

## Three-Wheel Vehicle

### Procedure:


























First gather all 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 three-wheeler.

1. Rear Caster Wheel
2. Frame Assembly
3. Motor Assembly
4. Mounting the Computer and Motors



Figure 1: Completed picture of the three wheeler

Materials: From the LEGO Mindstorms Education NXT Base Set

Qty	Part Name	Part Image
2	Angle Connector #2	
2	Axle Joiner Perpendicular	
4	Axle Joiner Perpendicular w/ 2 Holes	
2	Beam 1x15 Straight	 -15
6	Beam 1x3 Straight	 -3
4	Beam 2x4 L Shape	
4	Beam 3x5 L Shape	
4	Blue Axle Pin with Friction	
12	Long Pin with Friction	
4	Long Pin with Stop Bushing	
2	NXT Cable 20cm	
1	NXT Computer	
2	Pin 3L Double	
14	Pin with Friction and Slots	
4	Size 2 Axle Notched Red	
3	Size 4 Axle	 -4
2	Size 5 Axle	 -5
1	Size 6 Axle	 -6
1	Stop Bushing	
1	Tire 24x14	
2	Tire 56x26 Balloon	
1	Wheel 30.4x14	
2	Wheel 43.2x22 without Pinholes	
8	Yellow 1/2 Bushing	
2	NXT Motor	






## Rear Caster Wheel

This section describes how assemble the rear caster wheel. The caster allows the vehicle to pivot so that only three wheels are needed.

### Step 1:

Slide the axle jointers on to the end of the size 6 axle. Next slide on a stop bushing and then a ½ yellow bushing. Place the two angle connectors on to the axle next and secure them in place with a yellow ½ bushing.

### Parts:

	Part
2	
2	
2	
1	 -6
1	

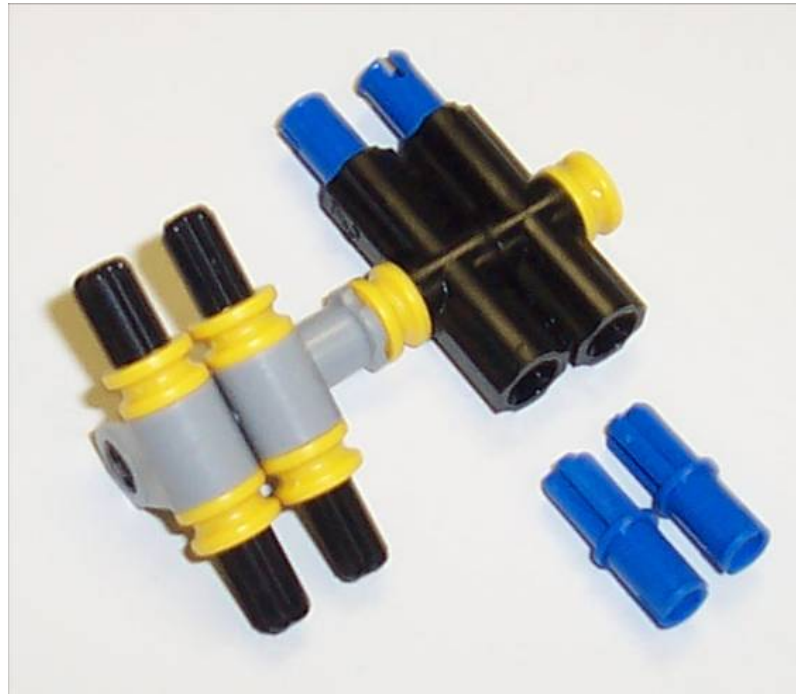


**Step 2:**

Insert the two size 4 axles centered through the holes of the axle joiners and secure them in place with two yellow 1/2 bushings. Insert a blue axle pin into each of the four ends of the angle connectors.

**Parts:**





Qty	Part
2	
4	
2	



**Step 3:**

Insert the size 4 axle into one end of a 2x4 L beam. Place the L beam over two of the axles from last step. Slide the wheel on to the axle and place the second L beam on the other end to secure it in place. This completes construction of the rear caster wheel.

**Parts:**

Qty	Part
1	 -4
1	
1	
2	







## Frame Assembly

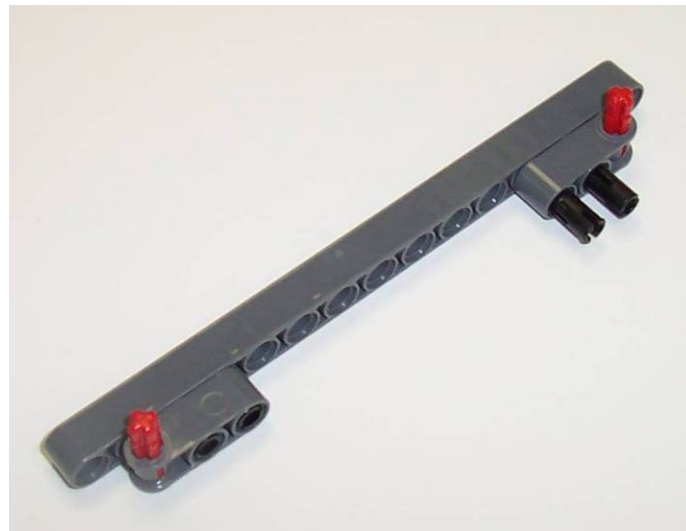
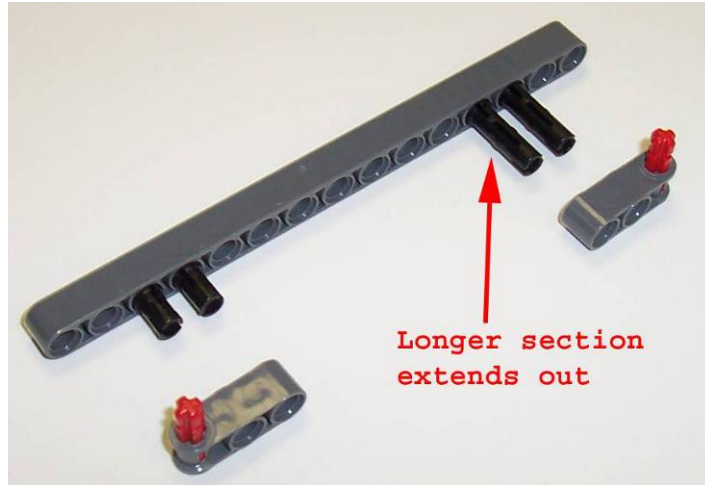
This section describes how to build the frame of the vehicle. The frame supports the motors and computer. Two sides of the frame will be made; the second is just a mirror image of the first. The part lists include everything needed for both sides.

### Step 1:

Begin by placing two pins with friction and two long pins with friction on to the 1x15 beam as shown. There should be two holes spacing on both ends and seven holes in the middle. Place a red size 2 axle into each of the axle joiners and connect them to the pins on the 1x15 beam.

### Parts:

Qty	Part
2	 -15
4	
4	
4	
4	





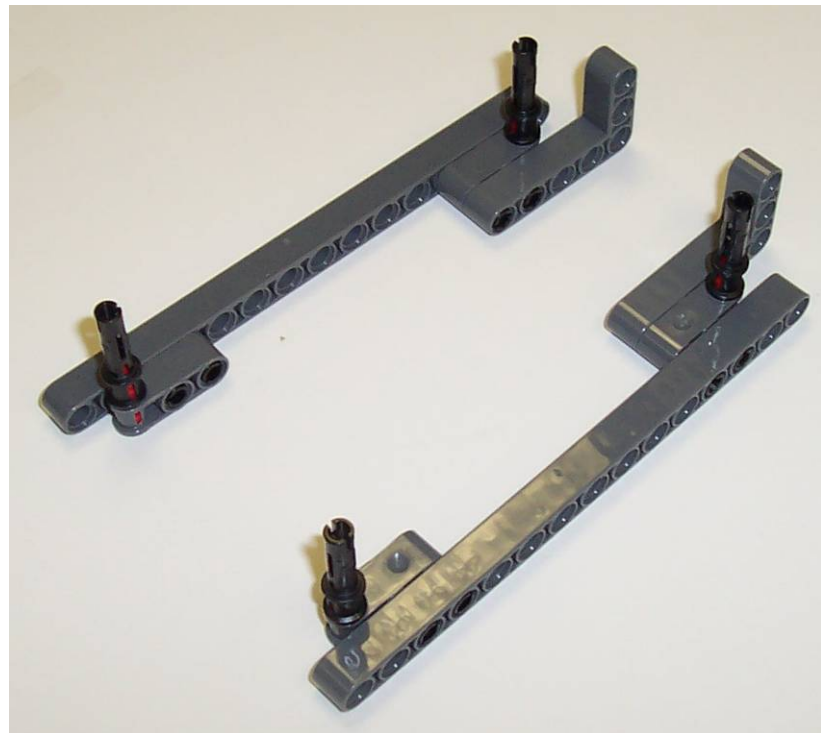
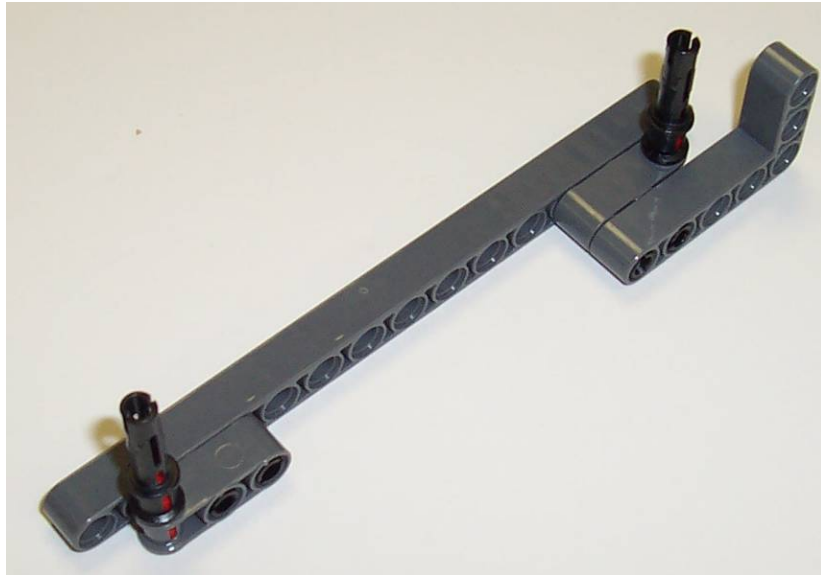
**Step 2:**

Place the 3x5 L beam onto the long pins still extending out. Attach a long pin with stop bushing to each of the 4 red axles pointing upward.

Repeat steps 1 and 2 for the second side. It will be a mirror image of the first.

**Parts:**

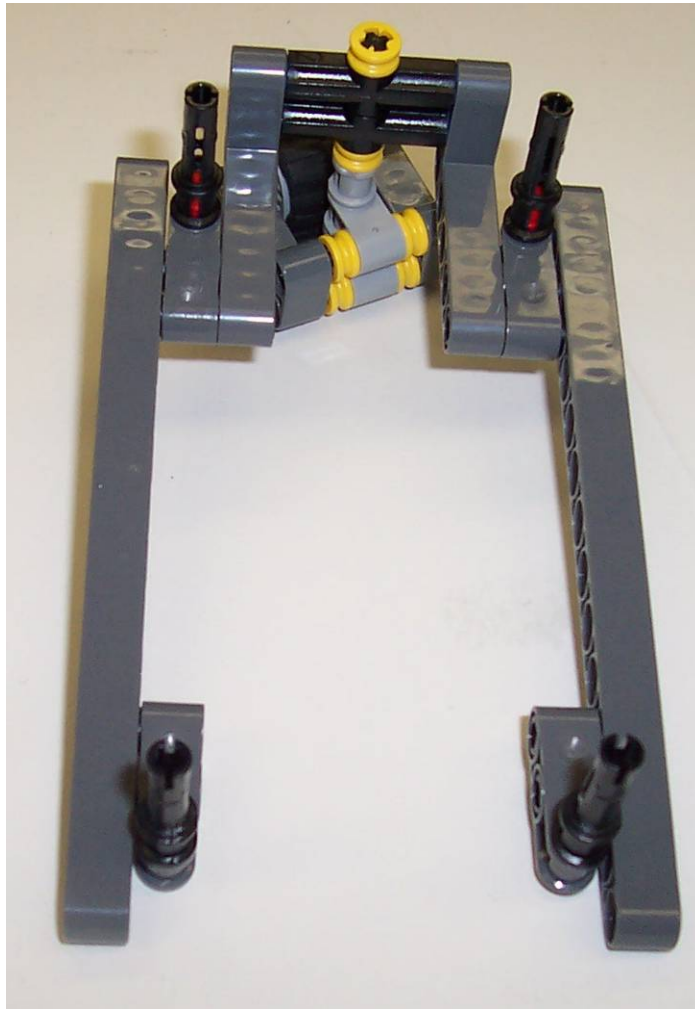
Qty	Part
2	
4	



**Step 3:**

Connect both halves of the frame together using the caster wheel from section one. Attach it to each side at the top two holes of the 3x5 L beam using the blue pins on the caster wheel. This completes the assembly of the frame.

No new parts are needed for this step.



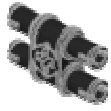


## Motor Assembly

This section illustrates how to build the two motor modules to power this vehicle, as well as the necessary mounts to connect the modules to the computer brick and the frame. The two motor modules will be mirror images of each other. The part lists contain everything needed for both motors.

### **Step 1:**

Connect the double 3L pin to the lower two holes at the rear-side of the motor. Attach three pins to the top three holes on the same side of the motor.

### **Parts:**



Qty	Part
2	
6	
2	



**Step 2:**

Attach two pins to opposite ends of the 1x3 straight beam. Connect this to the orange rotating part of the motor. This acts as a wheel spacer to prevent tire rubbing.

Parts:



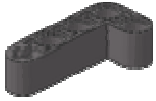

Qty	Part
2	 -3
4	

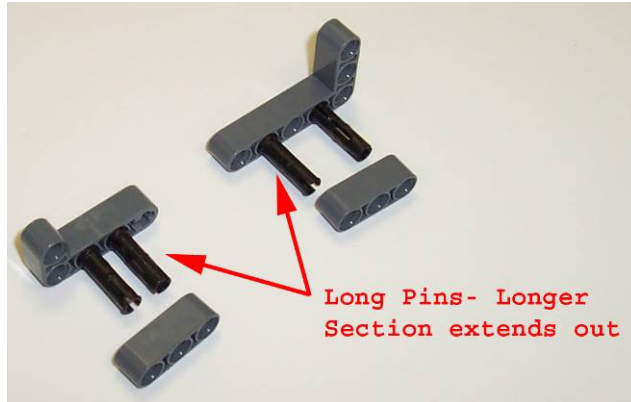


**Step 3:**

Attach two long pins to each the 3x5 and the 2x4 L beams. Slide a 1x3 straight beam on to the pins next. These will be used to mount the motor to the computer brick later.

**Parts:**

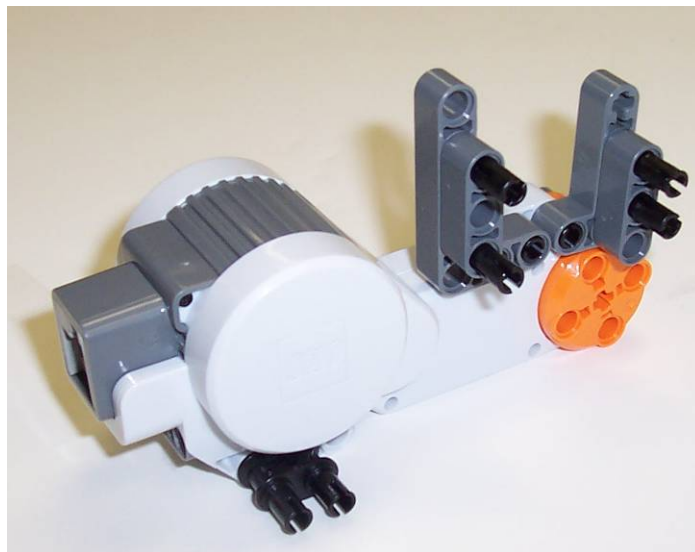
Qty	Part
4	
8	
2	
2	



**Step 4:**

Connect the beams you constructed in last step to the three upper pins on the motor. The 3x5 L beam connects to the rear two pins and the 2x4 L beam to the remaining front pin.

No new parts are needed for this step.

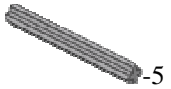





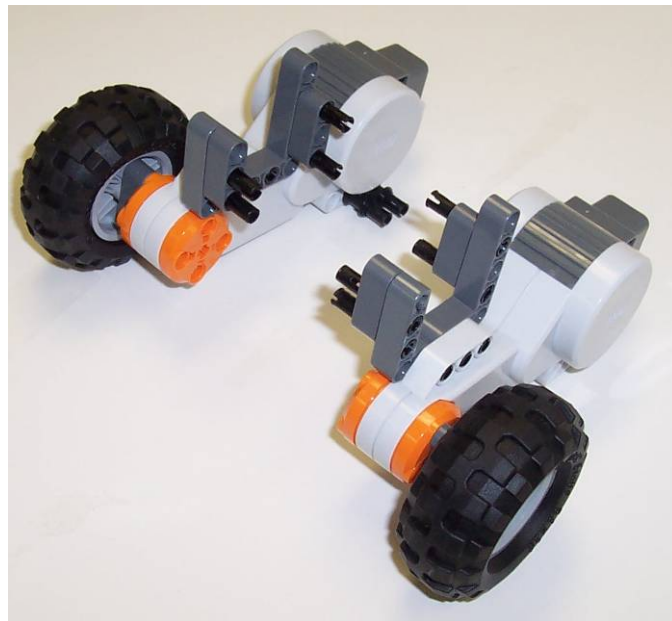
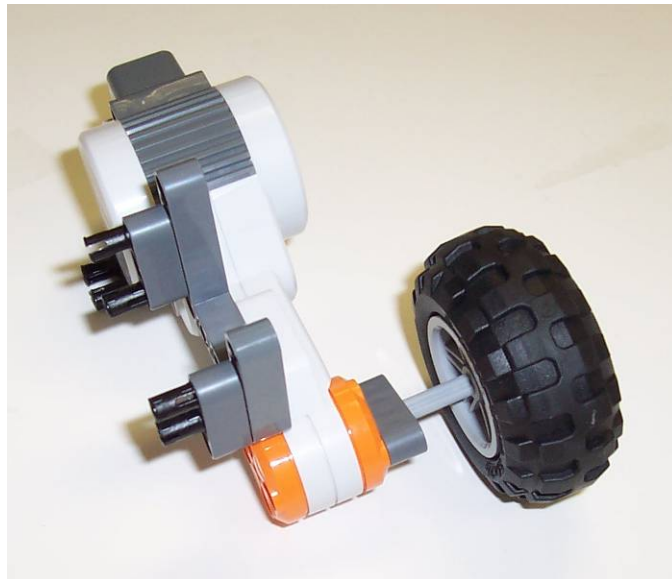
**Step 5:**

Put the yellow bushing on the end of the size 5 axle and slide it completely through the wheel up to the stop. Then connect the wheel to the motor on the same side as the 1x3 beam spacer. The axle will go through the center hole.

Repeat steps 1 through 5 for the second motor. Remember to mirror everything for the second side.

Parts:

Qty	Part
2	 -5
2	
2	
2	



## Mounting the Computer and Motors


This section describes how to mount the computer and two motors to finalize the construction of the three wheel bot.

### **Step 1:**

Insert the battery into the NXT brick.

Place the computer onto the frame by placing each of the upright long pins of the frame to the outermost four holes on the bottom of the computer.

### **Parts:**

Qty	Part
1	



**Step 2:**

Connect each side of the motor using the six pins that extend outward. The double pin connects to the rearmost two holes on the 1x15 beam. The other four on each side connect to the side of the computer brick. Do this for both sides.

No new parts are needed for this step.



**Step 3:**

Connect the motors to the B and C ports on the computer using the data cables. This completes the construction of the three wheeler.

**Parts:**

Qty	Part
2	