Tank Vehicle

Procedure:

Begin by gathering all the required parts listed in the materials section below. The notations next to some parts in the material list (ex. -9, -11, -15) are the stud lengths of that part. Then use the construction guidelines to build the vehicle. The guidelines are split into separate sections for each part of the vehicle and then they will be combined together in later stages of construction. The sections are listed below. Figure 1 shows the completed tread driven vehicle.

1. Frame Construction
2. Motor Assembly and Mounting
3. Computer Mounting

Figure 1: Completed Vehicle

Materials:

From the LEGO Mindstorms Education NXT Base and Supplemental Set:

Qty	Part Name	Part Image
4	3x3 Beam Bent with Pins	
2	Beam 1x11 Straight	 -11
1	Beam 1x13 Straight	 -13
2	Beam 1x15 Straight	 -15
2	Beam 1x7 Straight	 -7
2	Beam 1x9 Bent	
3	Beam 1x9 Straight	 -9
4	Beam 3x5 L Shape	
2	Gear 24-tooth	
2	Gear 8-tooth	

16	Long Pin with Friction	
2	NXT Cable 35cm	
1	NXT Computer	
2	NXT Motor	
10	Pin with Friction and Slots	
2	Size 4 Axle	 -4
4	Size 6 Axle	 -6
2	Tread	
4	Wheel 43.2 x 22 without Pinholes	
6	Yellow ½ Bushing	

Frame Construction

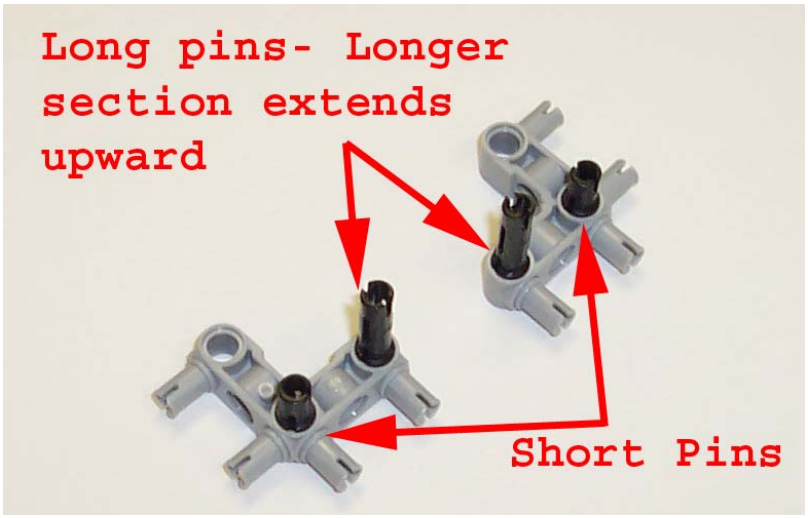
This section details how to construct the frame of the treaded vehicle. Some steps will require two of the same part to be made and will be noted accordingly.

Step 1:

Attach one pin and one long pin to each of the 3x3 bent beams with pins. Connect them to the 1x7 straight beam with one hole spacing between them.

Parts:

Qty	Part
2	
2	
2	
1	 -7

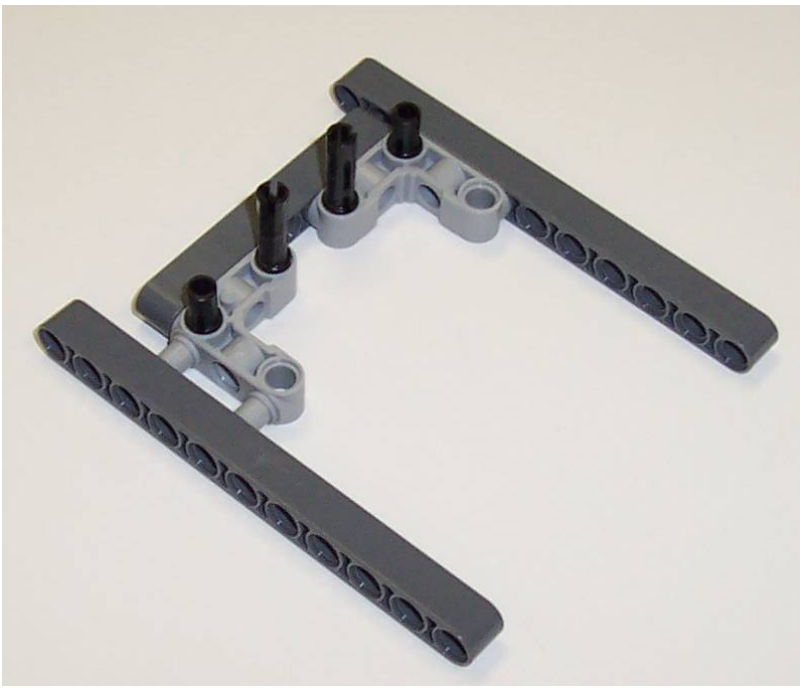


Step 2:

Connect a 1x11 straight beam to either side of the part from last step. Use the pins from the 3x3 bent beam. Leave two holes spacing on the side with the 1x7 beam and six holes on the other.

Parts:

Qty	Part
2	 -11

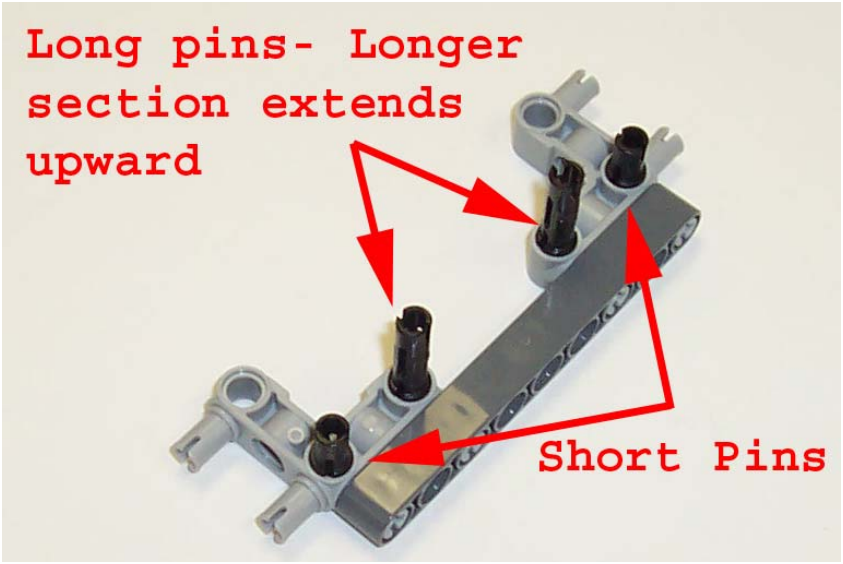


Step 3:

Create another pair of the 3x3 bent beams using one long pin and one regular pin on each one. Connect them to the ends of a 1x9 straight beam leaving three holes spacing in the middle.

Parts:

Qty	Part
1	 -9
2	
2	
2	

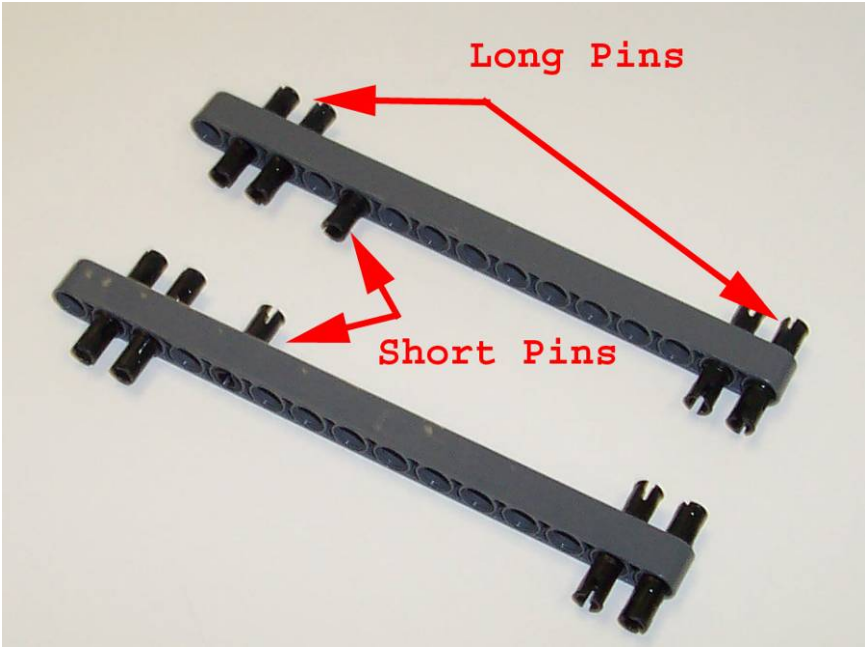


Step 4:

This step requires making two of the same part. Attach four long pins to each of the 1x15 beams. Two will be at one end and the other two on the opposite side one hole from the end. Insert a regular pin into each of the beams as shown. Both sides are identical, one is just flipped over.

Parts:

Qty	Part
2	 -15
2	
8	

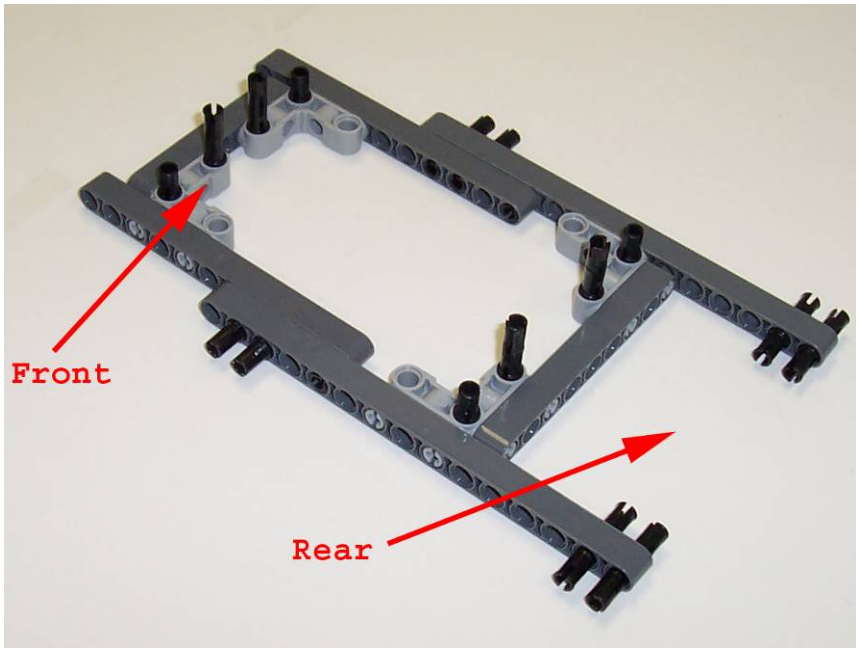


Note: Orientation of long pins shorter/longer sections does not matter in this step.

Step 5:

Attach the part created in step 2 to both of the 1x15 beams. The last hole on the 1x9 beams will connect to the regular pin on either side. Attach the part made in step 3 with one hole of spacing behind the end of the 1x9 beams.

No new parts are needed for this step.

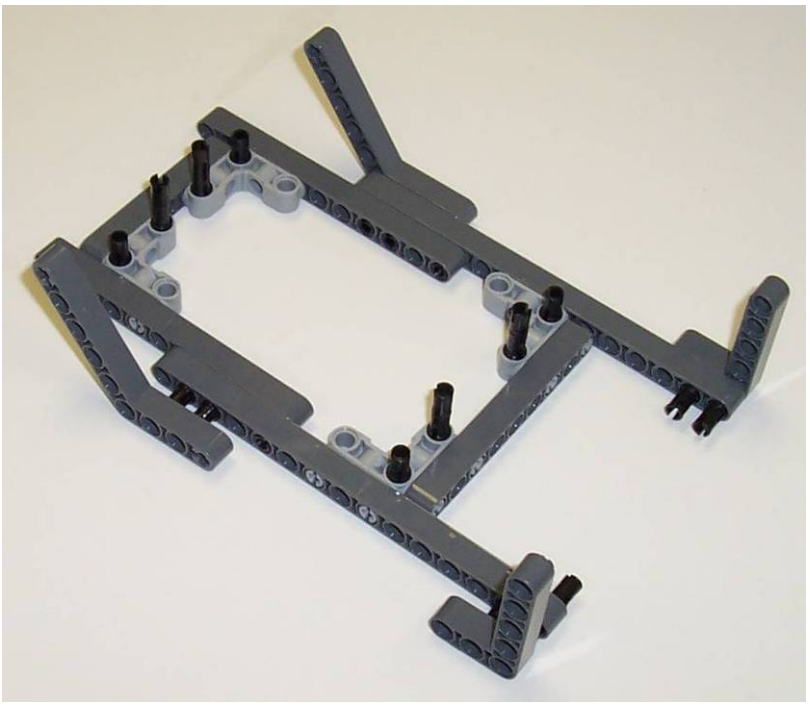


Step 6:

Using the outward facing pins on either side; connect a 3x5 L beam to each side in the rear and a 1x9 bent beam to the forward pins.

Parts:

Qty	Part
2	
2	

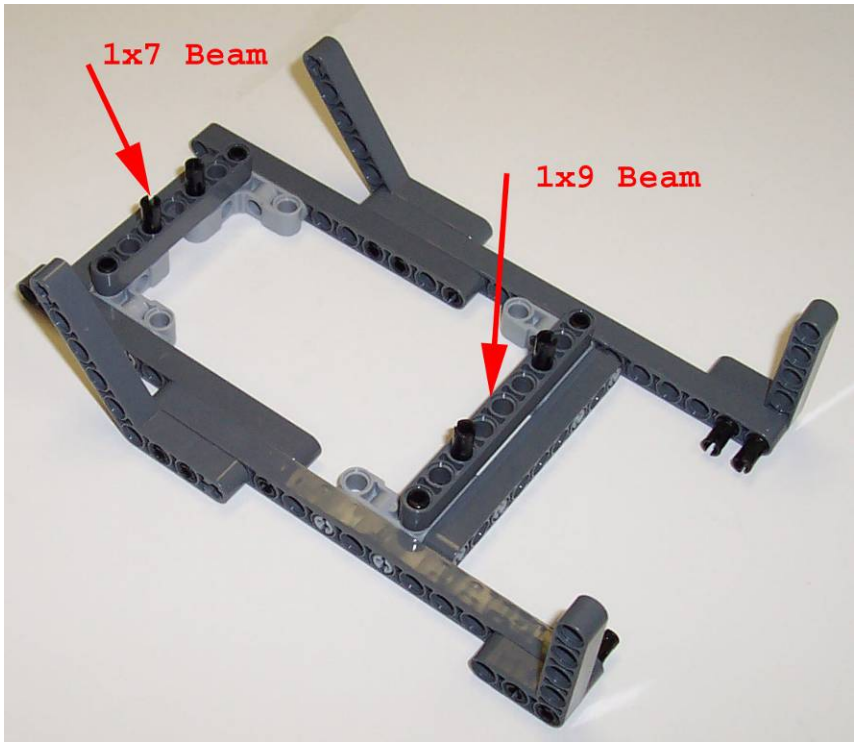


Step 7:

Attach the 1x7 beam across the span of the front four pins facing upward. Do the same for the rear four pins using the 1x9 beam. This completes the construction of the frame.

Parts:

Qty	Part
1	 -9
1	 -7



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Motor Assembly and Mounting

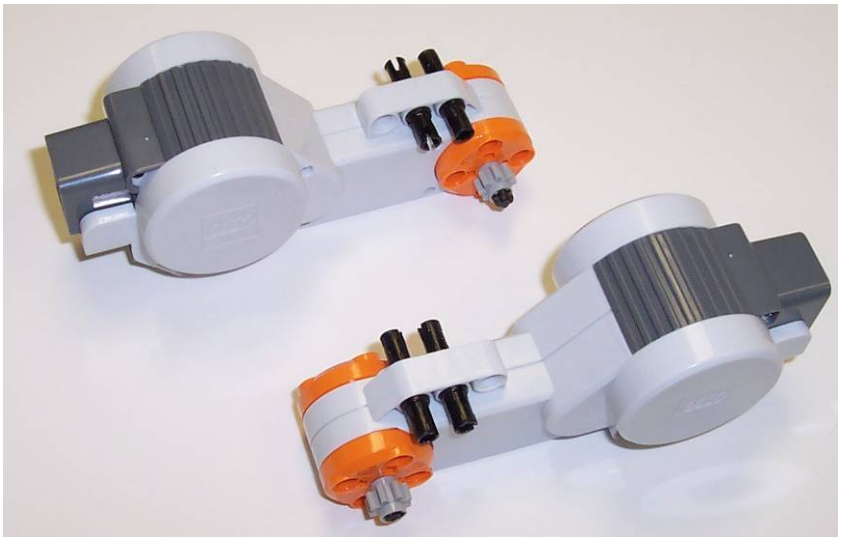
This section details how to assemble motor modules for the vehicle and attach them to the frame. The two motor modules will be mirror images of each other. The wheel and tread assembly will also be added in this section.

Step 1:

Insert two long pins into the upper two holes closest to the orange section of the motor. Attach one 8-tooth gear to each of the size 4 axles and insert one into each motor. As shown the gears will be on opposite sides for the two motors.

Parts:

Qty	Part
2	
2	 -4
4	
2	



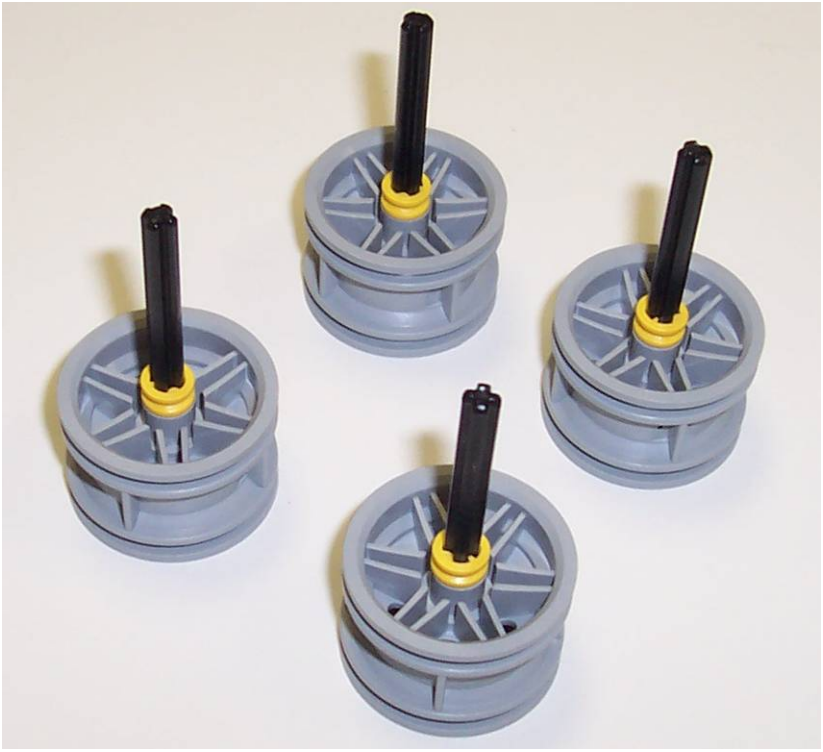
Note: Orientation of long pins shorter/longer sections does not matter in this step.

Step 2:

Assemble the four wheels by inserting a size 6 axle and a yellow ½ bushing on to each one.

Parts:

Qty	Part
4	
4	 -6
4	

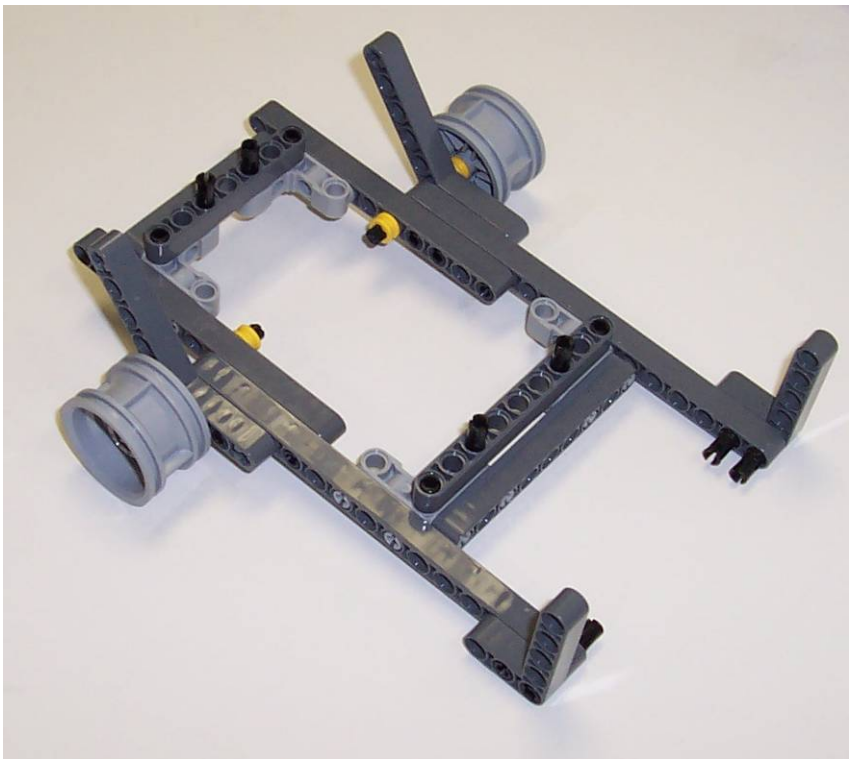


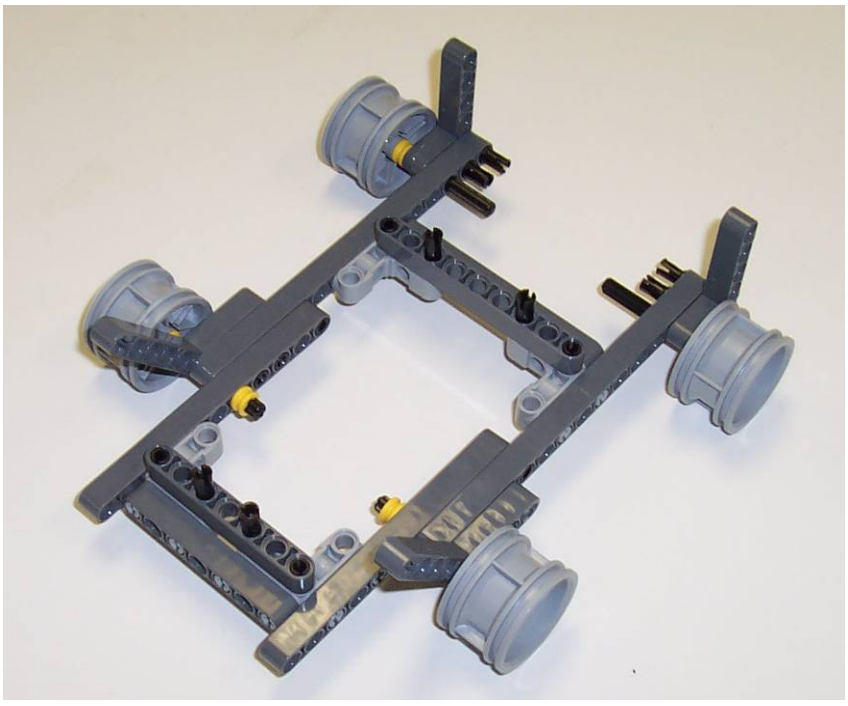
Step 3:

Insert the front two wheels through the holes at the corner of the bent 1x9 beam and secure them in place with a yellow ½ bushing. Insert the rear two wheels through the front-most hole of the 3x5 L beams in the rear. They will be secured into place in the next step.

Parts:

Qty	Part
2	





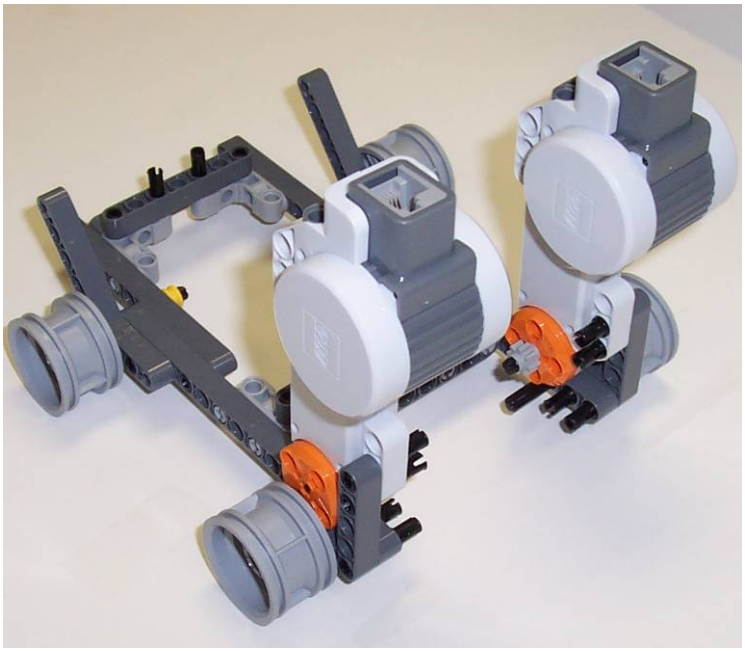
Step 4:

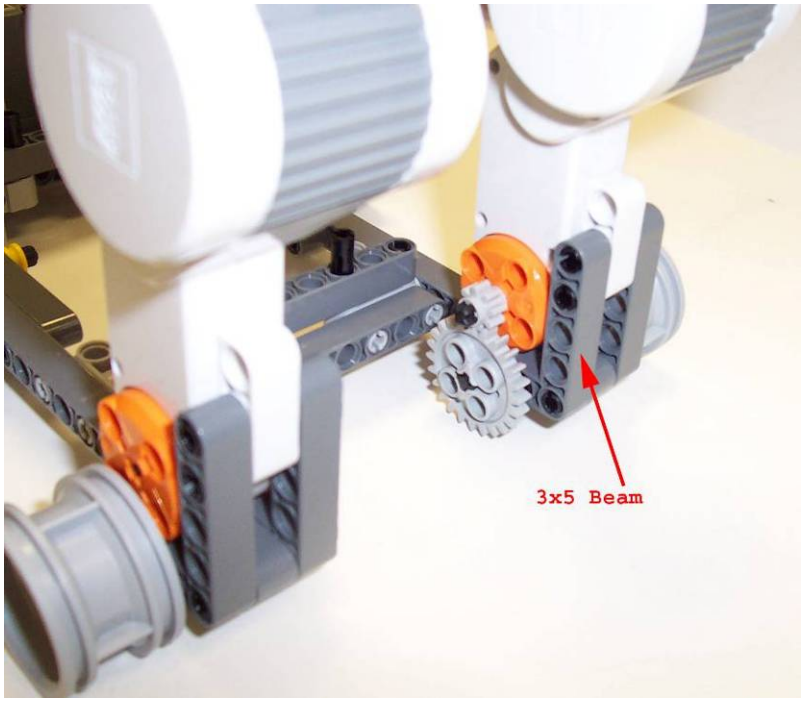
Mount the two motors assembled in step 1. These are placed upright and are attached to the 3x5 L beam using the 2 long pins already on the top of the motor. The side of the motor with the gear should be facing inward.

Attach a 3x5 L beam to each motor on the inside. The bottom connects to two pins and goes over the wheel axle. The top connects to the two pins on the motor. Insert a 24-tooth gear on to each axle to secure the wheel in place. The 24 and 8 tooth gears should mesh together.

Parts:

Qty	Part
2	
2	



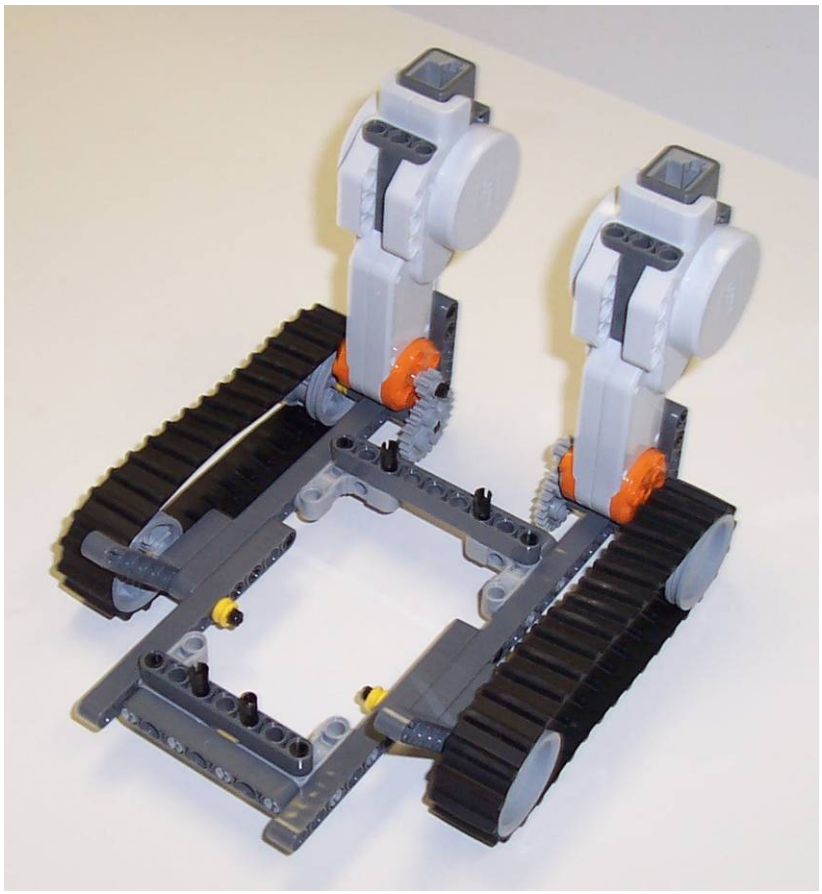


Step 5:

Now that all four wheels are secured in place, the treads should be attached to both sets of wheels.

Parts:

Qty	Part
1	

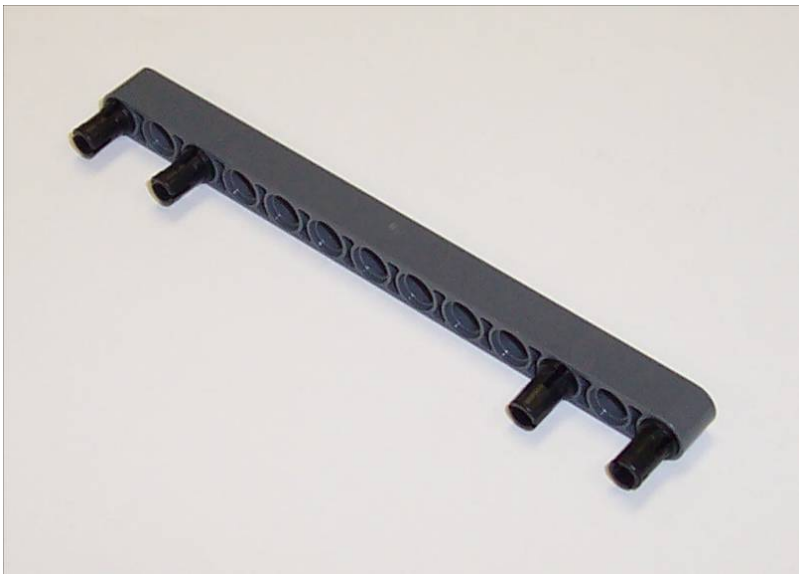


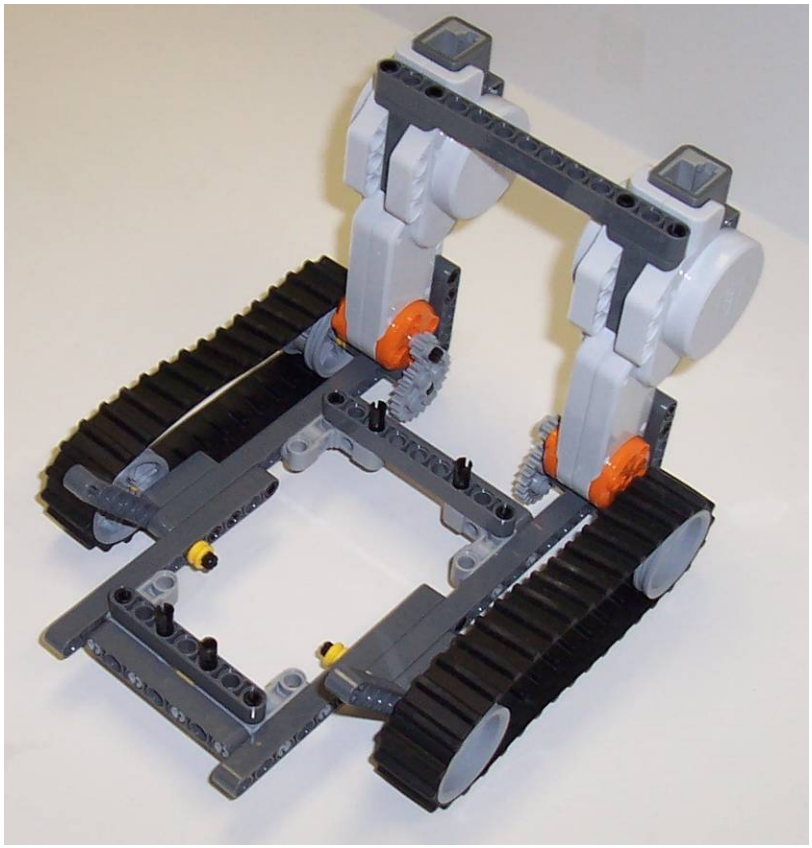
Step 6:

Connect four short pins to the 1x13 beam as shown. Connect each side to one of the motors using two pins each. This completes mounting the motors to the frame.

Parts:

Qty	Part
4	
1	 -13





Mounting the Computer

This section details how to finalize construction and connect the computer to the frame and motors and completes the construction of the base treaded vehicle.

Step 1:

Insert the battery into the NXT brick.

Place the brick onto the remaining four upward facing pins on the frame. The front side will connect to the inner two holes, and the rear to the center holes on each side. Connect the left motor to port C on the computer and the right motor to port B using the data cables. This completes the construction of the treaded vehicle

Parts:

Qty	Part
2	
1