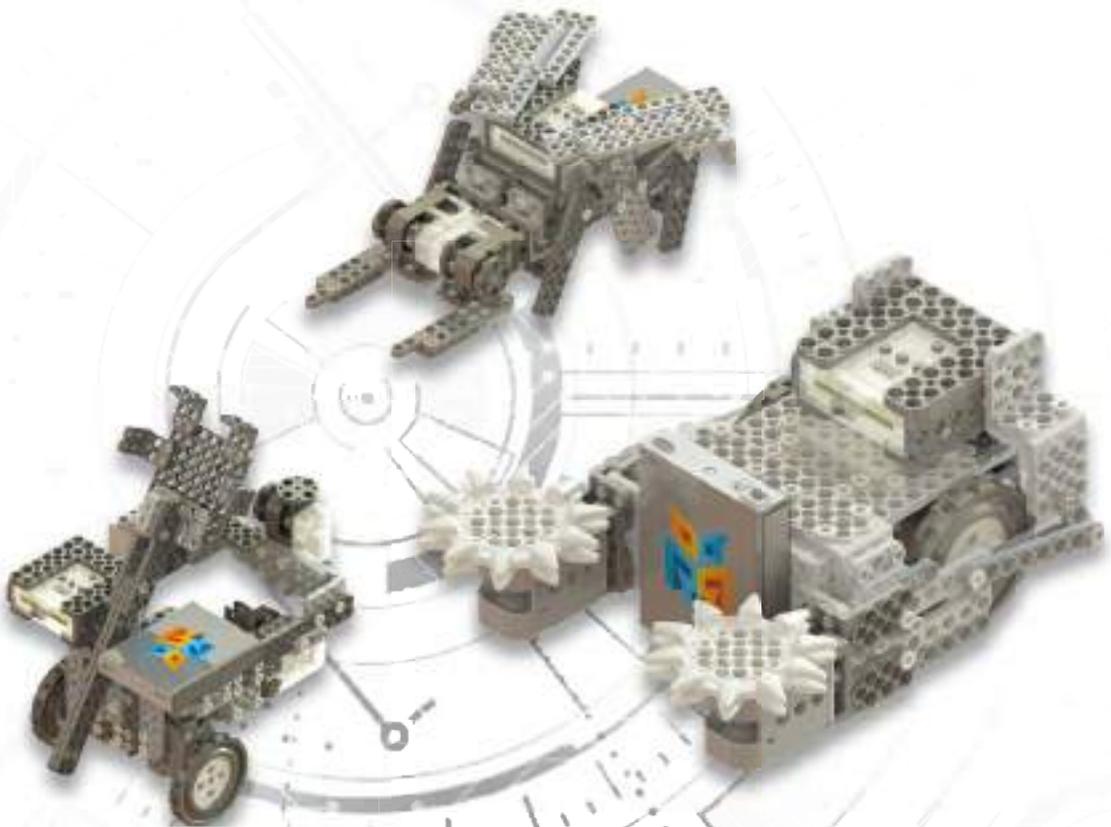


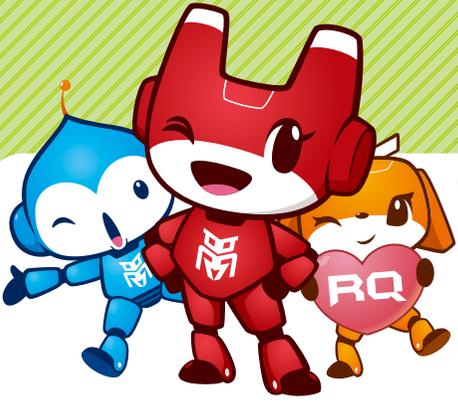
RQ⁺ 120

ROBOT CONSTRUCTION KIT

Construct more than 30 models with RQ⁺ 110, RQ⁺ 120 and RQ⁺ 130



ROBOBUILDER



List

 RQ⁺ BASICS	06
 1 Battle Bot	11
 2 Black/White Flag	27
 3 Walking Bot	43
 4 Sidecar	63
 5 Soccer Bot	81



RQ⁺

CONTENTS

- 6 My own Robot #1 97
- 7 Bug Bot 101
- 8 Transport Bot 117
- 9 Shooting Bot 135
- 10 Crayfish Bot 155
- 11 Cleaning Bot 169
- 12 My own Robot #2 189

RQ+ 120 Robot

Ch1. Battle Bot

LED1 LED2 LED3
■ ■ ■



Ch2. Black/White Flag

LED1 LED2 LED3
■ ■ ■



Ch3. Walking Bot

LED1 LED2 LED3
■ ■ ■



Ch4. Sidecar

LED1 LED2 LED3
■ ■ ■



Ch5. Soccer Bot

LED1 LED2 LED3
■ ■ ■



Ch6. My own Robot #1

LED1 LED2 LED3
■ ■ ■



Ch7. Bug Bot

LED1 LED2 LED3
[Grey] [Red] [Blue]



Ch8. Transport Bot

LED1 LED2 LED3
[Grey] [Red] [Blue]



Ch9. Shooting Bot

LED1 LED2 LED3
[Grey] [Red] [Blue]



Ch10. Crayfish Bot

LED1 LED2 LED3
[Grey] [Red] [Blue]



Ch11. Cleaning Bot

LED1 LED2 LED3
[Grey] [Red] [Blue]



Ch12. My own Robot #2

LED1 LED2 LED3
[Grey] [Red] [Blue]



RQ+ 120 Part **L****I****S****T**

Frame



1x7 frame **X4**



3x3 frame **X2**



3x5 frame **X4**



3x7 frame **X2**



3x9 frame **X2**



5x5 frame **X2**



7x7 frame **X2**



2x4 L frame **X2**



2x5 L frame **X2**



3x4 L frame **X6**



3x5 L frame **X2**



3x6 L frame **X2**



Big U frame **X2**



Right angle frame **X2**



Opposite angle frame **X2**



Tire **X2**



Big gear **X2**



Rubber pad **X4**



Spacer **X4**



Locking ring **X8**



Small axis **X4**

Electronics Parts



Smart servo (ID00, 01) **X2**



LED **X1**



Touch sensor **X1**

Rivet set



2s rivet



3s rivet

Joint and Others



Hinge A **X3**



Hinge B **X3**



Joint frame **X2**



Rubber ring **X3**



Short string **X2**



Soccer ball **X1**

※ Hinge A and Hinge B can be distinguished by its colors and letter A or B written on. Be careful that Hinge A is white color but it is described as black color in RQ+120 and RQ+130.



Warnings



- Power S/W is built in the smart controller. Insert power device (AAA battery) and connect to power connector of smart controller. Power off smart controller while your robot is not in use.
- Use the given electronic parts in RQ+ to connect with smart controller. Check the cable insert port carefully again not to misconnect.
- Do not use in humid environment, near water, wet place, or near other electric goods. The electronics part may be damaged.
- Do not pull out the cables or throw the assembled robot as the parts (frames, electronics parts) may break.
- Do not take out batteries or cables while robot is operating or moving to prevent damages.
- Electric current flows in set-up / standby mode. Power-off the smart controller when the robot is not in use.
- Place the robot parts away from baby or toddler. In any case of swallowing parts, contact doctor immediately.
- Do not operate the robot near you or facing you.
- Do not use a peeled off battery or damaged battery as it may lead to fire or burn skin.
- Clean up all RQ+ parts after you build or play with your robot.

Let's meet RQ+ family!



RQ Mong

This troublemaker always runs out of patience for curiosity. RQ Mong!



RQ Me

This cute little RQ Me always worry about things!

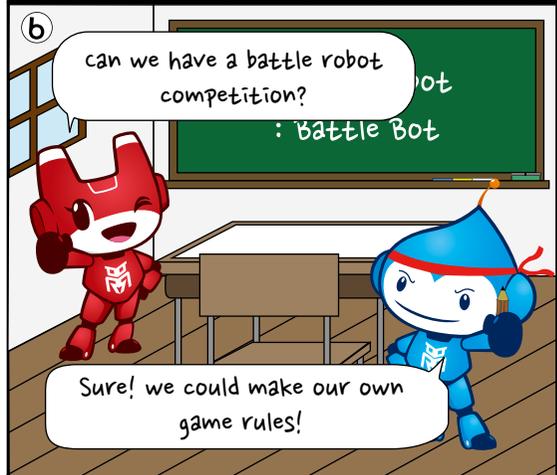
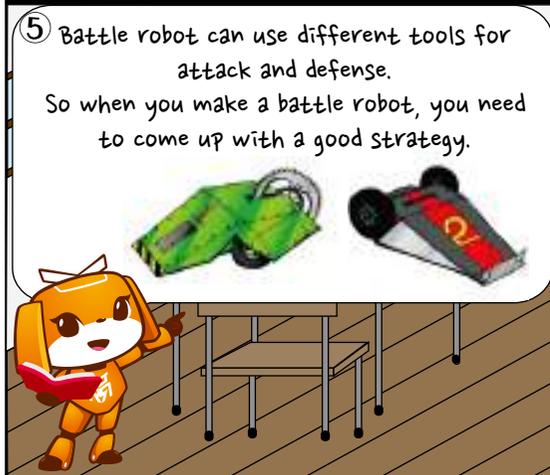
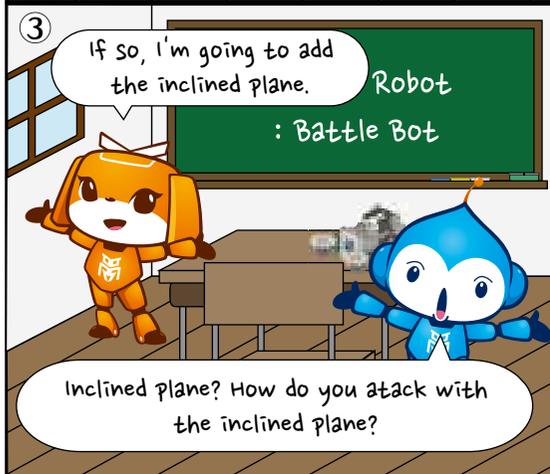
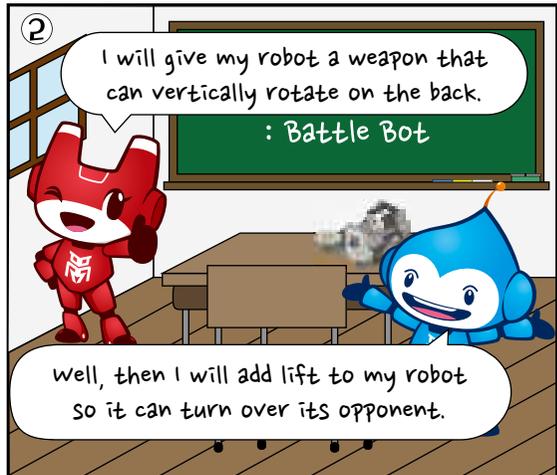
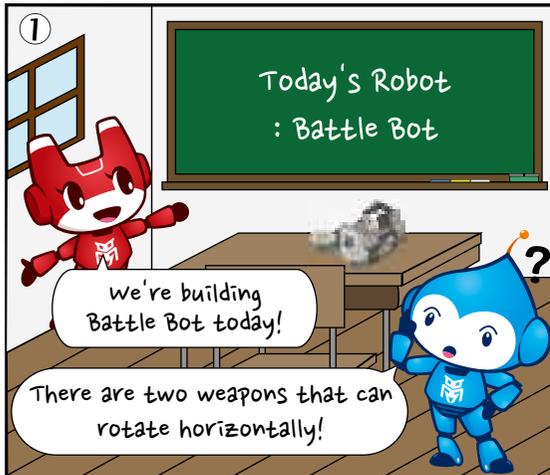
RQ Ro

This smart RQ Ro enjoys reading!



1. Battle Bot

Battle Robot Competition

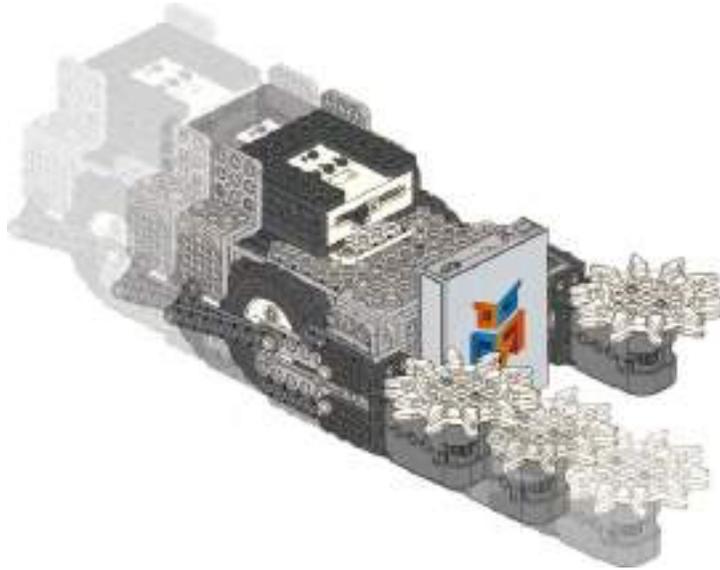




Today's Robot Class



Battle Bot can use a rotating weapon by using a gearwheel type gear. Rotating weapon is used to attack the opposite robot during the fight. The robot can move freely because smart servos are used as wheels, and it can also punch with the link structure to move forward or backward. What other principles are applied in this robot other than these functions? Let's assemble the Battle Bot and play a robot game.



After overseas battle robot game was introduced in early 2000, the first robot battle game as well as other small scale robot games were hosted in Korea.

In 2005, there was a TV show called Robot power that mainly showed battle robot games. Initially, this game was called 'fighting game', but the term 'battle robot' was coined in 2005 as the word was used at a Korean robot competition.

Well, I can turn the opposite robot over with the inclined side and rotating weapons.





Robot Assembly



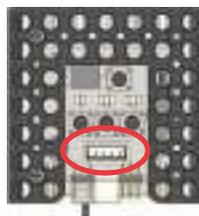
Prepare robot parts.

Smart controller X1	R. motor (ID29,30) X2	Smart servo (ID00,01) X2	Battery case X1	1x3 frame X4
1x5 frame X4	1x7 frame X1	1x8 frame X4	3x5 frame X6	3x7 frame X1
3x9 frame X4	5x5 frame X1	7x7 frame X1	3x8 slide frame X2	2x5 L frame X4
3x5 L frame X5	3x6 L frame X6	Wheel X2	Tire X2	Big gear X2
Ball frame X1	Spacer X2	2s rivet X34	3s rivet X16	Double rivet X64



Tips.

Smart controller has 4 smart servo ports. You can connect smart servo to any of 4 smart servo ports regardless of the ID number. However, you have to follow the assembly guide when you build a robot and check the smart servo ID.



Step 1 X2

Tip



Smart servo (ID00) X1



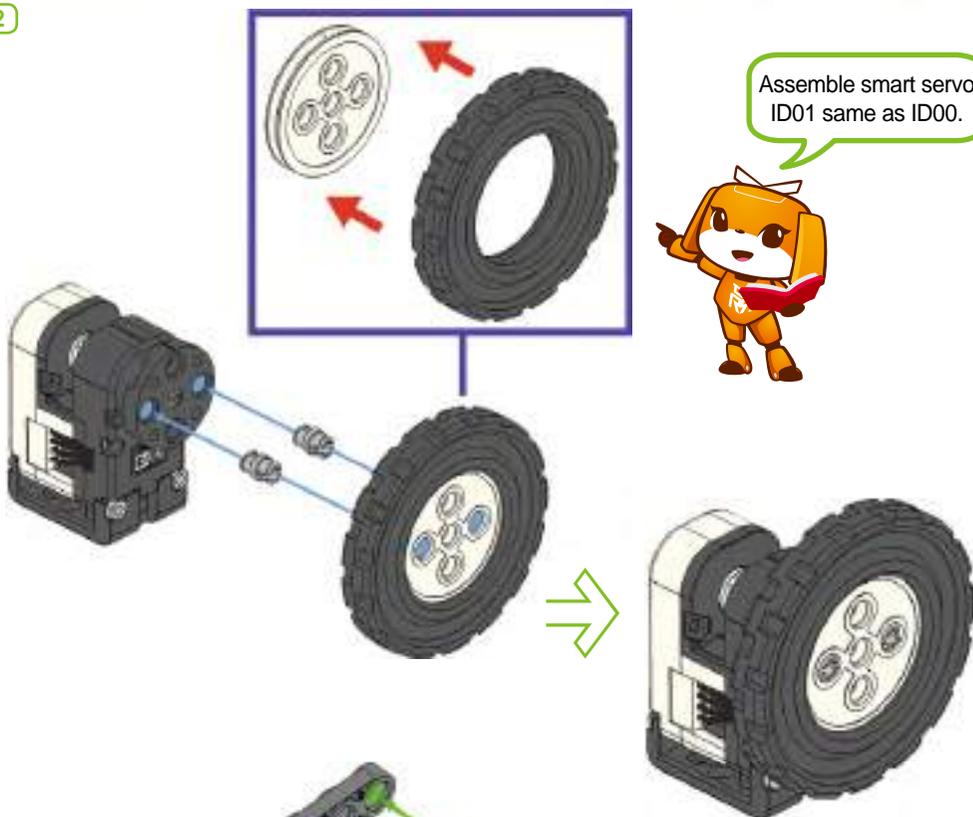
Wheel X1



Tire X1



Double rivet X2



Step 2

Tip



1x3 frame X2



7x7 frame X1



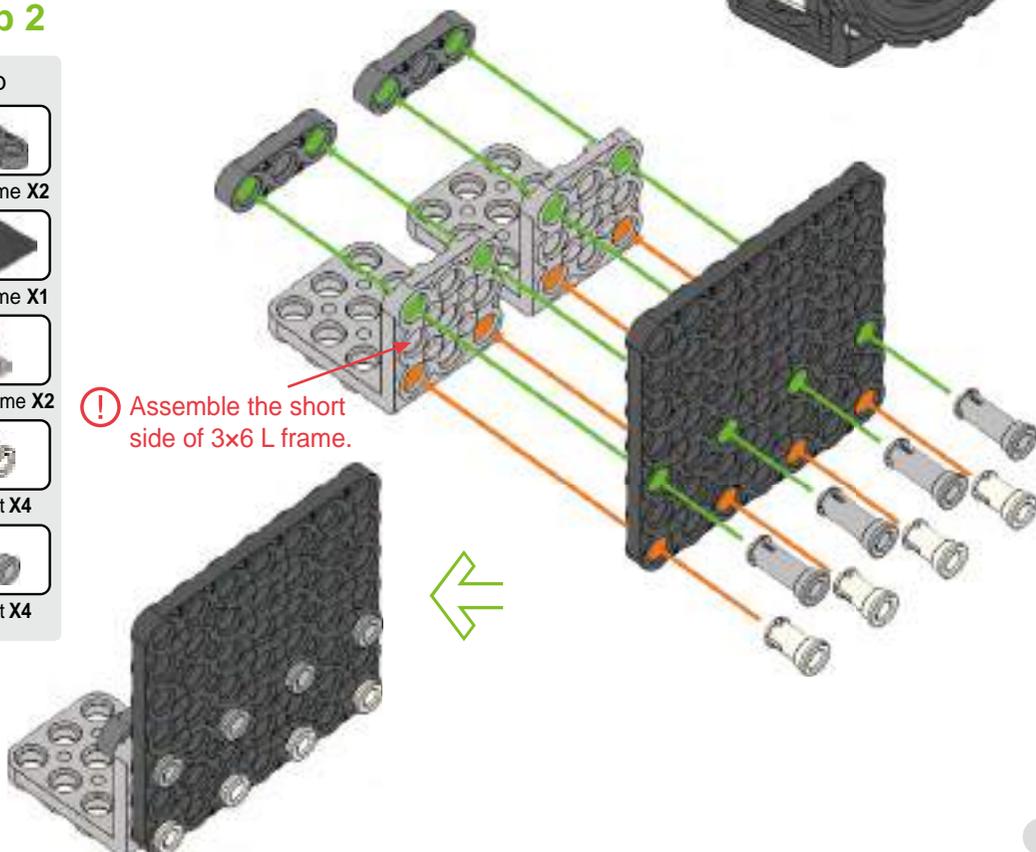
3x6 L frame X2



2s rivet X4



3s rivet X4



Step 3

Tip

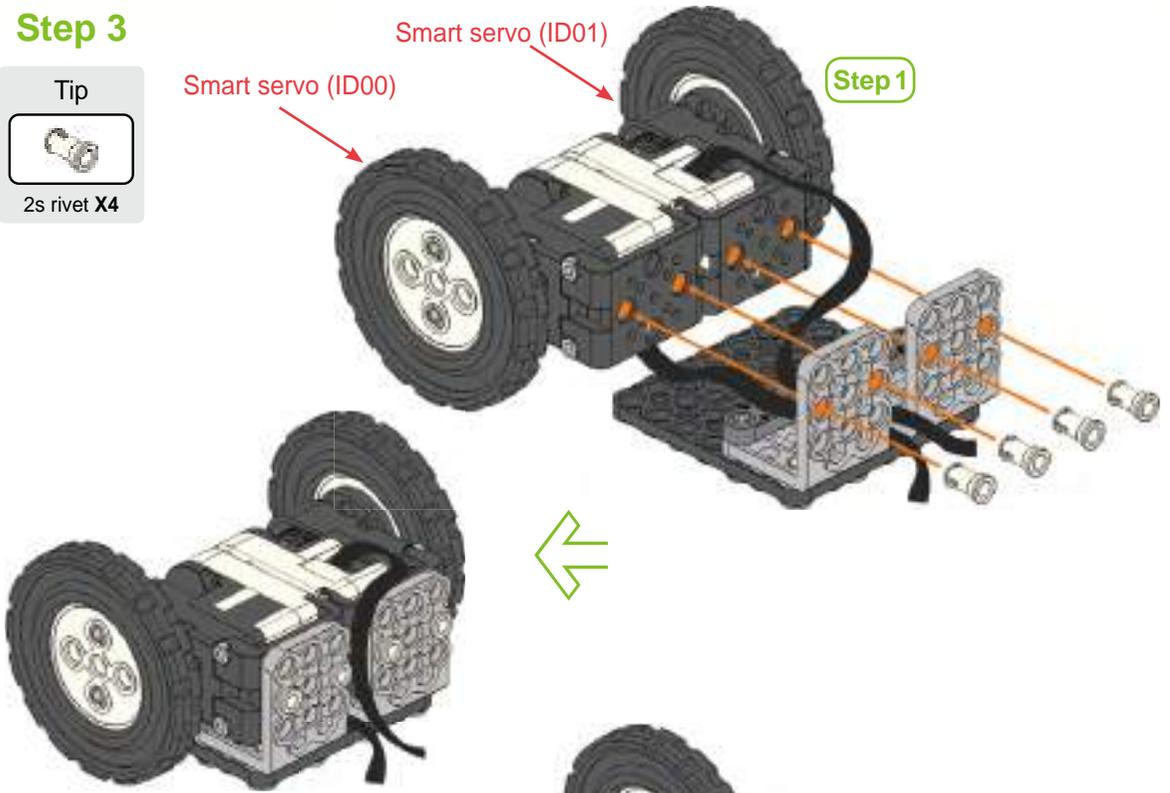


2s rivet X4

Smart servo (ID00)

Smart servo (ID01)

Step 1



Step 4

Tip



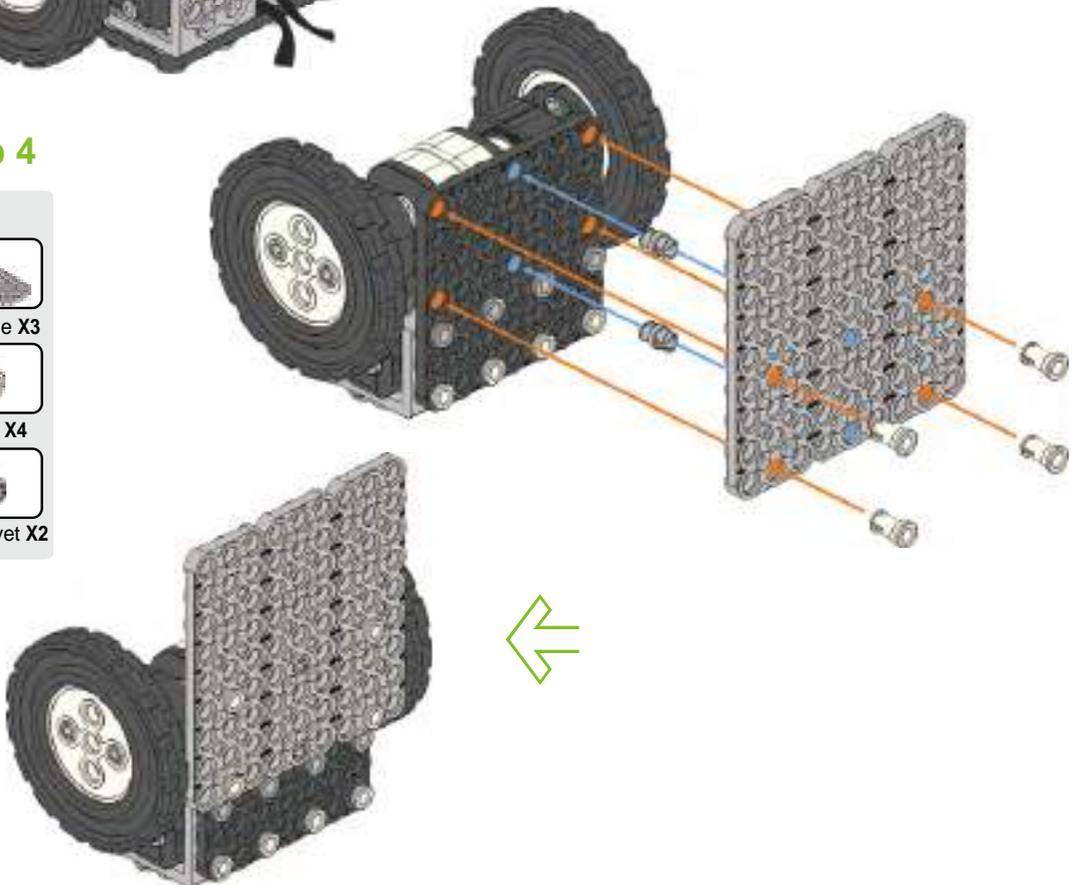
3x9 frame X3



2s rivet X4



Double rivet X2



Step 5

Tip



3x7 frame X1



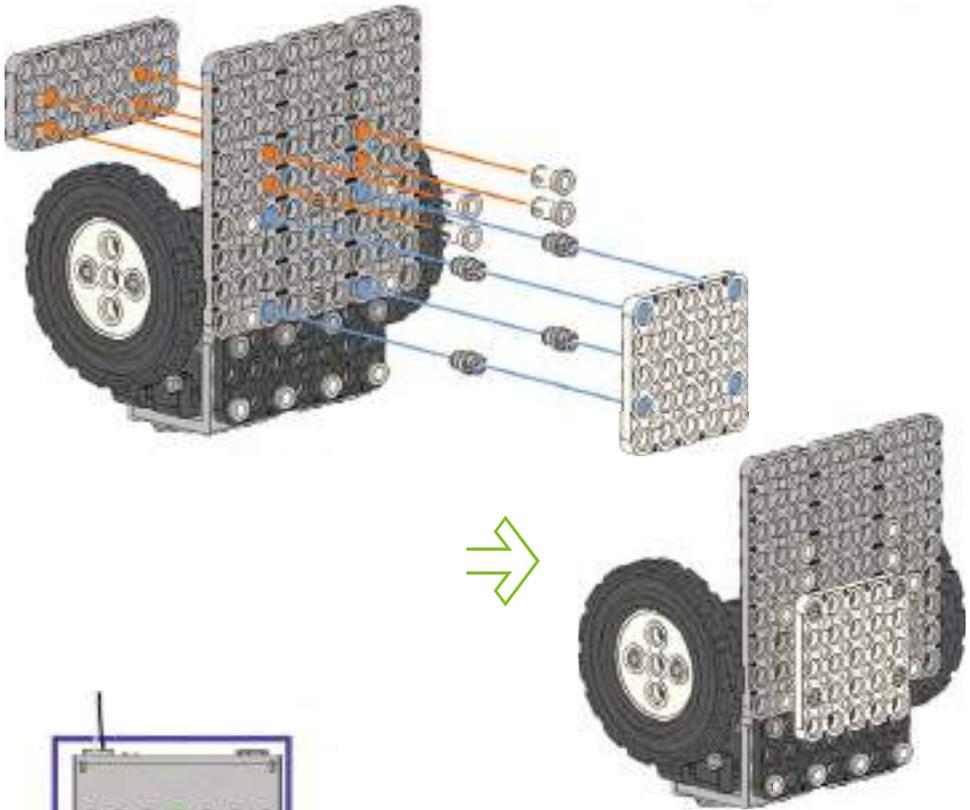
5x5 frame X1



2s rivet X4



Double rivet X4



Step 6

Tip



Battery case X1



3x9 frame X1



3x5 L frame X1



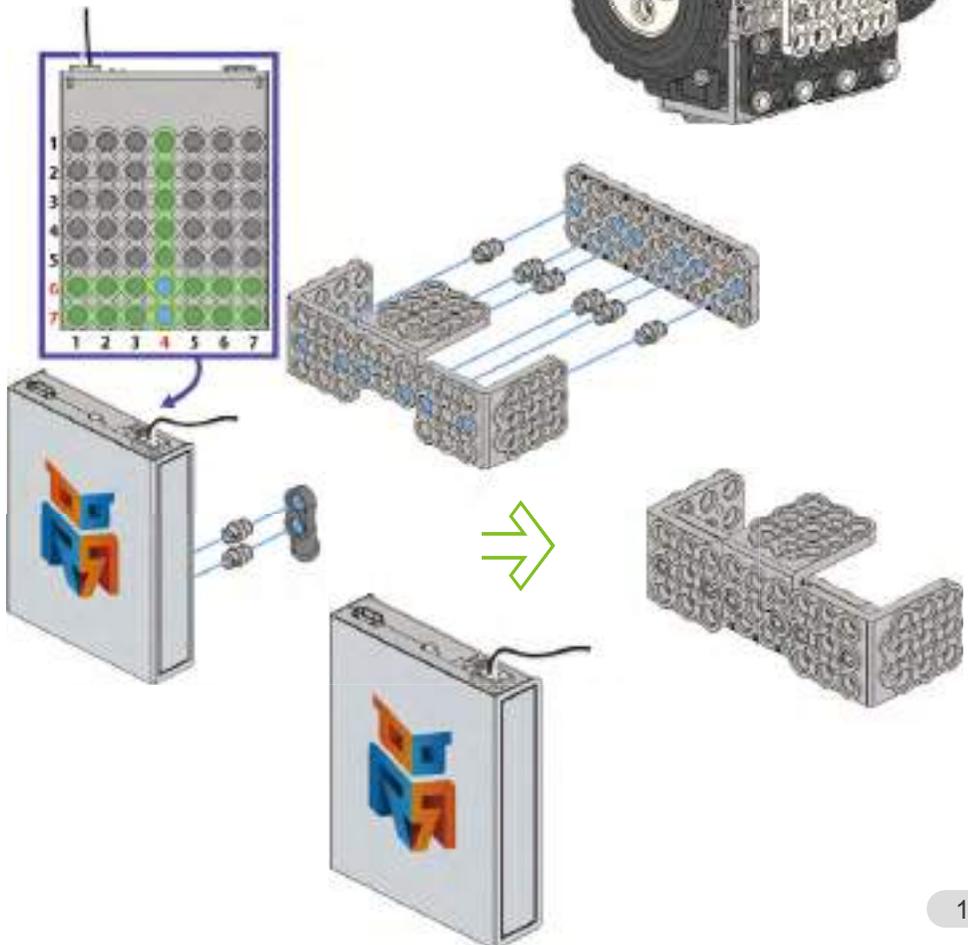
3x6 L frame X2



Ball frame X1



Double rivet X8

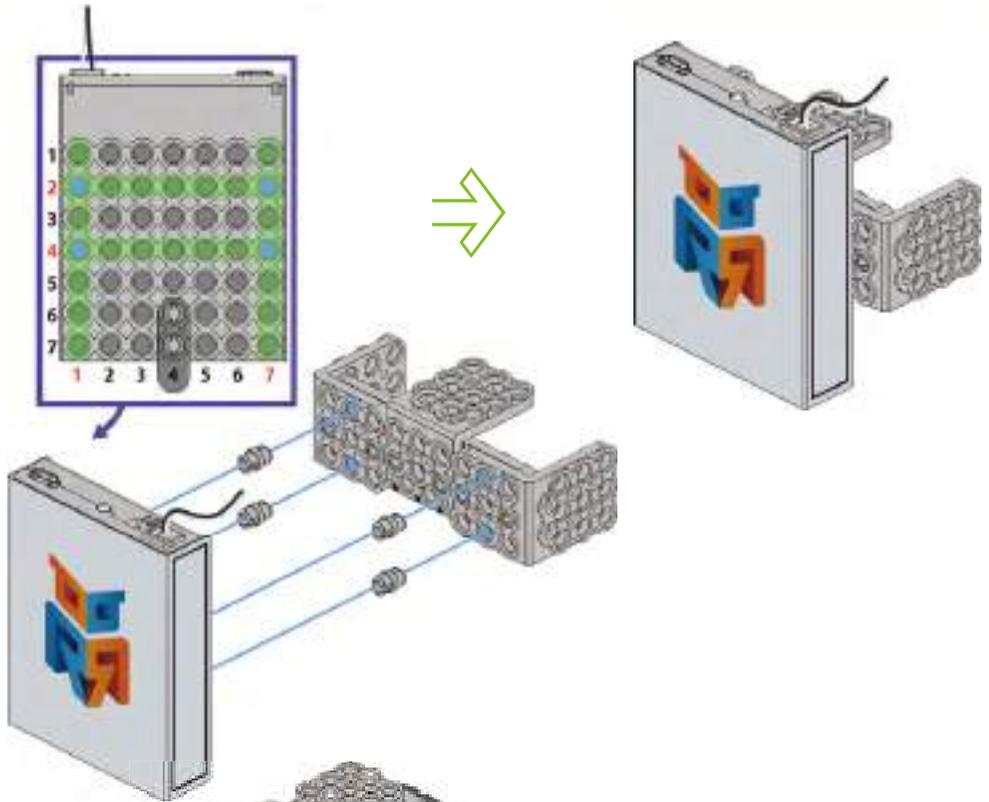


Step 7

Tip



Double rivet X4



Step 8

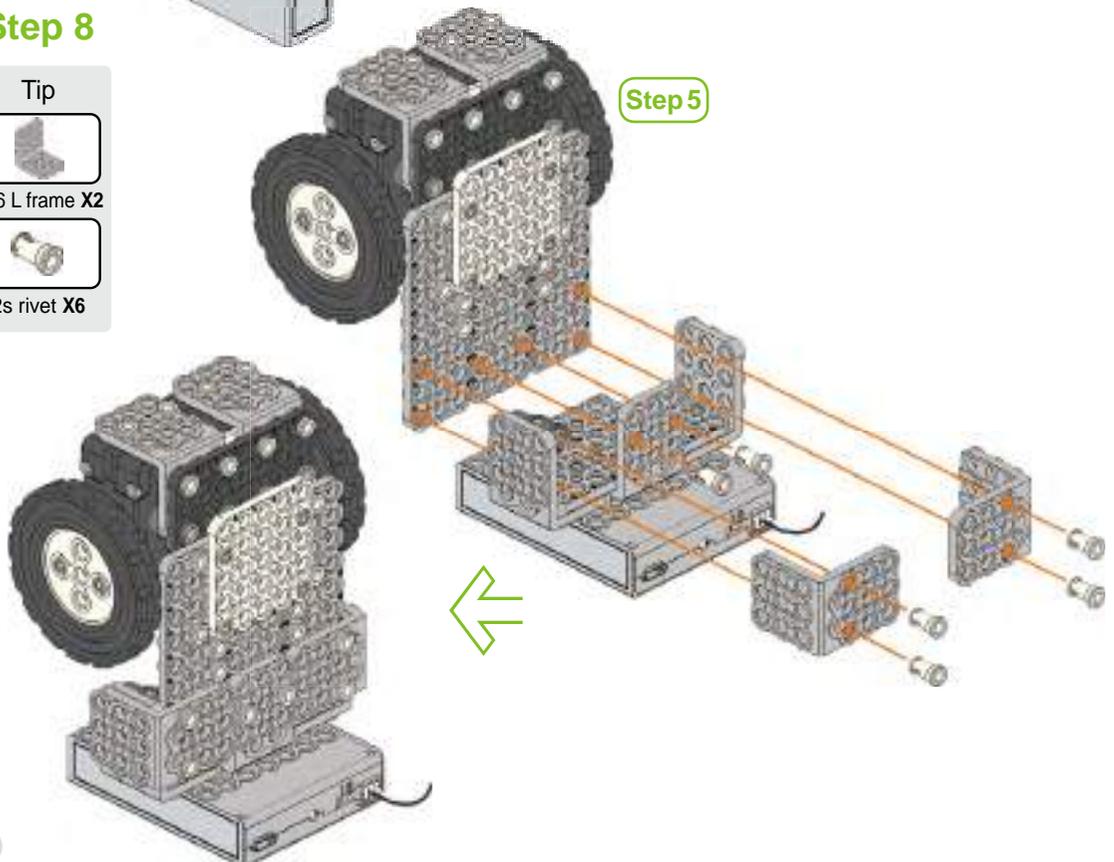
Tip



3x6 L frame X2



2s rivet X6



Step 5

Step 9

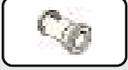
Tip



Smart controller X1



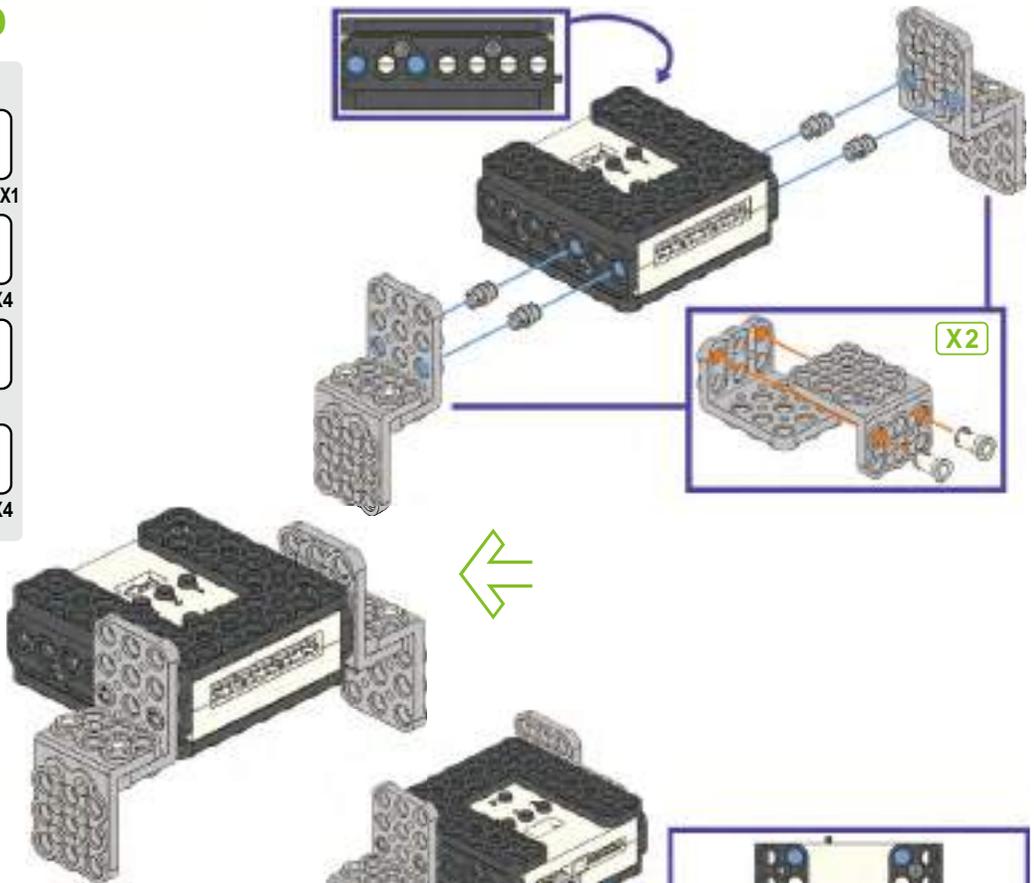
3x5 L frame X4



2s rivet X4



Double rivet X4

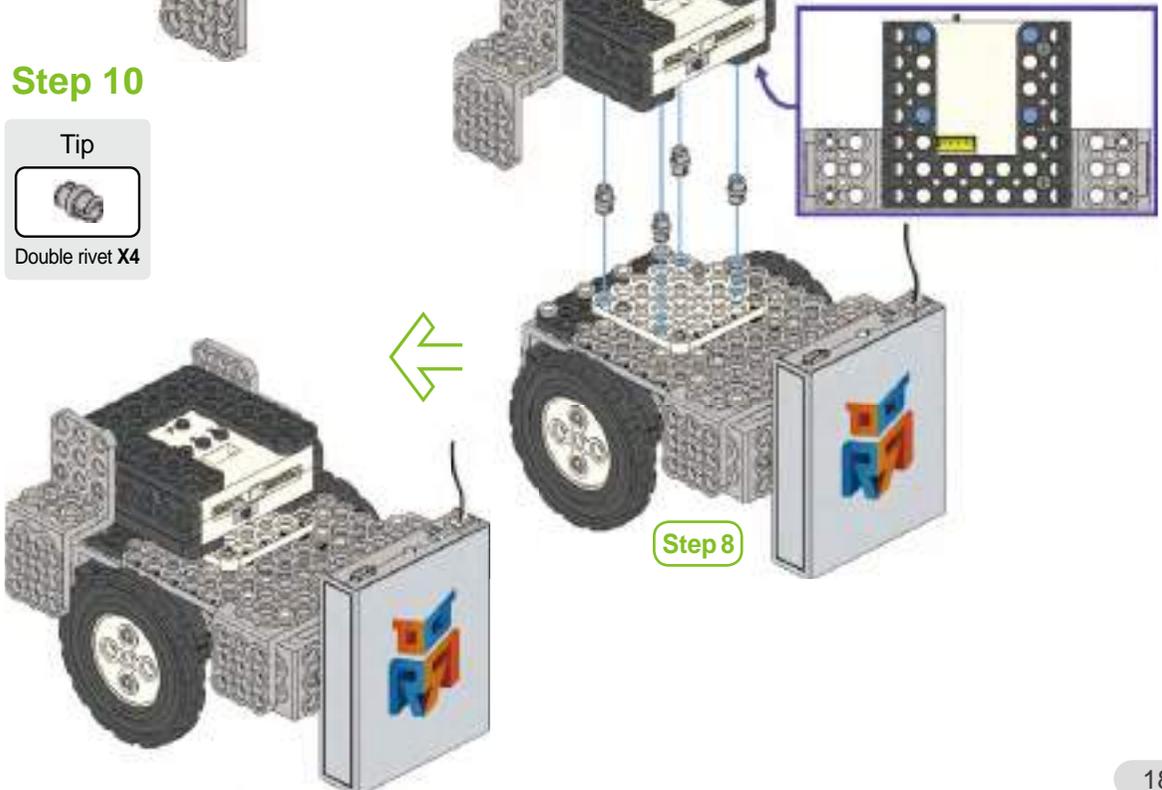


Step 10

Tip

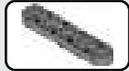


Double rivet X4



Step 11

Tip



1x5 frame X1



1x8 frame X1



3x5 frame X2



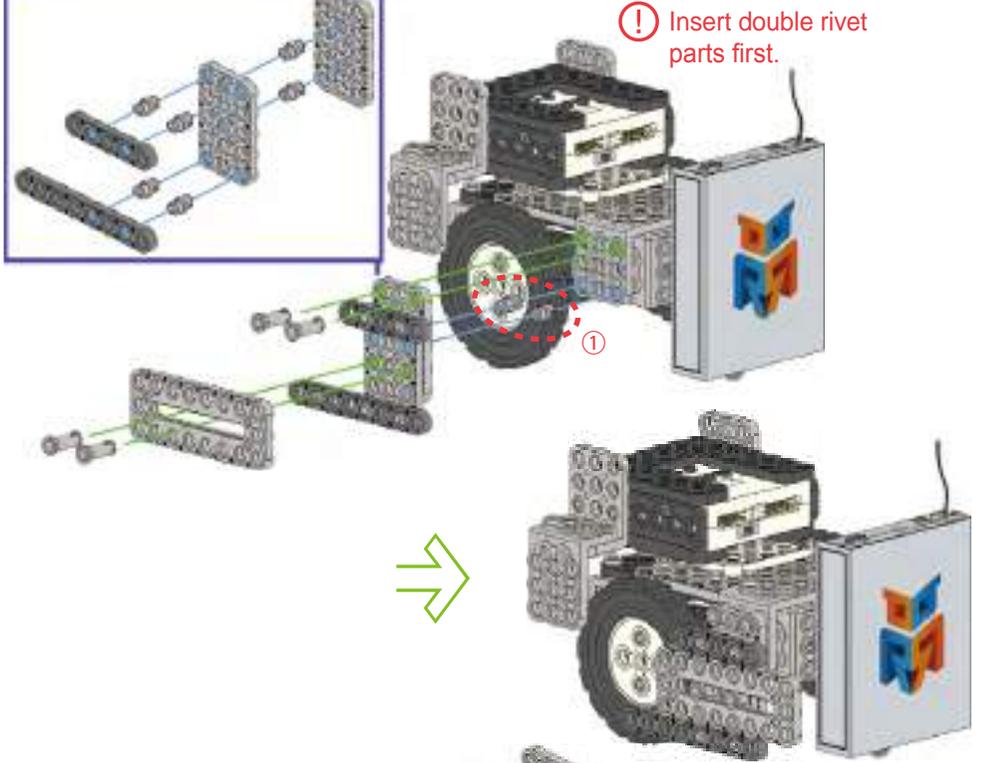
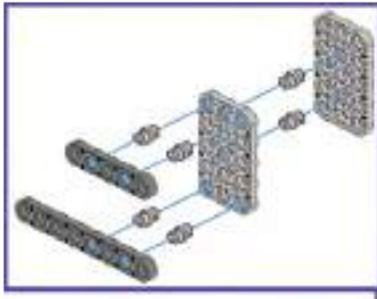
3x8 slide frame X1



3s rivet X4



Double rivet X8



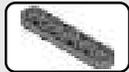
⚠ Insert double rivet parts first.

Step 12

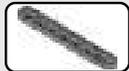
Tip



1x3 frame X1



1x5 frame X1



1x8 frame X1



Spacer X1



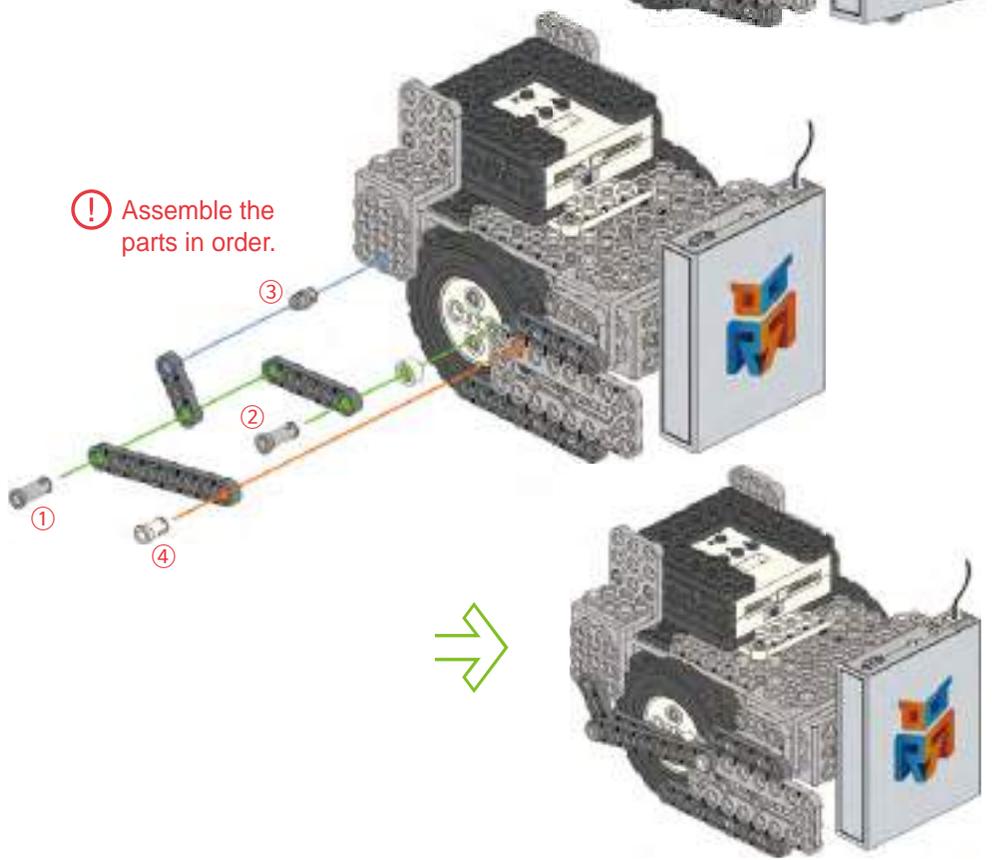
2s rivet X1



3s rivet X2



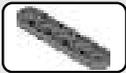
Double rivet X1



⚠ Assemble the parts in order.

Step 13

Tip



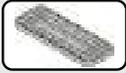
1x5 frame X1



1x8 frame X1



3x5 frame X2



3x8 slide frame X1

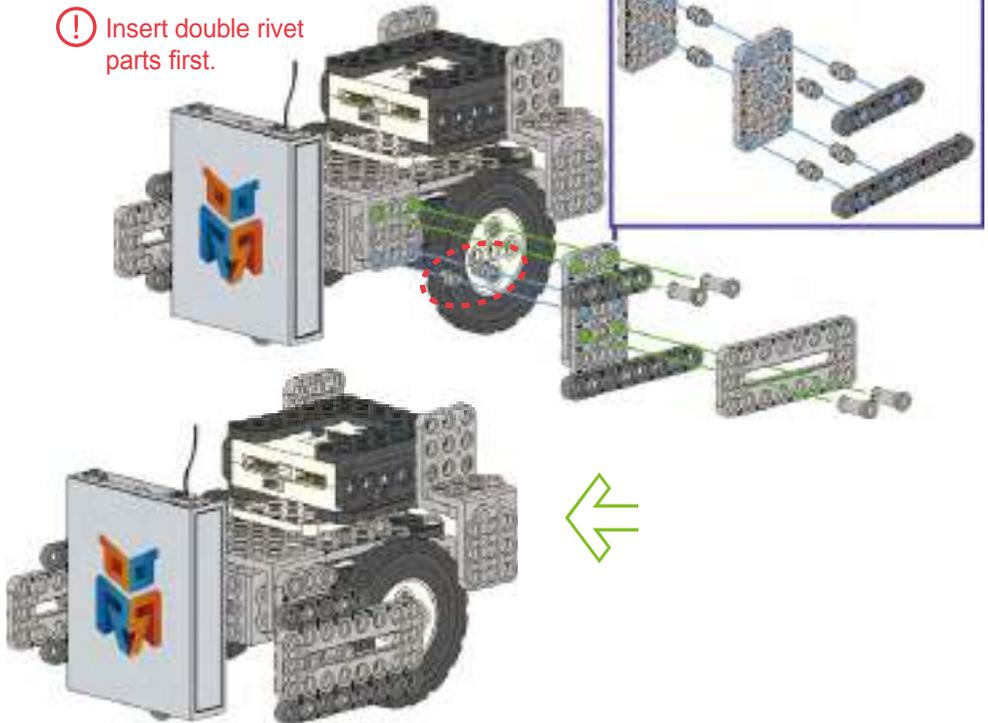


3s rivet X4



Double rivet X8

⚠ Insert double rivet parts first.

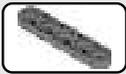


Step 14

Tip



1x3 frame X1



1x5 frame X1



1x8 frame X1



Spacer X1



2s rivet X1

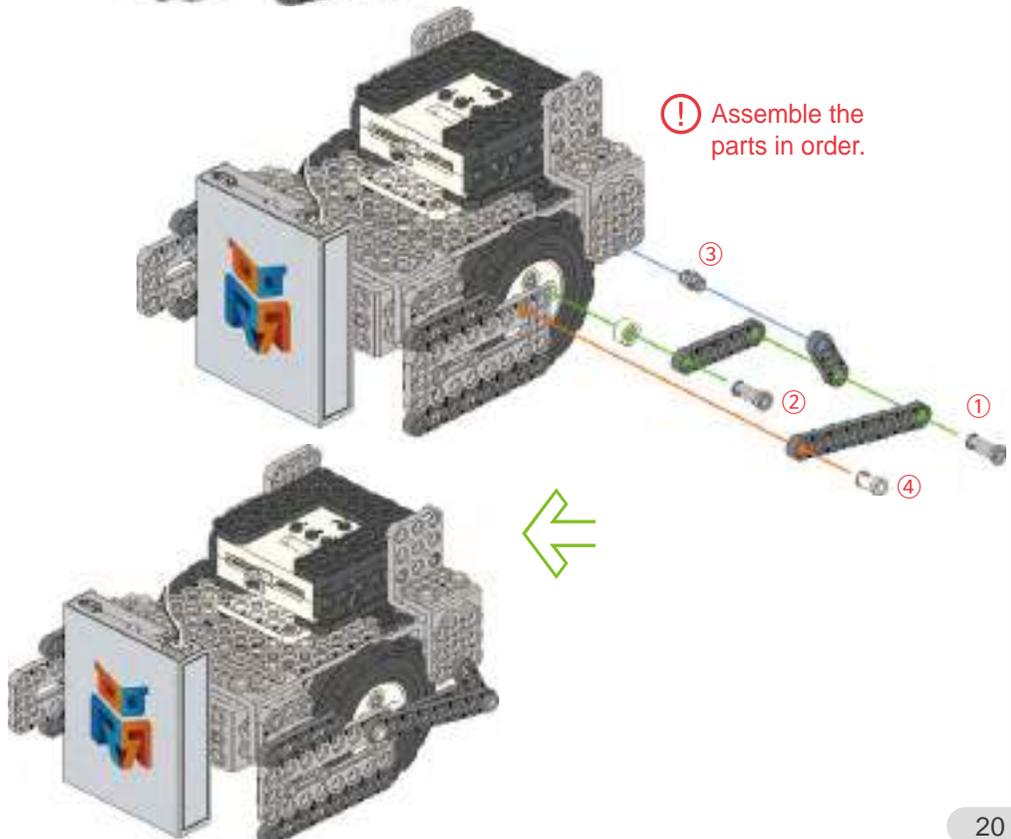


3s rivet X2



Double rivet X1

⚠ Assemble the parts in order.



Step 15

Tip



R. motor (ID29,30) X2



3x5 frame X2



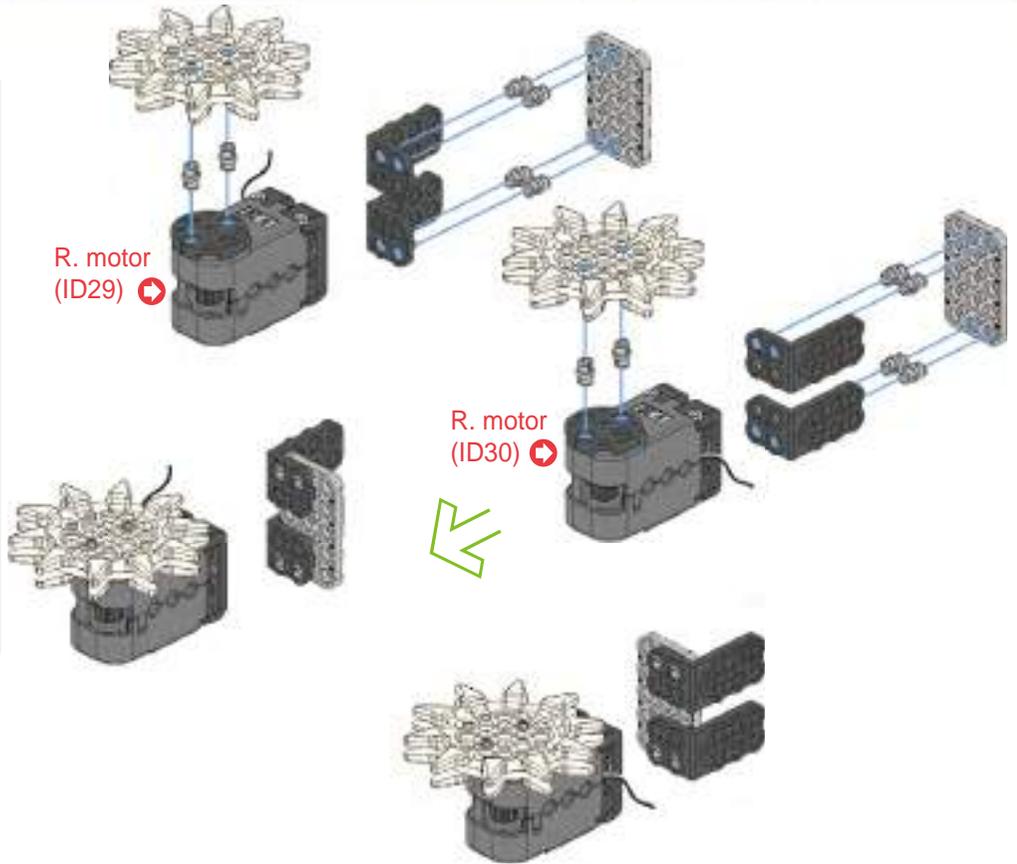
2x5 L frame X4



Big gear X2



Double rivet X12

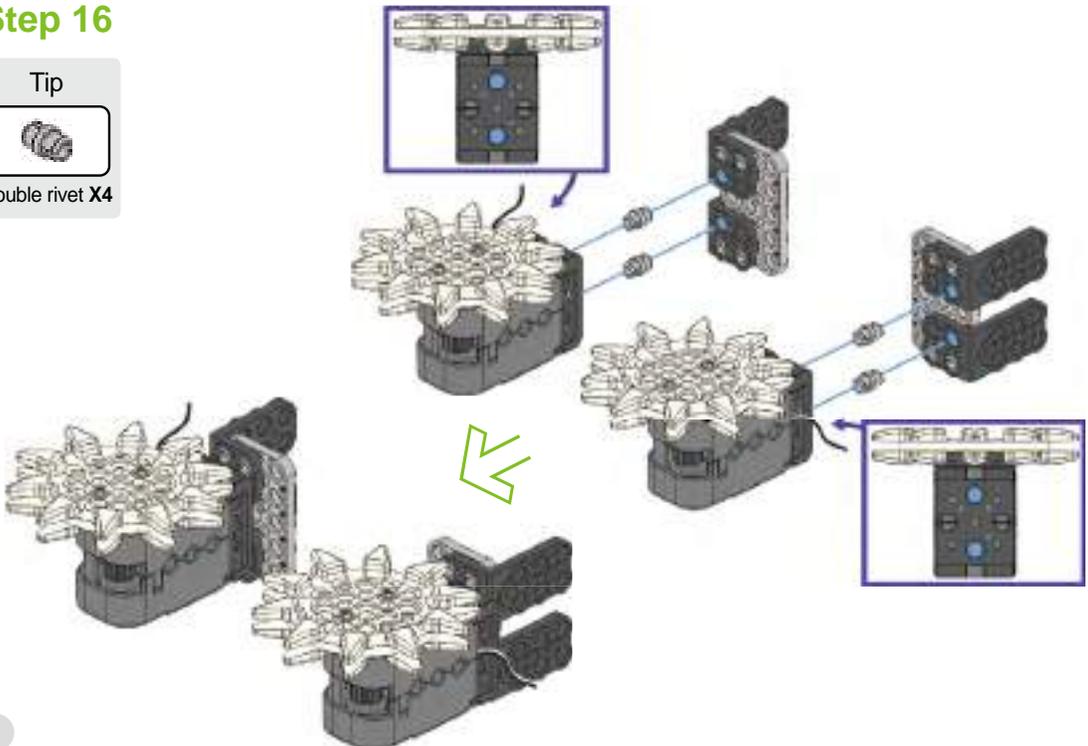


Step 16

Tip



Double rivet X4

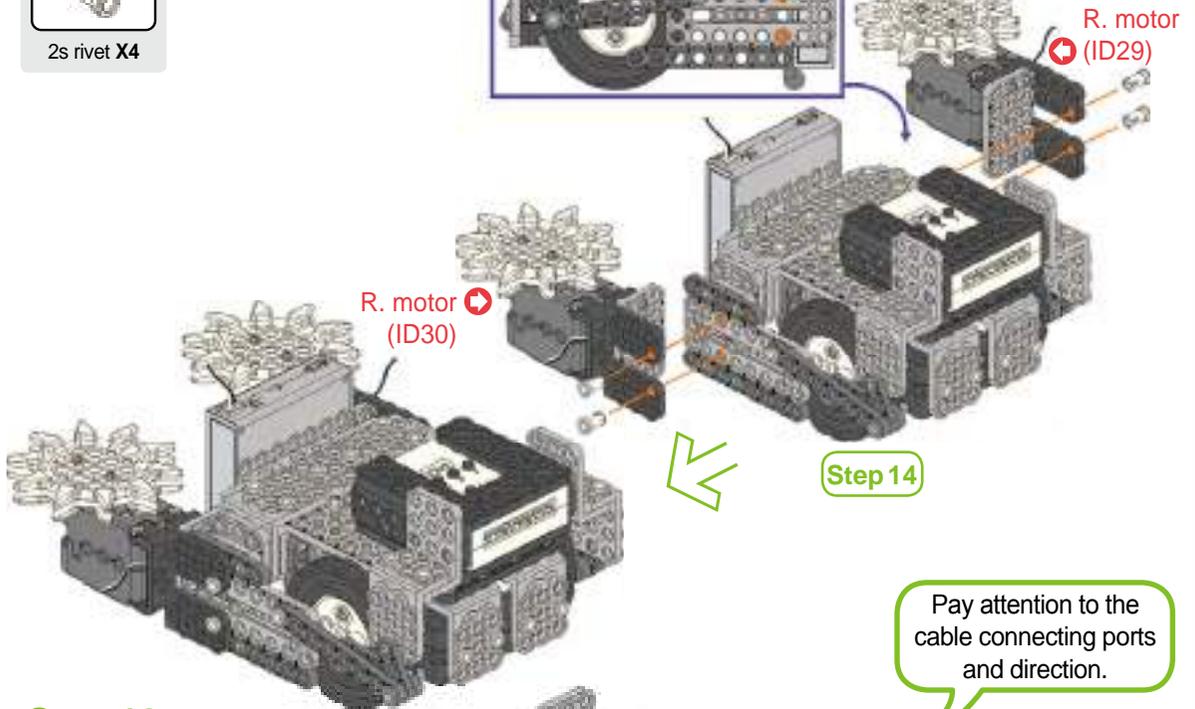
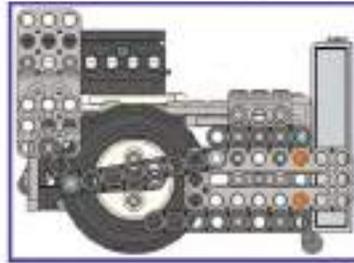


Step 17

Tip



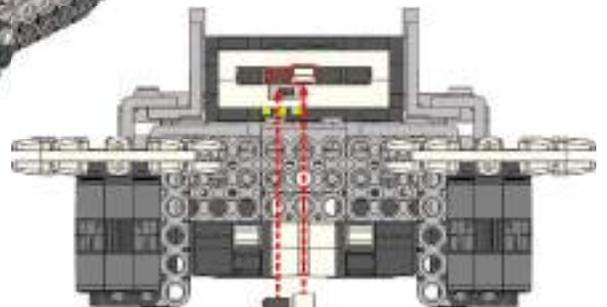
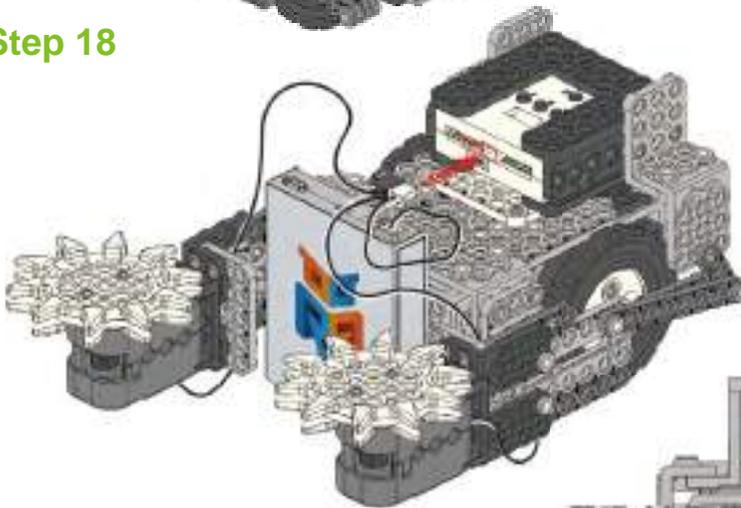
2s rivet X4



Step 14

Step 18

Pay attention to the cable connecting ports and direction.



R. motor (ID29) → Power
R. motor (ID30) →

Step 19

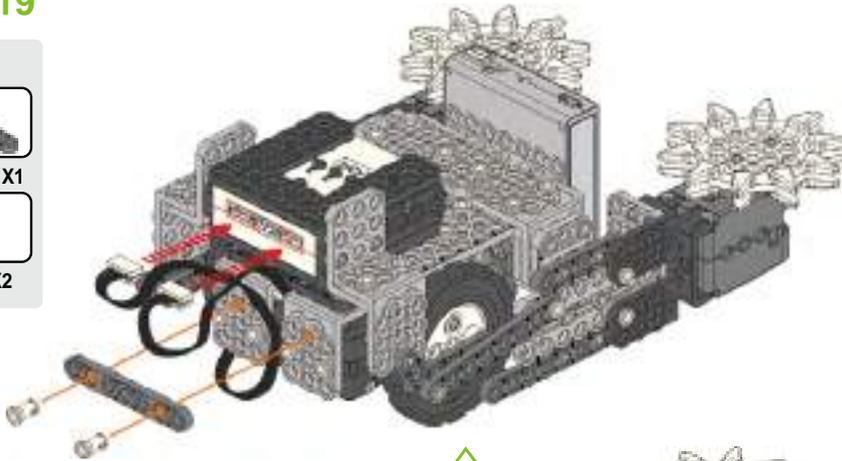
Tip



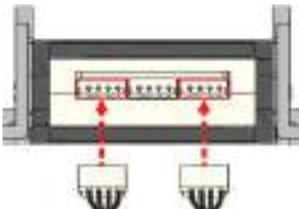
1x7 frame X1



2s rivet X2

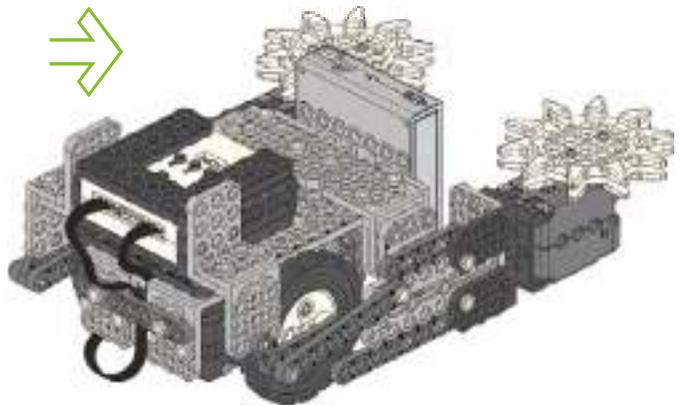


⚠ You can connect two servos to any other smart servo ports.

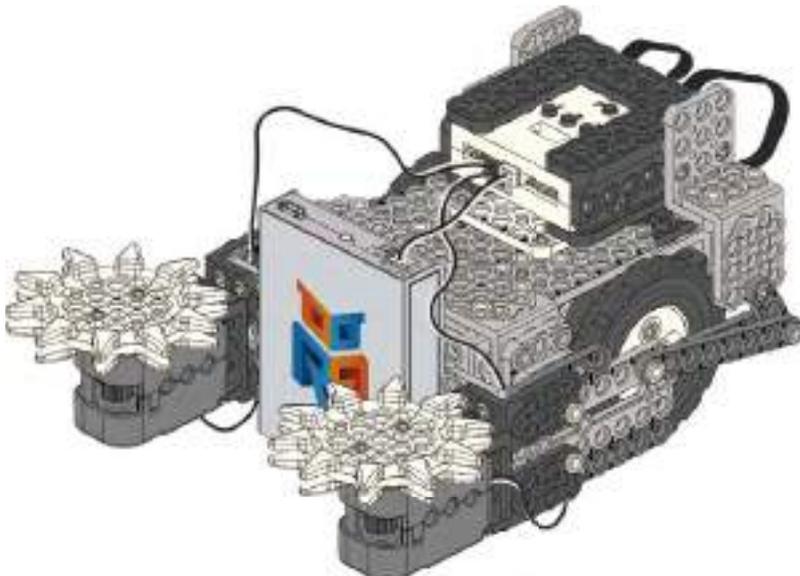


Smart servo (ID00)

Smart servo (ID01)



★ 'Battle Robot' is ready! ★



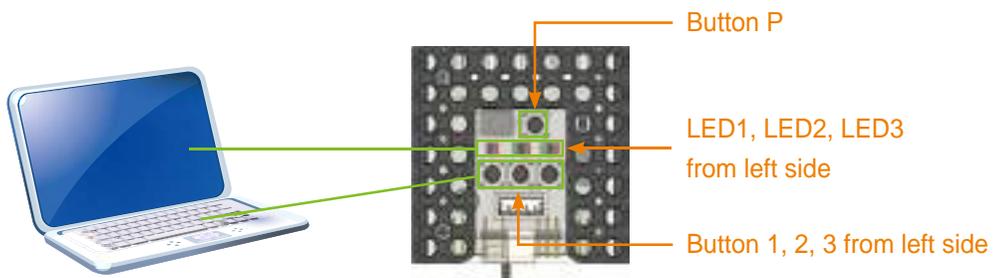


Robot Experience



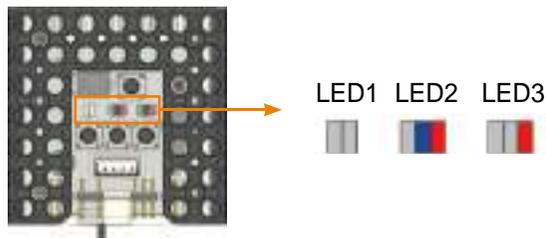
Set-up 'Battle Bot' robot model

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons work as the keyboard for PC.



First : Turn on the smart controller to enter <set-up mode>.

Second : Press button 2 or button 3 on smart controller to set-up 'Battle Bot' robot model. The buttons work as a keyboard for PC. Program the robot for proper operation.



Third : Press button P on smart controller to enter <standby mode>.

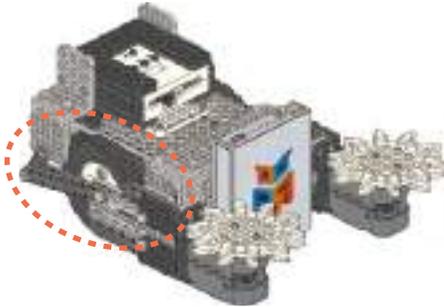
When robot is not working, check the following and reassemble.

1. When Battle Bot is not moving :
 - ▶ Check power connection and power switch, and Battle Bot robot model set-up.
2. When Battle Bot gear is not moving back and forth :
 - ▶ Refer to the assembly guide and check slide frame and smart servo ID.



Check movement and assembly.

1. Read below and write correct answers.



Battle Bot uses  structure to move smart servos, and make gears move back and forth for punch motion.

2. Match the IR remote controller buttons with the corresponding action.

A button •

•  Right gear rotates towards the outside.

B button •

•  Left gear rotates towards the outside.

1 button •

•  Right gear rotates towards the inside.

2 button •

•  Left gear rotates towards the inside.

3 button •

•  Stop left and right gears.

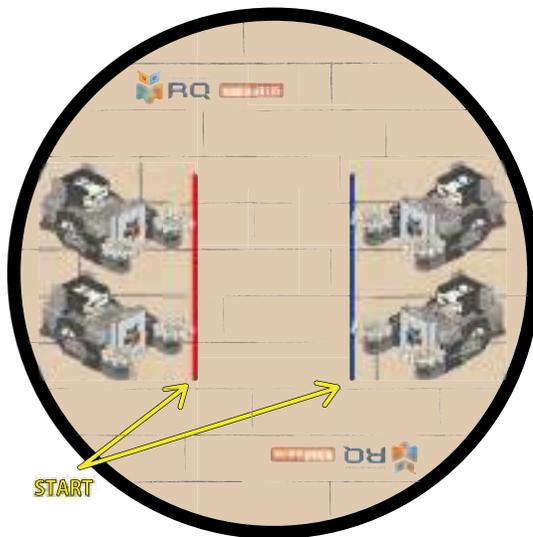
Robot Play



Play Battle Robot game.

Play Battle Robot game with your Battle Bot which can move freely and rotate gears. To win, push the opponent outside the ring or break the opponent.

- Play game in teams or individually.
- Each fight is 3 minutes long, and you win if you push opposite player outside the ring or damage the opponent.
(Example of damages: gear, rotation motor or frames falling apart)
- In case two robots get tangled for over 10 seconds, restart from 'START' position. You may not adjust the robot when you restart.



Think of strategies on how to attack and defense.



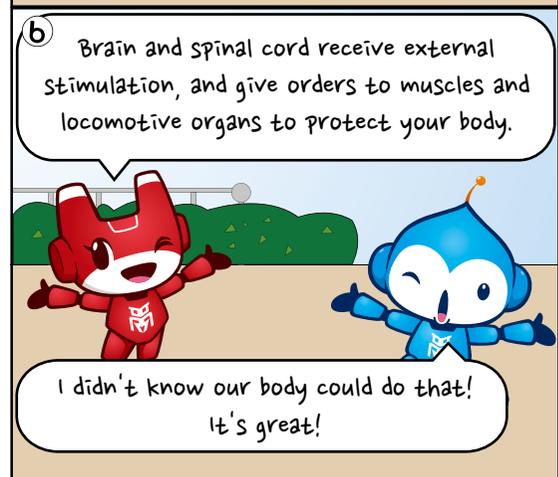
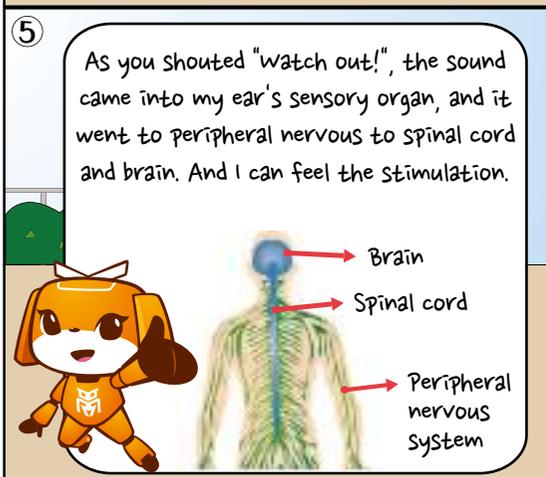
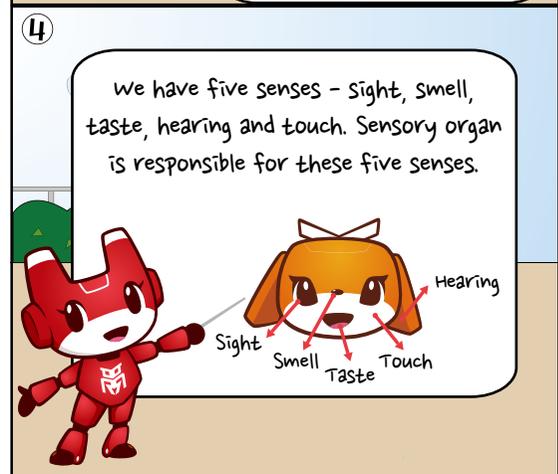
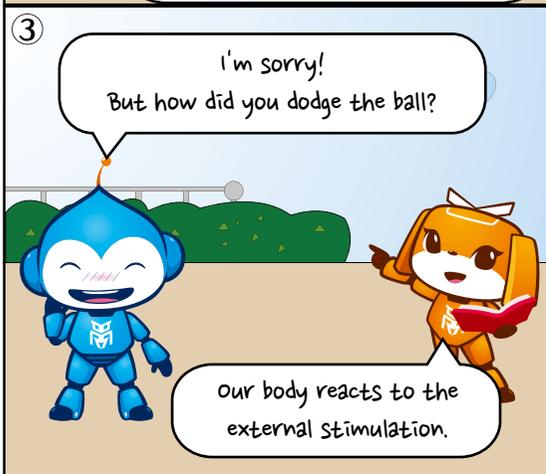
◆ Describe your 'Battle Bot'.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



2. Black/White flag

Our body - Stimulation / Reaction



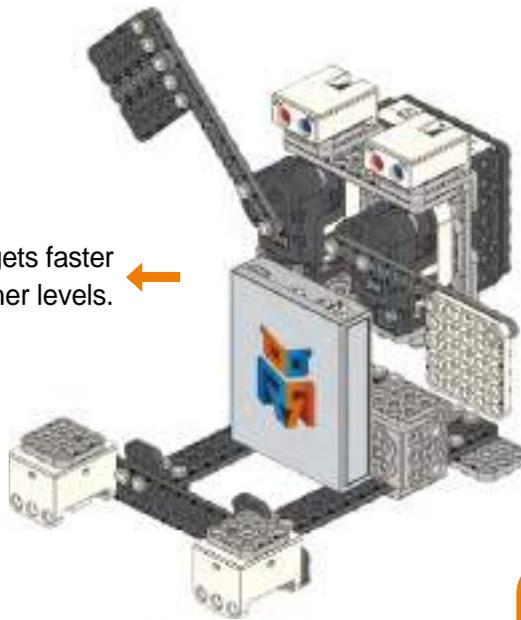


Today's Robot Class



Blue/White flag game is to follow the command saying either to raise the blue flag or the white flag or lower the blue or white flag. And such commands must be followed immediately and quickly. Back/White flag game is based on this game. To light the LEDs (red or blue) on the black or white flag, you press the IR remote controller button, or touch sensor. Then the black or white flag is raised or lowered according to the button you have pressed. You can control smart servo position freely, so the flags can be moved up, down or horizontally!

Game speed gets faster
for higher levels. ←



Prepare a blue and a white flag, and play with friends.

1. Pick one friend and make a team.
2. Give instructions to the other friend, such as 'raise blue flag', 'lower white flag', 'don't lower white flag', and 'raise blue flag' quickly.
3. Change your role with your friend after you give 10 instructions. Whoever is better at following the instruction correctly wins this game.

Mmm~ Let's focus
Bring it on!





Robot Assembly



Prepare robot parts.

Smart controller X1	Smart servo (ID00,01) X2	Battery case X1	LED X2	Touch sensor X2
1x5 frame X1	1x12 frame X2	2x5 frame X2	2x15 frame X3	3x5 frame X3
3x7 frame X4	3x9 frame X4	5x5 frame X1	2x4 L frame X2	3x4 L frame X2
3x5 L frame X4	3x6 L frame X3	2s rivet X49	3s rivet X8	Double rivet X30



Tips.

- The rear part of smart servo is transparent while rotation motor is all black. This is to show the LED light of smart servo. You can control smart servo to rotate as well as to move the position angle.
- Smart servo and front horn part have 'home' mark as shown in the image on the right. Match these two 'home' marks when you assemble the robot.



Step 1

Tip



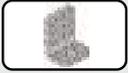
2x15 frame X1



2x4 L frame X1



3x4 L frame X1



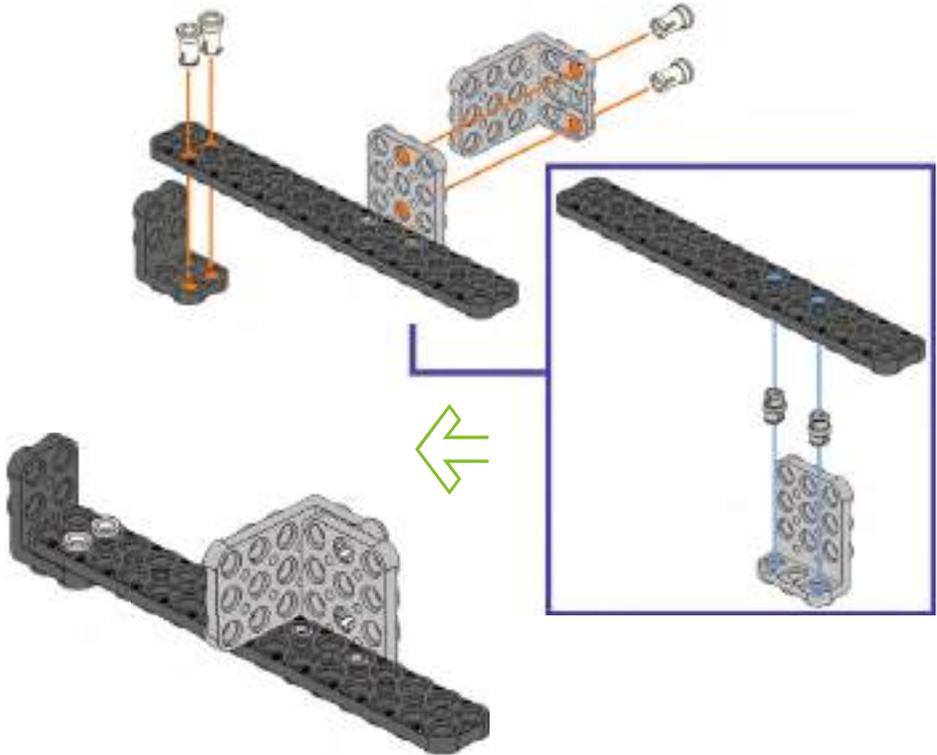
3x5 L frame X1



2s rivet X4



Double rivet X2



Step 2

Tip



2x15 frame X1



2x4 L frame X1



3x4 L frame X1



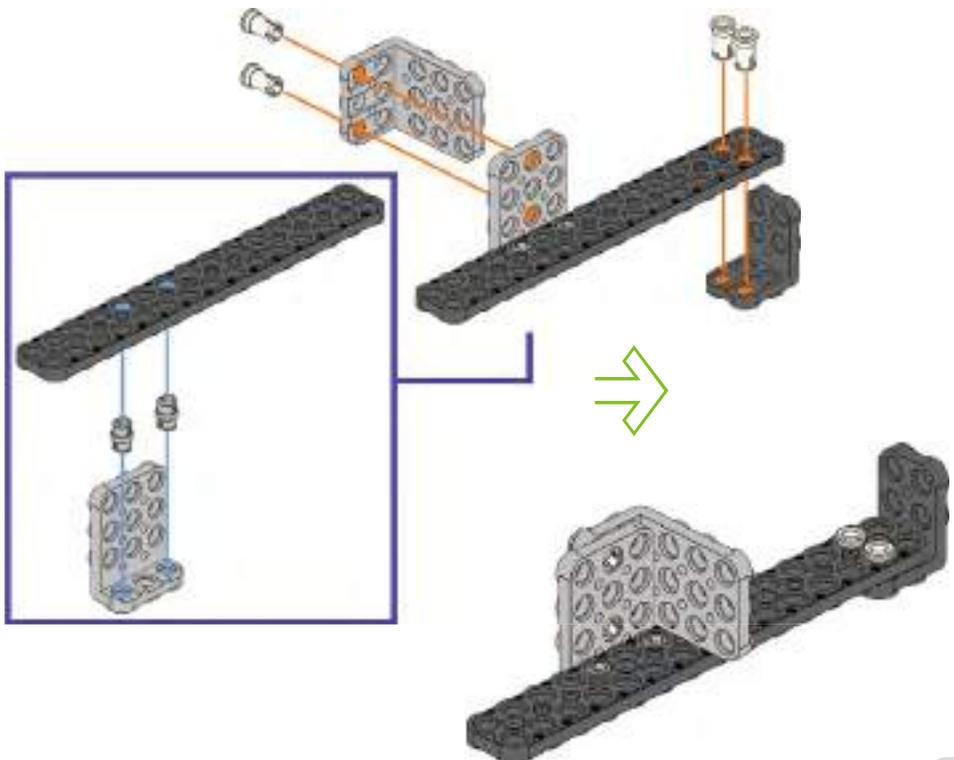
3x5 L frame X1



2s rivet X4

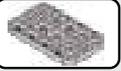


Double rivet X2



Step 3

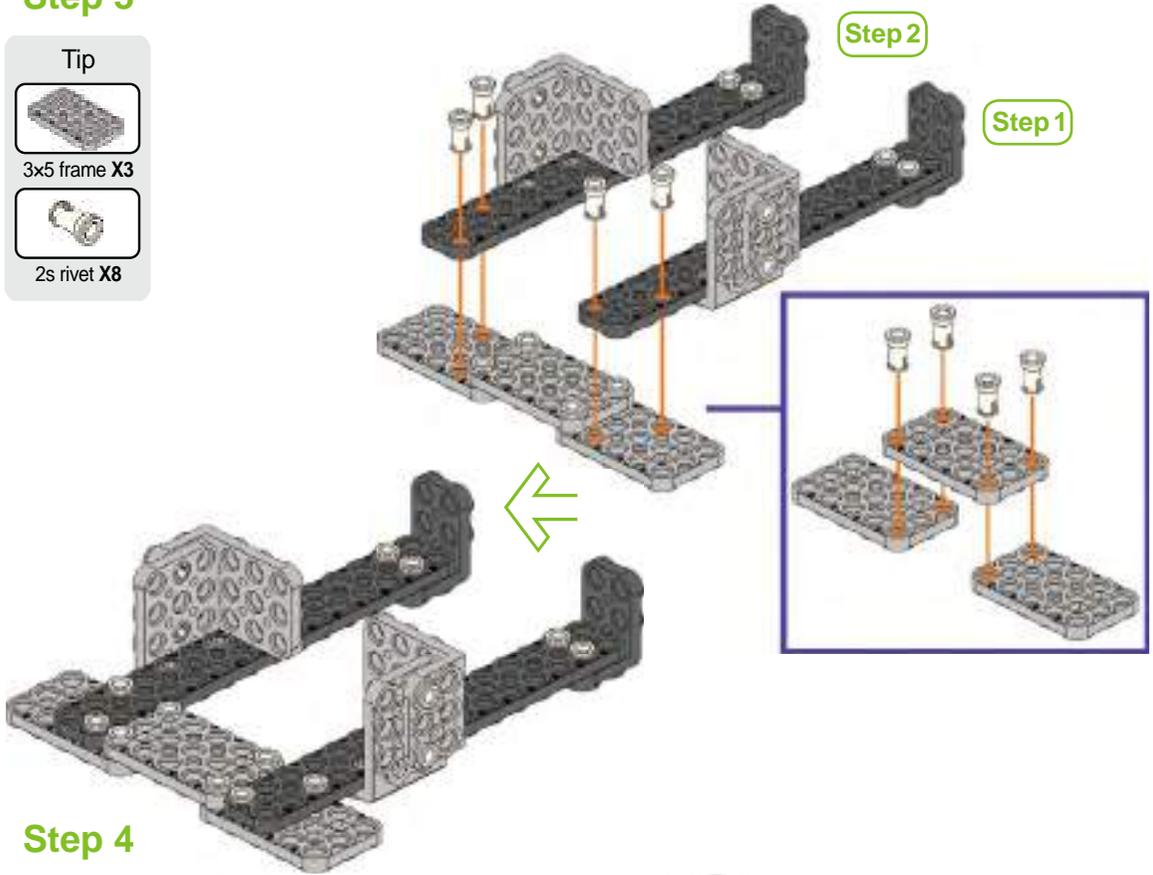
Tip



3x5 frame X3



2s rivet X8



Step 4

Tip



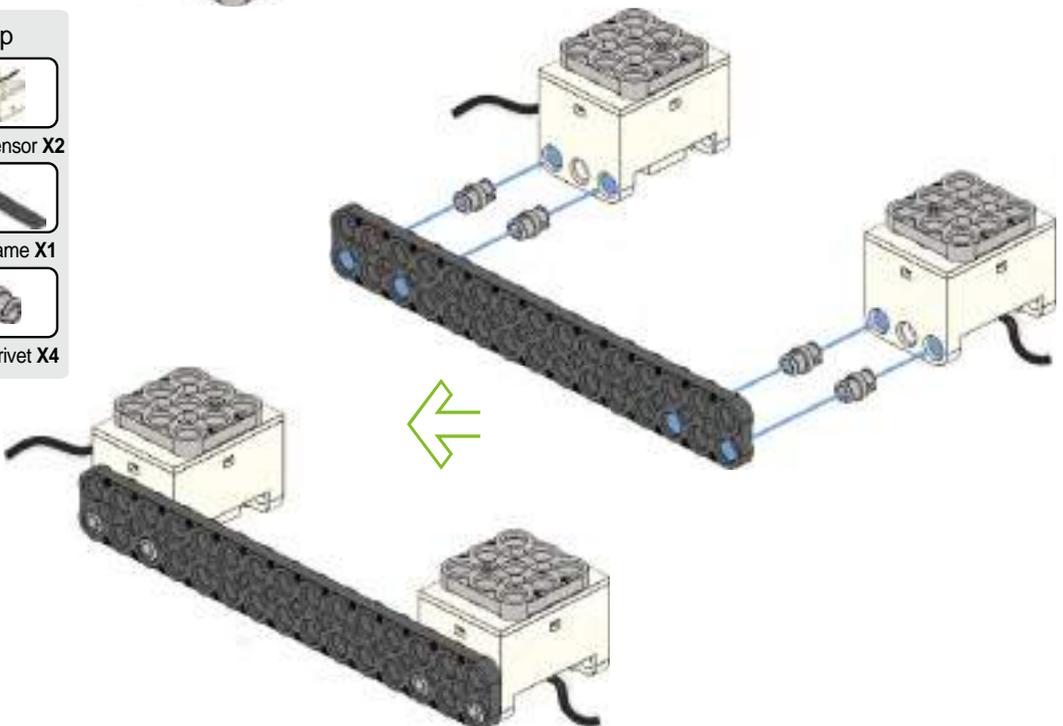
Touch sensor X2



2x15 frame X1



Double rivet X4

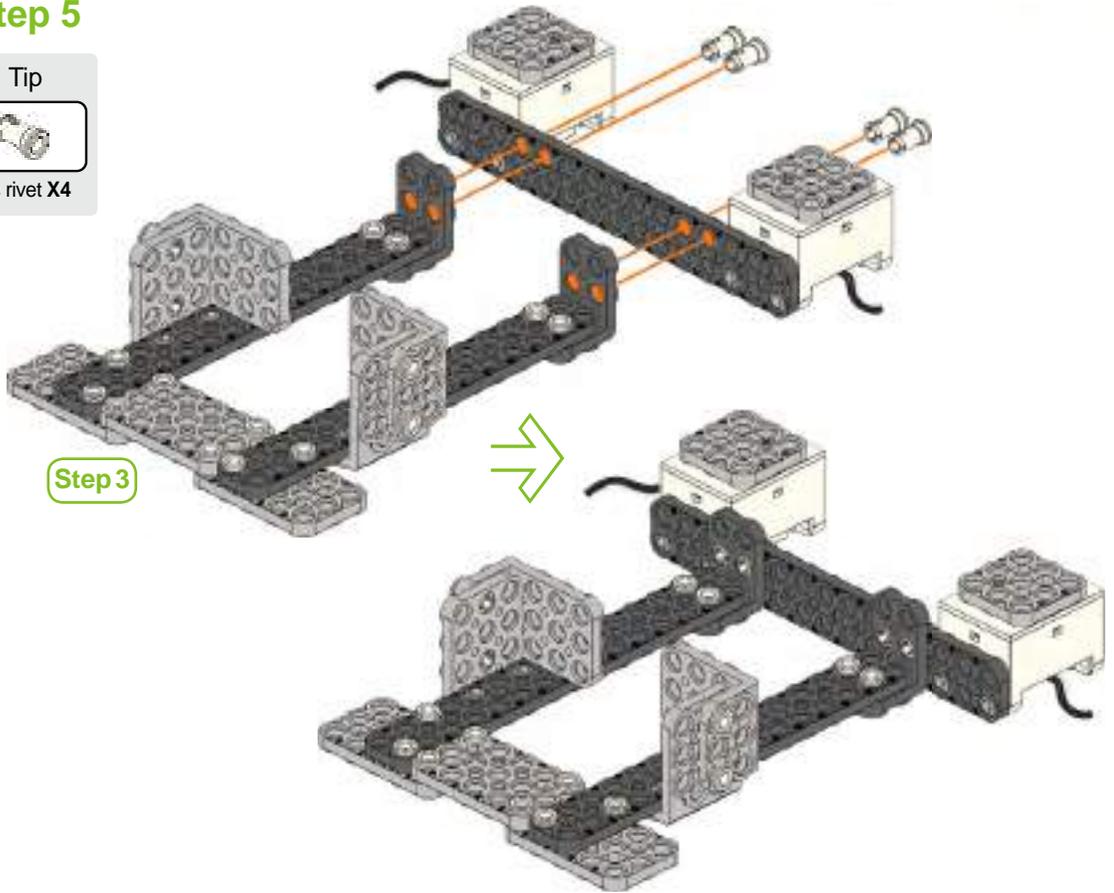


Step 5

Tip



2s rivet X4



Step 3

Step 6

Tip



3x7 frame X2



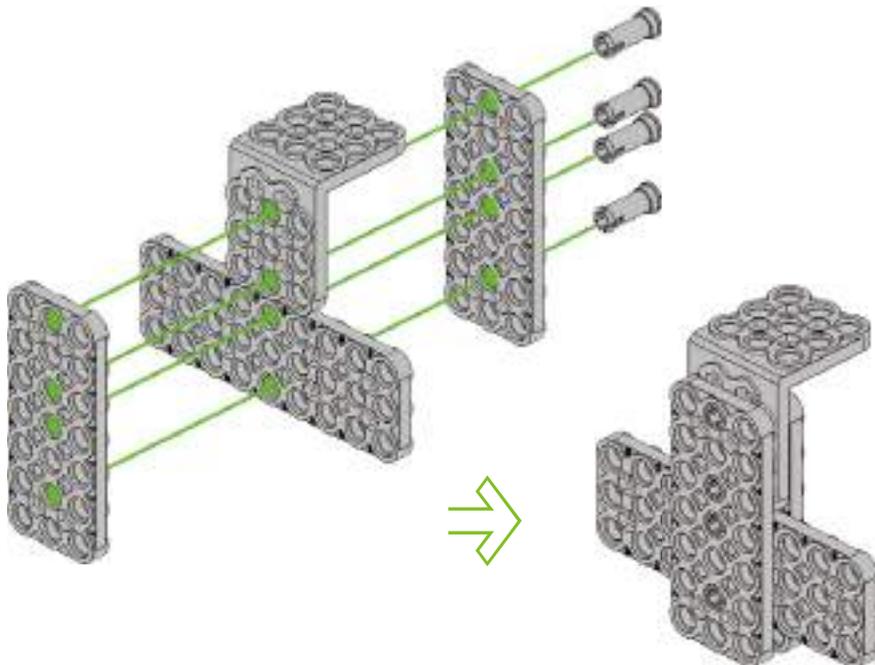
3x9 frame X1



3x6 L frame X1



3s rivet X4

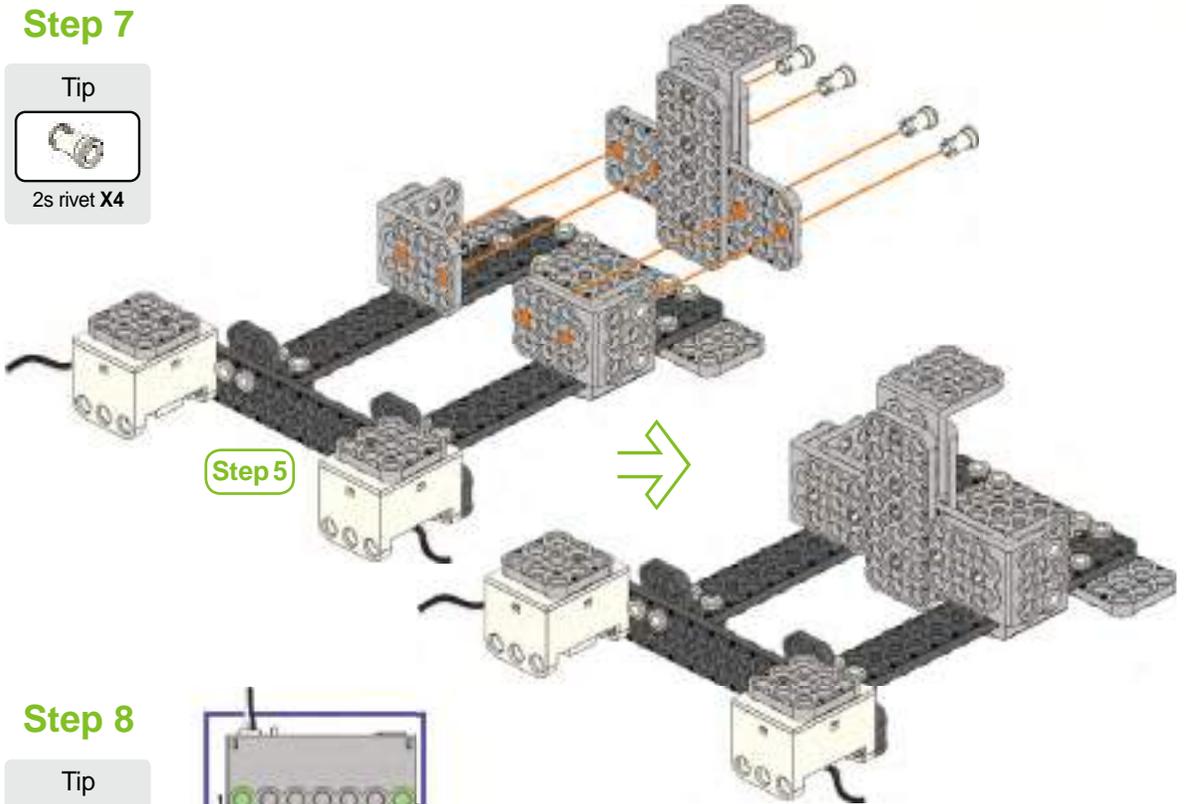


Step 7

Tip



2s rivet X4



Step 5

Step 8

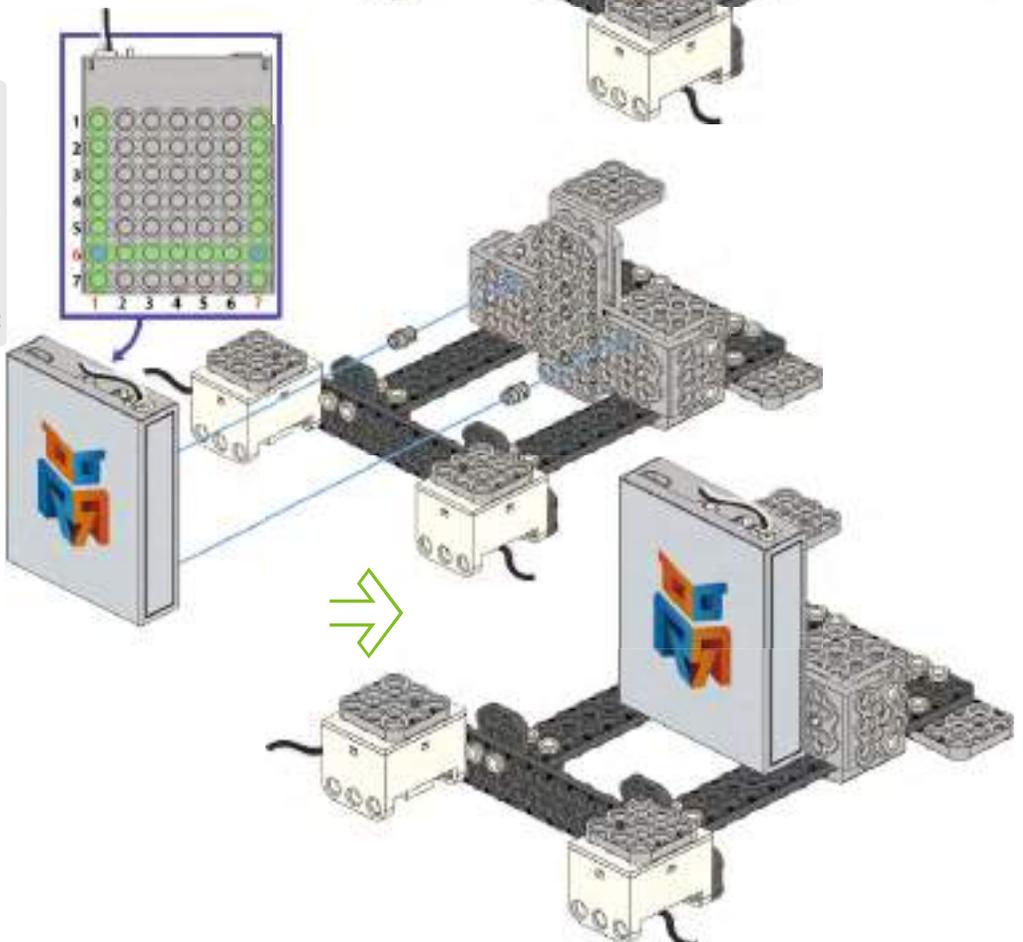
Tip



Battery case X1



Double rivet X2



Step 5

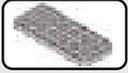


Step 9 X2

Tip



LED X1



3x7 frame X1



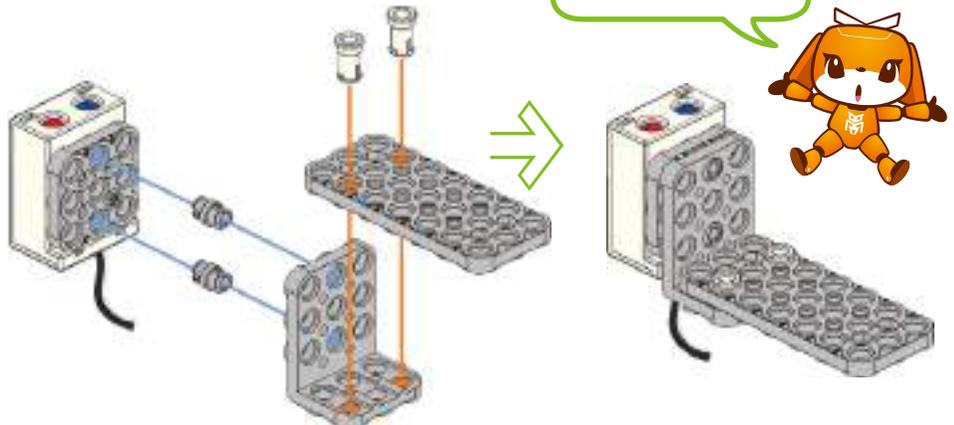
3x5 L frame X1



2s rivet X2

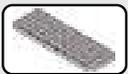


Double rivet X2



Step 10

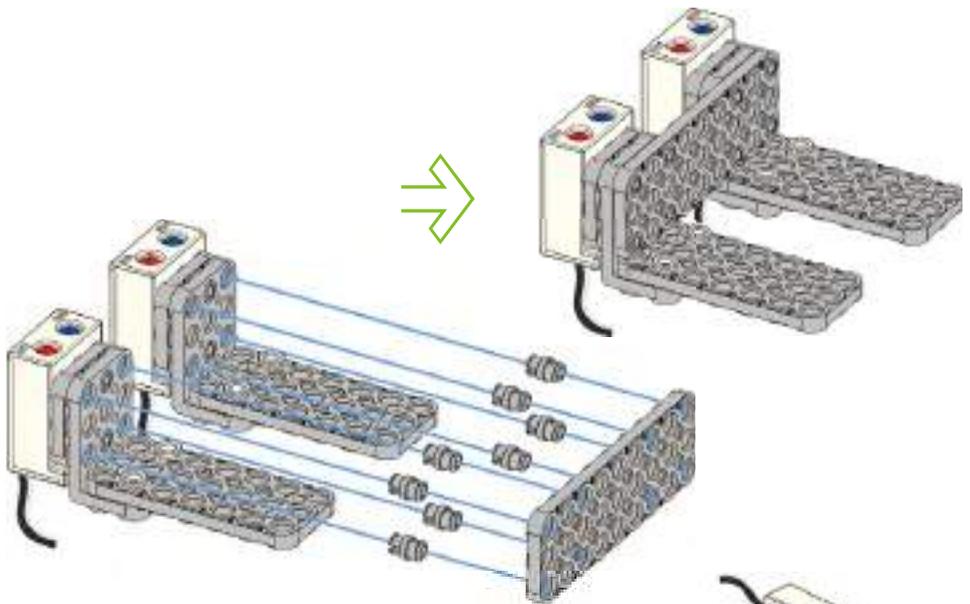
Tip



3x9 frame X1

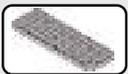


Double rivet X8



Step 11

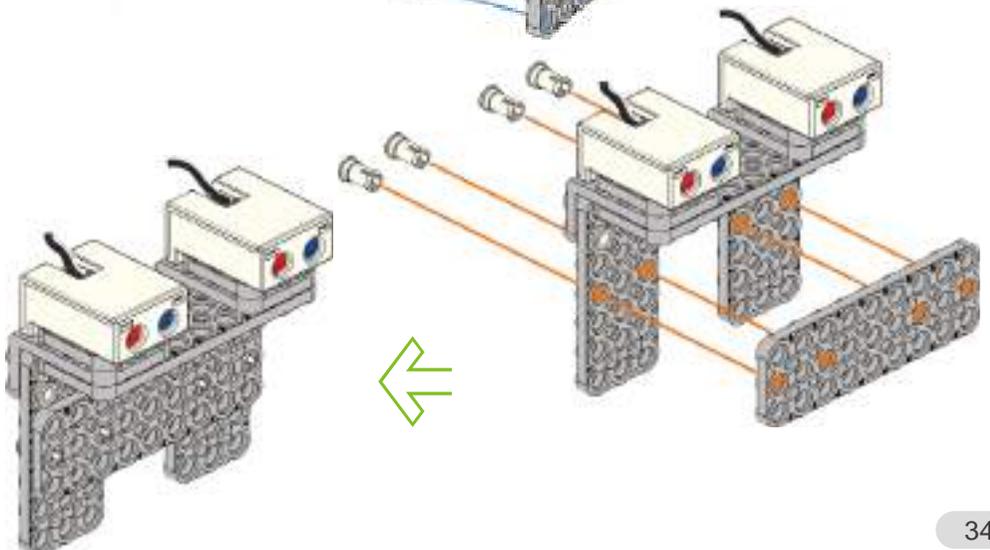
Tip



3x9 frame X1



2s rivet X4



Step 12

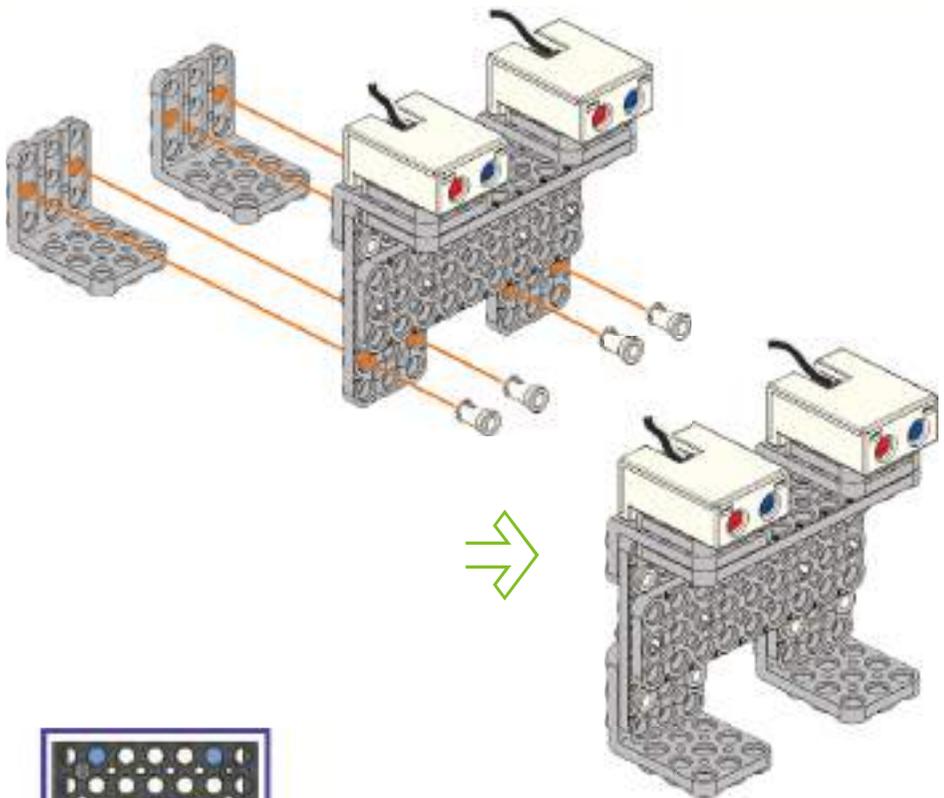
Tip



3x6 L frame X2



2s rivet X4



Step 13

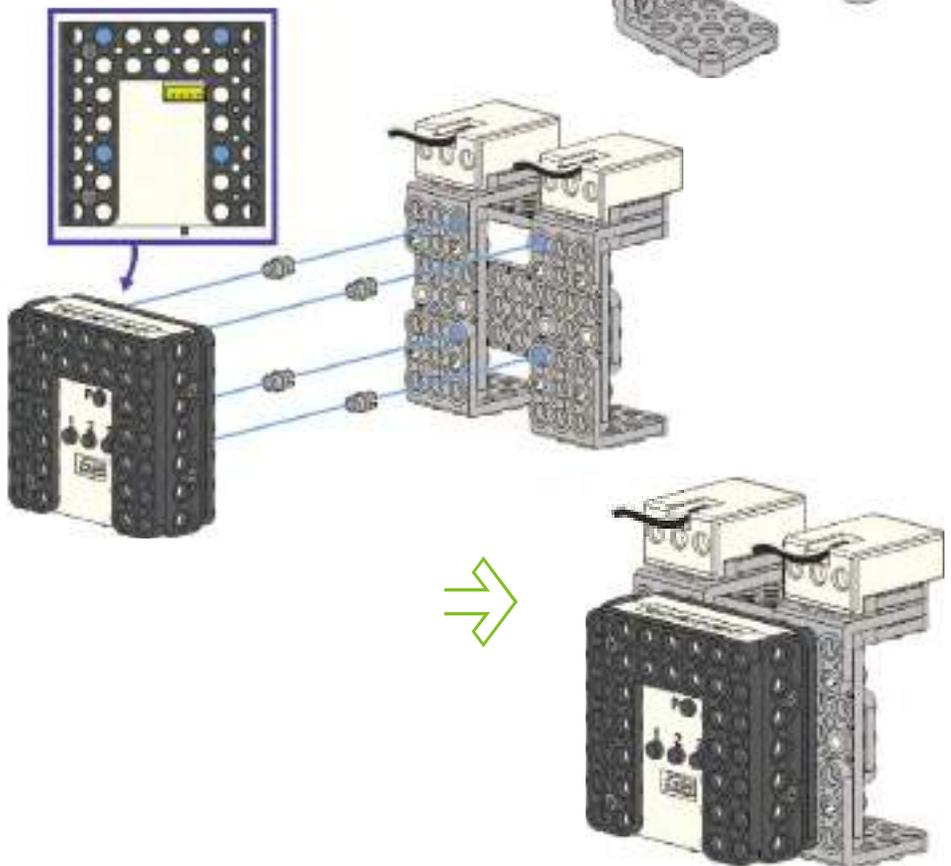
Tip



Smart controller X1

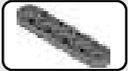


Double rivet X4



Step 14

Tip



1x5 frame X1



1x12 frame X2



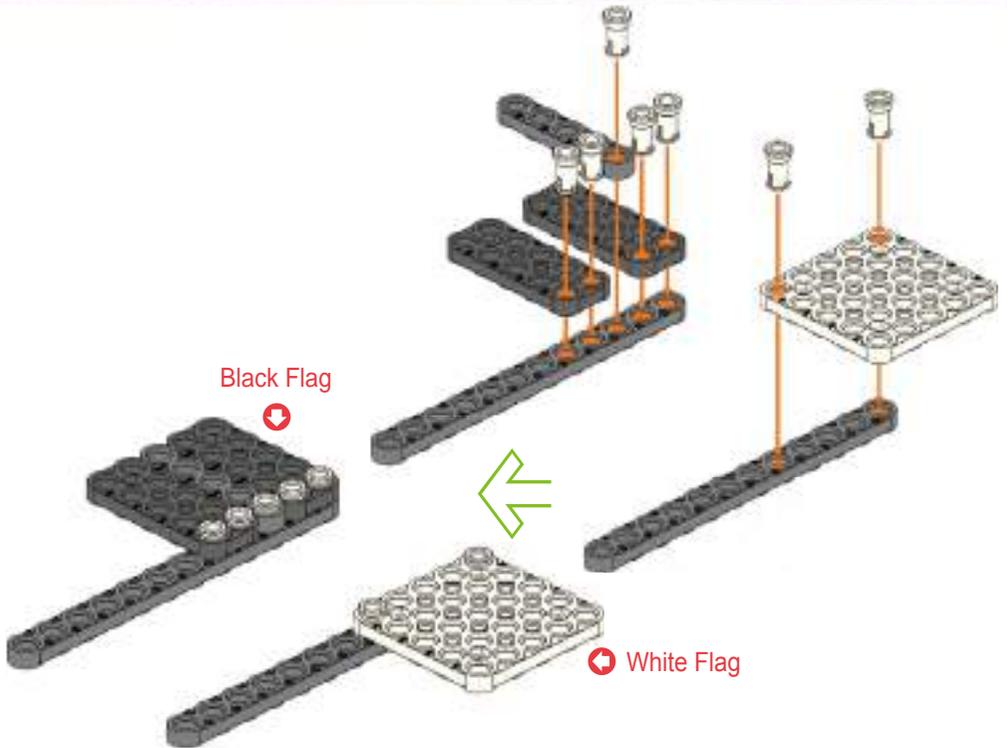
2x5 frame X2



5x5 frame X1



2s rivet X7

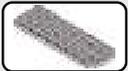


Step 15

Tip



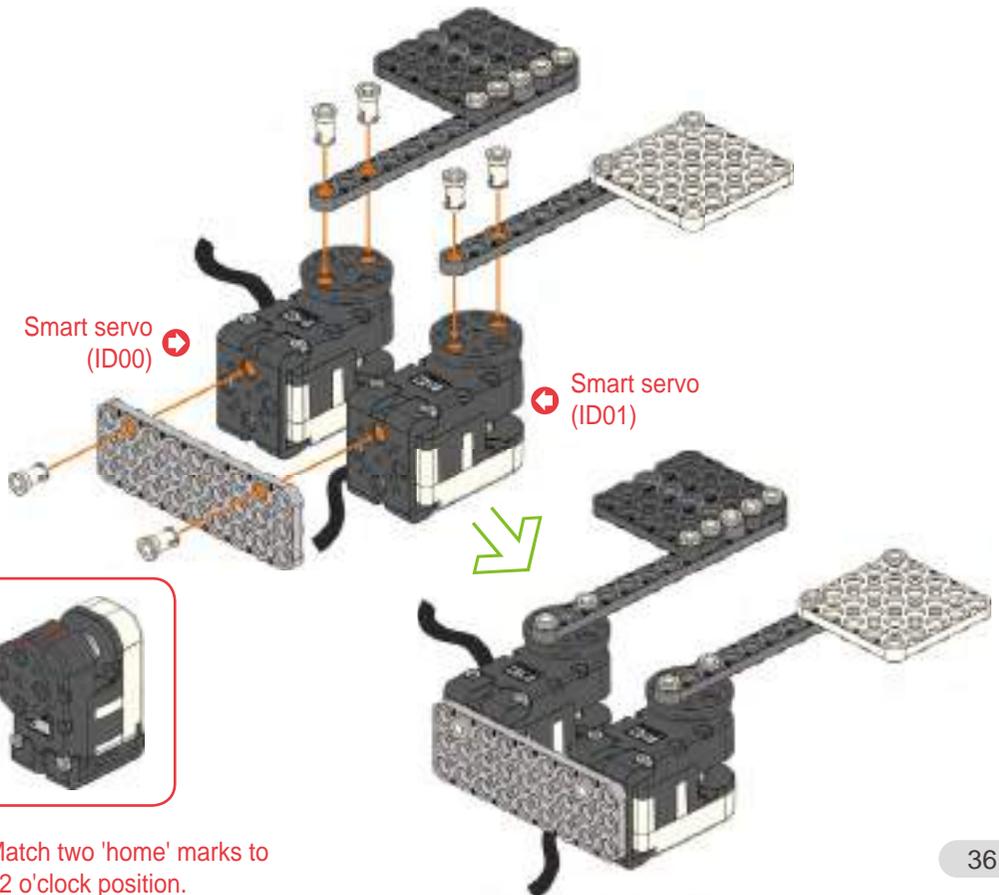
Smart servo (ID00,01) X2



3x9 frame X1



2s rivet X6



! Match two 'home' marks to 12 o'clock position.

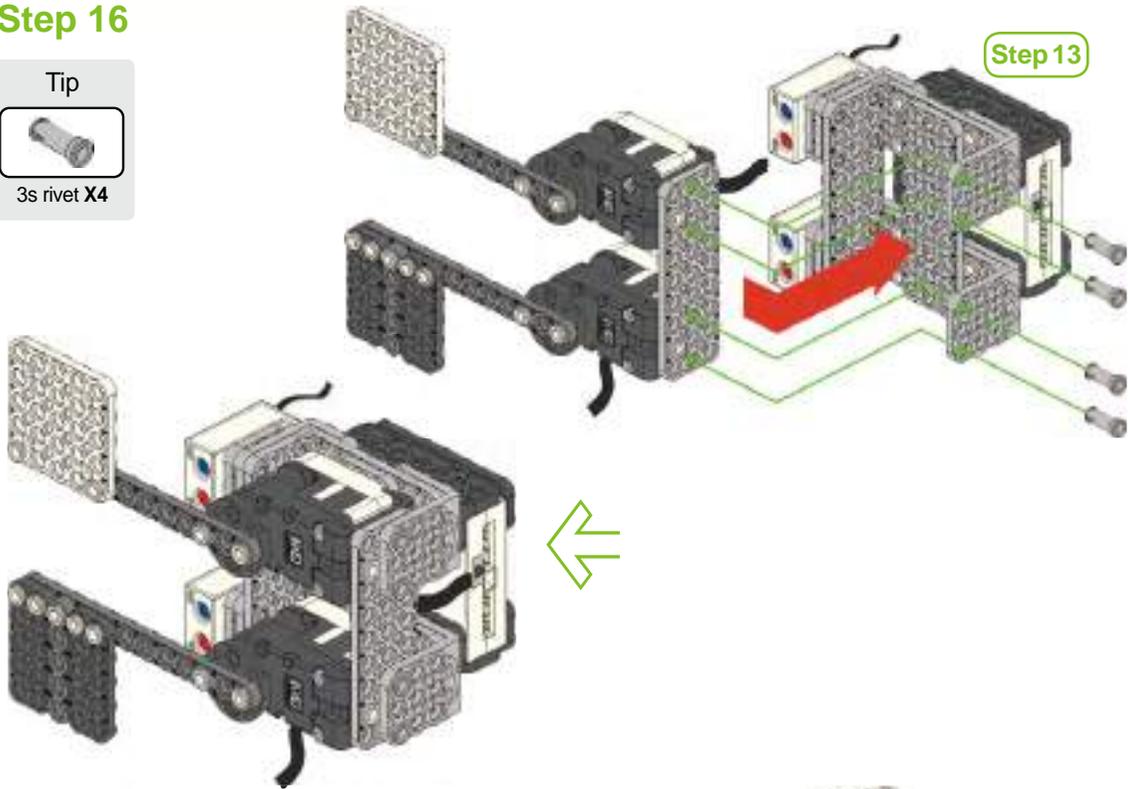
Step 16

Tip



3s rivet X4

Step 13



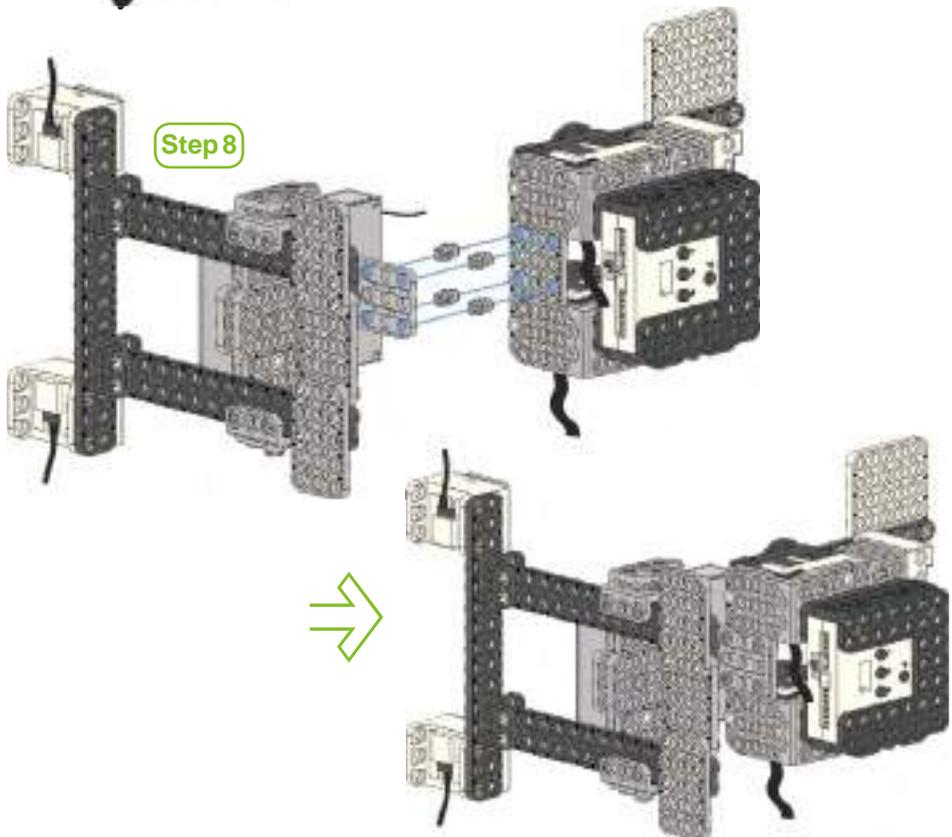
Step 17

Tip

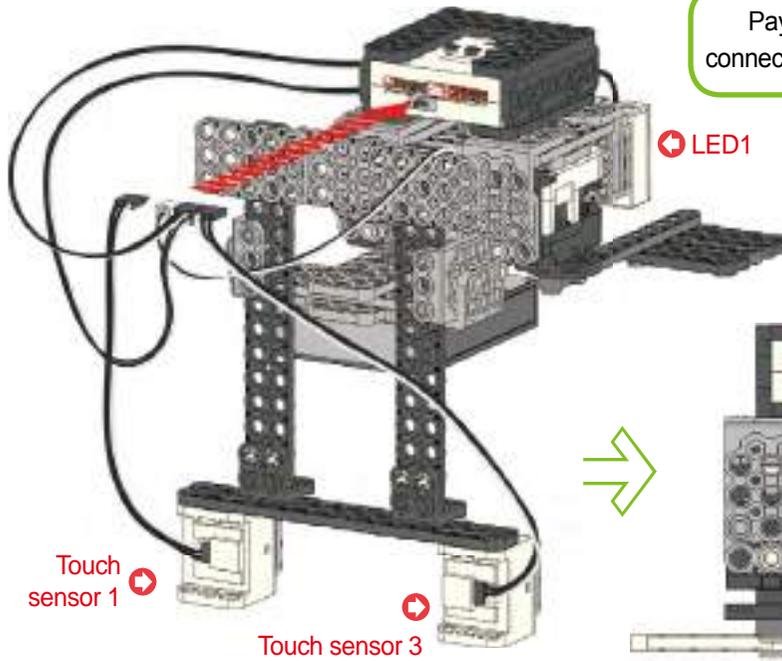


Double rivet X4

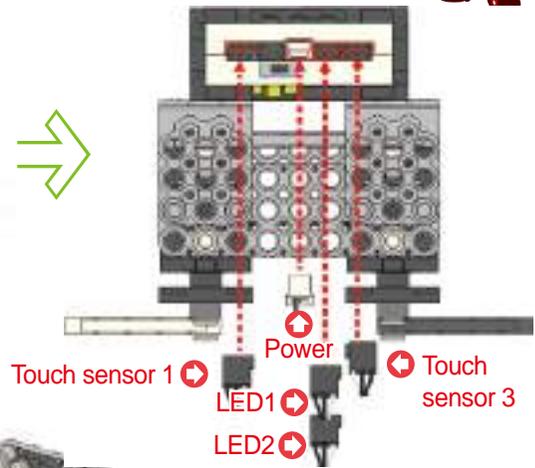
Step 8



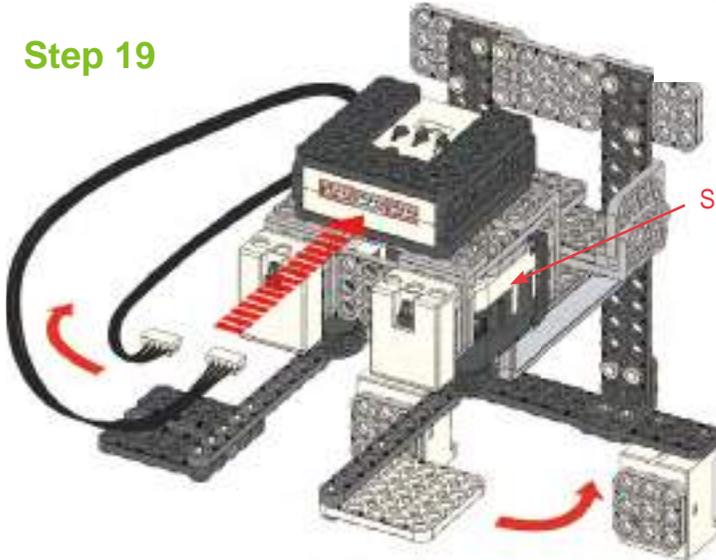
Step 18



Pay attention to the cable connecting position and direction!

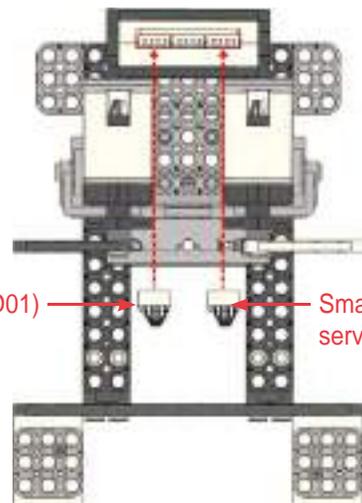


Step 19



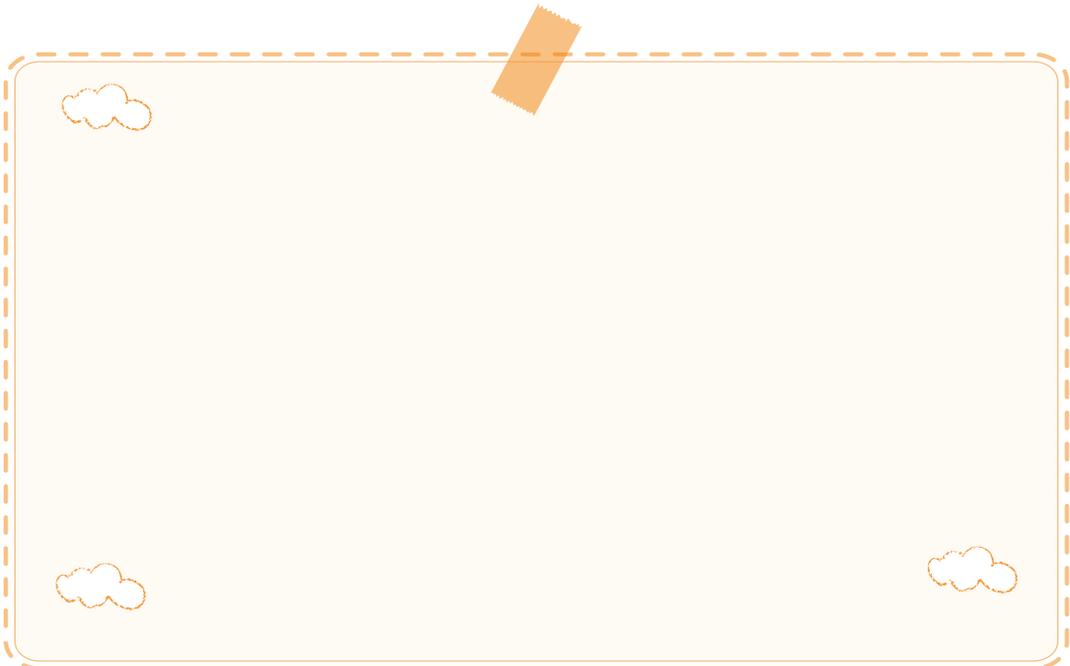
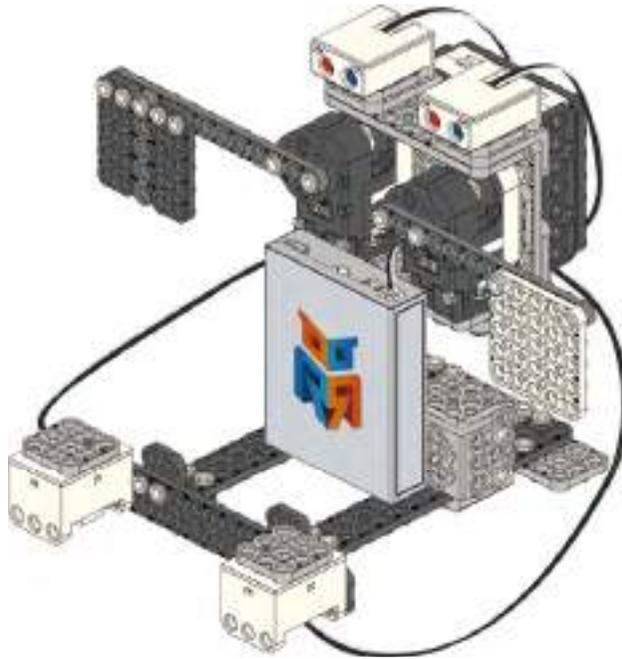
⚠ Spread the black and white flag to outside.

Smart servo (ID01) Smart servo (ID00)





★ 'Black/White flag' robot is ready! ★



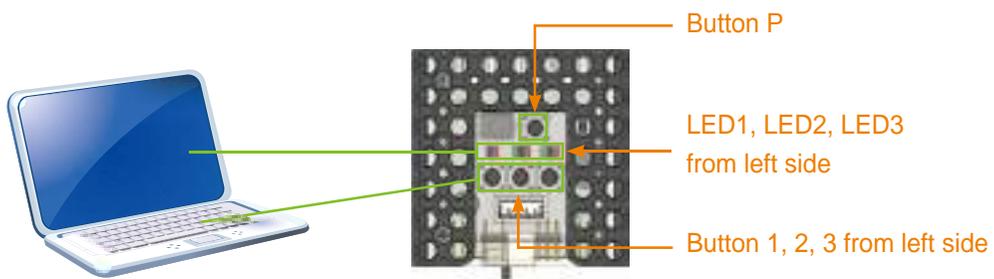


Robot Experience



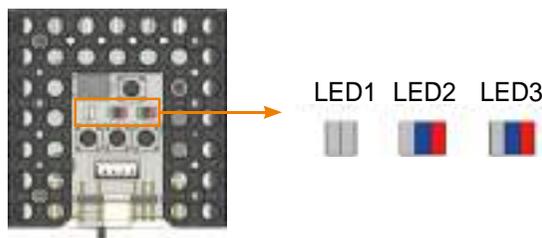
Set-up 'Black/White flag' robot model

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons work as the keyboard for PC.



First : Turn on the smart controller to enter <set-up mode>.

Second : Press button 2 or button 3 on smart controller to set-up 'Black/White flag' robot model. The buttons work as a keyboard for PC. Program the robot for proper operation.



Third : Press button P on smart controller to enter <standby mode>.

Check below and assemble again if robot is not working properly.

1. When Black/White flag is not moving :
 - ▶ Check power connection and robot model set-up.
2. When Black flag and white flag move in reverse direction :
 - ▶ See STEP15 and check smart servo ID00 and ID01 connection.
 - ▶ See STEP18 and check LED and touch sensor cable connection.

Robot Play



Play Black/White flag game.

Two LEDs are connected to the Black/White flag robot. Press IR remote controller button to move the black or white flag up or down following the sign given with blue or red LED light.

- Press '#' + '1' buttons or IR remote controller together to start the game.
→ '# + '1' (Level 1), '# + '2' (Level 2), '# + '3' (Level 3)
- Control the black flag for left LED light, and control the white flag for right LED light.
→ Use the IR remote controller button to control black/white flags as below.
- If you press a button correctly, you will hear the ringing, otherwise, you hear a short beep.
- If you press a wrong button 3 times out of 10, you lose. If you press a wrong button less than 3 times, you can go up to the next level.

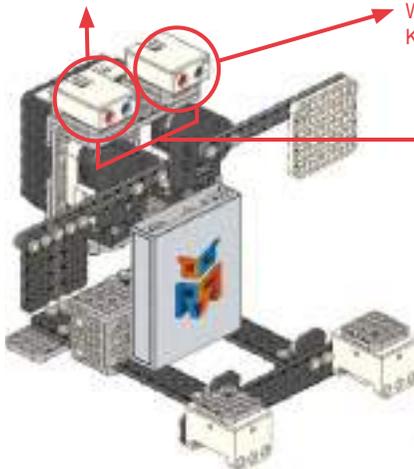
Black flag UP when blue light ON.
Black flag DOWN when red light ON.

Keep current position when blue and red lights ON.

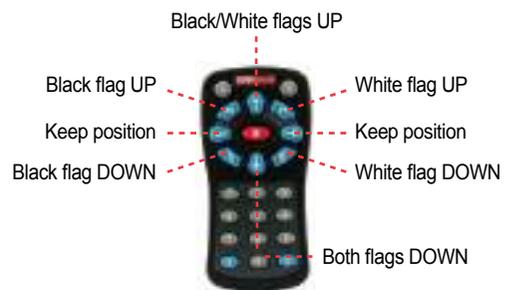
White flag UP when blue light ON.

White flag DOWN when red light ON.

Keep current position when blue and red lights ON



Black/White flags UP when two LEDs are blue.
Black/White flags DOWN when two LEDs are red.



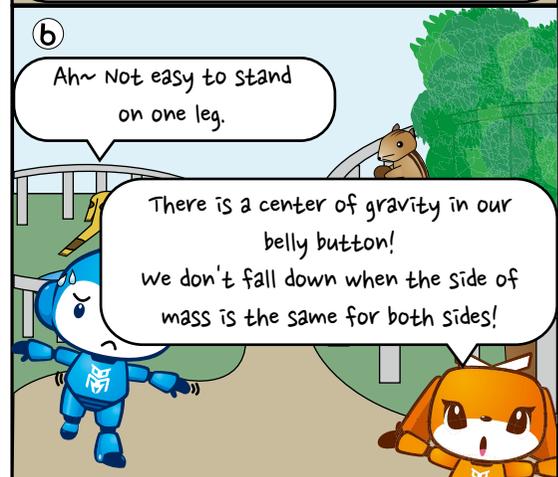
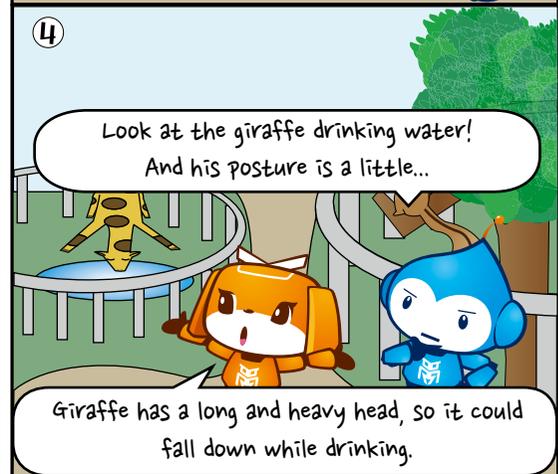
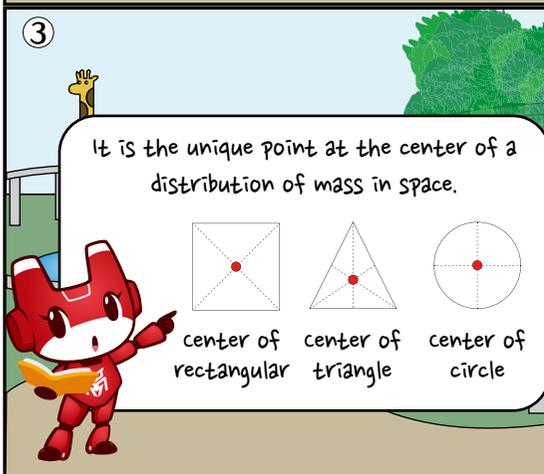
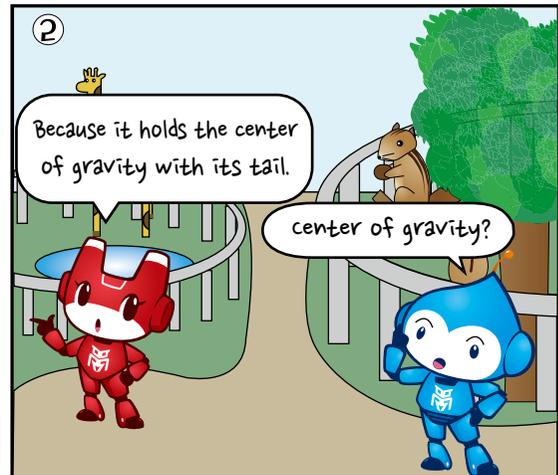
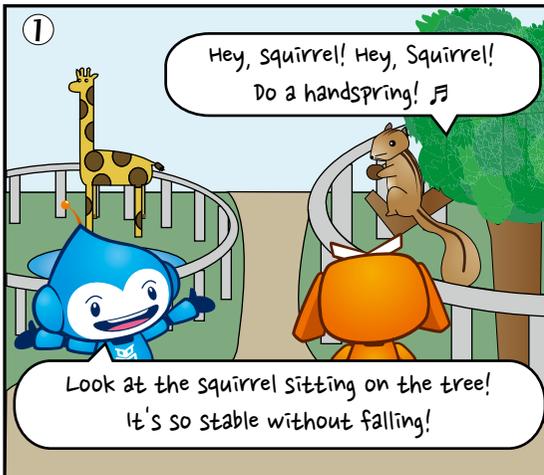
◆ Describe your 'Black/White flag' robot.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



3. Walking Bot

Hold a center of gravity.

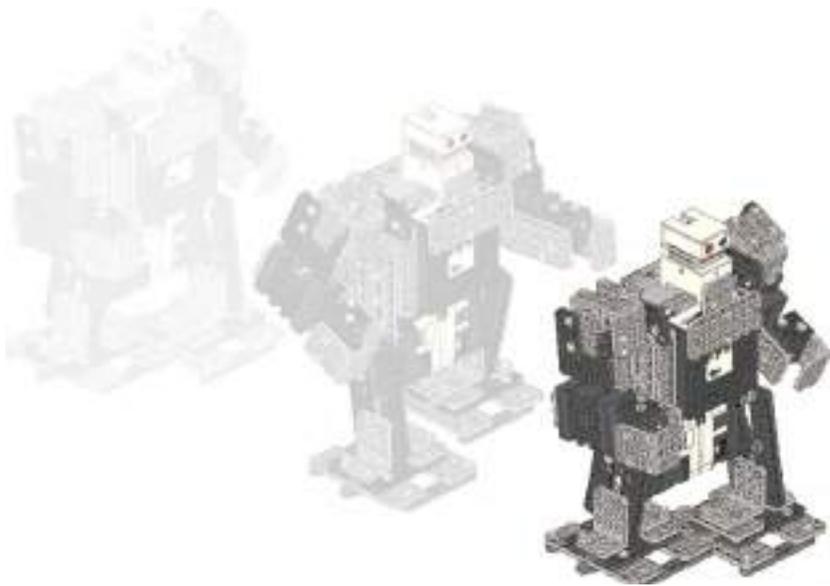




Today's Robot Class



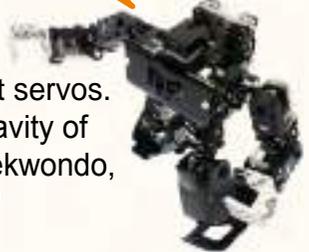
Walking Bot has to hold its center of gravity in order to walk with two legs. Center of gravity refers to a point to be balanced in order not to fall down. Robot does not fall when the weight of both side is the same with the center of gravity as the center. Robot falls down if the weight of each side is different. So we can stand up comfortably when we use two legs and two arms. We feel more comfortable when we lie down because the center of gravity is located on the bottom side.



I can move freely and naturally!



'RQ-HUNO' is a human-like intelligent robot that uses 16 smart servos. If you find the precise center of gravity of RQ-HUNO, it can walk, run, do taekwondo, play hockey and dance really well!





Robot Assembly

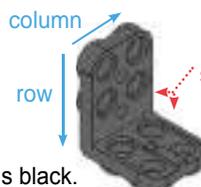


Prepare robot parts.



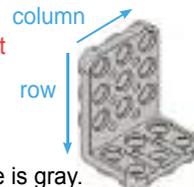
Tips.

Walking Bot uses various type of L frames. See the assembly guide carefully to see what kind of L frame is used in each step. And pay attention to frame position and direction when assembling.



Pay attention to two different sides of L frame.

- 2 col. L frame is black.
- 2x4 L frame consists of 2 col. X4 rows holes.



- 3 col. L frame is gray.
- 3x5 L frame consists of 3 col. X5 rows holes.



Step 1

Tip



Smart controller X1



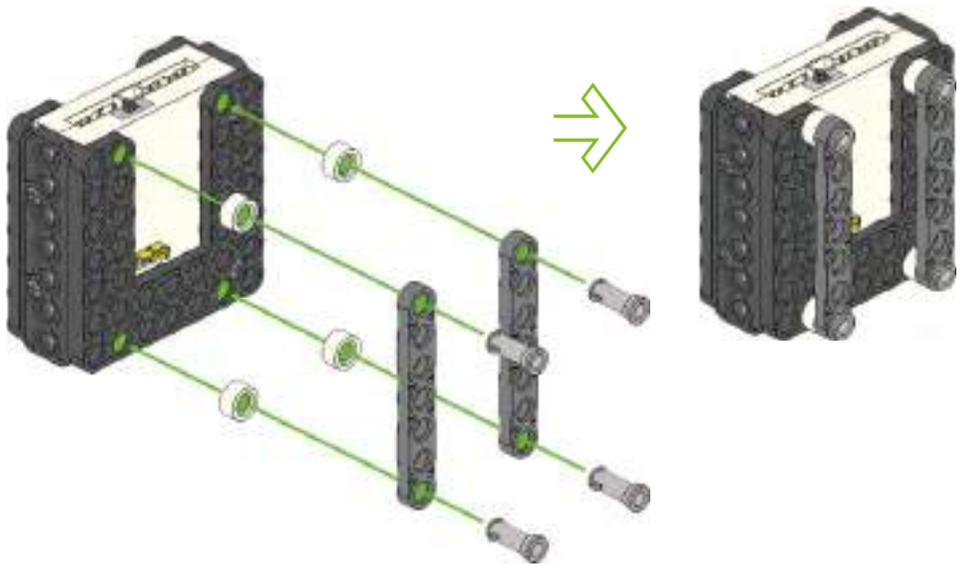
1x7 frame X2



Spacer X4



3s rivet X4



Step 2

Tip



2x5 frame X1



3x3 frame X1



3x7 frame X1



3x5 L frame X1



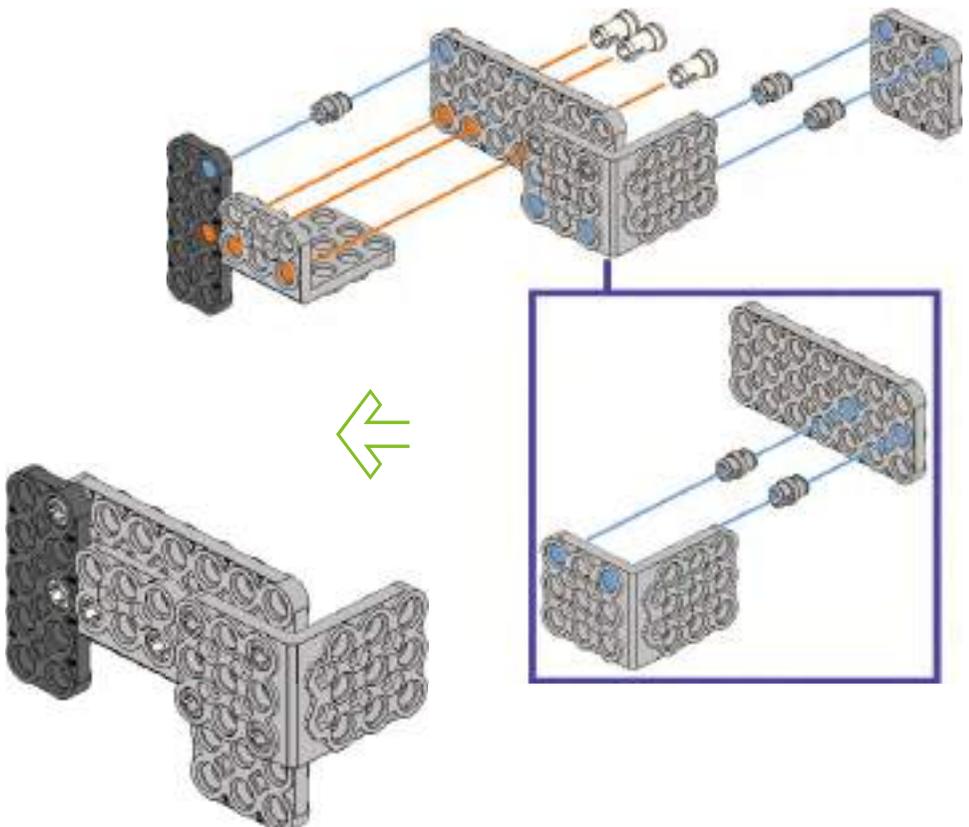
3x6 L frame X1



2s rivet X3



Double rivet X5



Step 3

Tip



2x5 frame X1



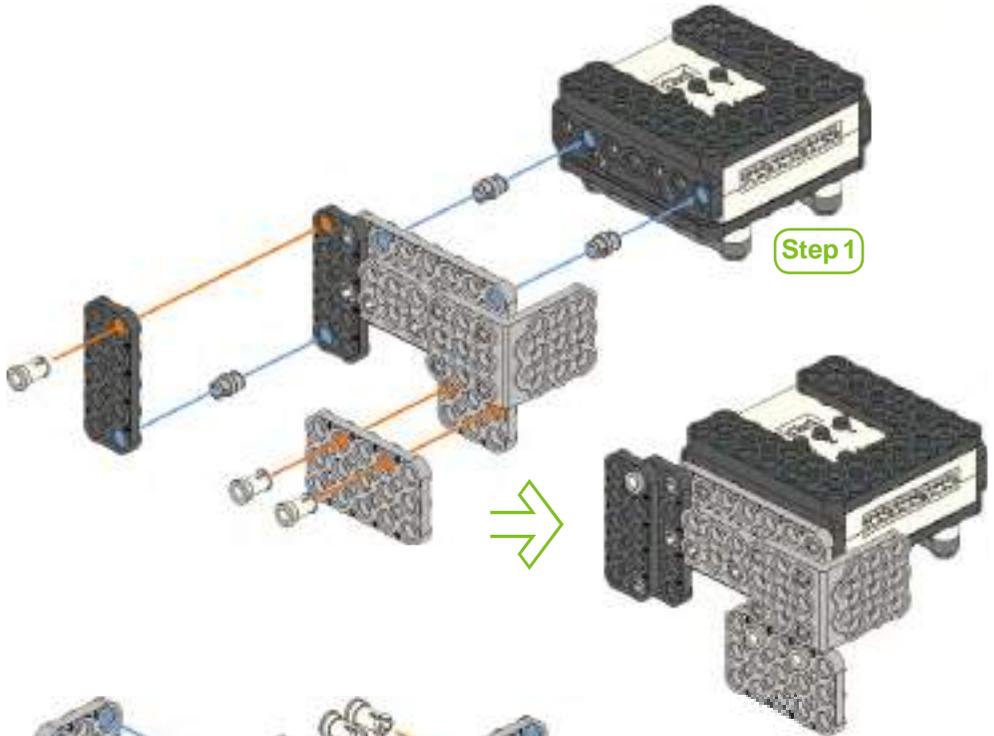
3x5 frame X1



2s rivet X4



Double rivet X3



Step 4

Tip



2x5 frame X1



3x3 frame X1



3x7 frame X1



3x5 L frame X1



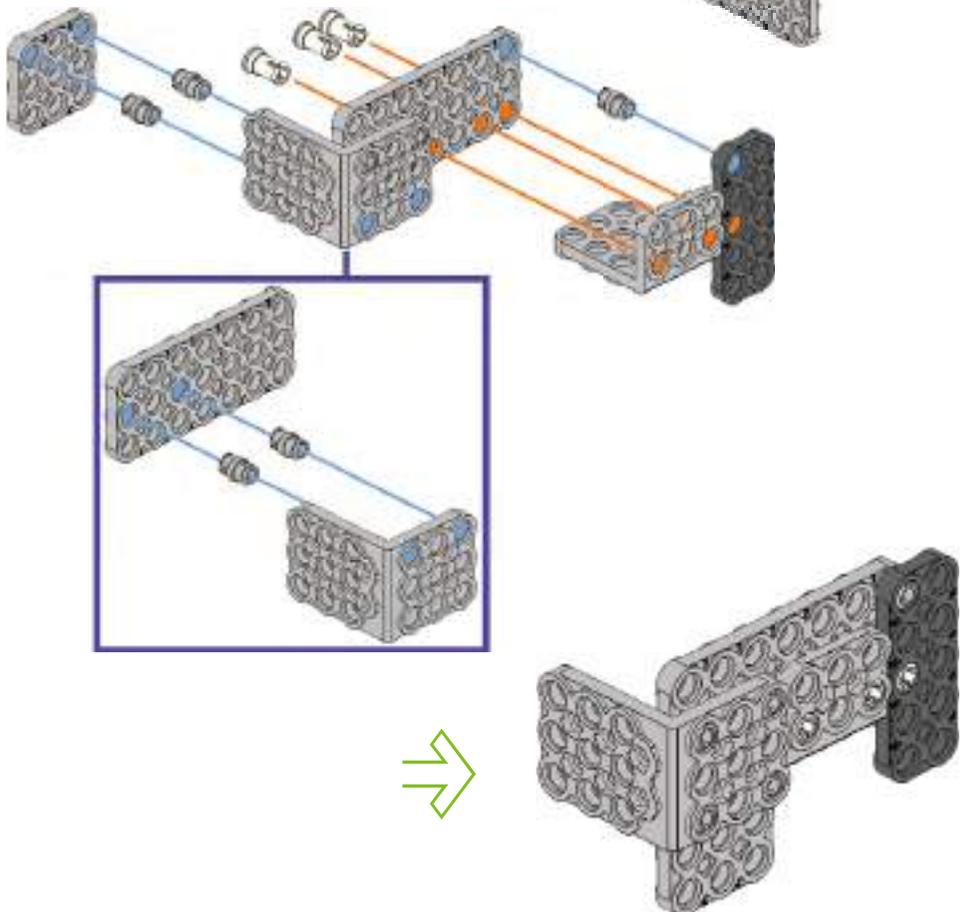
3x6 L frame X1



2s rivet X3



Double rivet X5



Step 5

Tip



2x5 frame X1



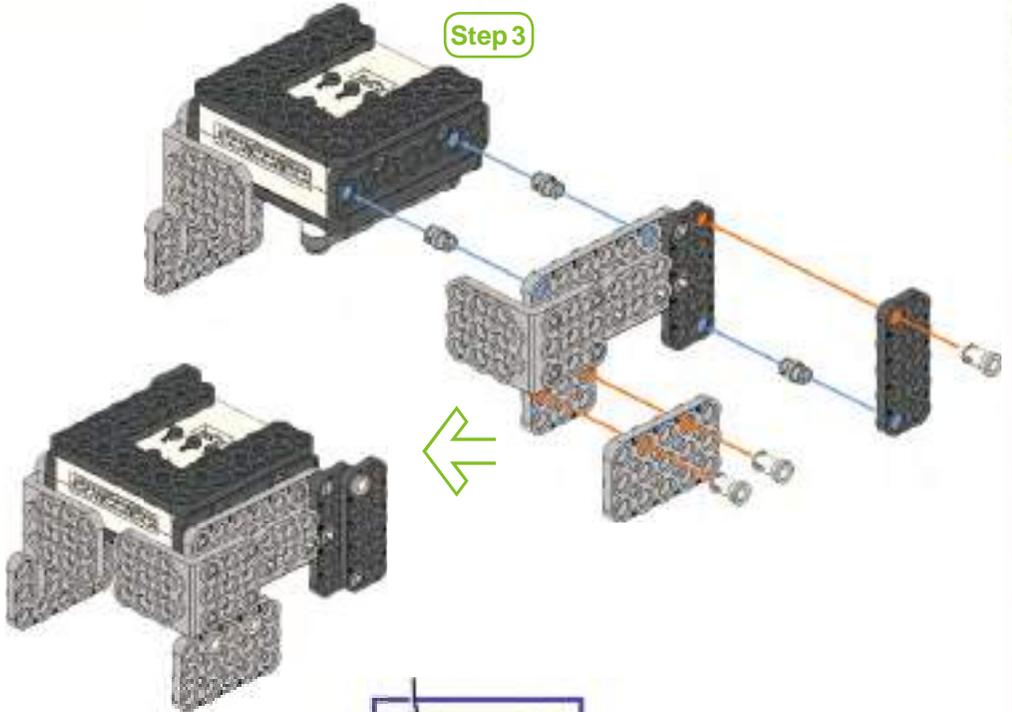
3x5 frame X1



2s rivet X3



Double rivet X3



Step 6

Tip



Smart servo (ID00,01) X2



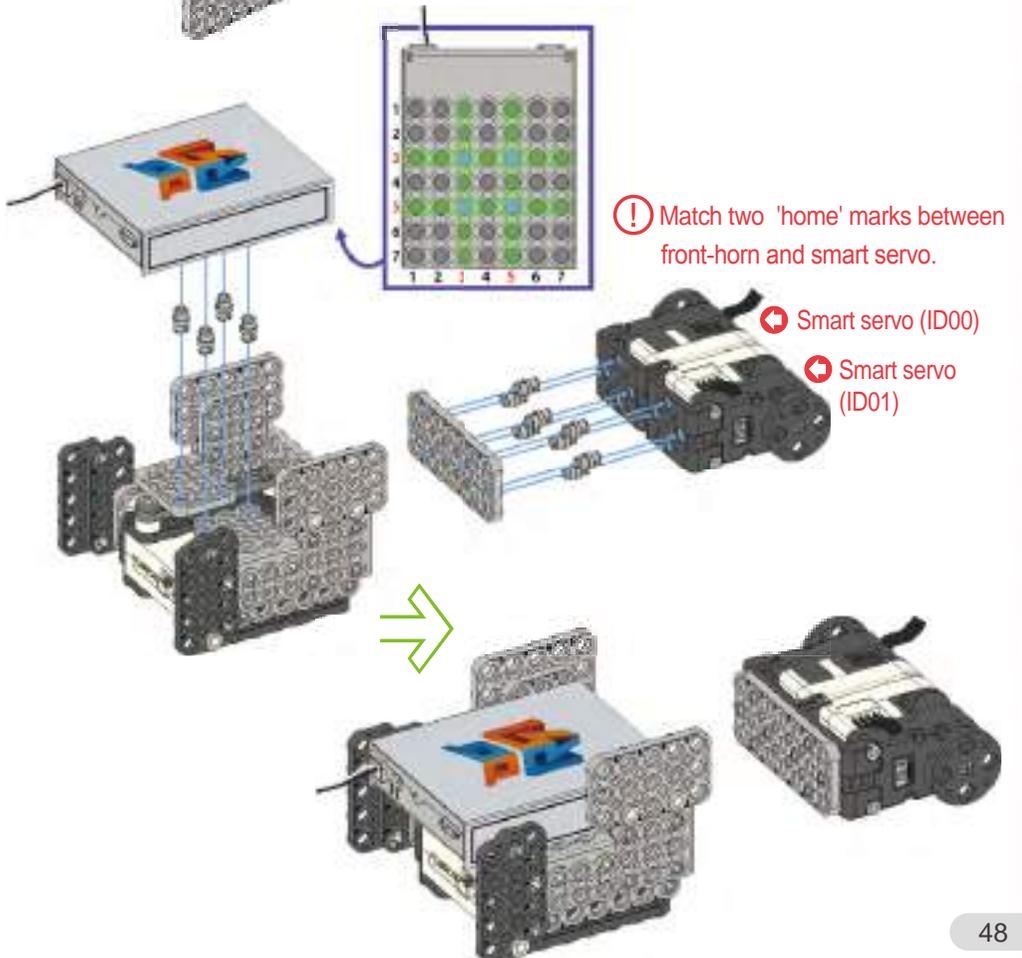
Battery case X1



3x7 frame X1



Double rivet X12

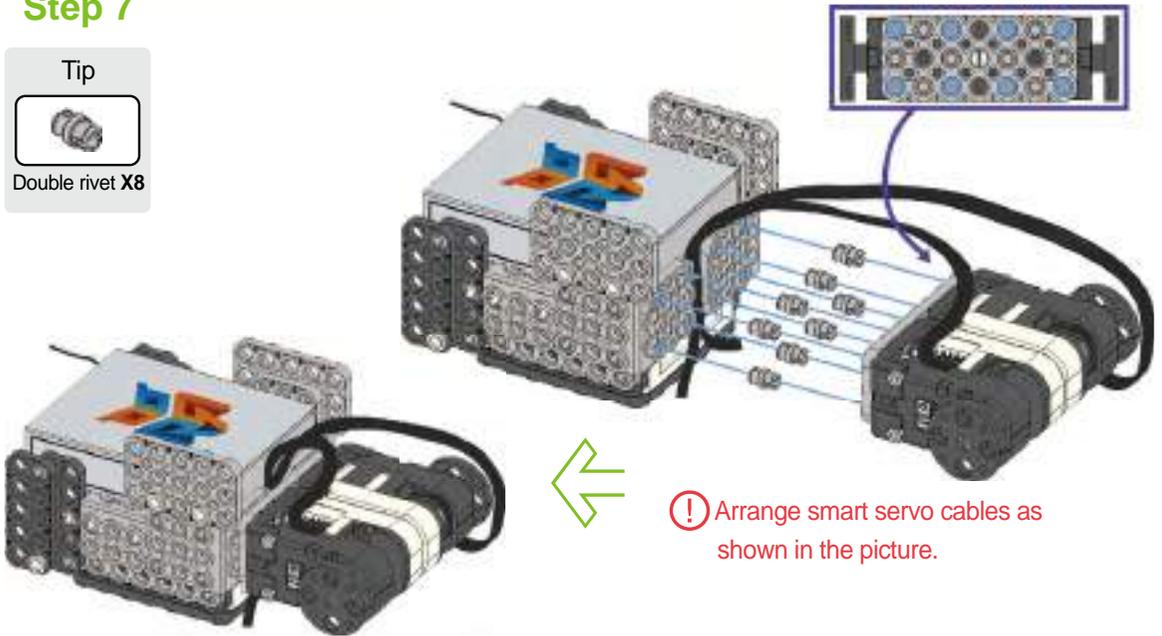


Step 7

Tip



Double rivet X8



⚠ Arrange smart servo cables as shown in the picture.

Step 8

Tip



1x7 frame X1



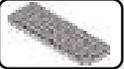
1x8 frame X1



2x7 frame X2



3x5 frame X1



3x9 frame X2



Ball frame X1



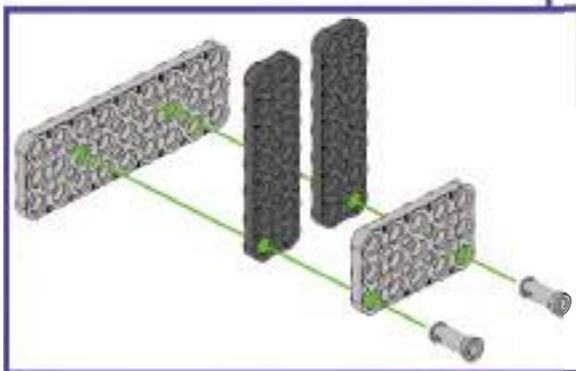
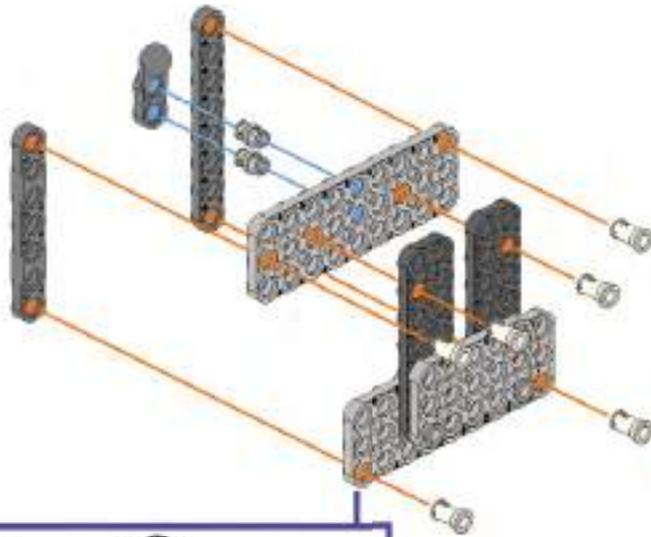
2s rivet X6



3s rivet X2



Double rivet X2



Step 9

Tip



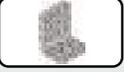
1x3 frame X2



2x9 frame X2



3x8 slide frame X1



3x5 L frame X1



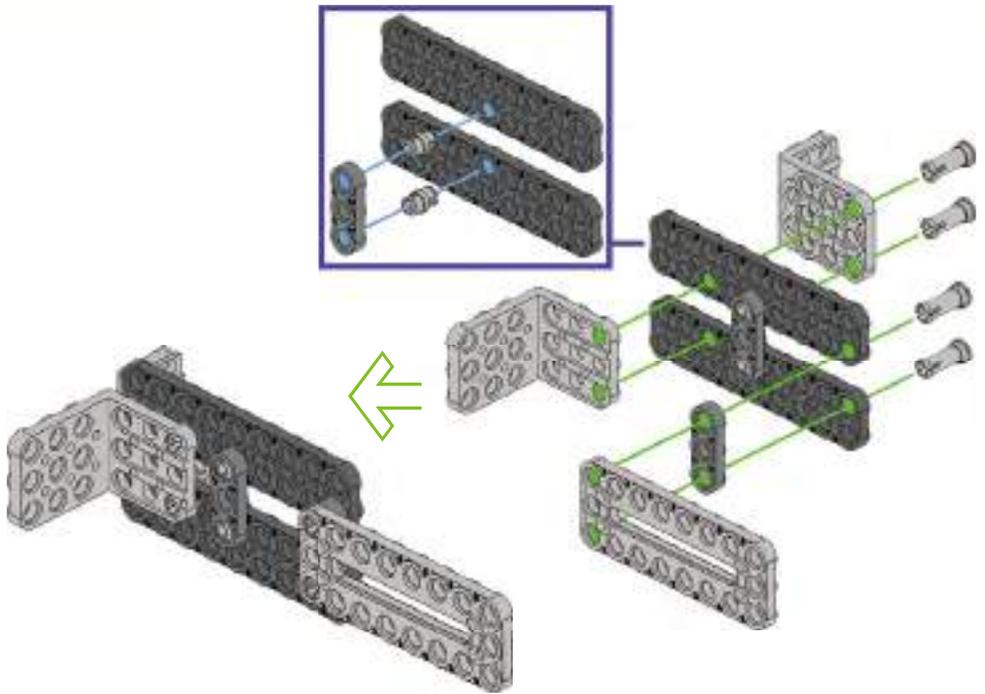
3x6 L frame X1



3s rivet X4

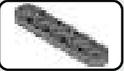


Double rivet X2

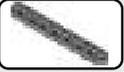


Step 10

Tip



1x5 frame X2



1x8 frame X1



3x4 L frame X1



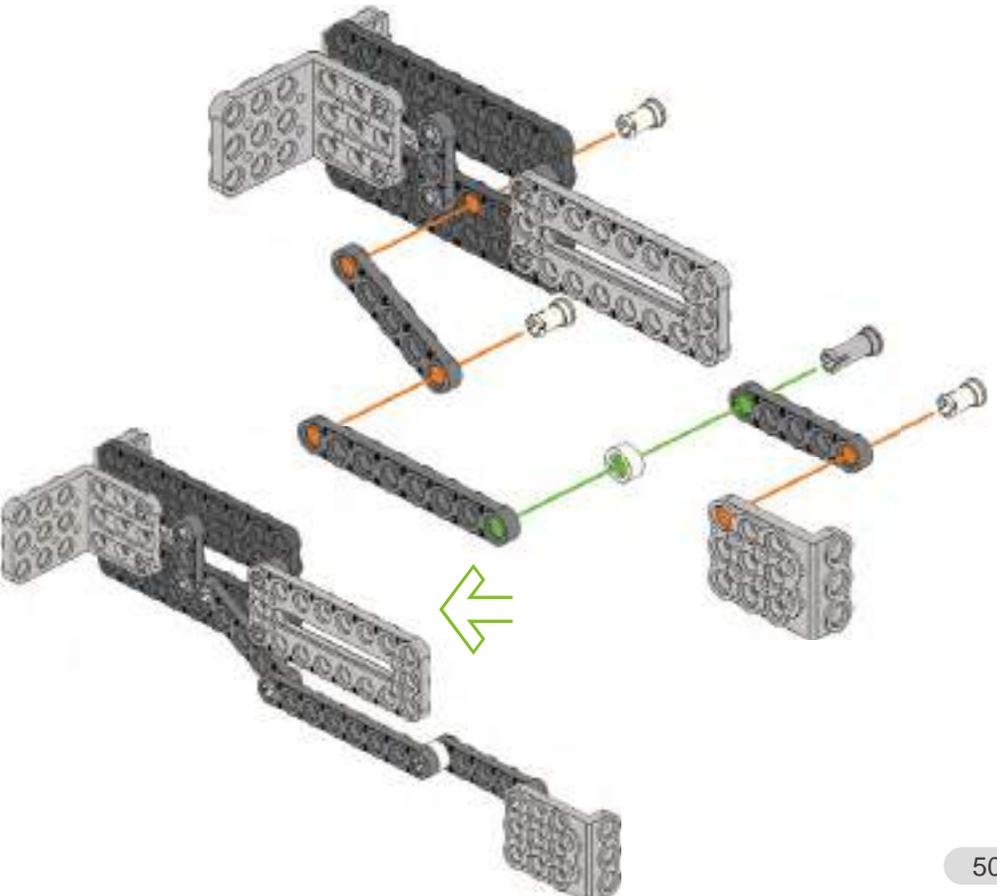
Spacer X1



2s rivet X3



3s rivet X1



Step 11

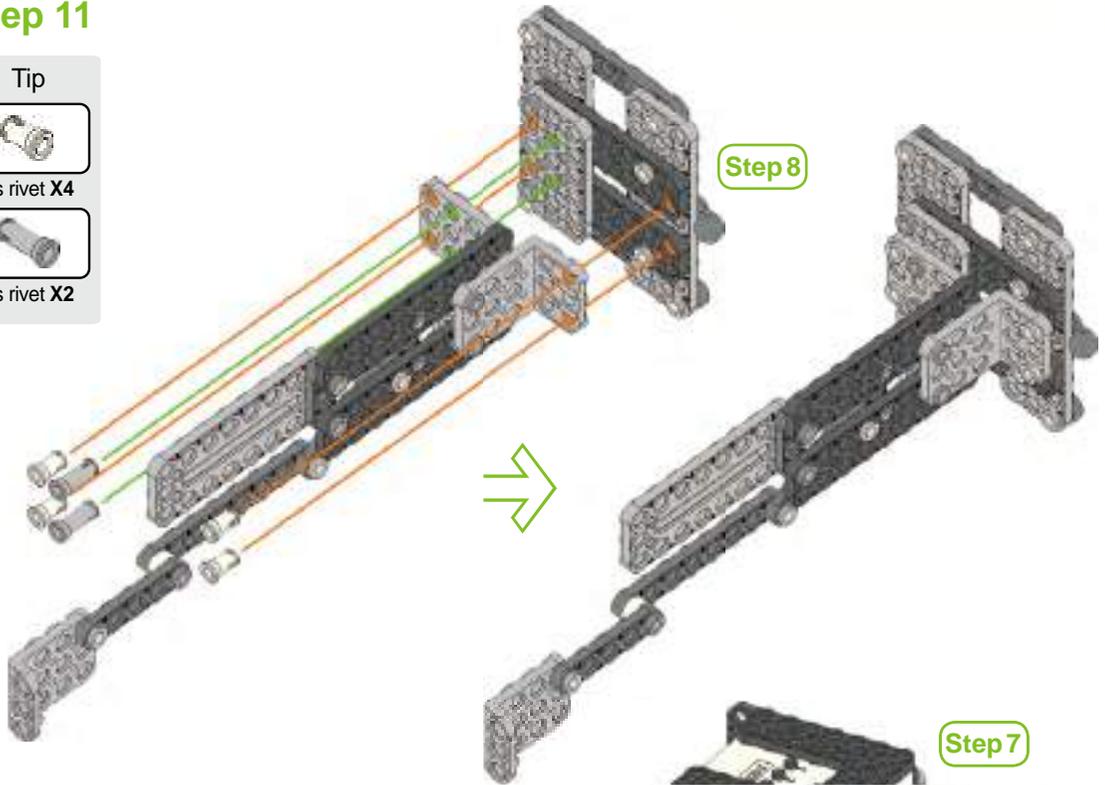
Tip



2s rivet X4



3s rivet X2



Step 12

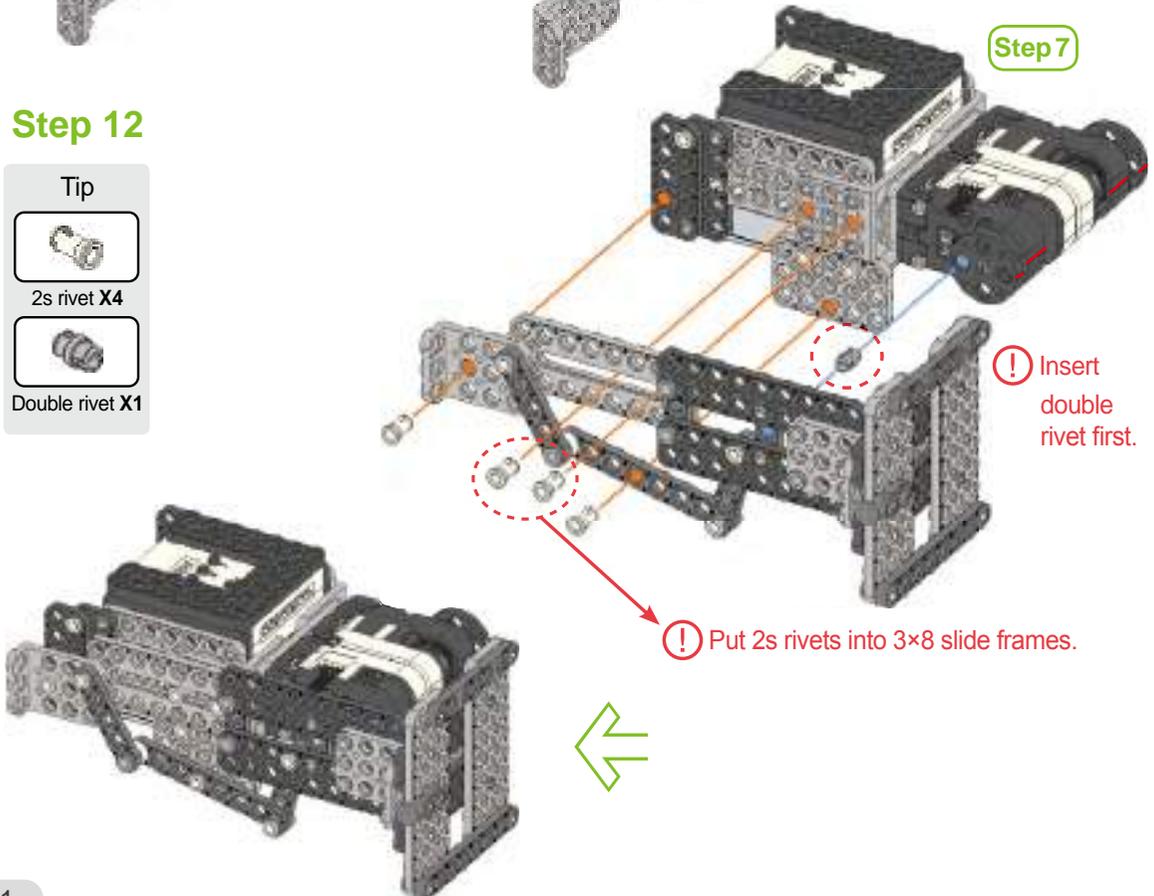
Tip



2s rivet X4



Double rivet X1



Step 13

Tip



1x7 frame X1



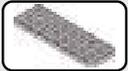
1x8 frame X1



2x7 frame X2



3x5 frame X1



3x9 frame X2



Ball frame X1



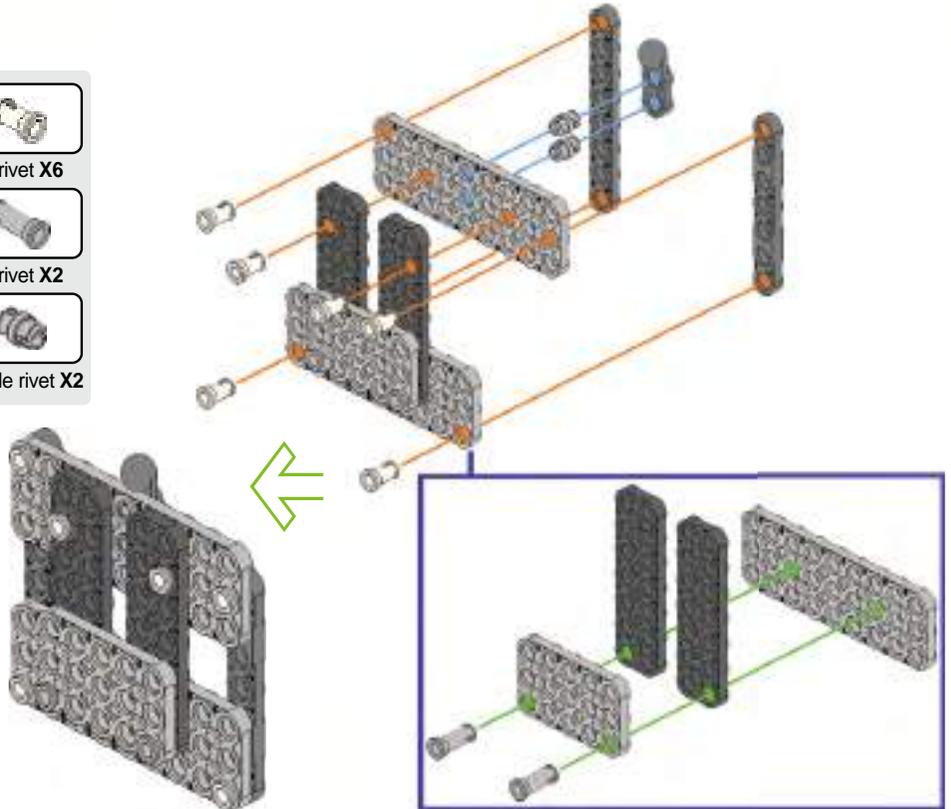
2s rivet X6



3s rivet X2



Double rivet X2



Step 14

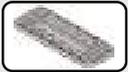
Tip



1x3 frame X2



2x9 frame X2



3x8 slide frame X1



3x5 L frame X1



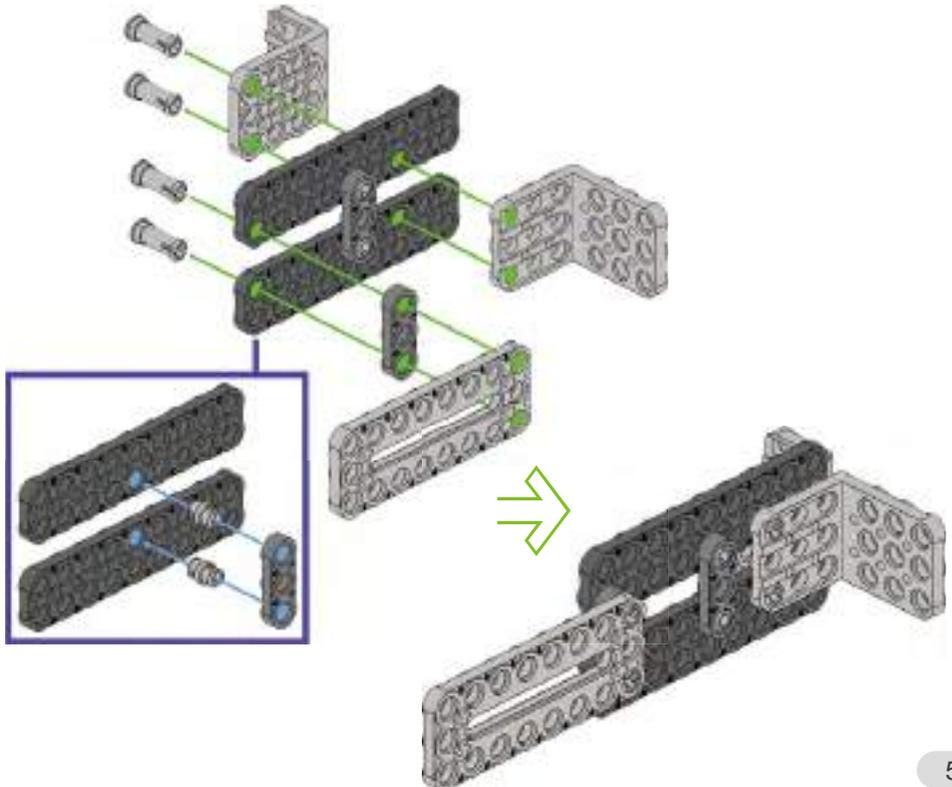
3x6 L frame X1



3s rivet X4

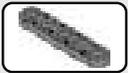


Double rivet X2



Step 15

Tip



1x5 frame X2



1x8 frame X1



3x4 L frame X1



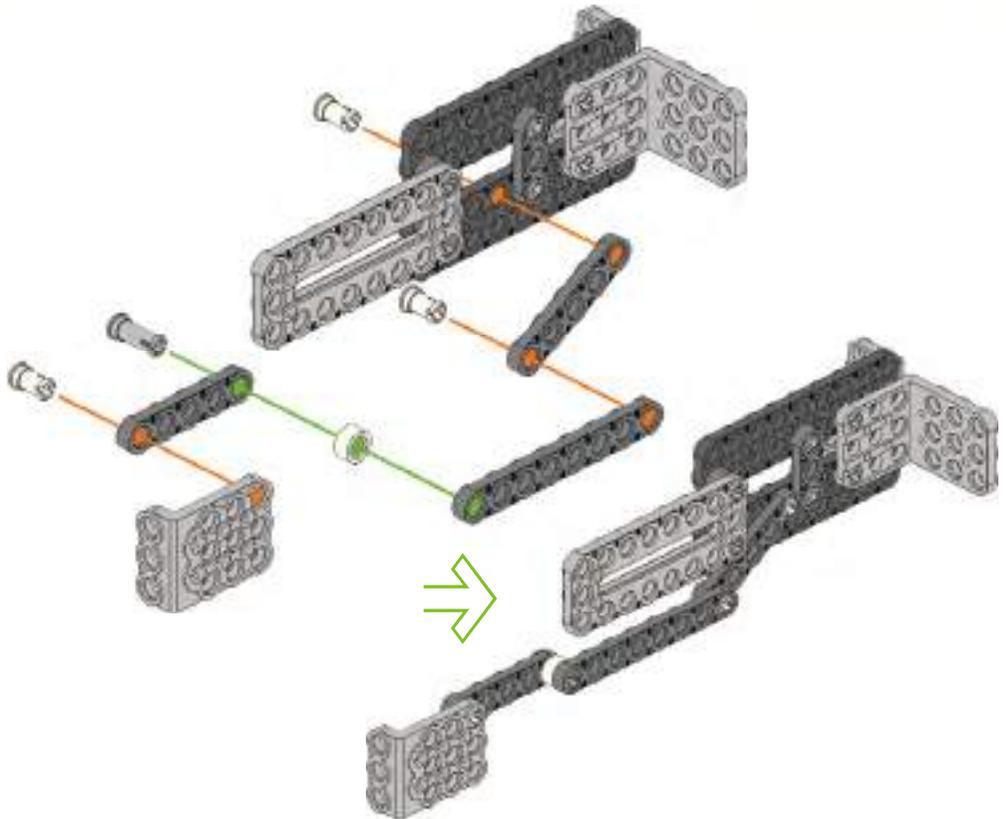
Spacer X1



2s rivet X3



3s rivet X1



Step 16

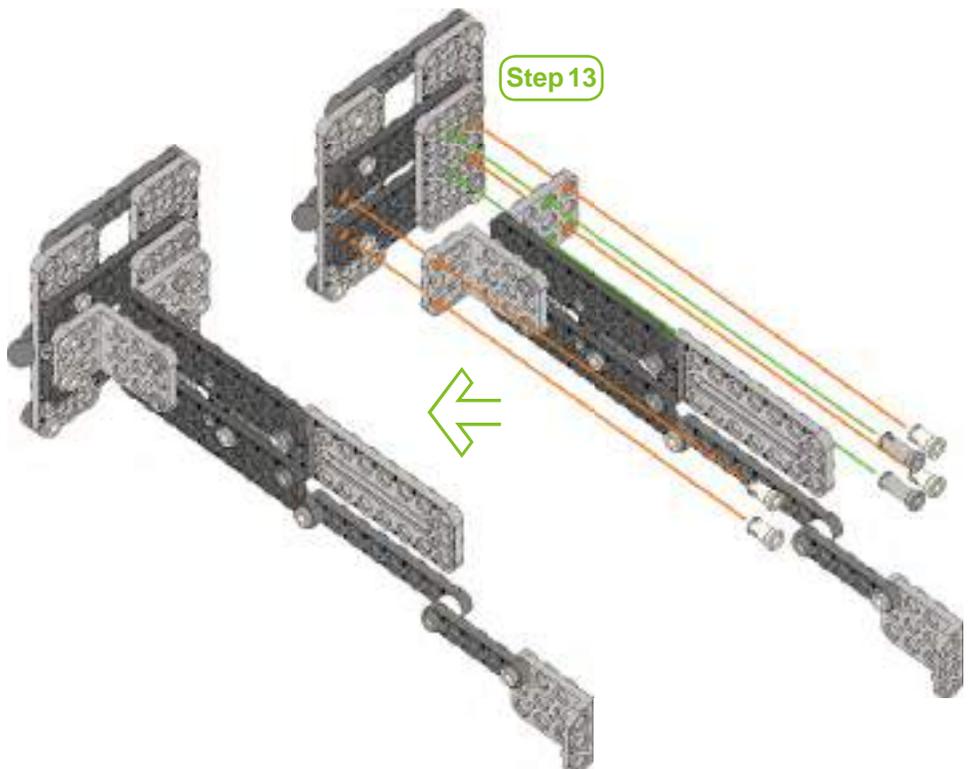
Tip



2s rivet X4



3s rivet X2



Step 17

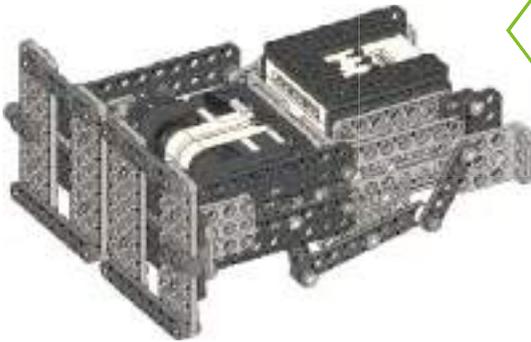
Tip



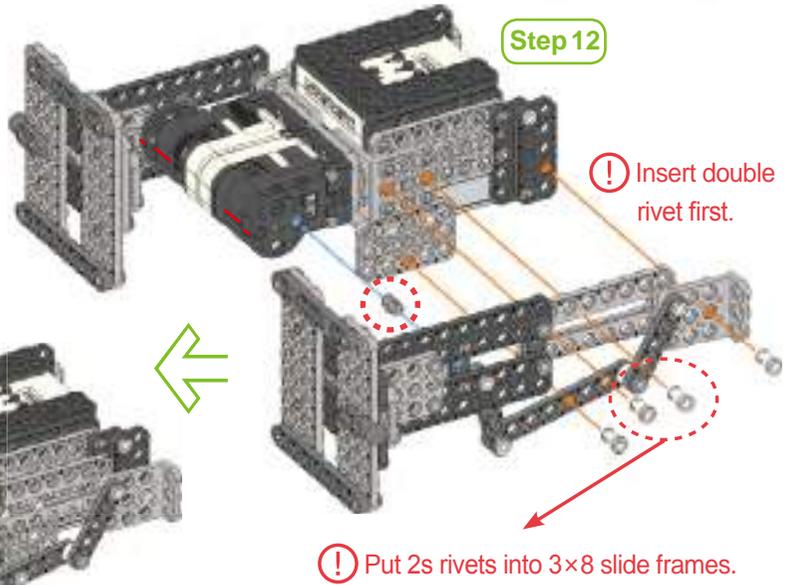
2s rivet X4



Double rivet X1



Step 12



Step 18

Tip



3x7 frame X1



3x9 frame X1



2x4 L frame X1



3x4 L frame X1



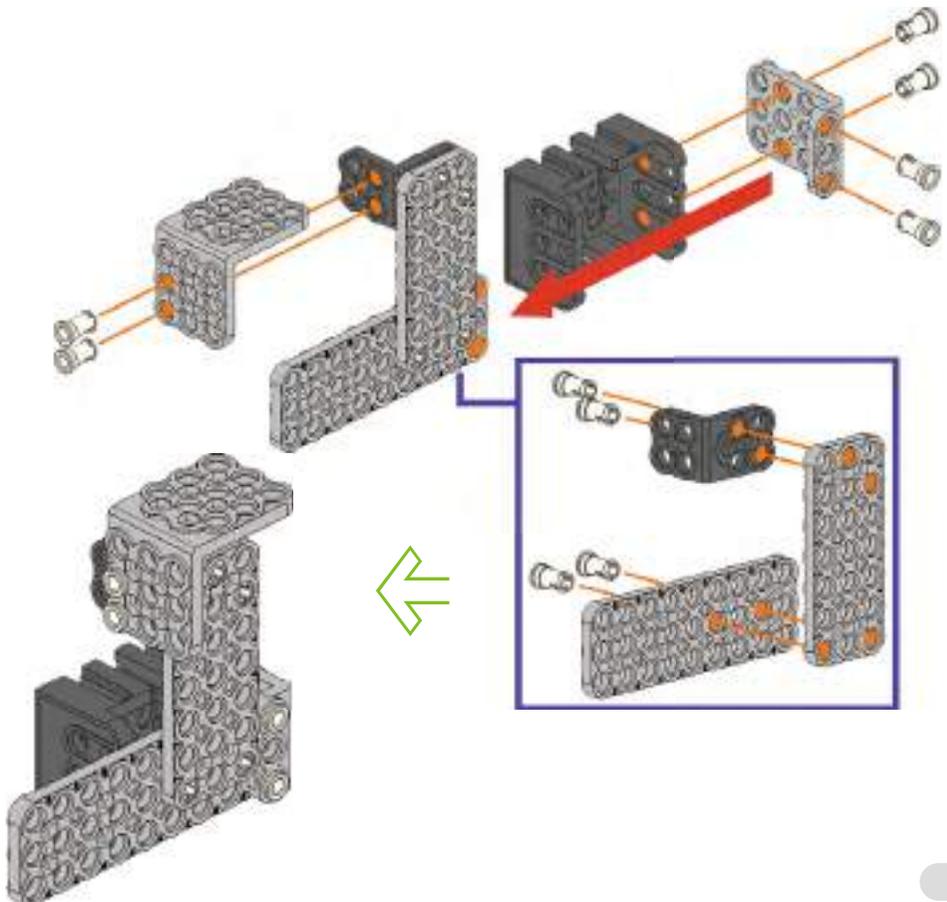
3x6 L frame X1



Big U frame X1



2s rivet X10



Step 21

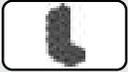
Tip



Right angle X1



2x4 L frame X1



2x5 L frame X1



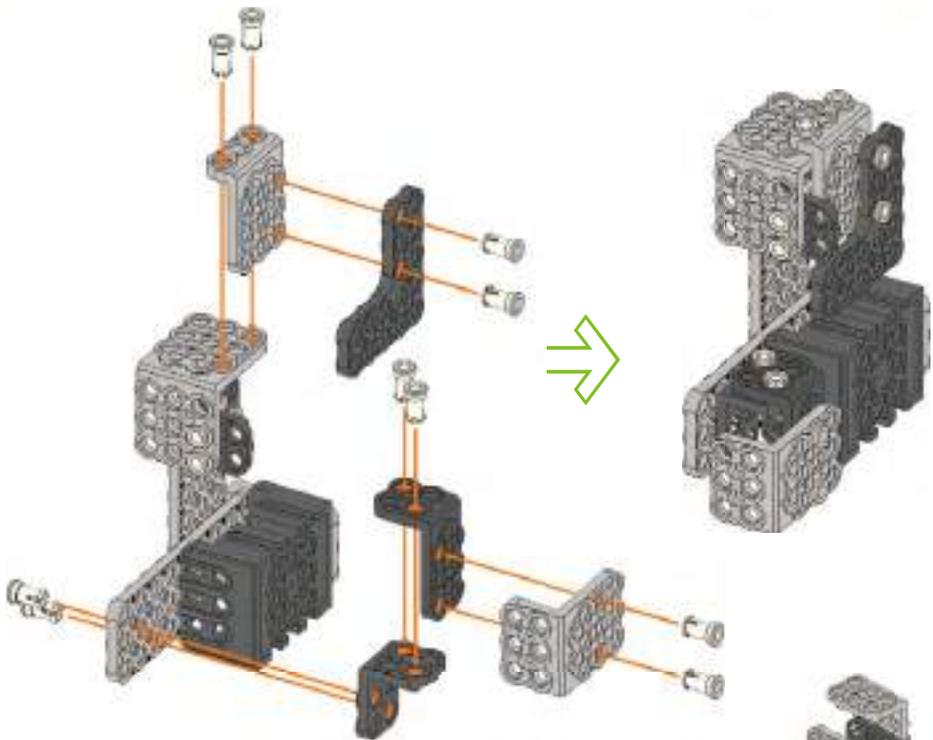
3x4 L frame X1



3x5 L frame X1



2s rivet X10



Step 17

Step 19

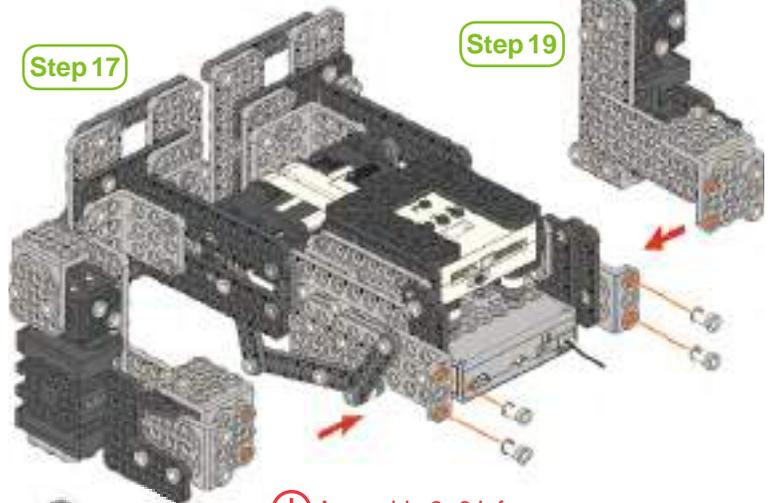
Step 22

Tip

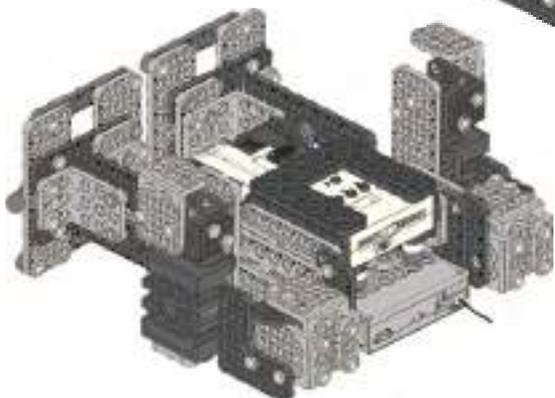


2s rivet X4

Step 21



⚠ Assemble 3x6 L frame goes down and 3x4 L frame goes up.



Step 23

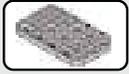
Tip



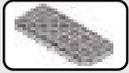
LED X1



Touch sensor X1



3x5 frame X1



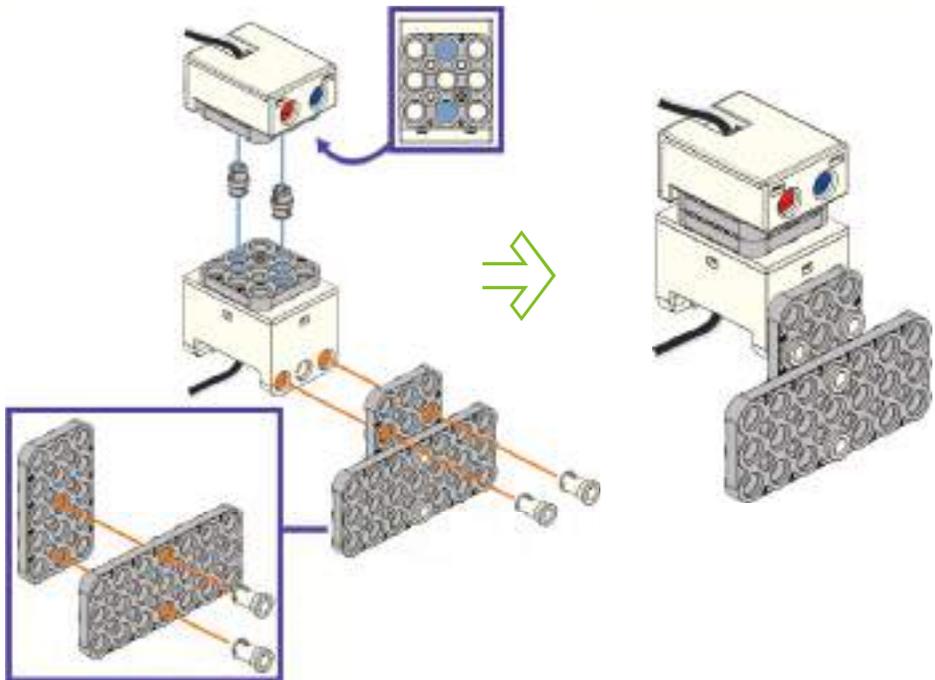
3x7 frame X1



2S rivet X4

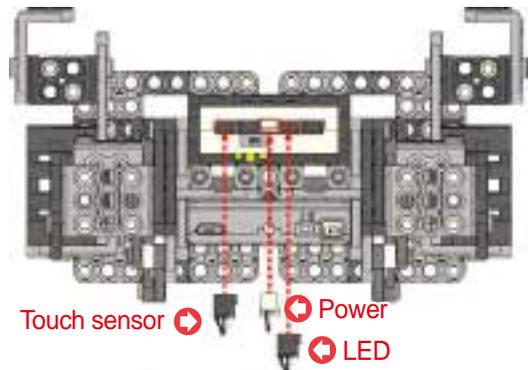
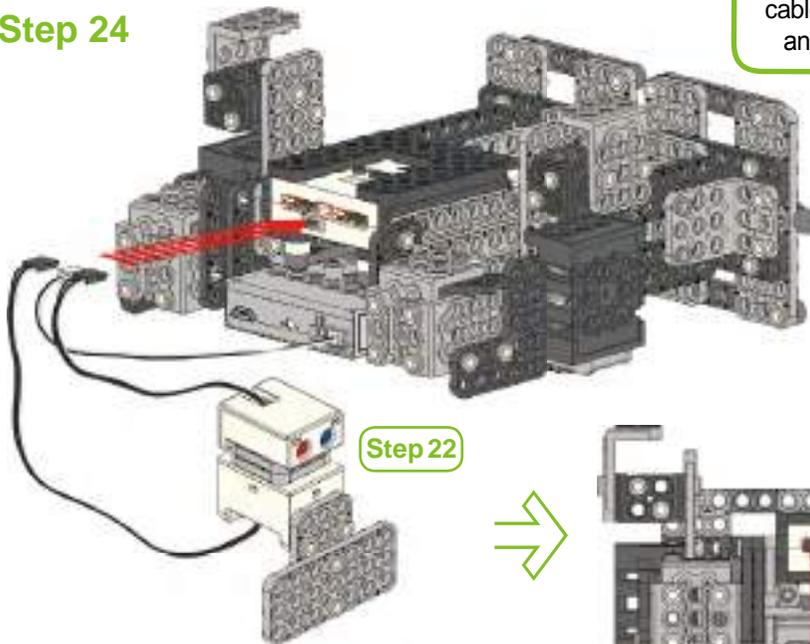


Double rivet X2



Step 24

Pay attention to the cable connection and direction!



Touch sensor →

→ Power

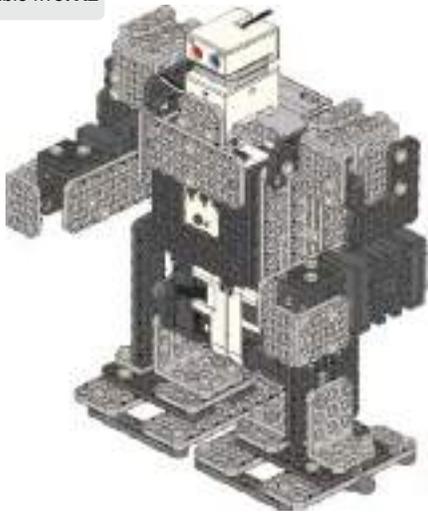
← LED

Step 25

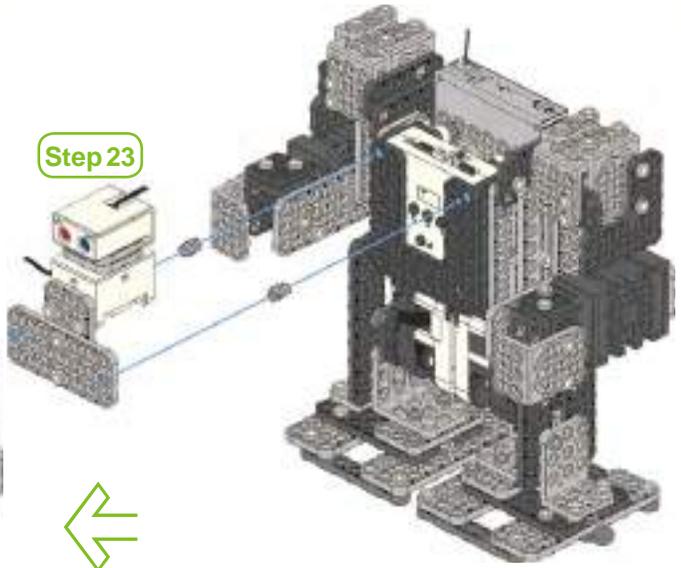
Tip



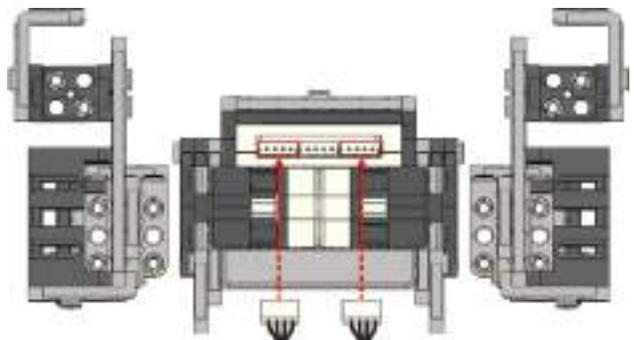
Double rivet X2



Step 23



Step 26

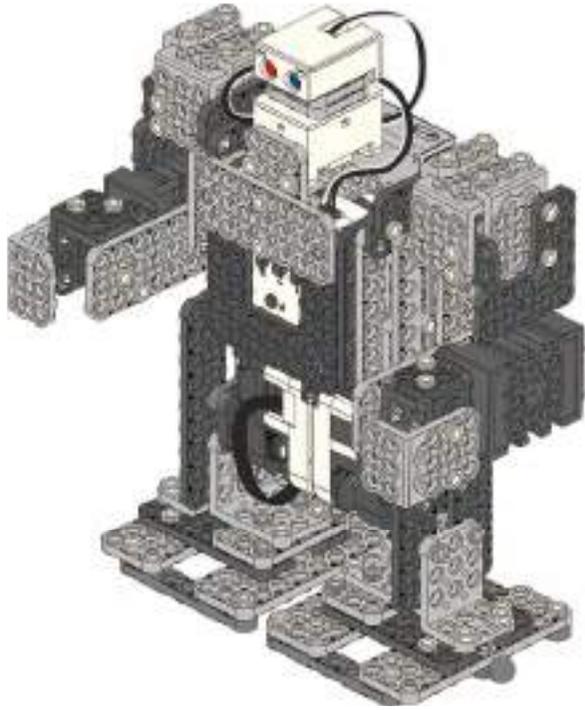


Smart servo (ID01) ⬆

⬆ Smart servo (ID00)

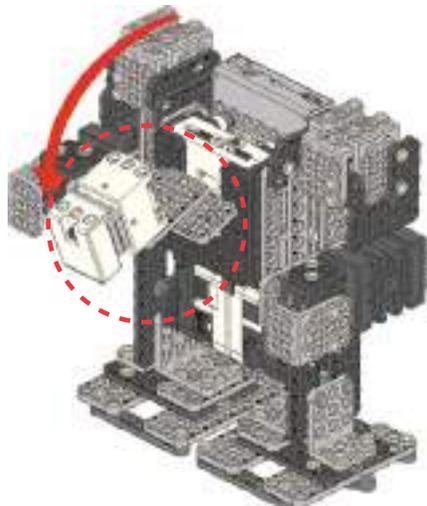


★ 'Walking Bot' is ready! ★



Tip

Separate the head-chest part to turn on/off the power SW.



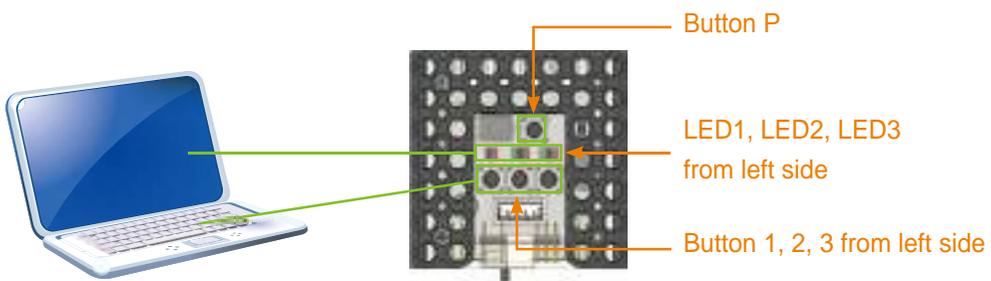


Robot Experience



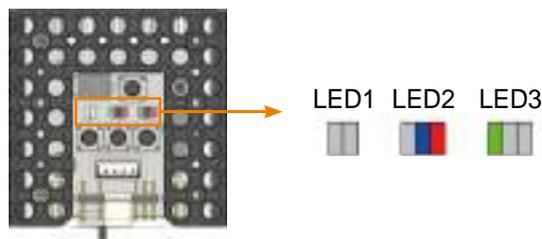
Set-up 'Walking Bot' robot model.

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons work as the keyboard for PC.



First : Turn on the smart controller to enter <set-up mode>.

Second : Press button 2 or button 3 on smart controller to set-up 'Walking Bot' robot model. The buttons work as a keyboard for PC. Program the robot for proper operation.



Third : Press button P on smart controller to enter <standby mode>.

Check the following when the robot is not working properly and reassemble.

1. When Walking Bot is not moving :
 - ▶ Check power connection and Walking Bot robot model set-up.
2. When Walking Bot's walking motion is abnormal :
 - ▶ See the assembly guide again to check smart servo ID and 3x8 slide frame.
 - ▶ Check connection for electronics parts with the smart controller.



Check movement and assembly.

1. Read the below, and circle the correct answer.

'A' button : Walking Bot takes the ( , ) motion,
 Basic Posture Walking Posture

'B' button : Walking Bot takes the ( , ) motion.
 Basic Posture Walking Posture

2. For running below motions, which button of IR remote controller should you press?

 Robot moves forward.
 1 button

(a)  Robot moves left leg and then right leg like dancing.
 (_____ button)

(b)  If touch sensor is detected, it move forward.
 (# + _____ button)

(c)  If touch sensor is detected, dance tricks with melody.
 (# + _____ button)

Robot Play



Hide-and seek

Play hide-and-seek with your Walking Bot robot. In this game, one player is 'it' running after the other player.

- Decide who is going to be 'it'.
- Have the 'it' go after other Walking Bot.
- Whoever is tagged or gets out of game panel, that robot is out for the game.
- Whoever tags the other player more within 3 minutes wins the game.



◆ Describe your 'Walking Bot' robot.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



4. Sidecar

Smart servo (servo motor)

①

vroom, vroom~
Step aside!
Sidecar is coming.

Huh? How does can it turn left and right with just one rotation motor?

②

Thanks to the smart servo in the handlebar!

Rotation motor
Smart servo

Sidecar is motorcycle robot that uses both rotation motor and smart servo!

③

Aren't both just motors?

Not close!
Smart servo has much more functions.

④

Rotation motor rotates itself and is used as a wheel or to rotate a fan.

Smart servo can turn and even rotate by different size of angles like 10° , 20° and 30° .

⑤

So it can be used in sidecar handlebar, walking robot, bird's wing or catapult.

Besides, smart servo has a LED inside so it can blink and move at the same time!

⑥

Wow, smart servo is all-powerful like me! Tell me more about its functions!

Before that, let's play a race game with our sidecar! I have been waiting long time for this.



Today's Robot Class



Smart servos and rotation motors are used together in the Sidecar robot. Rotation motors are used for rotating wheels while smart servos are used to control directions. You can easily notice the difference between smart servo and rotation motor. Rotation motor is used as a wheel and smart servo is used to switch the position angles by 10° , 20° and 30° so you can move the Sidecar to desired direction.



I am a Sidecar!
I can load human
or a luggage.



Side car is attached beside a motorcycle. Motorcycle is practical and usable transportation, but you can not load big luggage or people. And that's when side car comes into play.

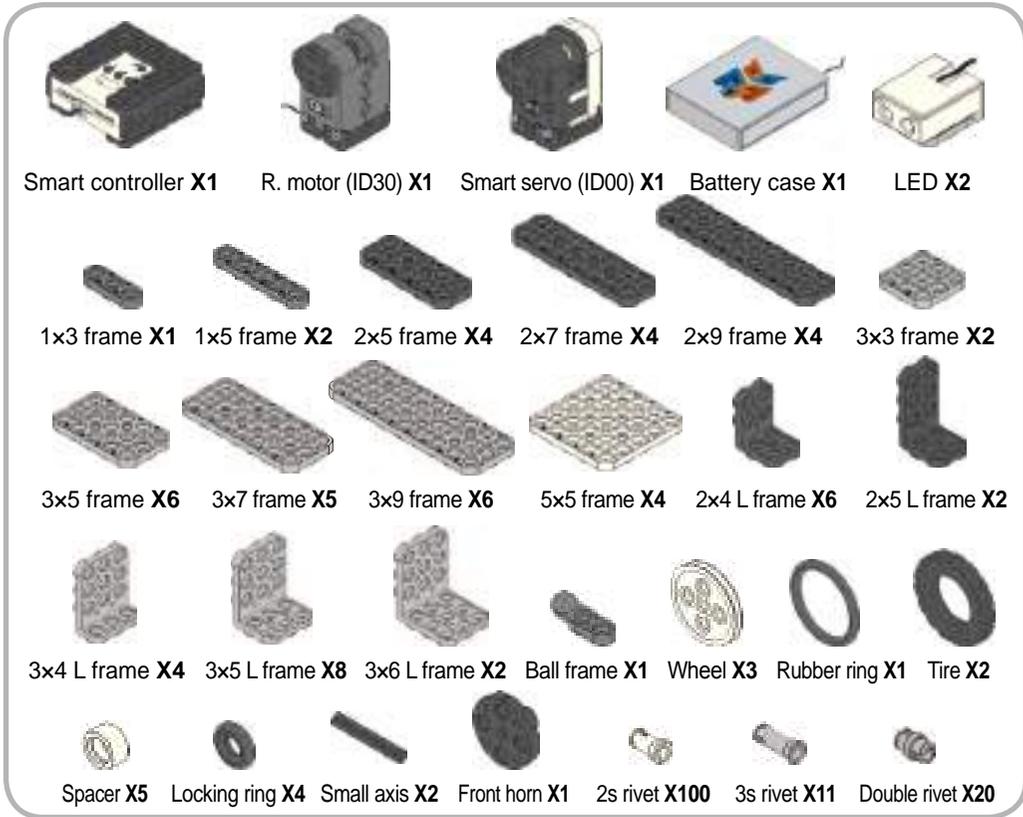




Robot Assembly



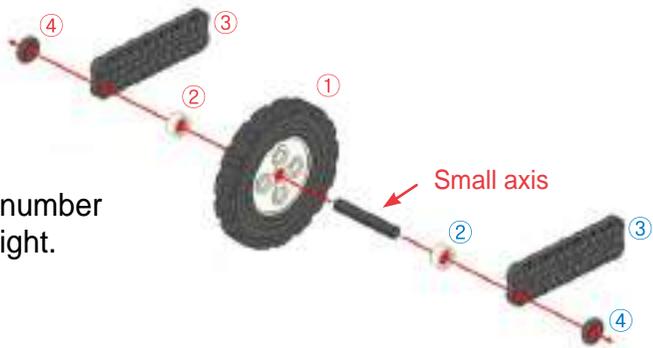
Prepare robot parts.



Tips.

Use small axis part in STEP3 and STEP7.

Assemble the parts in order of number as shown in the image on the right.



Step 1

Tip



Smart servo (ID00) X1



1x5 frame X1



3x5 frame X1



3x4 L frame X2



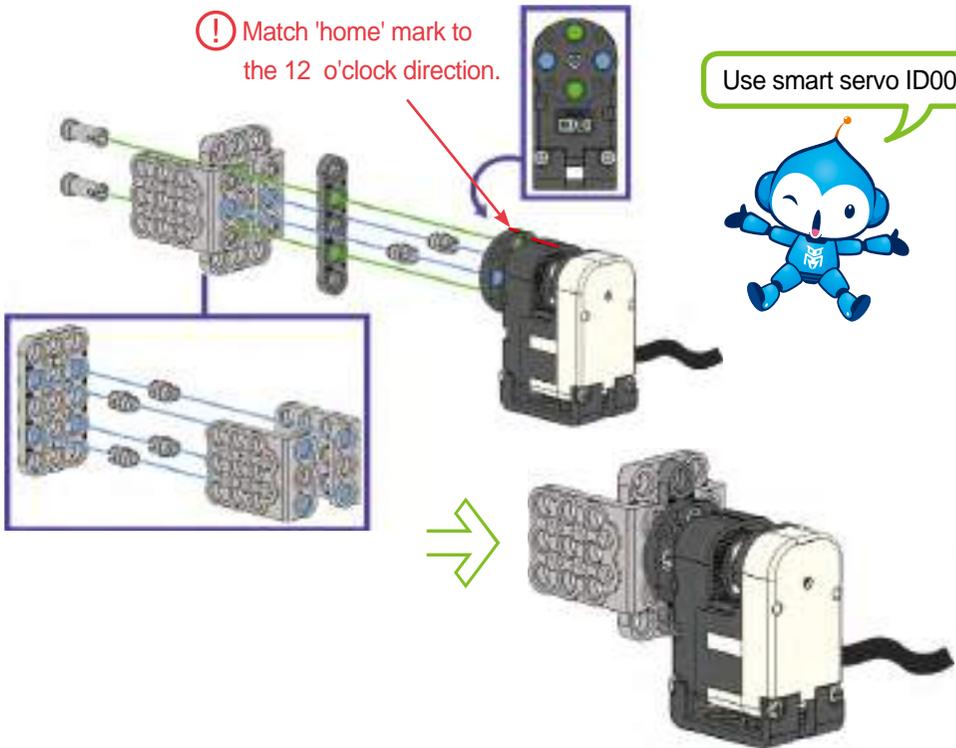
3s rivet X2



Double rivet X6

⚠ Match 'home' mark to the 12 o'clock direction.

Use smart servo ID00.



Step 2

Tip



2x5 frame X4



2x9 frame X2



2x5 L frame X2



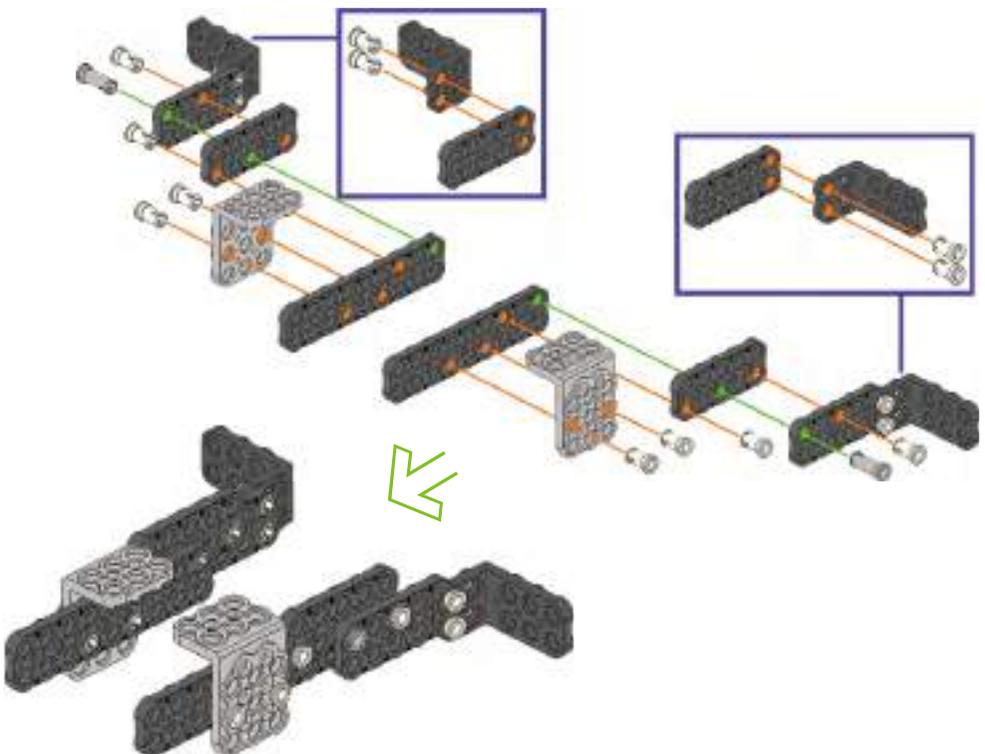
3x5 L frame X2



2s rivet X12

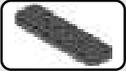


3s rivet X2



Step 3

Tip



2x7 frame X2



Wheel X1



Tire X1



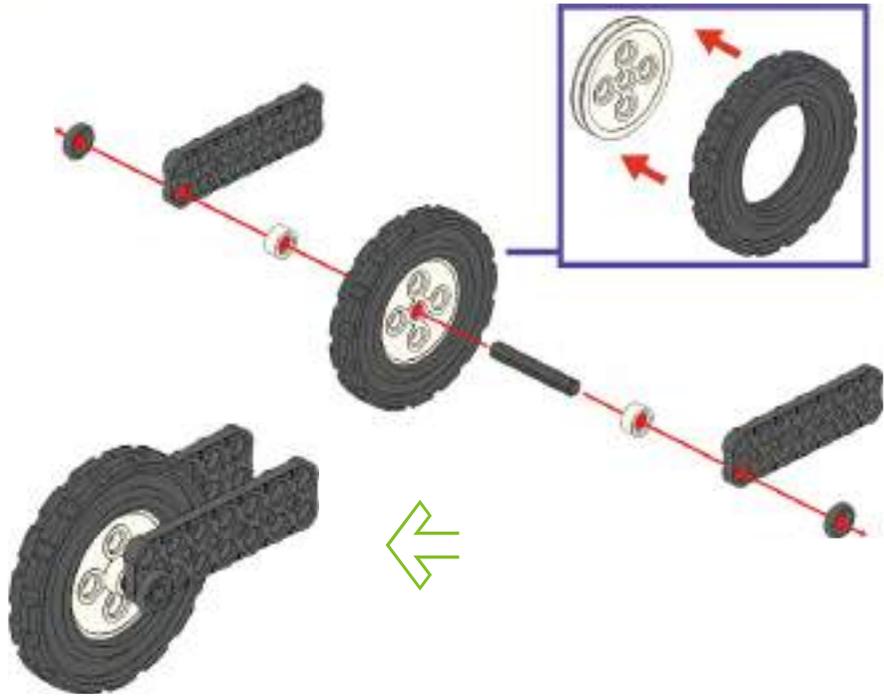
Spacer X2



Locking ring X2



Small axis X1

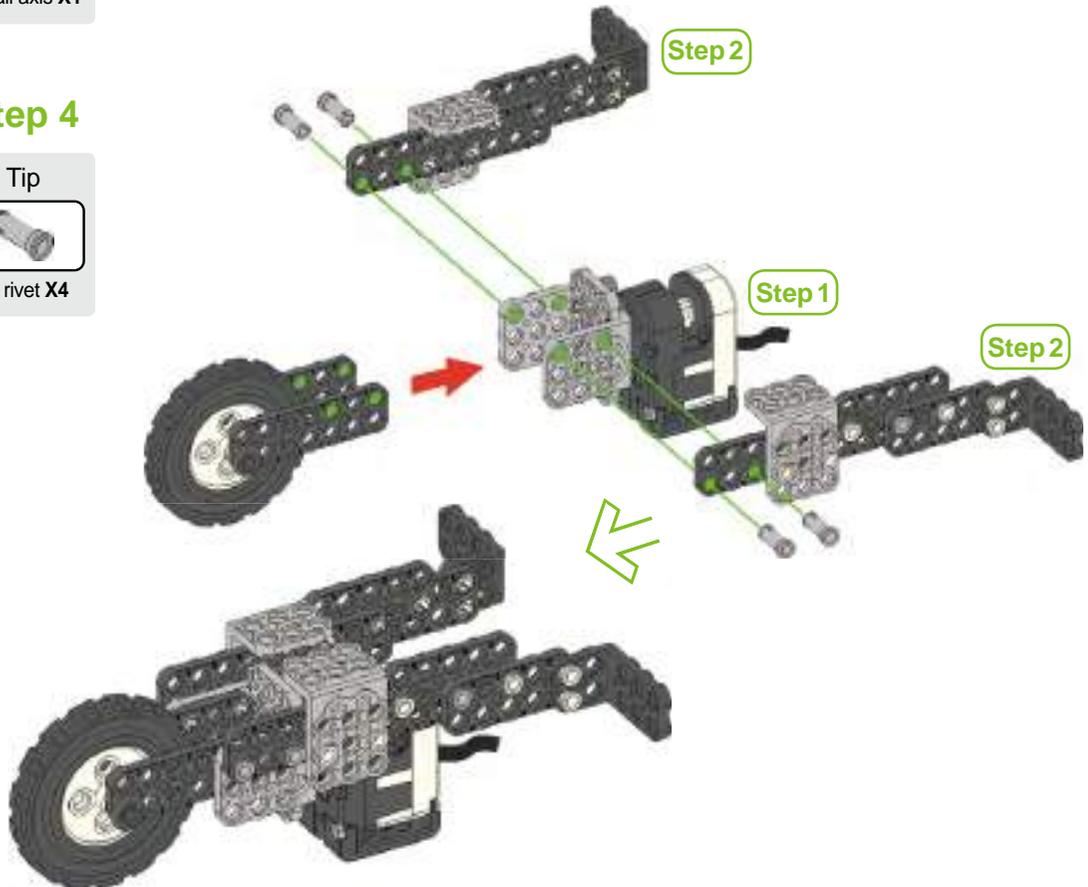


Step 4

Tip



3s rivet X4



Step 5

Tip



3x5 frame X1



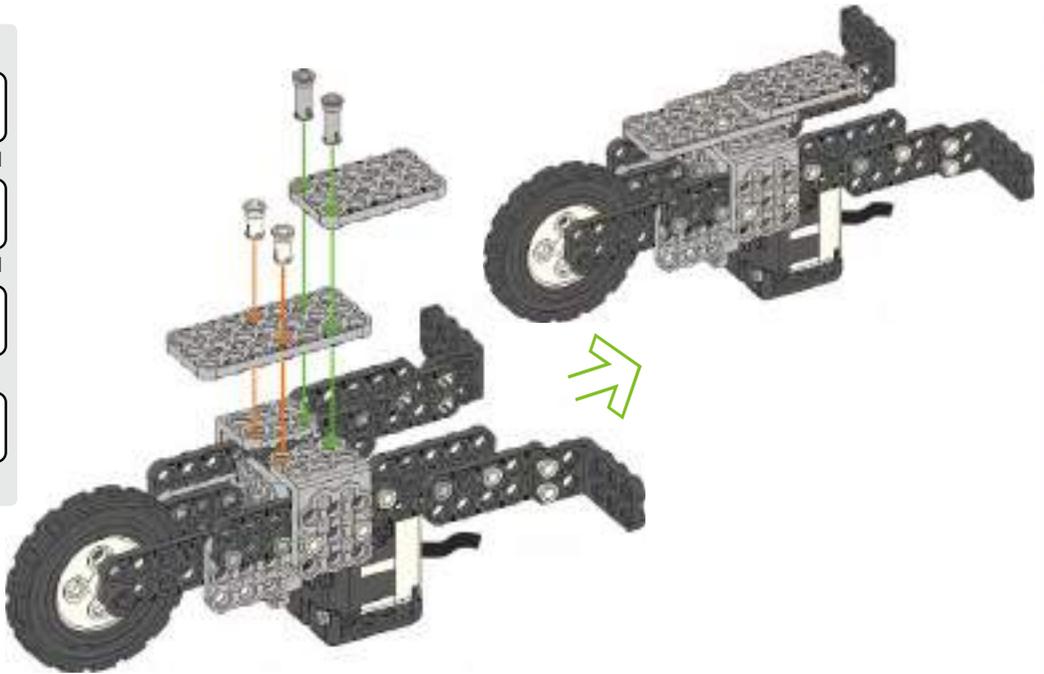
3x7 frame X1



2s rivet X2



3s rivet X2



Step 6

Tip



2x7 frame X2



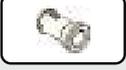
3x5 frame X2



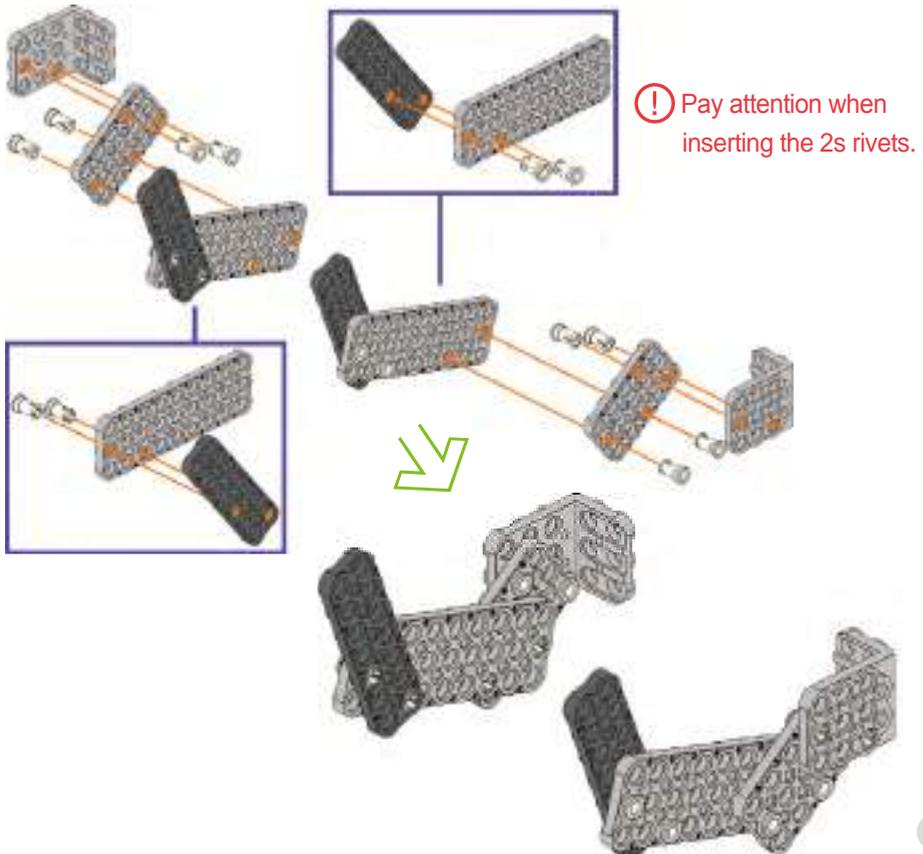
3x9 frame X2



3x5 L frame X2



2s rivet X12



Step 7

Tip



Ball frame X1



Wheel X1



Tire X1



Spacer X2



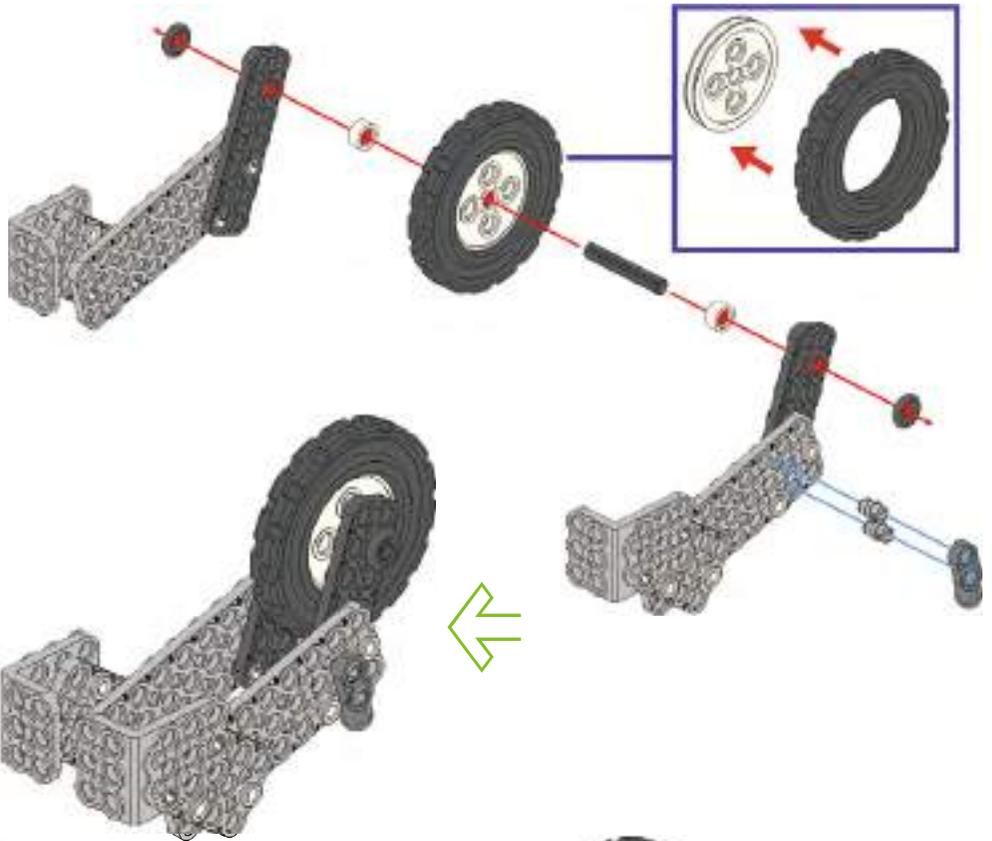
Locking ring X2



Small axis X1



Double rivet X2



Step 8

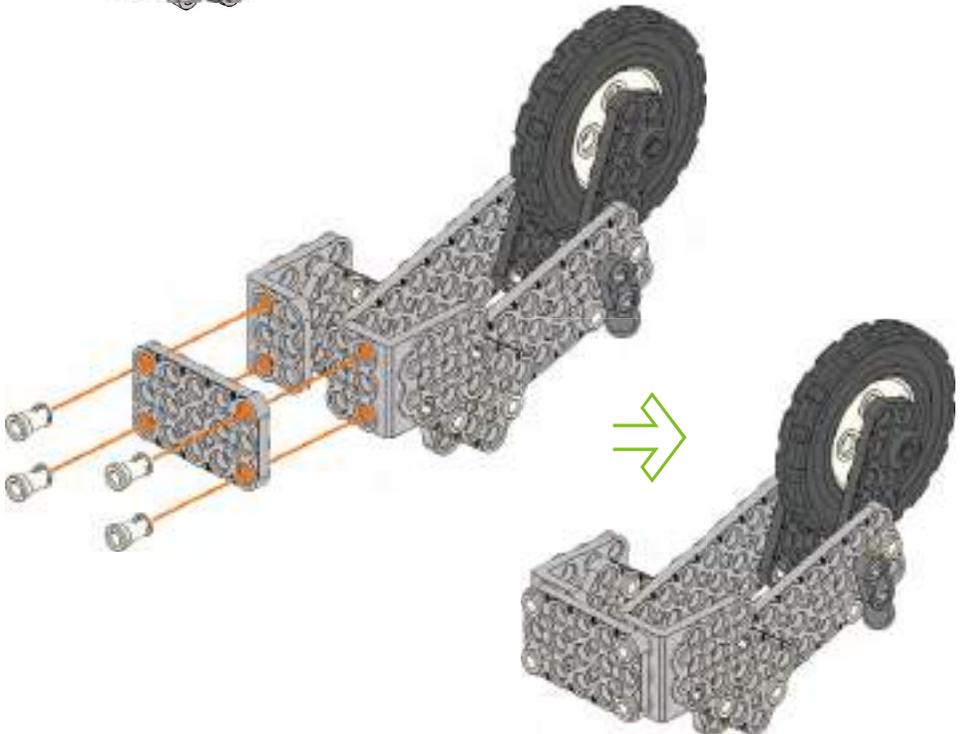
Tip



3x5 frame X1



2s rivet X4

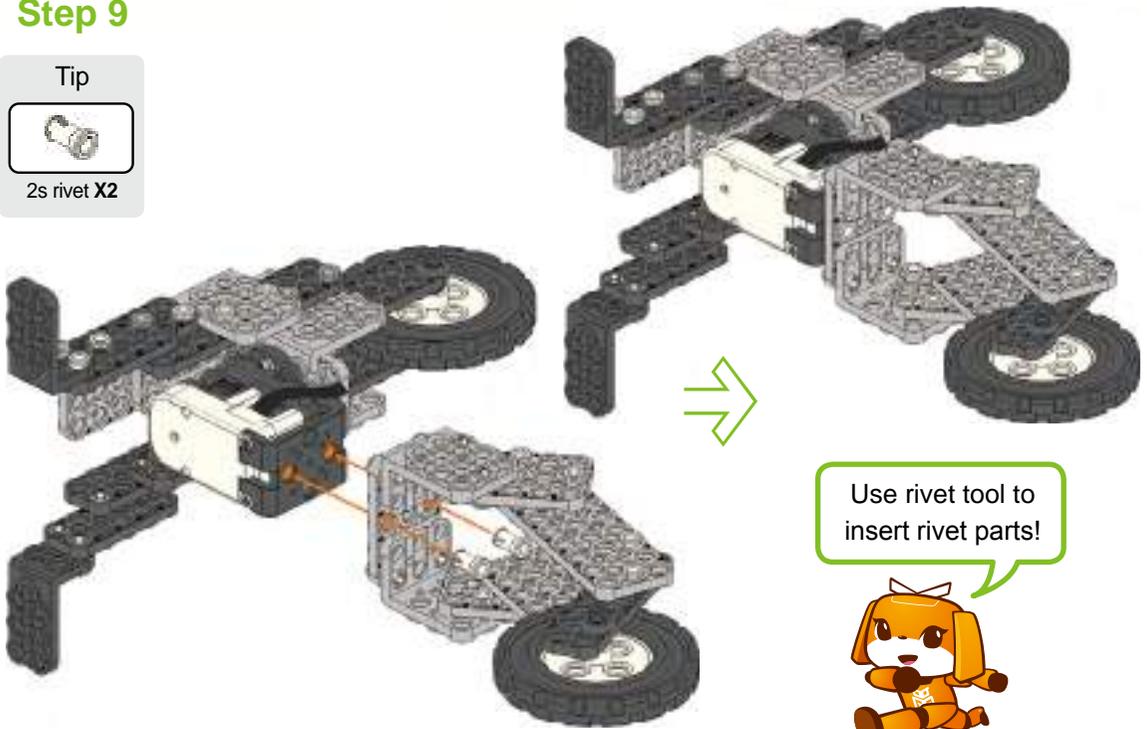


Step 9

Tip



2s rivet X2



Step 10

Tip



3x3 frame X2



3x5 frame X1



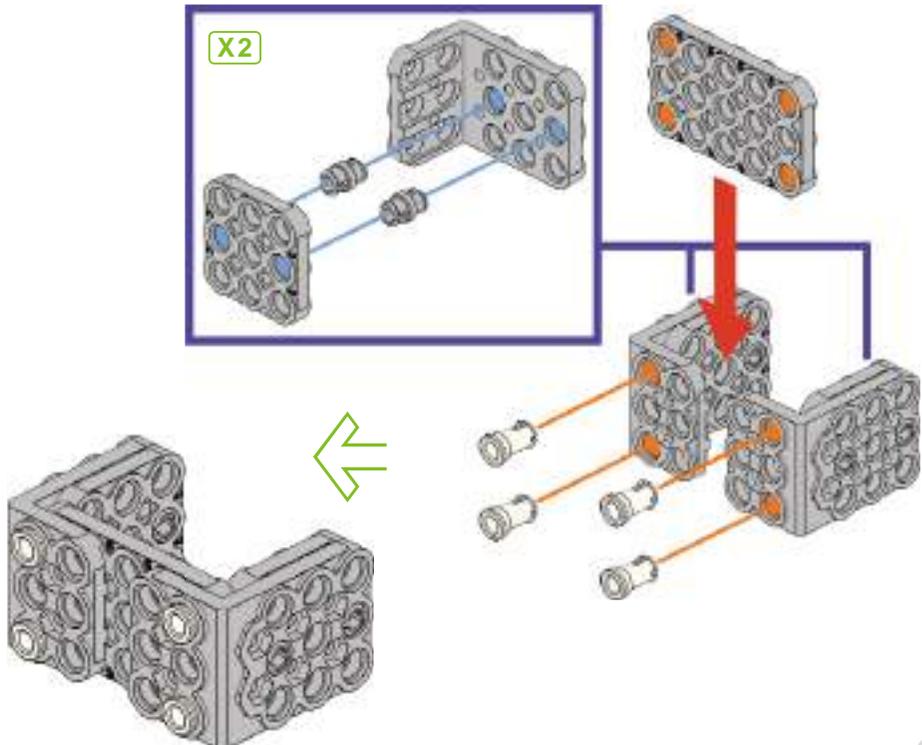
3x5 L frame X2



2s rivet X4



Double rivet X4



Step 11

Tip



R. motor (ID30) X2



2x9 frame X1



3x9 frame X1

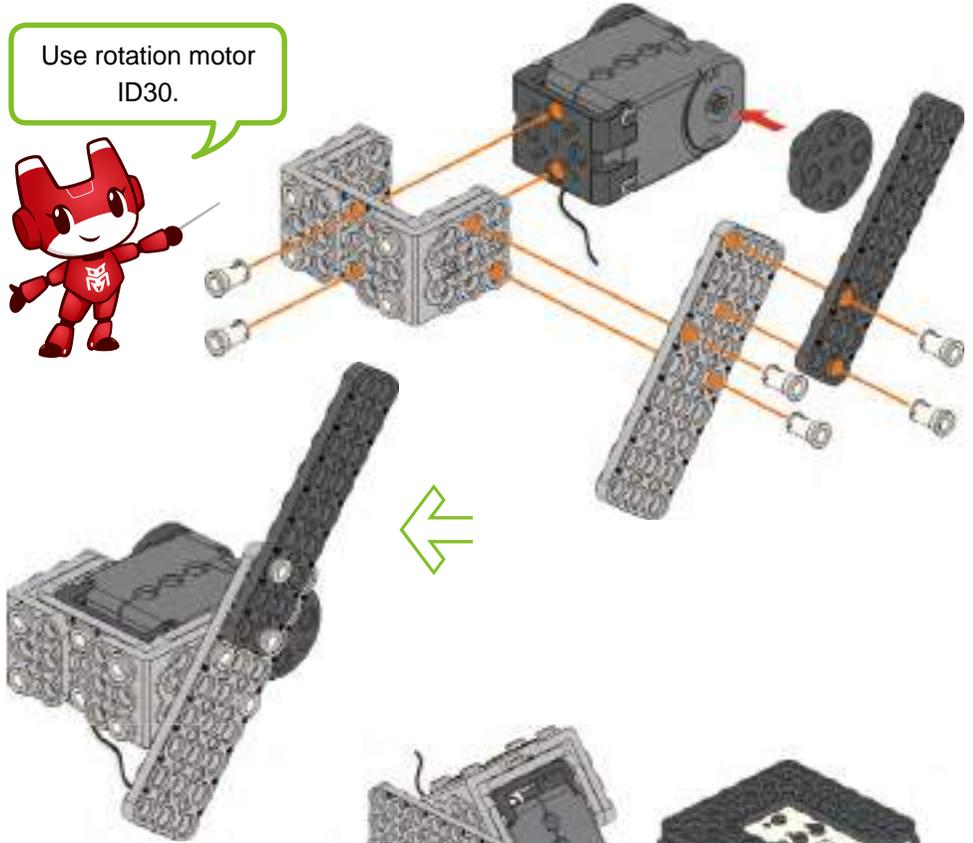


Front horn X1



2s rivet X6

Use rotation motor ID30.



Step 12

Tip



Smart controller X1



LED X2



1x3 frame X1



1x5 frame X1



Spacer X1



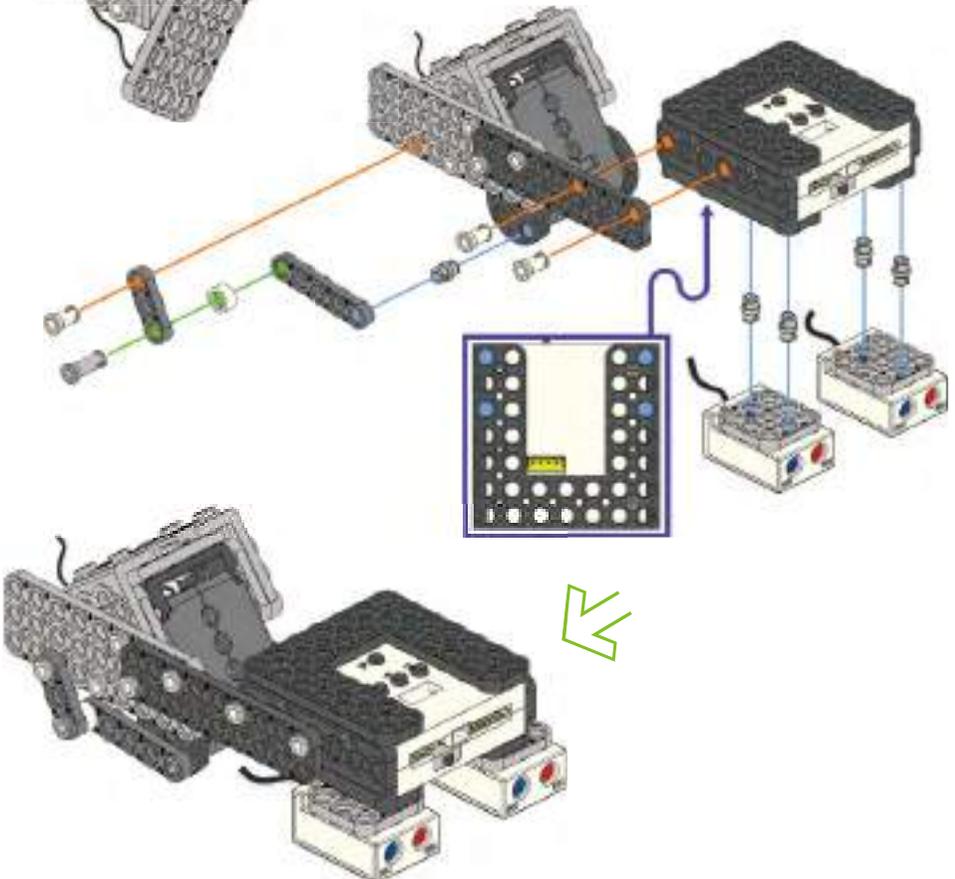
2s rivet X3



3s rivet X1



Double rivet X5



Step 13

Tip



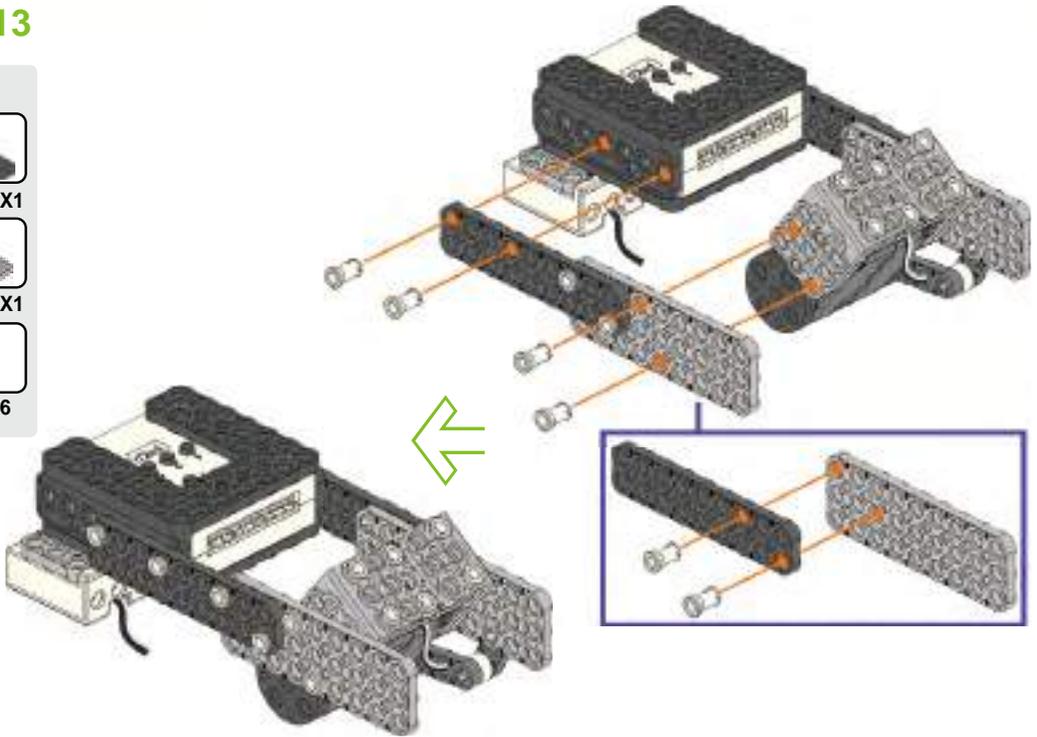
2x9 frame X1



3x9 frame X1



2s rivet X6

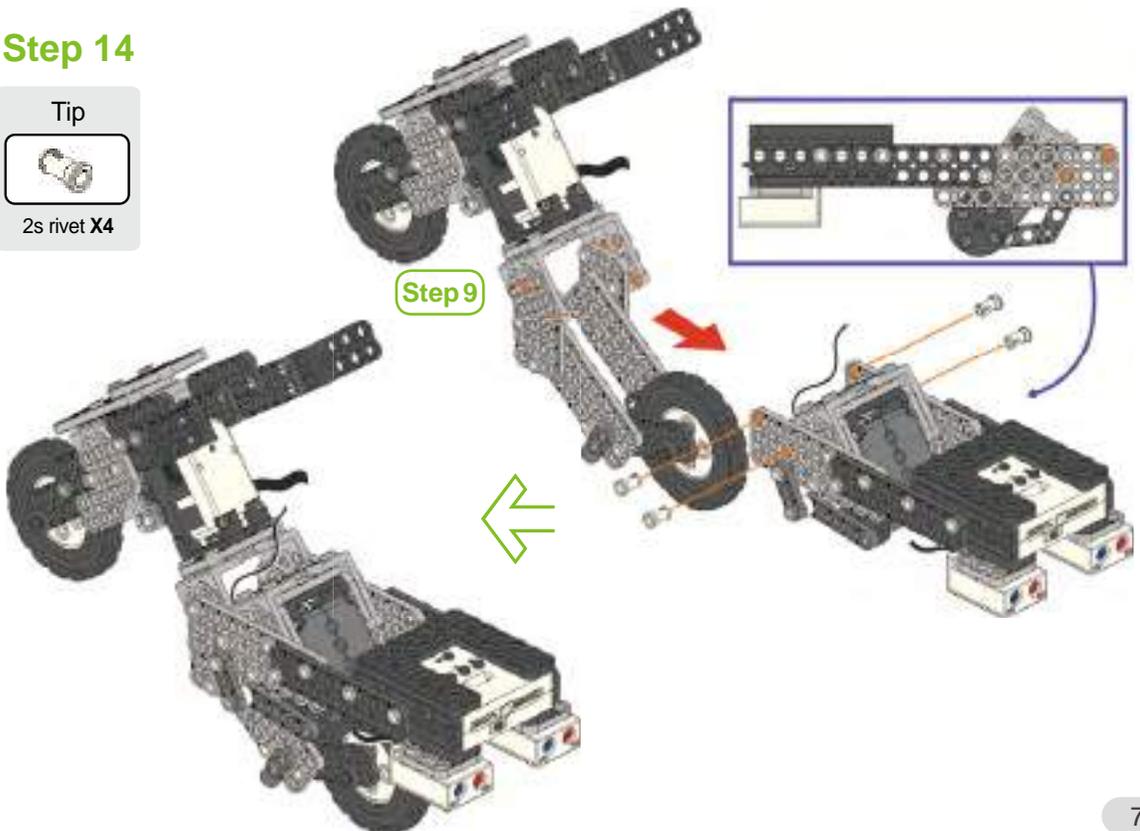


Step 14

Tip



2s rivet X4



Step 15

Tip



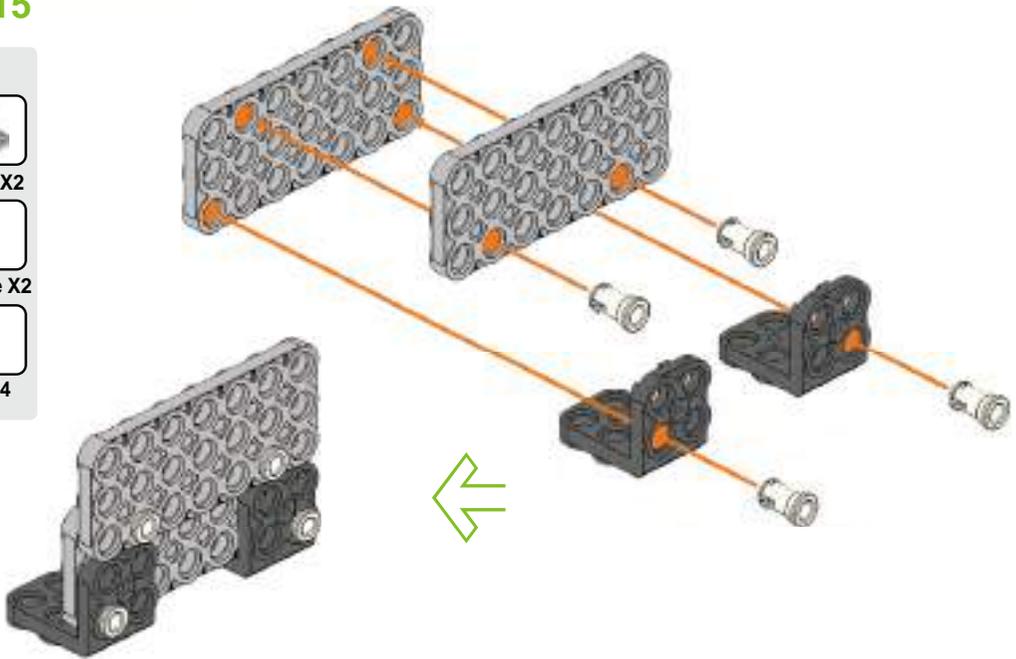
3x7 frame X2



2x4 L frame X2



2s rivet X4



Step 16

Tip



3x7 frame X1



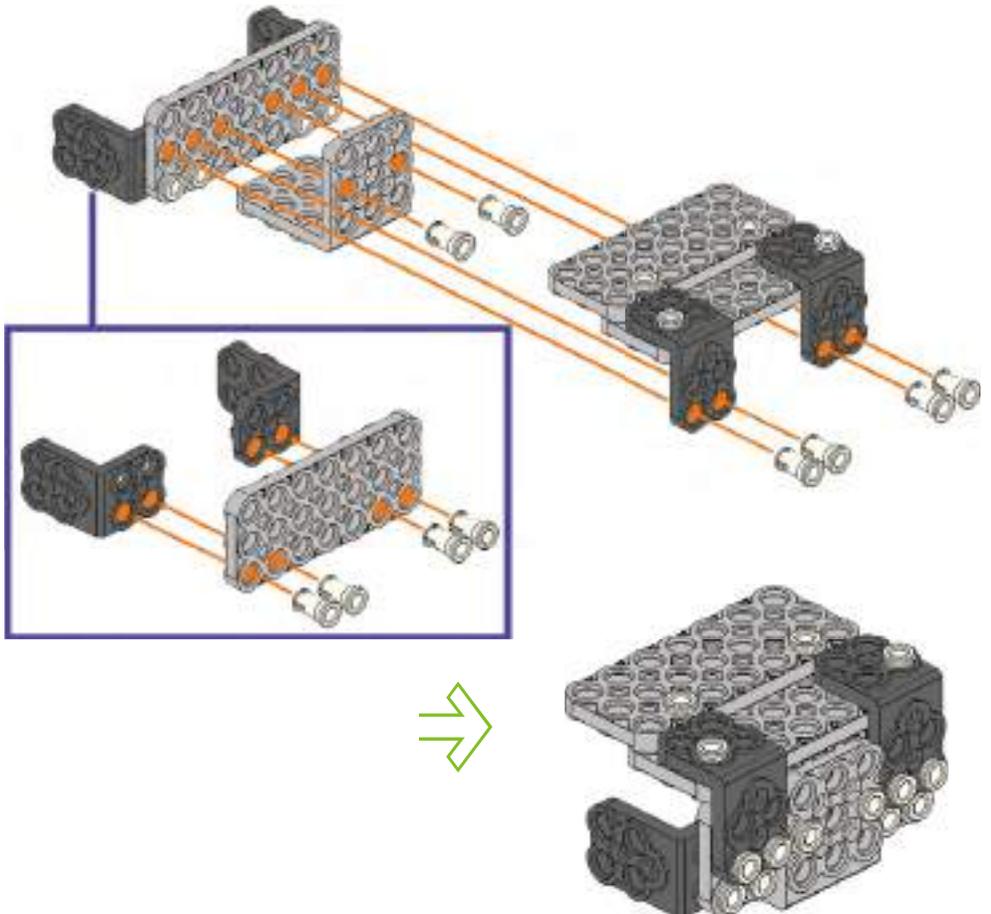
2x4 L frame X2



3x6 L frame X1



2s rivet X10



Step 17

Tip



Battery case X1



3x7 frame X1



2x4 L frame X2



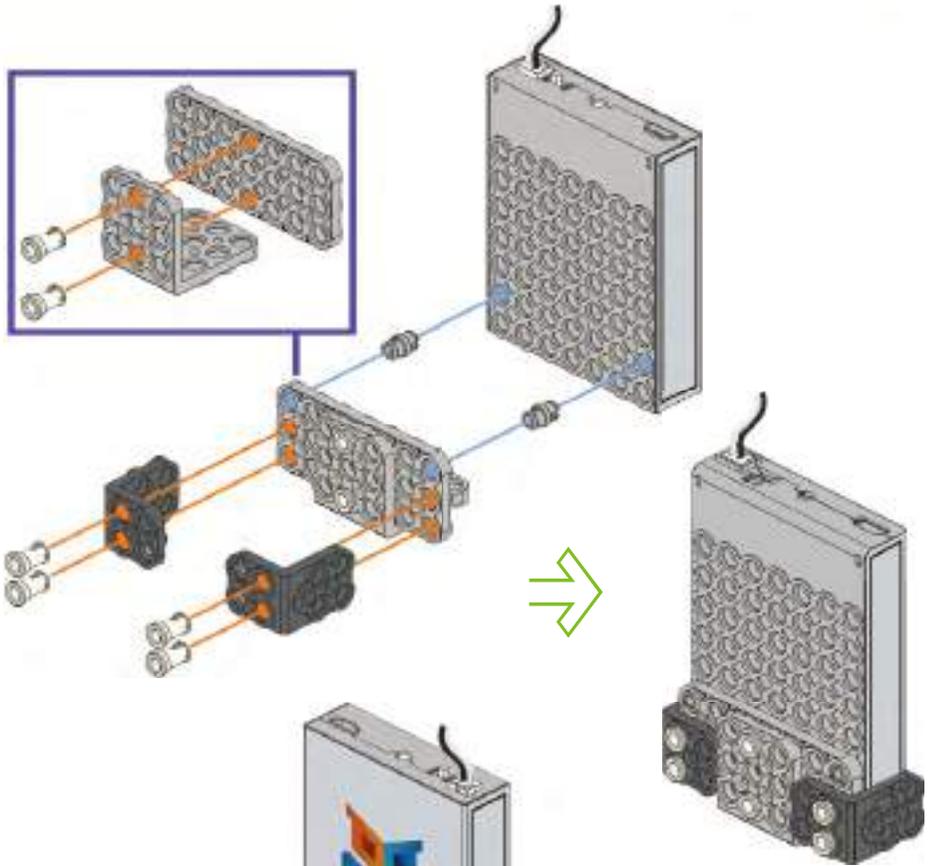
3x6 L frame X1



2s rivet X6

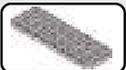


Double rivet X2



Step 18

Tip



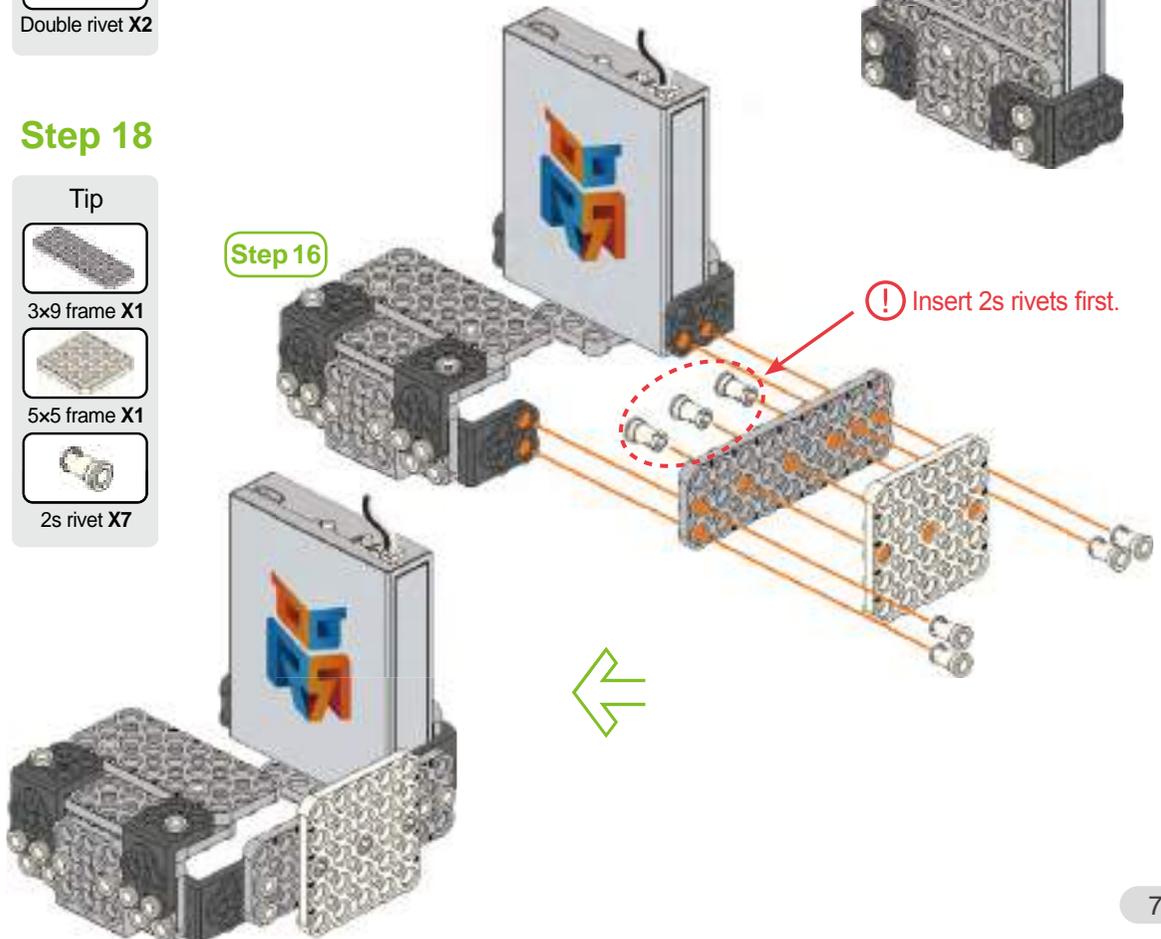
3x9 frame X1



5x5 frame X1

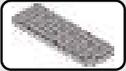


2s rivet X7



Step 19

Tip



3x9 frame X1



3x4 L frame X1



Wheel X1



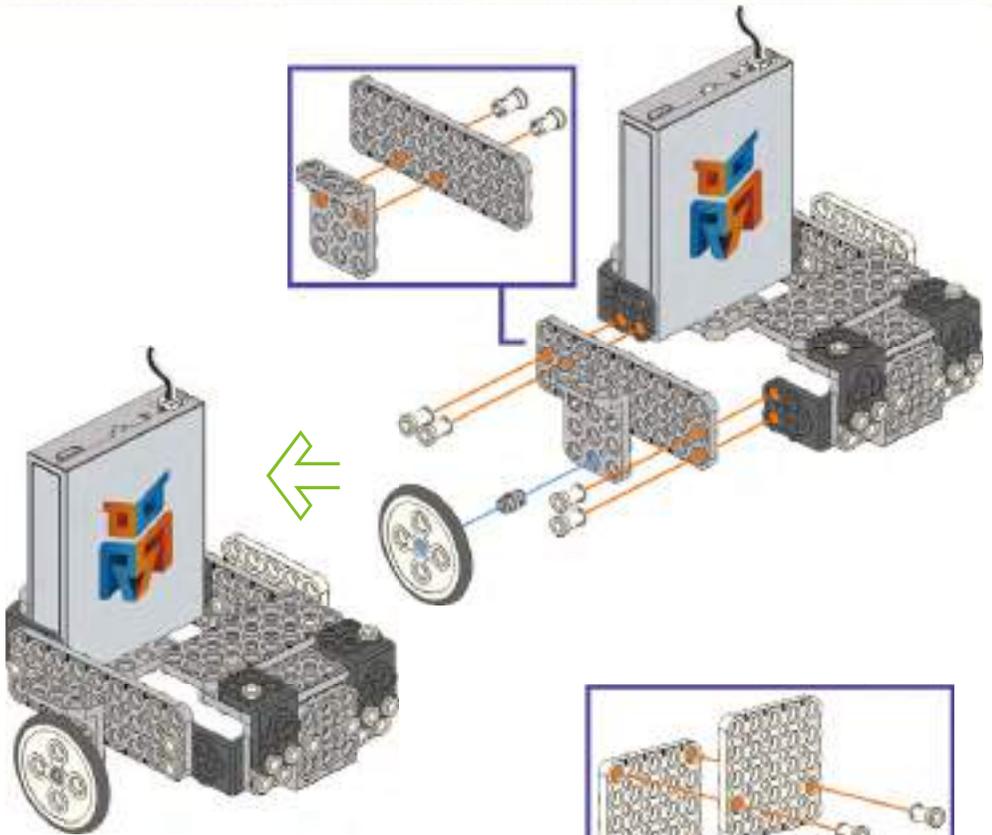
Rubber ring X1



2s rivet X6



Double rivet X1



Step 20

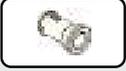
Tip



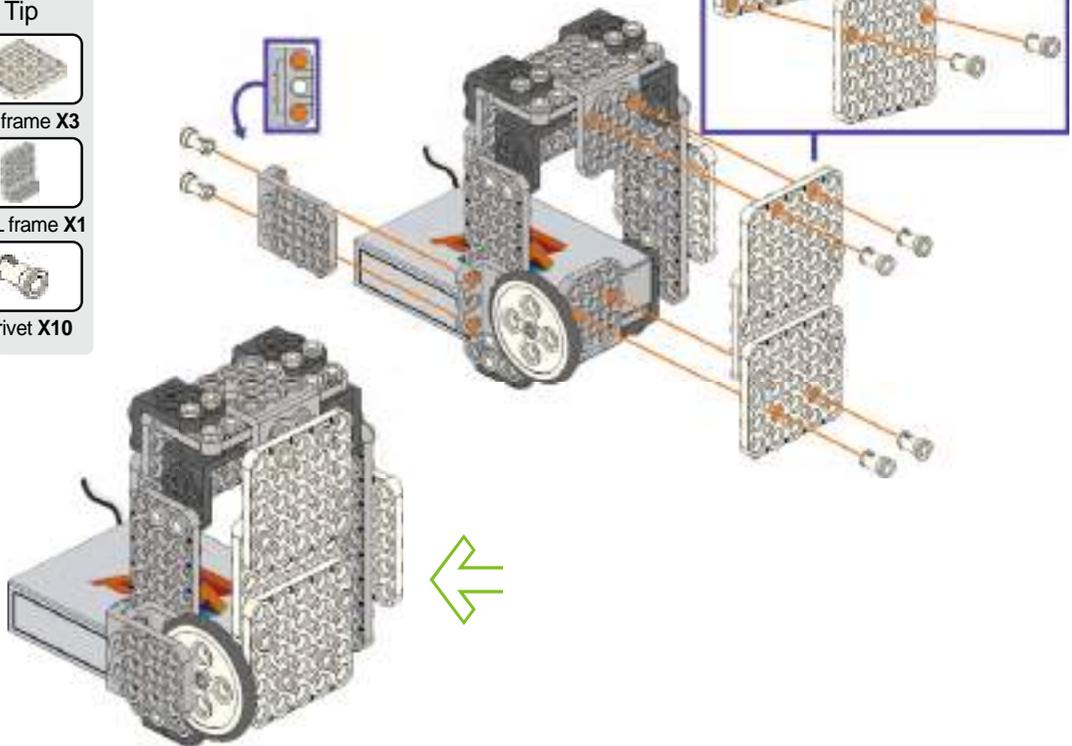
5x5 frame X3



3x4 L frame X1



2s rivet X10



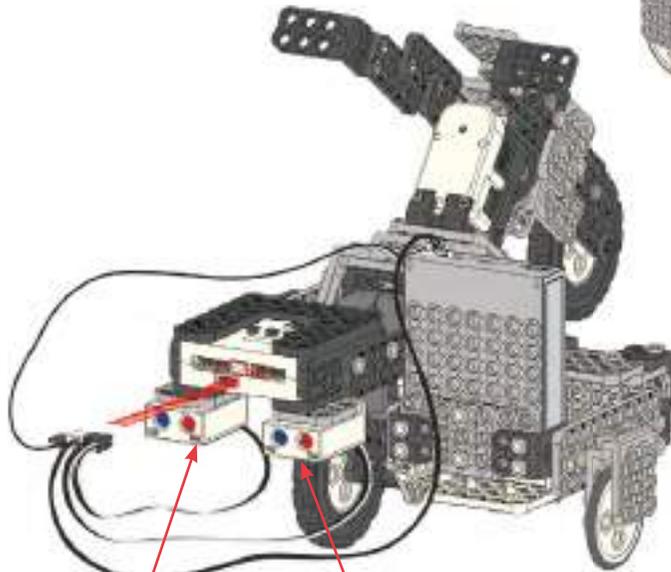
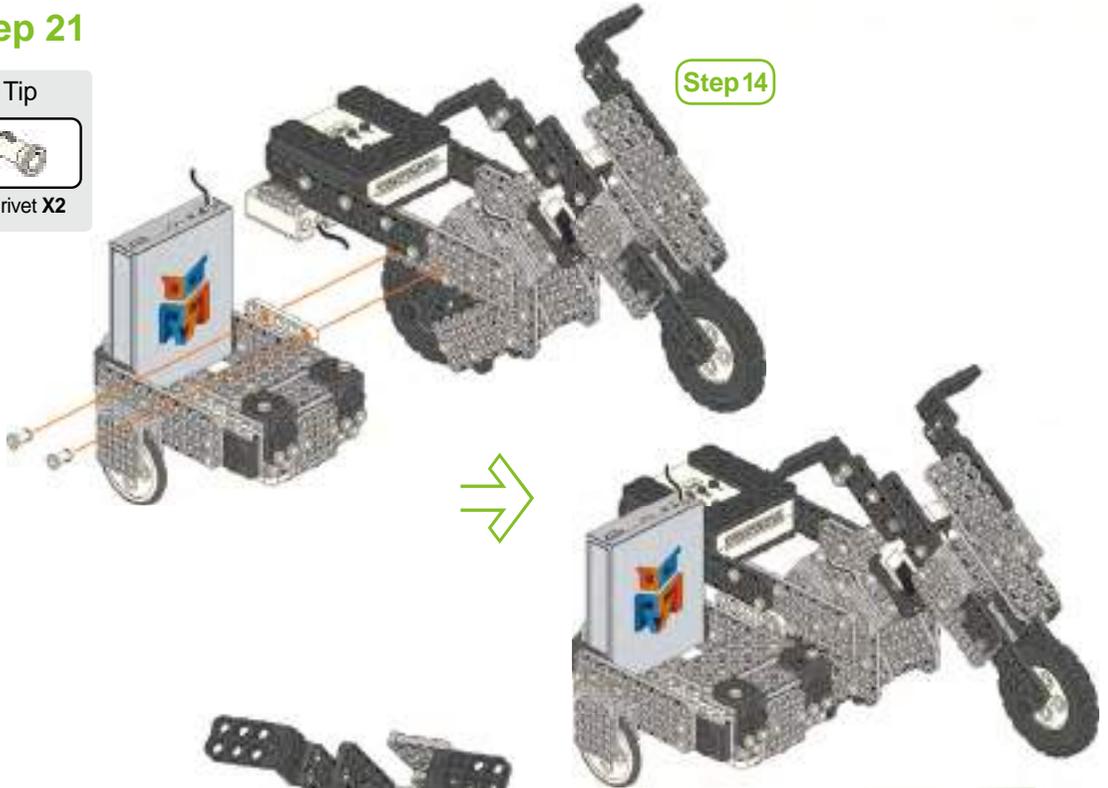
Step 21

Tip



2s rivet X2

Step 14



LED2

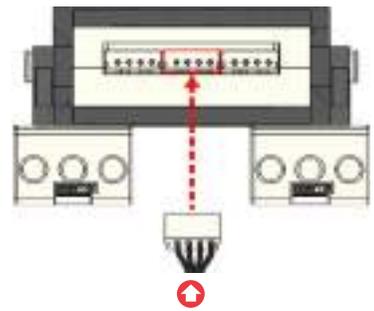
LED1

Pay attention to cable connection and direction.



R. motor (ID30)  Power 
 LED1
 LED2

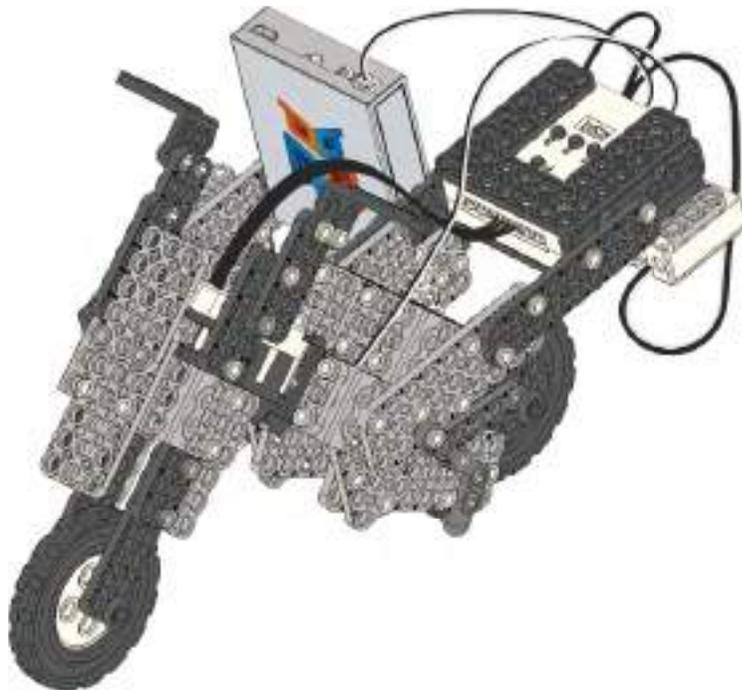
Step 23



Smart servo (ID00)



★ 'Sidecar' is ready! ★



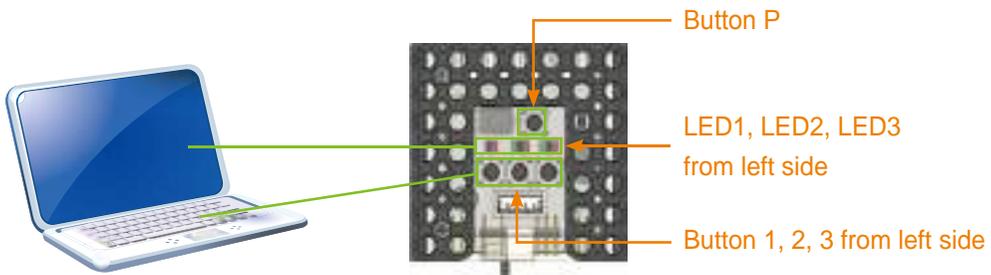


Robot Experience



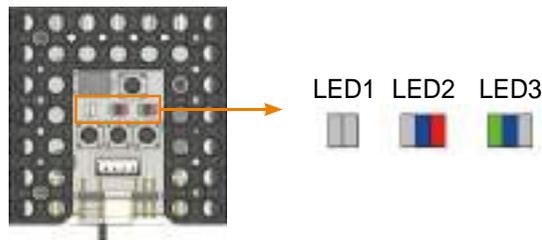
Set-up 'Sidecar' robot model.

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons work as the keyboard for PC.



First : Turn on the smart controller to enter <set-up mode>.

Second : Press button 2 or button 3 on smart controller to set-up 'Sidecar' robot model. The buttons work as a keyboard for PC. Program the robot for proper operation.



Third : Press button P on smart controller to enter <standby mode>.

Check the following if the robot is not working and reassemble.

1. When moving forward and backward reversely :
 - ▶ Refer to STEP11, and see the rotation motor ID carefully.
2. When you cannot control the direction :
 - ▶ Check smart serevo ID and assembled position.



Check movement and assembly.

1. Match the button on the IR remote controller with the corresponding action.

★ Examples ★

- (a)  Sidecar moves to the left.
- (b)  Sidecar moves to the right.
- (c)  Sidecar's left LED blinks.
- (d)  Sidecar's right LED blinks.
- (e)  Sidecar moves in S shape and then stops.
- (f)  Sidecar moves forward when sound is detected.



(1) A button : _____

(2) B button : _____

(3) 1 button : _____

(4) 3 button : _____

(5) # + 1 button : _____

(6) # + 2 button : _____

Robot Play

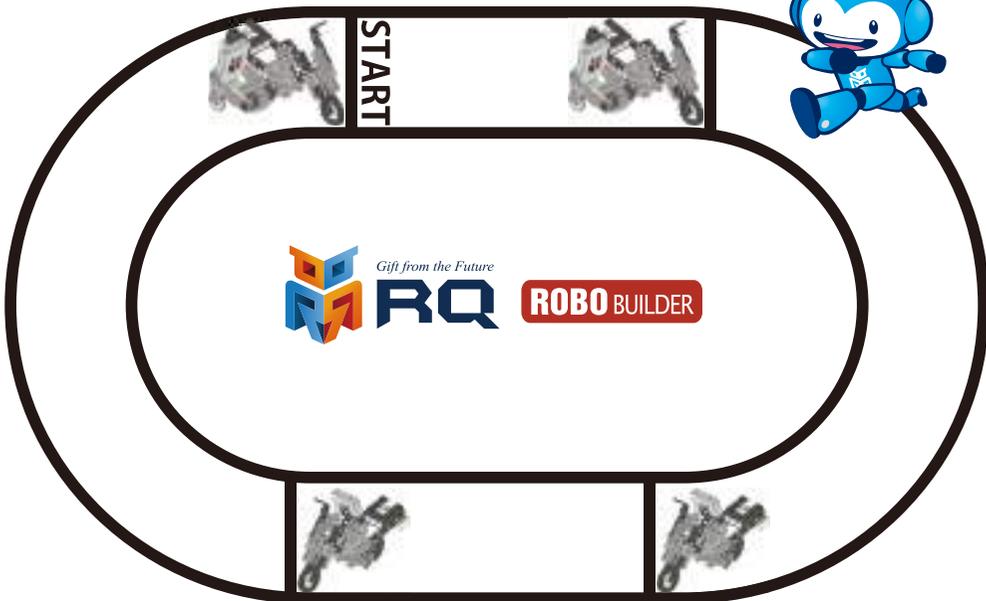


Play relay race game.

Make a team with 4 persons to play a relay race. Whoever arrives to the finishline first wins the game.

- Make a team, and place robots as below on the track.
- Start from 'START' position for running a lap and pass a baton.
- Whoever arrives to the finish line first wins the game.
- Discuss the game rules for more exciting race.

Do not get out of track during the race!



◆ Describe your 'Sidecar' robot.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



5. Soccer Bot

Generate driving force.

1 Go~ Red team!
Go, go, go!

Way to go, Red team!
Go~ Red team!

2 What? Ended in a tie in overtime?

Goal-in!

Please... Make a goal, goal, goal in penalty shoot-out.

3 Eh? Players run from a distant place to kick a ball.

It's for doing a run-up.

4 They do that to kick with more power to a farther position.

5 kinetic energy is generated when you run, and it makes driving force!

Jump over obstacle

Hurdle race

People do a run-up to jump over obstacles or a hurdle.

6 No wonder I am not good at kicking a ball...

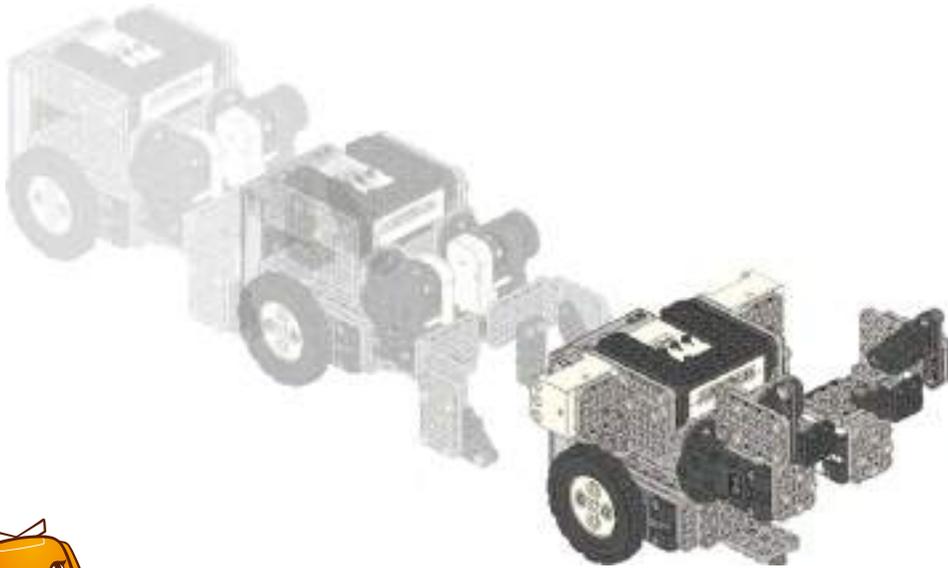
Hey~, it's our player's turn.
Go~, go! Shoot! Goal!!!



Today's Robot Class



Shoot~ Goal! Let's start a soccer competition with the Soccer Bot. Robot soccer competition is just like the human robot competition - it's about the number of goals you make within the game time. Your robot needs to take various motions such as going forward and backward, rotating, and some basic attack and defense motions. Rotation motors and smart servos are used in Soccer Bot. Kicking and blocking a ball and with smart servo and also you can make other player to stand for team cooperation!



My Soccer Bot in playing in the robot competition. It's so competitive like the World Cup game!

Robot soccer competition is world's state-of-the-art science technology robot competition. In each team there are 3 robots. The robots kick a ball to the opposite team's goal line to get a point. Soccer robots are pre-programmed for soccer games.





Robot Assembly



Prepare robot parts.

Smart controller X1	R. motor (ID29,30) X2	Smart servo (ID00,01) X2	Battery case X1	Touch sensor X2		
1x5 frame X2	2x7 frame X2	3x5 frame X4	3x7 frame X6	3x9 frame X1		
7x7 frame X1	Opposite angle frame X2	2x5 L frame X2	3x4 L frame X2	3x5 L frame X5	3x6 L frame X6	
Ball frame X2	Wheel X2	Tire X2	Joint frame X2	2s rivet X47	3s rivet X28	Double rivet X38



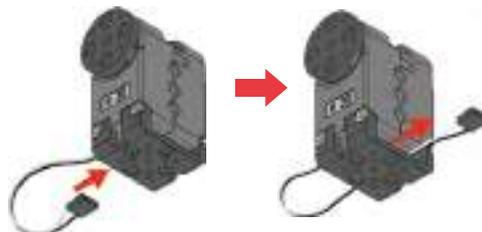
Tips.

Arrange rotation motor ID29 an ID30 cable as below to prevent tangling during the assembly.

(For other robot assembly, leave the cables as it was.)



R. motor (ID29)



R. motor (ID30)

Step 1 X2

Tip



R. motor (ID29) X1



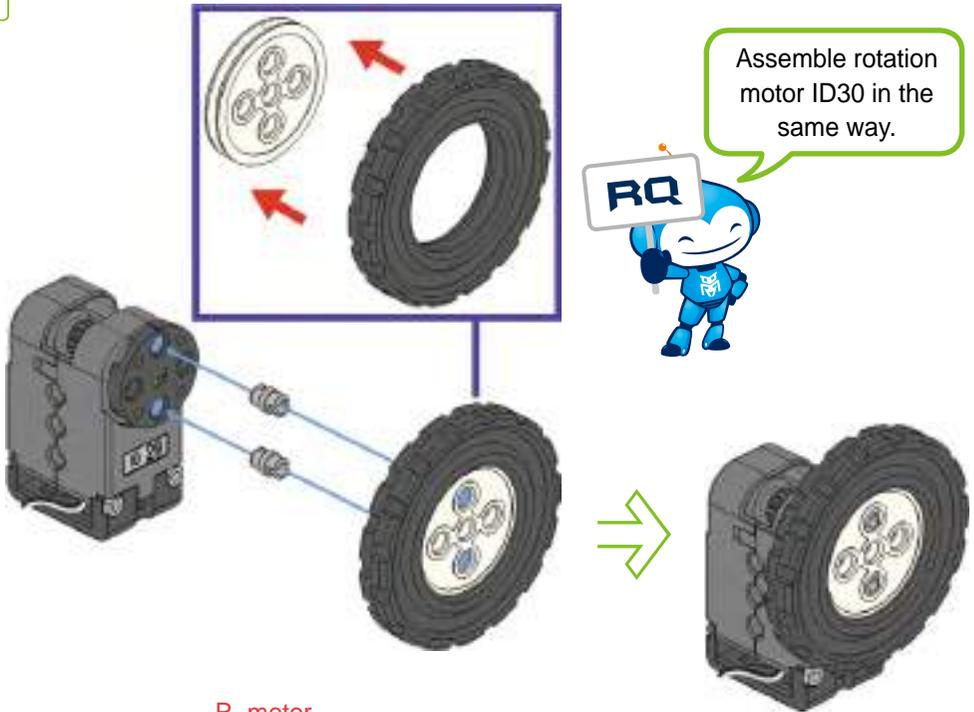
Wheel X1



Tire X1



Double rivet X2

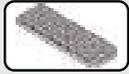


Step 2

Tip



3x7 frame X2



3x9 frame X1



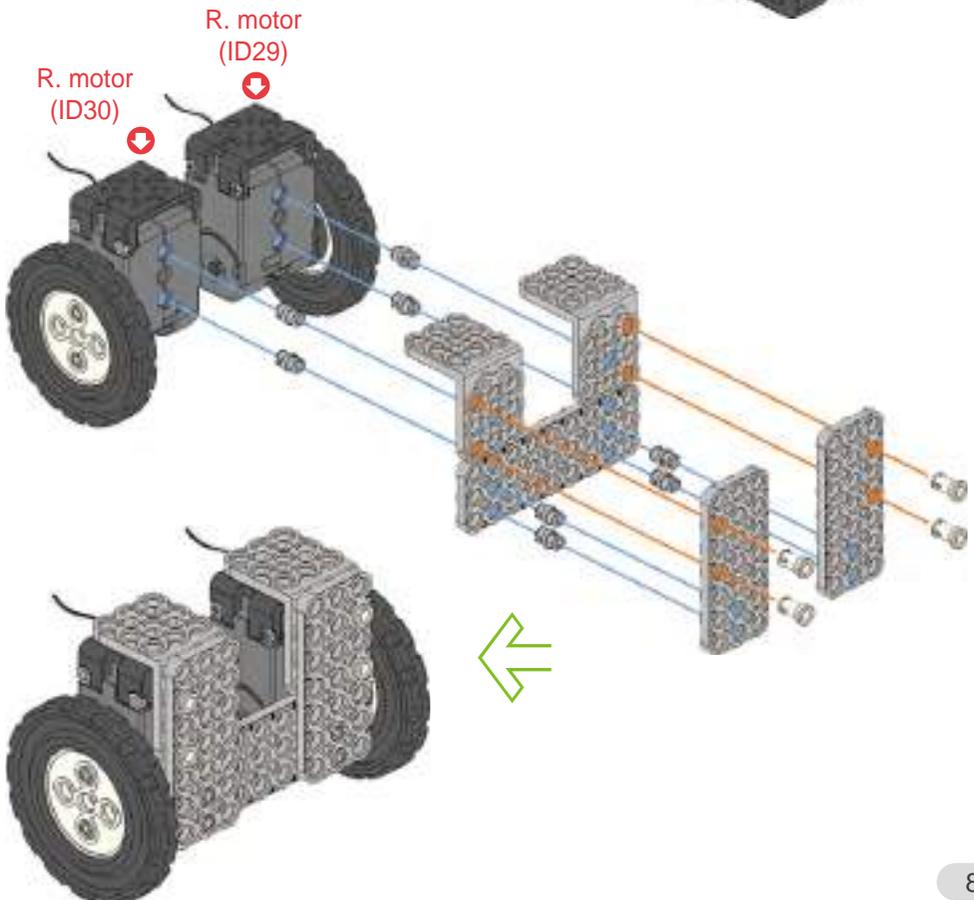
3x6 L frame X2



2s rivet X4



Double rivet X8



Step 3

Tip



3x7 frame X1



3x5 L frame X1



Ball frame X1



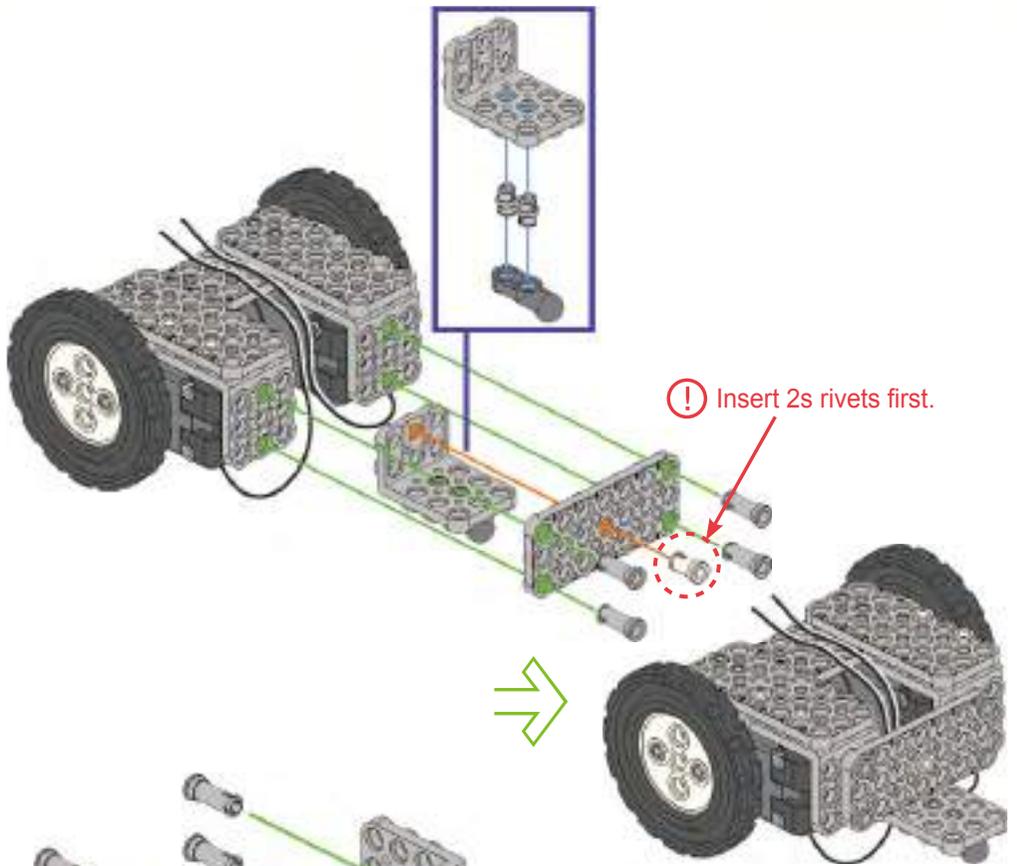
2s rivet X1



3s rivet X4



Double rivet X2



Step 4

Tip



3x7 frame X1



3x5 L frame X2



3x6 L frame X2



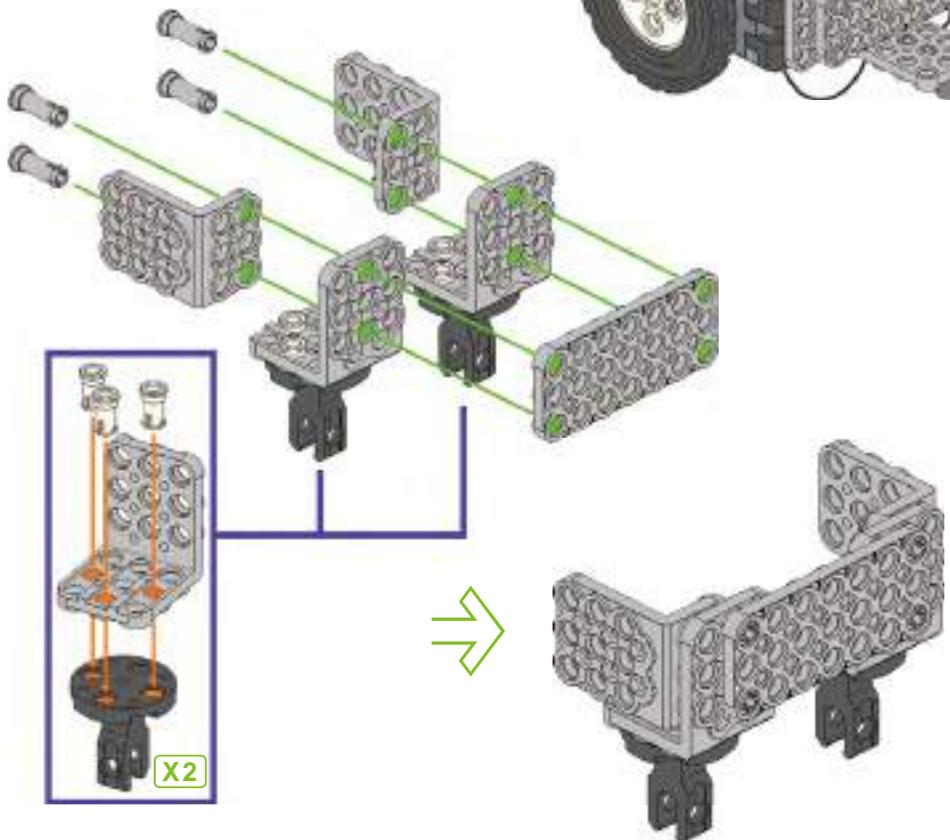
Joint frame X2



2s rivet X6



3s rivet X4

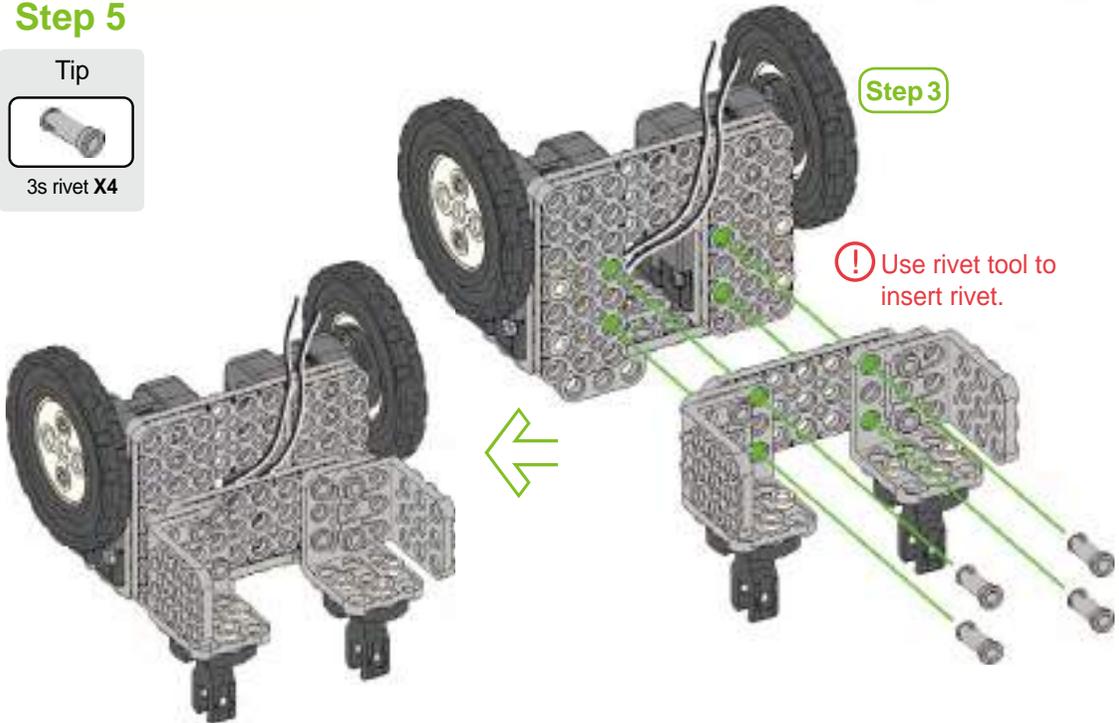


Step 5

Tip



3s rivet X4



Step 6

Tip



Battery case X1



7x7 frame X1



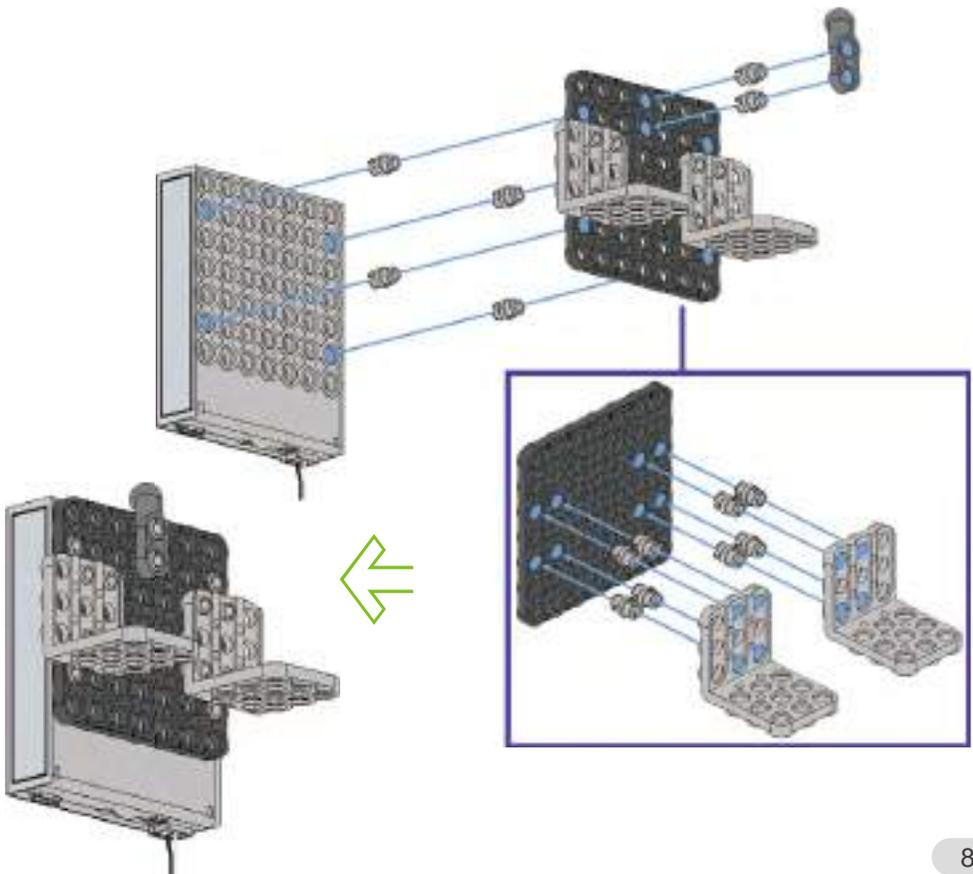
3x6 L frame X2



Ball frame X1



Double rivet X14

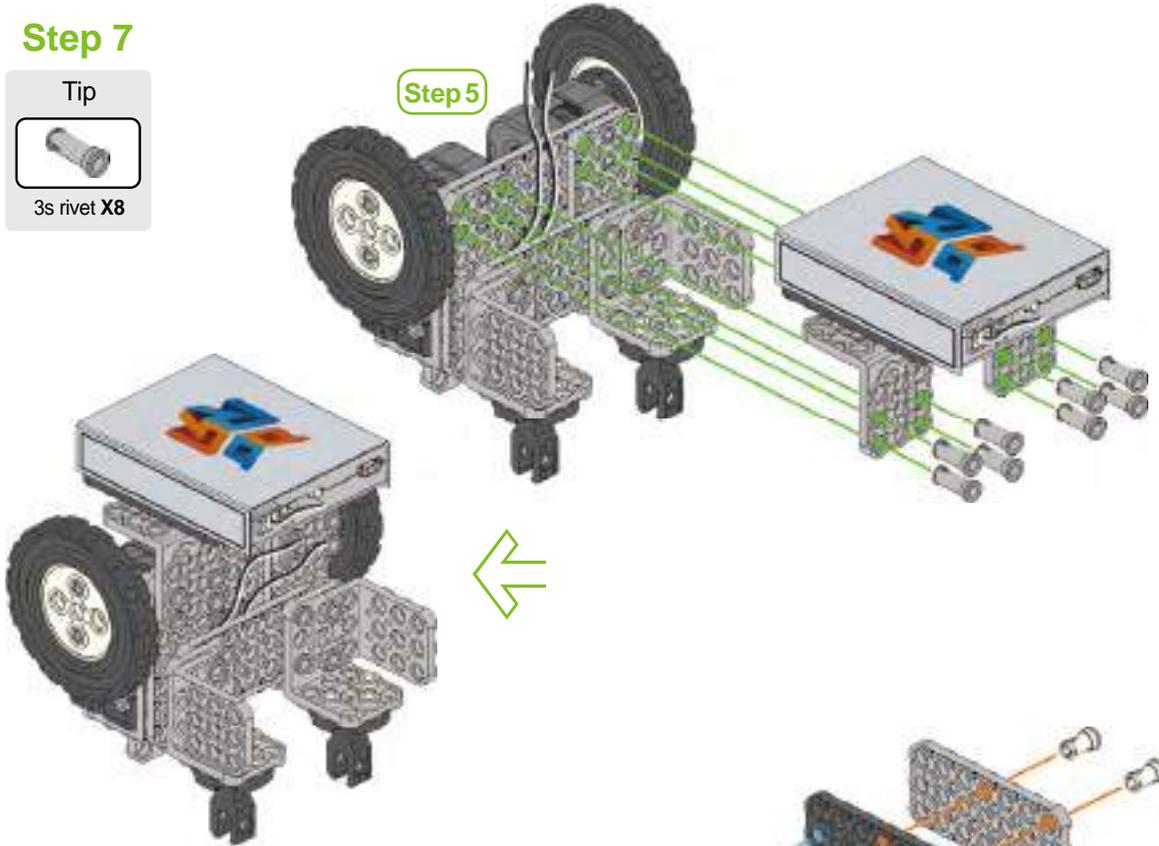


Step 7

Tip



3s rivet X8



Step 8

Tip



Smart controller X1



2x7 frame X2



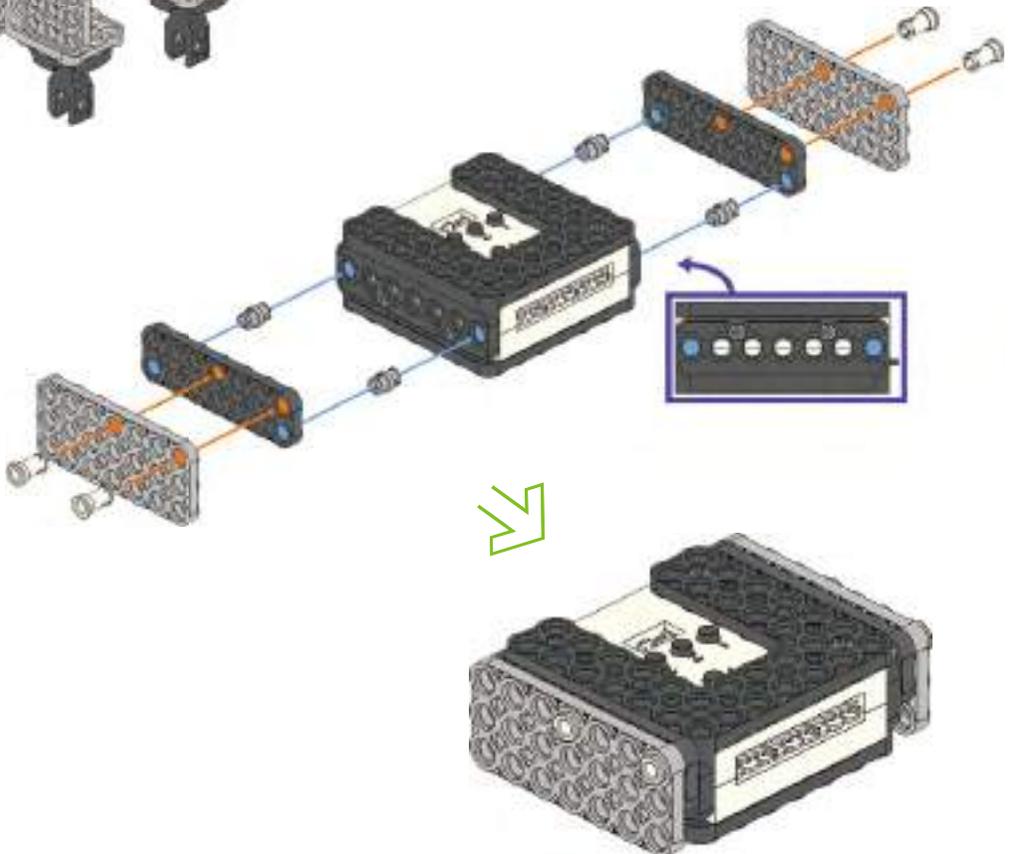
3x7 frame X2



2s rivet X4



Double rivet X4

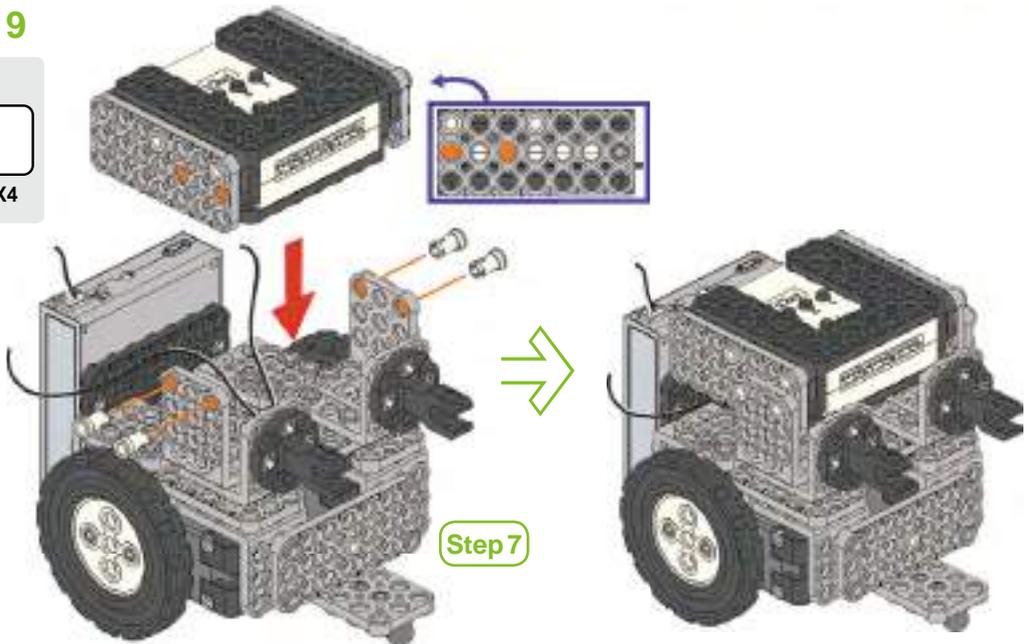


Step 9

Tip

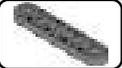


2s rivet X4



Step 10

Tip



1x5 frame X1



3x5 frame X2



2x5 L frame X1



3x4 L frame X1



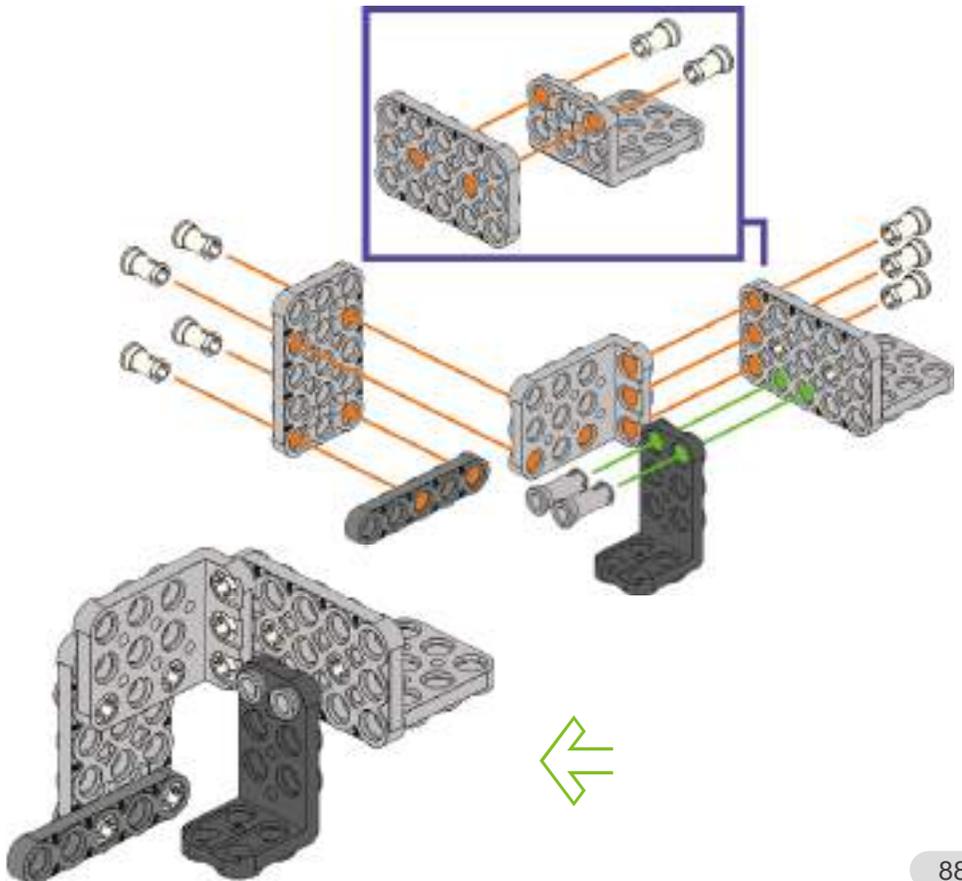
3x5 L frame X1



2s rivet X9



3s rivet X2



Step 11

Tip



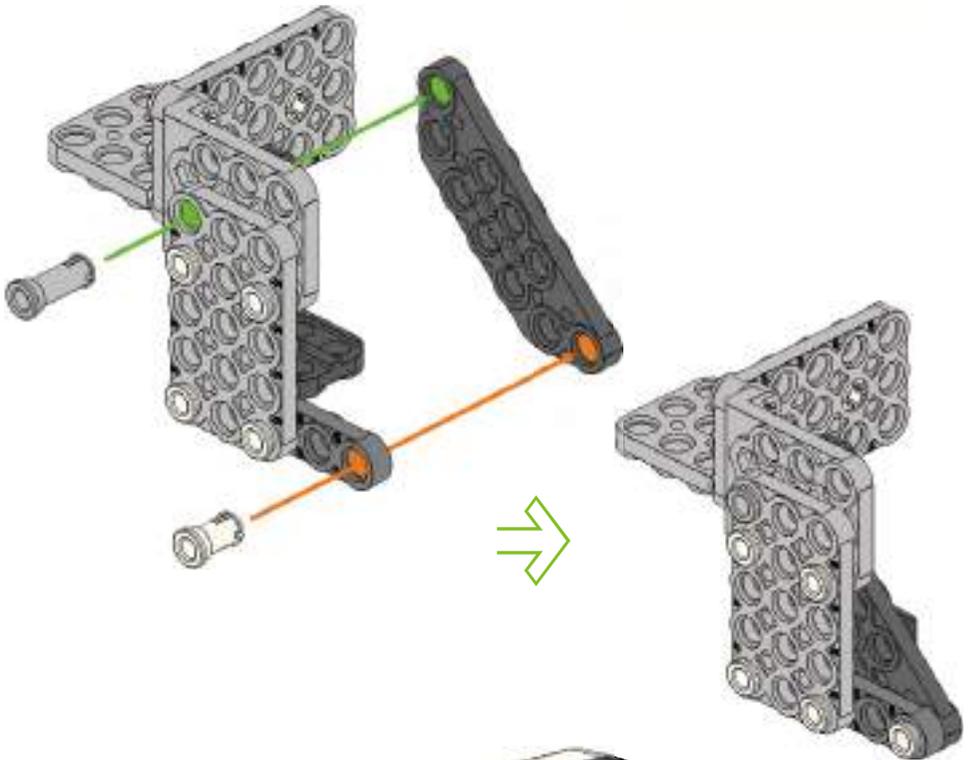
Opposite angle frame X1



2s rivet X1



3s rivet X1



Step 12

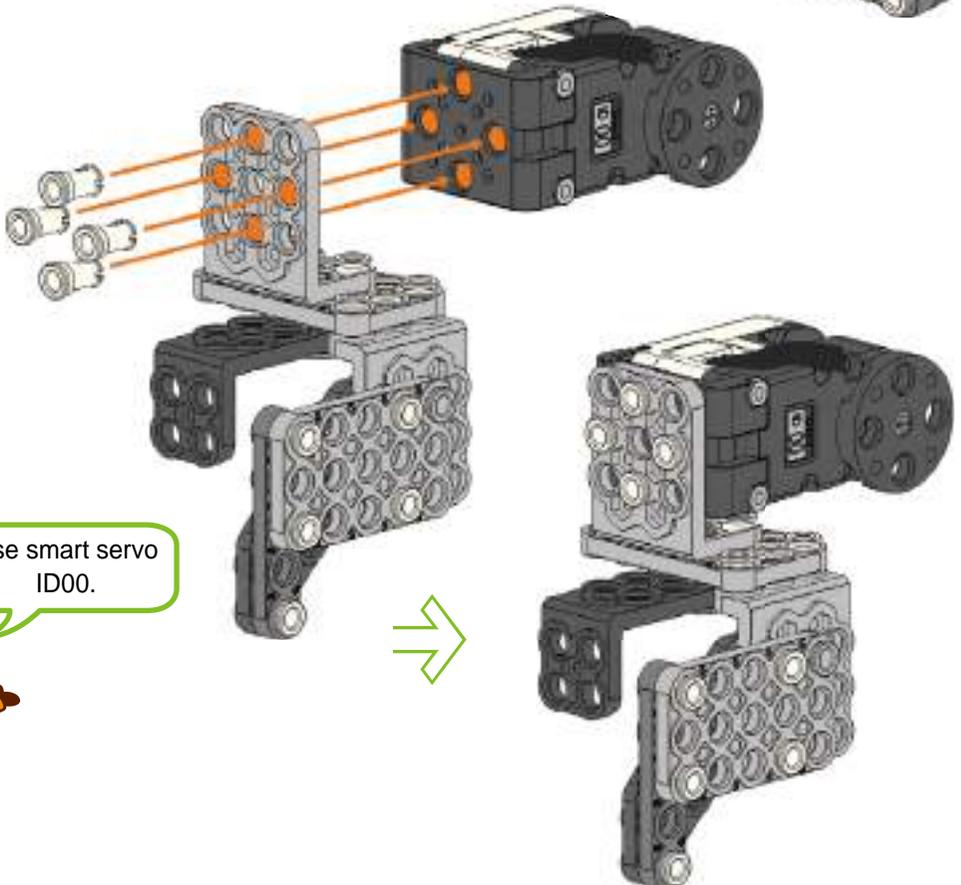
Tip



Smart servo (ID00) X1



2s rivet X4



Use smart servo
ID00.



Step 15

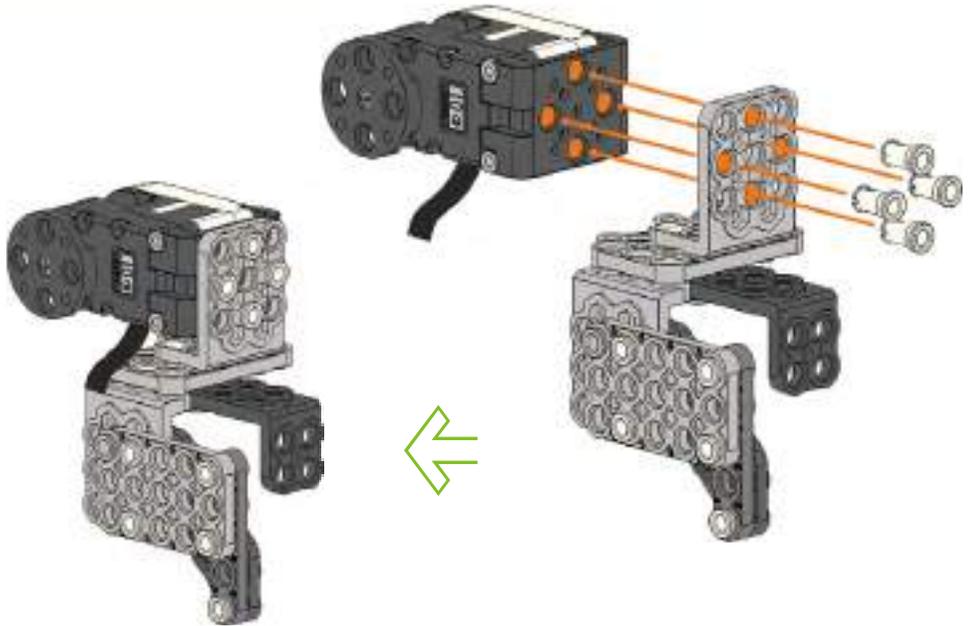
Tip



Smart servo (ID01) X1



2s rivet X4



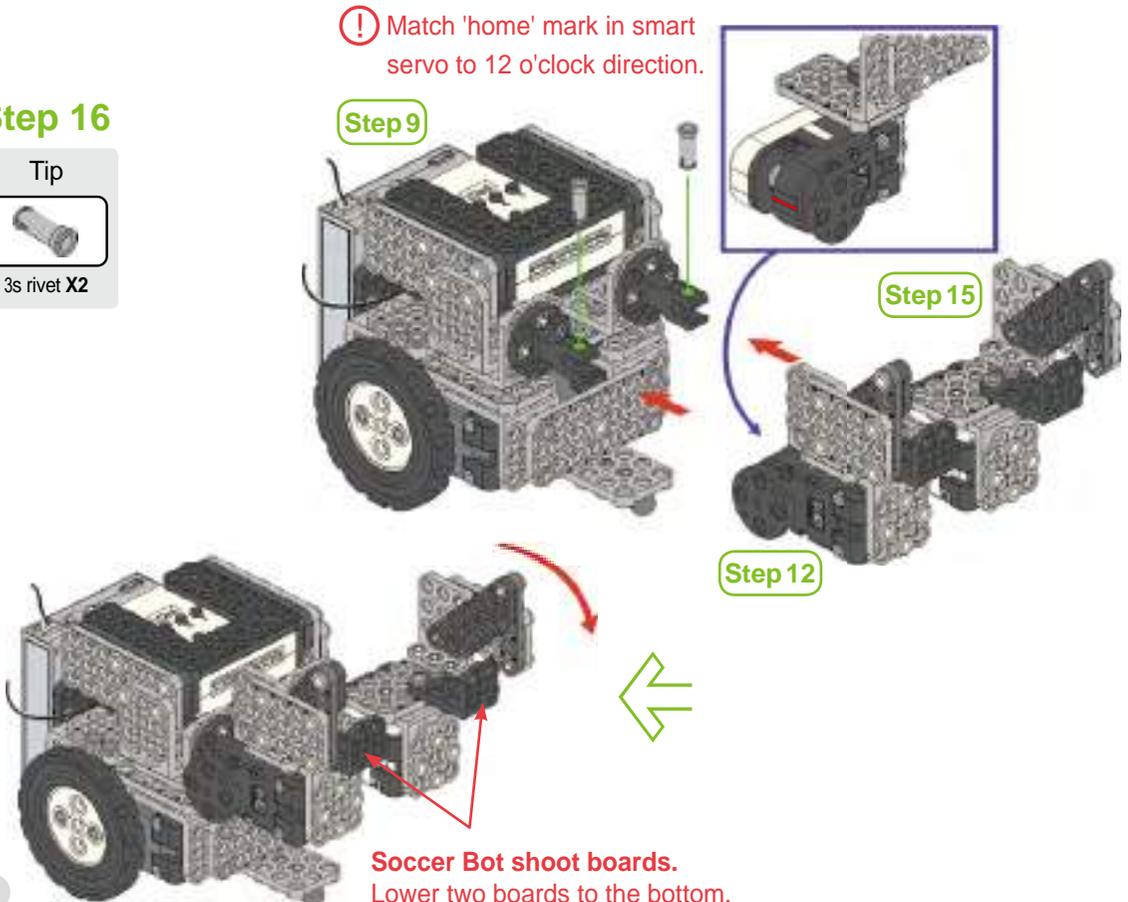
⚠ Match 'home' mark in smart servo to 12 o'clock direction.

Step 16

Tip



3s rivet X2



Soccer Bot shoot boards.
Lower two boards to the bottom.

Step 17

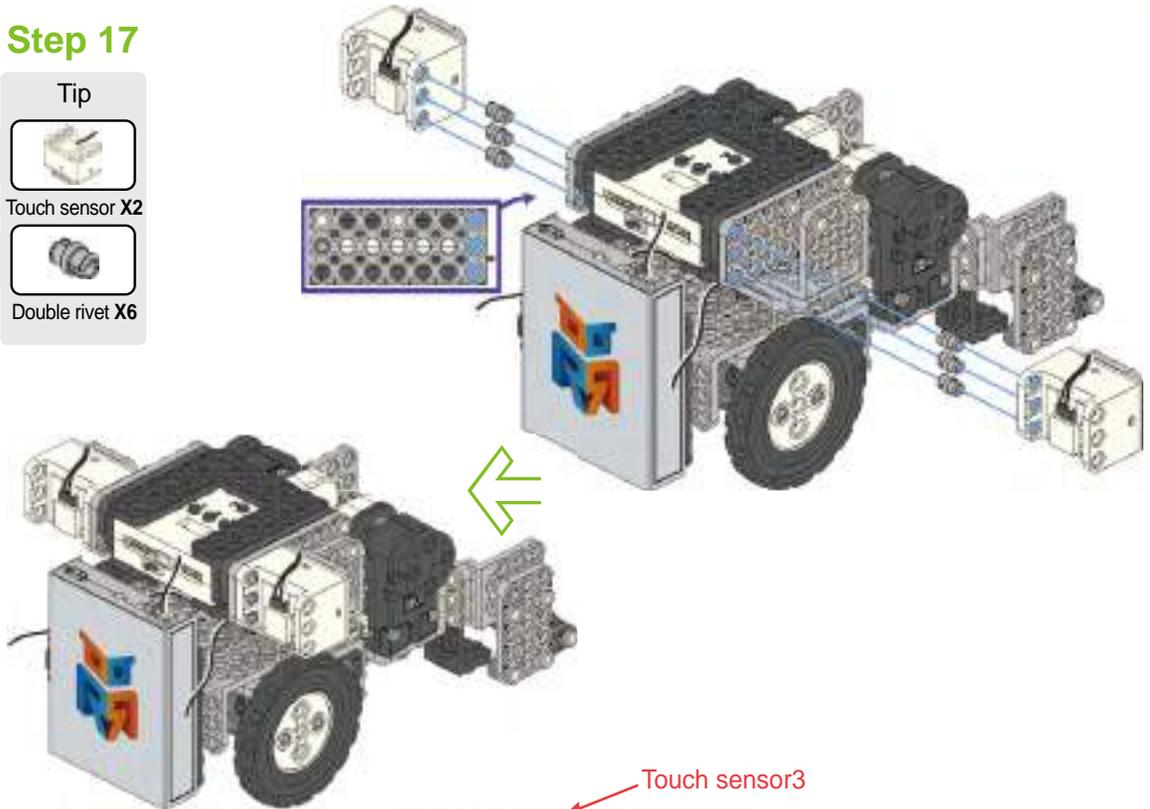
Tip



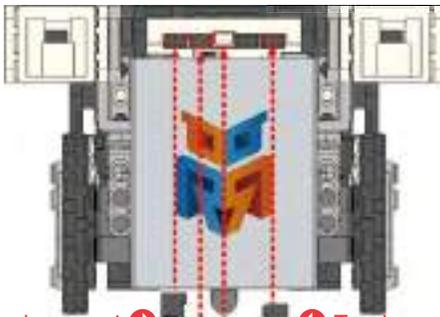
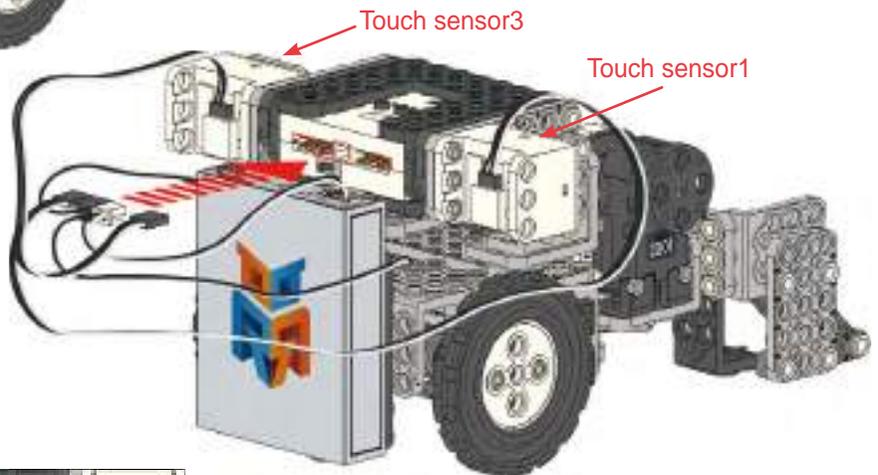
Touch sensor X2



Double rivet X6



Step 18

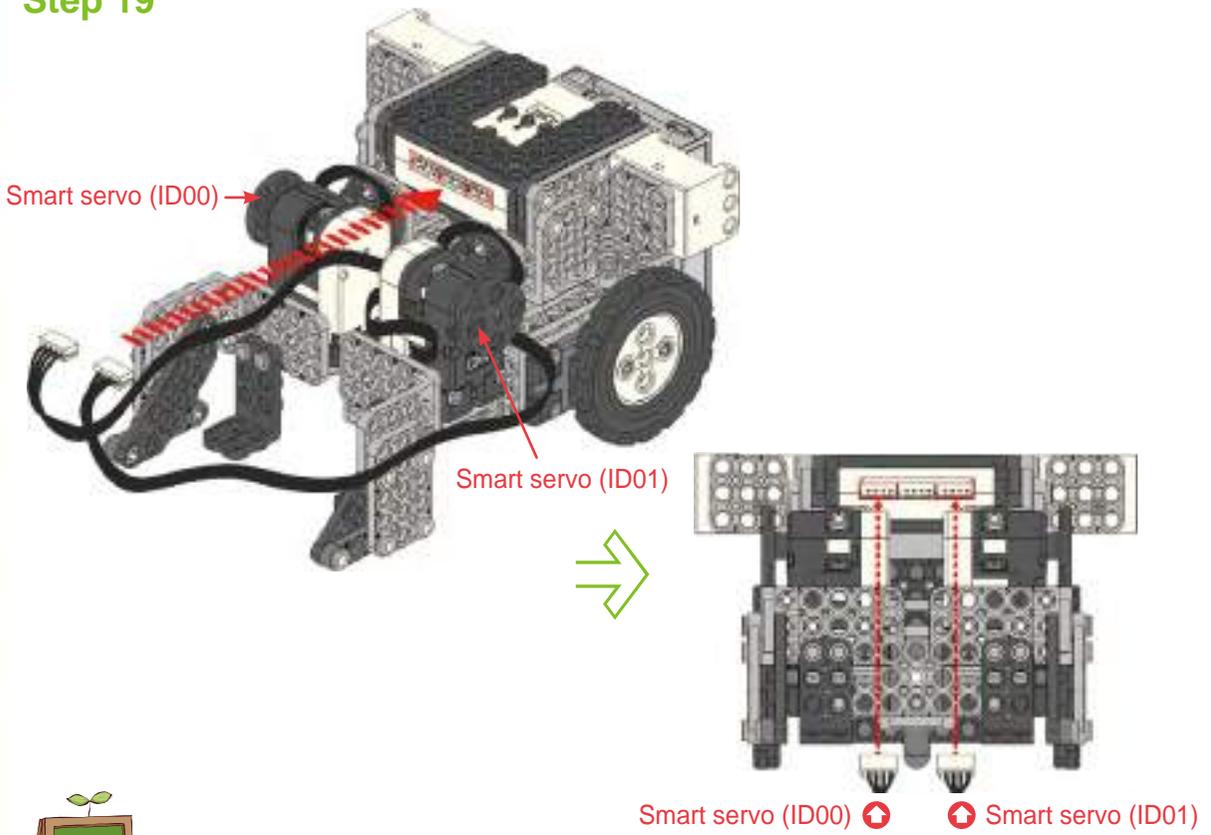


- Touch sensor1 →
- R. motor (ID29) →
- R. motor (ID30) →
- Touch sensor3
- Power

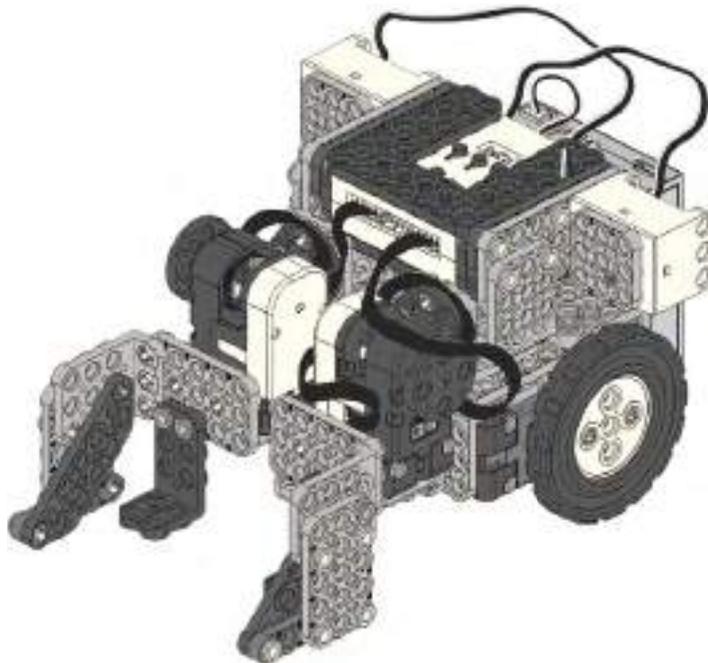
Pay attention to cable connection and direction!



Step 19



★ 'Soccer Bot' is ready! ★



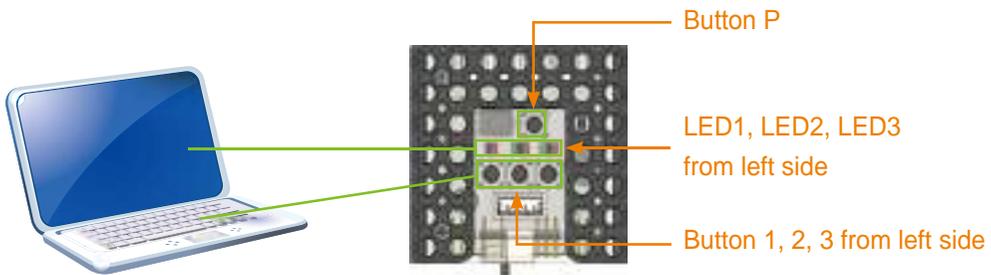


Robot Experience



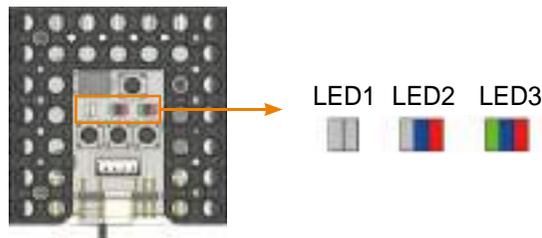
Set-up 'Soccer Bot' robot model.

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons work as the keyboard for PC.



First : Turn on the smart controller to enter <set-up mode>.

Second : Press button 2 or button 3 on smart controller to set-up 'Soccer bot' robot model. The buttons work as a keyboard for PC. Program the robot for proper operation.



Third : Press button P on smart controller to enter <standby mode>.

Check the following when robot is not working and reassemble.

1. When Soccer Bot boards are not working :
 - ▶ Refer to STEP19 to check smart servo ID and cable connections.



Check movement and assembly.

1. Which IR remote controller button should you pressed for following motions?
Choose and write the correct answers from examples.

★ Examples ★

- (a) A button (b) B button (c) 1 button (d) 2 button (e) 3 button
(f) # + 1 button (g) # + 2 button (h) # + 3 button

- (1)  Kick a ball with two boards. ()

- (2)  Kick a ball with the left boards. ()

- (3)  Kick a ball with the right boards. ()

- (4)  Go forward slowly, and kick the ball. ()

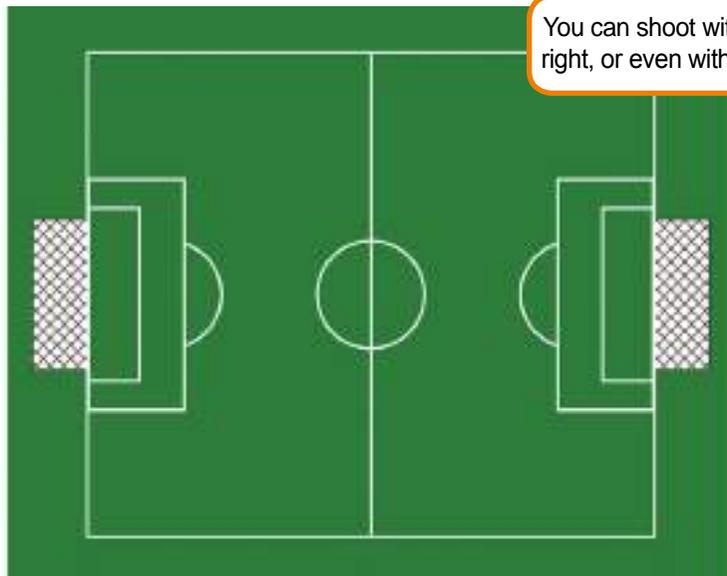
Robot Play



Shoot~ Goal! Robot soccer competition.

Play a robot soccer game with your Soccer Bot. This robot can kick and make basic movements. Discuss the number of players and game rules to make the game more exciting.

- Make a team and play 3 vs. 3, or 4 vs. 4.
- Control the robot to kick a ball or defense.
- First half and second half of the game is 3 minutes each. Whoever scores more wins the game.
- Change the position for the second half.
- Decide the game rules including maximum dribble distance and number of pass.



You can shoot with left, right, or even with both!



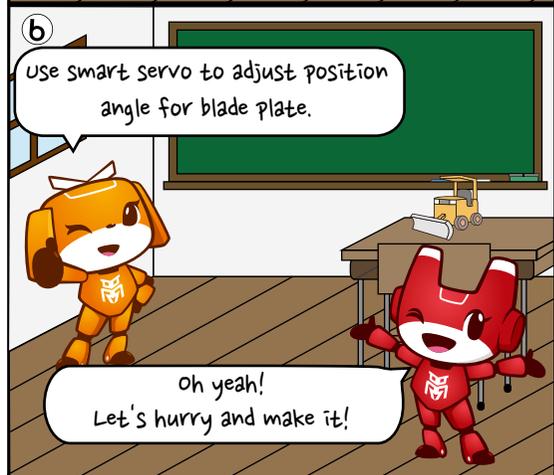
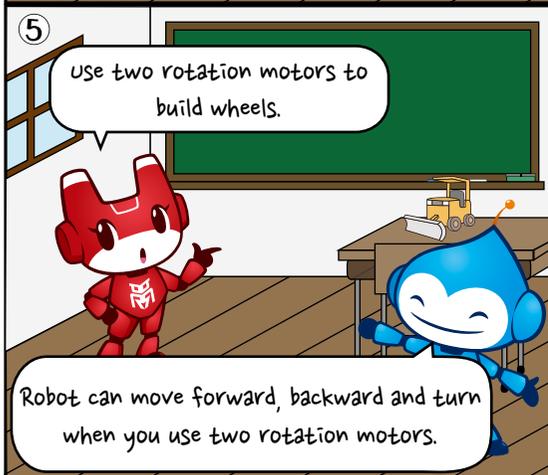
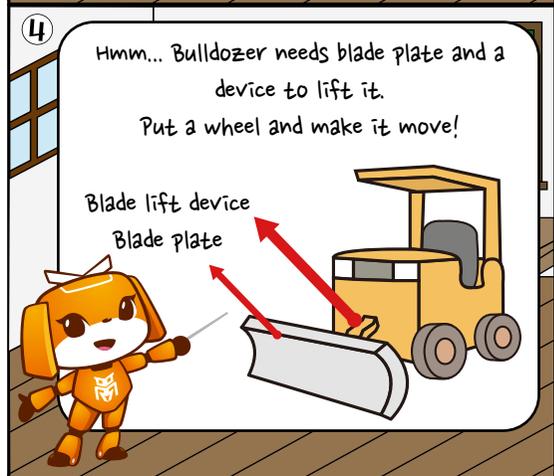
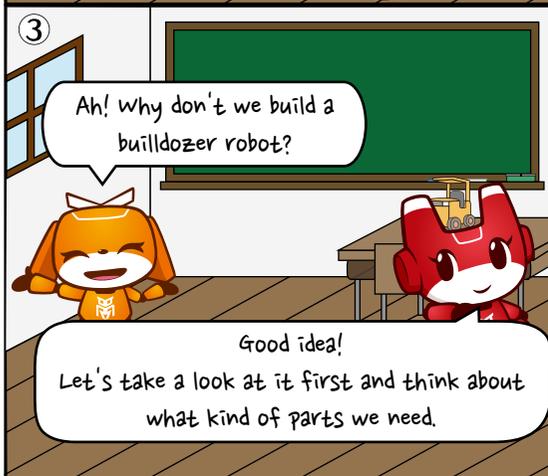
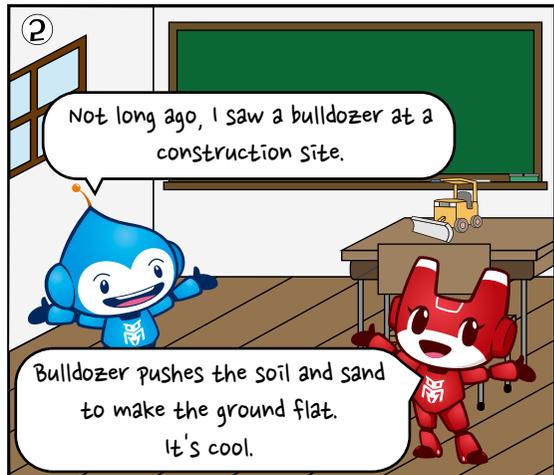
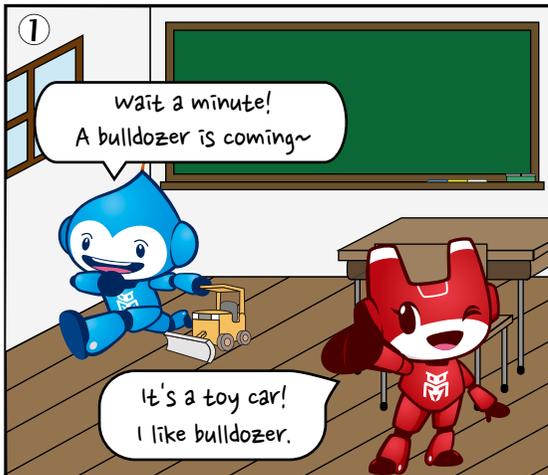
◆ Describe your 'Soccer Bot'.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



6. Imaginary Robot.

My own robot PART I



Creative Robot Class



Write a report on <My own robot PART1>.

★ My robot is called _____

Why did you
build this
robot?

How did you
build your
robot?

What kind of
function does
it have?

Problem /
Solution

Something you
learned while
building the
robot.



Post the picture of your own robot below.

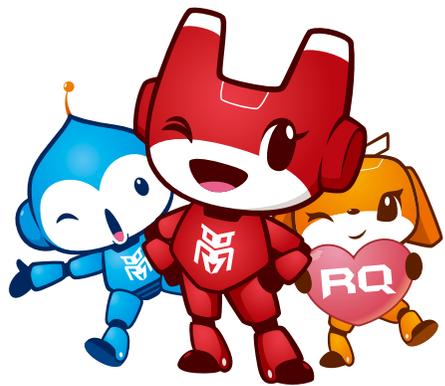


◆ Describe your own robot.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



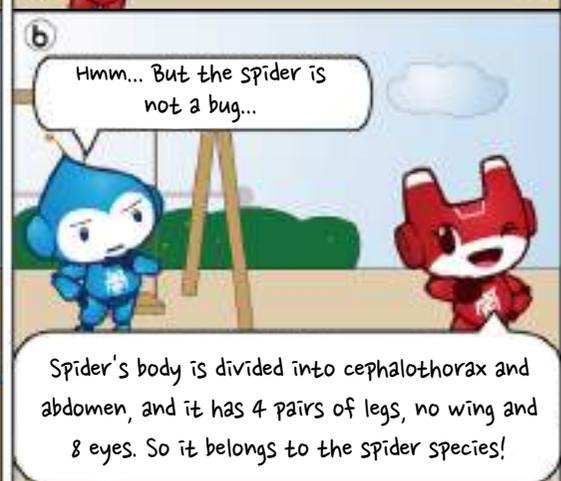
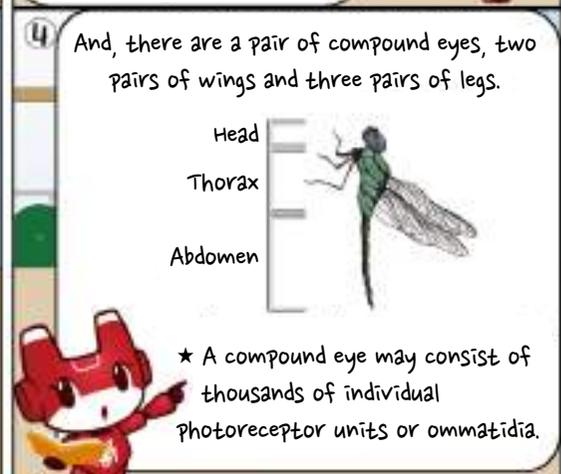
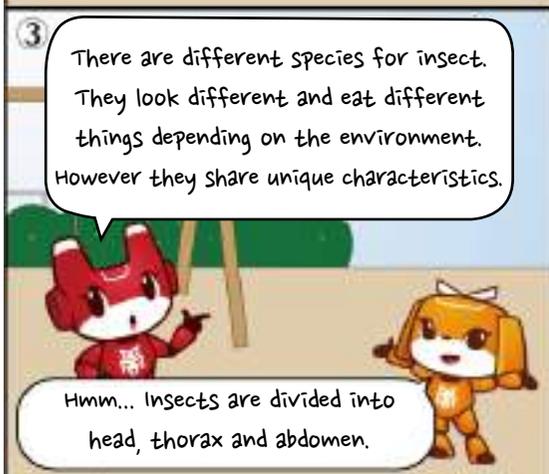
MEMO



RQ⁺

7. Bug Bot

Characteristic of bug





Today's Robot Class



Bug Bot is based on stag beetle with wings and big jaw (horn). Two smart servos are used to build a big jaw to move up and down (lift up), or move left and right (pick up). It can move up or attack opposite robot. Rotation motors are used to freely move the 6 legs. Therefore, it walks more stable than other bipedal or 4-legged robot.



Drosophila has sensitive smell ability while wasp has great vision.

Us Army and robot scientists have developed a very small bug robot long time ago, which can grasp enemy's status in secret. It can be deployed in a dangerous place such as area with bombs to search for or rescue people.

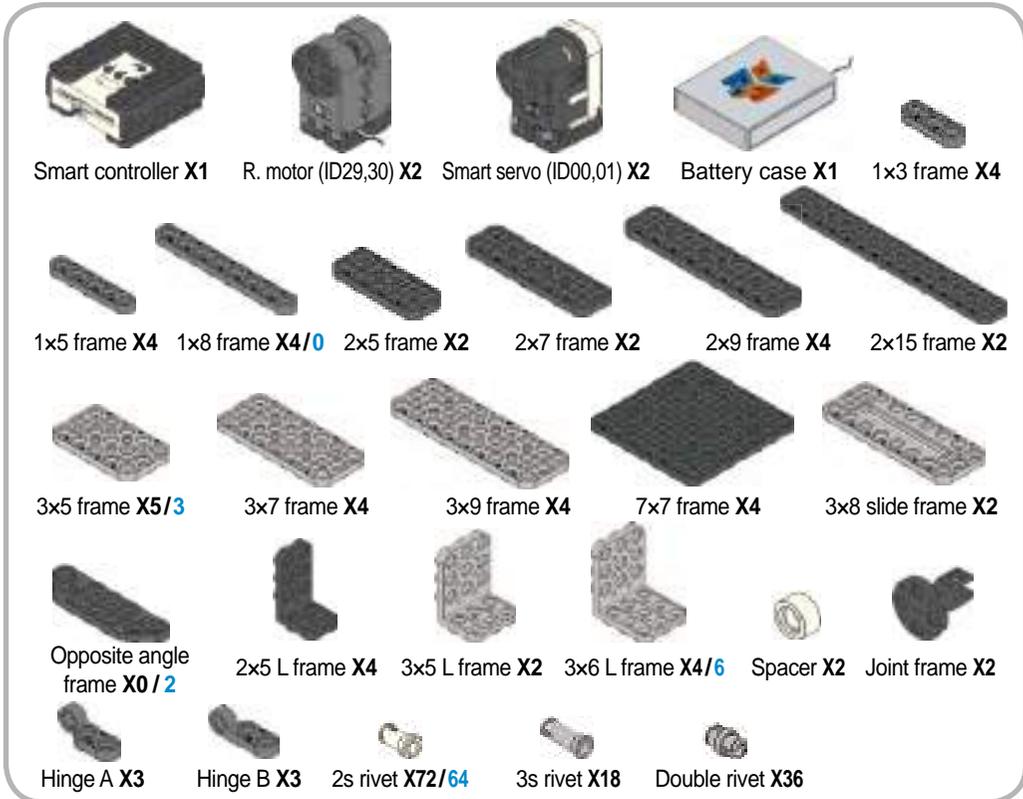




Robot Assembly



Prepare robot parts. Bug Bot Lift-up part / [Pick-up part](#).

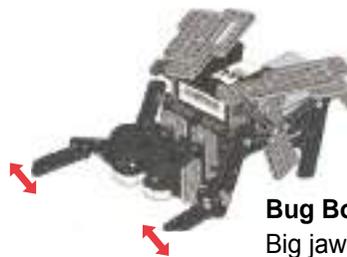


Tips.

Bug Bot has two types depending on the shape of its jaw (horn) : lift-up type and pick-up type. You can pick which one to make once you get to STEP13.



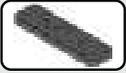
Bug Bot / Lift-up type
Big jaw lifts objects as it is moving up-and-down.



Bug Bot / Pick-up type
Big jaw Picks up objects as it is moving right-and-left.

Step 1

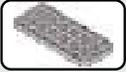
Tip



2x7 frame X2



2x15 frame X2



3x7 frame X1



7x7 frame X1



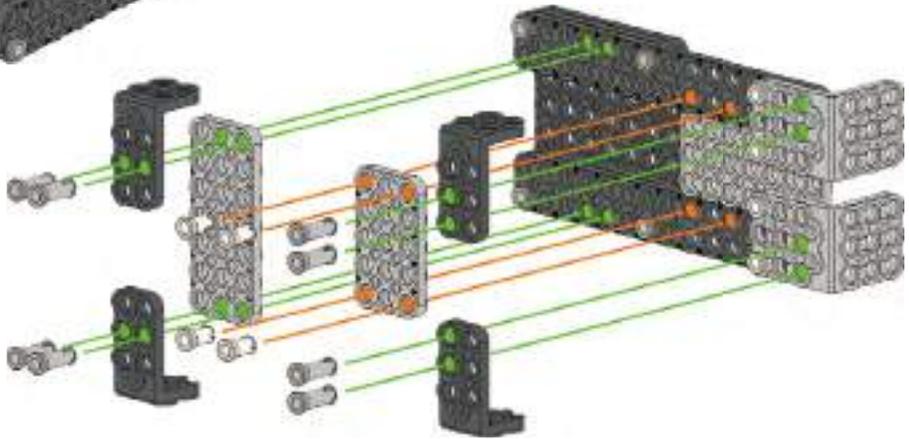
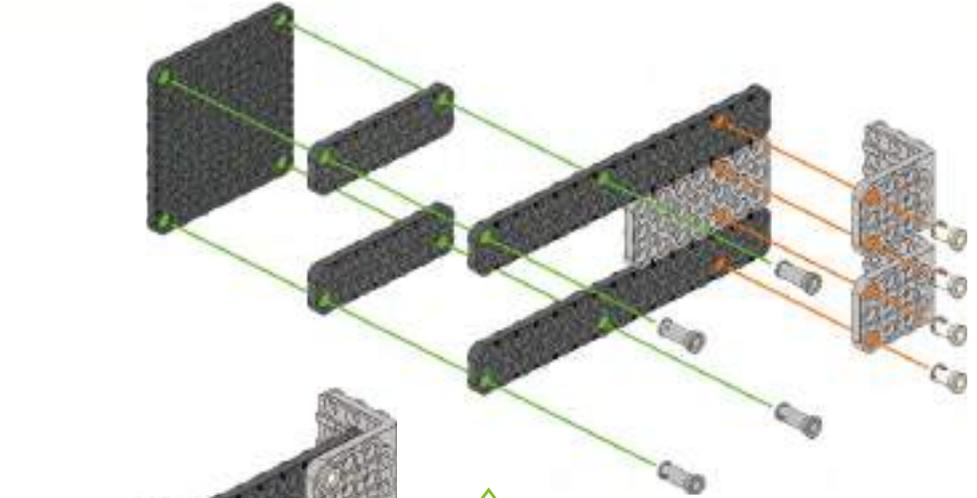
3x6 L frame X2



2s rivet X4



3s rivet X4



Step 2

Tip



3x5 frame X1



3x7 frame X1



2x5 L frame X4



2s rivet X4



3s rivet X8



Step 3

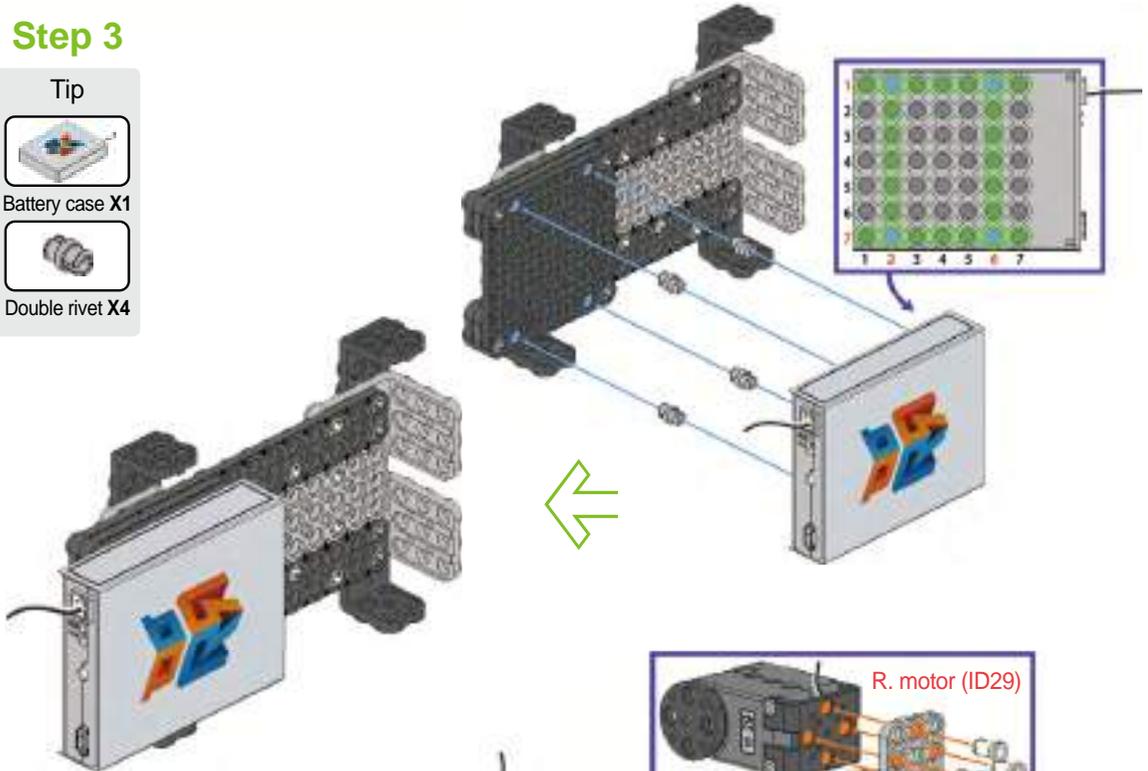
Tip



Battery case X1



Double rivet X4



Step 4

Tip



R. motor (ID29,30) X2



3x6 L frame X2

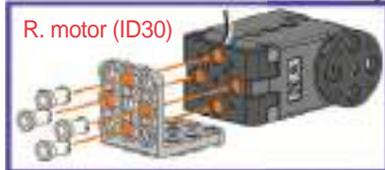


2s rivet X12

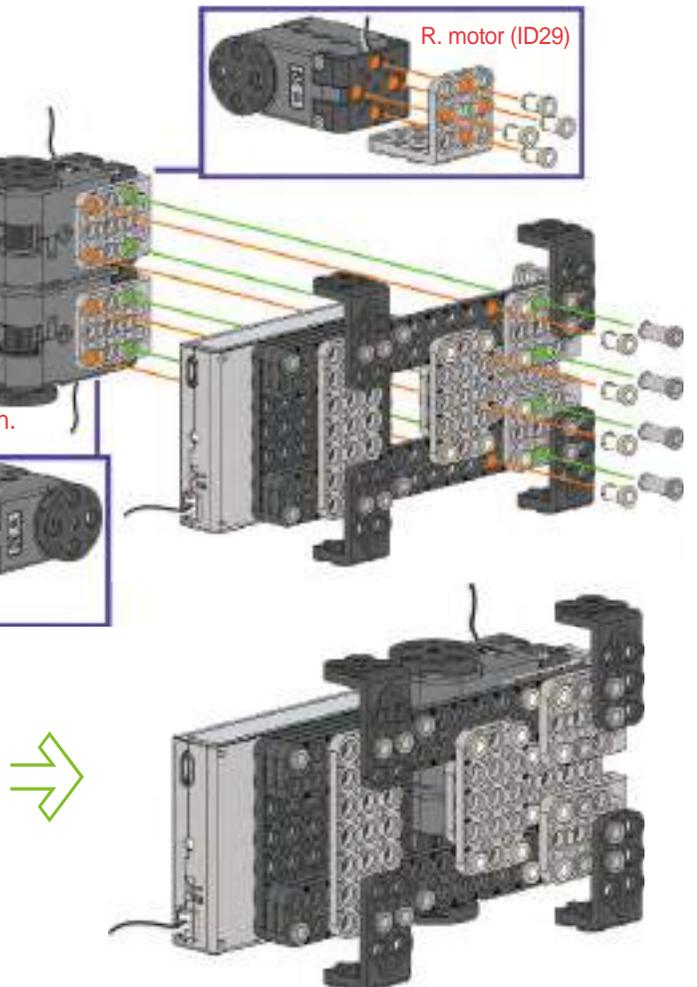


3s rivet X4

! Pay attention to two rotation motor positions and direction.



R. motor (ID30)



R. motor (ID29)

Step 5

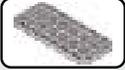
Tip



Smart controller X1



1x3 frame X4



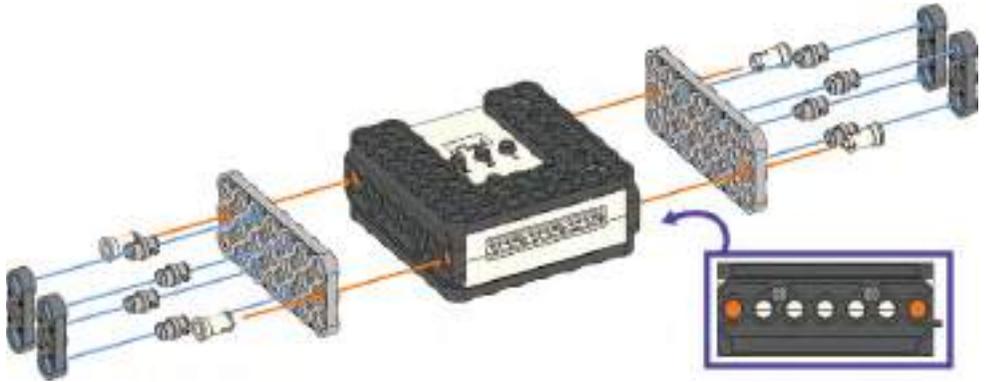
3x7 frame X2



2s rivet X4



Double rivet X8

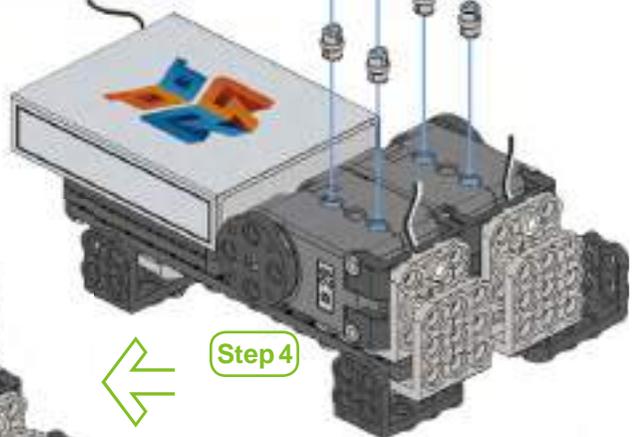
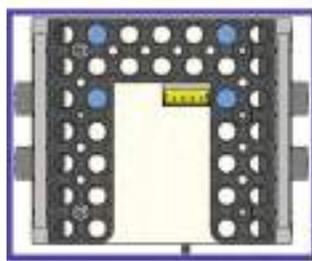


Step 6

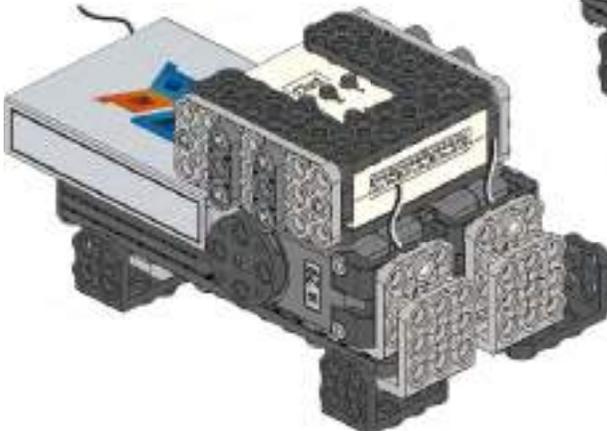
Tip



Double rivet X4

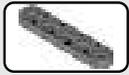


Step 4



Step 7 X2

Tip



1x5 frame X2



2x9 frame X2



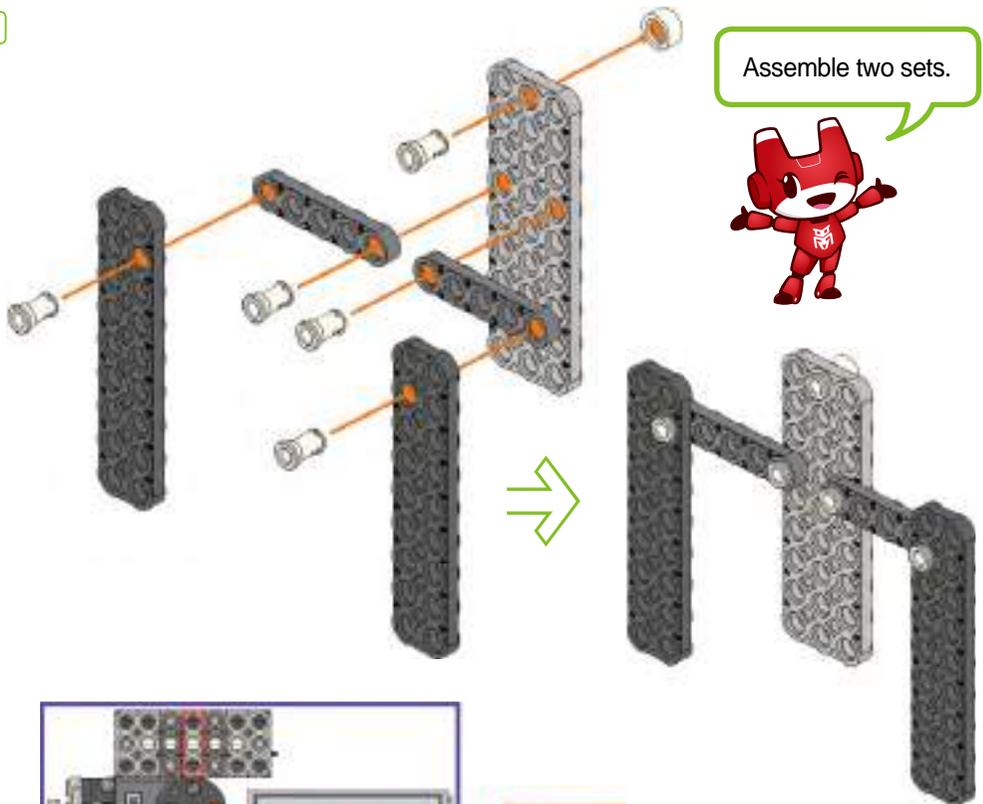
3x9 frame X1



Spacer X1



2s rivet X5



Assemble two sets.

Step 8

Tip



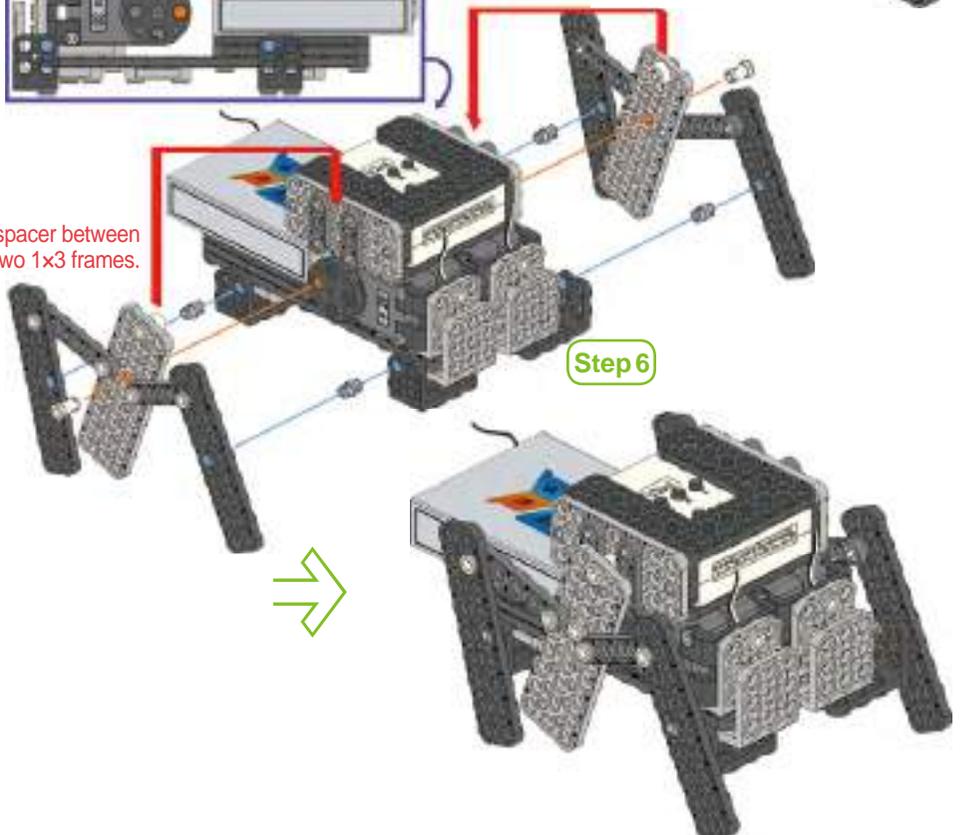
2s rivet X2



Double rivet X4



⚠ Insert a spacer between two 1x3 frames.



Step 6

Step 9

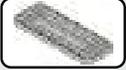
Tip



3x5 frame X1



3x9 frame X1



3x8 slide frame X1



3x5 L frame X1



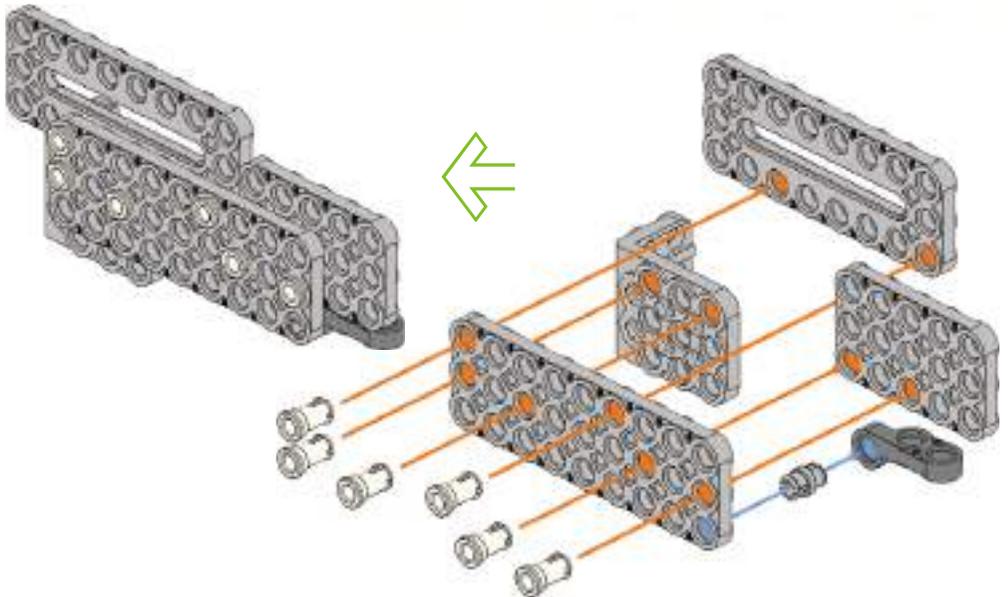
Hinge A X1



2s rivet X6



Double rivet X1



! Insert a double rivet first.

Step 8

Step 10

Tip



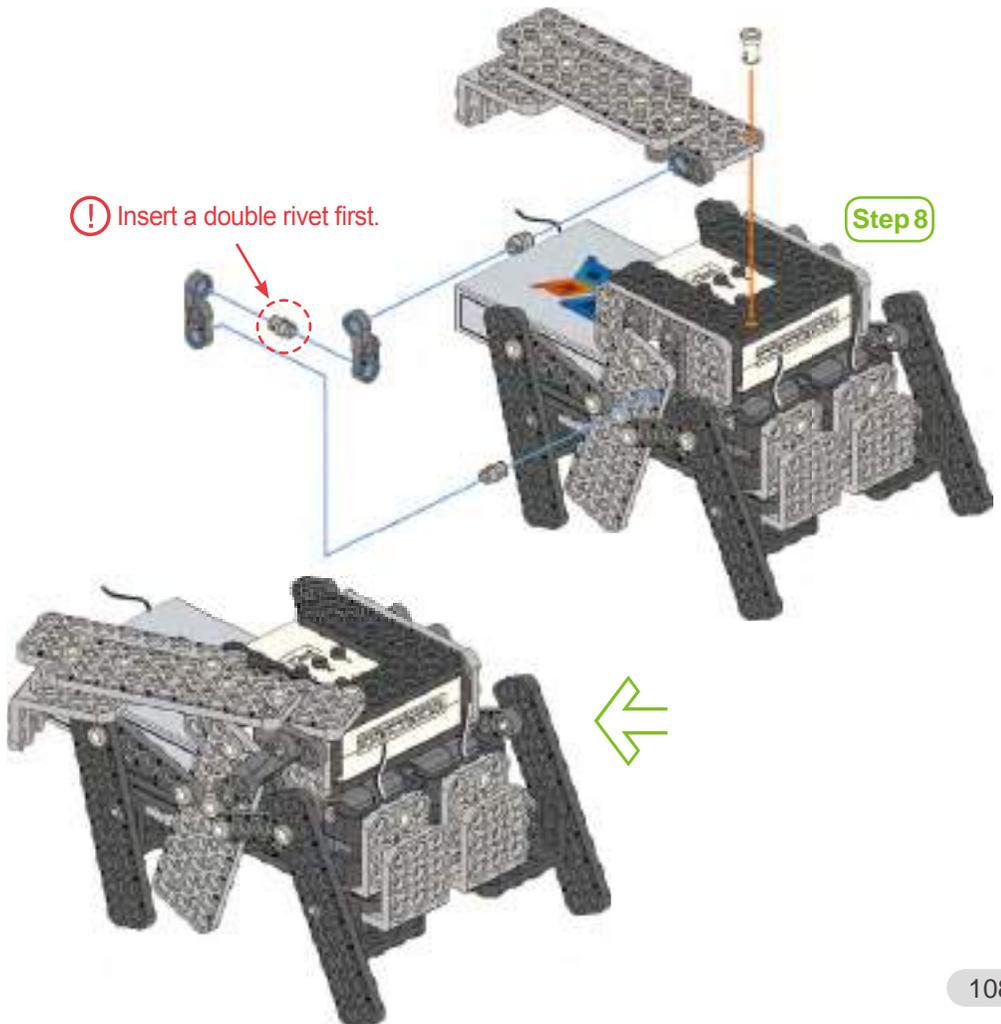
Hinge A X2



2s rivet X1



Double rivet X3



Step 11

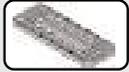
Tip



3x5 frame X1



3x9 frame X1



3x8 slide frame X1



3x5 L frame X1



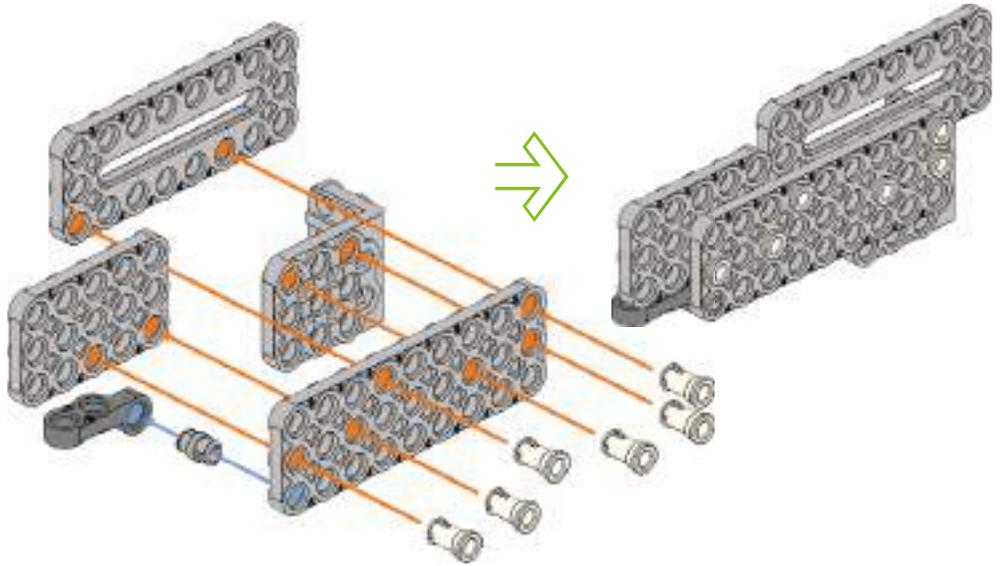
Hinge B X1



2s rivet X6



Double rivet X1



Step 12

Tip



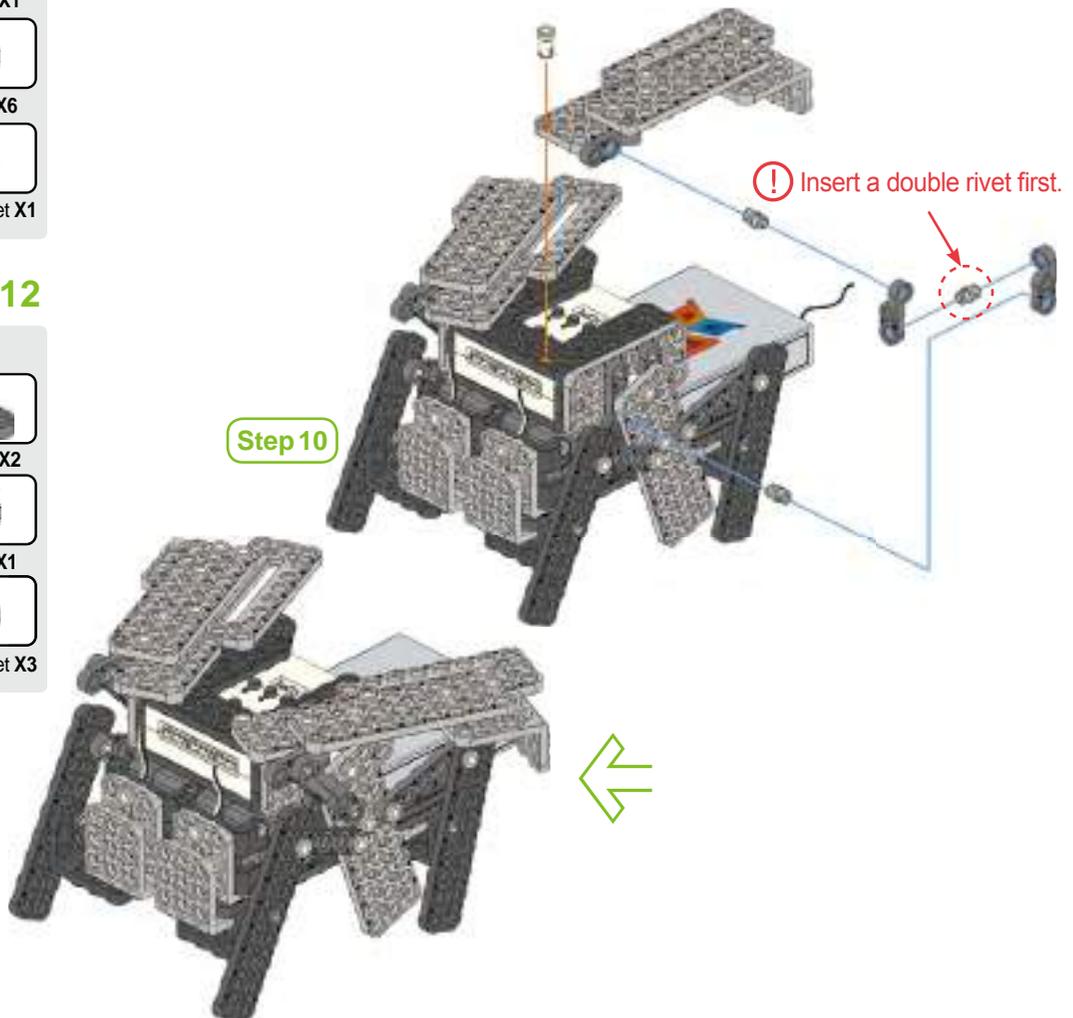
Hinge B X2



2s rivet X1



Double rivet X3



Step 10

! Insert a double rivet first.

According to its function, Bug Bot can be categorized into a lift-up type or a pick-up type. STEP13~14 is for the lift-up type, and STEP15~16 is for the pick-up type. Check out the steps first before assembling.

< Lift-up type Bug Bot assembly >

Step 13

Tip



Smart servo (ID00,01) X2



1x8 frame X4



2x5 frame X2



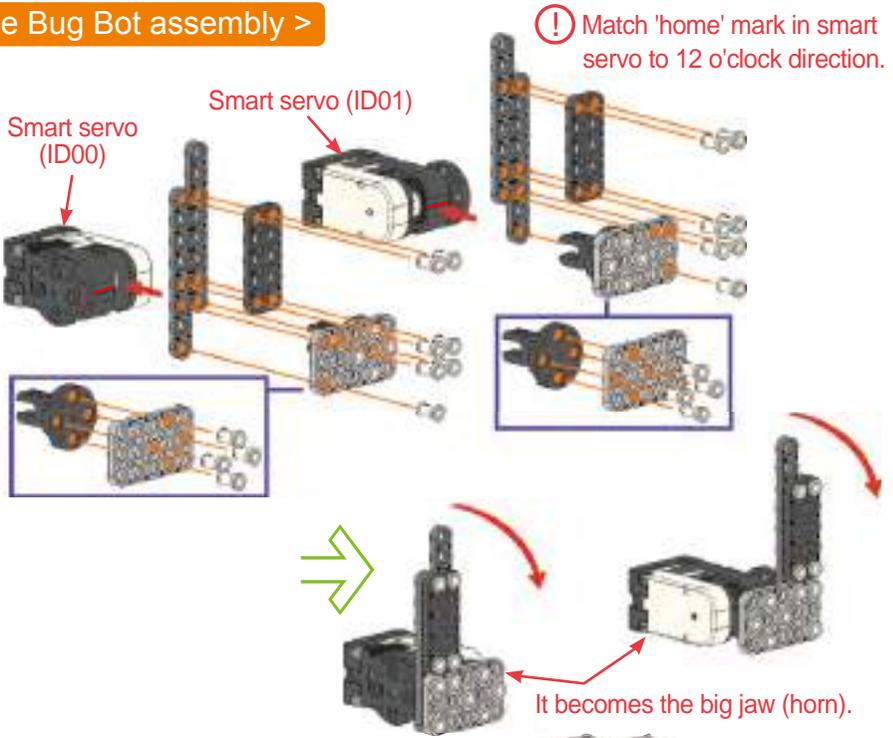
3x5 frame X2



Joint frame X2



2s rivet X22



'Lift-up' type Bug Bot

Step 12

Step 14

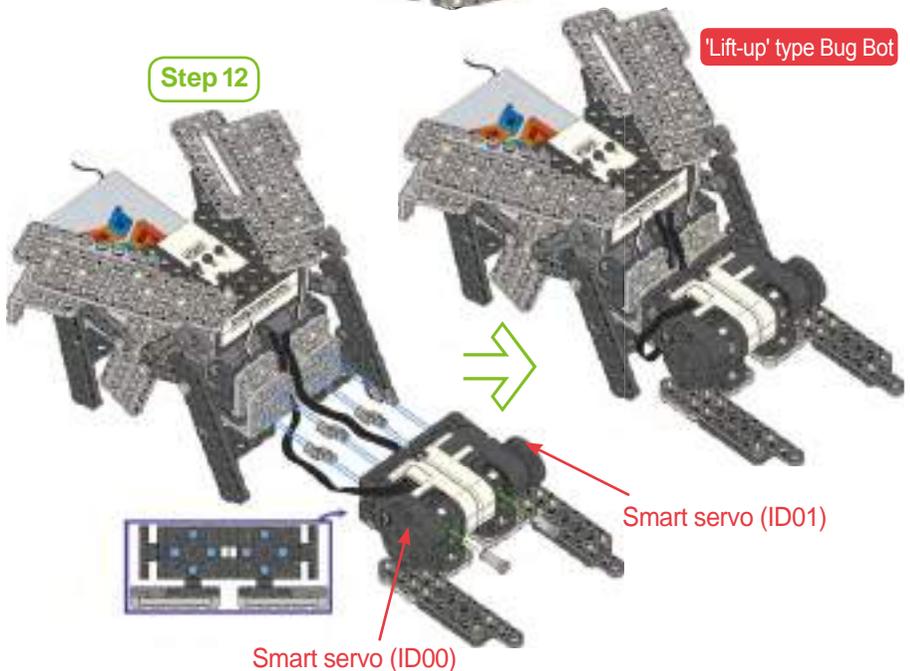
Tip



3s rivet X2



Double rivet X8



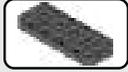
< Pick-up type Bug Bot assembly >

Step 15

Tip



Smart servo (ID00,01) X2



2x5 frame X2



Opposite angle frame X2



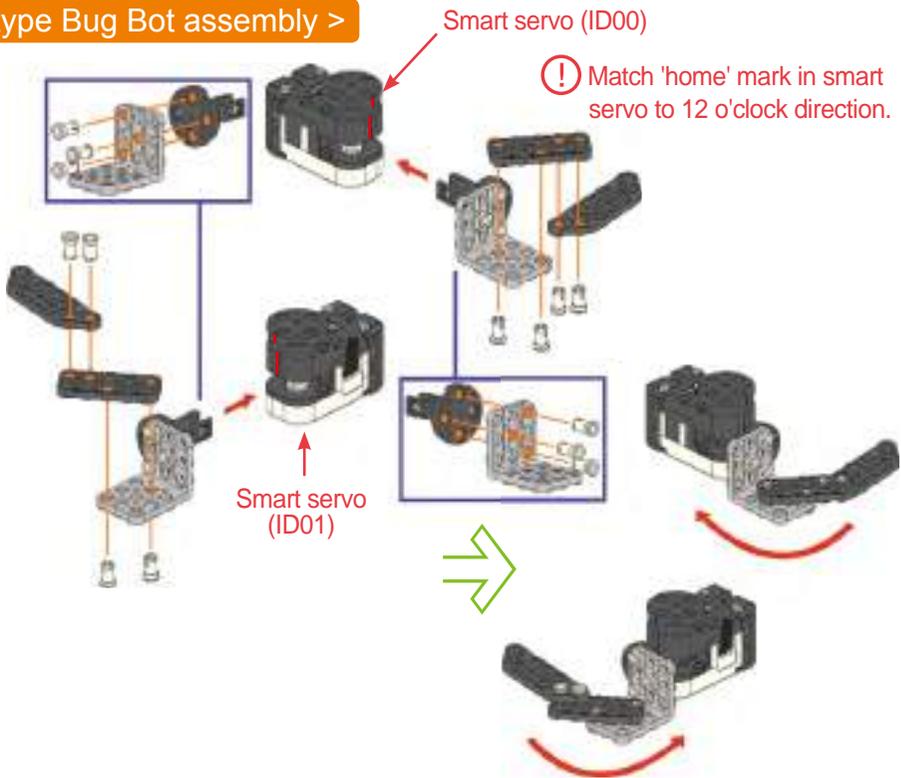
3x6 L frame X2



Joint frame X2



2s rivet X14



Step 16

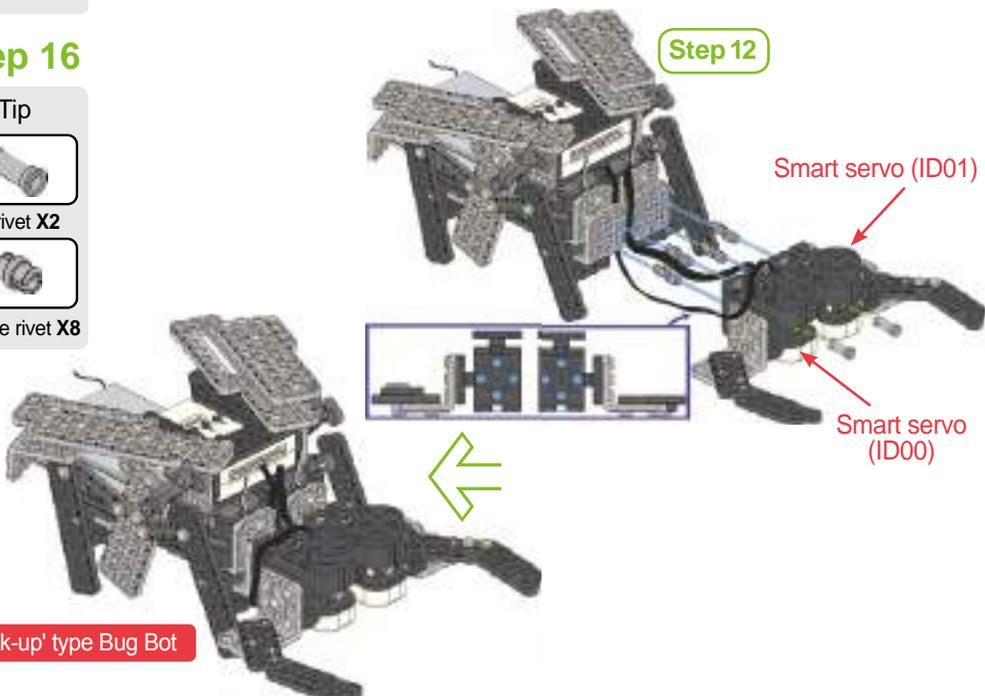
Tip



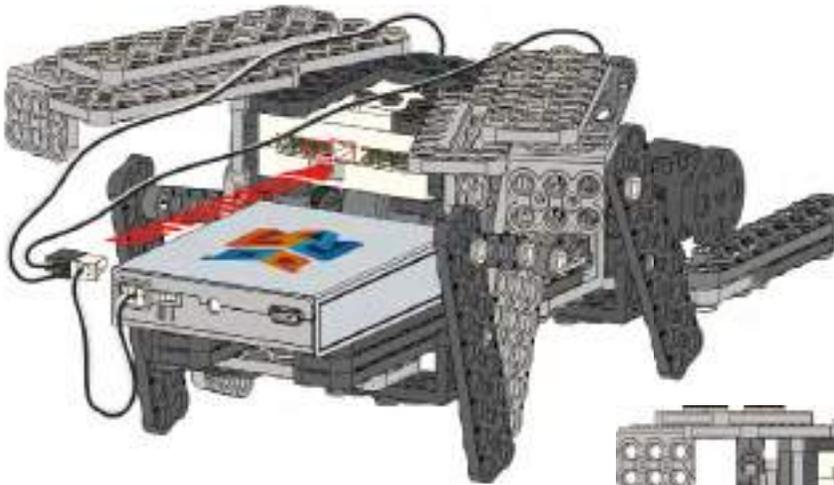
3s rivet X2



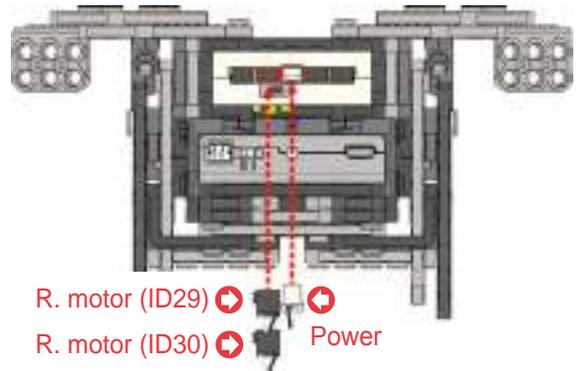
Double rivet X8



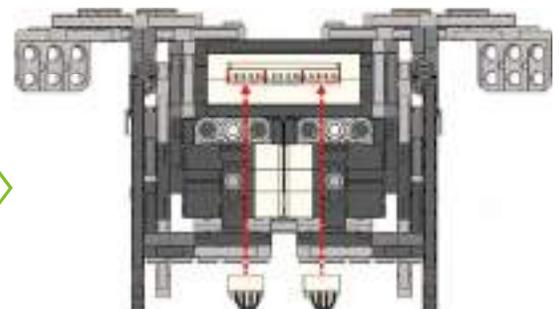
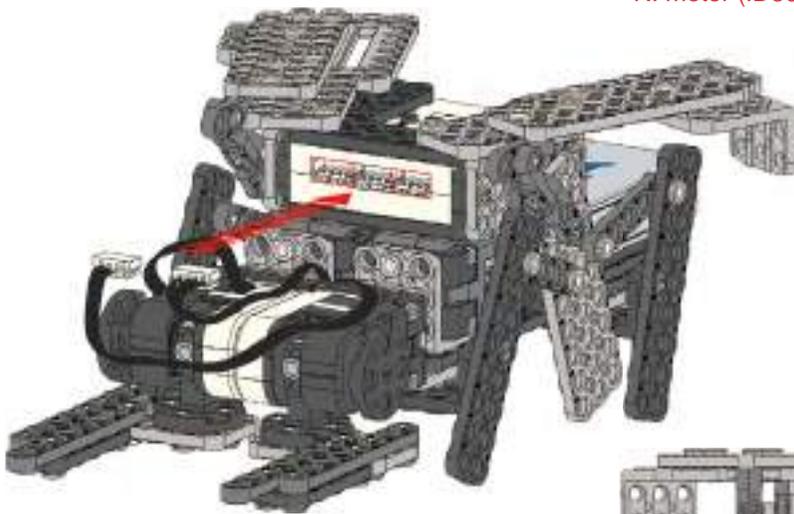
Step 17



Pay attention to cable connection and direction!



Step 18



Smart servo (ID01) ↑ ↑ Smart servo (ID00)



★ 'Bug Bot' is ready! ★



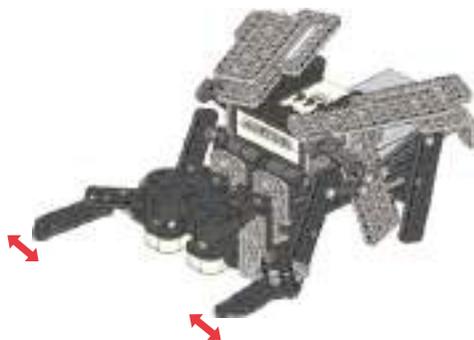
Tip

There are two types of Bug Bot : lift-up type and pick-up type.



Lift-up type Bug Bot

Lifts objects as big jaw moves up and down.



Pick-up type Bug Bot

Picks up objects as big jaw moves left and right.

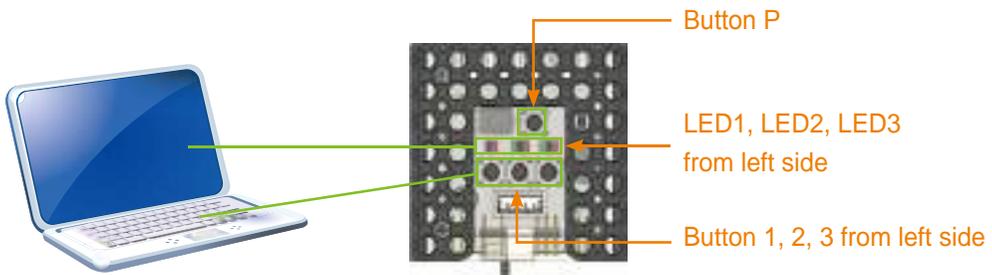


Robot Experience



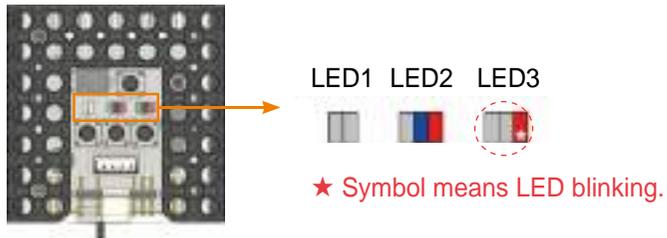
Set-up 'Bug Bot' robot model.

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons work as the keyboard for PC.



First : Turn on the smart controller to enter <set-up mode>.

Second : Press button 2 or button 3 on smart controller to set-up 'Bug Bot' robot model. The buttons work as a keyboard for PC. Program the robot for proper operation.



Third : Press button P on smart controller to enter <standby mode>.

Reassemble after checking the following when robot is not working.

1. When big jaw (horn) of Bug Bot is not moving :
 - ▶ Check smart servo ID and cable connection.
2. When Bug Bot is not moving with 6 legs :
 - ▶ Refer to STEP7~8, and check (leg part) assembly and rotation motor ID.



Check movement and assembly.

1. Put 'O' for true, and put 'X' for false.

- (1)  button  Lift both sides of the jaw.
()
- (2)  button  Lower both sides of the jaw.
()
- (3)  button  Lift right side of the jaw up-and-down.
()
- (4)  button  Lift both sides of the jaw up-and-down.
()
- (5)  button  Lift the left side of the jaw up-and-down.
()
- (6)  +  button  Go forward, and move up-and-down. ()
- (7)  +  button  Go backward, and move up-and-down. ()

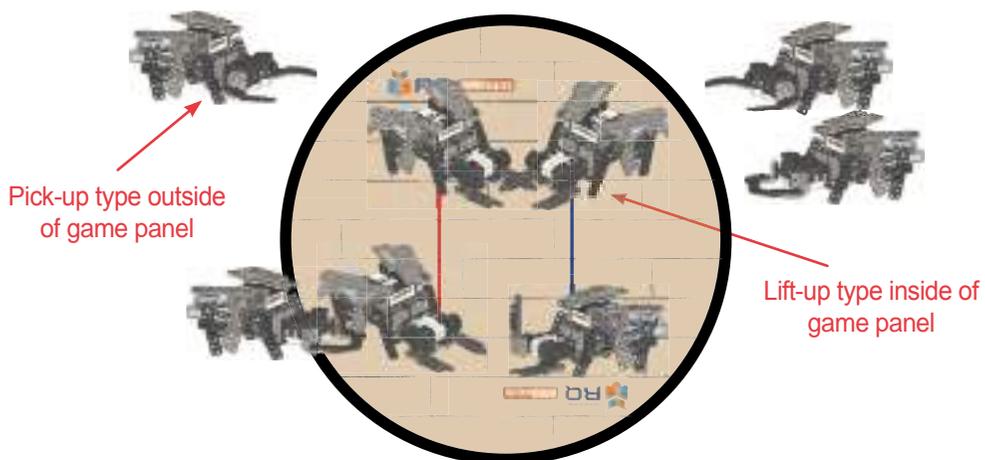
Robot Play



Push and pull.

Bug Bot uses a smart servo to move the big jaw up and down or left and right so that you can attack the opposite player. Make a team and play a push or pull game inside the game panel.

- Play 3 vs. 3 or 4 vs. 4 with friends.
- Assemble a lift-up type Bug Bot.
→ Use the big jaw to turn the opposite robot over or push out from the game panel.
- Assemble a pick-up type Bug Bot.
→ Use the big jaw to pull the opposite robot to outside of the game panel.
- Bug Bot inside of game panel cannot get out of game panel and vice versa. However, if the Bug Bot is placed outside the game panel, its head (jaw and smart servo) can enter the panel to pull the opposite robot.
- Game time is 3 minutes and whoever pushes the opposite player out more wins the game.



◆ Describe your 'Bug Bot'.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



8. Transport Bot

Pascal's principle

1 On three, pick up the balls and move!

Ok. I've got this game! watch me win!

2 Oh! It's the transport Bot! It's like a forklift, picking up objects.

Then, how does a forklift pick up heavy objects?

3 With Pascal's law.

It's a magical law where you can lift a heavy thing with only little power!

4 Pascal's law is defined as a change in pressure at any point in an enclosed fluid at any point in an enclosed fluid at rest is transmitted undiminished to all points in the fluid.

5 In other words, although you apply little strength at the small area of the container, if the area of the opposite side is large, it turns into great strength.

Squeezing the bottom of toothpaste to push out the content is also Pascal's law.

6 If you squeeze the bottom of toothpaste, toothpaste comes out because the pressure is delivered to the entire toothpaste.

Garbage collecting cars and forklift also use Pascal's law so that they can lift heavy objects with little power.



Today's Robot Class



Transport Bot uses tongs to pick up and move an object. It also picks up an object to place it on other robot's loading bay. Let's assemble the Transport Bot and operate it. Compare it with other type of vehicles. Plus, you can even play a relay race game with other friends!



Robot arm does dangerous work and repetitive task for human.



Robot arm looks like a human arm, and it does repetitive tasks instead of human. Just like we need joint and muscle to move, a robot arm needs motors and joints. To move like a real arm, you need to control the motor angle, speed and torque, and we call this device servo motor.





Robot Assembly



Prepare robot parts.



Tips.

Our fingers have a fingerprint. Fingerprint makes the tip of our finger less slippery so we can hold an object more tightly. Rubber pad on the Transport Bot works like fingerprint. Place a rubber pad on the frame and push it in to fix the rubber pad to the frame.



Step 1 X2

Tip



R. motor (ID29) X1



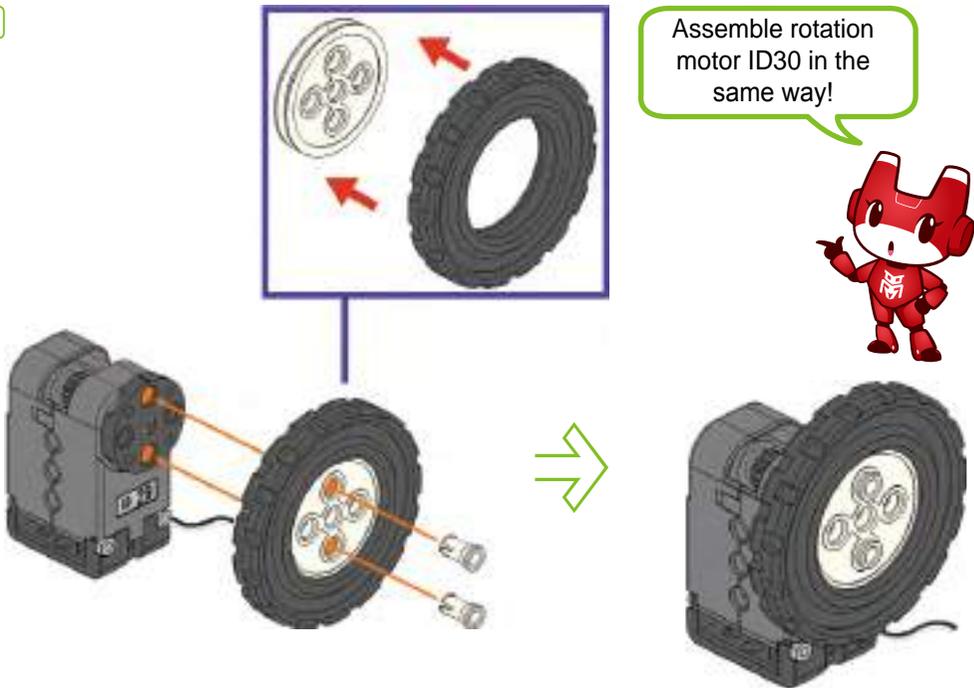
Wheel X1



Tire X1



2s rivet X2



Step 2

Tip



2x7 frame X1



2x9 frame X1



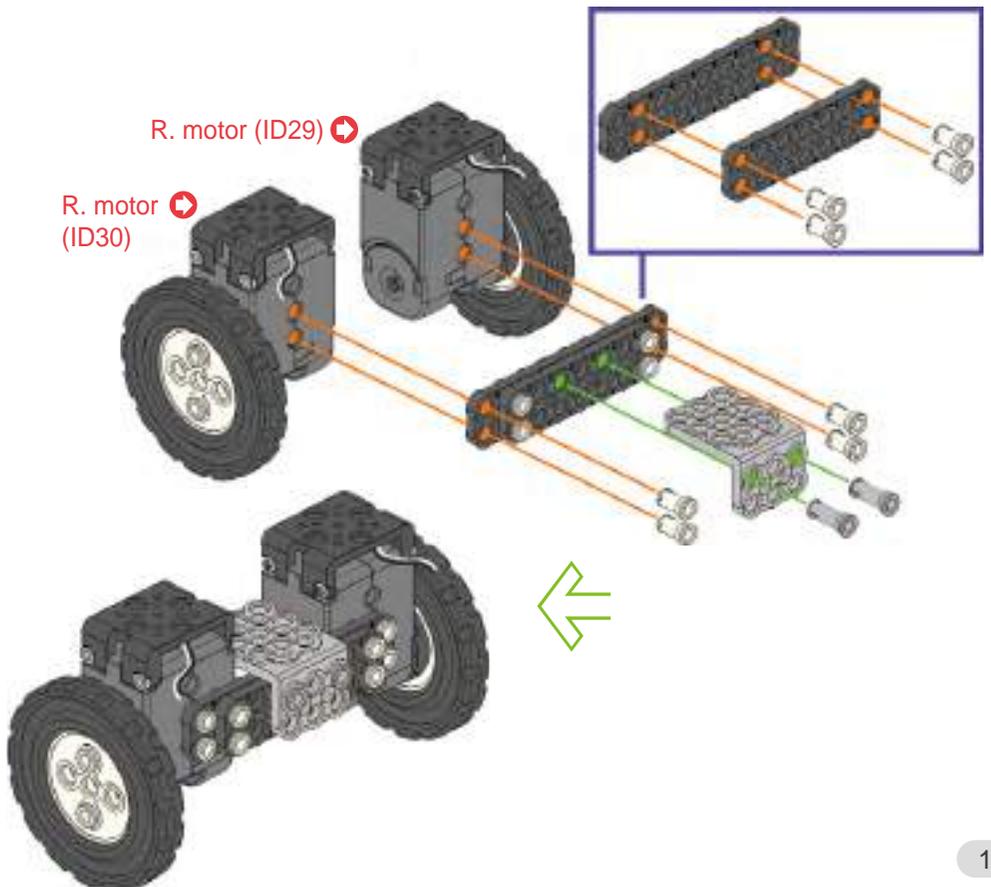
3x5 L frame X1



2s rivet X8



3s rivet X2



Step 3

Tip



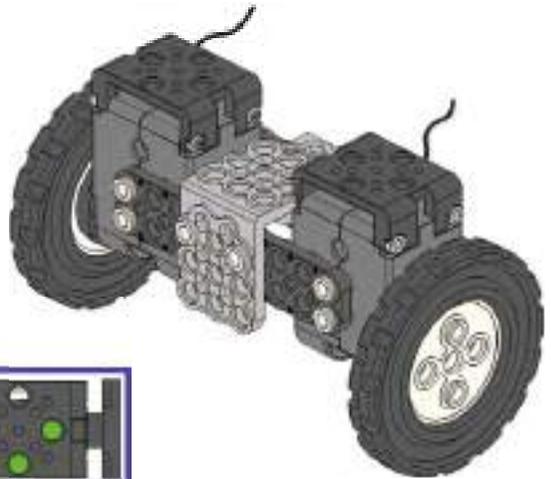
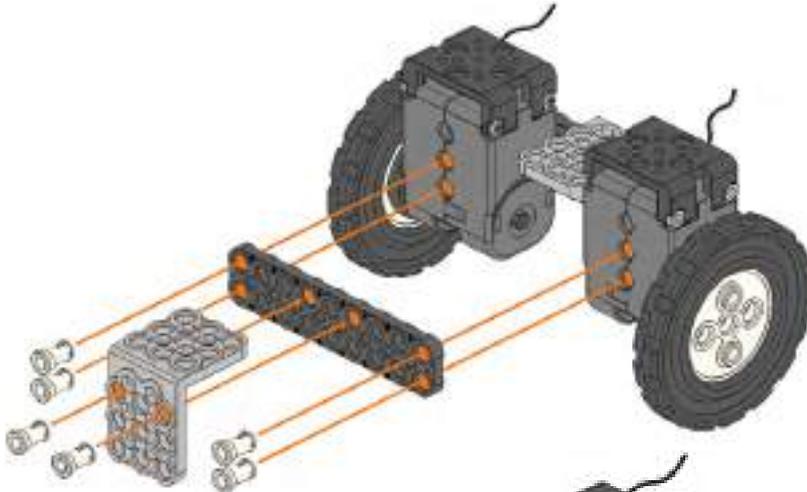
2x9 frame X1



3x6 L frame X1



2s rivet X6



Step 4

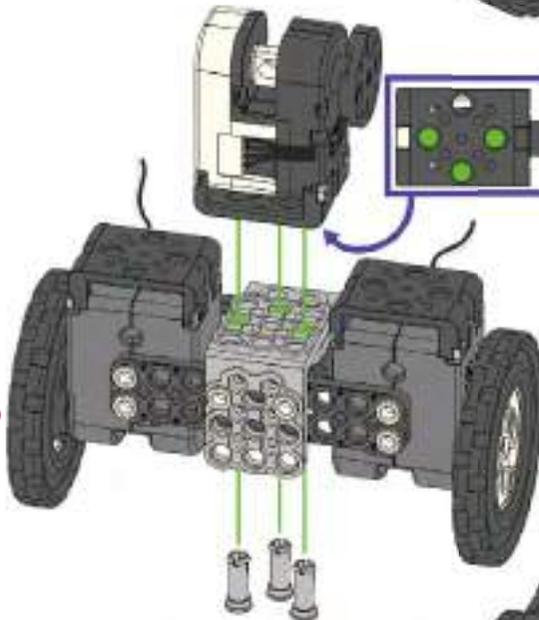
Tip



Smart servo (ID00) X1



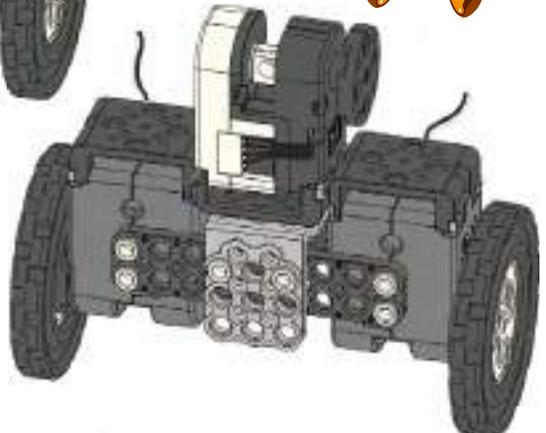
3s rivet X3



Use smart servo ID00.

R. motor (ID29)

R. motor (ID30)



Step 5

Tip



2x15 frame X2



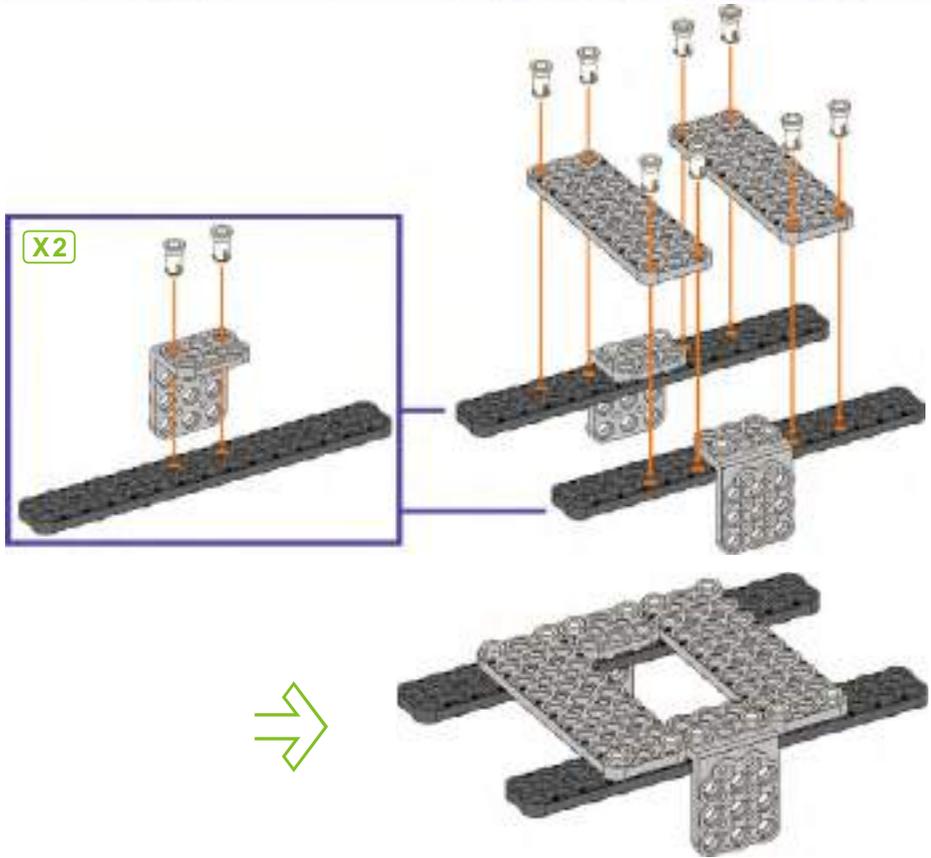
3x9 frame X2



3x5 L frame X2



2s rivet X12



Step 6

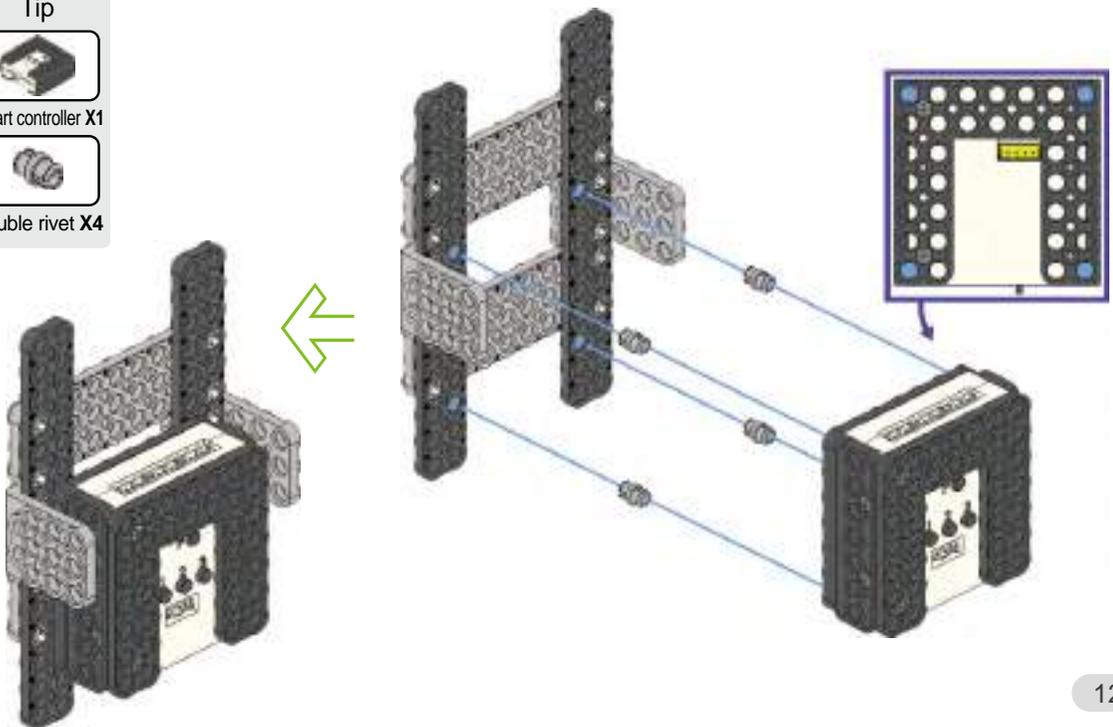
Tip



Smart controller X1



Double rivet X4



Step 7

Tip



3x9 frame X3



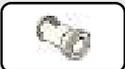
5x5 frame X2



2x4 L frame X2



Wheel X2



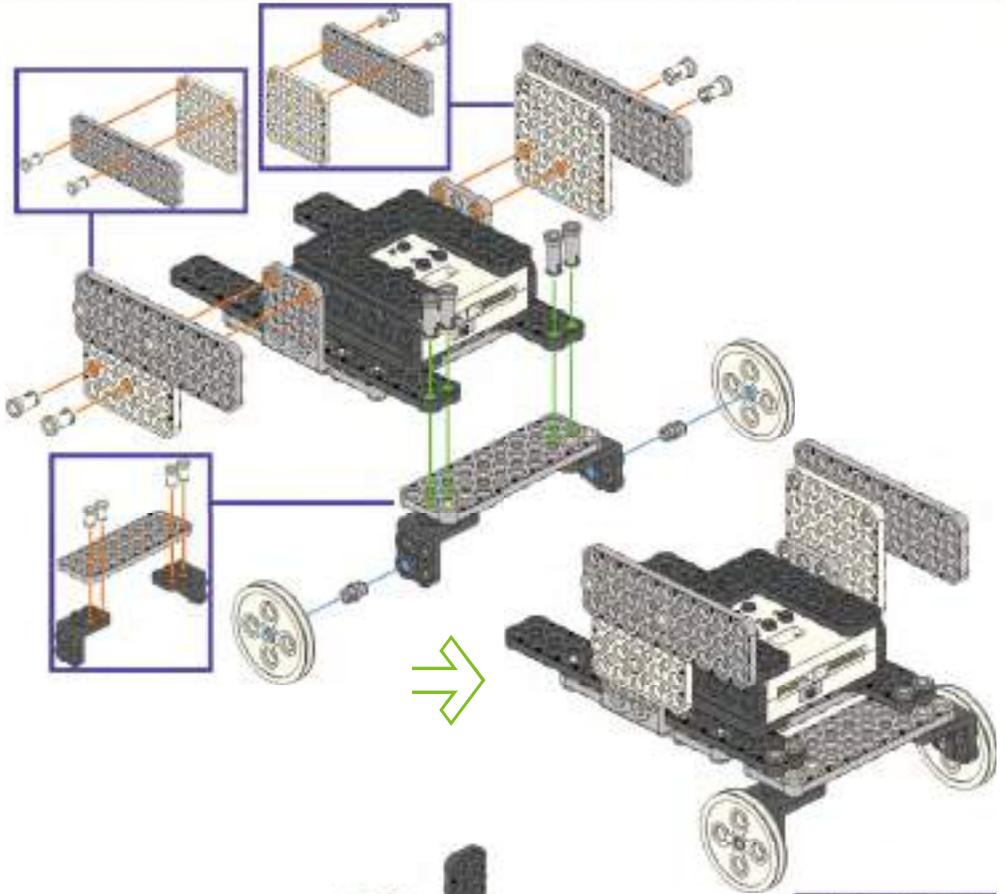
2s rivet X12



3s rivet X4



Double rivet X2



Step 8

Tip



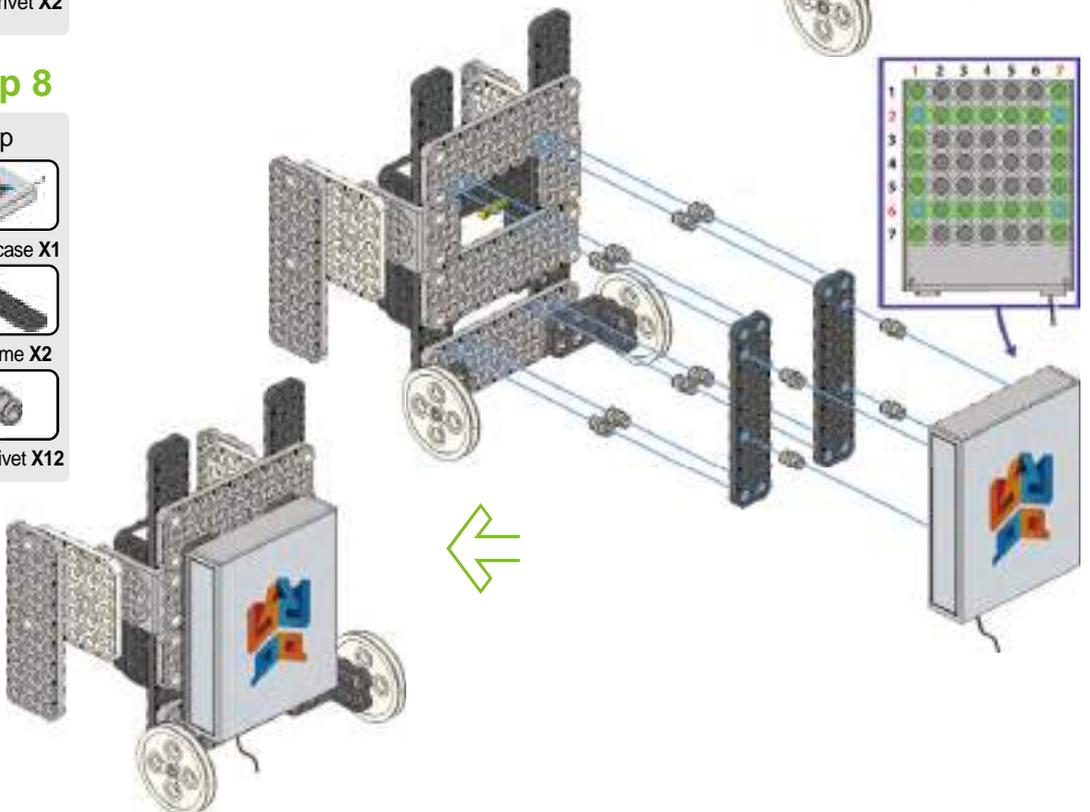
Battery case X1



2x9 frame X2



Double rivet X12

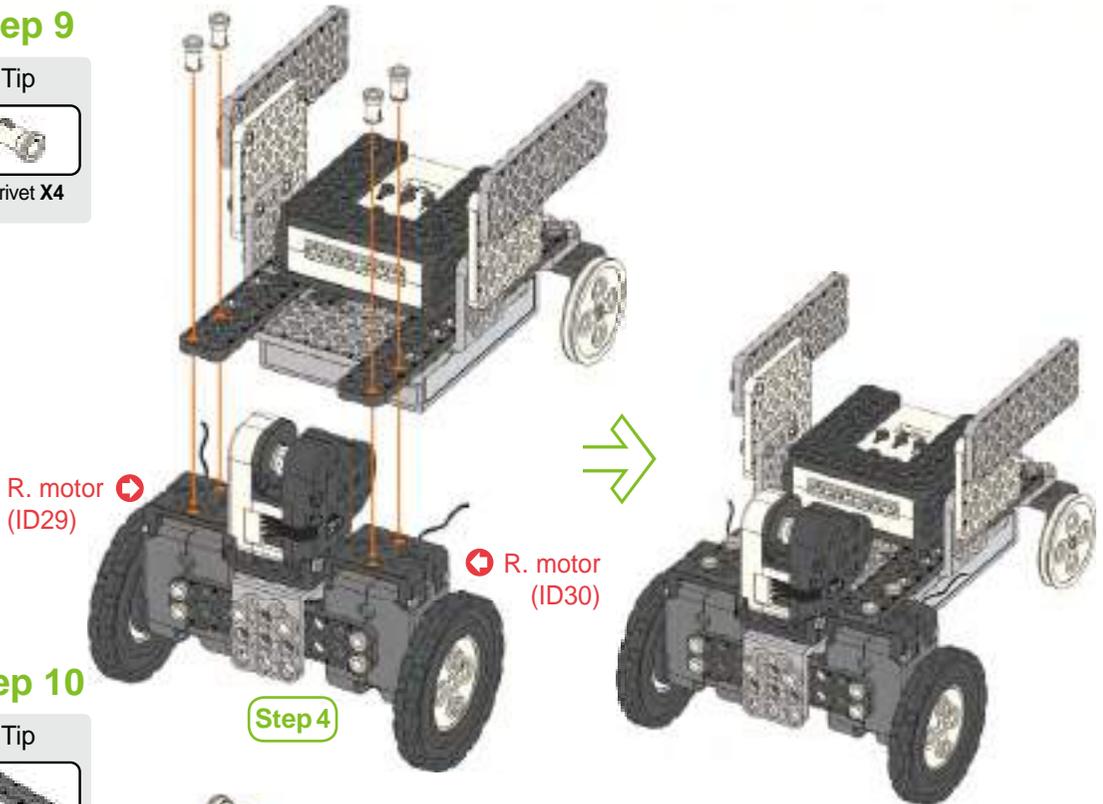


Step 9

Tip

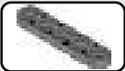


2s rivet X4

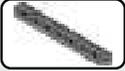


Step 10

Tip



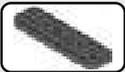
1x5 frame X1



1x8 frame X2



2x5 frame X2



2x7 frame X1



3x5 L frame X1



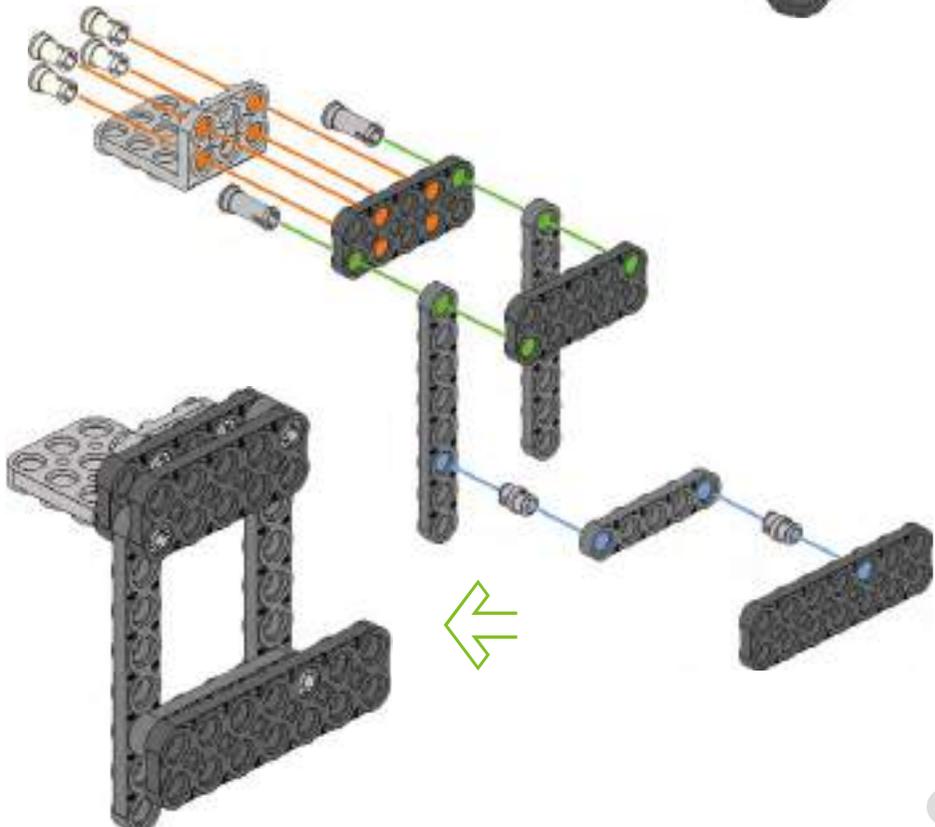
2s rivet X4



3s rivet X2



Double rivet X2



Step 11

Tip



3x3 frame X1



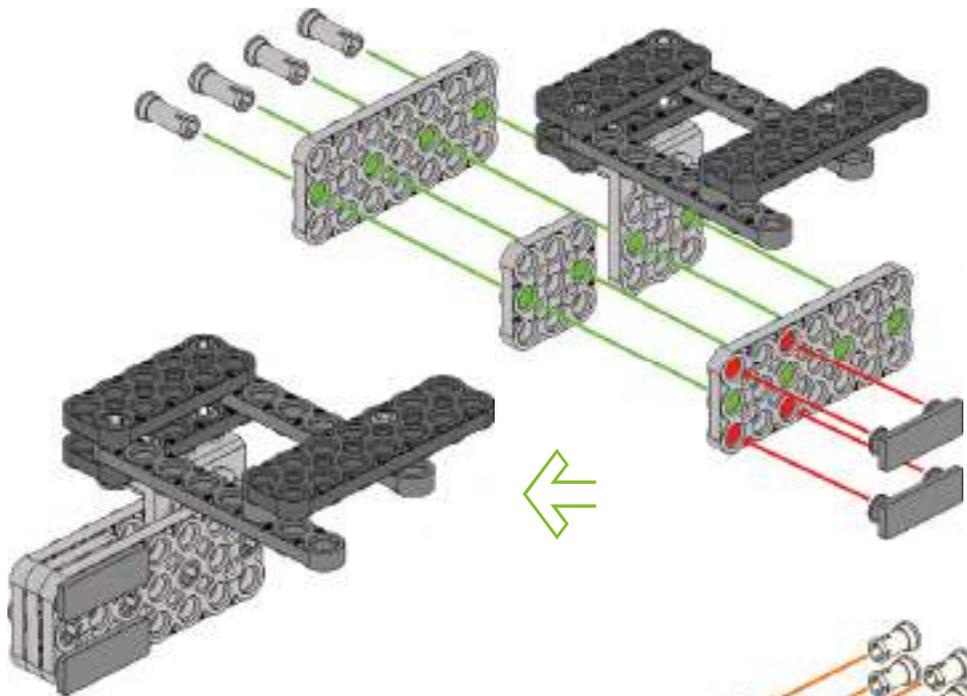
3x7 frame X2



Rubber pad X2

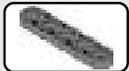


3s rivet X4



Step 12

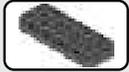
Tip



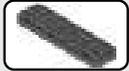
1x5 frame X1



1x8 frame X2



2x5 frame X2



2x7 frame X1



3x5 L frame X1



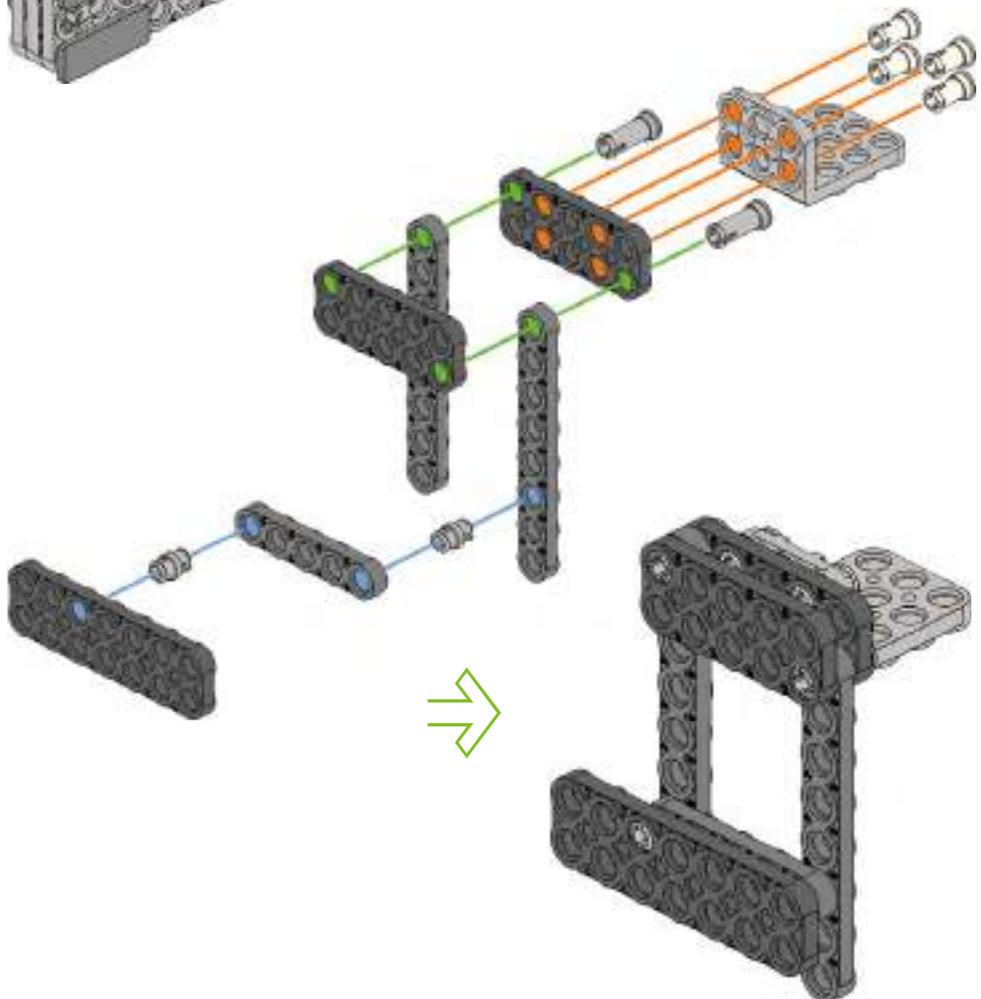
2s rivet X4



3s rivet X2



Double rivet X2

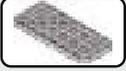


Step 13

Tip



3x3 frame X1



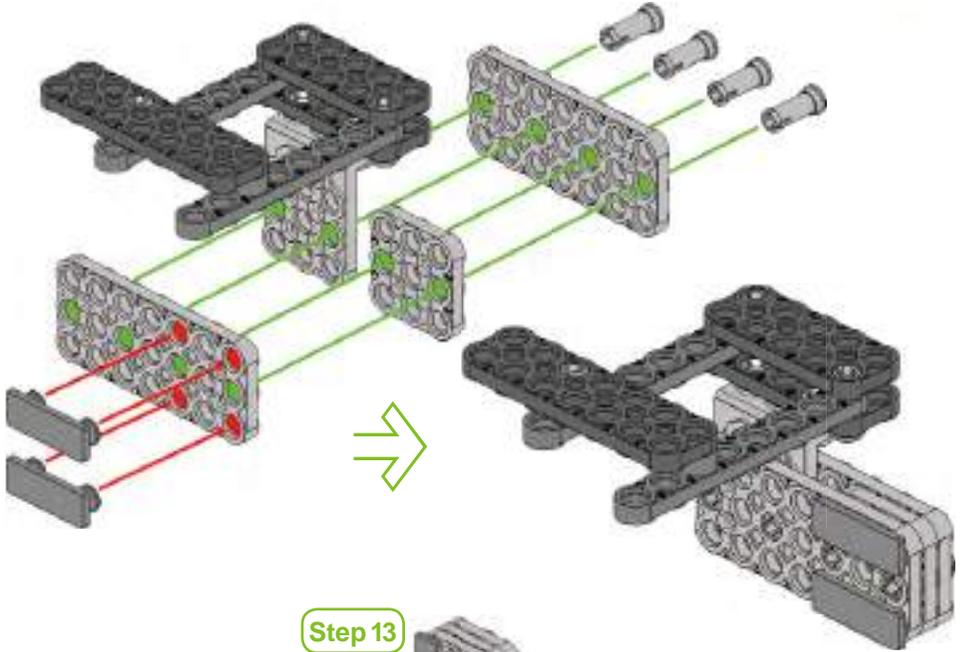
3x7 frame X2



Rubber pad X2



3s rivet X4



Step 13

Step 14

Tip



1x5 frame X2



5x5 frame X1



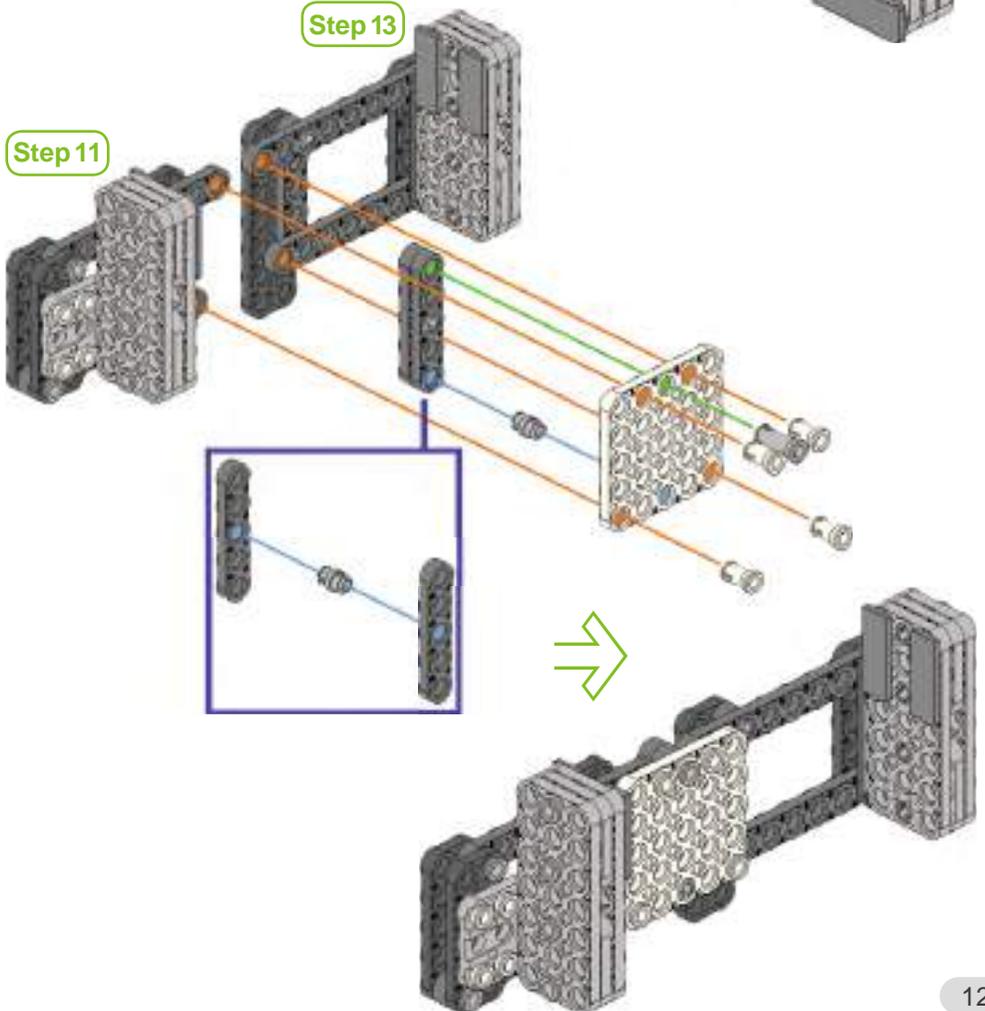
2s rivet X4



3s rivet X1



Double rivet X2



Step 11

Step 15

Tip



1x3 frame X2



1x7 frame X2



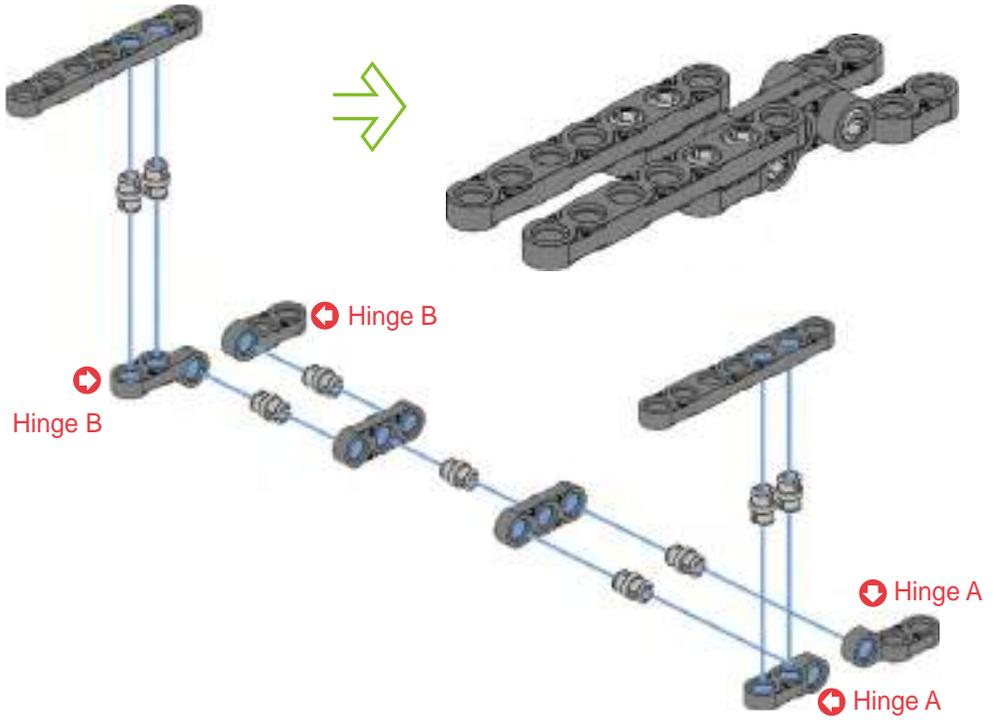
Hinge A X2



Hinge B X2



Double rivet X9

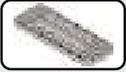


Step 16

Tip



3x7 frame X2



3x8 slide frame X1



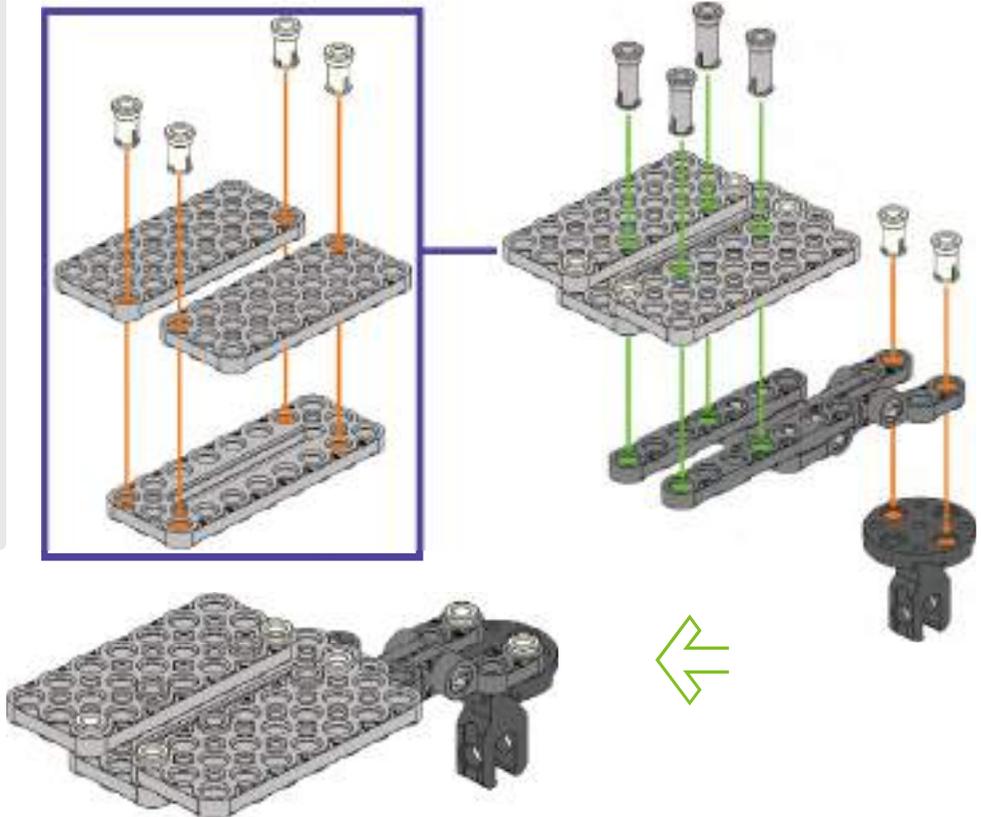
Joint frame X1



2s rivet X6



3s rivet X4



Step 17

Tip



Smart servo (ID01) X1



3x6 L frame X2



Joint frame X1



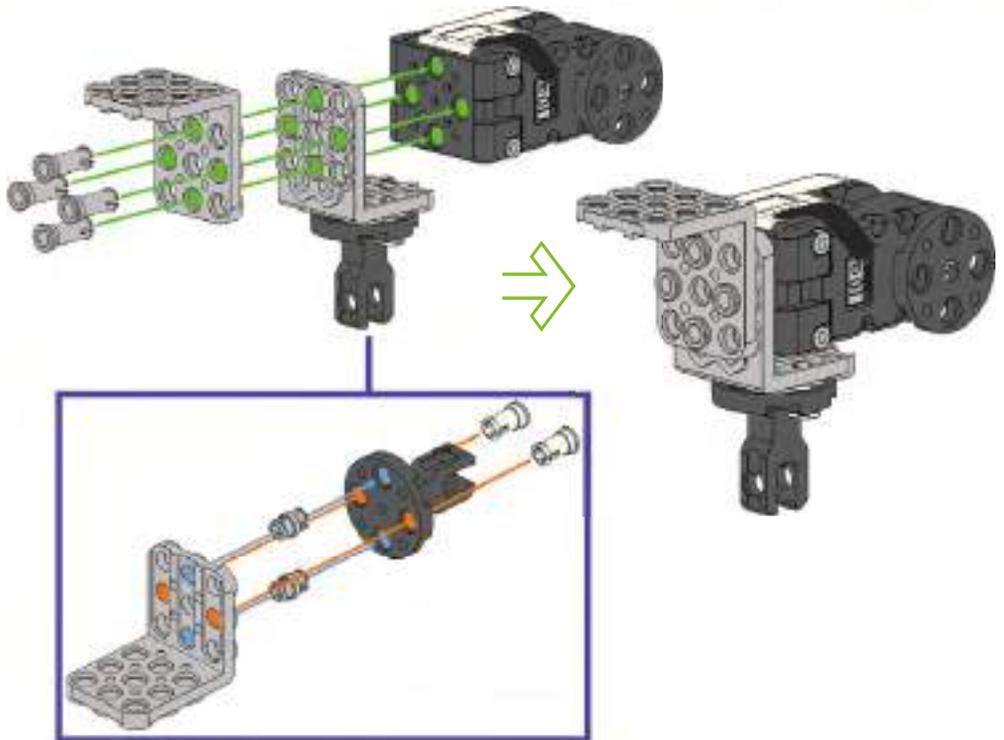
2s rivet X2



3s rivet X4



Double rivet X2



Step 18

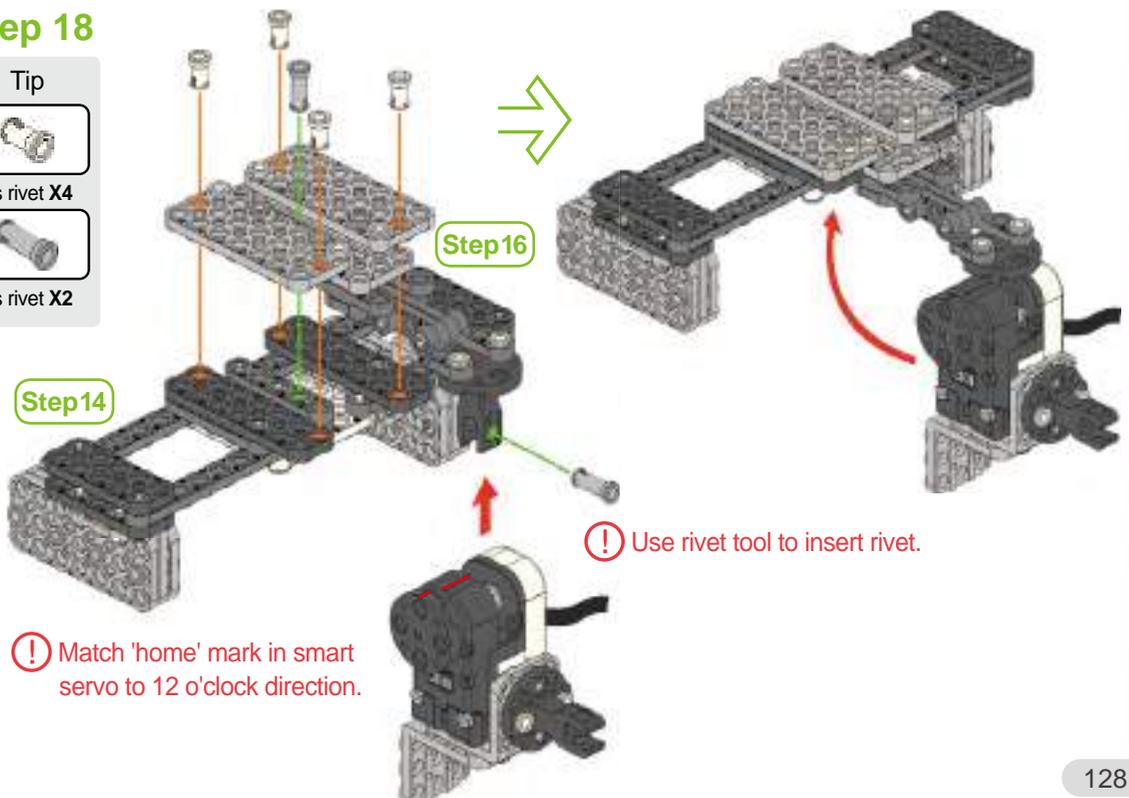
Tip



2s rivet X4



3s rivet X2



⚠ Match 'home' mark in smart servo to 12 o'clock direction.

⚠ Use rivet tool to insert rivet.

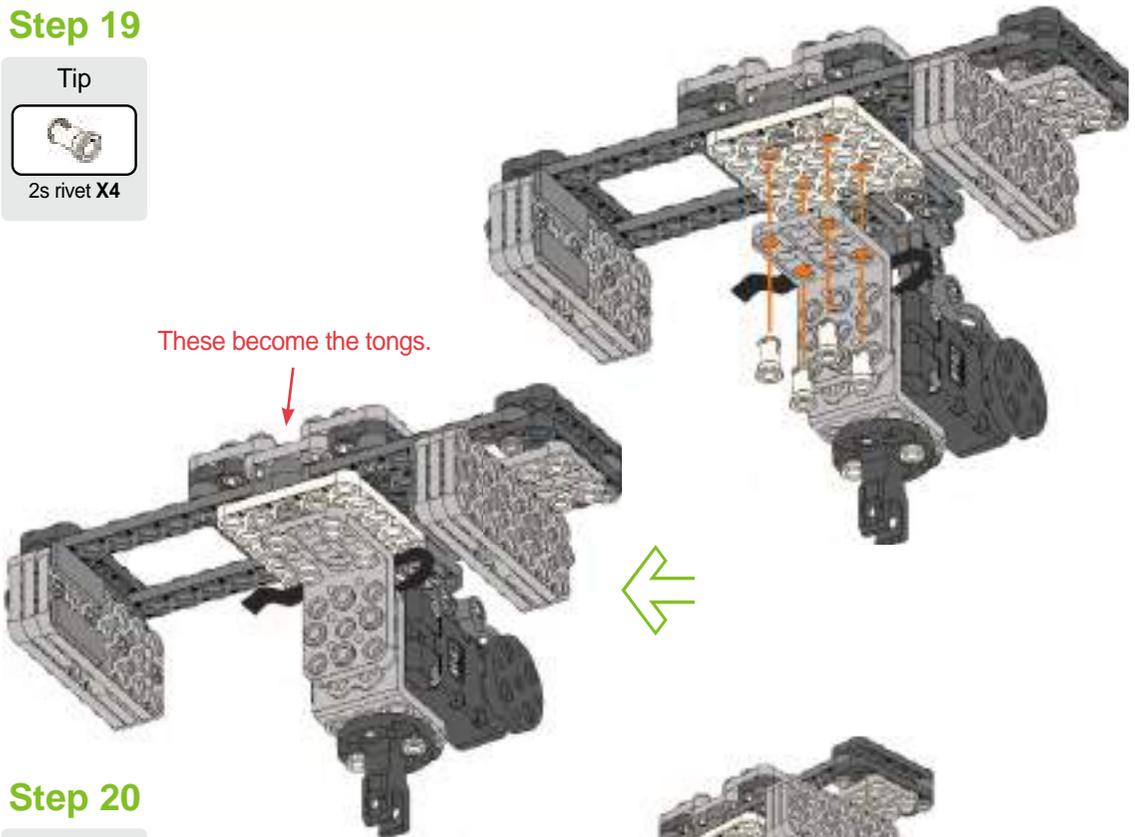
Step 19

Tip



2s rivet X4

These become the tongs.

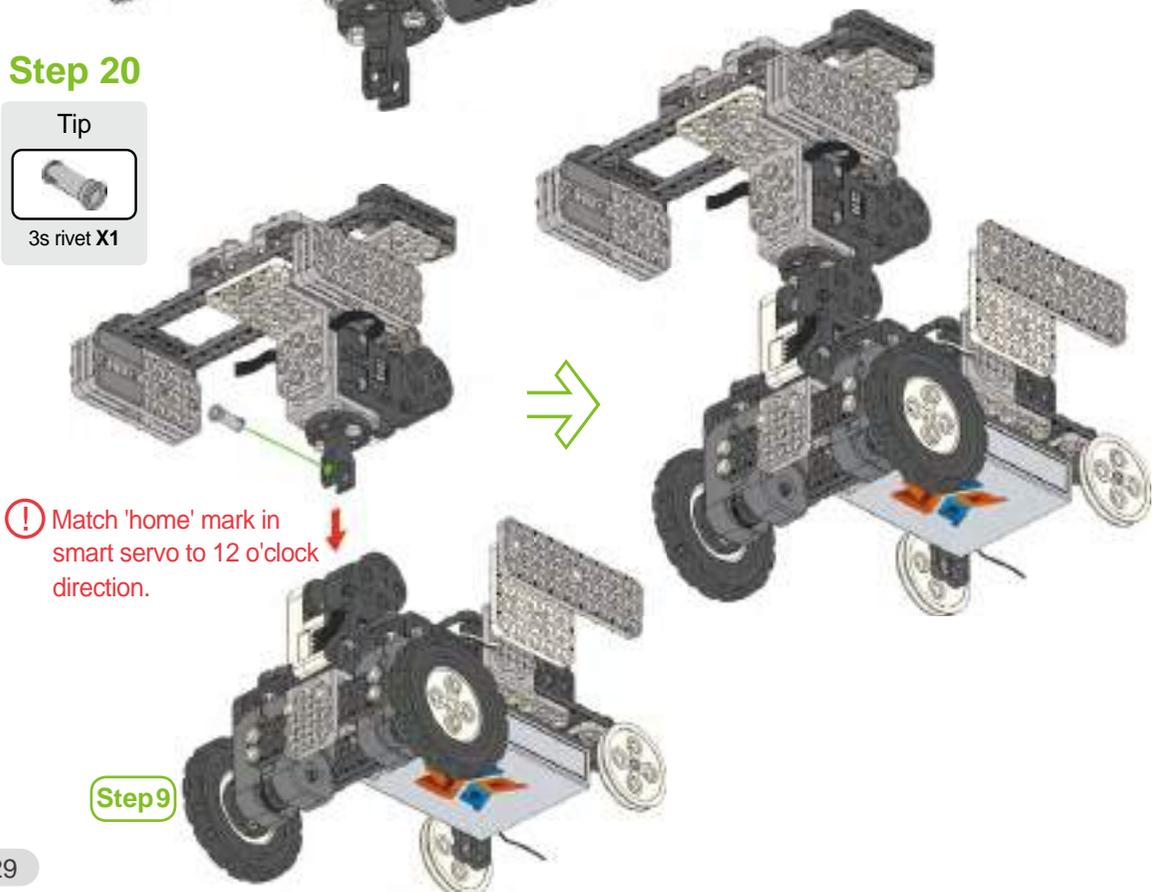


Step 20

Tip



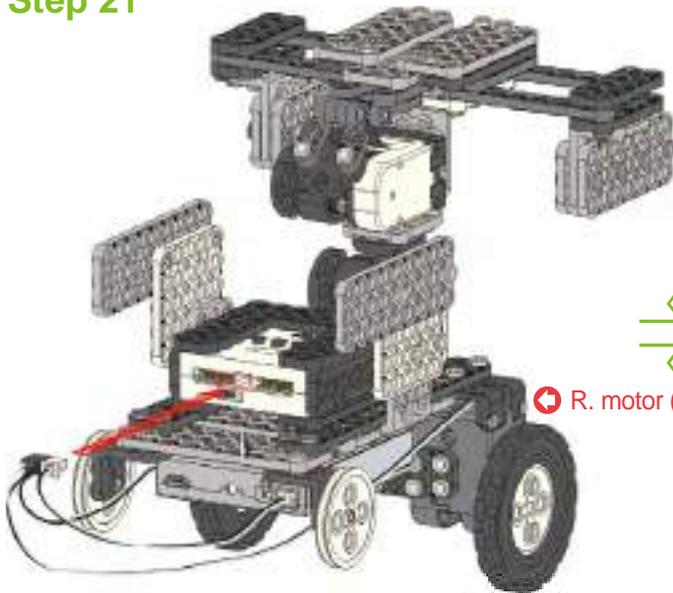
3s rivet X1



! Match 'home' mark in smart servo to 12 o'clock direction.

Step 9

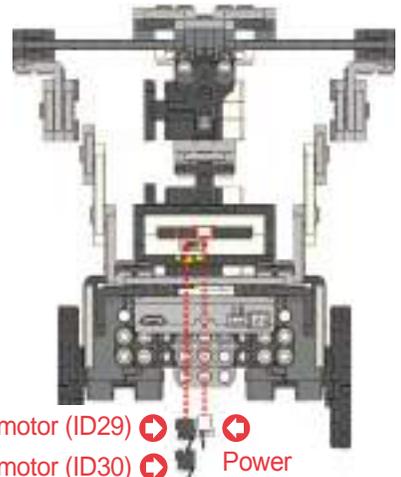
Step 21



⚠ Pay attention to cable connection and direction.



➡ R. motor (ID29)



R. motor (ID29) ➡
R. motor (ID30) ➡ Power

Step 22

Tip



3x9 frame X1



5x5 frame X1



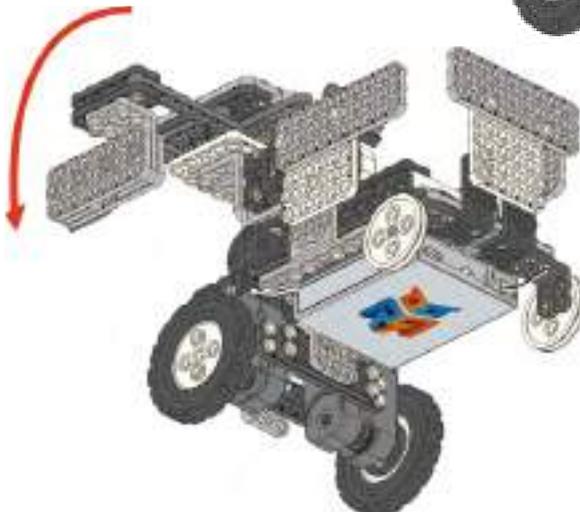
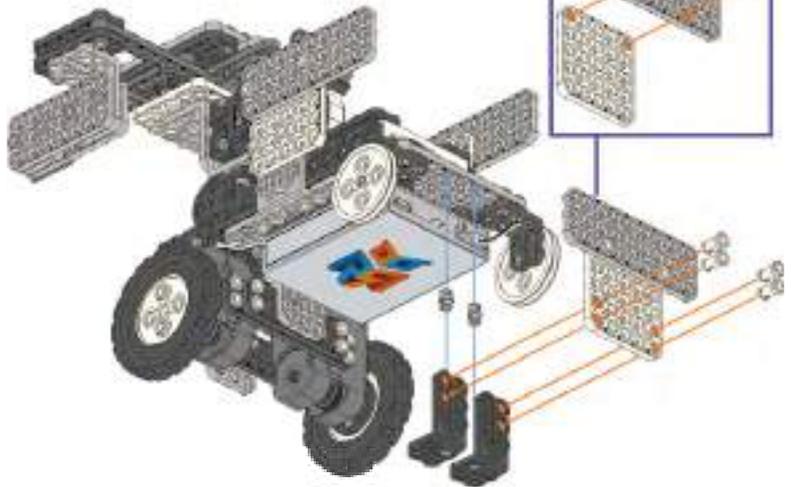
2x5 L frame X2



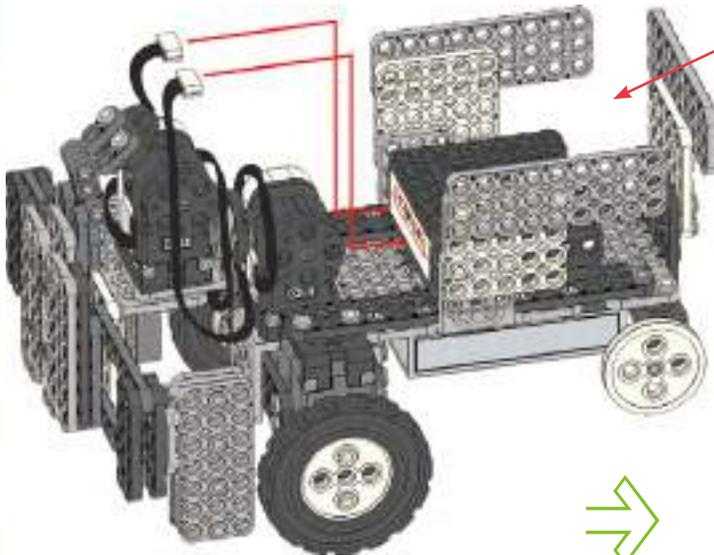
2s rivet X6



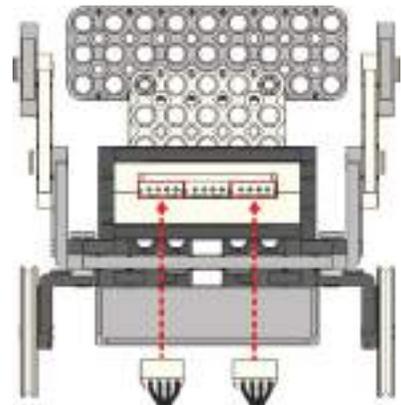
Double rivet X2



Step 23



This is a loading bay.

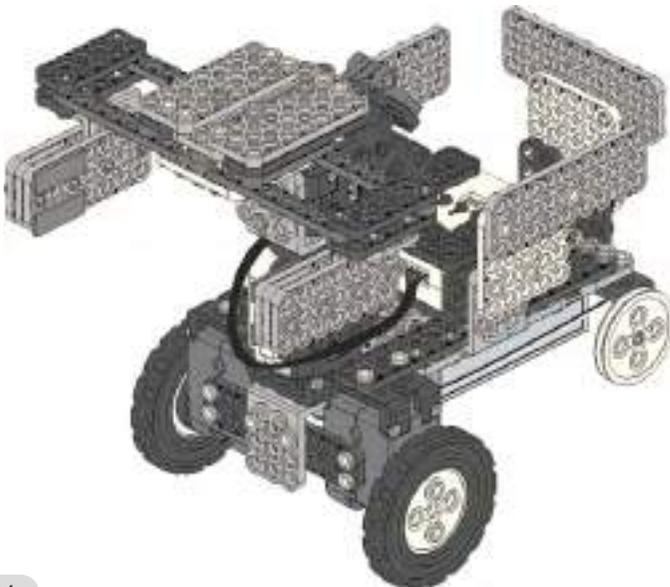


Smart servo (ID00) ⬆

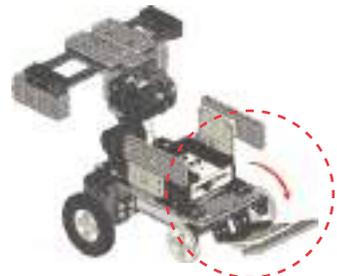
⬆ Smart servo (ID01)



★ 'Transport Bot' is ready! ★



You can separate the loading bay from the Transport Bot to control the power S/W.



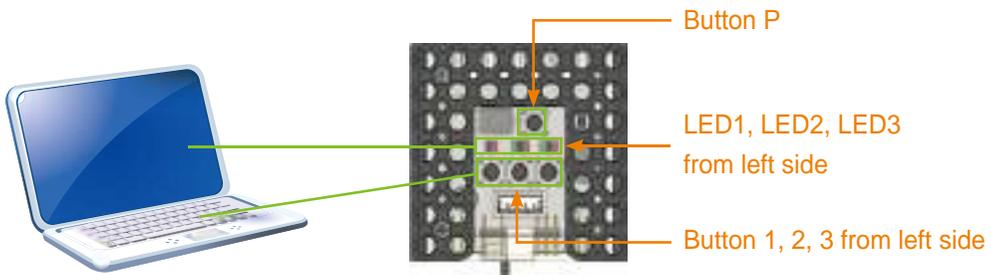


Robot Experience



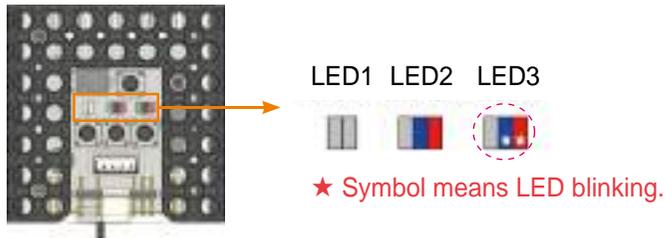
Set-up 'Transport Bot' robot model.

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons work as the keyboard for PC.



First : Turn on the smart controller to enter <set-up mode>.

Second : Press button 2 or button 3 on smart controller to set-up 'Transport Bot' robot model. The buttons work as a keyboard for PC. Program the robot for proper operation.



Third : Press button P on smart controller to enter <standby mode>.

Reassemble after checking the following when robot is not working.

1. When Transport Bot tongs are not moving :
 - ▶ Refer to assembly guide for slide structure and smart servo ID.
2. When Transport Bot is not moving forward or backward or not rotating :
 - ▶ Refer to STEP21, and check rotation motor ID and cable connection.



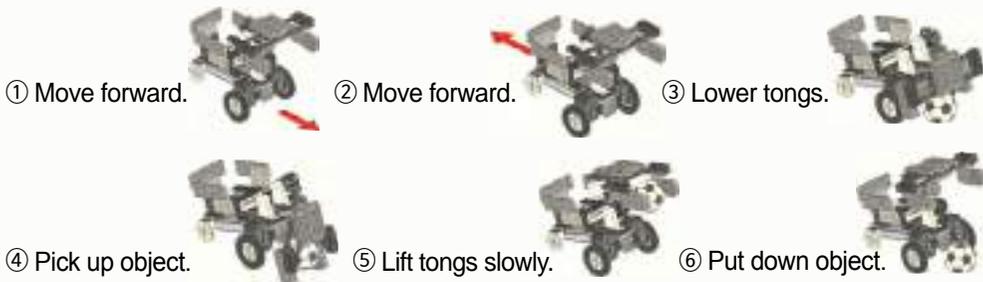
Check movement and assembly.

1. Which Transport Bot would be best at picking up an object?



2. Match the IR remote controller buttons with the corresponding action from the example.

★ Examples ★



(1) **A** button: _____

(2) **B** button: _____

(3) **1** button: _____

(4) **3** button: _____

Robot Play



Move after picking up a ball.

Host a relay race game with friends by using the Transport Bot and a soccer ball. Prepare the Transport Bot and a soccer ball first.

- Start from 'START' position and race.
- Play the game as below.



Pick up a soccer ball and race to the next player.



Pass the soccer ball to the next player's loading bay.



Next player picks up the soccer ball and race to the next player.

- Last player should put the ball down at 'START' position.
- Whoever arrives to finish line first wins the game.



You can place a hurdle or an obstacle on the track! Add more rules if you would like!



◆ Describe your 'Transport Bot'.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



9. Shooting Bot

Parabolic motion

①

Take my bean bag!



Ah~ Why does my bean bag keep going to the wrong side?

②

I threw my bean bag towards the big gourd, but I keep missing it.



Because your bean bag flies in a projectile motion.

③

Projectile motion?



Yeah, your bean bag flies up and then draws a curve in the air. That's called projectile motion.

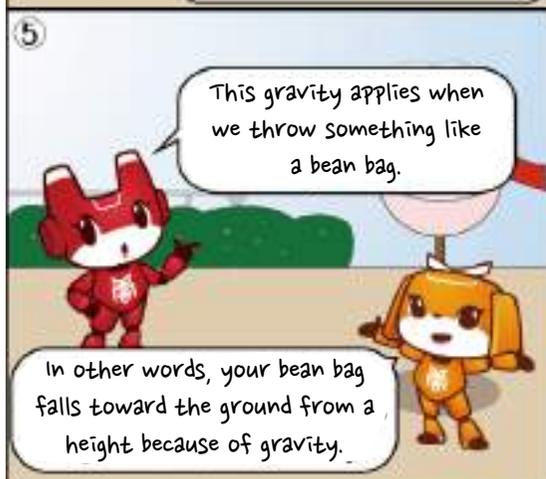
④

Apple falls down from an apple tree, and a ball falls down when you kick a ball high. All these are because of gravity. Gravity refers to the strength of earth pulling down objects towards the ground.



⑤

This gravity applies when we throw something like a bean bag.



In other words, your bean bag falls toward the ground from a height because of gravity.

⑥

And the angle you throw decides how far or how high the bean bag will go.





Today's Robot Class



Shooting Bot looks like a catapult and it uses the elastic force of rubber ring and principle of lever. With more elastic force, it can shoot further, and longer arm also means you can shoot further.

The angle of shooting arm decides whether the object would fly far or near. Normally, a 45° angle is the best angle to throw if you want to throw far. This fact has been proved by mathematical theories!



You can find a catapult in the movie 'Lord of the Ring'. It was used to break enemy's rampart a long time ago during the Roman era or in ancient Greece. Catapult is operated by pulling the big bowstring to throw stones. Catapult utilizes the principle of lever, elastic force and projectile motion.

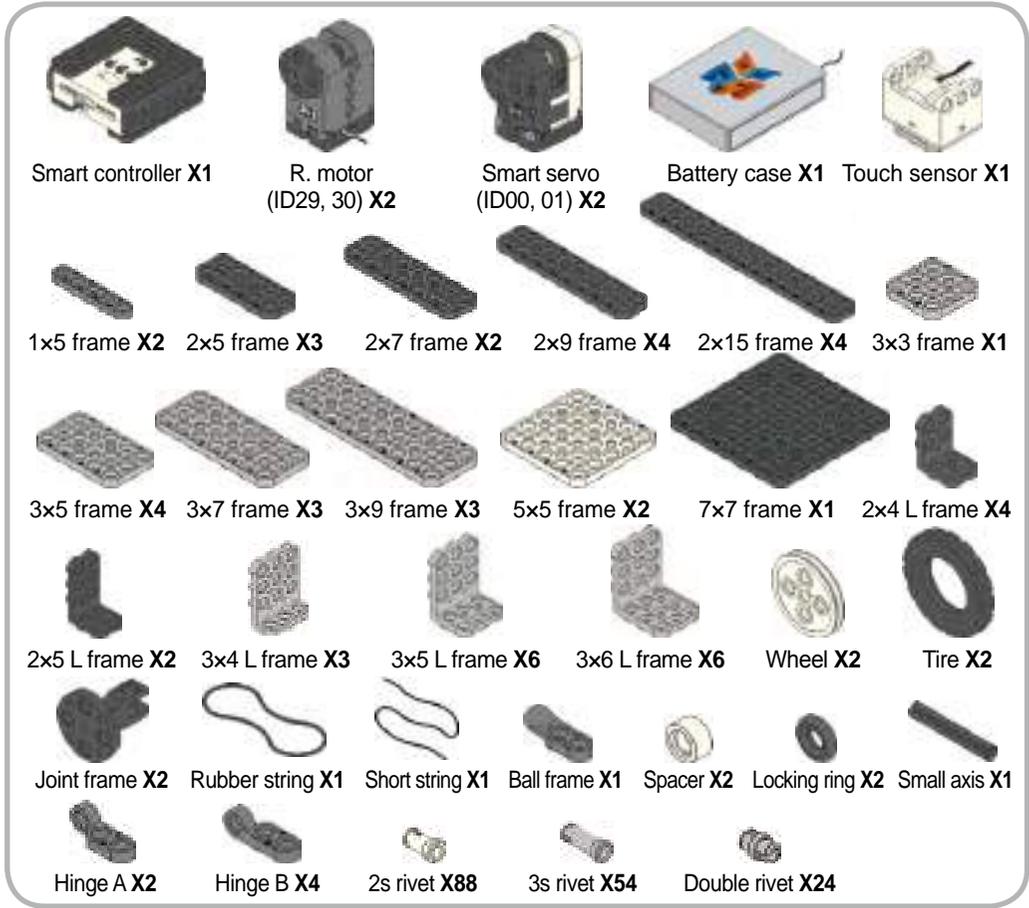




Robot Assembly



Prepare robot parts.



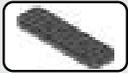
Tips.

Shooting Bot uses a string to shoot and load an object.
 Make a knot when you connect the string to the Shooting Bot.

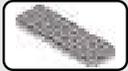


Step 1

Tip



2x7 frame X2



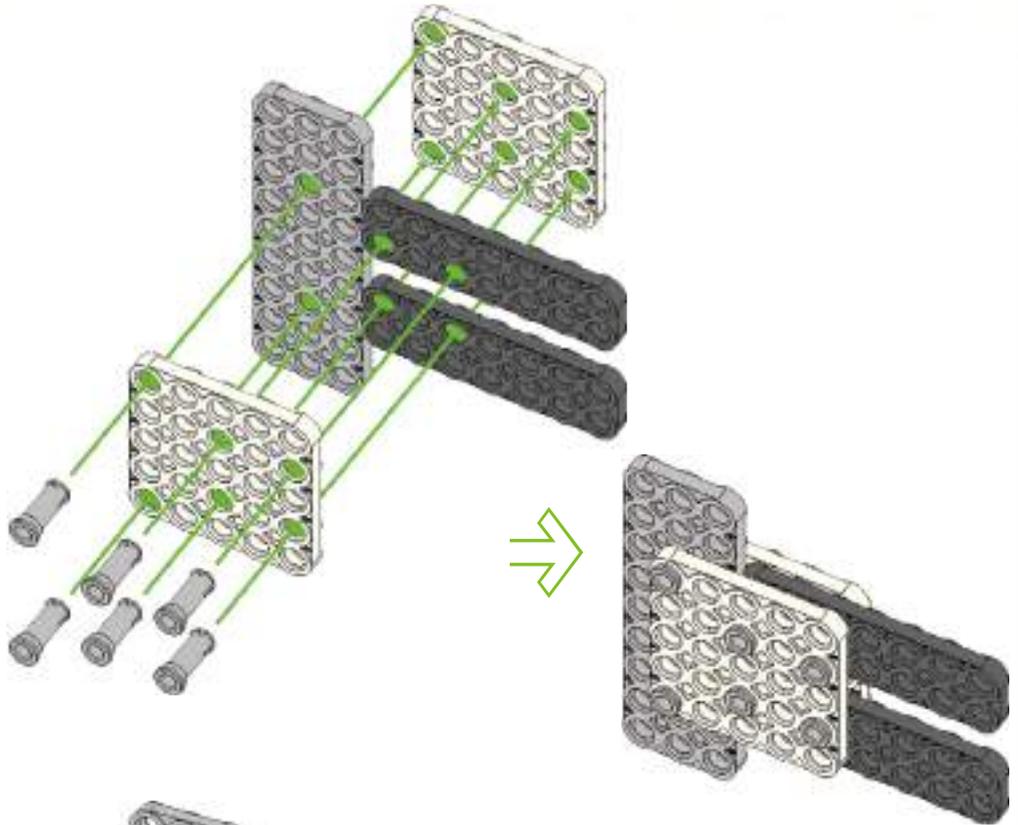
3x9 frame X1



5x5 frame X2

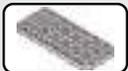


3s rivet X6



Step 2

Tip



3x7 frame X1



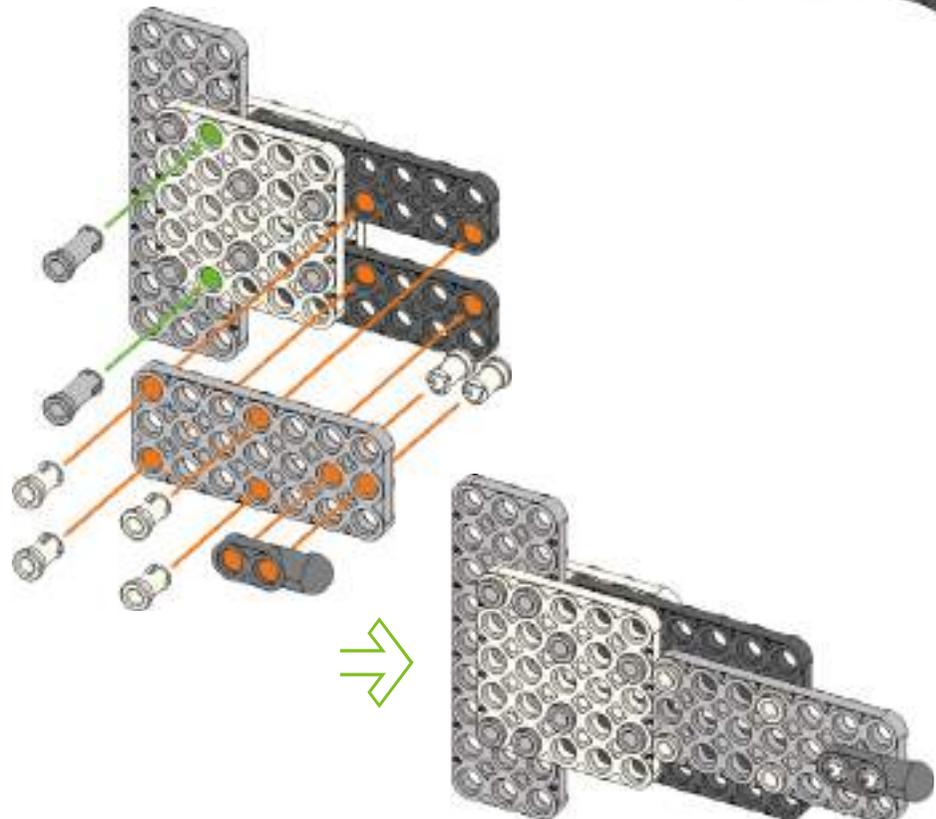
Ball frame X1



2s rivet X6

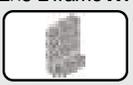


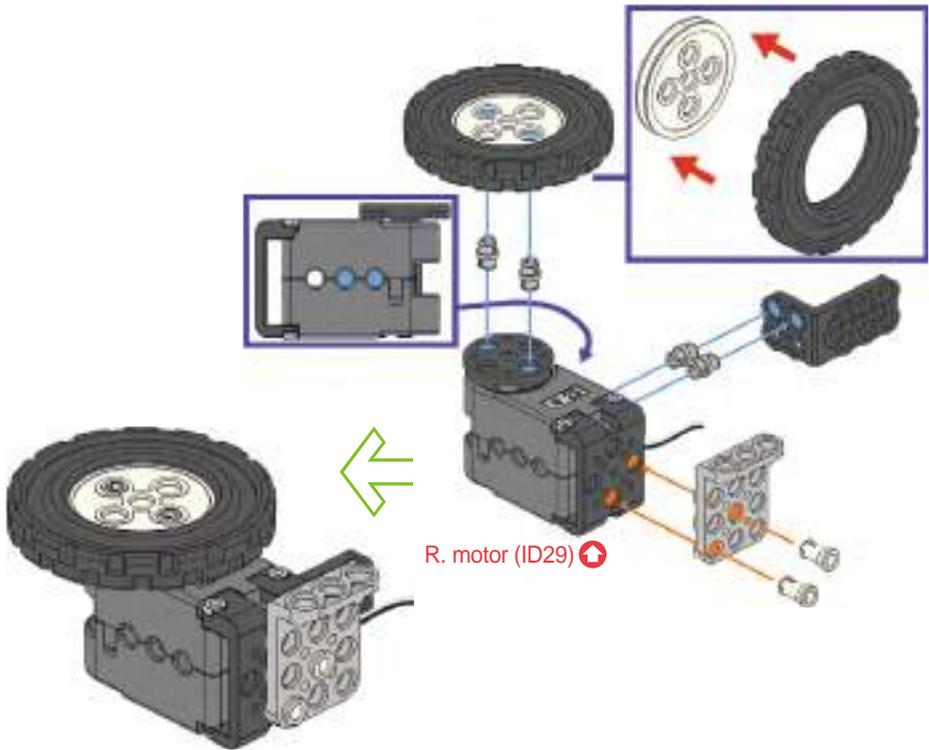
3s rivet X2



Step 3

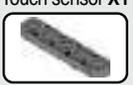
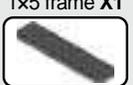
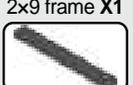
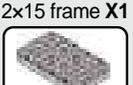
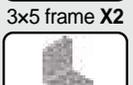
Tip

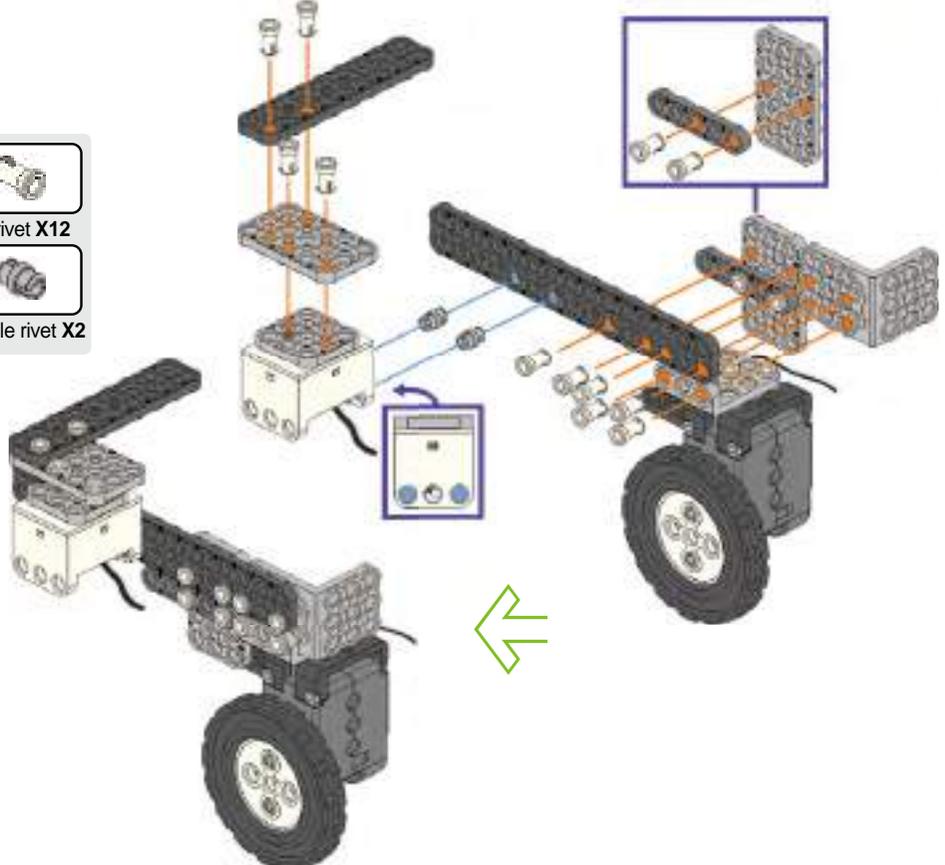
-  R. motor (ID29) X1
-  2x5 L frame X1
-  3x4 L frame X1
-  Wheel X1
-  Tire X1
-  2s rivet X2
-  Double rivet X4



Step 4

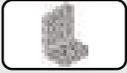
Tip

-  Touch sensor X1
-  1x5 frame X1
-  2x9 frame X1
-  2x15 frame X1
-  3x5 frame X2
-  3x6 L frame X1
-  2s rivet X12
-  Double rivet X2



Step 5

Tip



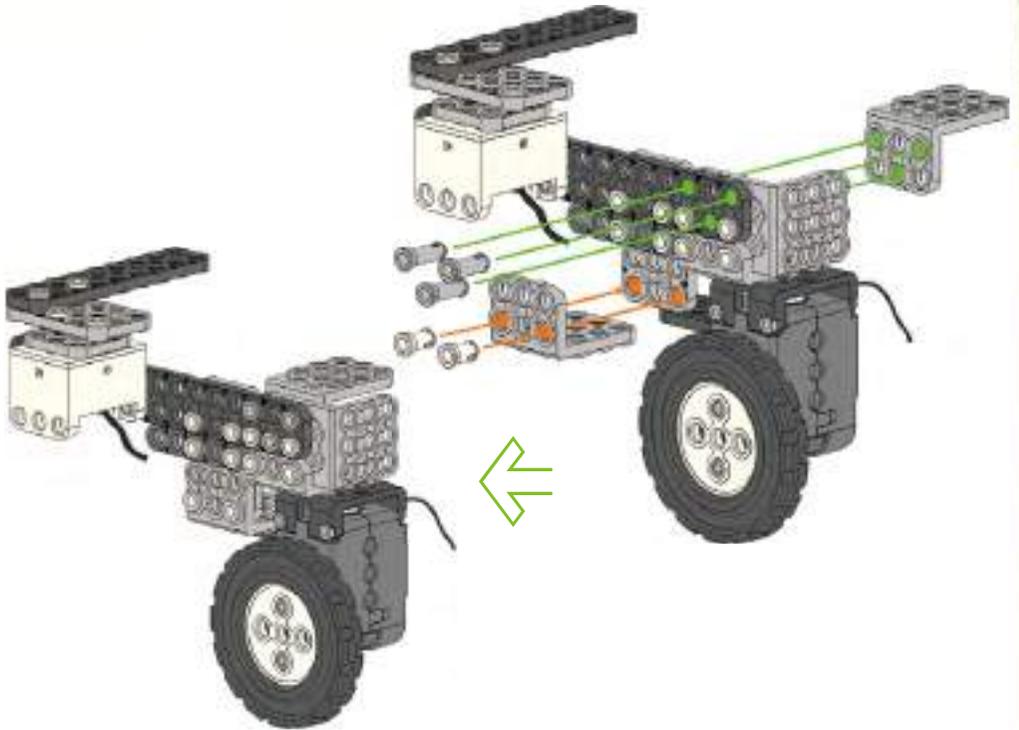
3x5 L frame X2



2s rivet X2



3s rivet X3



Step 6

Tip



R. motor (ID30) X1



2x5 L frame X2



3x4 L frame X1



Wheel X1



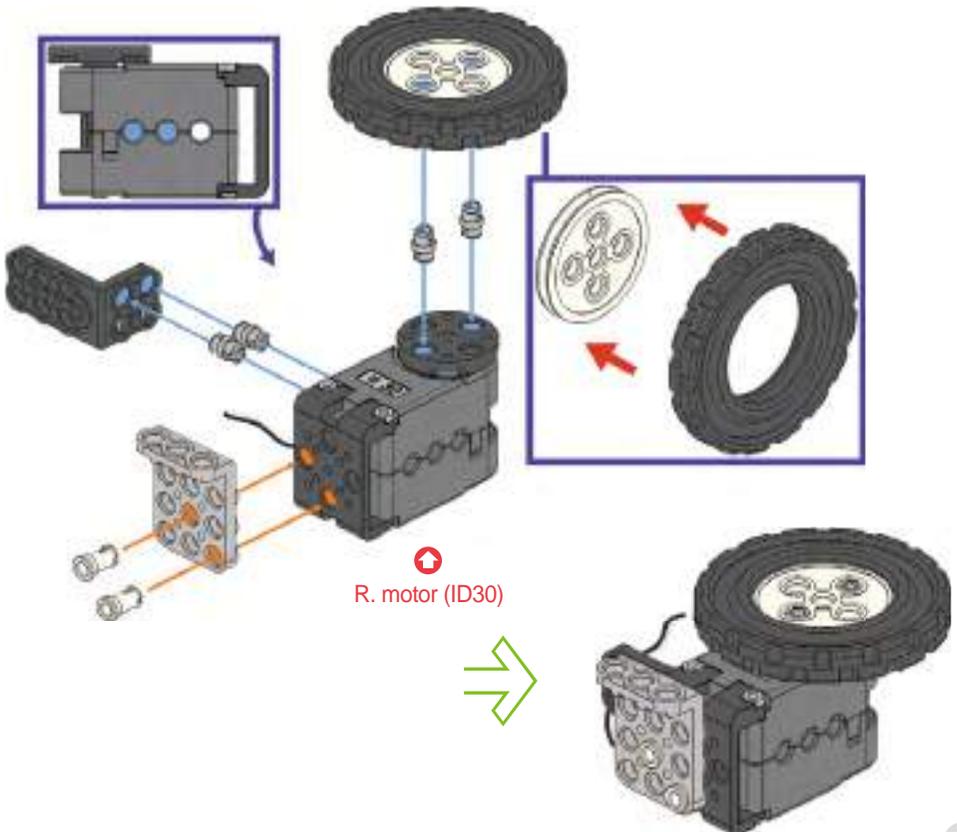
Tire X1



2s rivet X2



Double rivet X4



Step 7

Tip



Smart servo (ID00) X1



1x5 frame X1



3x5 frame X1



3x5 L frame X2



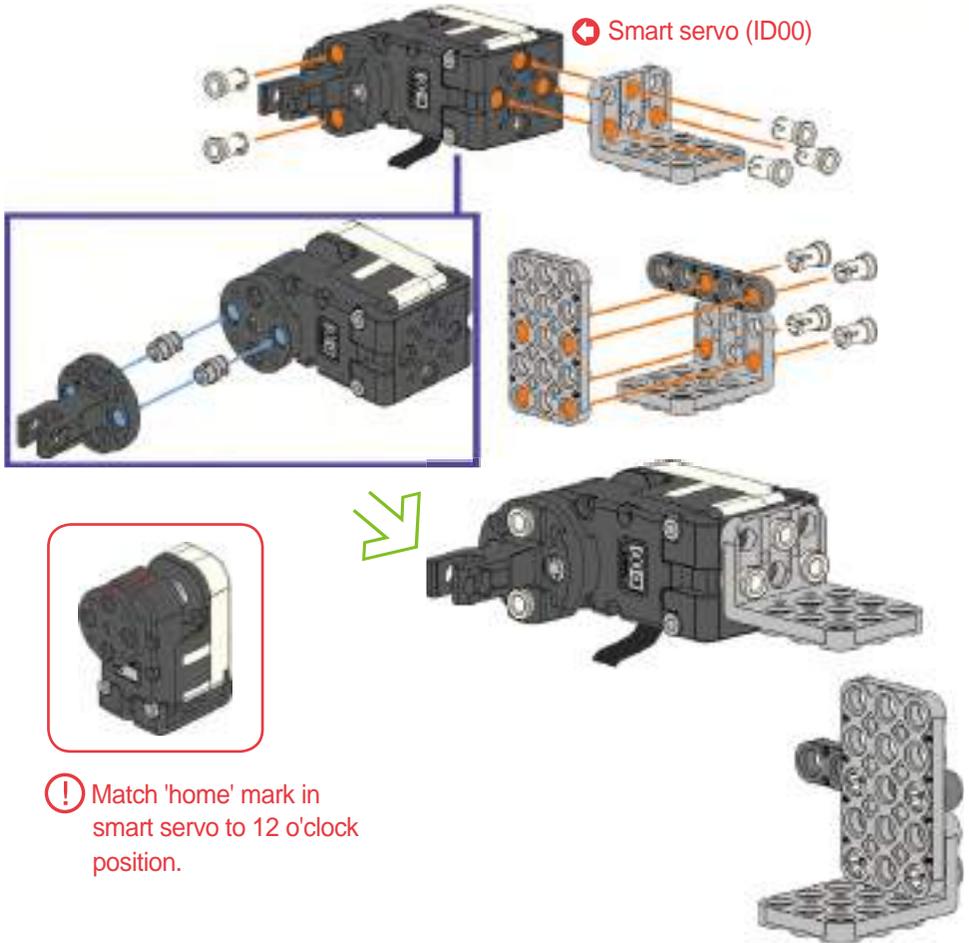
Joint frame X1



2s rivet X9



Double rivet X2



Step 8

Tip

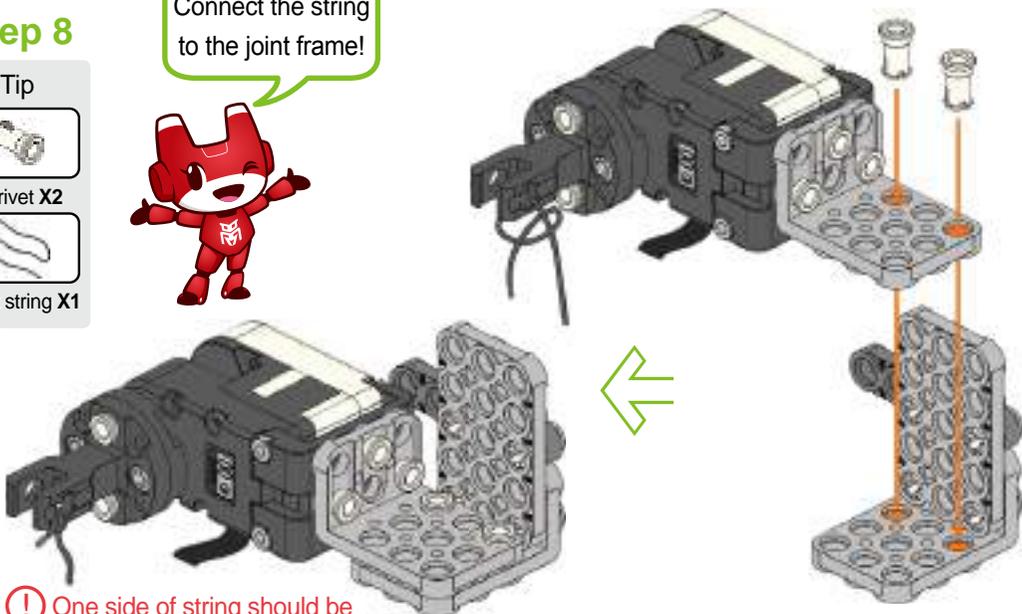


2s rivet X2



Short string X1

Connect the string to the joint frame!



Step 9

Tip



2x15 frame X1



3x4 L frame X1



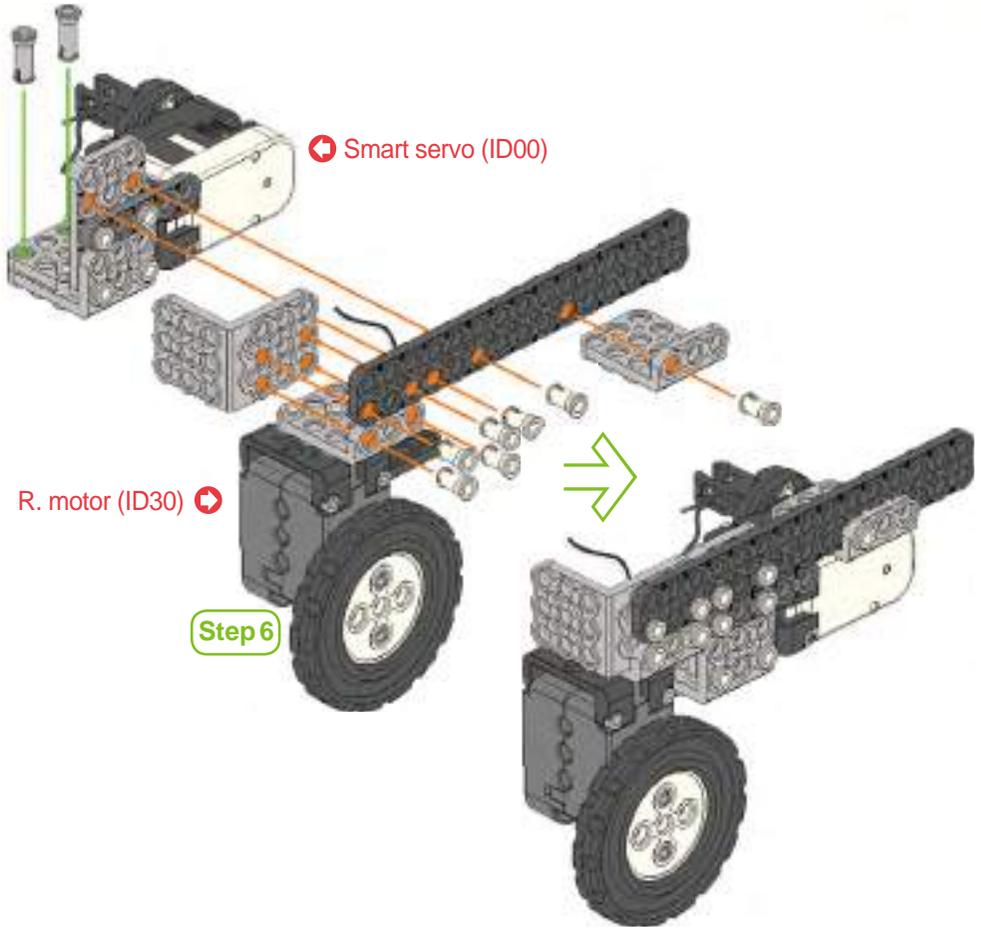
3x6 L frame X1



2s rivet X7



3s rivet X2



Step 10

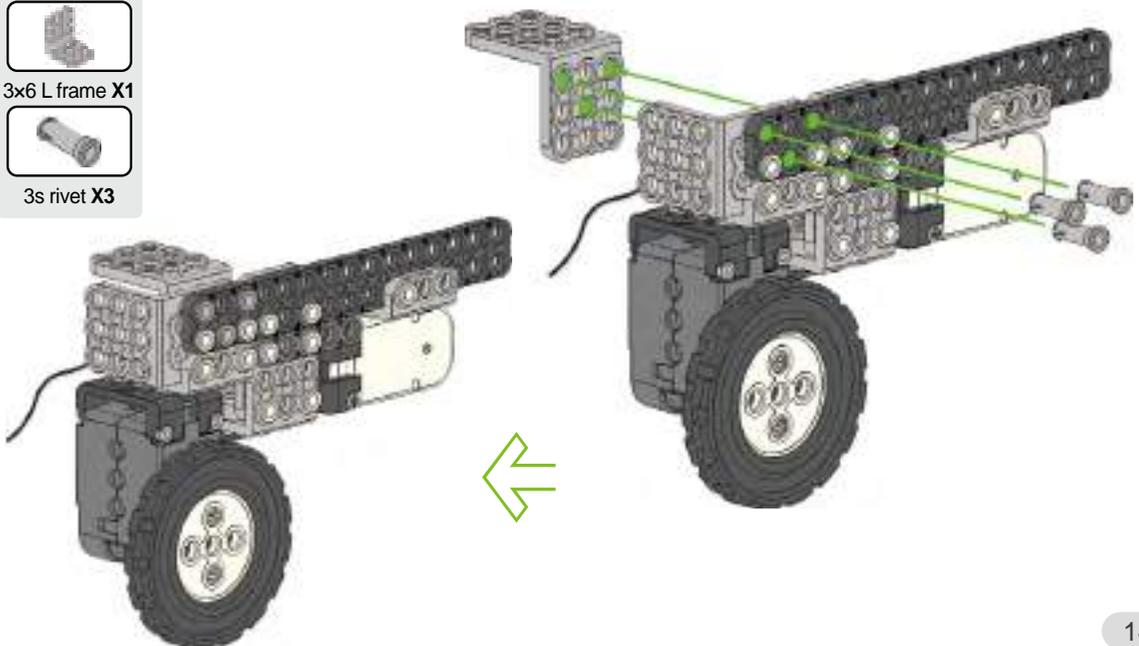
Tip



3x6 L frame X1



3s rivet X3

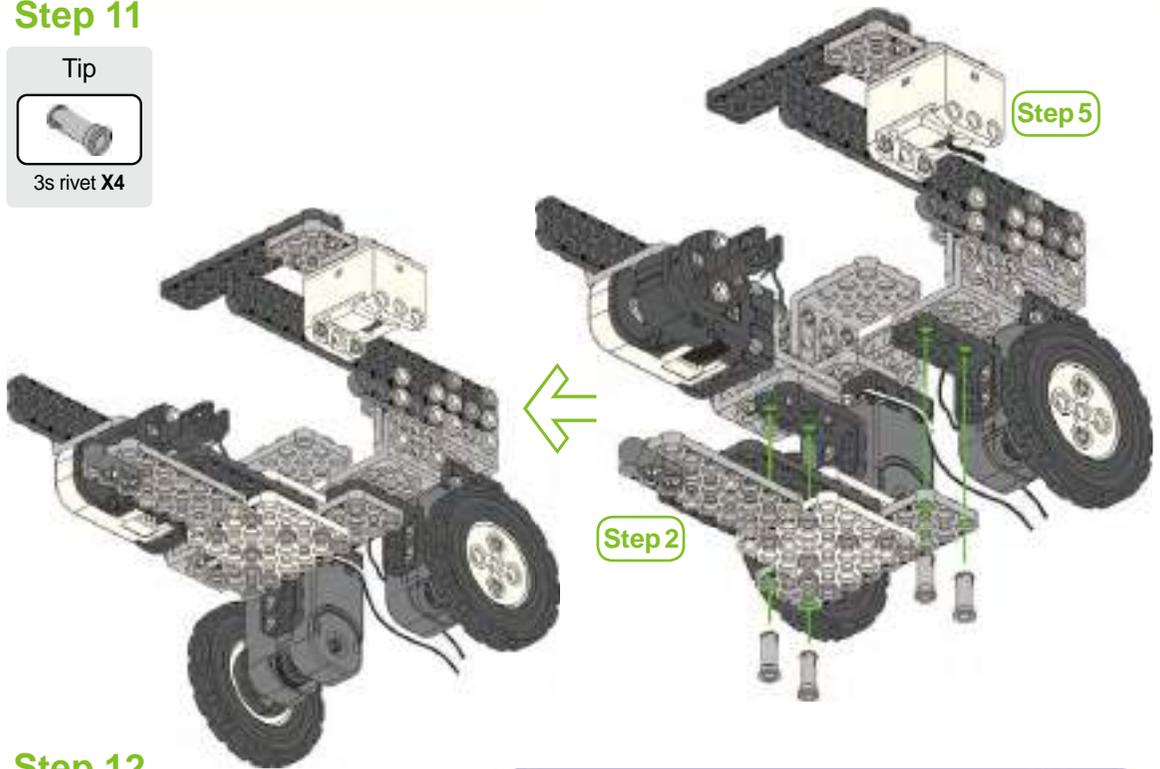


Step 11

Tip

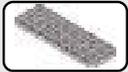


3s rivet X4



Step 12

Tip



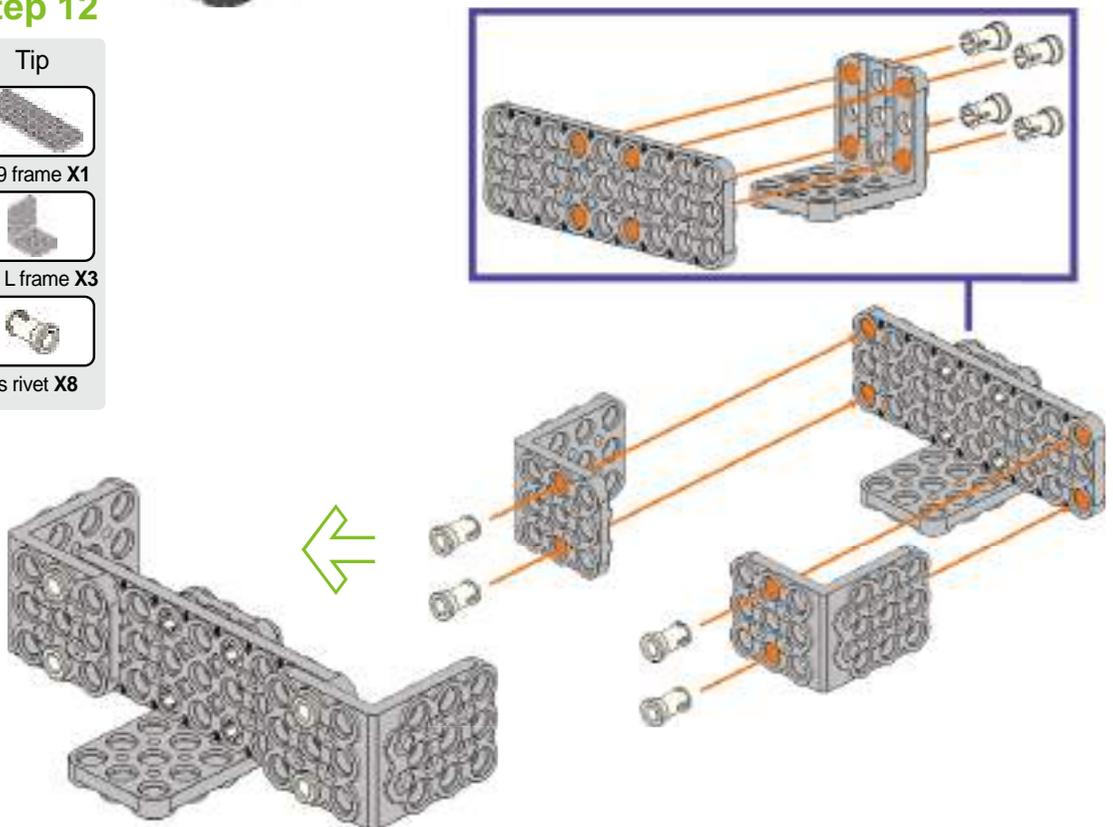
3x9 frame X1



3x6 L frame X3



2s rivet X8



Step 13

Tip



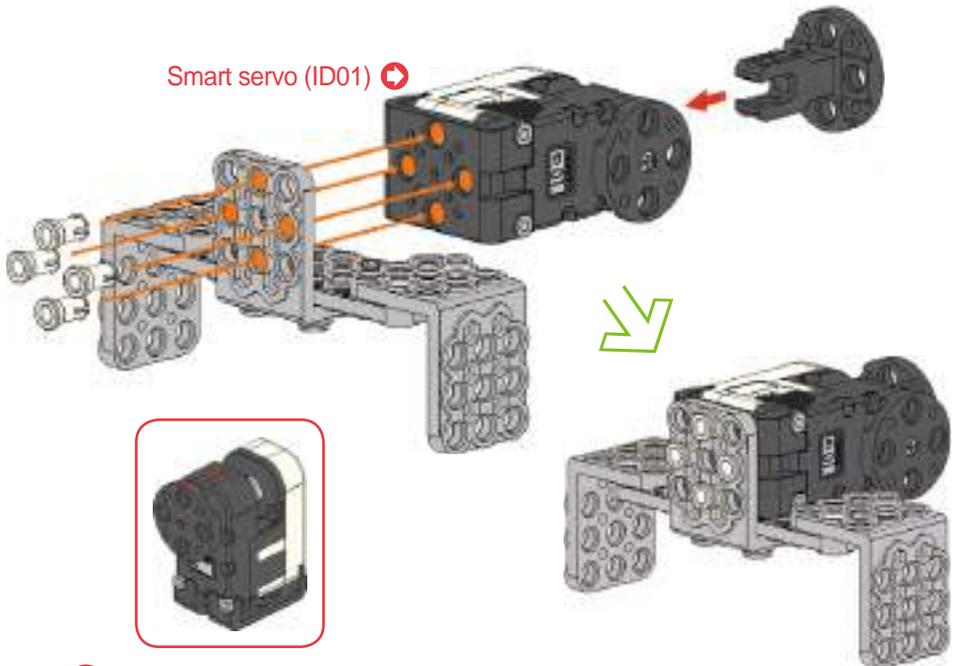
Smart servo (ID01) X1



Joint frame X1



2s rivet X4



Smart servo (ID01) ↻

⚠ Match 'home' mark in smart servo to 12 o'clock direction.

Step 14

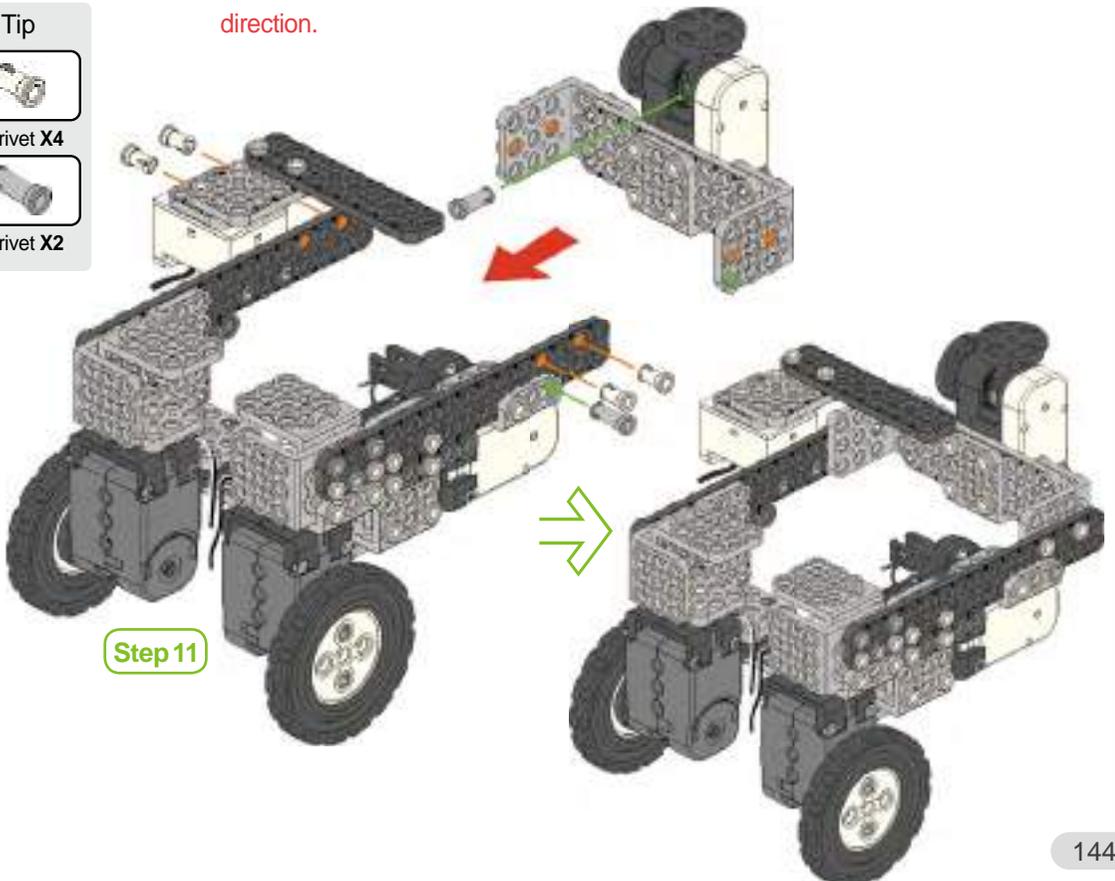
Tip



2s rivet X4



3s rivet X2



Step 11

Step 15

Tip



Spacer X2



Locking ring X2



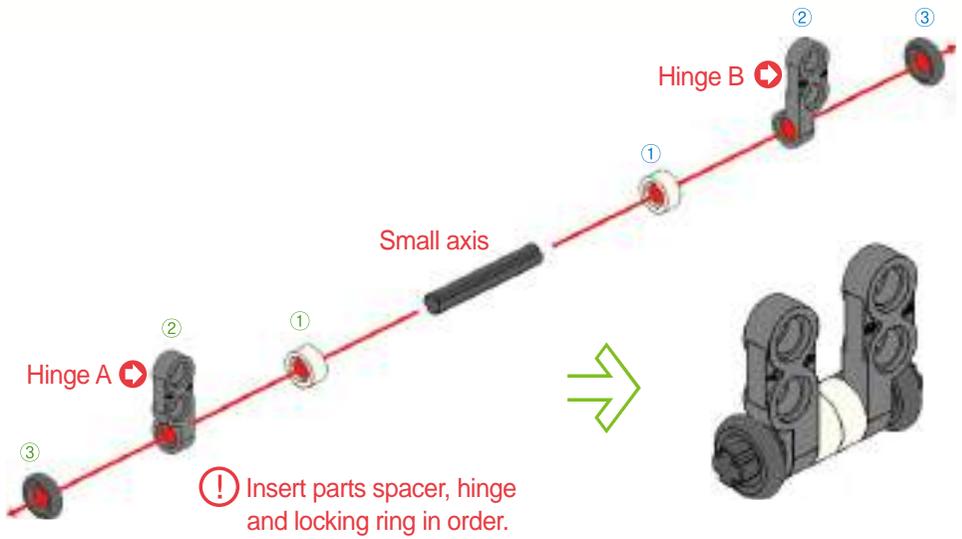
Small axis X1



Hinge A X1

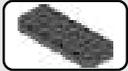


Hinge B X1

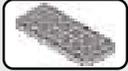


Step 16

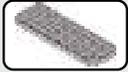
Tip



2x5 frame X3



3x7 frame X2



3x9 frame X1



Hinge A X1



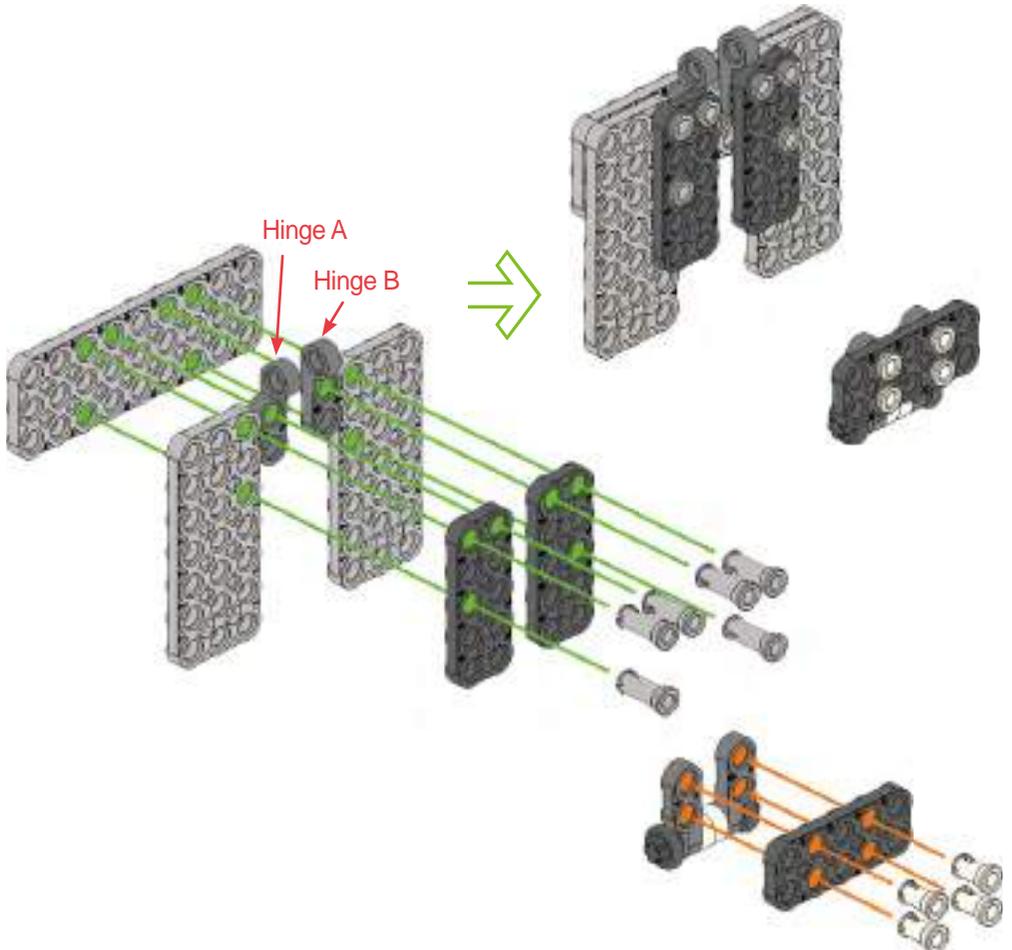
Hinge B X1



2s rivet X4



3s rivet X6

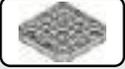


Step 17

Tip



2x9 frame X1



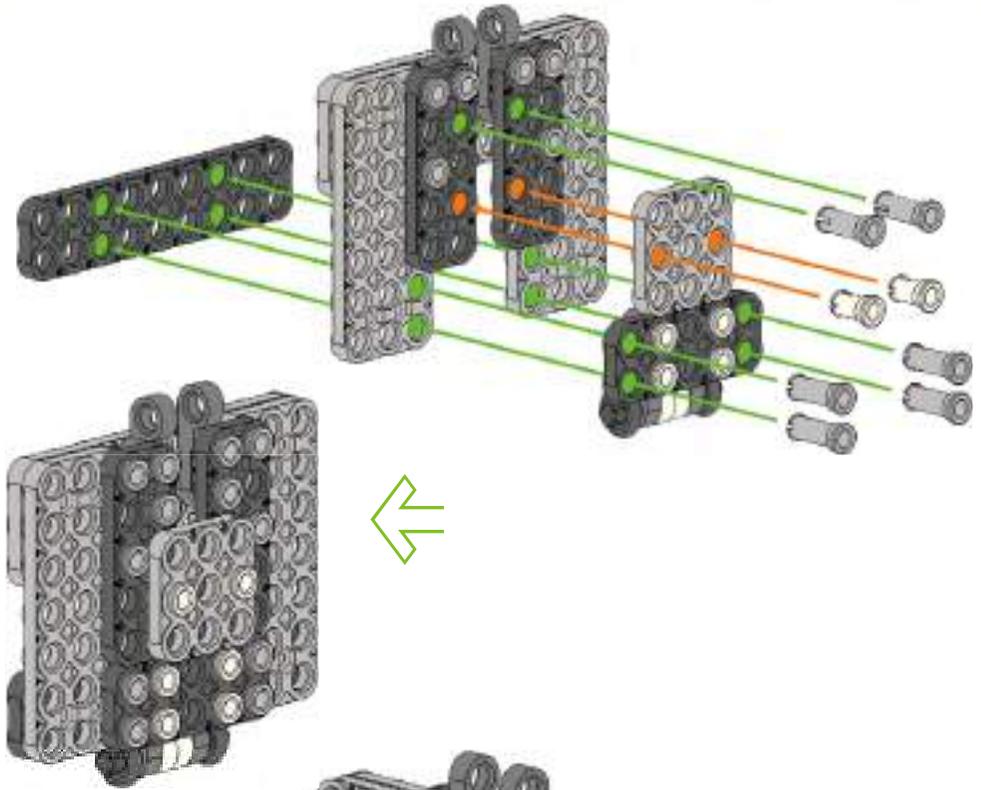
3x3 frame X1



2s rivet X2



3s rivet X6

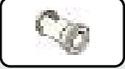


Step 18

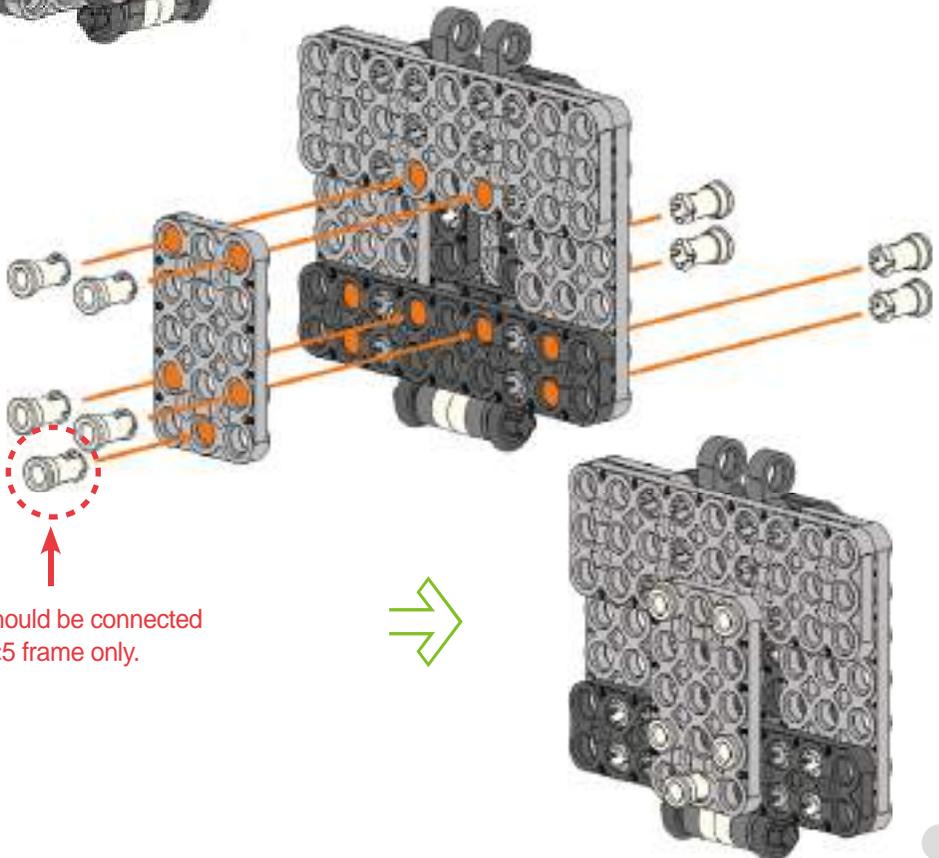
Tip



3x5 frame X1



2s rivet X9



⚠ 2s should be connected to 3x5 frame only.

Step 19

⚠ Insert double rivet first.

Tip



2x9 frame X1



2x15 frame X2



7x7 frame X1



2x4 L frame X4



3x5 L frame X2



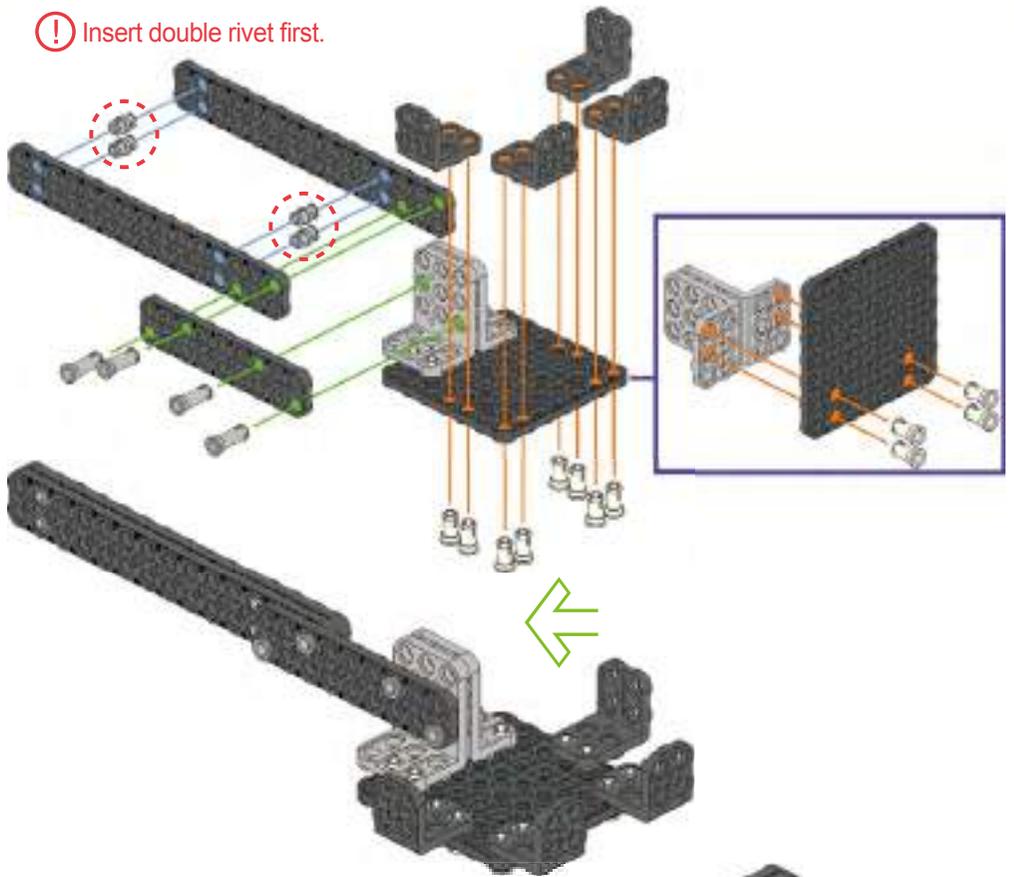
2s rivet X12



3s rivet X4



Double rivet X4



Step 20

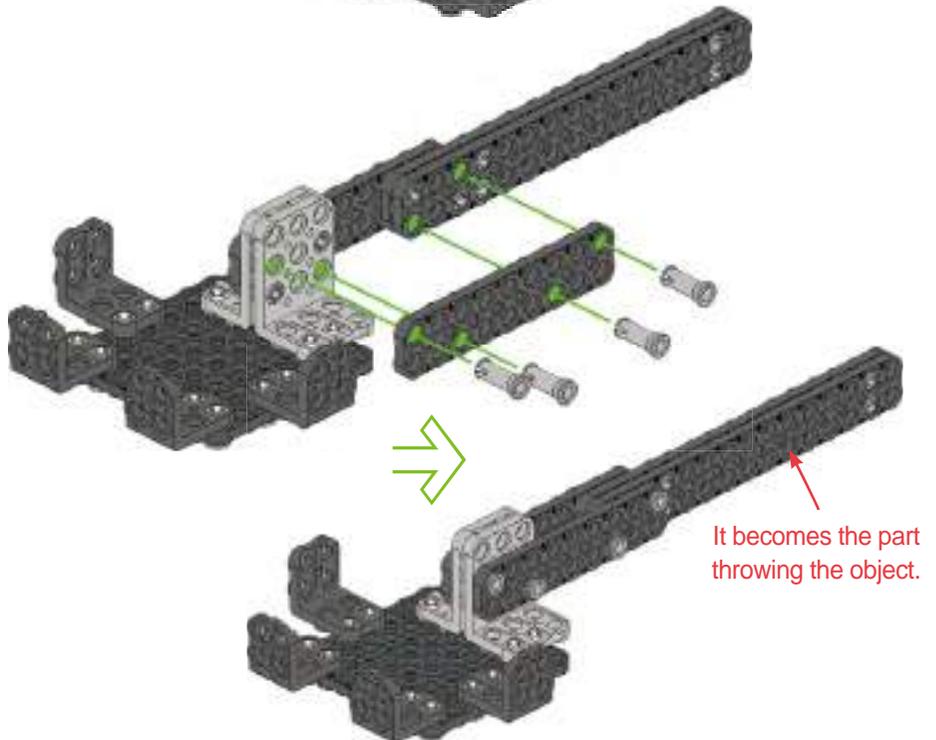
Tip



2x9 frame X1



3s rivet X4



It becomes the part throwing the object.

Step 21

Tip



2s rivet X2



Rubber string X1



! Hang a rubber ring up with 2s rivet.

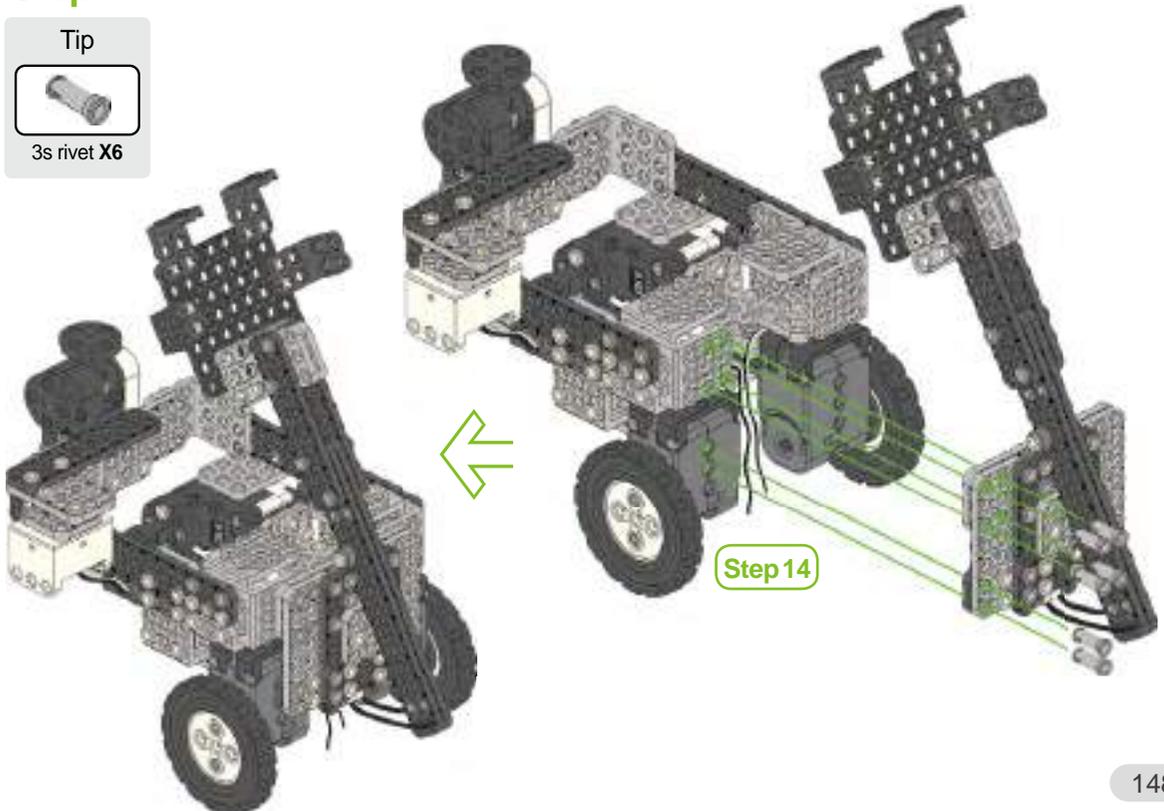
Step 18

Step 22

Tip



3s rivet X6

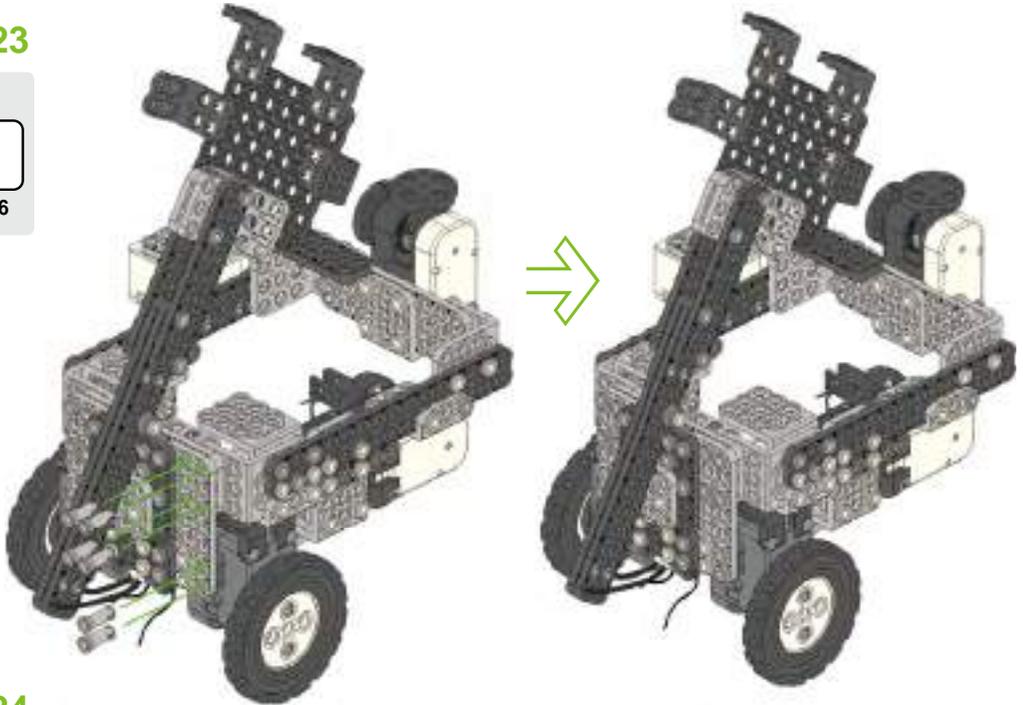


Step 23

Tip



3s rivet X6



Step 24

Tip



Hinge B X2

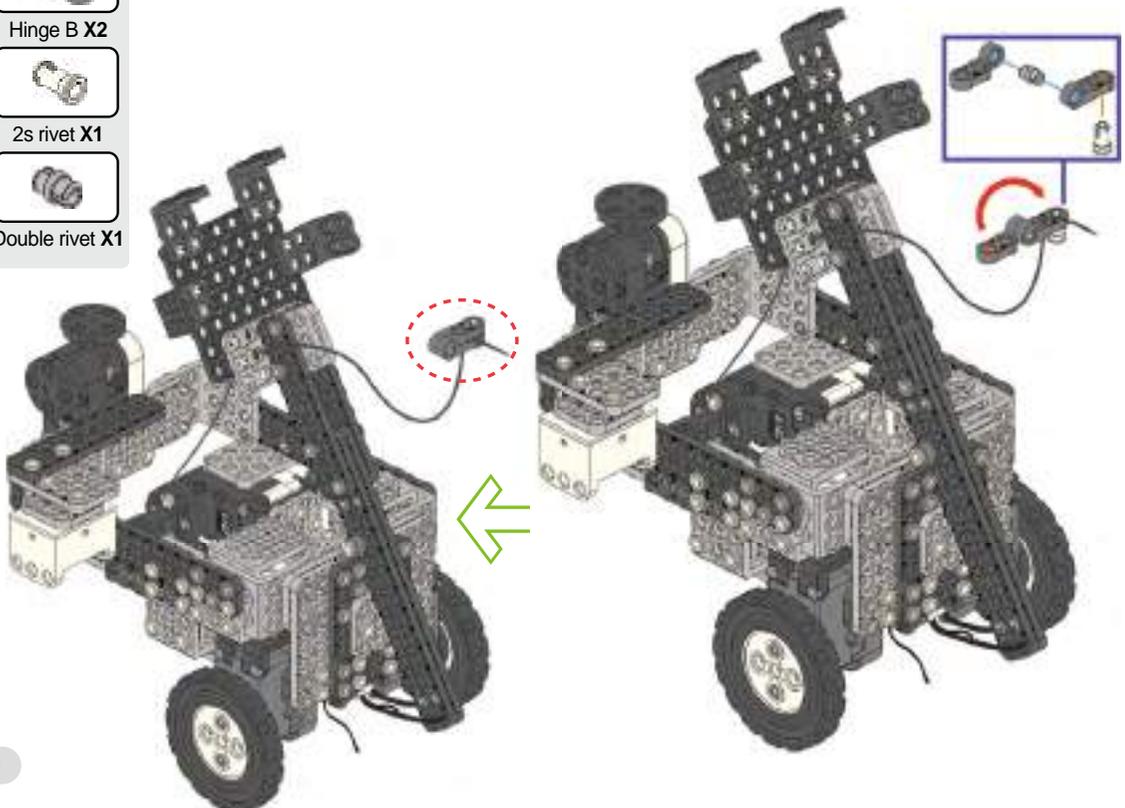


2s rivet X1



Double rivet X1

⚠ Insert one side of string between two hinge B part, then connect hinge B with hinge B.



Step 25

Tip



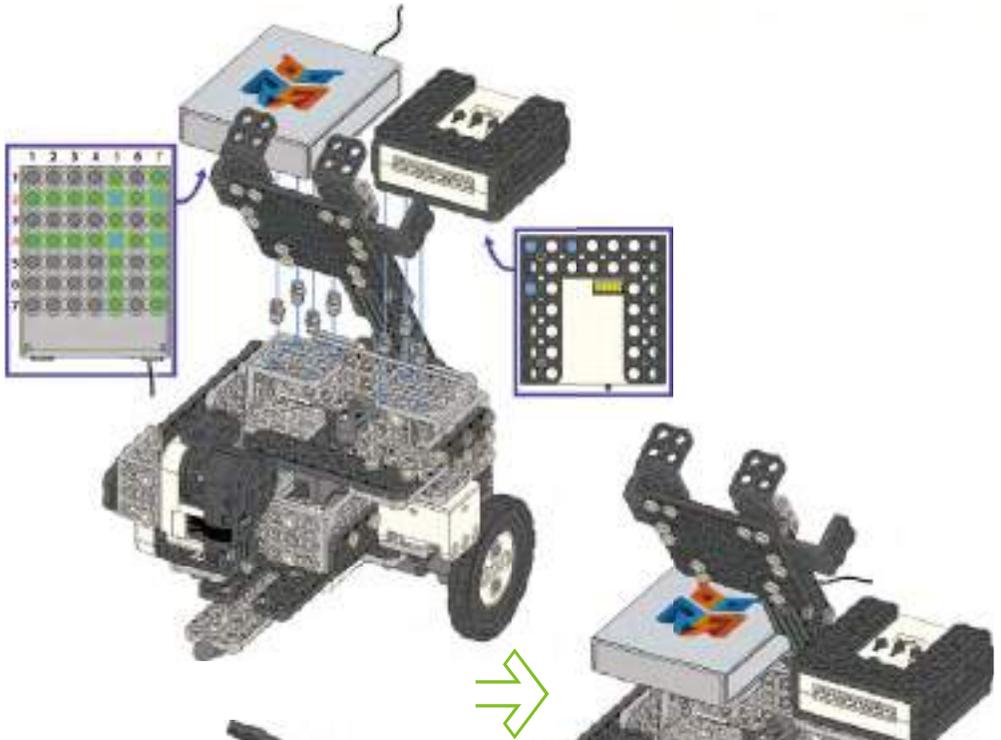
Smart controller X1



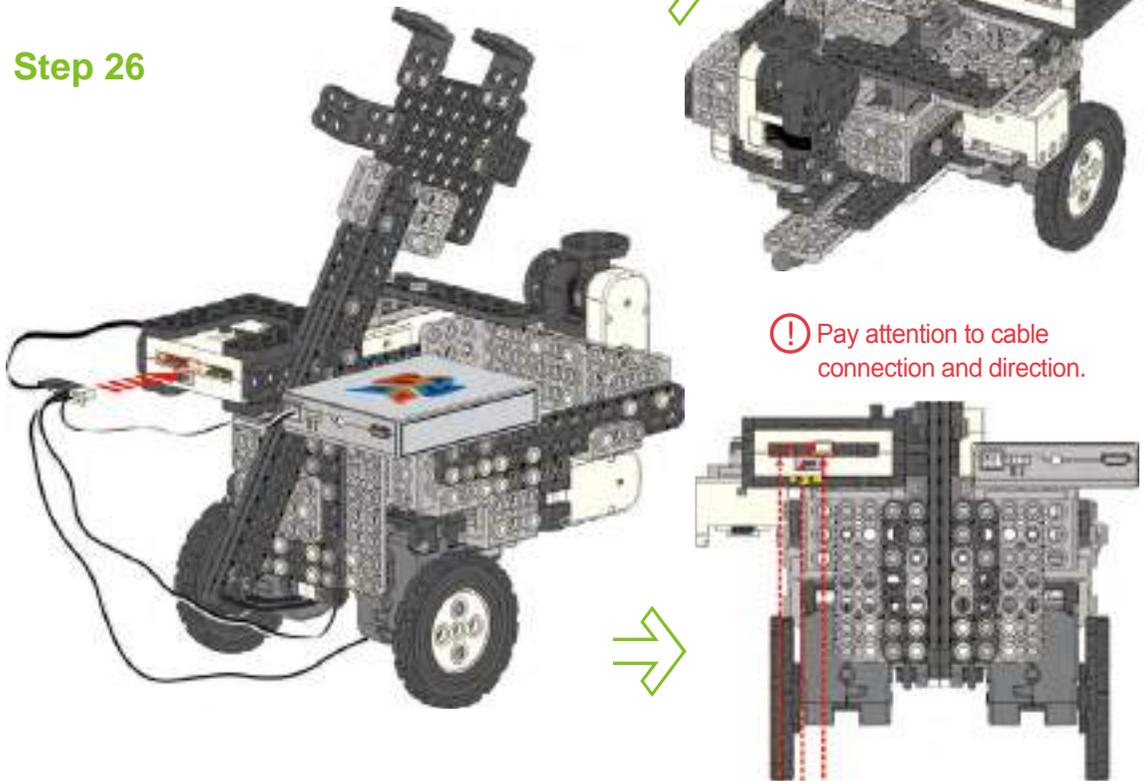
Battery case X1



Double rivet X7



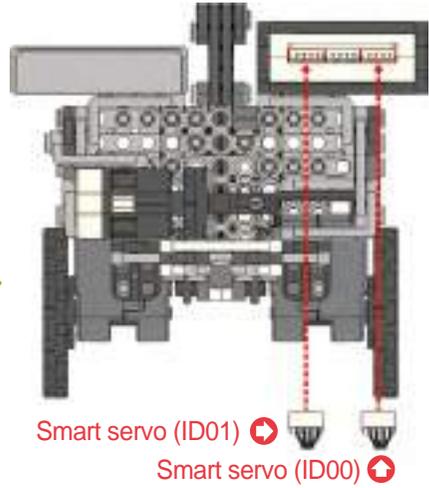
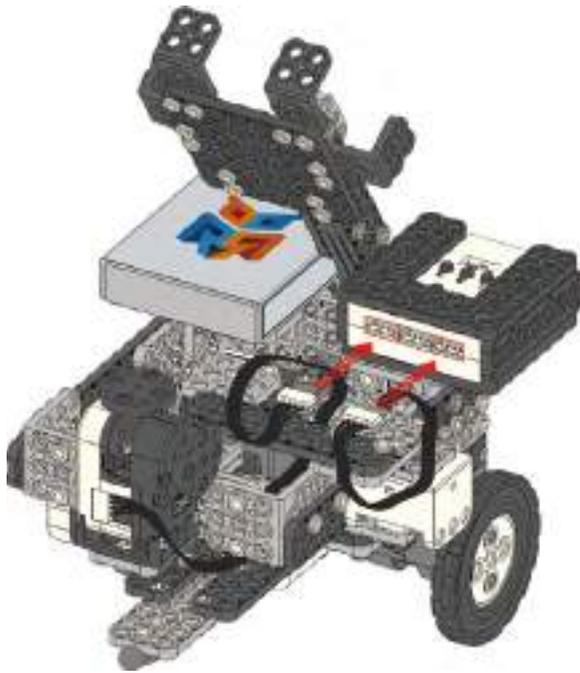
Step 26



! Pay attention to cable connection and direction.

R. motor (ID29) → Power
 R. motor (ID30) →
 Touch sensor →

Step 27



★ 'Shooting Bot' is ready! ★



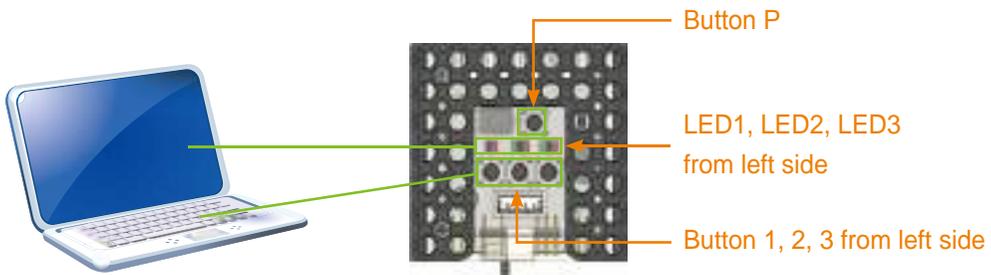


Robot Experience



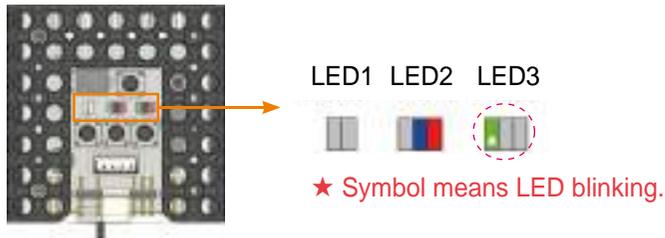
Set-up 'Shooting Bot' robot model.

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons work as the keyboard for PC.



First : Turn on the smart controller to enter <set-up mode>.

Second : Press button 2 or button 3 on smart controller to set-up 'Shooting Bot' robot model. The buttons work as a keyboard for PC. Program the robot for proper operation.



Third : Press button P on smart controller to enter <standby mode>.

Reassemble after checking the following when robot is not working.

1. When Shooting Bot's arm part is not working :
 - ▶ Check smart servo ID00 assembled position and the short string connected part.
2. When the shooting power of Shooting Bot's arm is weak :
 - ▶ Check the rubber ring connection. Shooting power increases when the elastic force of rubber ring is greater.



Check movement and assembly.

1. Match the IR remote controller buttons with the corresponding action.

① button •



Throws a ball and re-loads it.

② button •



Throws a ball.

③ button •



Re-loads a ball.

2. Which IR remote controller button should you press to check below motion?



Go forward.



Throw a ball and stop.

① # + ① button

① # + ② button

③ # + ③ button

④ # + [Red Square] button

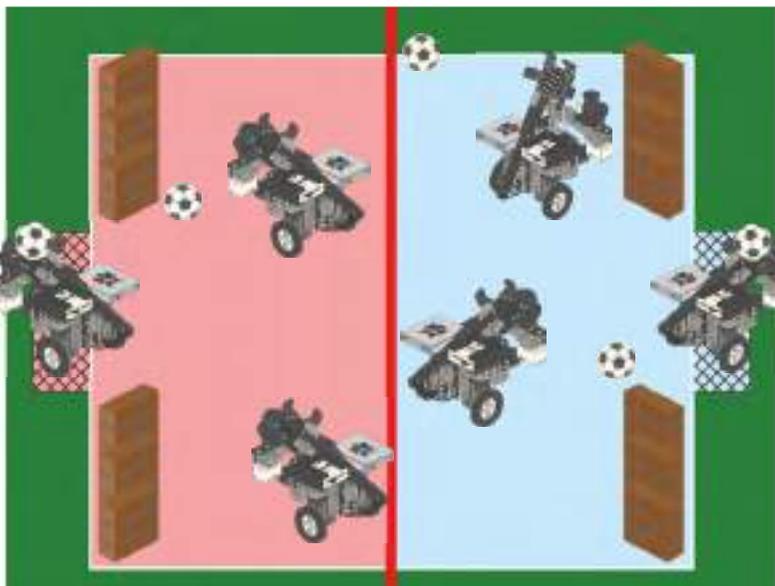
Robot Play



Hit target.

Control the Shooting Bot, then throw a ball targeting the goal area on the opposite player's field.

- Play 2 vs. 2 or 3 vs. 3.
- Red team can only move in red area and the same goes for the blue team. You can load a ball in each side of the goal line areas.
- Red team throws a ball to the target of blue team to get out of game panel, and vice versa.
- Game play time is 3 minutes, and whoever push the target to get out of game panel wins game.



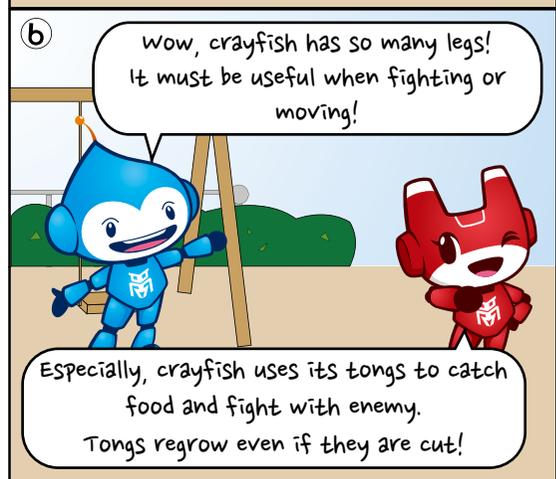
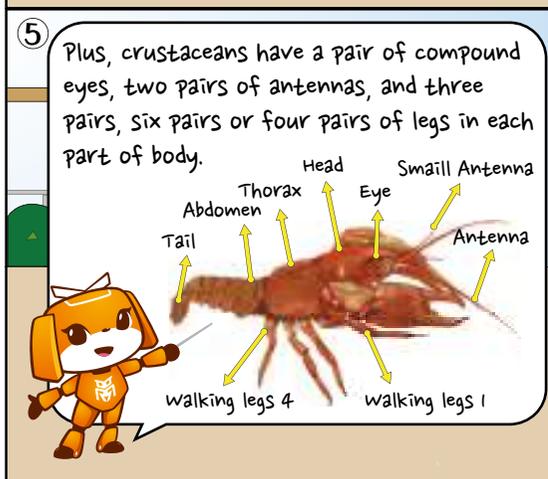
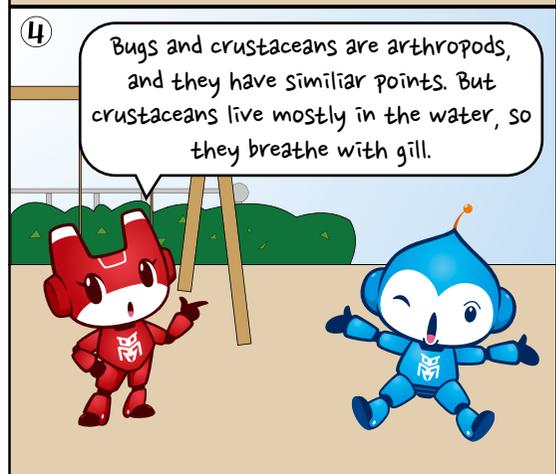
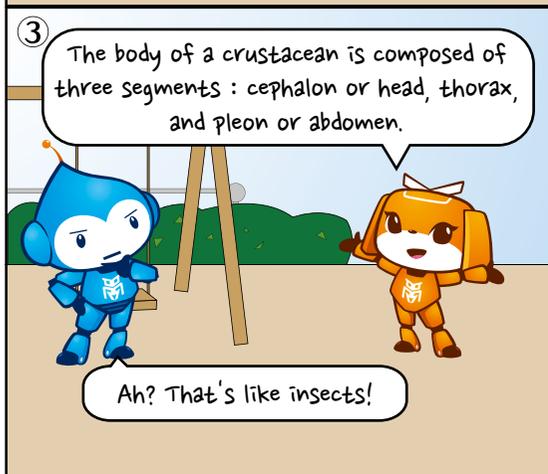
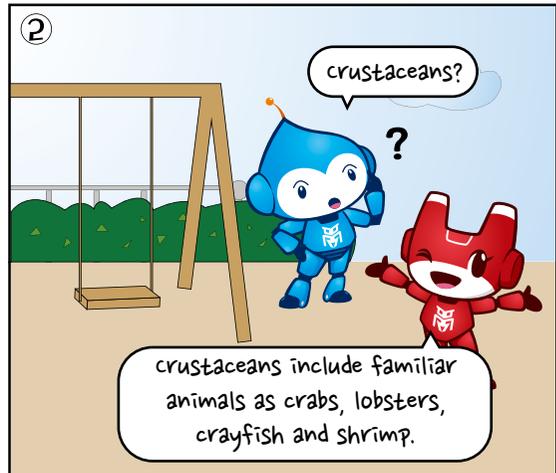
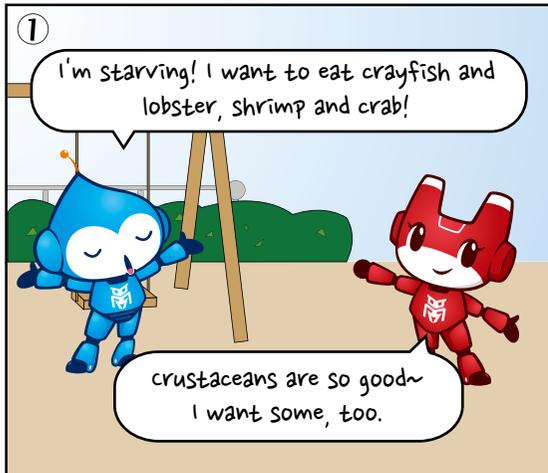
◆ Describe your 'Shooting Bot'.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



10. Crayfish Bot

Crustacean



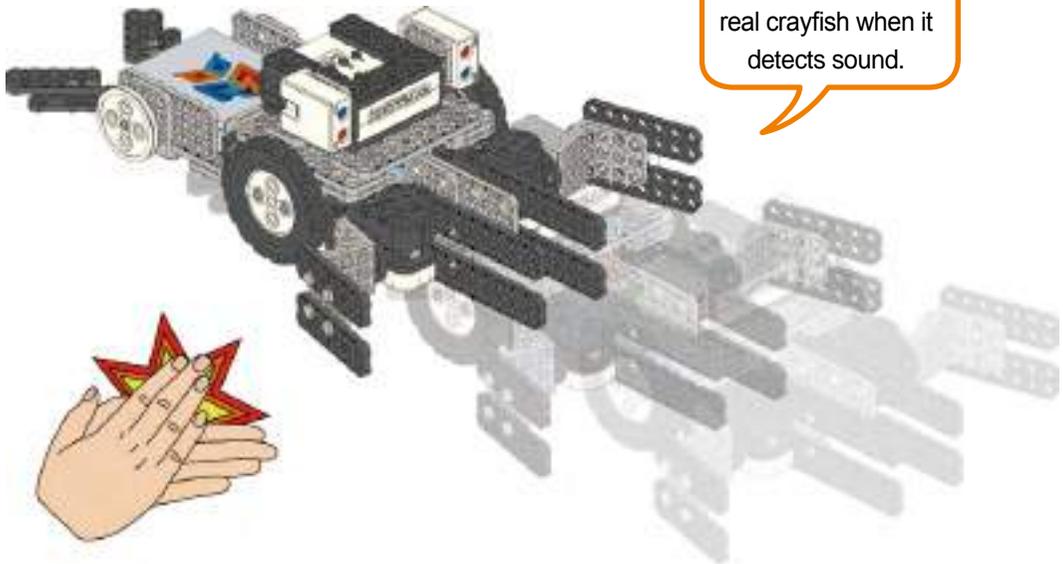
* Crustaceans are divided into head, thorax and abdomen, but some higher shellfish have the head and thorax joined.



Today's Robot Class



Crayfish Bot takes the shape of crayfish, it has two big pincers to pick up and move objects. Smart servos are used to move pincers for picking up objects, and rotation motors are used to move in different directions. You can control the speed as you'd like, and there is no obstacle in picking up an object. So you can play a game or host a competition with your friends!



It backs away like a real crayfish when it detects sound.



Crayfish breathes with gill and finds food using its antenna and eats with pincers. Sometimes it uses the pincers to fight others. Pincers grow back when they are detached from its body. Crayfish moves freely with its legs and tail. Normally, it moves slowly, but if it feels threatened, it speeds up.

I have stiff shell and big pincers.

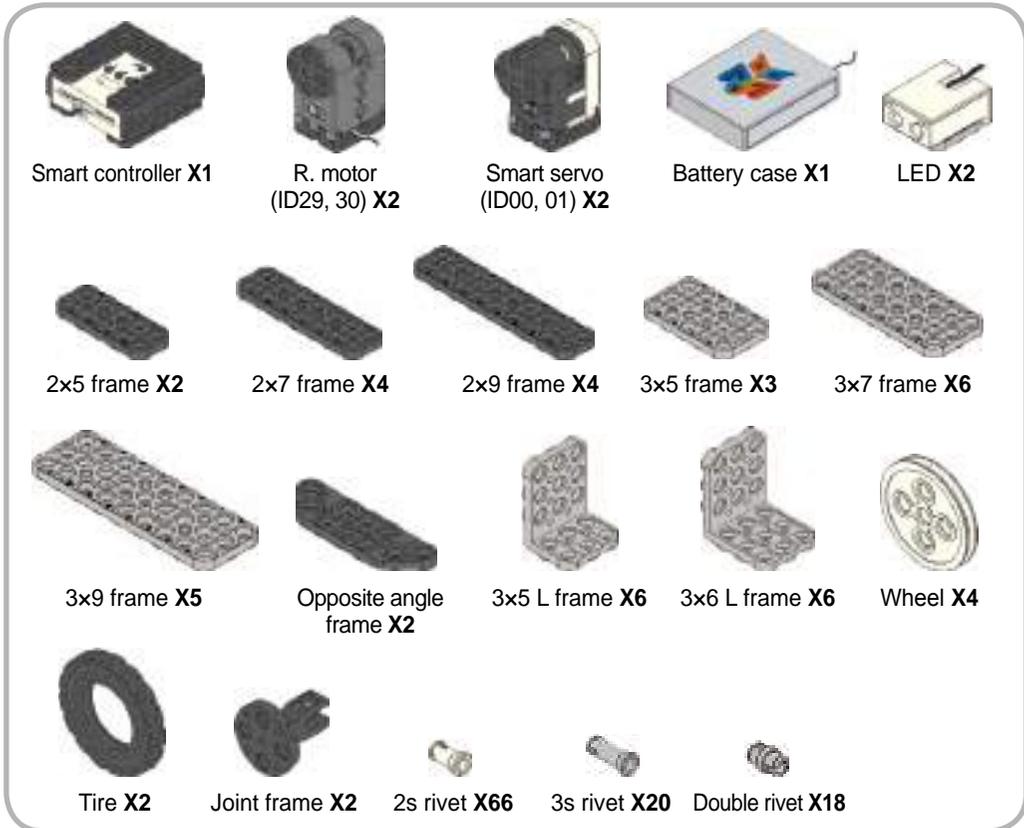




Robot Assembly



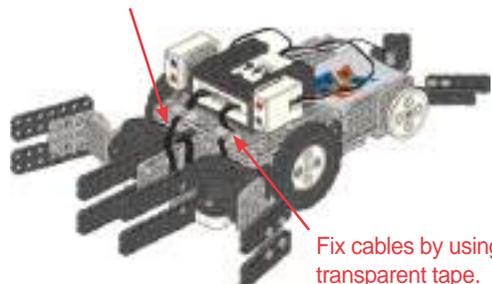
Prepare robot parts.



Tips.

Crayfish has a low and flat body, so you have to check the cables of smart servo and rotation motor to make sure they don't touch the ground and hinder it from crawling. Therefore, you need to organize the cables by winding up or fixing them with transparent tape.

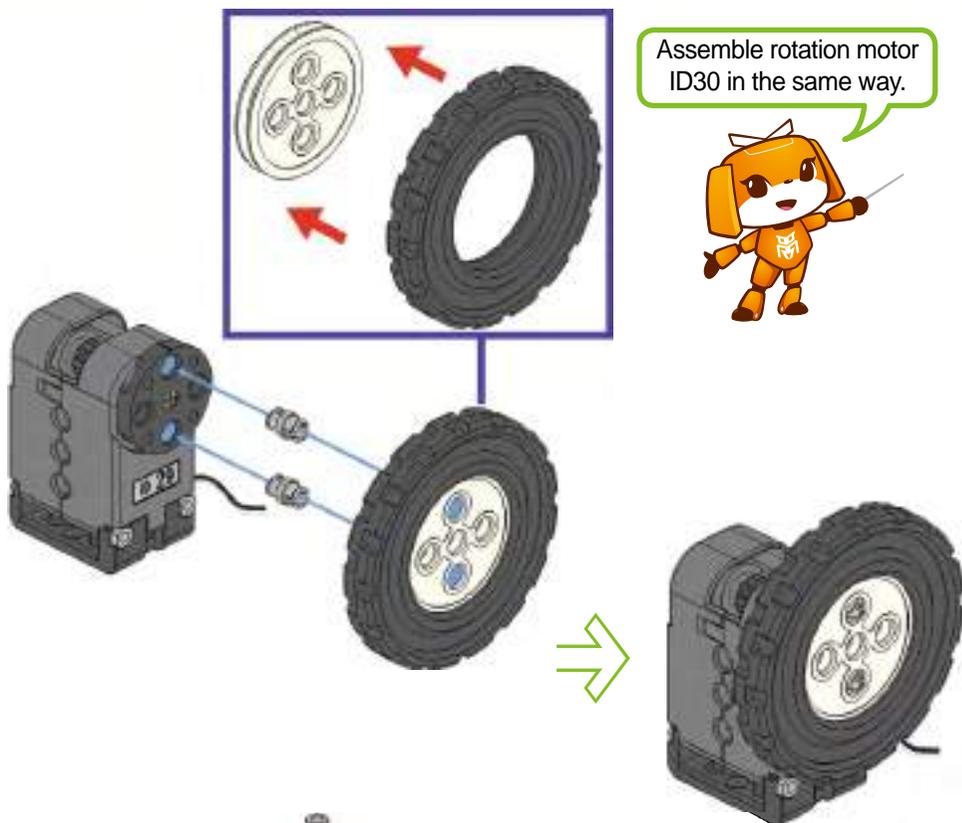
Wind up the cables to the frame.



Step 1 X2

Tip

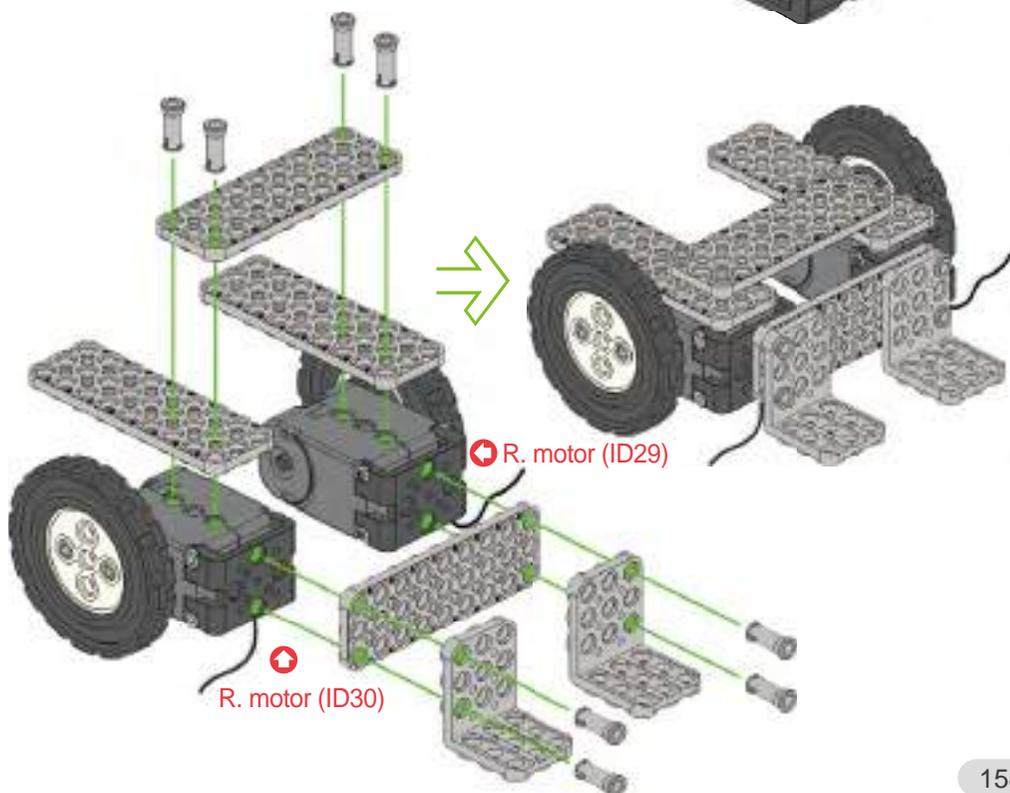
-  R. motor (ID29) X1
-  Wheel X1
-  Tire X1
-  Double rivet X2



Step 2

Tip

-  3x9 frame X4
-  3x6 L frame X2
-  3s rivet X8



Step 3 X2

Tip



2x7 frame X2



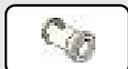
3x5 L frame X1



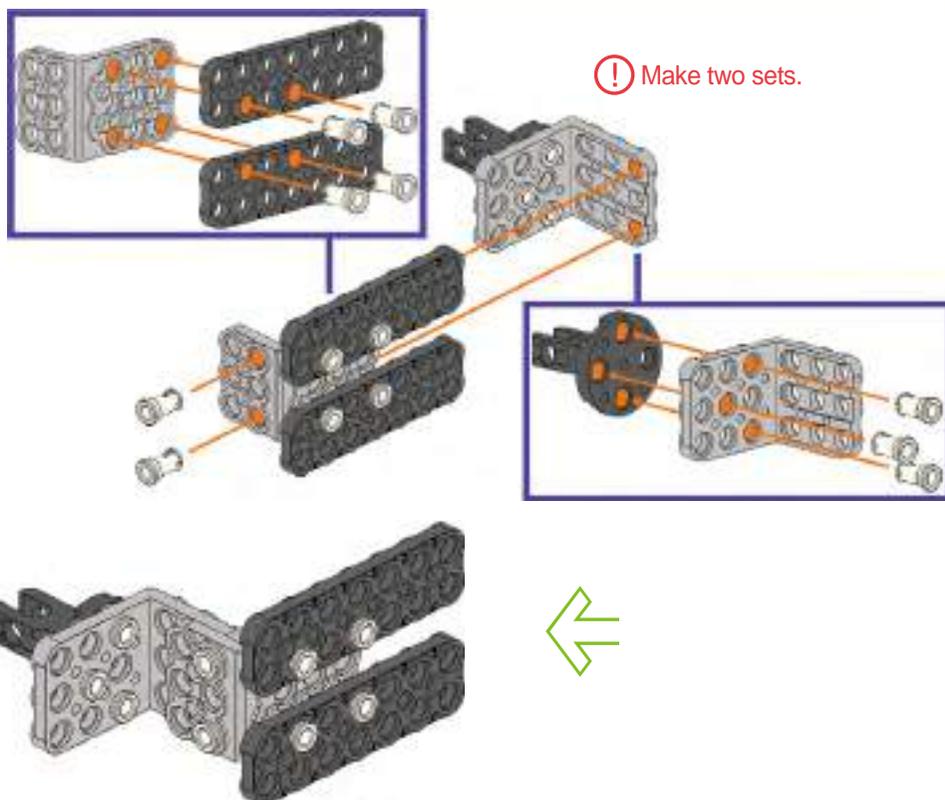
3x6 L frame X1



Joint frame X1



2s rivet X9



Step 4

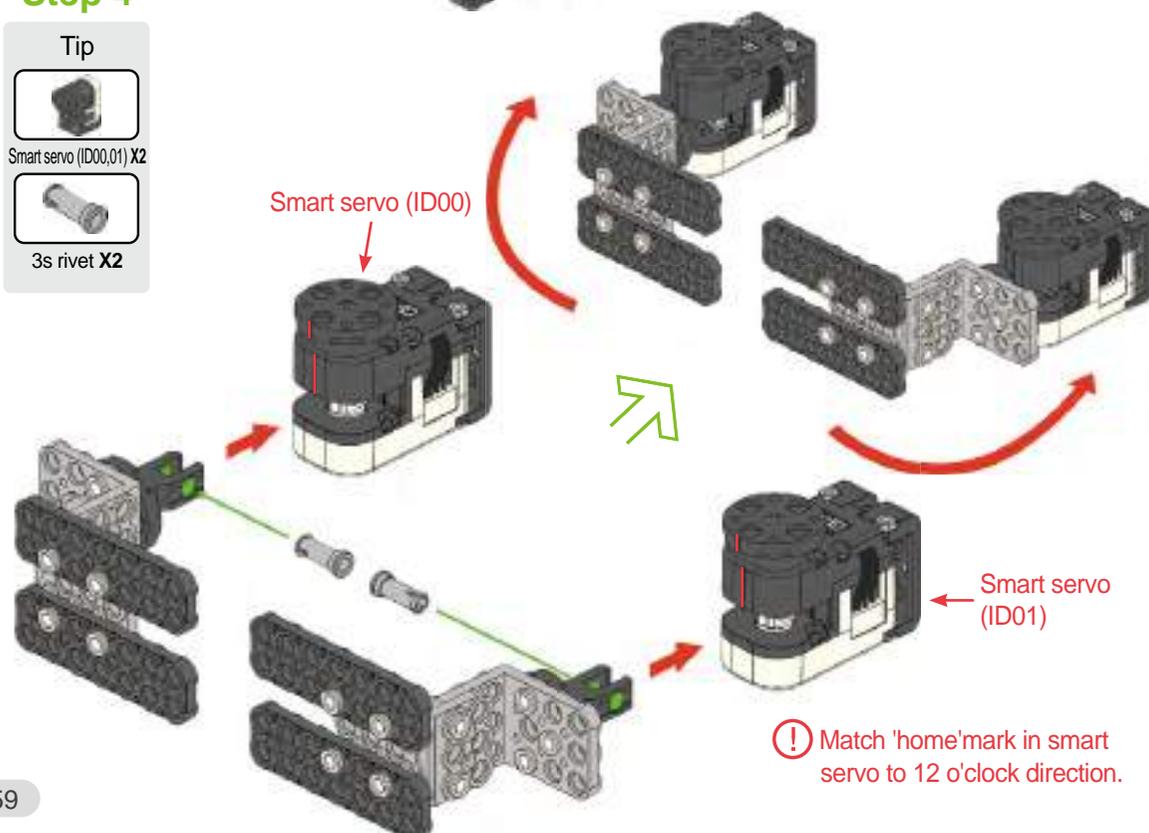
Tip



Smart servo (ID00,01) X2



3s rivet X2

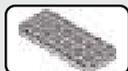


Step 5 X2

Tip



2x9 frame X2



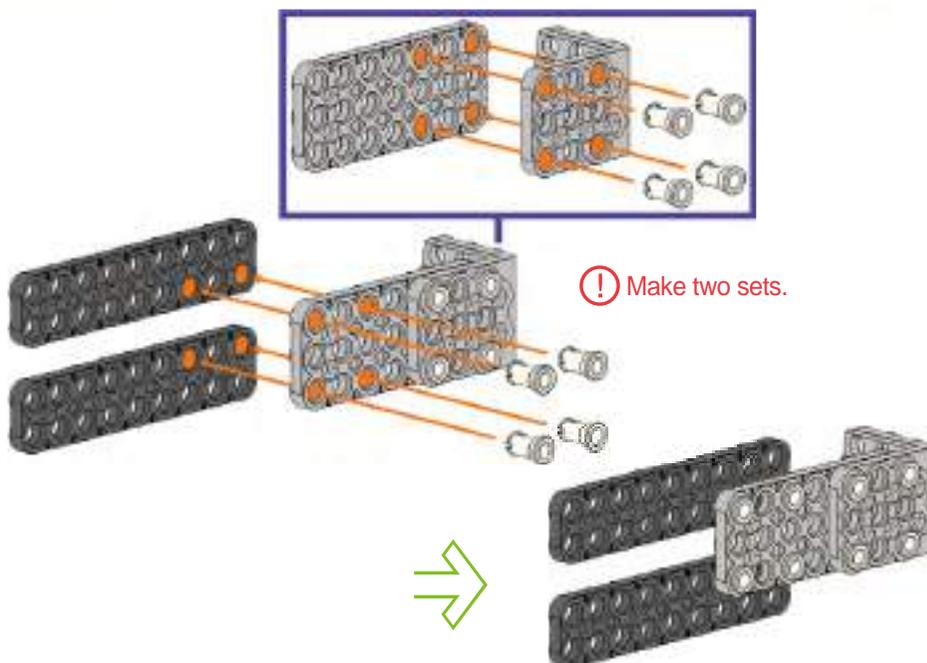
3x7 frame X1



3x6 L frame X1

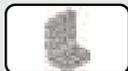


2s rivet X8



Step 6

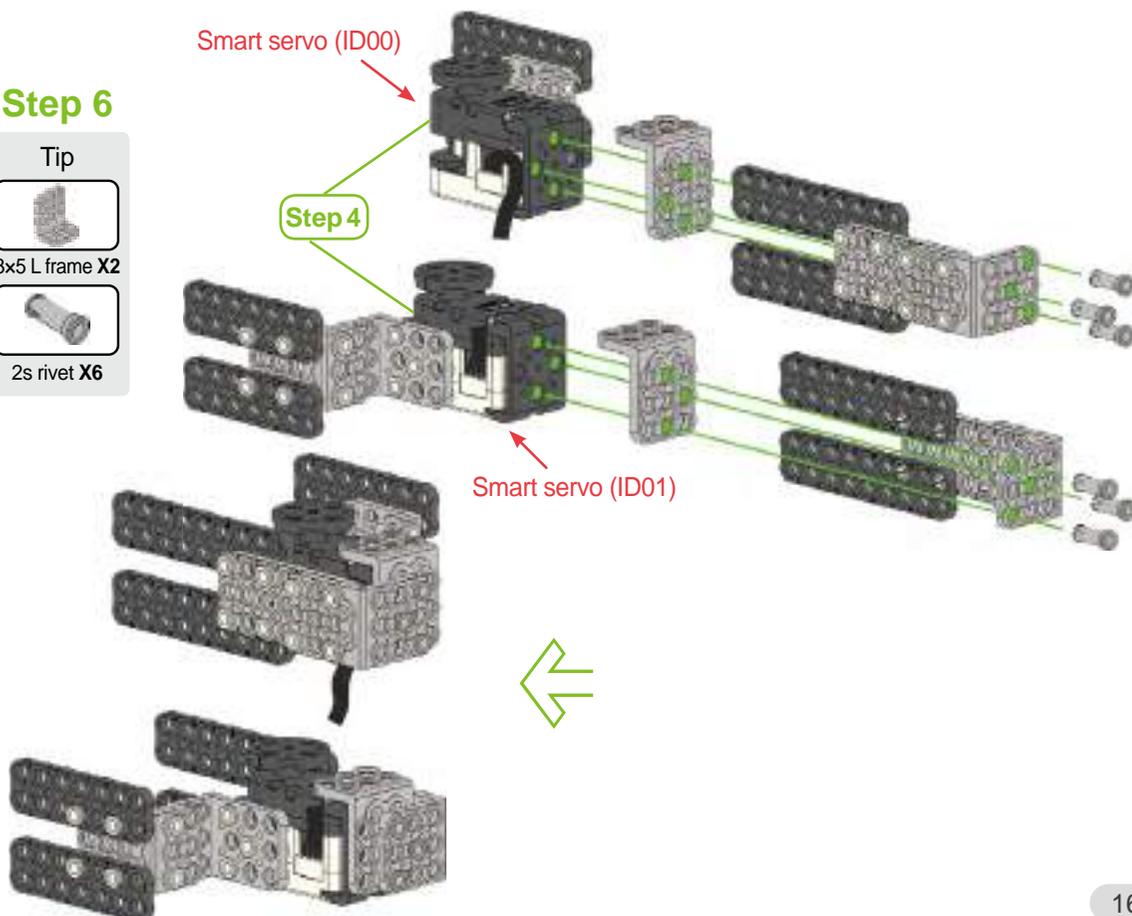
Tip



3x5 L frame X2



2s rivet X6



Step 7

Tip



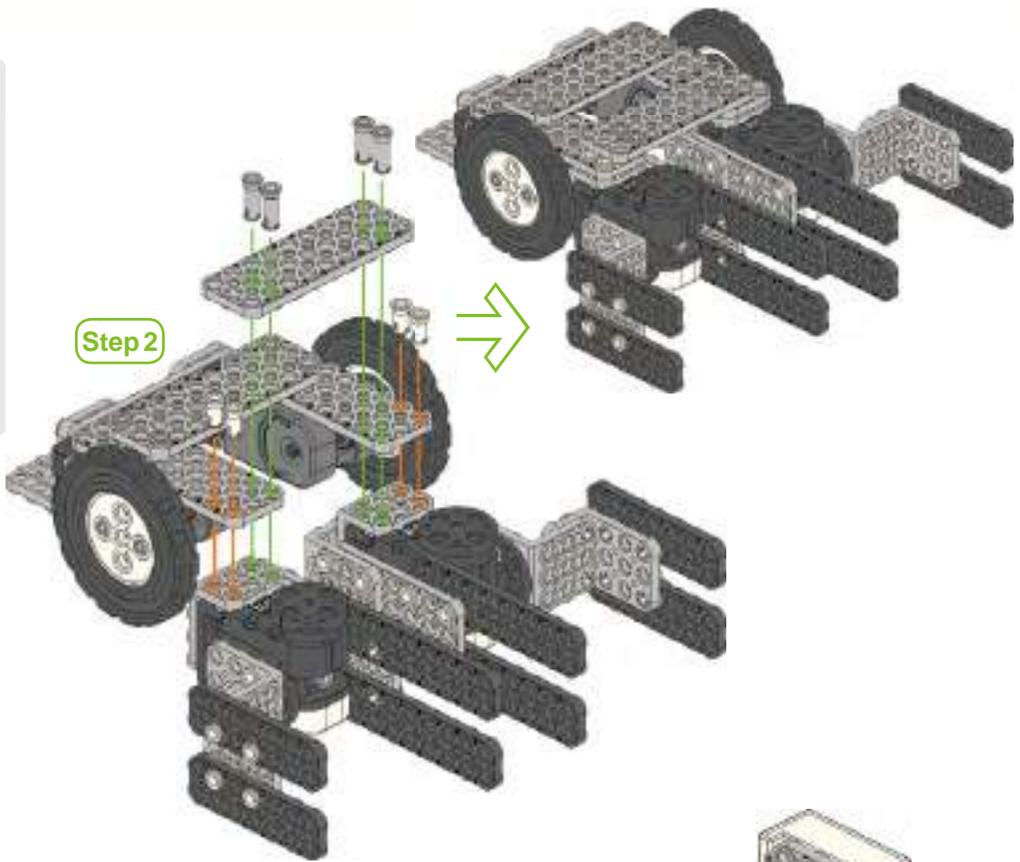
3x9 frame X1



2s rivet X4



3s rivet X4



Step 8

Tip



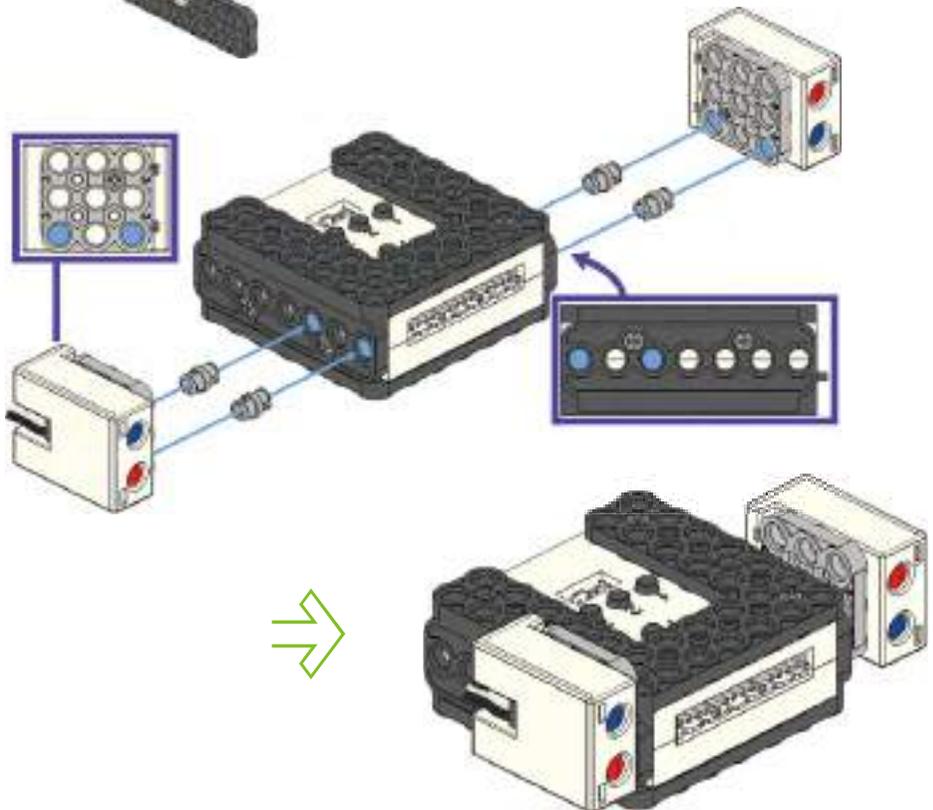
Smart controller X1



LED X2



Double rivet X4

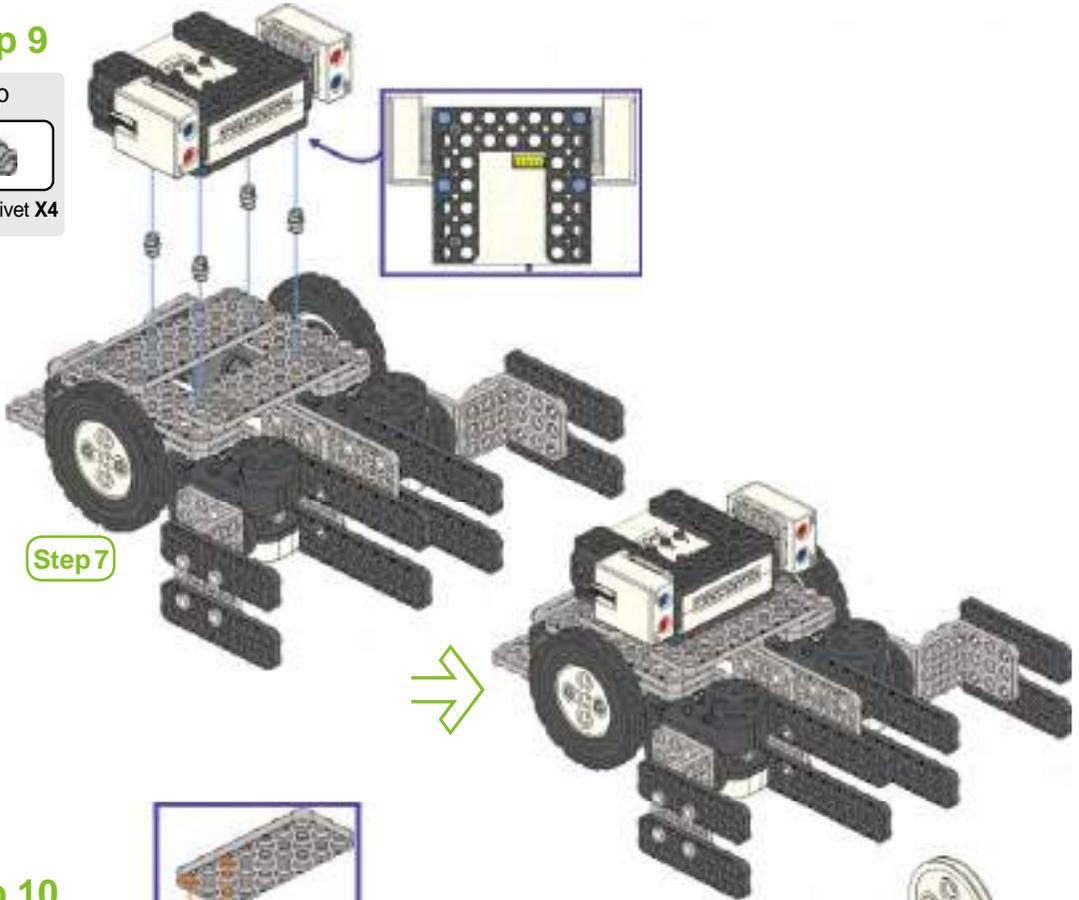


Step 9

Tip



Double rivet X4



Step 10

Tip



3x7 frame X4



3x5 L frame X2



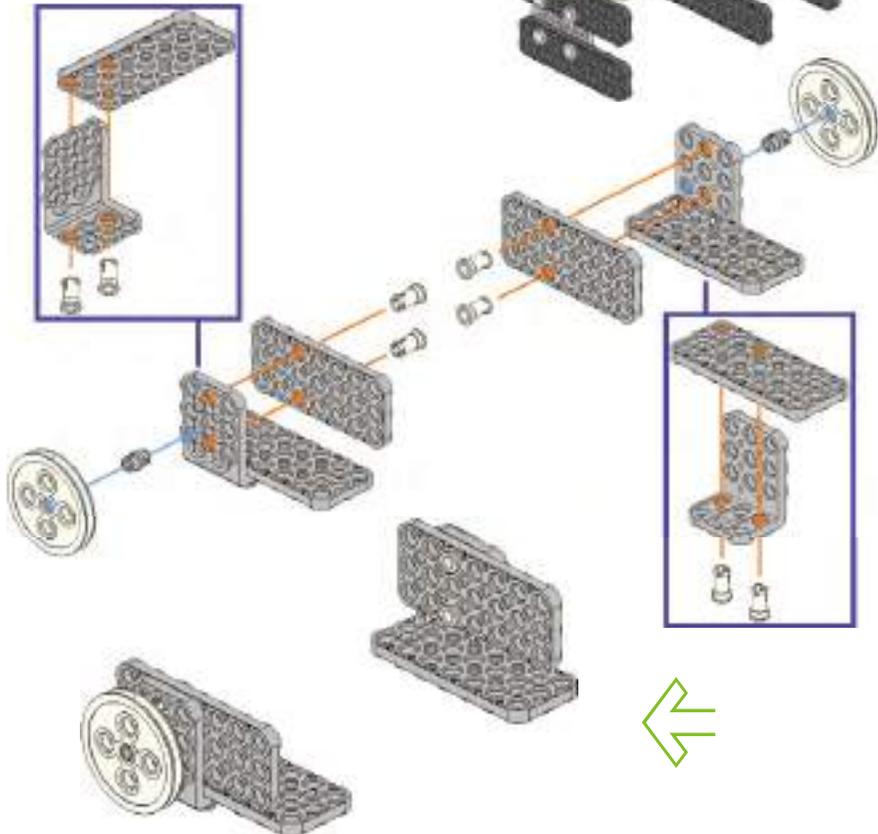
Wheel X2



2s rivet X8



Double rivet X2



Step 11

Tip



Battery case X1



2x5 frame X2



3x5 frame X3



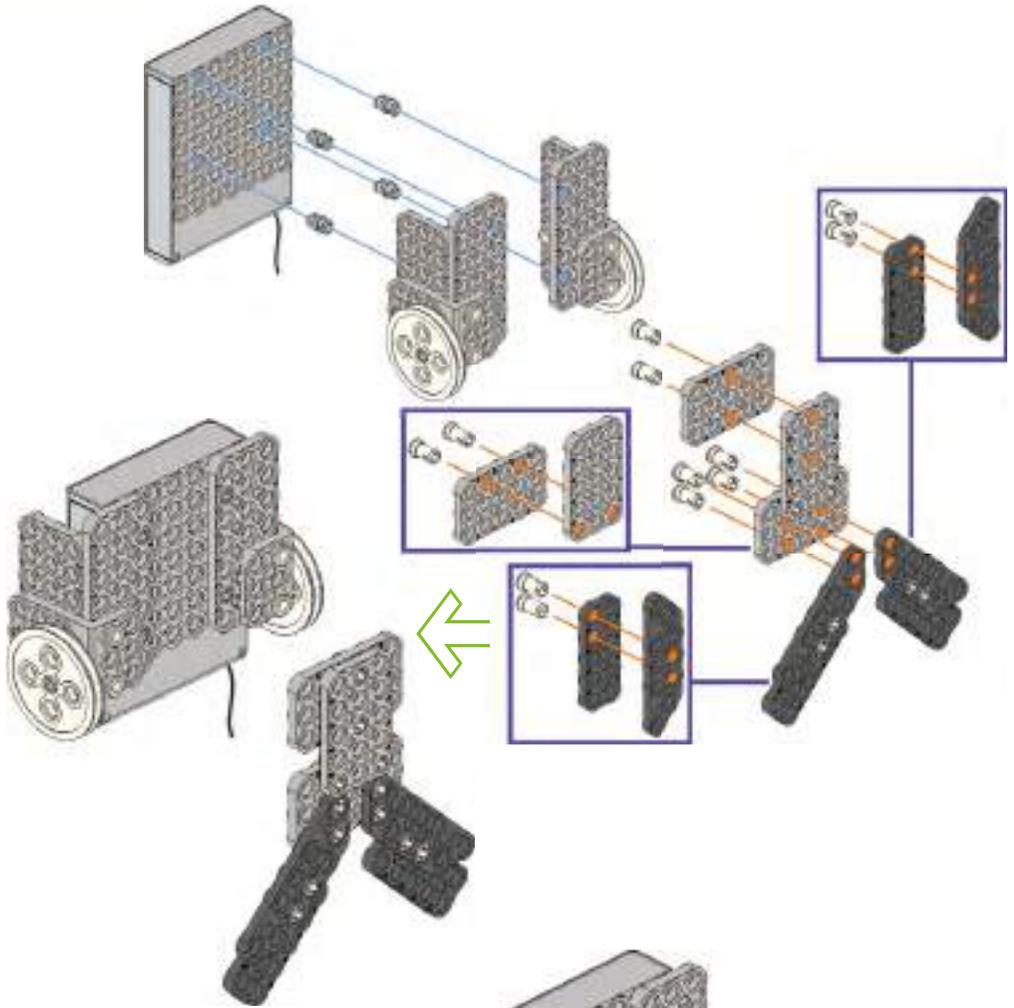
Opposite angle frame X2



2s rivet X12



Double rivet X4

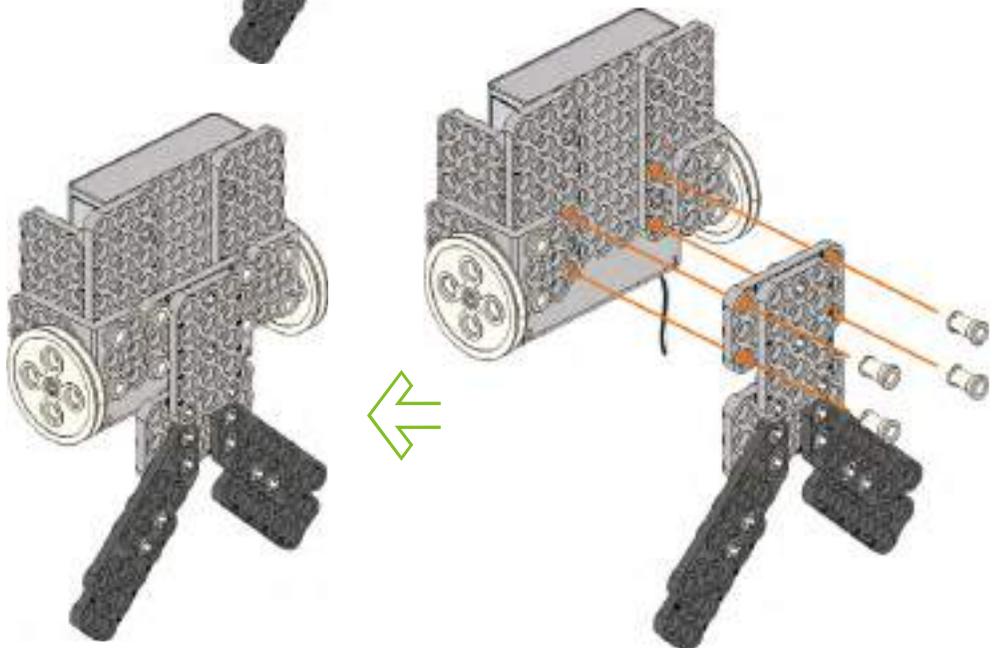


Step 12

Tip



2s rivet X4

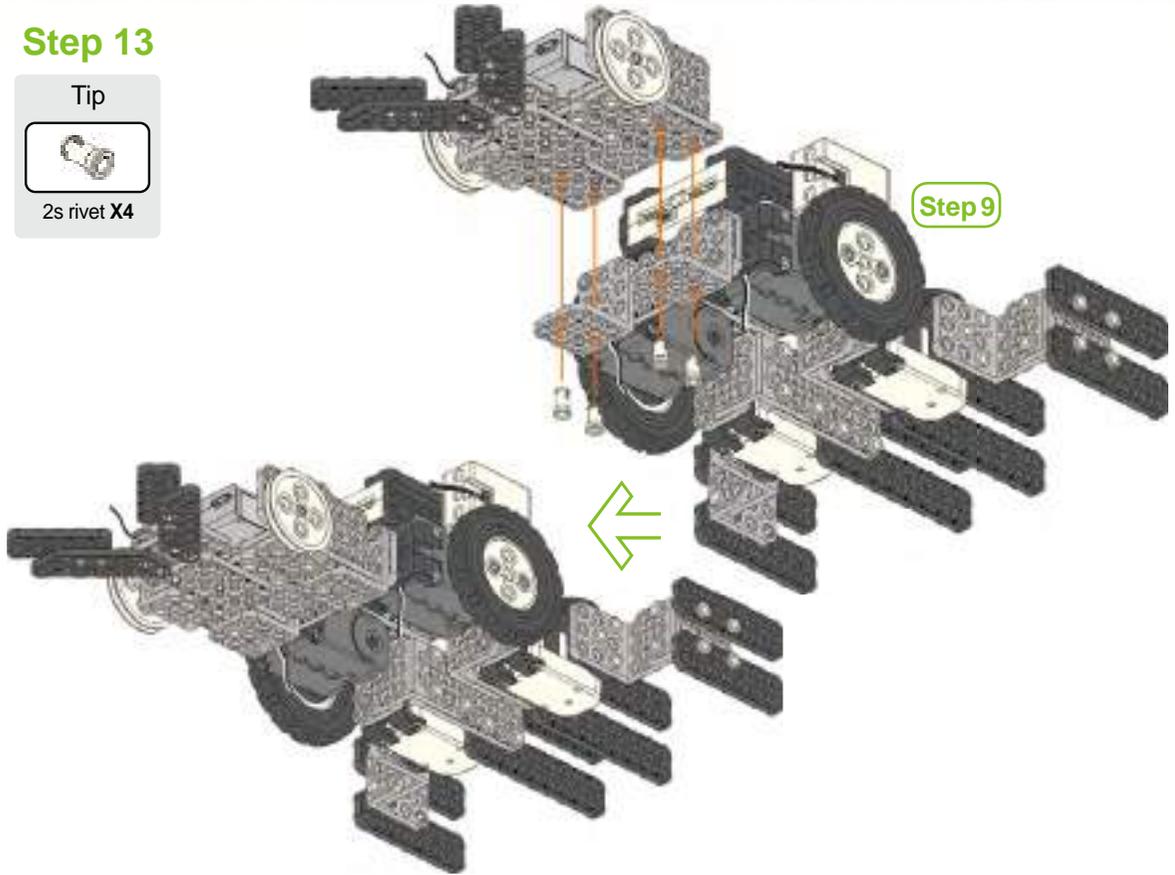


Step 13

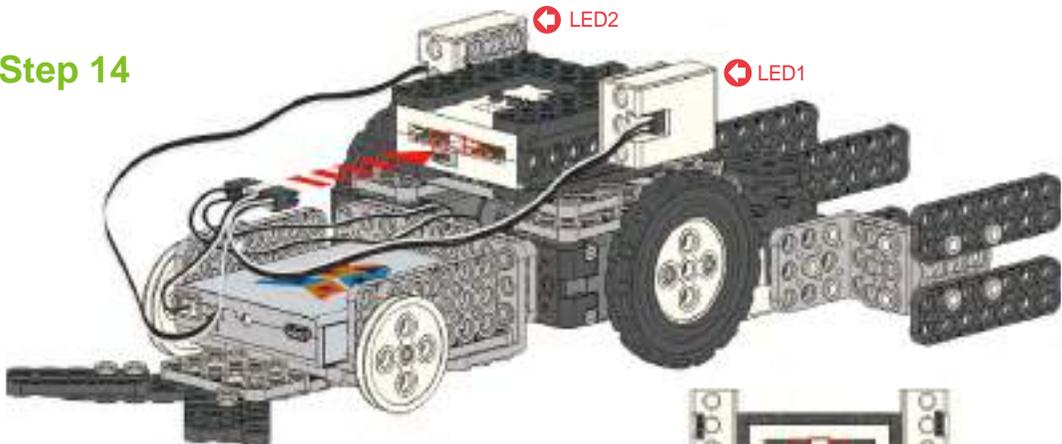
Tip



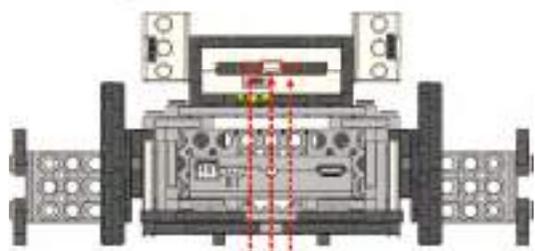
2s rivet X4



Step 14

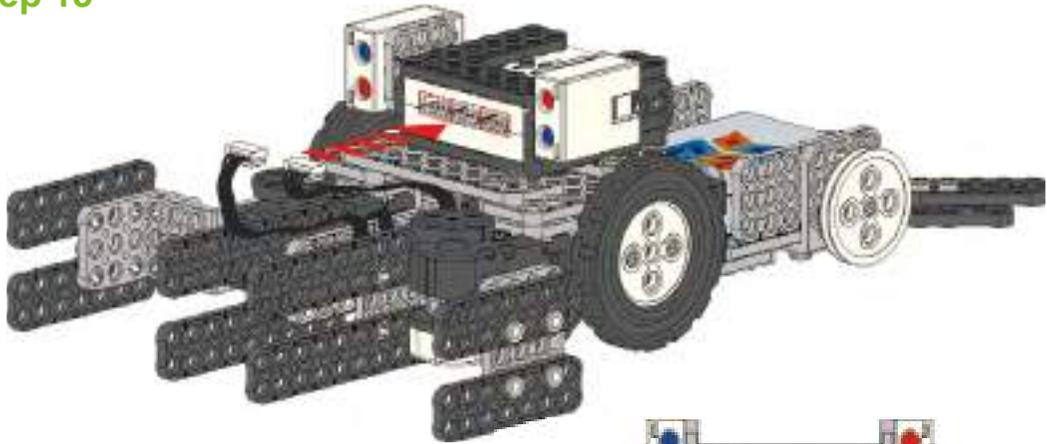


⚠ Pay attention to cable connection and direction.

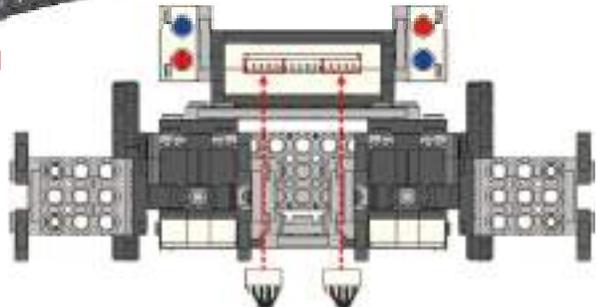


- R. motor(ID29) ➔
- R. motor(ID30) ➔
- Power ➔
- LED1 ➔
- LED2 ➔

Step 15



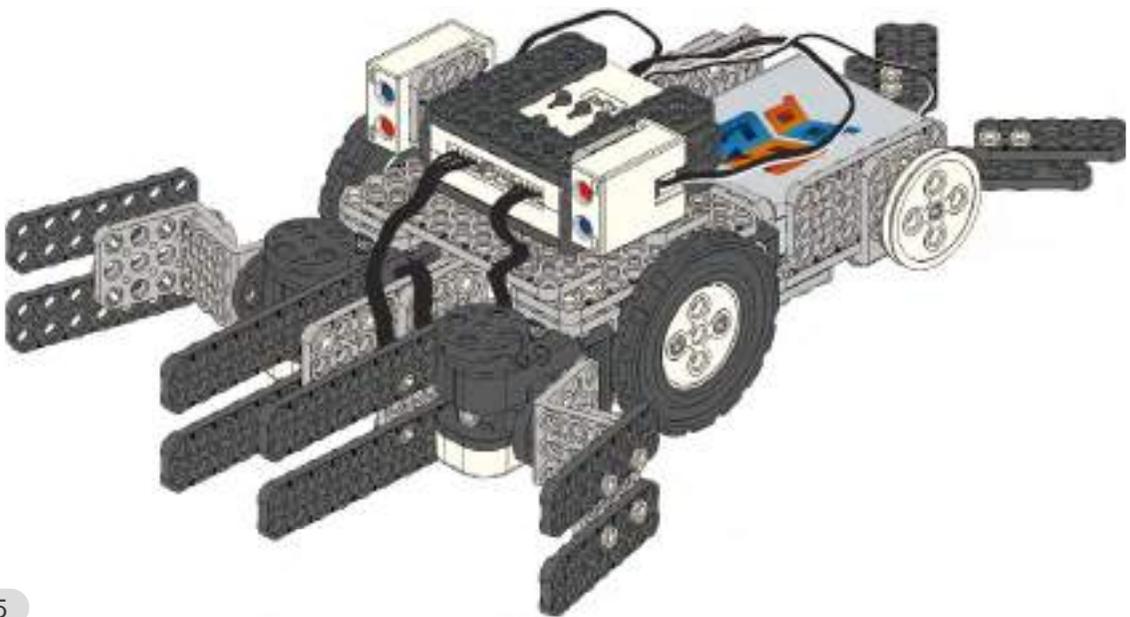
⚠ Arrange the cables of rotation motor and smart servo not to touch the ground.



Smart servo (ID01) → → Smart servo (ID00)



★ 'Crayfish Bot' is ready! ★



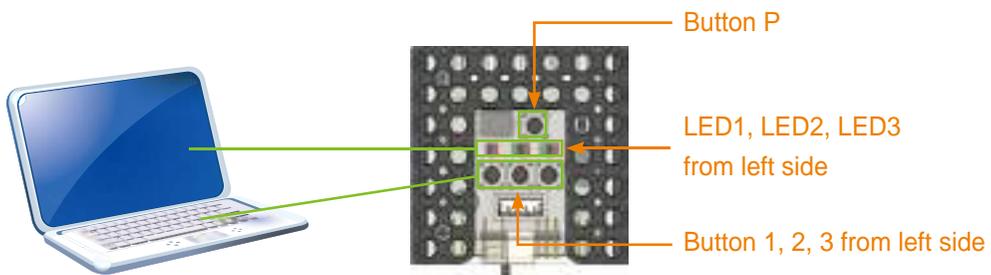


Robot Experience



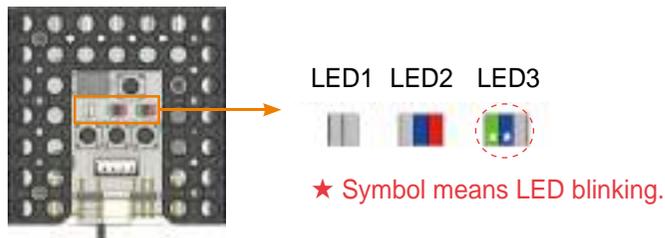
Set-up 'Crayfish Bot' robot model.

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons work as the keyboard for PC.



First : Turn on the smart controller to enter <set-up mode>.

Second : Press button 2 or button 3 on smart controller to set-up 'Crayfish Bot' robot model. The buttons work as a keyboard for PC. Program the robot for proper operation.



Third : Press button P on smart controller to enter <standby mode>.

Reassemble after checking the following when robot is not working.

1. When Crayfish Bot is not working :
 - ▶ Check power cable and S/W, and proper robot model set-up.
2. When robot moves so slow, or not moving at all :
 - ▶ Check rotation motor ID and assembled position. Also, check if cables are touching the ground.



Check movement and assembly.

1. Match the IR remote controller buttons with the corresponding action.

A button •



B button •



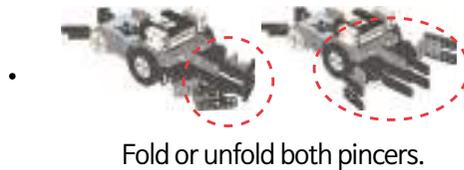
1 button •



2 button •



3 button •



2. Which IR remote controller button should you press to check below motion?



Backs away when detects sound.

Press # + ()

buttons together.

Robot Play



Defend frames.

Steal frames from the opposite side by using the pincers of Crayfish Bot. Whoever collects more frames wins the game.

- Play 2 vs. 2 or 3 vs. 3.
- Each team has a big 'U' shaped frame on their side.
(Gather all big 'U' shaped frames from friends.)
- Play time is 3 minutes, and you should collect the frame from opposite player's side.
- Discuss new game rules for more exciting game.



Each team should put a different sign on their frames!



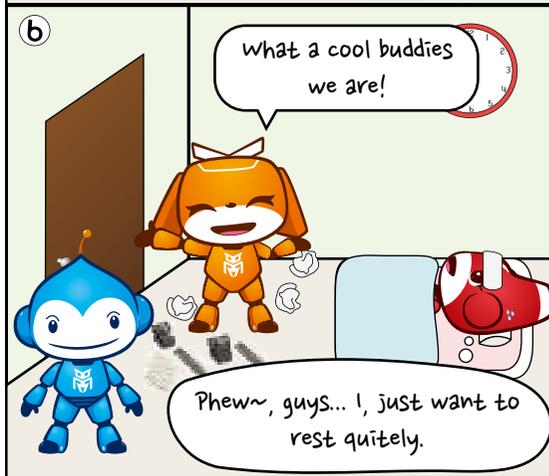
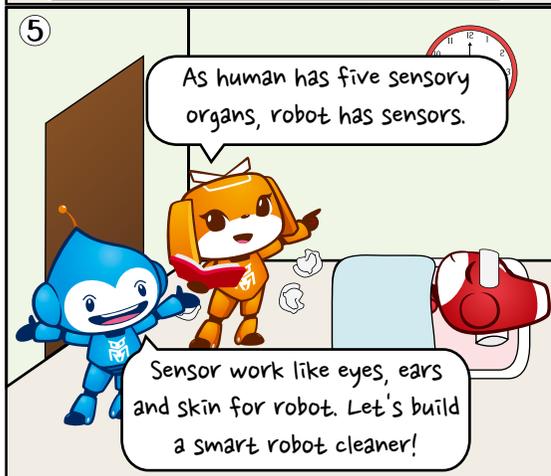
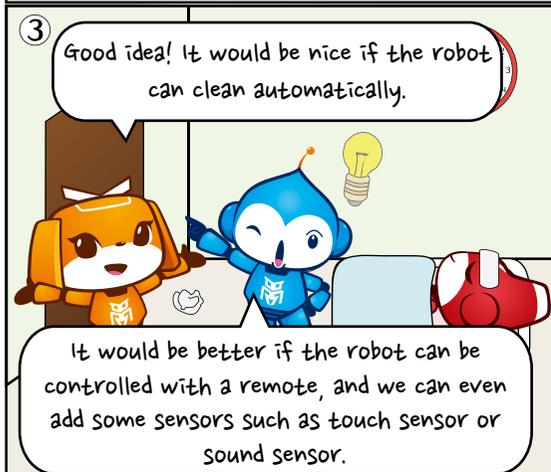
◆ Describe your 'Transport Bot'.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



11. Cleaning Bot

Robot sensor

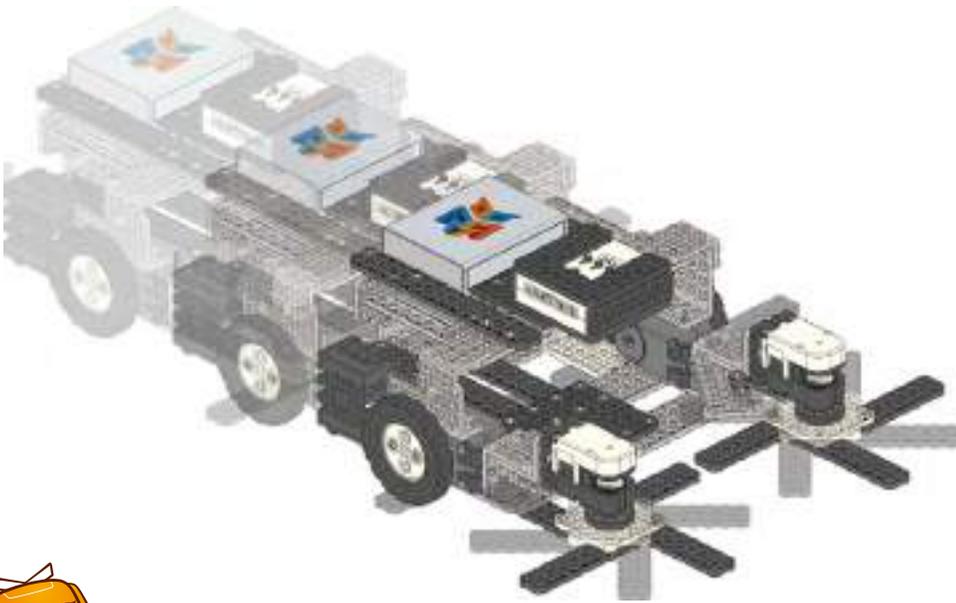




Today's Robot Class



Cleaning Bot uses two rotator blades to clean wastes for human. Rotator blades of Cleaning Bot consist of a smart servo. If waste papers are stuck inside of the rotator blade, the smart servo changes rotary direction to help easily removing the stuck papers. Let's look at functions of Cleaning Bot, and find out how it is different from real cleaning robot.



Buzz~ Found dust~!
Let's clean it up~

Equipped with the sensor with cutting-edge technology, an intelligent cleaning robot automatically goes around and cleans every corner. Robot cleaner detects objects by using the IR sensor, and cleans under the bed or sofa by using the light detection sensor on top of the voice sensor. It has the automatic charging function and allows making reservation for cleaning.

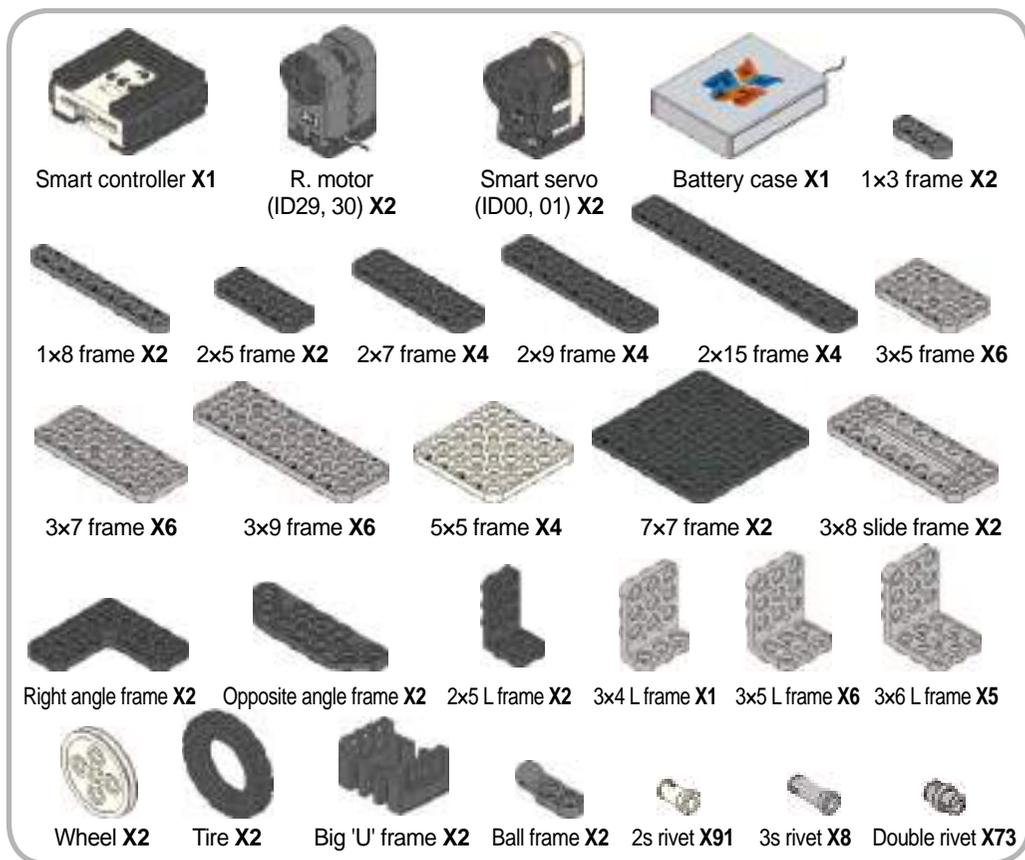




Robot Assembly

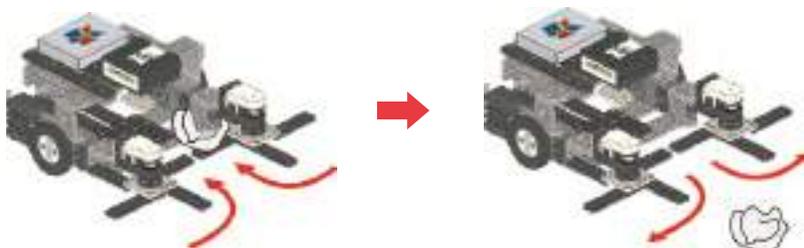


Prepare robot parts.



Tips.

Change the direction of rotary blade when waste paper is stuck inside of the rotary blade.



Step 1

Tip



3x9 frame X4



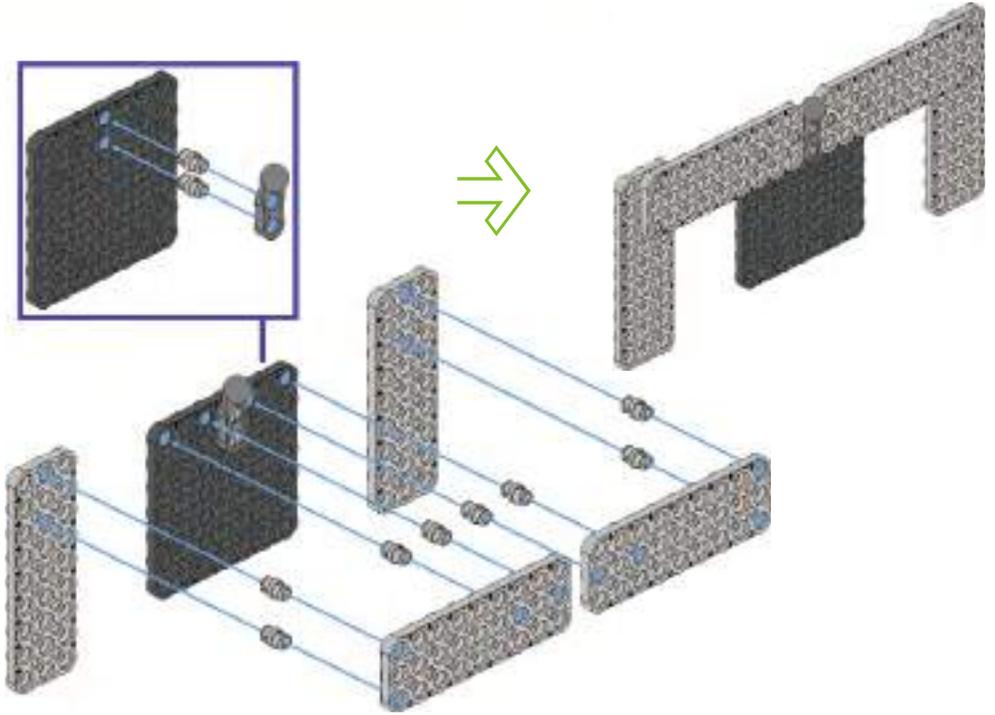
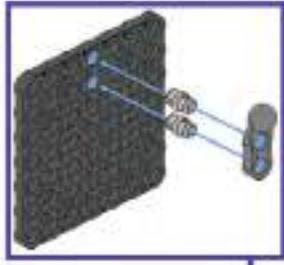
7x7 frame X1



Ball frame X1

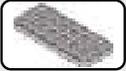


Double rivet X10



Step 2

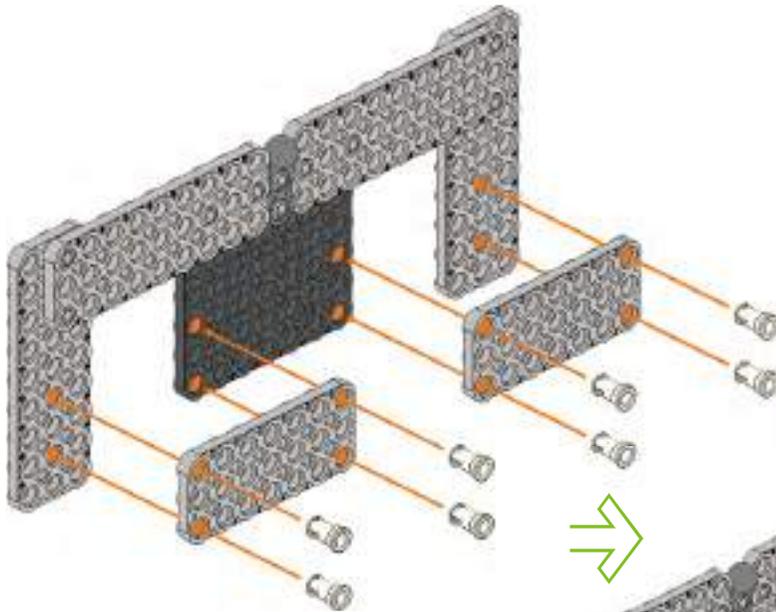
Tip



3x7 frame X2



2s rivet X8



Step 3

Tip



2x15 frame X2



3x5 frame X1



3x4 L frame X1



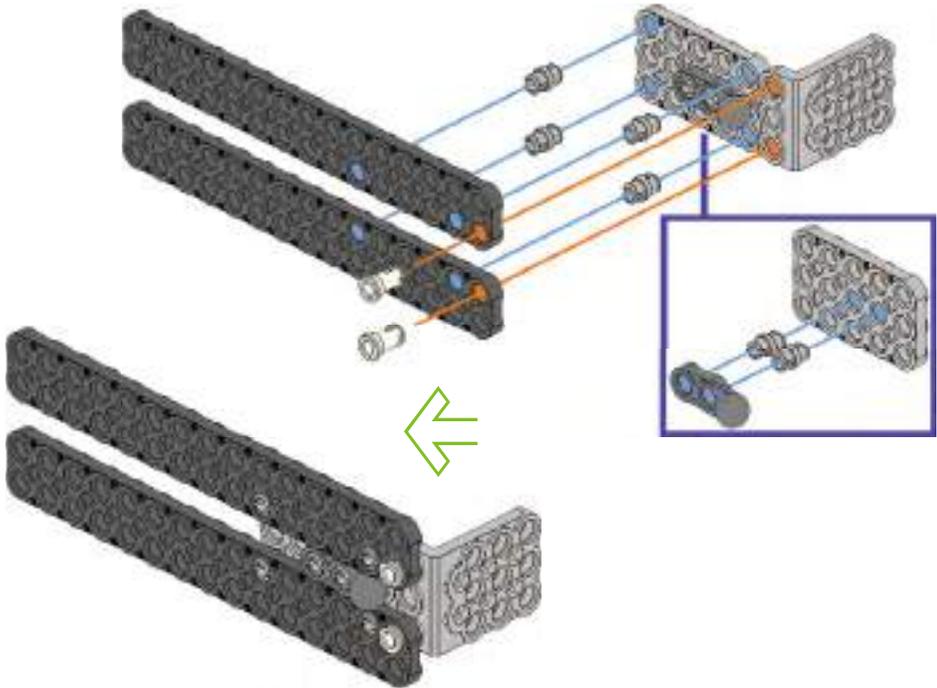
Ball frame X1



2s rivet X2

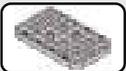


Double rivet X6



Step 4

Tip



3x5 frame X2



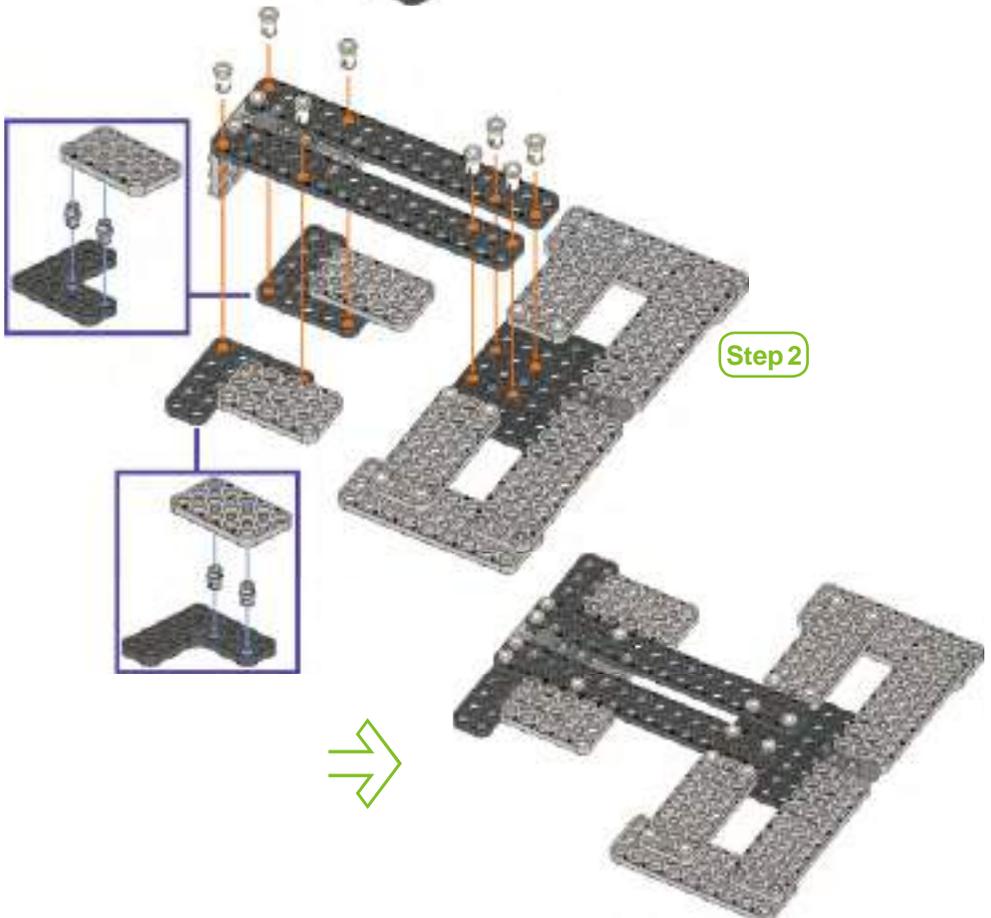
Right angle frame X2



2s rivet X8

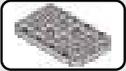


Double rivet X4



Step 5

Tip



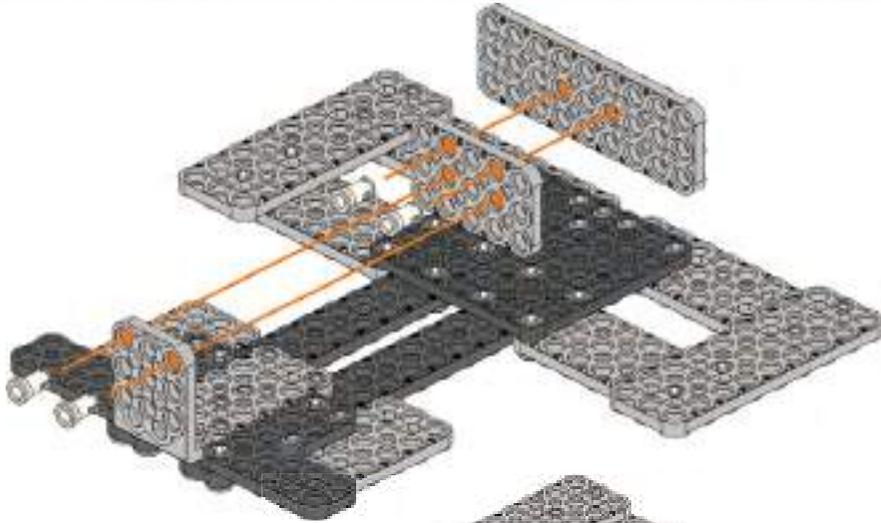
3x5 frame X1



3x9 frame X1



2s rivet X4



Step 6

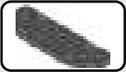
Tip



2x5 frame X1



5x5 frame X1



Opposite angle frame X1



2x5 L frame X1



3x5 L frame X1



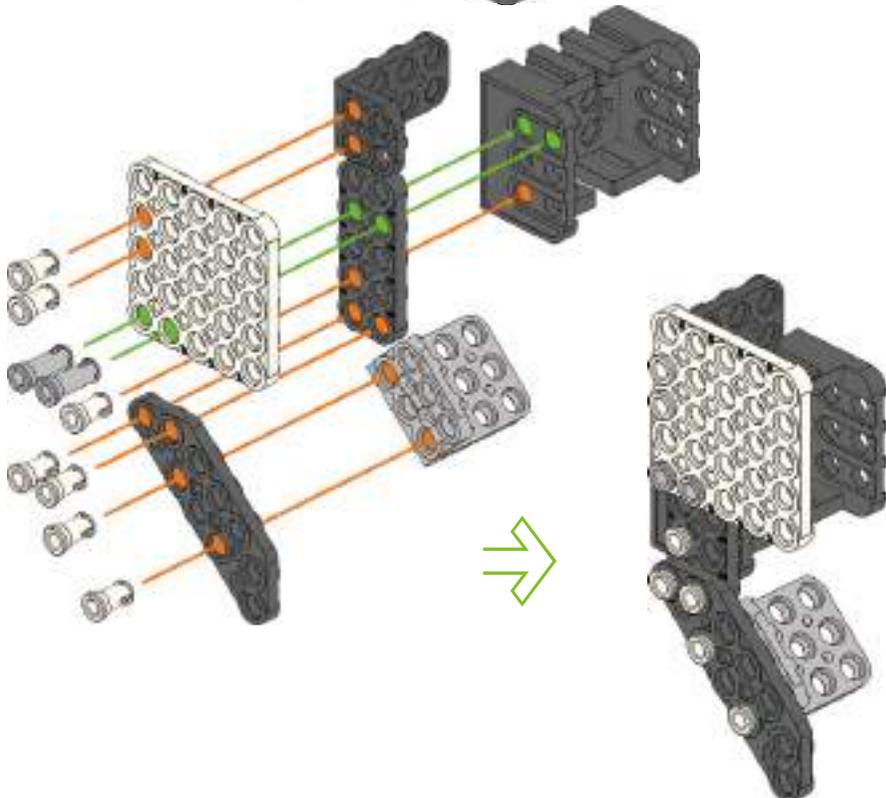
Big 'U' frame X1



2s rivet X7

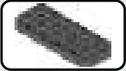


3s rivet X2



Step 7

Tip



2x5 frame X1



5x5 frame X1



Opposite angle frame X1



2x5 L frame X1



3x5 L frame X1



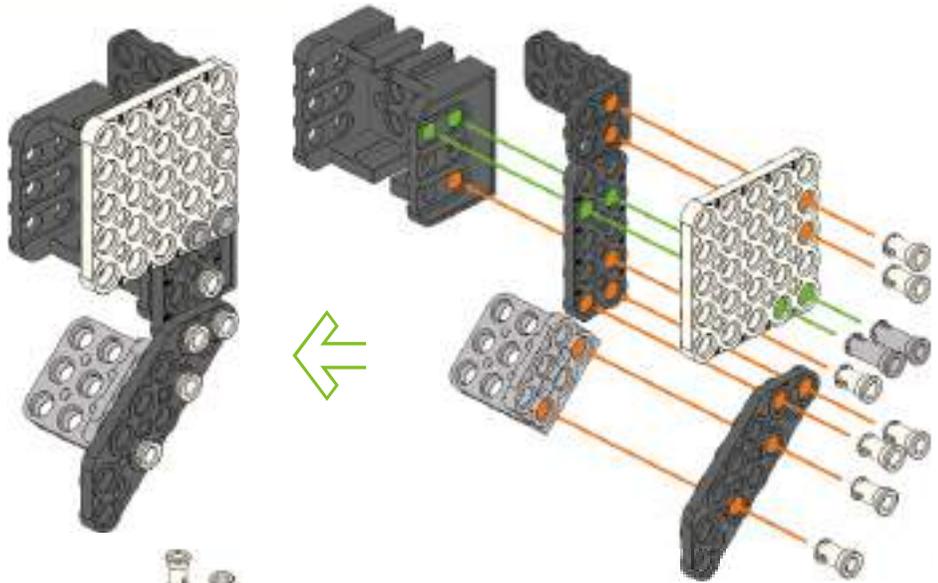
Big 'U' frame X1



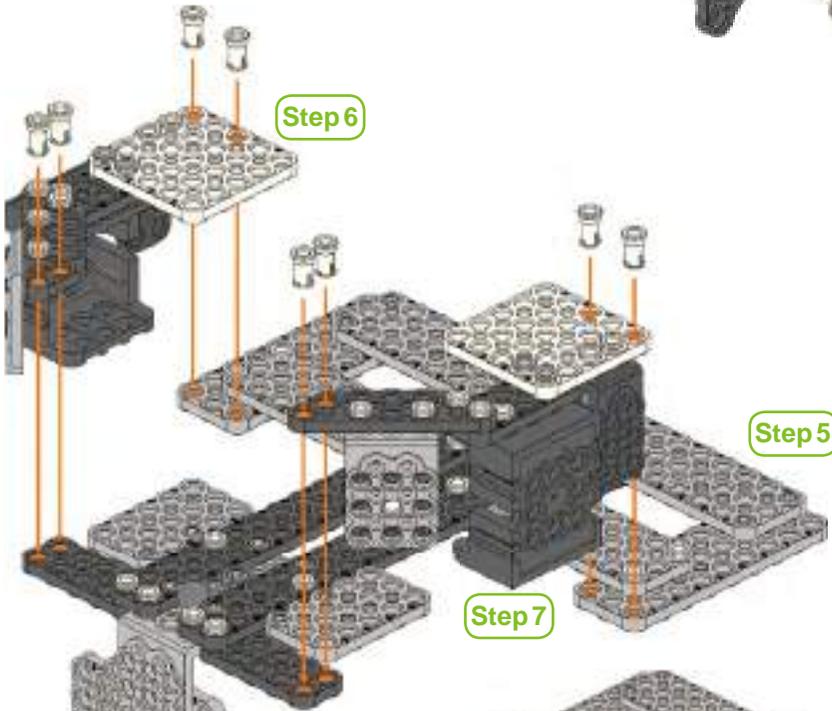
2s rivet X7



3s rivet X2



Step 6



Step 5

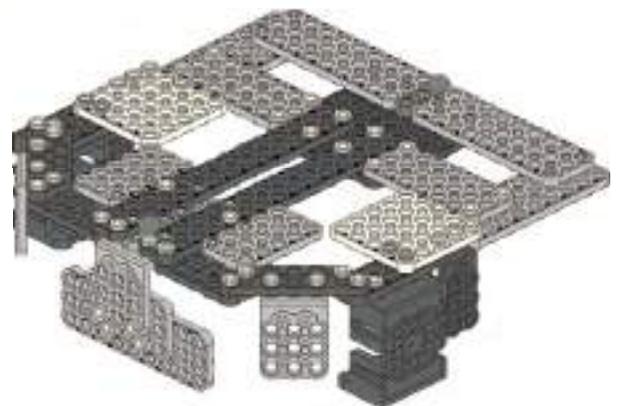
Step 7

Step 8

Tip



2s rivet X8



Step 9 X2

Tip



R. motor (ID29) X1



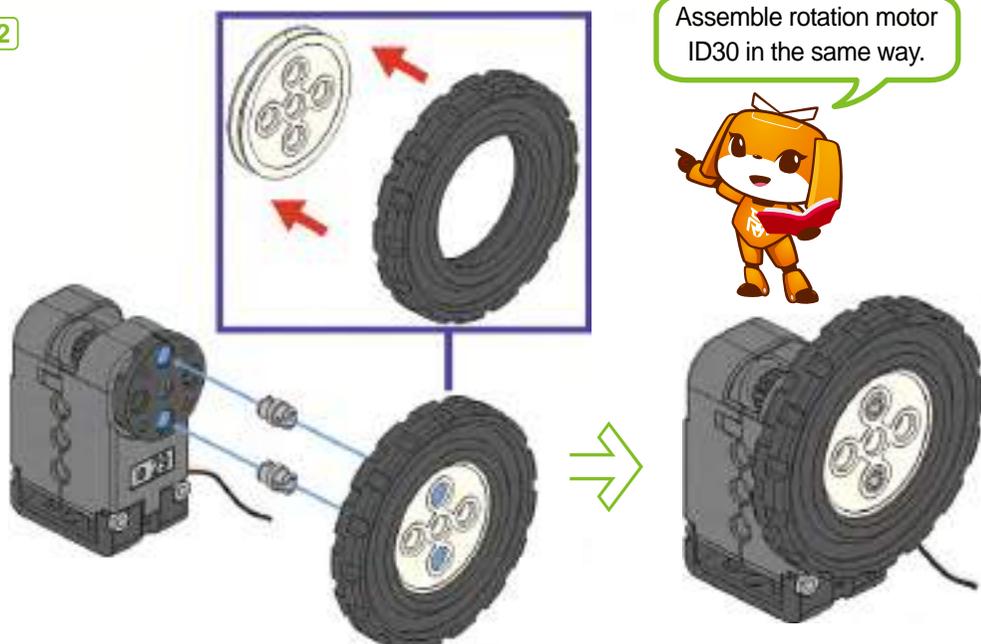
Wheel X1



Tire X1



Double rivet X2

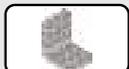


Step 10

Tip



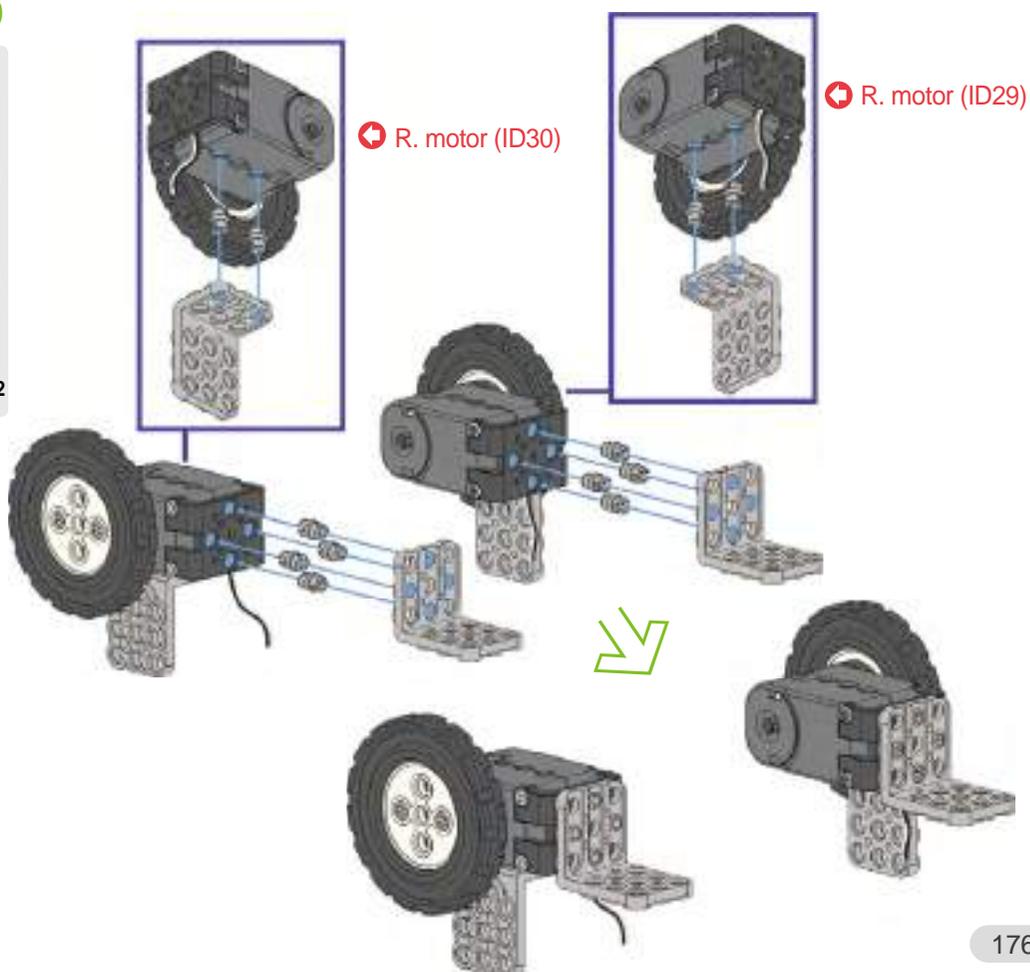
3x5 L frame X2



3x6 L frame X2



Double rivet X12

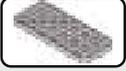


Step 11

Tip



1x3 frame X2



3x7 frame X2



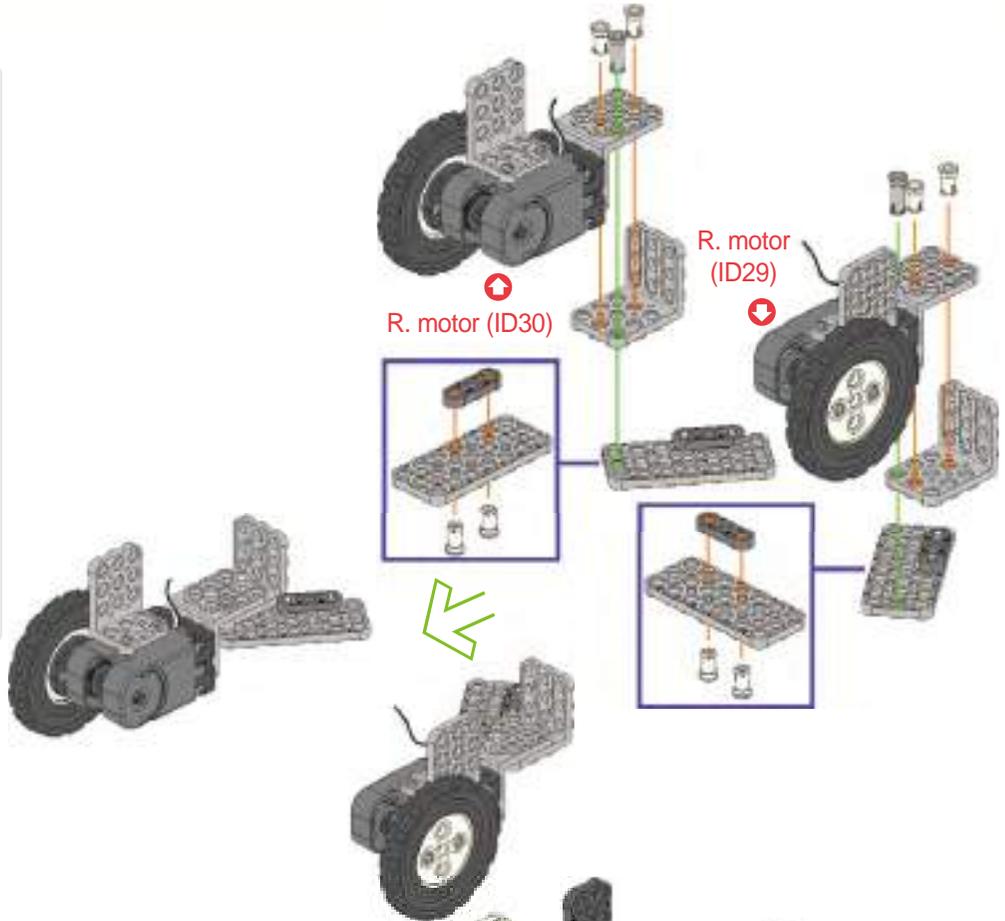
3x6 L frame X2



2s rivet X8



3s rivet X2



Step 12

Tip



2x7 frame X4



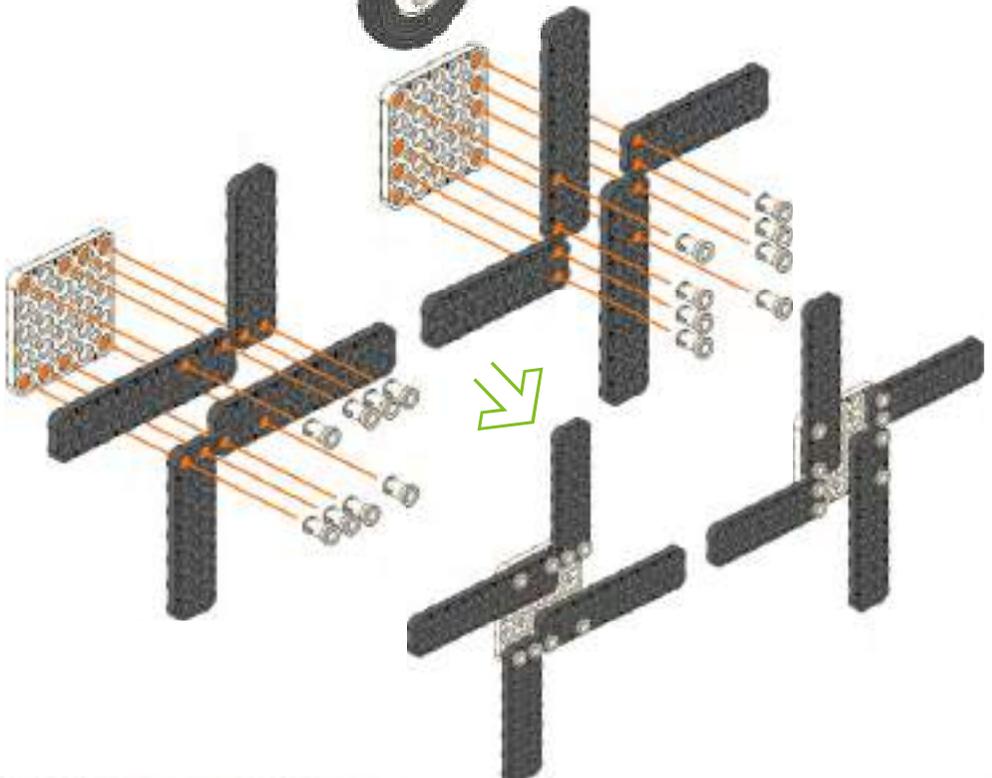
2x9 frame X4



5x5 frame X2



2s rivet X16



Step 13

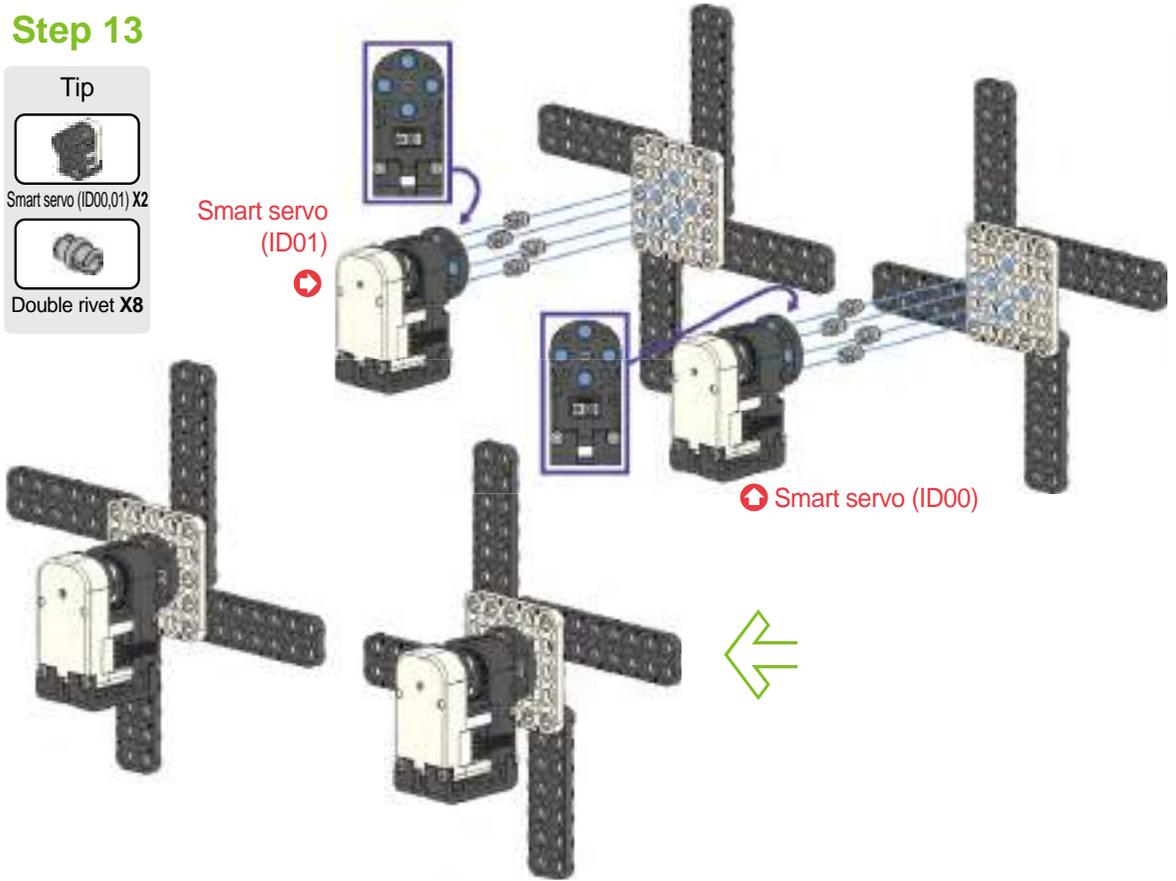
Tip



Smart servo (ID00,01) X2



Double rivet X8

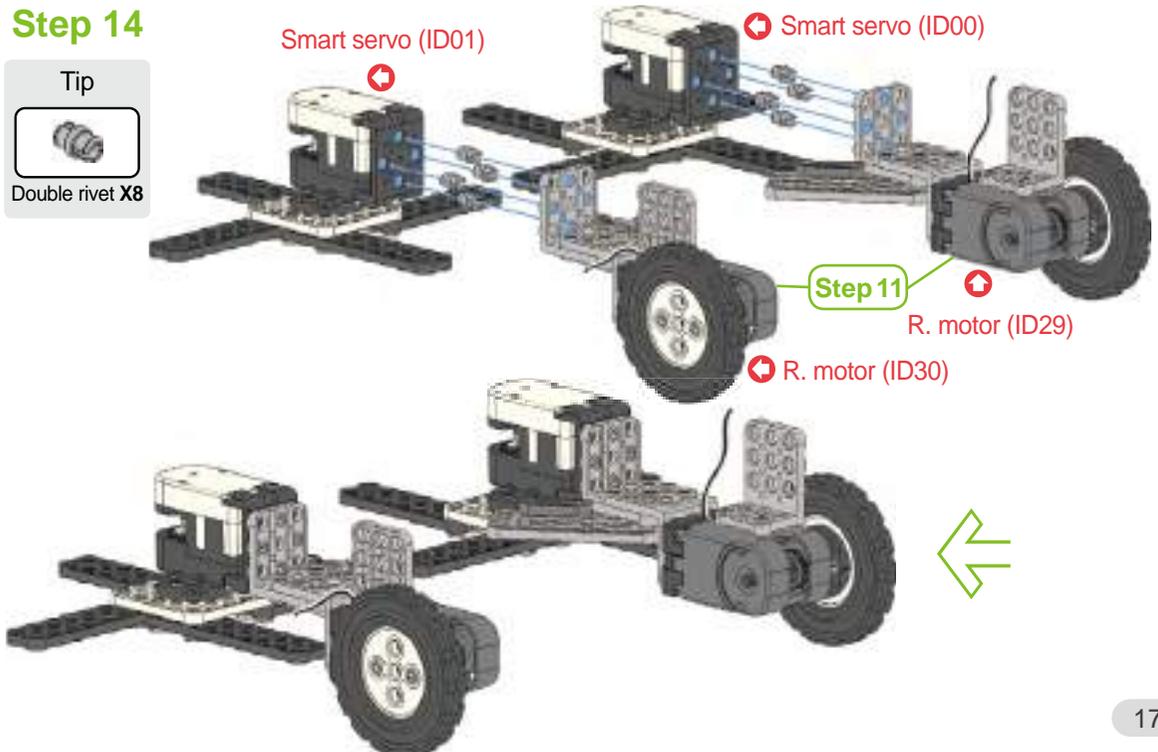


Step 14

Tip



Double rivet X8



Step 15

Tip

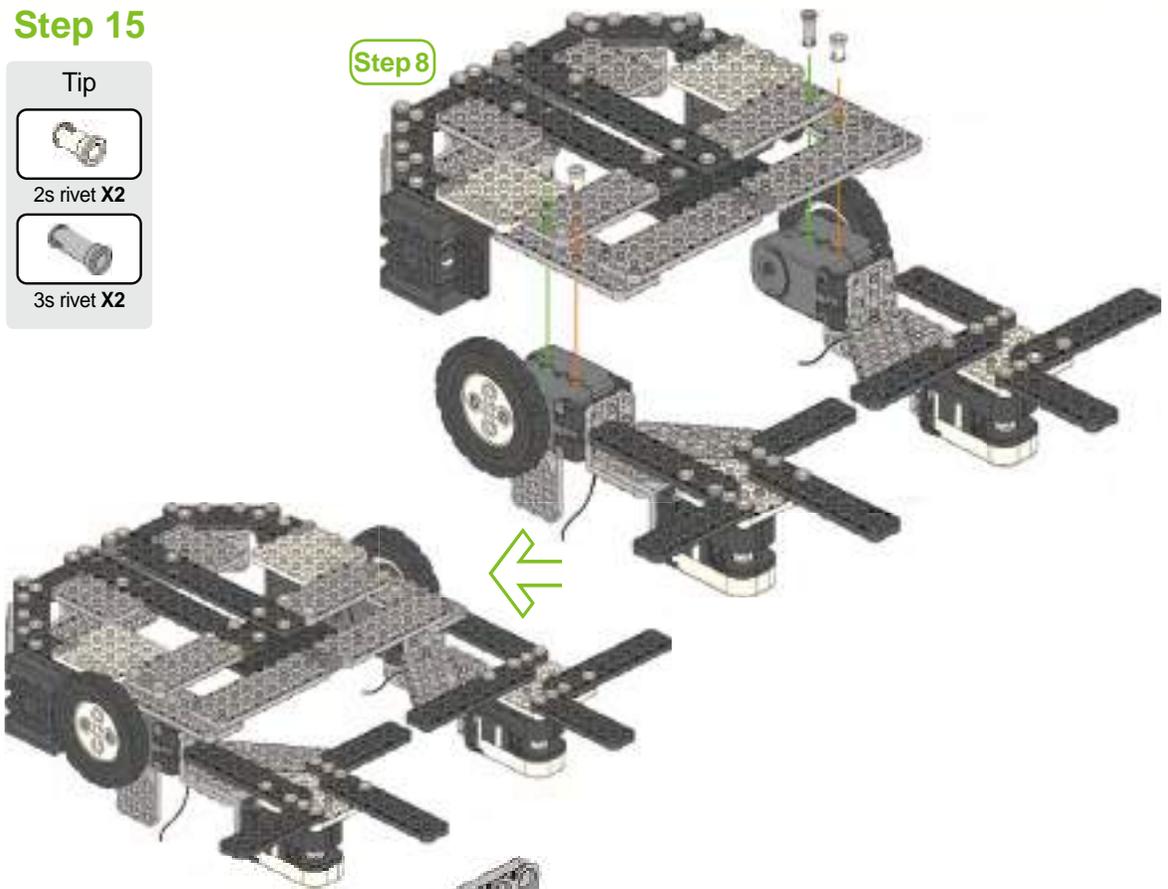


2s rivet X2



3s rivet X2

Step 8



Step 16

Tip



1x8 frame X2



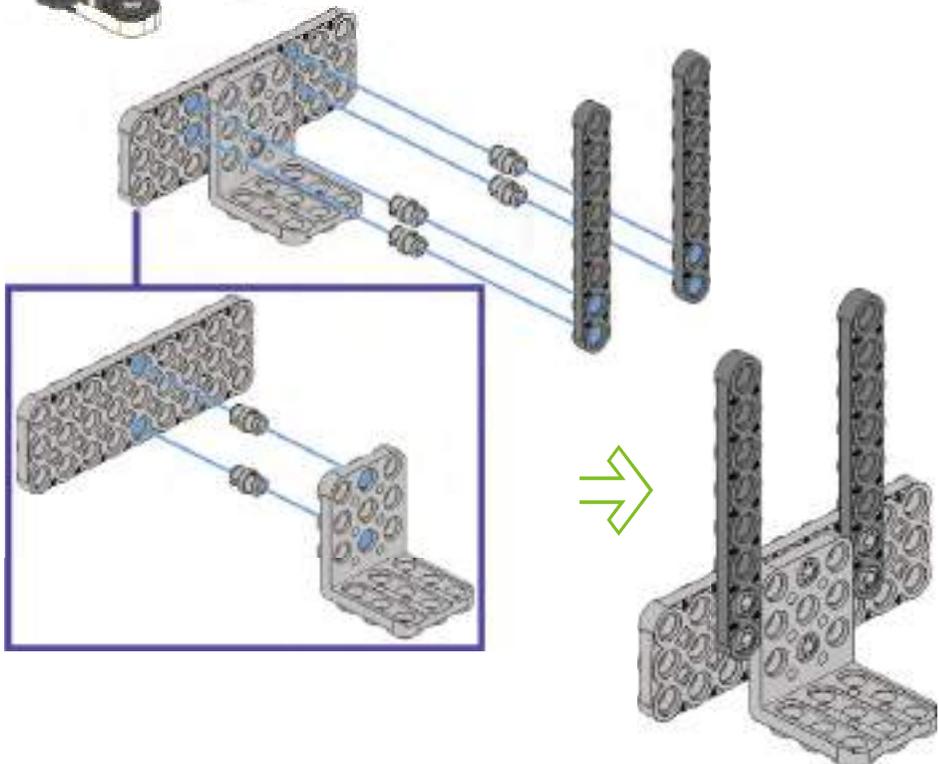
3x9 frame X1



3x6 L frame X1



Double rivet X6



Step 17

Tip



2x15 frame X2



3x7 frame X2



7x7 frame X1



3x8 slide frame X2



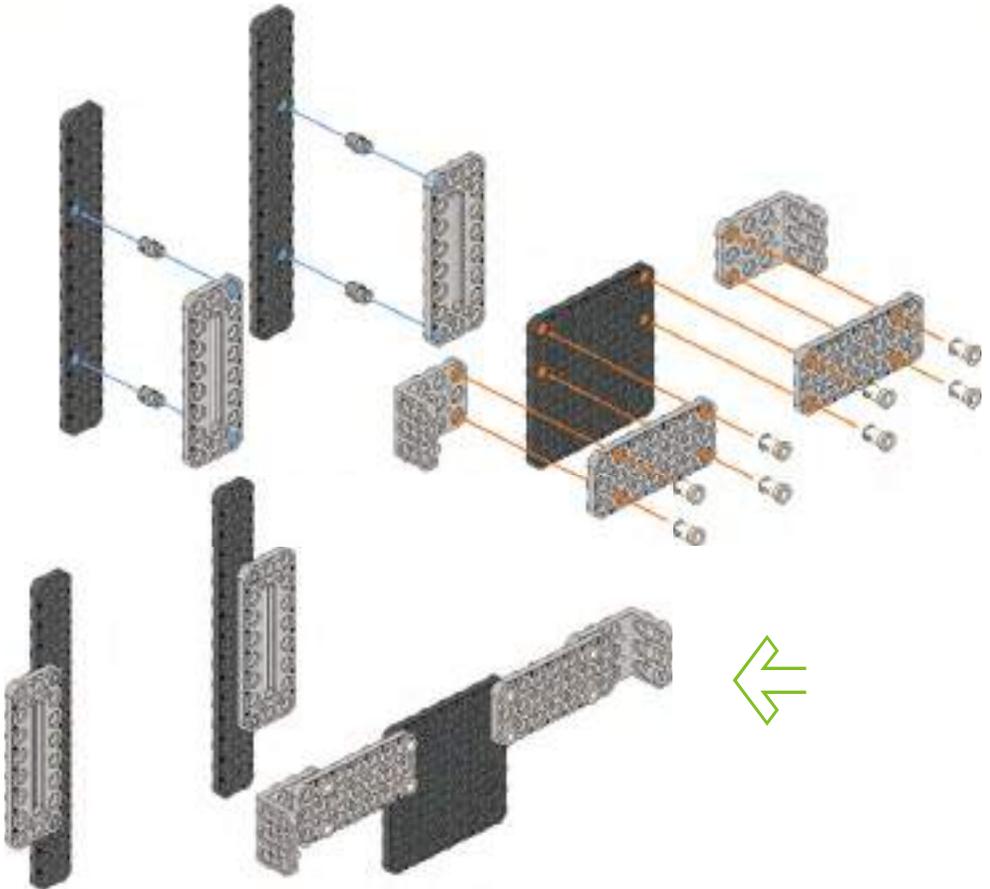
3x5 L frame X2



2s rivet X8



Double rivet X4

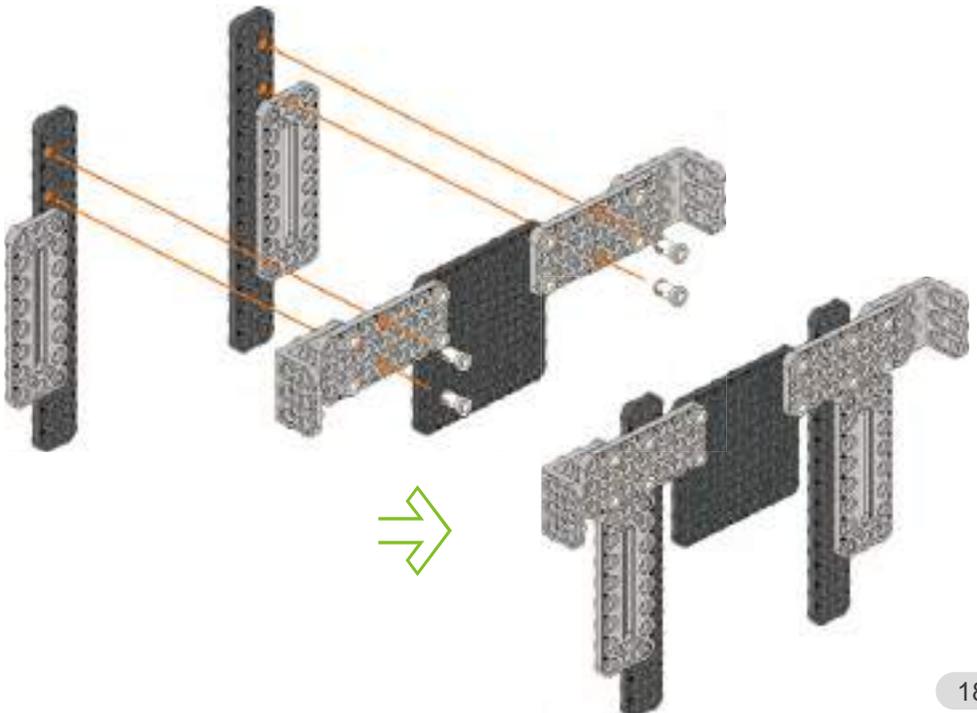


Step 18

Tip



2s rivet X4

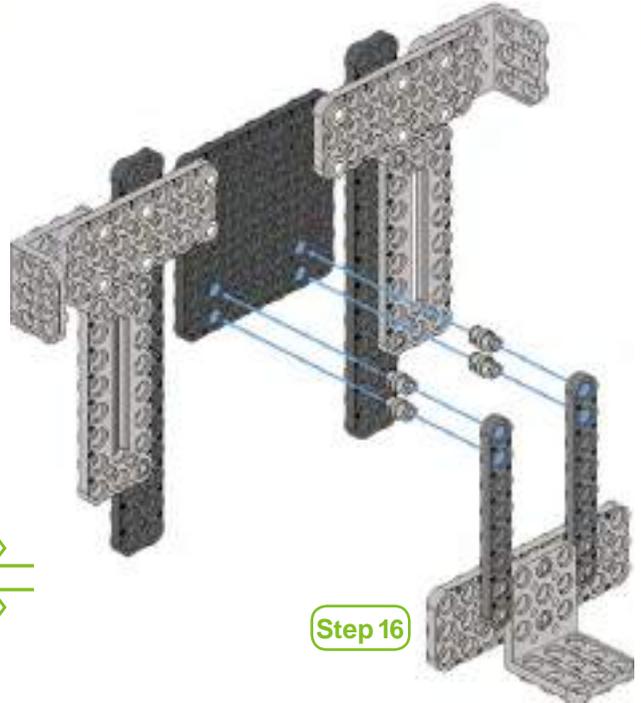


Step 19

Tip

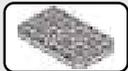


Double rivet X4



Step 20

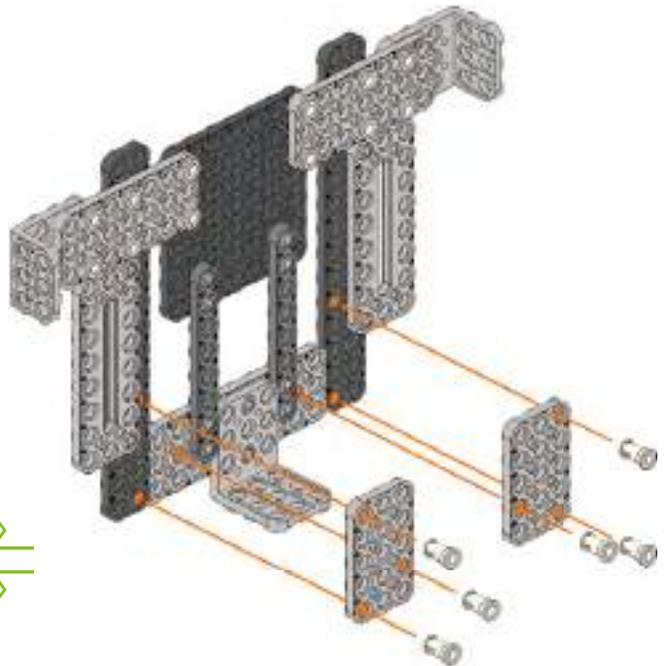
Tip



3x5 frame X2



2s rivet X6



Step 21

Tip



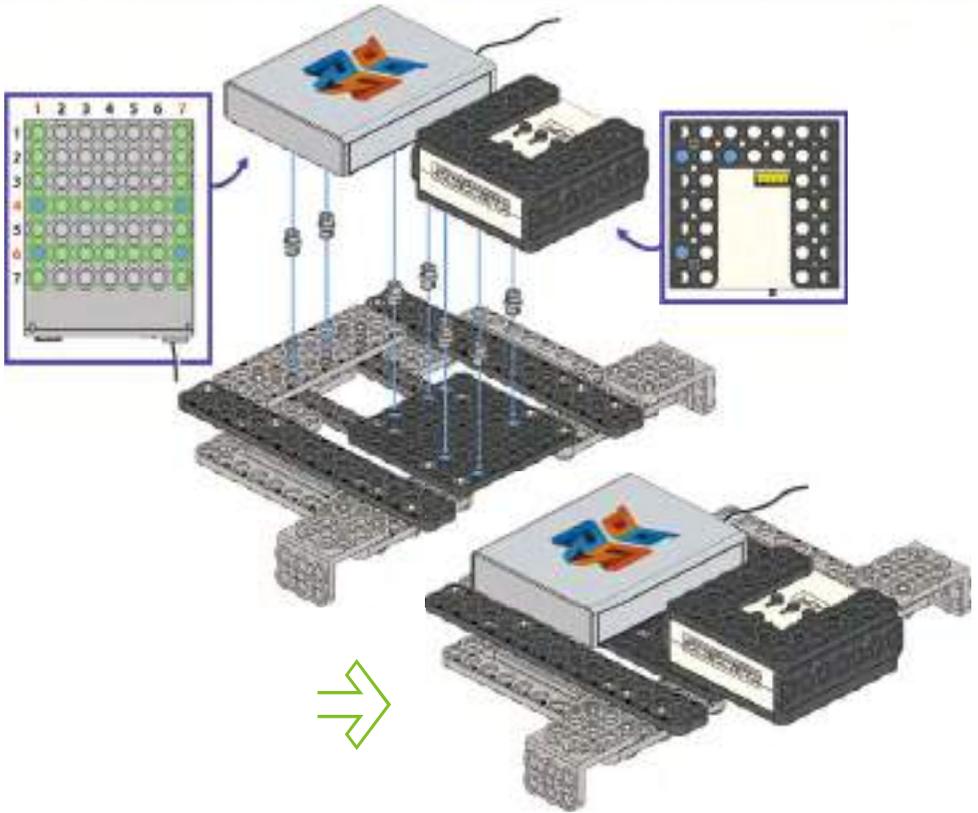
Smart controller X1



Battery case X1



Double rivet X7

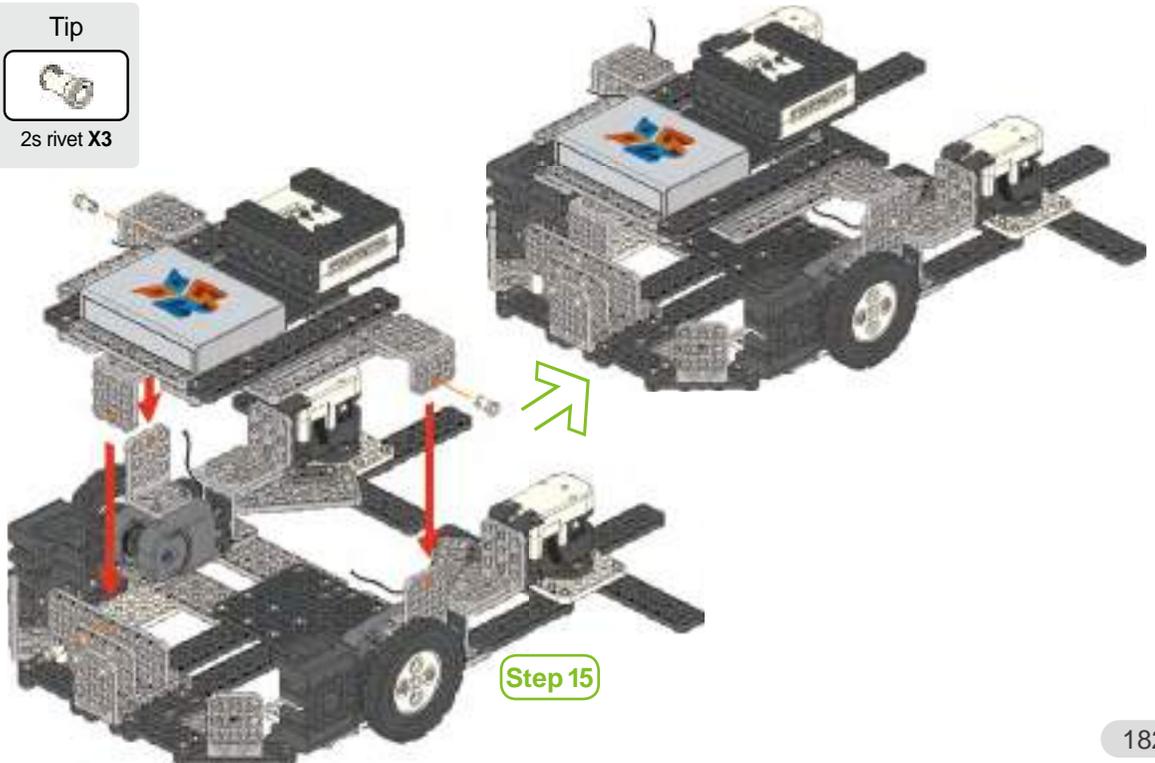


Step 22

Tip

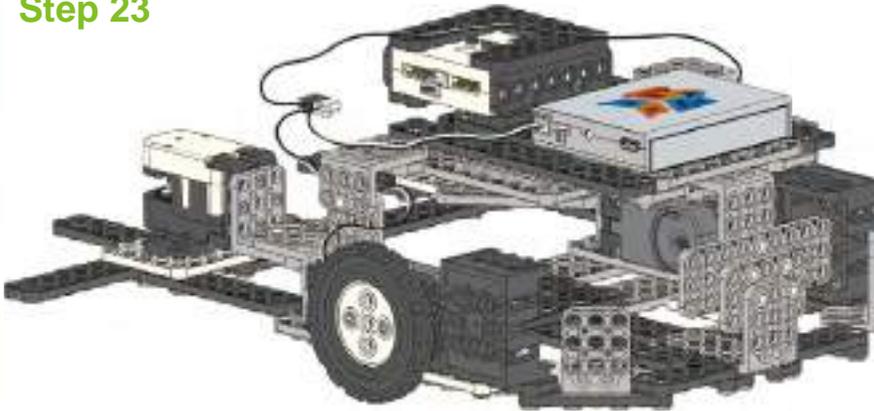


2s rivet X3

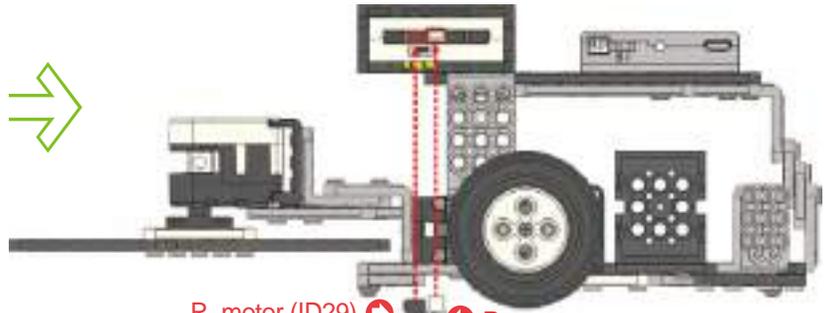


Step 15

Step 23

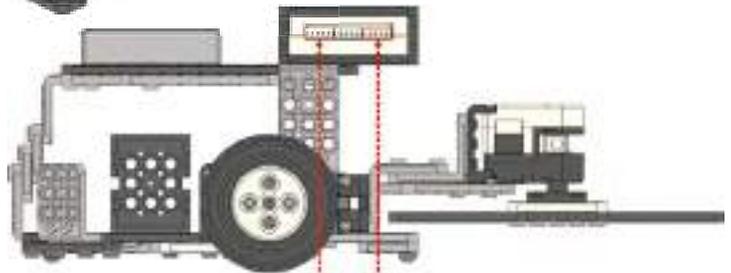


⚠ Pay attention to cable connection and direction.



R. motor (ID29) ⚡
R. motor (ID30) ⚡ Power

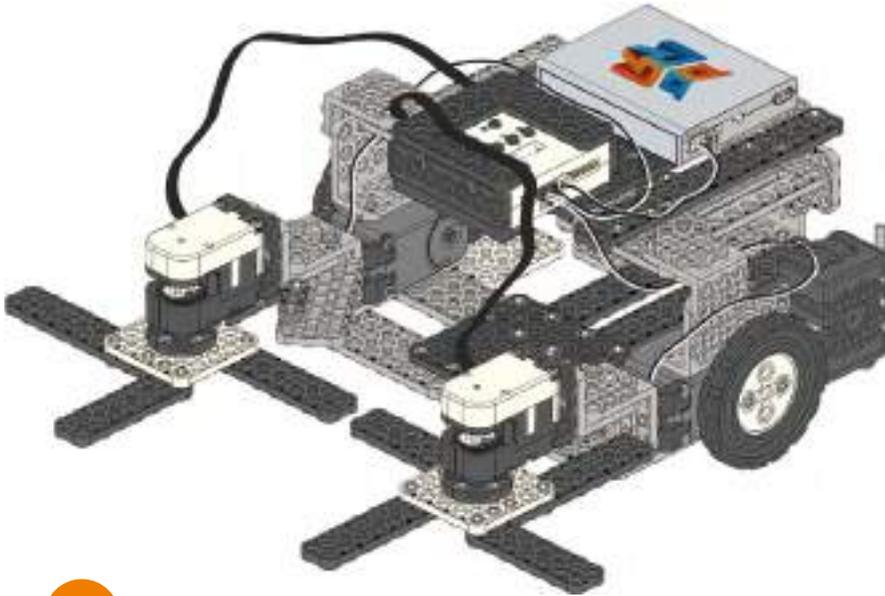
Step 24



Smart servo (ID00) ⚡ ⚡ Smart servo (ID01)

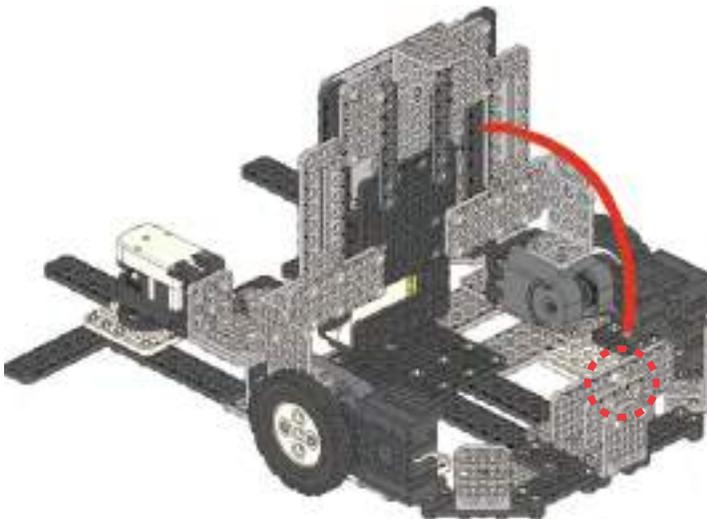


★ 'Cleaning Bot' is ready! ★



Tip

Lift the Cleaning Bot body to take out the waste paper.



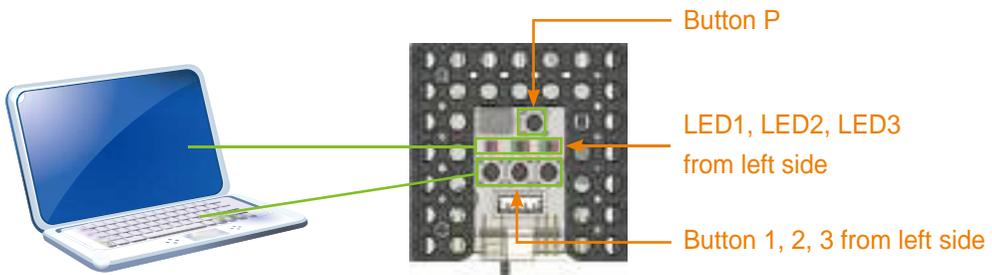


Robot Experience



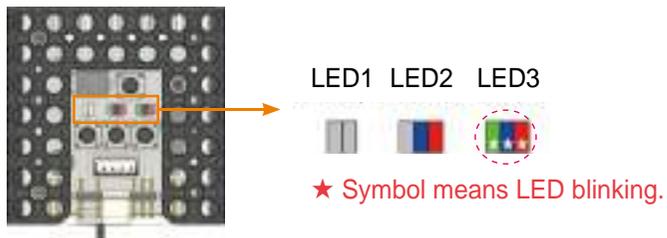
Set-up 'Cleaning Bot' robot model.

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons work as the keyboard for PC.



First : Turn on the smart controller to enter <set-up mode>.

Second : Press button 2 or button 3 on smart controller to set-up 'Cleaning Bot' robot model. The buttons work as a keyboard for PC. Program the robot for proper operation.



Third : Press button P on smart controller to enter <standby mode>.

Reassemble after checking the following when robot is not working.

1. When Cleaning Bot is not moving :
 - ▶ Check rotation motor ID and assembled position.
2. When Cleaning Bot rotary blade is not working :
 - ▶ Check smart servo cable connection, and see whether there are waste papers stuck inside of the rotary blade.



Check movement and assembly.

1. What does **A** button of IR remote controller do?

①



Makes the left rotary blade rotate towards inside.

②



Makes the left rotary blade rotate towards outside.

③



Makes the right rotary blade rotate towards inside.

④



Makes the right rotary blade rotate towards outside.

2. What does **B** button of IR remote controller do?

①



Makes the left rotary blade rotate towards inside.

②



Makes the left rotary blade rotate towards outside.

③



Makes the right rotary blade rotate towards inside.

④



Makes the right rotary blade rotate towards outside.

3. Press **1** and **3** button, and draw an arrow to show the direction of rotation.



[**1** button]



[**3** button]



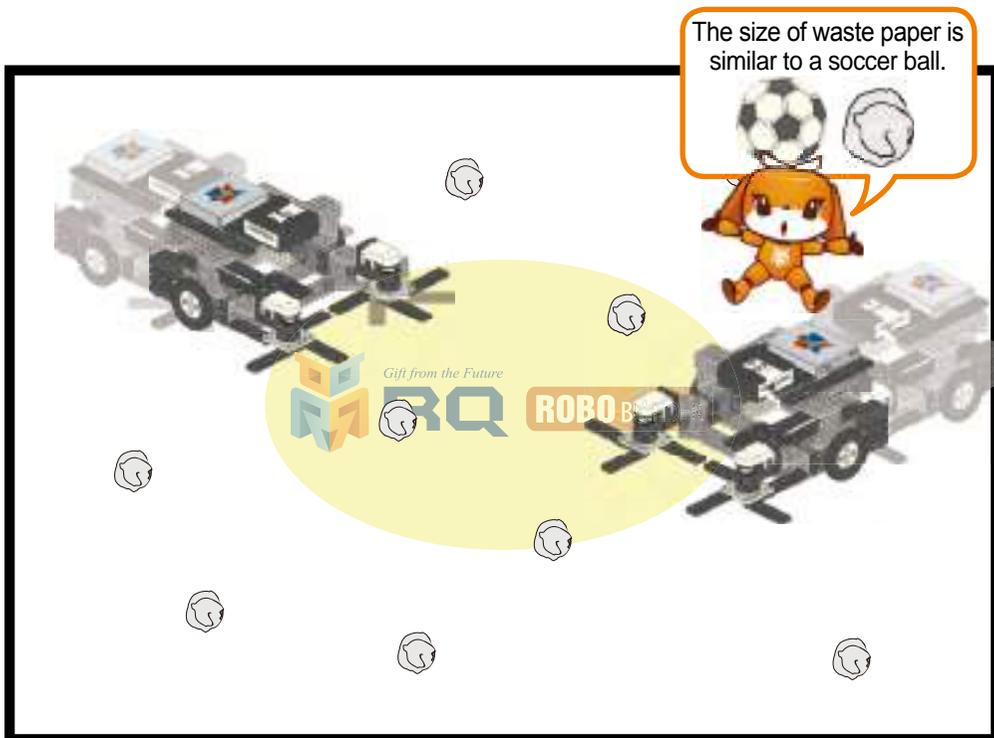
Robot Play



Clean your area.

Control the Cleaning Bot to clean the game panel, and see who cleans better.

- Place waste papers inside the game panel, but they should not be too small.
- Game time is 3 minutes. Whoever cleans more waste paper wins the game.
- Stop for 3 seconds when the robot goes outside the game panel.

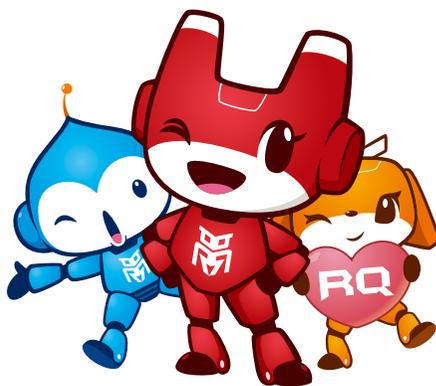


◆ Describe your 'Cleaning Bot'.

- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



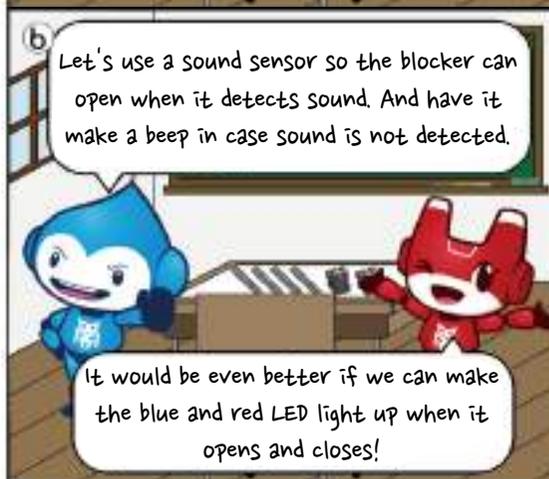
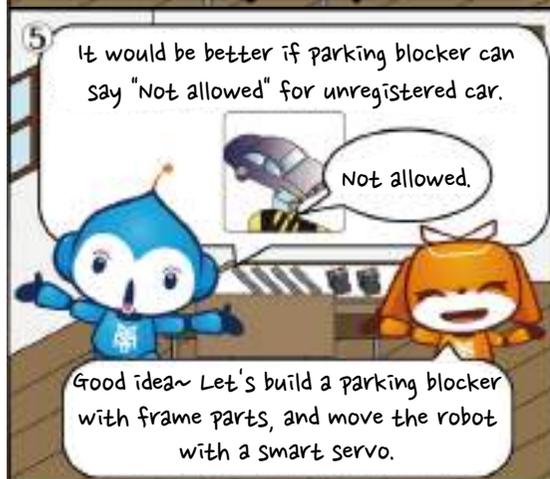
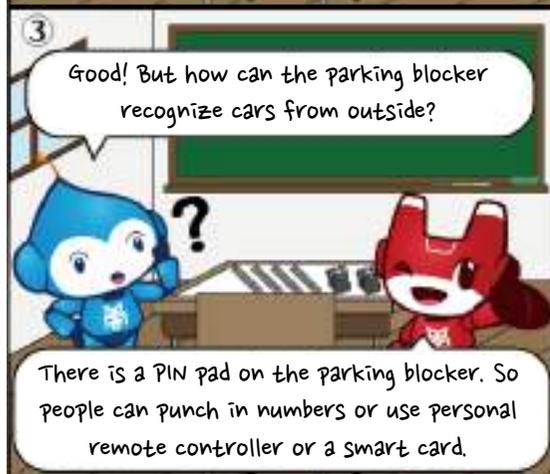
MEMO



RQ⁺

12. Imaginary Robot.

My own robot PART2



Creative Robot Class



Write a report on <My own robot PART2>.

★ My robot is called _____

Why did you
build this
robot?

How did you
build your
robot?

What kind of
function does
it have?

Problem /
Solution

Something you
learned while
building the
robot.



Post the picture of your own robot below.



◆ Describe your own robot.

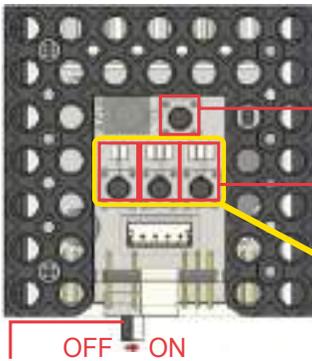
- Robot level?
- What was the most fun about it?
- What was the most difficult thing?
- Check your robot with your teacher.



Appendix

Set-up RQ+ robot model

Smart controller mode becomes <set-up mode> when you turn on the power. You can select a robot model and sensors. Smart controller mode becomes <standby mode> when you press button P. LED light stops blinking in set-up mode (some excluded) while LED blinks in standby mode.



Power S/W

OFF ON

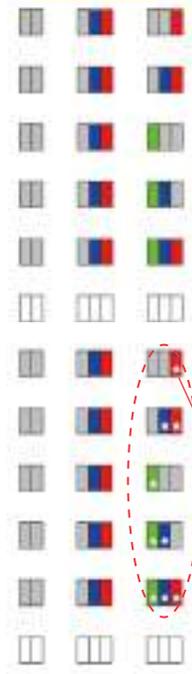
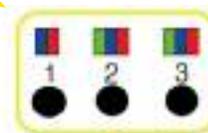
Button P:

Mode (set-up, standby) selection and save

Number 1, 2 and 3 are written from left to right. These indicate LED1, LED2, LED3, and Button 1, Button 2, Button 3 accordingly.

<RQ+120>

- Ch1 Battle Bot
- Ch2 Black/White Flag
- Ch3 Walking Bot
- Ch4 Sidecar
- Ch5 Soccer Bot
- Ch6 My own Robot #1
- Ch7 Bug Bot
- Ch8 Transport Bot
- Ch9 Shooting Bot
- Ch10 Crayfish Bot
- Ch11 Cleaning Bot
- Ch12 My own Robot #2



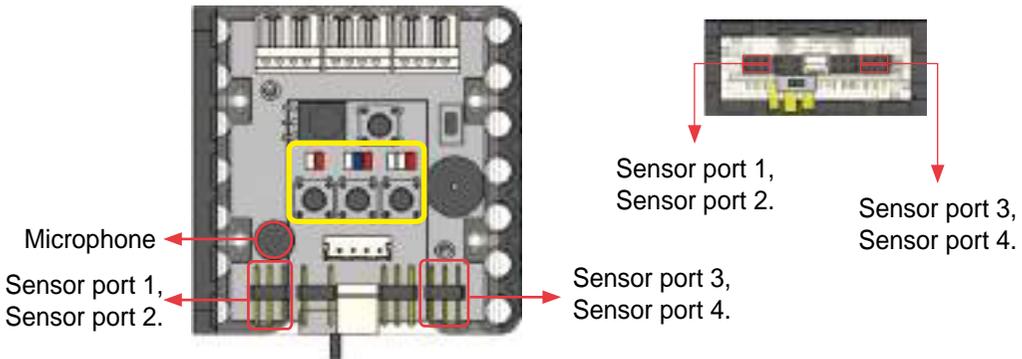
★ Symbol means LED is blinking.

Non-standard platform



Set-up RQ+ robot sensor

As you have done for RQ+ robot model set-up, select <set-up mode> in smart controller. Connect your sensor (IR sensor or touch sensor) to the sensor port.



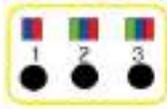
Sensor port 1

LED 1	LED 2	LED 3	Touch sensor	IR sensor, Mic (Sound sensor), Light sensor, Distance sensor
Grey	Grey	Grey	LED off	Each LED light color
Red	Grey	Grey	OFF	OFF
Red	Red	Grey	ON	ON (Lowest sensitivity)
Red	Red	Blue	ON	ON (Low sensitivity)
Red	Red	Green	ON	ON (Medium sensitivity)
Red	Red	Green	ON	ON (High sensitivity)
Red	Red	Green	ON	ON (Highest sensitivity)

Sensor port 2

LED 1	LED 2	LED 3	Touch sensor	IR sensor, Mic (Sound sensor), Light sensor, Distance sensor
Grey	Grey	Grey	LED off	Each LED light color
Red	Red	Grey	OFF	OFF
Red	Blue	Grey	ON	ON (Lowest sensitivity)
Red	Blue	Blue	ON	ON (Low sensitivity)
Red	Blue	Green	ON	ON (Medium sensitivity)
Red	Blue	Green	ON	ON (High sensitivity)
Red	Blue	Green	ON	ON (Highest sensitivity)

Sensor port 3

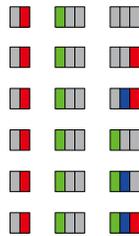


☐ LED off

█ Each LED light color

Touch sensor

IR sensor, Mic (Sound sensor),
Light sensor, Distance sensor



OFF

OFF

ON

ON (Lowest sensitivity)

ON

ON (Low sensitivity)

ON

ON (Medium sensitivity)

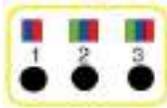
ON

ON (High sensitivity)

ON

ON (Highest sensitivity)

Sensor port 4

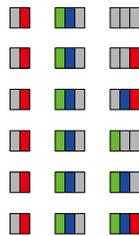


☐ LED off

█ Each LED light color

Touch sensor

IR sensor, Mic (Sound sensor),
Light sensor, Distance sensor



OFF

OFF

ON

ON (Lowest sensitivity)

ON

ON (Low sensitivity)

ON

ON (Medium sensitivity)

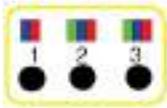
ON

ON (High sensitivity)

ON

ON (Highest sensitivity)

Microphone (Sound)

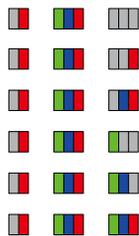


☐ LED off

█ Each LED light color

Touch sensor

IR sensor, Mic (Sound sensor),
Light sensor, Distance sensor



OFF

OFF

ON

ON (Lowest sensitivity)

ON

ON (Low sensitivity)

ON

ON (Medium sensitivity)

ON

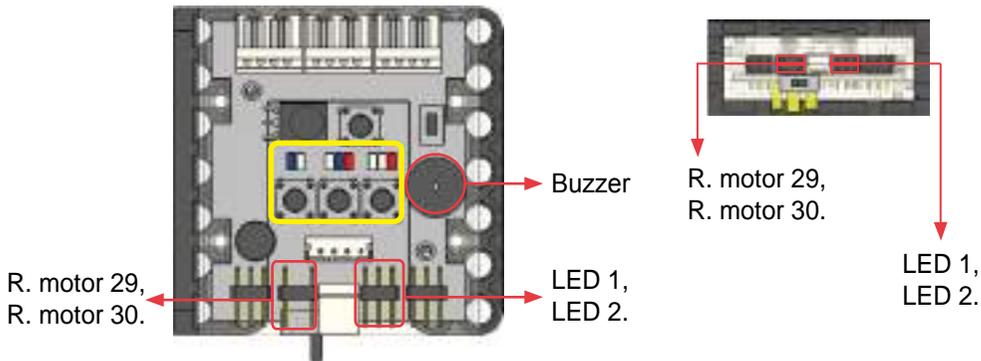
ON (High sensitivity)

ON

ON (Highest sensitivity)

Set-up RQ+ robot output device

As you have done for RQ+ robot sensor set-up, select <set-up mode>. Connect output device (rotation motor, smart servo, LED, Buzzer) as below.



R. motor 29

				LED off		Each LED light color
				Stop (Speed 0)		
				Speed level 1 forward direction		
				Speed level 2 forward direction		
				Speed level 3 forward direction		
				Speed level 1 reverse direction		 forward (go forward)
				Speed level 2 reverse direction		
				Speed level 3 reverse direction		

★ Symbol means LED is blinking.

When ID29 rotation motor is used as a right wheel.

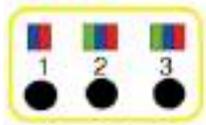
R. motor 30

				LED off		Each LED light color
				Stop (Speed 0)		
				Speed level 1 forward direction		
				Speed level 2 forward direction		
				Speed level 3 forward direction		
				Speed level 1 reverse direction		 forward (go backward)
				Speed level 2 reverse direction		
				Speed level 3 reverse direction		

★ Symbol means LED is blinking.

When ID30 rotation motor is used as a left wheel.

LED1



☐ LED off

▣ Each LED light color

- ☐ LED OFF
- ☐ LED red ON
- ☐ LED blue ON
- ☐ LED red and blue ON

LED2



☐ LED off

▣ Each LED light color

- ☐ LED OFF
- ☐ LED red ON
- ☐ LED blue ON
- ☐ LED red and blue ON

Buzzer (Melody)

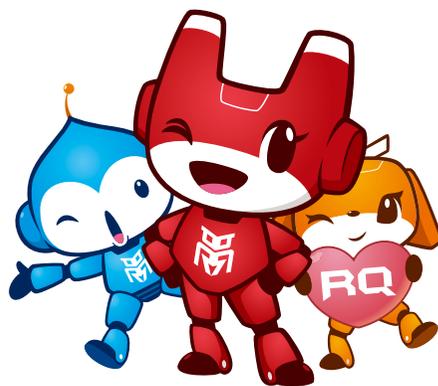


☐ LED off

▣ Each LED light color

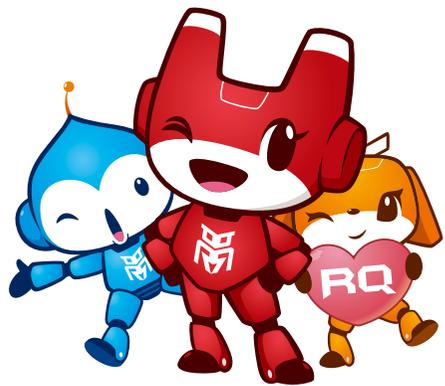
- ☐ Melody OFF
- ☐ Ten Little Indians
- ☐ Hello
- ☐ Twinkle, twinkle little stars
- ☐ Head, Shoulder, Knee and Foot
- ☐ For Elise
- ☐ Minuet (Bach)
- ☐ Congratulations
- ☐ Happy birthday to you
- ☐ Arirang

MEMO



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