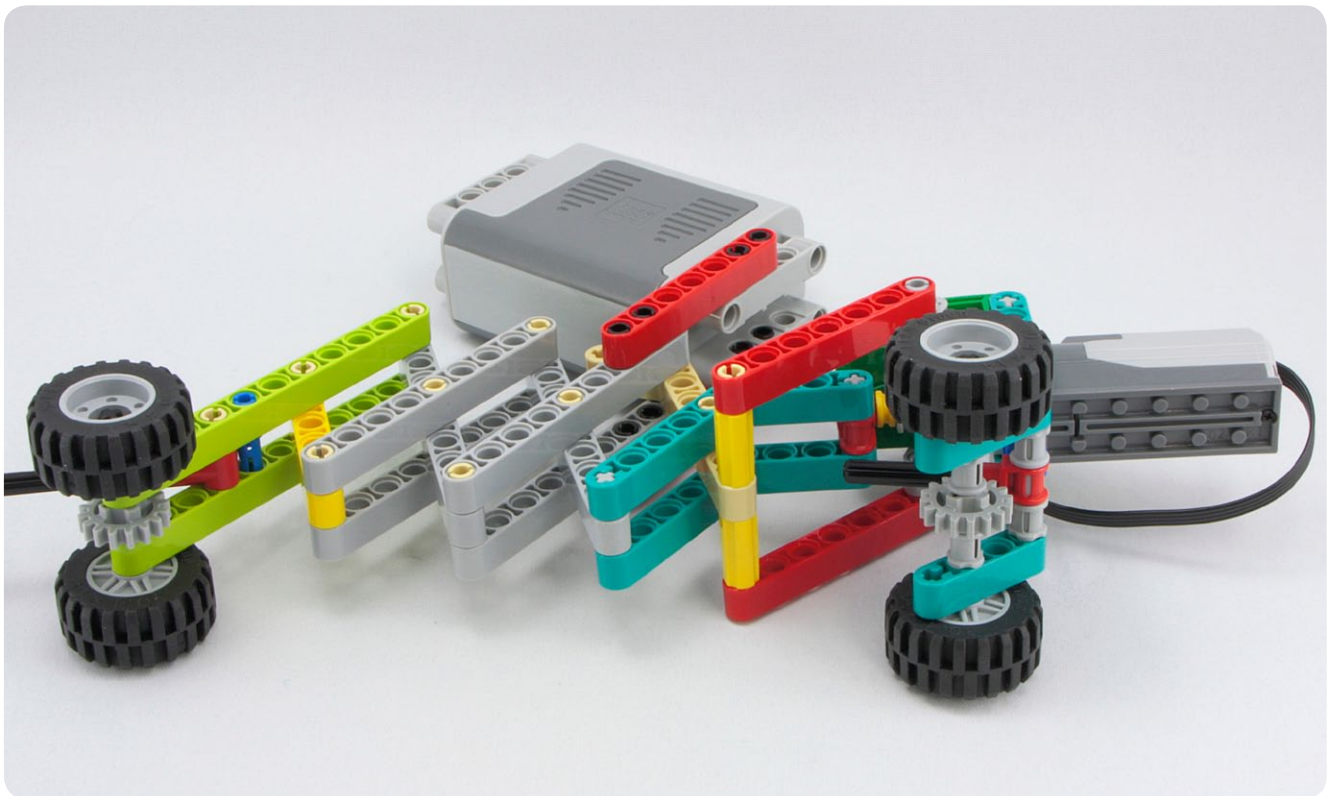
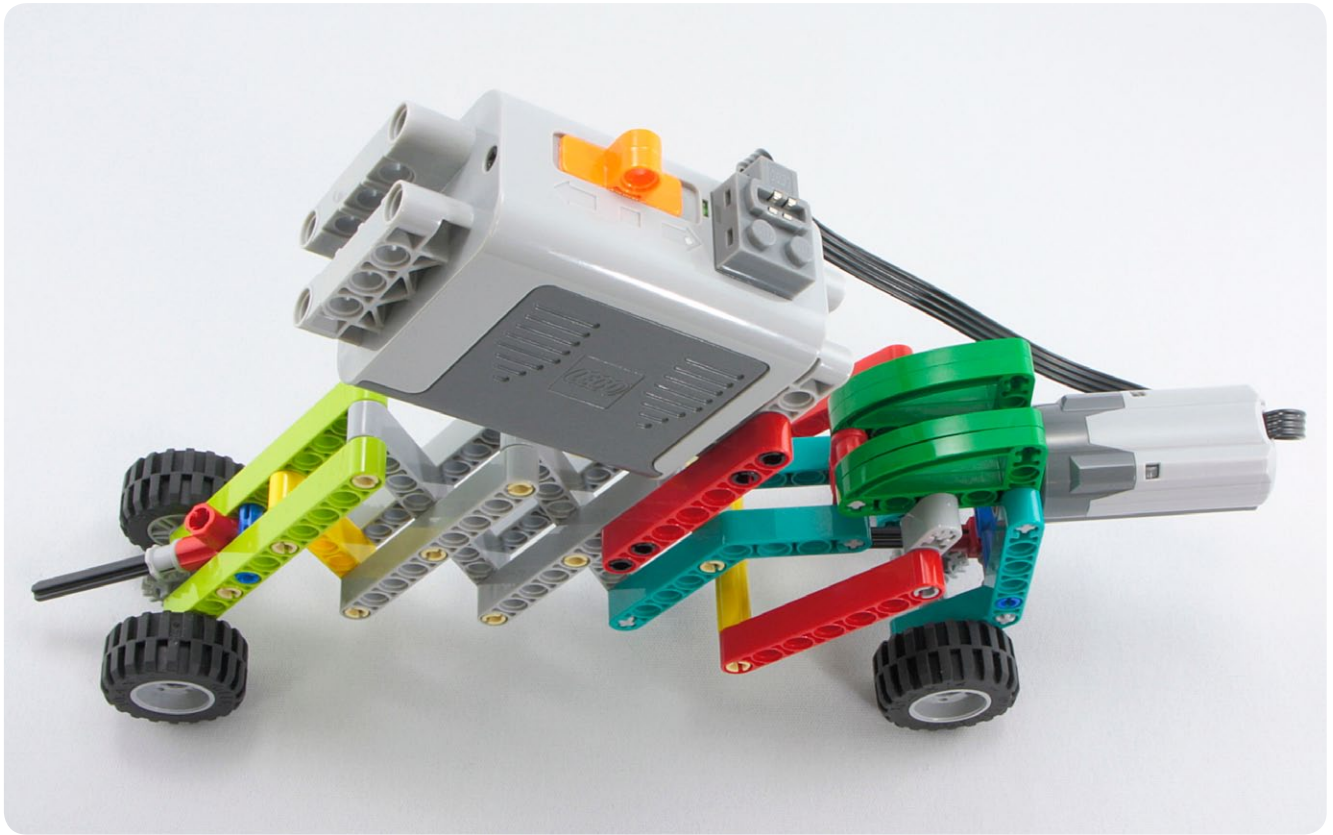


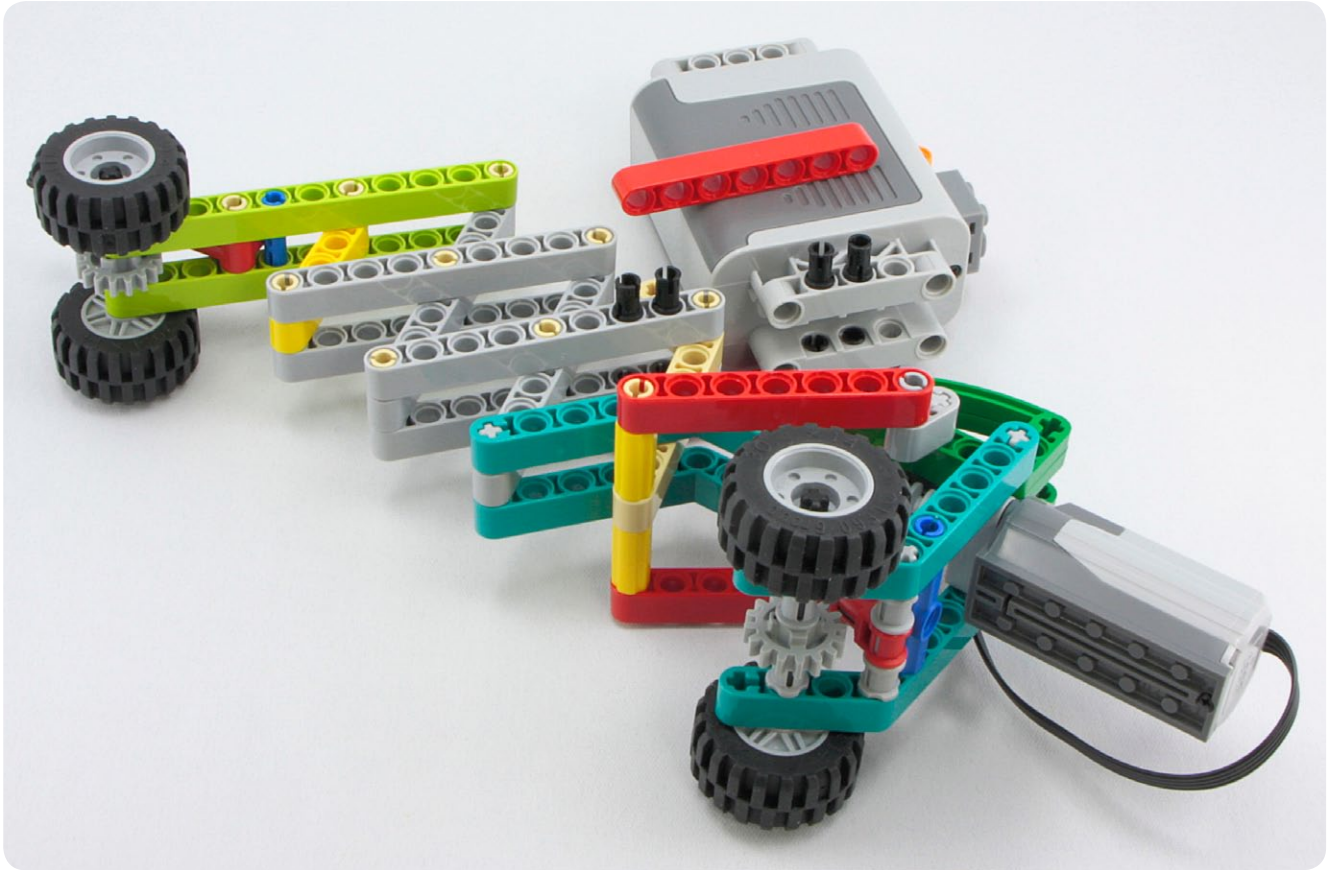




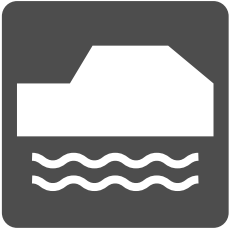






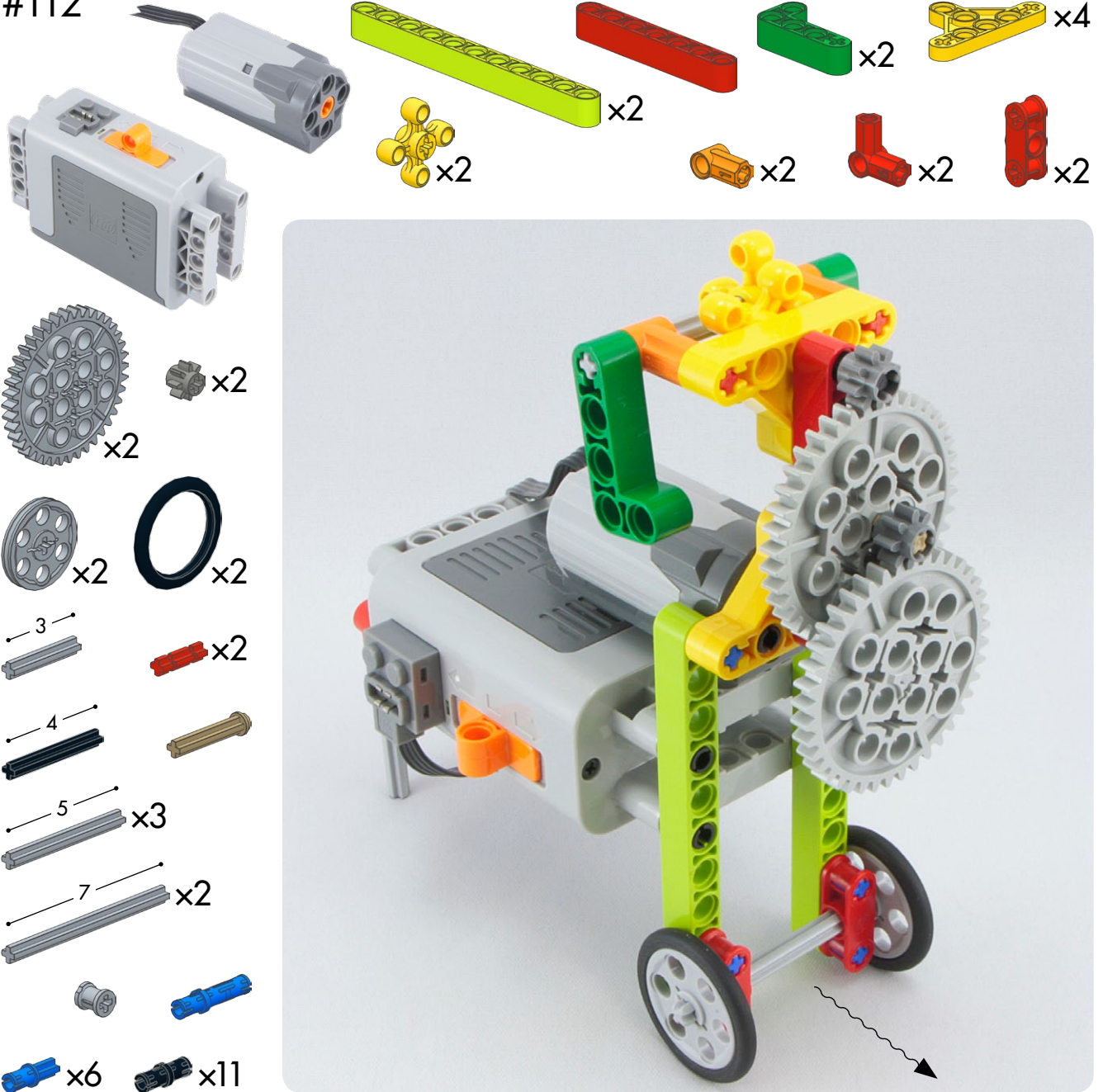


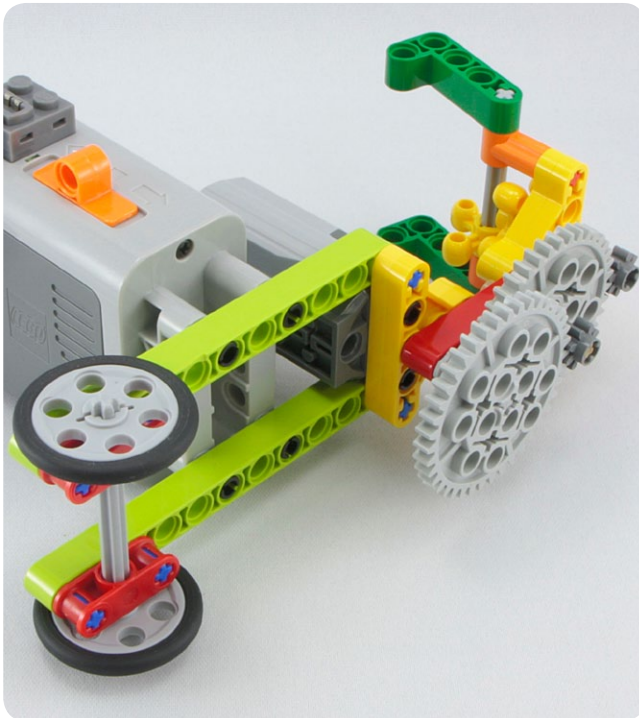
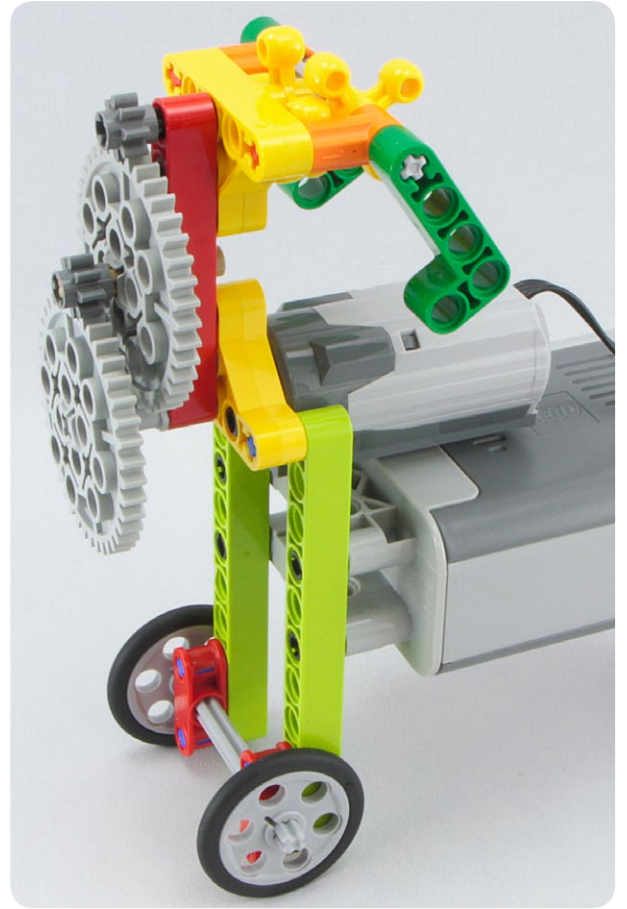




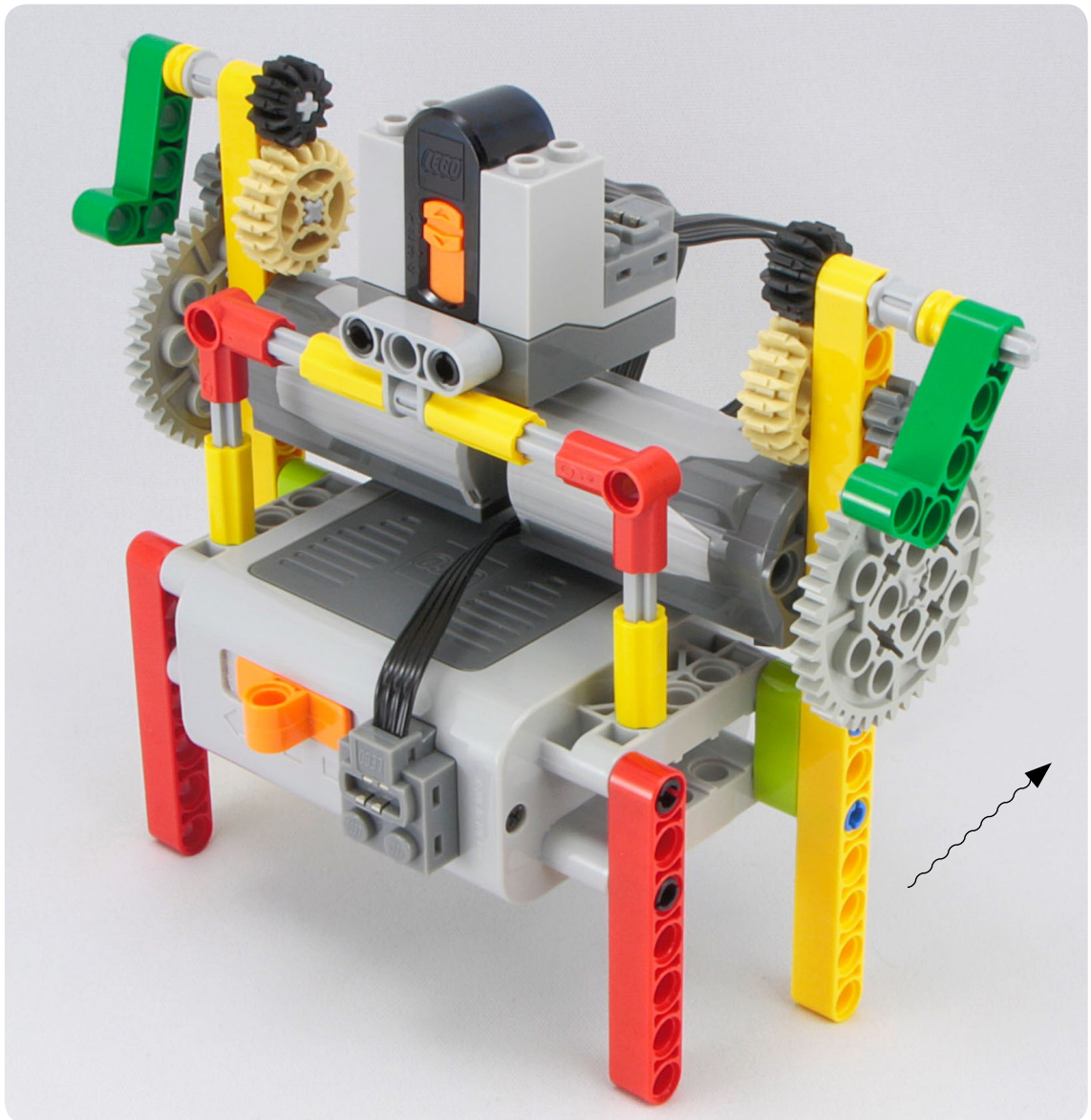
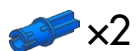
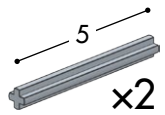
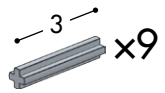
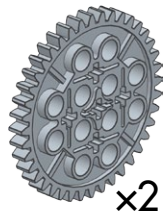
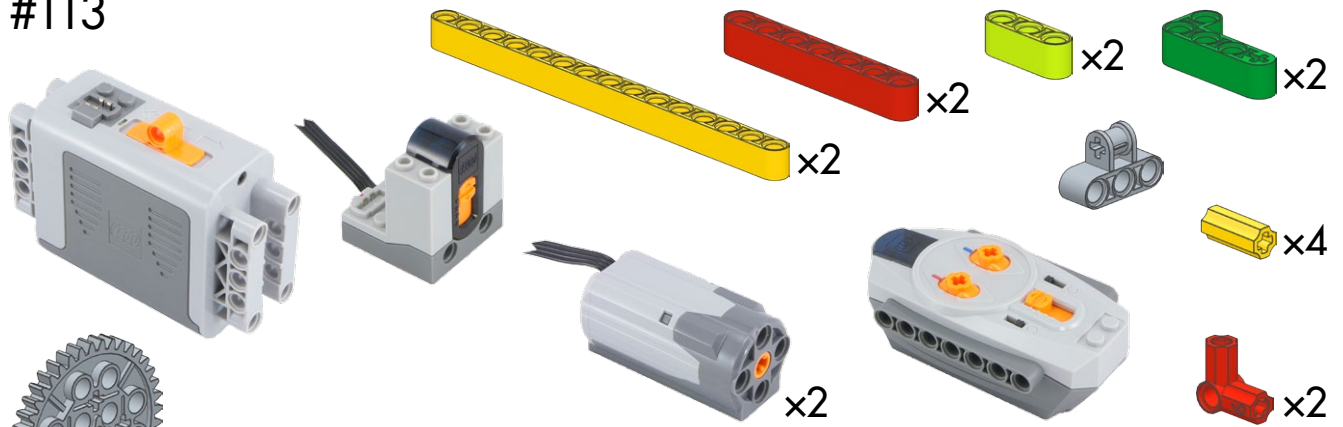
# Moving through vibration

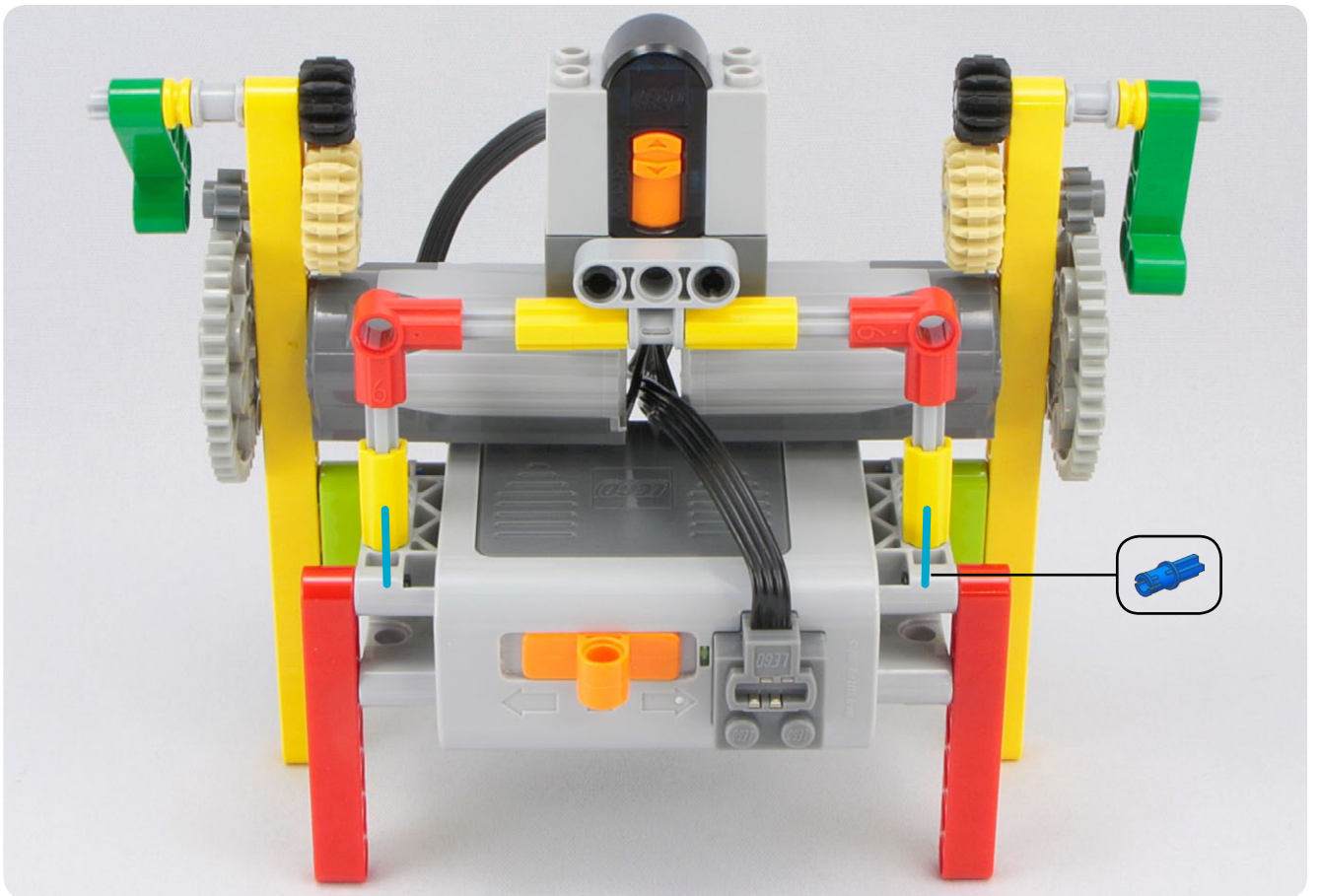
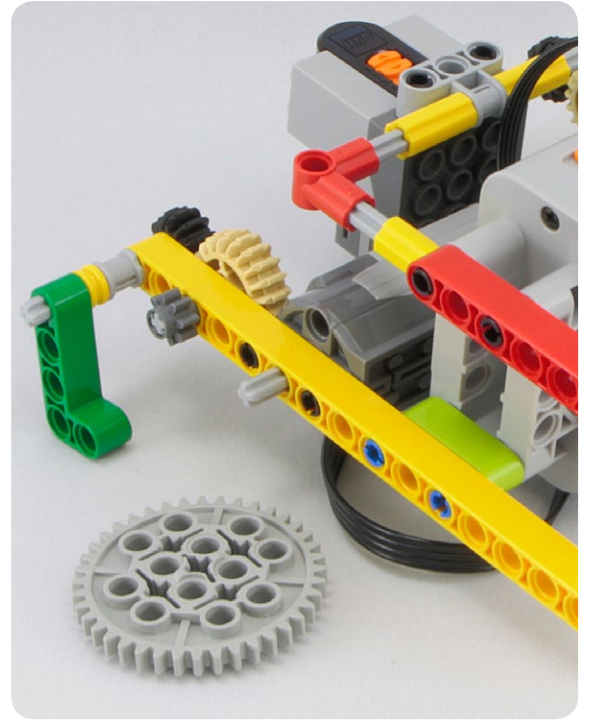
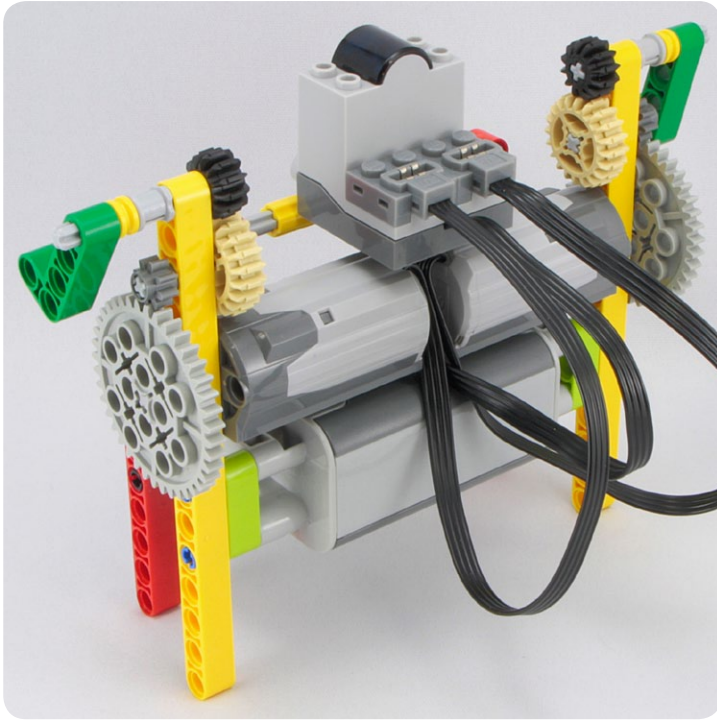
#112





# #113

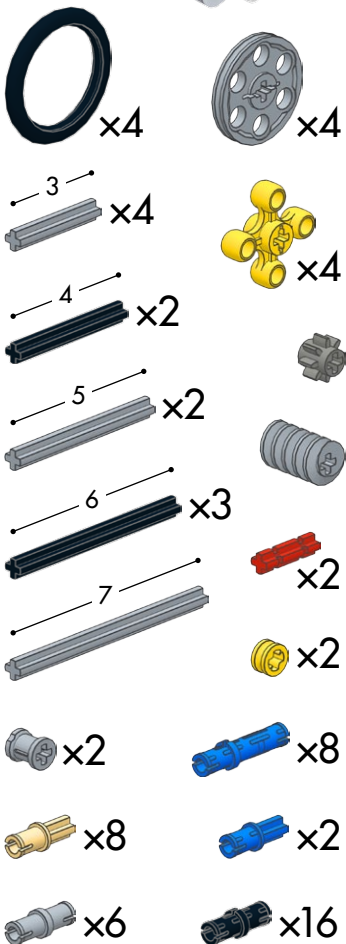
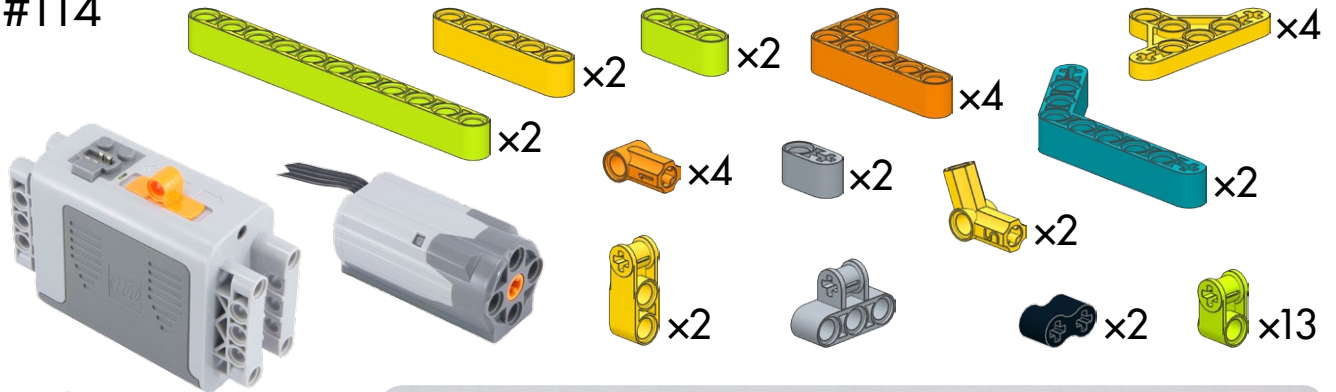


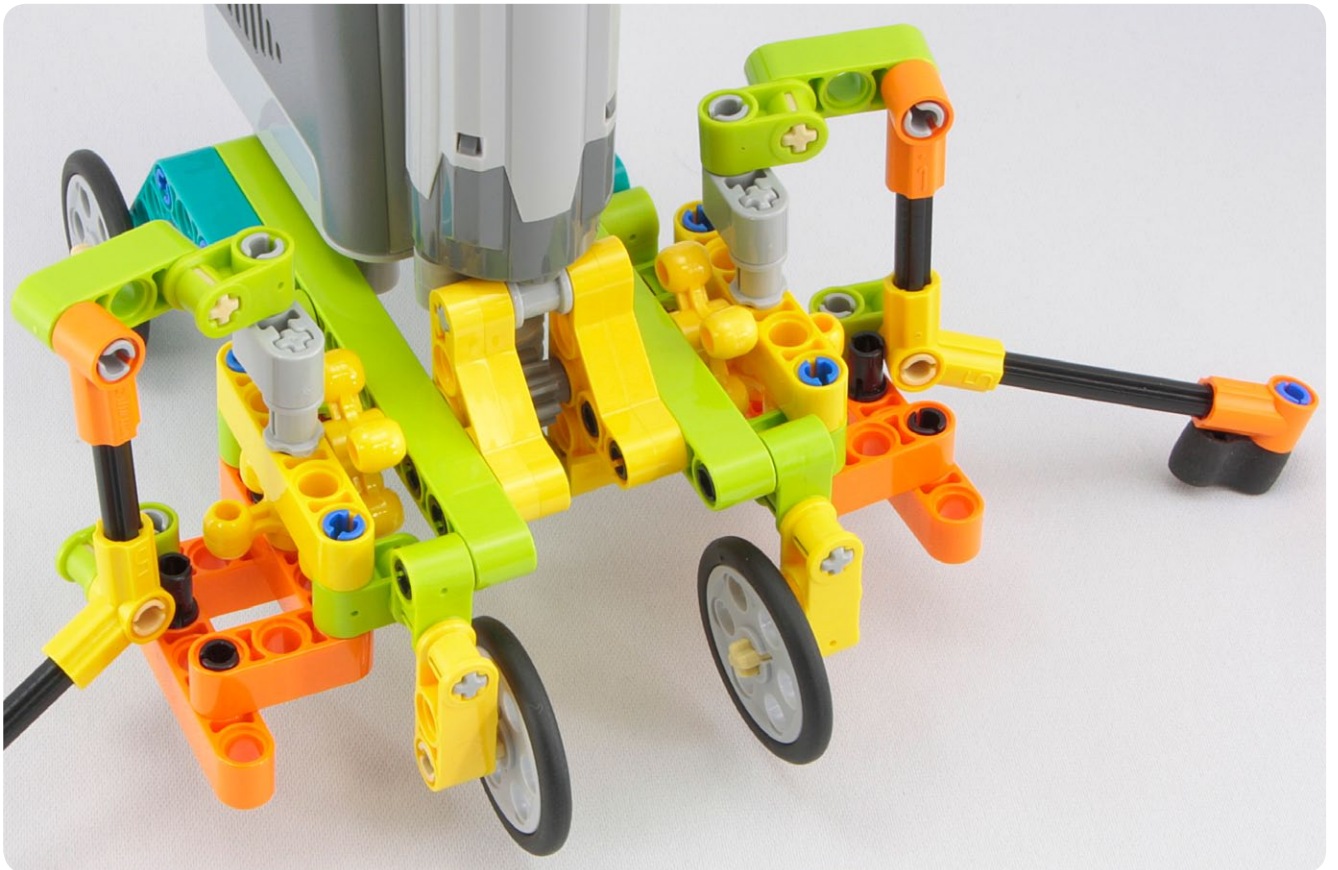


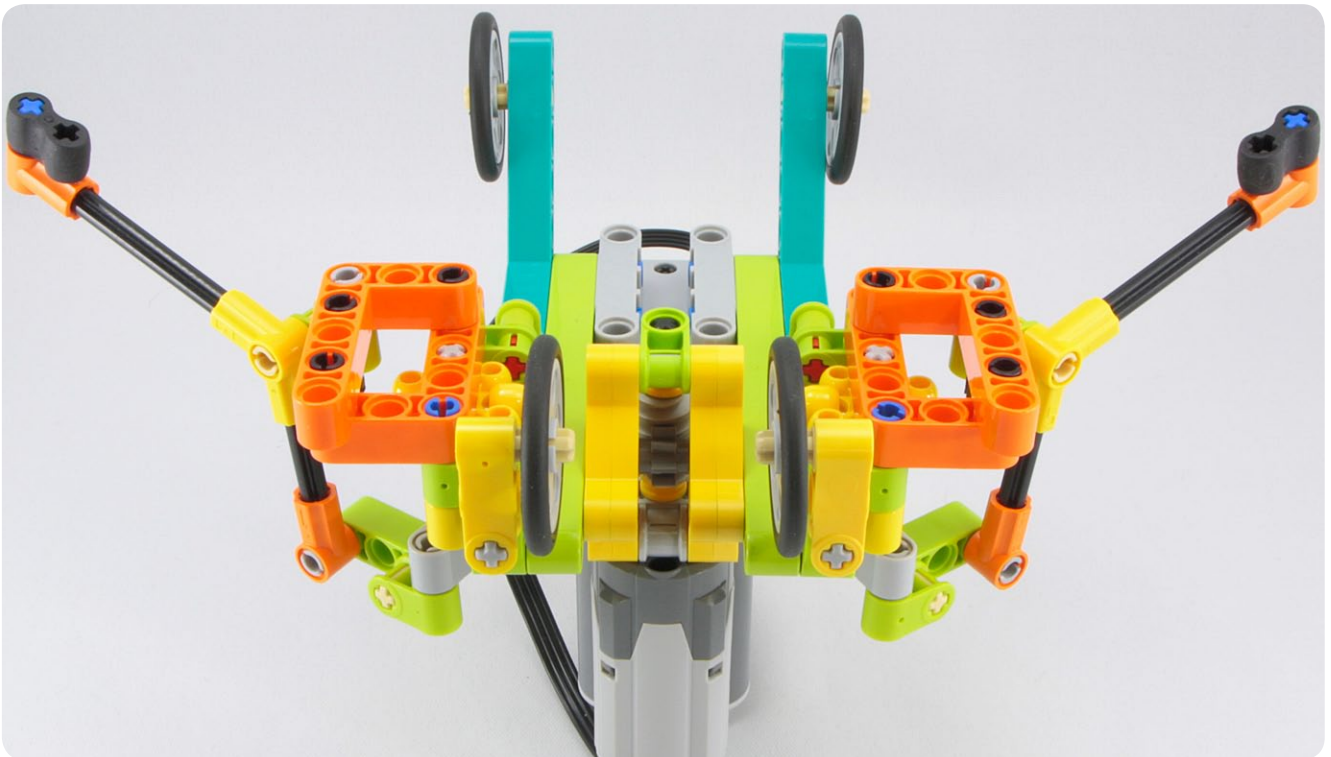
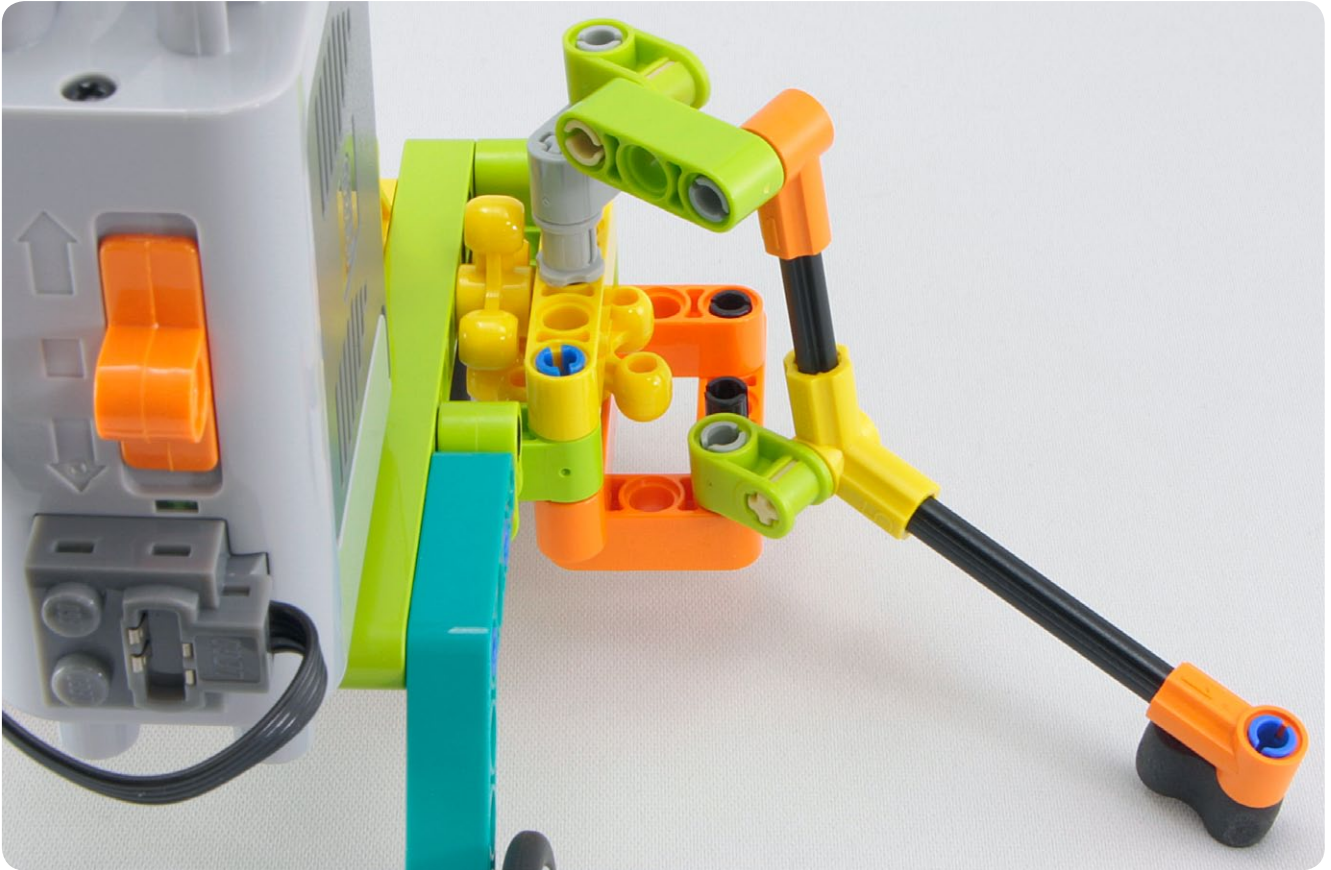


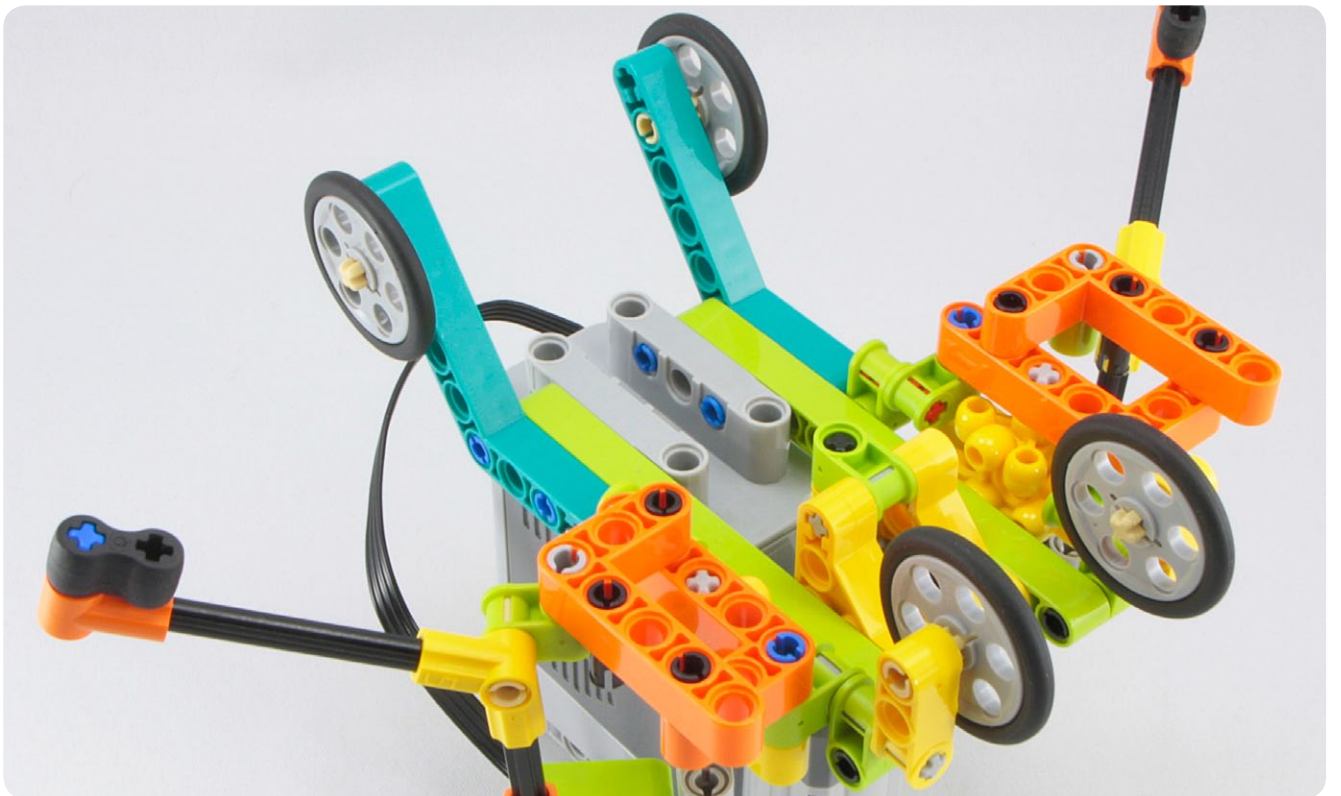
# Moving in other ways

#114













# PART 3

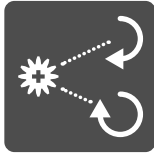
# Special Mechanisms



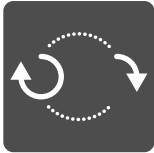
250



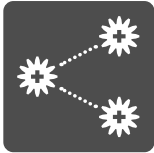
264



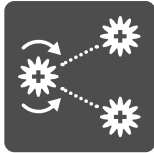
288



256



272

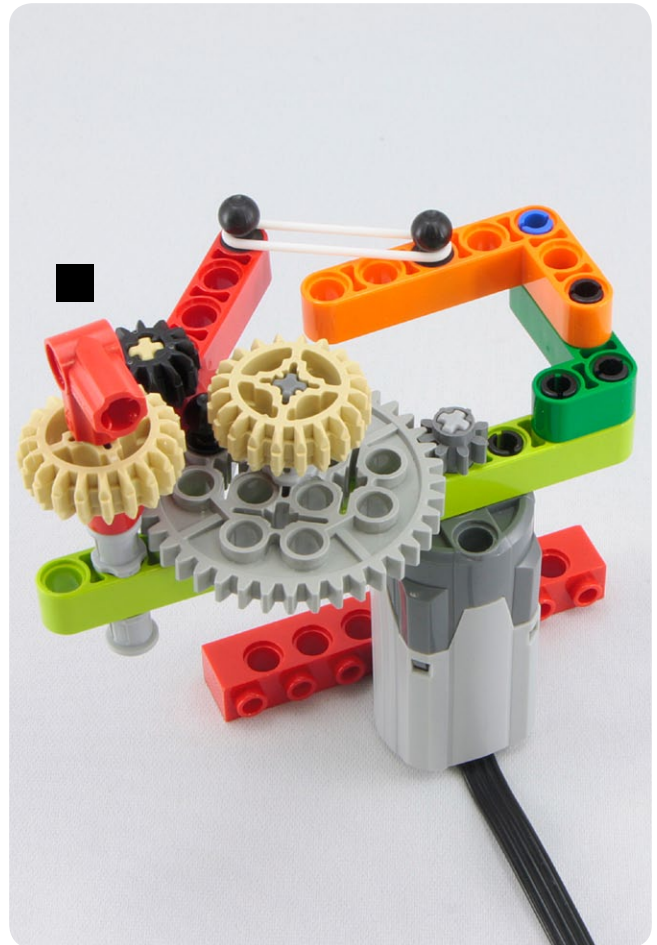
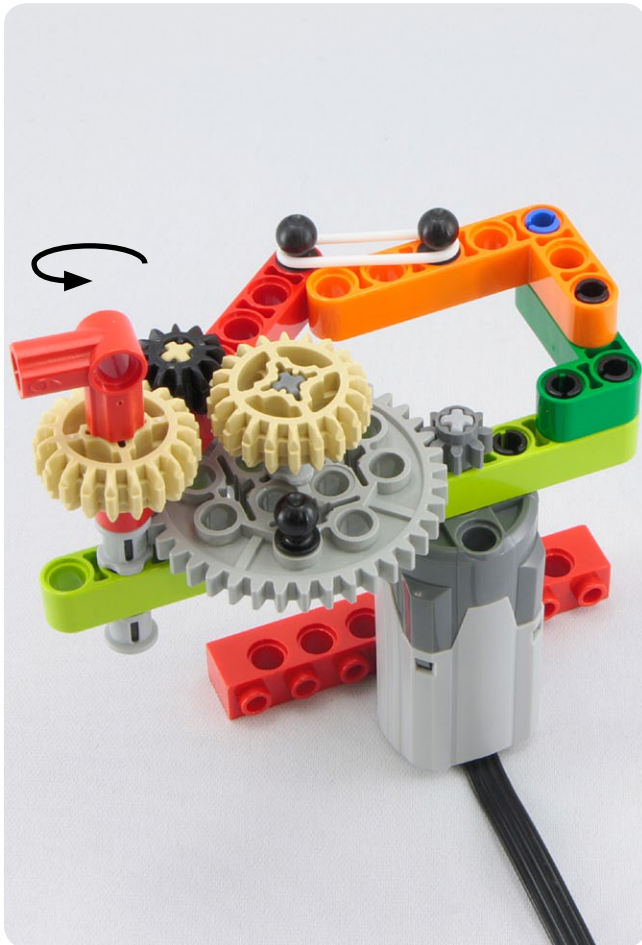
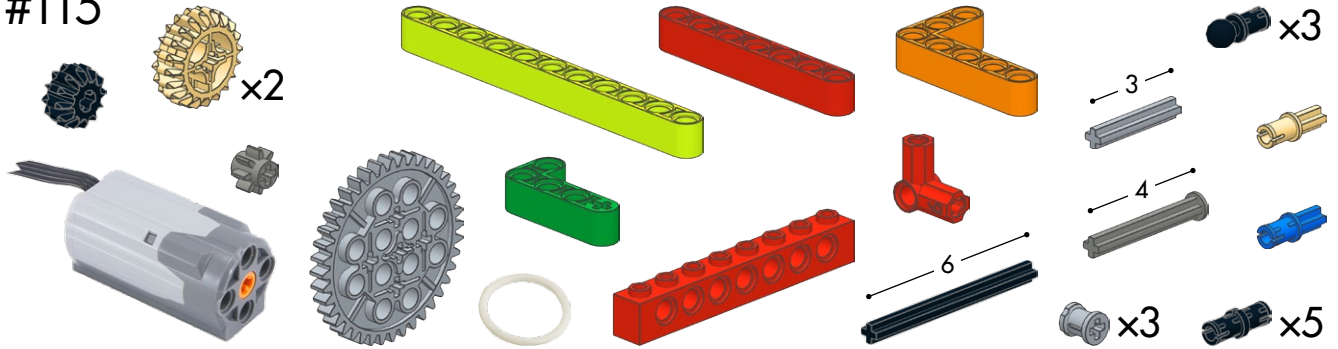


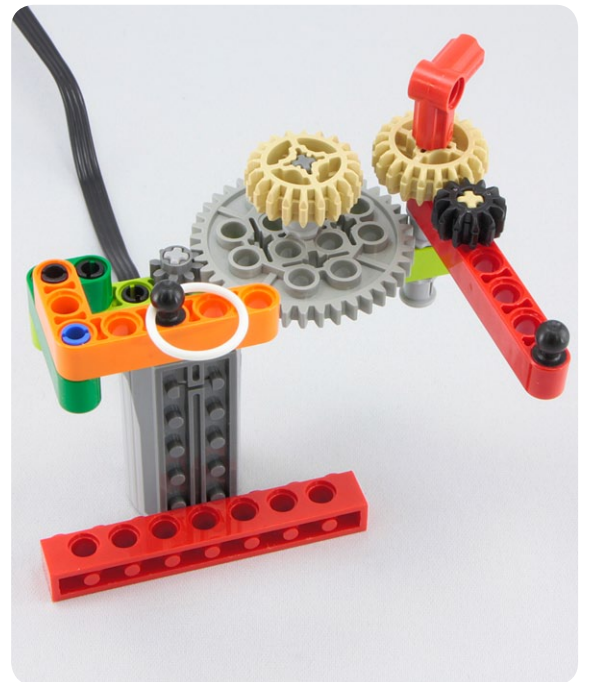
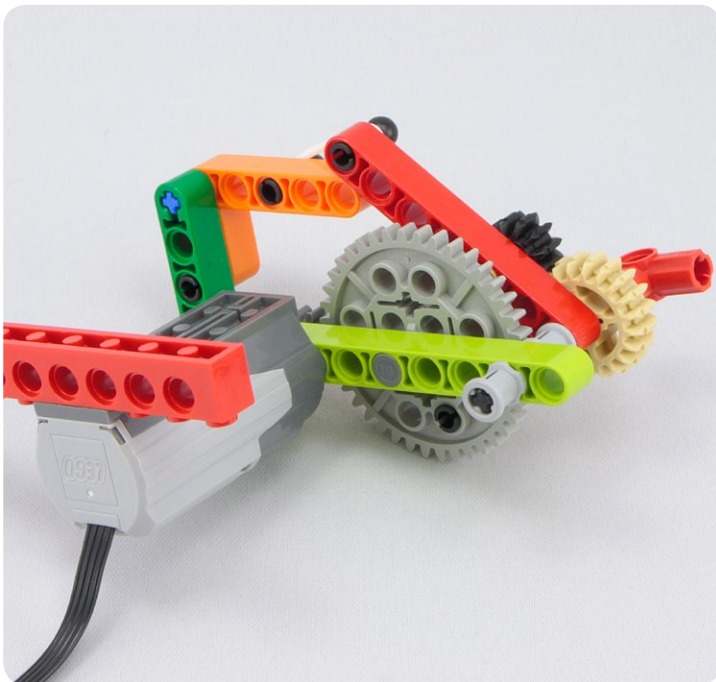
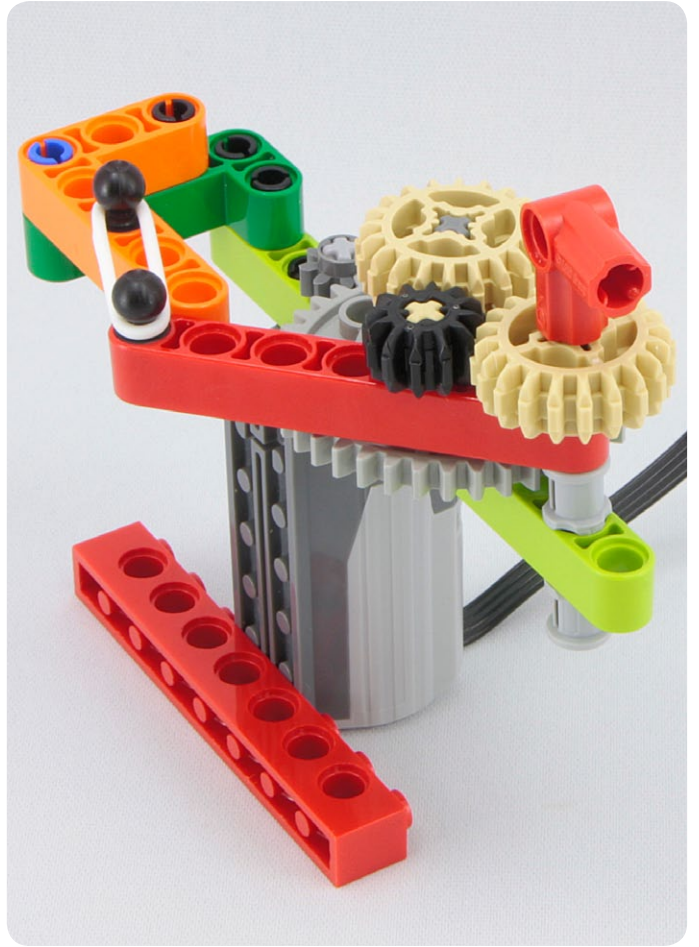
308



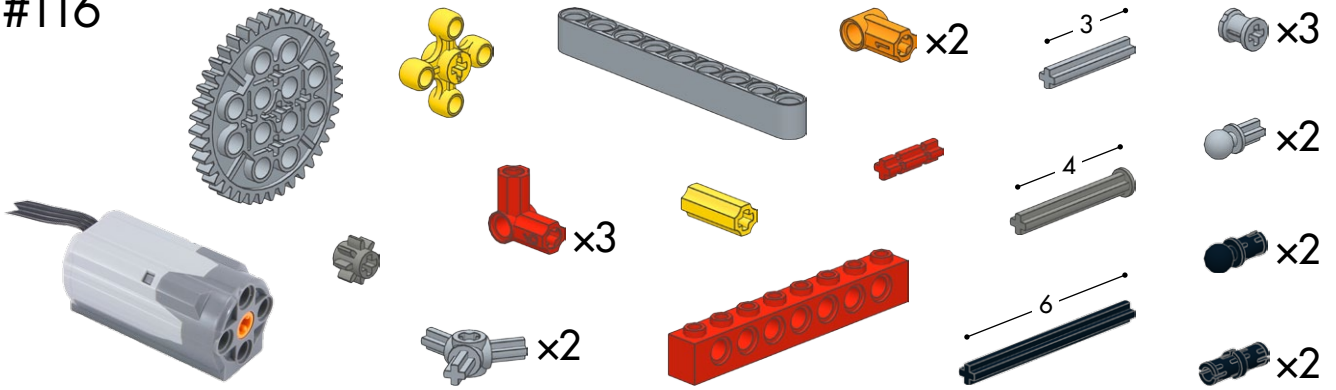
# Intermittent motion

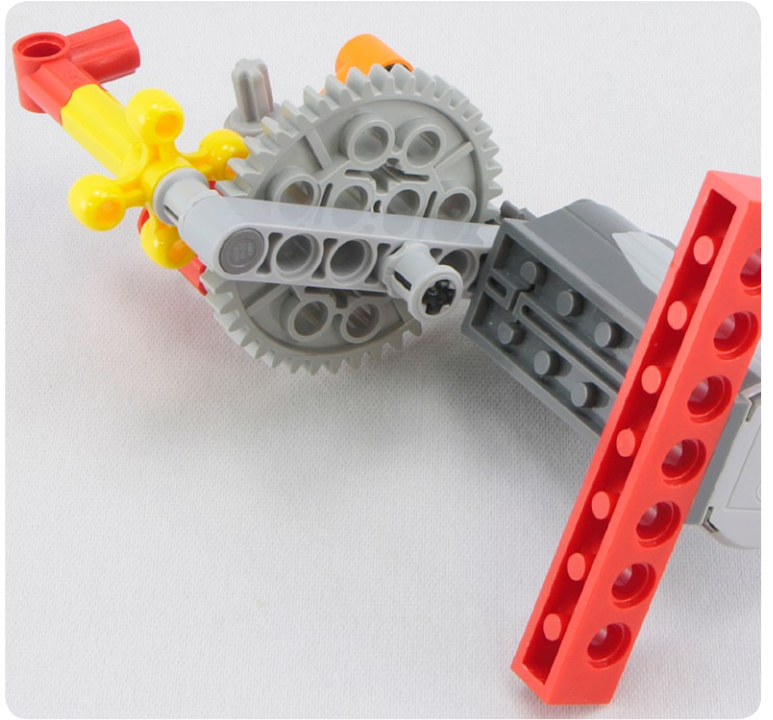
#115



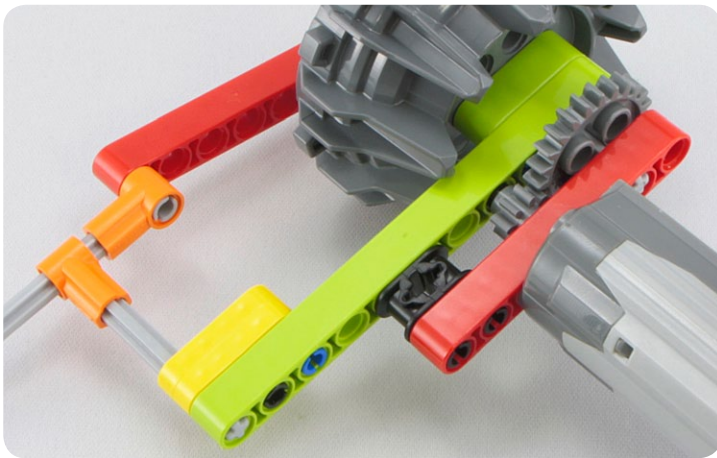
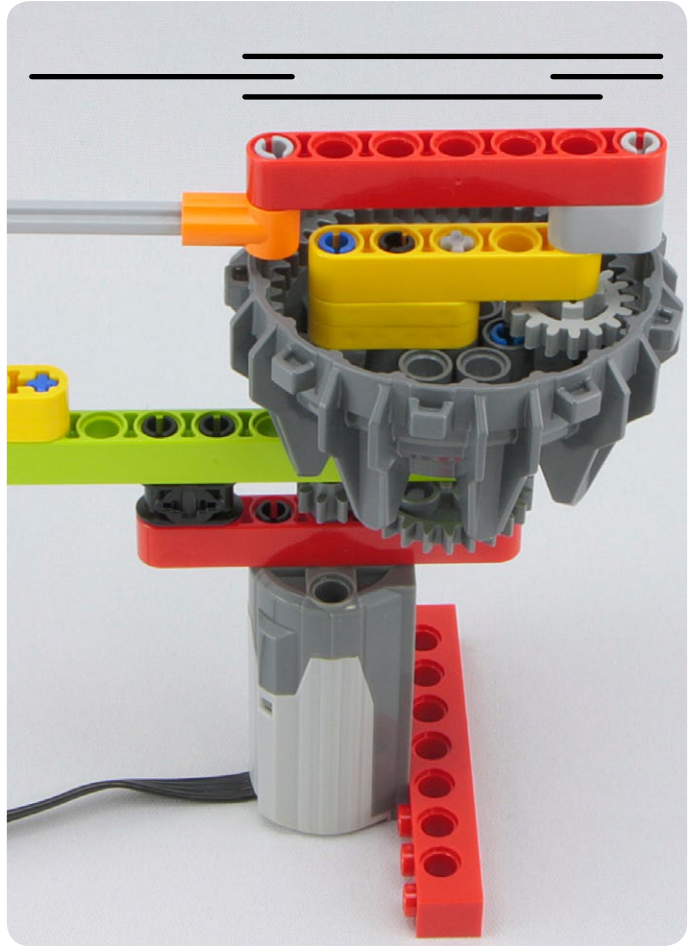


#116

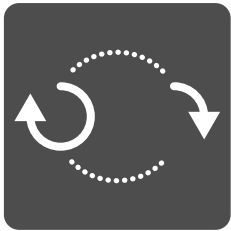






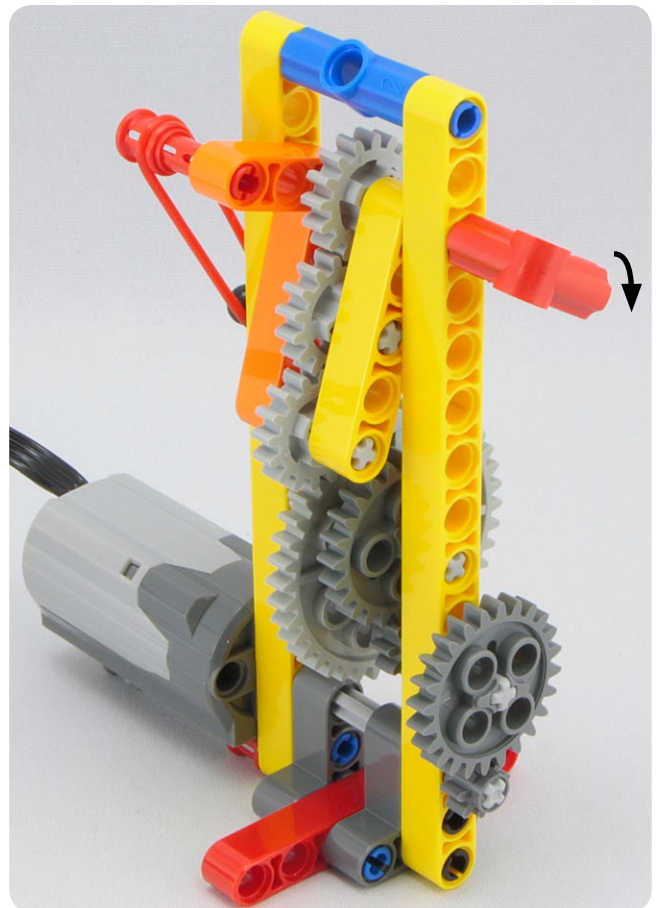
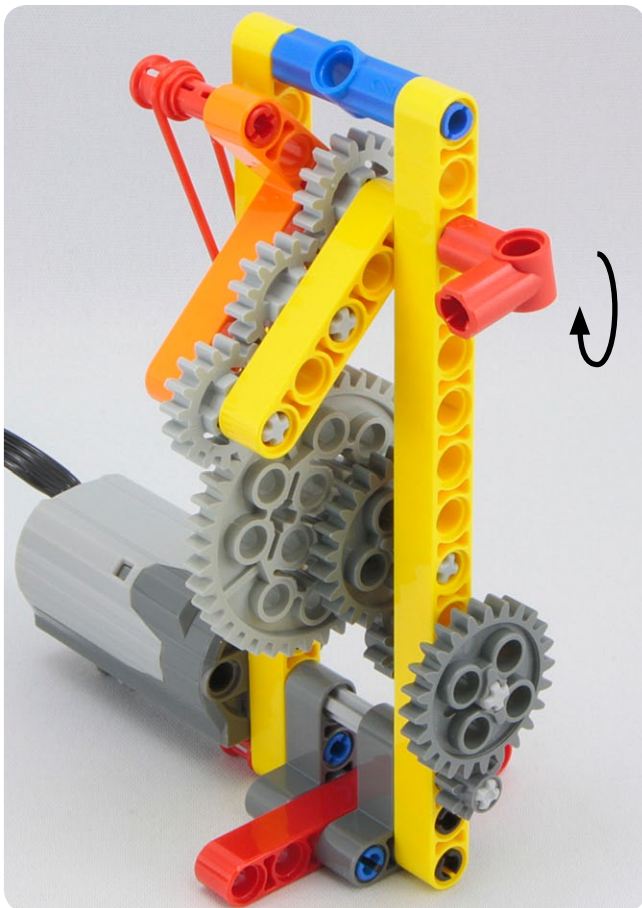
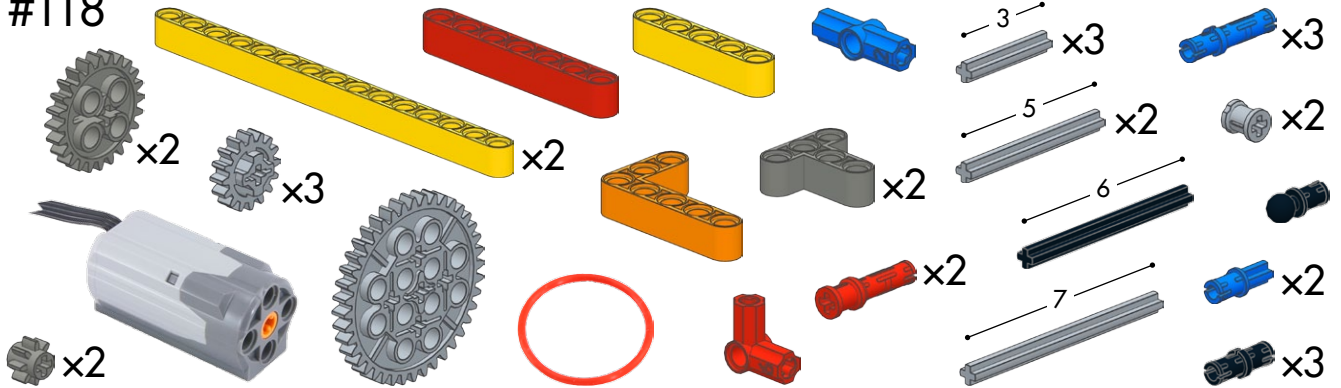


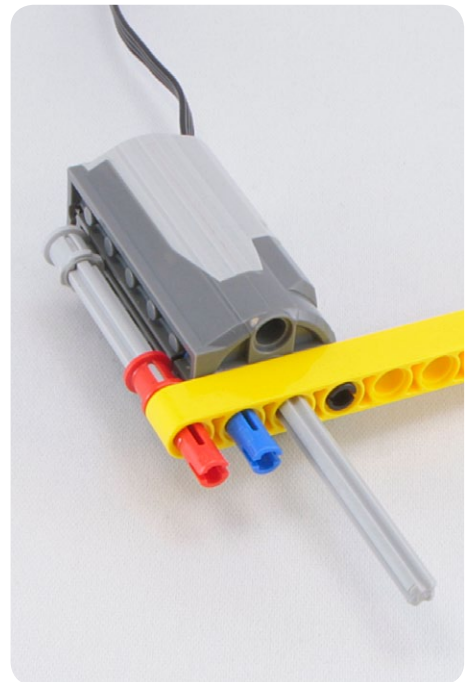
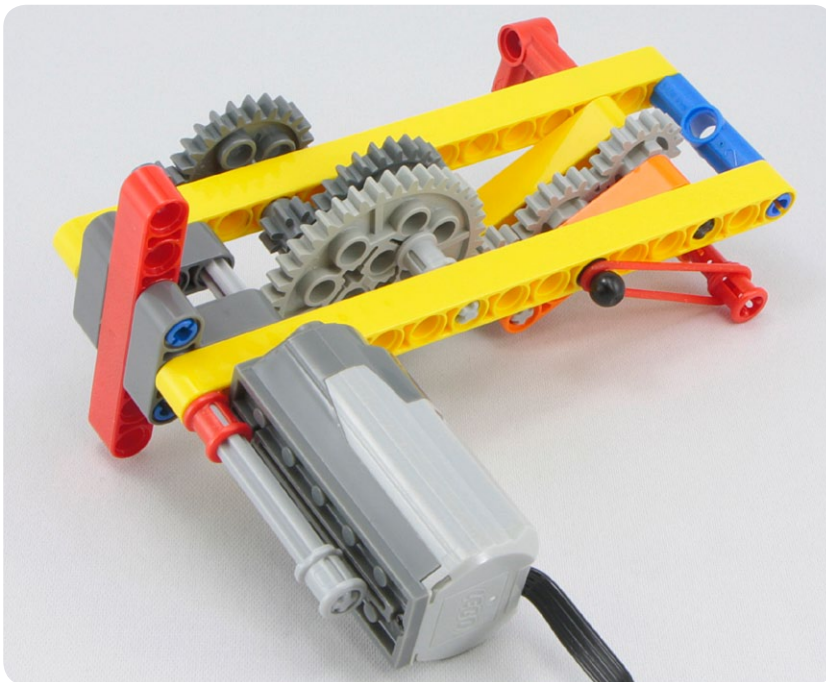
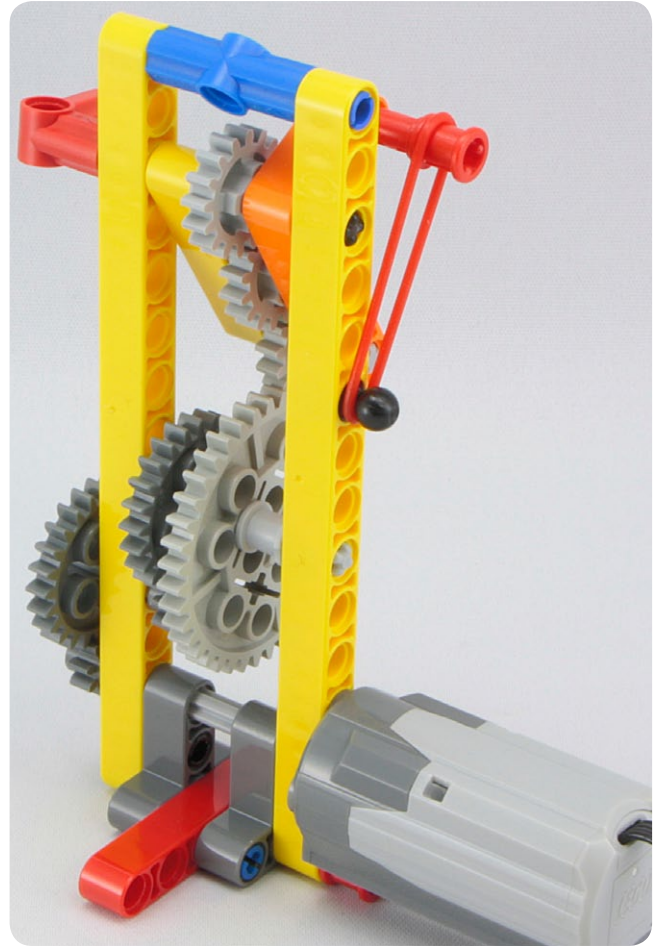




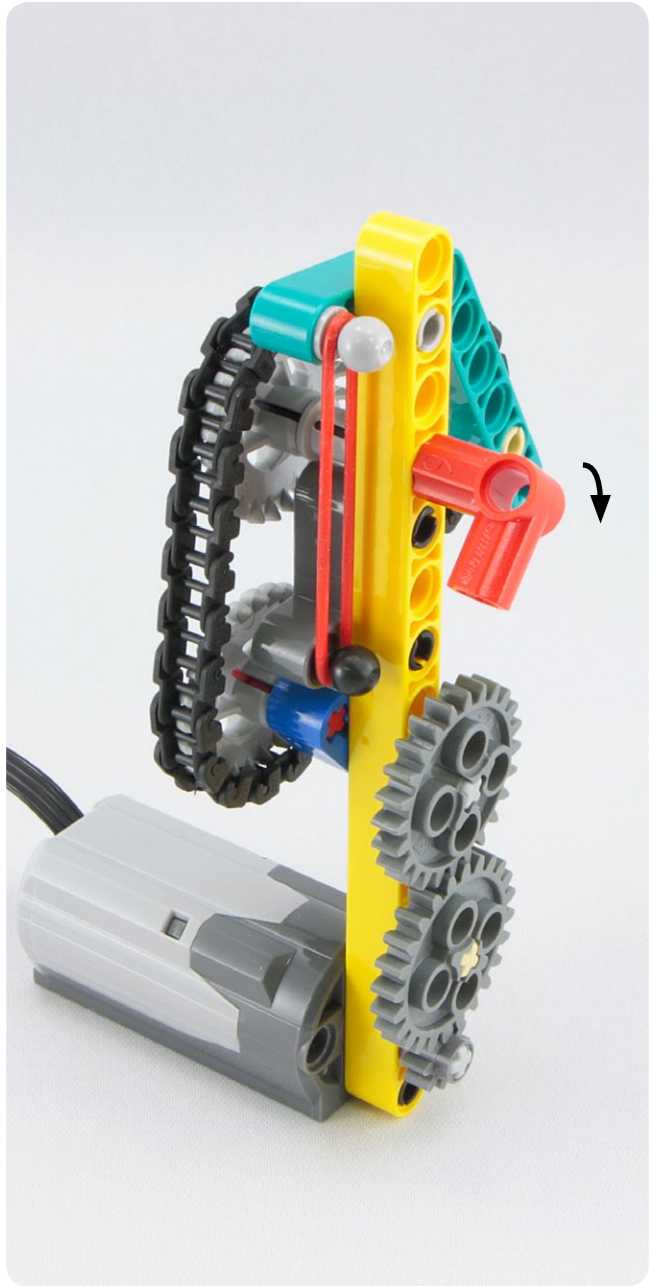
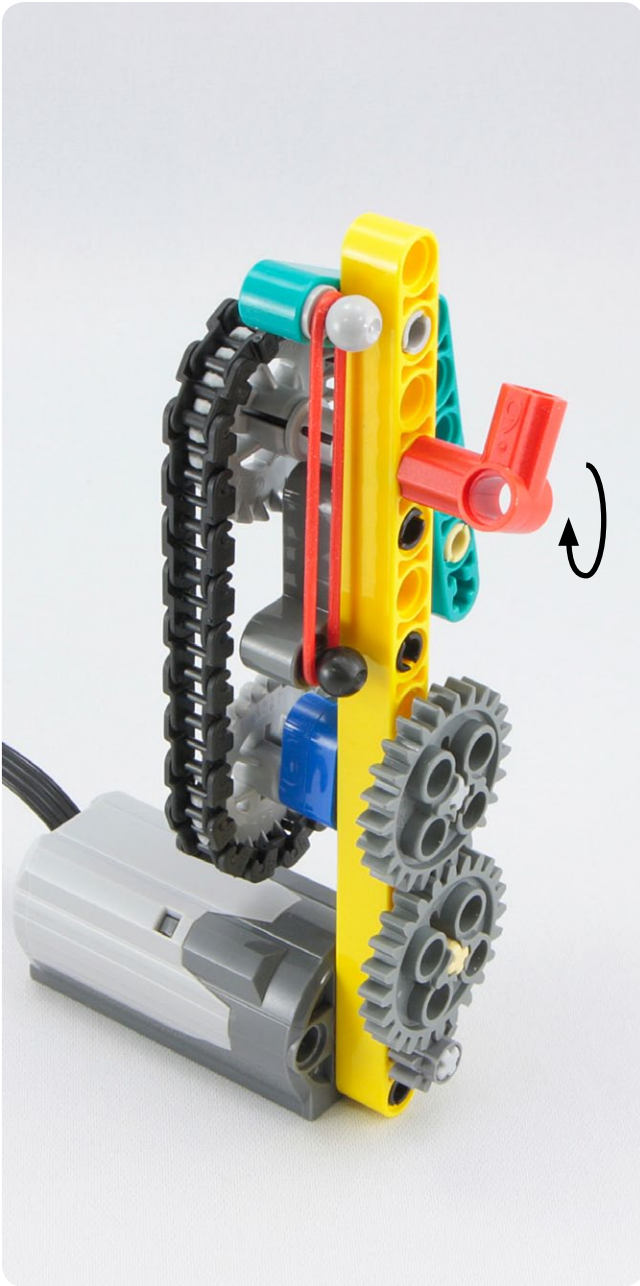
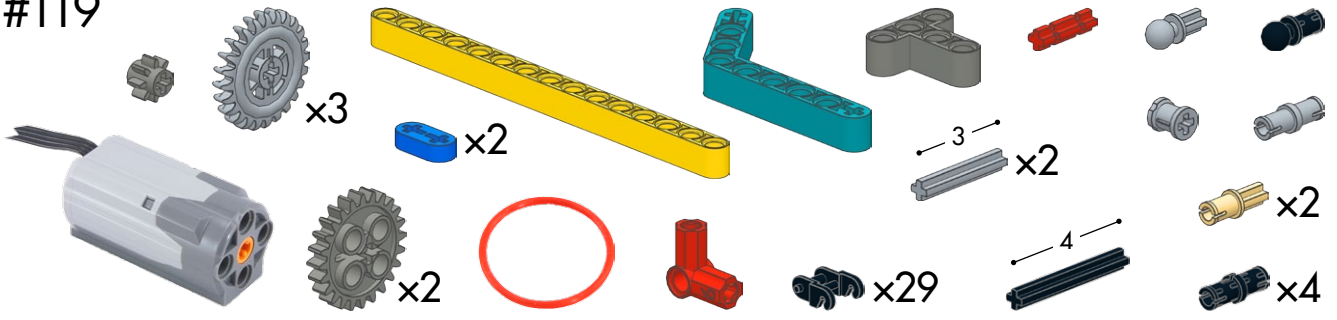
# Smooth changes of rotation speed

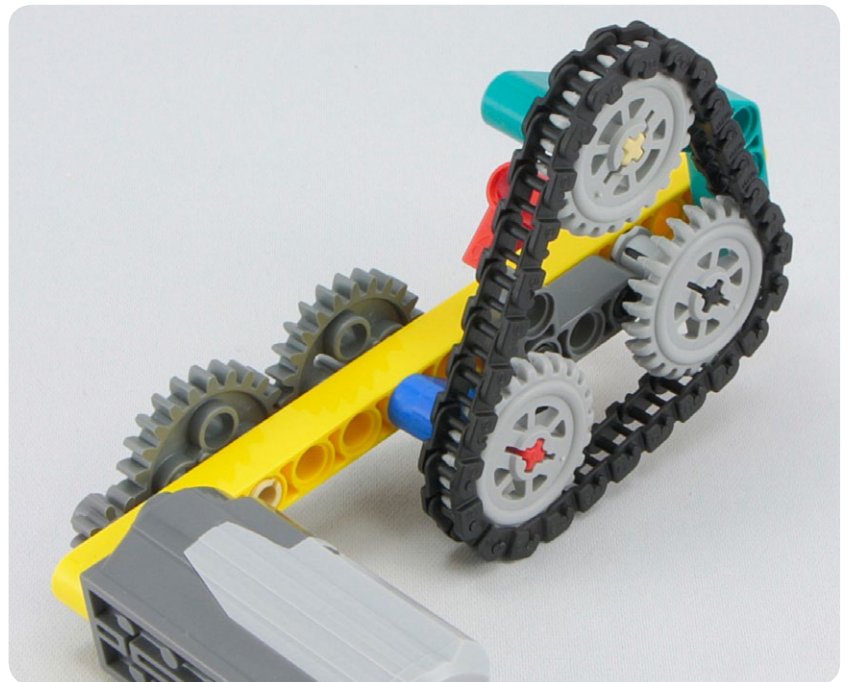
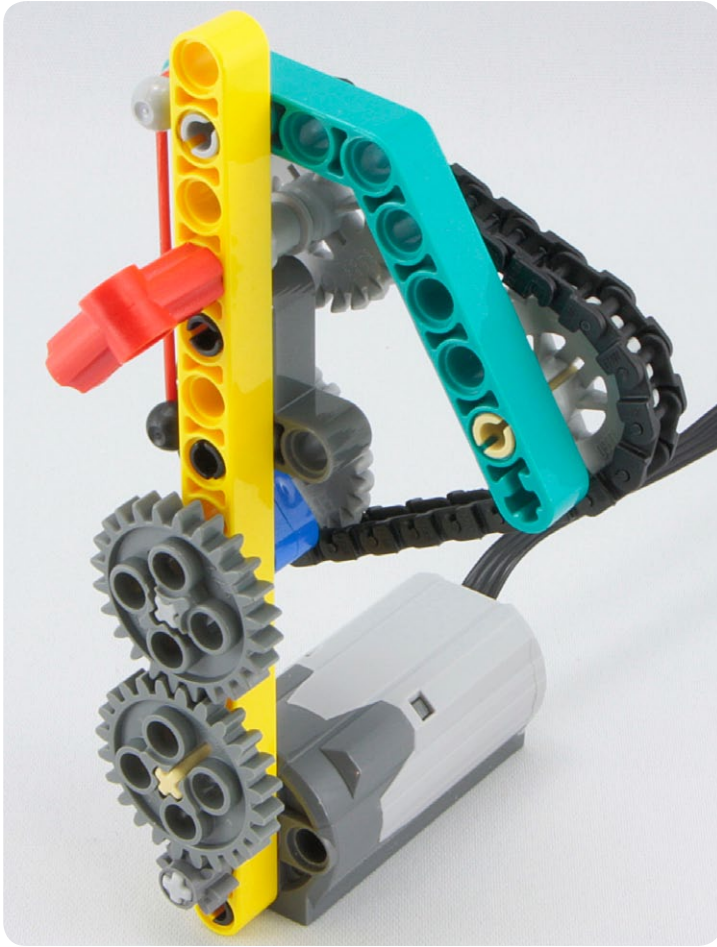
#118





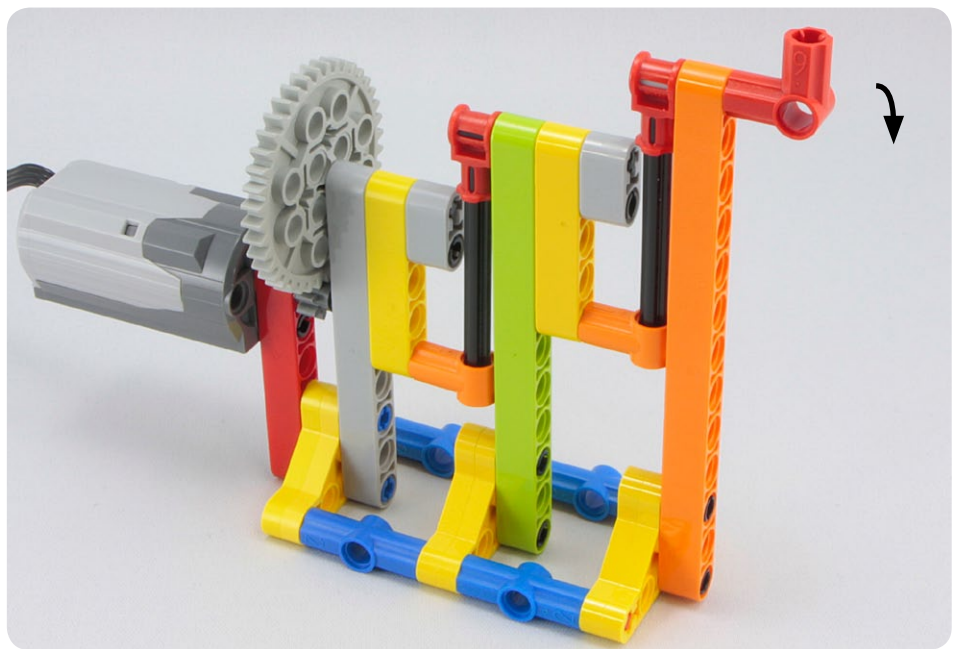
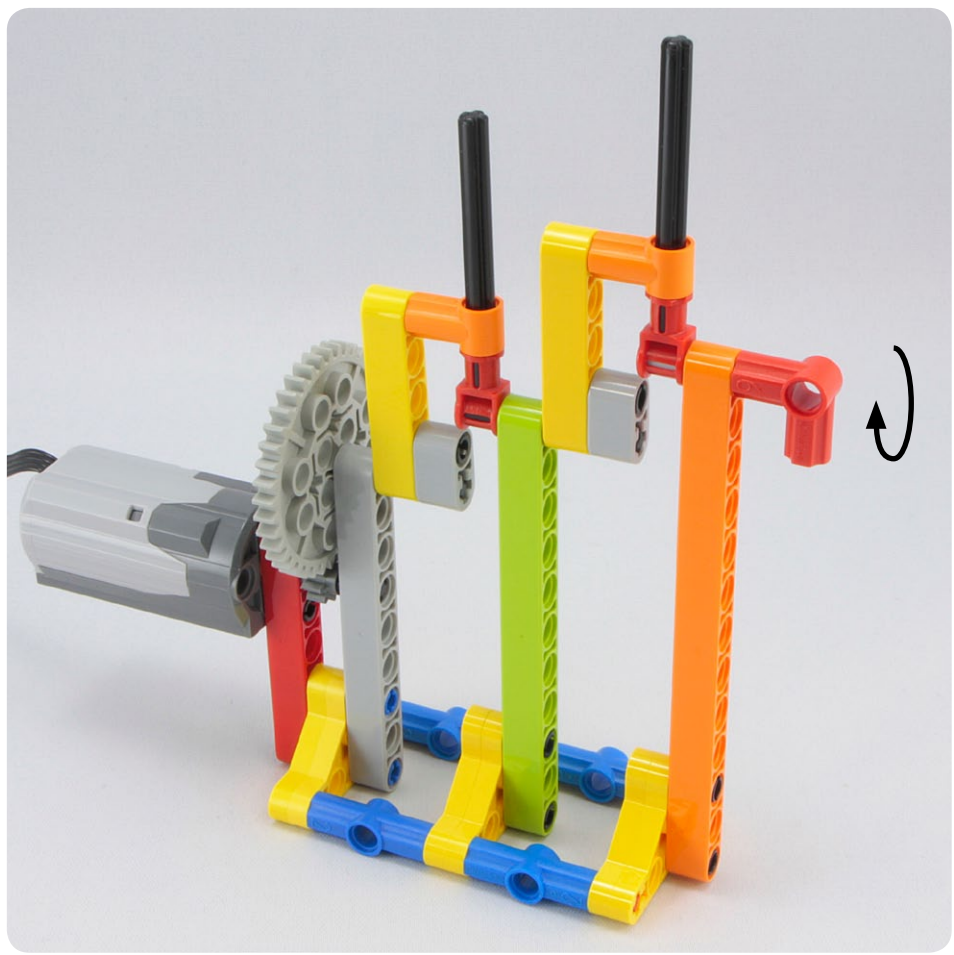
#119

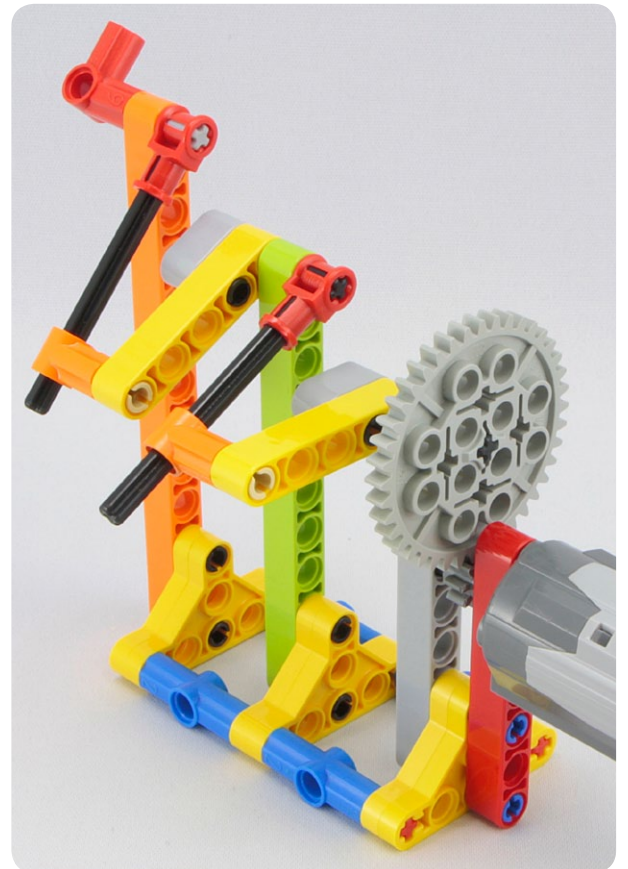
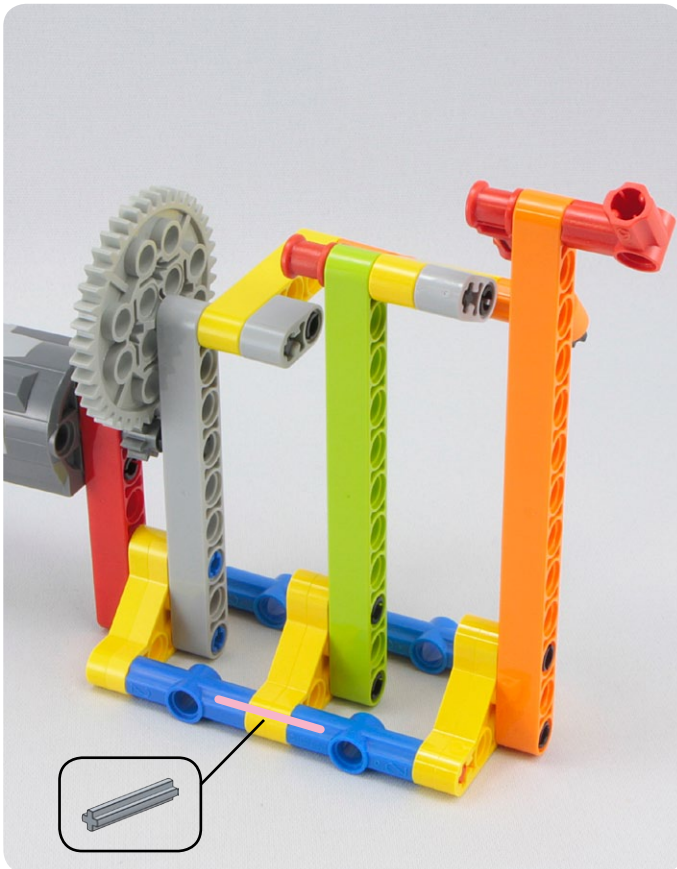
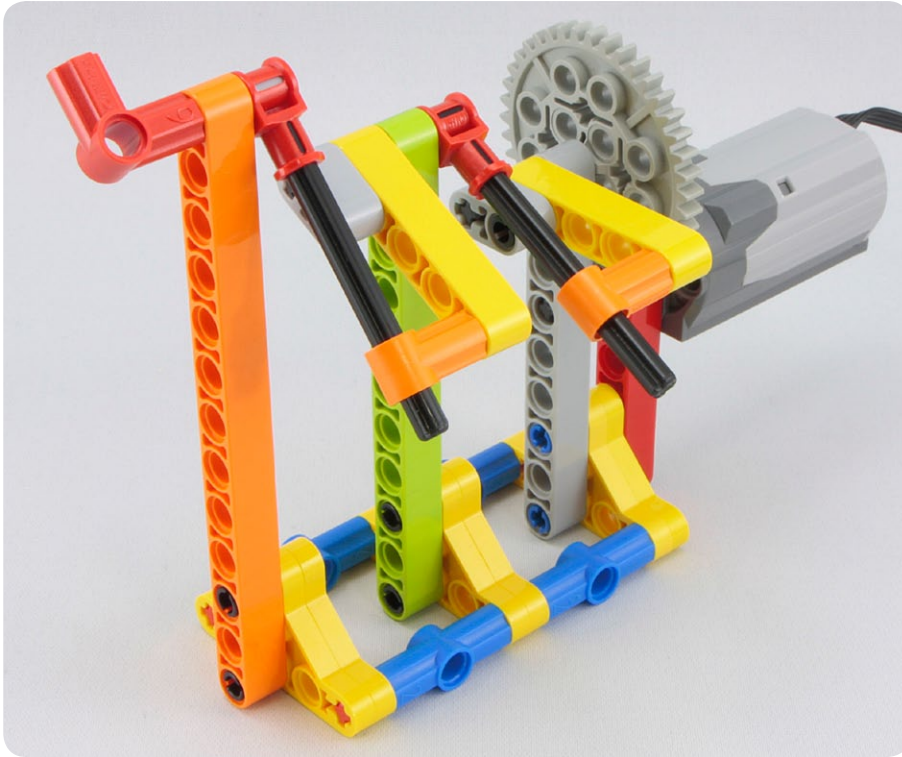




# #120

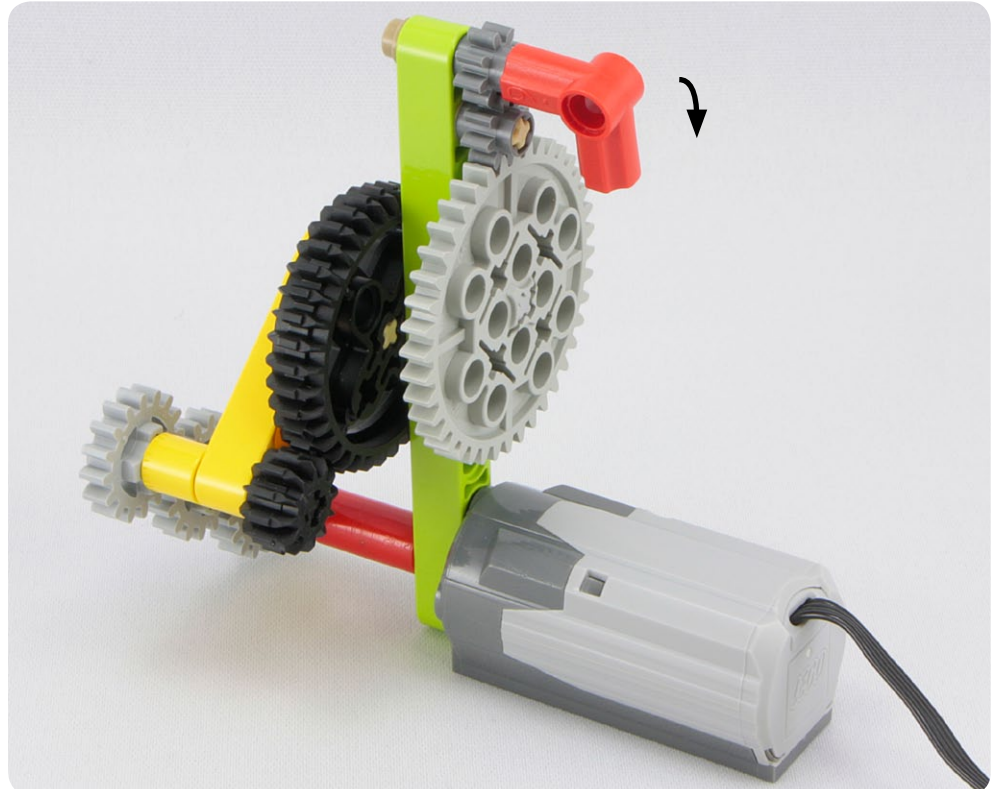
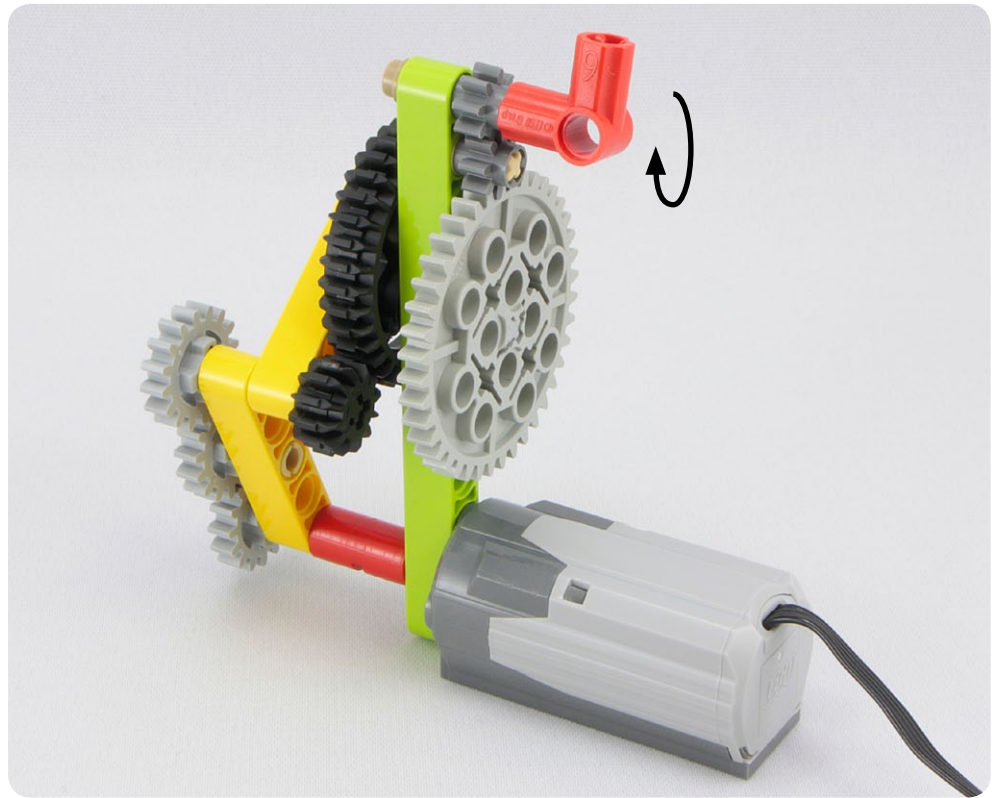
- 
- 
- 
- x6
- 
- 
- 
- 
- x2
- x2
- x2
- x4
- x2
- 
- x3
- 
- x3
- x4
- x2
- x2
- x2
- x8

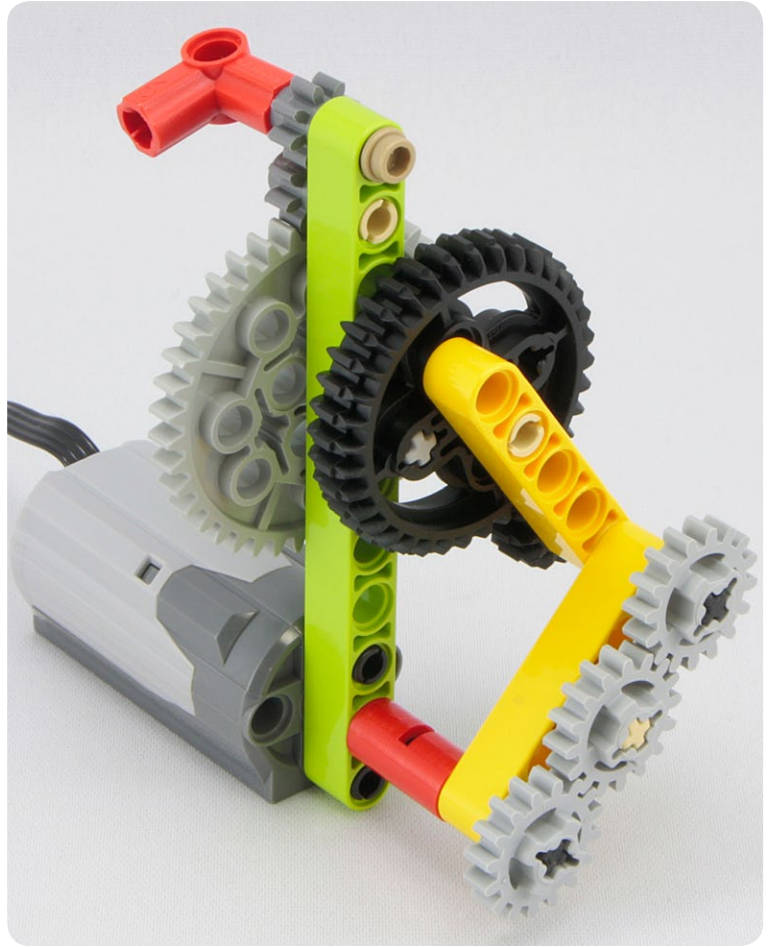




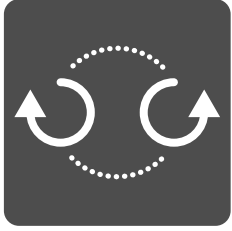
# #121

- 
- 
- 
- 
- 
- x2
- 
- x3
- 
- 
- x2
- 
- 
- 
- 
- 
- x3
- x2



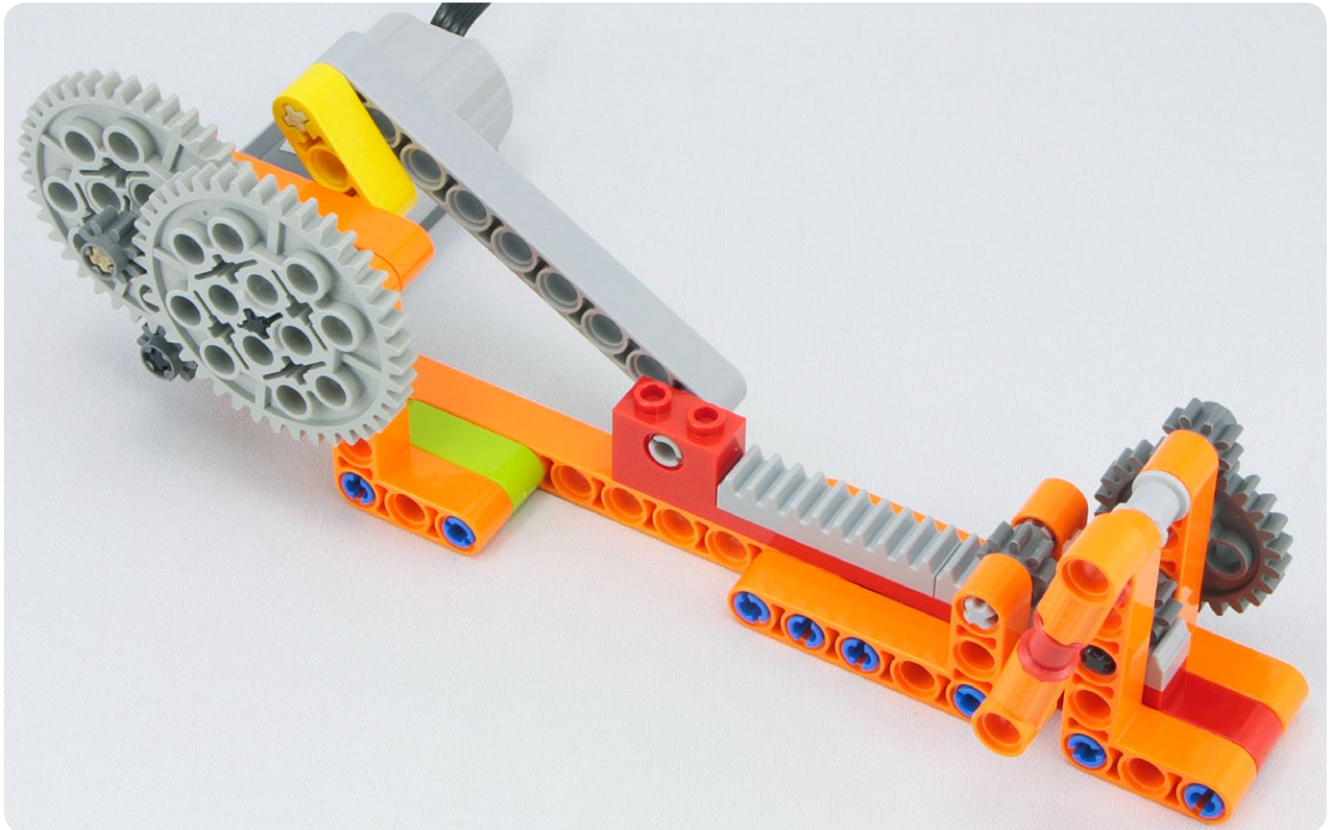
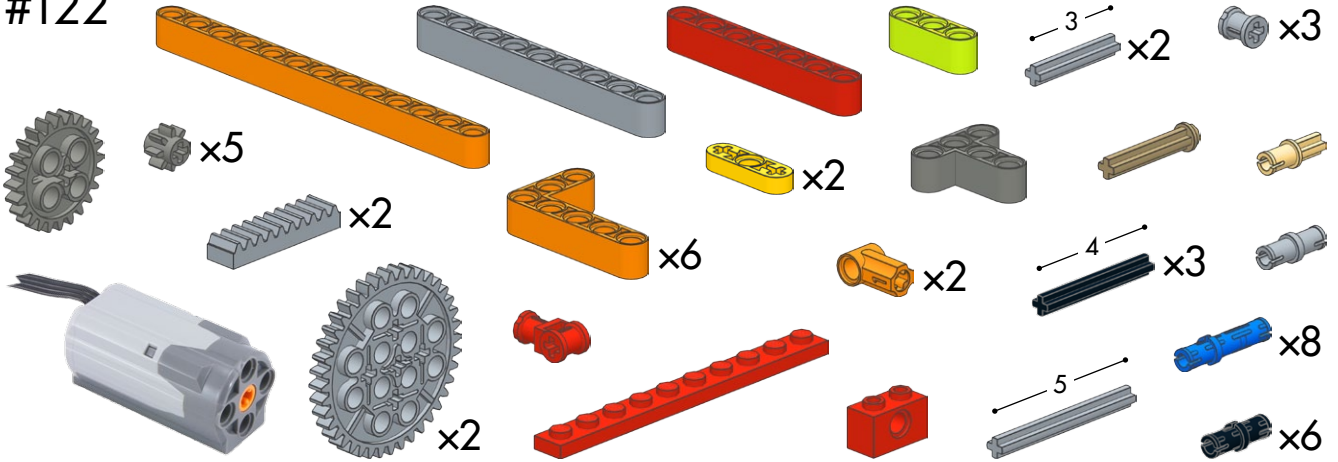


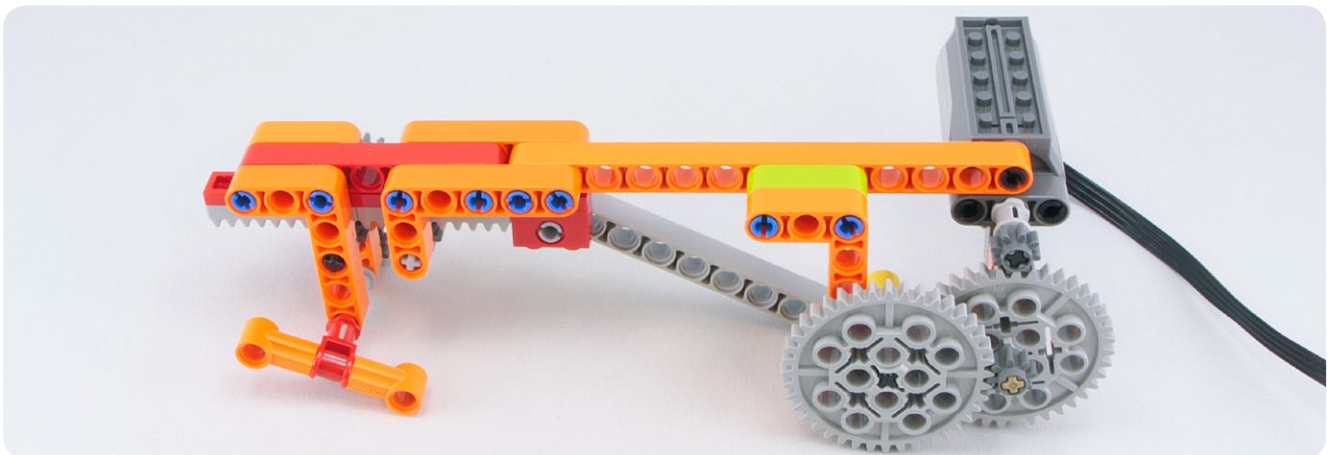
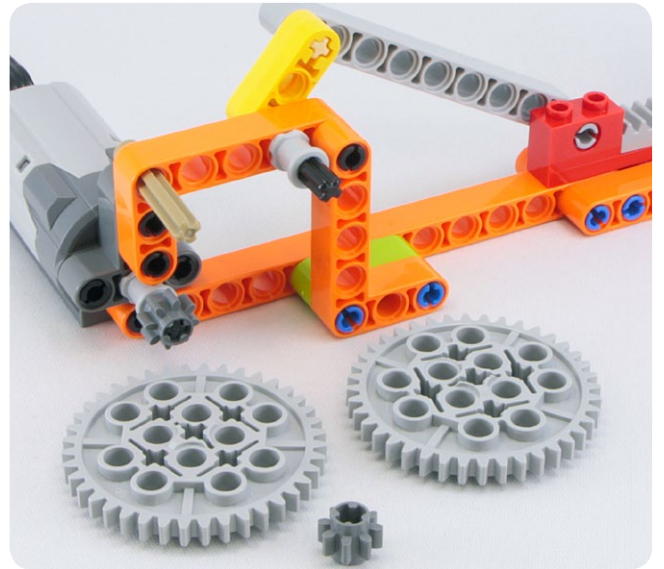
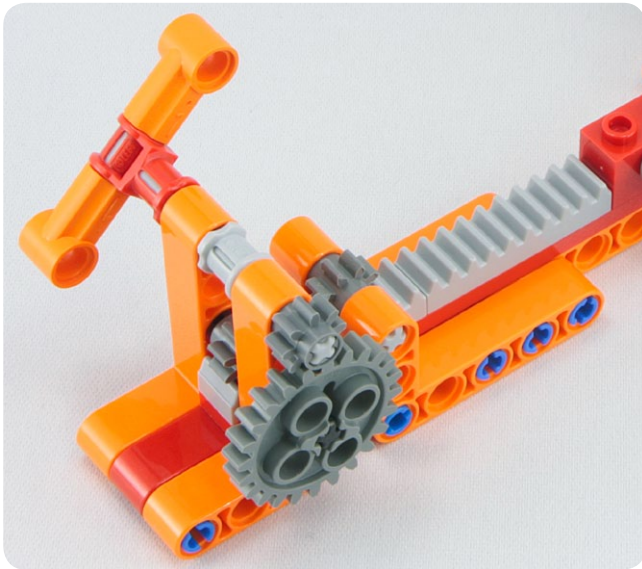
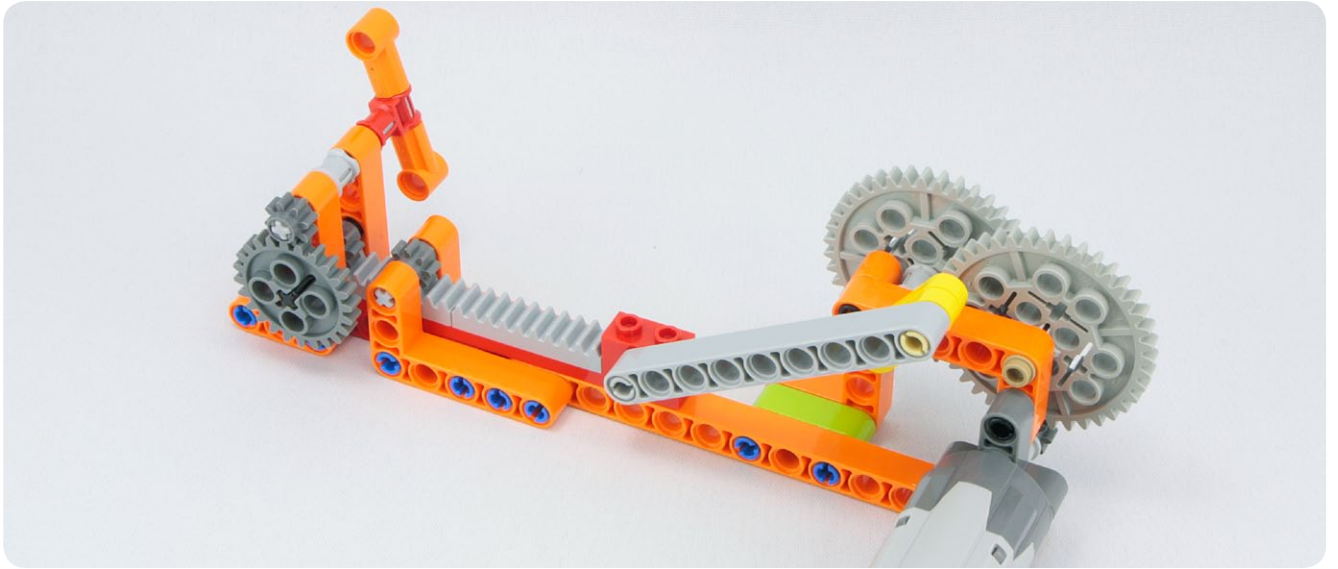




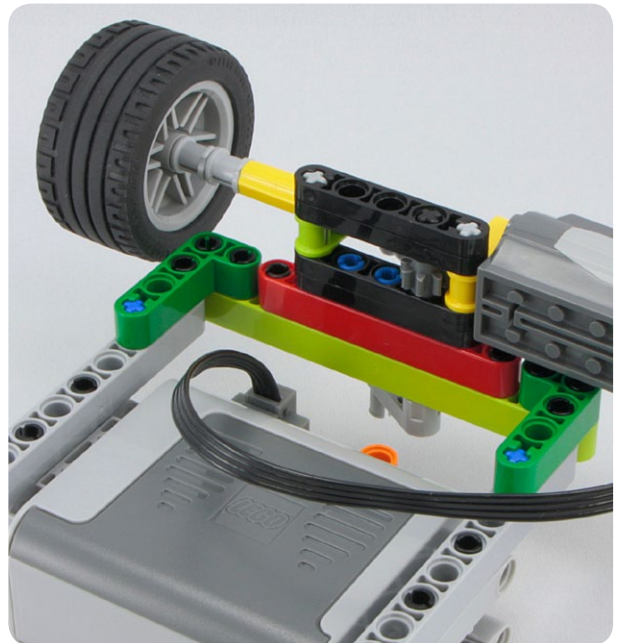
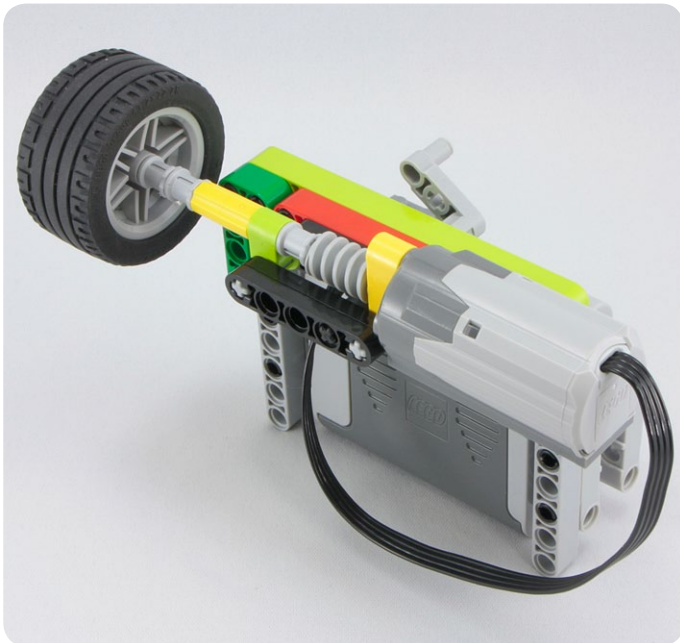
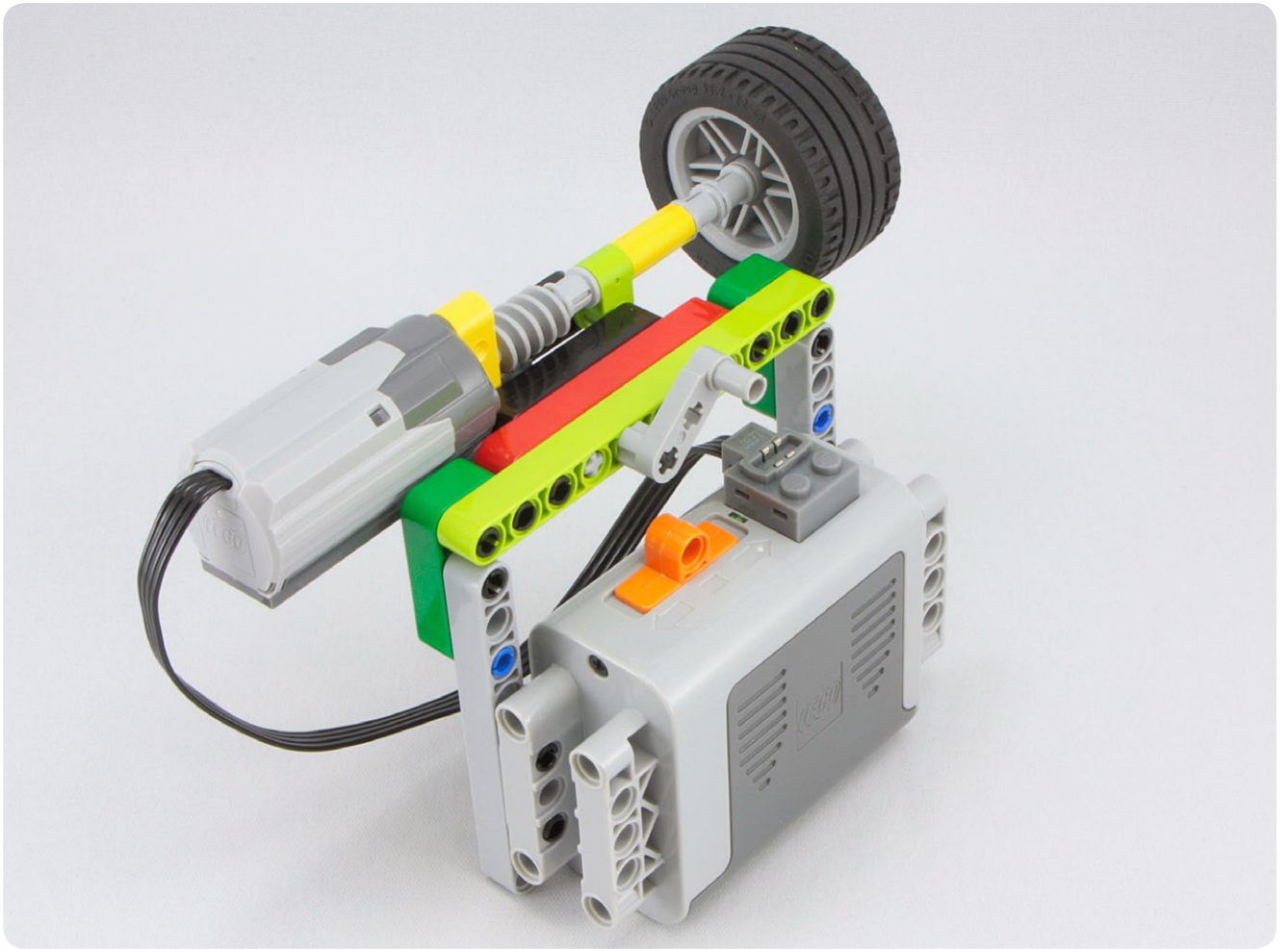
# Switching rotational direction

#122


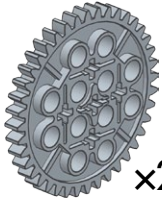




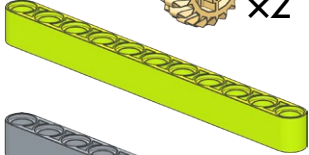
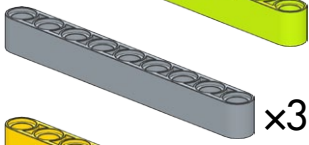
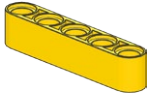
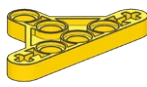
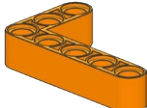
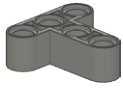
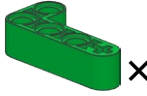





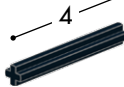

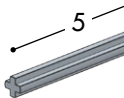
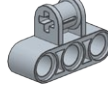
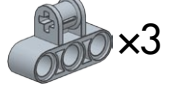
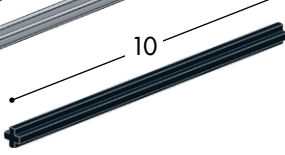







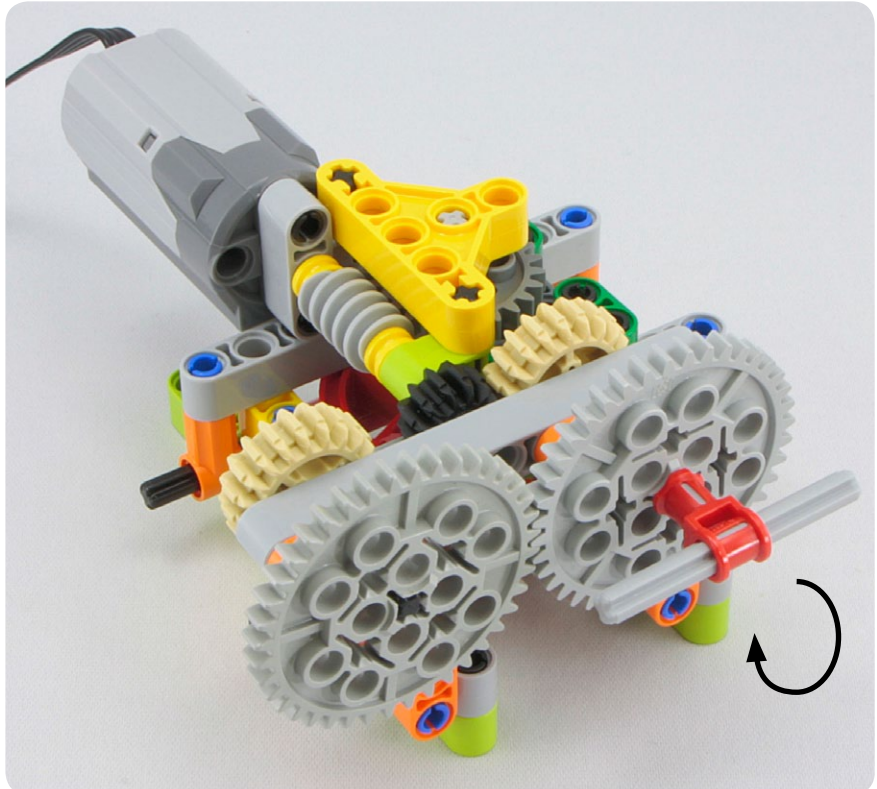
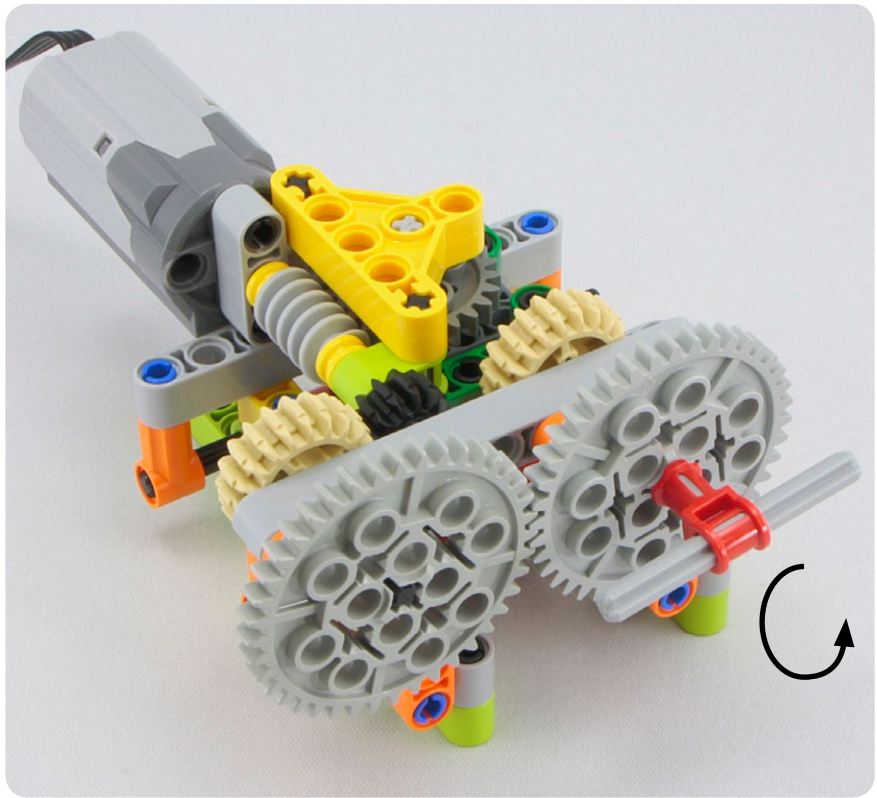


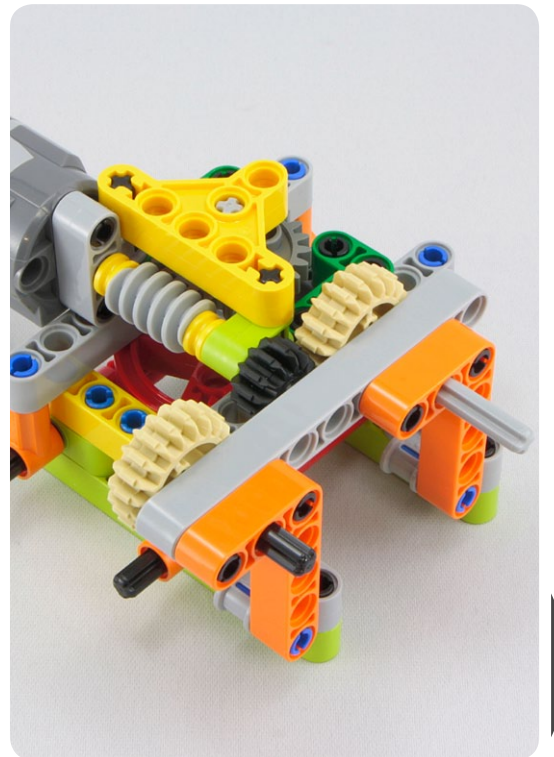
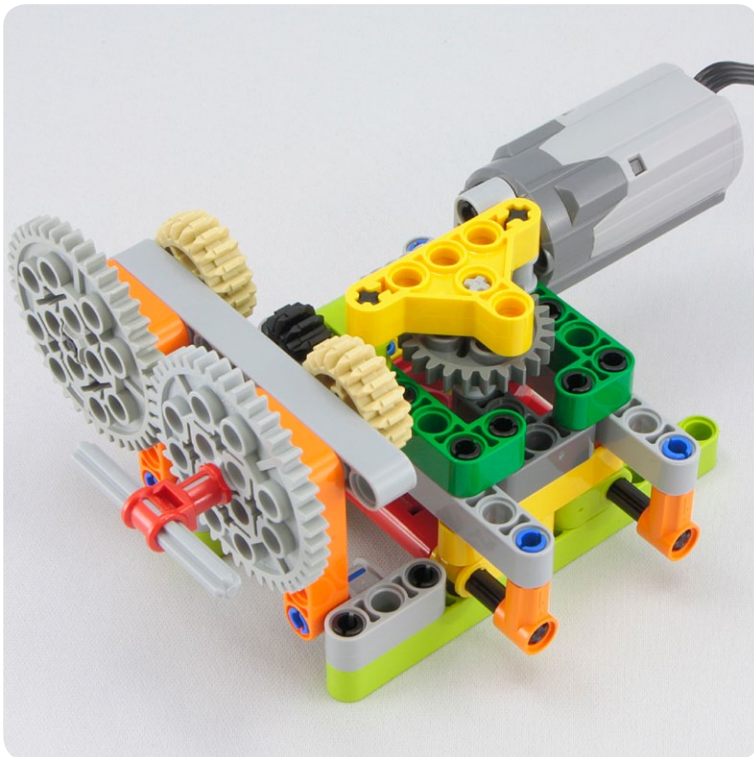
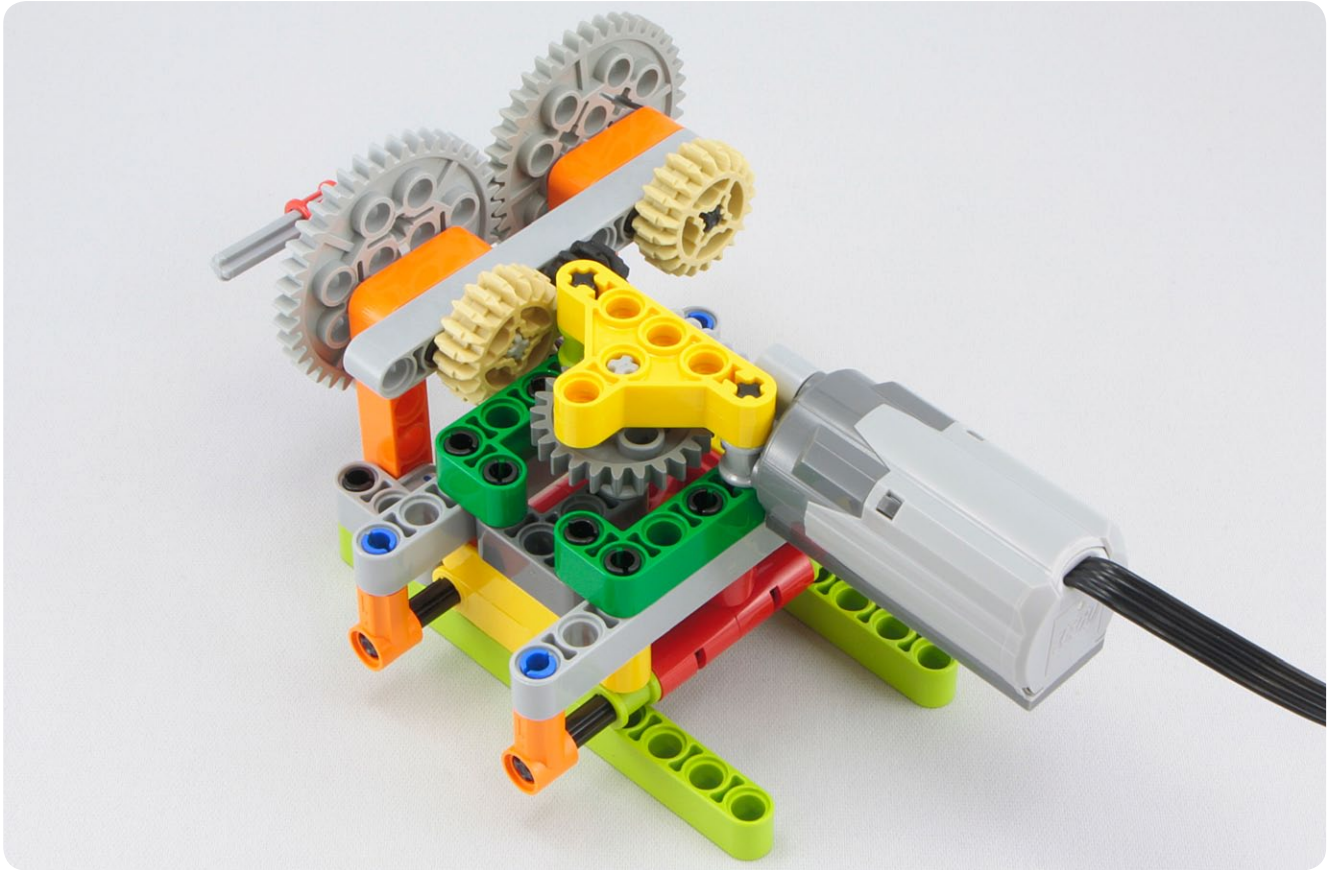


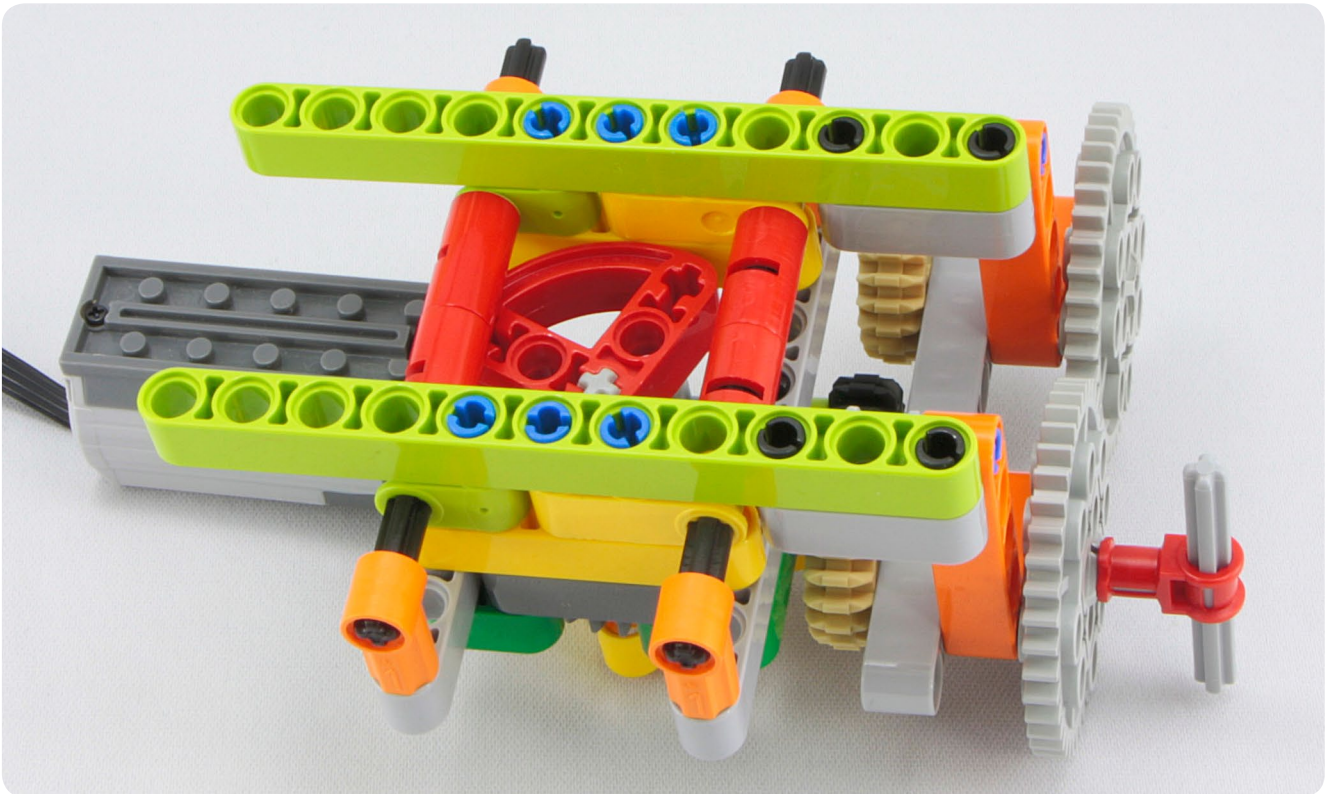
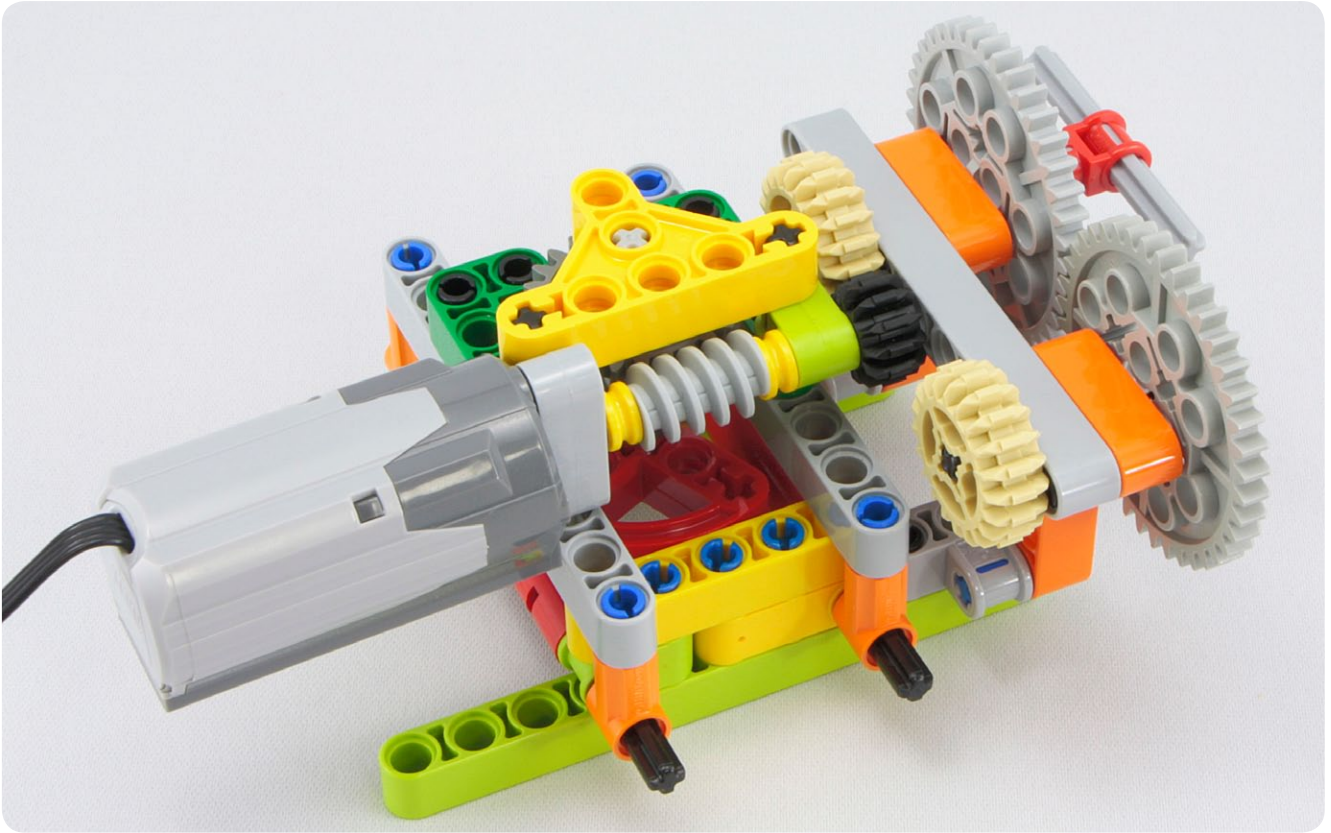


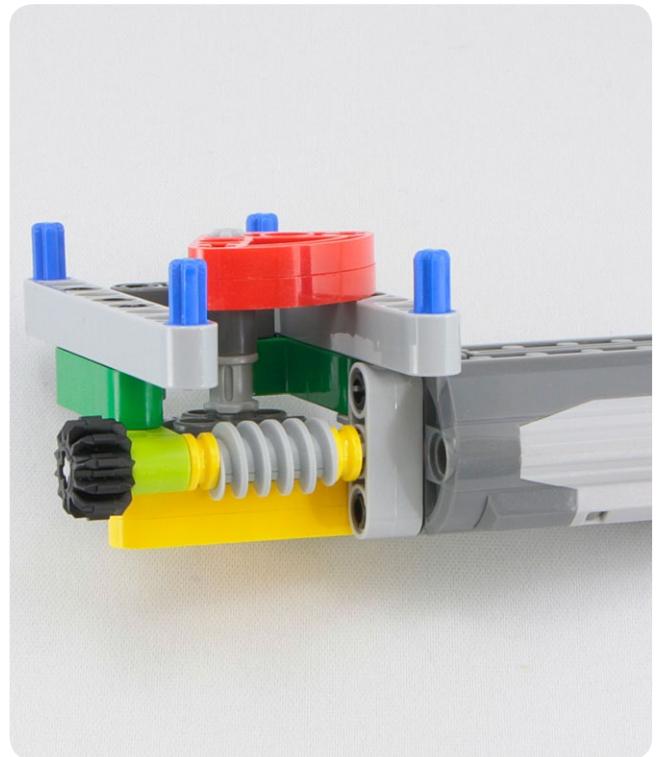
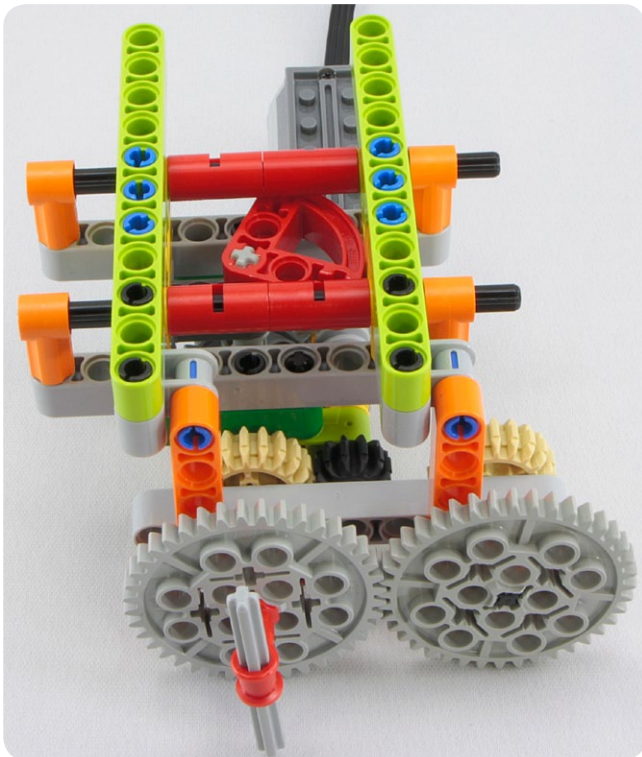
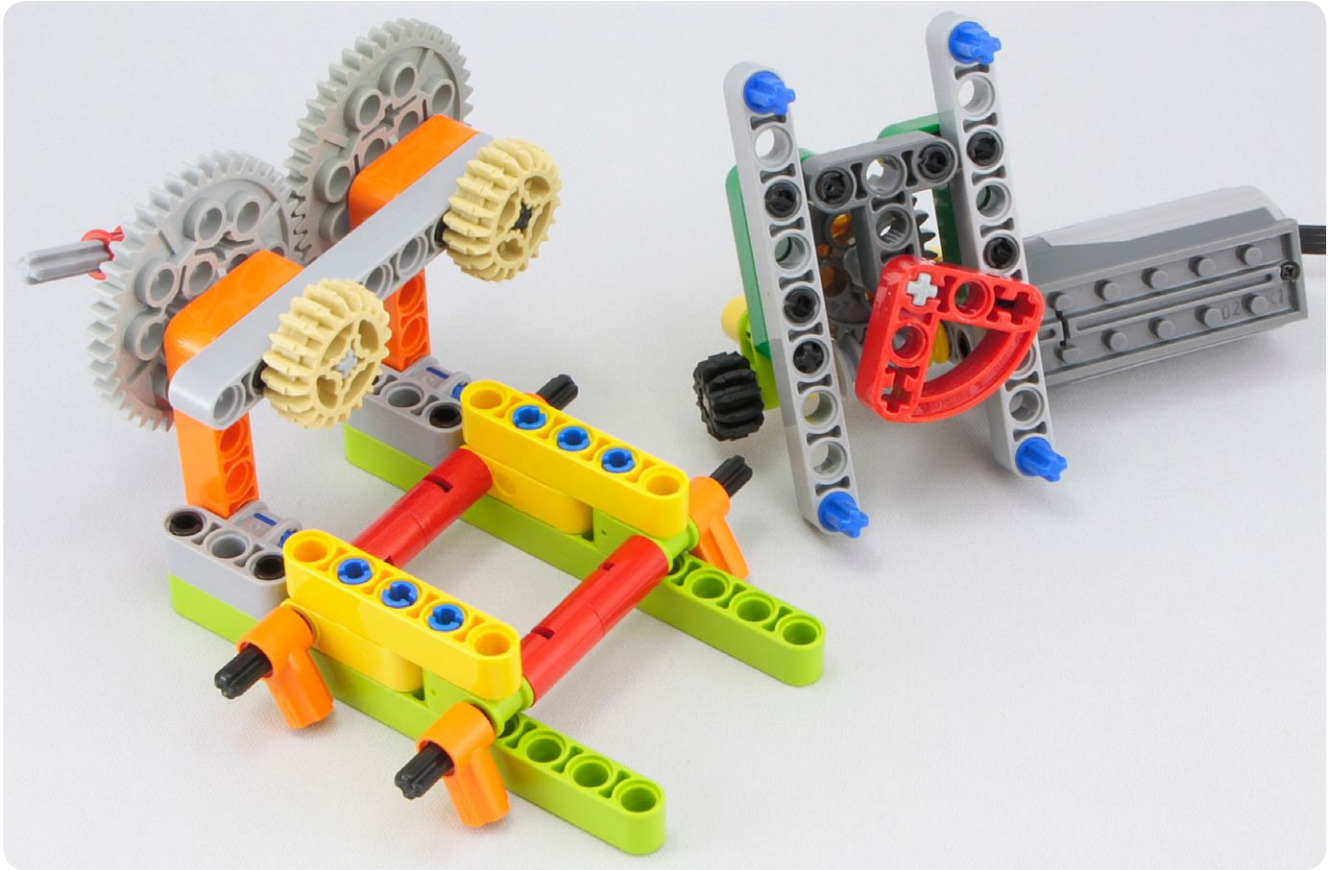
# #124

-  Motor
-  x2
- 
-  x2
-  x2
- 
-  x2
-  x3
-  x2
-  x2
-  x2
- 
-  x2
-  x2
-  x2
-  x3
-  x4
-  x4
-  x3
-  x4
-  x3
-  x3
-  x2
-  x2
-  x2
-  x6
-  x6
-  x6
-  x16



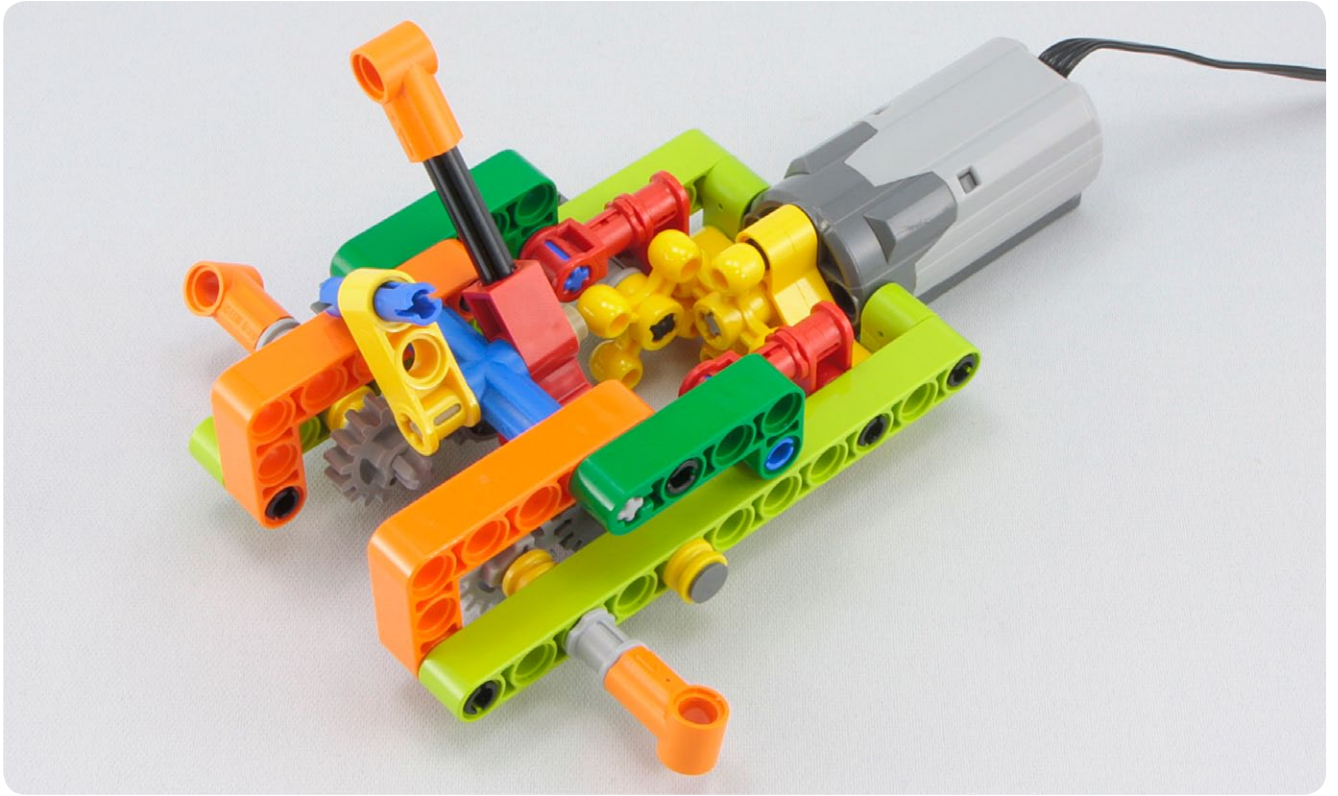


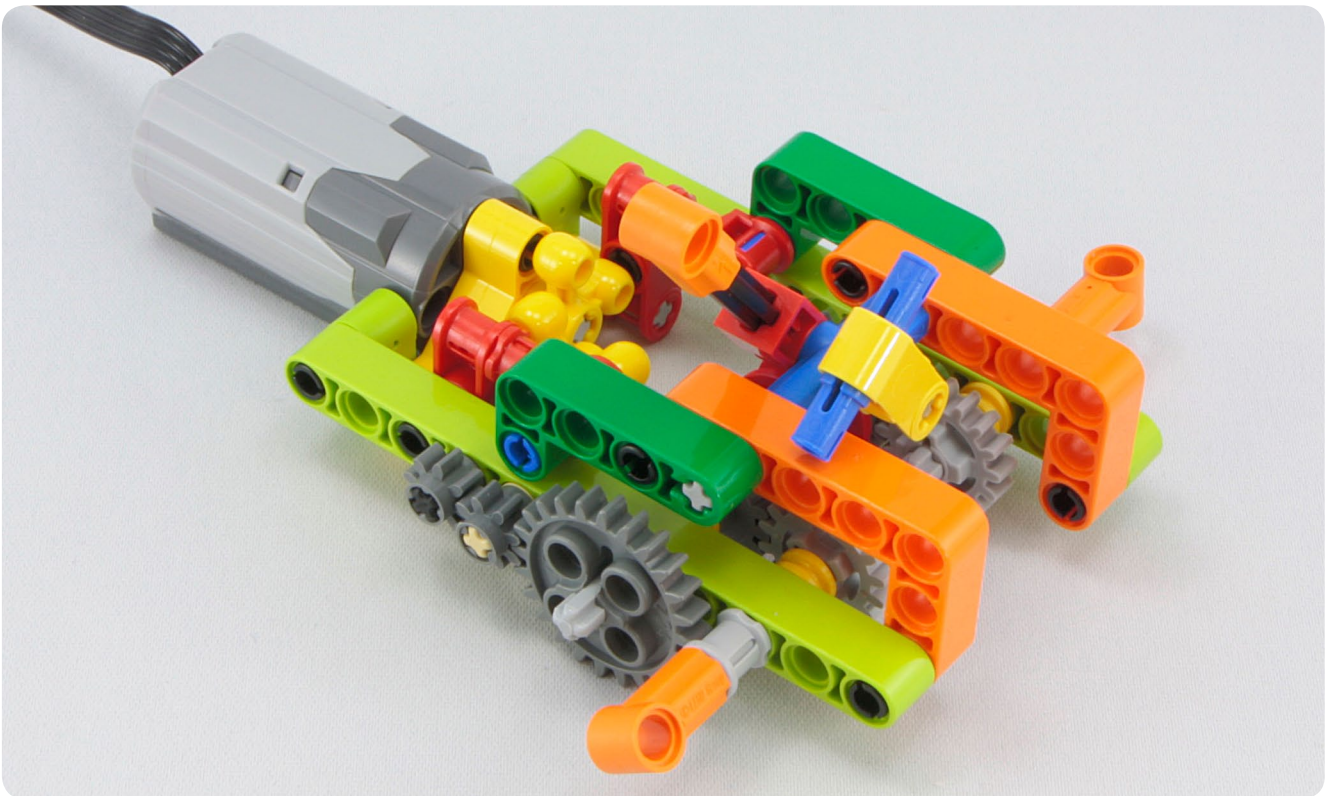
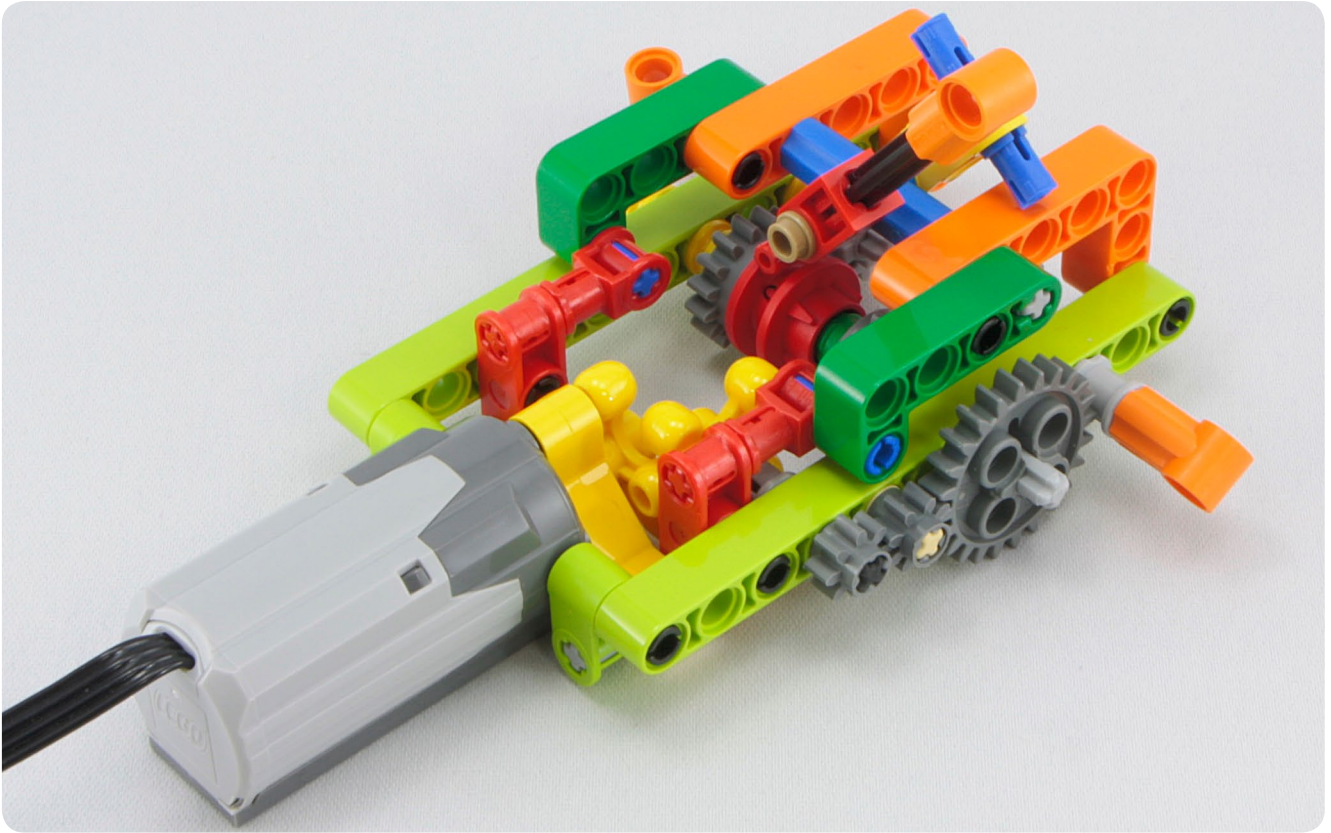


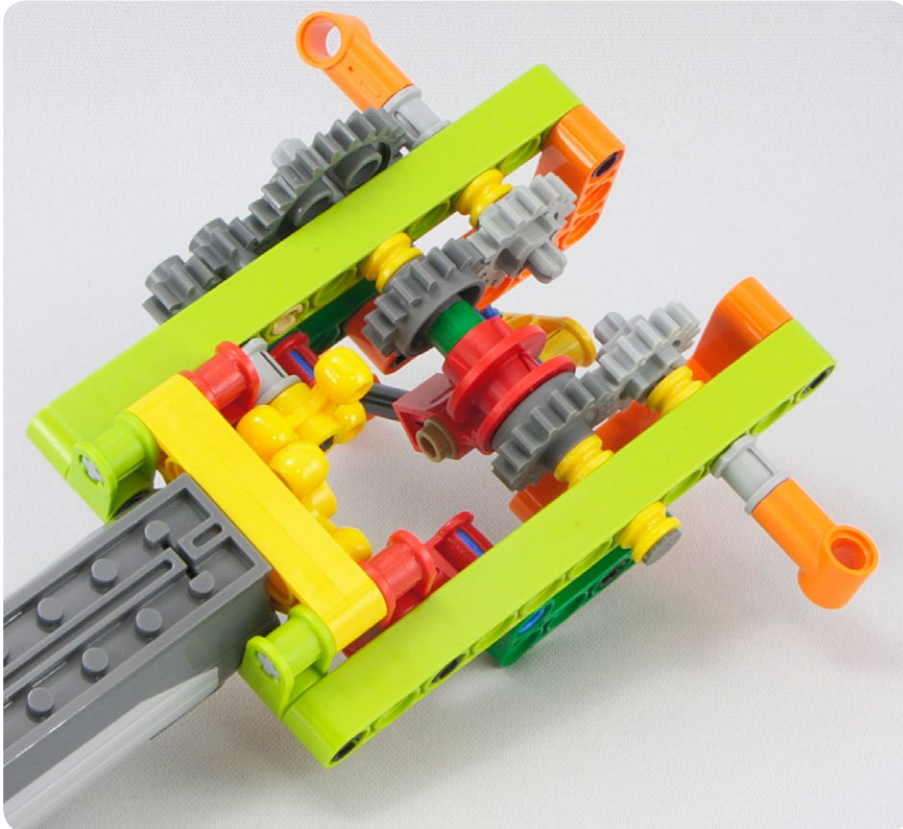
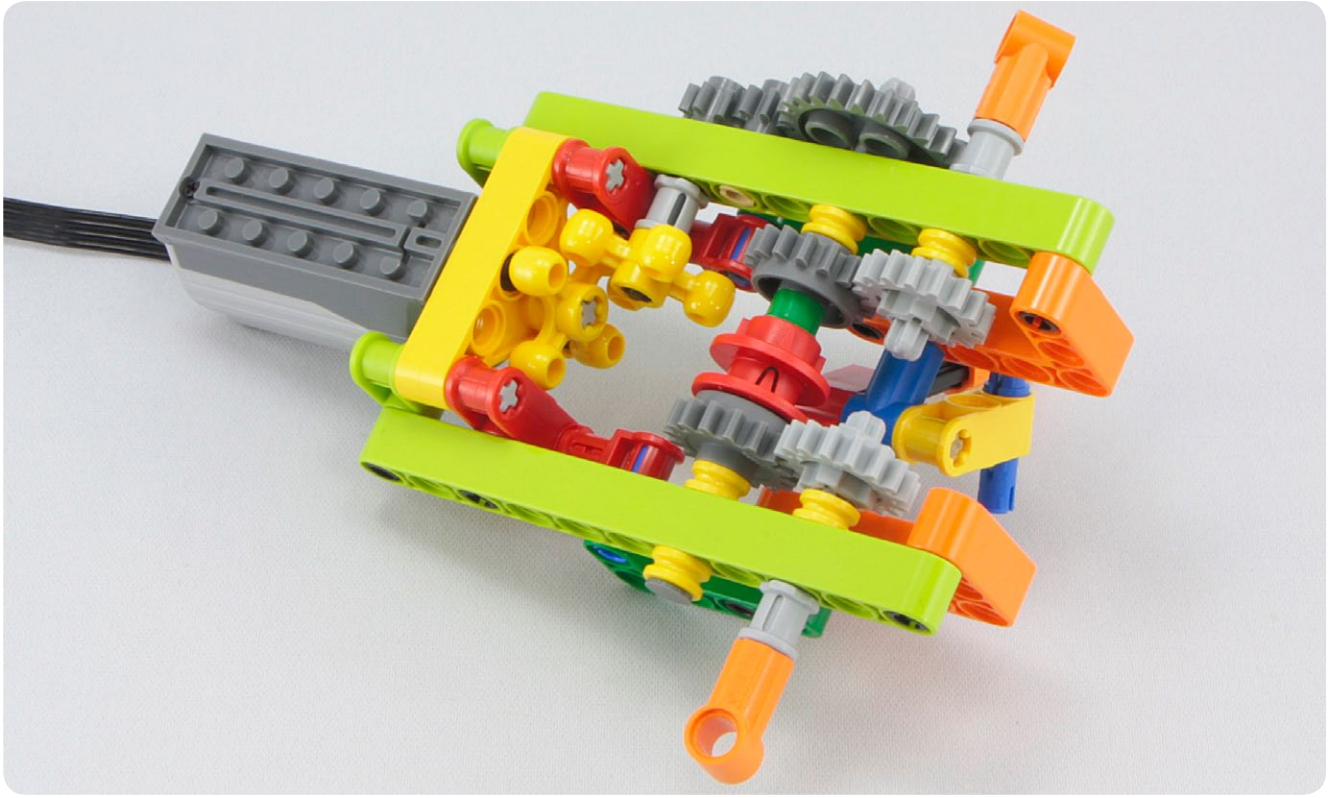




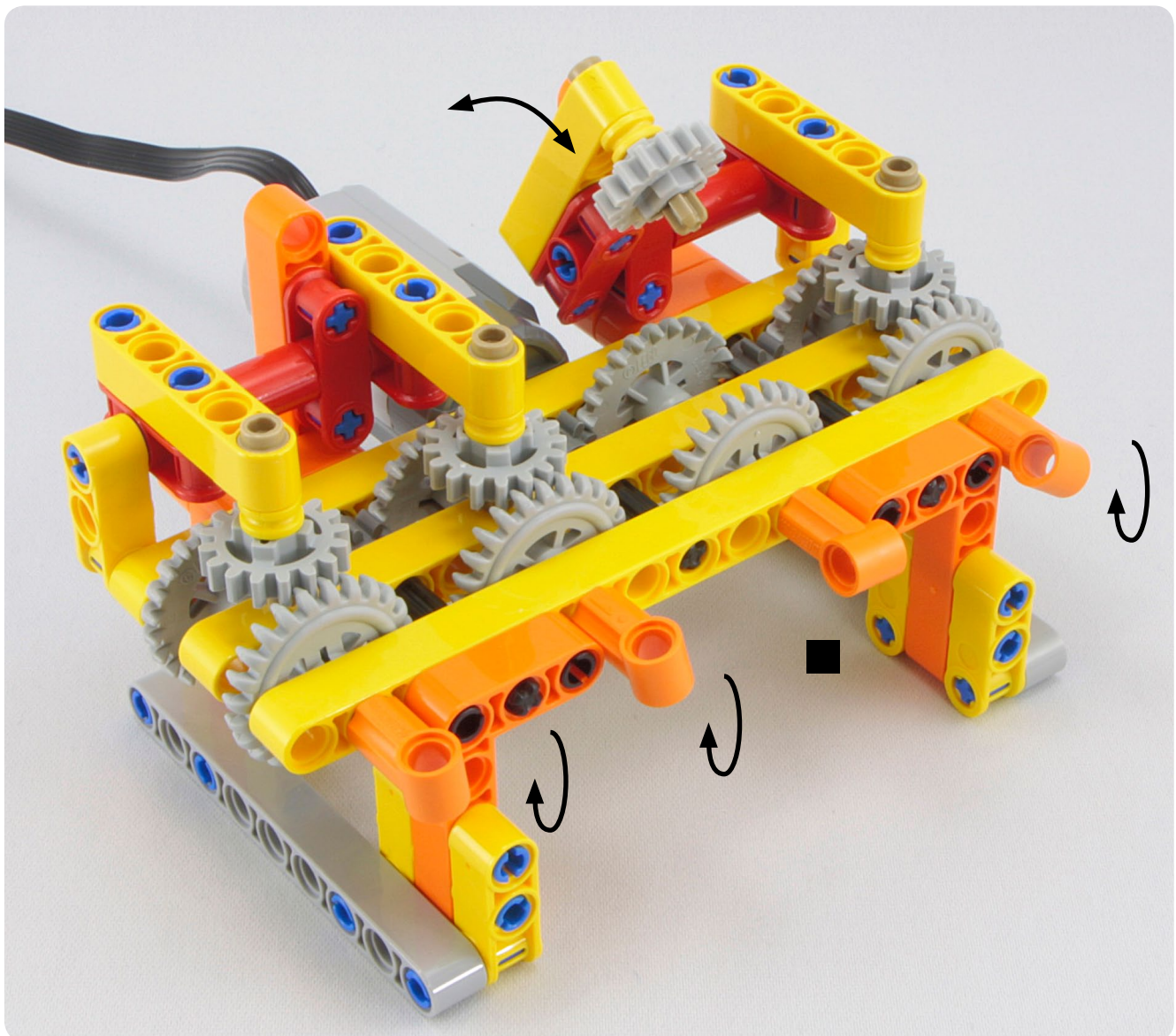
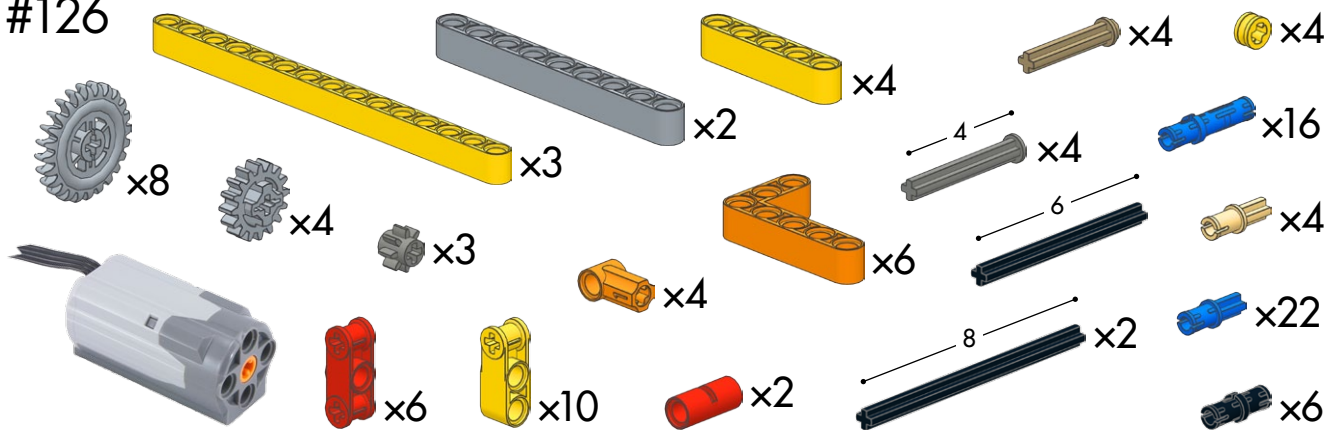


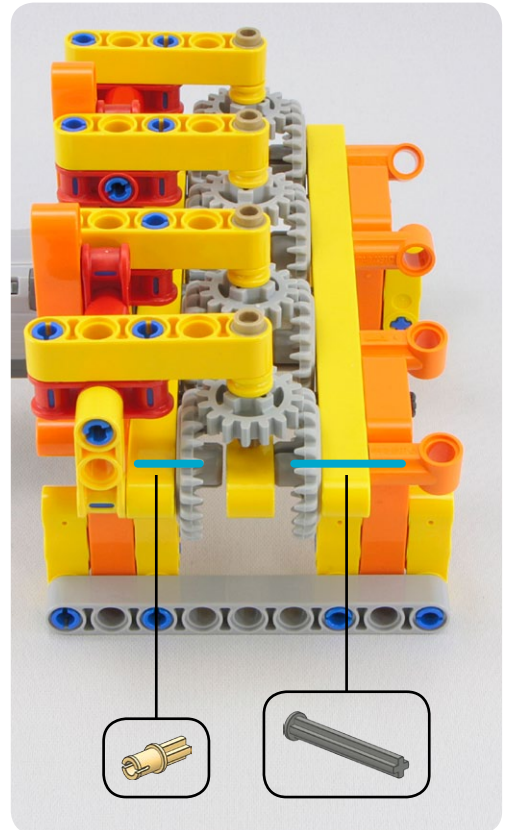
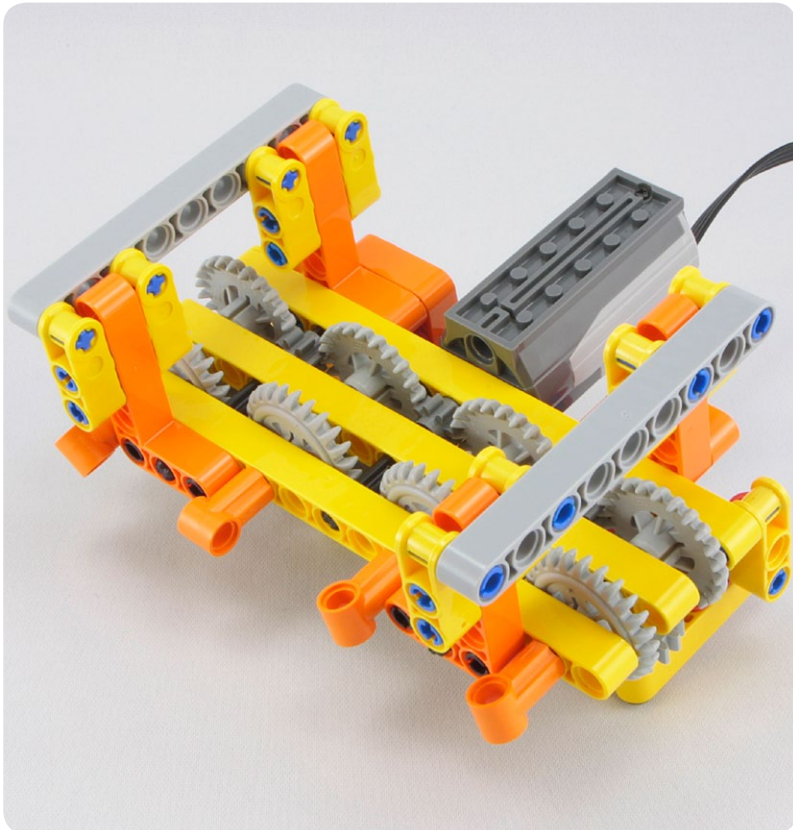
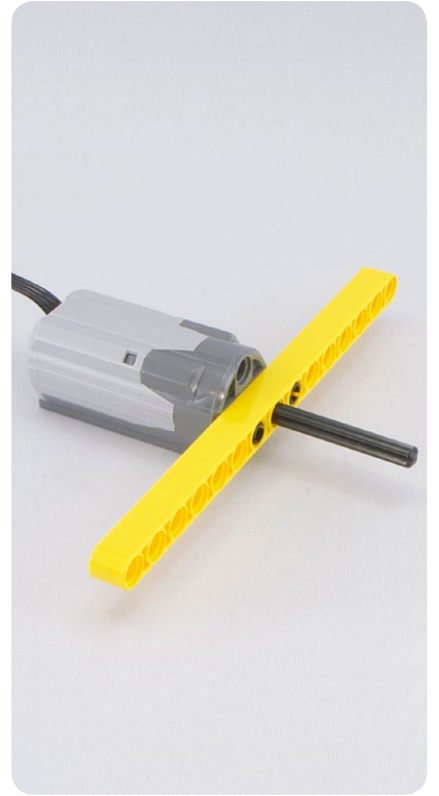
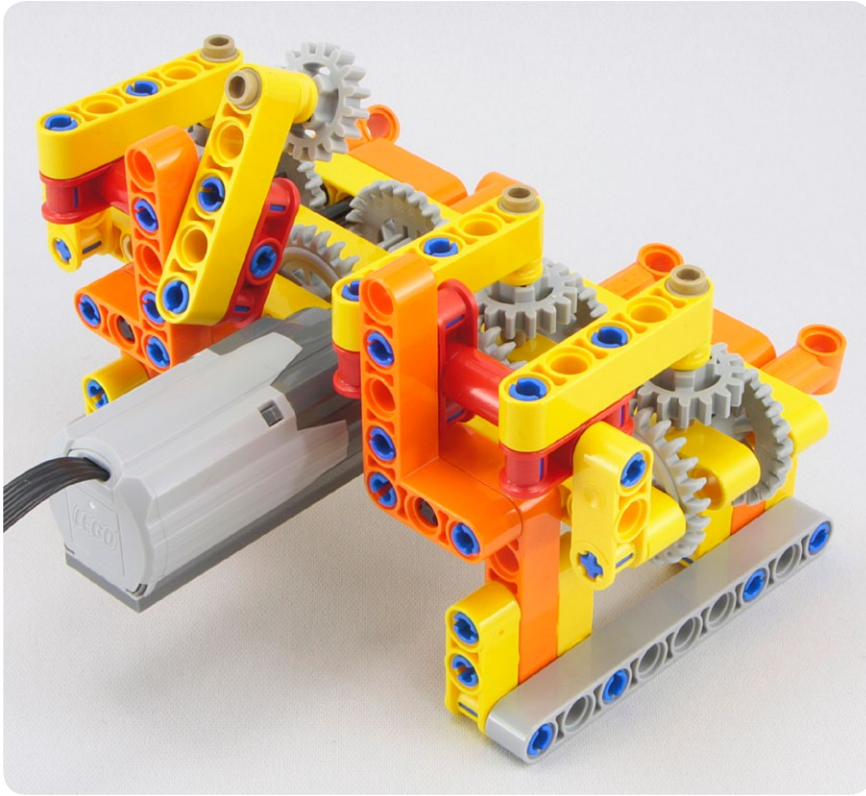








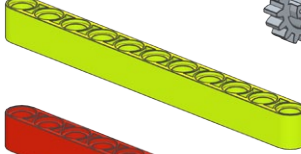

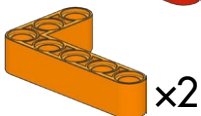
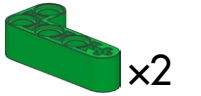




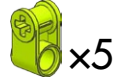
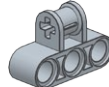
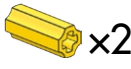



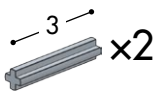



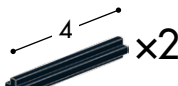
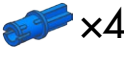







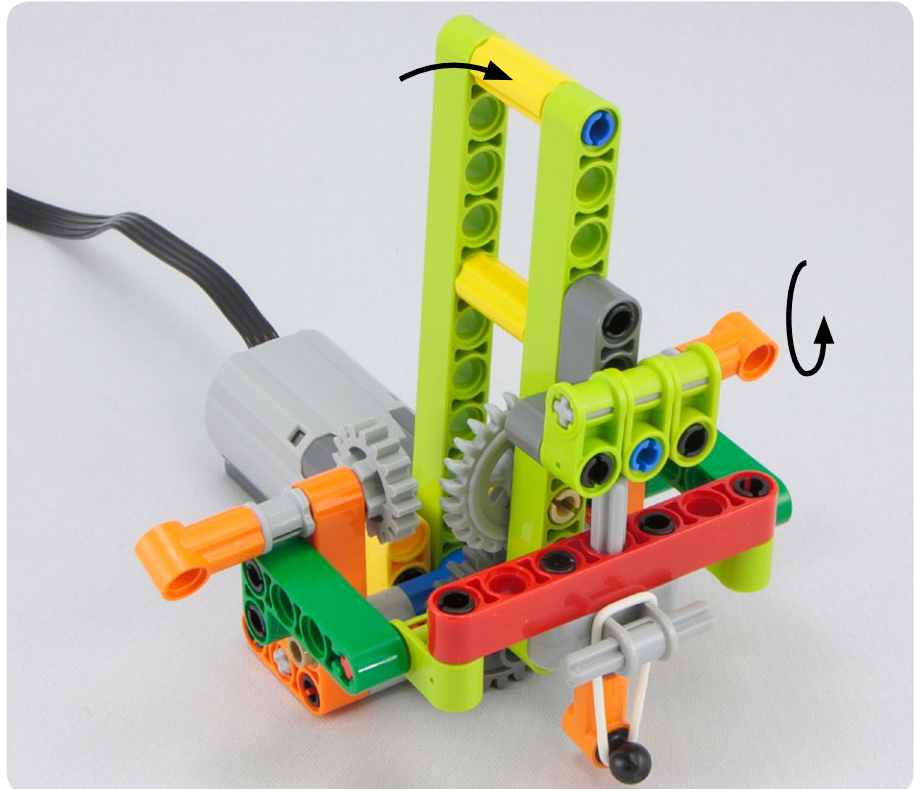
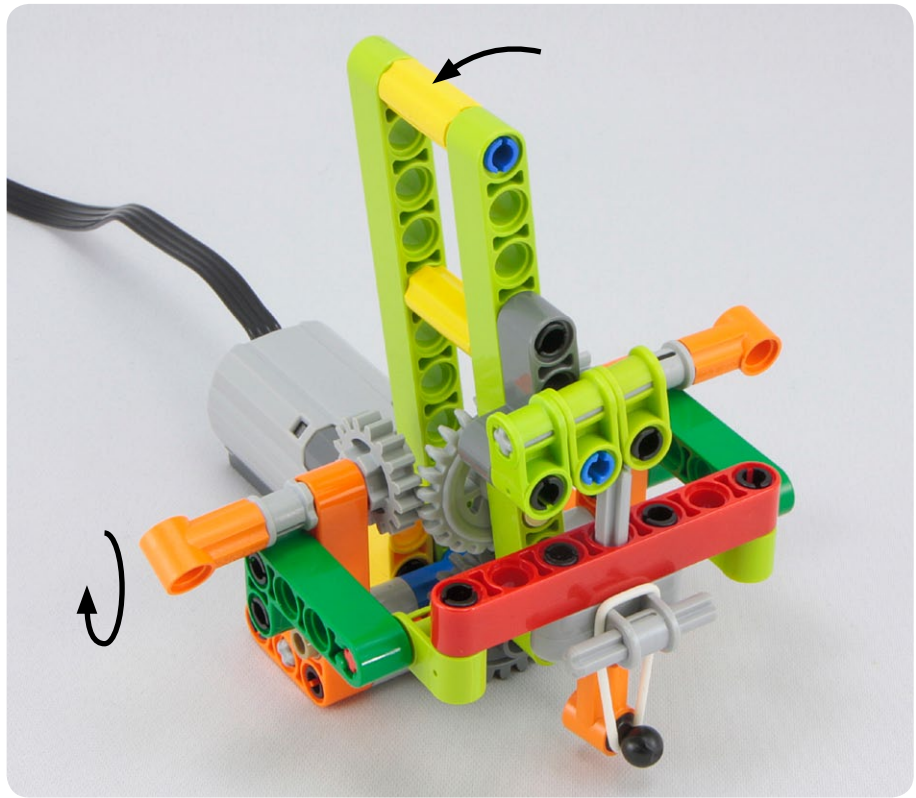
#126

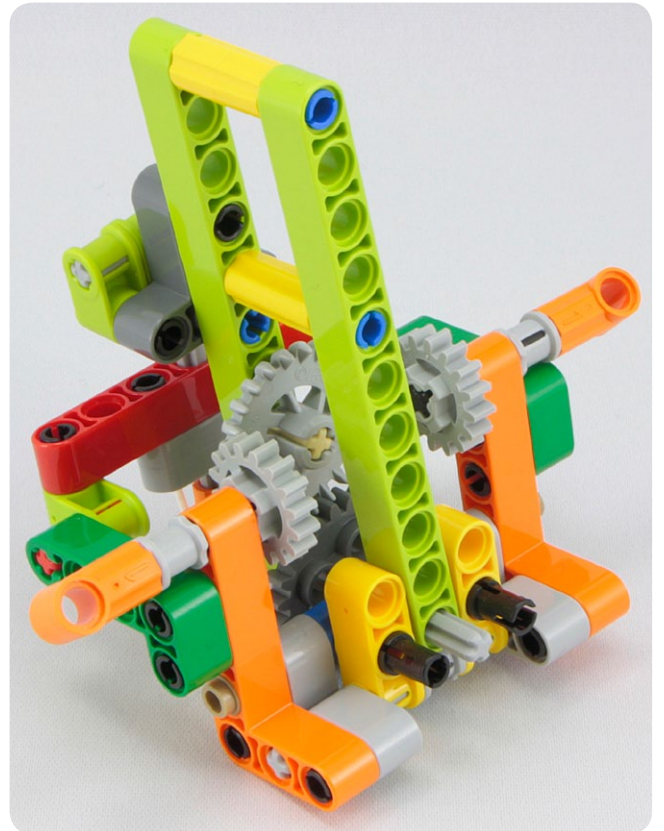
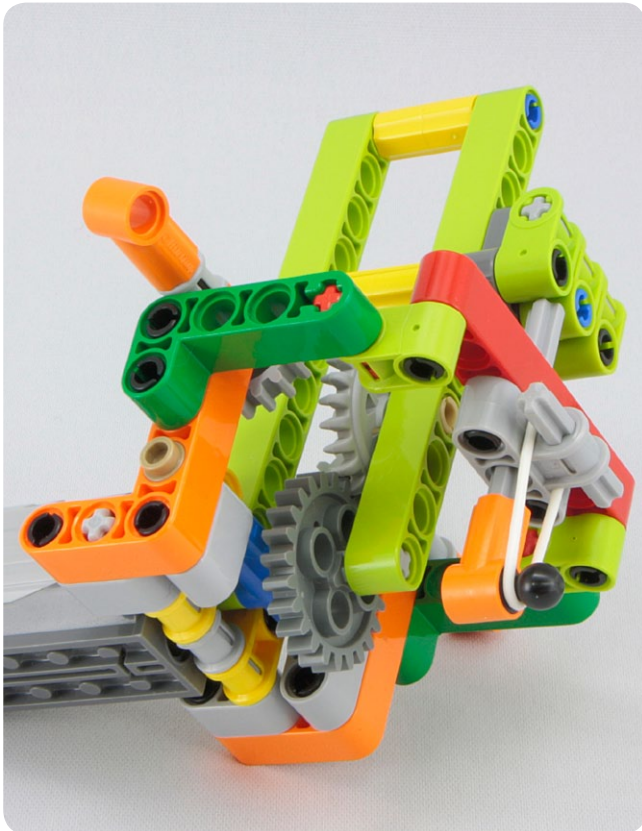
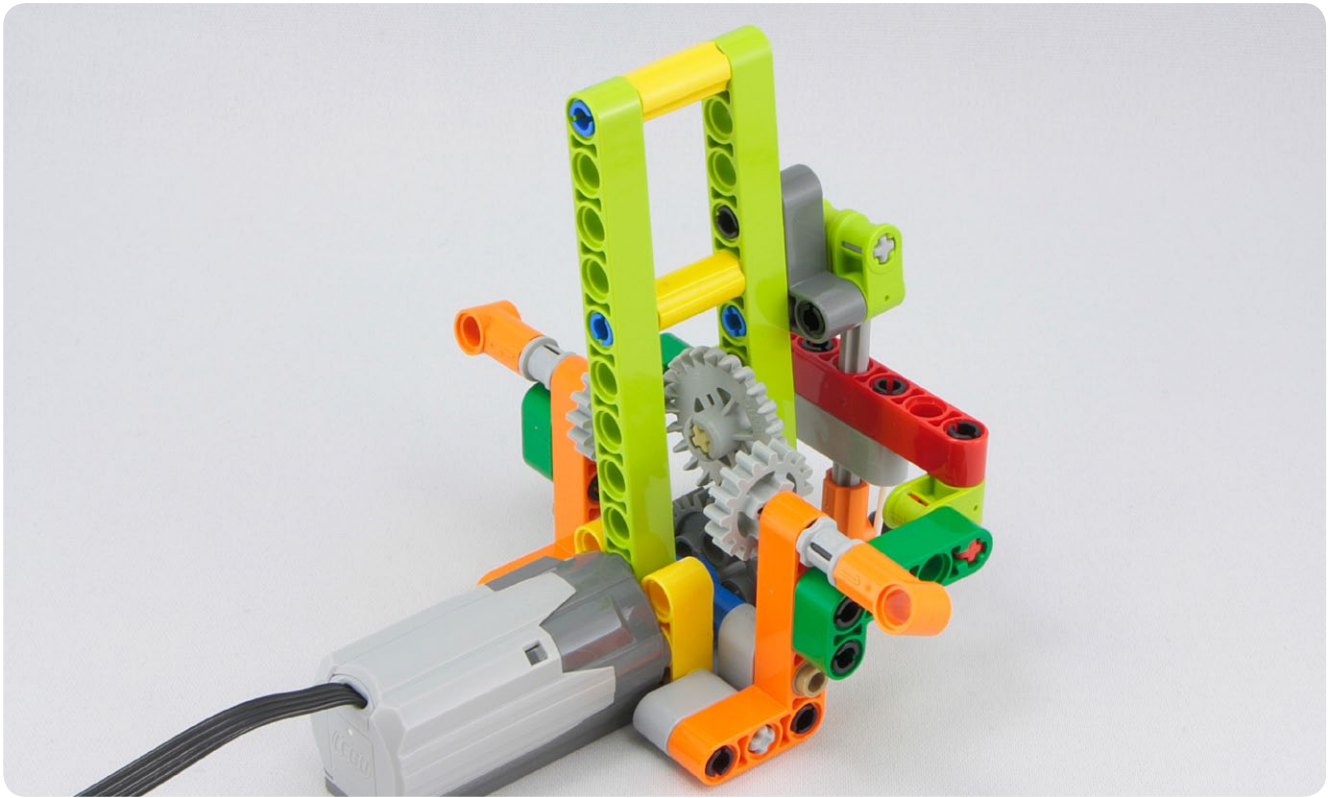




# #127

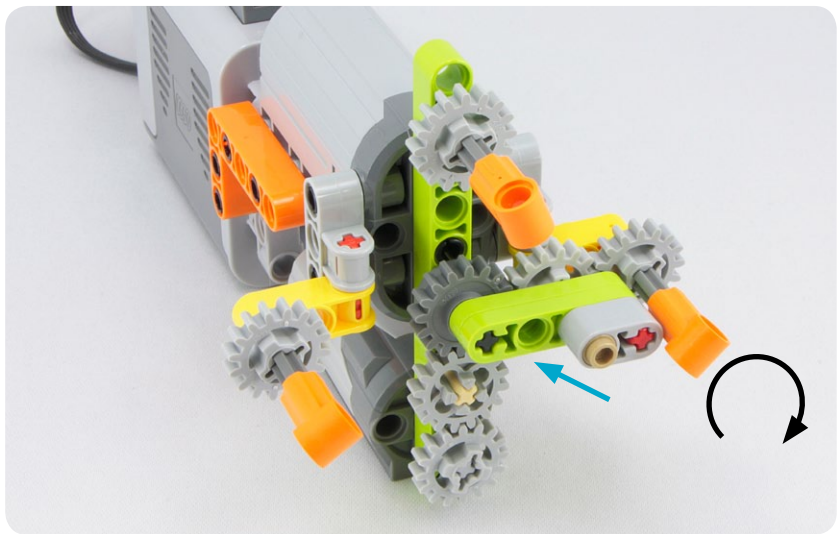
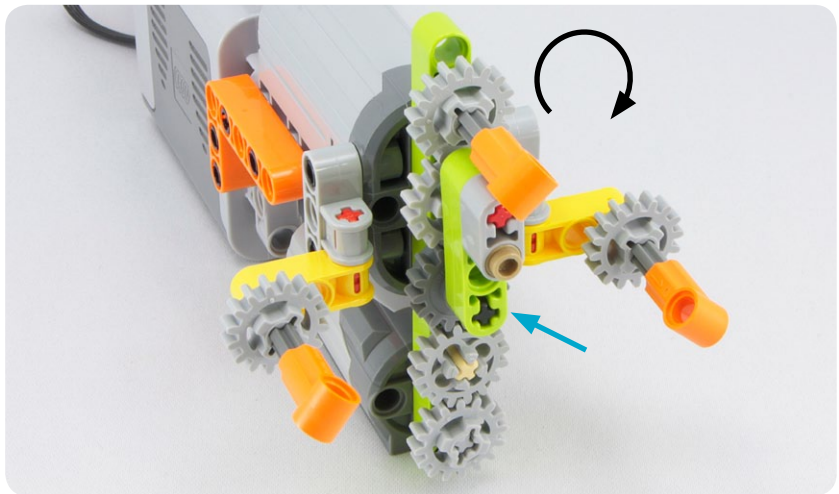
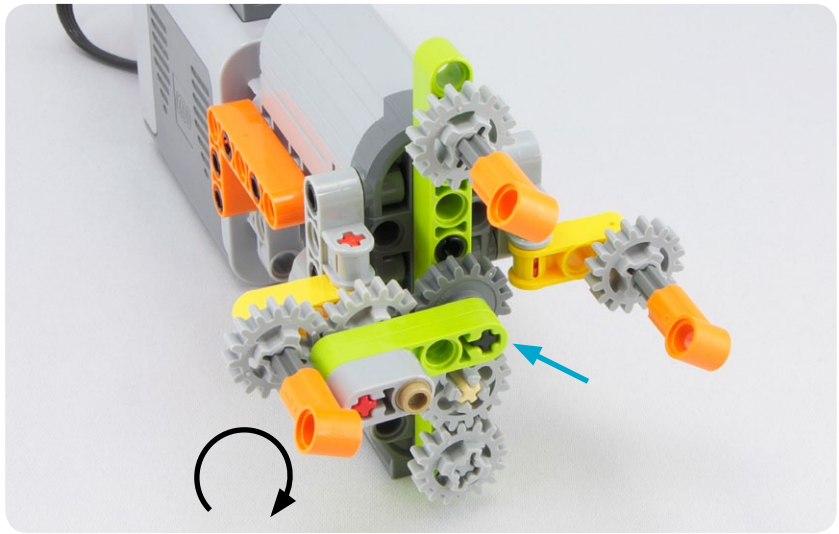
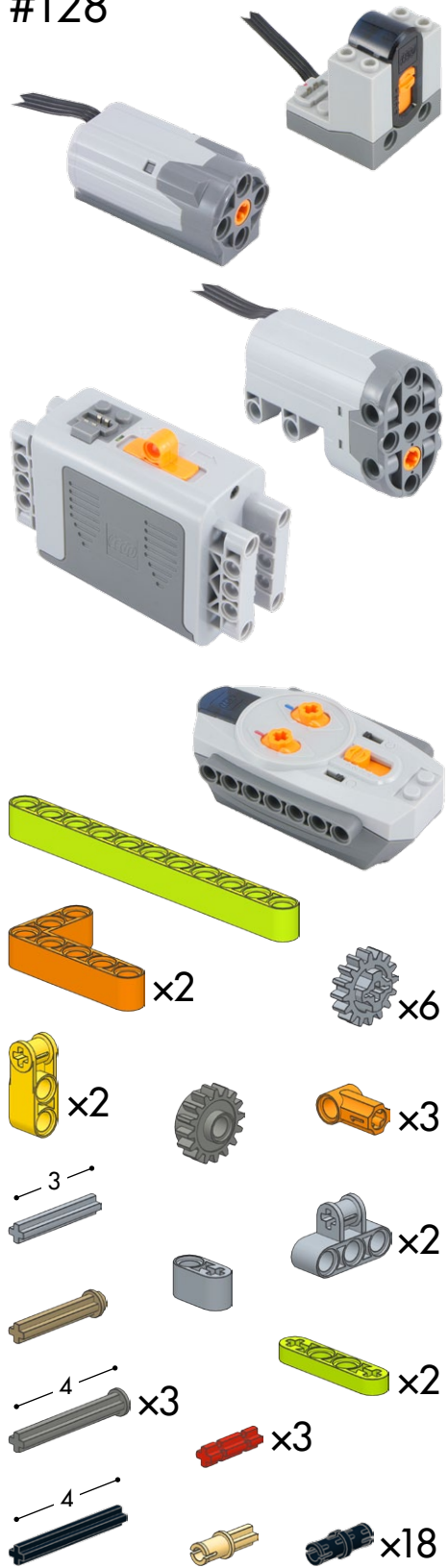
-  Motor
-  Gear 48
-  Gear 24
-  Gear 12 x2
-  Beam 1x12 yellow-green x2
-  Beam 1x6 red x2
-  Beam 1x3 orange x2
-  Beam 1x3 green x2
-  Beam 1x2 yellow x2
-  Beam 1x2 green x5
-  Bracket x4
-  Ring
-  Bracket
-  Bracket
-  Pin yellow x2
-  Pin orange x3
-  Pin red x2
-  Pin blue
-  Pin grey x2
-  Pin grey x3
-  Pin tan x2
-  Pin black
-  Pin black x2
-  Pin blue
-  Pin tan
-  Pin grey x2
-  Pin blue x4
-  Pin grey x2
-  Pin black x17

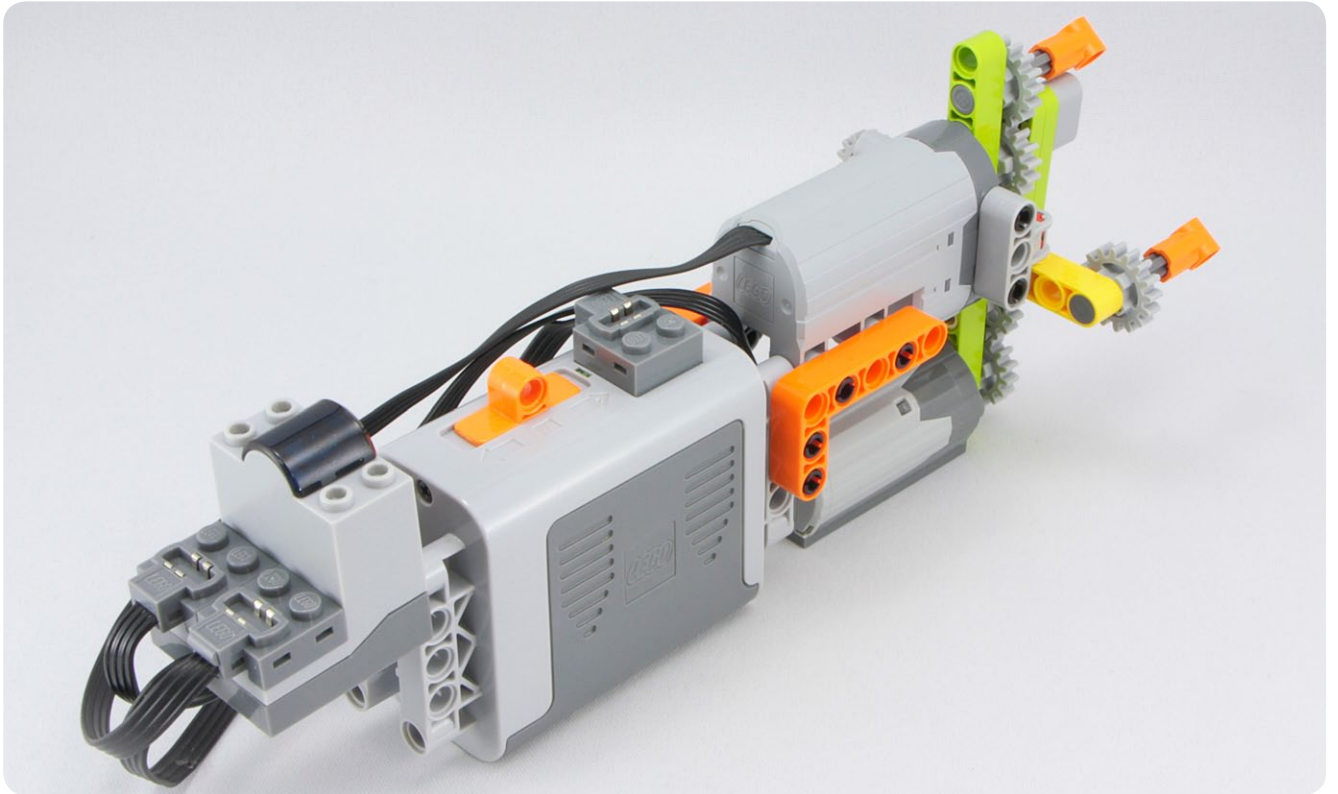
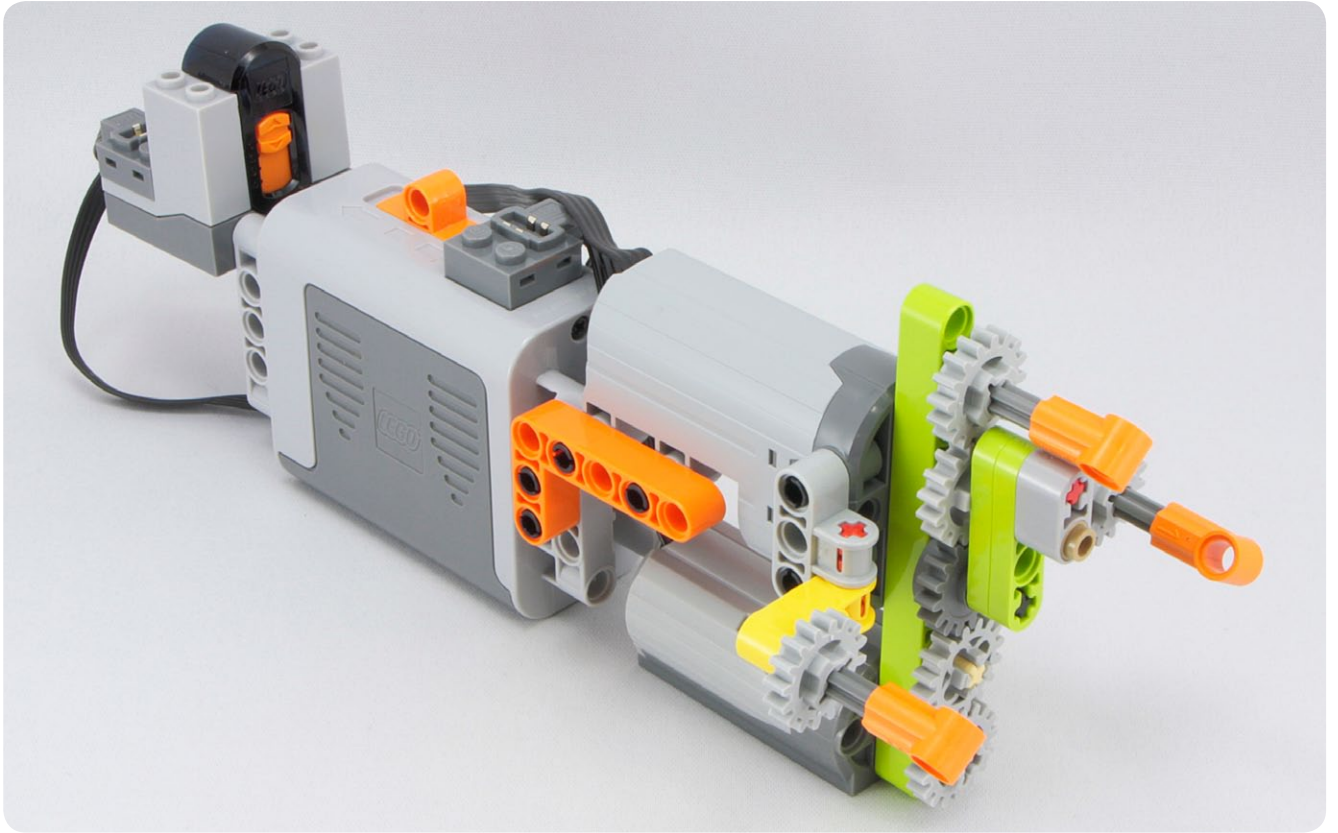


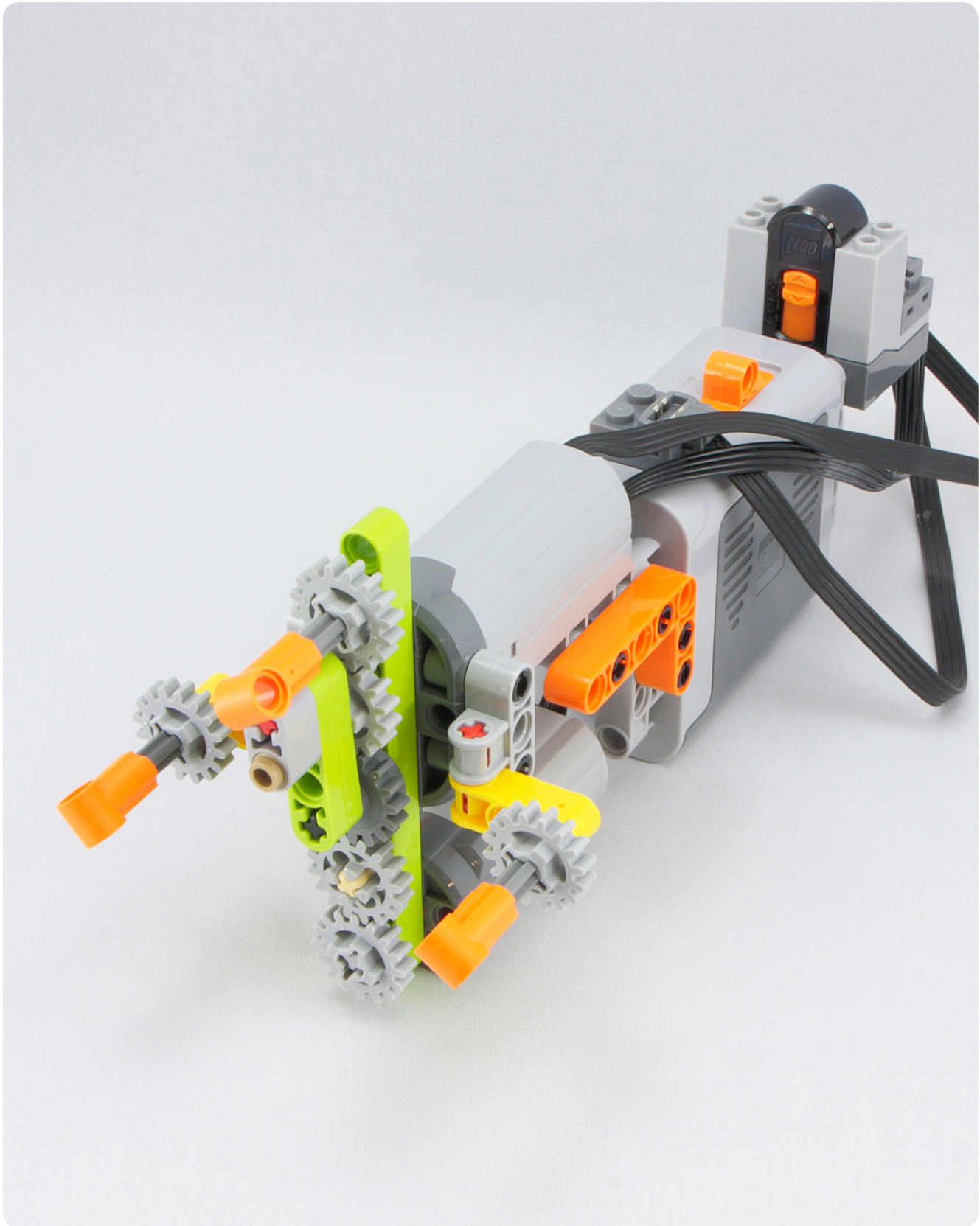


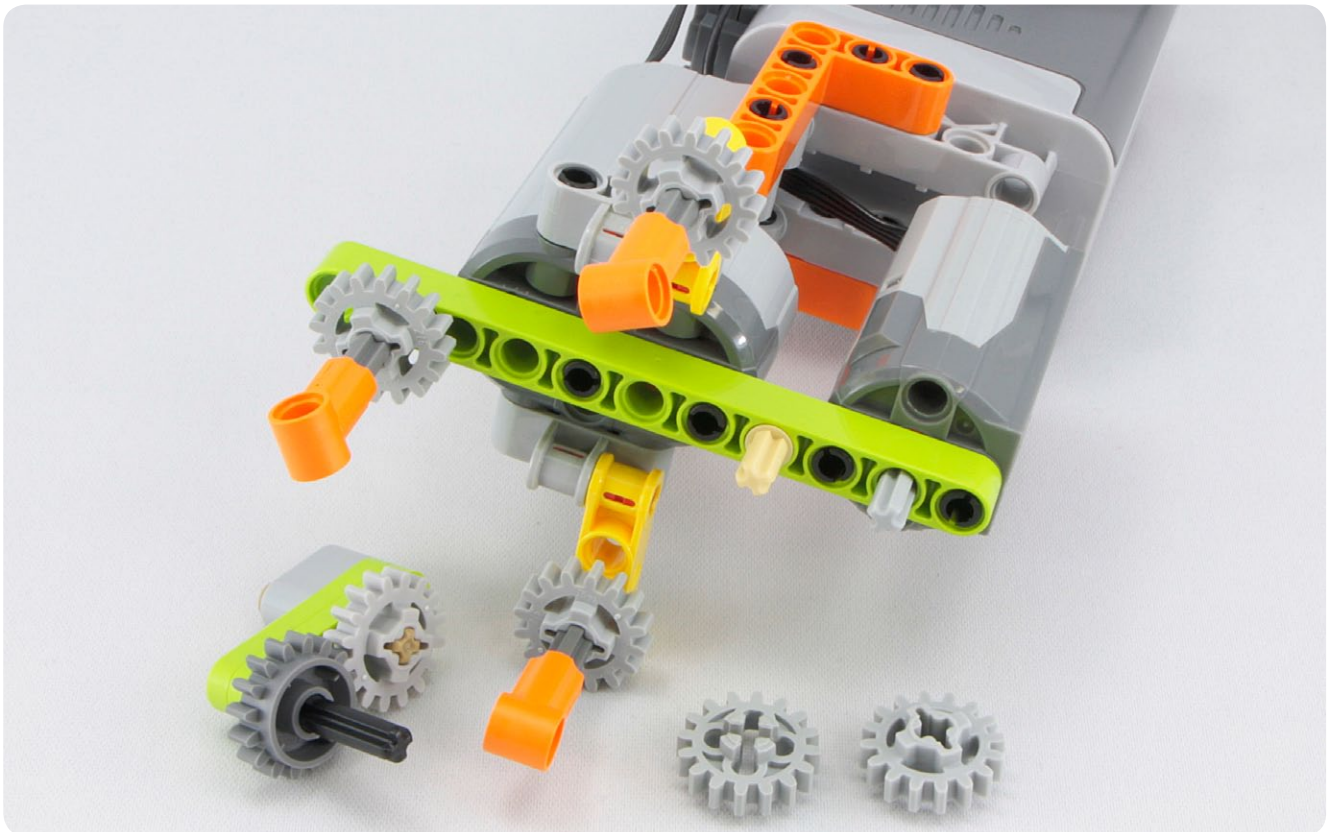
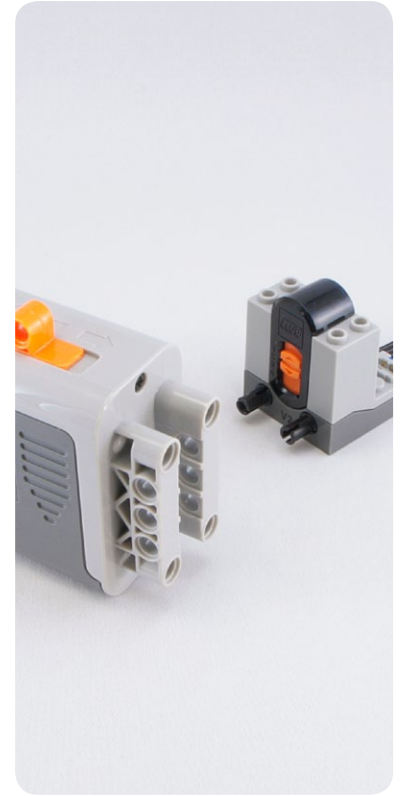


# #128

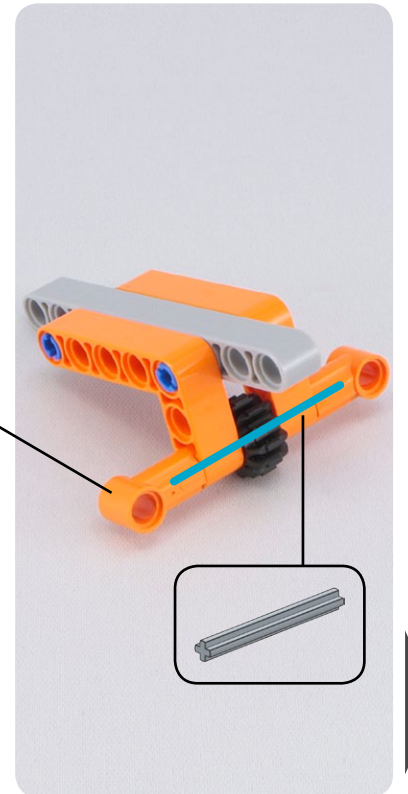
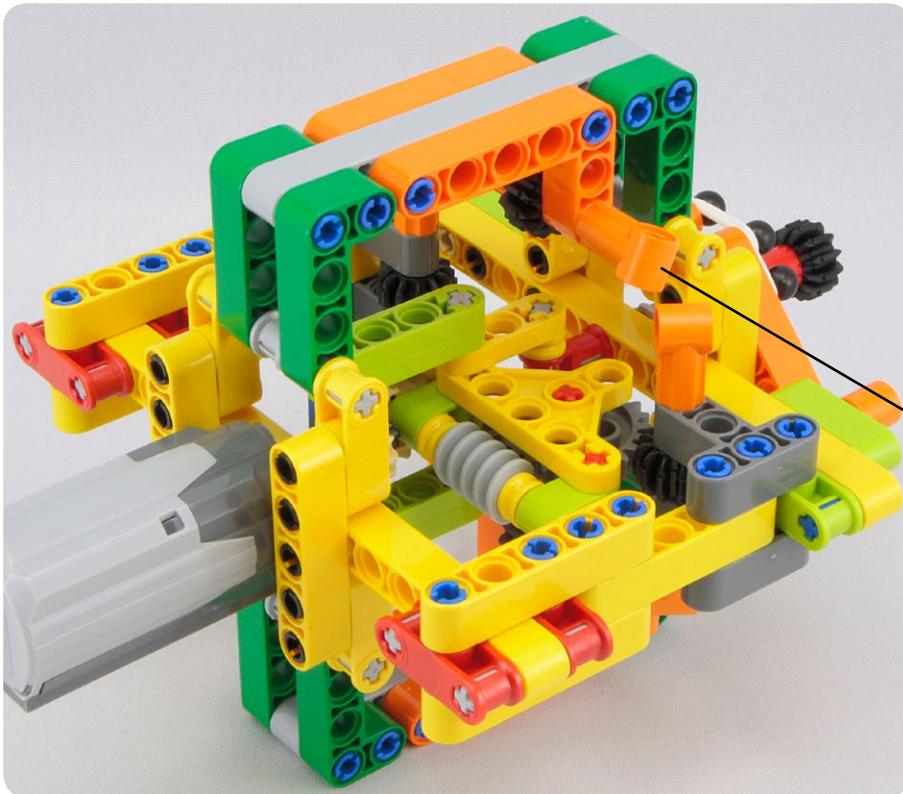
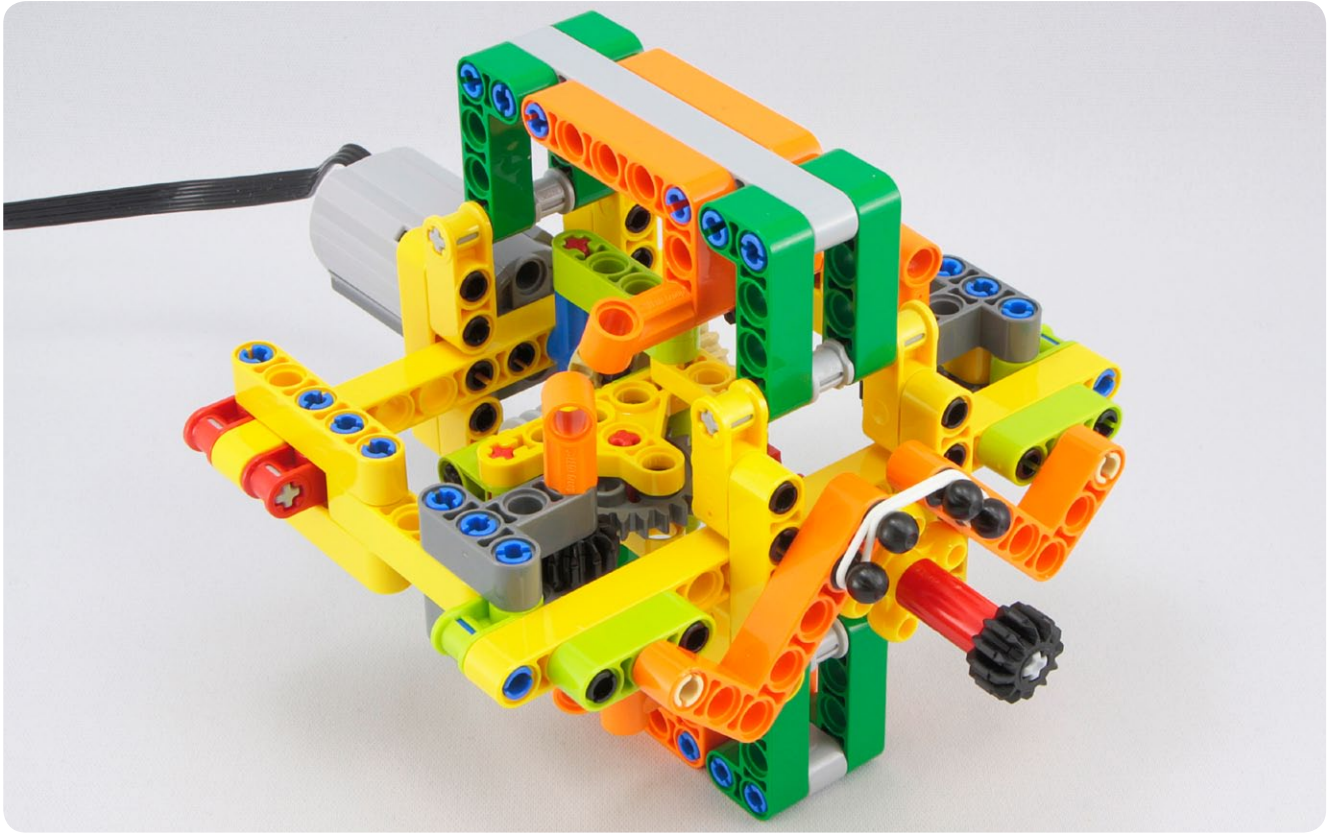


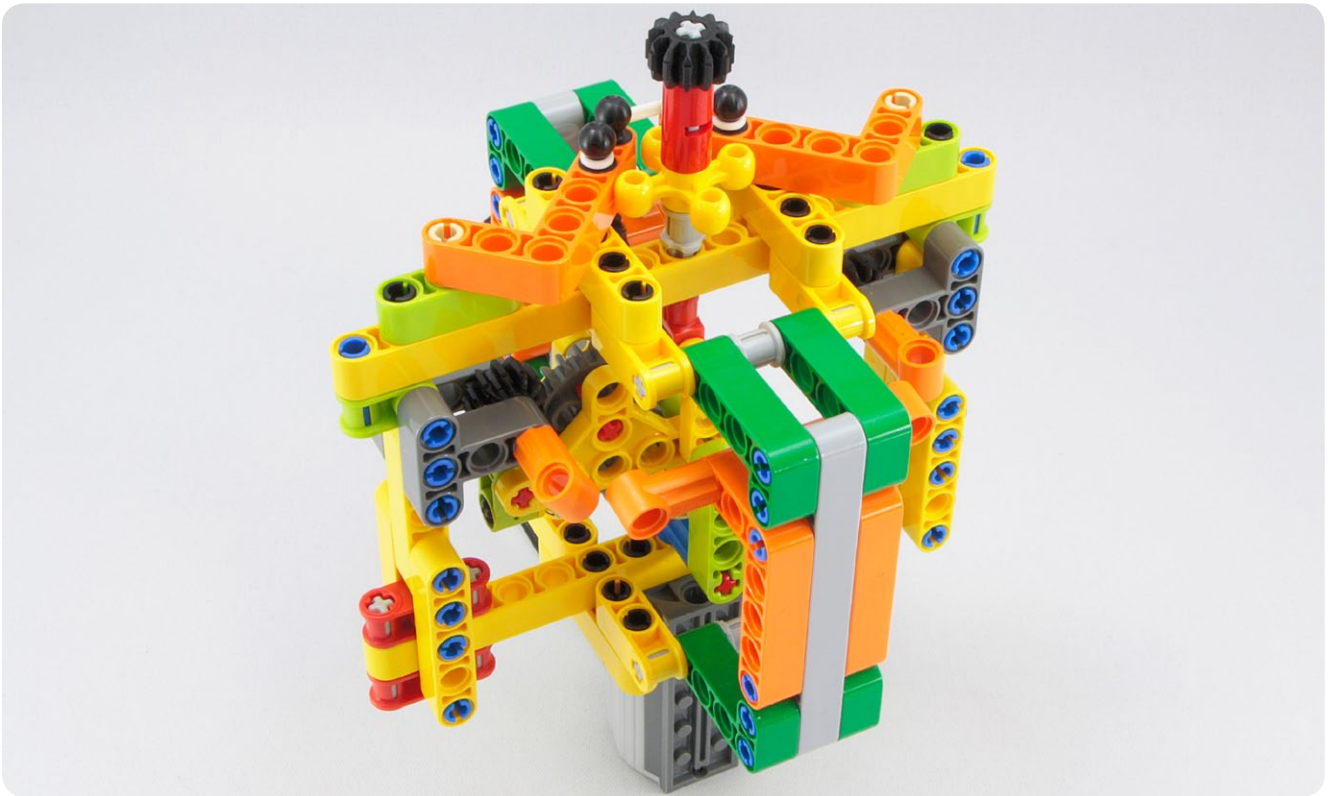
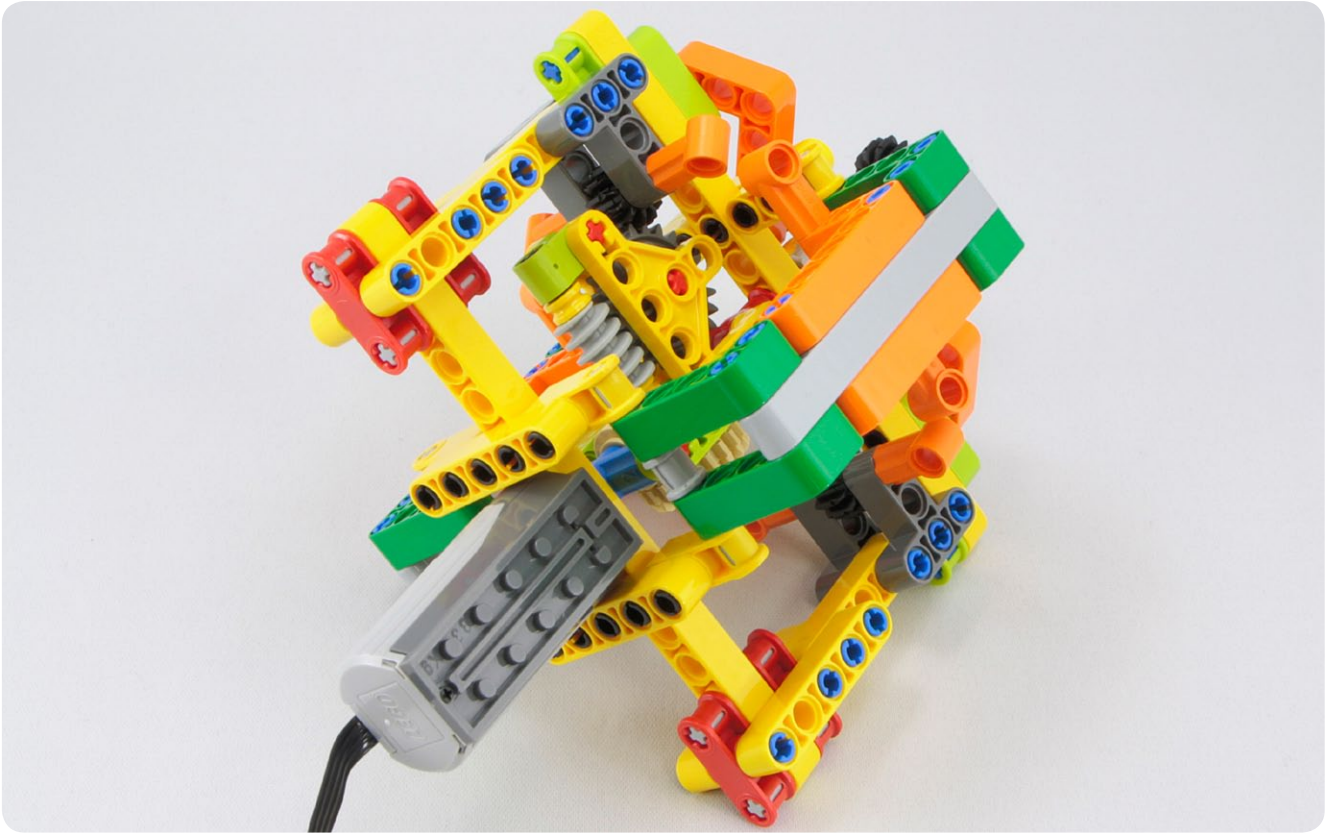


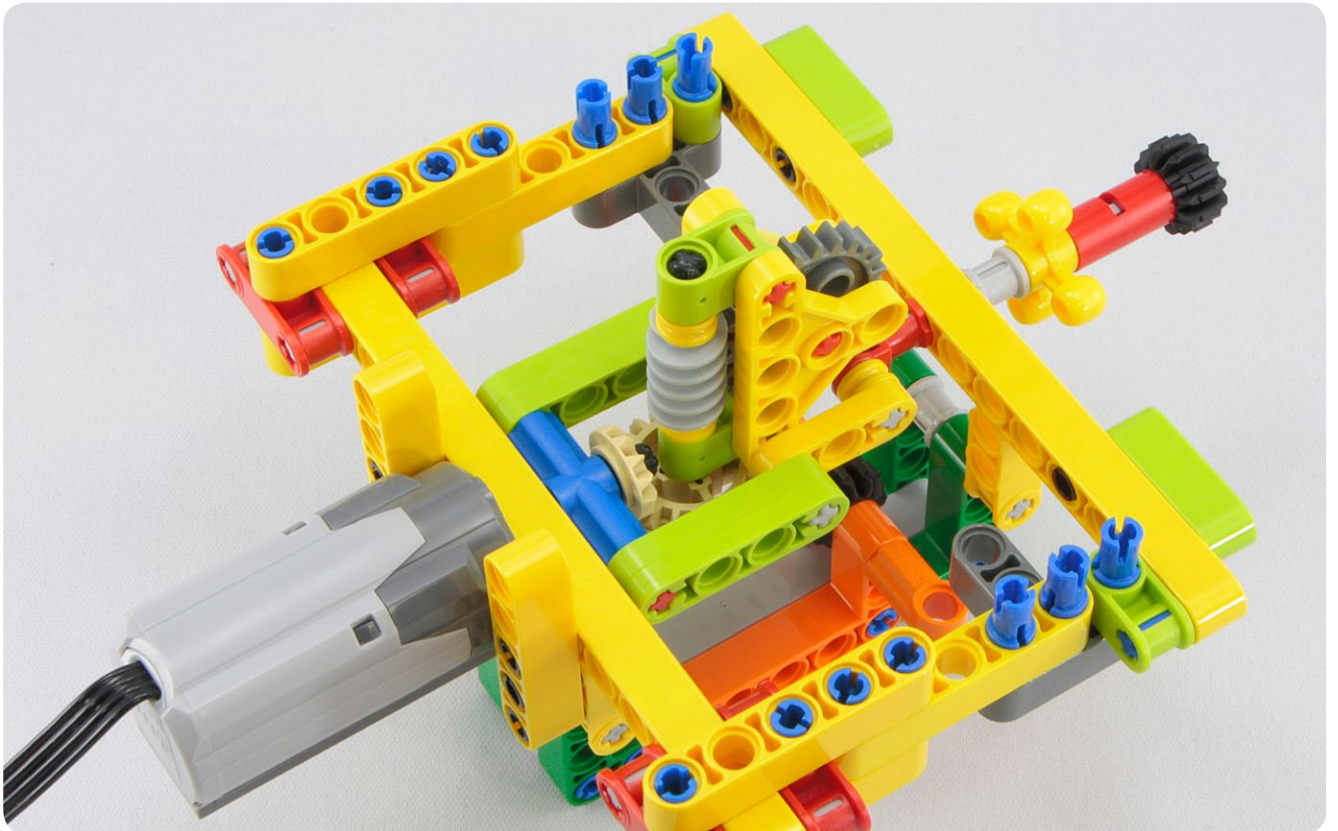
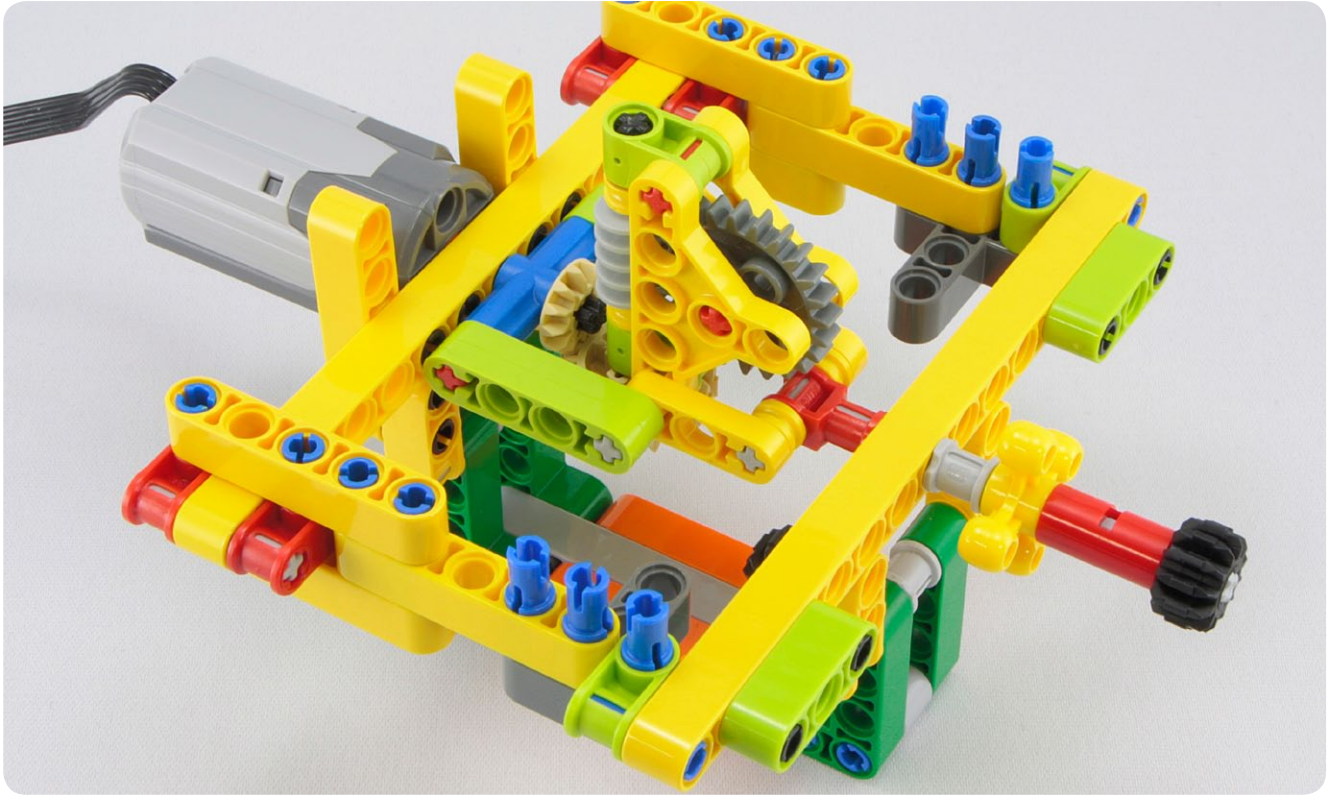




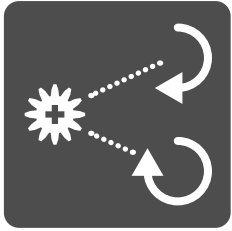






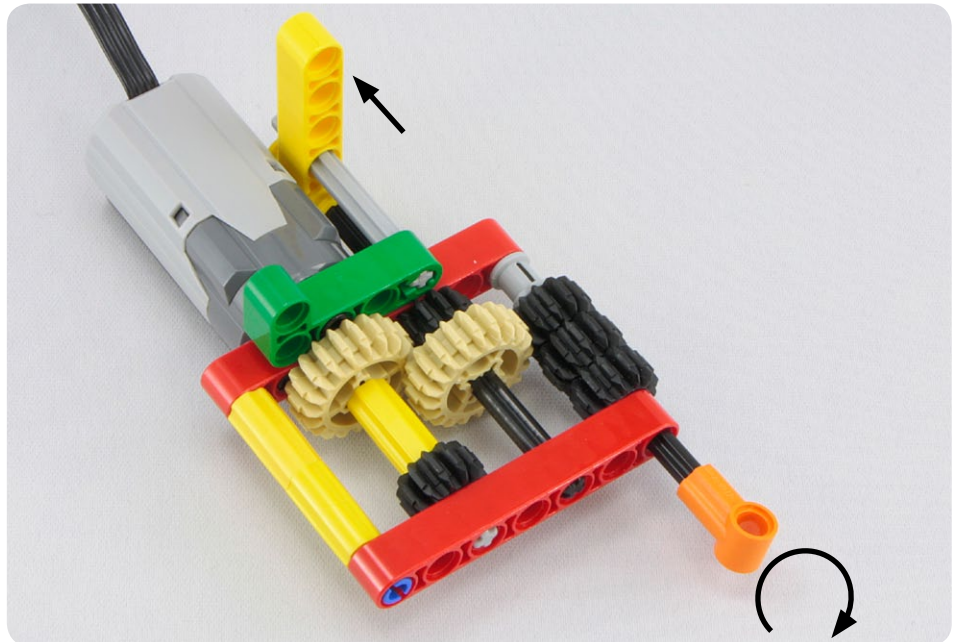
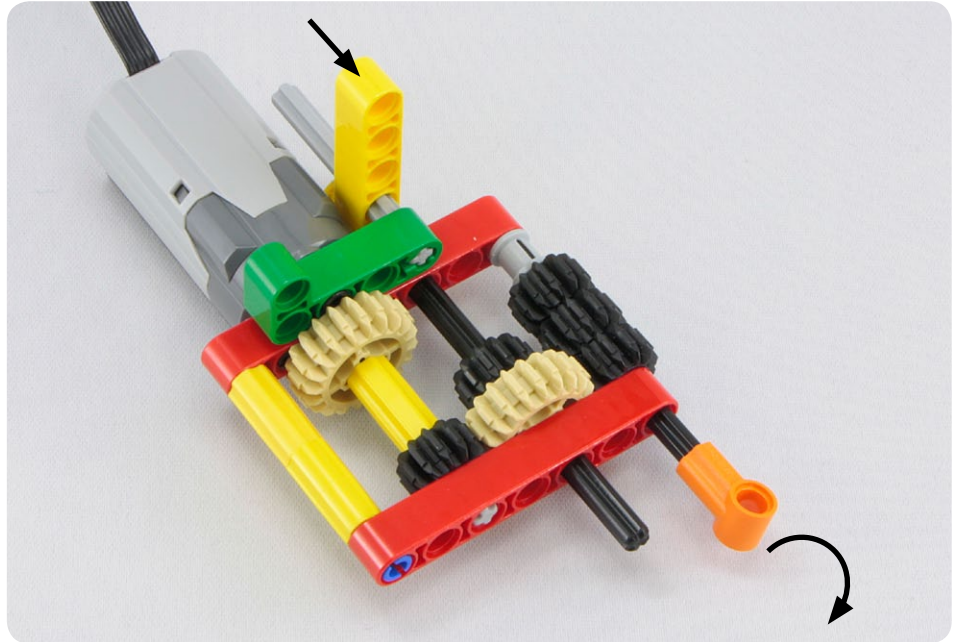
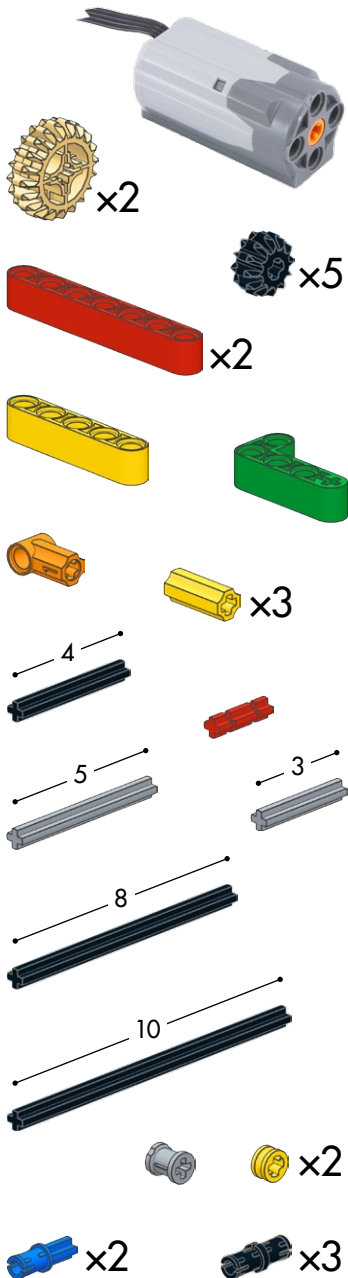


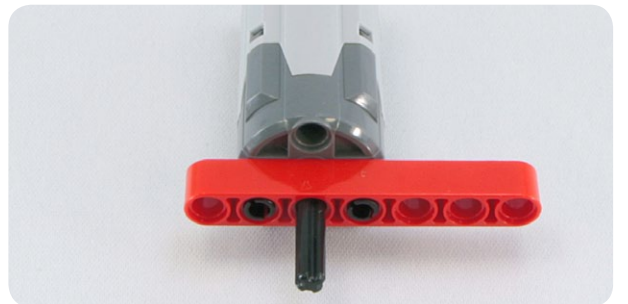
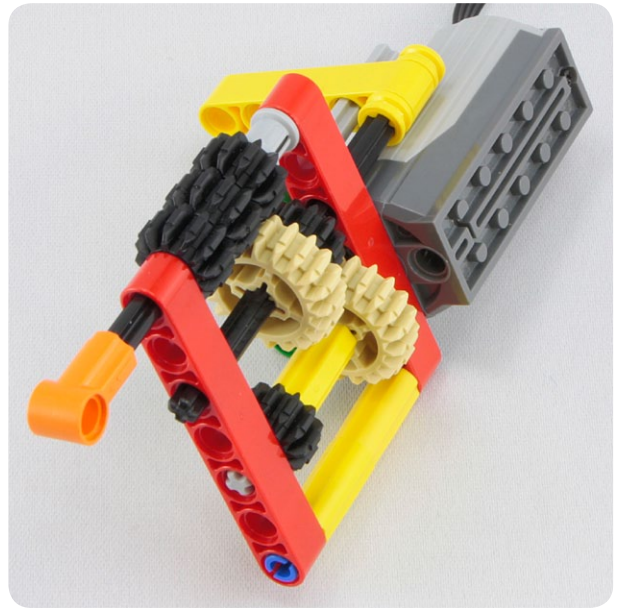
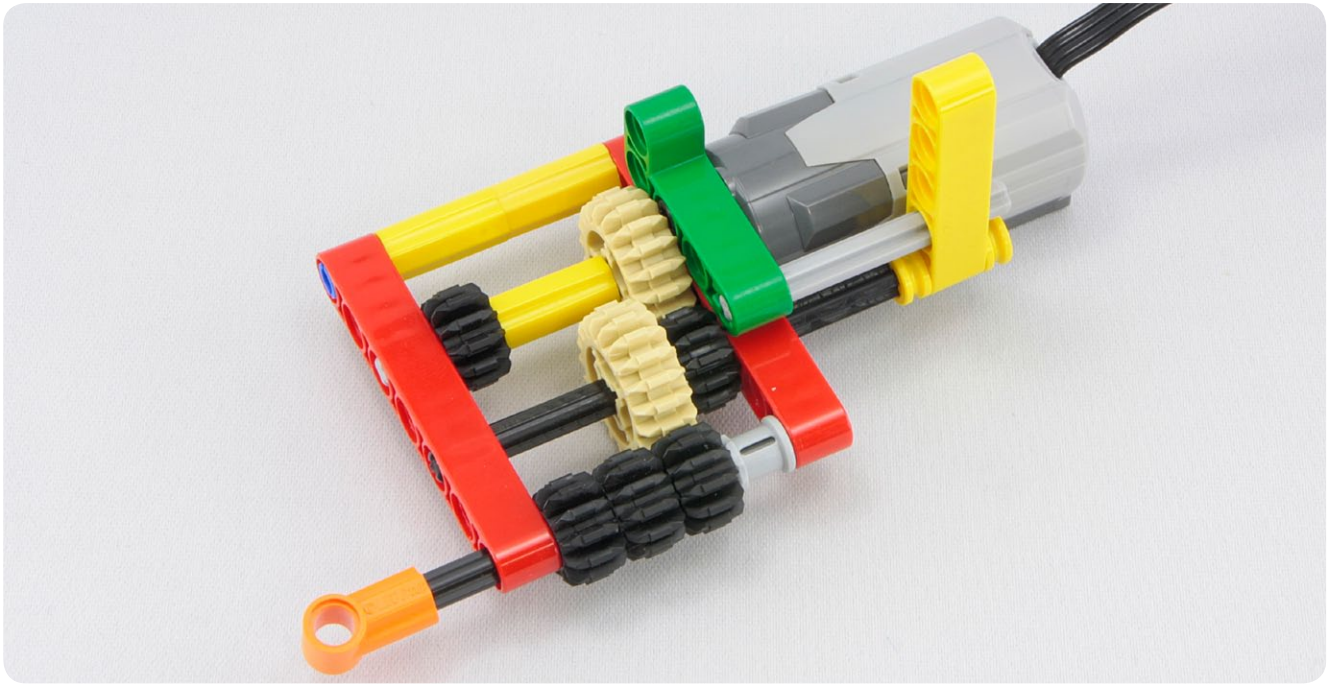




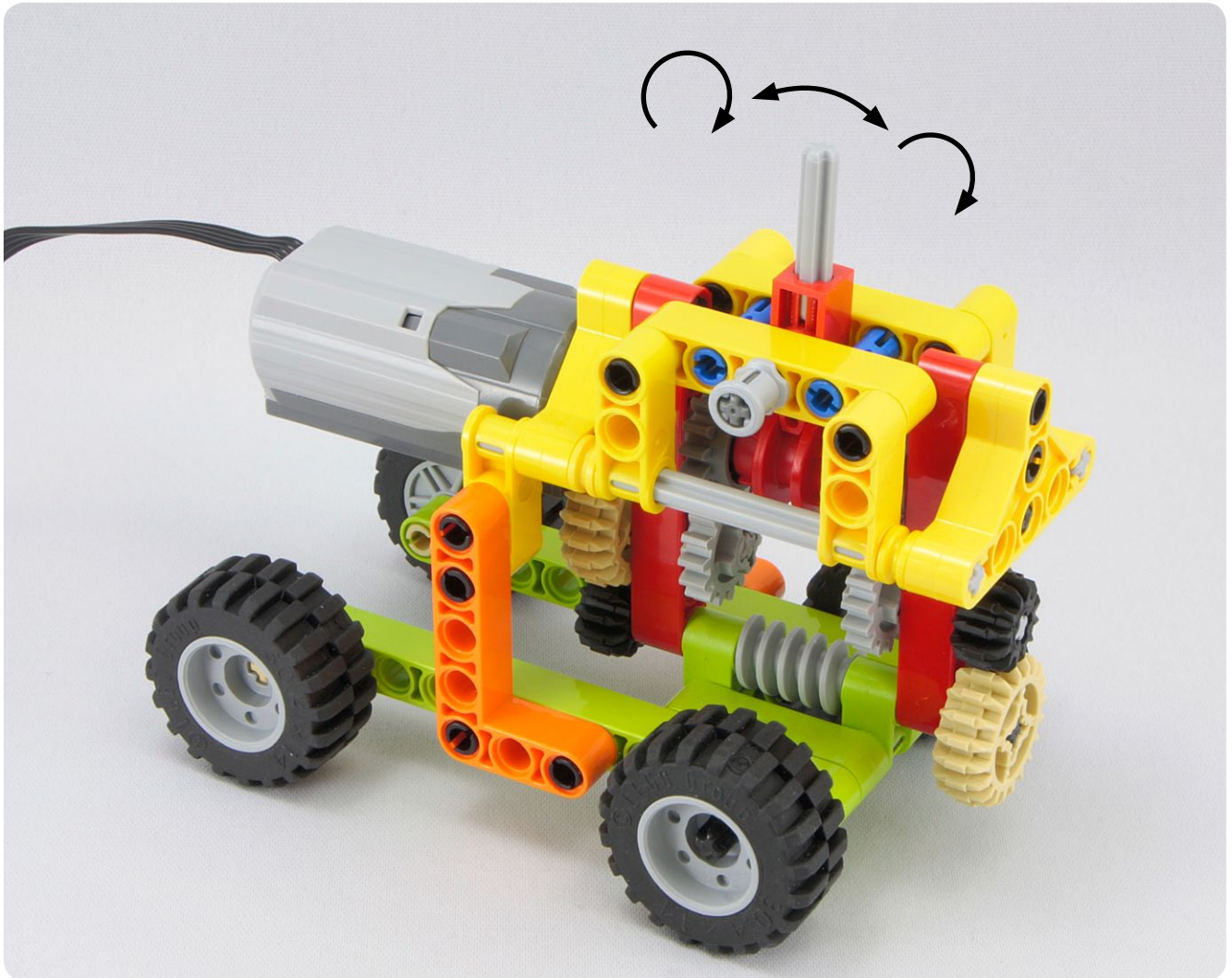
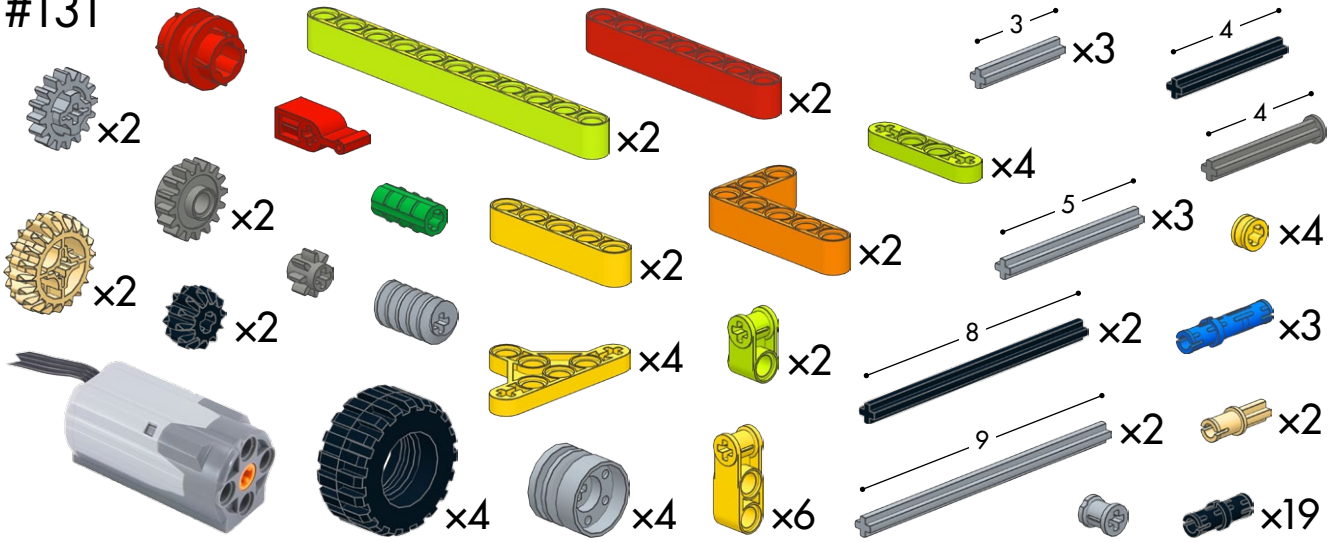
# Transmissions

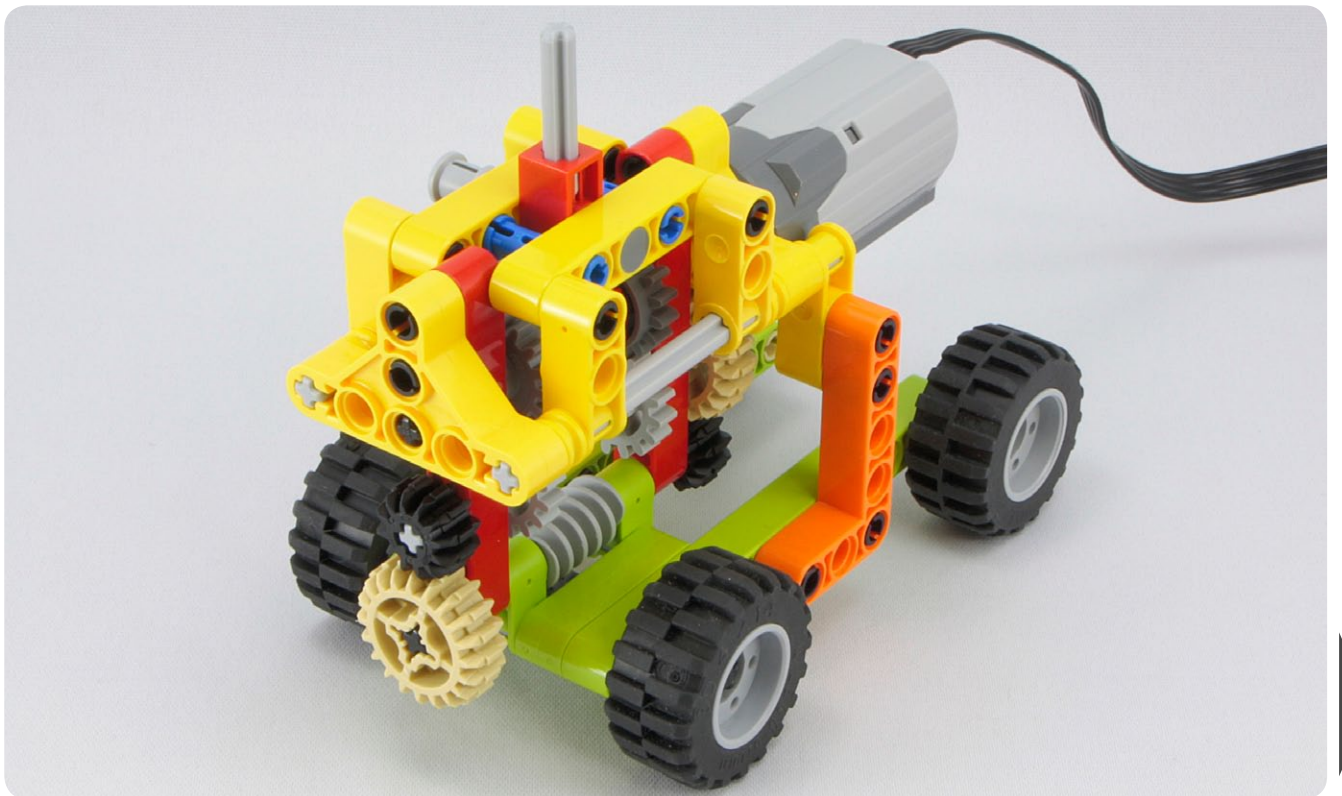
#130

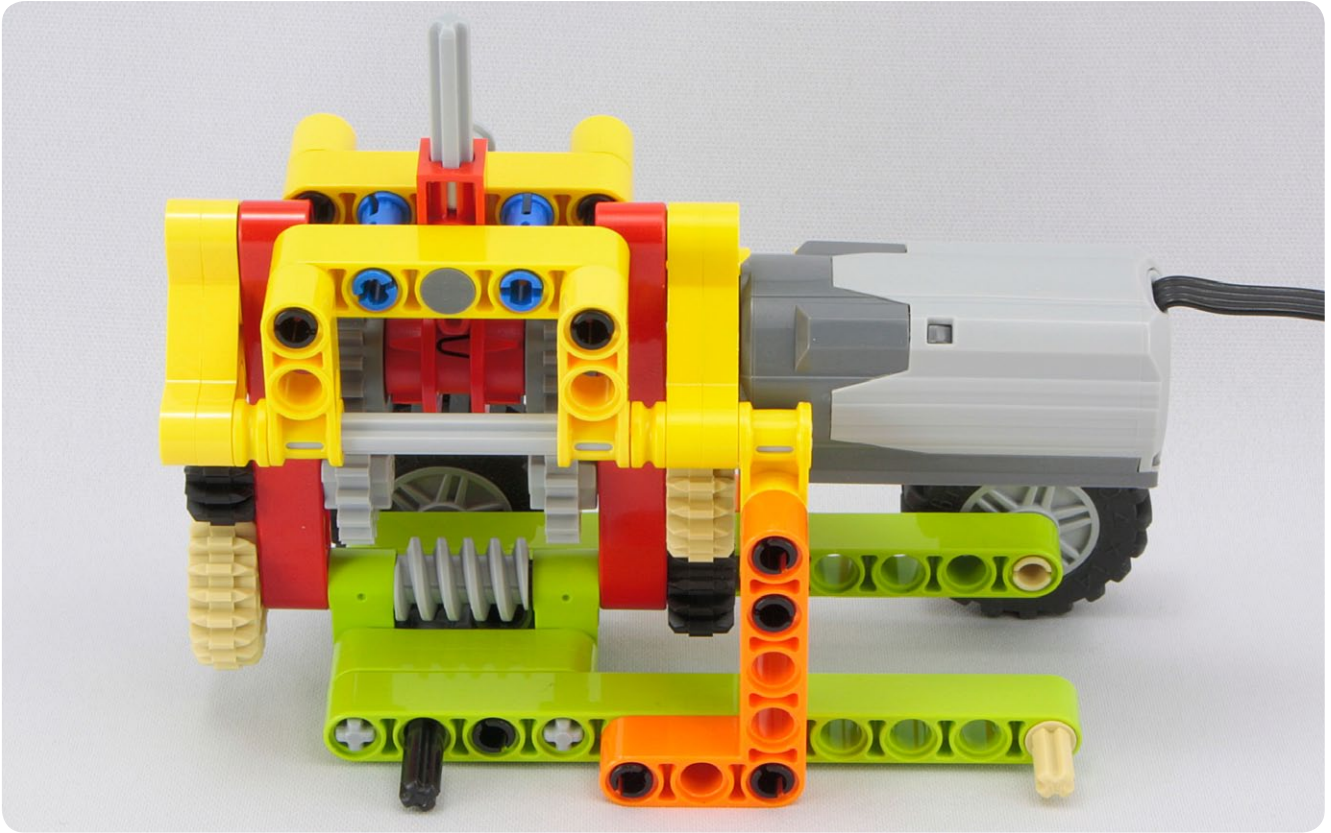


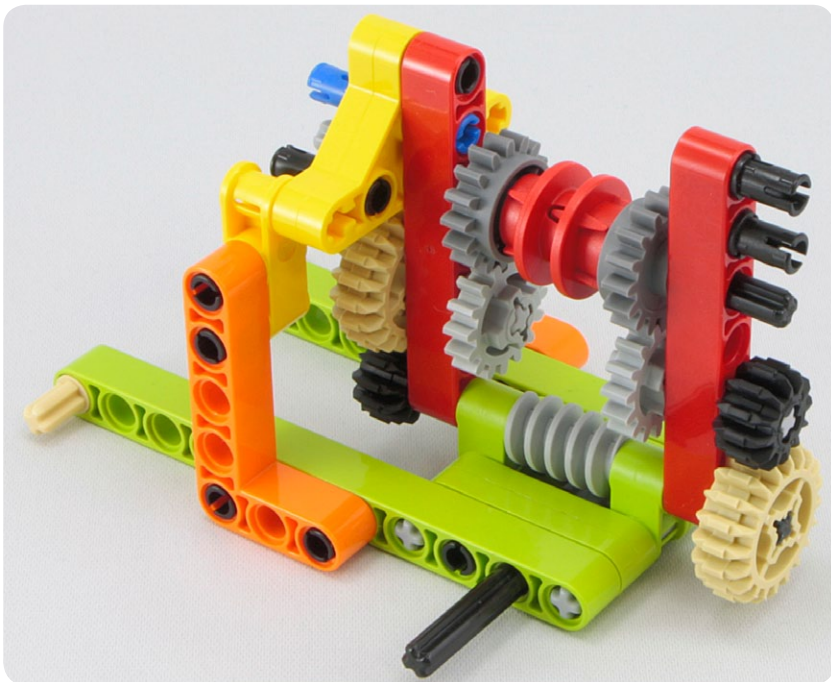


# #131

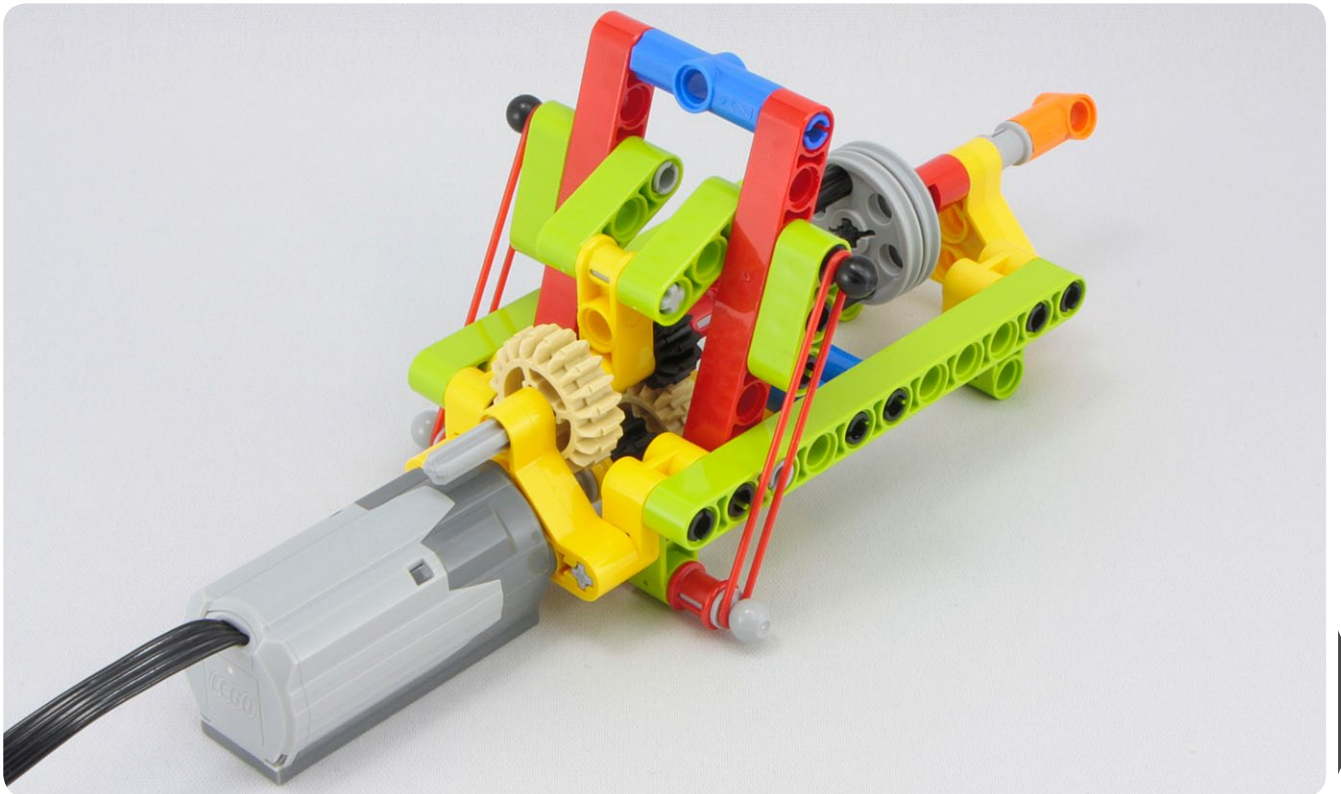
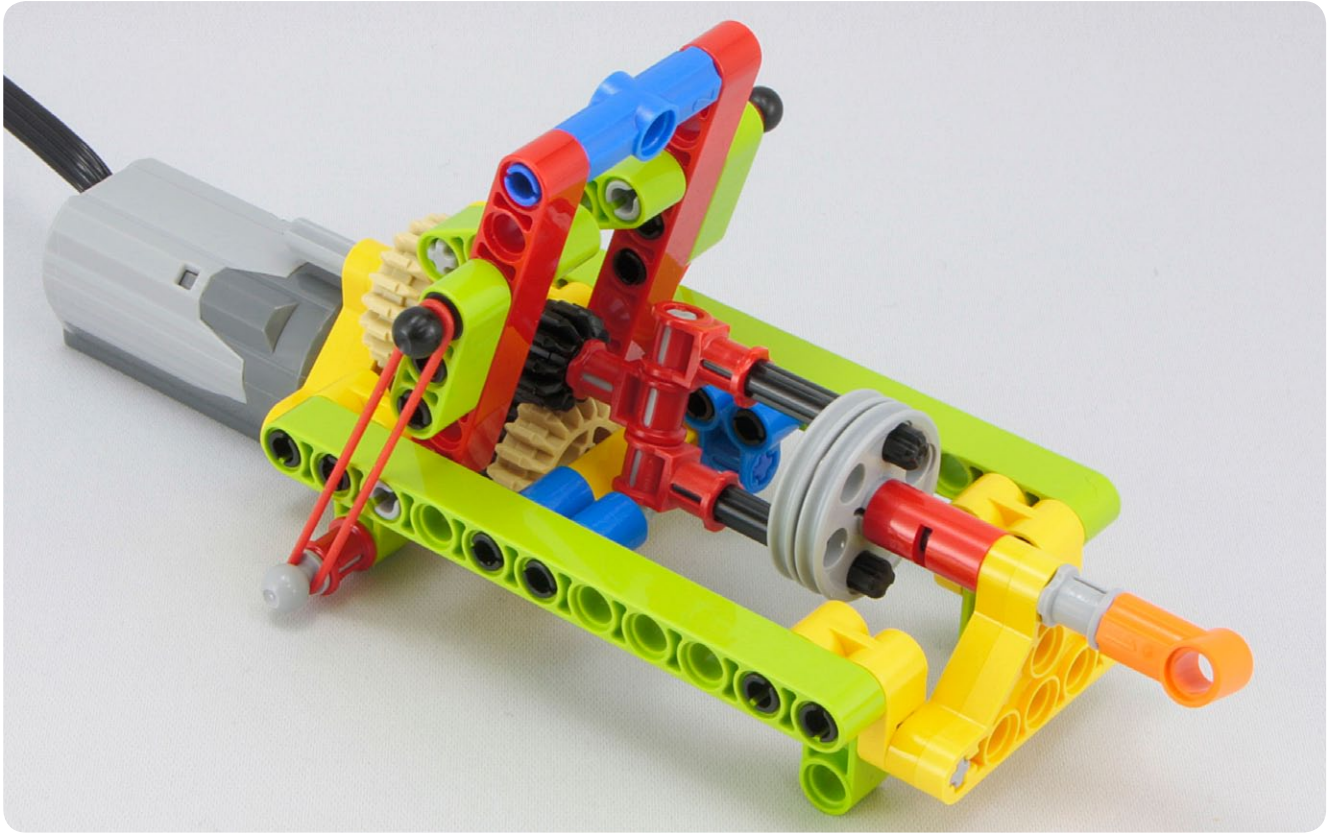




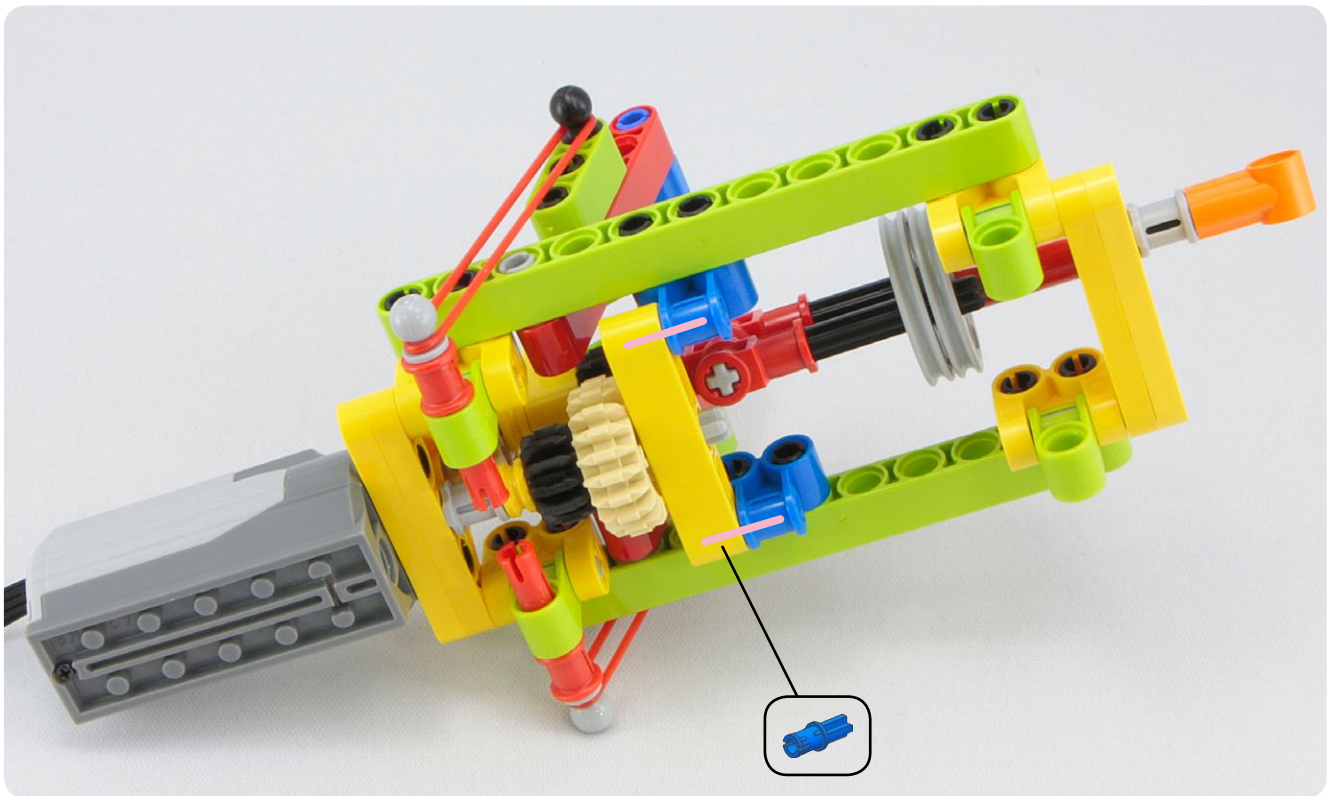
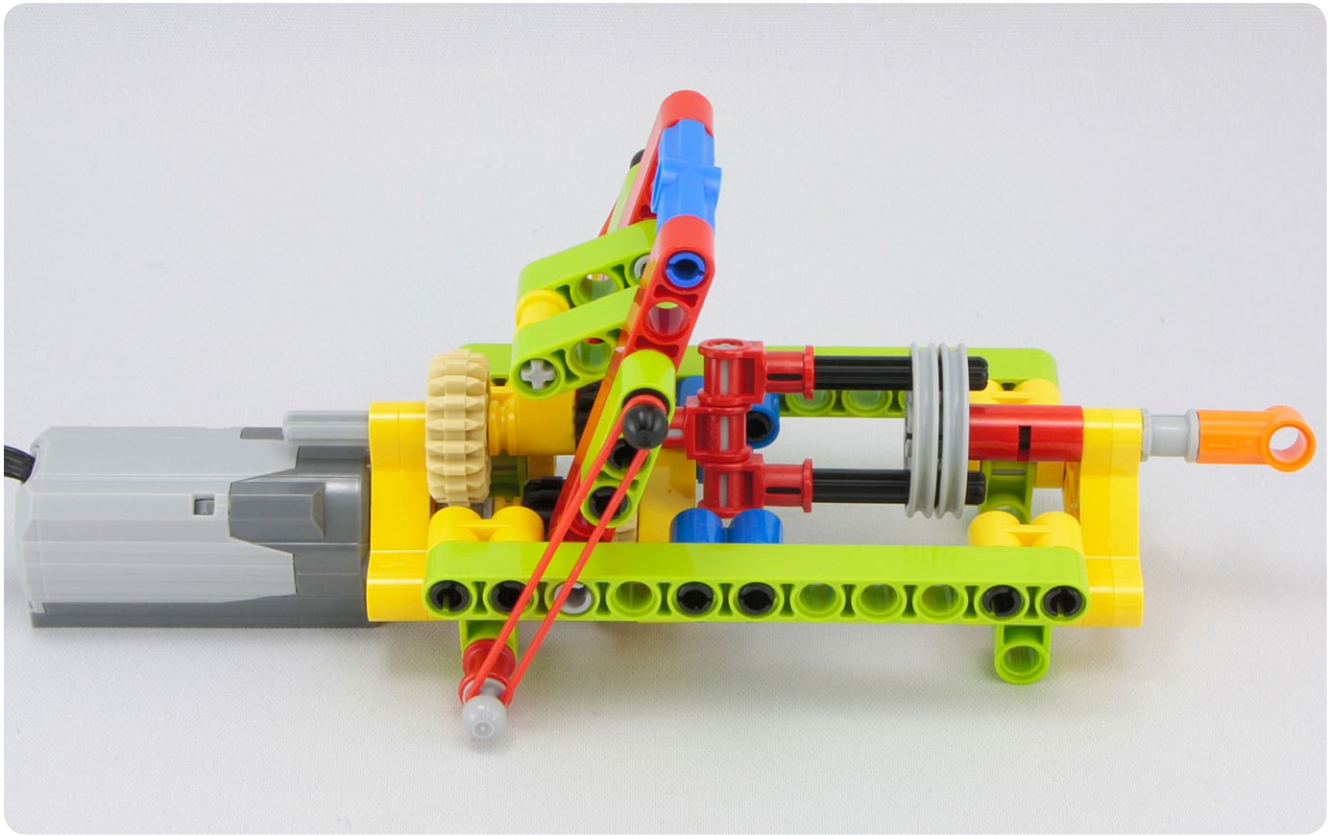


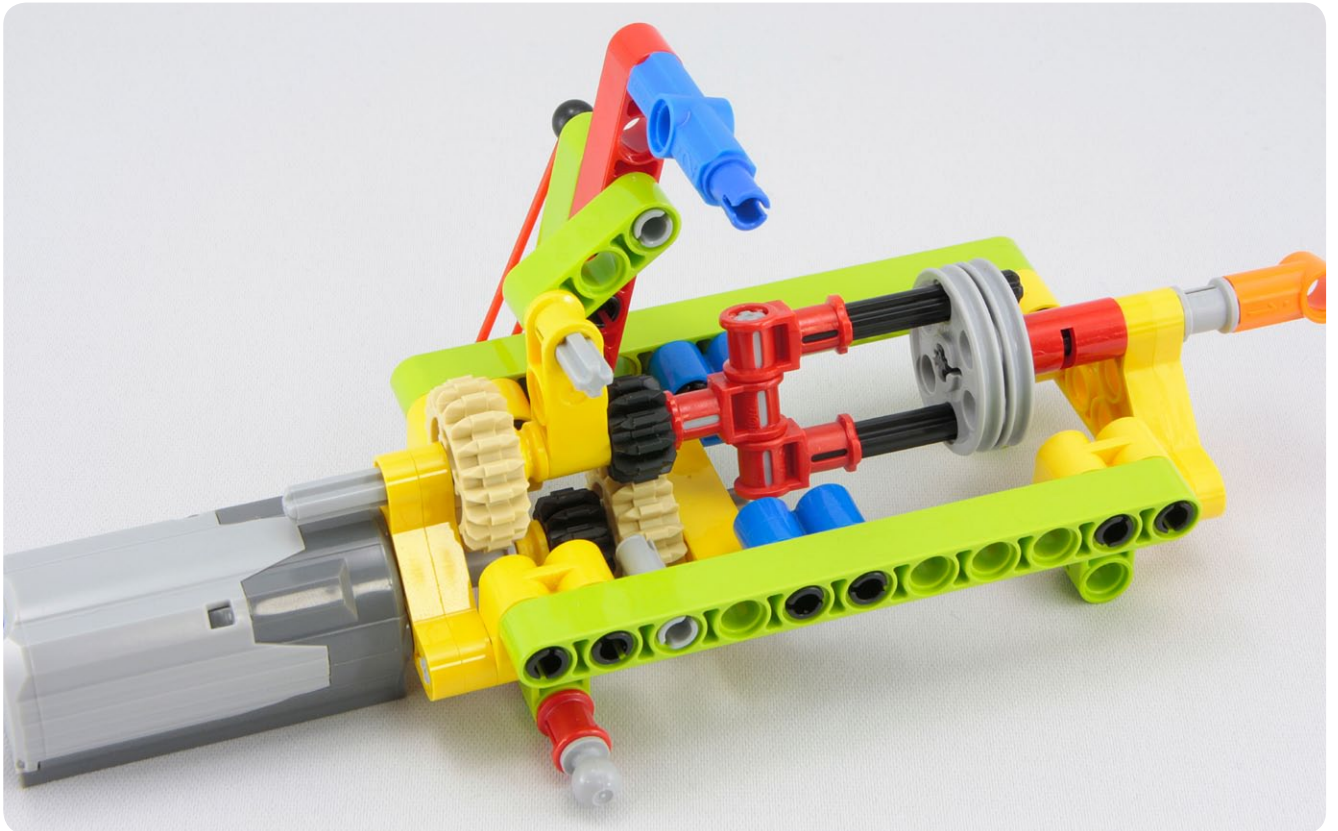
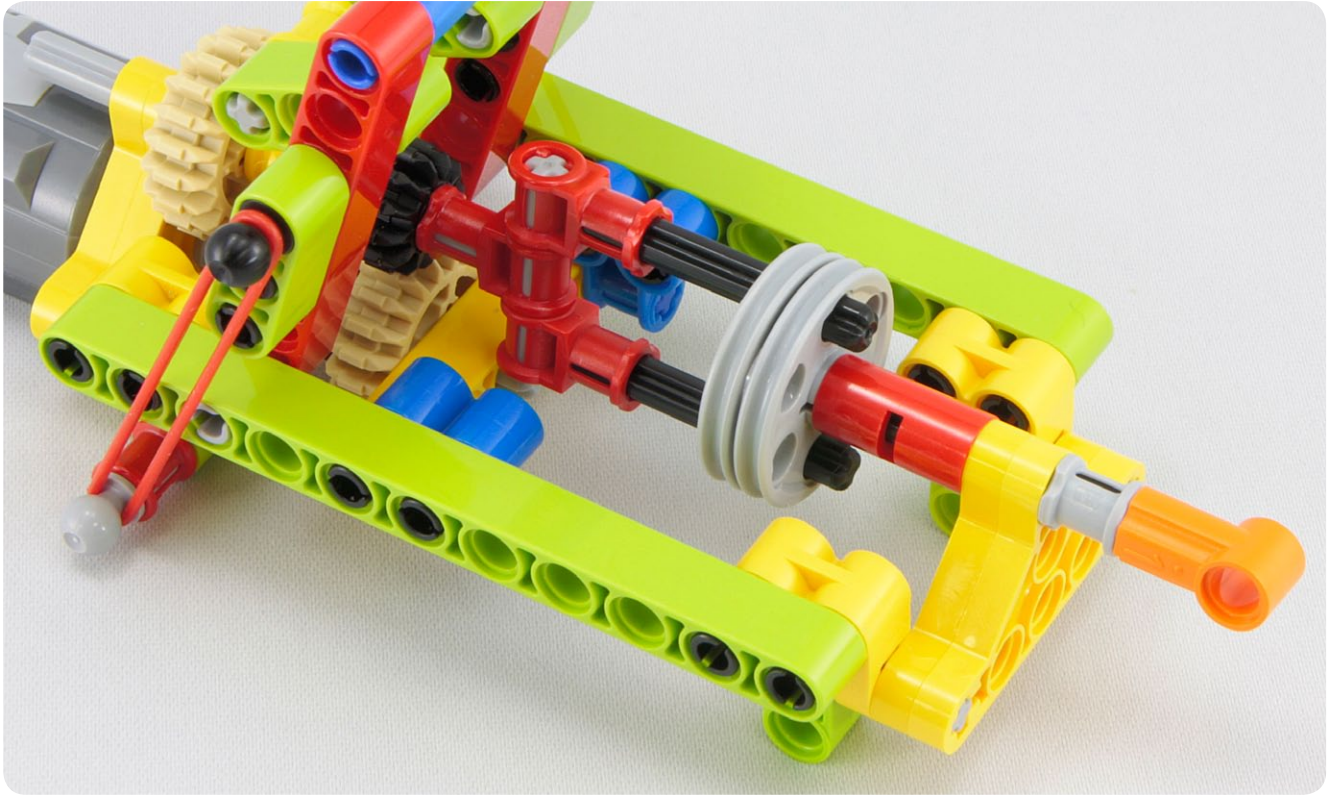







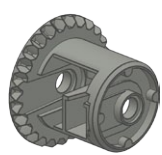



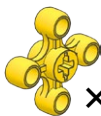

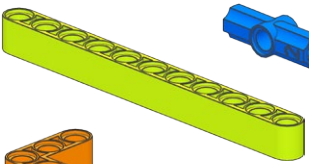

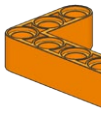

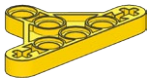
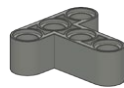

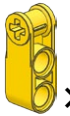

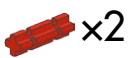


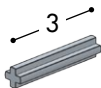
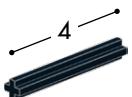

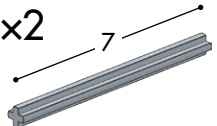
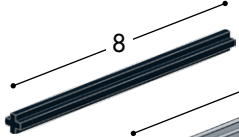
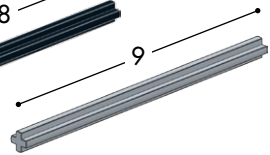


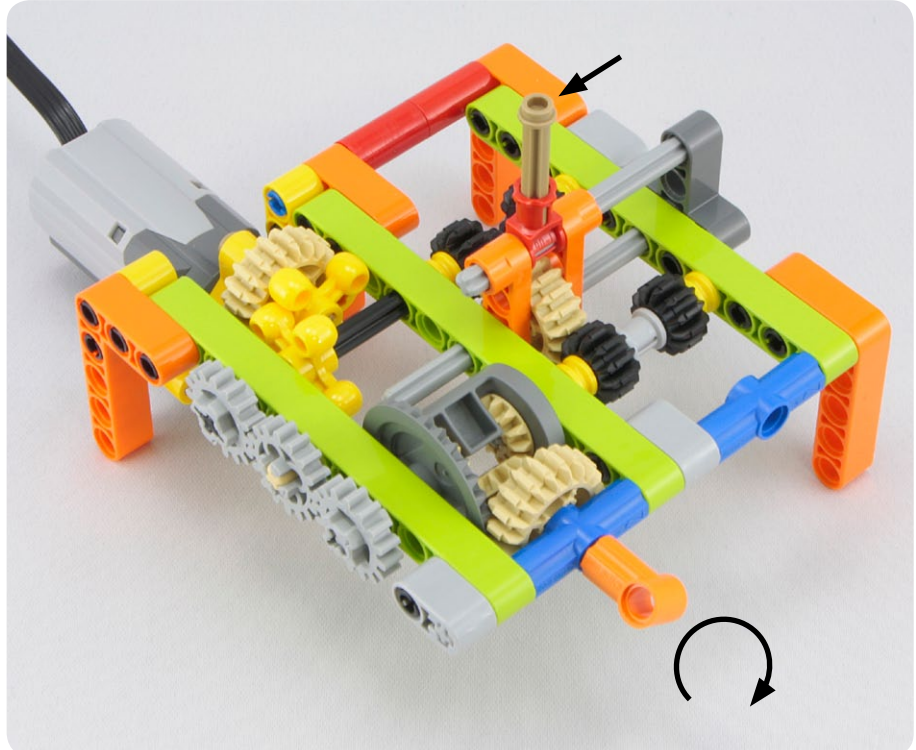
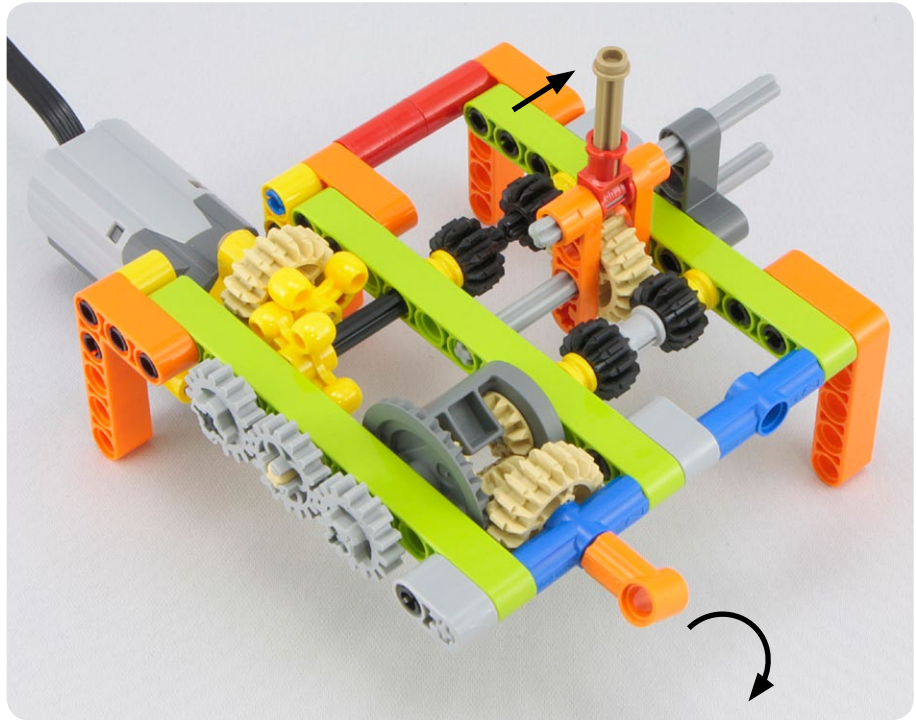


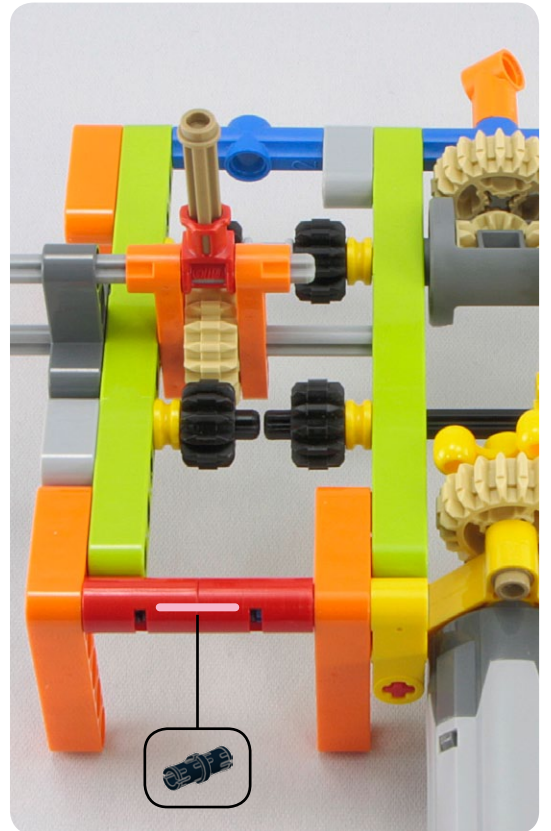
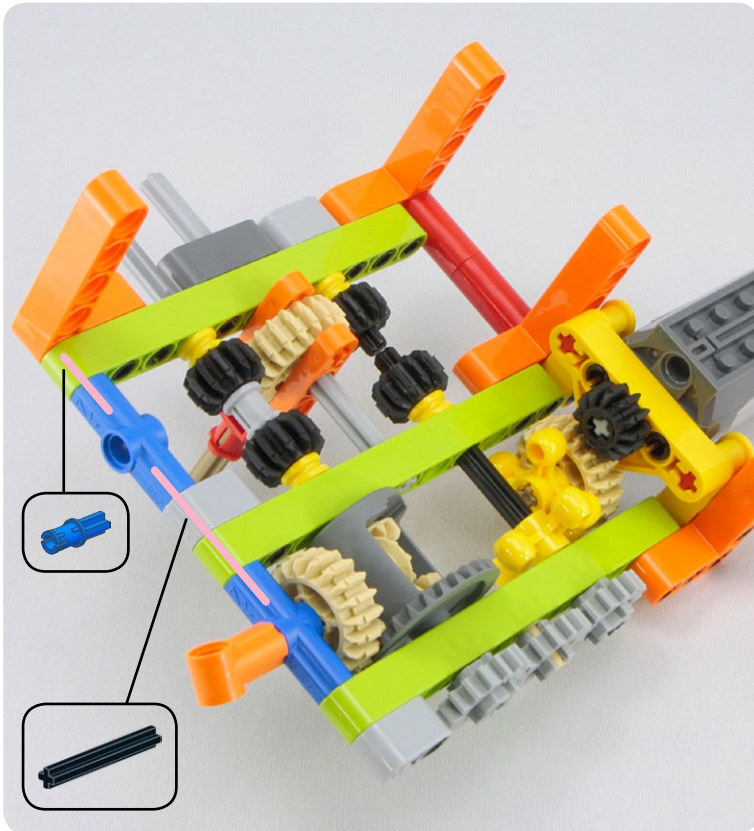
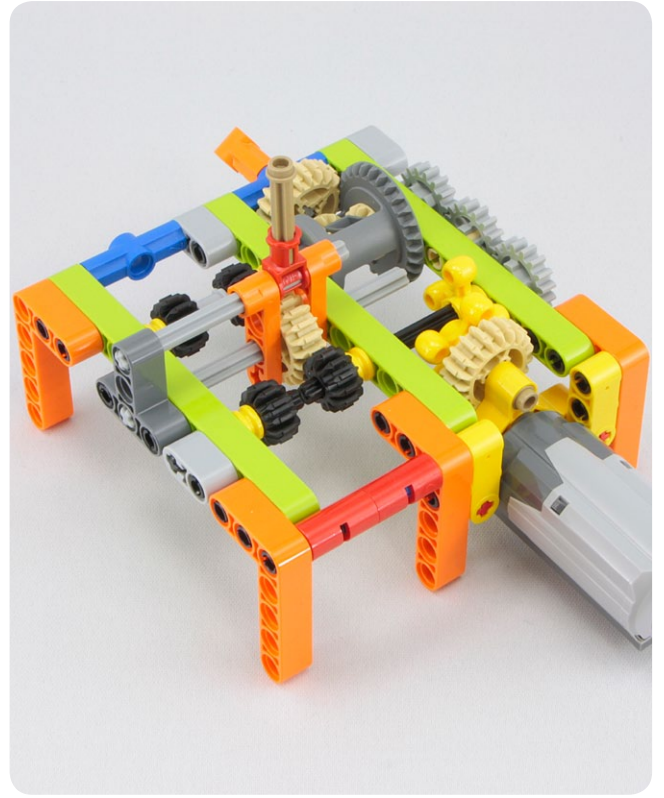


# #133

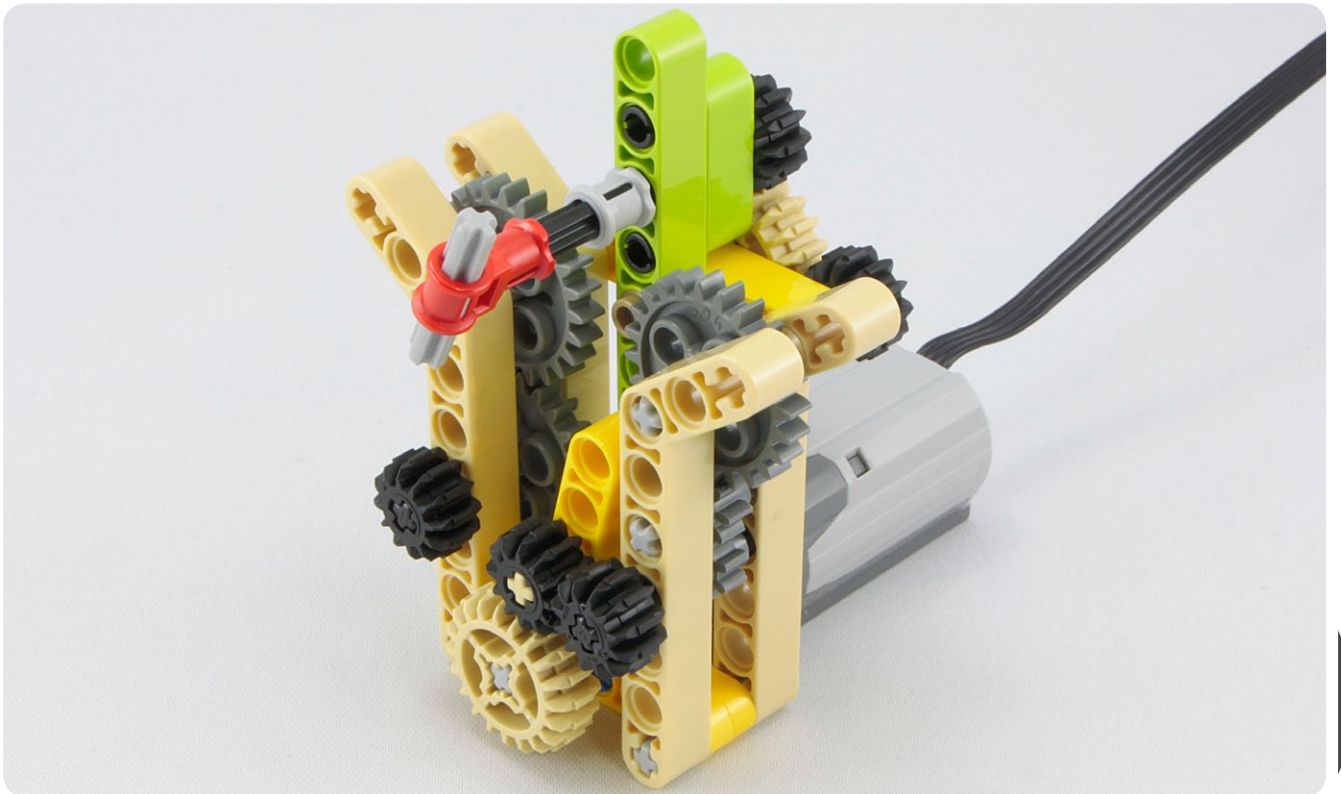
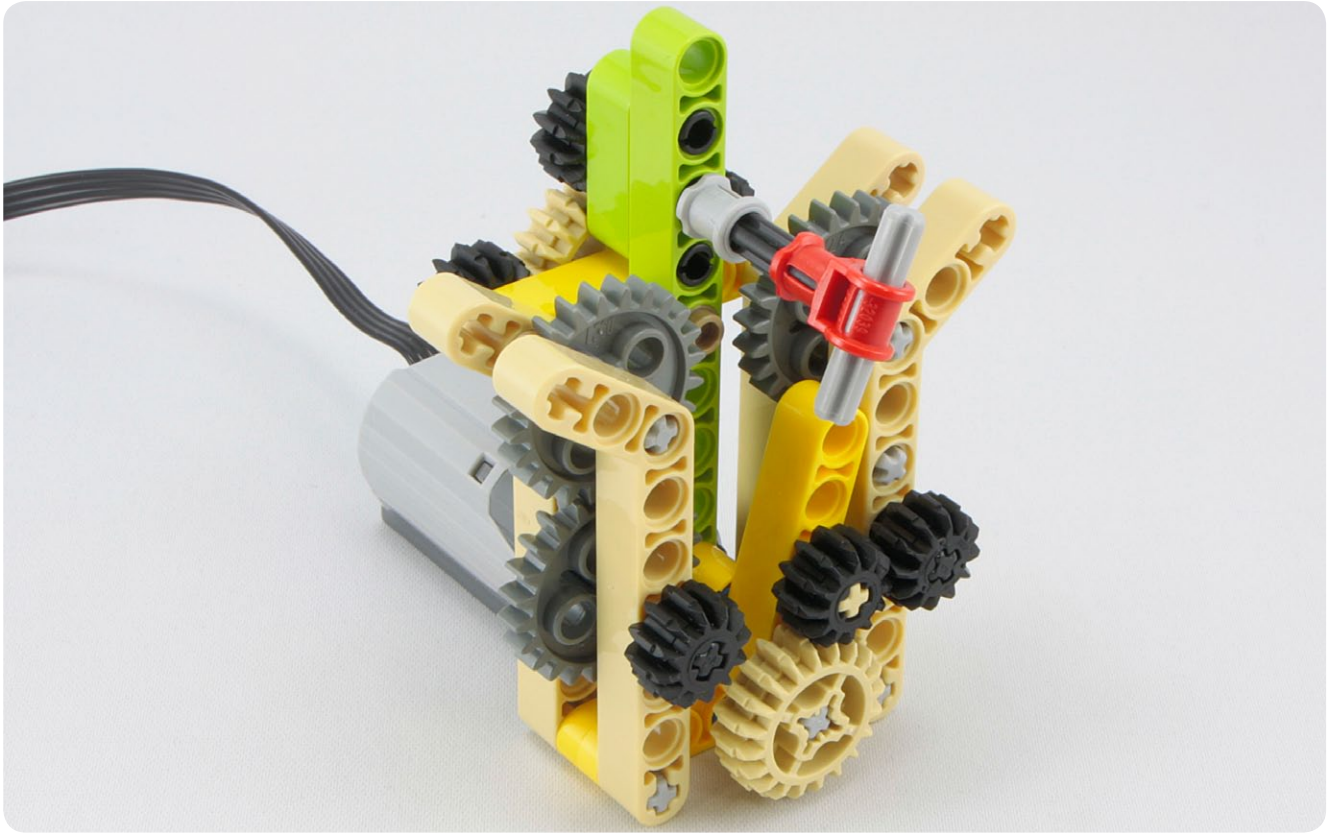
-  x4
- 
- 
- 
- 
-  x20

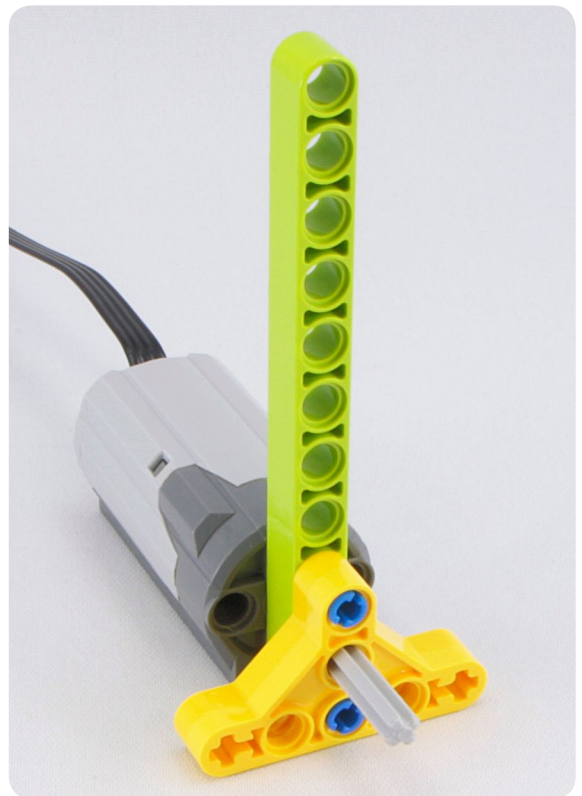
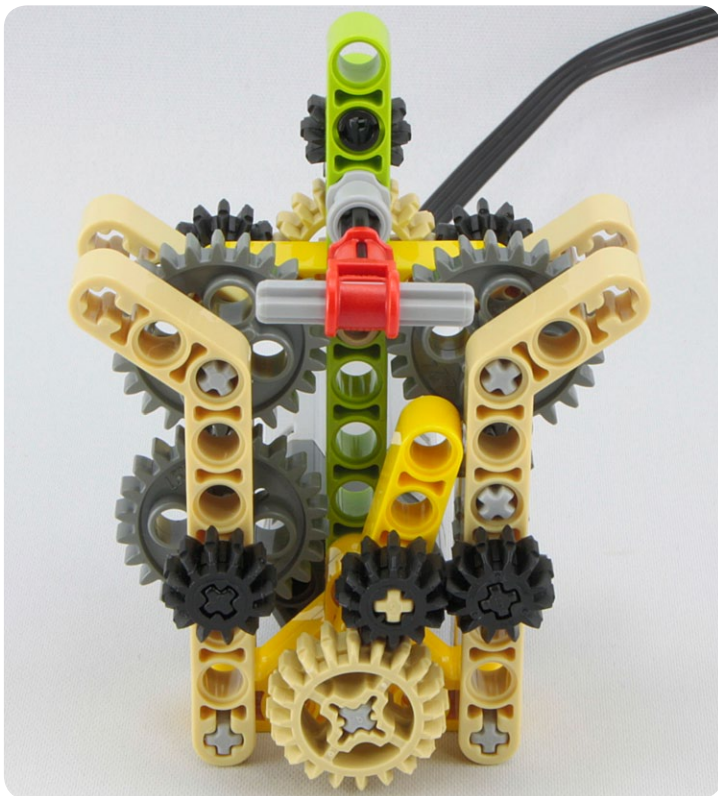
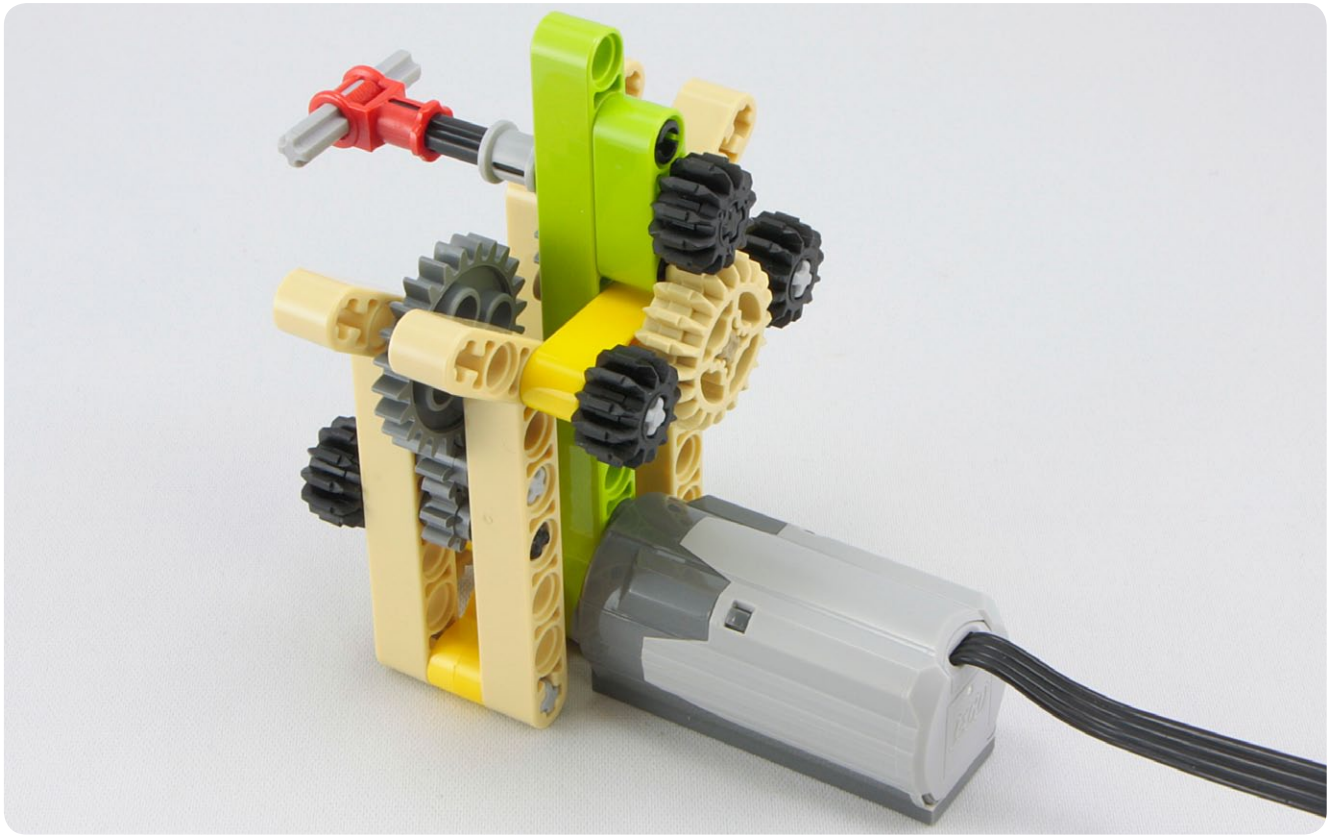
- 
- 
-  x3
-  x5
-  x3
-  x2
-  x3
-  x3
-  x2
-  x4
-  x3
-  x2
- 
-  x2
-  x2
-  x2
-  x2
- 
- 
-  x4
-  x2
-  x2
-  x2
-  x2
-  x2

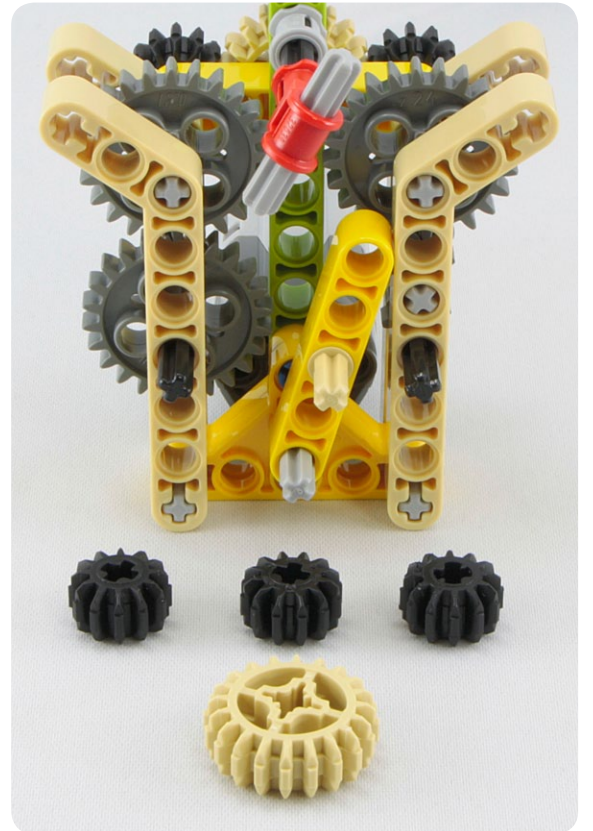
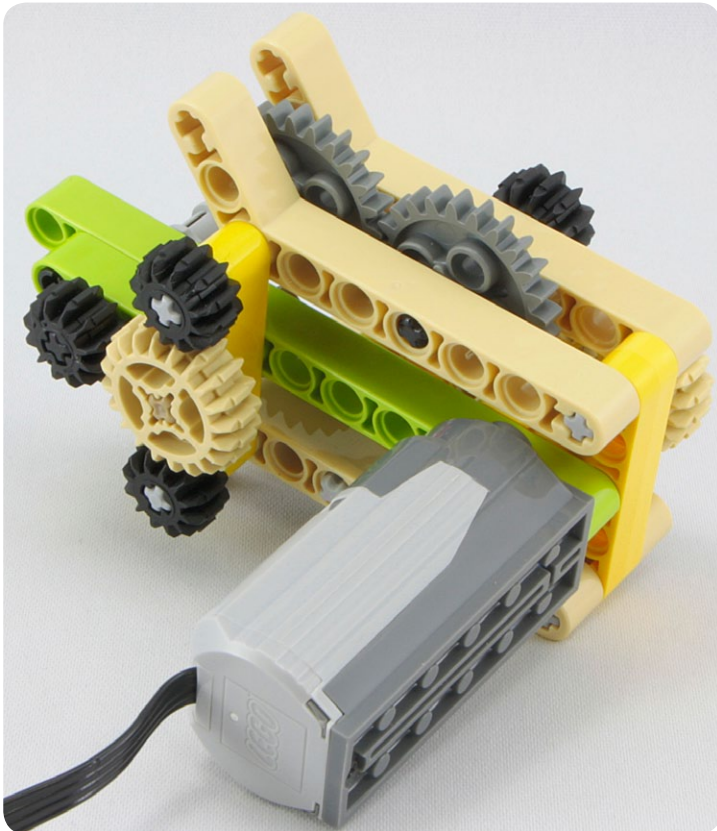
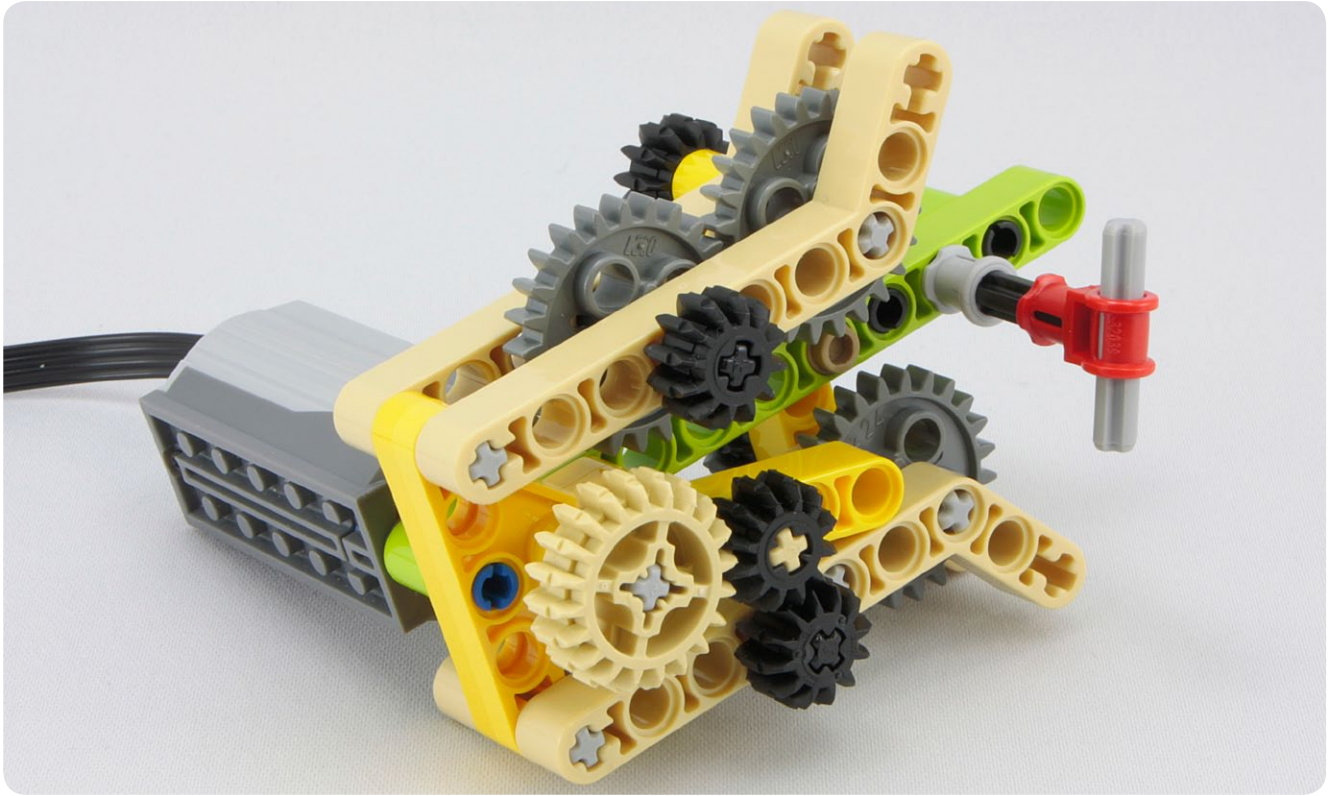






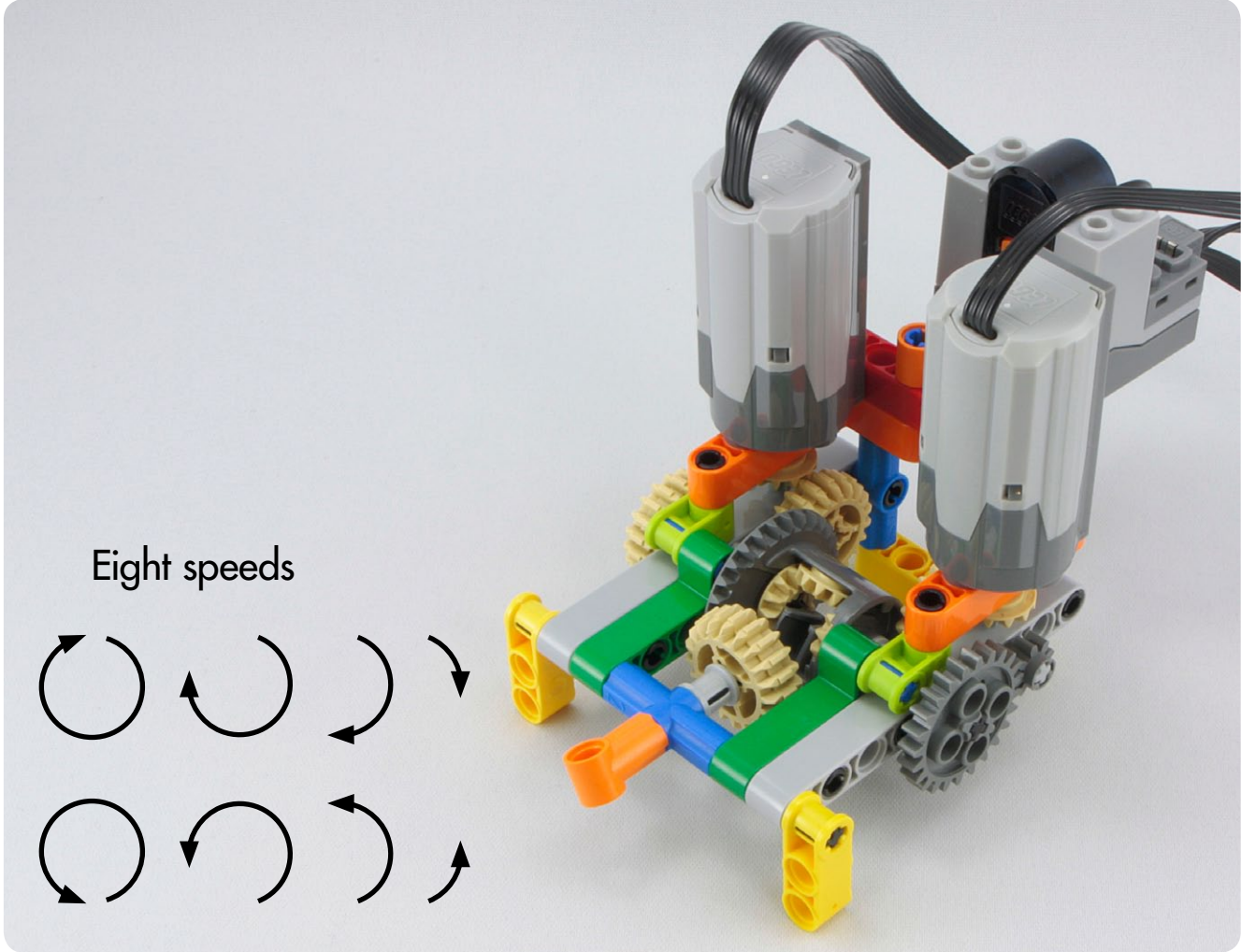


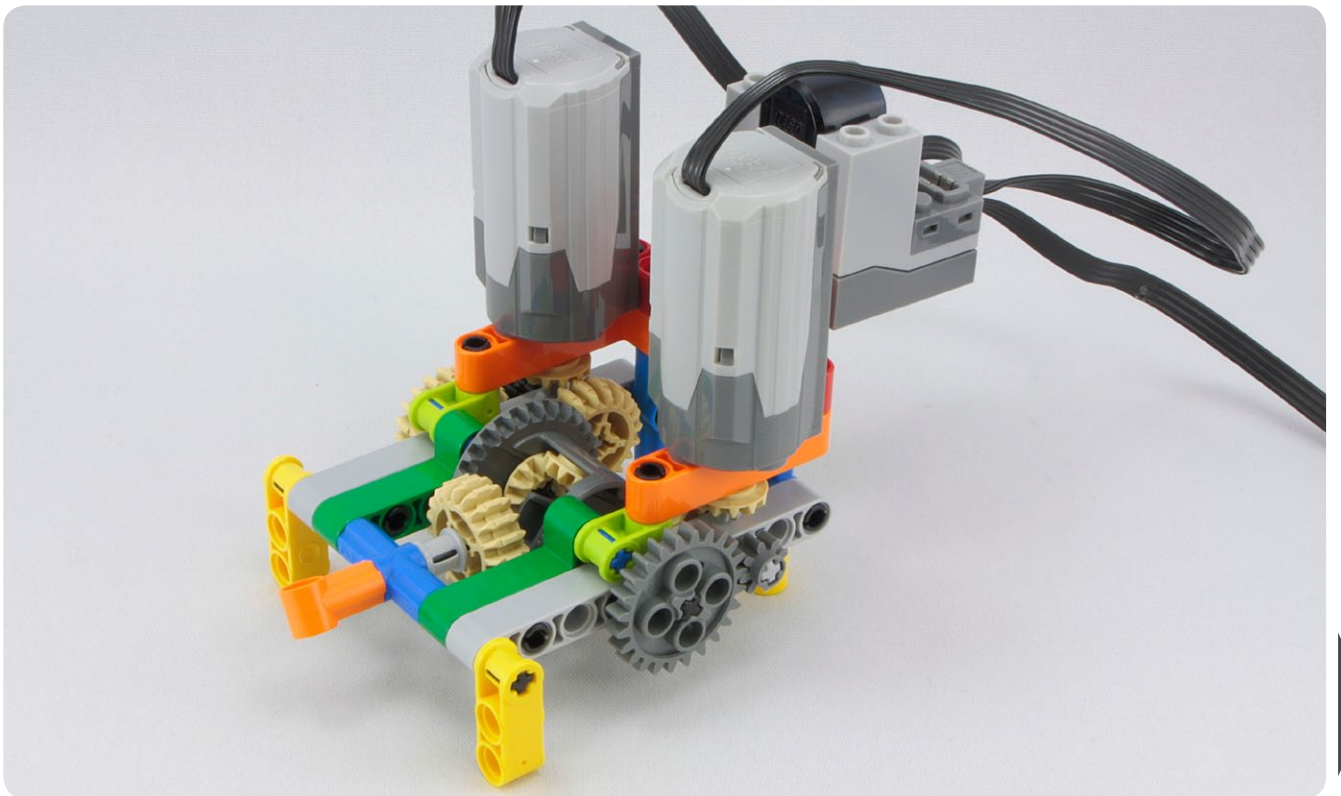
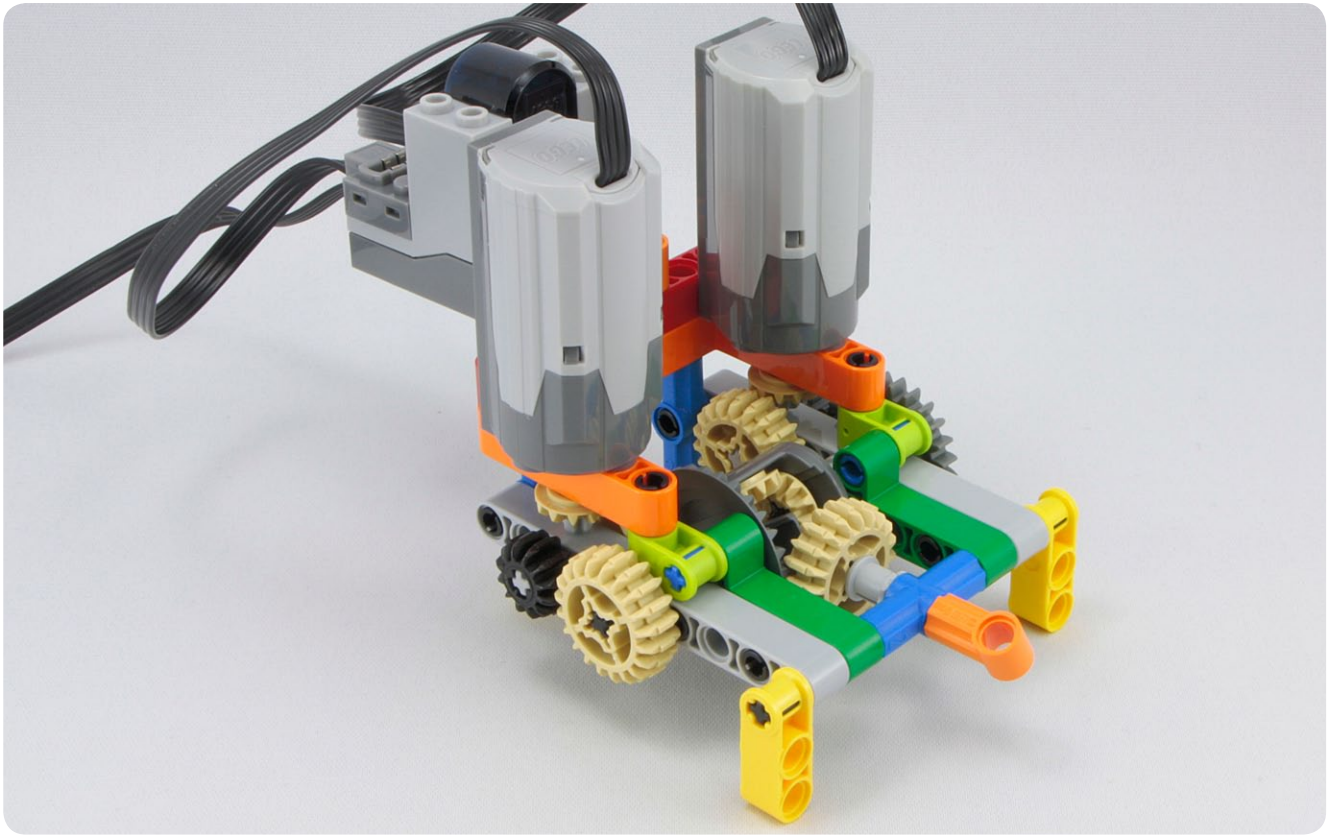


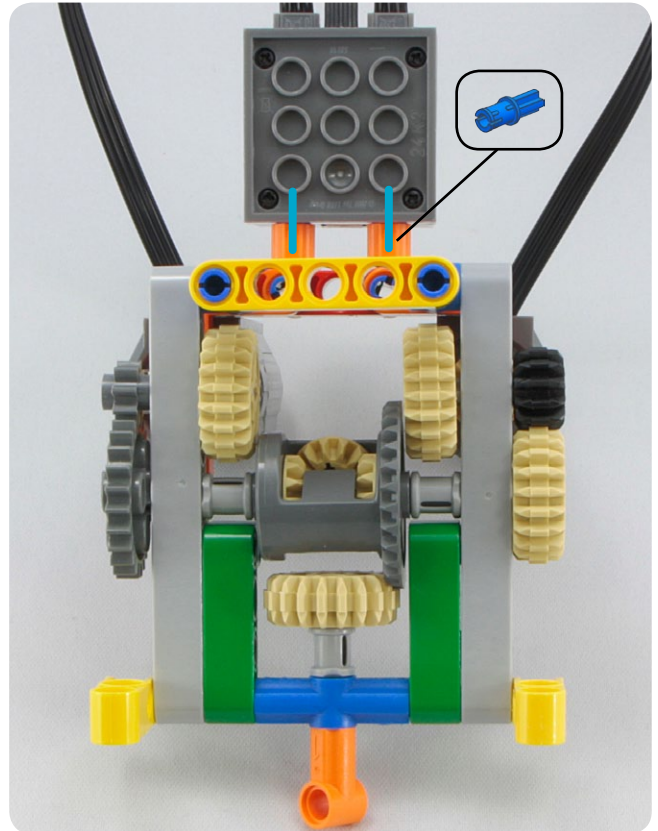
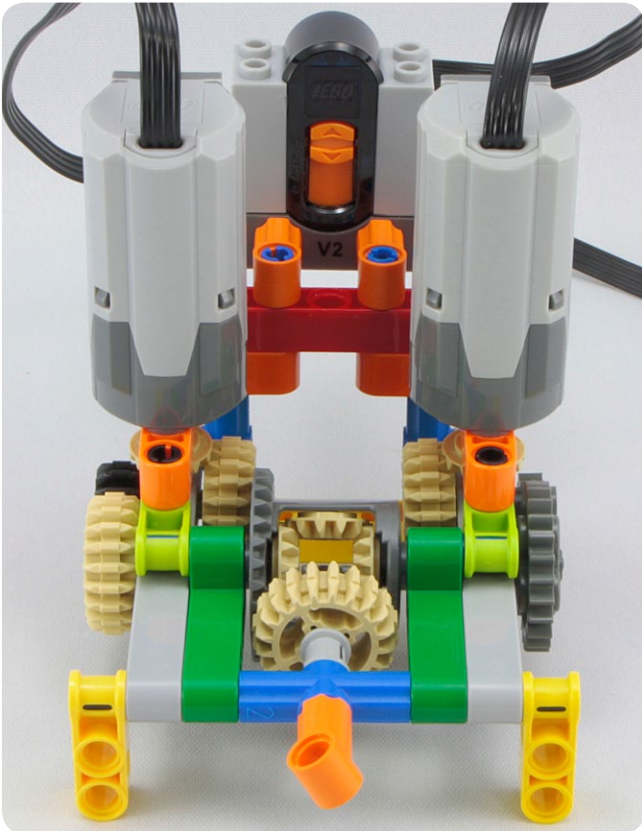
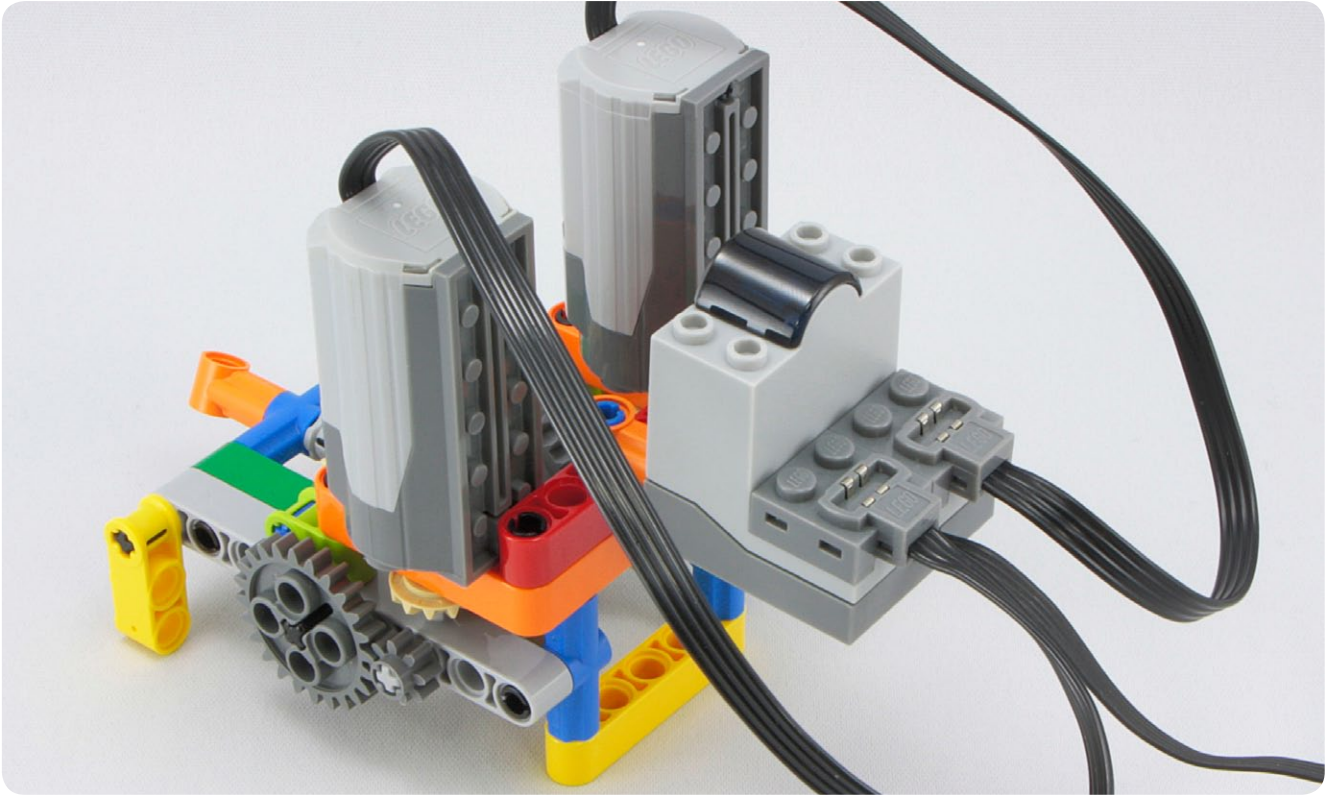


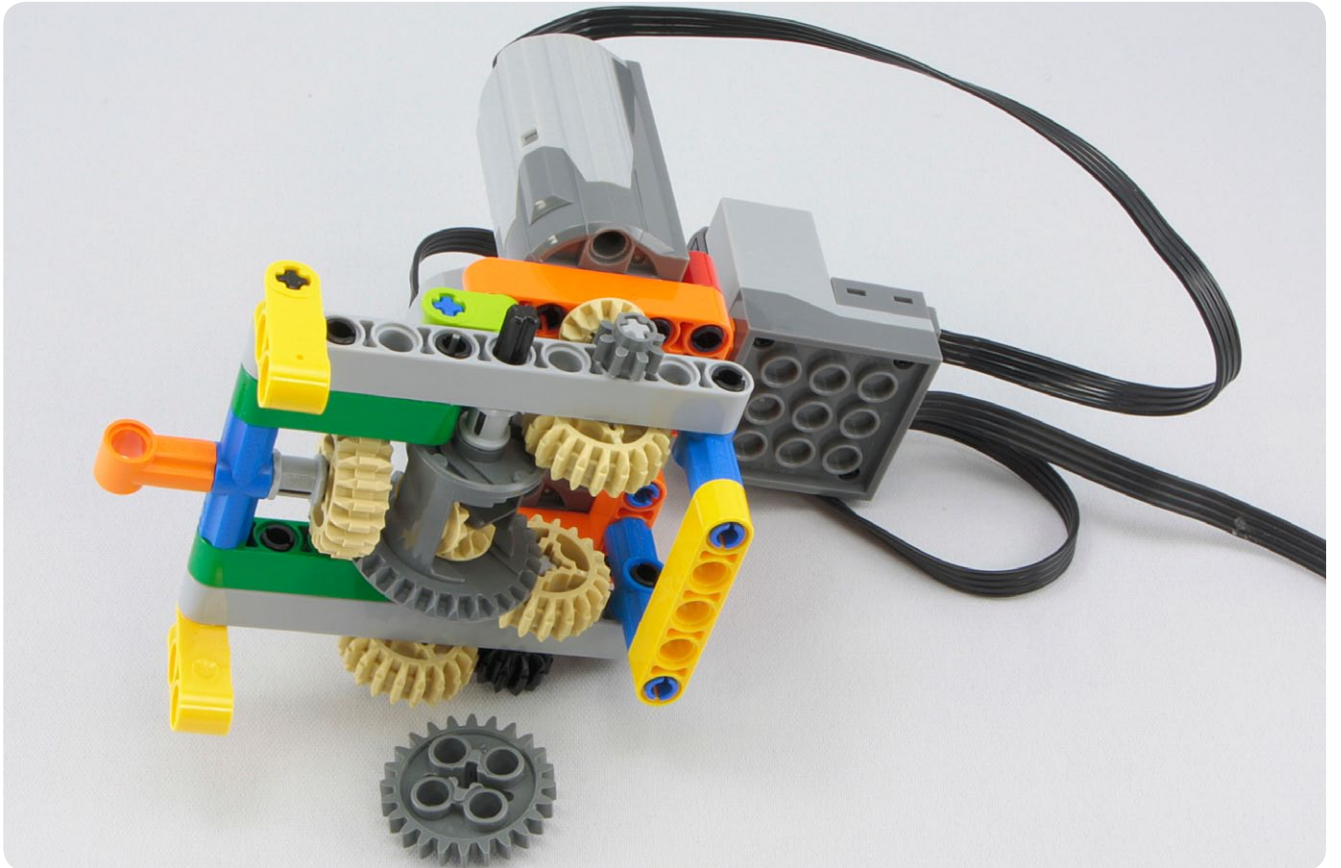
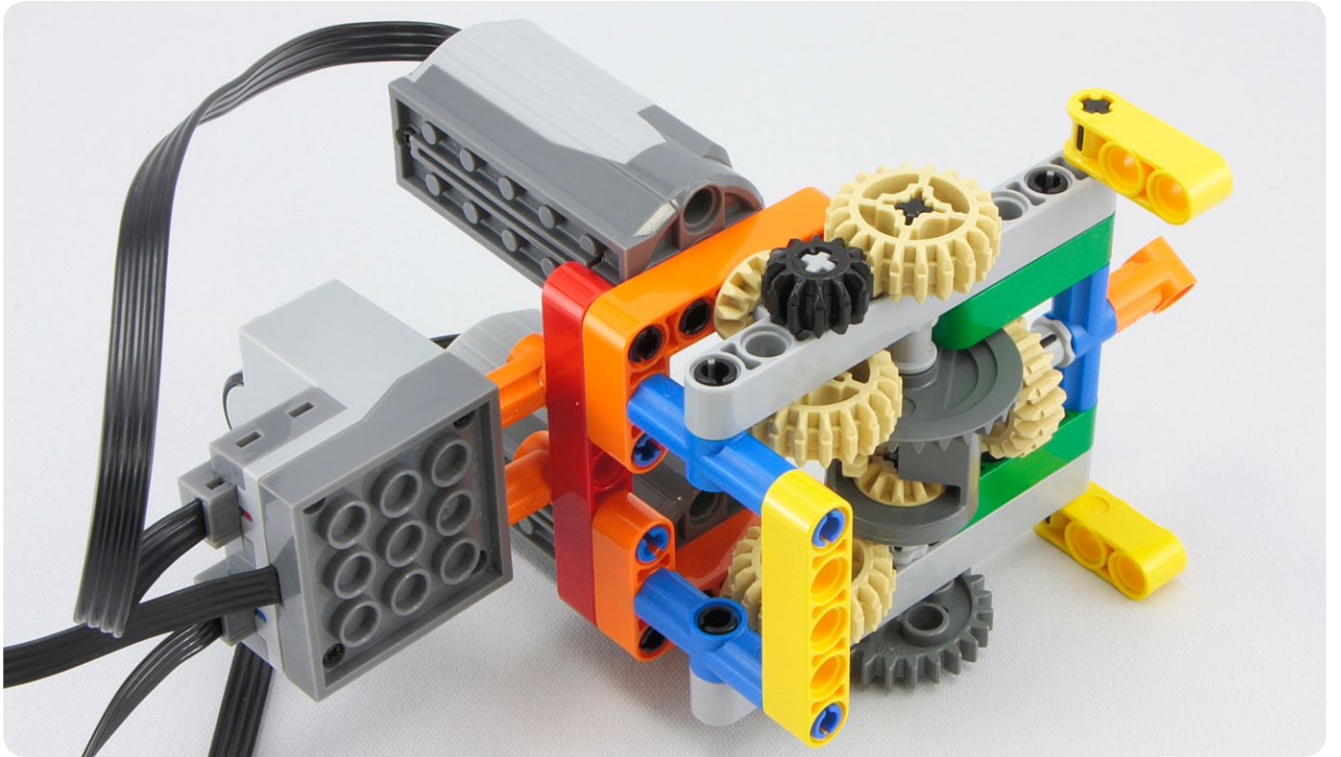


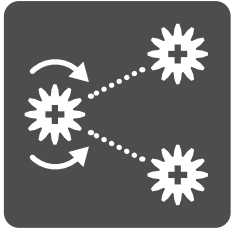
# #135










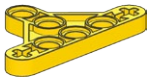

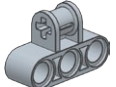

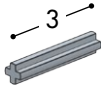
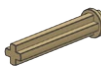
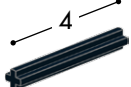
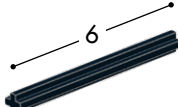




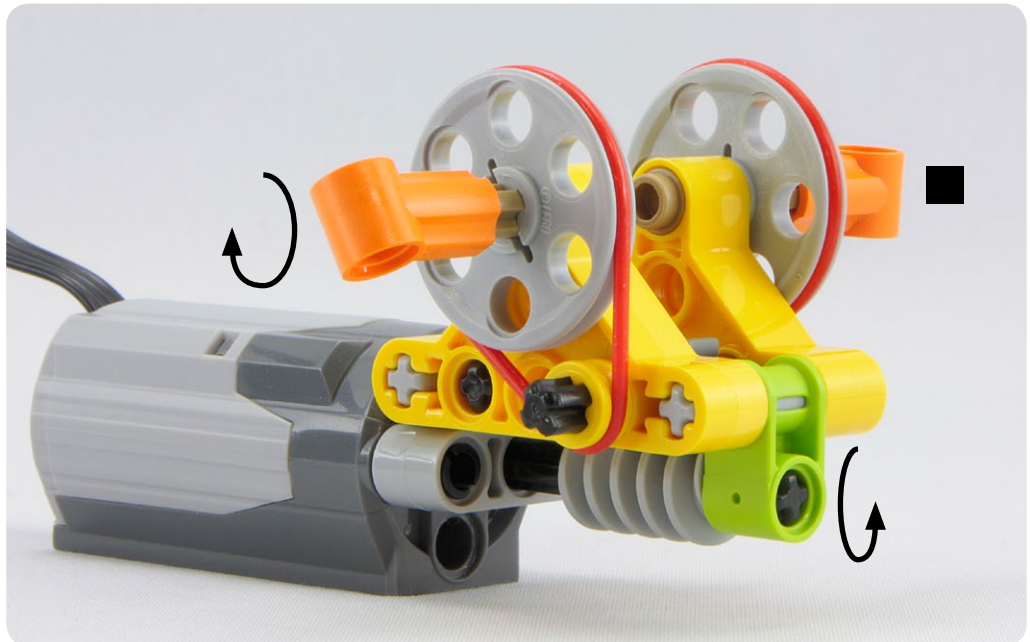
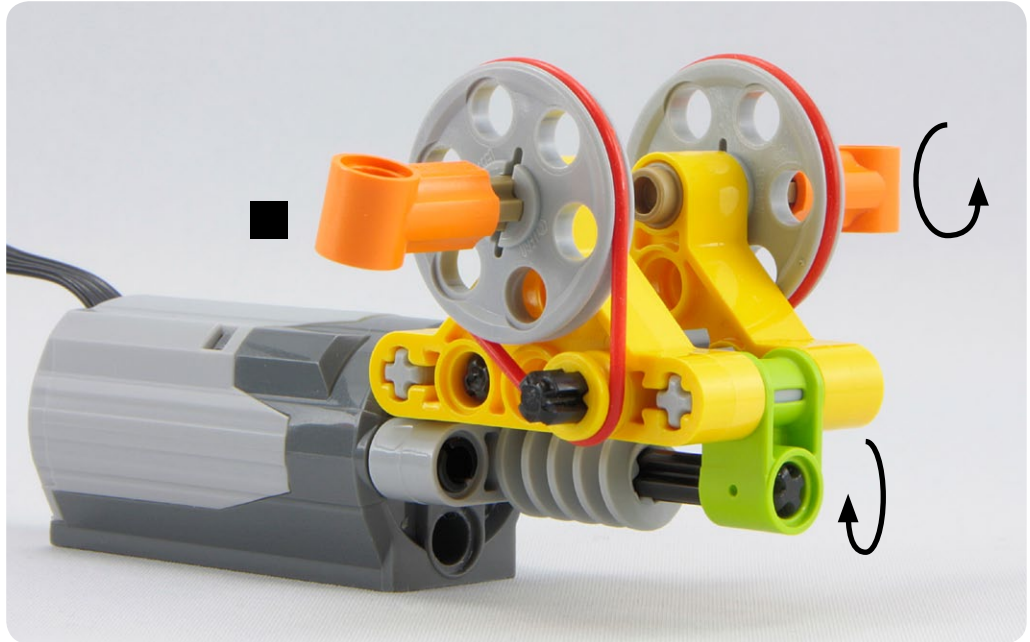


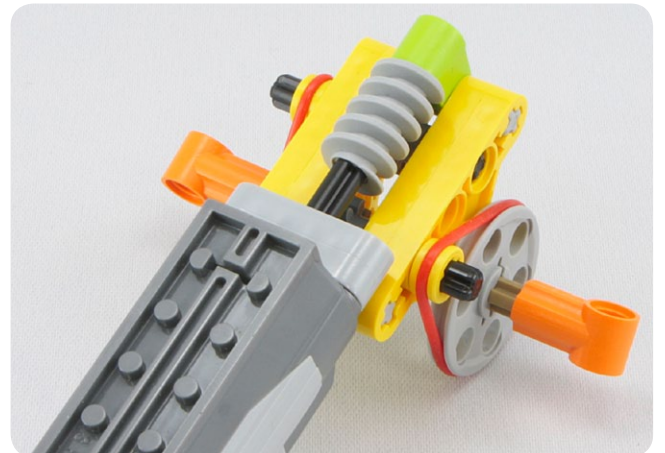
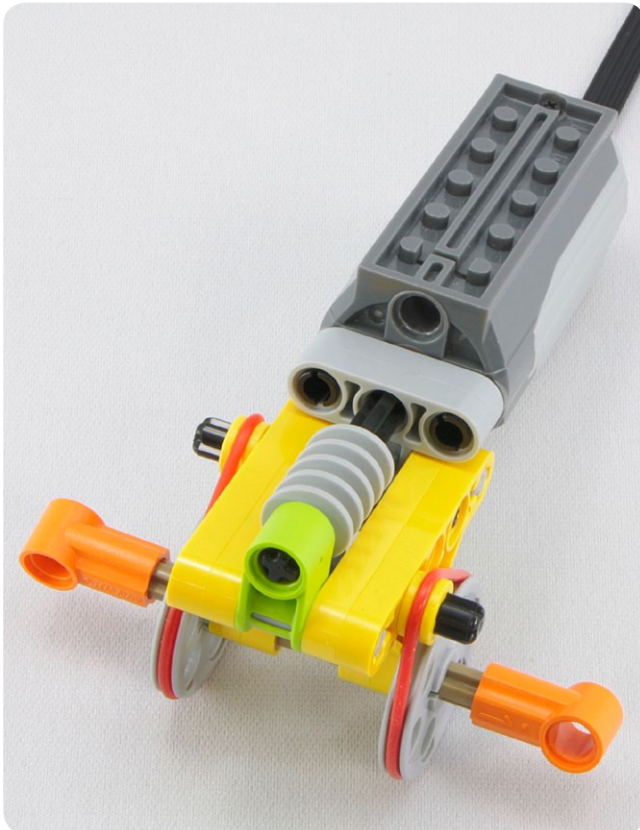
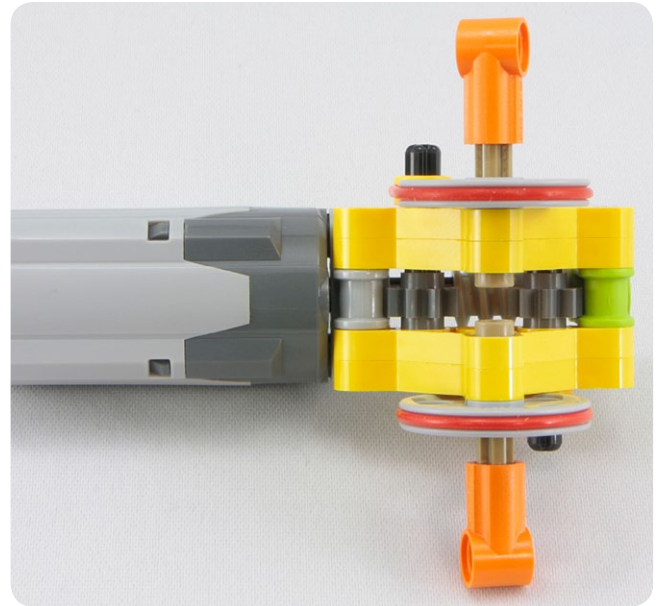
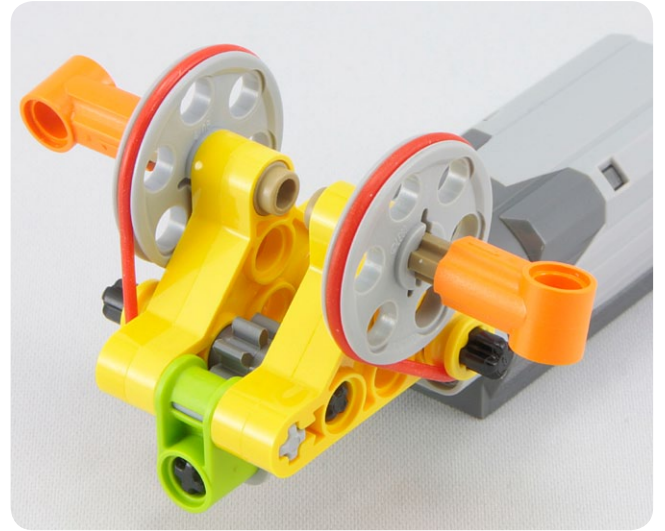


# Changeover mechanisms using rotational direction

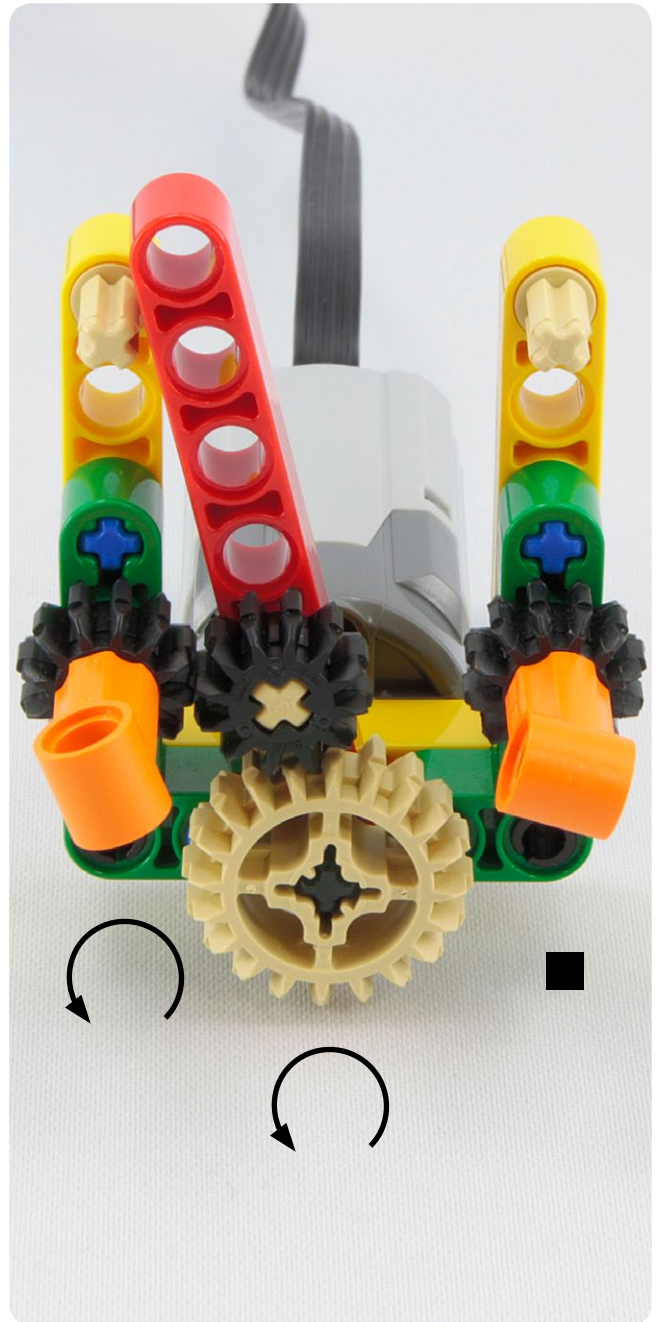
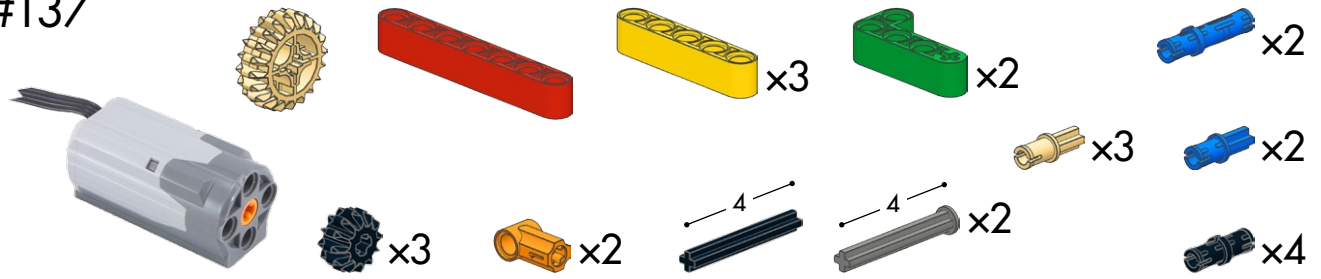
#136

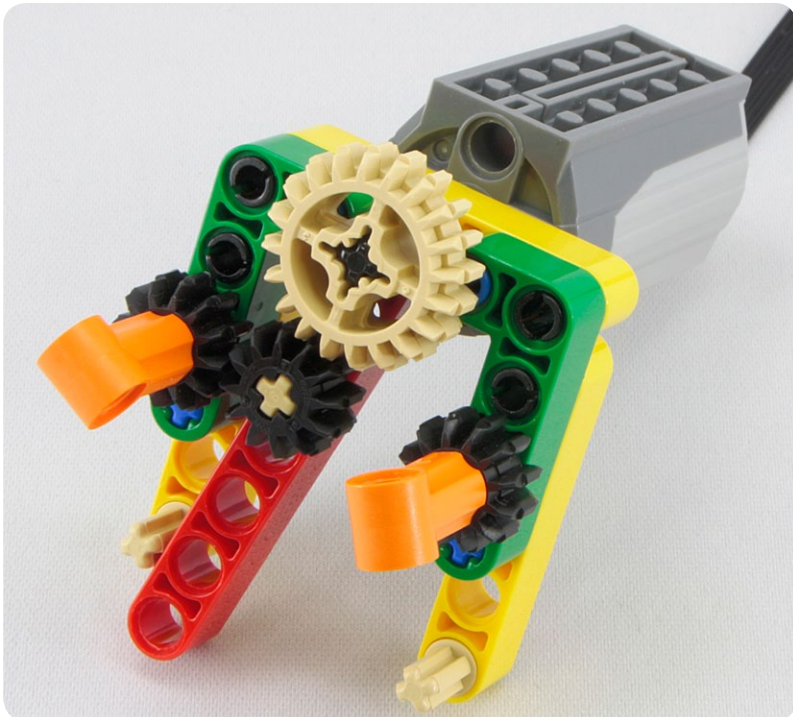
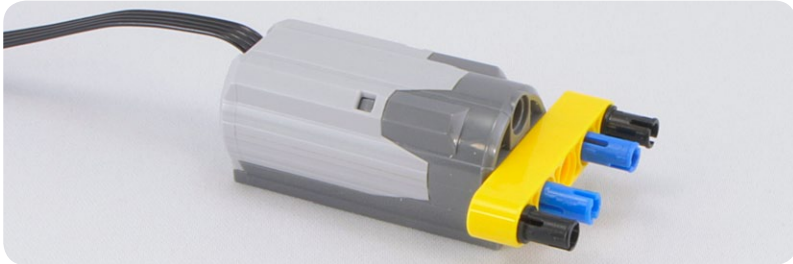
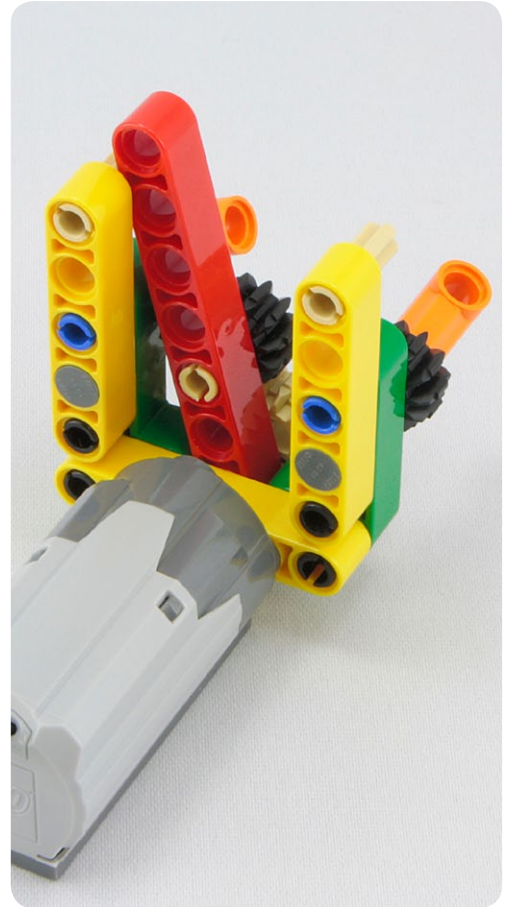
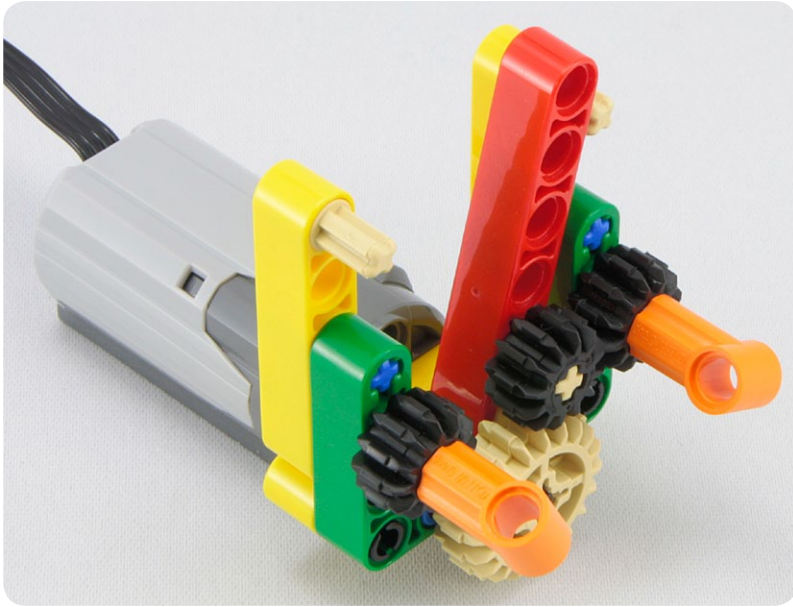
-  x2
- 
-  x2
-  x2
- 
-  x4
-  x2
- 
- 
-  x2
-  x2
-  x2
- 
-  x2
-  x2





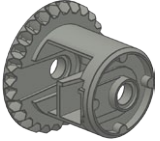





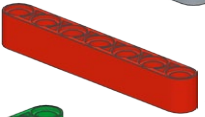
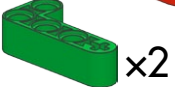




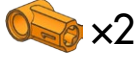


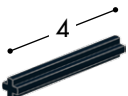



#137

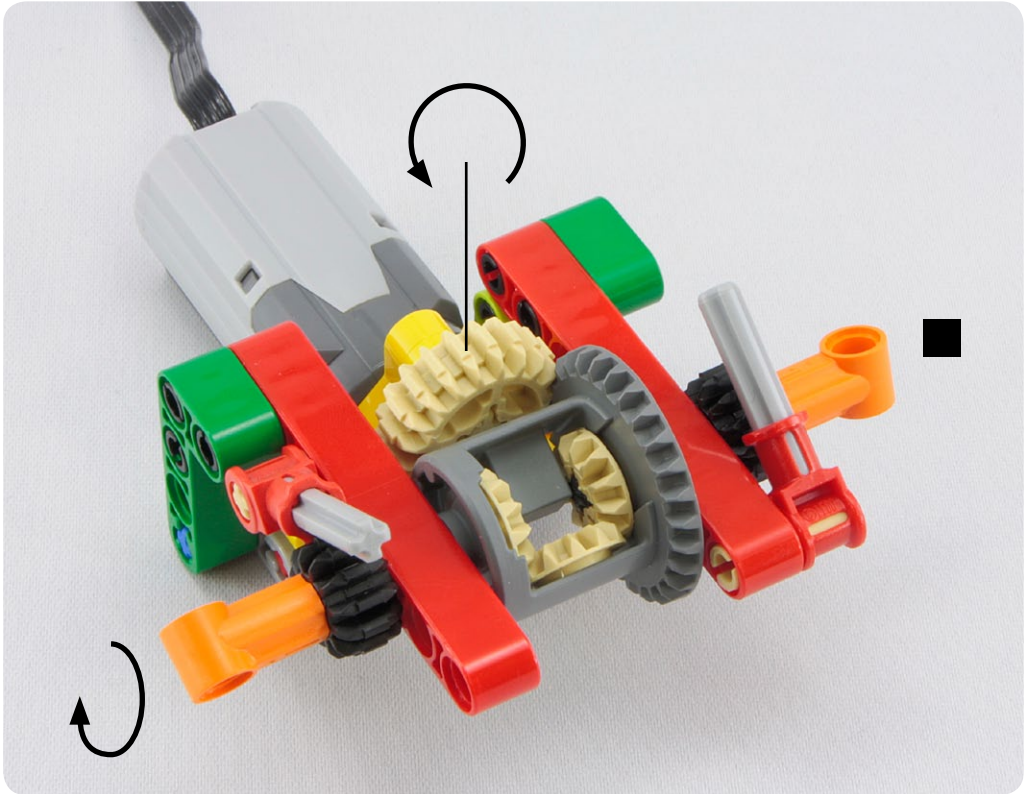
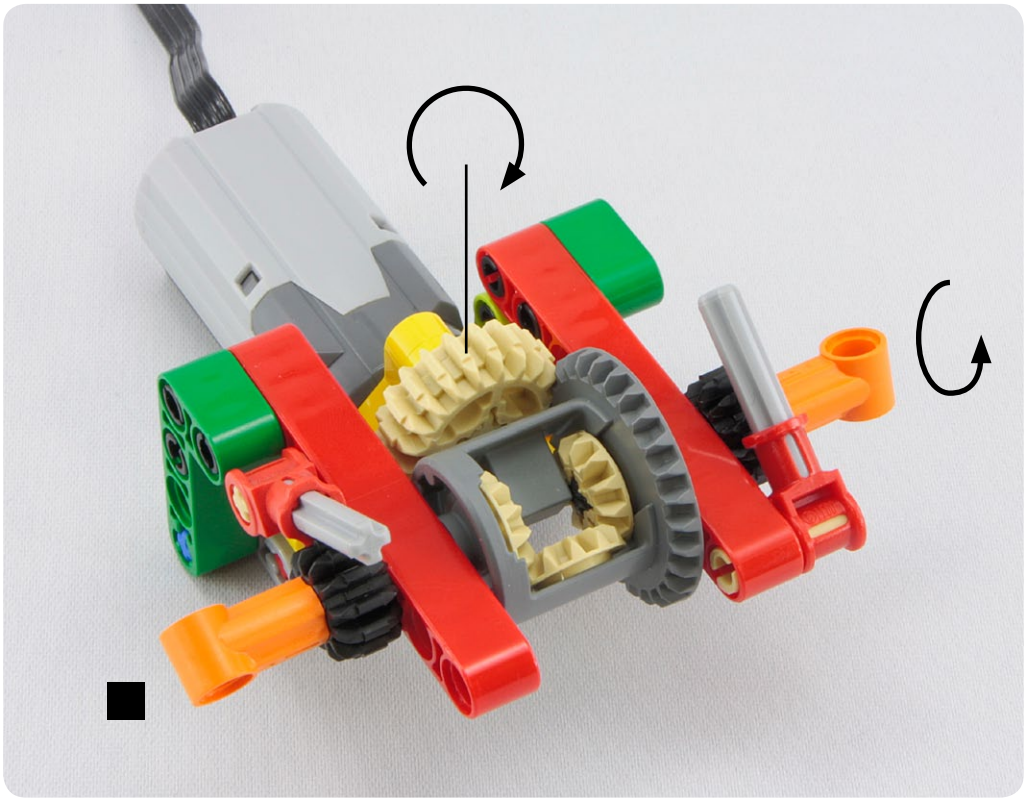


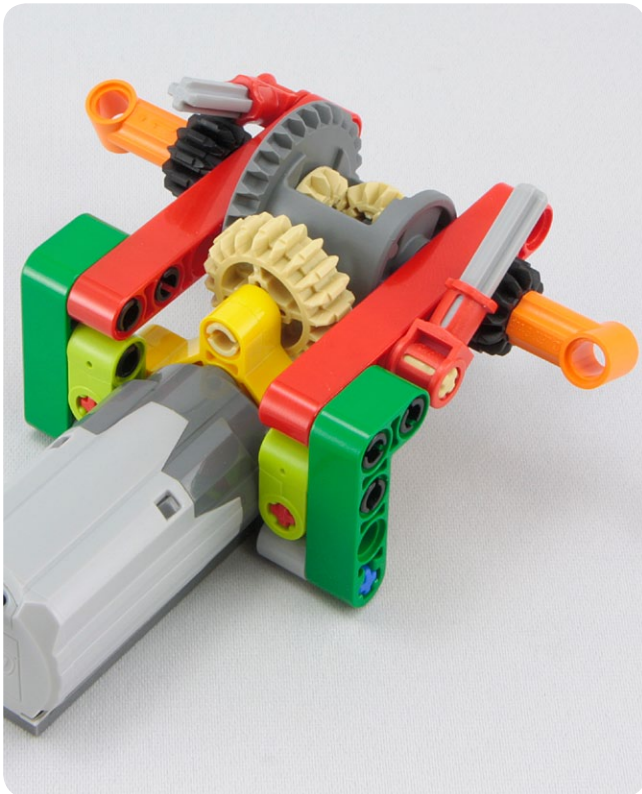
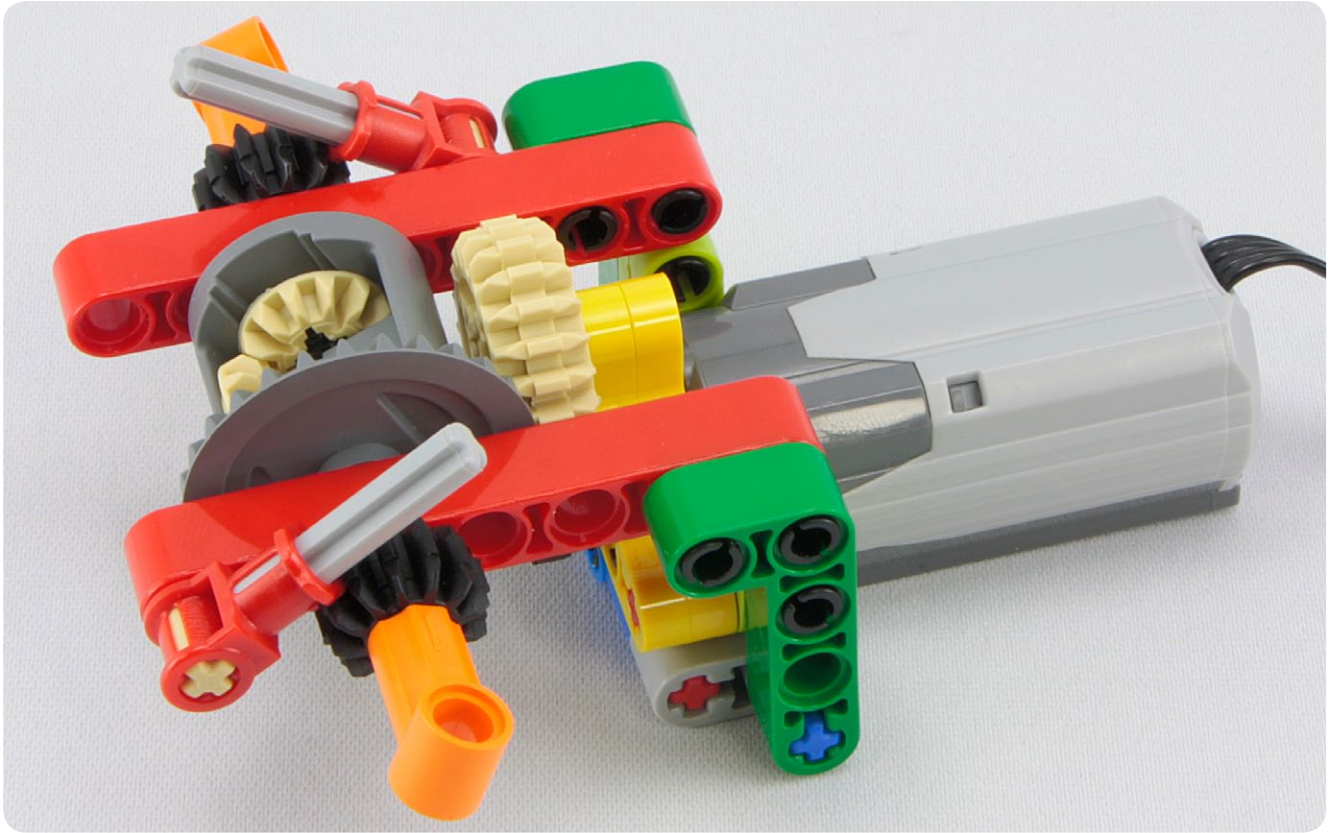




# #138

- 
- 
-  x3
-  x3
- 
-  x2
-  x2
-  x2
-  x2
-  x2
- 
-  x2
-  x2
-  x4
-  x3
-  x2
-  x2
-  x3
-  x9





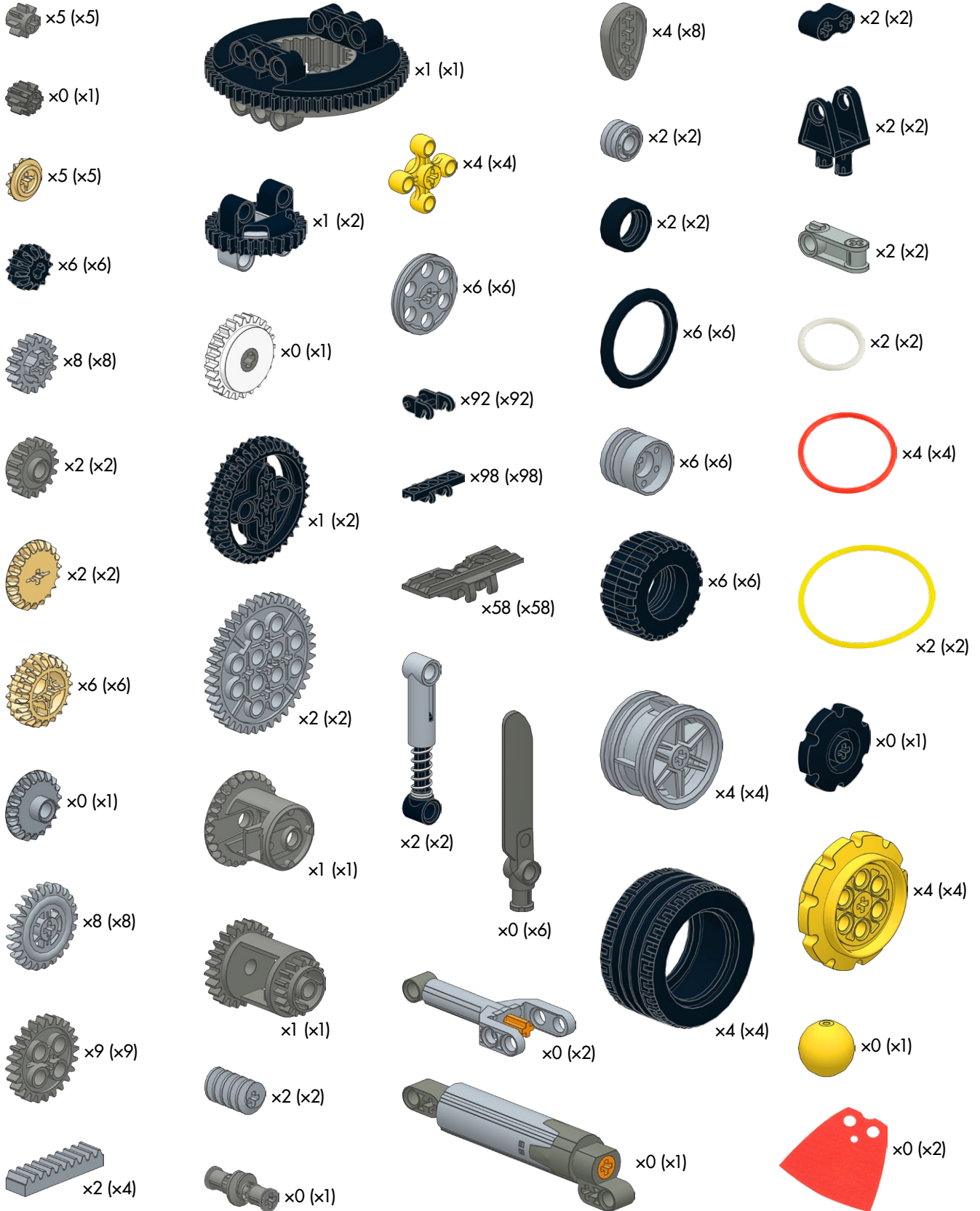
# Parts list

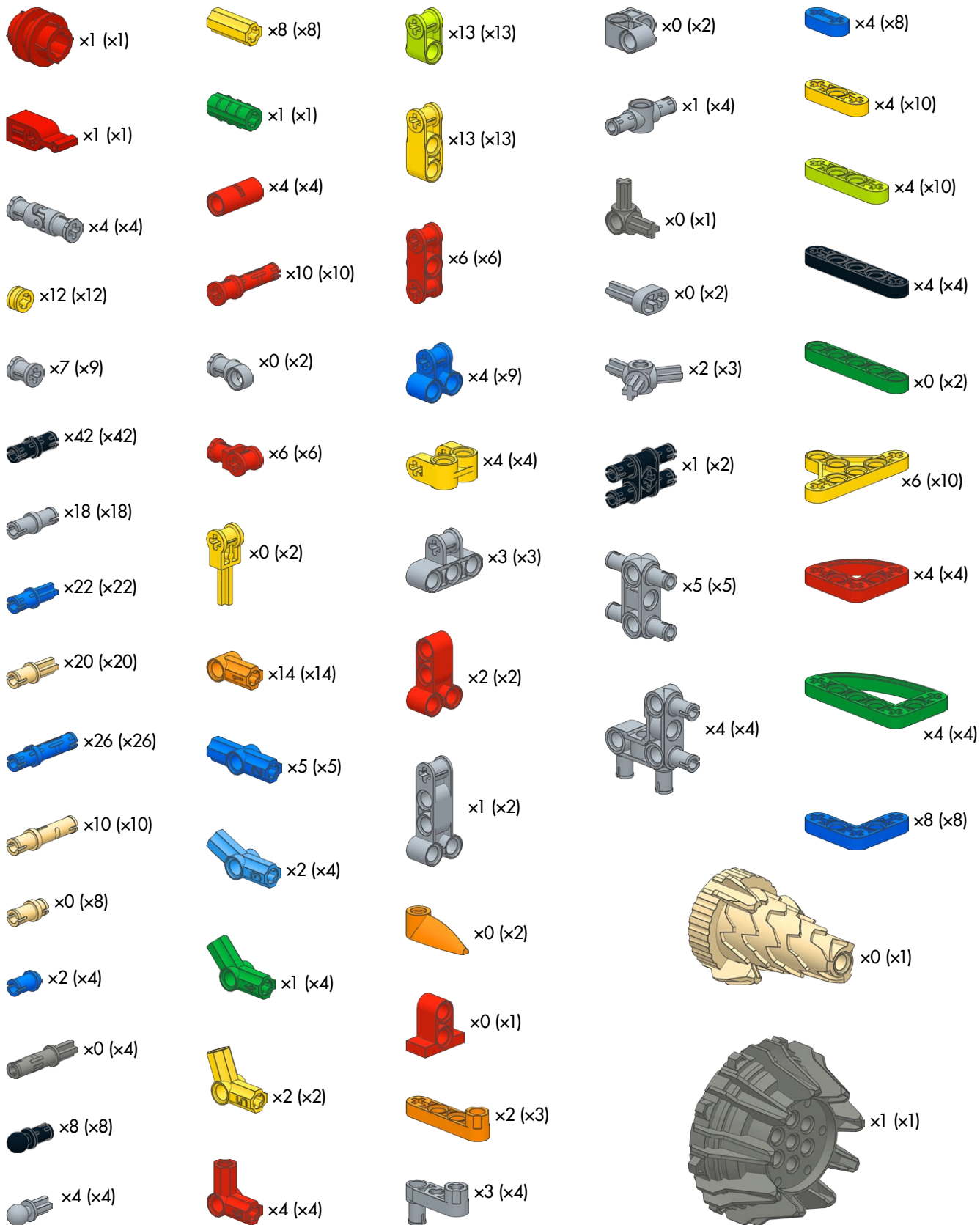
This is the maximum number of this part needed to build any single model in this book.

This is the maximum number of this part needed to build any single model in *both* volumes of *The LEGO Power Functions Idea Book* (*Machines and Mechanisms* and *Cars and Contraptions*).

This block contains a detailed parts list for a LEGO model. The parts are arranged in columns and rows, with their respective quantities and dimensions indicated. A green box highlights the first two parts, and a red box highlights the second two parts.

- Motor 1:** Grey motor with 4 ports, quantity  $\times 2$  (x2).
- Motor 2:** Grey motor with 4 ports, quantity  $\times 2$  (x2).
- Motor 3:** Grey motor with 4 ports, quantity  $\times 2$  (x2).
- Motor 4:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 5:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 6:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 7:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 8:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 9:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 10:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 11:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 12:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 13:** Grey motor with 4 ports, quantity  $\times 0$  (x1).
- Motor 14:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 15:** Grey motor with 4 ports, quantity  $\times 1$  (x1).
- Motor 16:** Grey motor with 4 ports, quantity  $\times 6$  (x7).
- Motor 17:** Grey motor with 4 ports, quantity  $\times 9$  (x9).
- Motor 18:** Grey motor with 4 ports, quantity  $\times 6$  (x6).
- Motor 19:** Grey motor with 4 ports, quantity  $\times 9$  (x9).
- Motor 20:** Grey motor with 4 ports, quantity  $\times 4$  (x4).
- Motor 21:** Grey motor with 4 ports, quantity  $\times 9$  (x9).
- Motor 22:** Grey motor with 4 ports, quantity  $\times 7$  (x7).
- Motor 23:** Grey motor with 4 ports, quantity  $\times 12$  (x12).
- Motor 24:** Grey motor with 4 ports, quantity  $\times 4$  (x4).
- Motor 25:** Grey motor with 4 ports, quantity  $\times 5$  (x5).
- Motor 26:** Grey motor with 4 ports, quantity  $\times 4$  (x4).
- Motor 27:** Grey motor with 4 ports, quantity  $\times 2$  (x4).
- Motor 28:** Grey motor with 4 ports, quantity  $\times 0$  (x2).
- Motor 29:** Grey motor with 4 ports, quantity  $\times 3$  (x3).
- Motor 30:** Grey motor with 4 ports, quantity  $\times 4$  (x4).
- Motor 31:** Grey motor with 4 ports, quantity  $\times 2$  (x4).







x16 (x16)



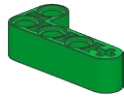
x4 (x4)



x2 (x2)



x2 (x2)



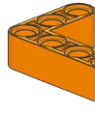
x10 (x10)



x2 (x2)



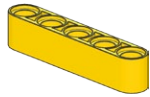
x4 (x6)



x6 (x8)



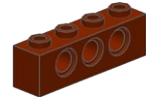
x0 (x2)



x10 (x10)



x4 (x4)



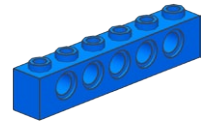
x2 (x5)



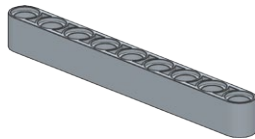
x6 (x7)



x4 (x4)



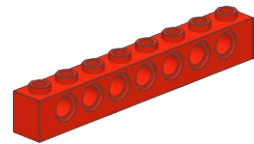
x0 (x4)



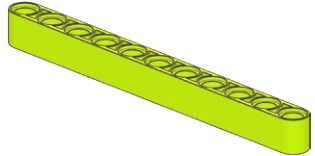
x6 (x6)



x4 (x4)



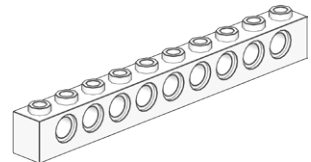
x4 (x4)



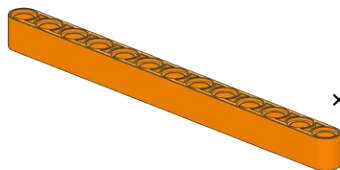
x6 (x6)



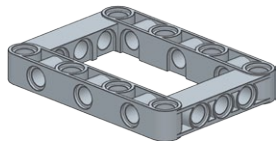
x2 (x2)



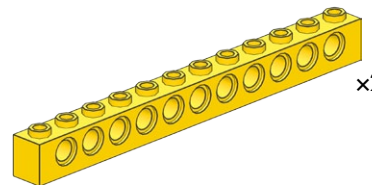
x2 (x2)



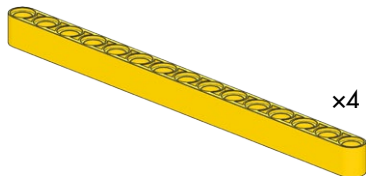
x2 (x2)



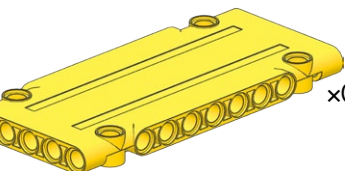
x0 (x1)



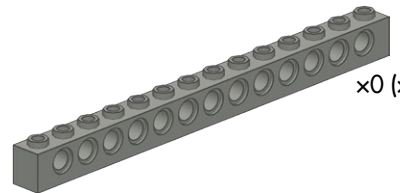
x2 (x2)



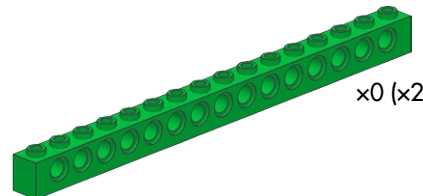
x4 (x4)



x0 (x3)



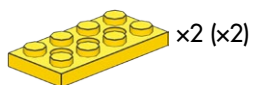
x0 (x2)



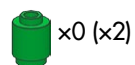
x0 (x2)



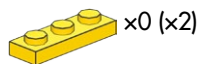
x2 (x2)



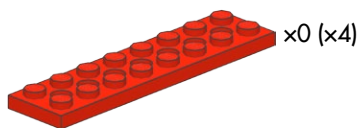
x2 (x2)



x0 (x2)



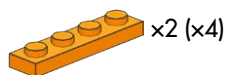
x0 (x2)



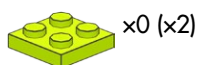
x0 (x4)



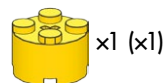
x1 (x1)



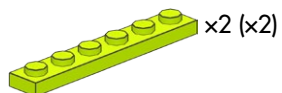
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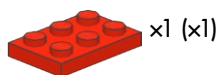
x0 (x2)



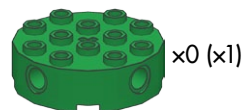
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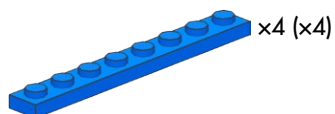
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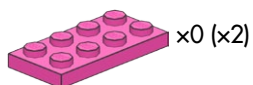
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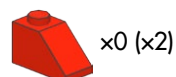
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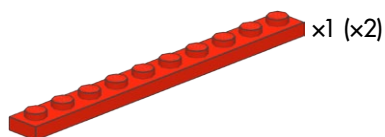
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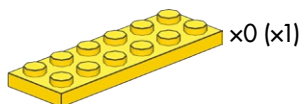
x0 (x2)



x0 (x2)



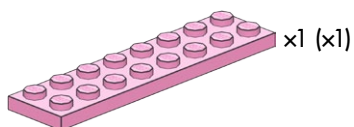
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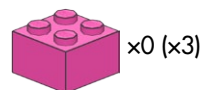
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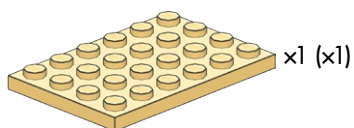
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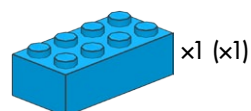
x1 (x1)



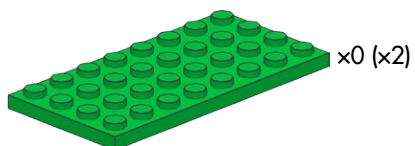
x0 (x3)



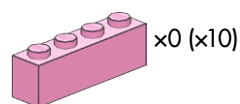
x1 (x1)



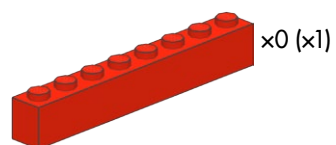
x1 (x1)



x0 (x2)



x0 (x10)



x0 (x1)

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