# avishkaar

# ROBOTICS
## —INTRO—

**Robots: Easy to Build,
Fun to Control!**
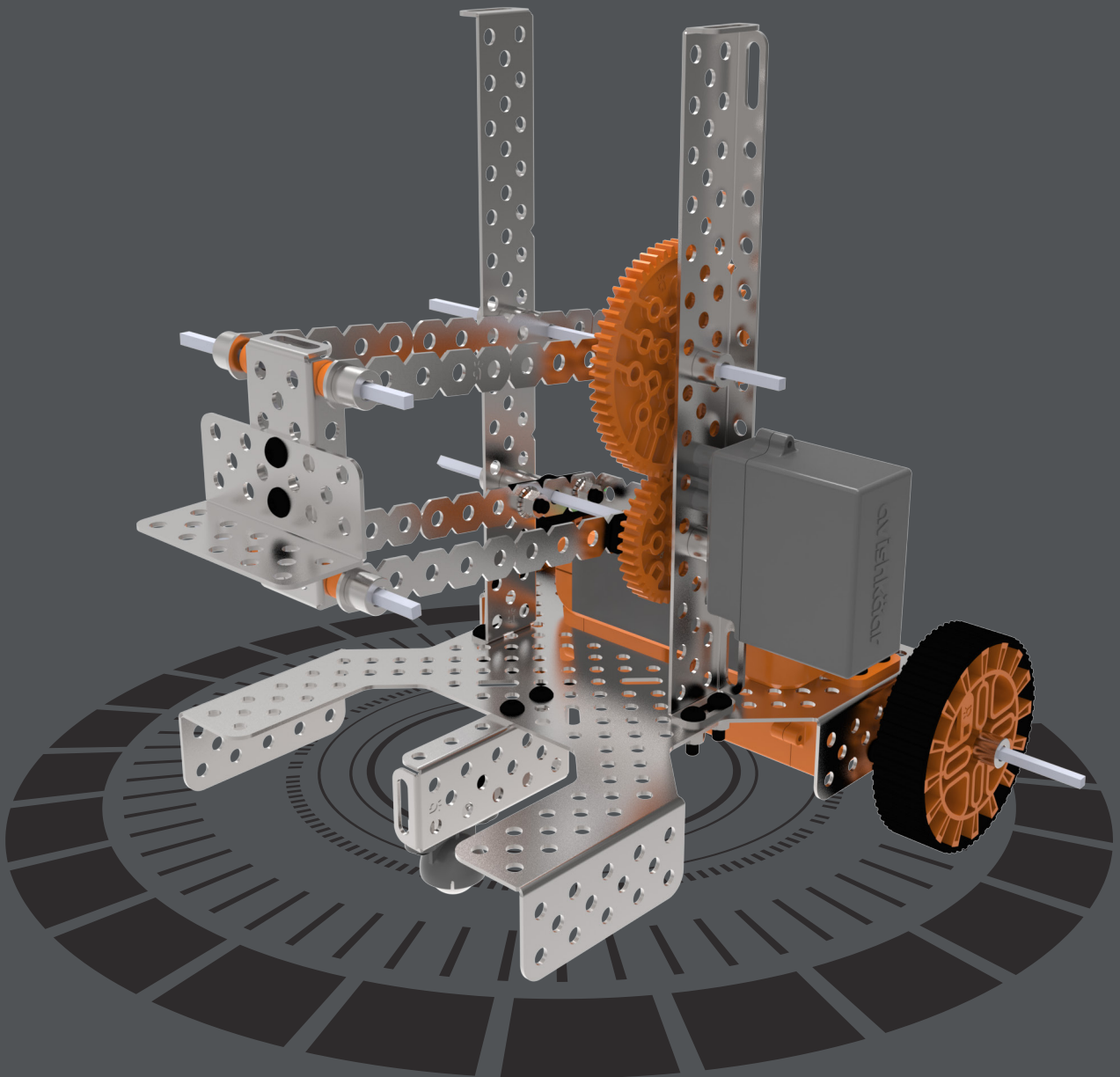
# Sneak Peak
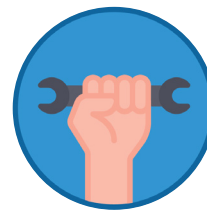
# Make the Most Out of Your Kit

## Innovate

### Take the Innovator's Oath

Take the innovator's oath mentioned on page 5 and understand what it means to be an innovator.

### Learn using Manual/Videos

Follow detailed instructions in the manual and learn how to build exciting robots with your kit.

### Build, Code & Control

Build innovative projects using your kit, and control the Robots using Avishkaar Remote and Code using Avishkaar Maker Studio.

## Share

## Win

### Join Let's Avishkaar

Join our whatsapp community - connect with innovators and get latest updates on webinars.

### Upload Projects

Upload projects on www. avishkaar.cc and share them with innovators globally.

### International Competitions

Participate in weekly, monthly and annual competitions and win glory globally.

# Innovator's Oath

Take the Innovator's Oath below to pledge yourself to lifelong commitment towards Innovation and Problem Solving. Share a photo on the Let's Avishkaar FB Community.

*I* *(write your name)* _____

*solemnly swear that, since I am now on the path of innovation, I will not give up until my innovation, my project is ready. I will hone my skills and tools and use them well. Innovation and I will be inseparable. I will always share my innovations with other innovators and learn with them.*

*Your Signature*

# Armour Check

All super heros need their super weapons, let us familiarize with yours.
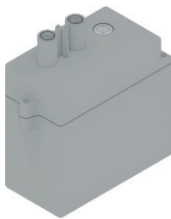
## Electronics

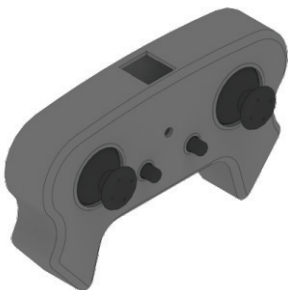The INTRO 2.0 brain helps us control 3 motors and connect a remote controller to it.
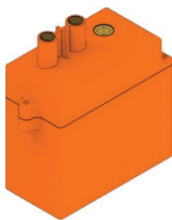
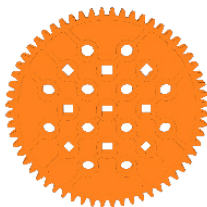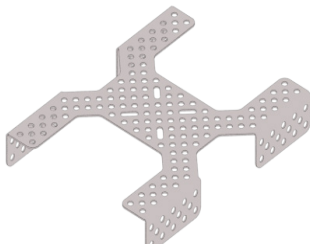| | | | | |
|---|---|---|---|---|
| Intro Brain x1 | High speed motor x2 | High torque motor x1 | Battery x1 | Manual Remote x1 |

## Plastic & Metal parts
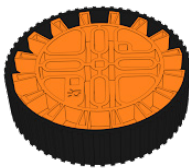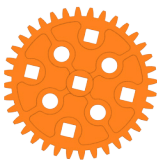
| | | | | |
|---|---|---|---|---|
| Small Wheels x 2 | Medium Gear x 2 | Big Gear x 2 | Chasis x 1 | L-beam x 2 |

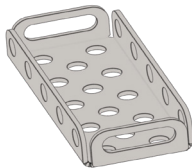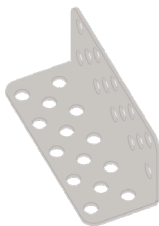| | | | | |
|---|---|---|---|---|
| Square Plate x 2 | 2.5" U-Beam x 2 | 2.5" L-Channel x 2 | 5.5" Axle x 2 | 3.5" Axle x 4 |
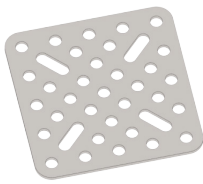
12.5" Flexible strip x 2

# Tools

Robotics series bolts and K-nuts made with strong metal and easy to use design for your grand robots
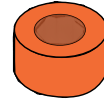
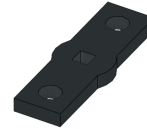Caster Wheel x1    Allen Key x1    Hook x1    Spanner x1    Fillers x15

k-Nuts x 28    12mm Bolts x 28    Axle locks x15    Three hole connectors x2

# Cables and charger

Here we have the remote cable to connect the remote to brain, connecting cables for connecting motor to brain, battery wire to connect the battery to the brain and the charger to charge the battery.

Remote Cable x1

Connecting Cable x 3

DC Battery Connecting Cable x 1

Charger x1

# Welcome to Avishkaar

## Download the Avishkaar App

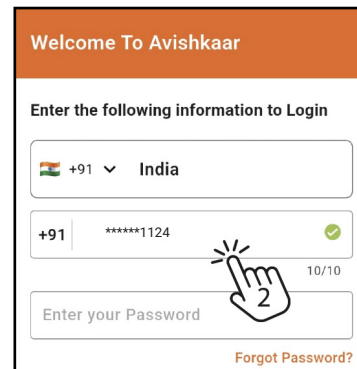Download the Avishkaar App by scanning the QR codes below:
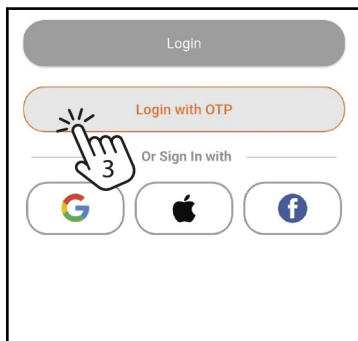


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## Create an Account and register the kit

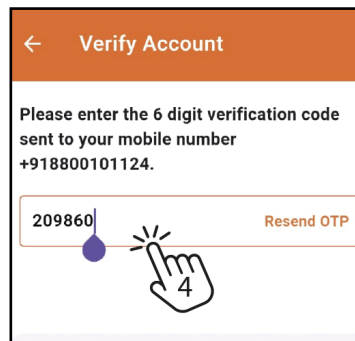1. Open the avishkaar app on your mobile phone.
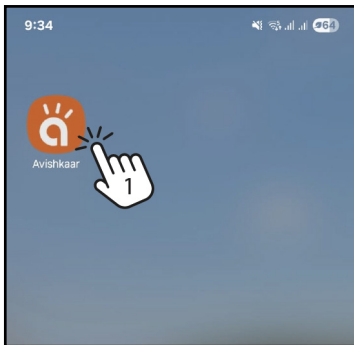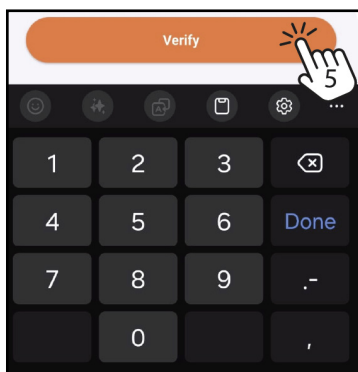


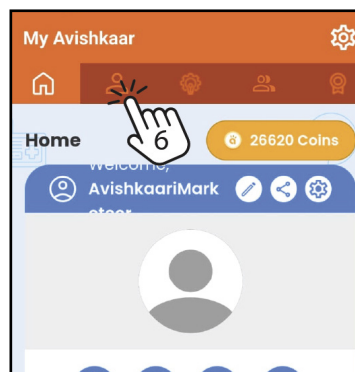2. Type your phone number in the section provided.

3 | Click on login with OTP.

Login

Login with OTP

Or Sign In with

G  (apple)  f

4 | You will be directed to verify OTP page, enter the OTP received.

← **Verify Account**

Please enter the 6 digit verification code sent to your mobile number +918800101124.

209860                    Resend OTP

5 | Click verify option and your account will be verified.

Verify

1  2  3  ⊗
4  5  6  Done
7  8  9  .-
   0      ,

6 | Click on the profile tab.

My Avishkaar ⚙

🏠

Home          🅑 26620 Coins

Welcome,
(Q) AvishkaariMark  ✏ ⟨ ⚙

7 | Press the add button and the kit registration menu will pop up.

My Avishkaar ⚙

🏠 👤

Bio          🅑 26620 Coins

📦 My Kits          + Add

MEX 3-in-1 Animals    MI
K_ME3_1679052407630   K_MTU_17
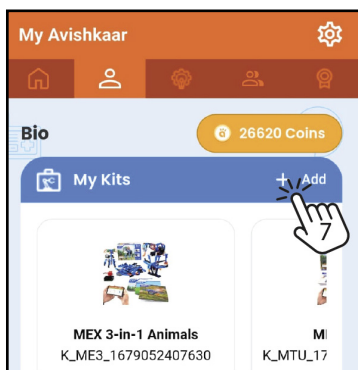
8 | Click on the scan QR option present, it will open up the screen to scan the QR code.

My Avishkaar ⚙

**Kit Registration**          ✕

Enter your kit code or scan the QR code from your manual

Kit code                    ▨

Don't have a code  **Fetch Code**
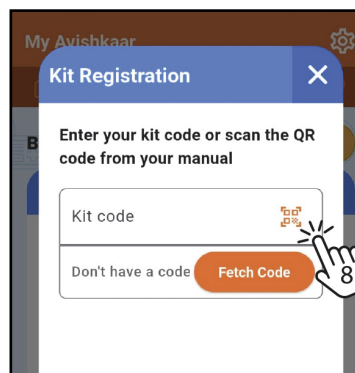
**9**    Scan the QR code present on your manual.
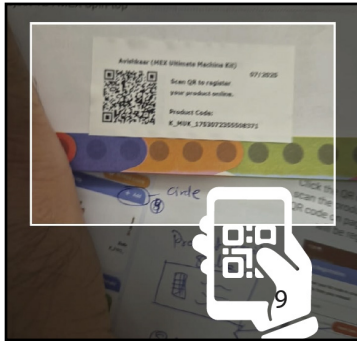


Product Registraion Sticker

**10**    A kit code will be displayed on your screen, showing your kit has been added.
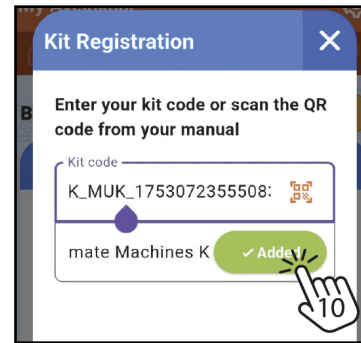


**11**    Press the save button to register your kit.
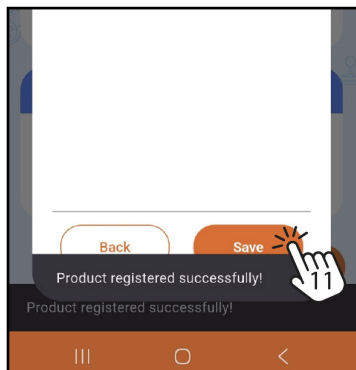


**12**    Your kit has successfully been registered.

# Robotics INTRO 2.0

**Remote**

This port allows you to connect the manual remote to the brain for manual remote control.

**Motor Port**

These ports allow you to connect the motors which can be controlled using the remote.

**Power Button**

These button allows you to turn the brain ON and OFF.

**Battery**

This Port allows you to connect an external battery to the brain using the given cable.

INTRO 2.0

Remote Port

R

Motor Ports

M1

M2

M3

Battery Level

High

Med

Low

Brain Status

Power Off

Power On

Remote Mode On

# Basics of Building

Let's understand some basics of building

## Tightening Screws

Tighten
(Rotate Clockwise)

Loosen
(Rotate Anti-clockwise)

## Tightening Axle Lock
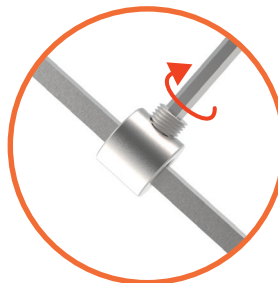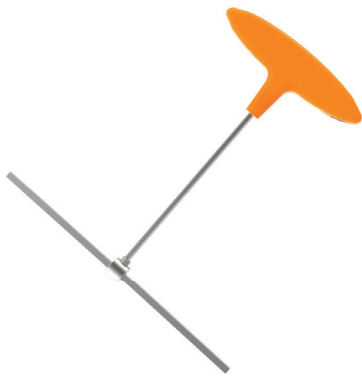
Tighten
(Rotate Clockwise)
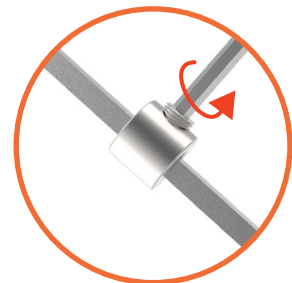
Loosen
(Rotate Anti-clockwise)

## Tightening a Motor to a Plate

### 01
Insert Axle
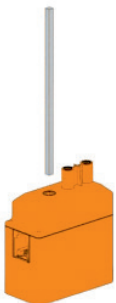
### 02
Lock Axle Lock
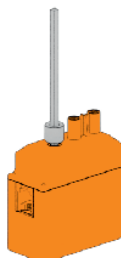
### 03
Insert Plate
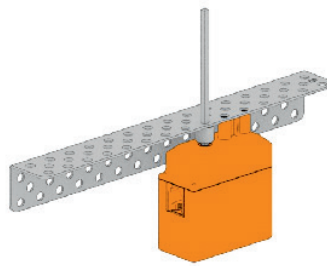
### 04
Insert Bolts
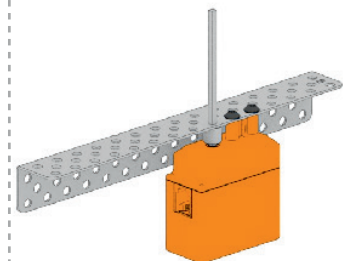
*Actual metal plate may vary from the image shown but principally will function the same way.*

# Control Method : **Manual Remote**

Right Joystick

Brain Connection Port

Left Joystick
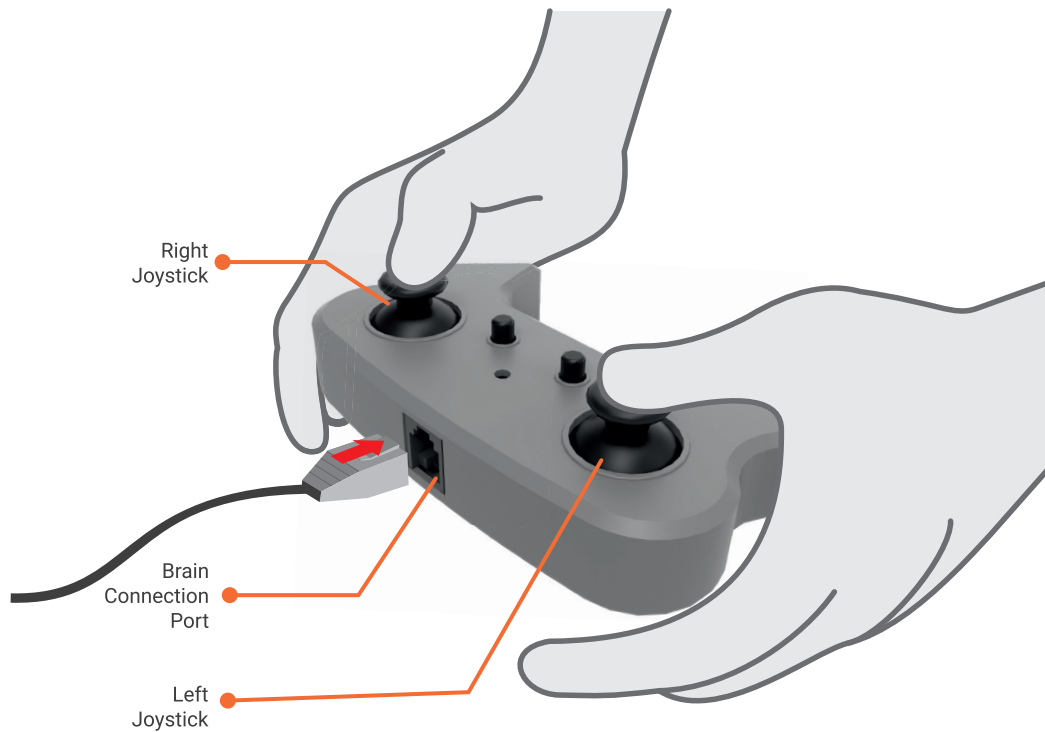
Here is a detailed mapping of the joysticks in the remote controller to the ports of the Intro Brain.

M3 Clockwise

M1Clockwise
M2 Clockwise

M1Clockwise
M2 Anticlockwise

M1 Anticlockwise
M2 Anticlockwise

M3 Anti-Clockwise

M1Anti-clockwise
M2 Clockwise
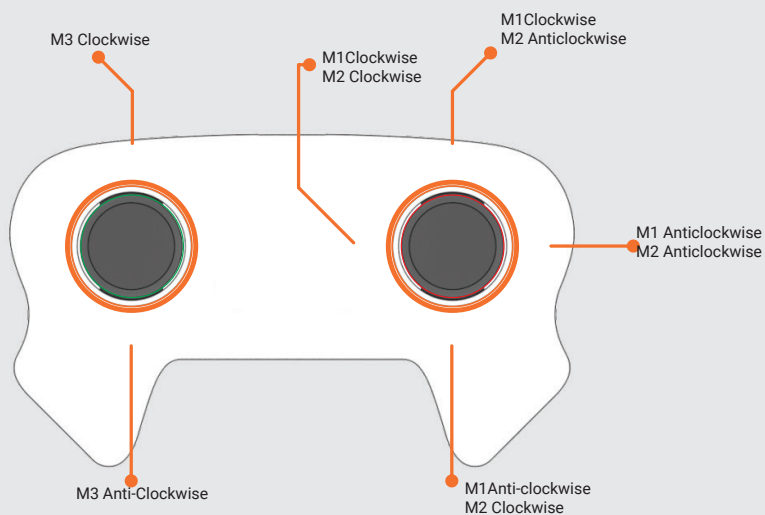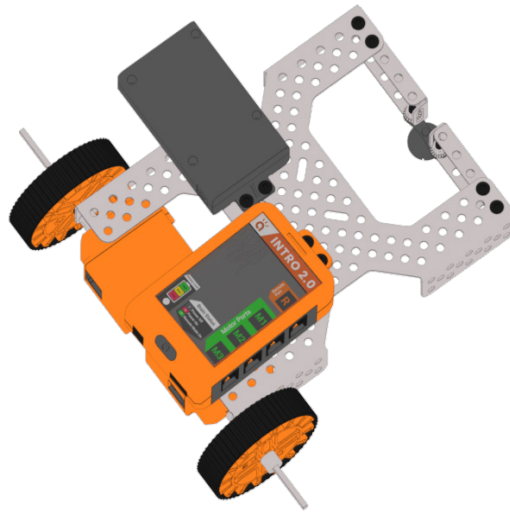
# 1. Three Wheel Drive

A Three Wheel Drive controlled by remote offers agile movement and precise control. Ideal for tasks like survelliance and exploration.

## What is our task?

We need to build a three-wheeled robot with high-speed motors and a remote control interface for agile movement and precise navigation.

## What will you learn?

Motor control and interfacing techniques

Remote operation

Robust Construction

Input to output transformations
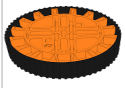
Mechanical Chassis Design

Rovio robot by WowWee, a three-wheeled mobile webcam robot capable of remote-controlled surveillance and communication.

# What will you need?

| | | | |
|---|---|---|---|
| Intro Brain x 1 | Battery x 1 | High Speed Motor x 2 | Manual Remote x 1 |
| Chasis x 1 | 2.5" U-Beam x 2 | Small Wheels x 2 | DC Battery Connecting Cable x 1 |
| 3.5" Axle x 2 | Remote Cable x 1 | Connecting Cables x 2 | Castor Wheel x 1 |
| Fillers x 2 | Axle locks x 4 | Nuts & bolts x 10 | |

# Let's Build!

**1**  Take one high speed motor and attach a 3.5 inch axle,and axle lock.

3.5" Axle
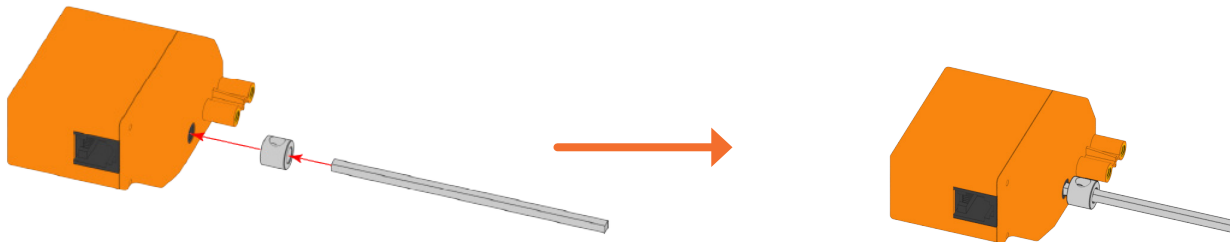
Take the chasis and attach the motor with the axle on 1st hole of the middle row and on 2nd and 3rd hole attach the bolts of the motor to secure it on the base.
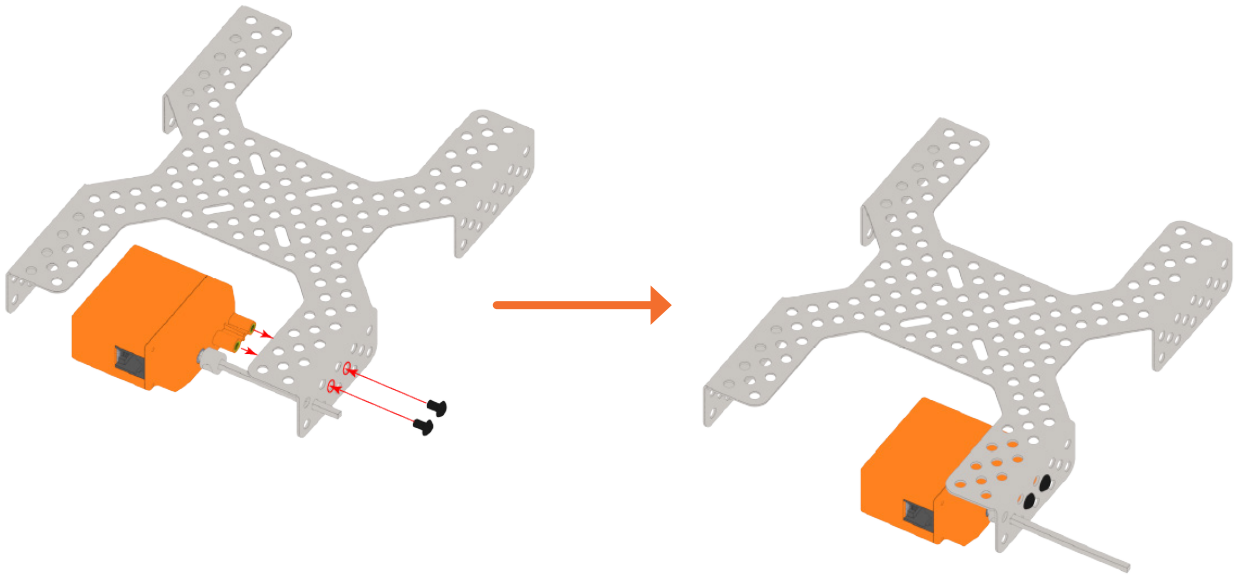
3

Similarly attach another motor on the opposite side.

3.5" Axle
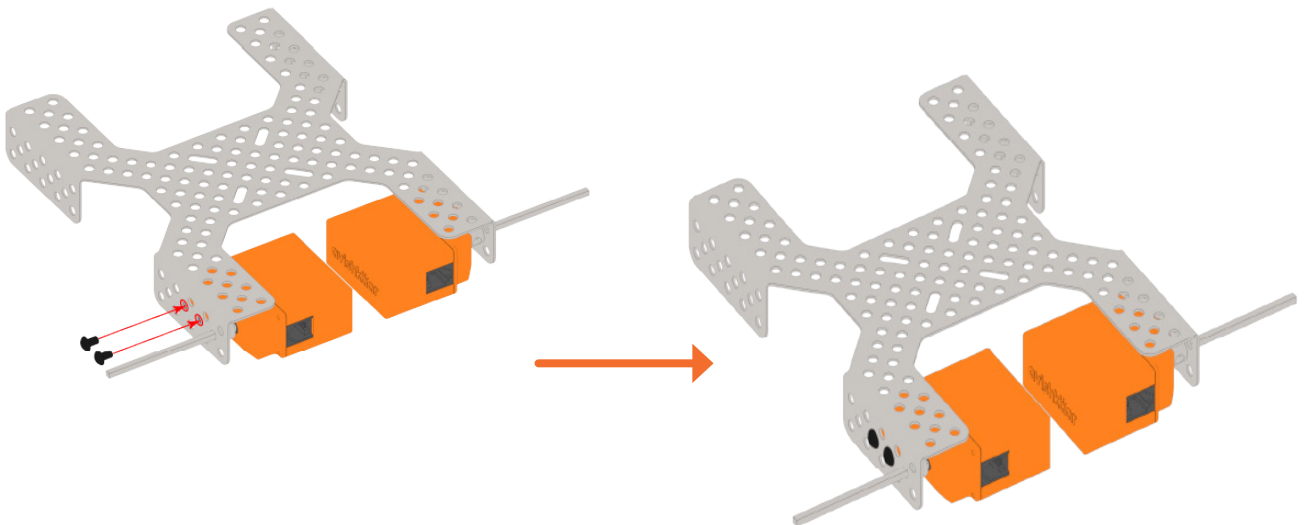
4 Add 1 filler then wheels on both sides and then secure them with axle locks.
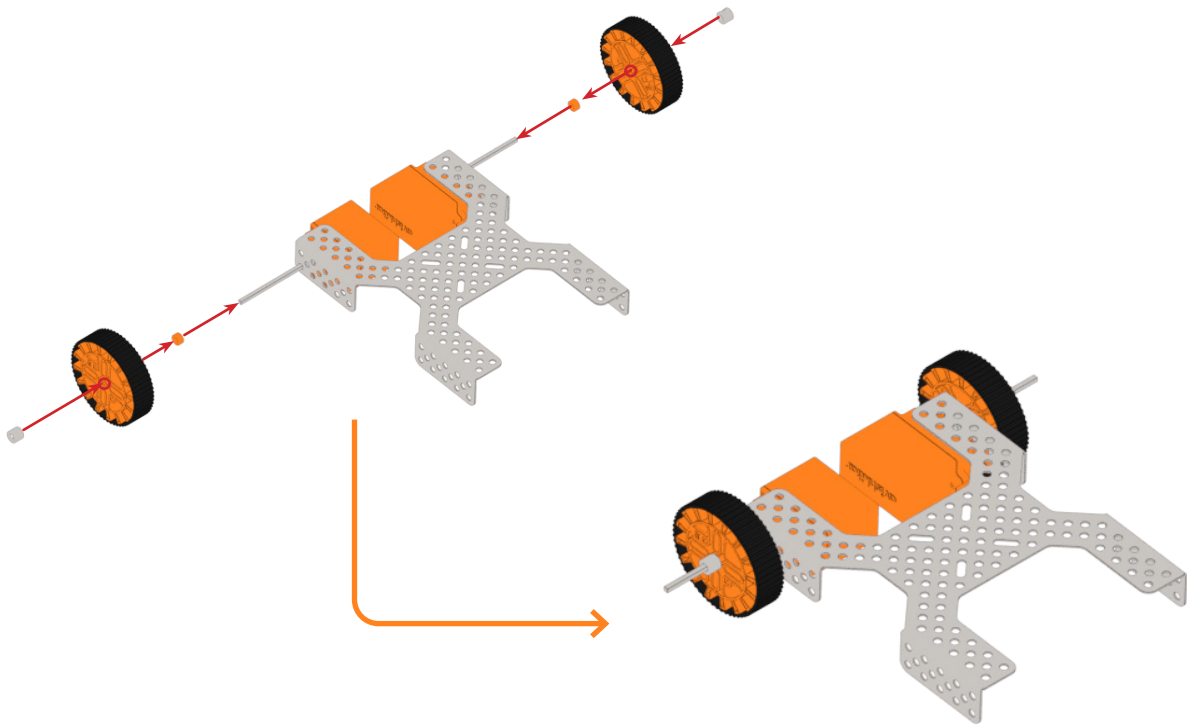
5 Take two, 2.5" U-beams and on first hole of each of the beams attach the castor wheel.
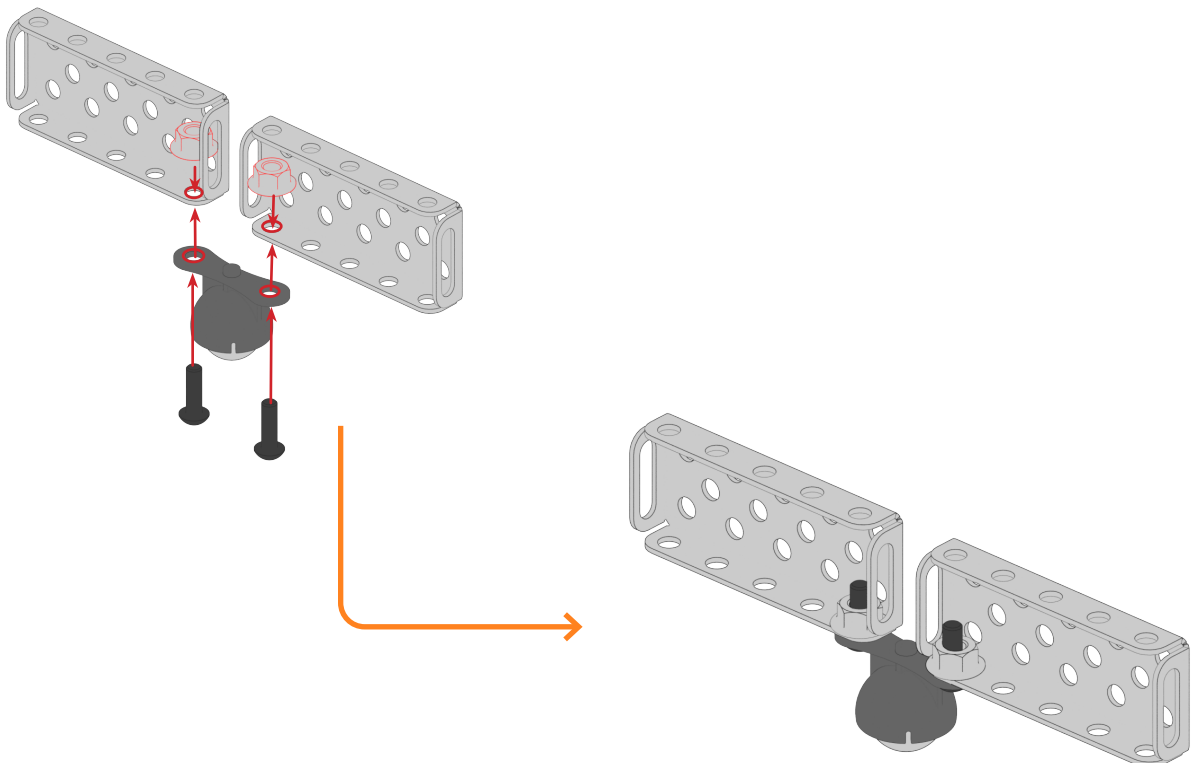
**6** Place the castor assembly in the front row of the chasis.
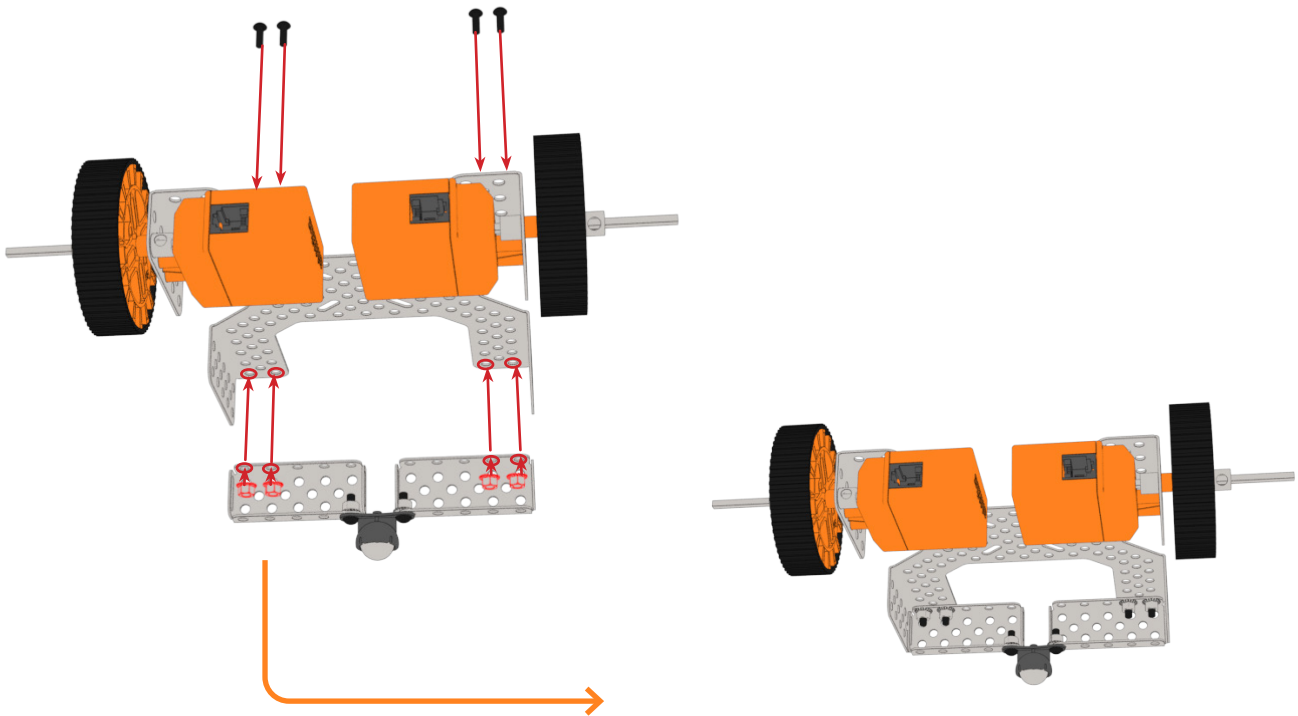


**7** Attach the brain on the 2nd and 3rd hole from left of the 4th row from the bottom.
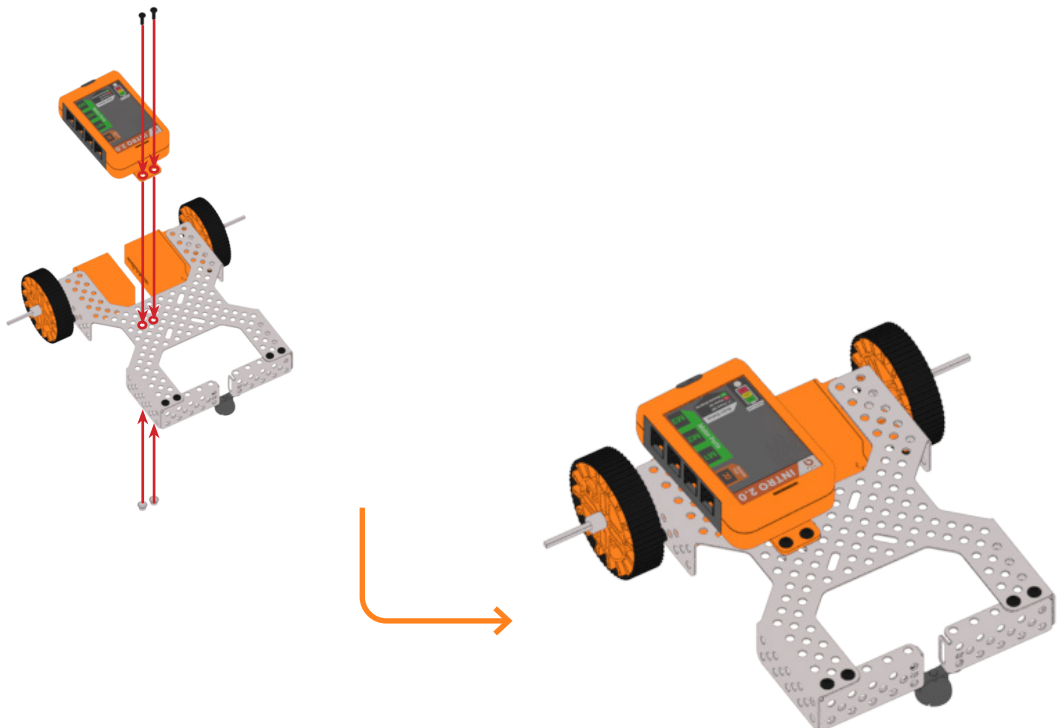
**8** Attach the battery in the 2nd and 4th row from the bottom, on 6th hole.
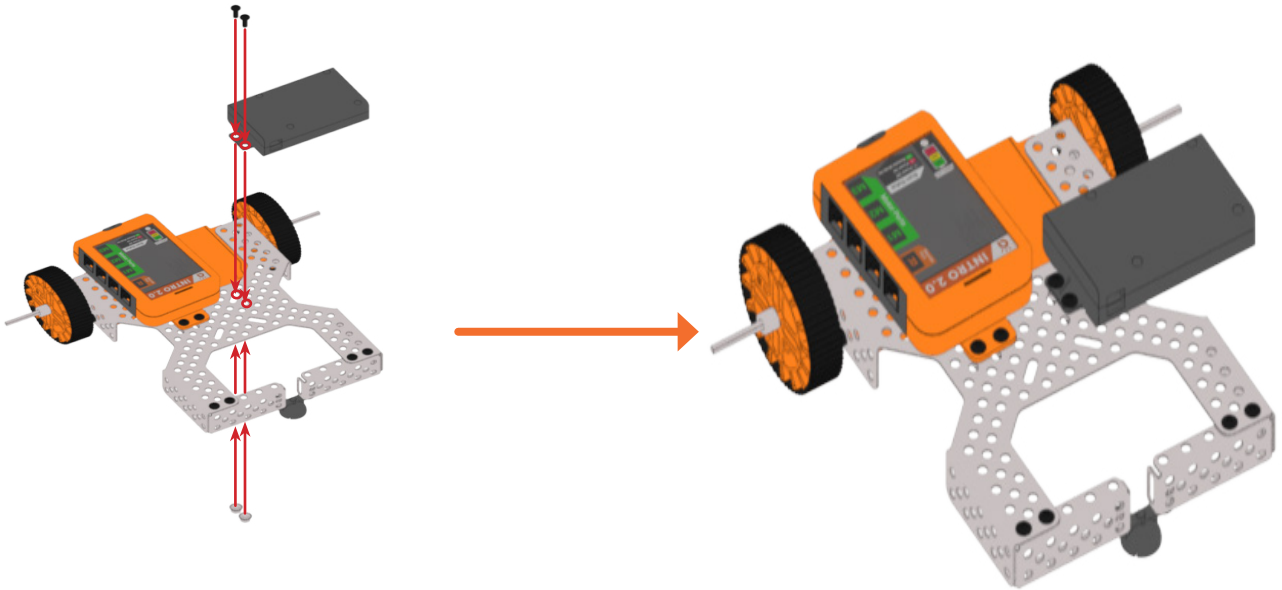
**9** Connect the right motor to M1 , left motor to M2 and the remote to R ports on the brain. Connect the brain and the battery.

Battery Brain connection
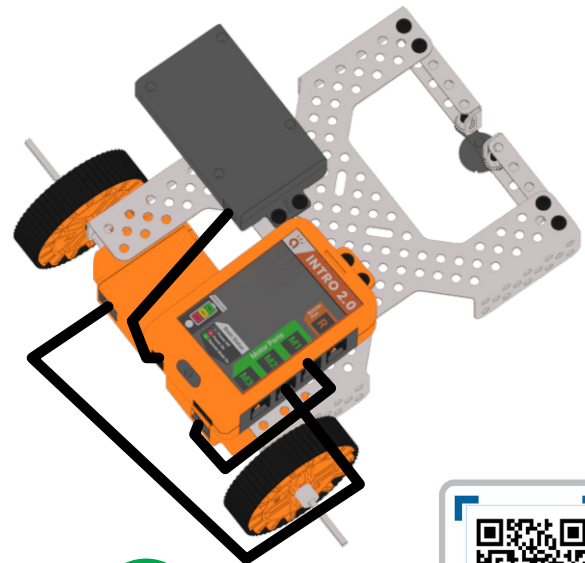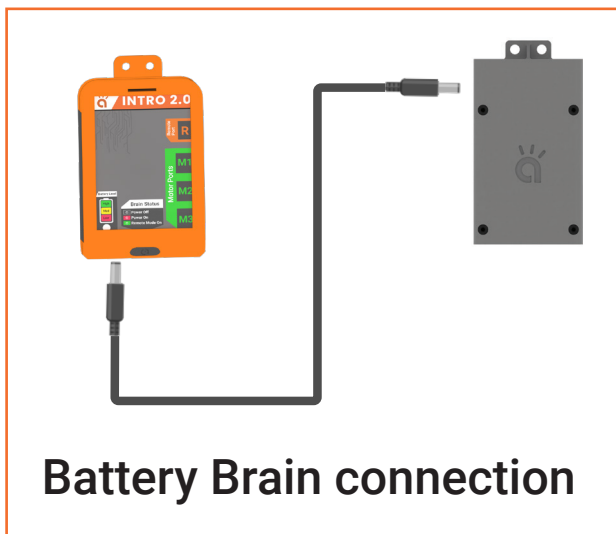
# Woohoo your first bot is ready!

# How to play - With Controller

You can use the remote controller to control your robot.
Follow the instructions below:-



- Connect the Right motor in M1 and Left motor in M2 port of Brain.

- Connect Remote cable in Port Labeled as R.

- Switch on the brain and use your Remote's Joystick to control the movement of the robot.



**Right Joystick**
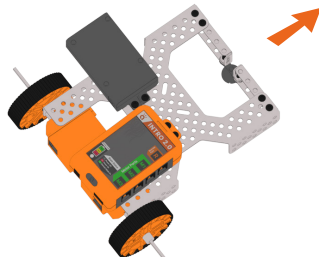
When we push the right joystick forward, the bot moves forward
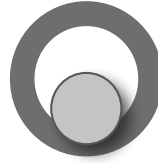


**Right Joystick**
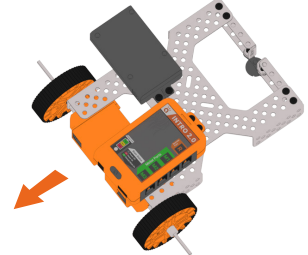
When we push the right joystick backward, the bot moves backward.
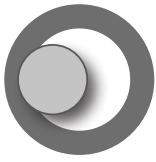


**Right Joystick**
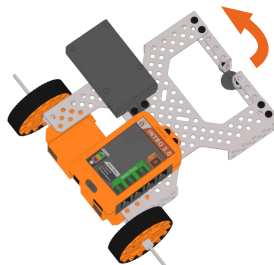
When we push the right joystick towards left, the bot moves left.
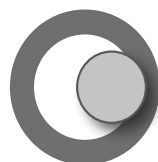


**Right Joystick**
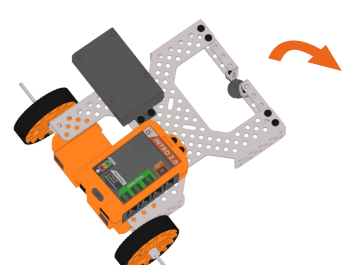
When we push the right joystick towards right, the bot moves right.

# 2. High Speed Car
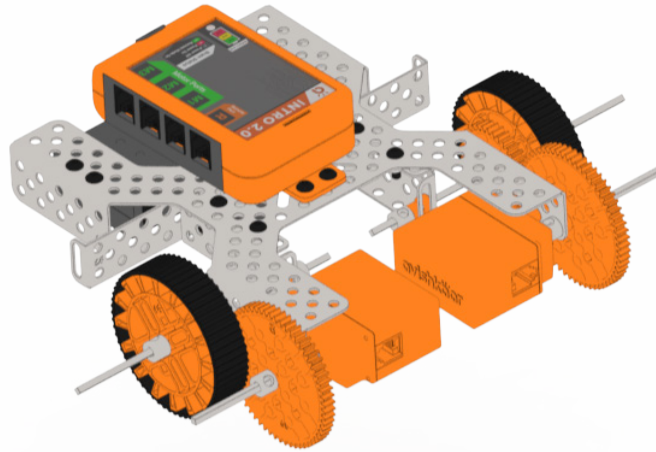


A Three Wheel Drive controlled by remote offers agile movement and precise control. Gears used to increase the speed of the robot.

## What is our task?

We need to build a three-wheeled robot with high-speed motors and a remote control.

## What will you learn?



Motor control and interfacing techniques



Remote operation



Robust Construction



Input to output transformations



Mechanical Chassis Design
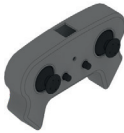


Increasing of speed



High-speed cars use gears to optimize power and speed. The proper gear selection allows the engine to reach its maximum power, which in turn results in the highest possible velocity. Lower gears provide more torque for acceleration, while higher gears allow for higher top speeds.

# What will you need?

| | | | |
|---|---|---|---|
| Intro Brain x 1 | Battery x 1 | High Speed Motor x 2 | Manual Remote x 1 |
| Chasis x 1 | 2.5" U-Beam x 2 | 7.5" L-Beam x 1 | Small Wheels x 2 |
| 3.5" Axle x 2 | 5.5" Axle x 2 | Connecting Cables x 2 | Remote Cable x 1 |
| DC Battery Connecting Cable x 1 | Medium Spur Gear x 2 | Big Spur Gear x 2 | Castor Wheel x 1 |
| Fillers x 8 | Axle locks x 6 | Nuts & bolts x 14 | |

# Let's Build!

**1** Refer project1 steps1-3 for this construction.
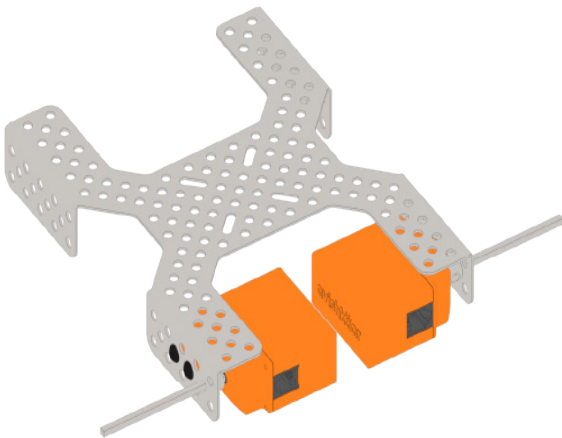
**2** Take a 7.5inch L-Beam and attach two, 2.5 inch U-Beam on the L-beam as shown.
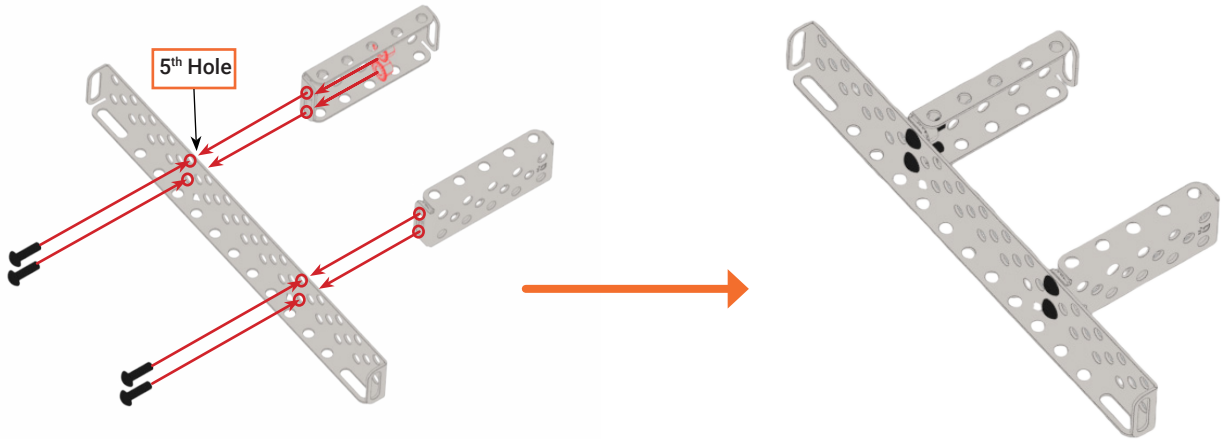
5th Hole

**3** On the 5th and the 7th hole of the L-Beam attach the casor wheel.
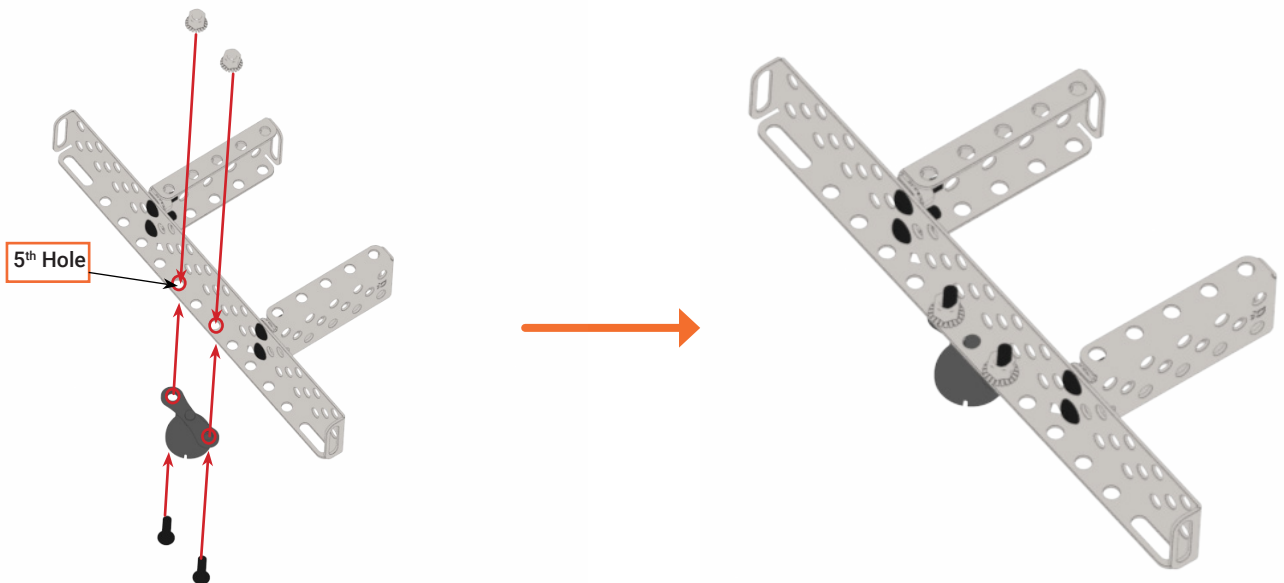
5th Hole

4 Take the assembly of the castor wheel as made and then attach it to the chassis as shown.
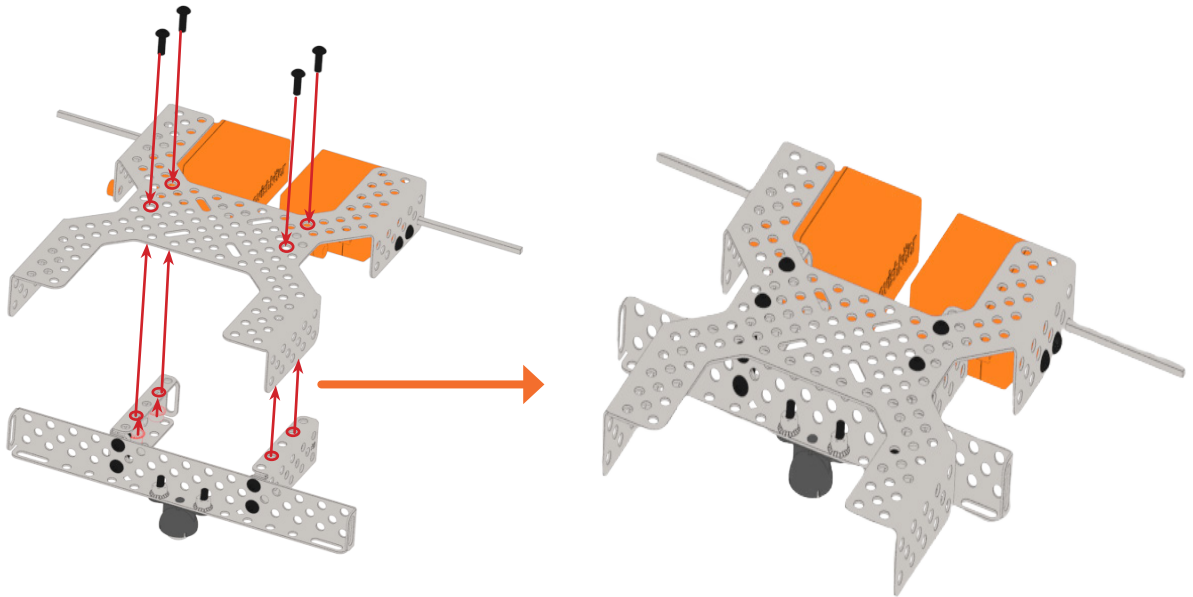
5 Attach fillers, big gears and secure both of them with axle locks, on the axles of the motors.

Large Gear
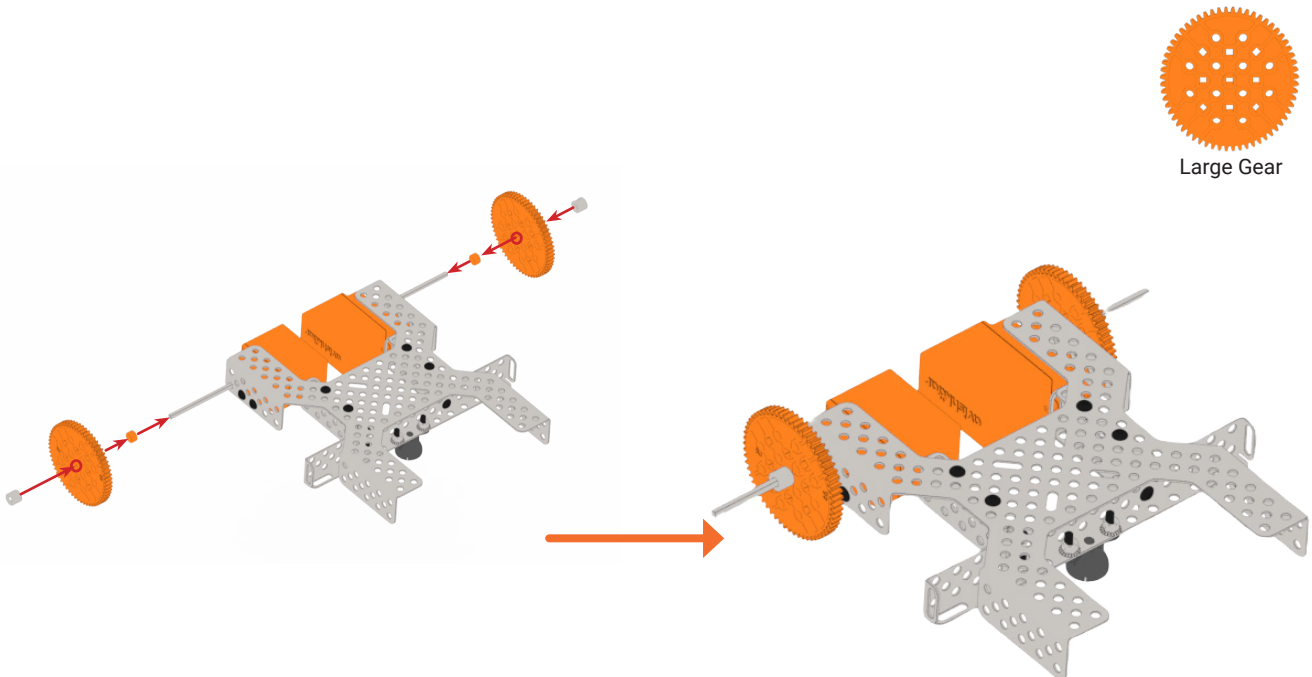
**6** Take another 5.5" axle and attach that on the 5th hole of the first row of the chasis and 1st hole of the first row of the 2.5" U-Beam.
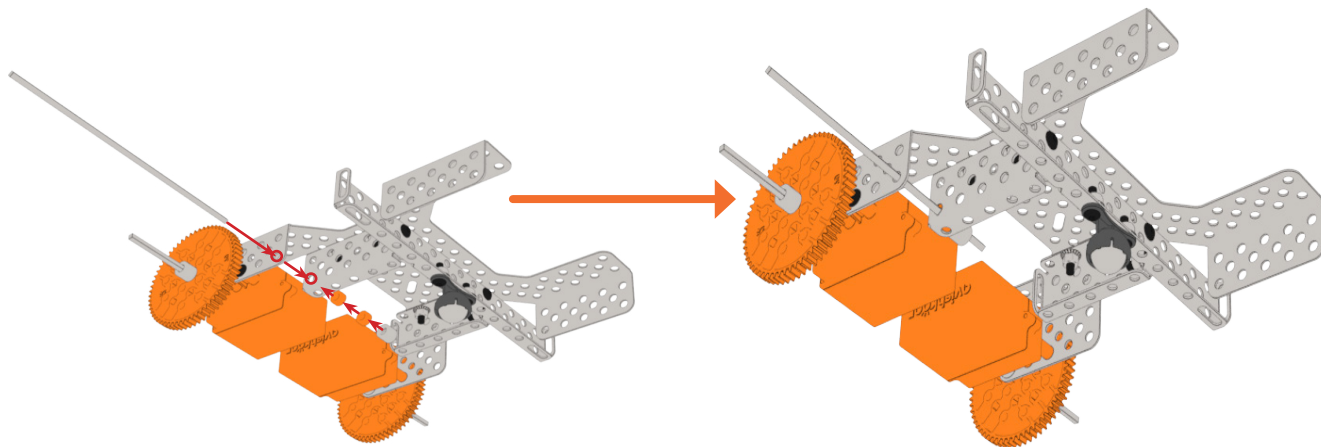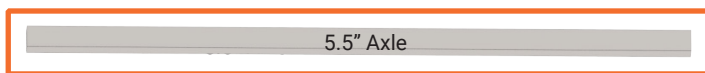
5.5" Axle



**7** Similary, do that on the other side.
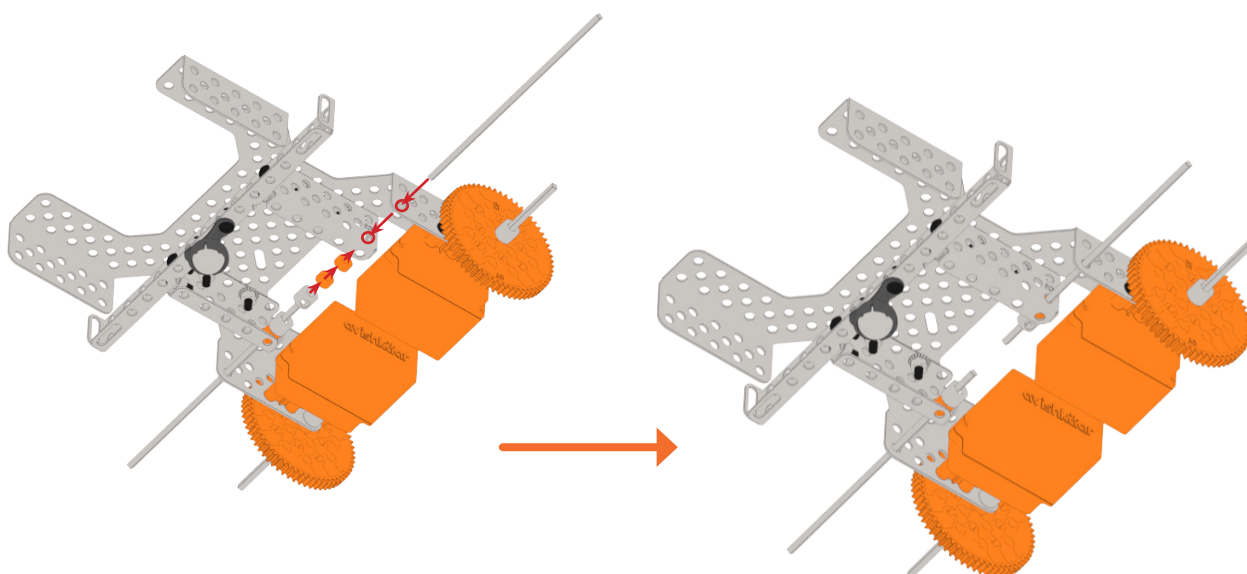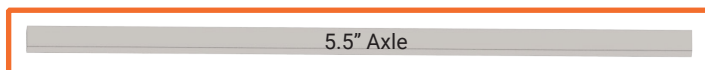
5.5" Axle

**8** Attach a filler, medium spur gear and wheels on both sides, and secure them with axle locks on the 5.5" axles.

Medium Gear
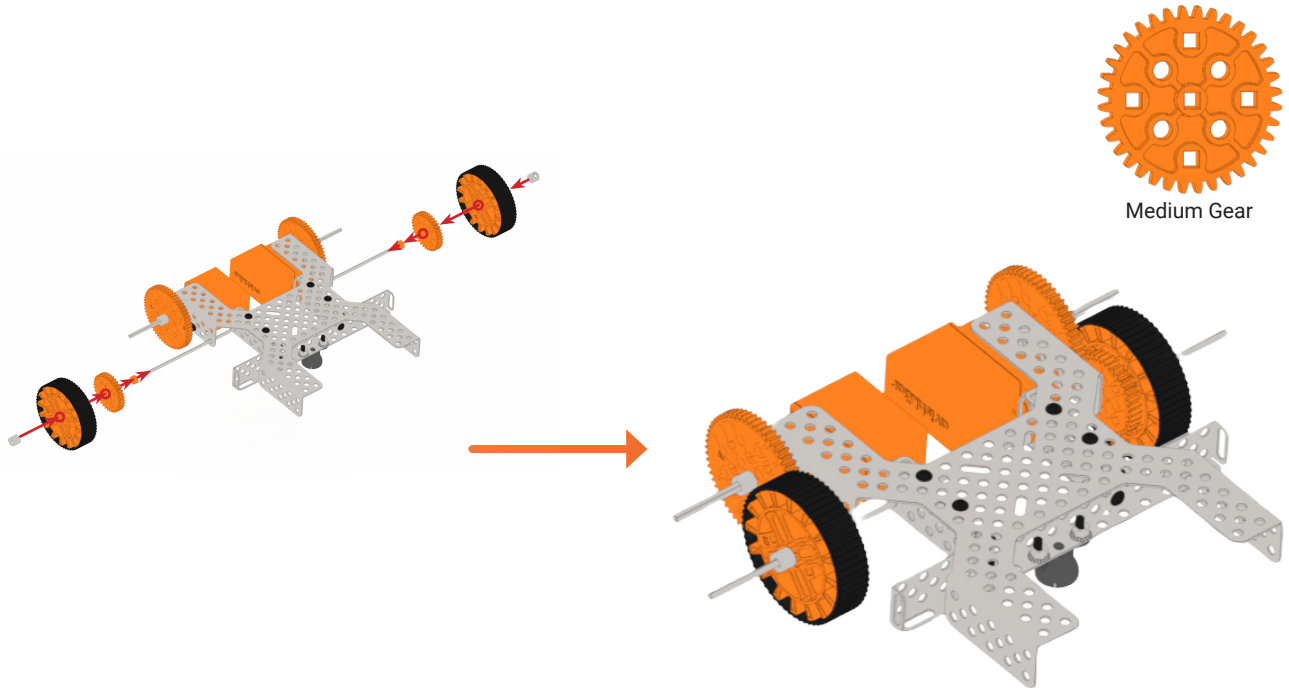
**9** From front left, on 3rd row of the chasis attach the battery on the 3rd and 4th hole.
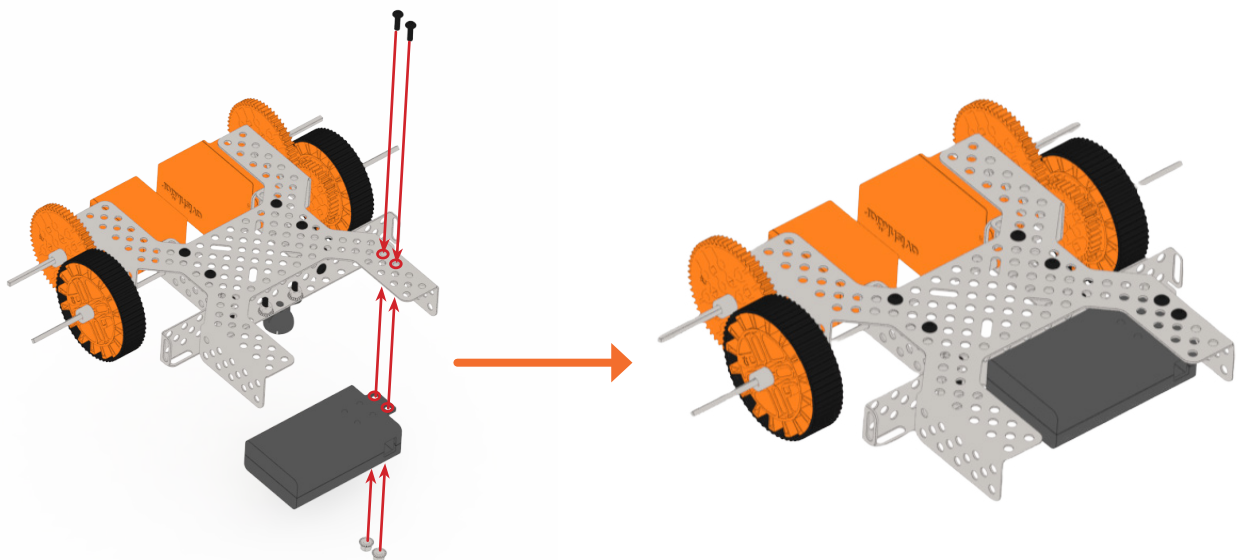
**10** On the first row of the chasis, attach the brain on the 4th and 5th hole
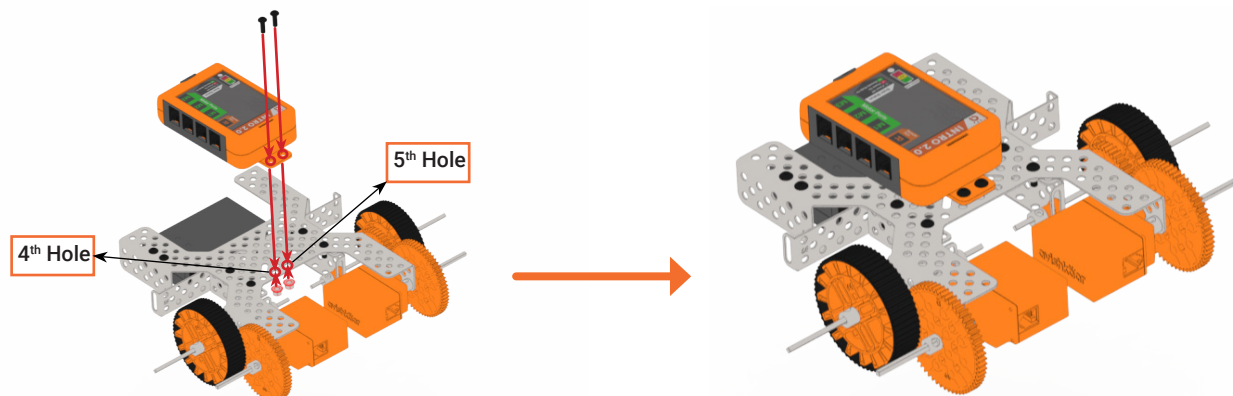


5th Hole

4th Hole

**11** Connect the right motor to M1 , left motor to M2 and the remote to R ports on the brain. Connect the brain and the battery.



# Battery Brain connection
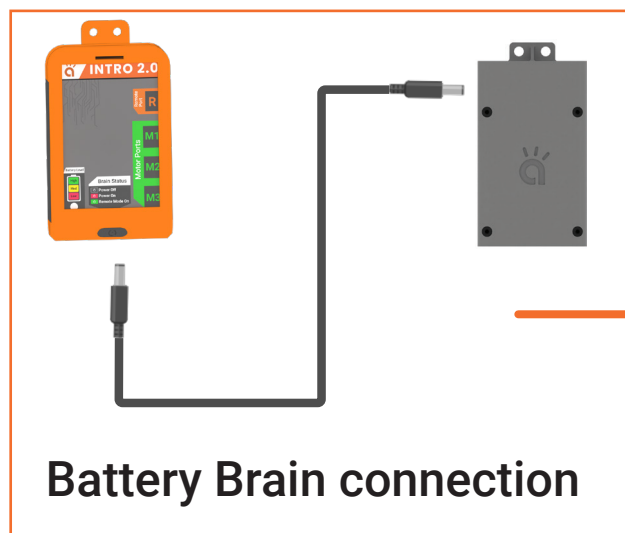
Scan the QR to upload the project

# 3. Soccer Robot
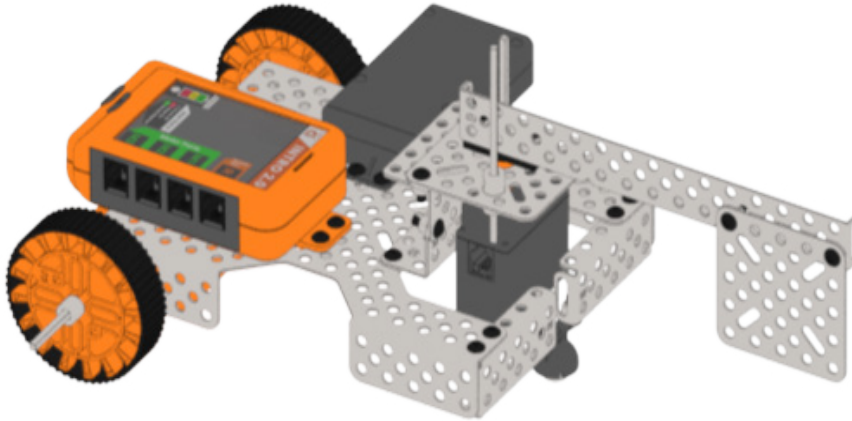


A Soccer robot is a gaming robot. It is designed to play soccer game.

## What is our task?

We need to build a three-wheeled robot with high-speed motors and attach an arm on the base for playing soccer.

## What will you learn?



Motor control and interfacing techniques



Remote operation



Input to output transformations



Robust Construction



Robo soccer is a game designed where, physically build robots play soccer. Robots can be manually controlled or can be pro-grammed.

# What will you need?

| | | | |
|---|---|---|---|
| Intro Brain x 1 | Battery x 1 | High Speed Motor x 2 | High Torque Motor x 1 |
| Manual Remote x 1 | 2.5" U-Beam x 2 | 2.5" U-Beam x 2 | Square plate x 1 |
| 7.5" L-Beam x1 | Chasis x 1 | 3.5" Axle x 3 | Small Wheels x 2 |
| DC Battery Connecting Cable x 1 | Connecting Cables x 3 | Remote Cable x 1 | Castor Wheel x 1 |
| Fillers x 3 | Axle locks x 6 | Nuts & bolts x 20 | Three hole connectorx 1 |

# Let's Build!

1  Refer project1 for this construction.
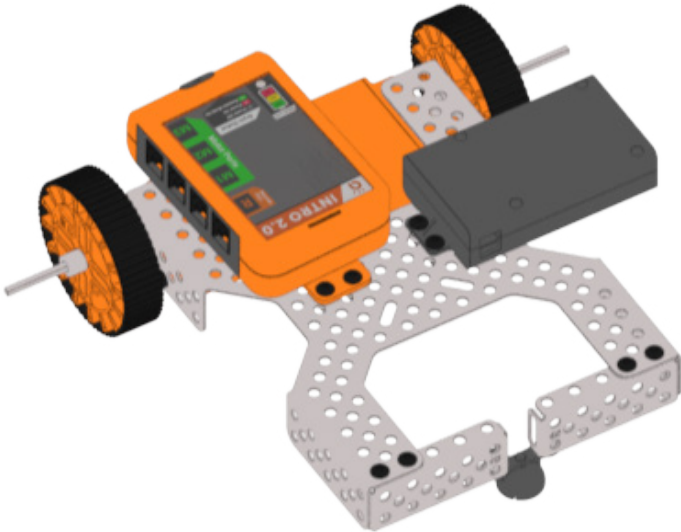
**2** Attach a 2.5inch L-Channel using the 1st and 5th hole of the first row on the 3rd and 7th hole of the first row of the chasis.
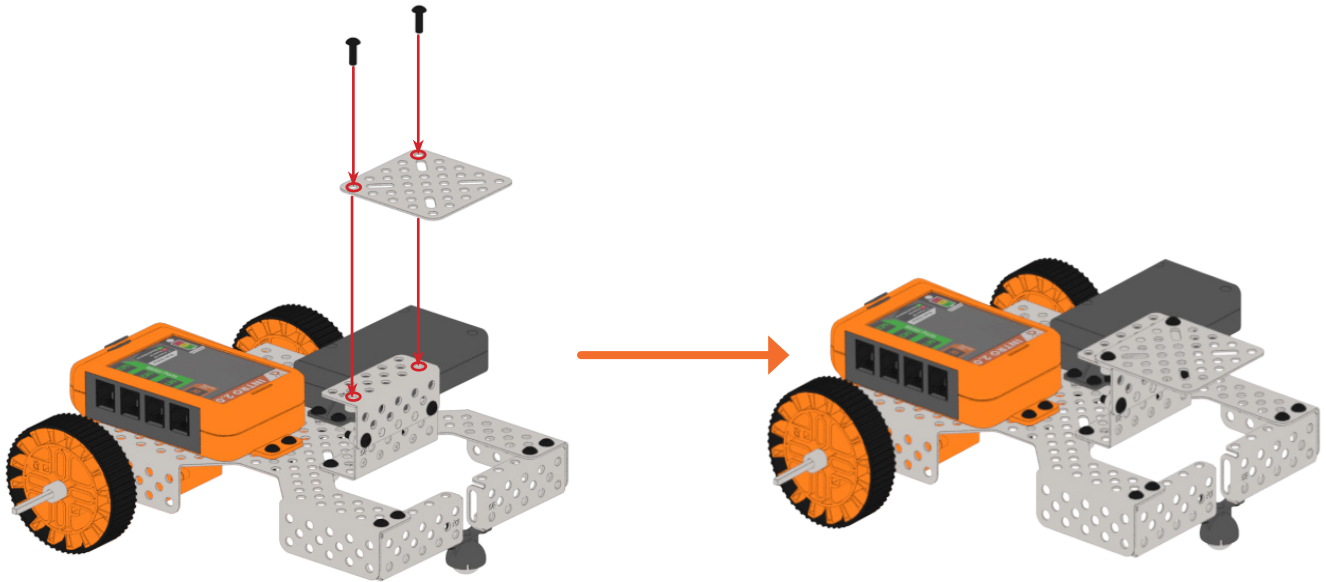
3ʳᵈ Hole
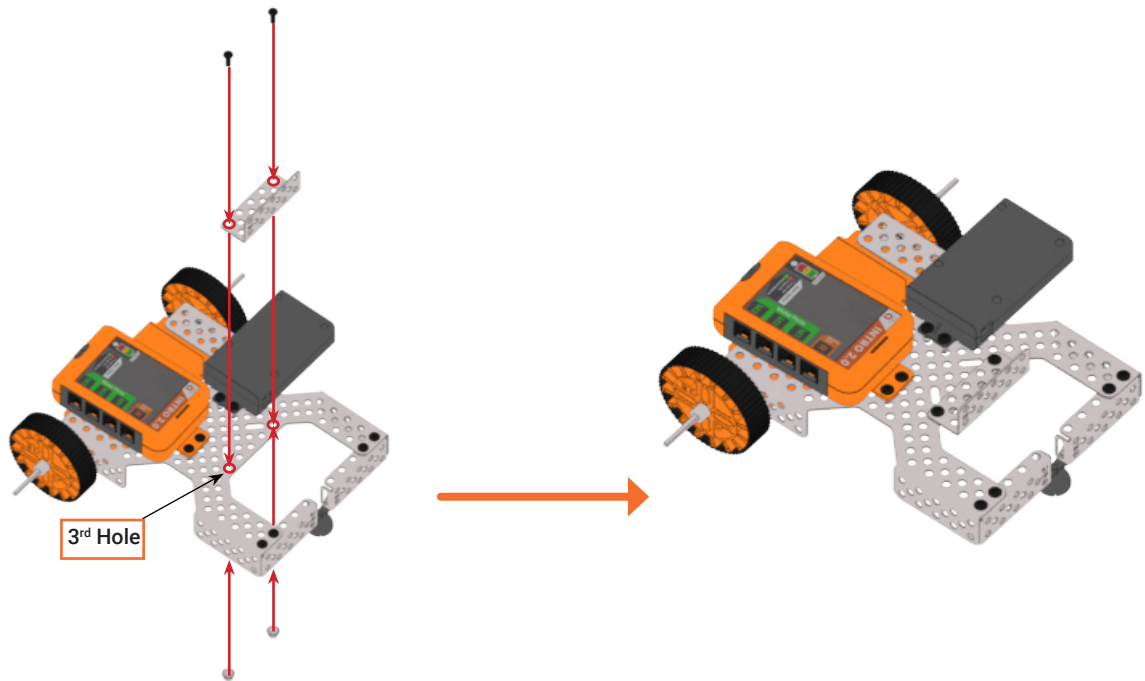
**3** Take another 2.5 inch L-channel and attach using the 1st and 5th hole of the 1st row to the 1st and 5th hole of the 3rd row of L-channel (as shown on the picture below) present on the base.
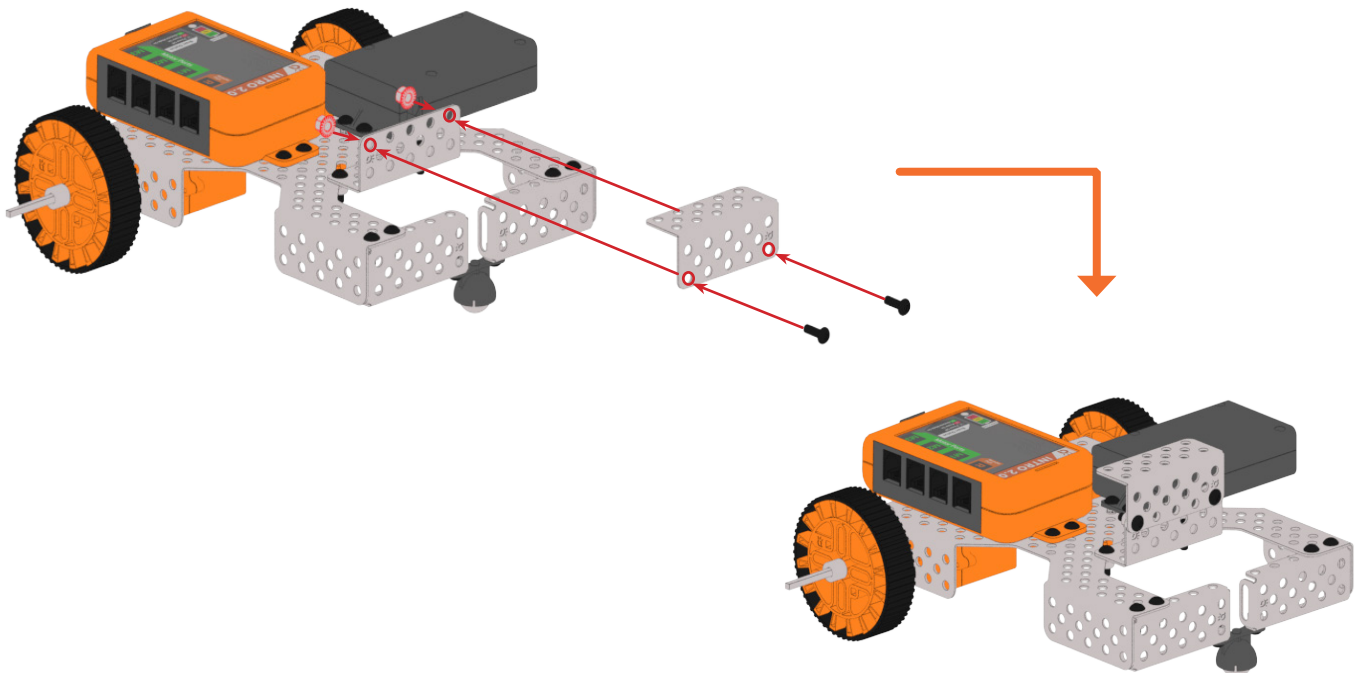
Take one square plate and using the 1st and 5th hole of the first row attach it to the 1st and 5th hole of the third row of the L-channel.

Take one motor and attach it's axle to the 3rd hole of the 3rd row and it's bolts to the 4th and 5th hole of the 5th row.

3.5" Axle

3ʳᵈ Row

3ʳᵈ Hole
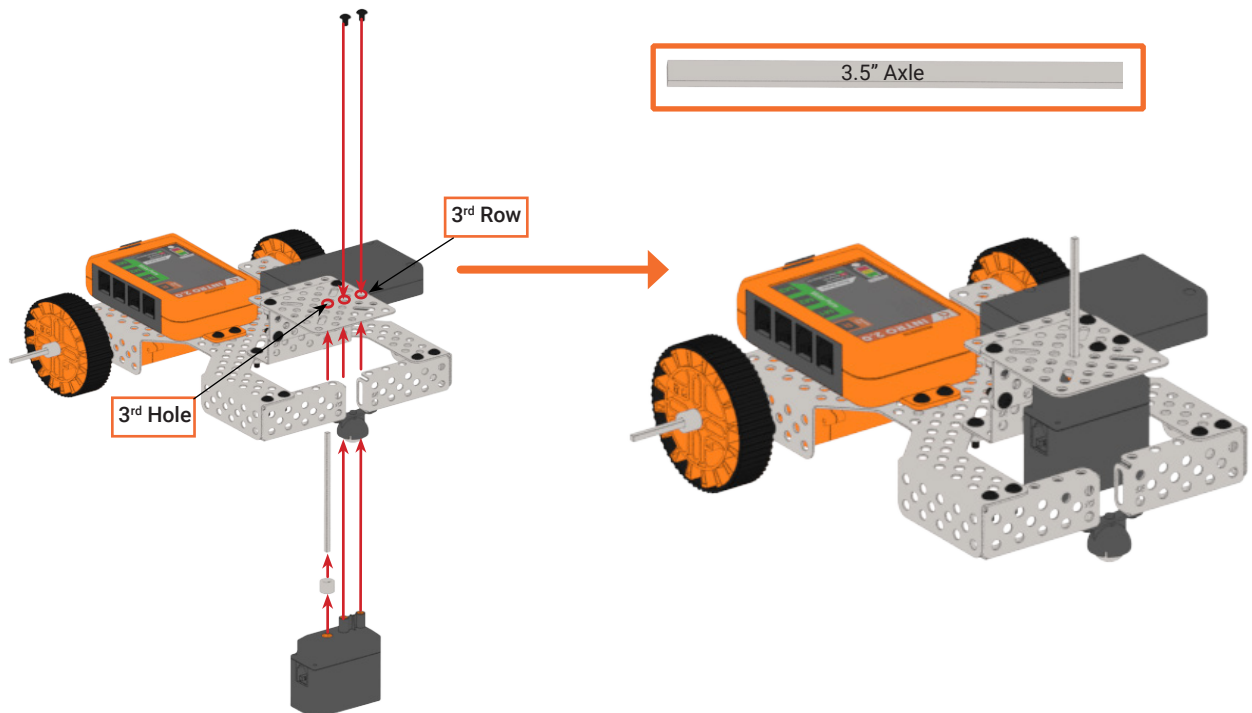
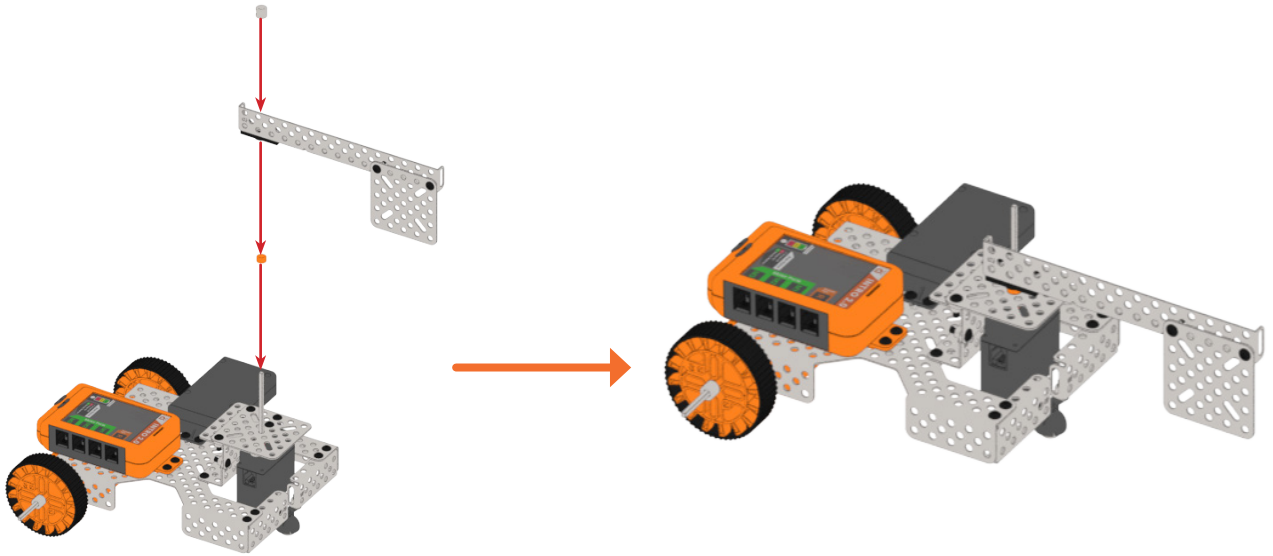Using the 1st and 5th hole of the square plate attach it to the 1st and 5th hole of the 3rd row of the L-beam.
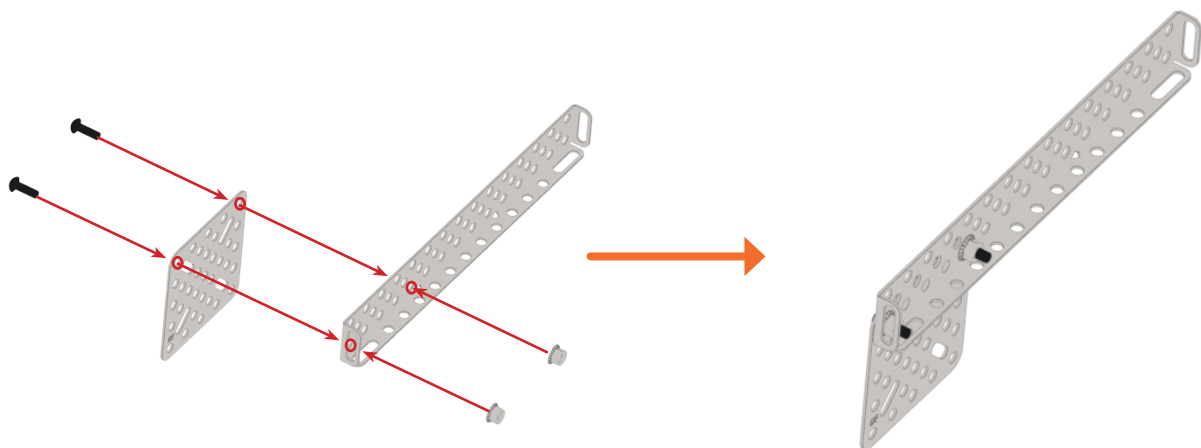
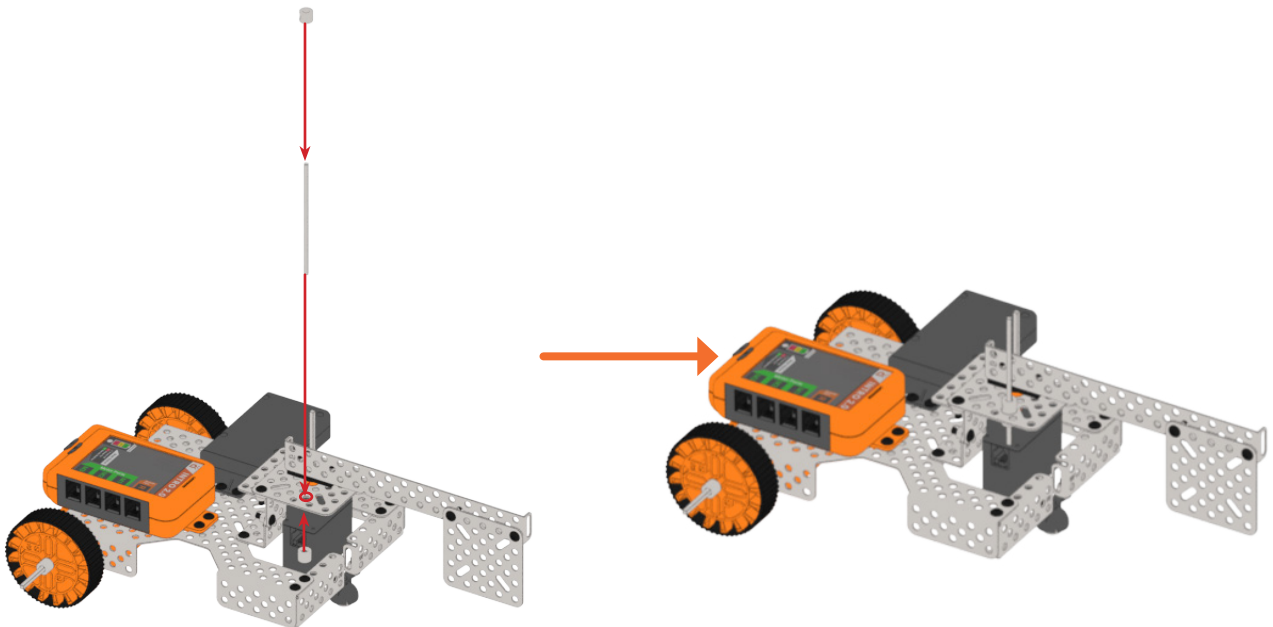On the last and the 3rd last hole of the L-Beam attach the 3-Hole connector.
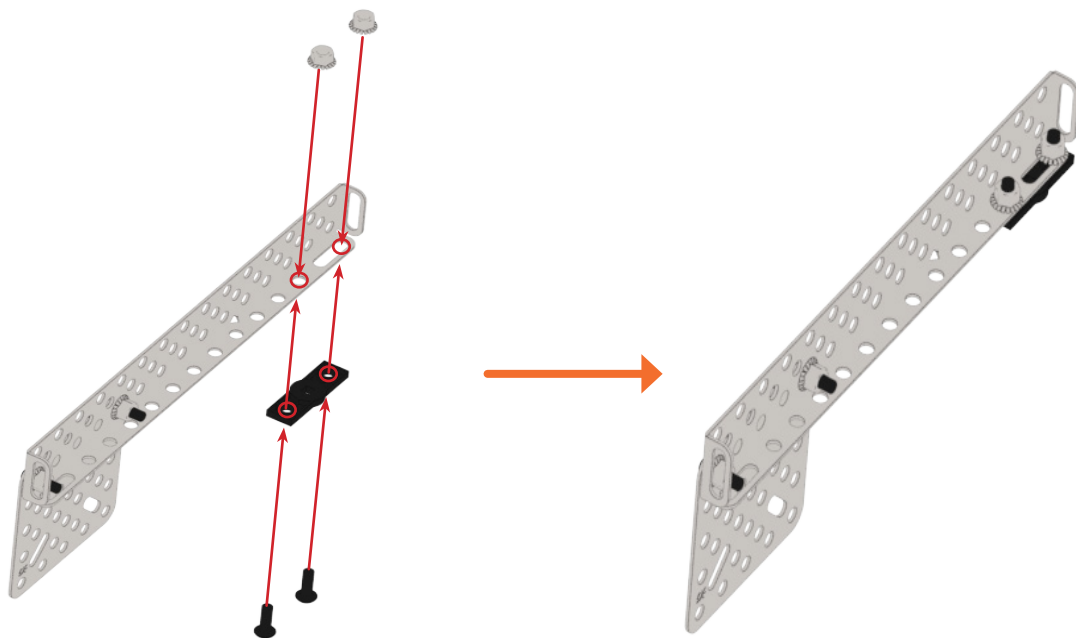
**8** Fix the arm of the motor using one filler on the motor, below the arm and locking it with an axle lock above the arm.

**9** Take one 3.5" axle and using axle locks above and below the on the 1st hole of the 4th row of the square plate, lock it up to restrict the movement of the arm.

10 Attach the battery cable to both the brain and battery, and connect the motors to the brain.



**Battery Brain connection**
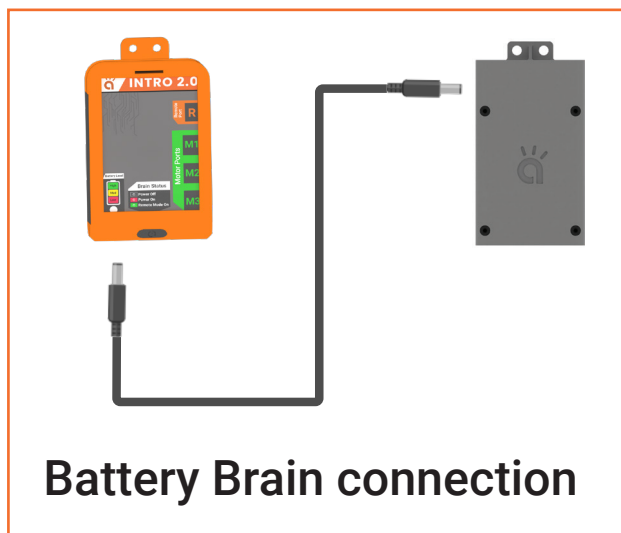
- **Connect Right speed motor to M1 port.**
- **Connect Left speed motor to M2 port.**
- **Connect Arm torque motor to M3 port.**
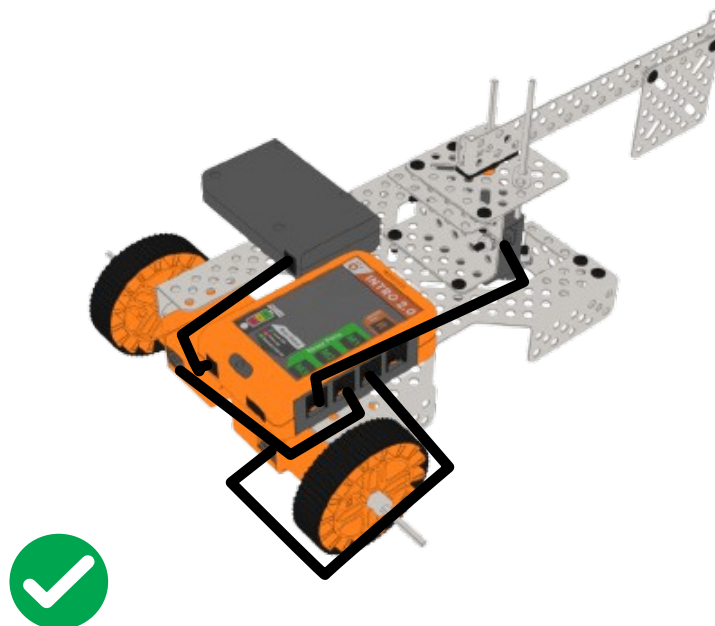




Scan the QR to upload the project

# 4. Gripper Robot
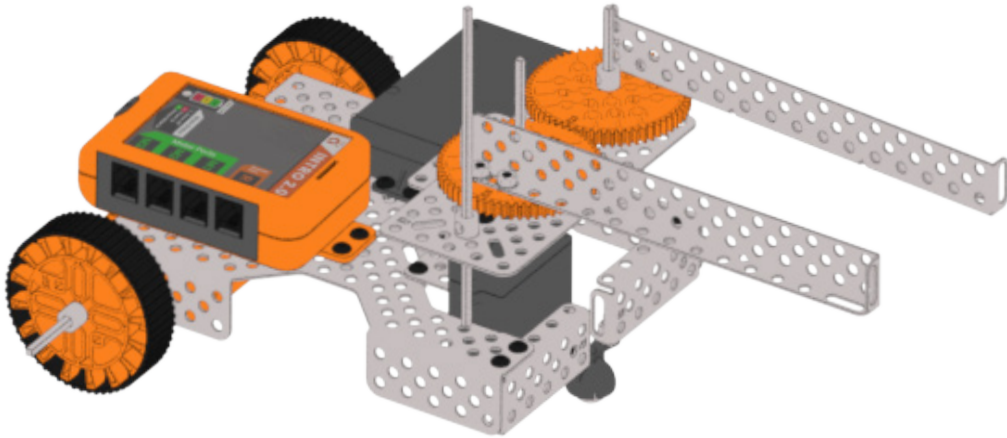


A gripper robot is a mechanical device designed to hold and manipulate objects. It consists of a set of jaws or fingers that can open and close to grasp various items. The gripper robot is commonly used in manufacturing and automation industries to handle objects efficiently. By employing different grip styles and materials, it can securely hold objects of different shapes, sizes, and weights.

## What is our task?

We create a robot with chassis on wheels and two arms with gripping action created by gears. Let's design a robot that can grip, pick and place objects from one place to another

## What will you learn?



Motor control and interfacing techniques



Remote operation



Robust Construction



Input to output transformations



Mechanical Chassis Design



Gripping arms are a very useful robotic component used for picking and placing up of products from one place to another.

# What will you need?

| | | | |
|---|---|---|---|
| Intro Brain x 1 | Battery x 1 | High Speed Motor x 2 | High Torque Motor x 1 |
| Manual Remote x 1 | 2.5" U-Beam x 2 | 2.5" U-Beam x 2 | Square plate x 2 |
| 7.5" L-Beam x1 | Chasis x 1 | 3.5" Axle x 4 | 5.5" Axle x 1 |
| Connecting Cables x3 | Remote Cable x 1 | DC Battery Connecting Cable x 1 | Big Spur Gear x 2 |
| Castor Wheel x 1 | Fillers x 4 | Axle locks x 8 | Nuts & bolts x 22 |
| Small Wheels x 2 | | | |

## Let's Build!

1  Refer project1 for this construction.
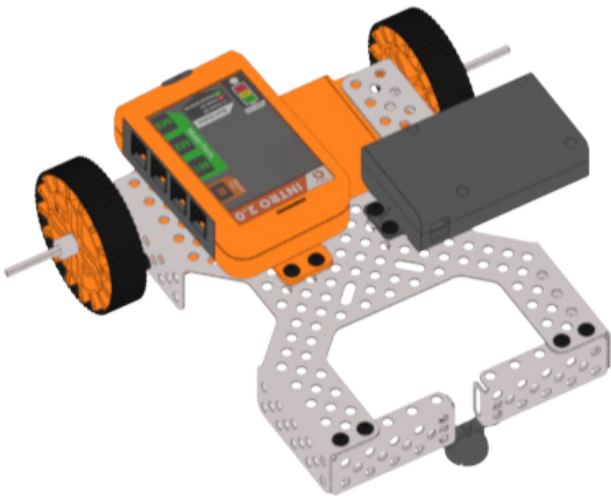
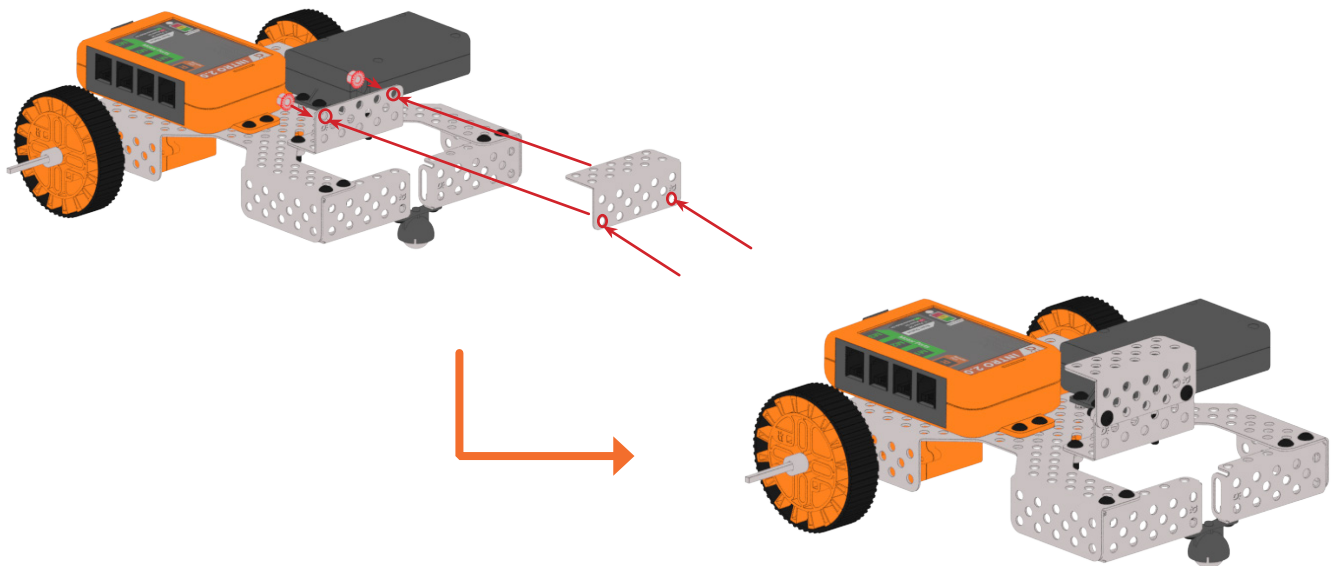**2** Attach a 2.5inch L-Channel using the 1st and 5th hole of the first row on the 3rd and 7th hole of the first row of the chasis.
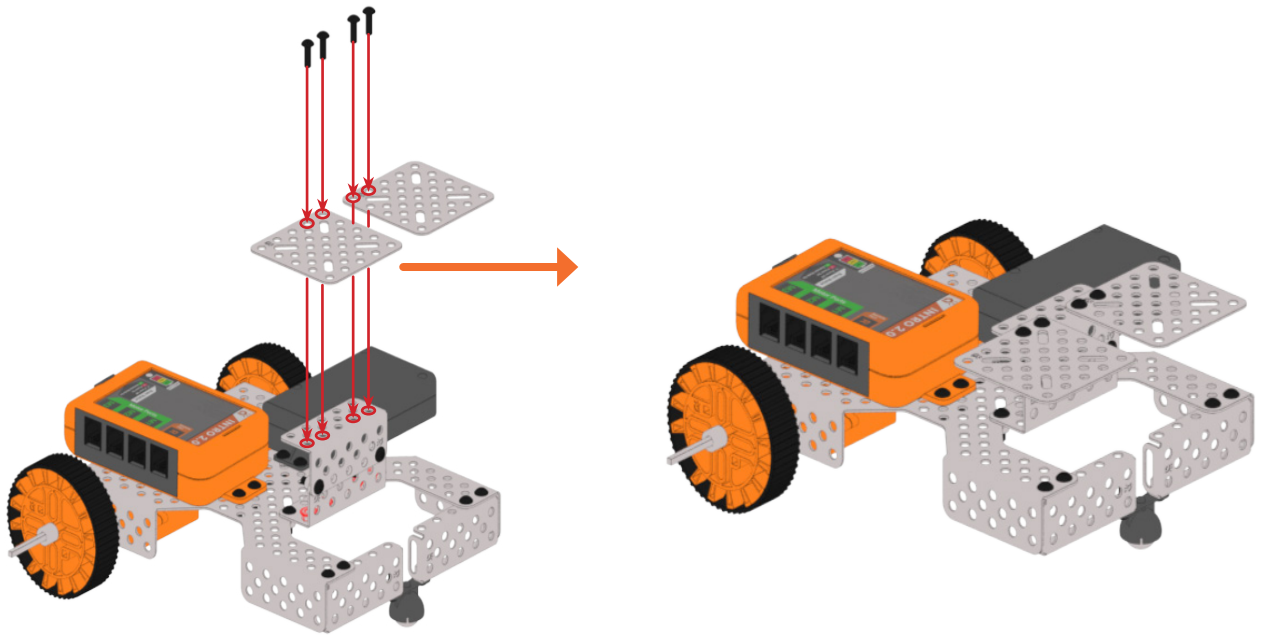


7th Hole

3rd Hole
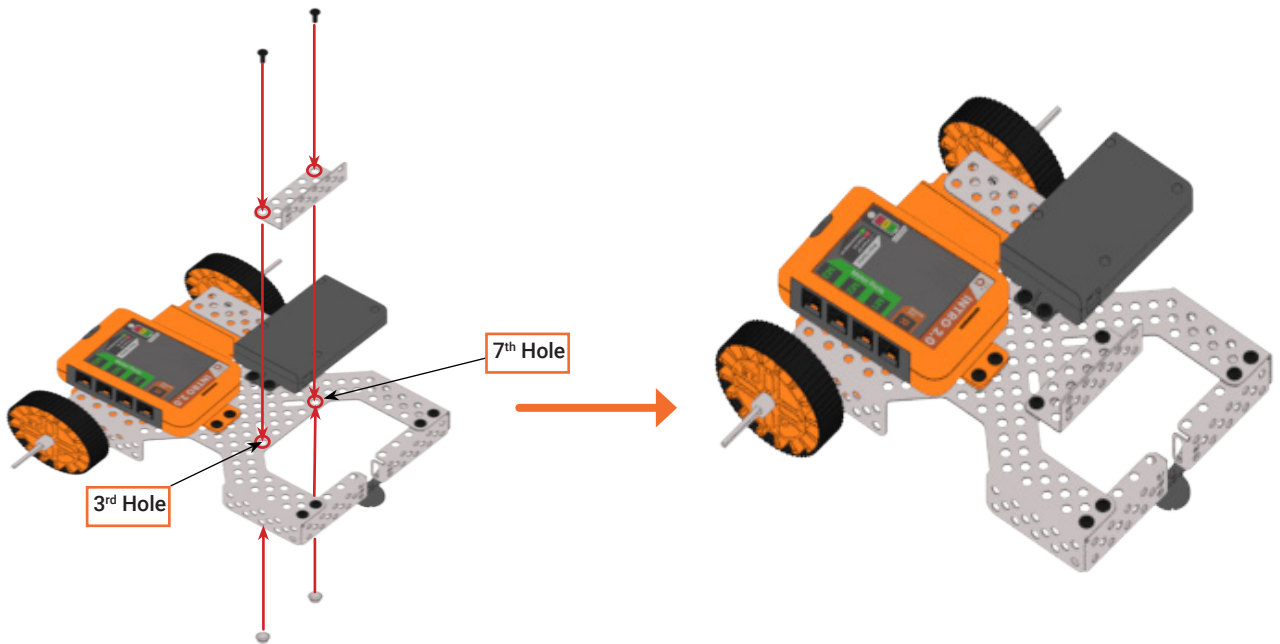
**3** Take another 2.5 inch L-channel and attach using the 1st and 5th hole of the 1st row to the 1st and 5th hole of the 3rd row of L-channel present on the base.
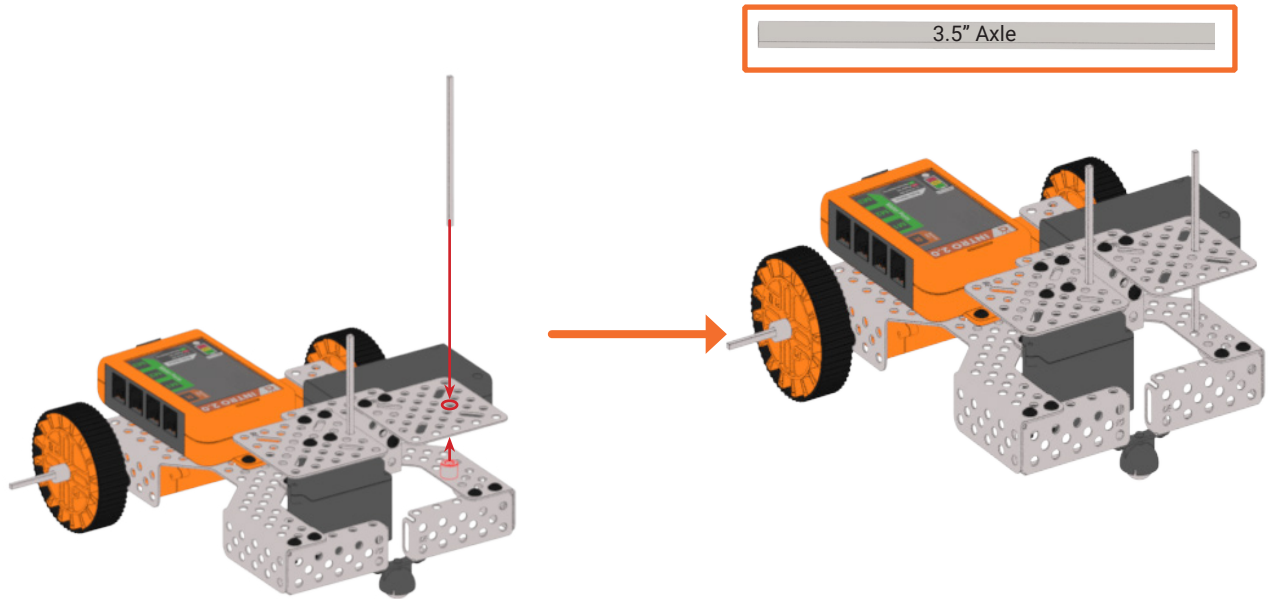
**4** Take 2 square plates and attach them on the L-channel on first row as shown.

**5** Take one motor and attach it's axle to the 5th hole of the middle row of the square plate and it's bolts to the 3rd and 4th hole.
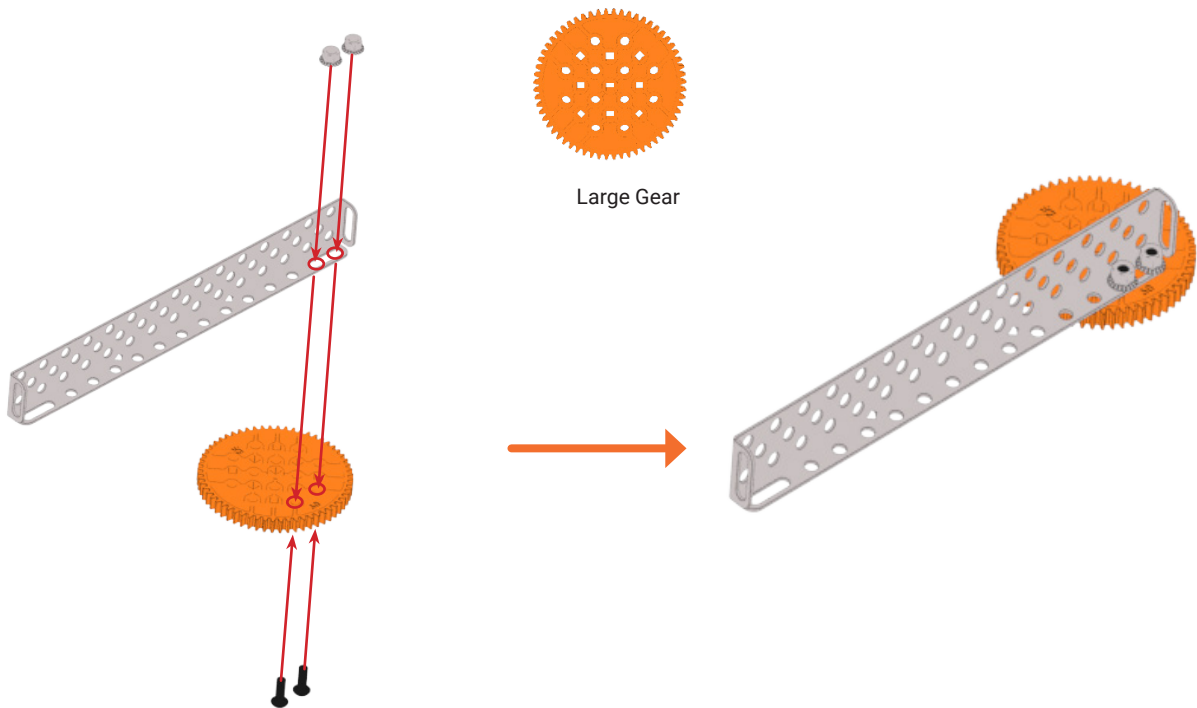
3.5" Axle

5th Hole
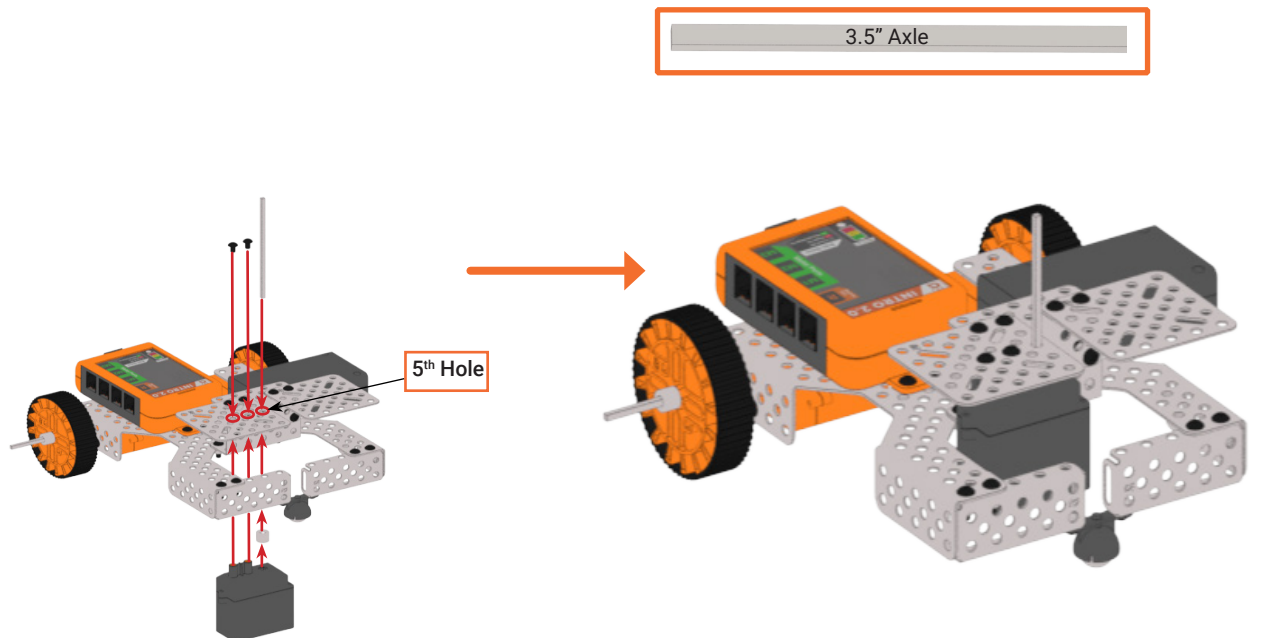
**6** Now, attach a 3.5" axle to the 2nd hole of the middle row, and attach an axle lock in the bottom to secure it up.
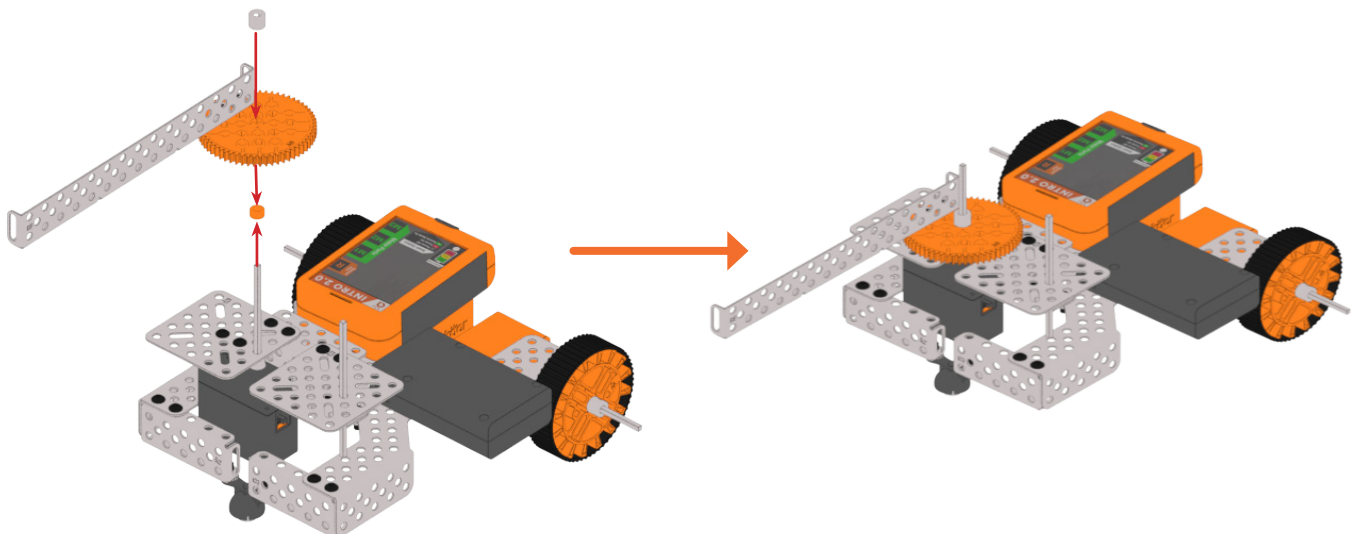
3.5" Axle

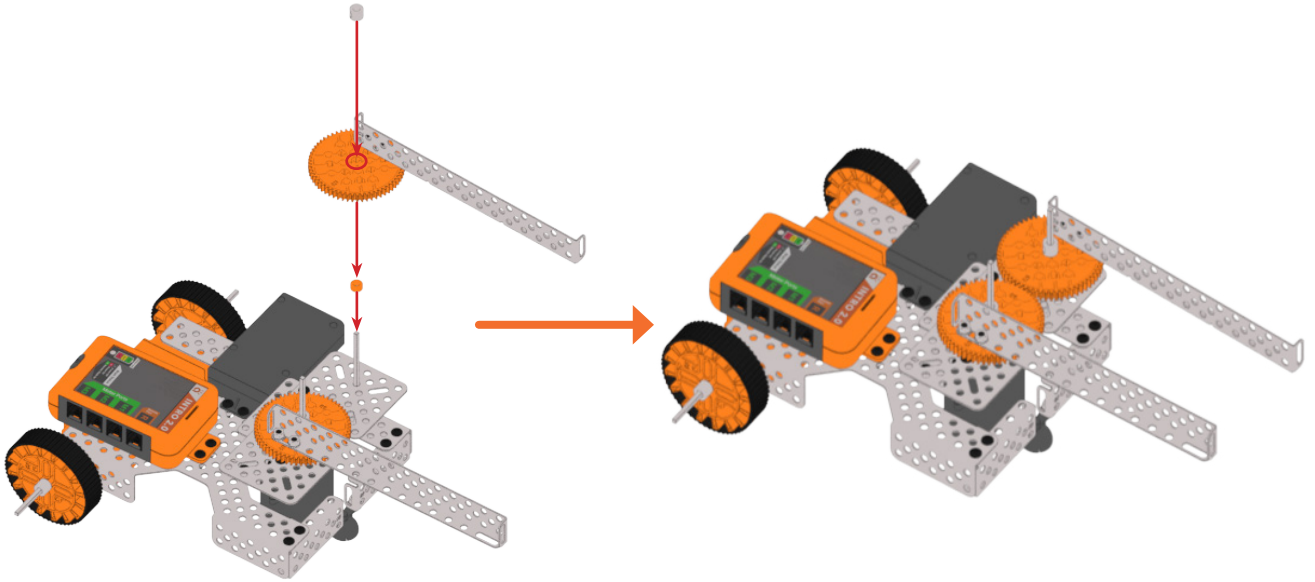**7** On the adjacent holes of the gear attach a 7.5" L-channel using the first 2 holes to make an arm of the grabber

Large Gear
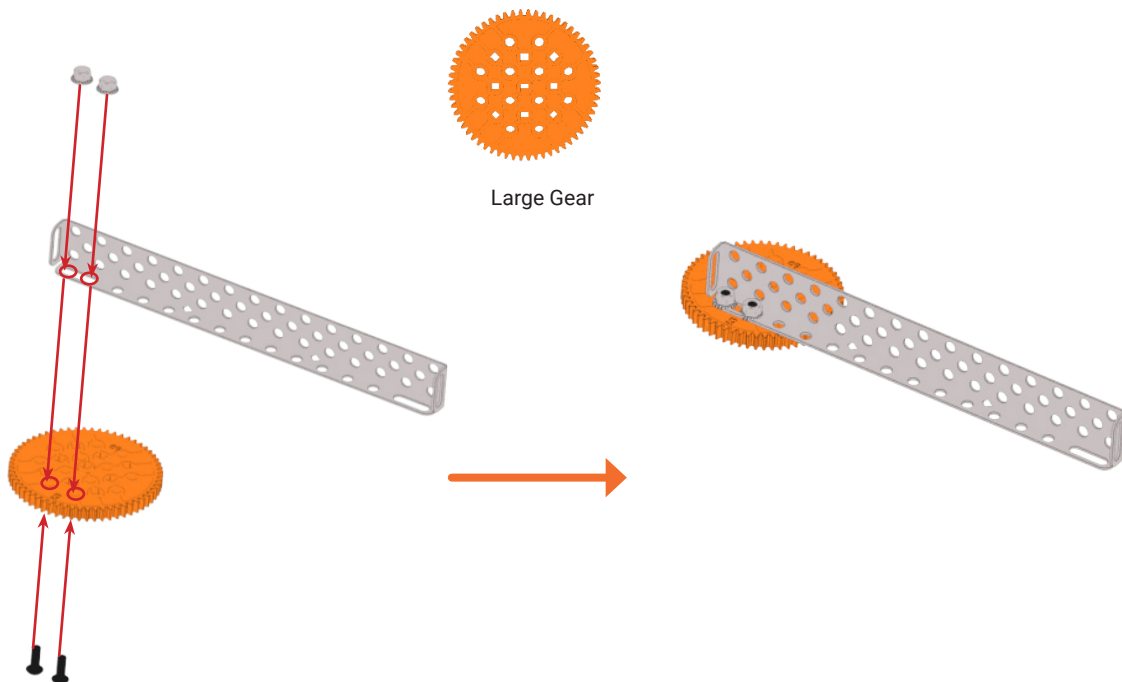
8   Make the opposite arm similarly.

Large Gear

9   Connect the first arm on the axle of the motor, below the arm attach a filler and then attach the arm and lock it up with an axle lock.

**10** Similarly connect the second arm on the free axle present.

**11** Take one 5.5" axle and using axle locks above and below the on the 2nd hole of the 5th row of the square plate, lock it up to restric the movement of the arm.
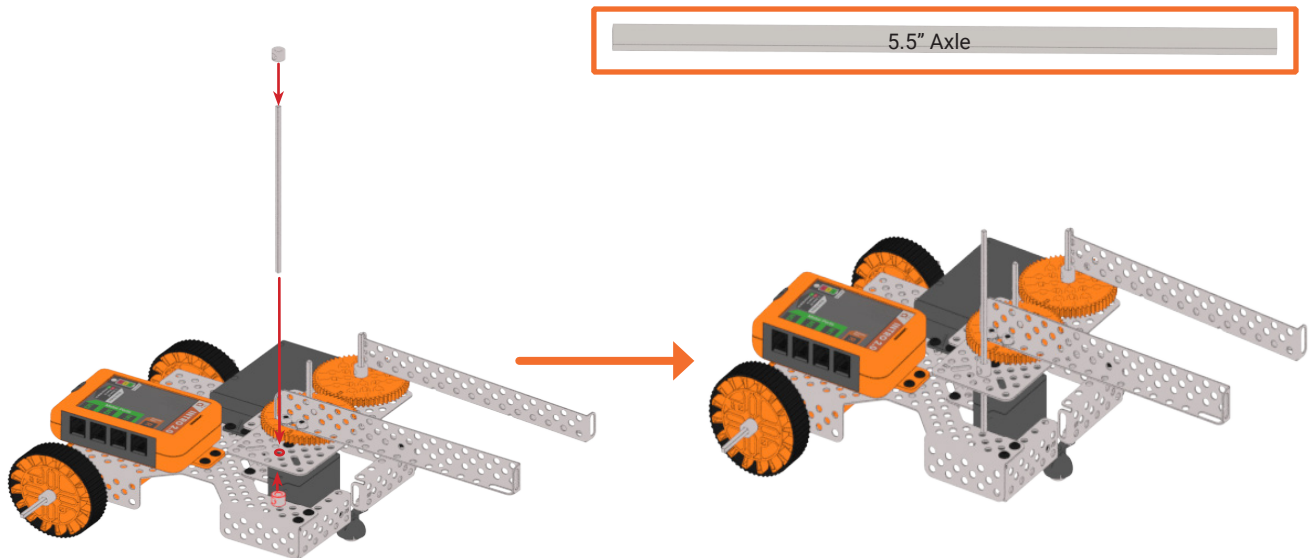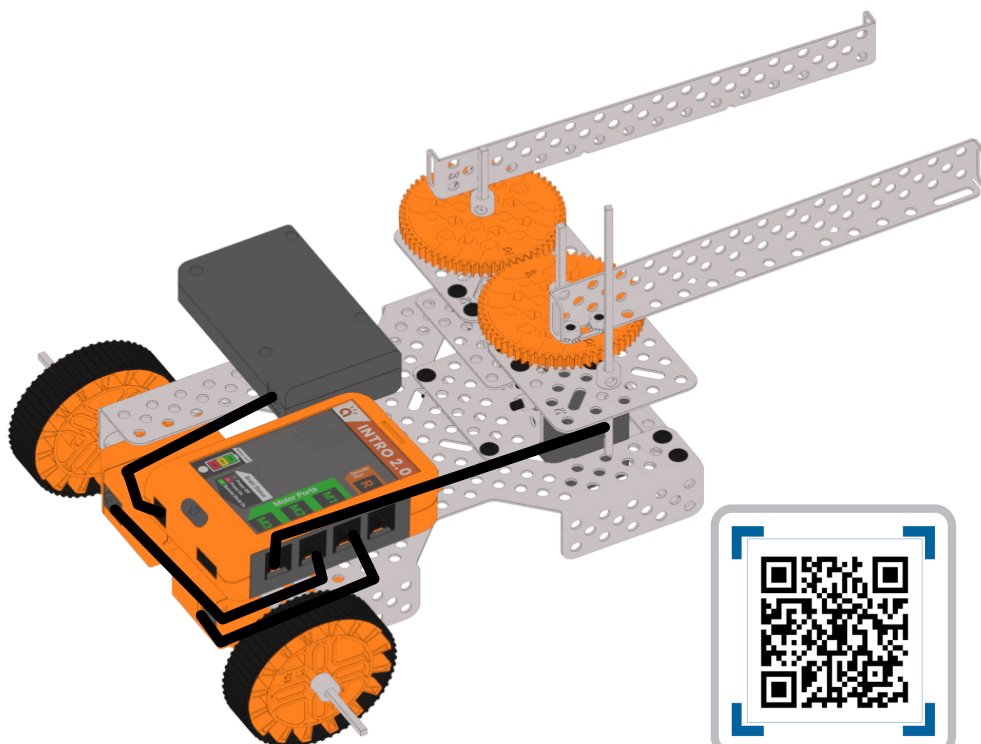
5.5" Axle

12 Attach the battery cable to both the brain and battery, and connect the motors to the brain.

**Battery Brain connection**
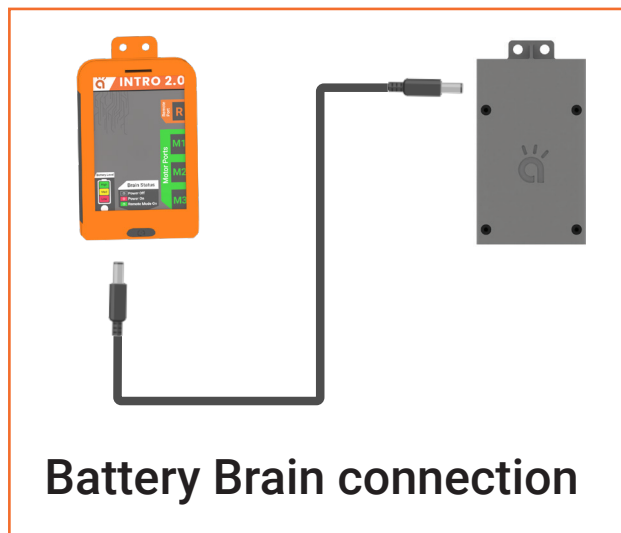
- **Connect Right speed motor to M1 port.**
- **Connect Left speed motor to M2 port.**
- **Connect arm torque motor to M3 port.**

Scan the QR to upload the project

# 5. Moving Windmill Robot
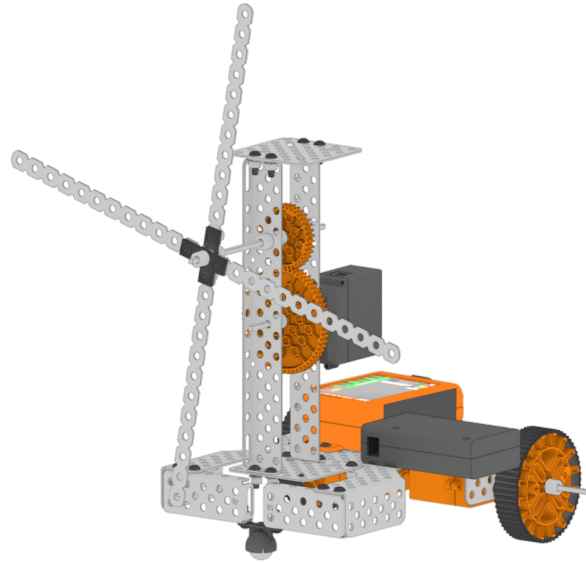


A windmill is one of the best sources of renewable energry, mostly windmills are fixed this is a moving one.

## What is our task?

Design and construct a windmill which can move.

## What will you learn?



Motor control and interfacing techniques



Remote operation



Robust Construction



Input to output transformations
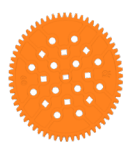


Mechanical Chassis Design
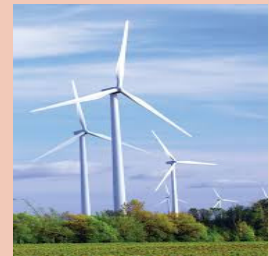


A windmill is a machine that uses wind power to generate mechanical energy, which can be used for various tasks like grinding grain, pumping water, or generating electricity. Modern windmills, often called wind turbines, are widely used to produce electricity, with large groups of them forming wind farms.

# What will you need?

| | | | |
|---|---|---|---|
| Intro Brain x 1 | Battery x 1 | High Speed Motor x 2 | High Torque Motor x 1 |
| Manual Remote x 1 | 2.5" U-Beam x 2 | Square plate x 2 | 12.5" Flexible Strip x 2 |
| 7.5" L-Beam x1 | Chasis x 1 | 3.5" Axle x 3 | 5.5" Axle x 1 |
| Connecting Cables x 3 | Remote Cable x 1 | DC Battery Connecting Cable x 1 | Big Spur Gear x 1 |
| Medium Spur Gear x1 | Small Wheels x 2 | Axle locks x 11 | Castor Wheel x 1 |
| Nuts & bolts x 24 | Fillers x 2 | Three hole connector x 2 | |

# Let's Build!

1    Refer project1 for this construction.
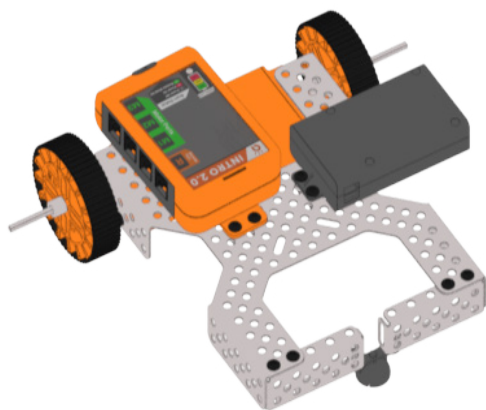
2 | Attach a square plate using the 1st and 5th hole of the first row on the 3rd and 8th hole of the 1st row of the chasis.
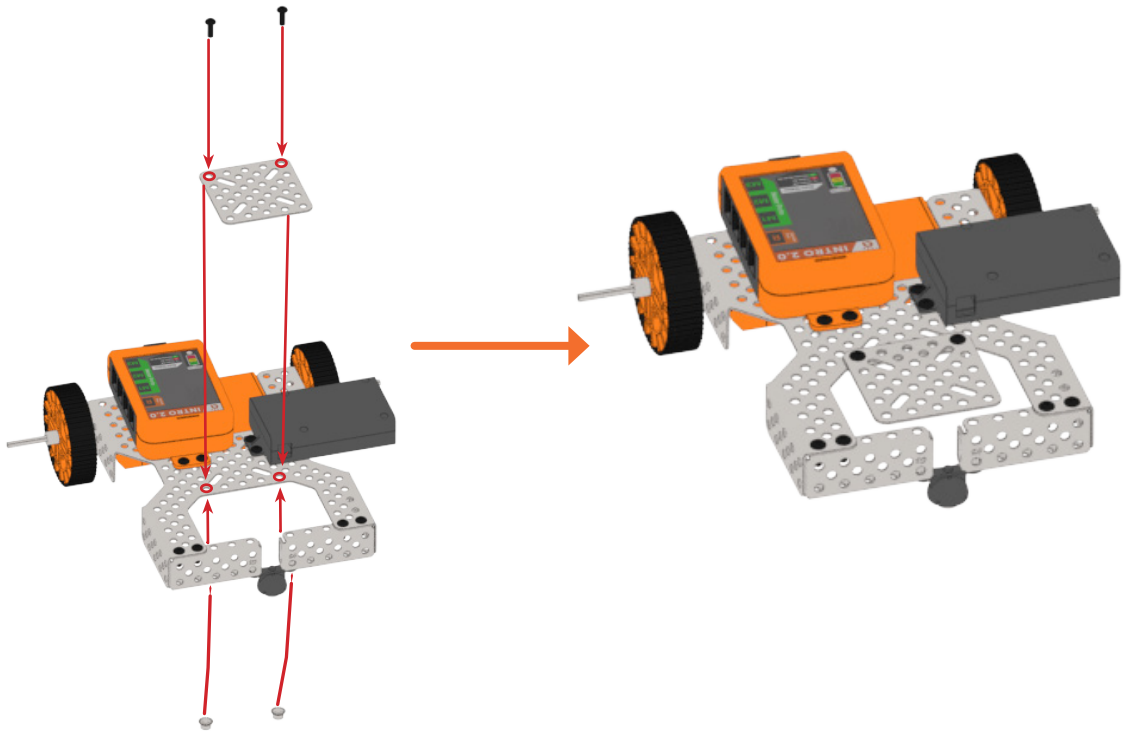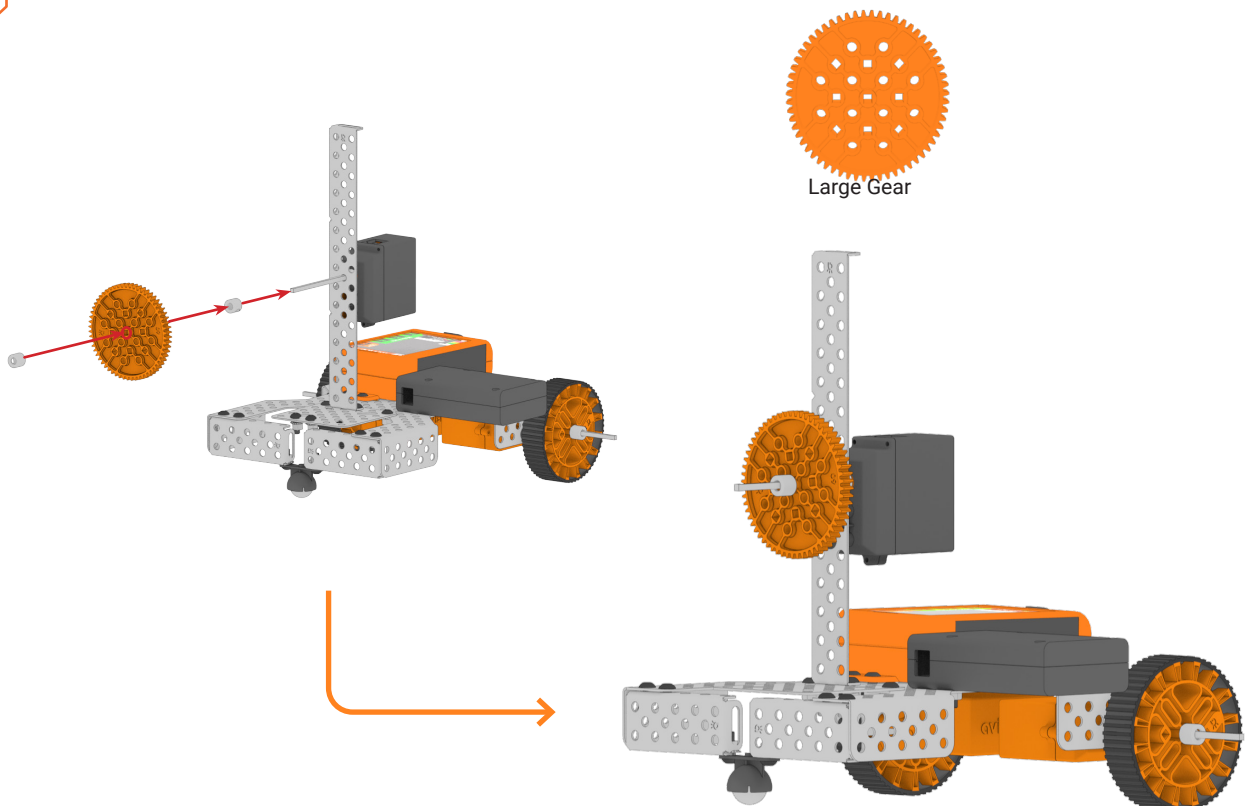
3 | Take another 7.5" L-beam and attach using the 2nd and 3rd hole of the 1st row of the square plate.

2ⁿᵈHole
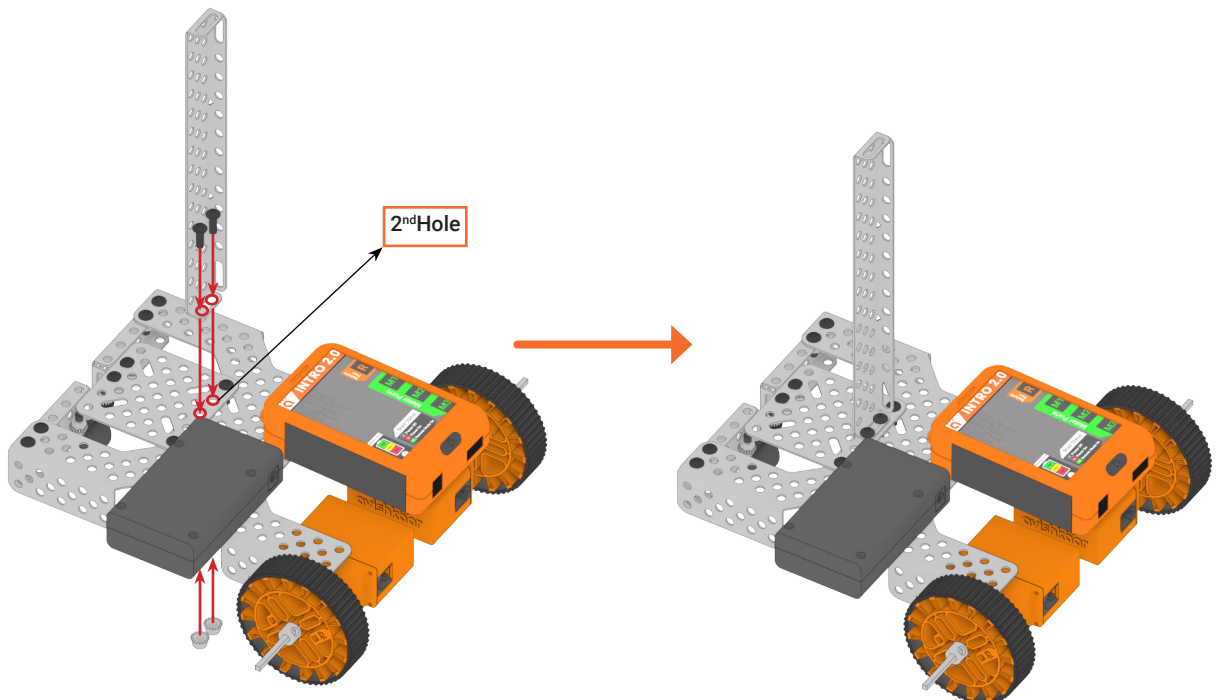
**4** Take one motor and attach it's axle to the 7th hole of the middle row of the L-Beam and it's bolts to the 5th and 6th hole of the same row.
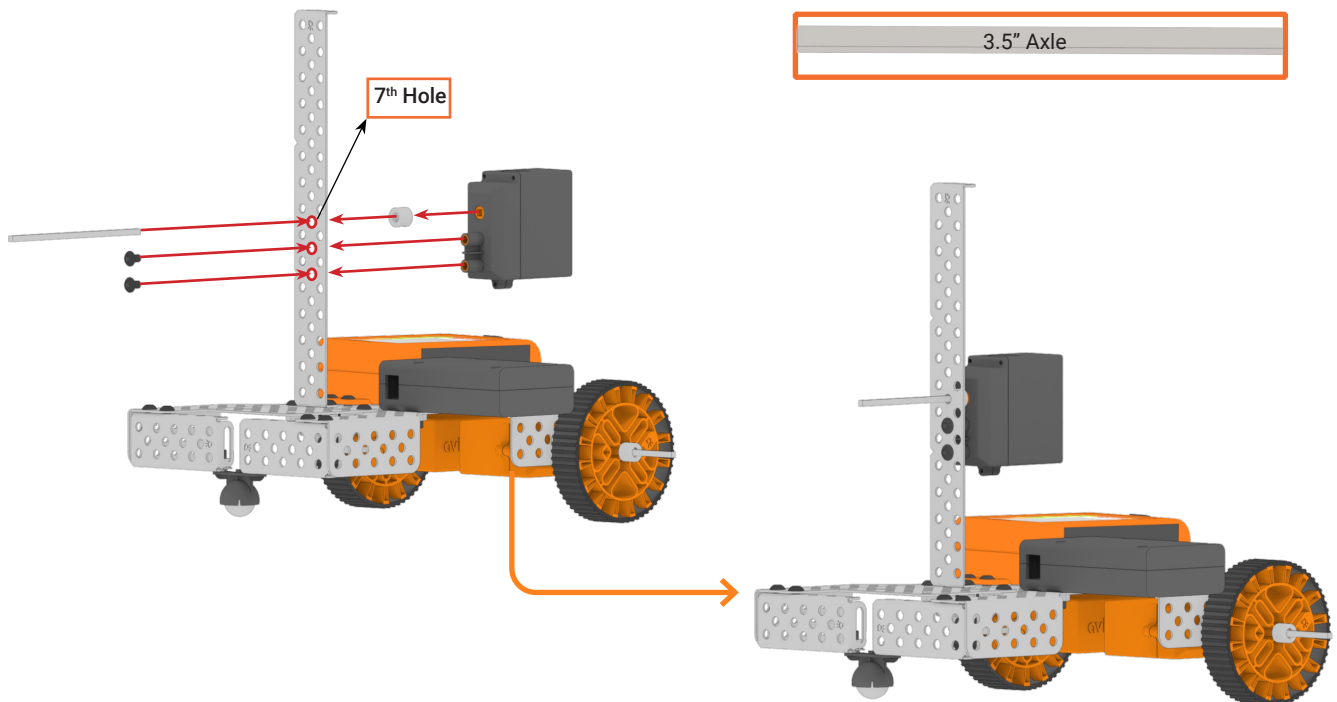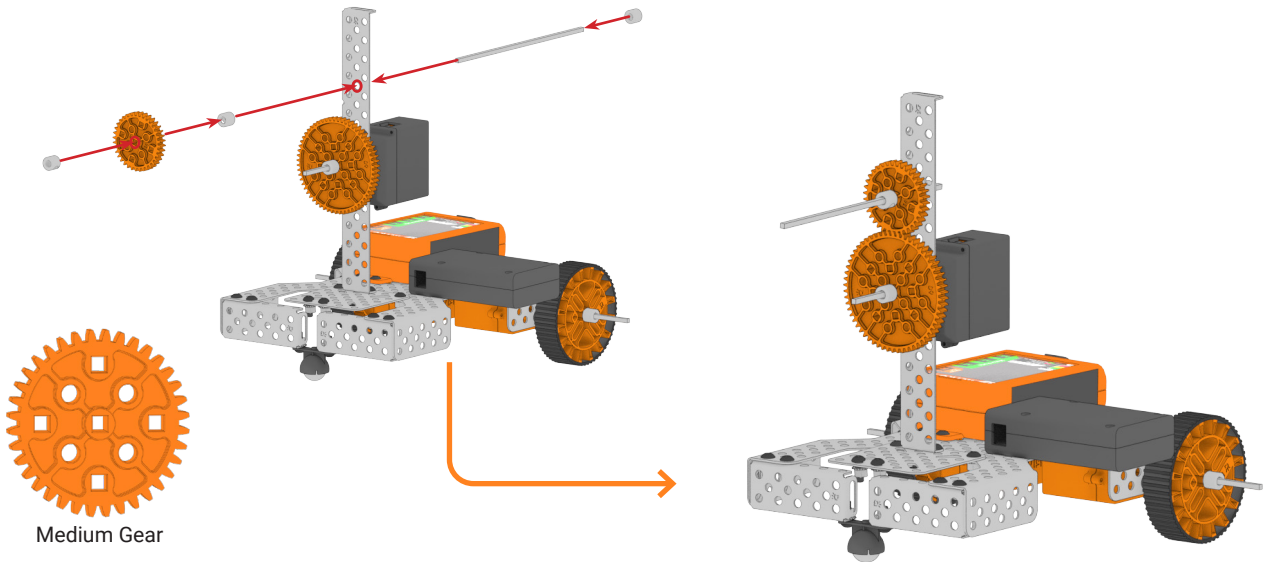
7th Hole

3.5" Axle

**5** Attach one axle lock, big spur gear and then again an axle lock on the 3.5" axle.
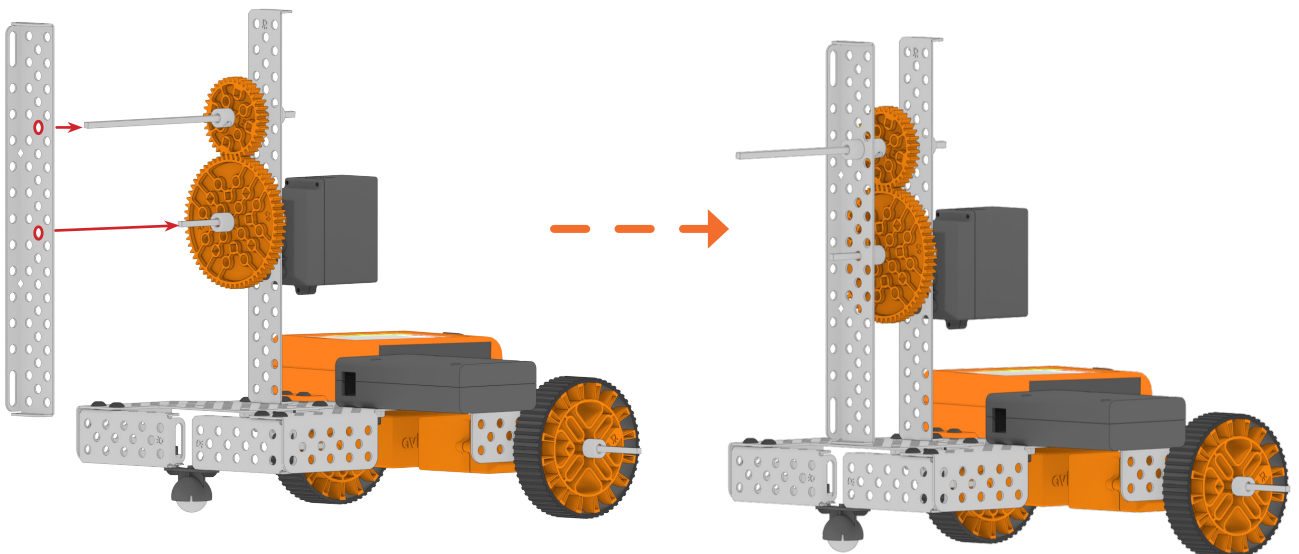
Large Gear

**6** Attach one axle lock, small spur gear and then again an axle lock and the 5.5" axle on the 4th hole of the middle row of the L-Beam, also attach one more axle lock from behind to lock the axle.
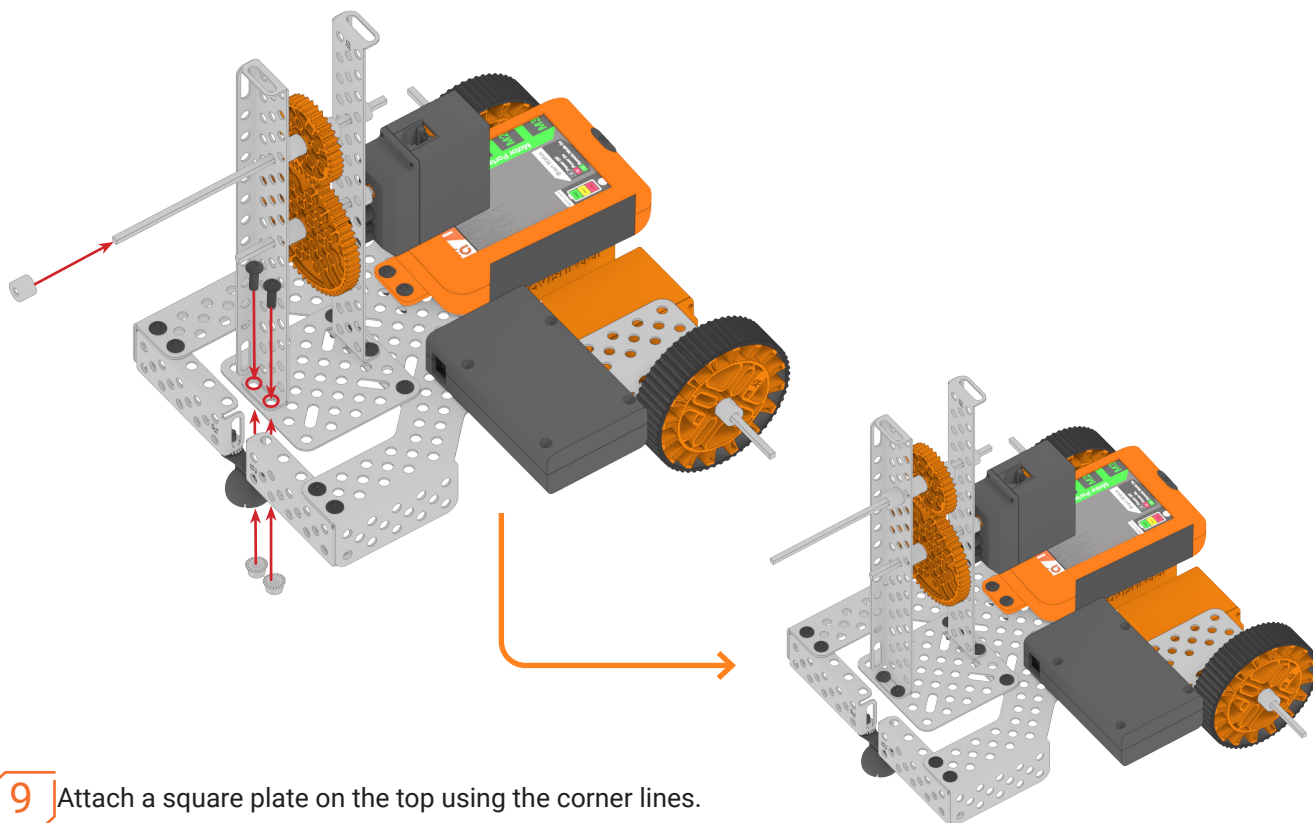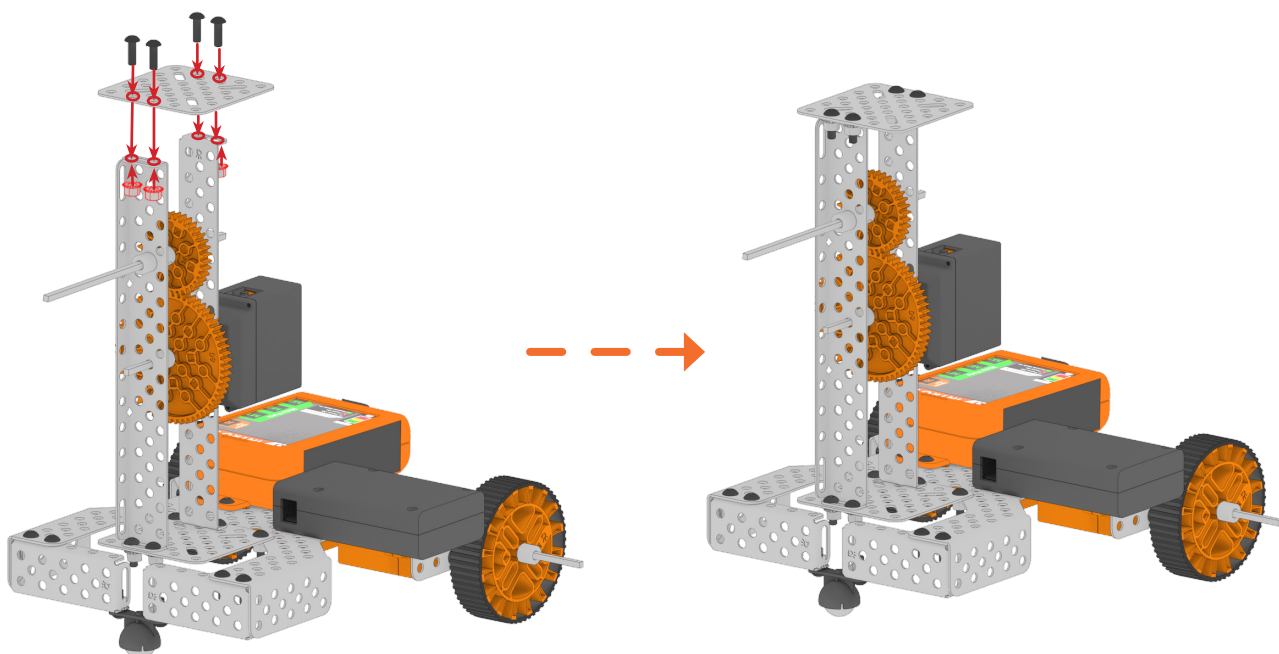
5.5" Axle

Medium Gear

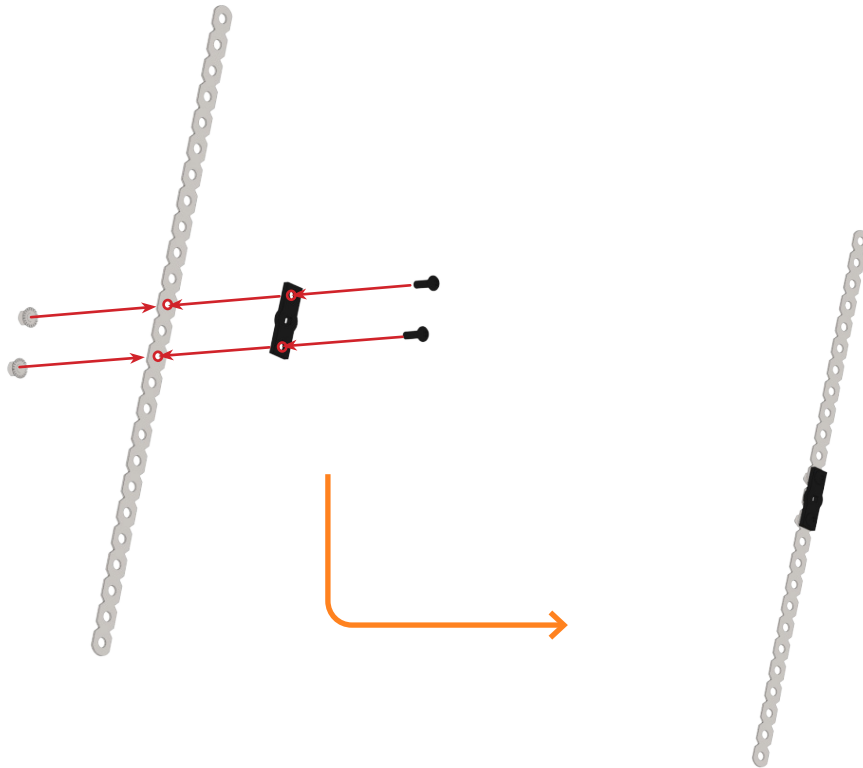**7** Take a 7.5" L-Beam and attach that similarly in the front of the previos L-Beam.

8 Attach the beam using the 2nd and 3rd hole of the first row of the square plate, also lock the axle using the axle lock.
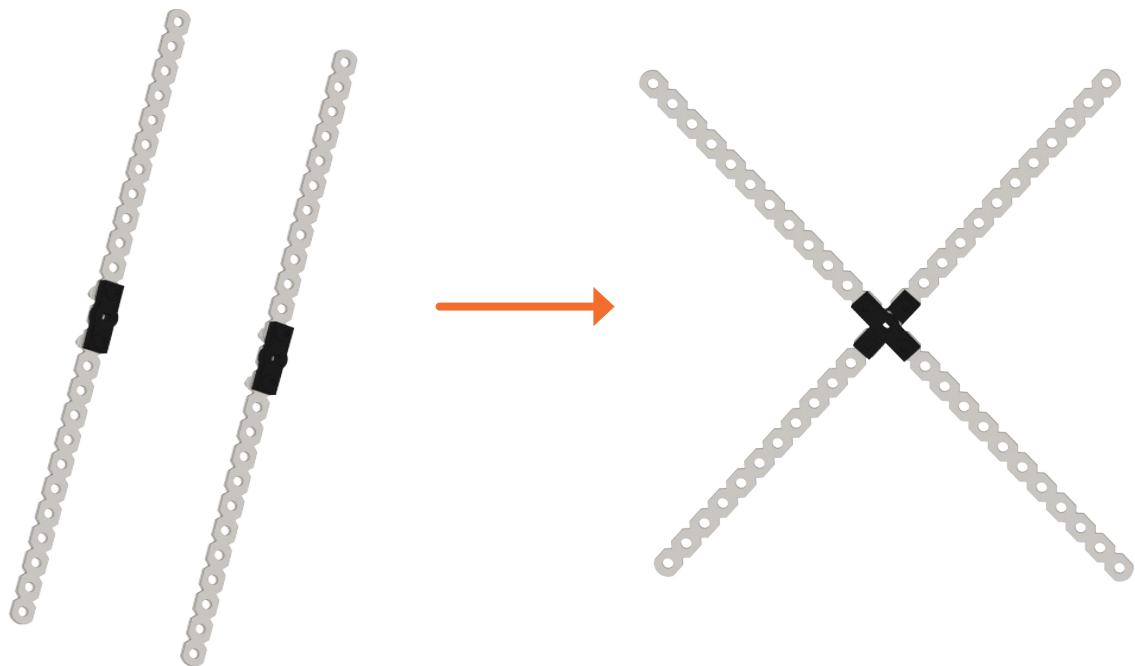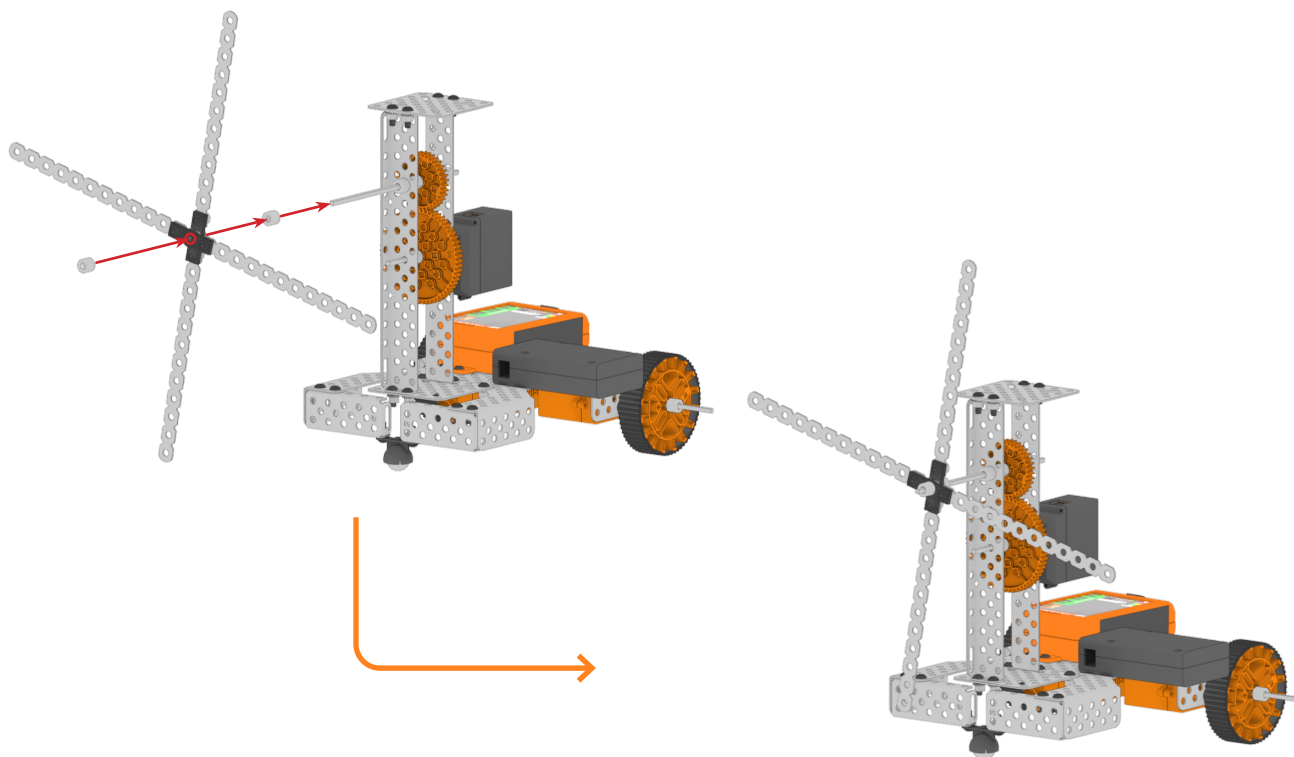
9 Attach a square plate on the top using the corner lines.

**10** Take another 12.5" flexible strip and attach a three hole connector on the 12th and 14th hole of the flexible strip.
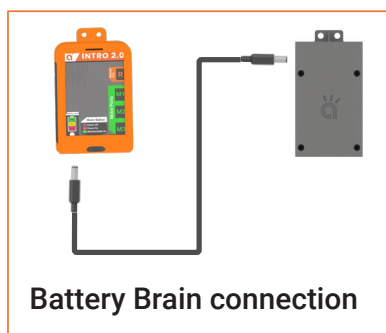
**11** Make two of them and place them like an X shape to make the propellor/fan of the windmill.

12 Attach the propellor using an axle lock before and after the propellor.



13 Attach the battery cable to both the brain and battery, and connect the motors to the brain.
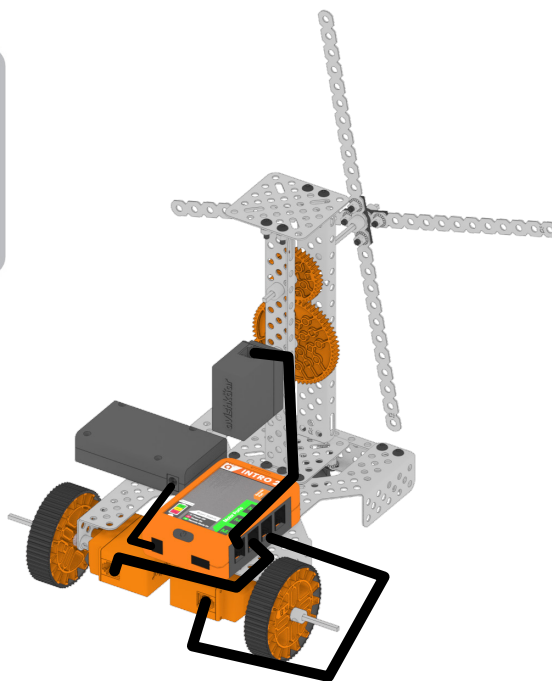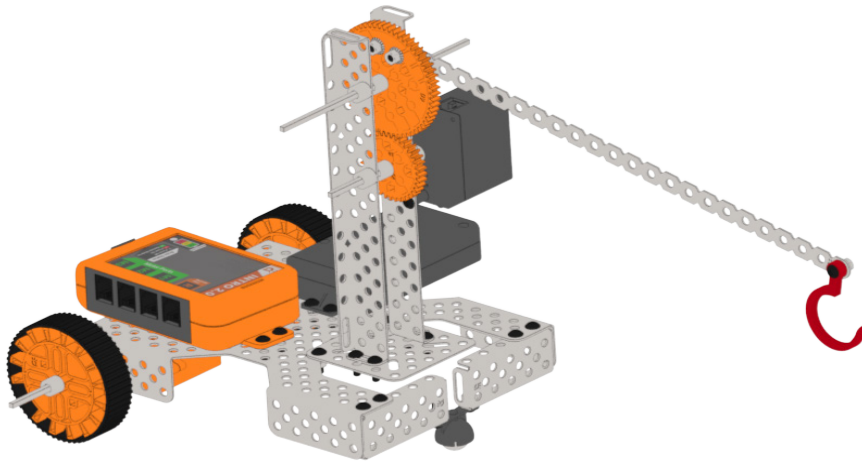


Battery Brain connection

Scan the QR to upload the project

- **Connect Right speed motor to M1 port.**
- **Connect Left speed motor to M2 port.**
- **Connect Windmill torque motor to M3 port.**

# 6. Simple Crane Robot

A Crane Robot is a dynamic robotic crane equipped with a hook mechanism for lifting objects. It incorporates a gear mechanism with large and medium gears to amplify torque, enabling efficient lifting capabilities.

## What is our task?

Design and construct a sturdy crane structure capable of supporting the hook mechanism and gear system.

## What will you learn?

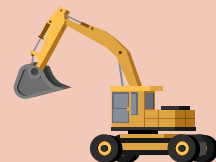Motor control and interfacing techniques

Remote operation

Robust Construction

Input to output transformations
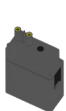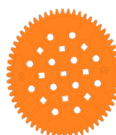
Mechanical Chassis Design

Mechanical Advantage, by using a combination of medium and large gears, simple crane demonstrates the concept of mechanical advantage allowing the robot to lift heavier objects with less motor power.

# What will you need?

| | | | |
|---|---|---|---|
| Intro Brain x 1 | Battery x 1 | High Speed Motor x 2 | High Torque Motor x 1 |
| Manual Remote x 1 | 2.5" U-Beam x 2 | Square plate x 2 | 12.5" Flexible Strip x 1 |
| 7.5" L-Beam x1 | Chasis x 1 | 3.5" Axle x 3 | 5.5" Axle x 1 |
| Connecting Cables x 3 | Remote Cable x 1 | DC Battery Connecting Cable x 1 | Big Spur Gear x 1 |
| Medium Spur Gear x 1 | Small Wheels x 2 | Axle locks x 10 | Castor Wheel x 1 |
| Nuts & bolts x 23 | Fillers x 4 | Hook x1 | |

# Let's Build!

1. Refer project1 for this construction.
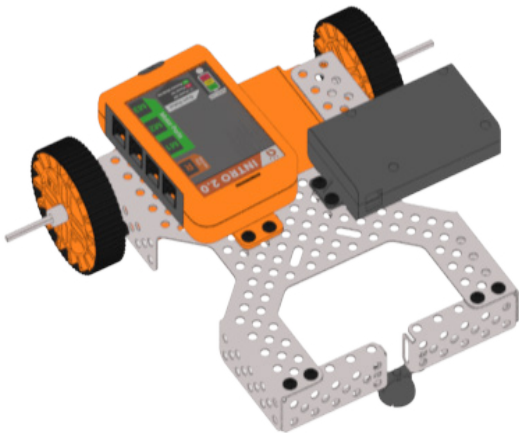
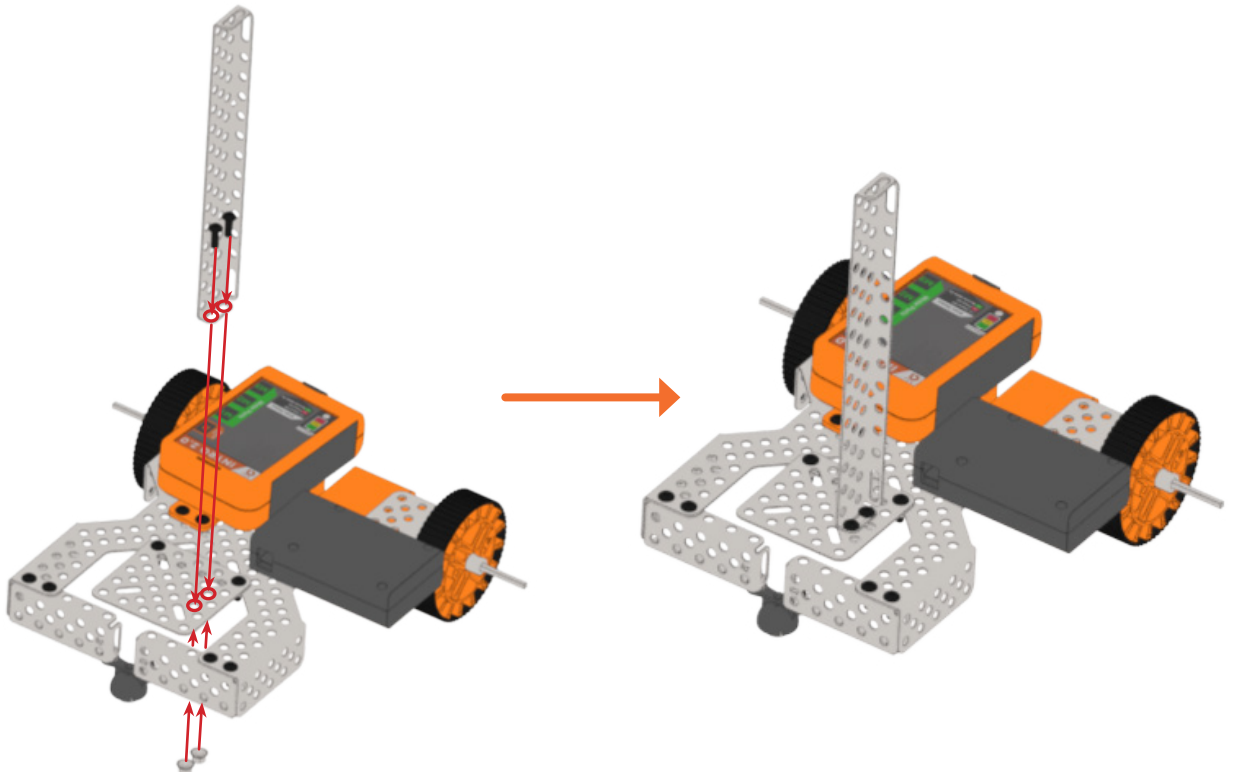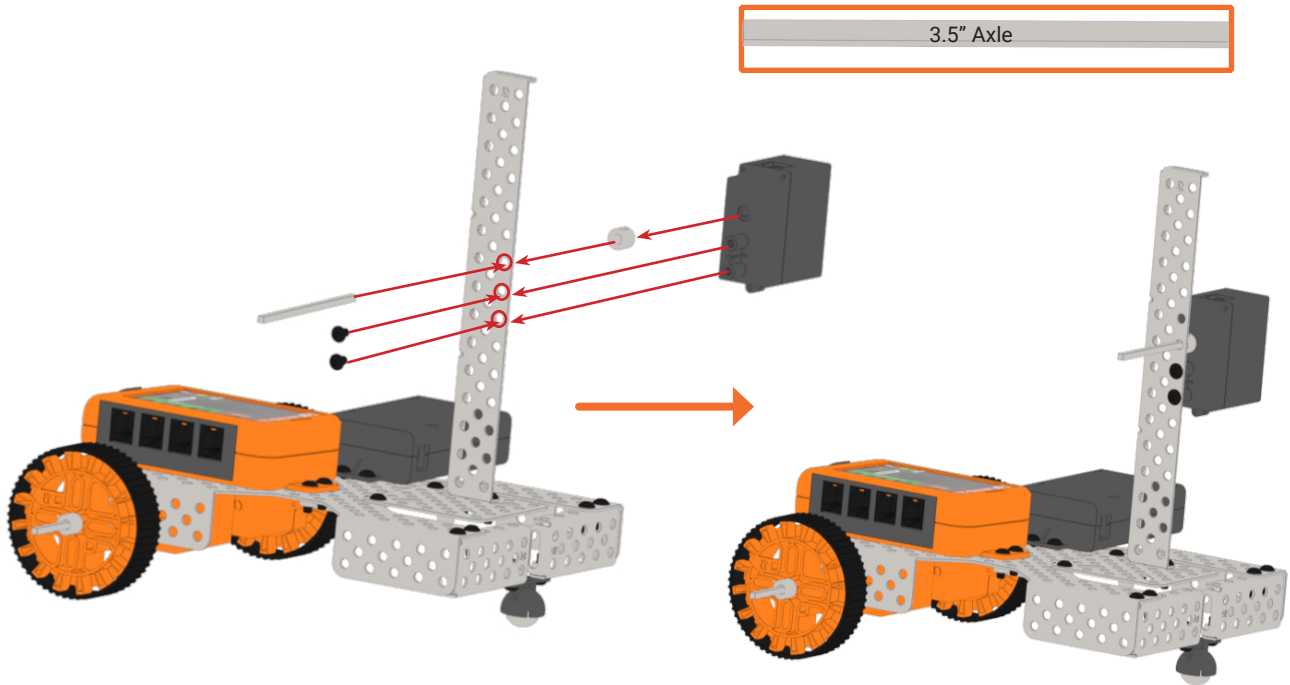2 Attach a square plate using the 1st and 5th hole of the first row on the 3rd and 8th hole of the 1st row of the chasis.
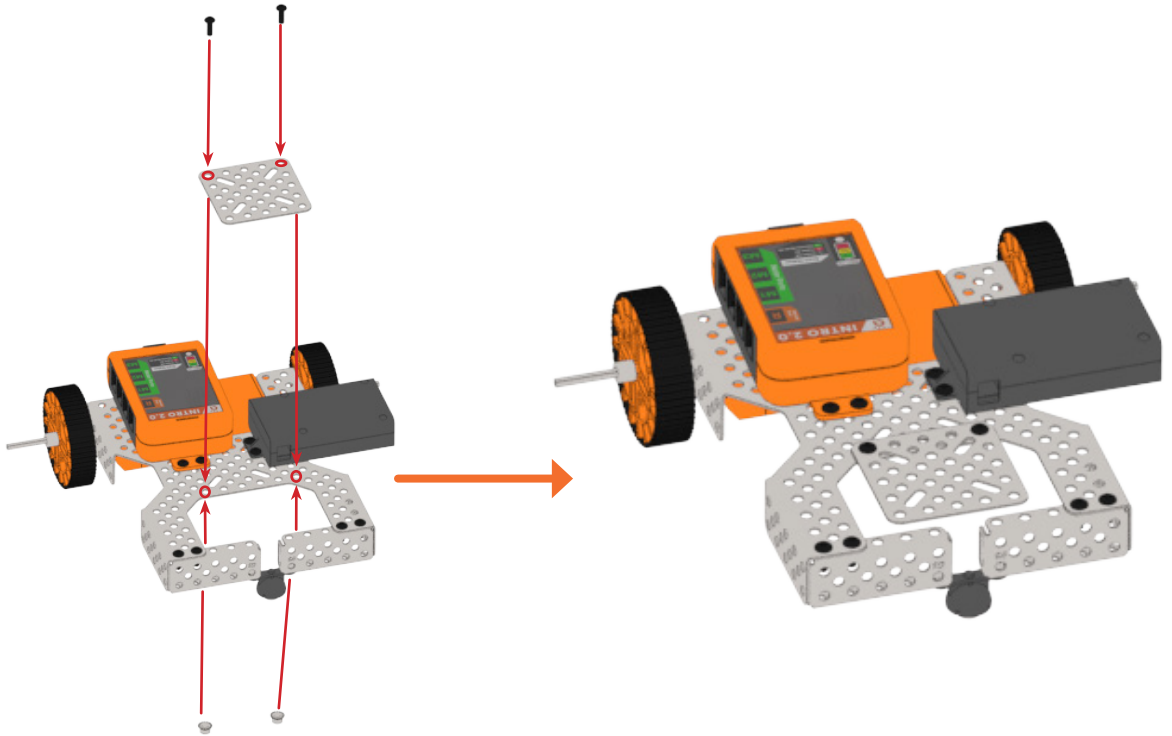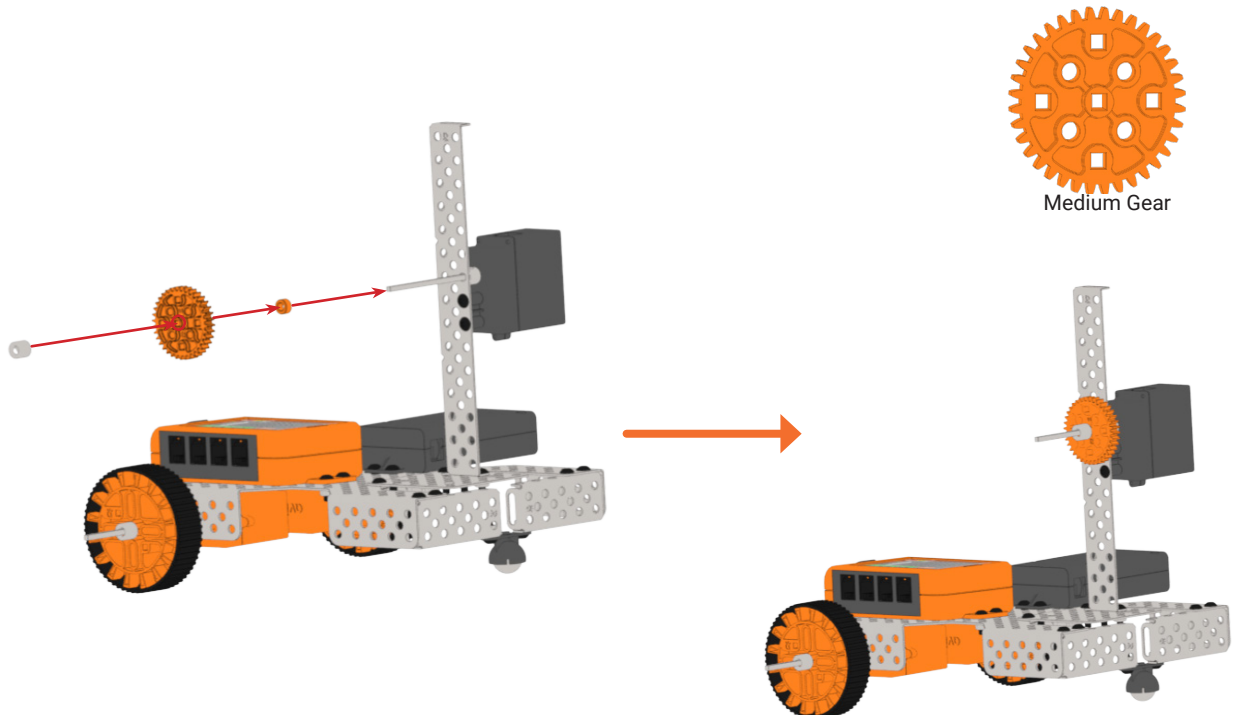
3 Take another 7.5" L-beam and attach using the 1st hole of the 4th and 6th row of the square plate.

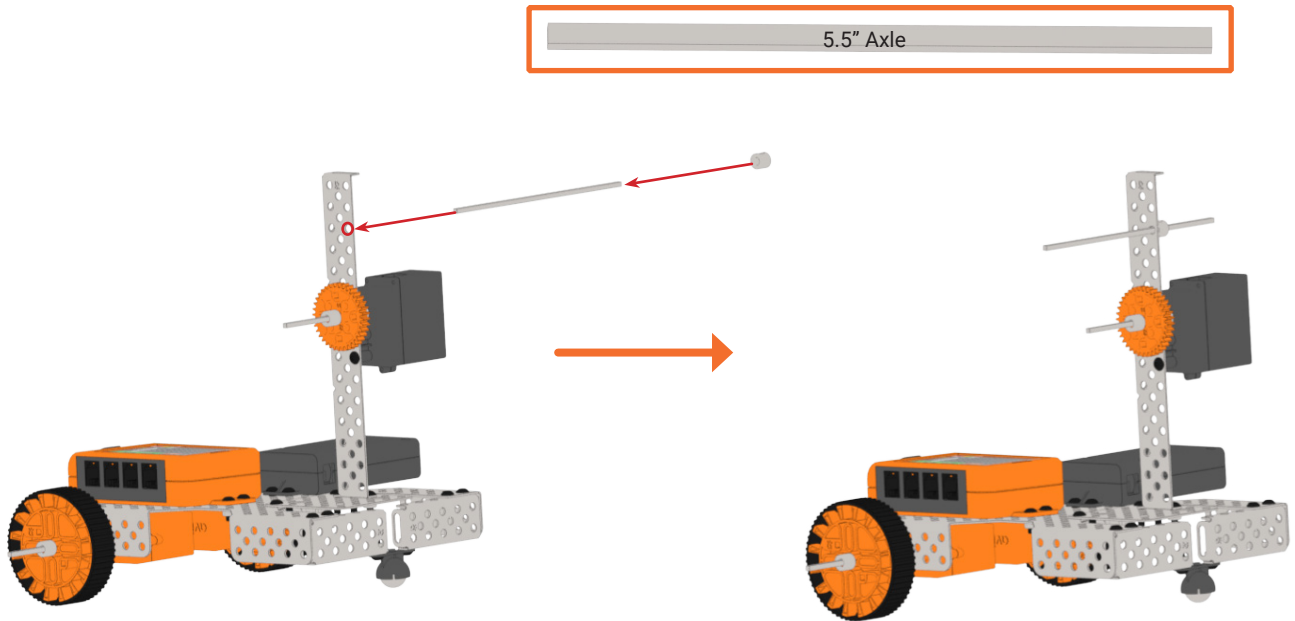**4** Take one high torque motor, using 1st row, attach it's axle to the 7th hole and bolts to 8th and 9th hole of the L-Beam.
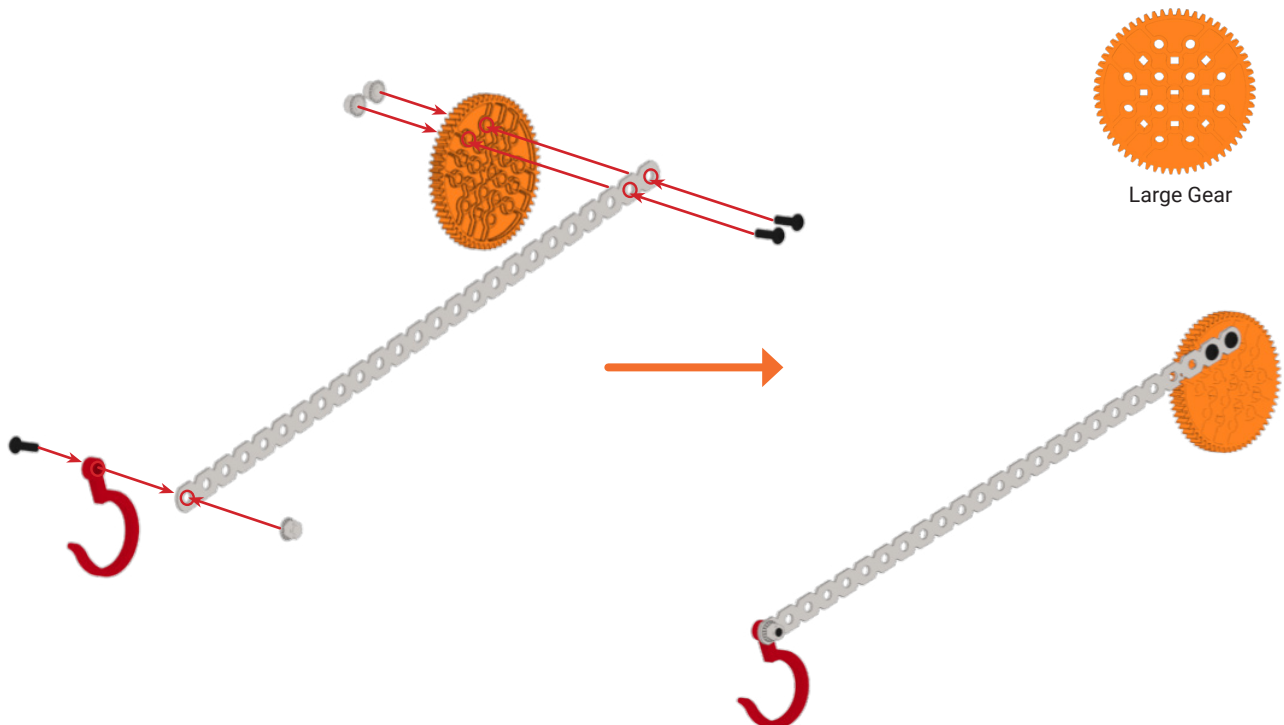
3.5" Axle

**5** Attach one filler, medium spur gear and then axle lock on the 3.5" axle.
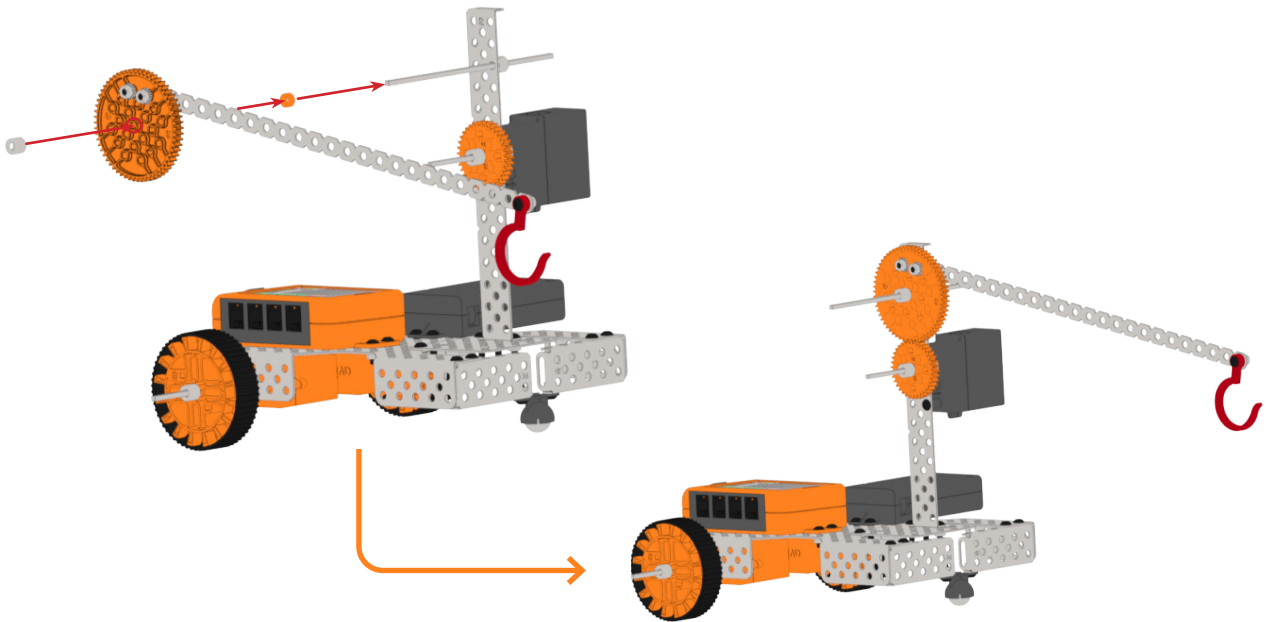
Medium Gear

Take one 5.5" Axle and attach it with an axle lock using the 3rd hole of the first row .

5.5" Axle



Take one big spur gear and join it with the 1st and 2nd hole of the 12.5" flexible strip with the two adjacent holes of the big spur gear.

Large Gear
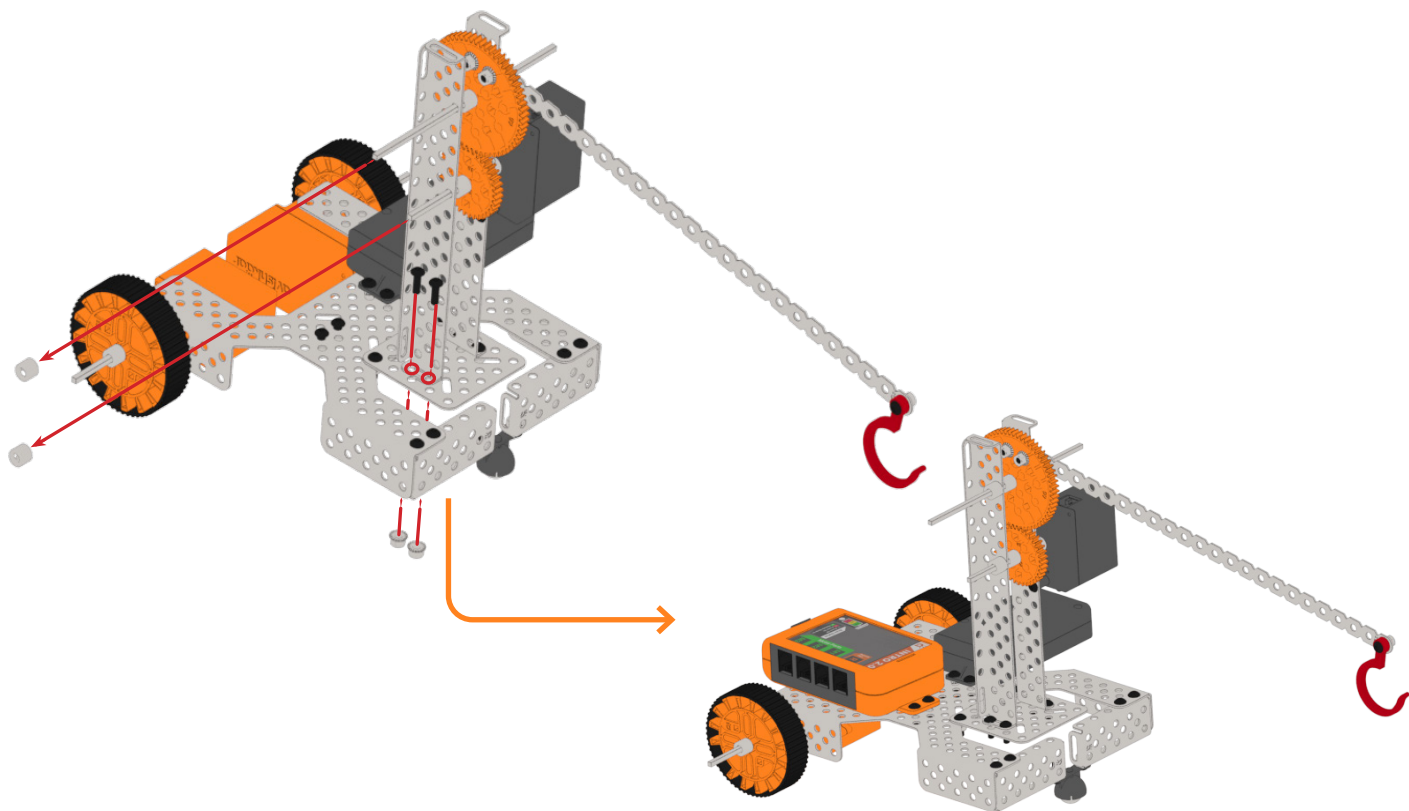
Attach a filler, the arm made using the middle hole of the big spur gear, and lock it up using an axle lock.
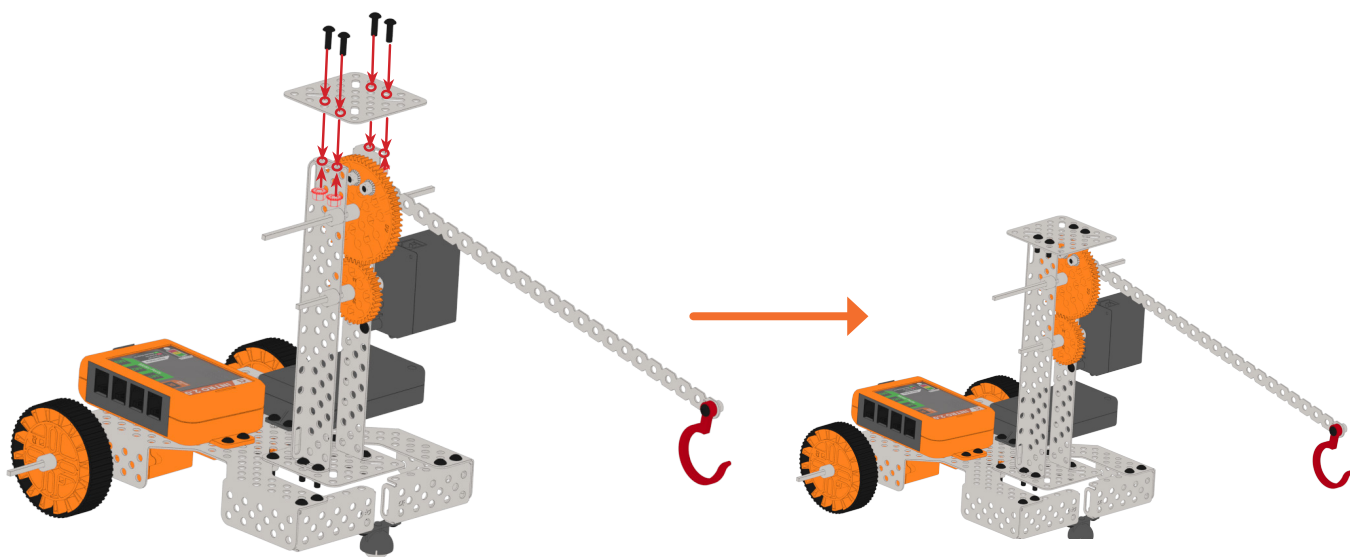
9 Take one 7.5" L-Beam and attach to the axles.
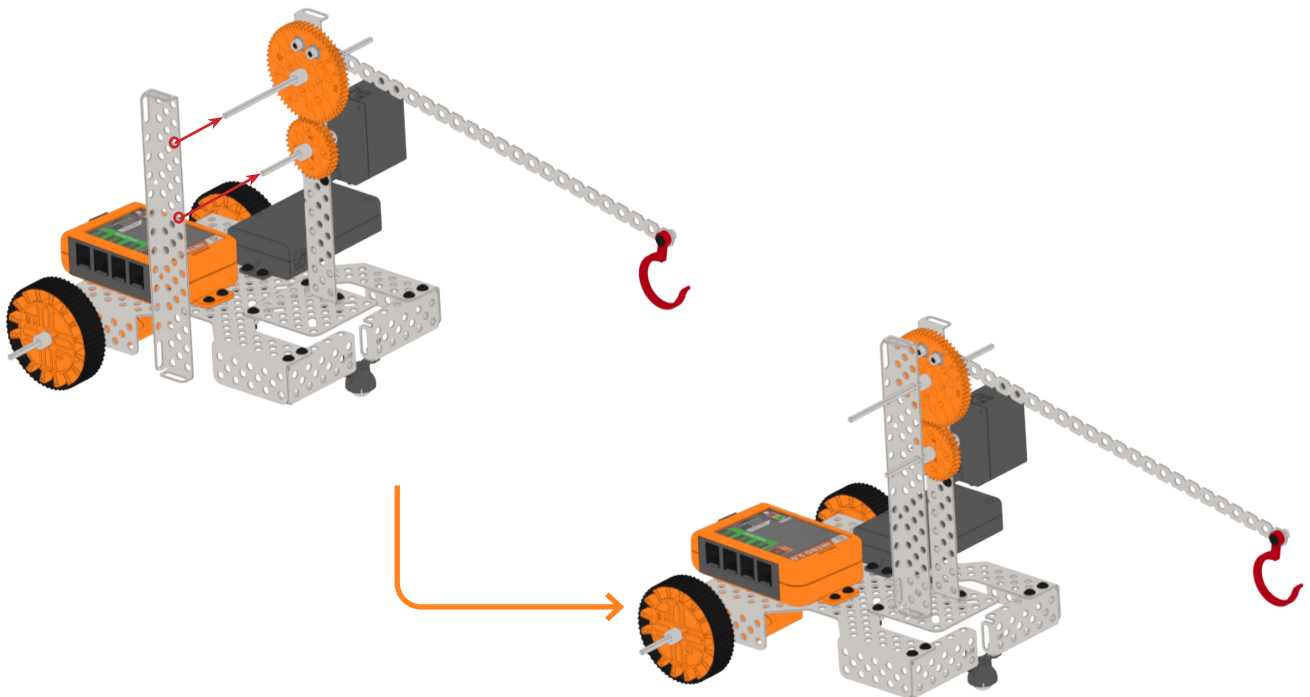
**10** Attach a filler, the arm made using the middle hole of the big spur gear, and lock it up using an axle lock.
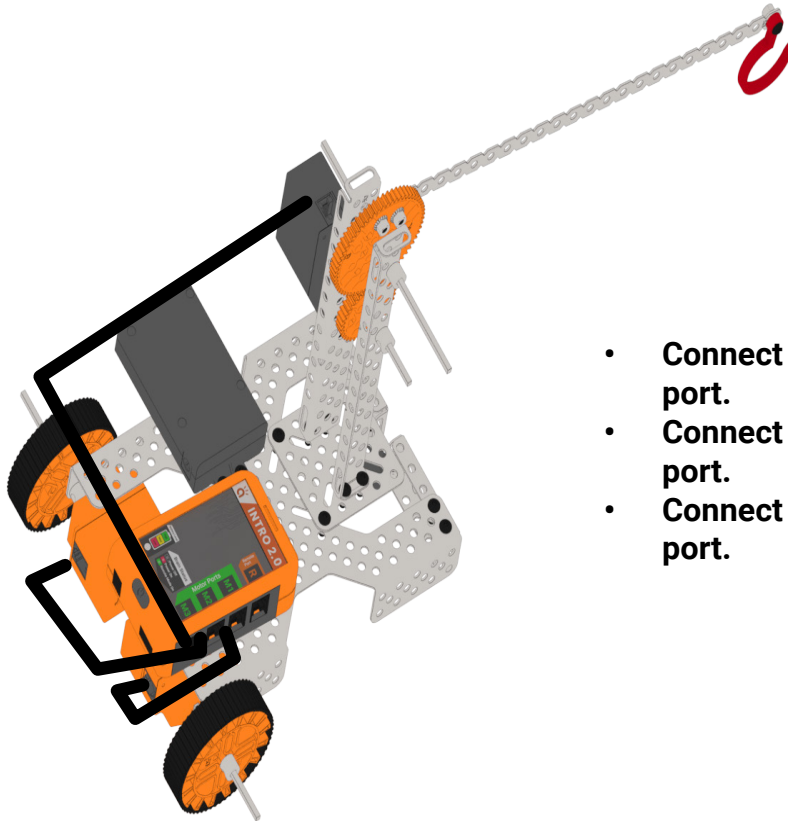
**11** Attach a filler, the arm made using the middle hole of the big spur gear, and lock it up using an axle lock.

**12** Attach the battery cable to both the brain and battery, and connect the motors to the brain.
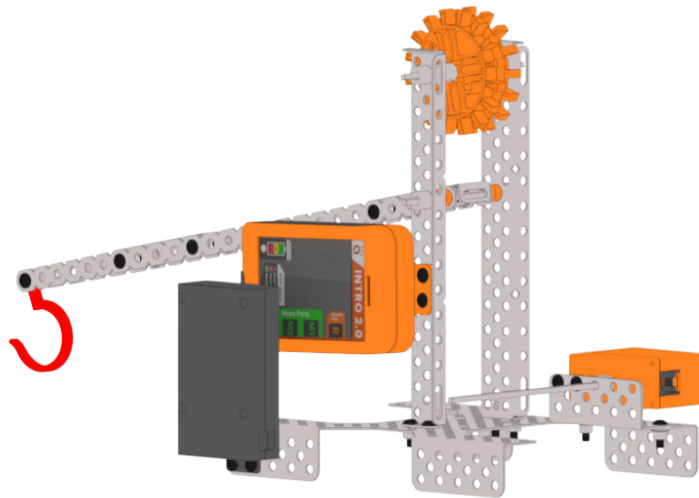


# Battery Brain connection
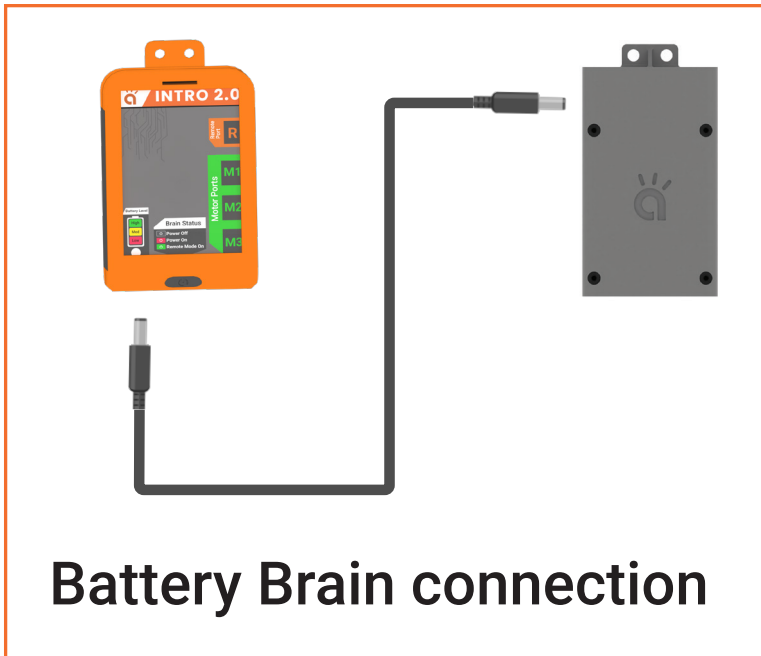
- **Connect Right speed motor to M1 port.**
- **Connect Left speed motor to M2 port.**
- **Connect crane torque motor to M3 port.**

# 7. Single pulley construction lift

Pulley Crane is a type of Simple Machine where the Concept of Pulley is applicable. The heavy weight objects are lifted by the hook and High Torque Motor connected to the pulley of the Crane.

## What is our task?

Create a crane which works using a pulley mechanism to lift heavy objects like the pulley crane. We will create a crane which works using a pulley mechanism to lift heavy objects

## What will you learn?

Remote operation

Motor control and interfacing techniques

Input to output transformations

Pulley concept

The pulley helps make it possible for the crane to lift heavy loads without having to put additional stress on the arm by forcing it to do all of the work, the cables between the motor and the object being lifted is run through a series of cables and pulleys to minimize the amount of work needed to lift the object off

# What will you need?

| | | | |
|---|---|---|---|
| Intro Brain x 1 | Battery x 1 | High Speed Motor x 1 | Pulley x 1 |
| Manual Remote x 1 | Chasis x 1 | 2.5" U-Beam x 2 | 7.5" L-Beam x 2 |
| 12.5" Flexible Strip x 2 | 2.5" U-Beam x 1 | 3.5" Axle x 2 | 5.5" Axle x 1 |
| Connecting Cables x 1 | Remote Cable x 1 | DC Battery Connecting Cable x 1 | Axle locks x 9 |
| Nuts & bolts x 19 | Fillers x 5 | Hook x1 | |

# Let's Build!

**1** Take one 2.5" L-Channel and join its hole 1 and 5 with the chasis at hole 1 & 5of the corner row.
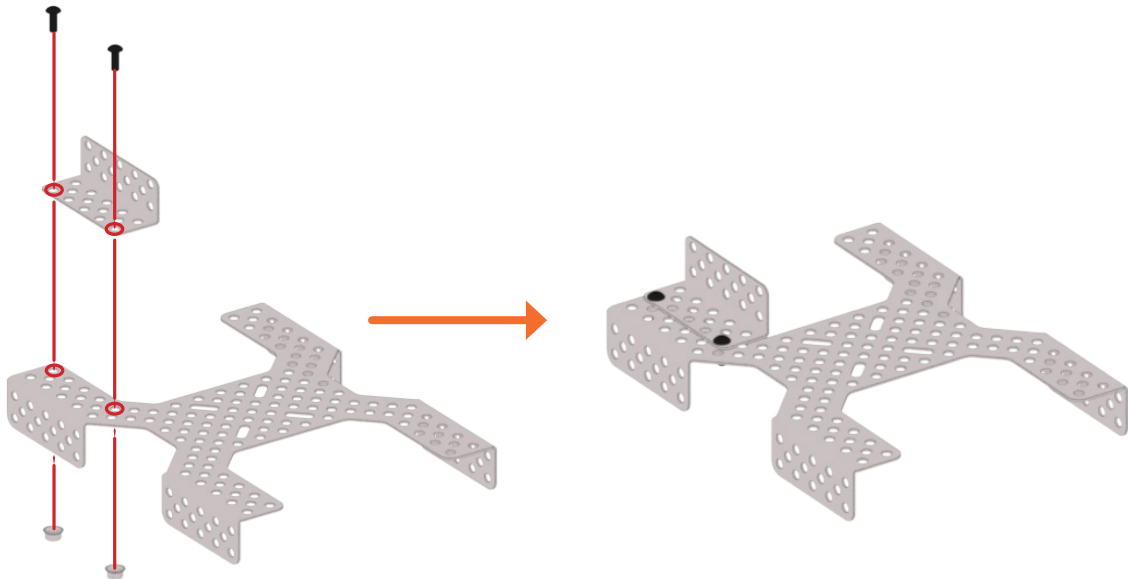
**2** Take one high speed motor and attach it's axle to the center hole of the middle row and besides it add the bolts.

5.5" Axle
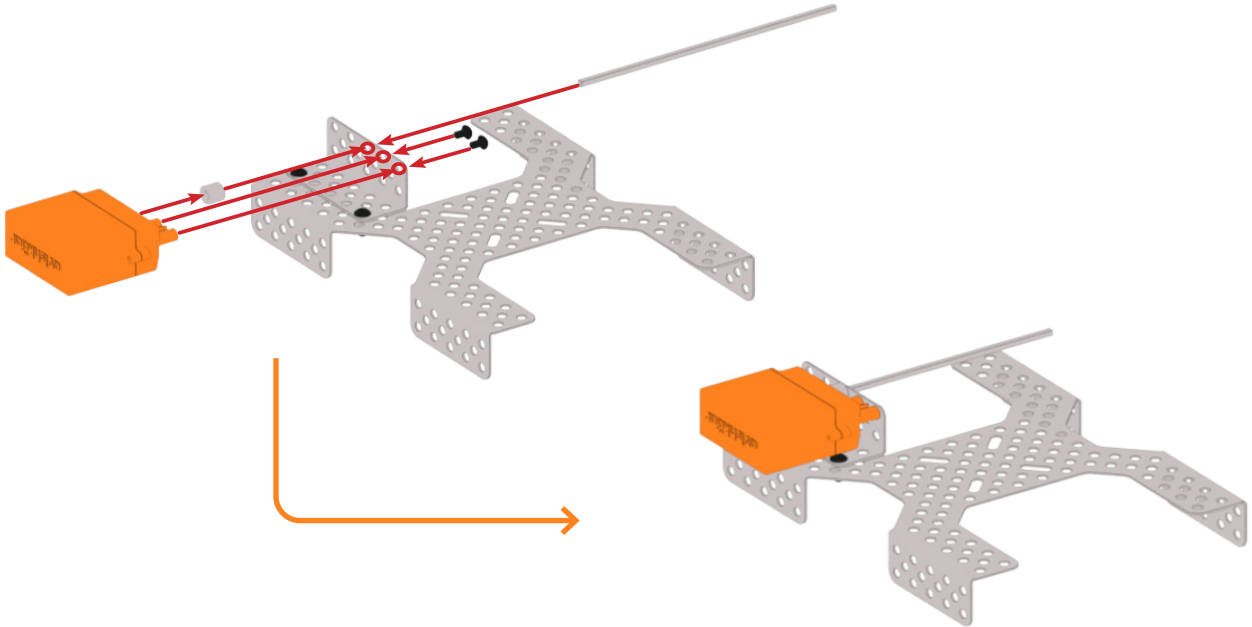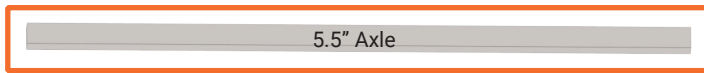
**3** Take another 7.5" L-Channel and join it on the chassis as shown.
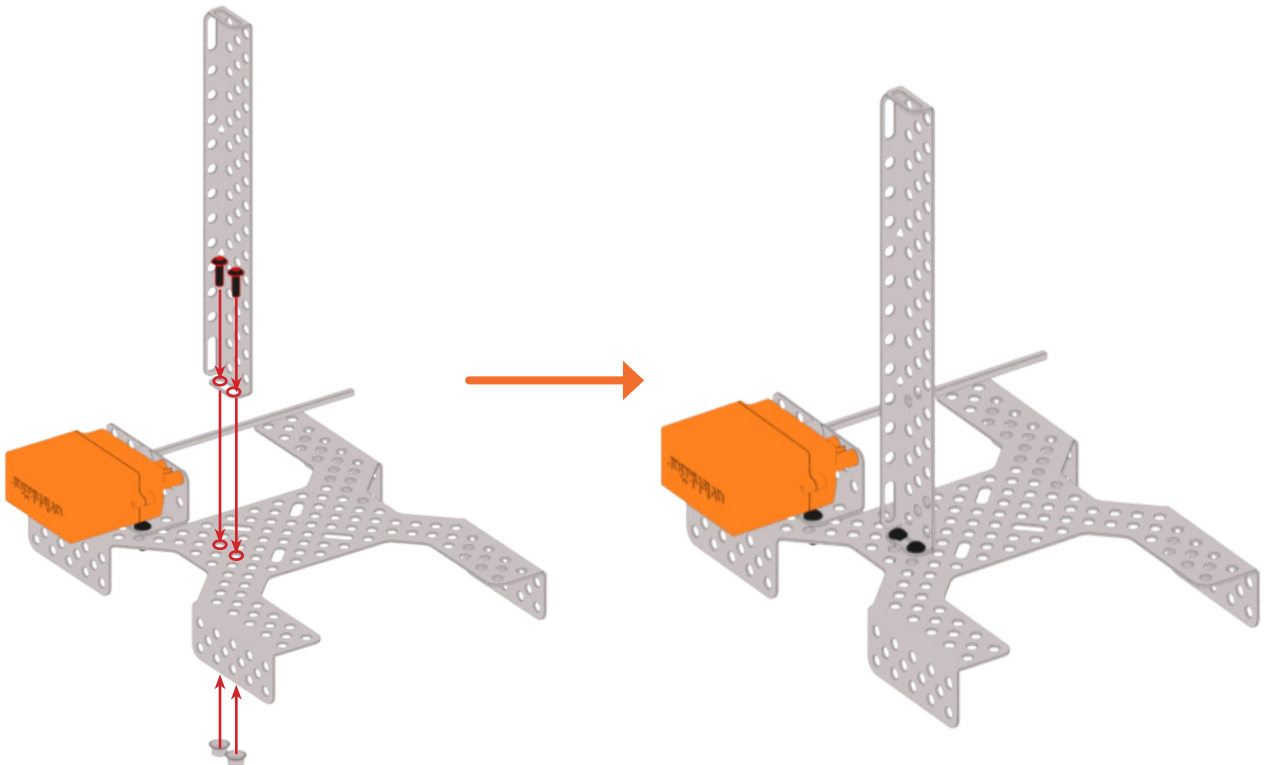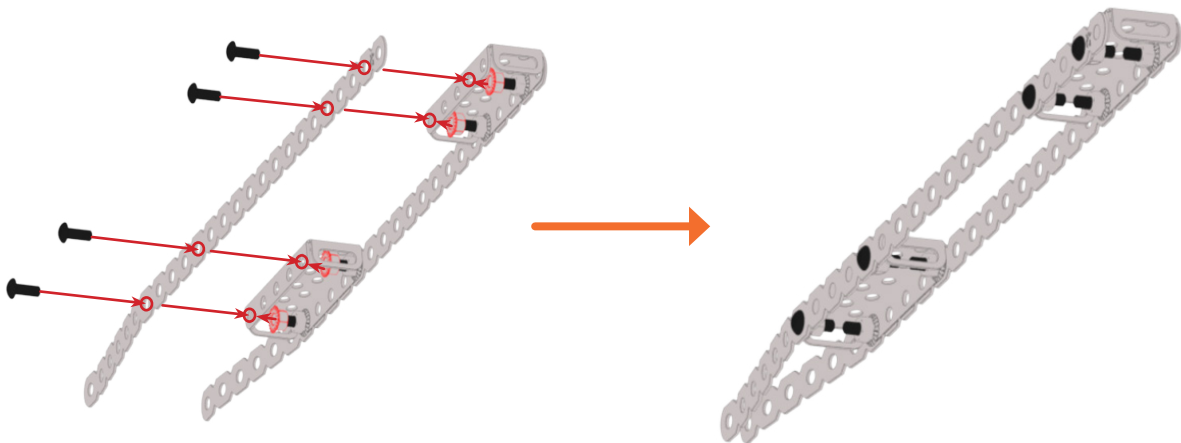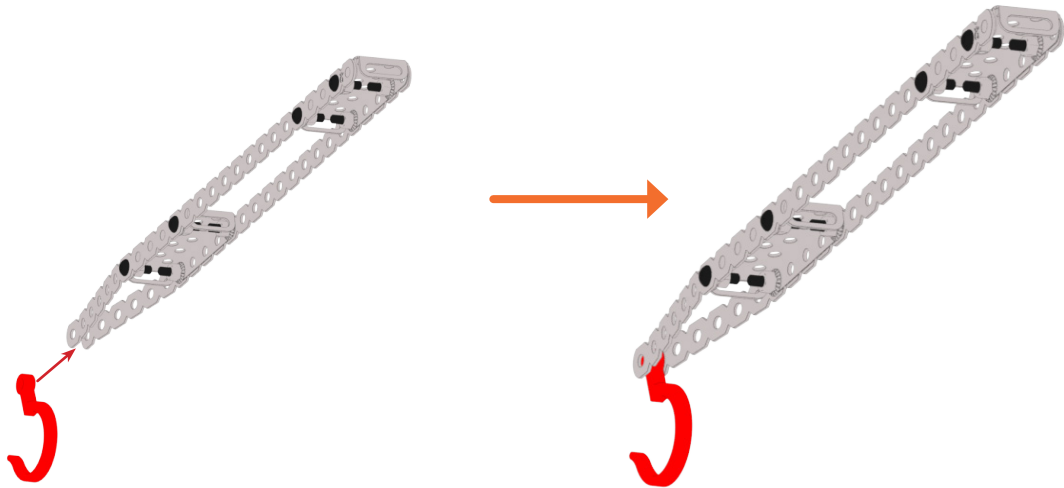
**4** Bend one flexibale strip as shown. Take two 2.5" U-Beam and attach the back one using the 2nd and 5th hole of the flexible strip and the front one using the 15th and the 19th hole.
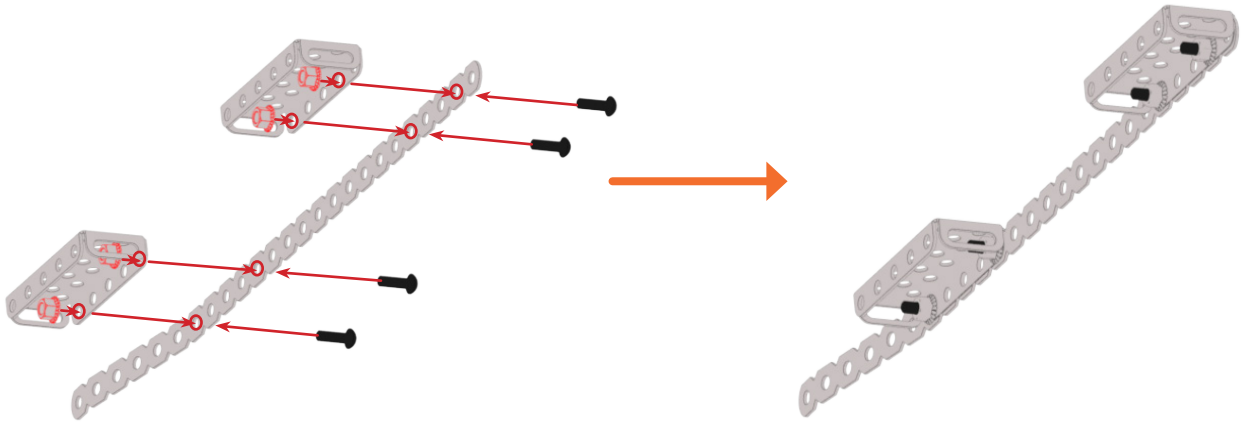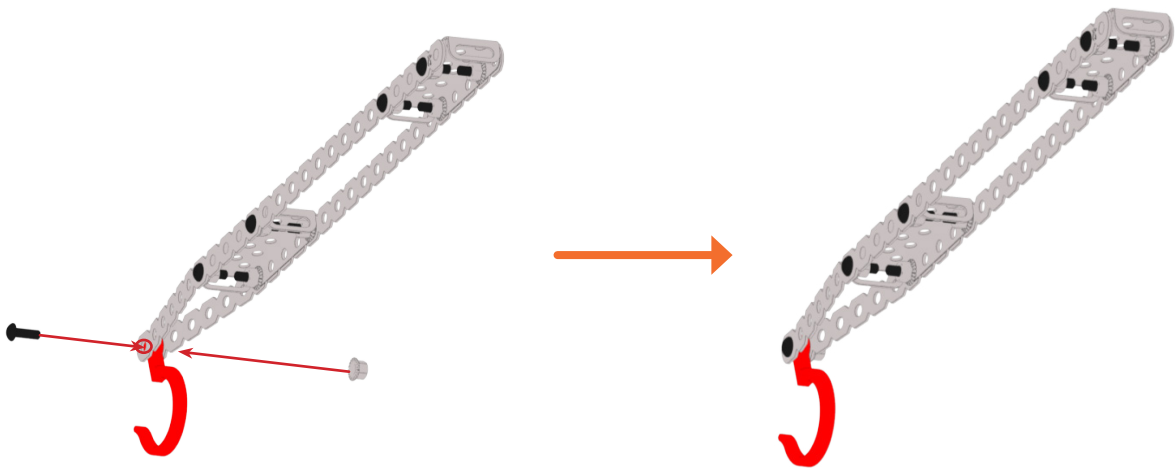
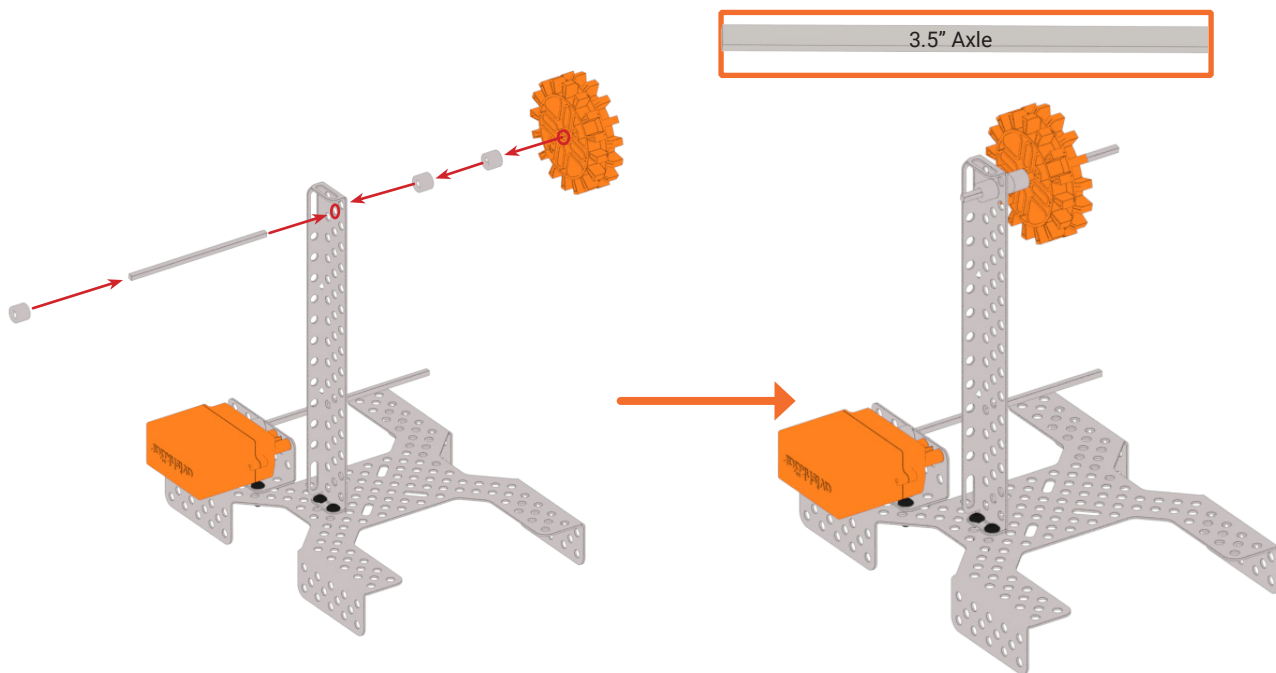**5** Similarly attach the other flexible strip.

Take a hook and place it in the front.

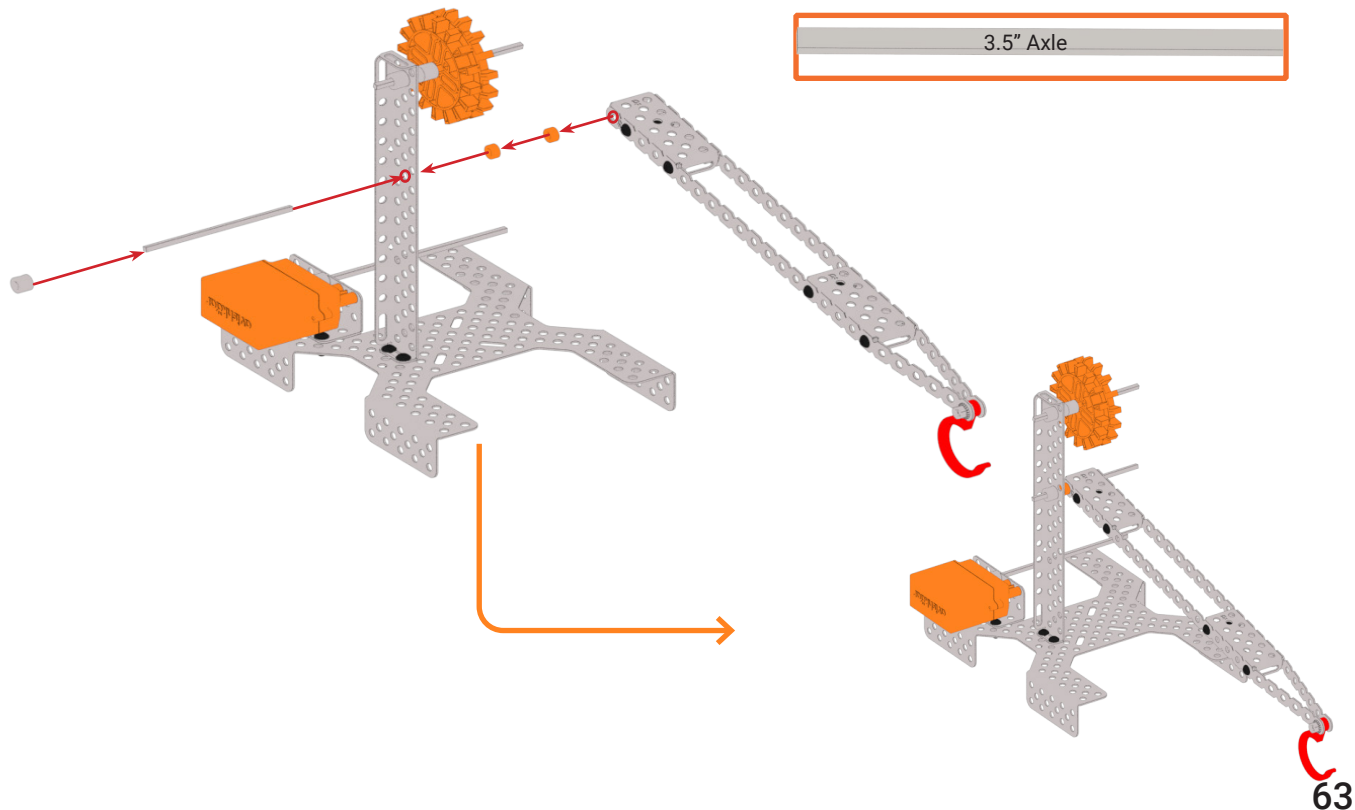Attach the hook at front using a nut and bolt.

**8** Take one 3.5" axle and join it with the 7.5" L-Beam, using an axle lock on the top hole of the middle row and attach two axle locks and a pulley wheel on the axle.

3.5" Axle

**9** Take one 3.5" axle and join it with the 7.5" L-Beam, using the 6th hole(from top) of the middle row and attach two fillers and an arm made on the axle.

3.5" Axle

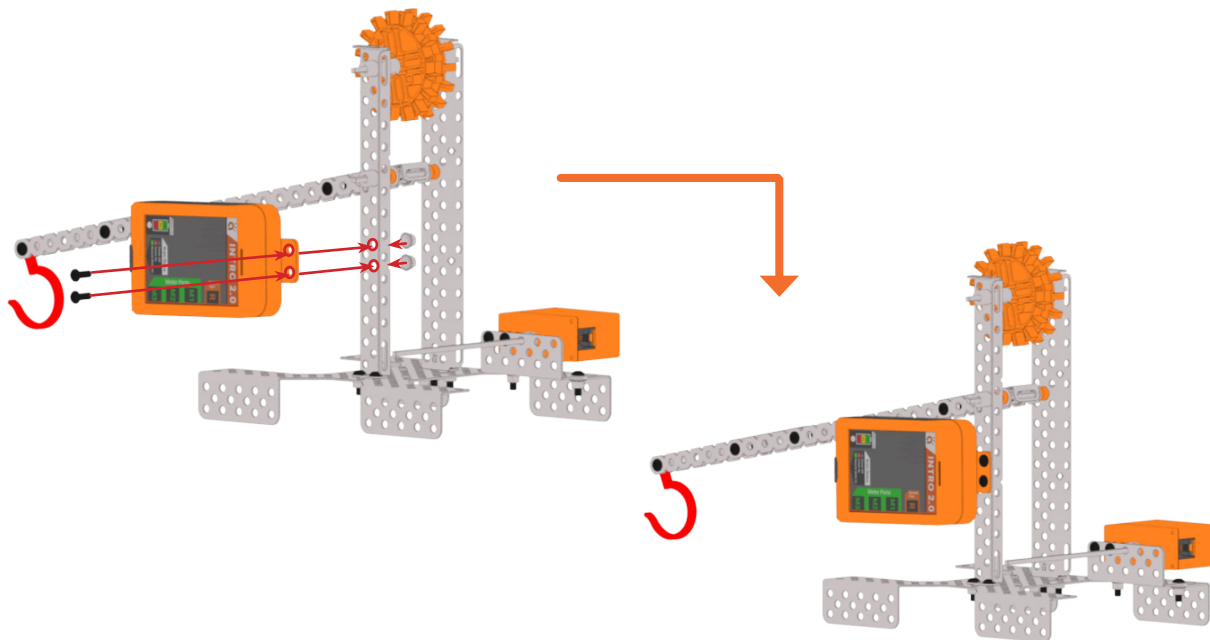**10** On the top axles attach two axle locks and on the bottom one add 3 fillers and attach a L-Beam on the axles using the 1st and 6th hole of the middle row.
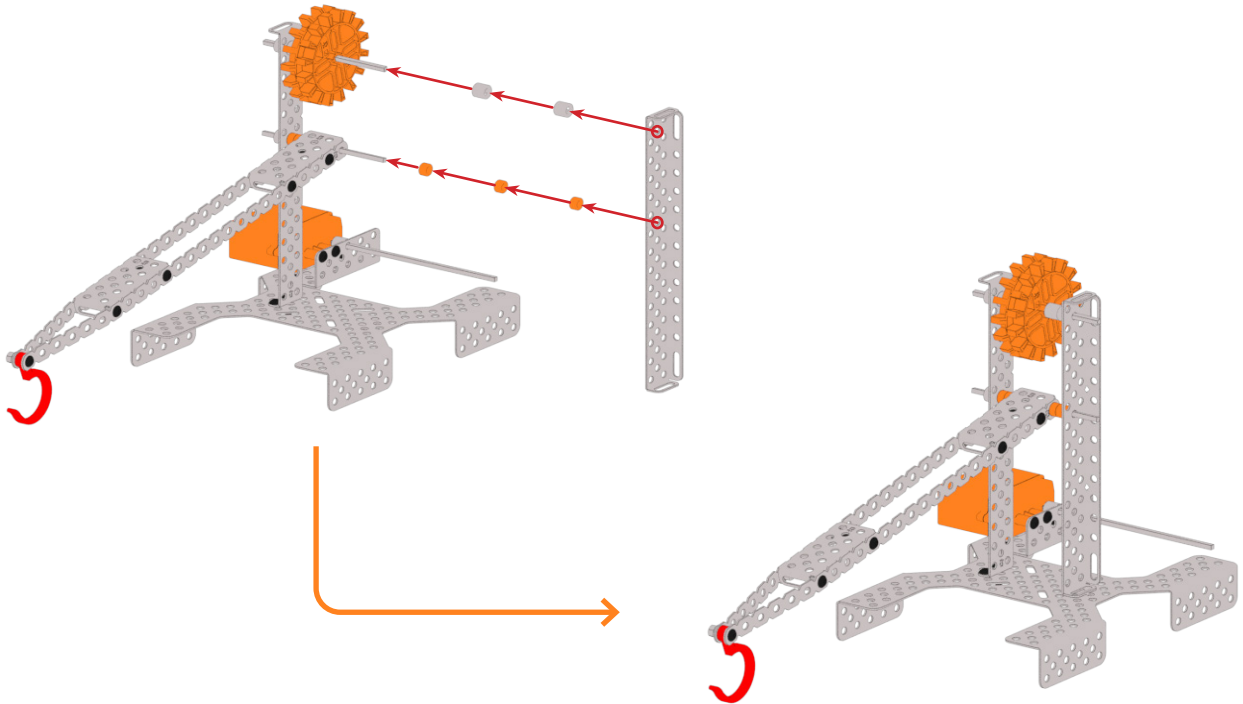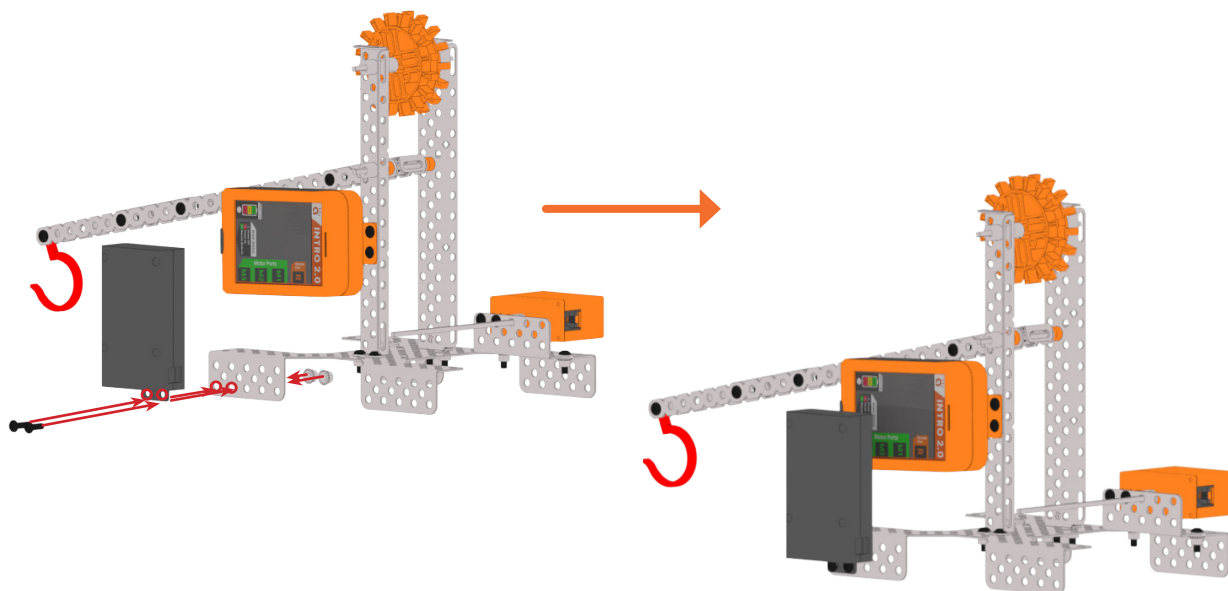
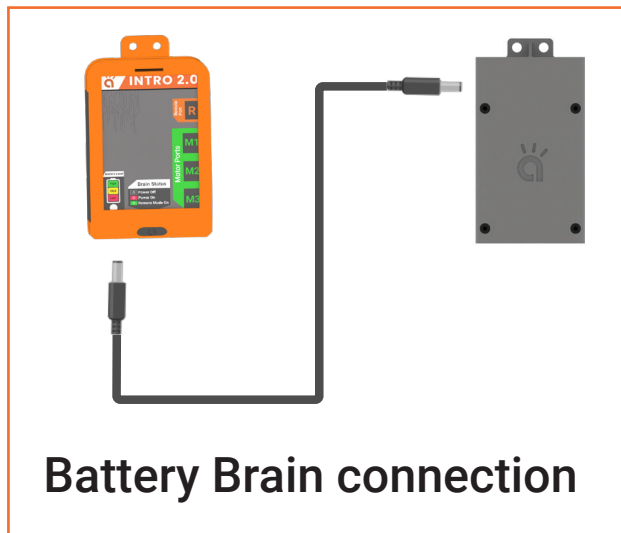**11** Attach the L-Beam on the chasis using 2 nuts and bolts and axle locks on the axle.
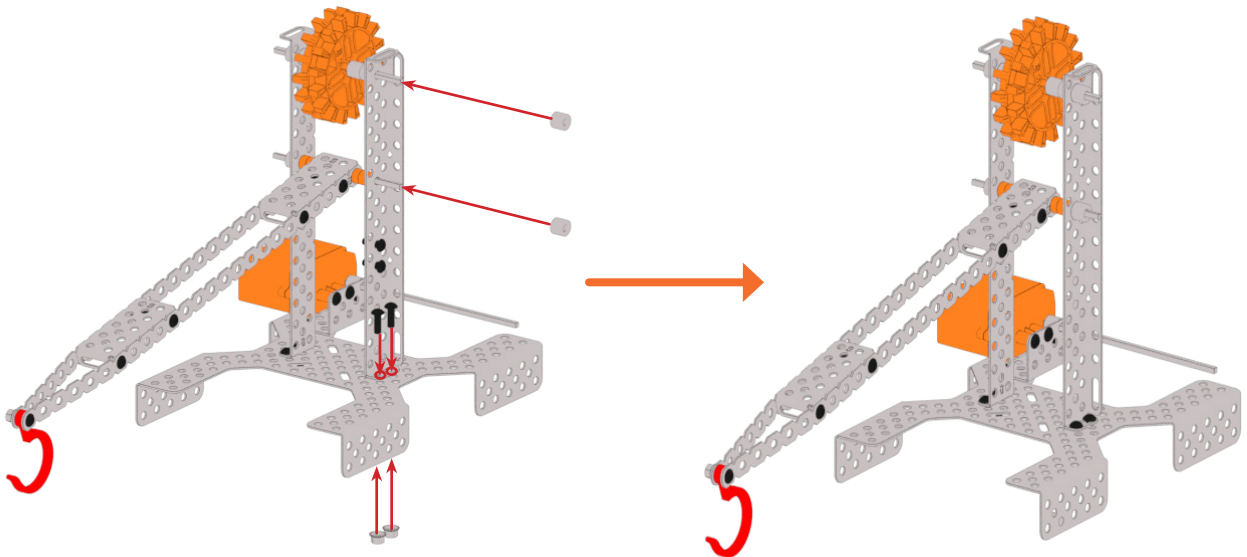
12 Attach brain with a 7.5" L-Channel at hole 9th and 10th (from the top) of the middle row.

13 Attach the battery to the chasis using the corner holes of the bottom row.

Attach the battery cable to both the brain and battery, and connect the motors to the brain.

## Battery Brain connection

- **Connect the motor to M1 port.**
- **Attach a thread, tie the first end to the hook, bring it from above the pulley and roll and tie the other end on the axle of the motor.**
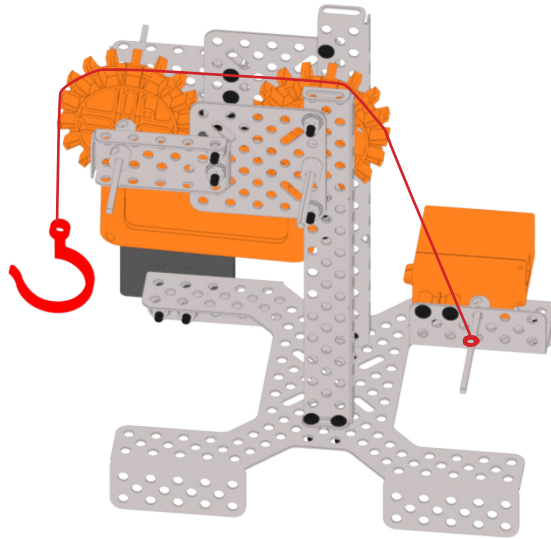
Scan the QR to upload the project
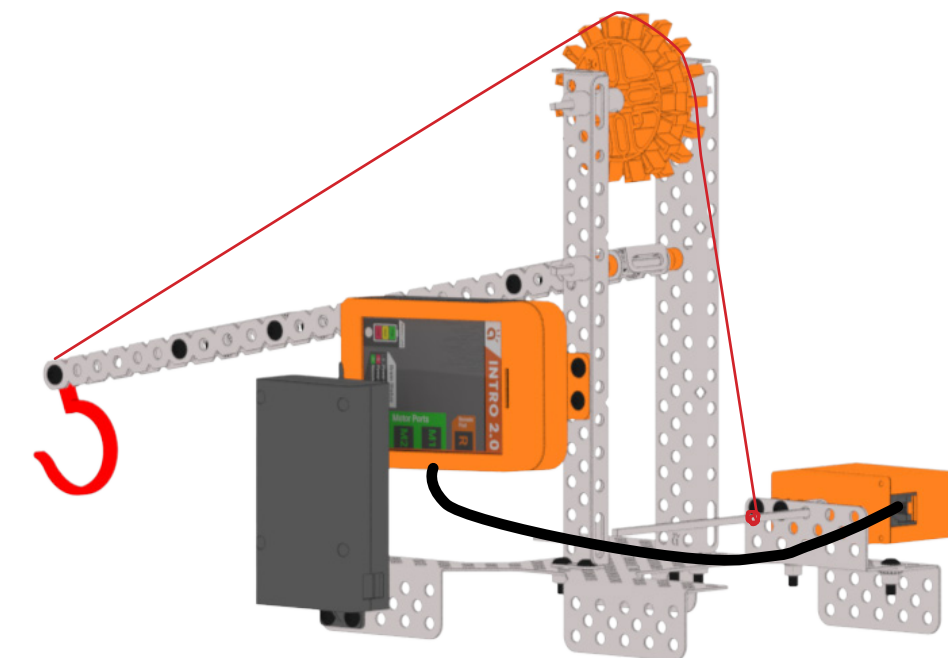
# 8. Dual Pulley Construction Lift



In construction lifts , pulleys are assembled to form blocks and then blocks are paired so that one is fixed and one moves with the load. The rope is threaded through the pulleys to provide mechanical advantage that amplifies the force applied to the rope.

## What is our task?

Create a crane which works using a dual pulley mechanism to lift heavy objects. The crane should use two pulleys, which divides the weight to increase, the weight lifting capacity.

## What will you learn?



Remote operation



Motor control and interfacing techniques



Input to output transformations



Pulley concept



A dual pulley crane uses two pulleys in a system to lift or move a load. This configuration provides a greater mechanical advantage than a single pulley, meaning less effort is required to lift a heavy object. The pulleys are typically connected by a rope or wire, and the system can be designed to lift or move a load vertically, horizontally, or at an angle.

# What will you need?

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Intro Brain x 1 | | Battery x 1 | | High Speed Motor x 1 | | Pulley x 2 |
| | Manual Remote x 1 | | 2.5" U-Beam x 2 | | Square plate x 2 | | 12.5" Flexible Strip x 2 |
| | 7.5" L-Beam x 2 | | Chasis x 1 | | 3.5" Axle x 1 | | DC Battery Connecting Cable x 1 |
| | Connecting Cables x 1 | | Remote Cable x 1 | | Hook x1 | | Axle locks x 13 |
| | Nuts & bolts x 18 | | | | | | |

# Let's Build!

1   Take one 2.5" L-Channel and join its hole 1 and 5 with the chasis at hole 1 & 5of the corner row.
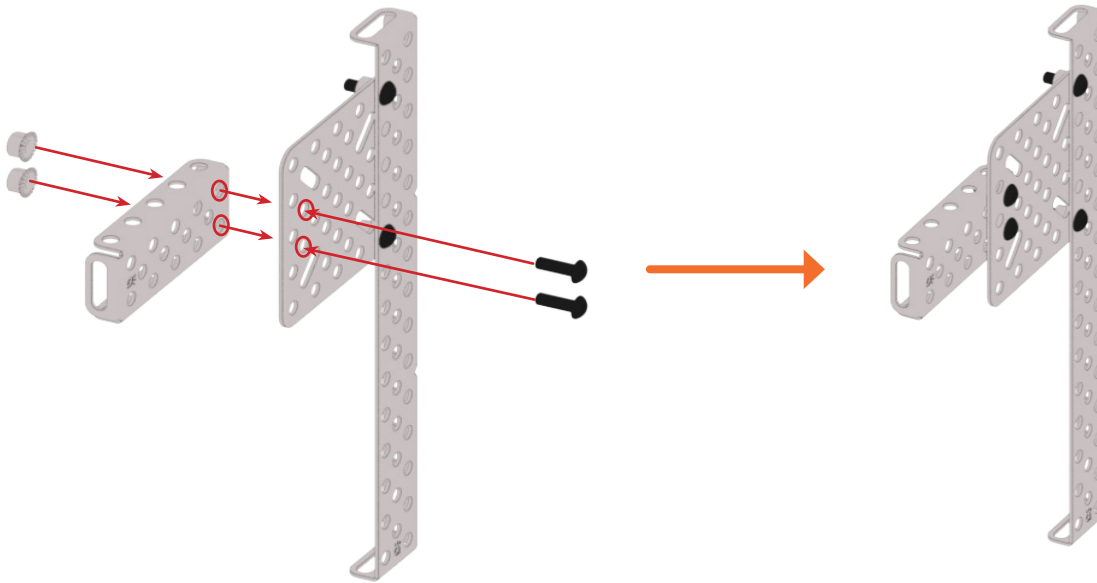


1st Hole

5th Hole
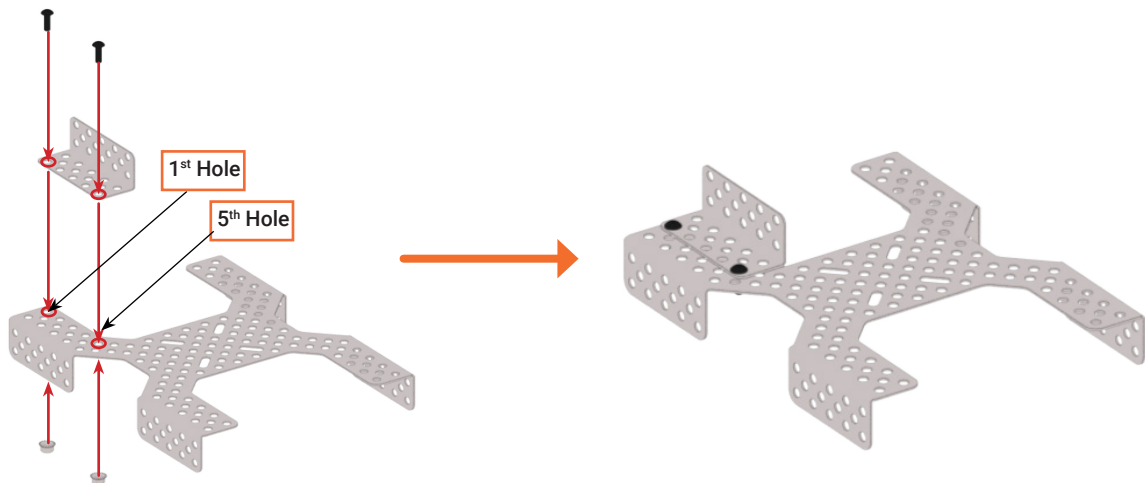
**2** Take one high speed motor and attach a 5.5" axle on motor to the center hole of the middle row and besides it add the bolts.

5.5" Axle
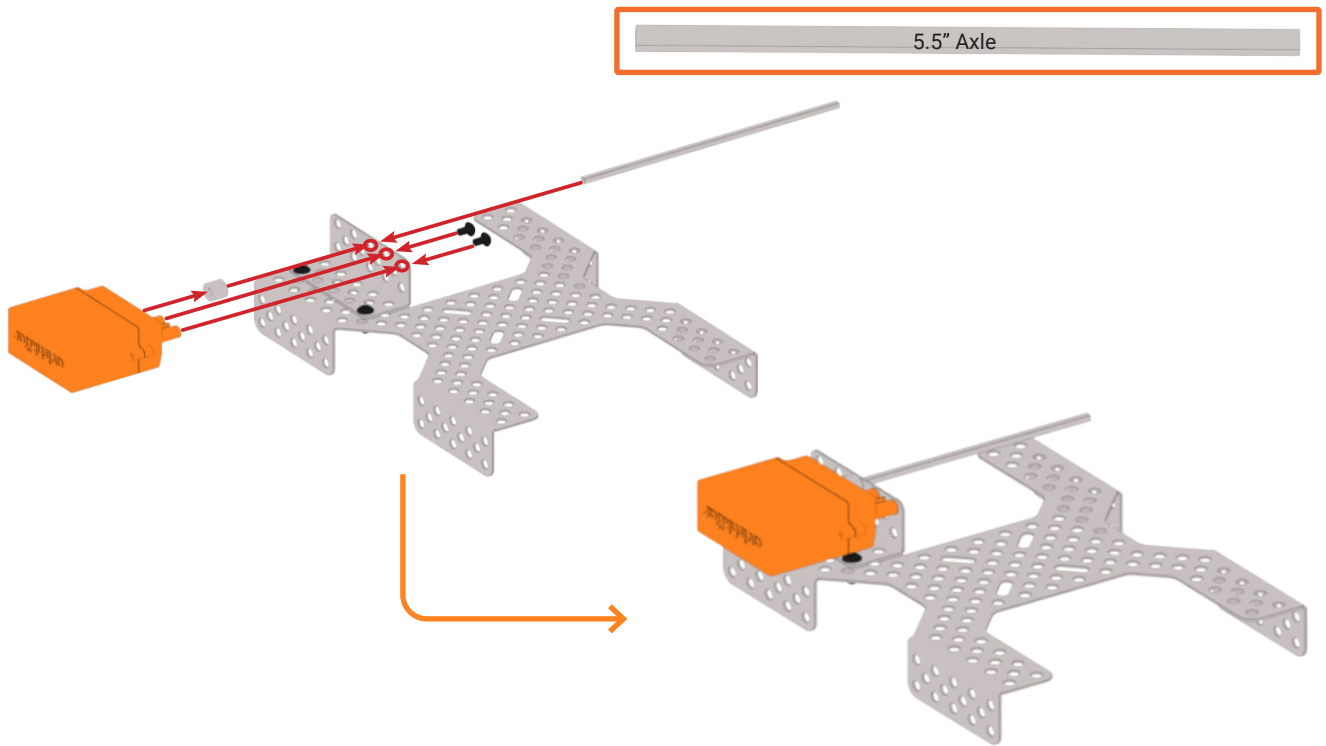
**3** Take another square plate and join it with a 7.5" L-Beam after giving 1 hole spacing from top side on first row.

2nd Hole

6th Hole
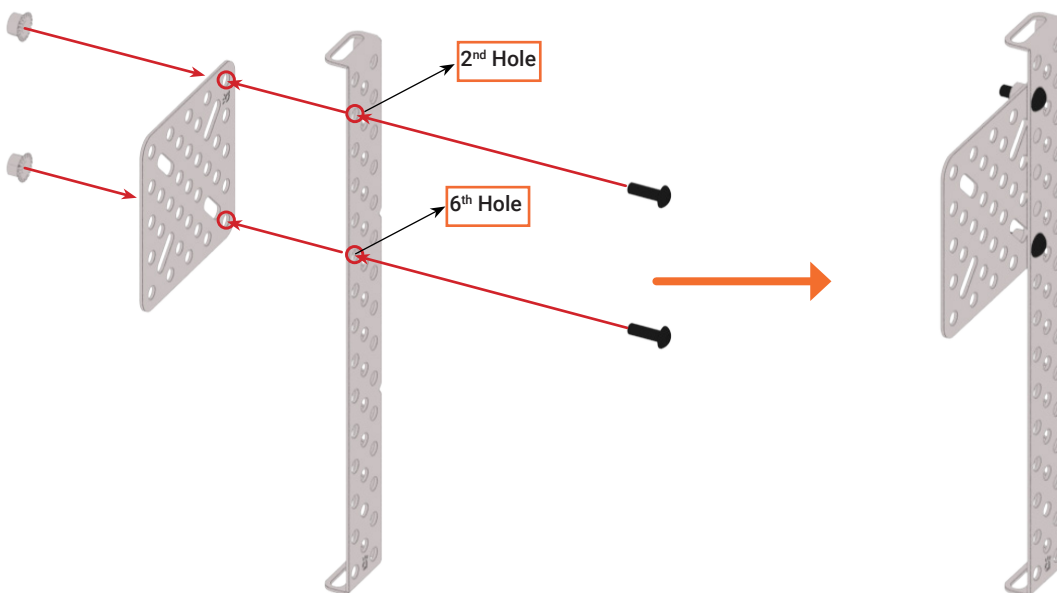
4  Take one 2.5" L-beam and join it with a 7.5" L-Beam at the middle holes of 2nd row.
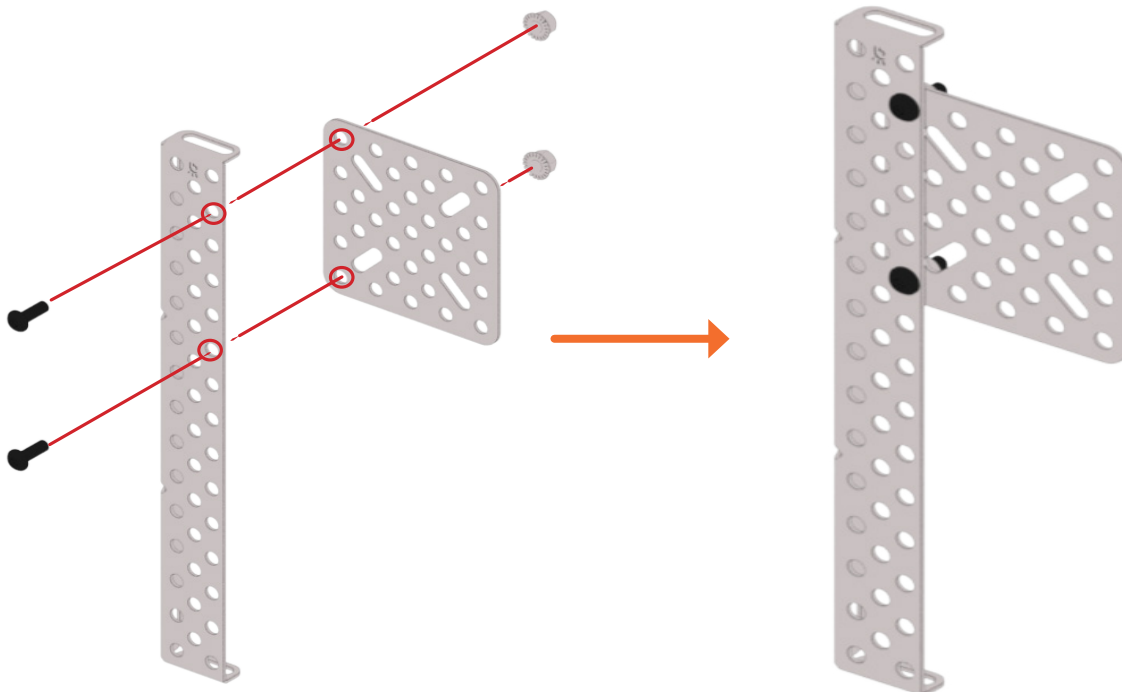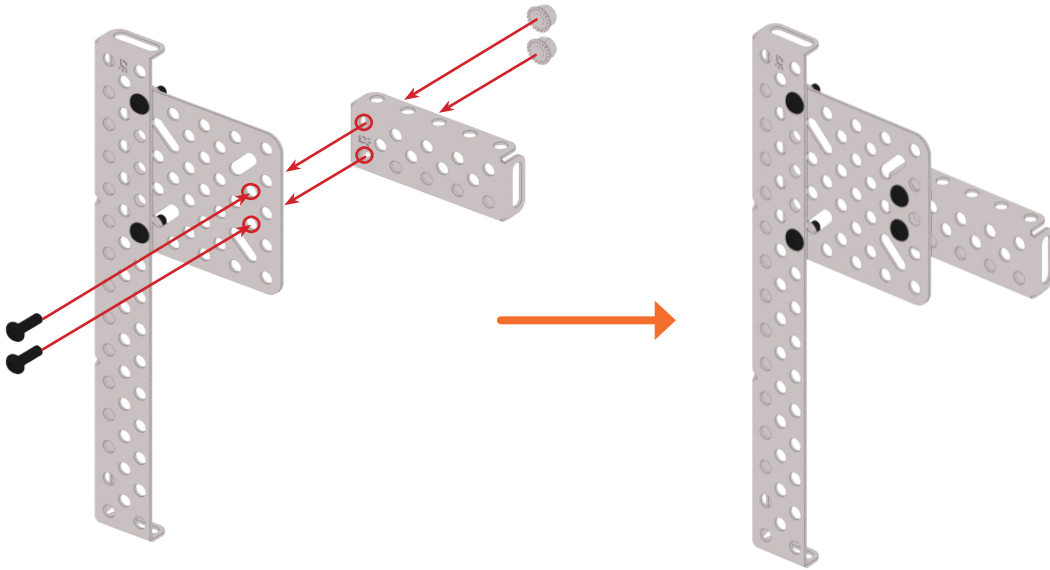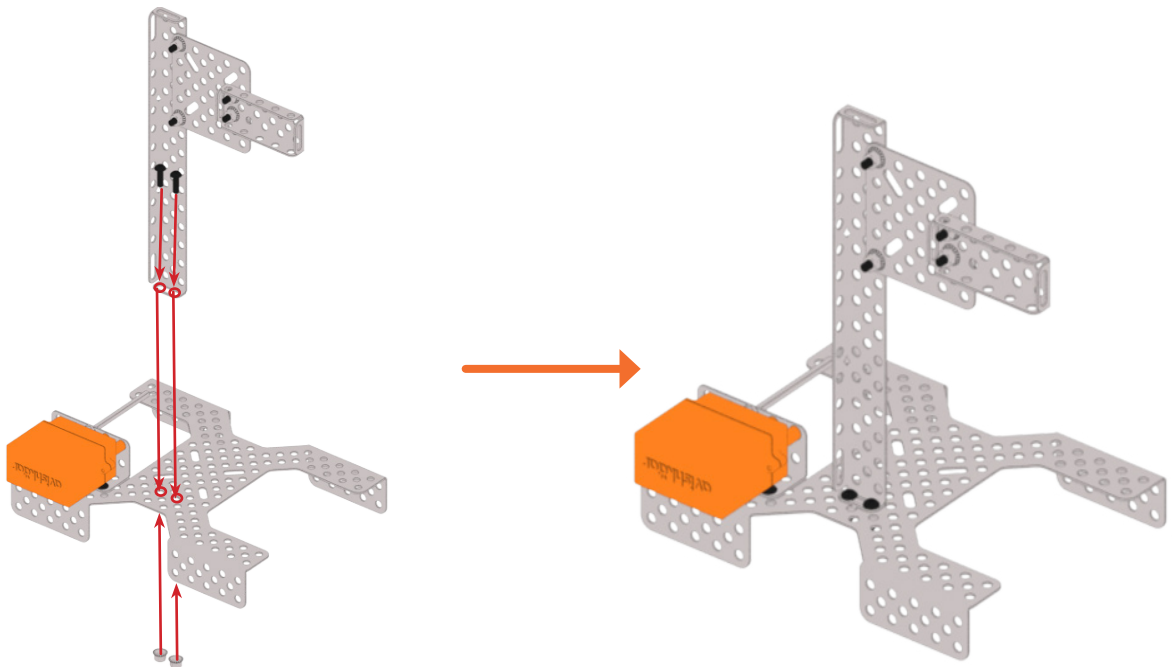
5  Similarly prepare the other side. Take another square plate and join it with a 7.5" L-Beam after giving 1 hole spacing from top side on first row.
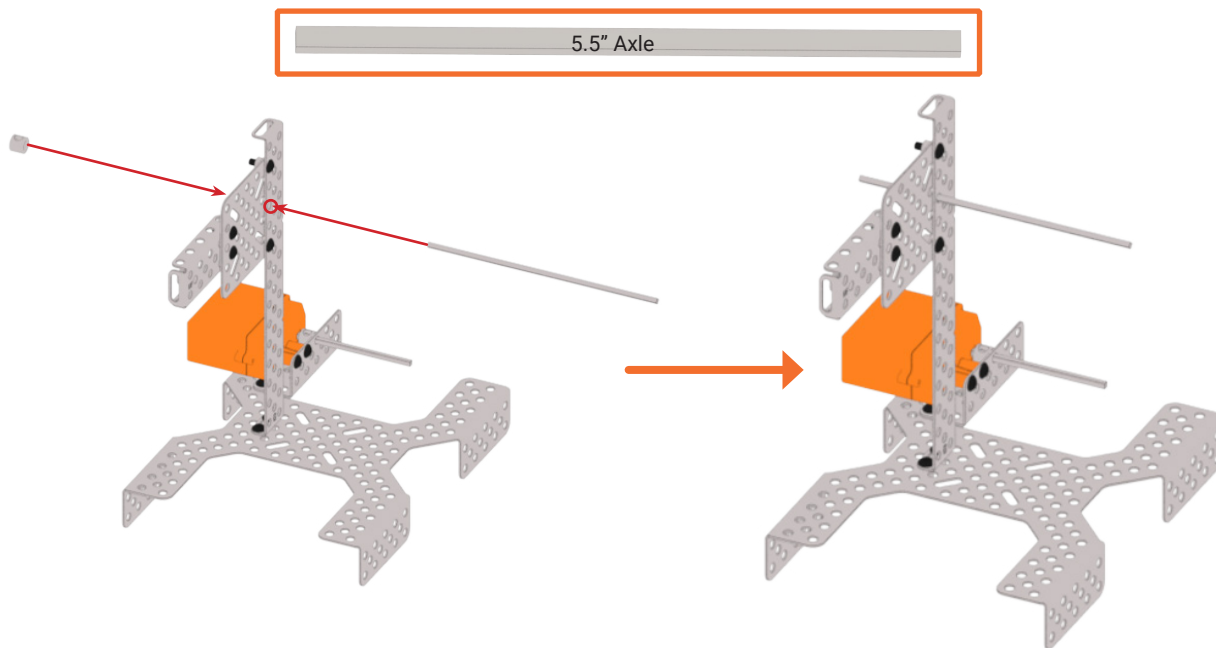
**6** Take one 2.5" L-beam and join it with a 7.5" L-Beam at the middle holes of 2nd row.

**7** Take the first assembly made and attach that using 2 bolts on the chasis.

**8** Take one 5.5" axle and join it with the 7.5" L-Beam, using an axle lock on center hole of the square plate, using the row common to the L-Beam.

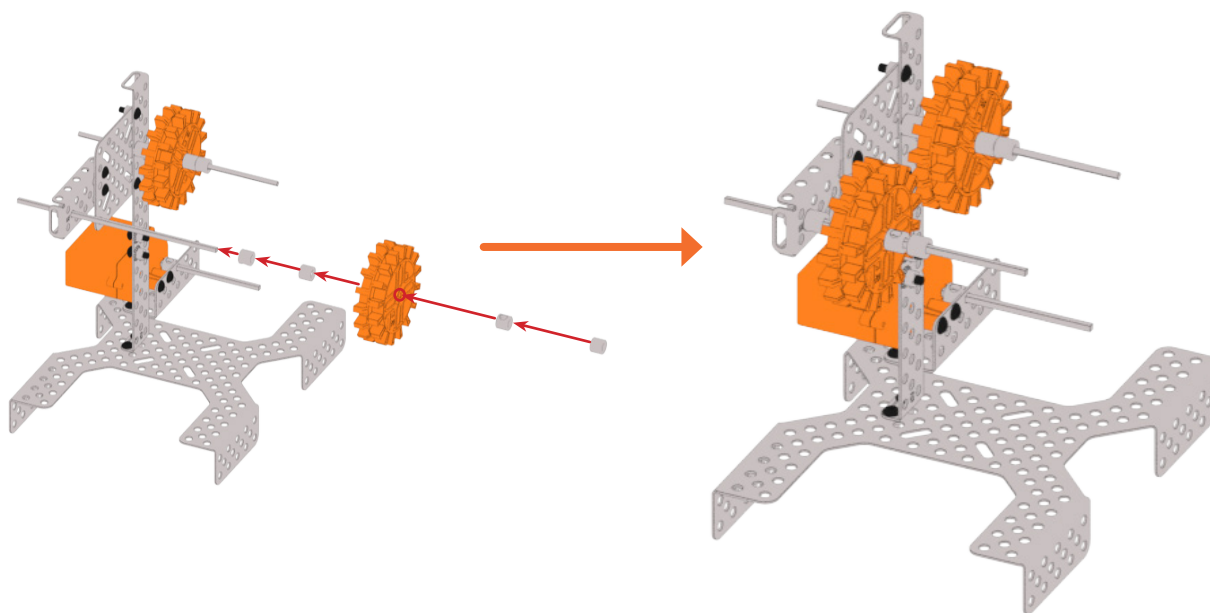5.5" Axle

**9** Attach 2 axle locks, then a pulley wheel and then 2 more axle locks after the pulley wheel on the axle attached.
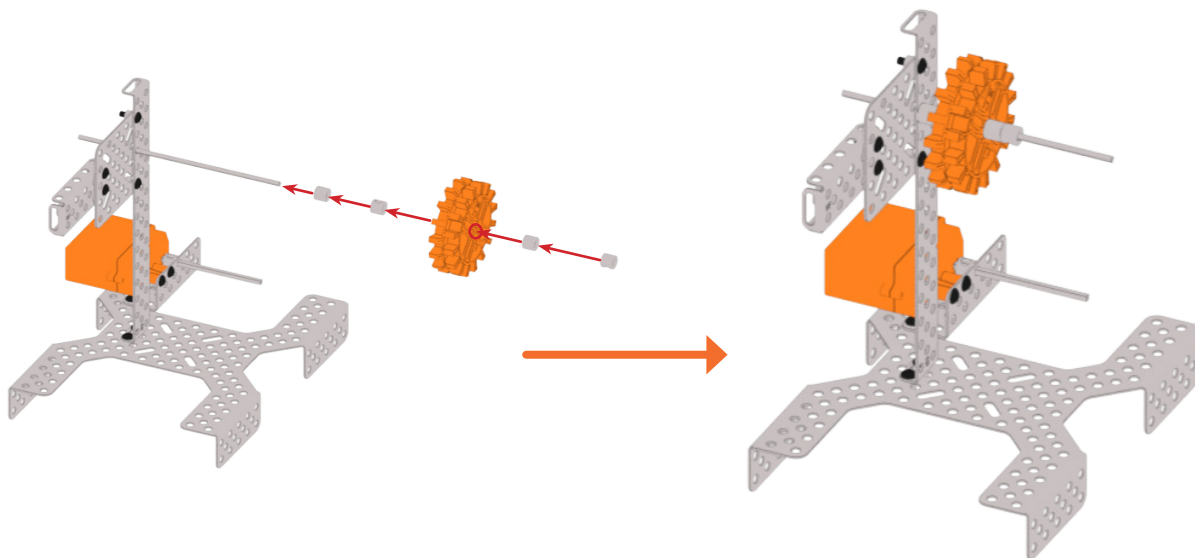
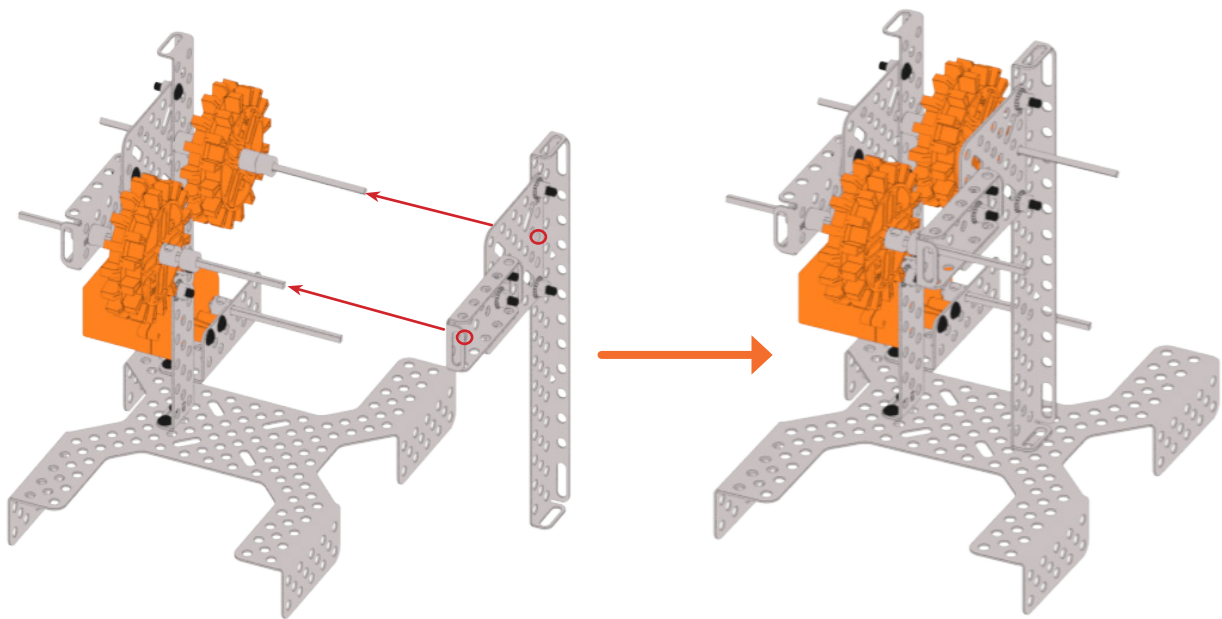10 Take one 5.5" axle and join it with the 2.5" U-Beam, using an axle lock on the front most hole of the middle row.

5.5" Axle
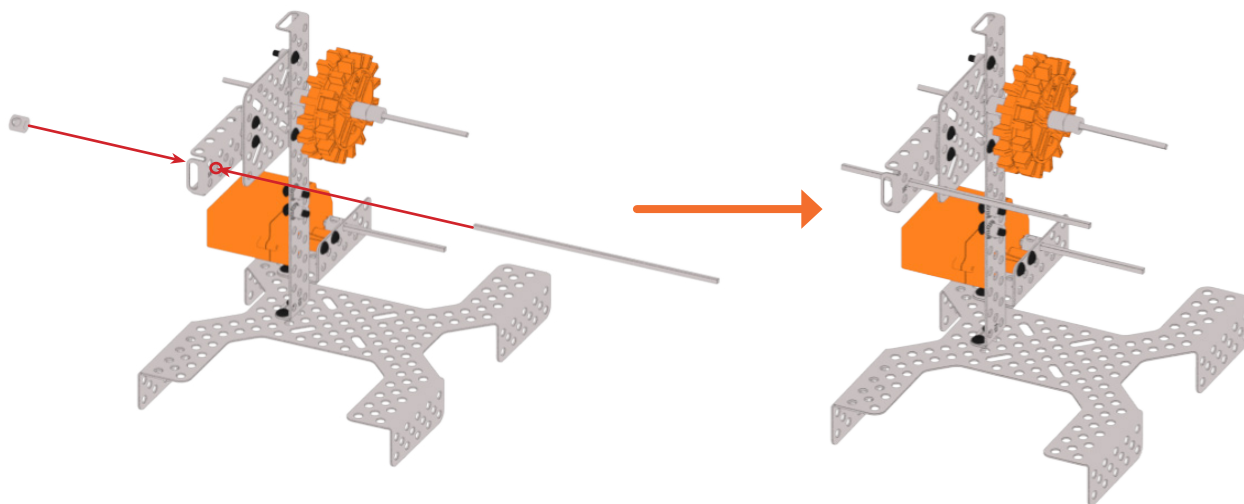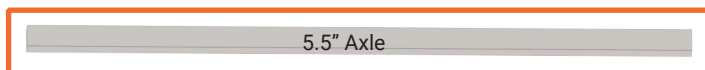
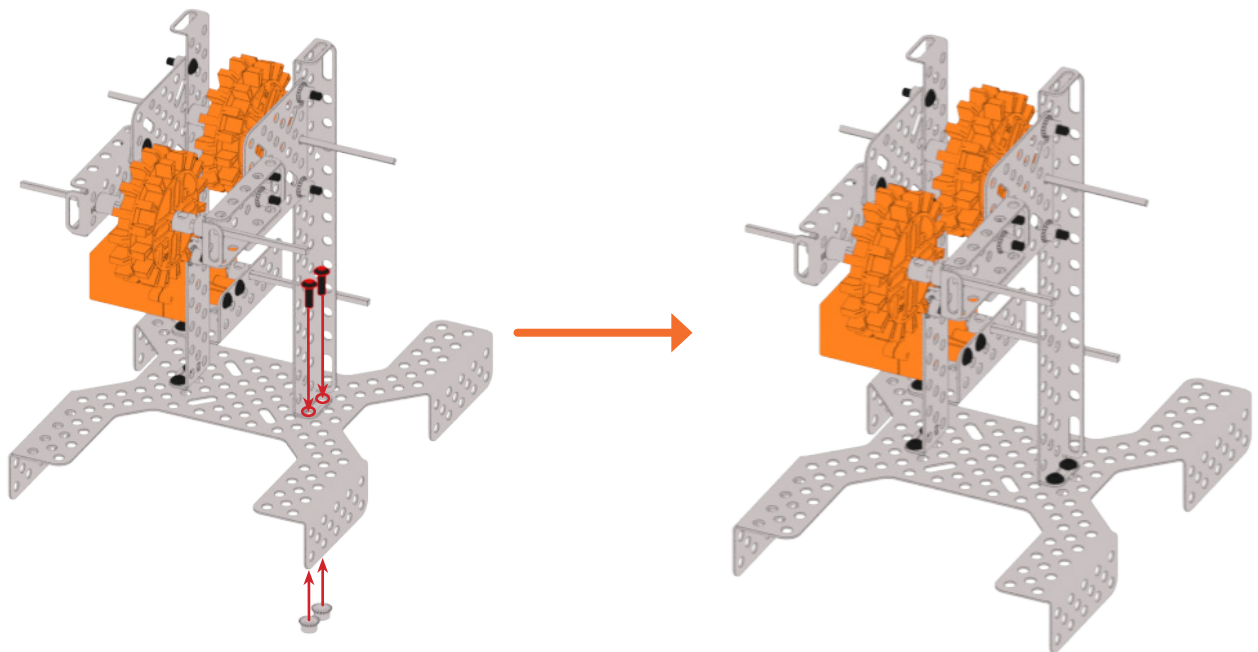11 Attach 2 axle locks, then a pulley wheel and then 2 more axle locks after the pulley wheel on the axle attached.

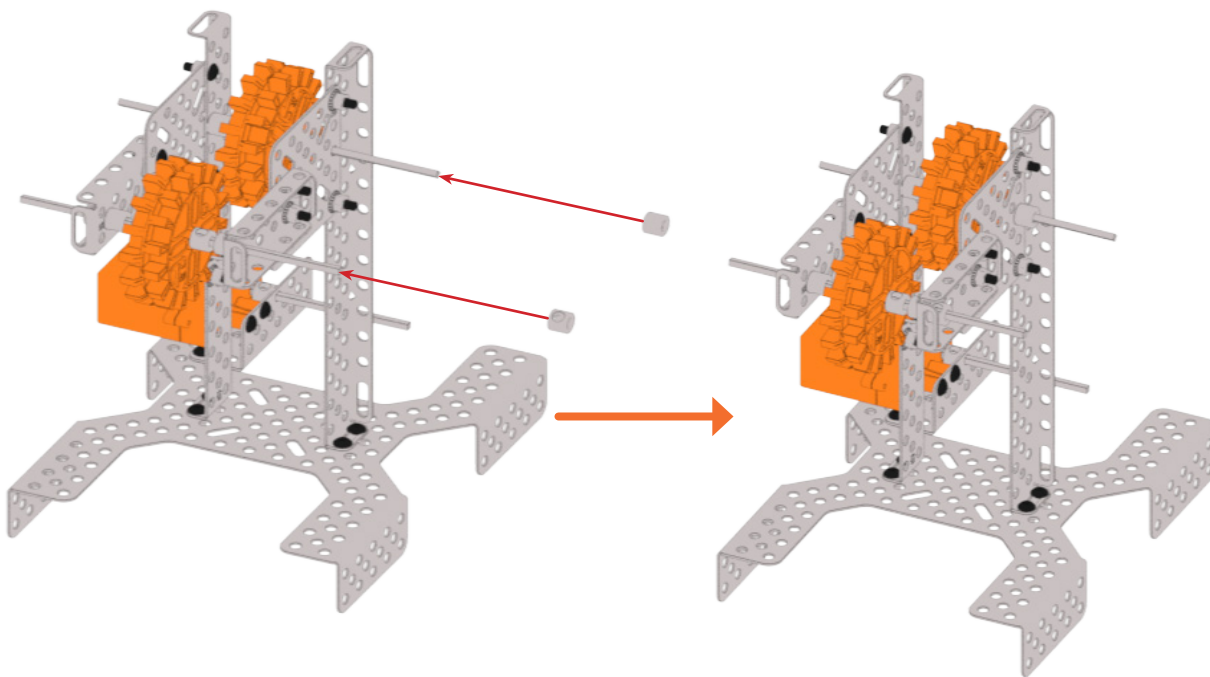Attach the assembly of the other side on the axles using the similar holes of the pulley wheels.
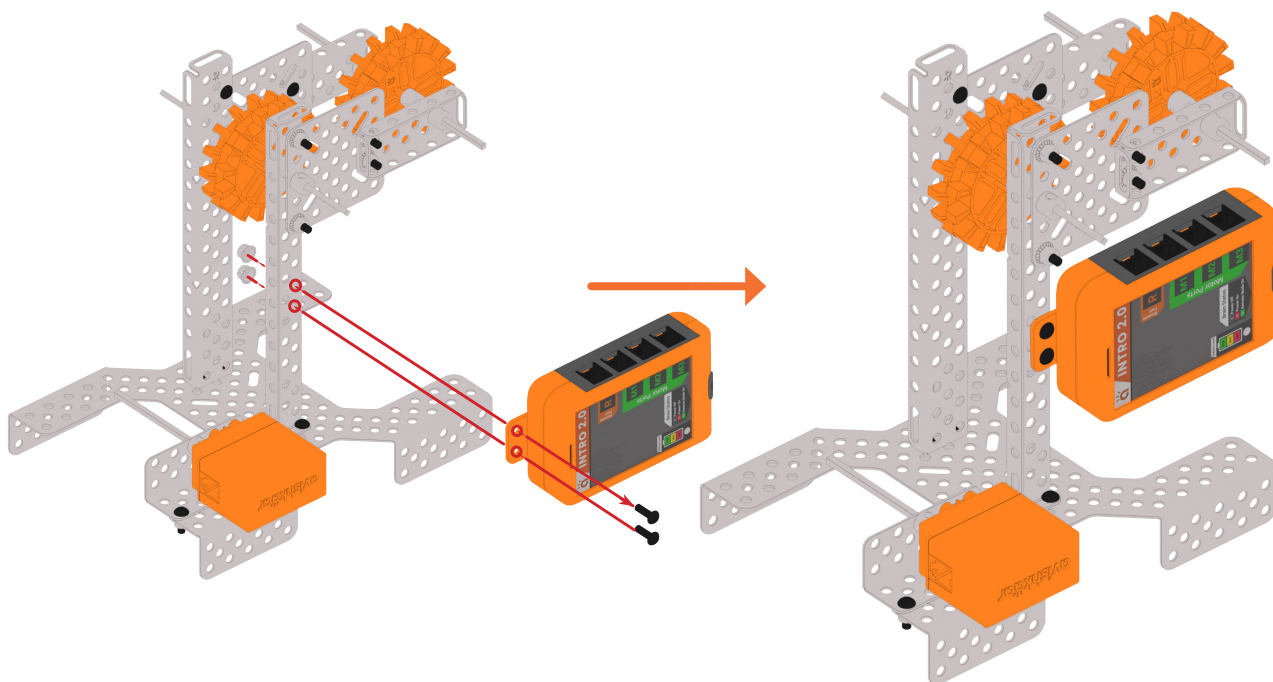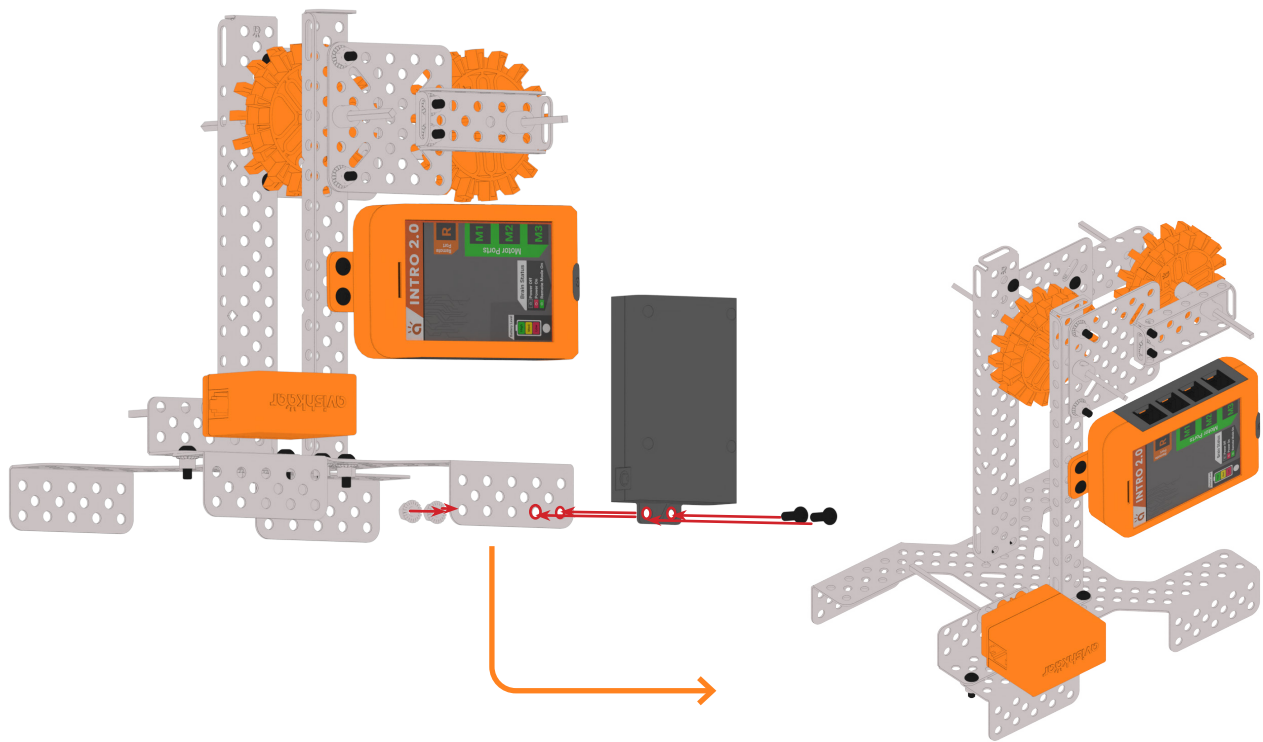
Attach the assembly using nuts and bolts.
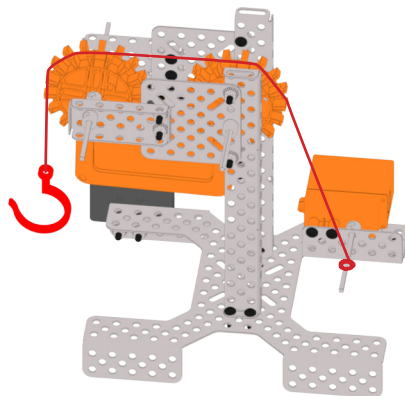
14 Attach 2 axle locks on both the axles.

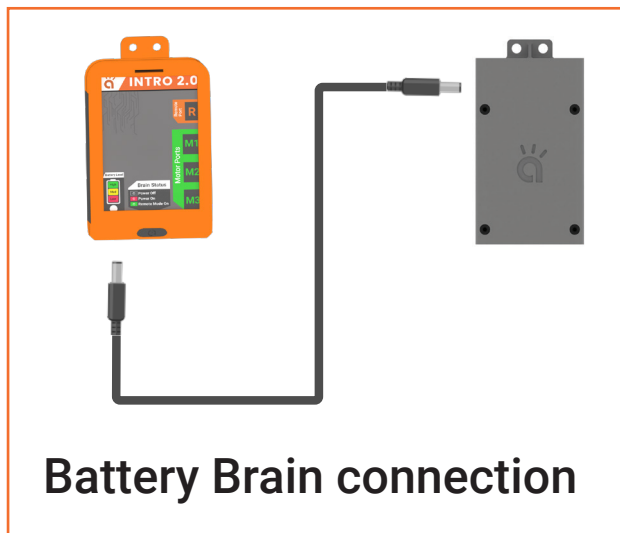15 Attach the brain to the L-Beam using the first row on the 6th and 7th hole from bottom.

**16** Attach battery using the 1st and 2nd hole of the bottom row of the chassis.

**17** Attach a thread, tie the first end to the hook, bring it from above both the pulley
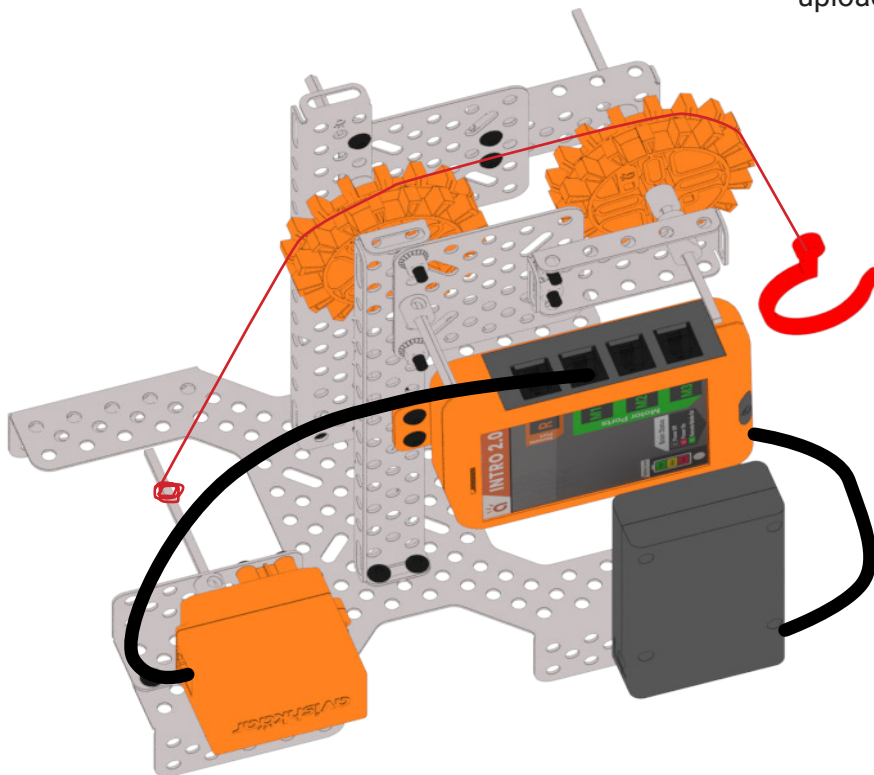
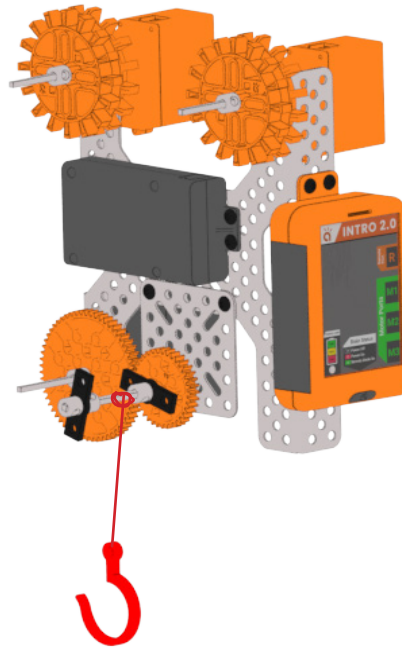18 Attach the battery cable to both the brain and battery, and connect the motors to the brain.



# Battery Brain connection

- **Connect the motor to M1 port.**



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# 9. Rope Car with pulley



A rope car robot is a robotic vehicle designed to travel along a rope or cable, similar to a zipline. These robots often utilize wheels or other mechanisms to grip and move along the rope, and may be controlled remotely or autonomously.

## What is our task?

Design and build a sorting mechanism to direct balls left or right based on color detection.
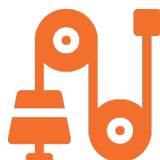
## What will you learn?


Remote operation


Motor control and interfacing techniques


Input to output transformations


Pulley concept


Rope cars are a huge time saver at hill stations and even at some times in other regions, rope cars are used as a proper transport. With inclusion of a pulley it can be used to pick and drop objects from place to place.

# What will you need?

| | | | | | | |
|---|---|---|---|---|---|---|
| | Intro Brain | | Battery x 1 | | High Speed Motor x 2 | |
| | | | | | High Torque Motor x 1 | |
| | Manual Remote x 1 | | 2.5" U-Beam x 2 | | Square plate x 2 | | 12.5" Flexible Strip x 2 |
| | Chasis x 1 | | 3.5" Axle x 2 | | 5.5" Axle x 2 | | DC Battery Connecting Cable x 1 |
| | Connecting Cables x 2 | | Remote Cable x 1 | | Pulley | | Big Spur Gear x 1 |
| | Medium Spur Gear x1 | | Three hole connectorx 2 | | Axle locks x 10 | | Hook x1 |
| | Nuts & bolts x 6 | | Fillers x 5 | | | | |

## Let's Build!

1. Take one 7.5" Rectangular Plate and join it with 7.5" L-Channel at first and last hole of 3$^{rd}$ row.
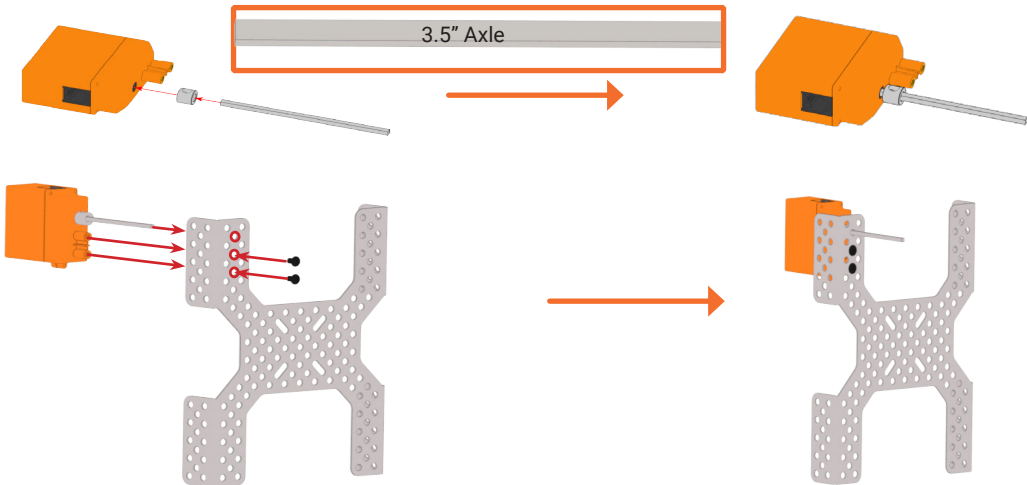
3.5" Axle

**2** Similarly attach the motor on the other side.
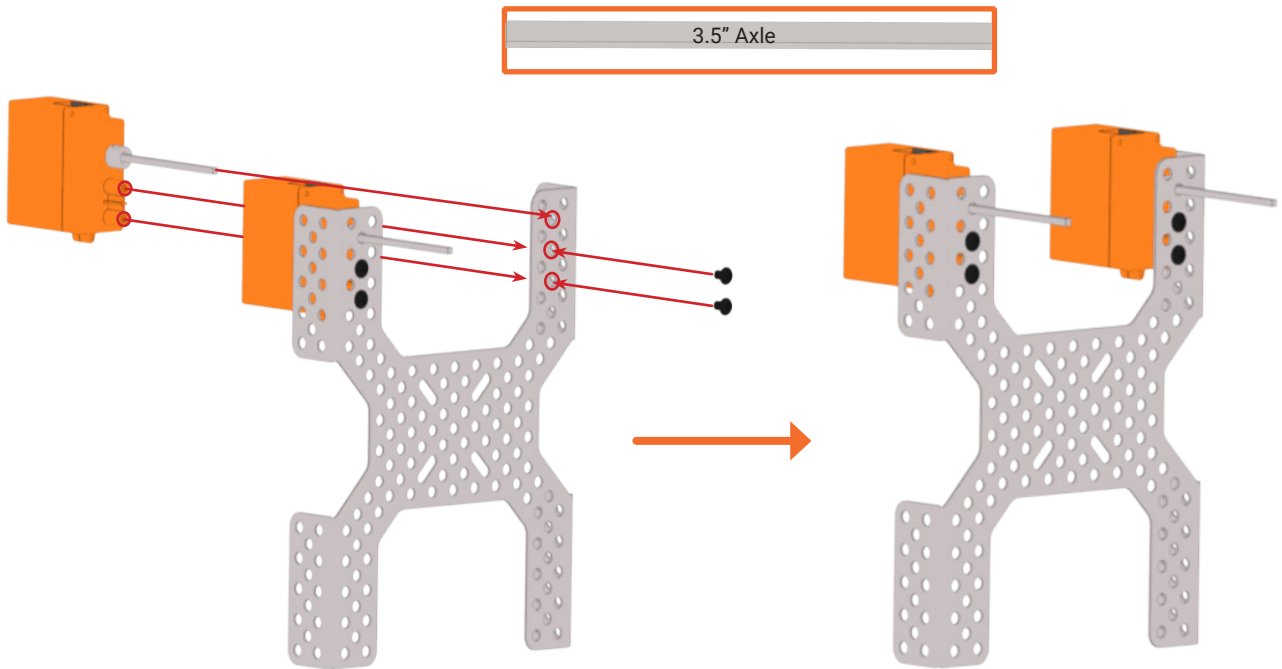
3.5" Axle

**3** Attach one filler, pulley wheel and then axle lock on the 3.5" axle.
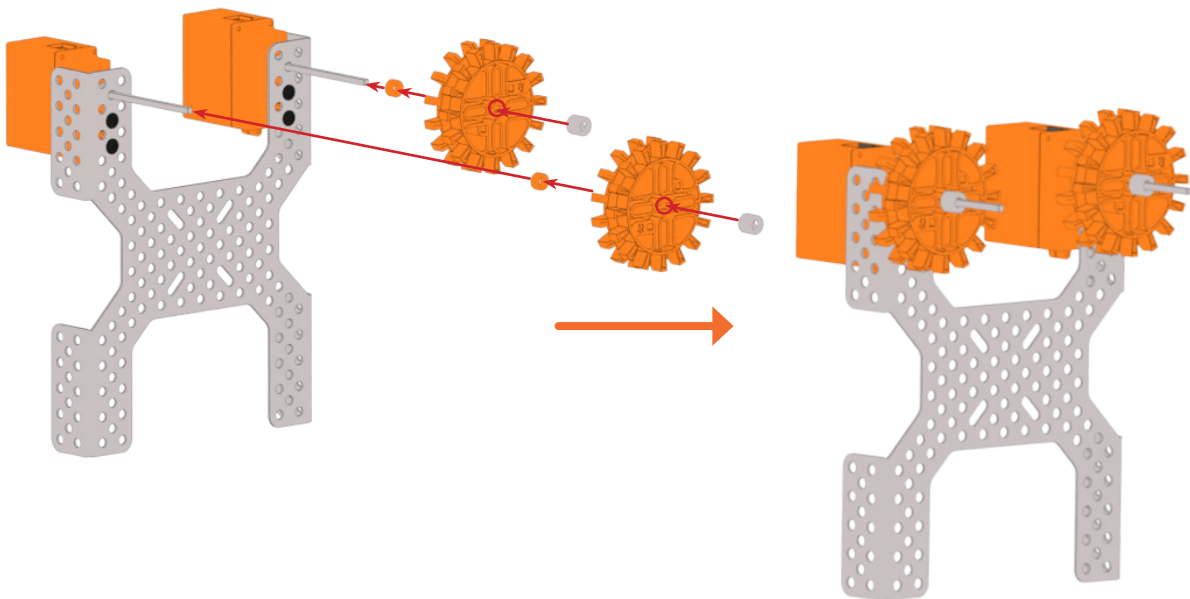
4 | Attach a motor on the left bottom flap, middle row. On 2nd hole from bottom, attach the axle and above the axle attach the bolts to secure it.

5 | Take one square plate and using the 1st and 5th hole of the 1st row attach it to the chasis
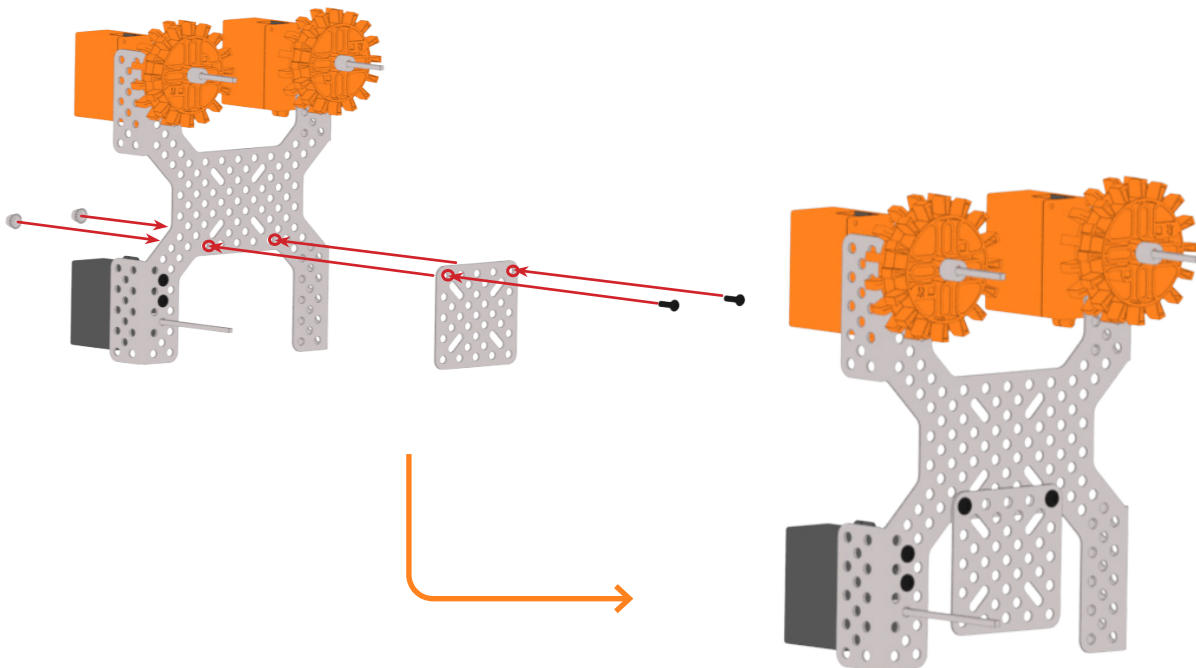
Attach one filler, spur gear and lock it up on the axle of the motor.
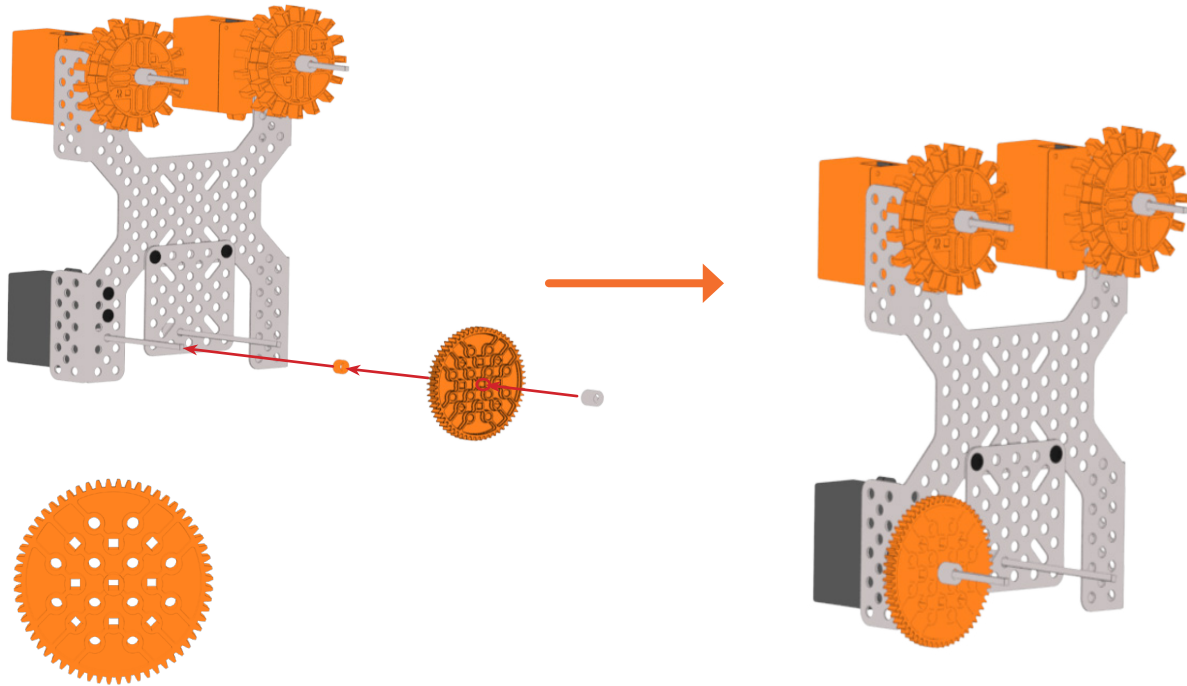
Large Gear

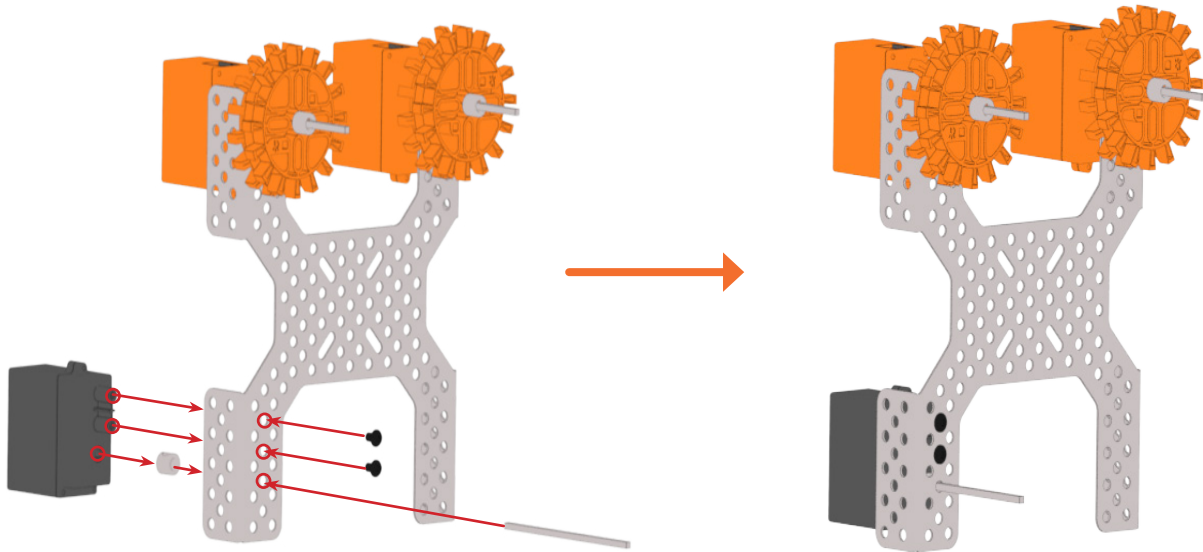On the other axle attach one filler, one spur gear, again a filler, a three hole connector and lock all using an axle lock.

Medium Gear

On the same axle, leaving some space attach an axle lock, a three hole connector and again lock it using an axle lock.
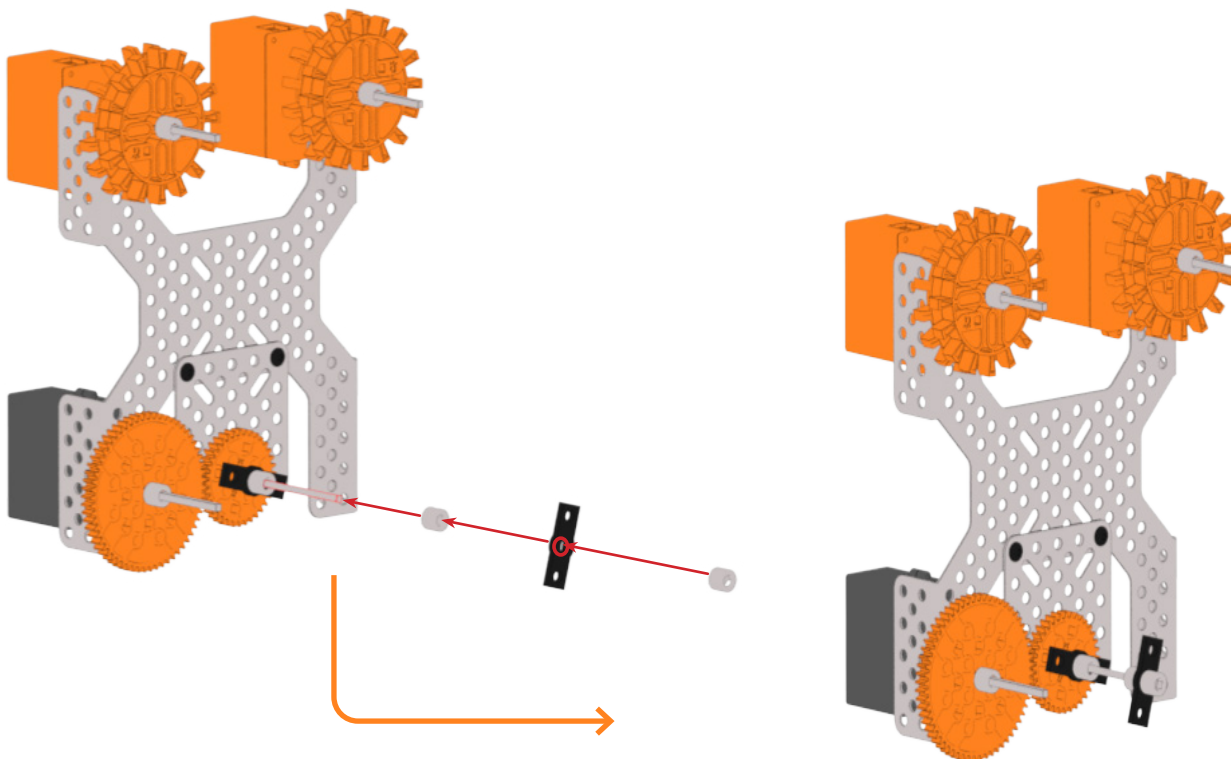
Attach the battery on the chasis.

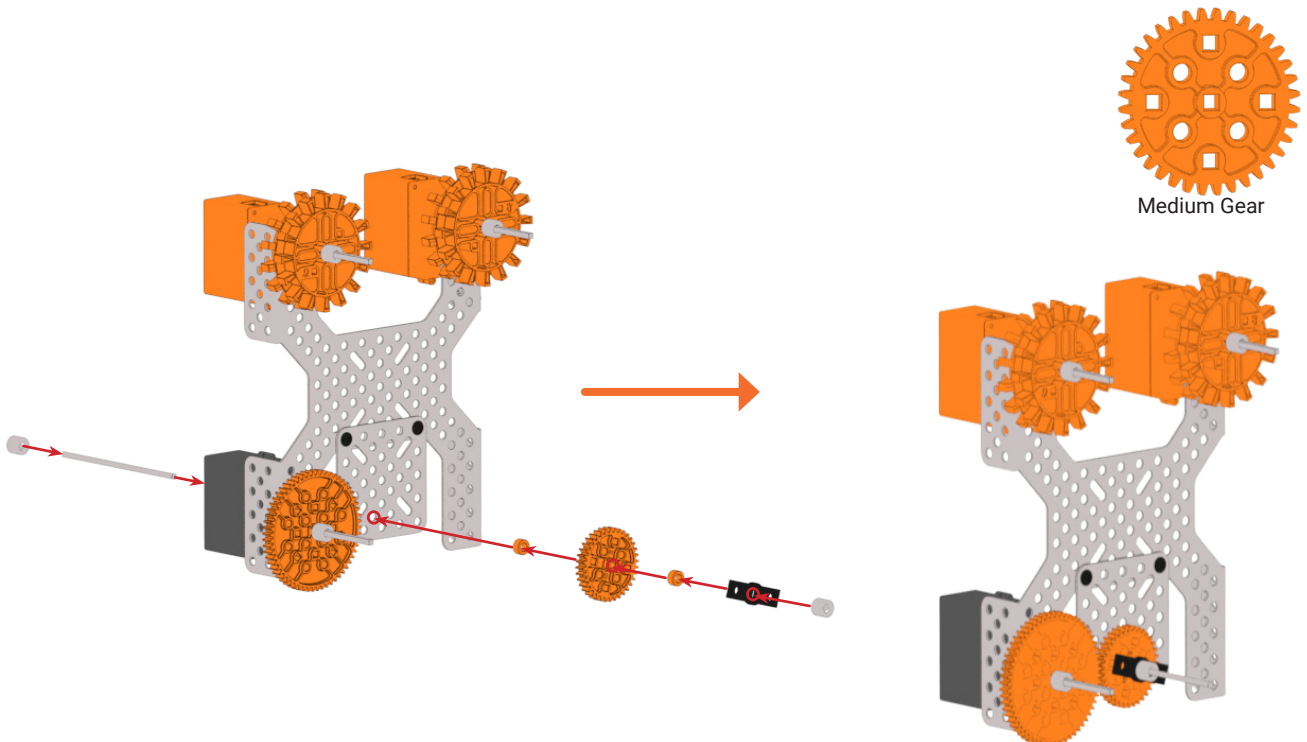12 On the right top flap of the chasis, using the bottom row attach a brain.



13 On the axle of the small spur gear, attach a hook using a thread. Place it on a rope and play!!

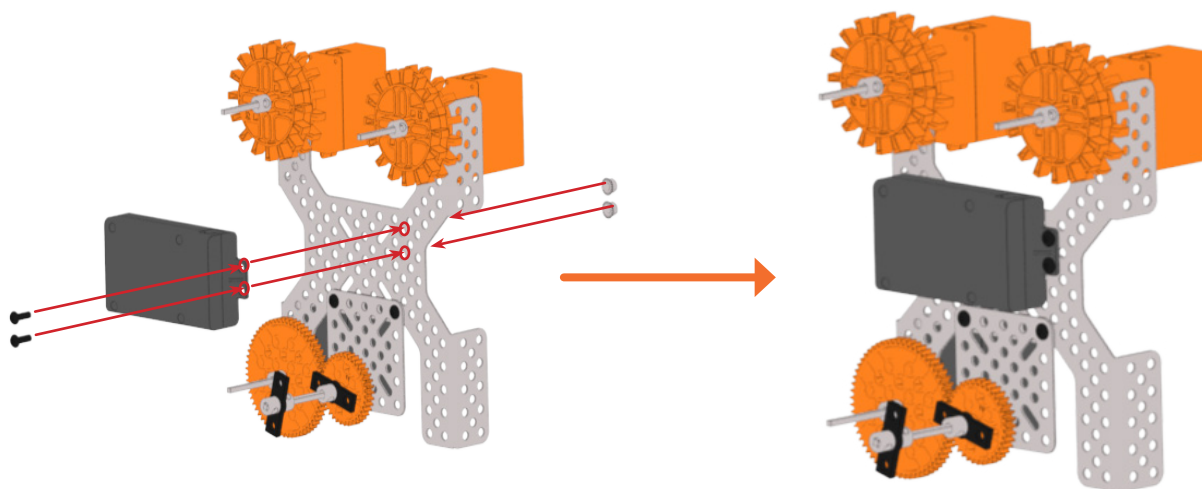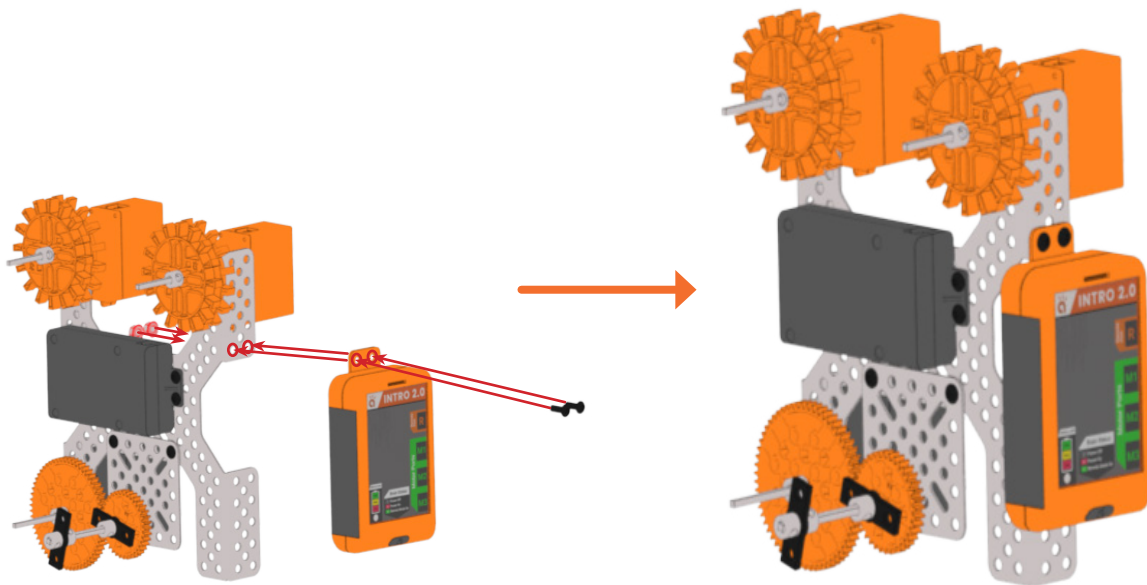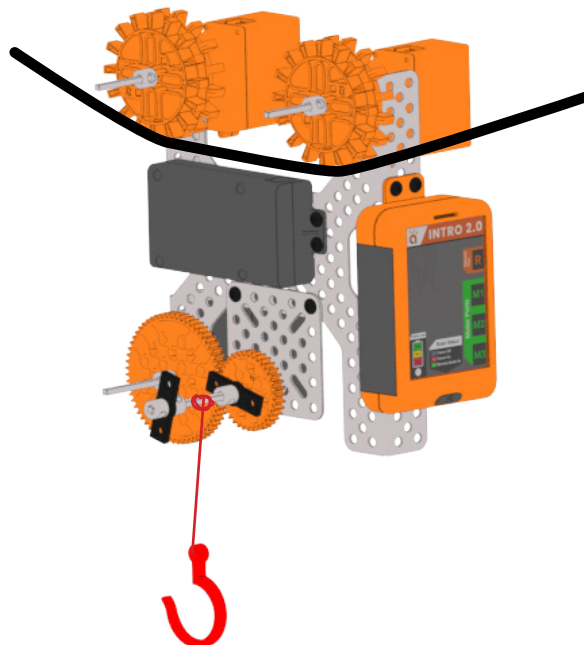14 Attach the battery cable to both the brain and battery, and connect the motor and sensor to the brain.

## Battery Brain connection
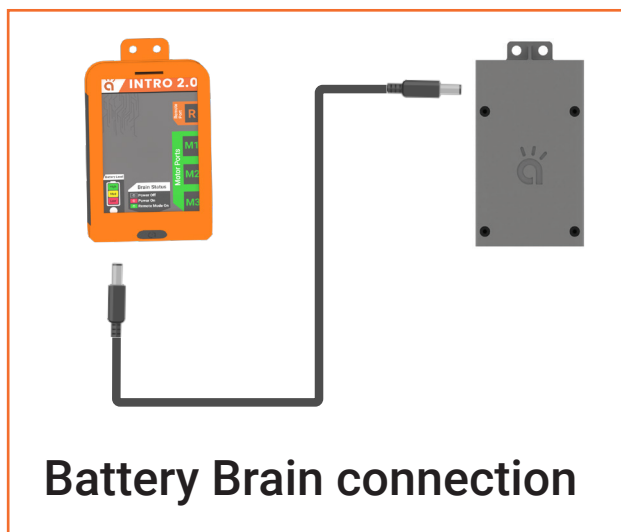
- **Connect Right speed motor to M1 port.**
- **Connect Left speed motor to M2 port.**
- **Connect pulley motor to M3 port.**

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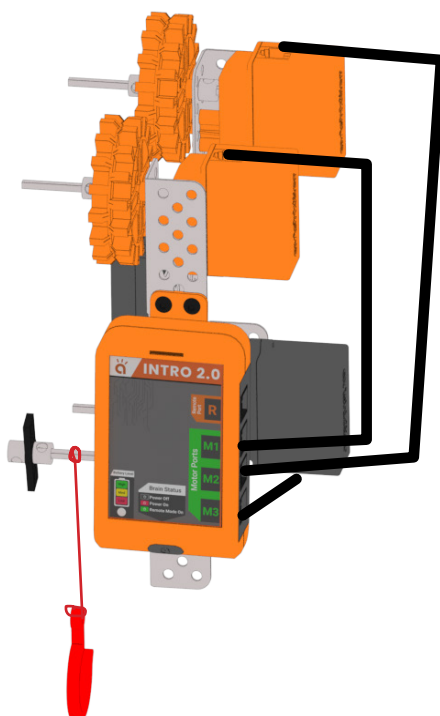
# 10. Rope Car with arm



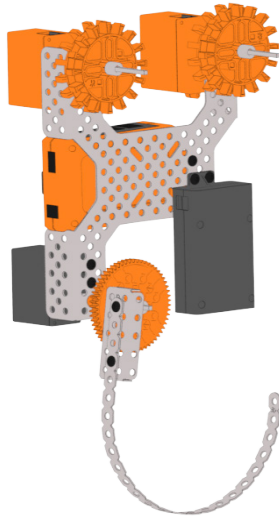A rope car robot is a robotic vehicle designed to travel along a rope or cable, similar to a zipline. These robots often utilize wheels or other mechanisms to grip and move along the rope, and may be controlled remotely or autonomously.

## What is our task?

Design and build a sorting mechanism to direct balls left or right based on color detection.

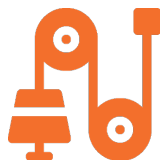## What will you learn?



Remote operation



Motor control and interfacing techniques



Input to output transformations



Pulley concept



Rope cars are a huge time saver at hill stations and even at some times in other regions, rope cars are used as a proper transport. With inclusion of an arm it can be used to pick and drop objects from place to place.

# What will you need?

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Intro Brain | | Battery x 1 | | High Speed Motor x 2 | | High Torque Motor x 1 | |
| Manual Remote x 1 | | 2.5" U-Beam x 1 | | 12.5" Flexible Strip x 1 | | Chasis x 1 | |
| 3.5" Axle x 3 | | DC Battery Connecting Cable x 1 | | Connecting Cables x 3 | | Remote Cable x 1 | |
| Pulley x2 | | Big Spur Gear x 1 | | Axle locks x 6 | | Three hole connectorx 1 | |
| Nuts & bolts x 5 | | | | | | | |
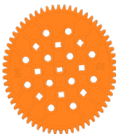
# Let's Build!

**1** Refer steps 1-3 of previous project for this construction.
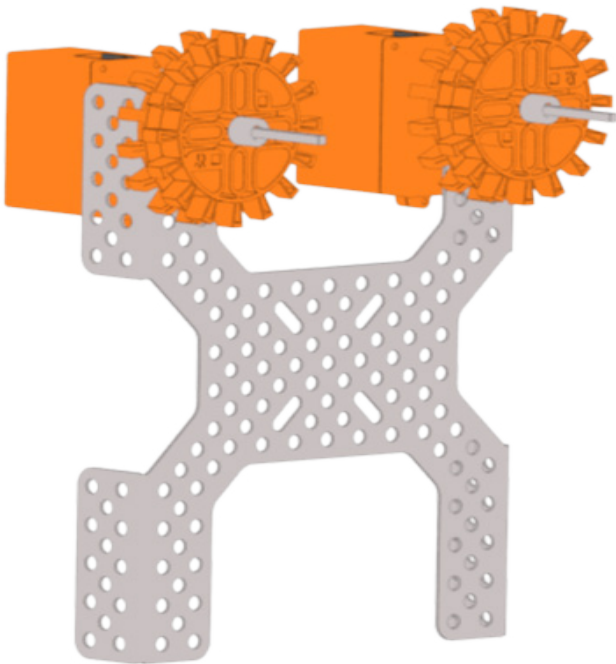
On the left (bottom) flap of the rope car, attach the motor, on the bottom hole of the middle row attach the axle and bolts on holes above that.
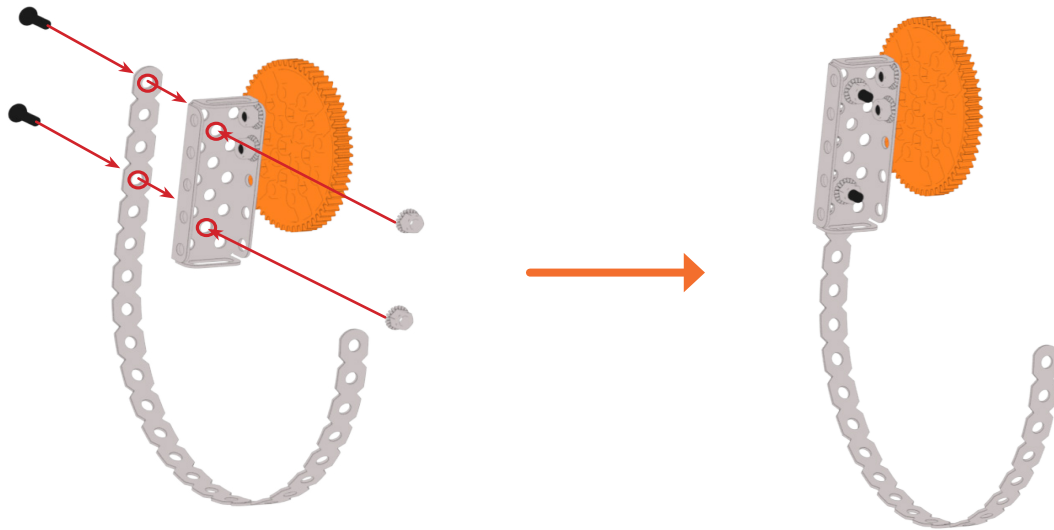
3.5" Axle
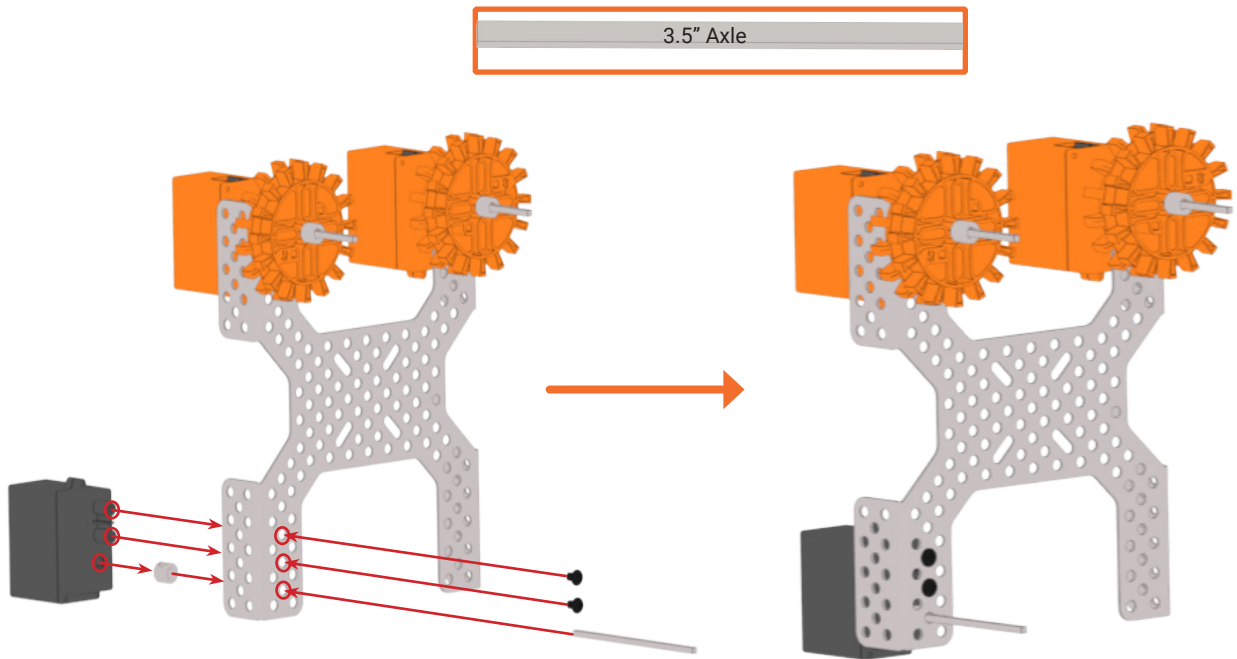


3

Let's make the arm, using the adjacent holes of the big spur gear, attach the 2.5" U-beam.
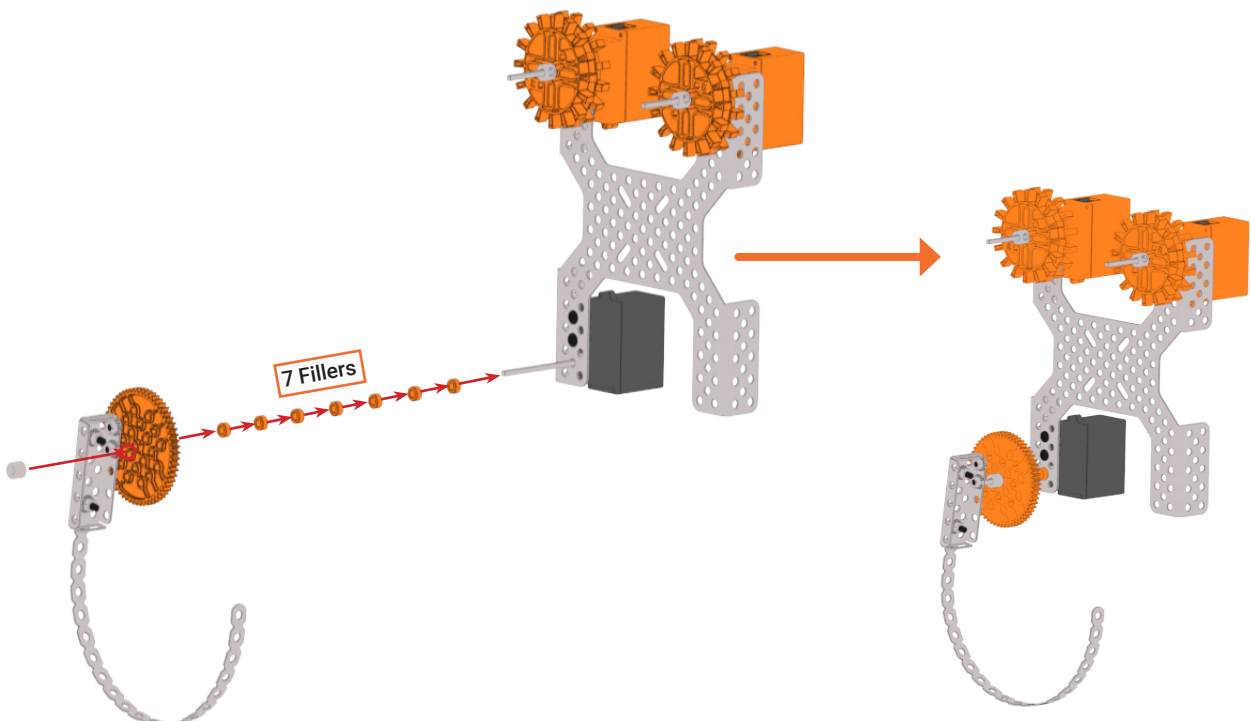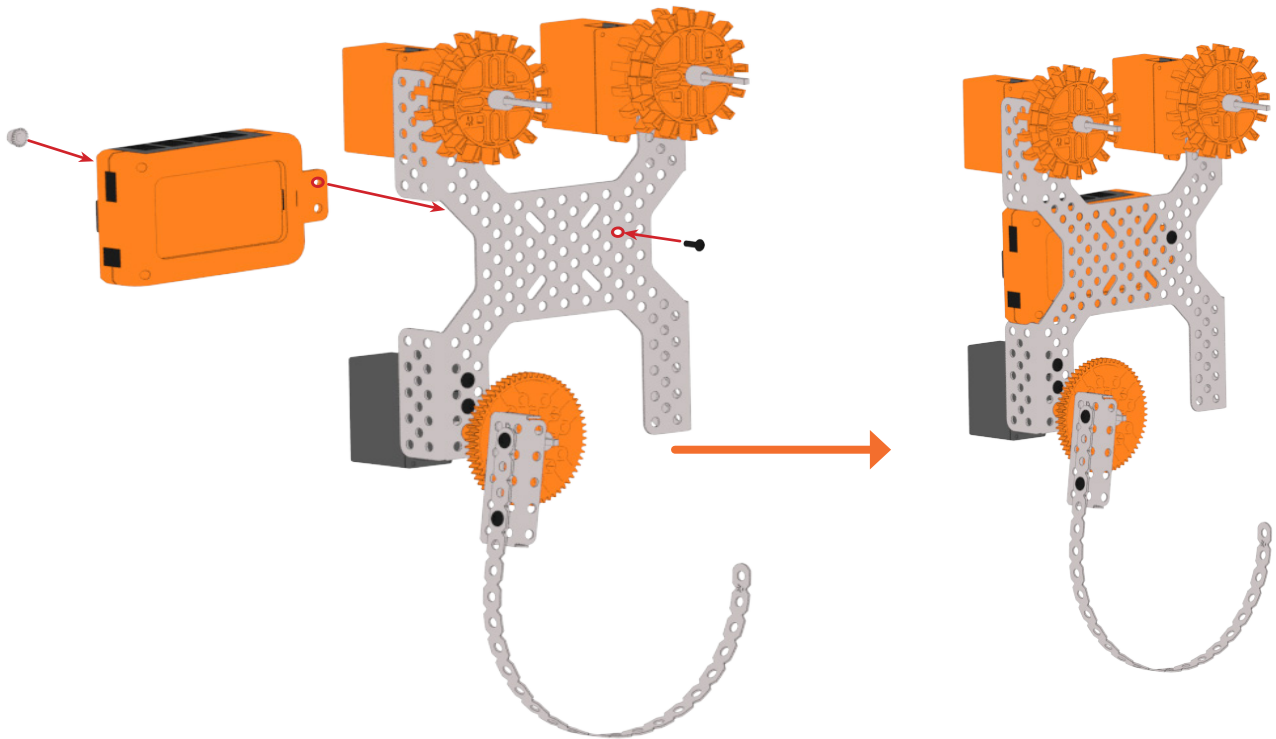


Large Gear
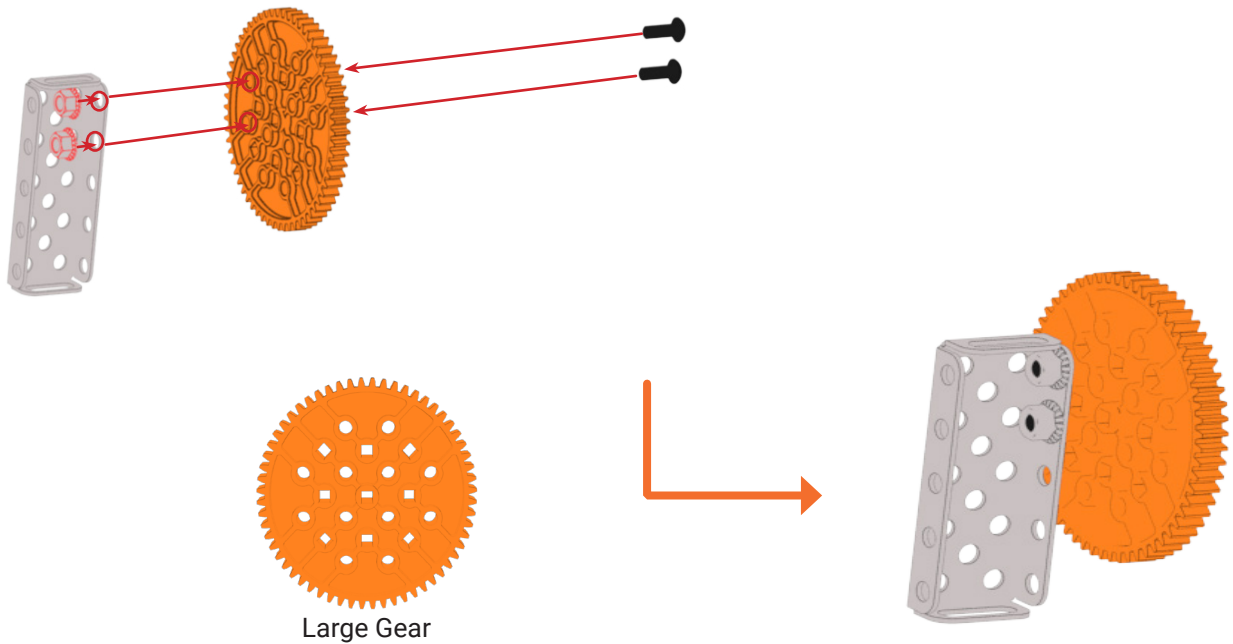
**4** Bend a flexible strip to form a U shape arm and attach it on the U-Beam using the 1st and last hole of the middle row.
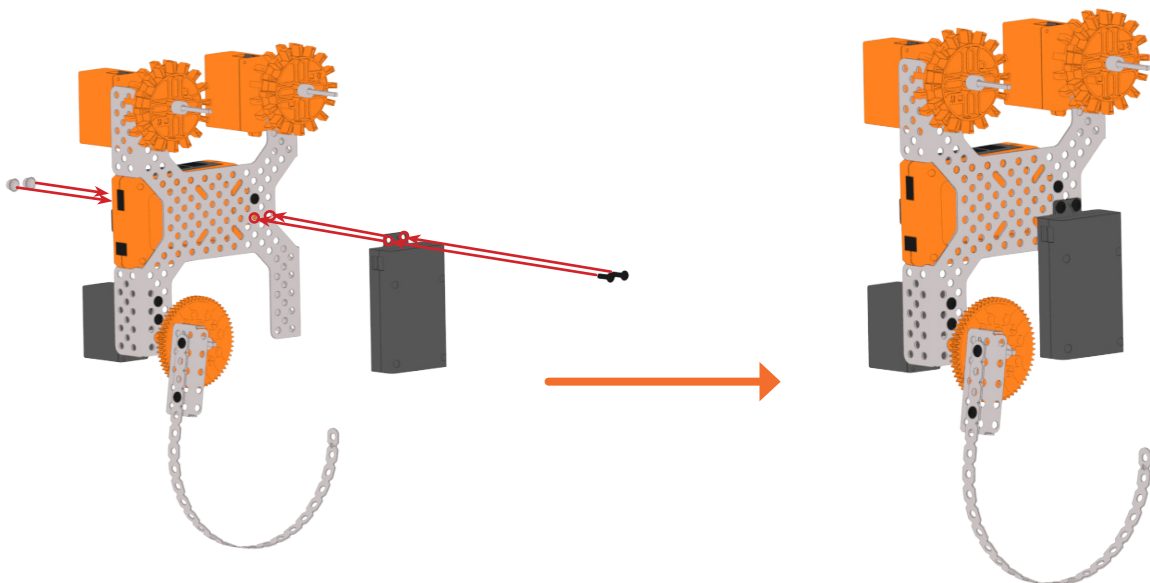


**5** Attach 7 fillers, the arm made on the axle of the high torque motor, and lock it up using an axle lock.

7 Fillers

From the back side, attach the brain, for now just use 1 top bolt.
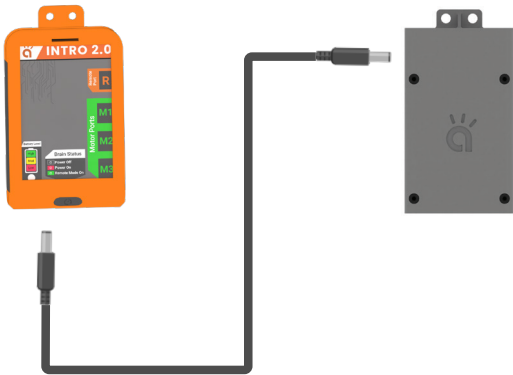


On the front side add the battery, 1 bolt for the brain and battery is common using that attach the battery, and then attach the second bolt to fix the battery in place.

**8** Attach the battery cable to both the brain and battery, and connect the motor and sensor to the brain.
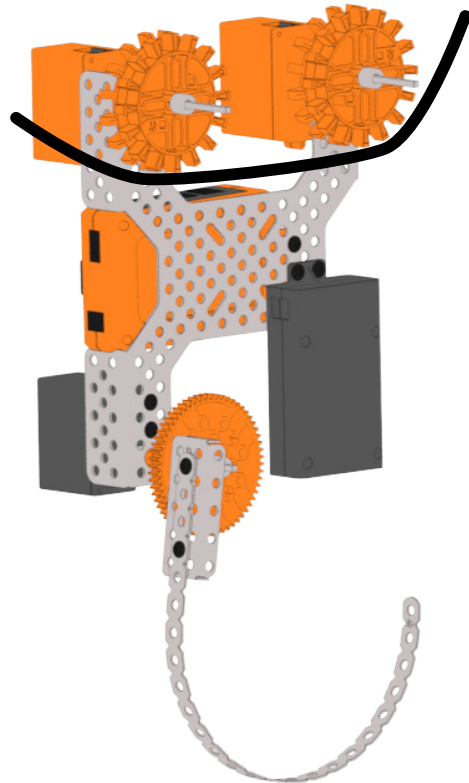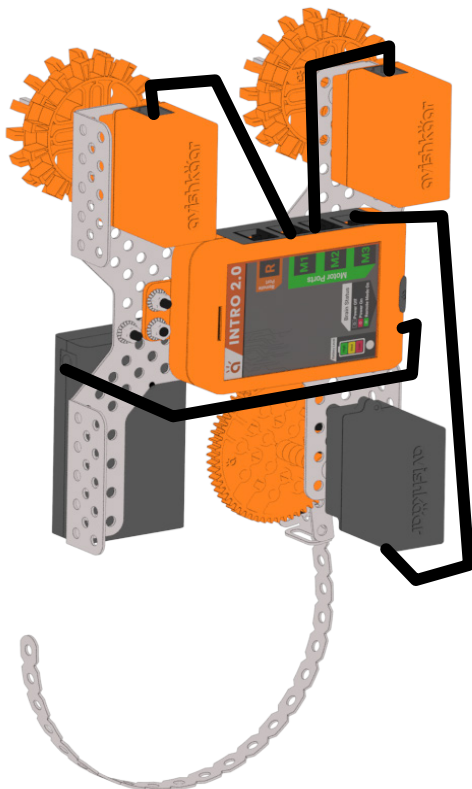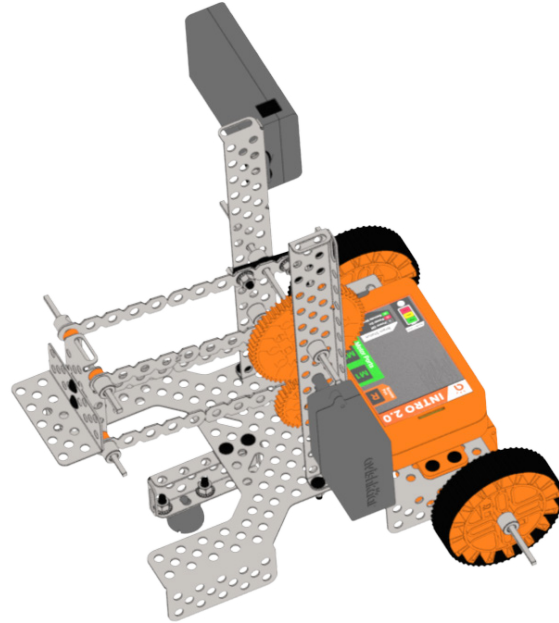


**Battery Brain connection**

- **Connect Right speed motor to M1 port.**
- **Connect Left speed motor to M2 port.**
- **Connect pulley motor to M3 port.**



Scan the QR to
upload the project

# 11. Mini Skyrise



Skyrise robot uses a linkage mechanism known as four-bar linkage, also called a four-bar, is the simplest movable closed-chain linkage. It consists of four bodies, called bars or links, connected in a loop by four joints. Generally, the joints are configured so the links move in parallel planes, and the assembly is called a planar four-bar linkage

## What is our task?
Design a robot that can go high up in the sky using the four Bar Linkage mechanism.

## What will you learn?



Motor control and interfacing techniques



Remote operation



Robust Construction



Input to output transformations
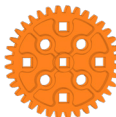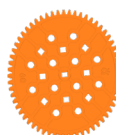


Mechanical Chassis Design



Cherry picker, bucket truck or mobile elevating work platform is a mechanical device used to provide temporary access for people or equipment to inaccessible areas,

# What will you need?

| | | | |
|---|---|---|---|
| Intro Brain | Battery x 1 | High Speed Motor x 2 | High Torque Motor x 1 |
| Manual Remote x 1 | 2.5" U-Beam x 2 | Square plate x 1 | 2.5" U-Beam x 1 |
| 7.5" L-Beam x2 | Chasis x 1 | 12.5" Flexible Strip x 2 | 5.5" Axle x 2 |
| 3.5" Axle x 4 | Connecting Cables x 3 | Remote Cable x 1 | DC Battery Connecting Cable x 1 |
| Medium Spur Gear x 1 | Big Spur Gear x 1 | Small Wheels x 2 | Castor Wheel x 1 |
| Nuts & bolts x 19 | Fillers x 9 | Three hole connectorx 2 | Axle locks x 13 |

# Let's Build!
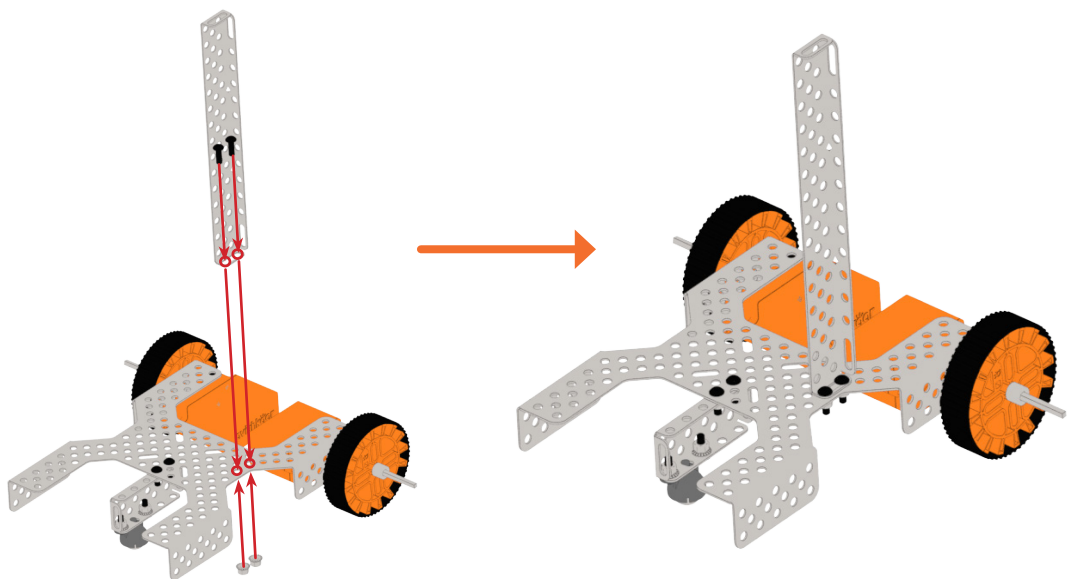
1 | Refer project 1 for steps 1-4 uptil this construction.
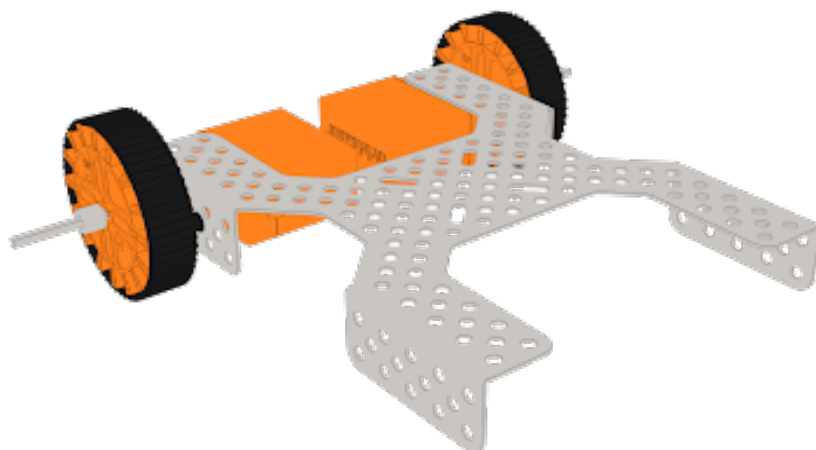
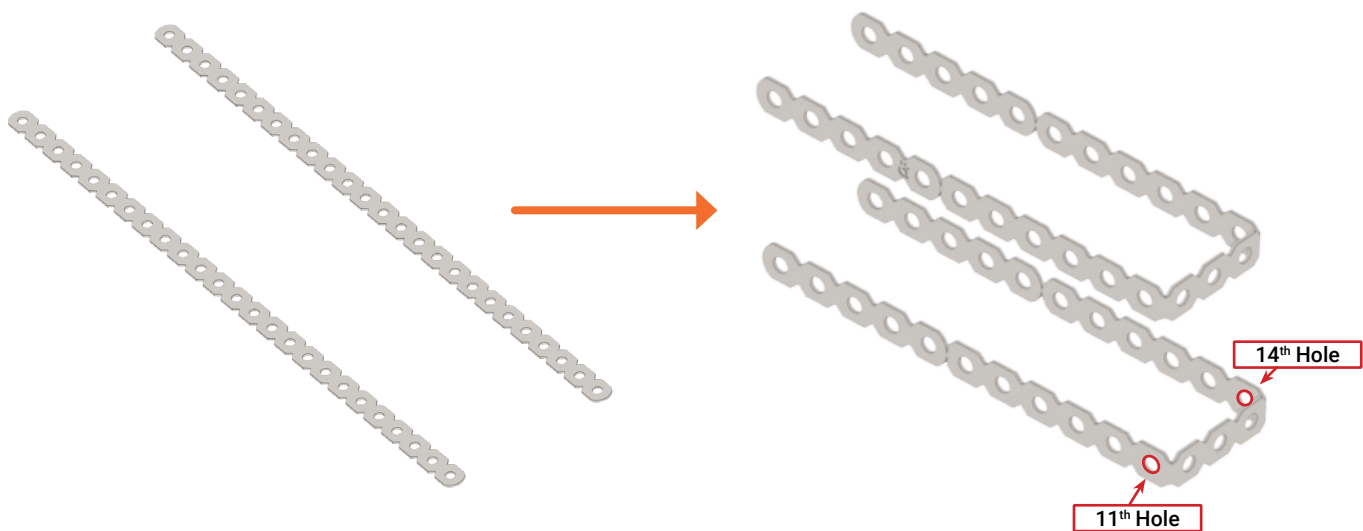Take one 2.5" U-beam and attach a castor wheel on the 1st and 3rd hole.
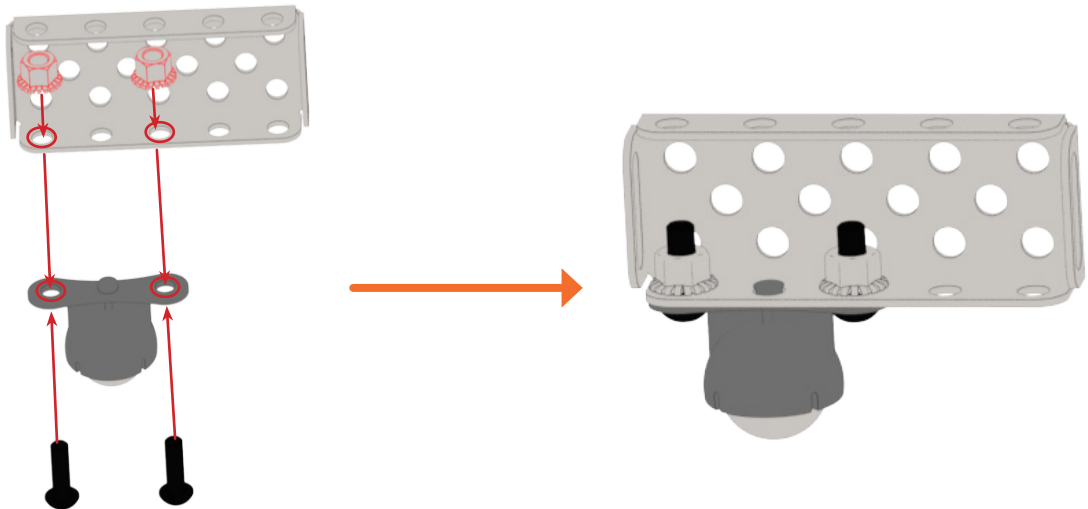
3 Attach the assembly made on the front 2 holes of the middle row of the chasis.
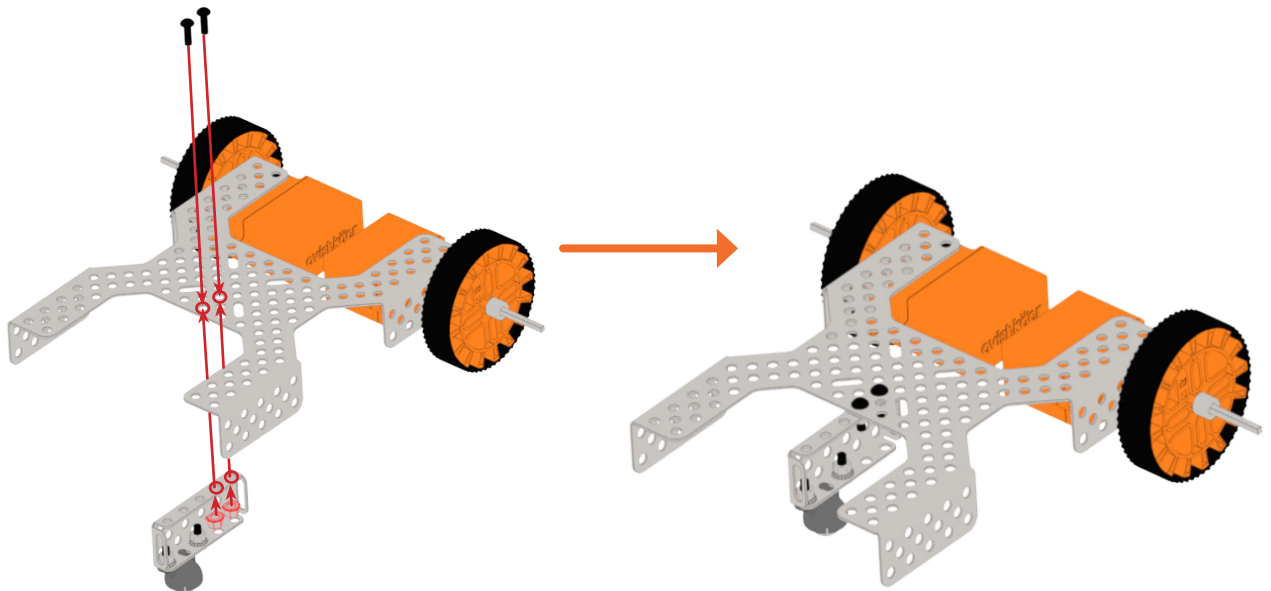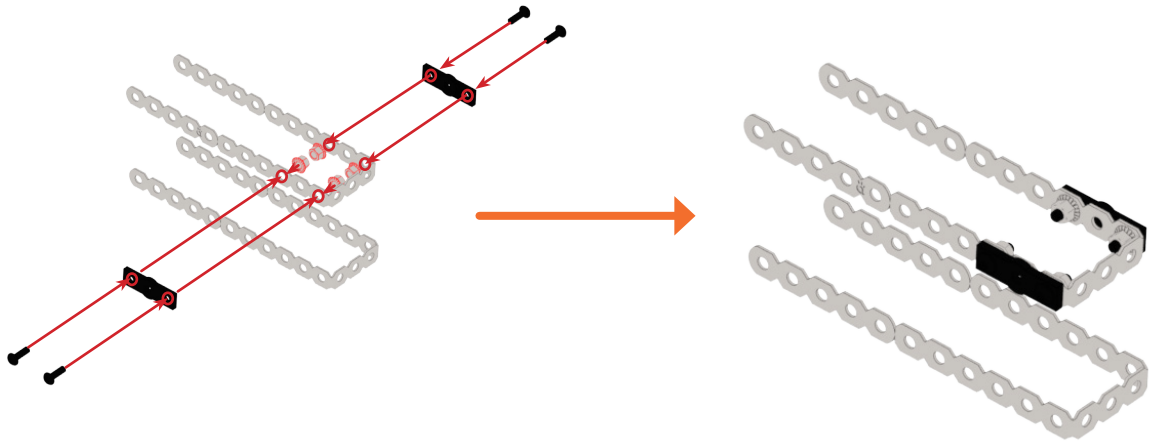
**4** Attach a 7.5" L-beam on the chassis.



**5** Take two 12.5" flexible strips and make one bend on both of them after the 11th hole and the second bend after the 14th hole.
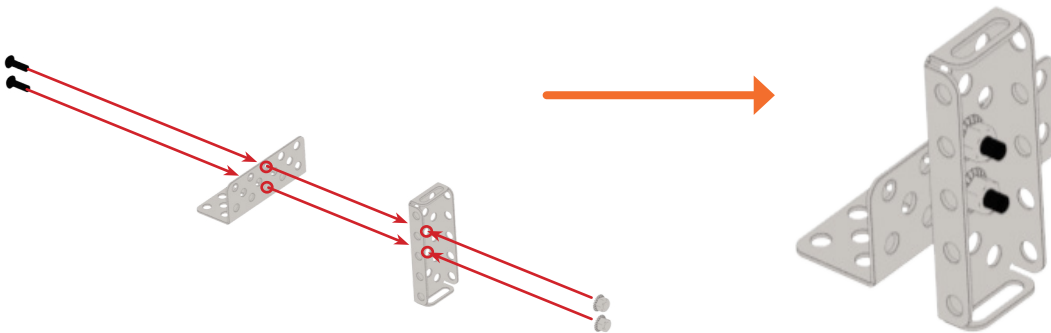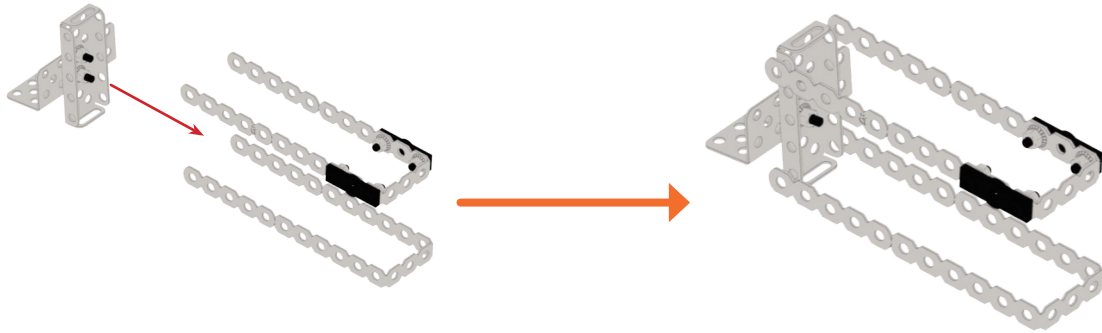


14th Hole

11th Hole

On one of the flexible strips at the back side attach two 3 hole connectors using nuts and bolts.

Attach one 2.5" L-channel on the 2.5" U beam using the middle 2 holes of the middle row.

Place both of the assemblies together to form an arm.



Attach fillers before and after the U-Beam and then attach two 3.5" axles on the top and bottom row of the U-Beam and then lock it up using axle locks.

3.5" Axle



97
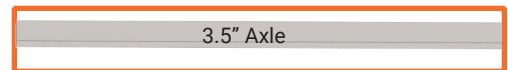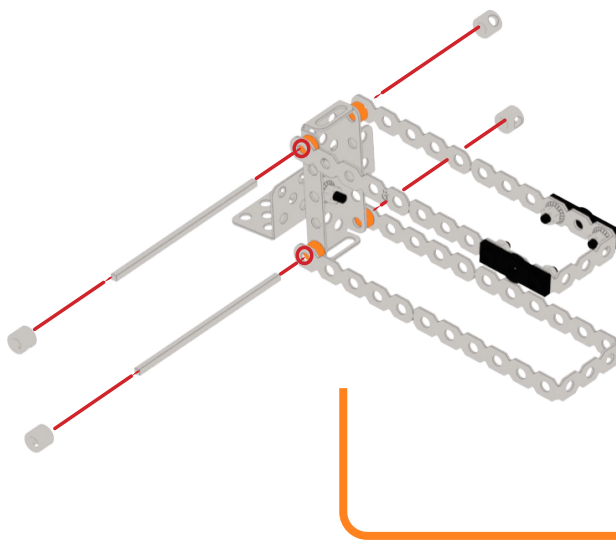
**10** Attach the motor on the L-beam, on the middle row from the 4th hole (bottom) attach the 5.5" axle and on the motor and lock it up using the holes above it.

5.5" Axle

6th Hole

4th Hole
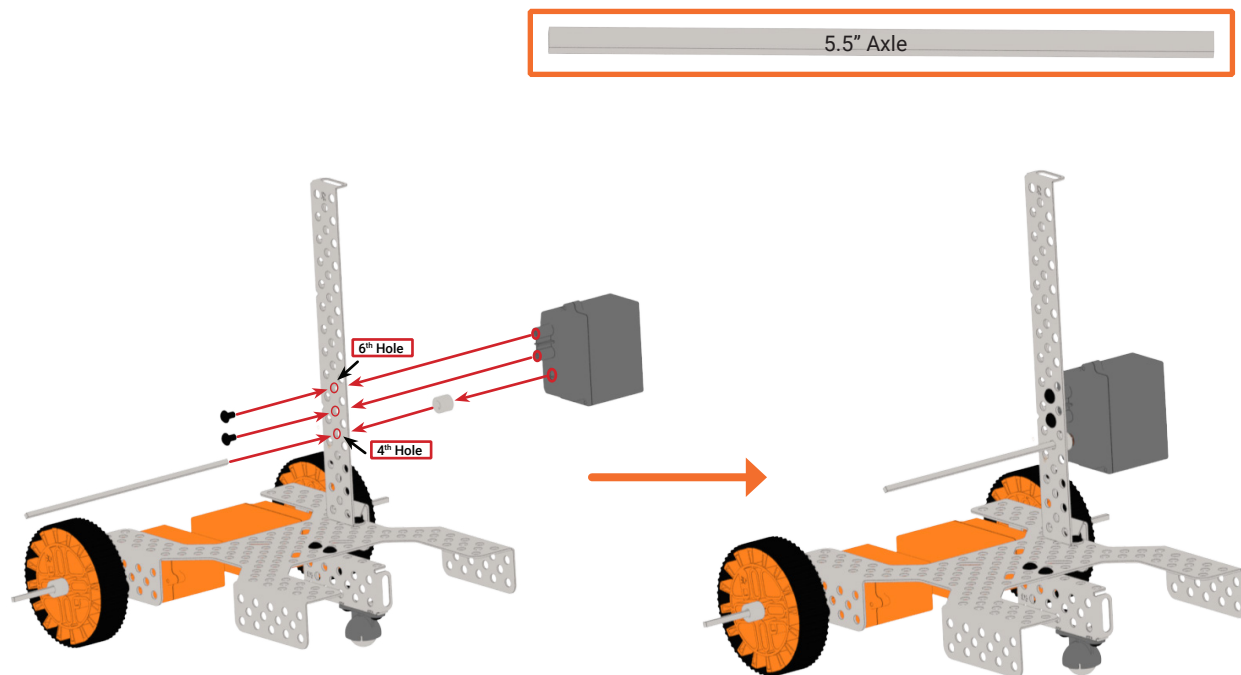
**11** Attach a filler, a medium spur gear and again a filler on the axle.

Medium Gear
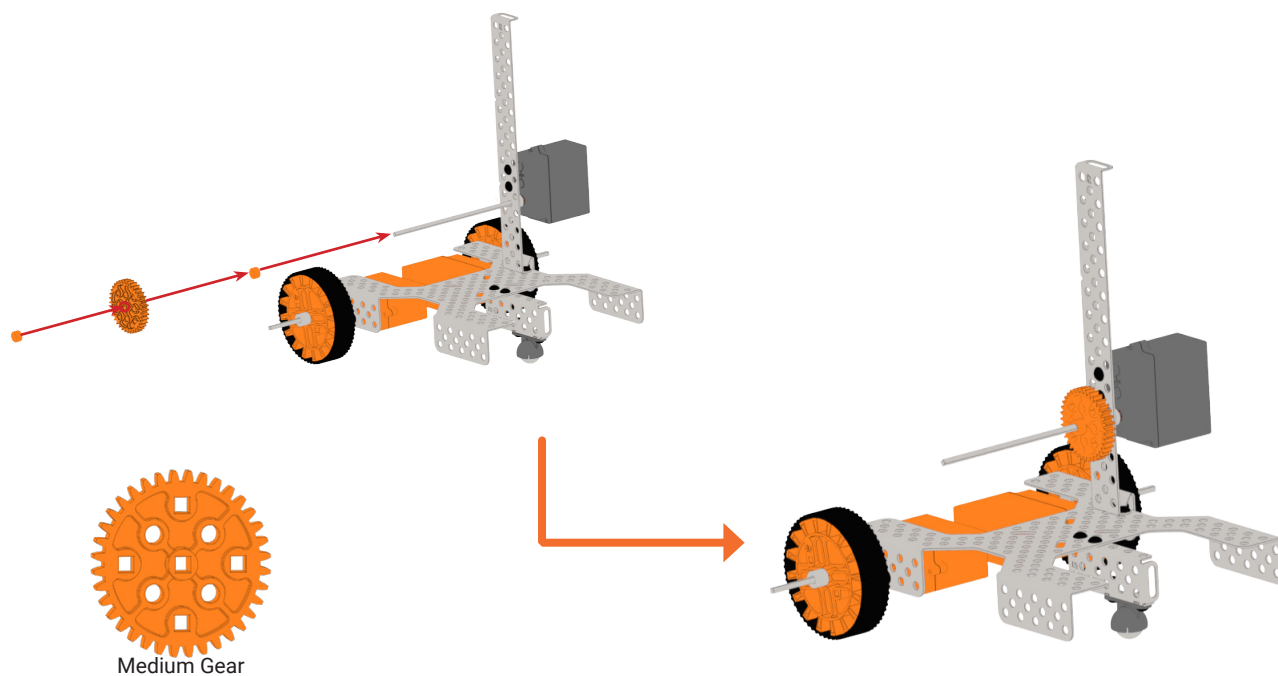
**12** Attach a 5.5" axle, lock it using an axle lock on the back side. On the front side, attach a filler and a big spur gear.
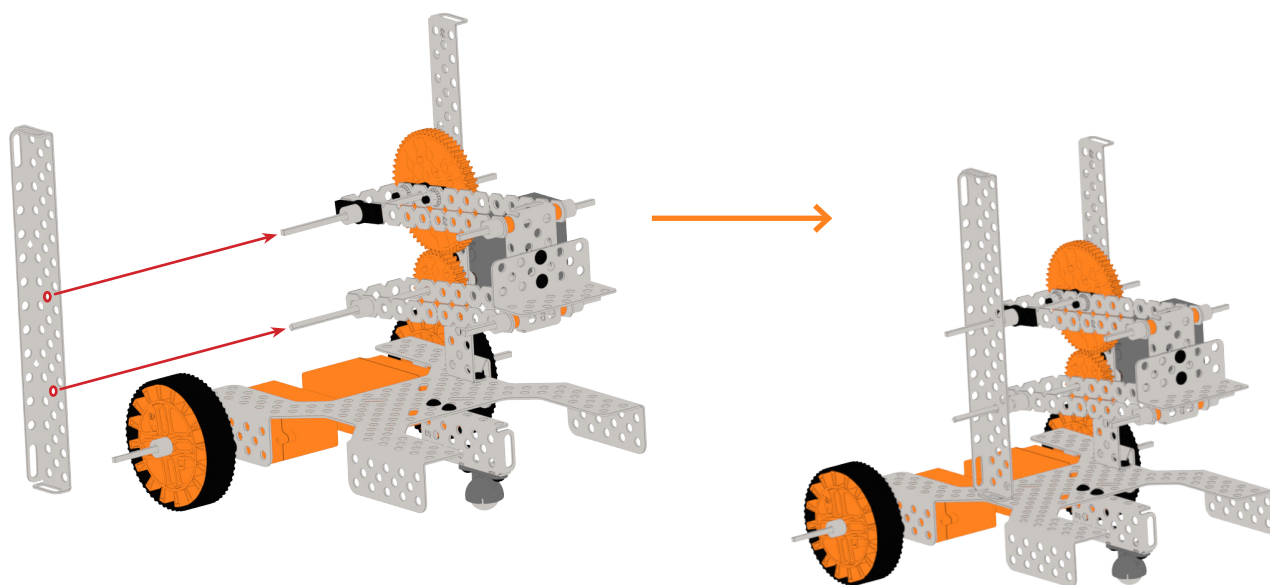


Large Gear

5.5" Axle
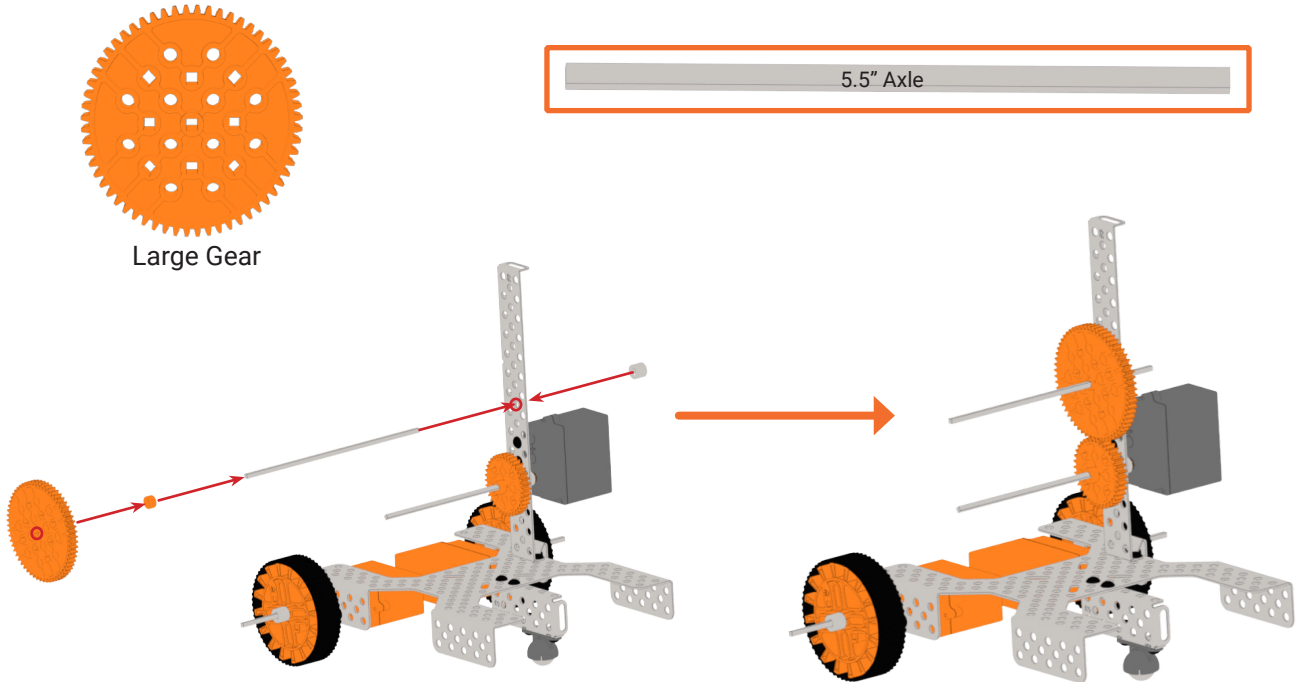
**13** Attach the assembly made, using the middle hole of the three hole connector, attach the top arm to the big spur gear. Attach the bottom arm using the second hole on the axle of the motor.
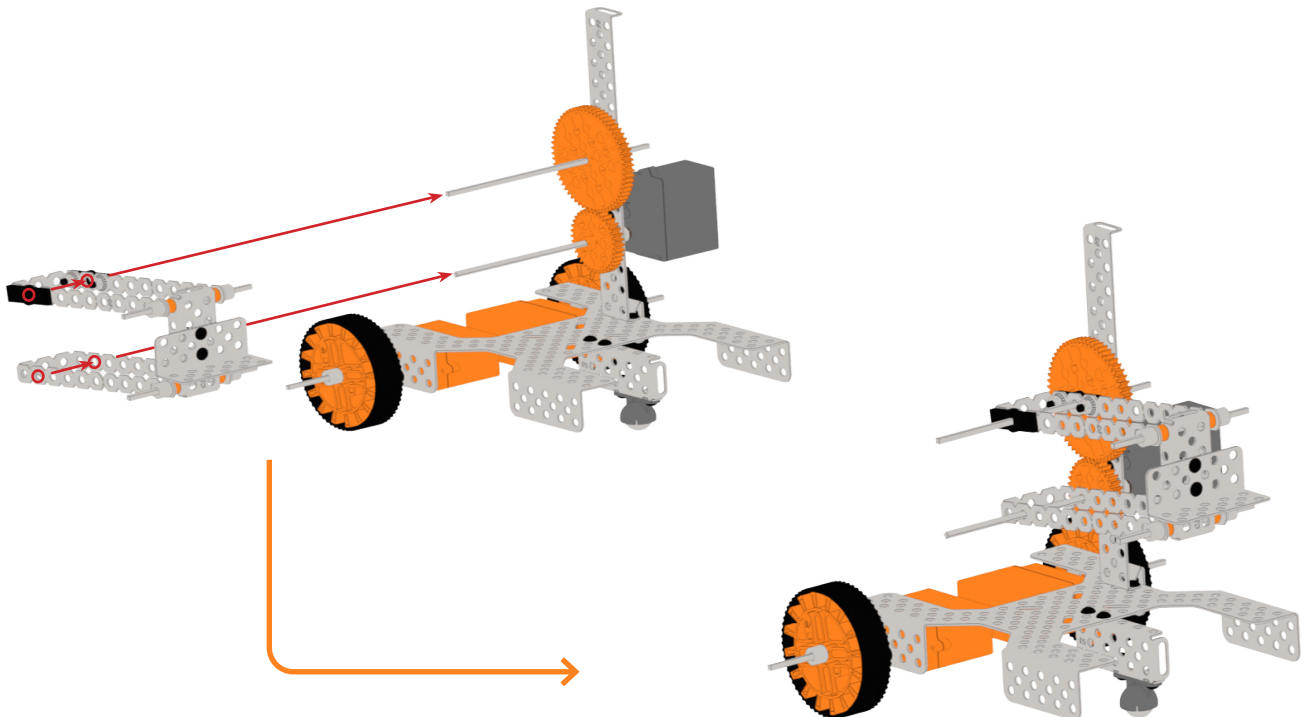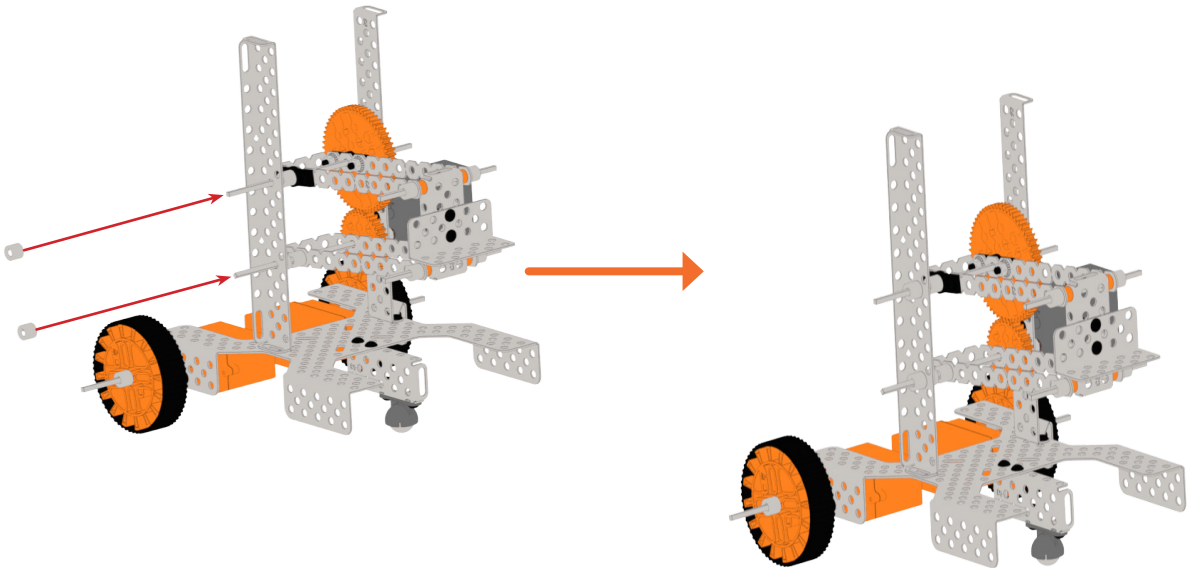
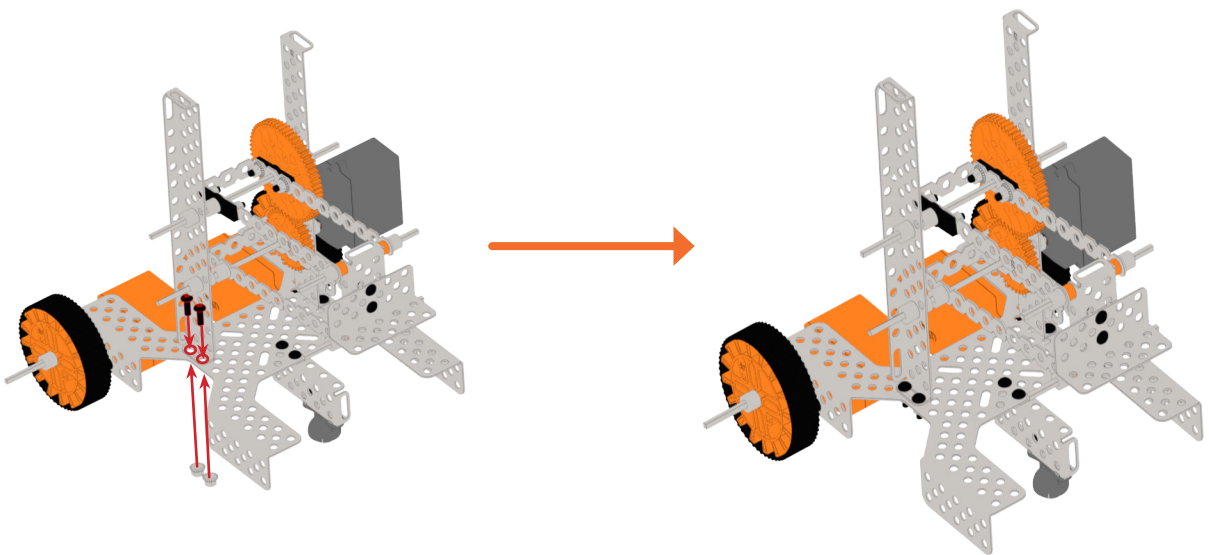Attach one axle lock on the top axle and 2 axle locks on the bottom one.
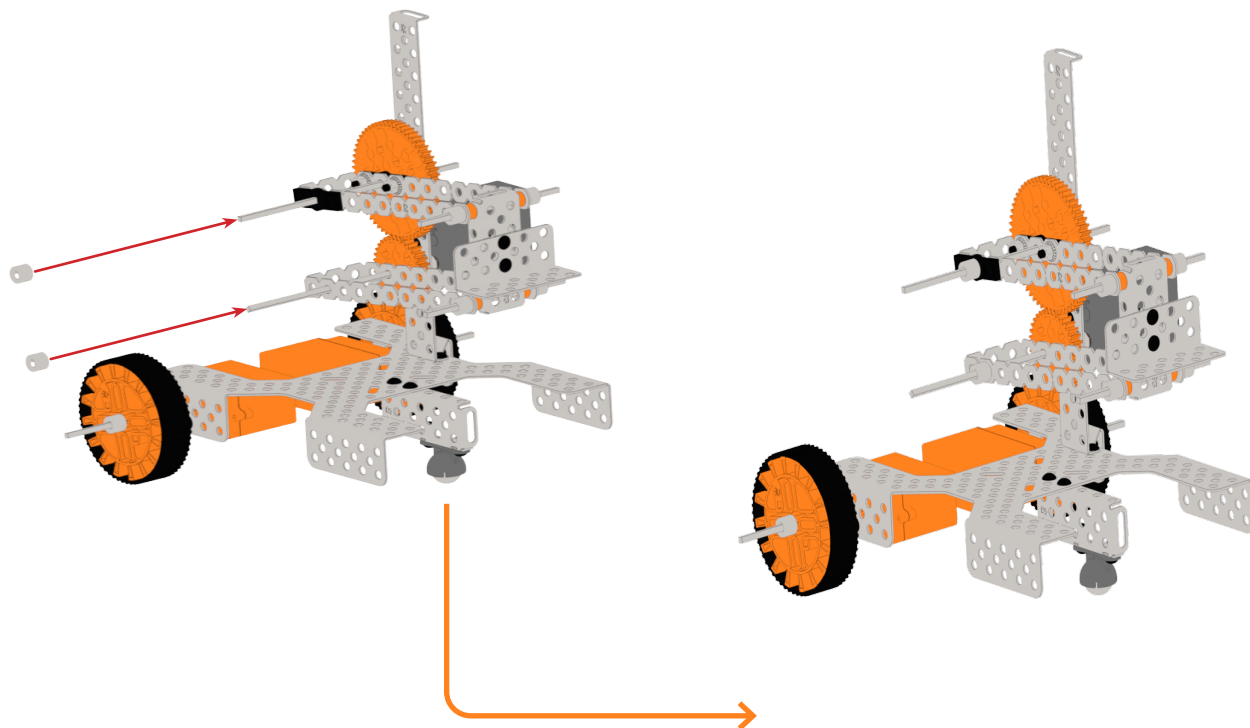
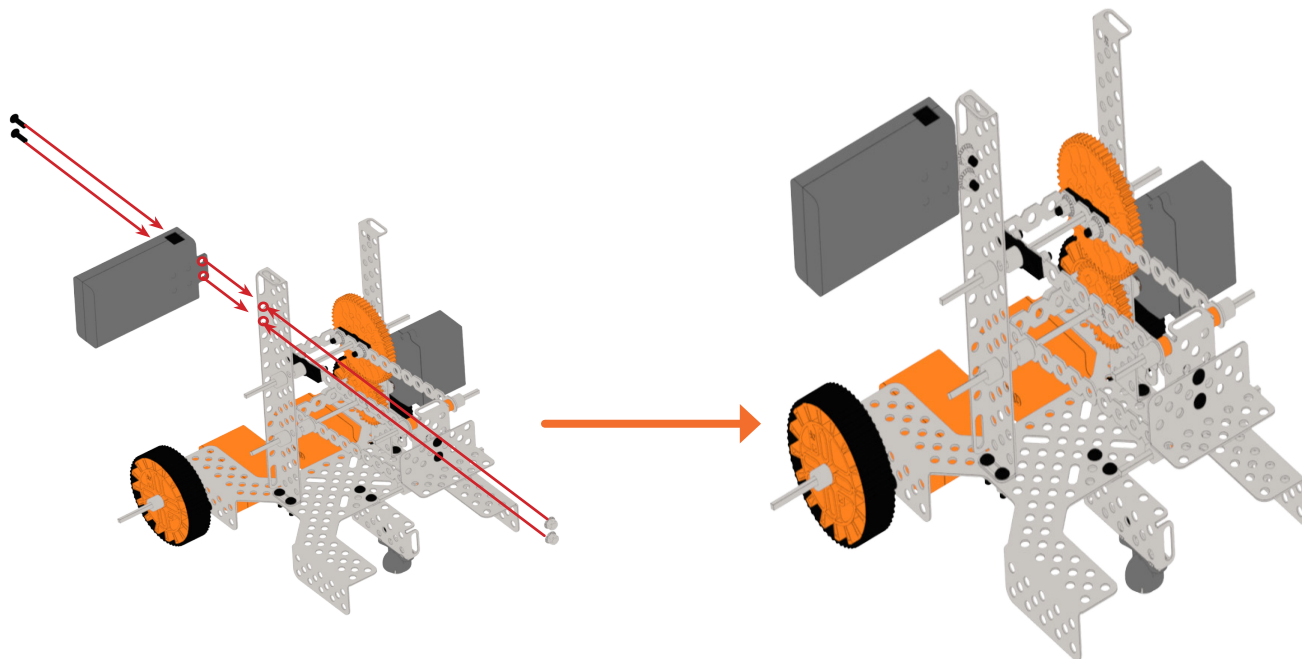Attach another L-Beam using the 7th and 11th hole (from top) on the axles of the assembly.

**16** Attach 2 axle locks on the axles.



**17** Fix the L-beam on the chasis using two bolts.

18 From the back side, attach the battery on the L-Beam, on the 3rd ans 4th hole from top.

19 Attach the brain on the on the chasis the placement of the brain is above the motor, so to attach the brain you can remove the motor, attach the brain and then re-attach the motor, if you are not able to place it directly.
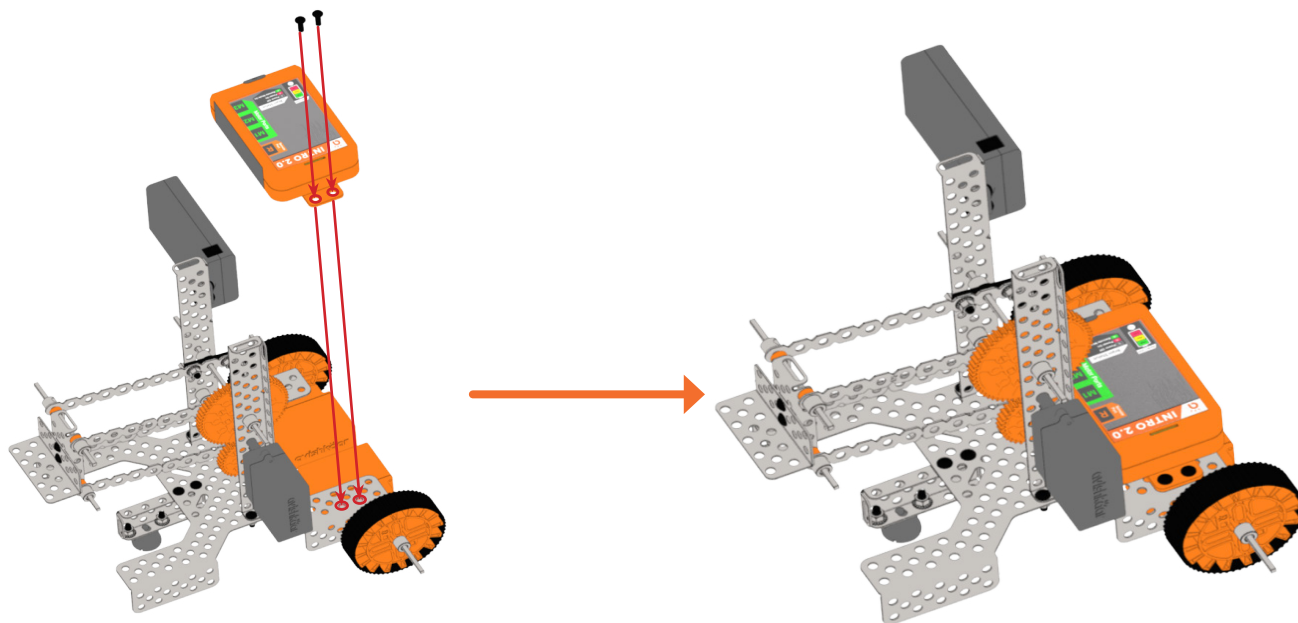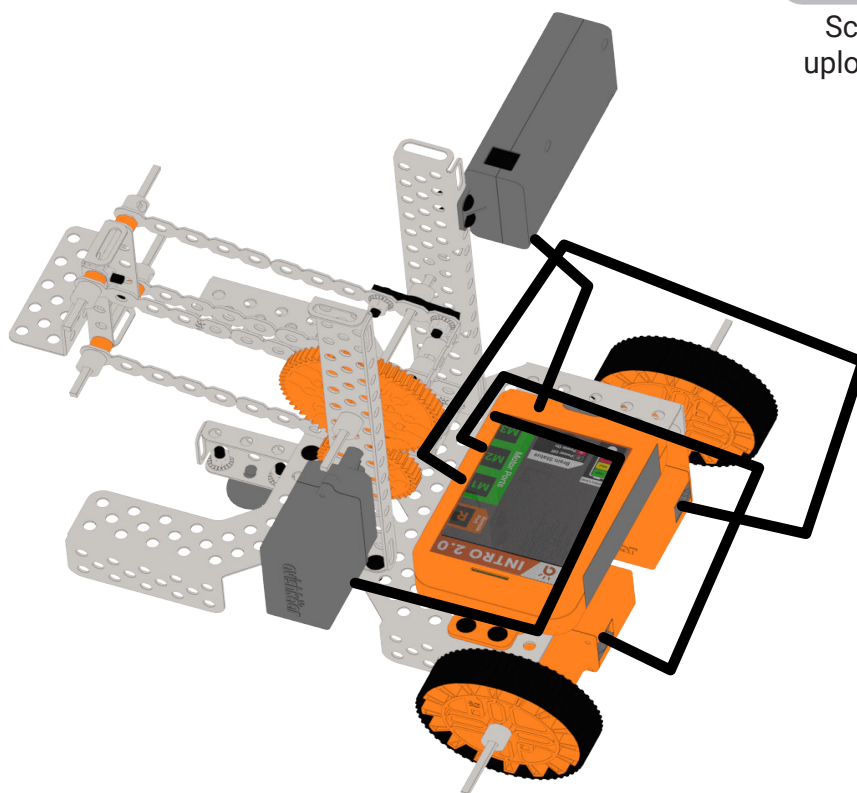
**20** Attach the battery cable to both the brain and battery, and connect the motor and sensor to the brain.



## Battery Brain connection
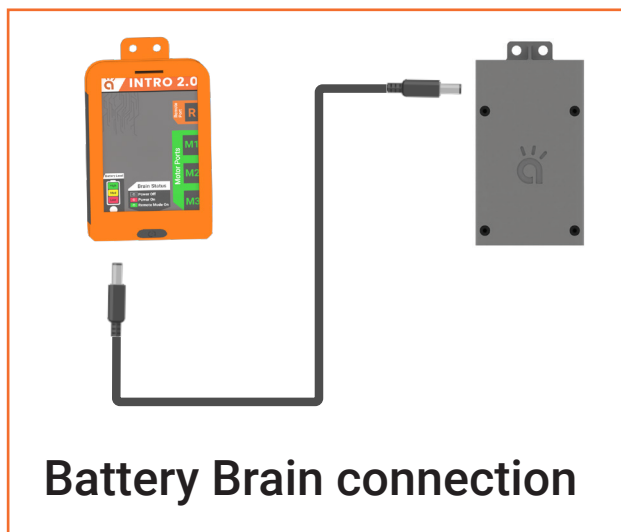
- **Connect Right speed motor to M1 port.**
- **Connect Left speed motor to M2 port.**
- **Connect pulley motor to M3 port.**



Scan the QR to upload the project

# 12. Shooter



Shooter is a type of gun which is mechanially constructed used to shoot objects. It can be compared to a rubber-band powerd toy gun.

## What is our task?

Design and construct a shooter mechanism which can be used to shoot objects.

## What will you learn?



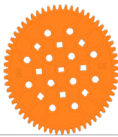Motor control and interfacing techniques



Remote operation
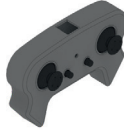


Input to output transformations



Now testing is being done on humanoid robots as soldiers. In this, aim is to handover a gun to a robot which can automatically find and kill opponent or can be manually controlled.

# What will you need?

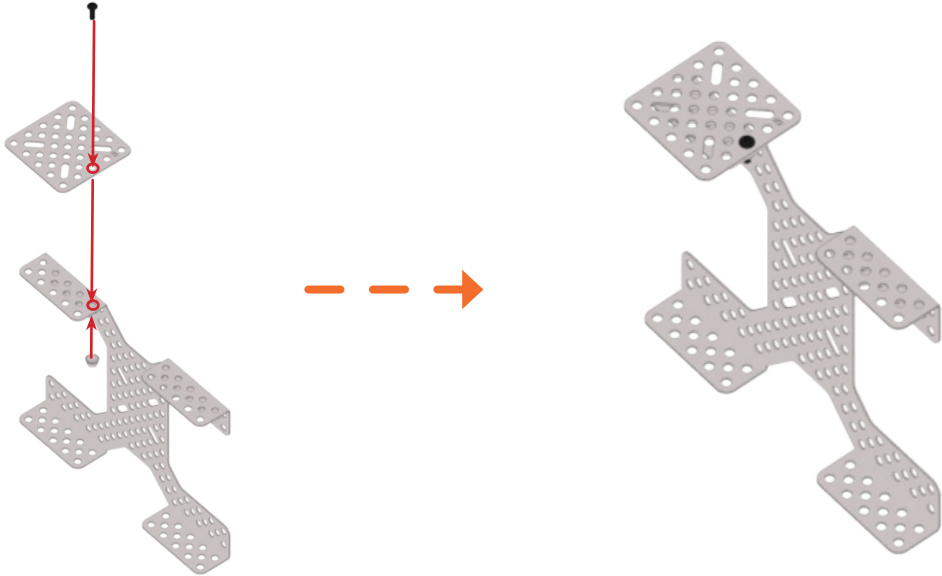| | | | |
|---|---|---|---|
| Intro Brain | Battery x 1 | Big Spur Gear x 1 | High Torque Motor x 1 |
| Manual Remote x 1 | 2.5" U-Beam x 2 | Square plate x 1 | 2.5" U-Beam x 1 |
| Chasis x 1 | 7.5" L-Beam x1 | 3.5" Axle x 1 | Remote Cable x 1 |
| Connecting Cables x 1 | DC Battery Connecting Cable x 1 | Axle locks x 4 | Nuts & bolts x 13 |
| Fillers x 2 | | | |

# Let's Build!

1. Take one 2.5" square plate and join it with chasis using the middle hole of the bottom row.

**2** Take one 2.5" U-Beam and join it with above assembly 2.5" L-Channel at 1st and 2nd hole of 3rd row (from right).
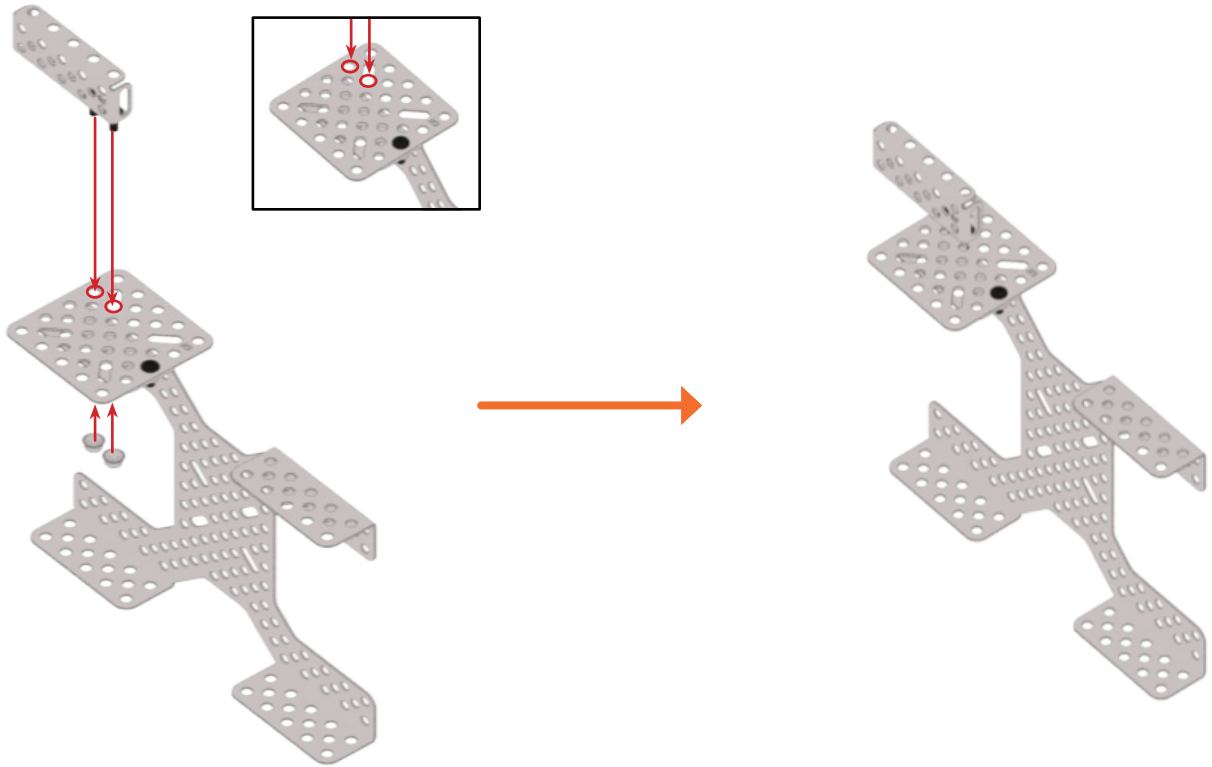
**3** Take one 2.5" U-Beam and join it with above assembly 2.5" L-Channel at 1st and 2nd hole of 3rd row (from left).
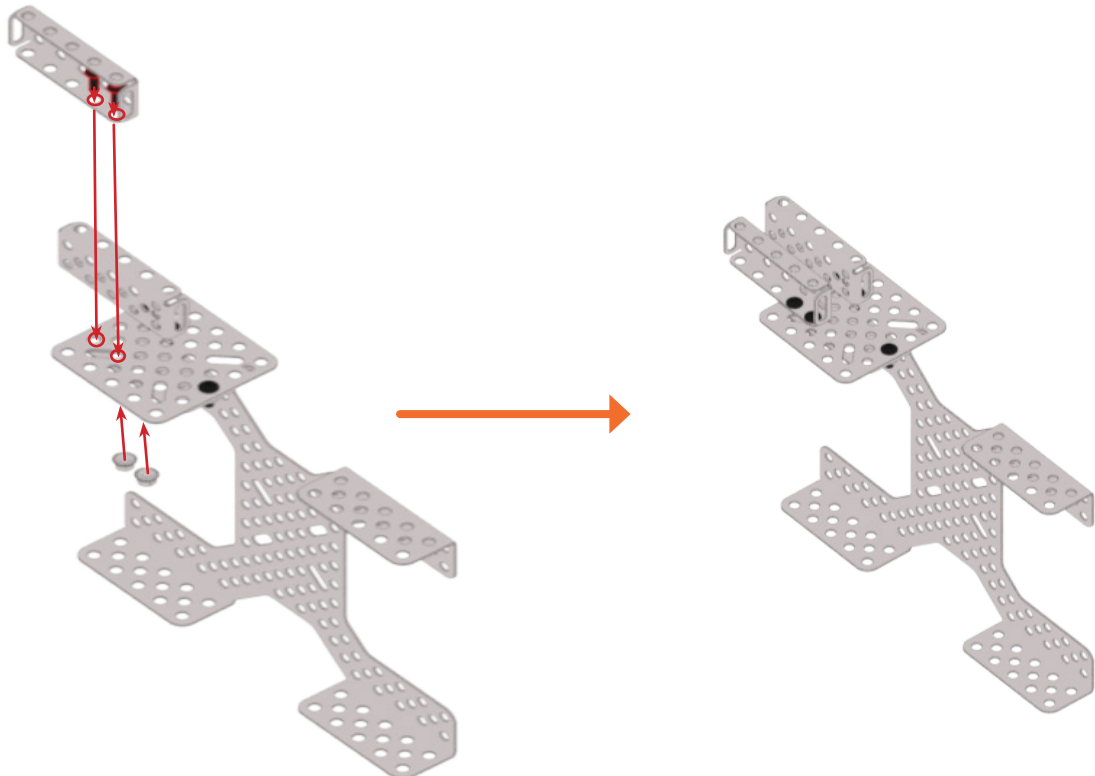
**4** Attach a high torque motor on the middle row of the chasis, on top hole join the axle and below that join it with two bolts.
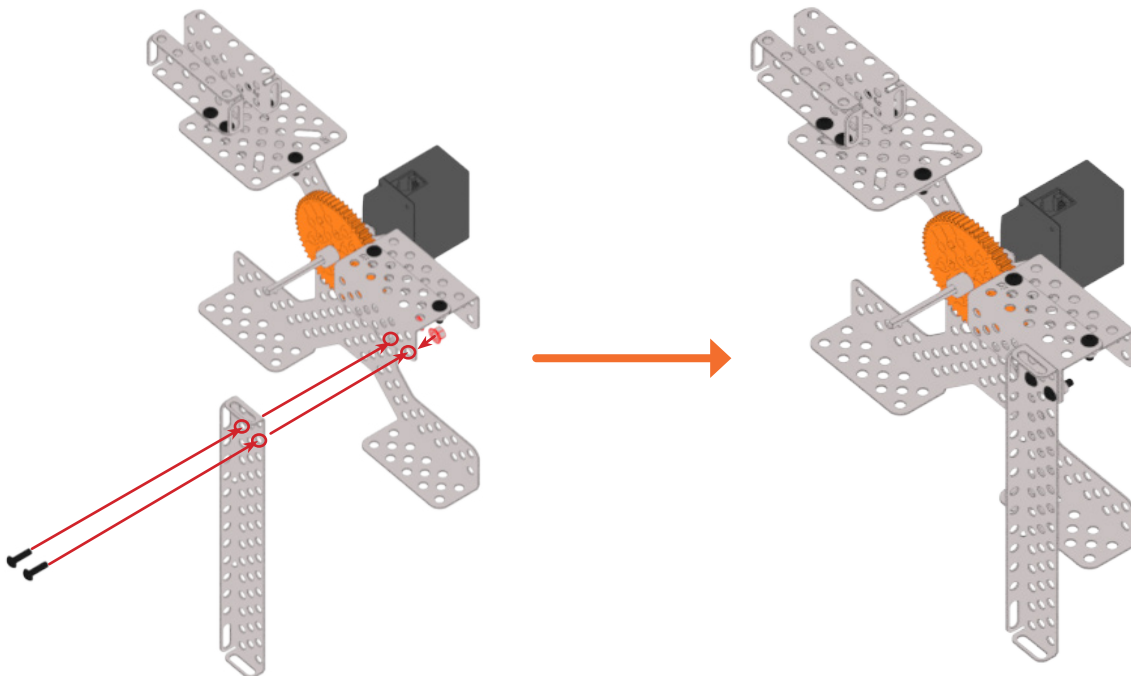
3.5" Axle
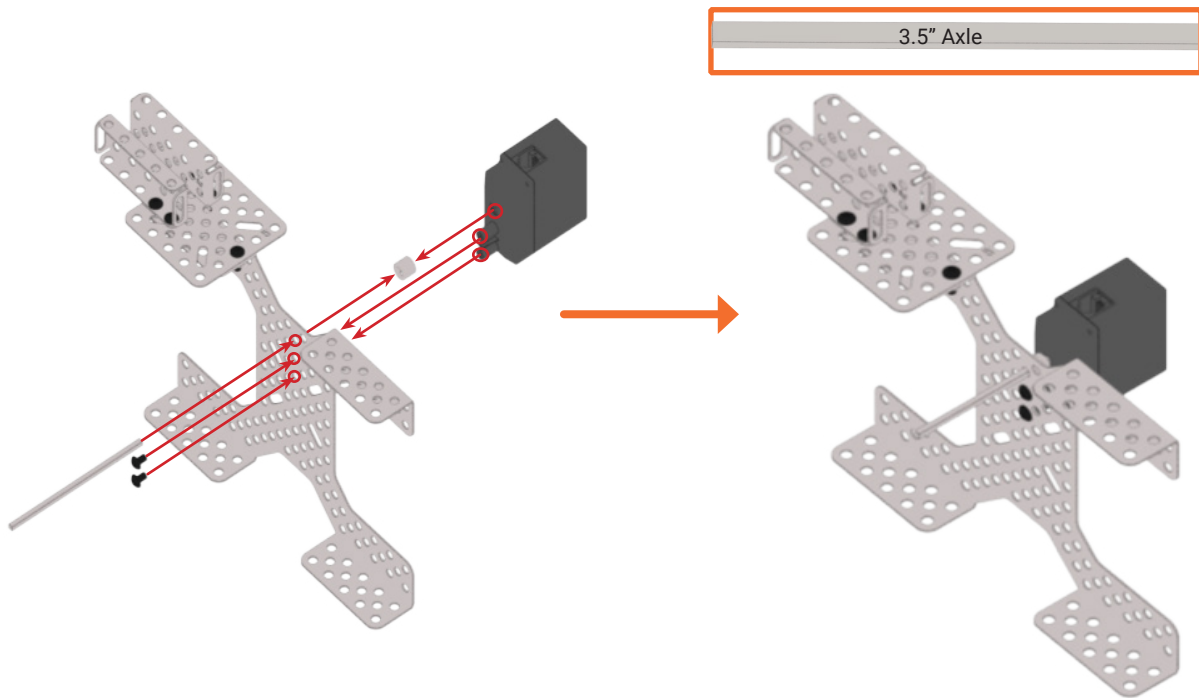
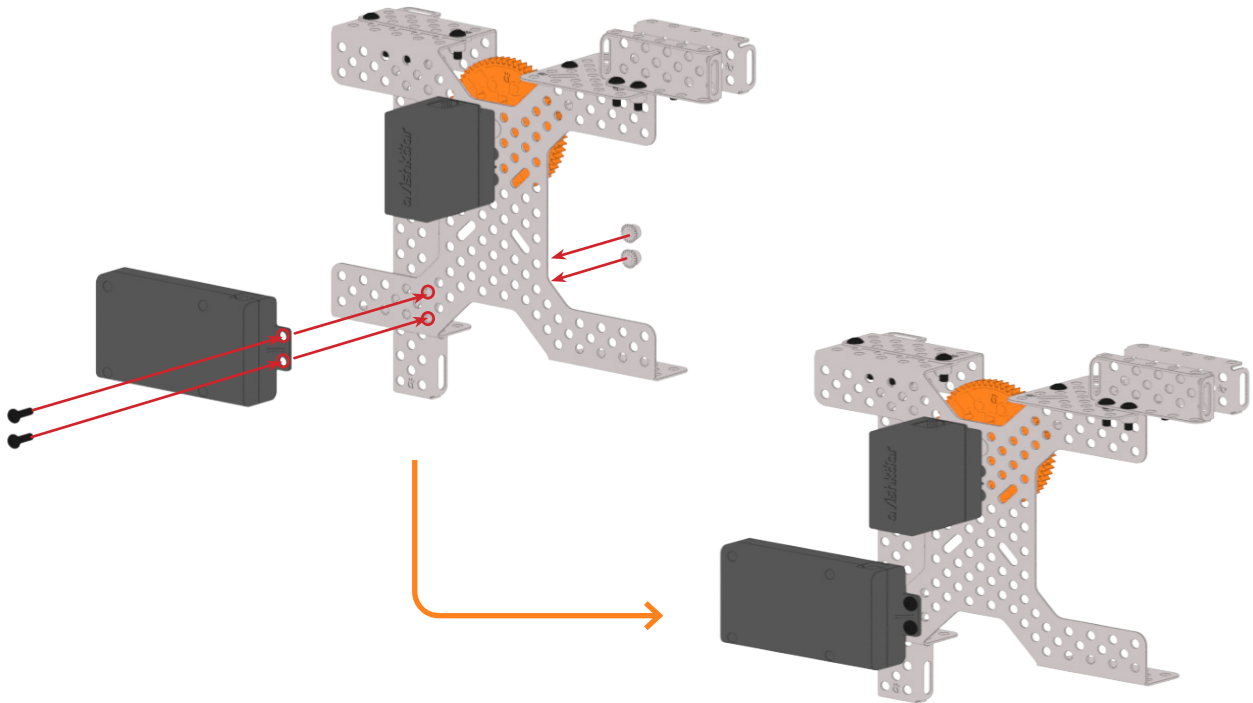**5** Attach 1 filler, a big spur gear and lock it with the axle lock on the axle of the motor.

Large Gear
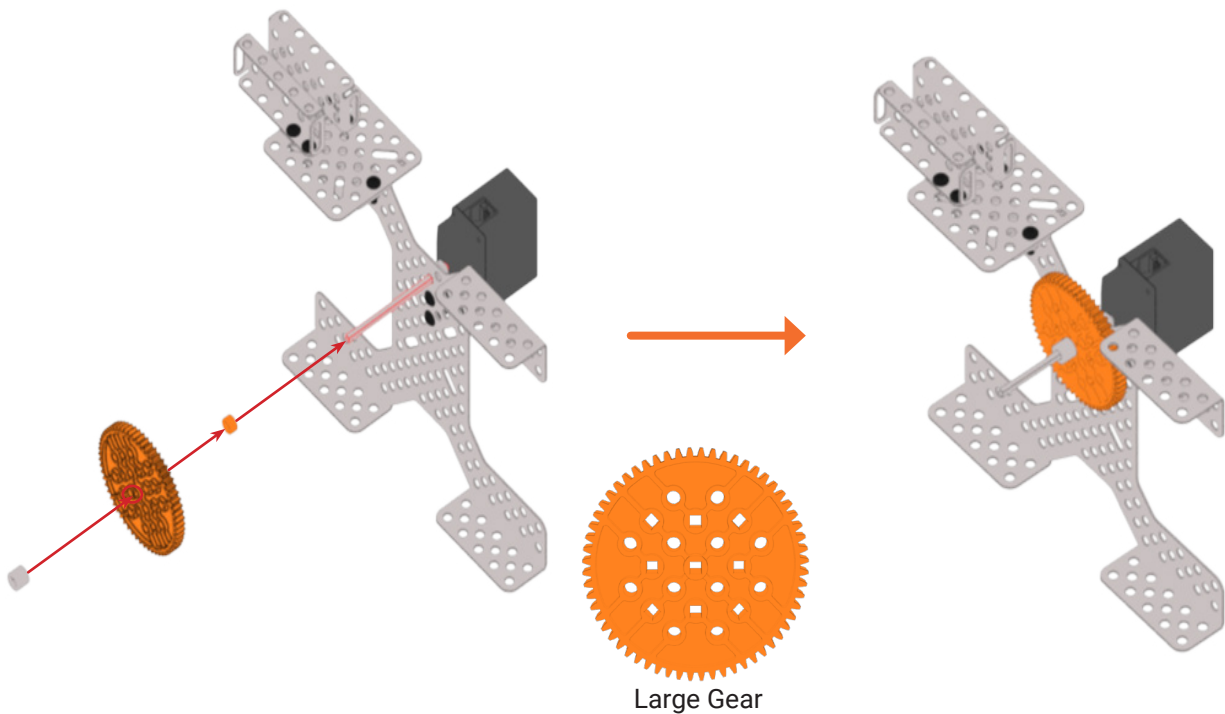
Take another 2.5" L-Channel using the 1st and 5th hole, join it with the chasis.
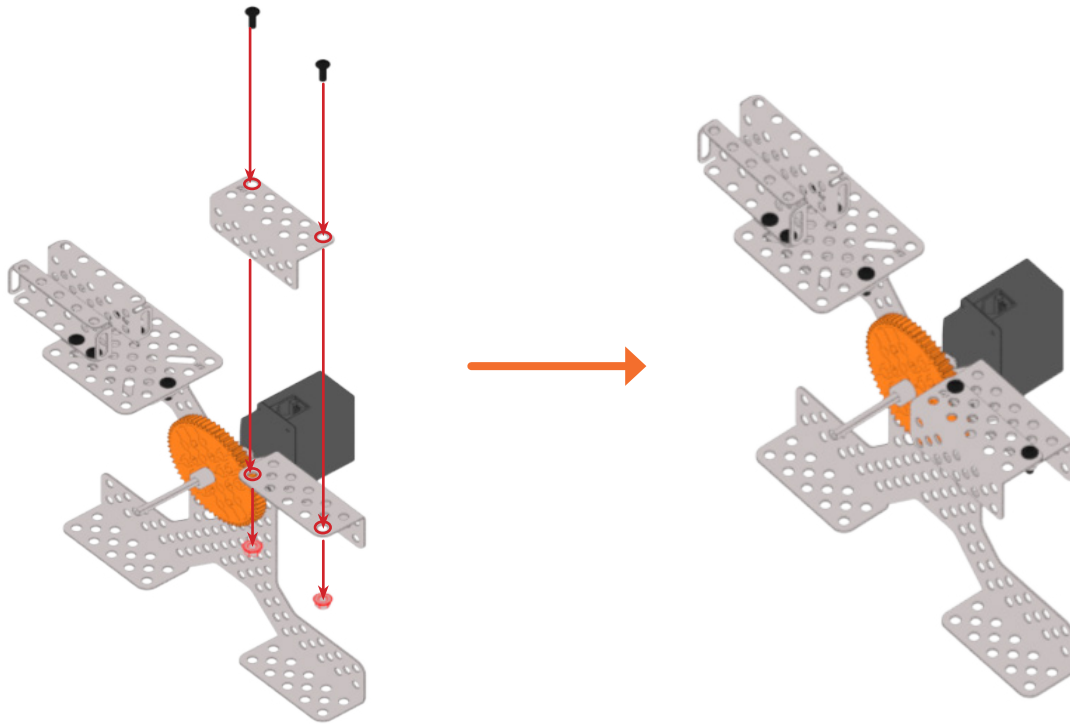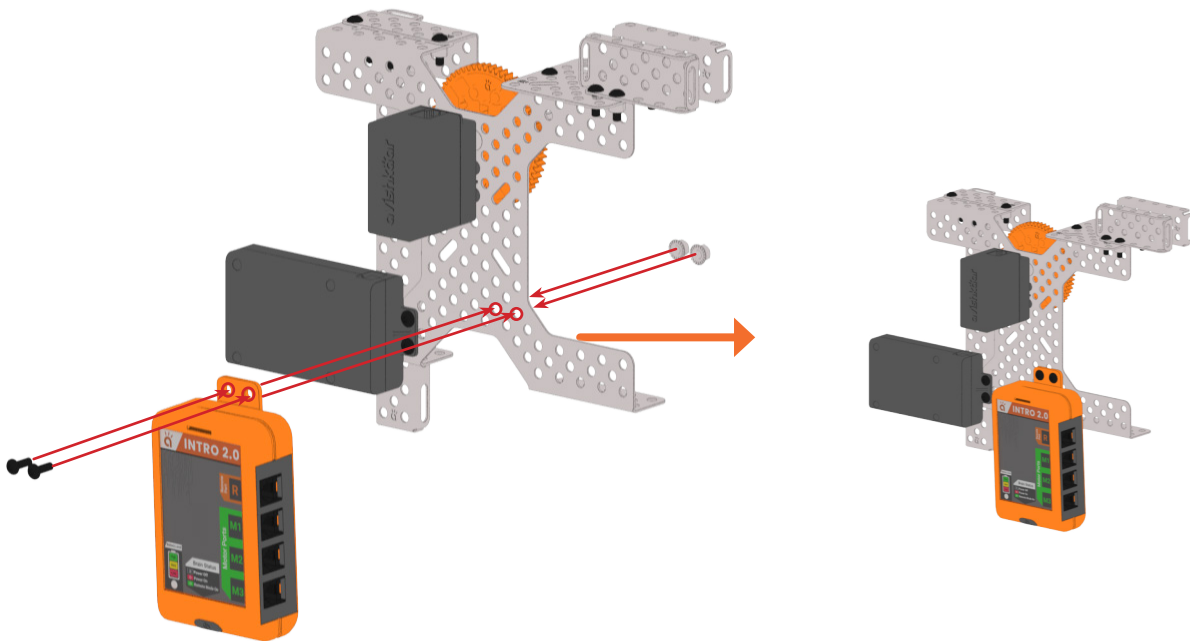
Take one 7.5" L-Beam and join it with the L-channel at holes 4 and 5 of 1st row.
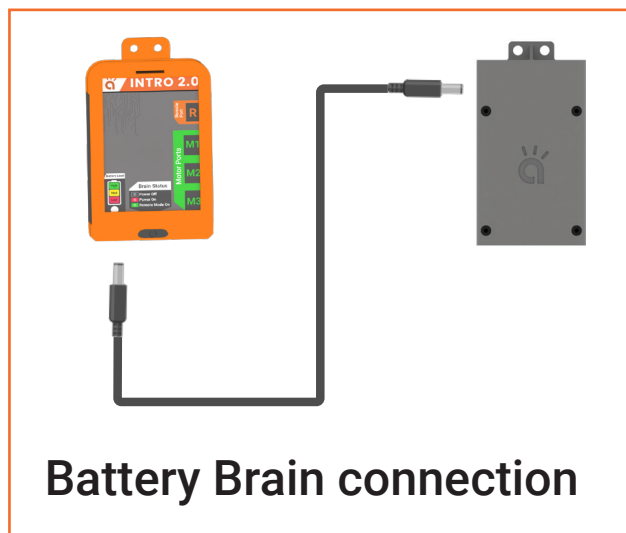
8 Attach the battery on the chassis using two bolts.
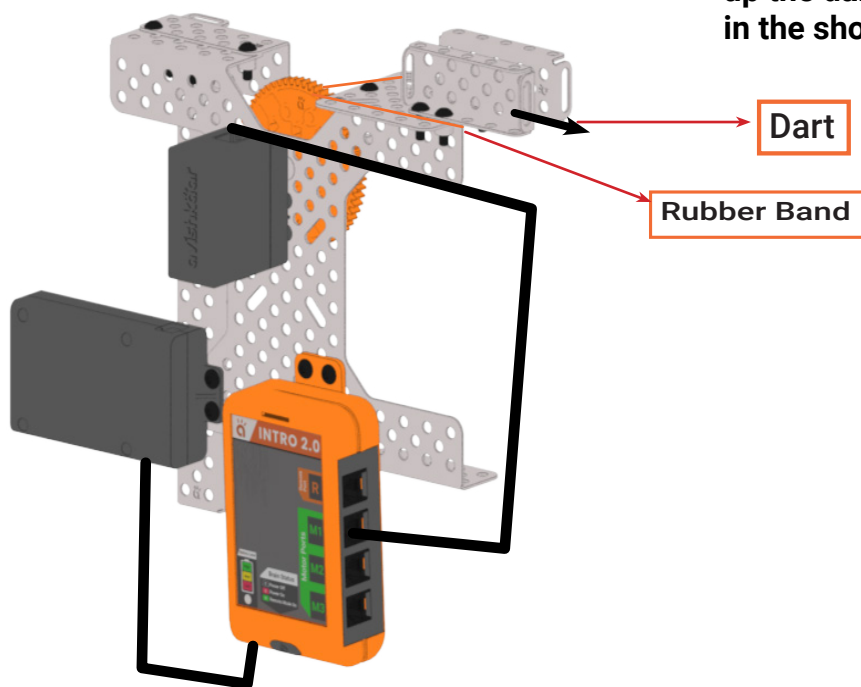
9 Attach the brain on the chassis using two bolts.

**10** Attach the battery cable to both the brain and battery, and connect the motor to the brain, add a rubber band.

**Battery Brain connection**

- **Connect Right speed motor to M1 port.**
- **Connect a rubberband, take it from the U-beams and roll it over to the spur gear.**

**How will it work?**
1. **Place a pen/pencil to form a dart in between the U-beams.**
2. **The rolled up rubberband would shoot up the dart when you rotate the motor in the shooting direction.**
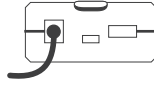
Dart

**Rubber Band**
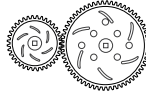
Scan the QR to upload the project

# Troubleshooting

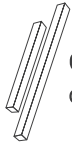Check if you have connected the ports as mentioned in the chapter.

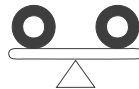Check whether the wire is connected properly or not.

Check if the battery is connected properly to the brain or not.

Check if gears are meshed properly or not.

Check if the axle shaft is properly connected.

Check your structure is stable or not.

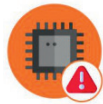Check if any of the gear is not stuck with any plate.

## Facing an issue?
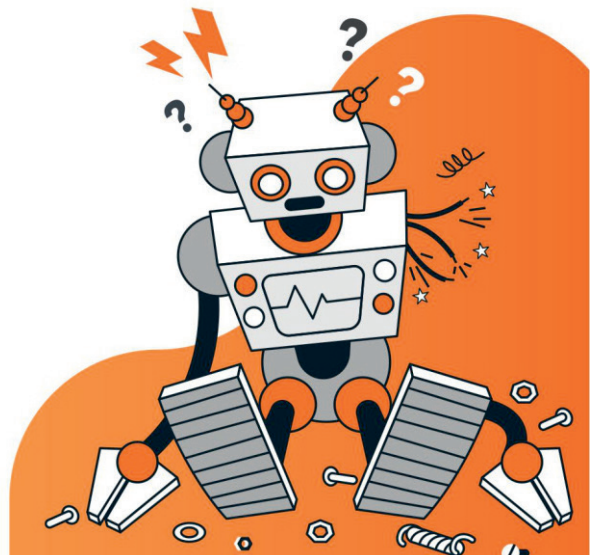
Software Issues

Usability Issues

Hardware Issues

Contact support by scanning the QR Code.

support@avishkaar.cc
+91-8506931515

# avishkaar