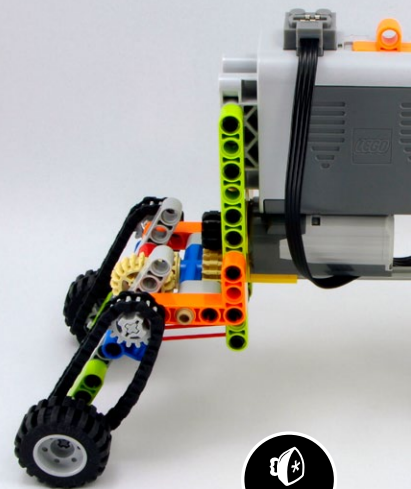
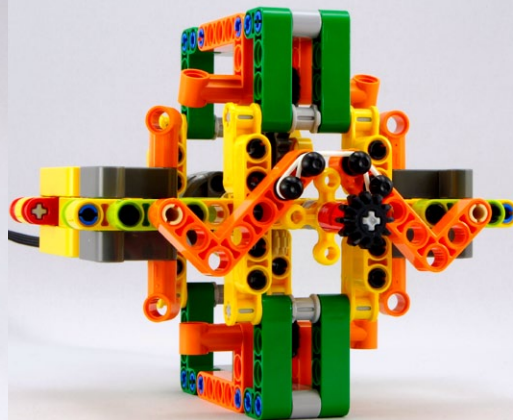
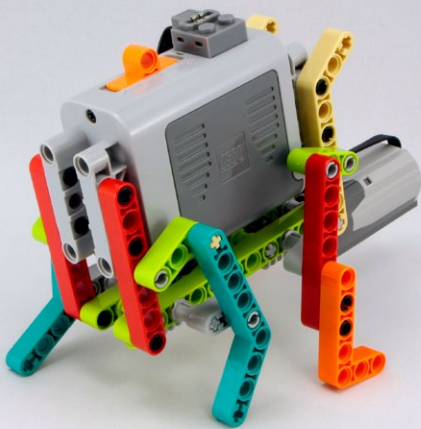




THE LEGO®
POWER
FUNCTIONS
IDEA BOOK

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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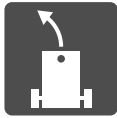
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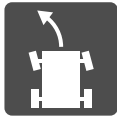
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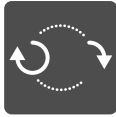


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Introduction

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

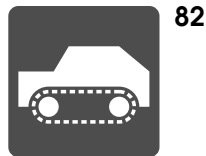
Vehicles



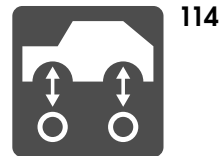
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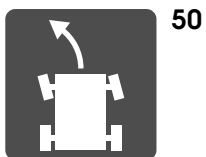
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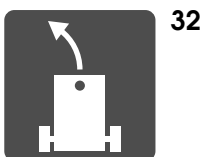
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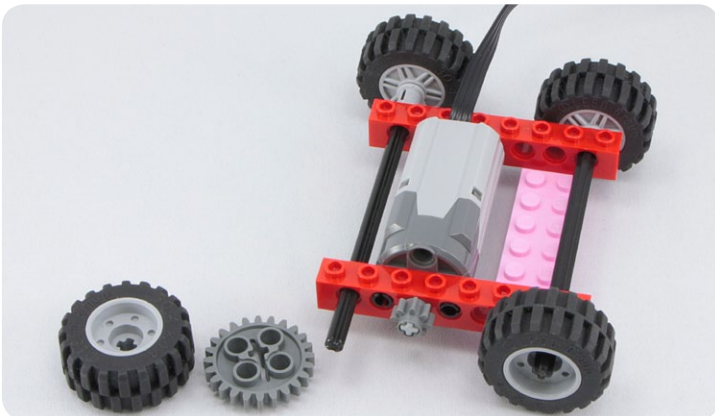
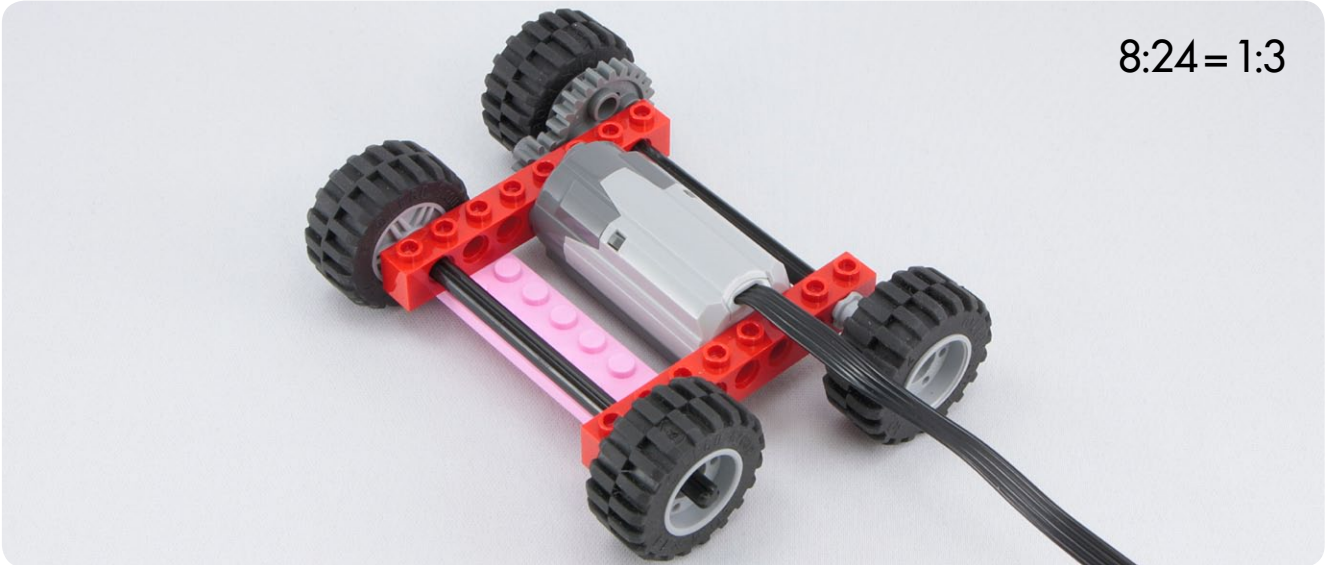
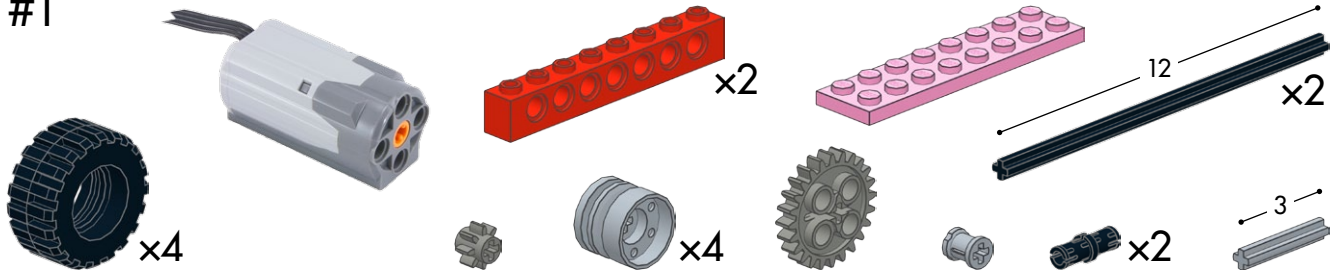


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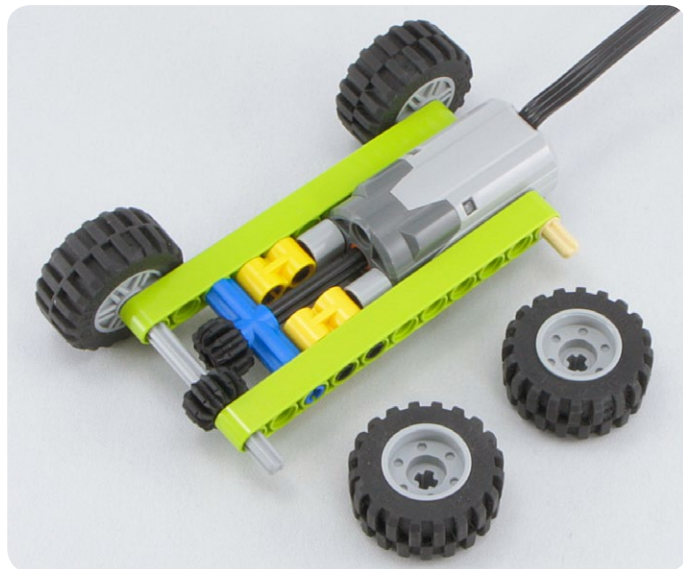
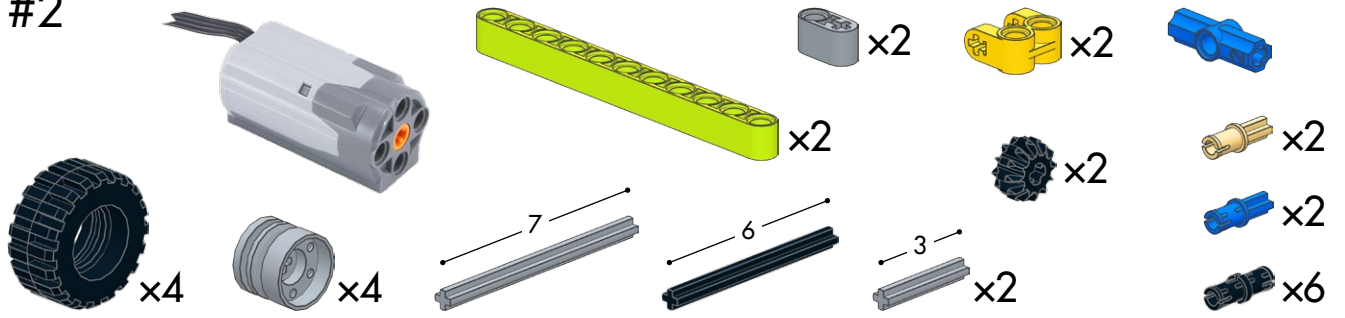


Driving wheels with a motor

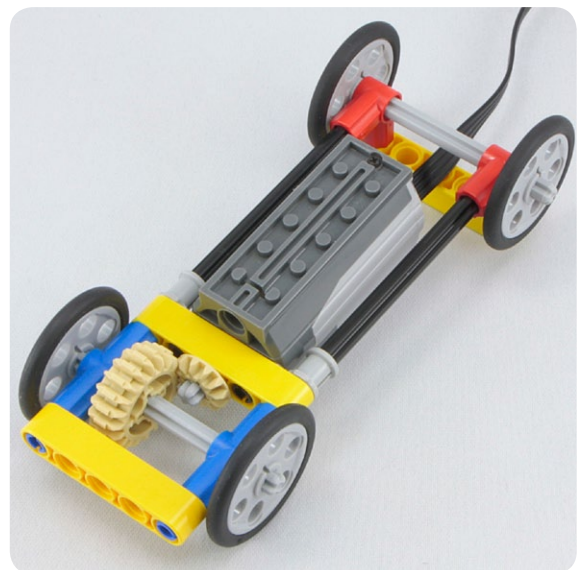
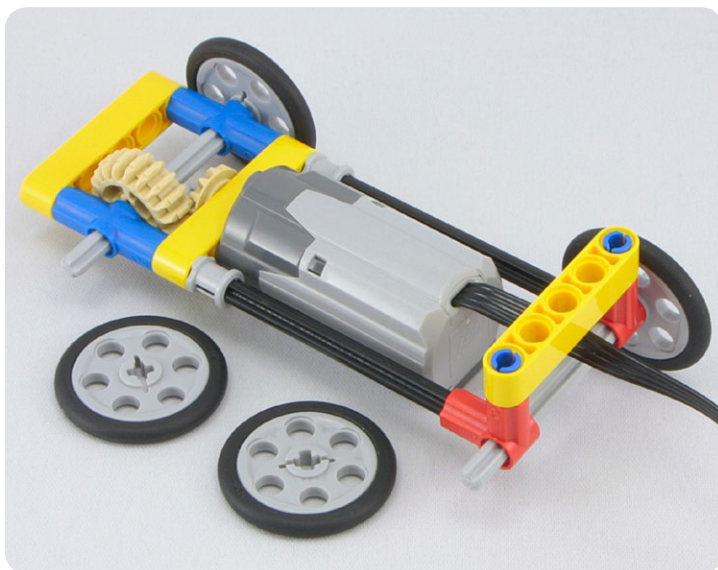
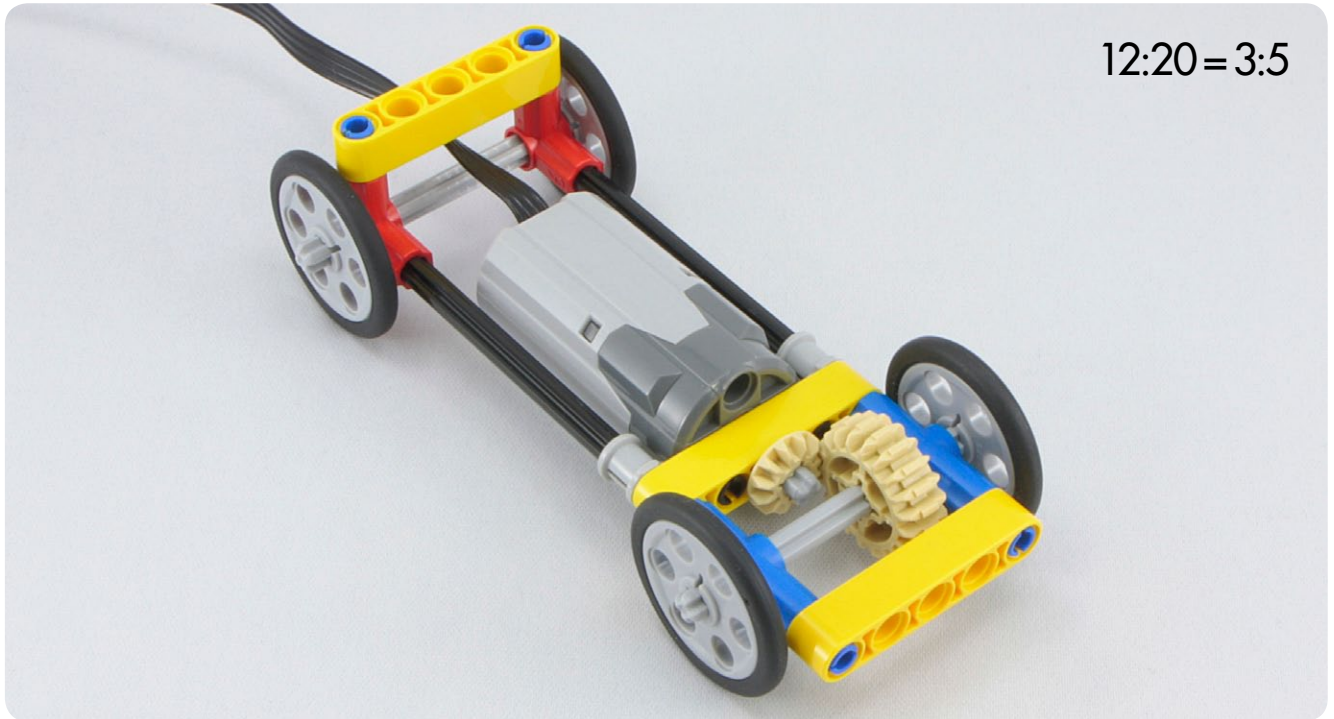
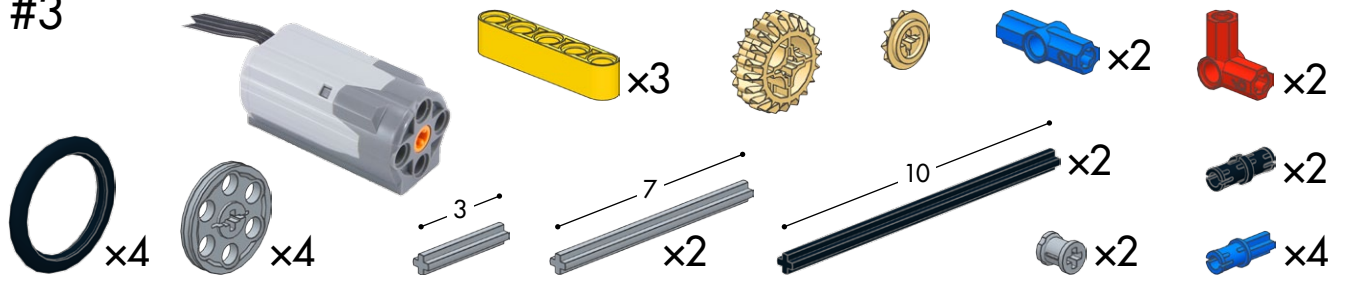
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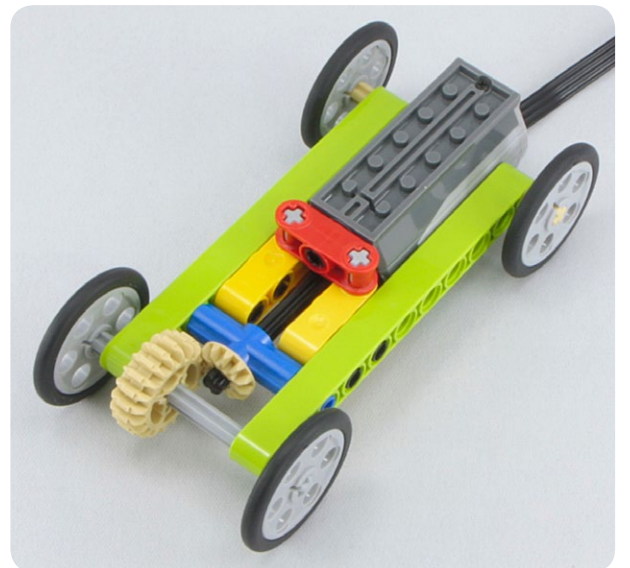
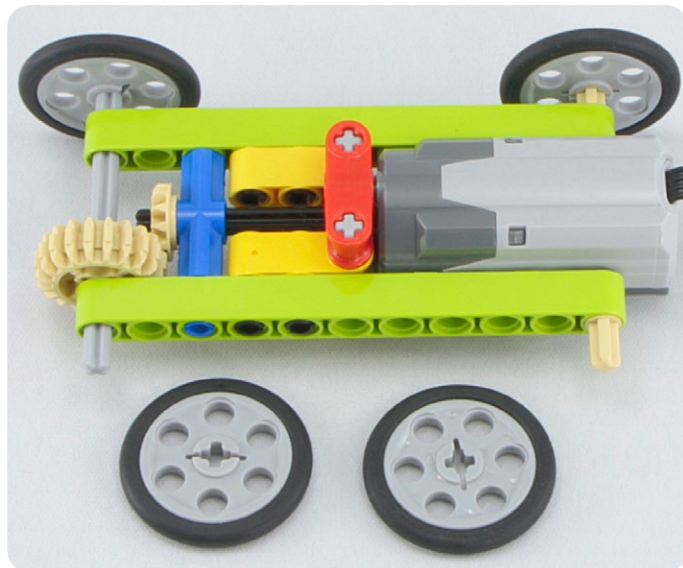
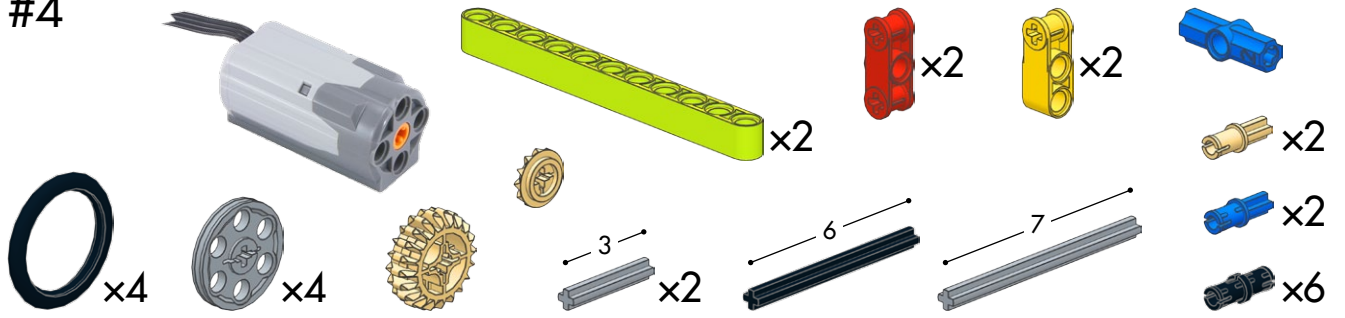
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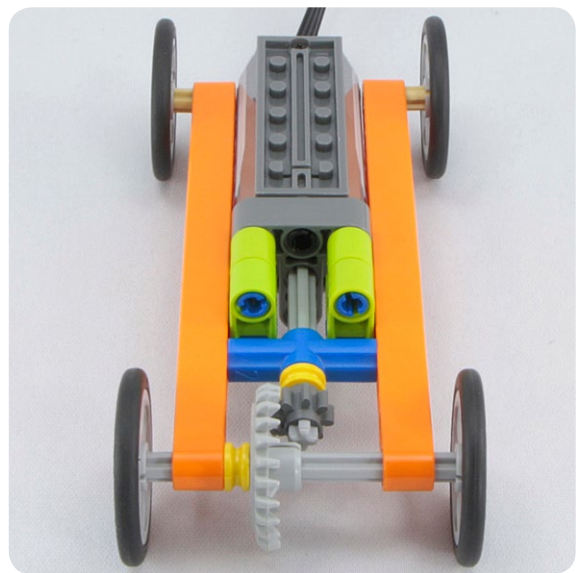
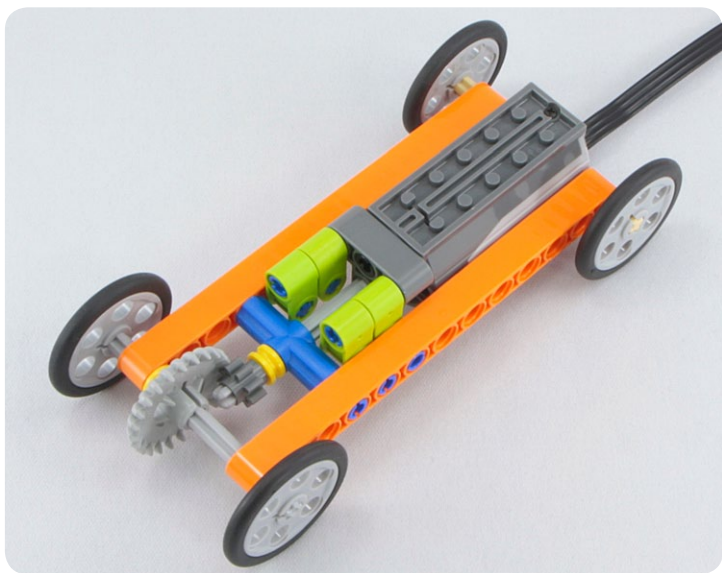
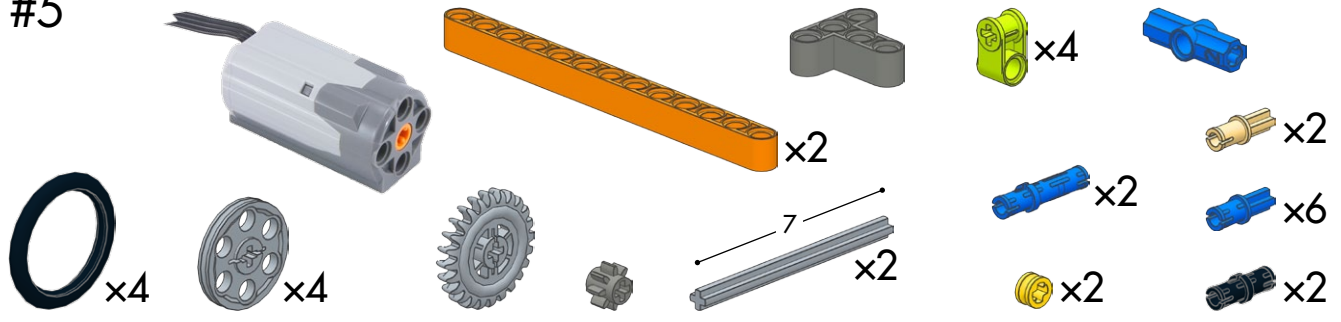
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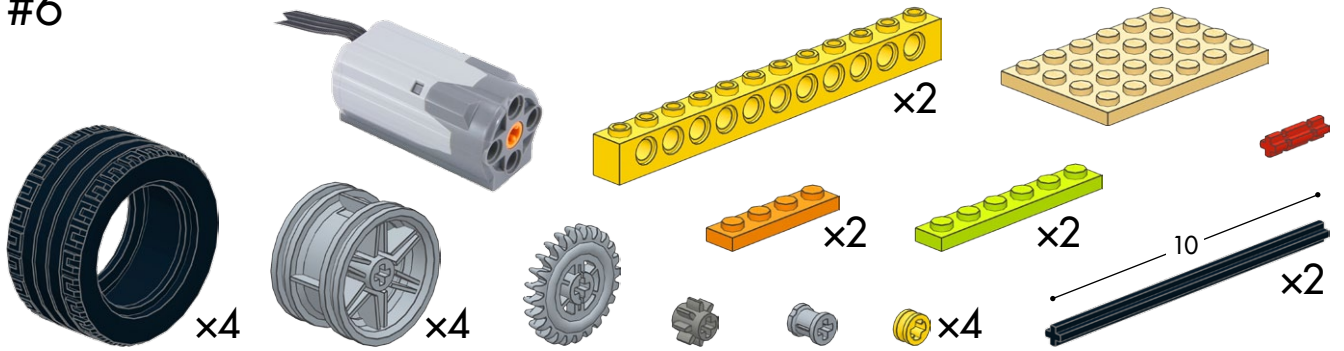
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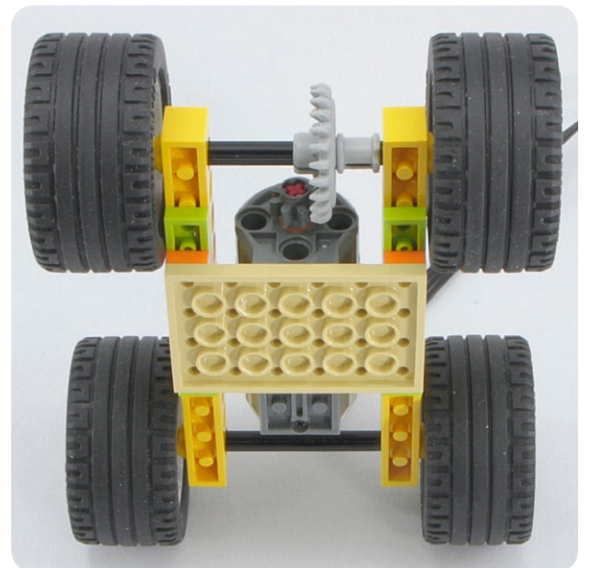
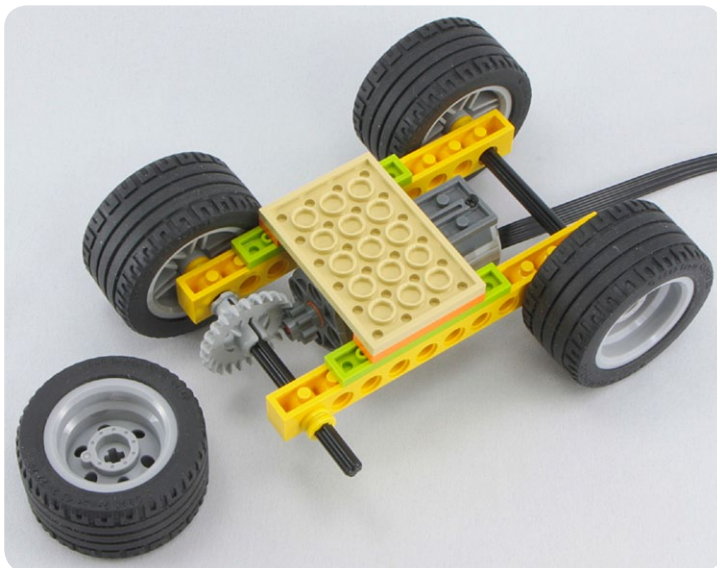
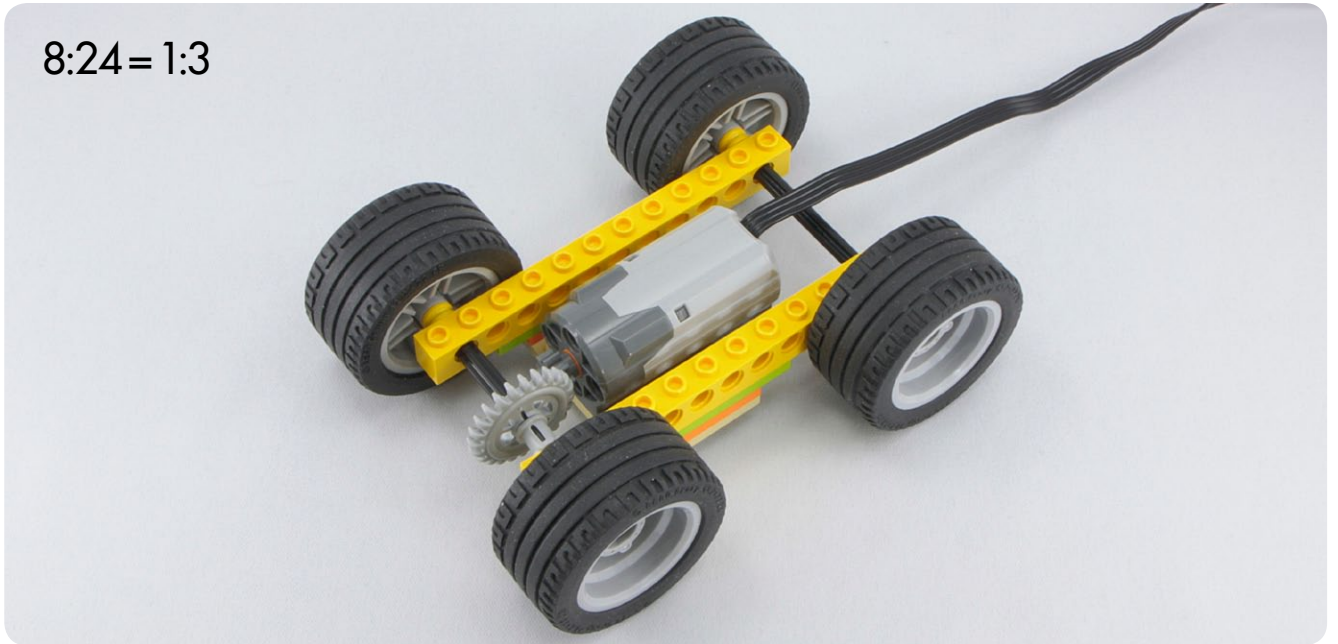
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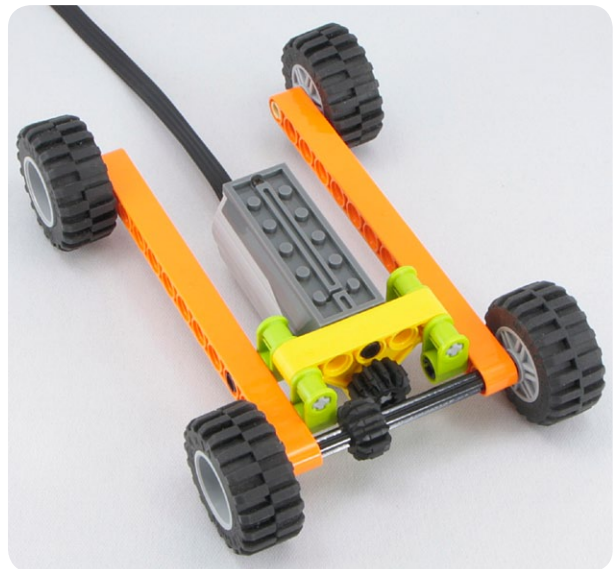
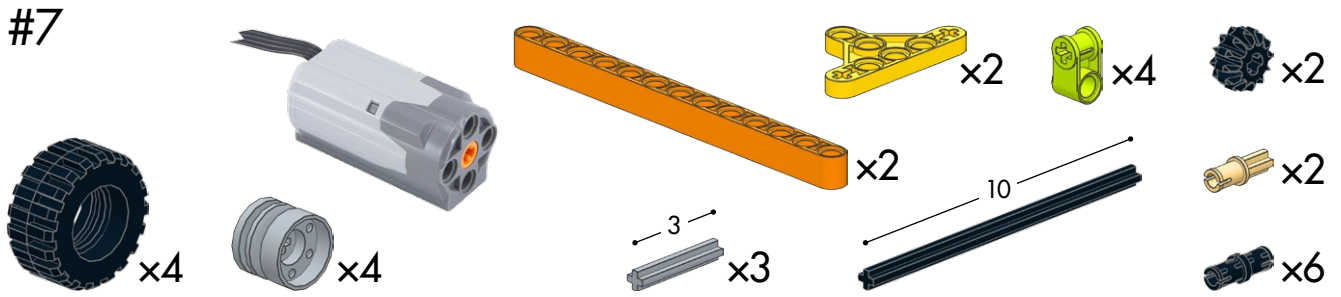


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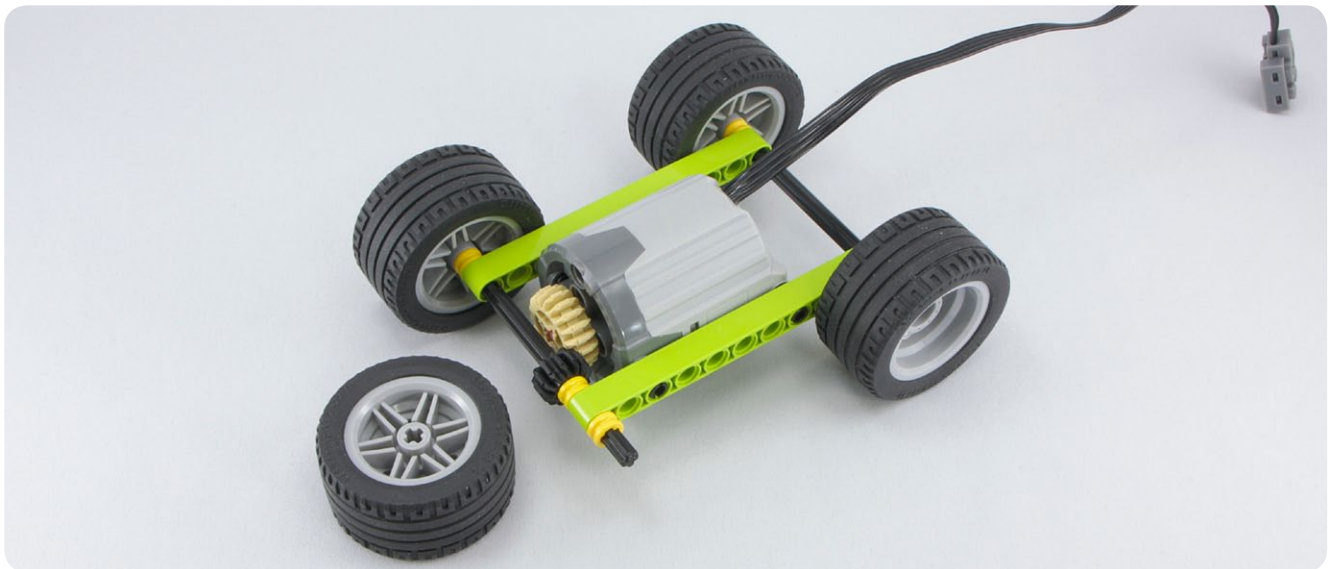


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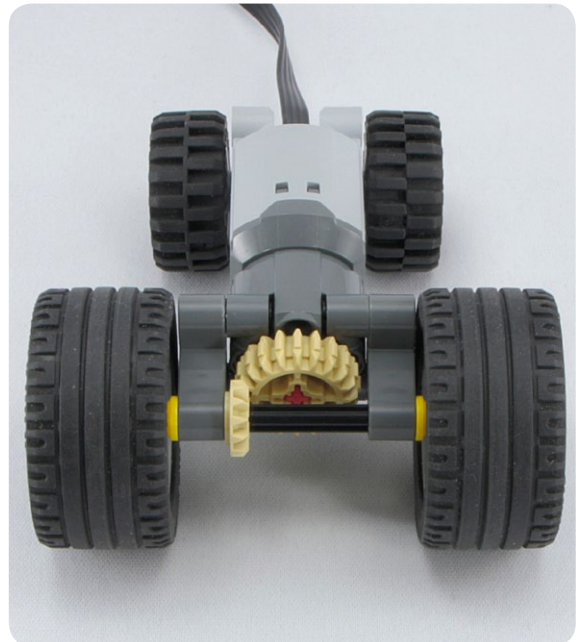
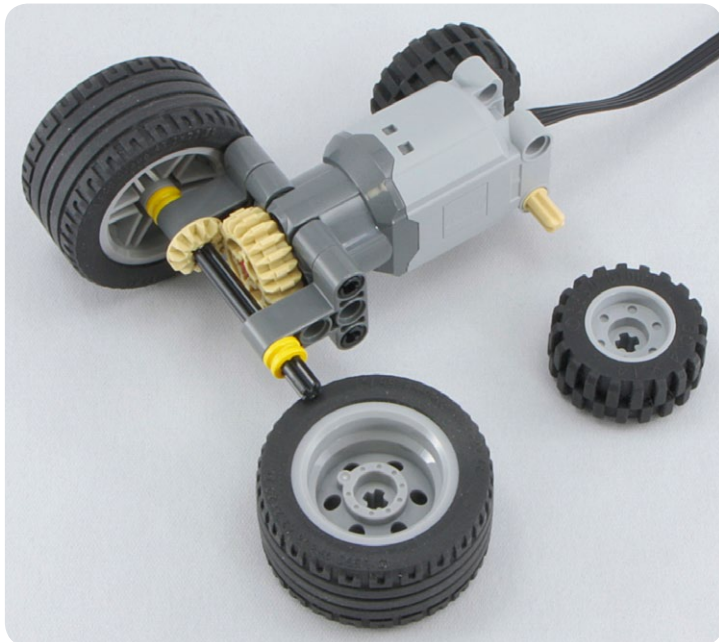
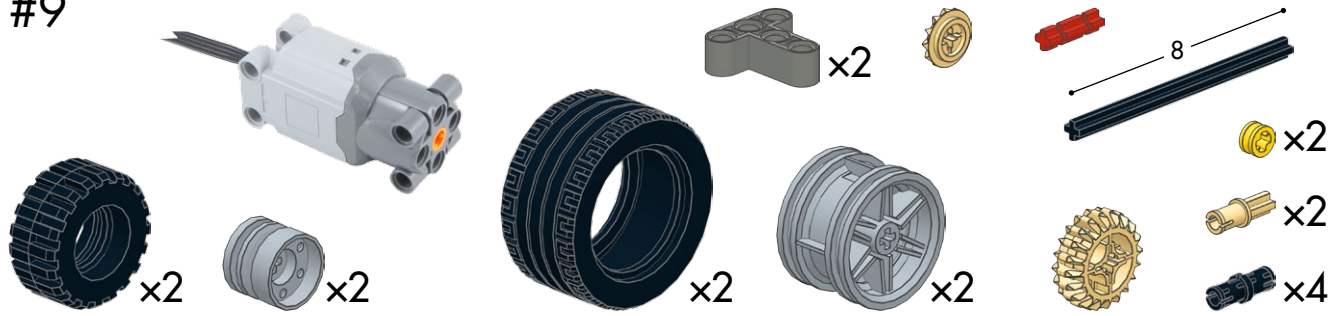




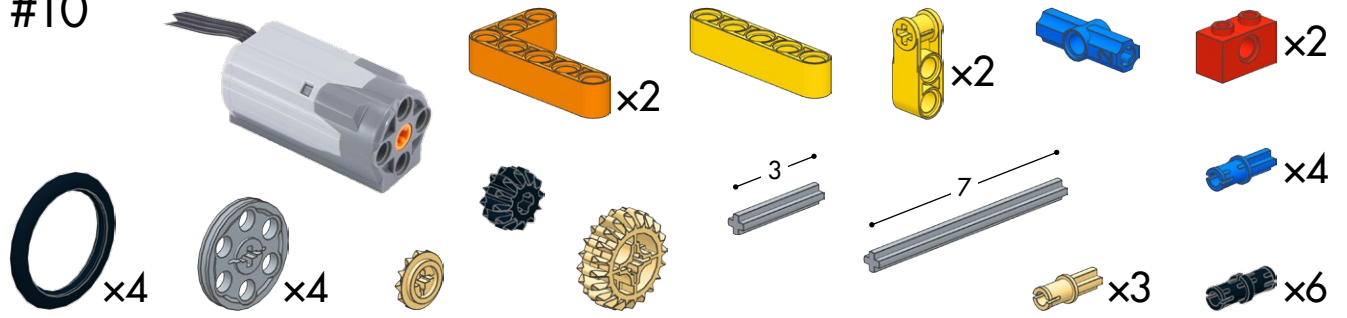
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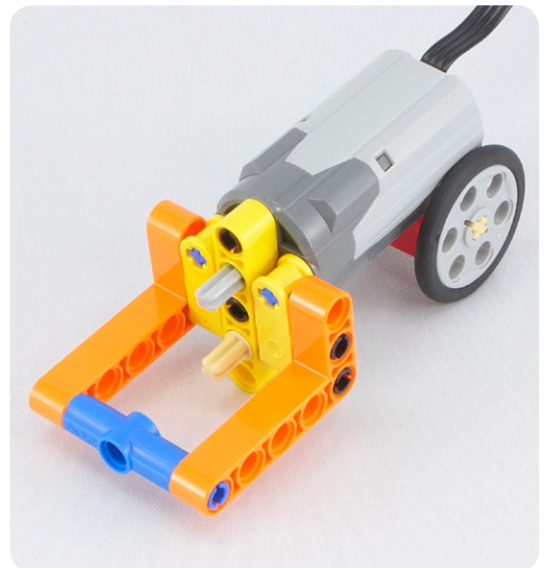
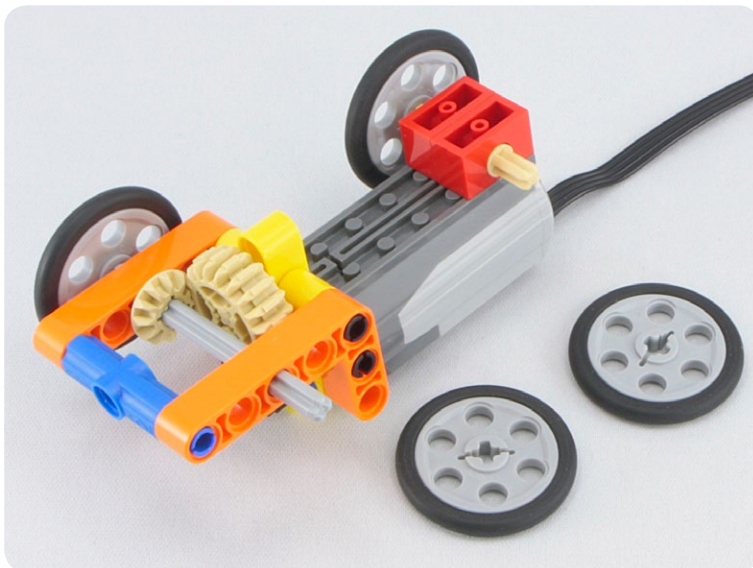
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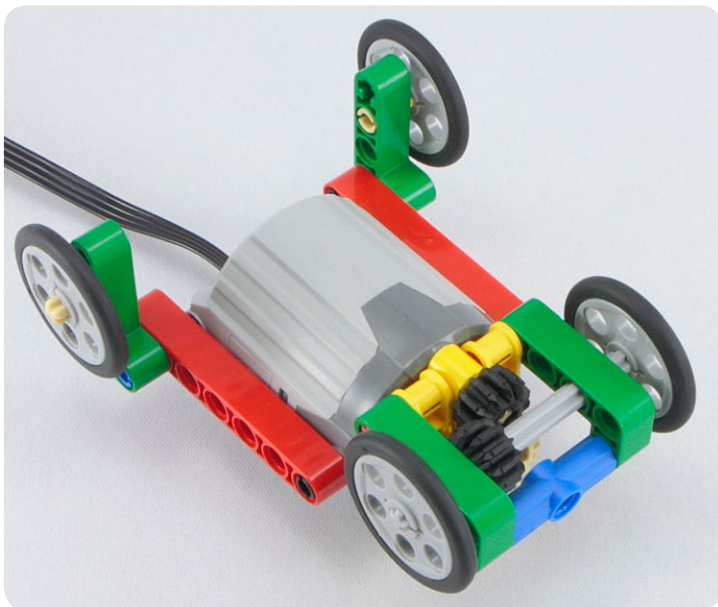
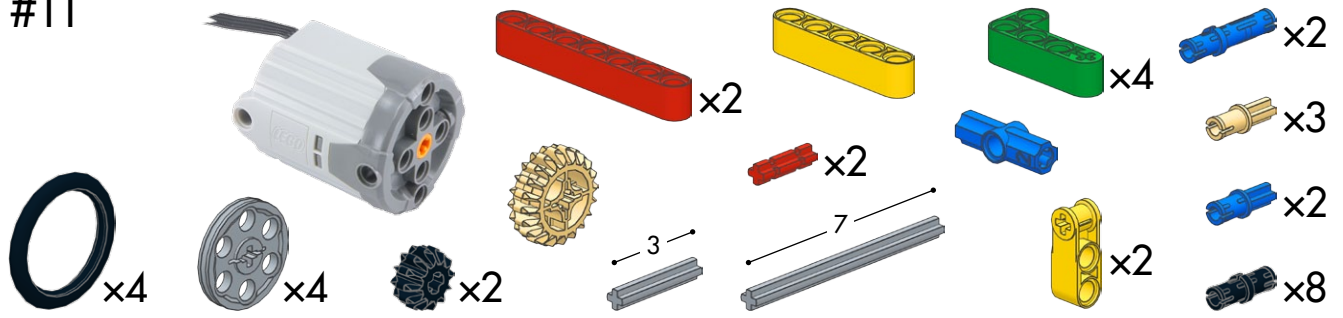
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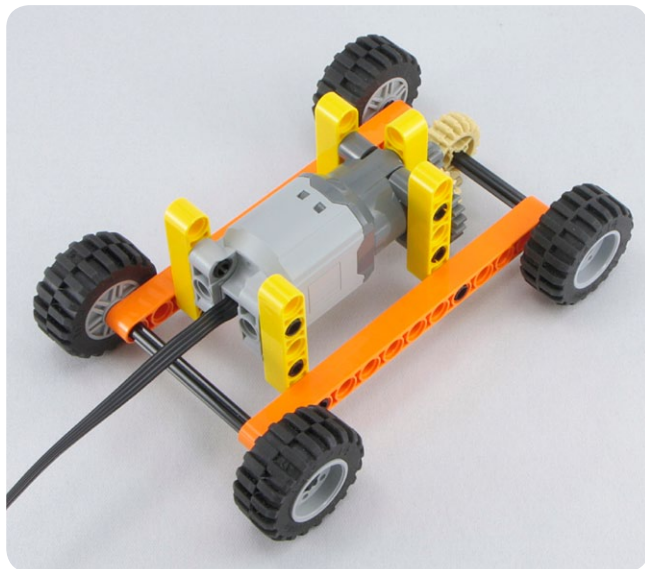
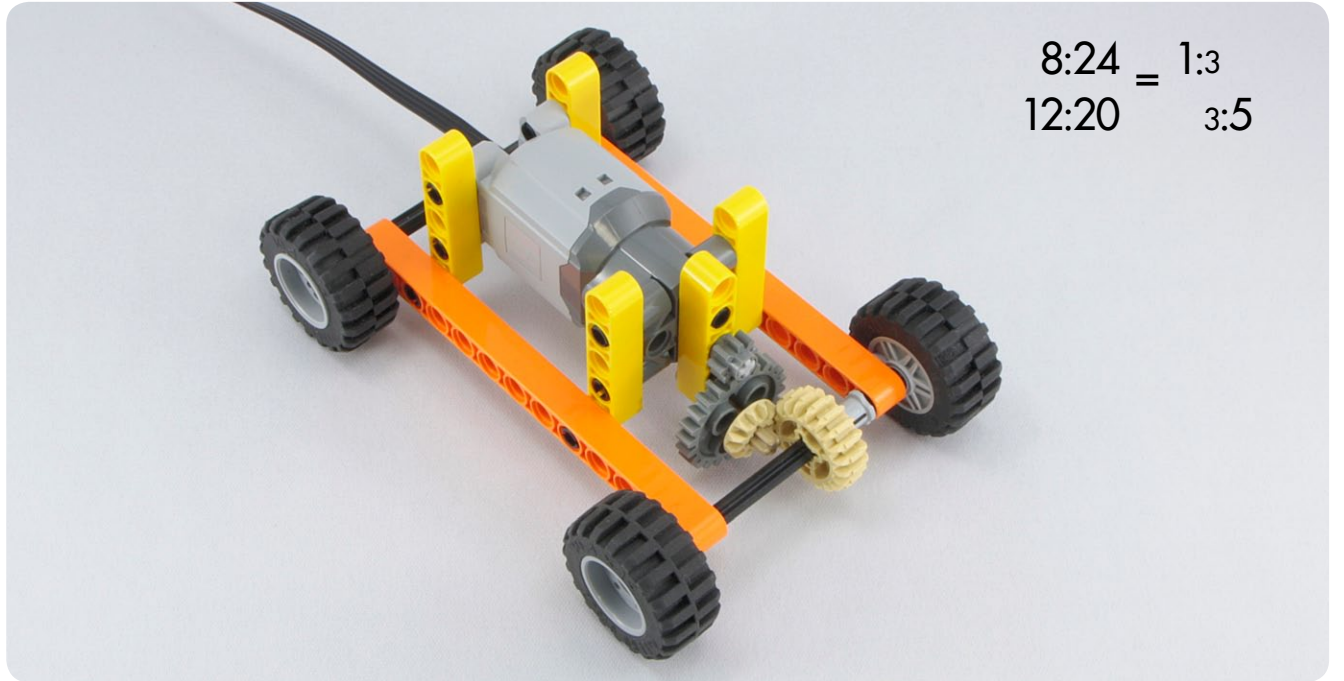
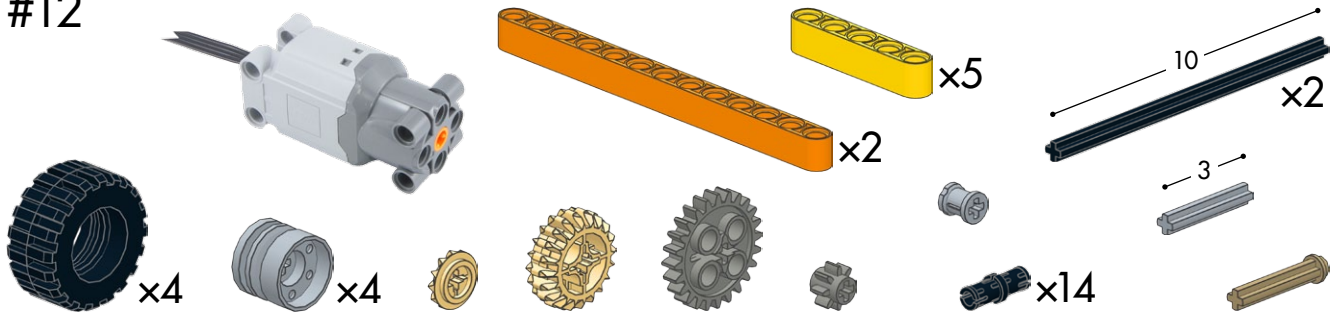
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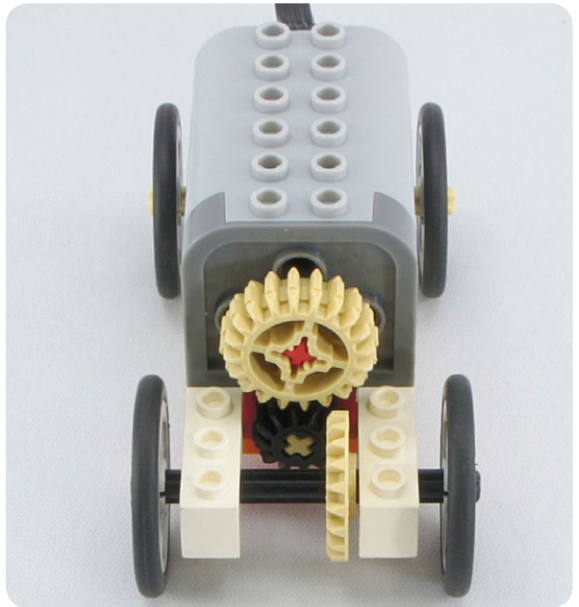
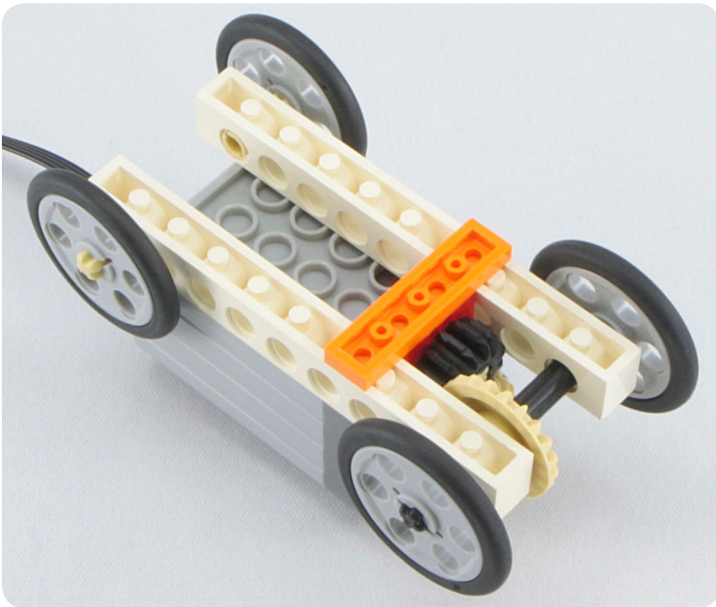
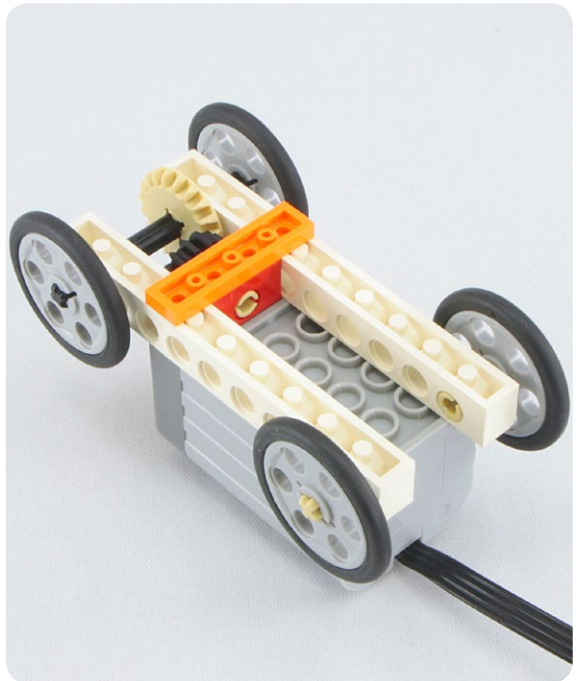
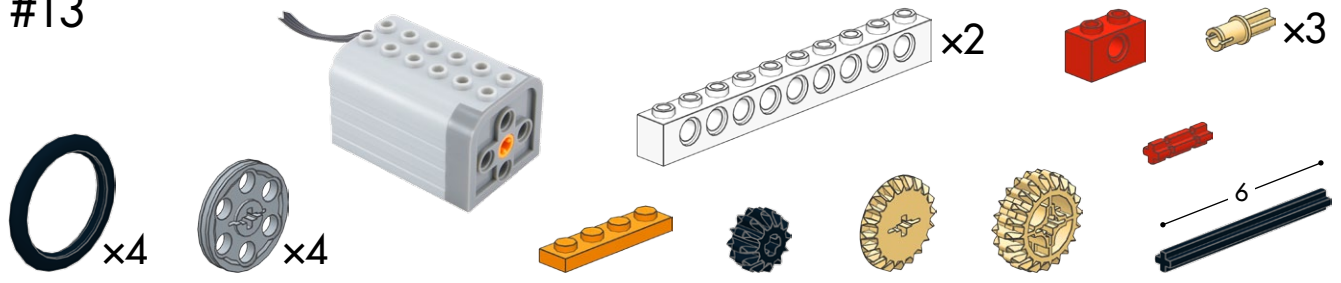
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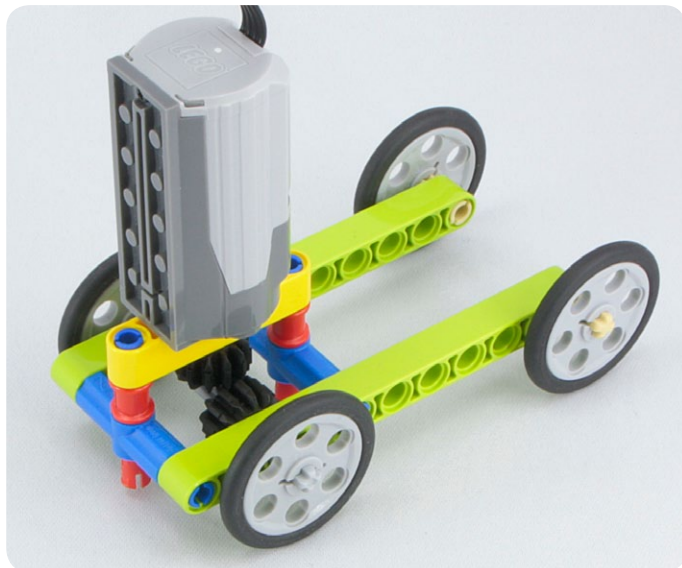
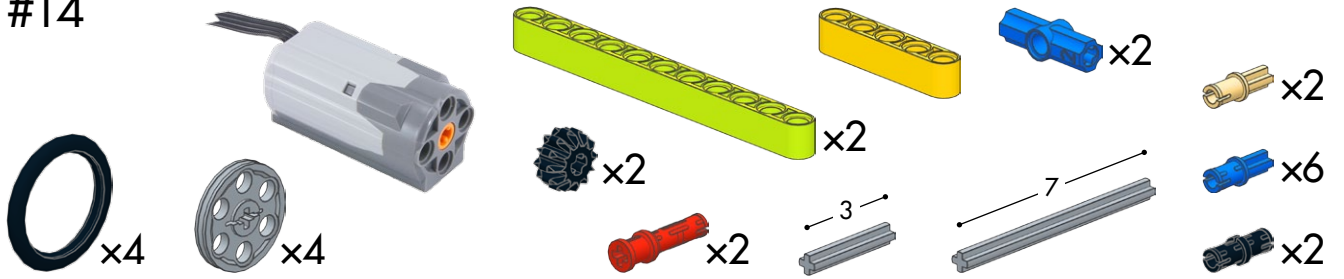
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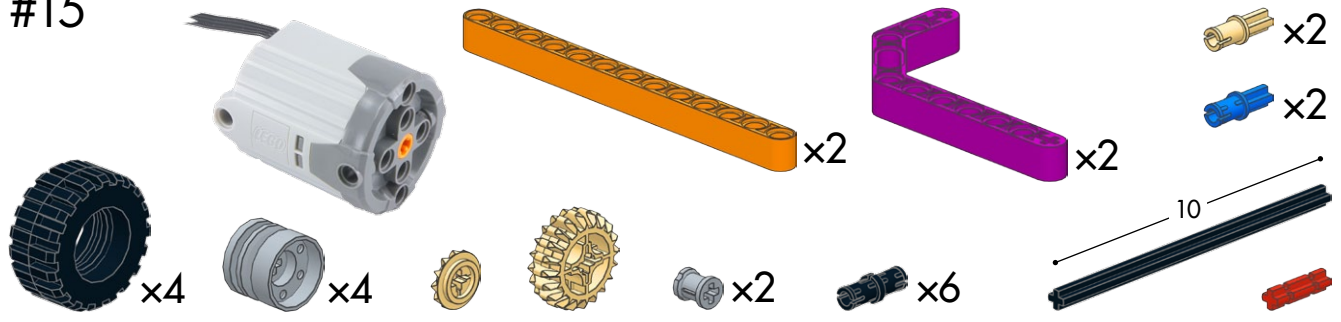
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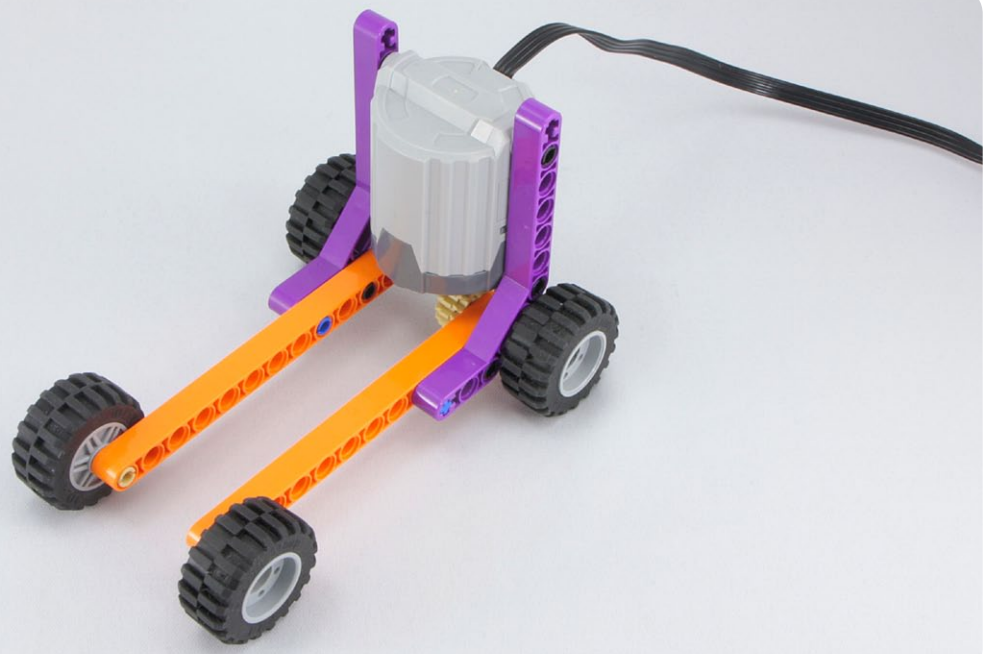
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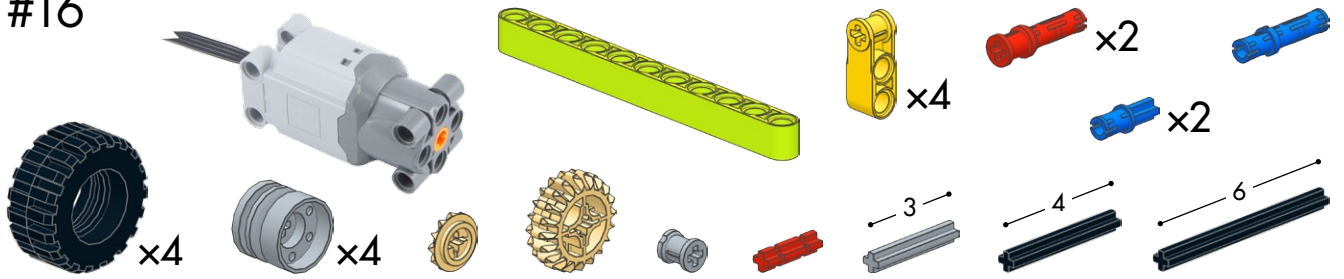
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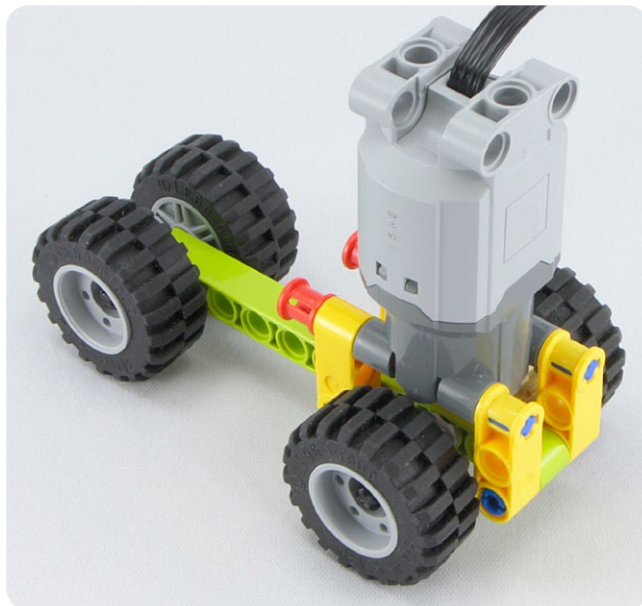
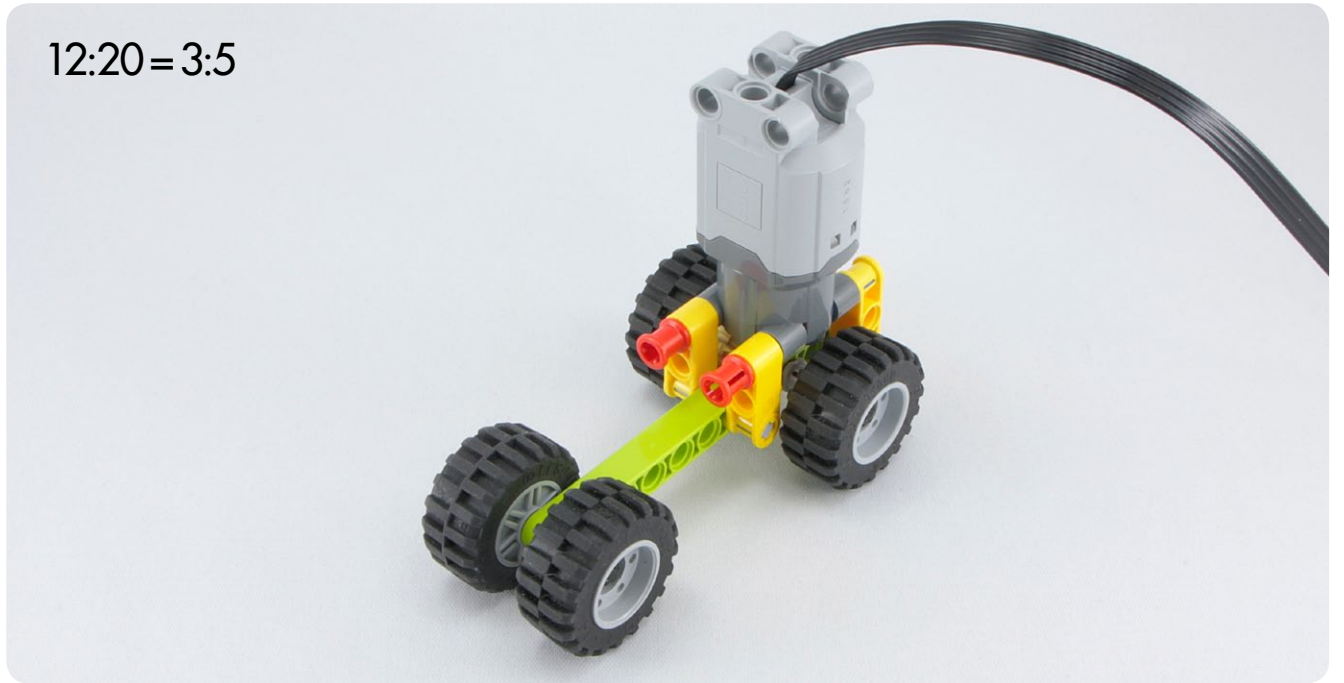
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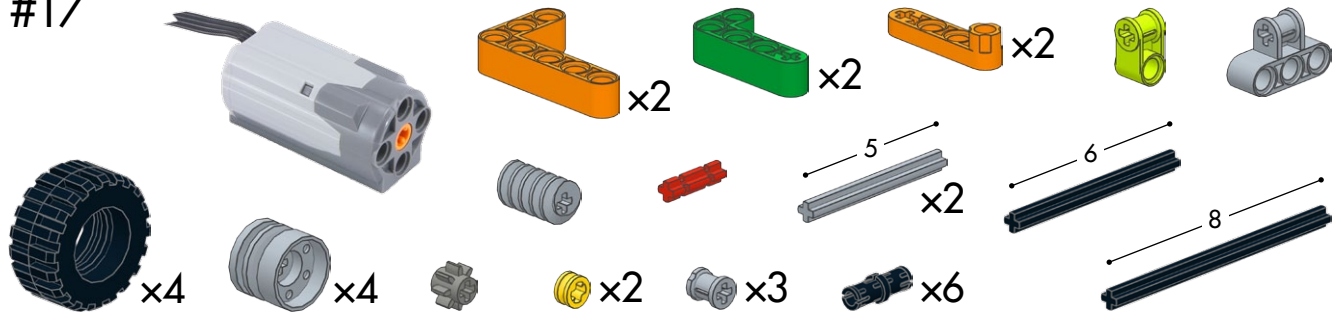
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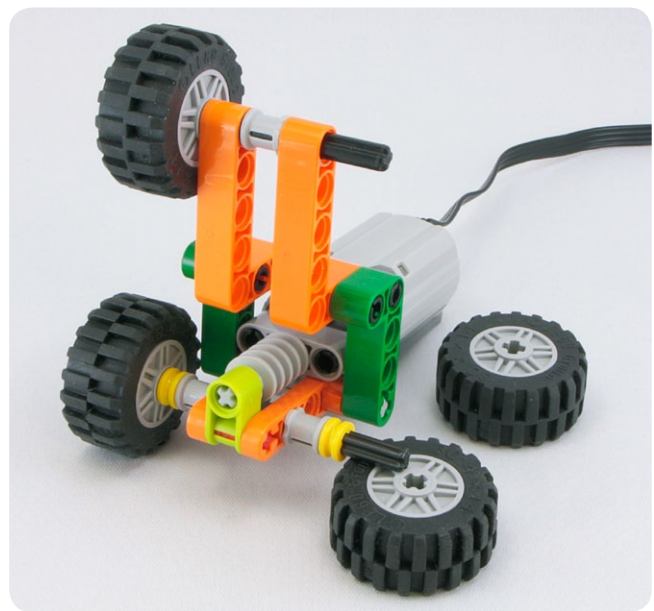
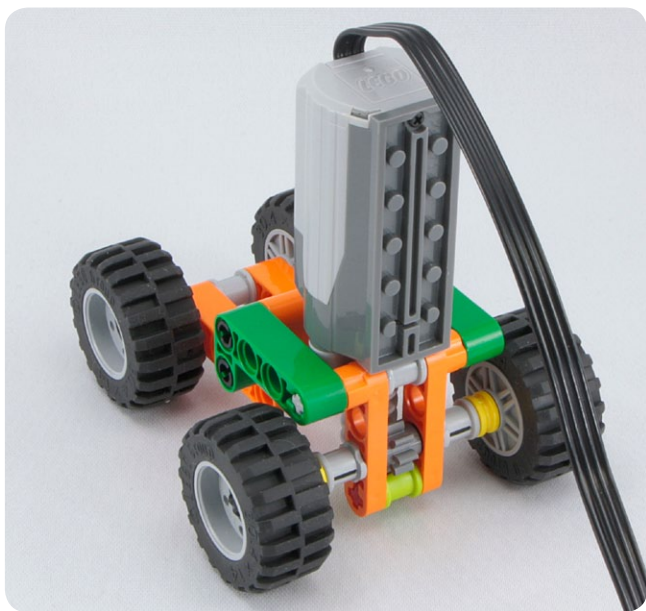
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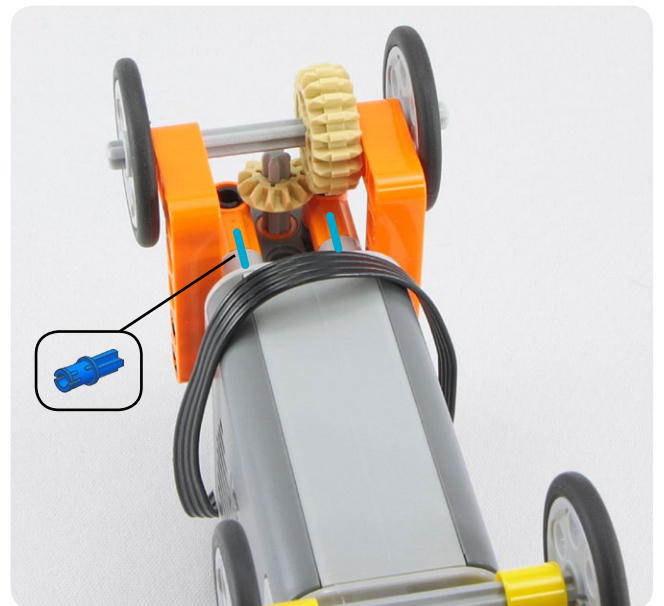
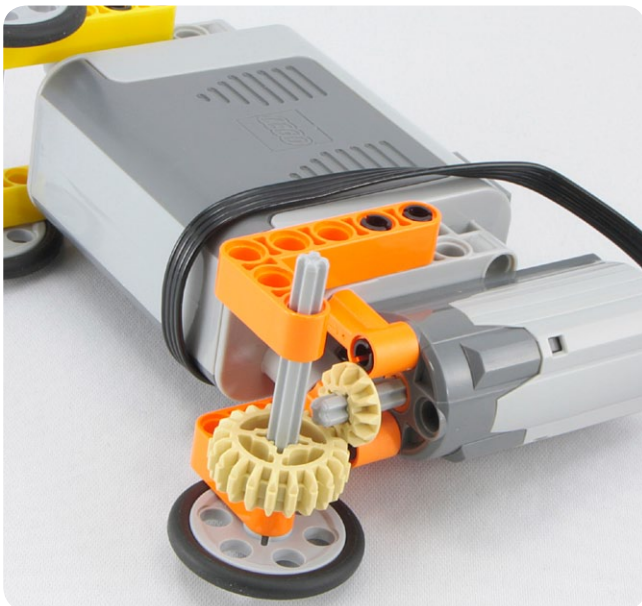
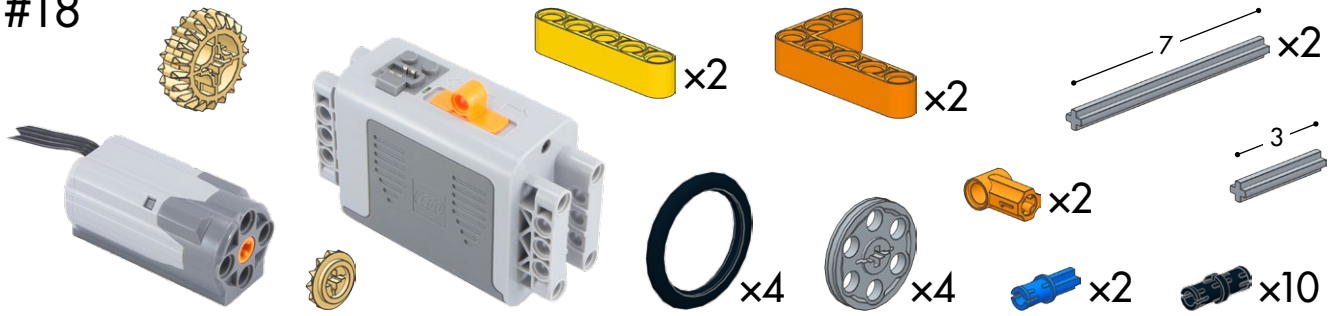
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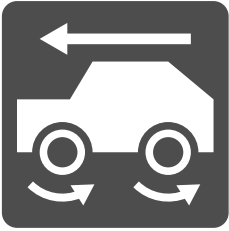


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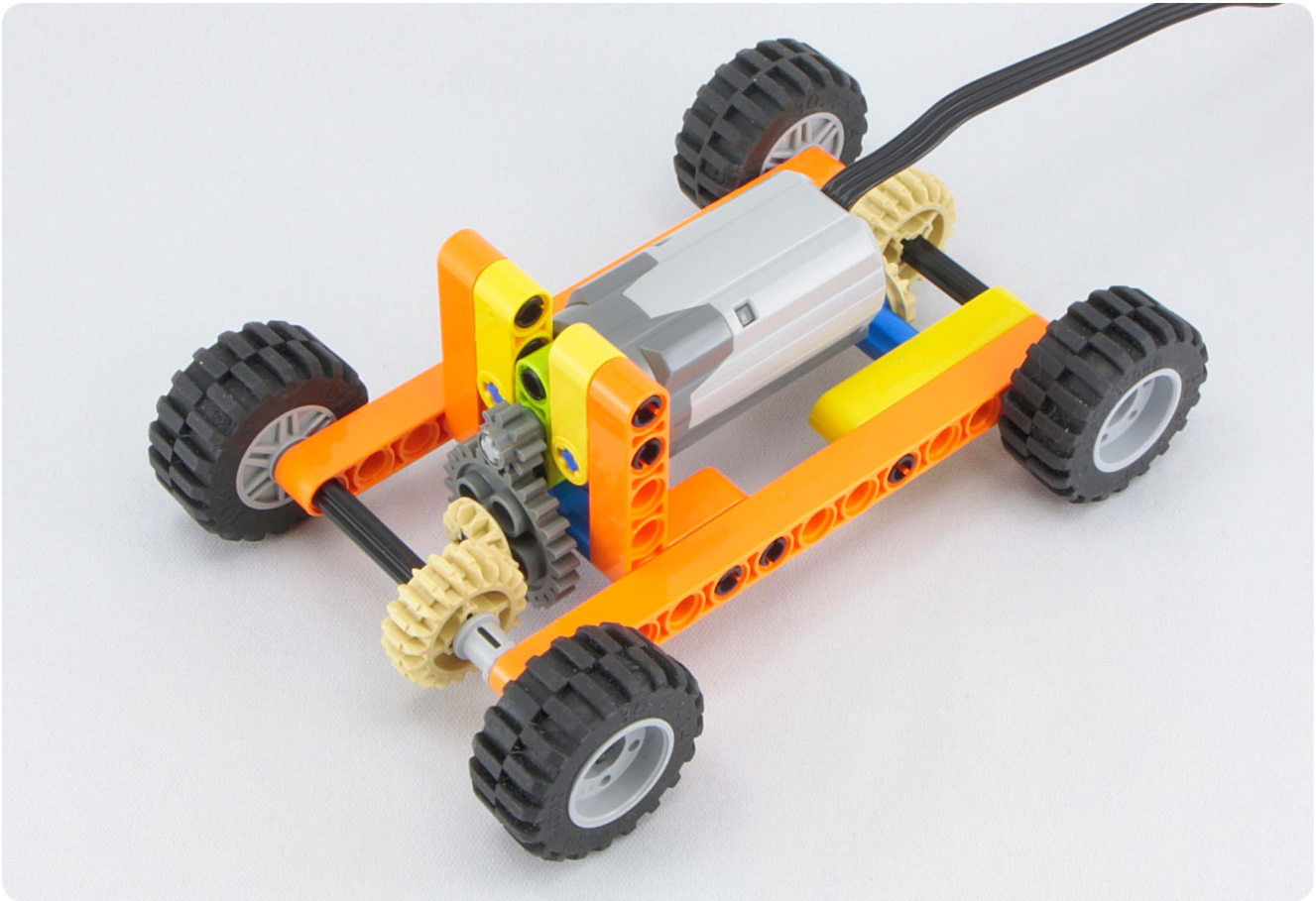
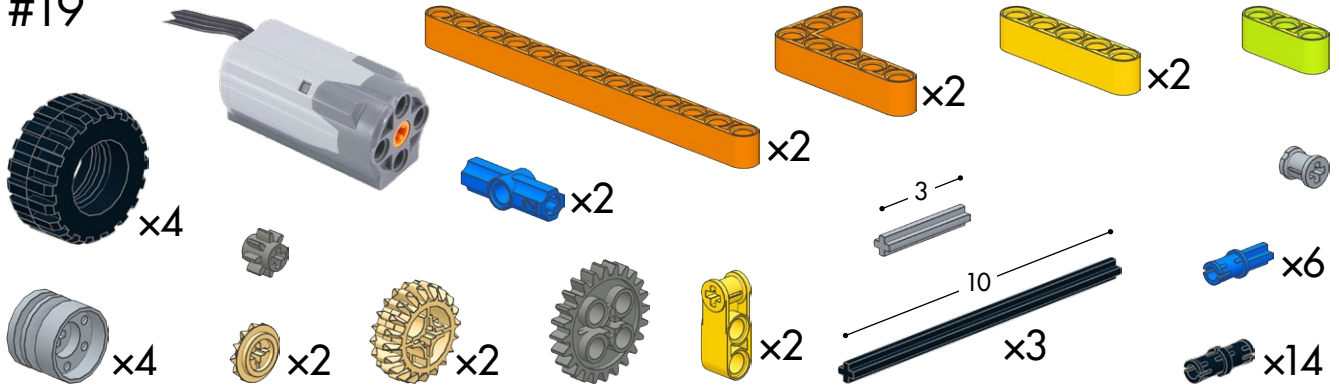
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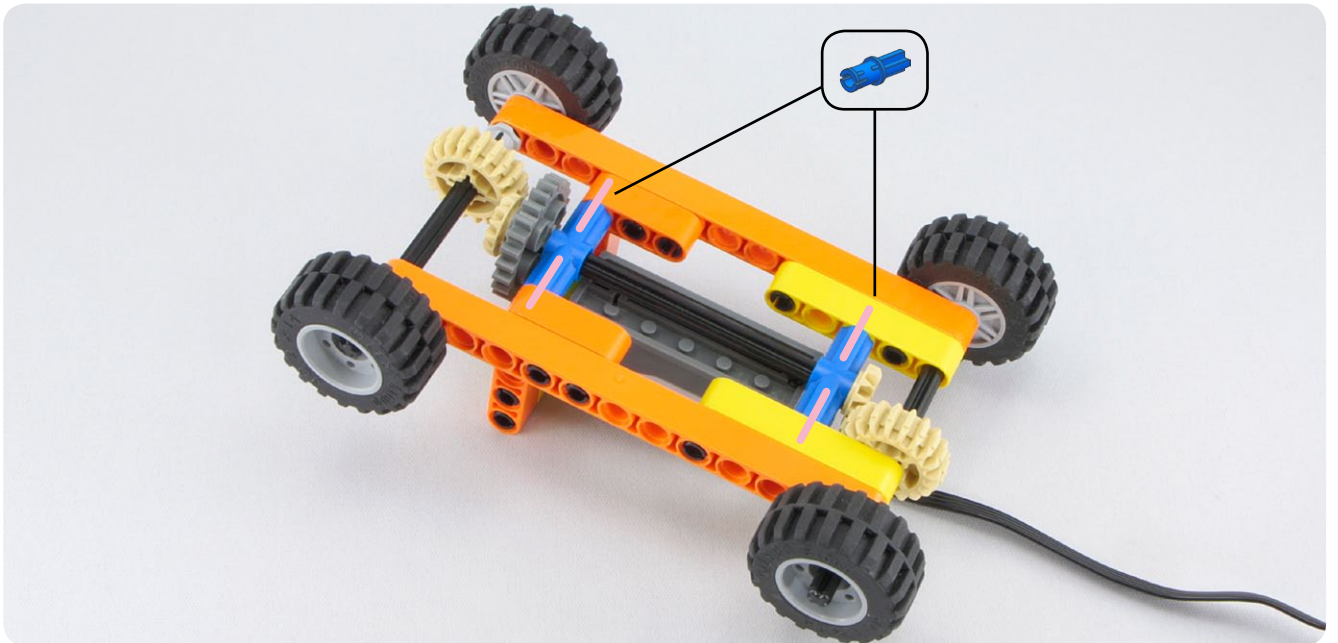
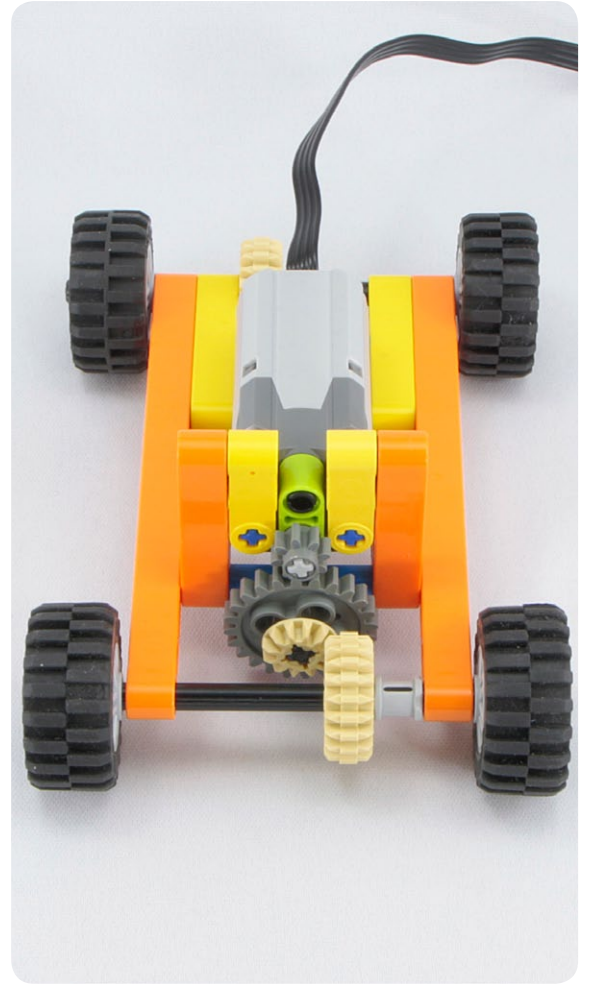




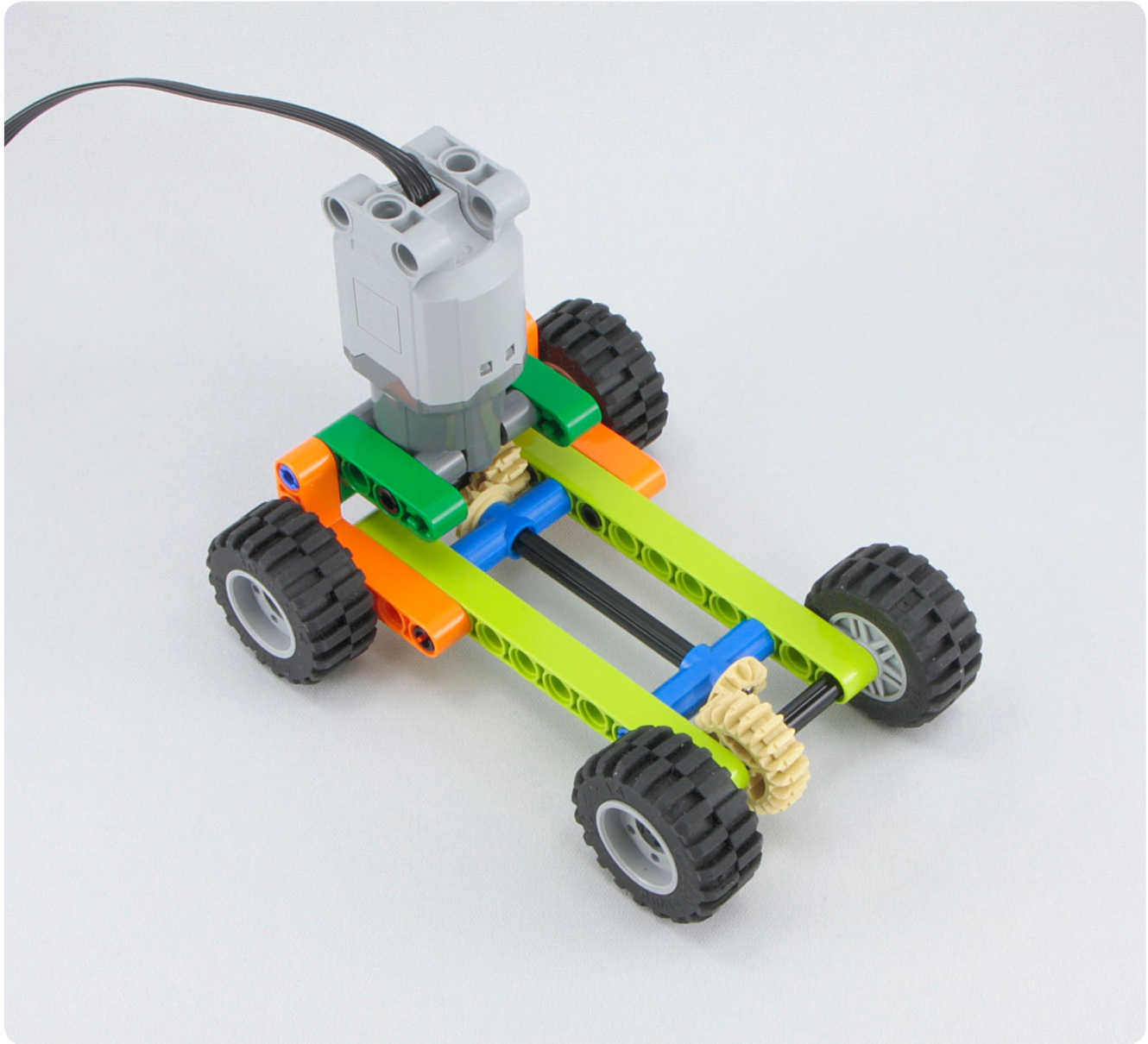
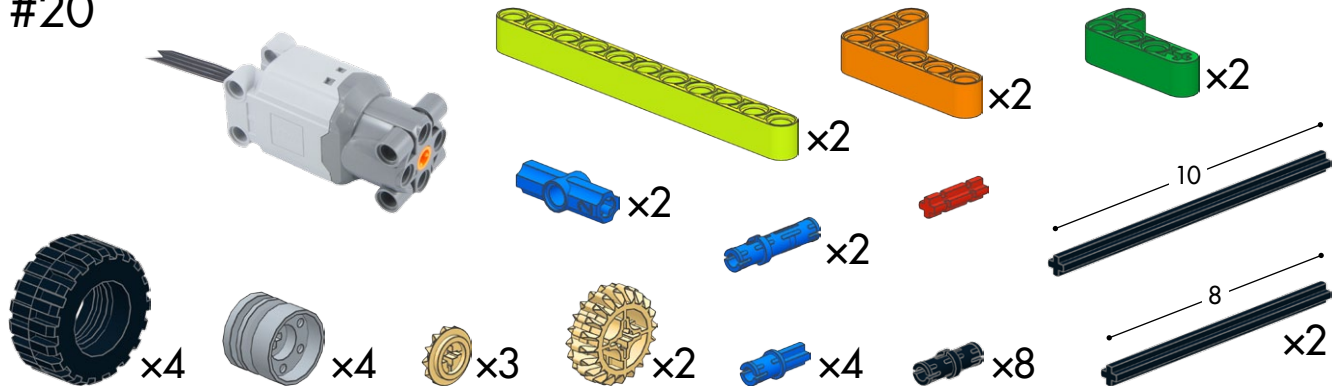
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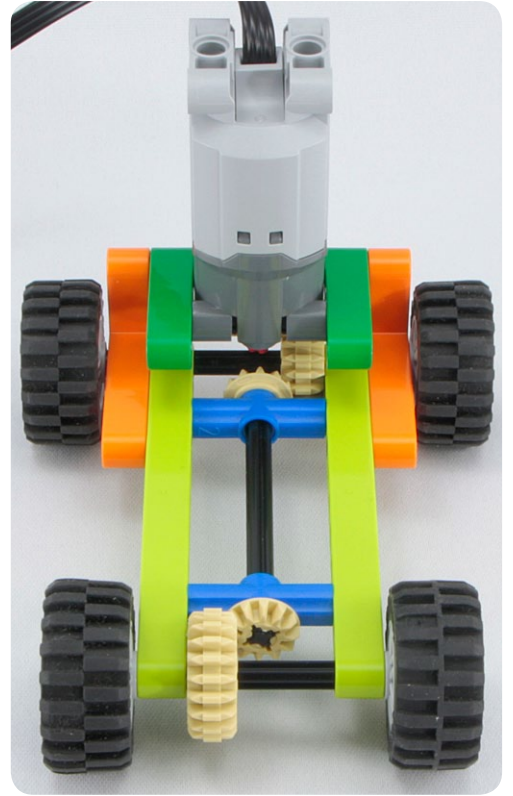
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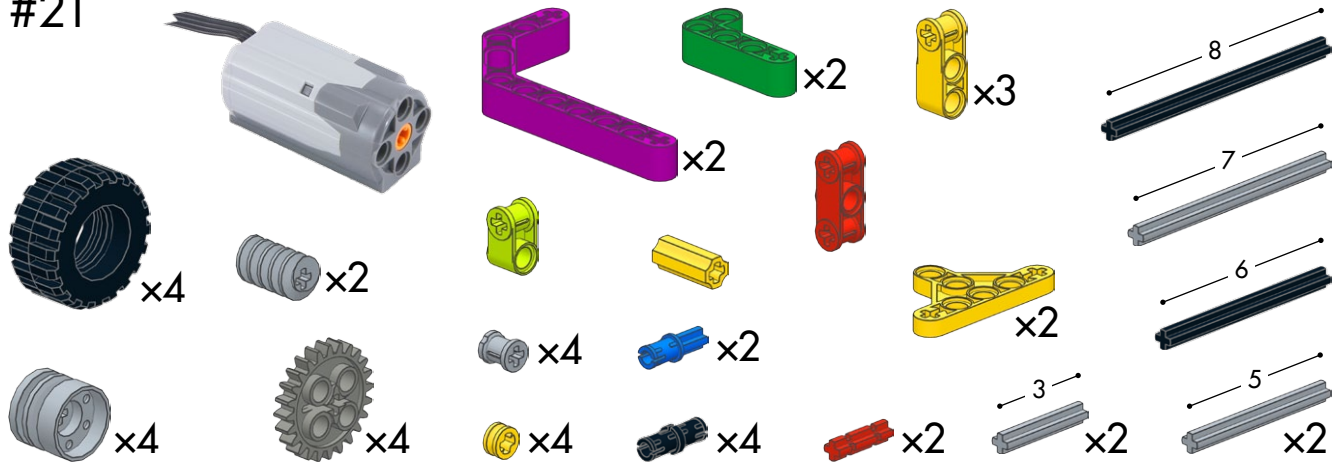


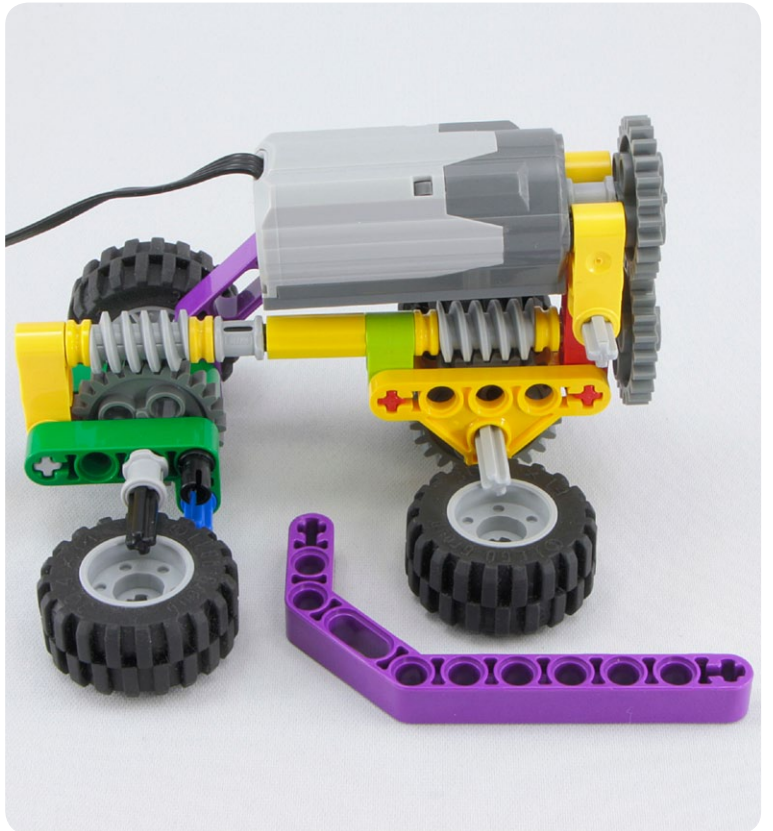
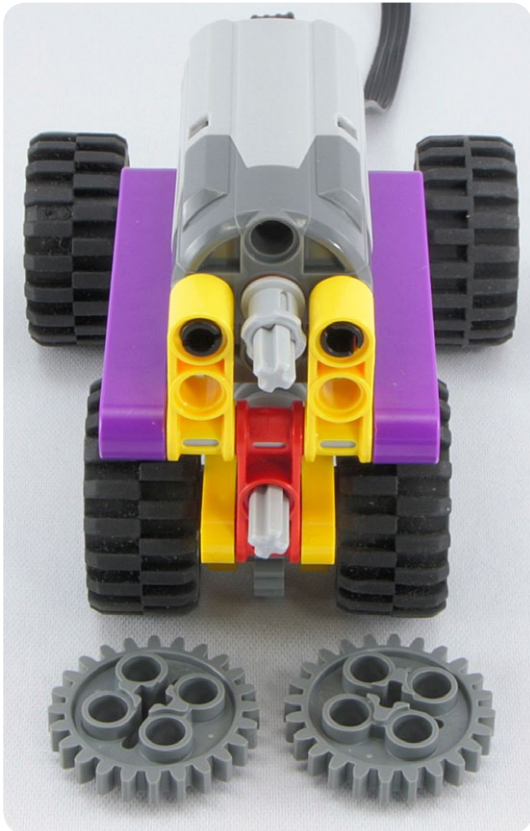
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



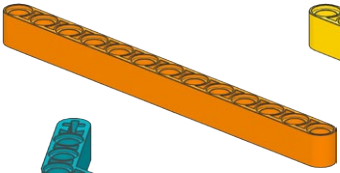
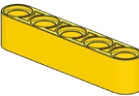
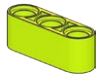
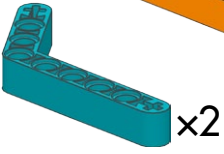



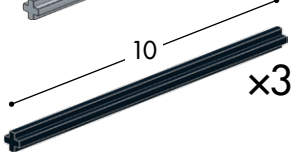





#21

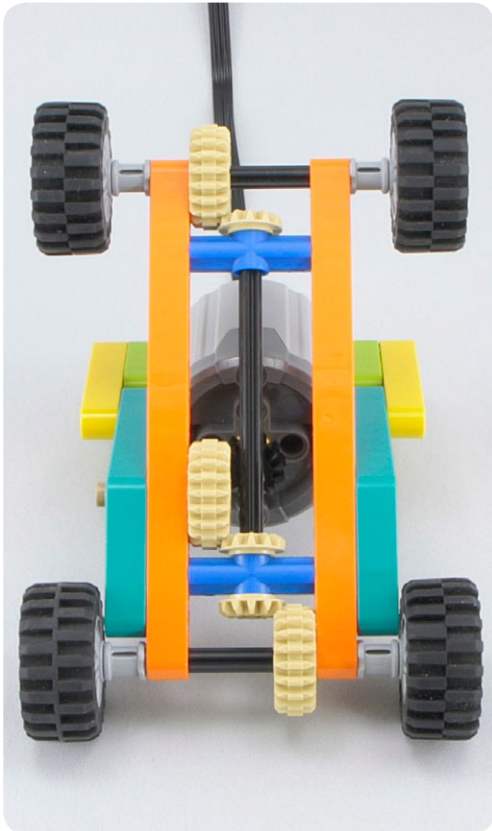




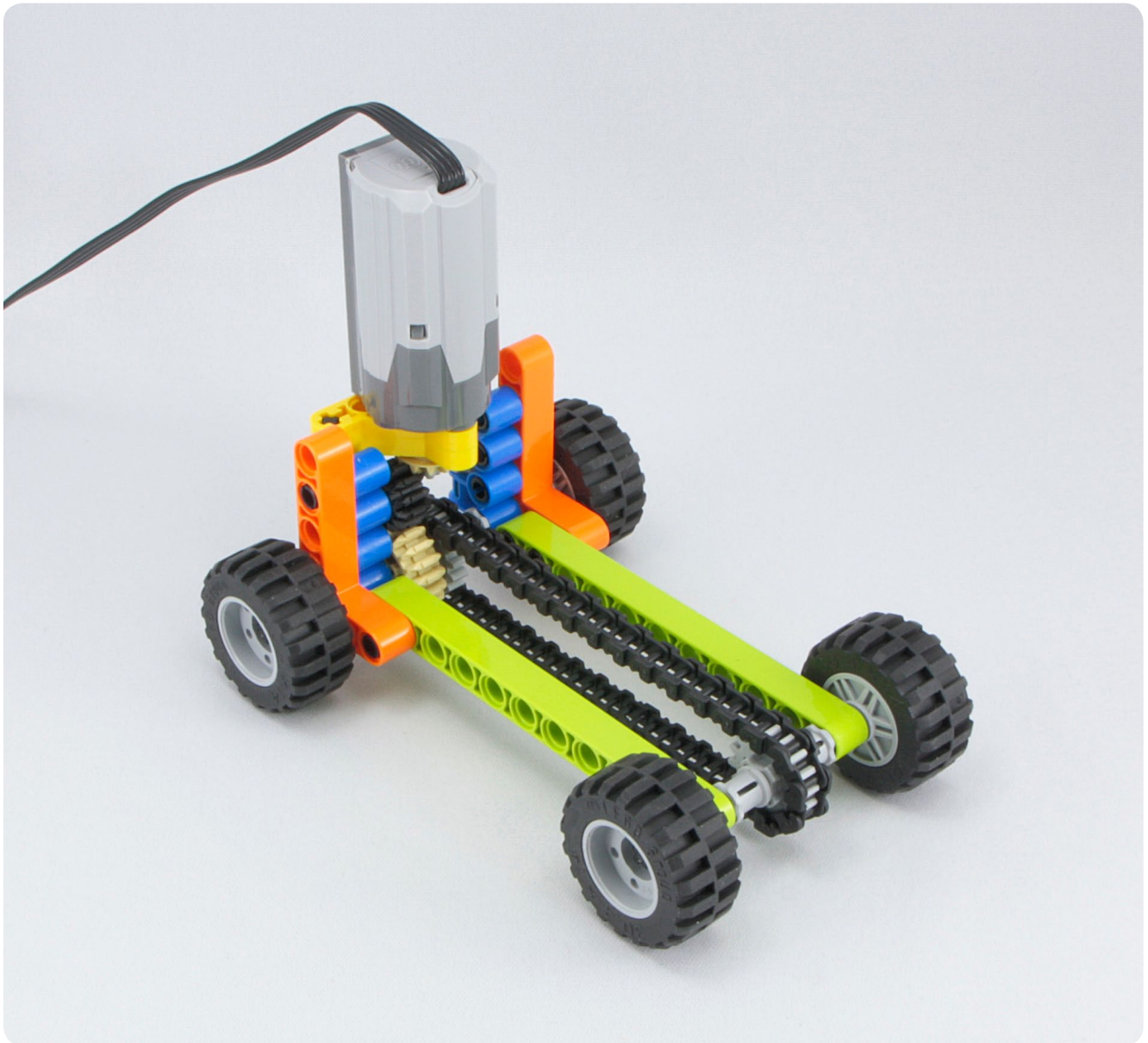
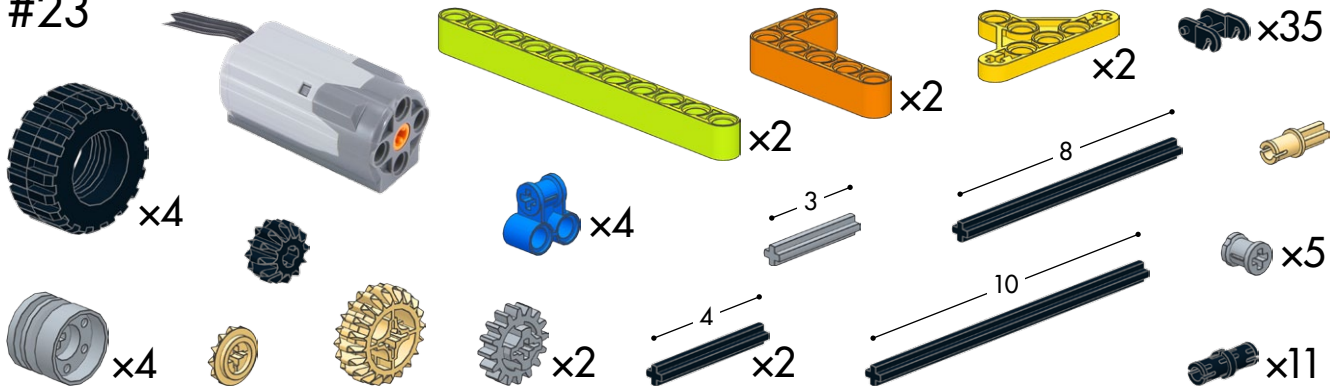
#22

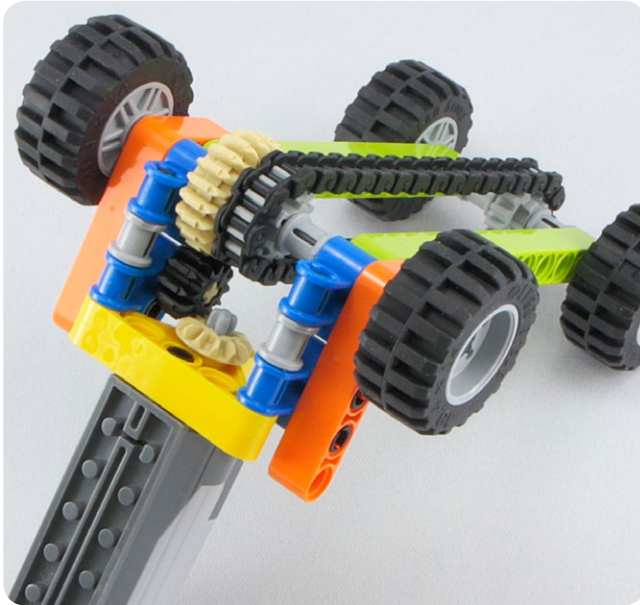
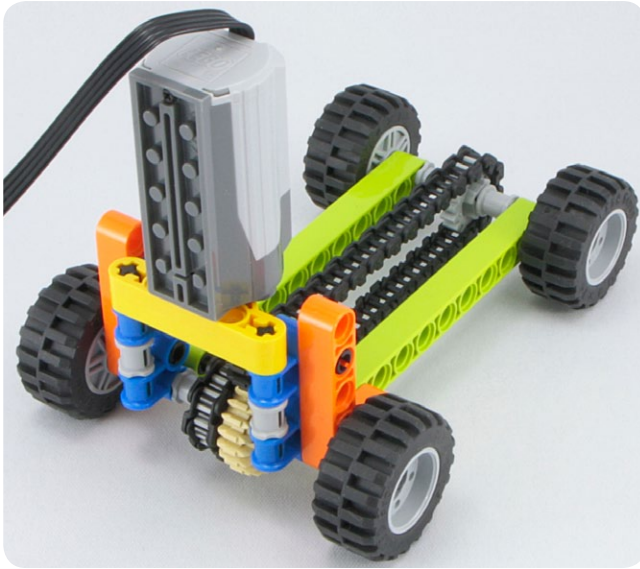
- 
-  x2
-  x2
-  x2
-  x2
-  x4
-  x2
-  x4
-  x2
-  x4
-  x1
-  x3
-  x3
-  x1
-  x3
-  x8
-  x3
-  x8

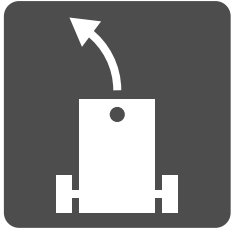




#23





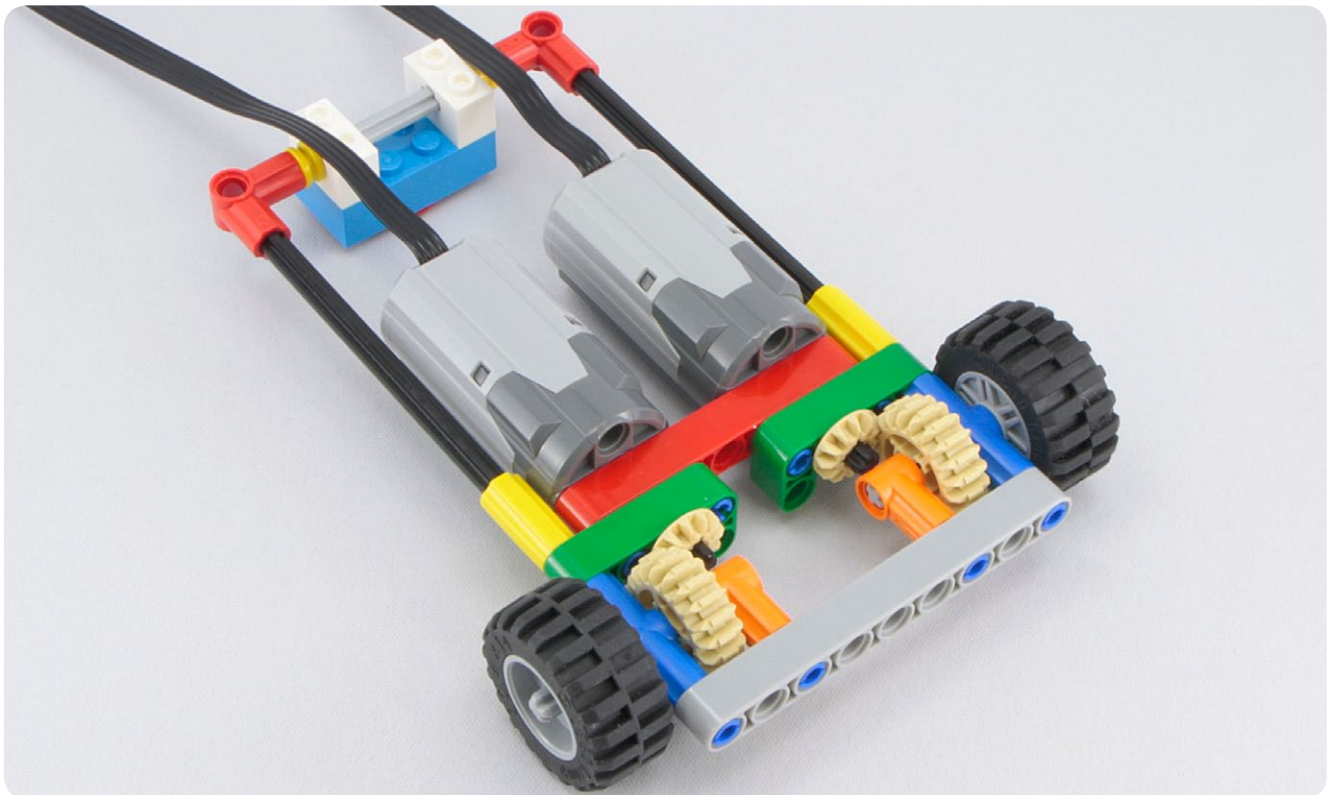
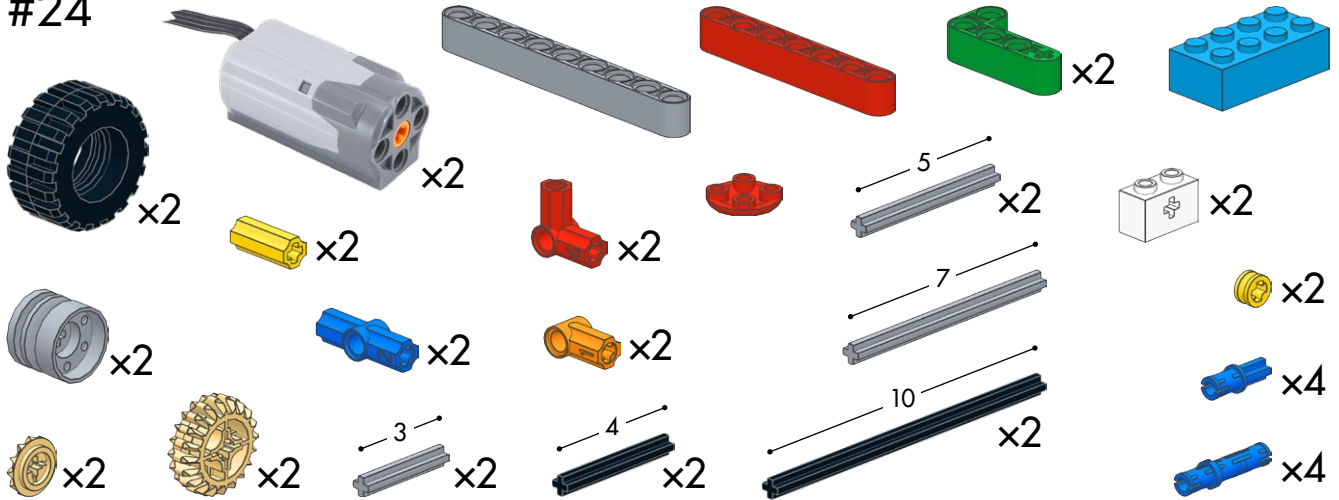


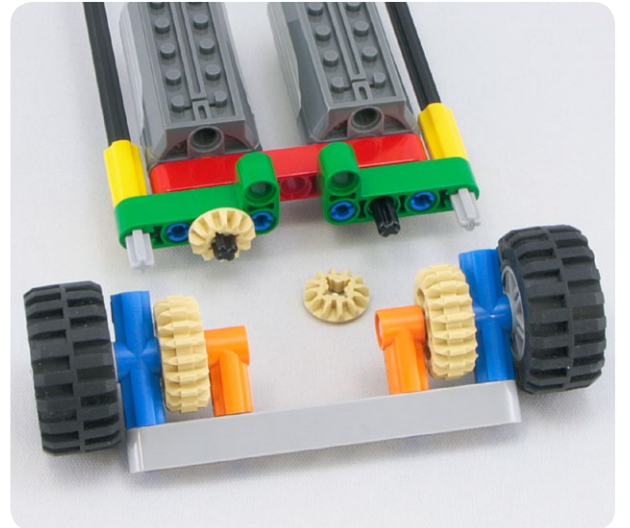
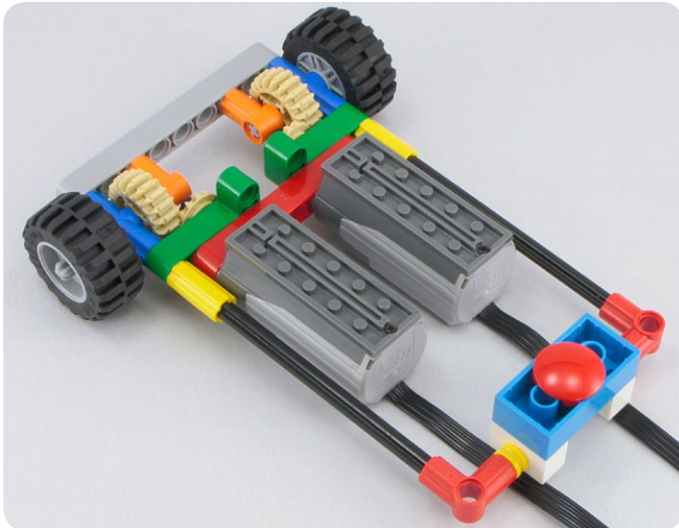
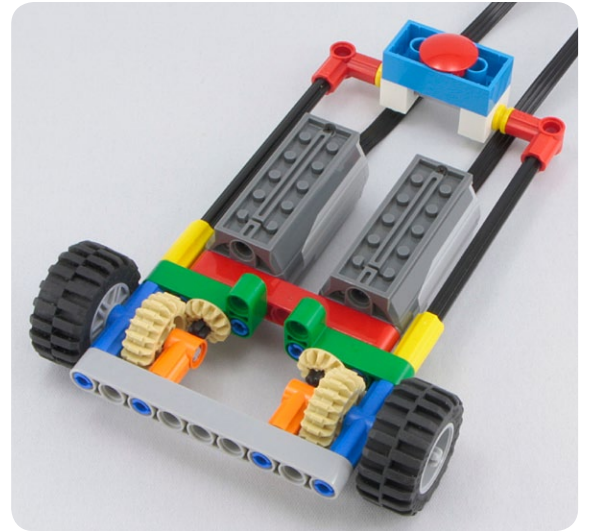
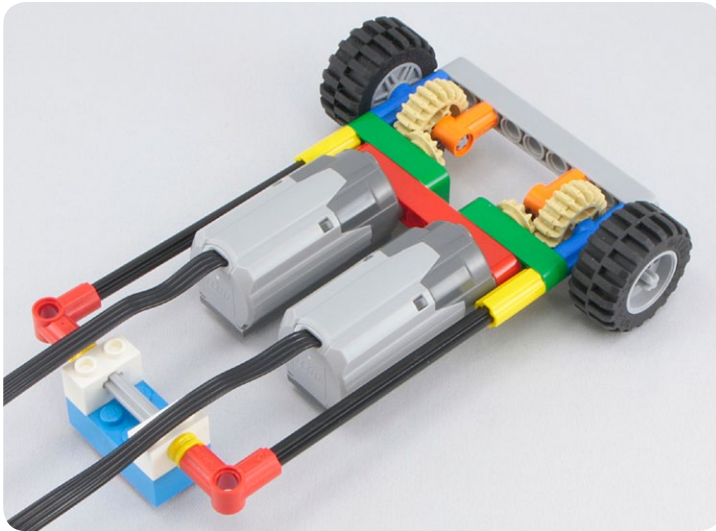
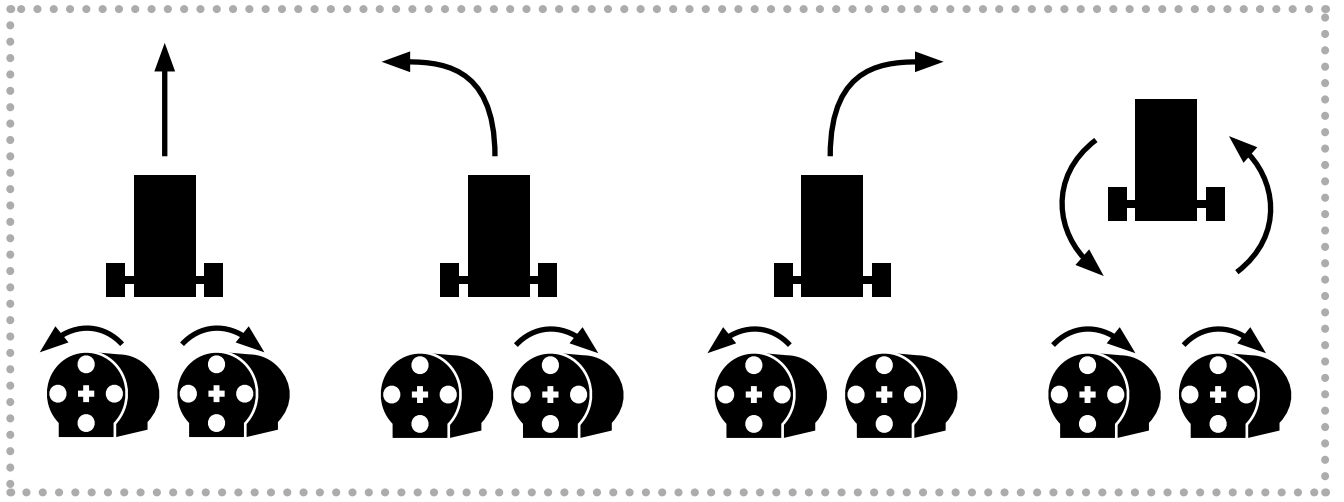
You can build cars that steer by combining these with the models in **Caster wheels** (page 44).



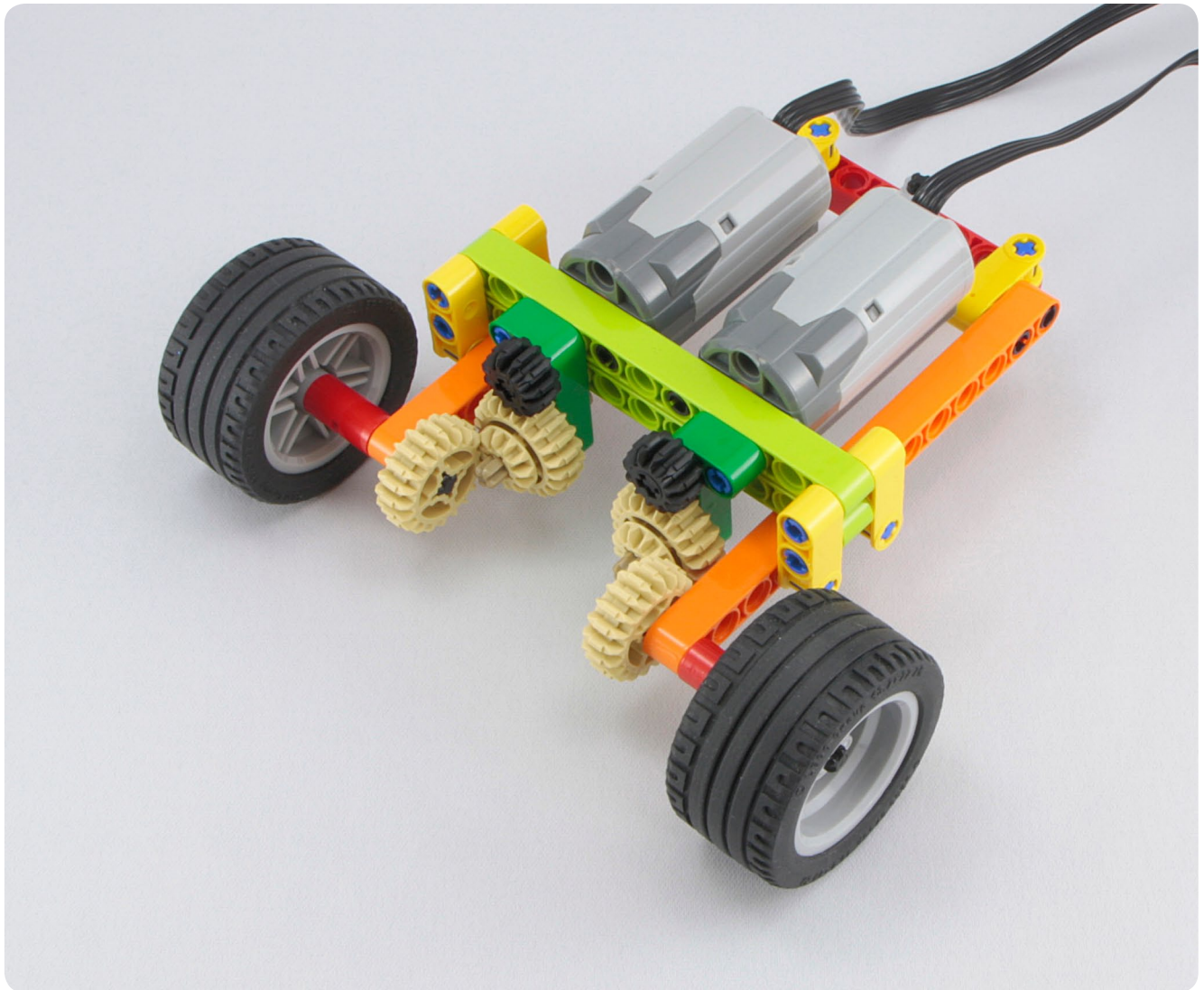
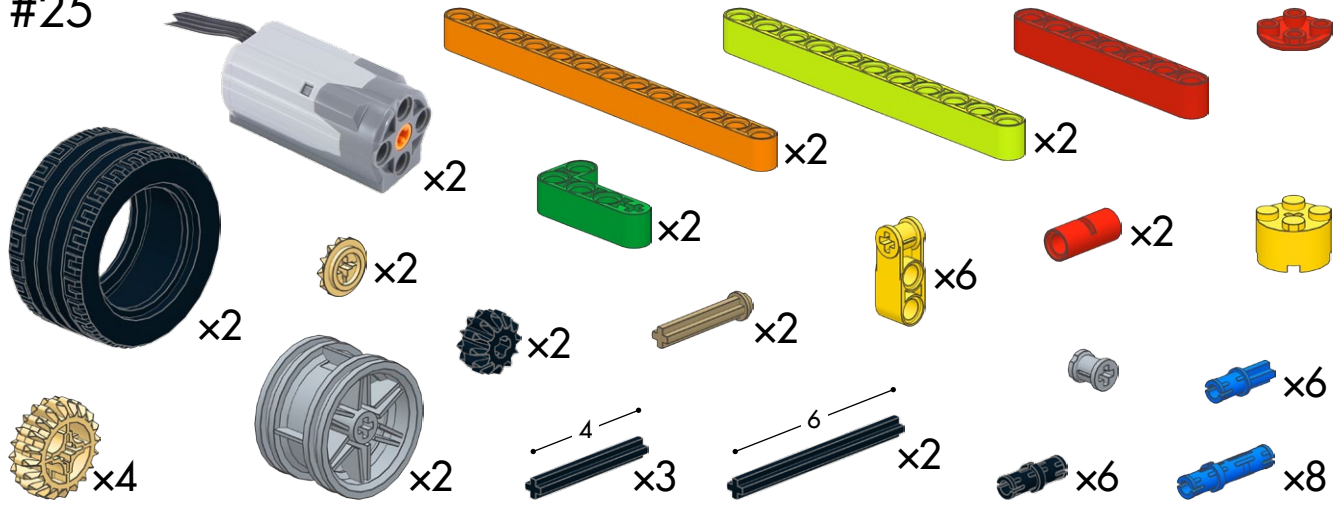
Each motor turns a wheel

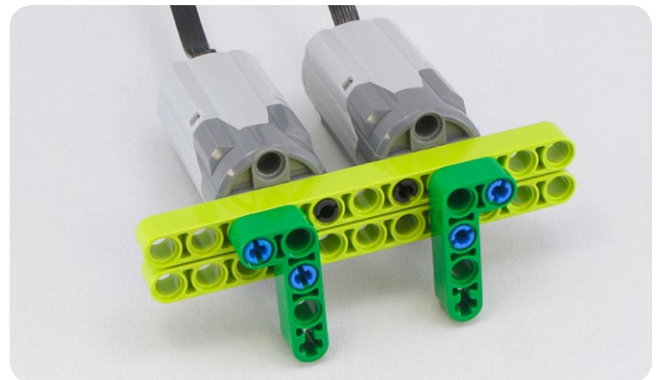
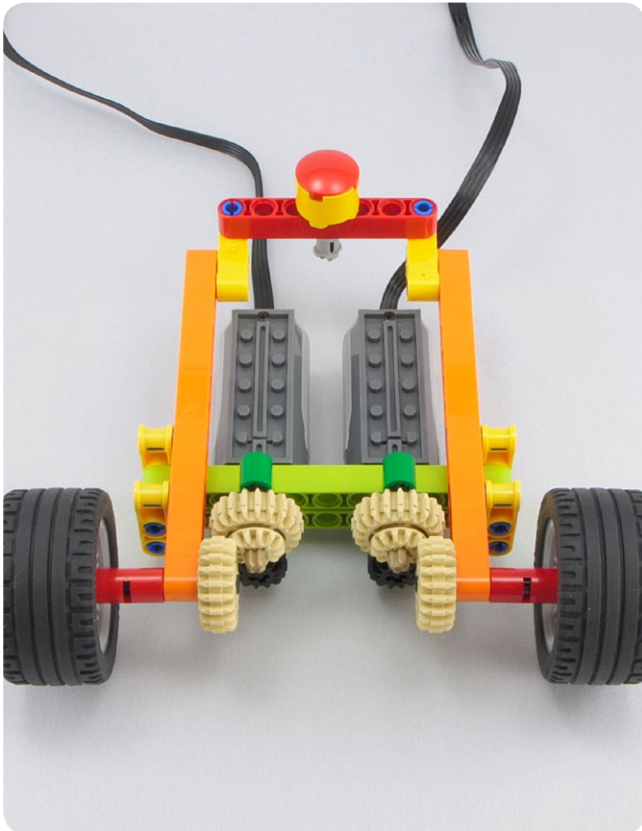
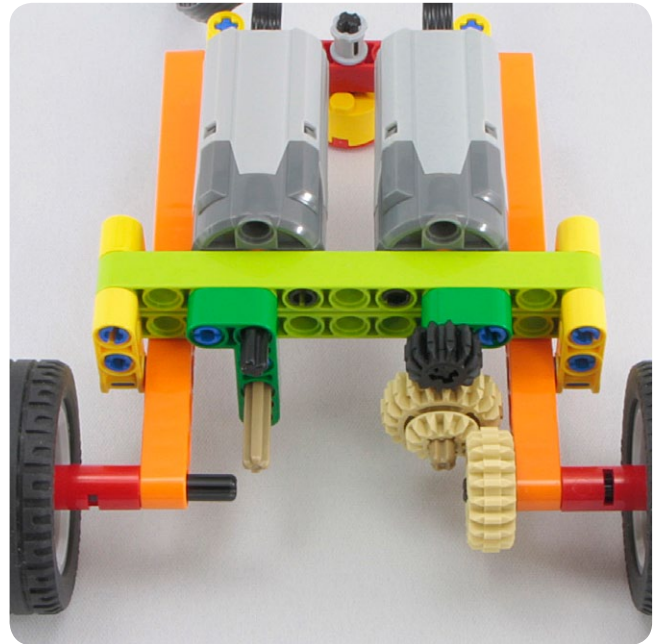
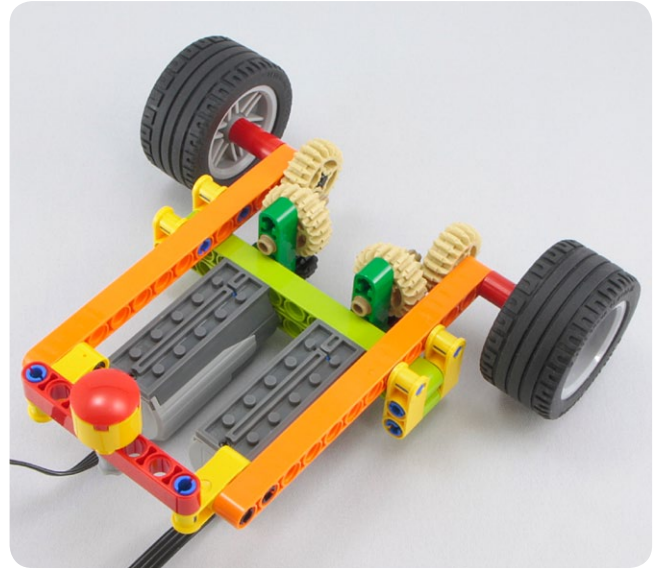
#24



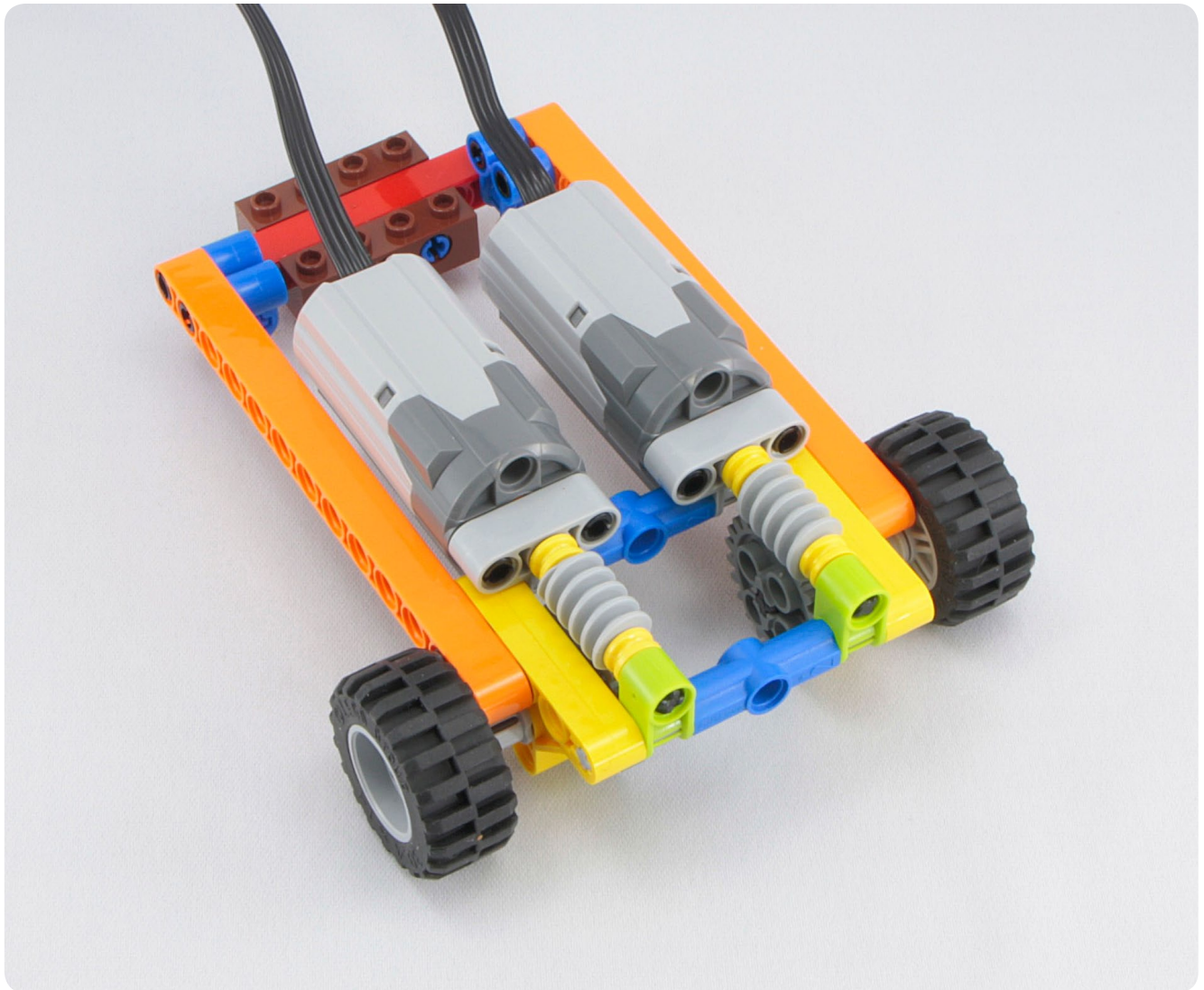
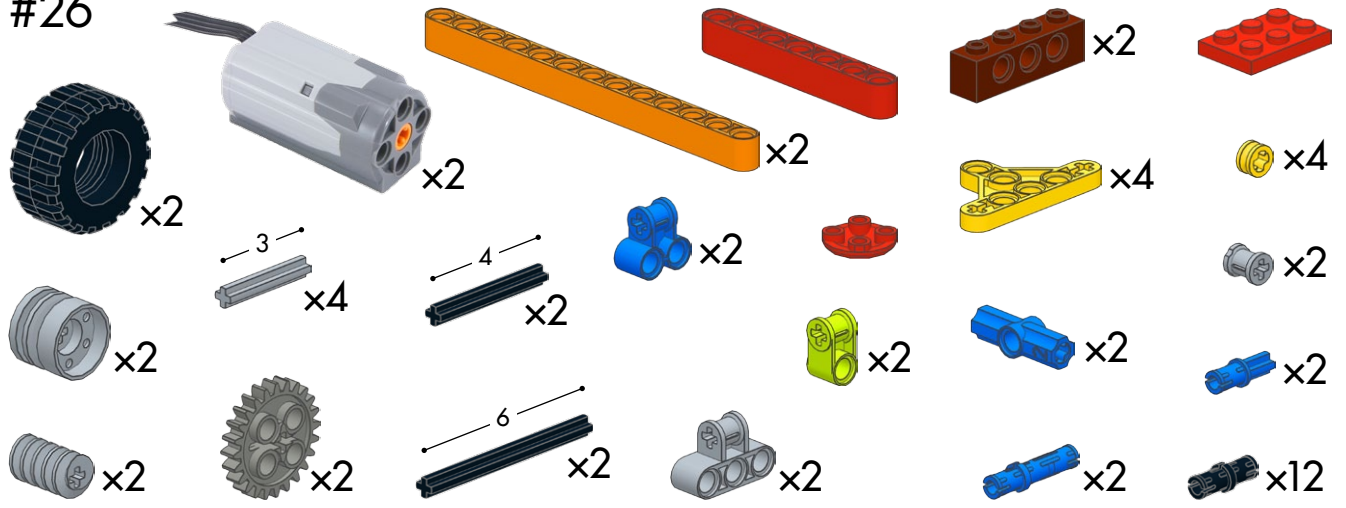


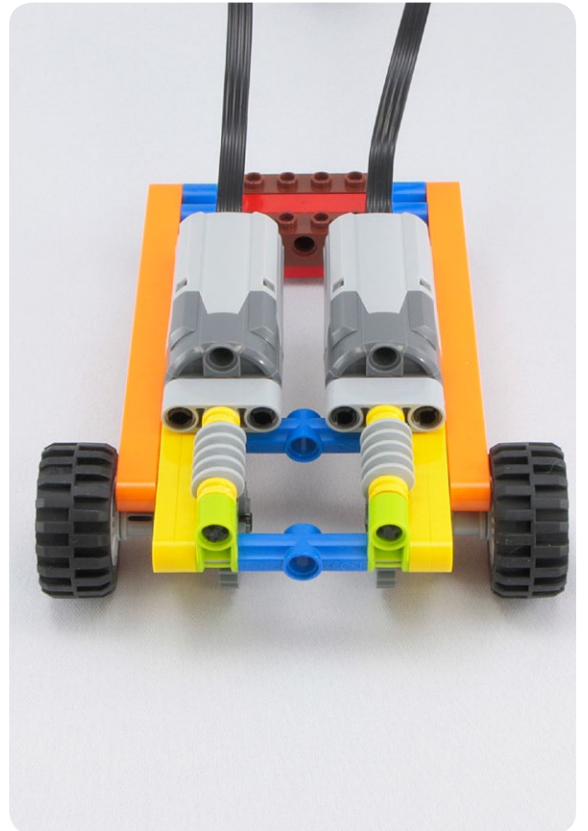
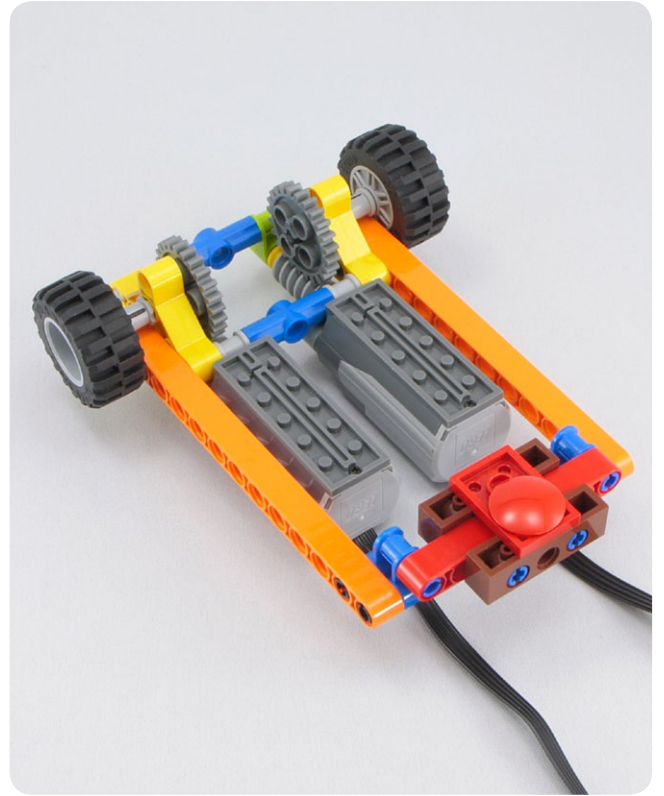
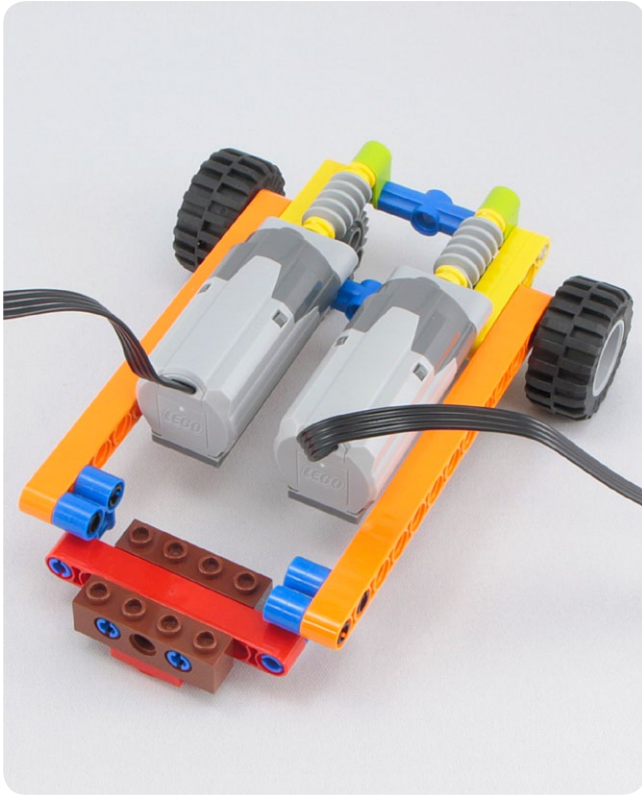
#25



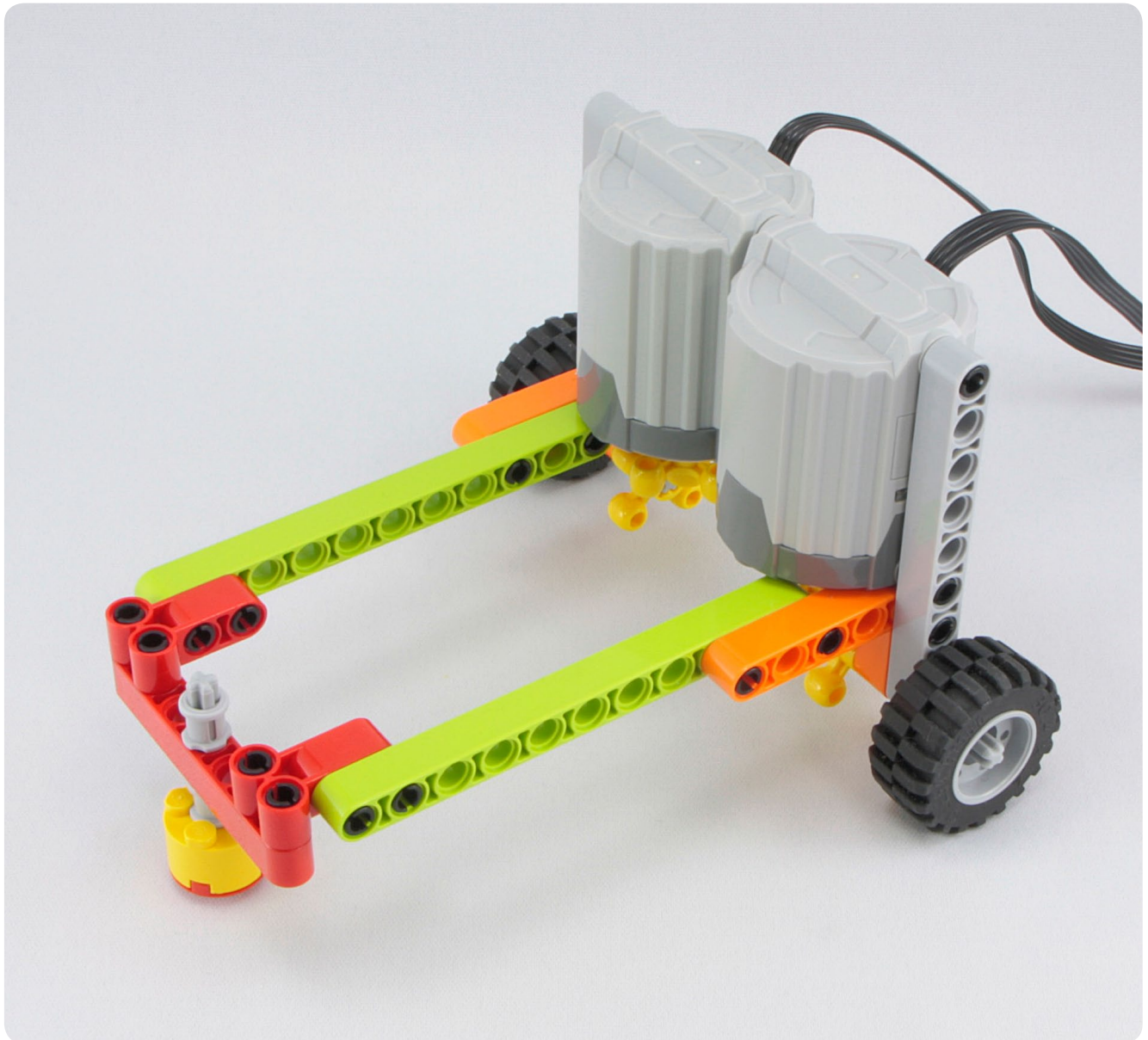
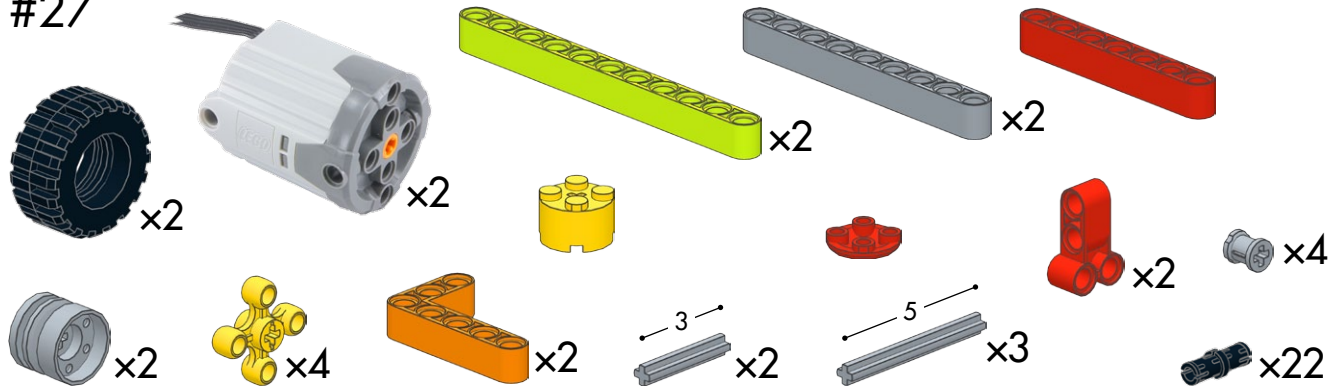


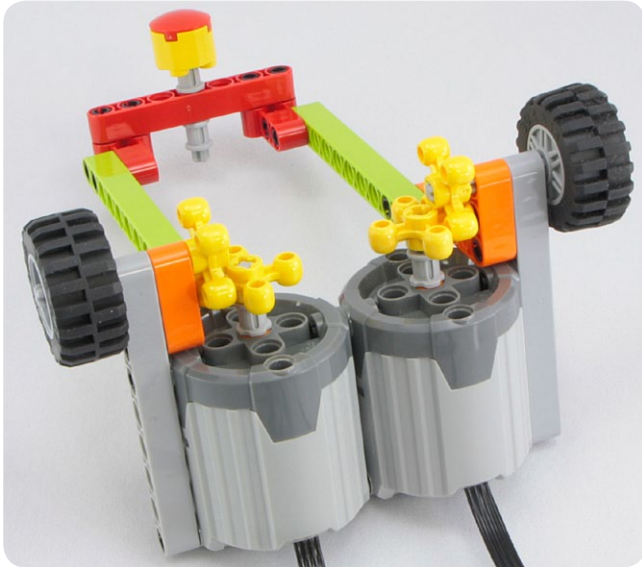
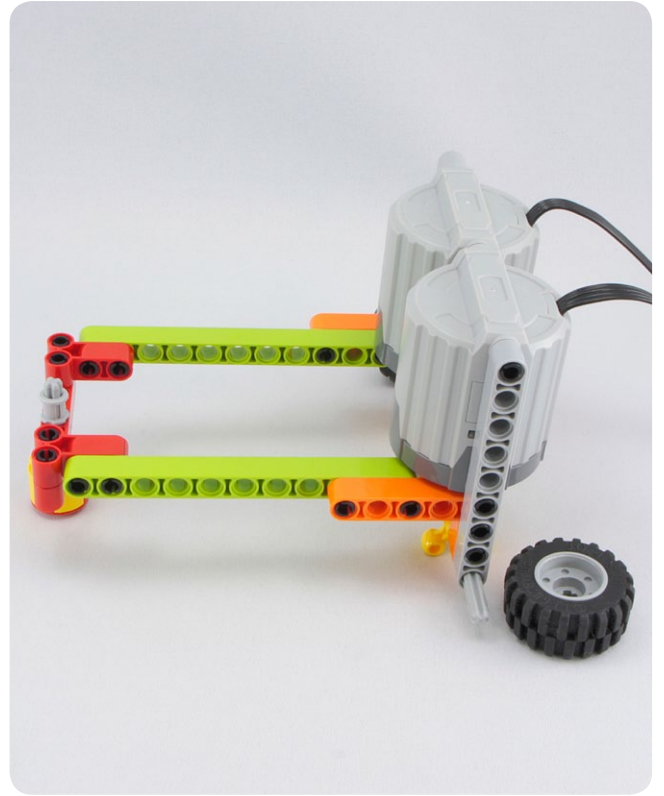
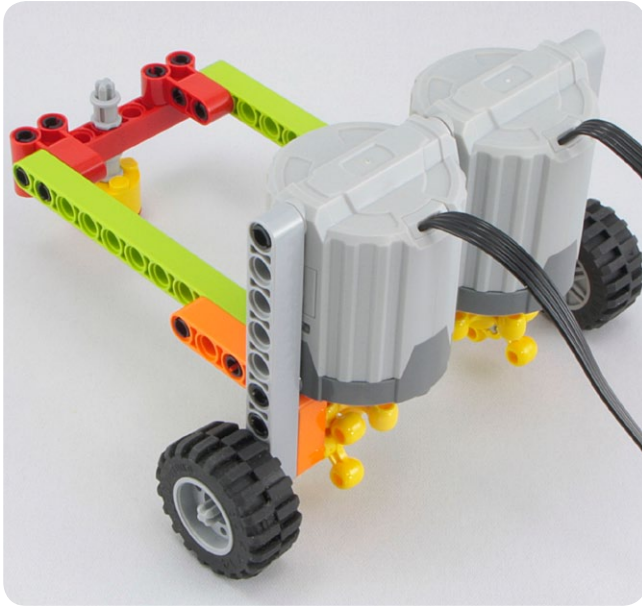
#26

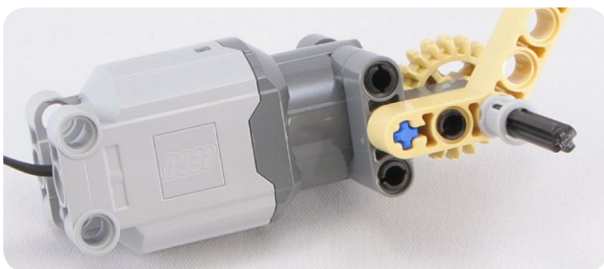
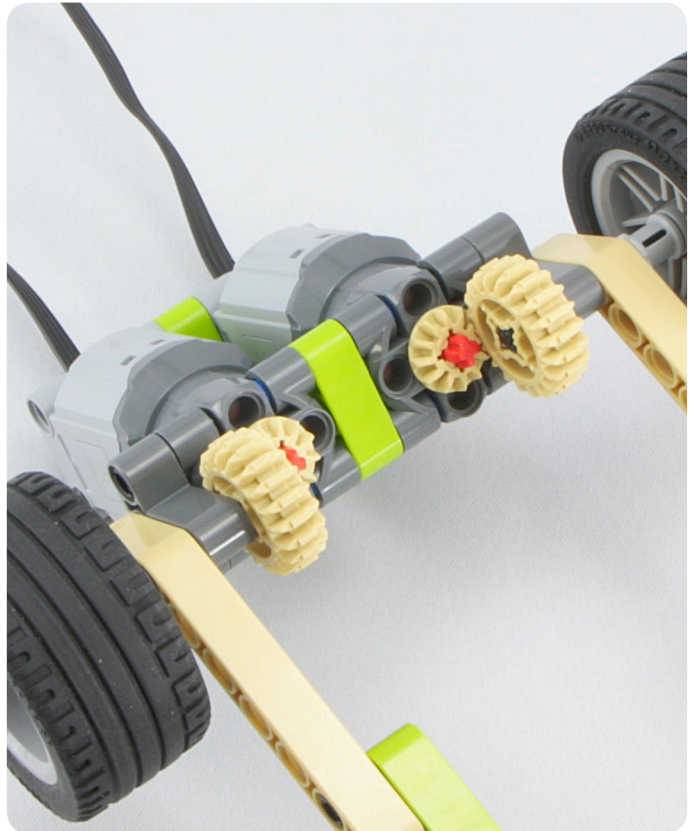
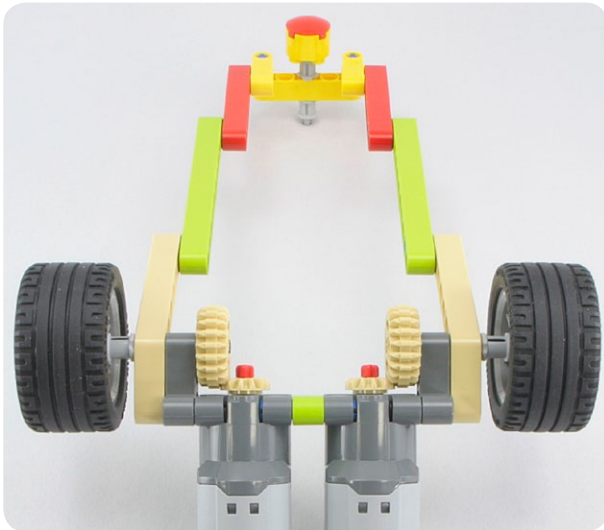
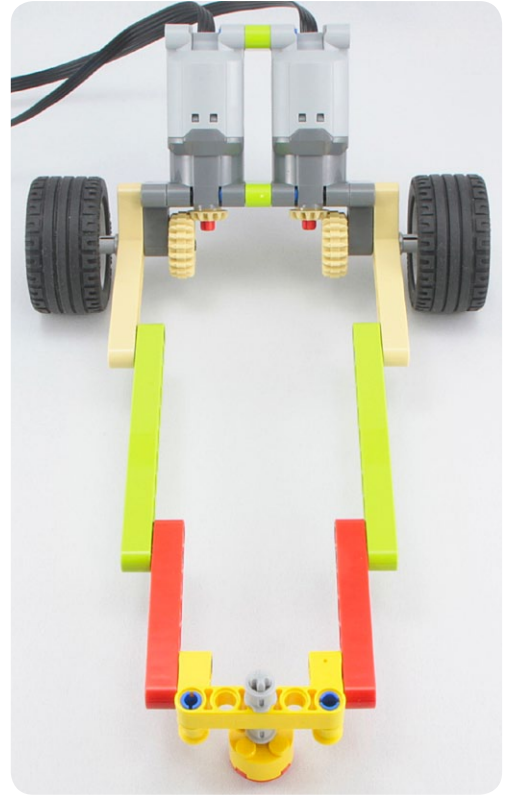




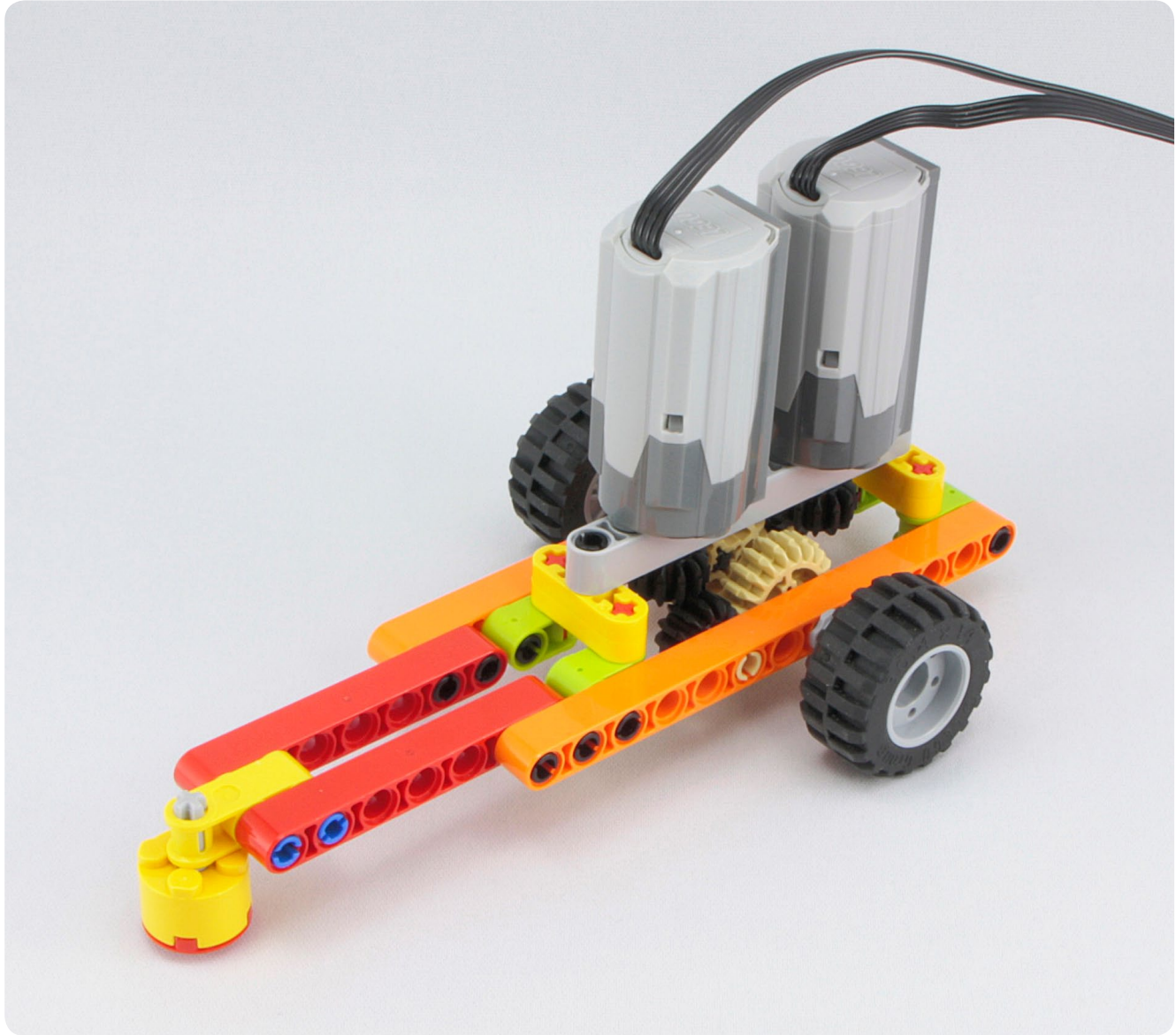
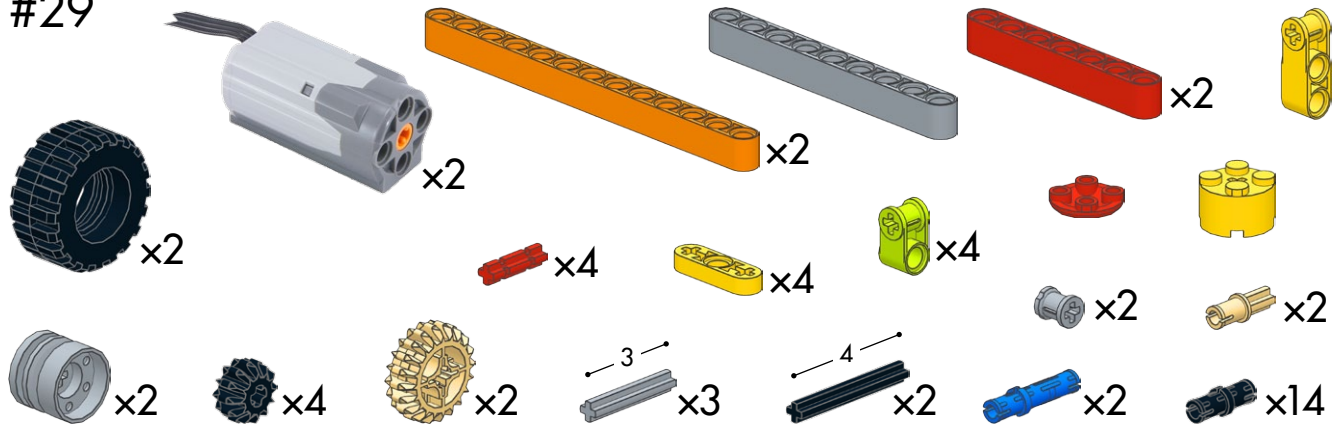
#27



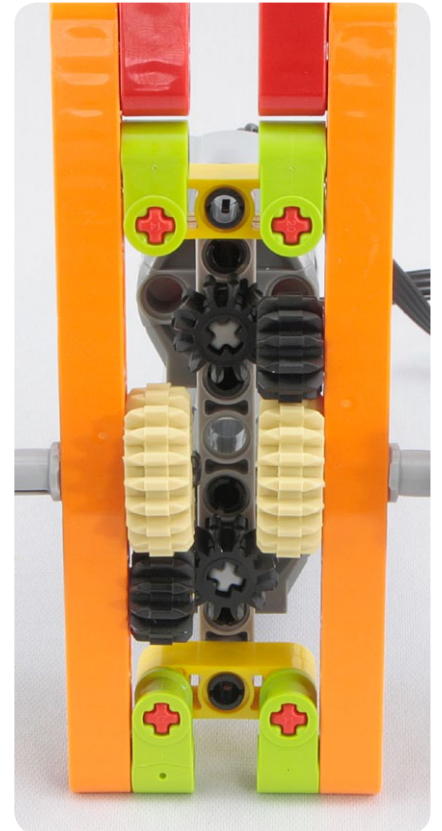
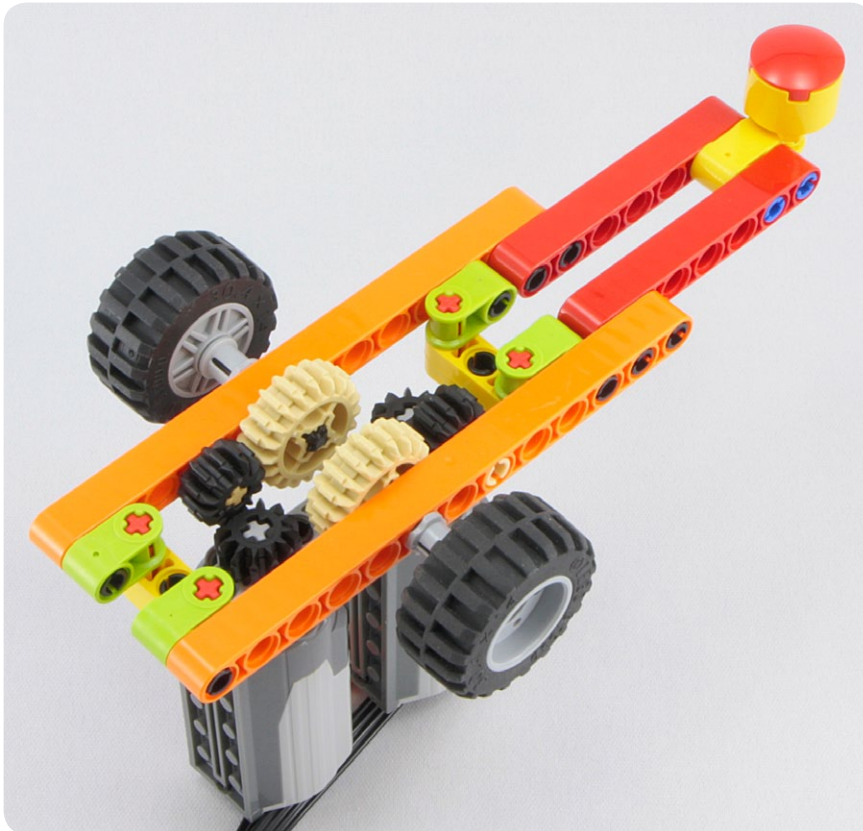


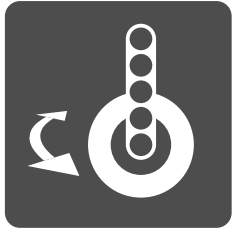


#29

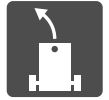


42 Each motor turns a wheel



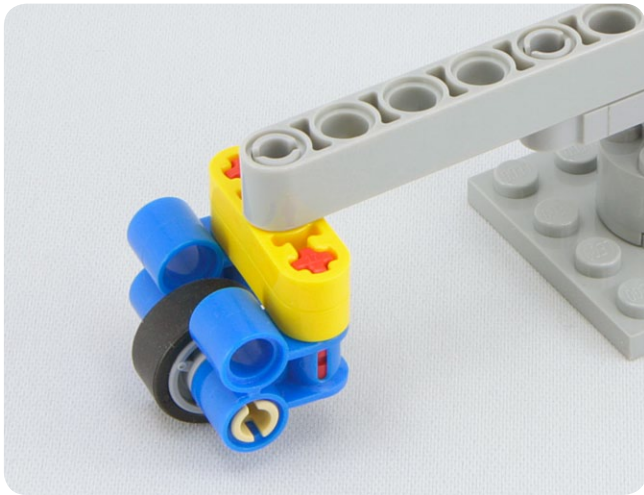


You can build cars that steer by combining these with the models in **Each motor turns a wheel** (page 32).

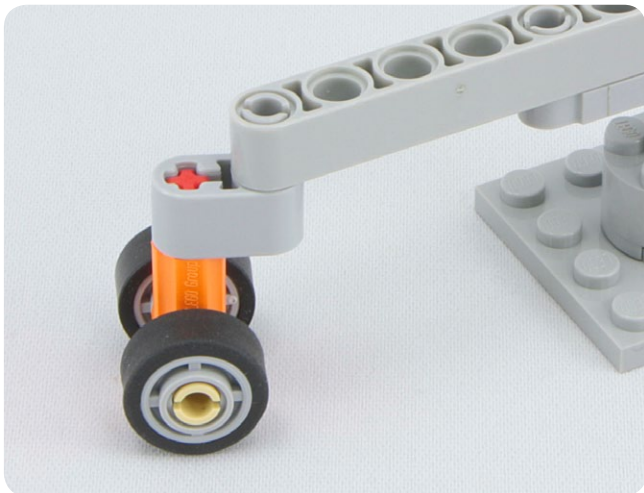


Caster wheels

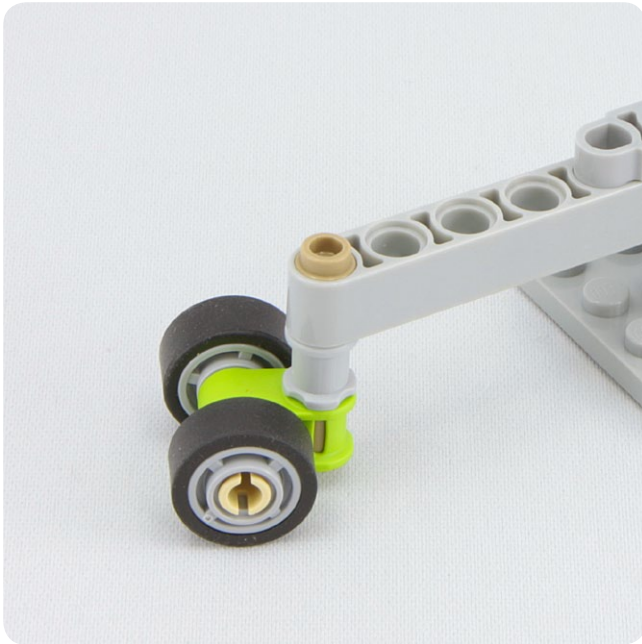
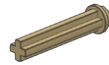
#30



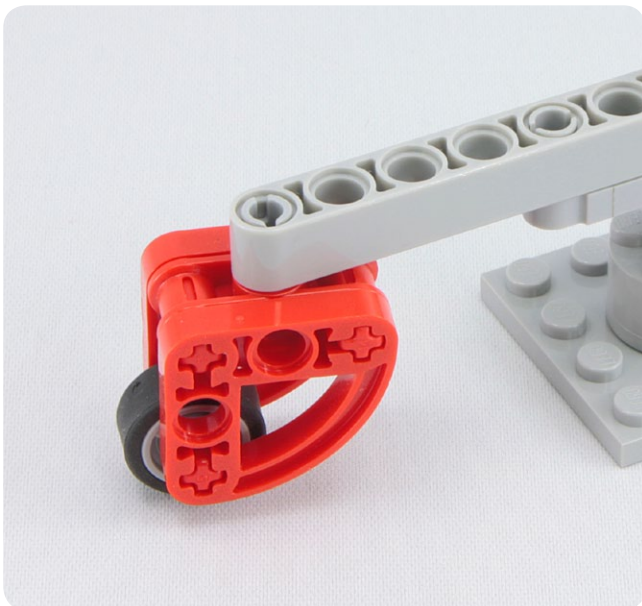
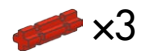
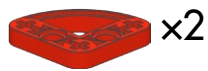
#31



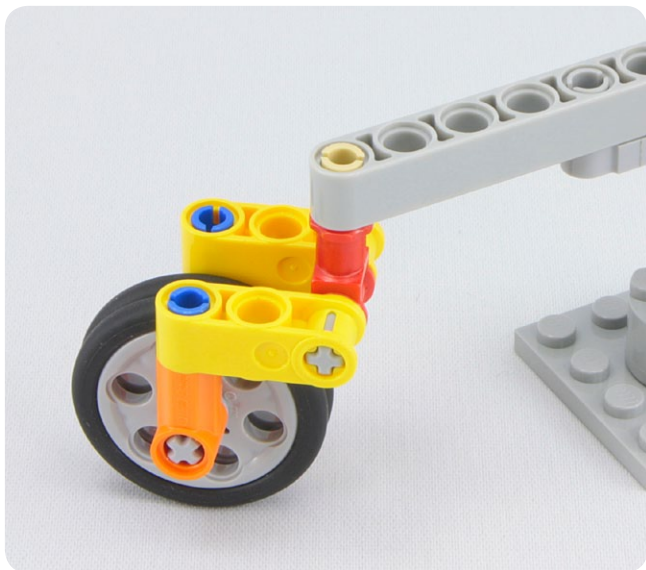
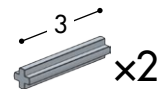
#32



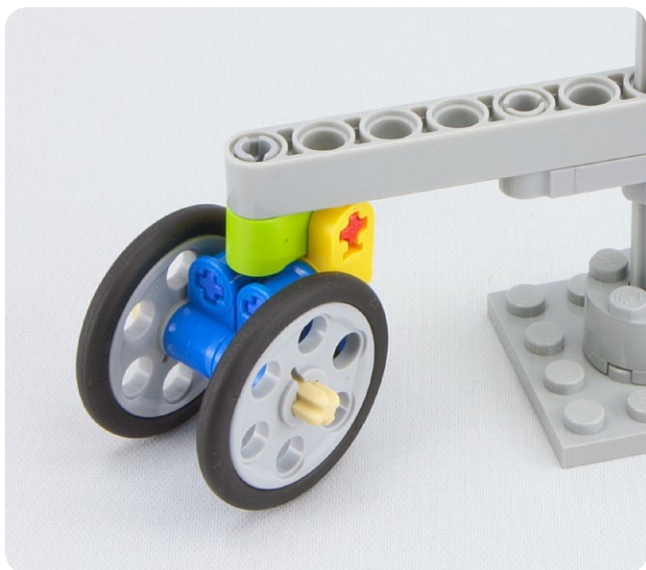
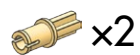
#33



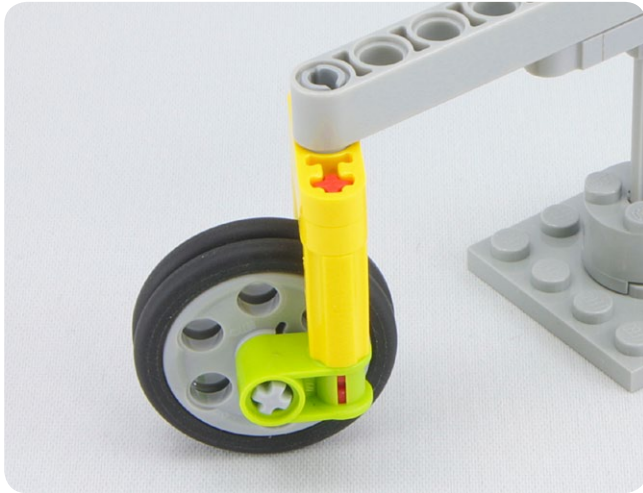
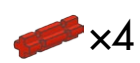
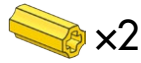
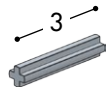
#34



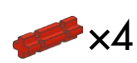
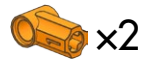
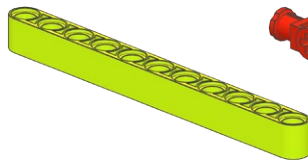
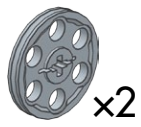
#35



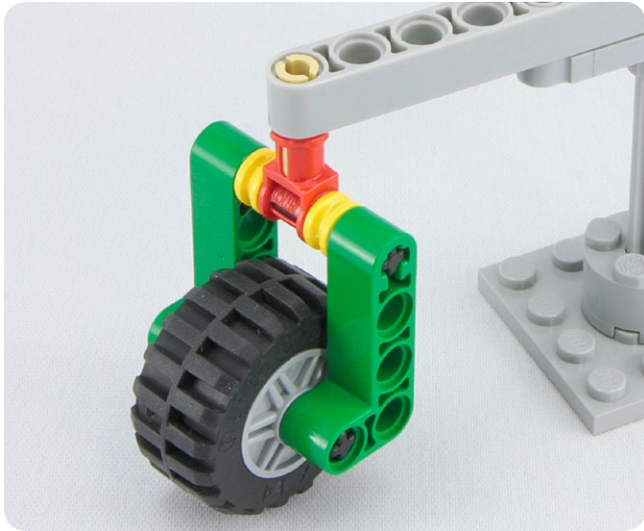
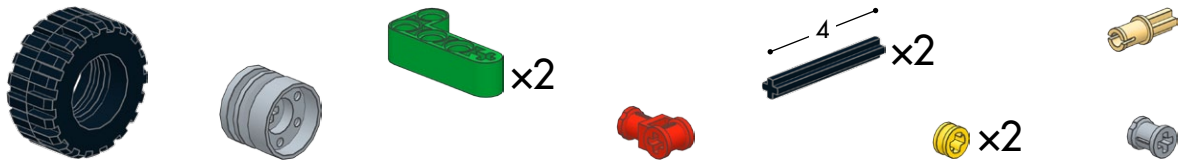
#36



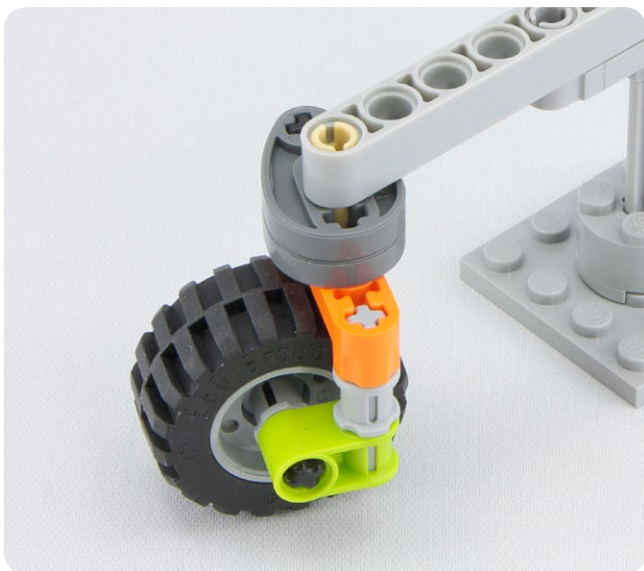
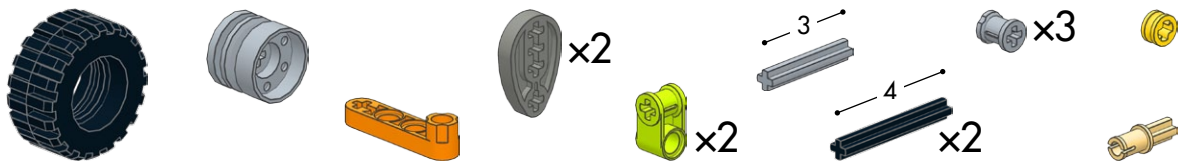
#37



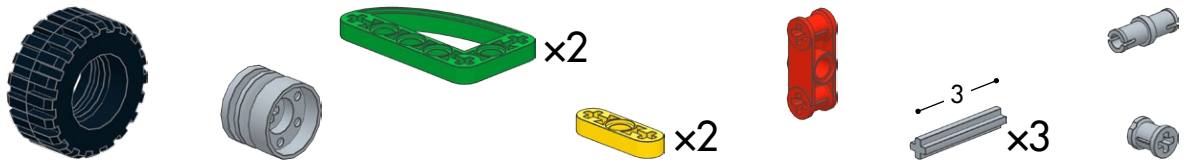
#38



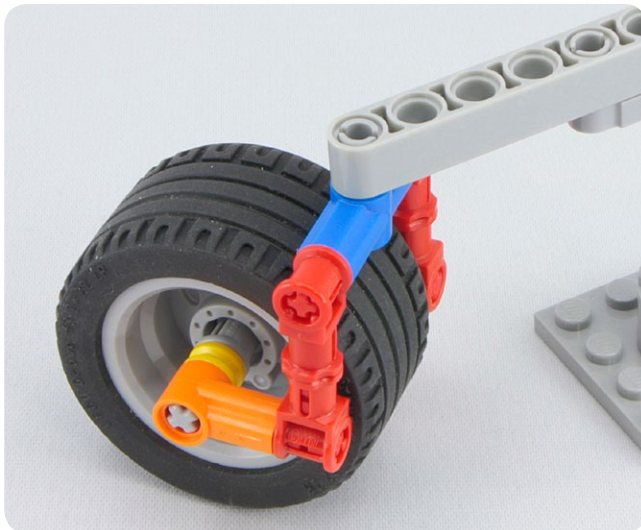
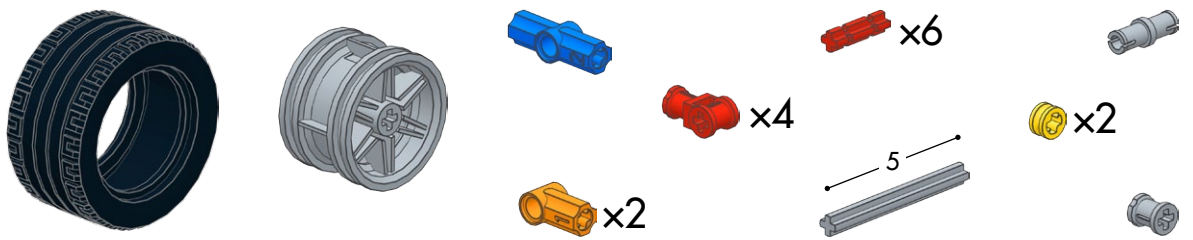
#39

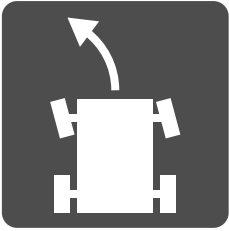


#40



#41





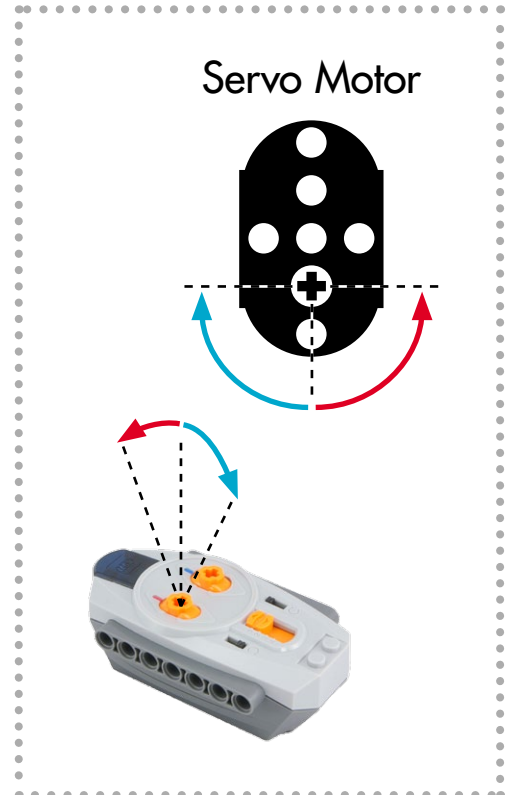
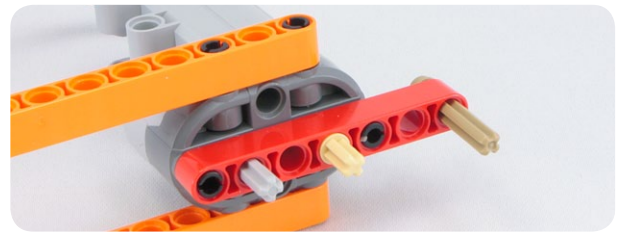
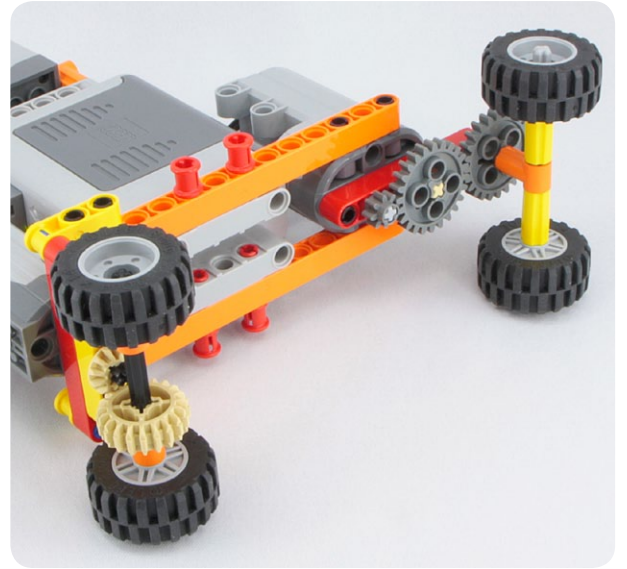
You can combine these models with those in **Differential gears** (page 68).



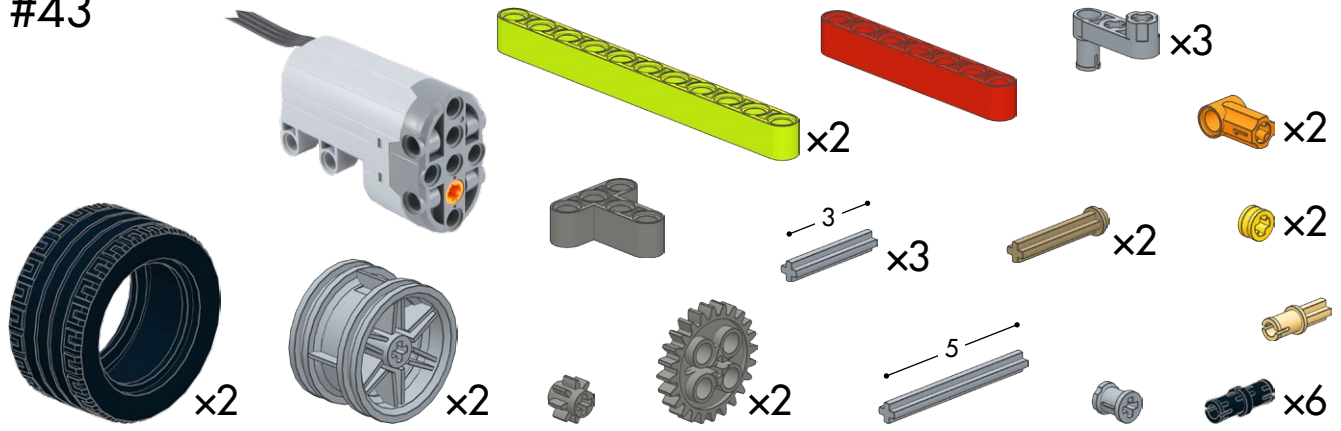
Steering with the servo motor

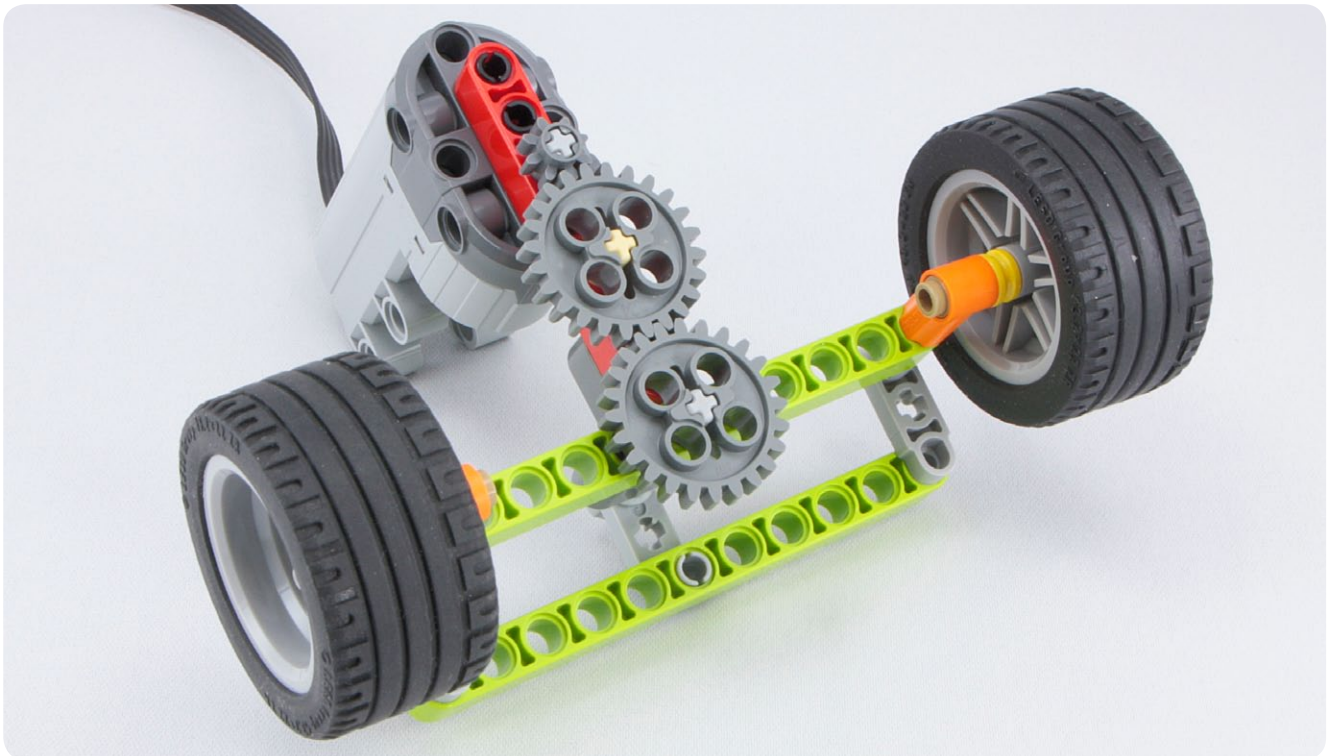
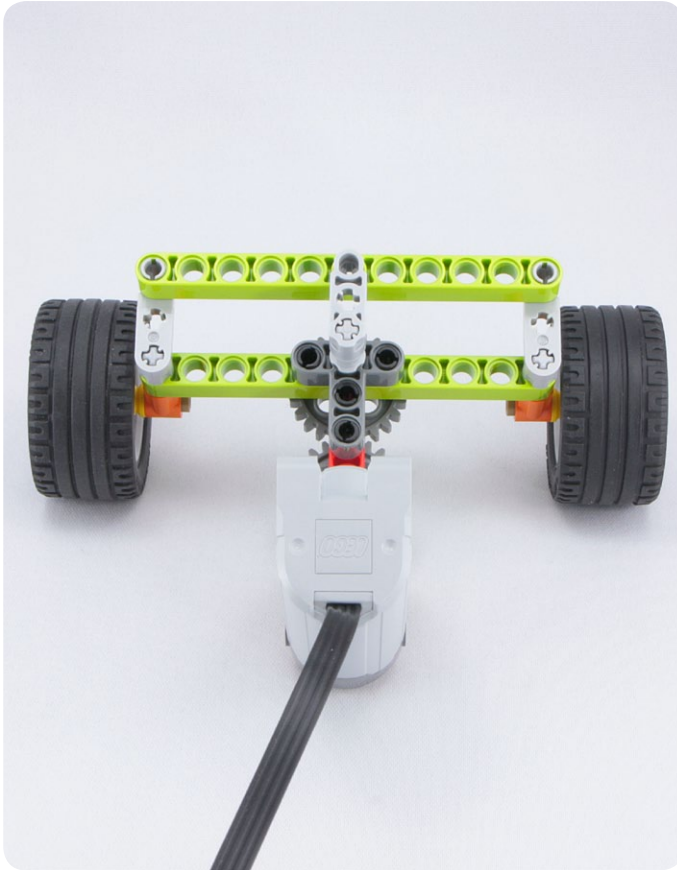
#42



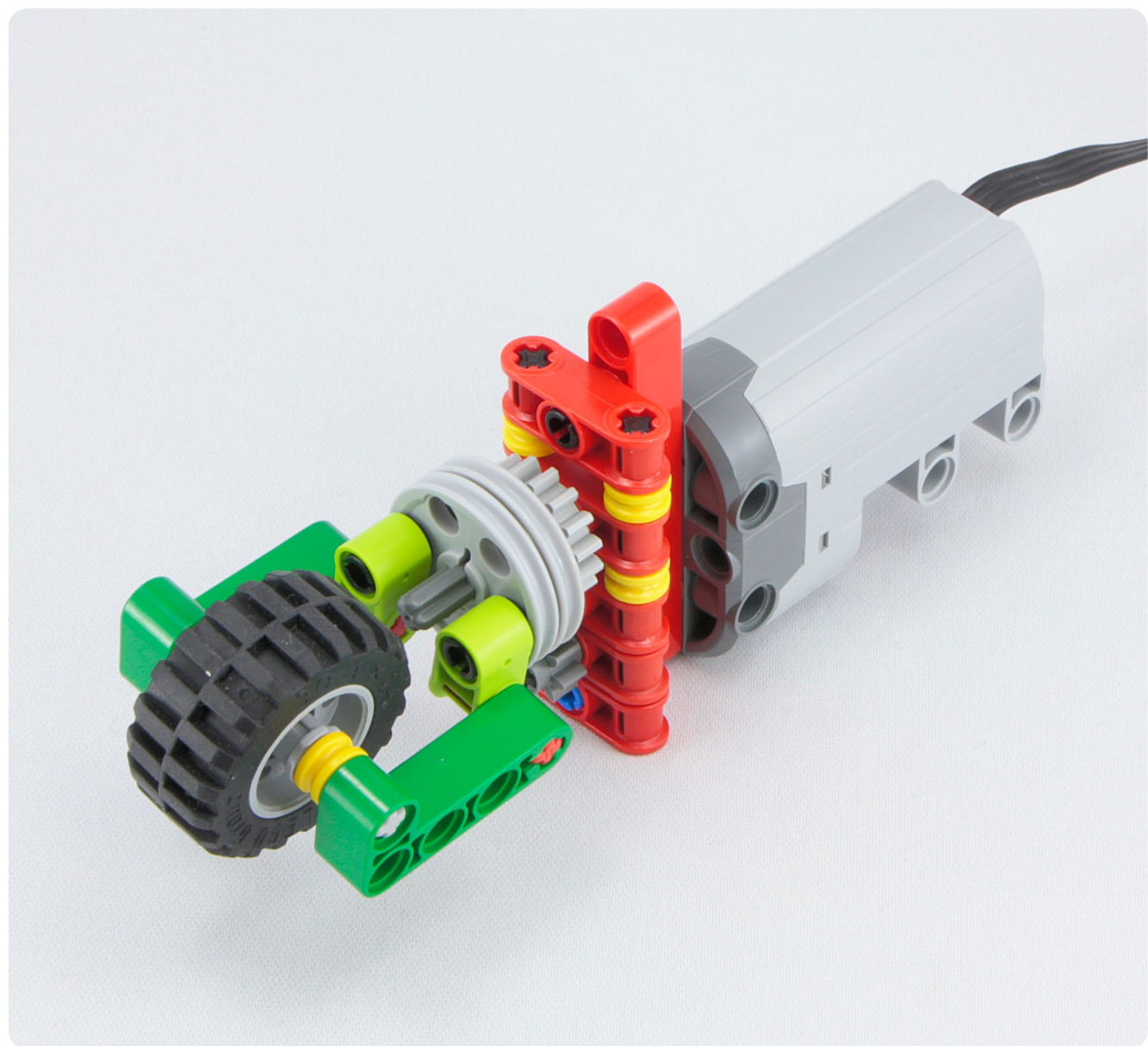
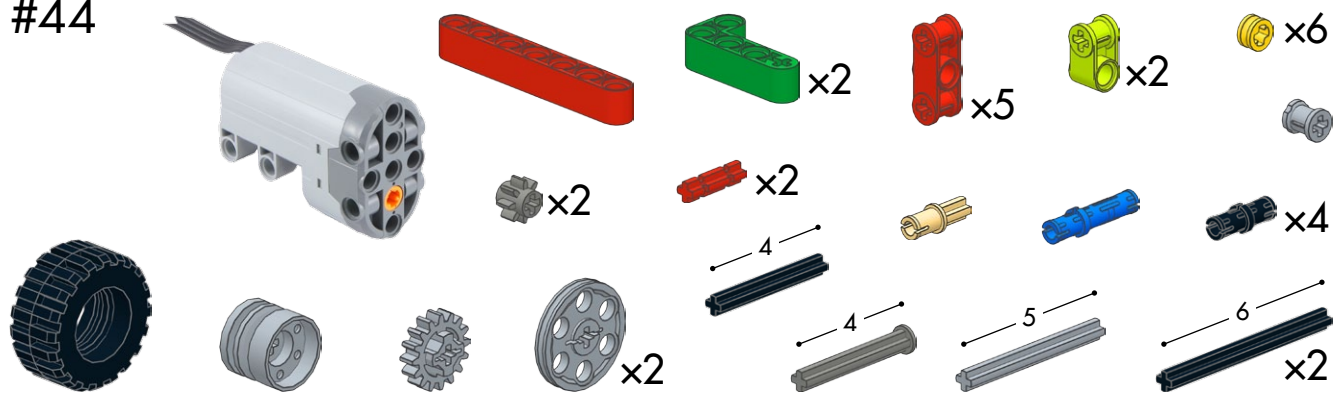


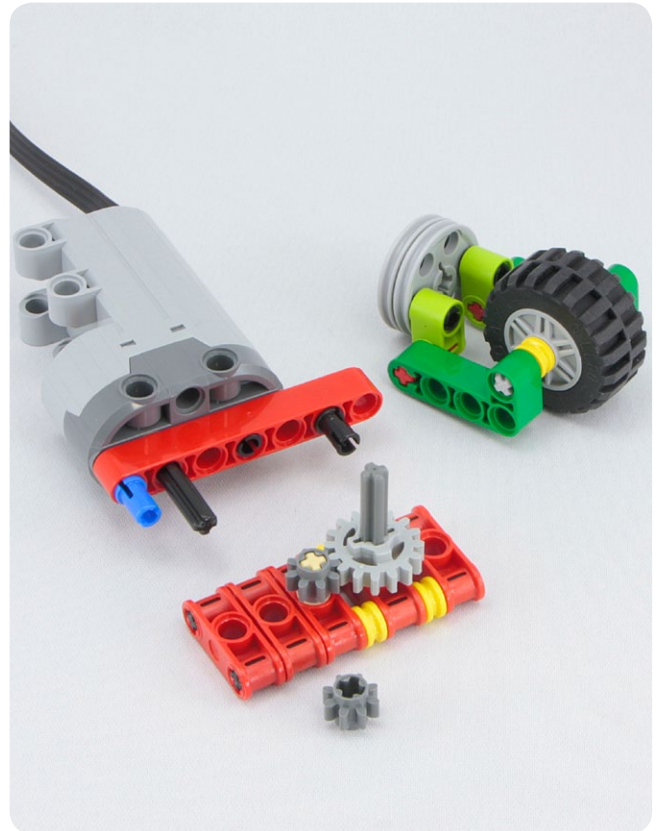
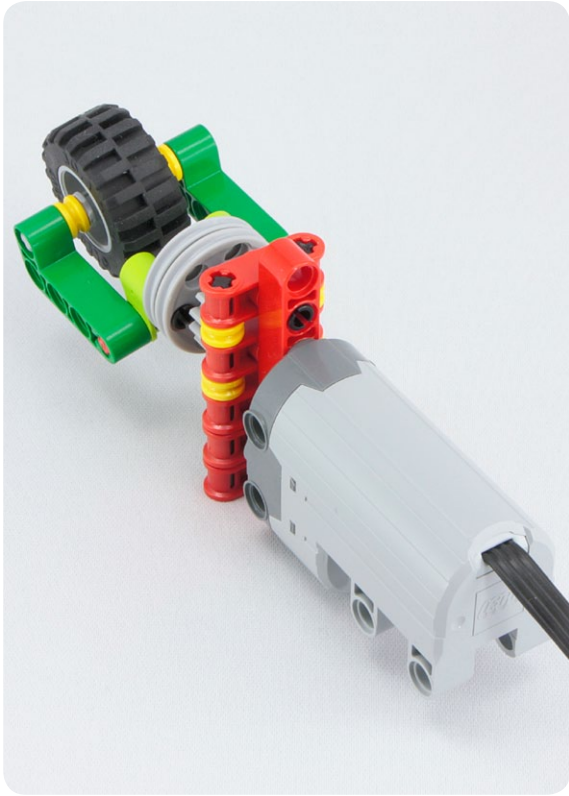
#43



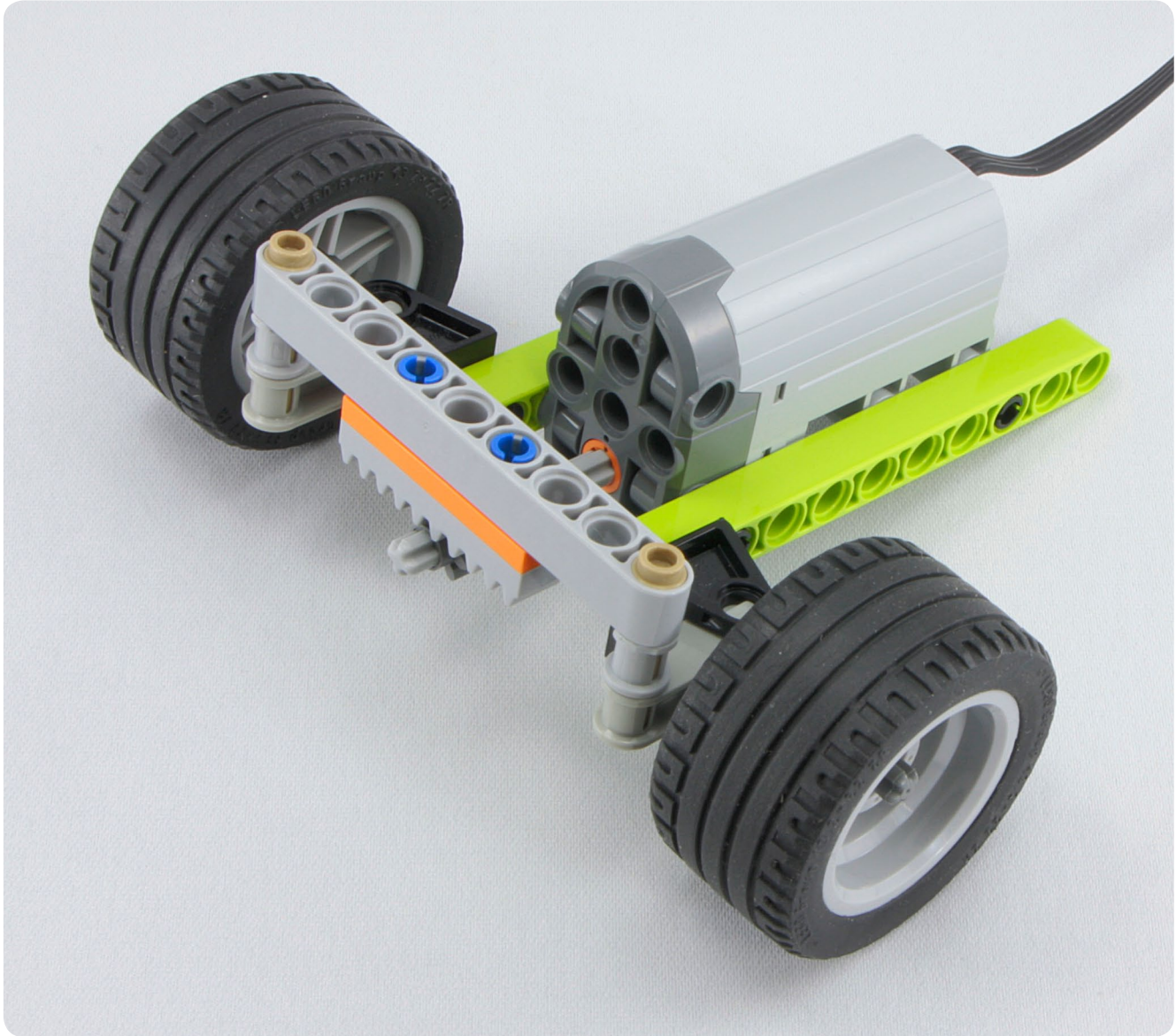
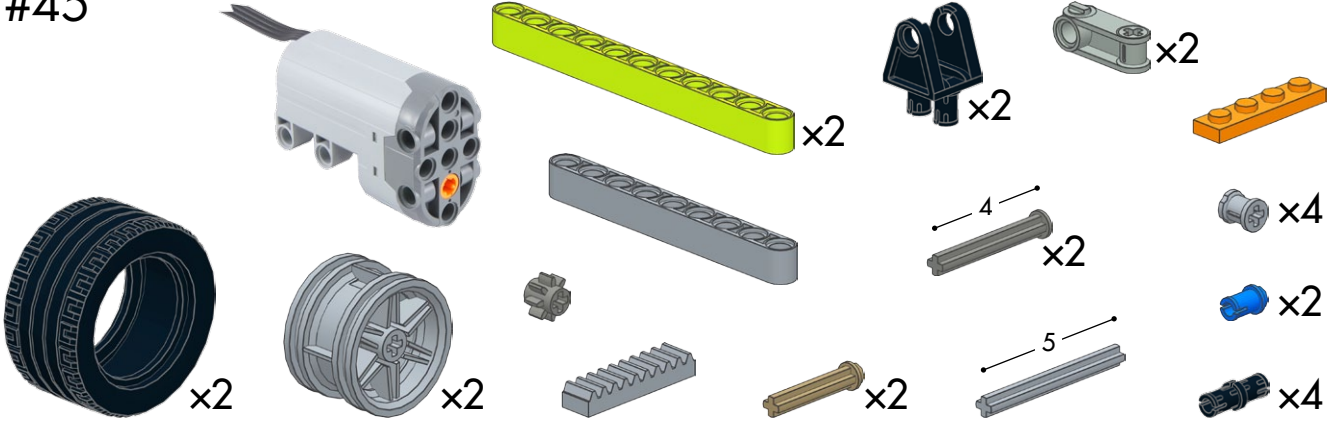


#44



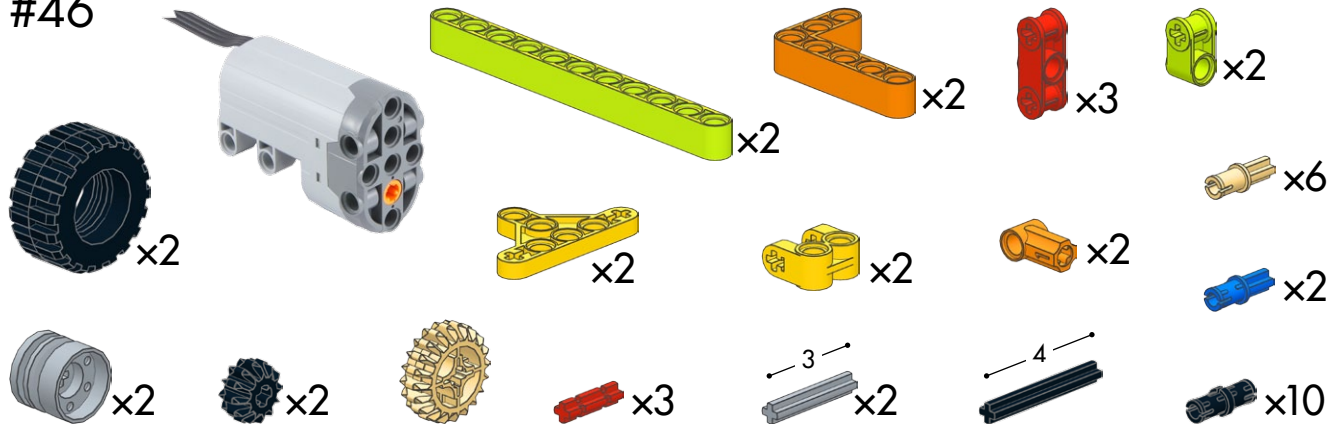


#45



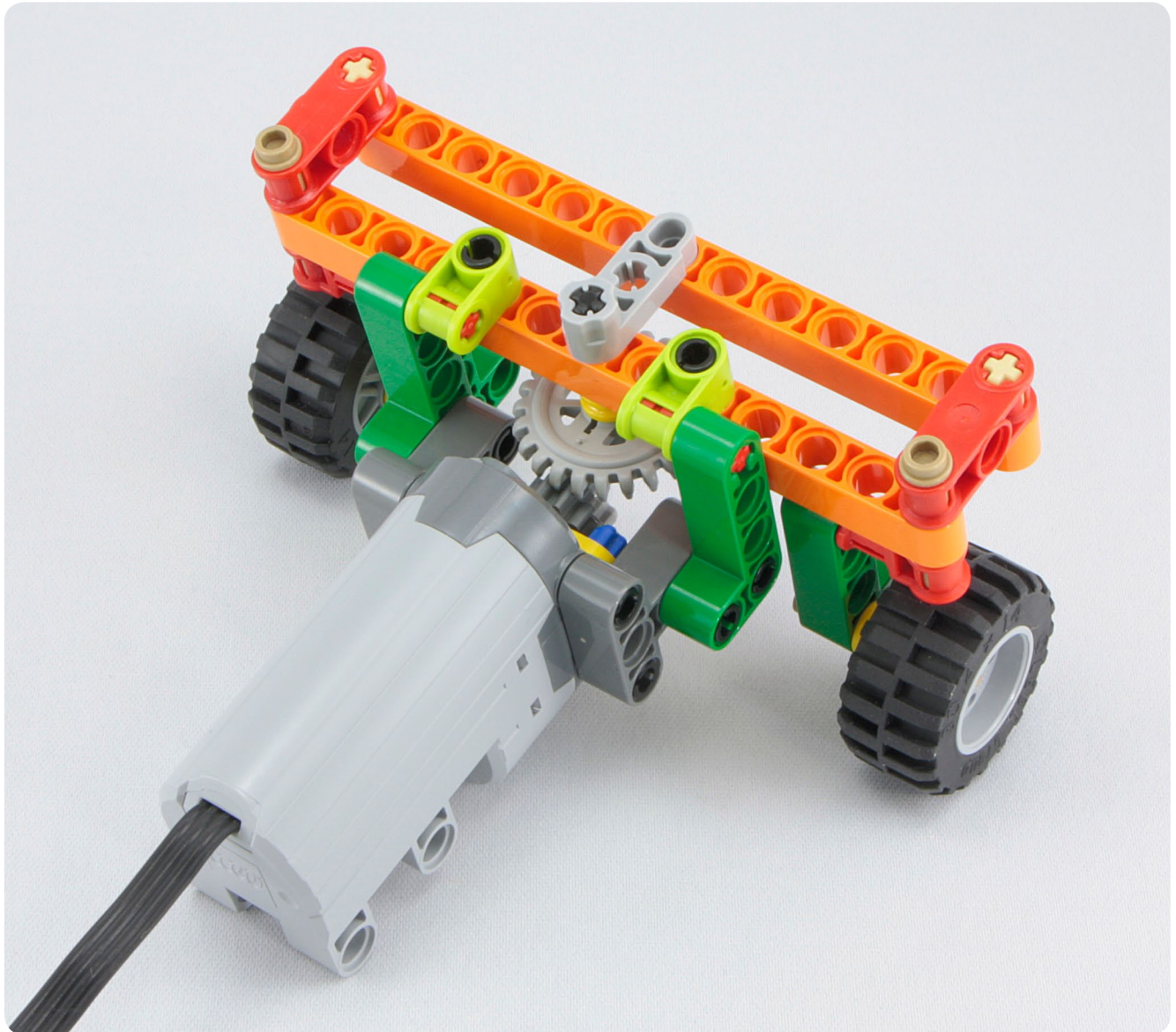
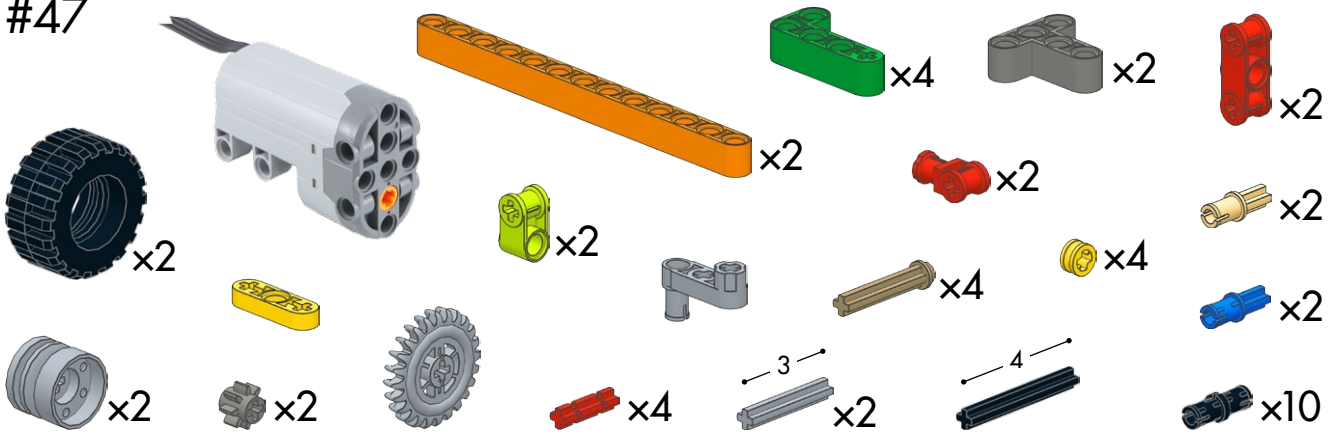


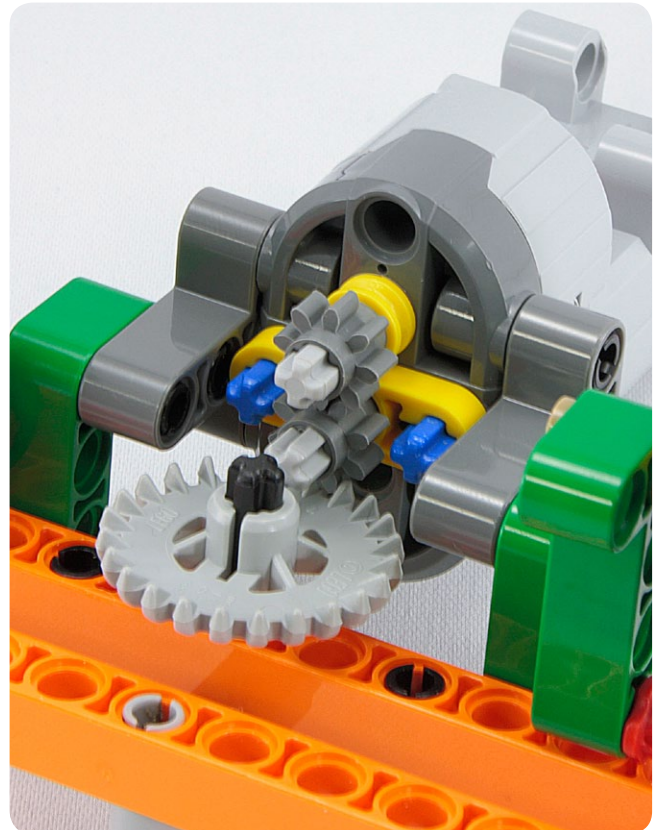
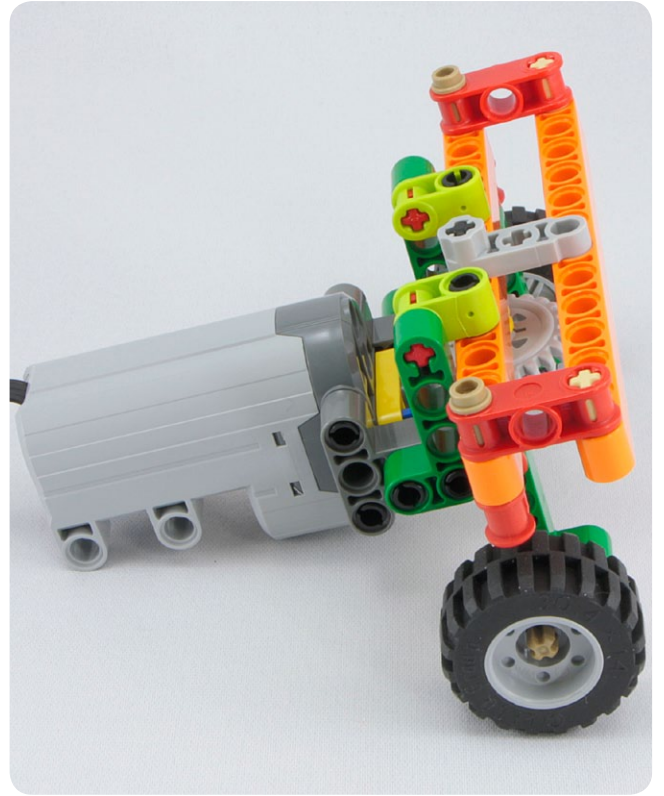
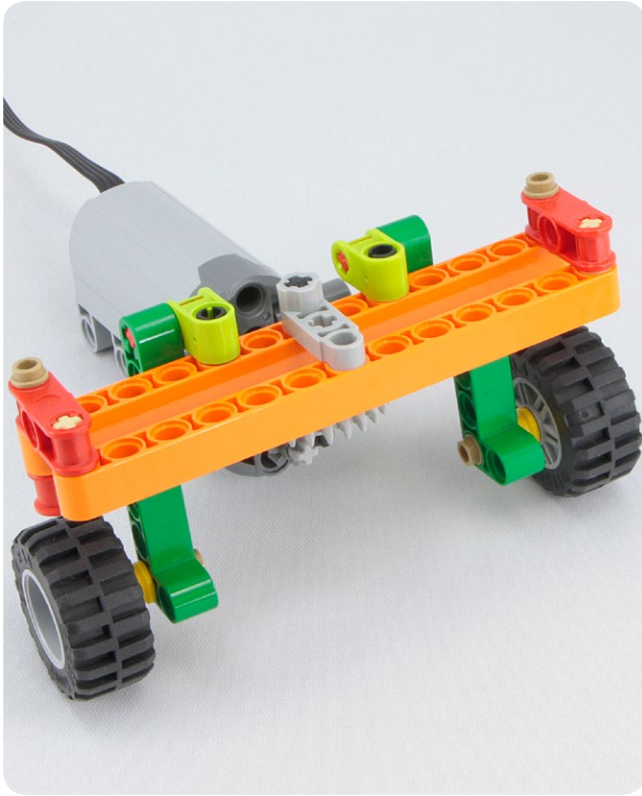
#46



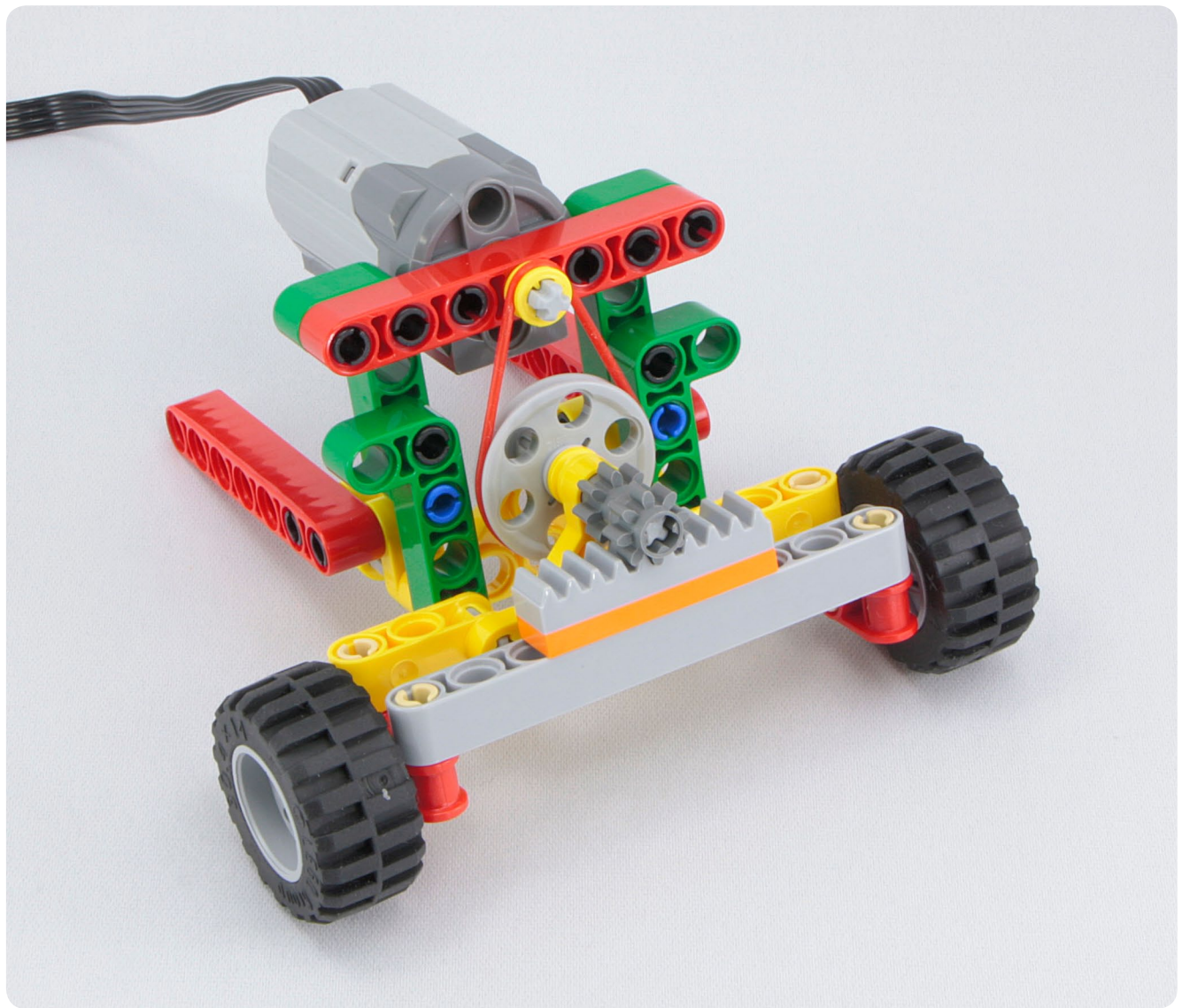
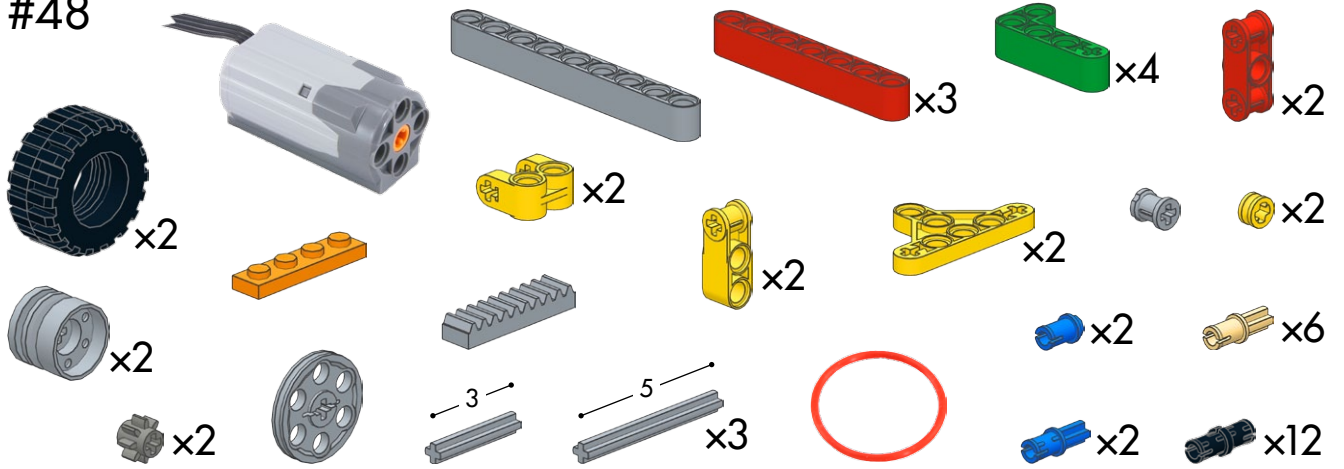


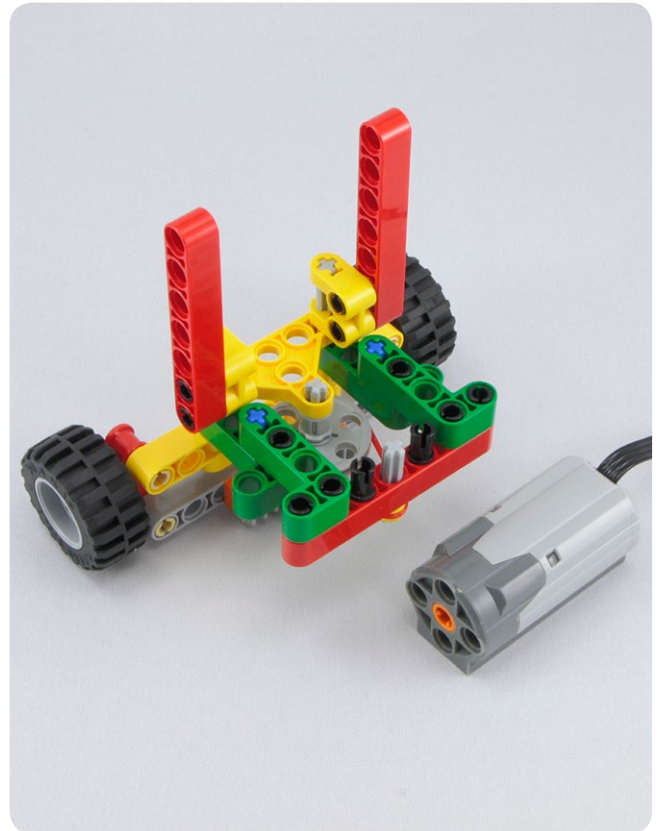
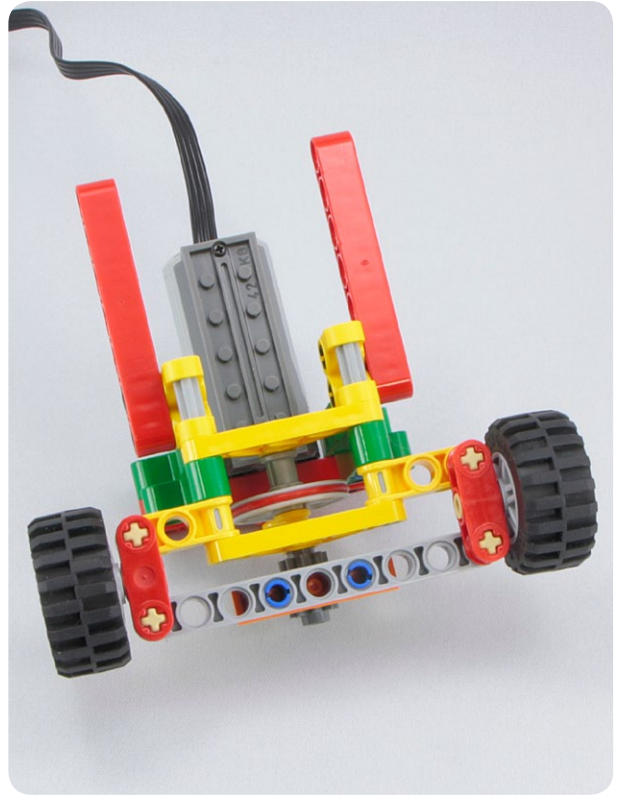
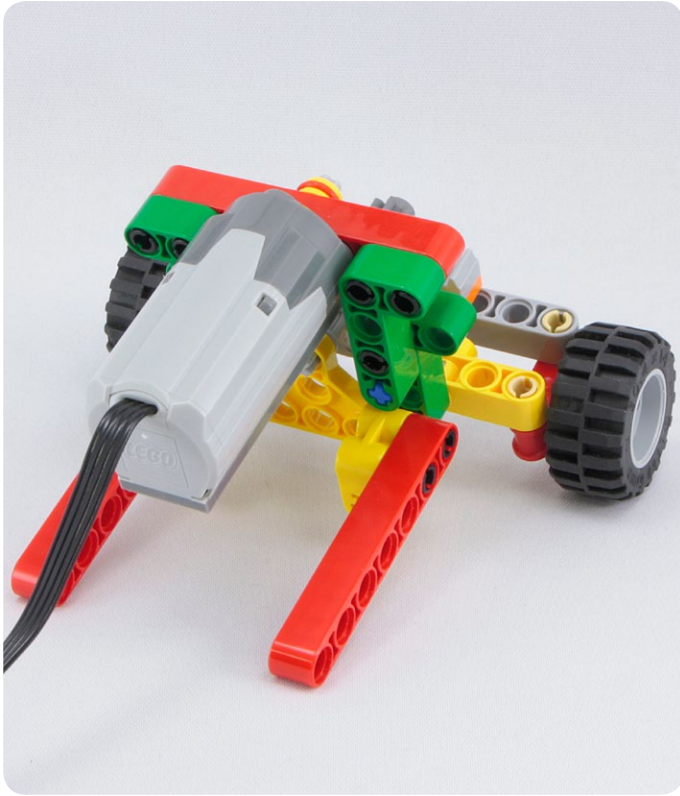
#47



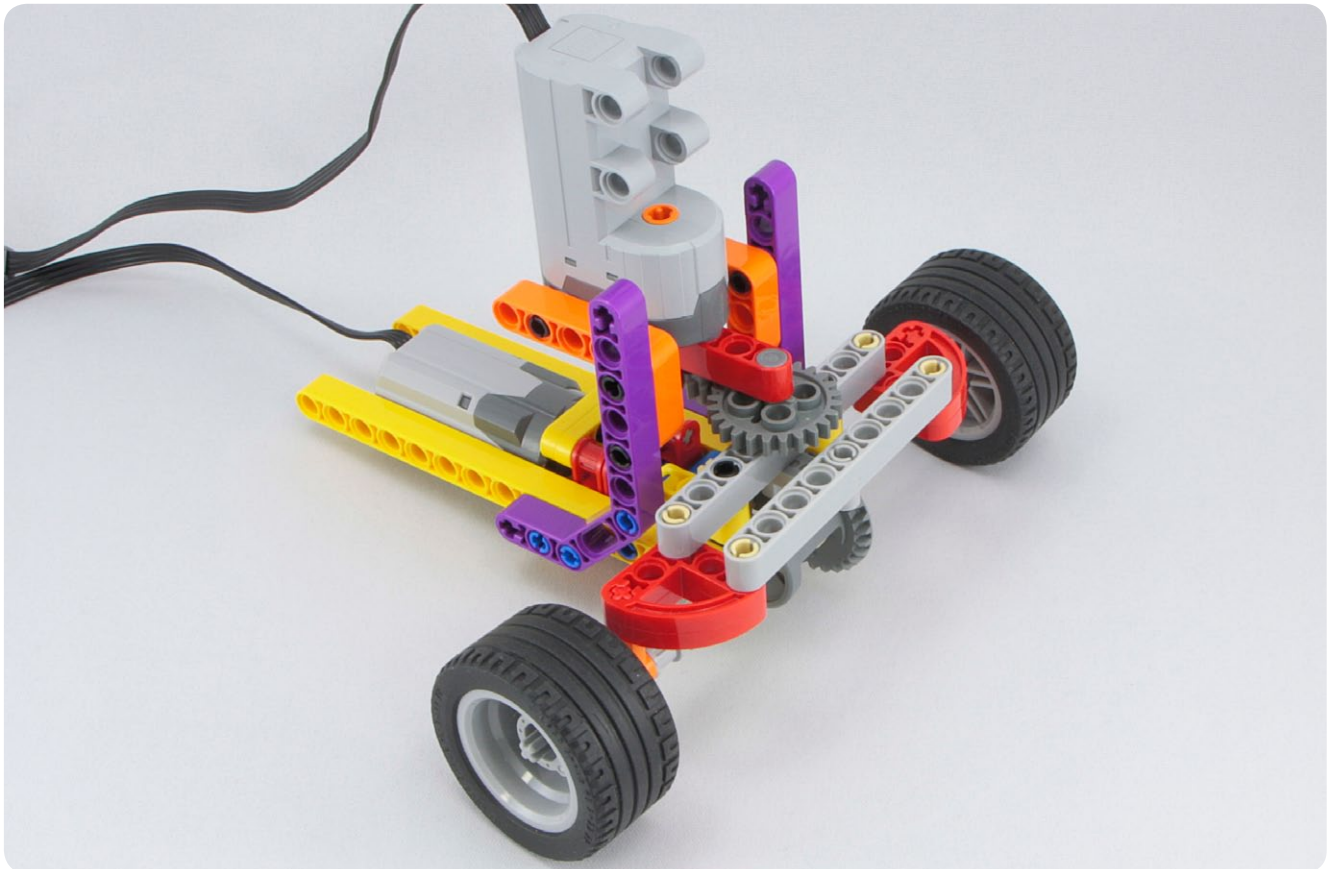
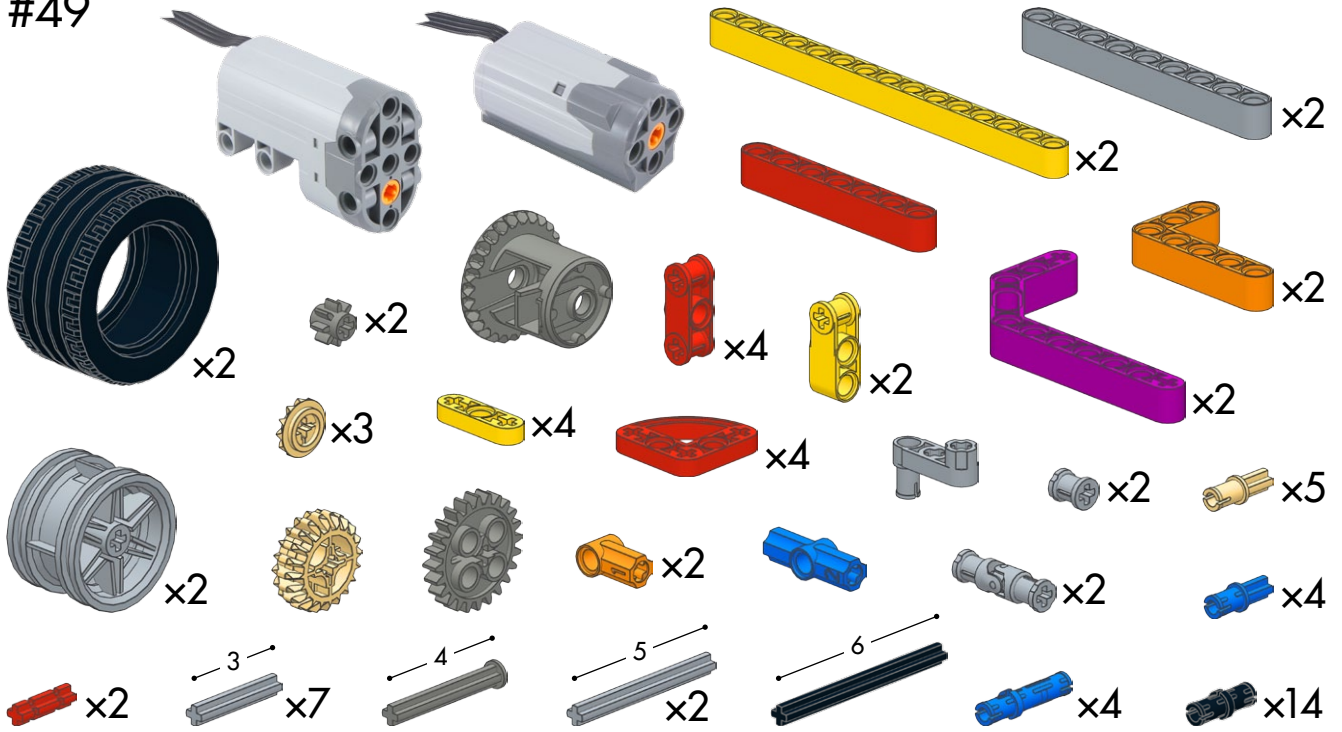


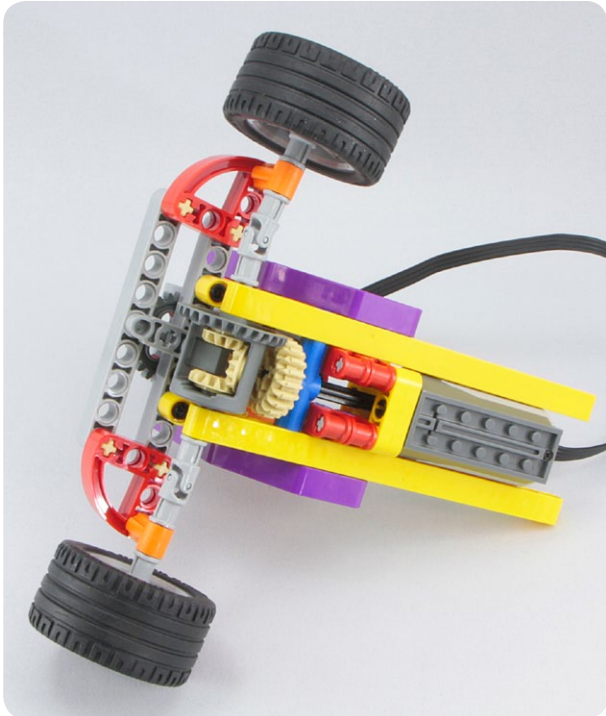
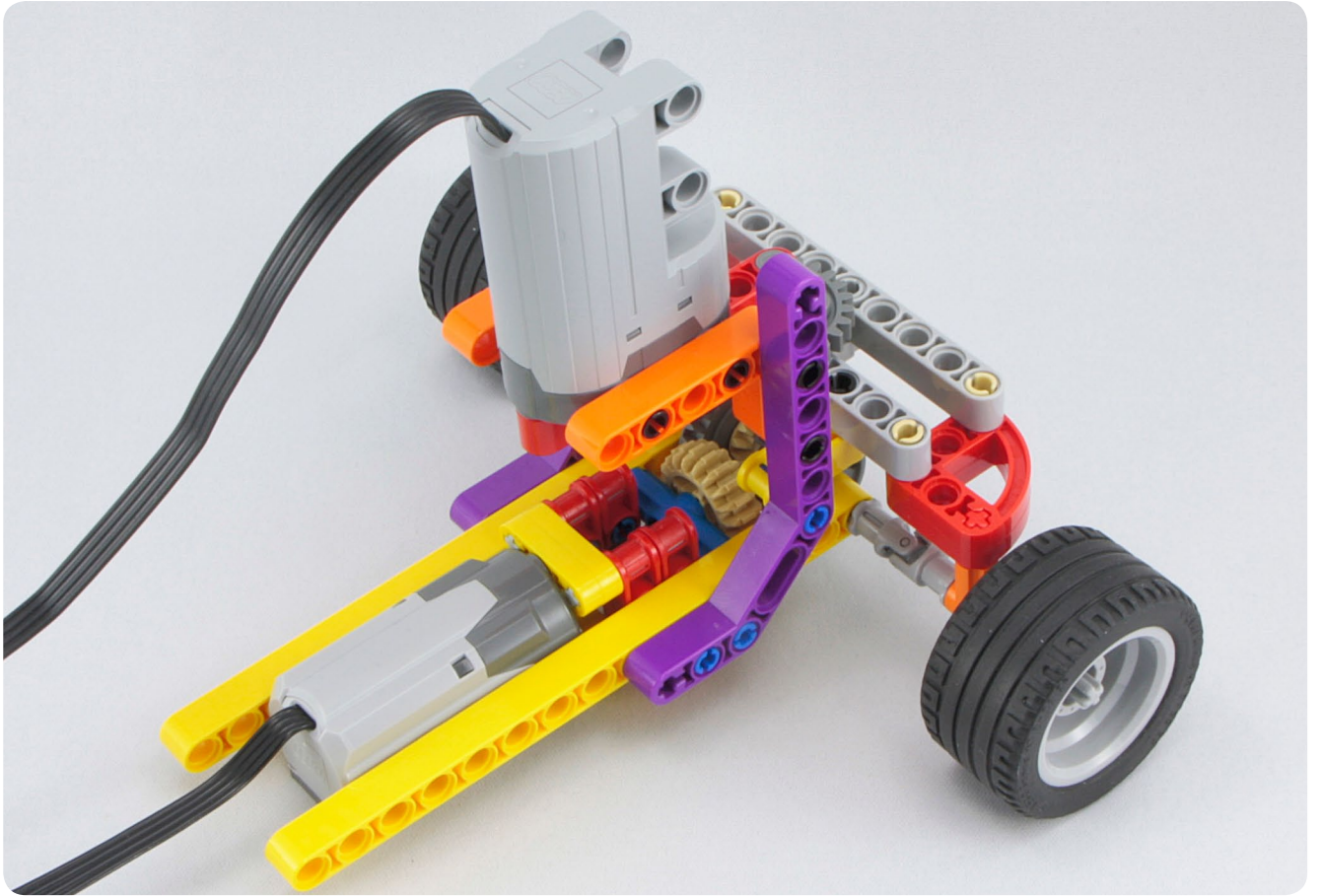
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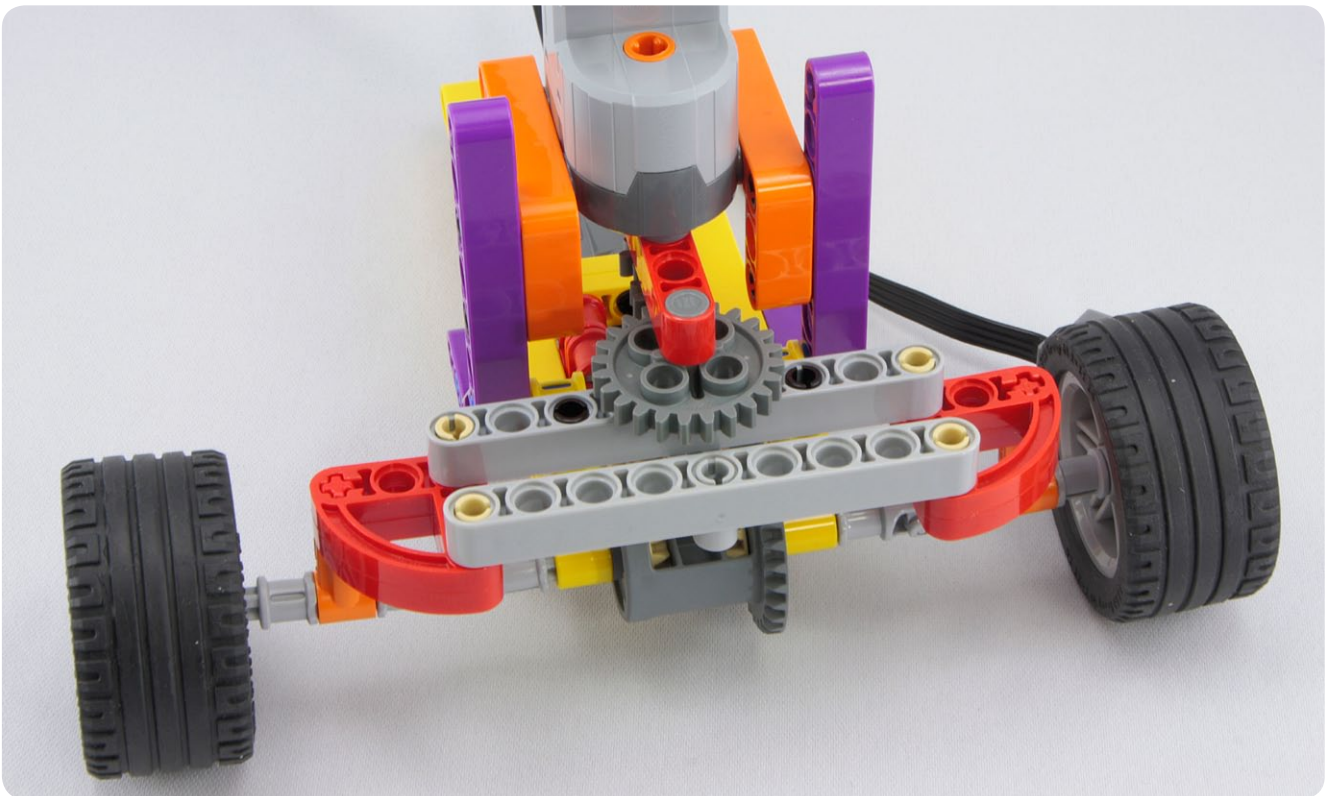
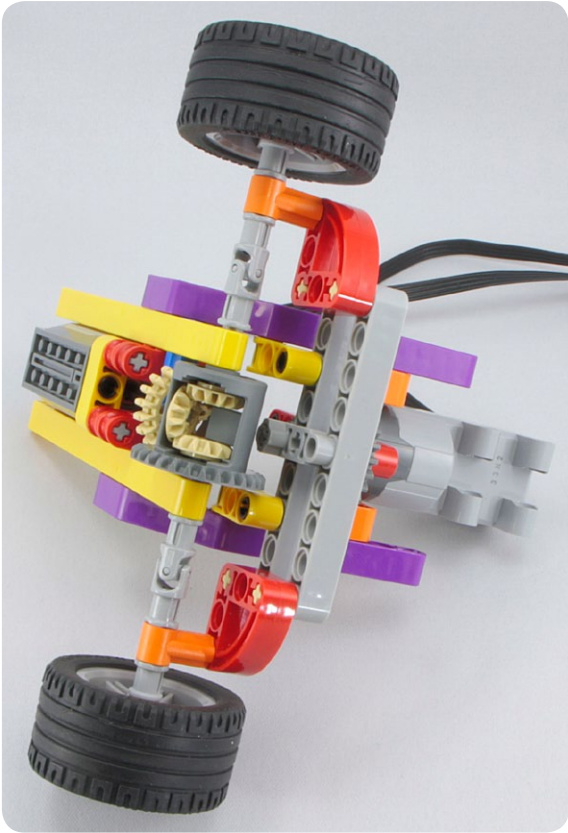


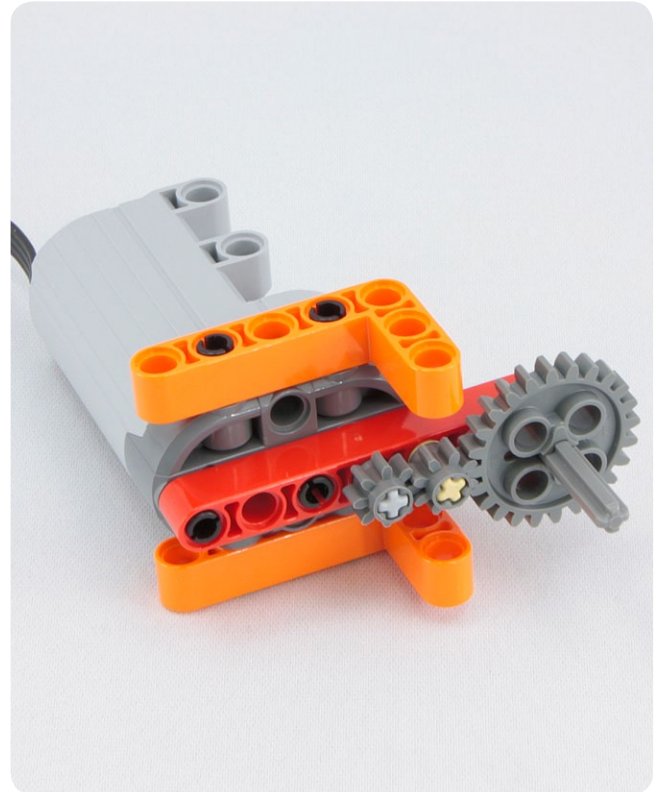
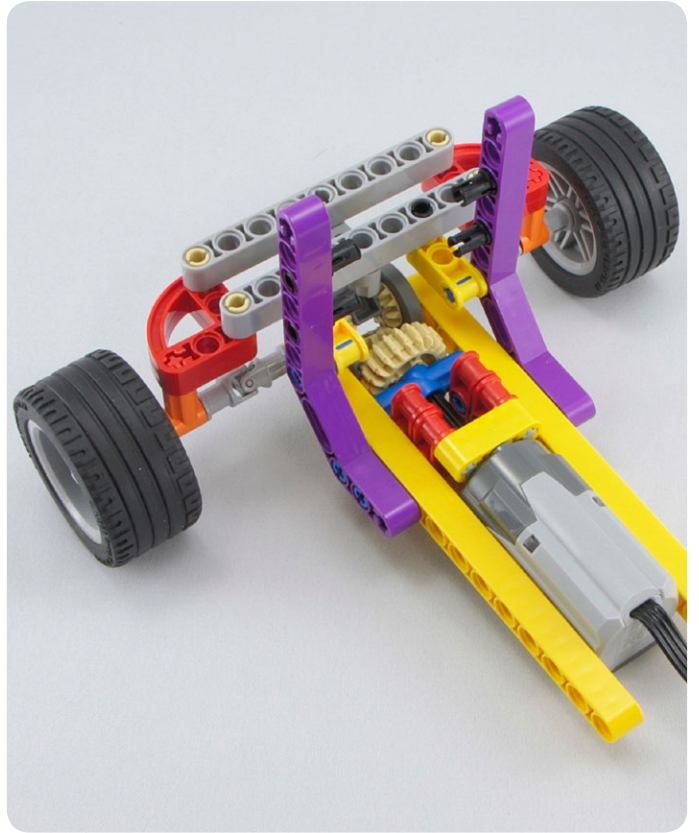
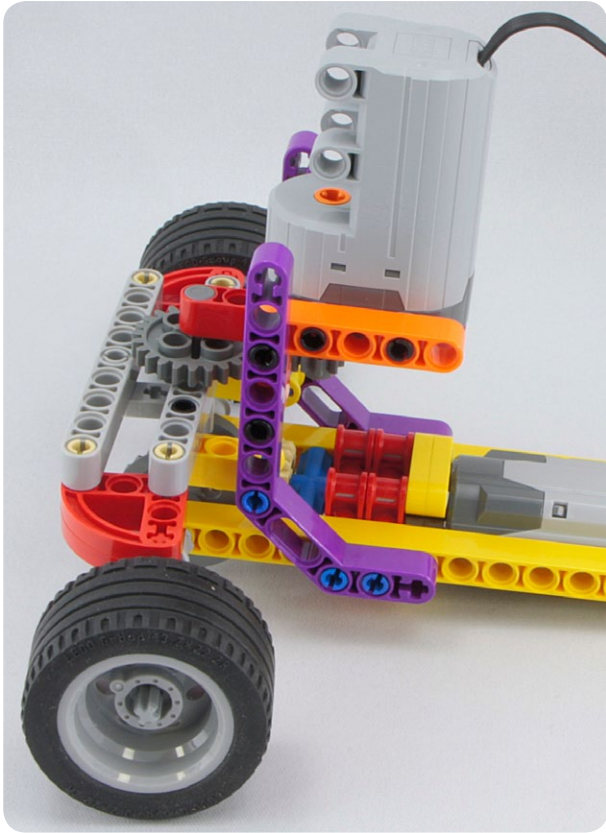


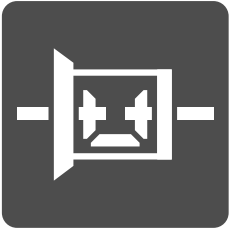
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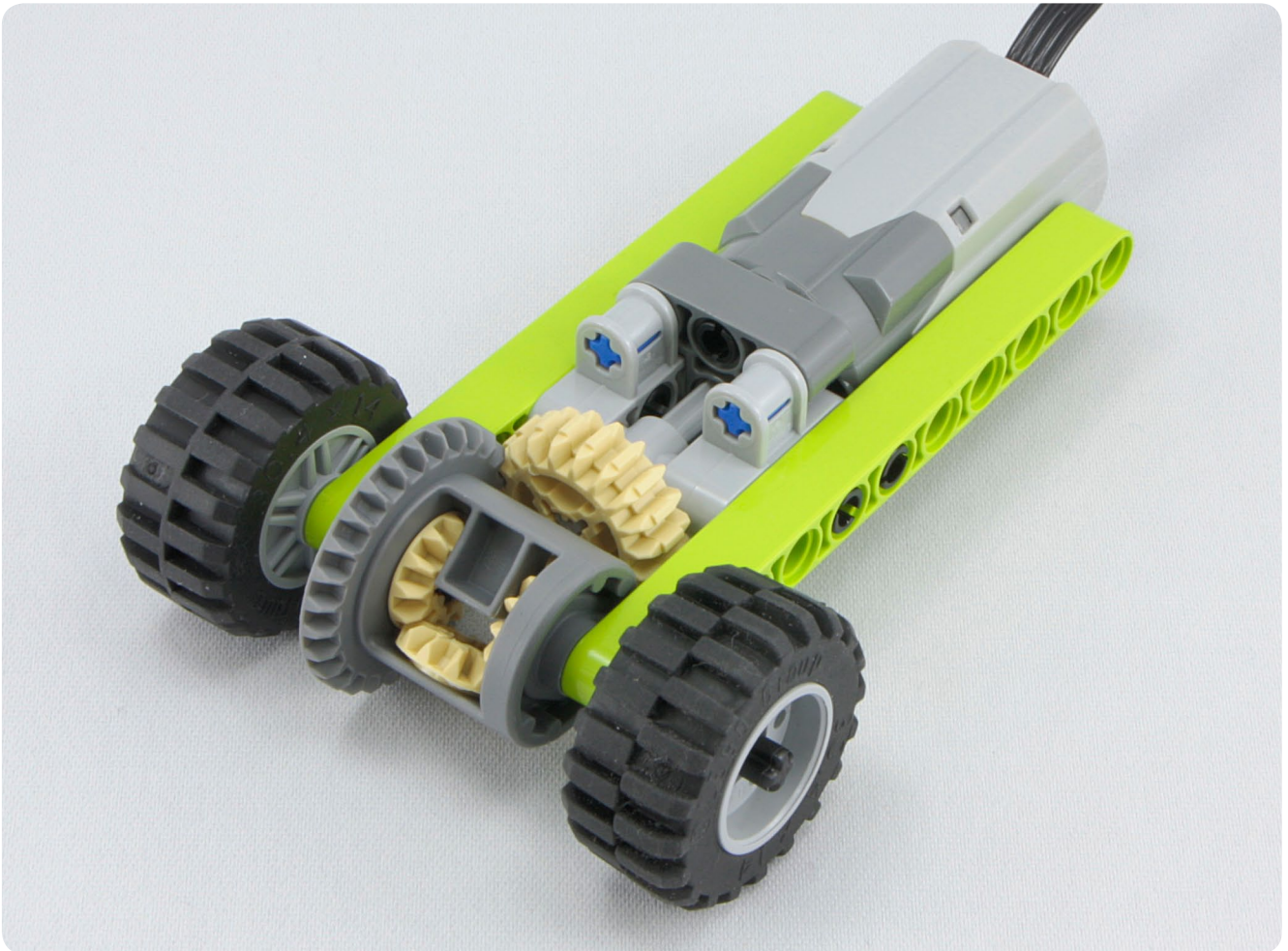
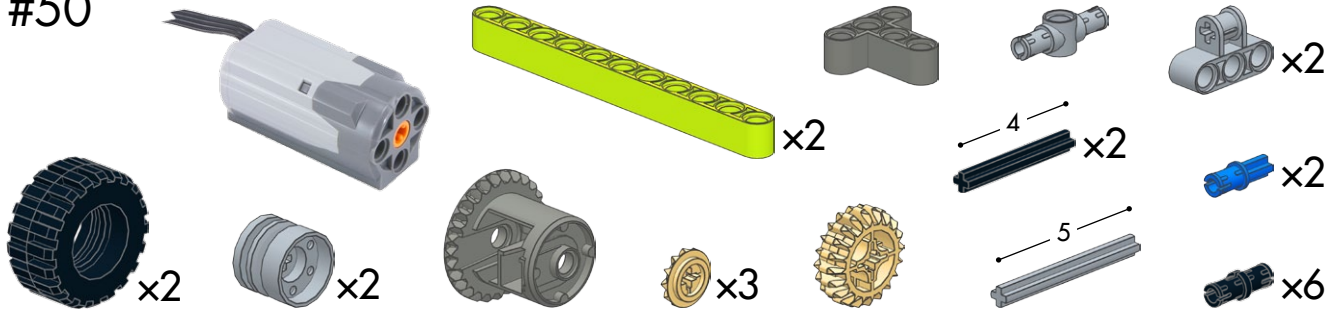


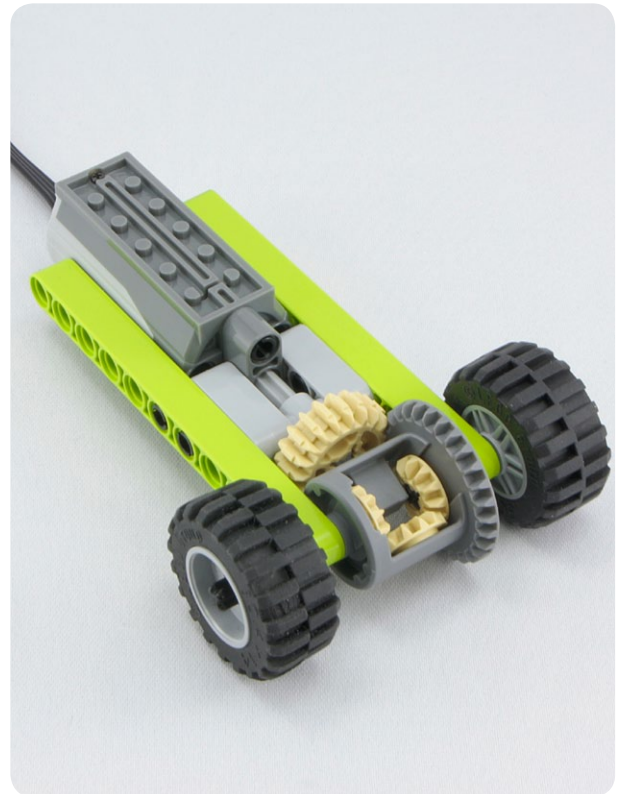
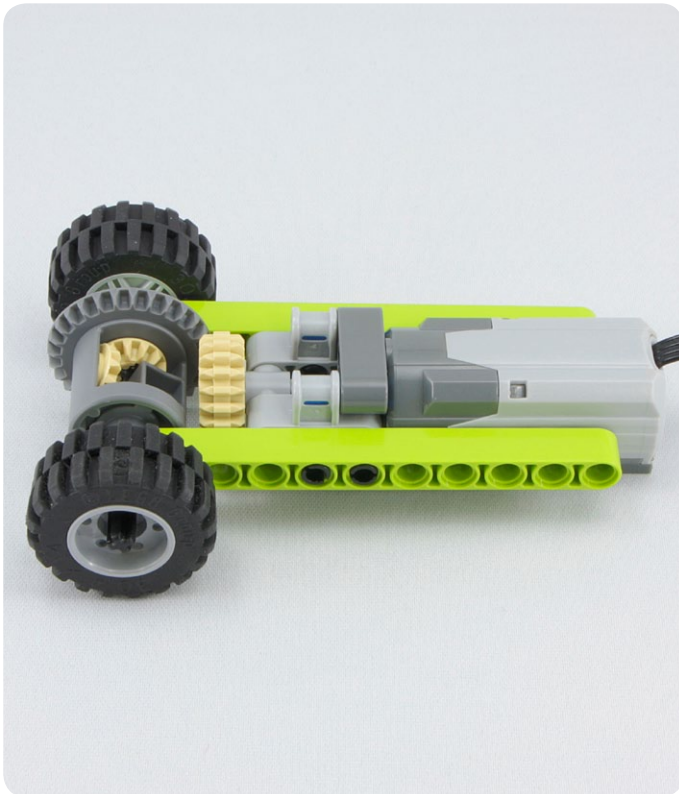
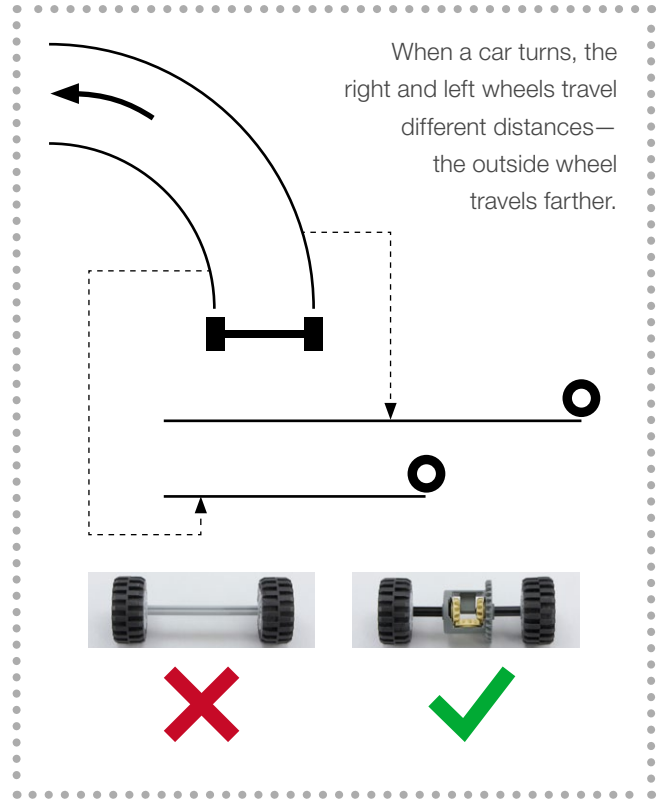
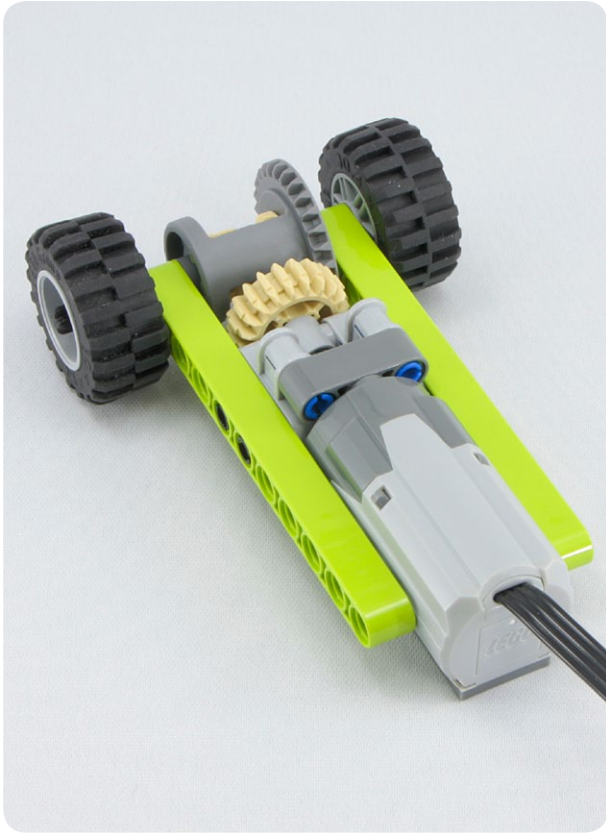
You can combine these models with those in **Steering with the servo motor** (page 50).



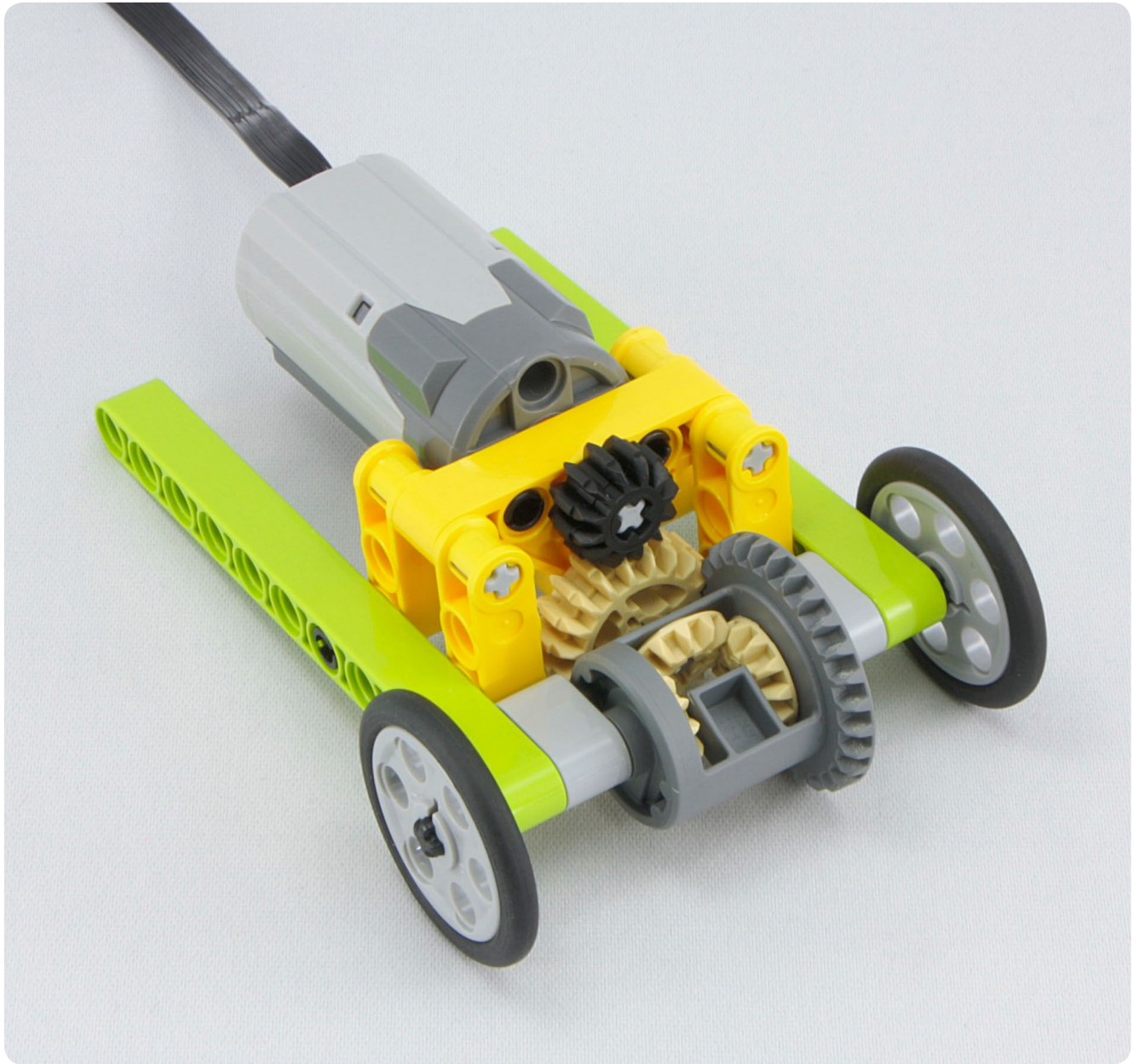
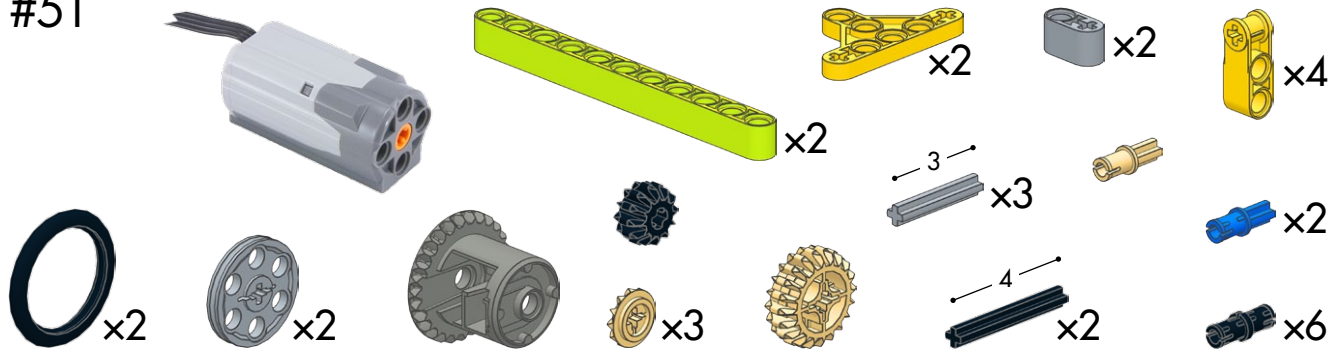
Differential gears

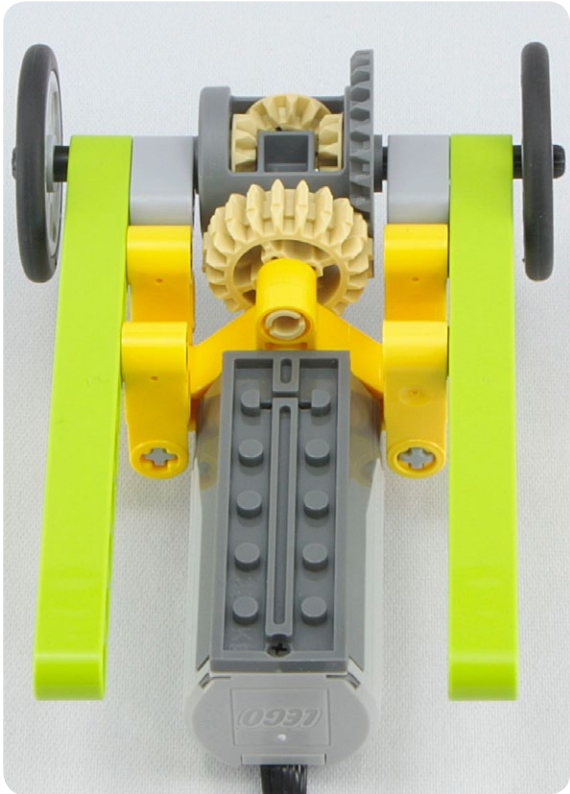
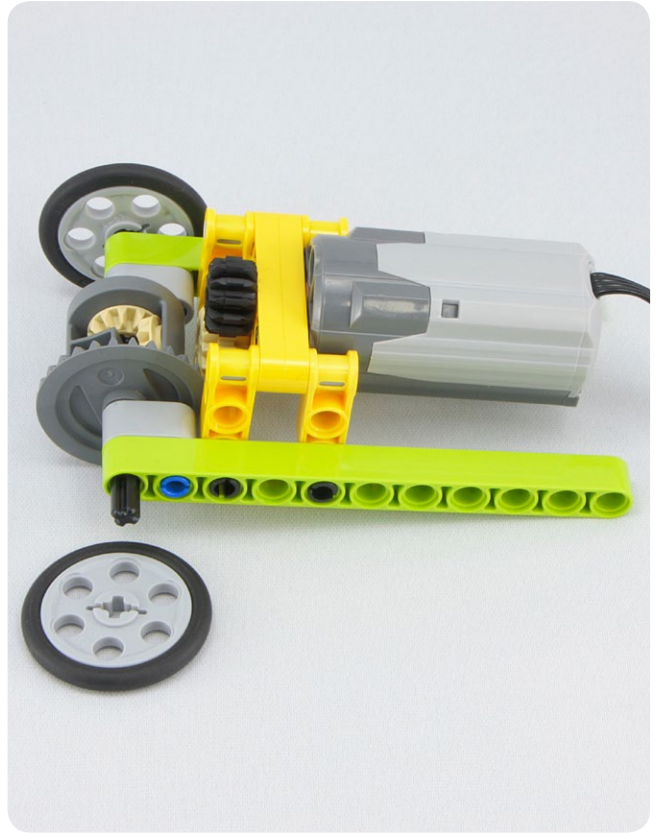
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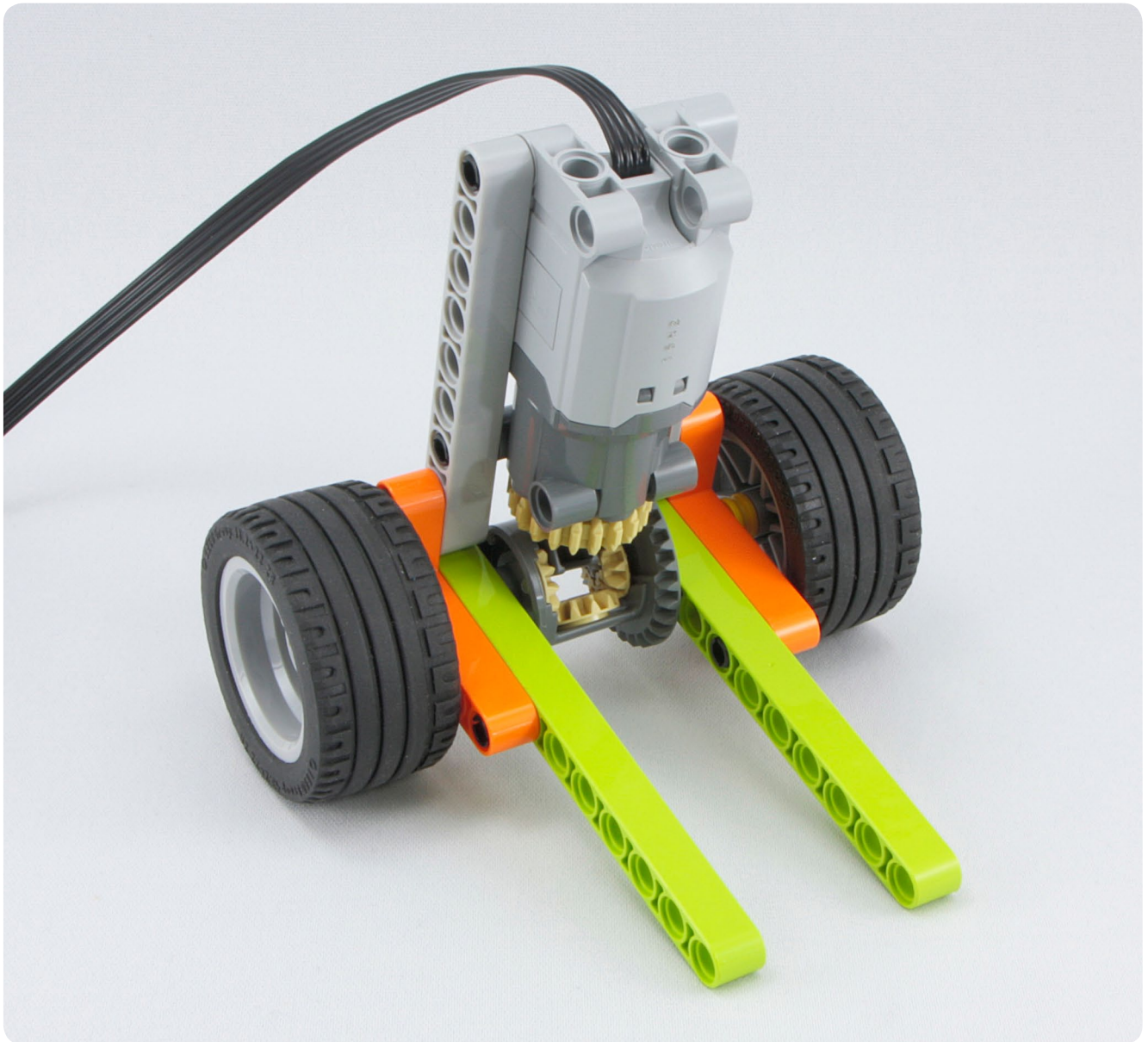
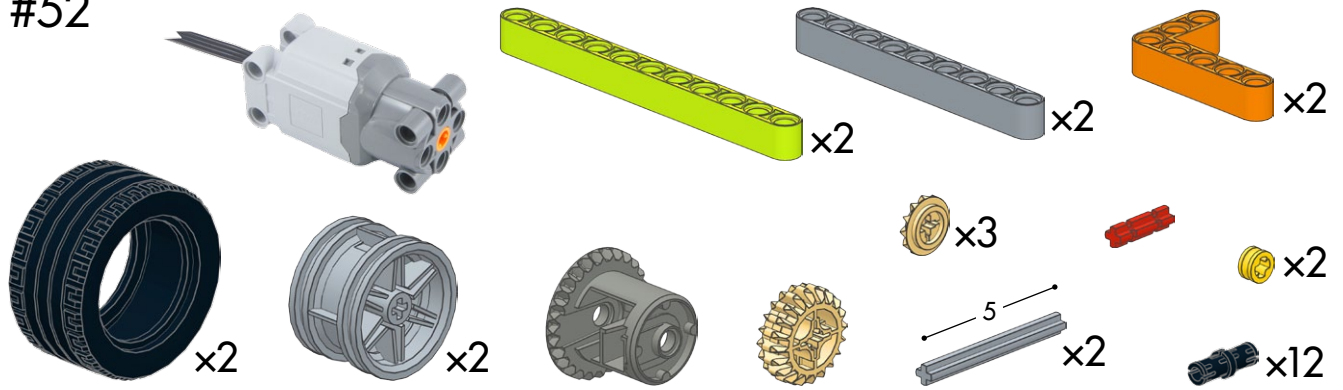


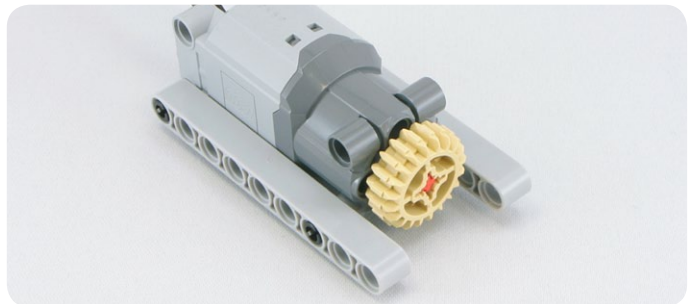
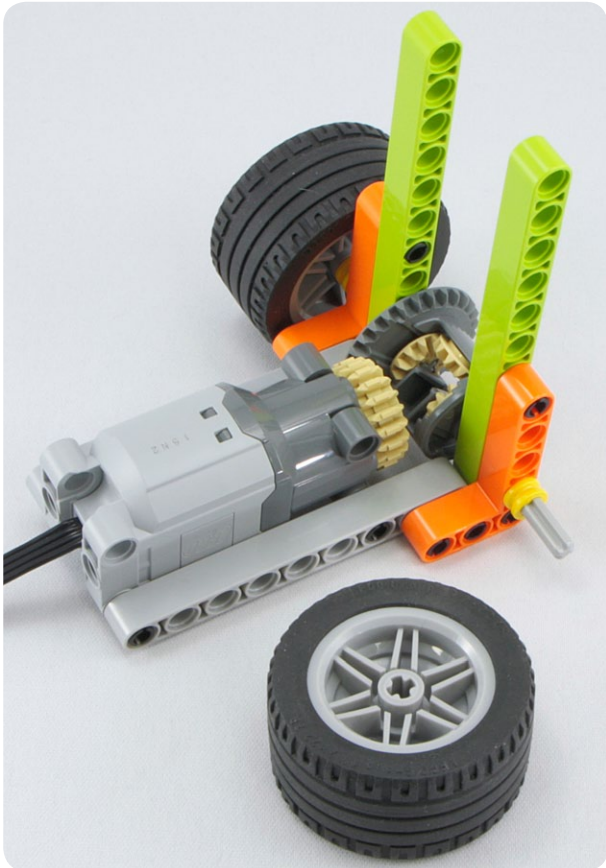
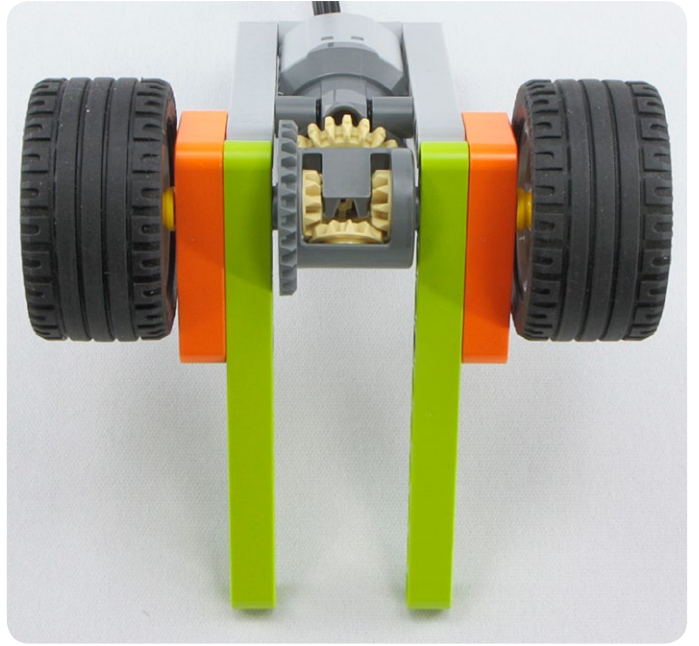
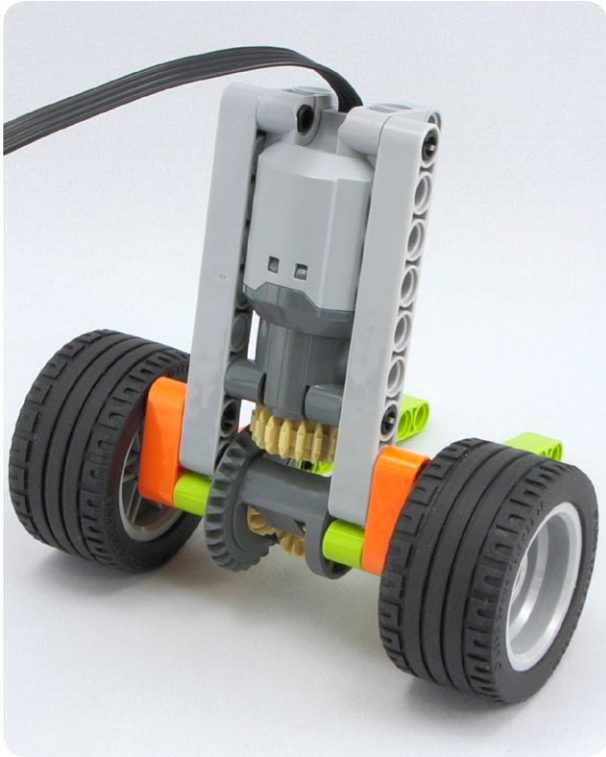
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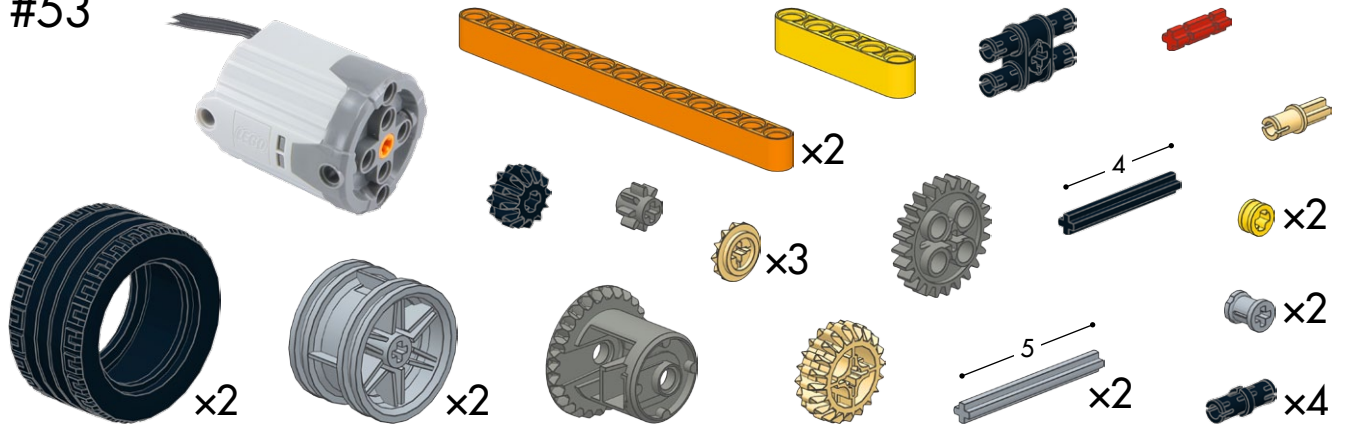


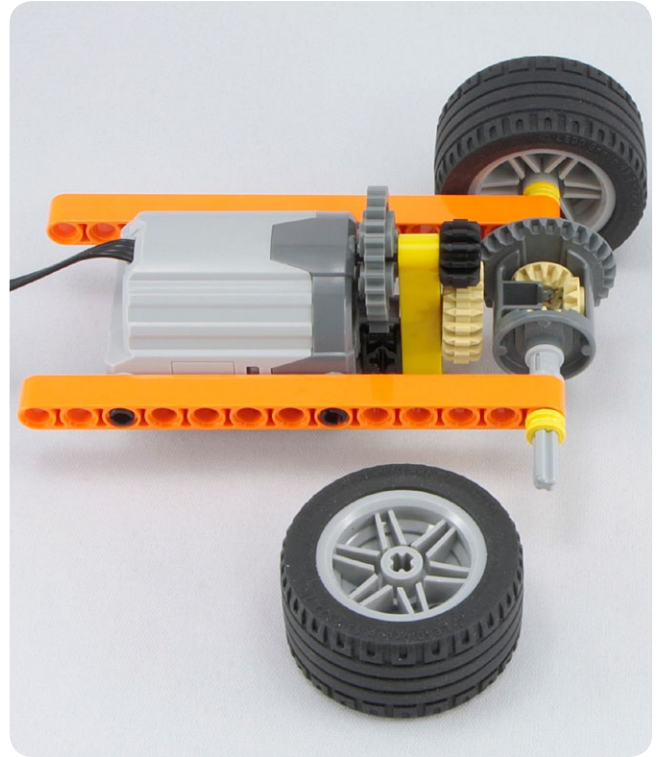
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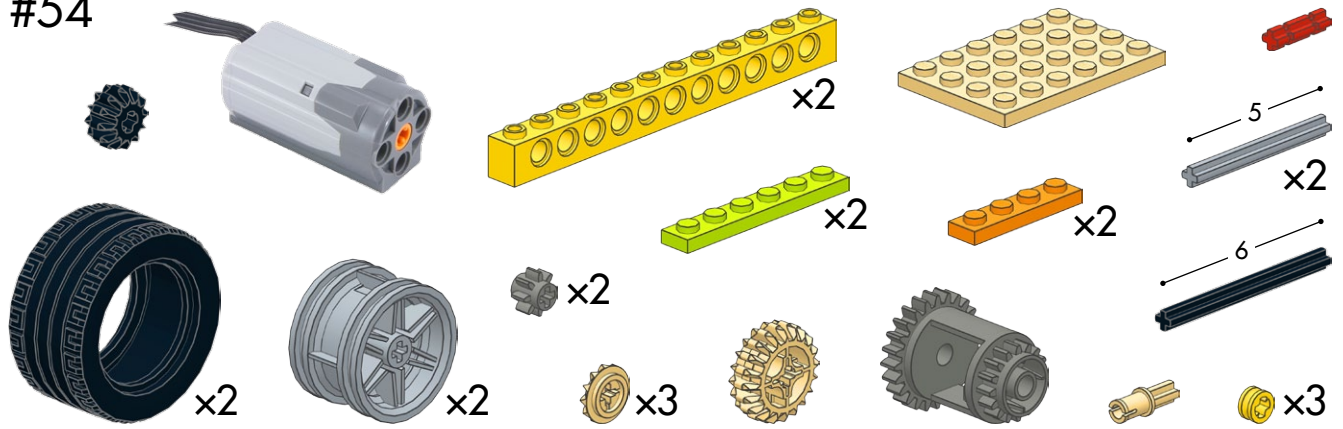


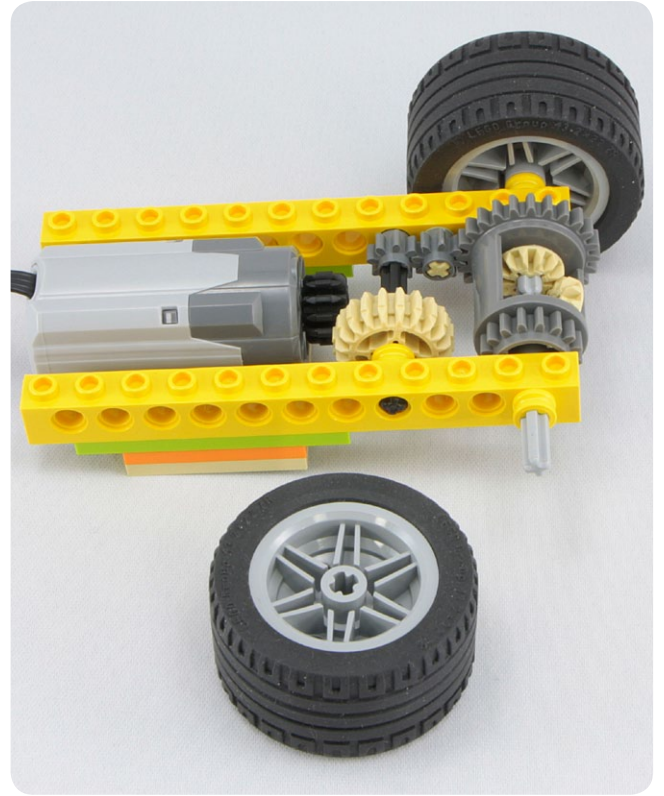
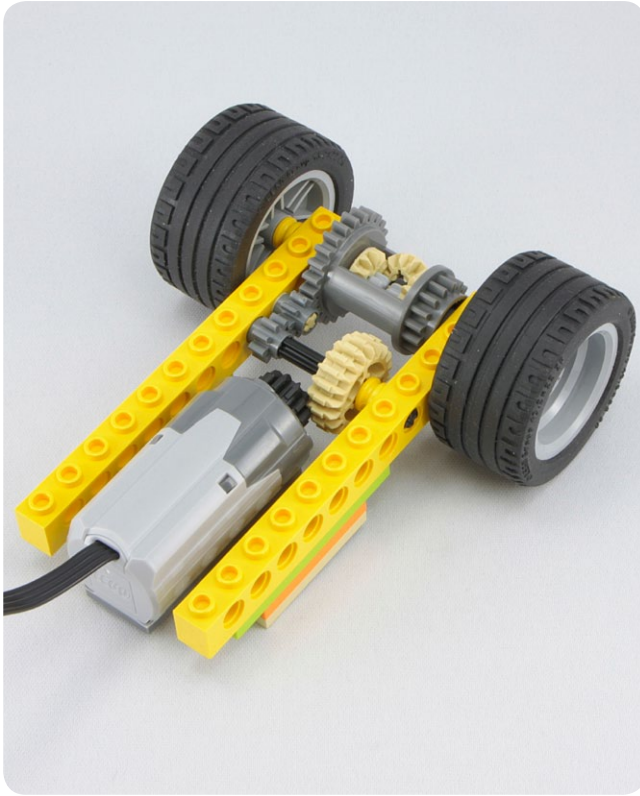
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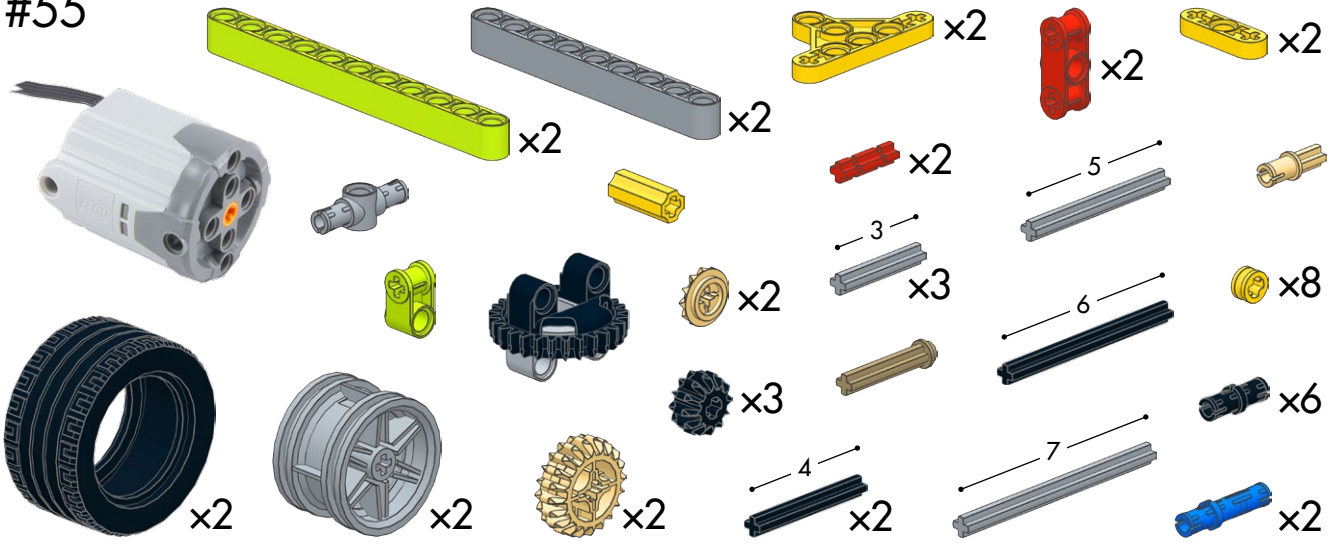


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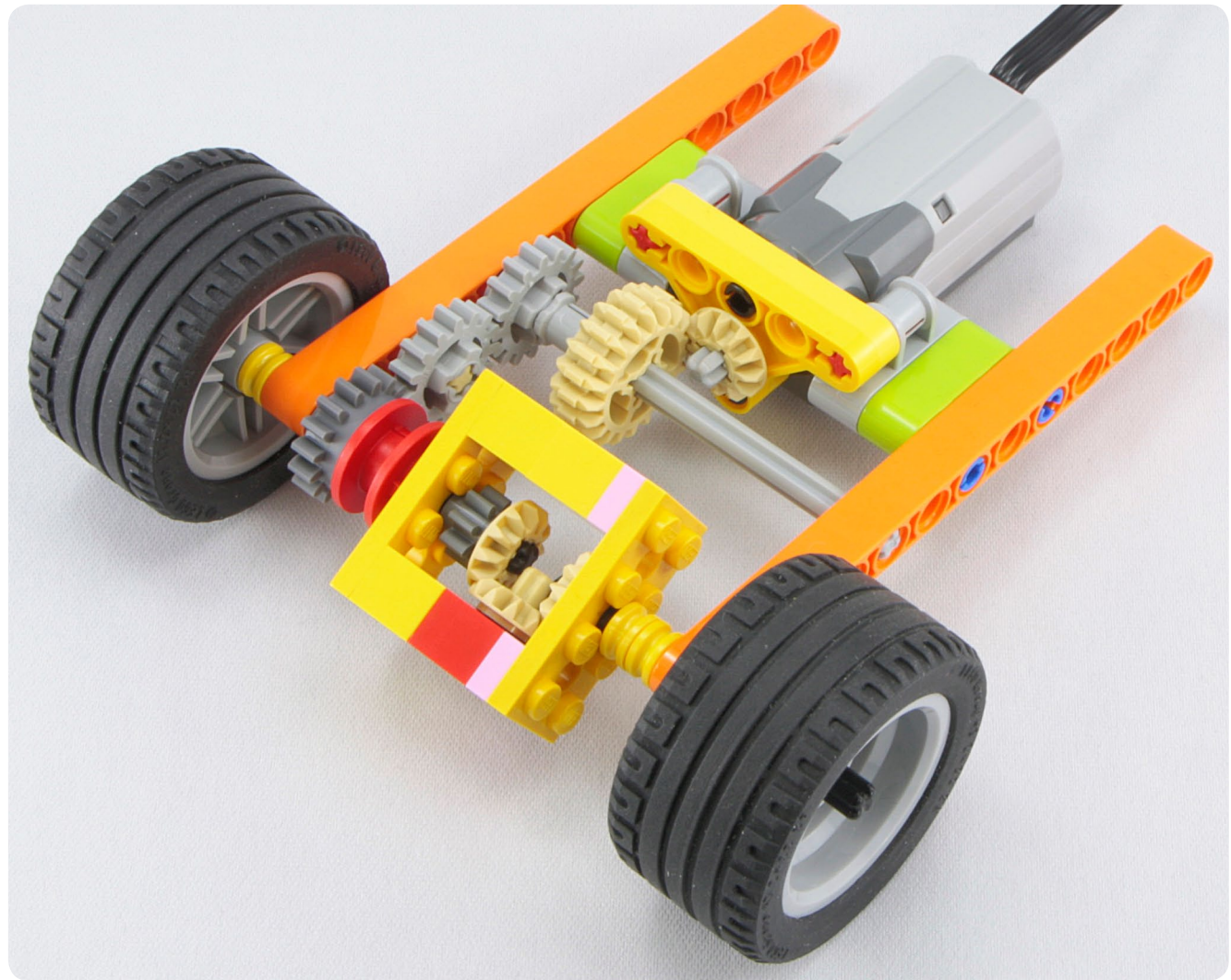
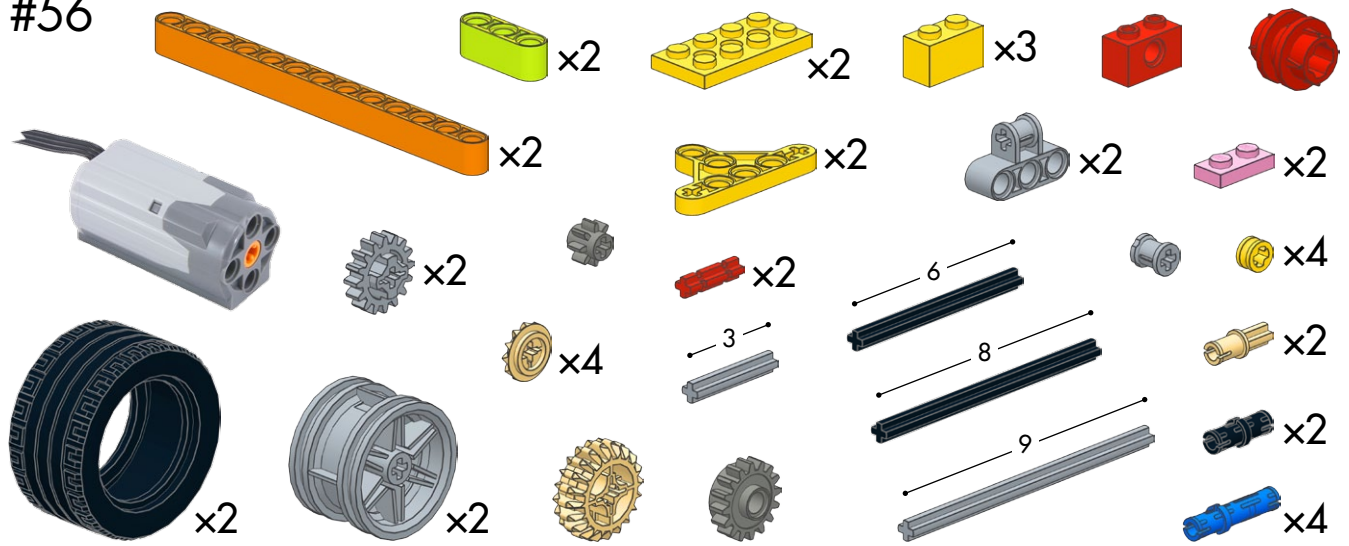


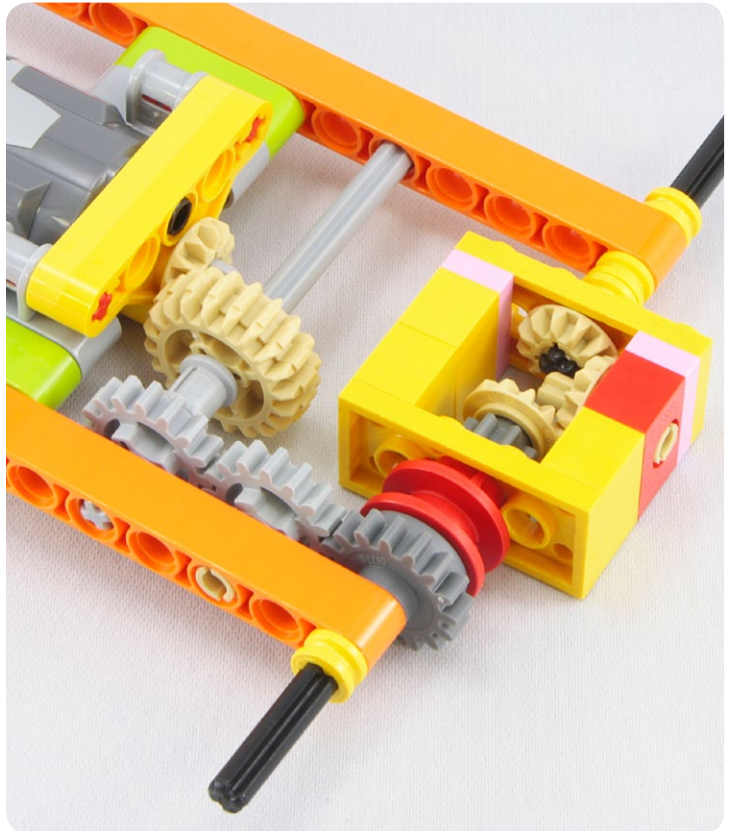
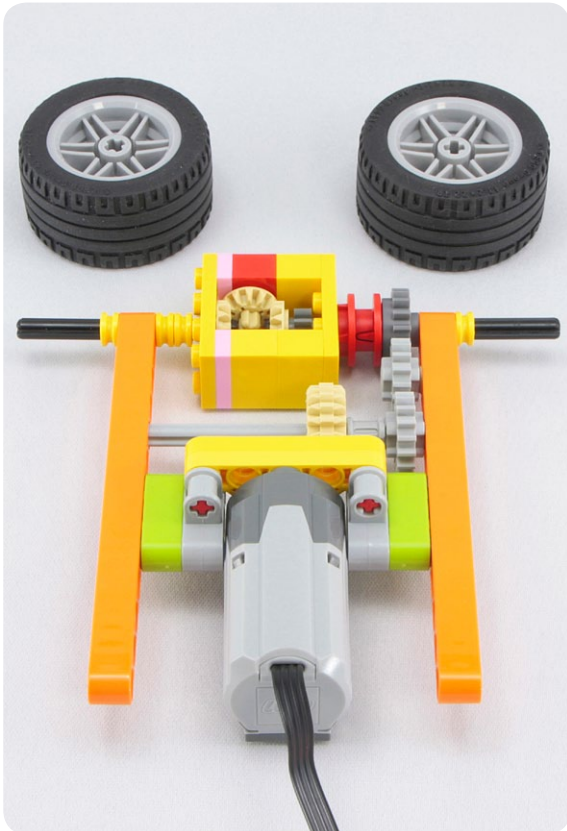
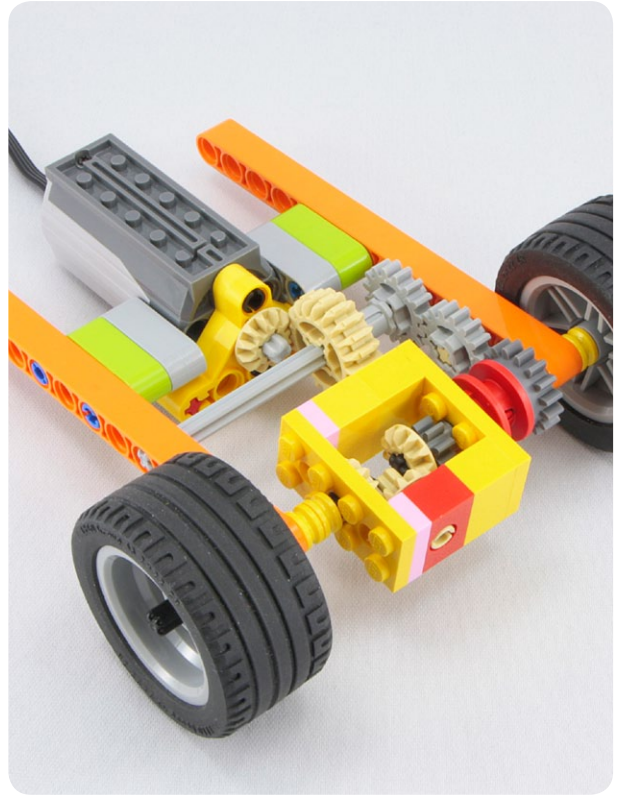
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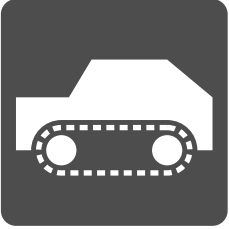




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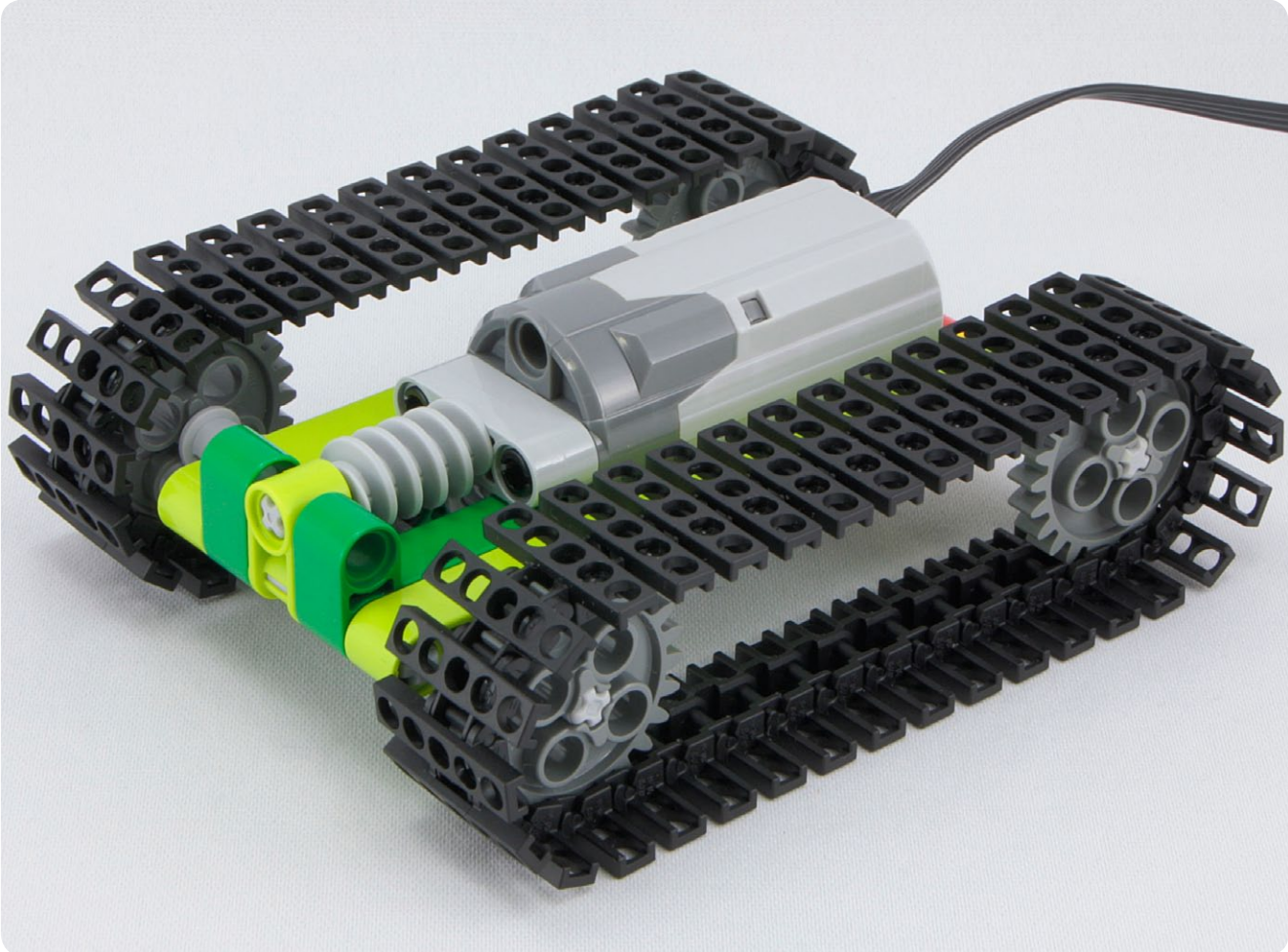
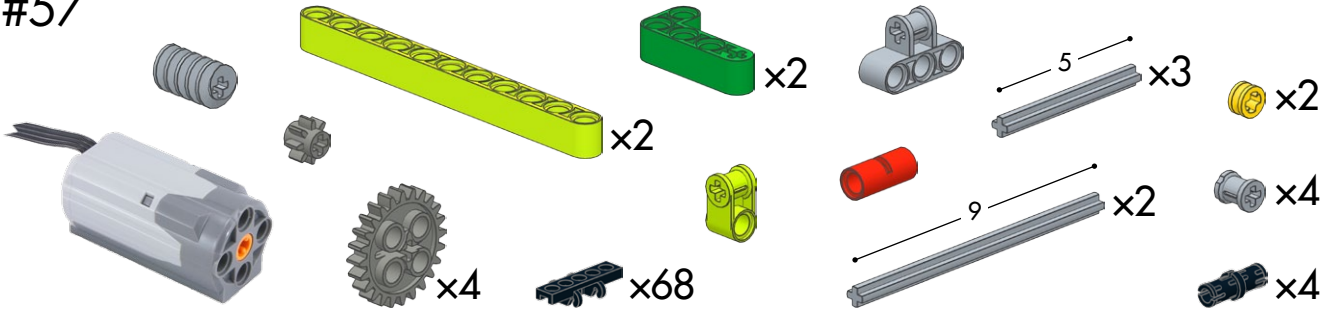


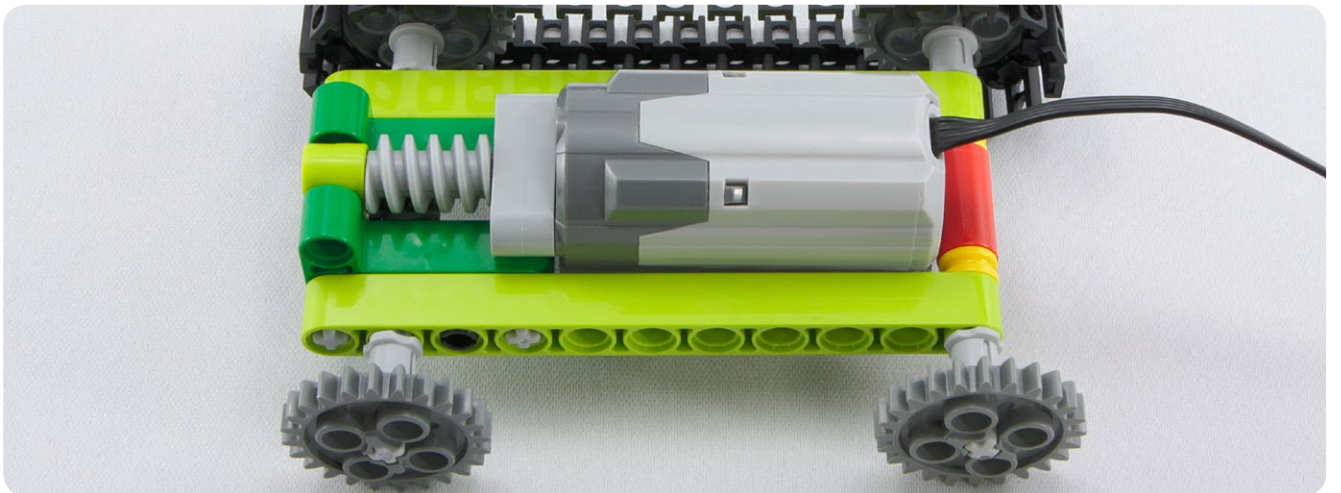
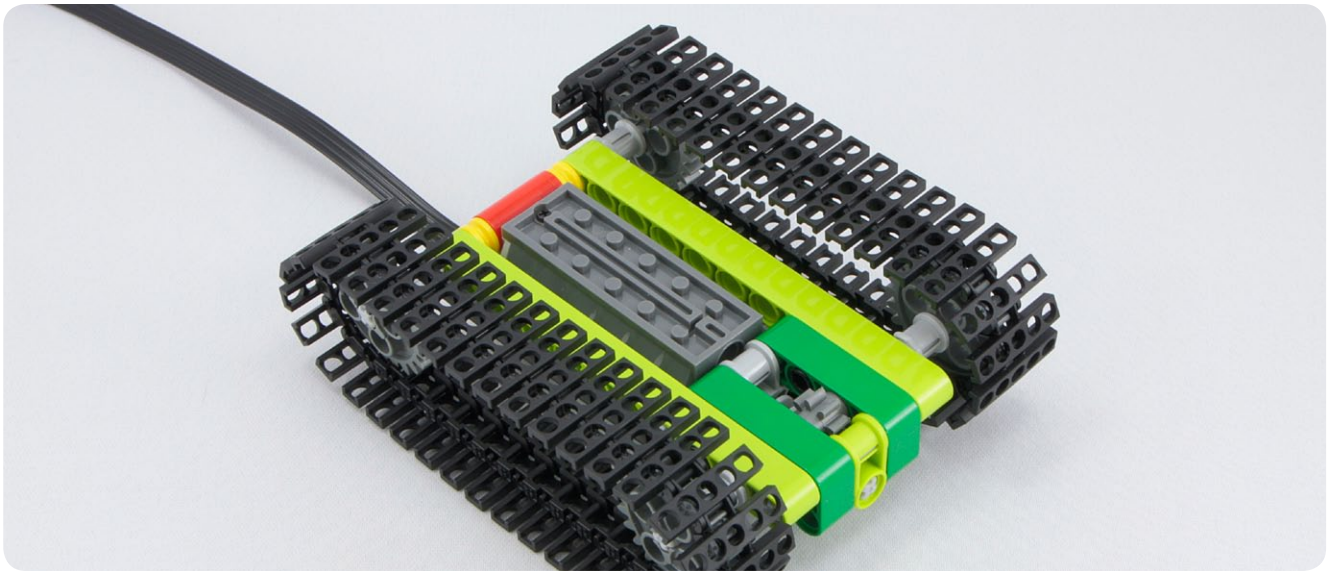
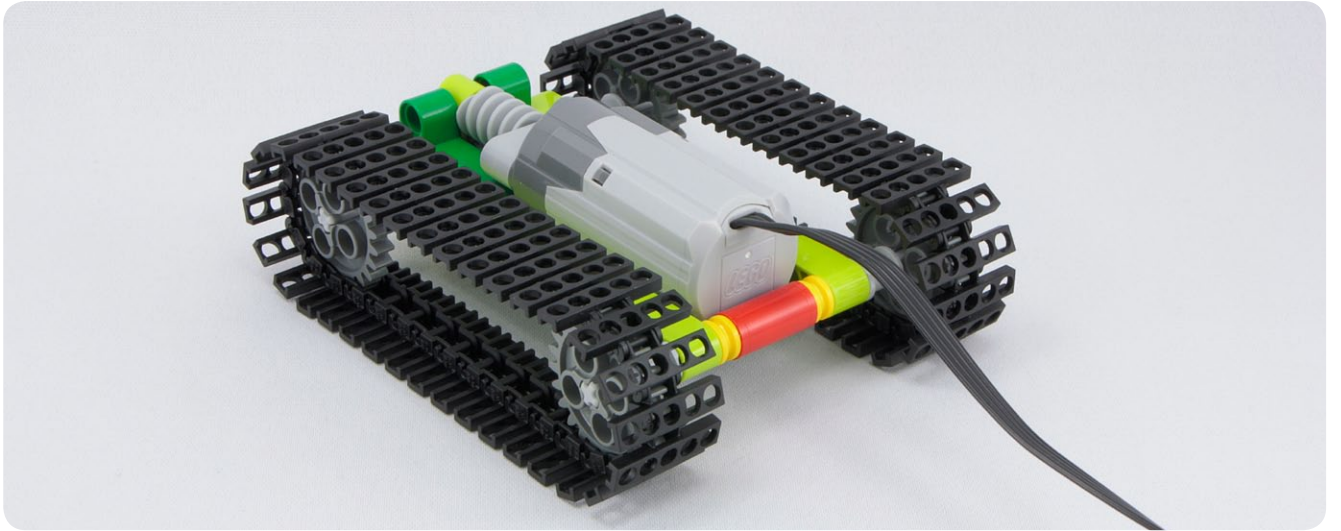




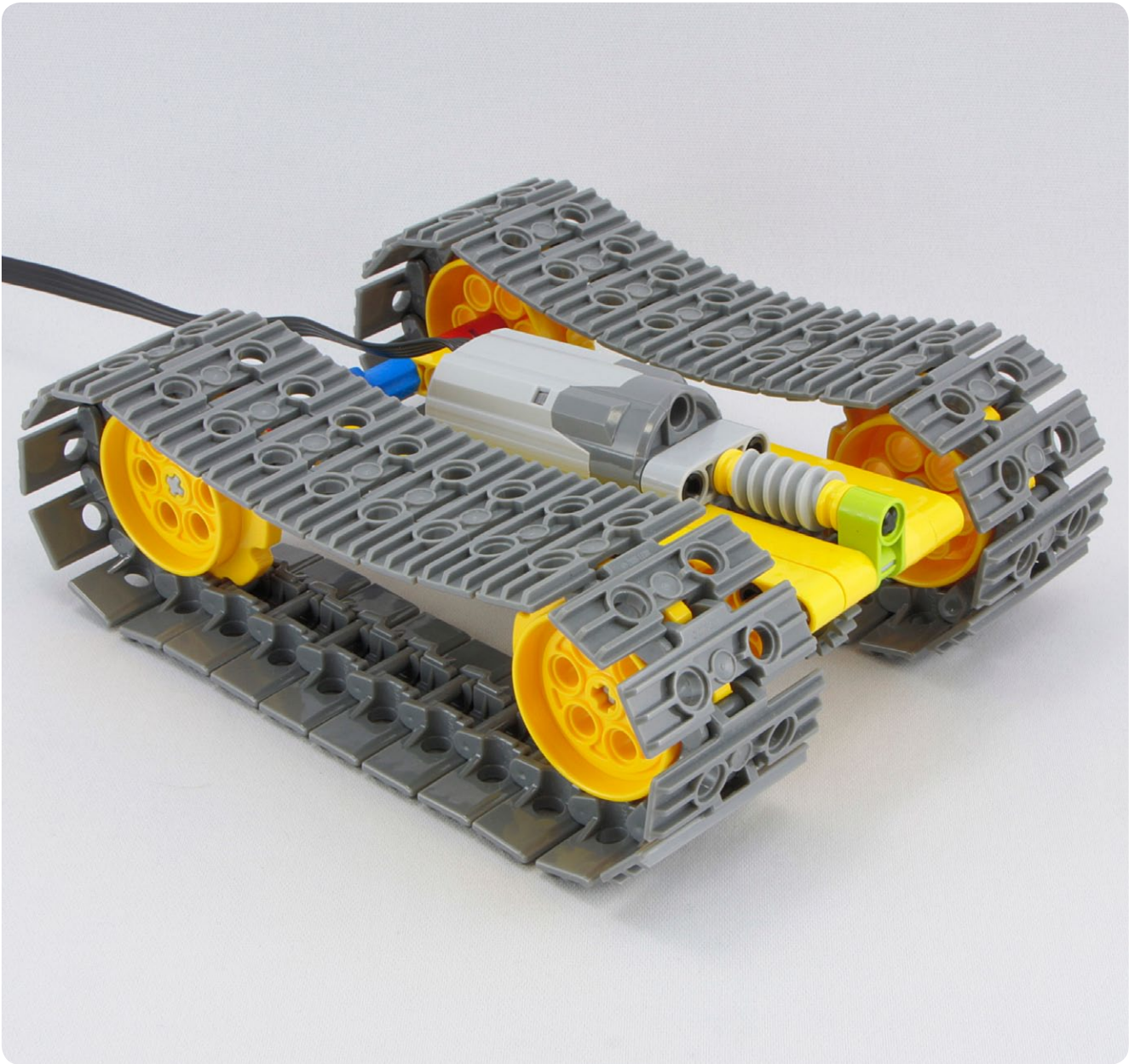
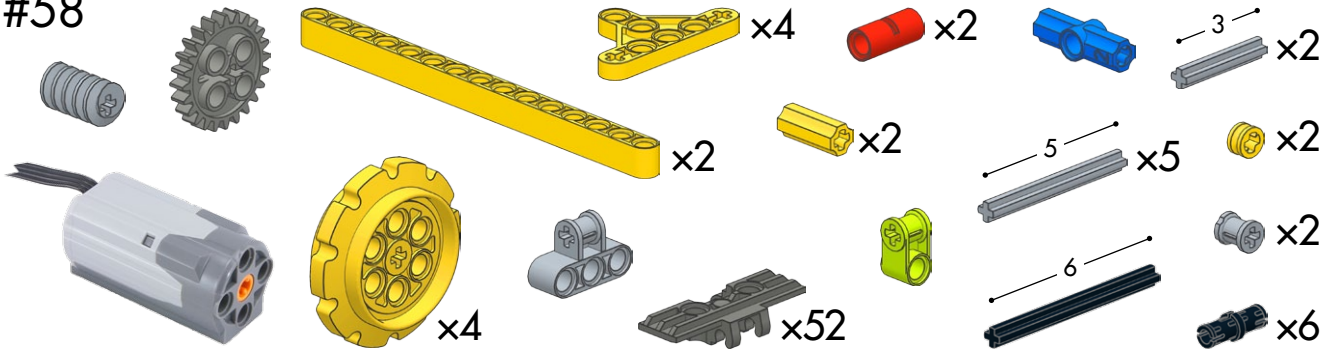
Crawlers

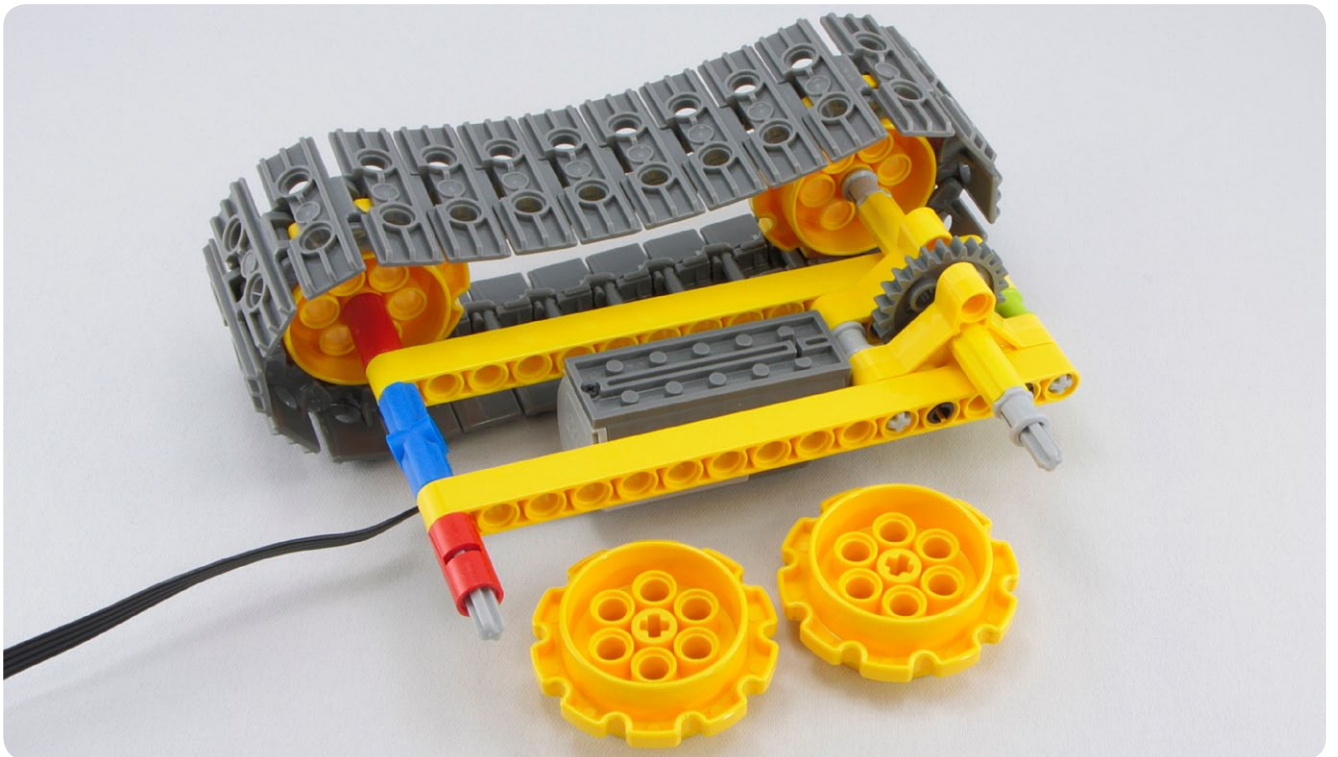
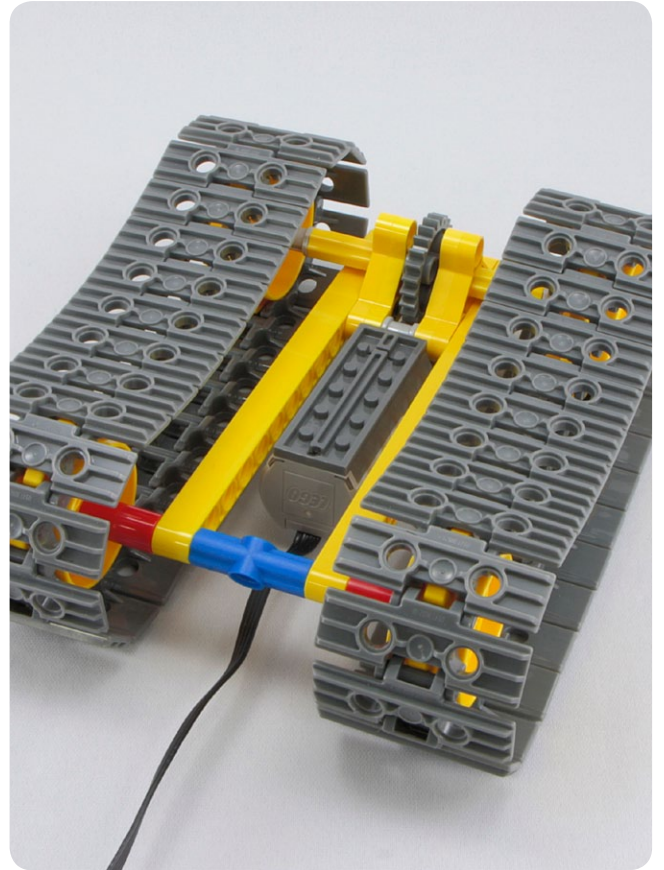
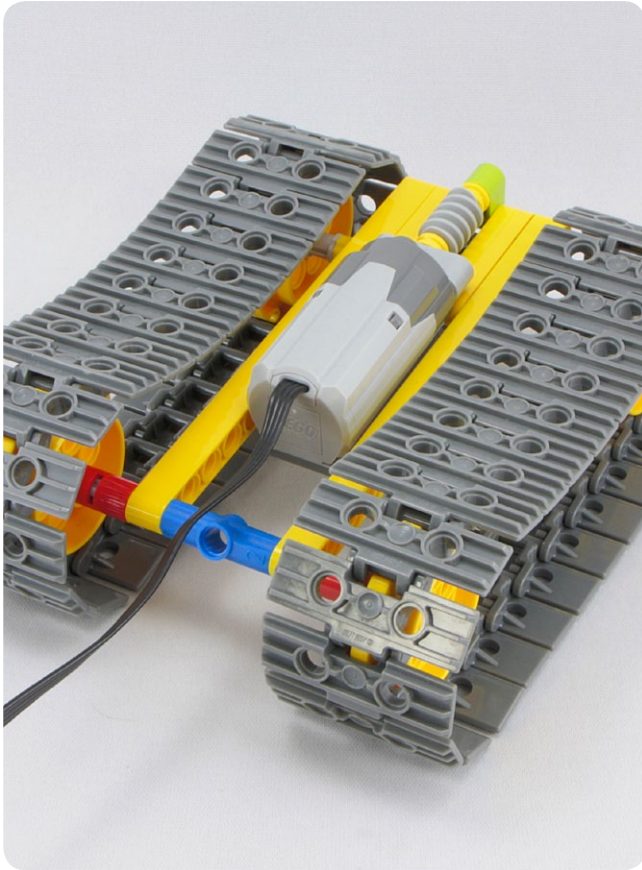
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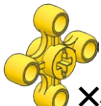





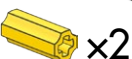

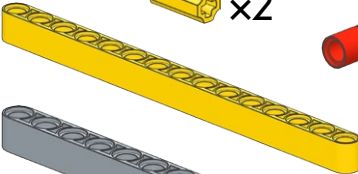
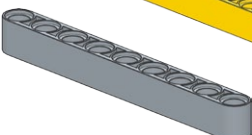




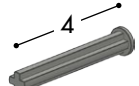

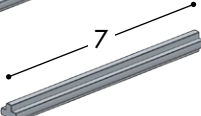






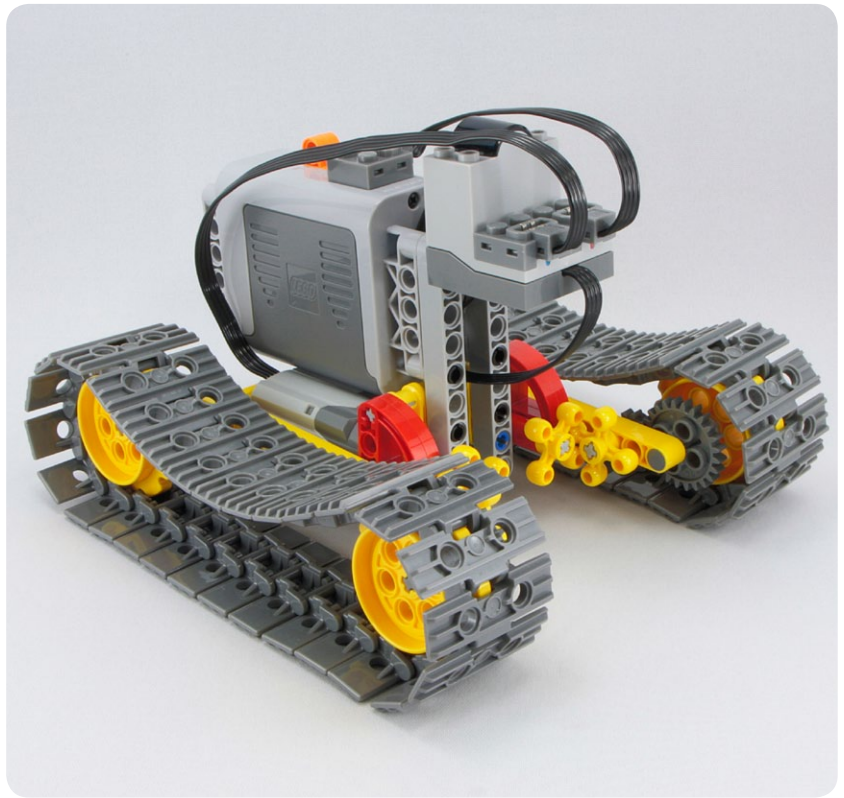
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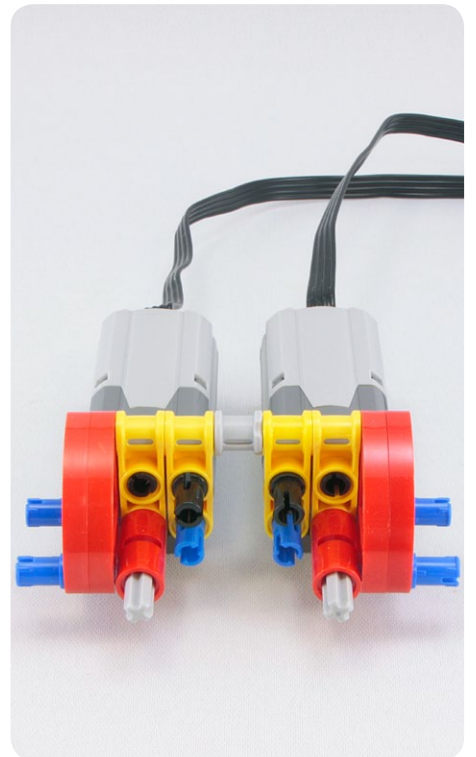
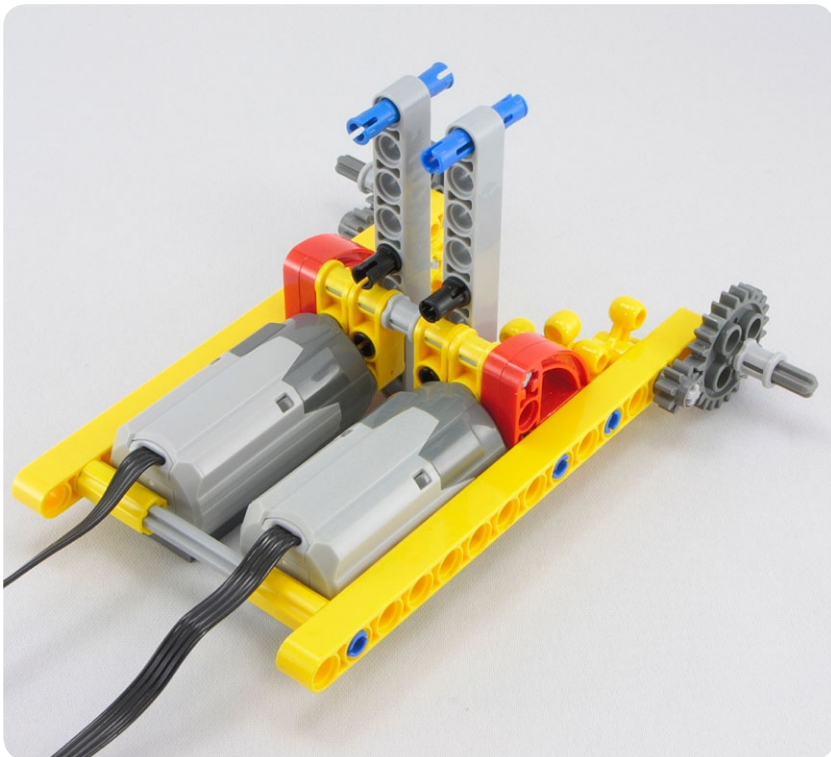




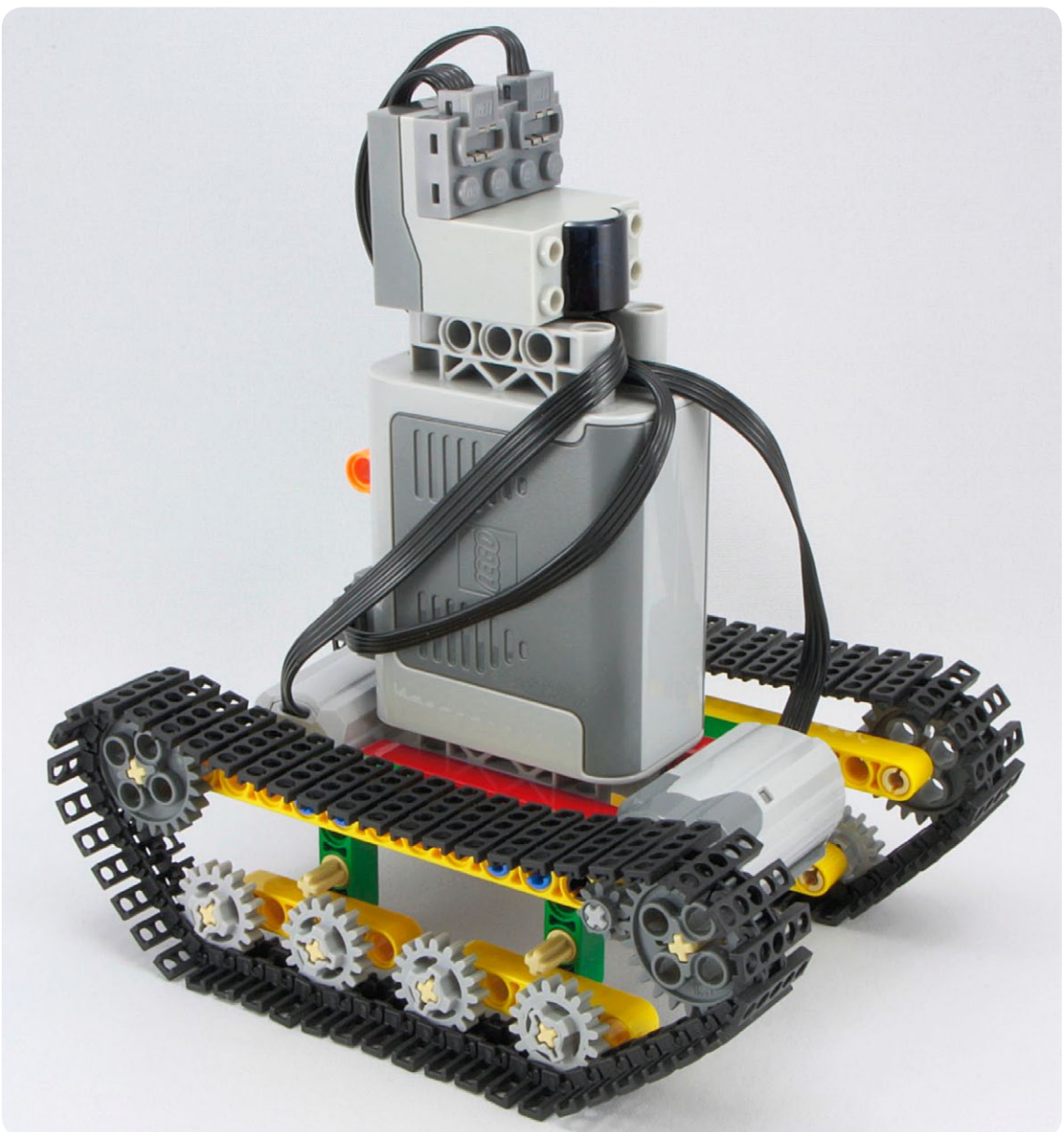
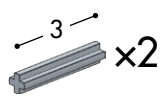
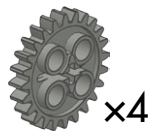
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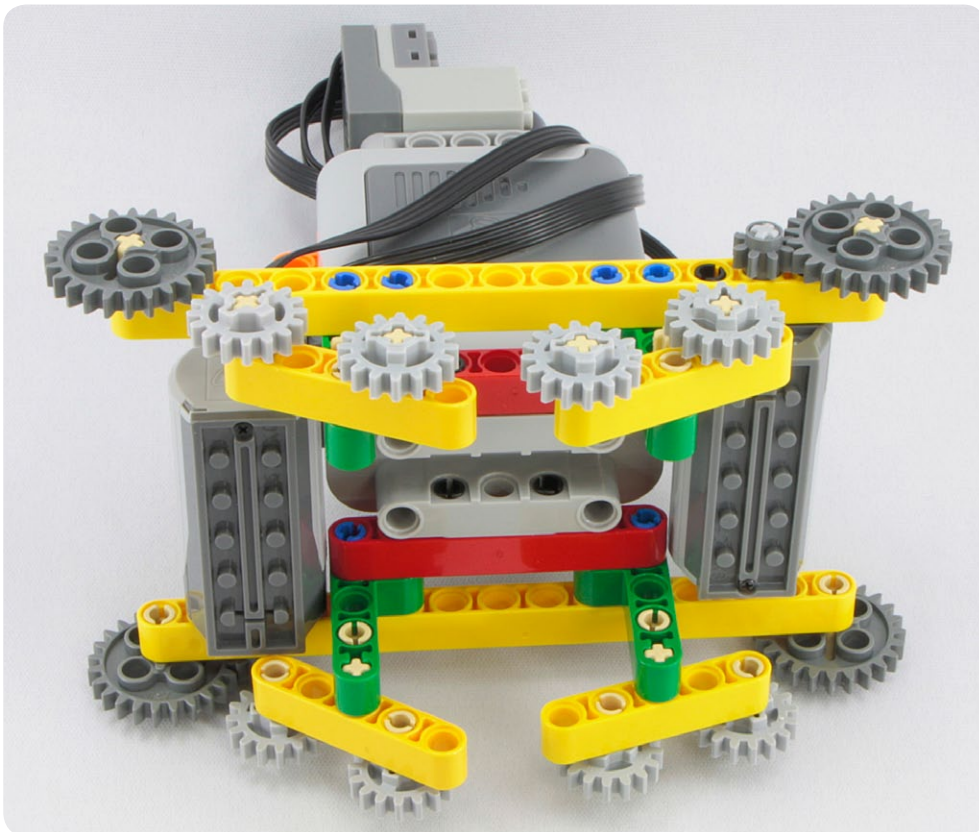
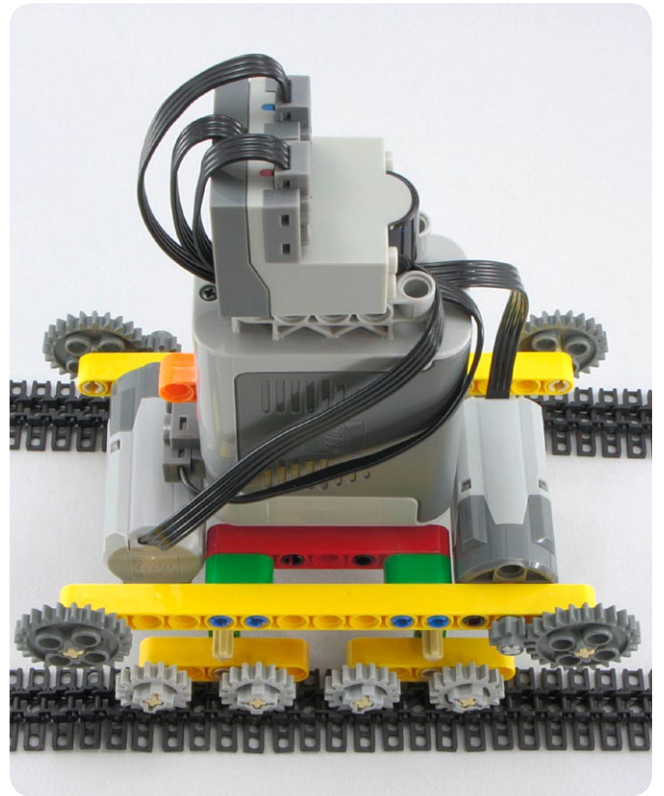
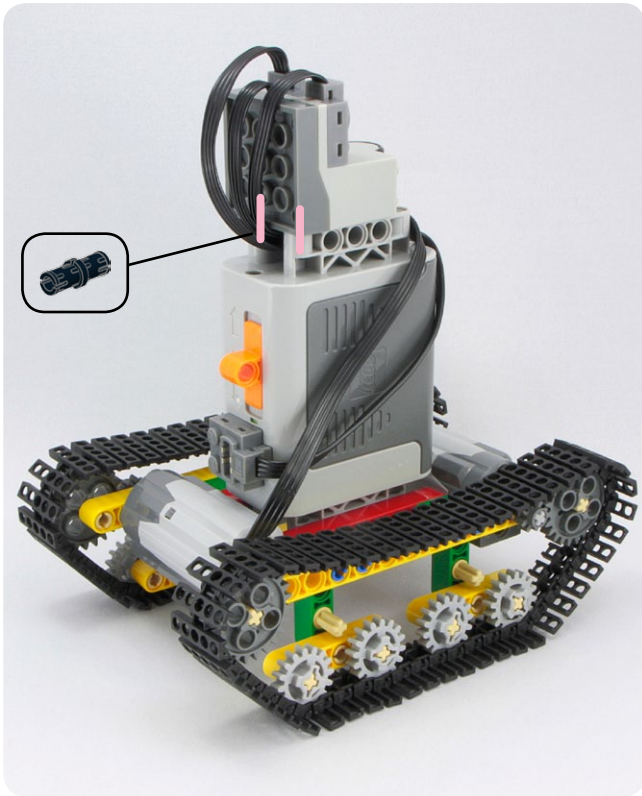
-  x2
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-  x4
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-  x2
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-  x4
-  x58
-  x2
-  x4
-  x2
-  x2
-  x2
-  x4
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-  x2
-  x4
-  x3
-  x4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

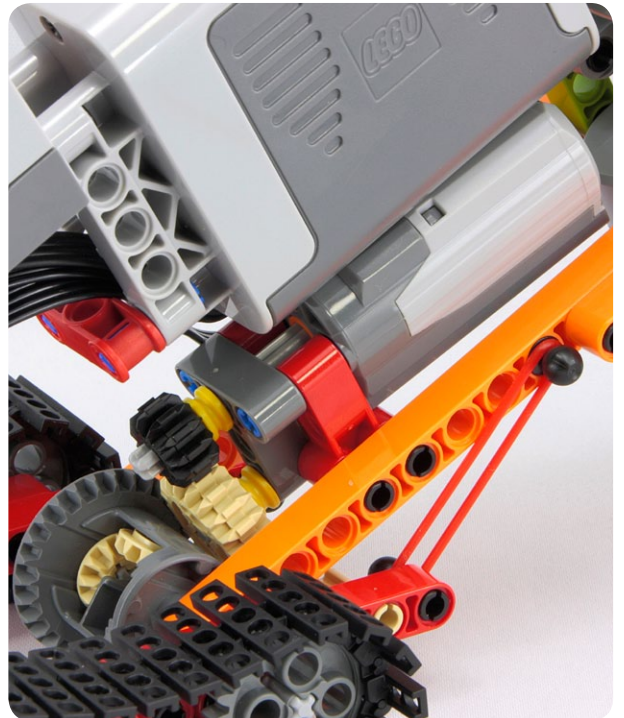
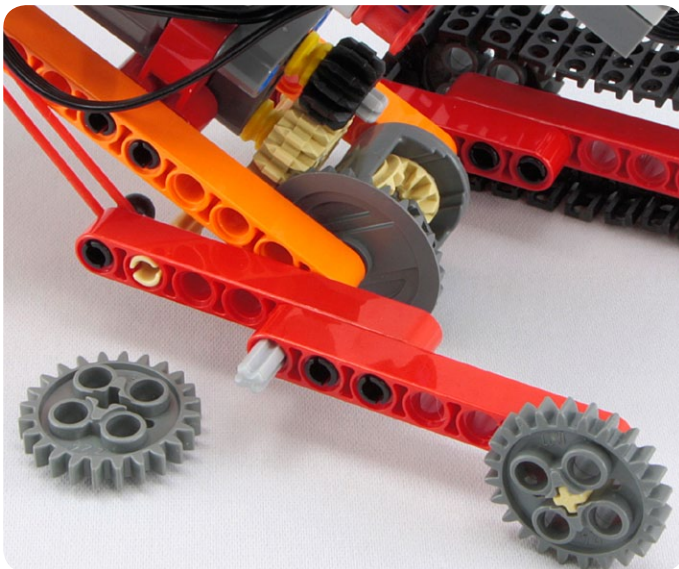
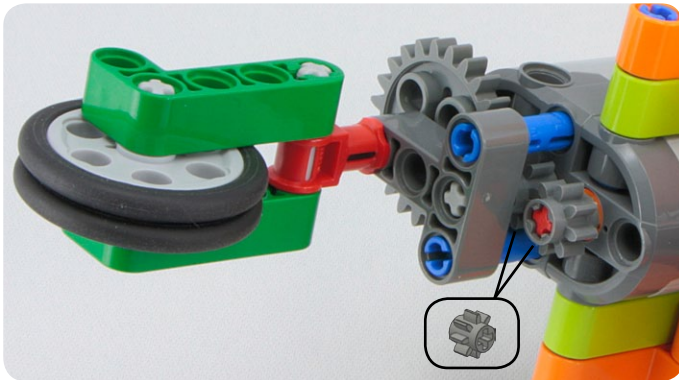


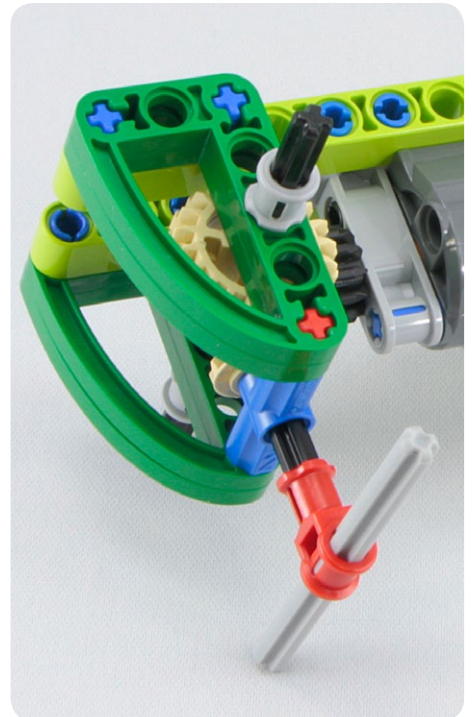
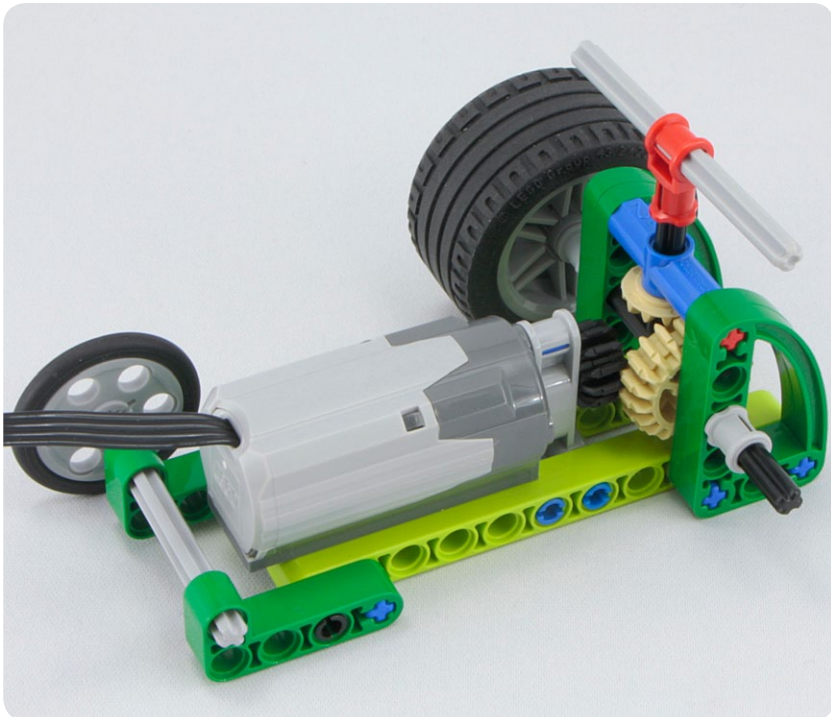
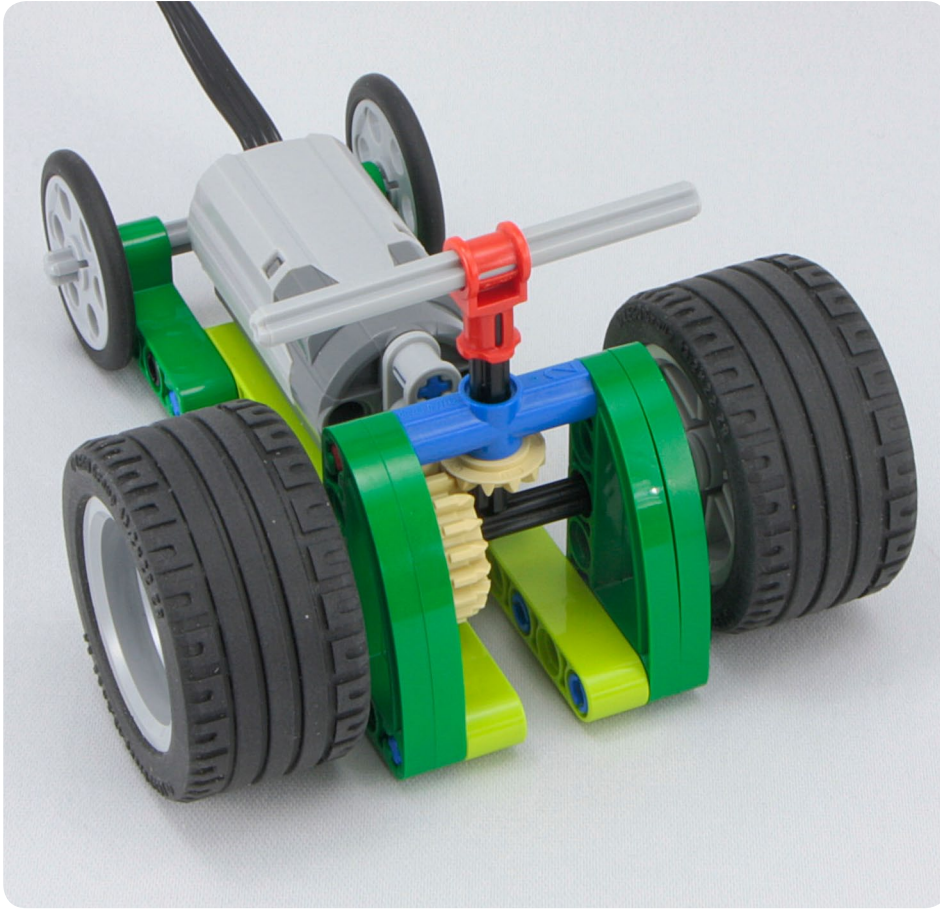


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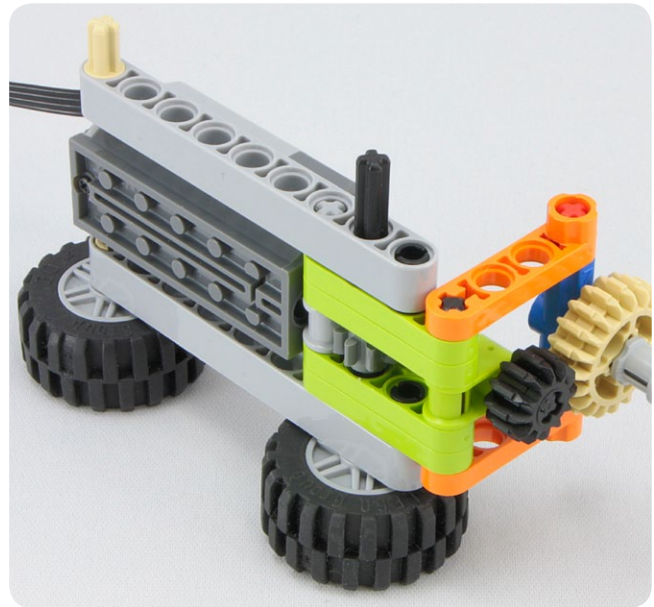
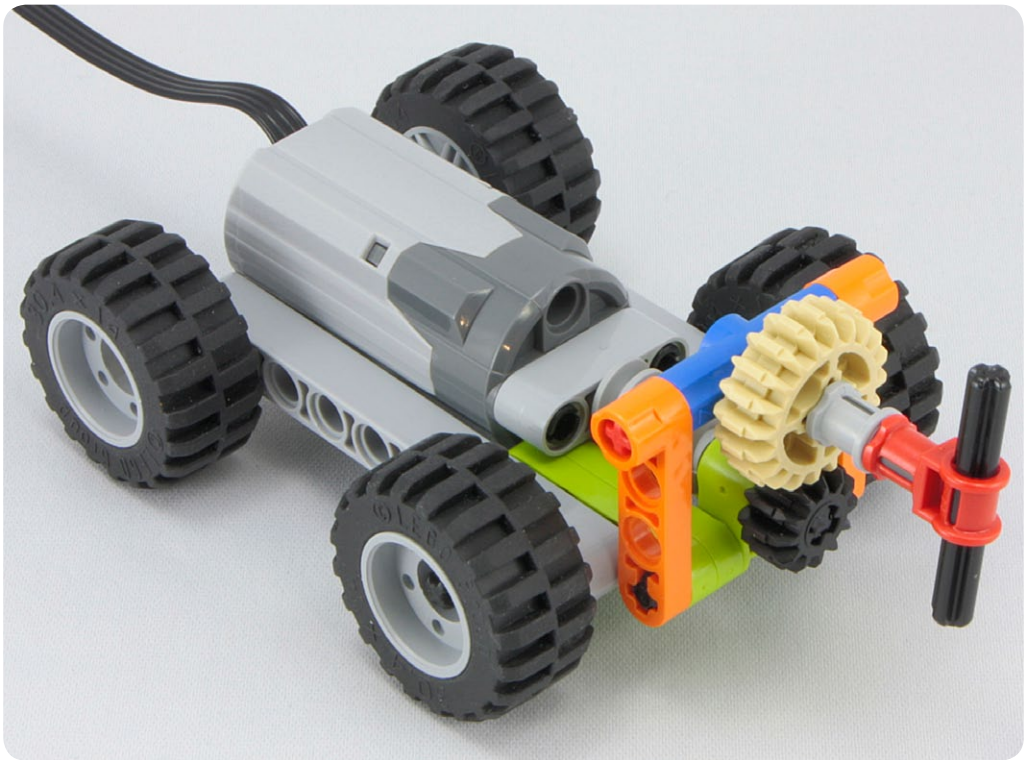






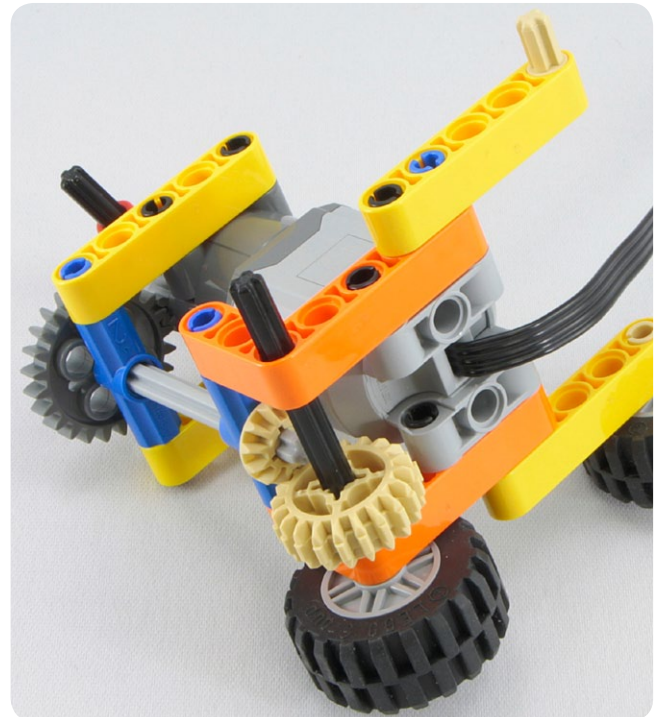
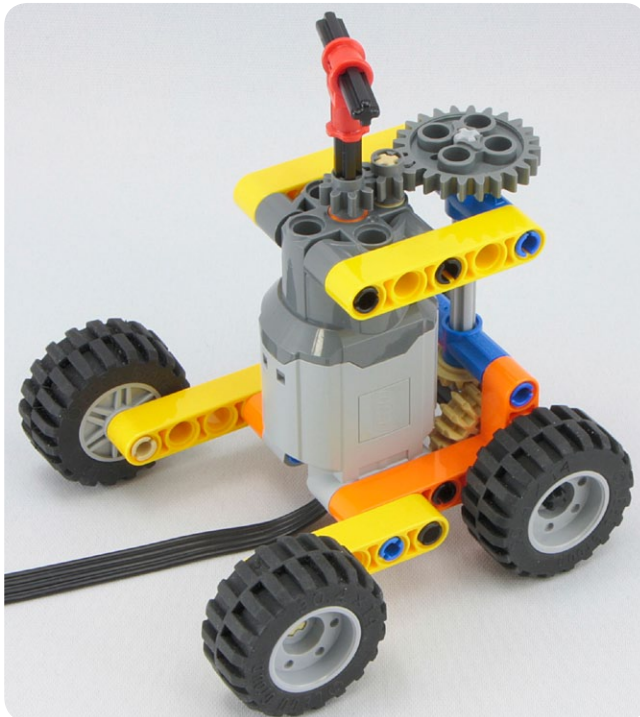


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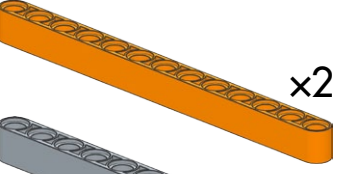
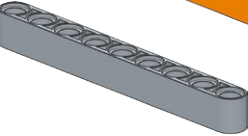






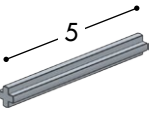
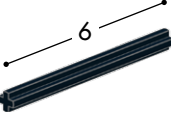
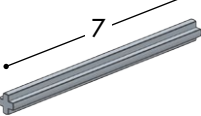




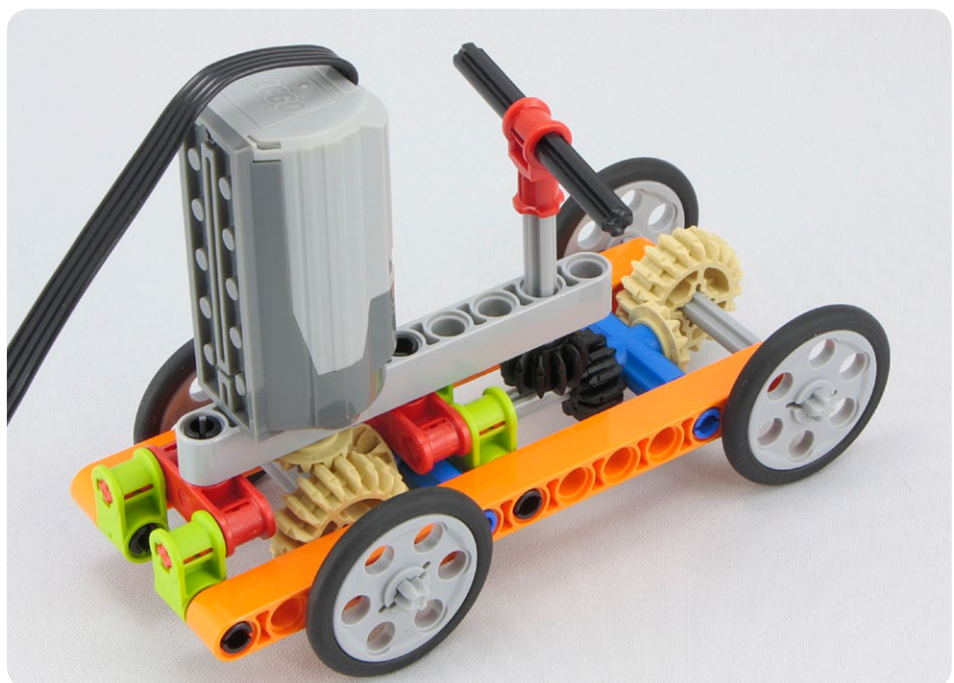
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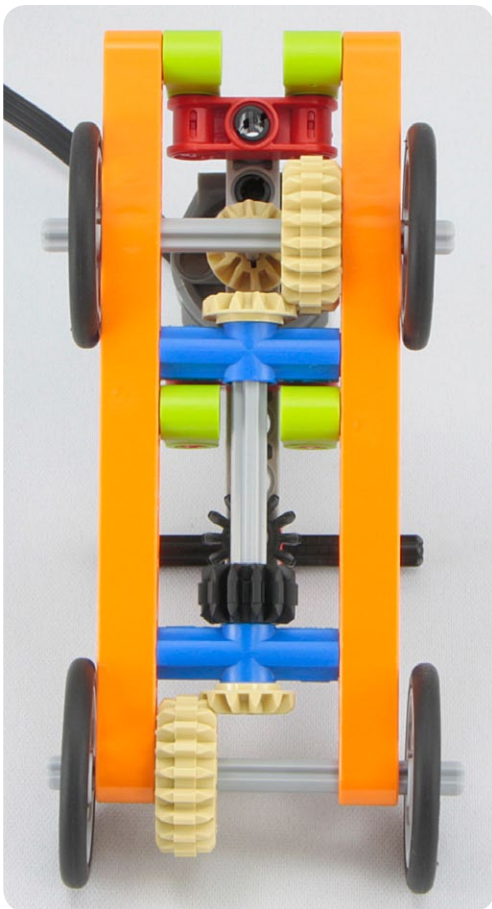
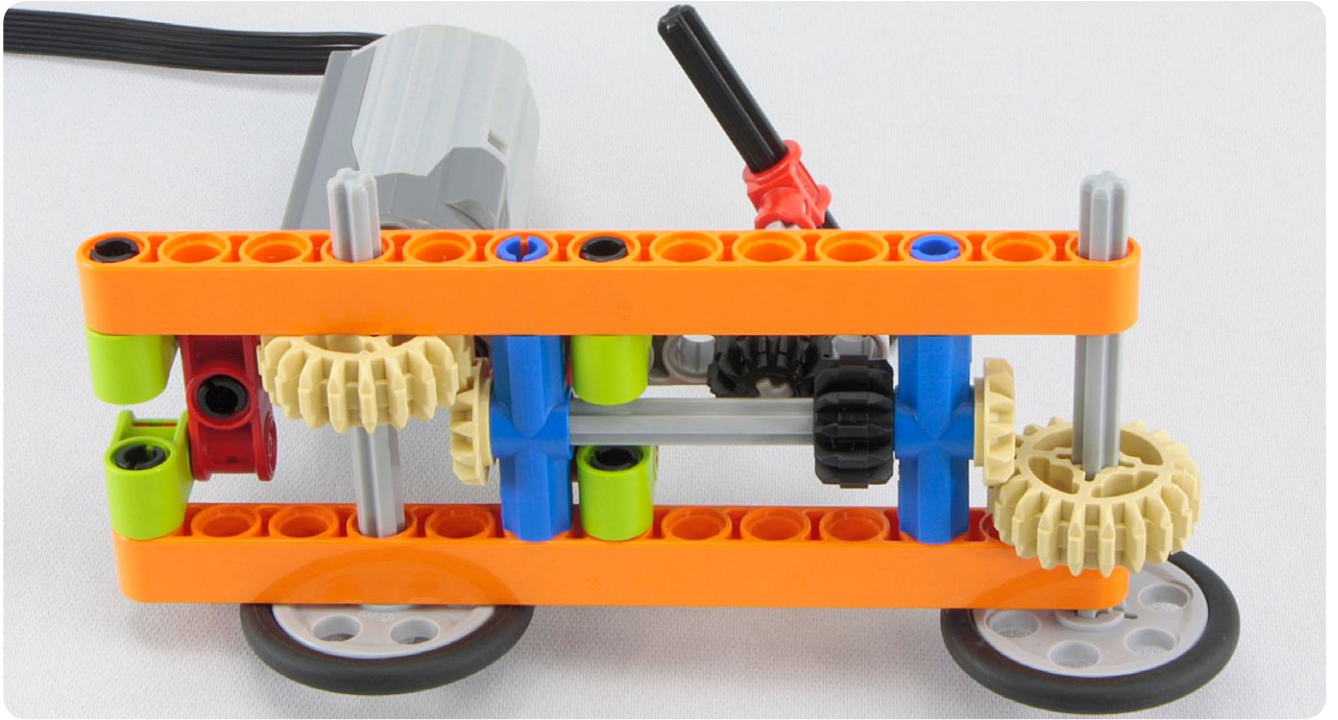
- x4
- x4
- x1
- x1
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- x1
- x2
- x1
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- x2
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- x4
- x8



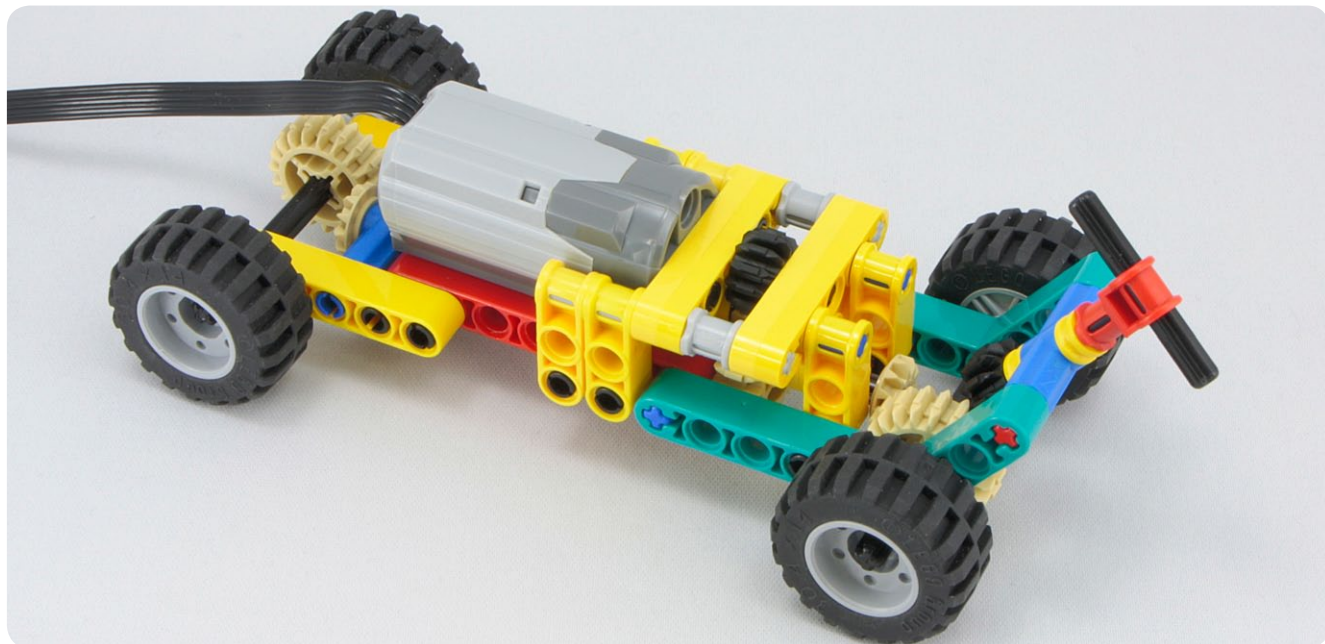
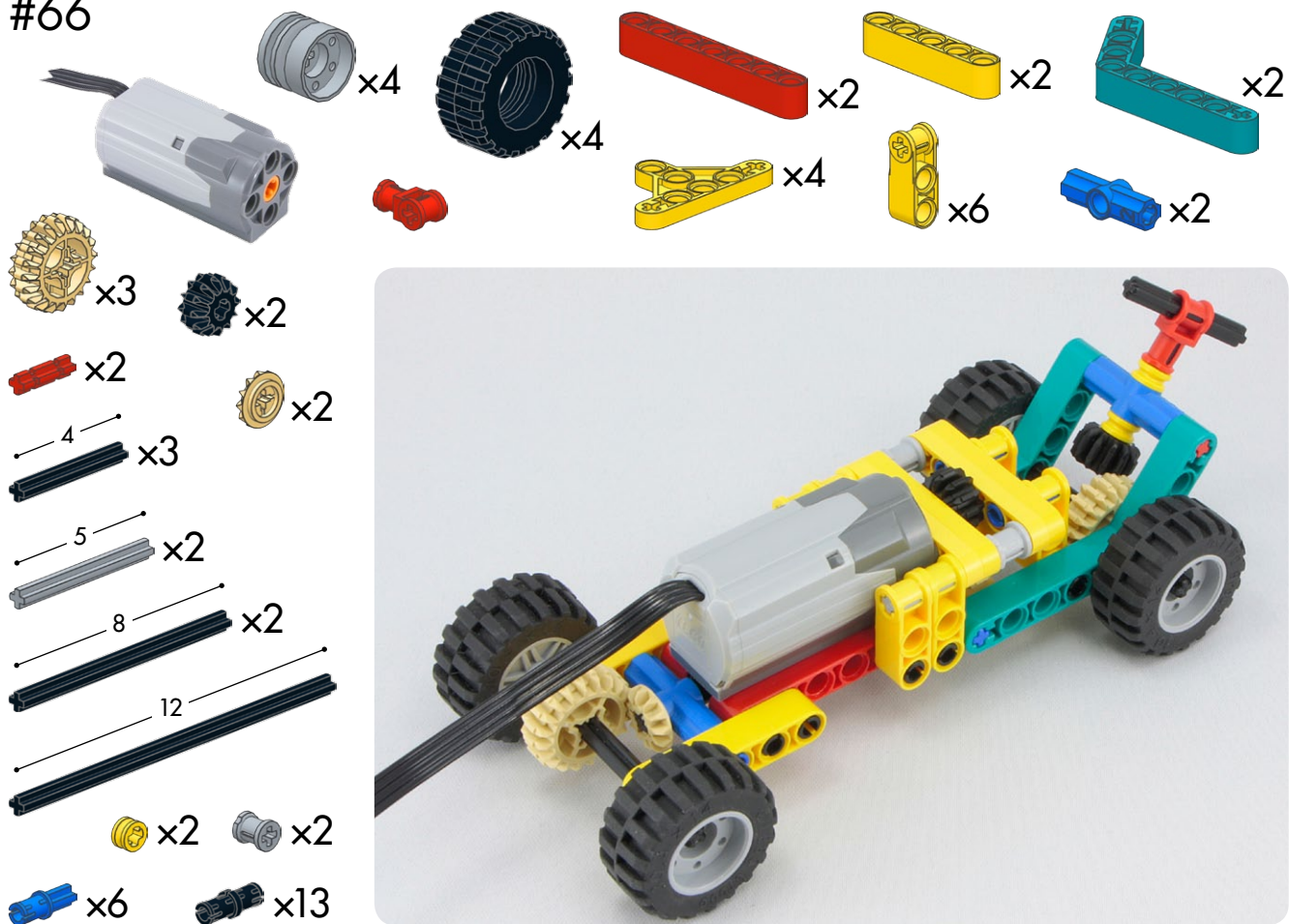
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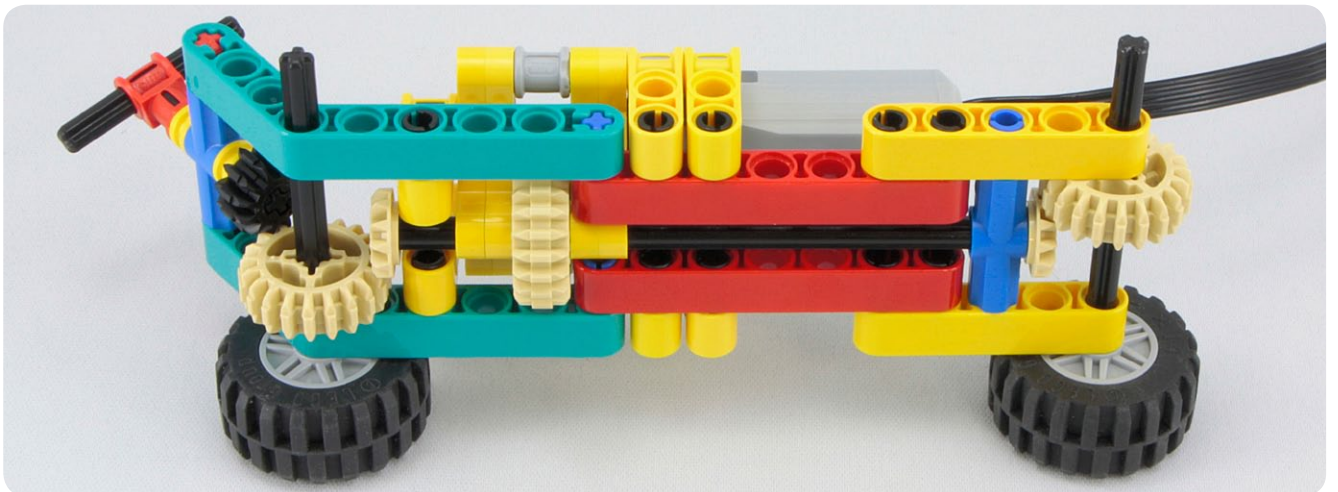
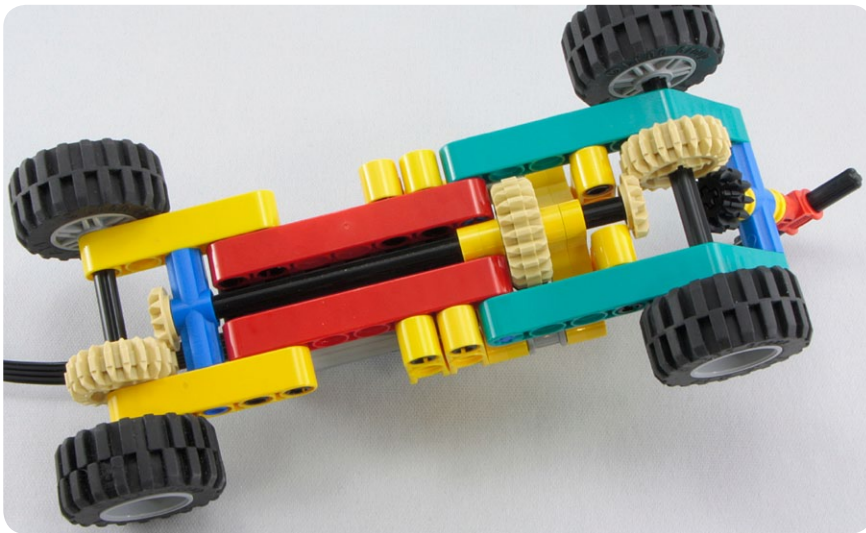
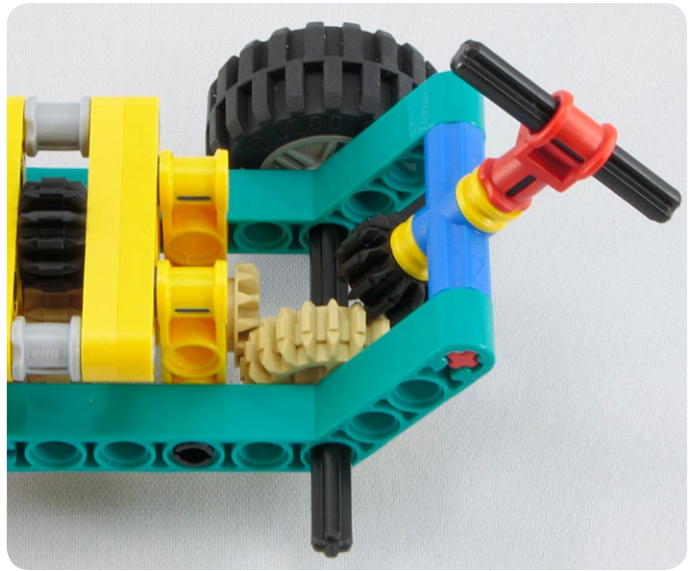
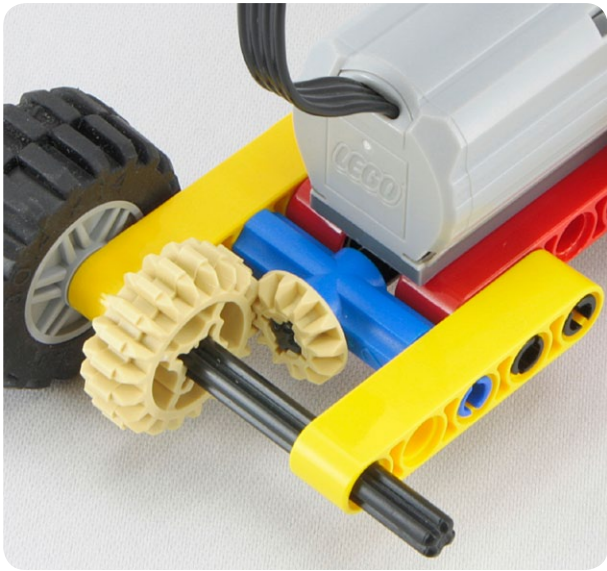
-   x2
-  x3
-  x2
-  x4
-  x4
-  x2
- 
-  x2
- 
-  x4
-  x2
-  3
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-  5
-  6
-  7 x3
-  x4
-  x8



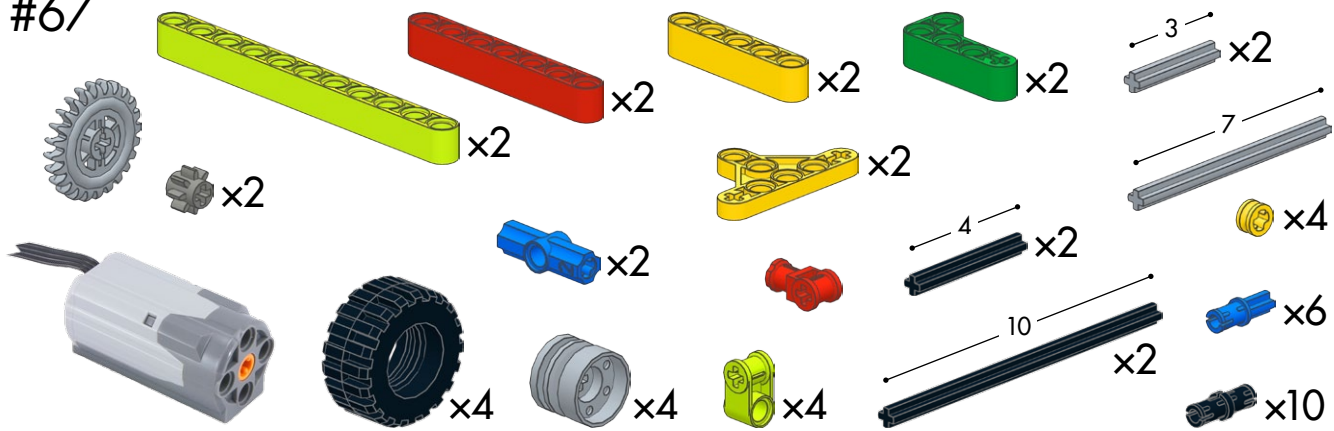


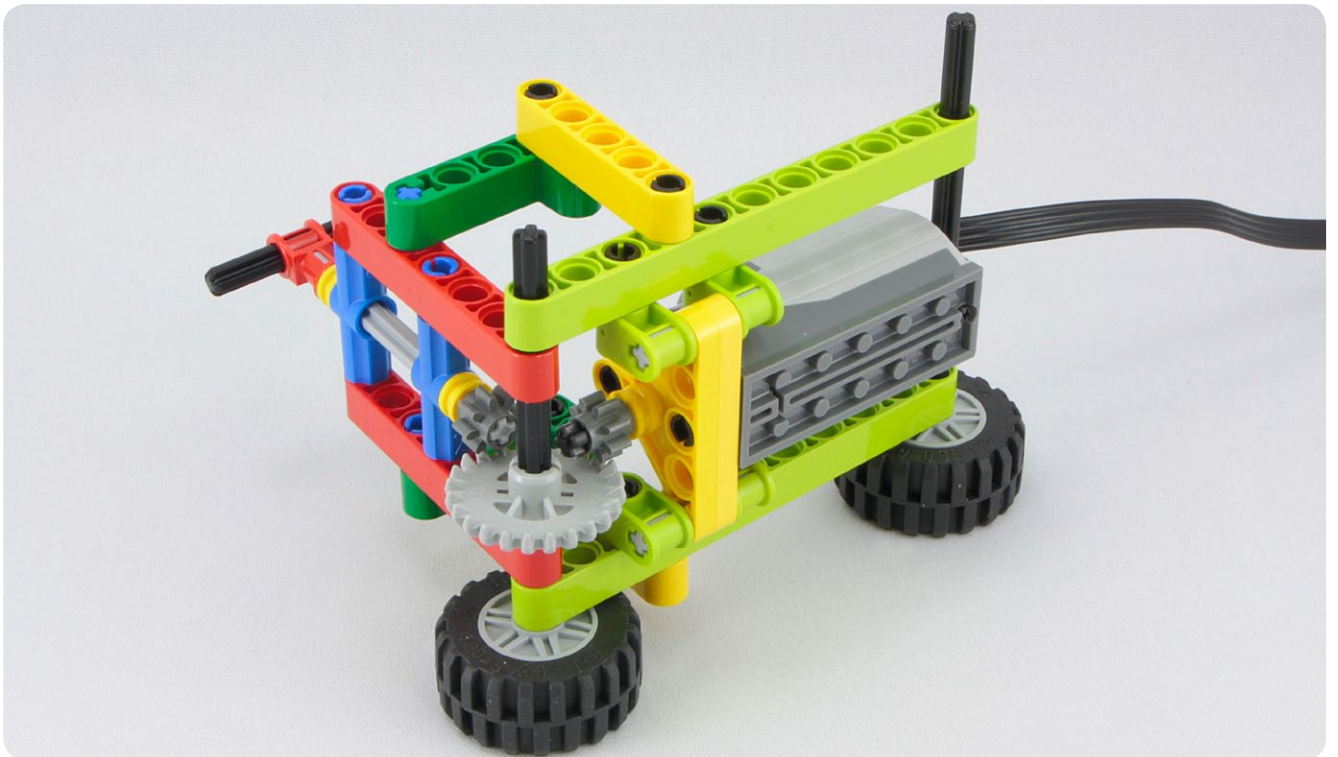
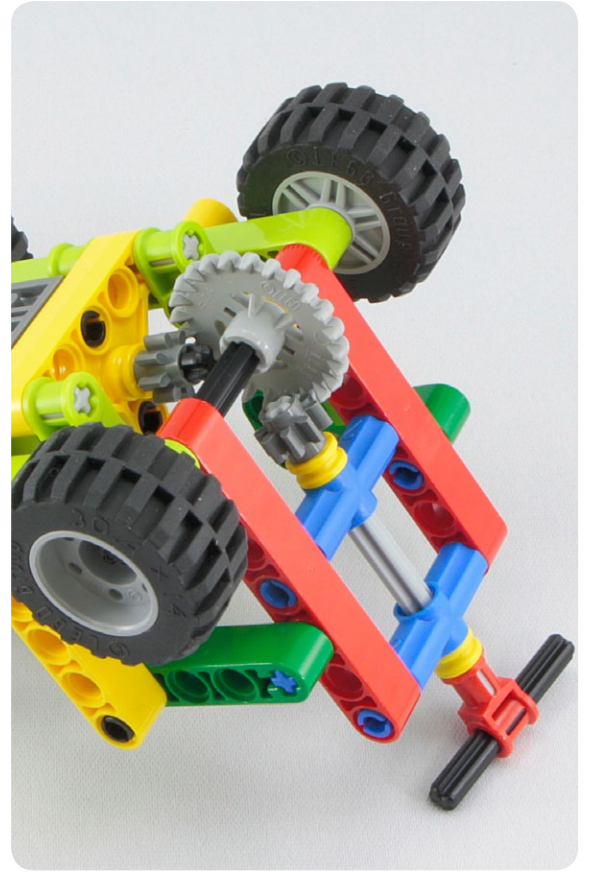
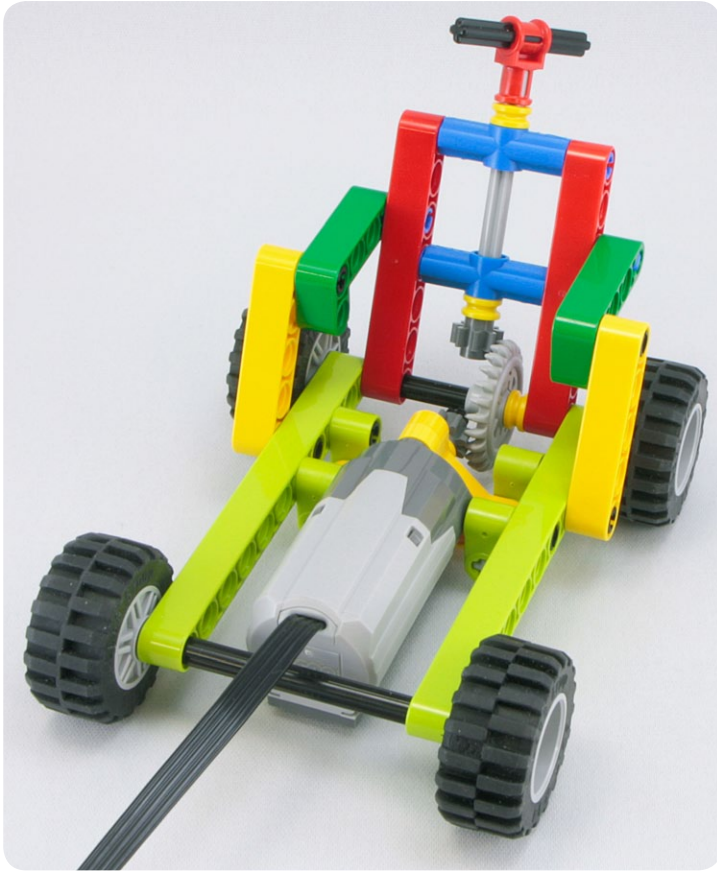
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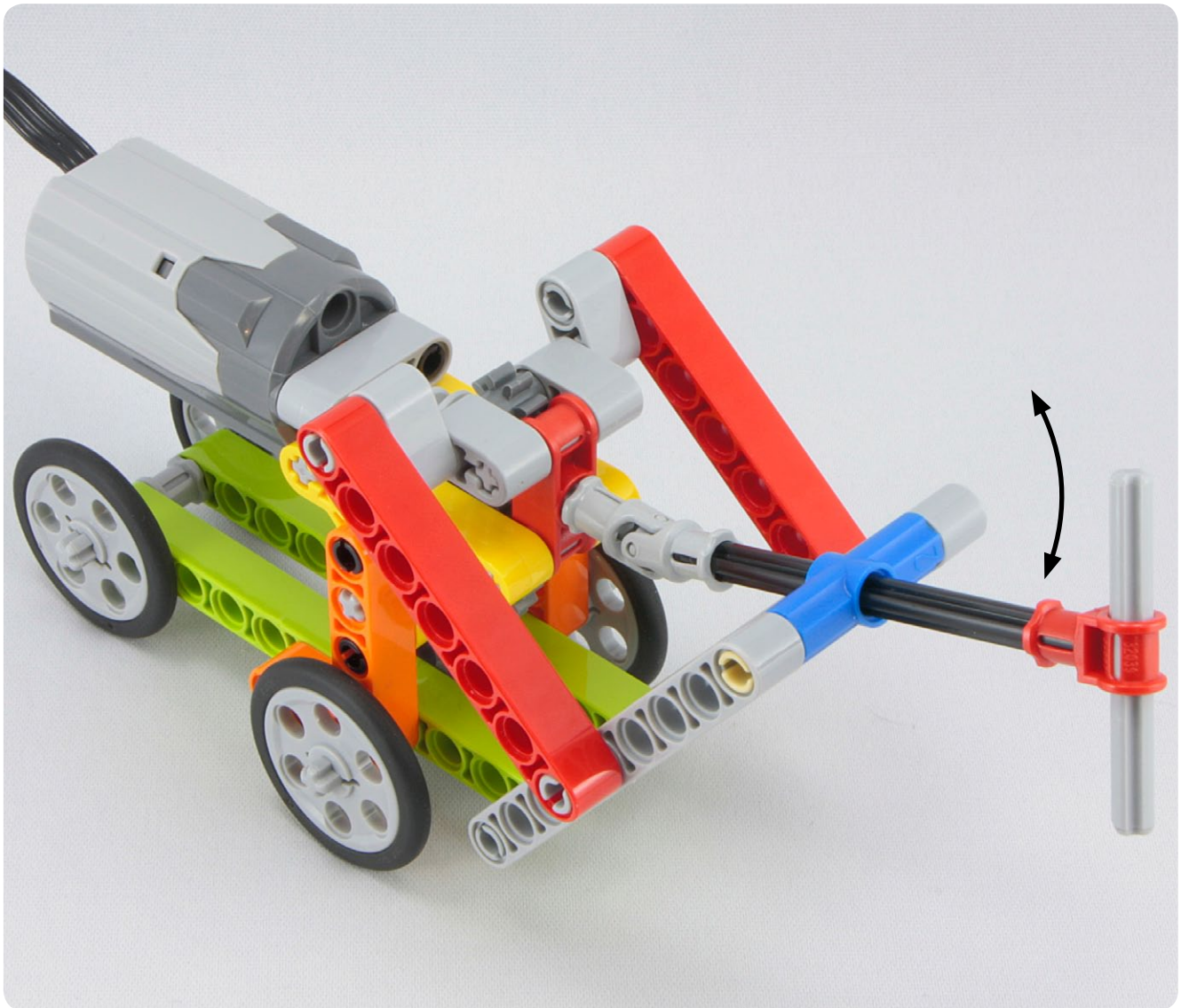
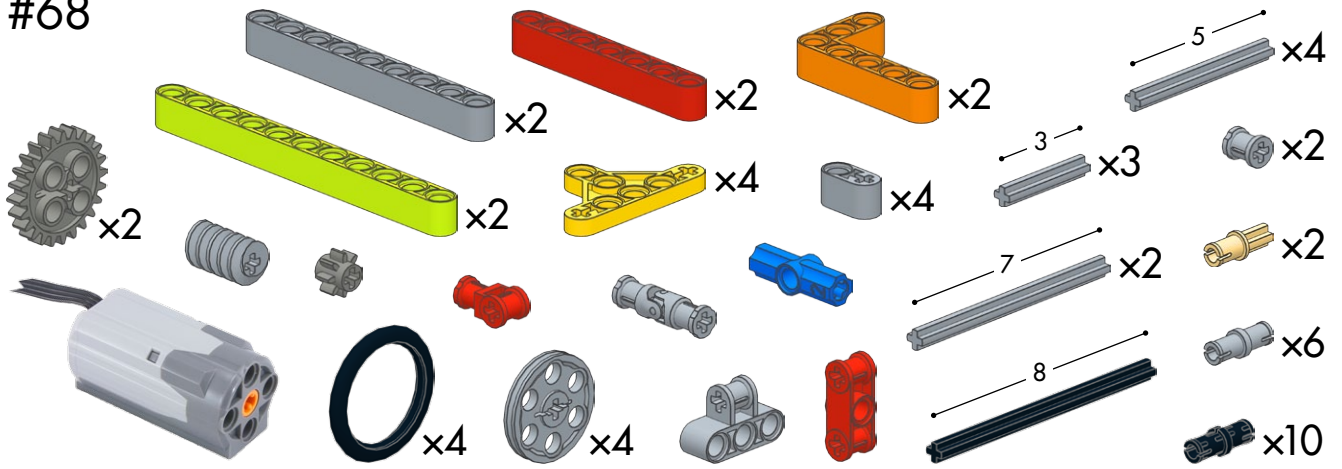


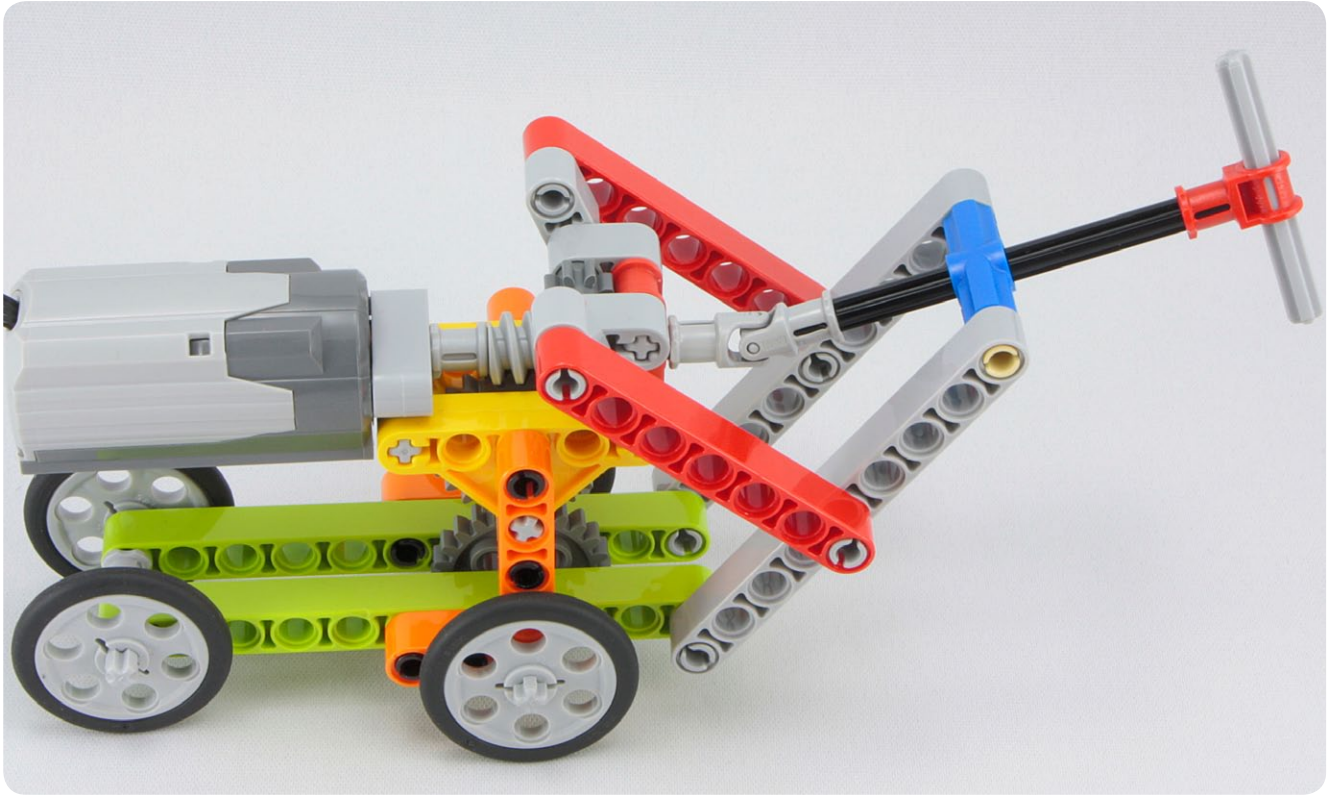
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#68

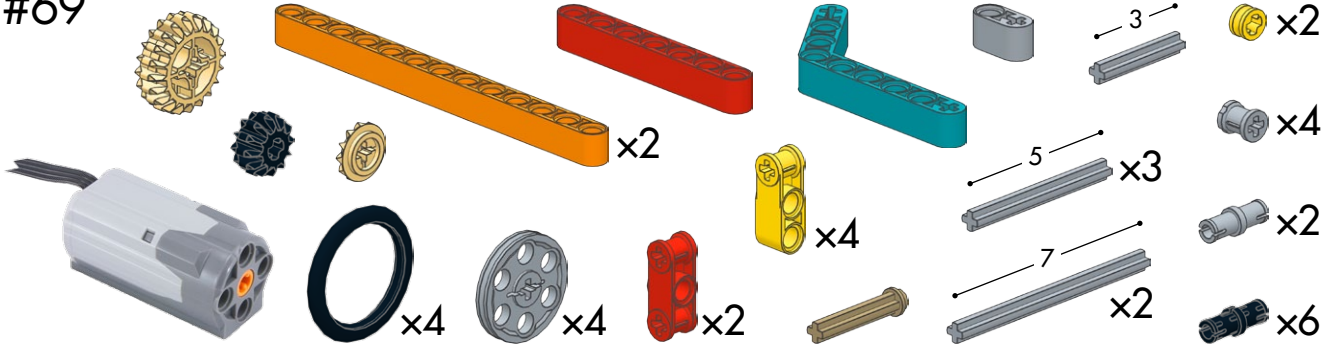


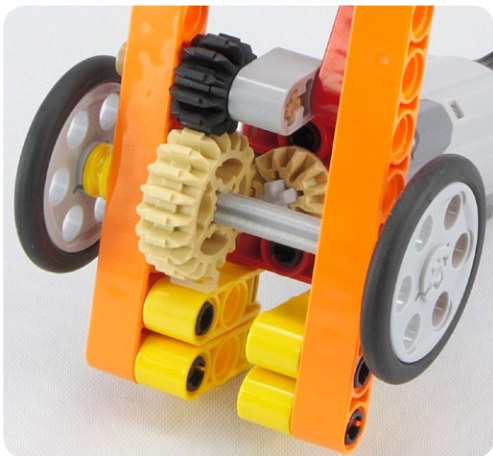
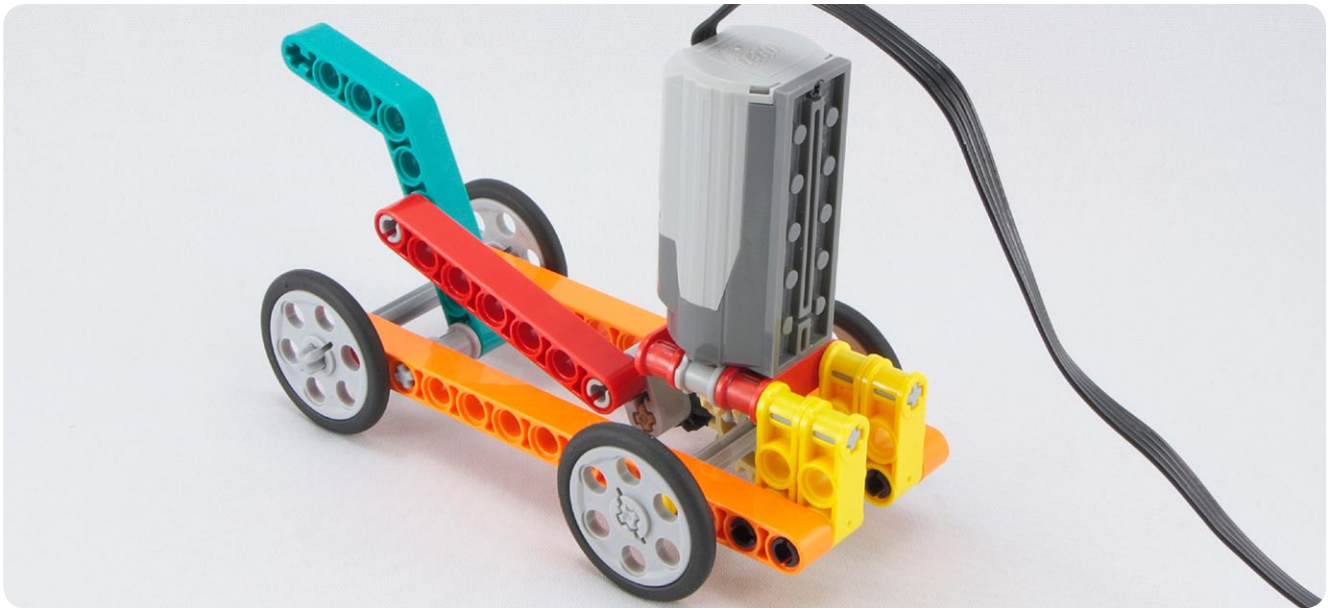




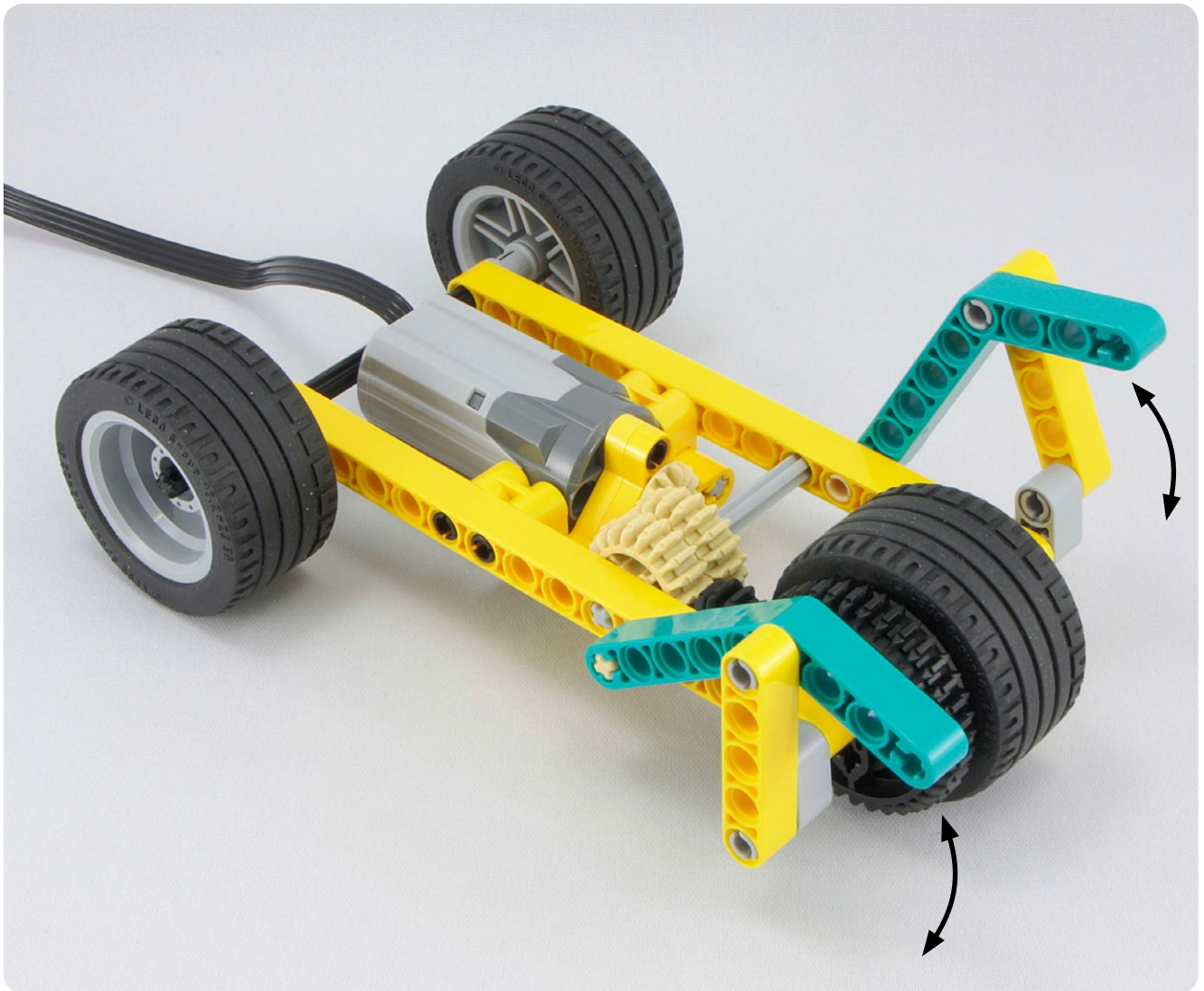
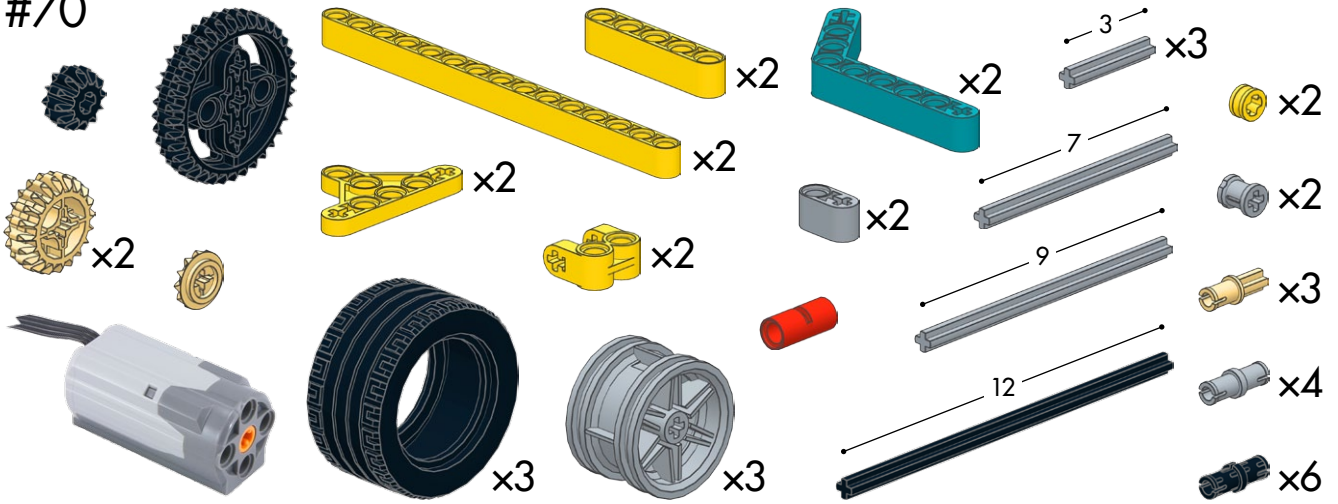
Cars that move something

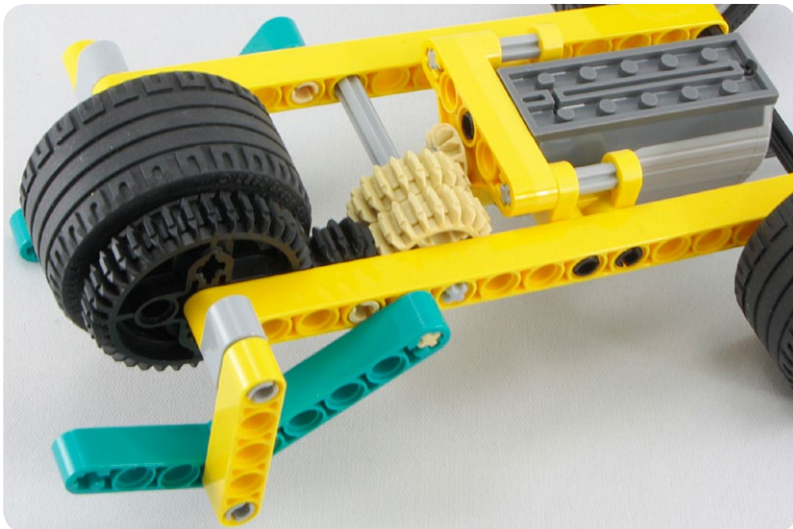
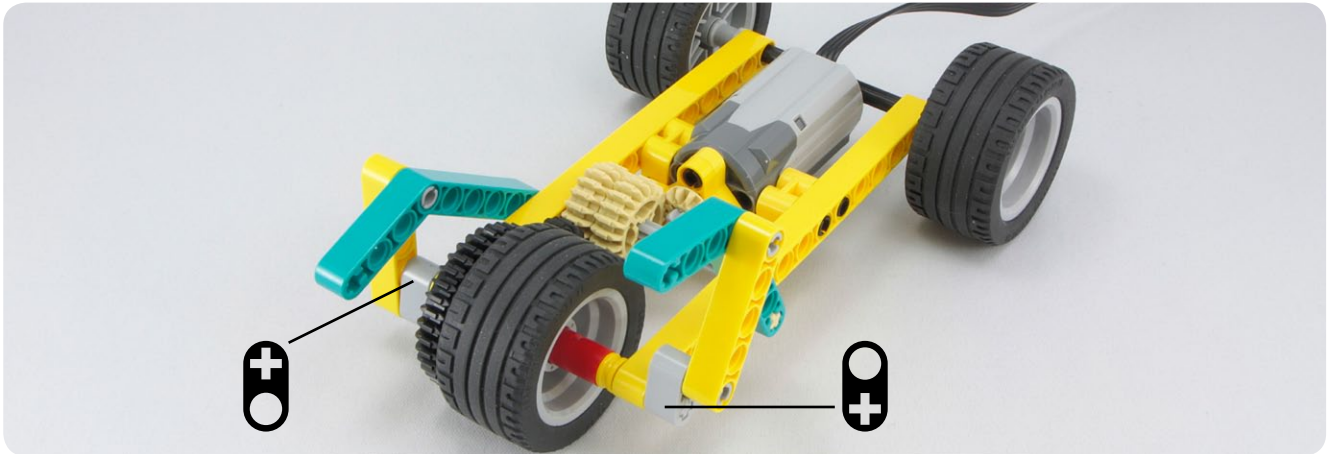
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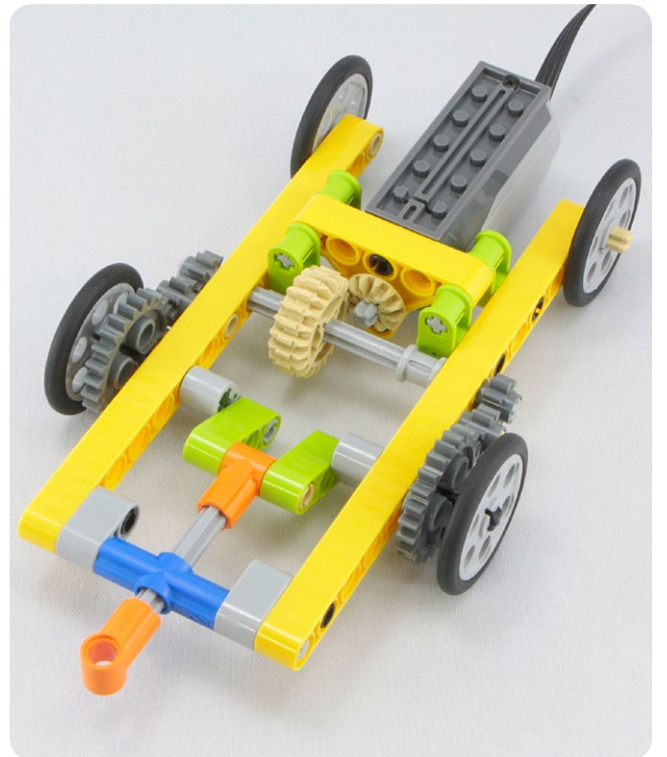
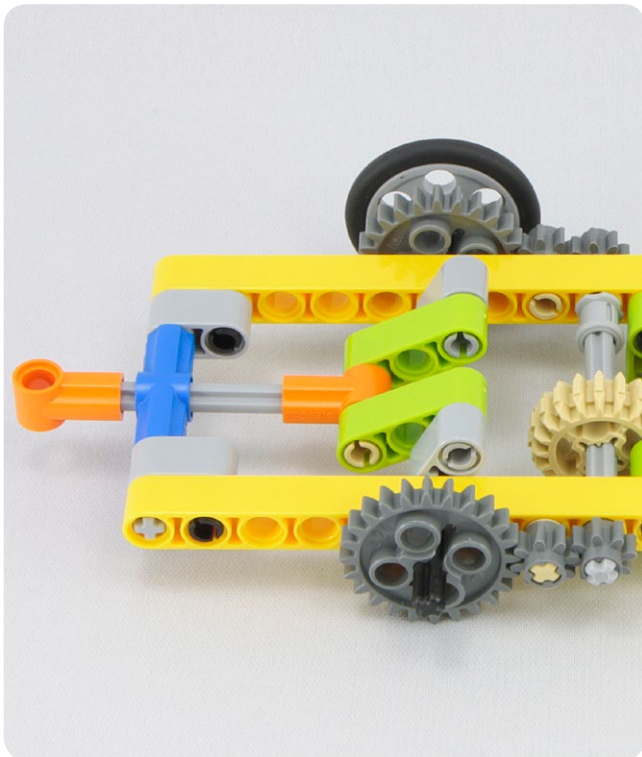




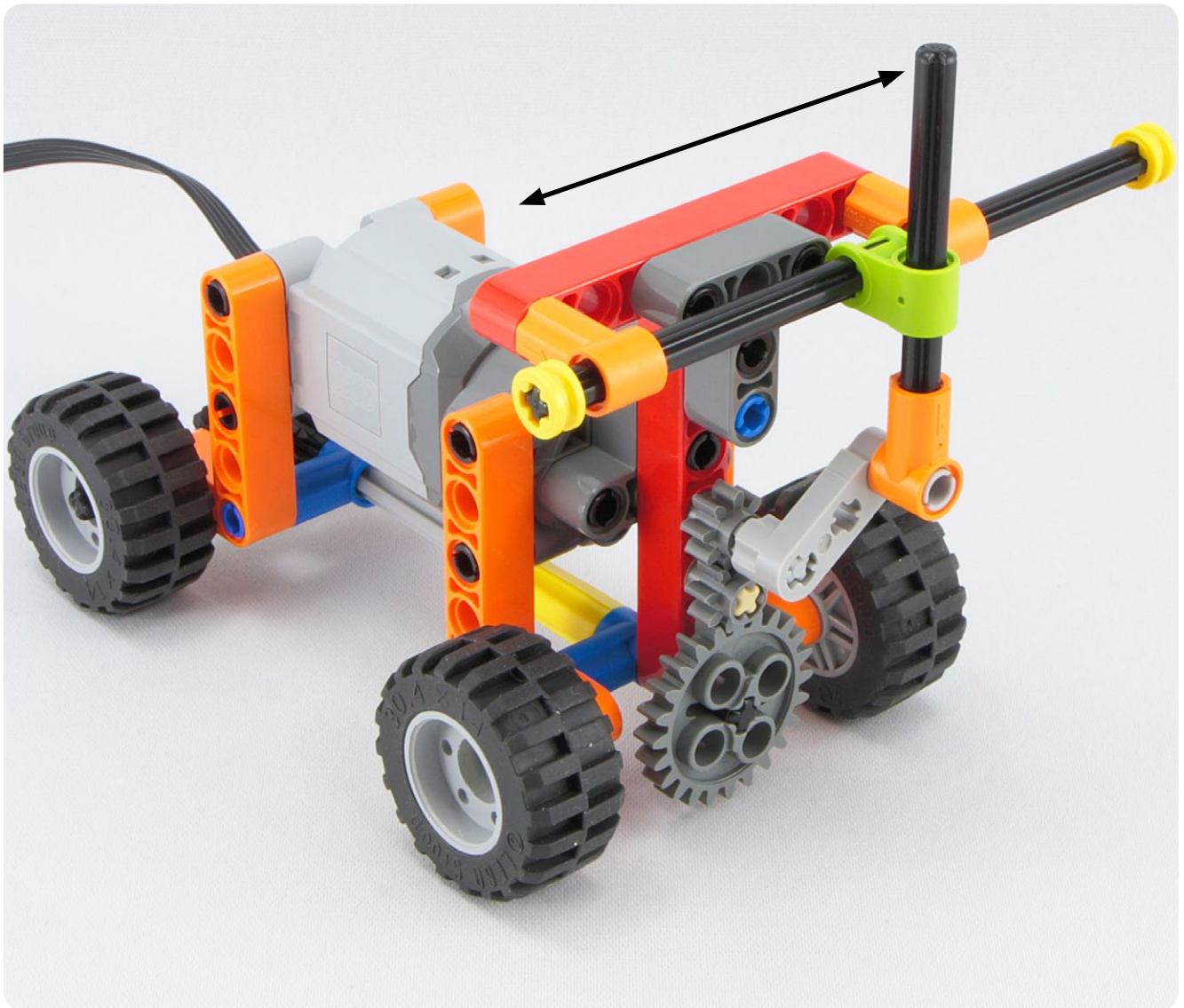
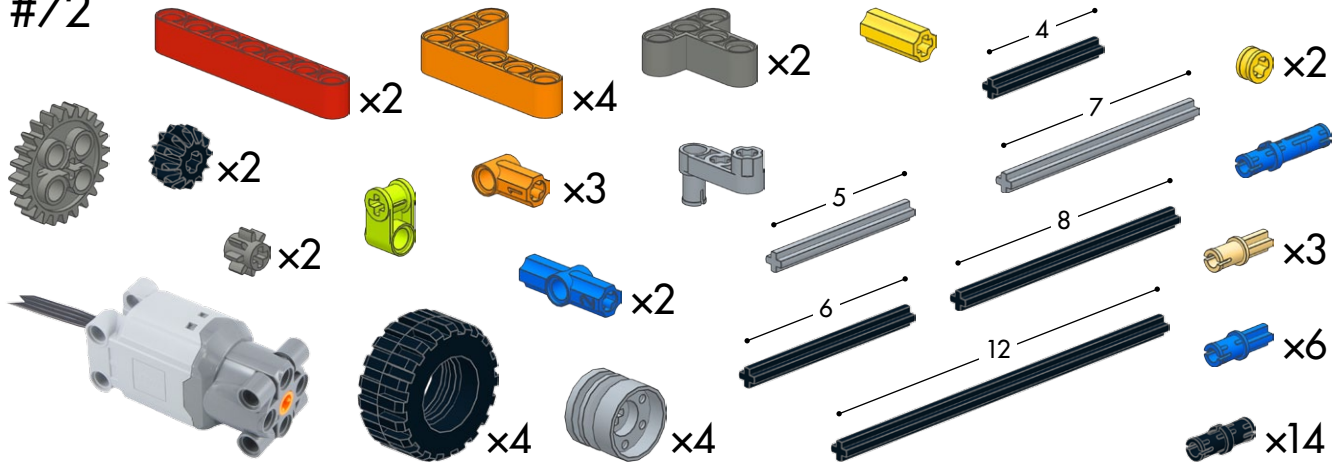
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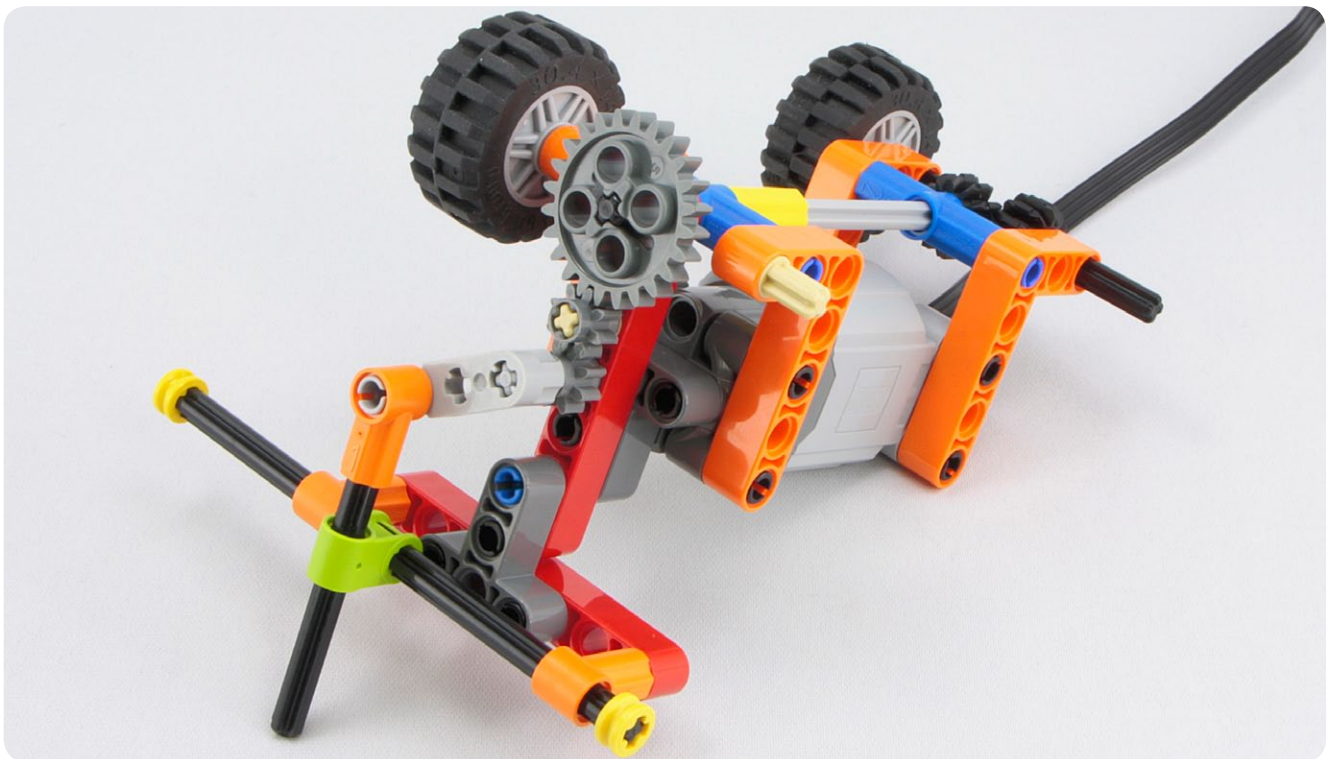




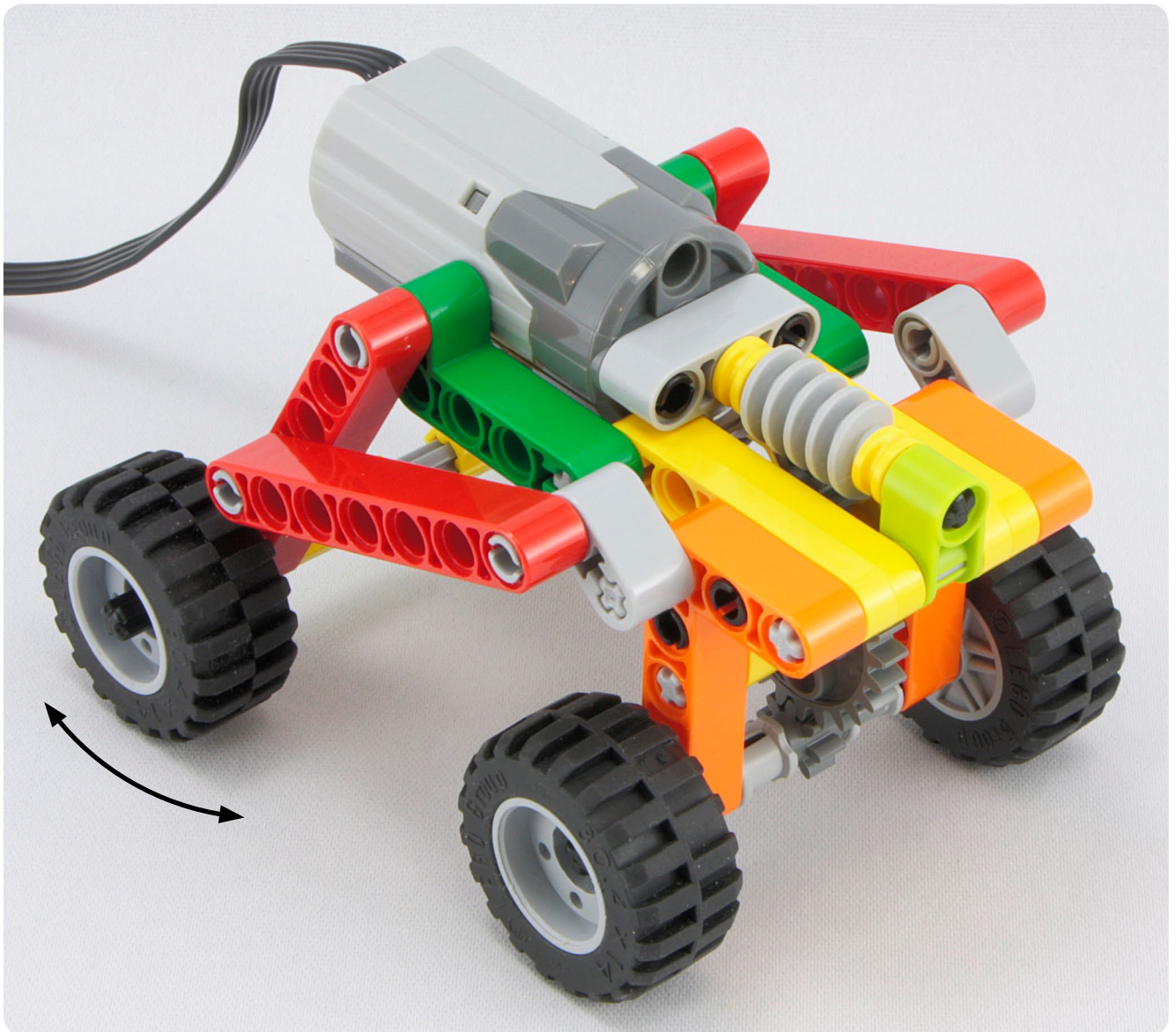
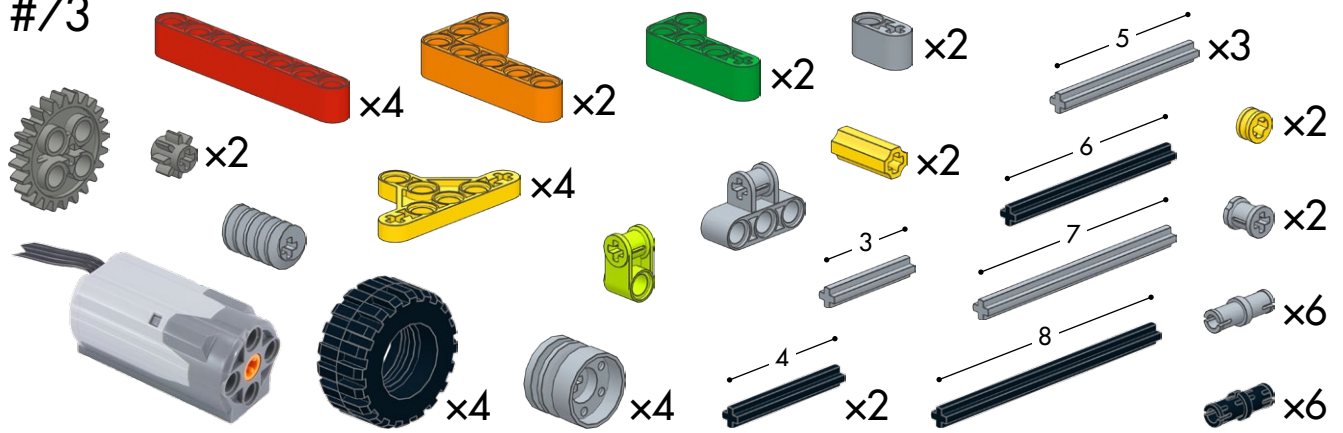


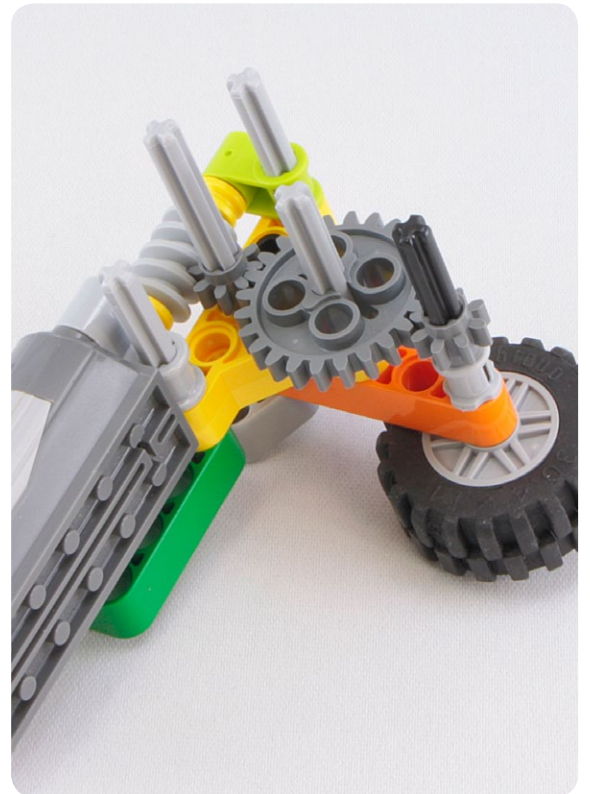
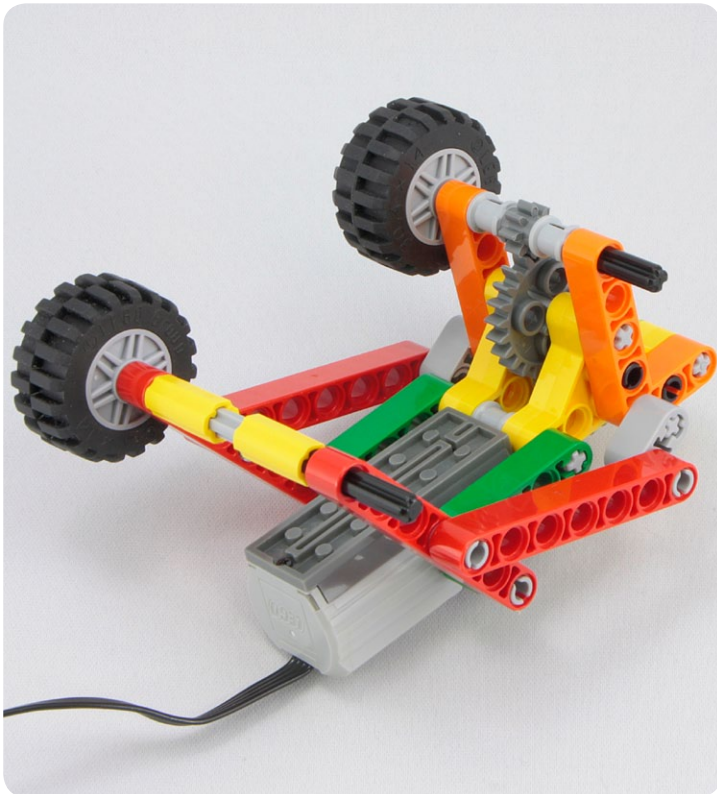
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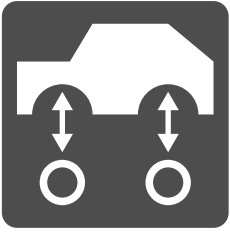




#73

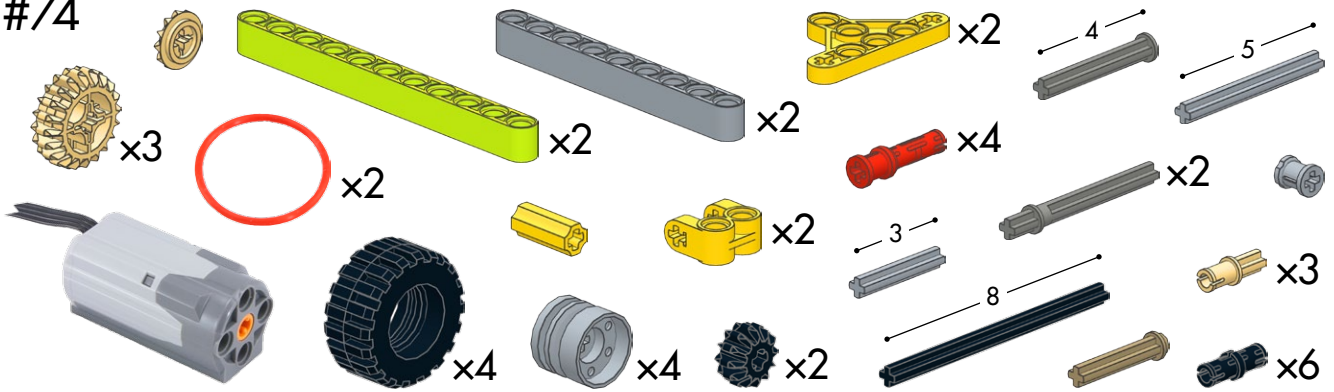


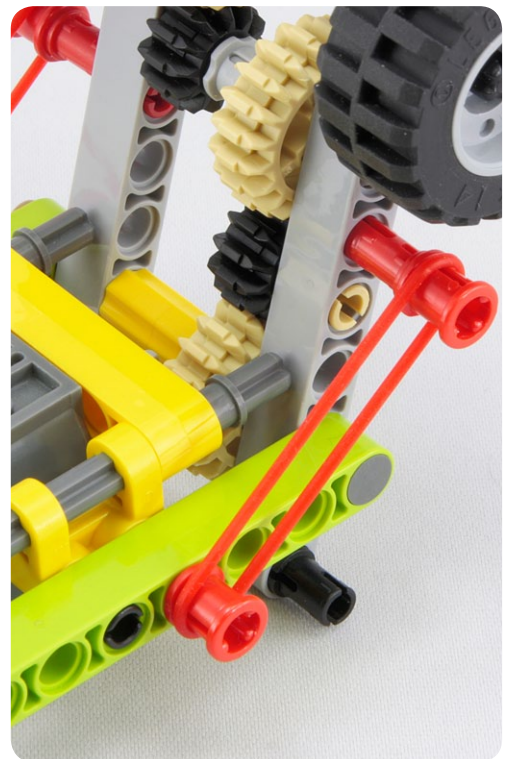
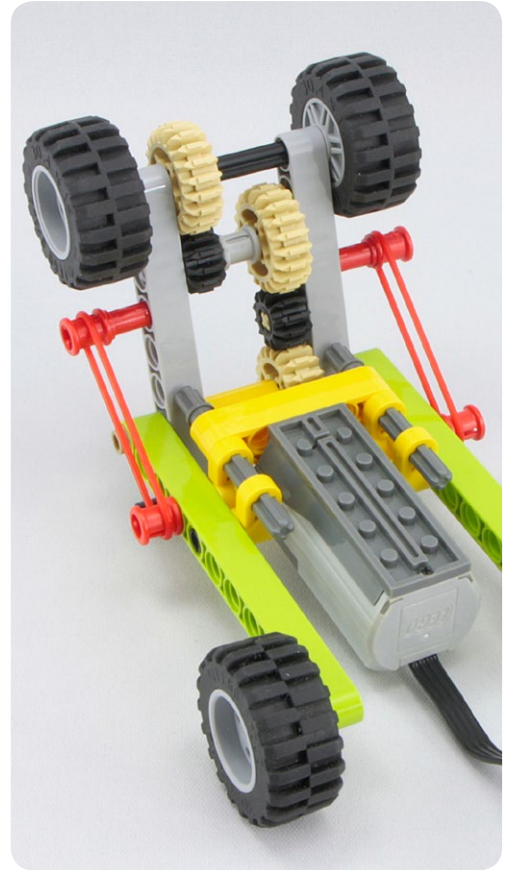


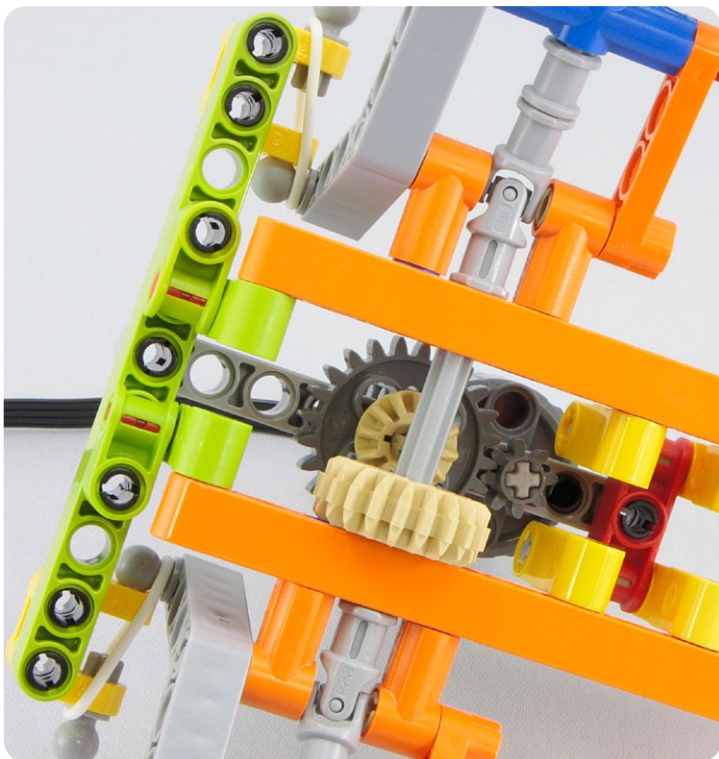


Cars with suspension

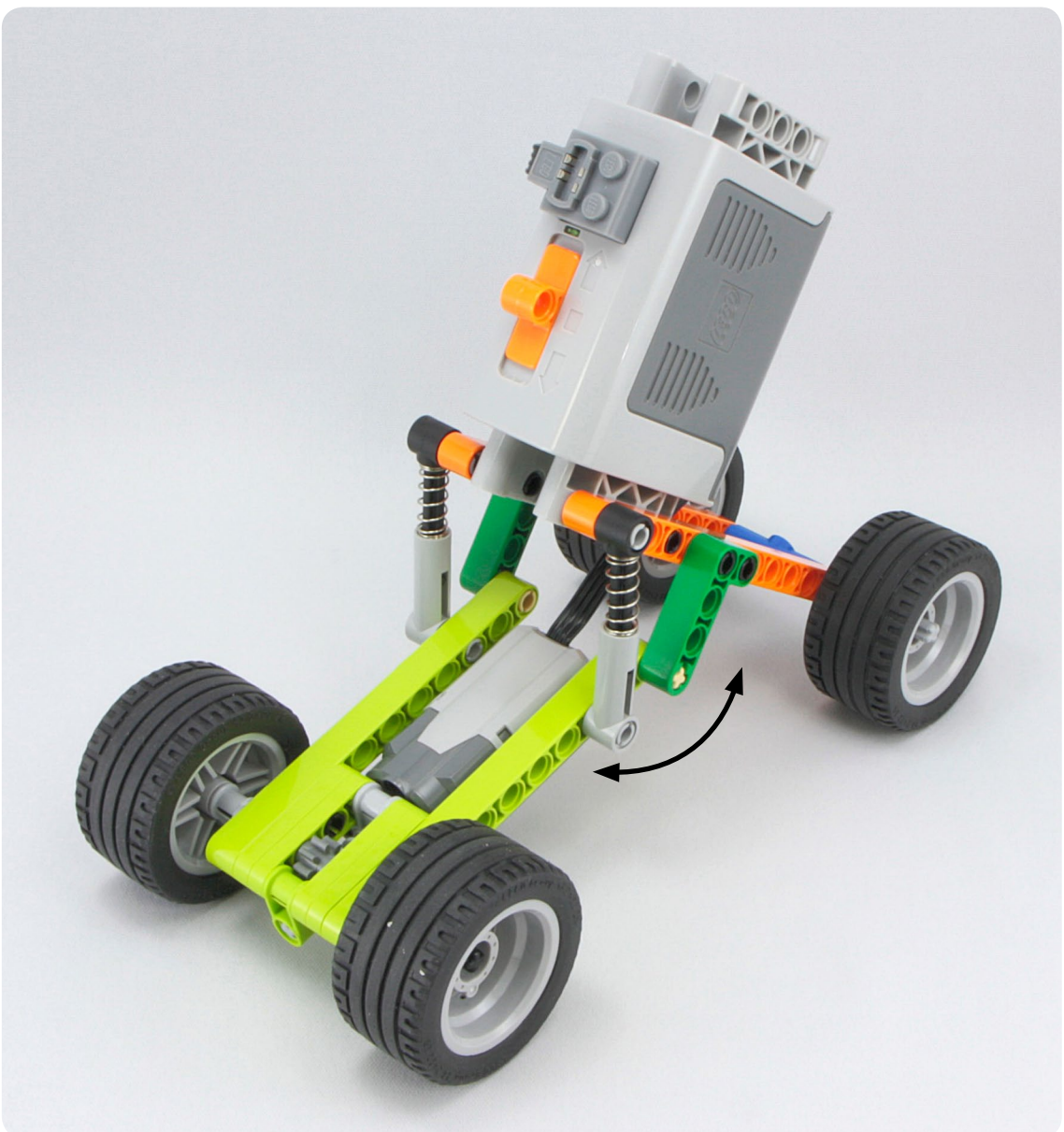
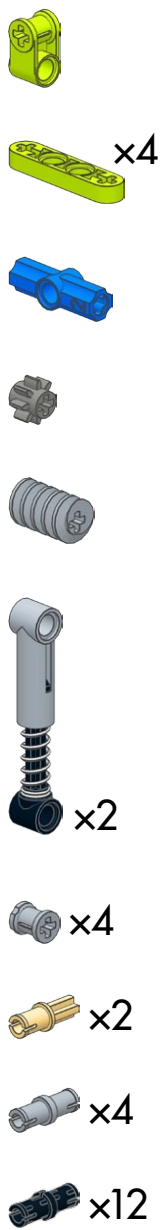
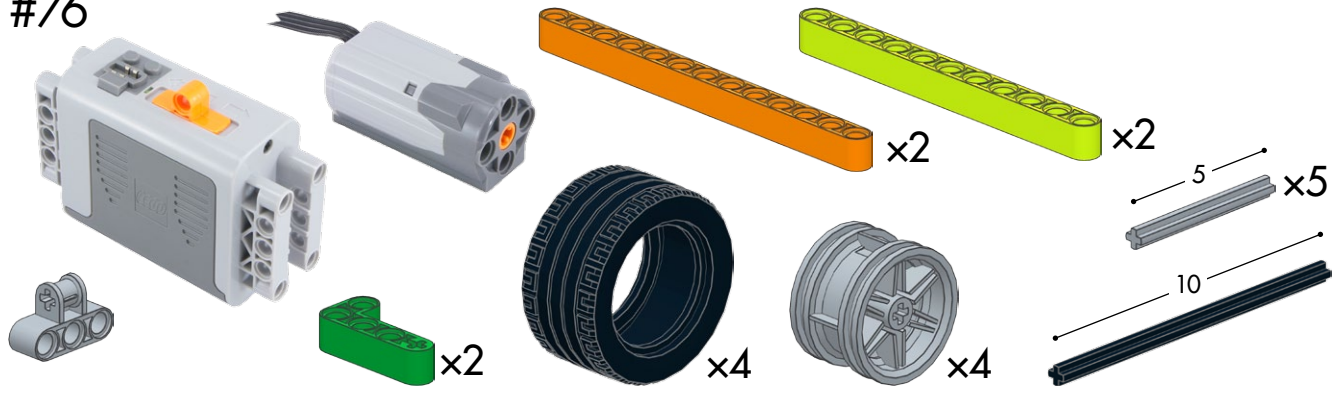
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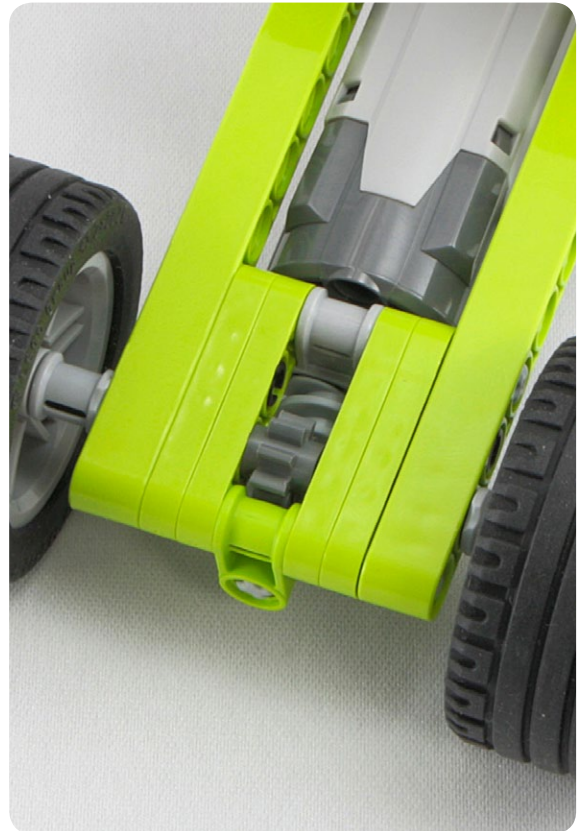
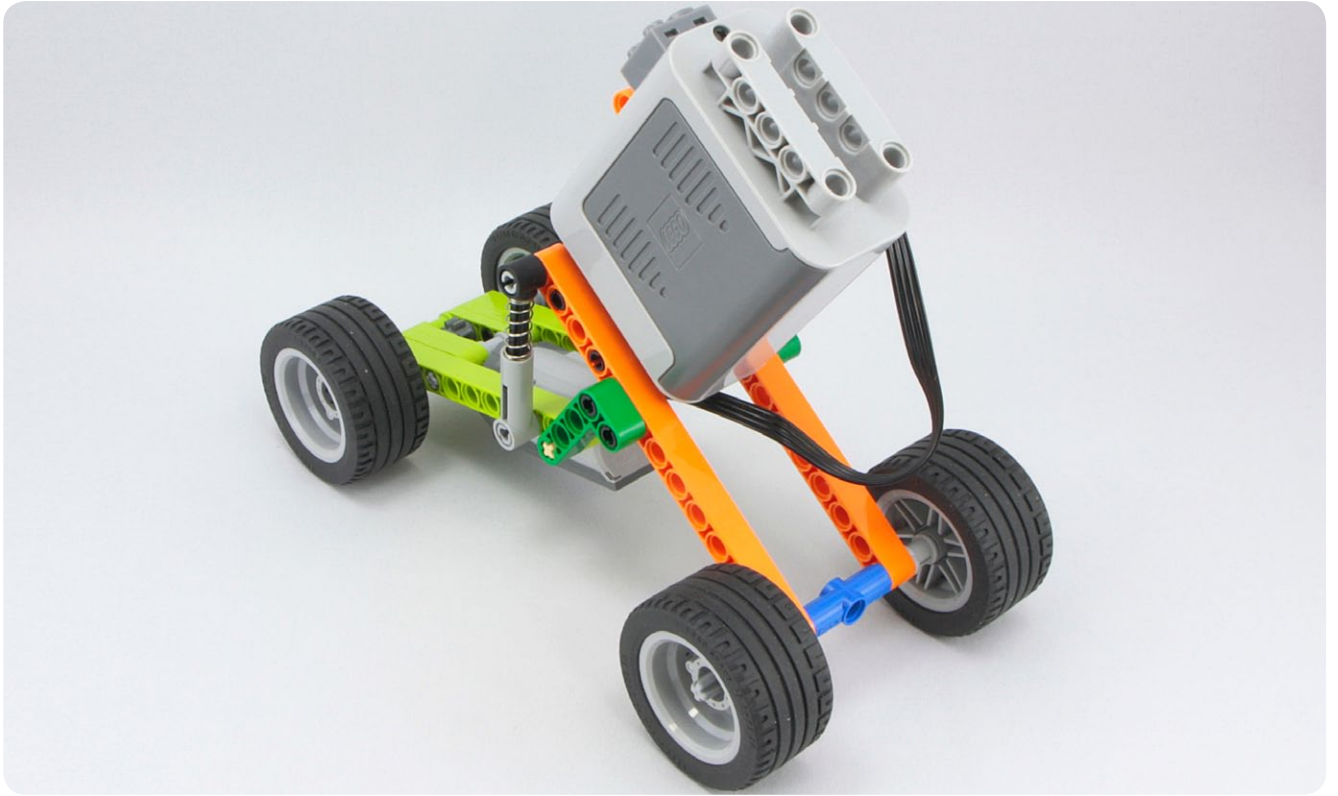




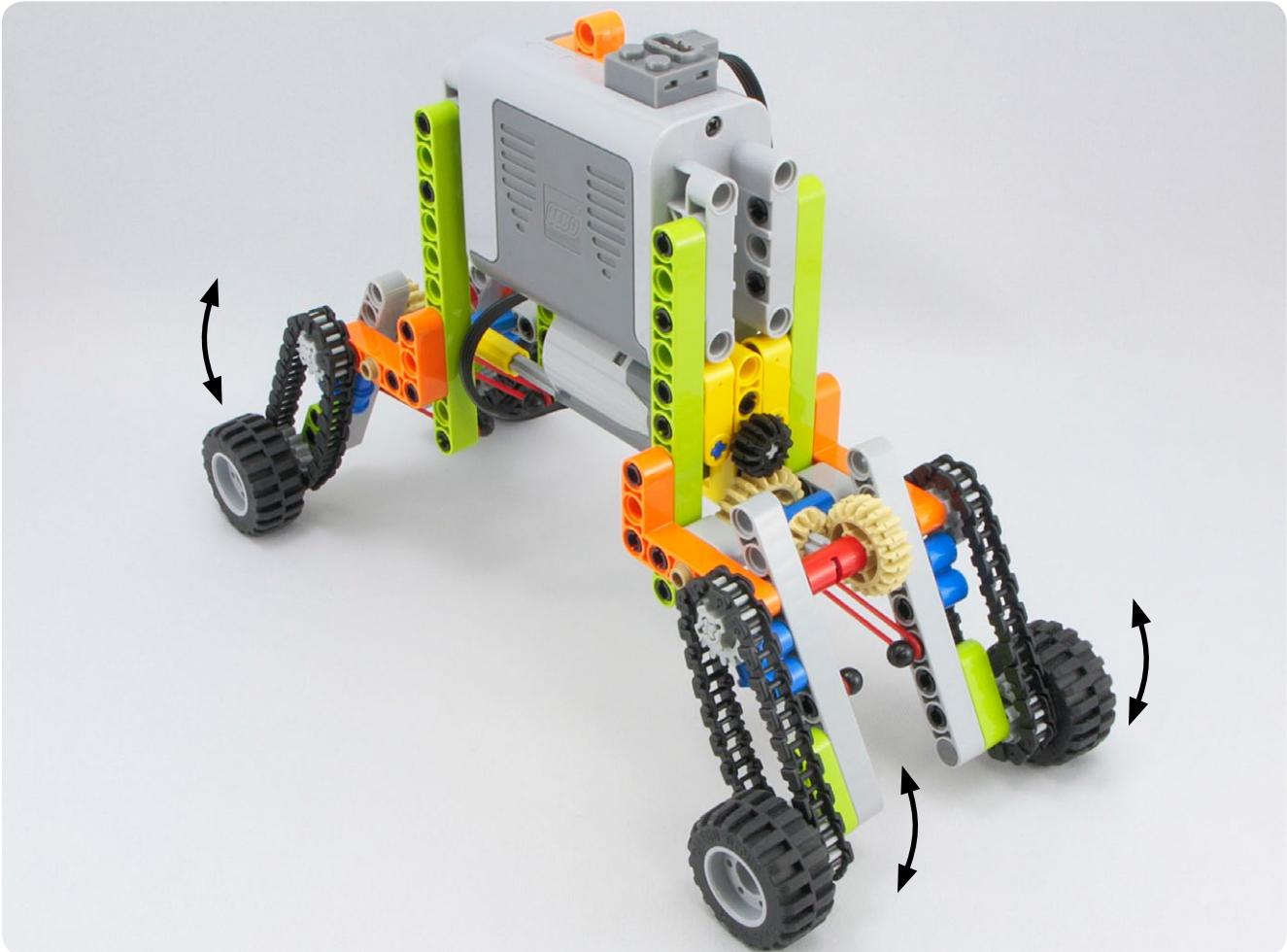
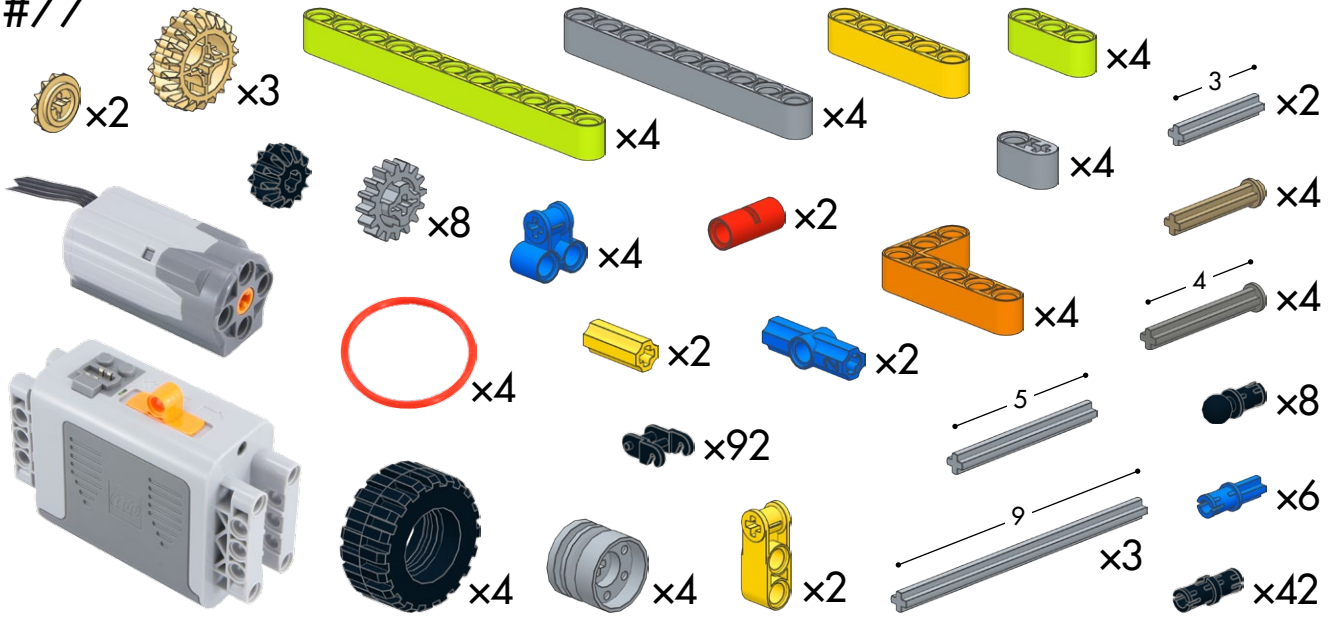


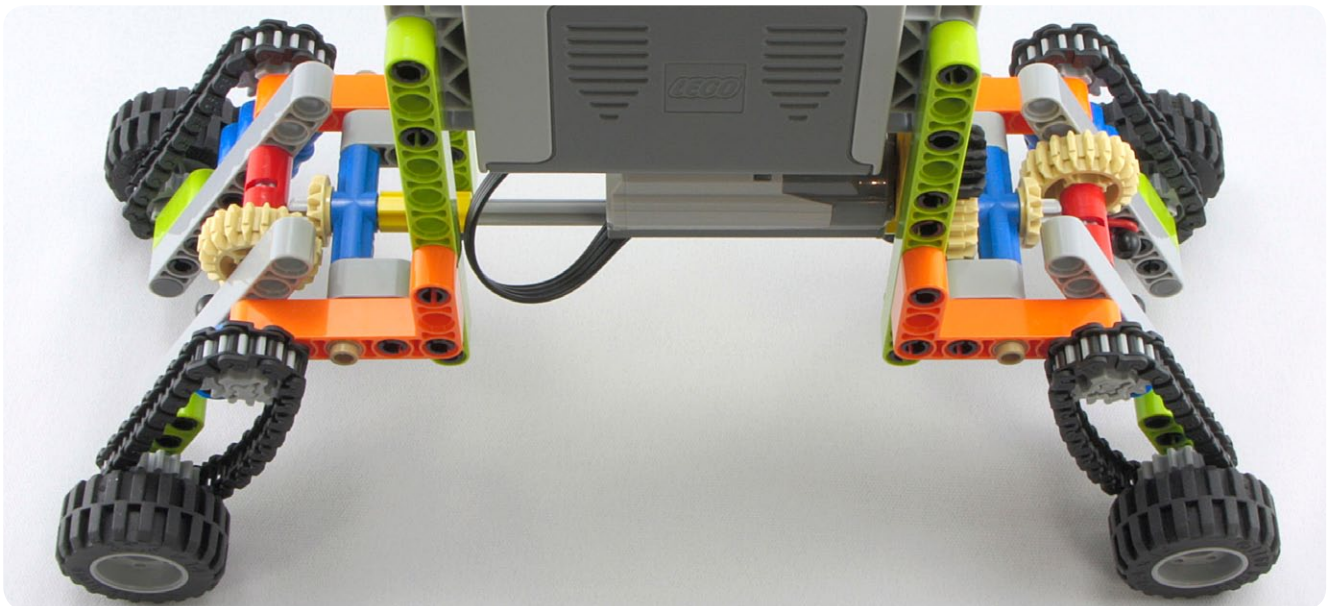
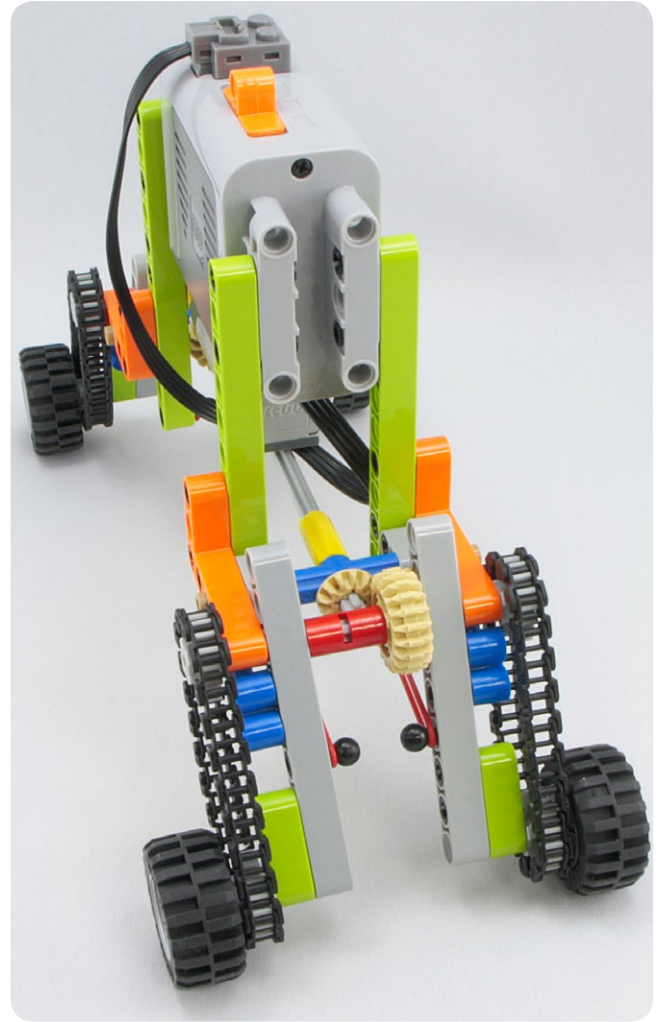
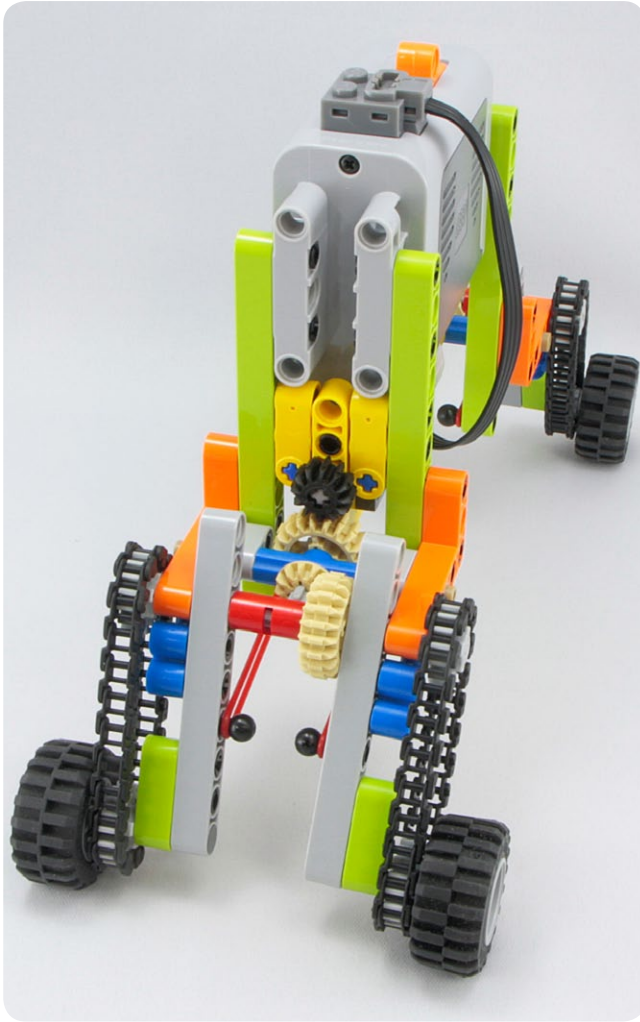
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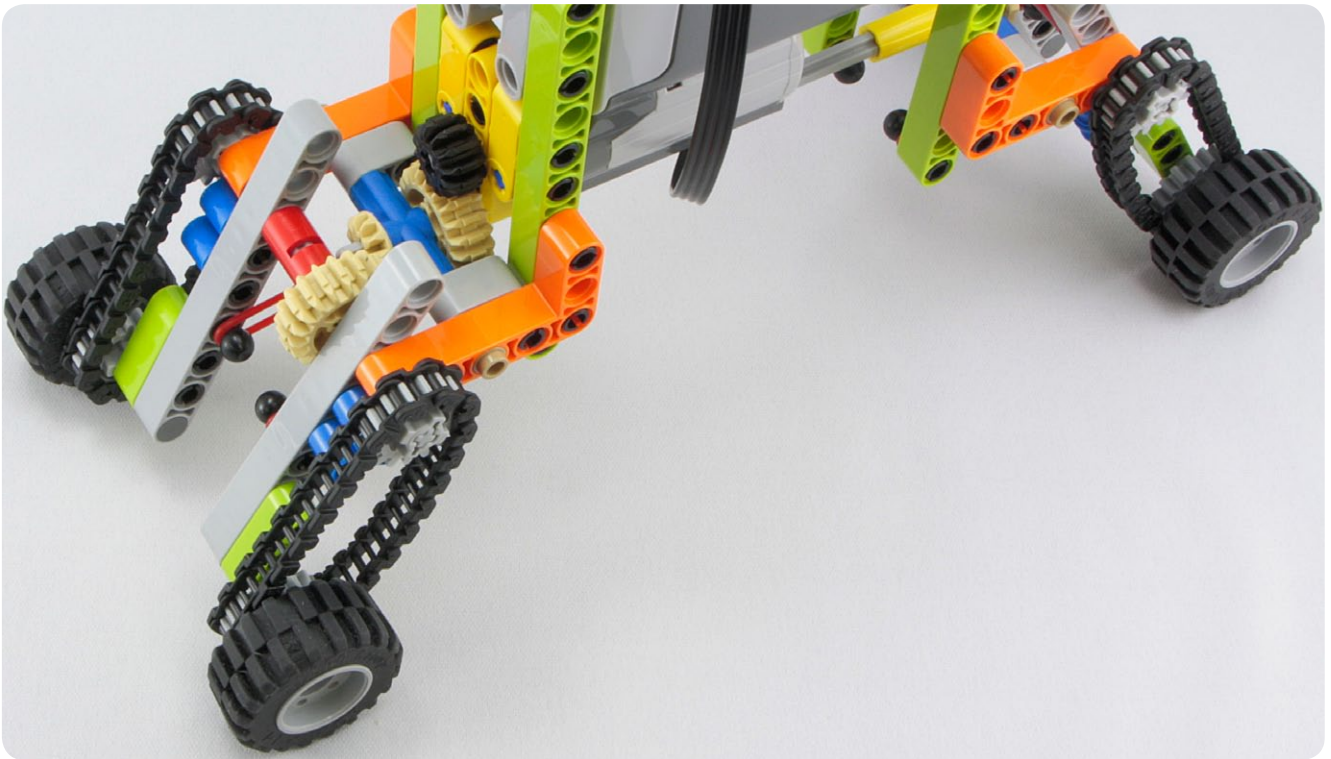


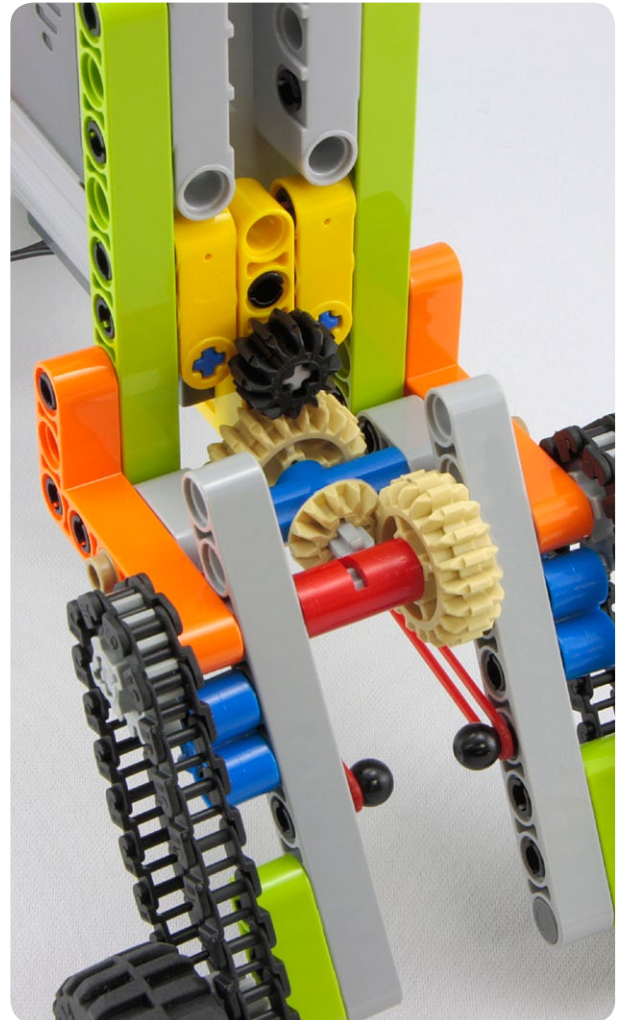
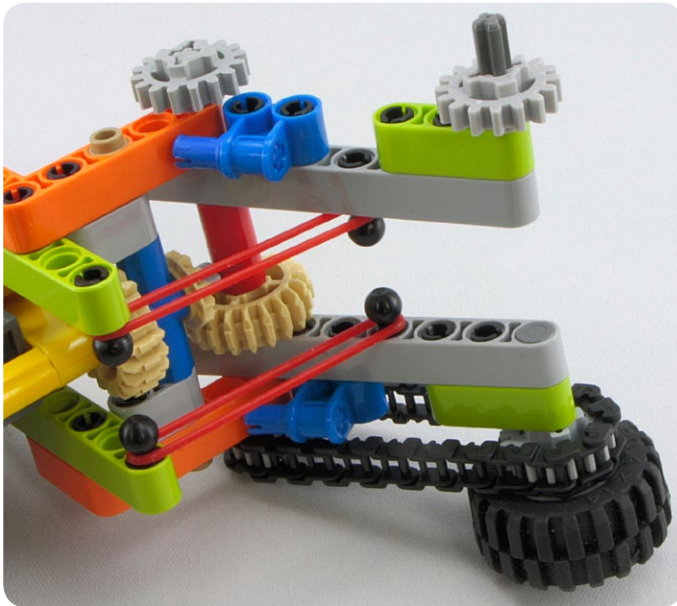
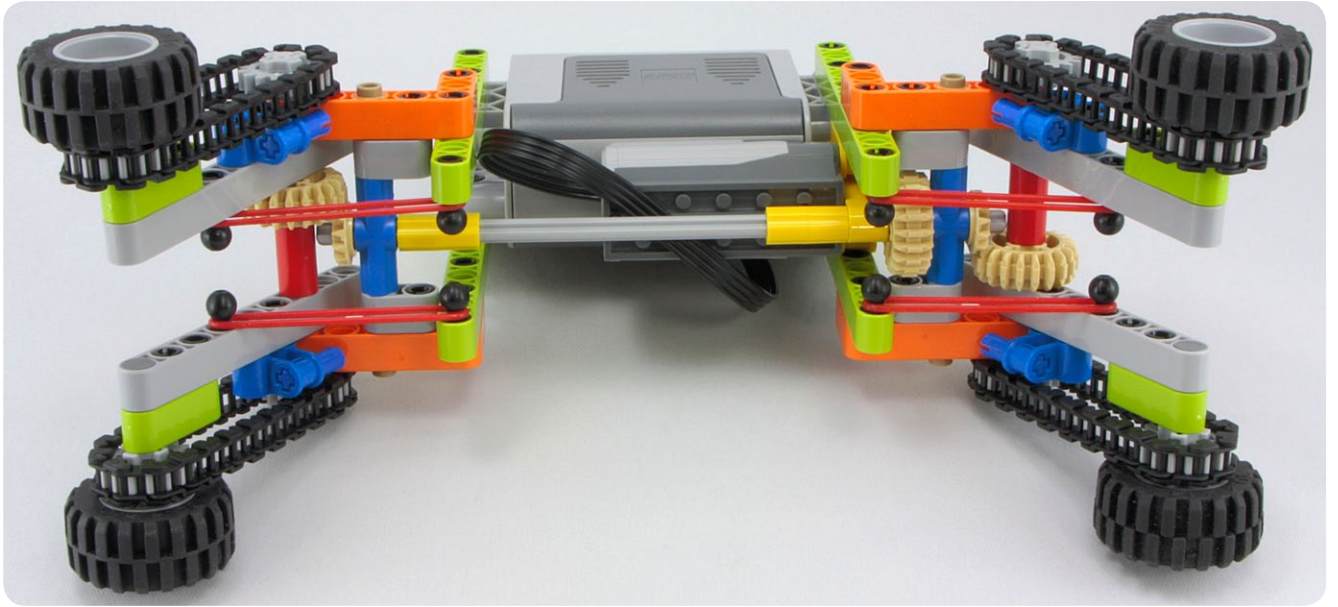


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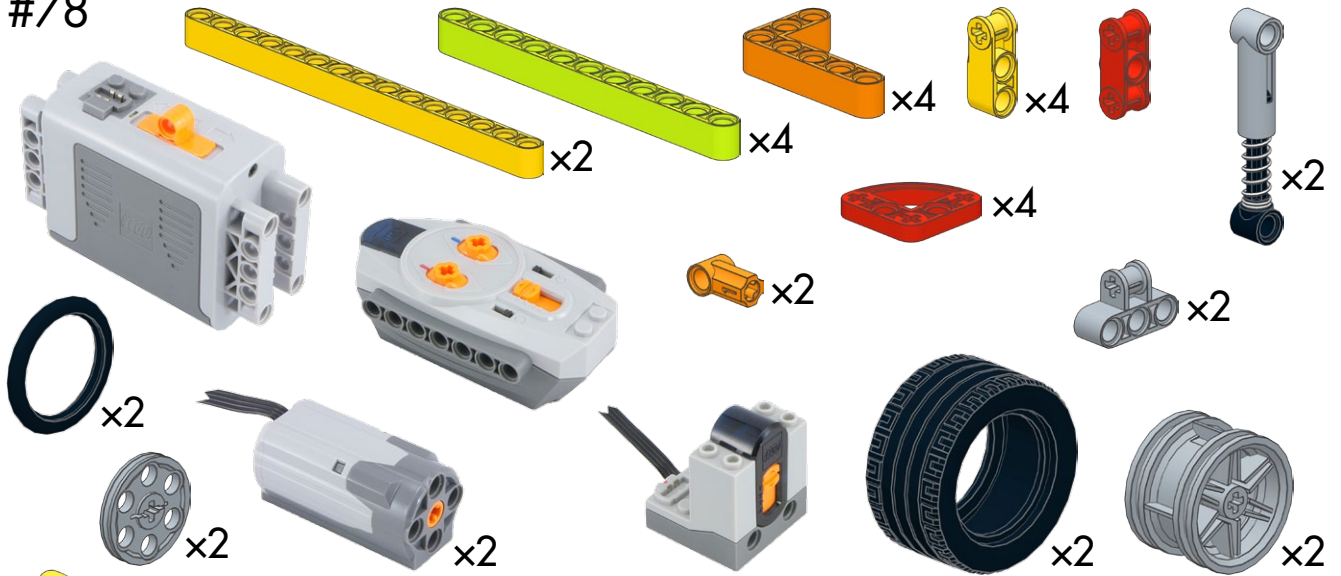


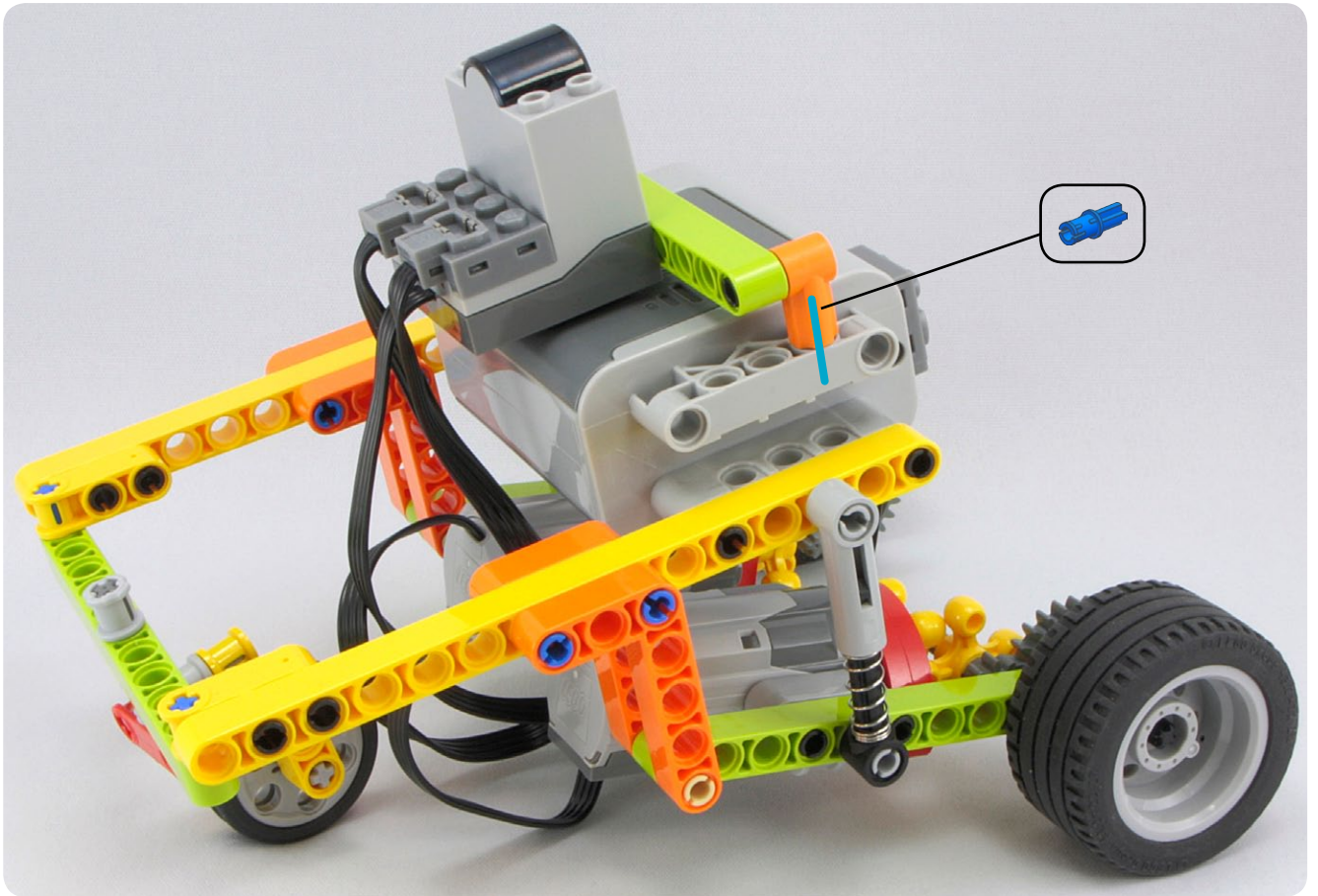


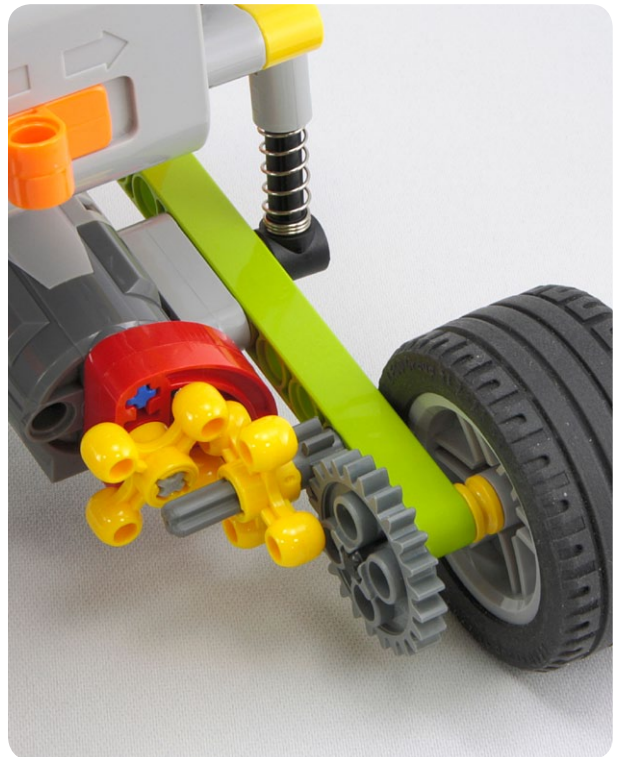
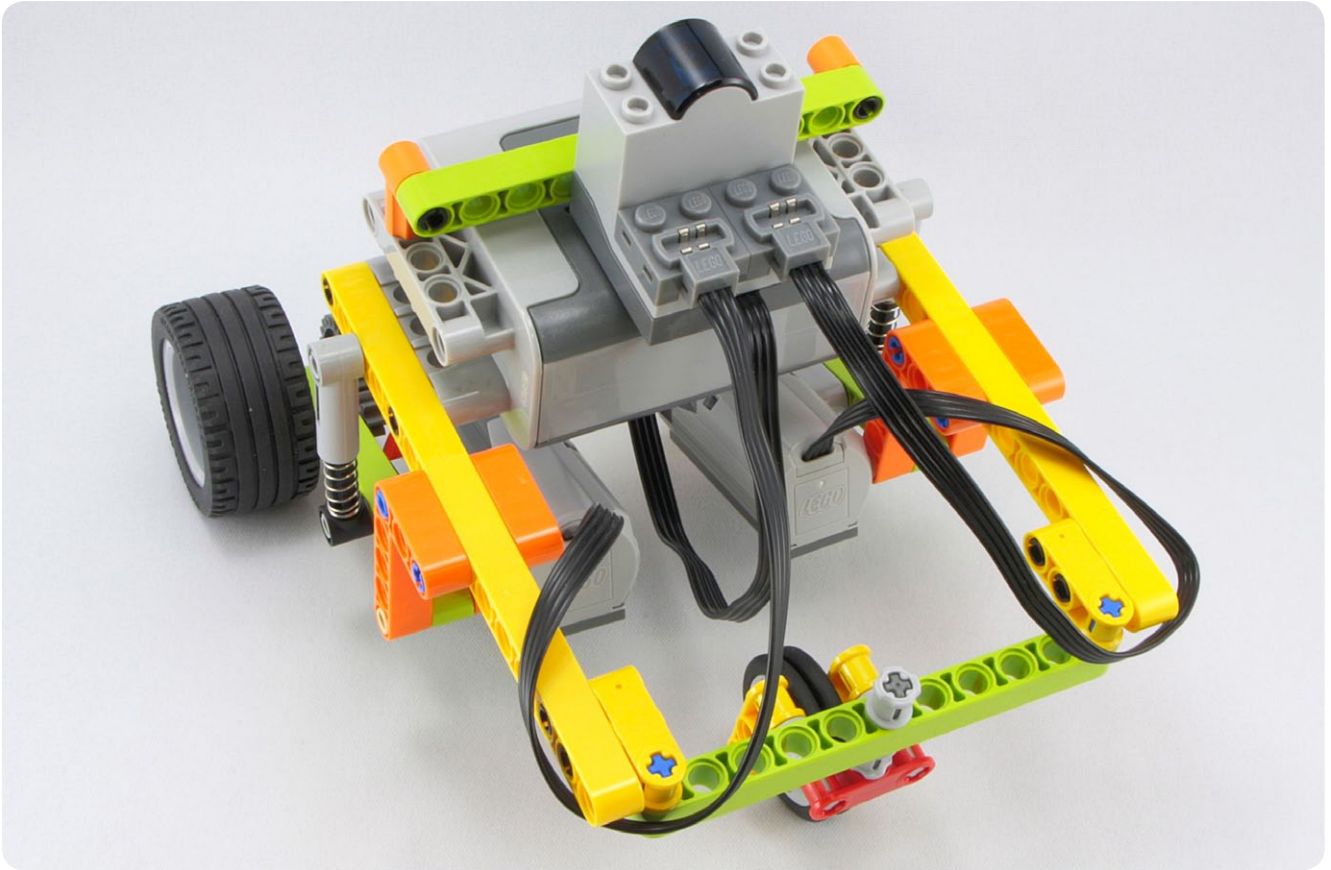




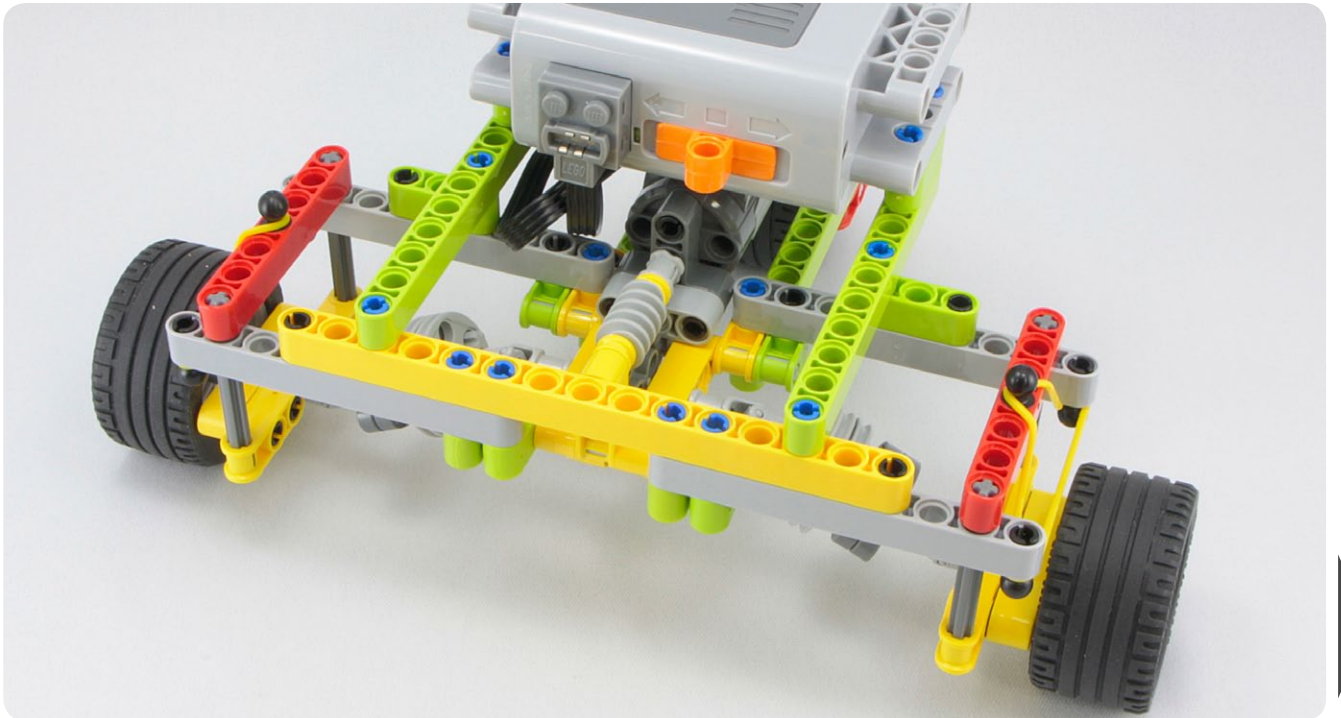
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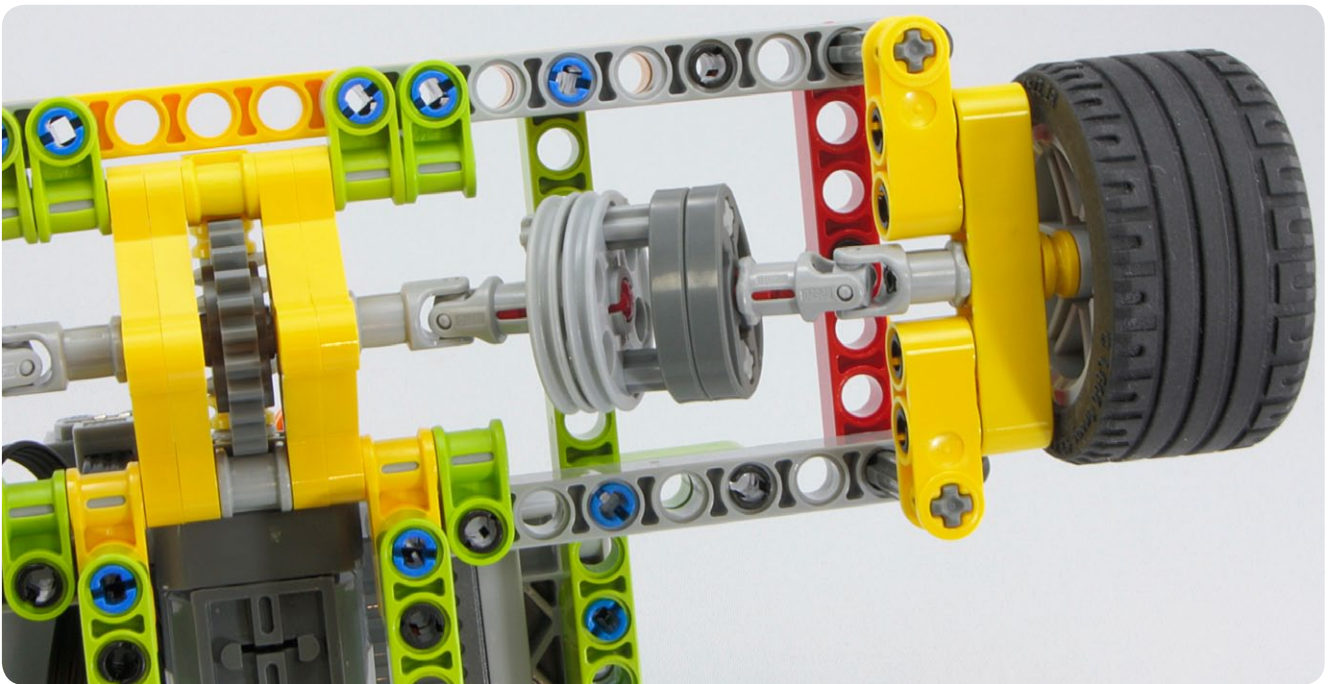


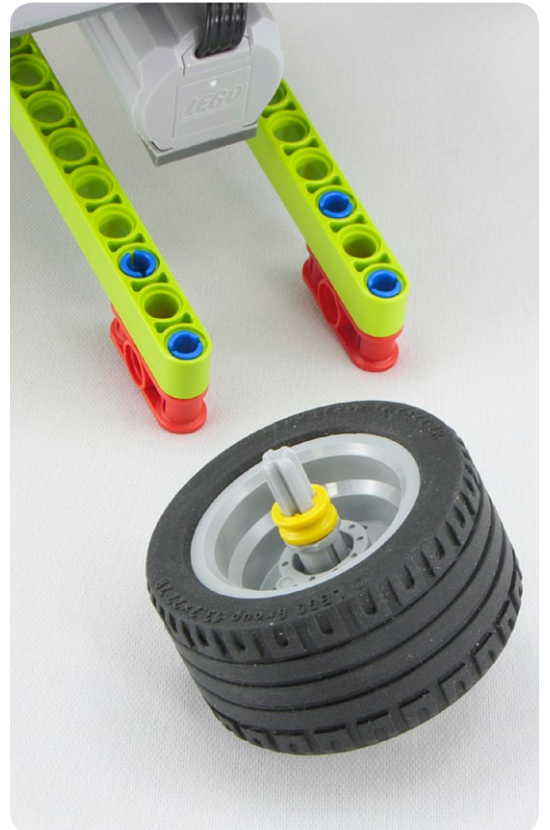
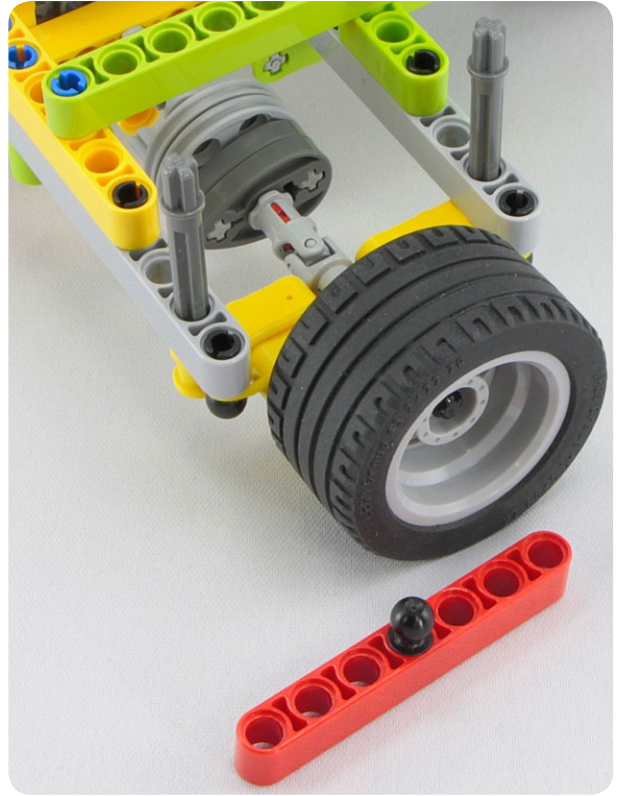






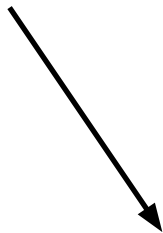
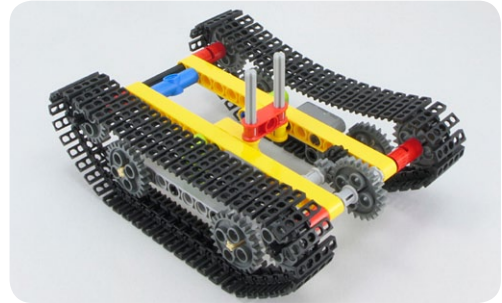


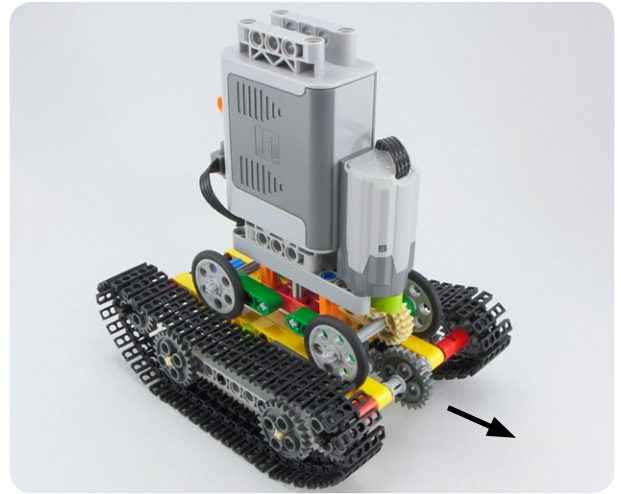
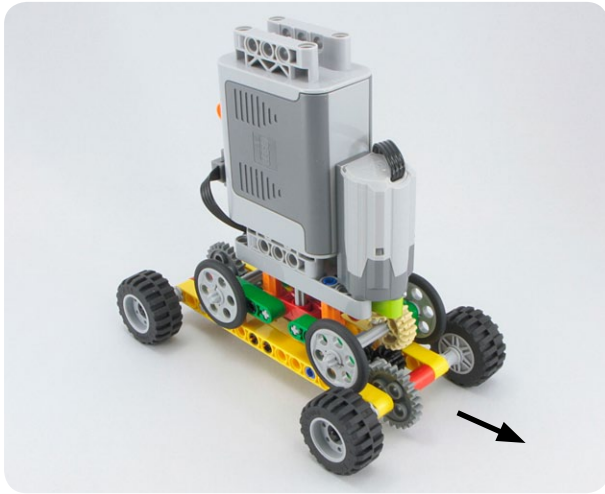




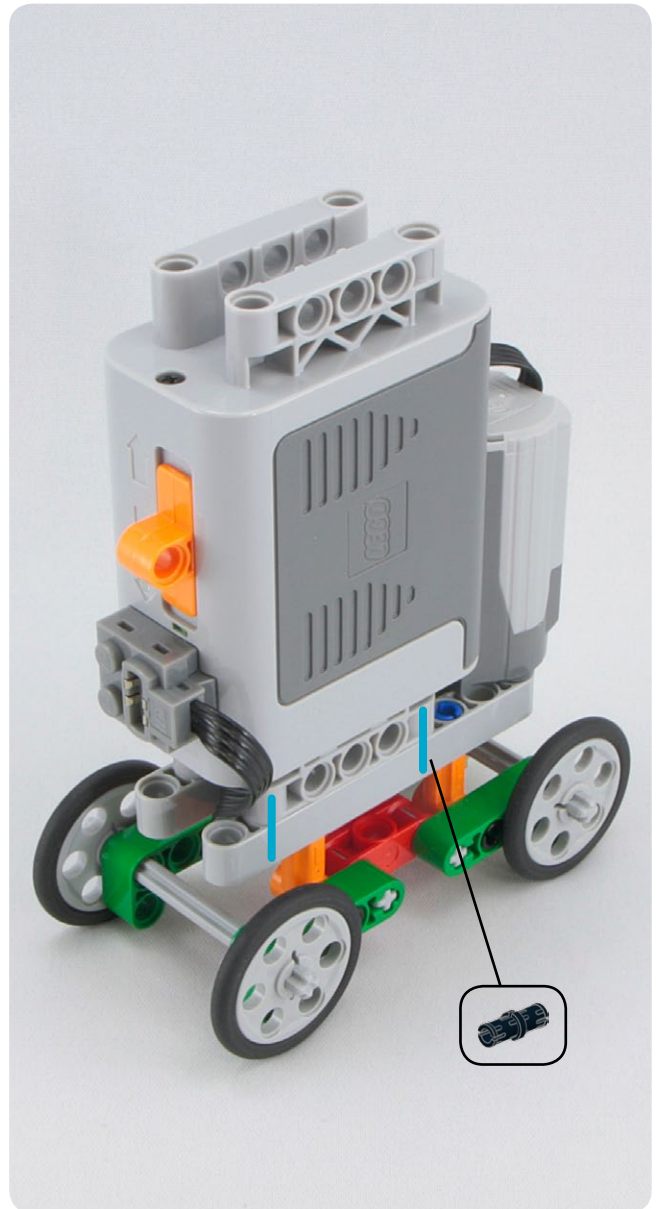
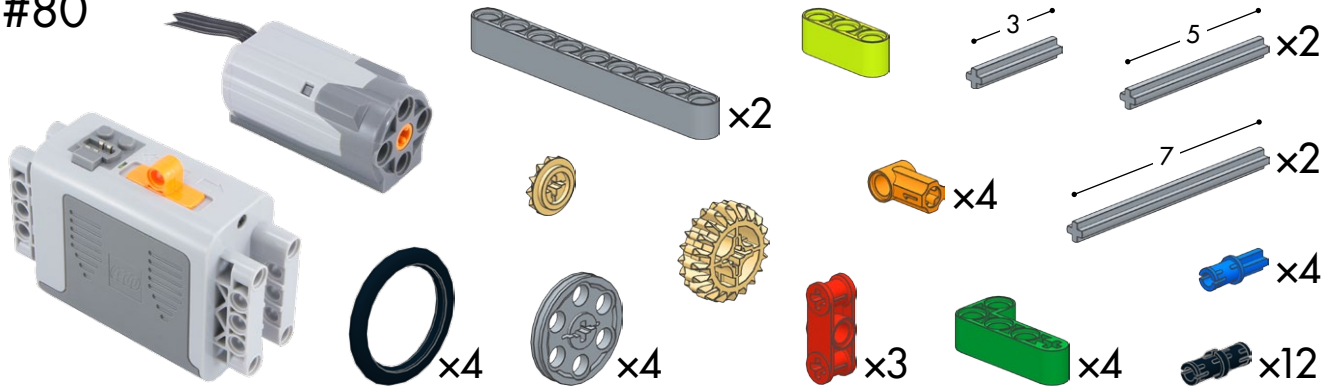


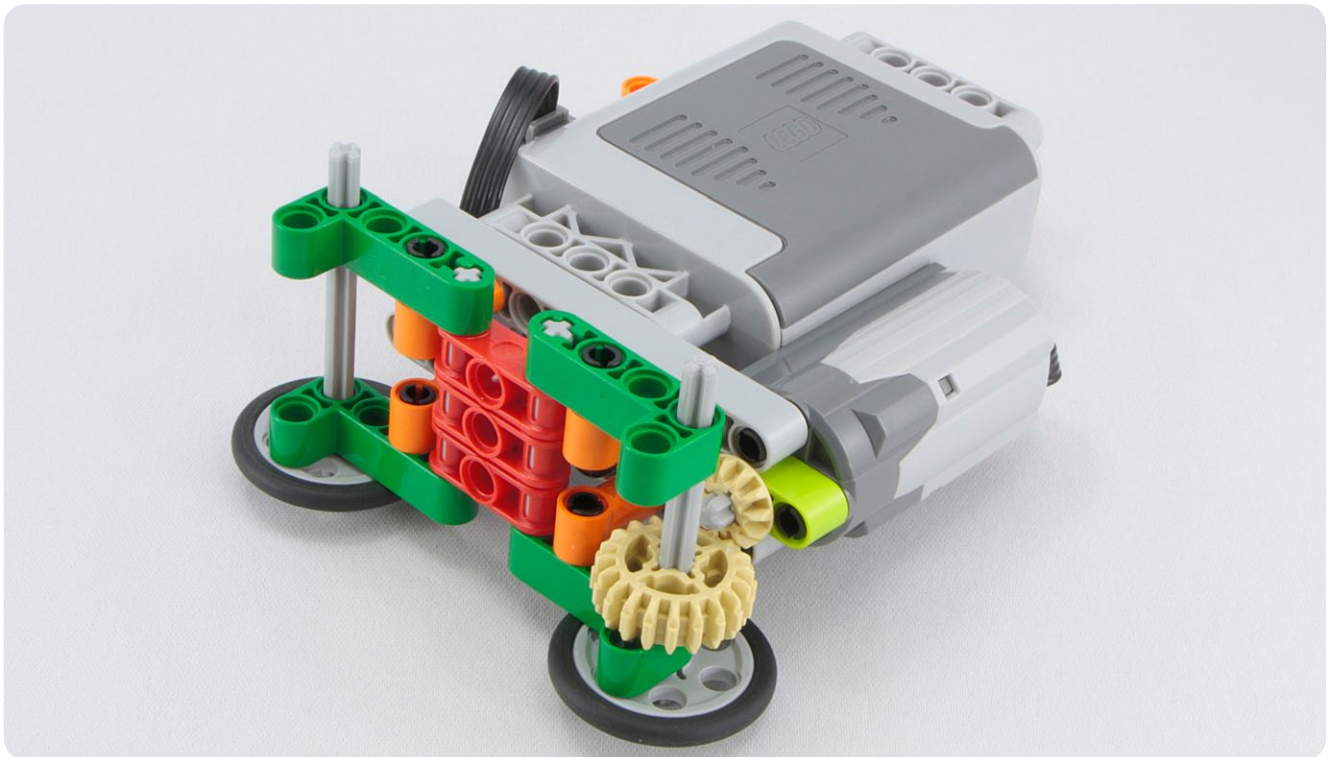
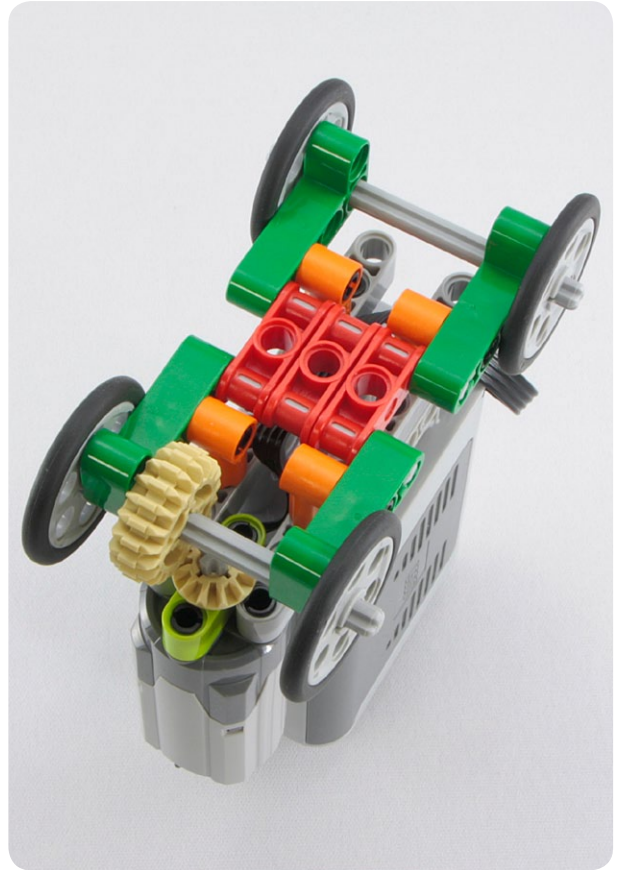
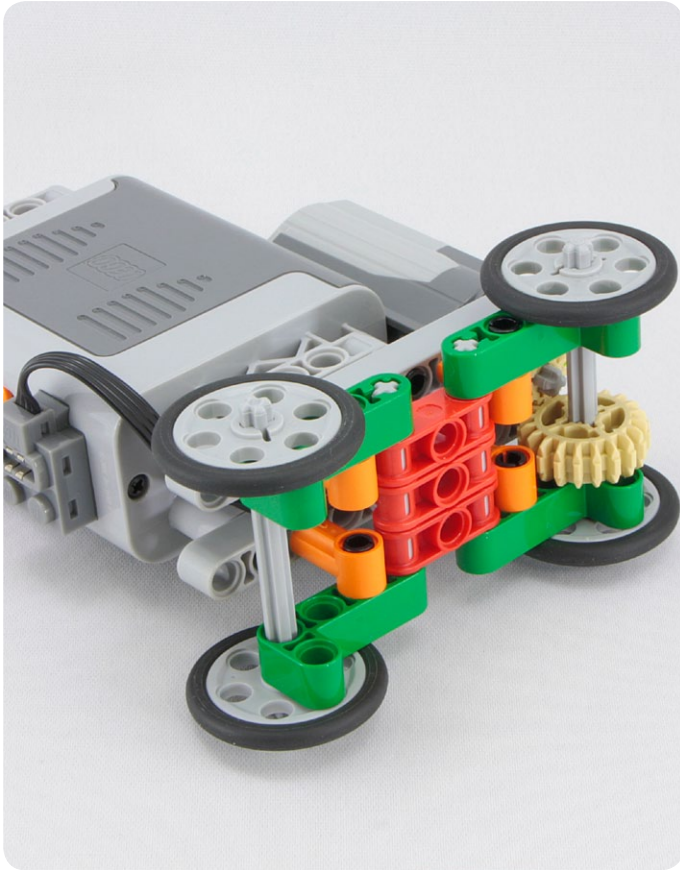
Five different bases for a small car



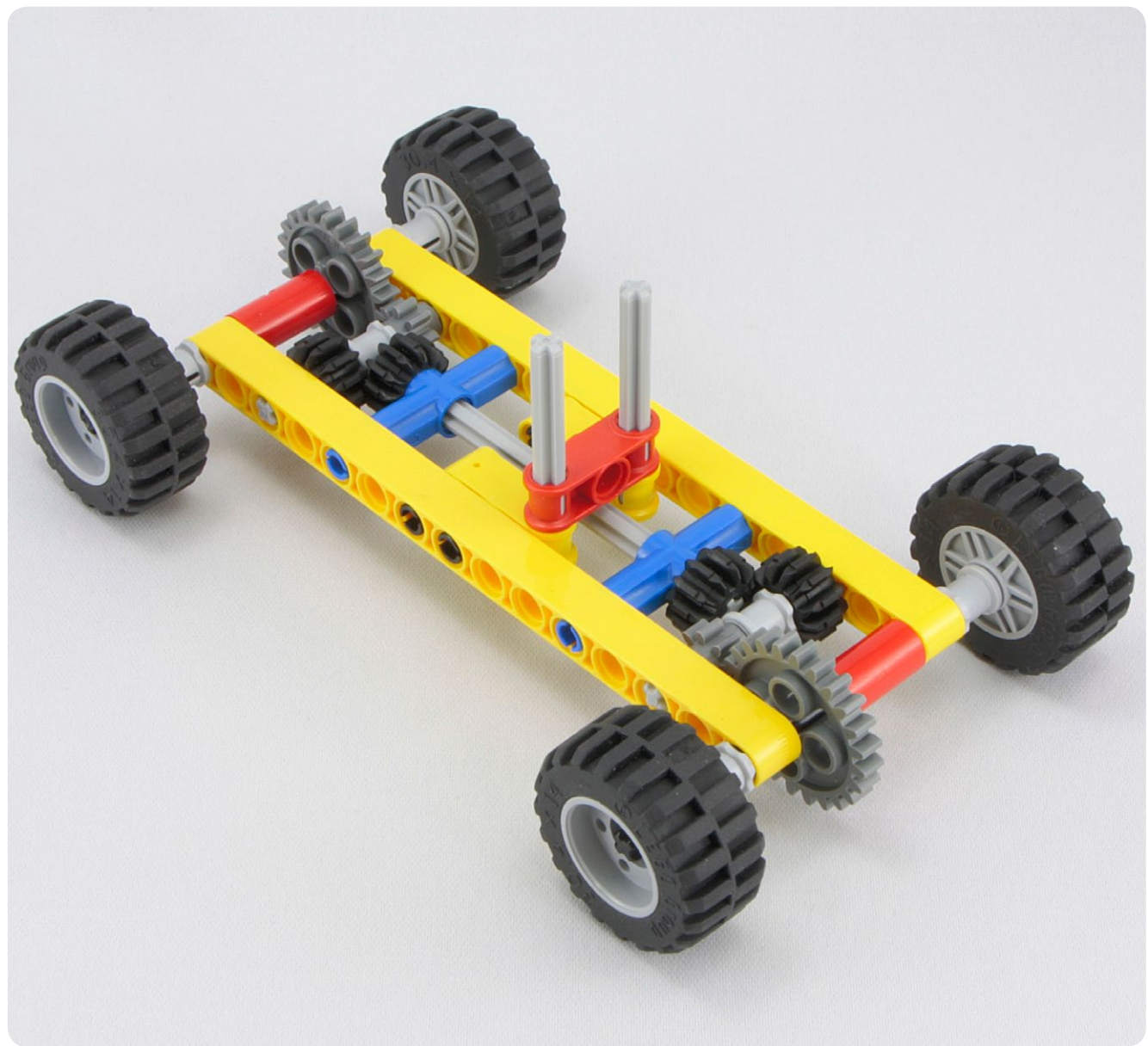
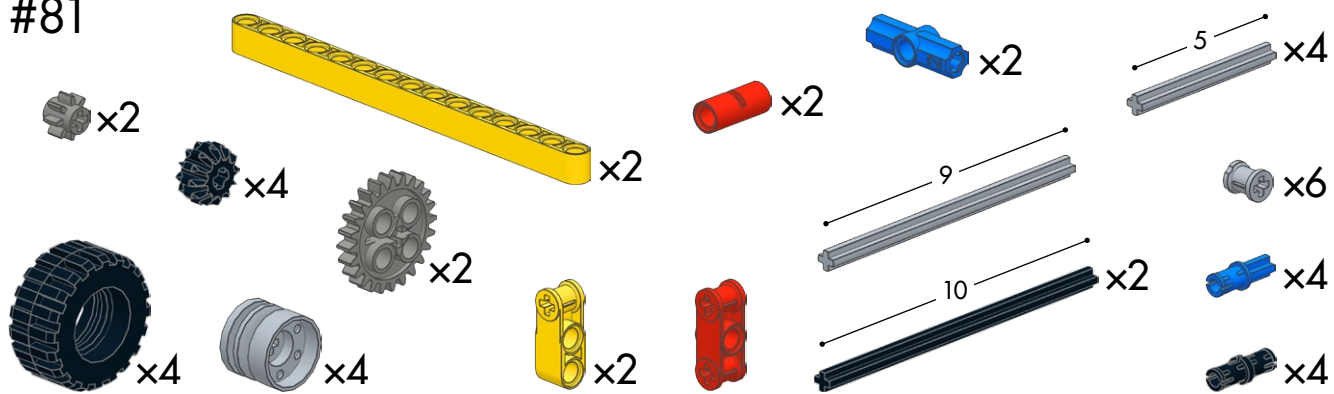


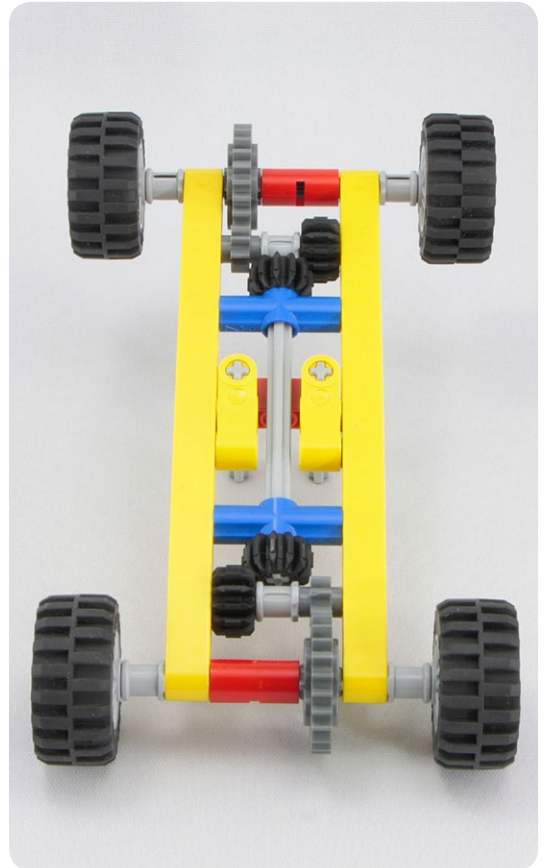
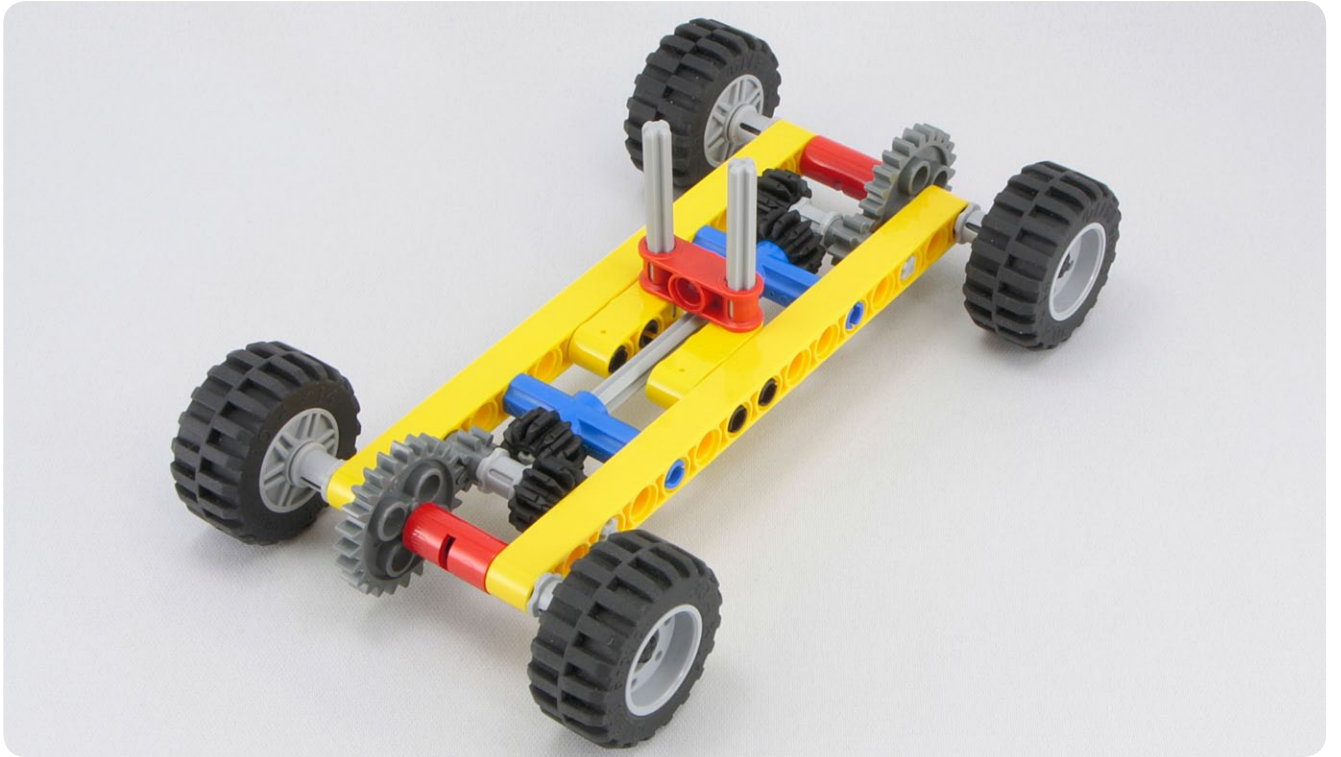
#80



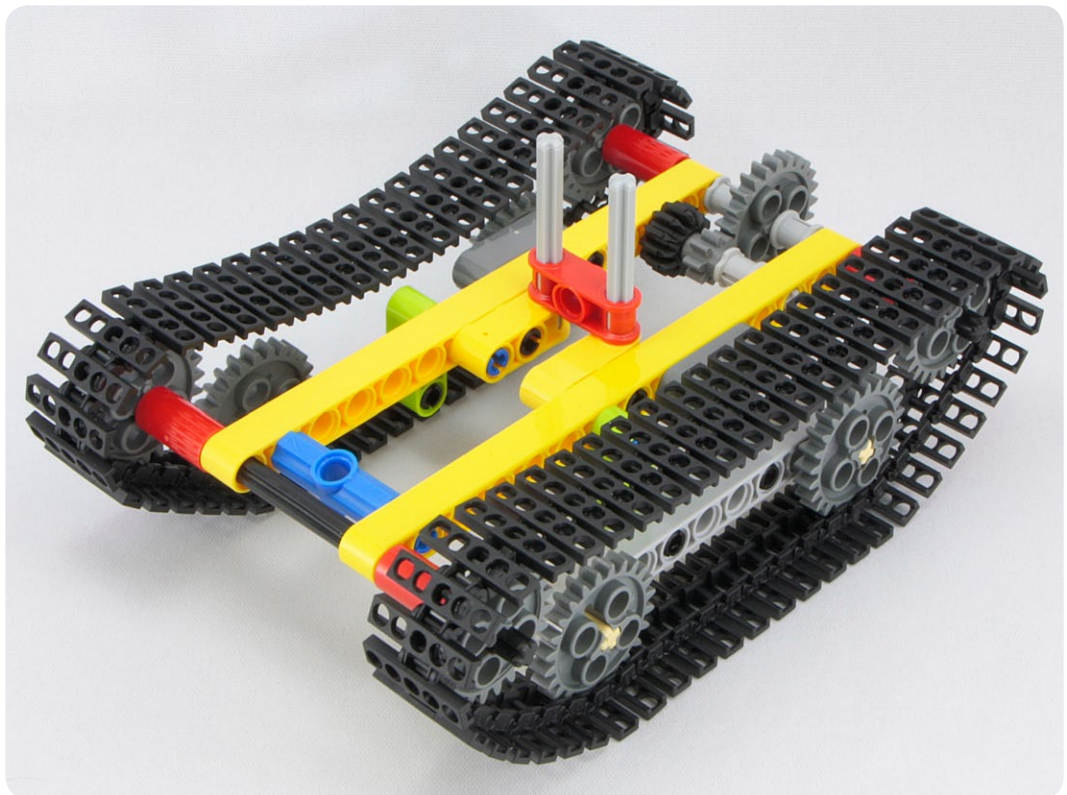
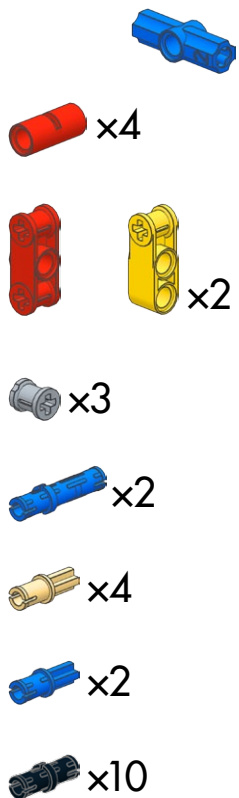
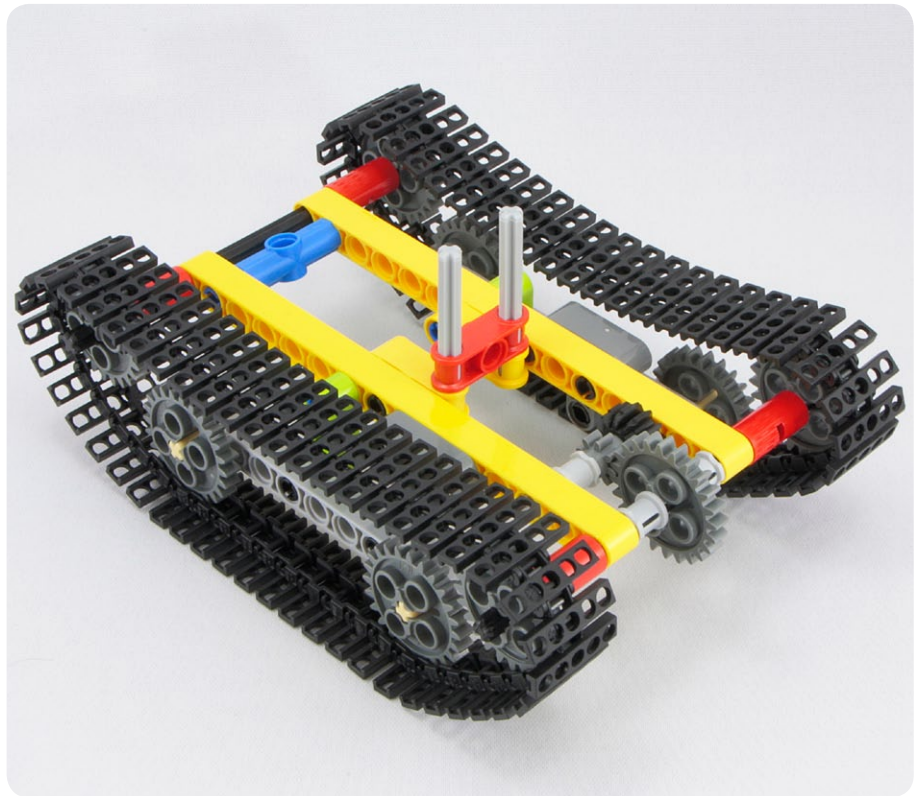
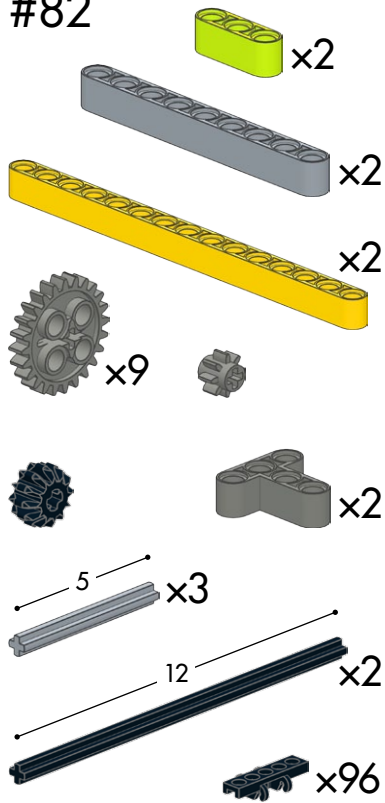


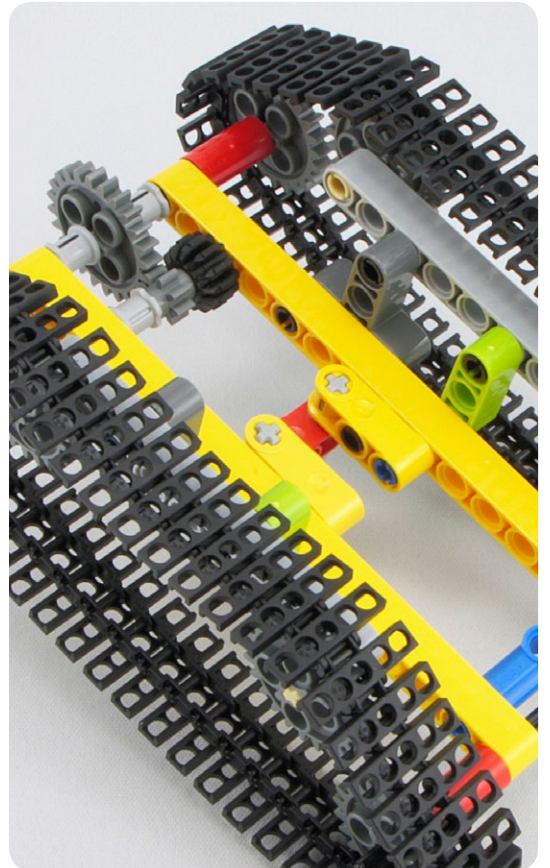
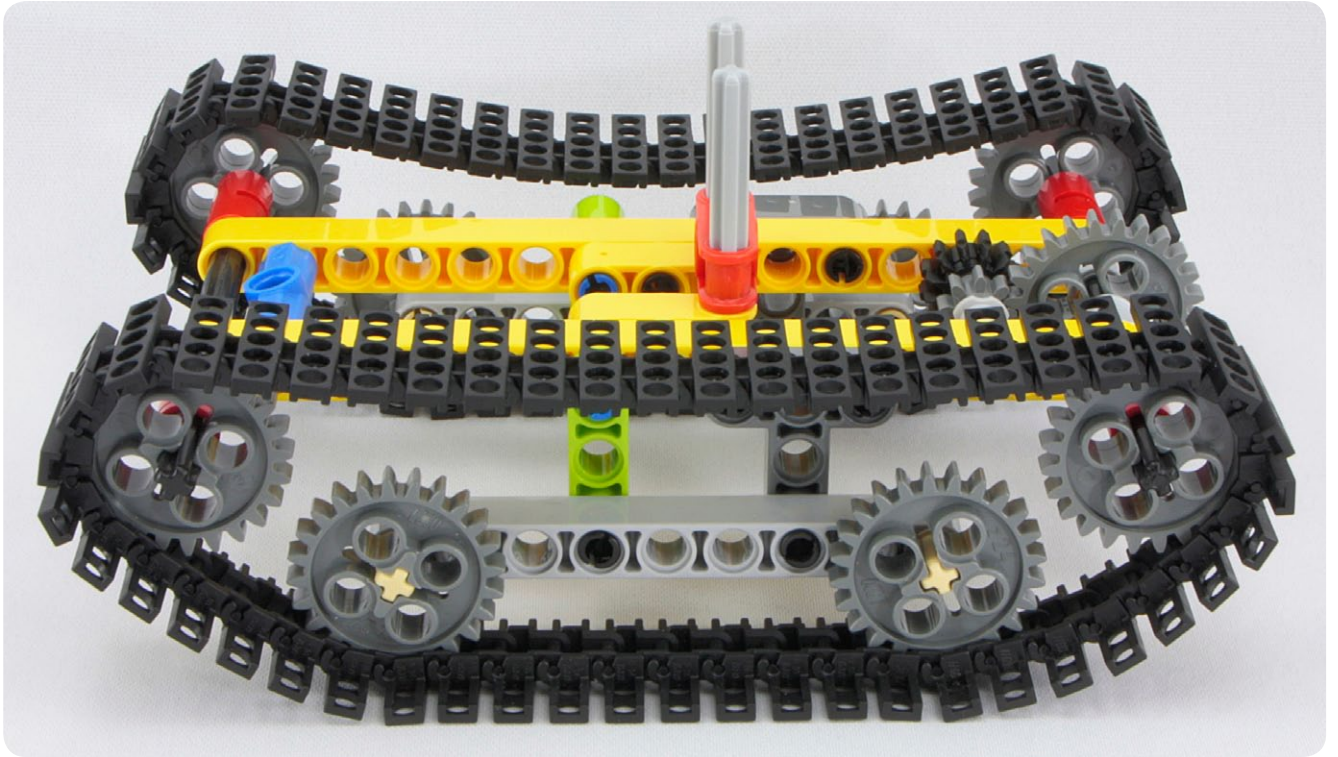
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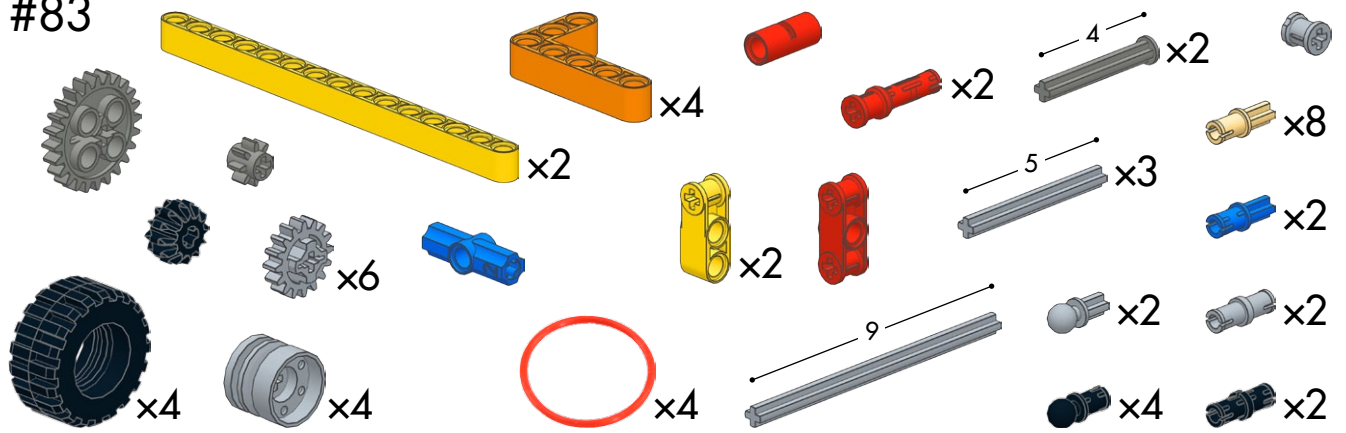


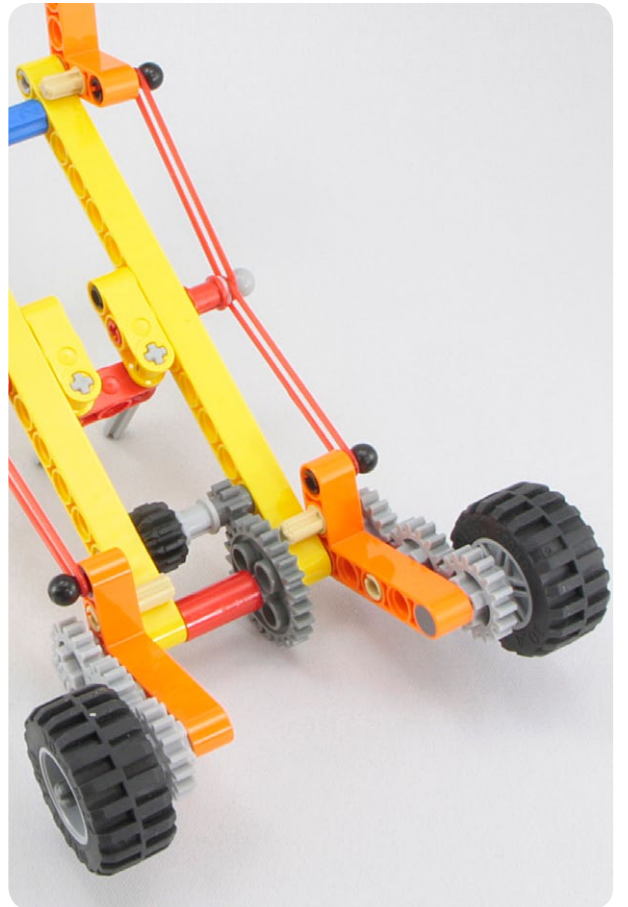
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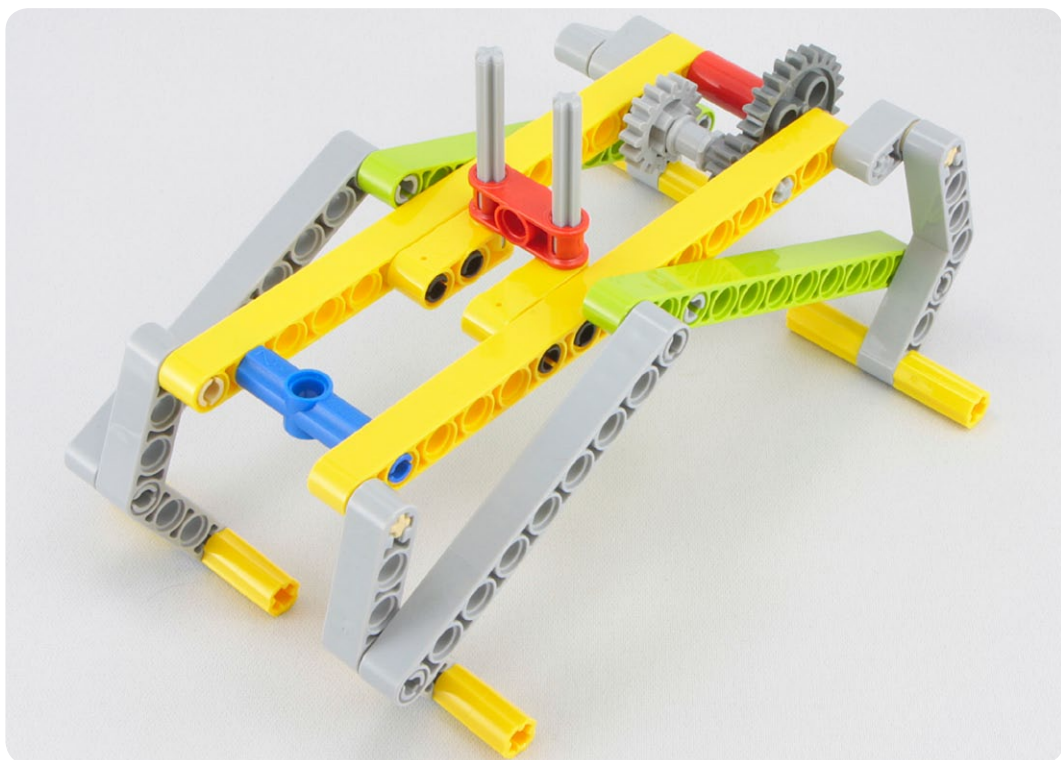
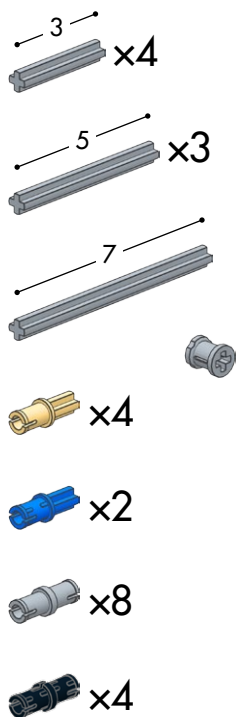
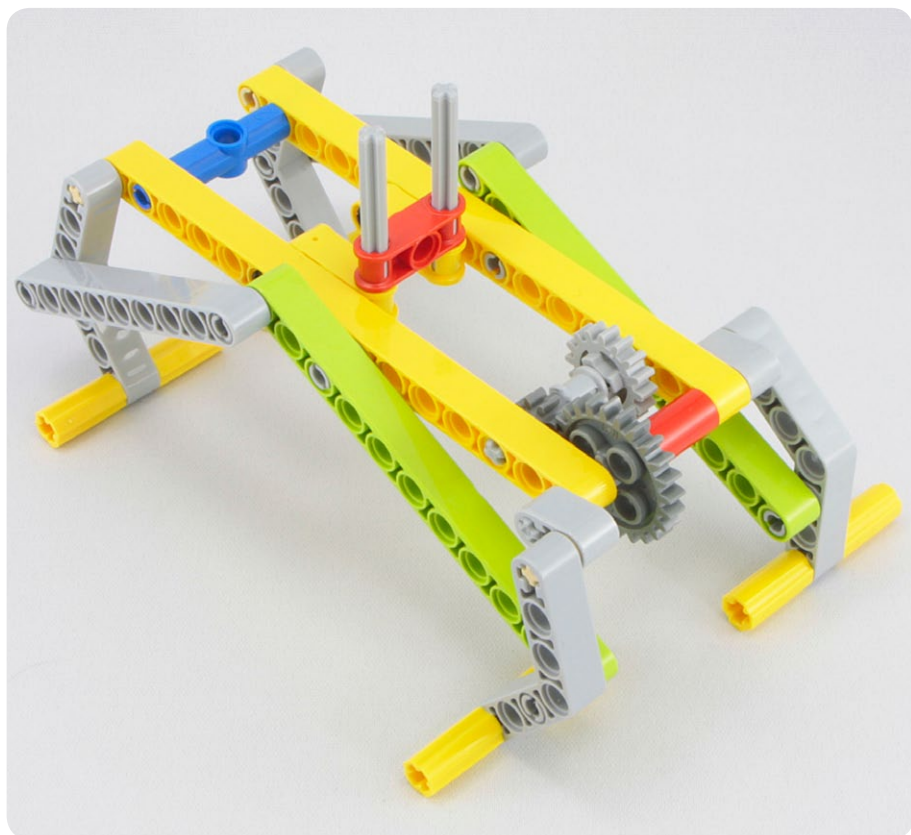
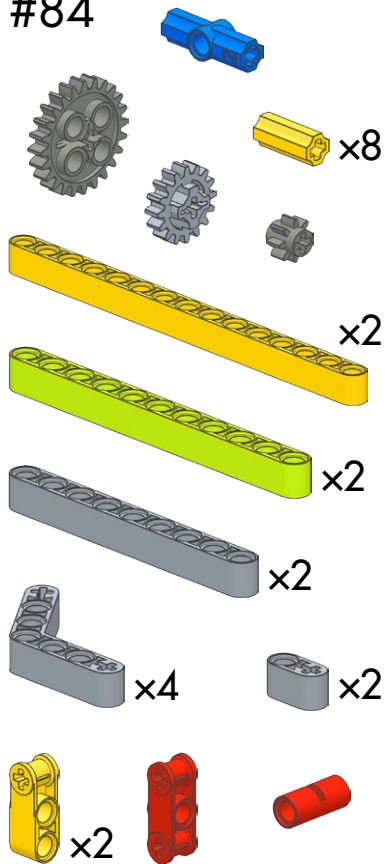


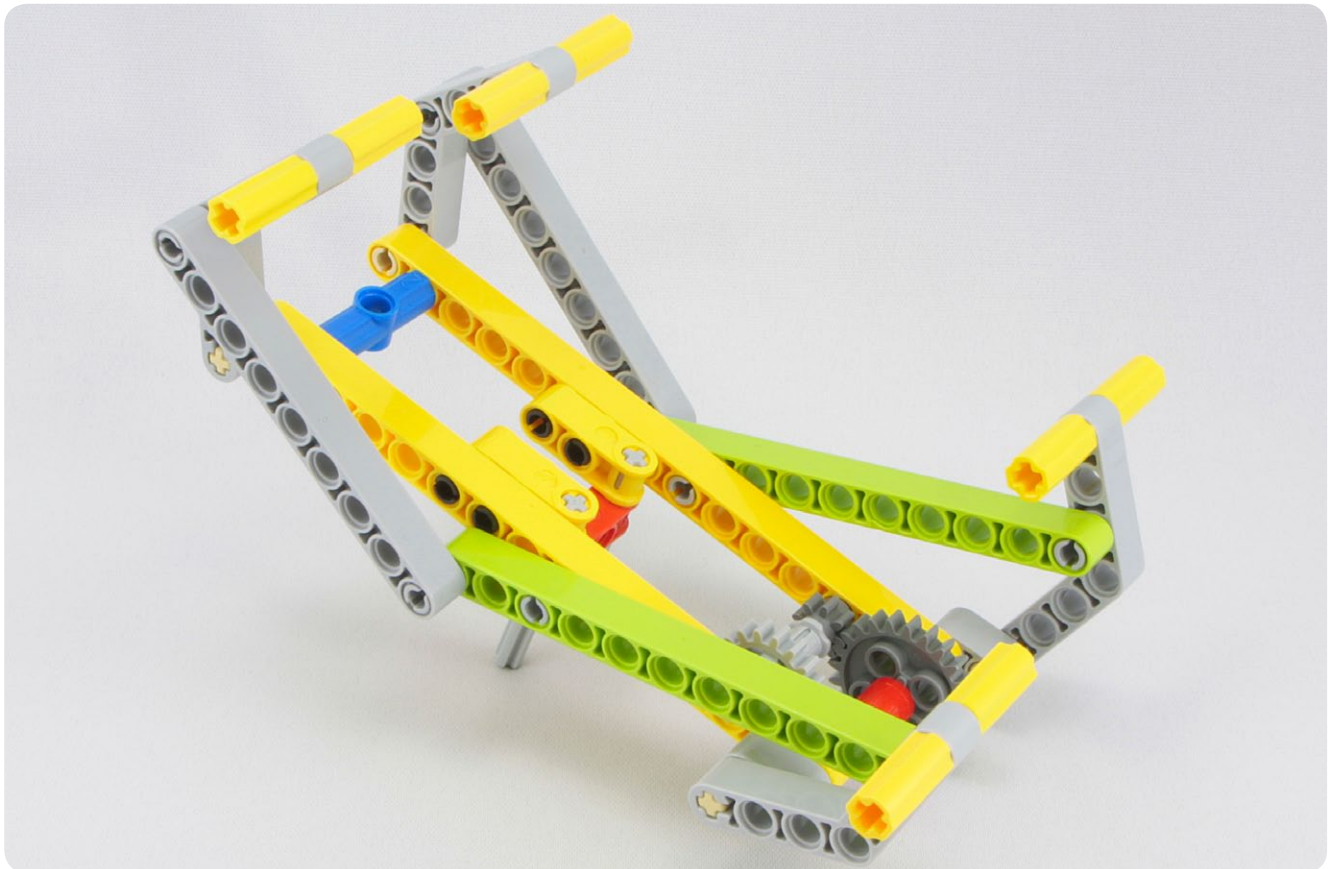
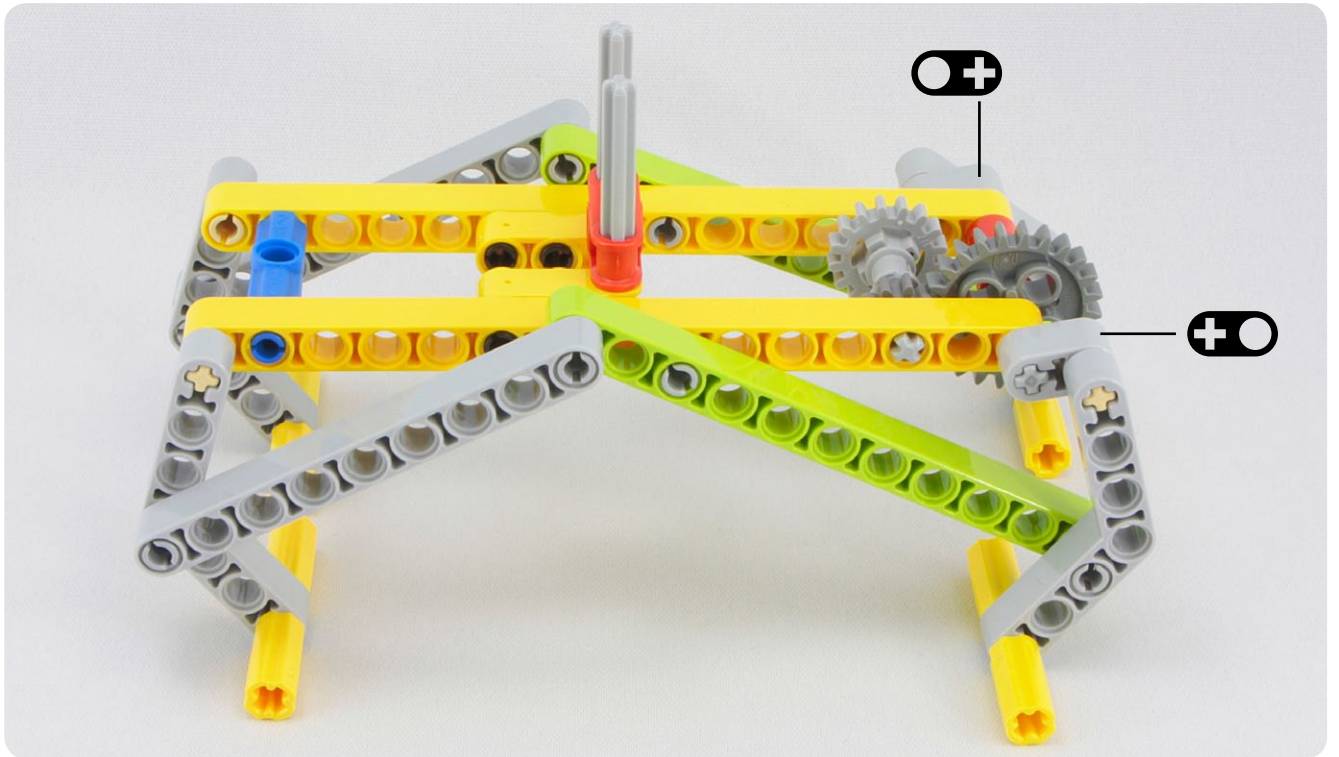
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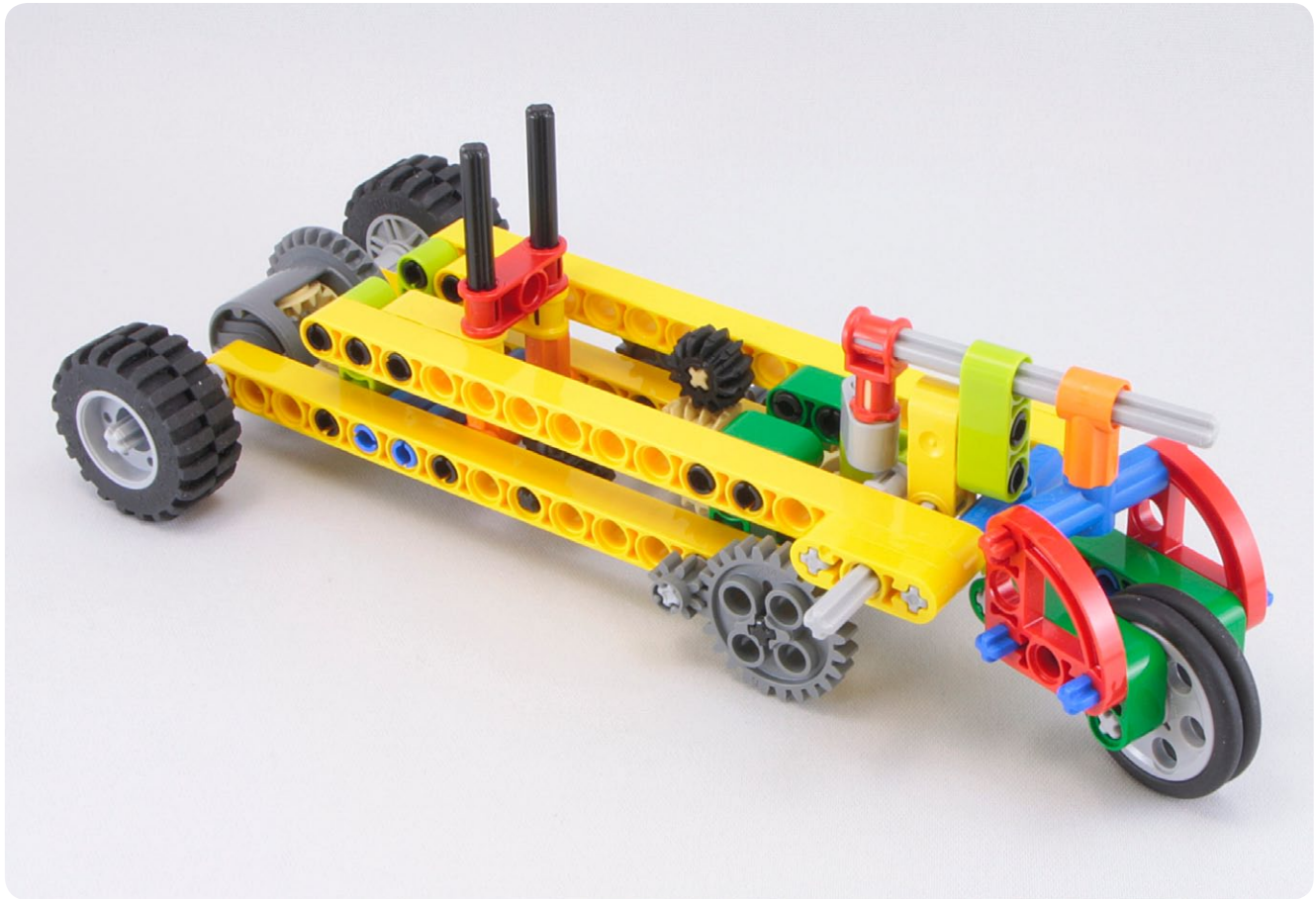
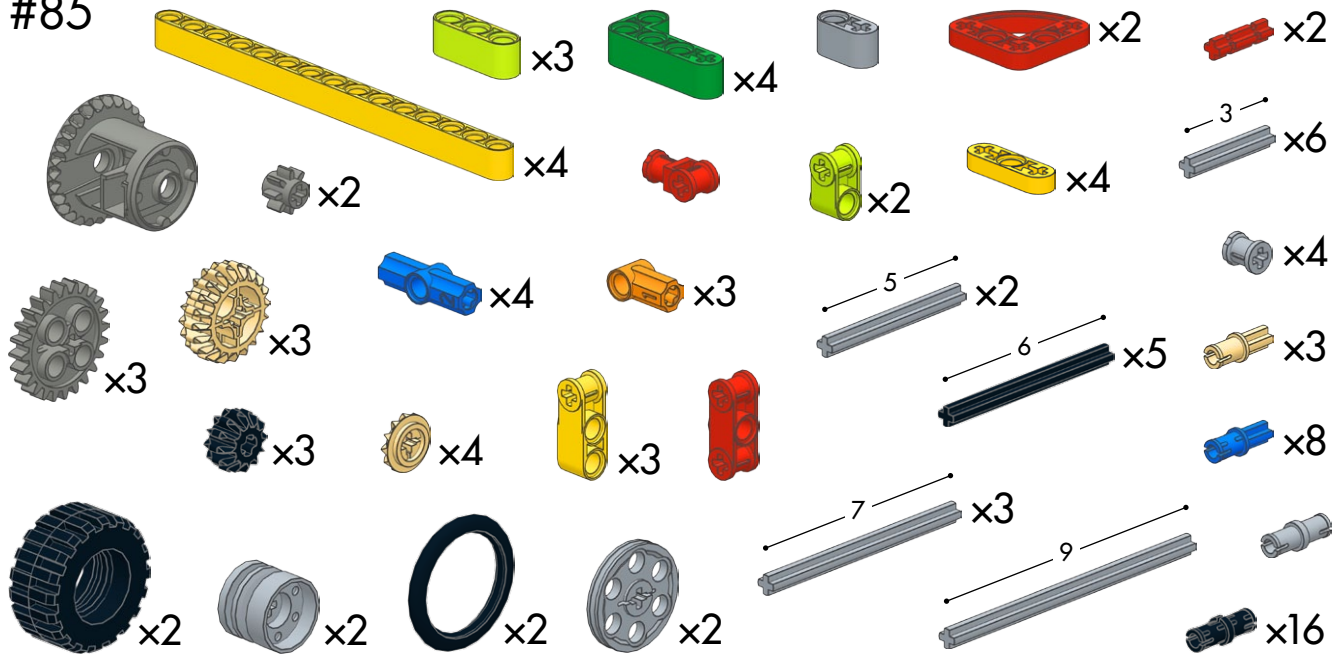


#84

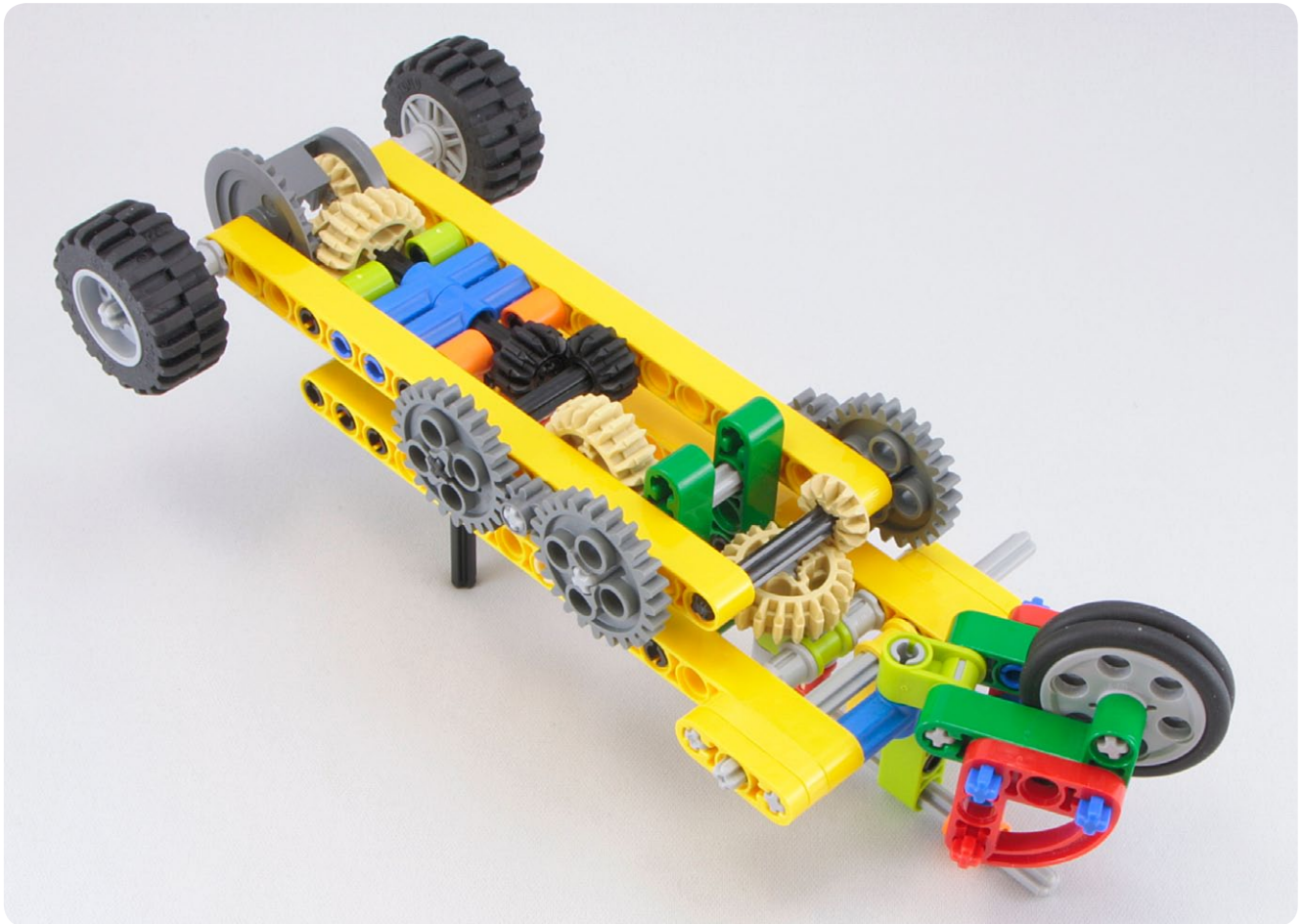
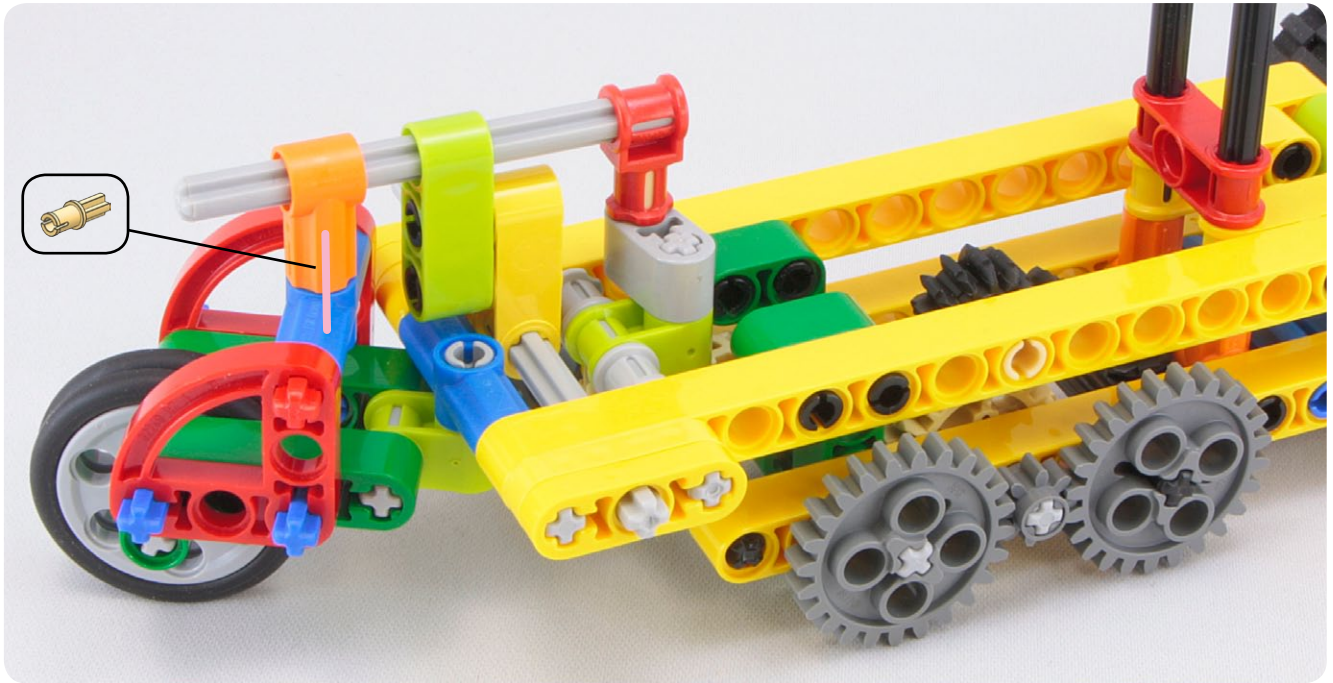


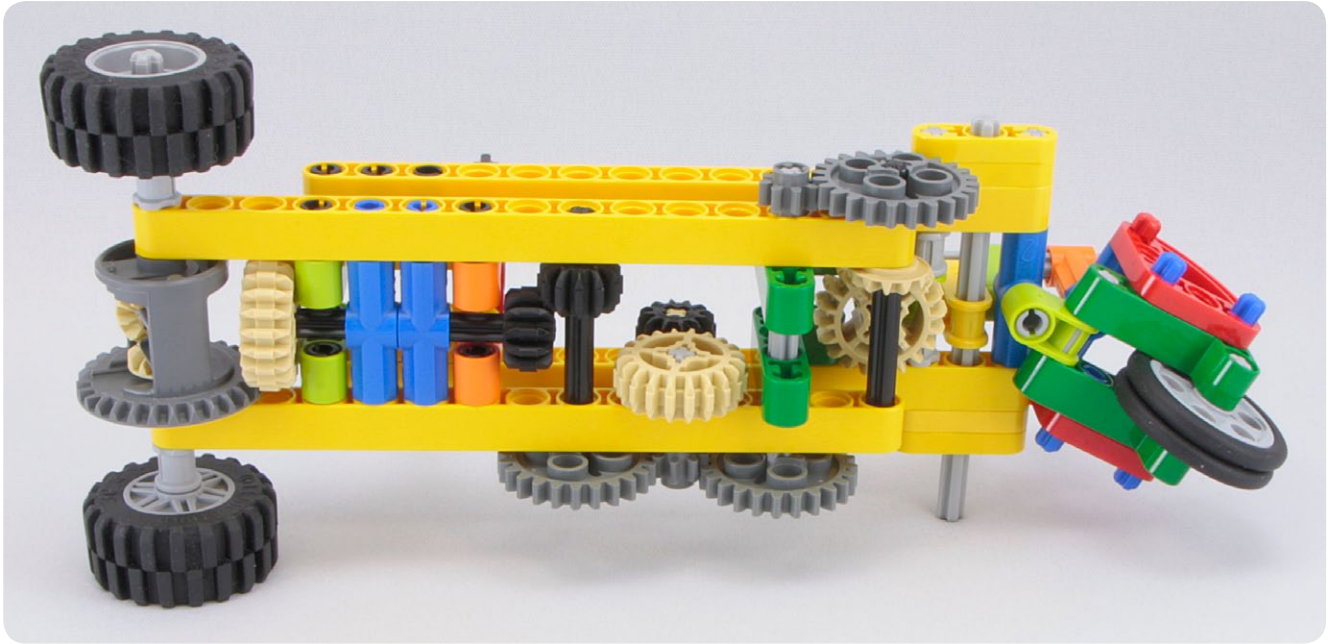


#85

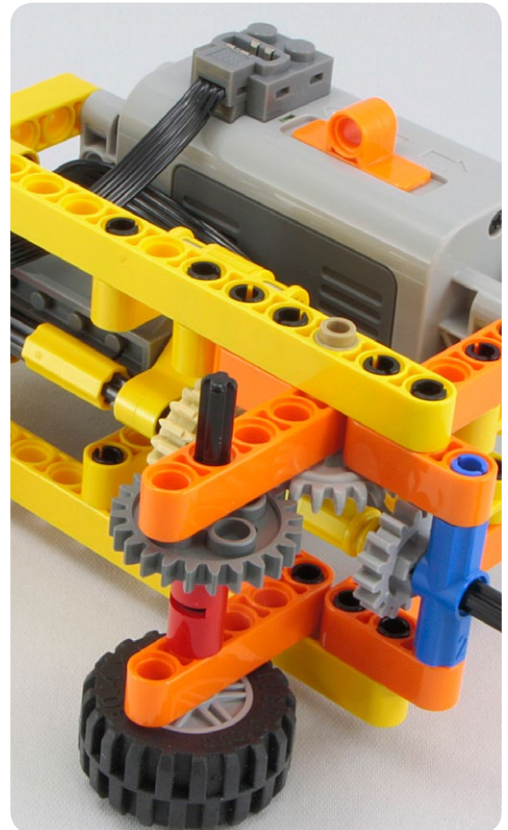
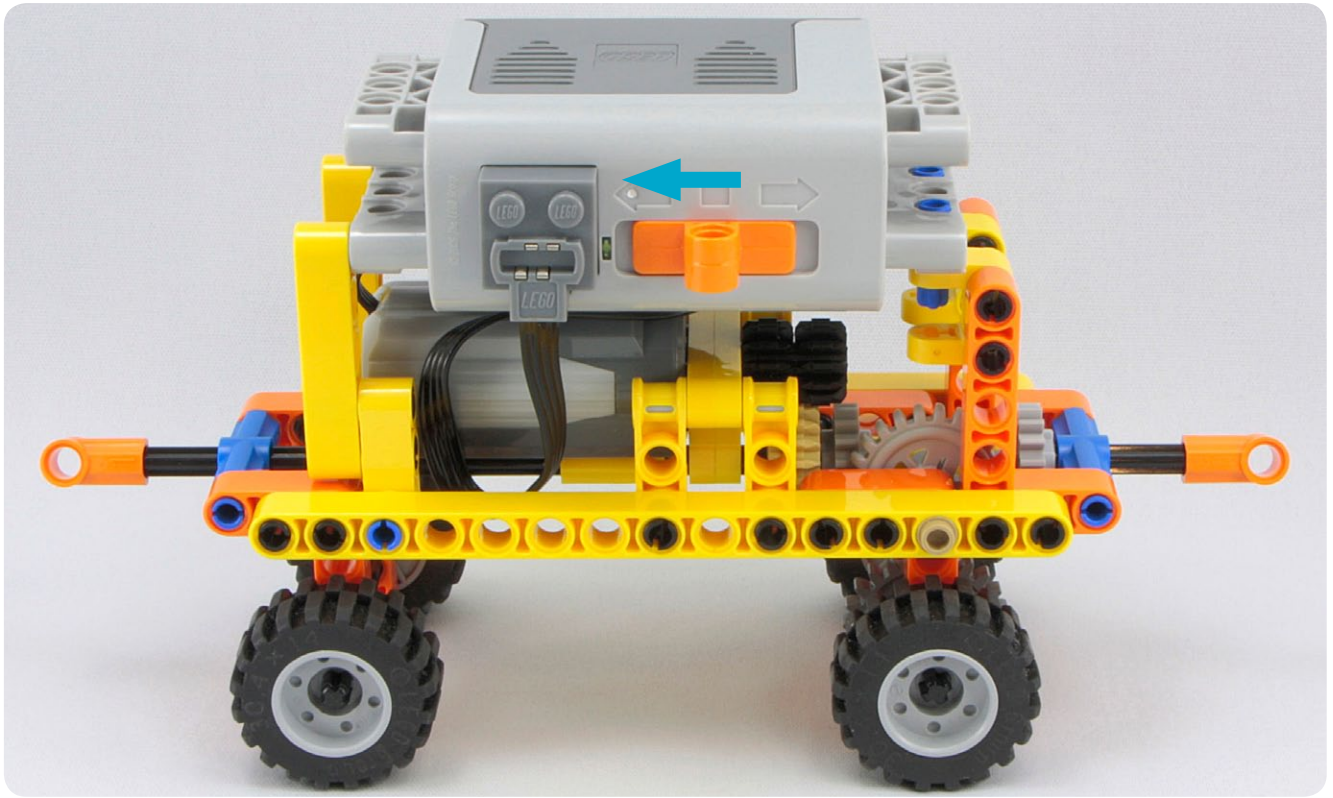


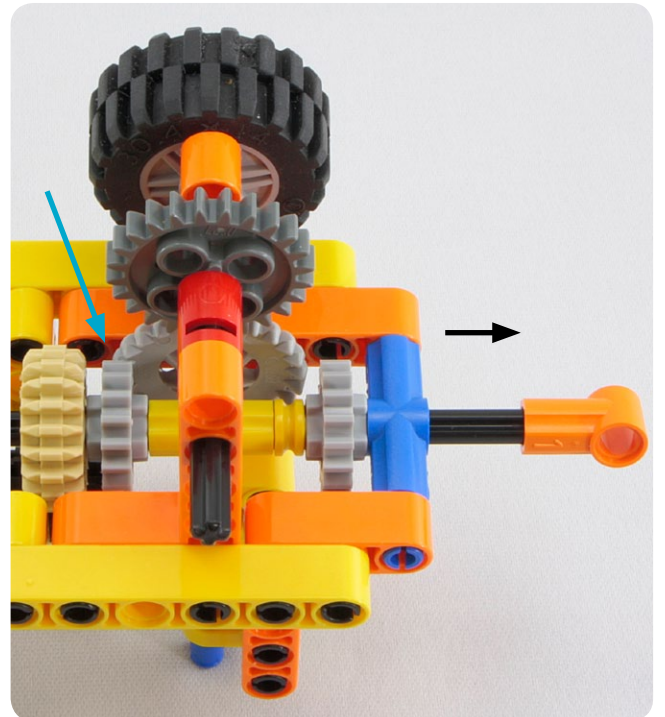
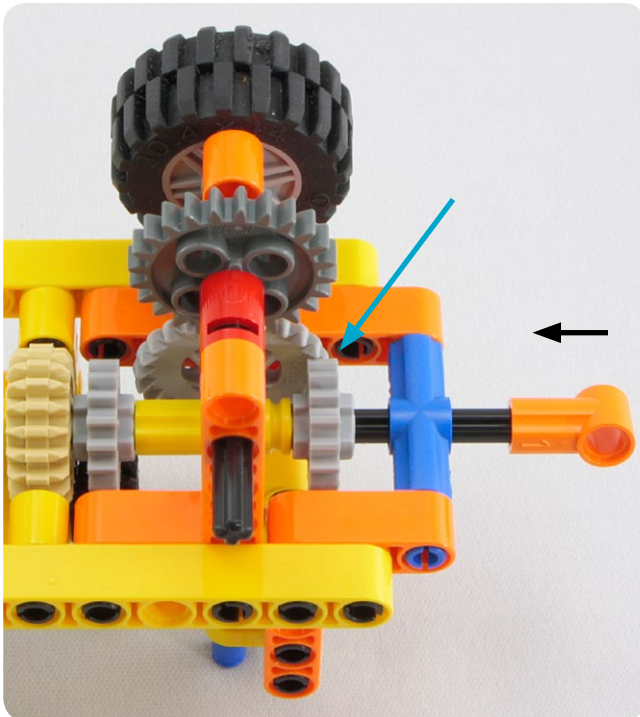
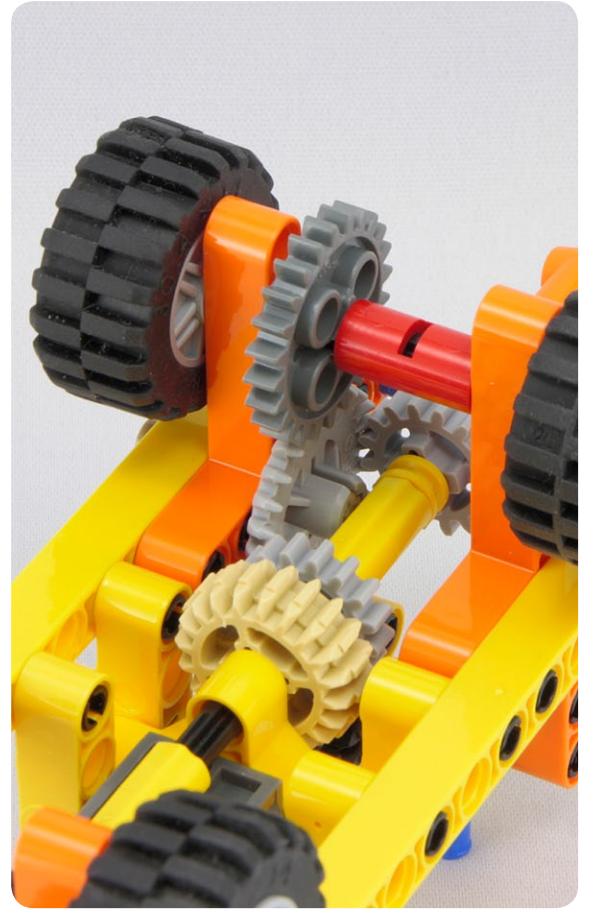




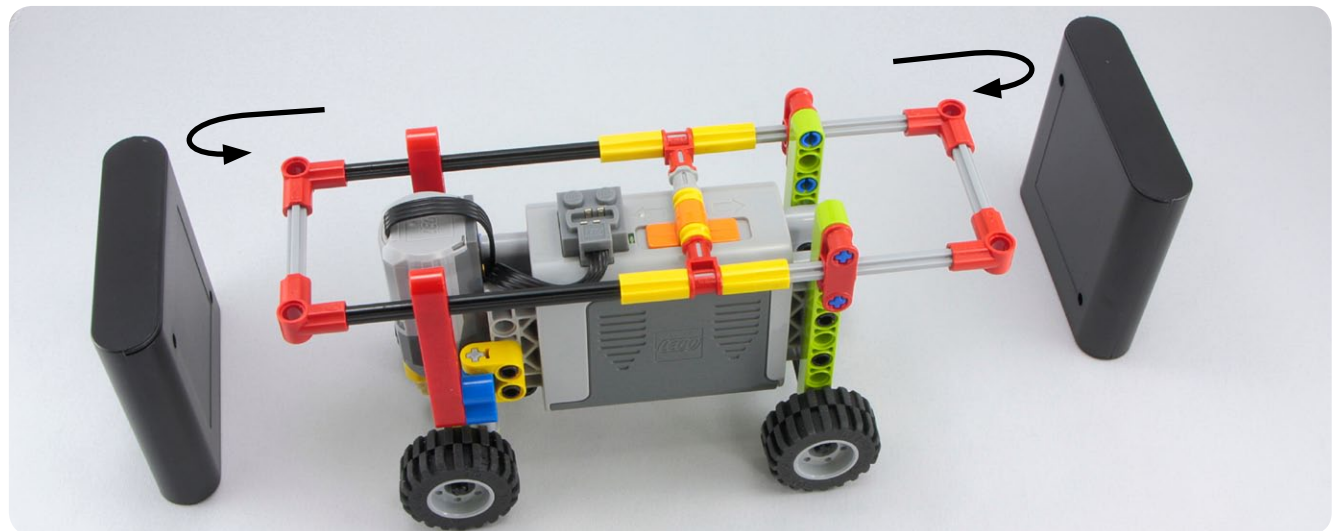
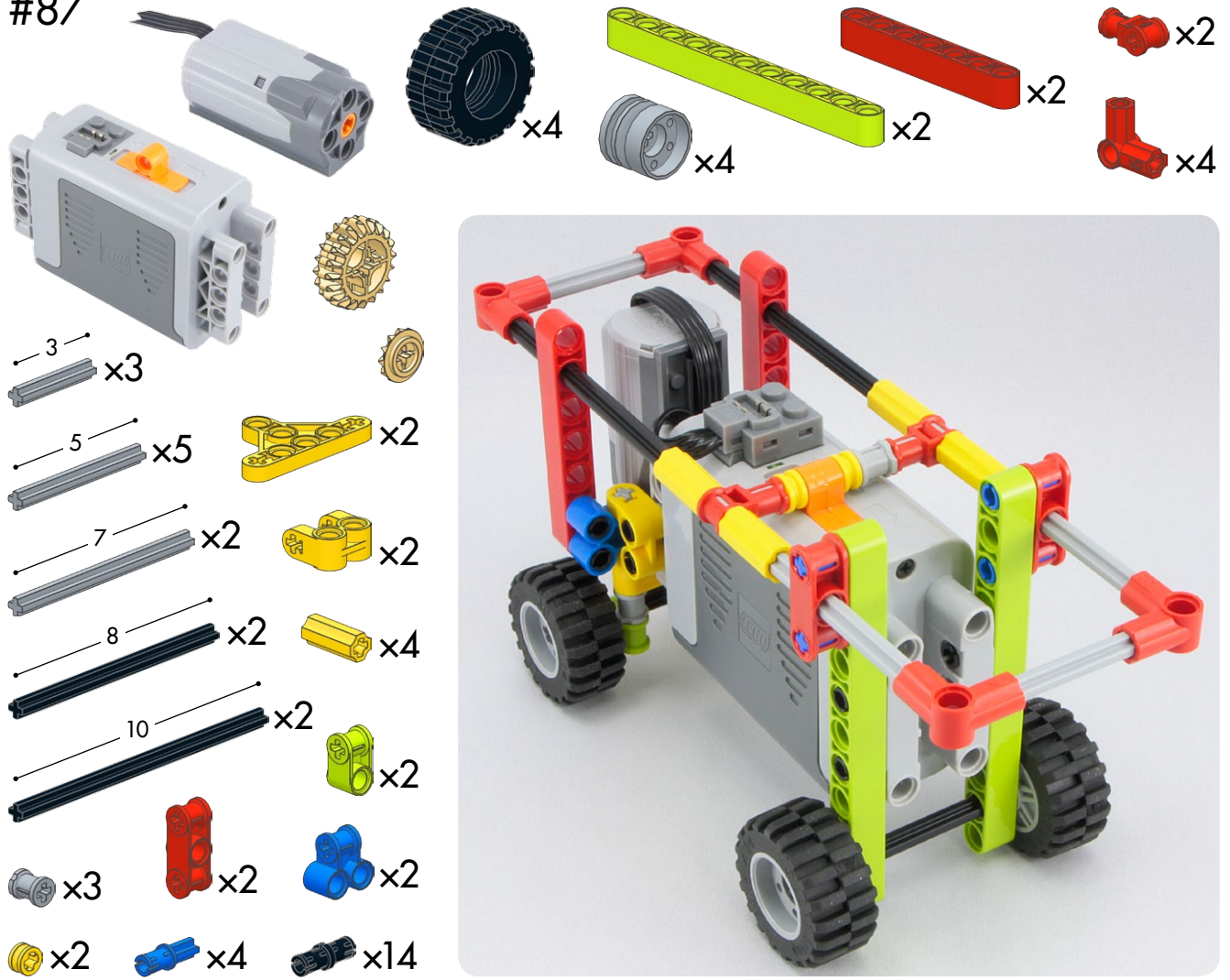


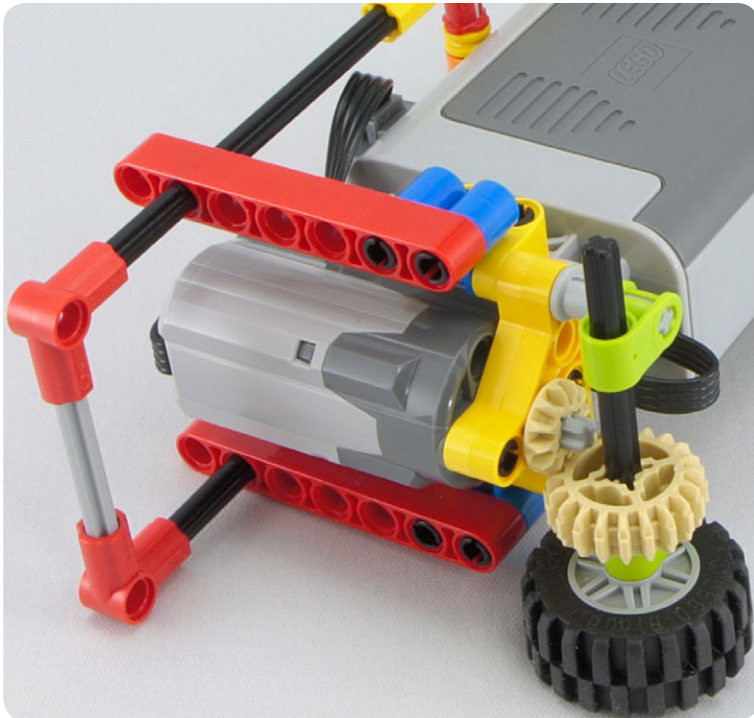
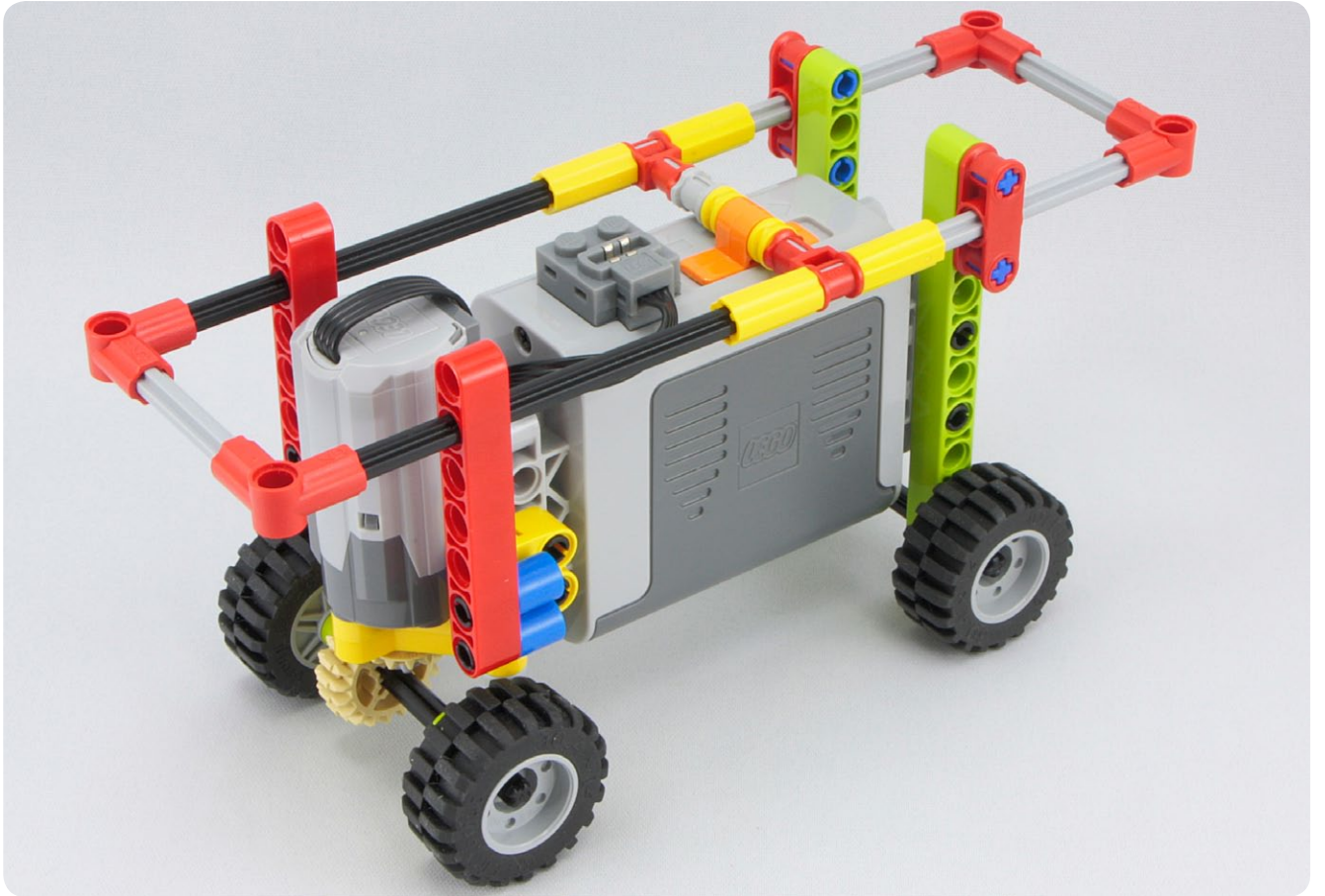




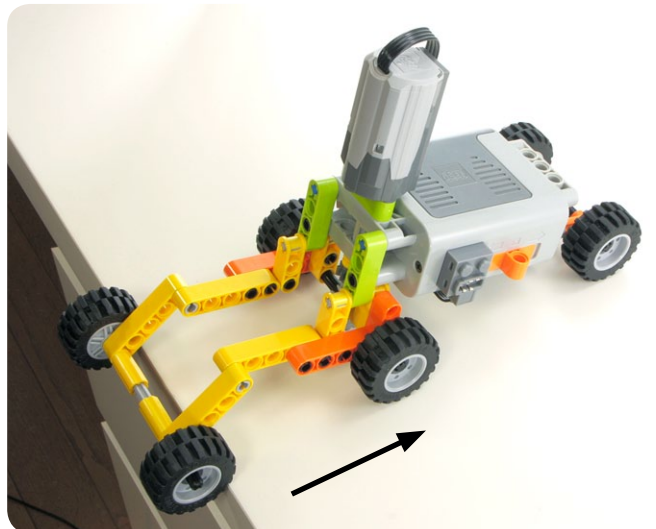
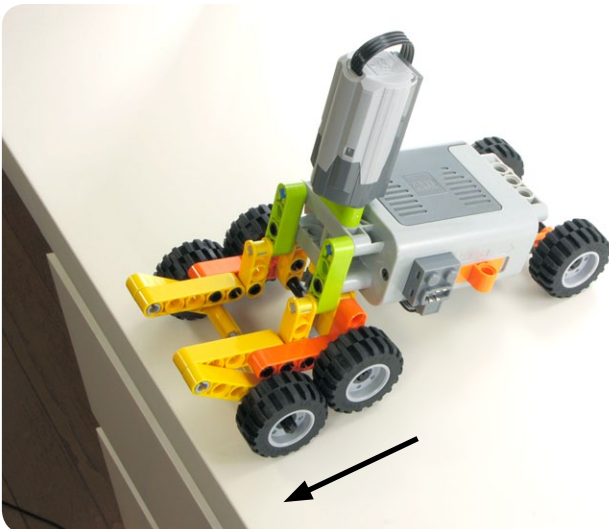
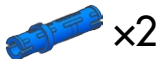
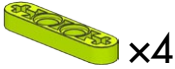
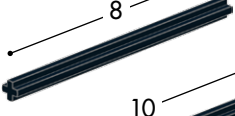
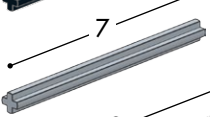
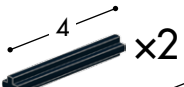
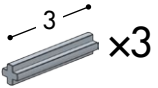
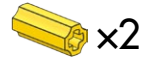
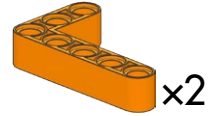
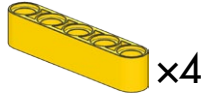
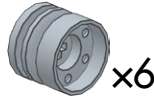


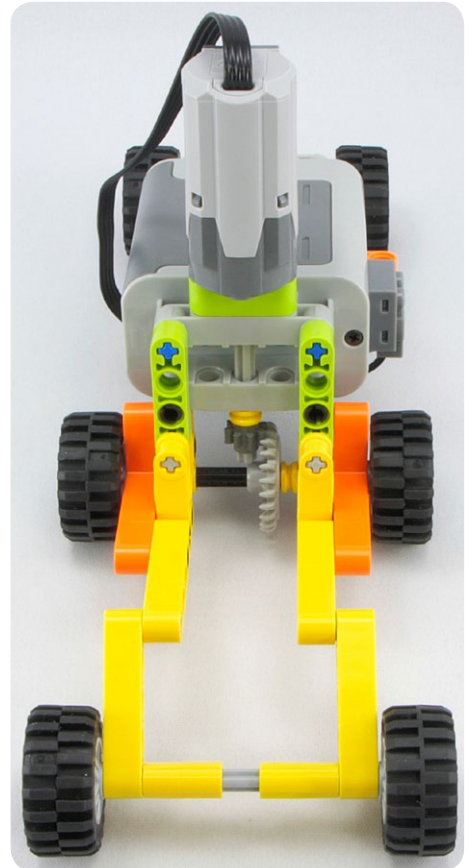
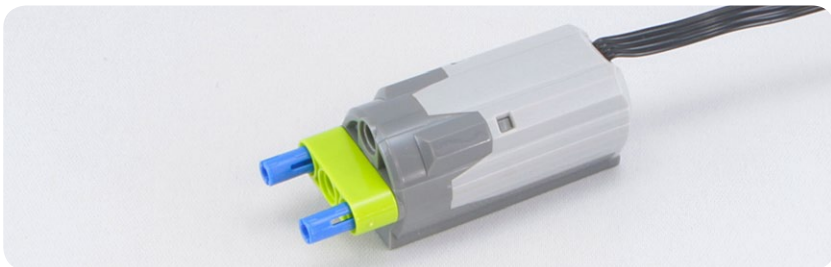
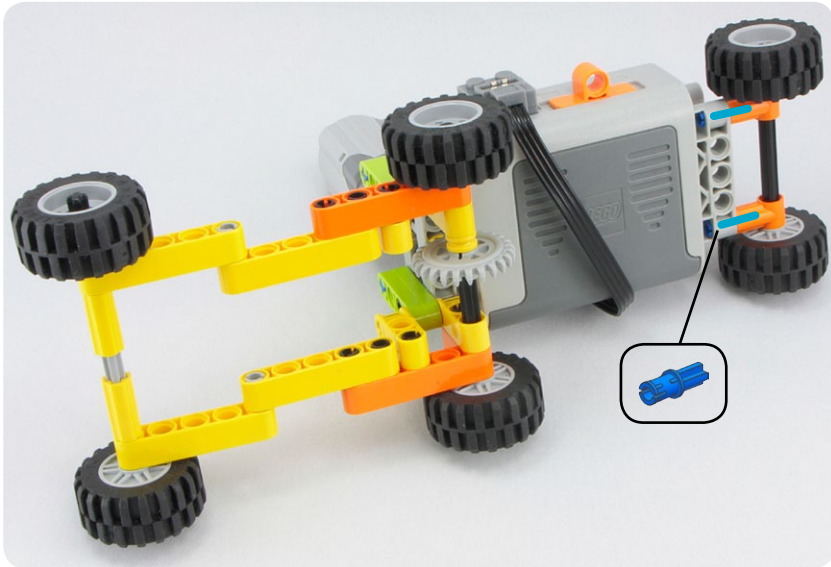
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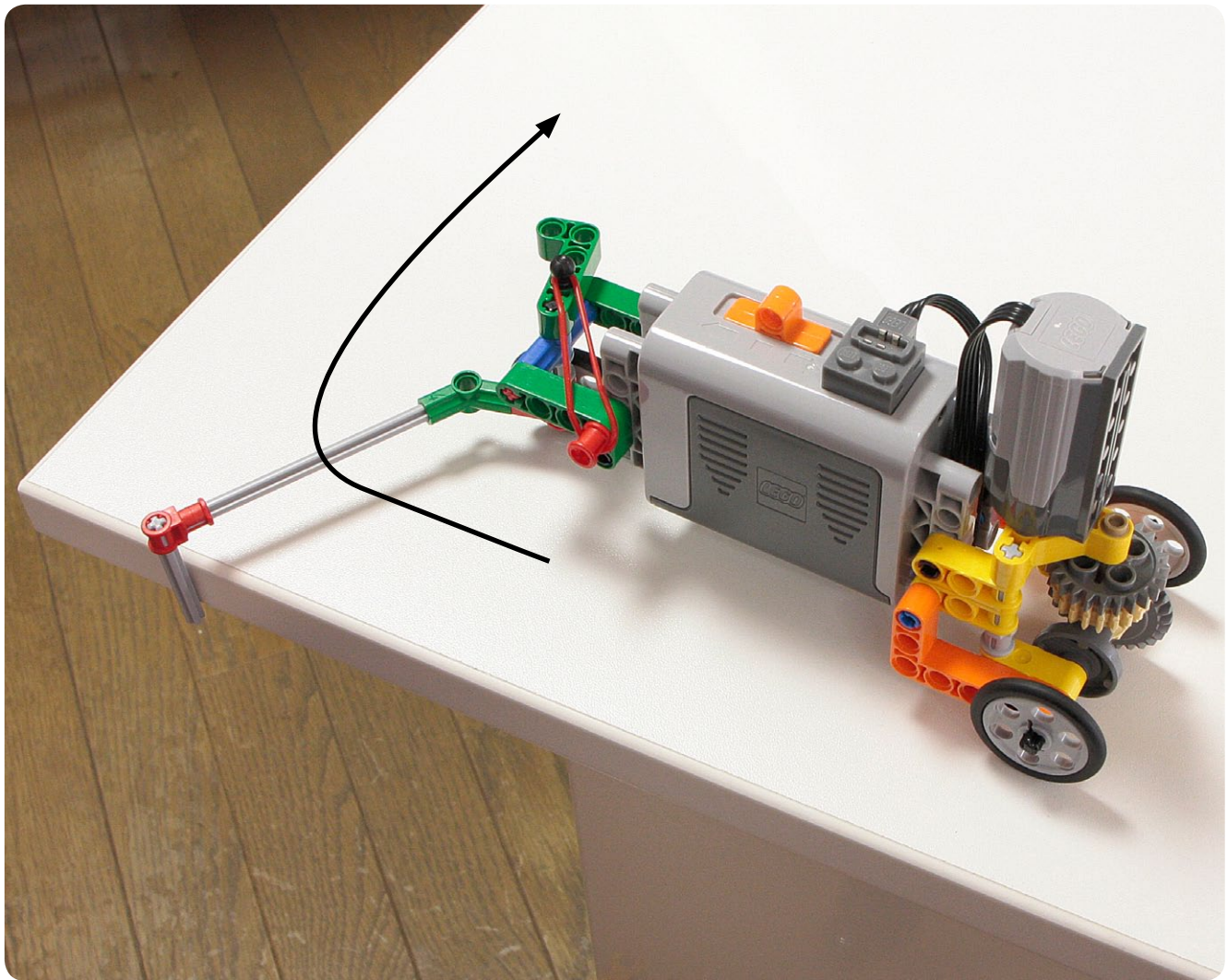
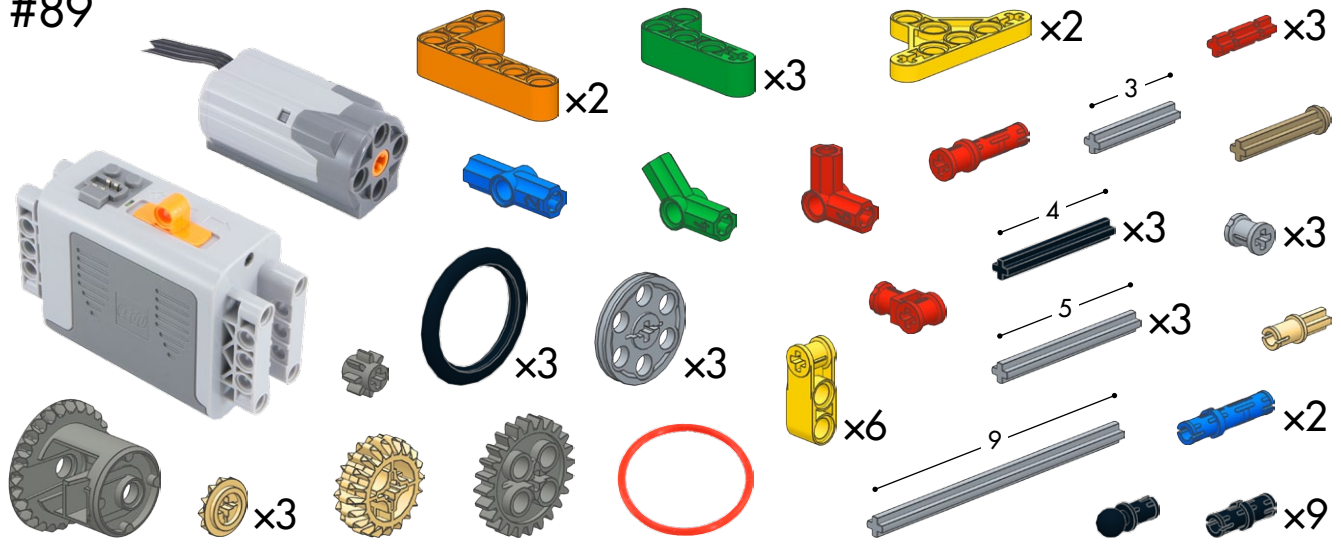


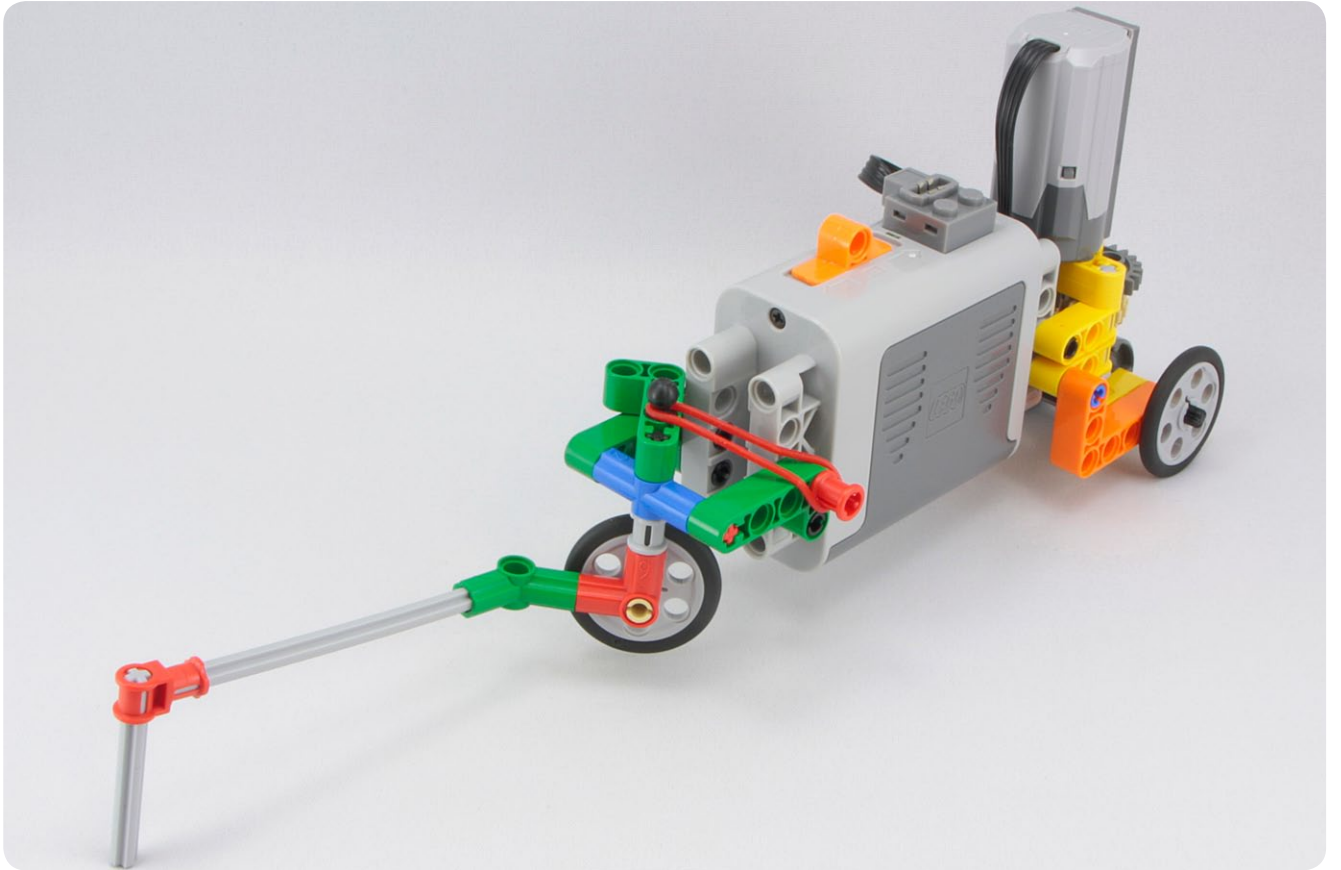
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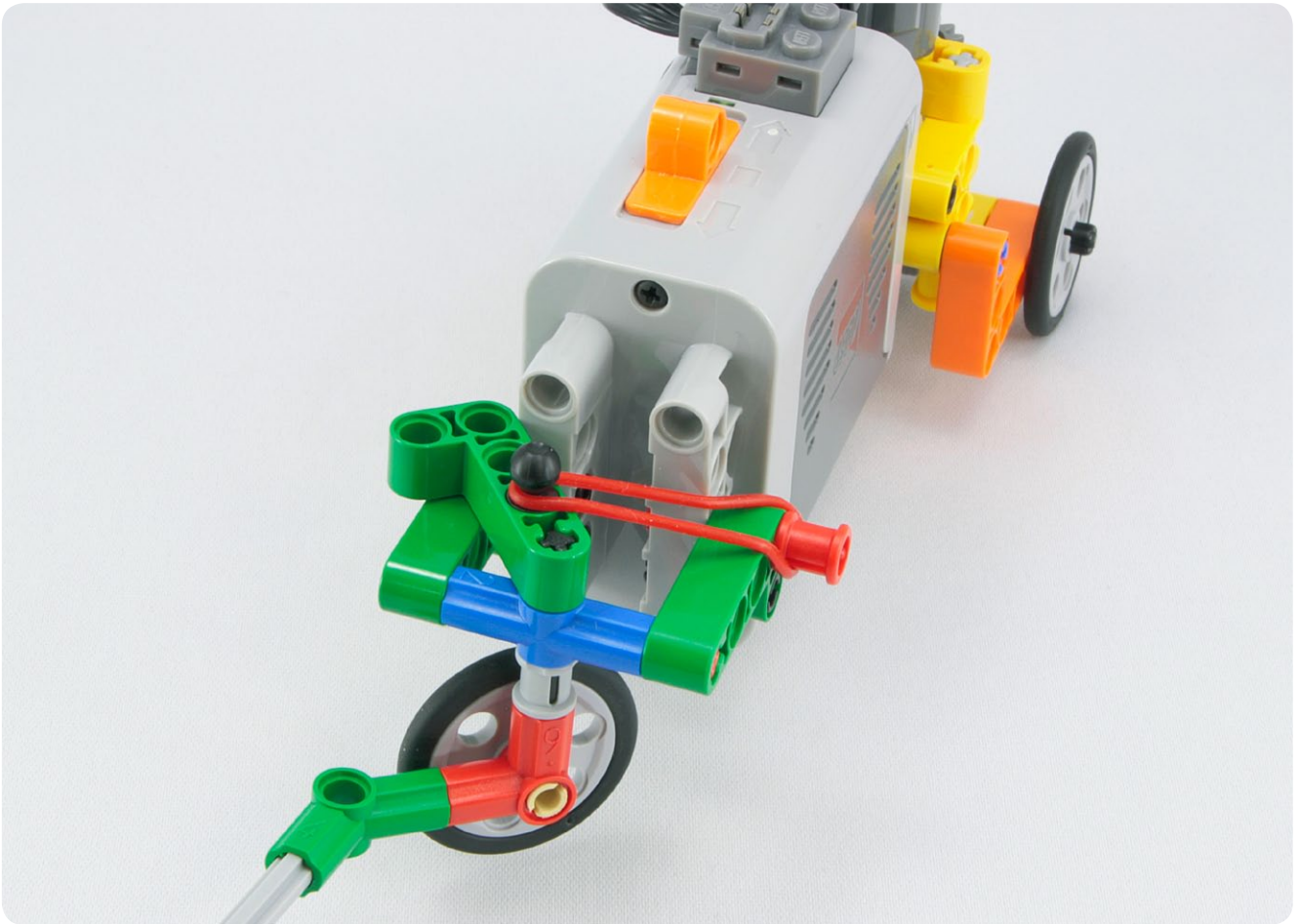
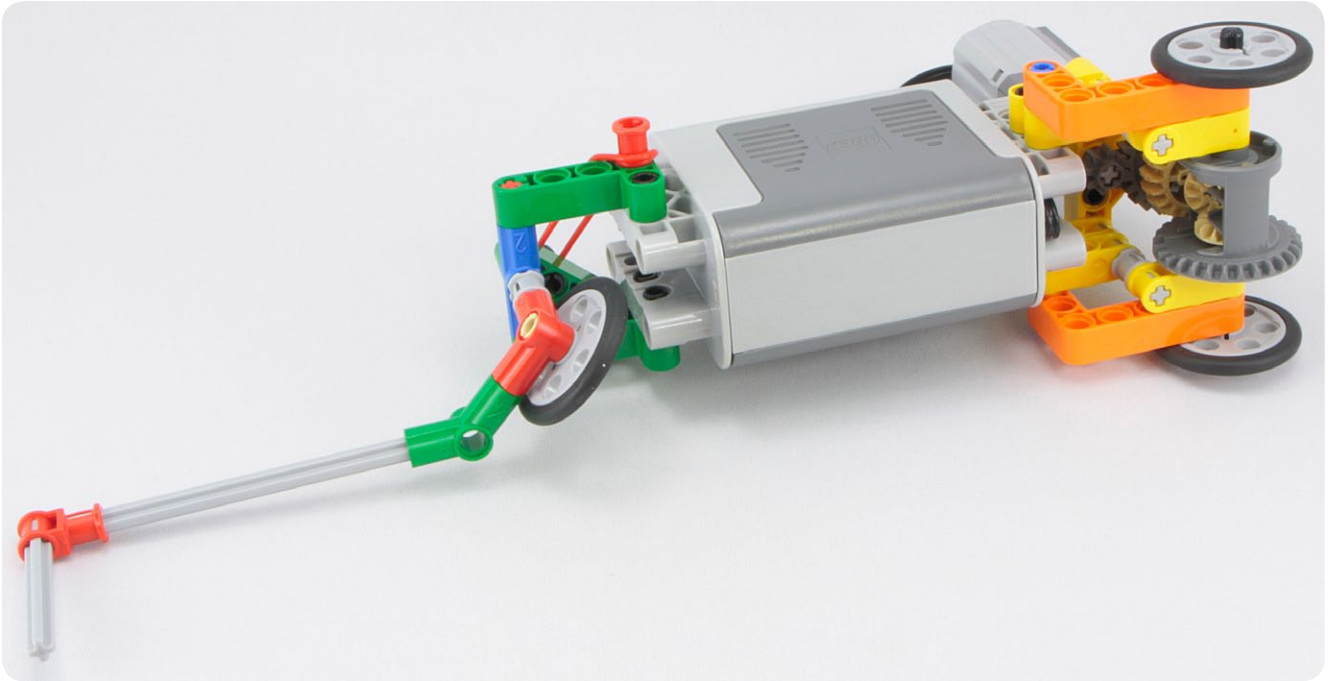


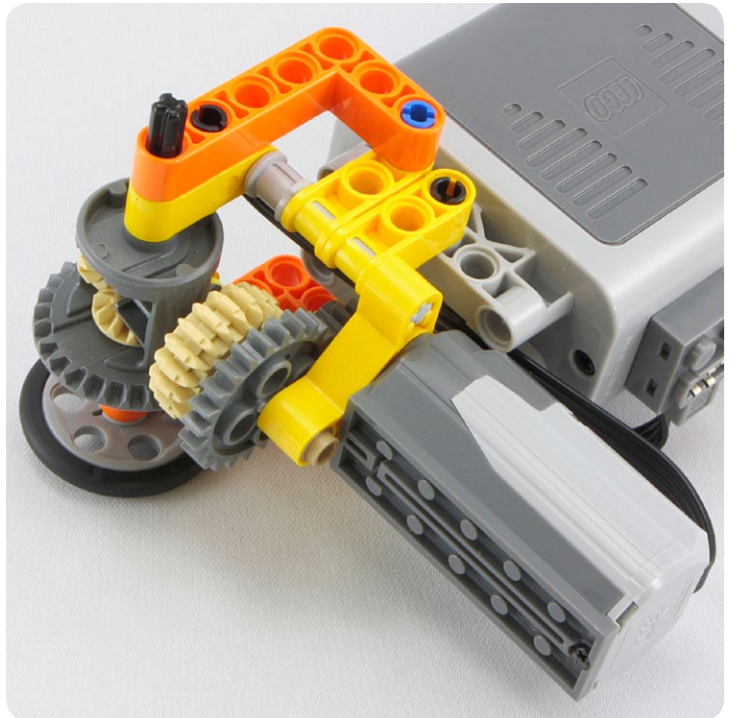
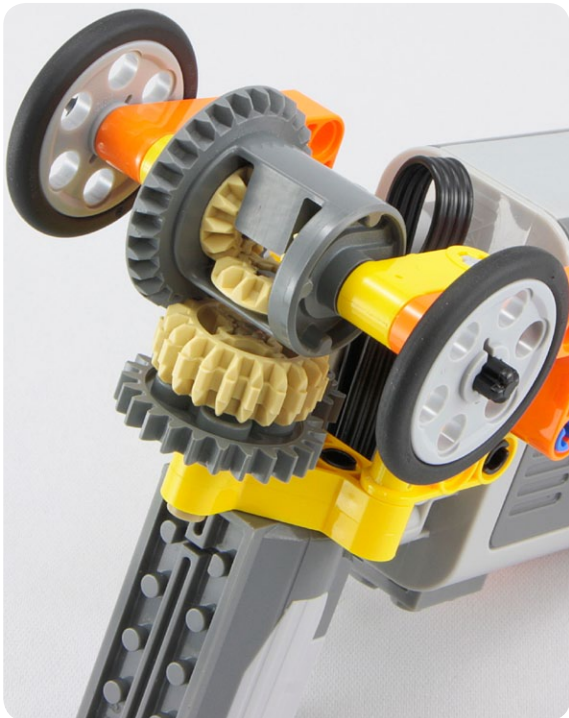
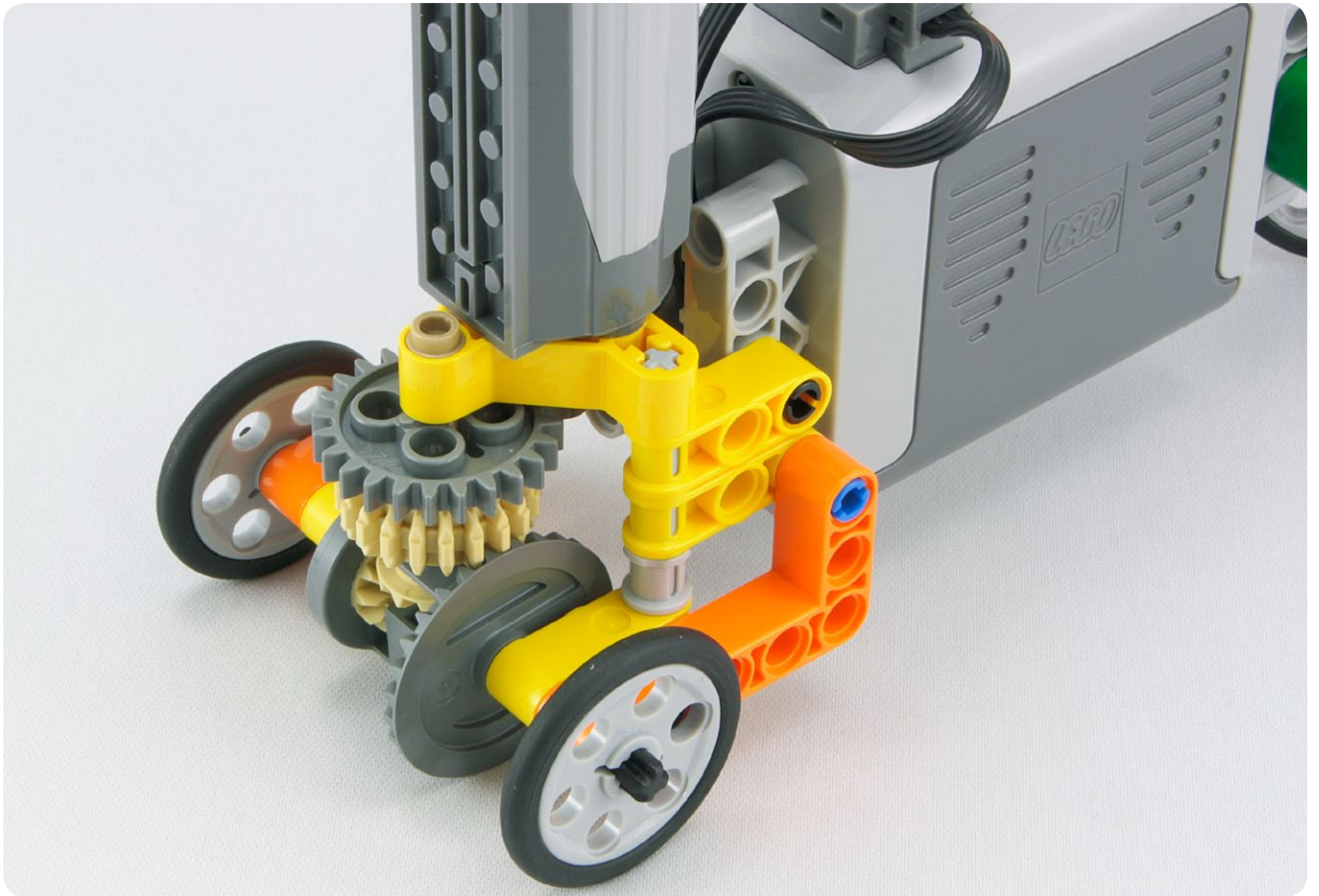


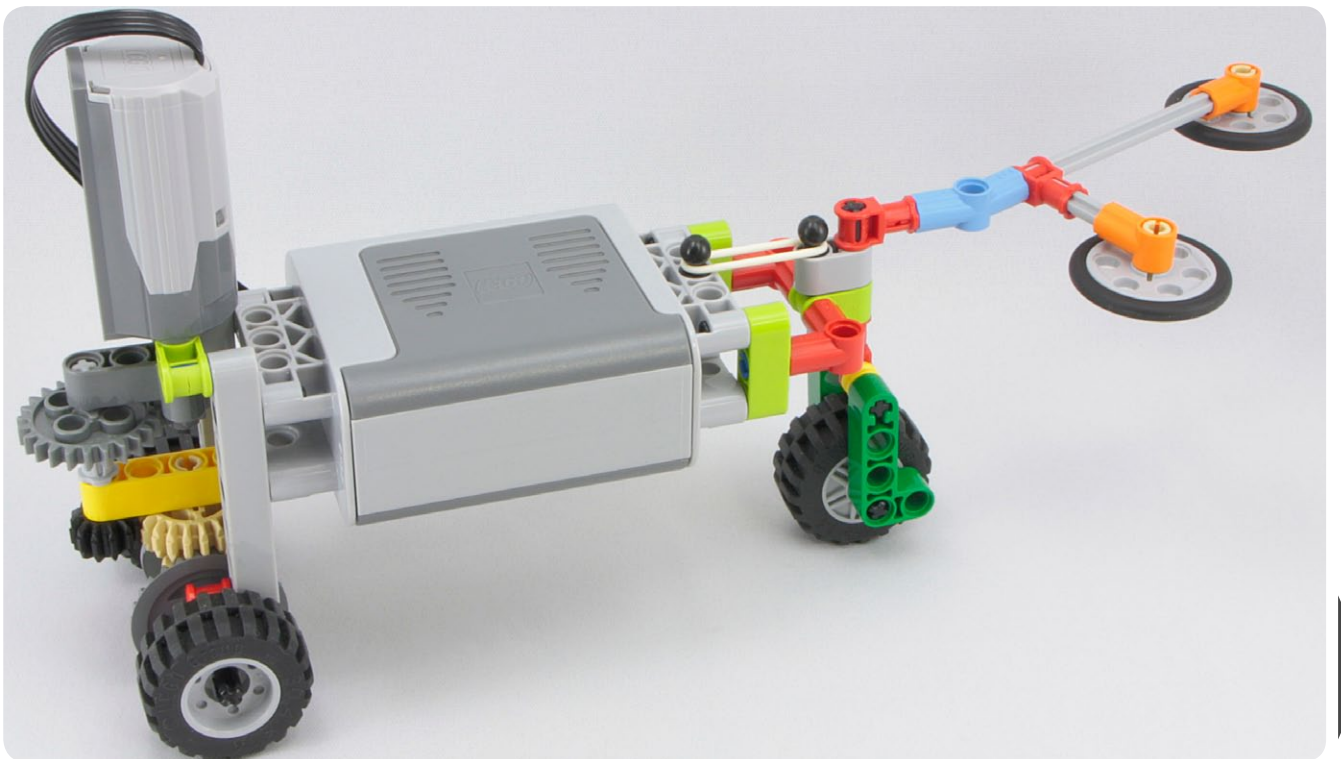
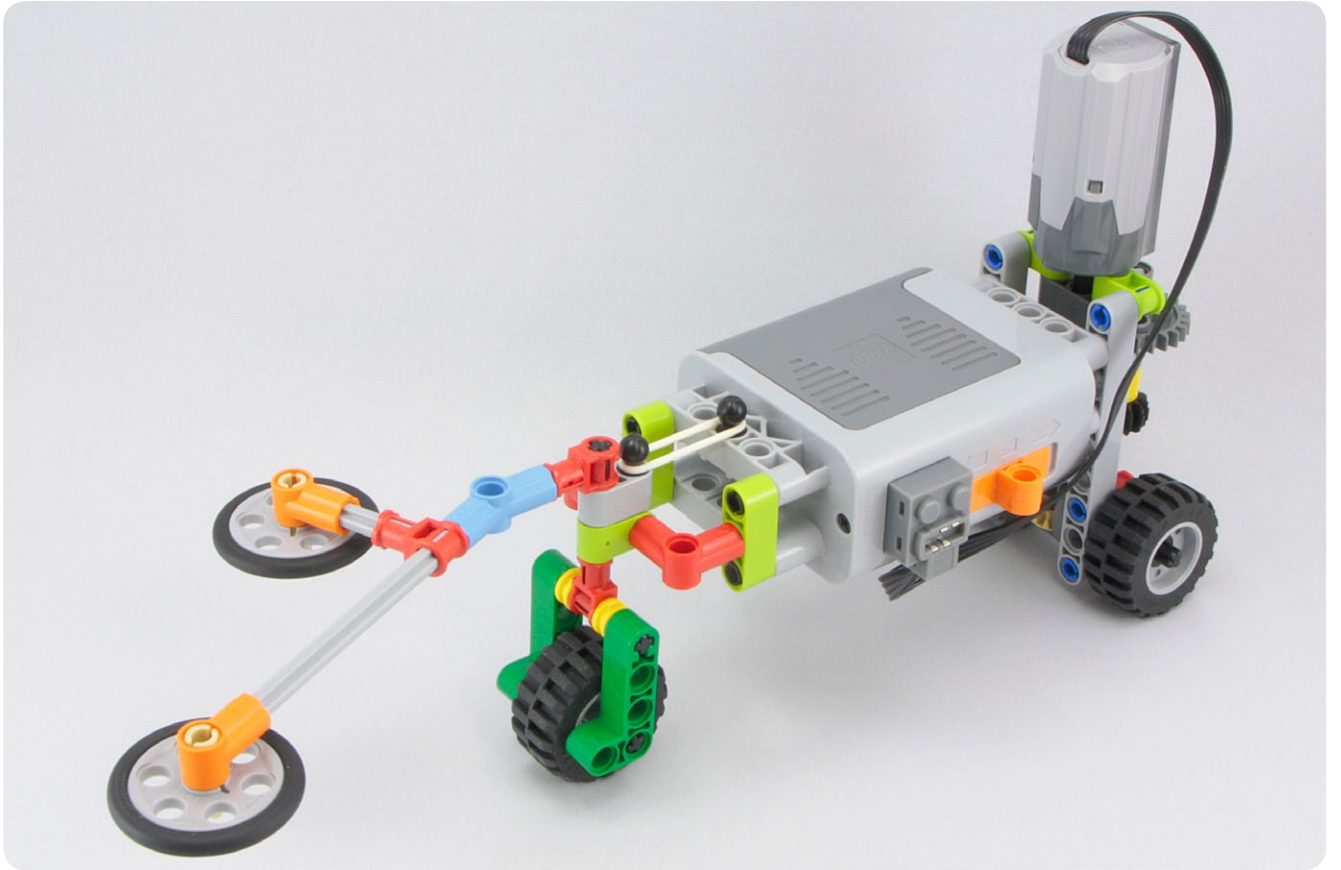
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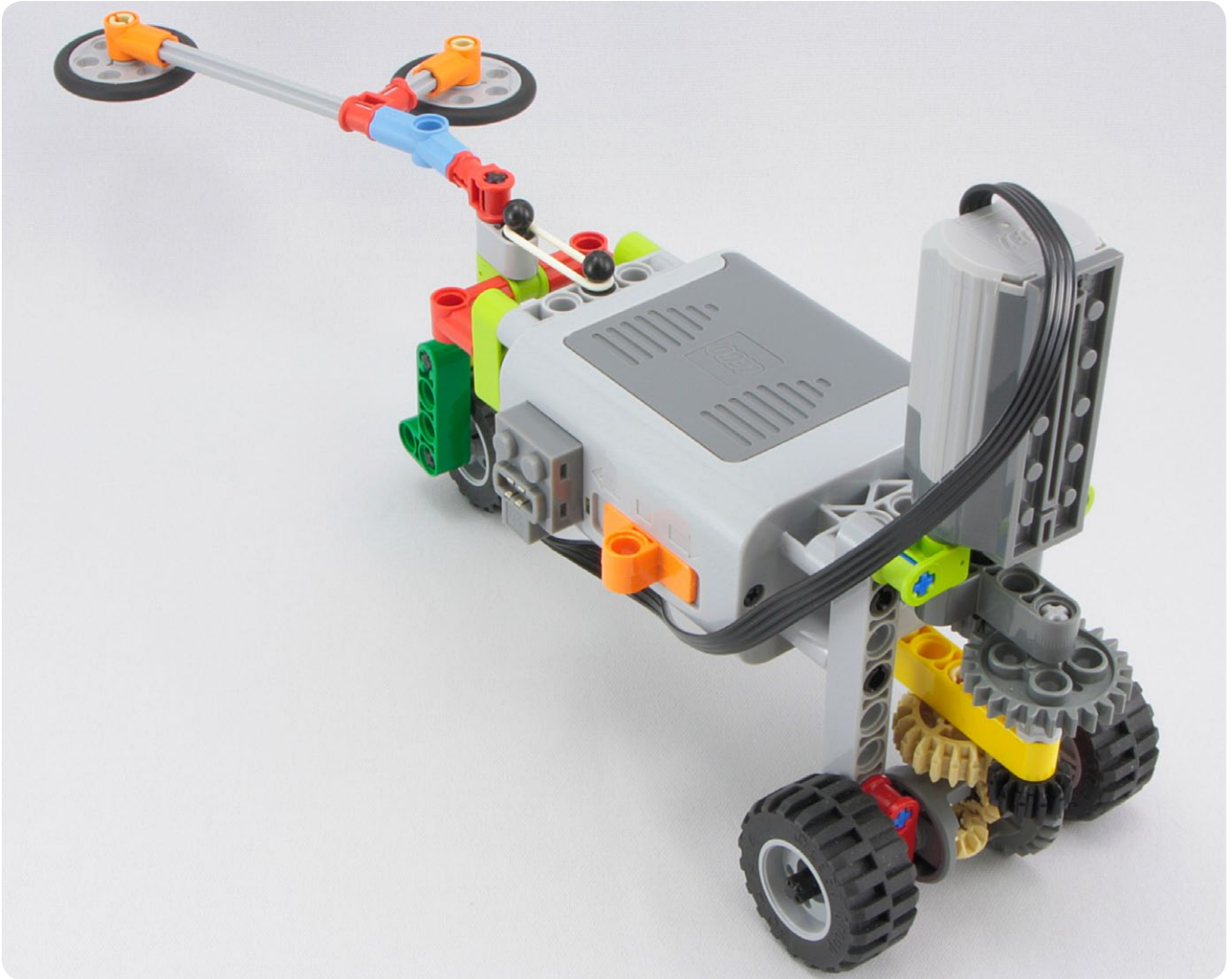


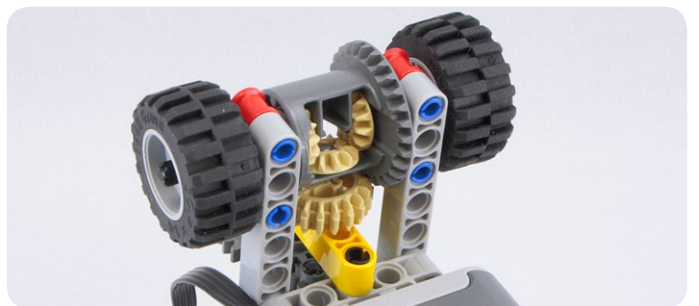
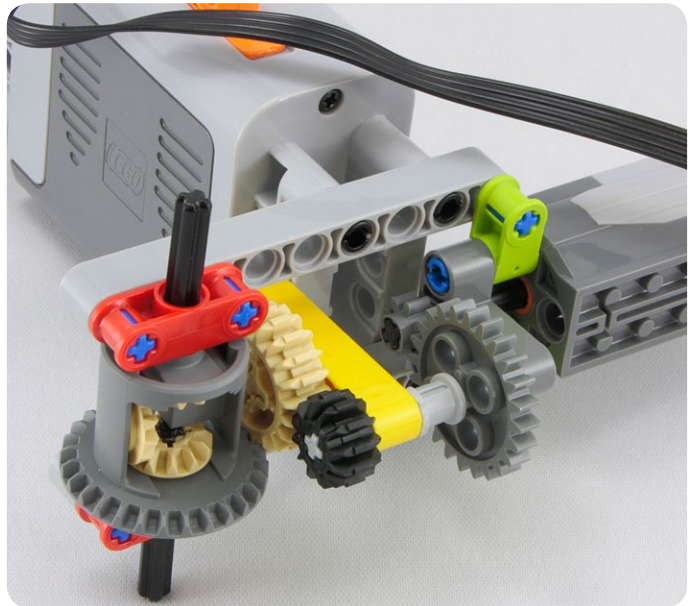
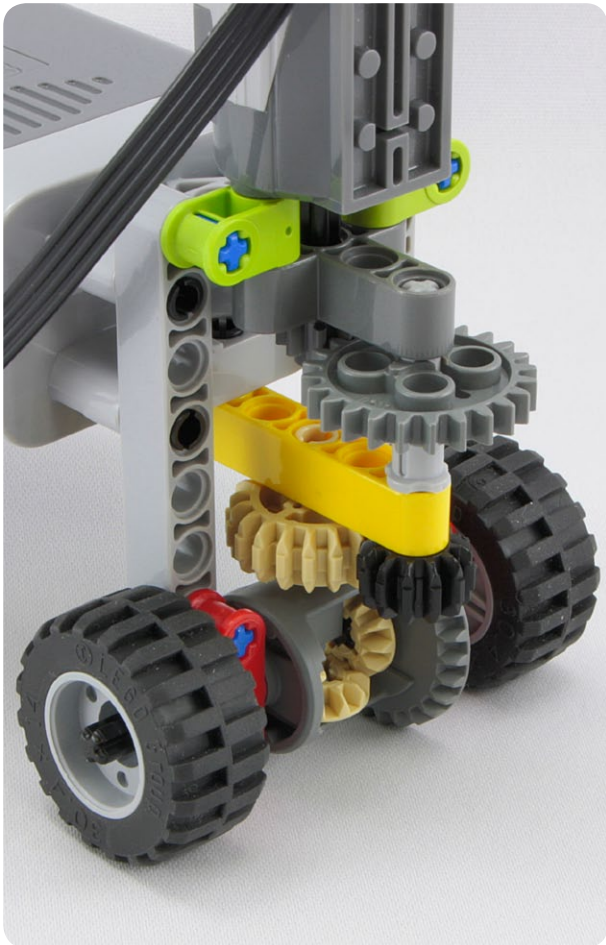
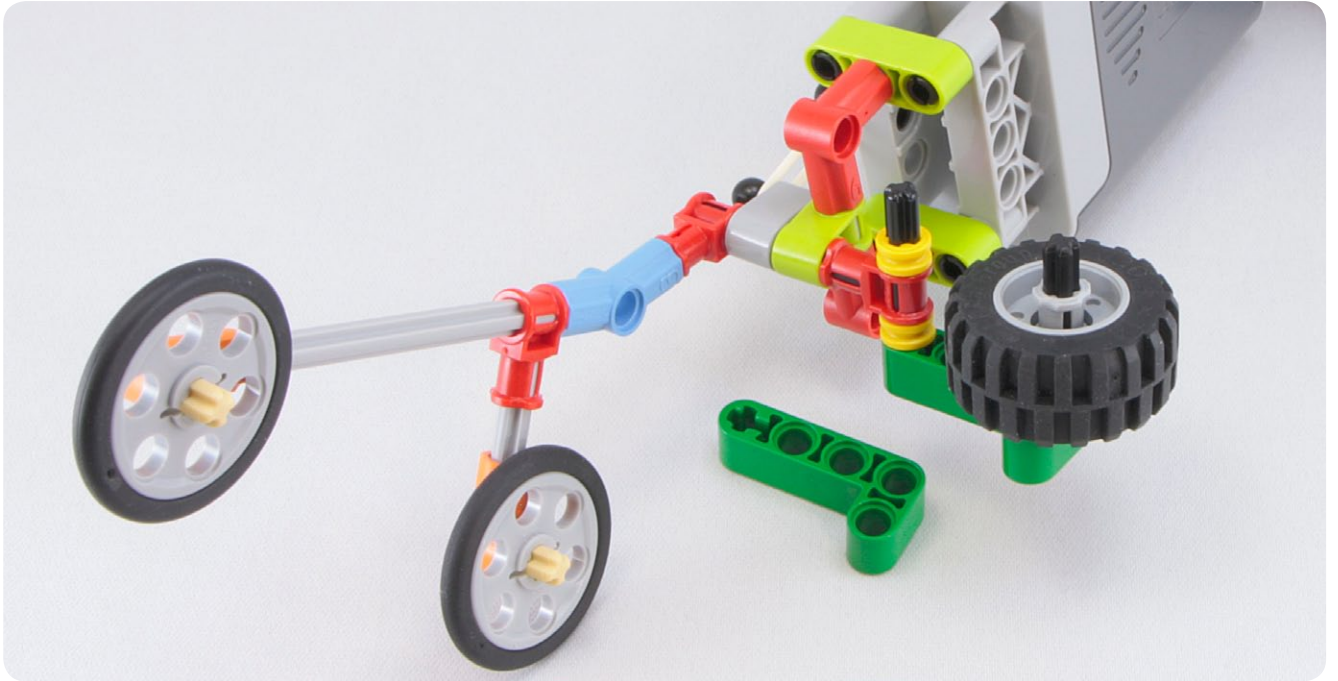




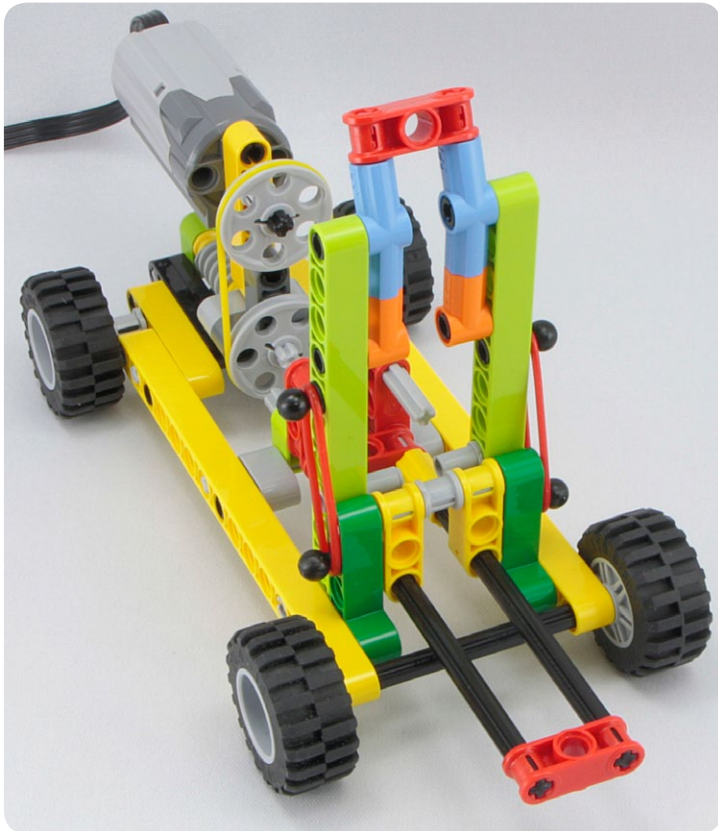
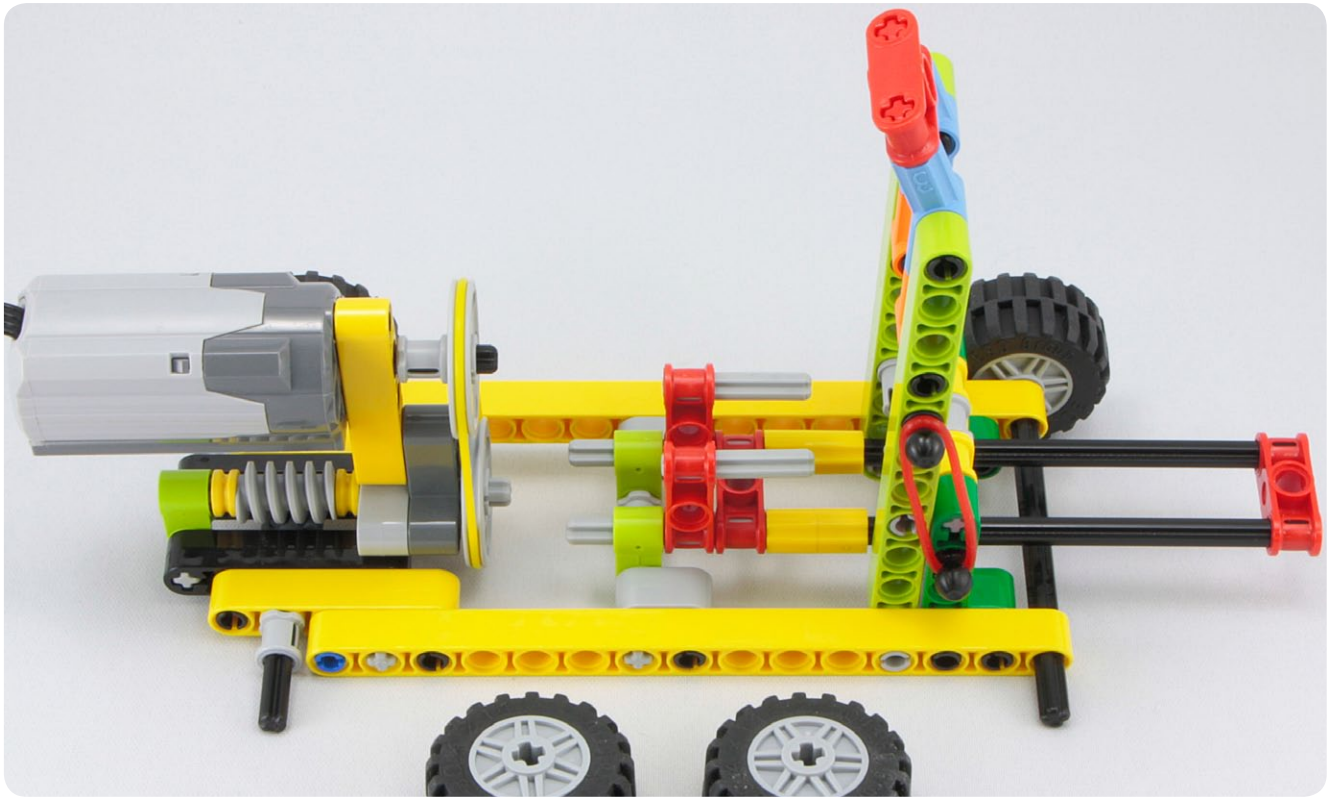


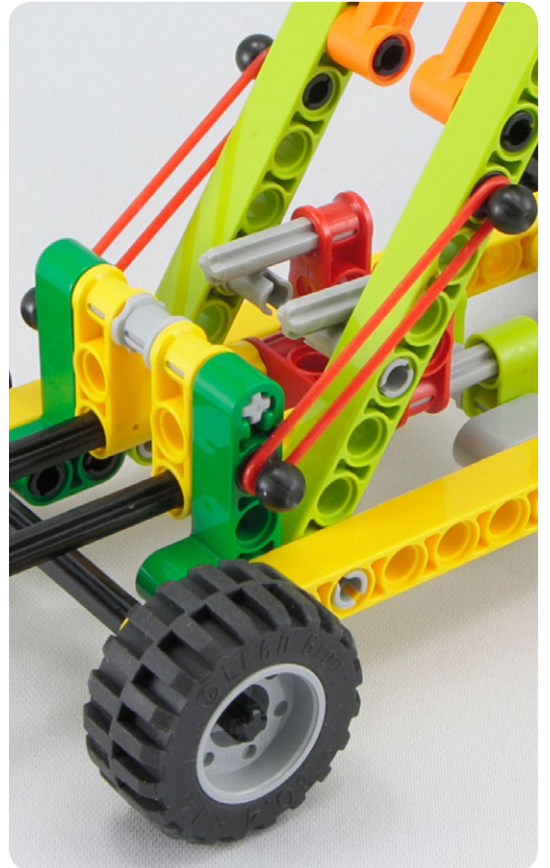
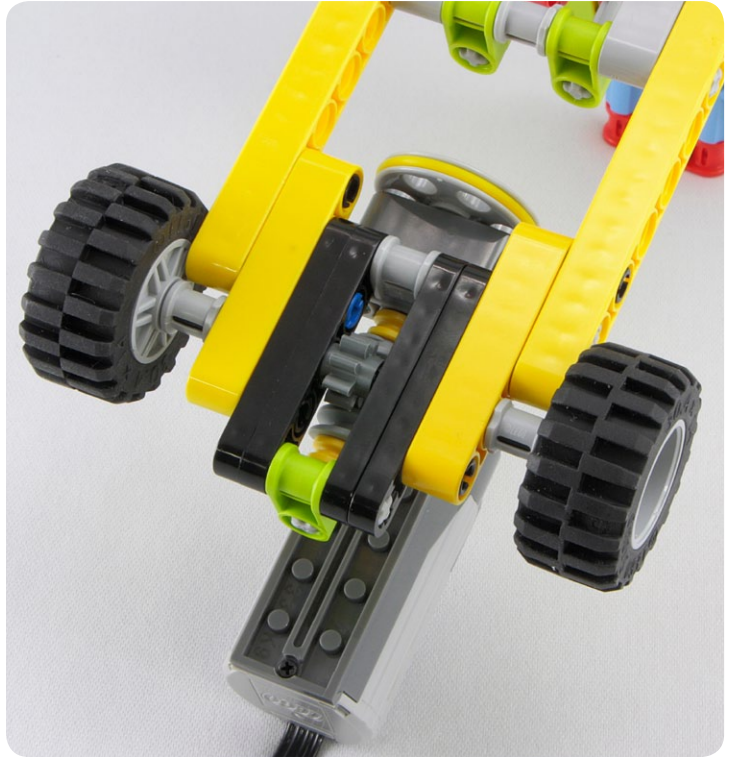
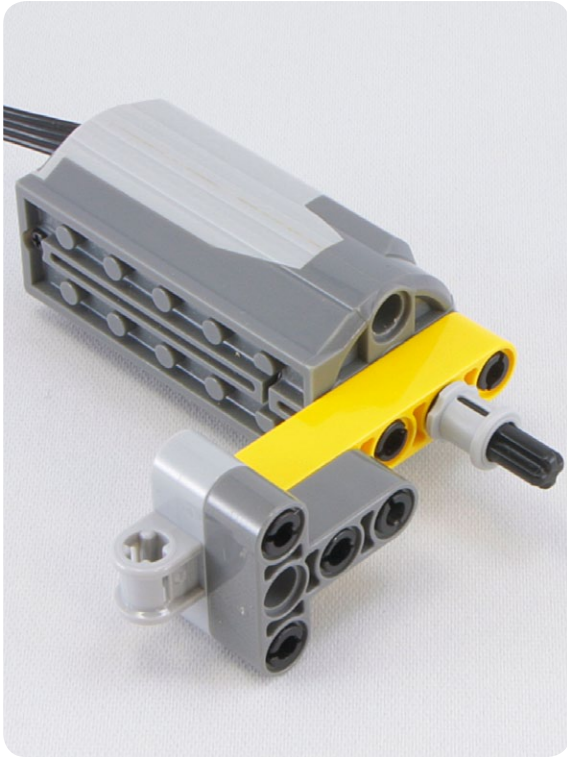




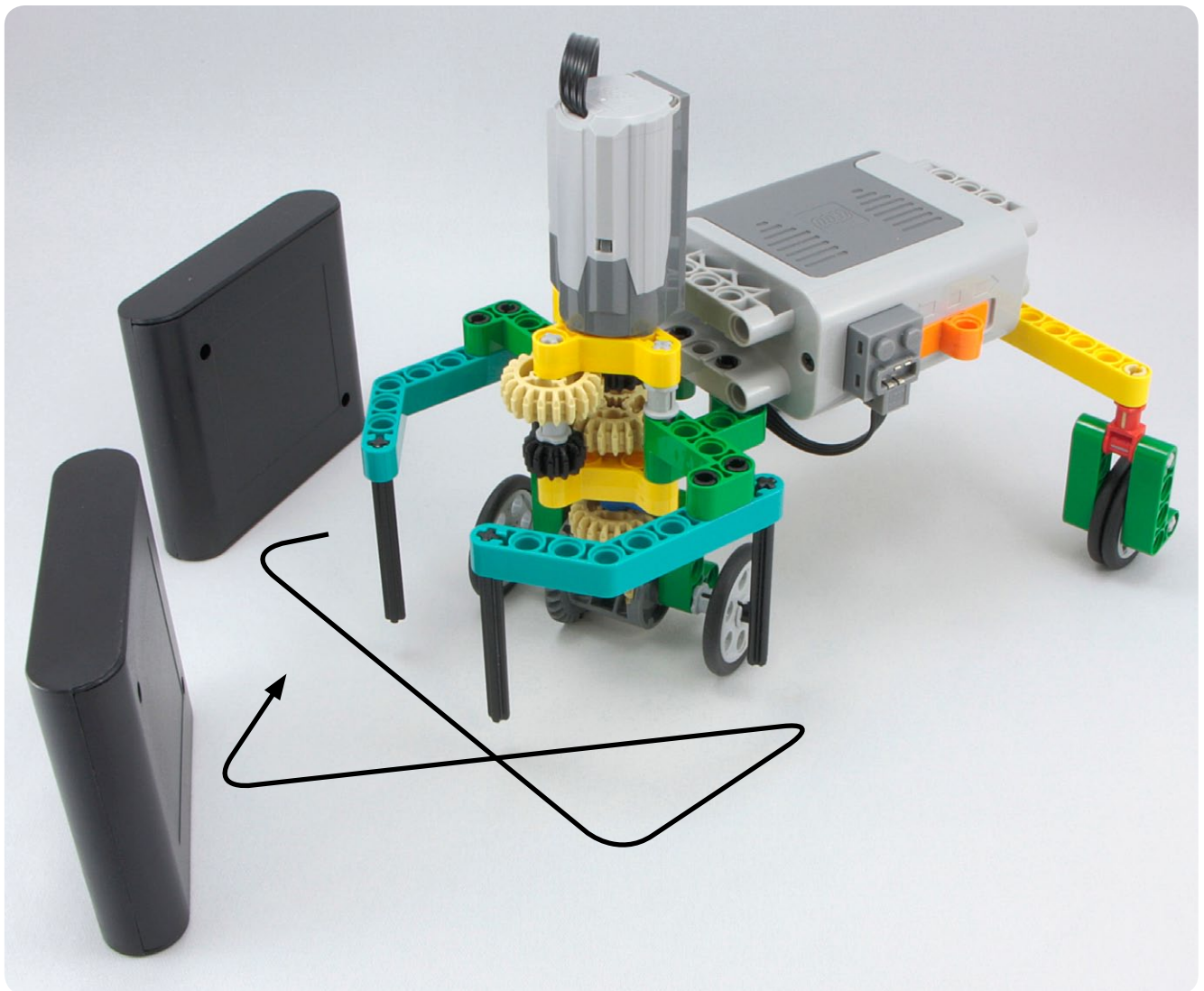
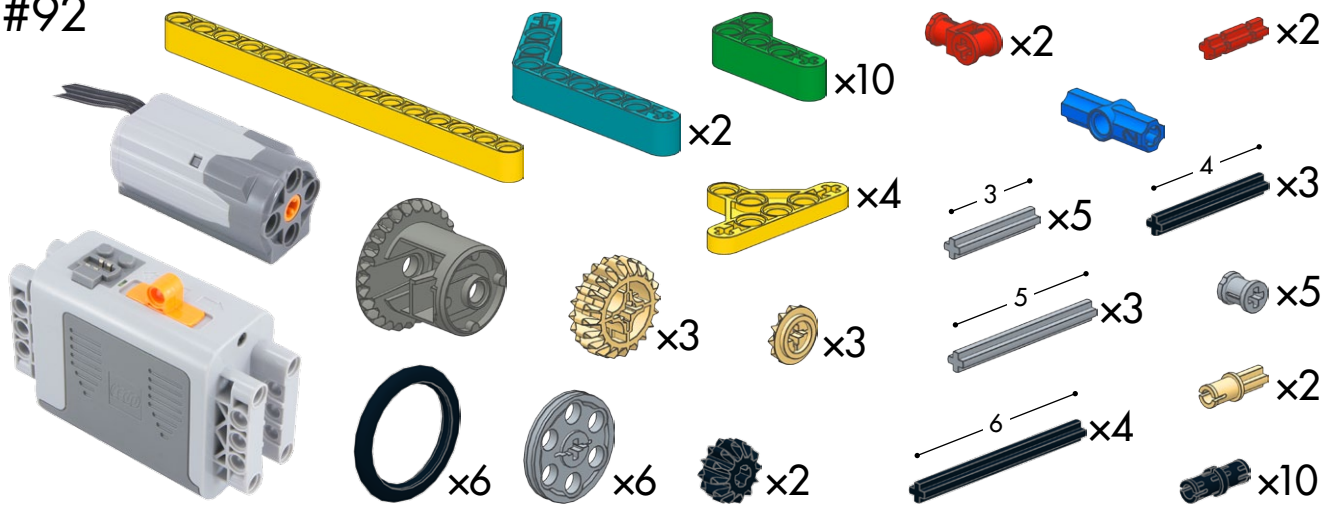


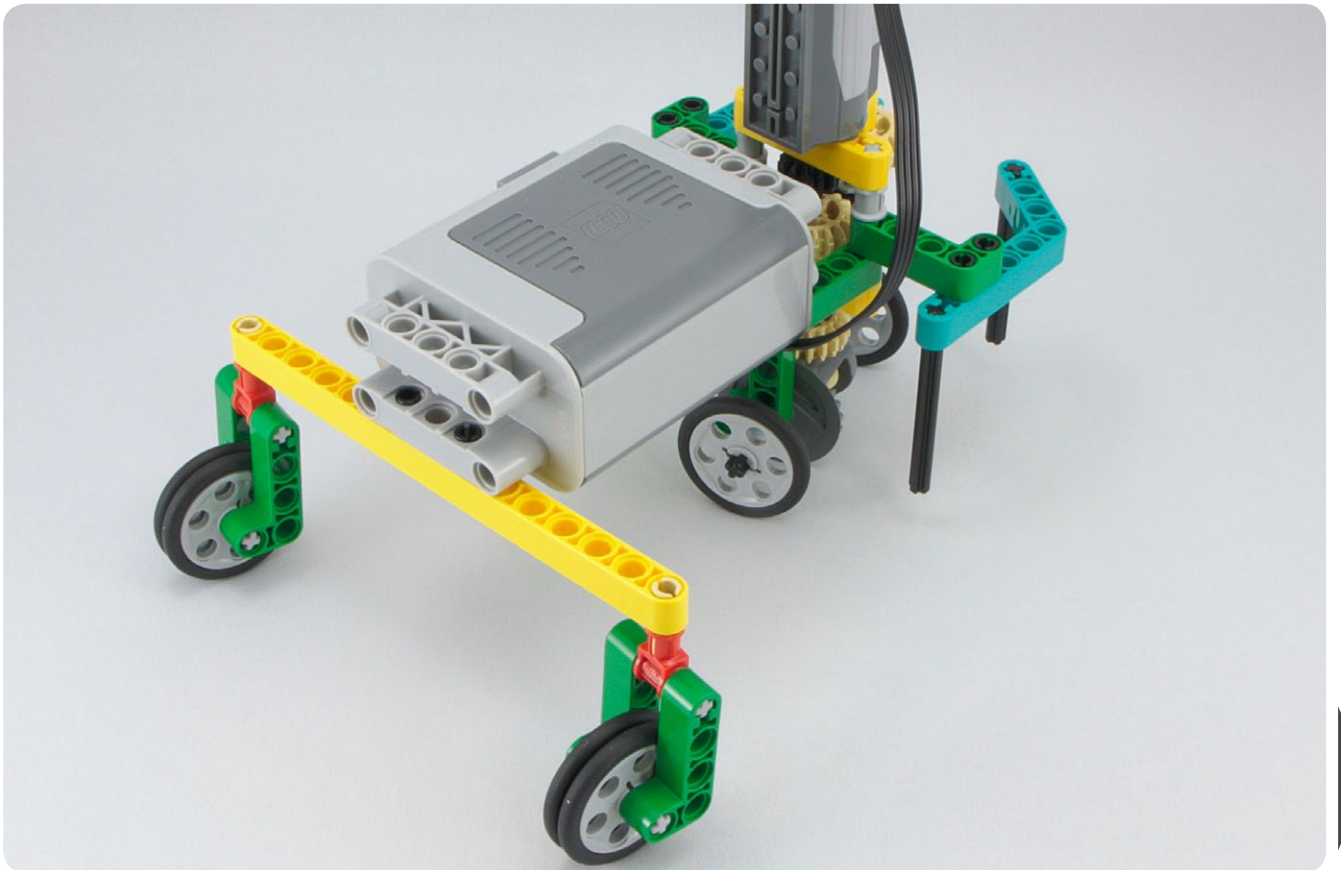
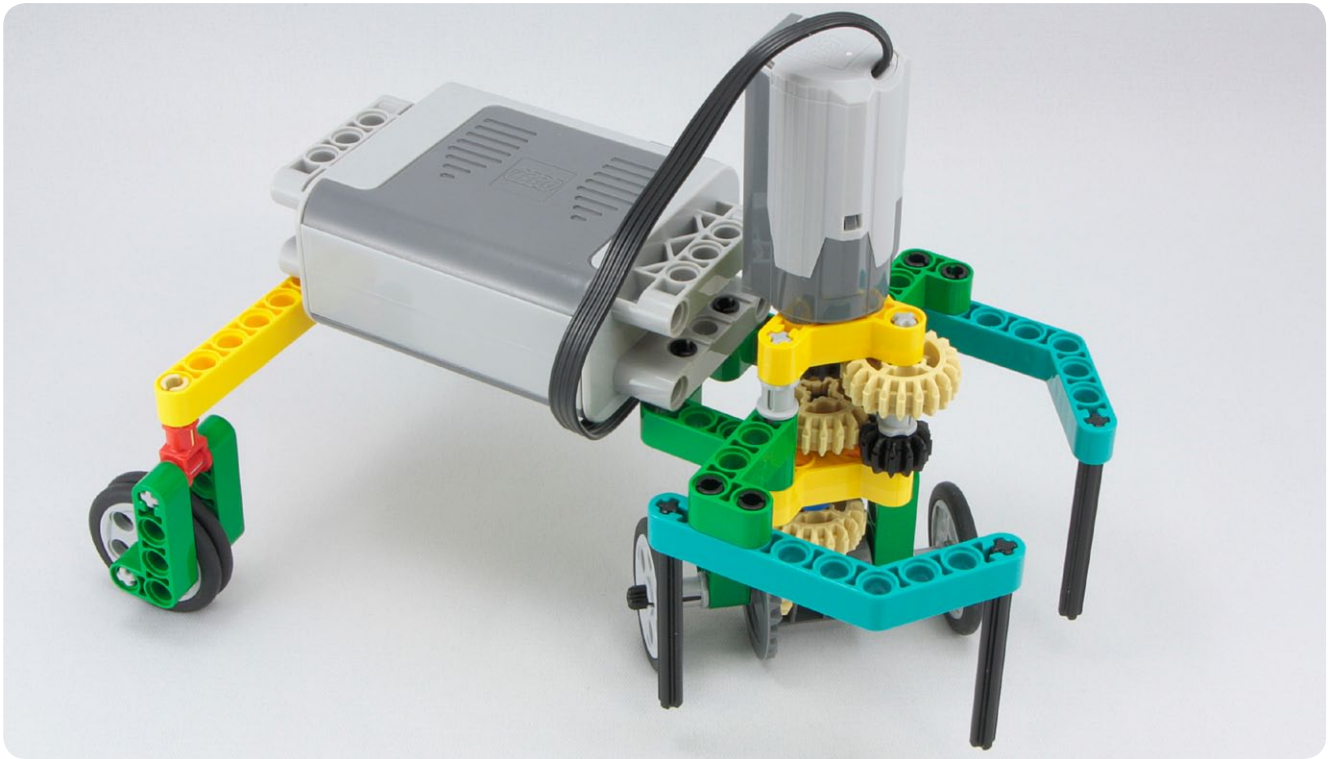


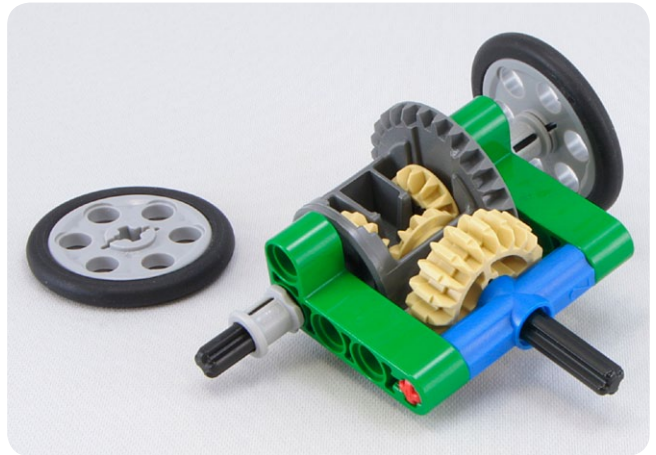
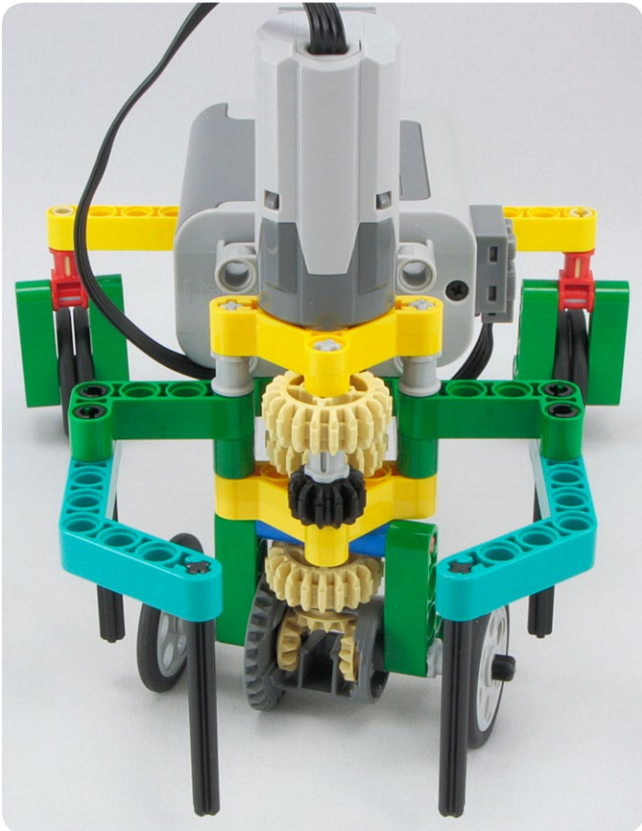
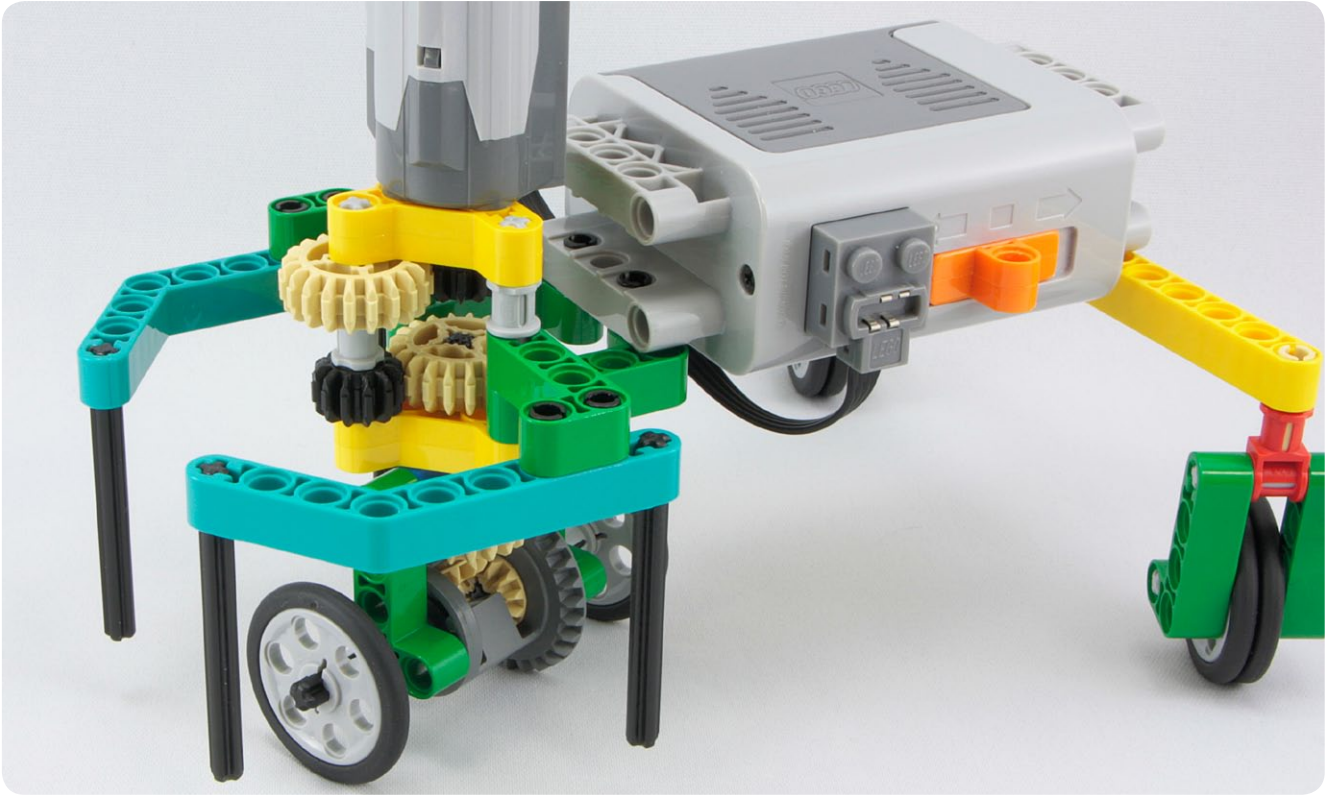


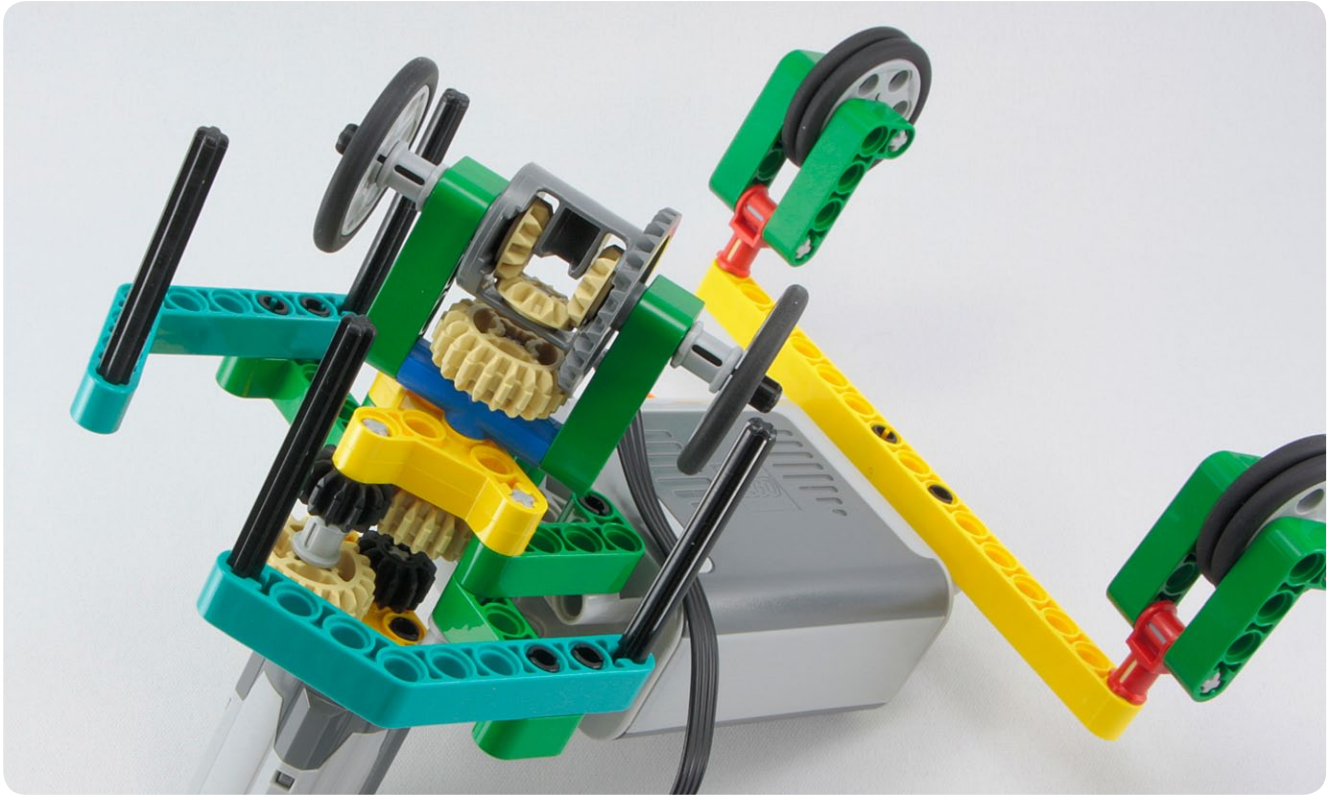


#92





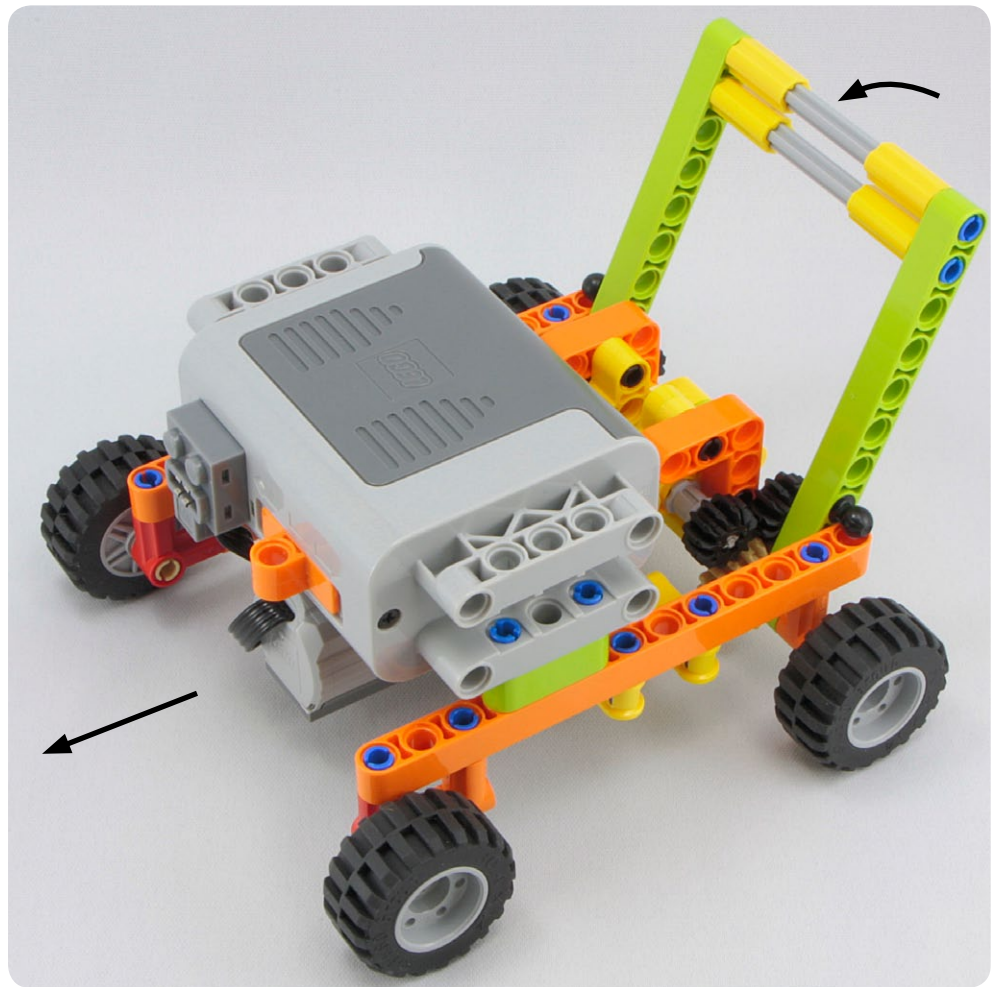
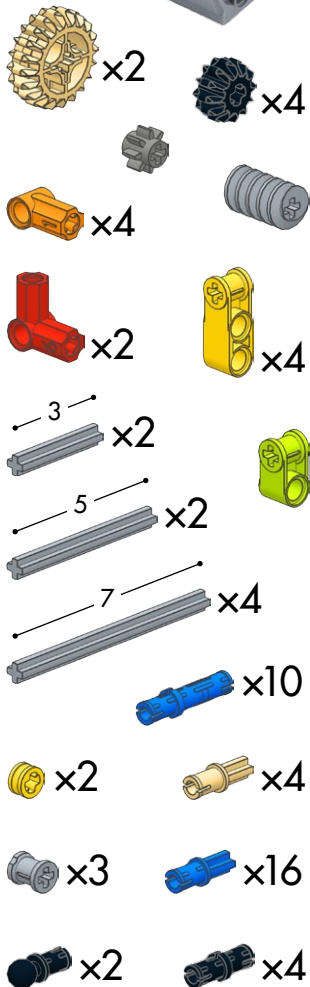
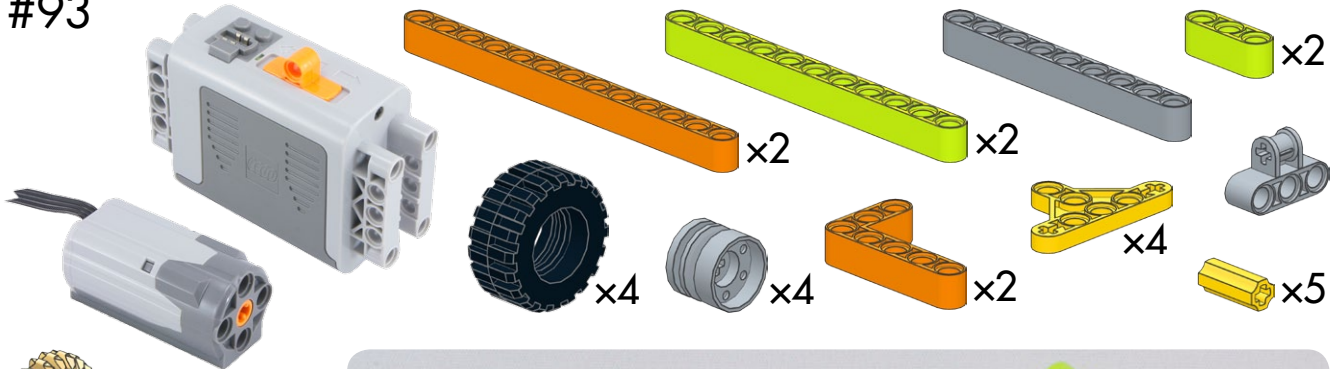


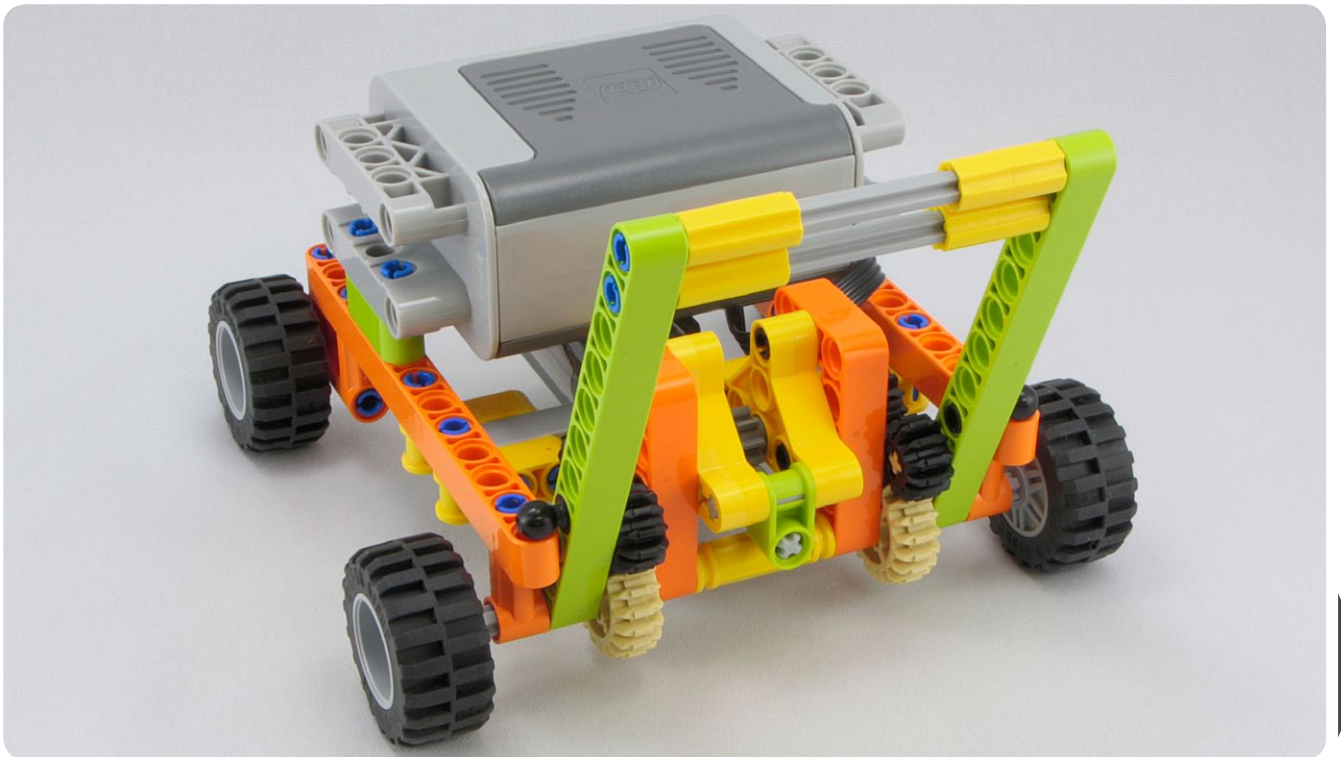


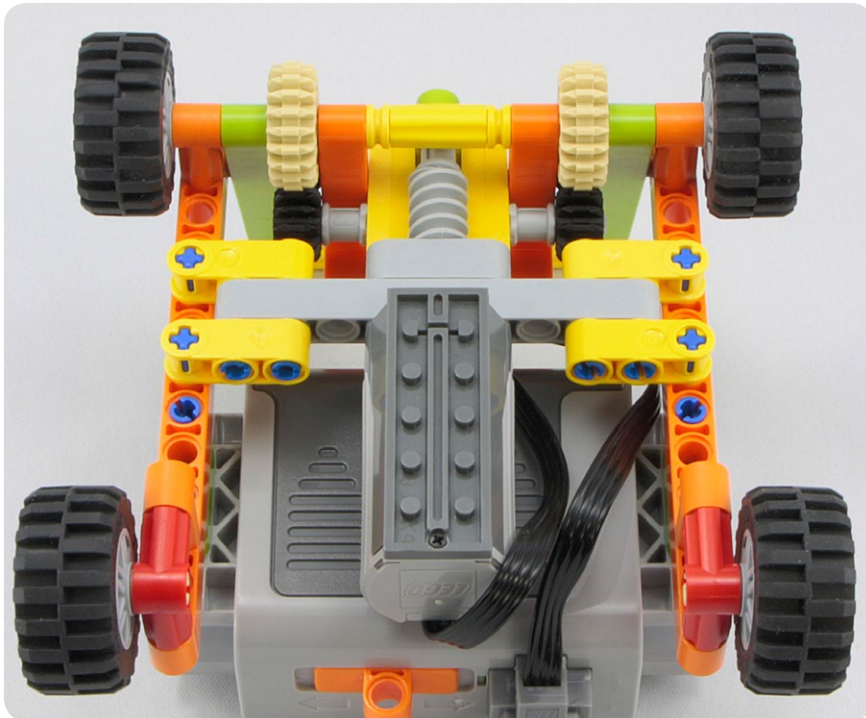
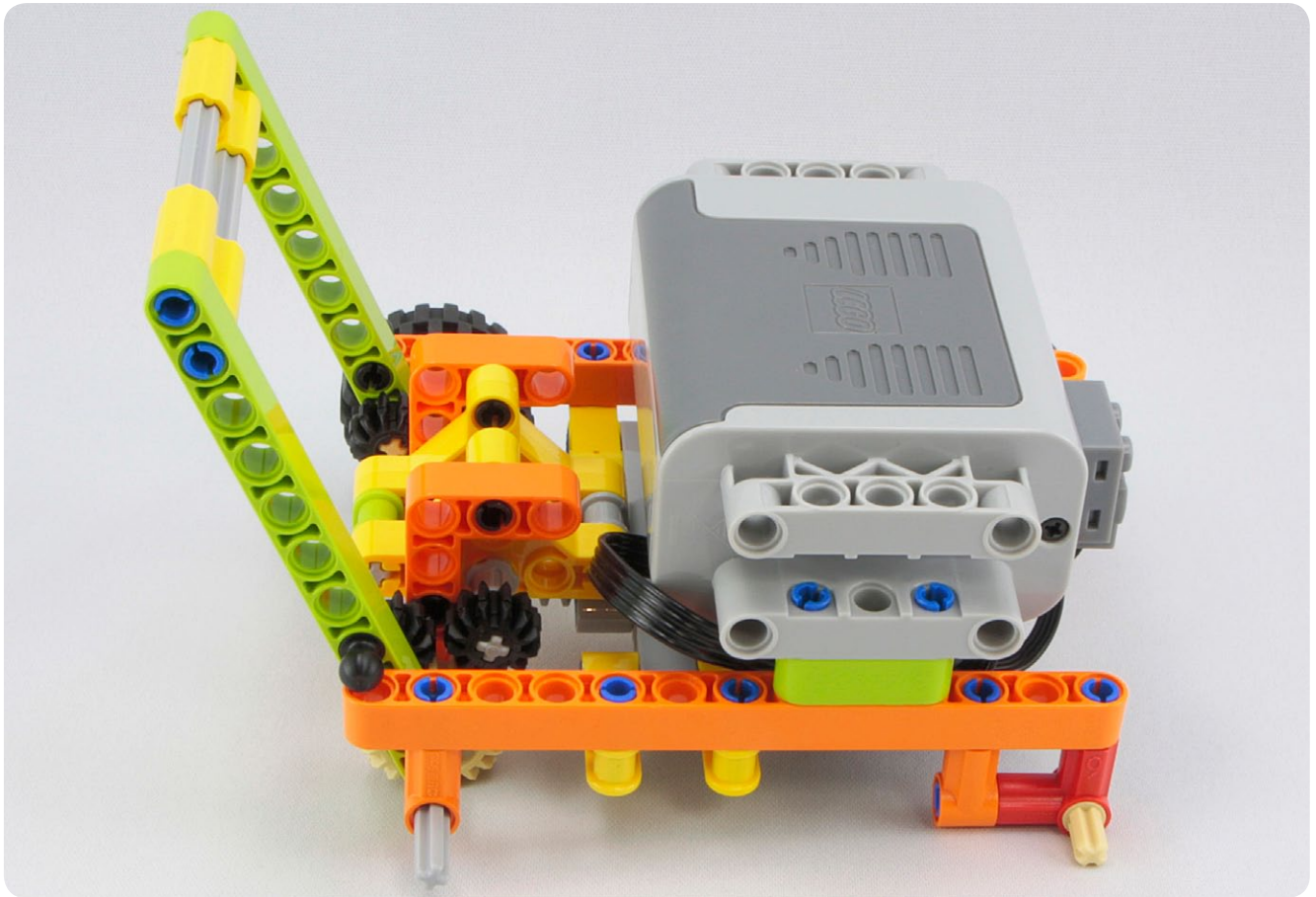


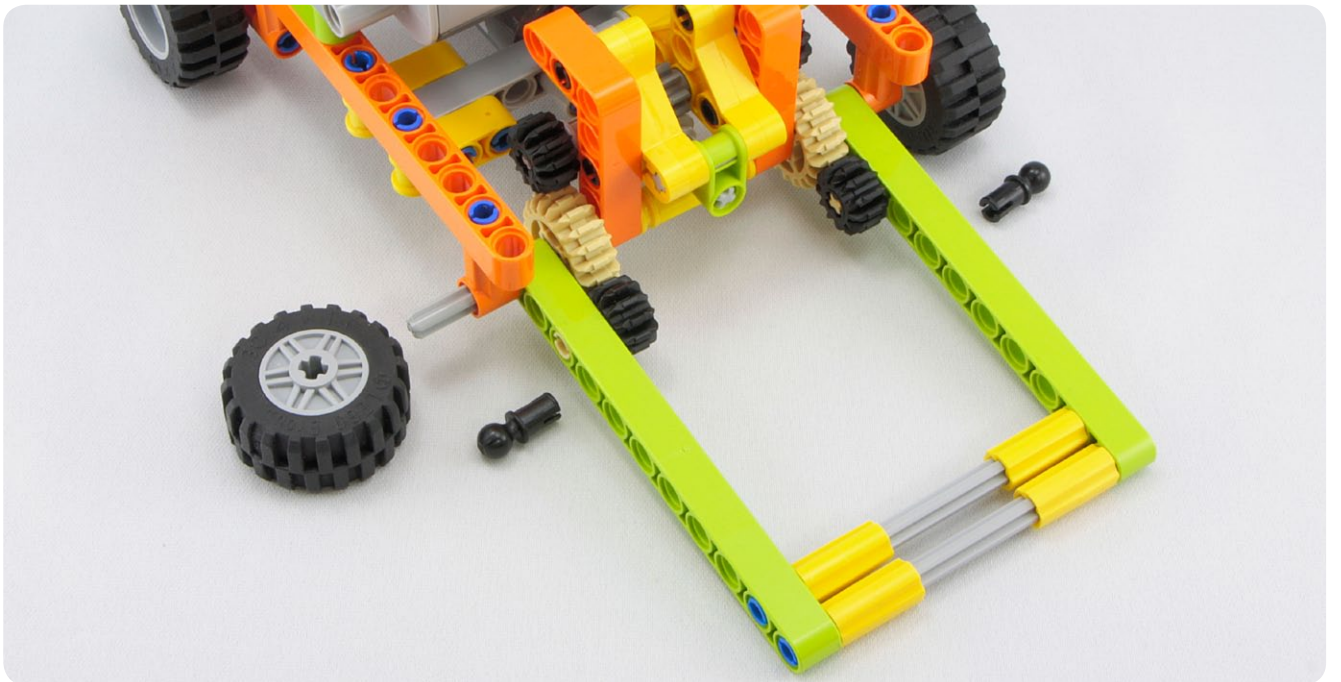
Cool cars

#93

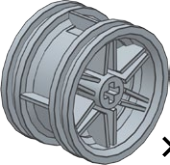






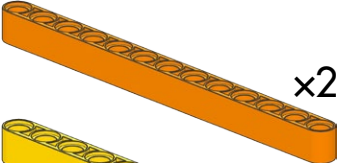
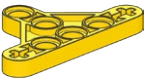









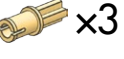





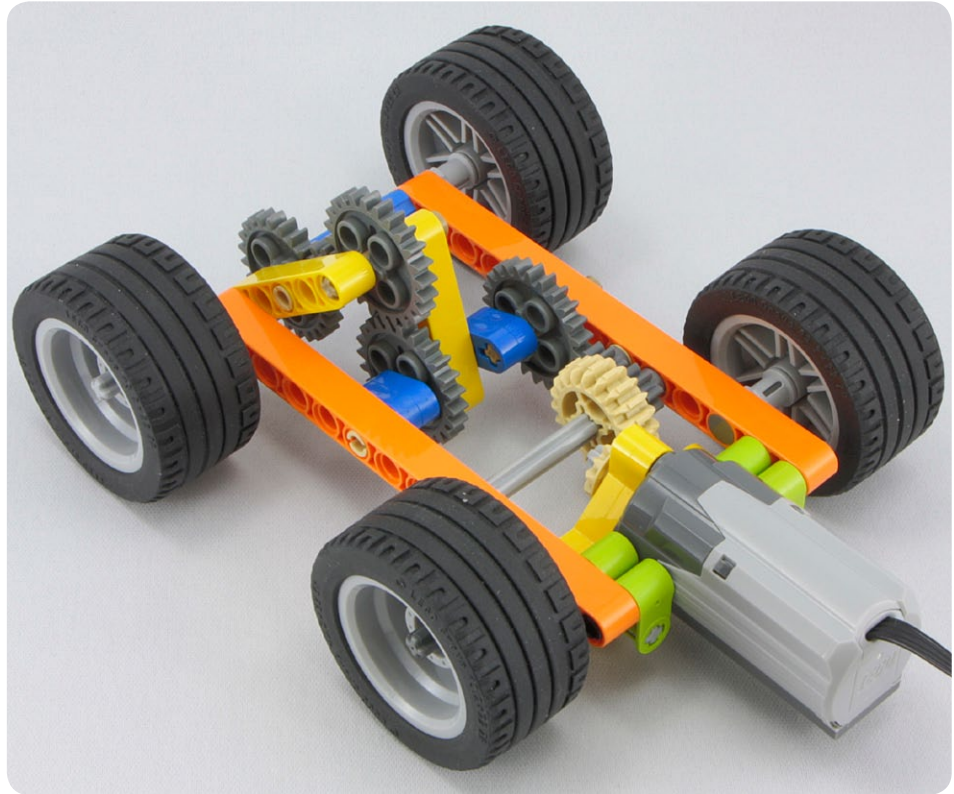
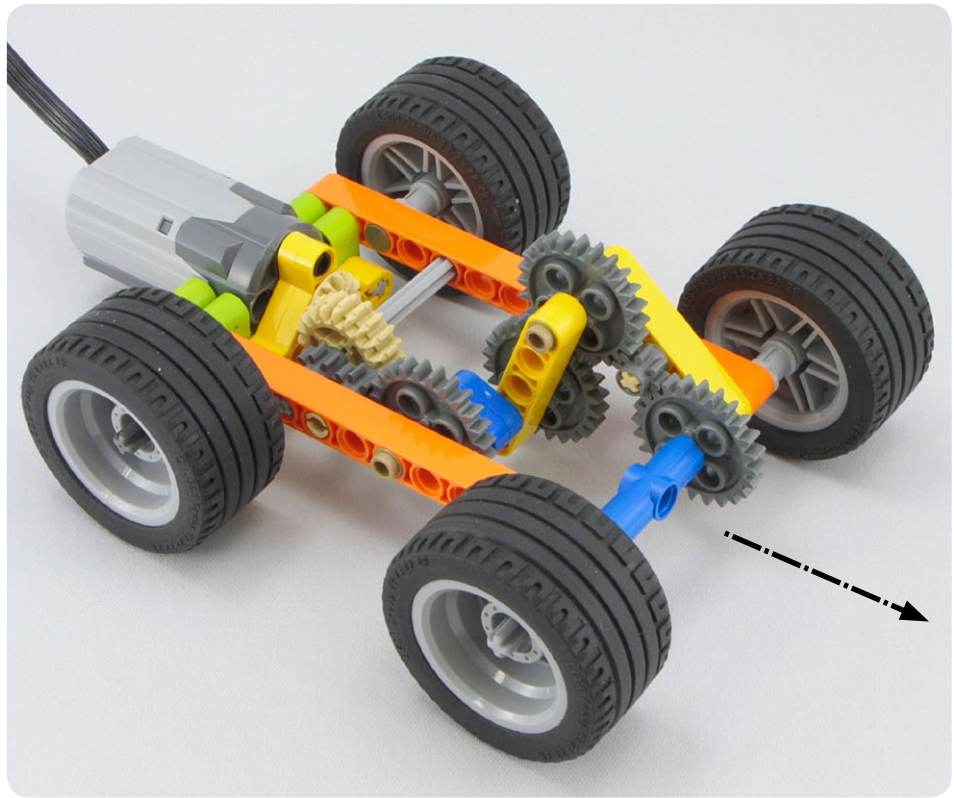


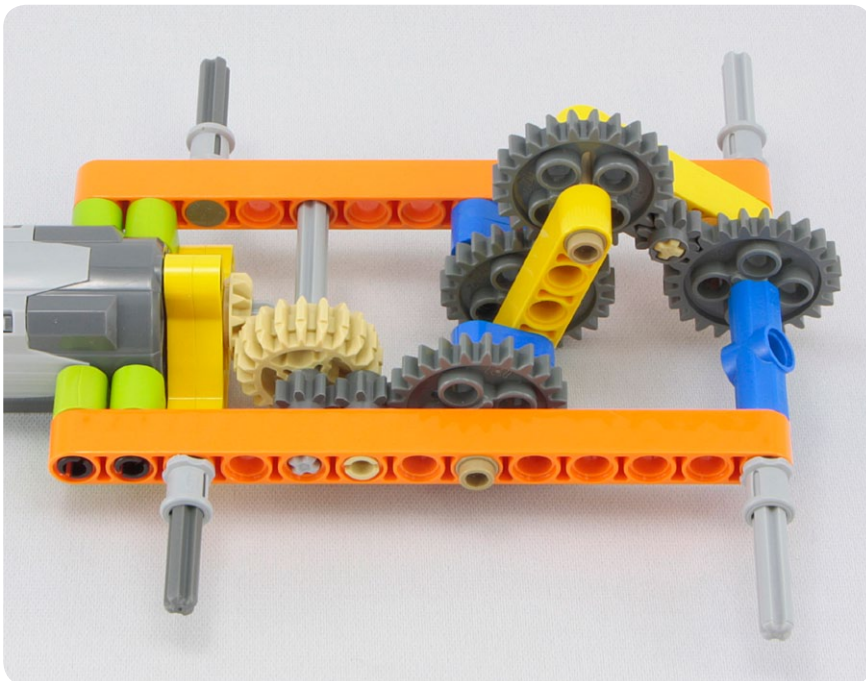
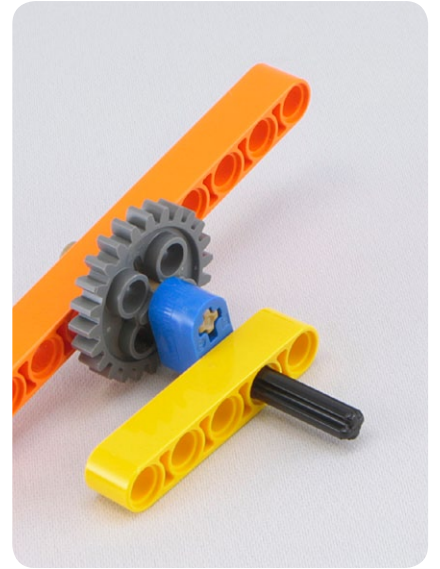
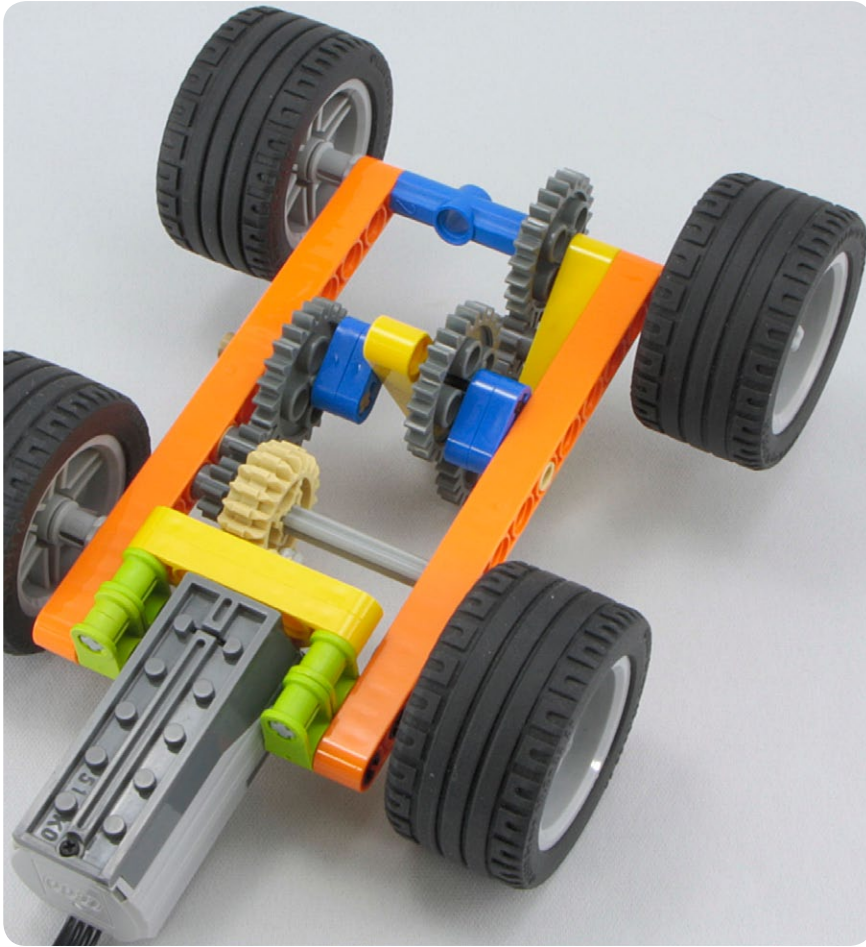













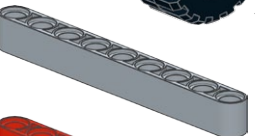

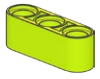
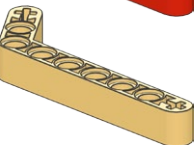
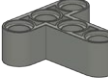
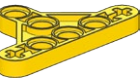

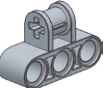







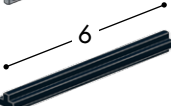
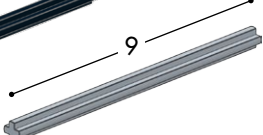
#94

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

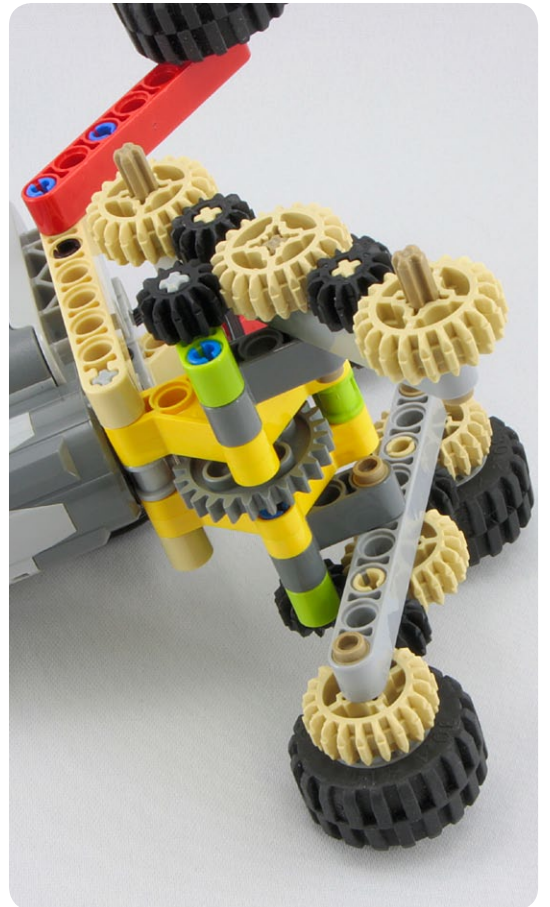
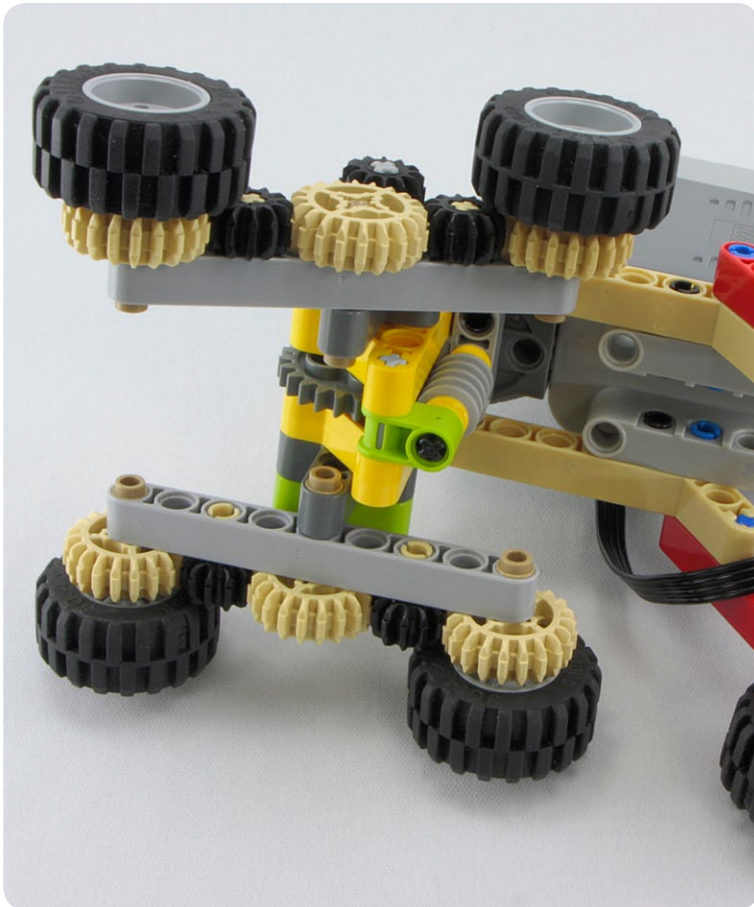
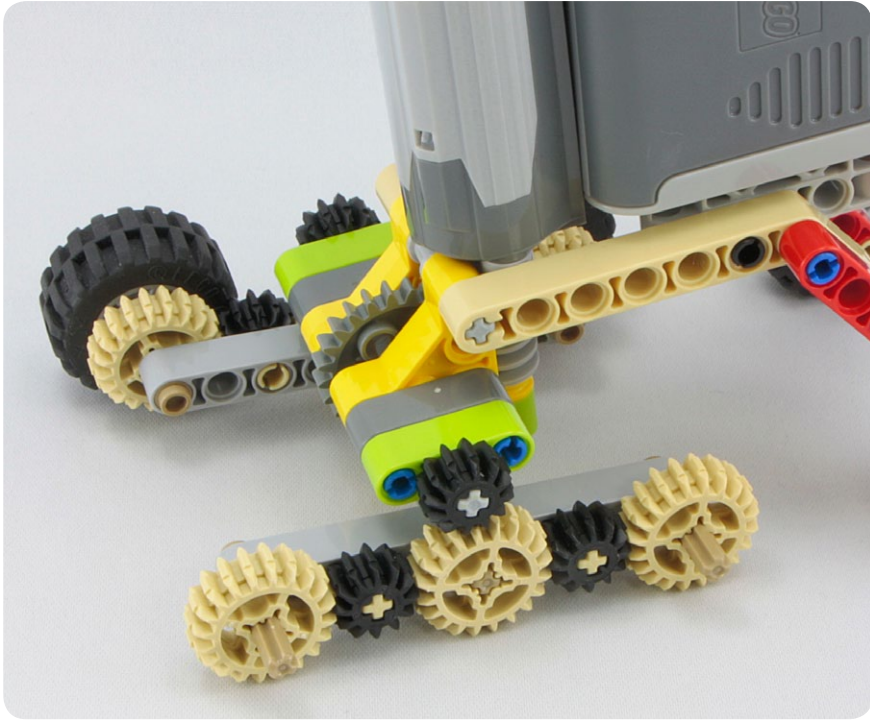




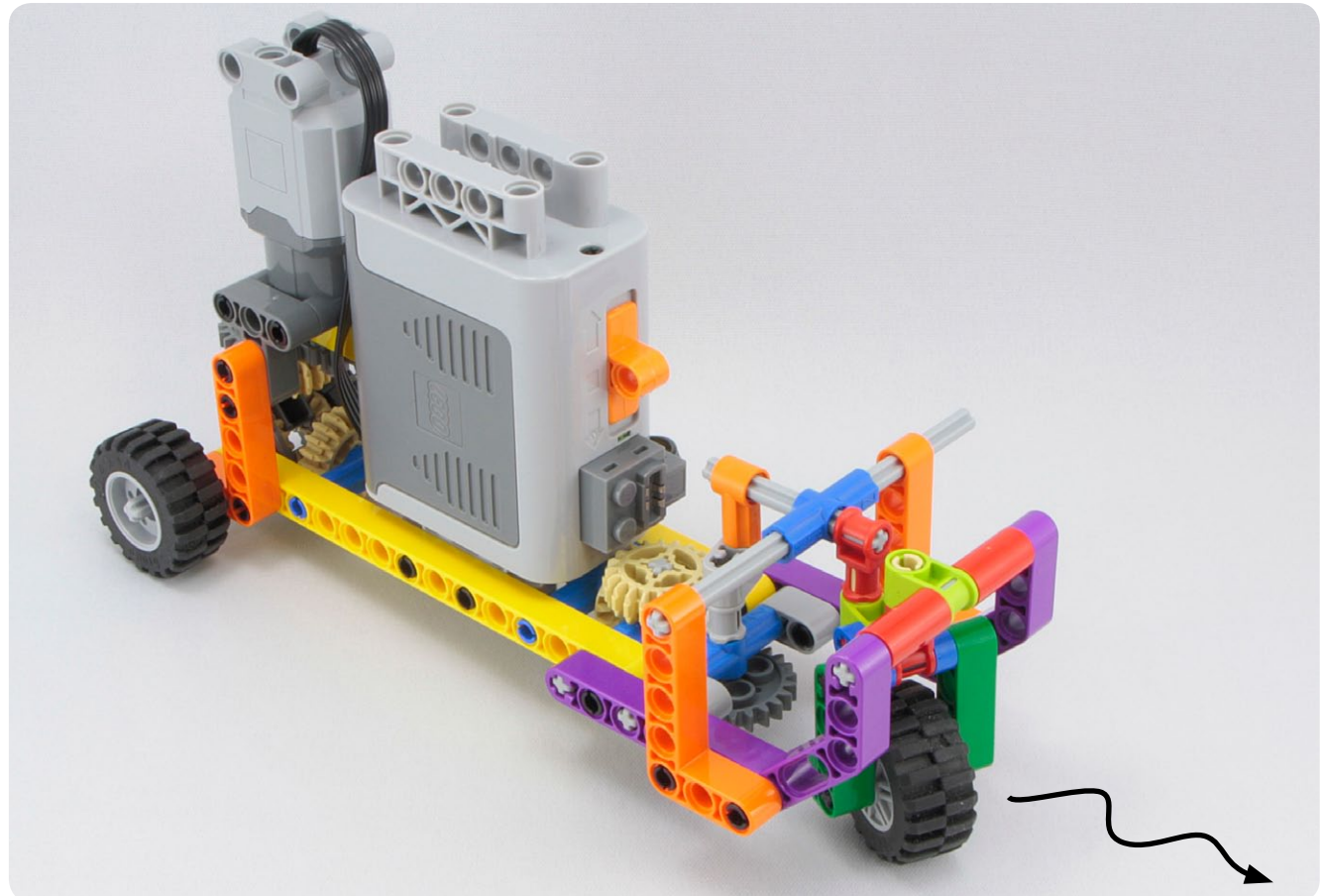
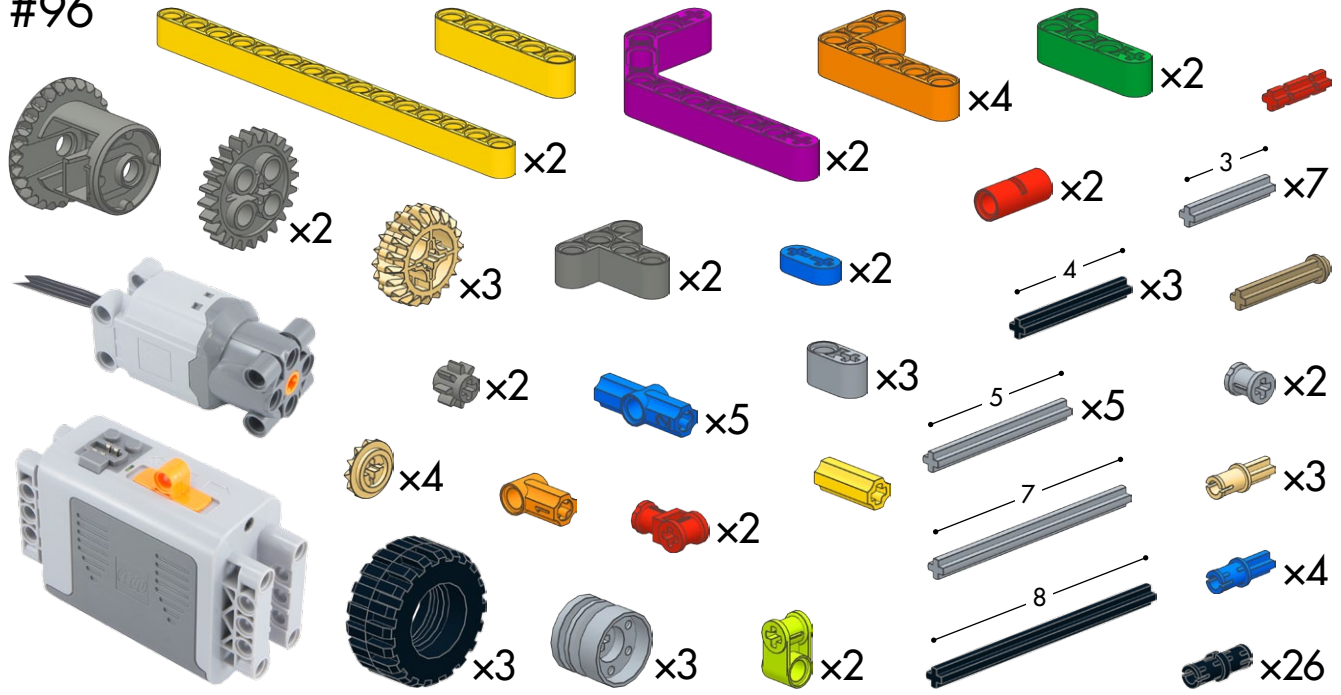
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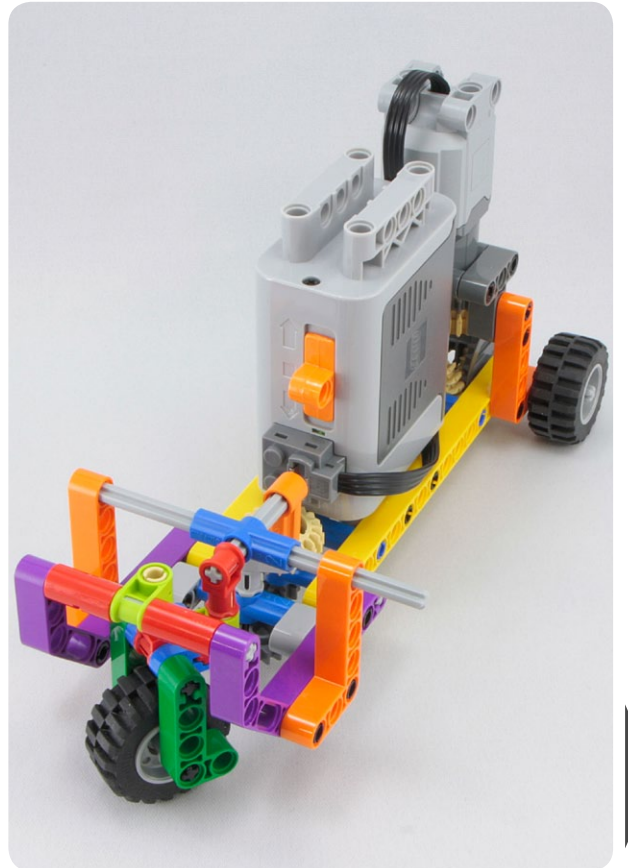
-  x6
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-  x6
-  x6
-  x2
-  x2
-  x2
-  x2
-  x2
-  x4
-  x2
- 
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-  x6
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-  3
-  x2
-  5
-  x4
-  6
-  9

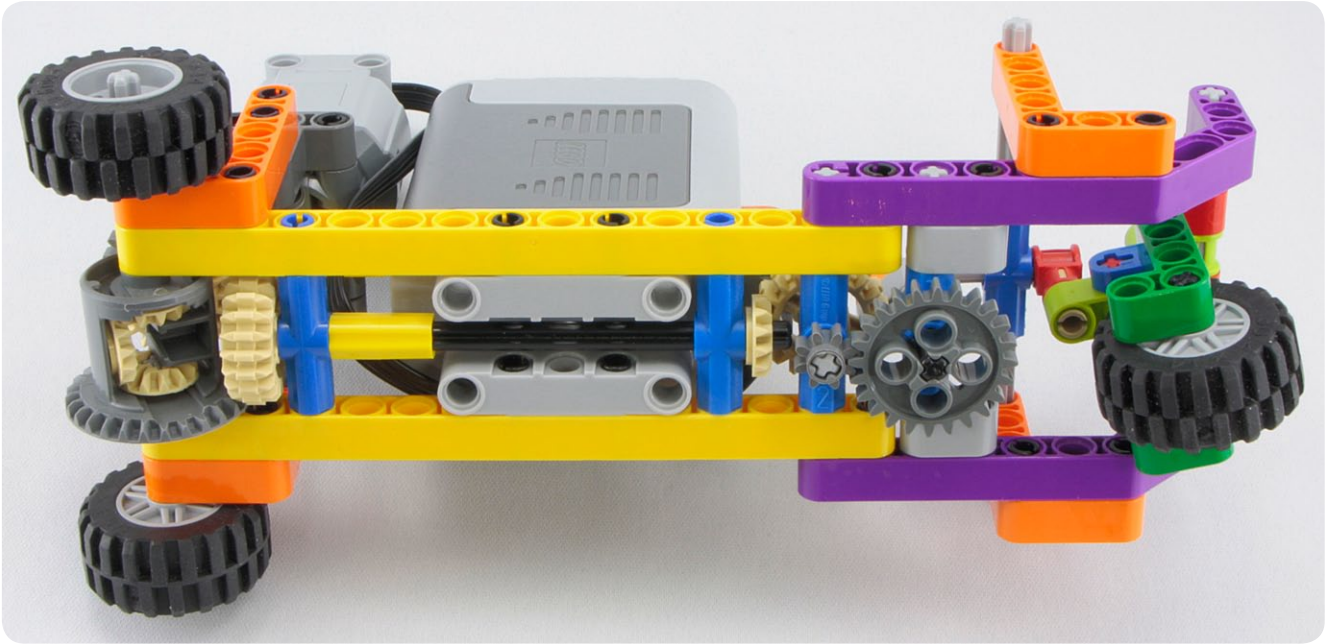


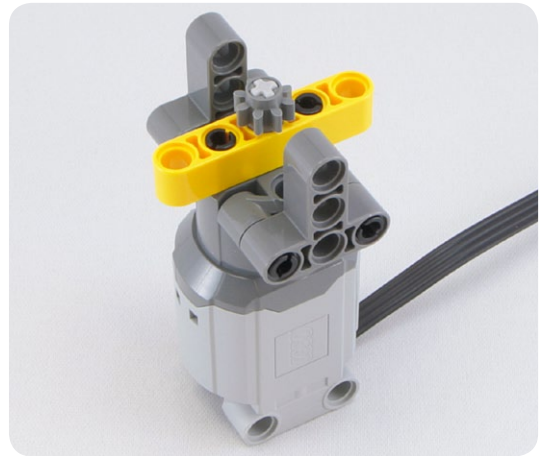
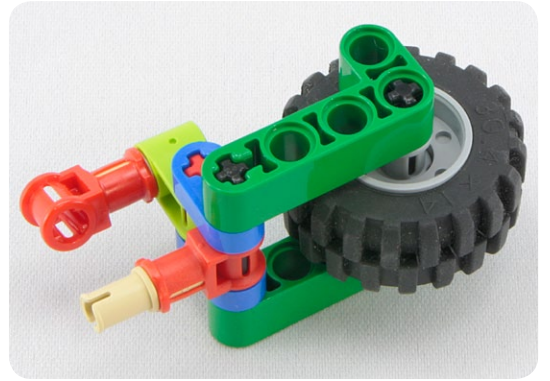
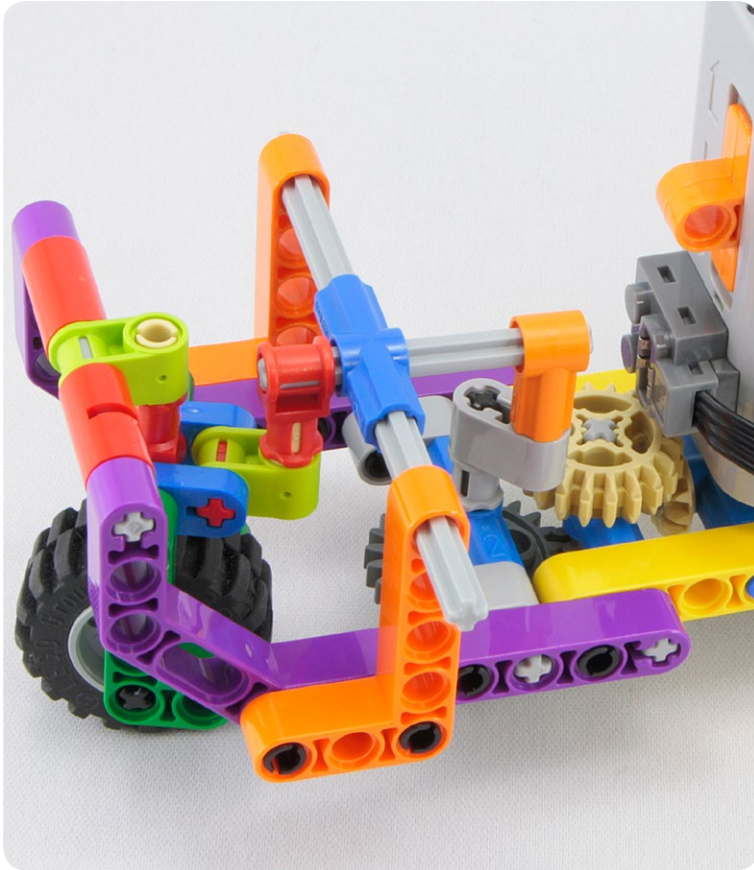


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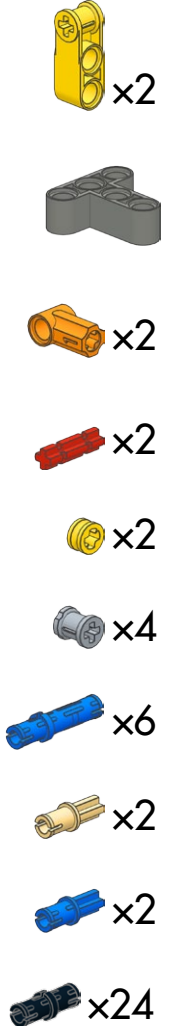
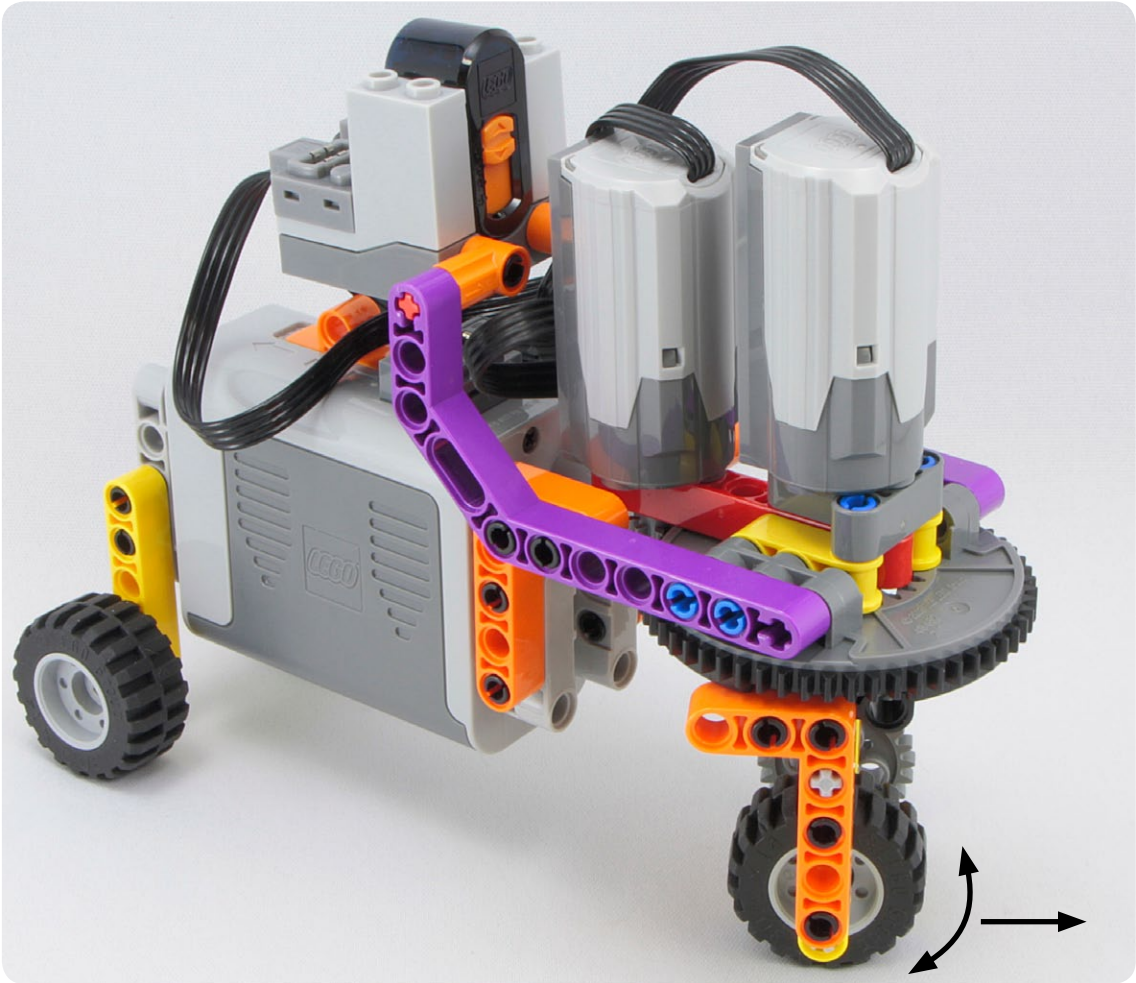
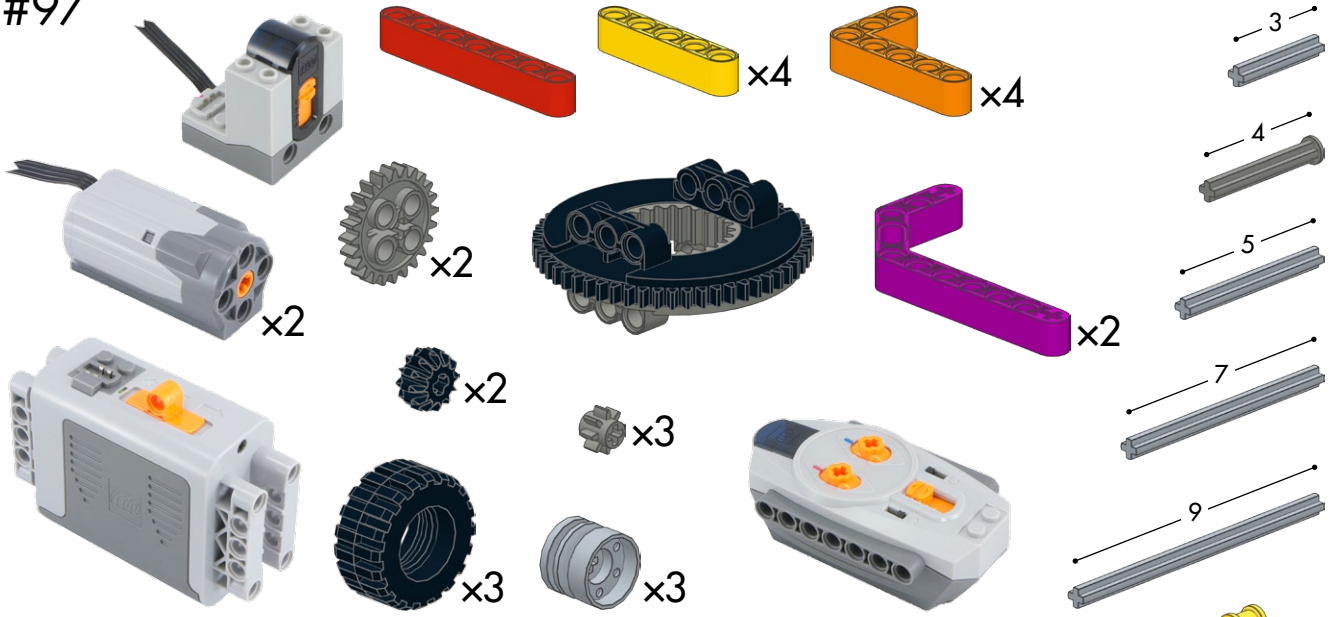




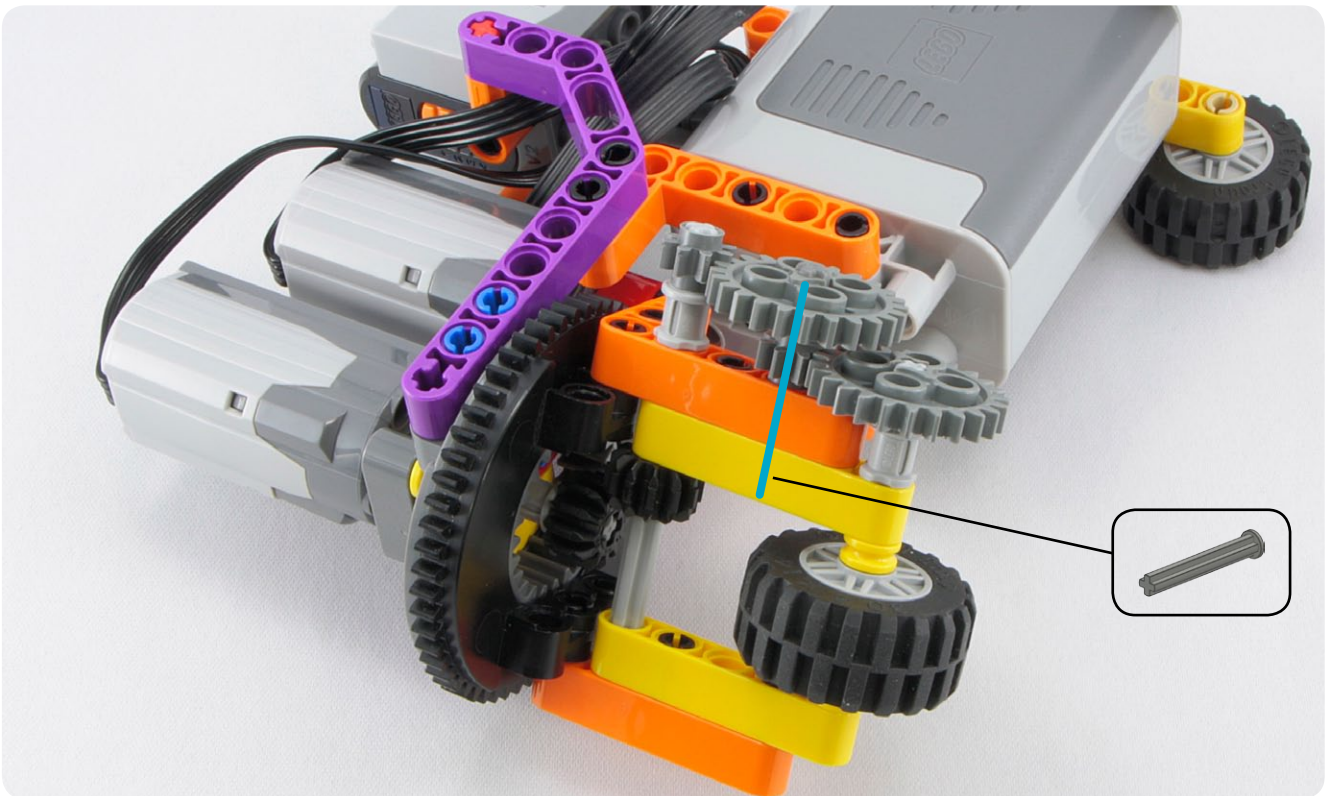
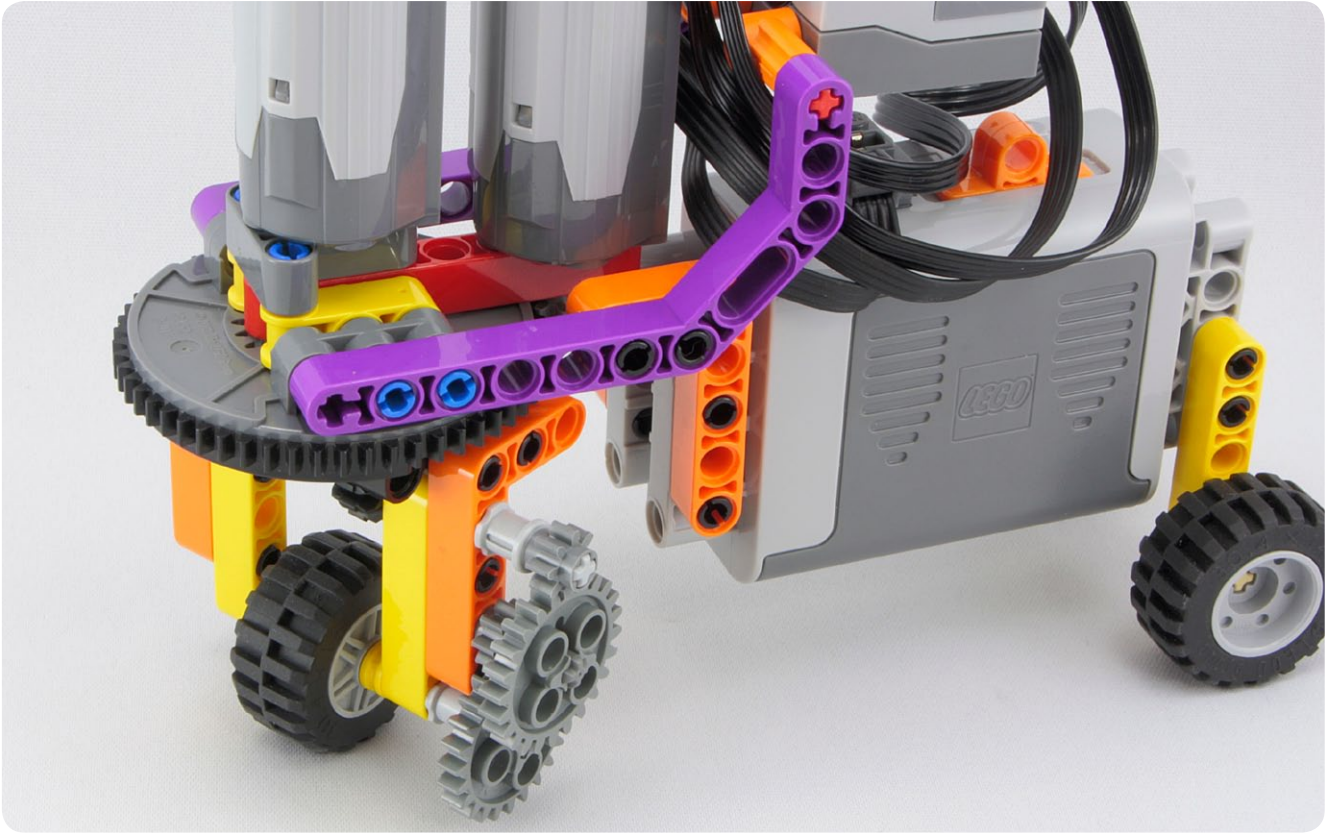


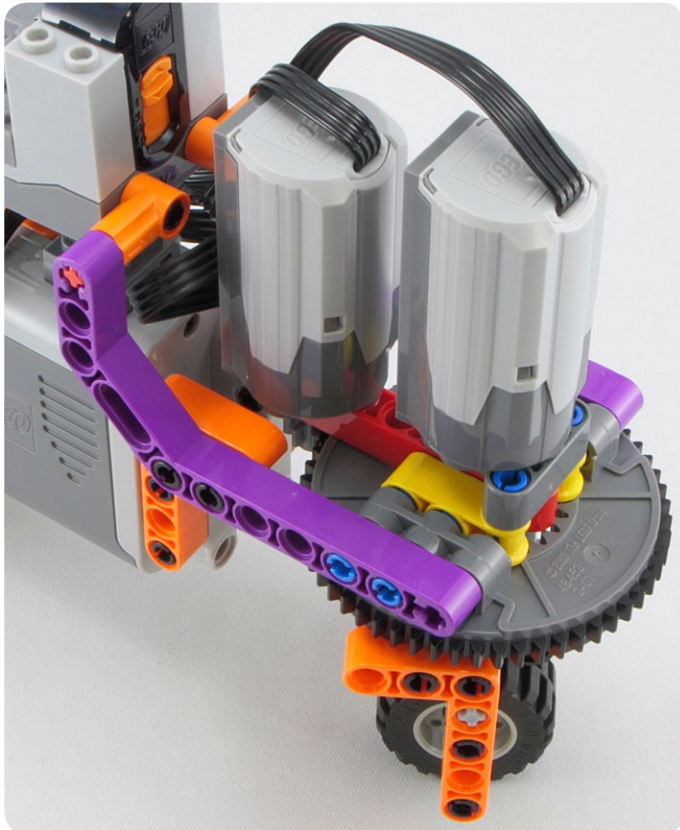
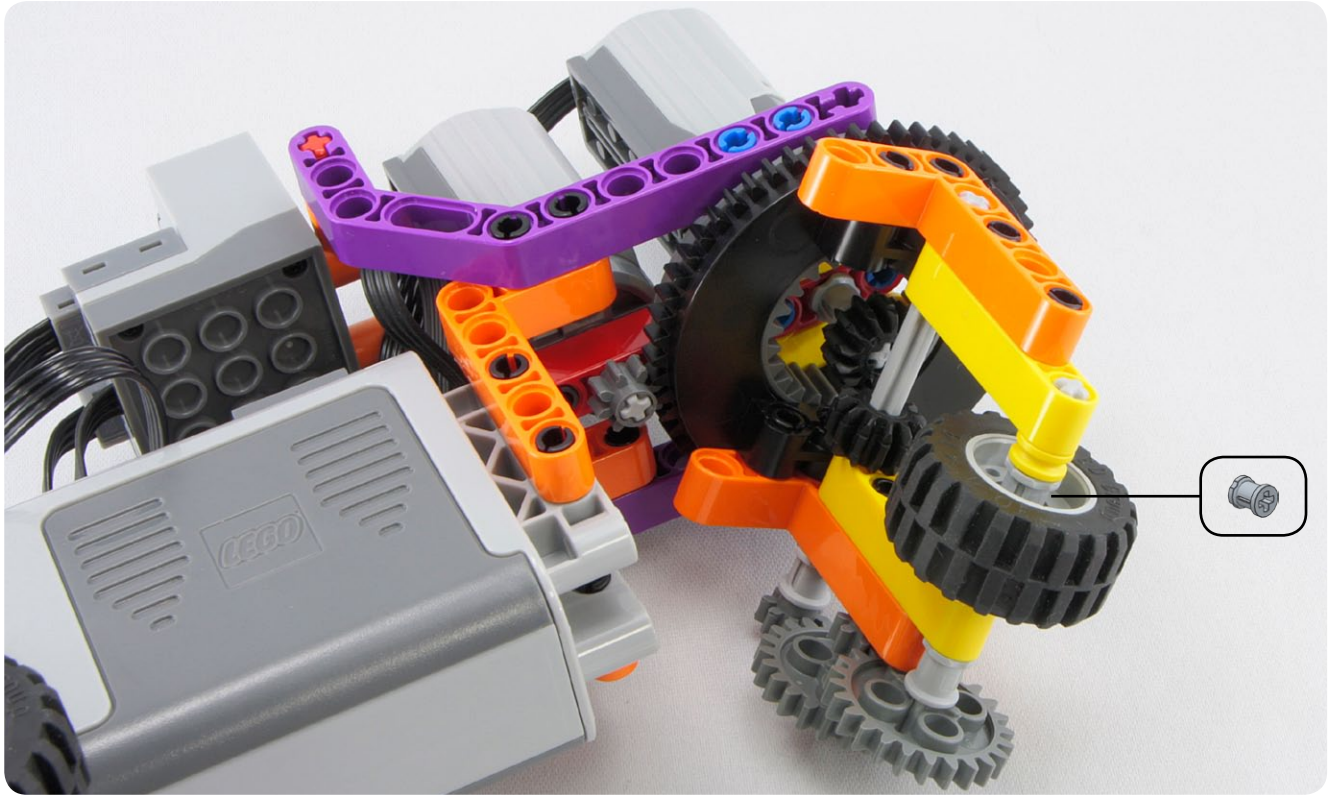


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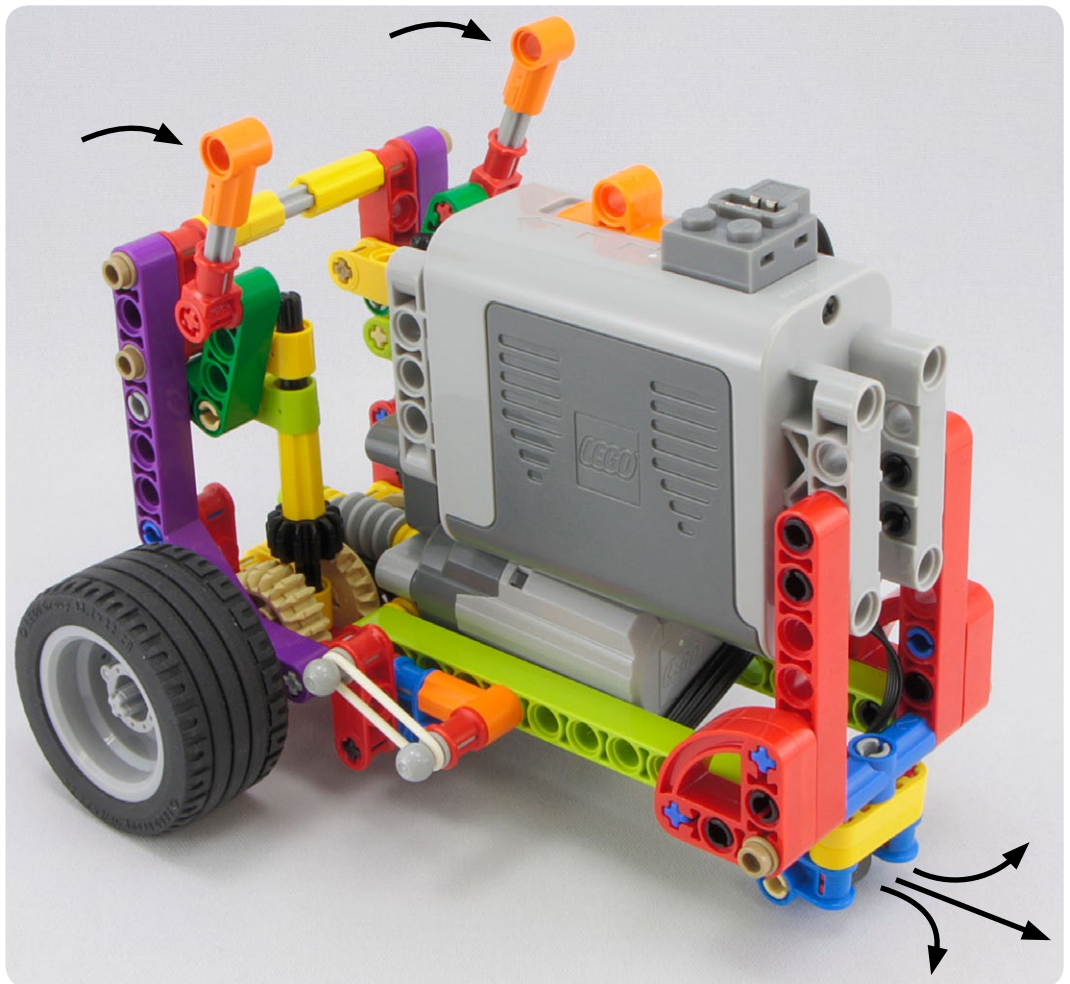
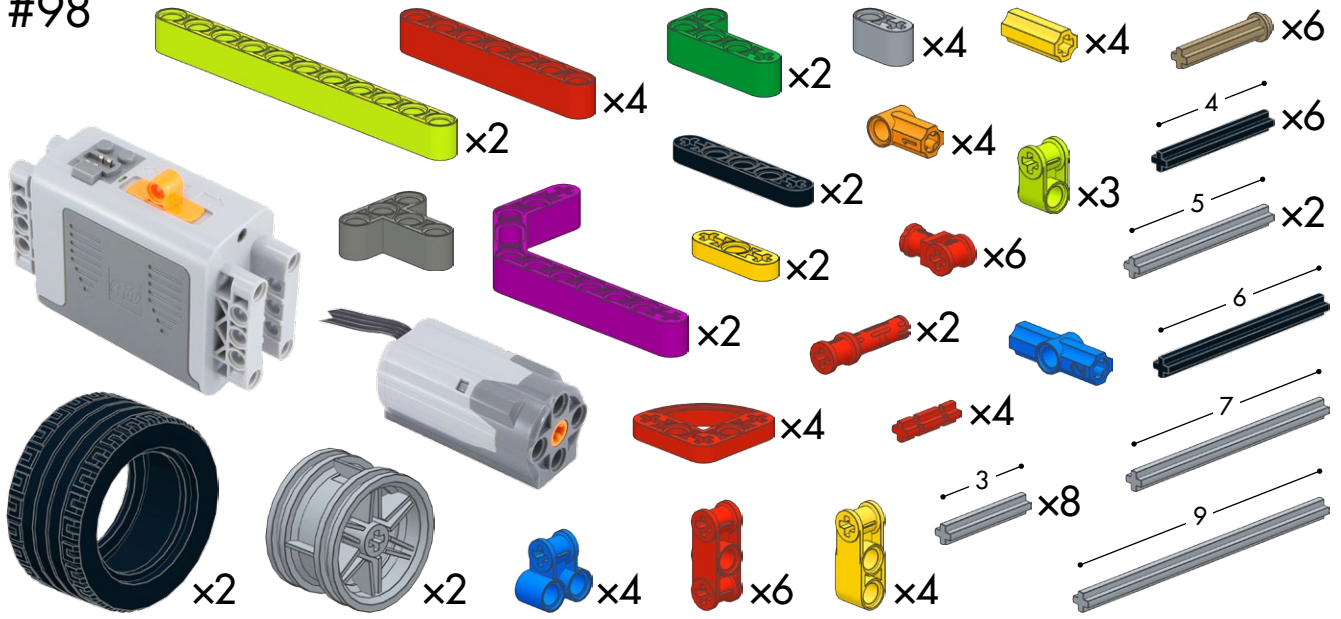


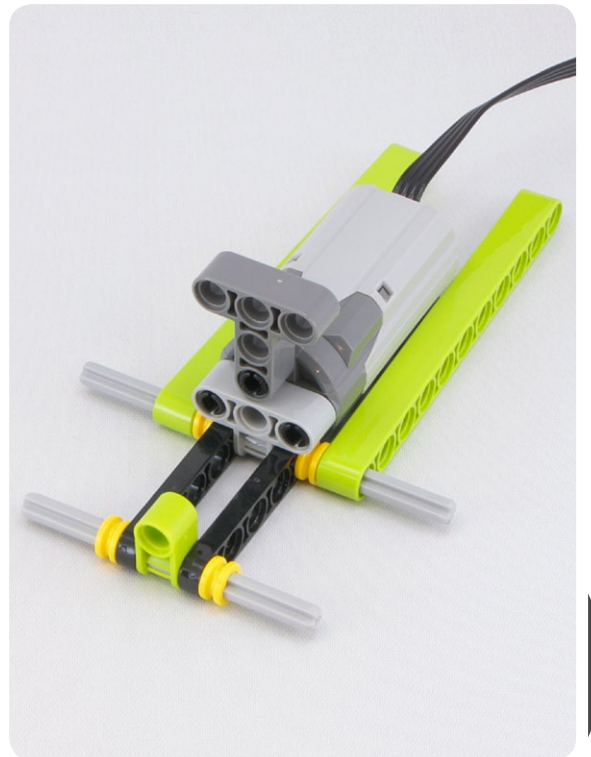
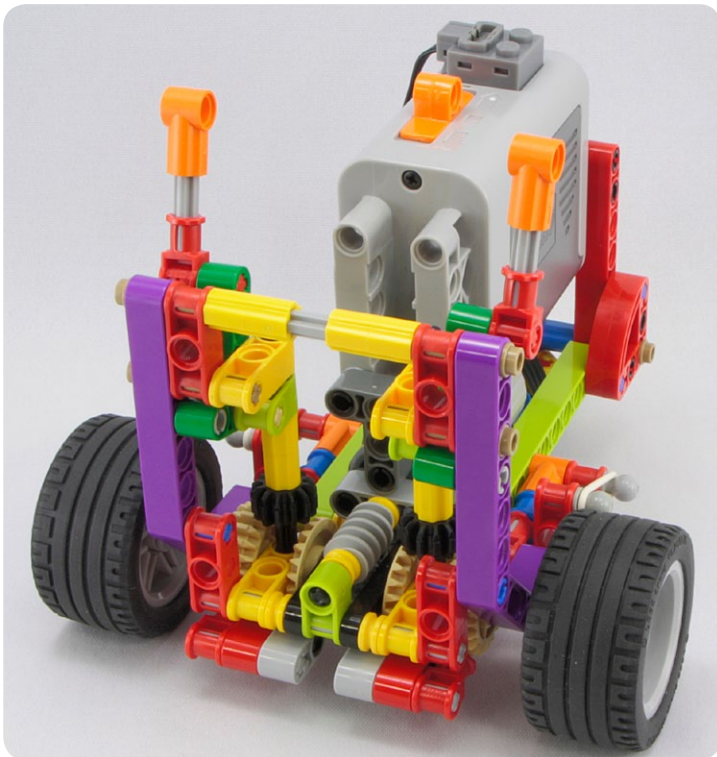




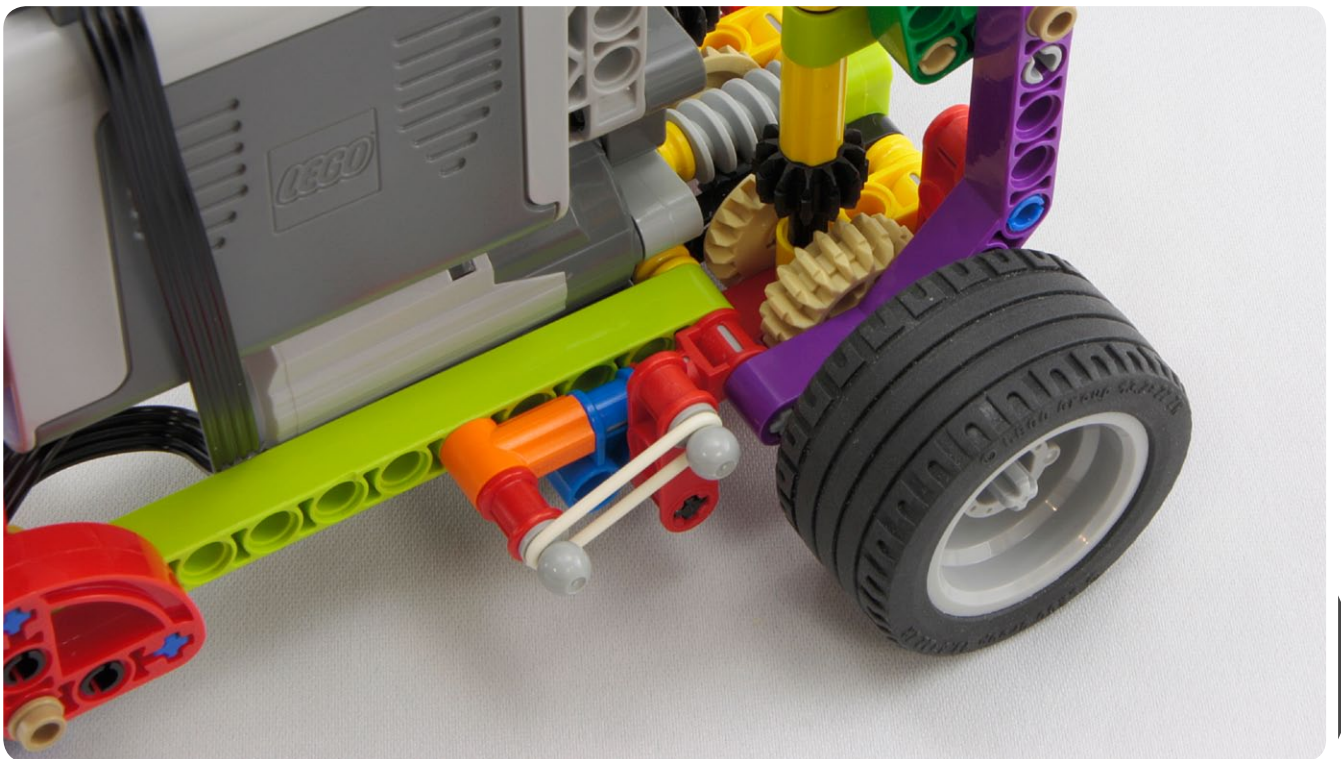
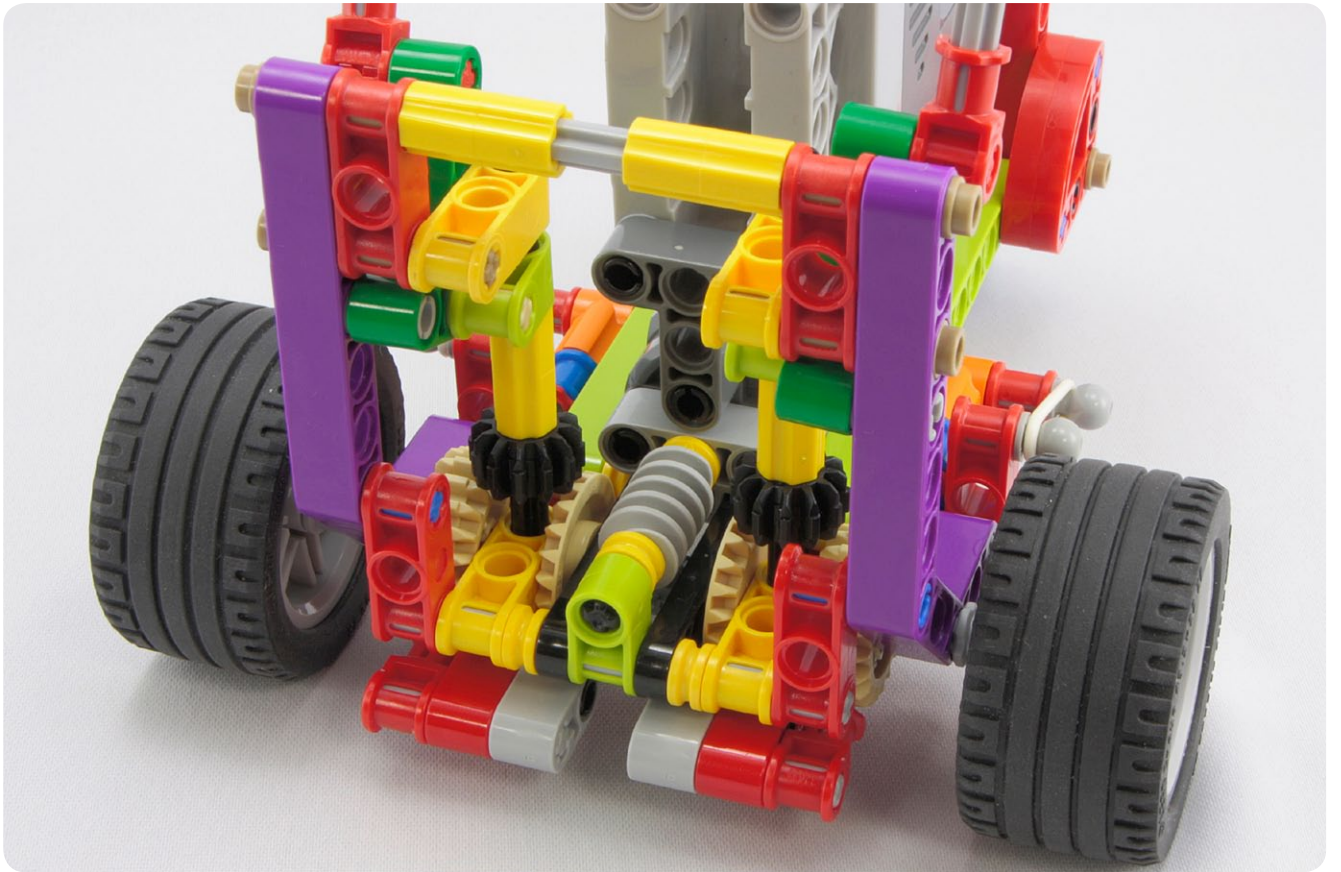


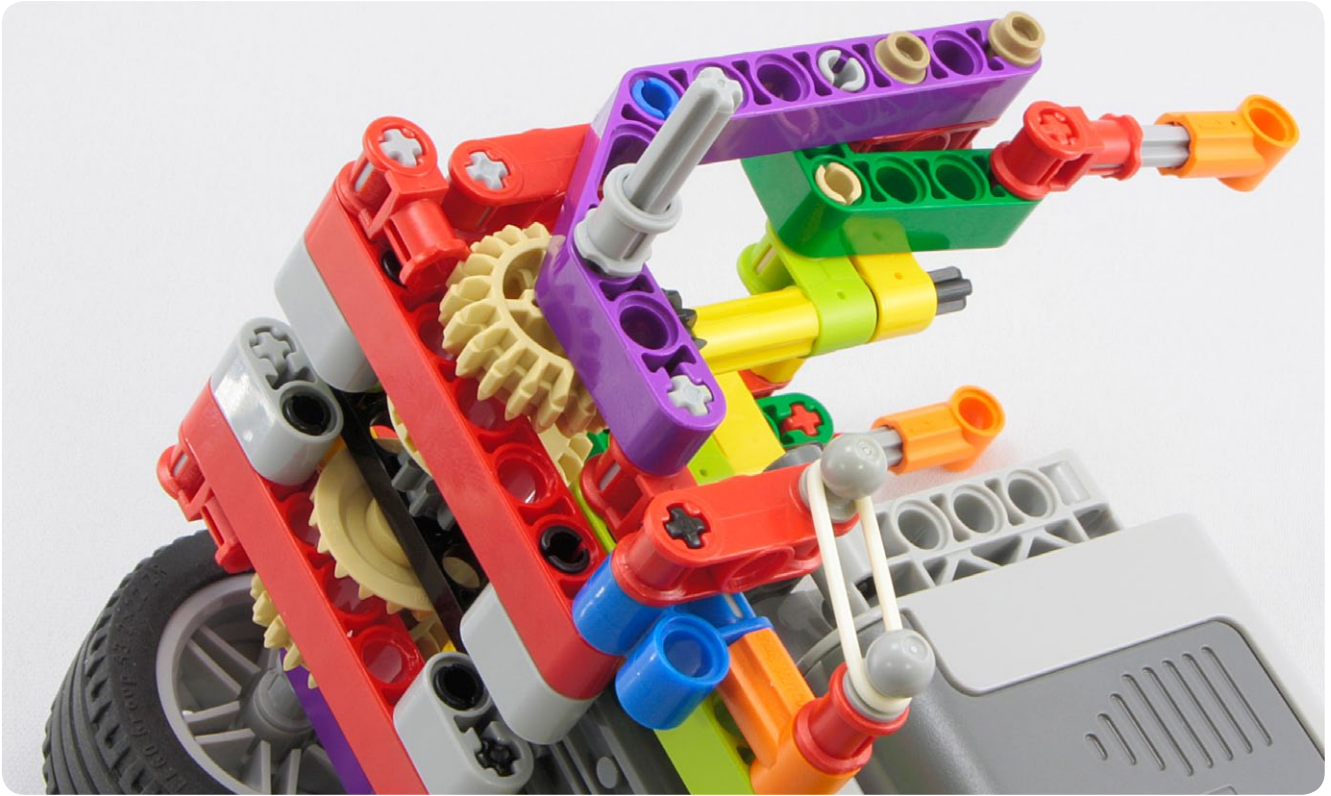
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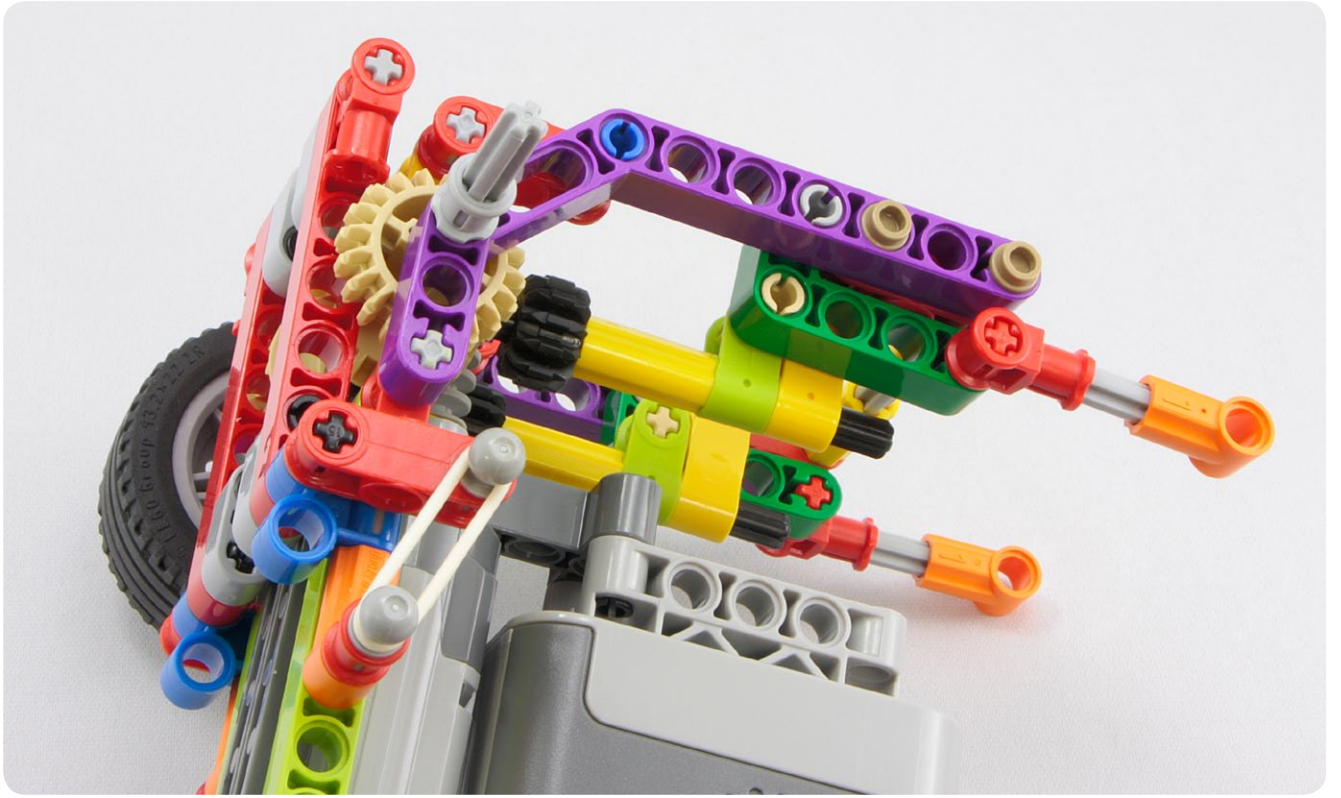














PART 2

Moving Without Tires



196



220



234



244



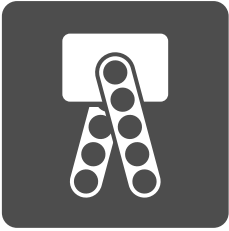
208



224

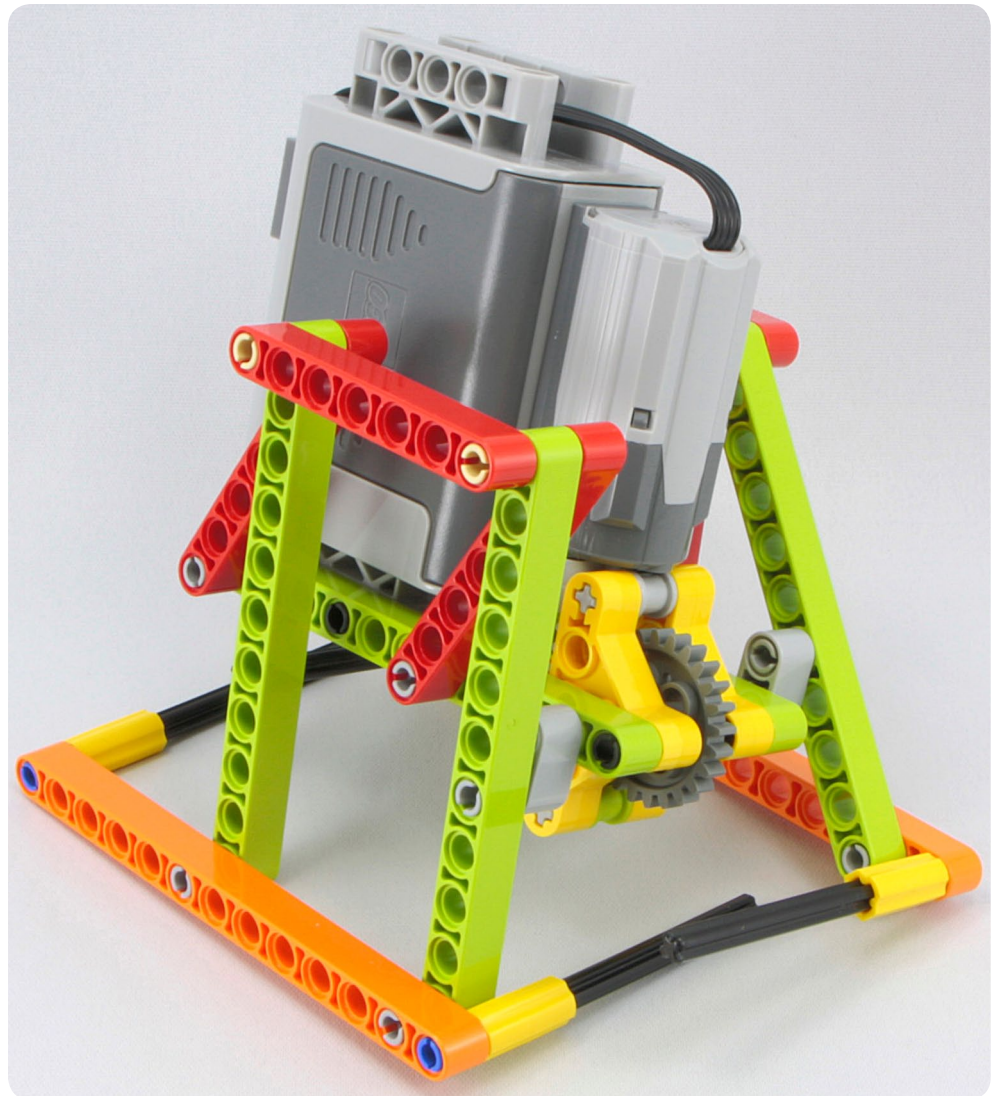
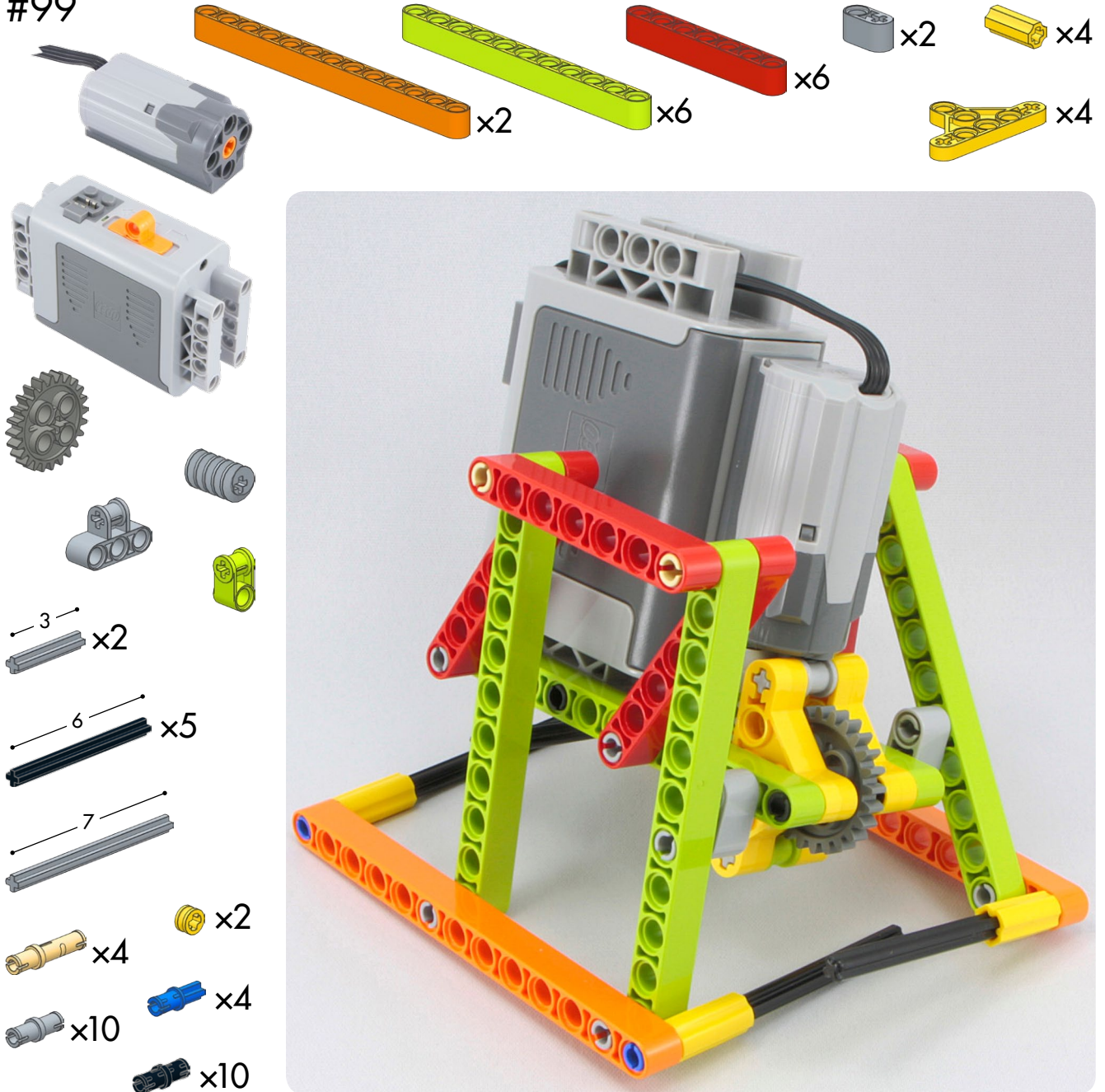


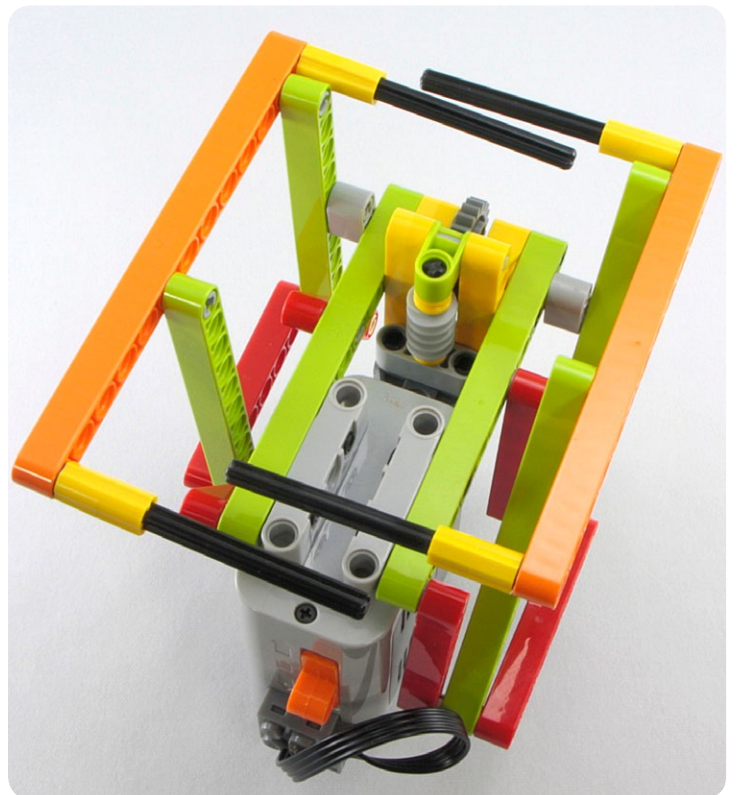
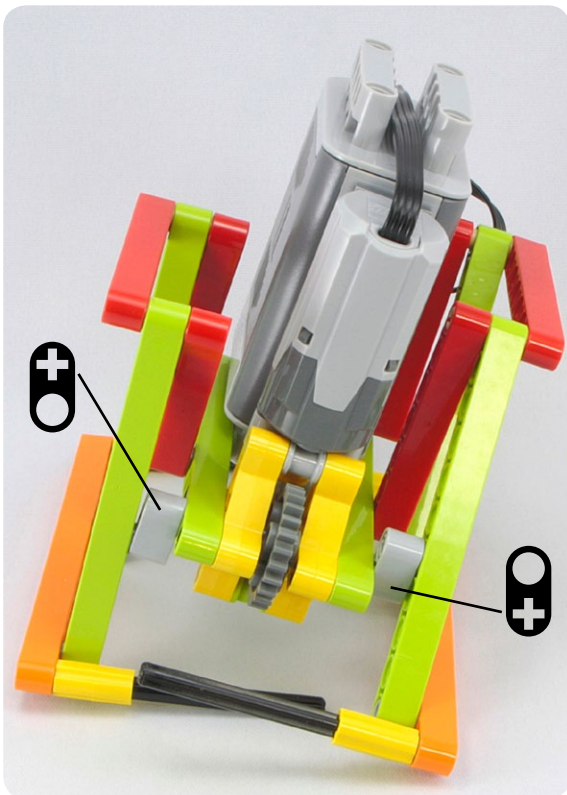
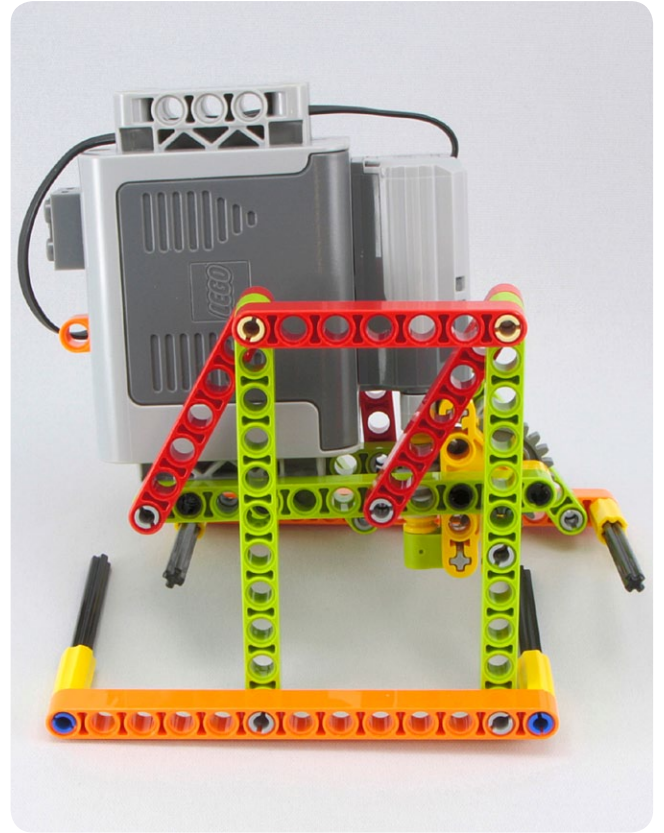
240



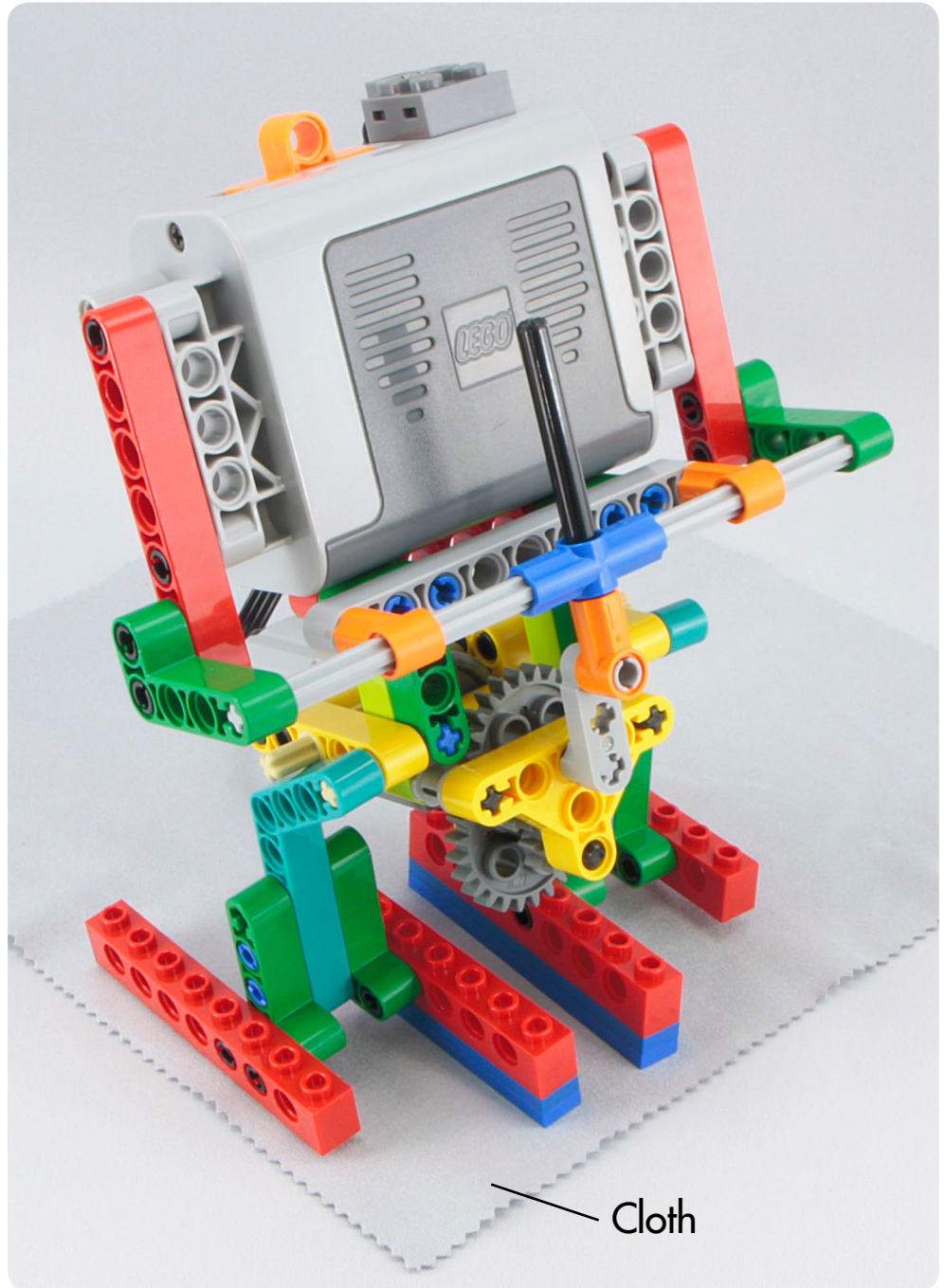
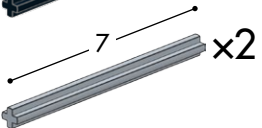
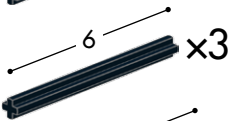
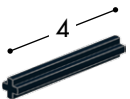
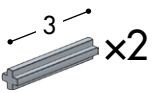
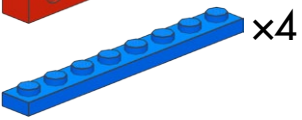
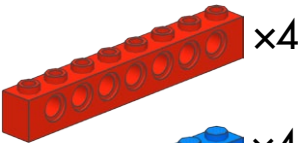
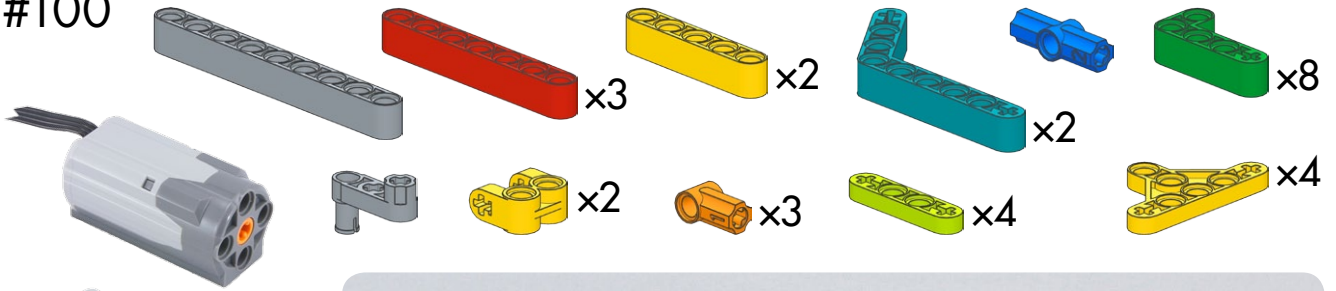
Two-legged walkers

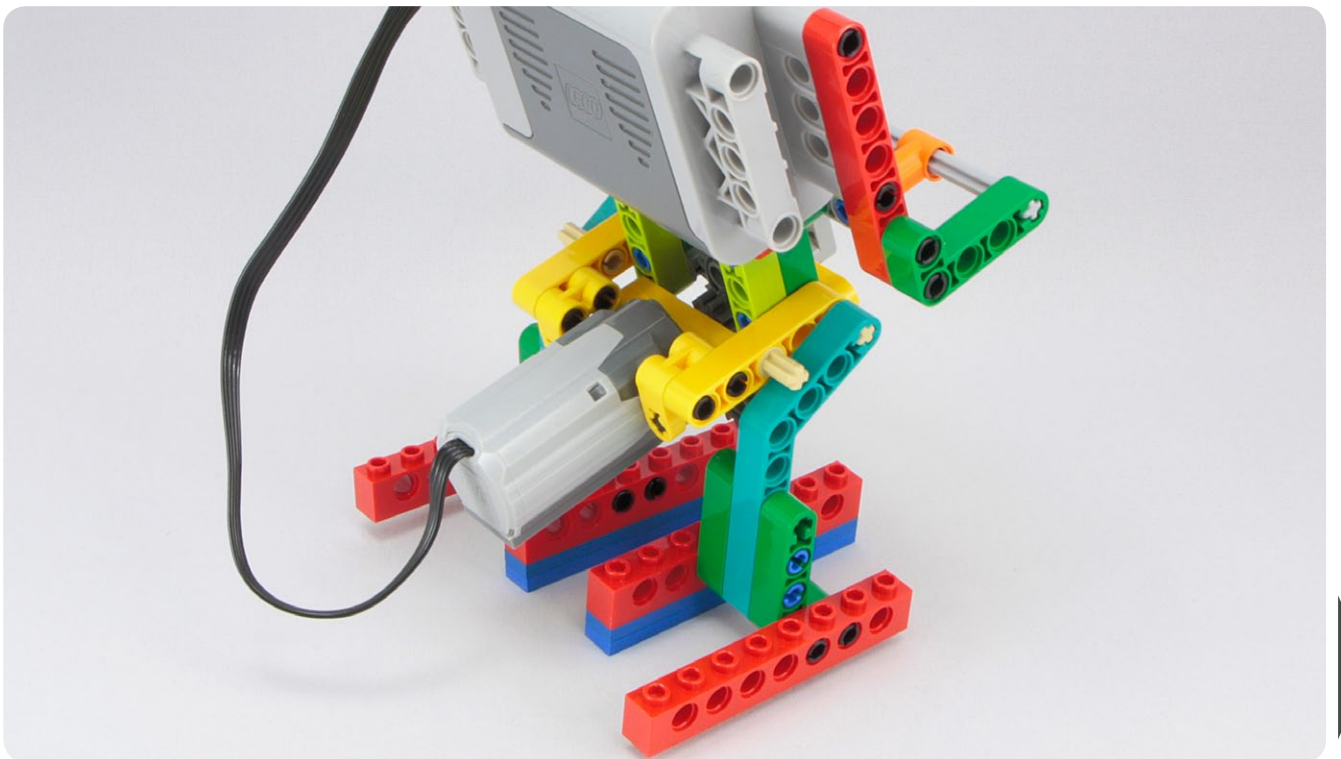
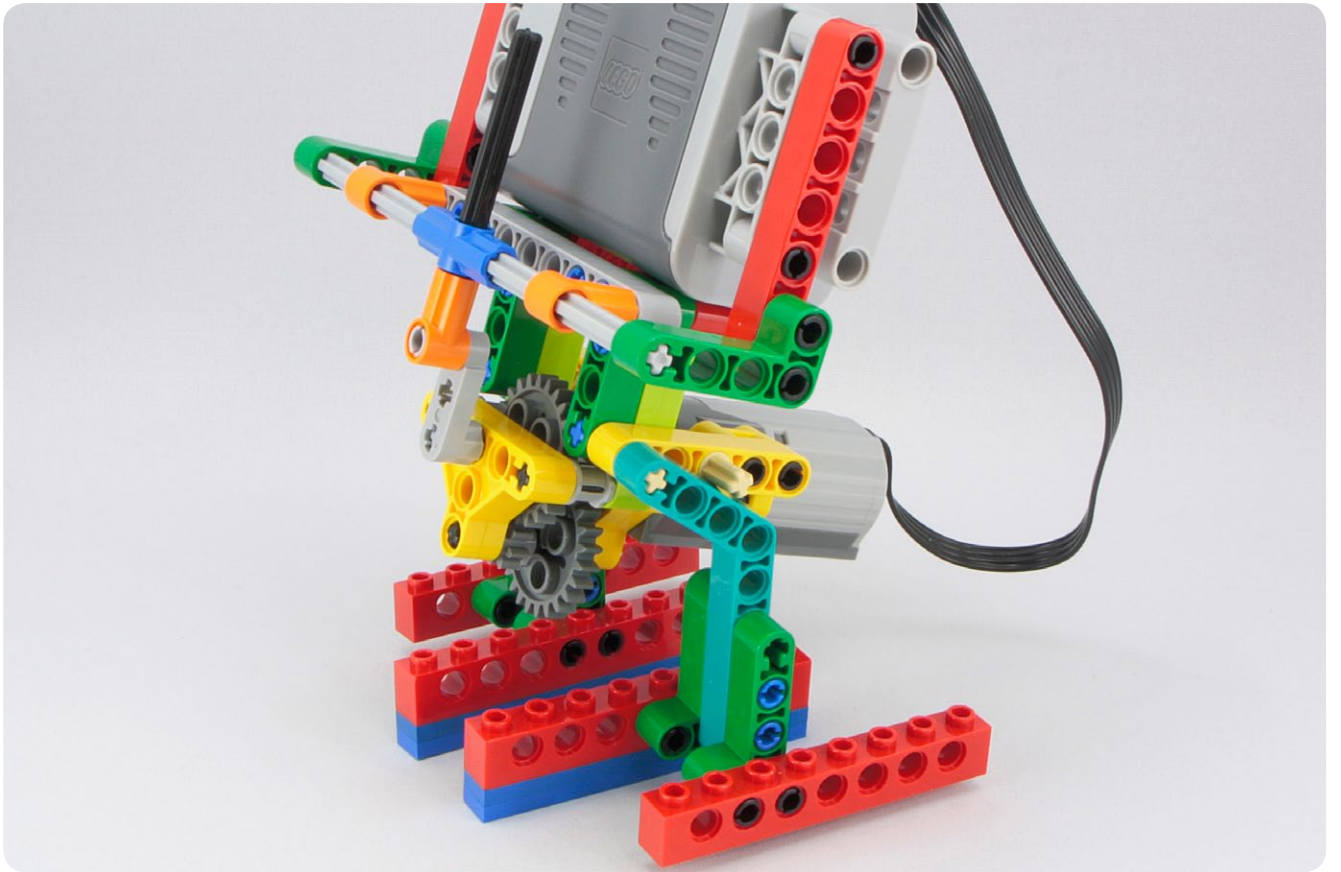
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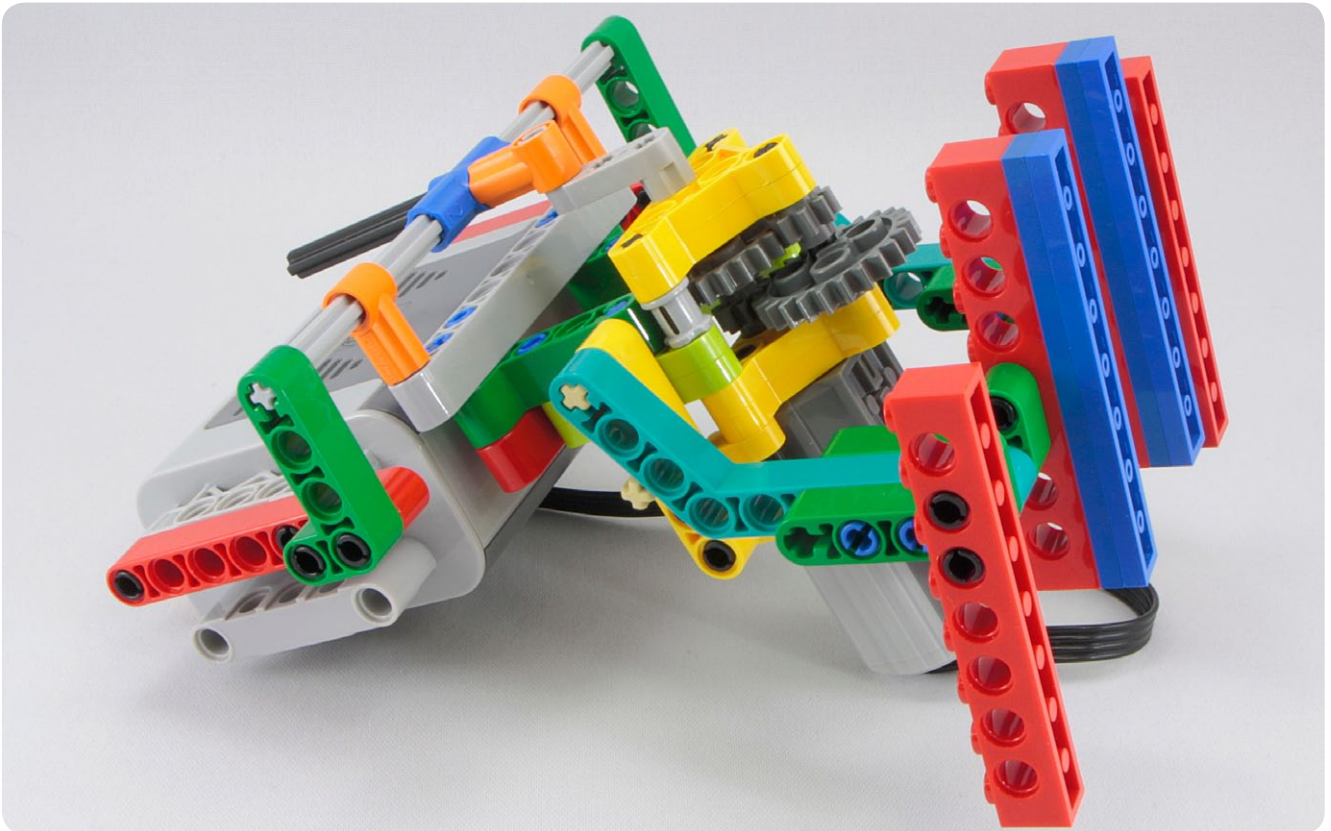
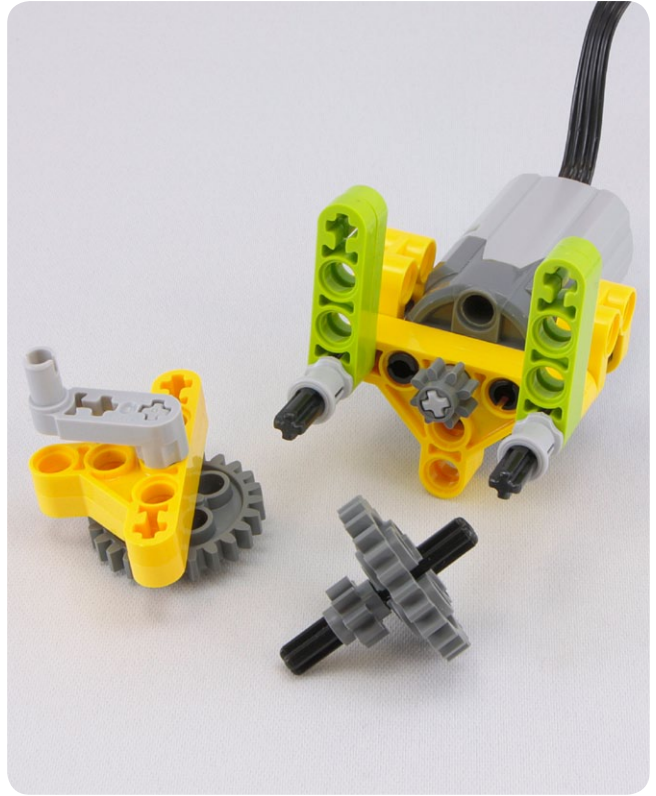
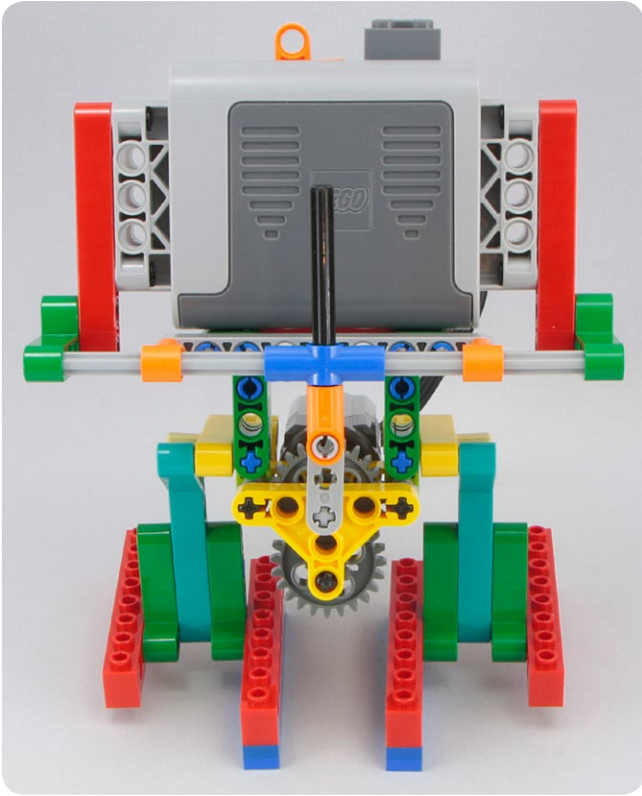


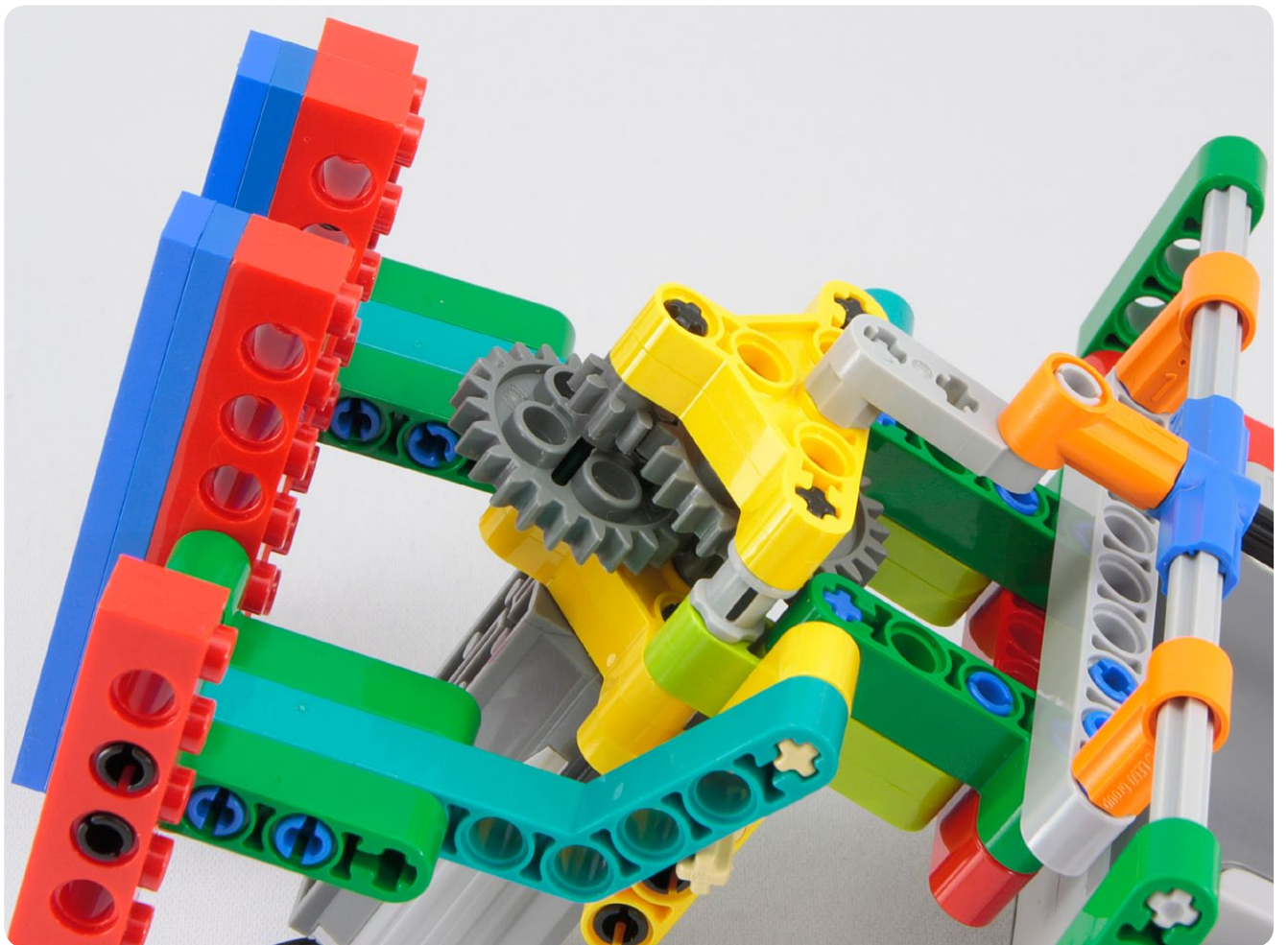
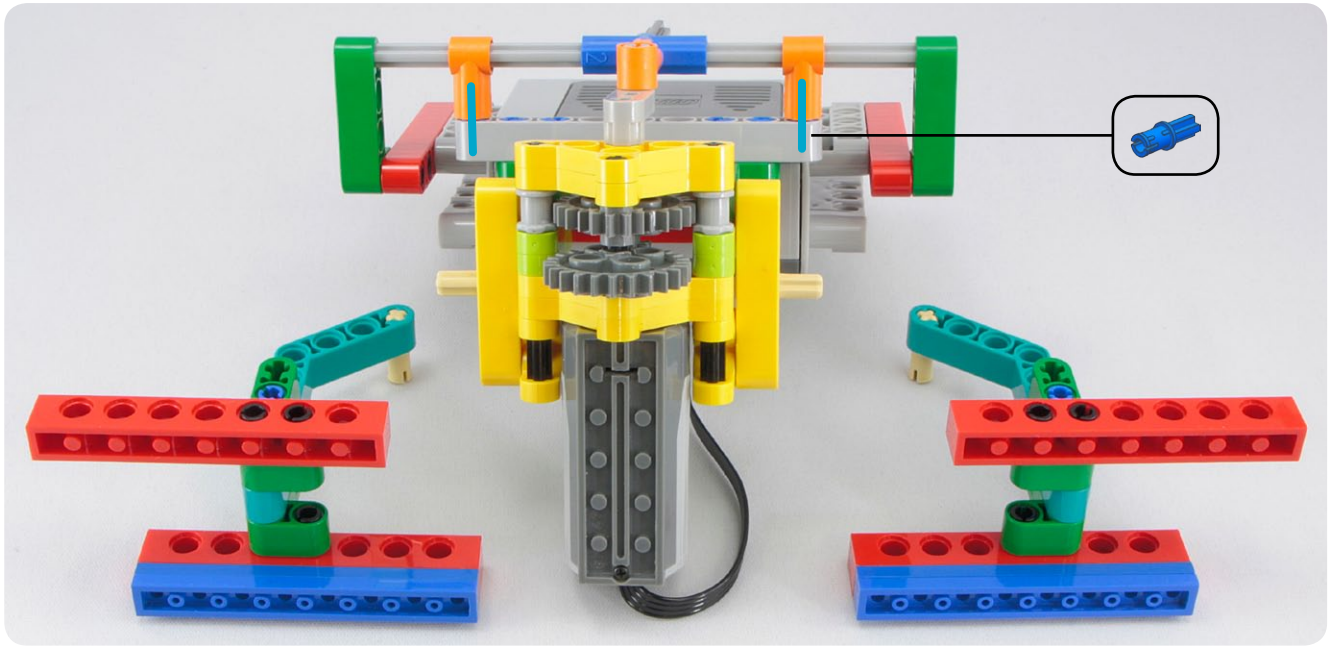


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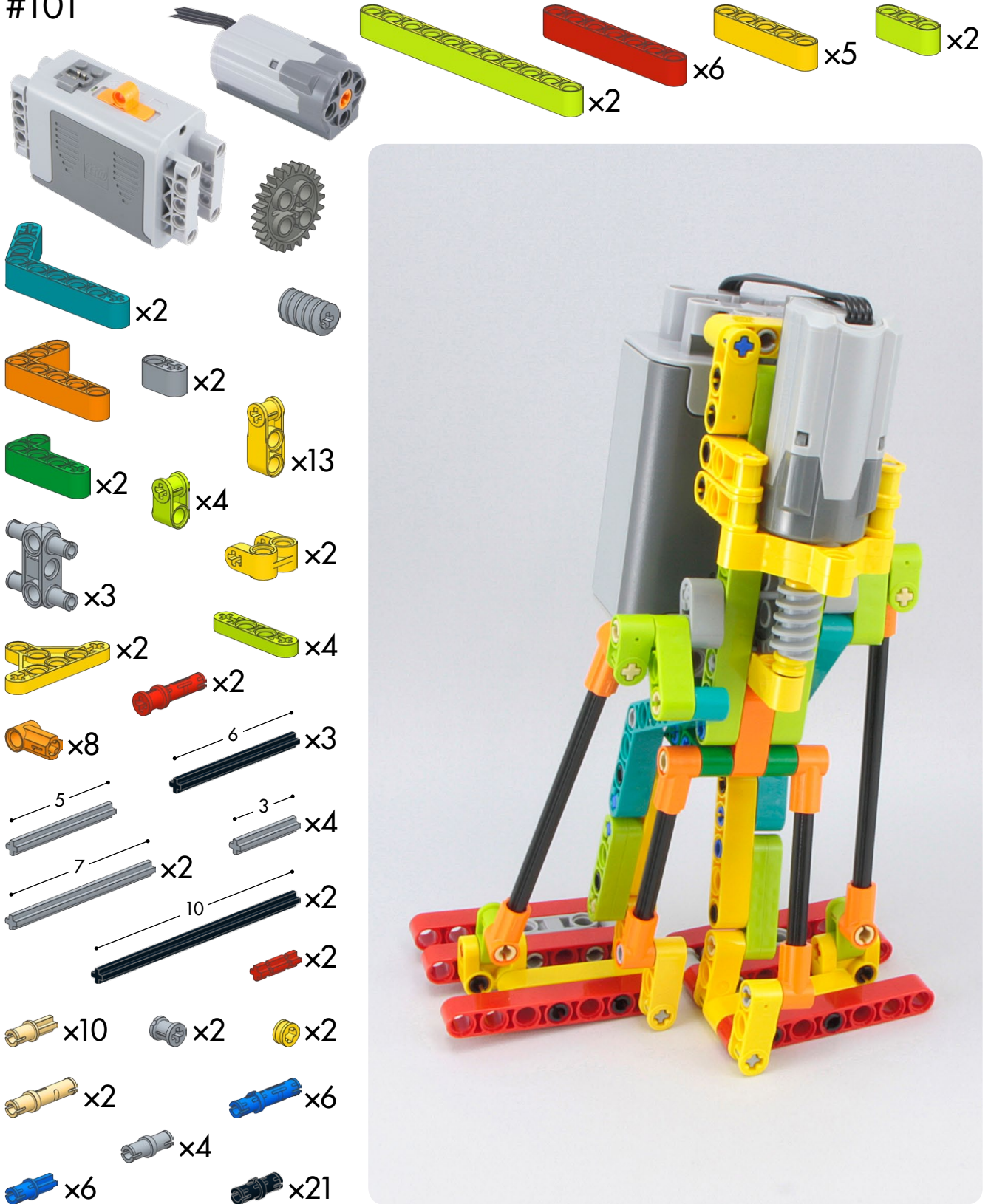


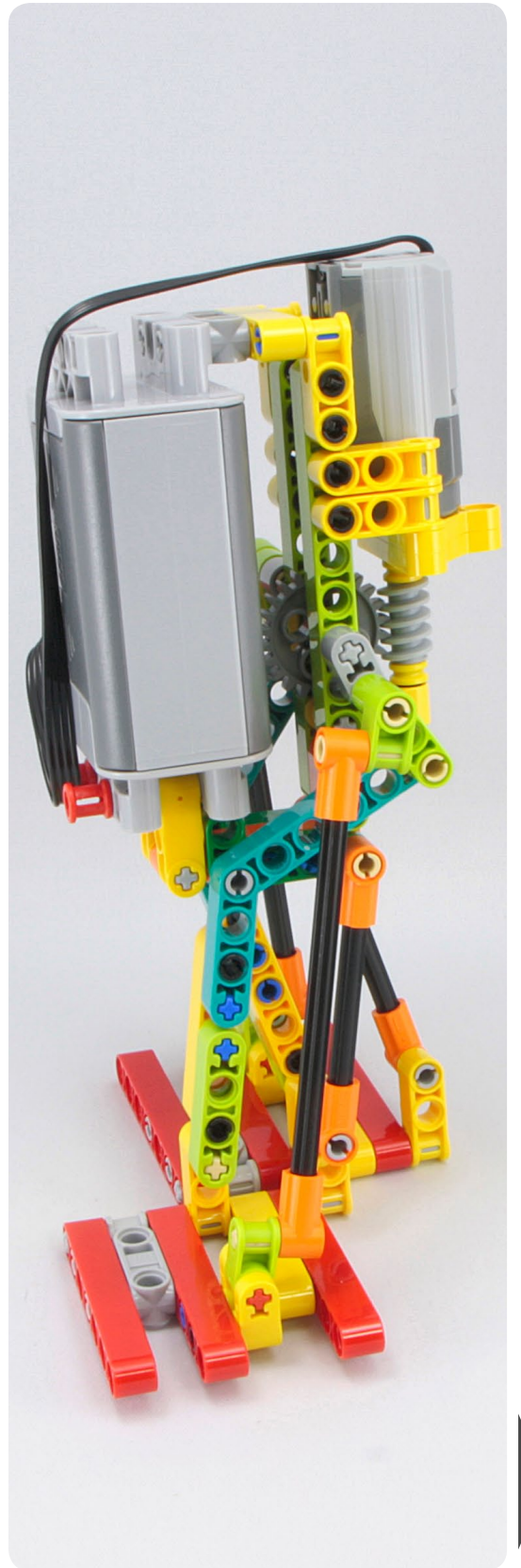
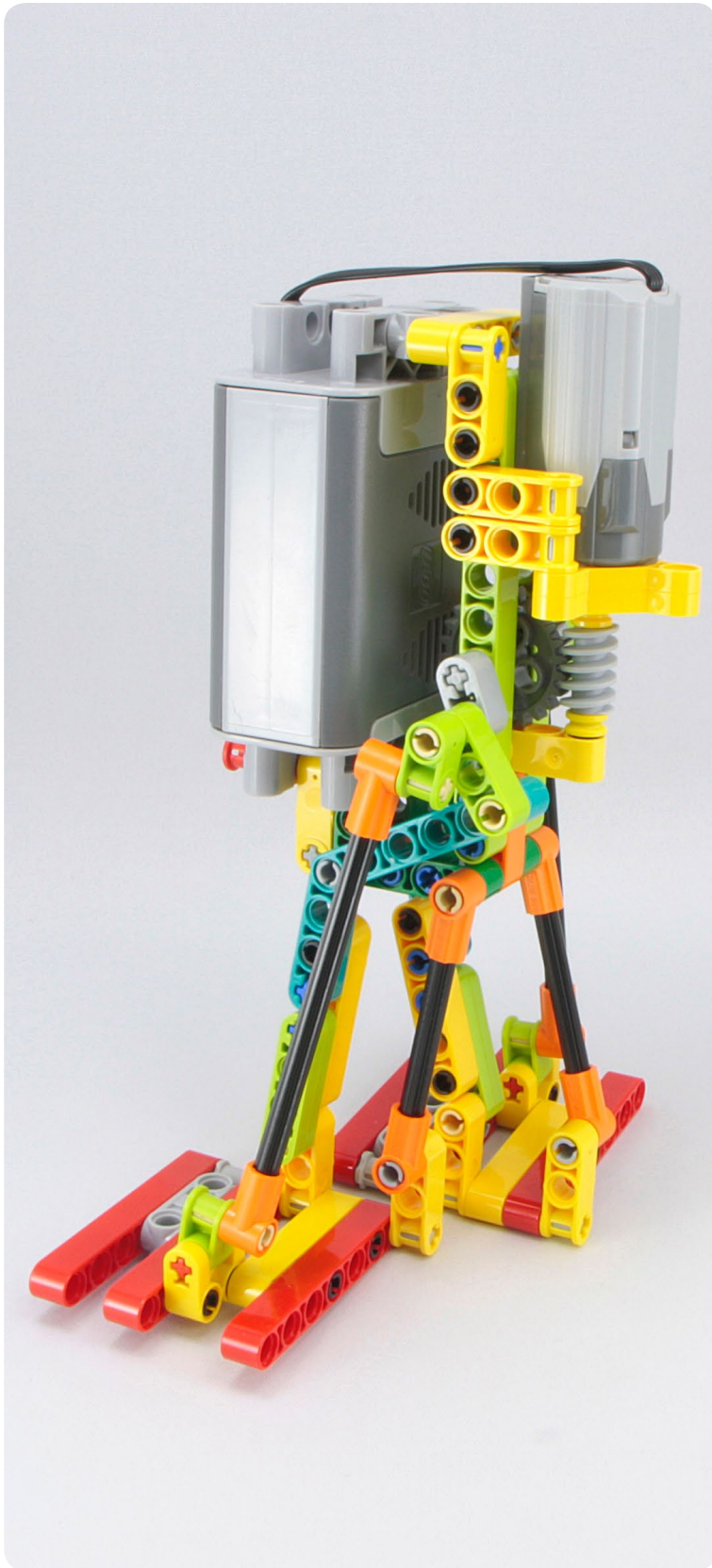


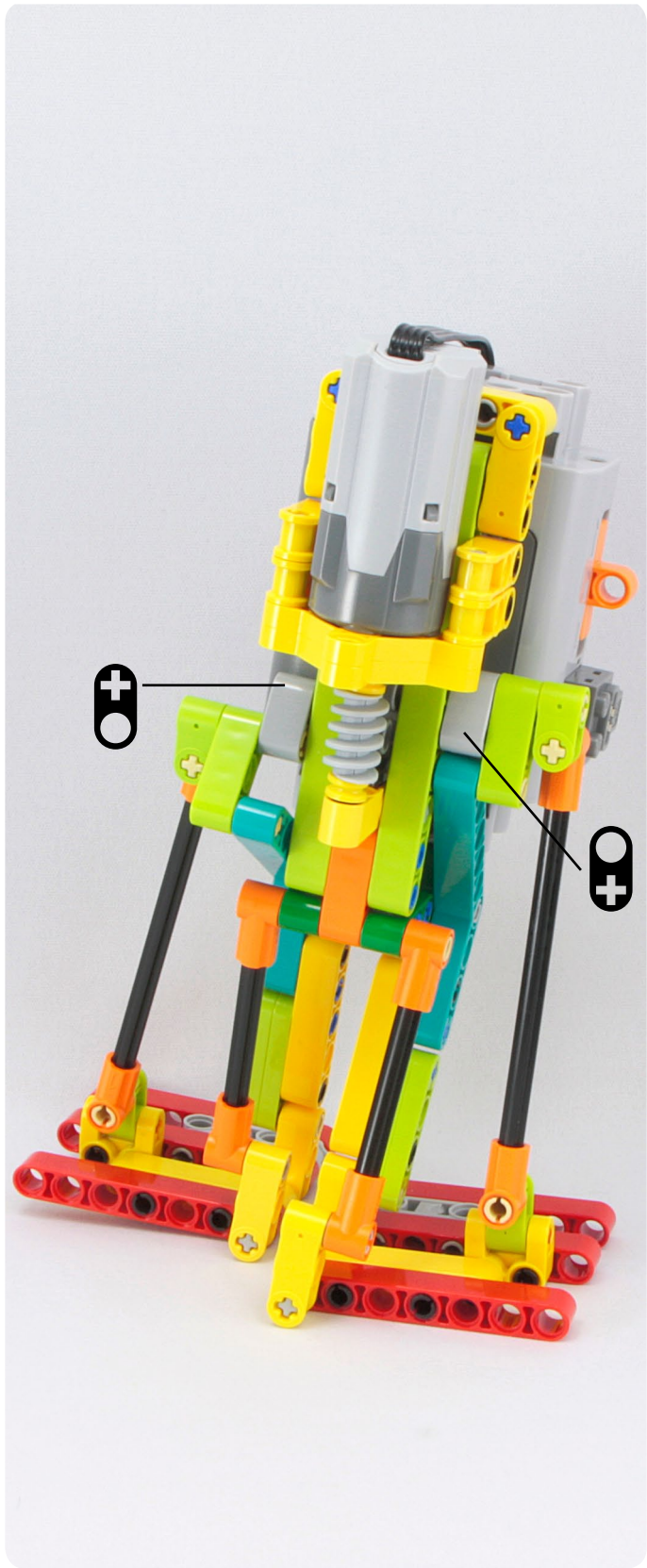


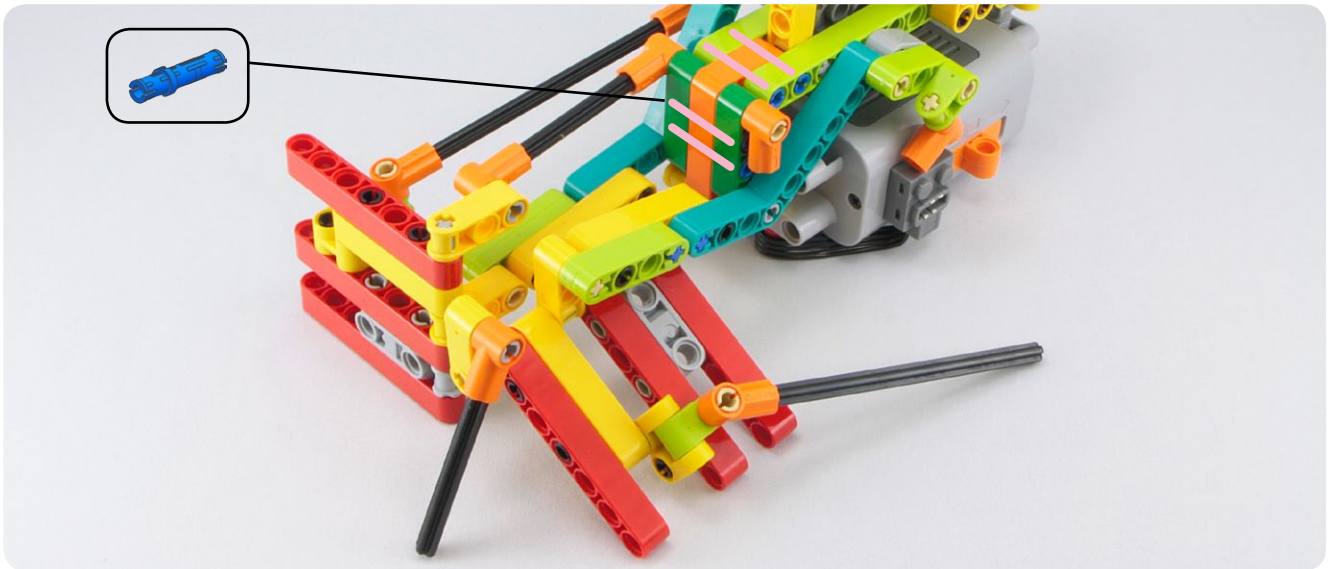
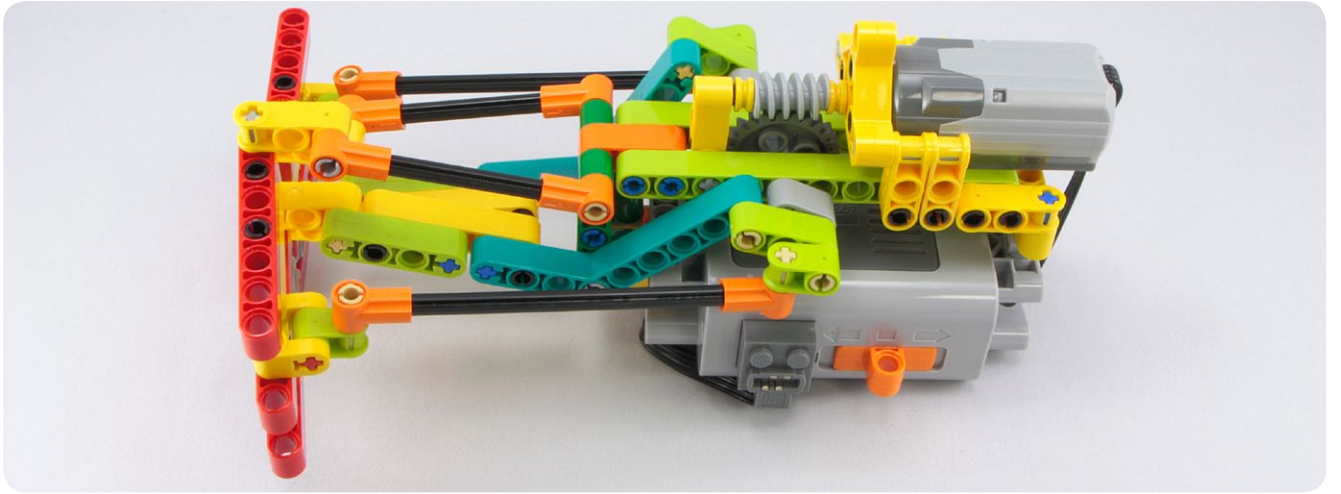


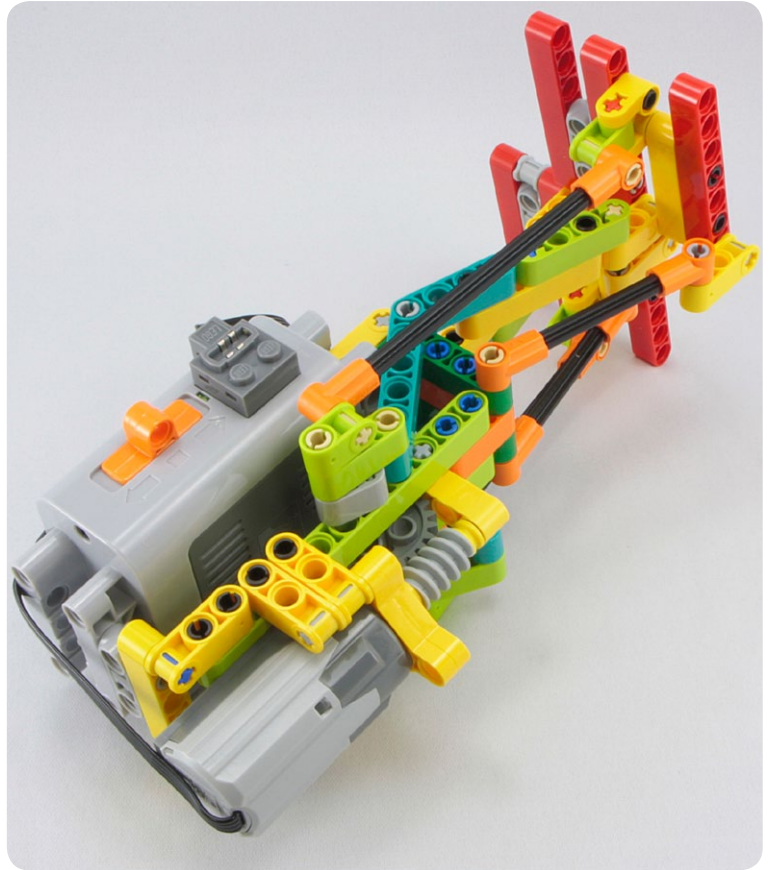
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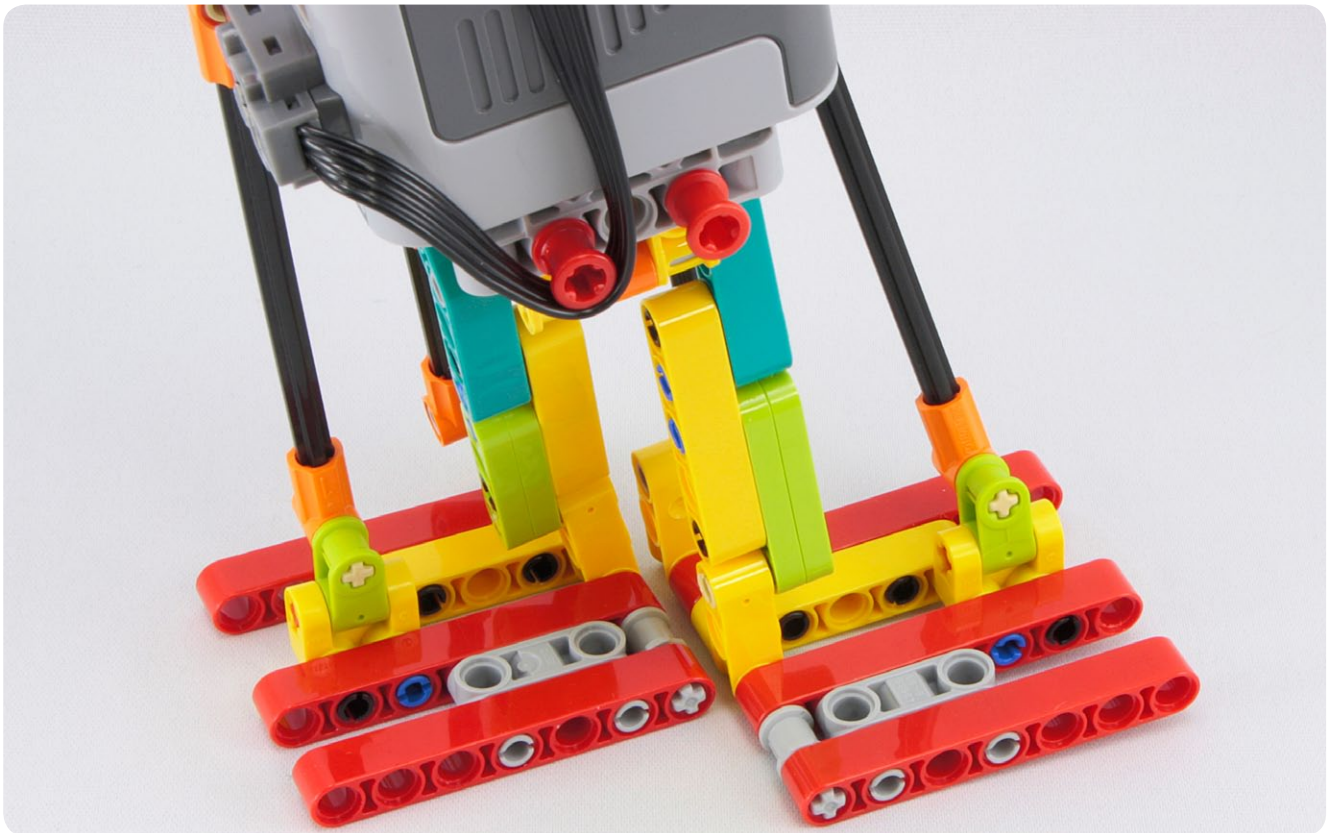
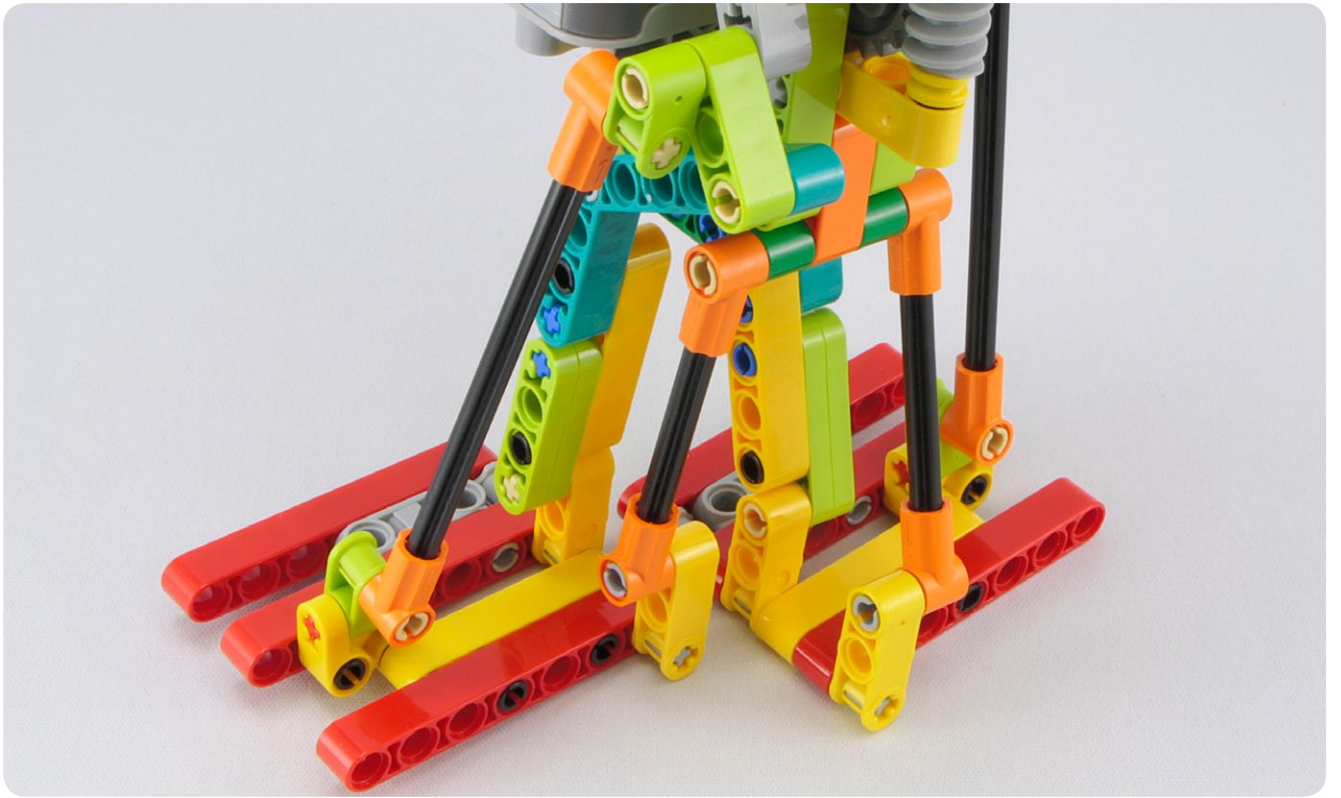


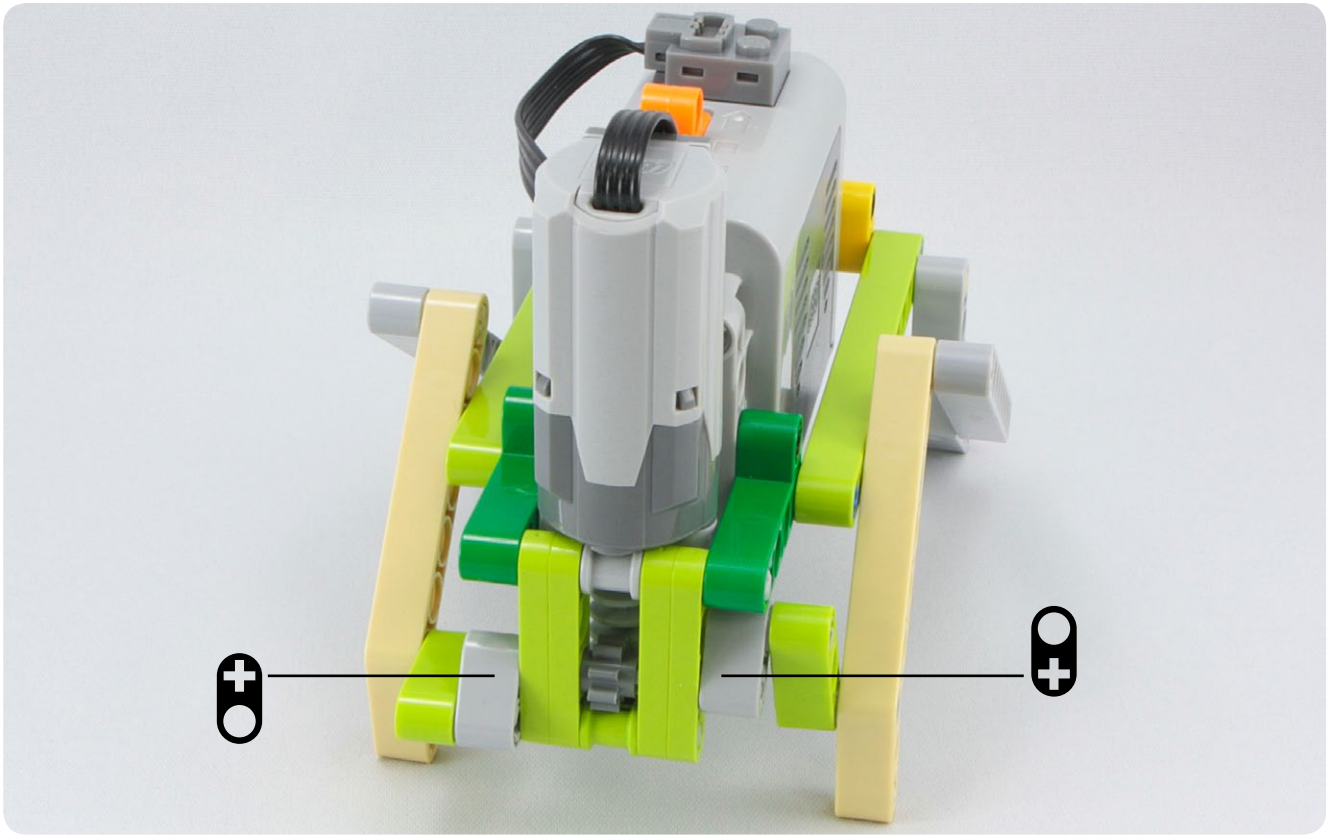








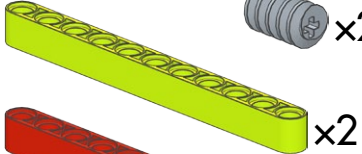
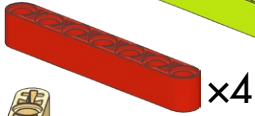
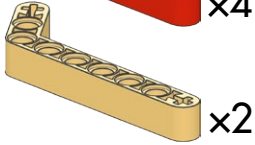

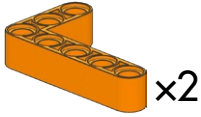
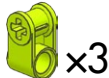
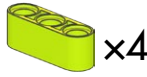
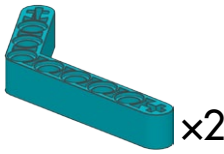
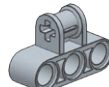

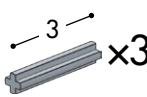
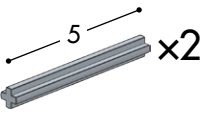
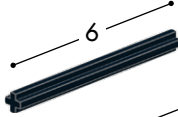
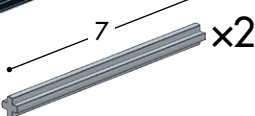






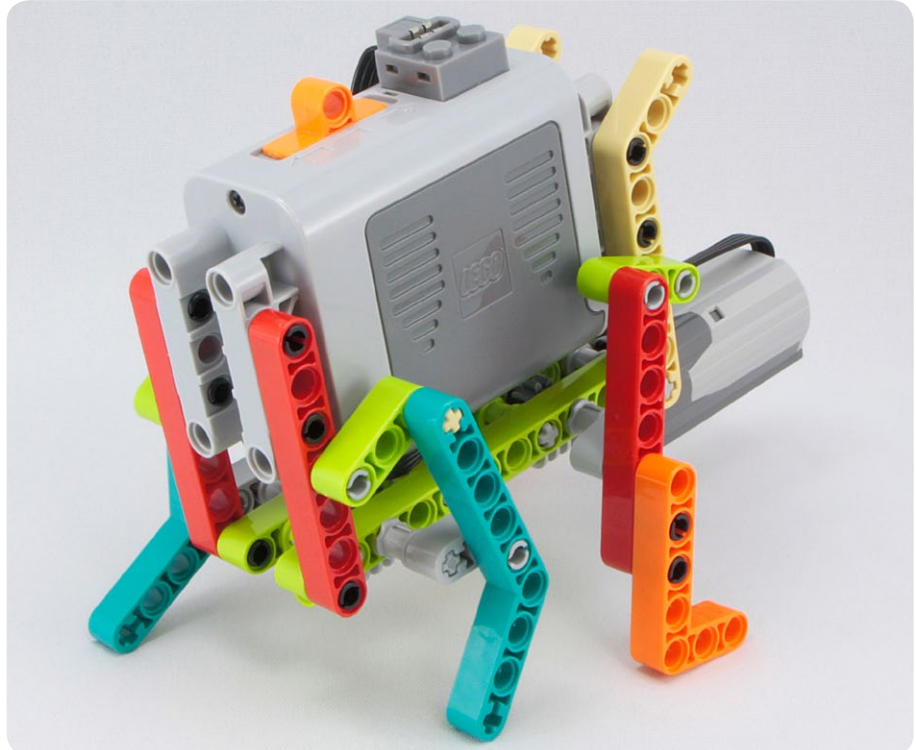
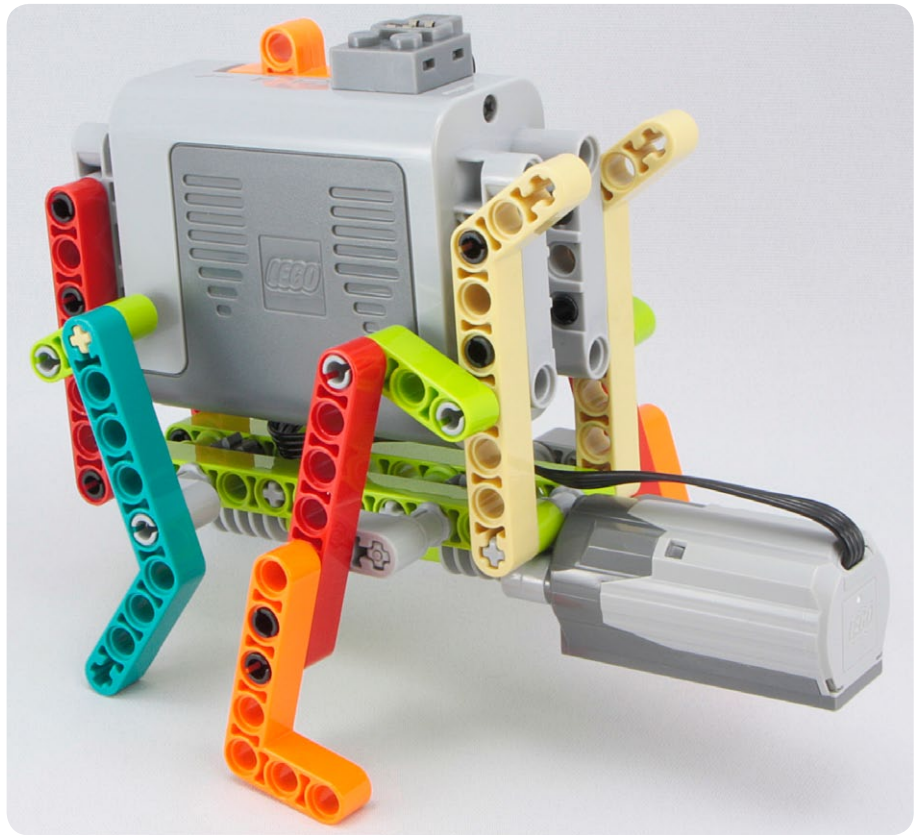


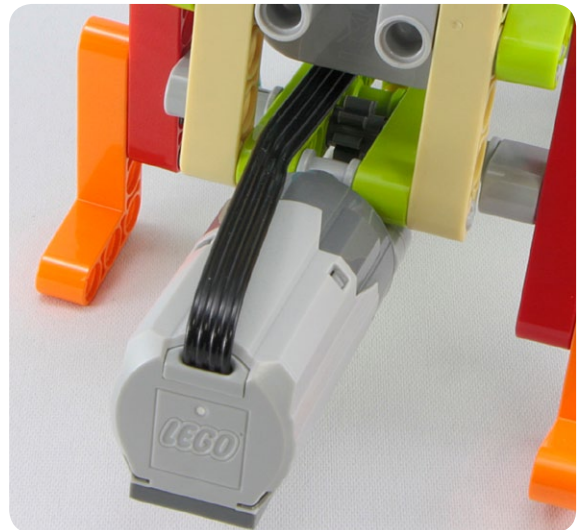
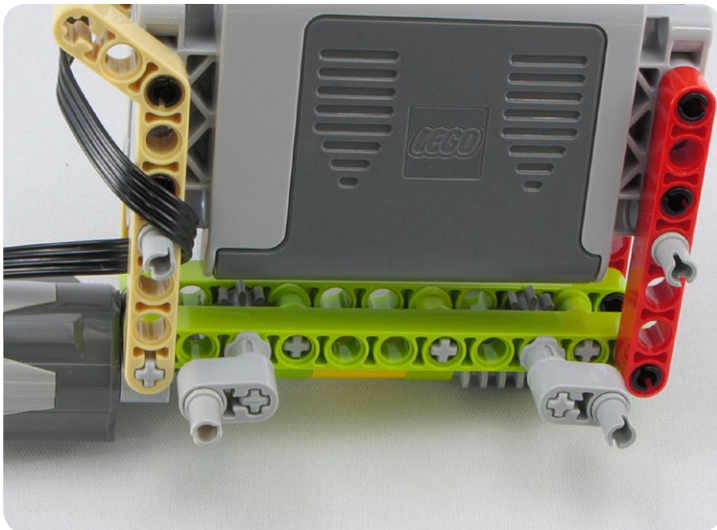
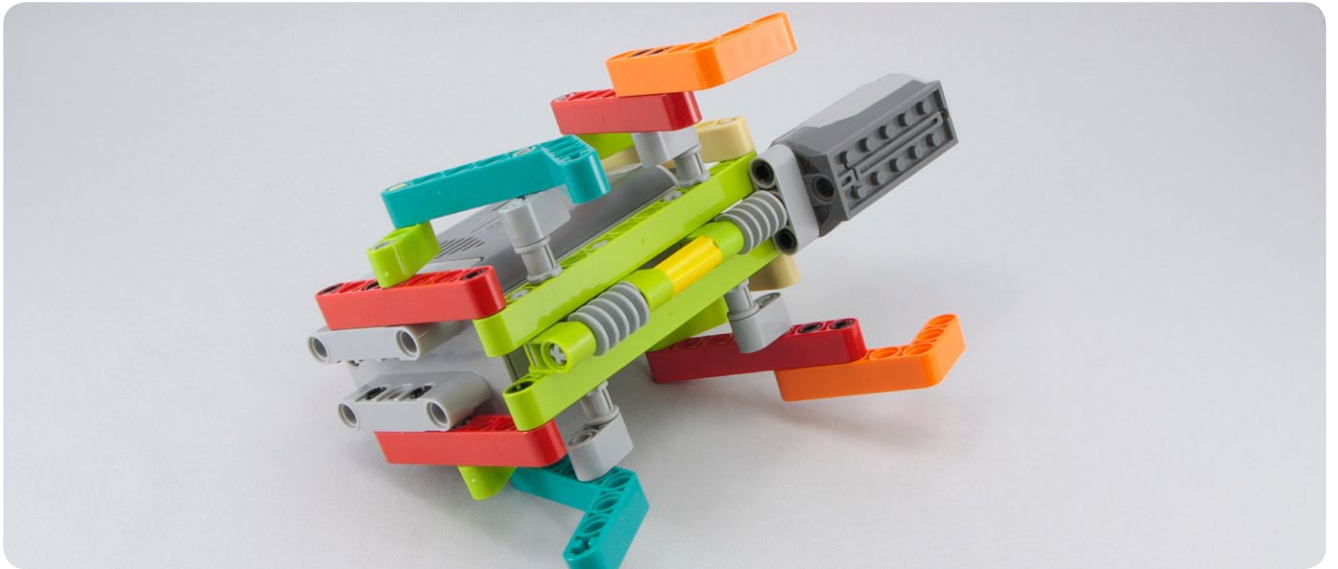
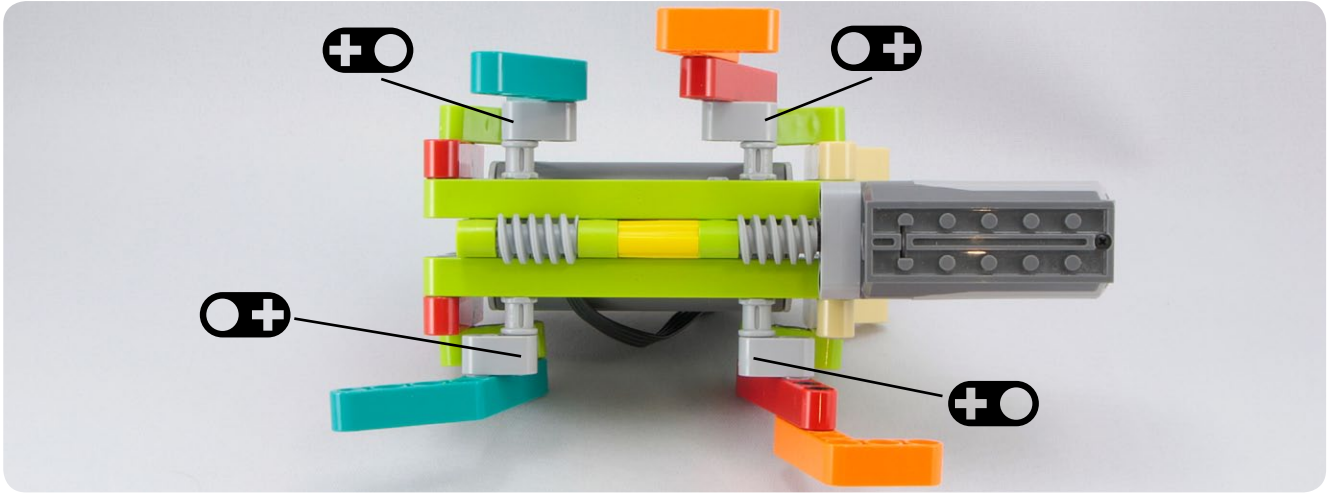




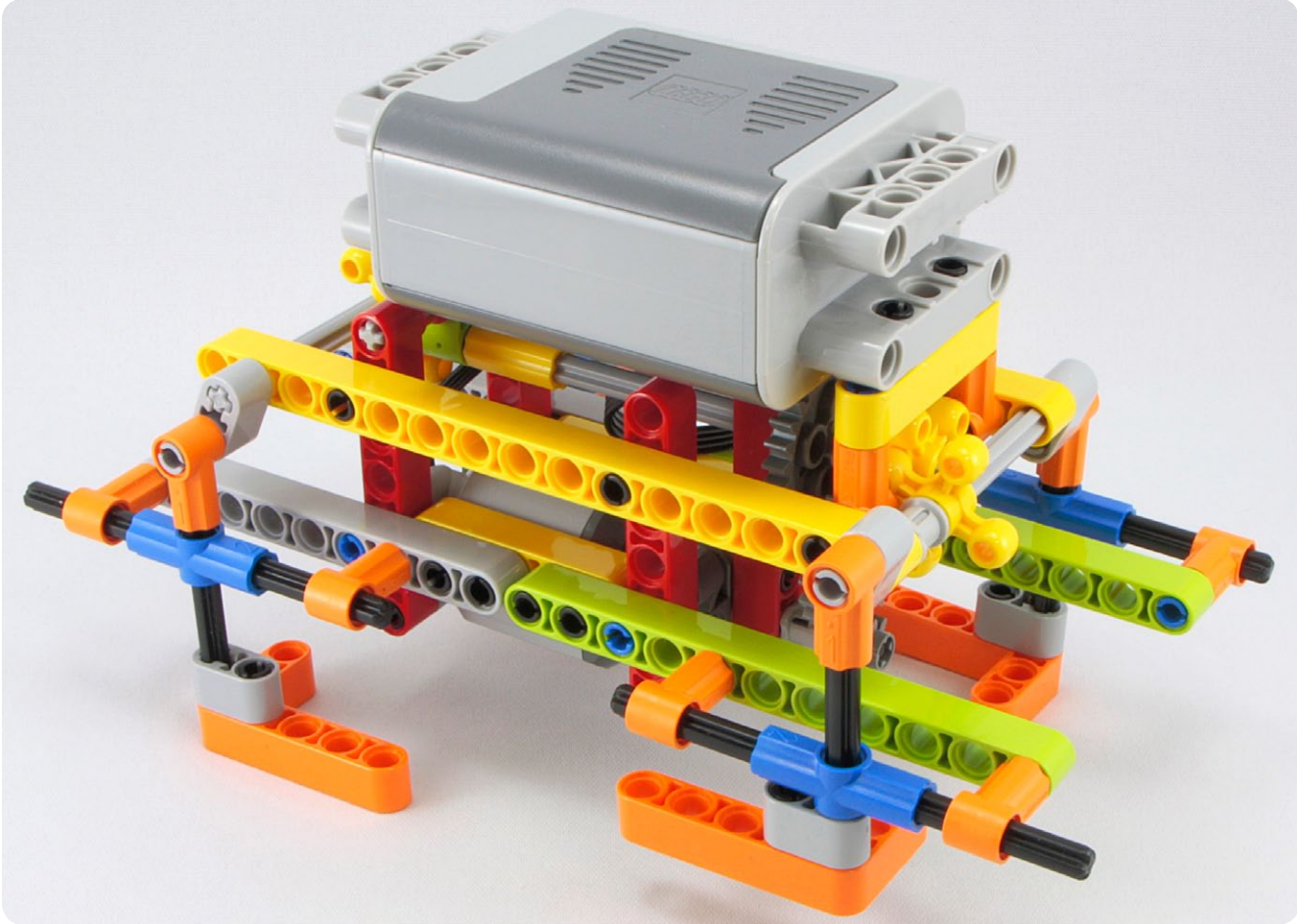
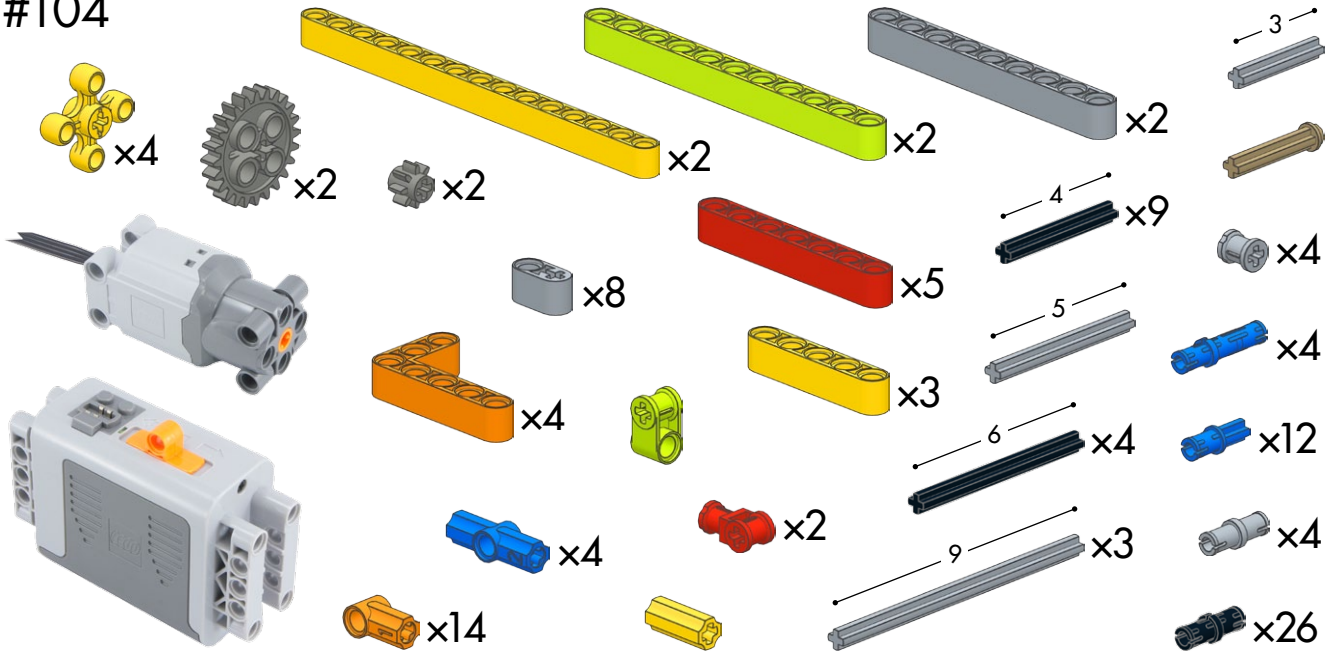
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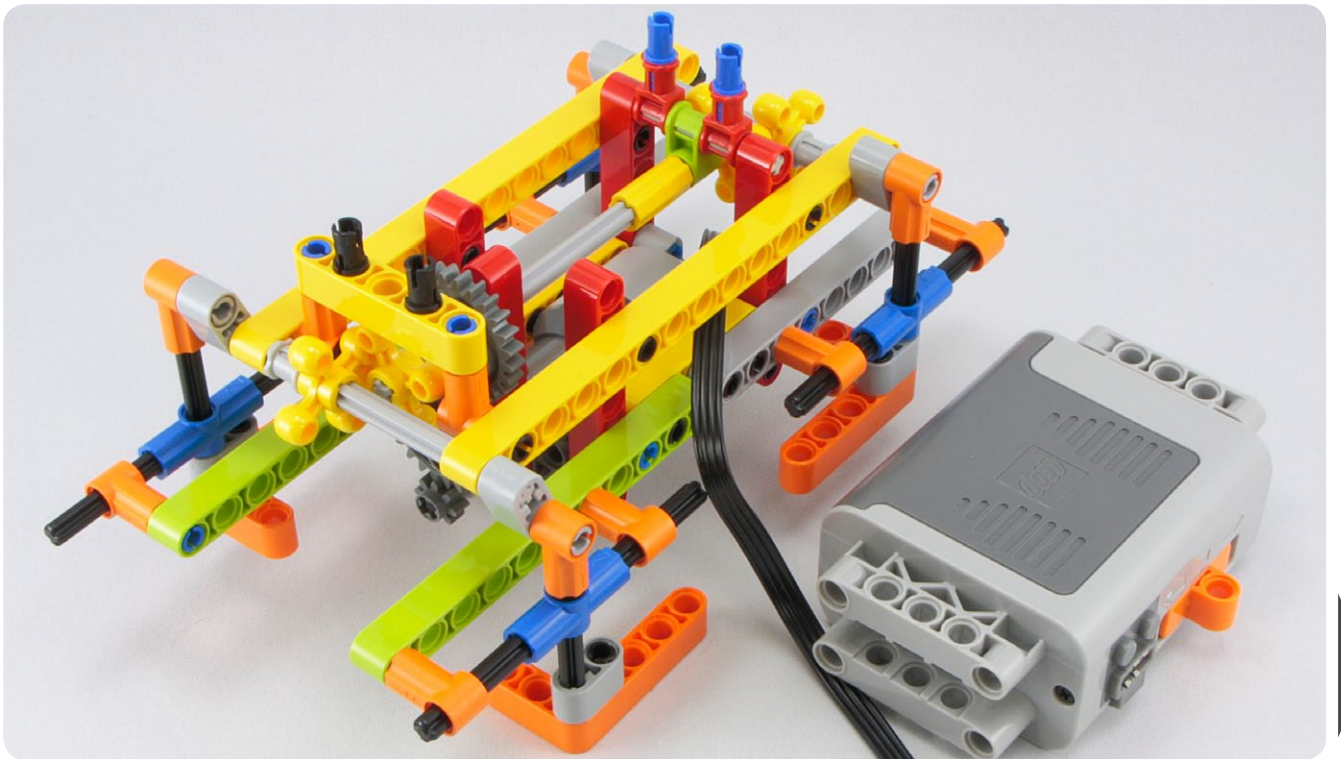
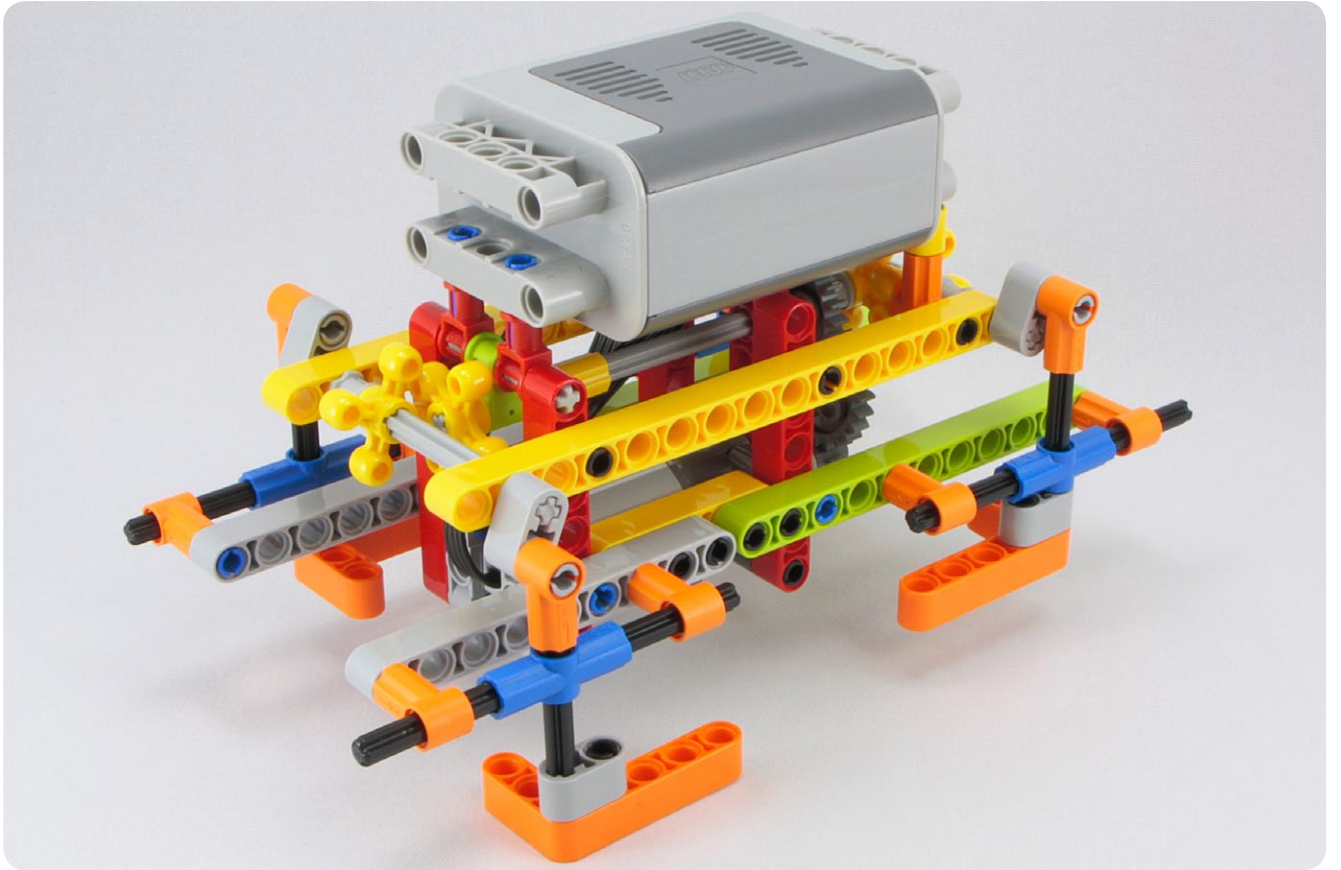
- 
- 
-  x2
-  x2
-  x2
-  x4
-  x2
-  x4
-  x2
-  x3
-  x4
-  x2
-  x2
- 
-  x3
-  x2
-  x2
-  x2
-  x4
-  x2
-  x10
-  x16

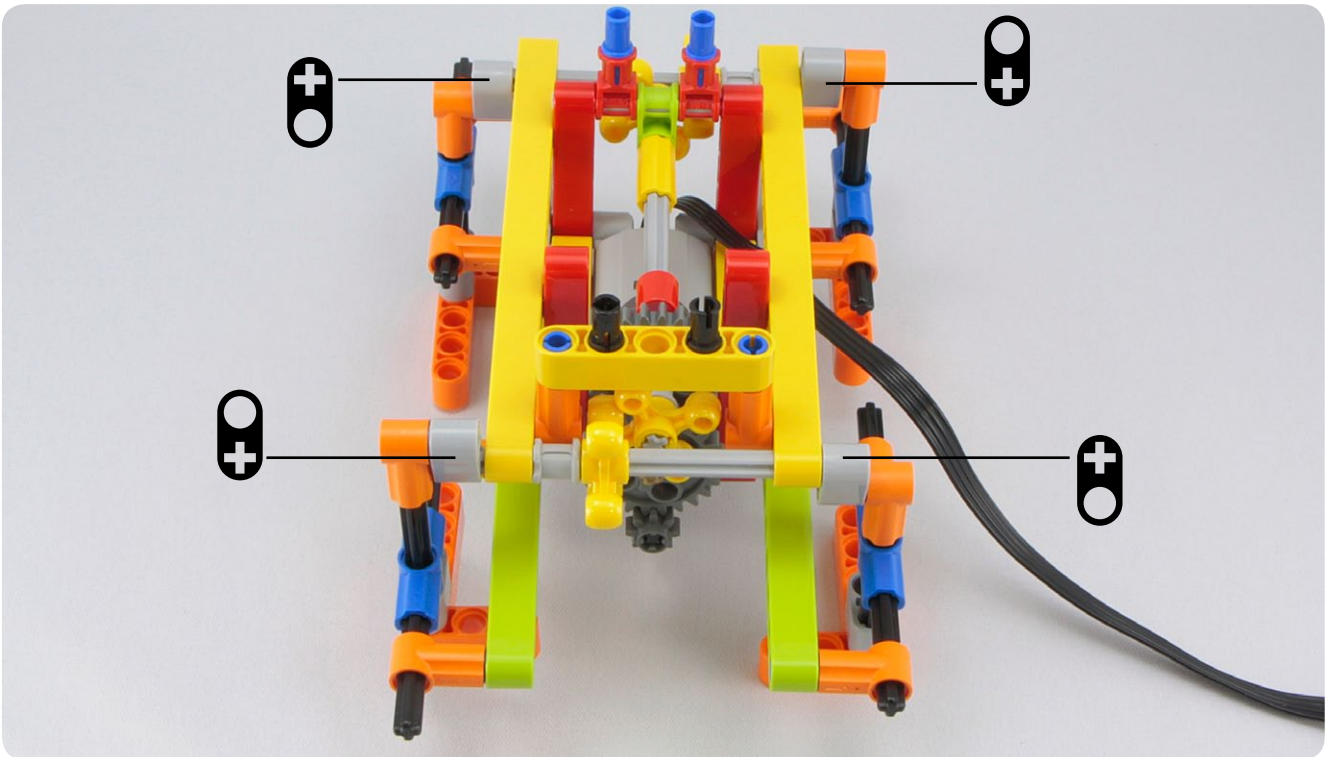
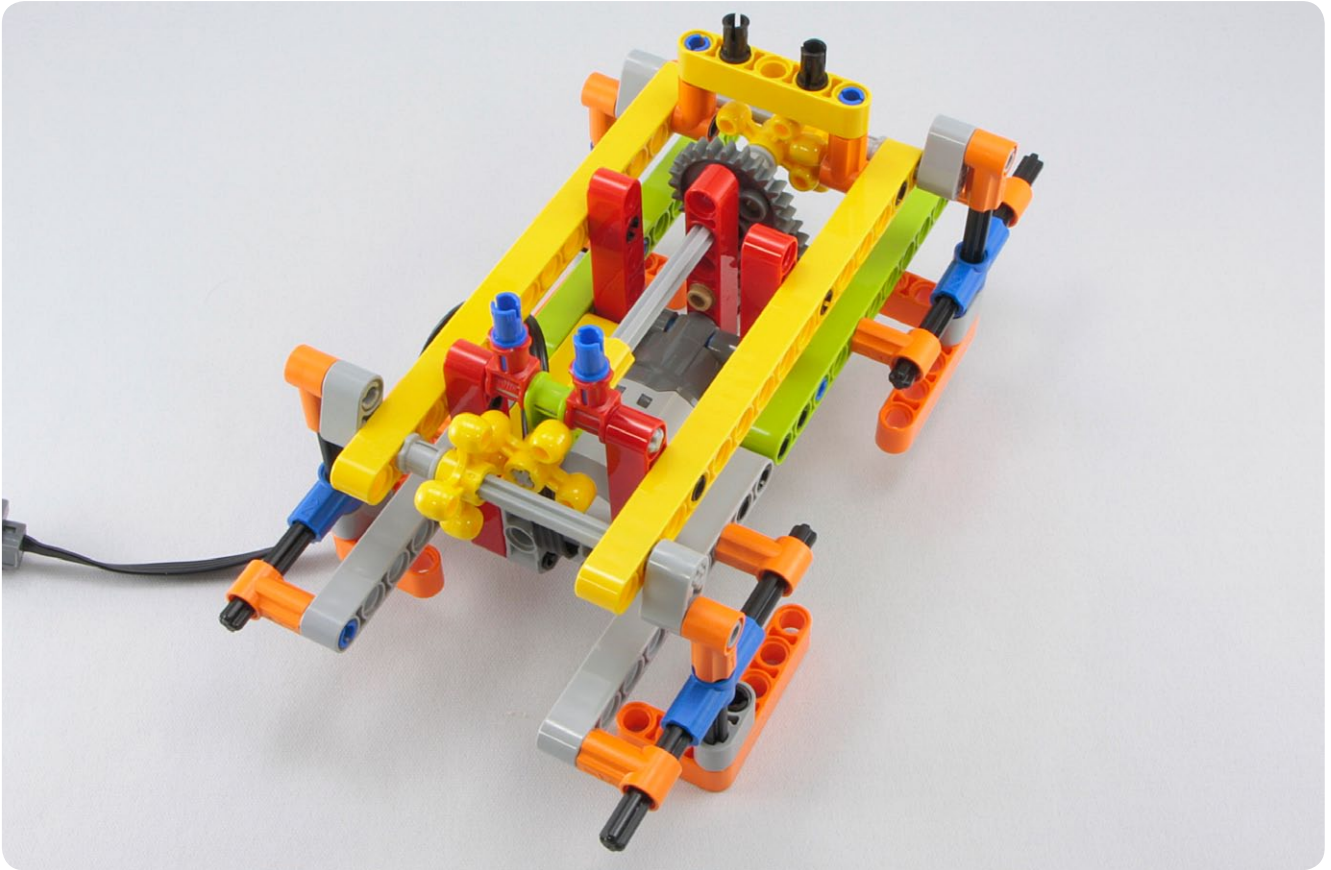


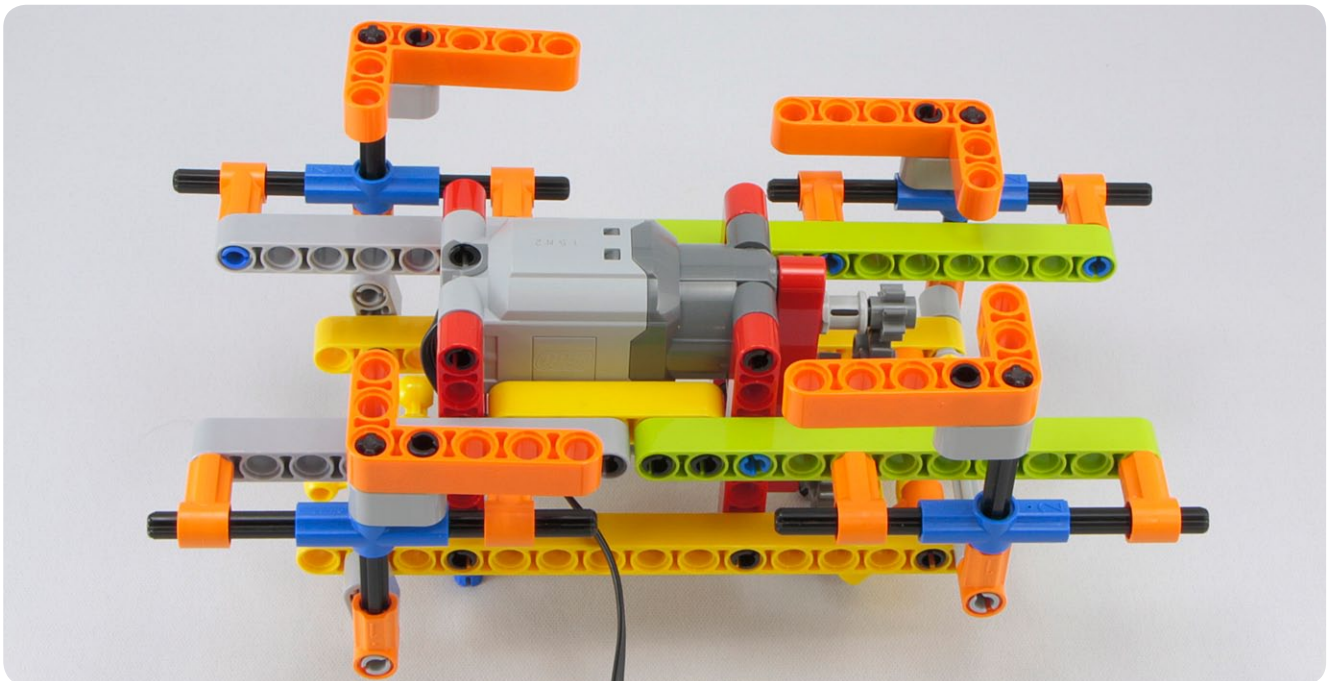
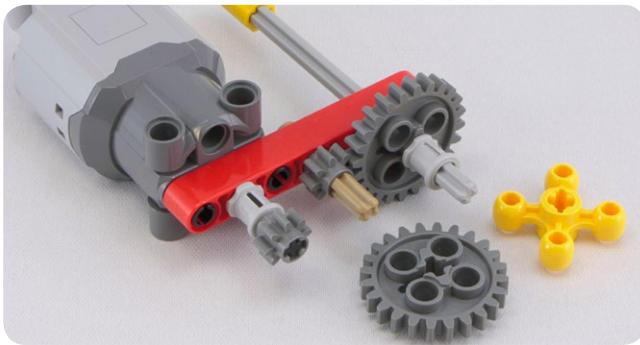
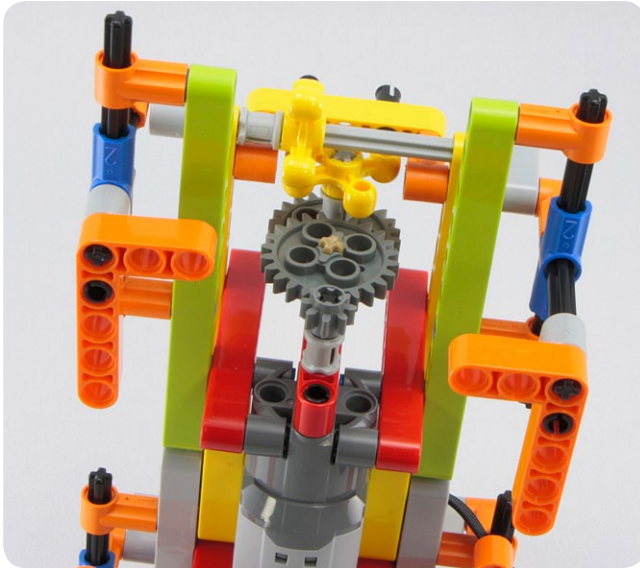


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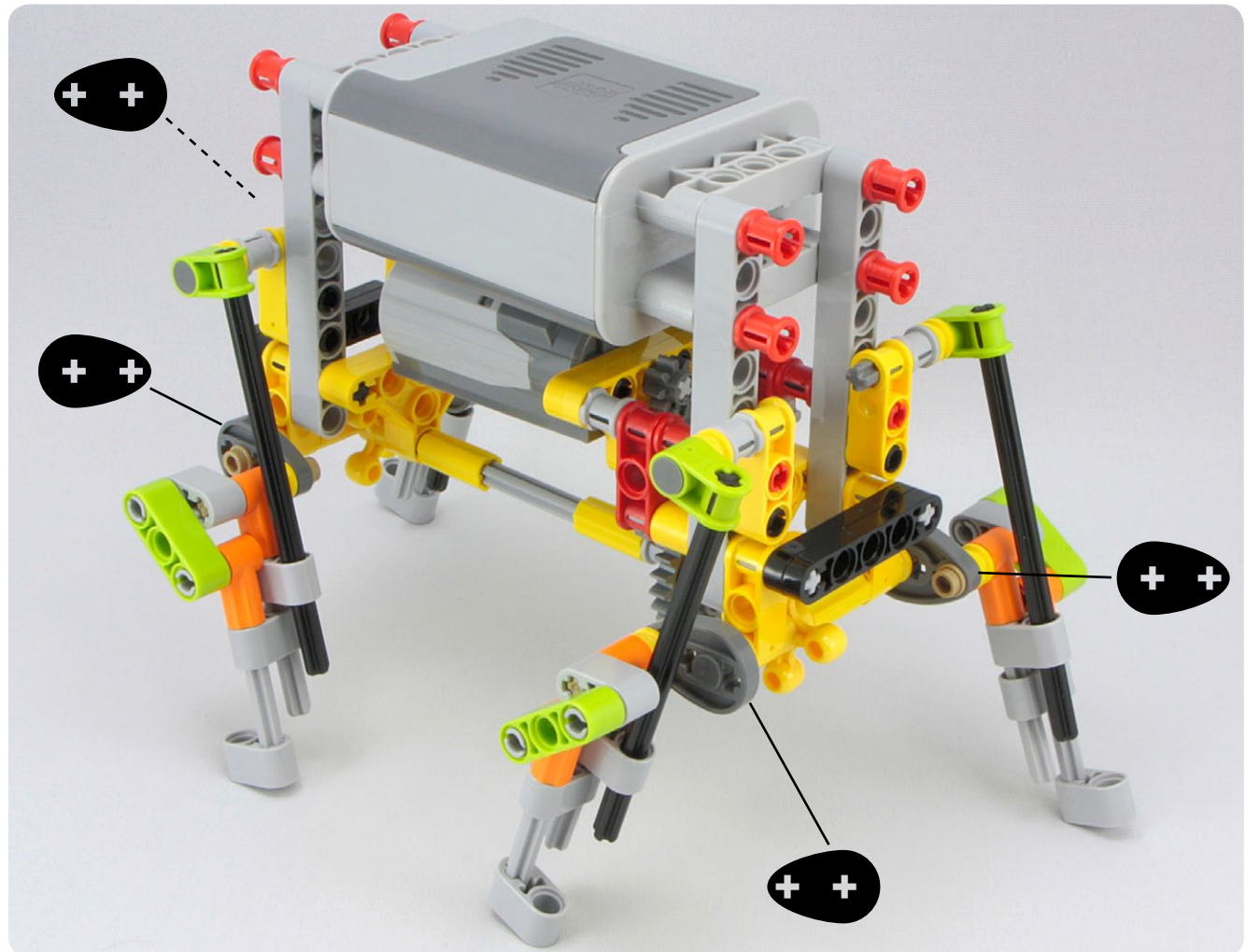
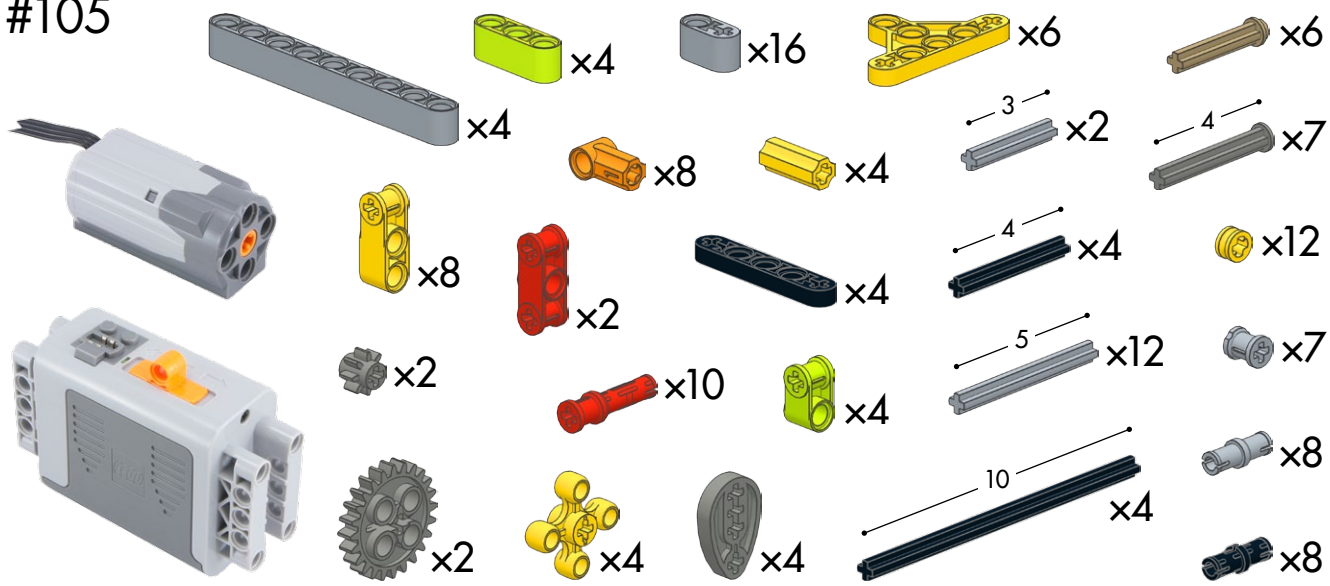


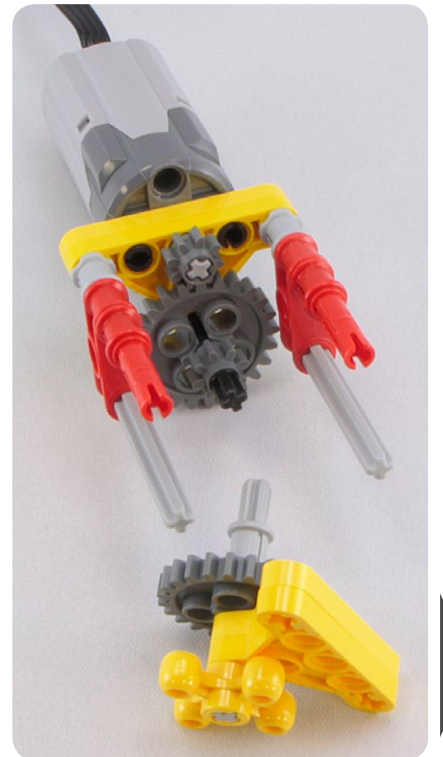
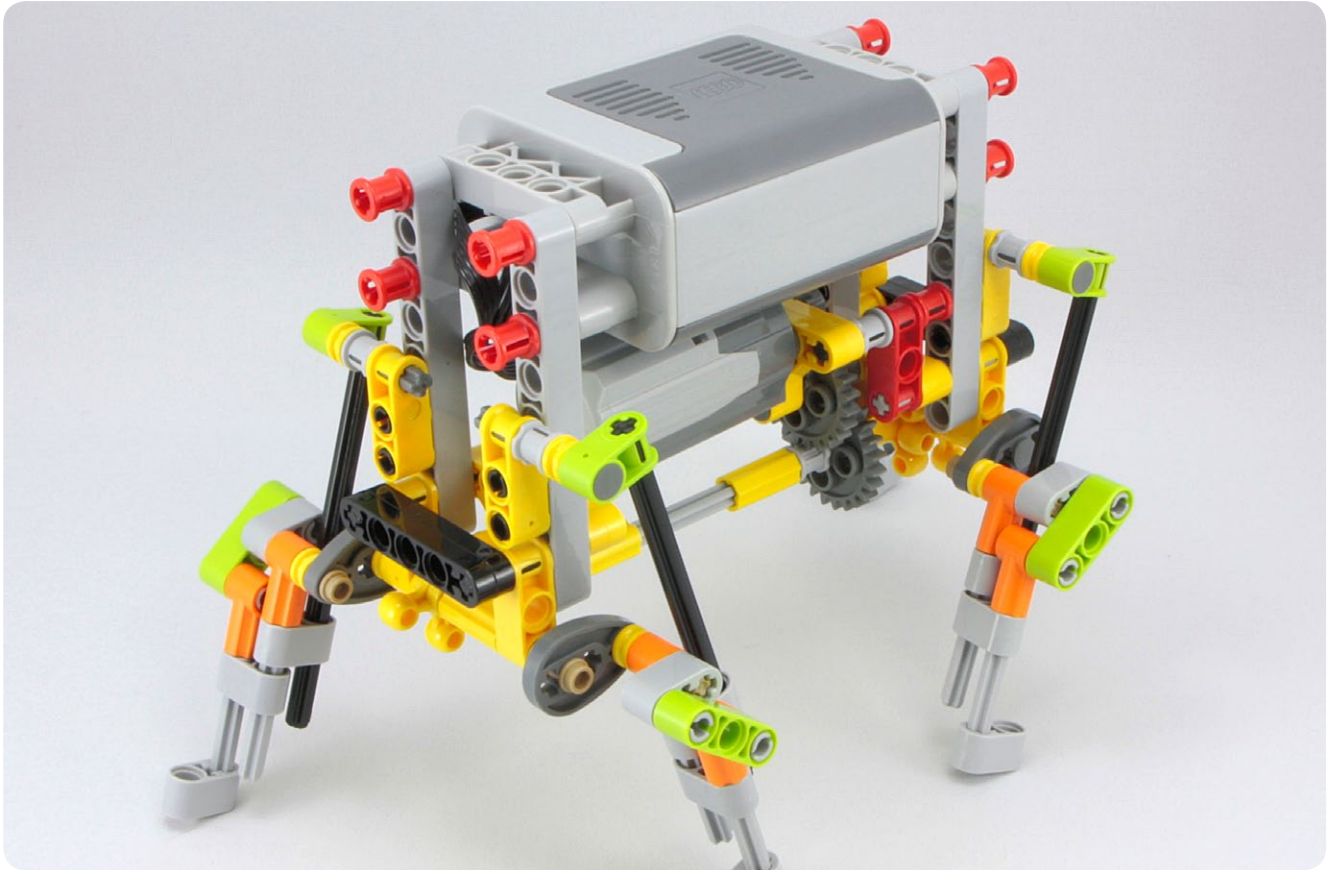


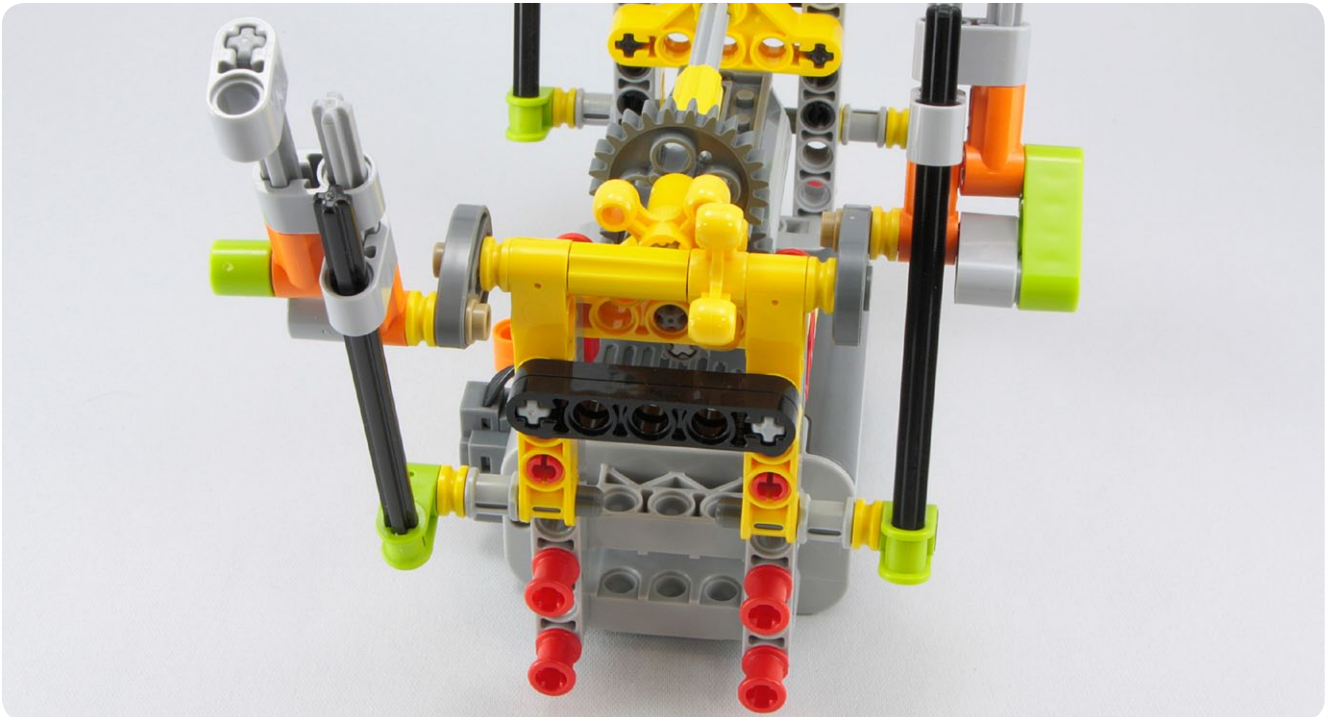
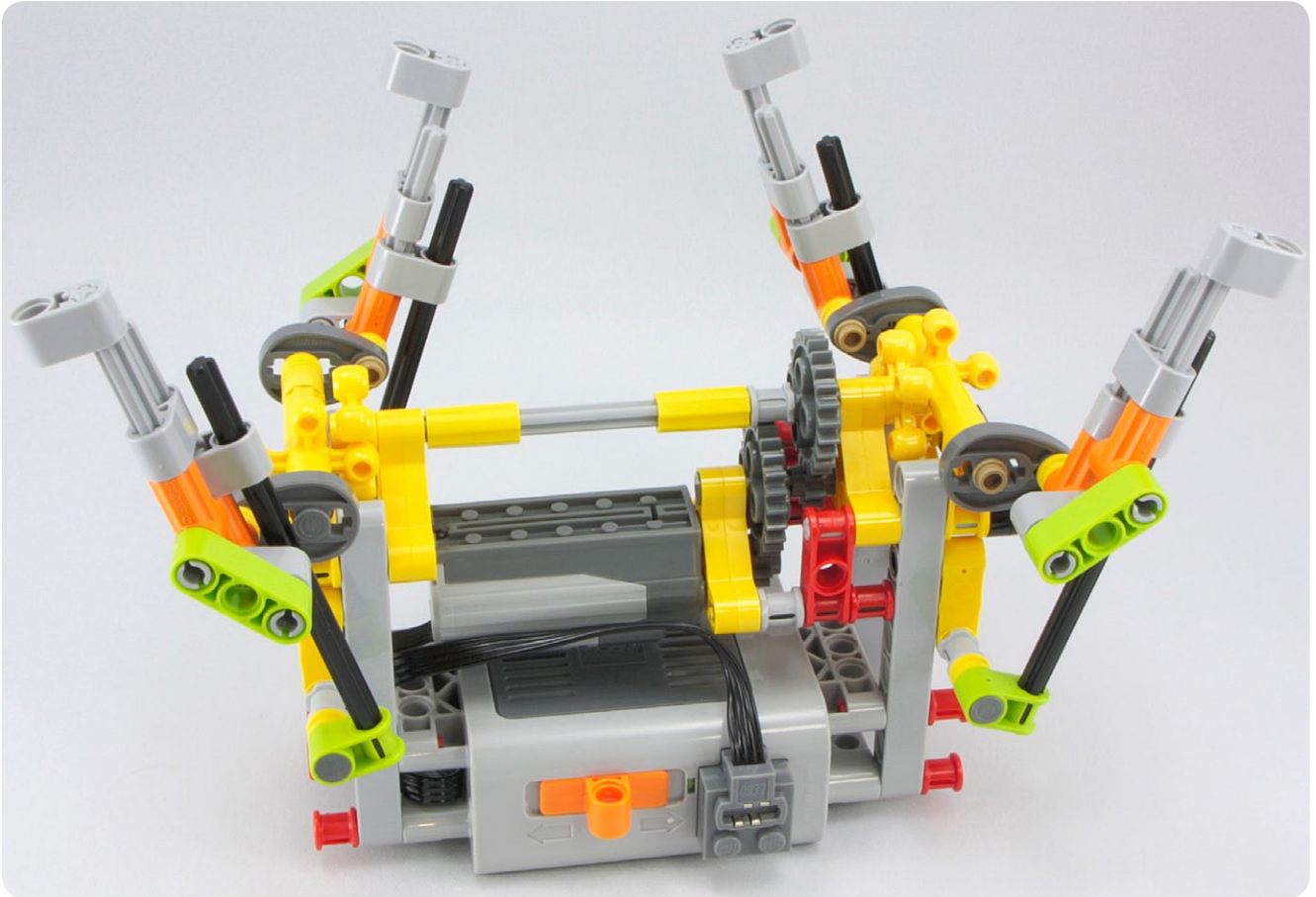


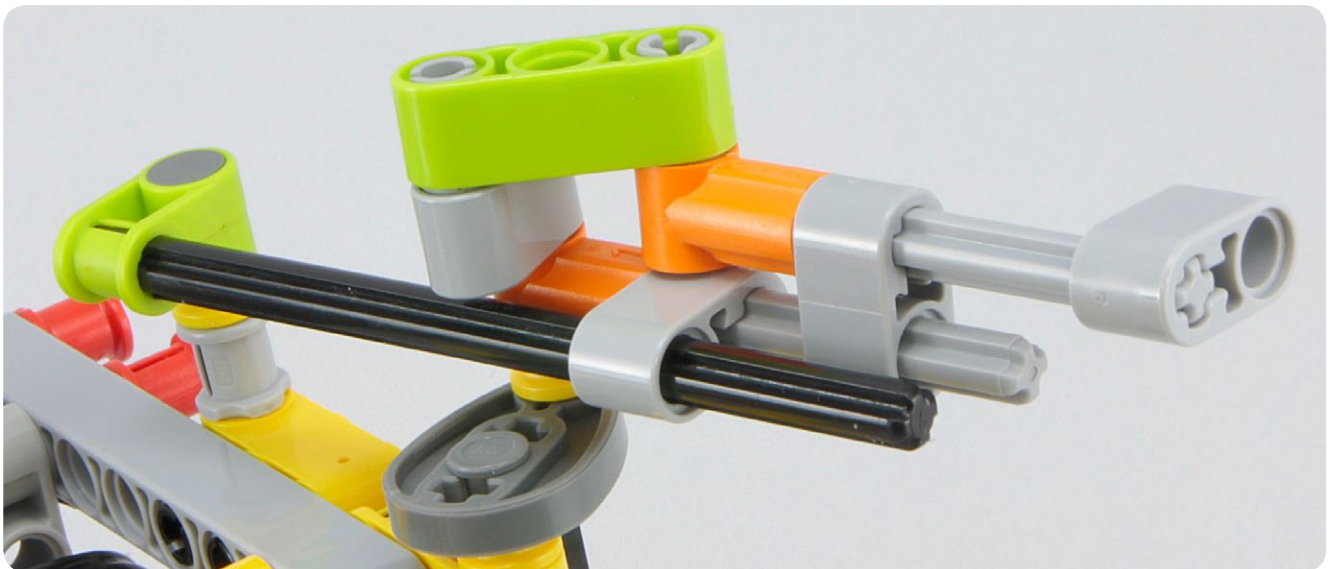
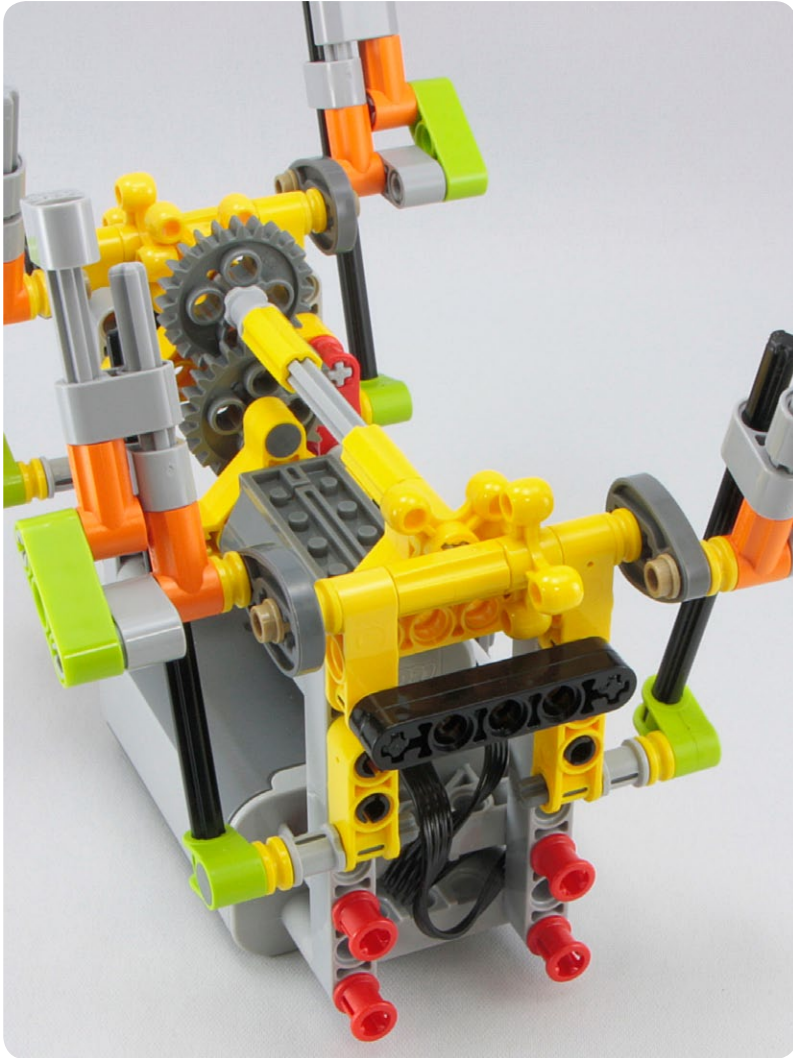


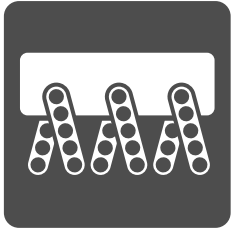
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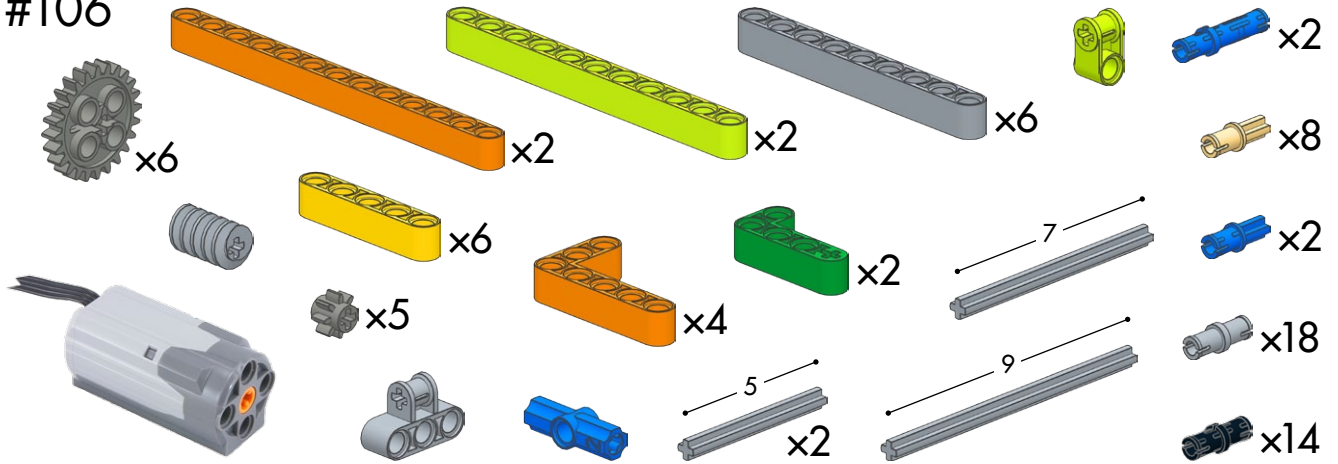


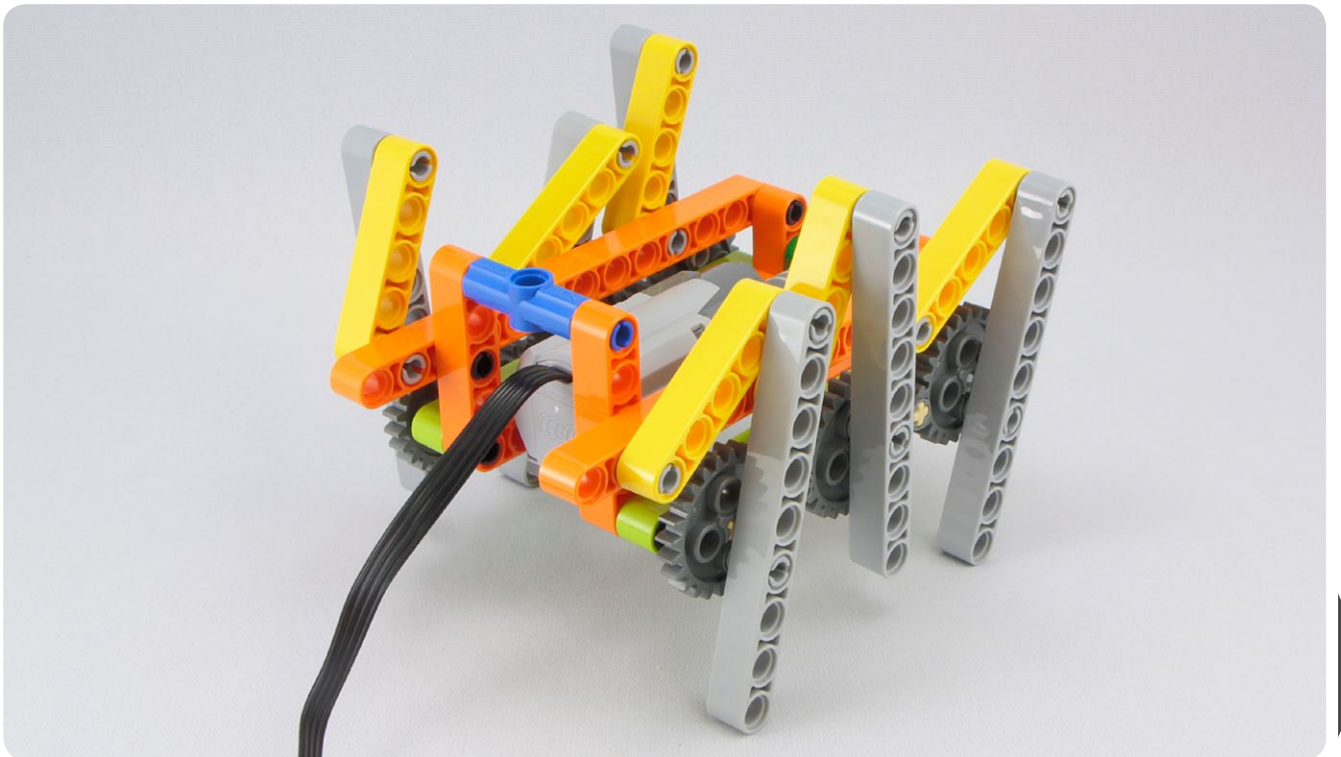
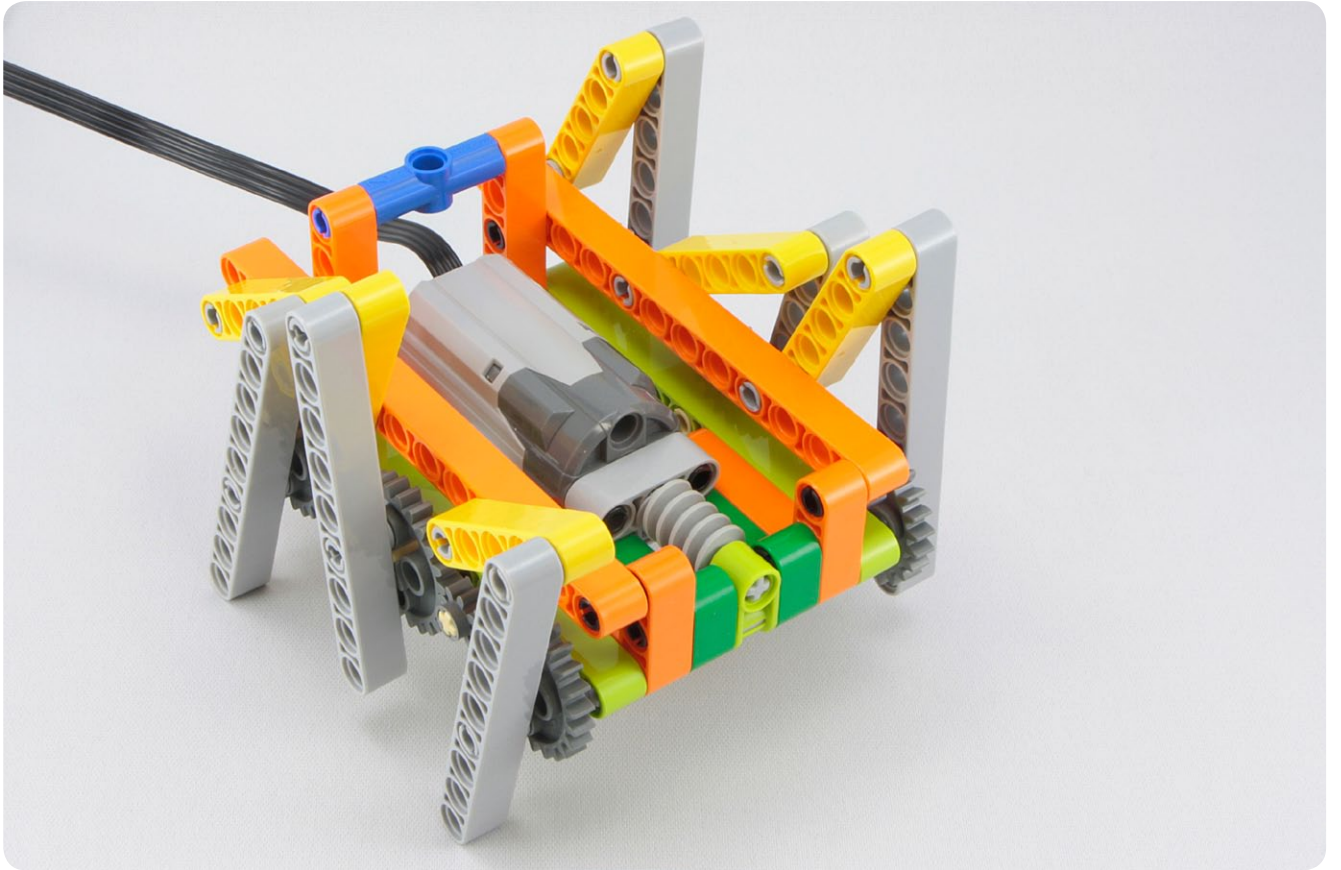


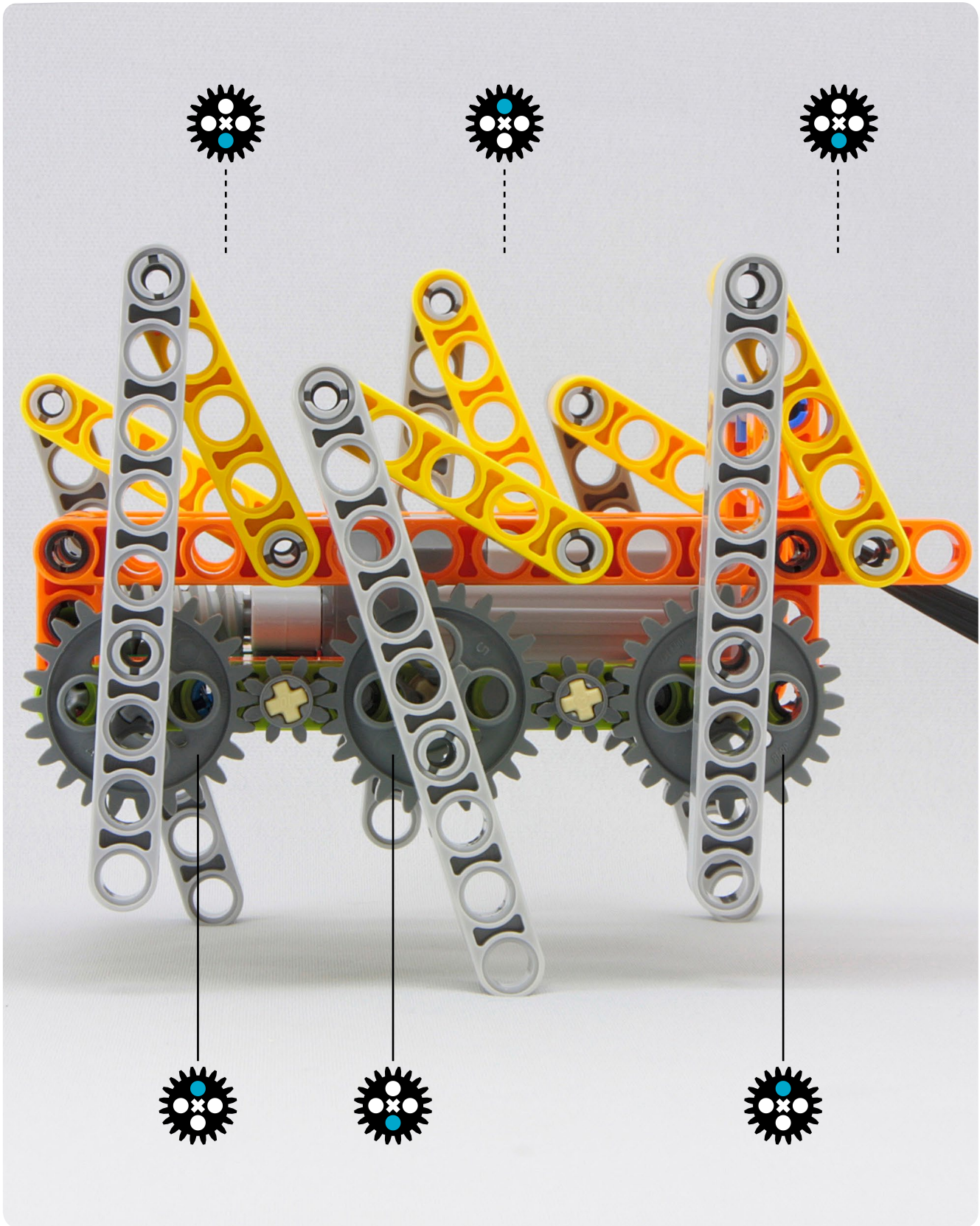


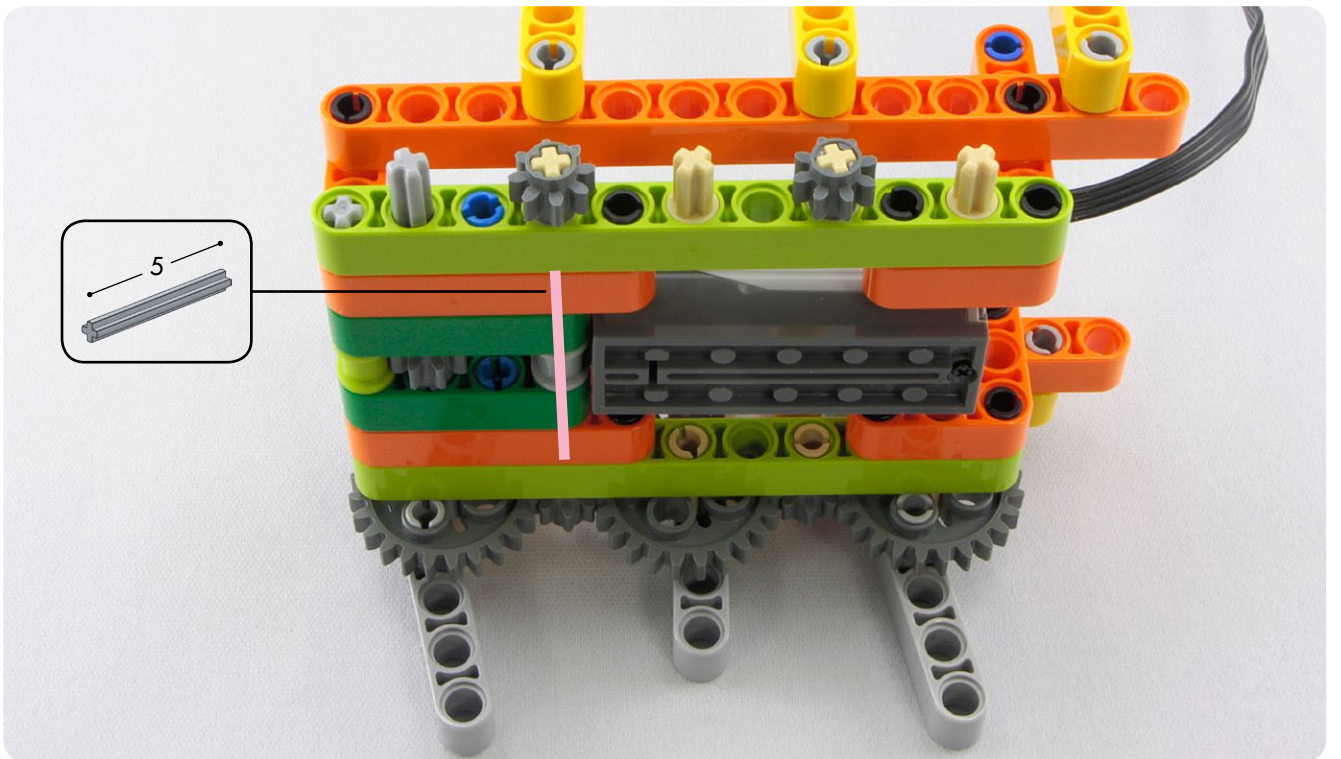
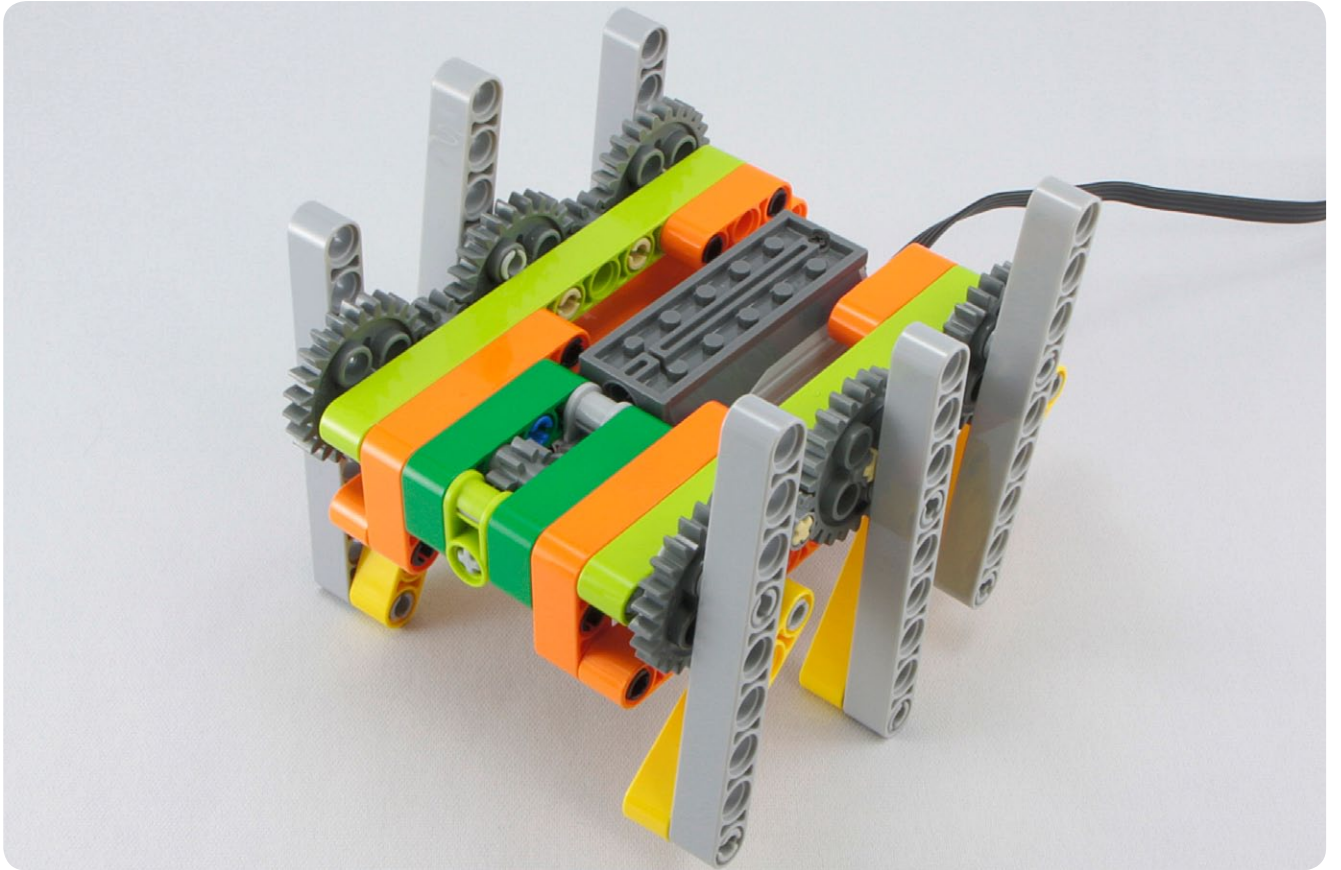
Six-legged walkers

#106





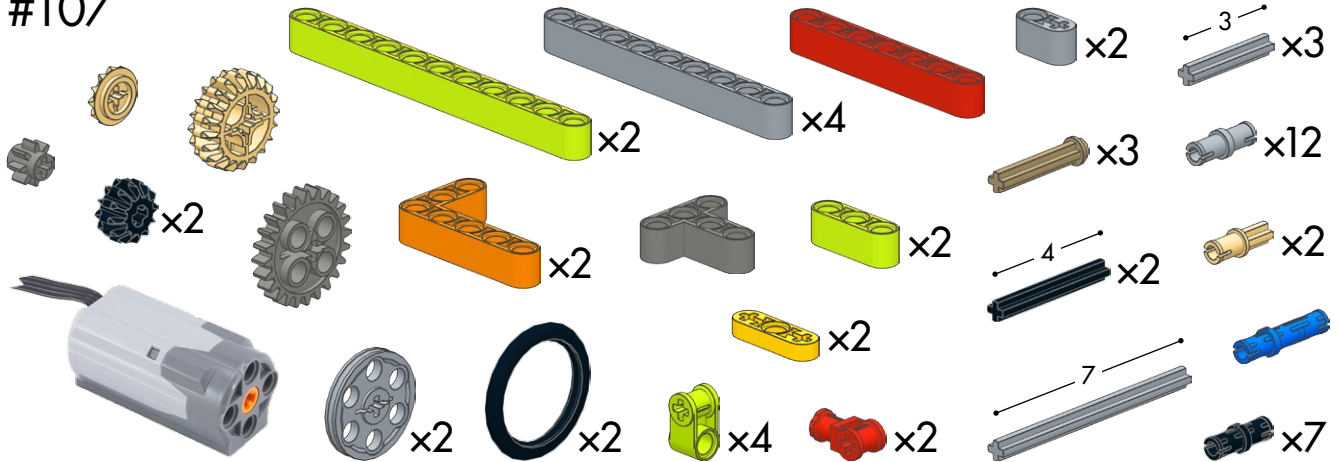


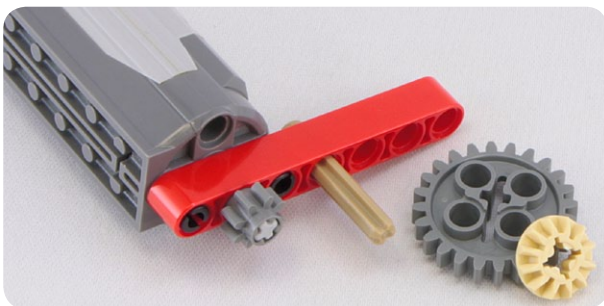
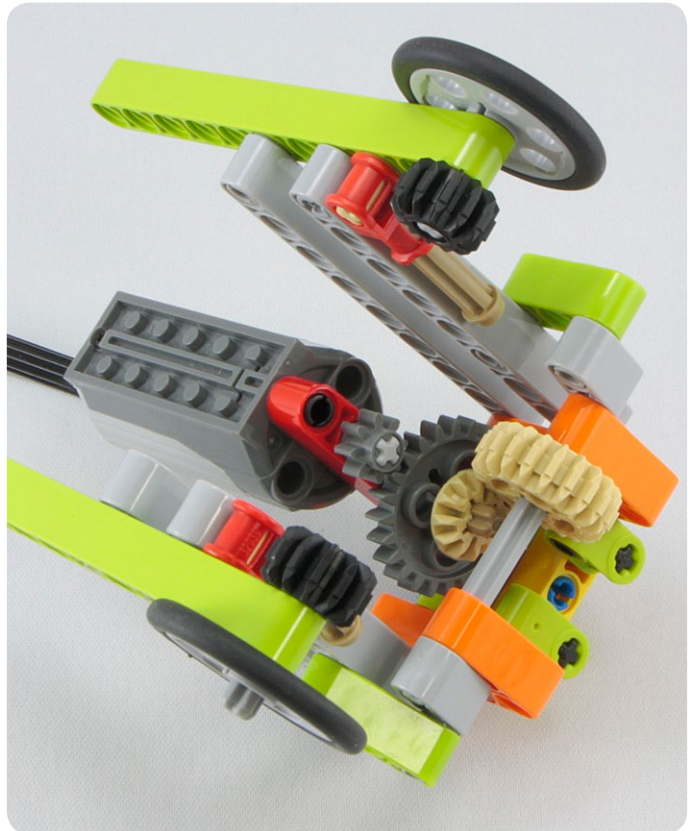
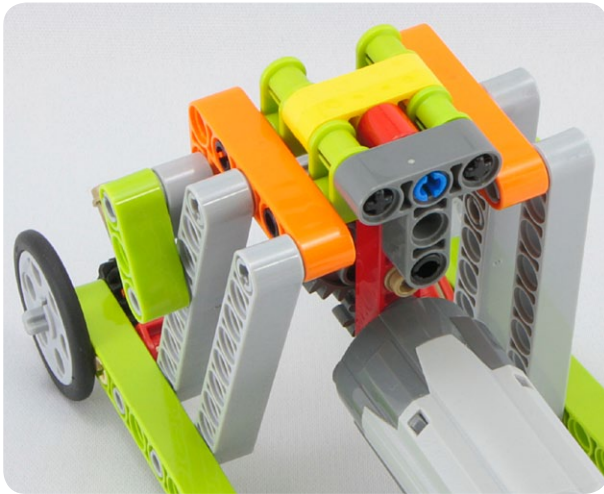
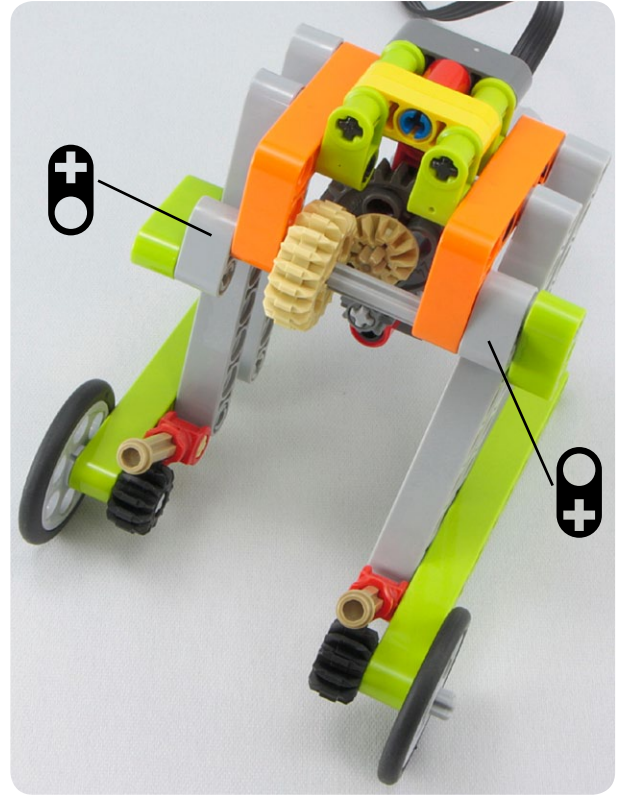
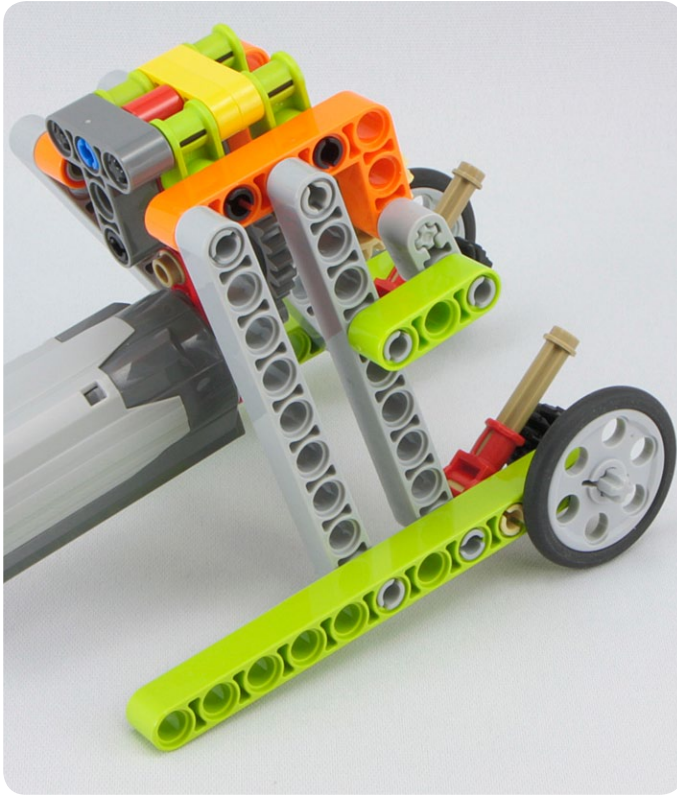




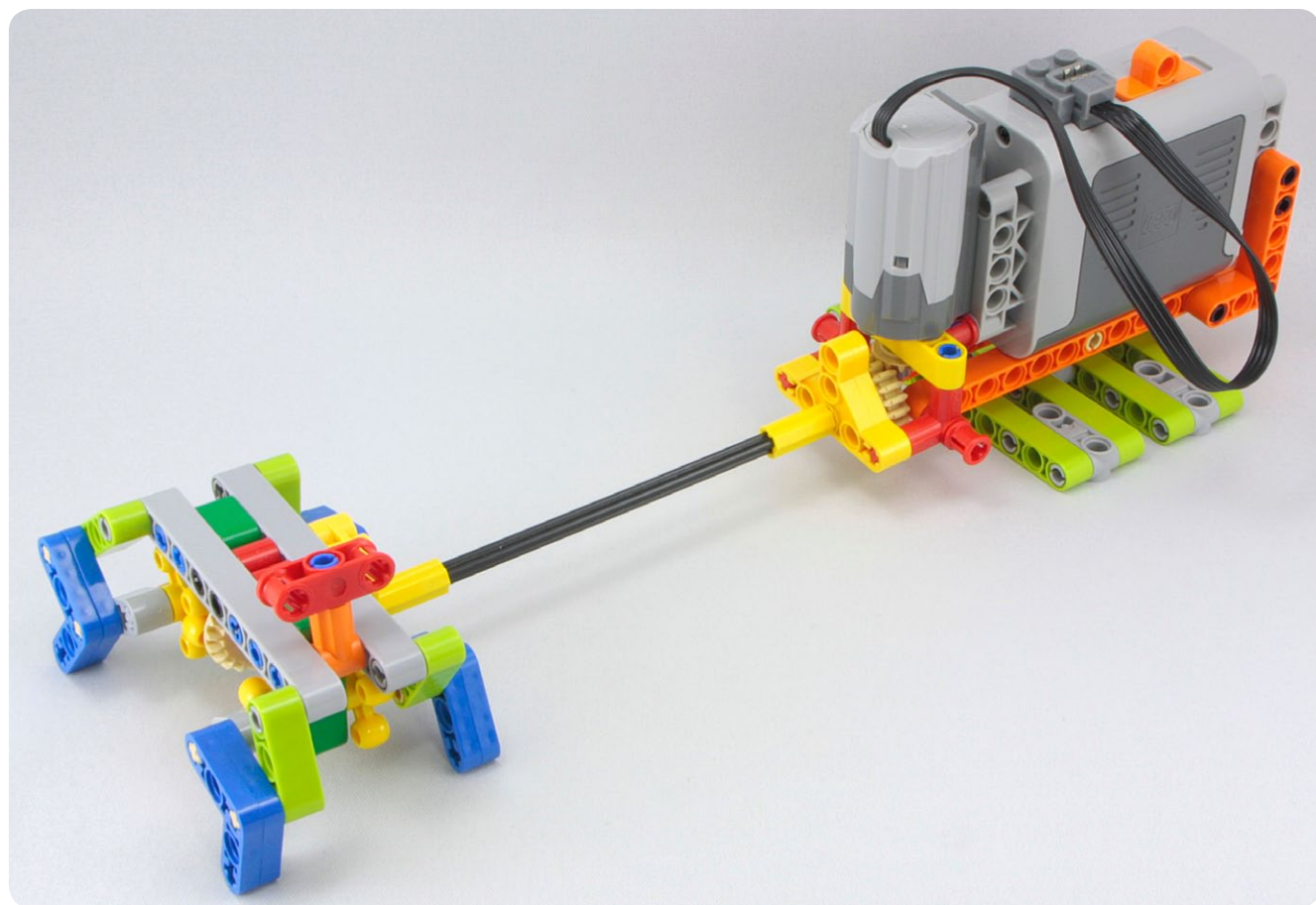
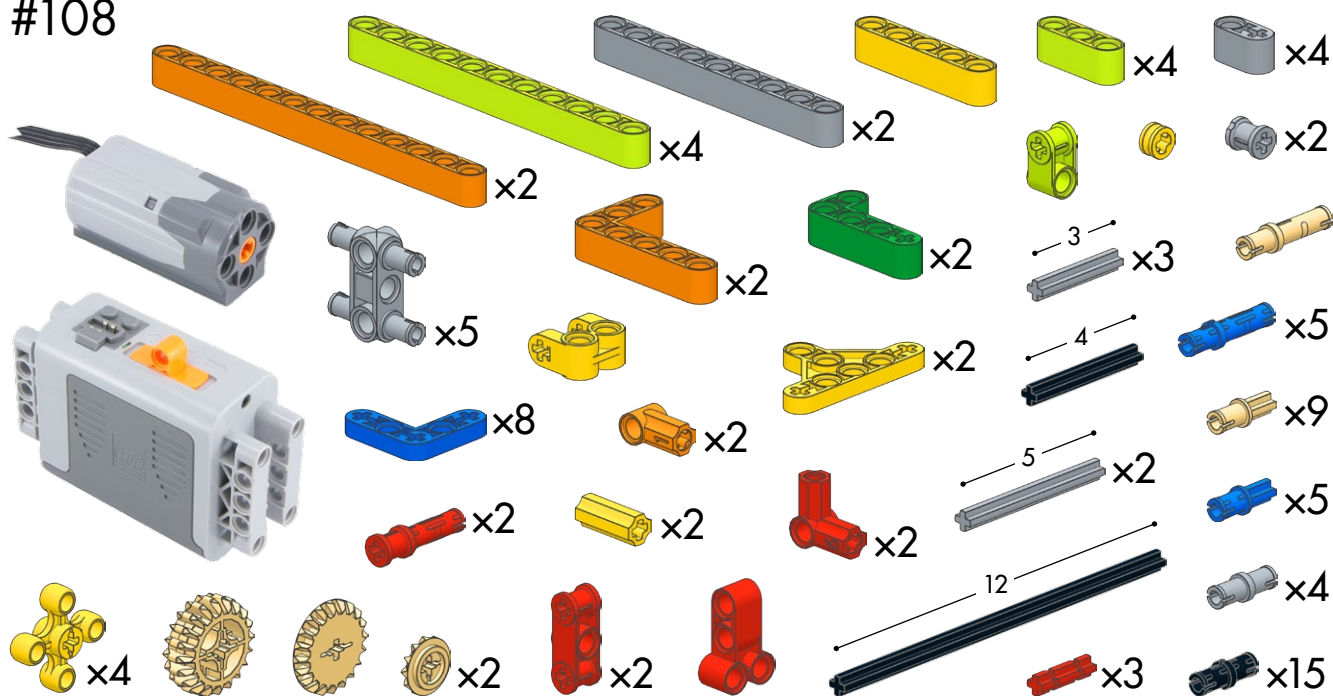
Cool walkers

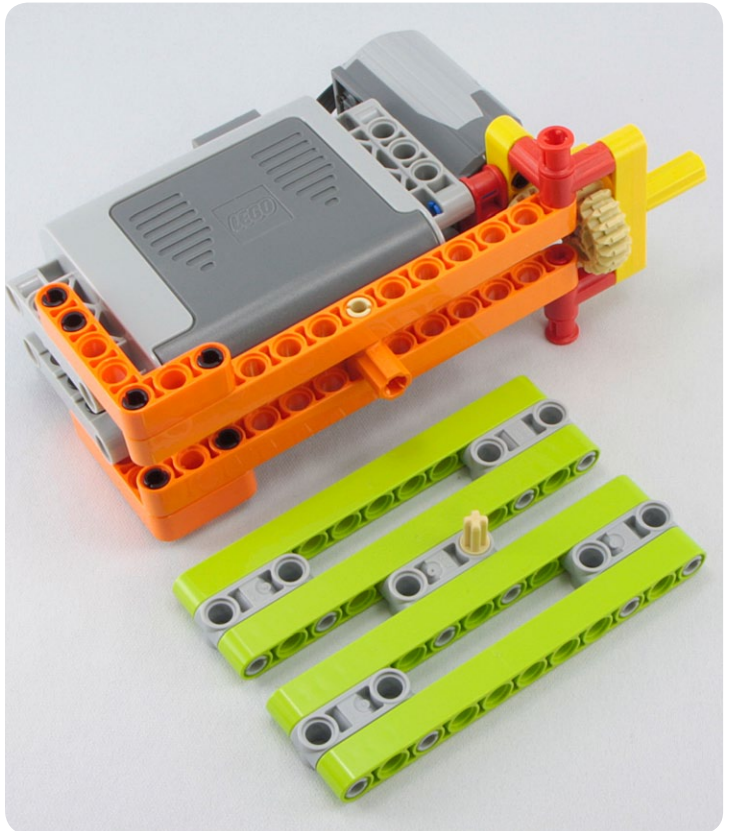
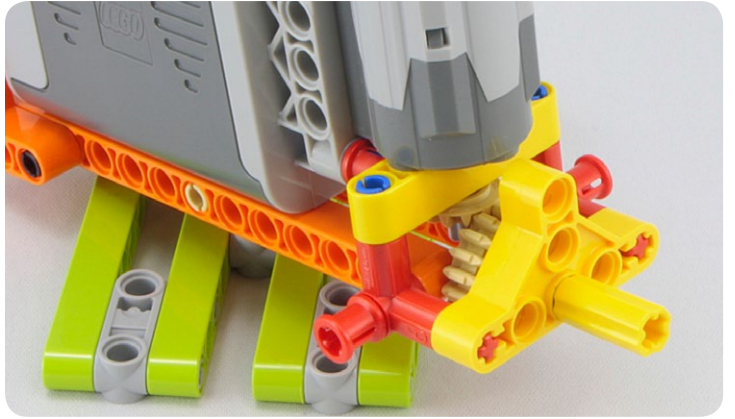
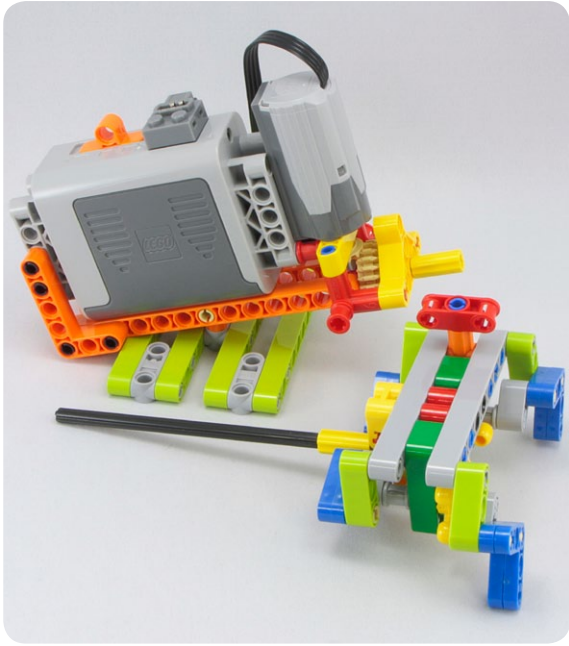
#107

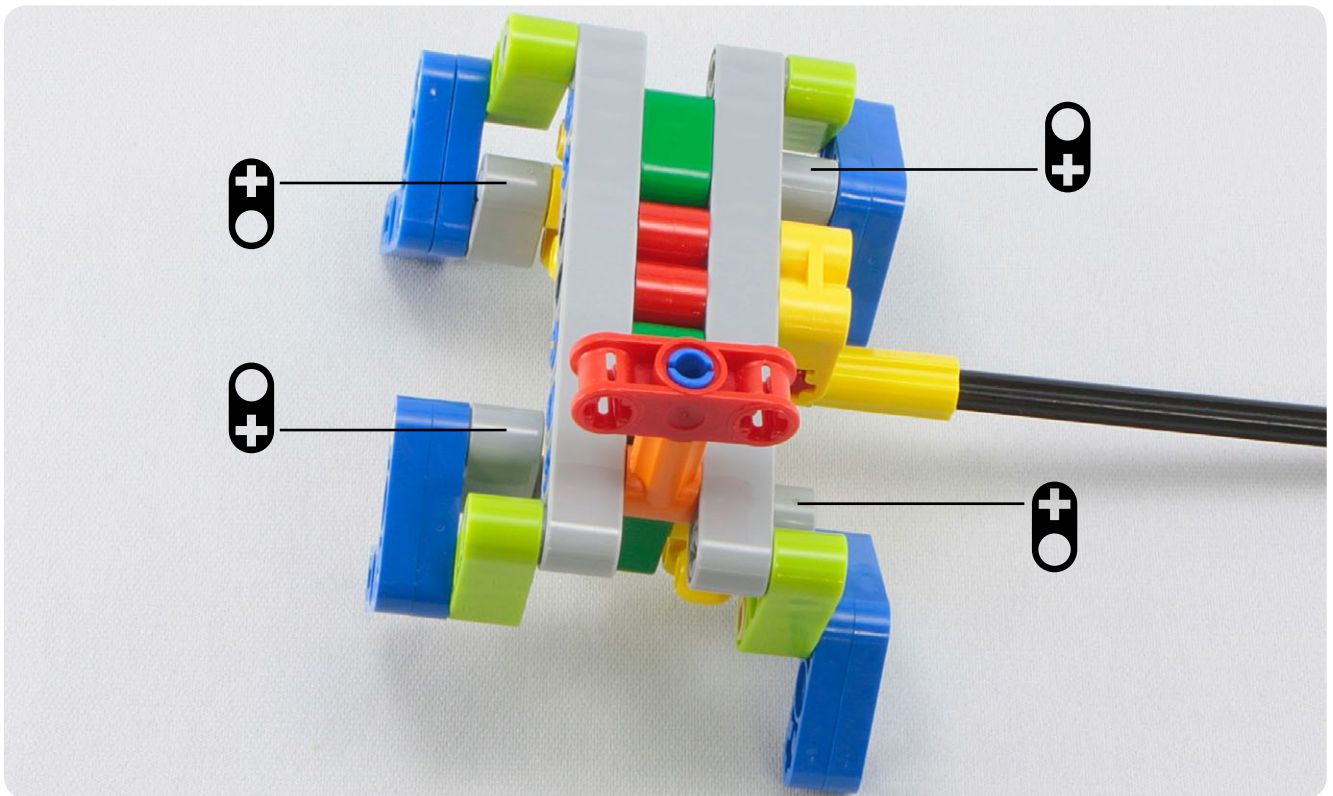
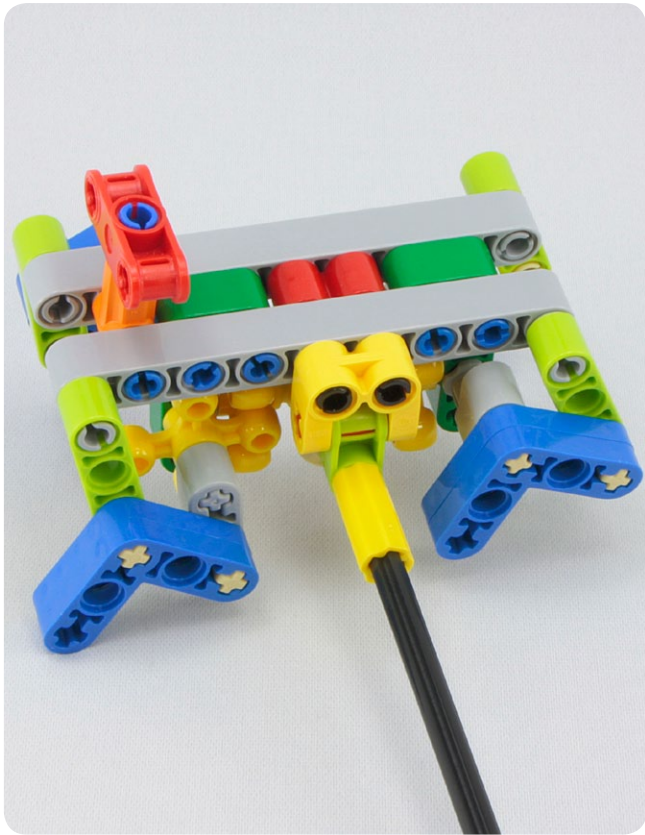


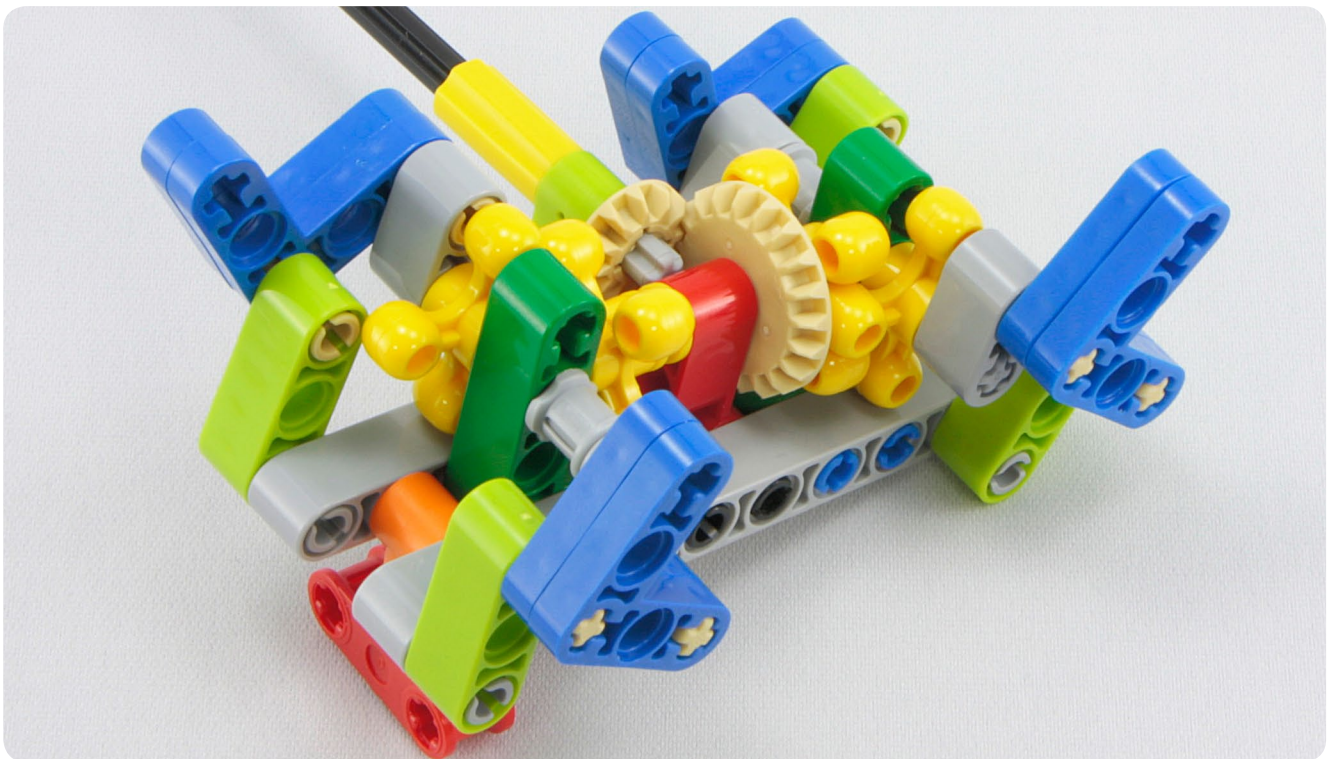
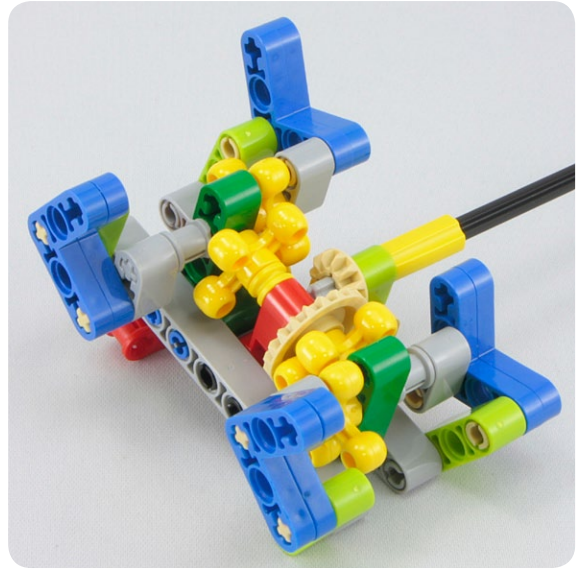
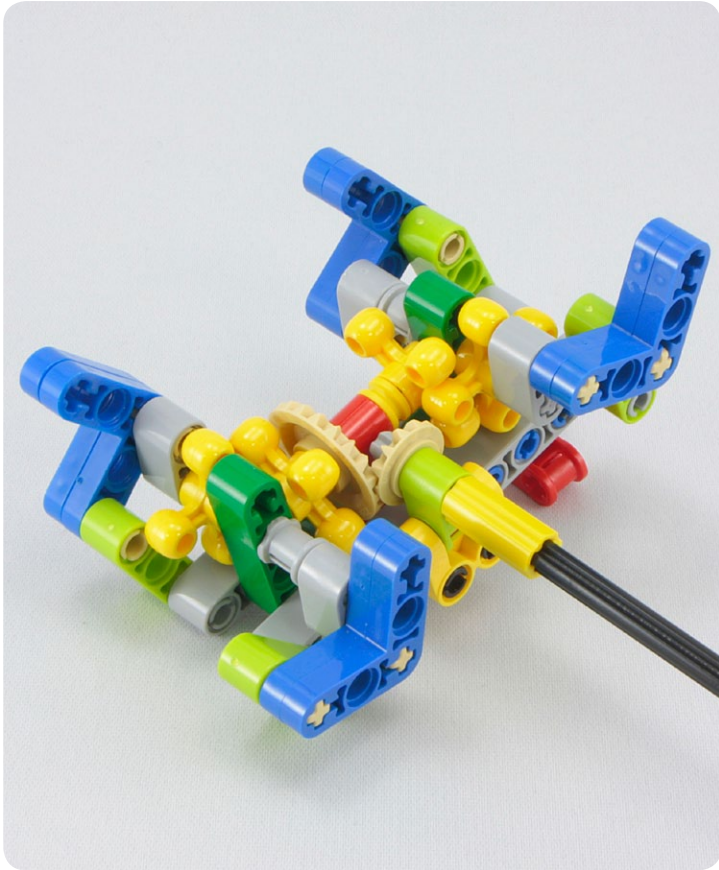


#108

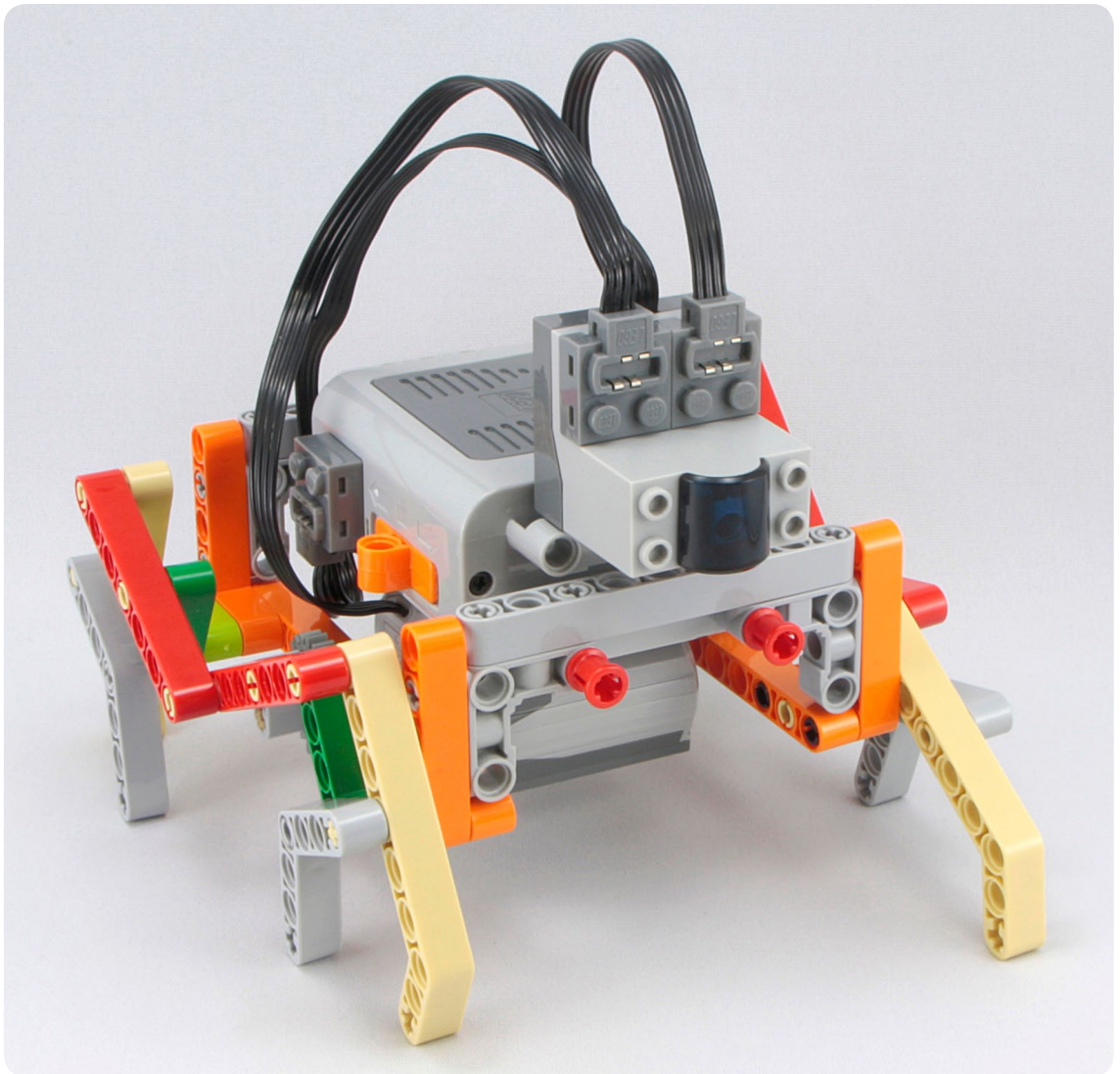
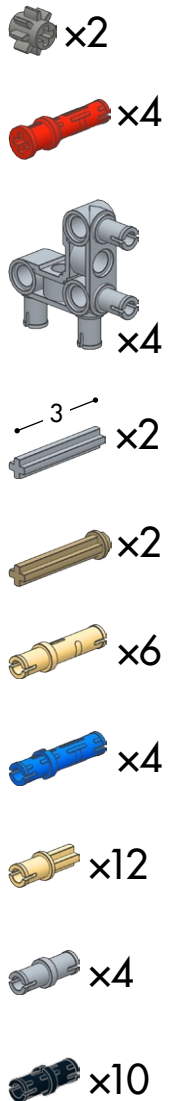


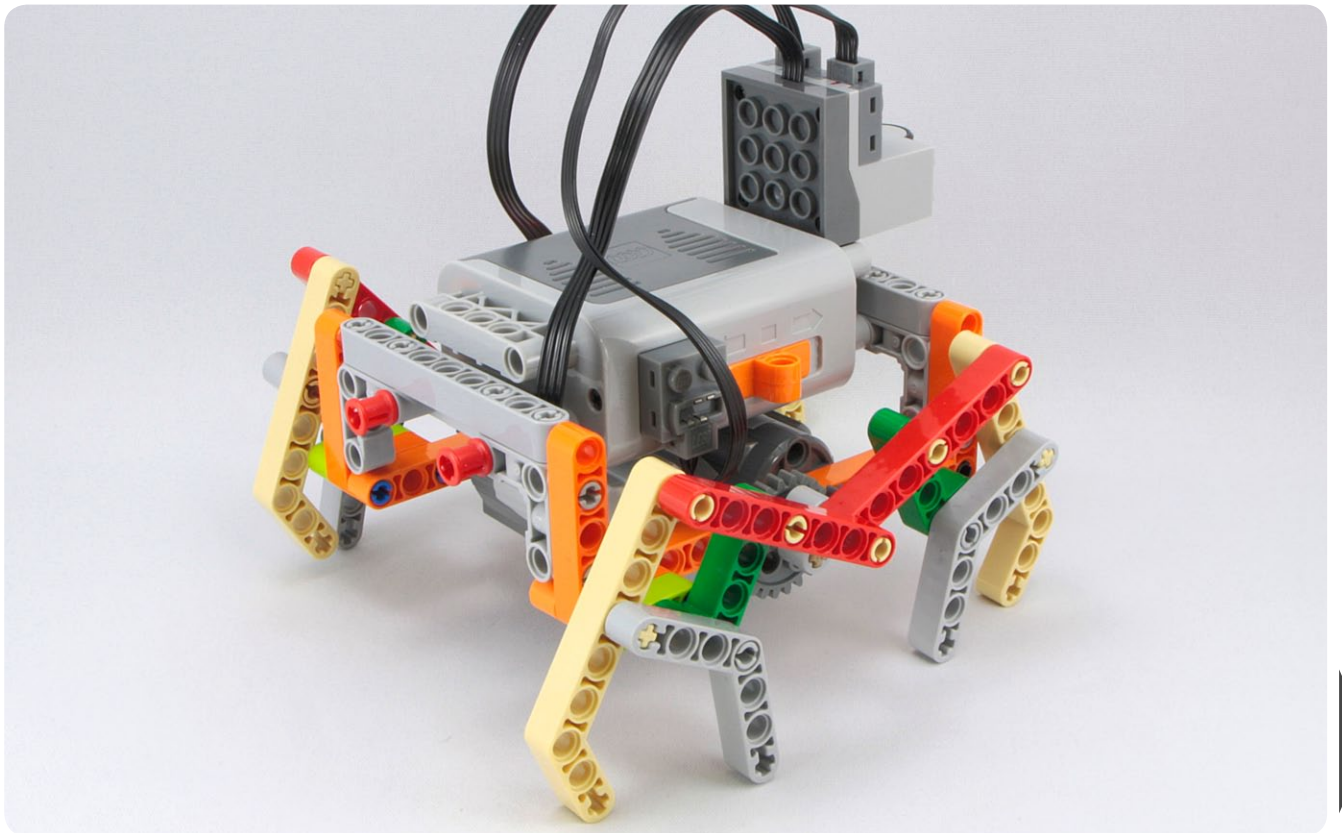
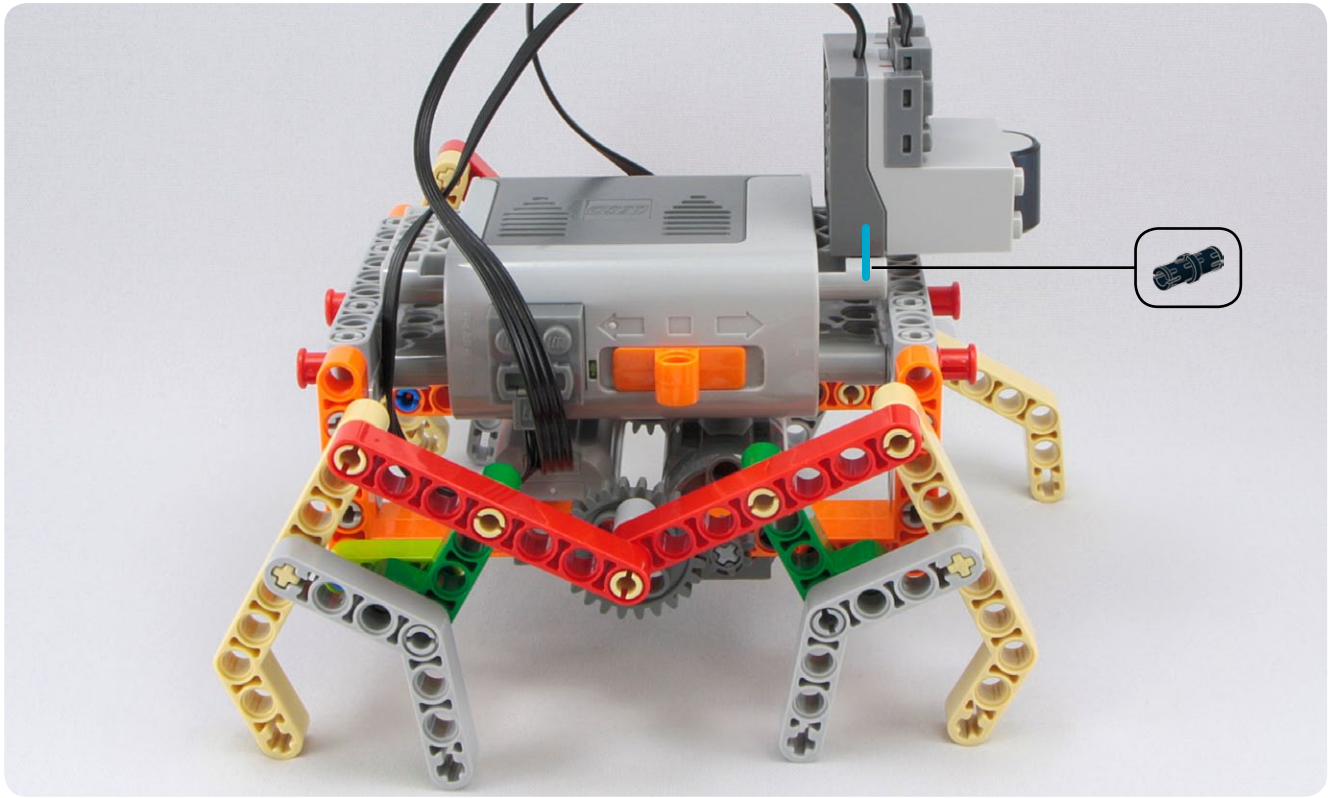


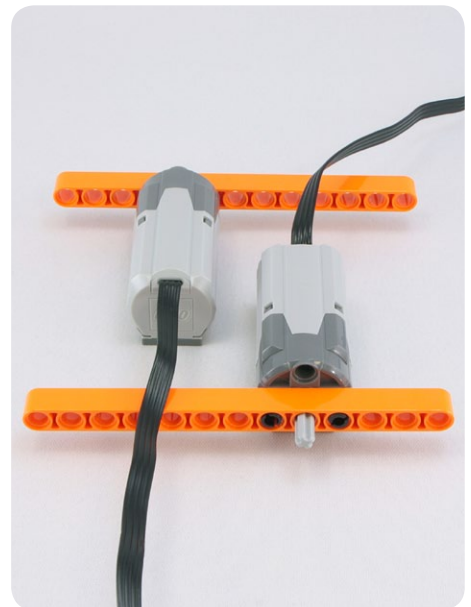
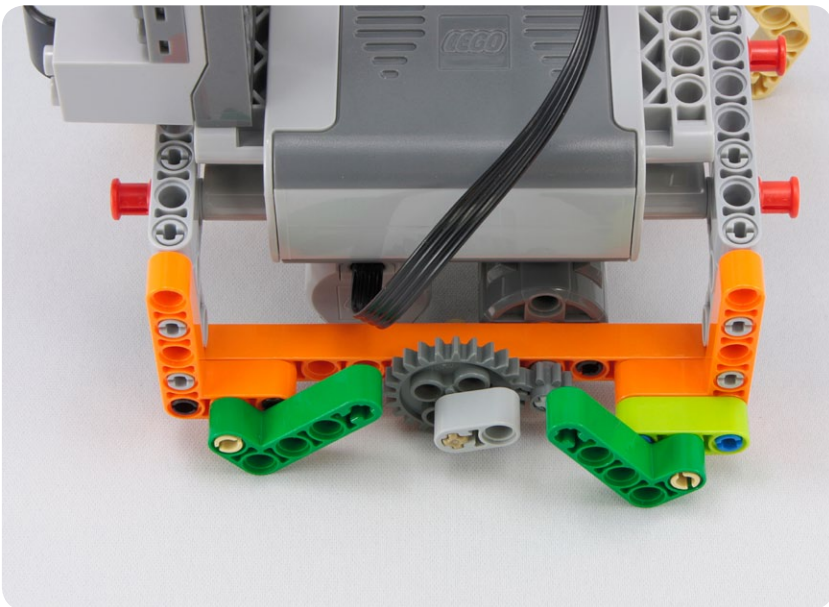
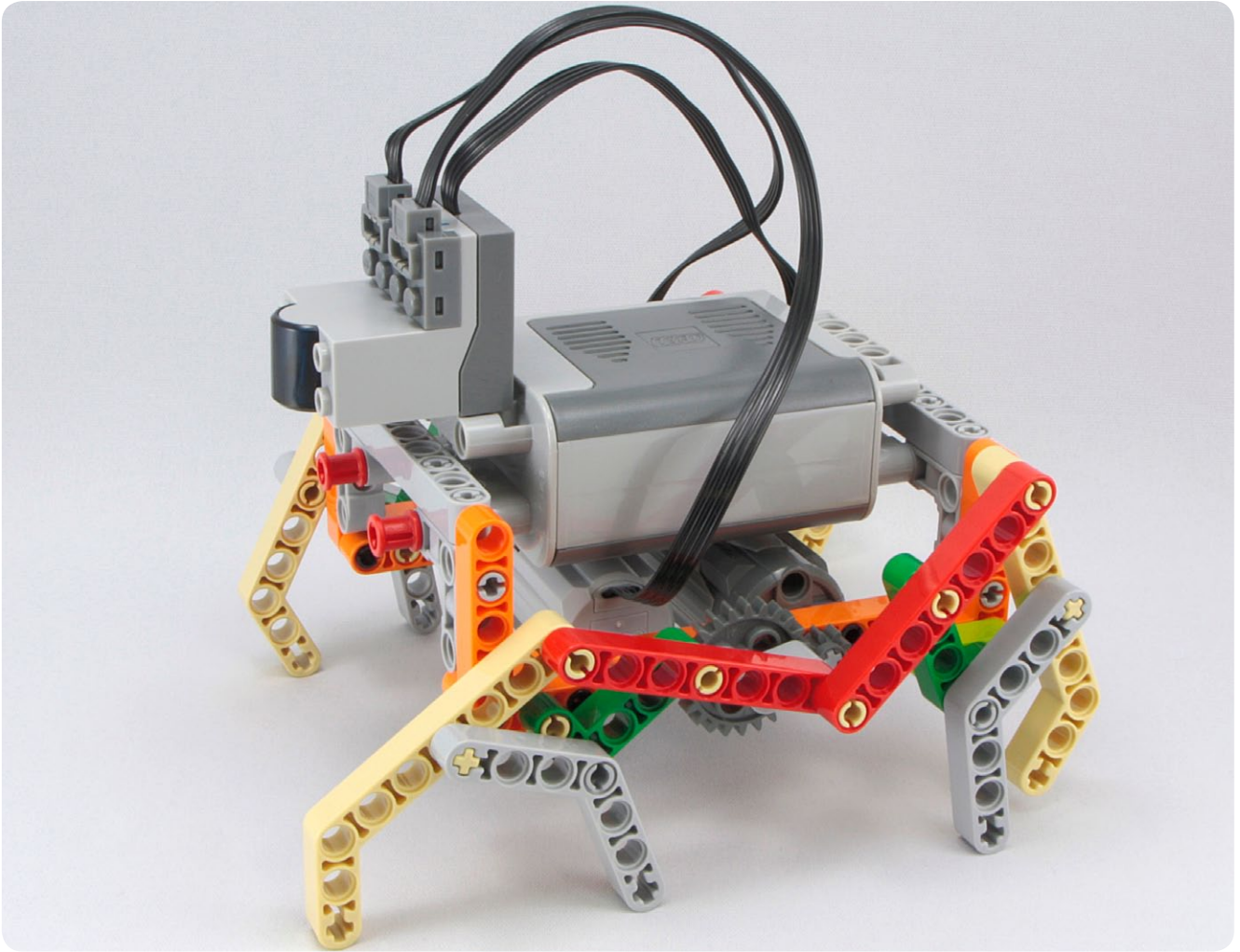


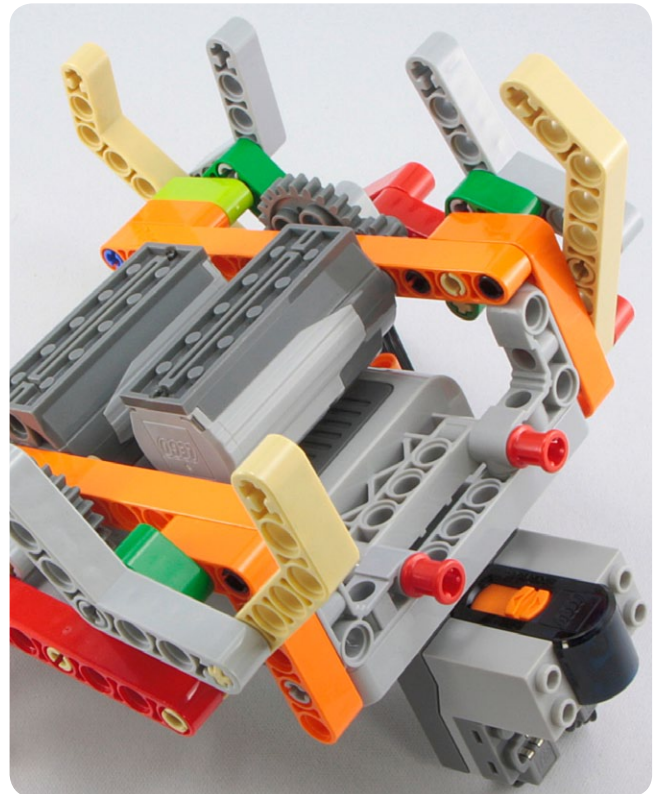
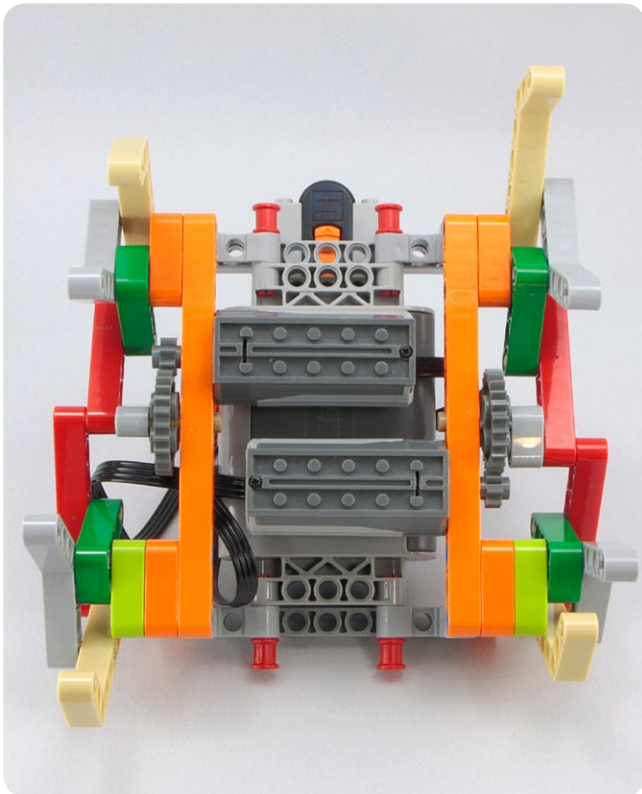
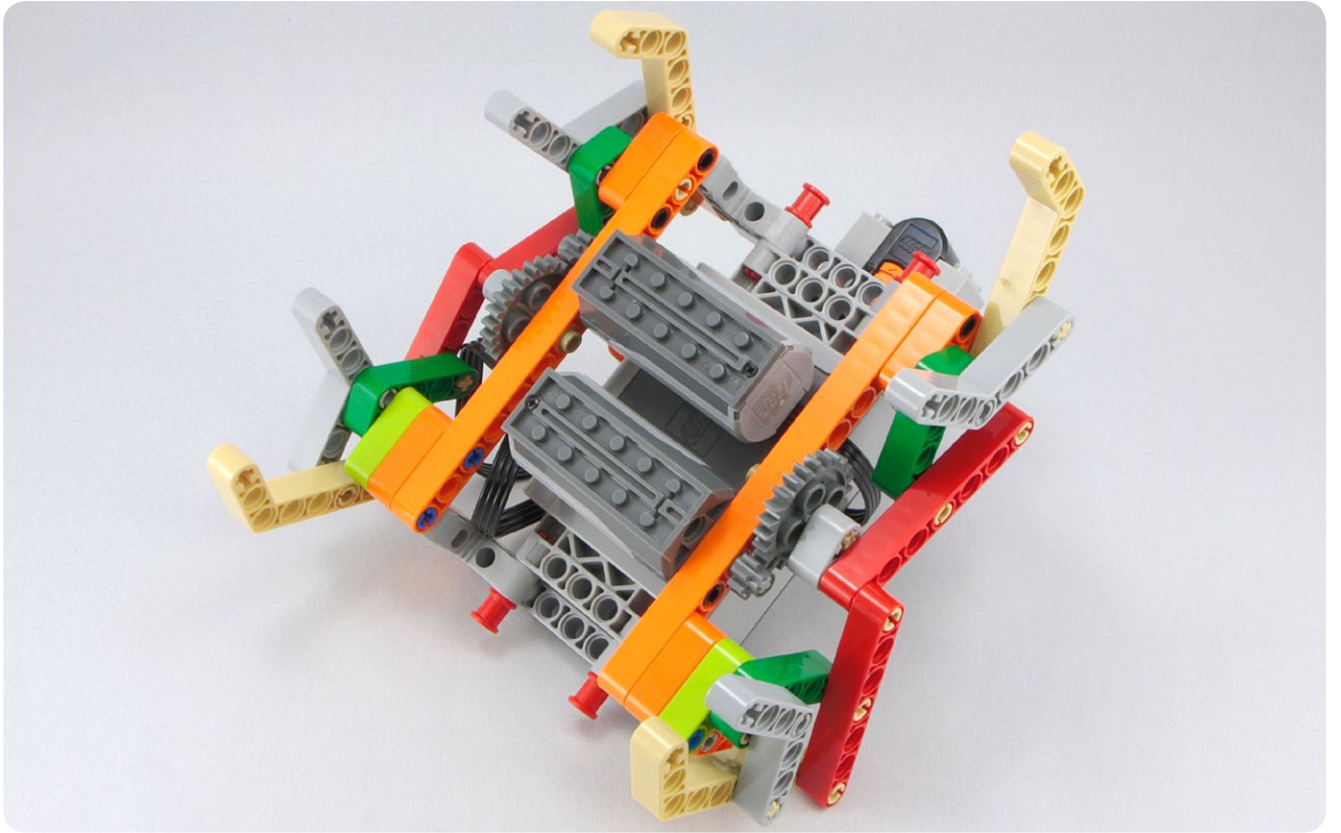


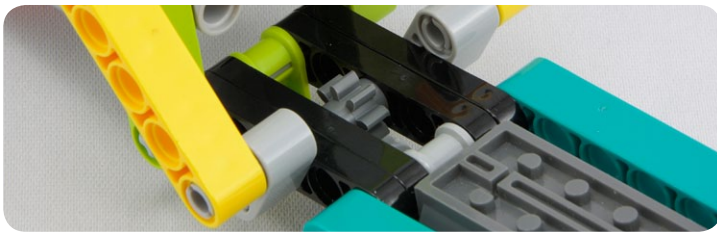
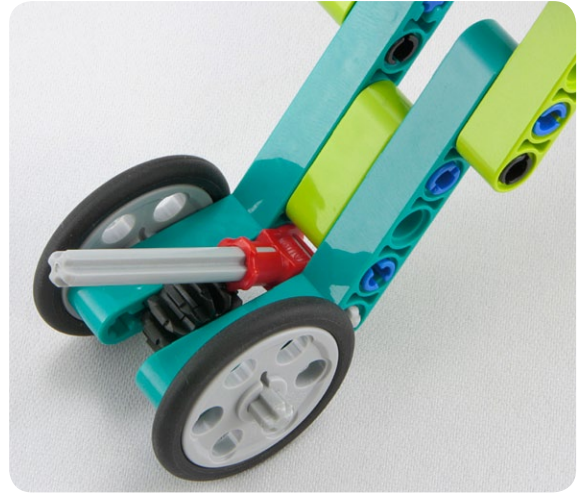
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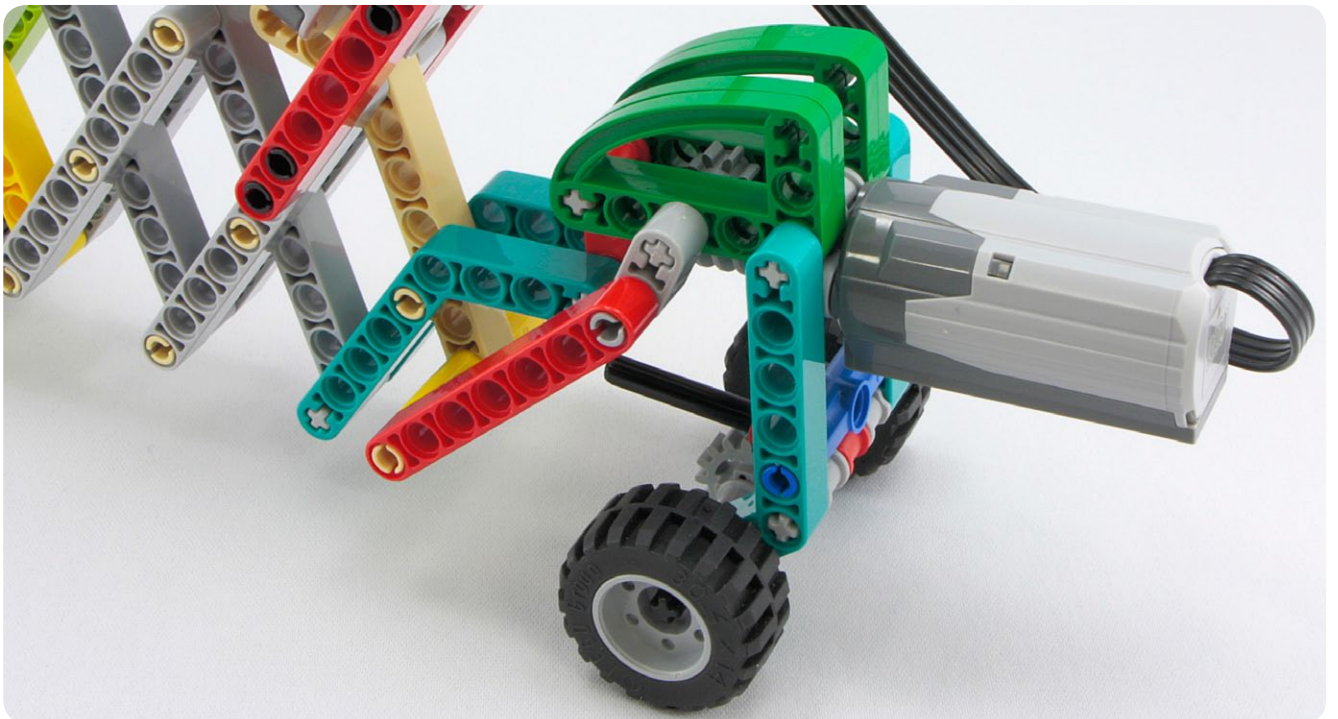
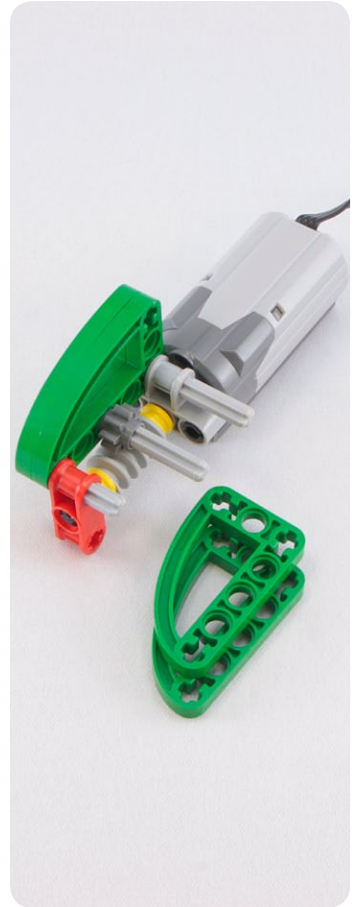


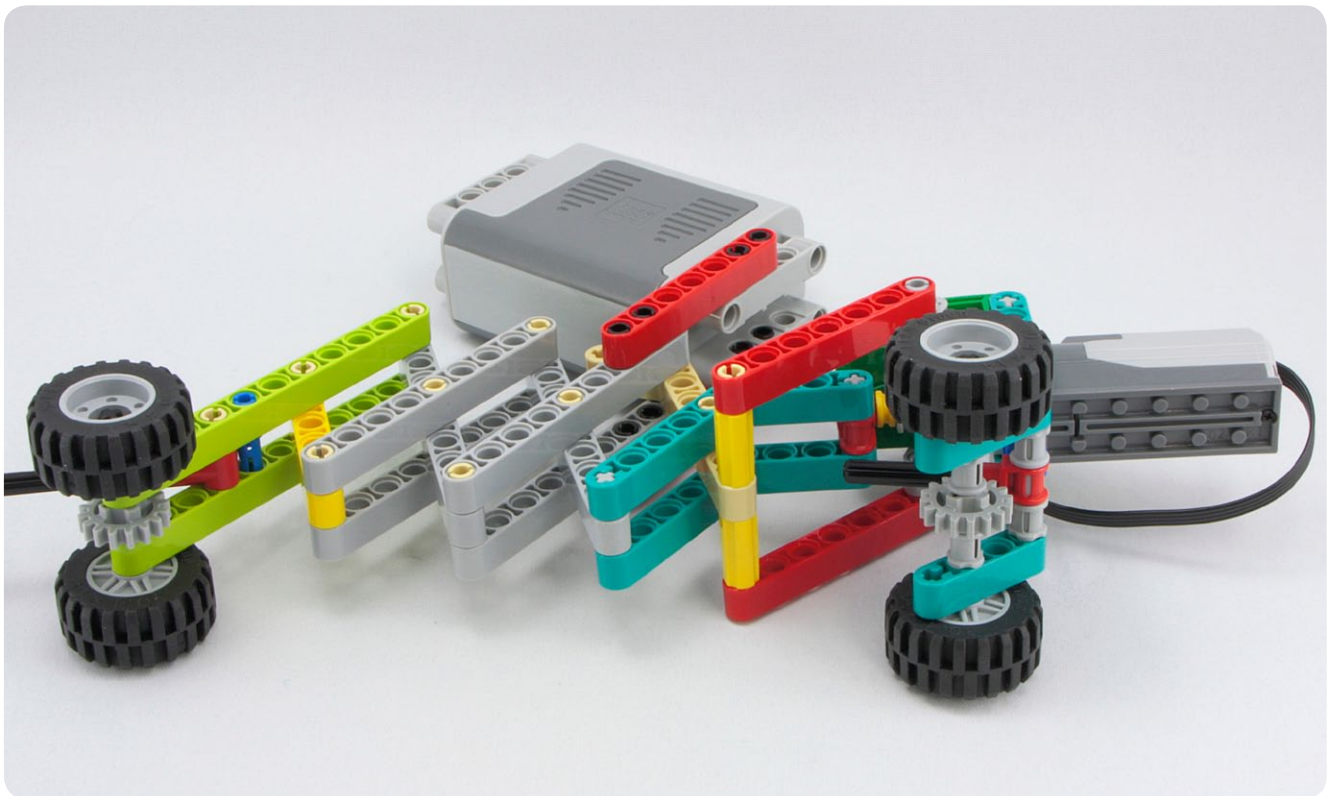
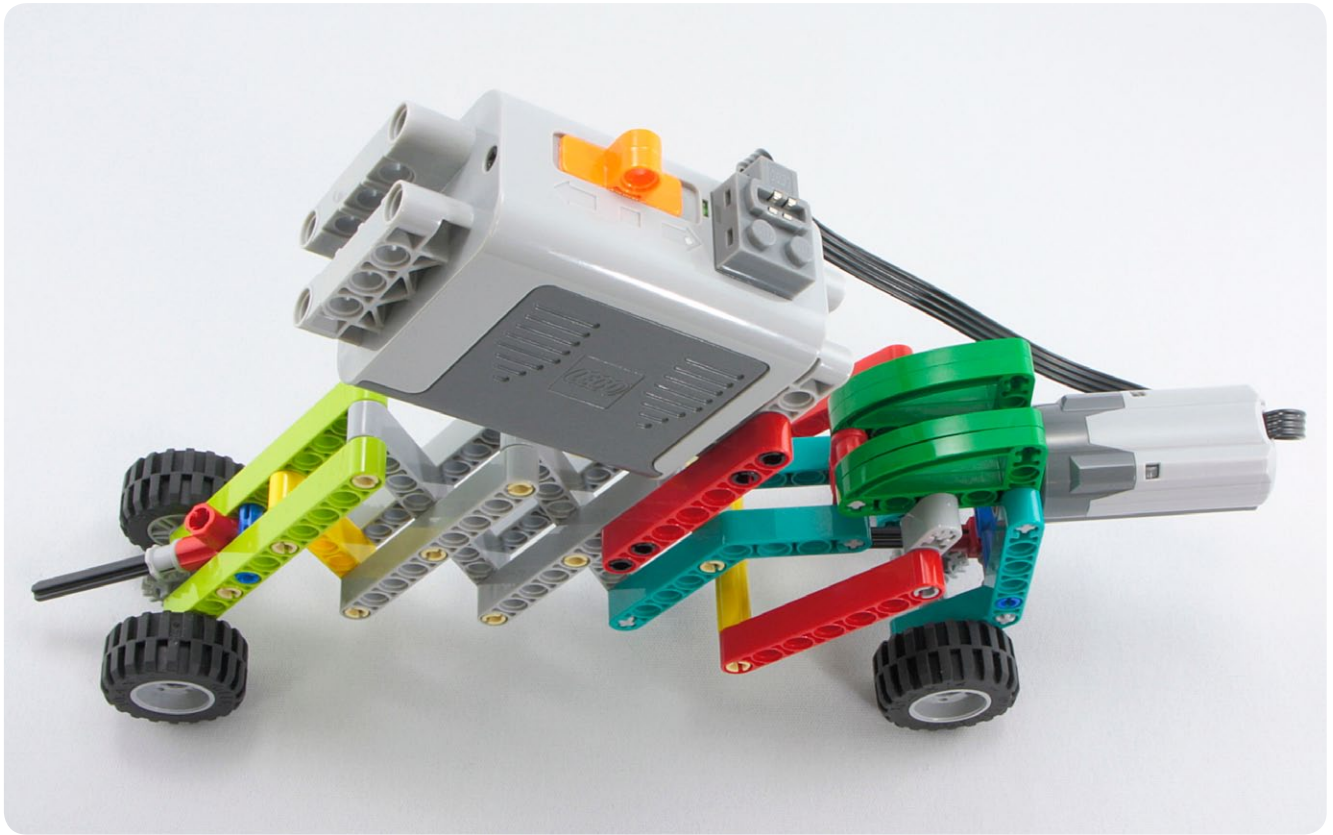


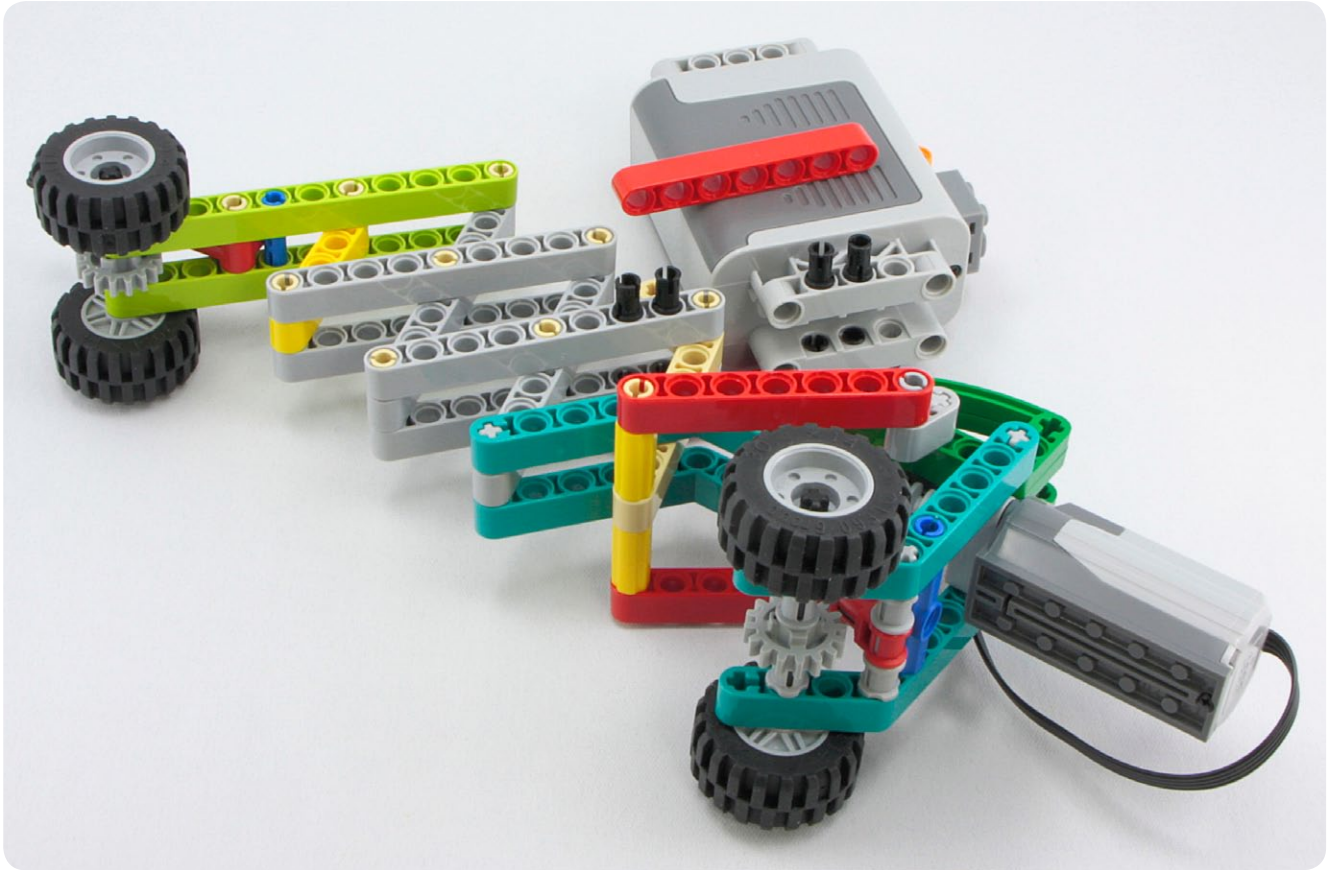


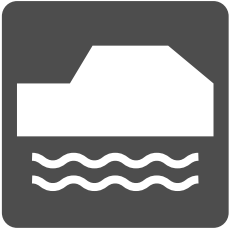






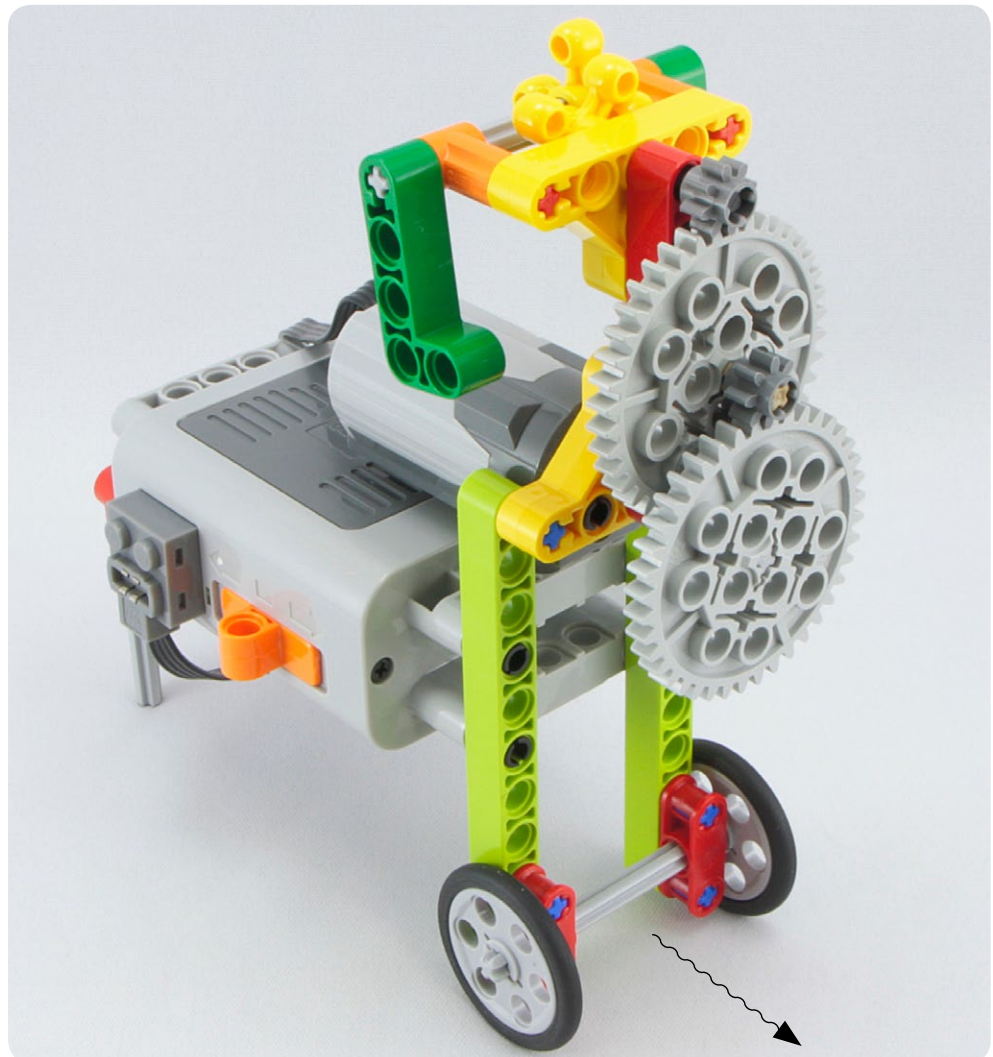
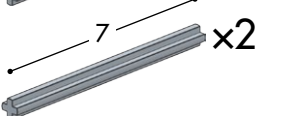
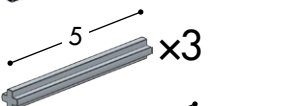
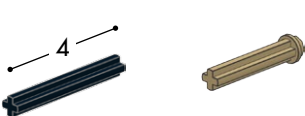
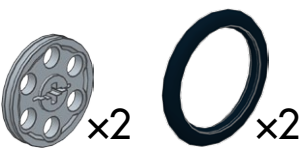
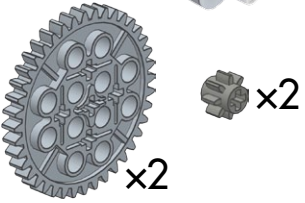
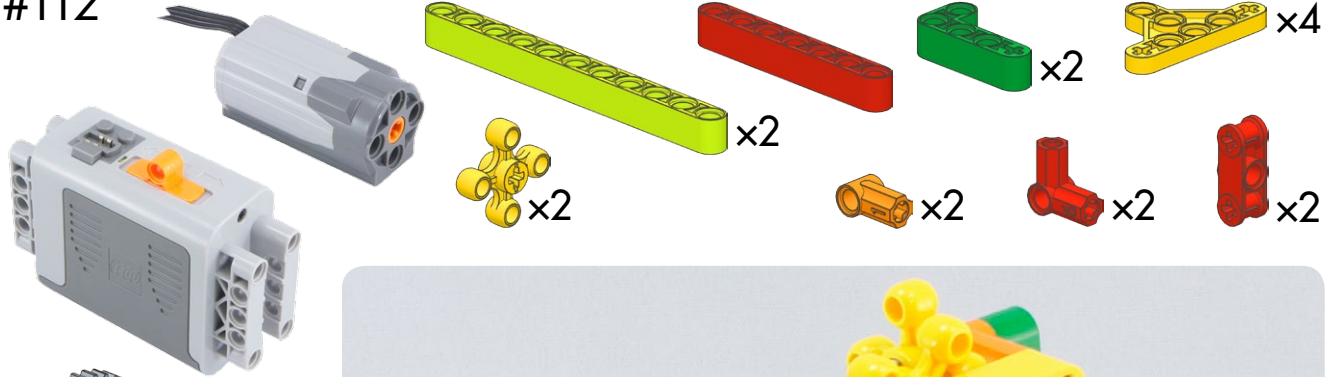


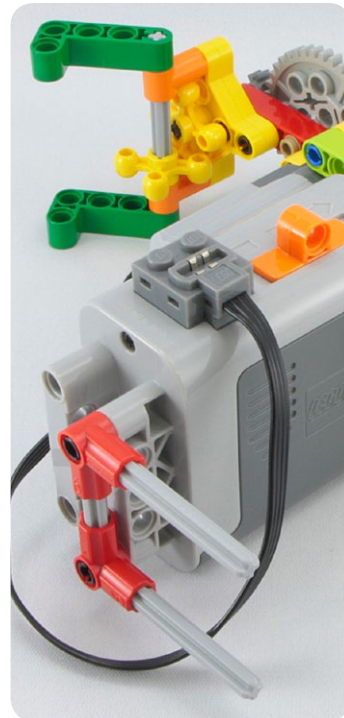
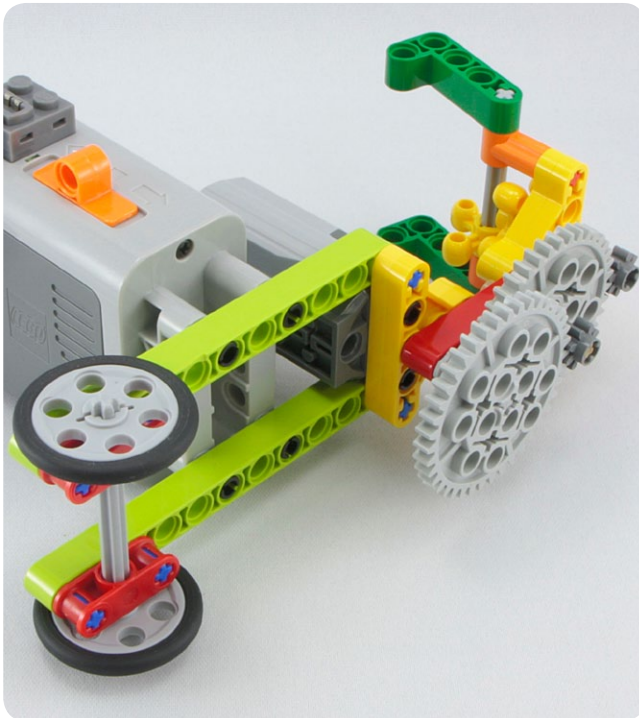
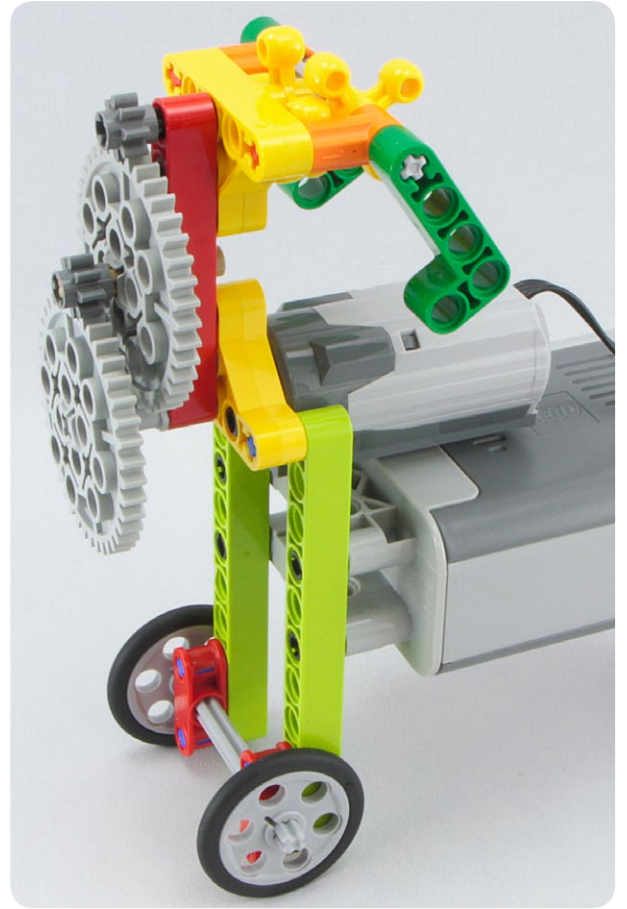




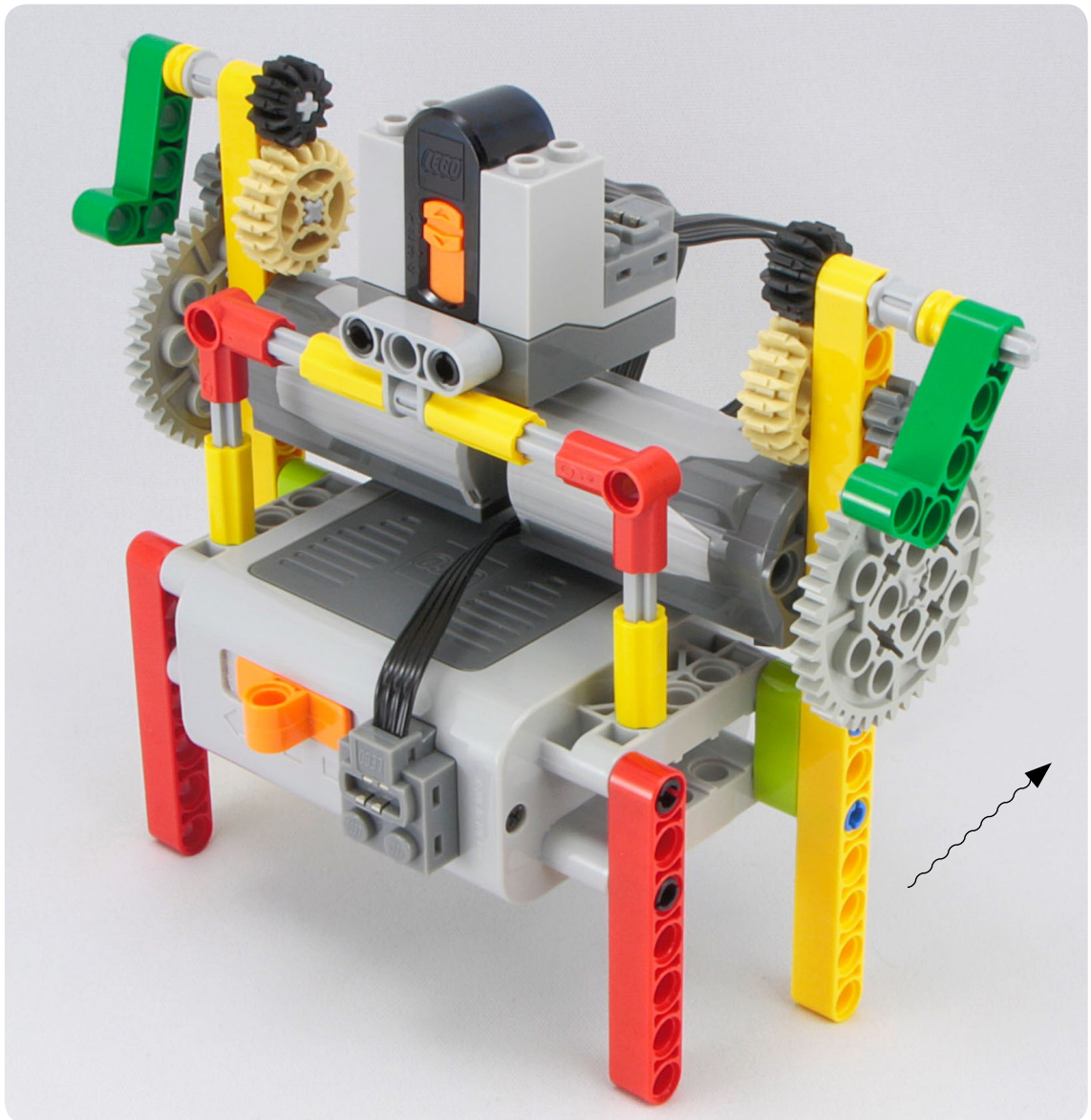
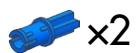
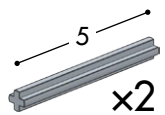
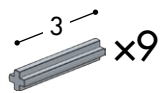
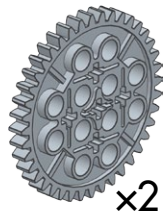
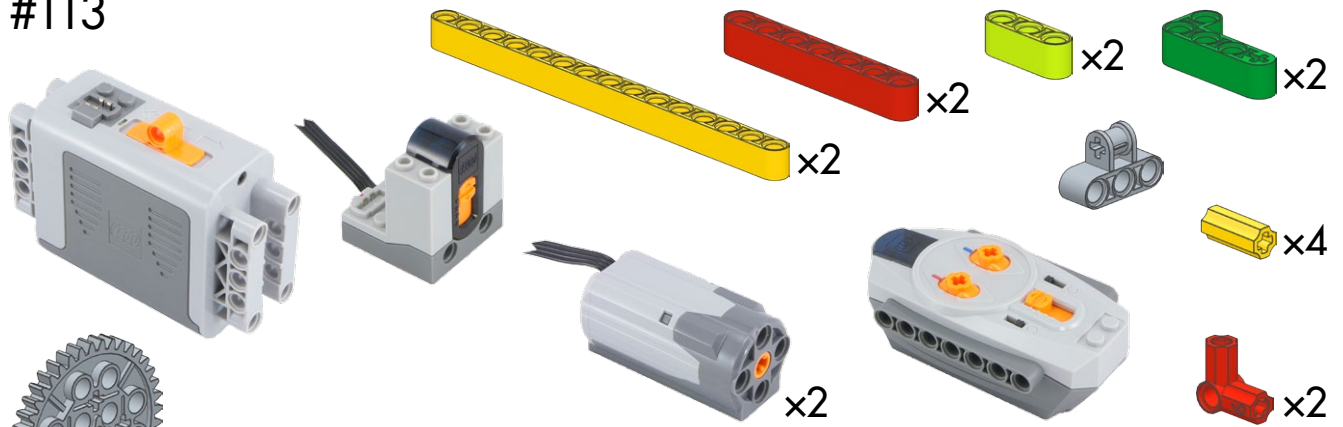
Moving through vibration

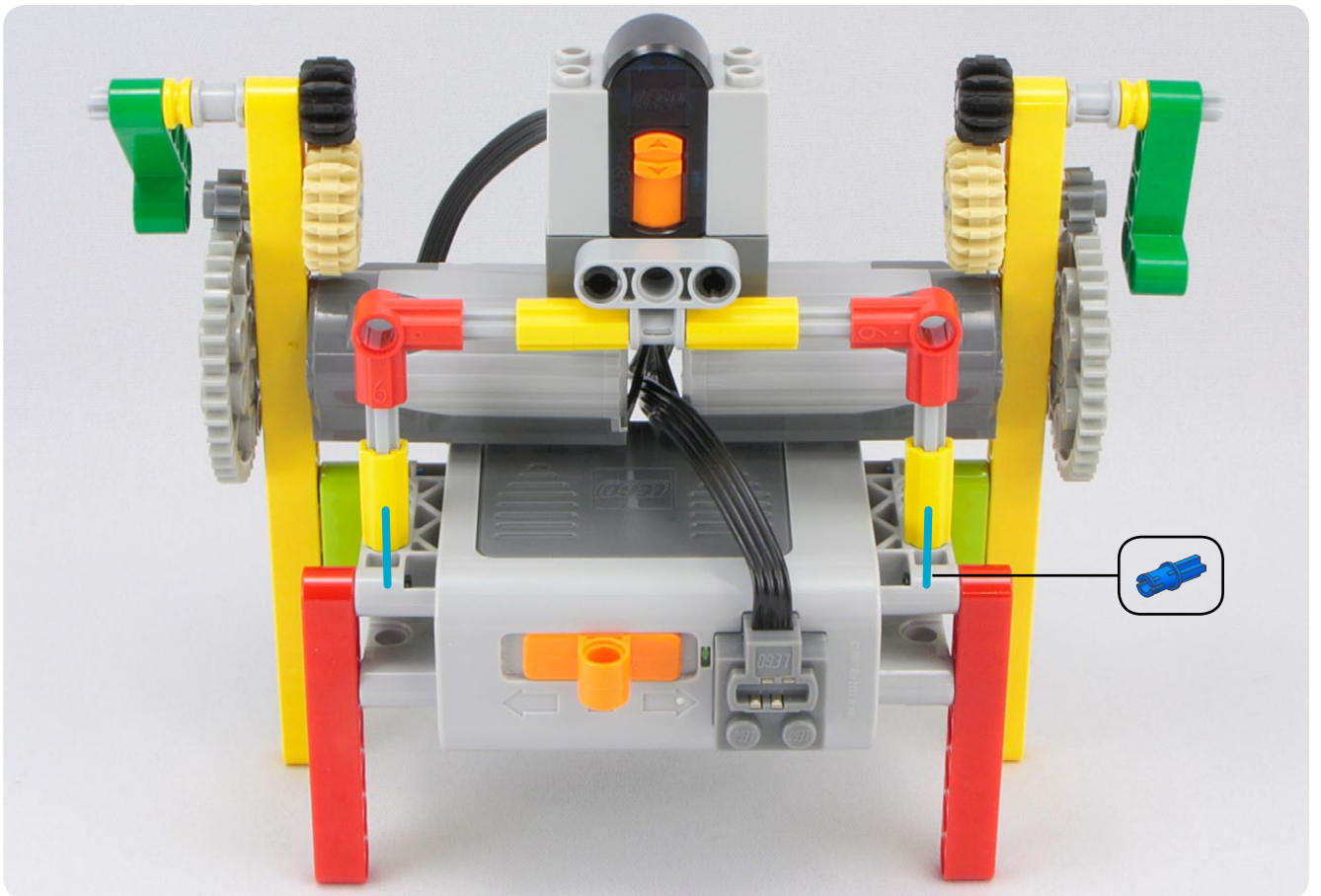
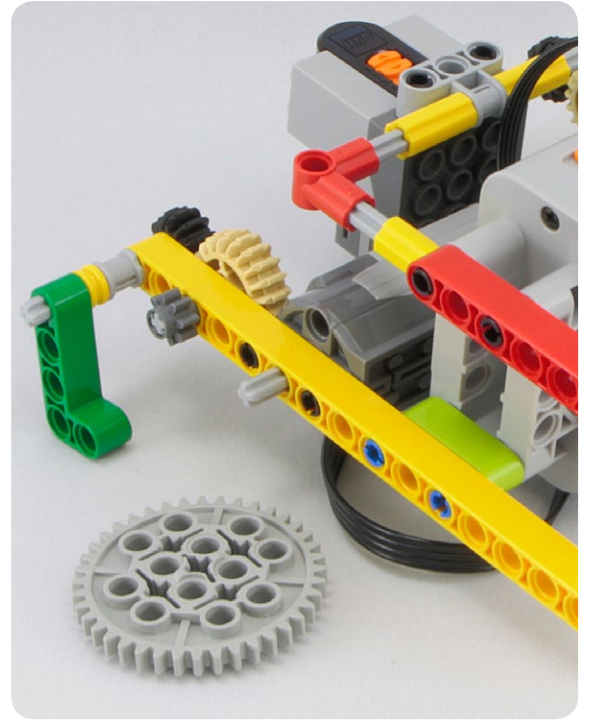
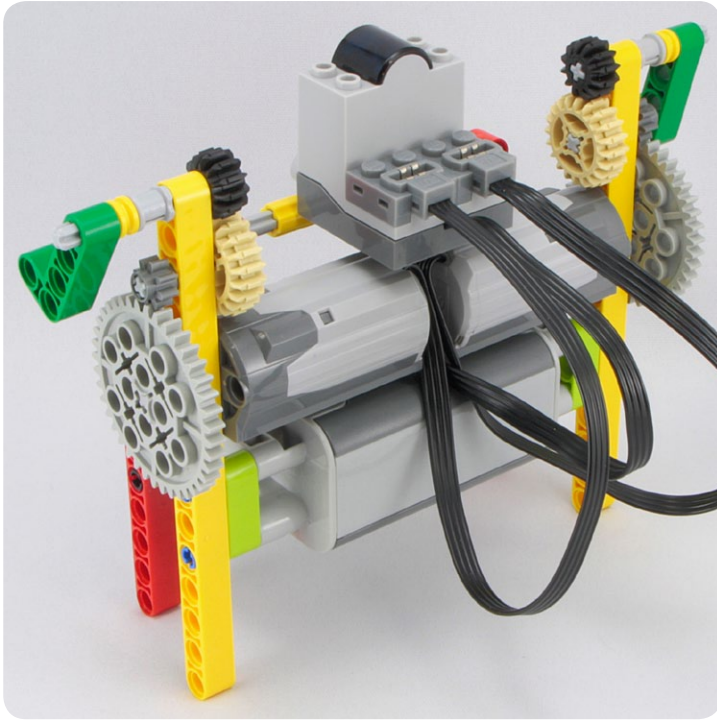
#112





#113

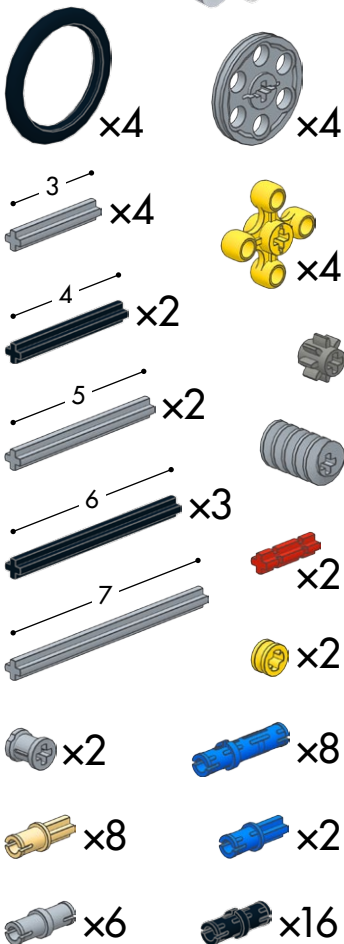
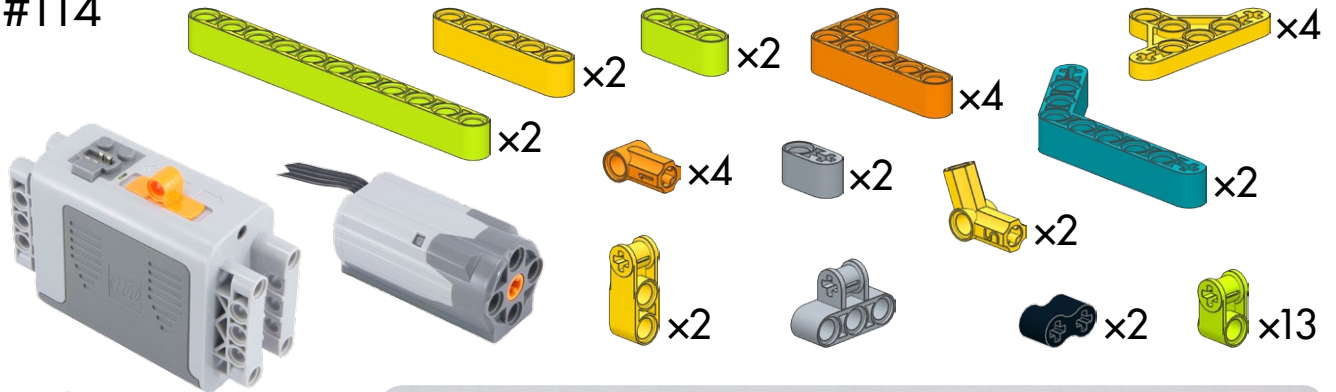


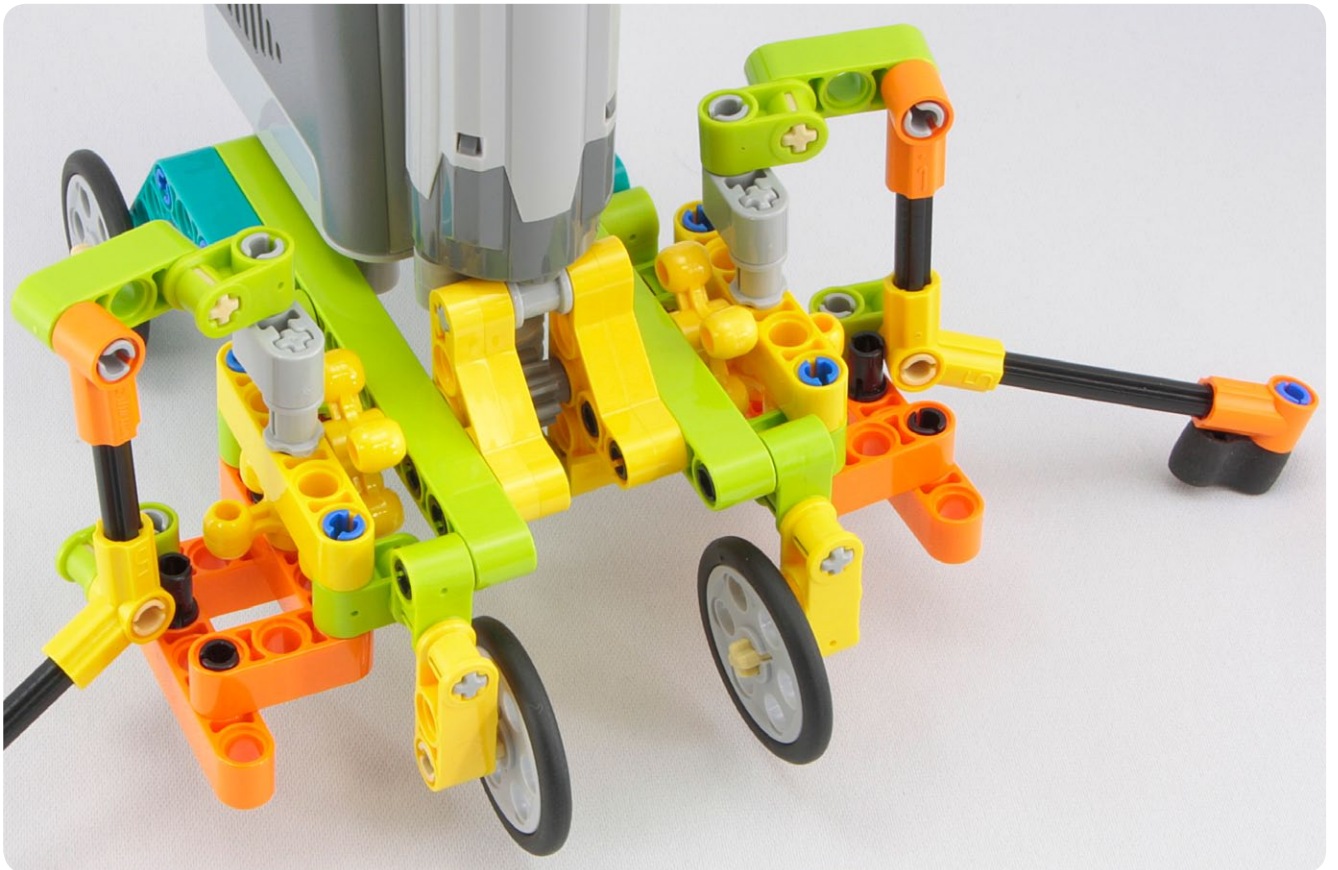


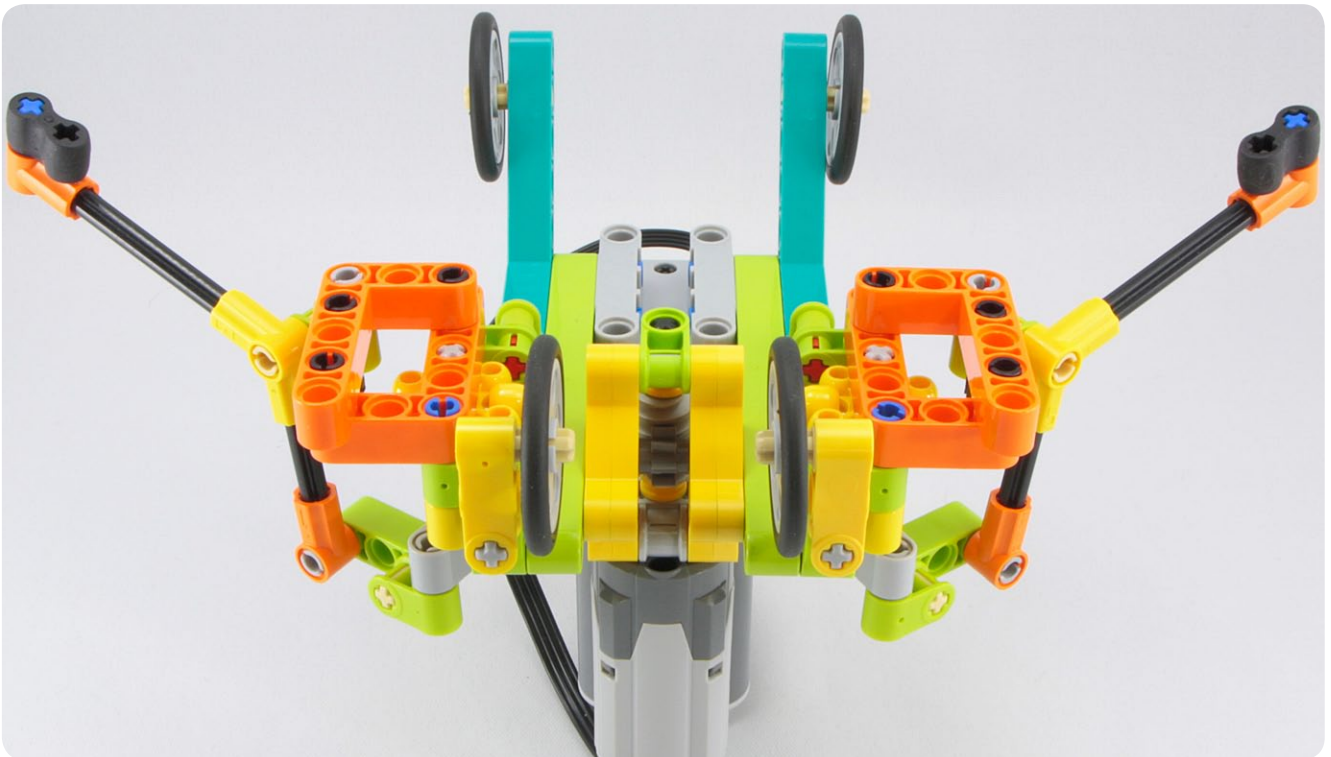
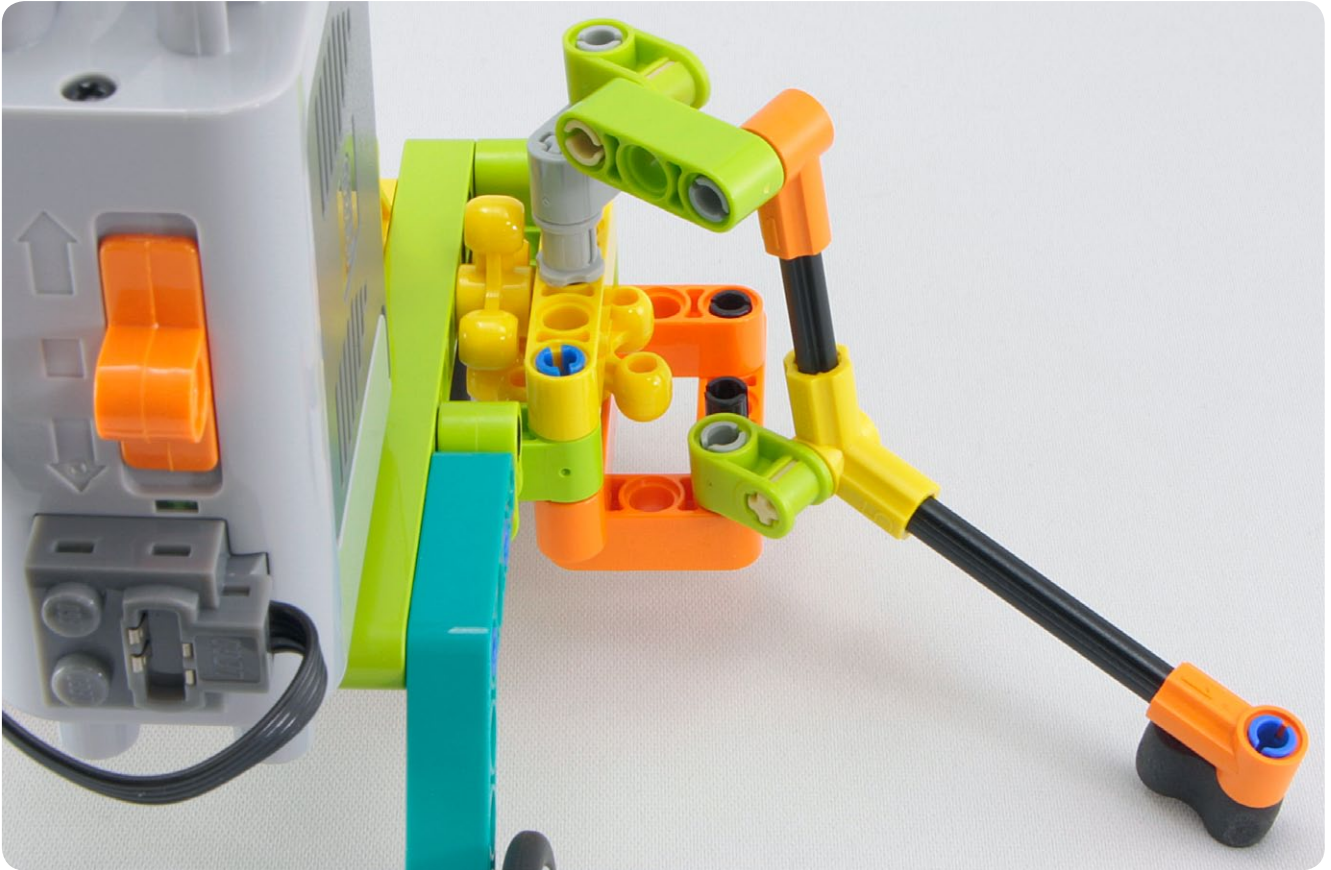


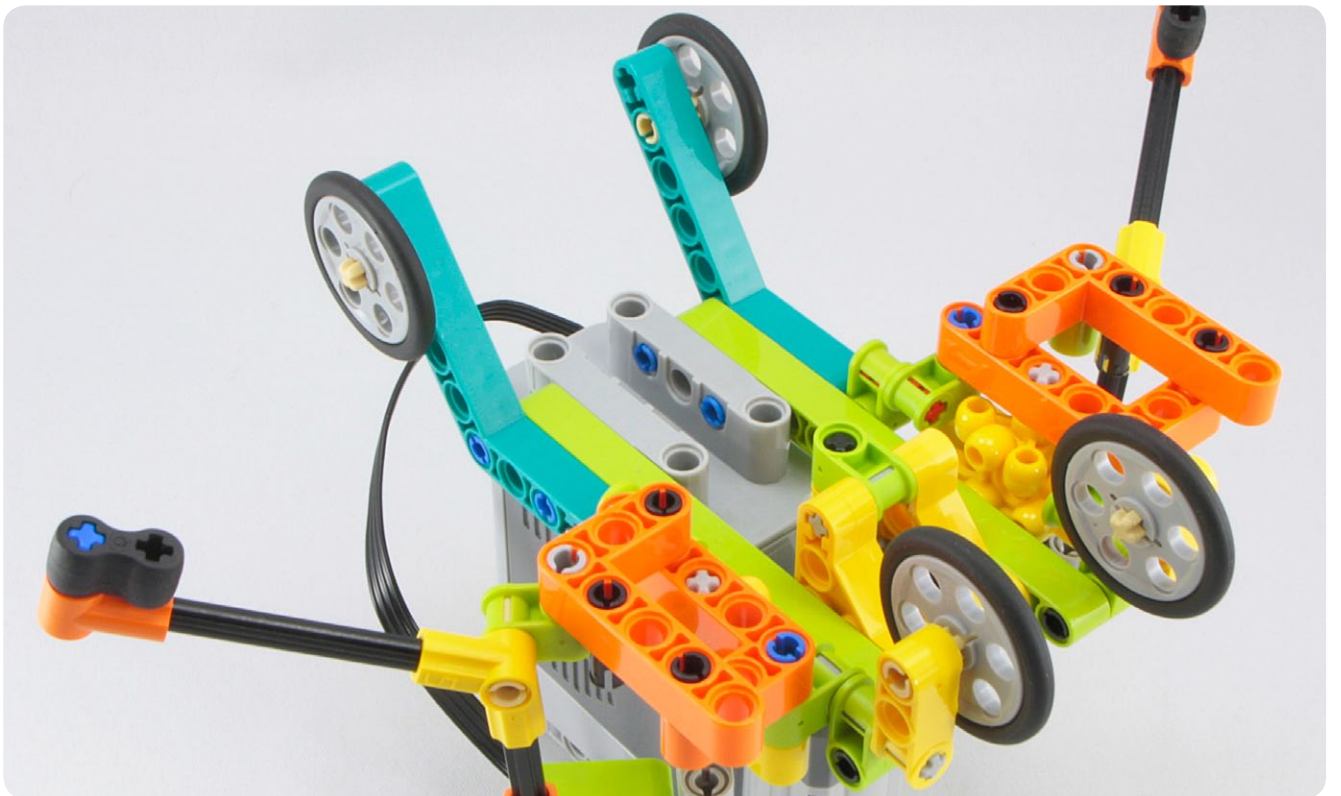
Moving in other ways

#114











PART 3

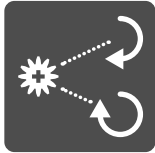
Special Mechanisms



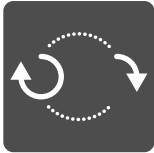
250



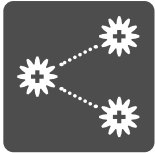
264



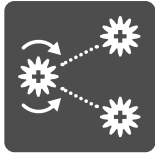
288



256



272

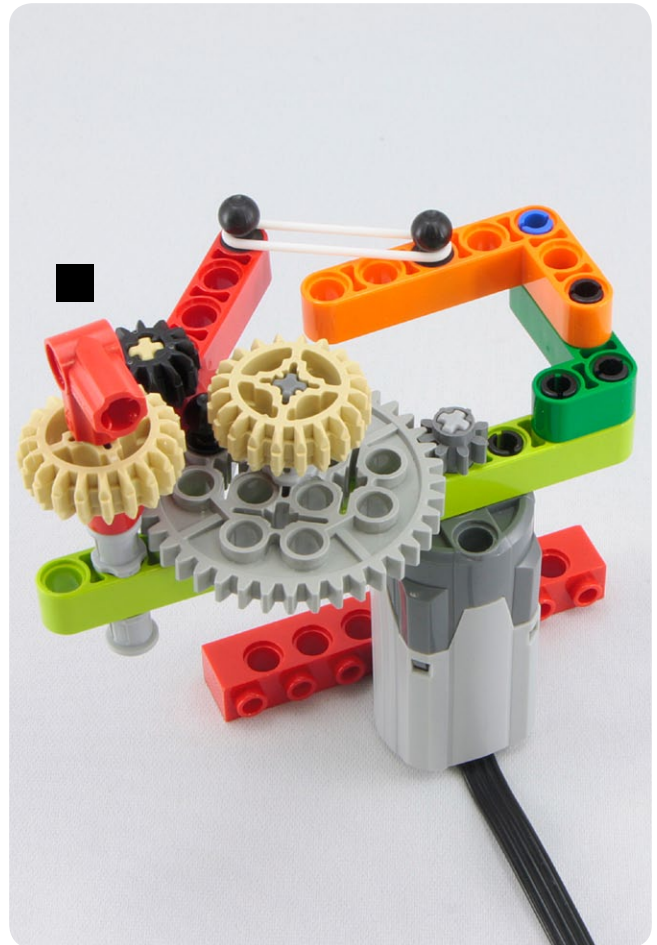
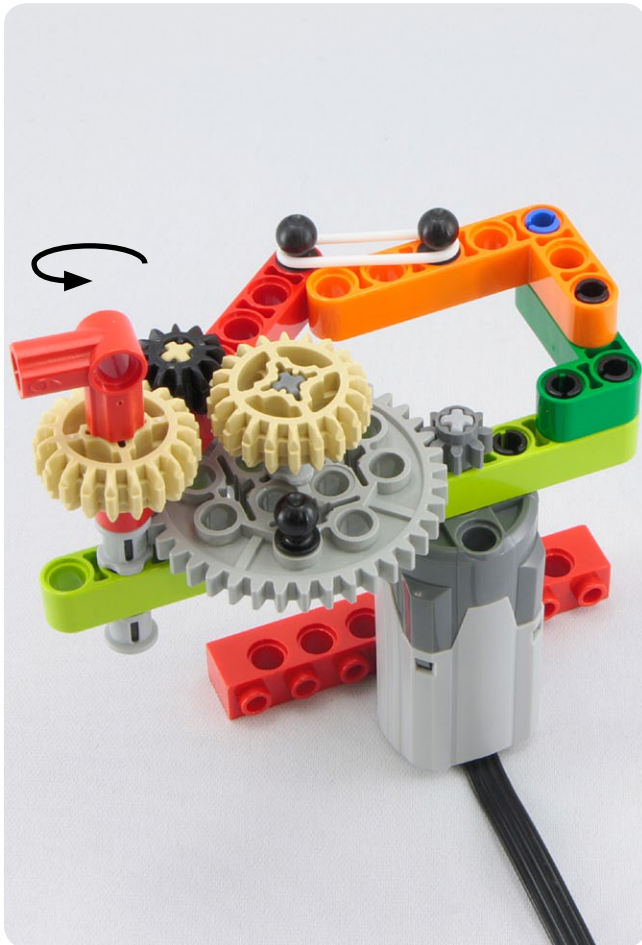
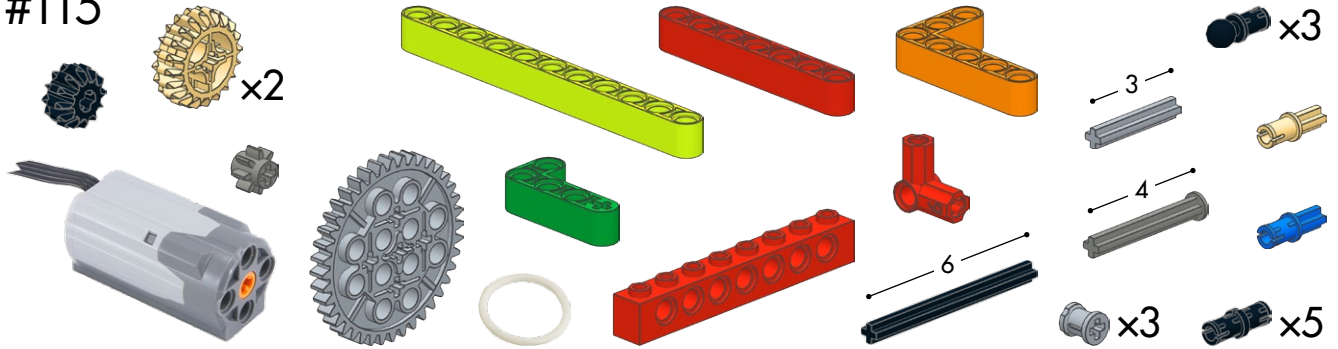


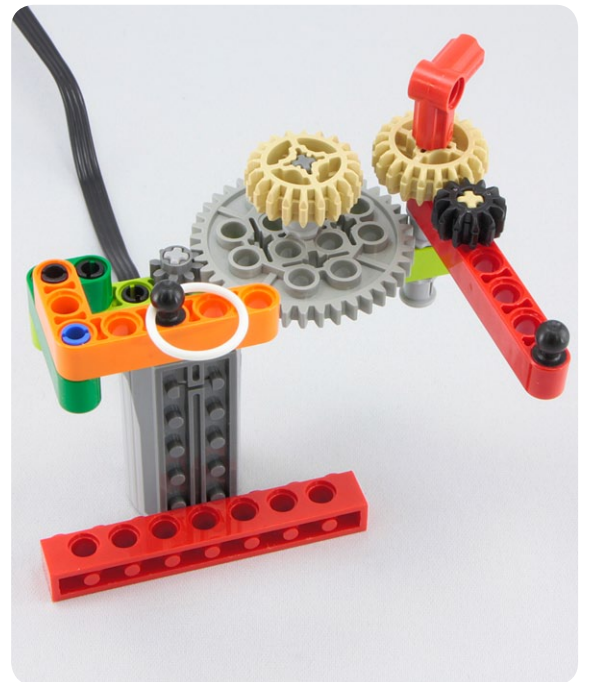
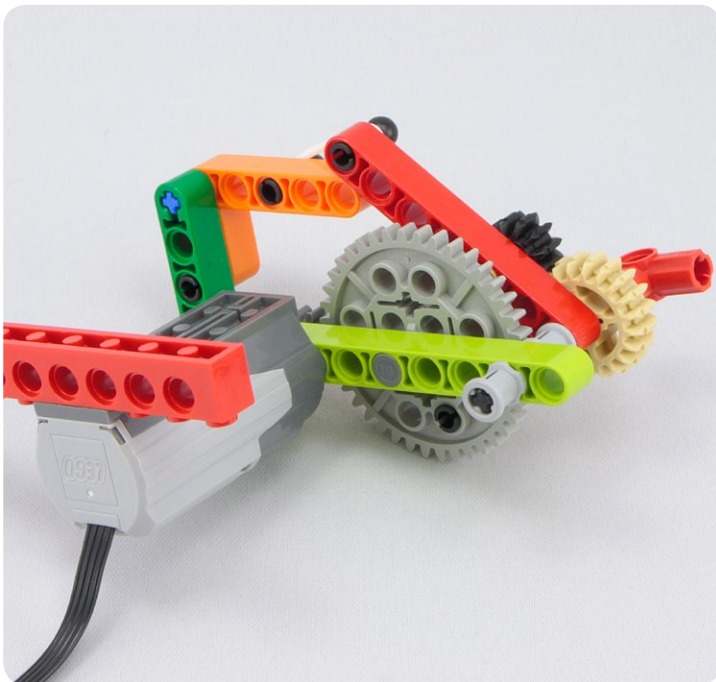
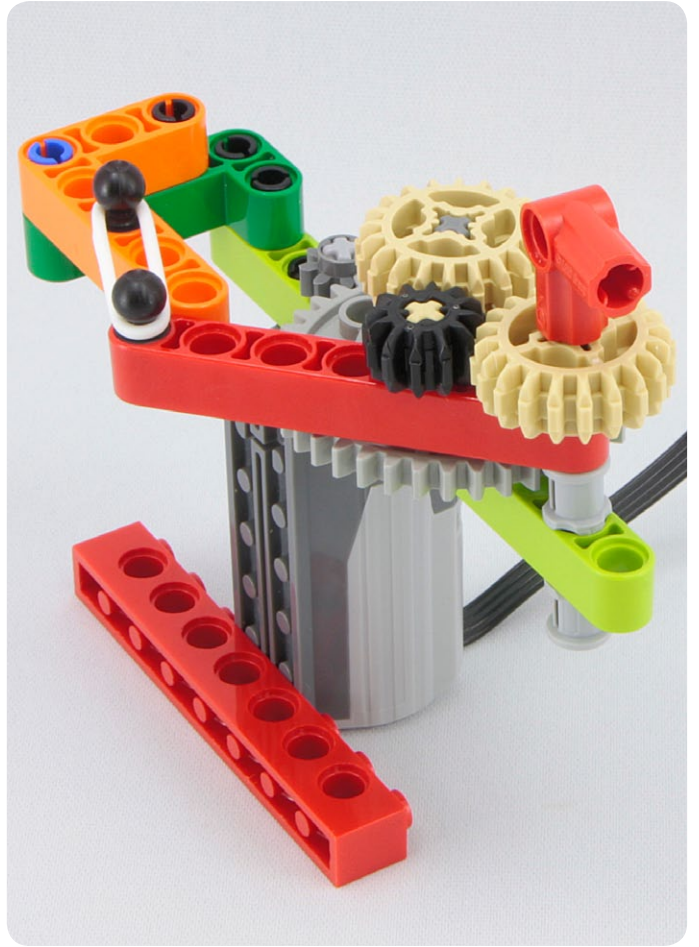
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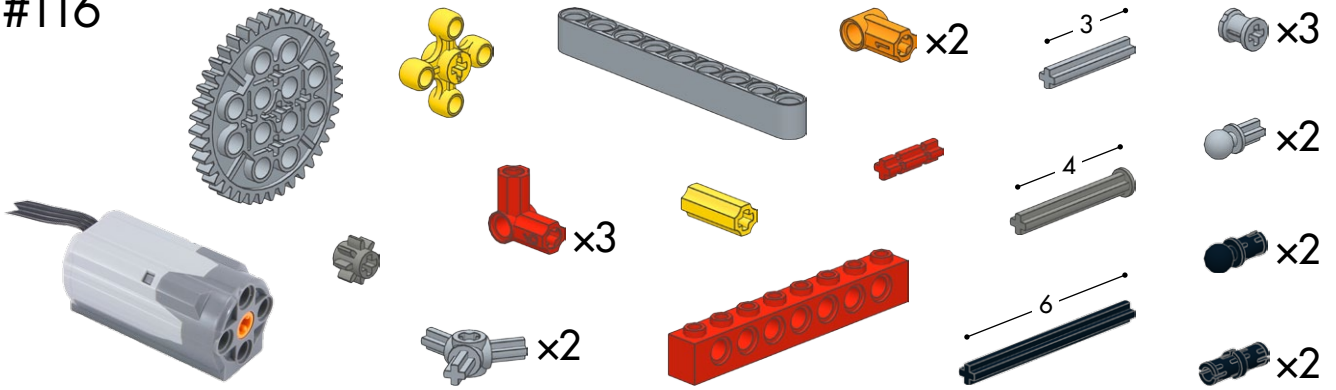
Intermittent motion

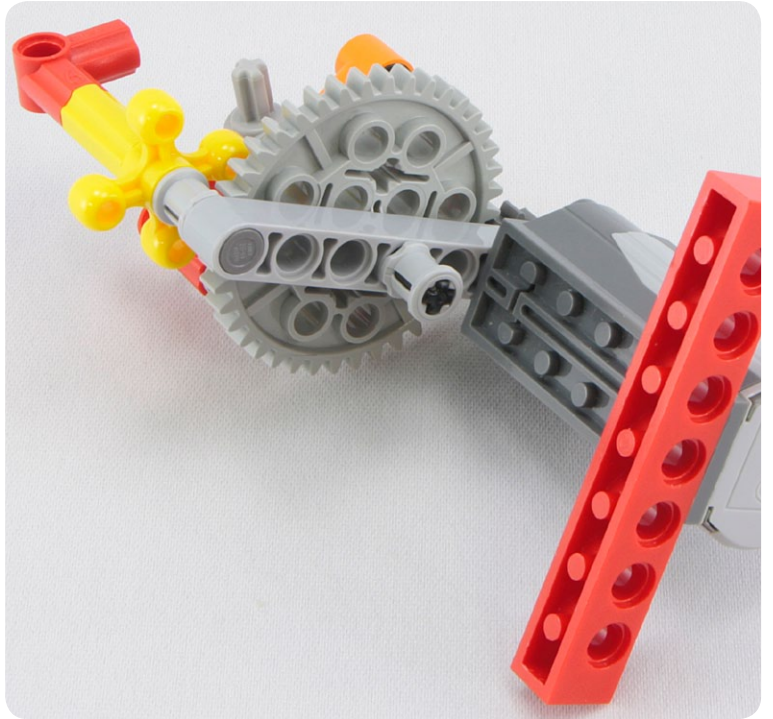
#115



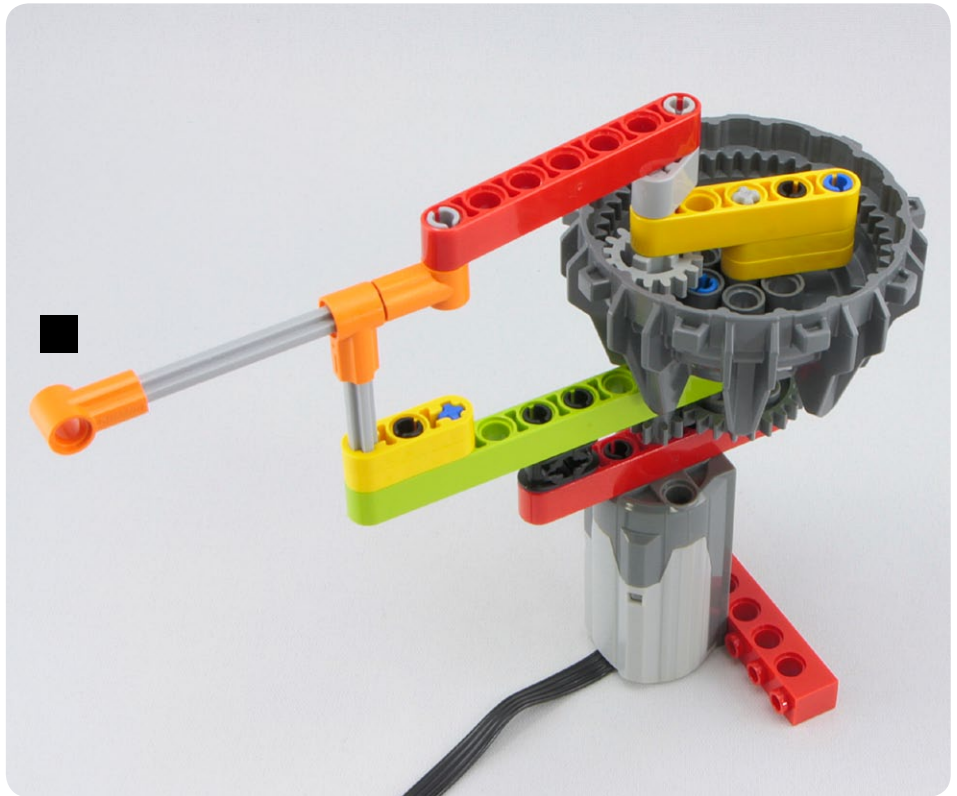
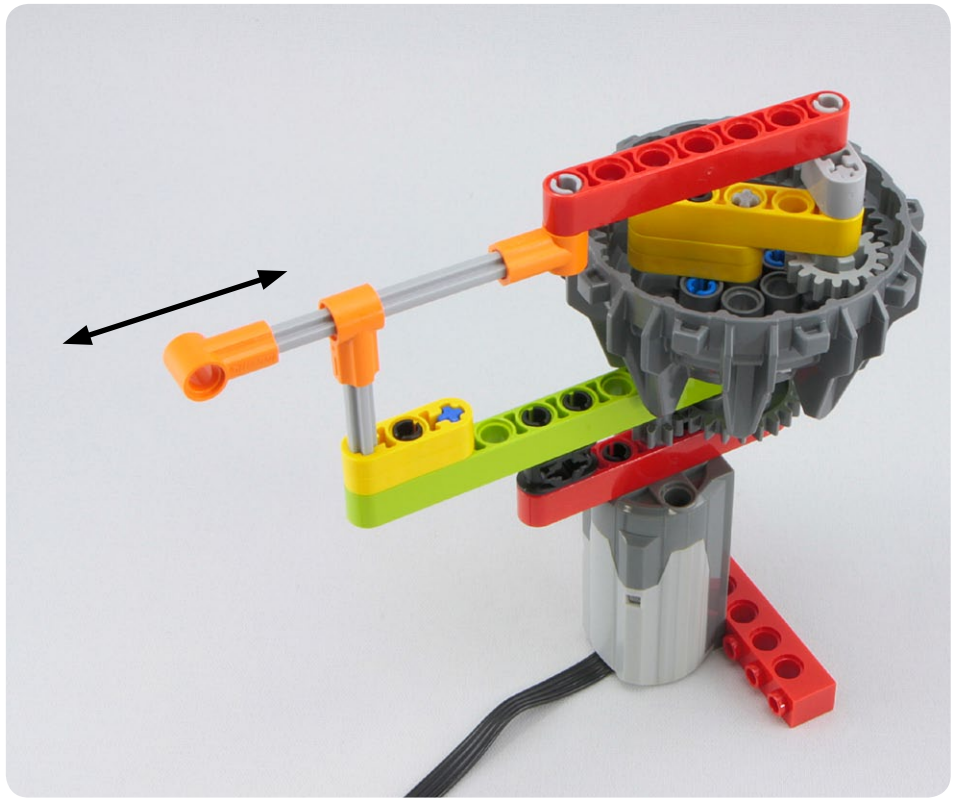
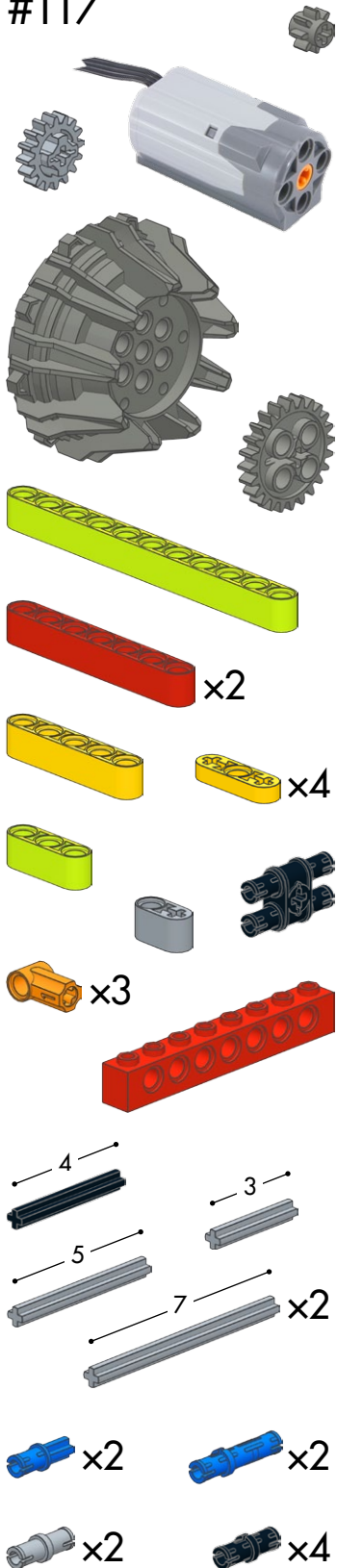


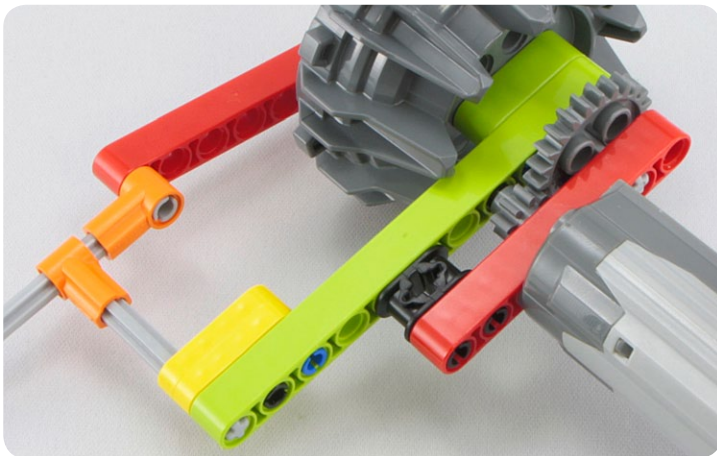
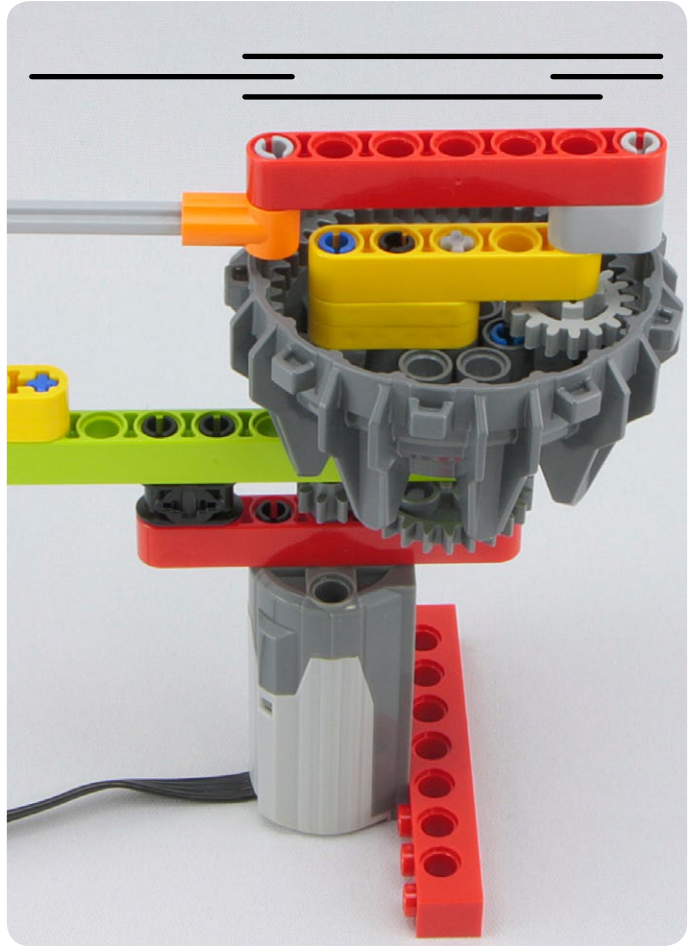
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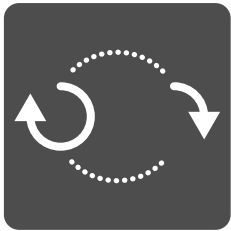




#117

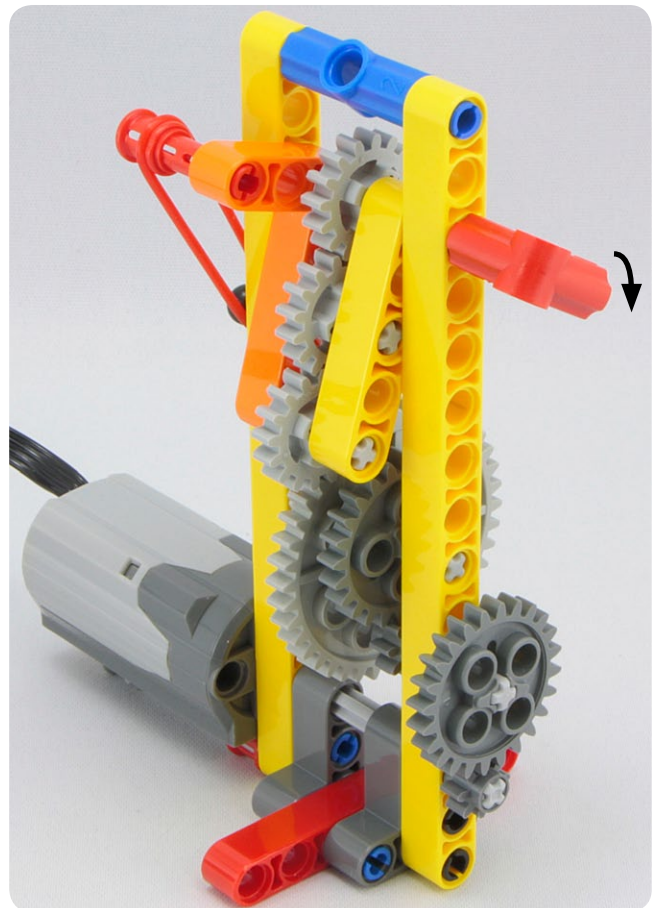
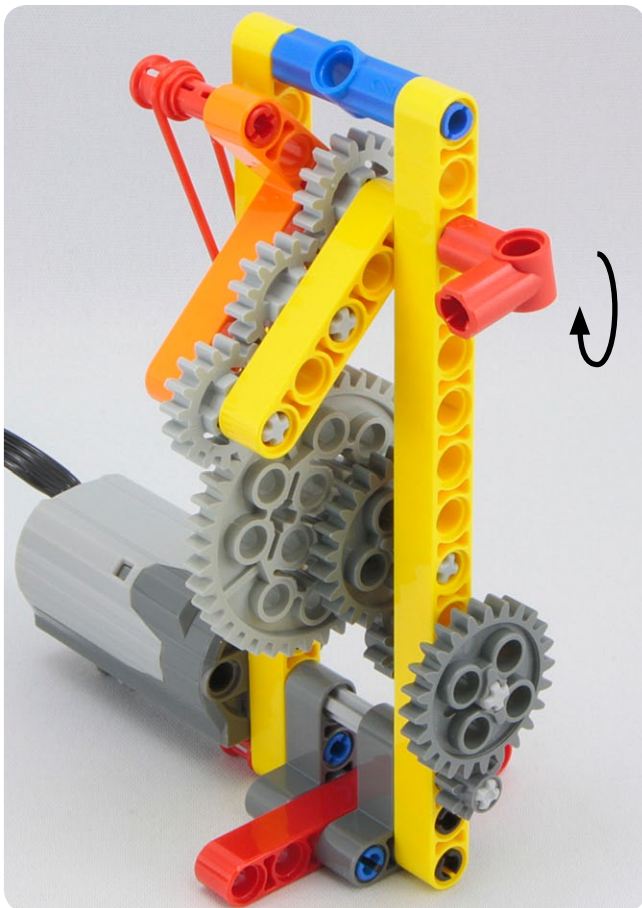
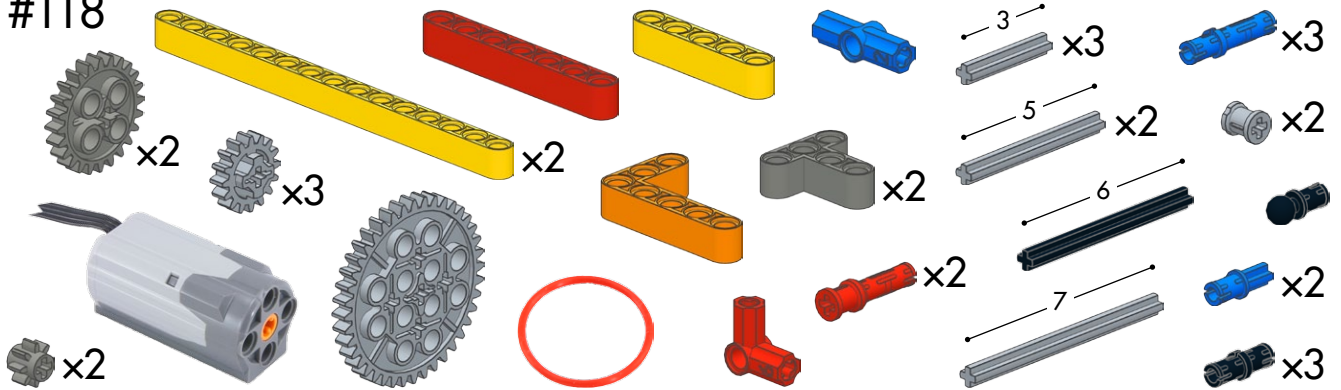


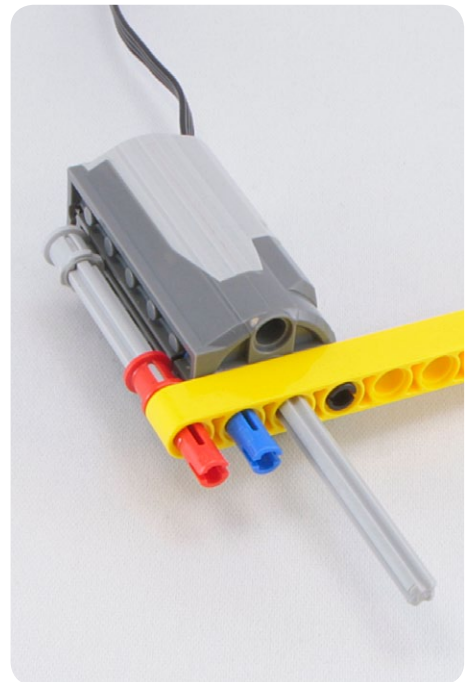
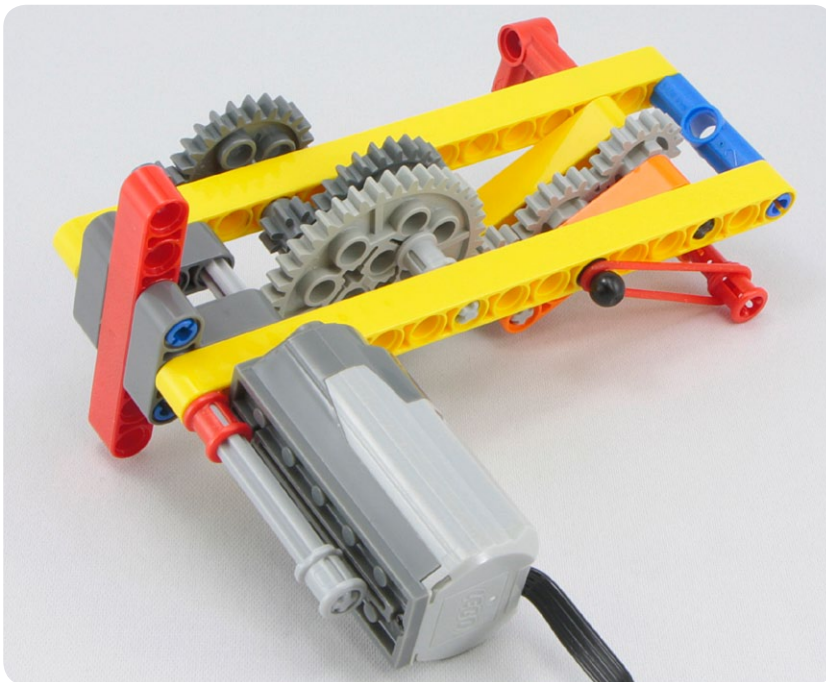
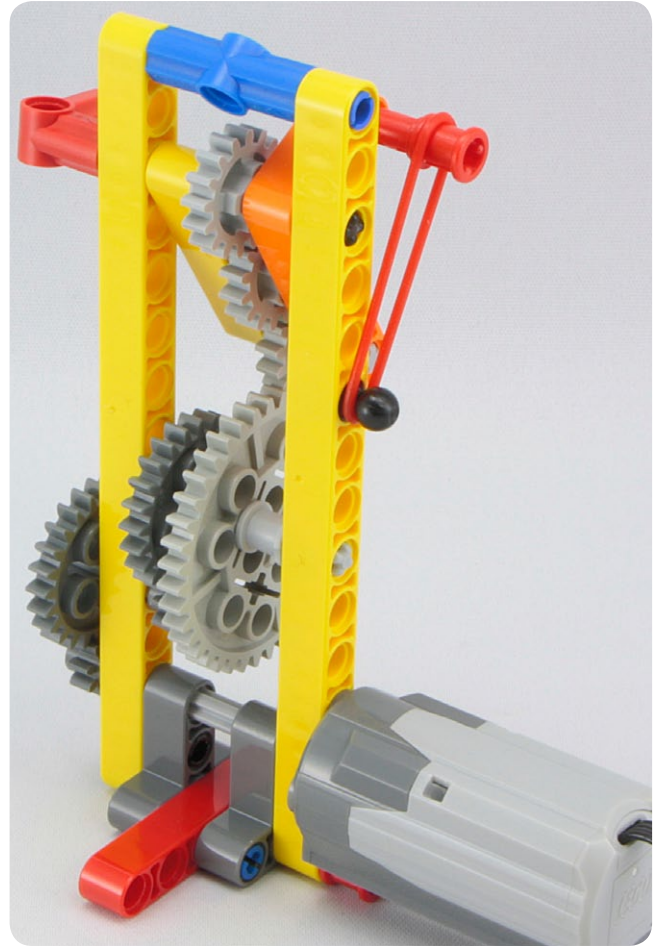




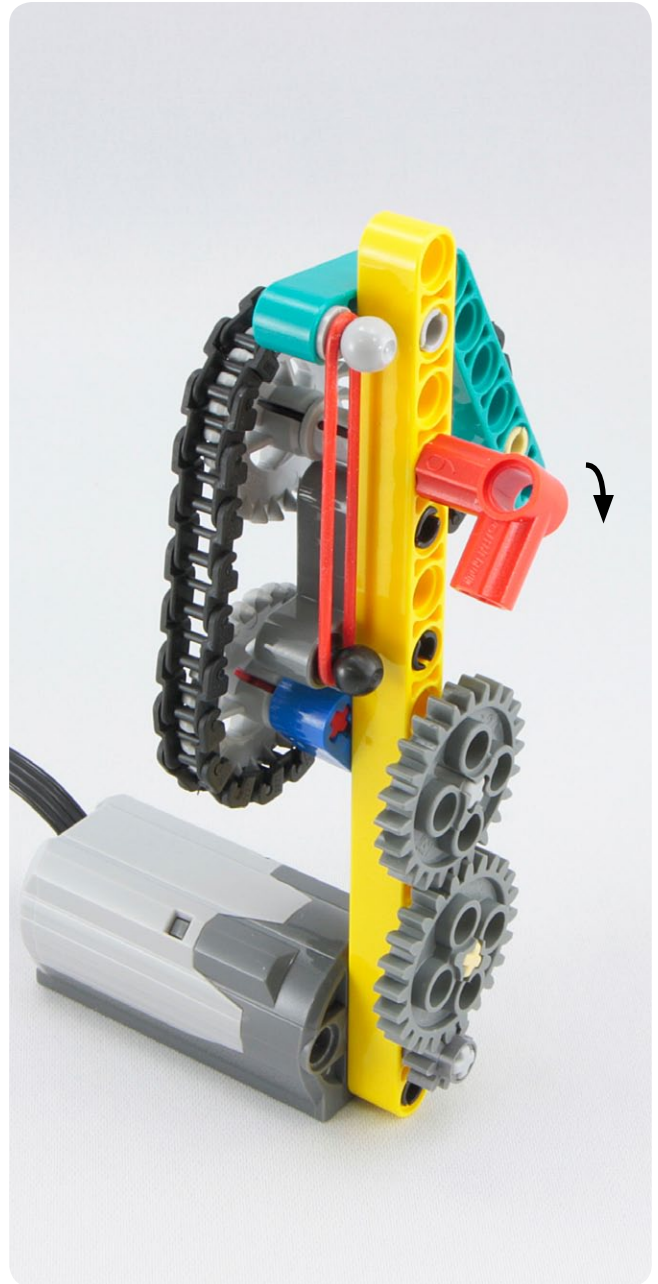
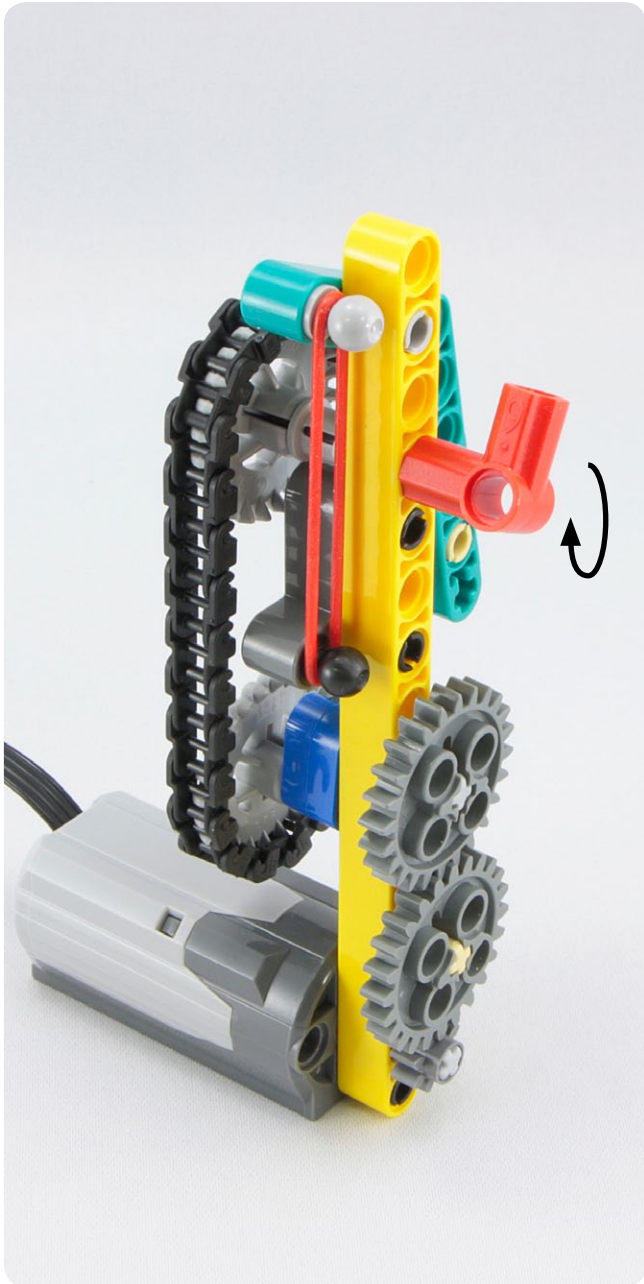
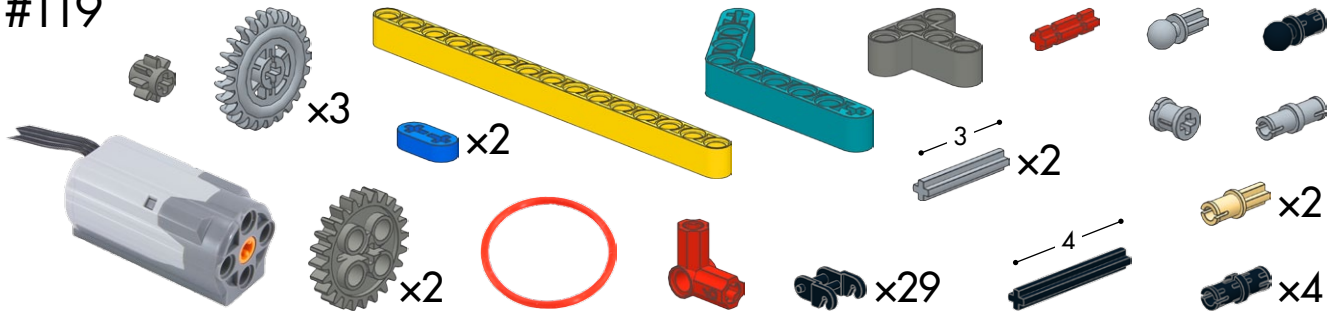
Smooth changes of rotation speed

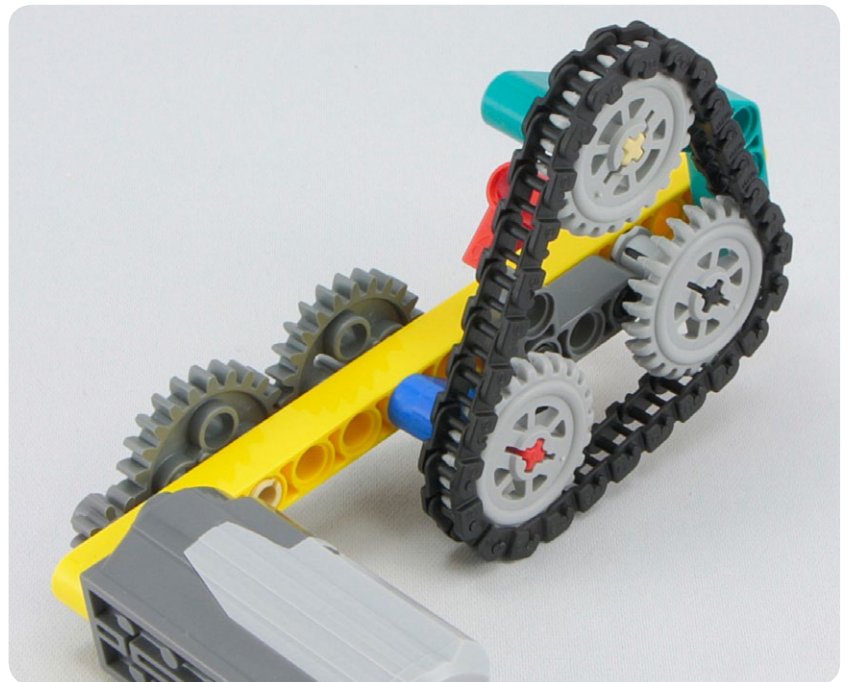
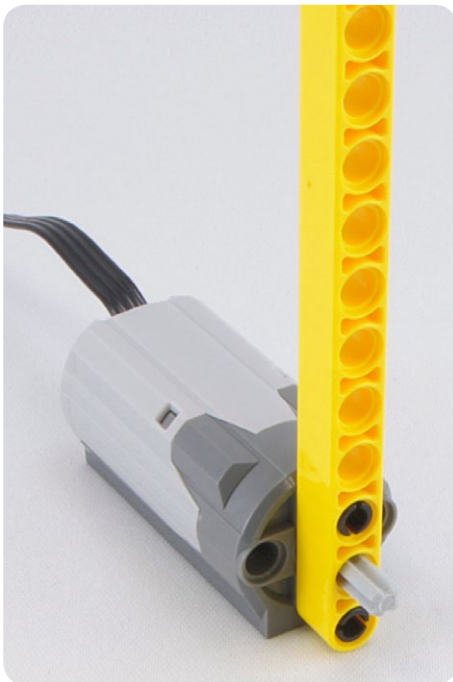
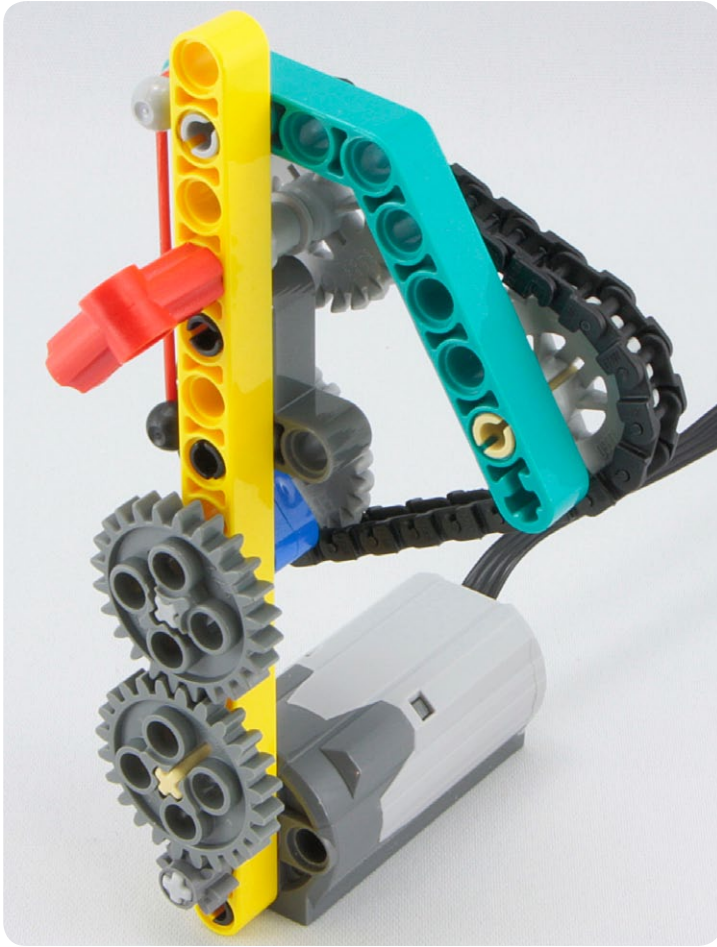
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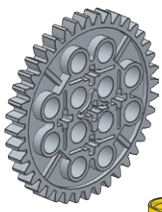

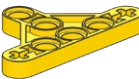
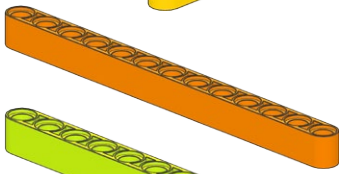
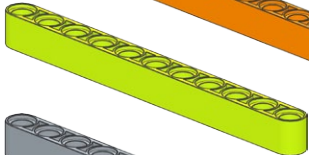
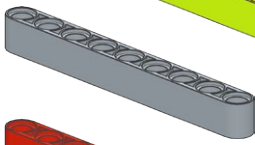
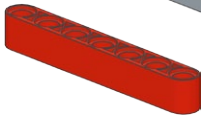
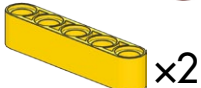



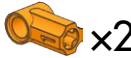

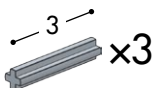
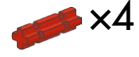
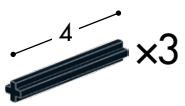
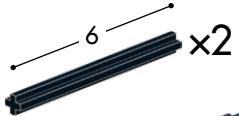





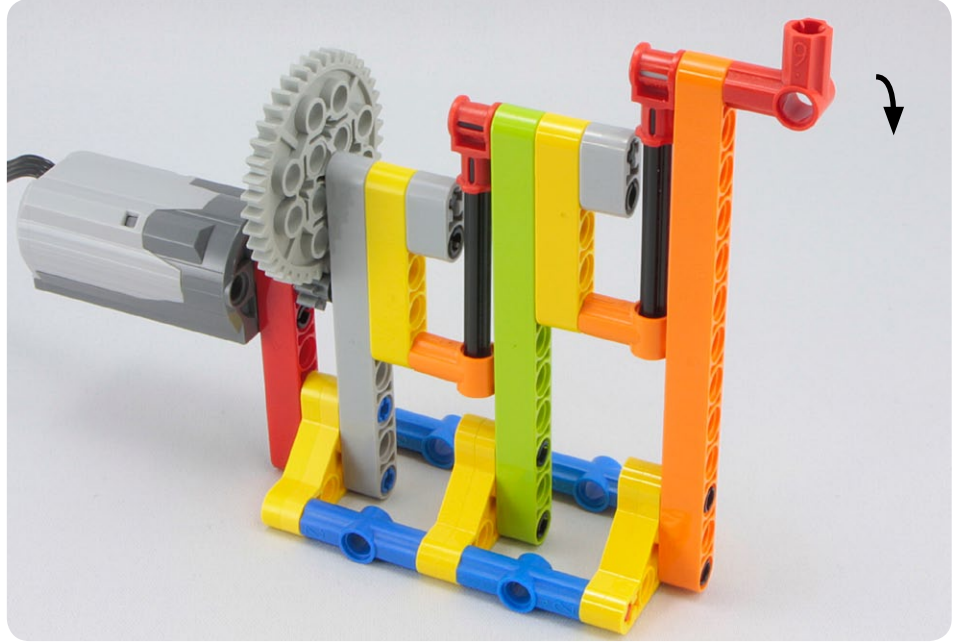
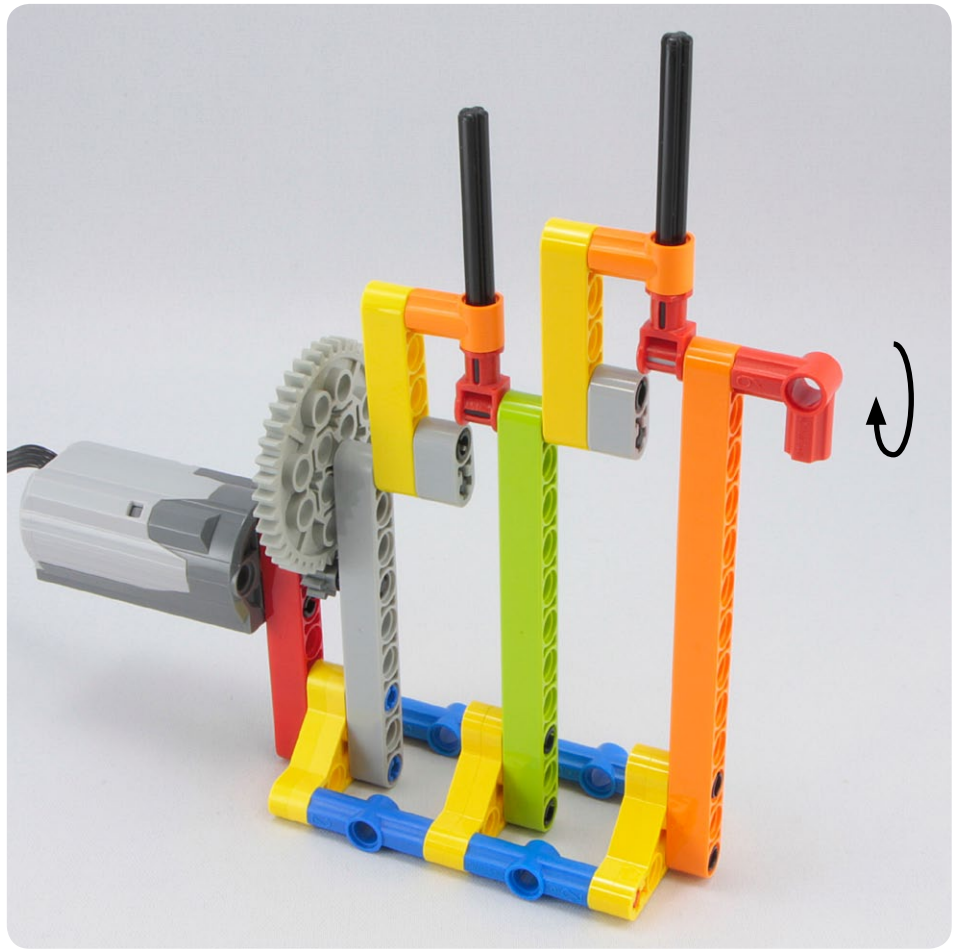
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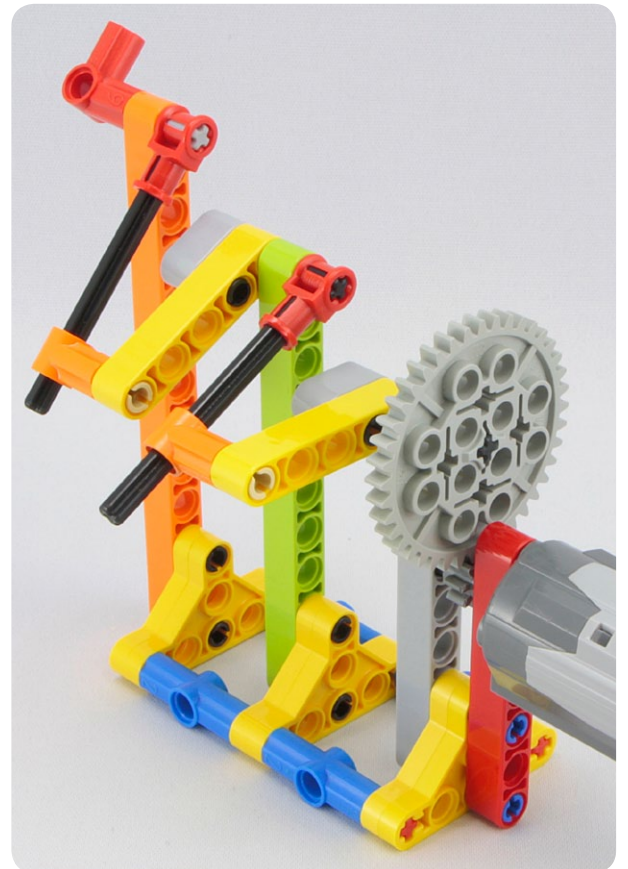
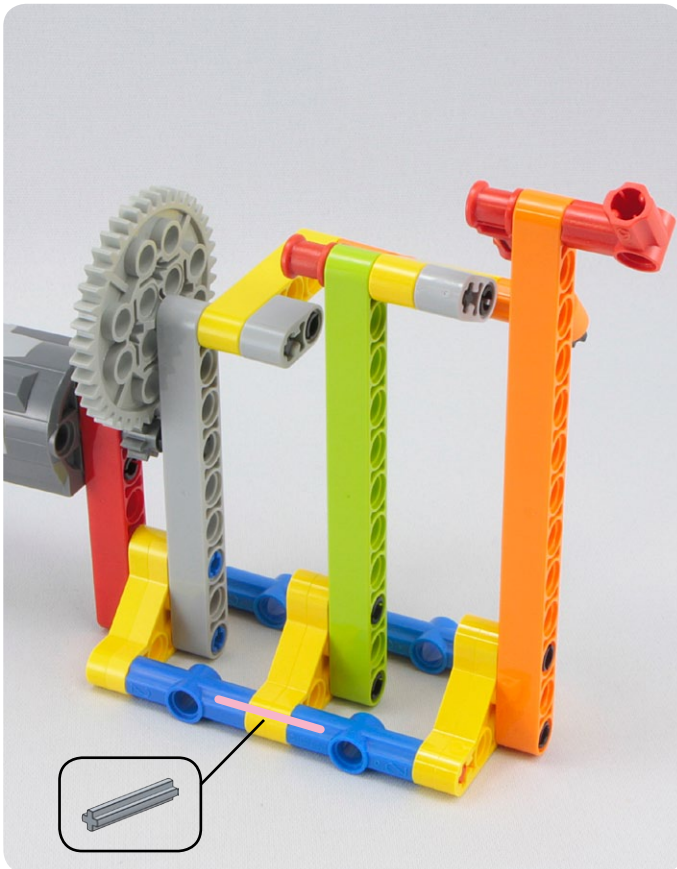
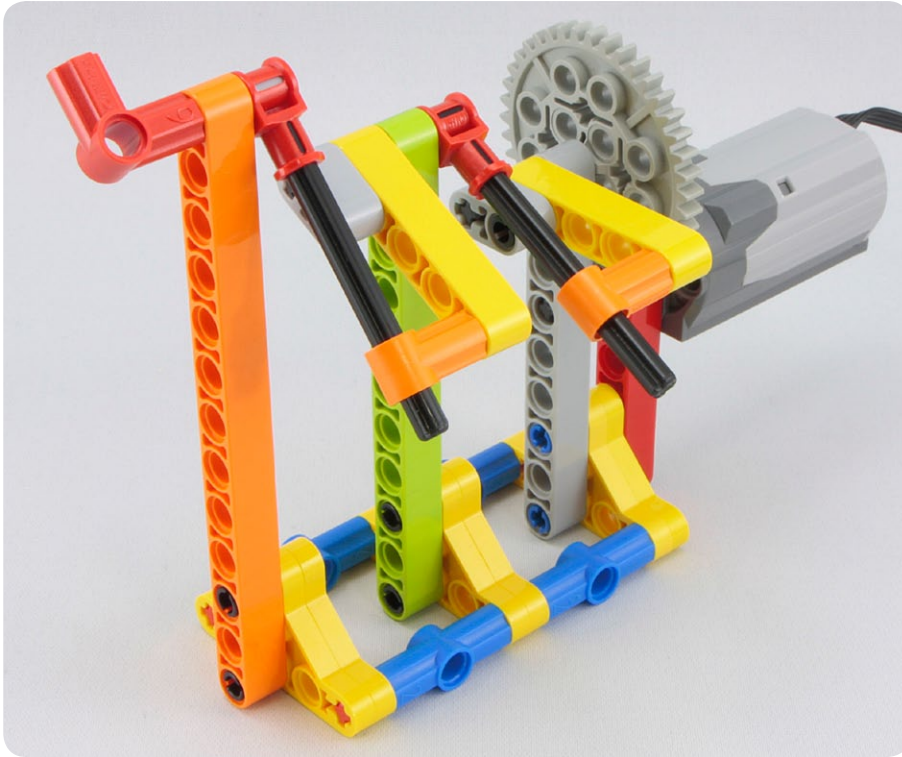







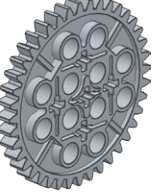



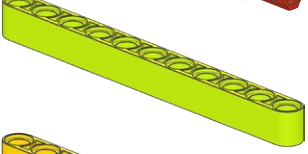
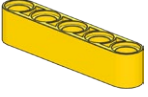



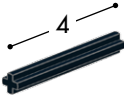
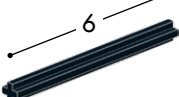


#120

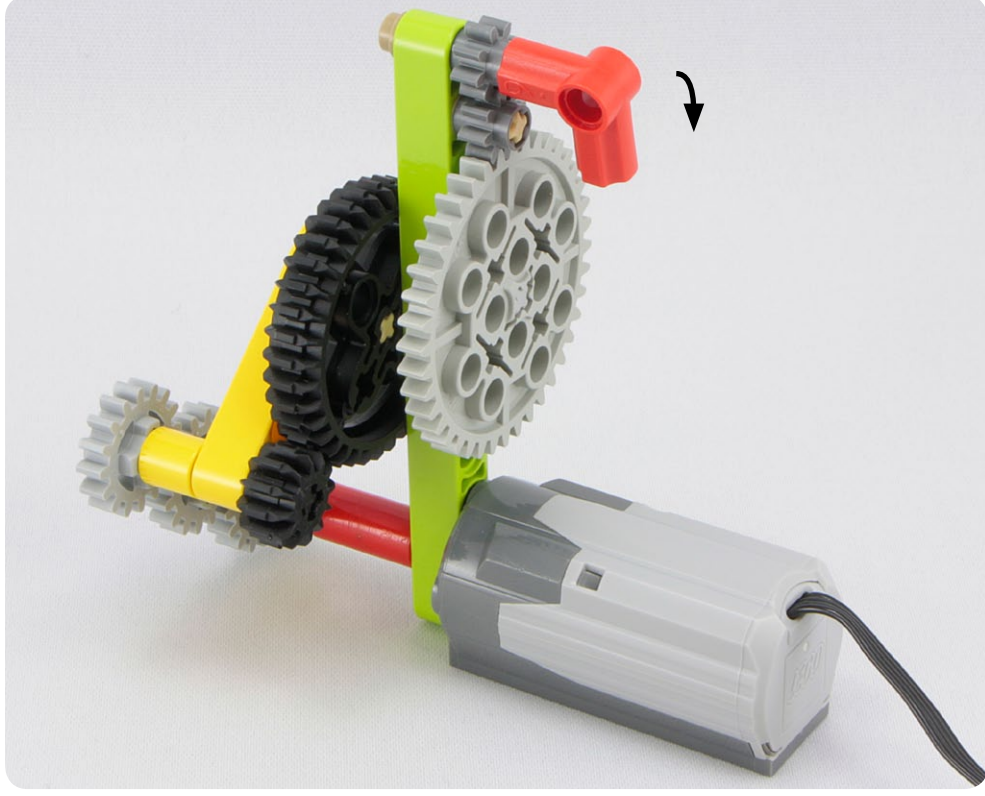
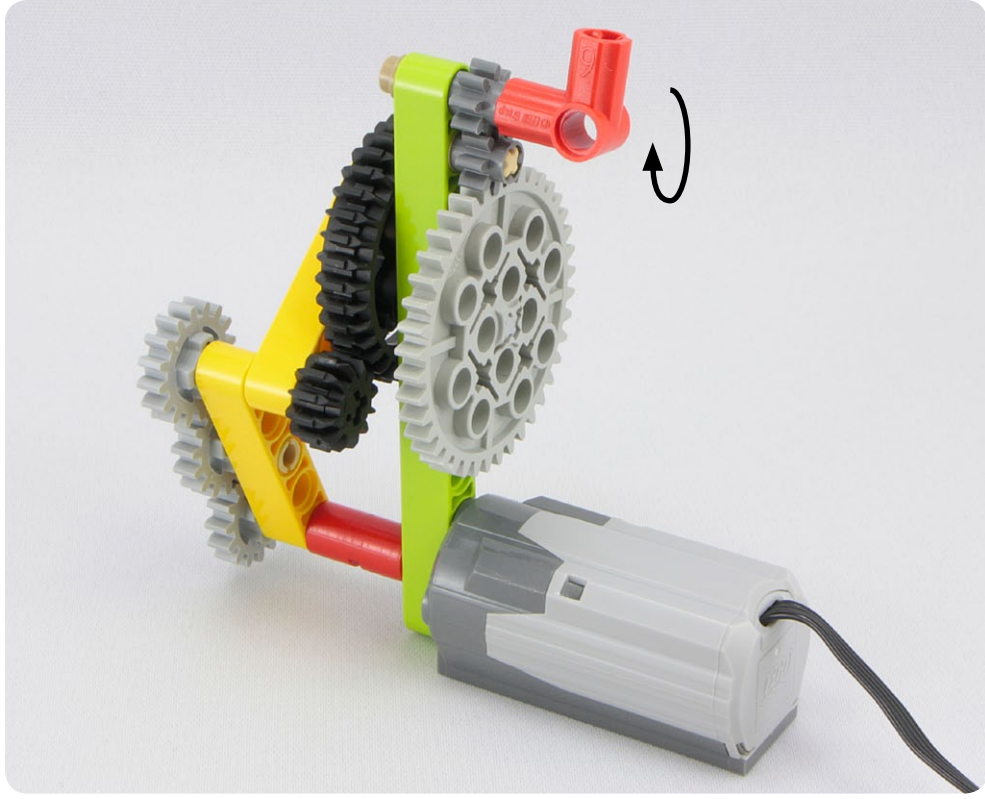
- 
- 
- 
-  x6
- 
- 
- 
- 
-  x2
-  x2
-  x2
-  x4
-  x2
- 
-  x3
-  x4
-  x3
-  x2
-  x2
-  x2
-  x8

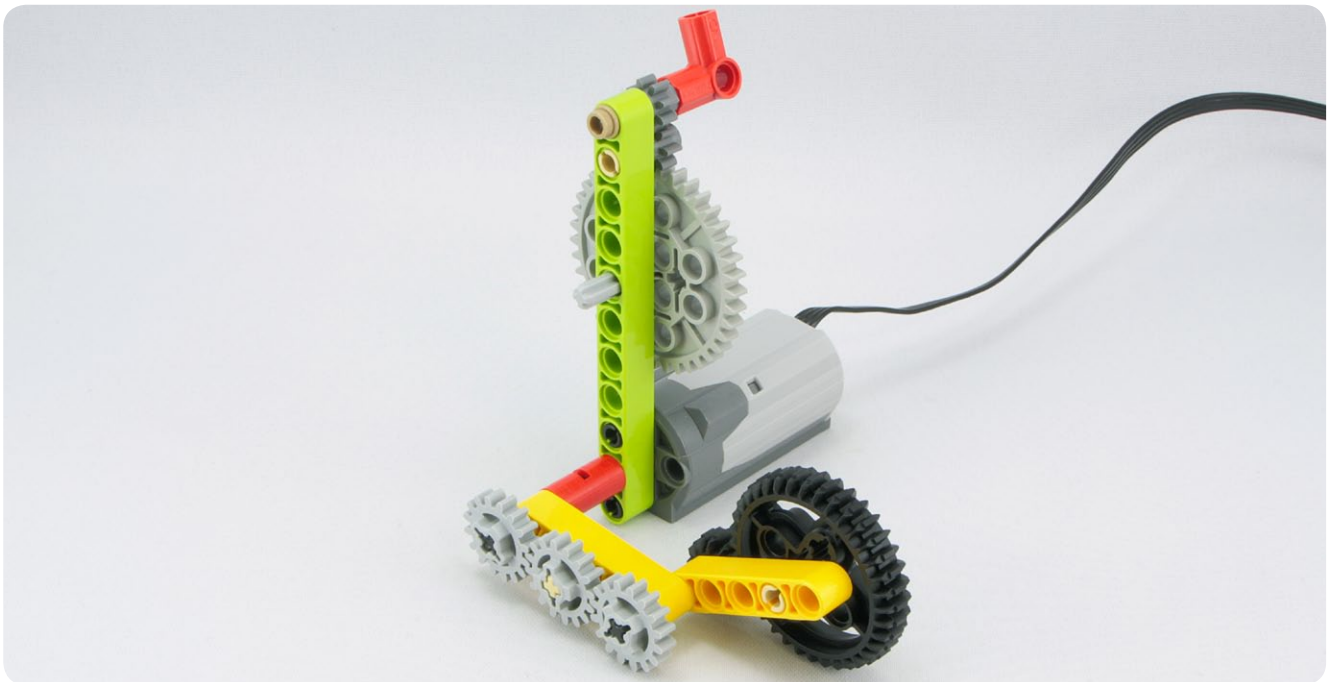
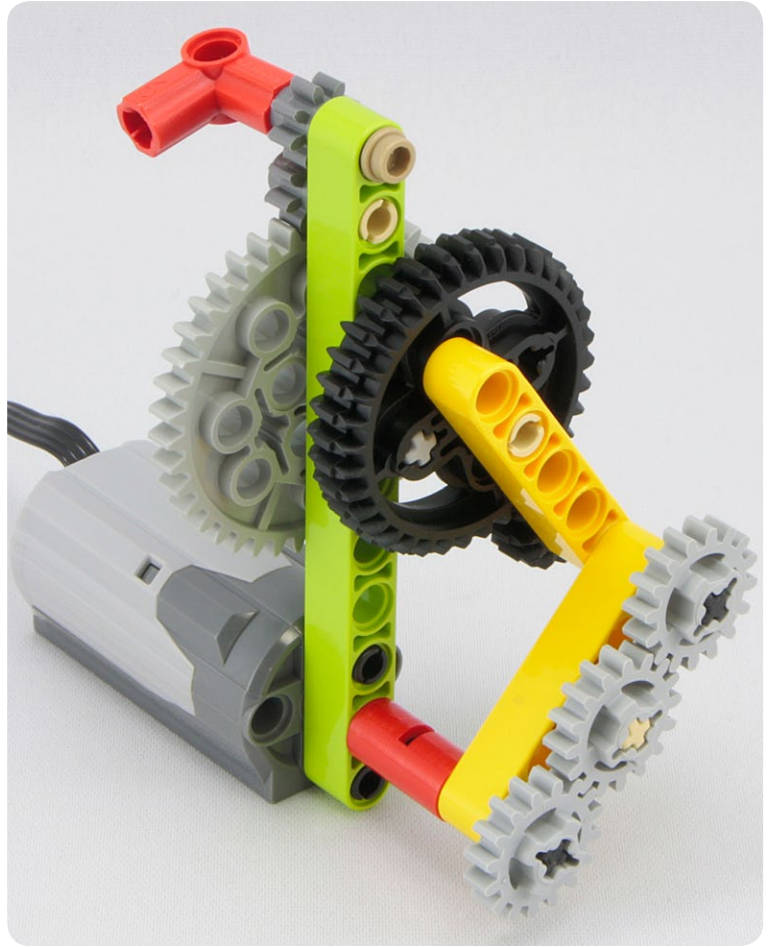


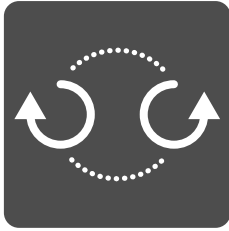


#121

- 
- 
- 
- 
-  x2
-  x3
- 
- 
-  x2
-  3
- 
- 
-  4
-  6
-  x3
-  x2

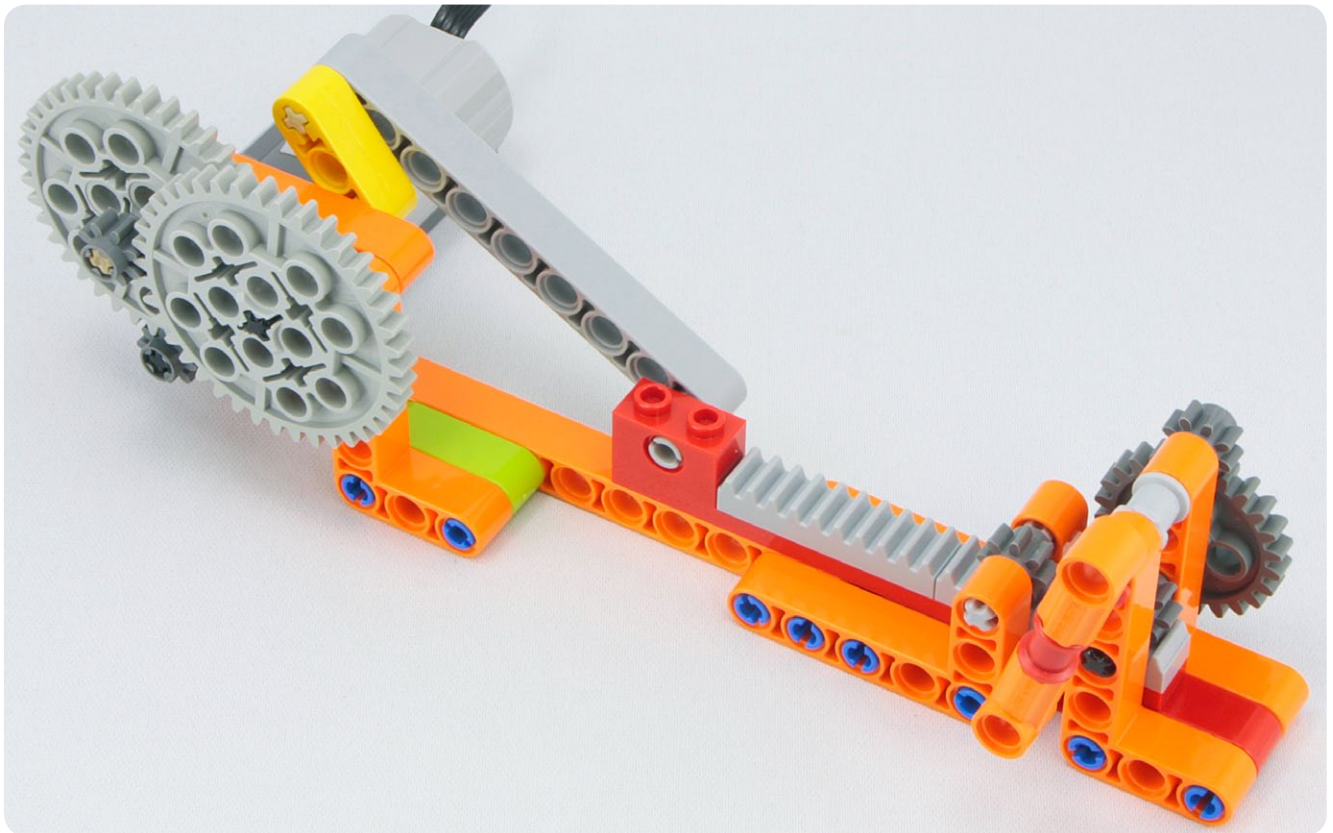
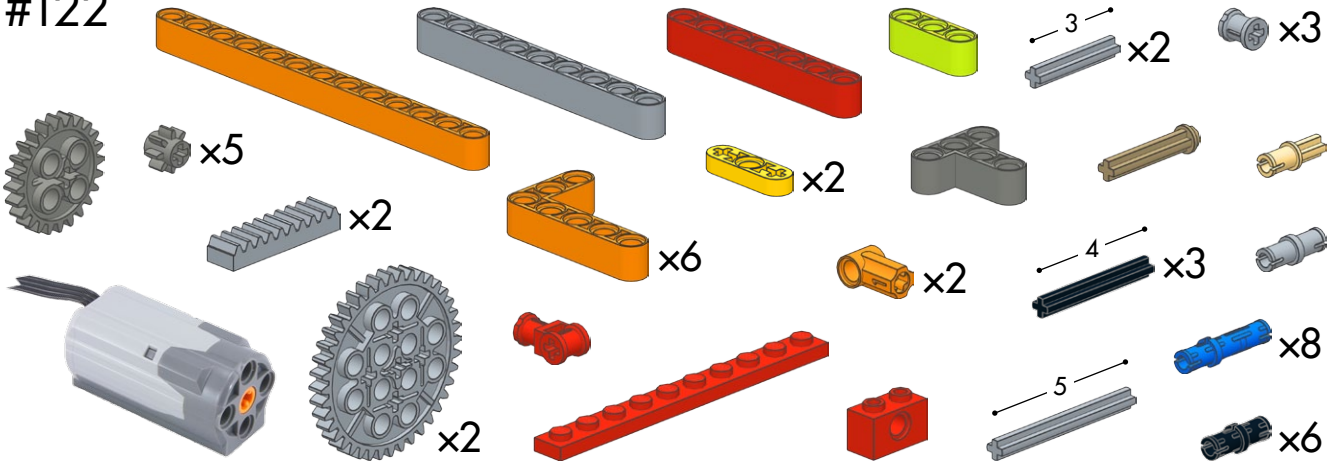


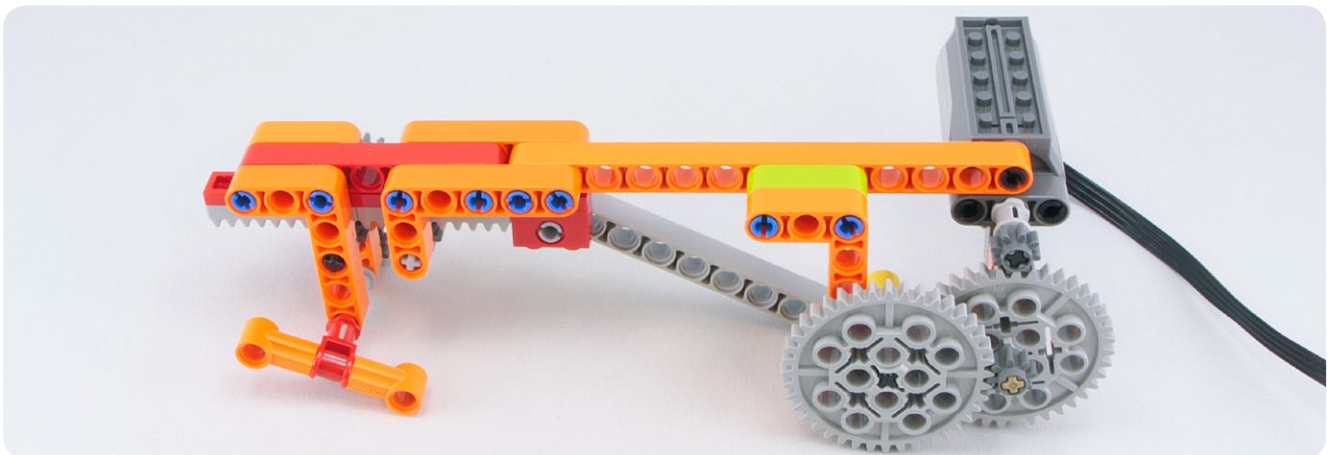
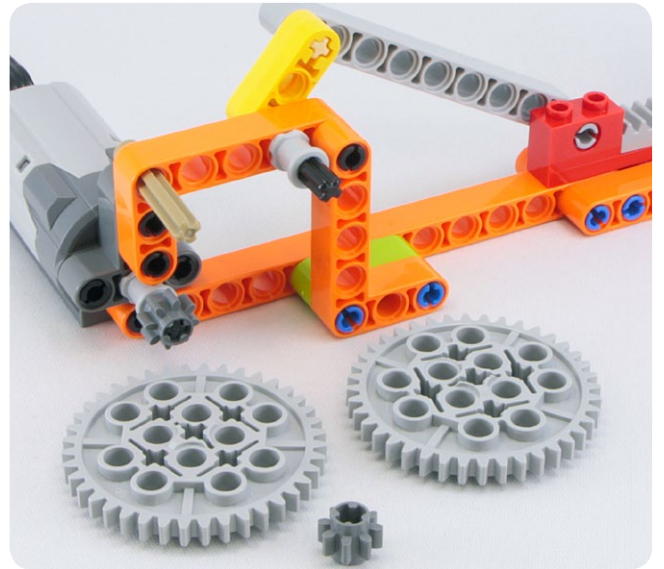
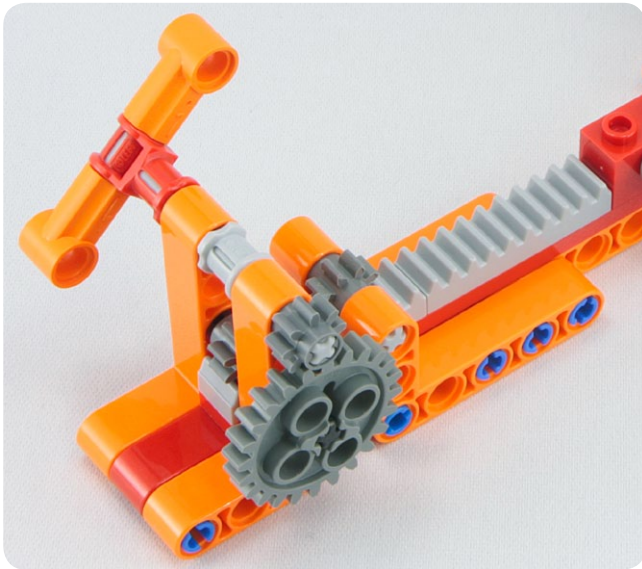
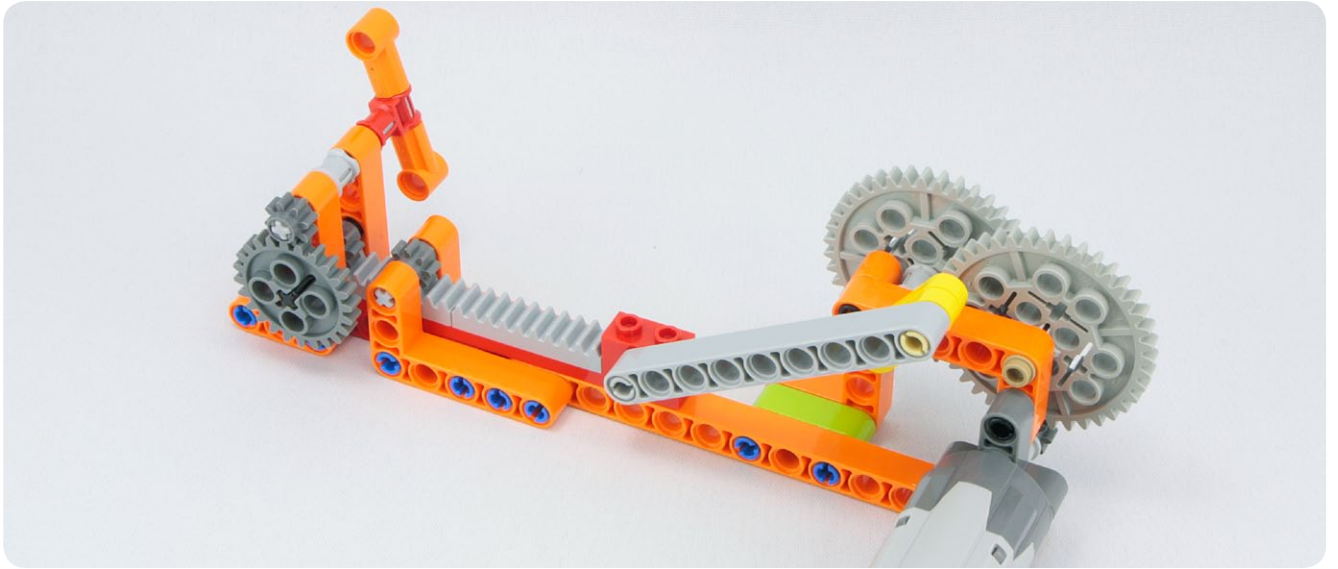




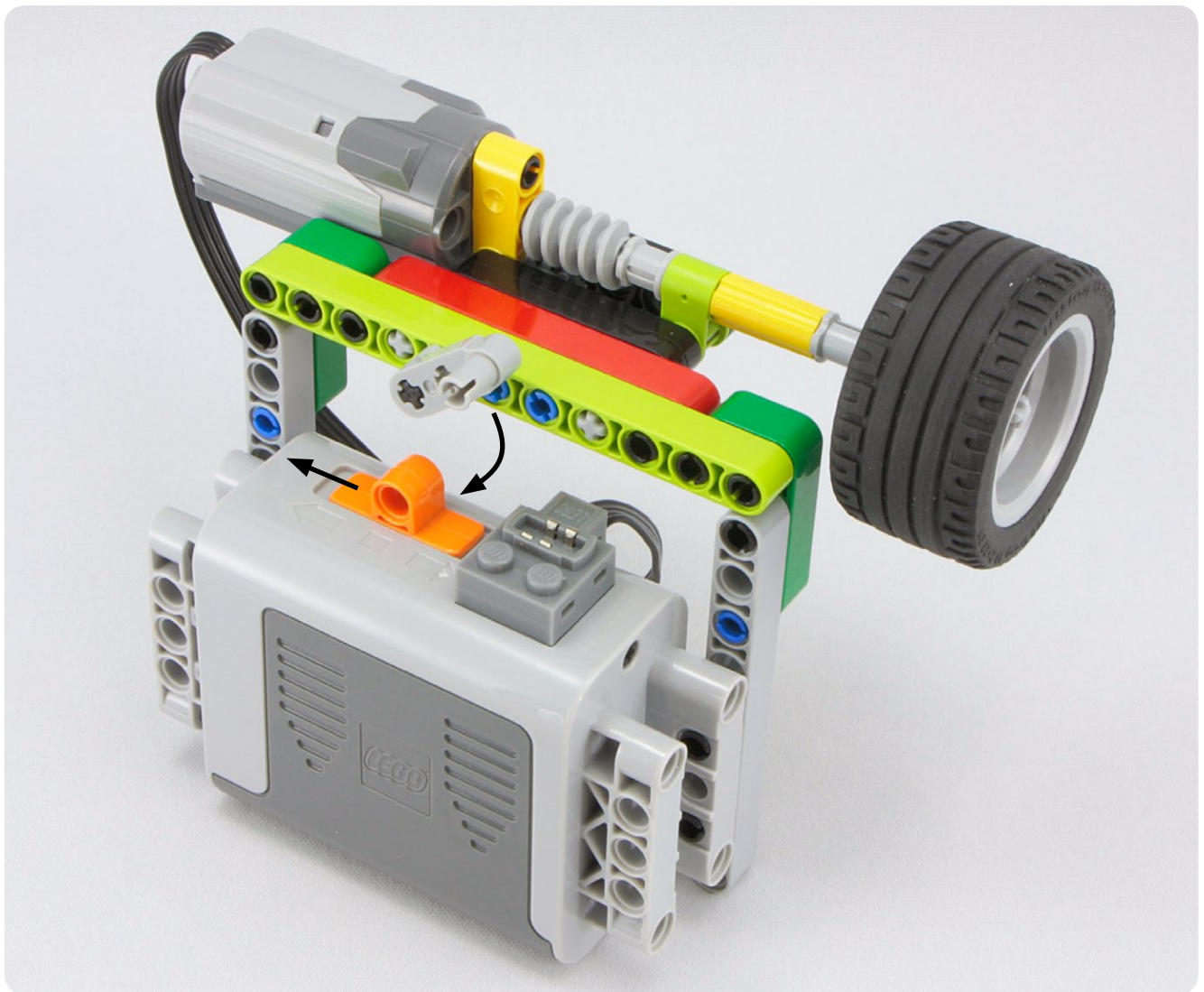
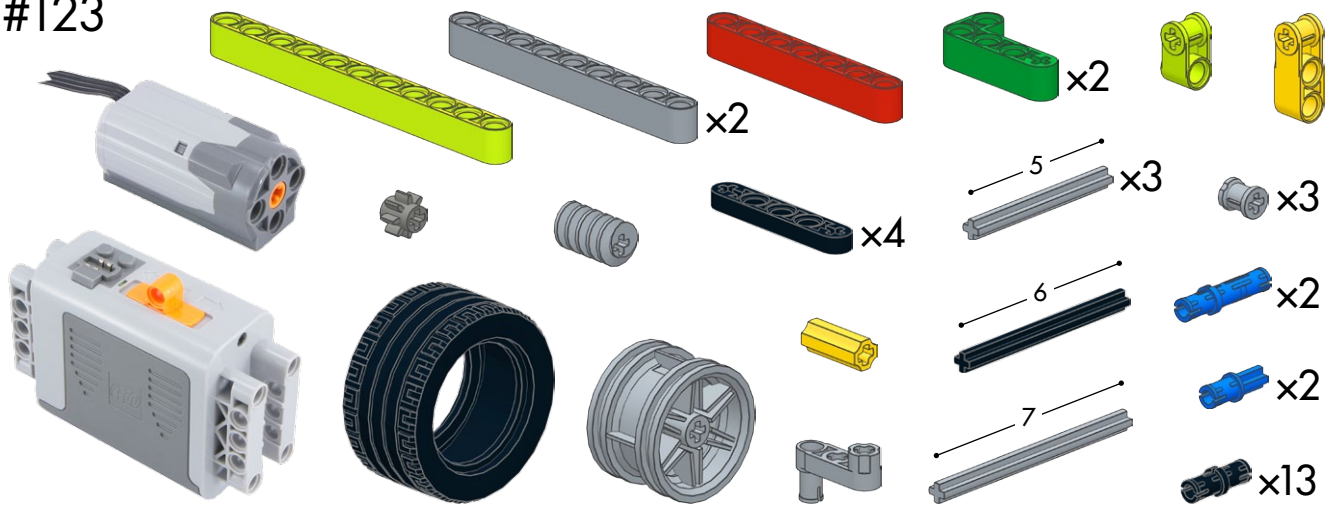
Switching rotational direction

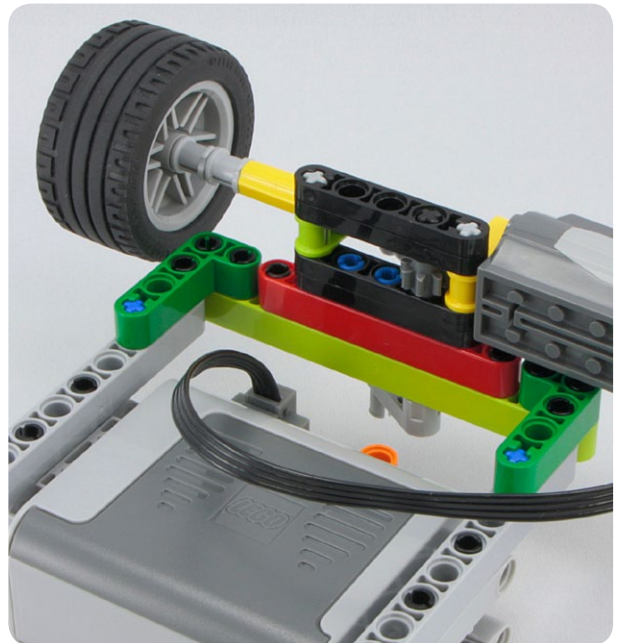
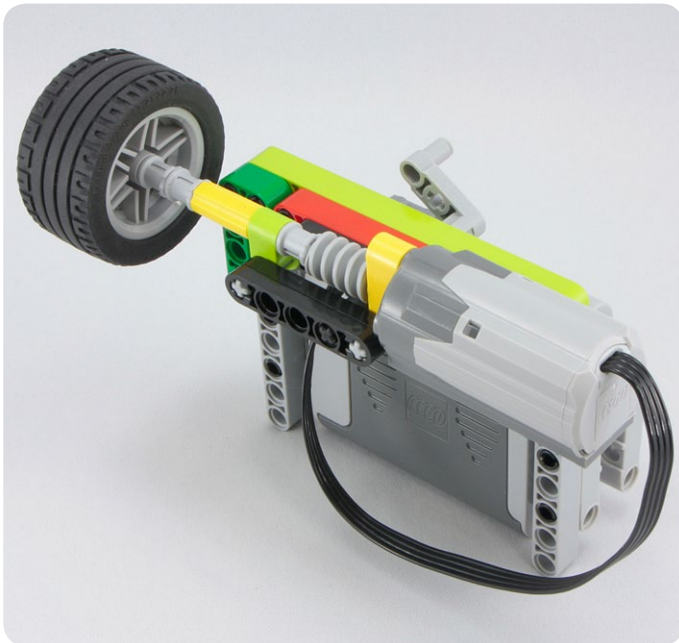
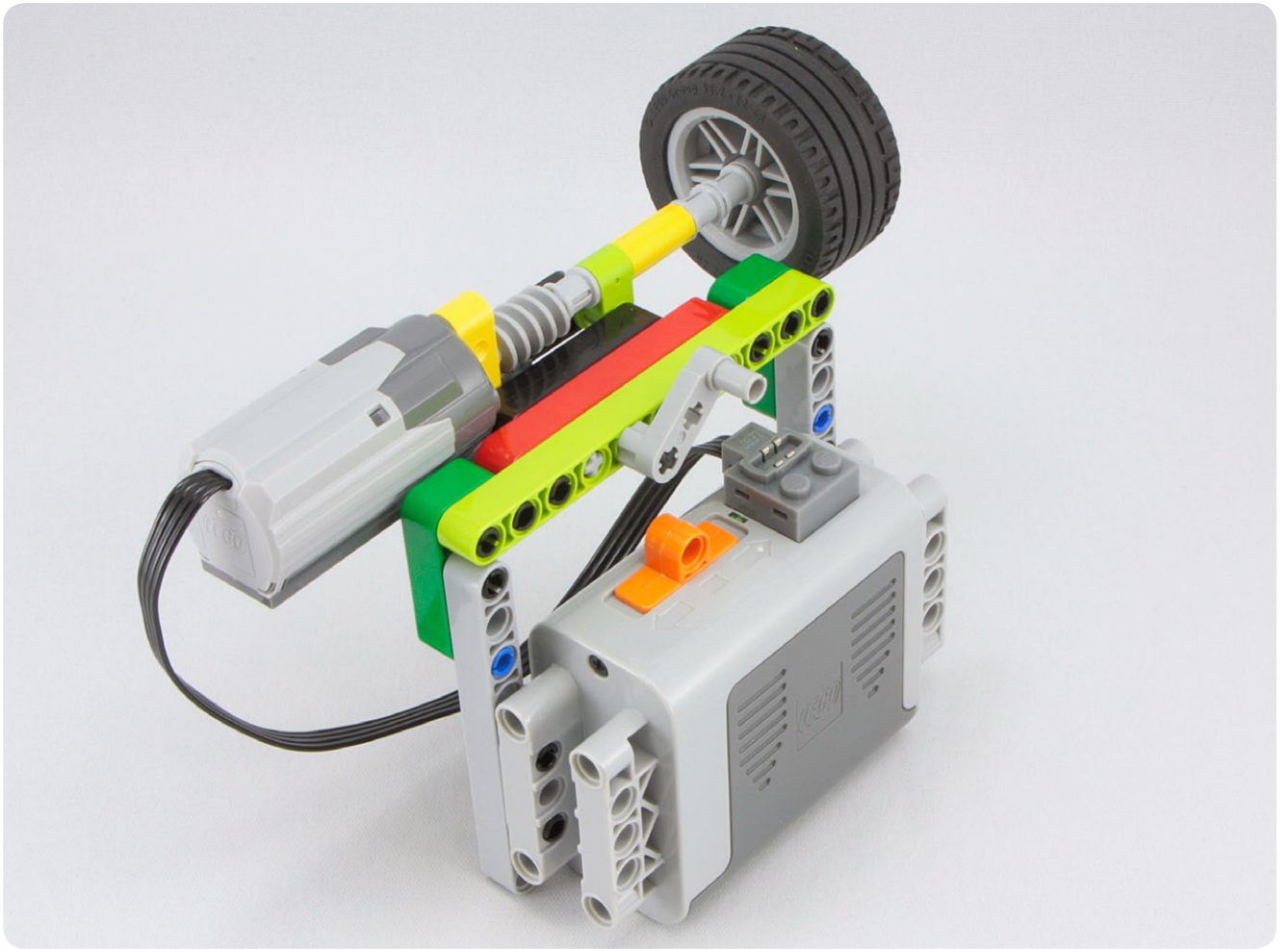
#122




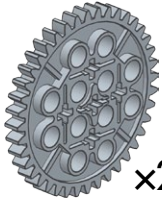




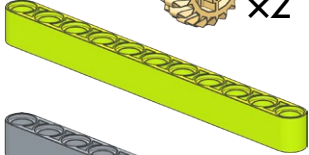
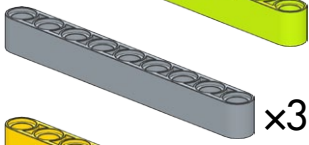
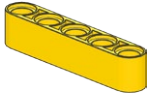
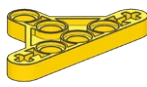
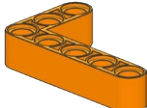
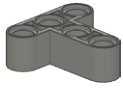
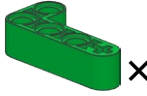





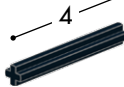

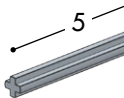
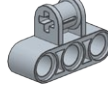
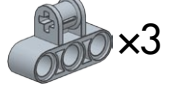
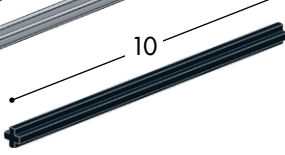







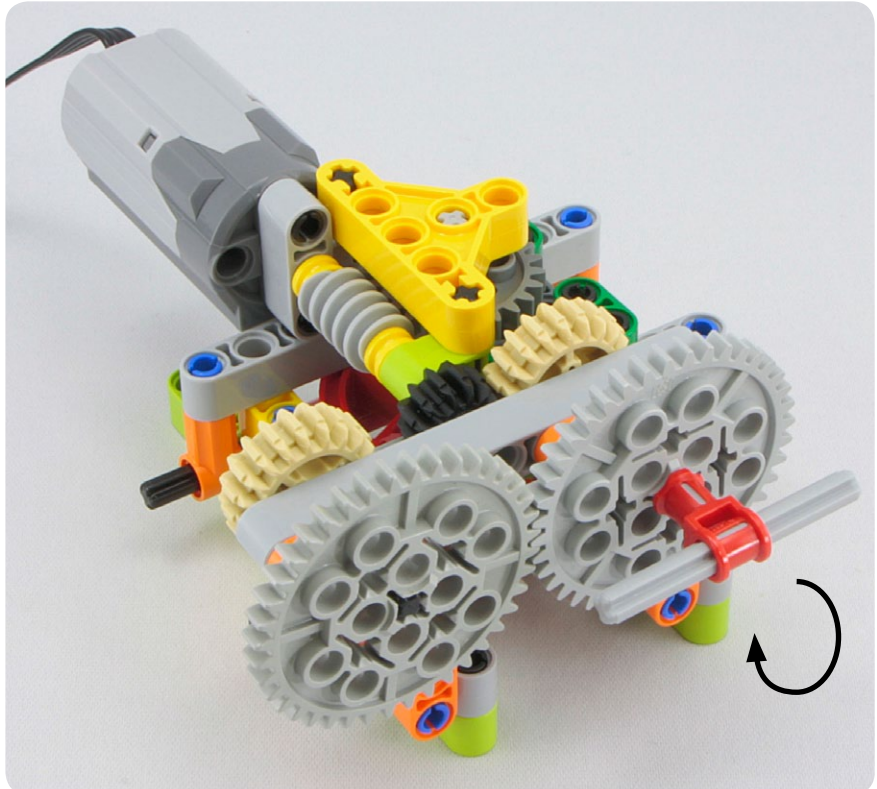
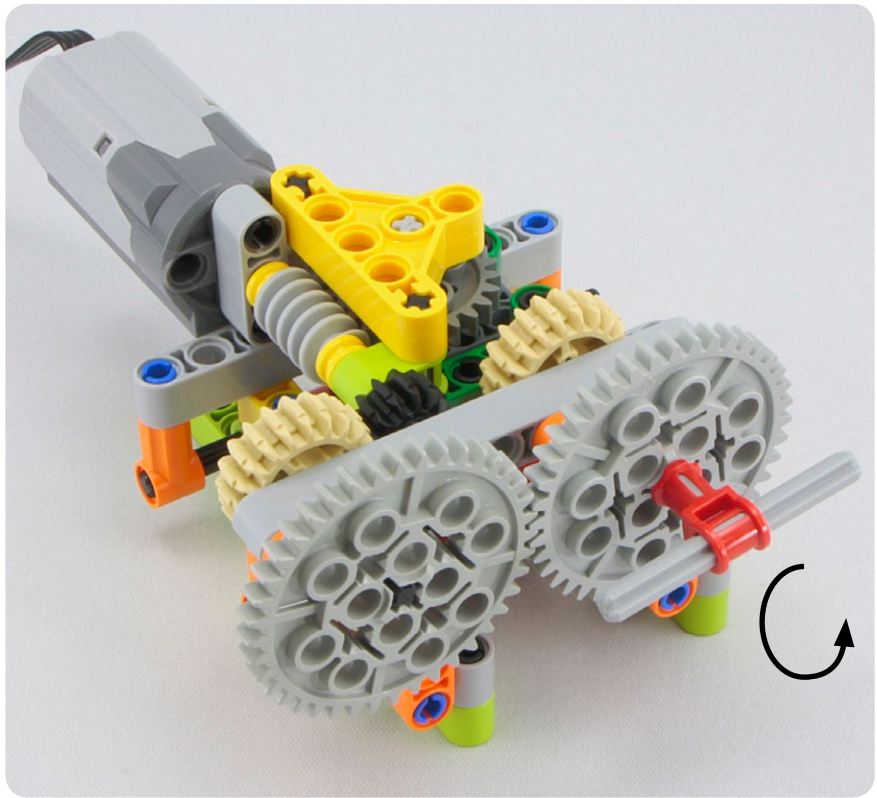
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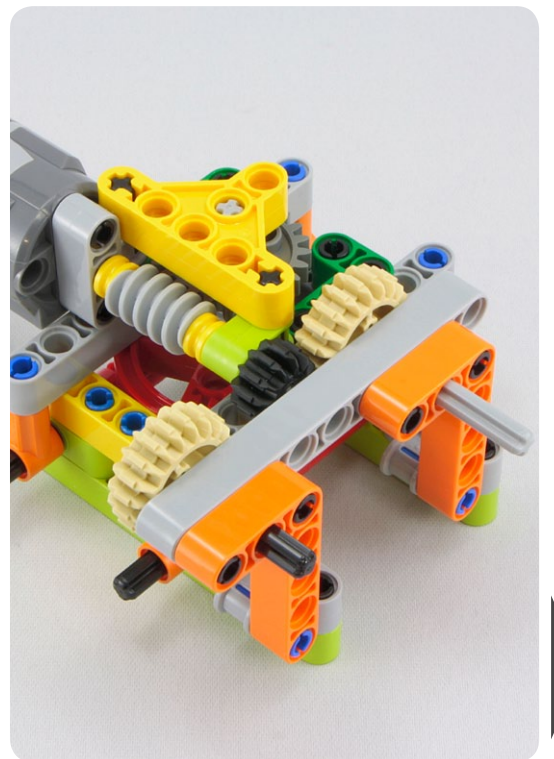
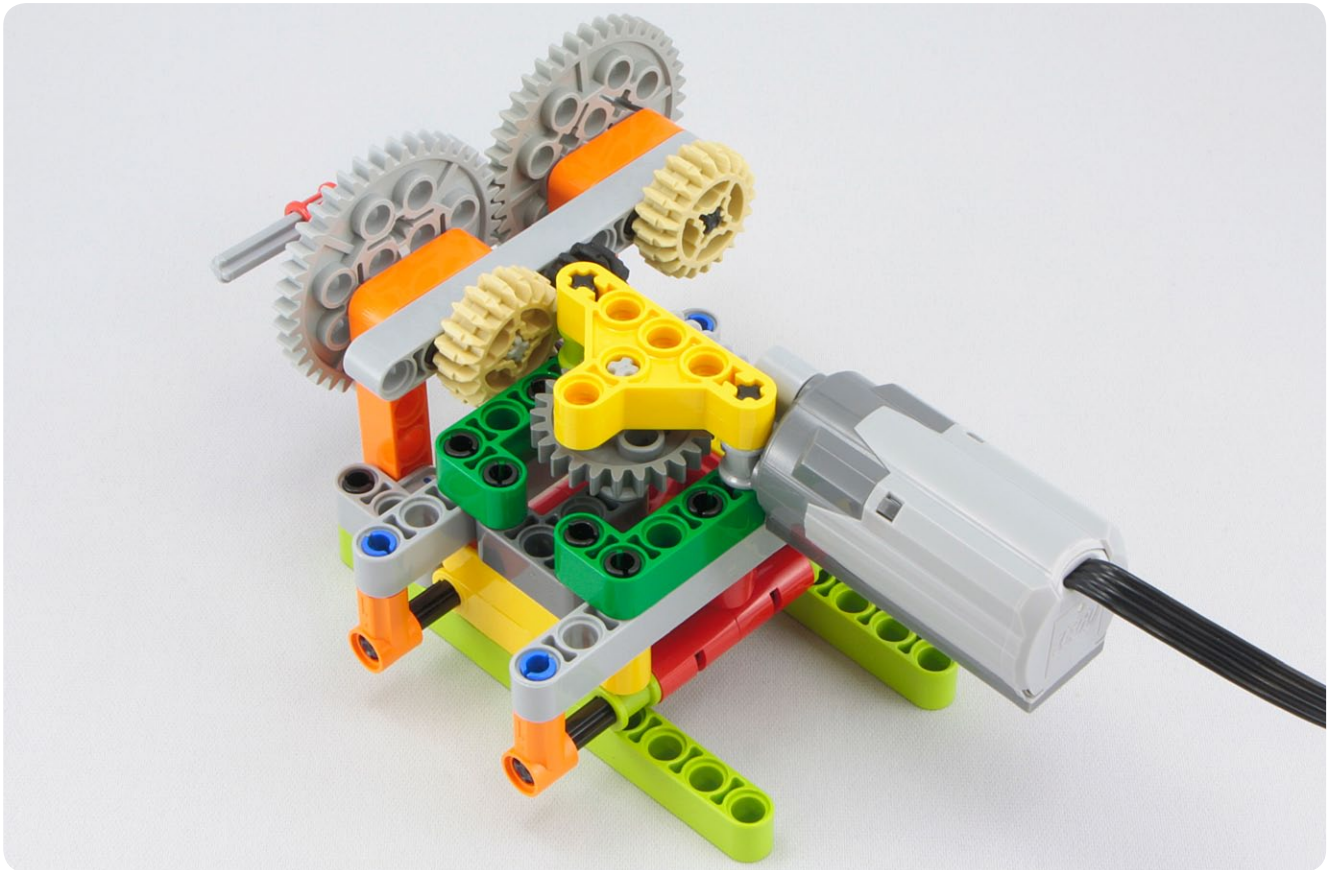


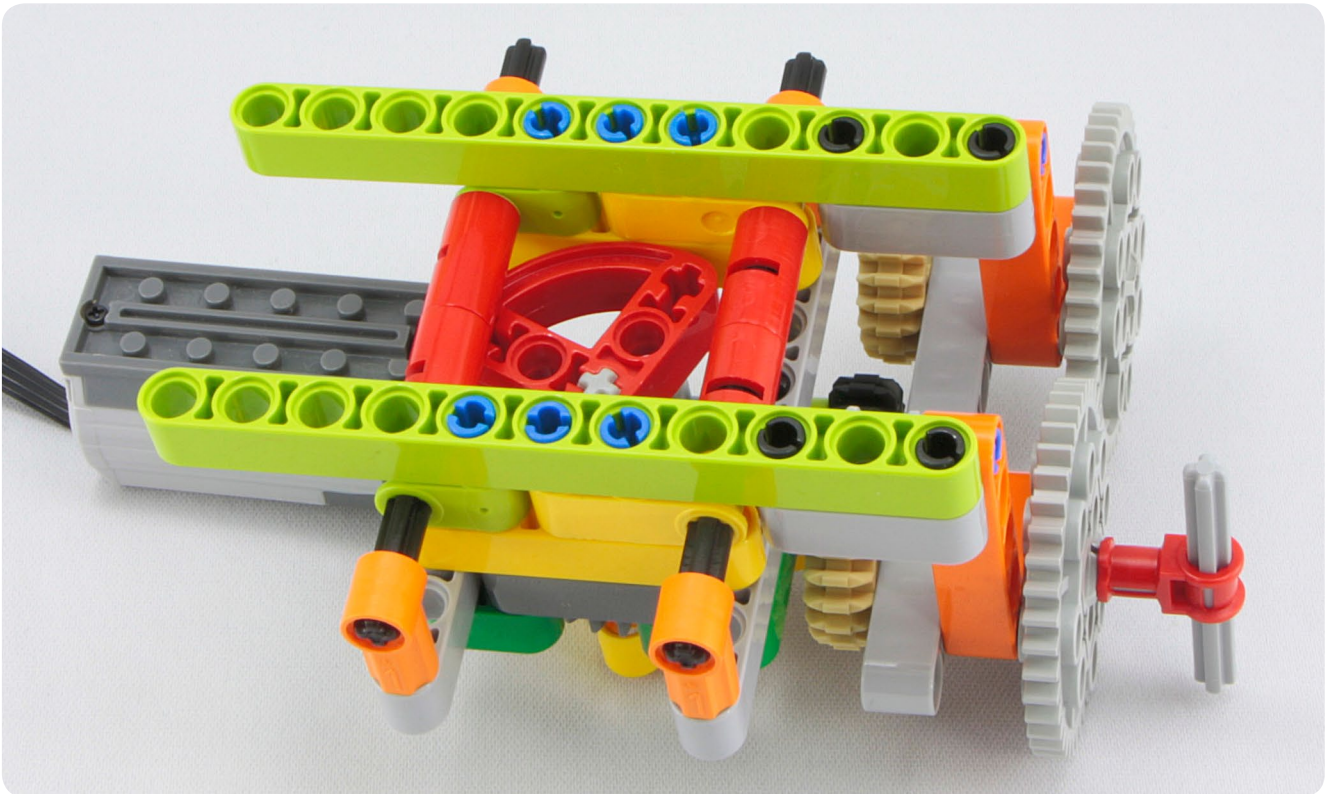
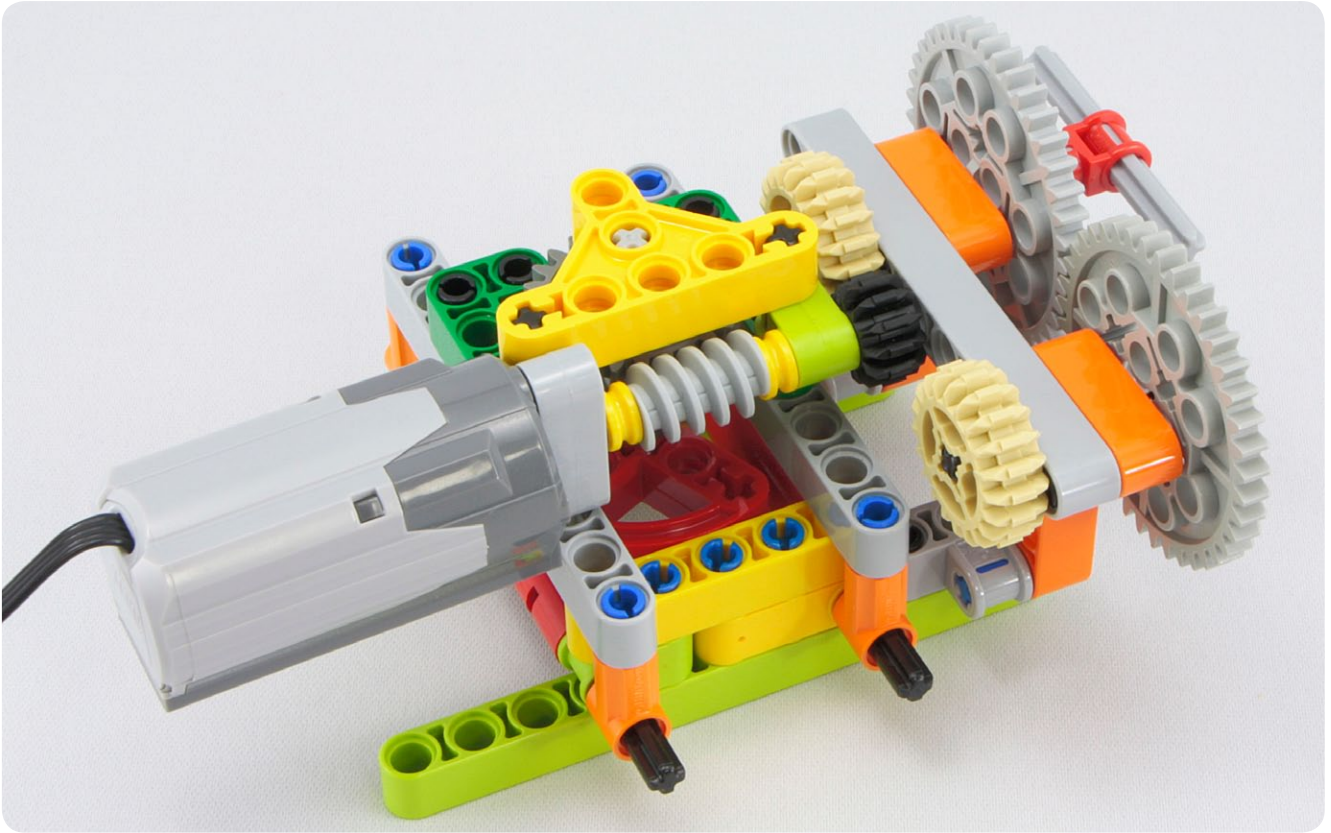


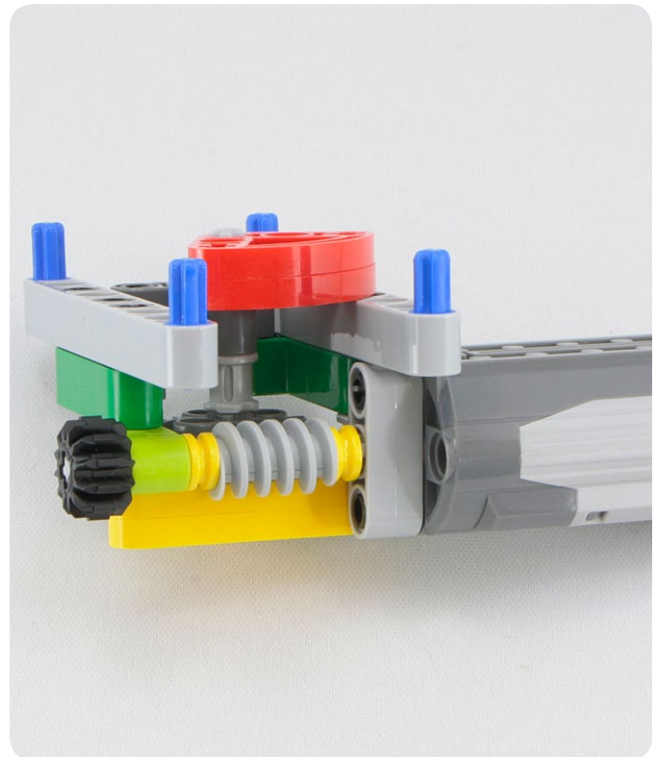
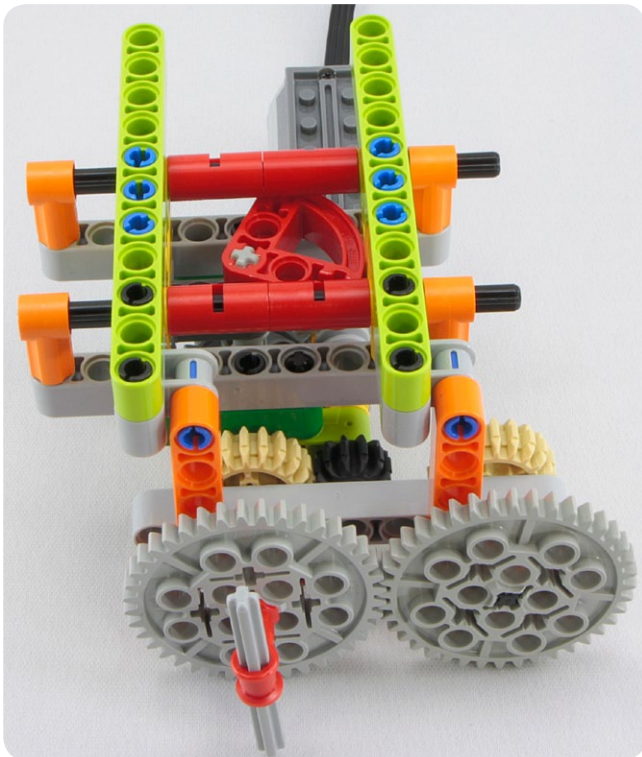
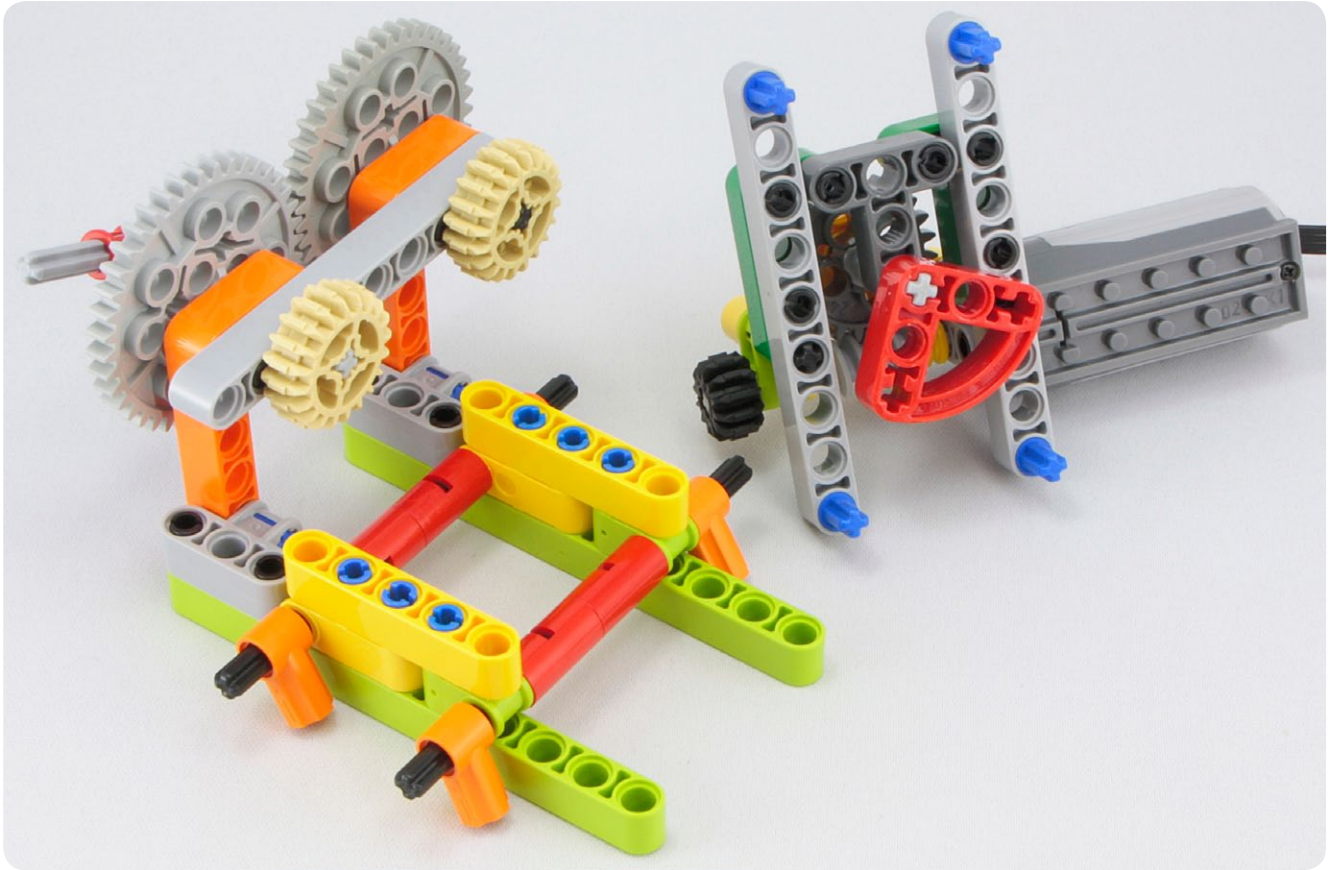
#124

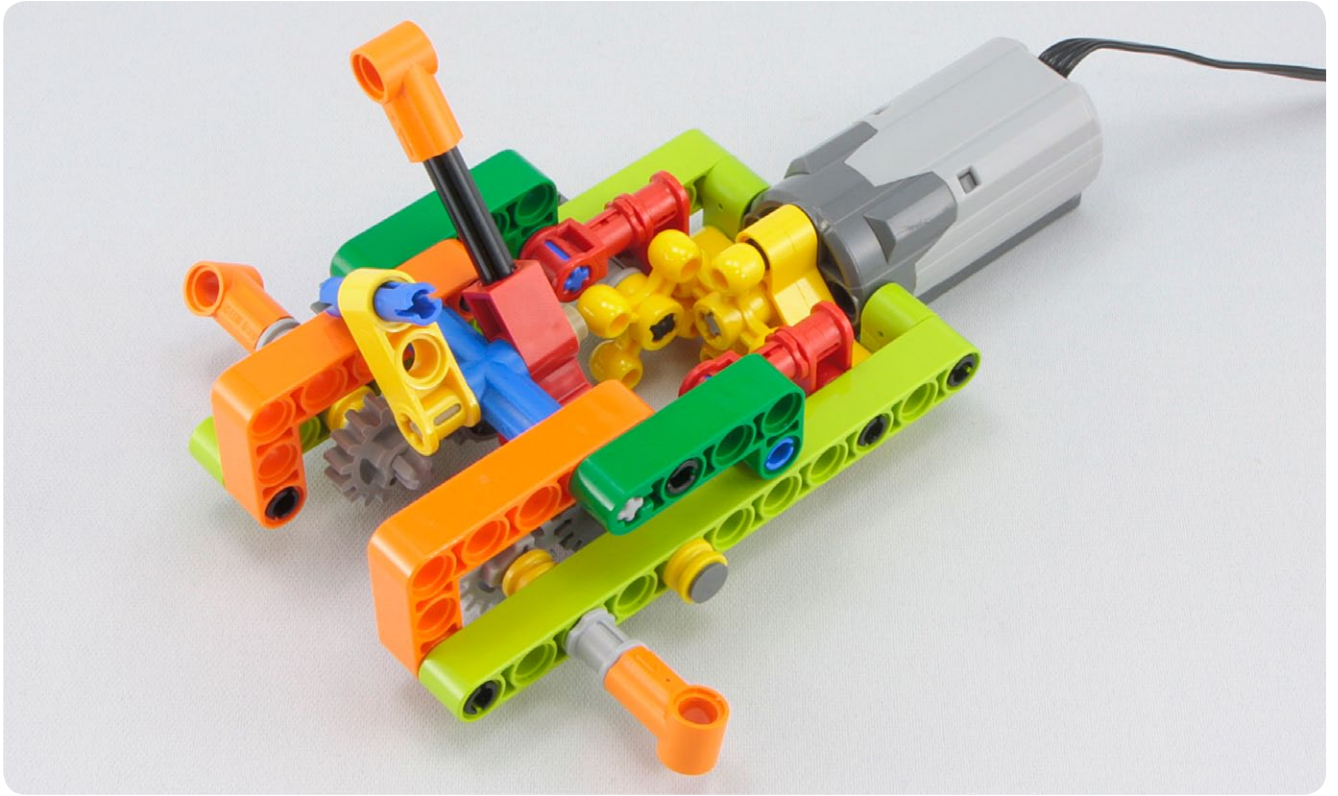
-  Motor
-  x2
- 
-  x2
-  x2
- 
-  x2
-  x2
-  x3
-  x2
-  x2
-  x2
- 
-  x2
-  x2
-  x2
-  x3
-  x4
-  x2
-  x3
-  x4
-  x3
-  x3
-  x2
-  x2
-  x2
-  x6
-  x6
-  x16

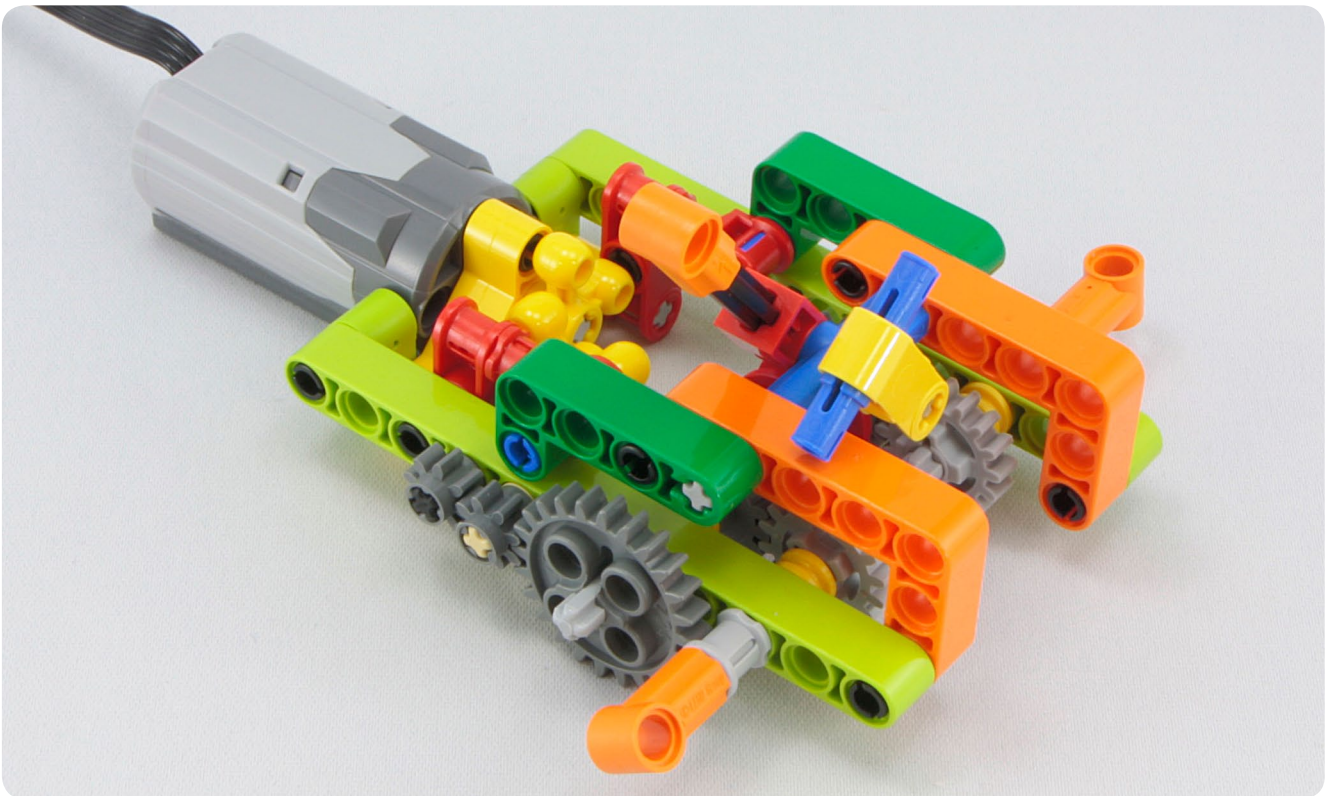
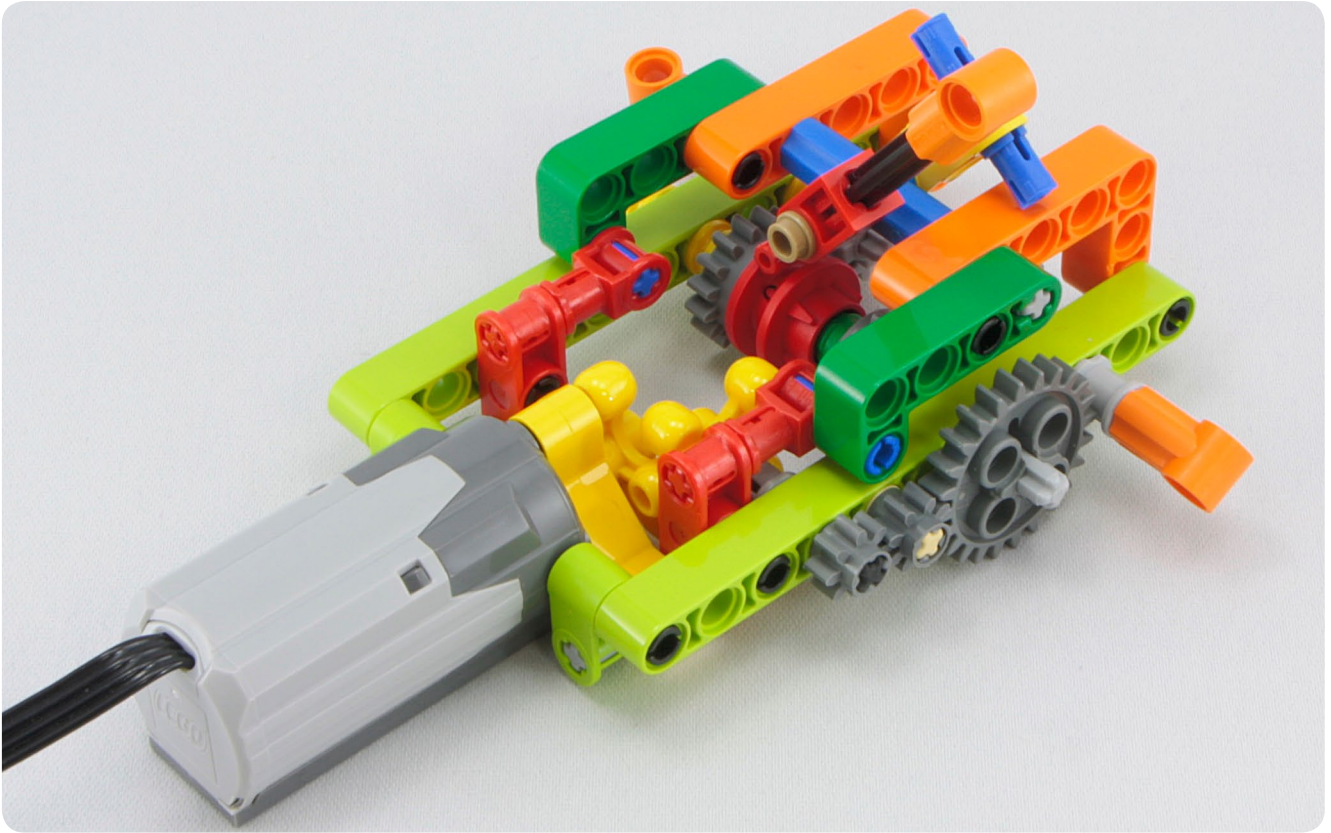


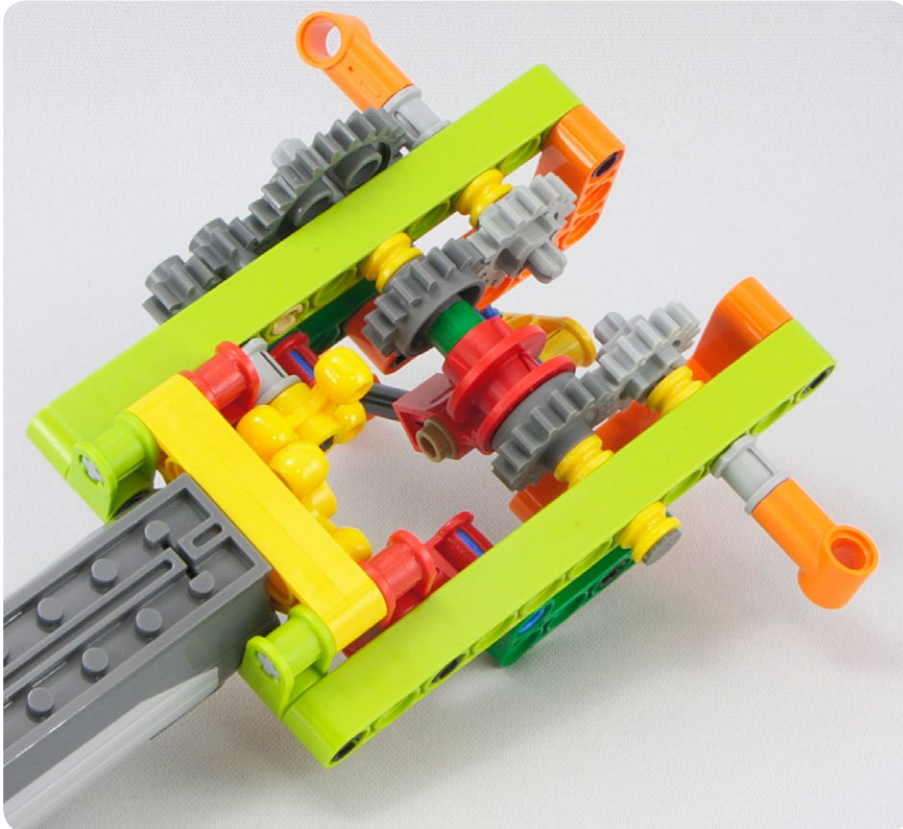
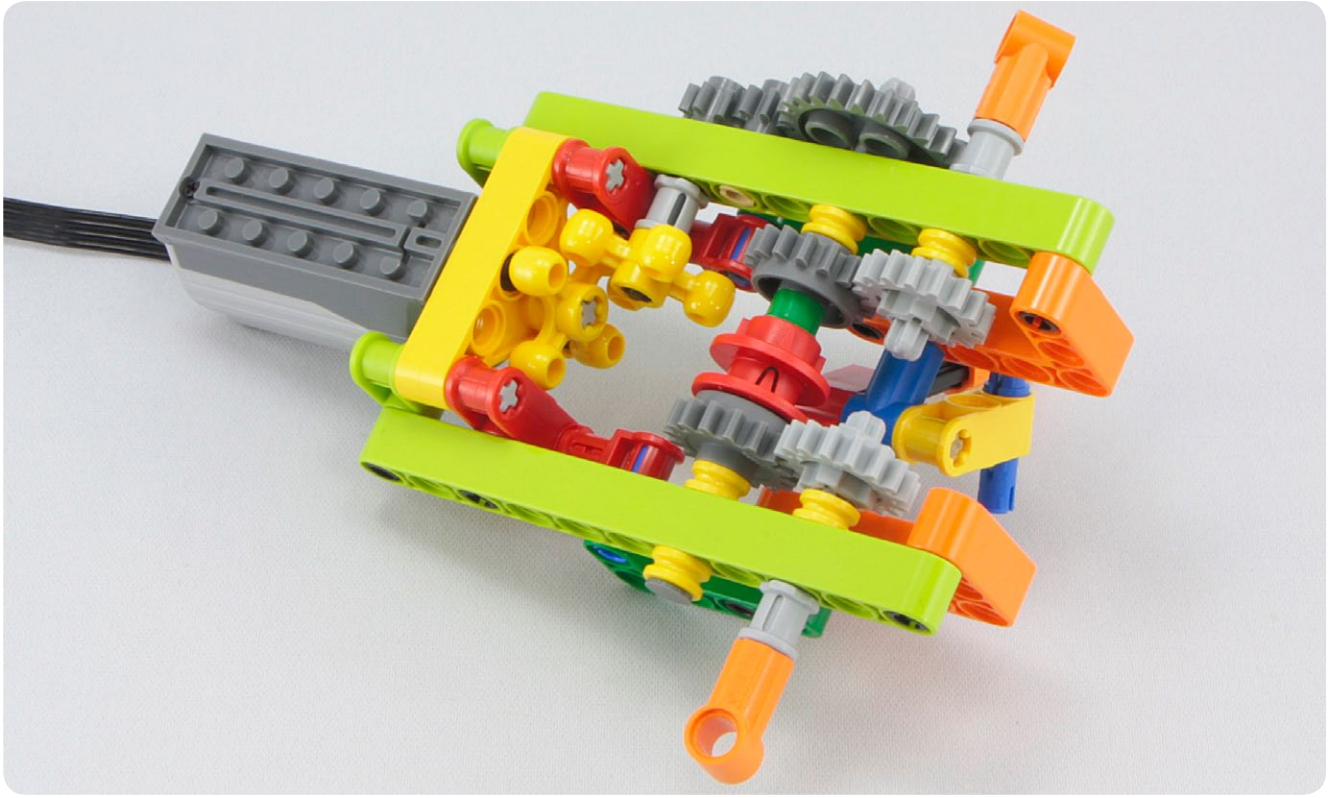




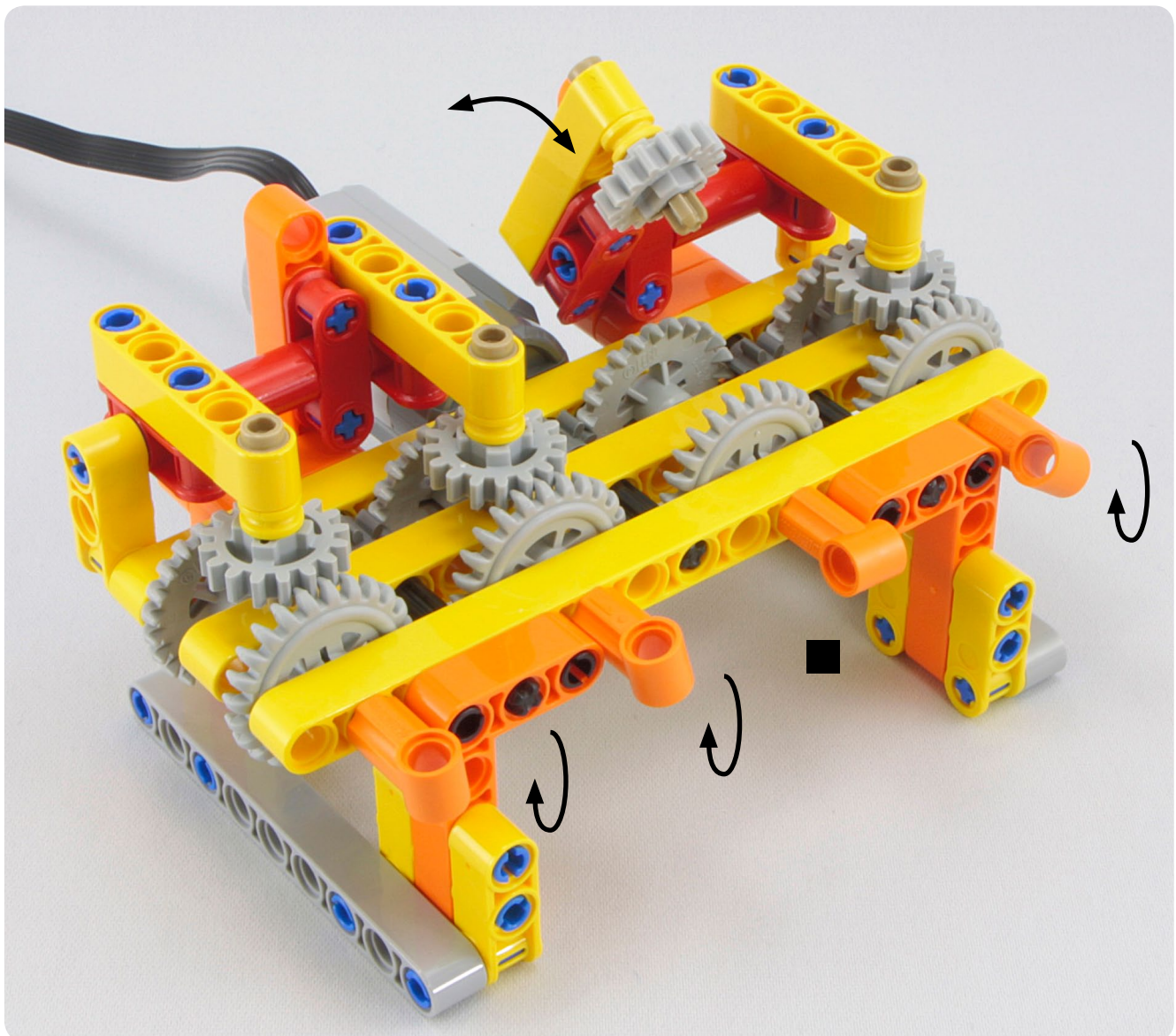
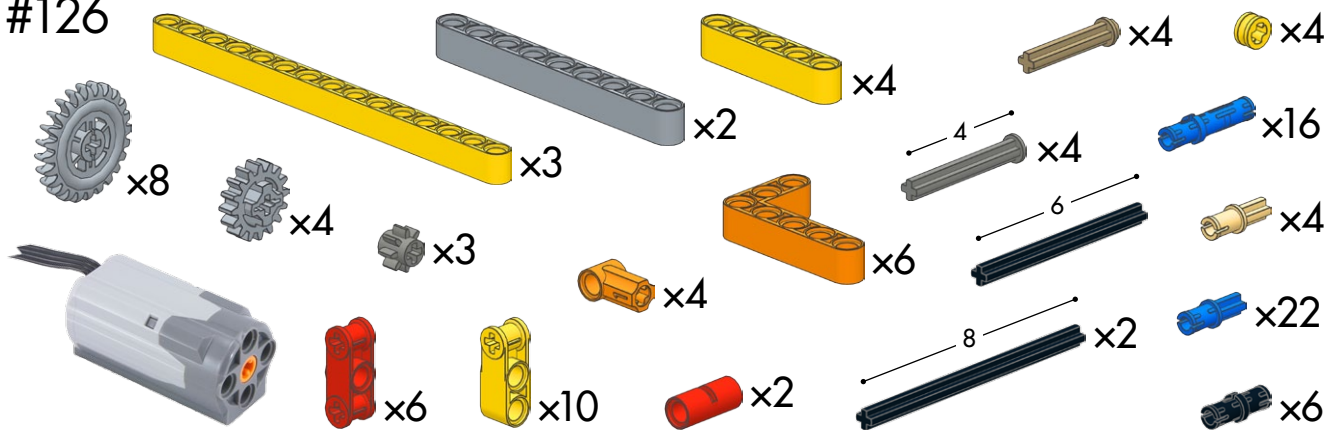


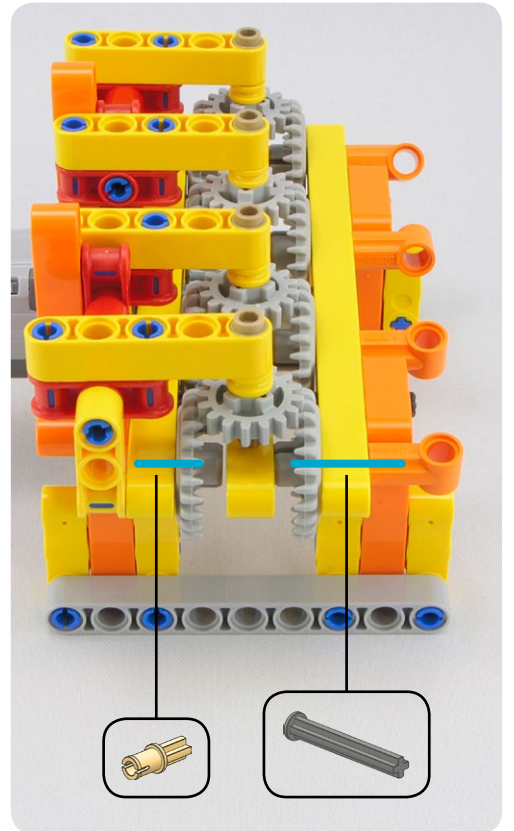
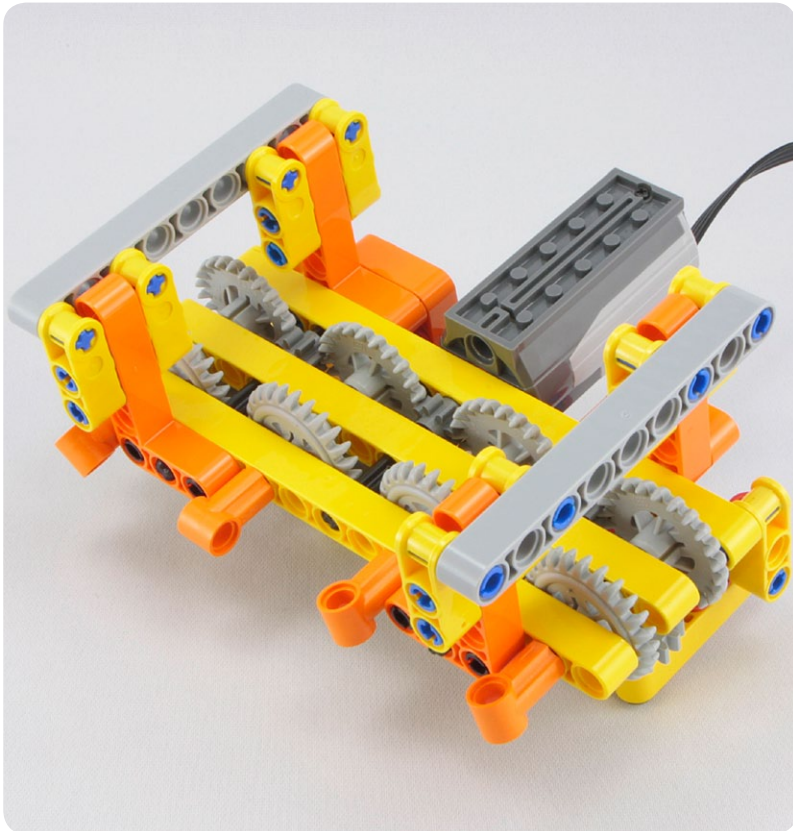
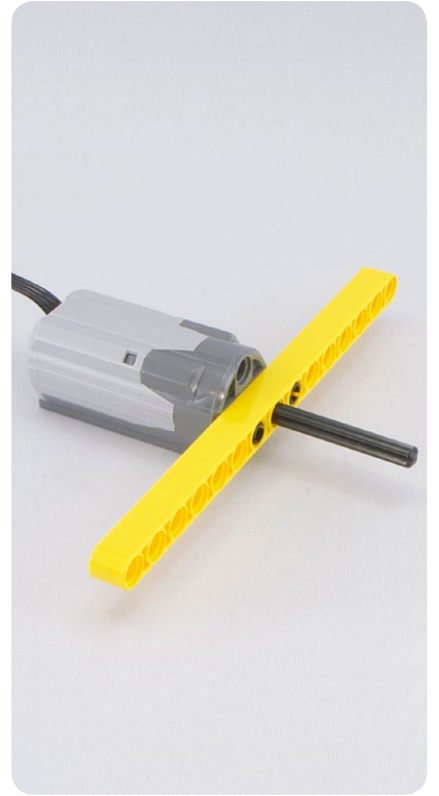
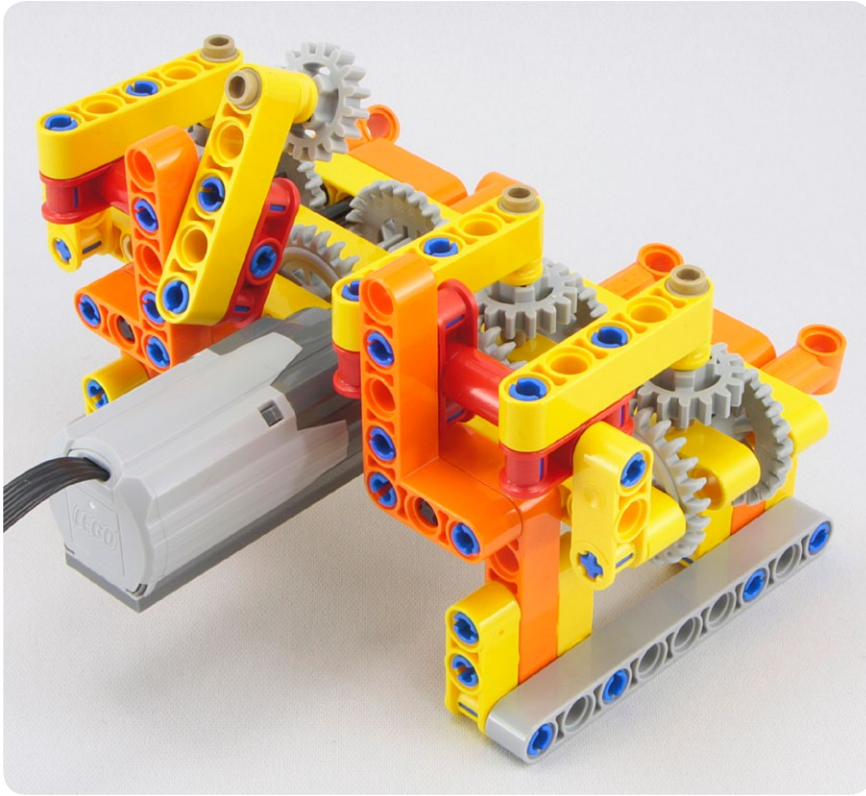








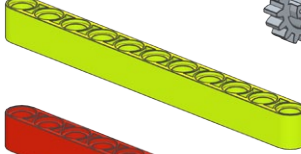

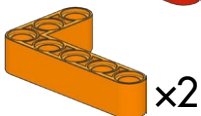
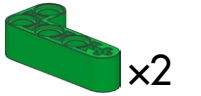




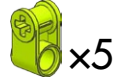
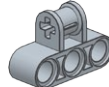
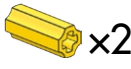



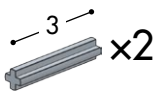



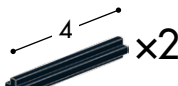
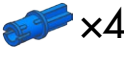








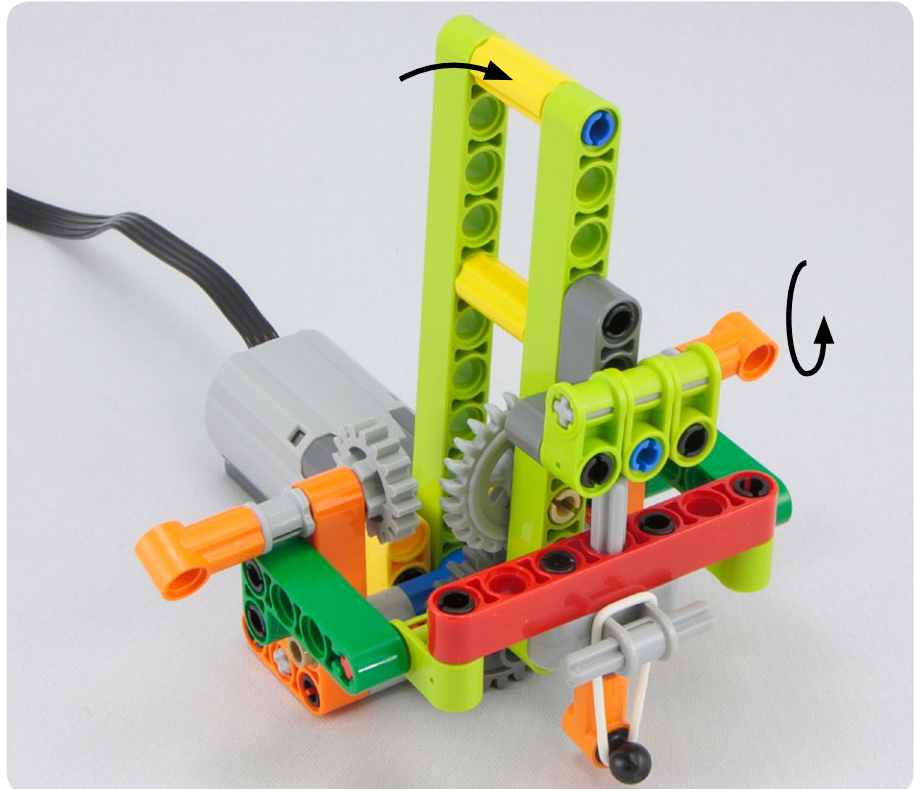
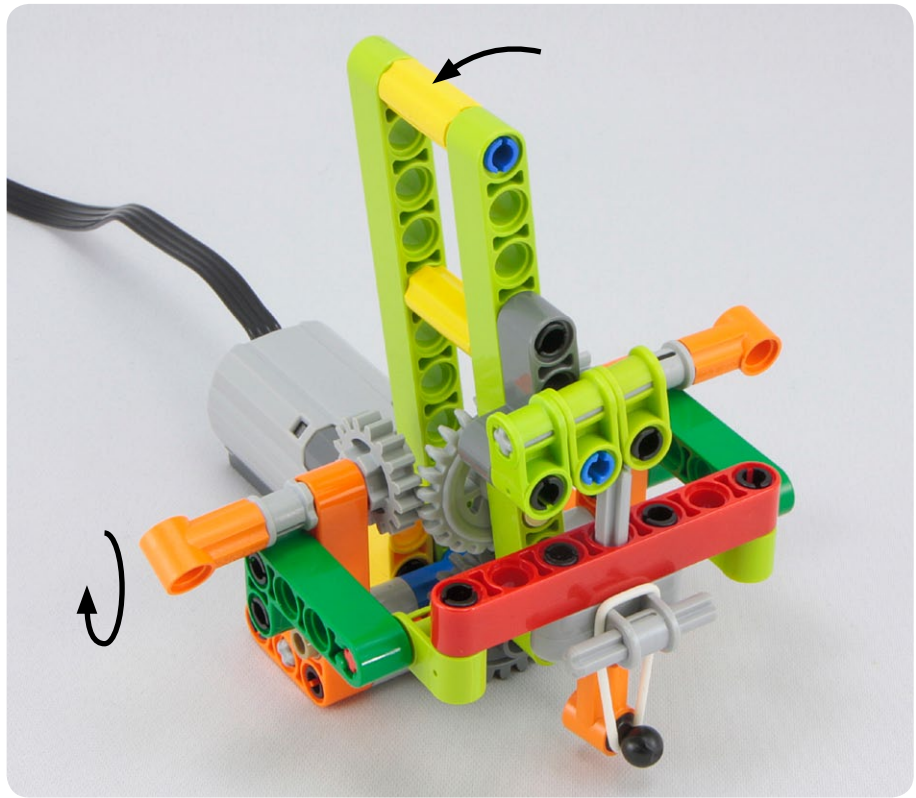
#126

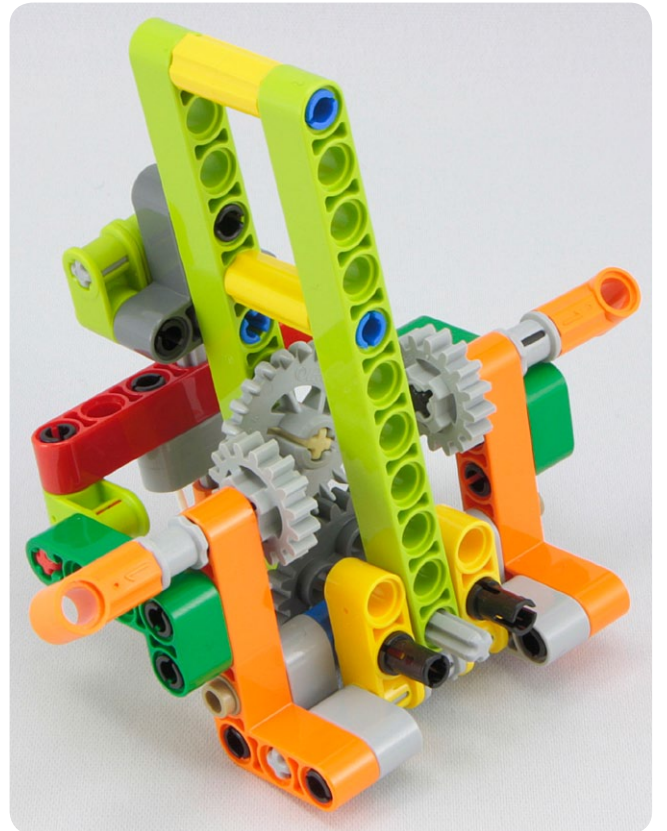
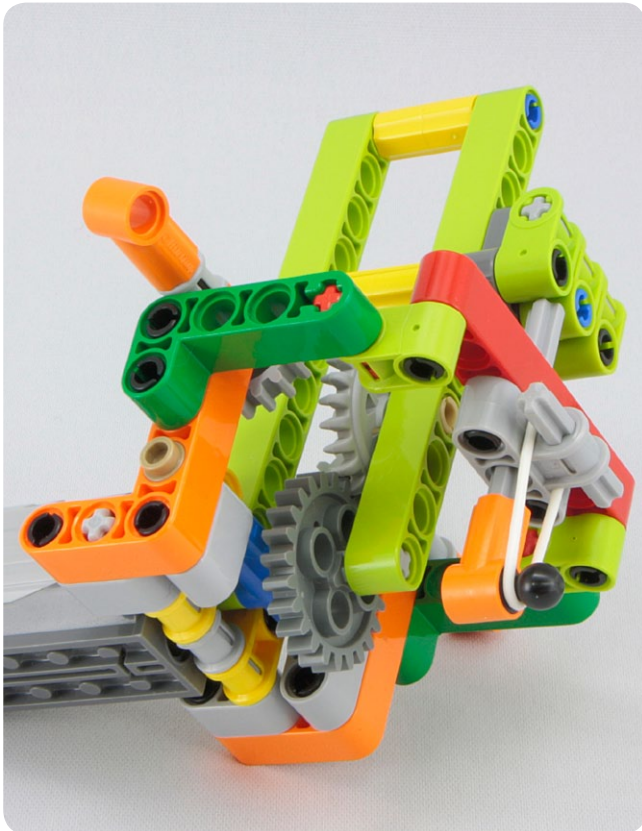
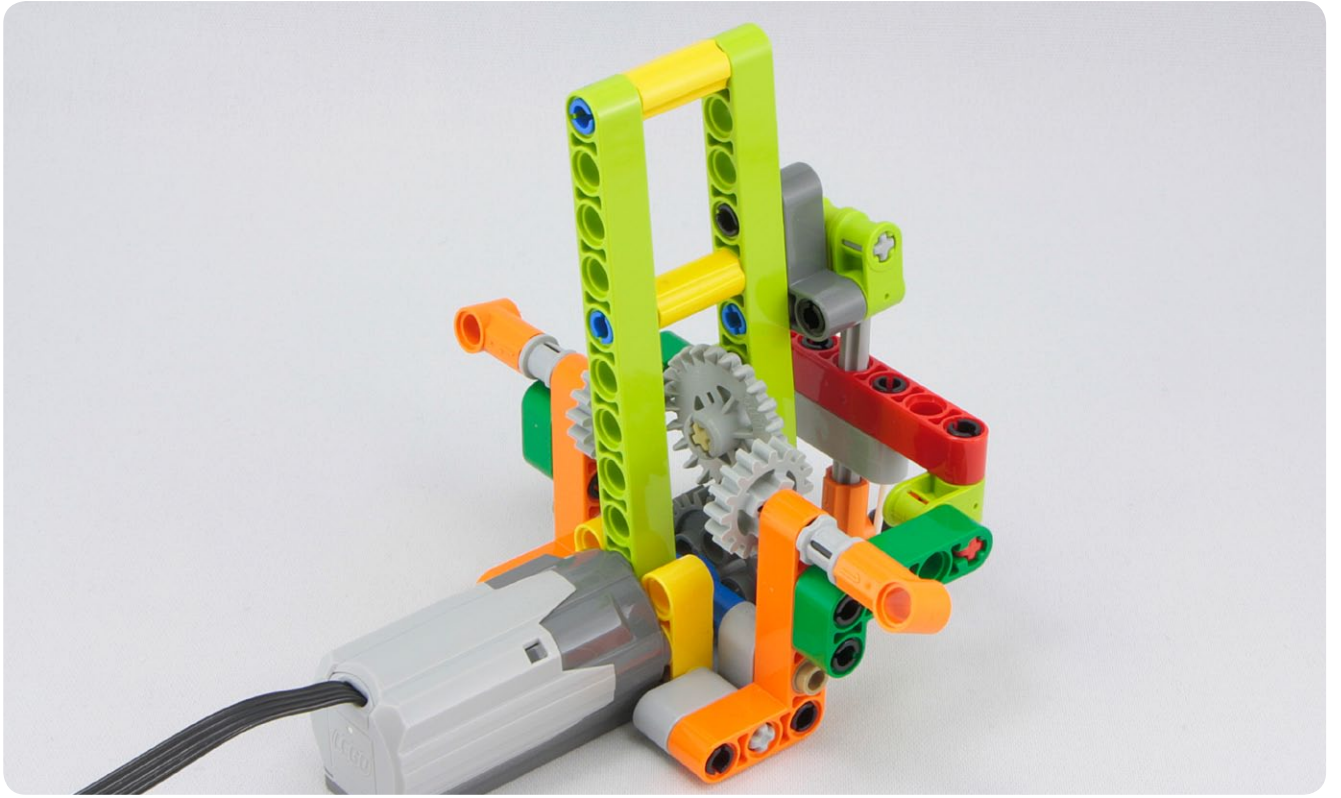




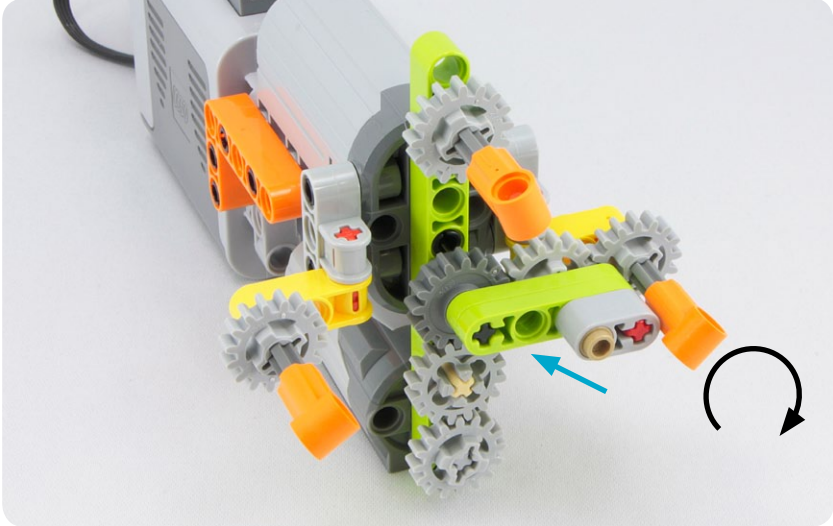
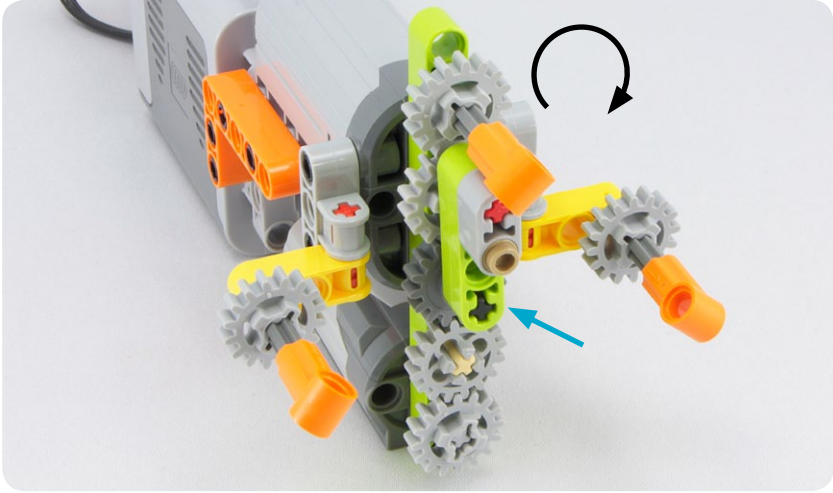
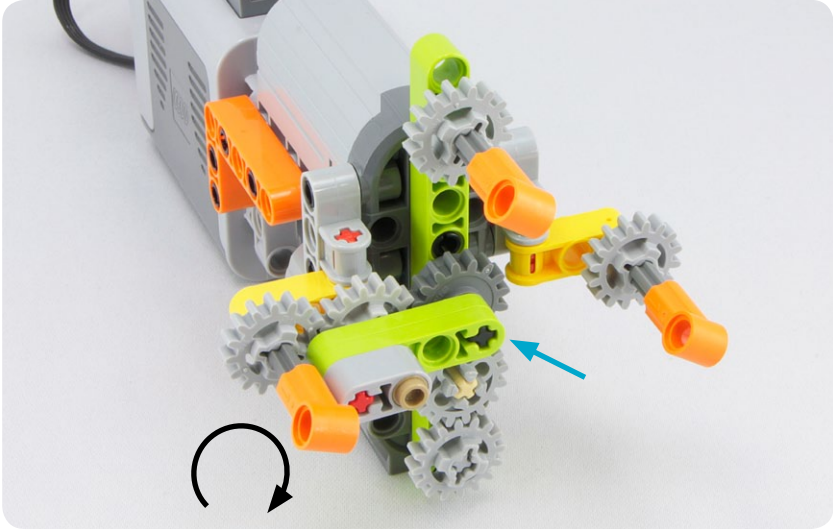
#127

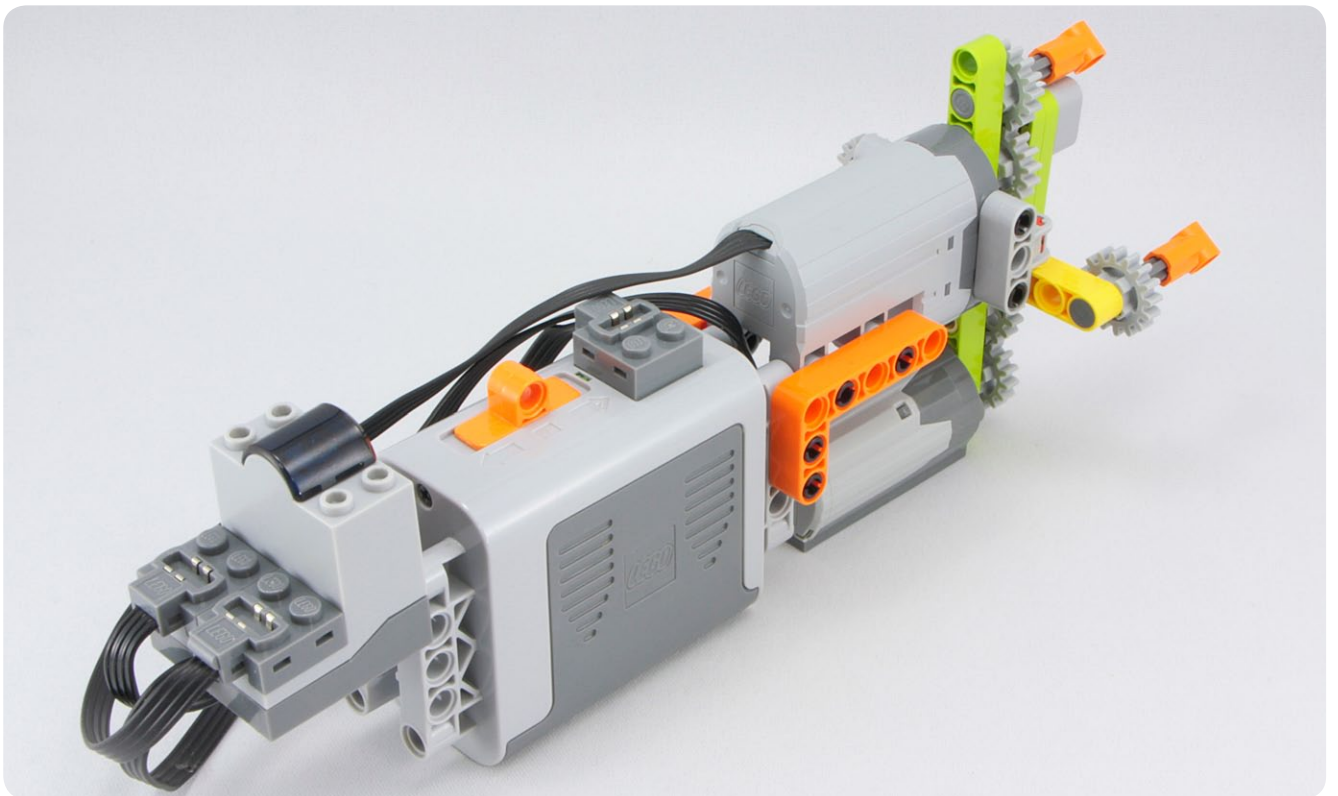
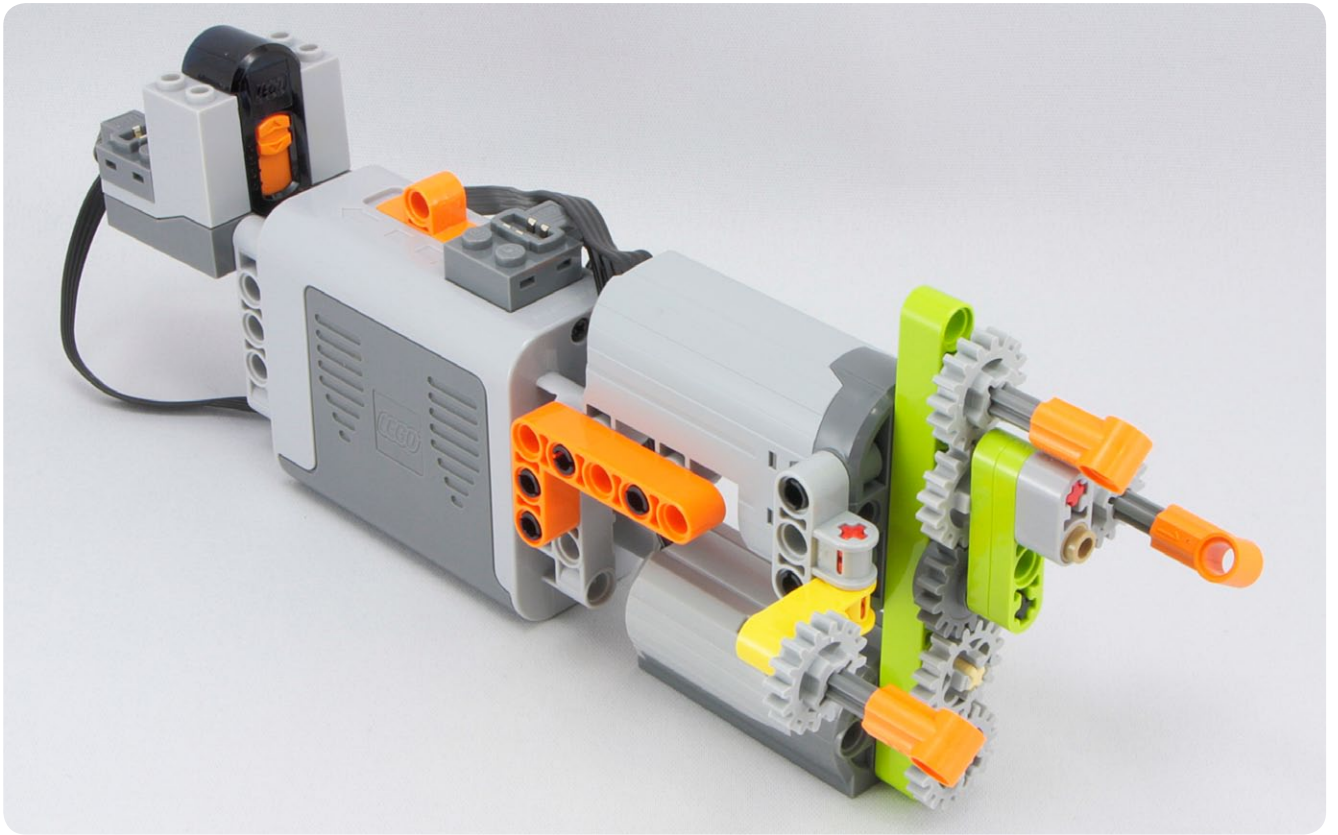
-     x2
-  x2
-  x2
-  x2
-  x2
-  x4
- 
- 
-  x2
-  x5
- 
-  x2
-  x3
-  x2
- 
-  x2
-  x3
-  x2
- 
-  x2
- 
-  x2
- 
-  x2
-  x4
-  x2
-  x17

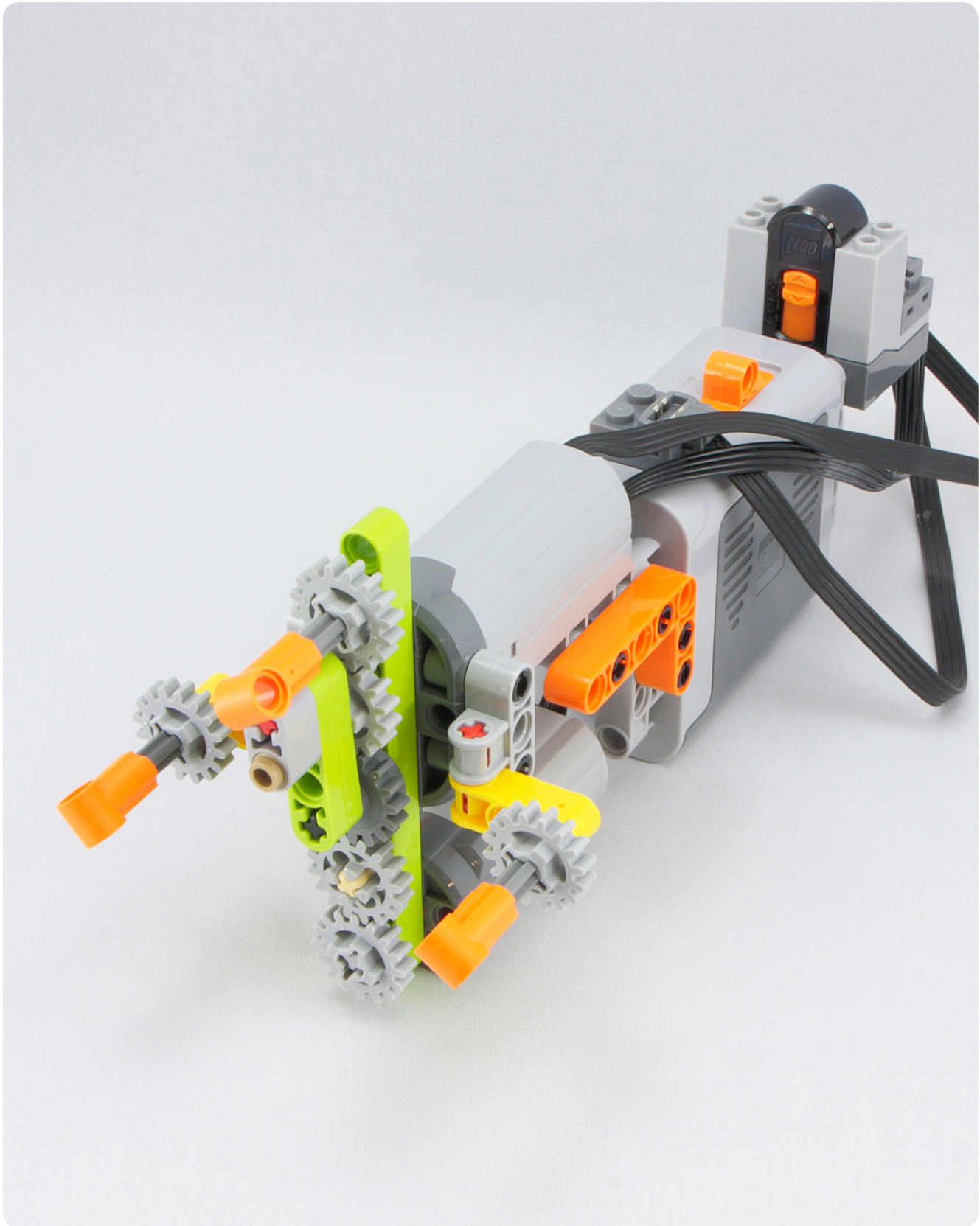


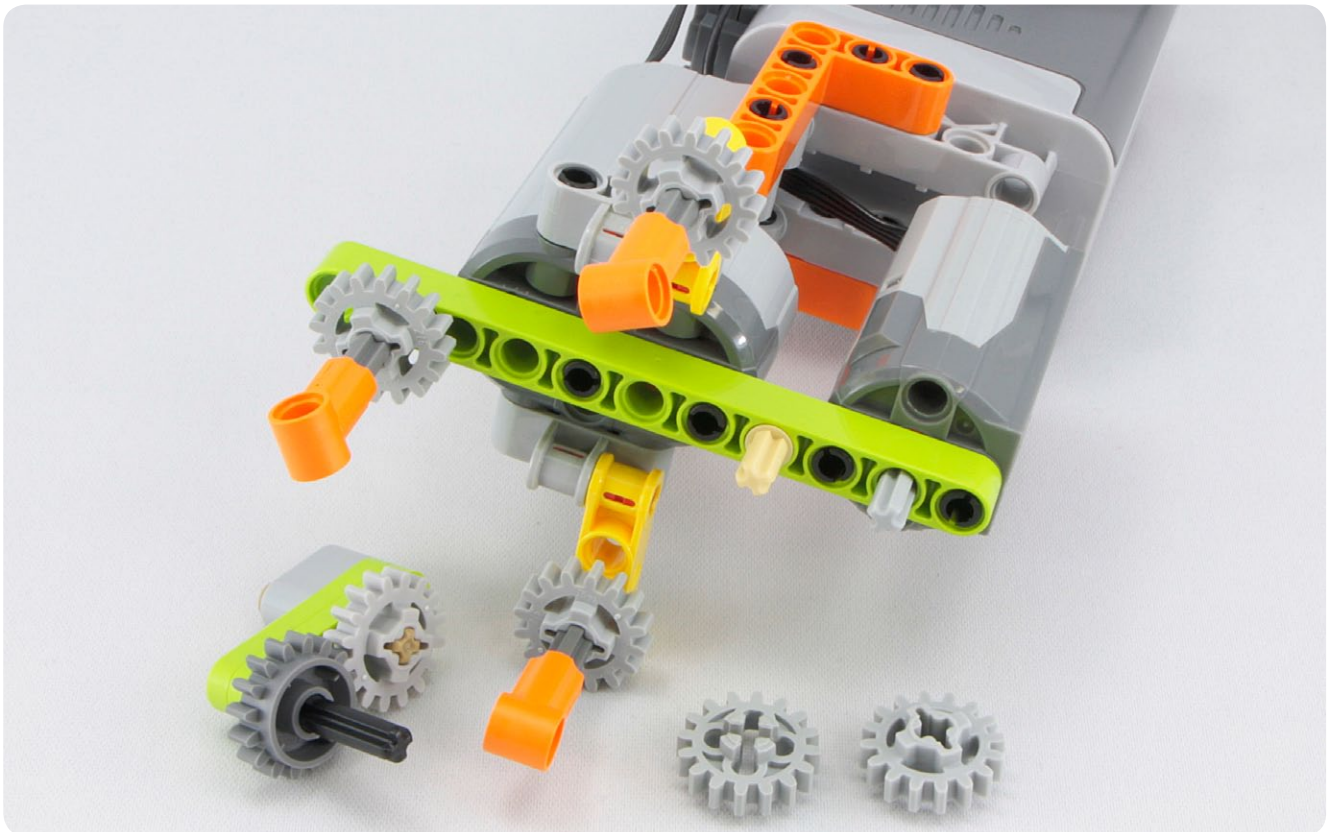


#128



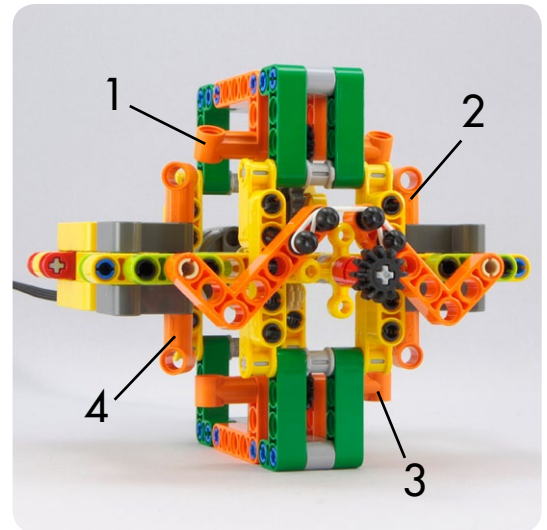
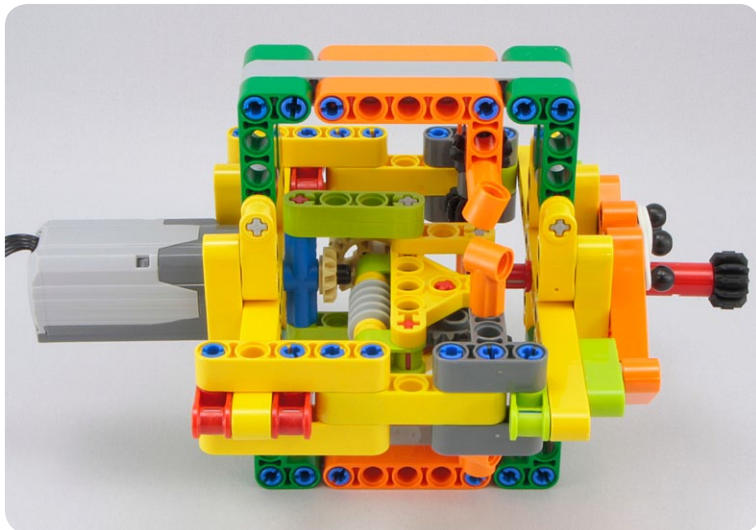


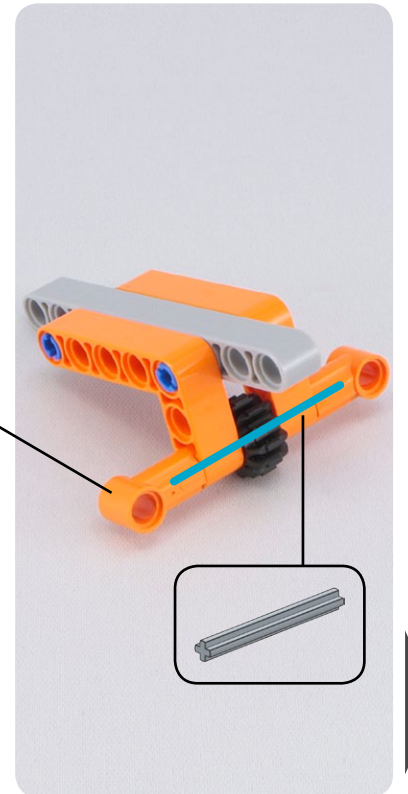
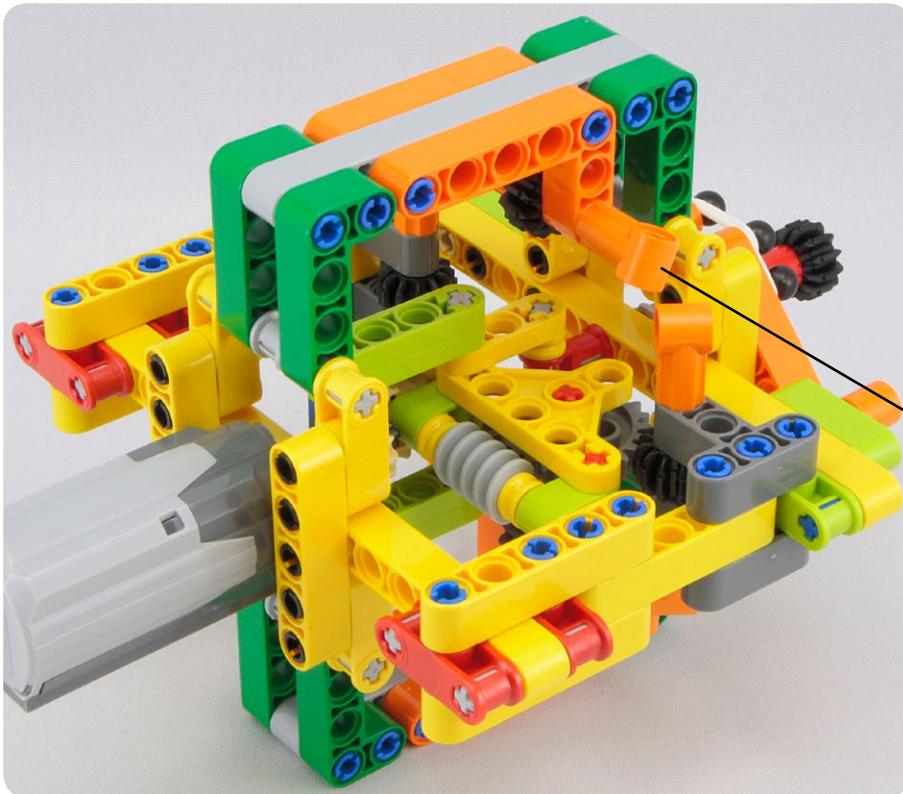
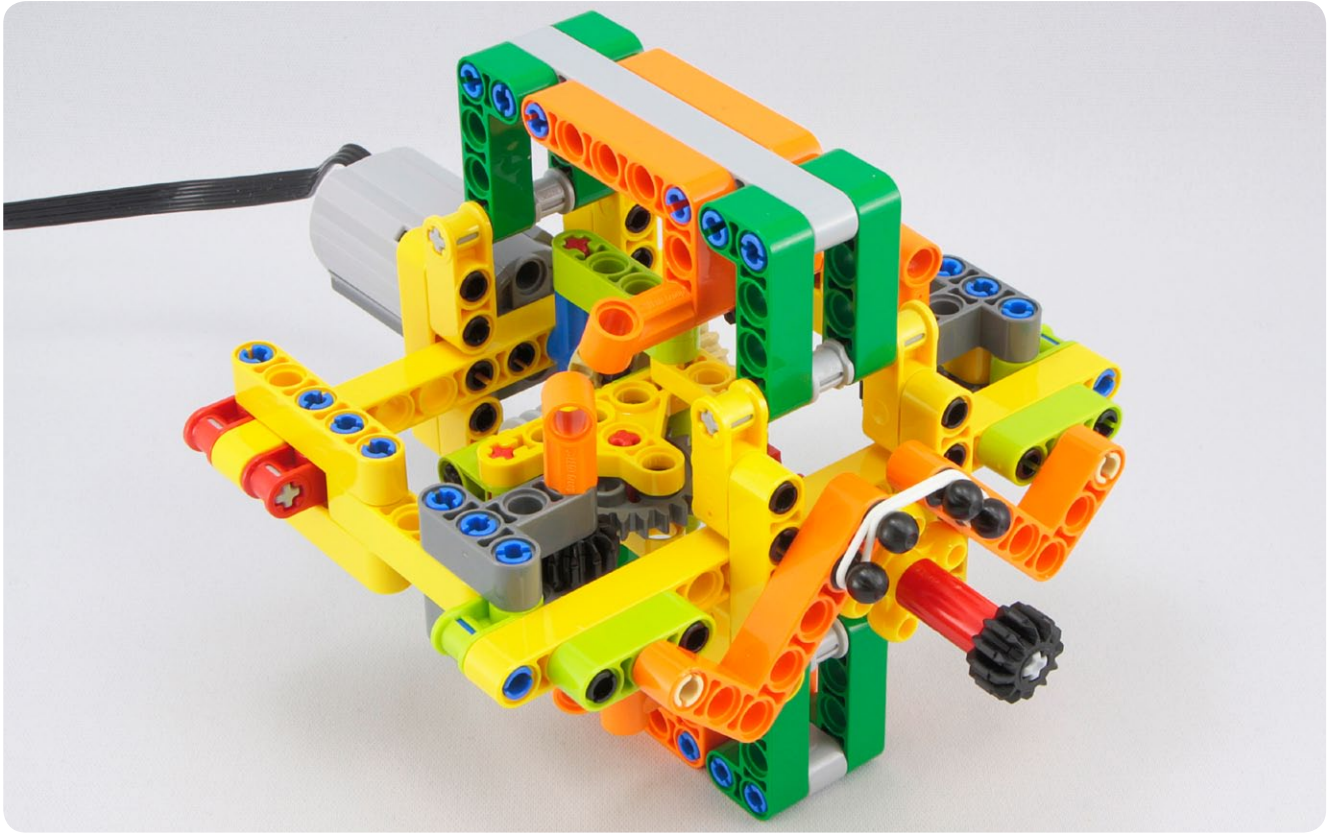


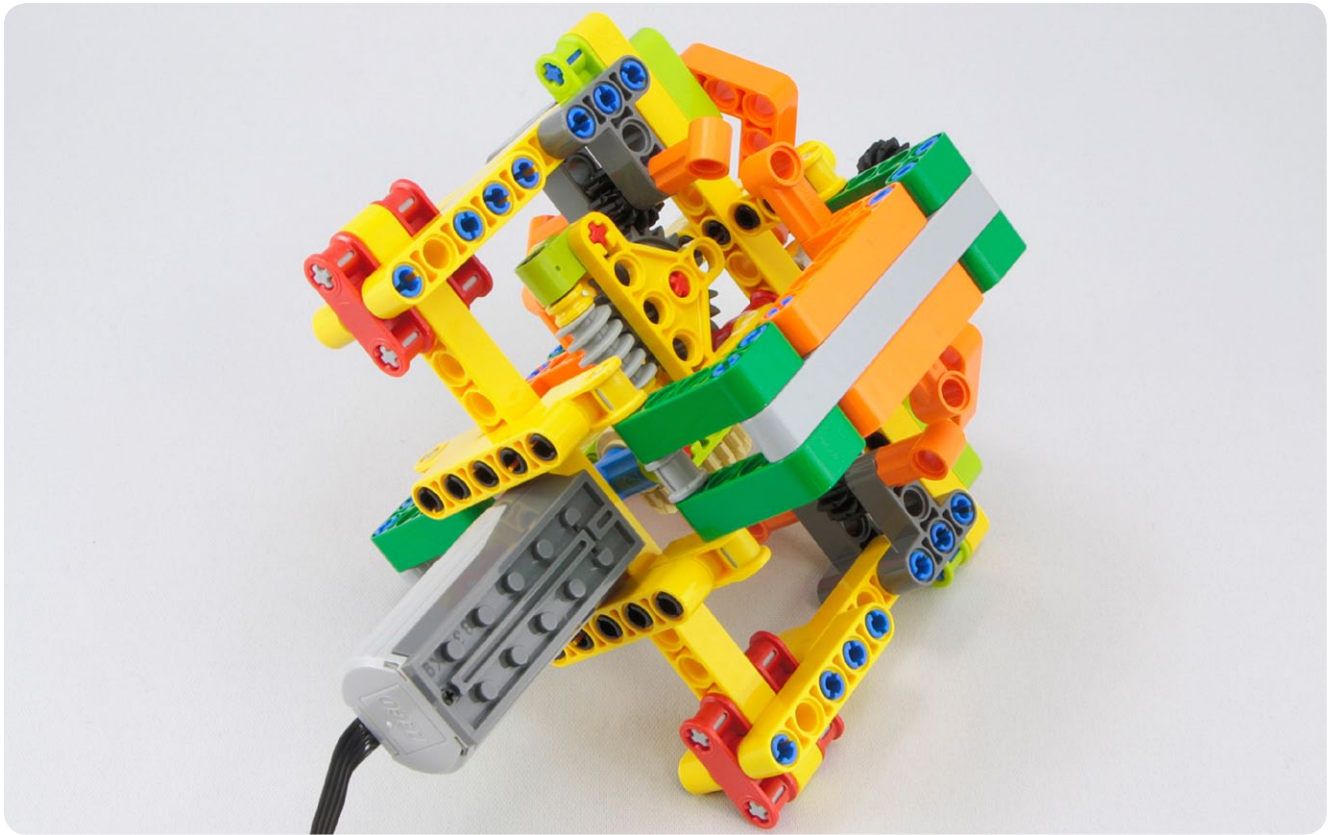


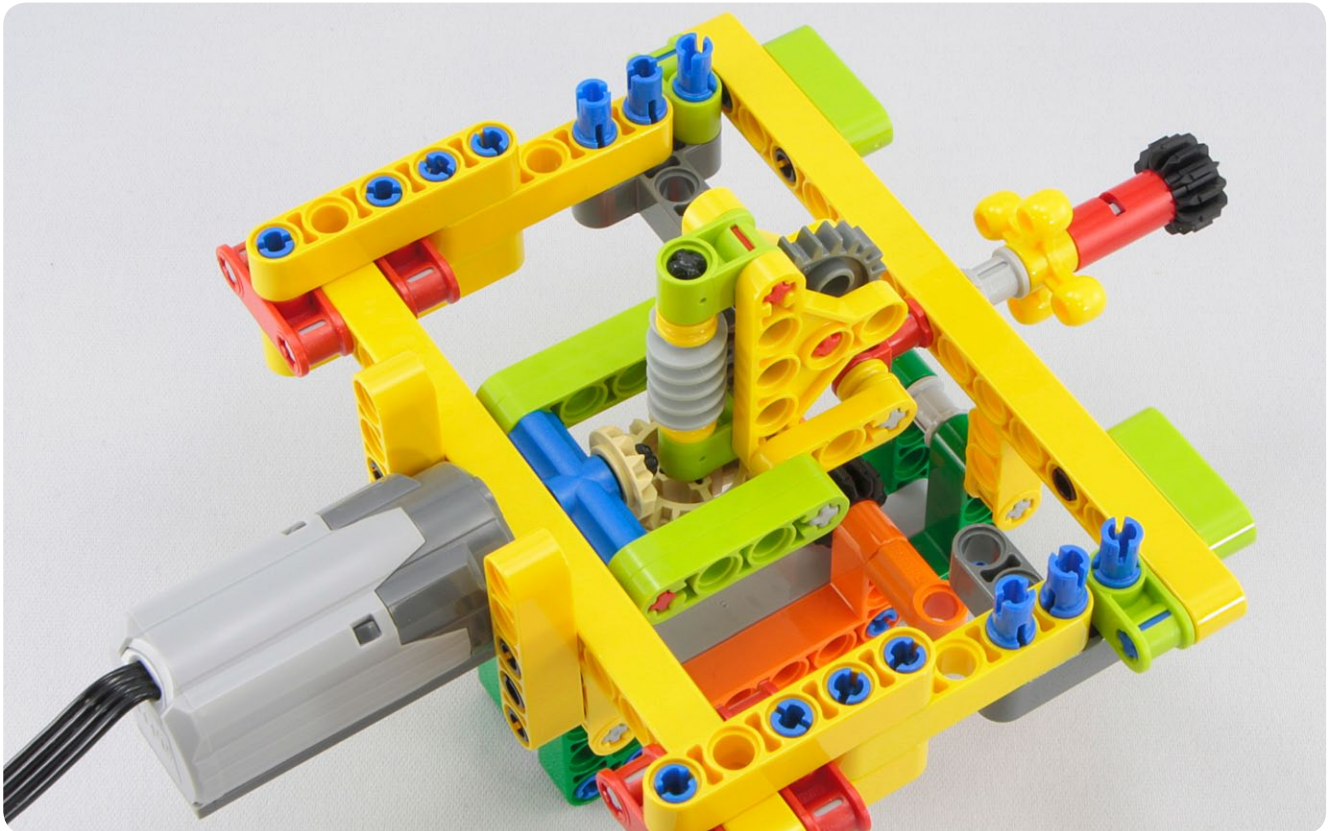
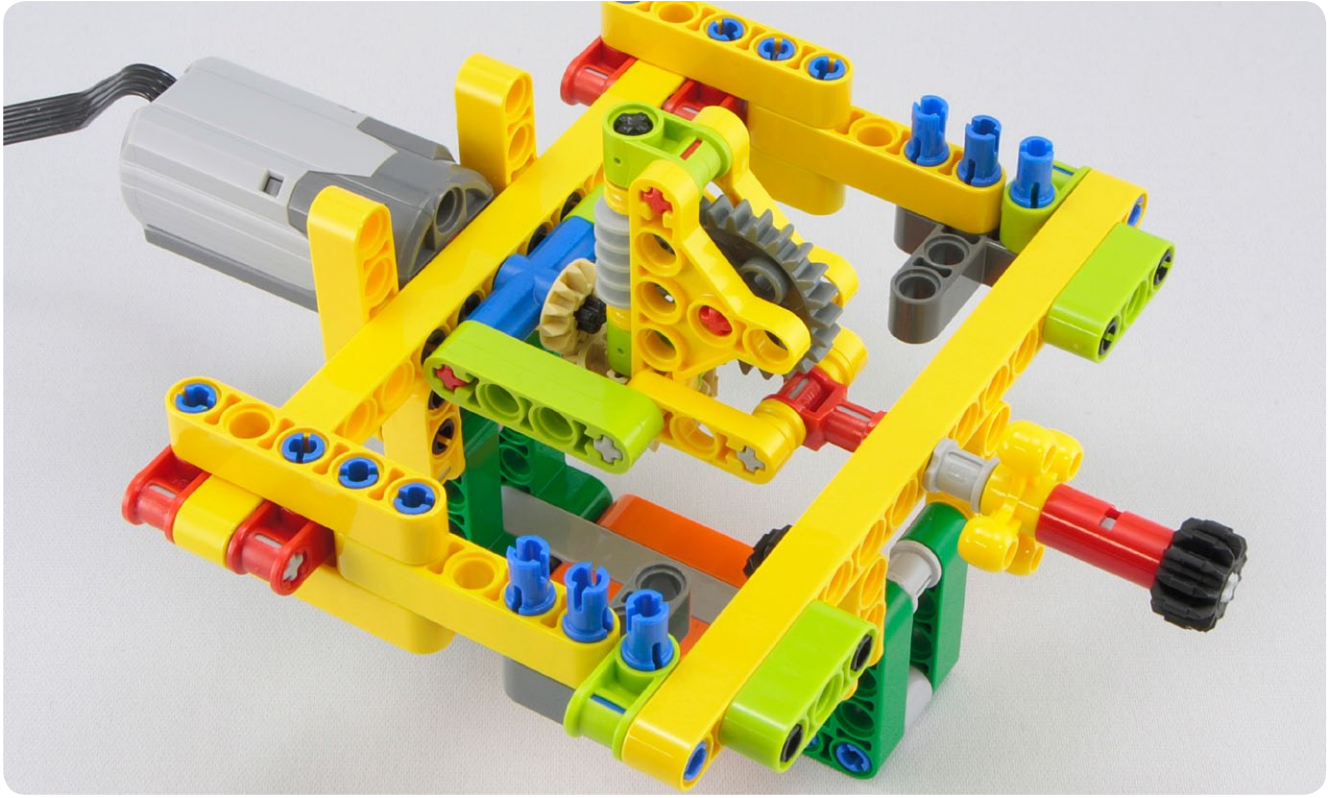
#129

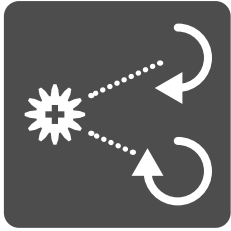
x2	x2	x10	x6	
			x2	x4
		x5		
		x4		
		x8		x4
		x4		
x8	x4		x4	
				x4
				x2
				x2
				x26





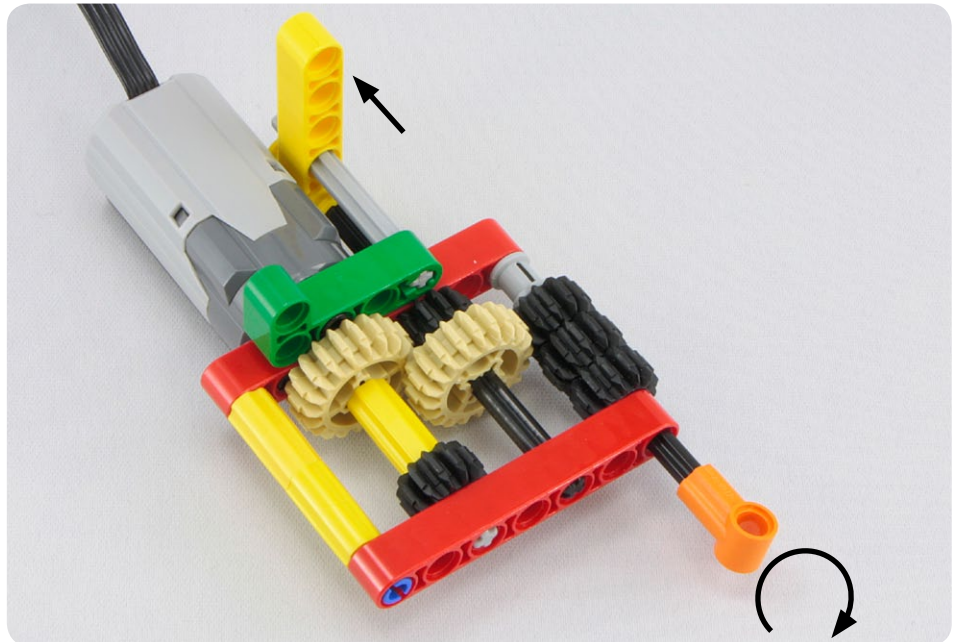
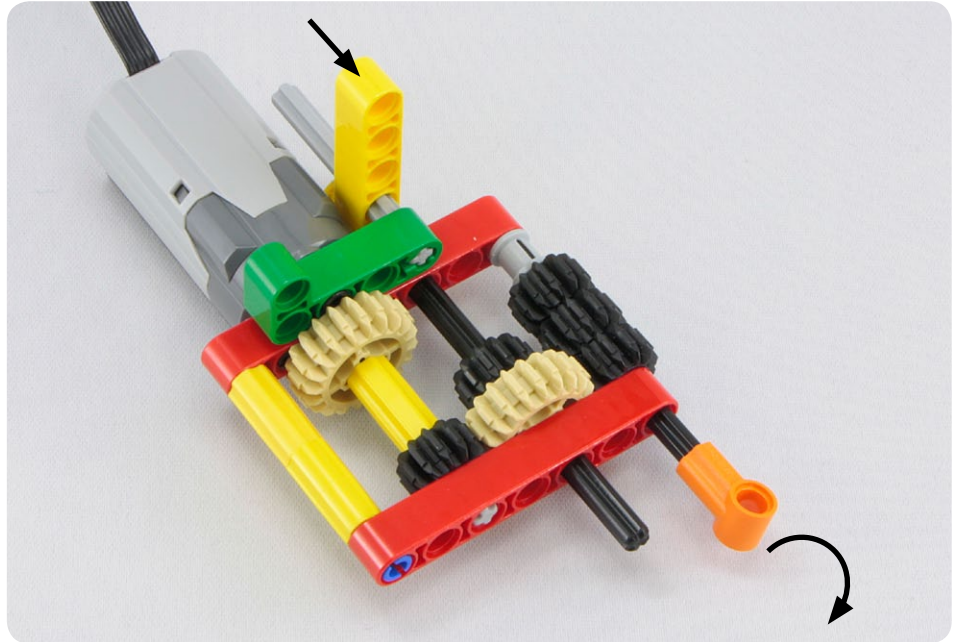
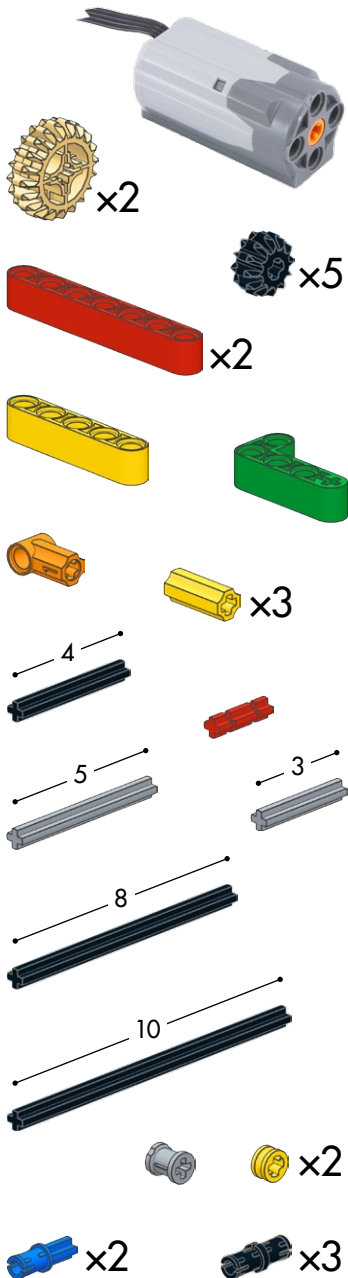


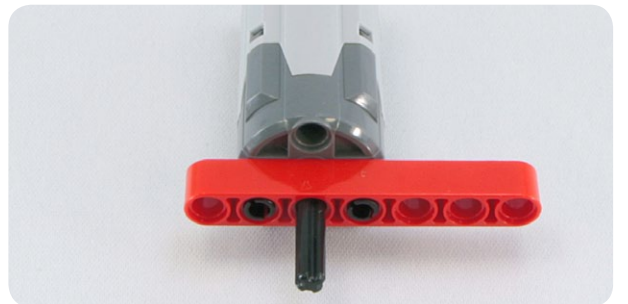
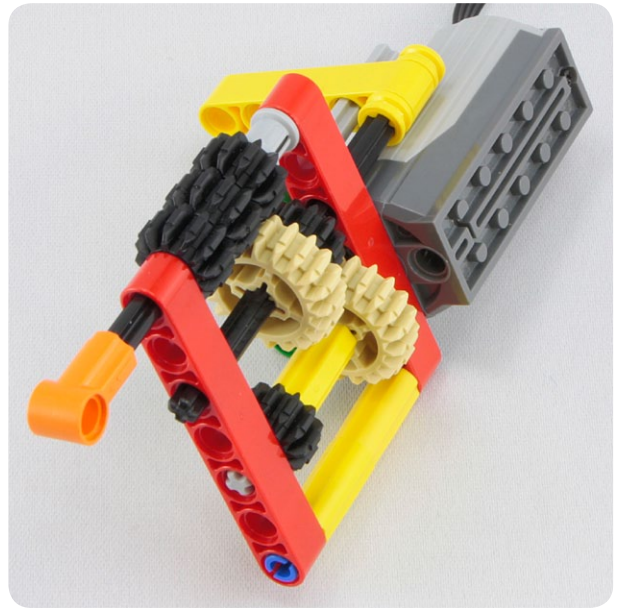
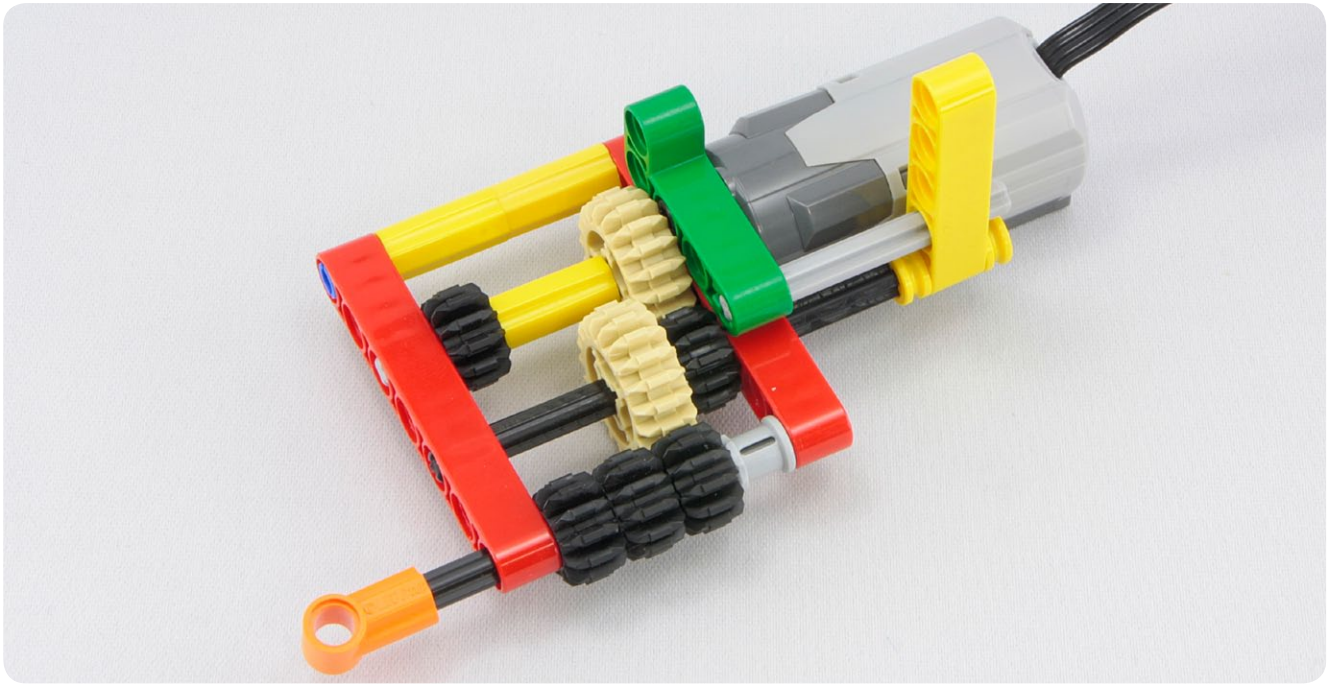


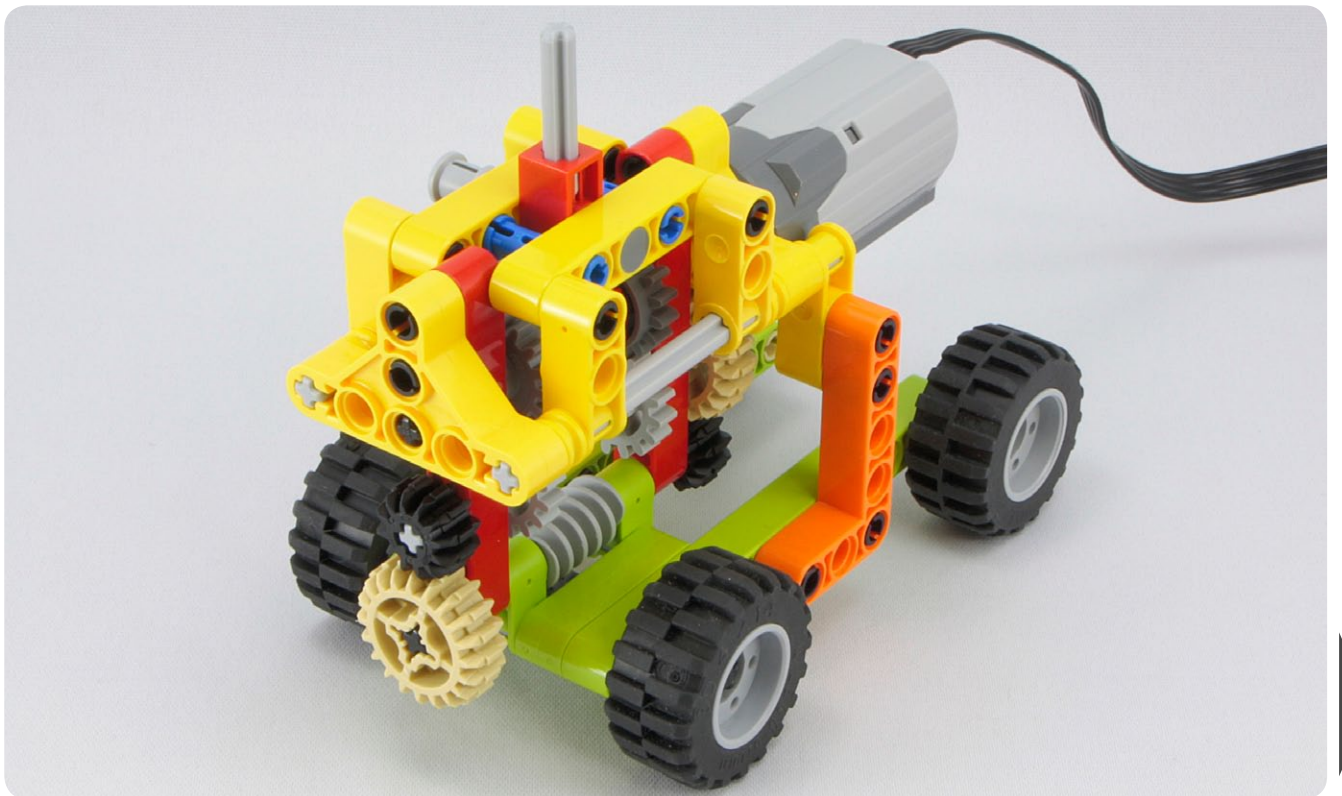


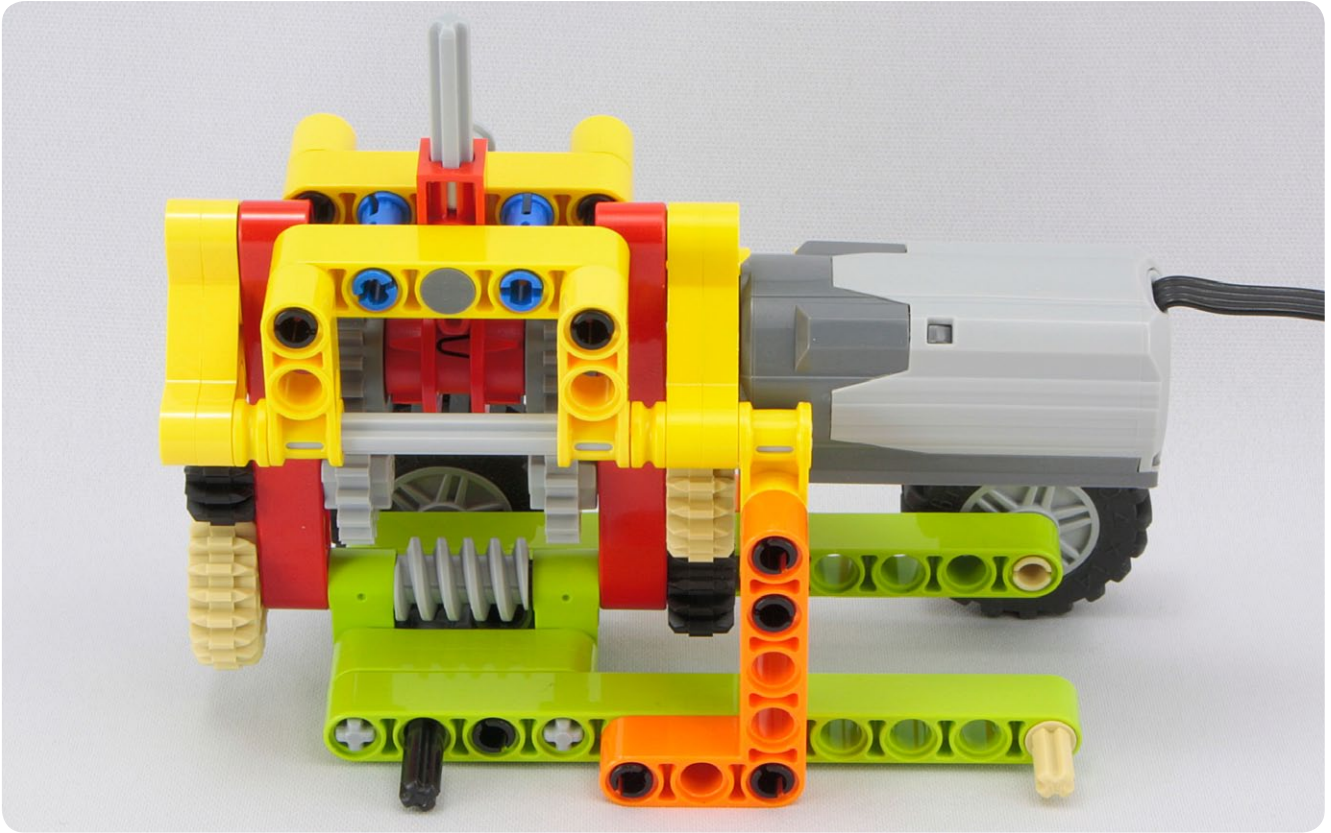
Transmissions

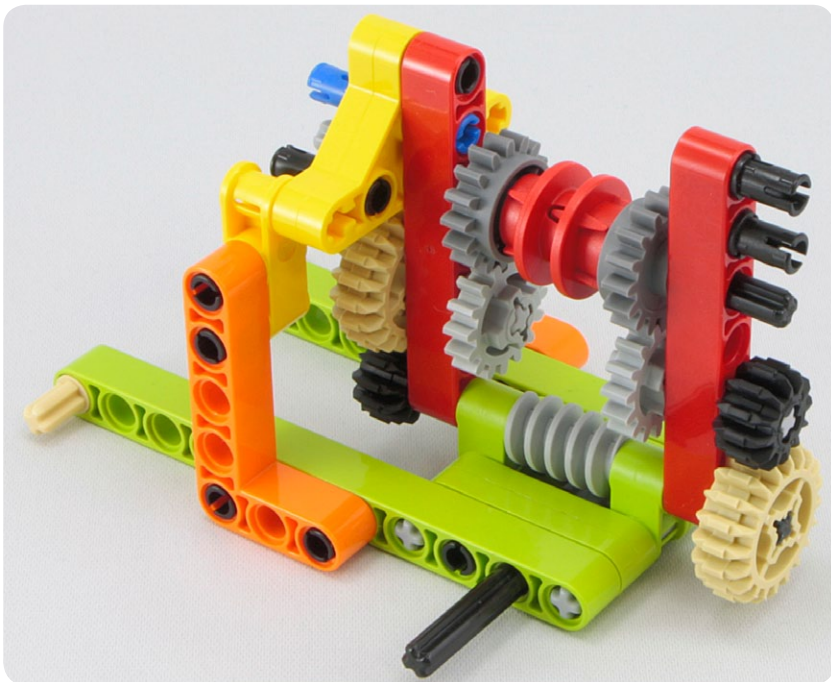
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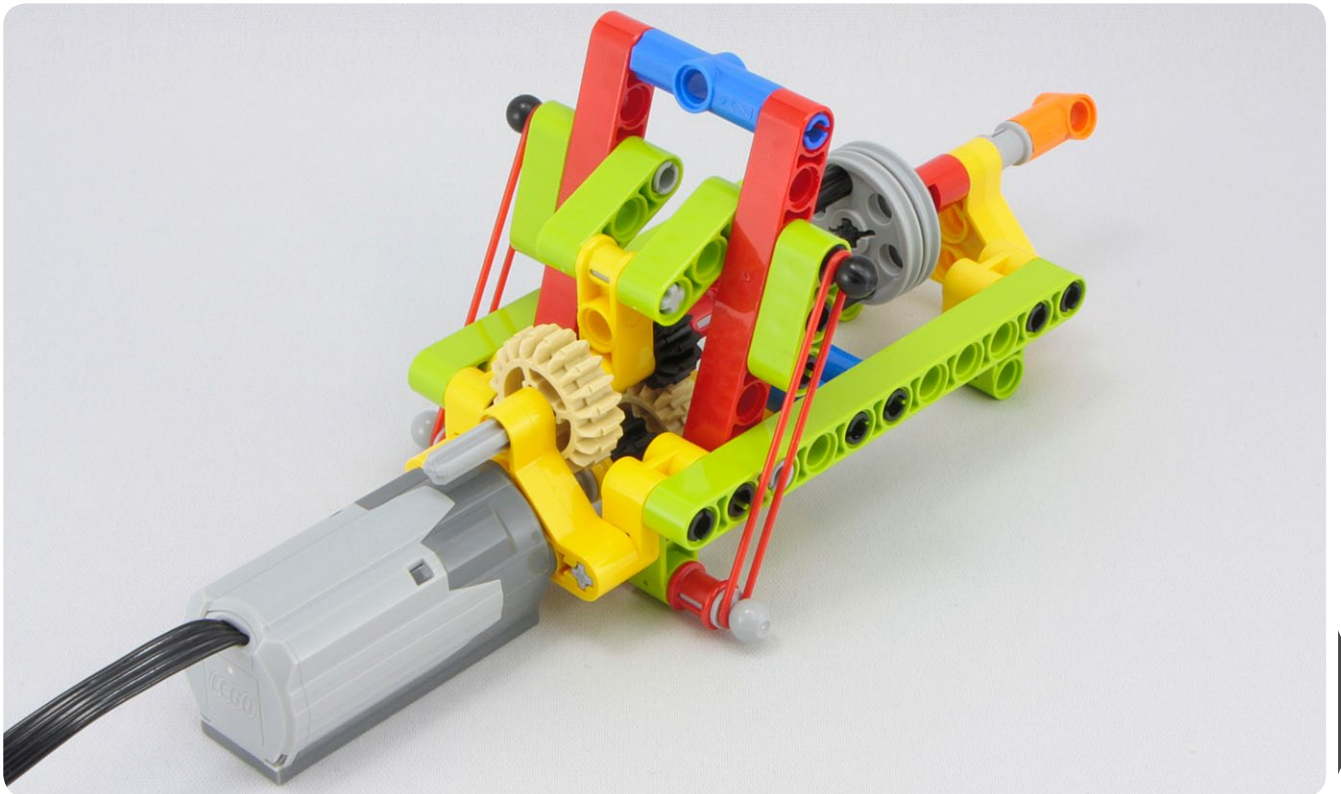
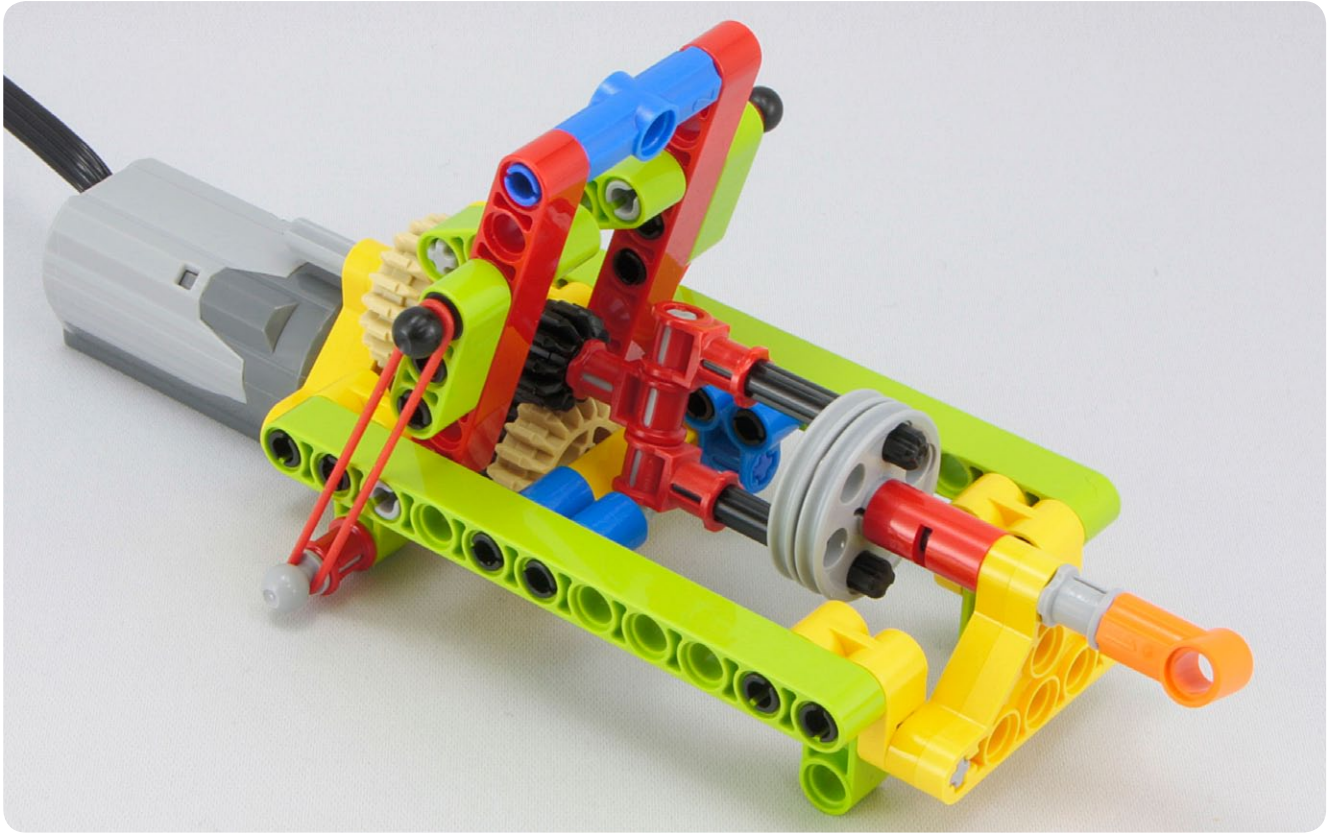


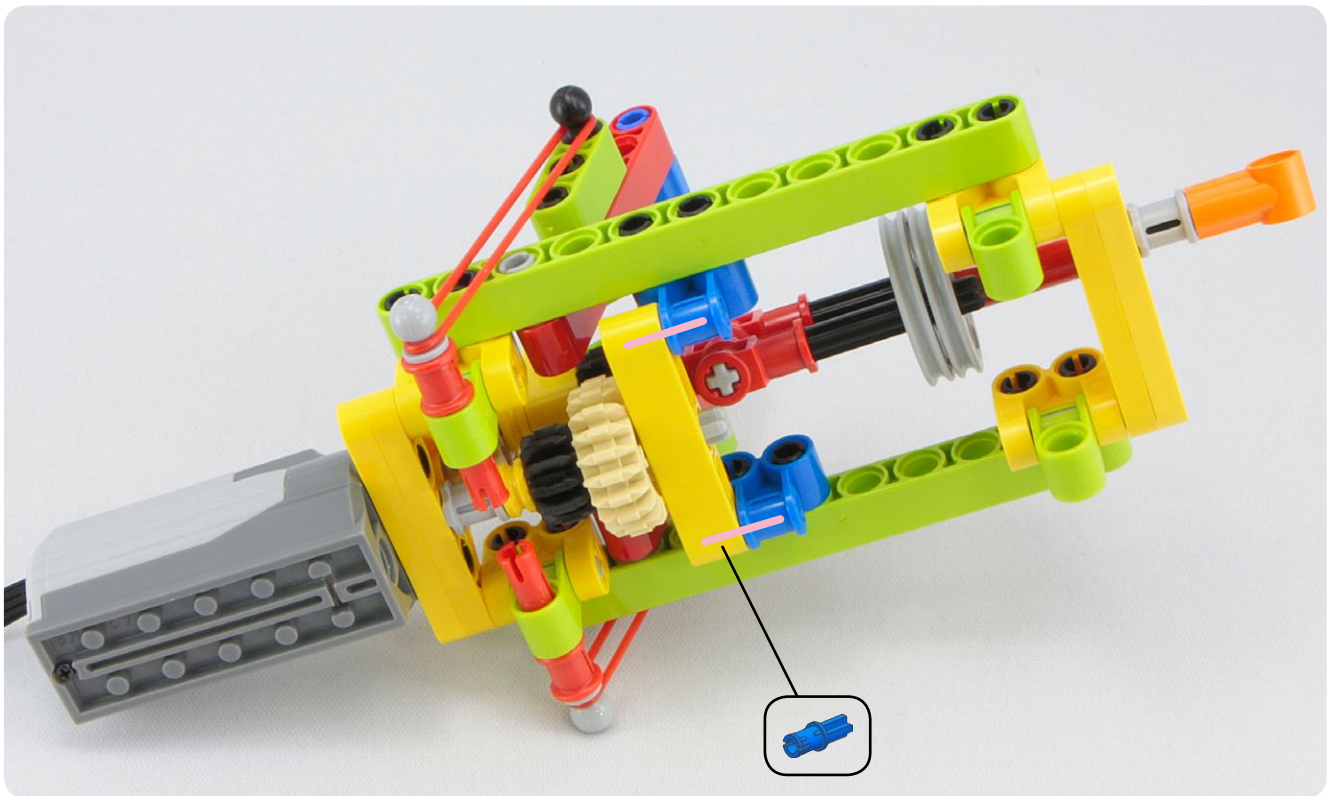
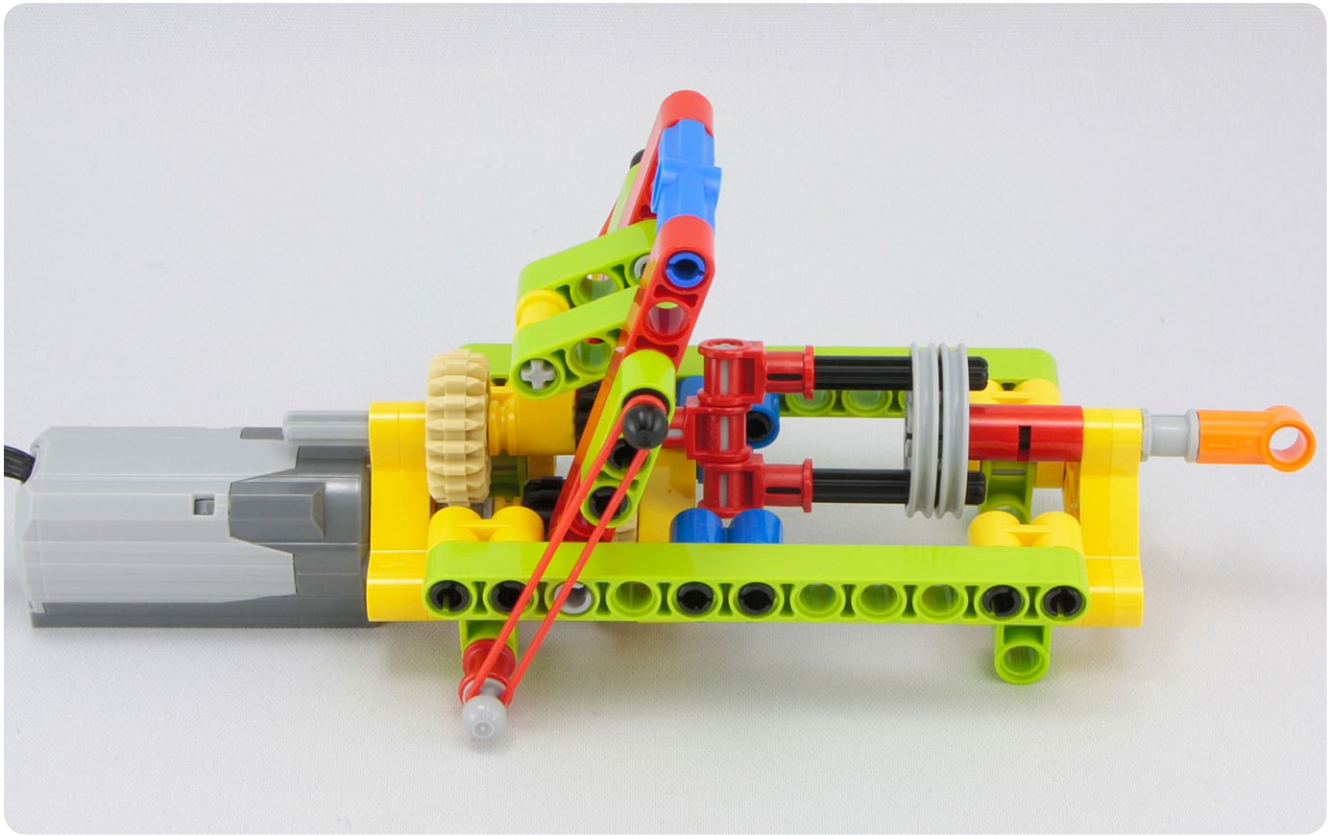


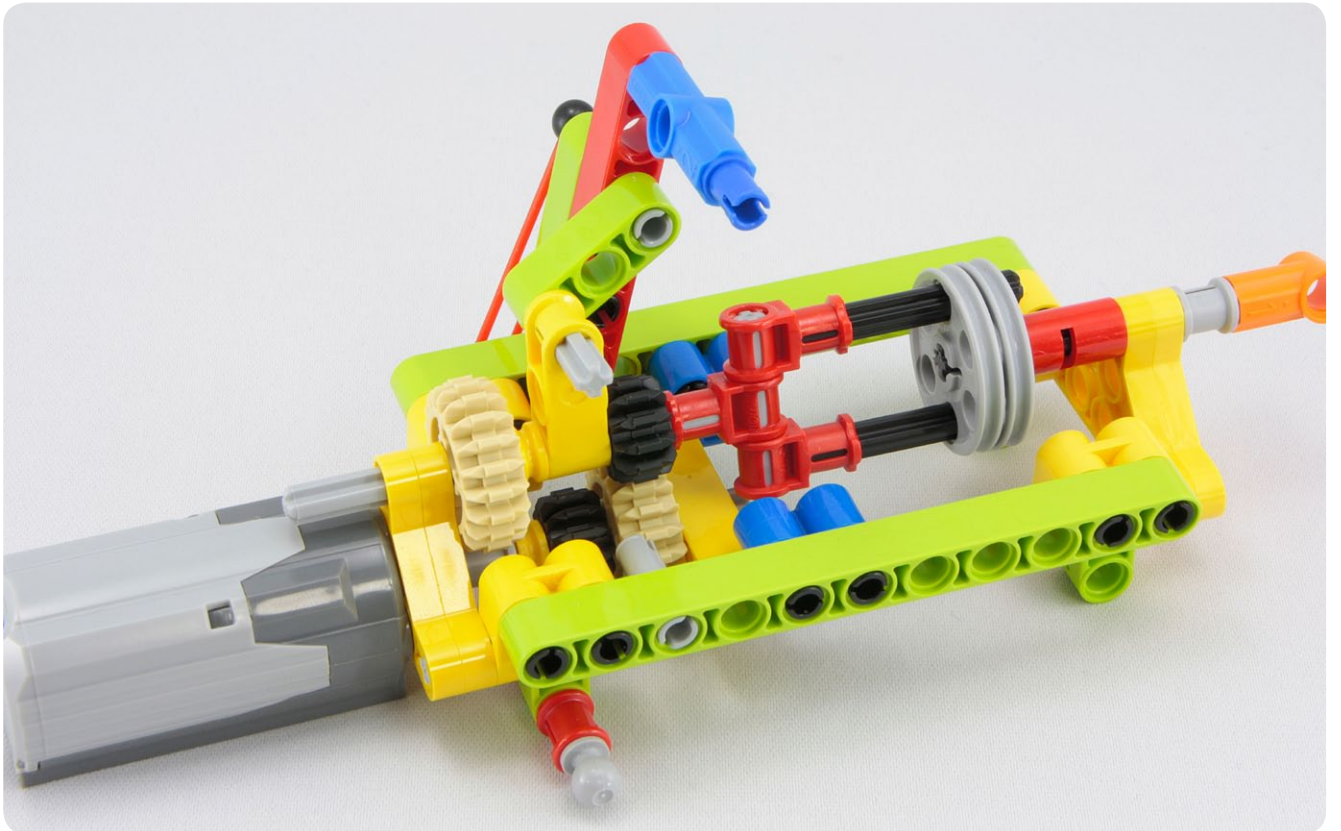
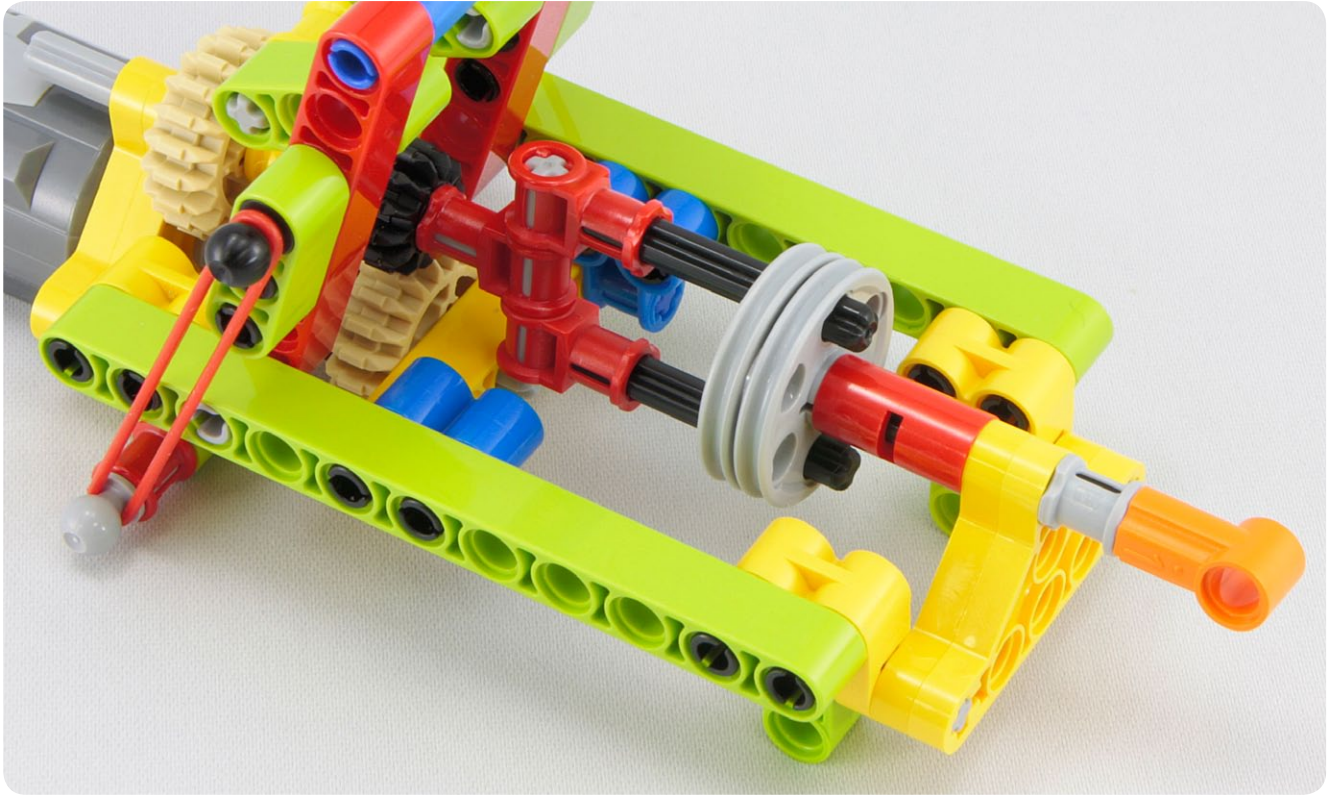







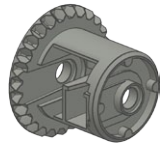



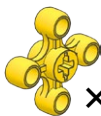

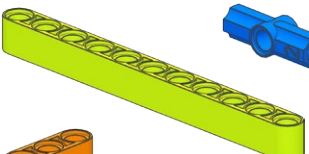

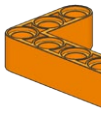

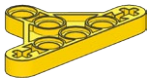
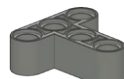

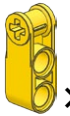

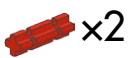

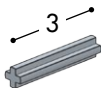
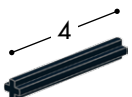

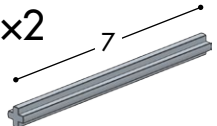
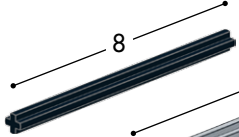
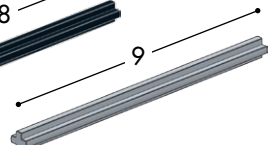


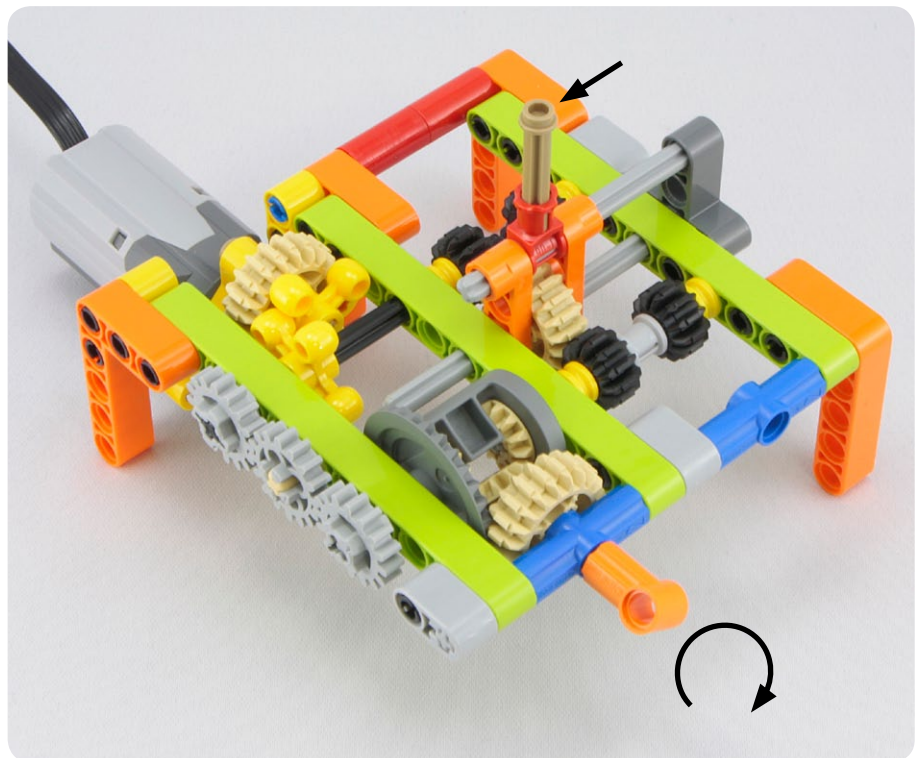
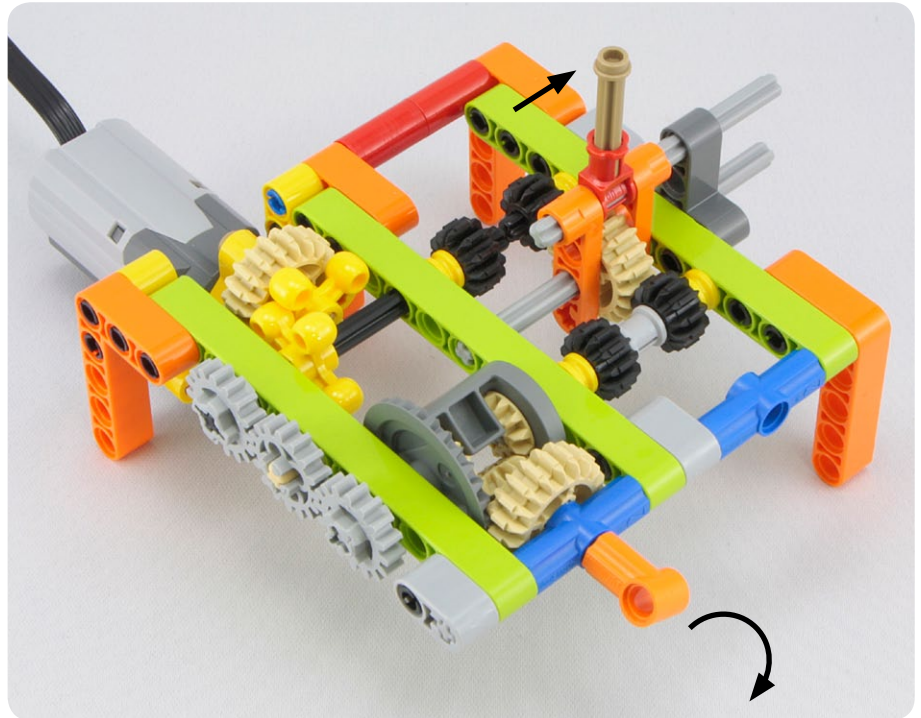


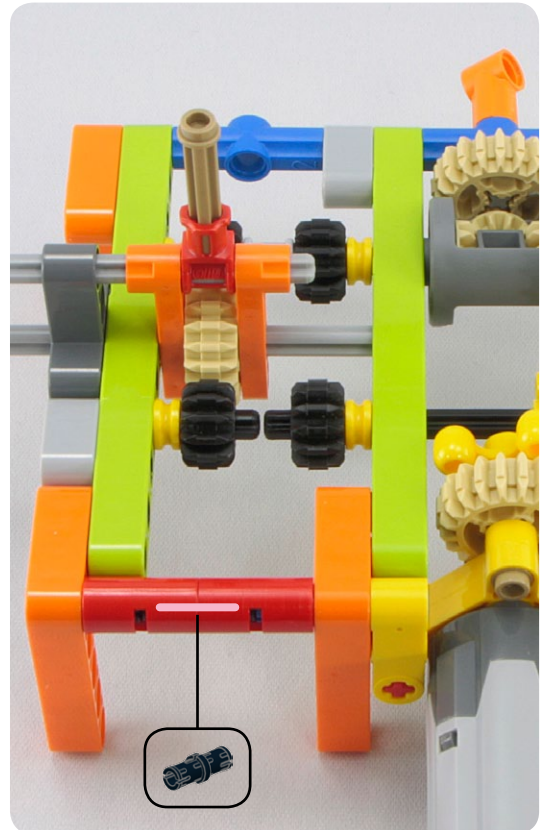
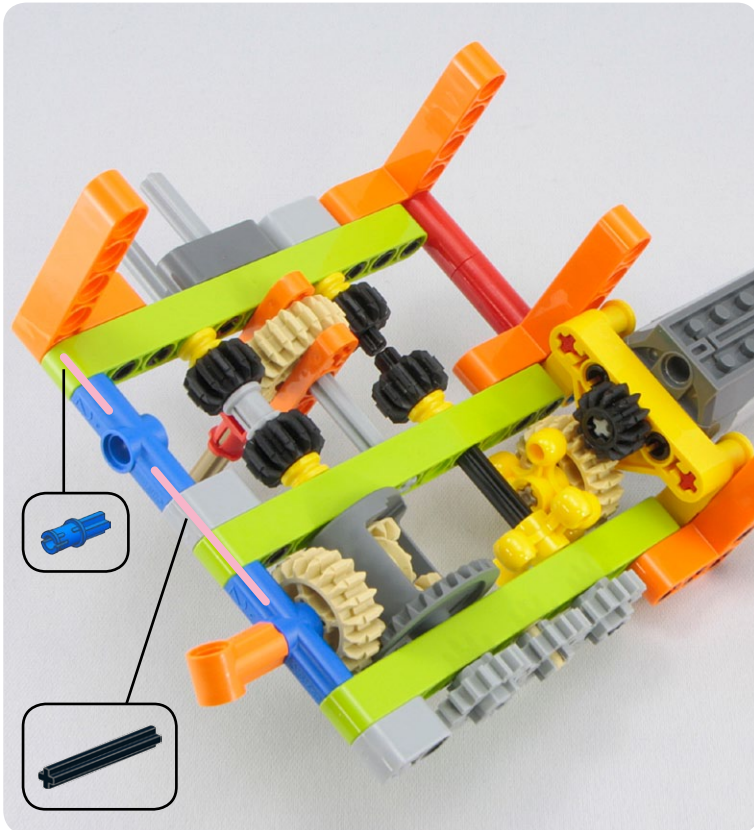
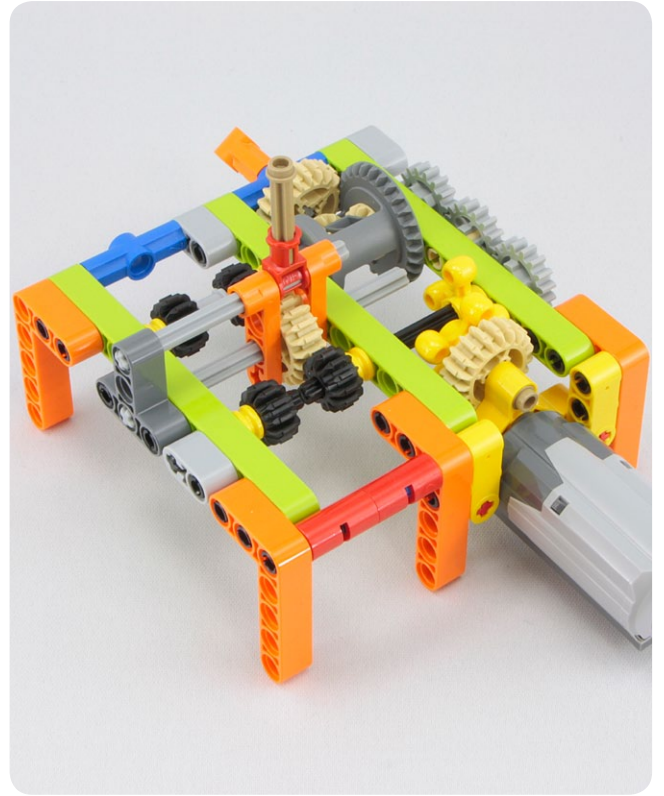
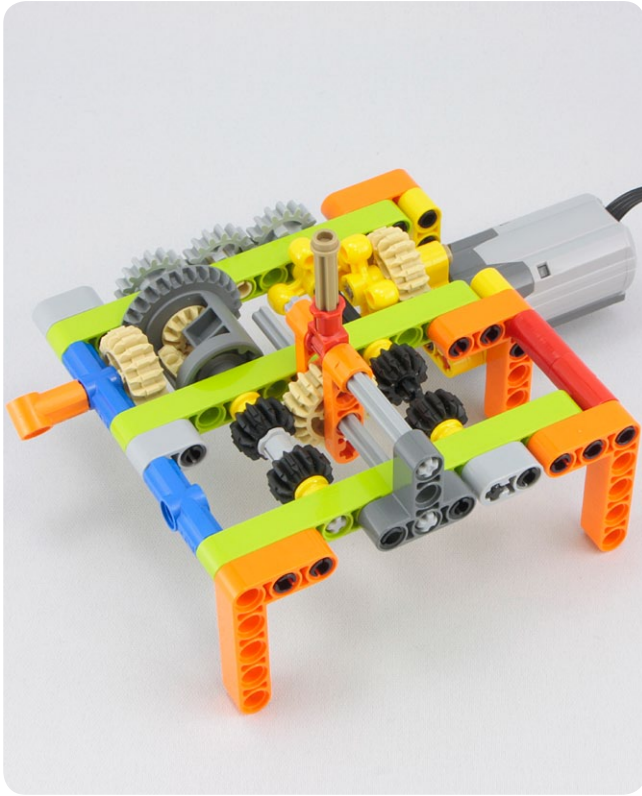


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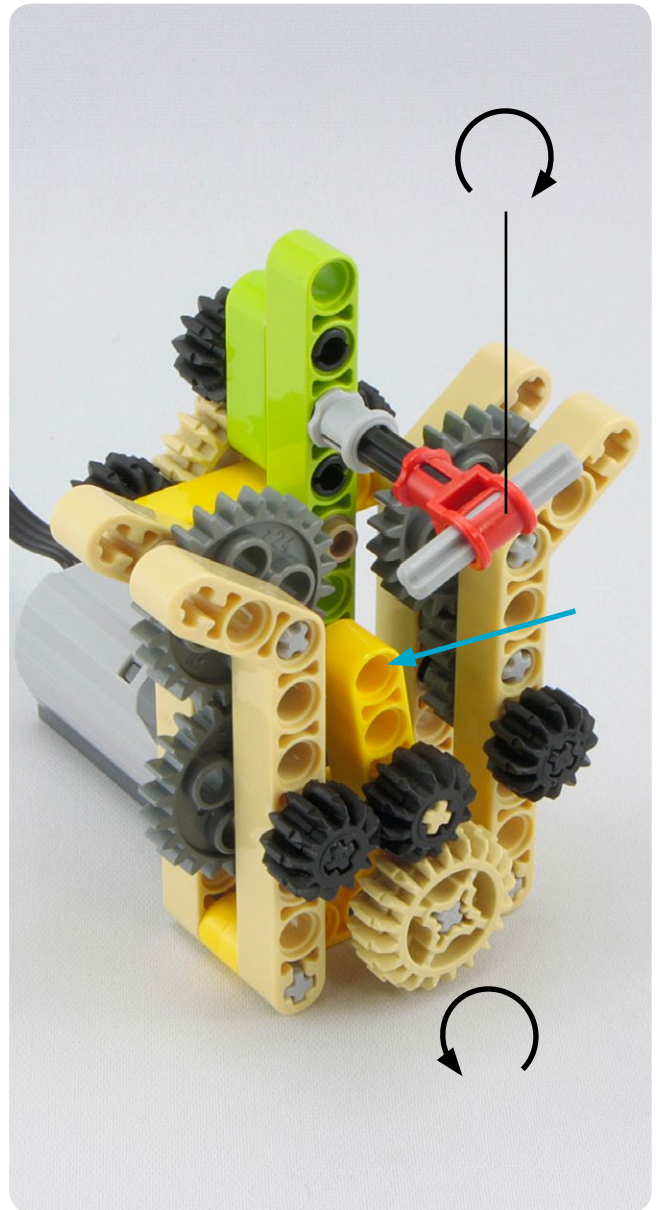
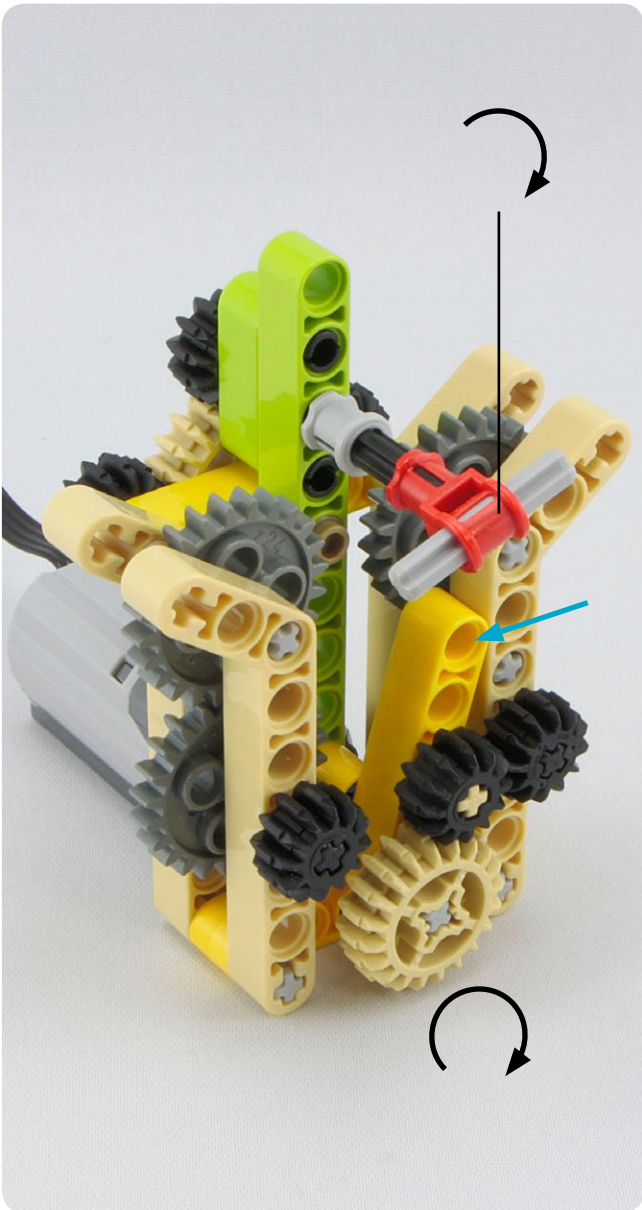
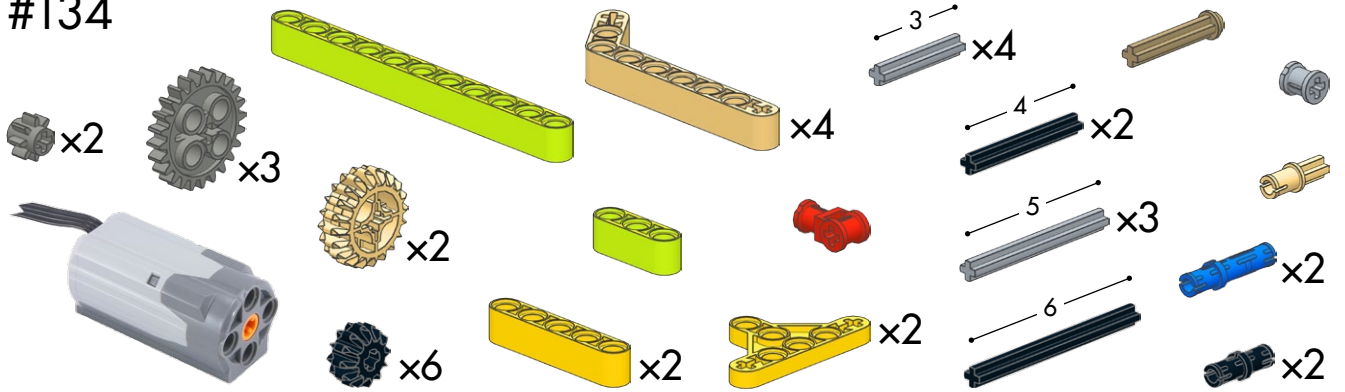
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-  x20

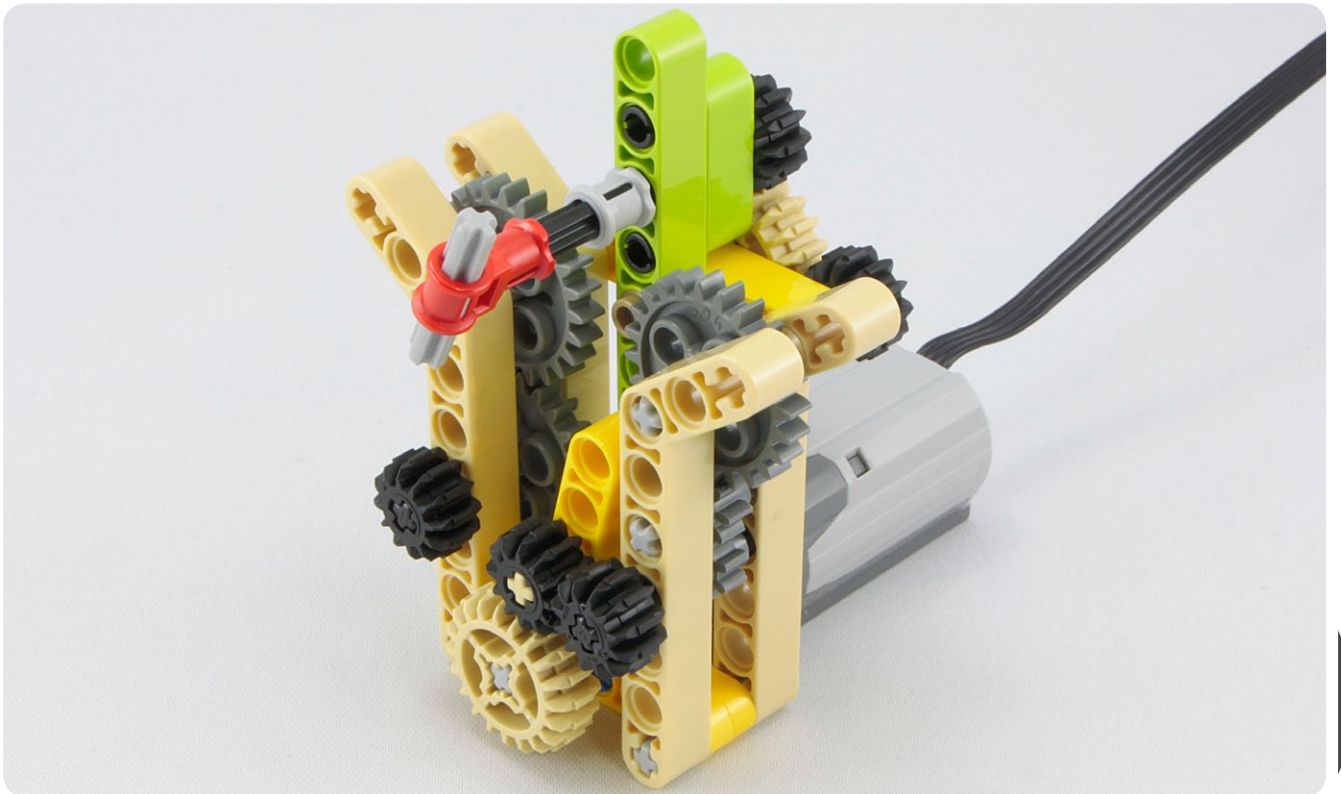
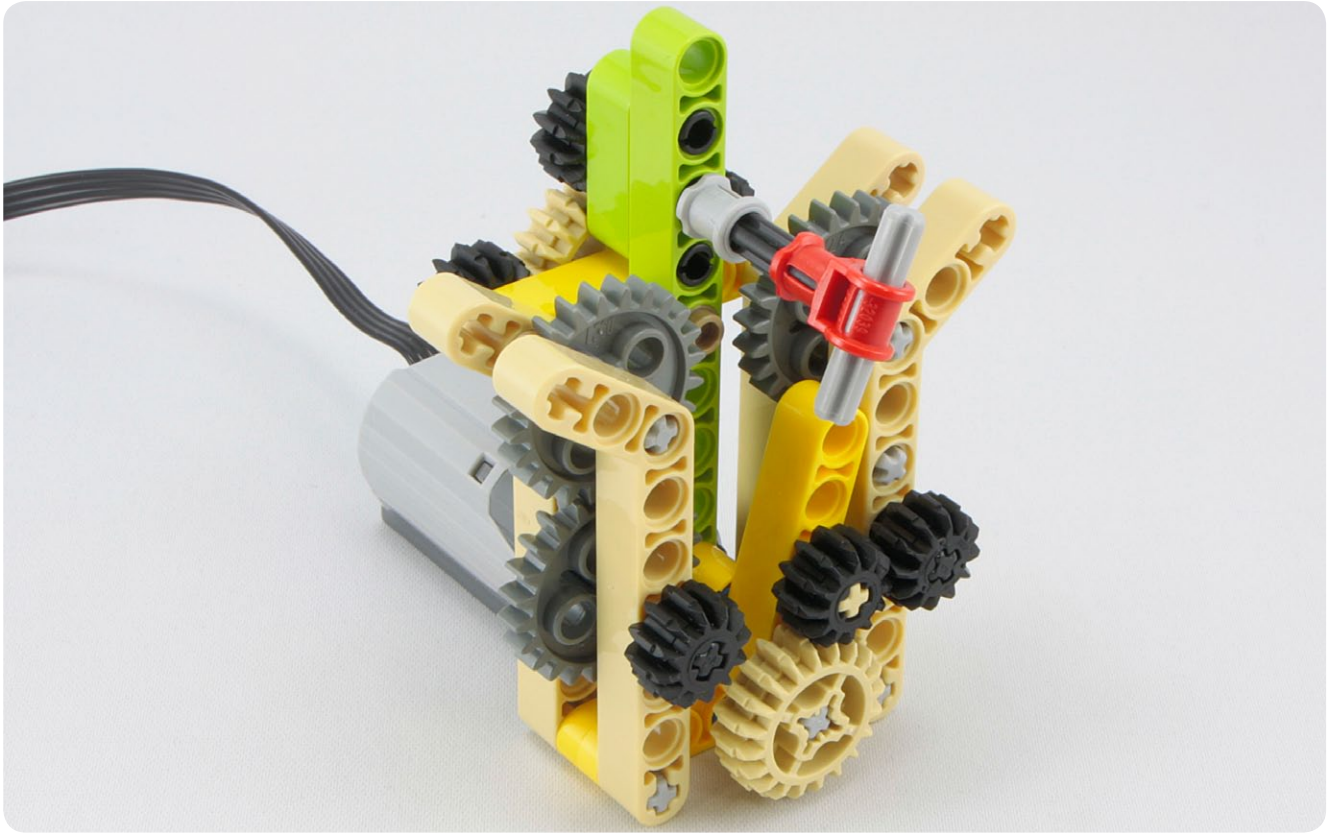
- 
- 
-  x3
-  x5
-  x3
-  x2
-  x3
-  x3
-  x2
-  x4
-  x3
-  x2
- 
-  x2
-  x2
-  x2
-  x2
- 
-  x4
-  x2
-  x2
-  x2
-  x2
-  x2

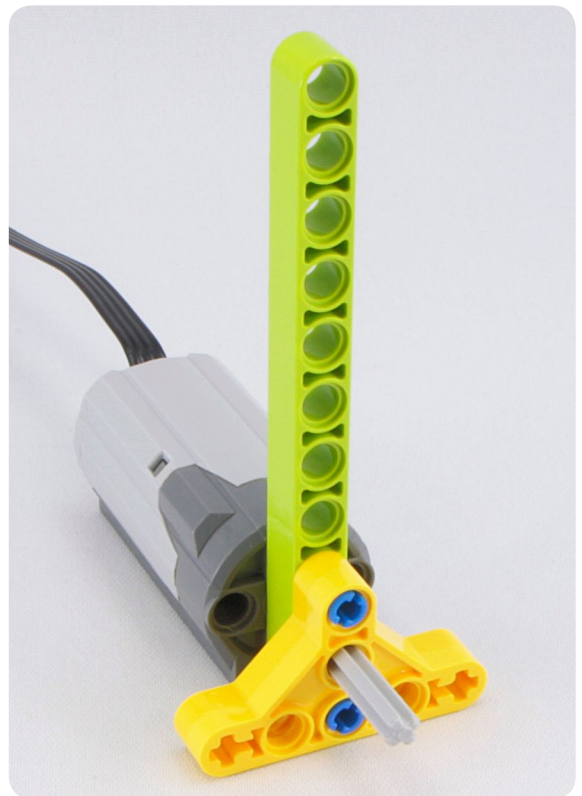
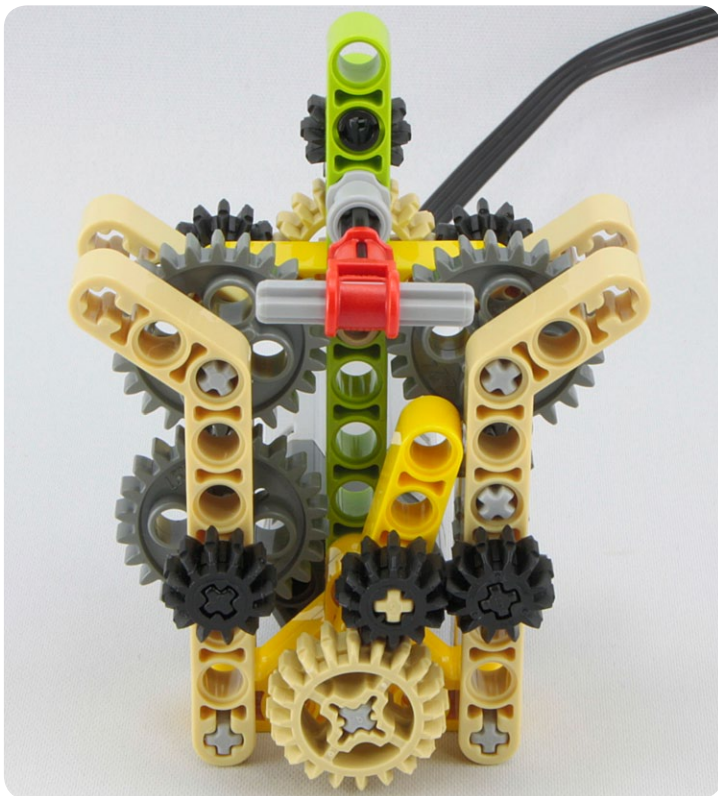
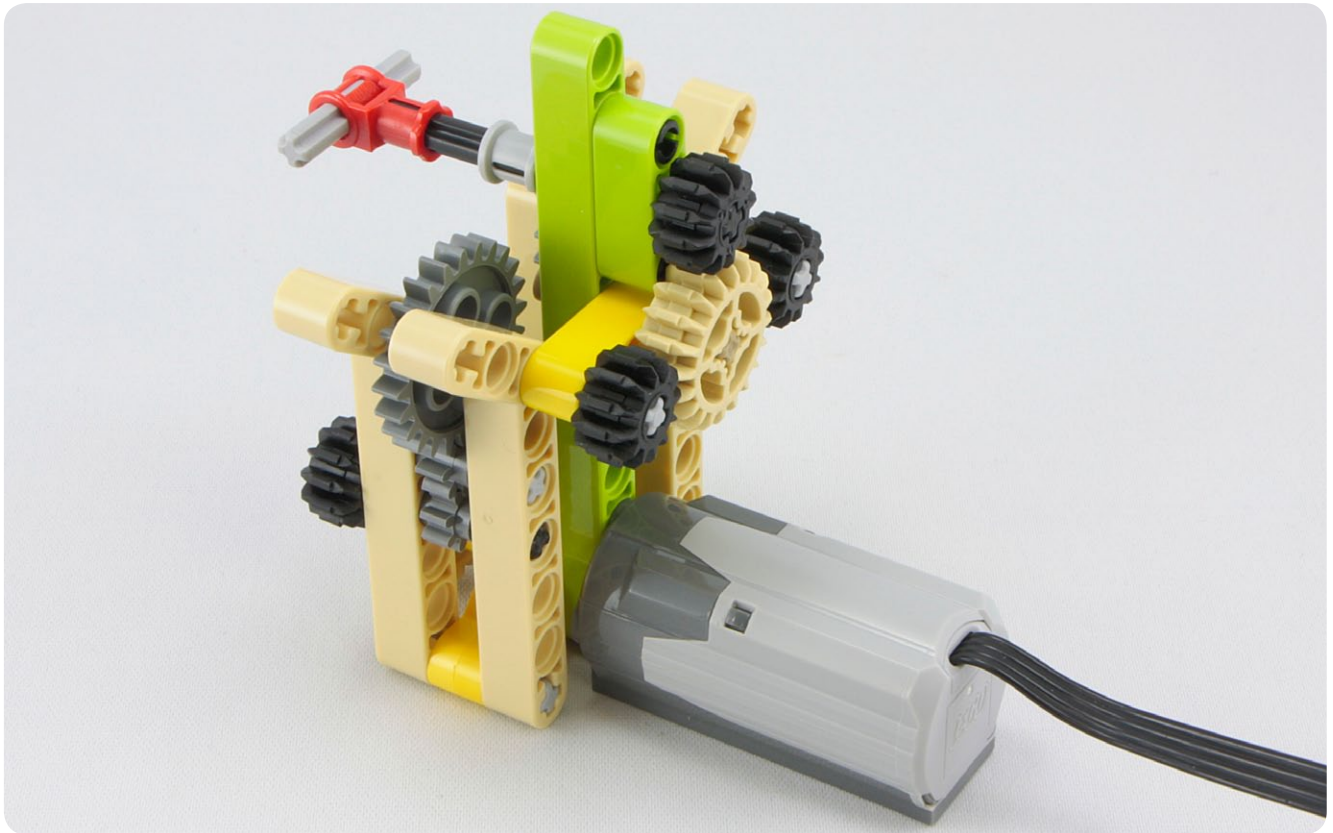


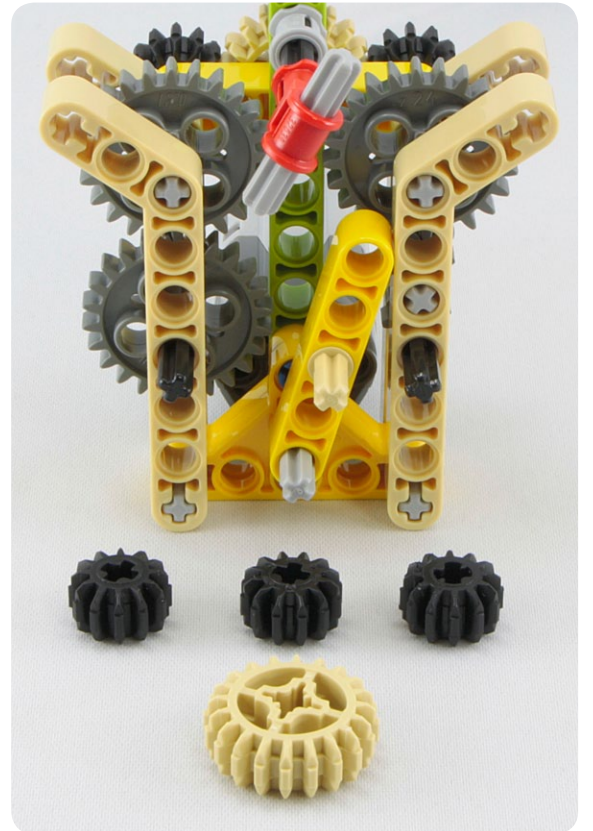
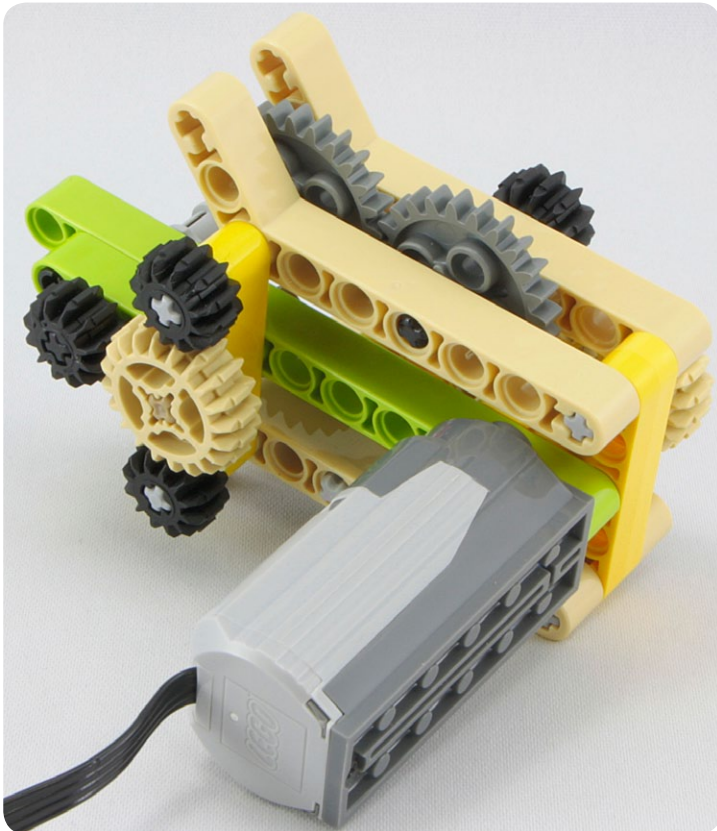
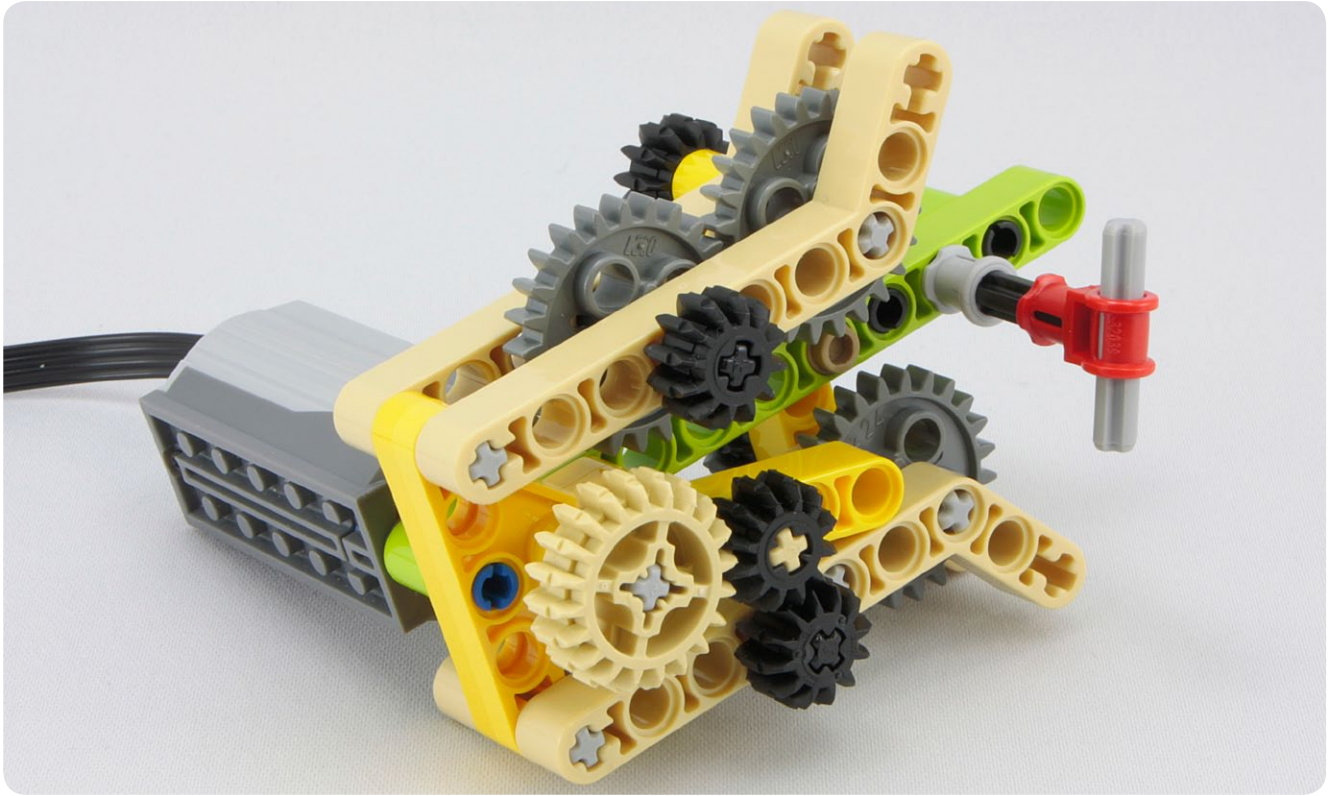


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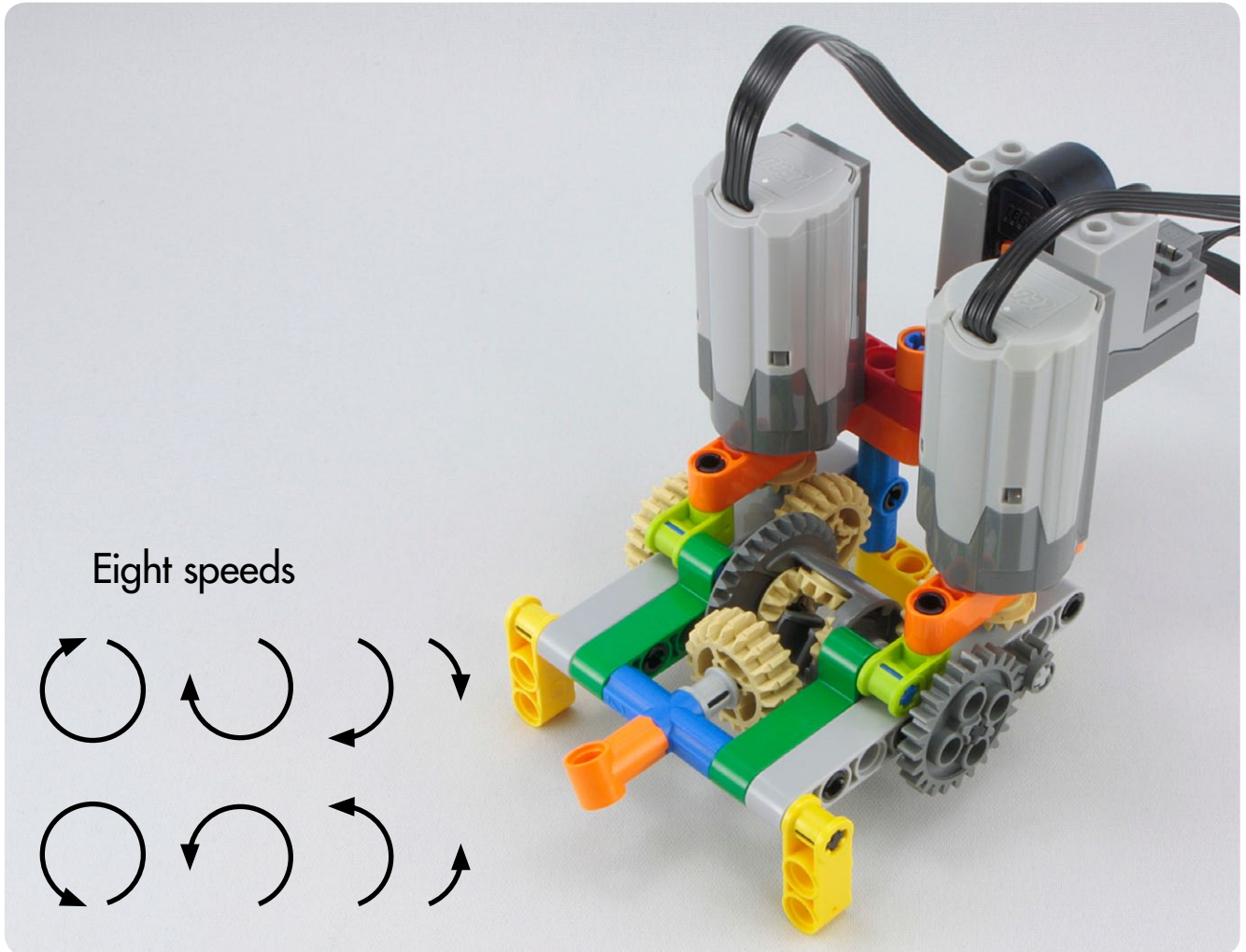


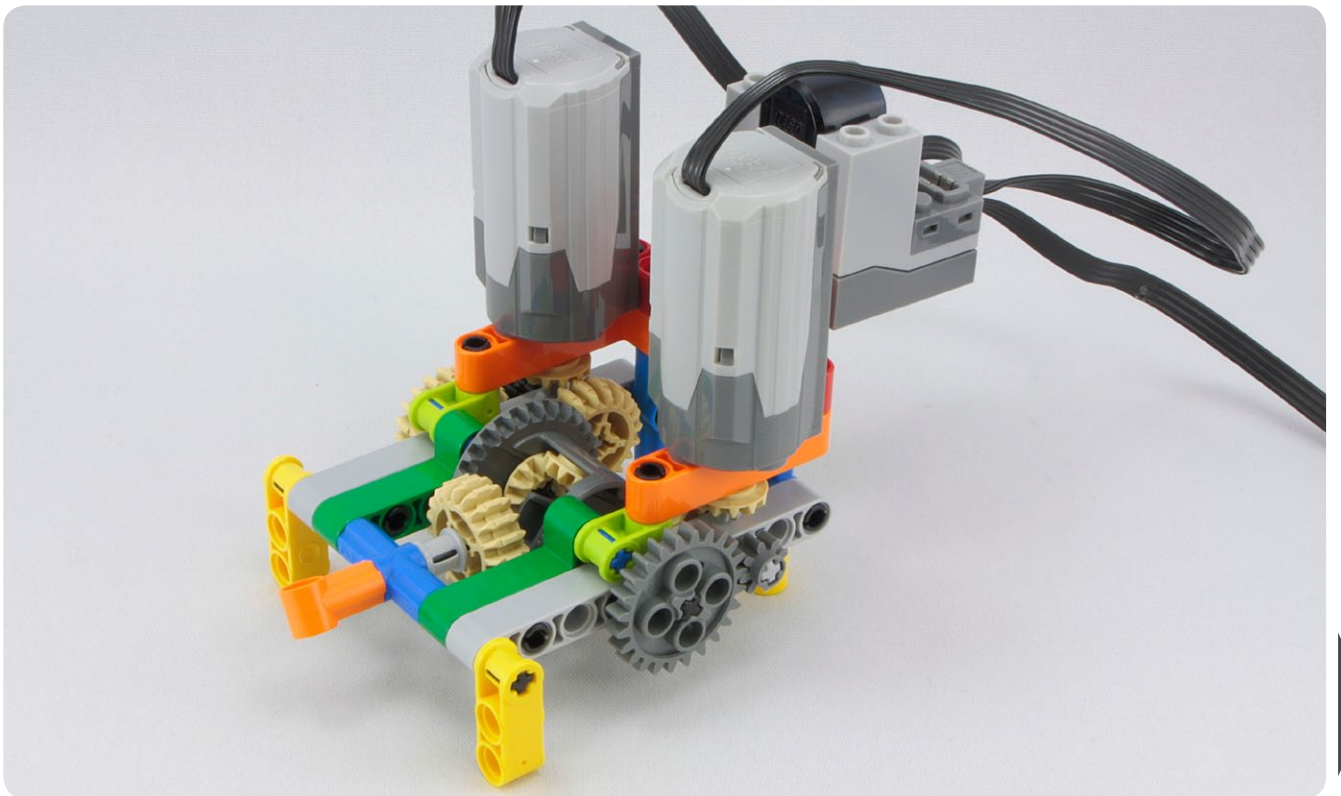
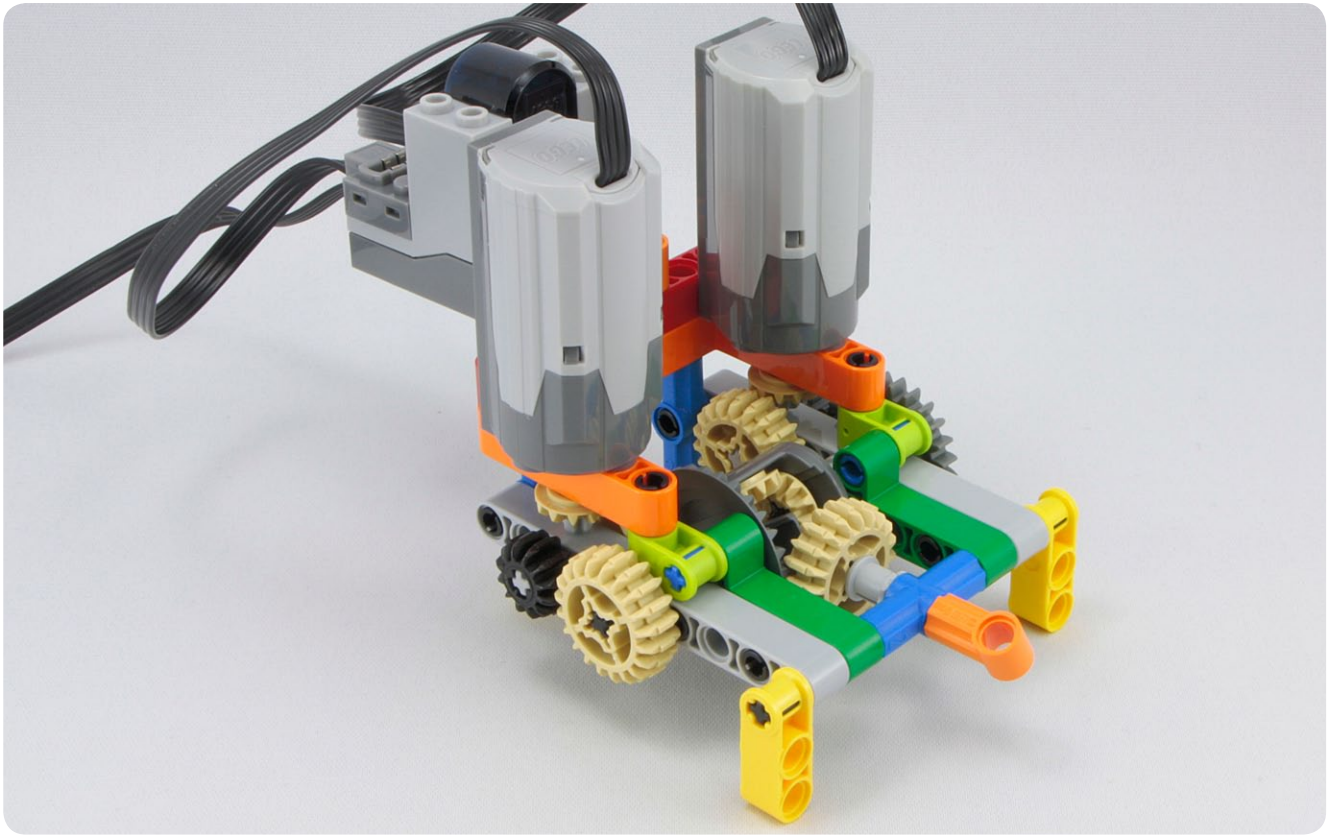


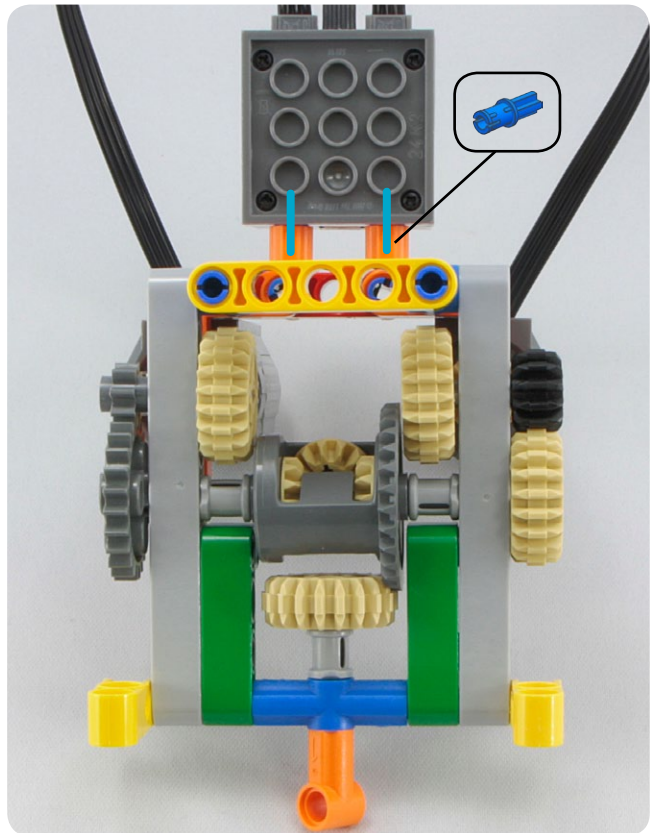
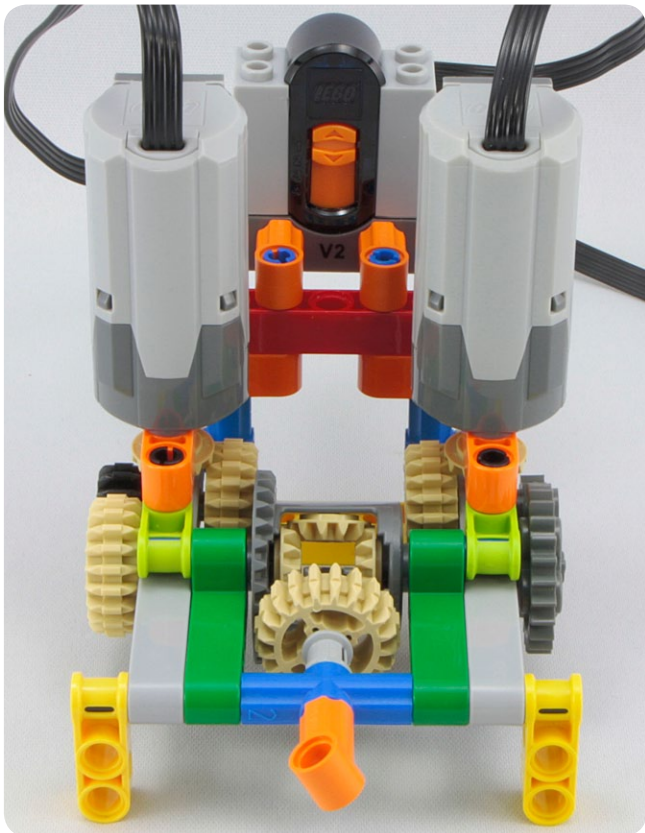
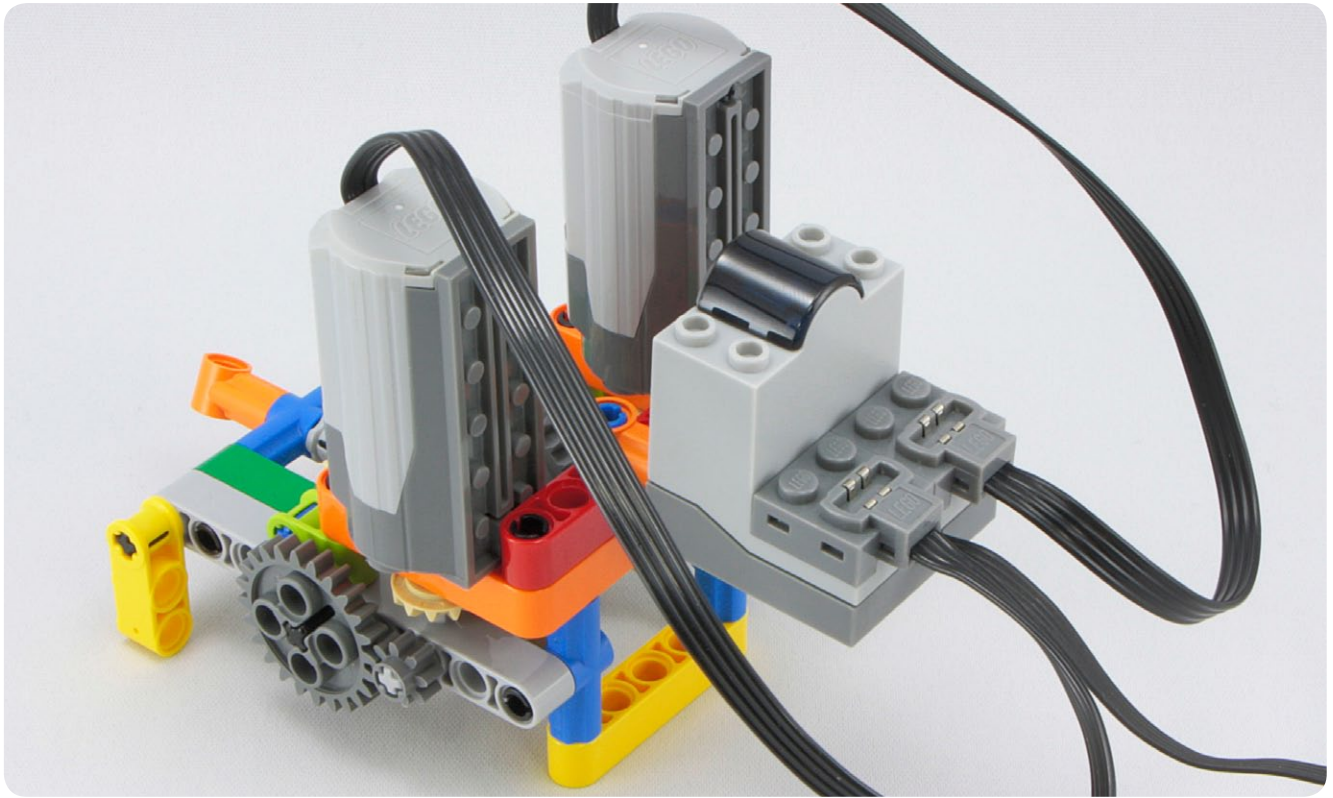


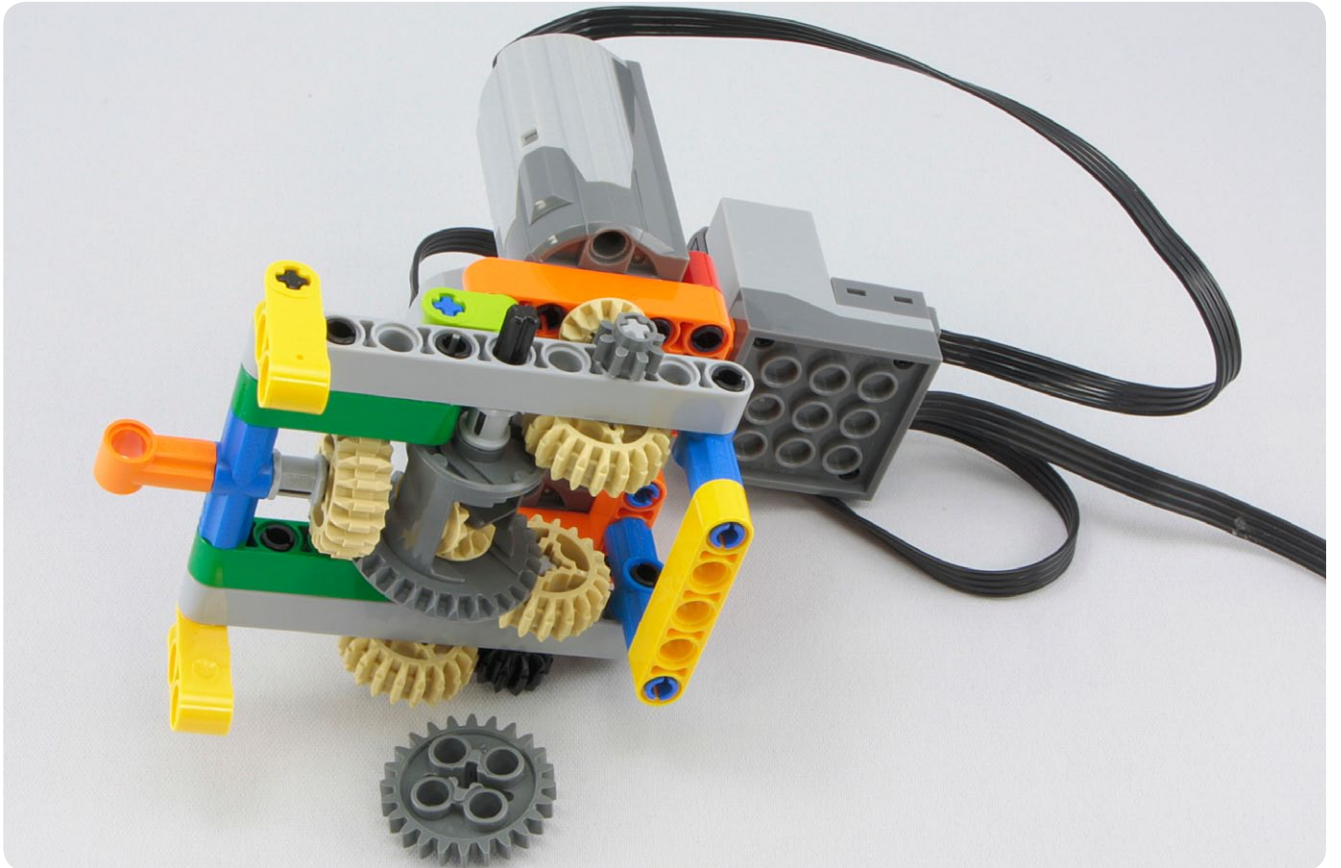
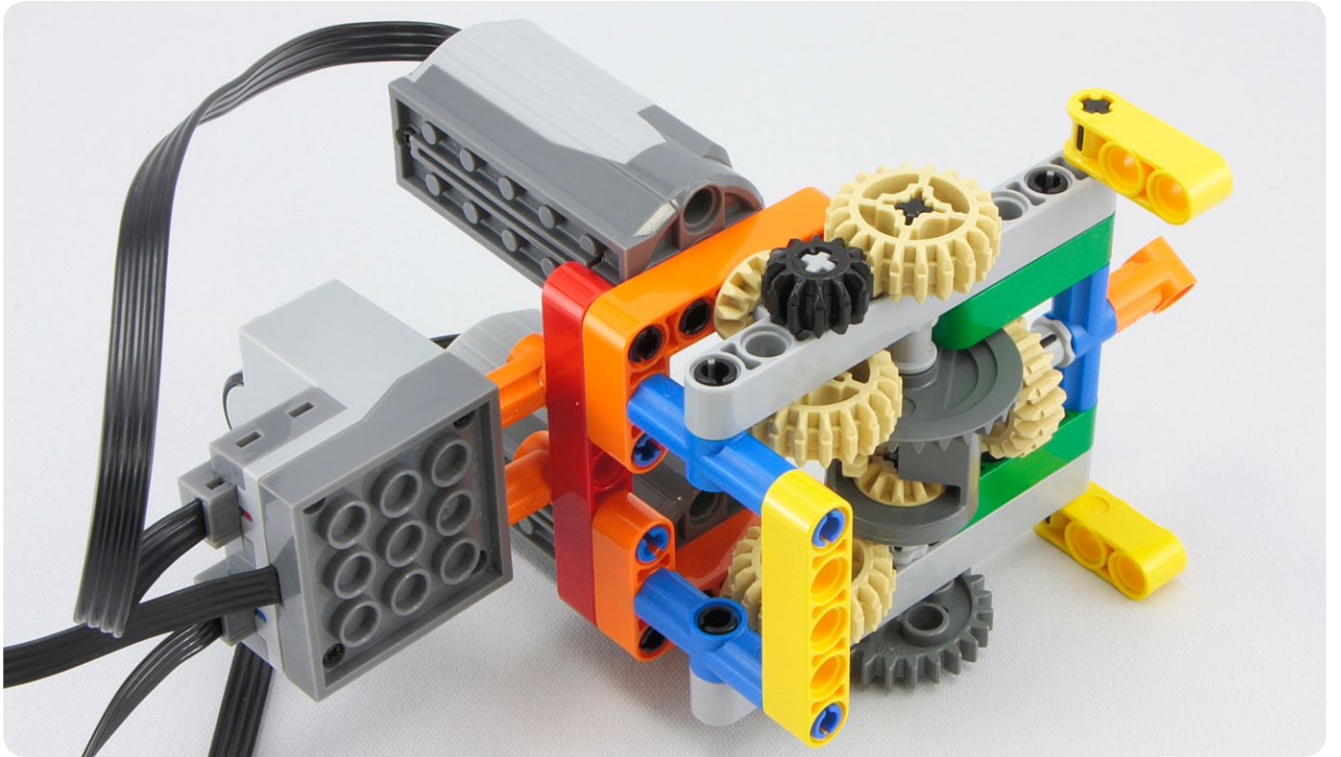


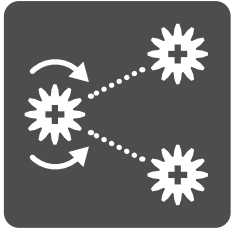
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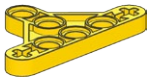

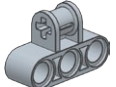

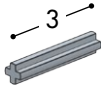
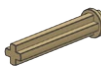
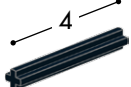
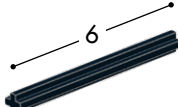




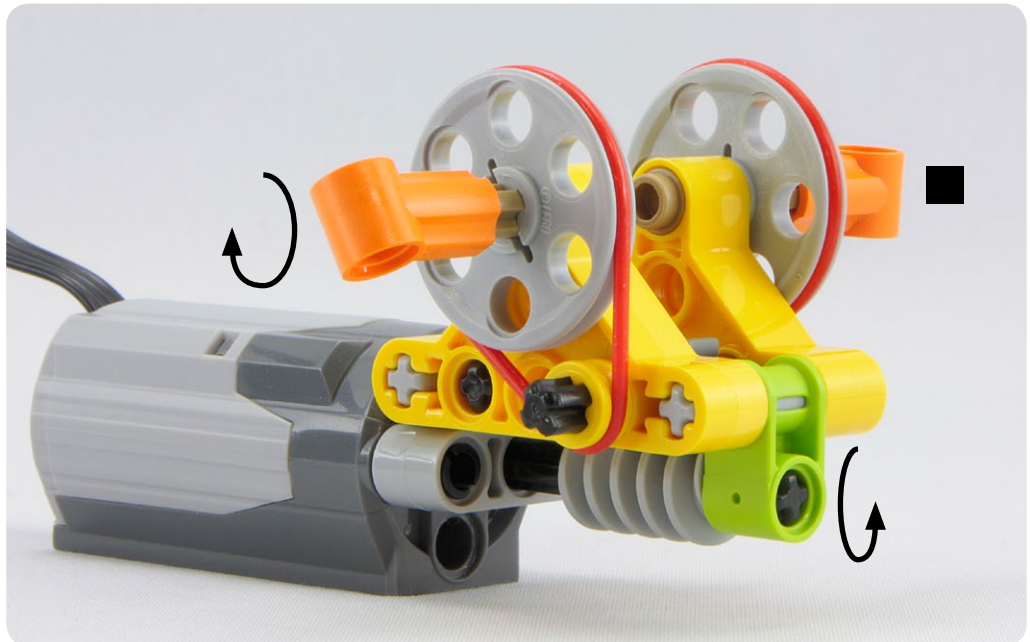
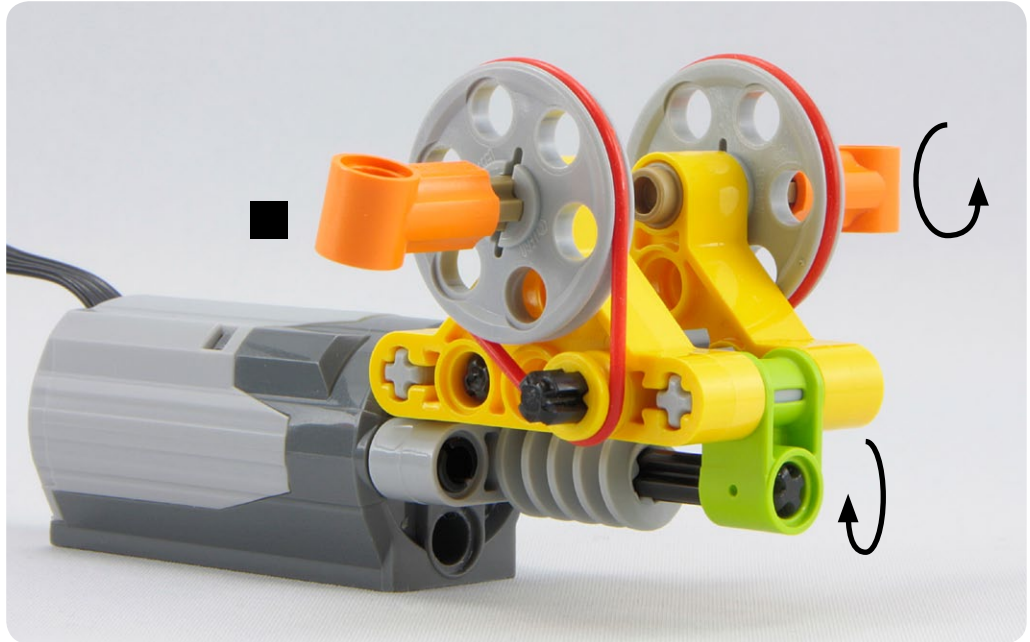


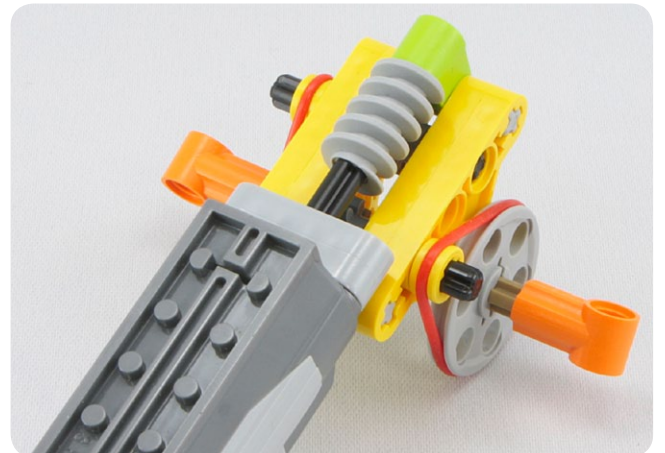
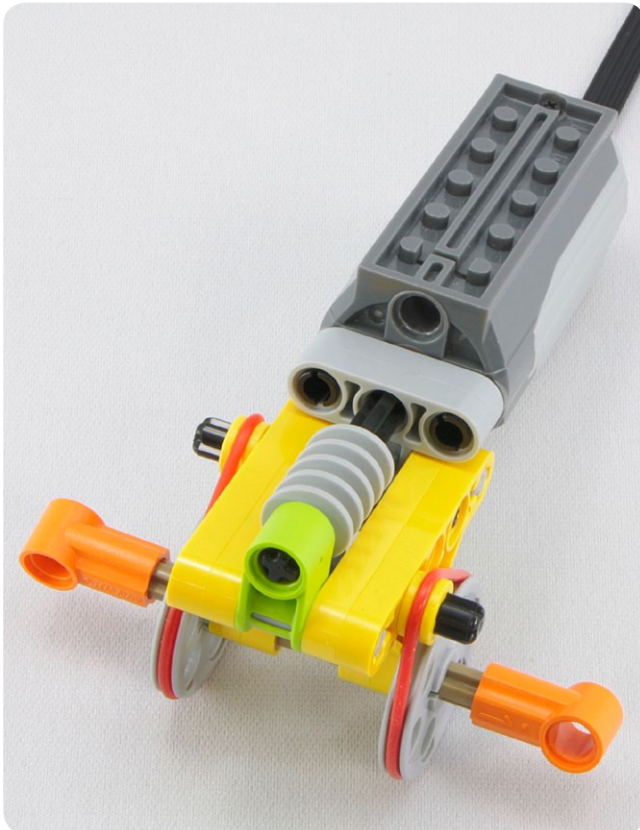
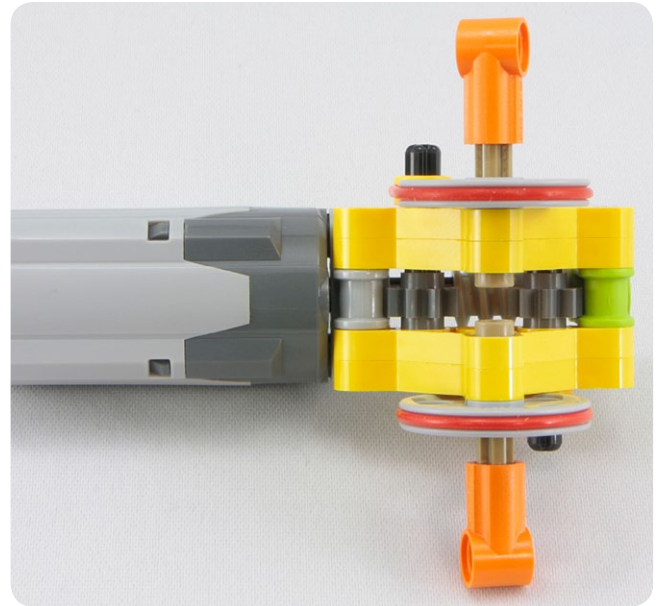
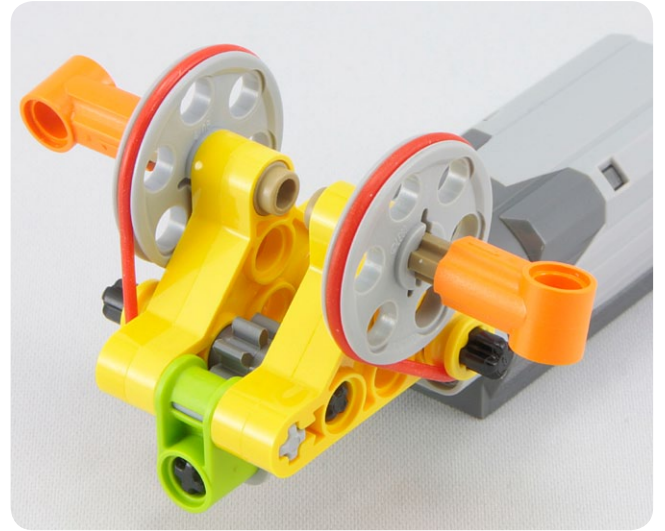


Changeover mechanisms using rotational direction

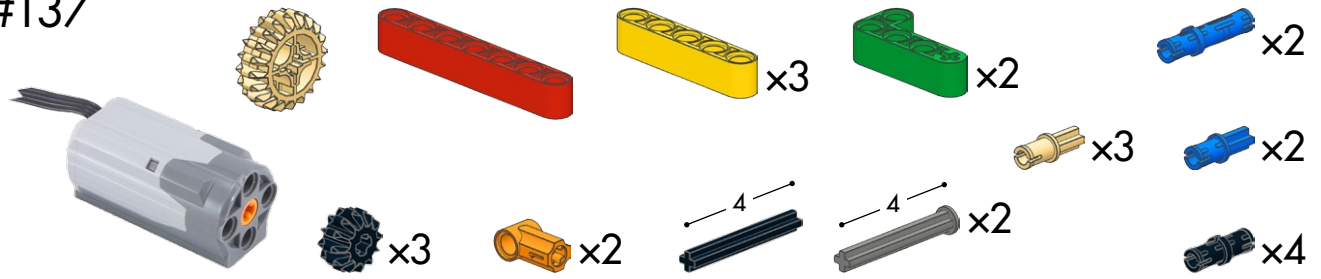
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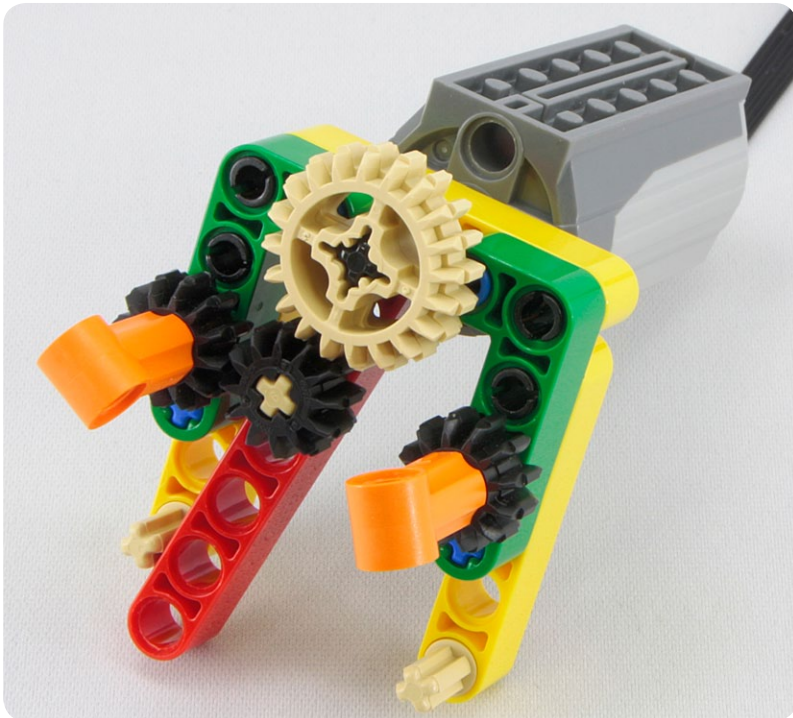
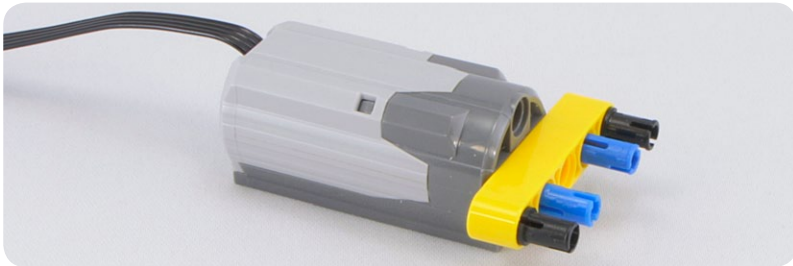
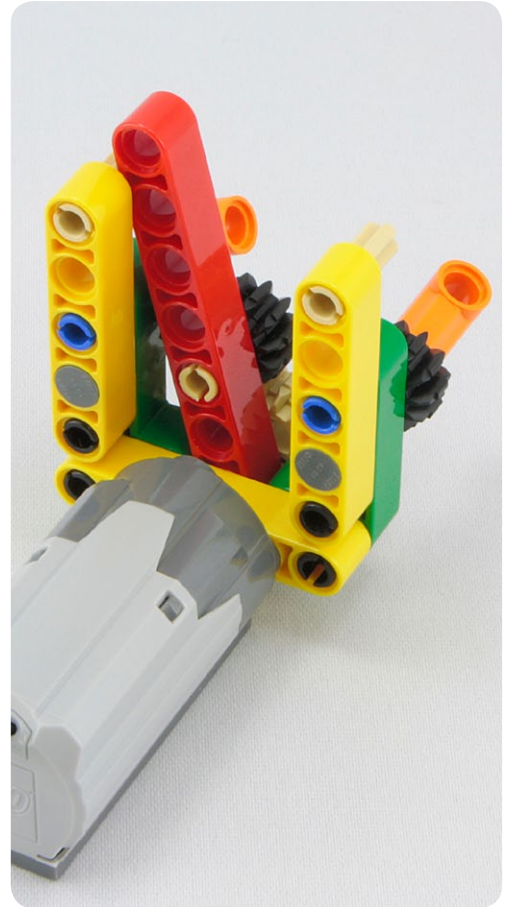
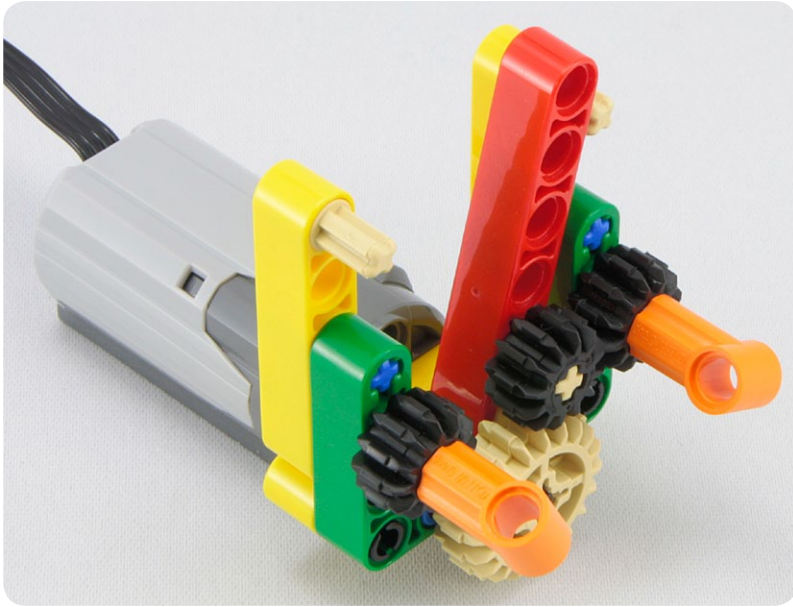
-  x2
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-  x2
-  x2
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-  x4
-  x2
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- 
-  x2
-  x2
-  x2
- 
-  x2
-  x2



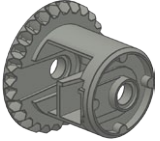





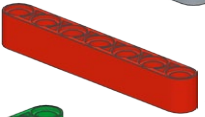
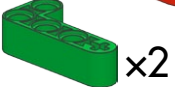




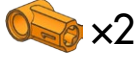


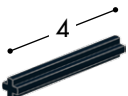





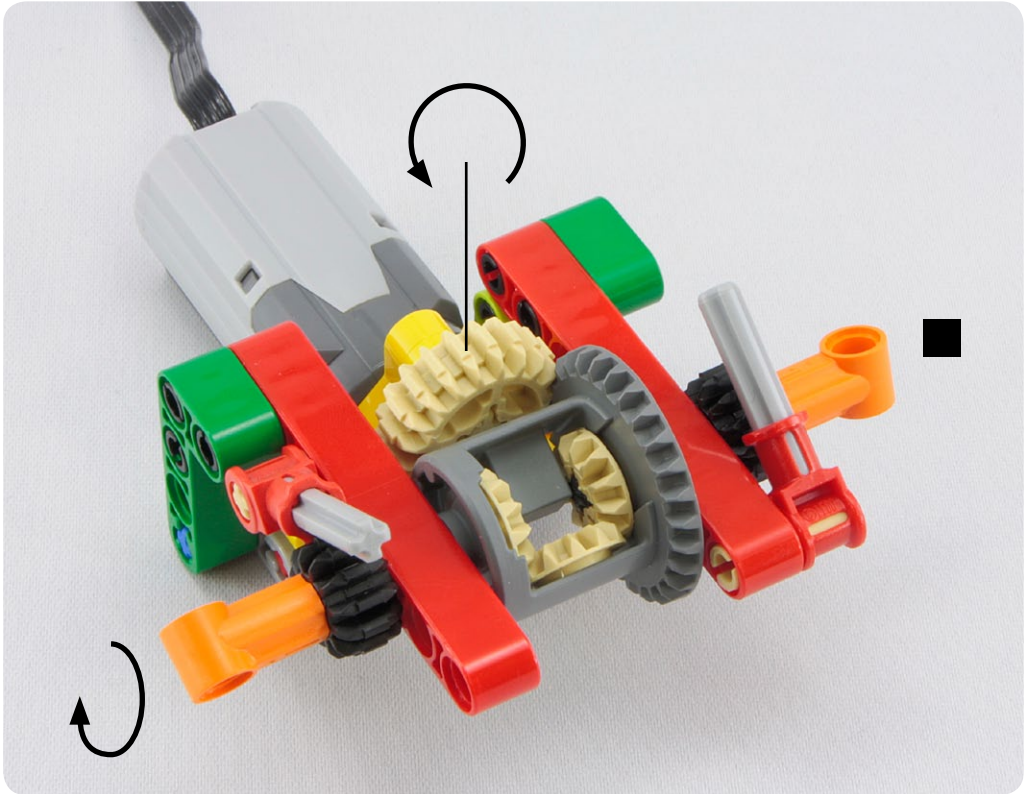
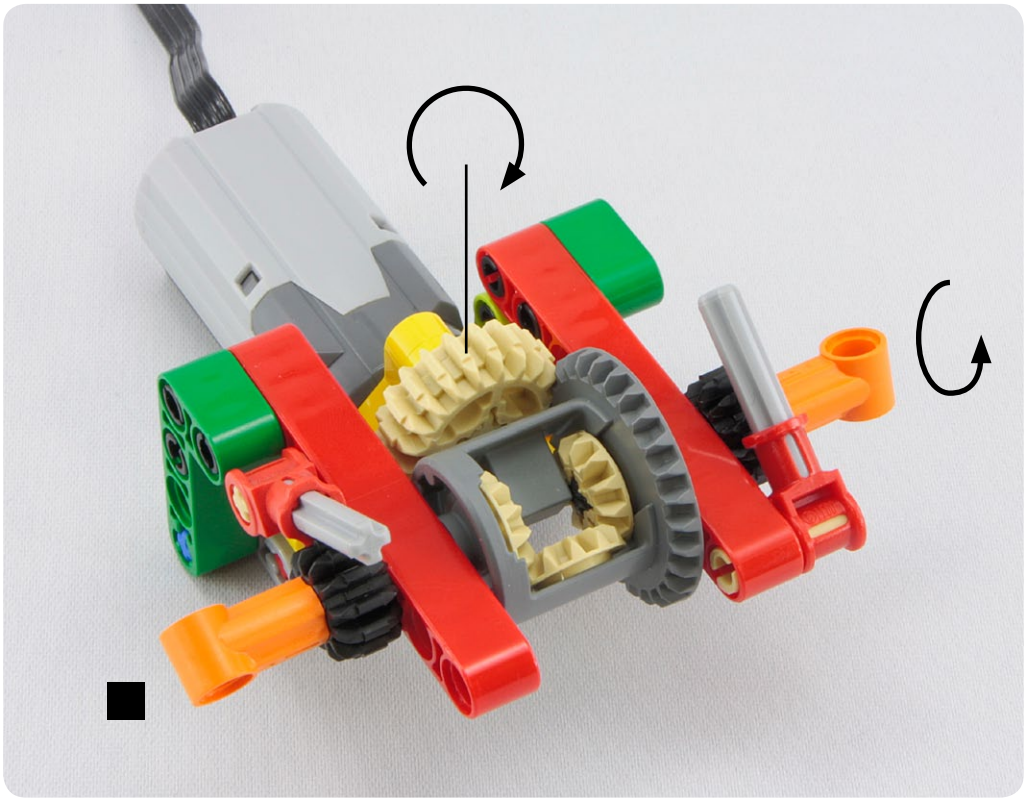
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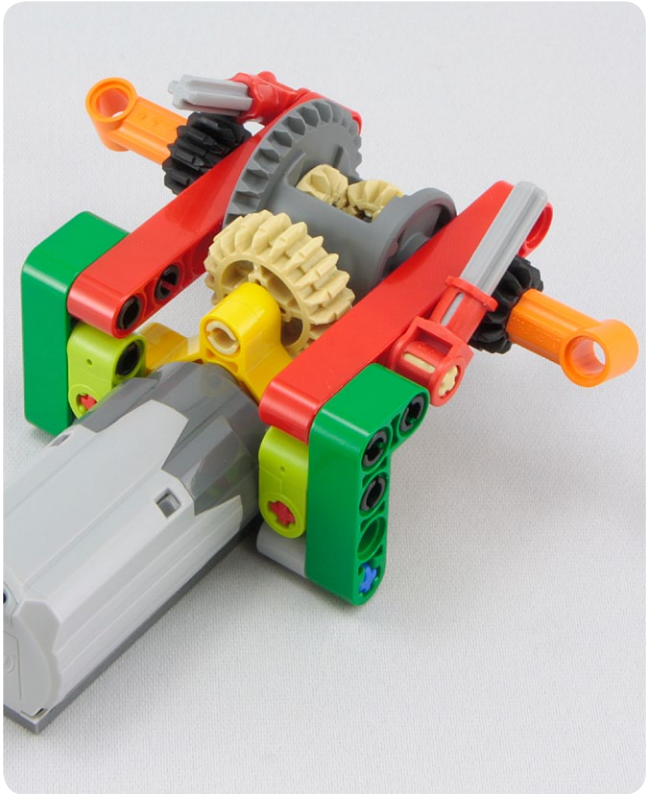
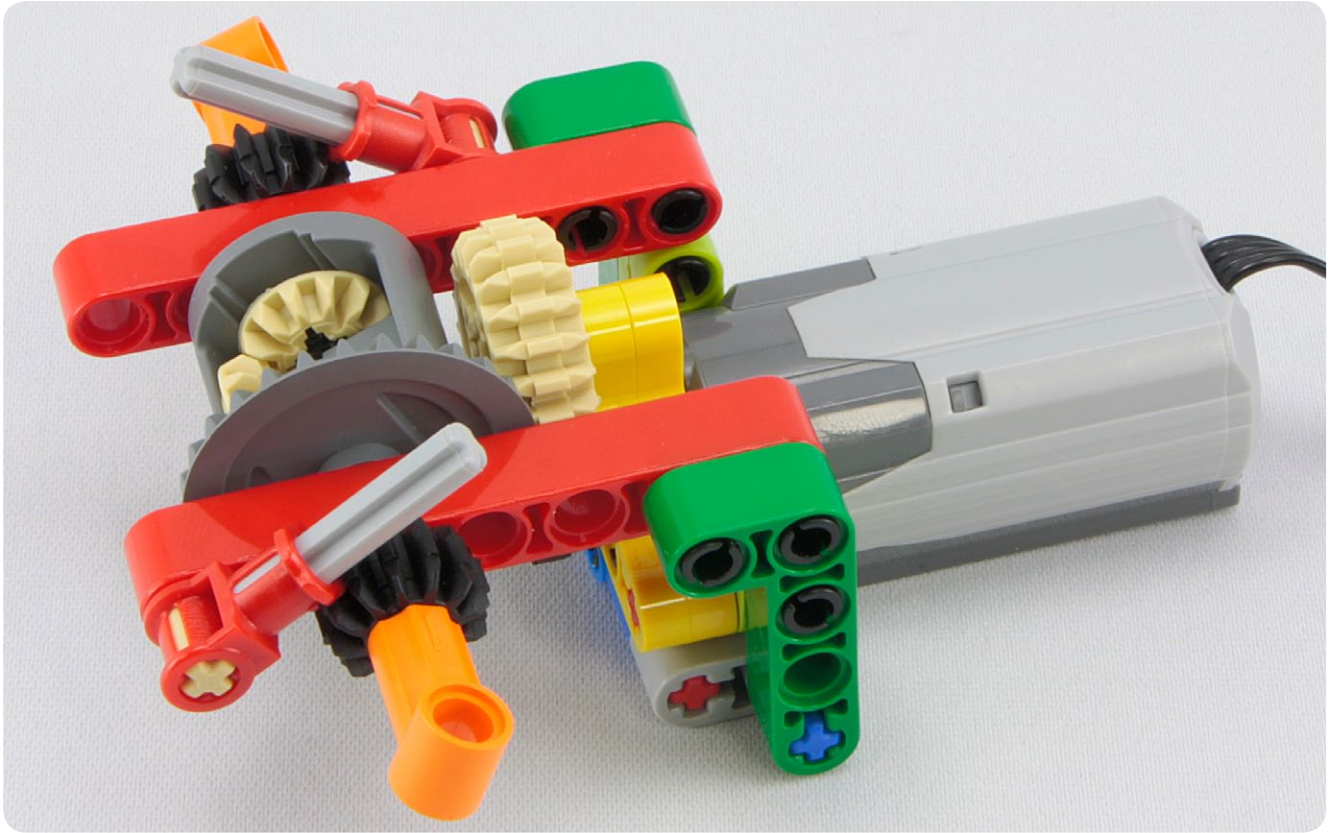




#138

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

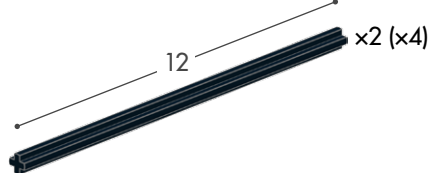
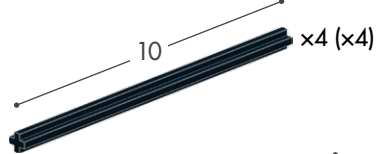
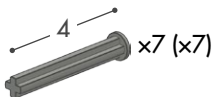
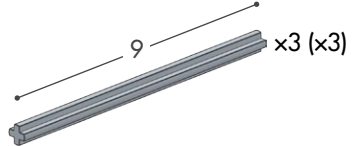
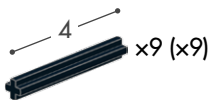
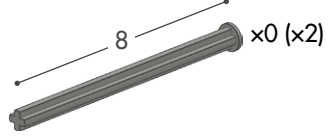
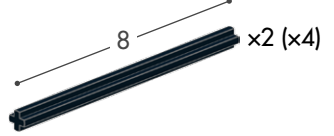
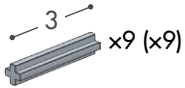
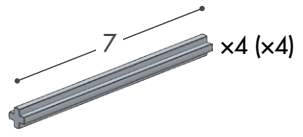
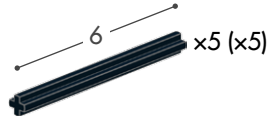
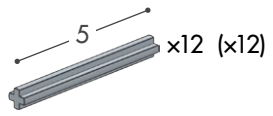
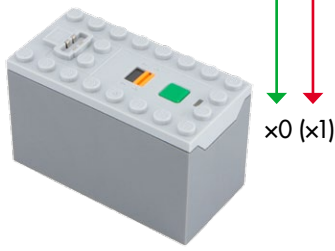


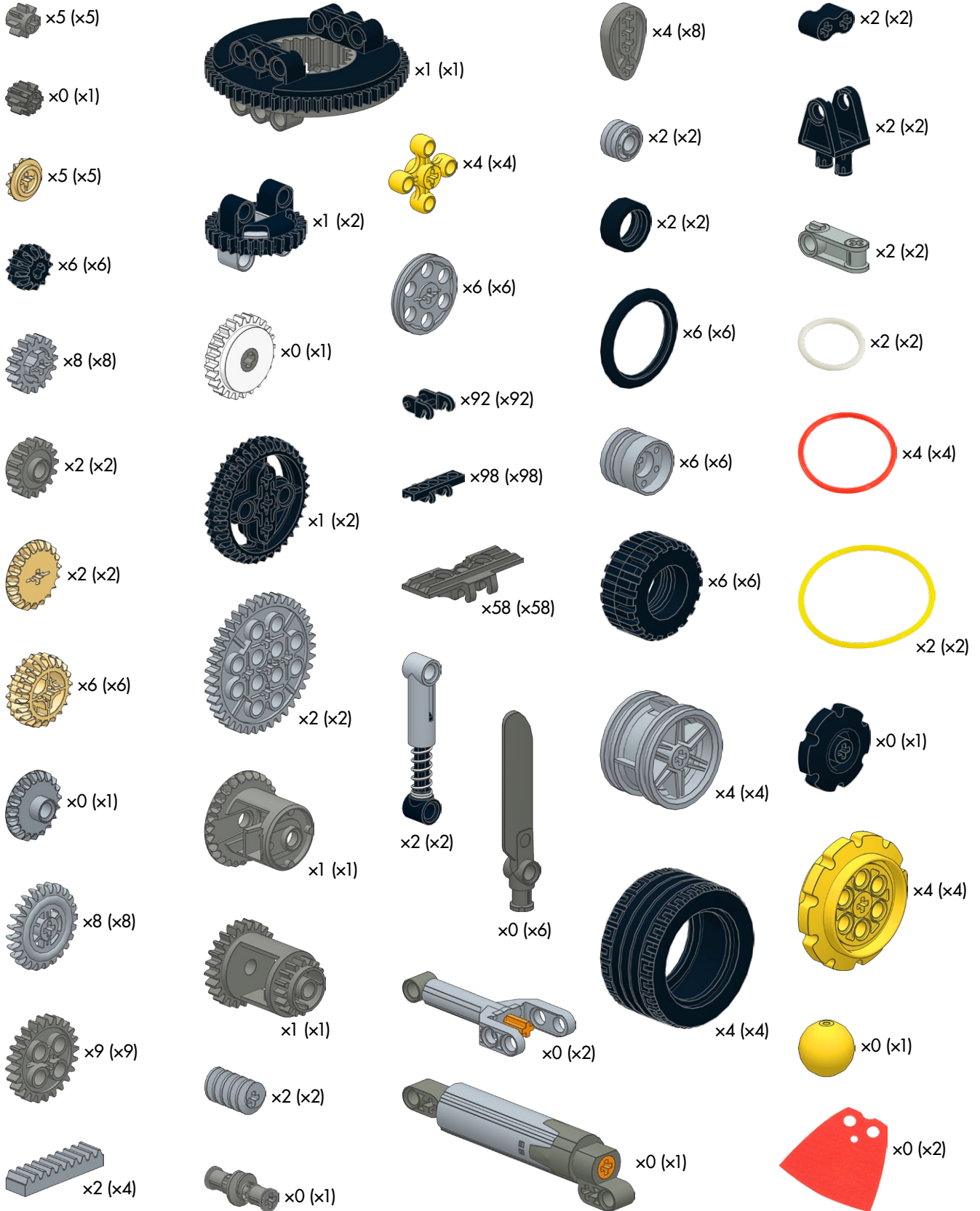


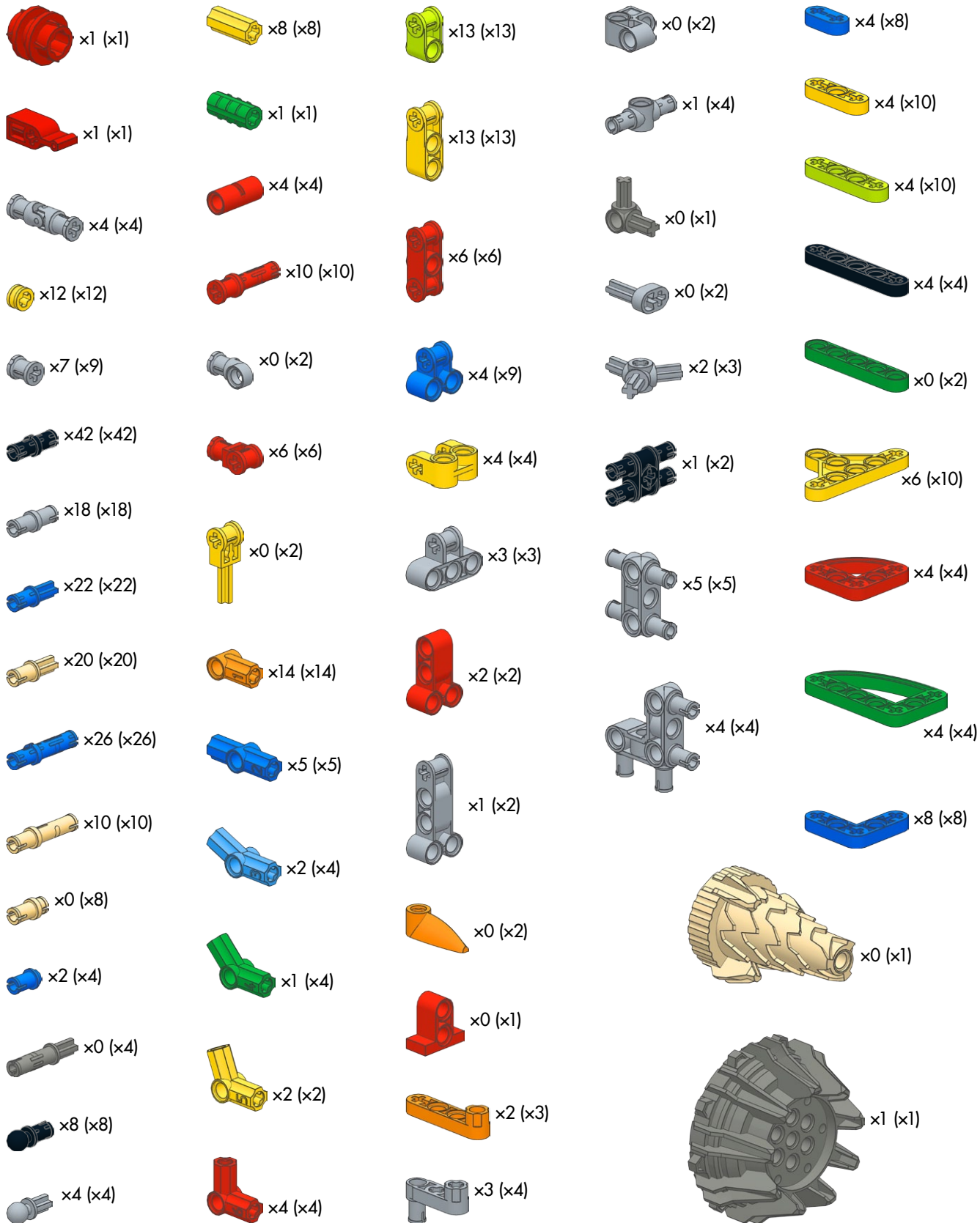
Parts list

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*).









x16 (x16)



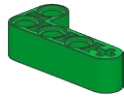
x4 (x4)



x2 (x2)



x2 (x2)



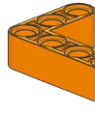
x10 (x10)



x2 (x2)



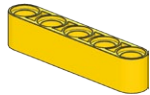
x4 (x6)



x6 (x8)



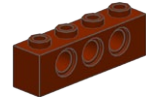
x0 (x2)



x10 (x10)



x4 (x4)



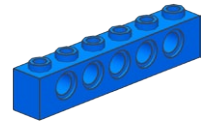
x2 (x5)



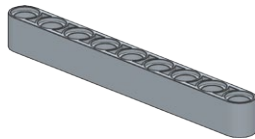
x6 (x7)



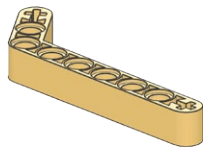
x4 (x4)



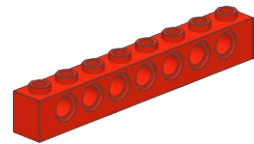
x0 (x4)



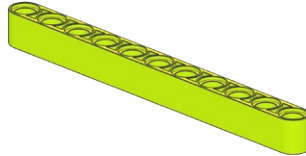
x6 (x6)



x4 (x4)



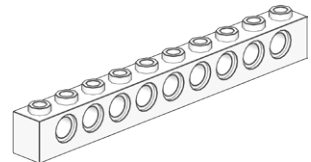
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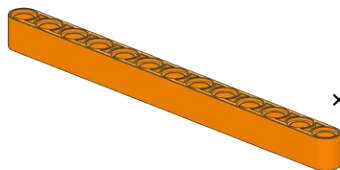
x6 (x6)



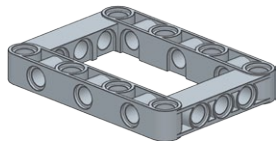
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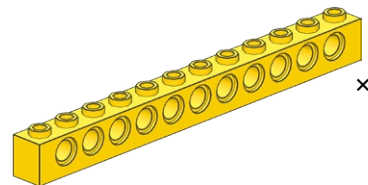
x2 (x2)



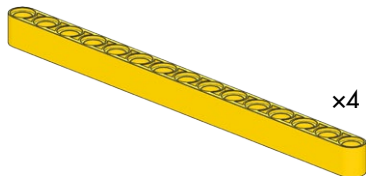
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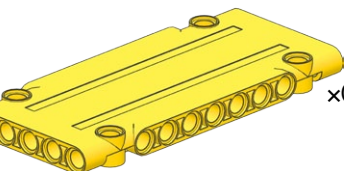
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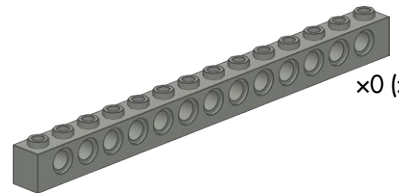
x2 (x2)



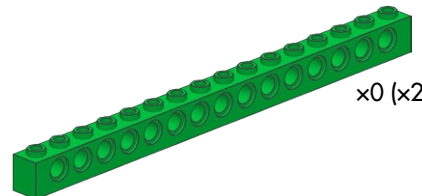
x4 (x4)



x0 (x3)



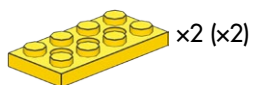
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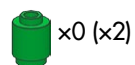
x0 (x2)



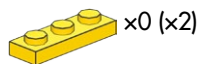
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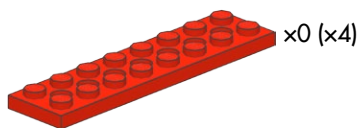
x2 (x2)



x0 (x2)



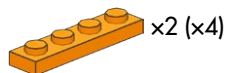
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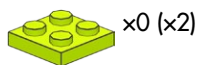
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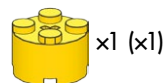
x1 (x1)



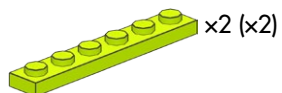
x2 (x4)



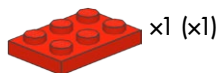
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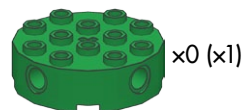
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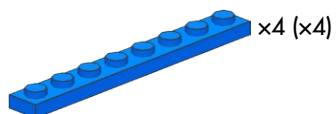
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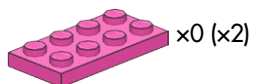
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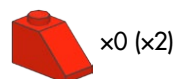
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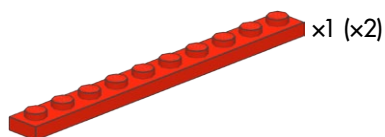
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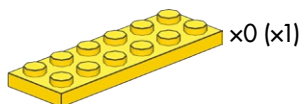
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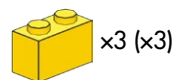
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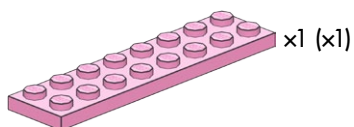
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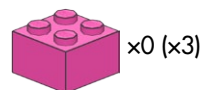
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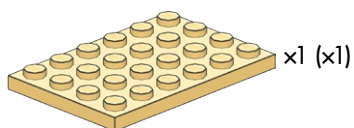
x3 (x3)



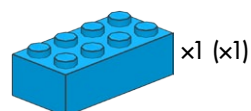
x1 (x1)



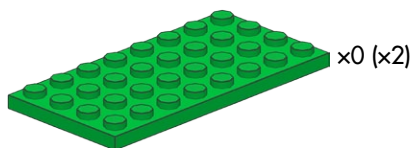
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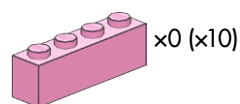
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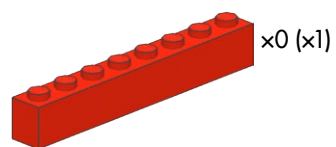
x1 (x1)



x0 (x2)



x0 (x10)



x0 (x1)

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This second volume of *The LEGO® Power Functions Idea Book, Cars and Contraptions*, showcases small projects to build with LEGO Technic gears, motors, gadgets, and other moving elements. You'll find hundreds of clever, buildable mechanisms, each one demonstrating a key building technique or mechanical principle.

You'll learn to build four-wheel drive cars, adorable walking 'bots, steerable tanks, robotic inchworms, and cars that can follow the edge of a table!

Each model includes a list of required parts and colorful photographs that guide you through the build without the need for step-by-step instructions. As you build, you'll explore the principles of gear systems, power translation, differentials, suspensions, and more.



YOSHIHITO ISOGAWA

is a LEGO luminary with 46 years of building experience. In addition to running Isogawa Studio, Inc., he regularly holds LEGO workshops, lectures at schools and science museums, and creates LEGO models for events and

exhibitions. He is the author of the *LEGO® Technic Idea Book* series and *The LEGO® MINDSTORMS® EV3 Idea Book* (No Starch Press), as well as many Japanese-language LEGO titles.



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