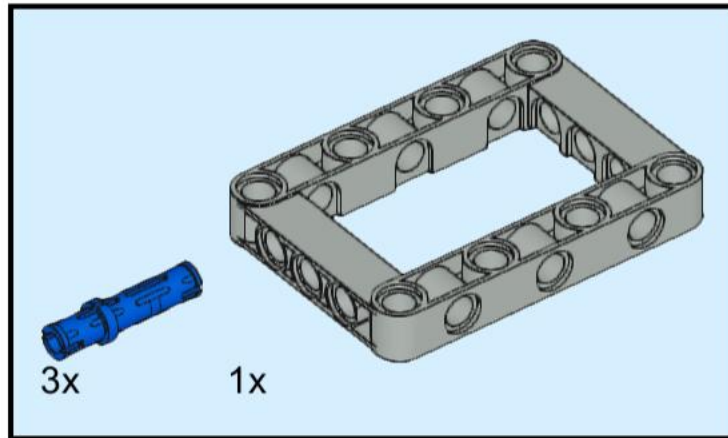
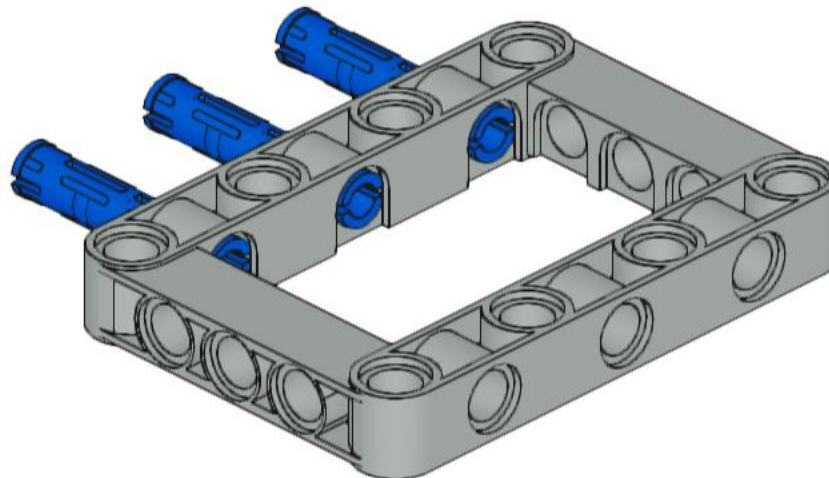
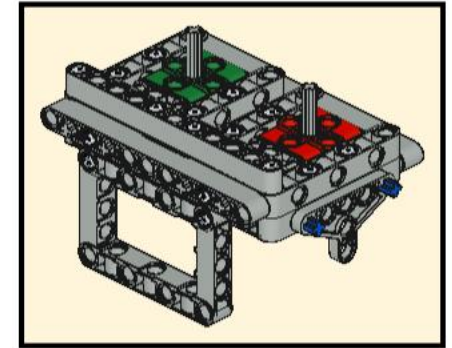


1



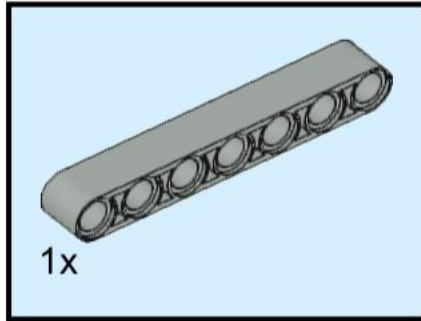
These are the "Build Plate" build instructions. All of your attachments will start with this. It is then up to you to figure out what else you need on your attachment. Everything will attach to this. You will not be able to "pin attach" anything directly to the robot, with one rare exception.



The large piece is called a "frame". It is five by seven studs. The blue peg is three studs long. You will be using these pieces a lot with your robot.

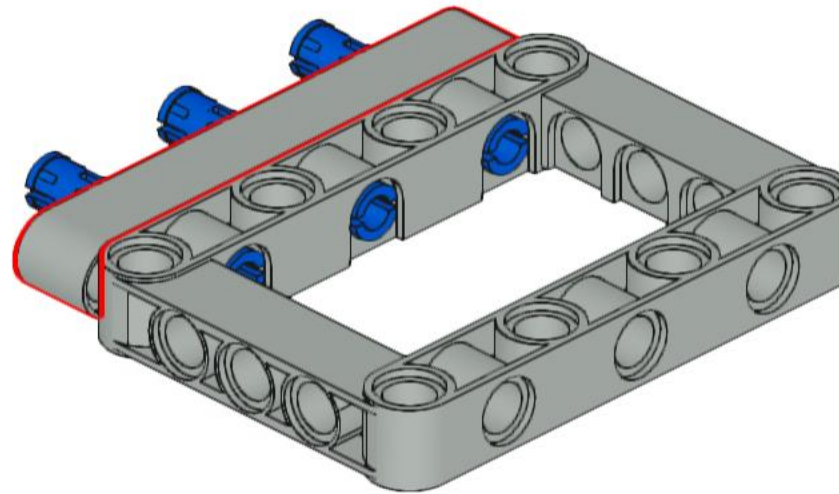
You should have these pieces in your colored bin of parts, but we have more in storage if you need them.

2

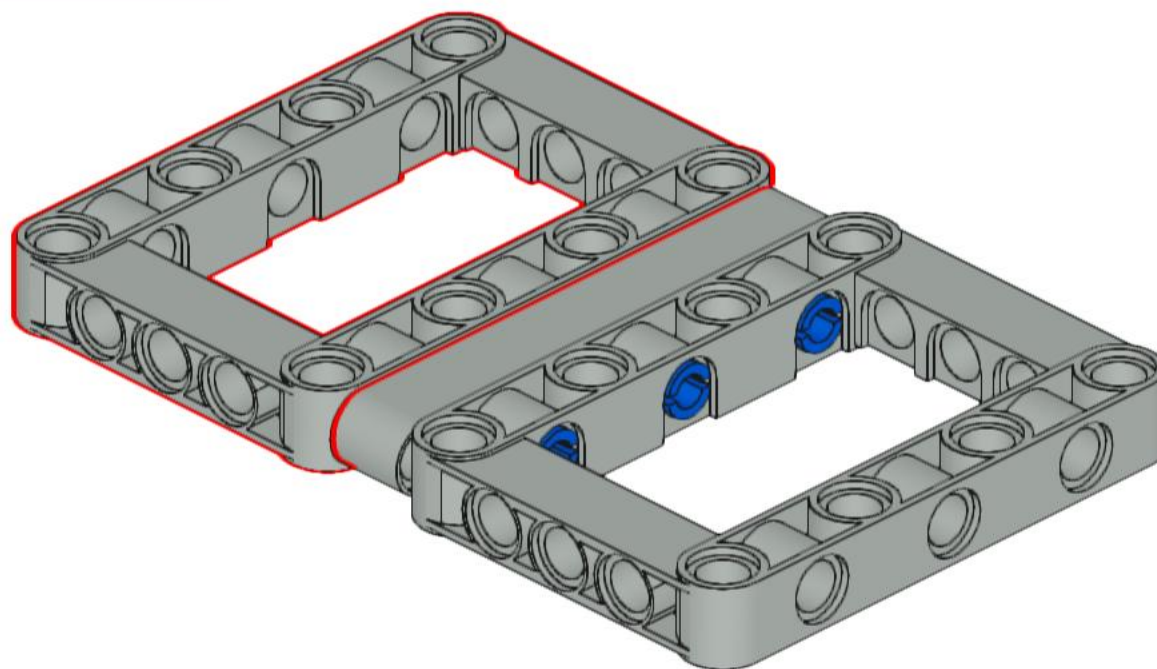
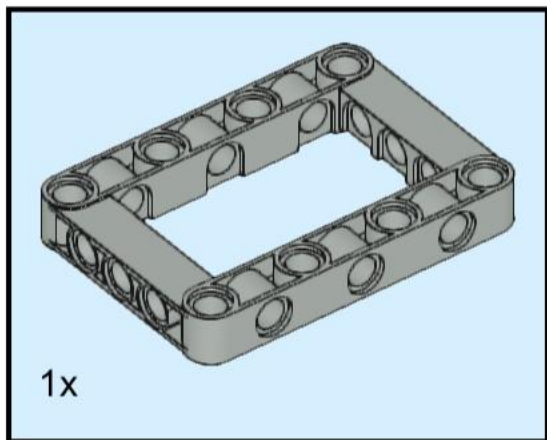


This is called a "beam", but Lego usually calls them "liftarms". You can get this piece from your colored bin of parts. They come in sizes from three to fifteen studs in length, but all odd numbers. However, there is one even numbered beam. Do you know which one? Hint: this is sort of a trick question.

By the way, we also have "beams" that are one stud long. We call them "one-beams"



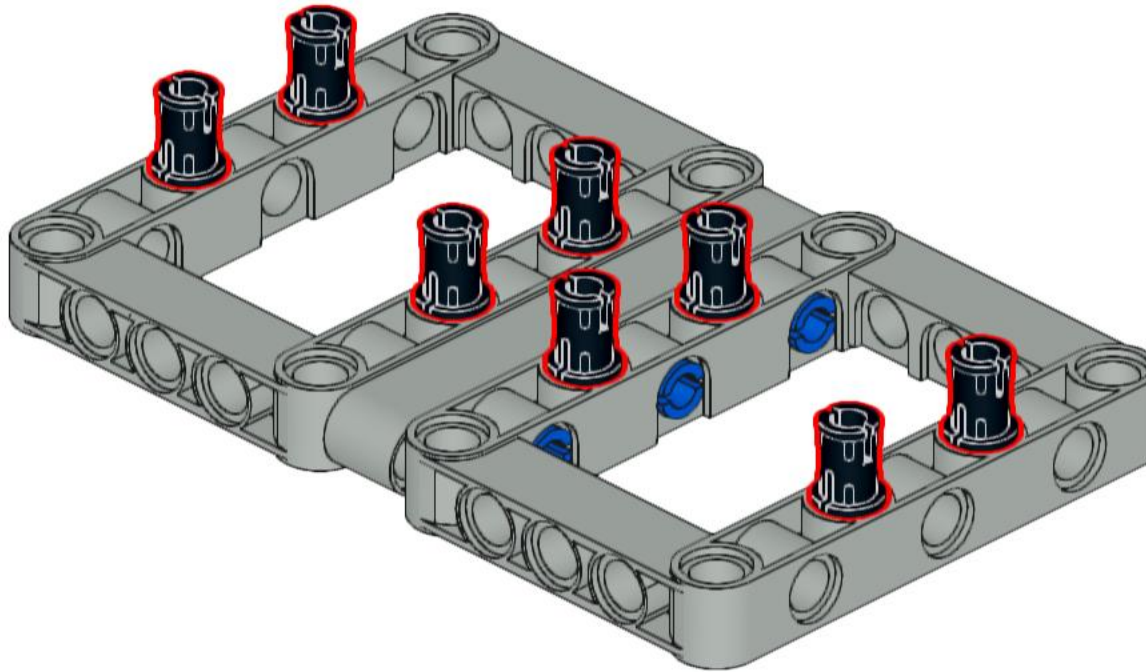
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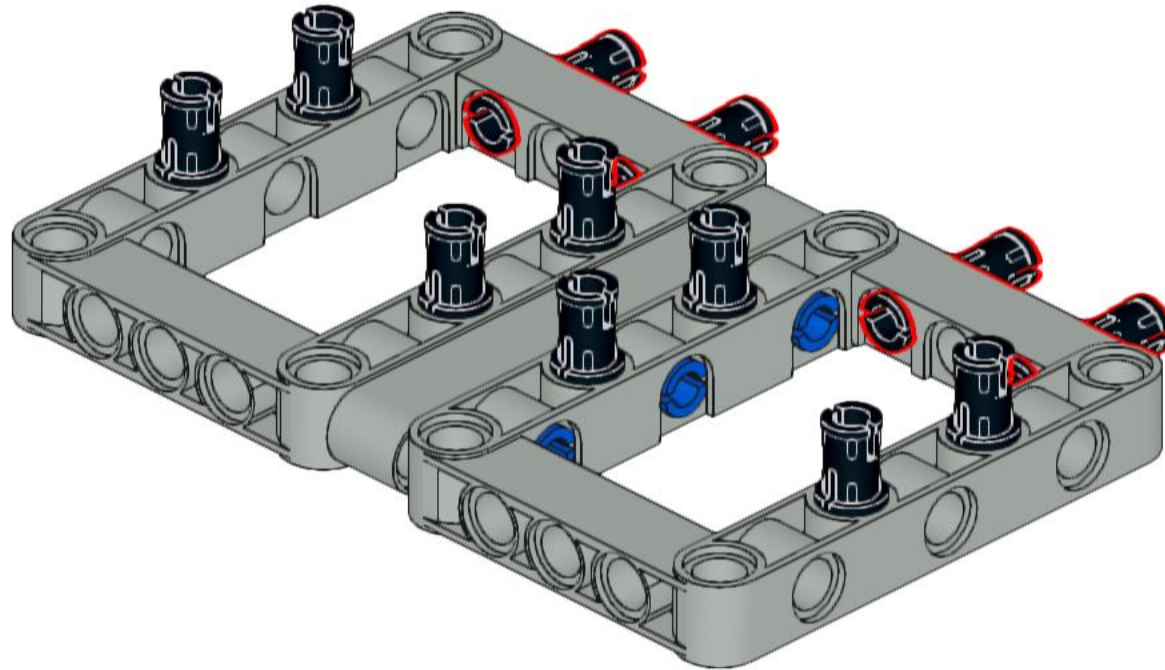
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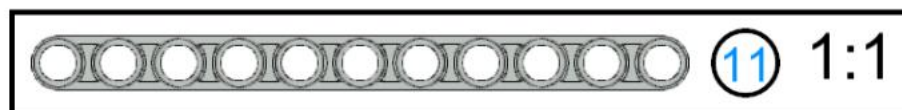
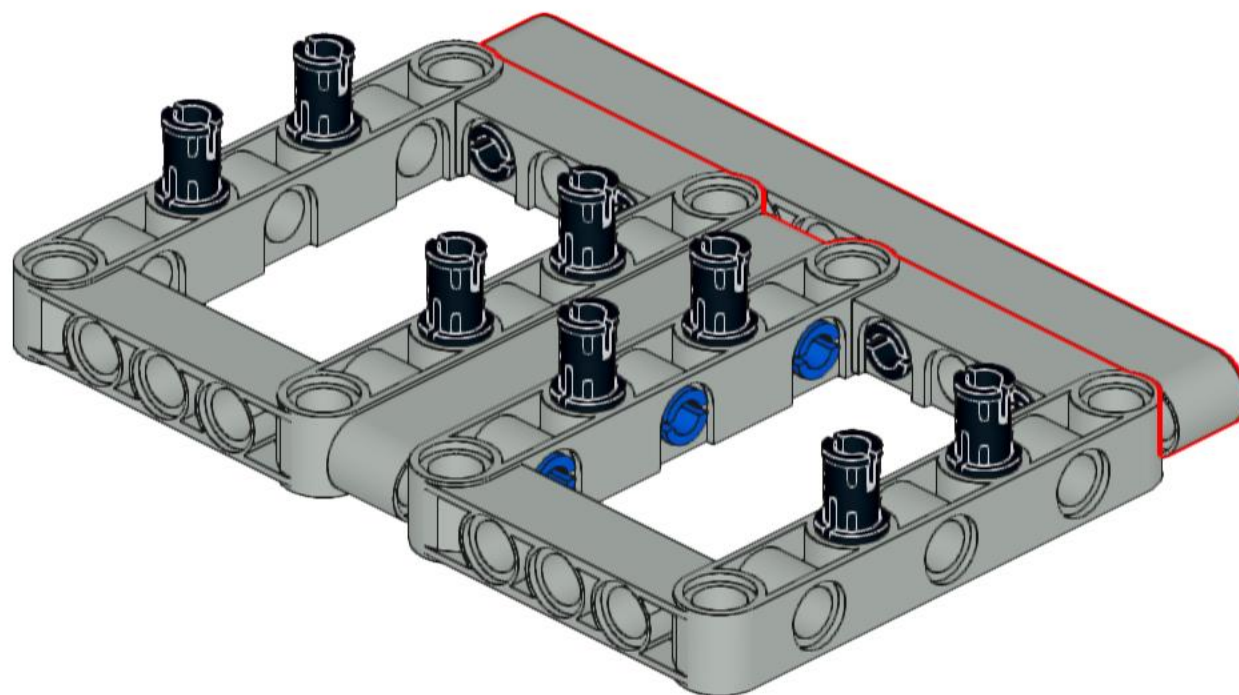
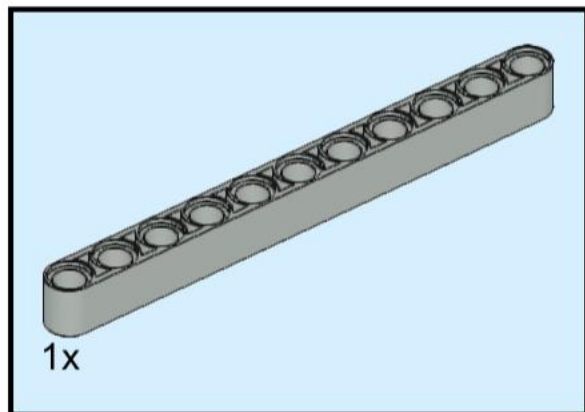
Ahhh.. the black peg. We have over six thousand of them in bins but there is probably one on the floor right now!



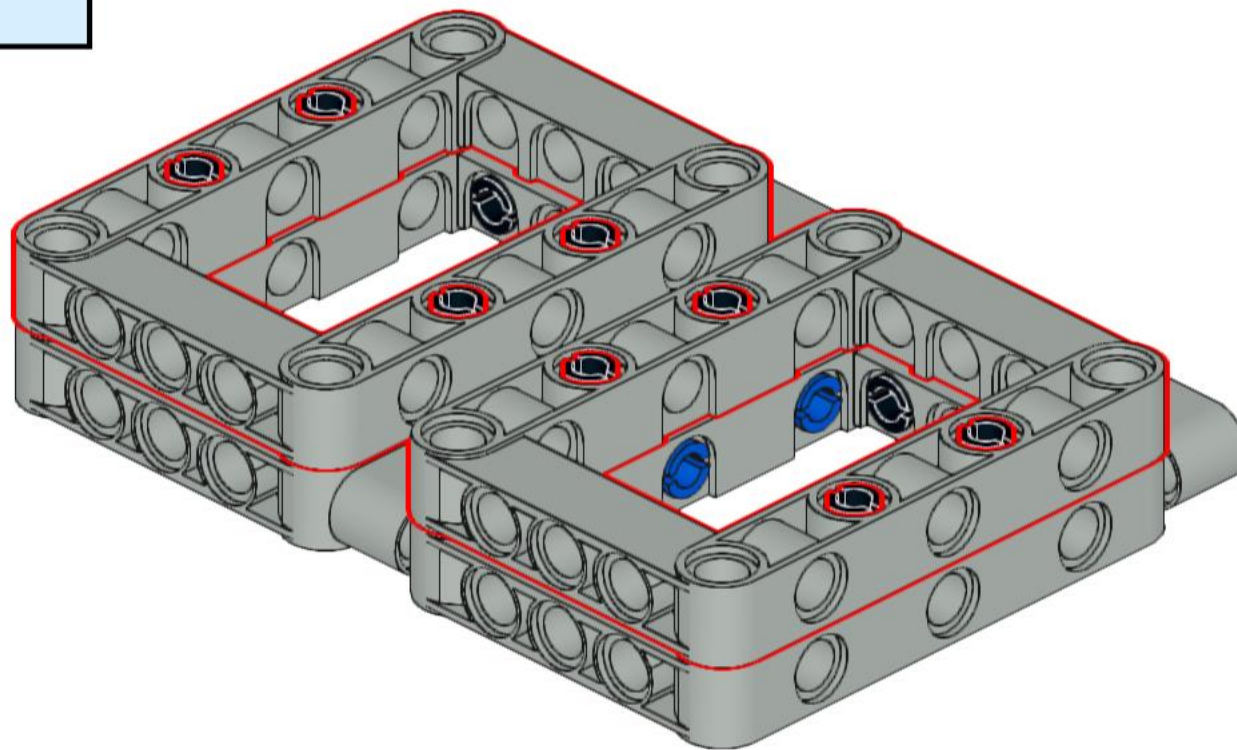
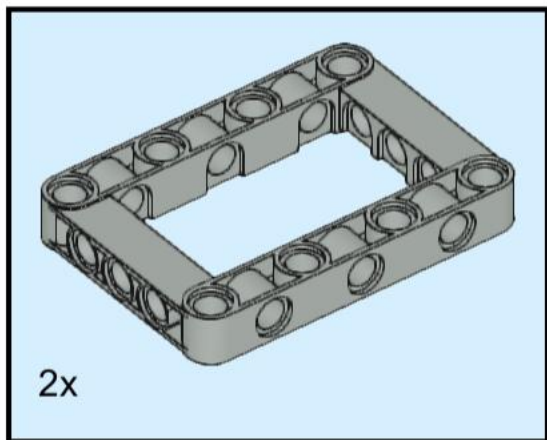
5



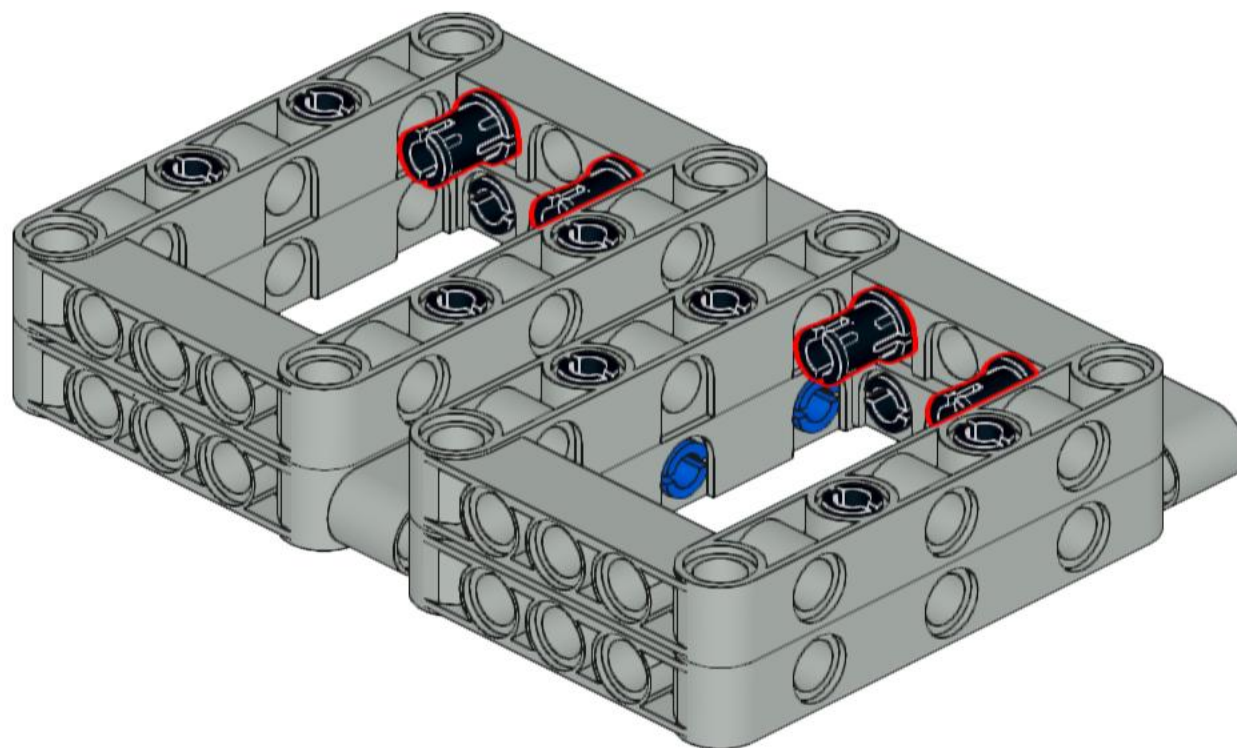
6



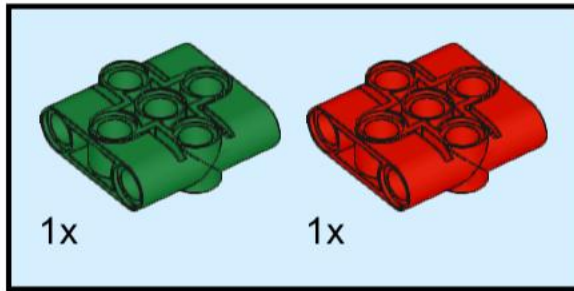
7



8



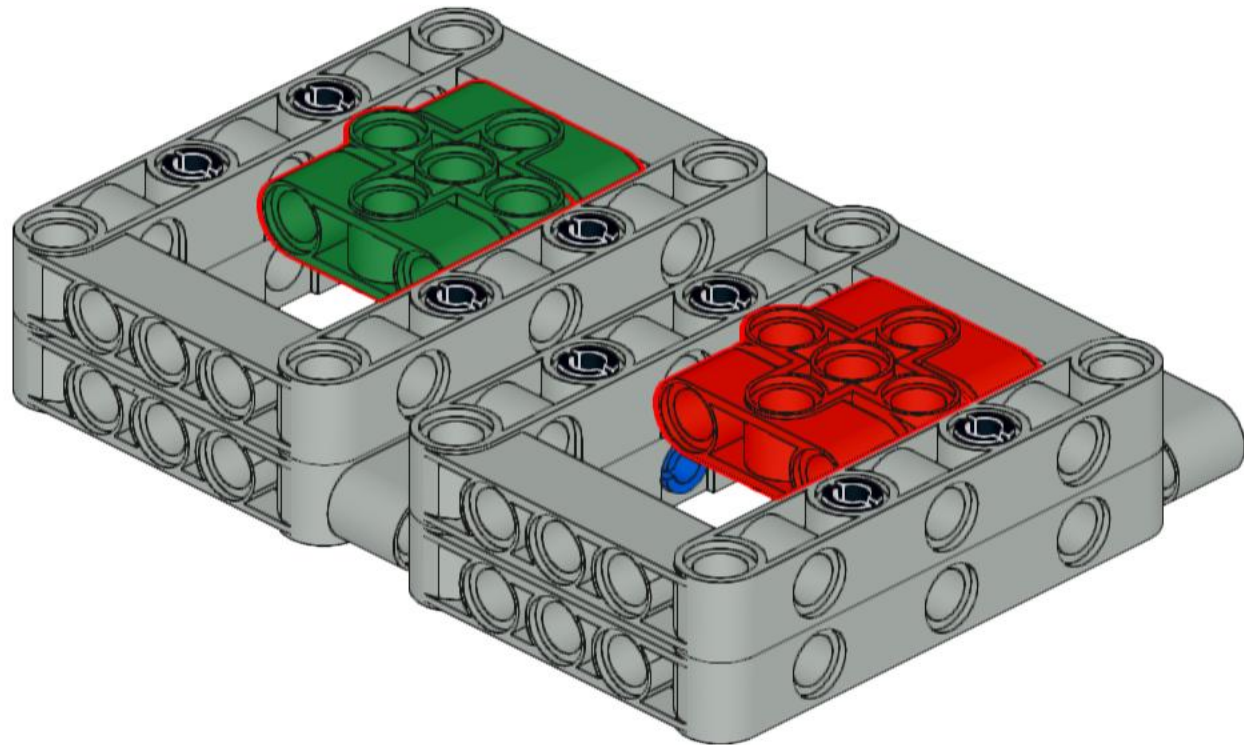
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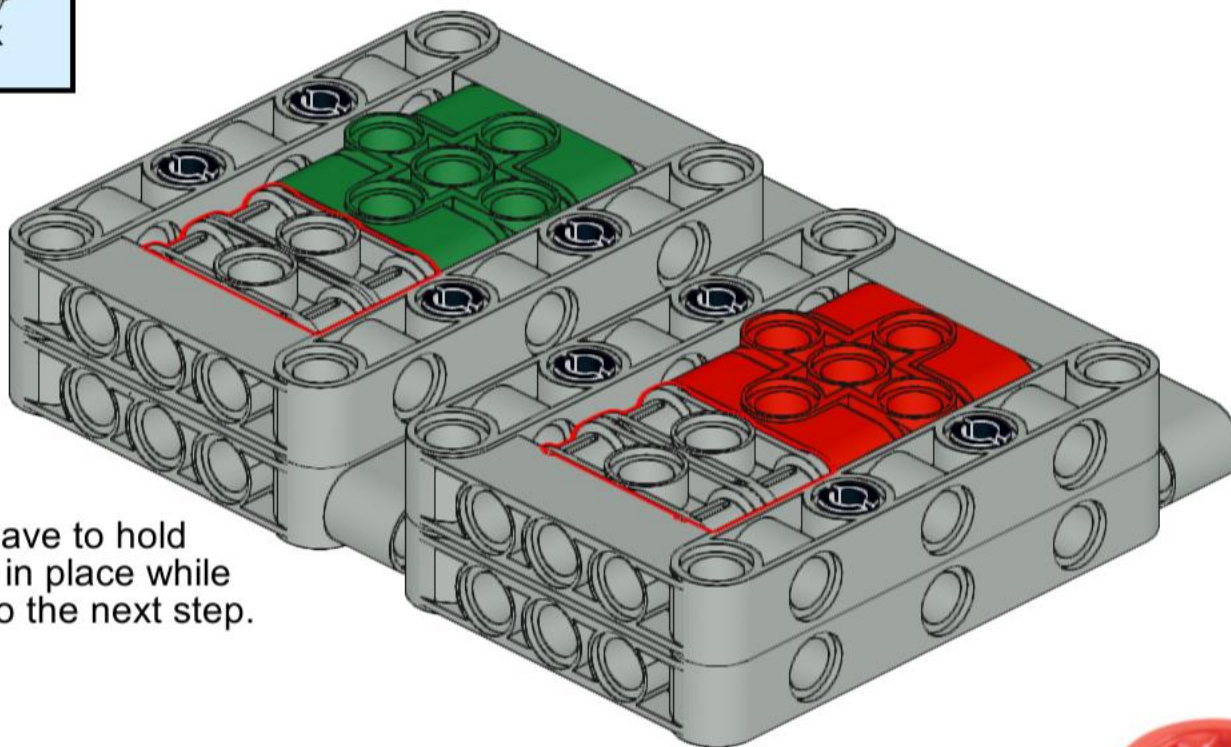
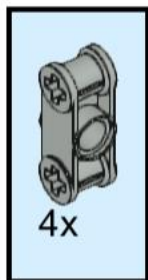
Colors don't matter here. The red and green is just to make it easier to follow the instructions.

These pieces are often called "waffles". Can you guess why?

The waffles are stored in a bin by themselves.



10

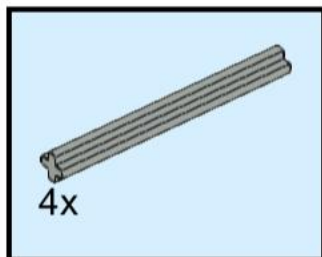


You have to hold these in place while you do the next step.

Here's a better picture of the piece you are looking for. They are in bins #2 and #7. Do you know why they are in two different bins? Hint, look at the title of those two bins and look carefully at the piece.



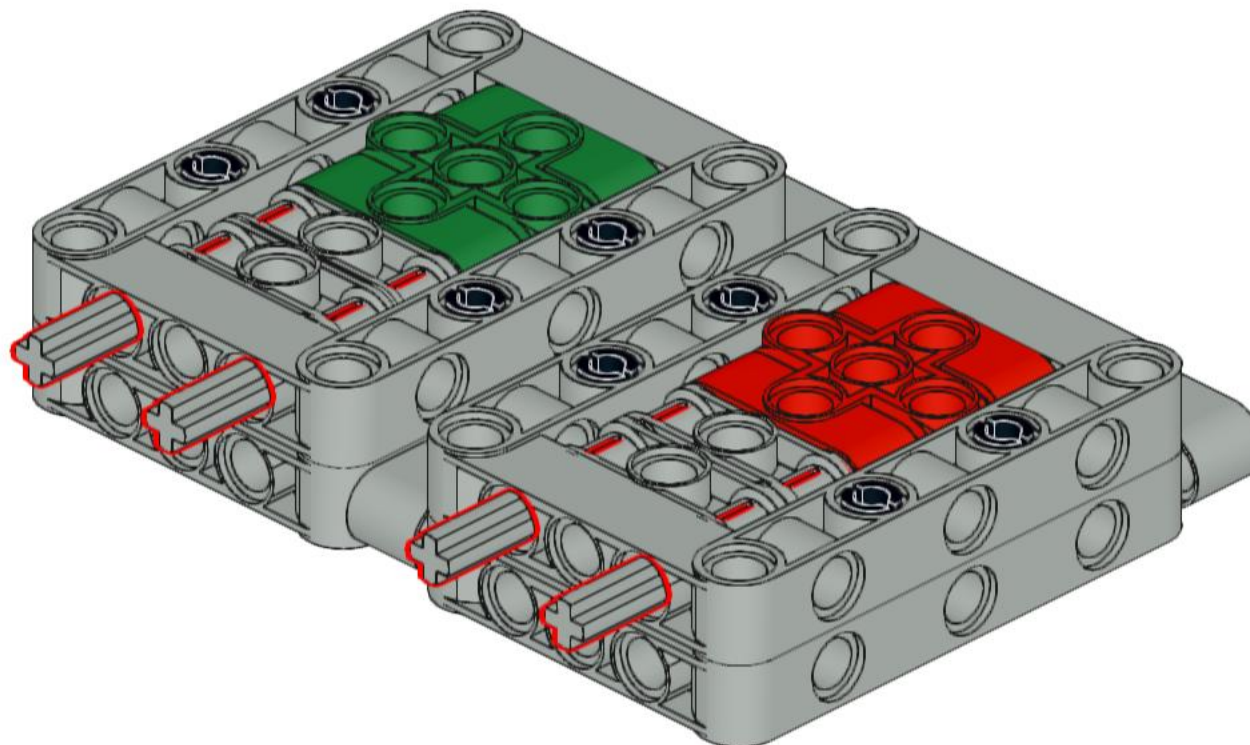
11



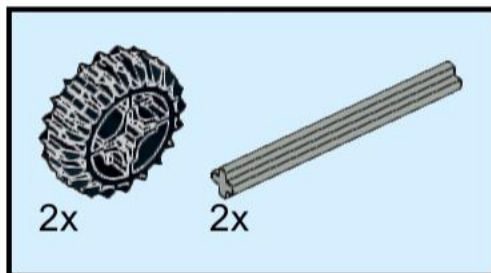
This piece is called an "axle". We normally use them to connect rotating pieces, but in this case we are using them for structure and support.

Axles are stored in bin #1 and come in sizes from two to twelve studs in length, plus some other really long ones. We have all kinds of connectors to make any size or shape you need.

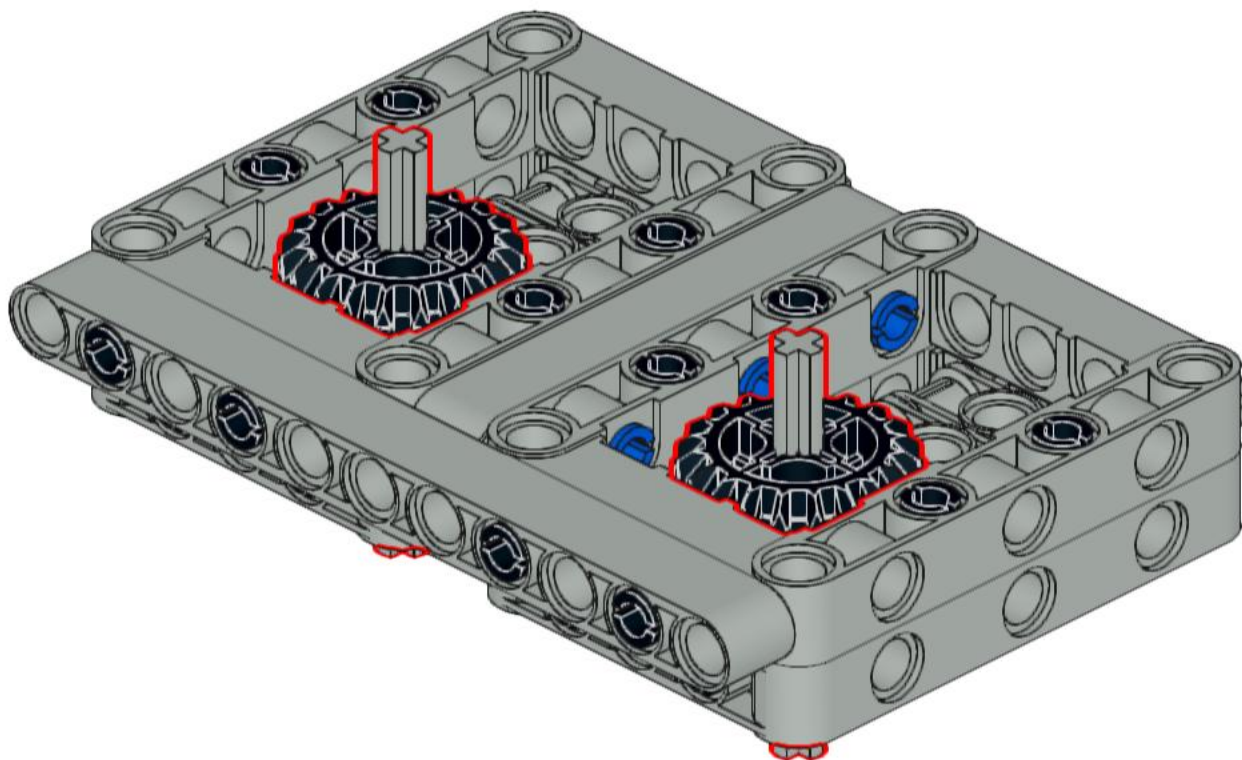
Yes, the axles will stick out the front just like the picture shows.



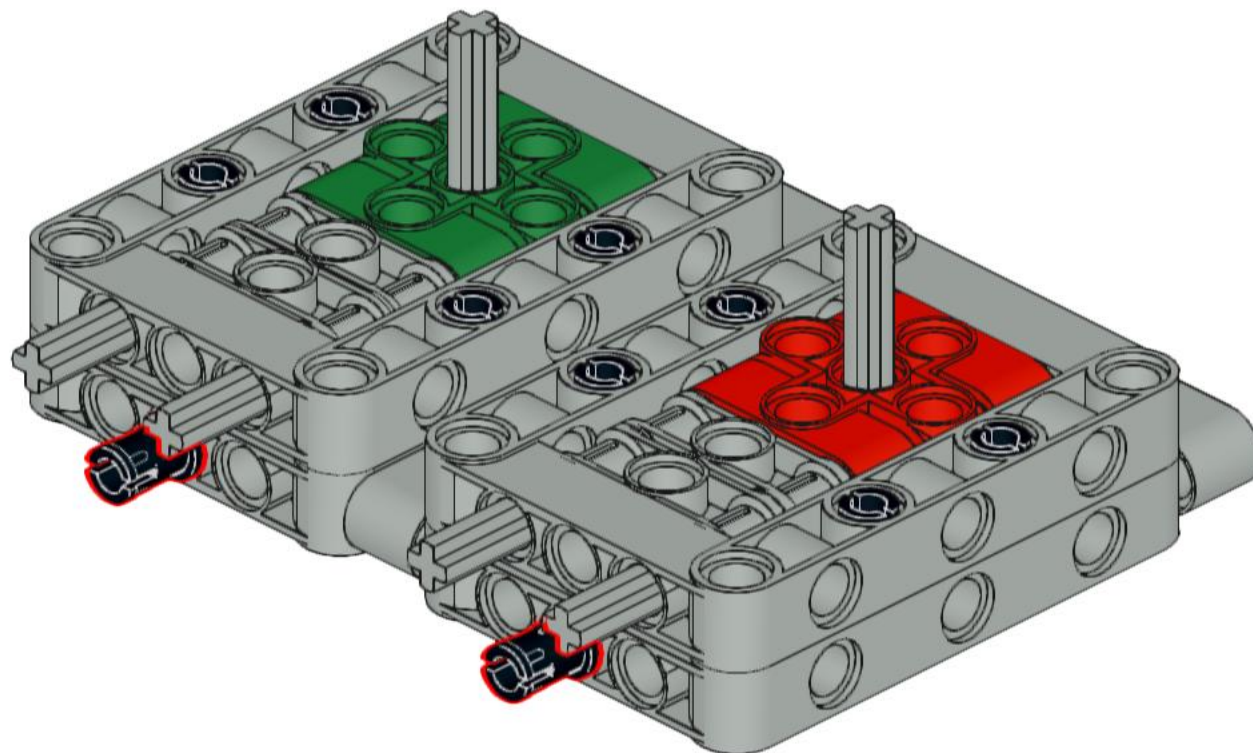
12



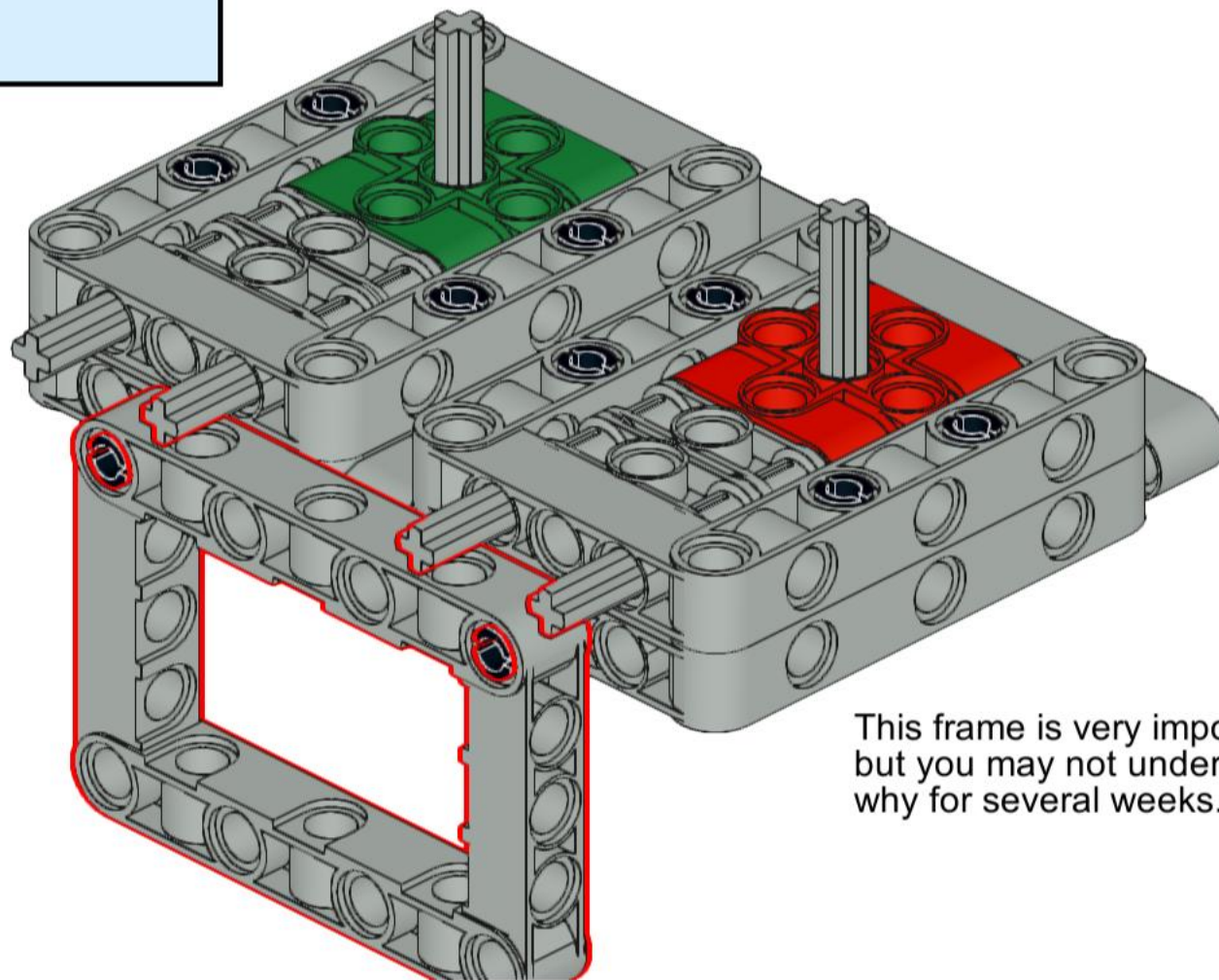
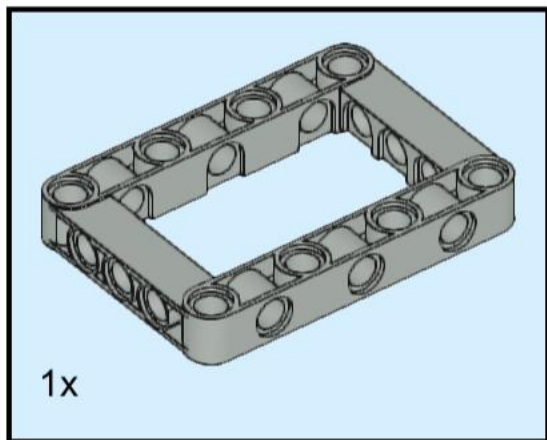
Gears are stored in the gear box, bin #4



13

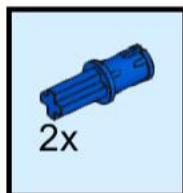


14

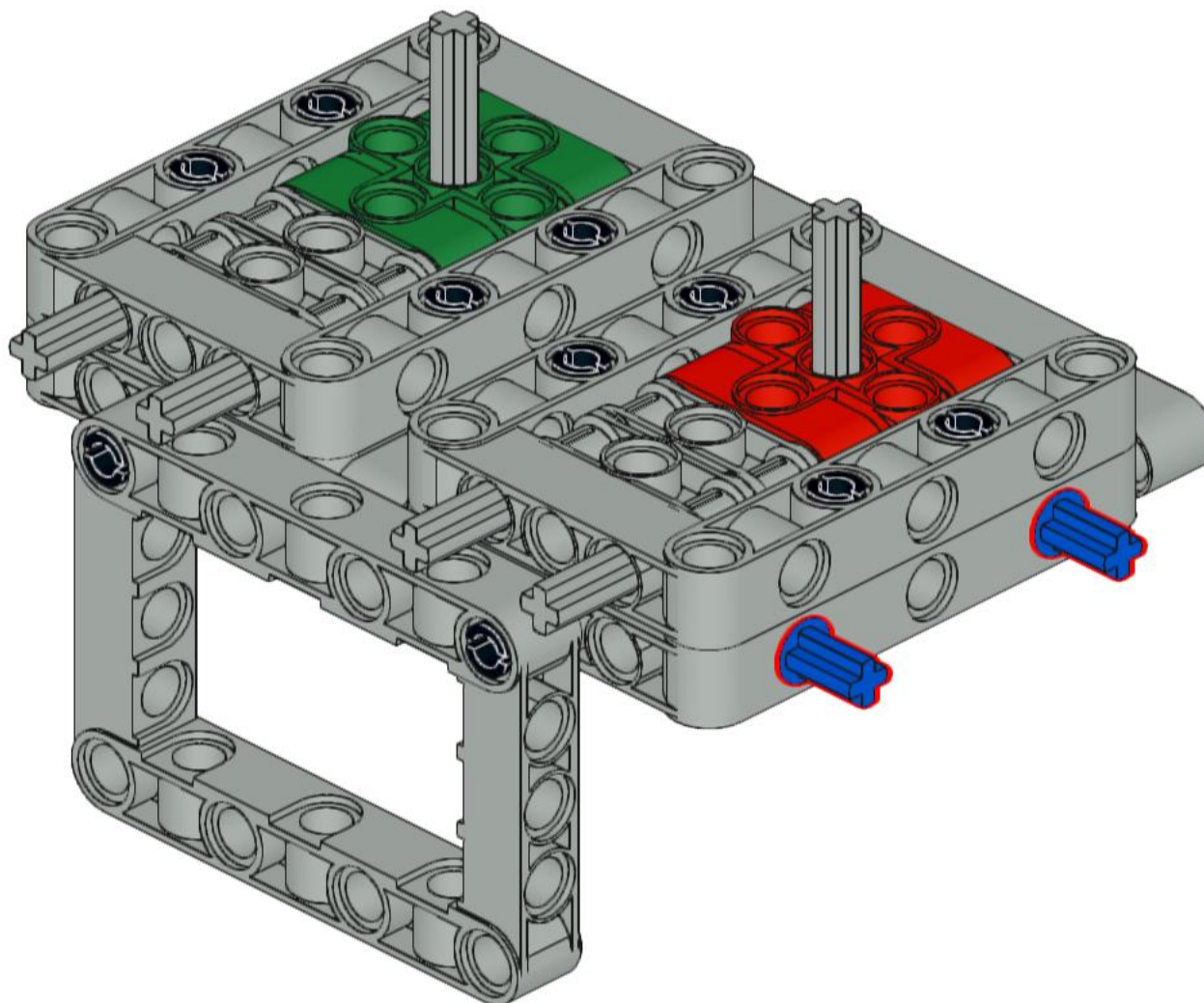


This frame is very important, but you may not understand why for several weeks.

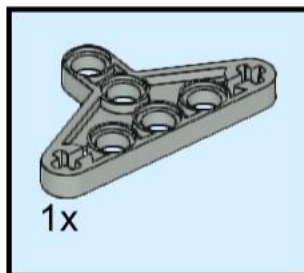
15



These blue pegs are stored in bins #3 and #6. Why do you think they are stored in two different bins?

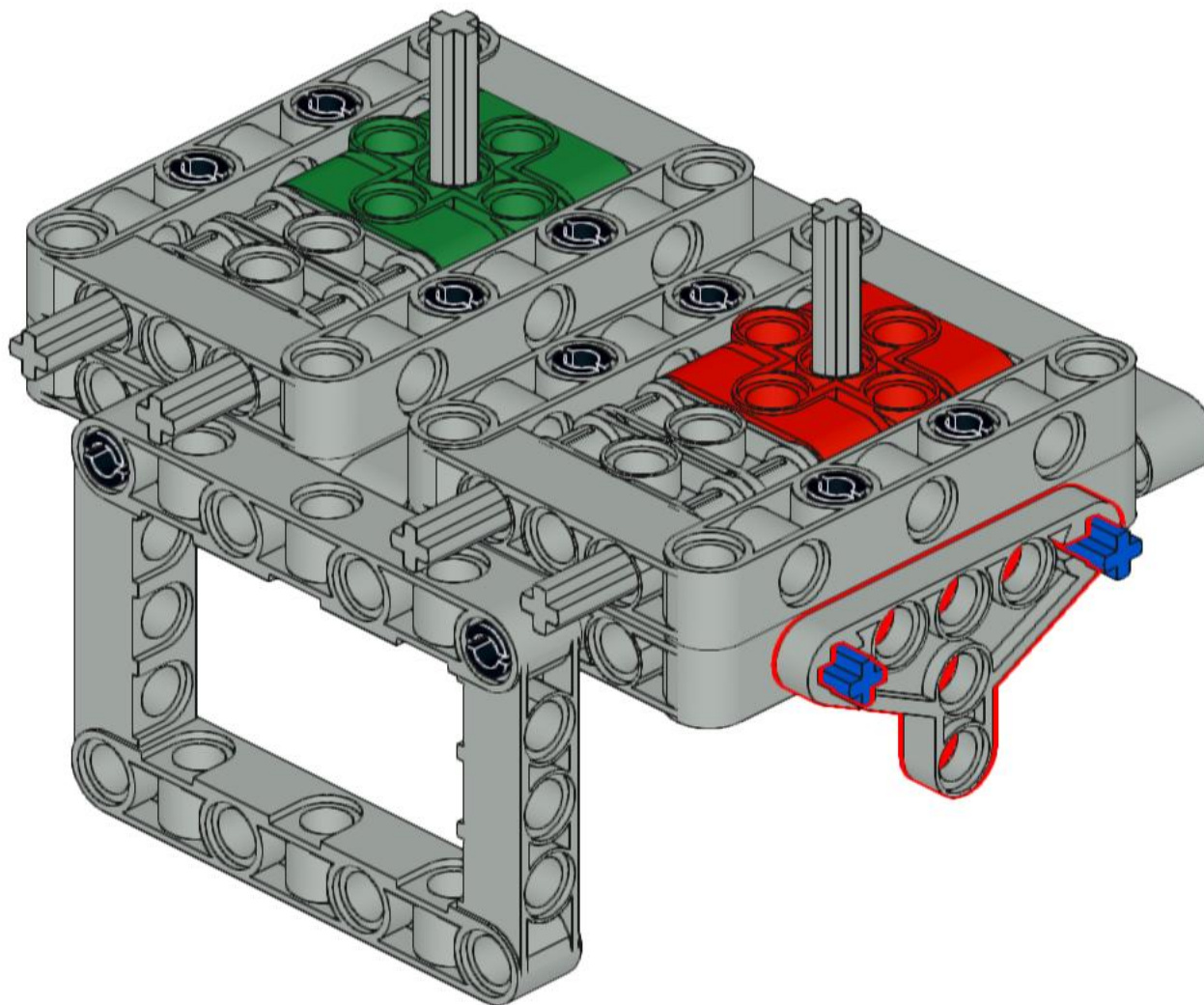


16

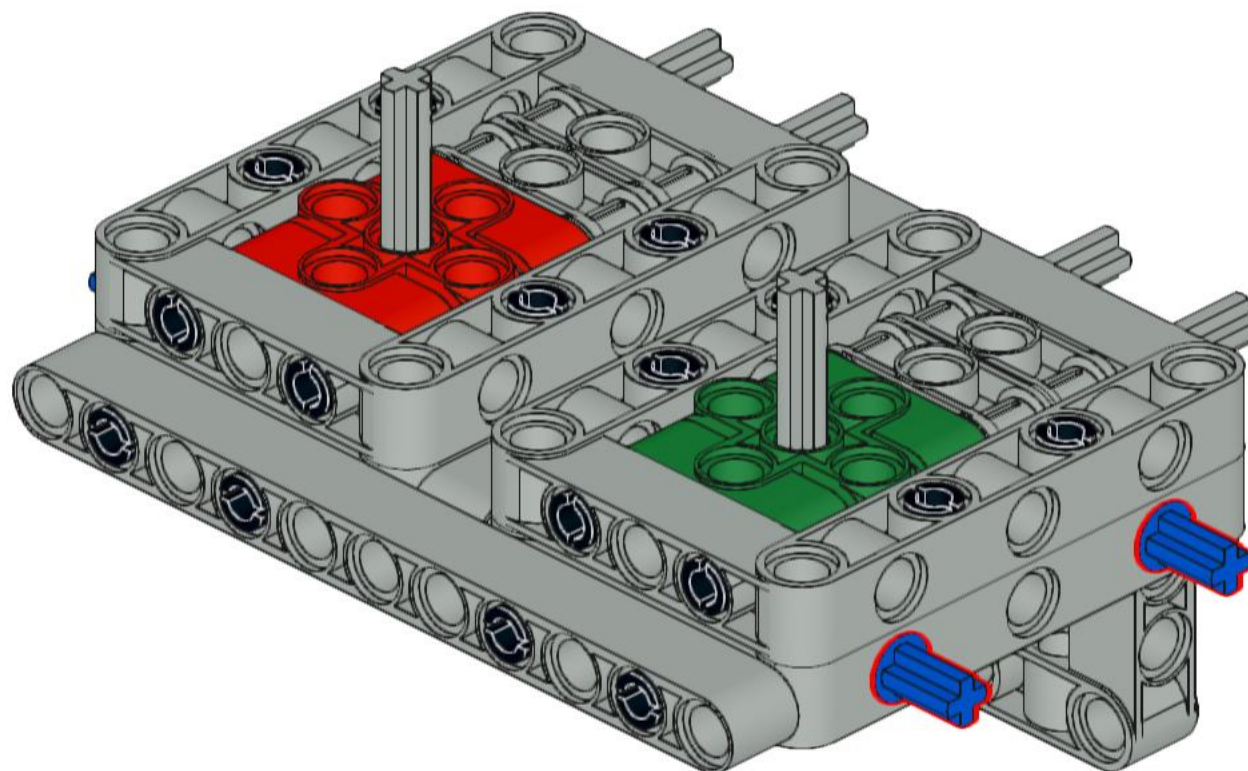
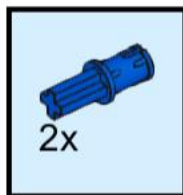


These triangle pieces are pretty cool and give us a lot of options for building things. In this case, we are using them as guides so we can quickly get the attachment on the robot. Why is it important that we be able to get the attachments on quickly?

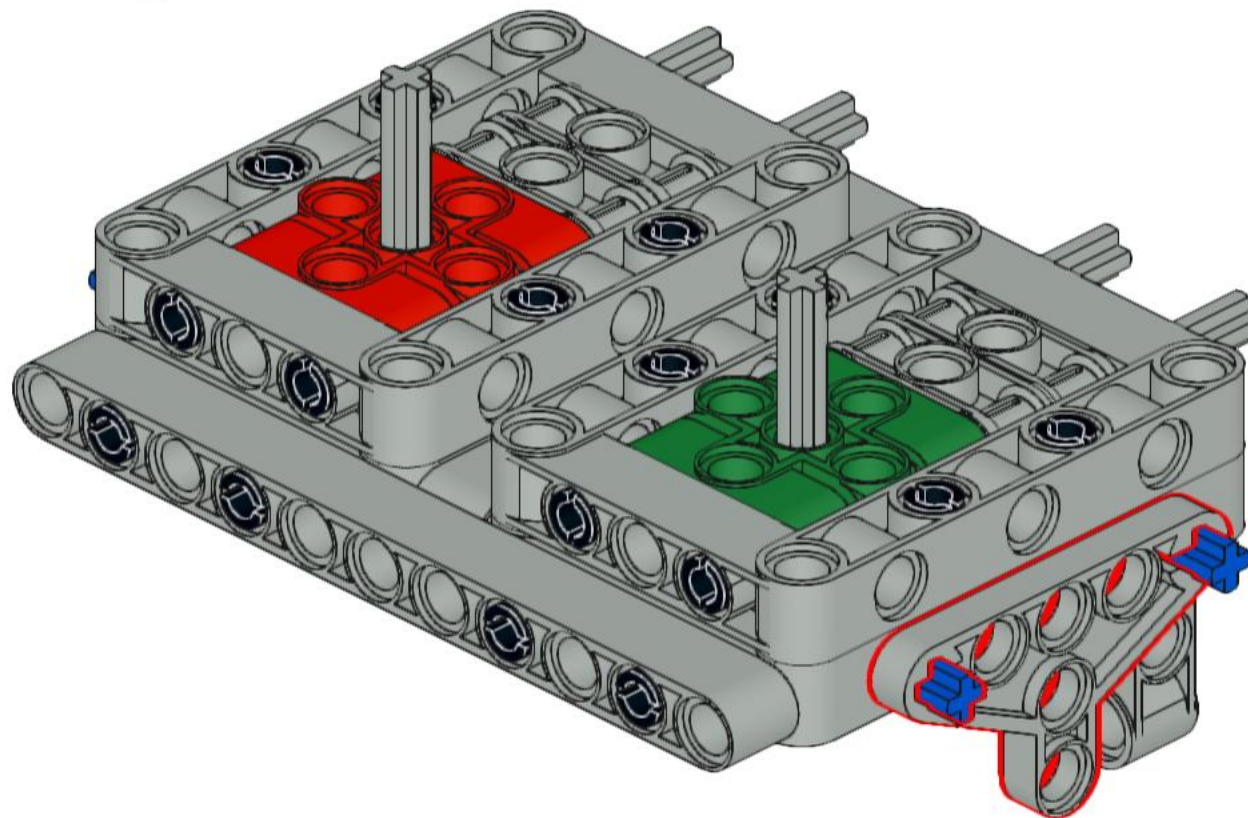
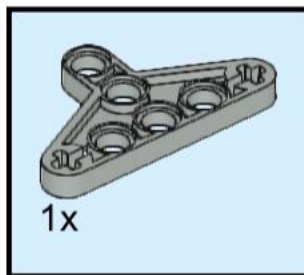
They are stored in bin #10.



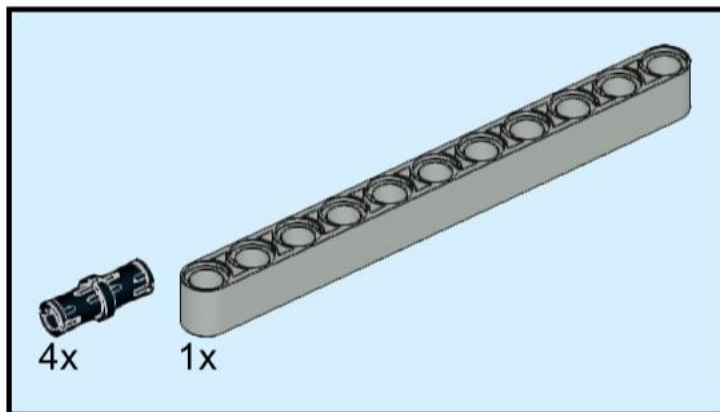
17



18

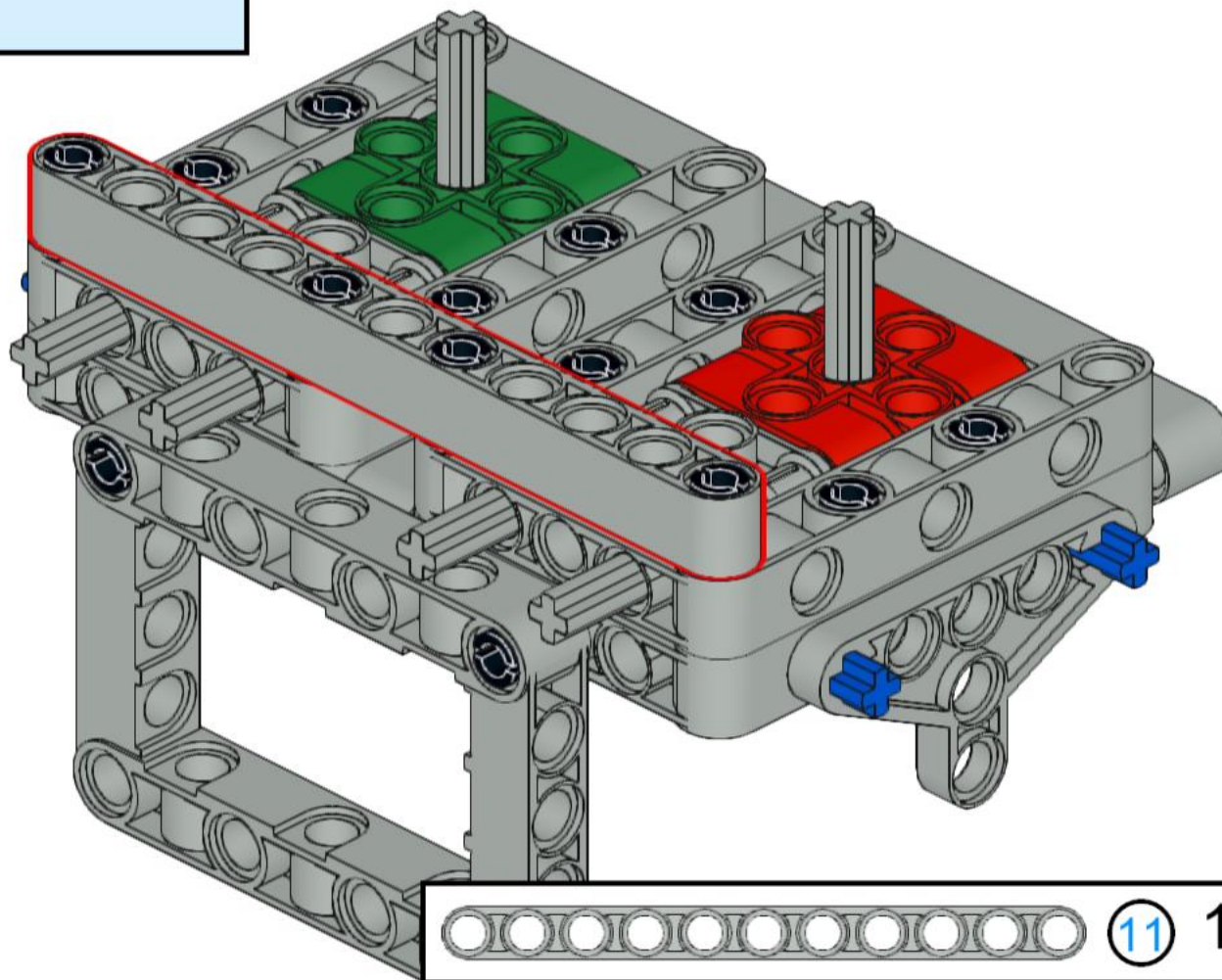


19

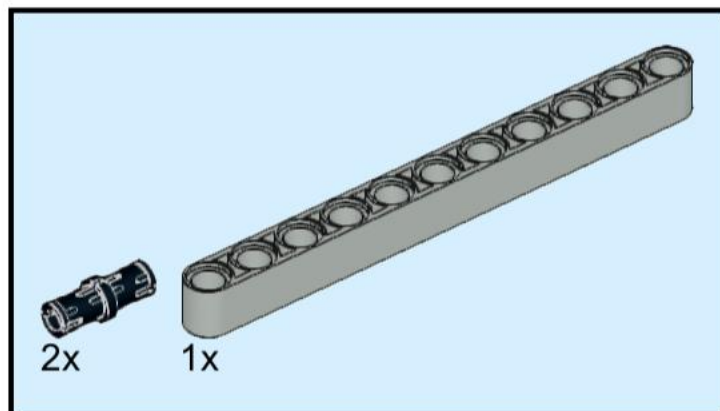


This step and the next are optional, but you should do at least one of them (you can do both). It probably makes your attachment a little stronger/sturdier, but it also puts extra pin holes on top in case you need them.

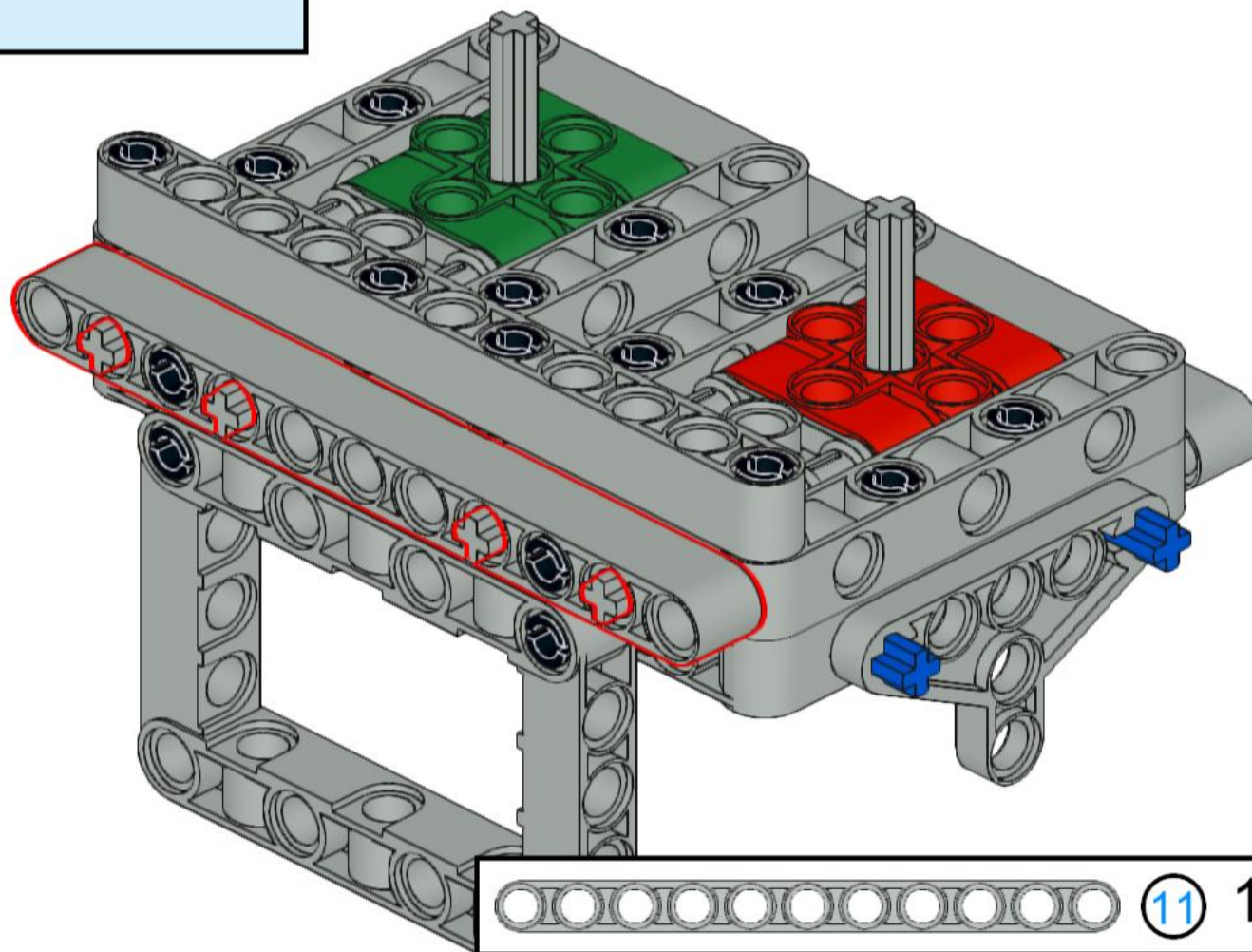
If you don't want this beam, then you should definitely use the beam in step 20.



20

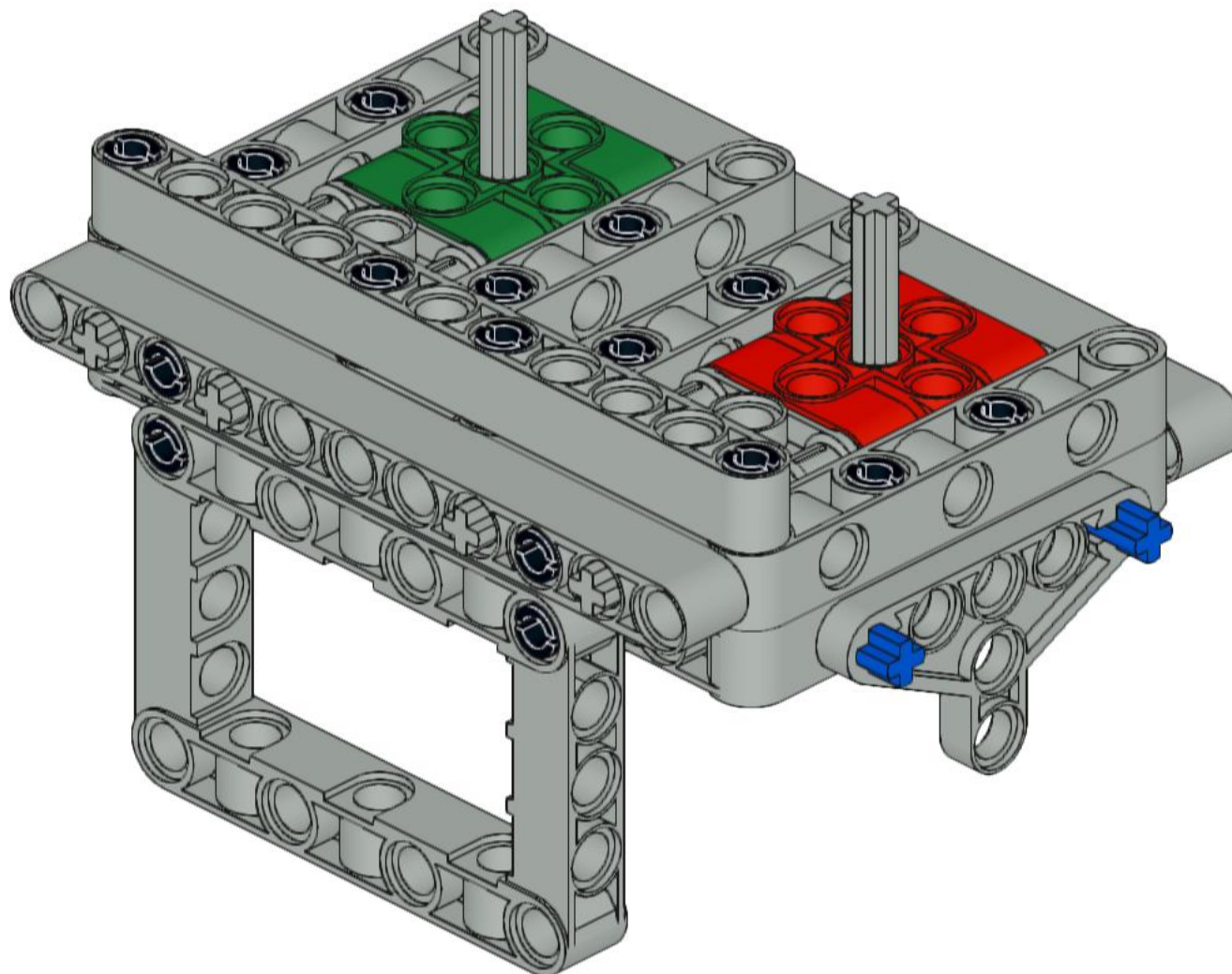


This step is also optional. It too probably makes your attachment stronger, but it also puts pin holes on the front of the robot and it covers up the exposed axles.



21

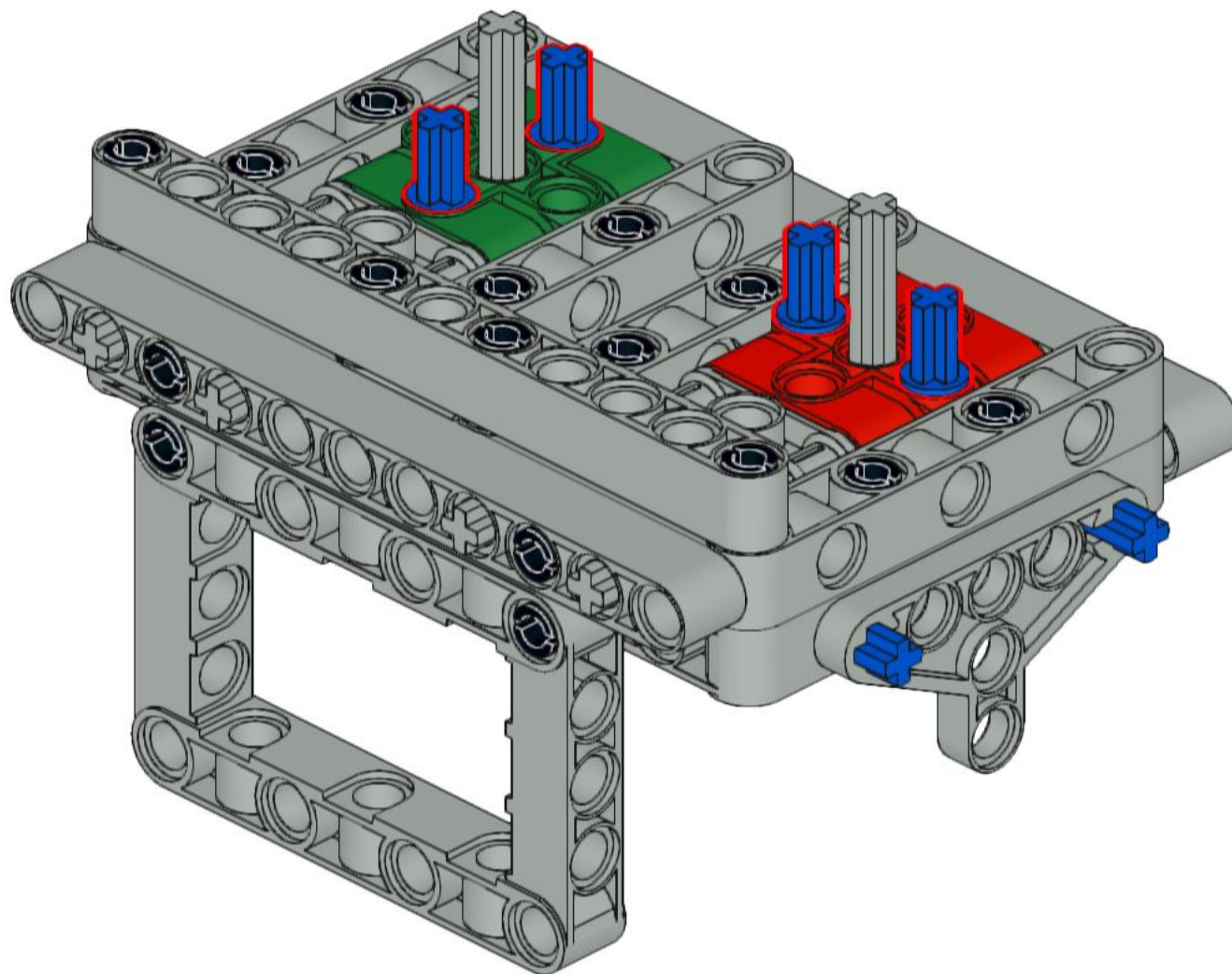
There you go. All done with the basic build plate. If you only need two axles pointing straight up, you are done (but you may want to adjust the axle length and add some bushings to keep the axles from falling out). But if you need an axle pointing out to either side, or out the front, then continue with the other steps, or check out some of the alternative build instructions in the help folder.



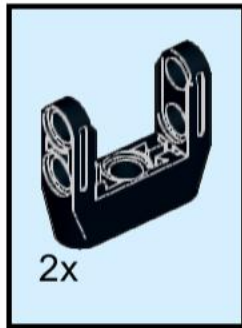
22



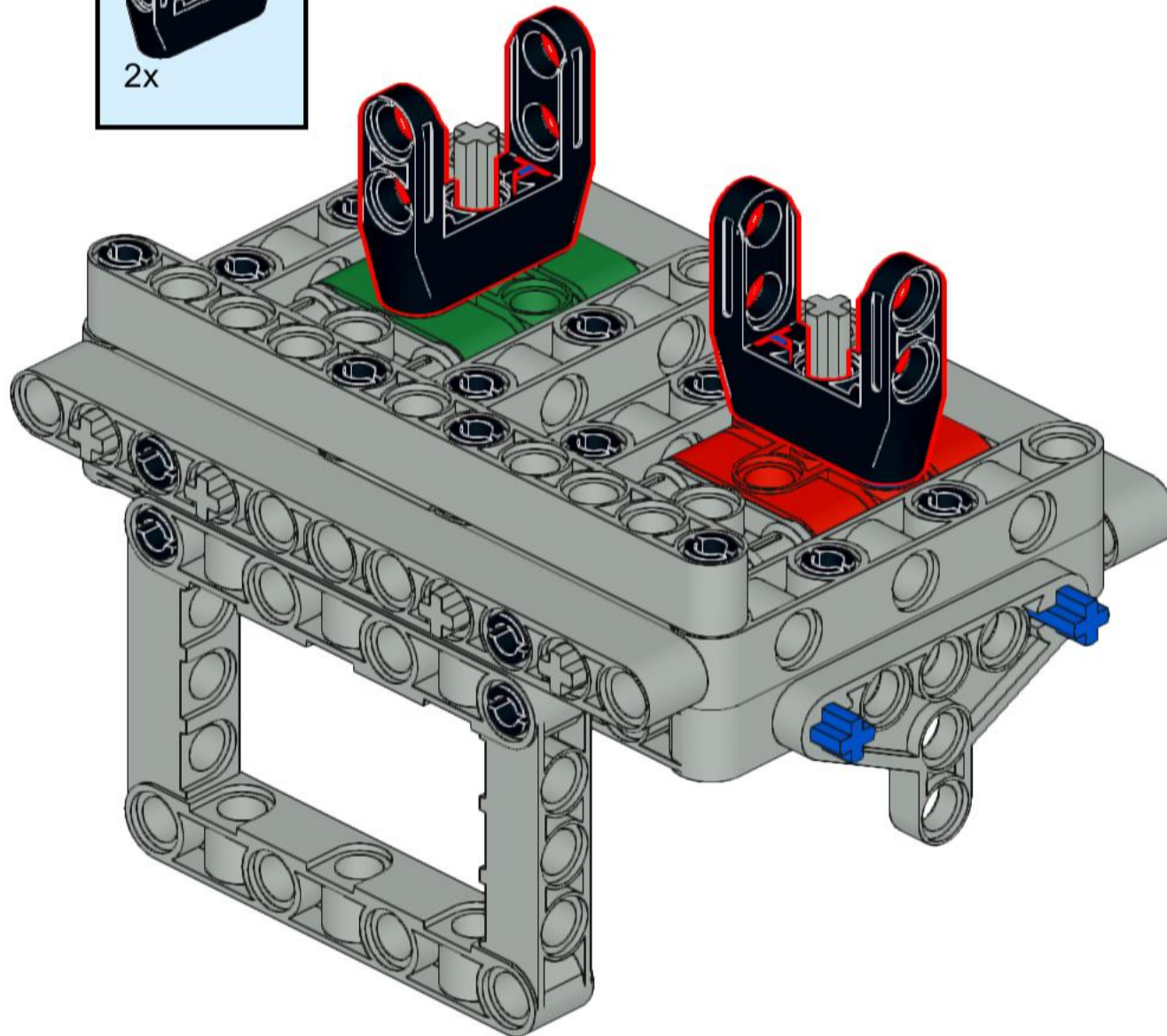
Orient these blue pegs however you need them on each side. Look ahead to the following steps and it will make sense.



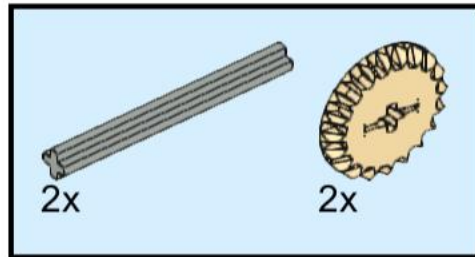
23



These are stored in bins #7 and #8.
Why do you suppose they are in two
different bins?

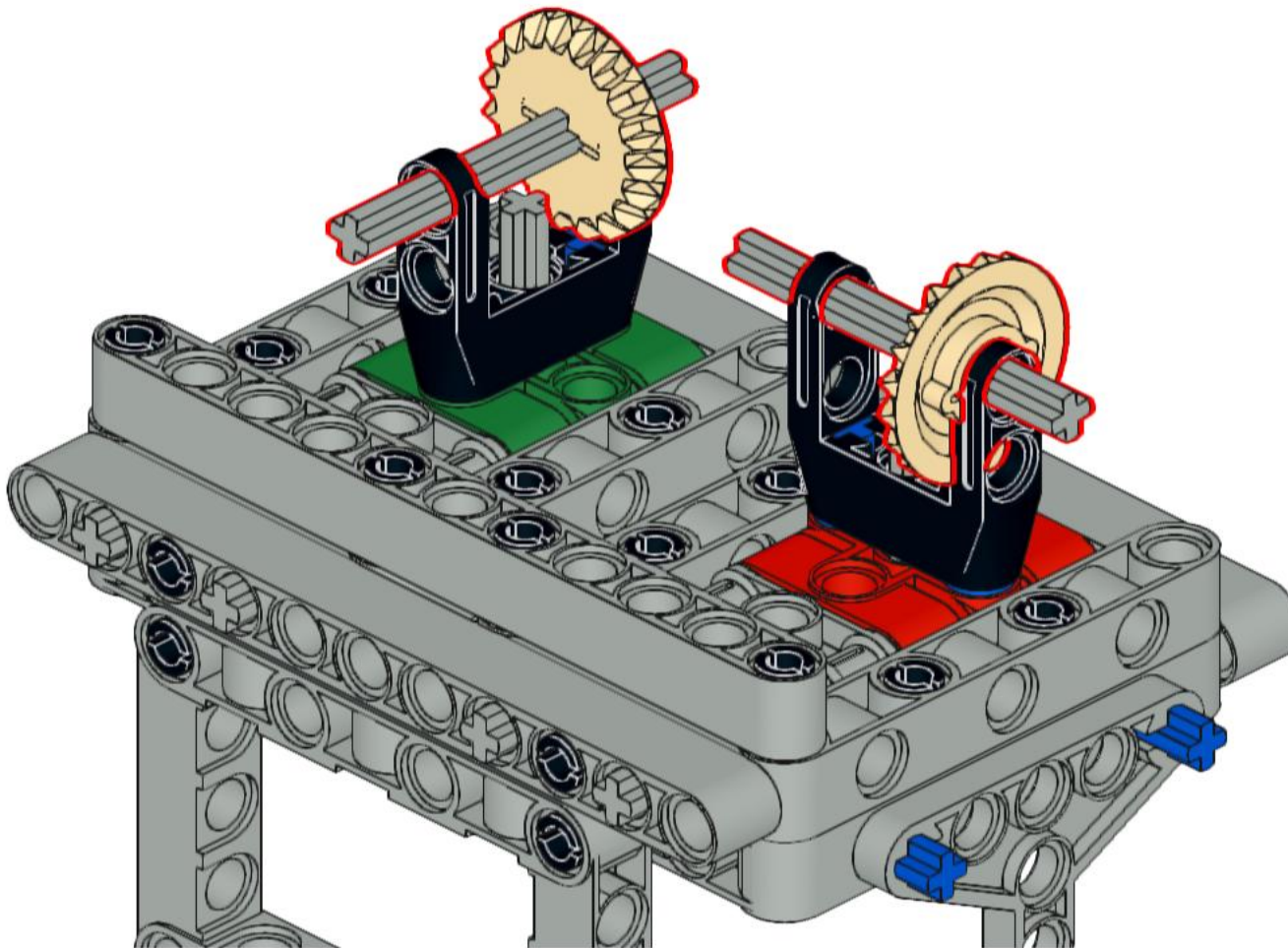


24



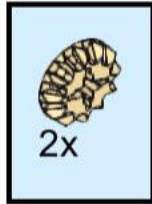
This gear is called a "bevel gear" which enables gears to mesh at right angles, which is exactly what we need here. This is a half bevel, where the gear on the bottom is a full bevel. We also have gears without any bevels.

Did you install these the way you wanted? You can always change it, but now would be a good time to fix it if you need to.

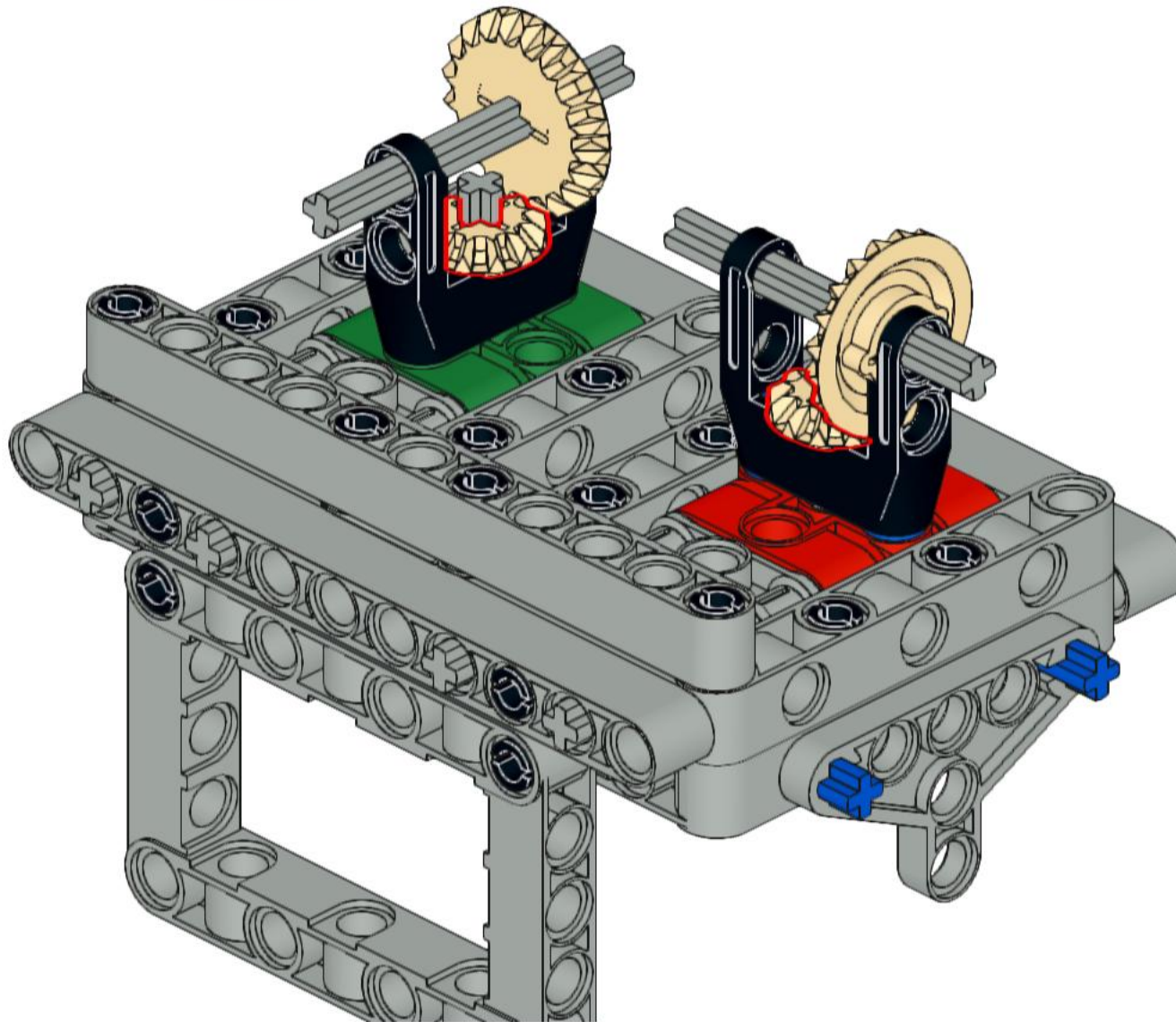


The axles here should be whatever length you need.

25

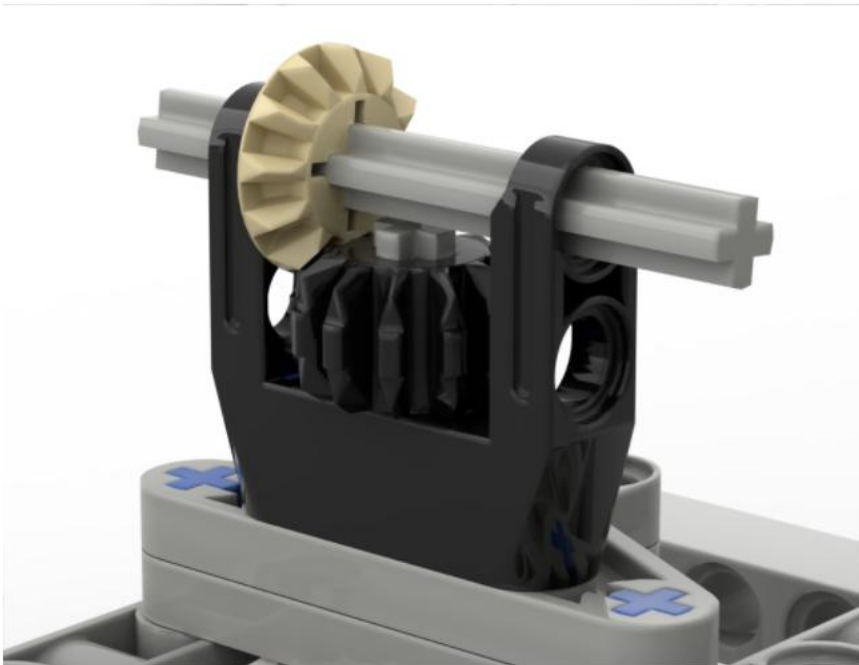


Gear ratios are important. Did you happen to notice that we have a small gear on the robot turning a larger gear on the attachment? Then here again, we have a small gear turning a larger gear. What does that mean for our attachment?



Do you want an attachment that moves faster? If so, you may need to look at your gear ratios. Here are a couple of ways to get a 1:1 (that is pronounced "one to one" gear ratios).

Why do these go faster? And are there any tradeoffs?



But wait! There's more!

There are other ways to make right angle gears that you might need to use. Some of these can be mounted directly to the base attachment, or maybe you can use them somewhere else on your attachment.

What do you think are some of the advantages and disadvantages of these different designs?

Each right angle gear has two axles. Which do you think is the input and which is the output?

