

# *Image-guided therapy and medical robotics tutorial using a LEGO Mindstorms NXT robot and 3D Slicer*

## Assembly Instructions: Robot



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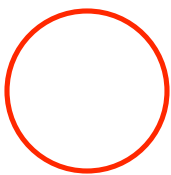
# Before you start:

5

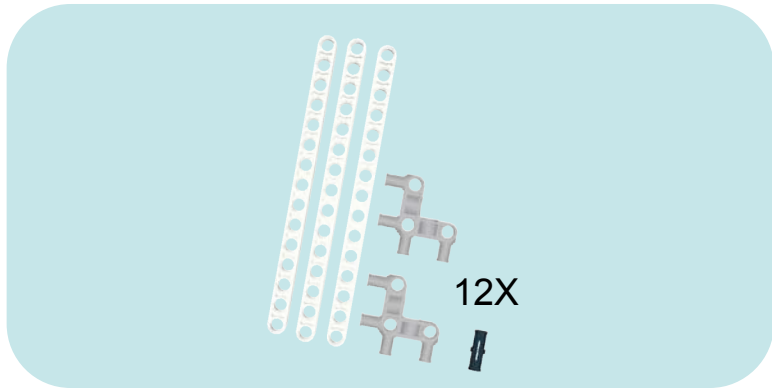
Gives the length for axels (see the back cover of the LEGO Mindstorms NXT User Guide)

12X

Tells you how many pieces to use (12 in this case)

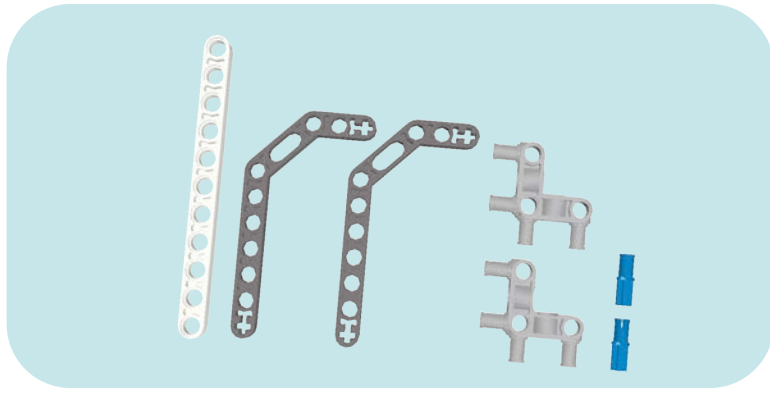


Shows where two constructions snap together or areas to pay special attention to



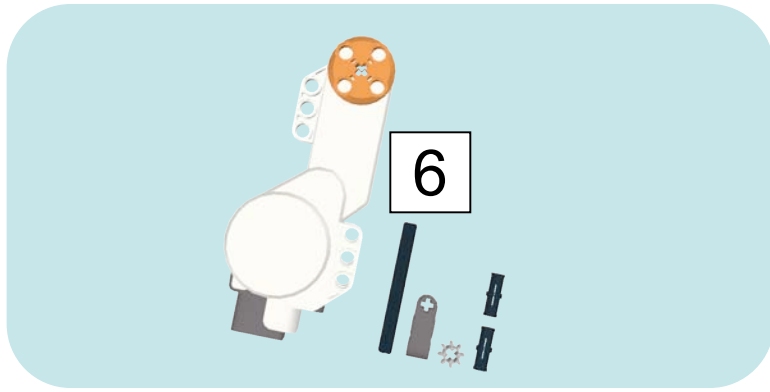
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2

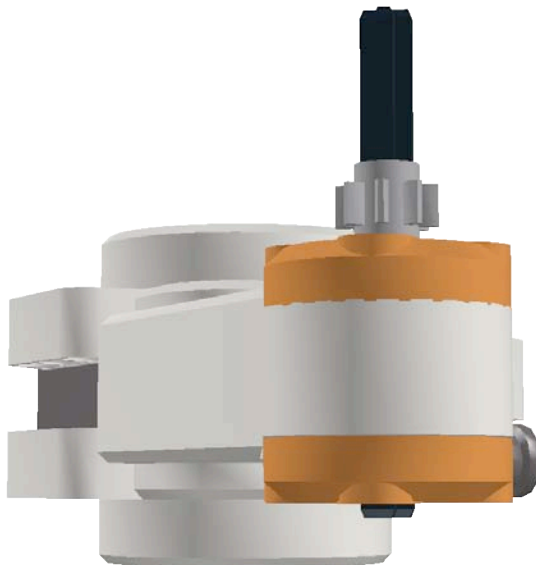


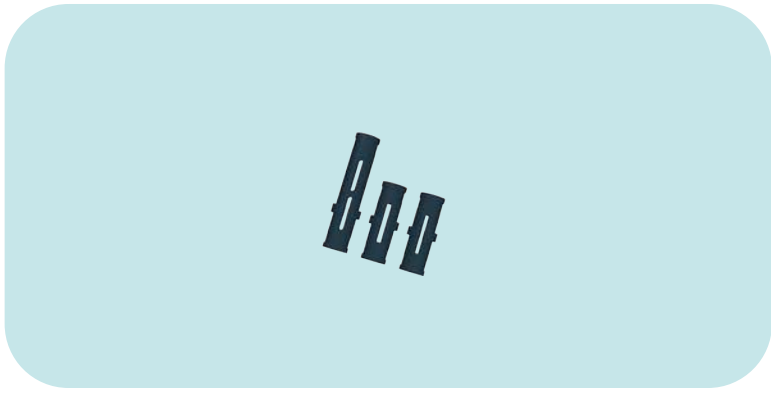


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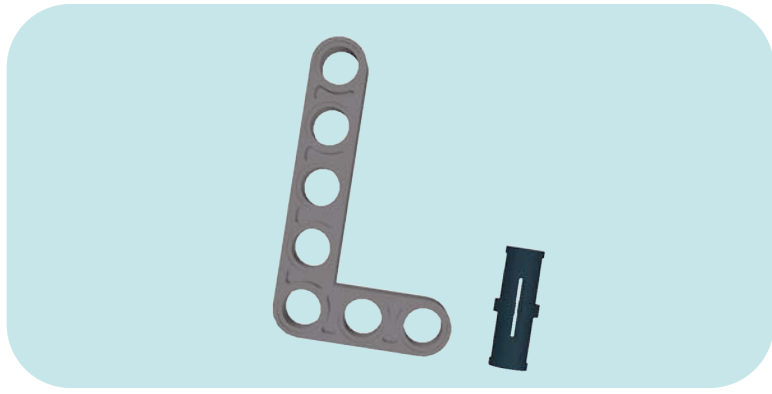
Alternate  
view:



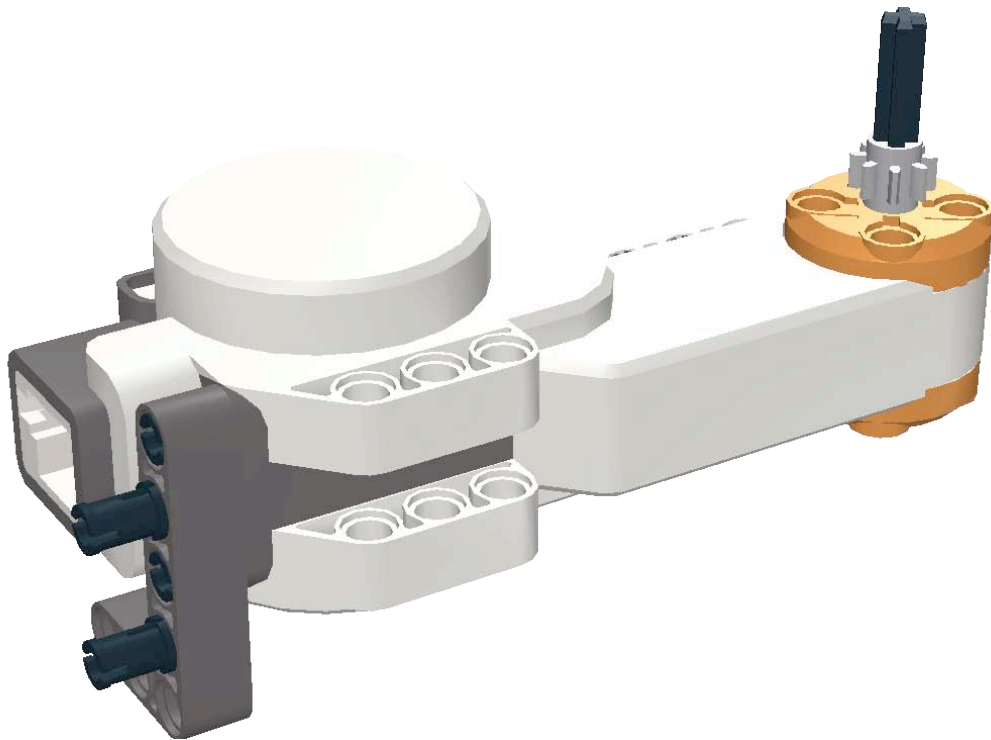


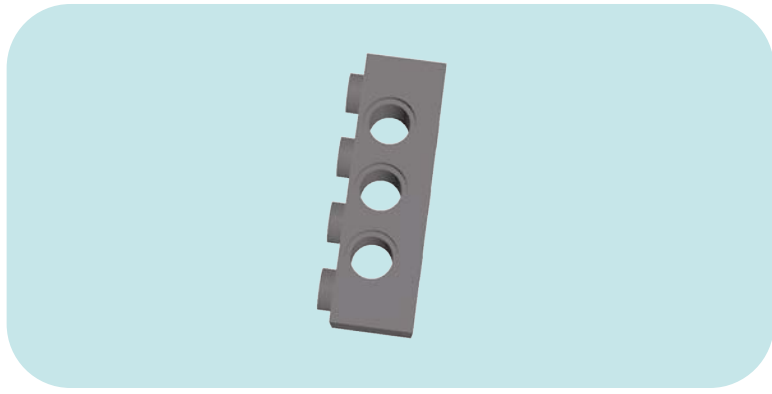
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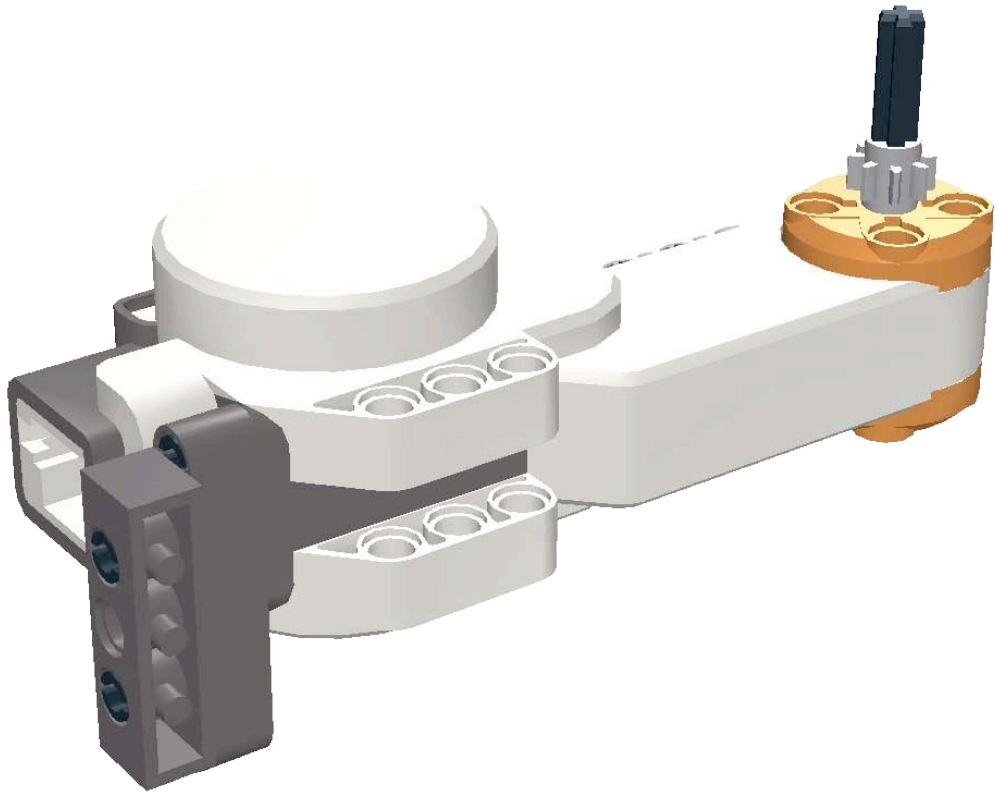


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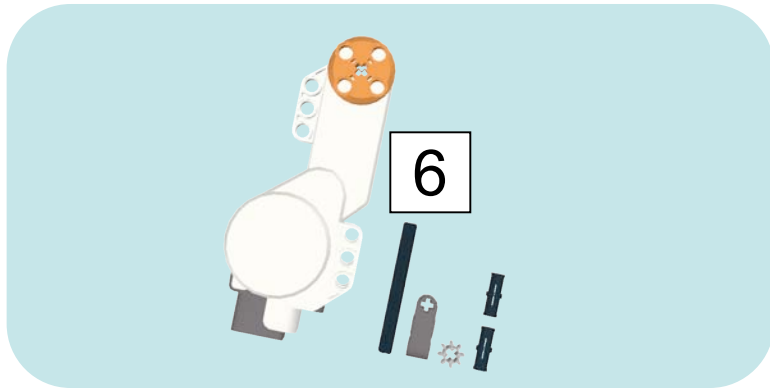




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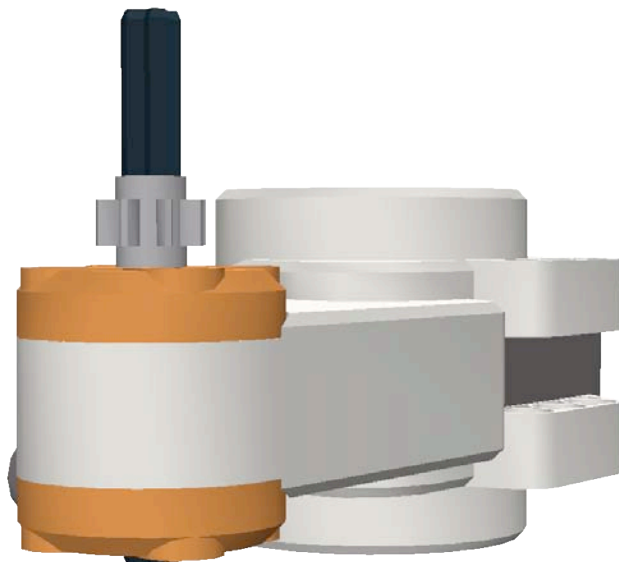


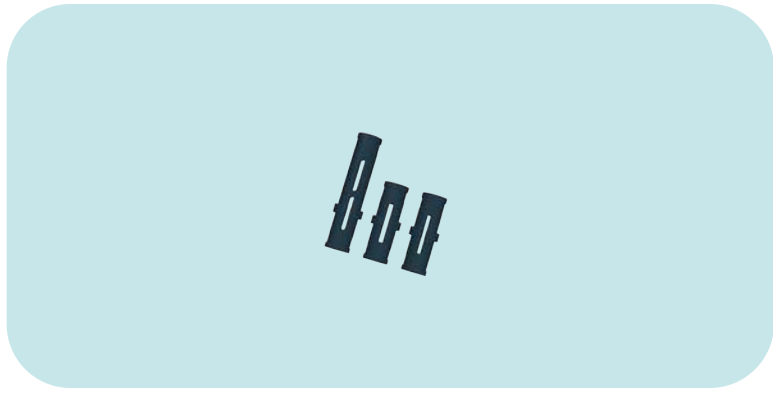


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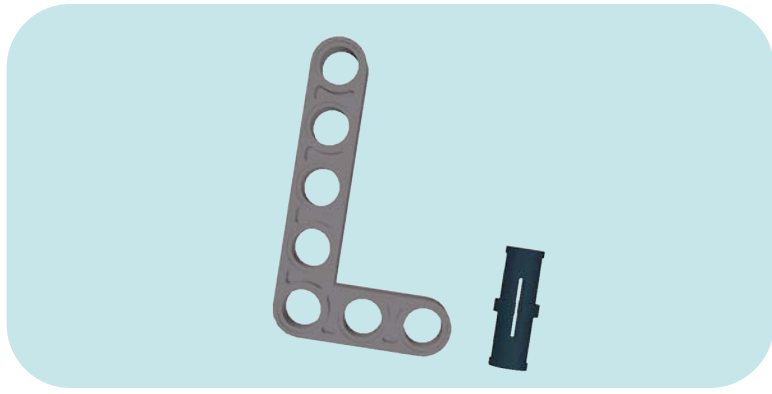
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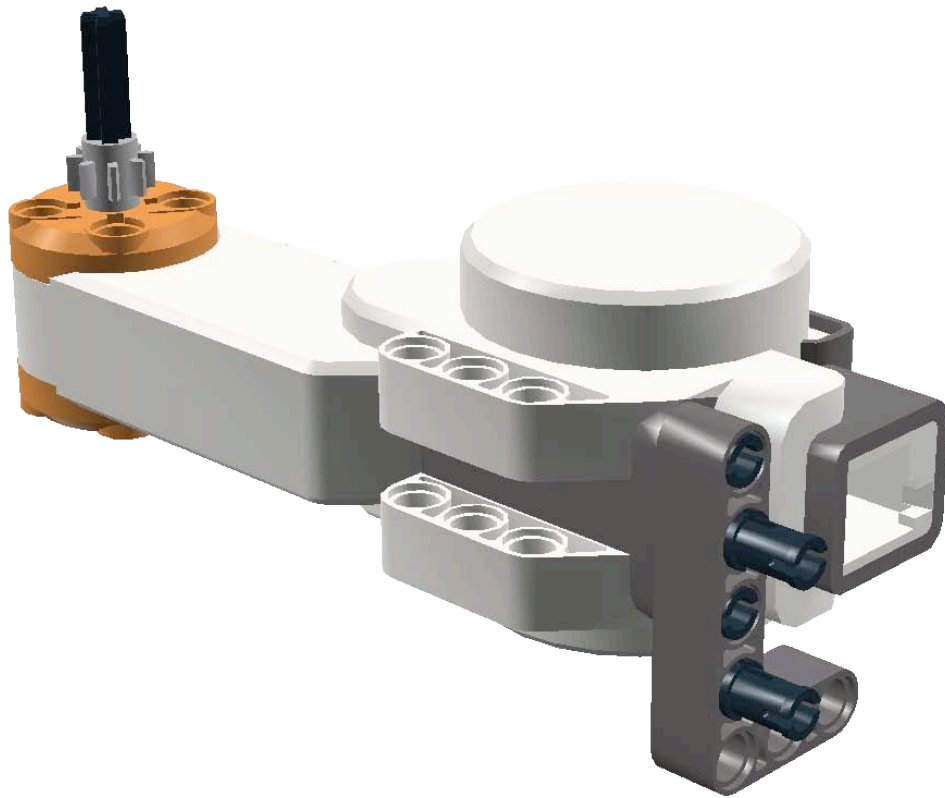


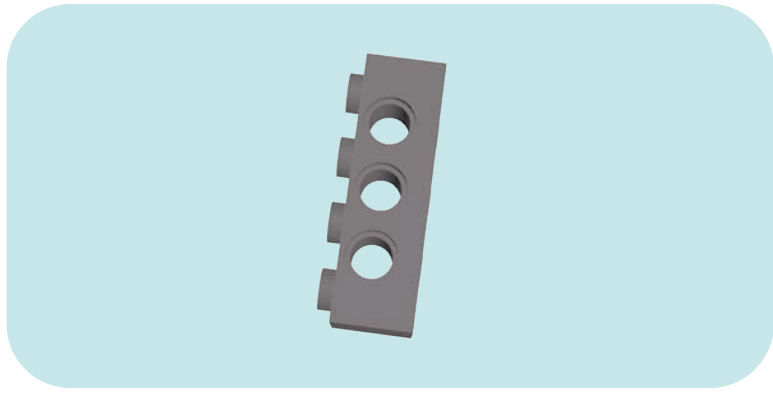
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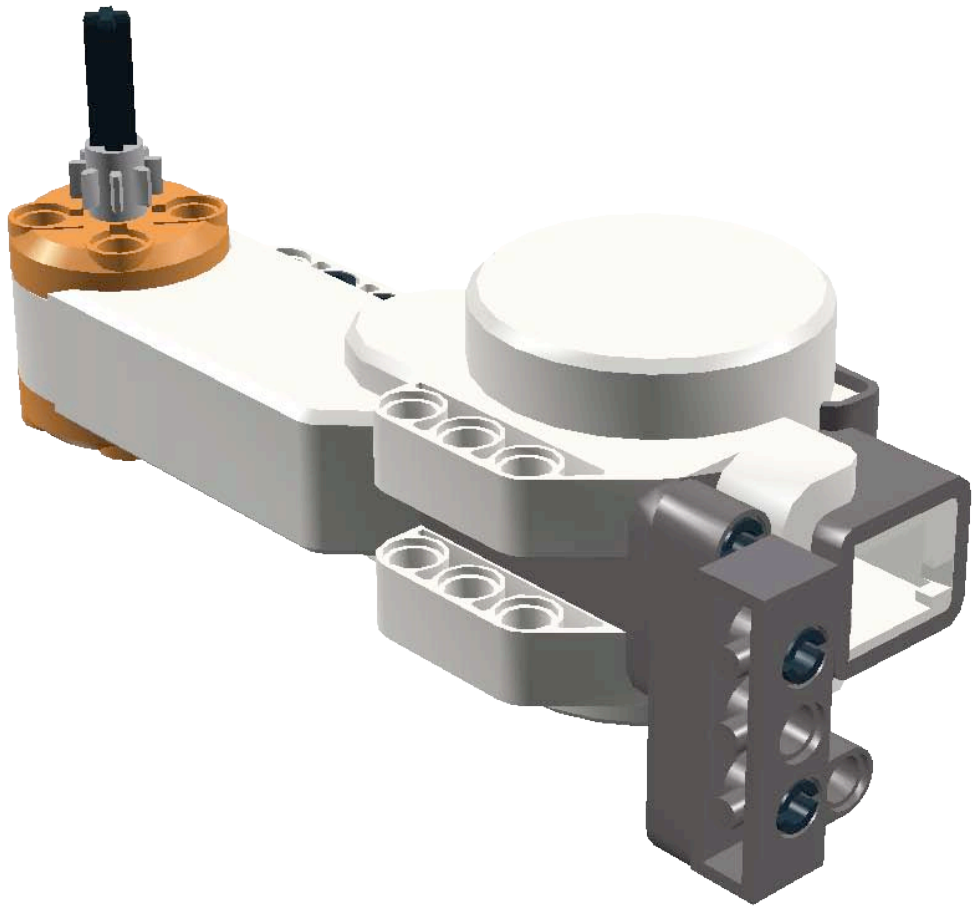


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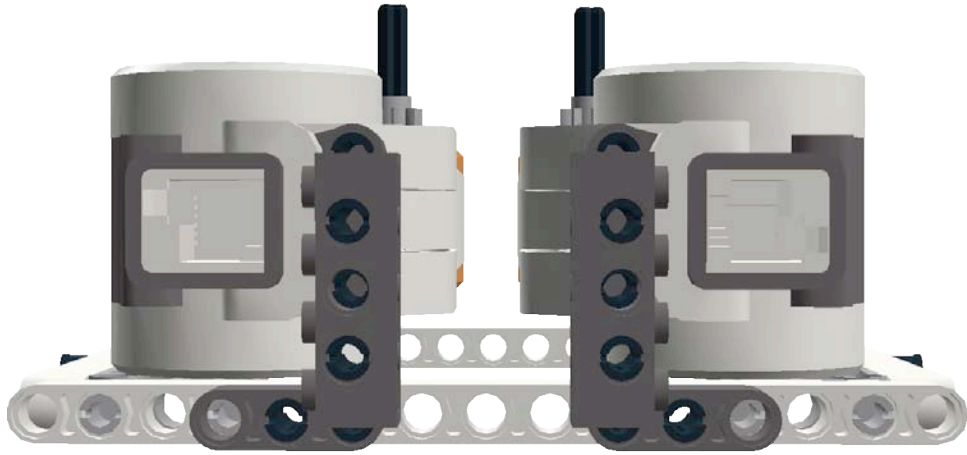




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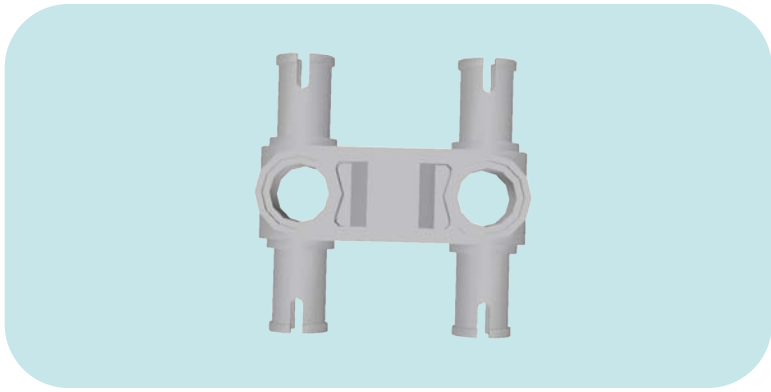


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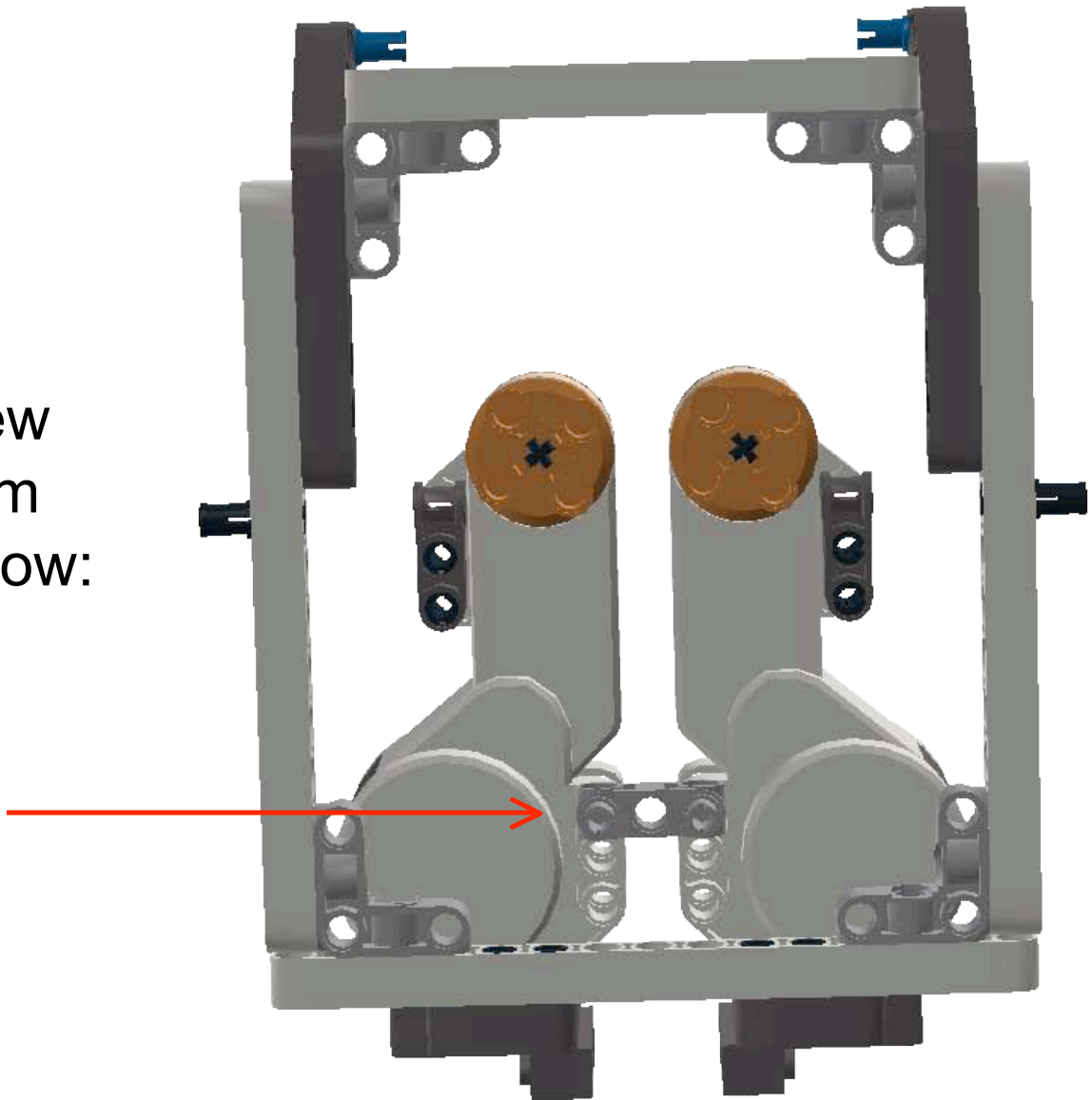
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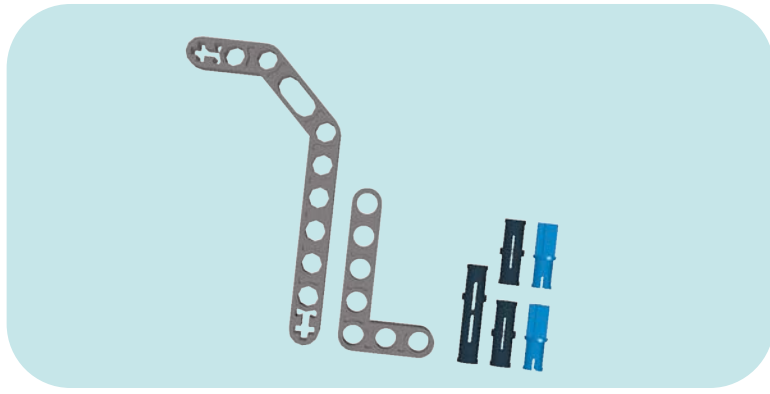




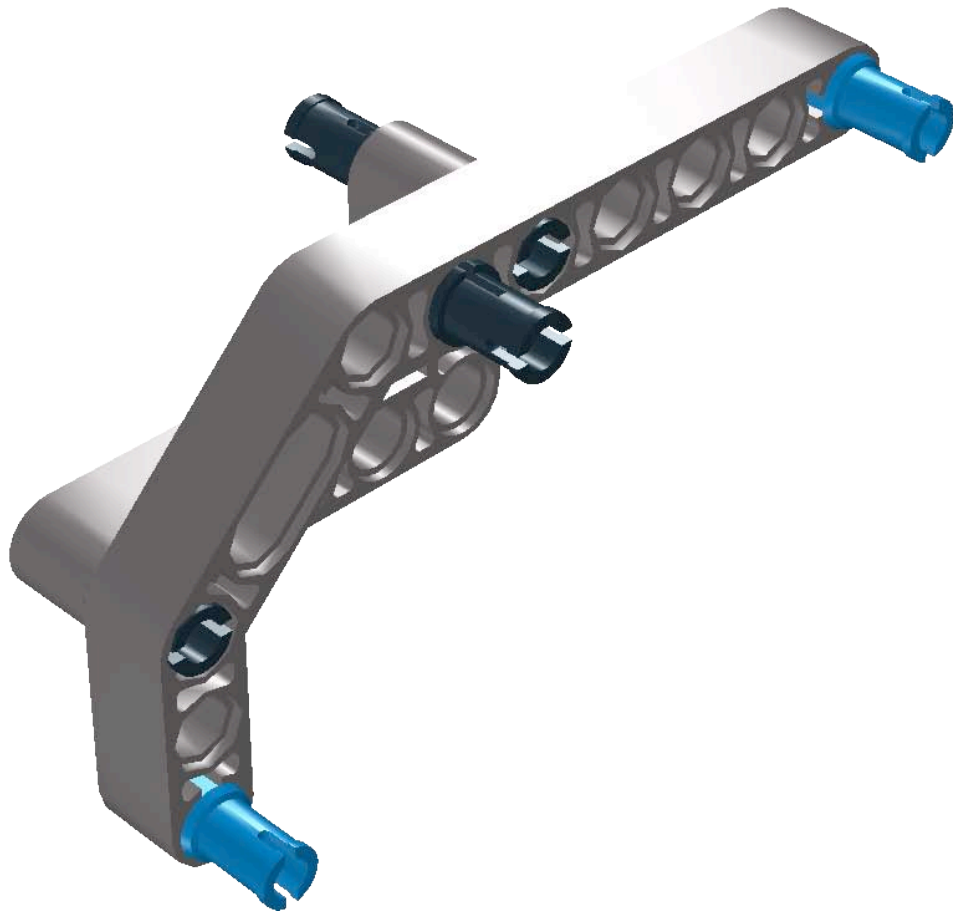
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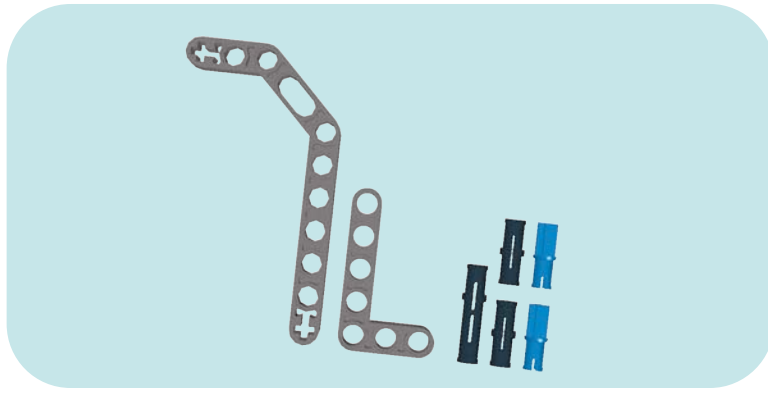
View  
from  
below:



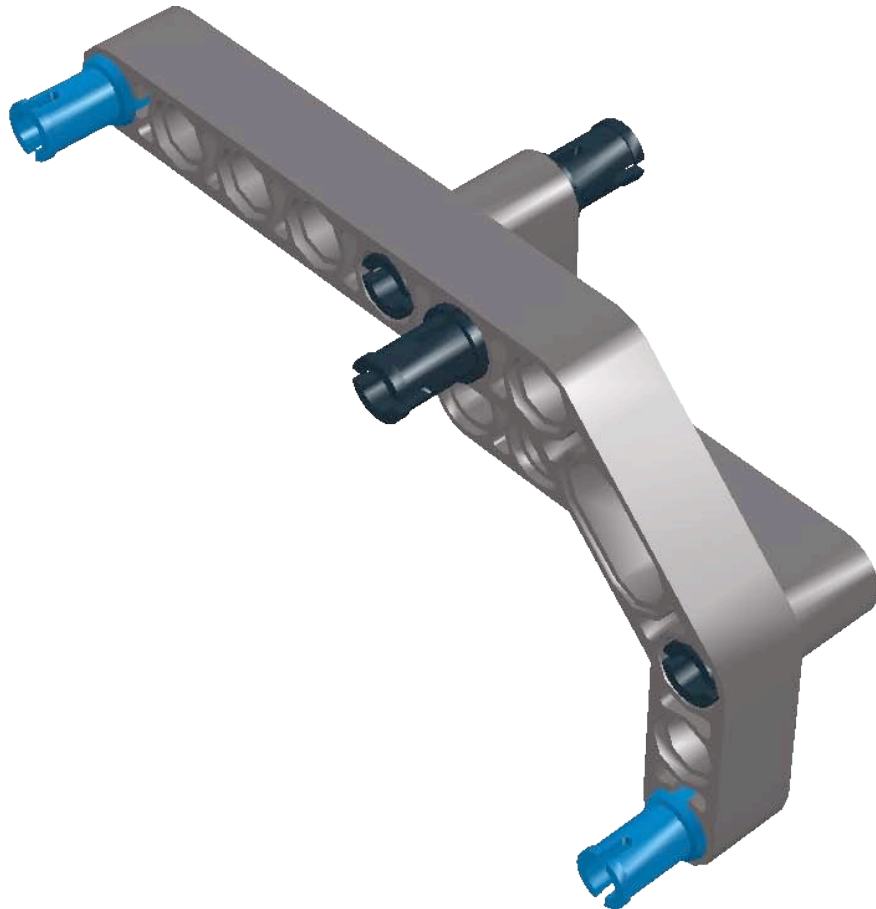


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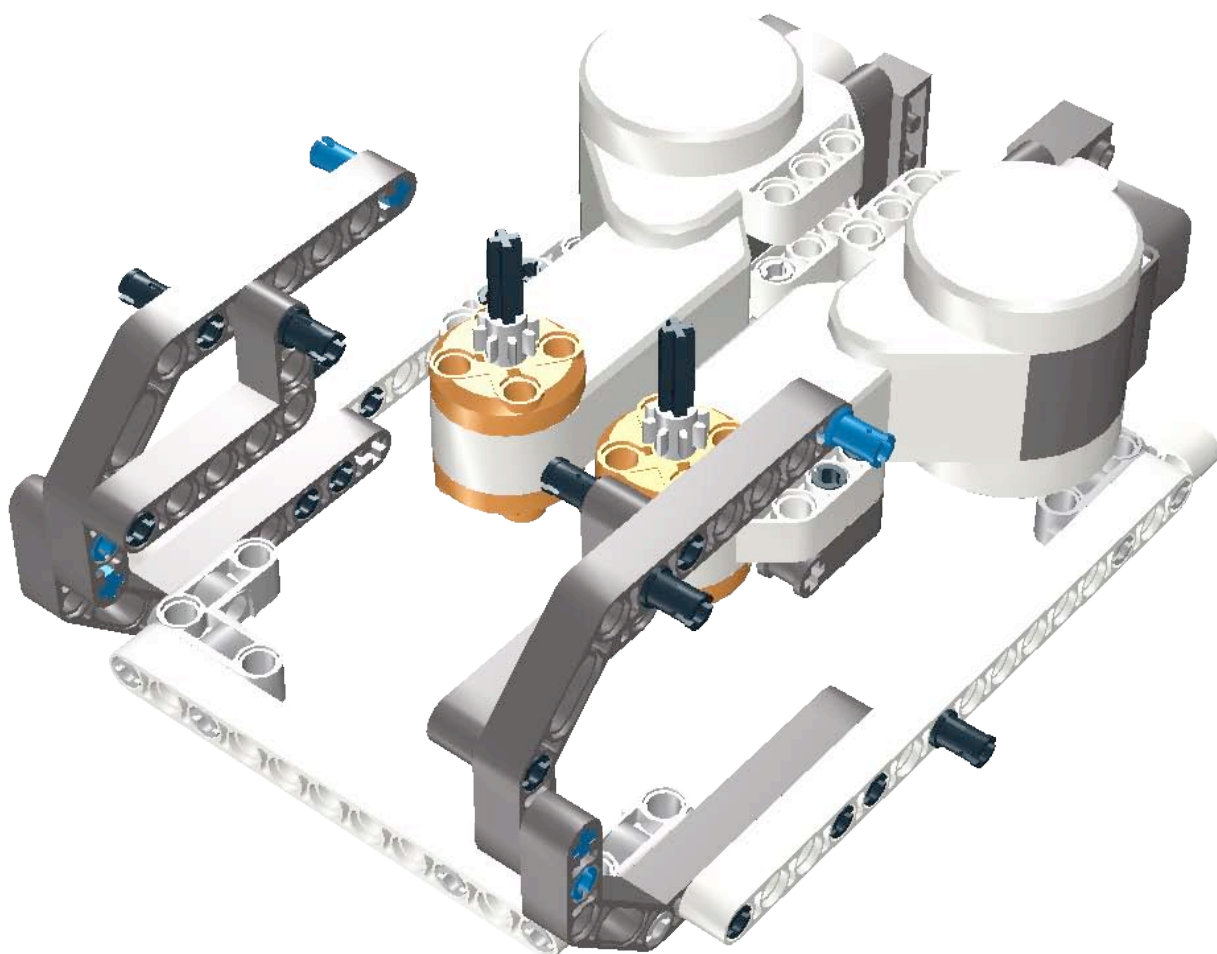


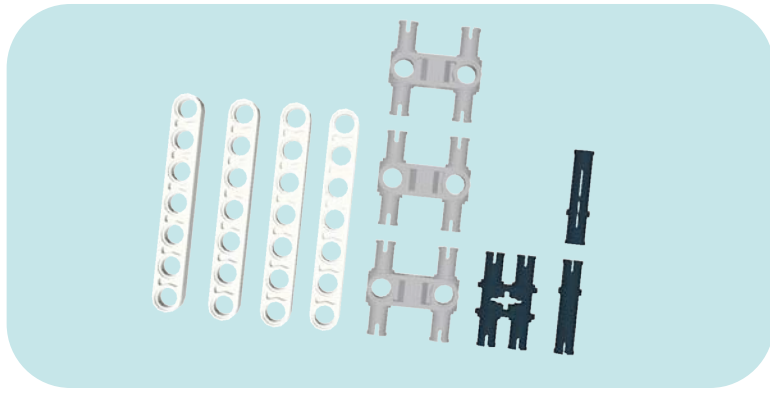
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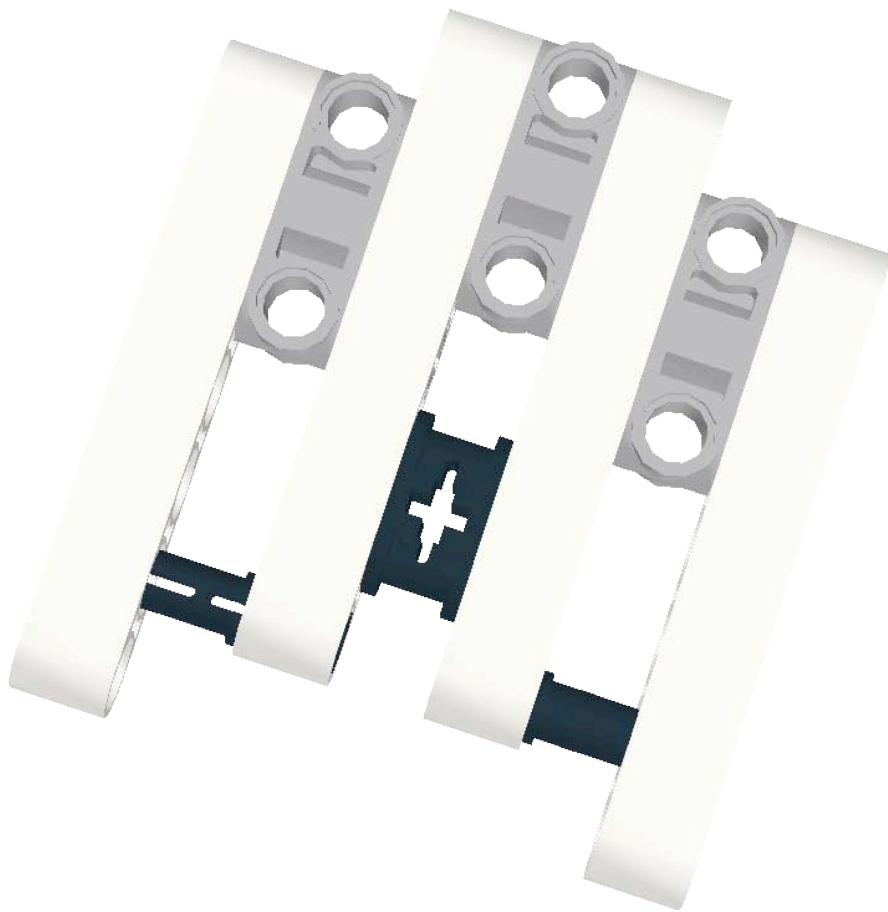


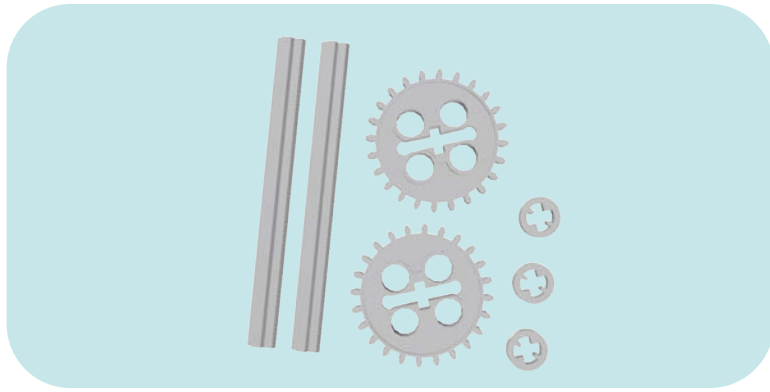
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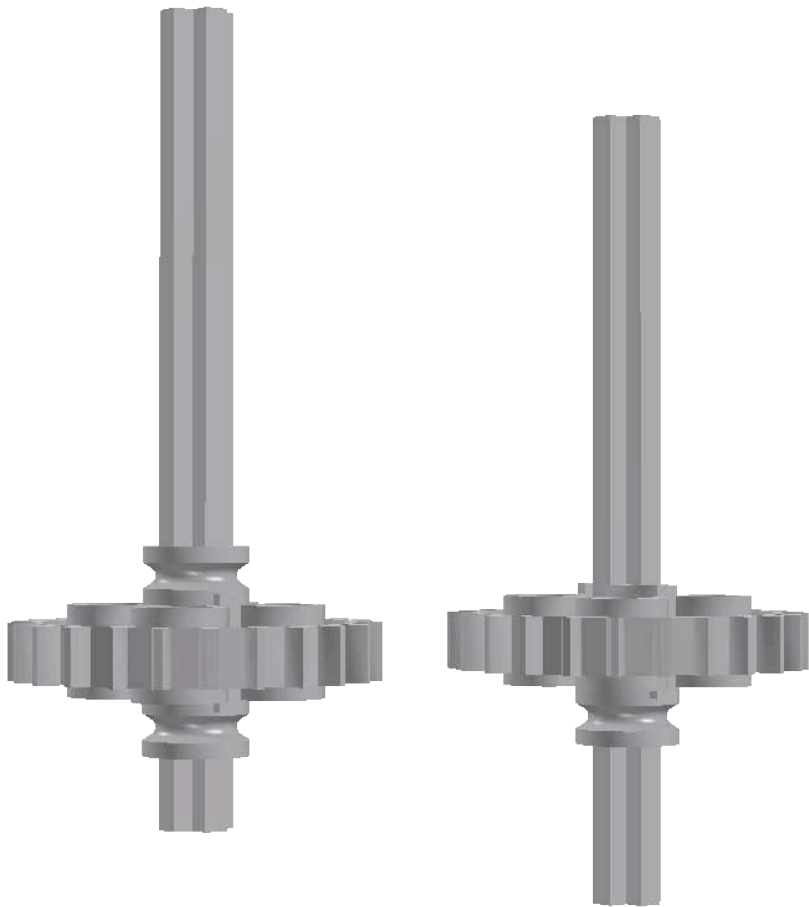


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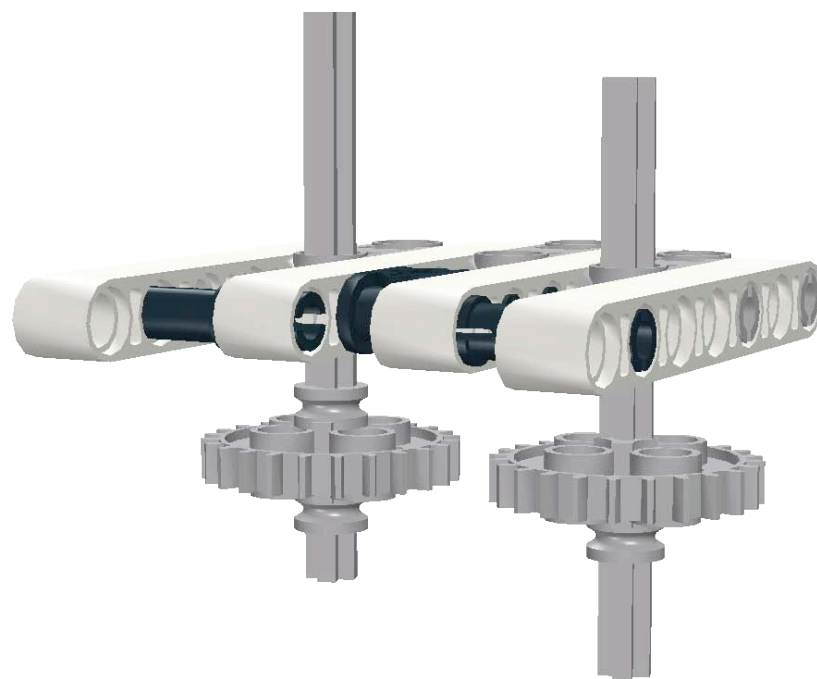
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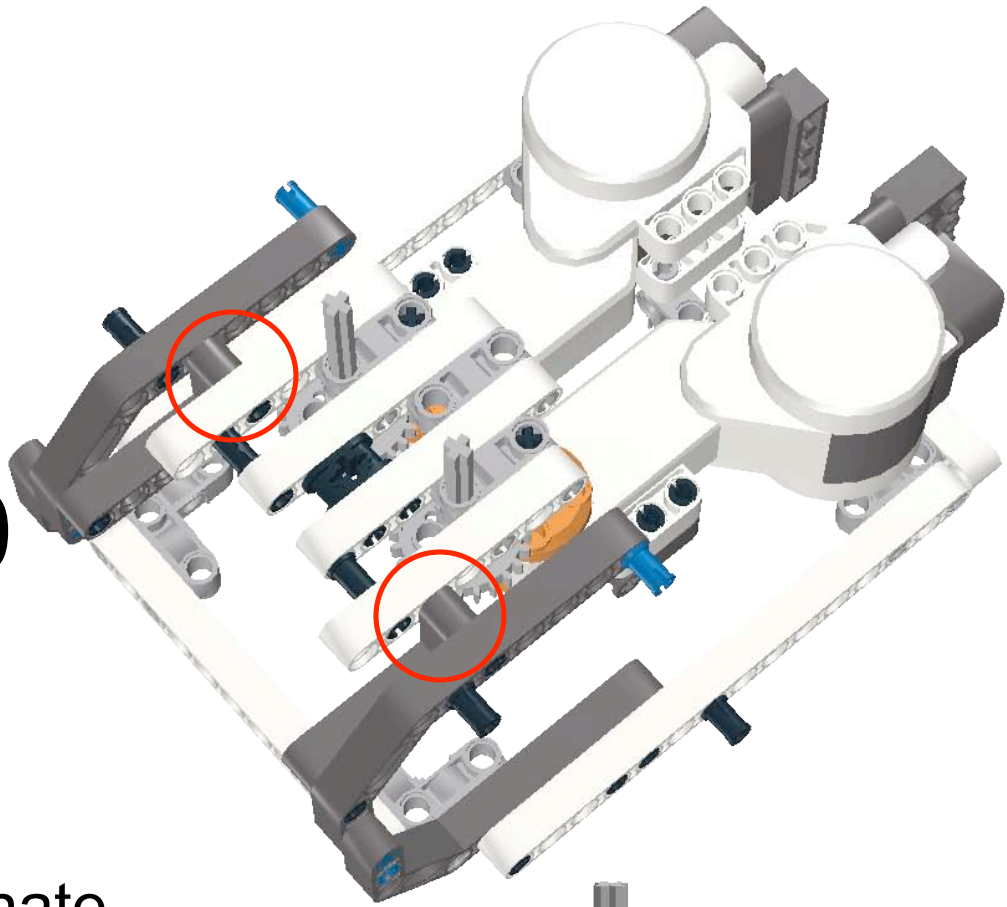
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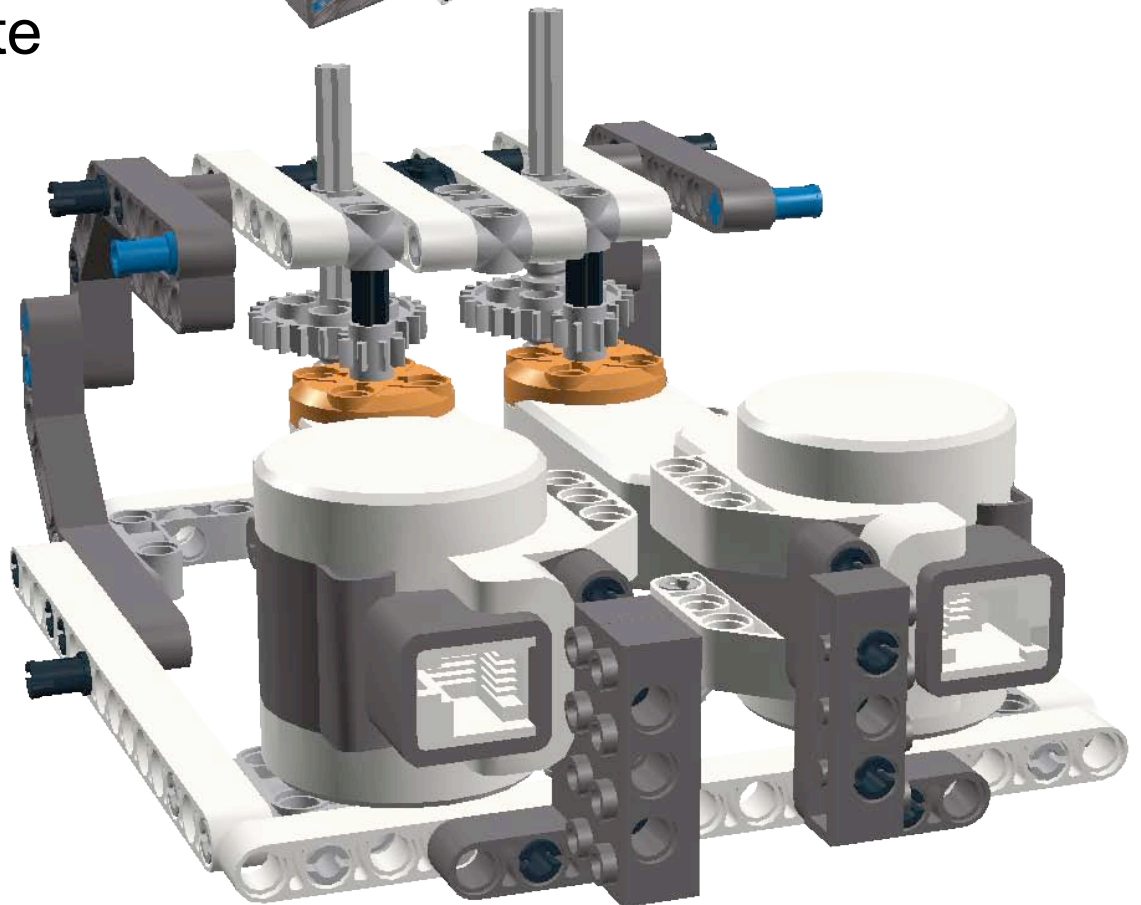
Alternate  
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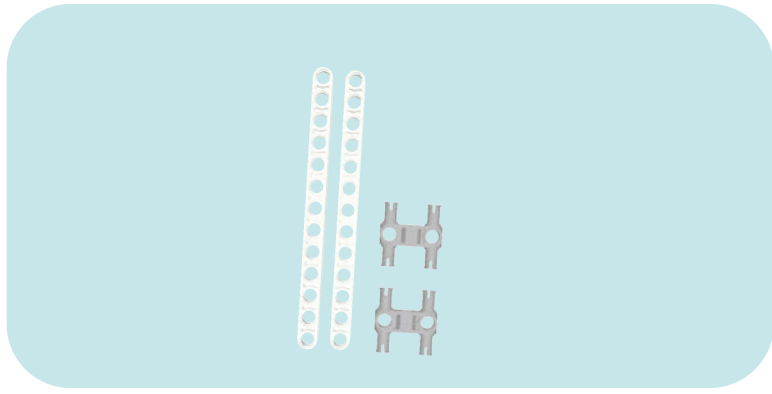


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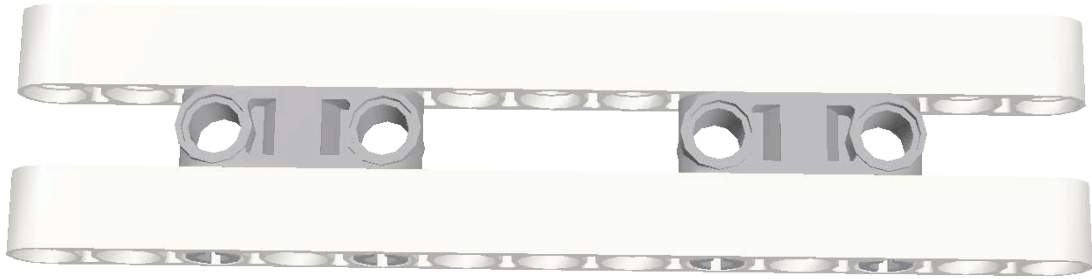


Alternate  
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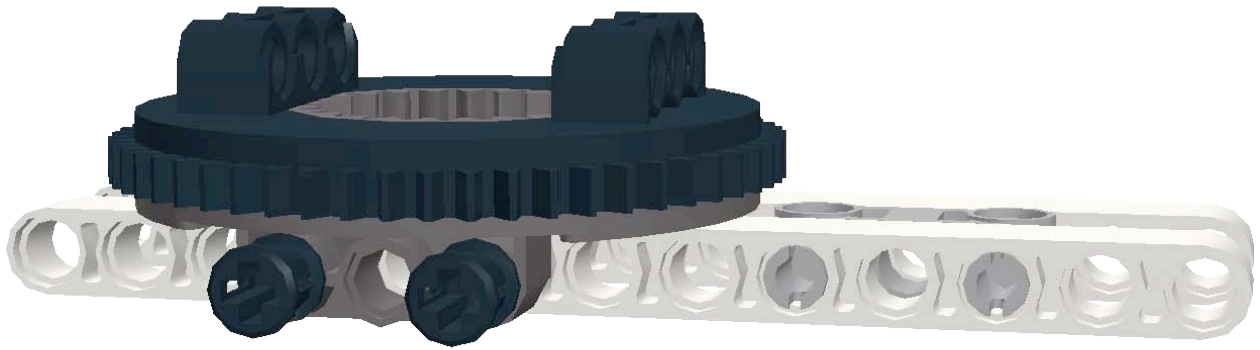


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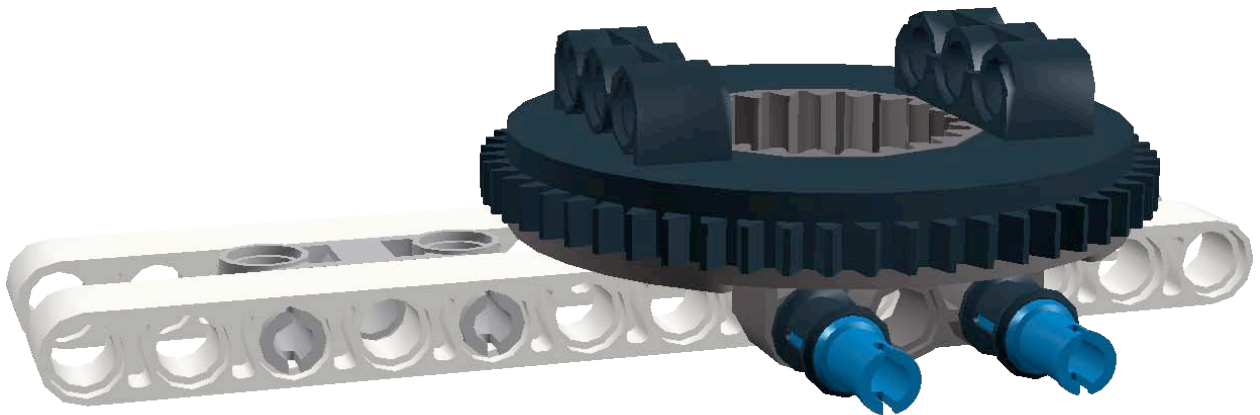


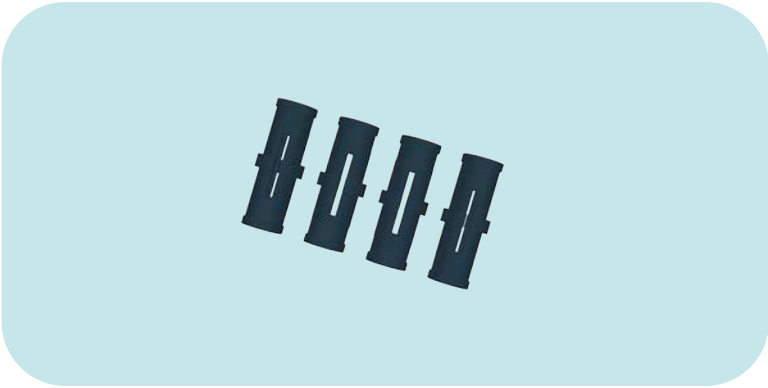


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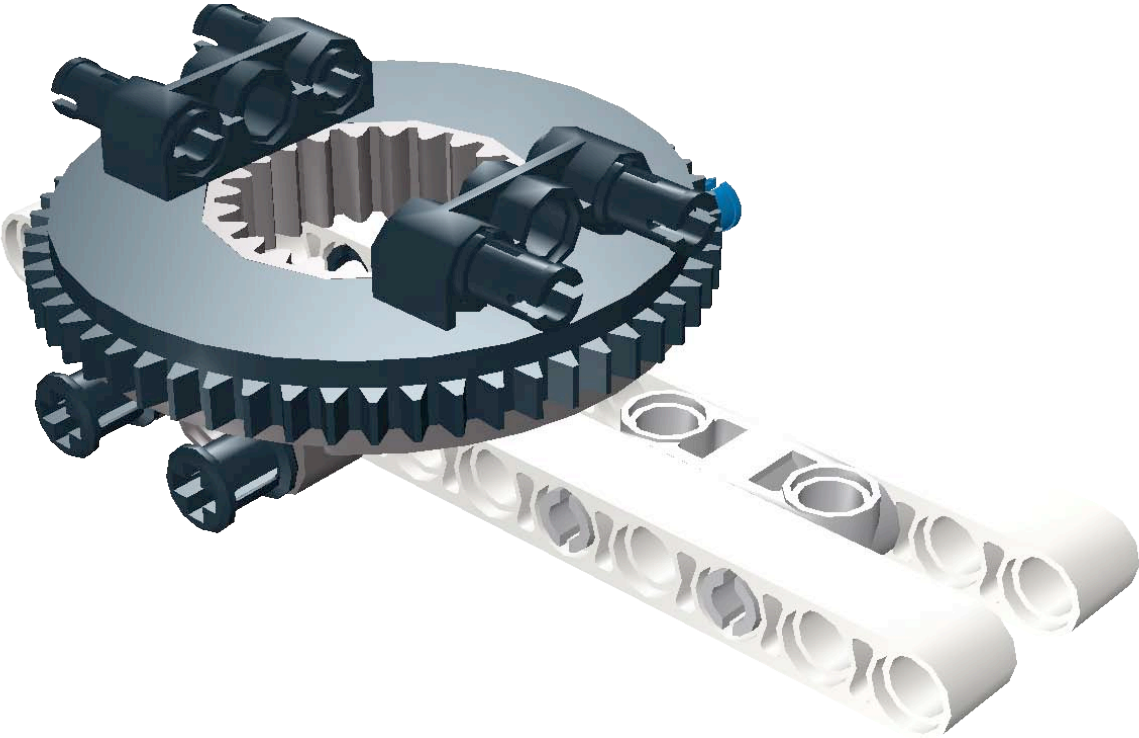


Back view:

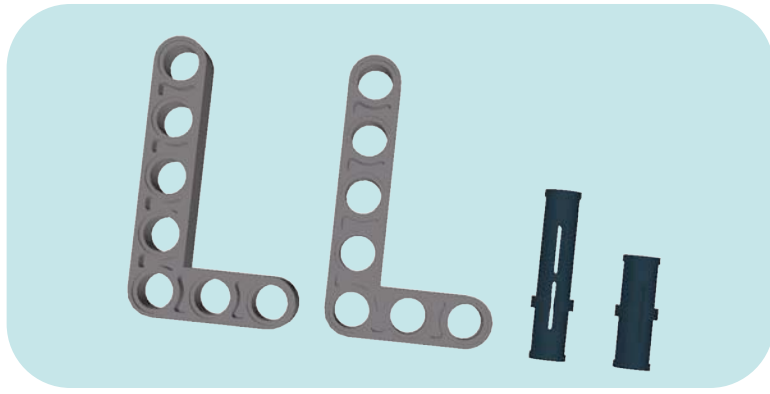




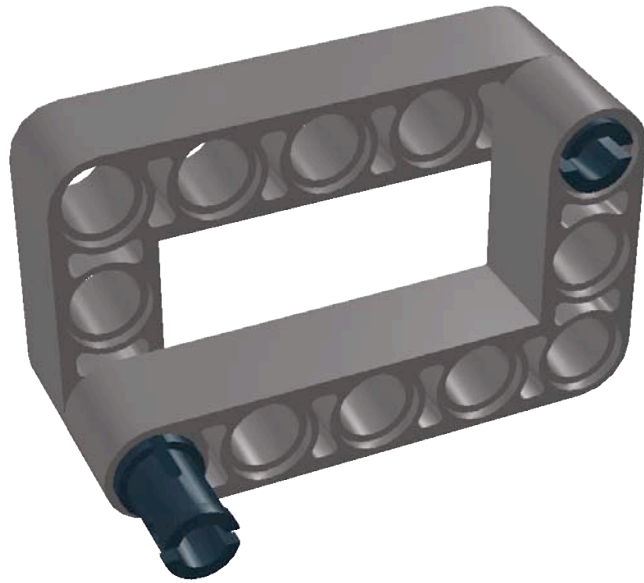
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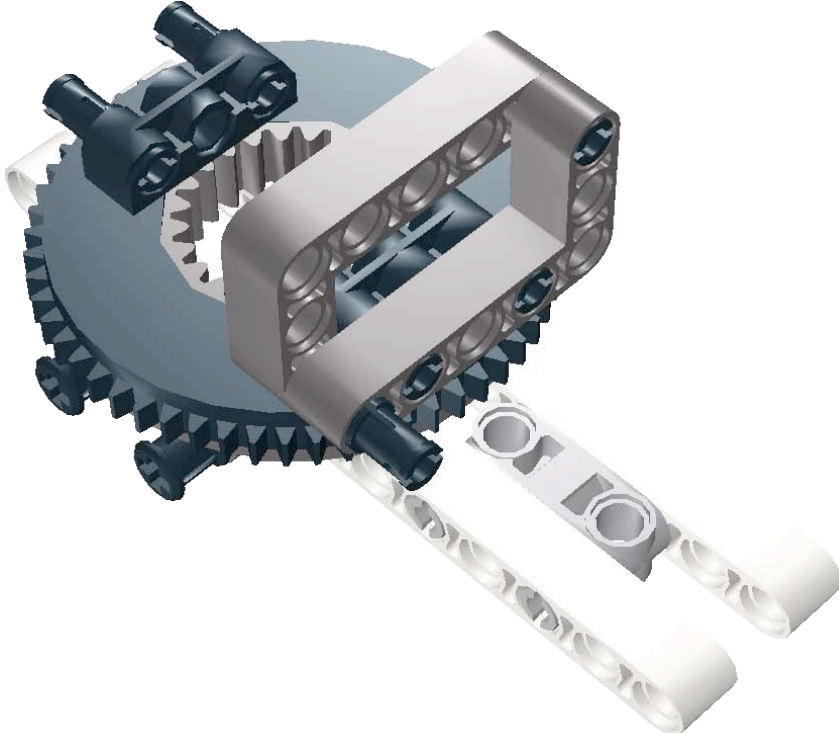


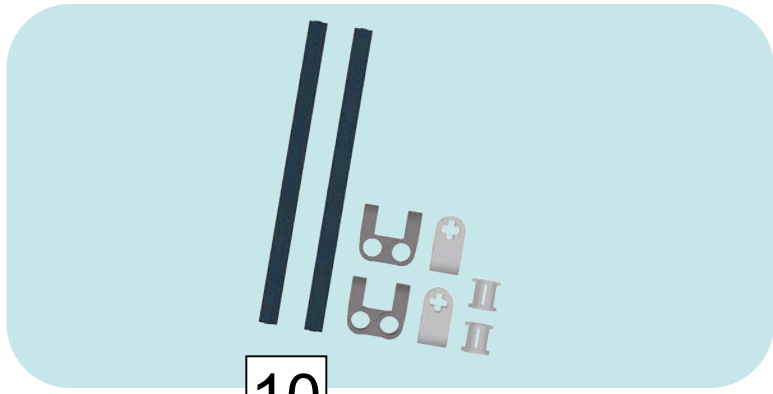


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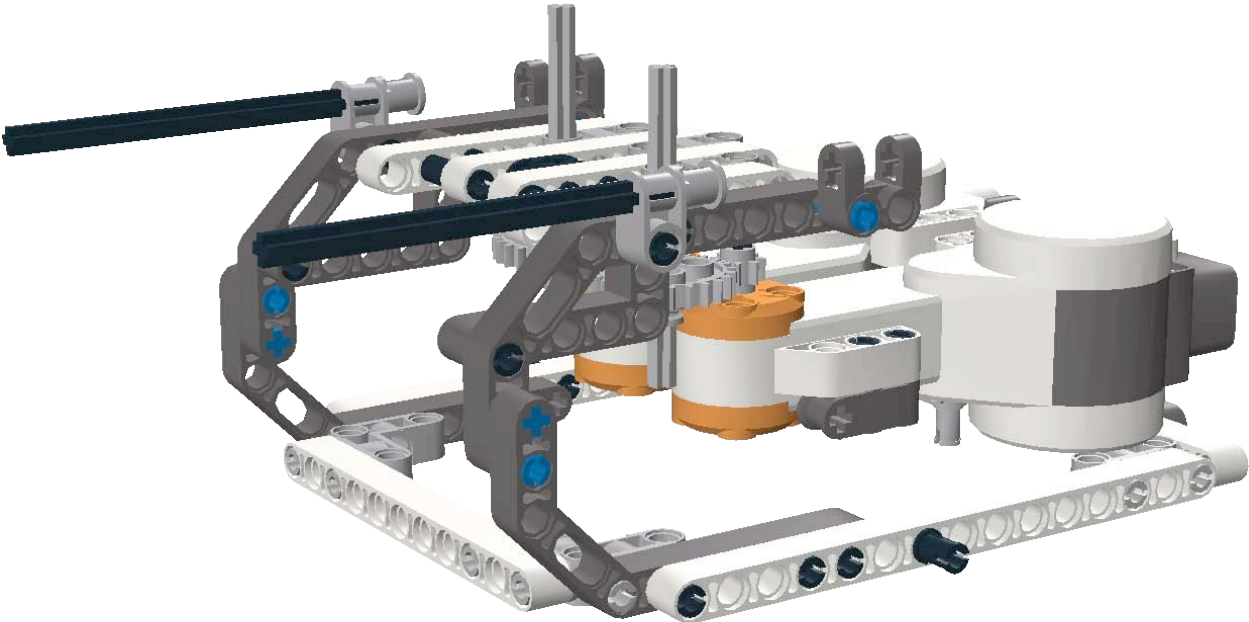
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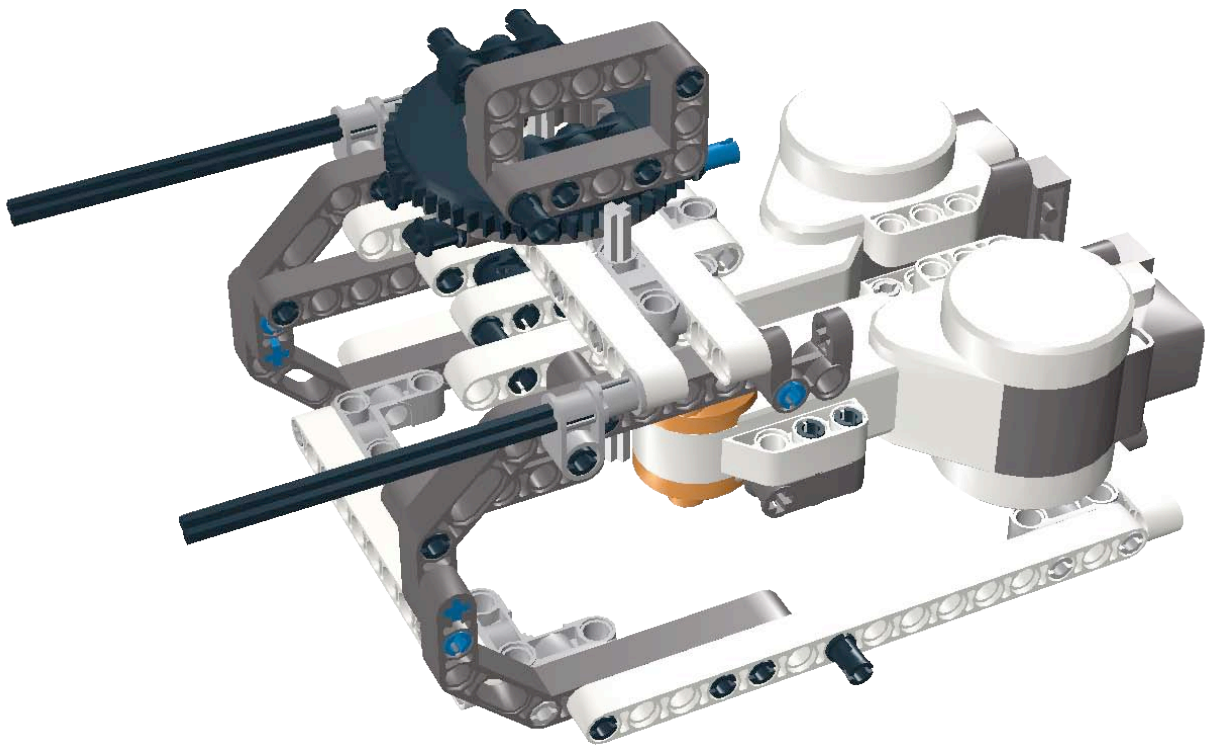


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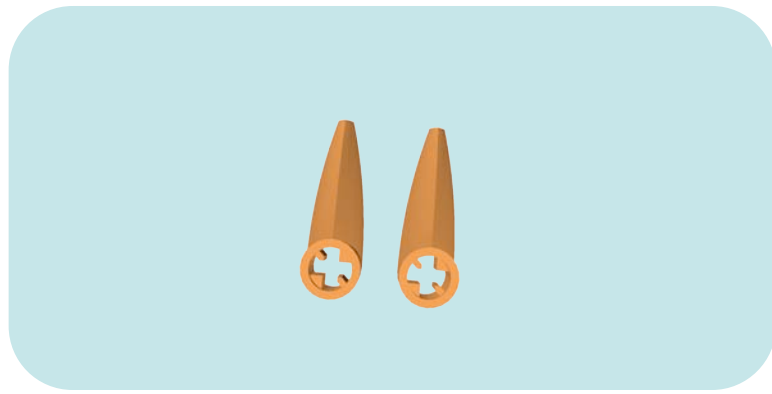
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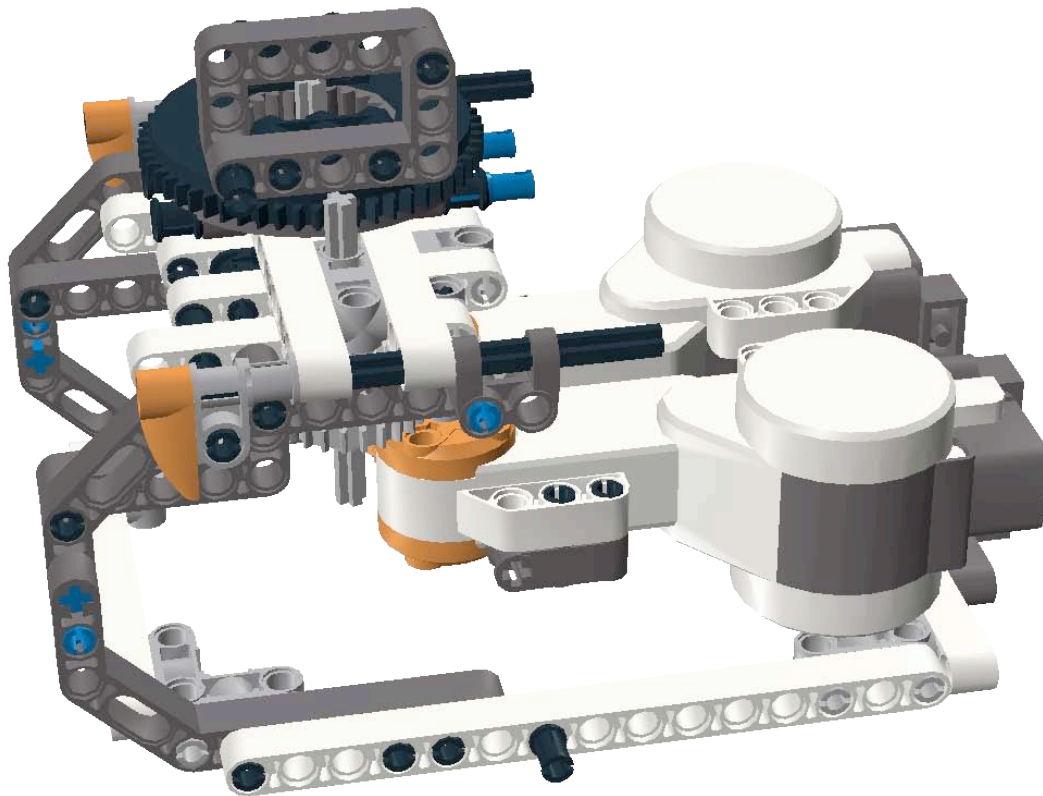
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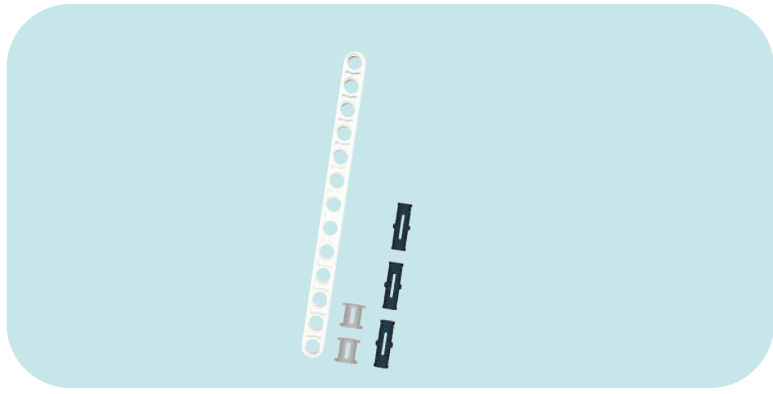
\* Don't snap any pieces together - simply rest the top portion onto the two vertical gray axels



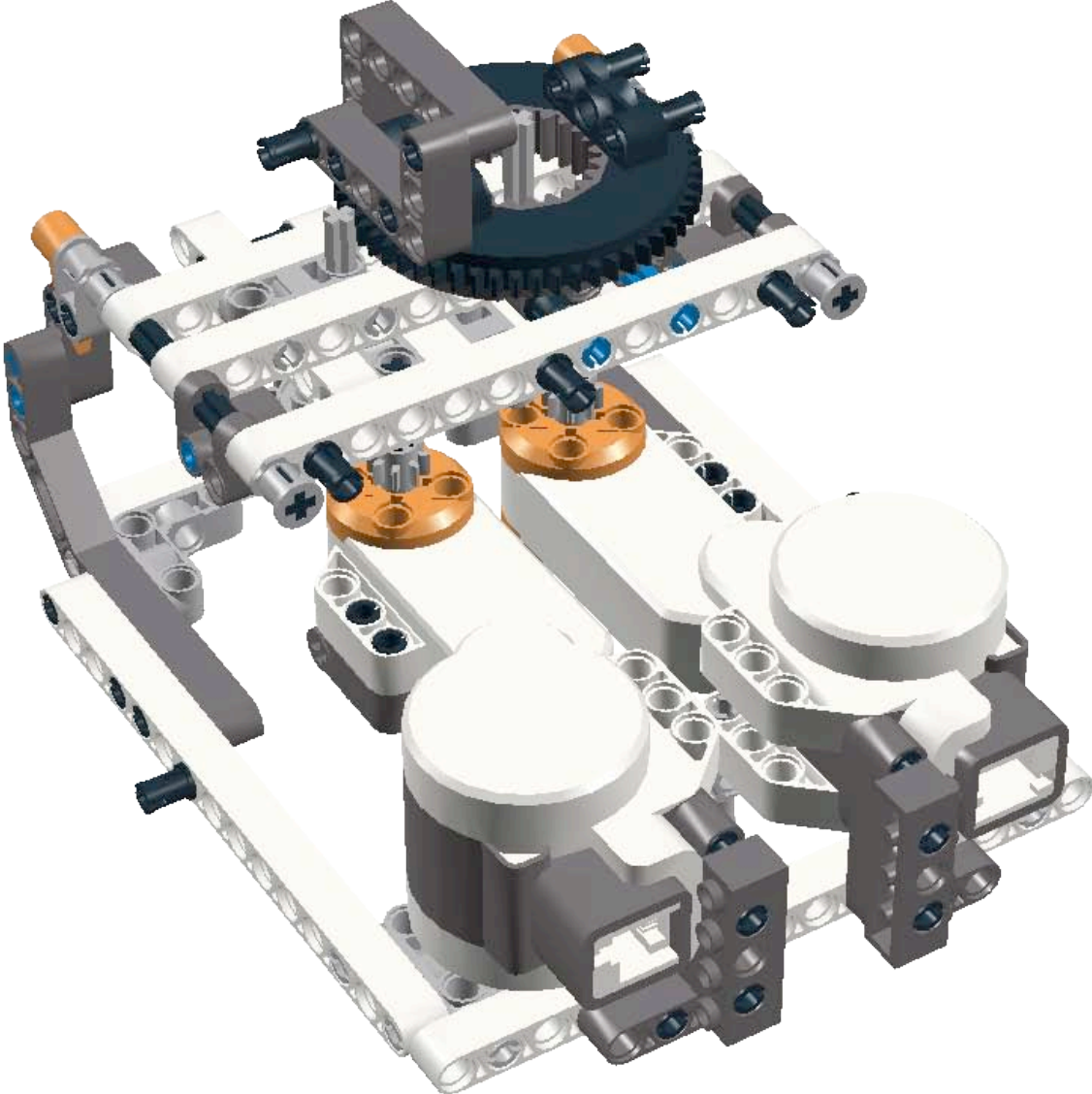
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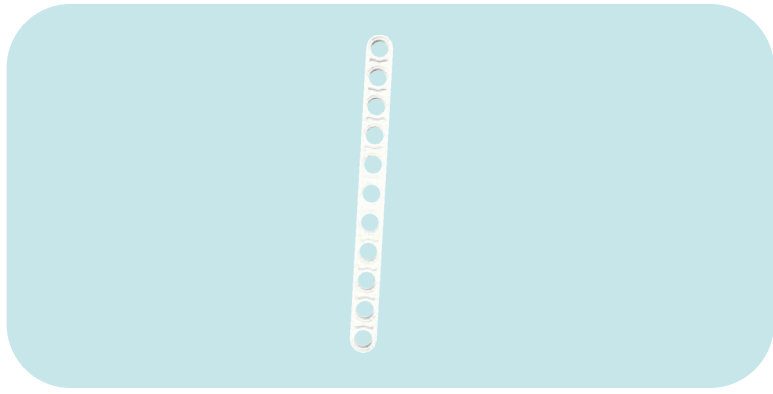


\* Push the two horizontal black axels through, then add the orange pieces

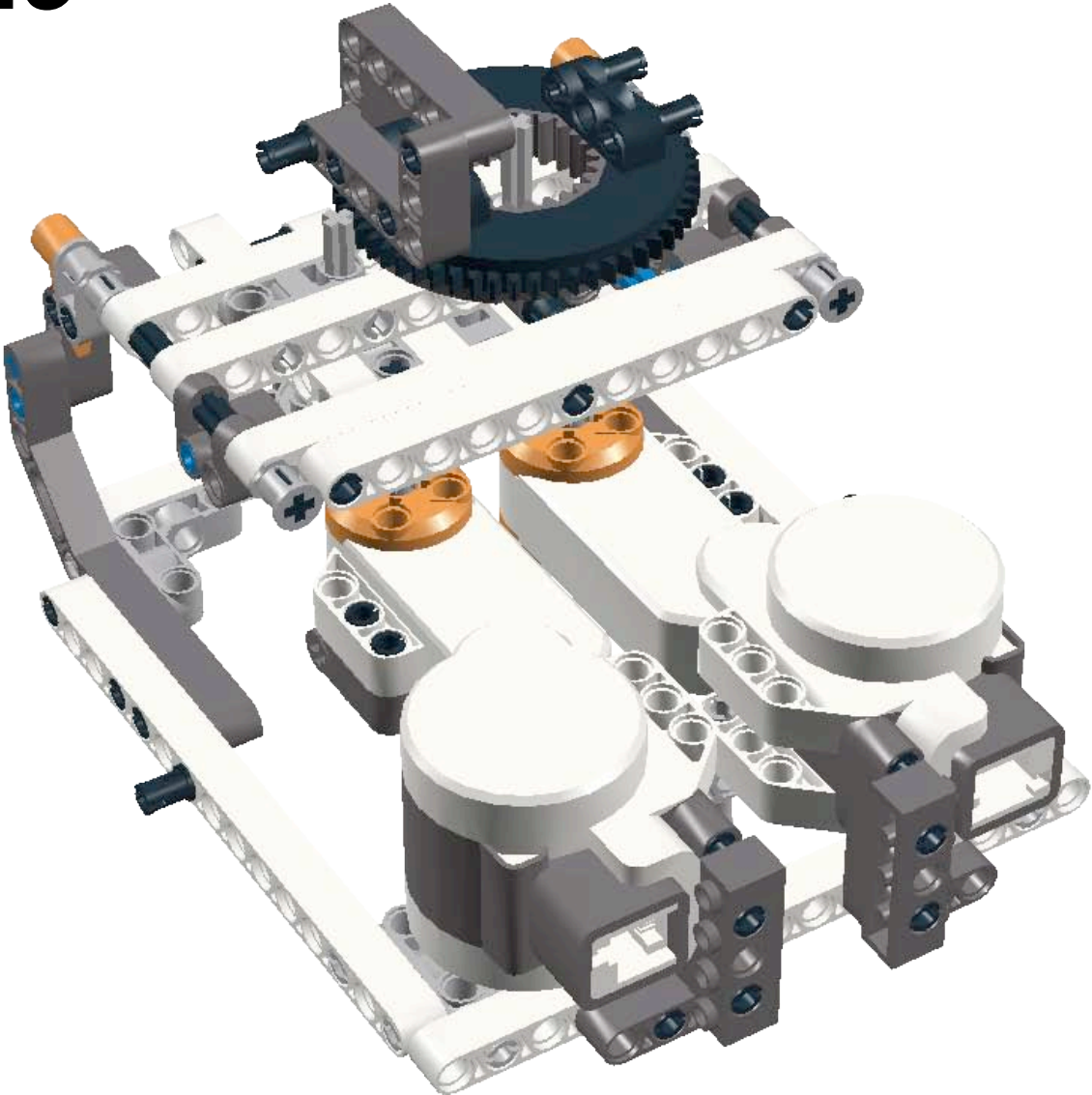


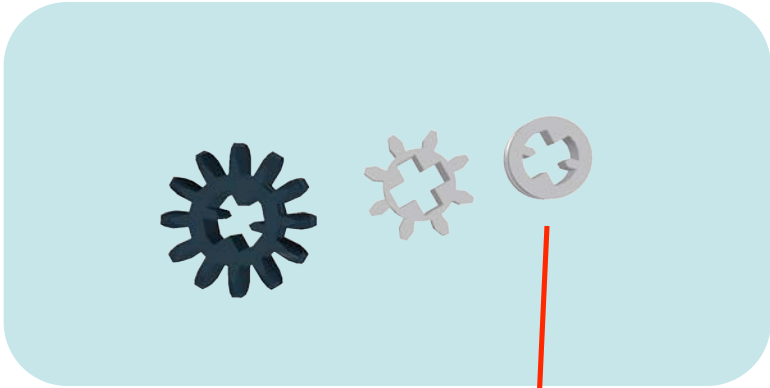
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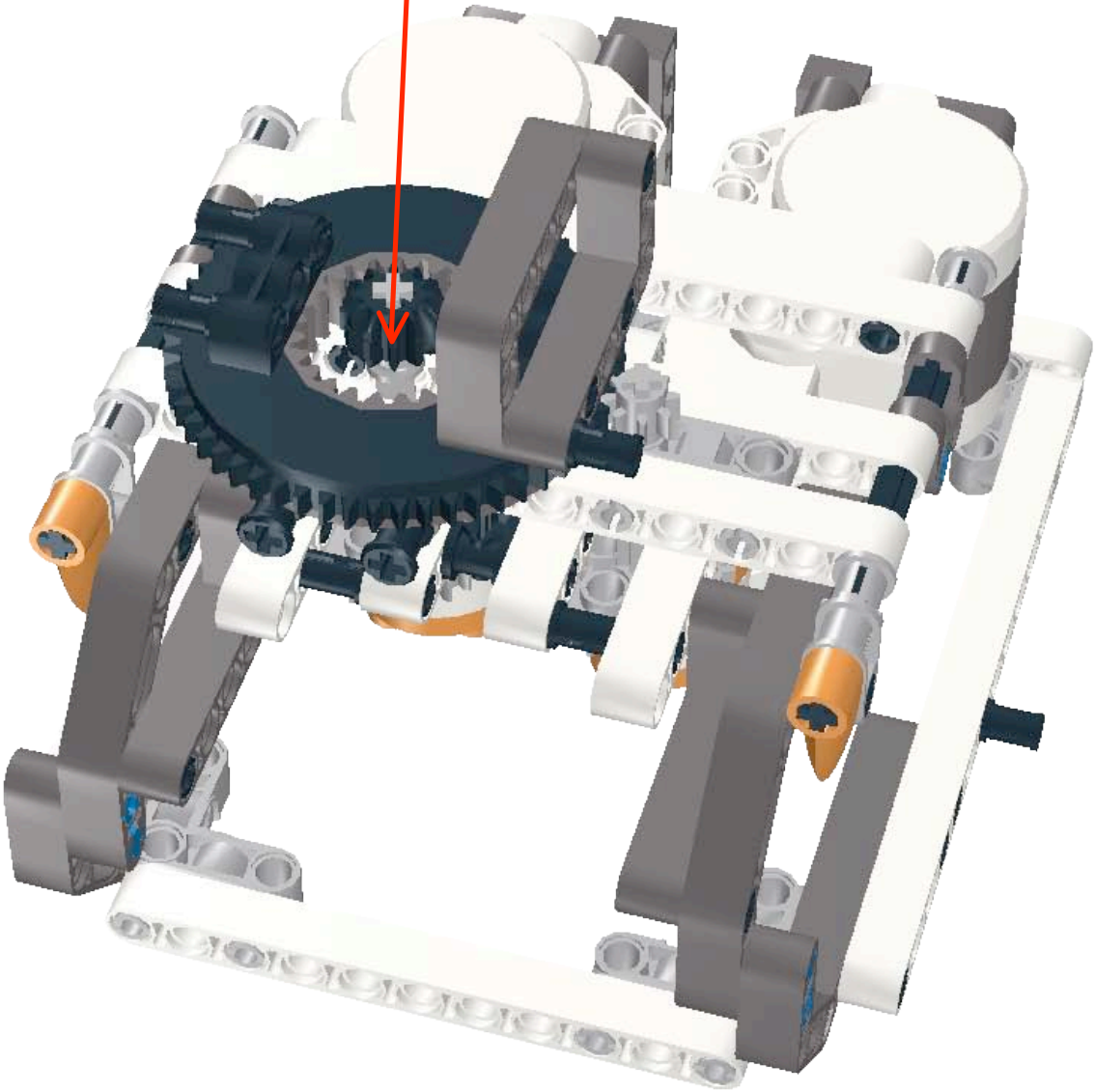
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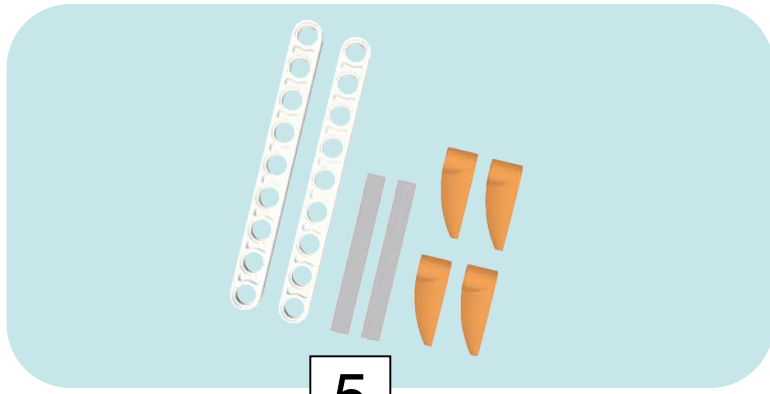


**30**

\* This piece goes under the black gear

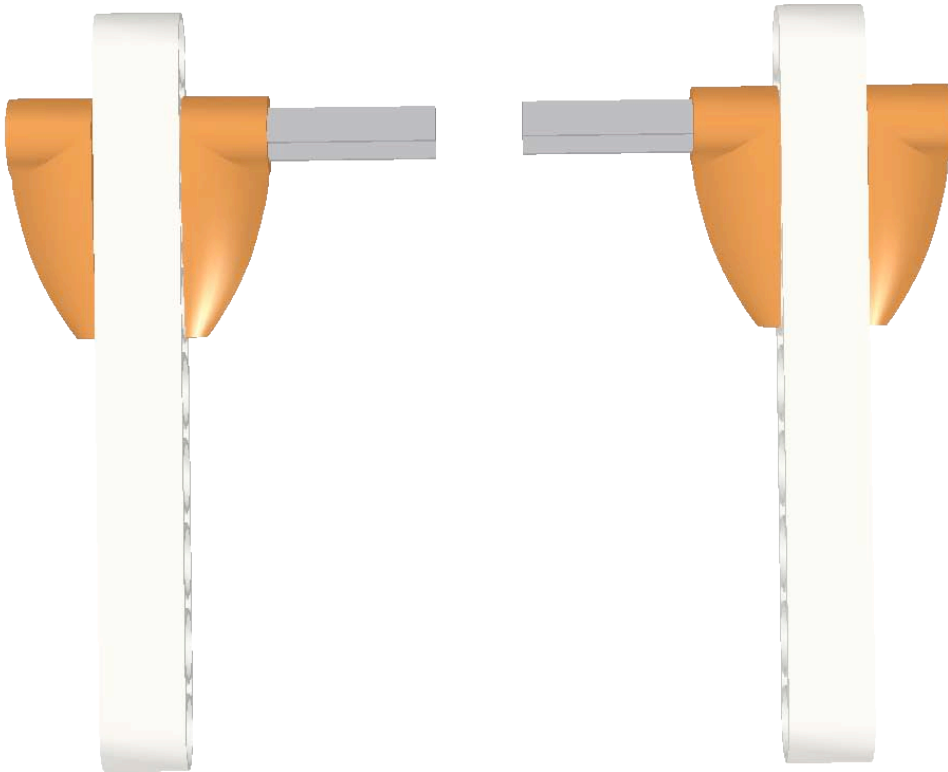


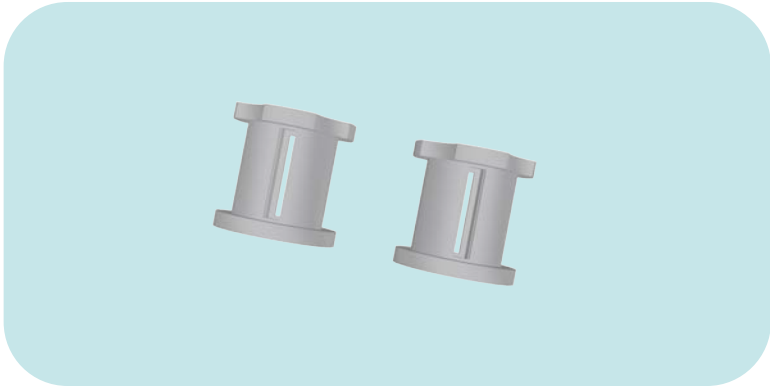




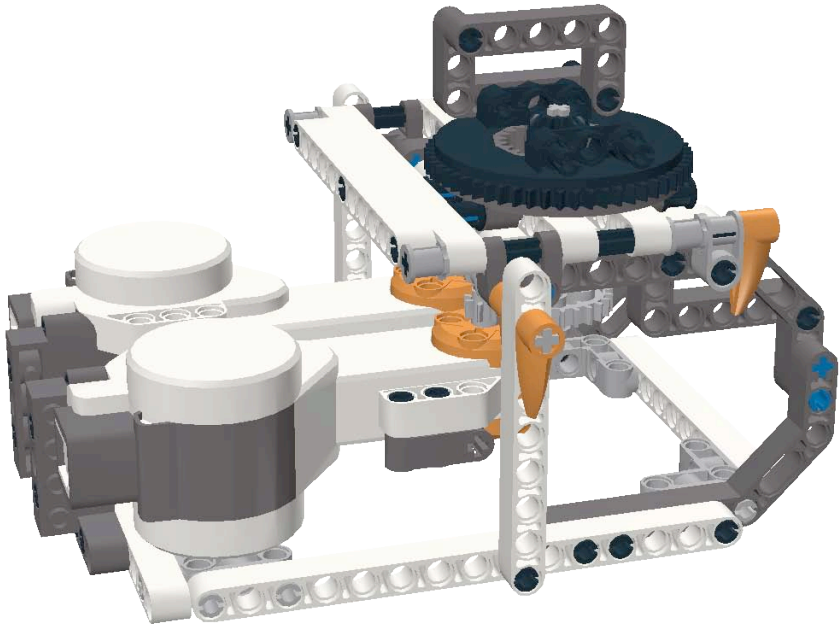
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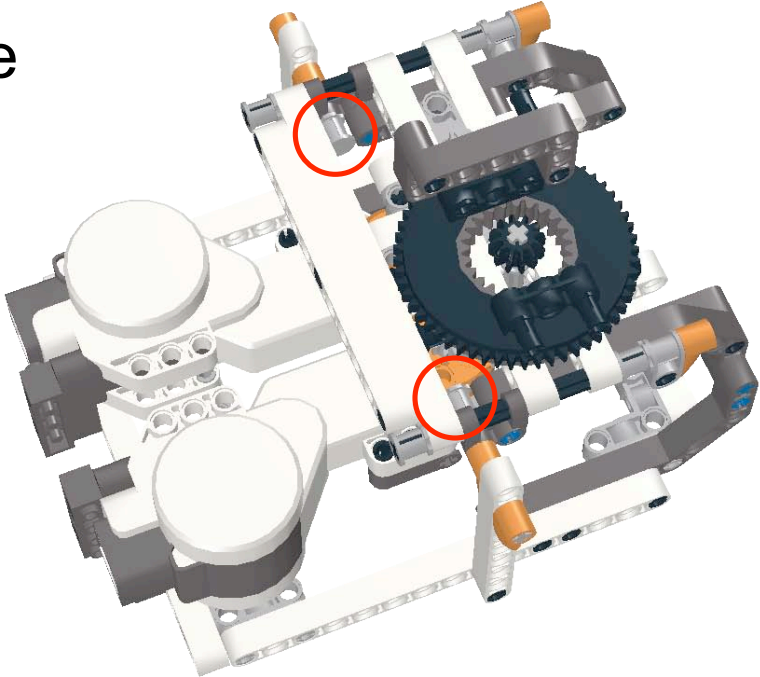


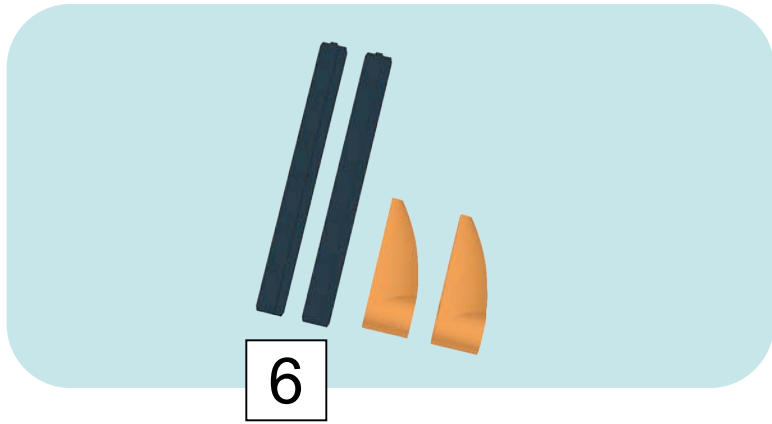


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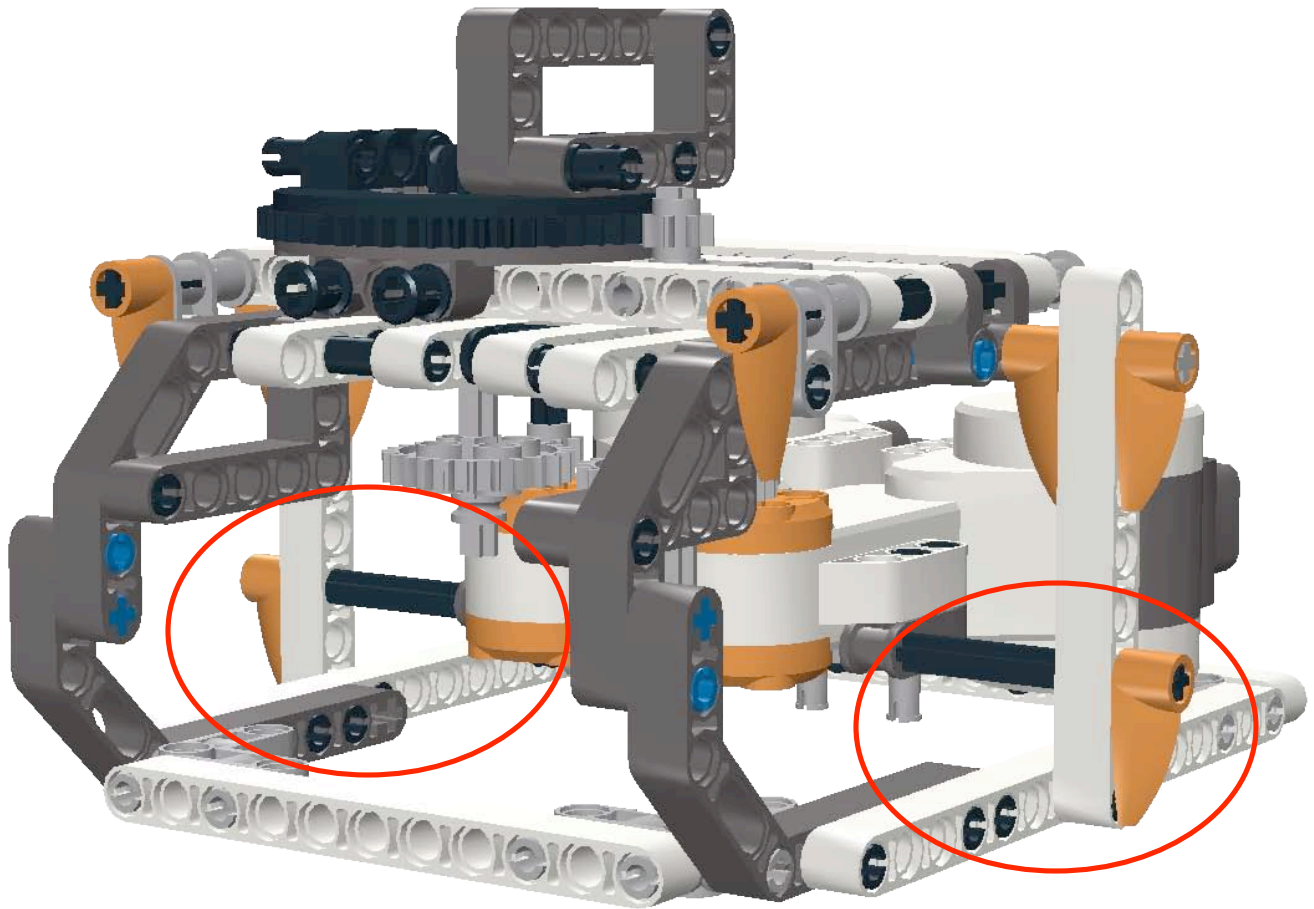


Alternate  
view:



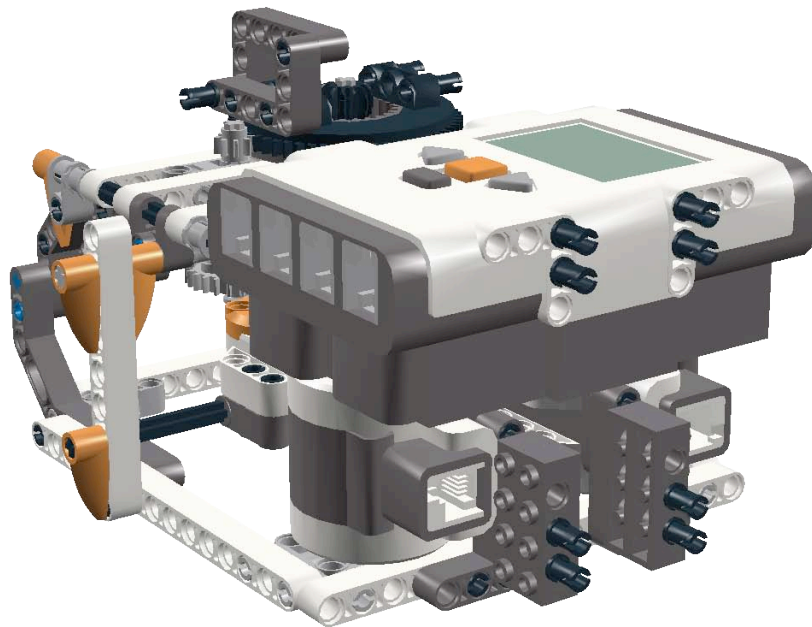


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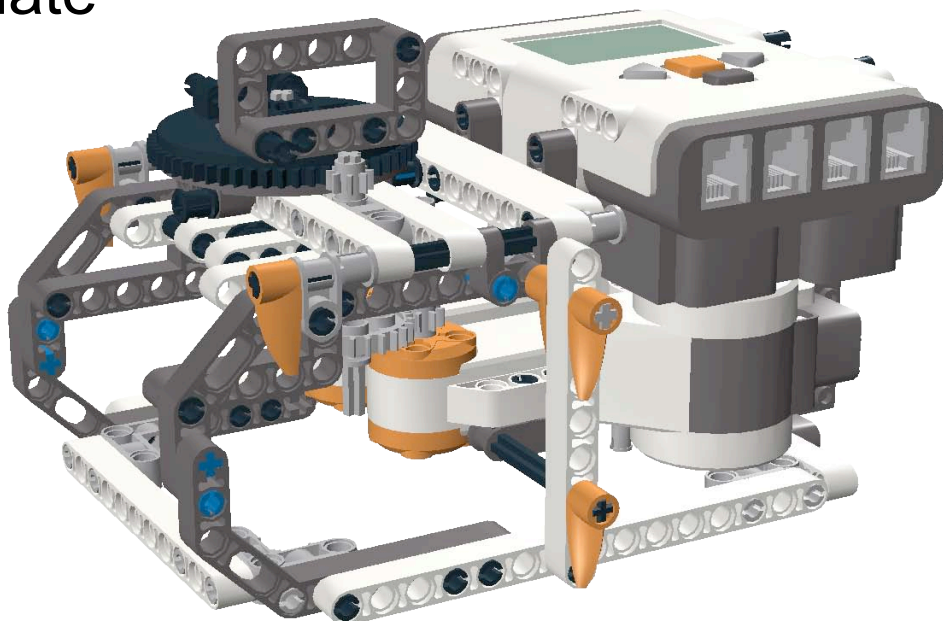


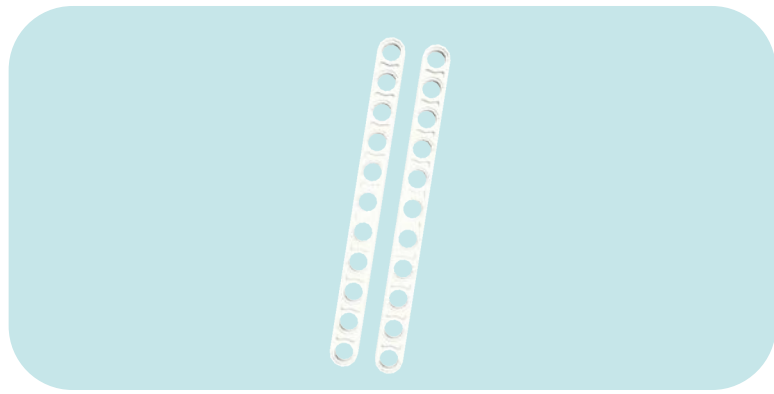


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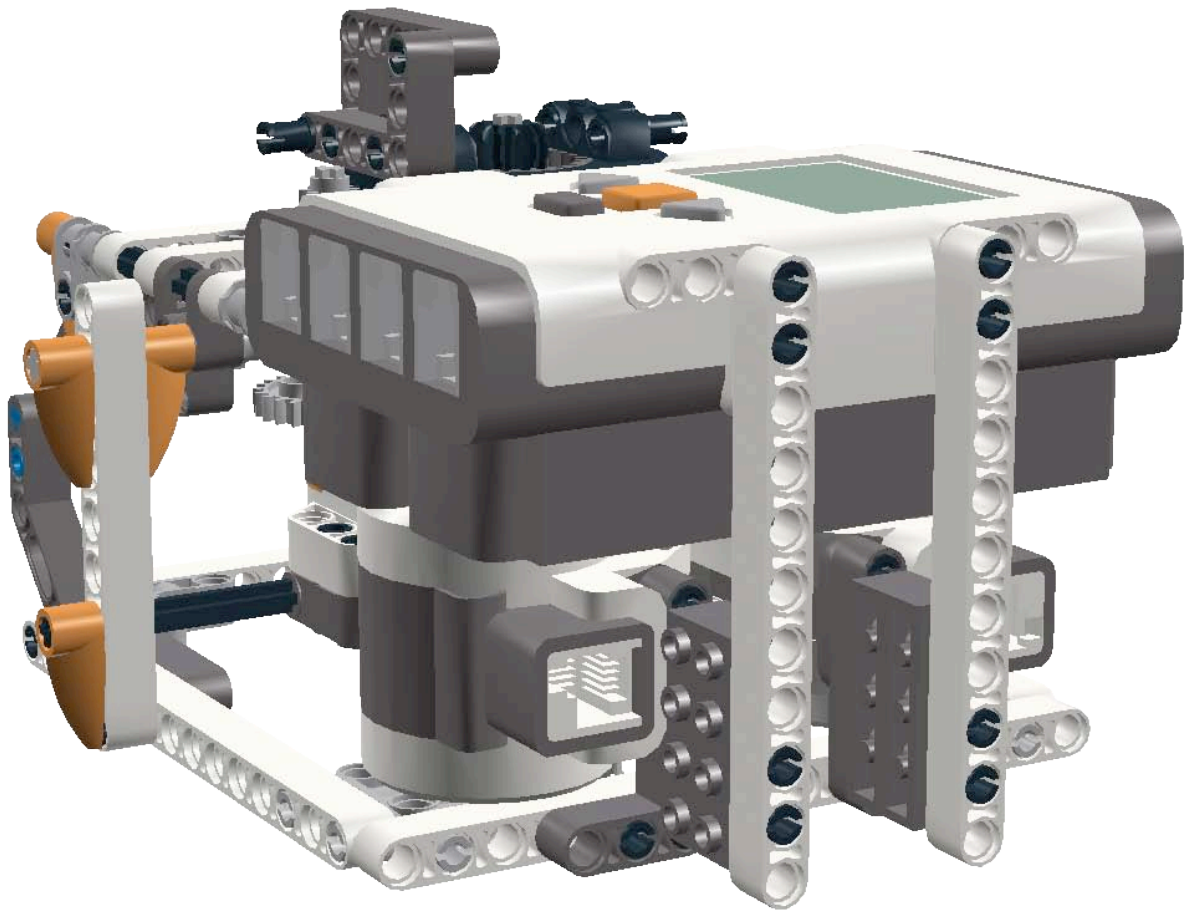


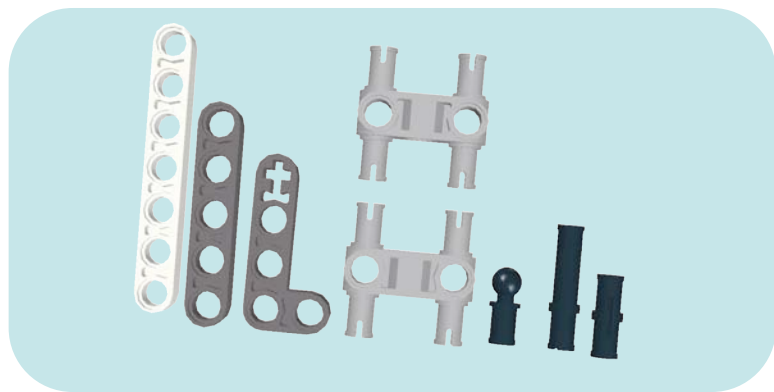
Alternate  
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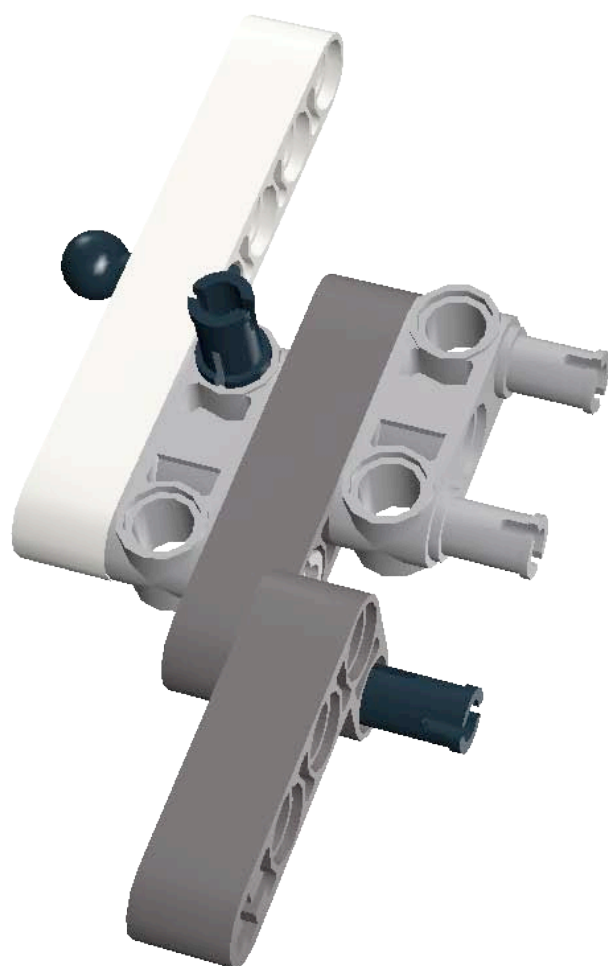


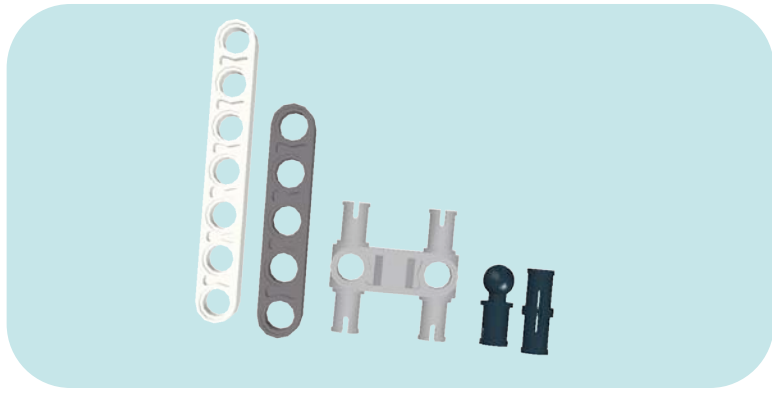
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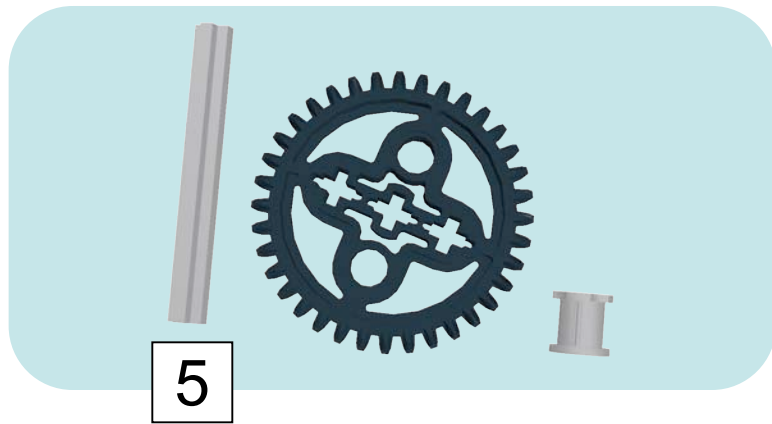
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37

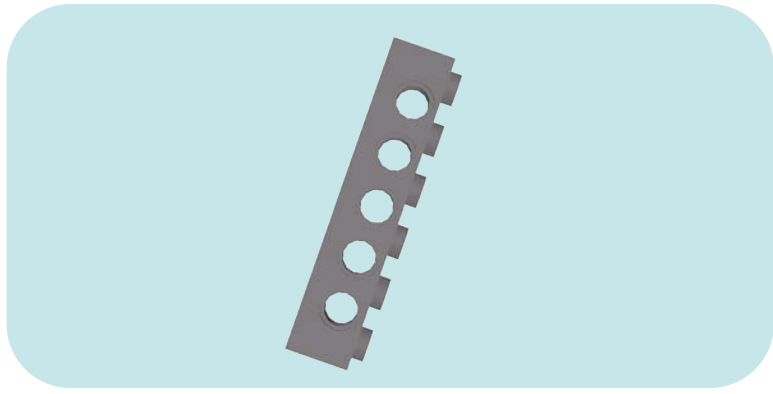




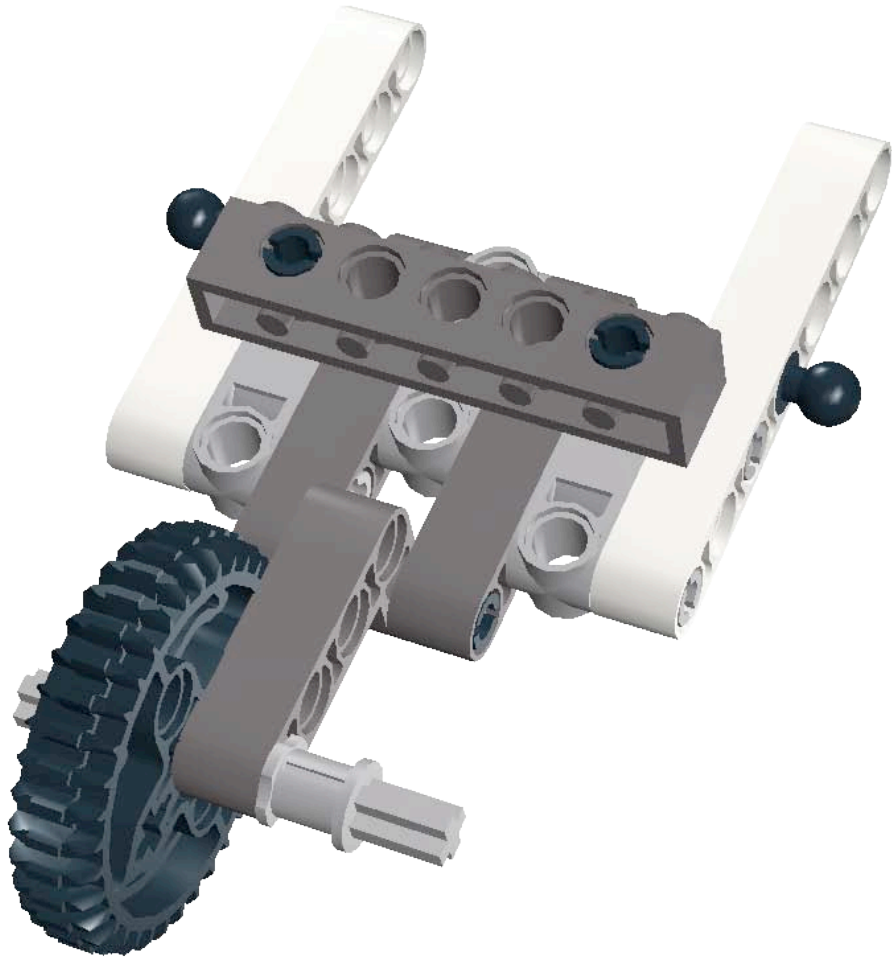
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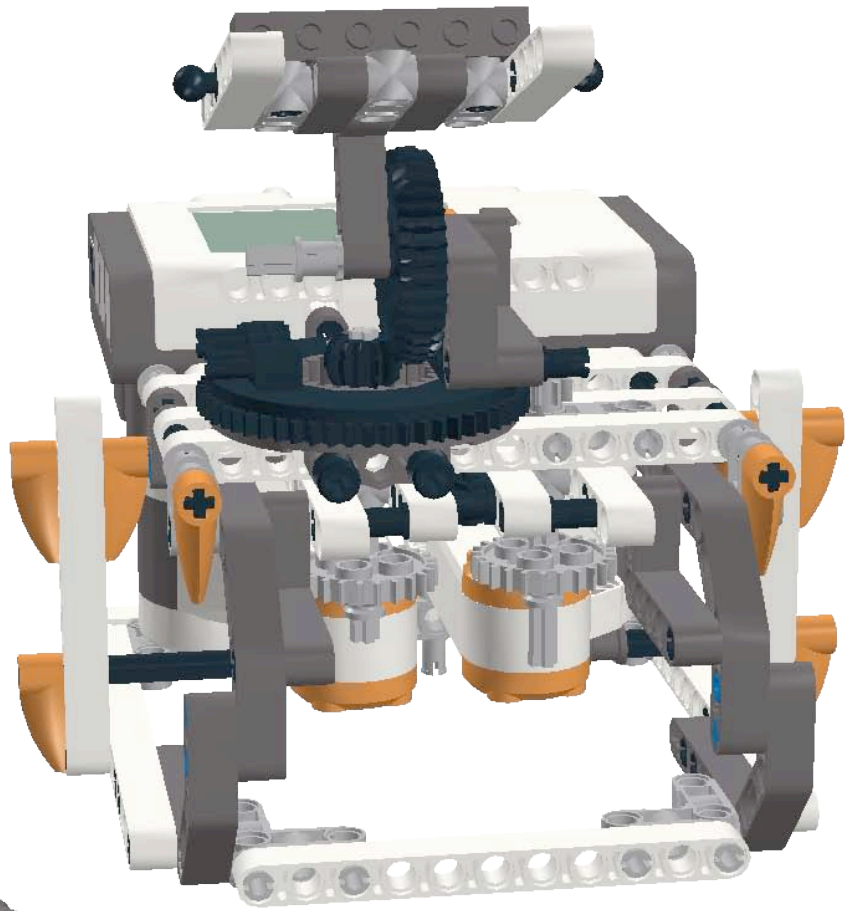




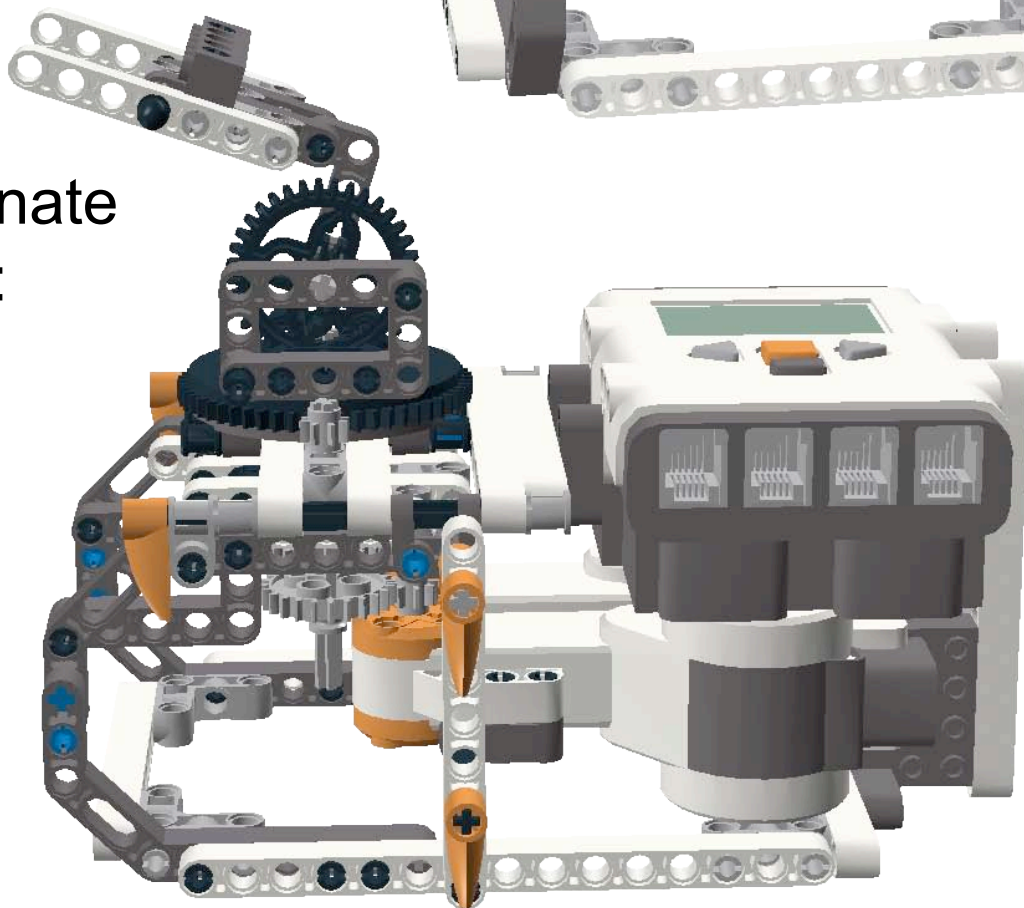
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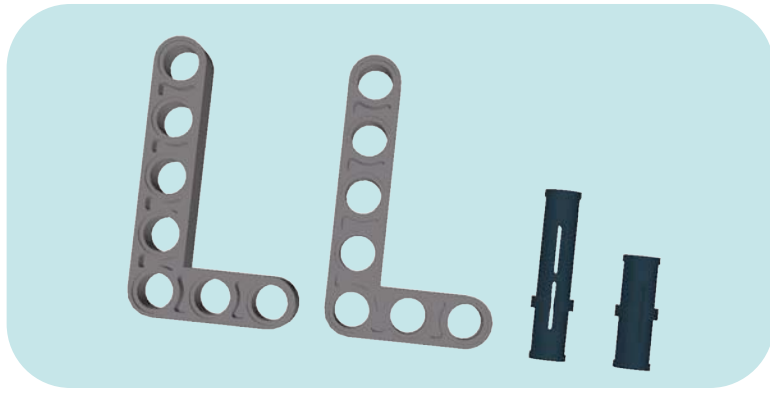


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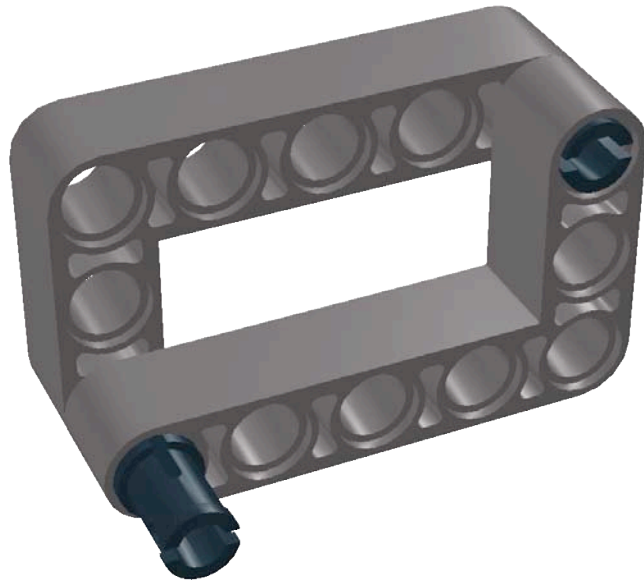


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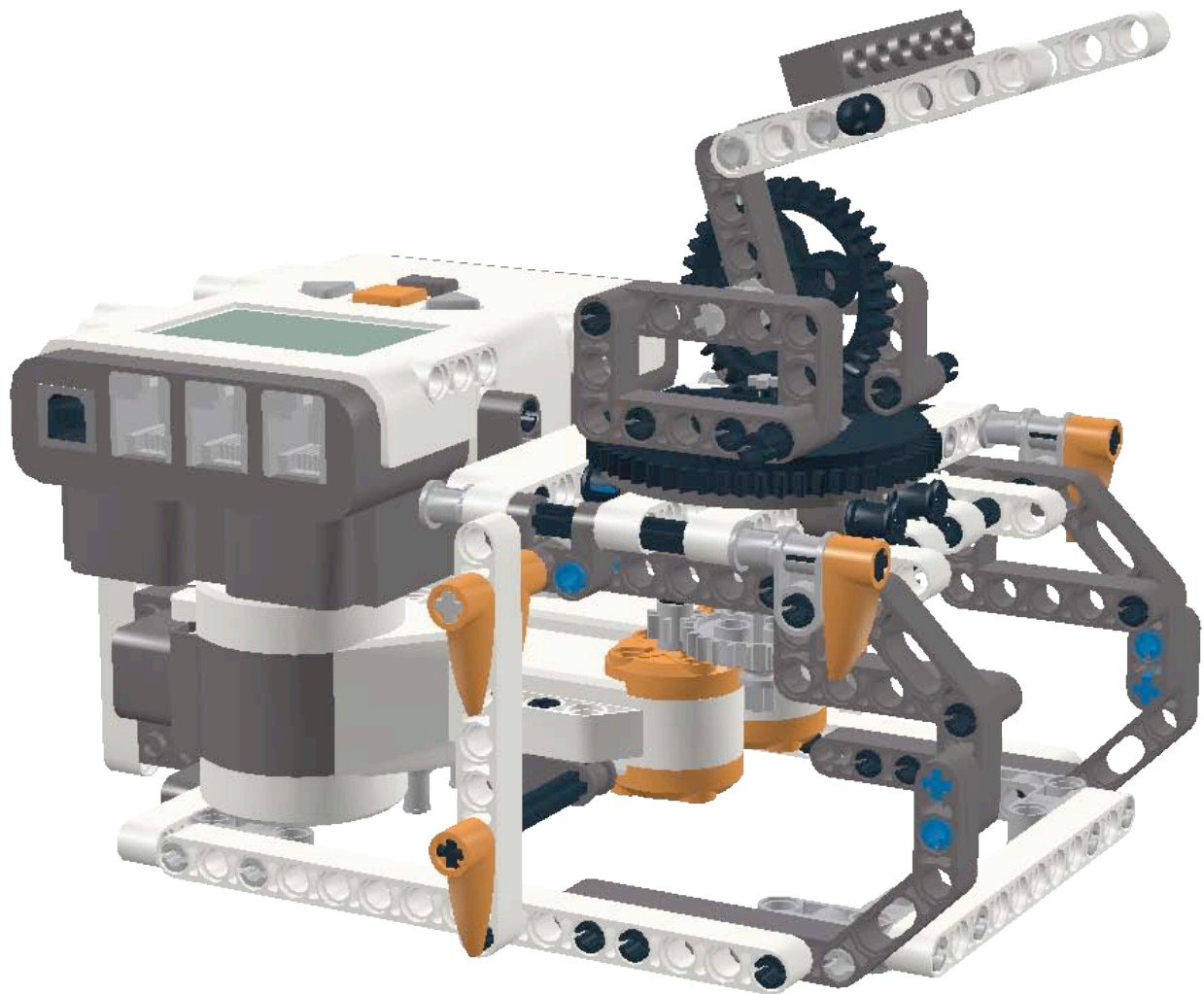


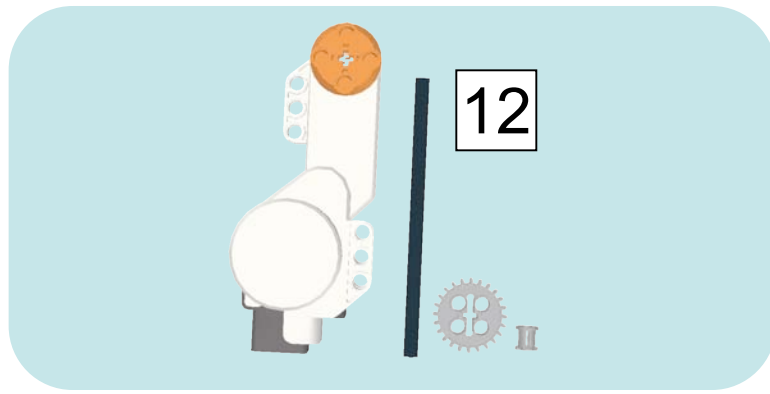


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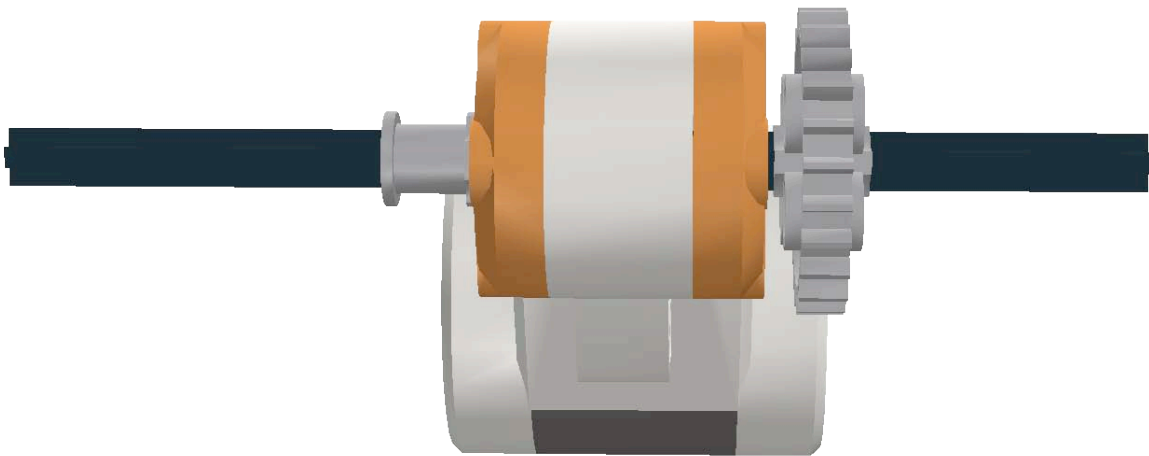


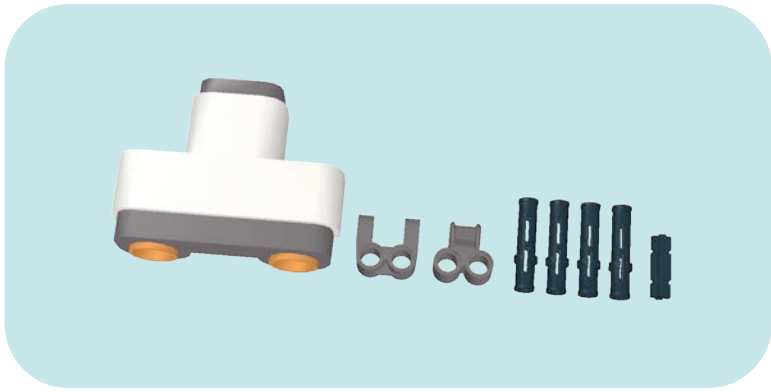
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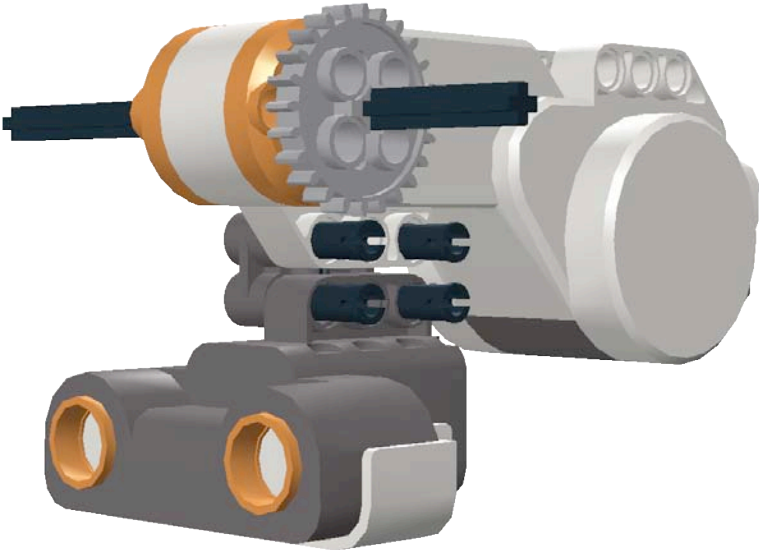
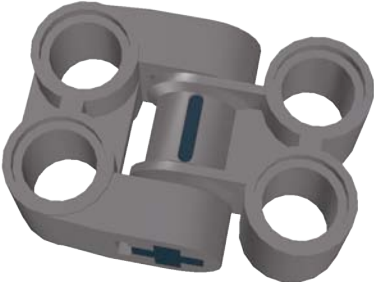


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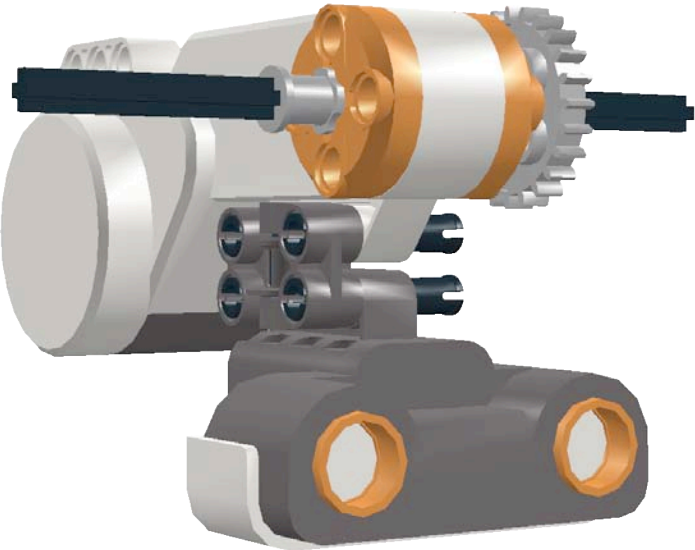


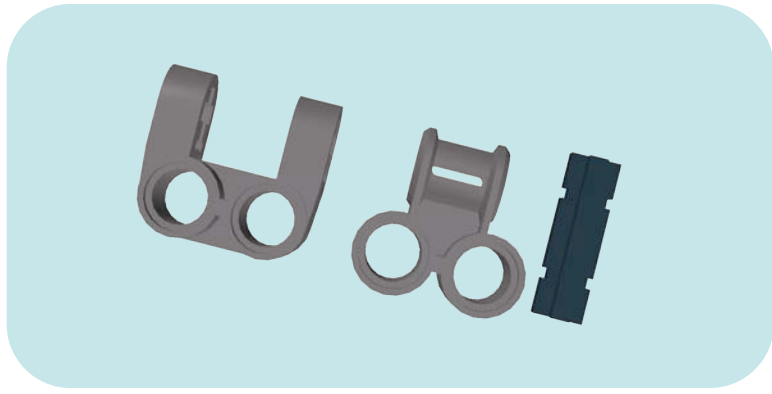


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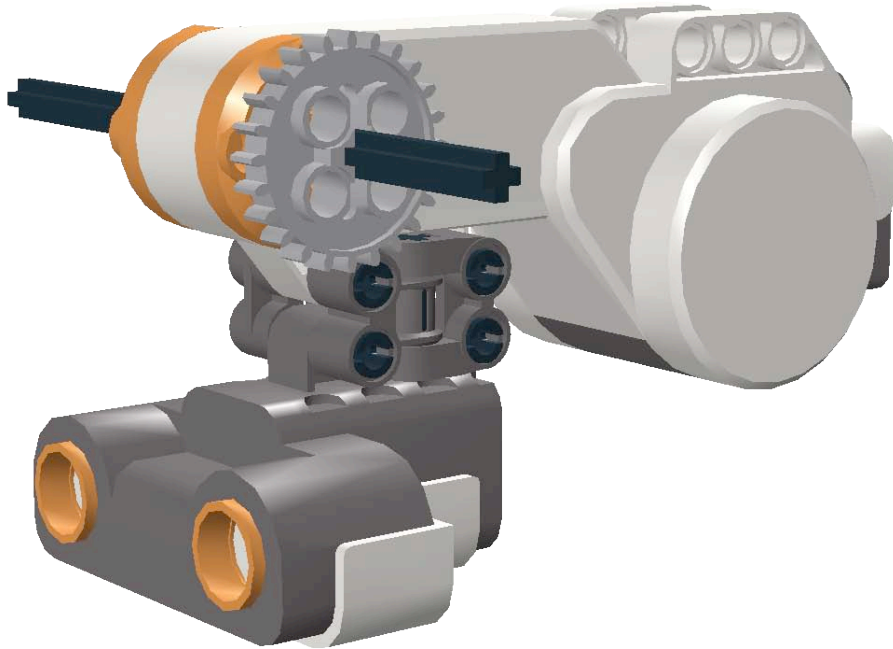


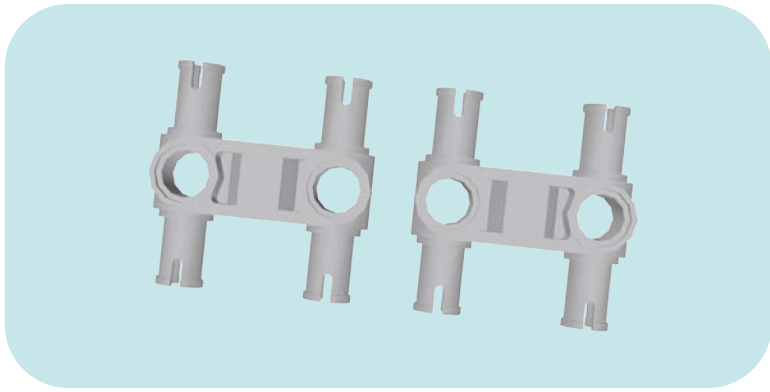
Alternate view:



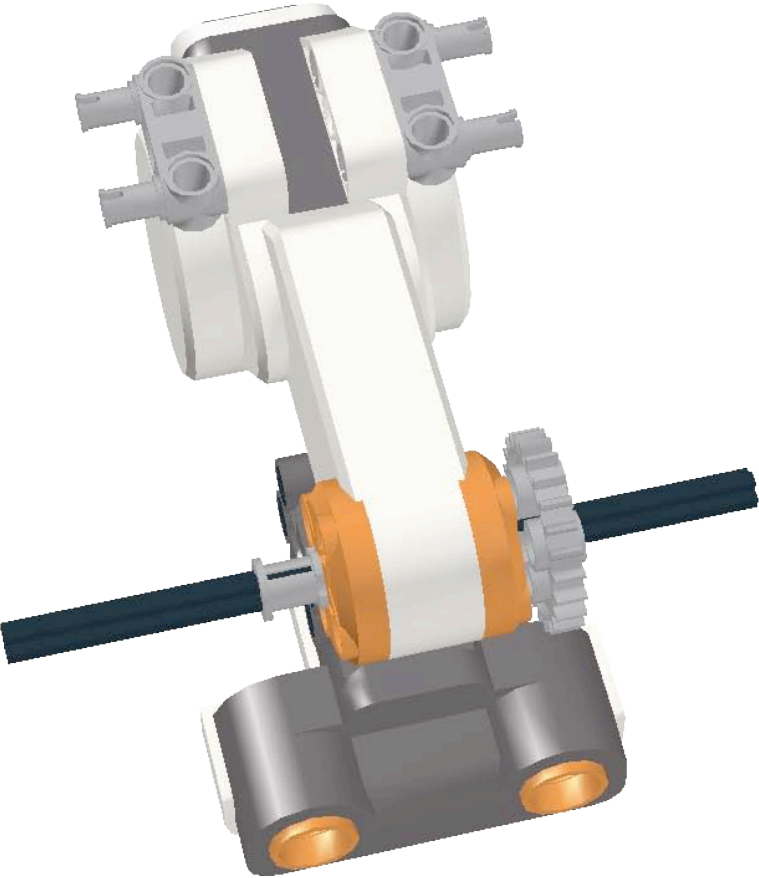


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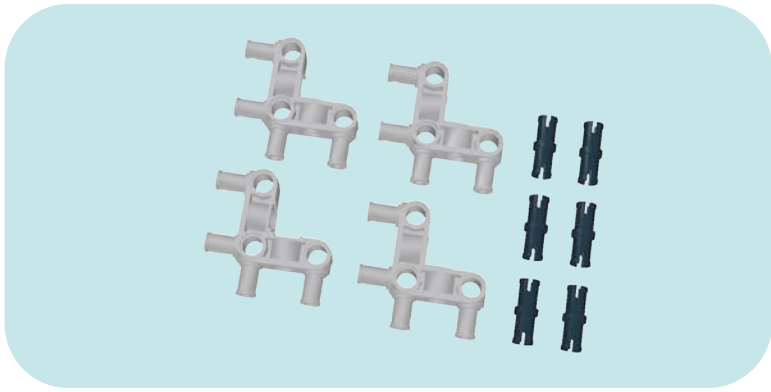




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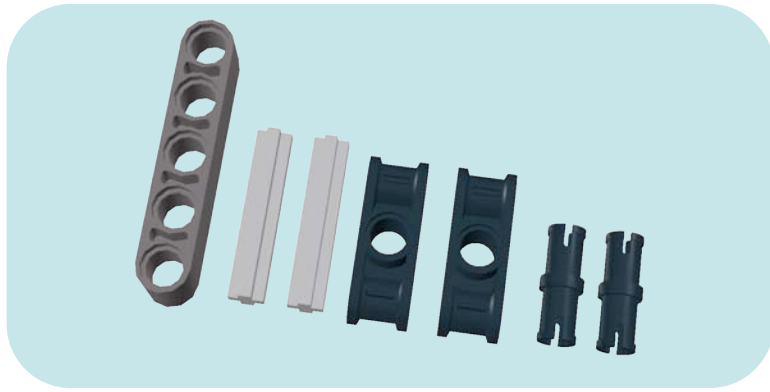




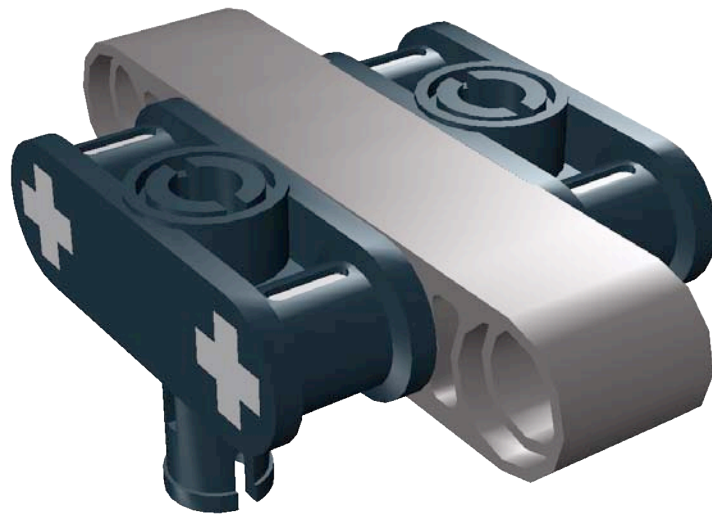


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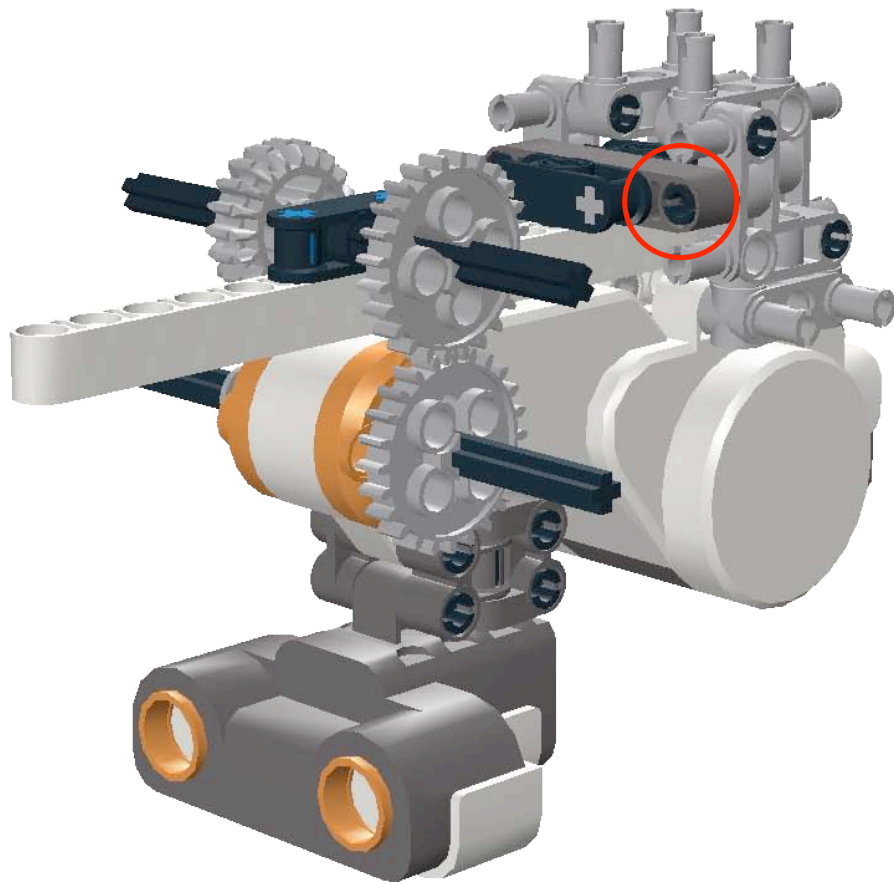


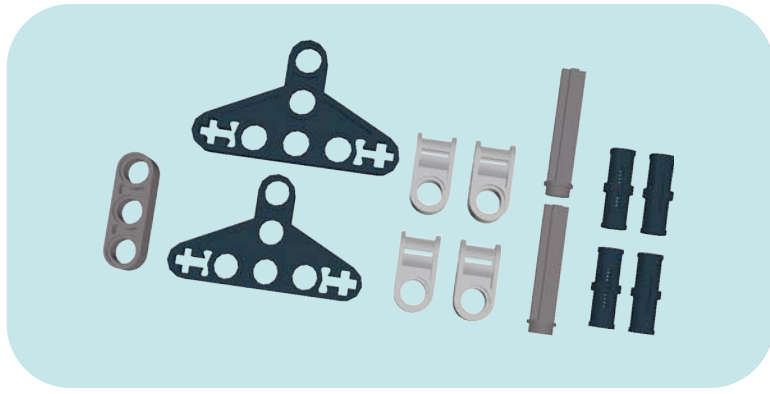
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50

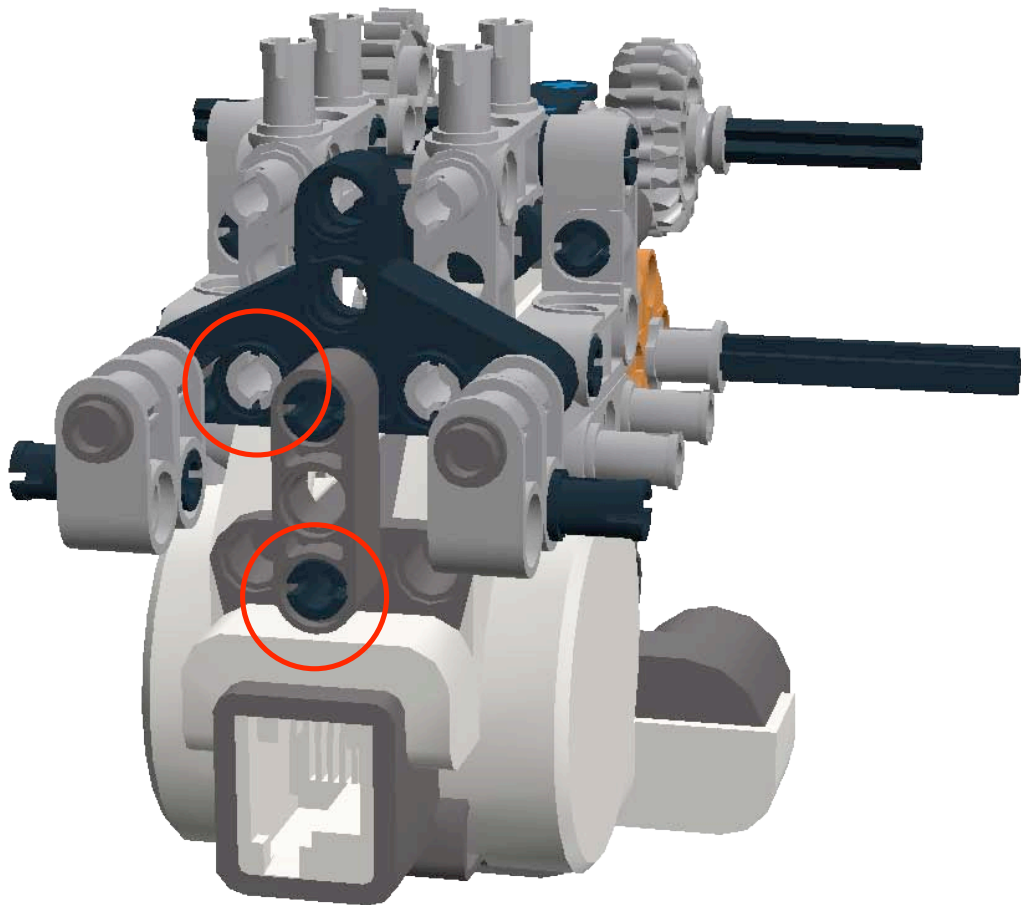




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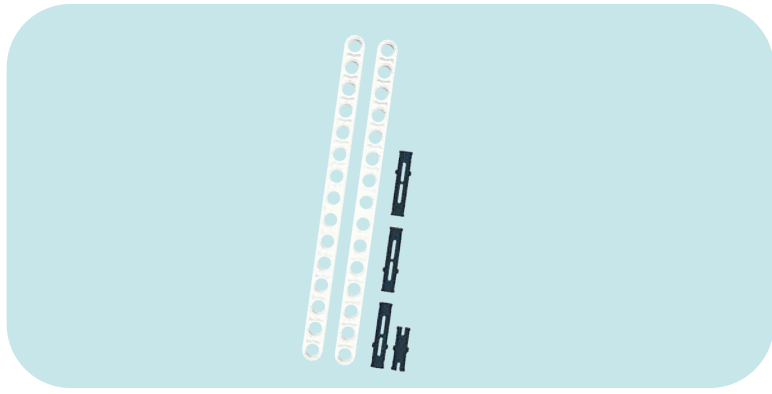
52





**53**

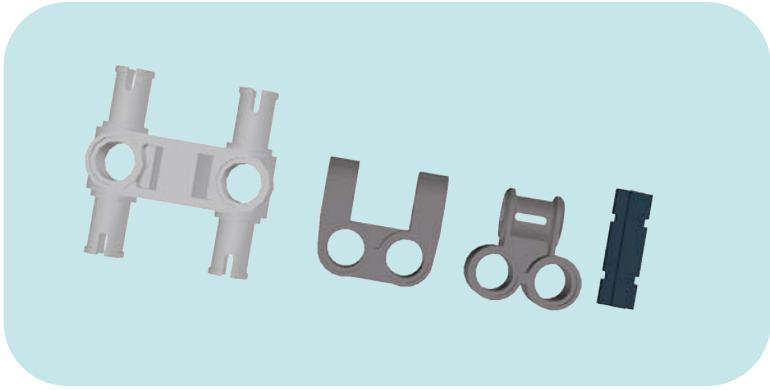




54

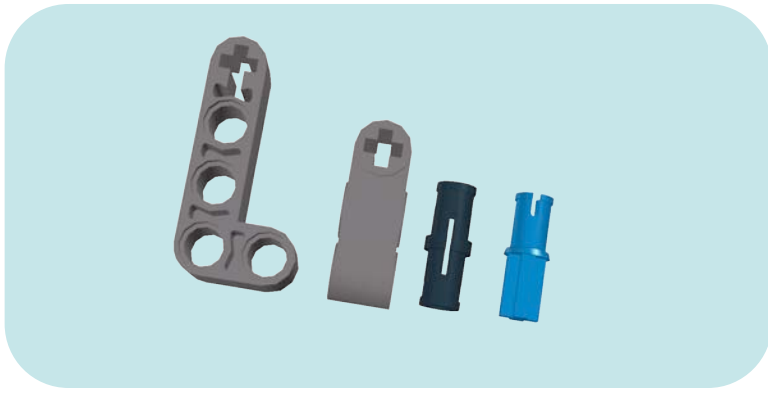




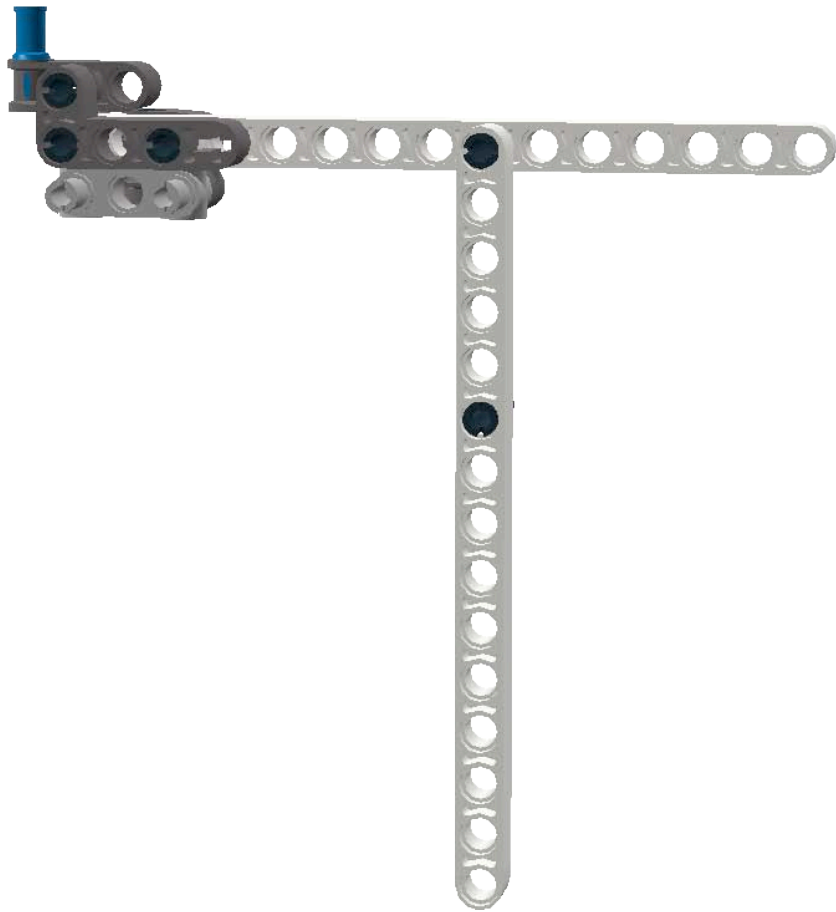


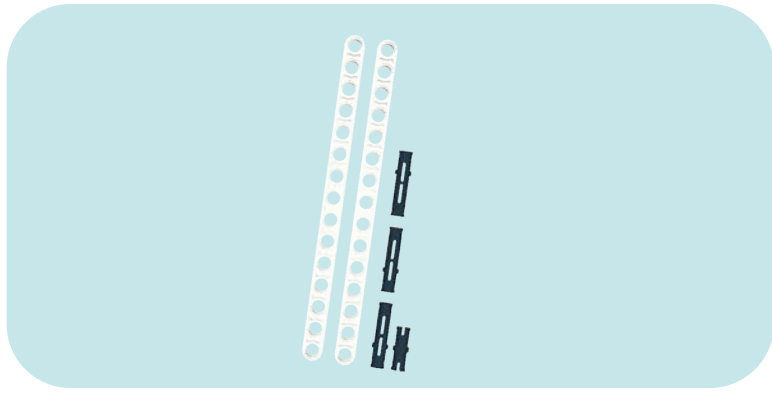
55





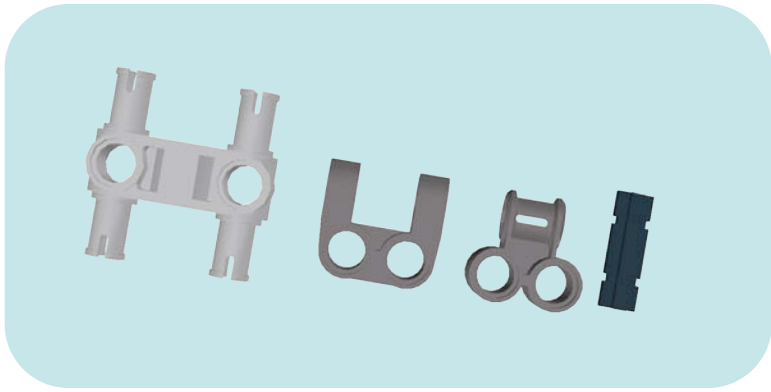
**56**





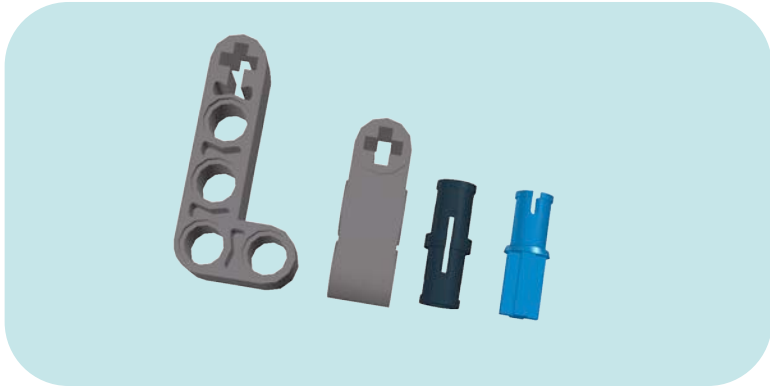
**57**





**58**

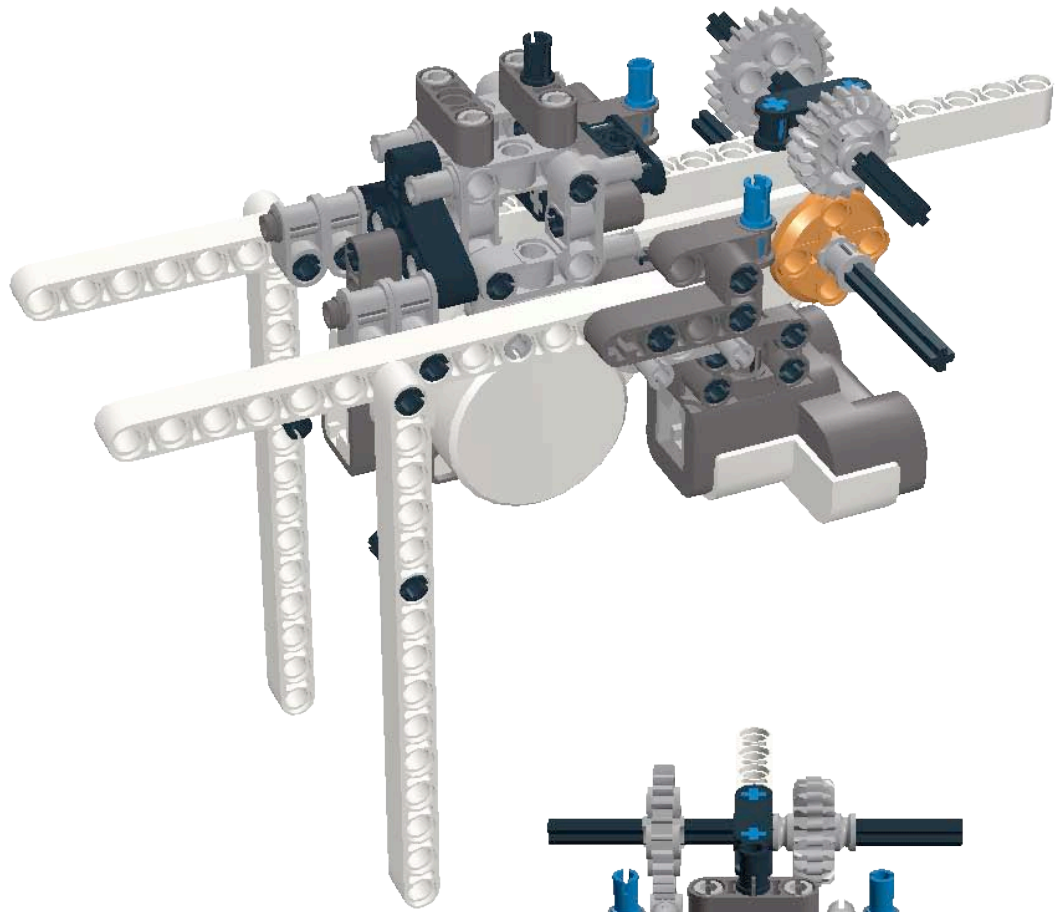




**59**

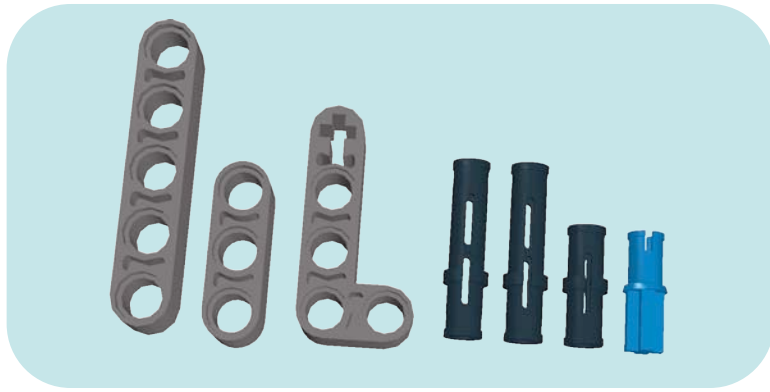


60

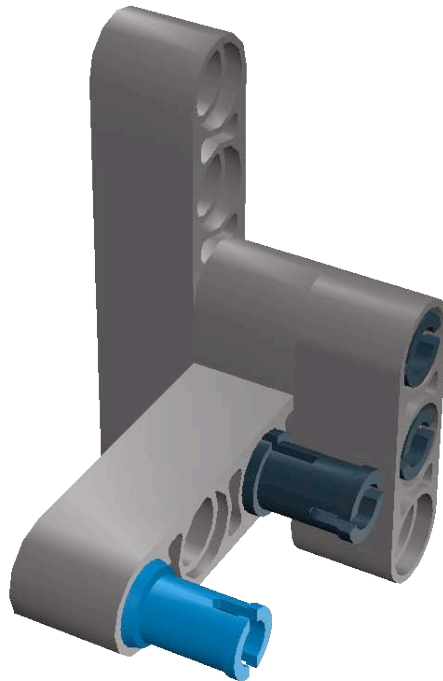


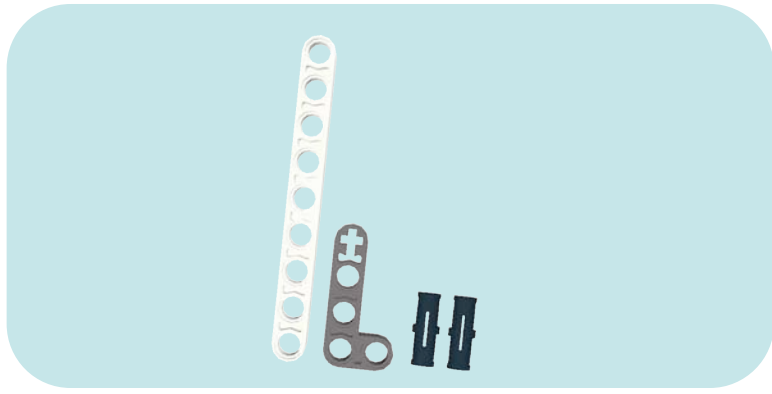
Alternate  
view:



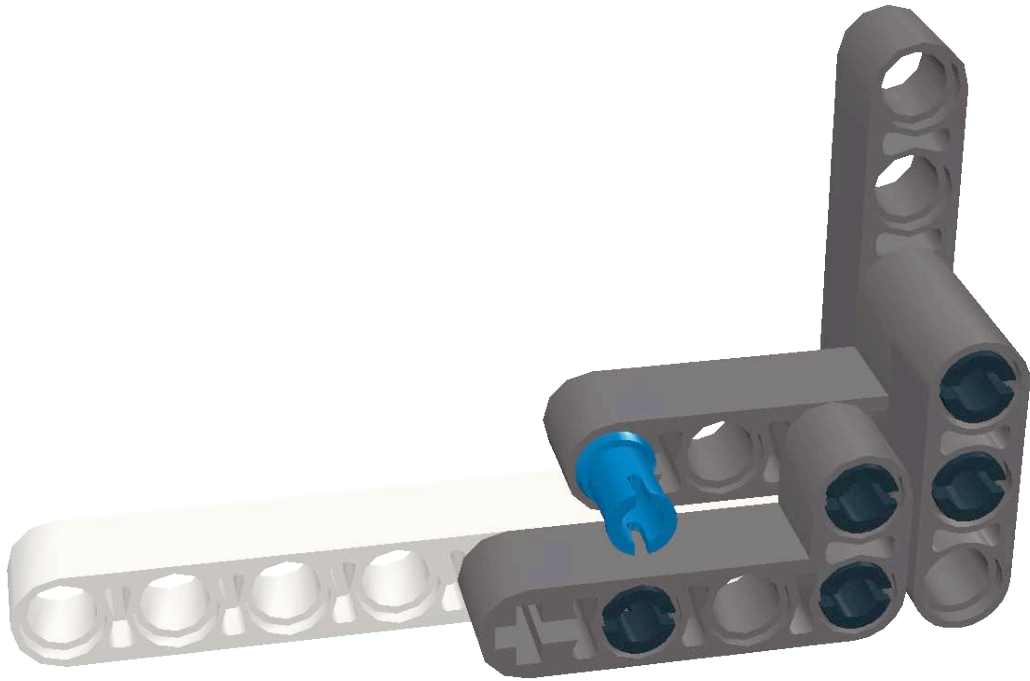


61

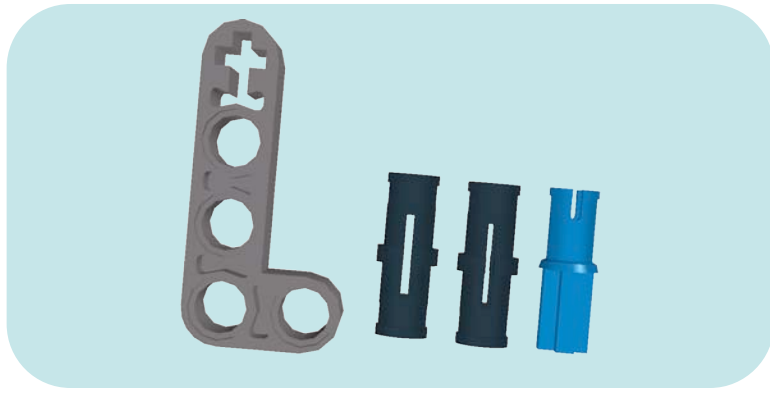




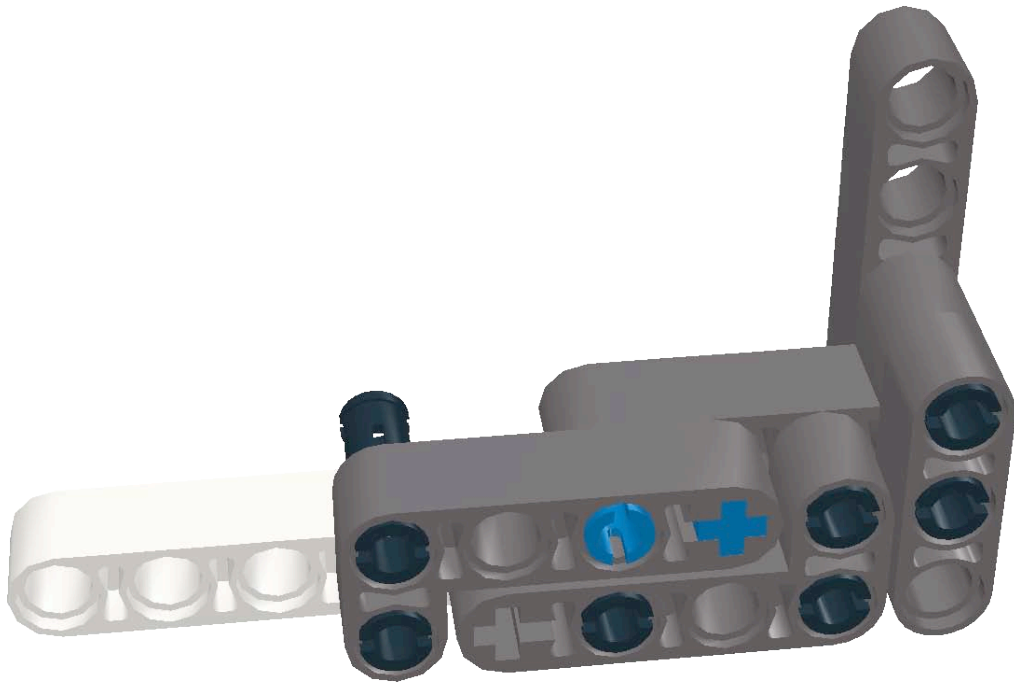
62

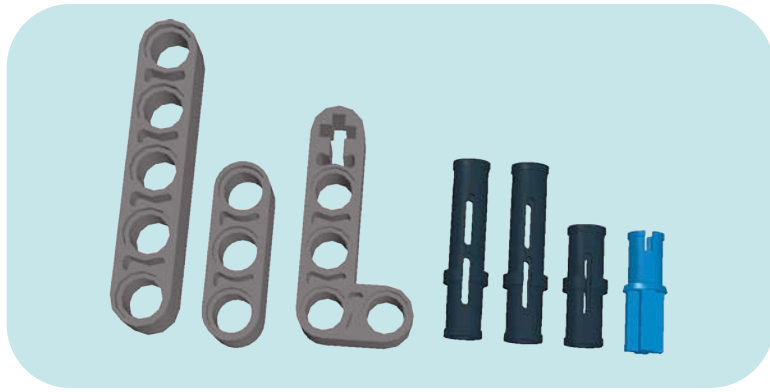




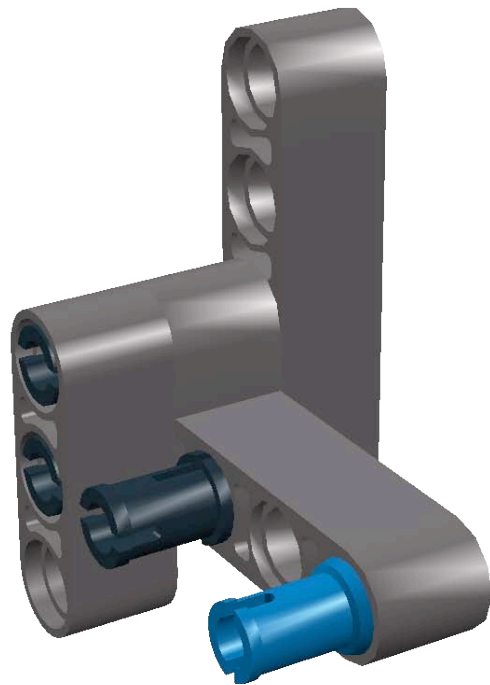


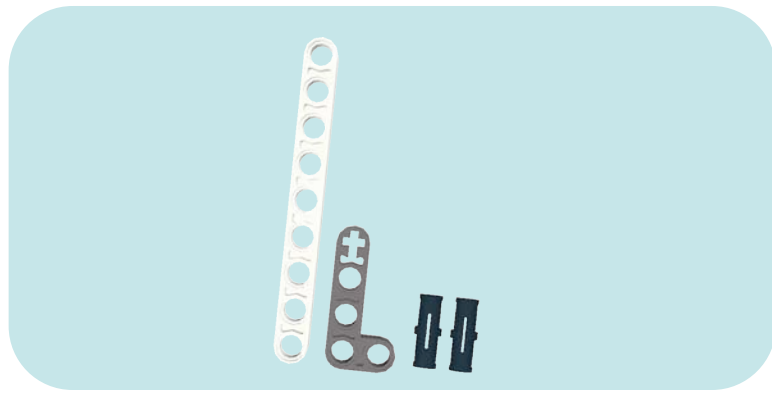
63



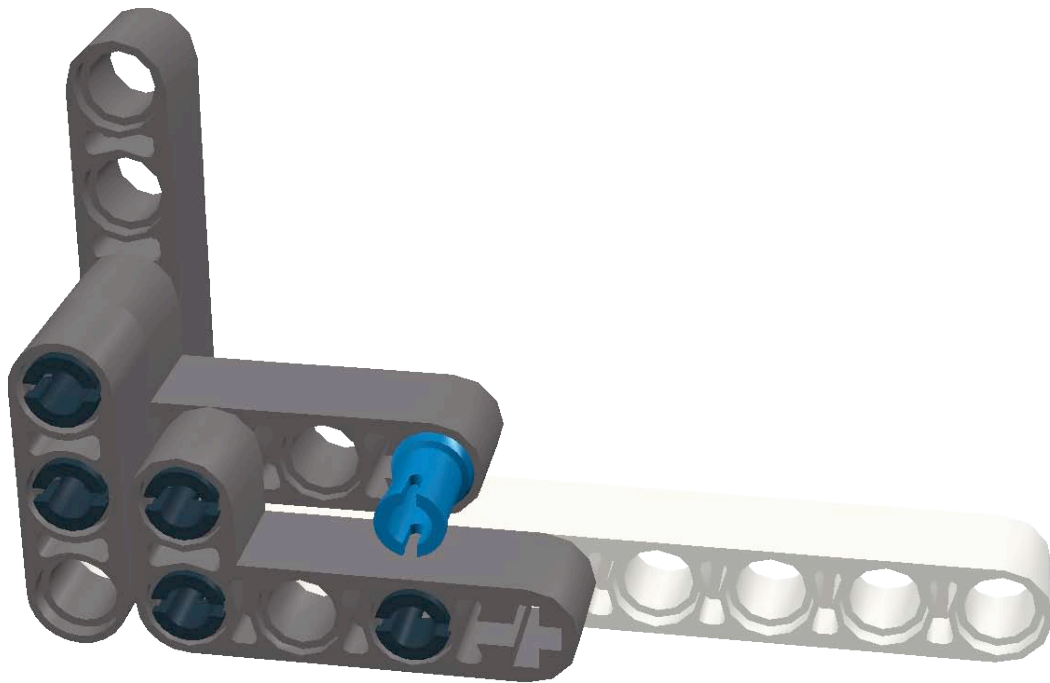


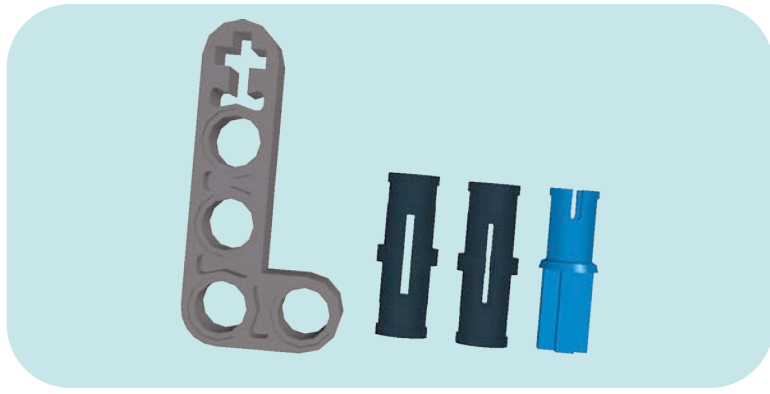
64



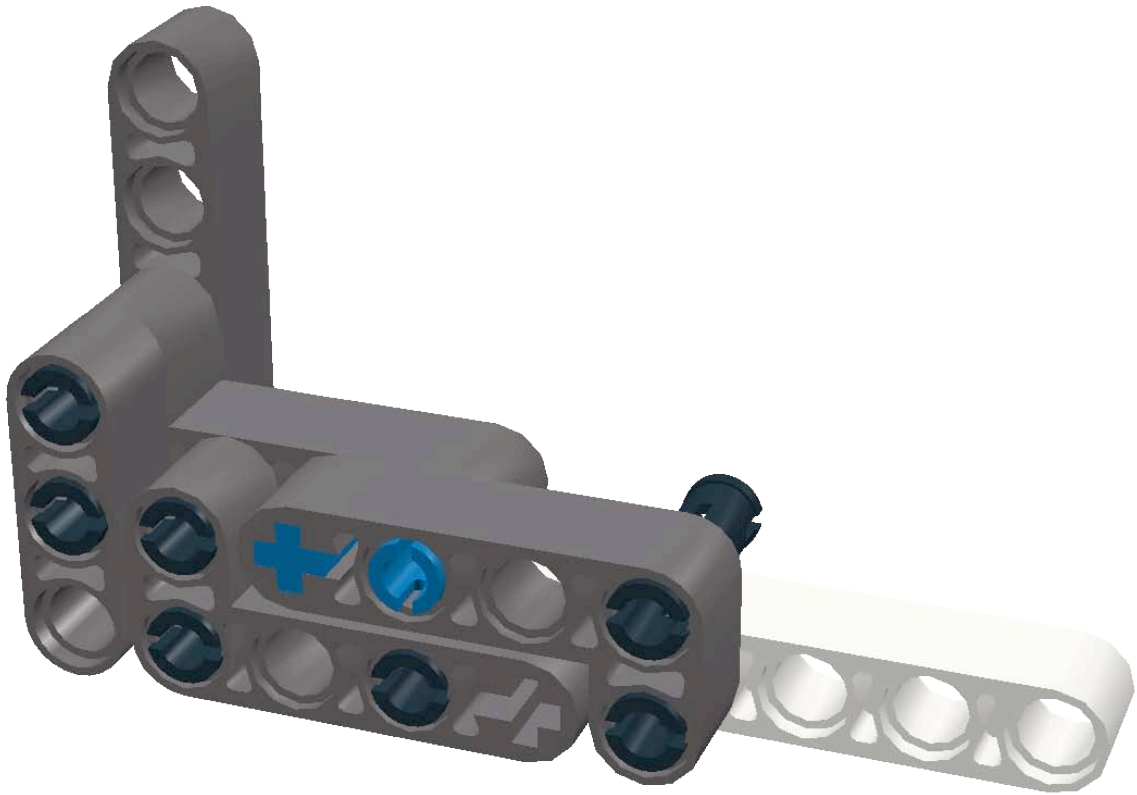


**65**

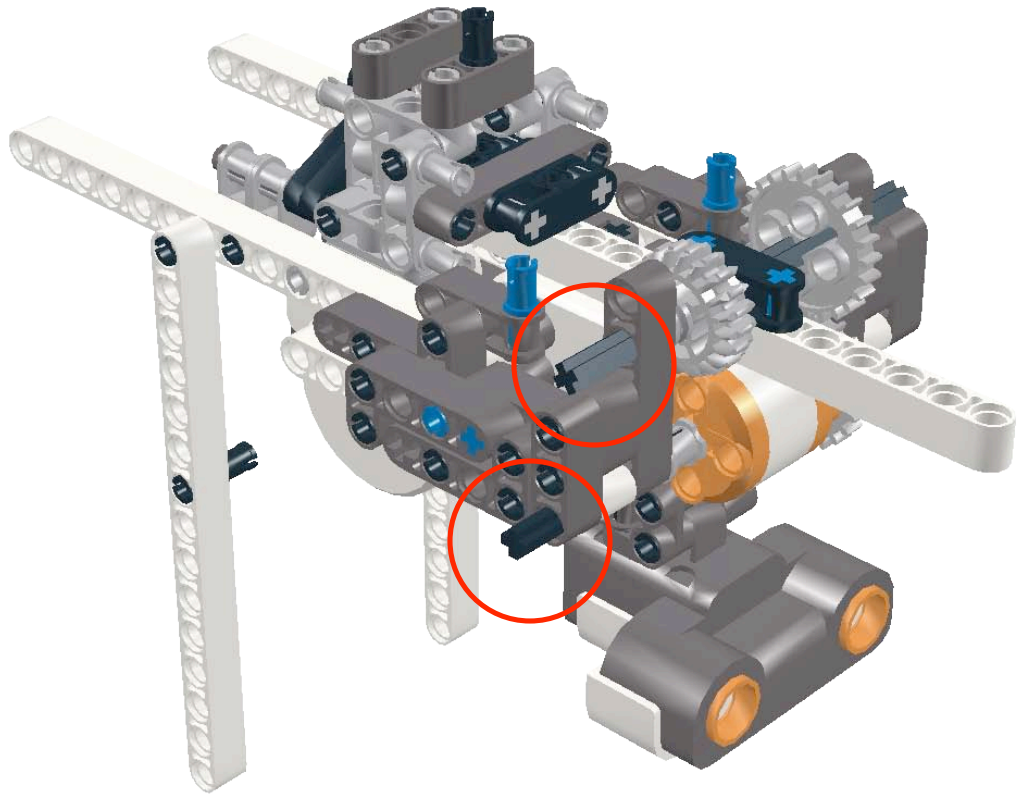




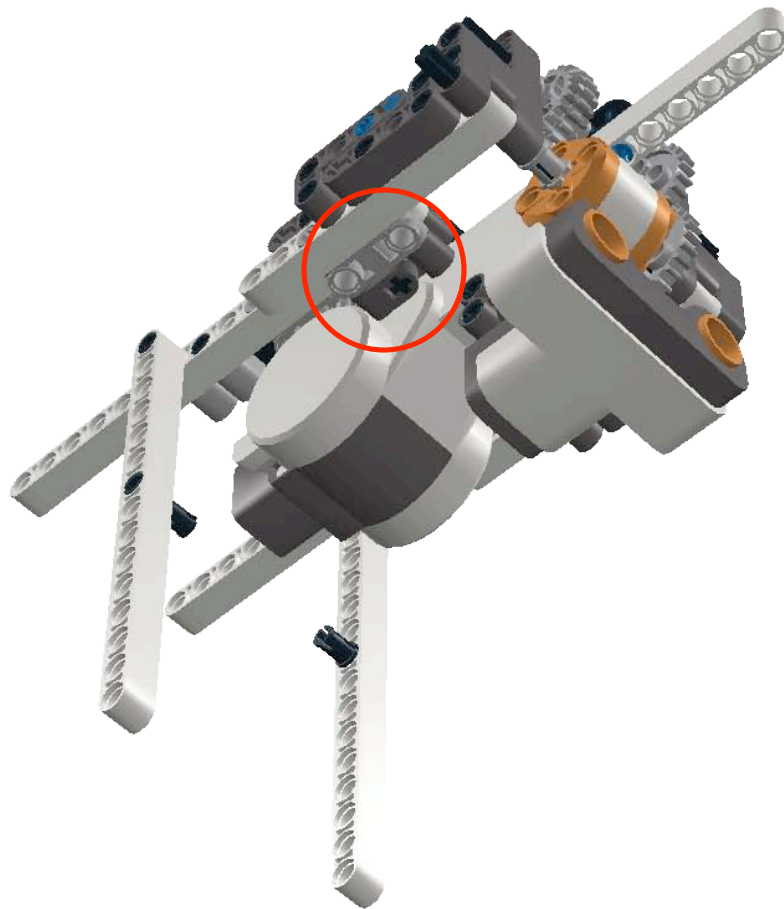
66



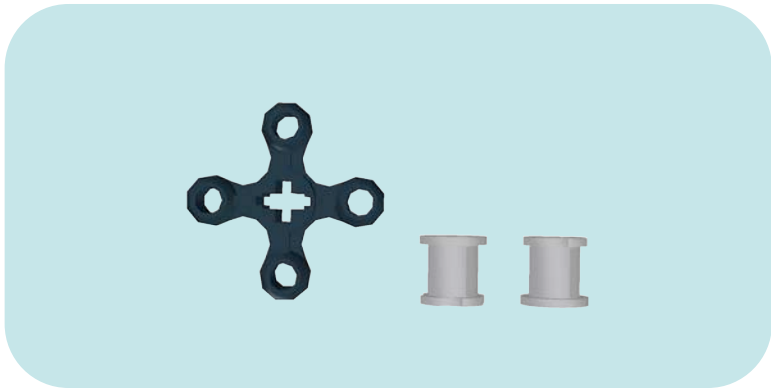
67



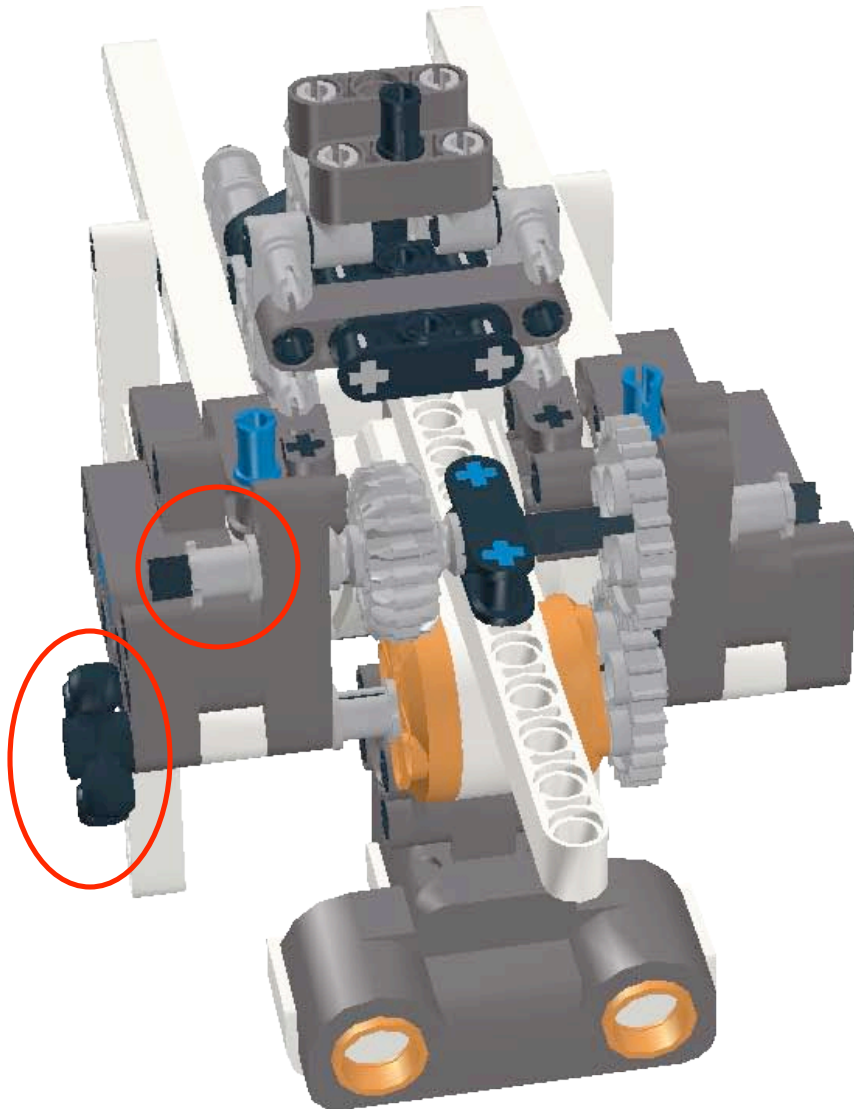
View  
from  
below:

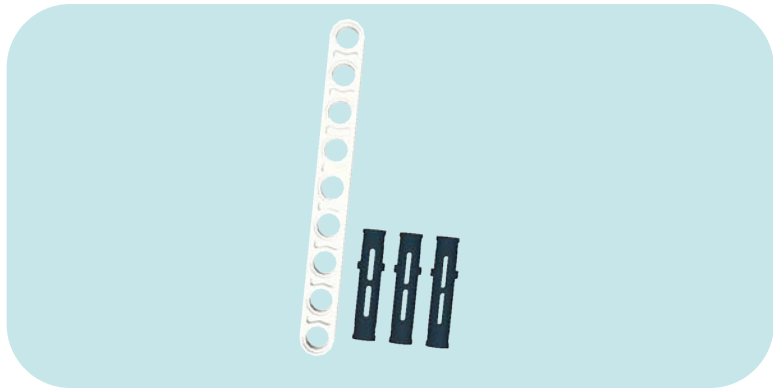


\* Snap the  
two side  
pieces  
onto the  
top piece

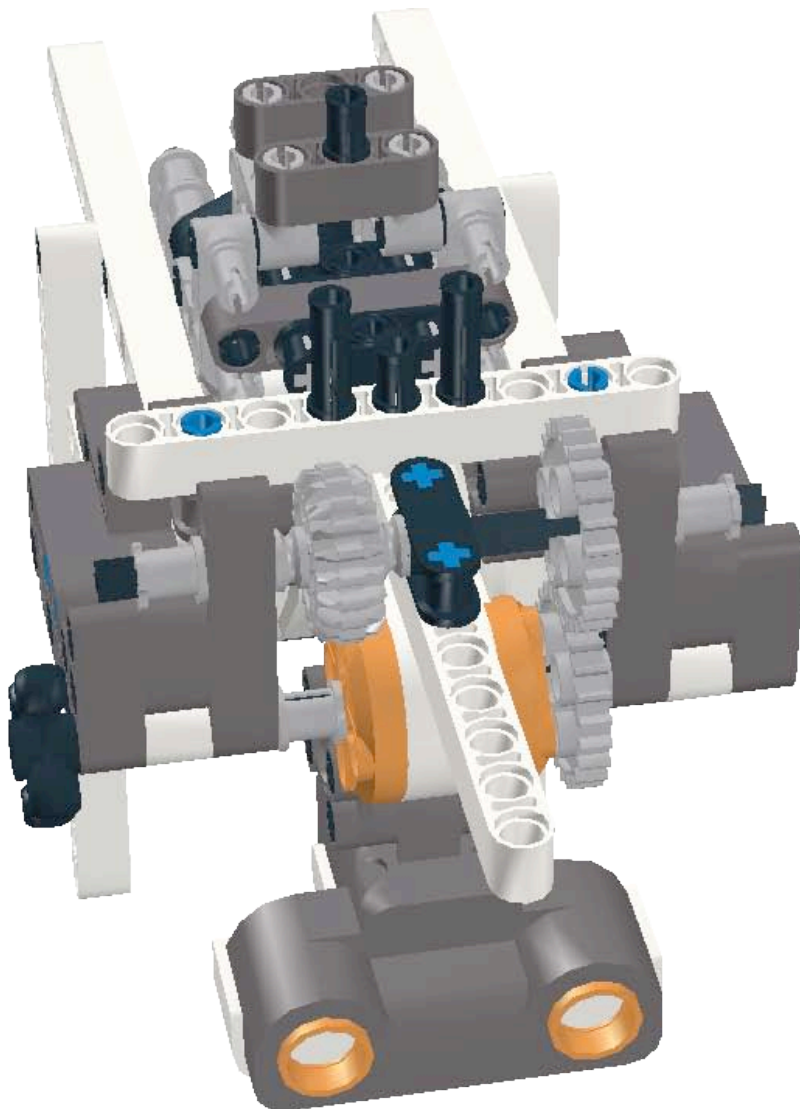


68



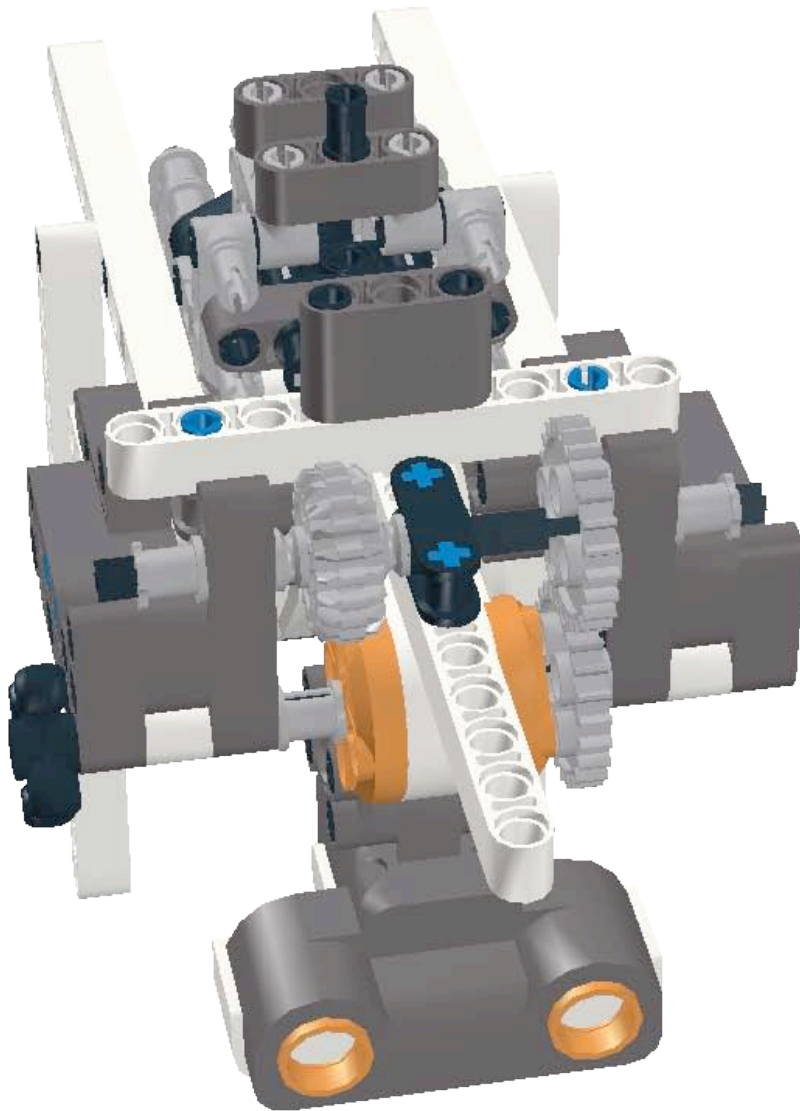


69

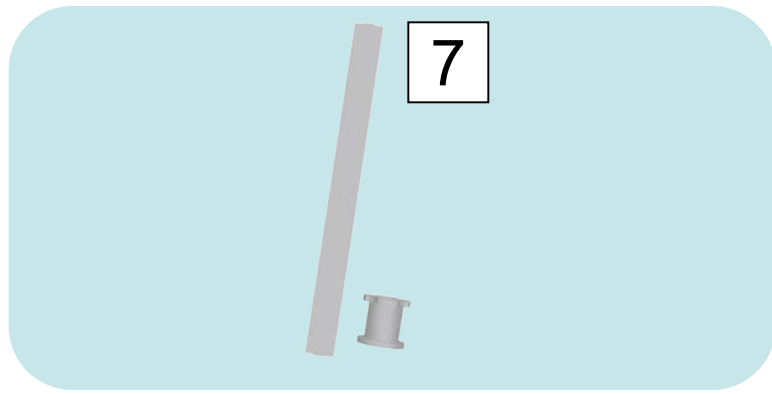




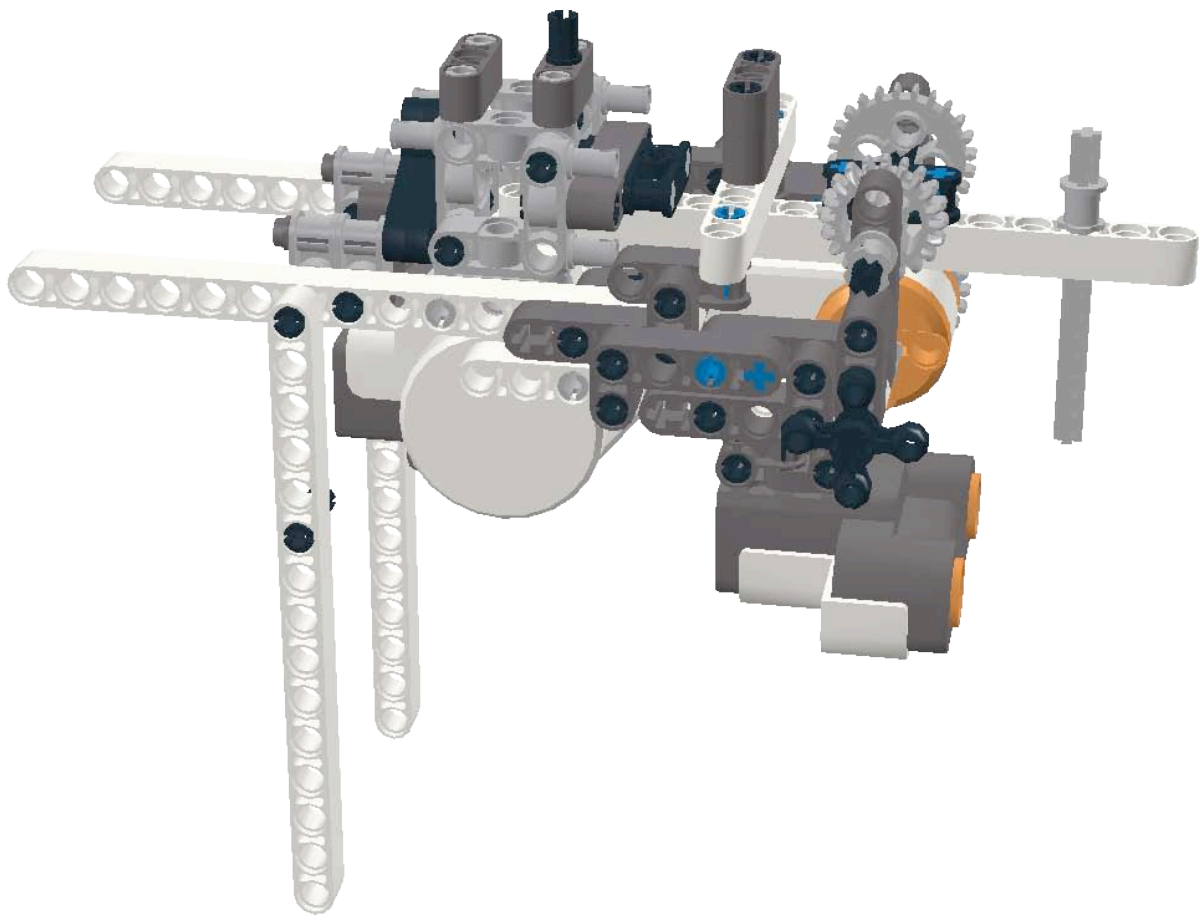
70

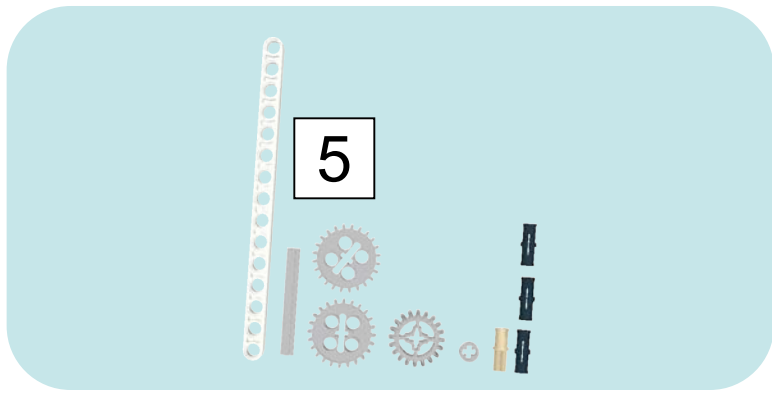




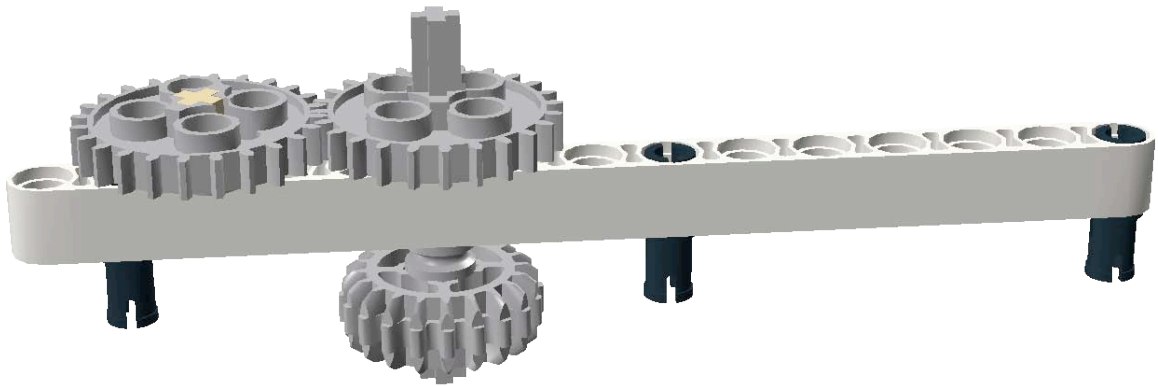


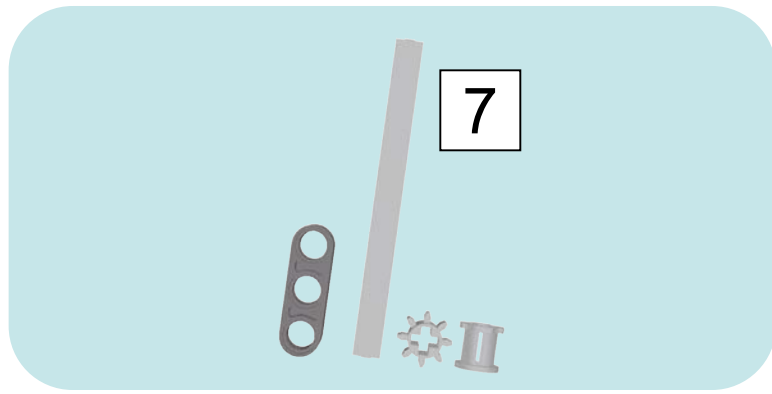
71



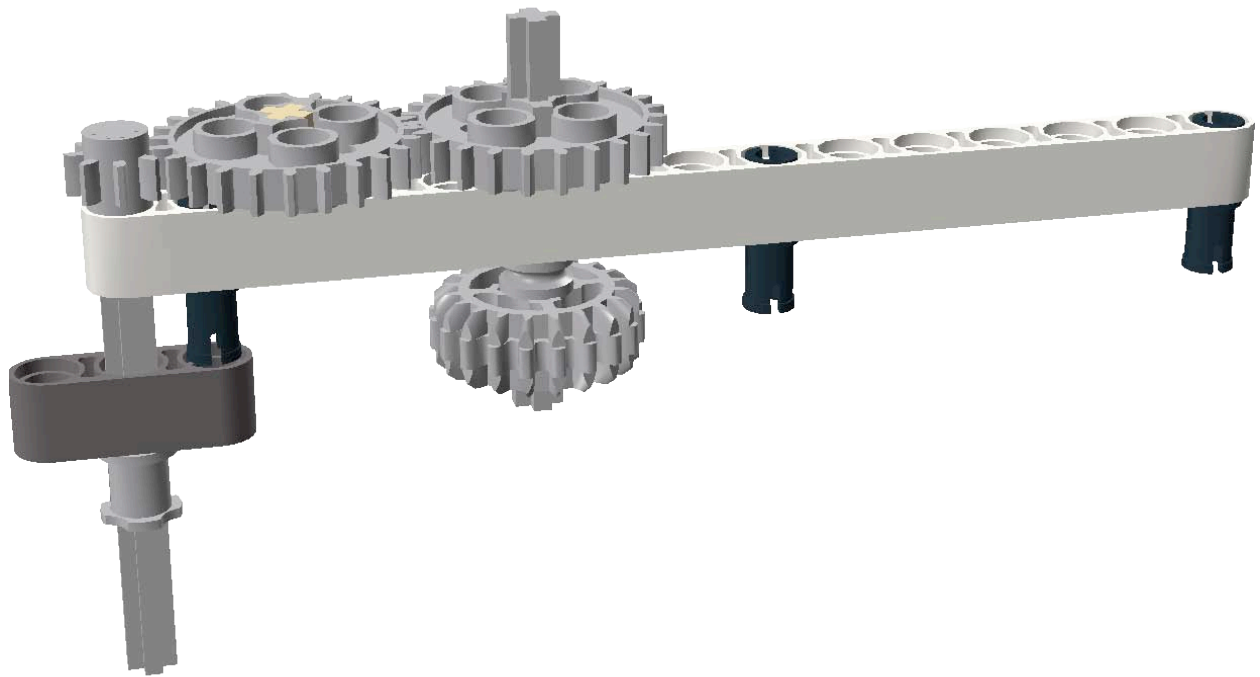


72

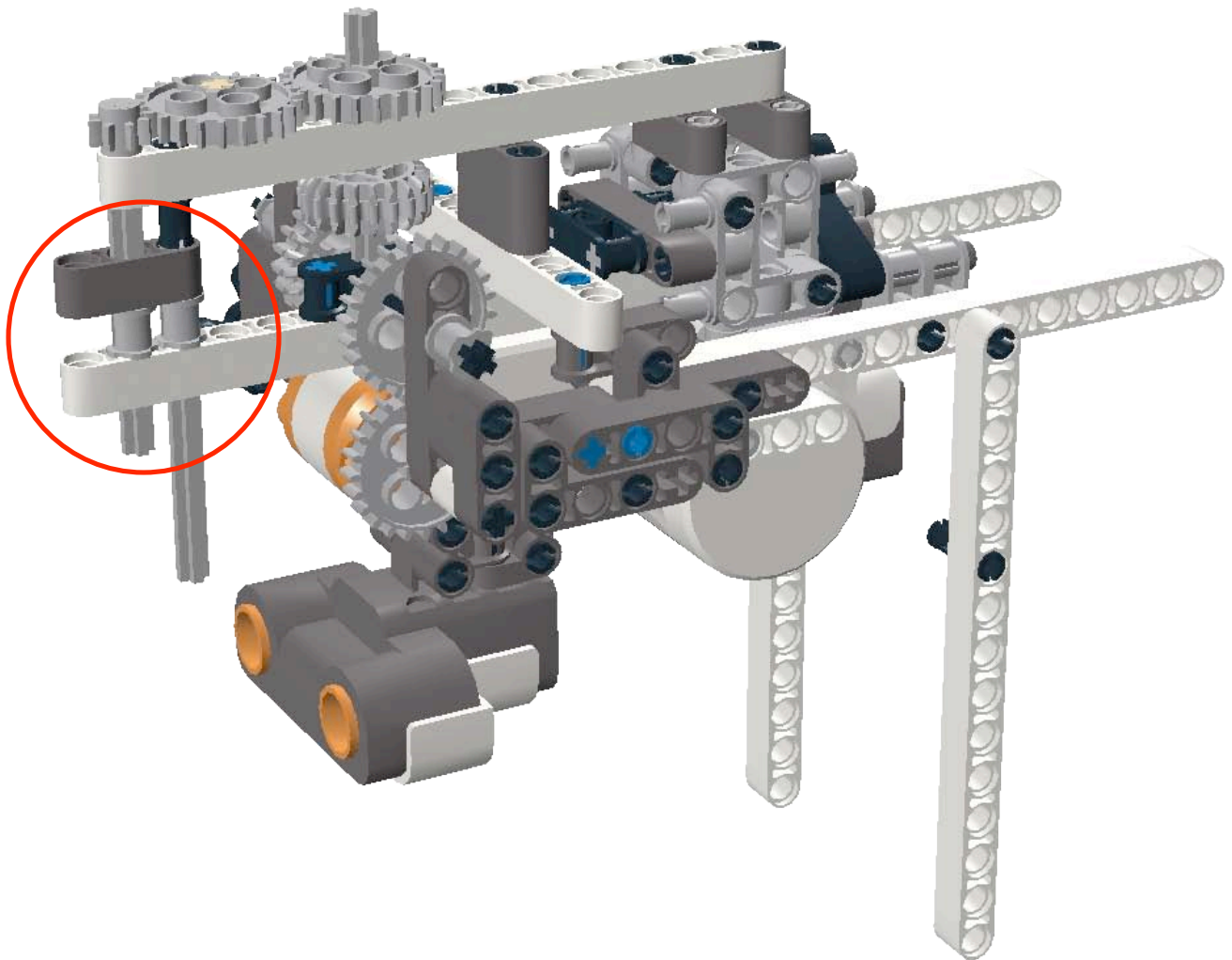


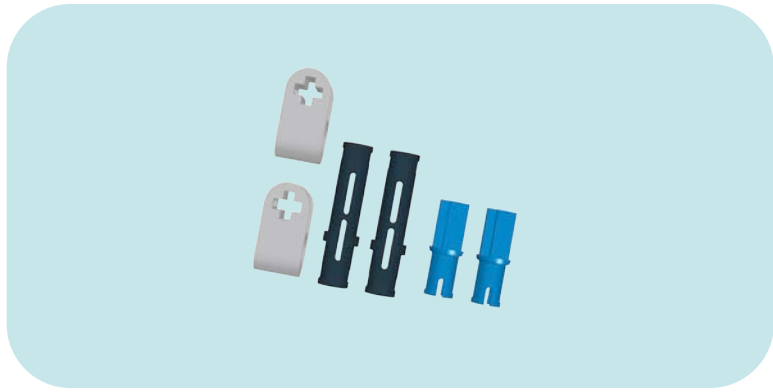


73

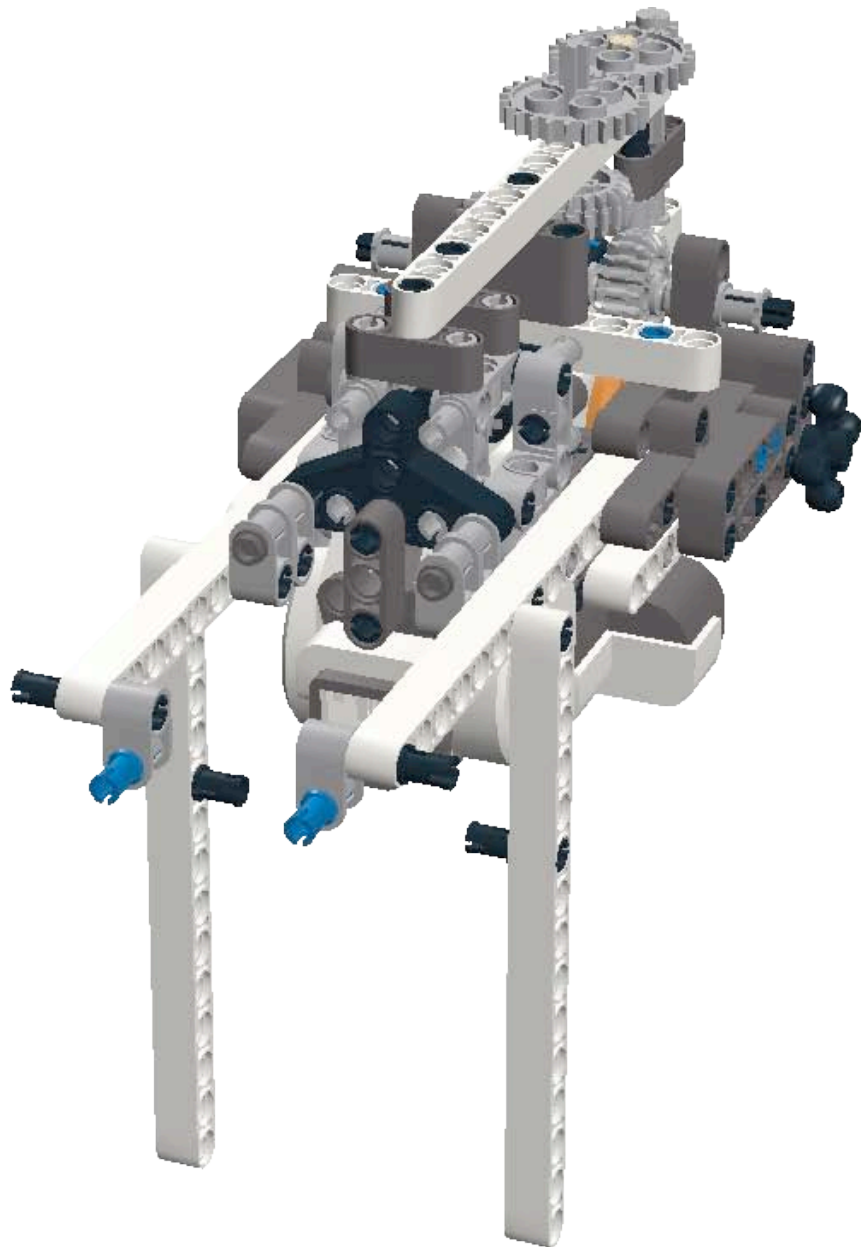


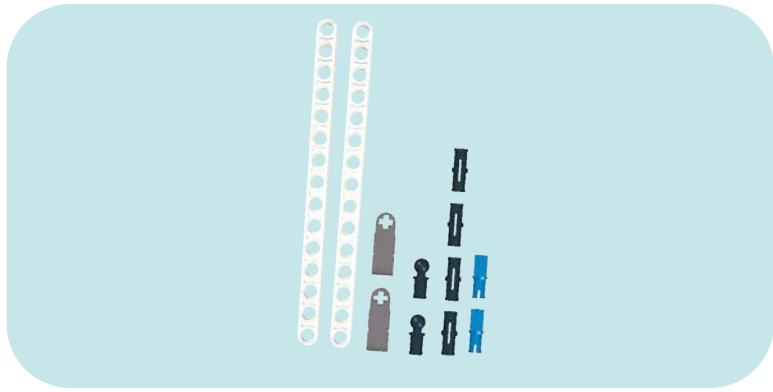
74



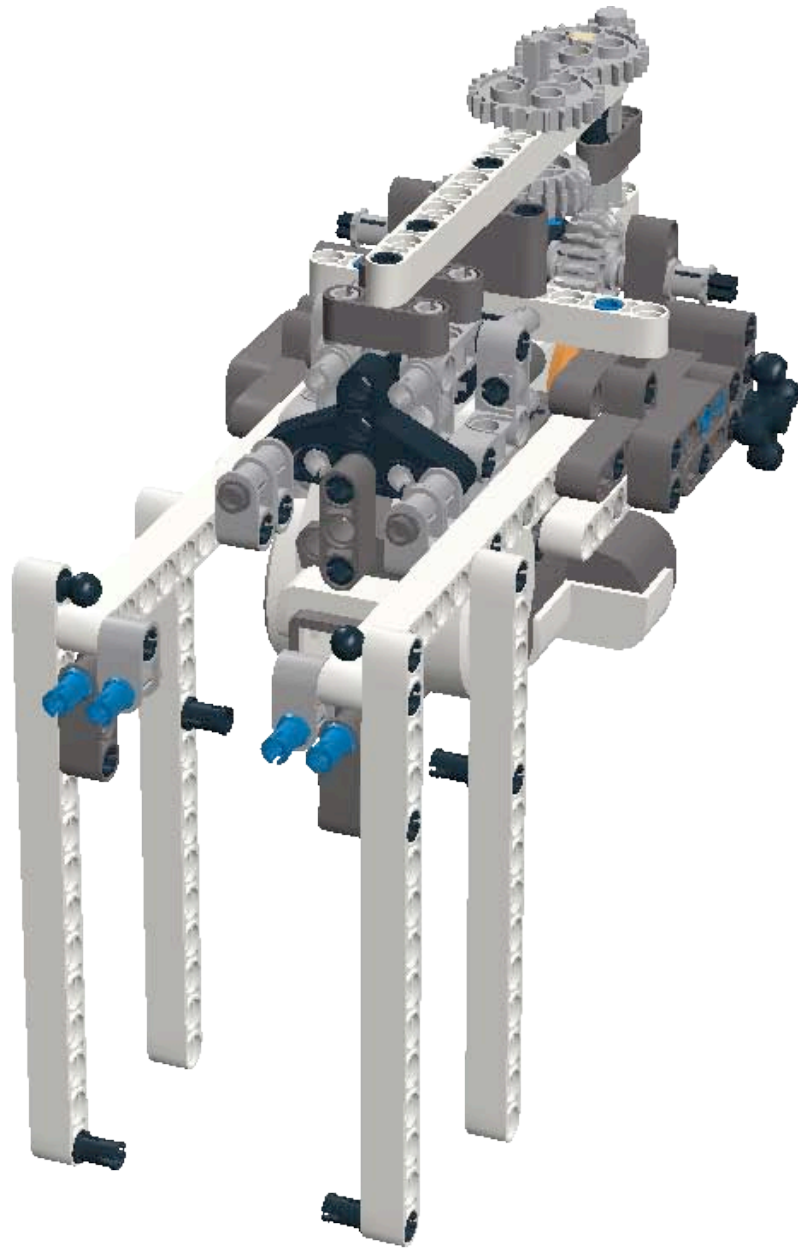


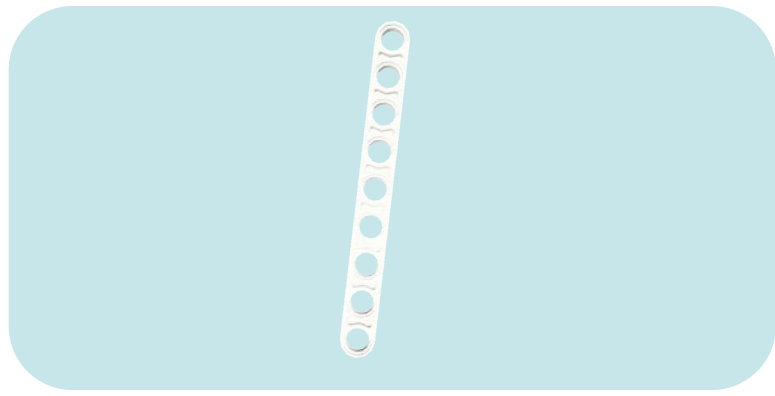
75



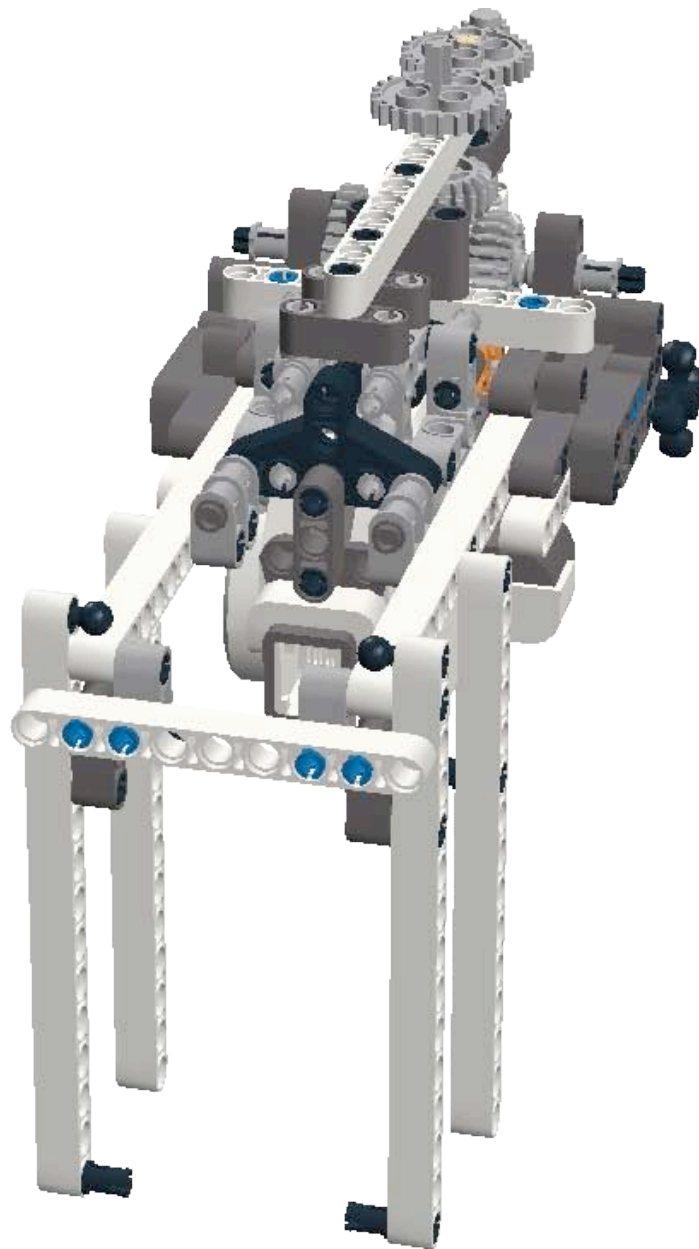


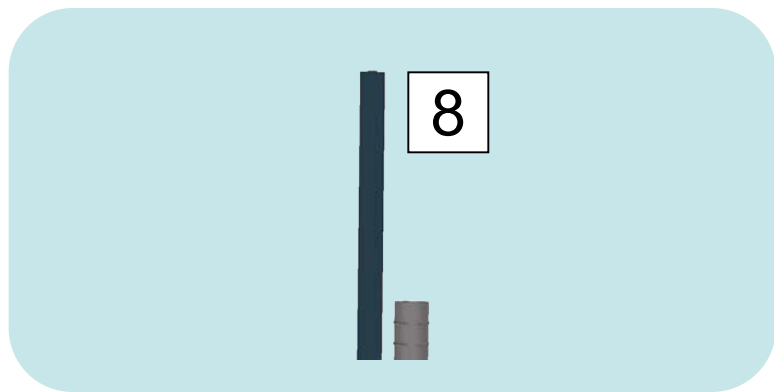
76





77

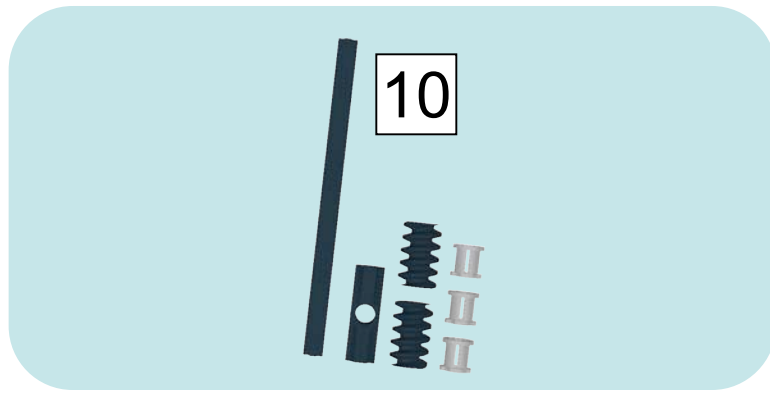




78

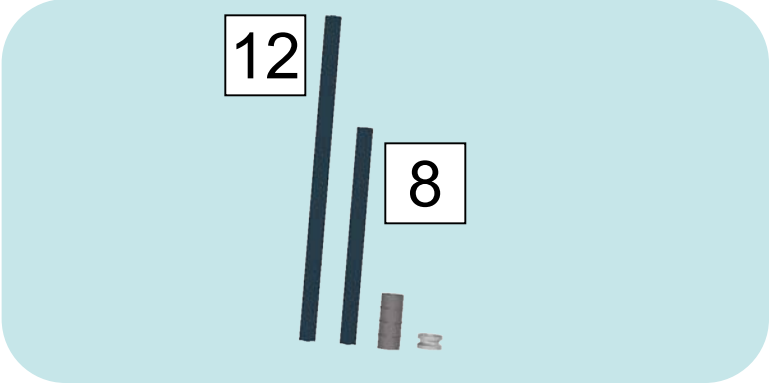






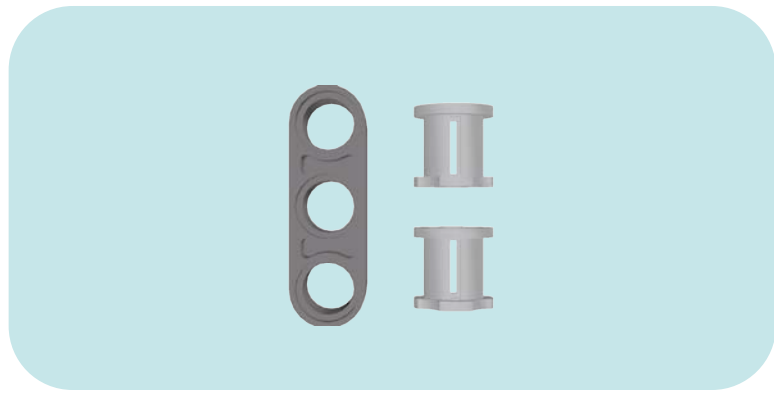
79





80

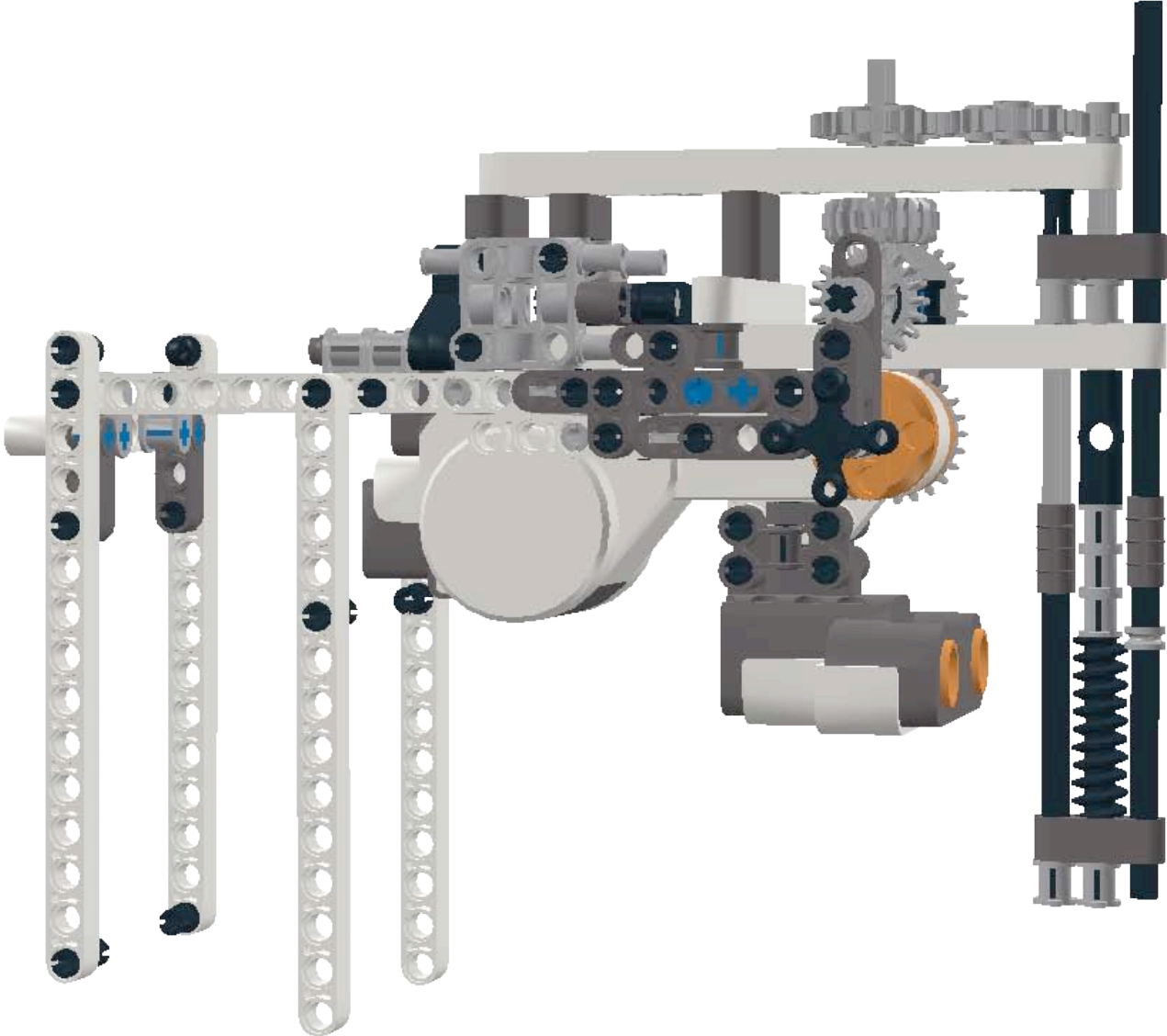




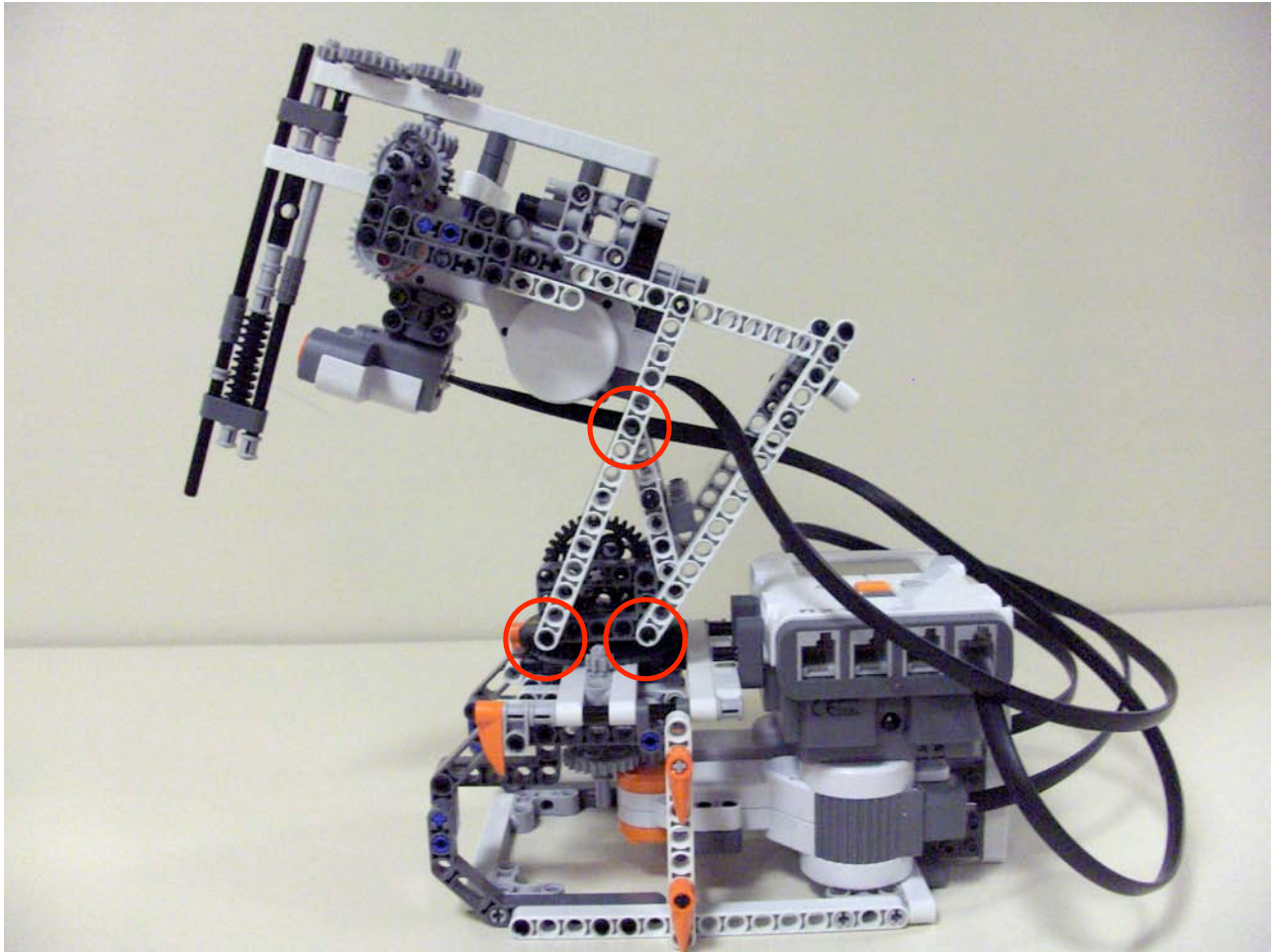
81



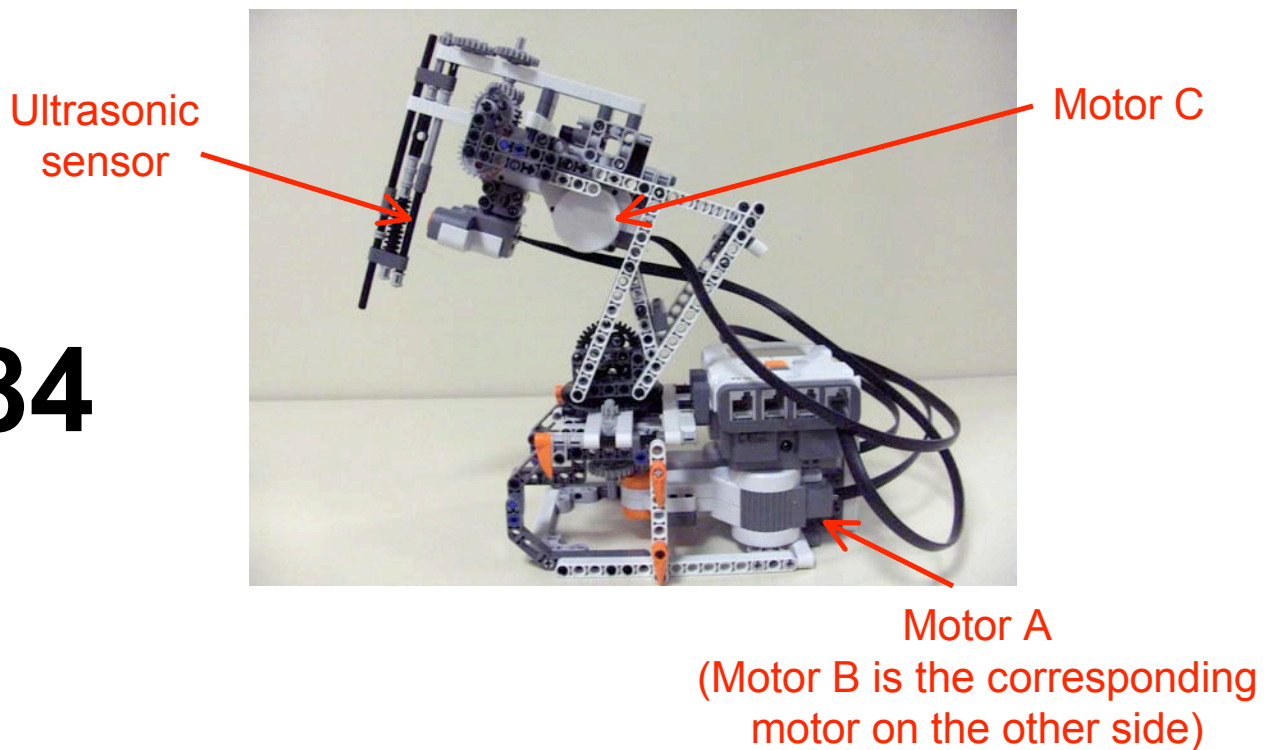
82



83



# 84



1. Use two of the large (495 mm) black 6-wire cables to connect:
  - The ultrasonic sensor and input port 4
  - Motor C and output port C
2. Use two of the medium (368 mm) black 6-wire cables to connect:
  - Motor A and output port A
  - Motor B and output port B
3. Try not to tangle the cables so that the robot can move freely

# Before you use the robot:

- Check that all of the joints are securely fastened
- Check that all of the gears line up with each other