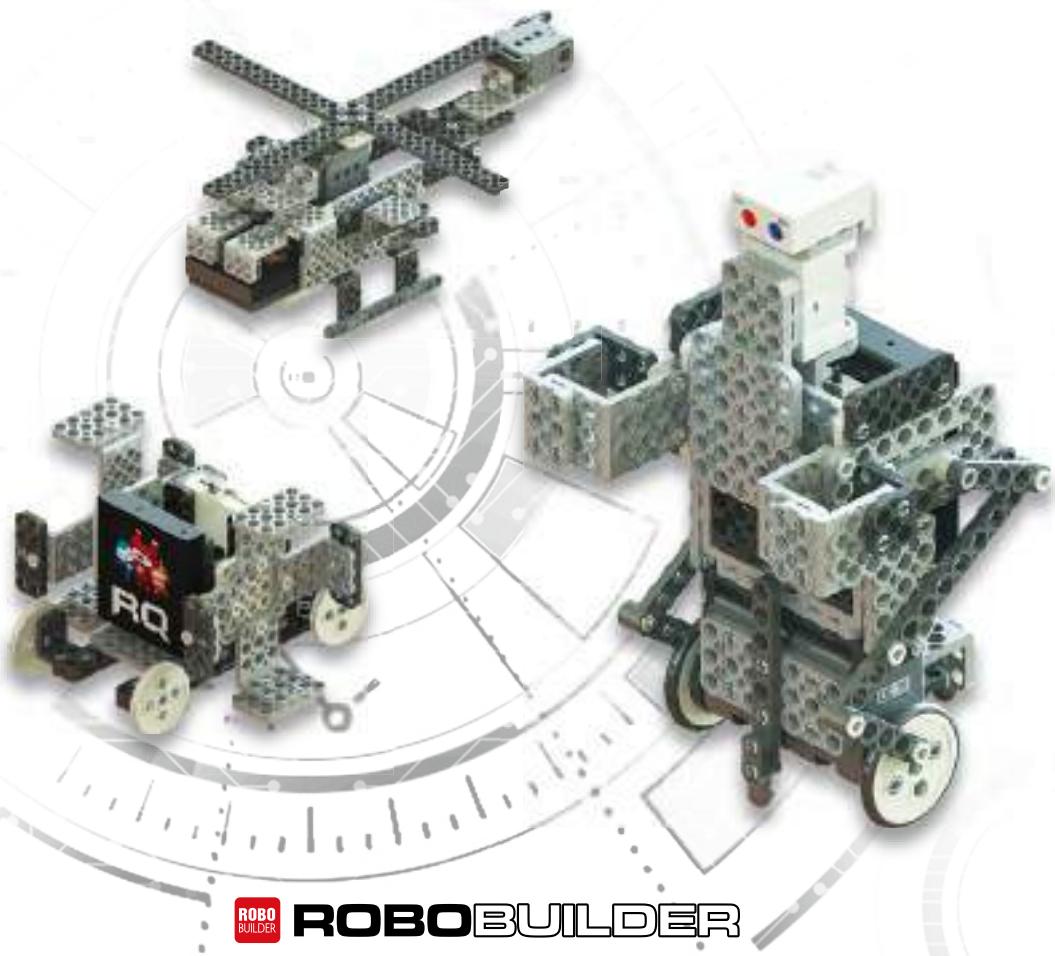




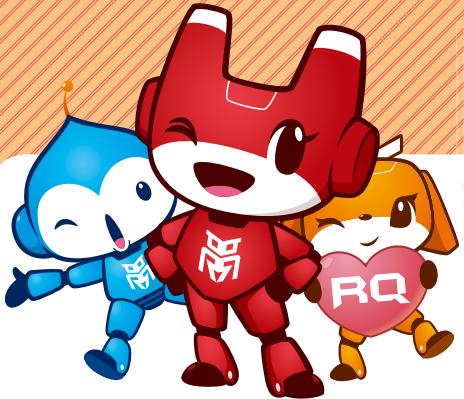
ROBOT CONSTRUCTION KIT

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



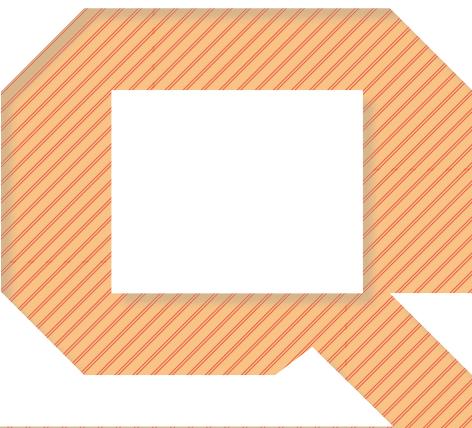
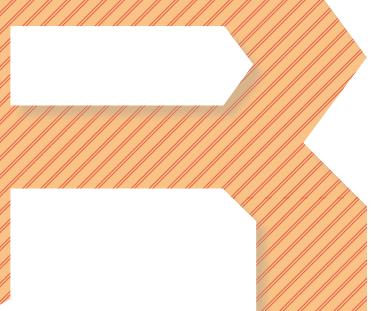
ROBO
BUILDER

ROBOBUILDER



List

- RQ⁺ BASICS 06
- 1 Punching Bot 20
- 2 Cultivator 40
- 3 Swing Bot 58
- 4 Fish Bot 74
- 5 Rolling Bot 90



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- 16 Imagine Robot 1 106
- 17 Bumper Car 110
- 18 Bowling Bot 126
- 19 Puppy Bot 144
- 10 Fencing Bot 160
- 11 Helicopter 178
- 12 Imagine Robot 2 194

RQ+ 110 Robot

Ch1. Punching Bot

LED1 LED2 LED3



Ch2. Cultivator

LED1 LED2 LED3



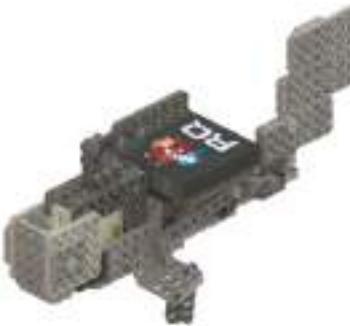
Ch3. Swing Bot

LED1 LED2 LED3



Ch4. Fish Bot

LED1 LED2 LED3



Ch5. Rolling Bot

LED1 LED2 LED3



Ch6. My own Robot #1



Ch7. Bumper Car

LED1 LED2 LED3



Ch8. Bowling Bot

LED1 LED2 LED3



Ch9. Puppy Bot

LED1 LED2 LED3



Ch10. Fencing Bot

LED1 LED2 LED3



Ch11. Helicopter

LED1 LED2 LED3



Ch12. My own Robot #2



RQ+ 110 Part LISTS

Frame



1x3 frame X4



1x5 frame X4



1x8 frame X4



1x12 frame X4



2x5 frame X4



2x7 frame X4



2x9 frame X4



2x15 frame X4



3x3 frame X2



3x5 frame X4



3x7 frame X4



3x9 frame X4



3x8 slide frame X2



5x5 frame X2



2x4 L frame X4



2x5 L frame X4



3x5 L frame X4



3x6 L frame X4

Frame



Ball frame X2



Wheel X4



Rubber ring X2



Spacer X4

Electronics Part



Smart controller X1



Battery case X1



Rotation motor X2



IR remote controller X1



LED X1



Touch sensor X1

Rivet Tool / Rivets



Rivet tool X1



2s rivet



3s rivet



Double rivet

Joints and others



Hinge A X3



Hinge B X3



Front horn X2



Rubber ring X3

Rivet and Rivet tool

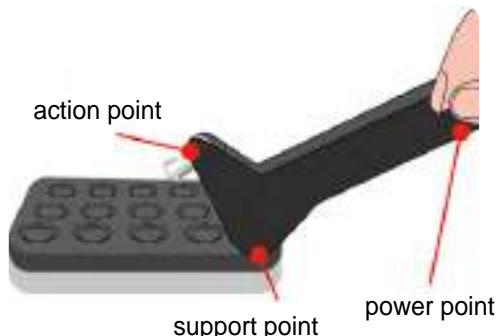
Science factors are included in rivet tool!

A lever is a handle or bar that is attached to a piece of machinery and which you push or pull in order to operate the machinery.

Point of action, fulcrum and point of force are required to operate this principle.



Rivet tool uses the principle of lever. 3 points (power point, support point, action point) exist in rivet tools like lever. Lean the rivet tool backward to take out rivets (except for double rivet) easily from frames.

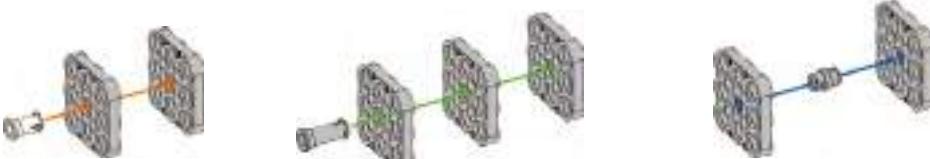


Do not take out rivets as below!



Rivet

- Rivet sets are divided into 2s rivet, 3s rivet and double rivet.



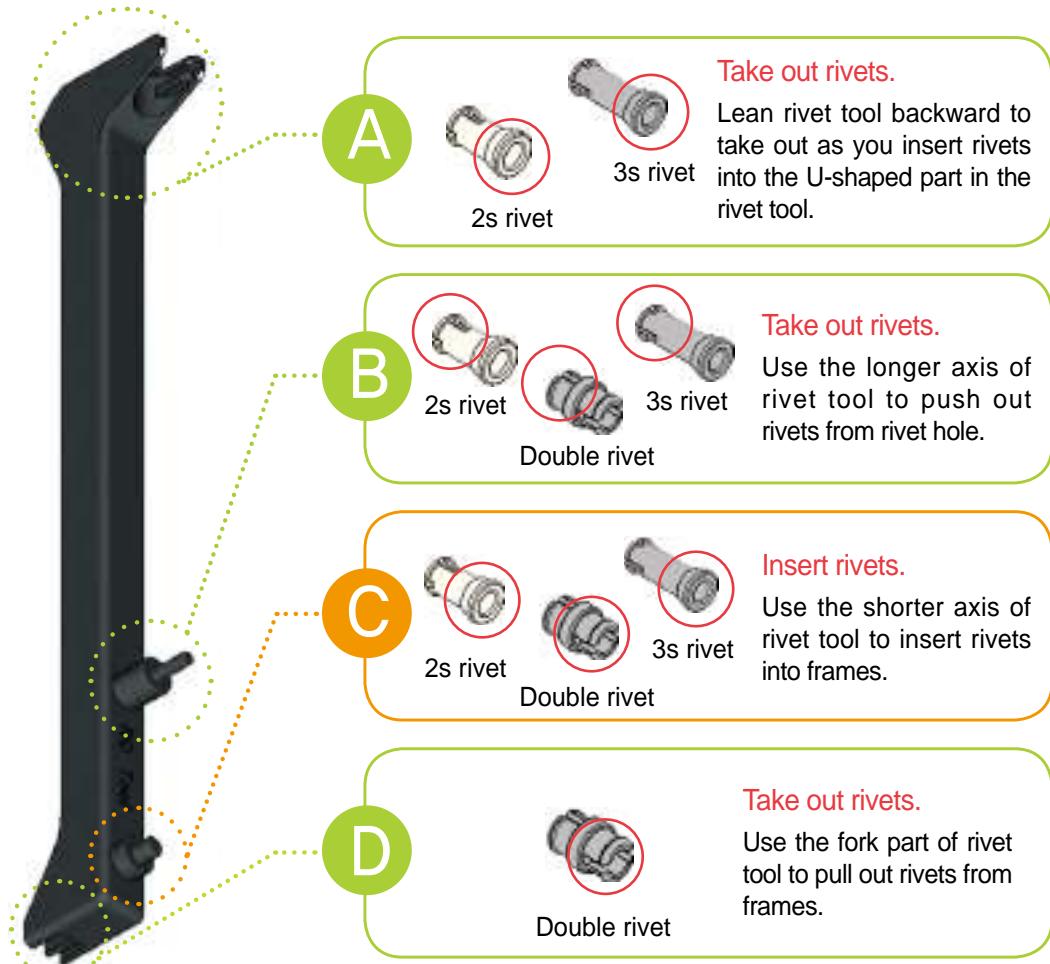
- 2s rivet is white.
- Connect two frames in a row.
- 3s rivet is gray.
- Connect three frames in a row.
- Double rivet is gray.
- Connect frames on both side.

* Use 2s rivet and double rivet to connect frames.

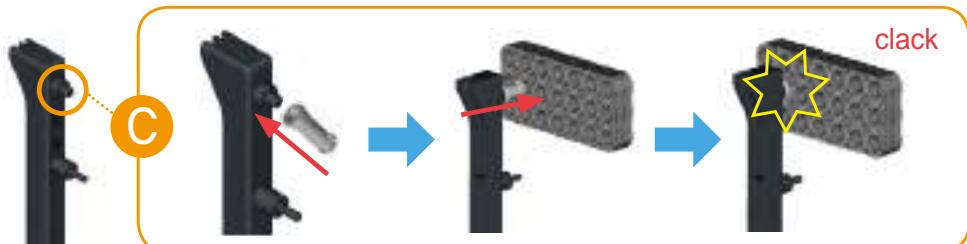
2s rivet connects frames tightly while double rivet connects them smoothly.

Double rivet is extracted from frames easier than 2s rivet.

Rivet tool

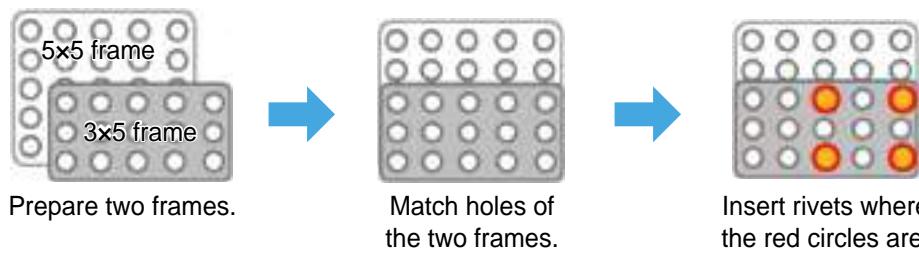


C Insert rivet



How to insert rivet #1

Applicable rivet types: 2s rivet, 3s rivet, Double rivet.



01



02



03

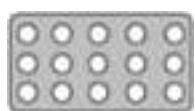


04



Insert 2s rivet one by one.

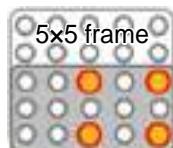
How to insert rivet #2



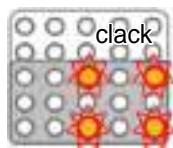
Prepare two frames.



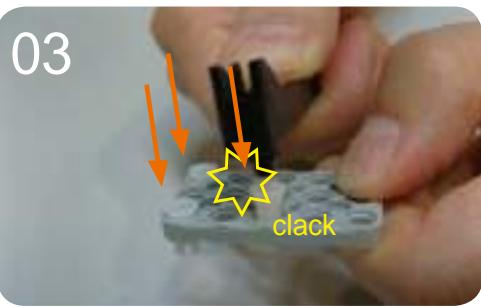
Insert 4 rivets.



Match holes of the
two frames.



Push and
connect.



Insert 4 rivets in one frame.



Match holes of the two frames.

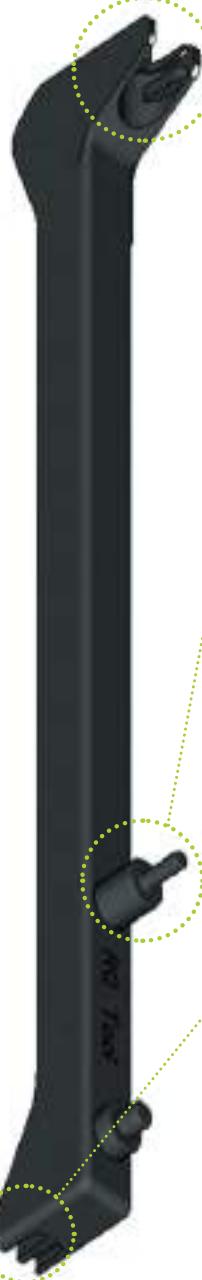


Push rivets one by one to connect two frames.



Done!

A B D take-out rivet part



Use the U-shaped part of rivet tool

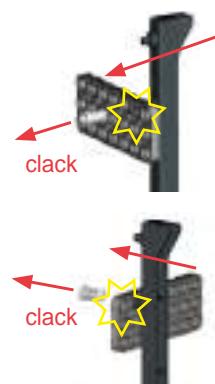
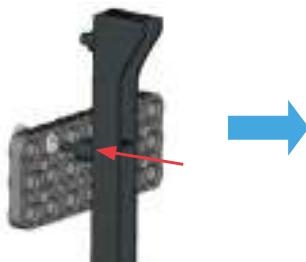


Applicable rivet type:
2s rivet, 3s rivet.

B

Use the longer axis of rivet tool

* Be careful not to bounce off.



Applicable rivet type:
2s rivet, 3s rivet, Double rivet.

D

Take-out (double rivet)

Pull out vertically.

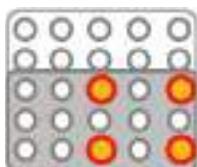


Applicable rivet type:
Double rivet.

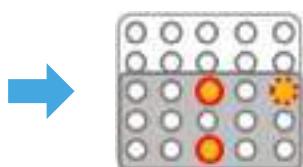
How to take out rivet safety



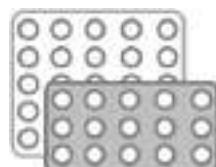
← Hold the rivet tool as shown on the left.



Take out 4 rivets.



Use your thumb to fix the rivet.



Separate two frames.



Push the end part of rivet tool with your thumb.



Lean rivet tool backward as pushing with your thumb.



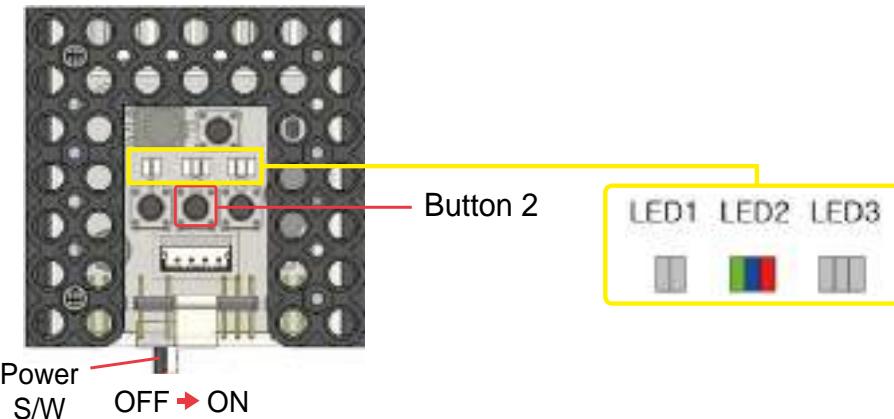
Take out the rivet as you push the frame with your thumb.



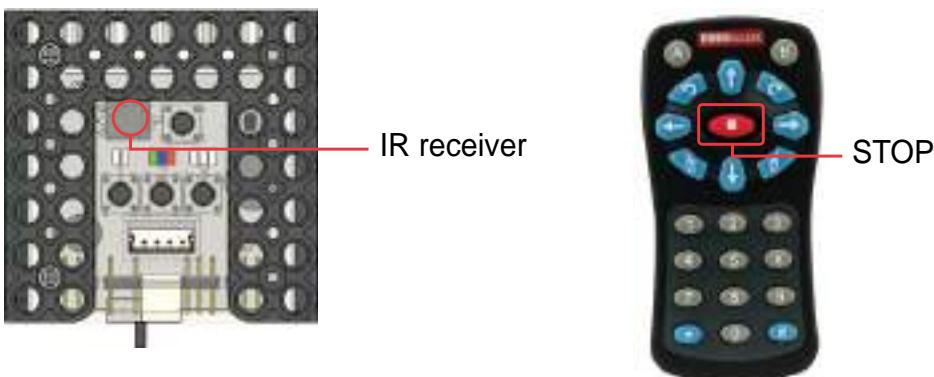
How to register IR remote controller

You can register IR remote controller into smart controller as below.

- ① Turn off the smart controller.
- ② Power on as you press button 2 ➔ You can see LED2 (green, blue, red) light on.



- ③ Hold IR remote controller towards the <IR signal receiver> part.
- ④ Press STOP (red) button of IR remote controller.
➔ LED2 (green, blue, red) blinks 3 times, and it's done!



★ NOTE!!!



- ▶ Unregistered IR remote controller cannot control a RQ robot.
- ▶ 1 IR remote controller can be registered in smart controller at a time. If a new IR remote controller is registered, a previously registered IR remote controller is deleted.
- ▶ Start from ①, if you want to register a new IR remote controller.

How to use IR remote controller

You can select mode A or mode B. In mode A, the robot goes forward in speed 1, speed 2 and speed 3 whenever you press forward button, In mode B, the robot goes forward continuously when forward button is pressed. The robot stops if button is released. In order to change from mode B to mode A, press button # and button A together. To return to mode B, press button # and button B again. **Default mode is mode B.**



When 'STOP' button is pressed: Robot stops.

When '*' + 'STOP' button are pressed: Go to set-up mode.

When '#' + 'STOP' button are pressed: Power off smart controller.

Same as button 1~3 of smart controller.

(ex.) '1' is same as button '1' in smart controller.

'#' is same as pressing button for a long time in smart controller.

(ex.) '#' + '1' is same as pressing button '1' for a long time in smart controller.

mode A ('Do, Re, Mi' sound is played when returning to mode A.)

↑	Go forward. Speeds up from speed 1 to speed 3 as you press this button.
↓	Go backward. Speeds up from speed 1 to speed 3 as you press this button.
←	Turn left. Move two wheels. Speeds up from speed 1 to 3 as you press this button.
→	Turn right. Move two wheels. Speeds up from speed 1 to 3 as you press this button.
↖	direction turn. Right wheel moves while left wheel does not. Speeds up from speed 1 to 3 as you press this button.
↗	direction turn. Left wheel moves while right wheel does not. Speeds up from speed 1 to 3 as you press this button.
↙	direction turn. Right wheel moves while left wheel does not. Speeds up from speed 1 to 3 as you press this button.
↘	direction turn. Left wheel moves while right wheel does not. Speeds up from speed 1 to 3 as you press this button.
* + ↗	If you press '*' + '↗' button, rotation motor 'ID30' speeds up very precisely.
* + ↙	If you press '*' + '↙' button, rotation motor 'ID29' speeds up very precisely.

mode B ('Do' sound is played when it switching into mode B.)

Robot moves continuously while button (direction 8 buttons) is pressed.

※ NOTE: Press IR remote controller button towards smart controller's IR receiver when you control a robot.

→ In RQ+ 110~130 robot models, pre-programmed robot motions are included in A, B, direction button and button 1, 2, 3 on the IR remote controller.

Robot motion of each robot is different depending on the robot model.

→ In RQ+ 110~130 robot models, a robot motion is saved from button 4 to button 0.

7 motions can be downloaded at maximum.

(Coding files are saved from button '# + '4' to '# + '0'...)

Button	Play	Button	Play	Button	Play
①	Run motion #1	# + ①	Run coding #1	* + ①	Ten Little Indians
②	Run motion #2	# + ②	Run coding #2	* + ②	Hello
③	Run motion #3	# + ③	Run coding #3	* + ③	Twinkle, Twinkle Little Star
④	Run motion #4	# + ④	Run coding #4	* + ④	Head, Shoulders, Knees and Toes
⑤	Run motion #5	# + ⑤	Run coding #5	* + ⑤	For Elise
⑥	Run motion #6	# + ⑥	Run coding #6	* + ⑥	Minuet (Bach)
⑦	Run motion #7	# + ⑦	Run coding #7	* + ⑦	Congratulations
⑧	Run motion #8	# + ⑧	Run coding #8	* + ⑧	Happy Birthday to You.
⑨	Run motion #9	# + ⑨	Run coding #9	* + ⑨	Arirang
⑩	Run motion #10	# + ⑩	Run coding #10	* + ⑩	STOP melody



The above motions and
coding files can be downloaded
on PC or mobile.



Melody is already
built in smart
controller.

In RQ+ 110~130,
downloaded files are saved
from button '4'.





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!

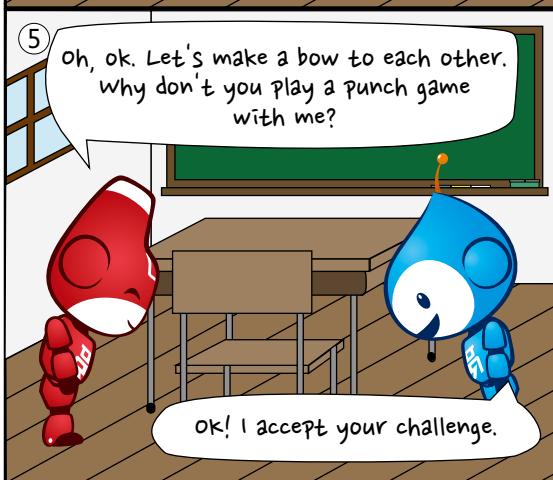
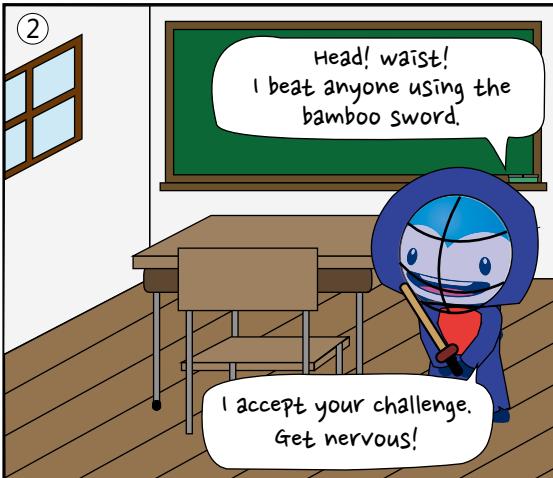
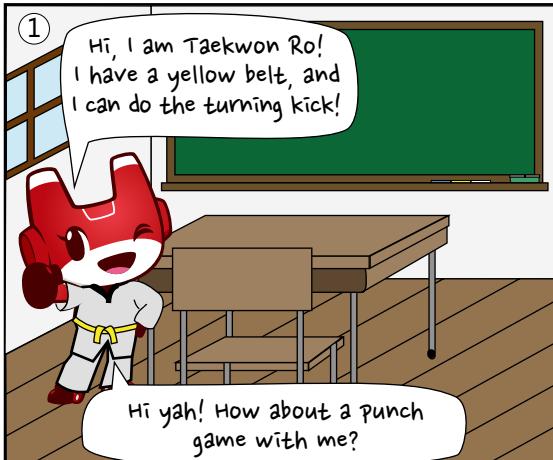
RQ Ro

This smart RQ Ro enjoys reading!



1. Punching Bot

Play a robot fight.

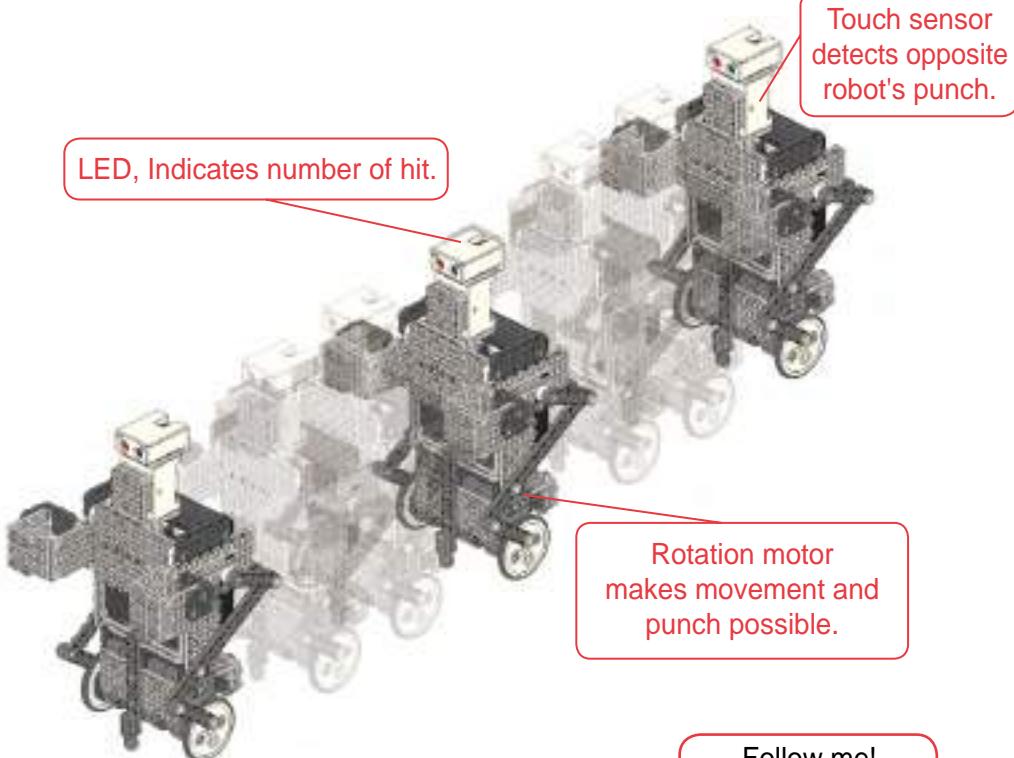




Today's Robot Class



Punching Bot is using two rotation motors to go forward and backward. Also, rotation motors are connected with frames for robot arm so that robot movement and punching at the same time. Punching Bot includes touch sensor to detect opposite robot punch and indicates hit numbers by LED light.



'Real Steel' is a movie depicting the year 2020 with robot fighters. Robot is controlled by wireless controller, and follows human motions to fight in the robot fights.



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Robot Assembly



Prepare robot parts.



Smart controller X1



R. motor (ID29,30) X2



Battery case X1



LED X1



Touch sensor X1



1x5 frame X4



1x8 frame X3



1x12 frame X2



2x5 frame X2



3x5 frame X4



3x7 frame X4



3x9 frame X1



5x5 frame X2



3x8 slide frame X2



2x4 L frame X4



2x5 L frame X2



3x5 L frame X4



3x6 L frame X4



Ball frame X2



Wheel X2



Rubber ring X2



Spacer X2



2s rivet X16



3s rivet X2



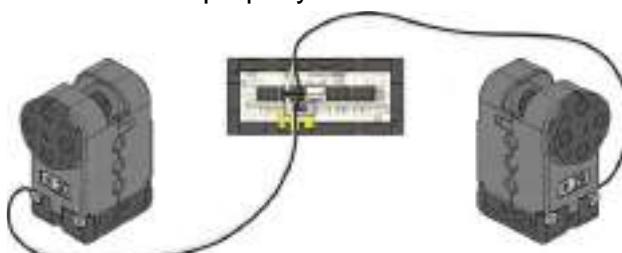
Double rivet X98



Tips.

Punching Bot uses two rotation motors to go forward, backward and rotate. Rotation motor ID29 is connected to the upper port while ID30 is connected to the bottom. ID29 is connected to right wheel and ID30 is connected to the left to go forward and backward properly.

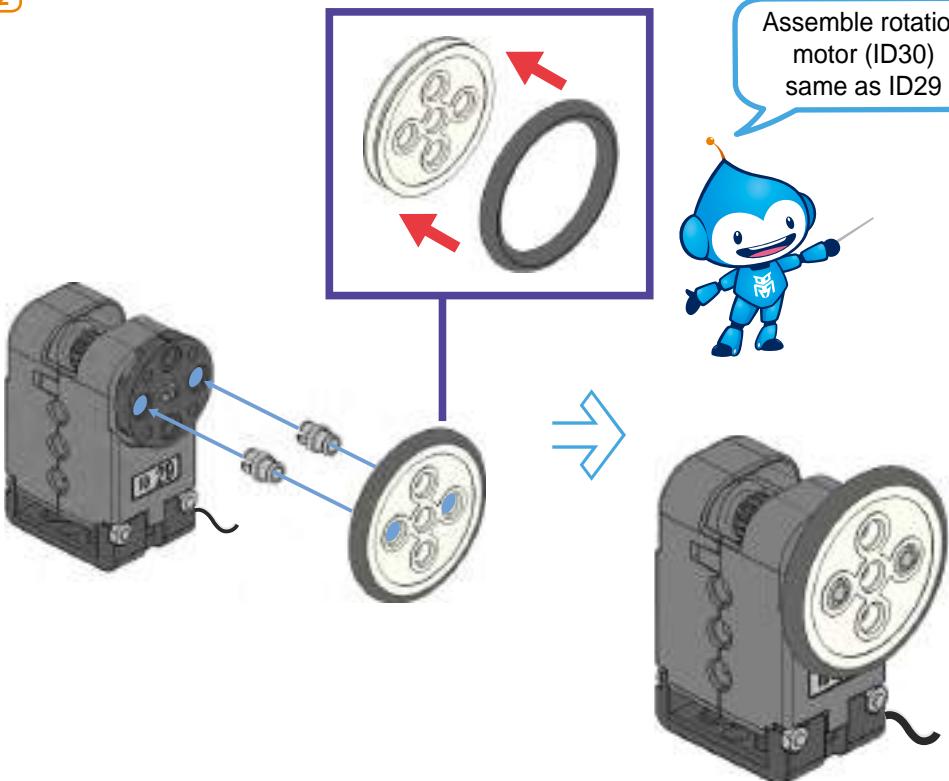
ID30
Connect to the bottom port, and is used as left wheel.



ID29
Connect to the upper port, and is used as right wheel.

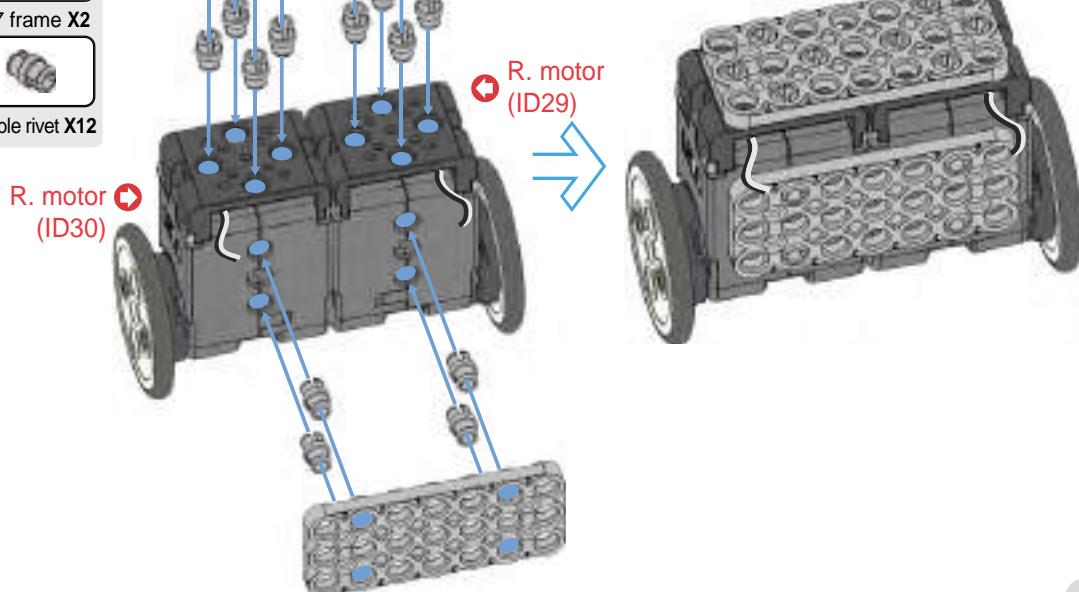
Step 1 (x2)

Tip
R. motor (ID29) X1
Wheel X1
Rubber ring X1
Double rivet X2

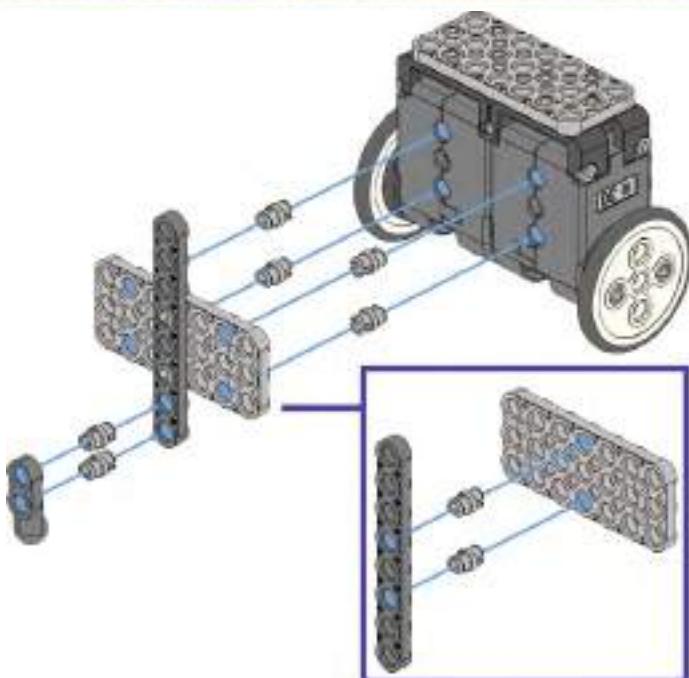
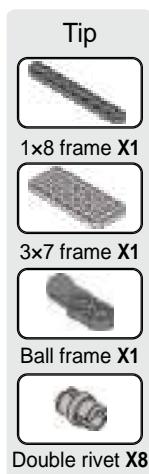


Step 2

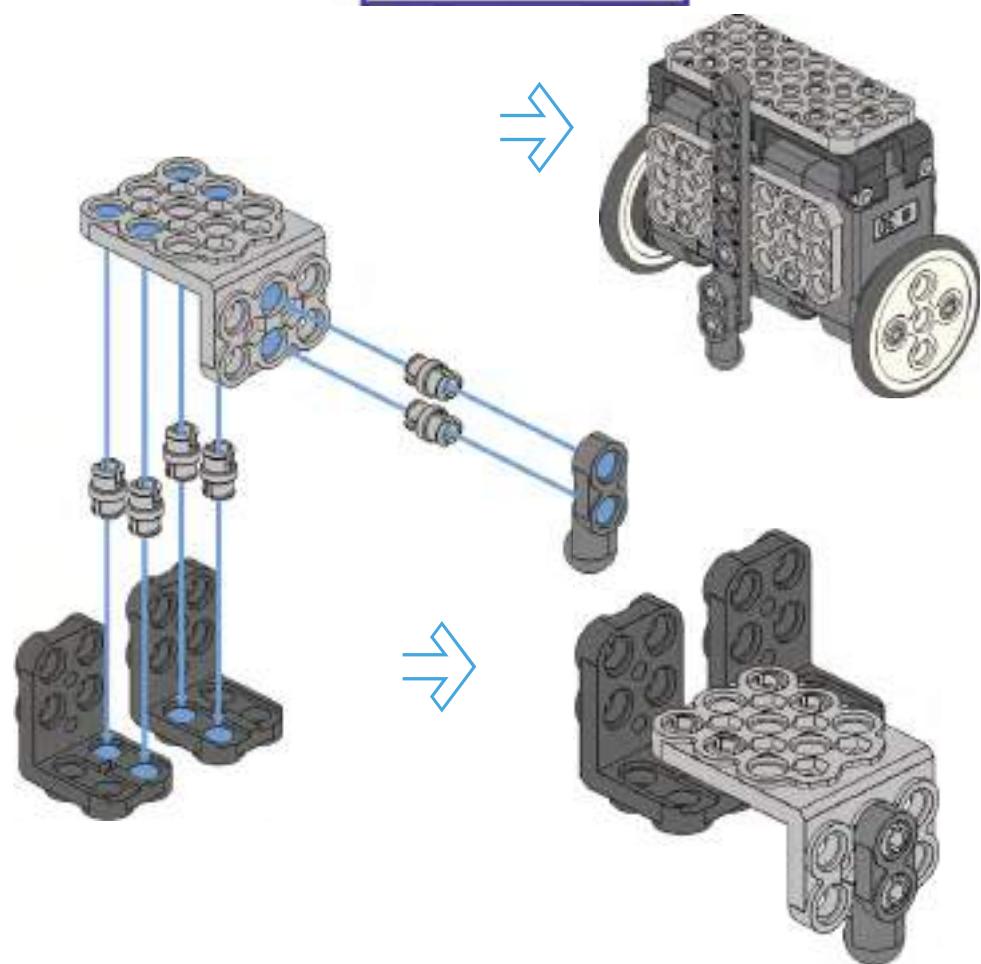
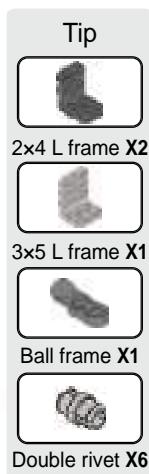
Tip
3x7 frame X2
Double rivet X12



Step 3



Step 4



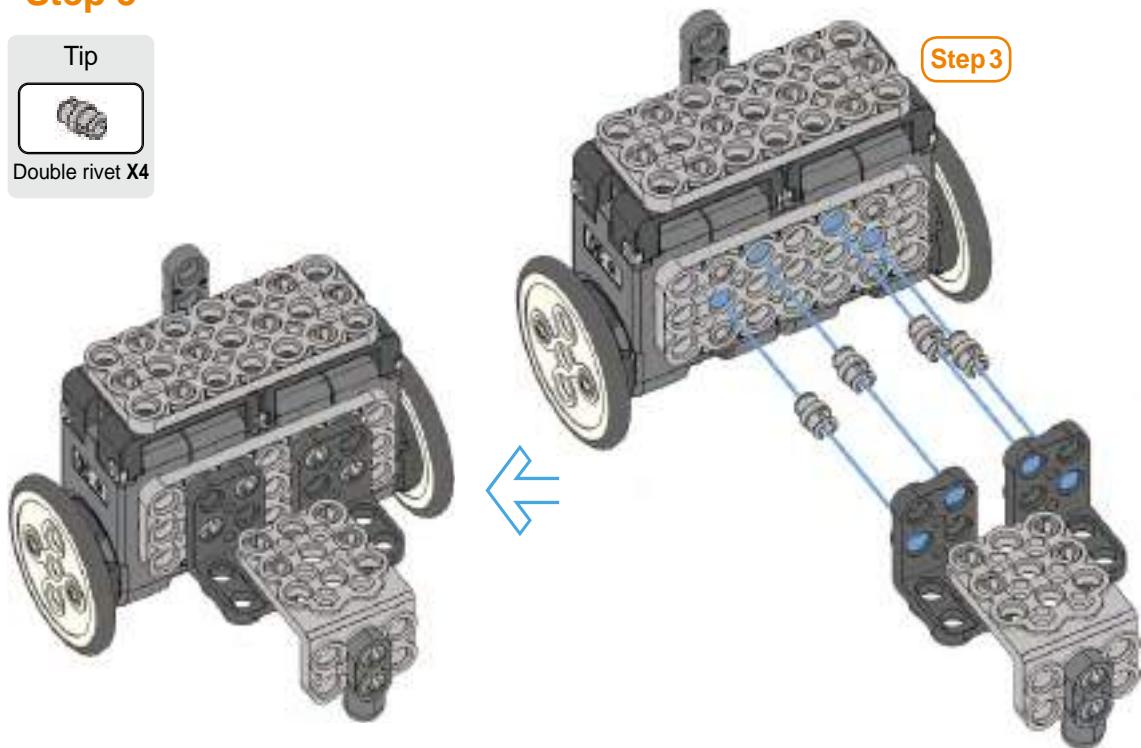
Step 5

Tip



Double rivet X4

Step 3



Step 6

Tip



3x5 frame X1



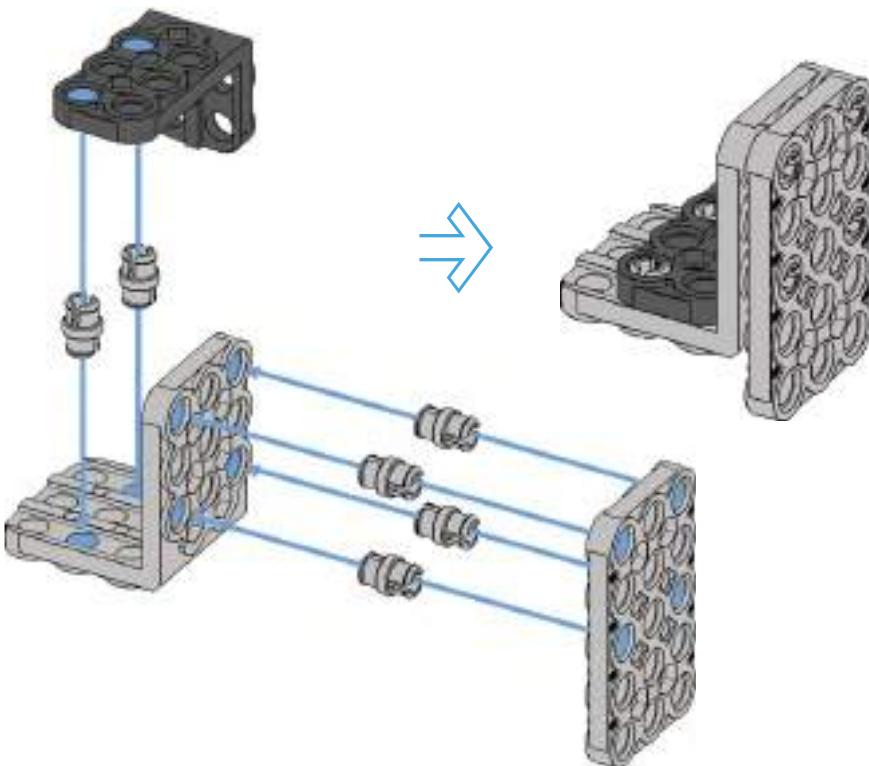
2x5 L frame X1



3x6 L frame X1



Double rivet X6



Step 7

Tip



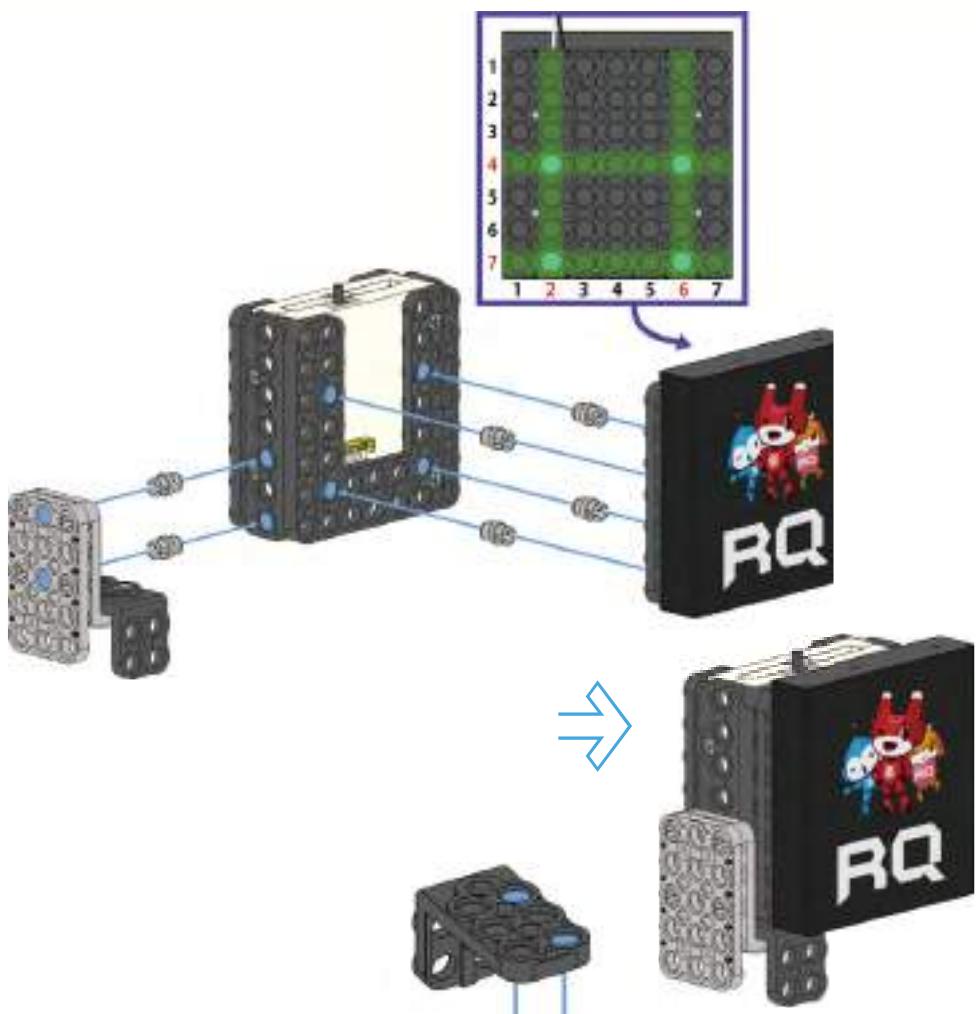
Smart controller X1



Battery case X1



Double rivet X6



Step 8

Tip



3x5 frame X1



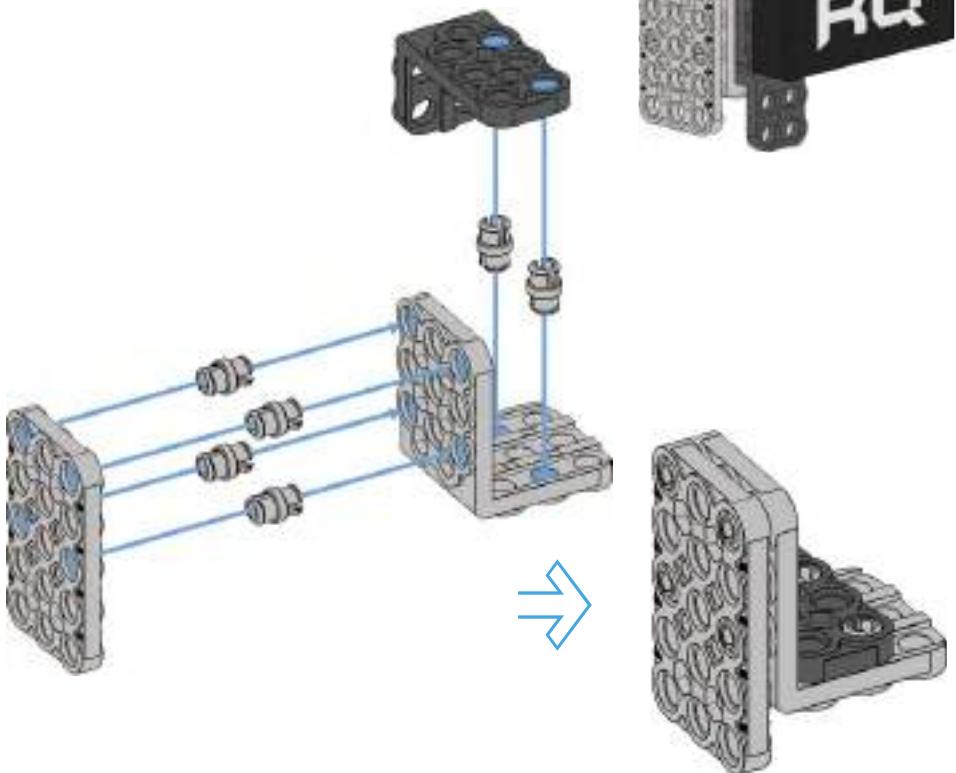
2x5 L frame X1



3x6 L frame X1



Double rivet X6



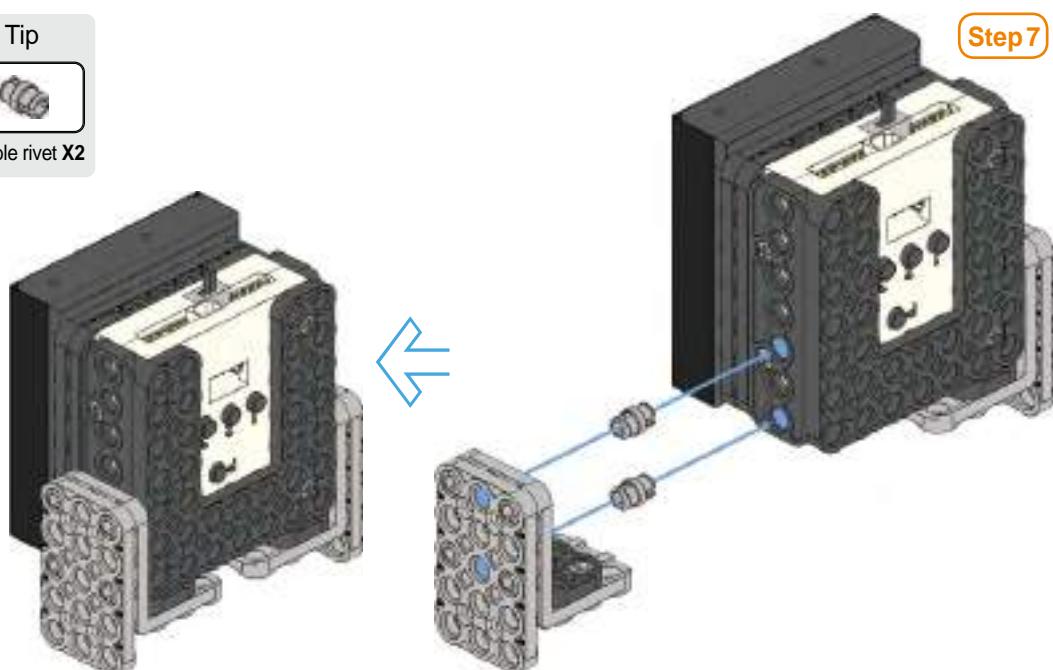
Step 9

Tip



Double rivet X2

Step 7



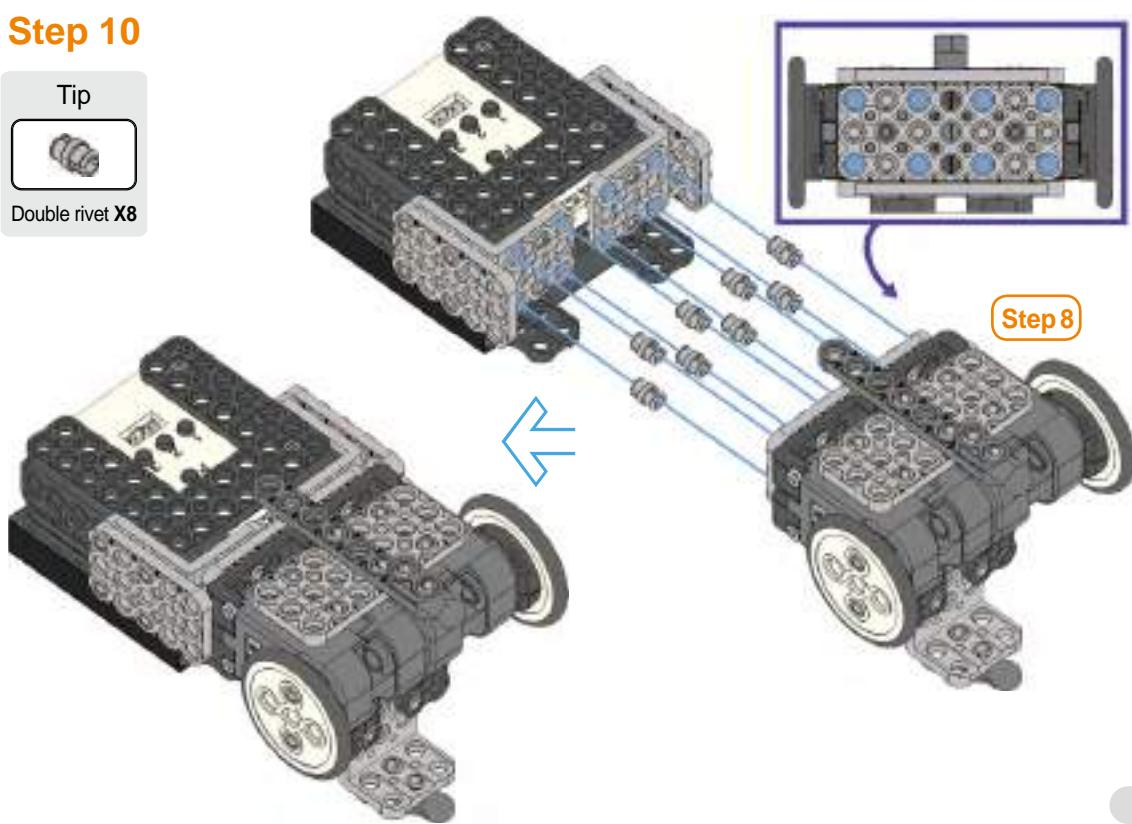
Step 10

Tip



Double rivet X8

Step 8



Step 11

Tip



1x8 frame X1



2x5 frame X1



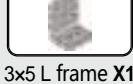
5x5 frame X1



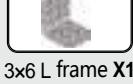
3x8 slide frame X1



2x4 L frame X1



3x5 L frame X1



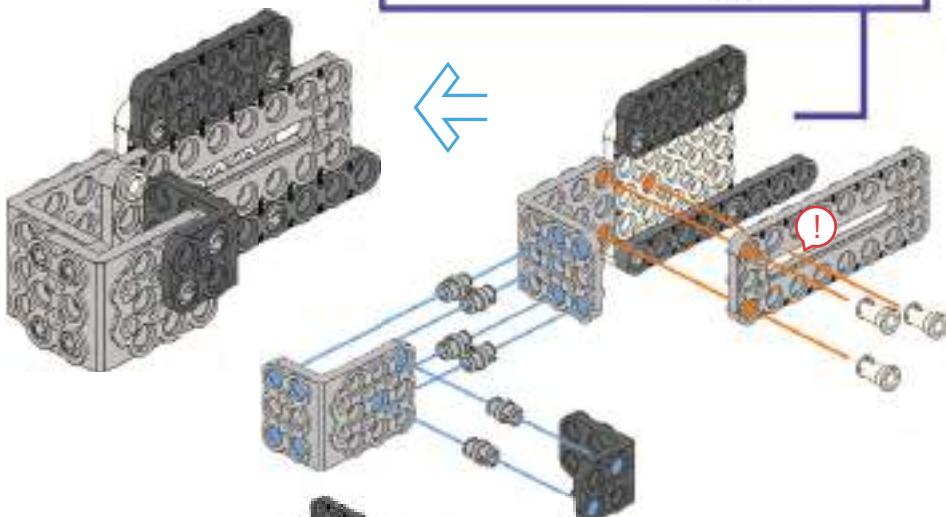
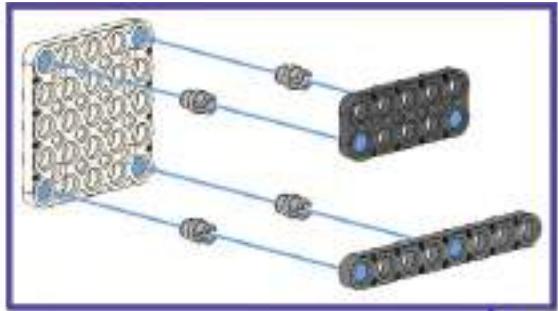
3x6 L frame X1



2s rivet X3



Double rivet X10



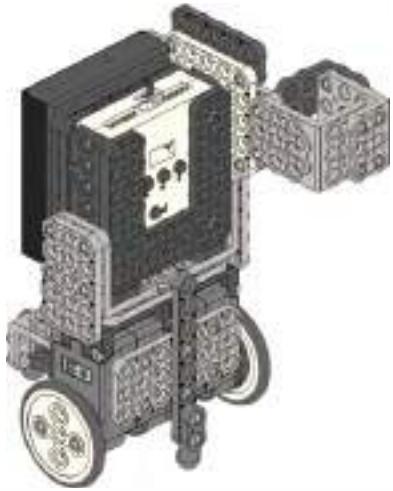
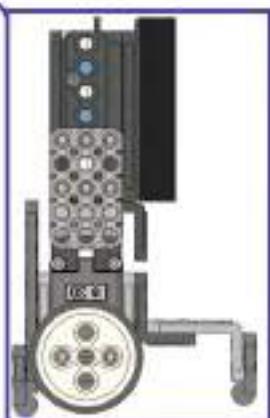
Step 12

Tip



Double rivet X2

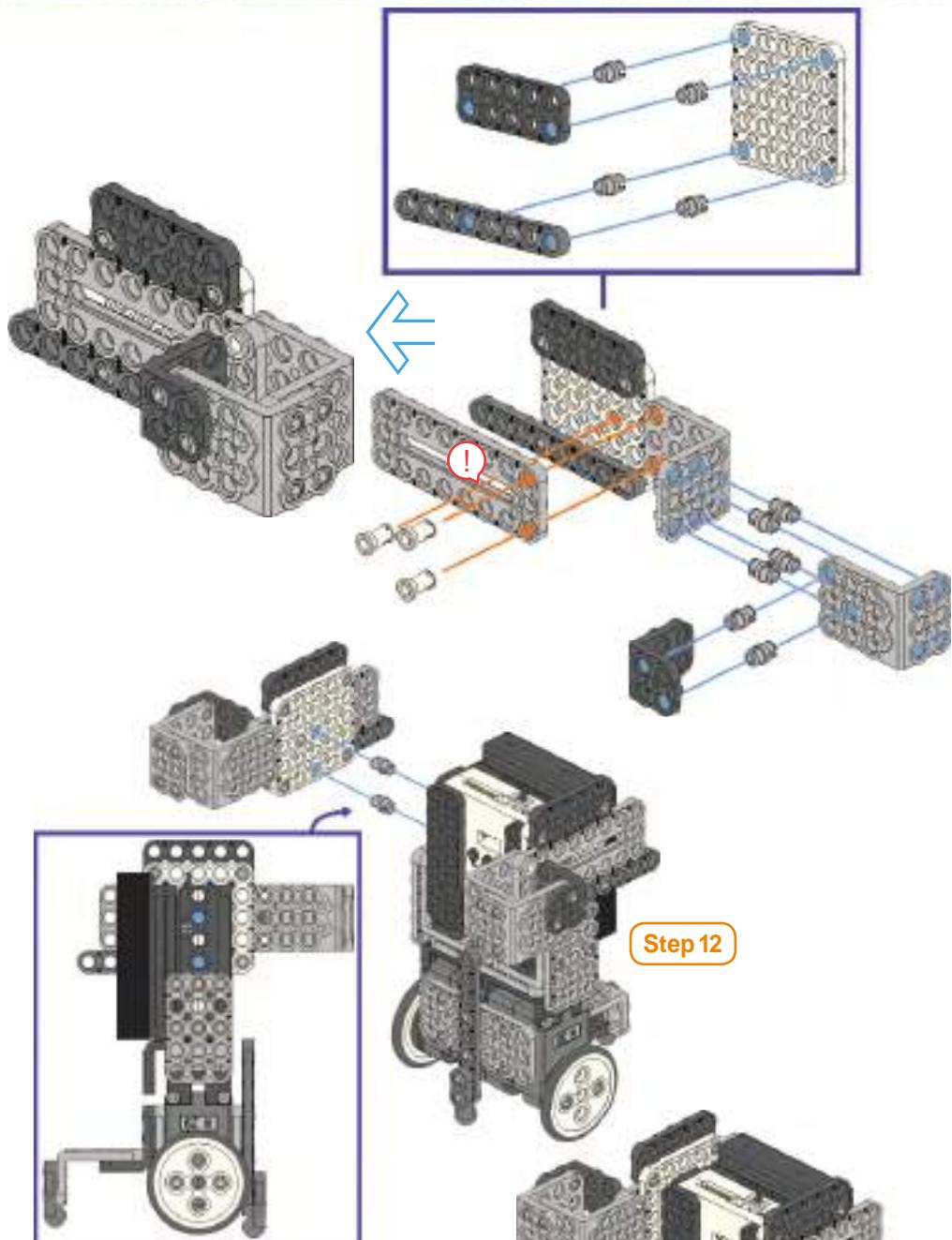
Step 10



Step 13

Tip

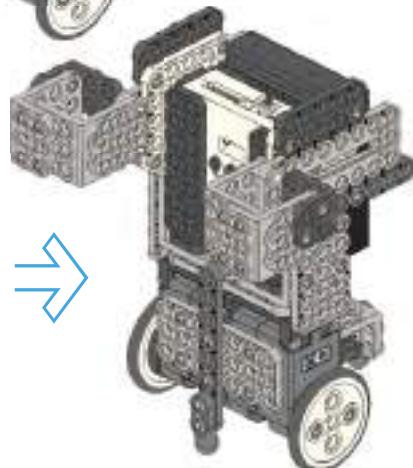
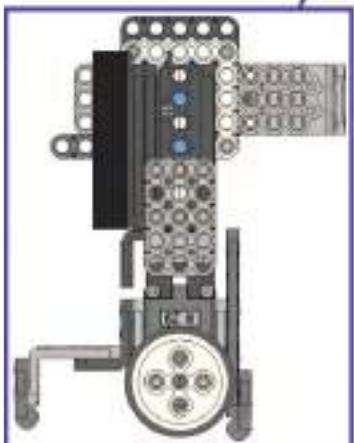
- 1x8 frame X1
- 2x5 frame X1
- 5x5 frame X1
- 3x8 slide frame X1
- 2x4 L frame X1
- 3x5 L frame X1
- 3x6 L frame X1
- 2s rivet X3
- Double rivet X10



Step 14

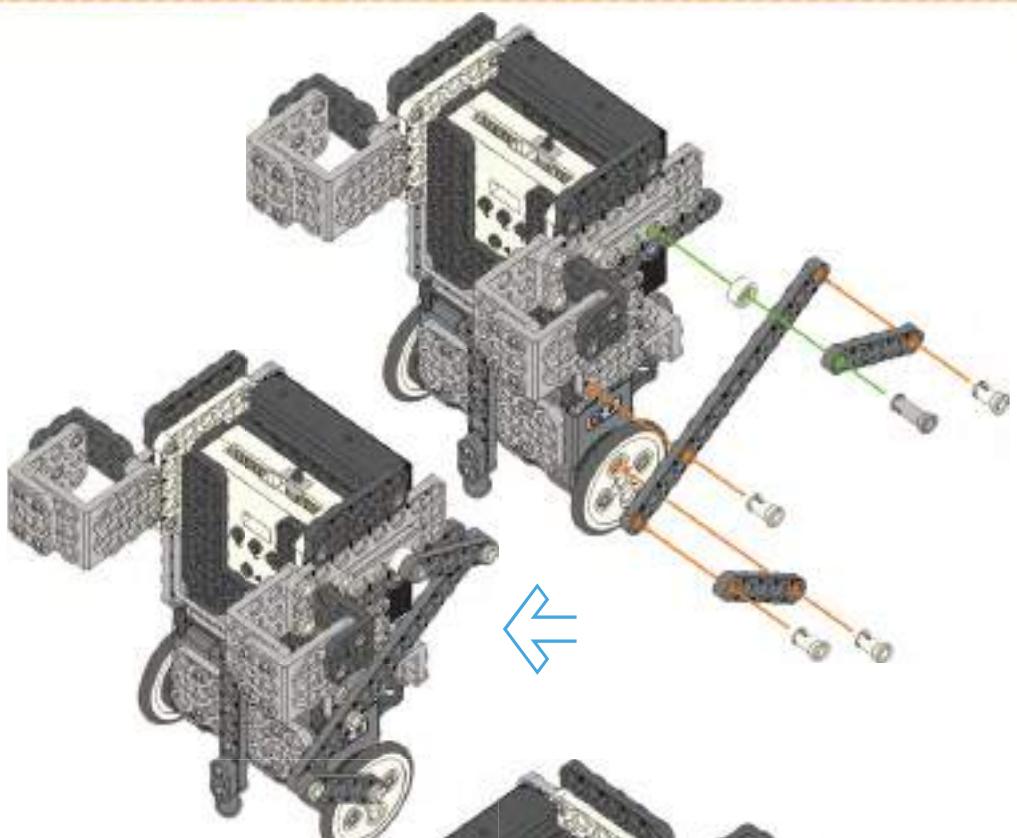
Tip

- Double rivet X2



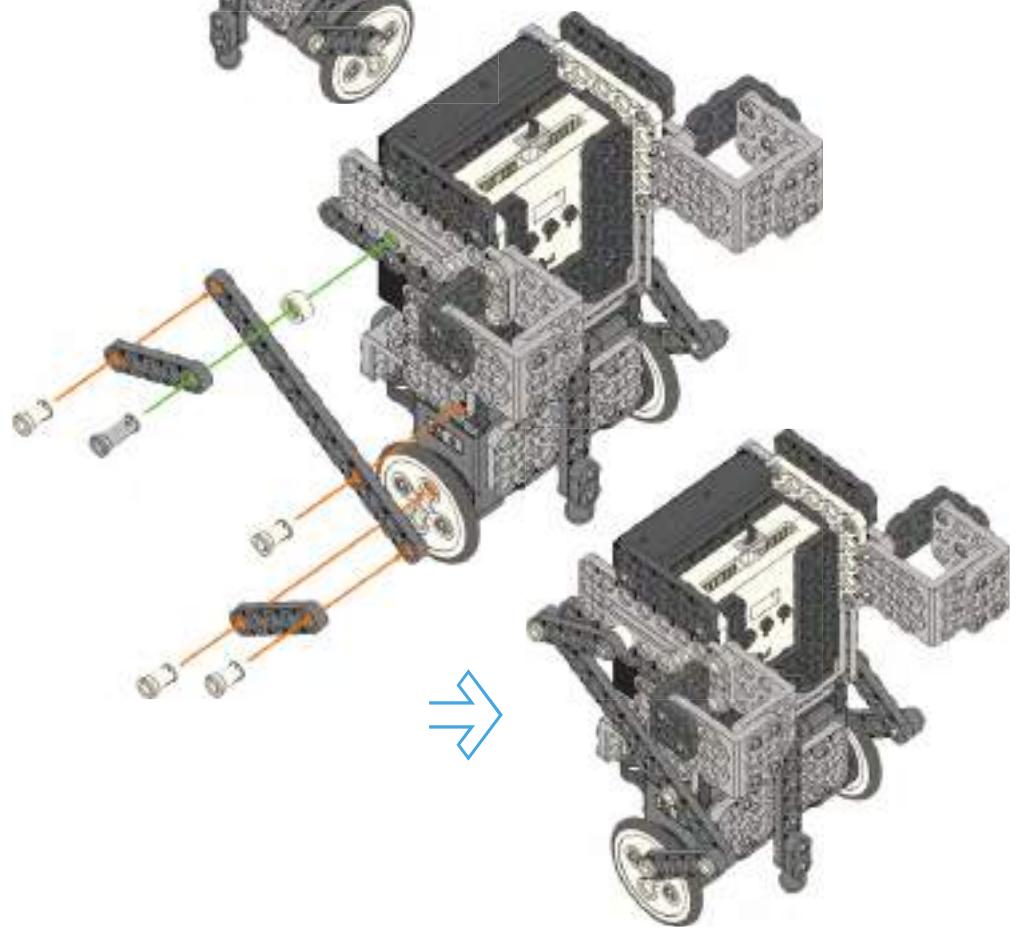
Step 15

Tip
1x5 frame X2
1x12 frame X1
Spacer X1
2s rivet X4
3s rivet X1



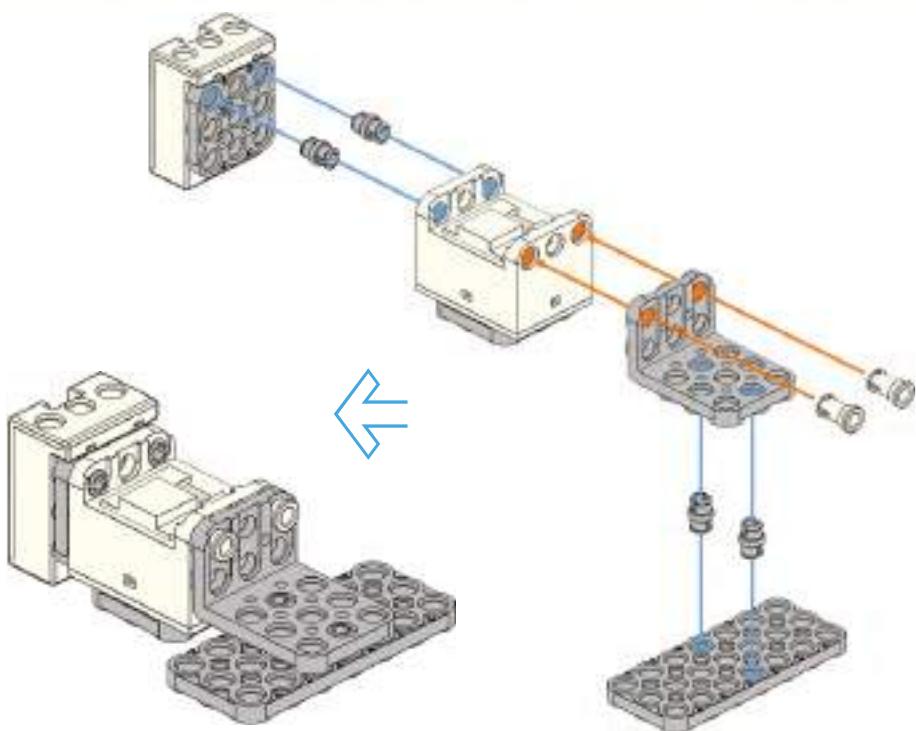
Step 16

Tip
1x5 frame X2
1x12 frame X1
Spacer X1
2s rivet X4
3s rivet X1



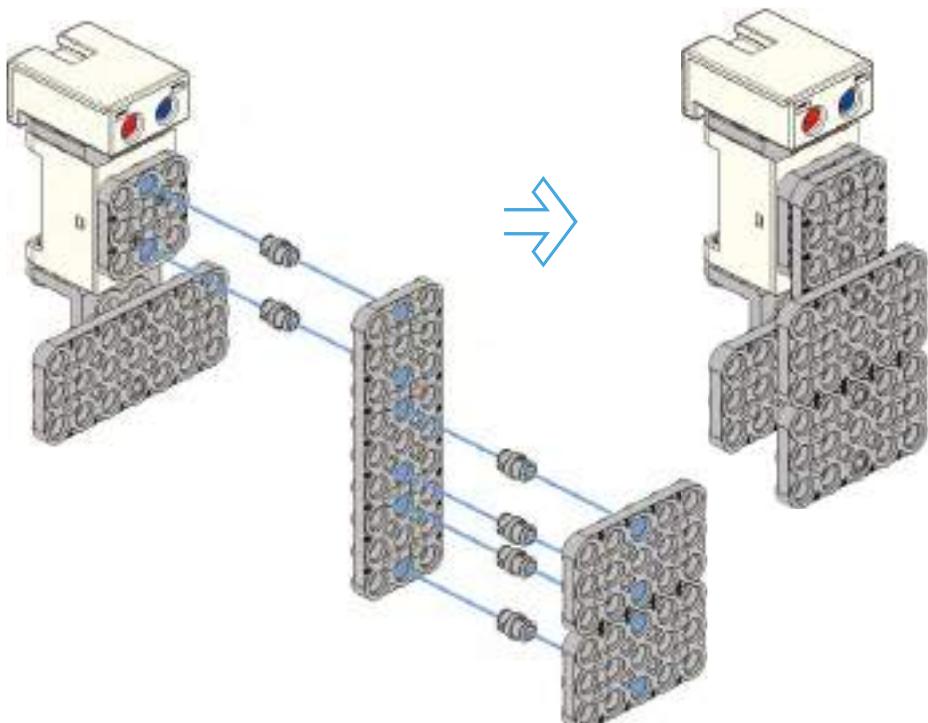
Step 17

Tip
LED X1
Touch sensor X1
3x7 frame X1
3x5 L frame X1
2s rivet X2
Double rivet X4



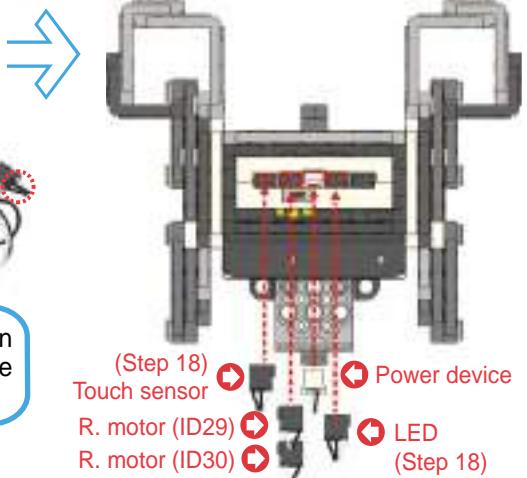
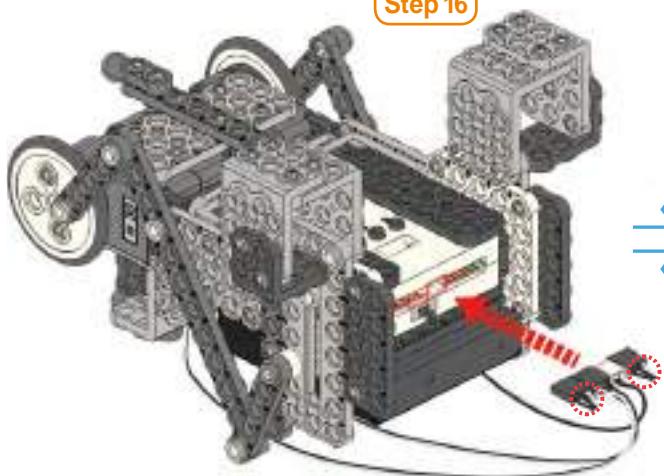
Step 18

Tip
3x5 frame X2
3x9 frame X1
Double rivet X6



Step 19

Step 16

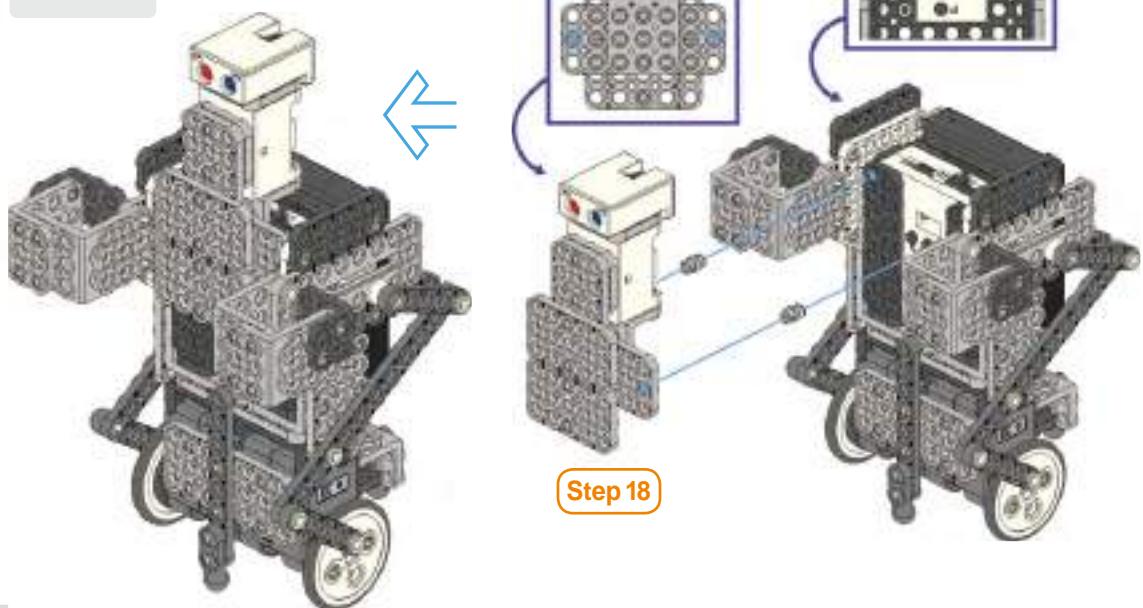


Step 20

Tip

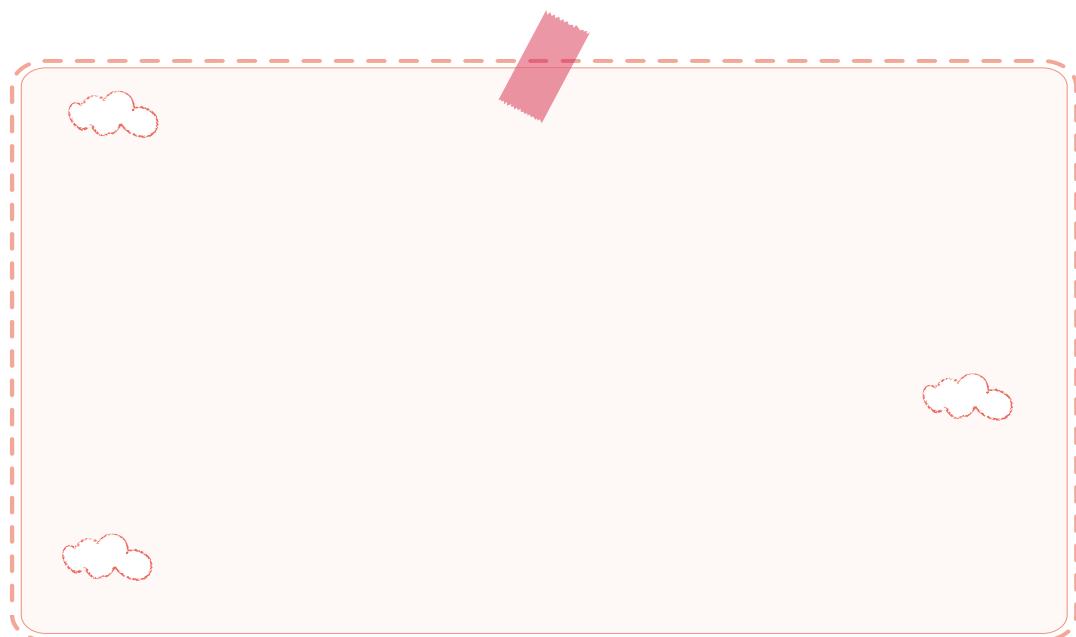
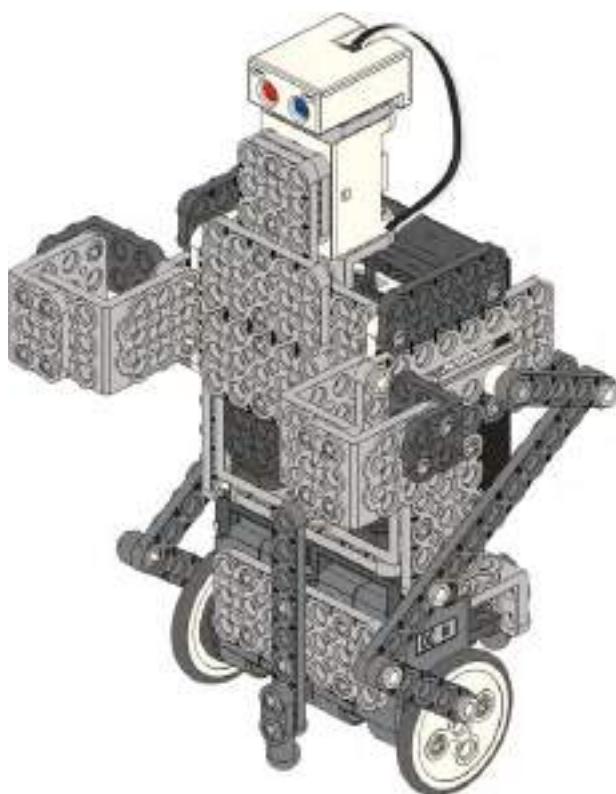


Double rivet X2





★ 'Punching Bot' ready! ★



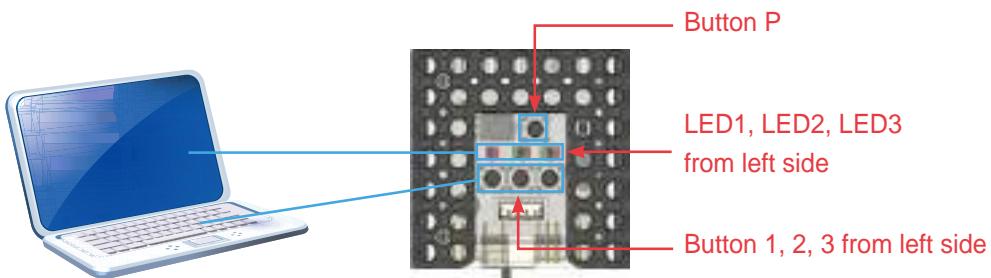


Robot Experience



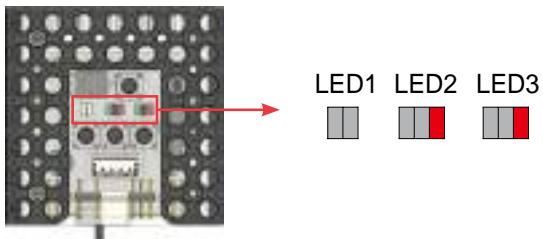
Select Punching Bot model.

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 'Punching Bot' robot model.



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

When robot is not working properly, check the following.

1. When 'Punching Bot' is not working well :

- ▶ Check the power device (battery case, power S/W) and 'Punching Bot' LED set-up.

2. When rotation motor, touch sensor and LED are not working well :

- ▶ Check the electronic parts and cables as shown in Step 19.



Check movement and assembly.

1. Press button 1, 2 or 3 or IR remote controller, and choose from the below example.



★ Example ★

(a)



Stop slowly.

(b)



Go forward with left and right movement.

(c)



Go backward with left and right movement.

(1) ① button :

(2) ② button :

(3) ③ button :

2. Read below and draw circle for correct answer as 'Punching Bot' movement.

(1) # + ② button (



).

(a) Go forward when touch sensor is pressed.

(b) Go forward slowly and stop slowly.

(c) Go backward when touch sensor is pressed.

(2) # + ③ button (



).

(a) Go forward when touch sensor is pressed.

(b) Go forward slowly and stop slowly.

(c) Go backward when touch sensor is pressed.



Robot Play



Punch Punch

Let's play 'Punching Bot' with other friend.

- Check the punching behavior and whether it properly moved forward, backward and rotates.
- Touch sensor detects opposite robot's punch while LED detects the number of hits.
- Whoever punches the opposite robot's chest (touch sensor part) first wins.
- You can also win when the opposite robot falls or goes outside the ring.
- Designate the game time and rules through discussion.



LED basic value : blue + red light on

Detect hit one time : blue light on

Detect hit two times : red light on

Detect hit three times :
All LED light off, and STOP



◆ Describe your 'Punching Bot'.

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



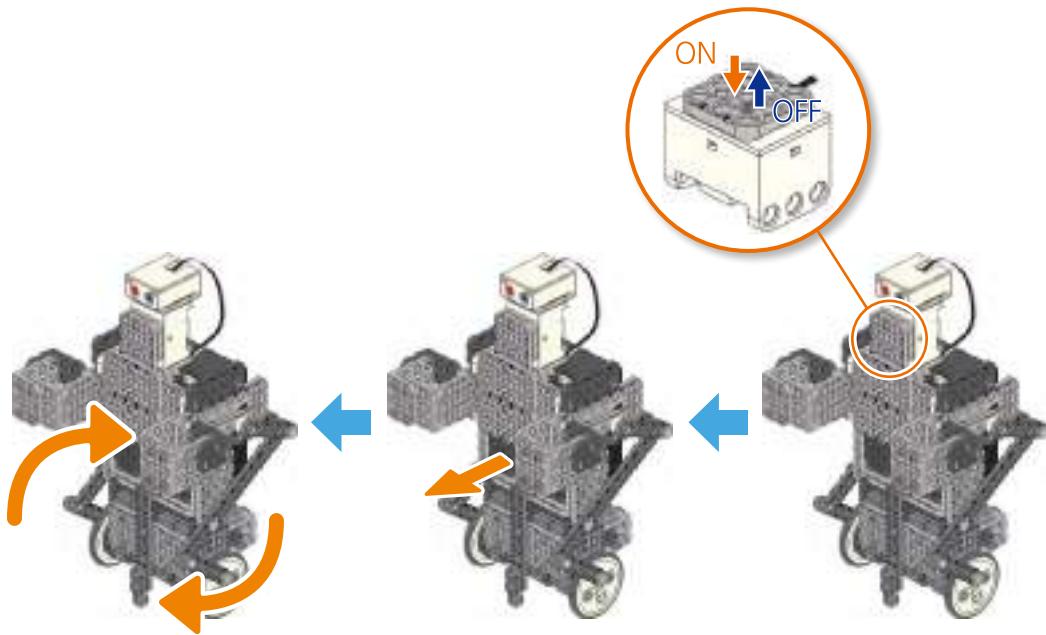


Robot coding with Scratch



Coding Mission

Punching Bot moves straight → rotates → stops whenever its head is pressed.



⟨ Rotate and stop ⟩

⟨ Move straight ⟩

⟨ Detect with touch sensor ⟩

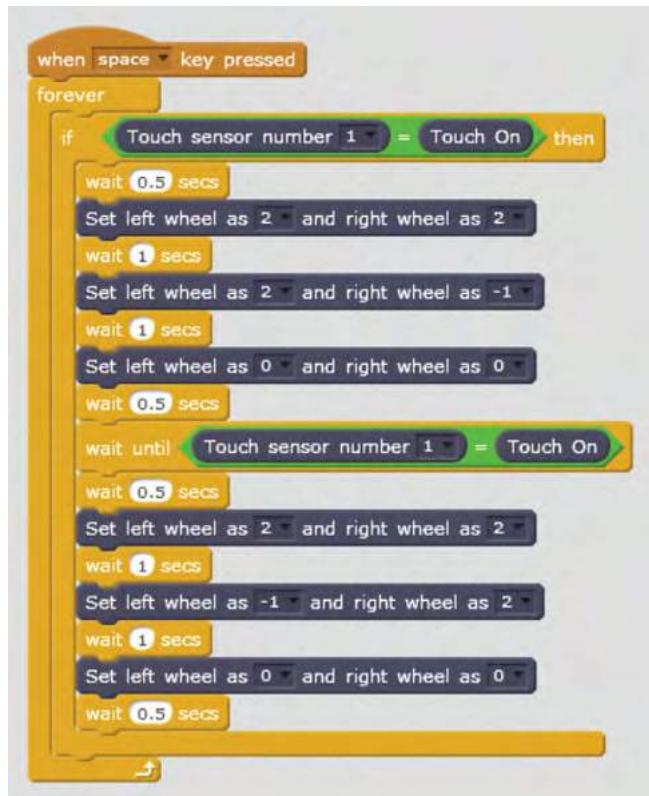
◆ Check before Coding Mission

- Check if Scratch Builder is installed before Coding Mission.
- Download Scratch Builder from the Robobuilder site and install.
(Download the most recent version in Support-Software at www.robobuilder.net.)
- Download other detailed explanation at the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



Making a Scratch block

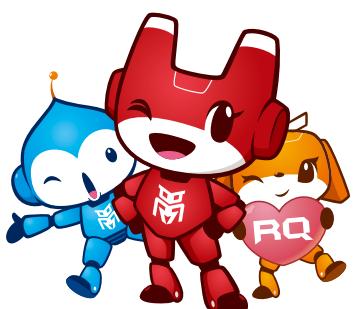
Create a Scratch block as below and run by pressing the spacebar on the keyboard.



Save the block on Scratch and upload to the robot using Scratch Builder to run without the communication cable (**press # + 4 button** on the remote to run the uploaded code).

◆ Any questions about Coding Mission?

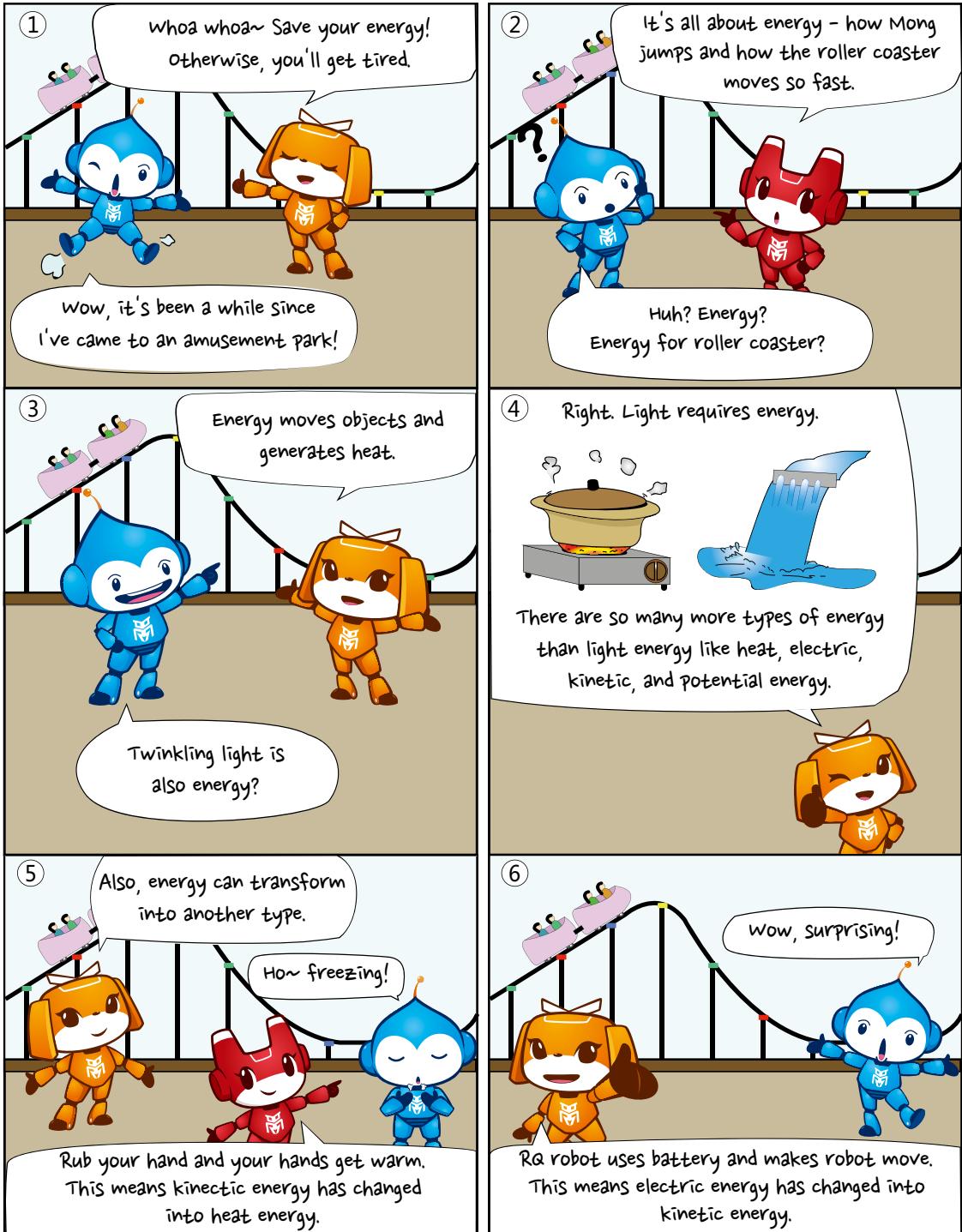
- For any questions about robot coding mission, visit Support-Technical support at www.robobuilder.net.
- Download the 'Scratch Builder' manual on the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



RQ⁺

2. Cultivator

Change in energy!



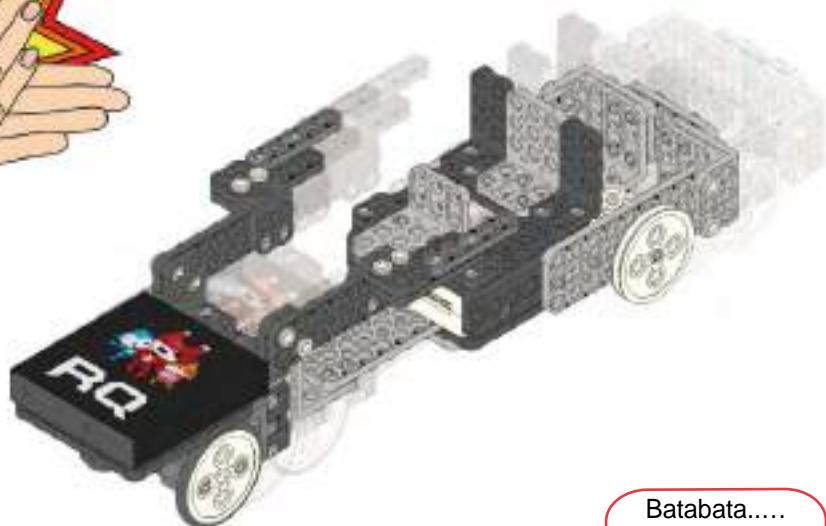


Today's Robot Class



RQ+'s second robot! We are going to build 'Cultivator' robot. How does a cultivator robot move? And by what power? Energy. Electric energy from battery transformed to kinetic energy makes the cultivator robot go forward and backward like a real cultivator. Let's build a cultivator robot, and check out its movements.

Clap!



Batabata.....
Let's wake up the
morning of farm
village!!



'Batabata……' Cultivator is very important machinery in farm village. It is not fast but it cultivates farmland, transports things and more.





Robot Assembly



Prepare robot parts.



Smart controller **X1**



R. motor (ID30) **X1**



Battery case **X1**



1x5 frame **X2**



2x5 frame **X3**



2x7 frame **X3**



3x5 frame **X2**



3x9 frame **X4**



5x5 frame **X1**



2x4 L frame **X4**



2x5 L frame **X2**



3x5 L frame **X4**



3x6 L frame **X4**



Wheel **X4**



Rubber ring **X2**



Front horn **X1**



2s rivet **X12**



3s rivet **X7**



Double rivet **X63**



Tips.

Check the rotation motor ID30 before start assembling.

First!

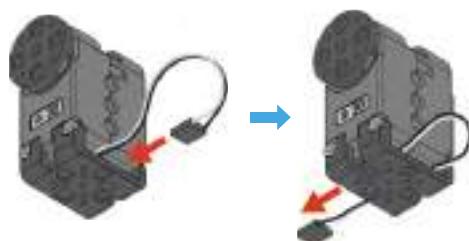
Match 'home' marks of the front horns.

The front side has the ID mark.



Second!

Check out the cable of rotation motor.



* You can see how to connect front horn with the motor.

Step 1

Tip



R. motor (ID30) X1



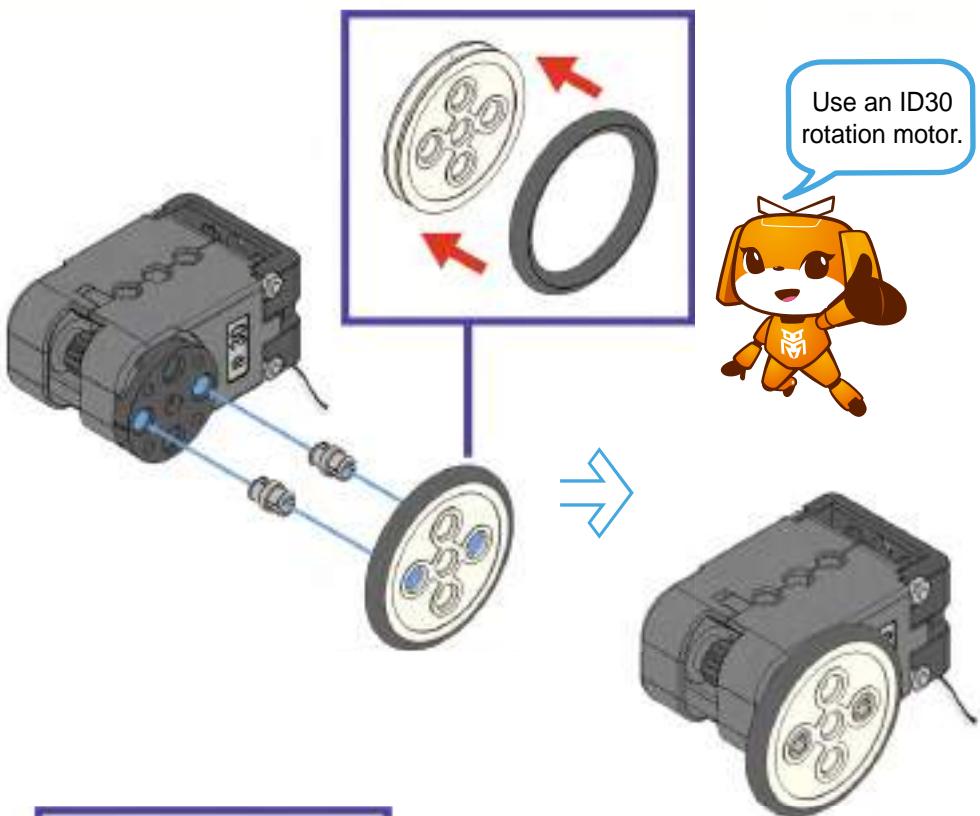
Wheel X1



Rubber ring X1



Double rivet X2



Step 2

Tip



Wheel X1



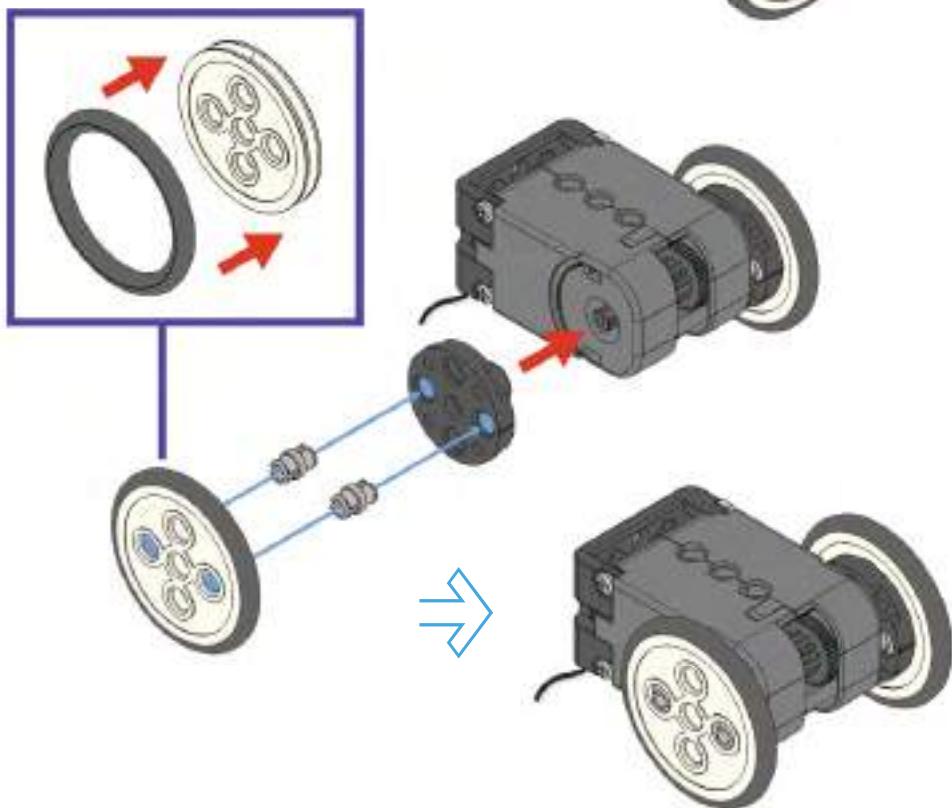
Rubber ring X1



Front horn X1



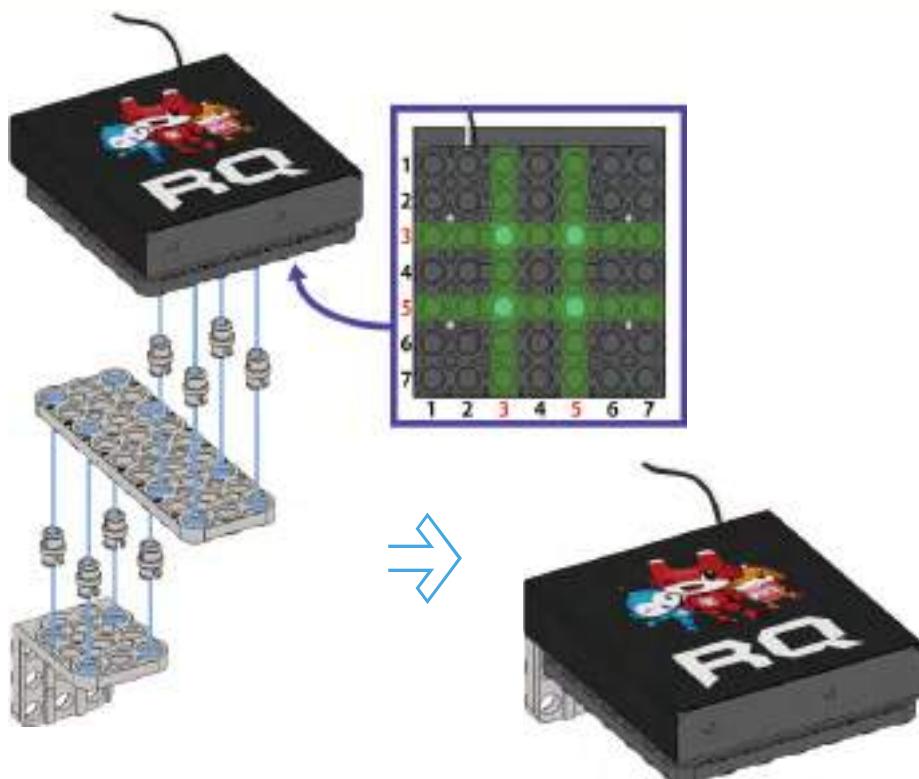
Double rivet X2



Step 3

Tip

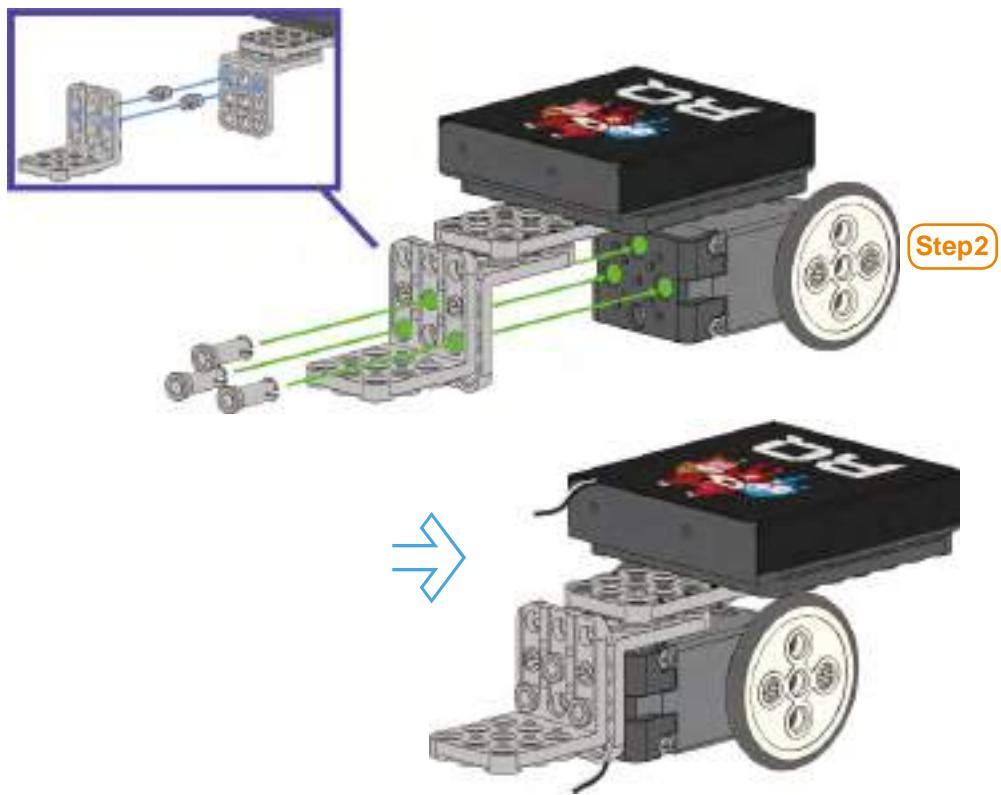
- Battery case X1
- 3x9 frame X1
- 3x6 L frame X1
- Double rivet X8



Step 4

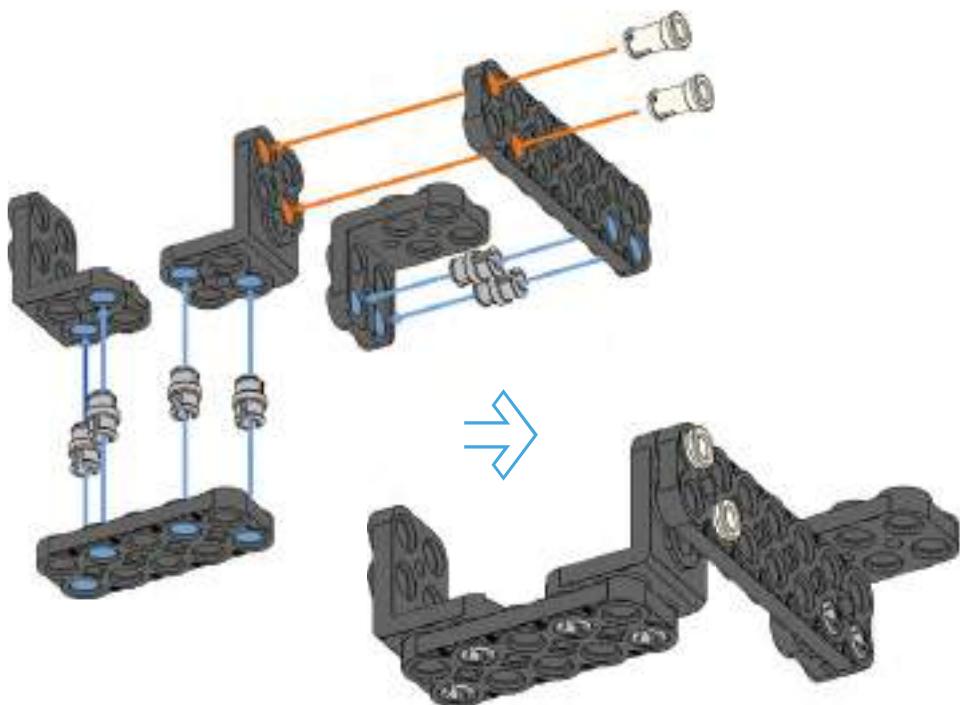
Tip

- 3x6 L frame X1
- 3s rivet X3
- Double rivet X2



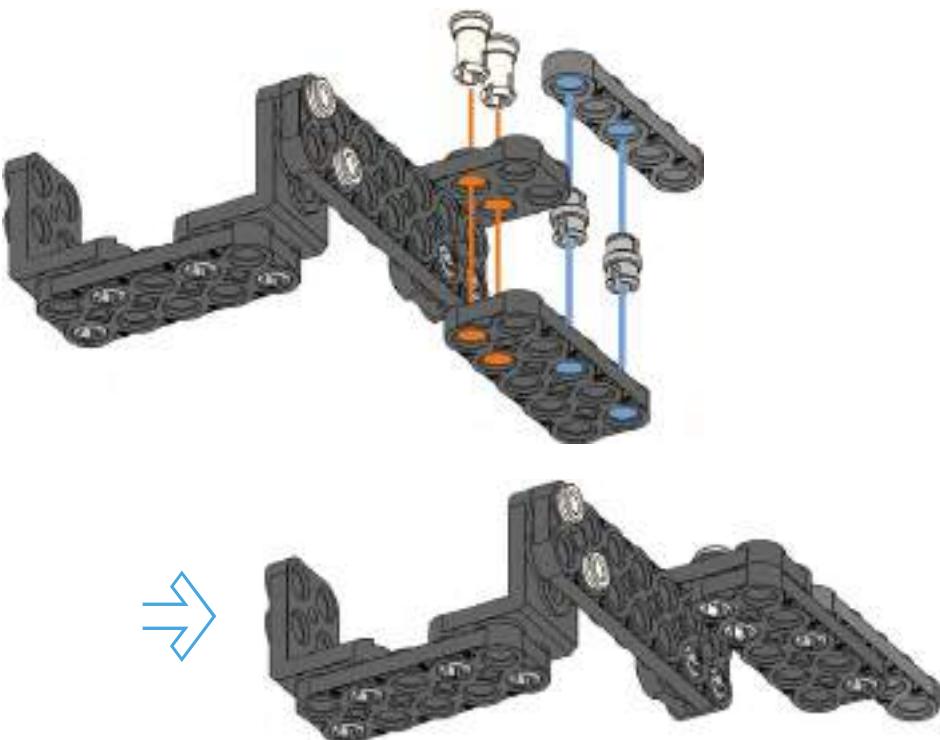
Step 5

Tip
2x5 frame X1
2x7 frame X1
2x4 L frame X3
2s rivet X2
Double rivet X6



Step 6

Tip
1x5 frame X1
2x5 frame X1
2s rivet X2
Double rivet X2



Step 7

Tip



2x7 frame X1



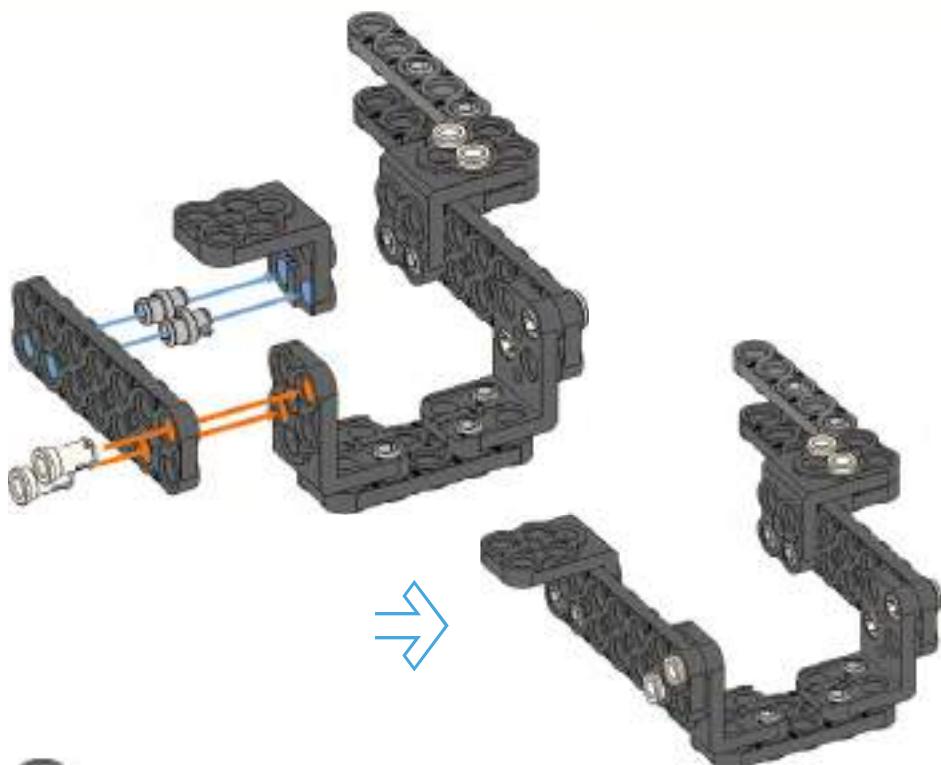
2x4 L frame X1



2s rivet X2



Double rivet X2

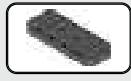


Step 8

Tip



1x5 frame X1



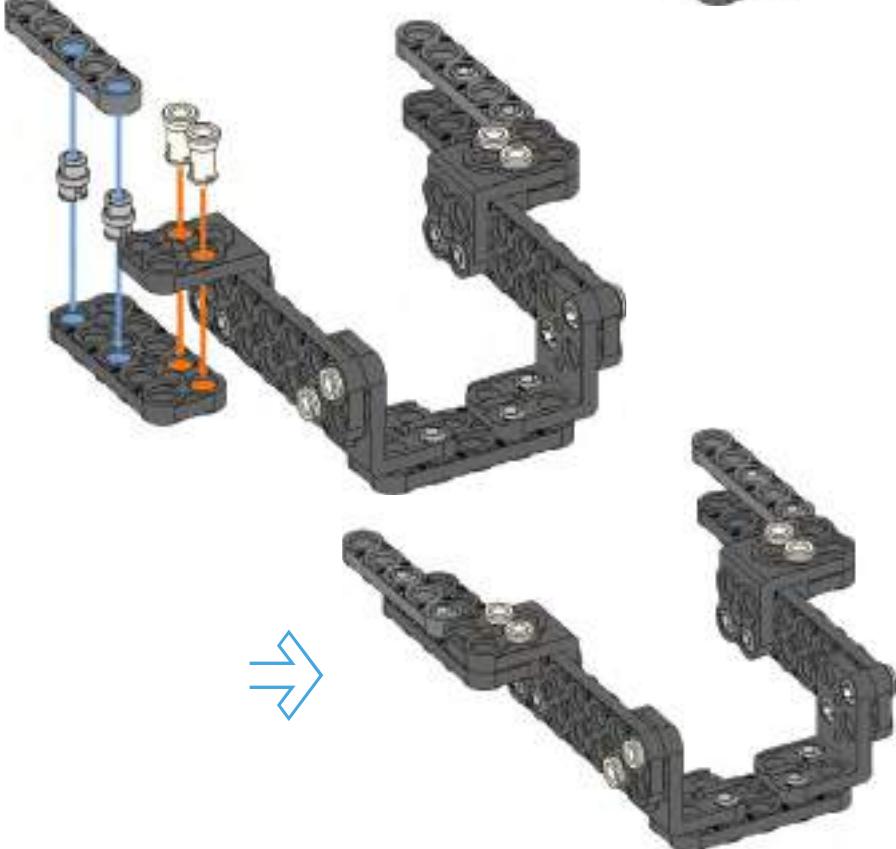
2x5 frame X1



2s rivet X2



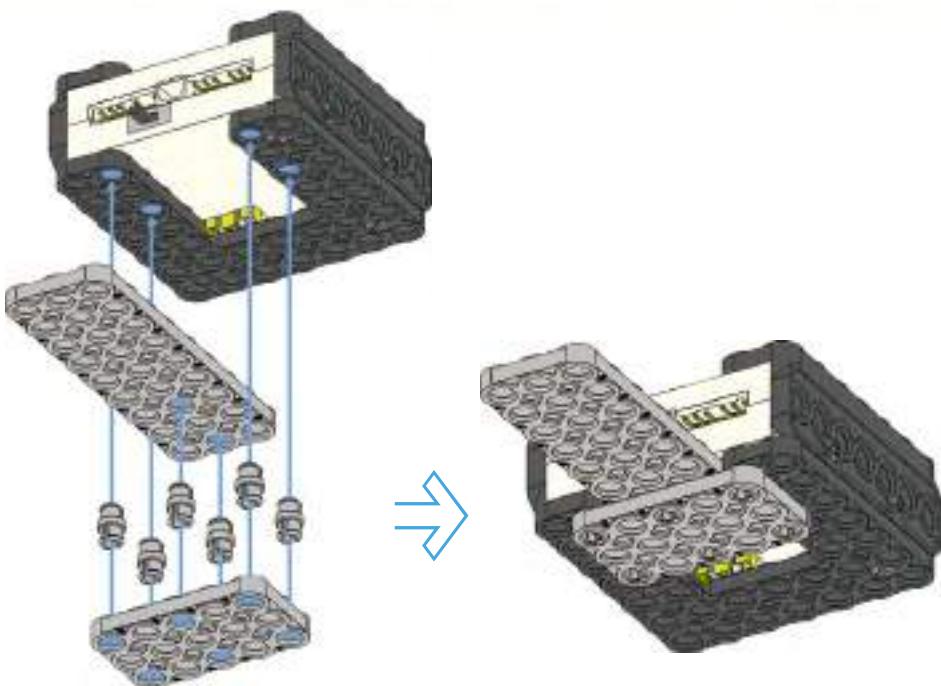
Double rivet X2



Step 9

Tip

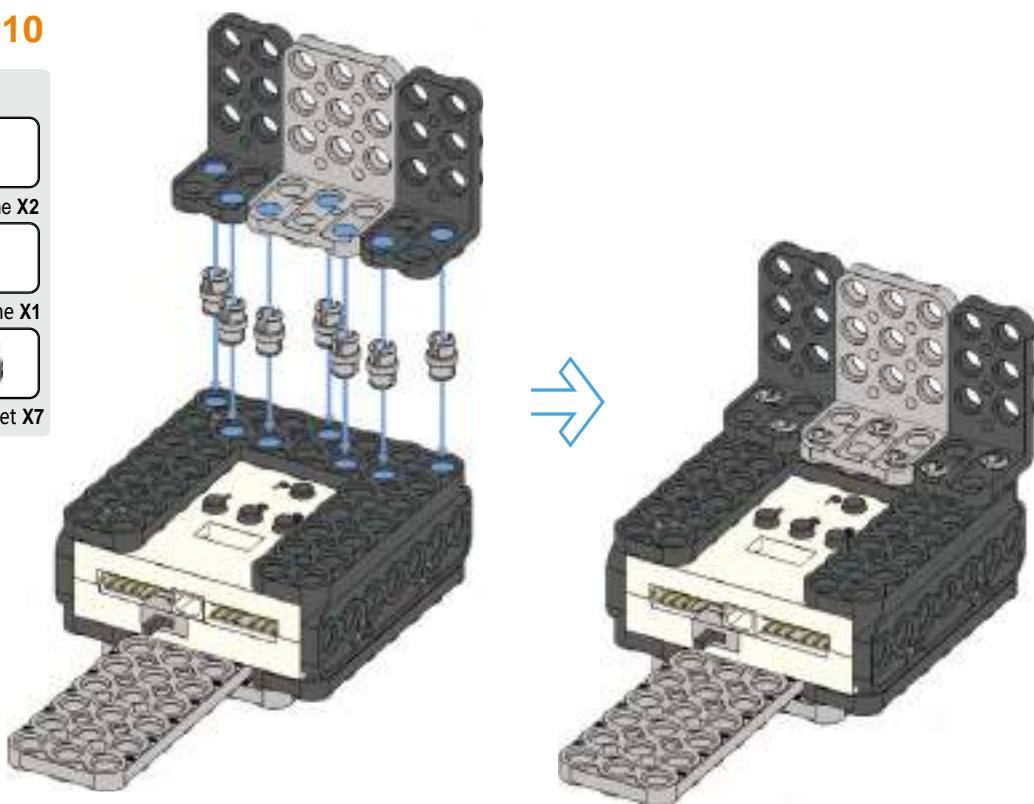
- Smart controller X1
- 3x5 frame X1
- 3x9 frame X1
- Double rivet X6



Step 10

Tip

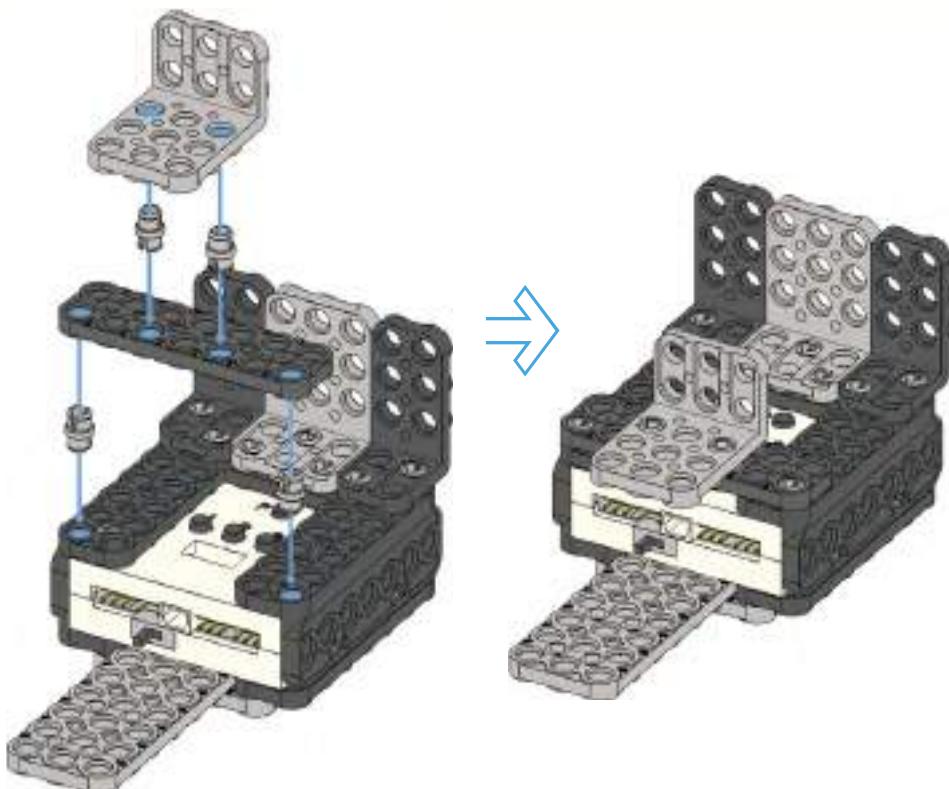
- 2x5 L frame X2
- 3x5 L frame X1
- Double rivet X7



Step 11

Tip

-  2x7 frame X1
-  3x5 L frame X1
-  Double rivet X4

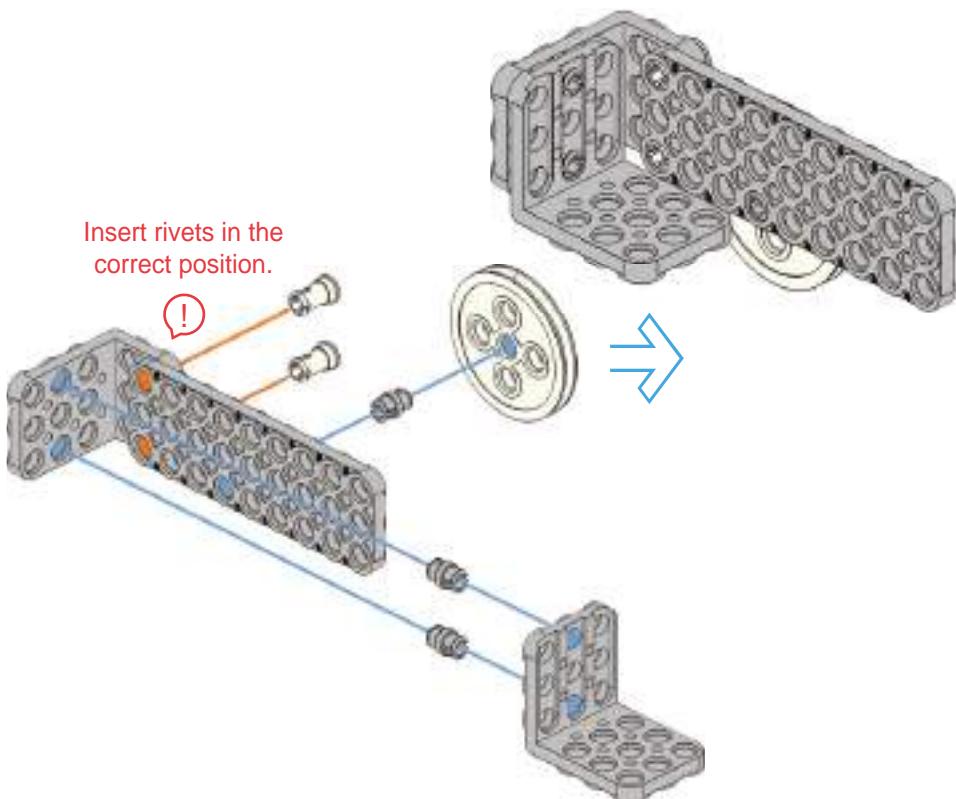


Step 12

Tip

-  3x9 frame X1
-  3x5 L frame X1
-  3x6 L frame X1
-  Wheel X1
-  2s rivet X2
-  Double rivet X3

Insert rivets in the correct position.

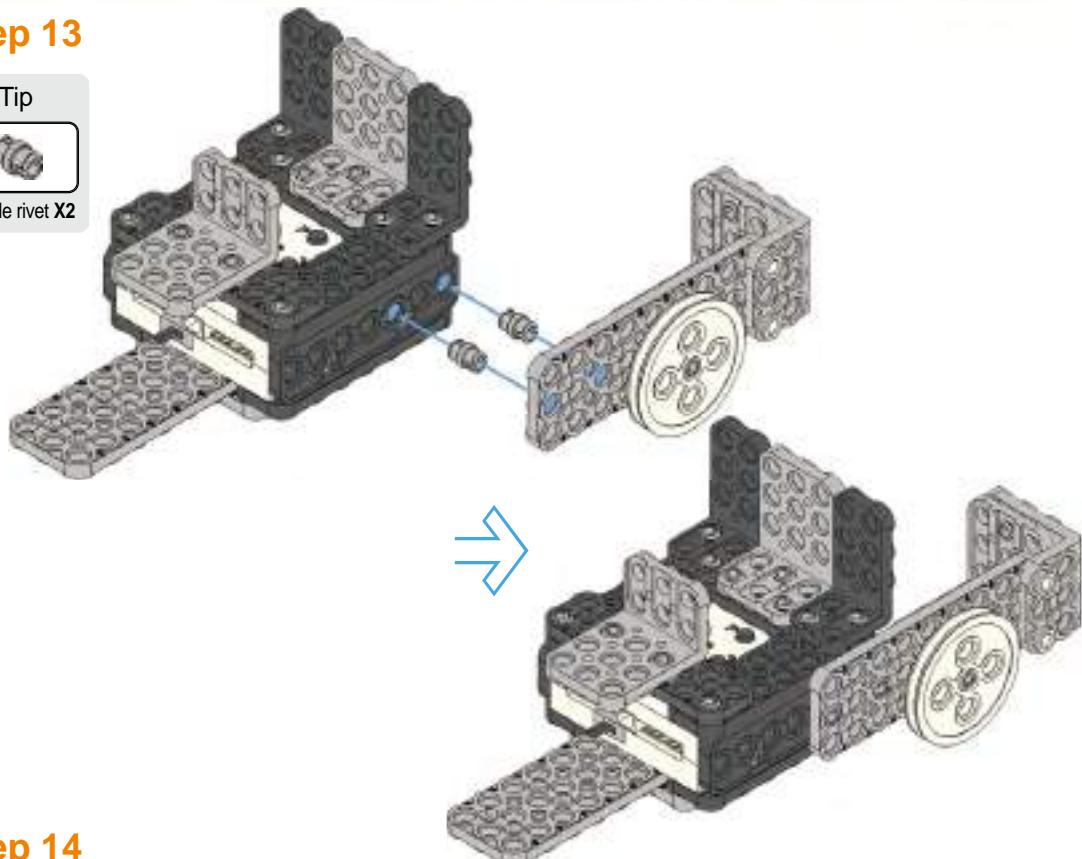


Step 13

Tip



Double rivet X2



Step 14

Tip



3x9 frame X1



3x5 L frame X1



3x6 L frame X1



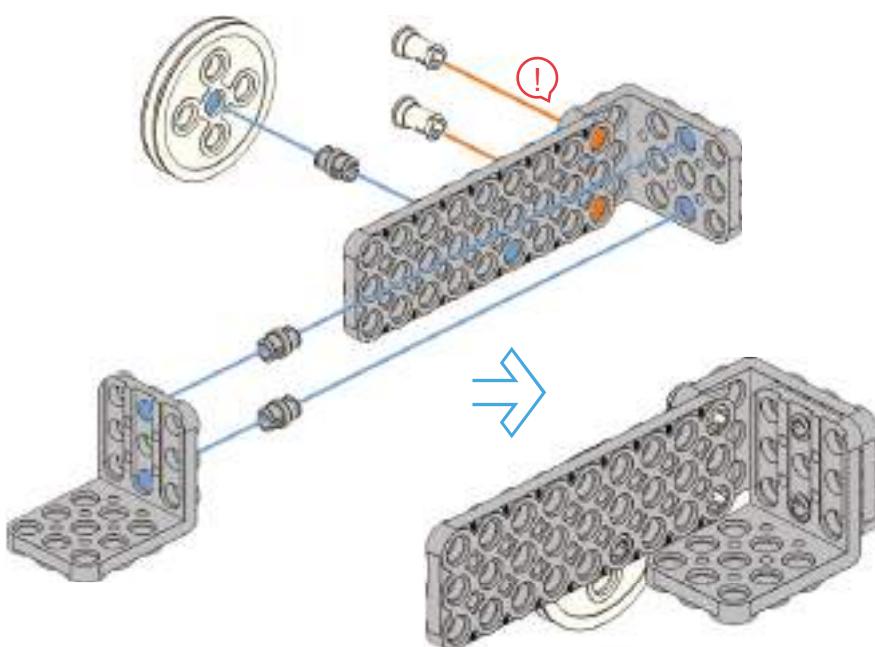
Wheel X1



2s rivet X2



Double rivet X3

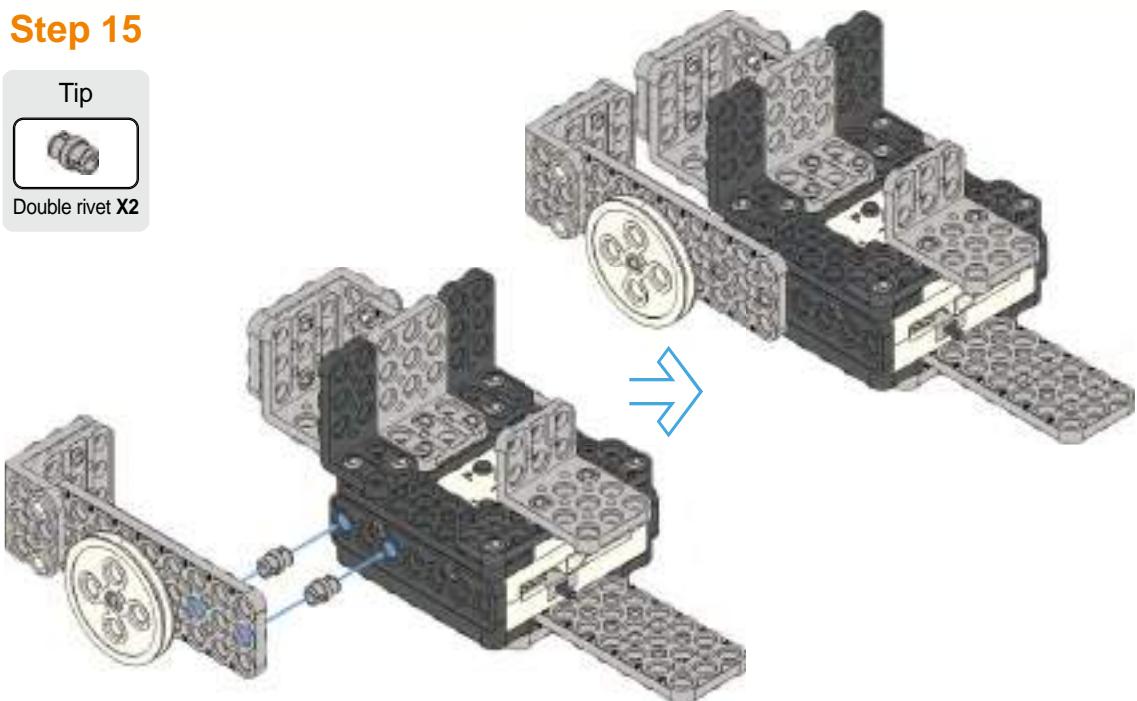


Step 15

Tip



Double rivet X2



Step 16

Tip



3x5 frame X1



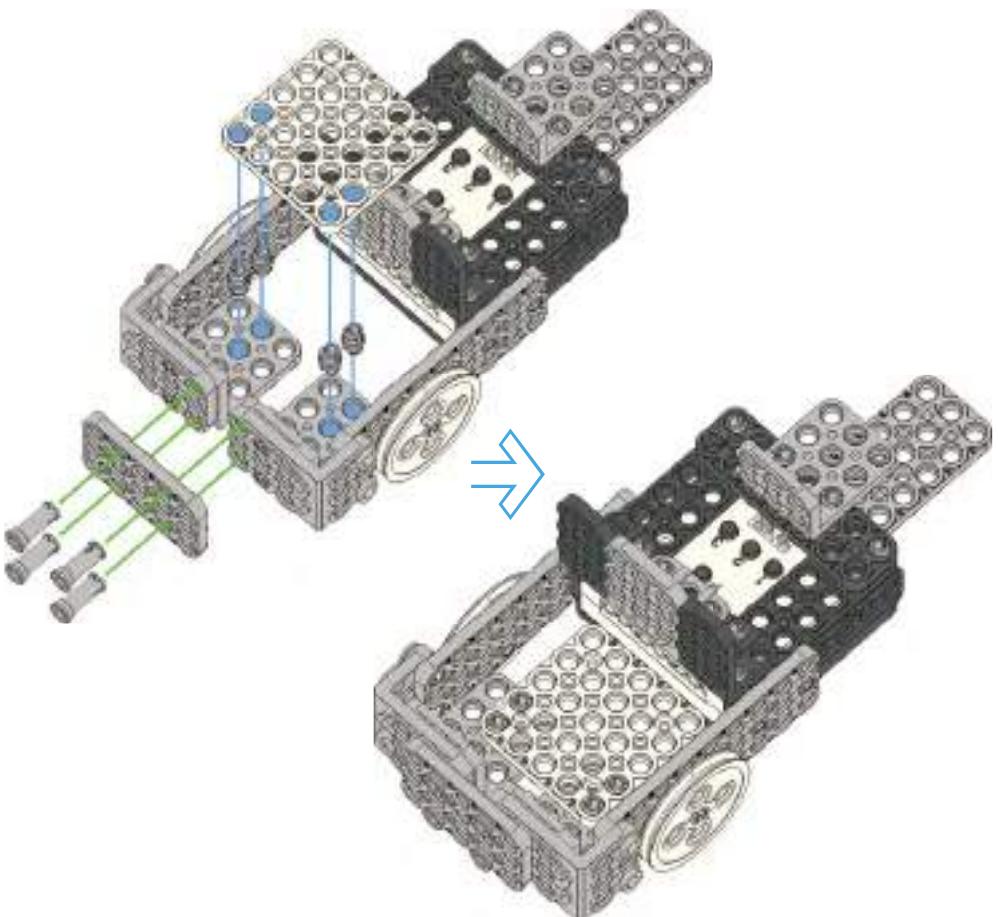
5x5 frame X1



3s rivet X4



Double rivet X4

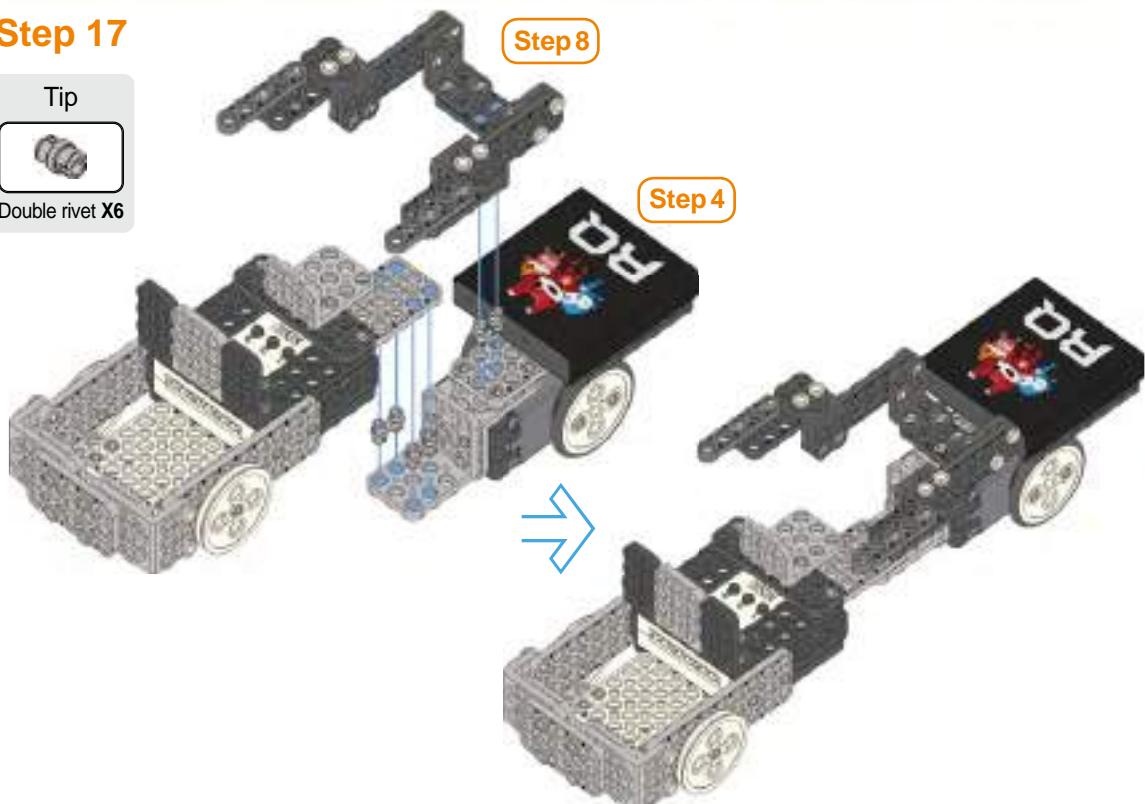


Step 17

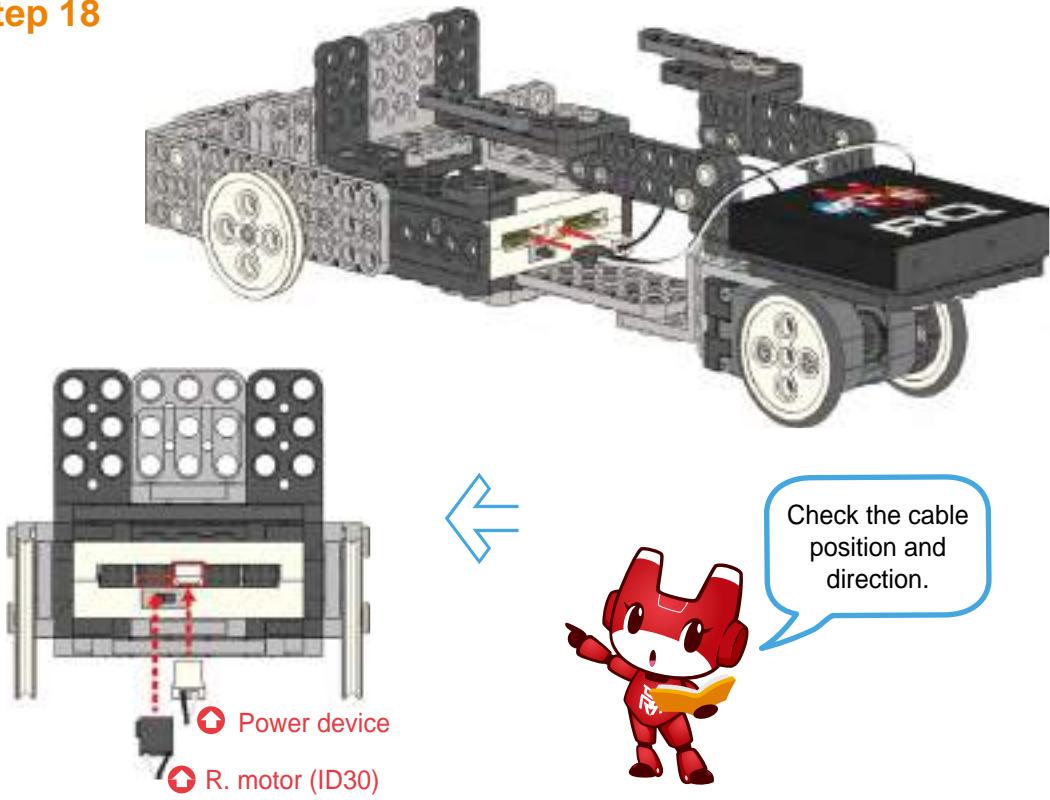
Tip
Double rivet X6

Step 8

Step 4

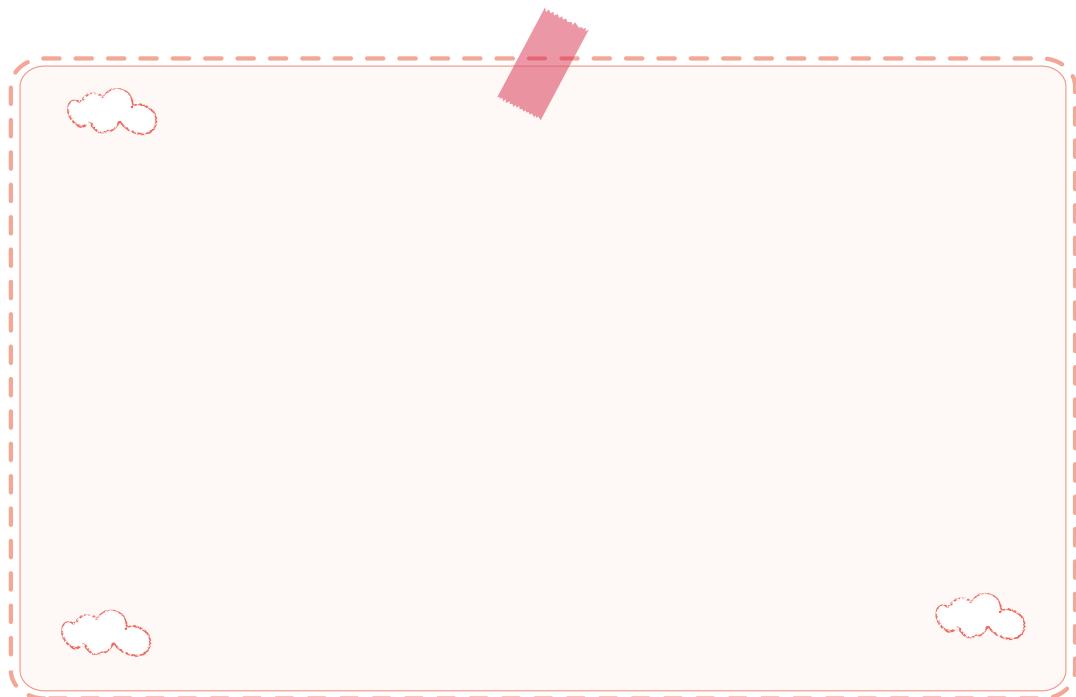
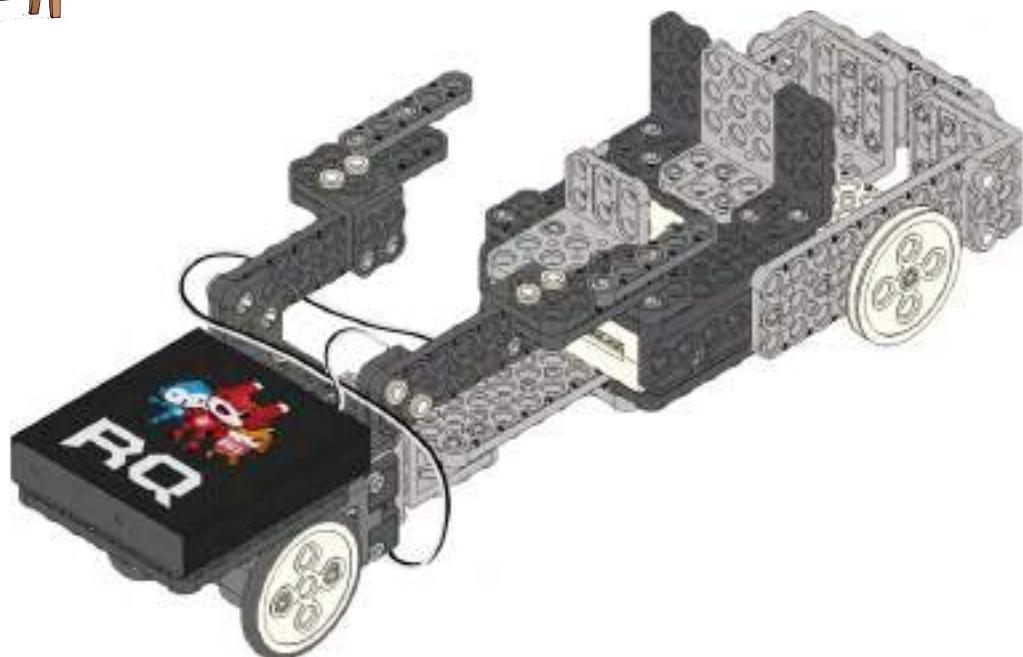


Step 18





★ 'Cultivator' robot ready! ★



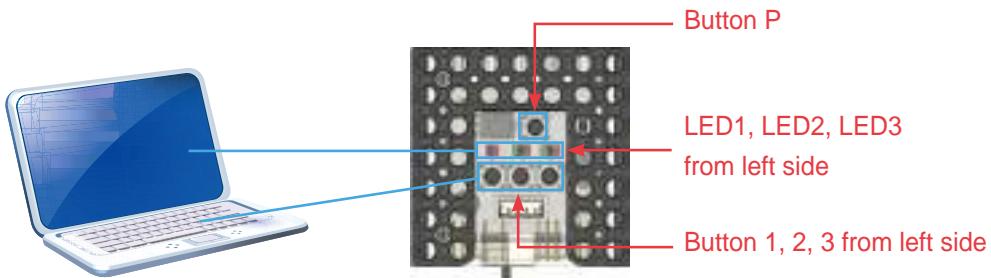


Robot Experience



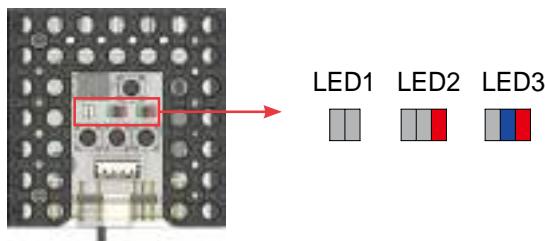
Program for 'Cultivator' robot model set-up.

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons do as keyboards in 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 'Cultivator' 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 properly, check the following.

1. When 'Cultivator' robot is not working well :
 - ▶ Check the assembly status and 'Cultivator' robot LED set-up.
2. When rotation motor is not working well :
 - ▶ Check to see if the rotation motor ID30 is connected correctly to the smart controller.



Check movement and assembly.

1. Press button 1, 2 or 3 of IR remote controller, then, write your answer from examples below.

★ Examples ★

- ①  'Batabata…' go forward.
- ②  'Batabata…' go backward.
- ③  Stop slowly.
- ④  Clap!
'Batabata…' go backward when sound is detected.
- ⑤  Clap!
'Batabata…' go forward when sound is detected.
- ⑥  Go forward slowly and then go backward slowly.



- (1) ① button :
- (2) ② button :
- (3) ③ button :
- (4) # + ① button :
- (5) # + ② button :
- (6) # + ③ button :



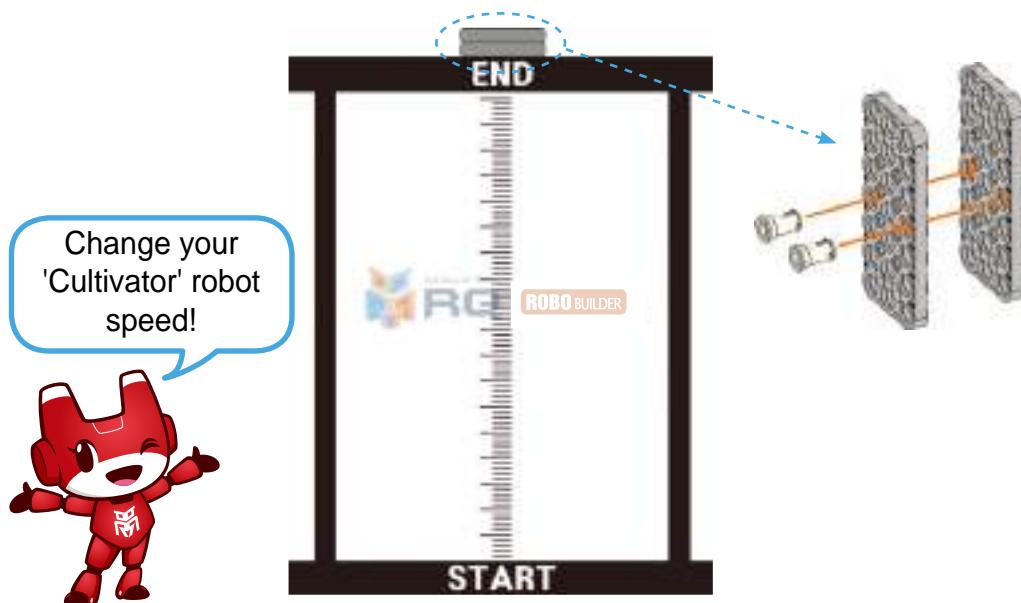
Robot Play



Who comes closer…?

Use 'Cultivator' robot and 3x7 frame to play 'Who comes closer' game.

- As below, overlap two 3x7 frames, and have them sit on the 'END' point.
- Start from 'START', then go towards the 3x7 frames.
- You can only press 'STOP' once. Whoever comes closer to this frame wins.
- Do not let the 3x7 frames fall or move away from the game zone.



◆ Describe your 'Cultivator' robot.

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



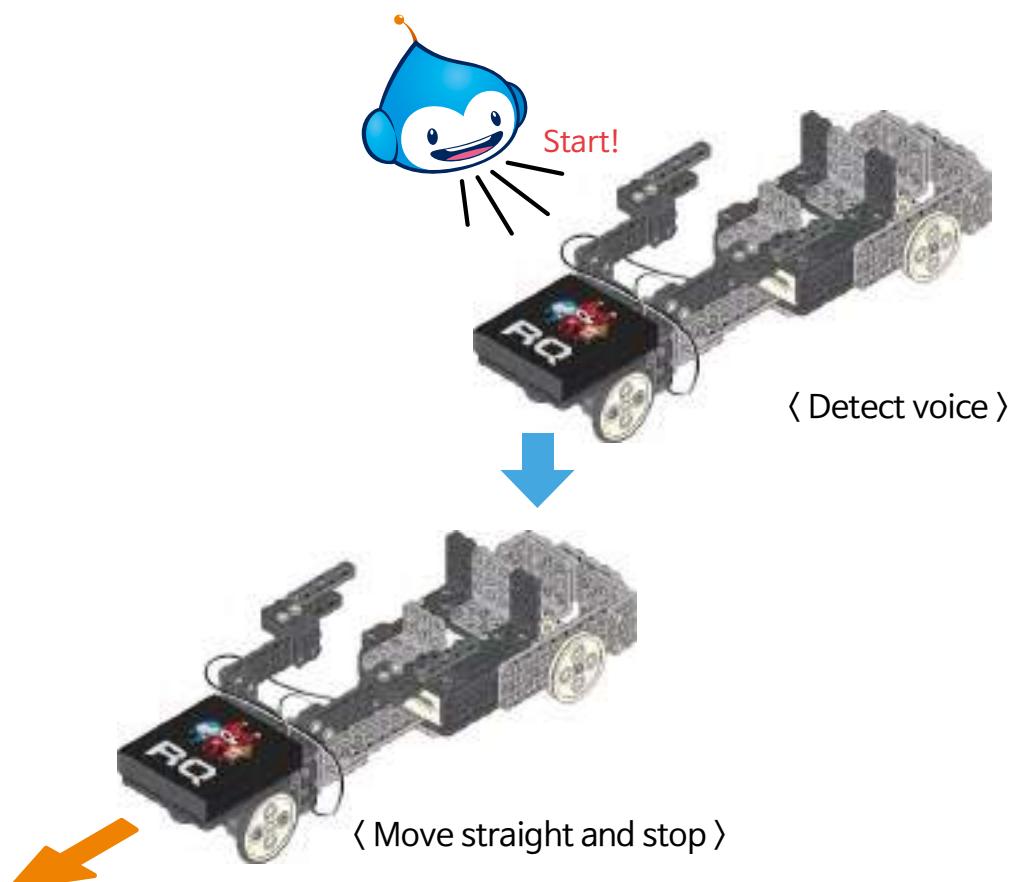


Robot coding with Scratch



Coding Mission

Once Cultivator detects voice, it moves straight and stops.



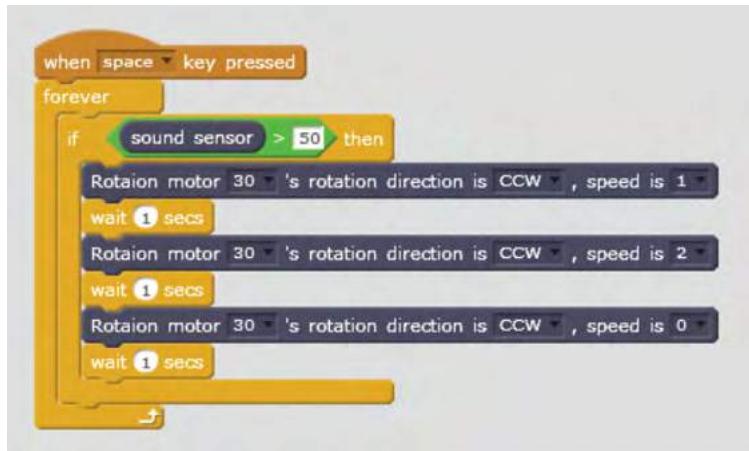
◆ Check before Coding Mission

- Check if Scratch Builder is installed before Coding Mission.
- Download Scratch Builder from the Robobuilder site and install.
(Download the most recent version in Support-Software at www.robobuilder.net.)
- Download other detailed explanation at the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



Making a Scratch block

Create a Scratch block as below and run by pressing the spacebar on the keyboard.



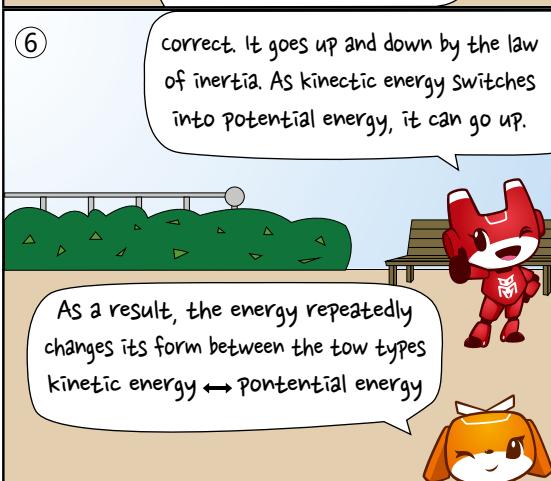
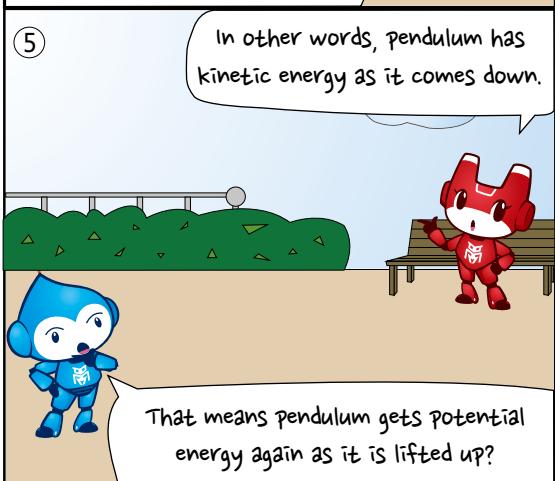
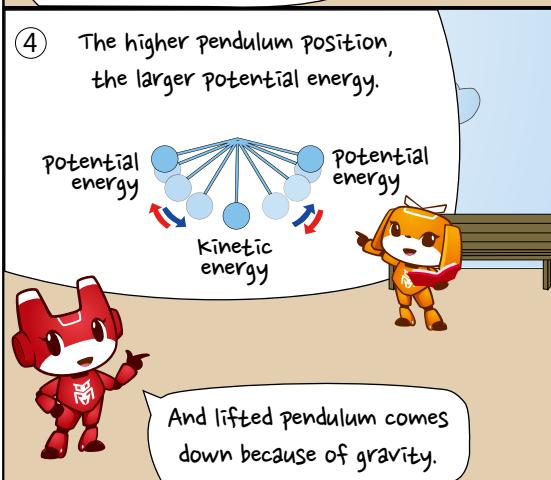
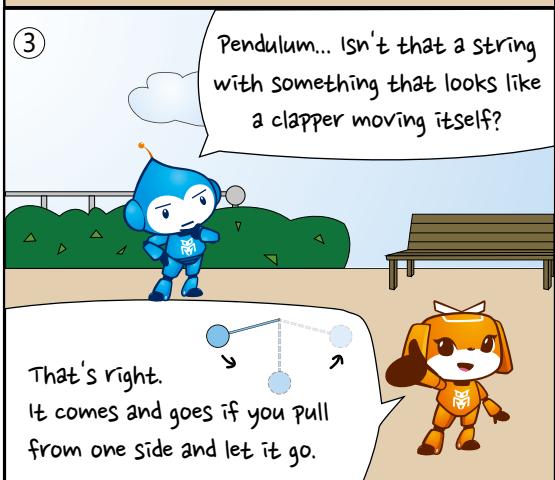
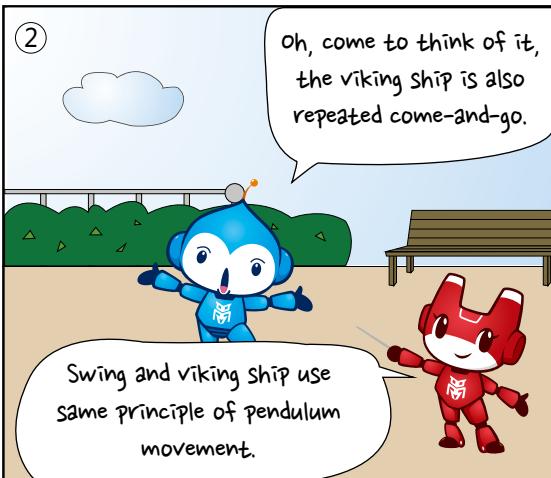
Save the block on Scratch and upload to the robot using Scratch Builder to run without the communication cable (**press # + 4 button** on the remote to run the uploaded code).

❖ Any questions about Coding Mission?

- For any questions about robot coding mission, visit Support-Technical support at www.robobuilder.net.
- Download the 'Scratch Builder' manual on the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)

3. Swing Bot

Come-and-go, ride swing

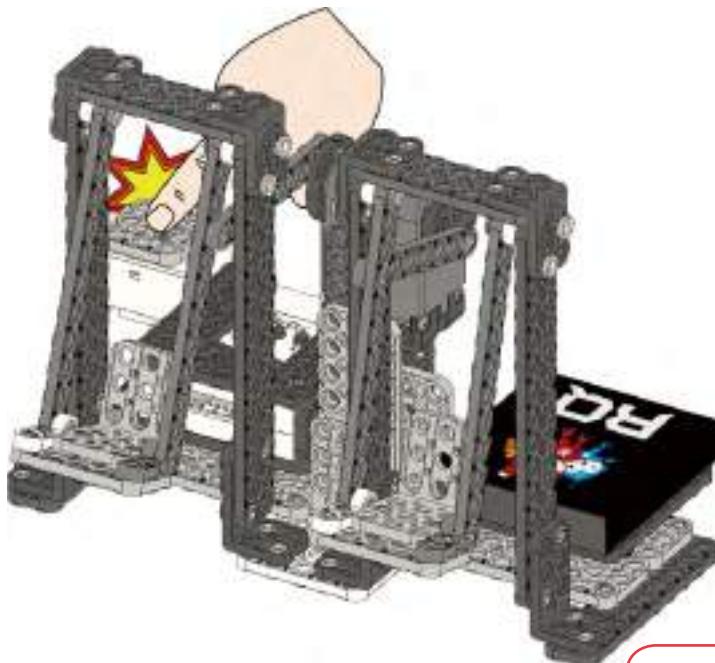




Today's Robot Class



What principle is applied in come-and-go swing? Swing uses the principle of the pendulum of a clock. It has a weight at the end and swings from side to side in order to make the clock work. We are going to build a twin 'Swing Bot' in this chapter. RQ+ rotation motor has two axes to allow two different motions at once. Furthermore, we can enjoy a fun board game by using this twin 'Swing Bot'



Mmm... This is like a rocking chair for twins!



A swing is a seat hanging with two ropes or chains from a metal frame or from the branch of a tree.
You can sit on the seat and swing front and back through the air.





Robot Assembly



Prepare robot parts.



Smart controller **X1**



R. motor (ID30) **X1**



Battery case **X1**



Touch sensor **X1**



1x8 frame **X2**



1x12 frame **X4**



2x7 frame **X3**



2x9 frame **X3**



2x15 frame **X4**



3x5 frame **X2**



3x7 frame **X1**



3x9 frame **X4**



5x5 frame **X2**



2x4 L frame **X4**



2x5 L frame **X4**



3x5 L frame **X1**



3x6 L frame **X3**



Spacer **X4**



Hinge A **X2**



Hinge B **X2**



Front horn **X1**



2s rivet **X8**



3s rivet **X4**

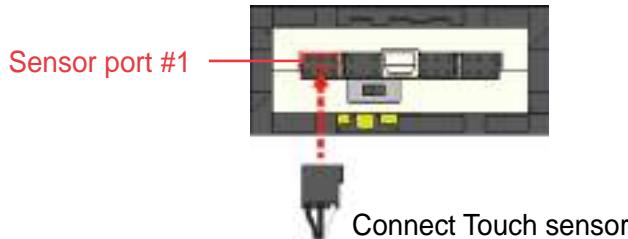


Double rivet **X80**



Tips.

Connect the touch sensor to sensor port #1 of smart controller.

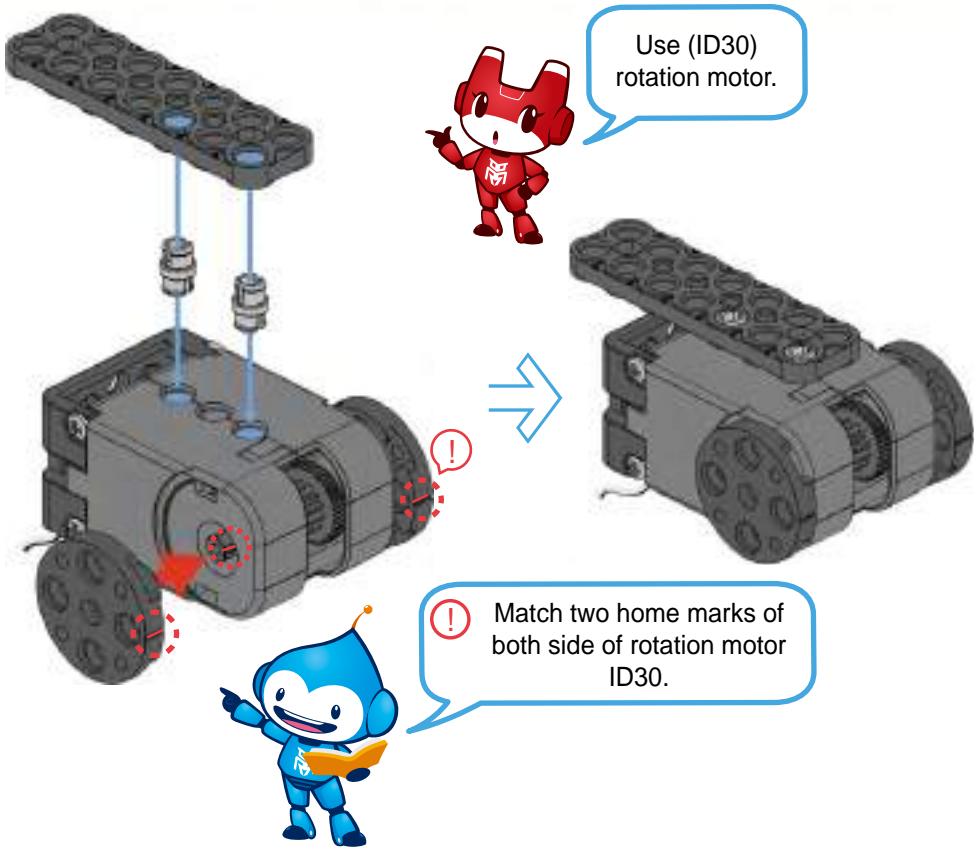


* Connect the touch sensor carefully as you check the cable position and direction.

Step 1

Tip

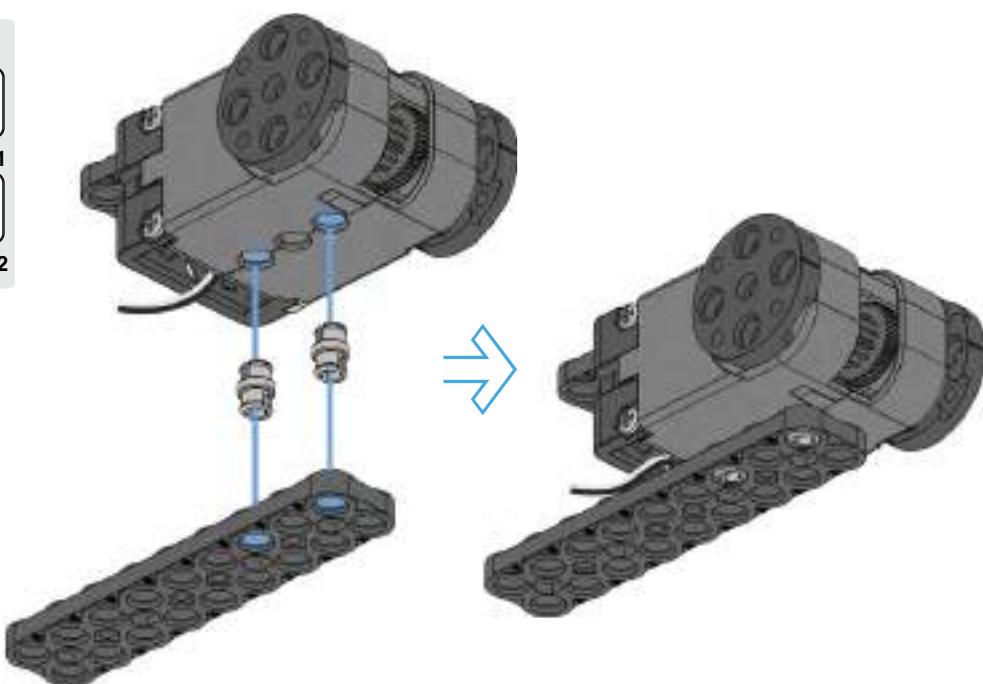
-  R. motor (ID30) X1
-  2x7 frame X1
-  Front horn X1
-  Double rivet X2



Step 2

Tip

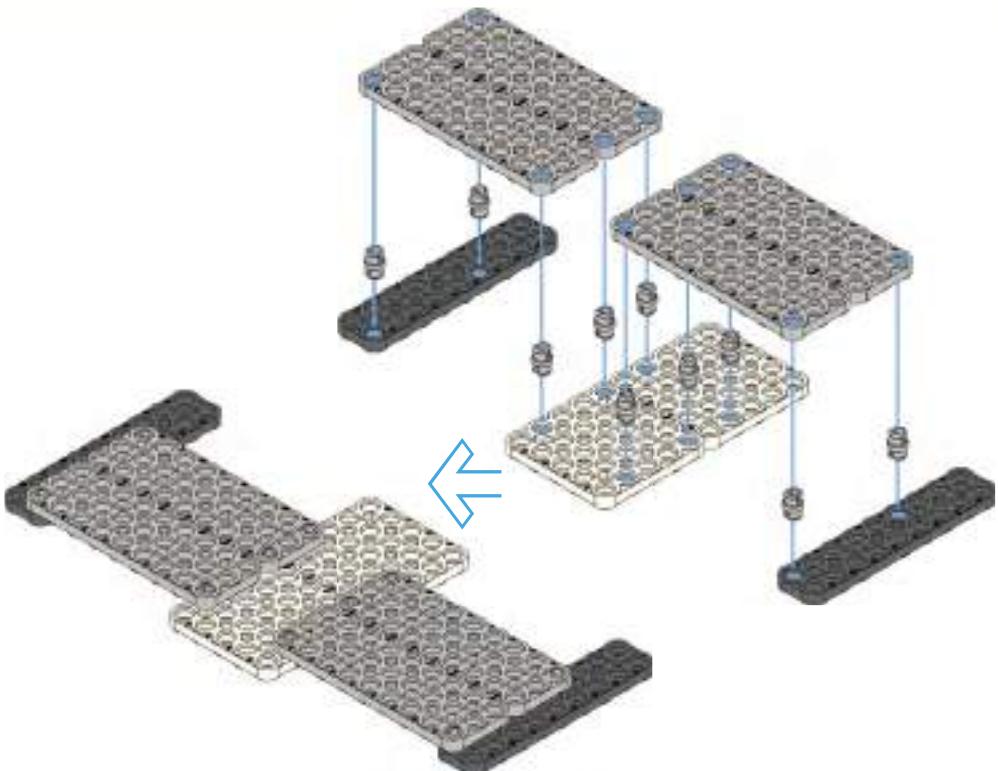
-  2x9 frame X1
-  Double rivet X2



Step 3

Tip

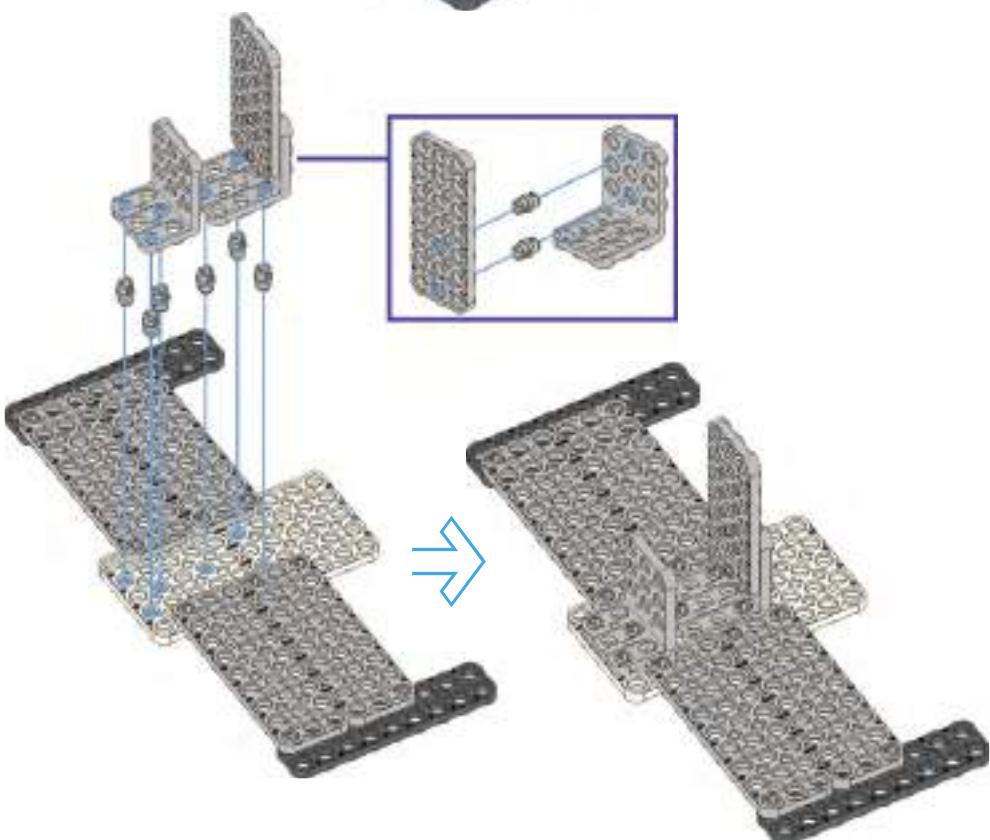
- 2x9 frame X2
- 3x9 frame X4
- 5x5 frame X2
- Double rivet X10



Step 4

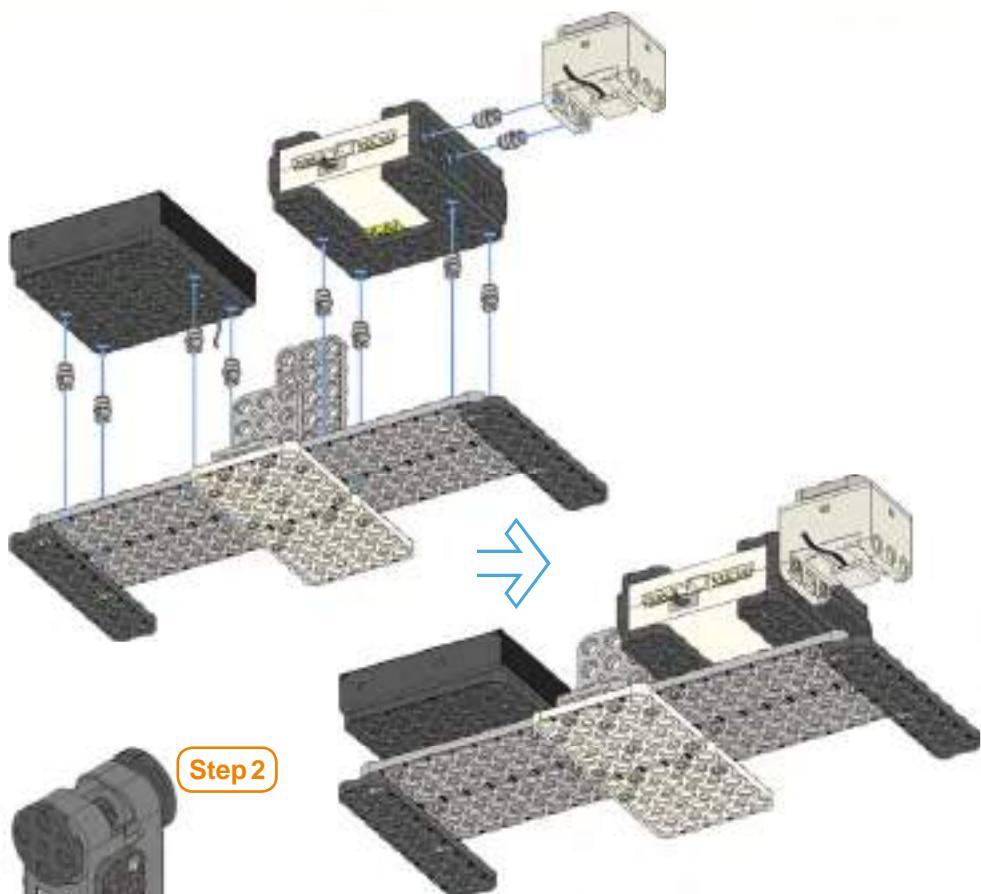
Tip

- 3x7 frame X1
- 3x5 L frame X1
- 3x6 L frame X1
- Double rivet X8



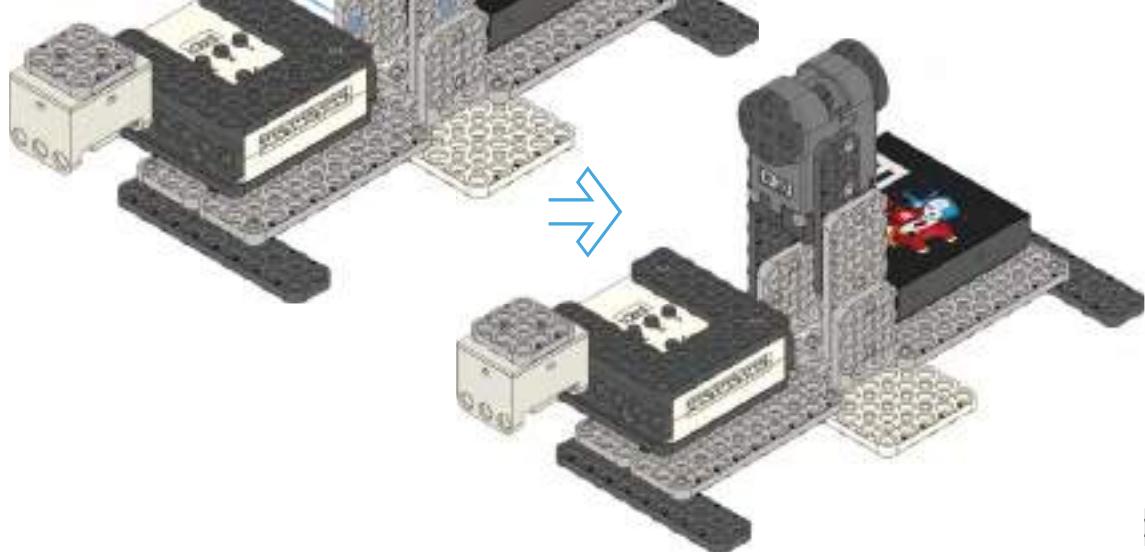
Step 5

Tip
Smart controller X1
Battery case X1
Touch sensor X1
Double rivet X10



Step 6

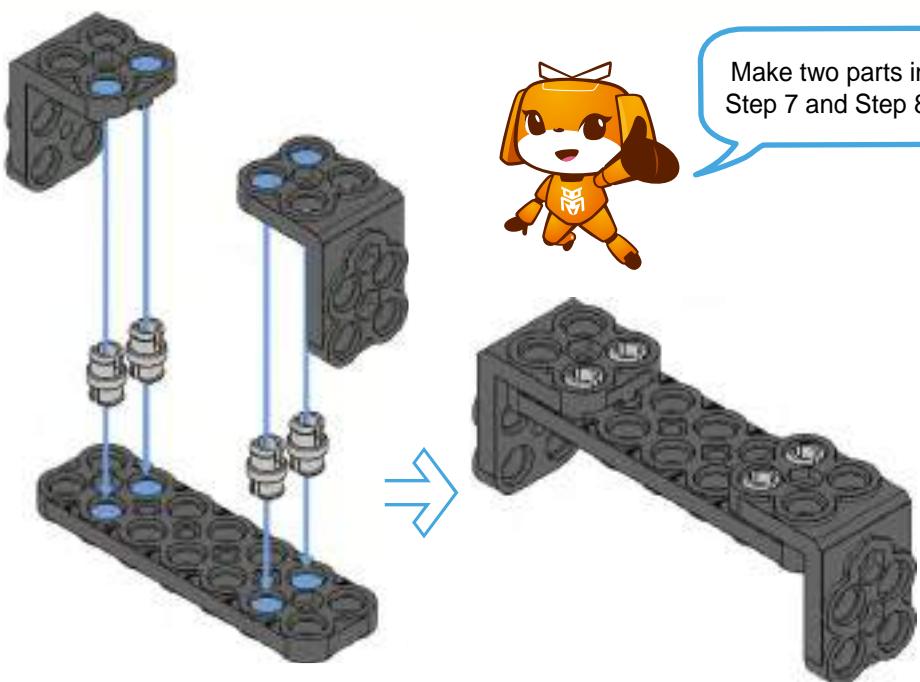
Tip
Double rivet X4



Step 7 (x2)

Tip

- 2x7 frame X1
- 2x4 L frame X2
- Double rivet X4

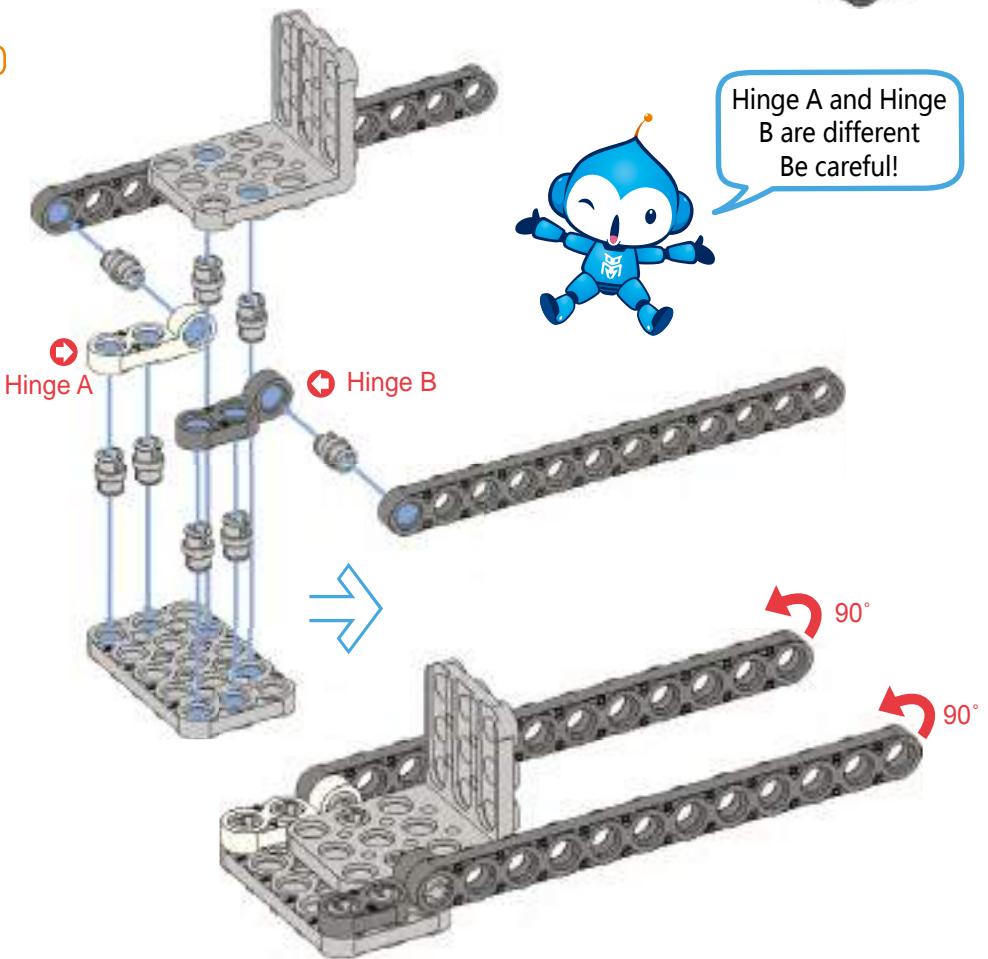


Make two parts in
Step 7 and Step 8!

Step 8 (x2)

Tip

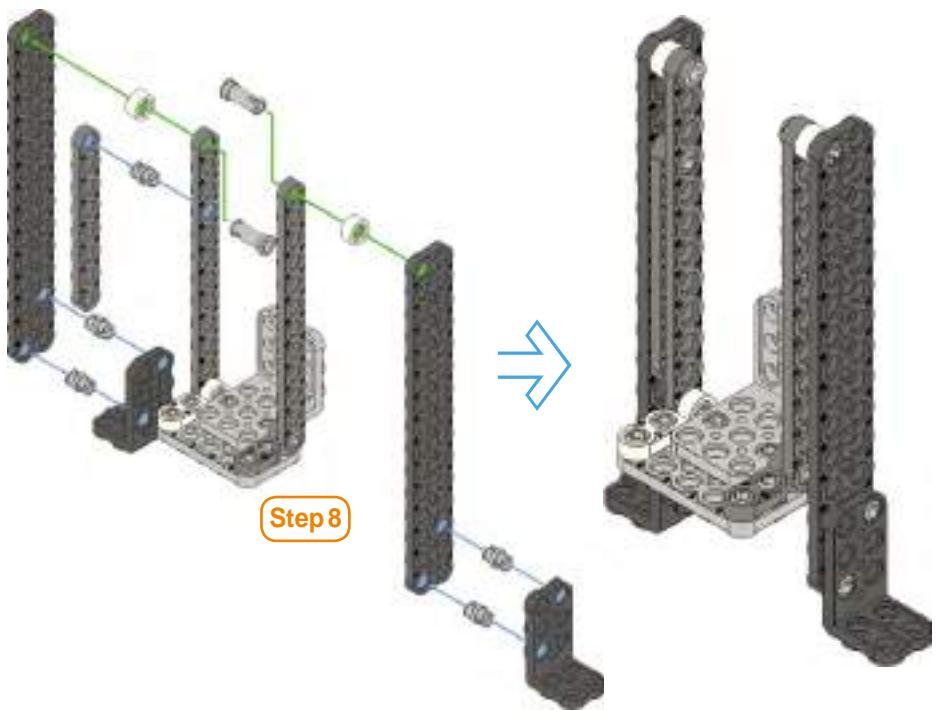
- 1x12 frame X2
- 3x5 frame X1
- 3x6 L frame X1
- Hinge A X1
- Hinge B X1
- Double rivet X8



Hinge A and Hinge
B are different
Be careful!

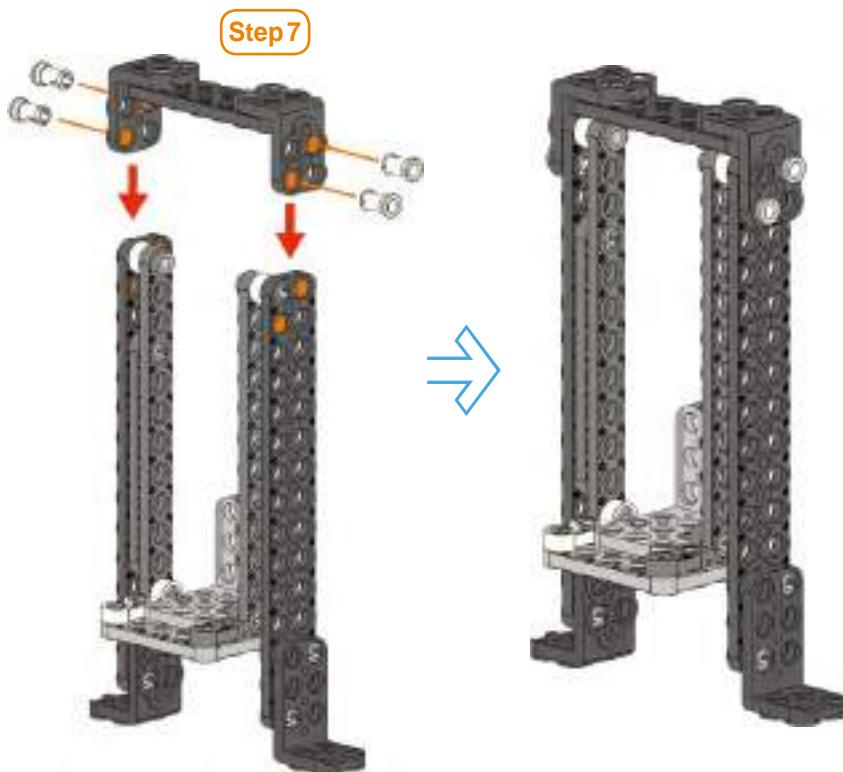
Step 9

Tip
1x8 frame X1
2x15 frame X2
2x5 L frame X2
Spacer X2
3s rivet X2
Double rivet X5



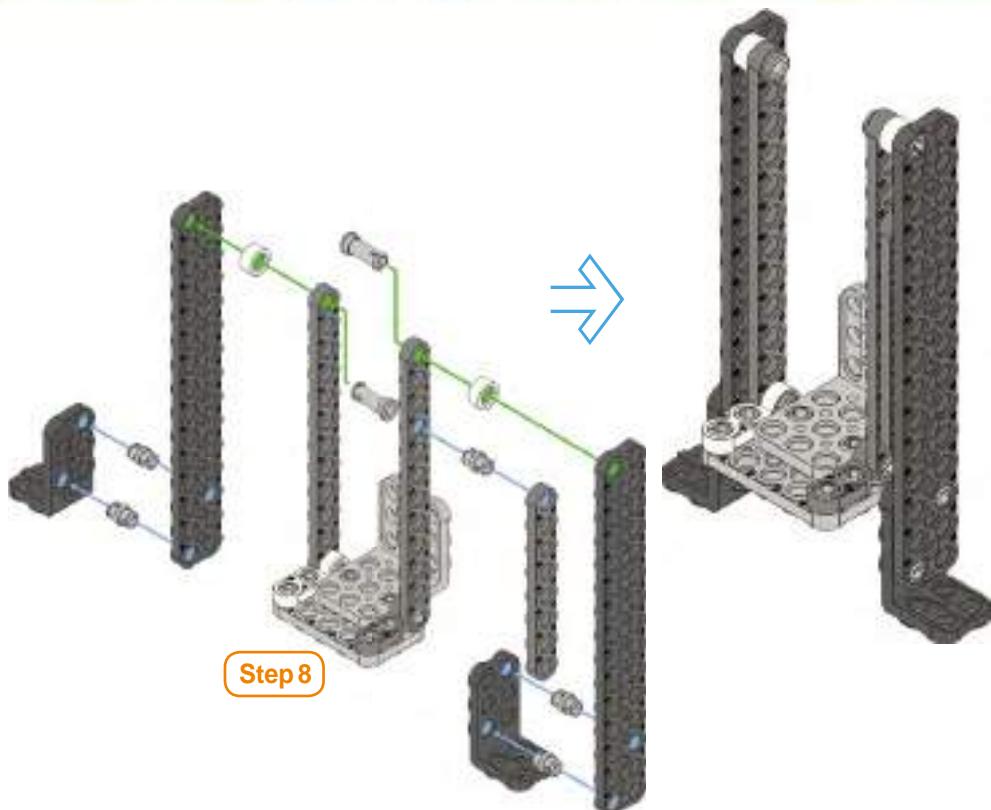
Step 10

Tip
2s rivet X4



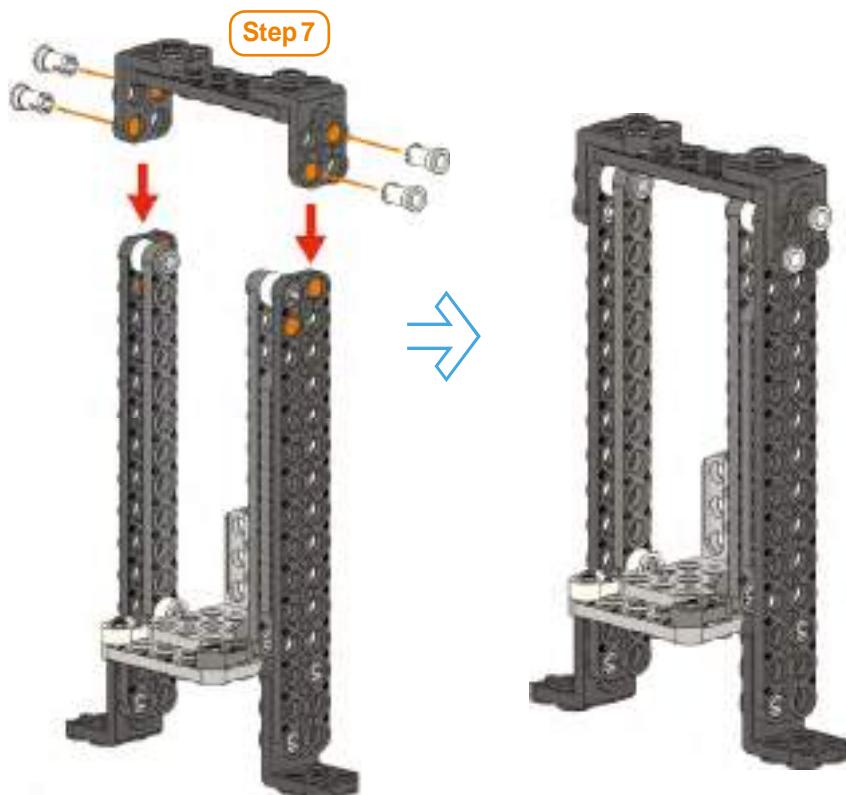
Step 11

Tip
1x8 frame X1
2x15 frame X2
2x5 L frame X2
Spacer X2
3s rivet X2
Double rivet X5



Step 12

Tip
2s rivet X4



Step 13

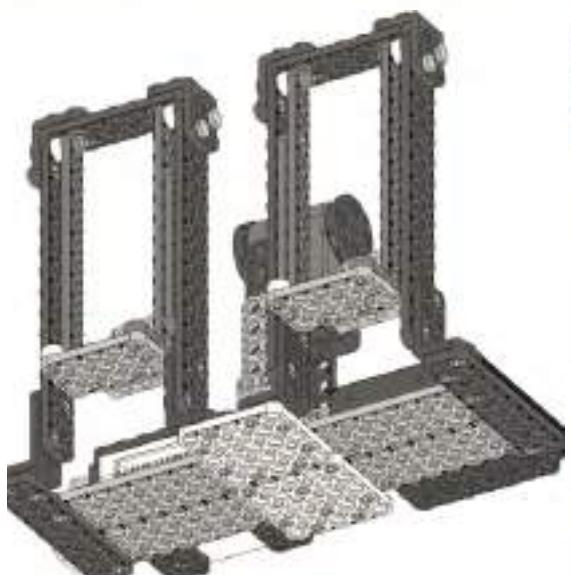
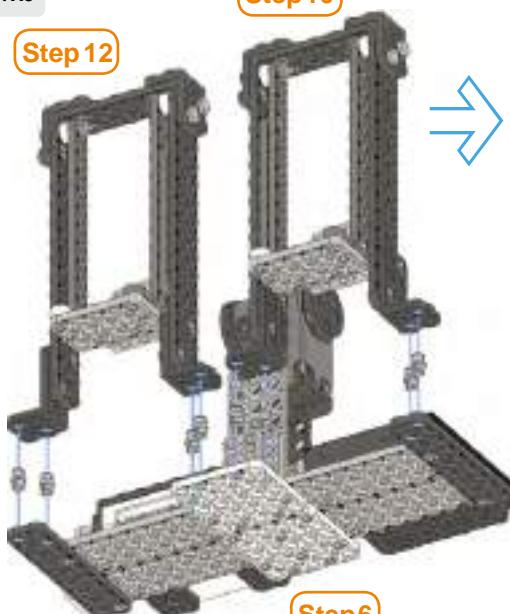
Tip



Double rivet X8

Step 10

Step 12



Step 6

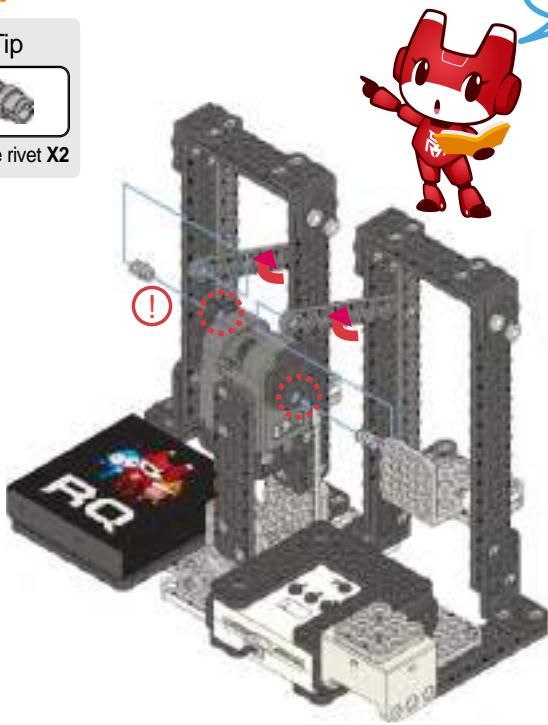
! See carefully
for double rivet
insert position!

Step 14

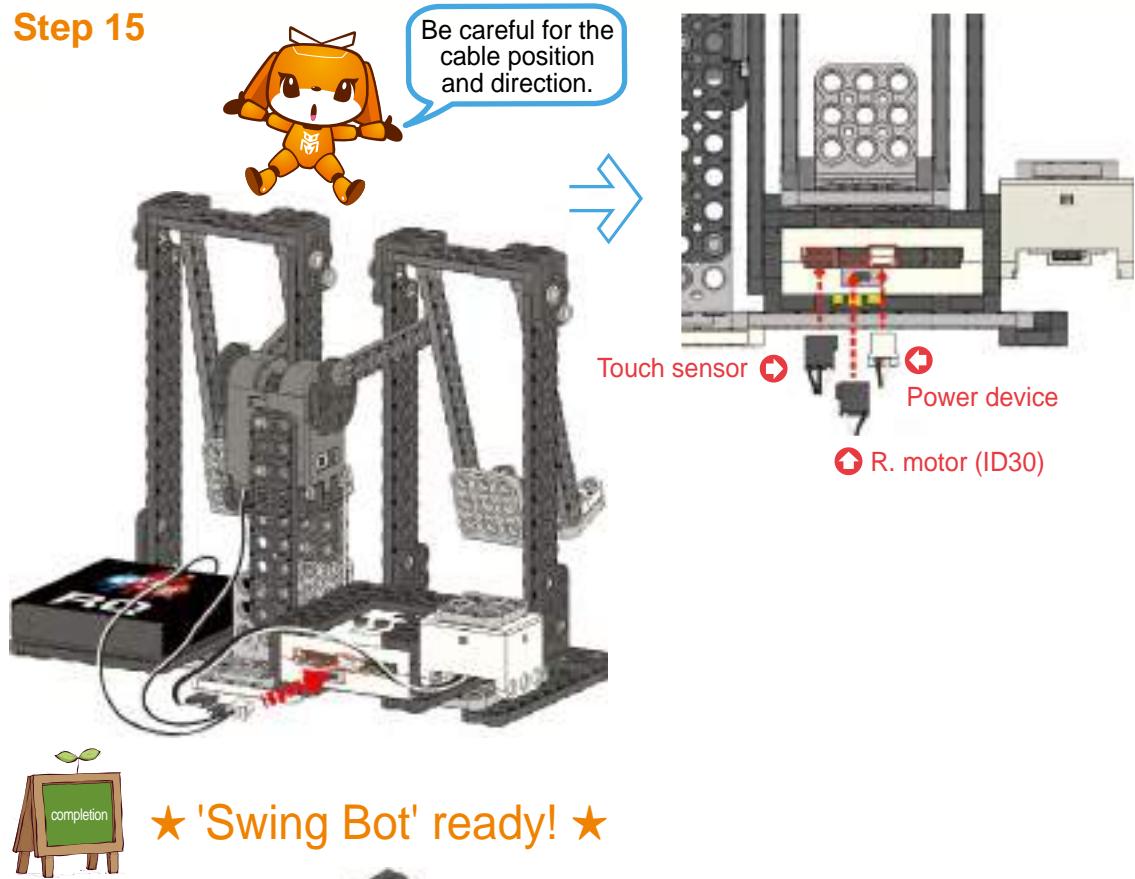
Tip



Double rivet X2



Step 15



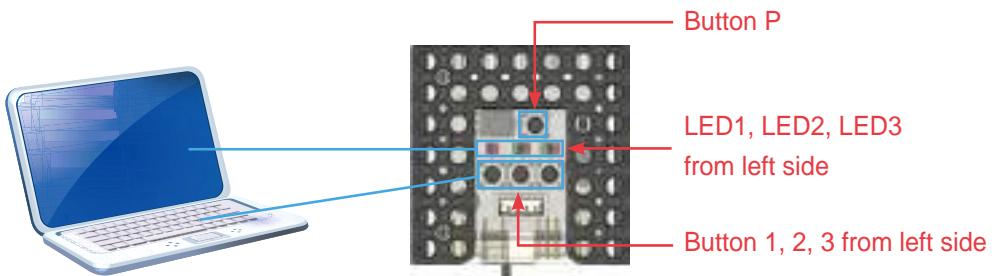


Robot Experience



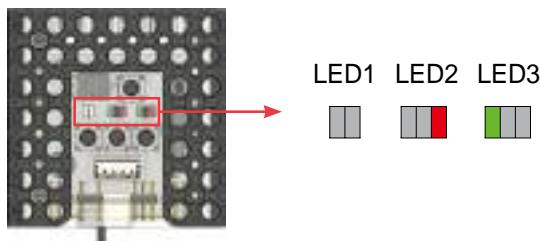
Set-up for 'Swing Bot' model

There are various LEDs and buttons in smart controller. LED indicates input or output value like monitor while buttons works 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 'Swing 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 properly, check the following.

1. When 'Swing Bot' is not working well :
 - ▶ Check the power device (battery case, power S/W), and set-up platform.
2. When twin 'Swing Bot' is not moving come-and-go :
 - ▶ Refer to the Step 14 and 15 to check the assembly status and cable connection.



Check movement and assembly.

1. Press button 1, 2 or 3, and then write your answer on how a robot moves.



2. Connect lines for corresponding motions and actions with the IR remote controller buttons.

+ 1 button •



Swing moves slowly when touch sensor is pressed.

+ 2 button •



Swing moves slowly and then stops slowly.

+ 3 button •



Swing moves slowly when touch sensor is pressed.



Robot Play

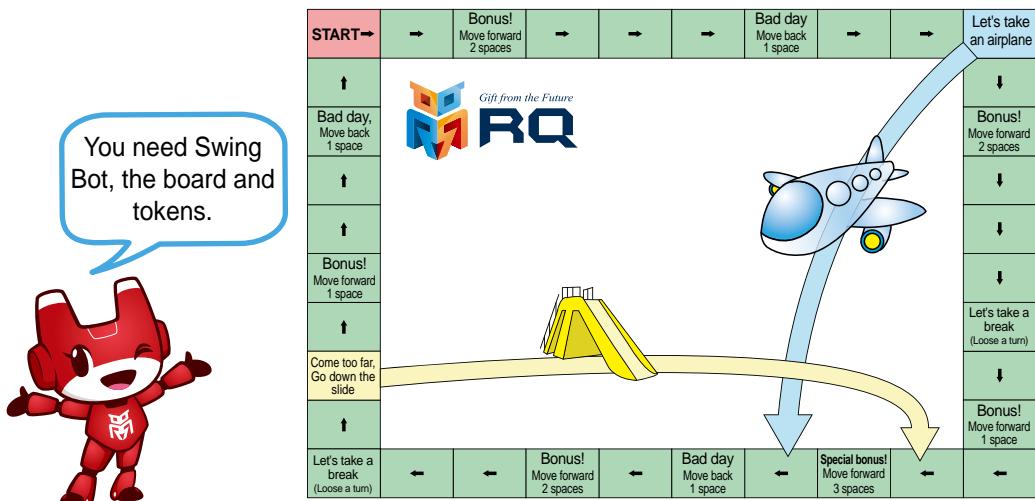


Swing board game

Play a board game as you control the 'Swing Bot'. Make game rules or design your board panel for fun.

- Start from 'START' position and come back to the original start point.
- Prepare your own token to use as a marker.
- Press 'STOP' when Swing Bot moves. And refer to the rules below.

If left swing comes to the front,	If right swing comes to the front,	If both swings stay in center,
		
Move one step.	Move two steps.	Move three steps.



◆ Describe your 'Swing Bot'.

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



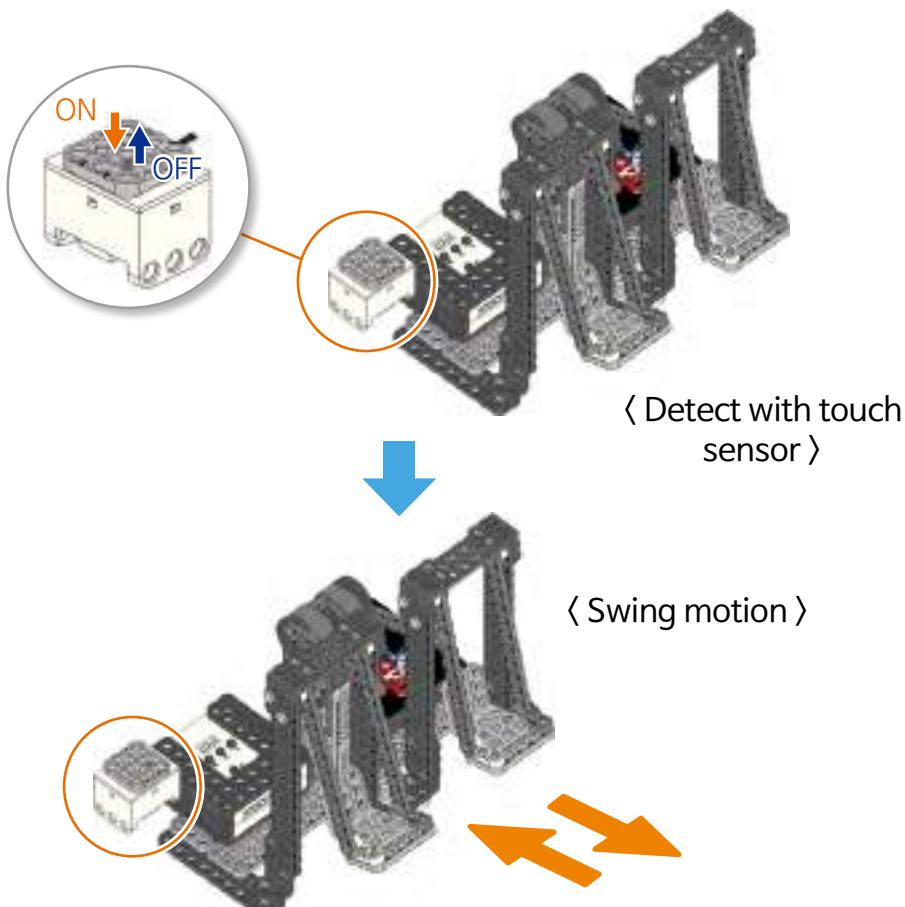


Robot coding with Scratch



Coding Mission

The swing moves whenever Swing Bot's touch sensor is pressed.



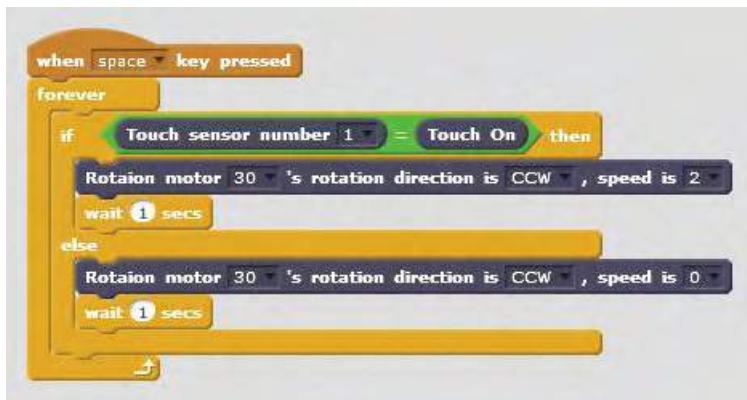
◆ Check before Coding Mission

- Check if Scratch Builder is installed before Coding Mission.
- Download Scratch Builder from the Robobuilder site and install.
(Download the most recent version in Support-Software at www.robobuilder.net.)
- Download other detailed explanation at the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



Making a Scratch block

Create a Scratch block as below and run by pressing the spacebar on the keyboard.



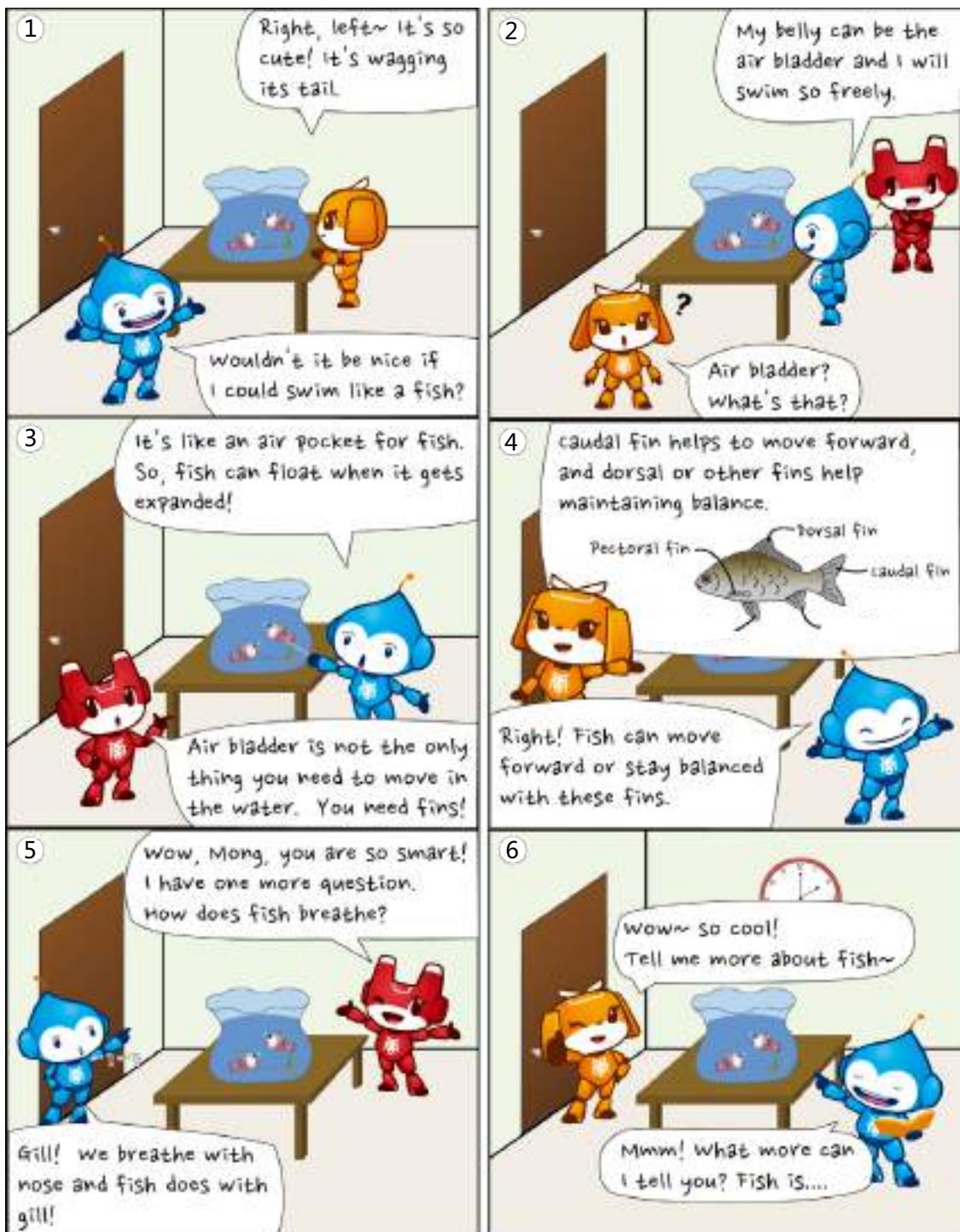
Save the block on Scratch and upload to the robot using Scratch Builder to run without the communication cable (**press # + 4 button** on the remote to run the uploaded code).

◆ Any questions about Coding Mission?

- For any questions about robot coding mission, visit Support-Technical support at www.robobuilder.net.
- Download the 'Scratch Builder' manual on the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)

4. Fish Bot

Living under water – fish

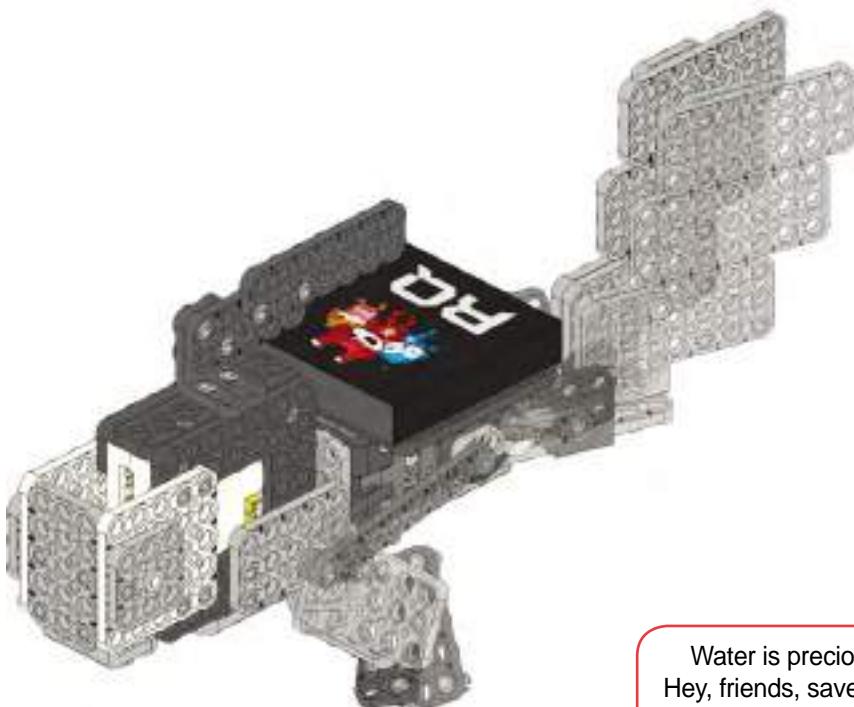




Today's Robot Class



Mudskipper is an amphibious fish - fish that can use their pectoral fins to walk on land. Being amphibious, they are uniquely adapted to intertidal habitats unlike most fish in such habitats which survive the retreat of the tide by hiding under wet seaweed or in tidal pools. Fish Bot looks like a mudskipper and moves like one, too.



Water is precious!
Hey, friends, save your
water!



Fish robot that looks like carp
swims as it finds polluted place or
toxins in water.
Not just that, it returns to recharge
itself when needed.





Robot Assembly



Prepare robot parts.



Smart controller **X1**



R. motor (ID30) **X1**



Battery case **X1**



1x3 frame **X3**



1x8 frame **X2**



2x5 frame **X3**



2x7 frame **X1**



3x3 frame **X2**



3x5 frame **X4**



3x7 frame **X3**



3x9 frame **X4**



5x5 frame **X2**



2x4 L frame **X3**



3x5 L frame **X4**



3x6 L frame **X1**



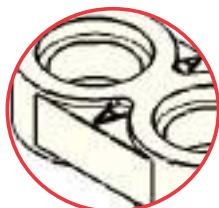
Ball frame **X1**



Tips.



Hinge A and Hinge B parts look quite similar. It can be distinguished by its colors and letter A or B written on.



Hinge A Hinge B

Step 1

Tip



Smart controller X1



1x3 frame X1



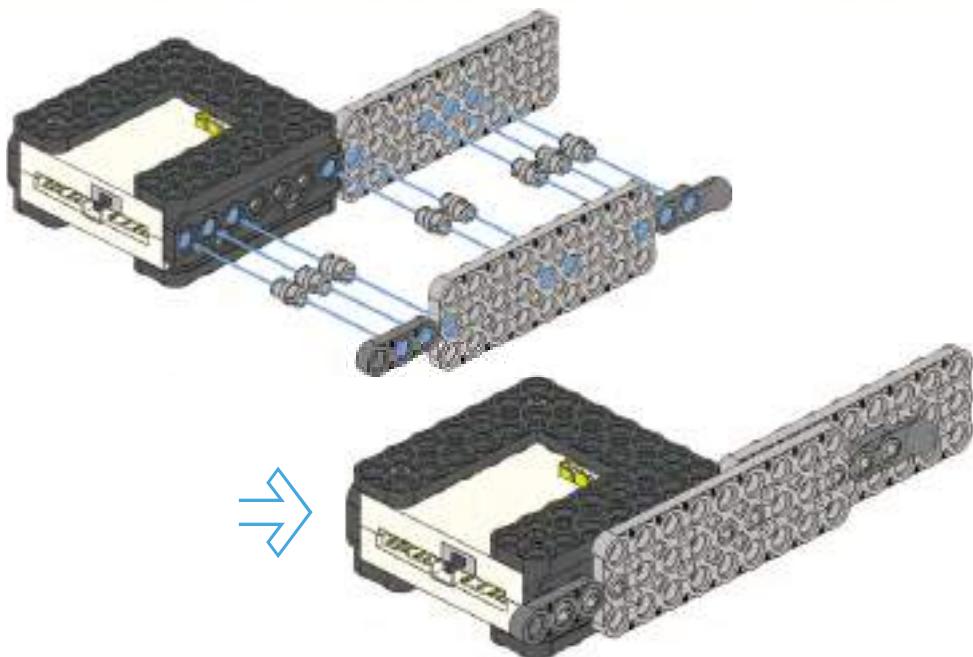
3x9 frame X2



Ball frame X1



Double rivet X8



Step 2

Tip



3x3 frame X1



3x5 frame X1



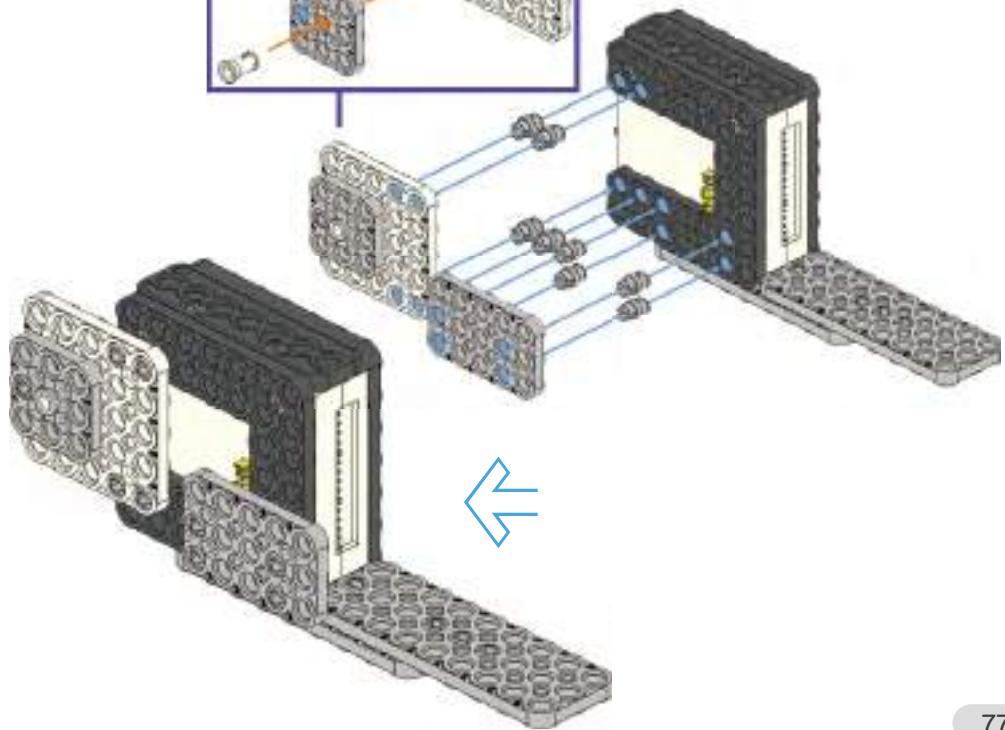
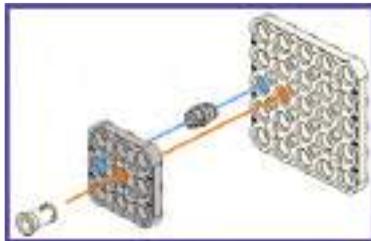
5x5 frame X1



2s rivet X1

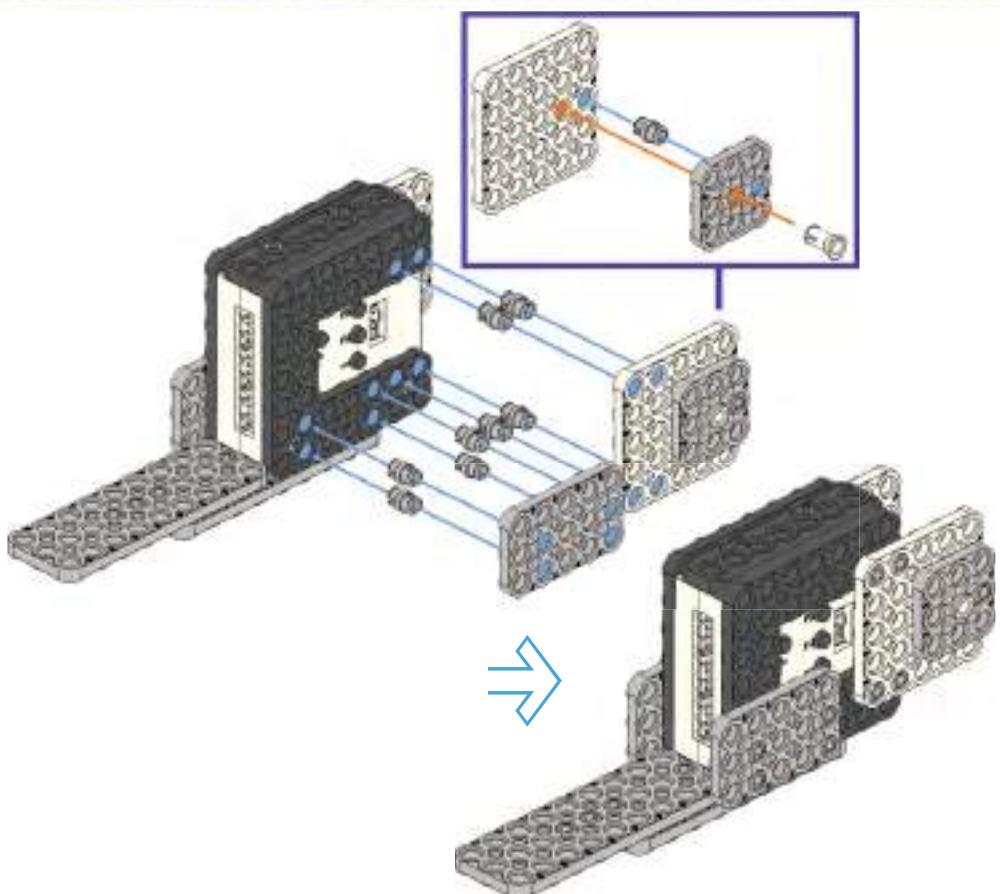


Double rivet X9



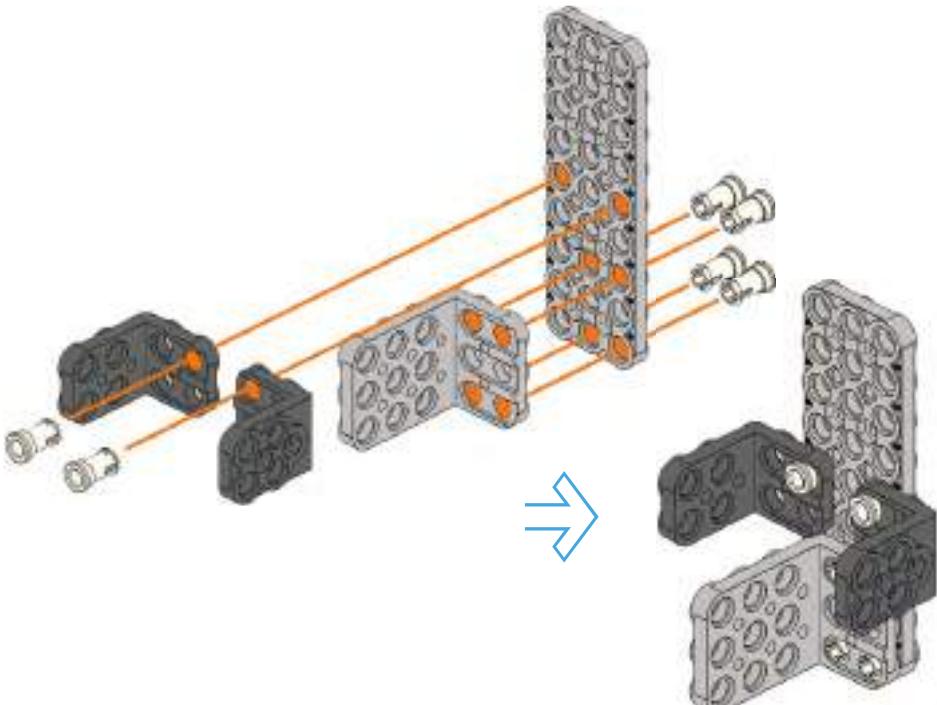
Step 3

Tip
3x3 frame X1
3x5 frame X1
5x5 frame X1
2s rivet X1
Double rivet X9



Step 4

Tip
3x9 frame X1
2x4 L frame X2
3x5 L frame X1
2s rivet X6



Step 5

Tip



3x7 frame X3



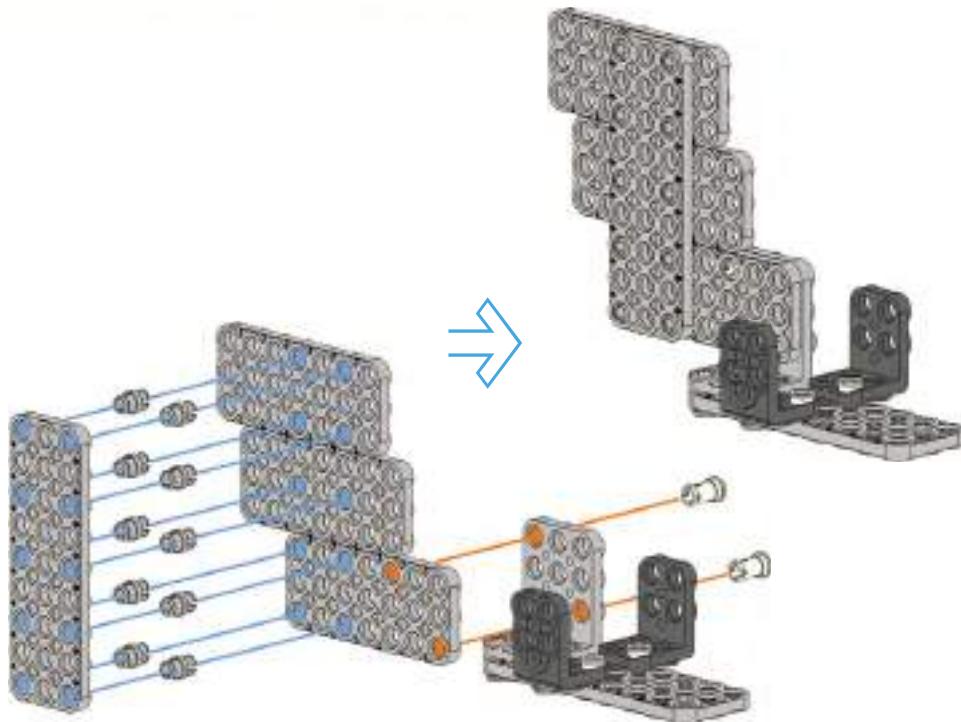
3x9 frame X1



2s rivet X2



Double rivet X10

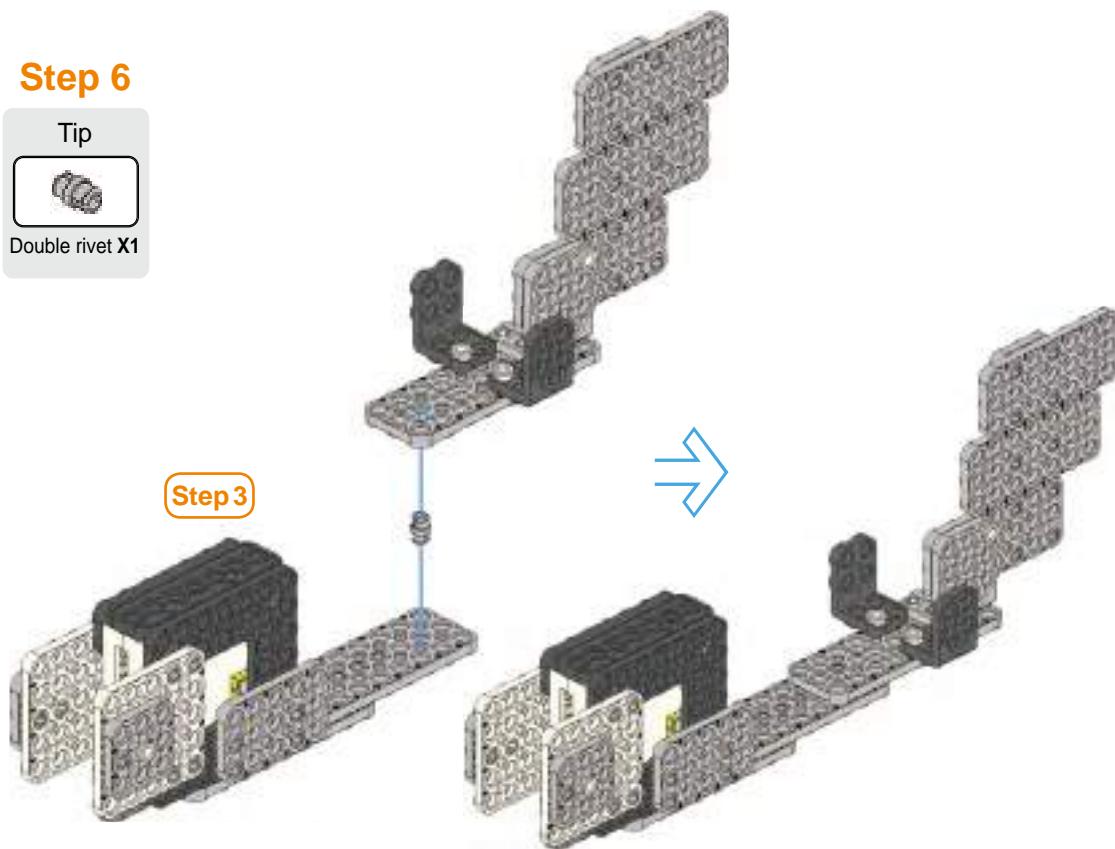


Step 6

Tip

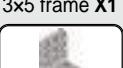
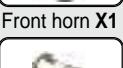


Double rivet X1

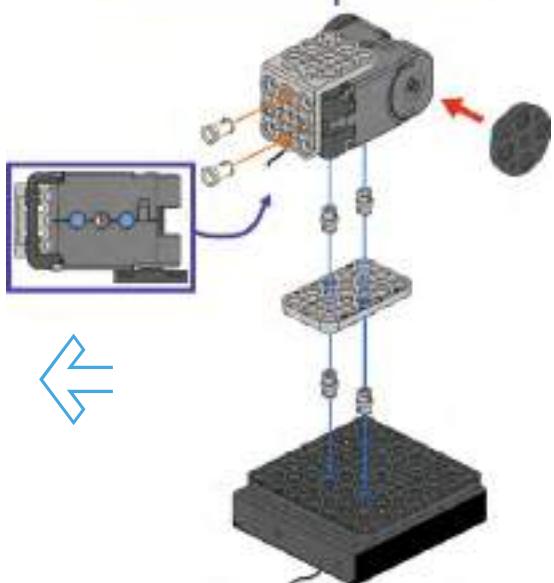
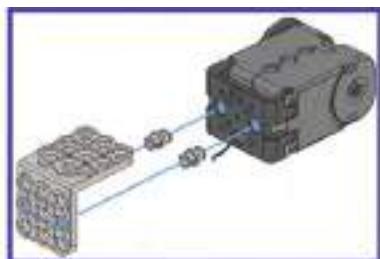


Step 7

Tip

-  R. motor (ID30) X1
-  Battery case X1
-  3x5 frame X1
-  3x6 L frame X1
-  Front horn X1
-  2s rivet X2
-  Double rivet X6

Match 'home' marks
on both side of ID30.

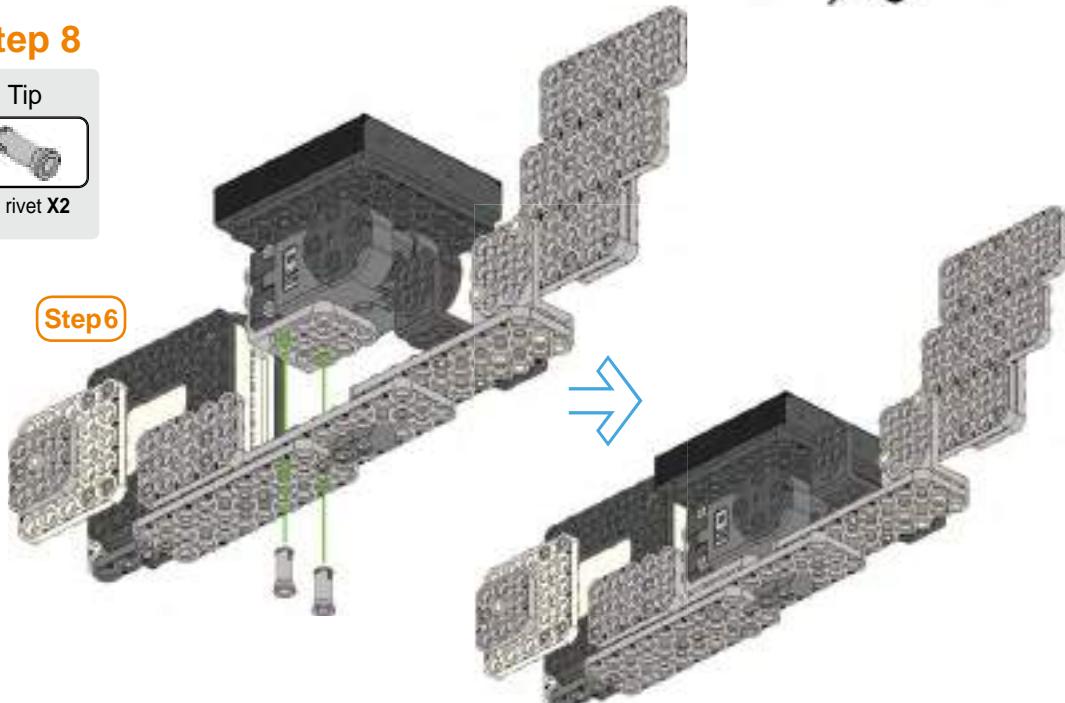


Step 8

Tip

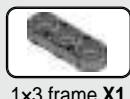
-  3s rivet X2

Step 6

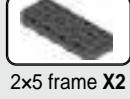


Step 9

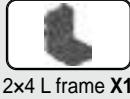
Tip



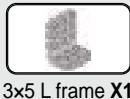
1x3 frame X1



2x5 frame X2



2x4 L frame X1



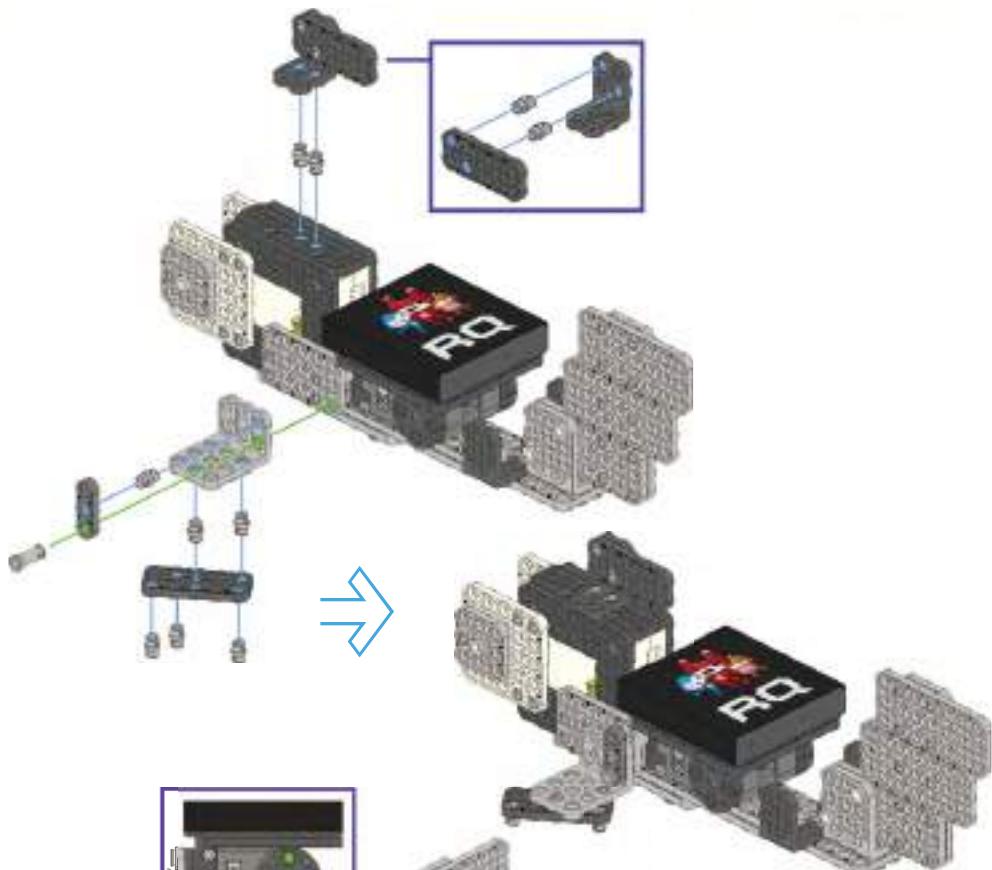
3x5 L frame X1



3s rivet X1



Double rivet X10



Step 10

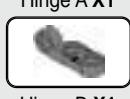
Tip



1x8 frame X1



Hinge A X1



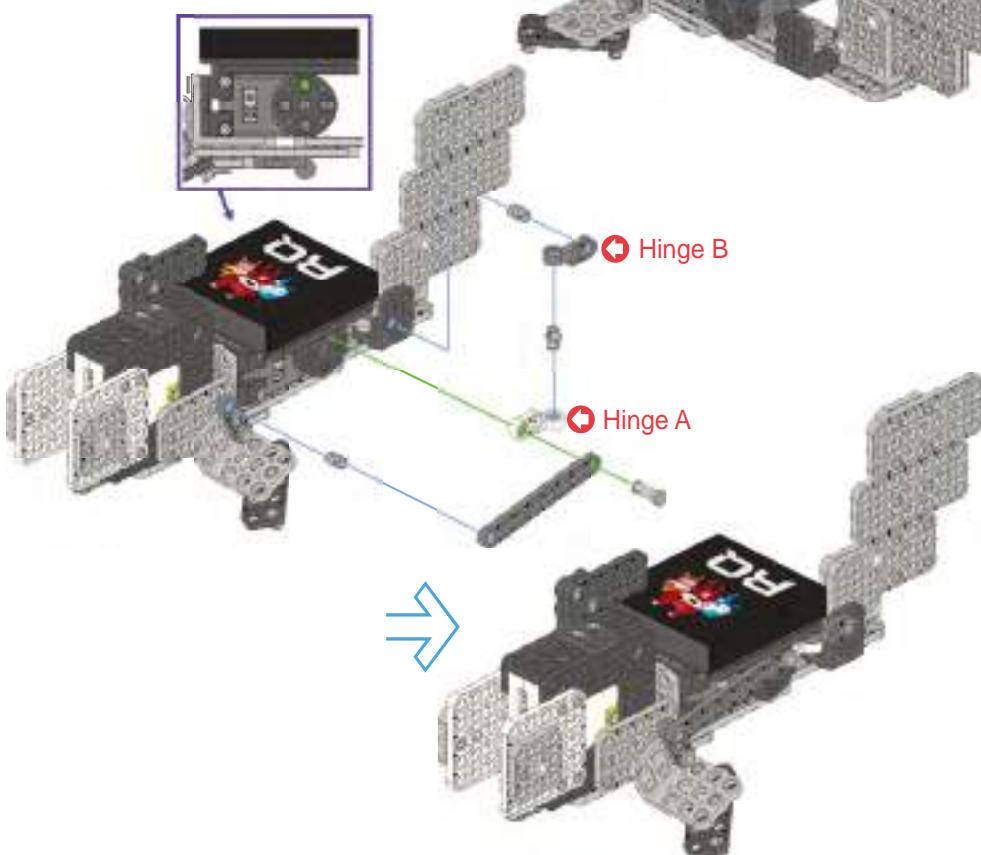
Hinge B X1



3s rivet X1

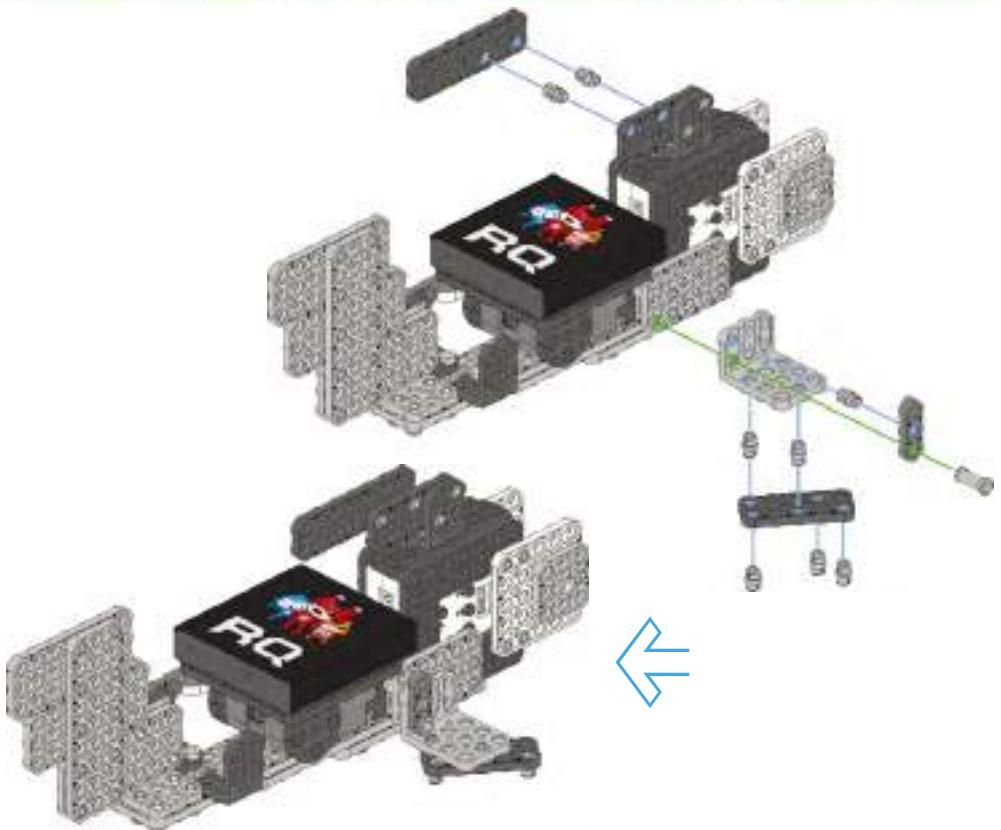


Double rivet X3



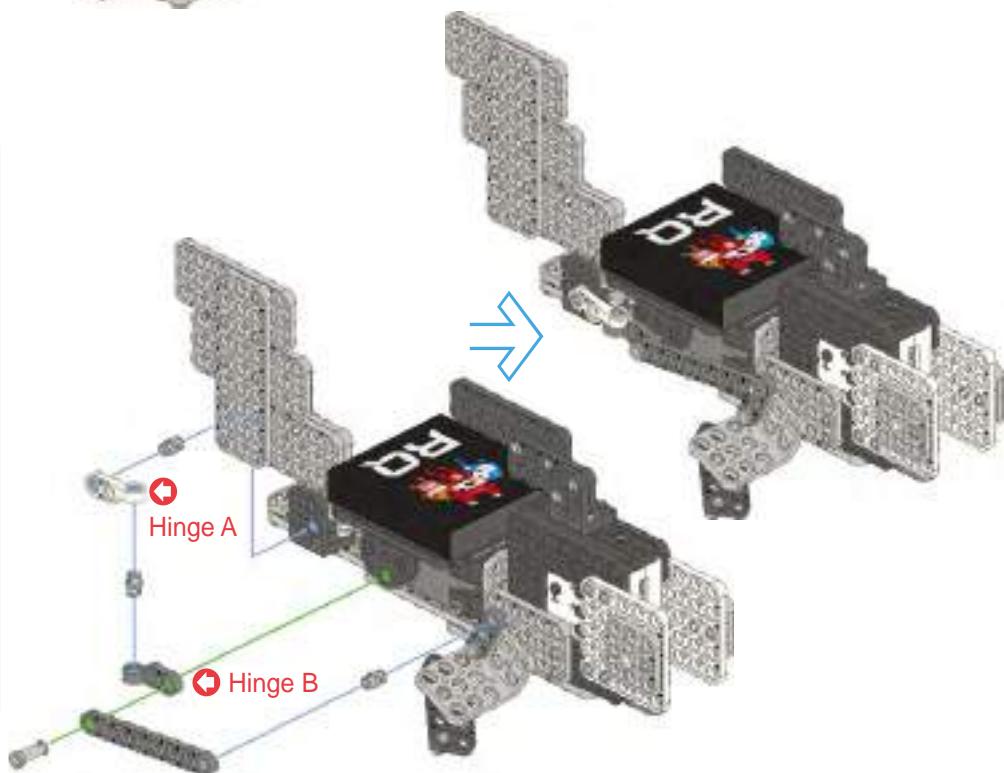
Step 11

Tip
1x3 frame X1
2x5 frame X1
2x7 frame X1
3x5 L frame X1
3s rivet X1
Double rivet X8

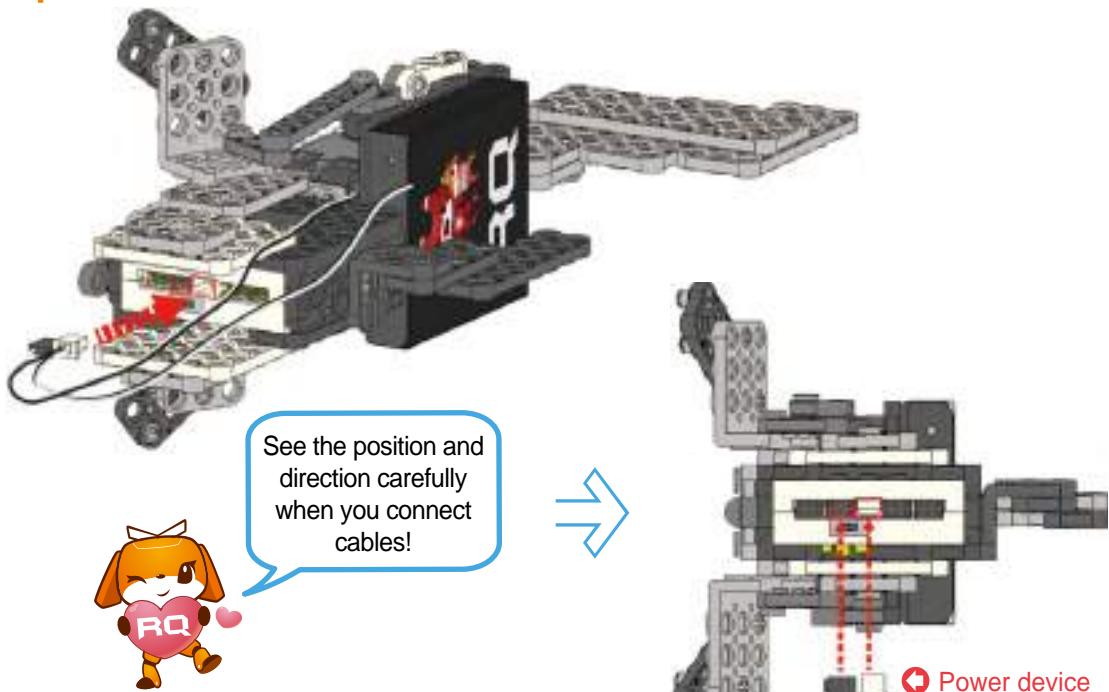


Step 12

Tip
1x8 frame X1
Hinge A X1
Hinge B X1
3s rivet X1
Double rivet X3

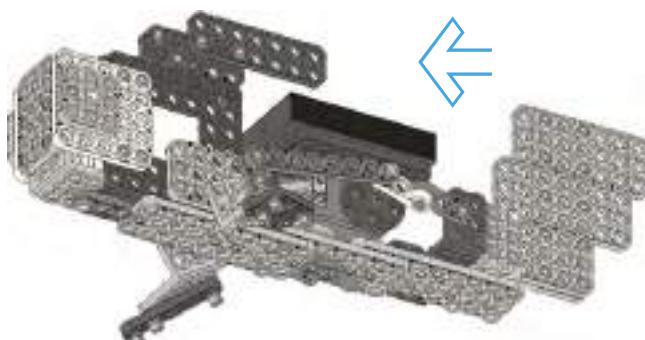
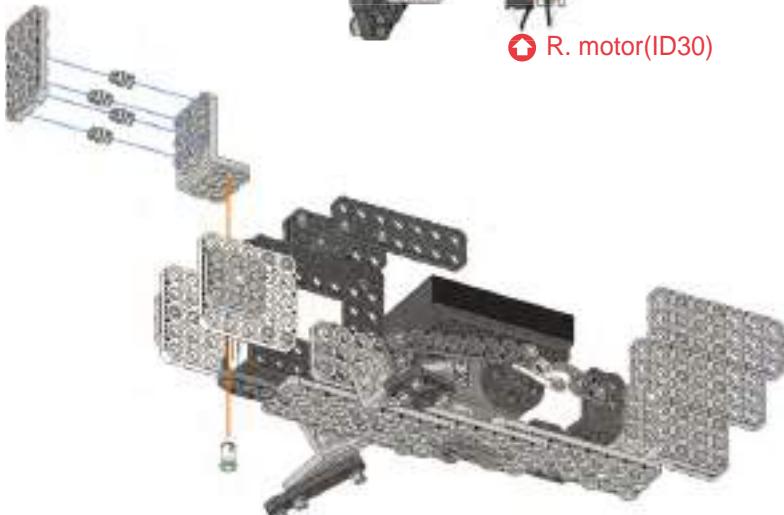


Step 13



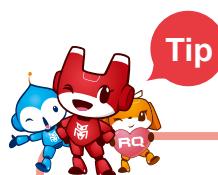
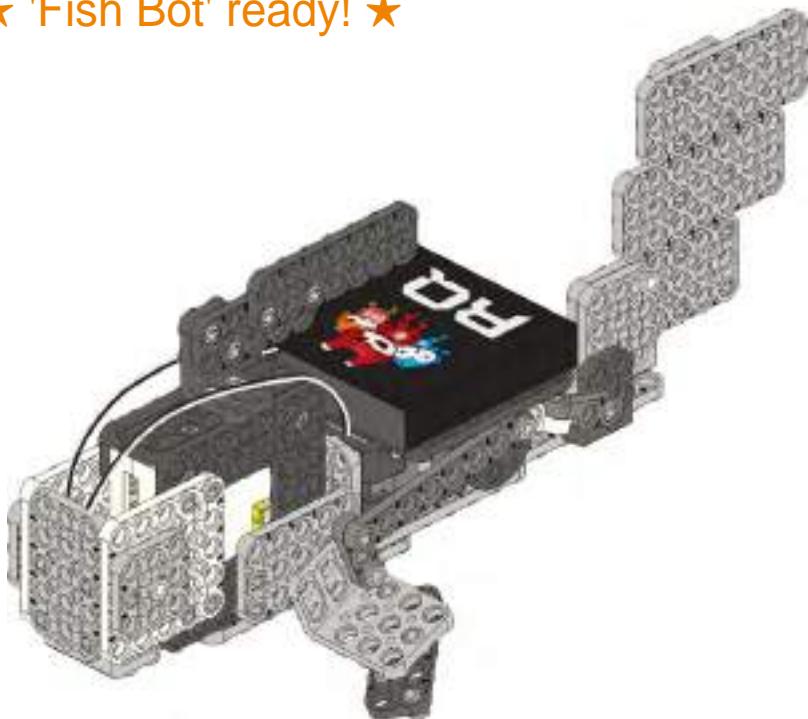
Step 14

Tip
3x5 frame X1
3x5 L frame X1
2s rivet X1
Double rivet X4

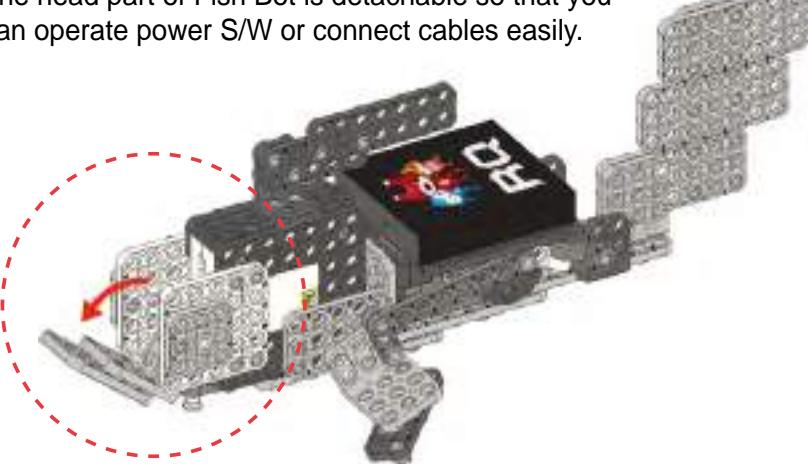




★ 'Fish Bot' ready! ★



The head part of Fish Bot is detachable so that you can operate power S/W or connect cables easily.



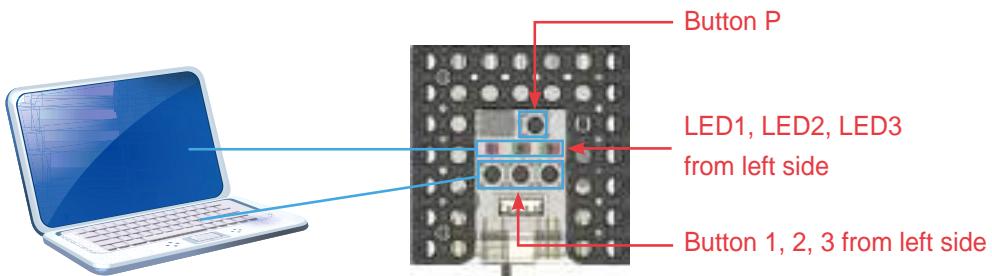


Robot Experience



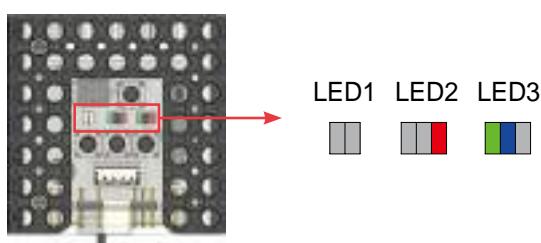
Set-up for 'Fish Bot' model.

There are various LEDs and buttons in smart controller. LED indicates input output value like monitor while buttons works 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 'Fish 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 properly, check the following.

1. When 'Fish Bot' robot's fin is not moving well :
 - ▶ Check the assembling status of 'fin part' and motor ID30 cable.
2. When 'Fish Bot' is not moving forward :
 - ▶ This could happen when the surface is very slippery.
Try again on non-slippery surface.



Check movement and assembly.

1. Press button 1, 2 or 3 of IR remote controller, and then draw a line to the corresponding motion of Fish Bot.



① button •



Fish Bot goes pit-a-pat, and stops when sound is detected, then moves again.

② button •



Fish Bot goes pit-a-pat and stop.

③ button •



Fish Bot stops slowly.

+ ① button •



Fish Bot moves slowly.

+ ② button •



Fish Bot goes pit-a-pat and stops when sound is detected.

+ ③ button •



Fish Bot moves slowly and stops slowly.



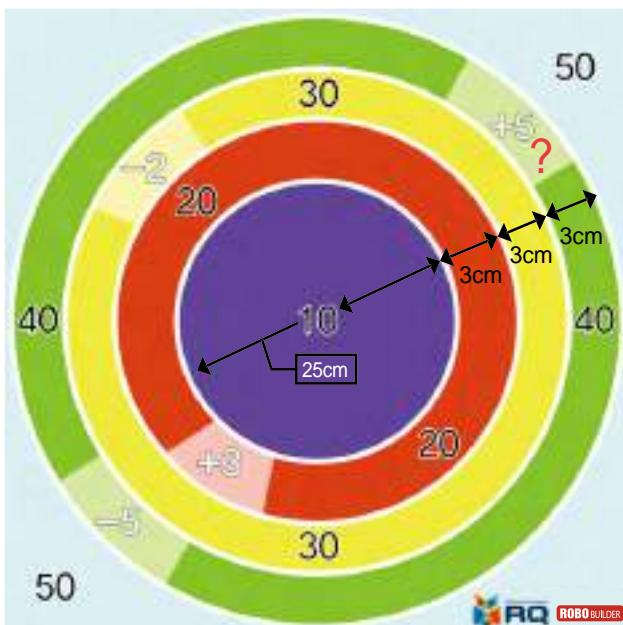
Robot Play



Escape game

Make a team and play the escape game with your friend. Sum up all the scores and the one with the higher score wins.

- Place the Fish Bot in the center (10 point). The direction does not matter.
- Control Fish Bot for 1 minute, and escape for 1 minute.
- Different score is written for each color. +, - sections are for adding or subtracting scores.
- Discuss with your friend to assign new rules, game time or scores.



Let's say you stay
on green +5.
Your total is '45'.



◆ Describe your 'Fish Bot'.

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



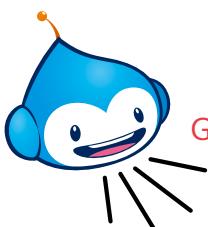


Robot coding with Scratch



Coding Mission

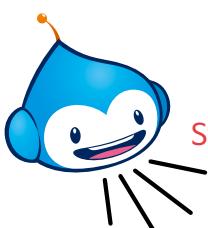
Fish Bot moves when it hears voice, and the stops when it hears the voice again



Go forward!



⟨ Detect voice and move straight ⟩



Stop!



⟨ Detect voice and stop ⟩

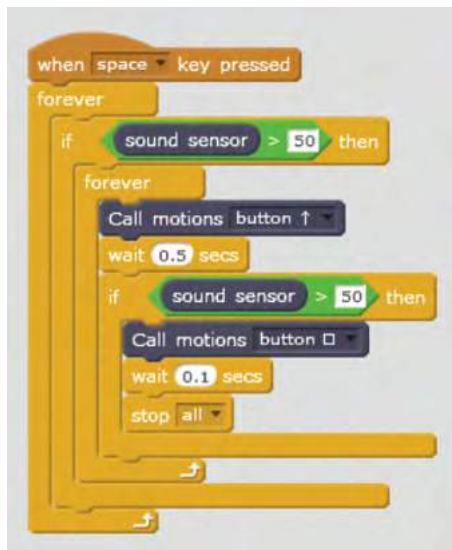
◆ Check before Coding Mission

- Check if Scratch Builder is installed before Coding Mission.
- Download Scratch Builder from the Robobuilder site and install.
(Download the most recent version in Support-Software at www.robobuilder.net.)
- Download other detailed explanation at the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



Making a Scratch block

Create a Scratch block as below and run by pressing the spacebar on the keyboard.



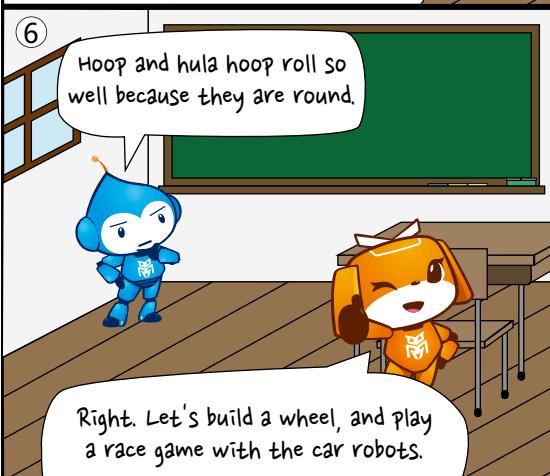
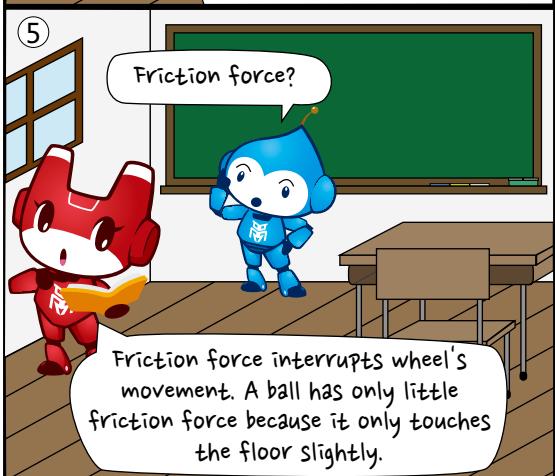
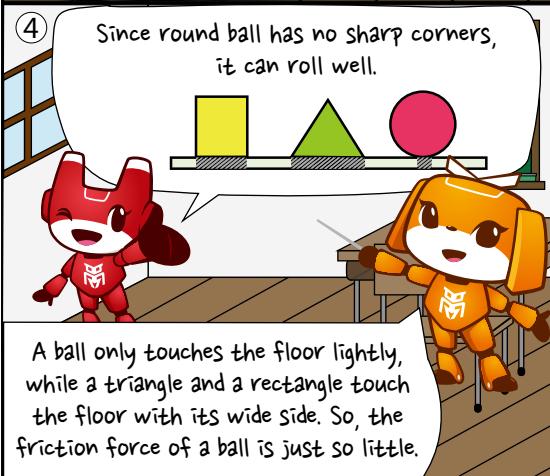
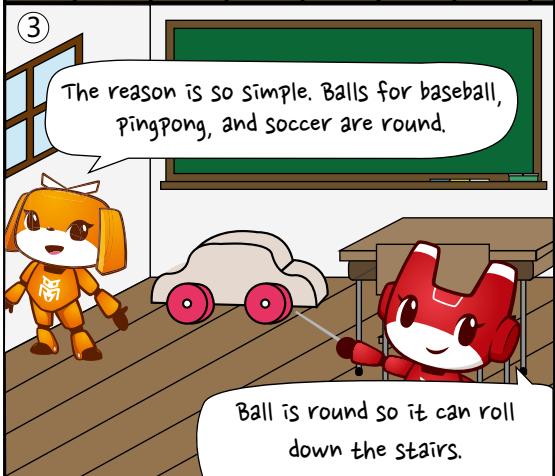
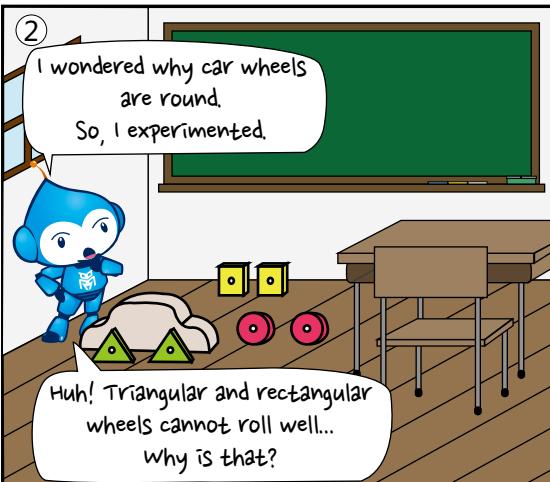
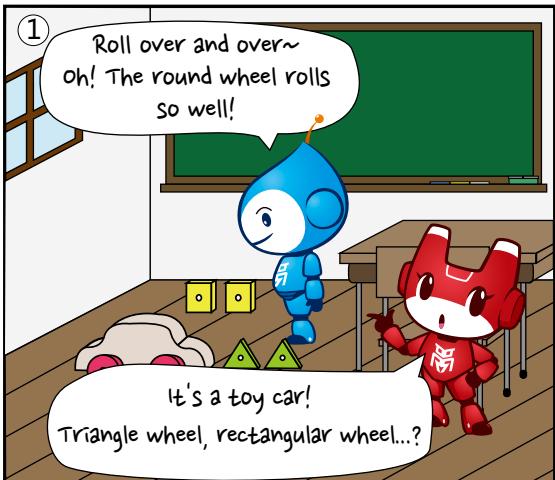
Save the block on Scratch and upload to the robot using Scratch Builder to run without the communication cable (**press # + 4 button** on the remote to run the uploaded code).

◆ Any questions about Coding Mission?

- For any questions about robot coding mission, visit Support-Technical support at www.robobuilder.net.
- Download the 'Scratch Builder' manual on the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)

5. Rolling Bot

Wheels are round.



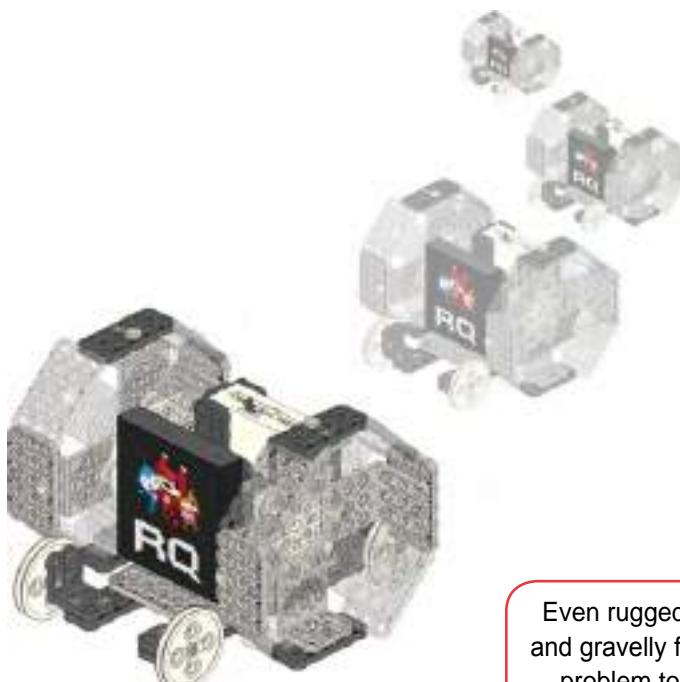


Today's Robot Class



Cart has wheels so that it can transport heavy objects with little power. Wheels make our life more comfortable in various ways, used in cars, bicycles, trains, luggage, wheel chair, vacuum cleaner and more.

In this chapter, we will build a 'Rolling Bot' and learn about wheels. Later, play a game with friends with the assembled robot.



Even rugged mountain and gravelly field is not a problem to pass by.



Monster truck has very huge wheels that enables it to move with no issue on rough and rugged roads safely.





Robot Assembly



Prepare robot parts.



Smart controller X1



R. motor (ID29,30) X2



Battery case X1



2x5 frame X4 2x15 frame X2



3x5 frame X4



3x7 frame X2



5x5 frame X2



2x4 L frame X4



2x5 L frame X2



3x5 L frame X4



3x6 L frame X4



Wheel X4



2s rivet X16

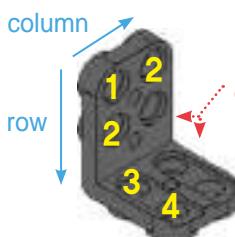


Double rivet X70

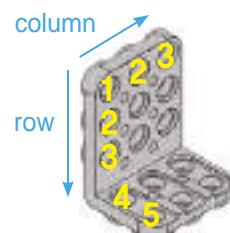


Tips.

Rolling 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.

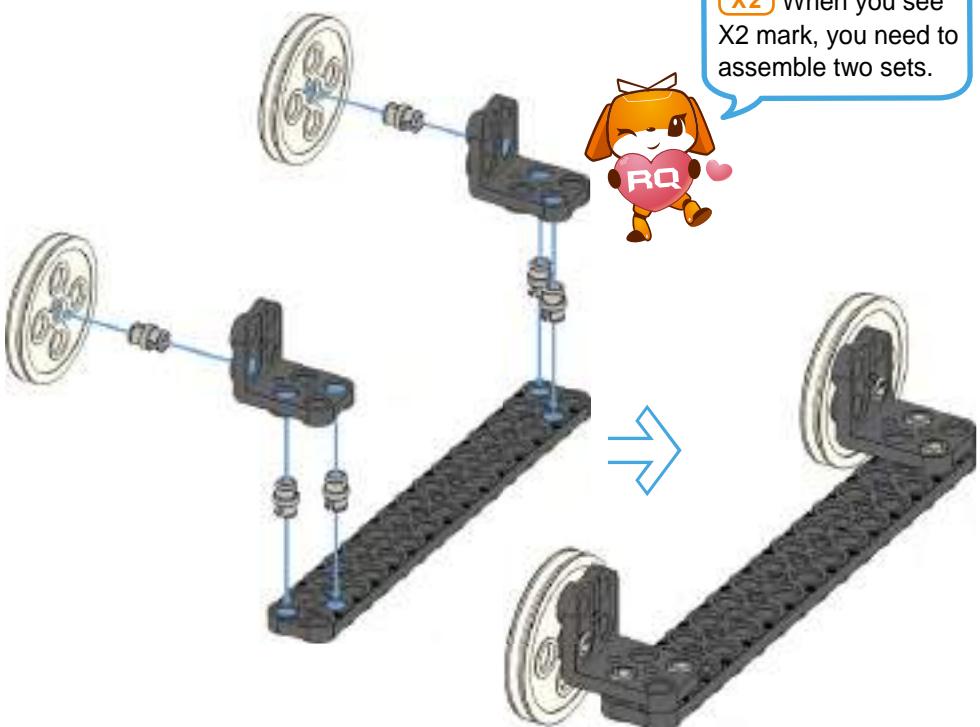


- 2 col. L frame is black.
- 2x4 L frame consists of 2 col. × 4 rows hole.

- 3 col. L frame is gray.
- 3x5 L frame consists of 3 col. × 5 rows hole.

Step 1 X2

Tip
2x15 frame X1
2x4 L frame X2
Wheel X2
Double rivet X6

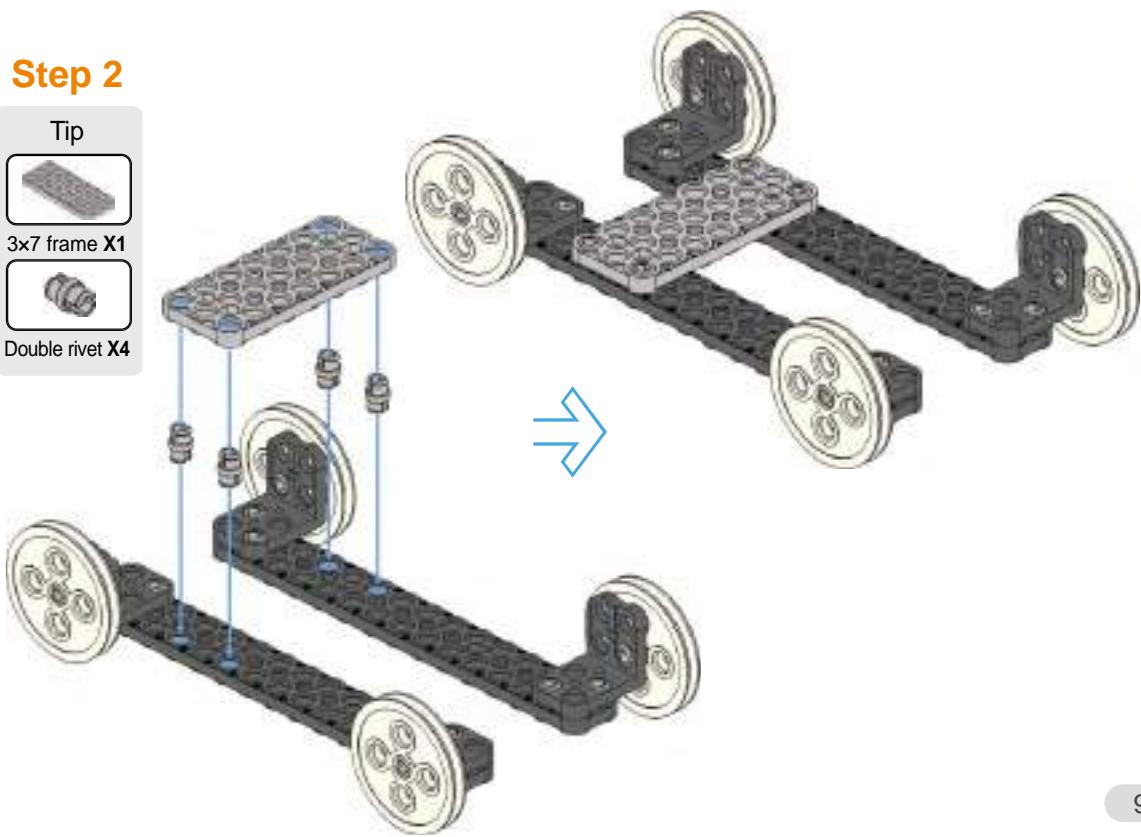


X2 When you see X2 mark, you need to assemble two sets.

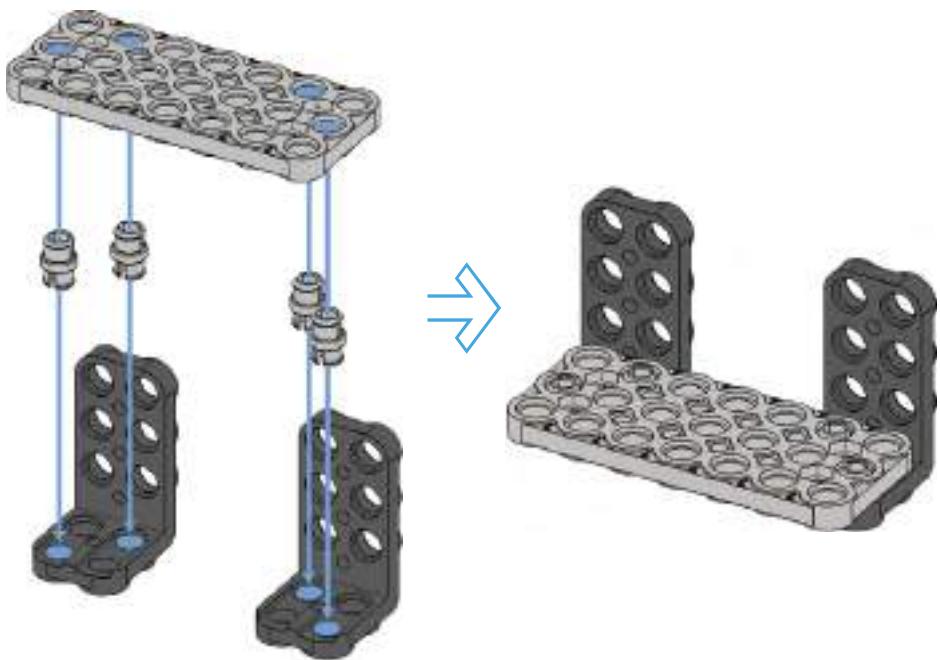
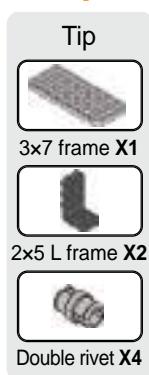


Step 2

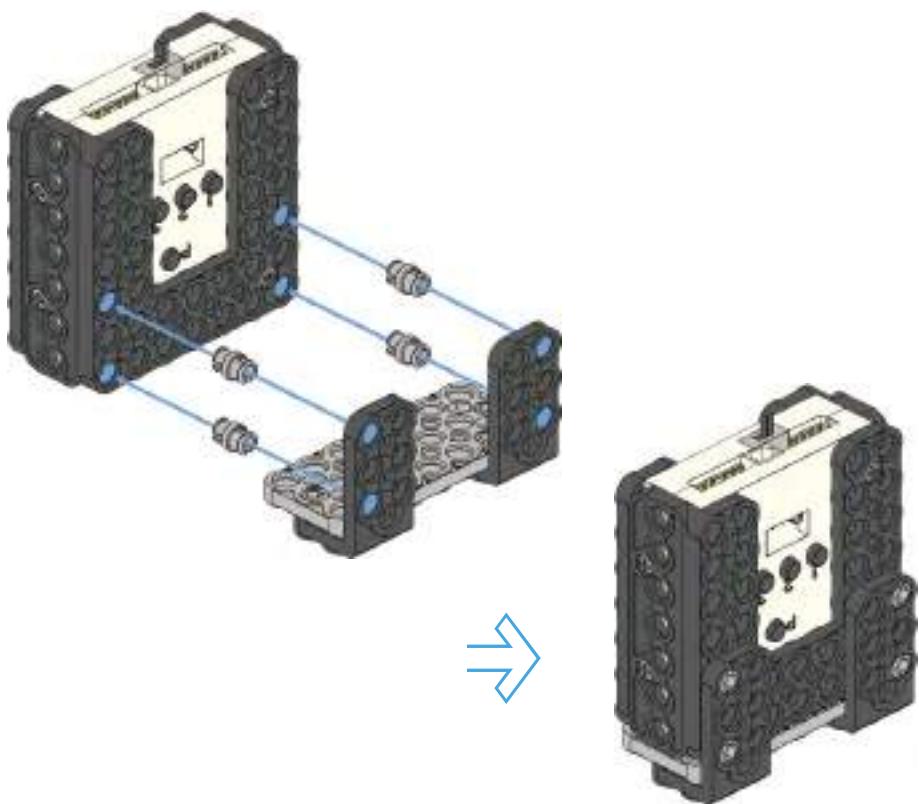
Tip
3x7 frame X1
Double rivet X4



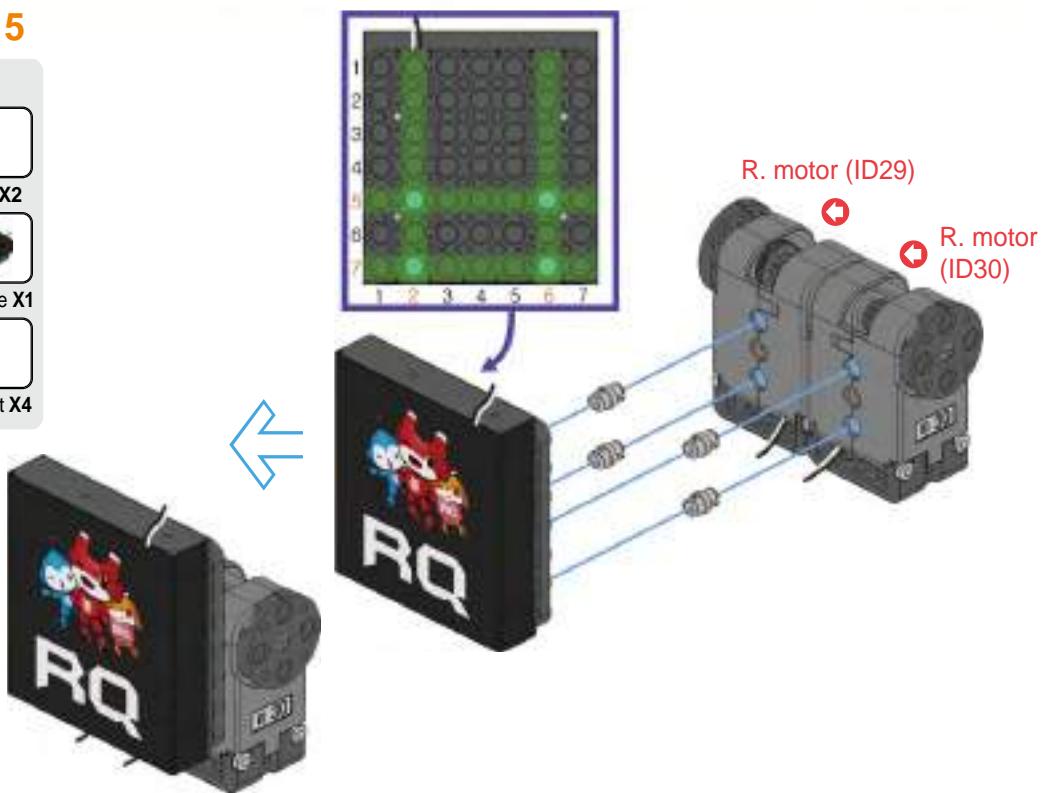
Step 3



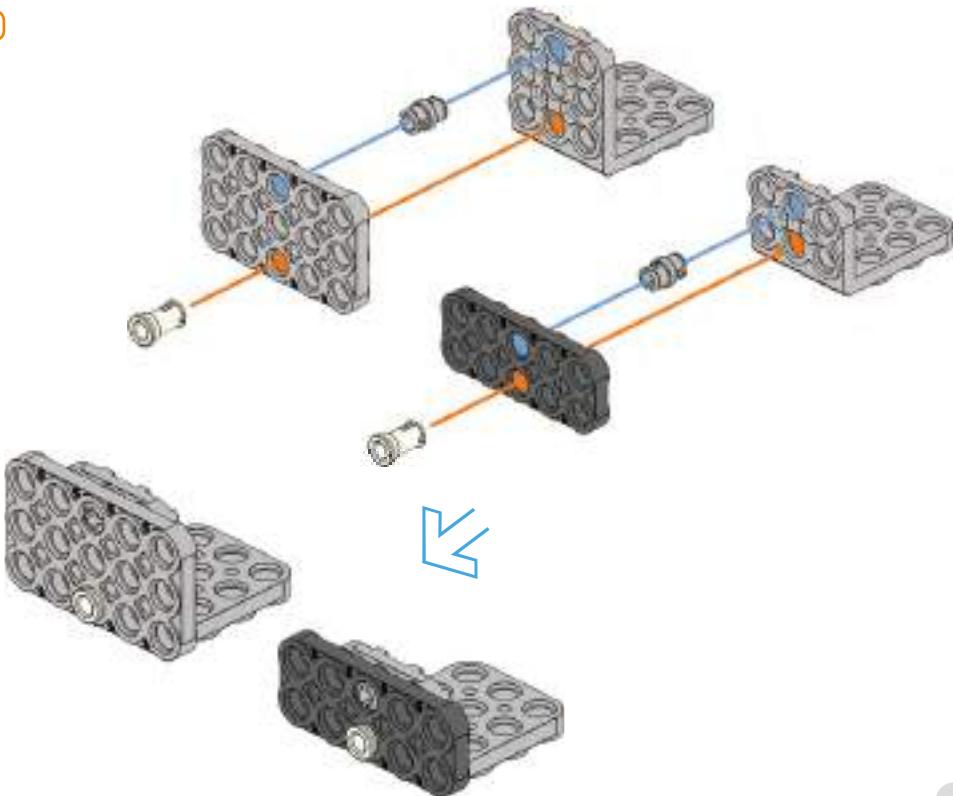
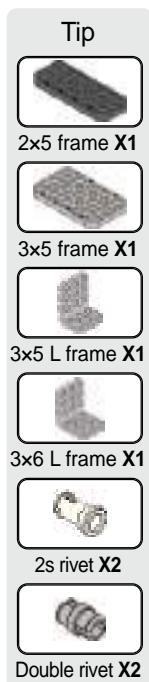
Step 4



Step 5



Step 6 (X2)



Step 7 (x2)

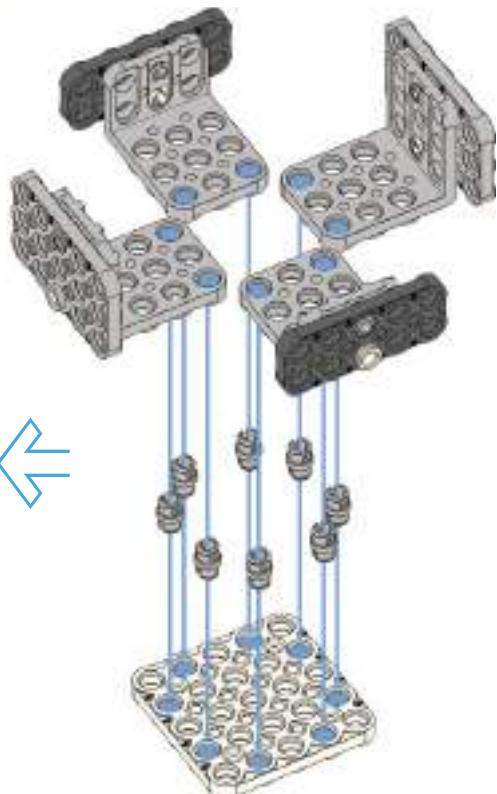
Tip



5x5 frame X1



Double rivet X8

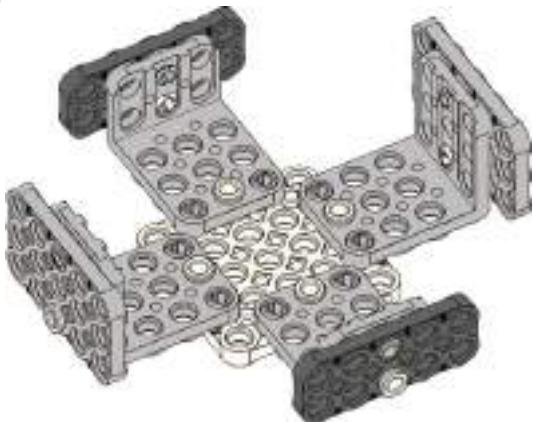
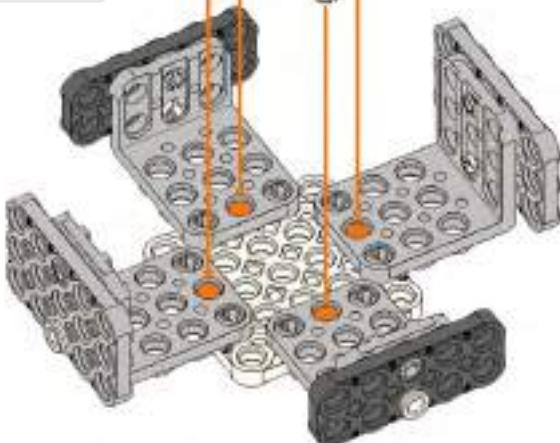


Step 8 (x2)

Tip



2s rivet X4



Step 9

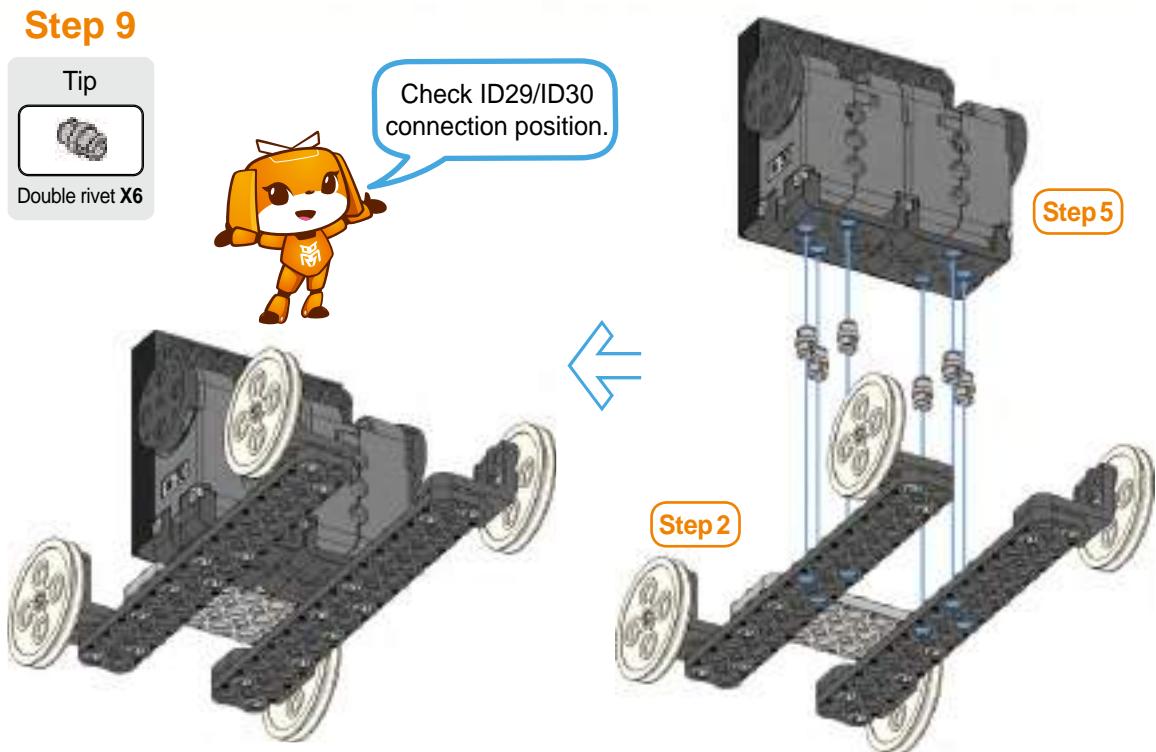
Tip



Double rivet X6



Check ID29/ID30
connection position.

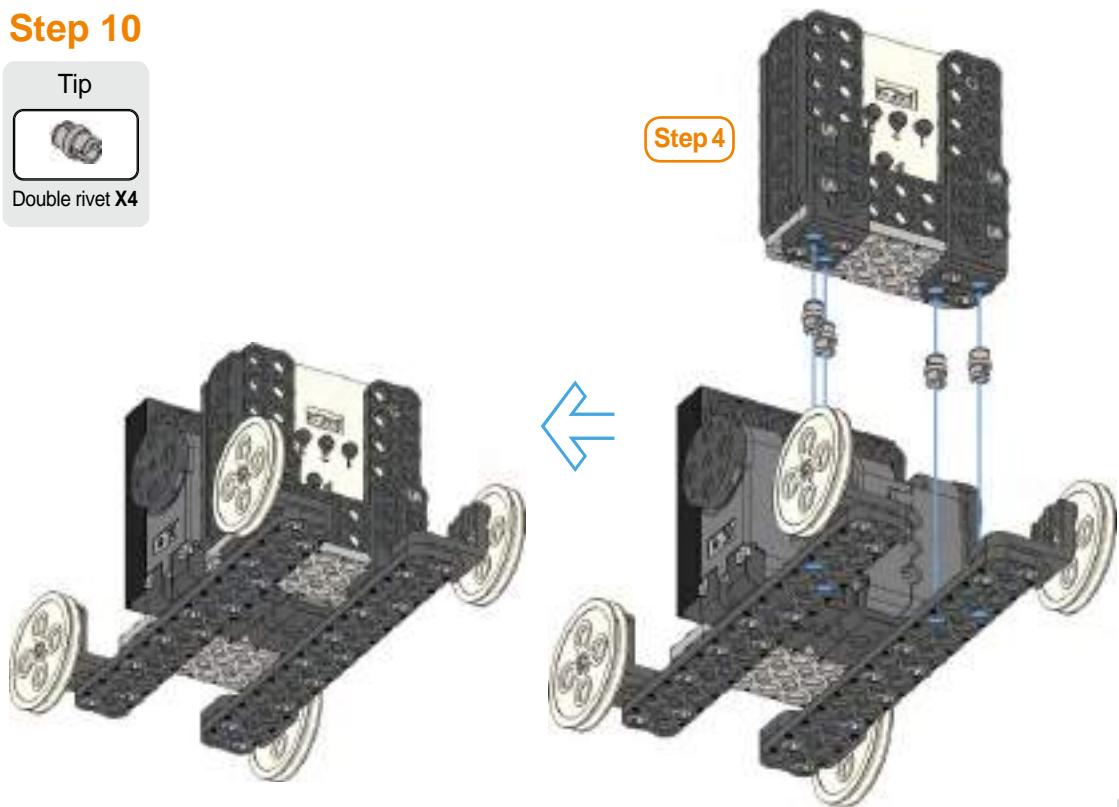


Step 10

Tip



Double rivet X4

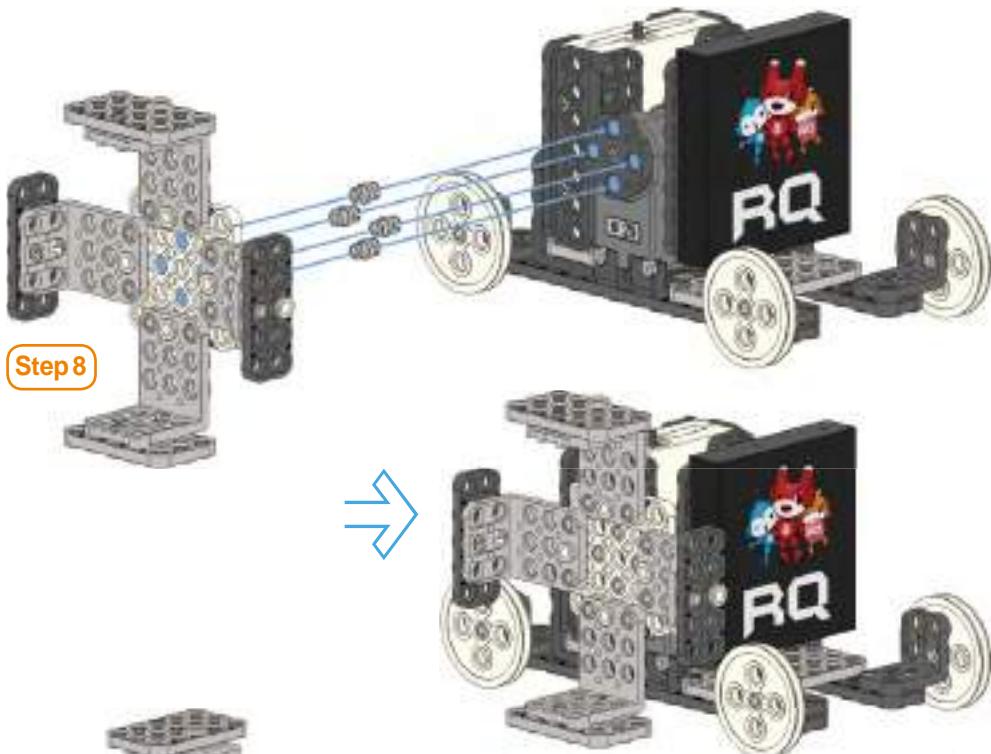


Step 11

Tip



Double rivet X4

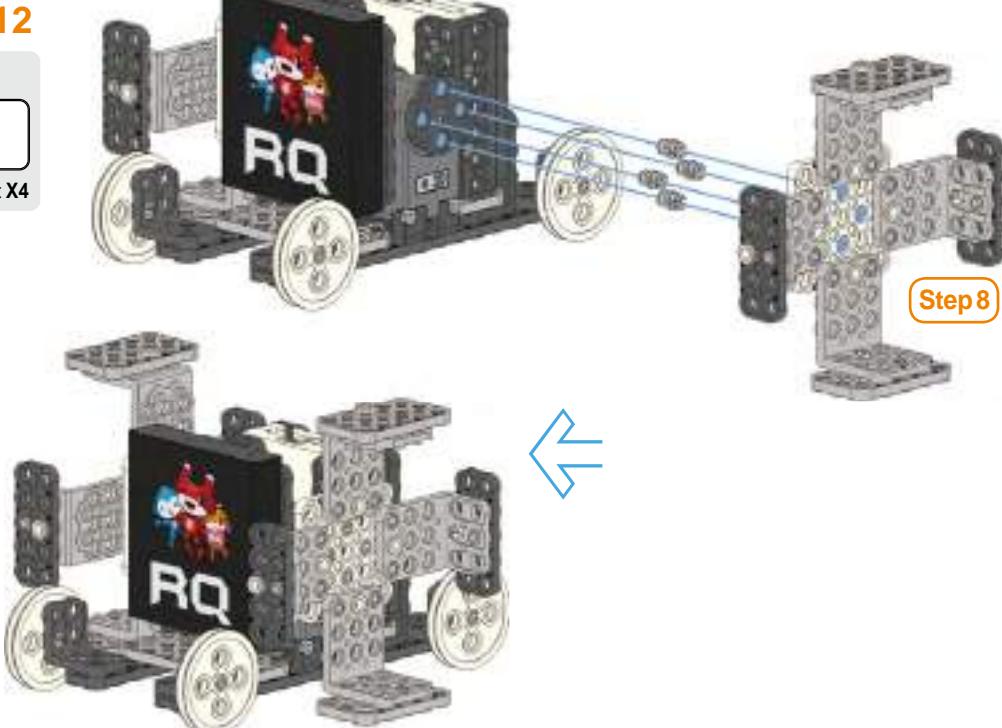


Step 12

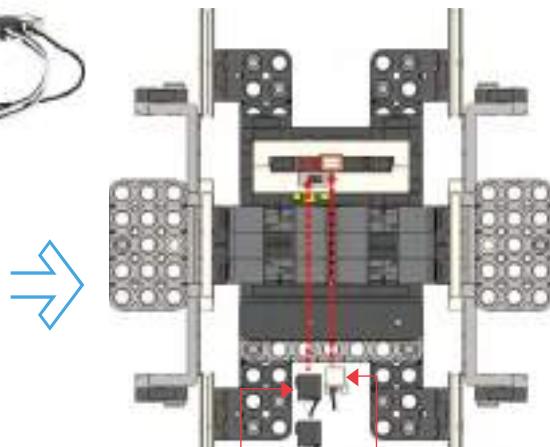
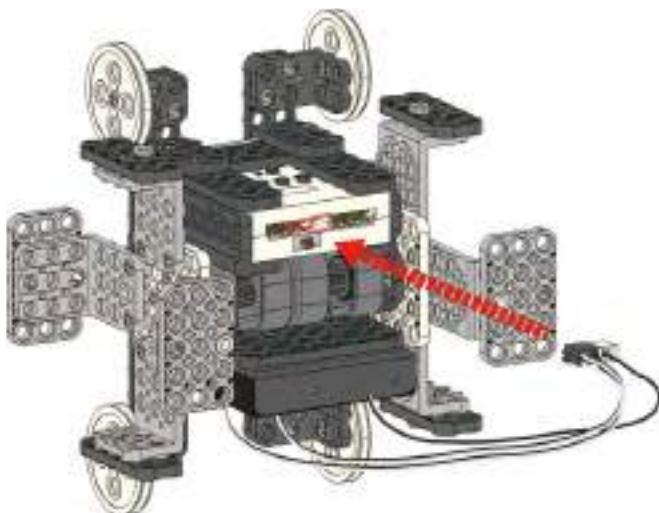
Tip



Double rivet X4

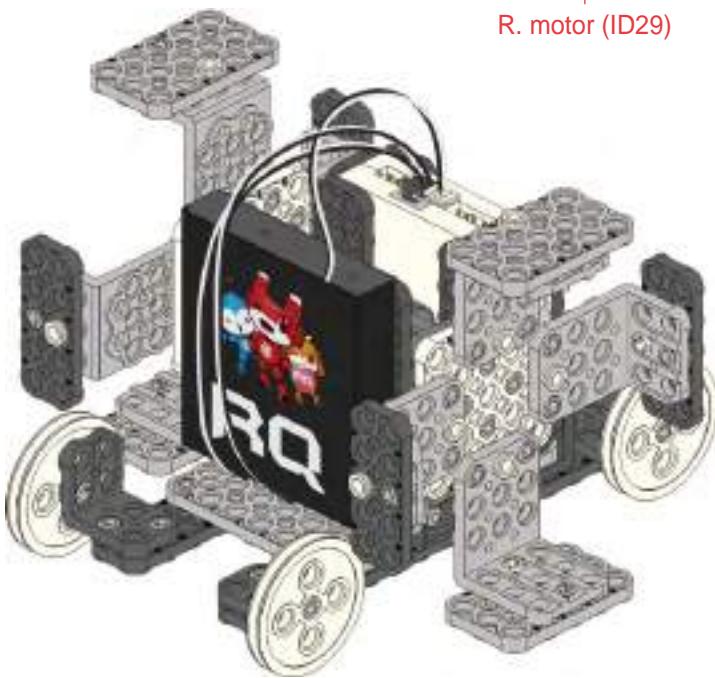


Step 13



★ 'Rolling Bot' ready! ★

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



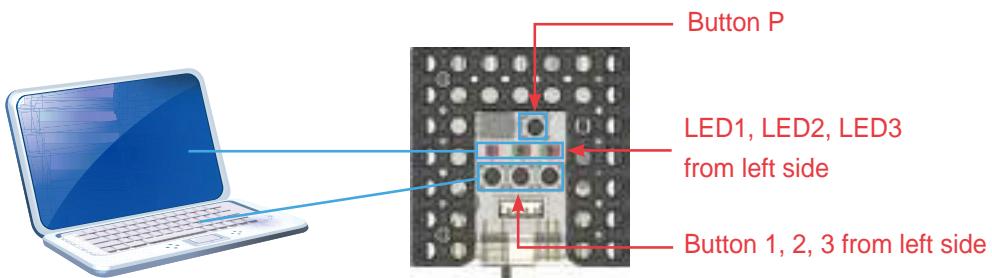


Robot Experience



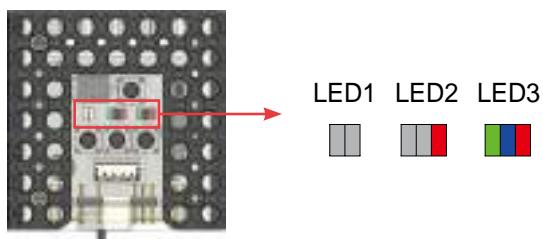
Set-up for Rolling Bot robot model.

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 'Rolling Bot' robot model.



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

When robot is not working properly, check the following.

1. When Rolling Bot is not working well :
 - ▶ Check the power device (battery case, power S/W) and robot LED platform set-up.
2. When rotation motor is not moving :
 - ▶ Check if rotation motor ID29, ID30 are connected correctly to the smart controller.

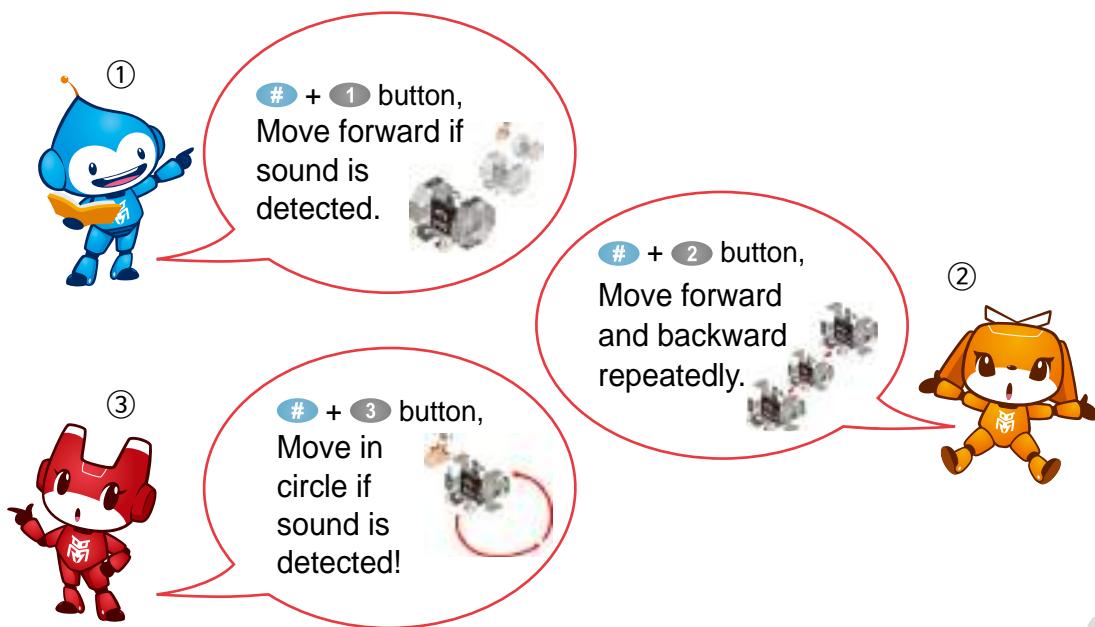


Check movement and assembly.

1. Press button 1, 2 or 3 of IR remote controller, and write your answer below.



2. Who answered correctly in your class?





Robot Play

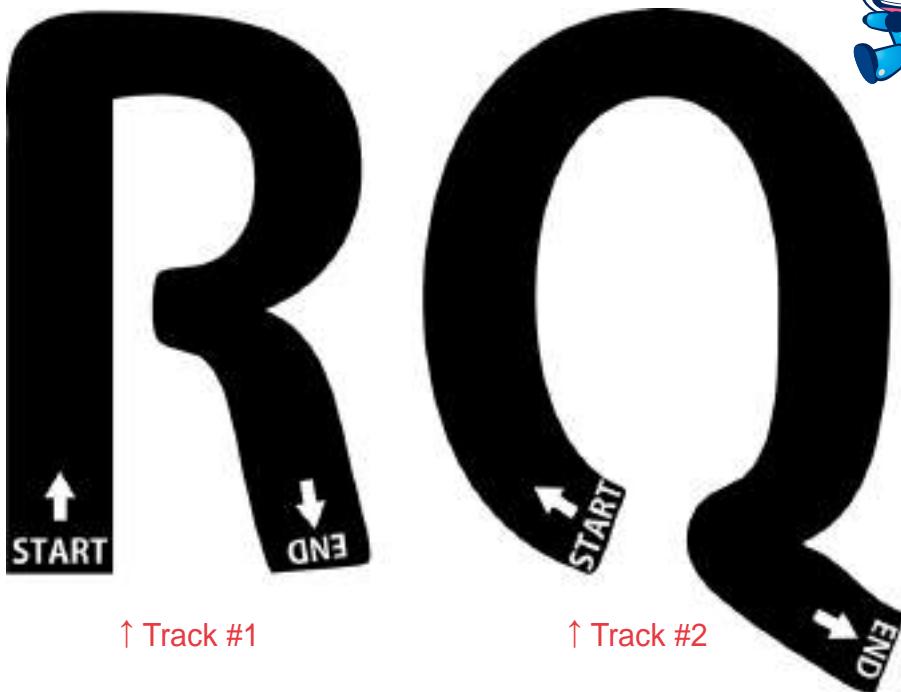


Zigzag track game

Use your Rolling Bot and play a track game with your friend. Control your robot to follow the line and try cornering in this zigzag track field.

- Start from 'START' position and move to 'END' point.
- Whoever finishes faster wins the game.
- Robot stops for 5 seconds when it finishes the track.

You can add hurdles to make it more fun!



↑ Track #1

↑ Track #2

◆ Describe your 'Rolling Bot'.

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





Robot coding with Scratch



Coding Mission

Rolling Bot rotates → moves straight → stops when it detects the voice.



⟨ Rotate and stop ⟩



⟨ Move straight ⟩



⟨ Detect voice ⟩

◆ Check before Coding Mission

- Check if Scratch Builder is installed before Coding Mission.
- Download Scratch Builder from the Robobuilder site and install.
(Download the most recent version in Support-Software at www.robobuilder.net.)
- Download other detailed explanation at the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



Making a Scratch block

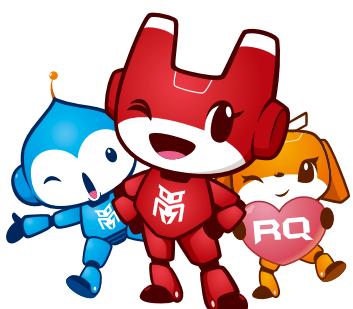
Create a Scratch block as below and run by pressing the spacebar on the keyboard.



Save the block on Scratch and upload to the robot using Scratch Builder to run without the communication cable (**press # + 4 button** on the remote to run the uploaded code).

◆ Any questions about Coding Mission?

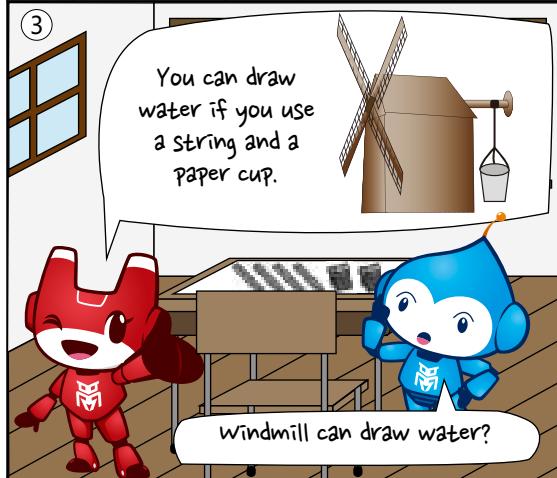
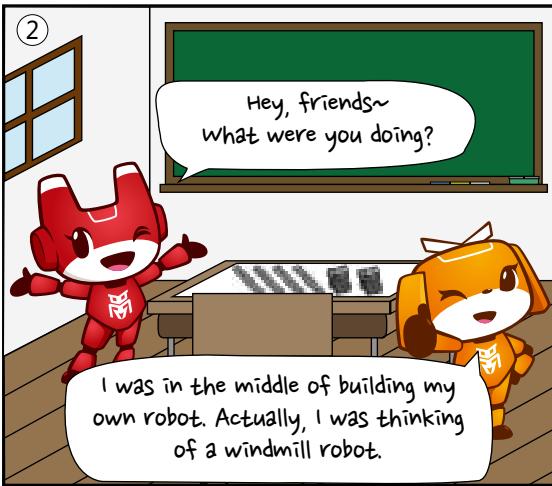
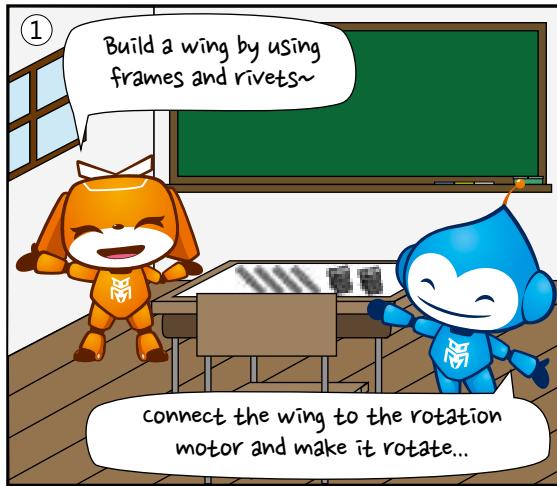
- For any questions about robot coding mission, visit Support-Technical support at www.robobuilder.net.
- Download the 'Scratch Builder' manual on the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



RQ⁺

6. Imagine Robot.

My own robot PART 1



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



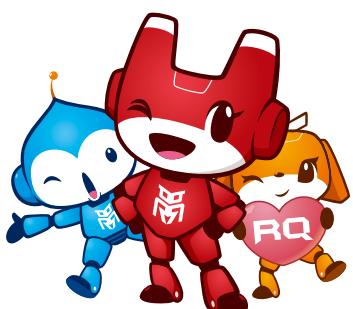
Post the picture of your own robot below.



◆ 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.

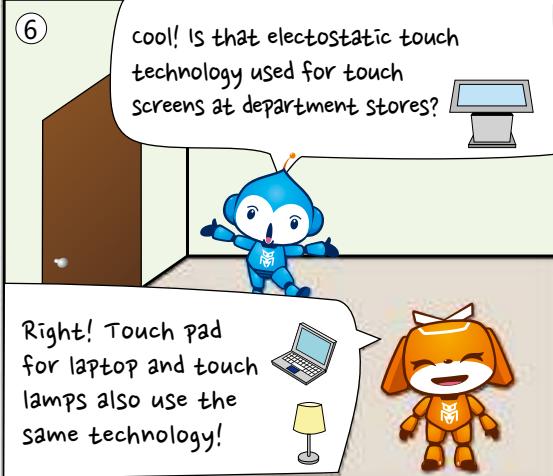
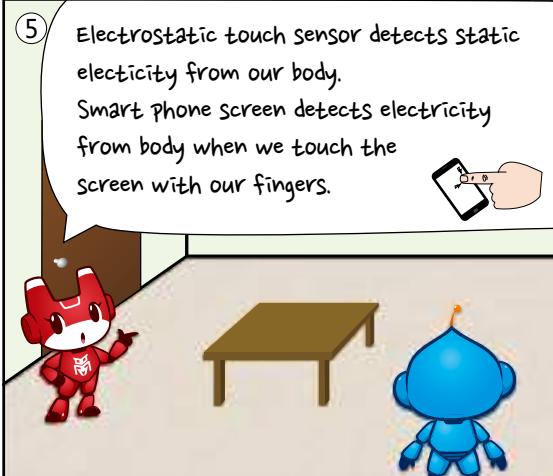
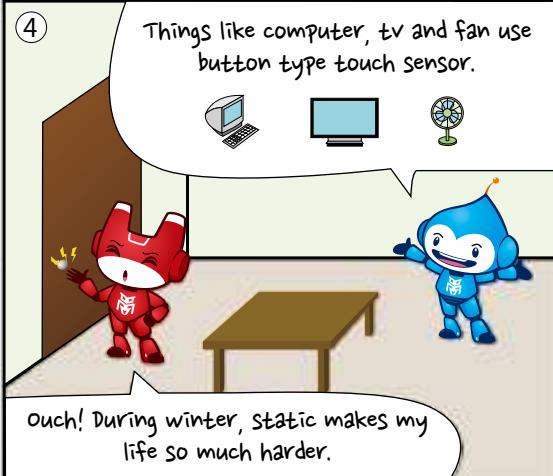
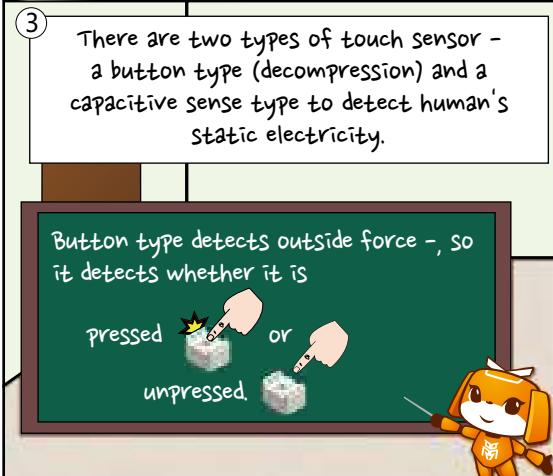
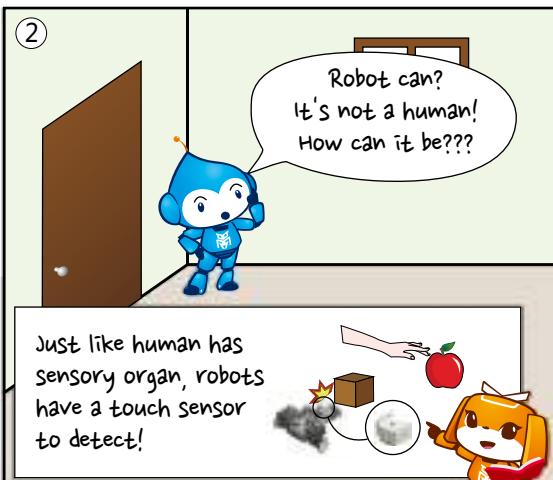
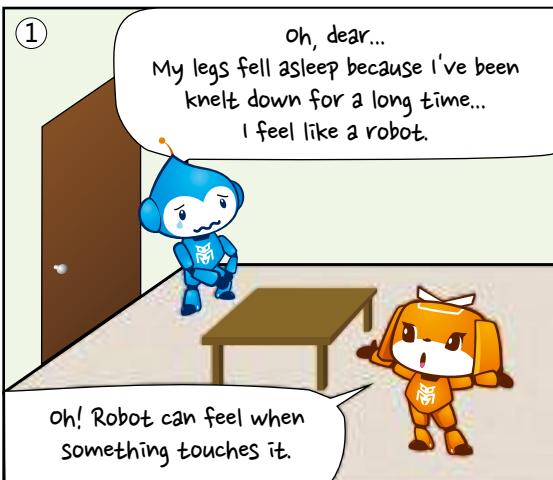




RQ⁺

7. Bumper Car

Clack clack~ Touch sensor

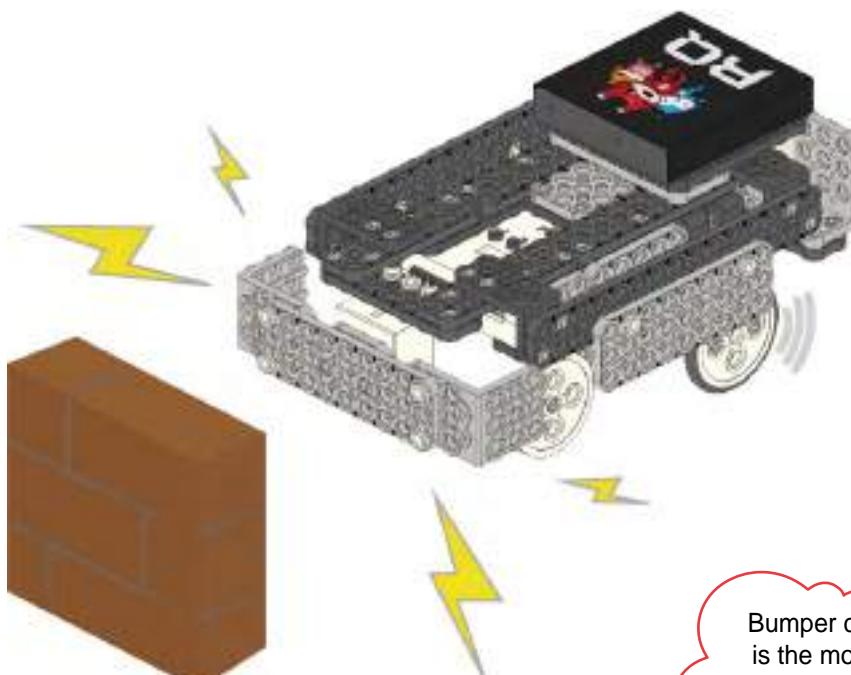




Today's Robot Class



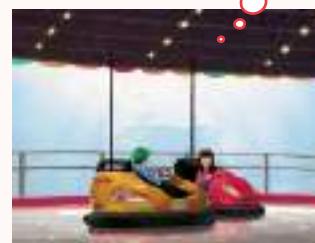
Bumper car is like a regular car, freely moving forward and backward and turning left and right. Two rear wheels use two rotation motors and two front wheels are auxiliary wheels. 'Clack clack' bumper car has a special function. It avoid obstacles when touch sensor detects them. Let's find out what principle is applied for this bumper car.



Bumper car
is the most
popular ride in
amusement park!



Bumper car can easily be found at amusement parks. Even when you bump into others, it is still safe because it has an air tube. It moves with electric energy.





Robot Assembly



Prepare robot parts.



Smart controller X1



R. motor (ID29,30) X2



Battery case X1



LED X1



Touch sensor X1



2x7 frame X3



2x9 frame X3



2x15 frame X2



3x5 frame X4



3x7 frame X2



3x9 frame X4



2x4 L frame X2



2x15 L frame X4



3x5 L frame X2



3x6 L frame X3



Wheel X4



Rubber ring X2



2s rivet X15

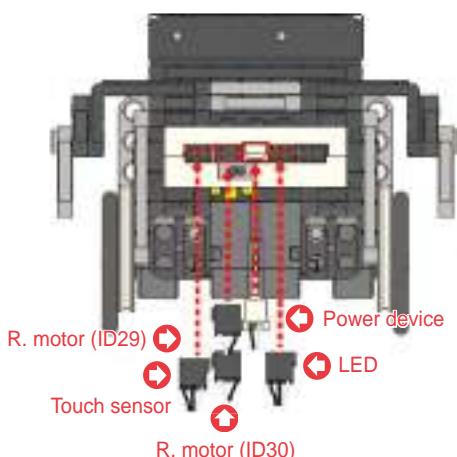


Double rivet X81



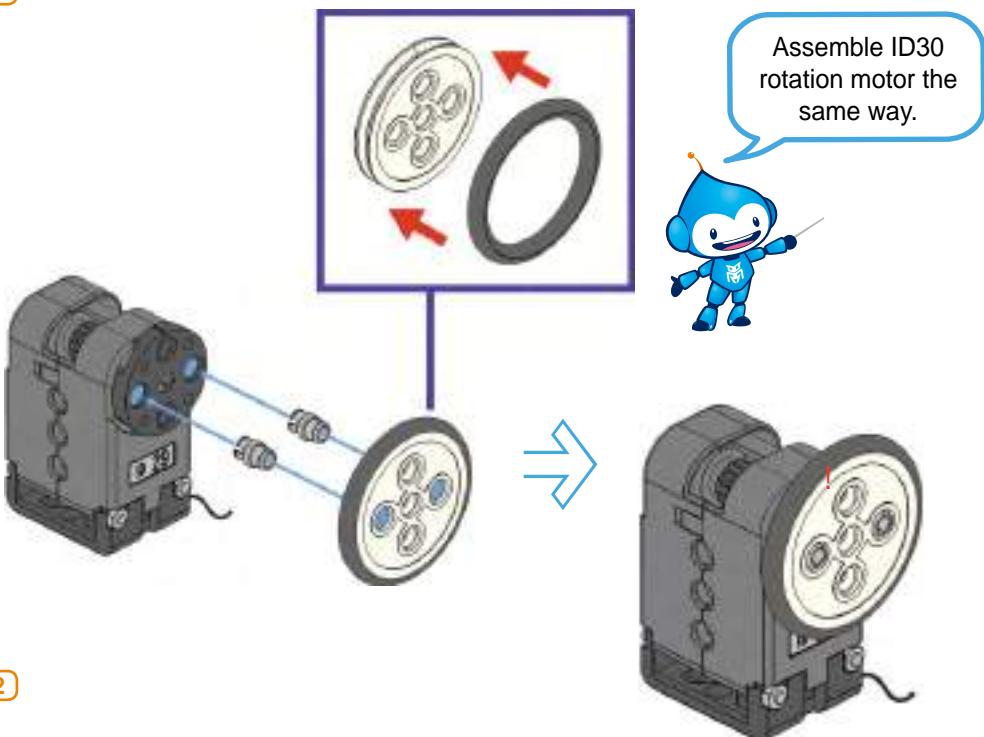
Tips.

You have to connect 5 cables (including battery cable) to the smart controller for bumper car robot. Carefully check the cable's connection position and direction to avoid misconnection.



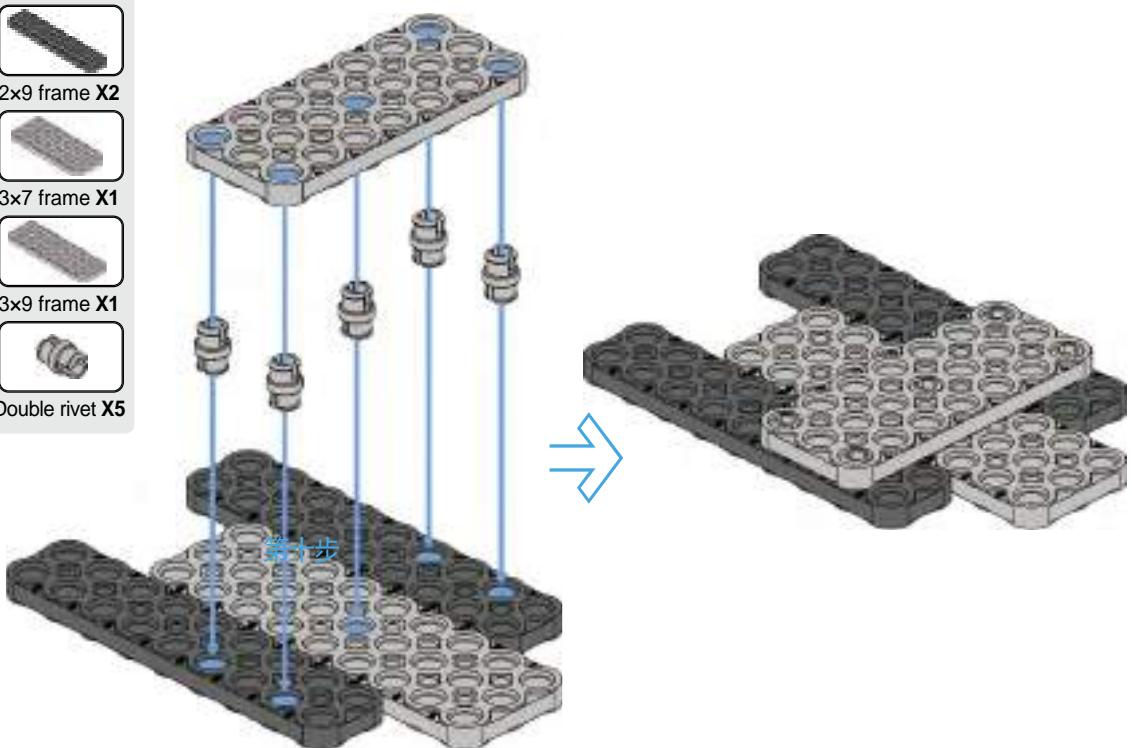
Step 1 (x2)

- Tip
- R. motor(ID29) X1
 - Wheel X1
 - Rubber ring X1
 - Double rivet X2

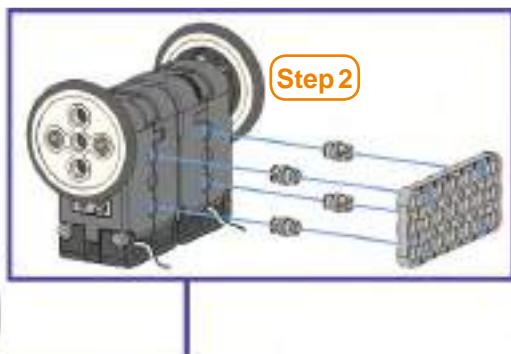
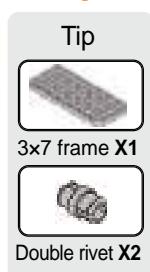


Step 2 (x2)

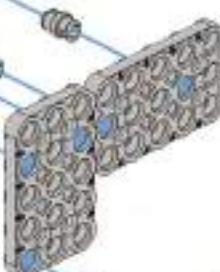
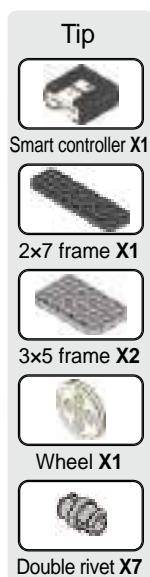
- Tip
- 2x9 frame X2
 - 3x7 frame X1
 - 3x9 frame X1
 - Double rivet X5



Step 3



Step 4



Step 5

Tip



2x7 frame X1



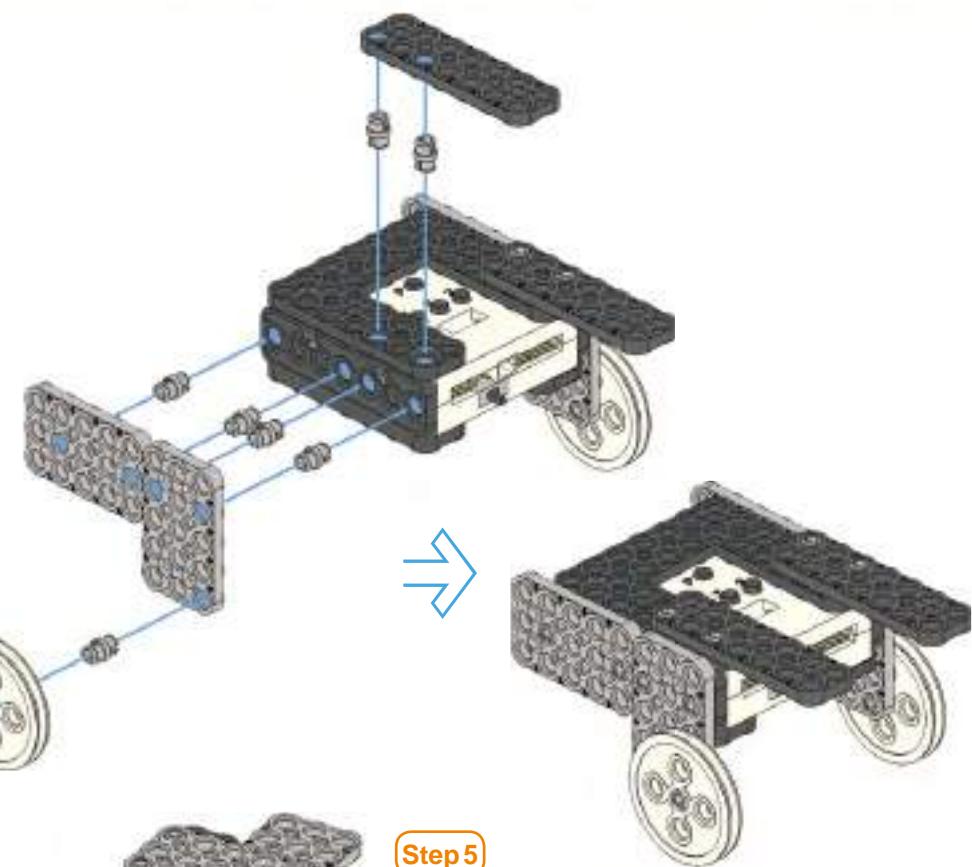
3x5 frame X2



Wheel X1



Double rivet X7



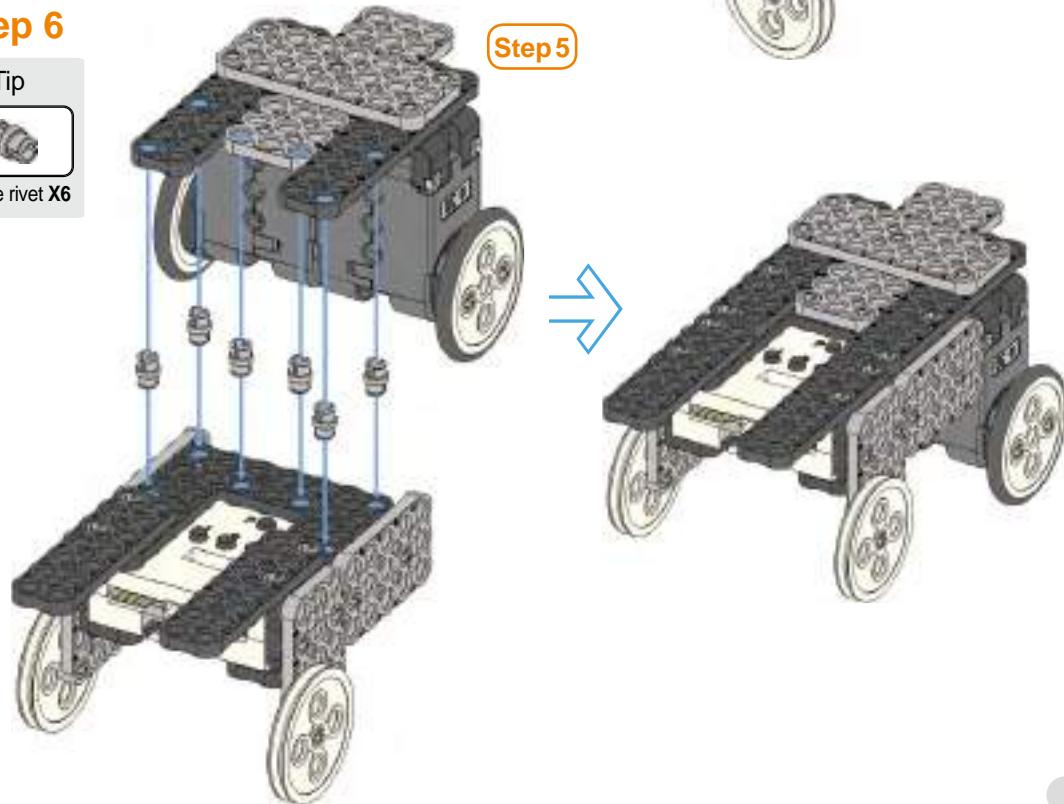
Step 6

Tip



Double rivet X6

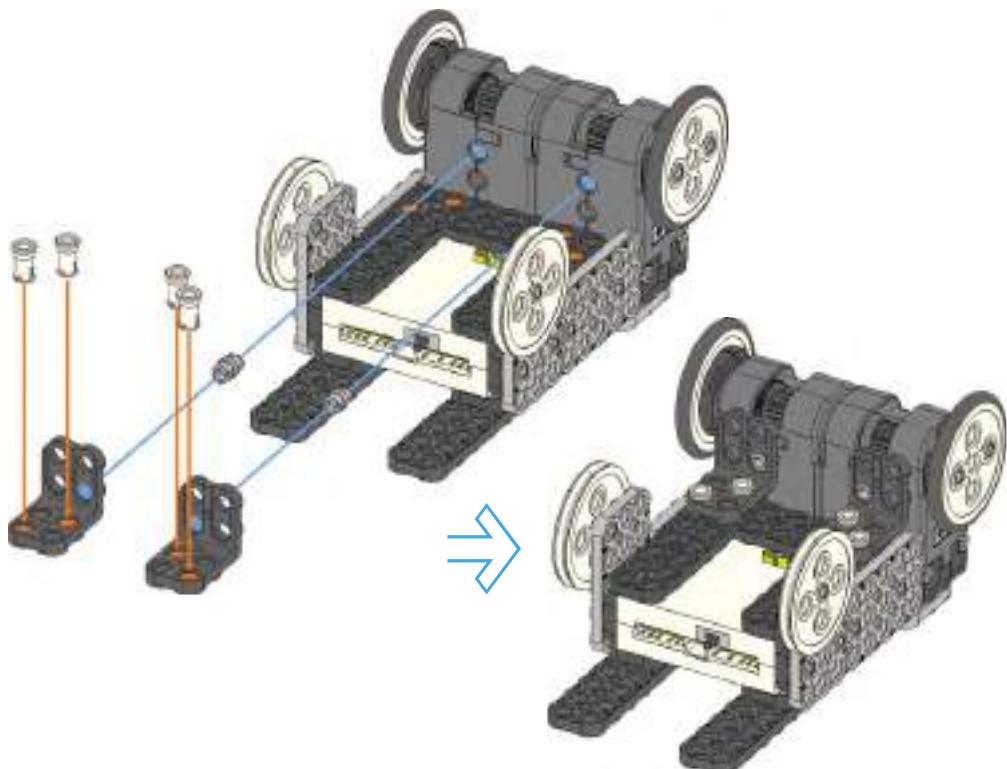
Step 5



Step 7

Tip

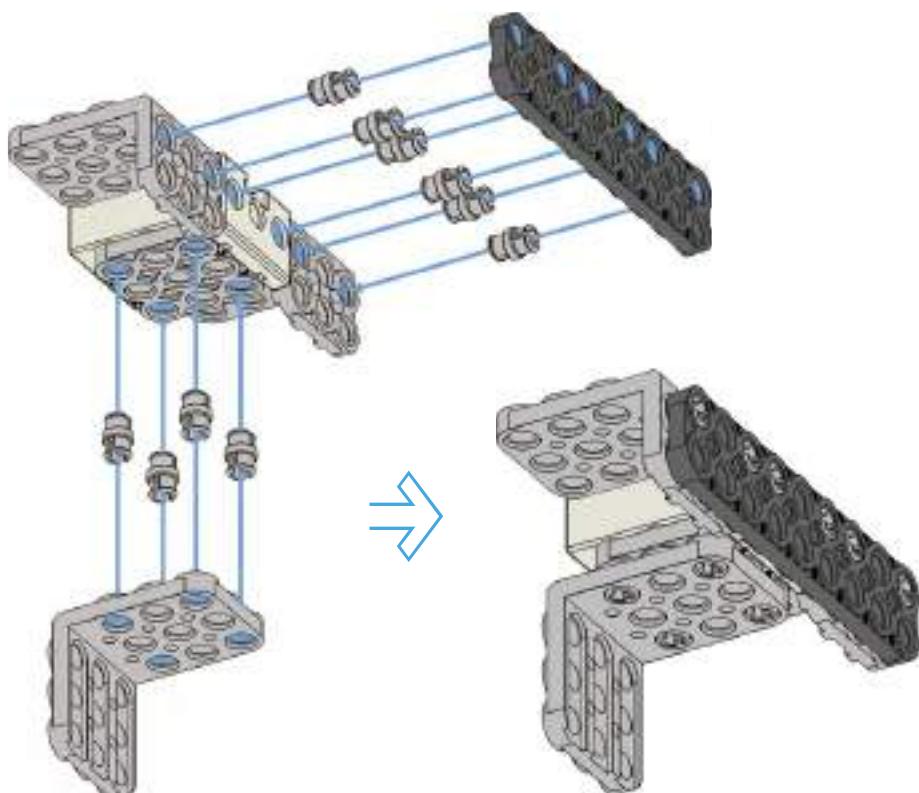
- 
- 2x4 L frame X2
- 
- 2s rivet X4
- 
- Double rivet X2



Step 8

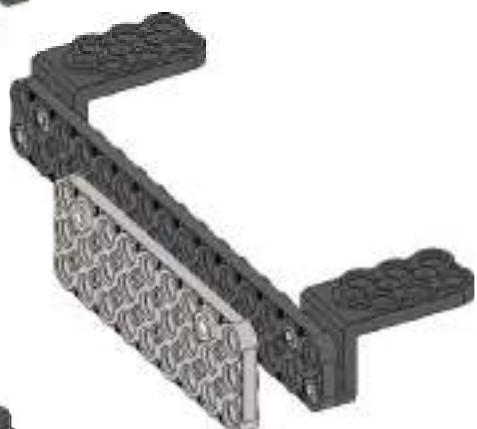
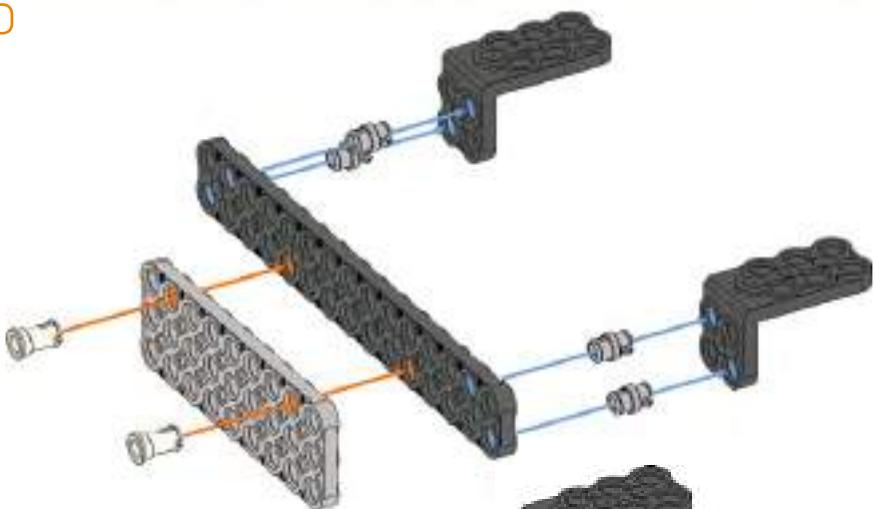
Tip

- 
- LED X1
- 
- 2x9 frame X1
- 
- 3x5 L frame X2
- 
- 3x6 L frame X1
- 
- Double rivet X10



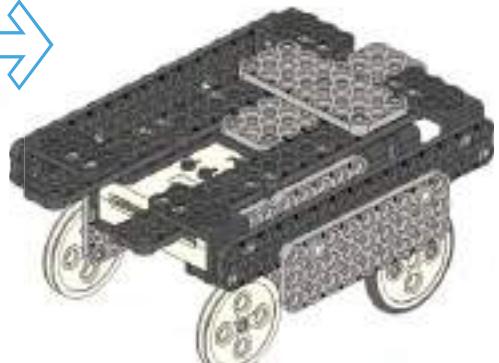
Step 9 (x2)

Tip
2x15 frame X1
3x9 frame X1
2x5 L frame X2
2s rivet X2
Double rivet X4

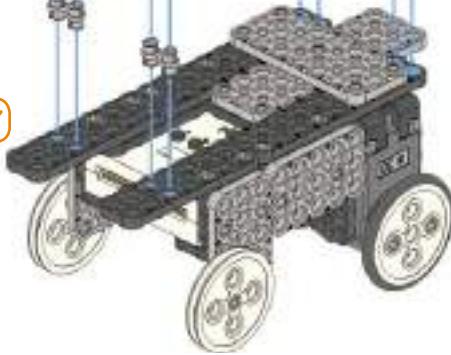


Step 10

Tip
Double rivet X8



Step 7



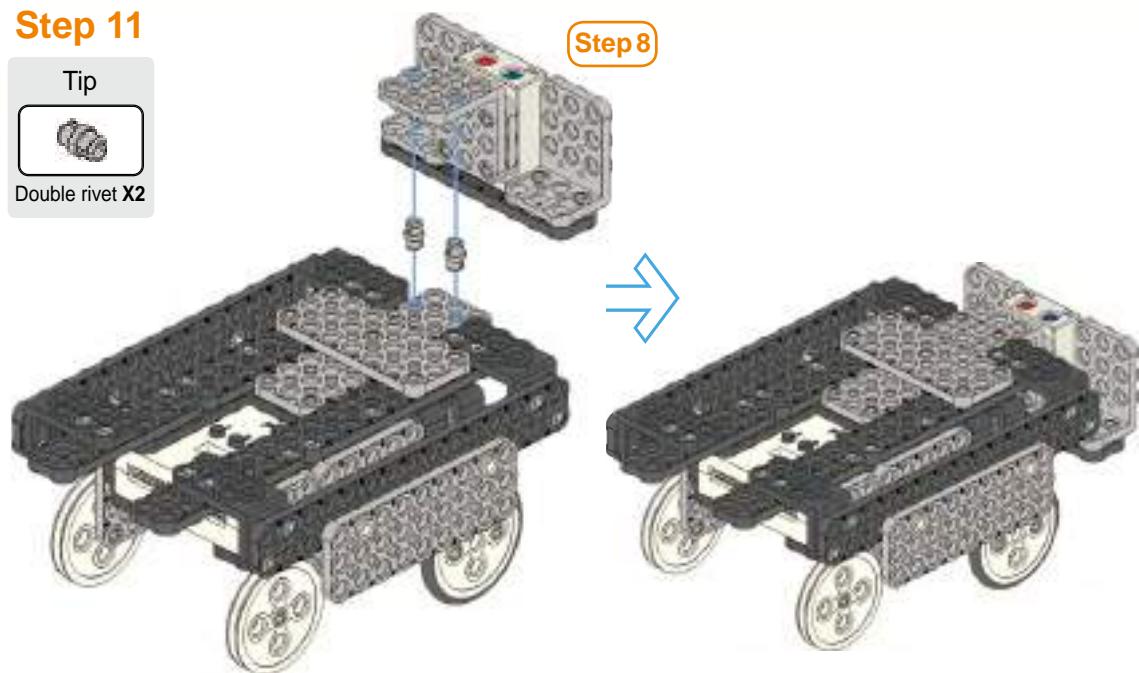
Step 11

Tip



Double rivet X2

Step 8



Step 12

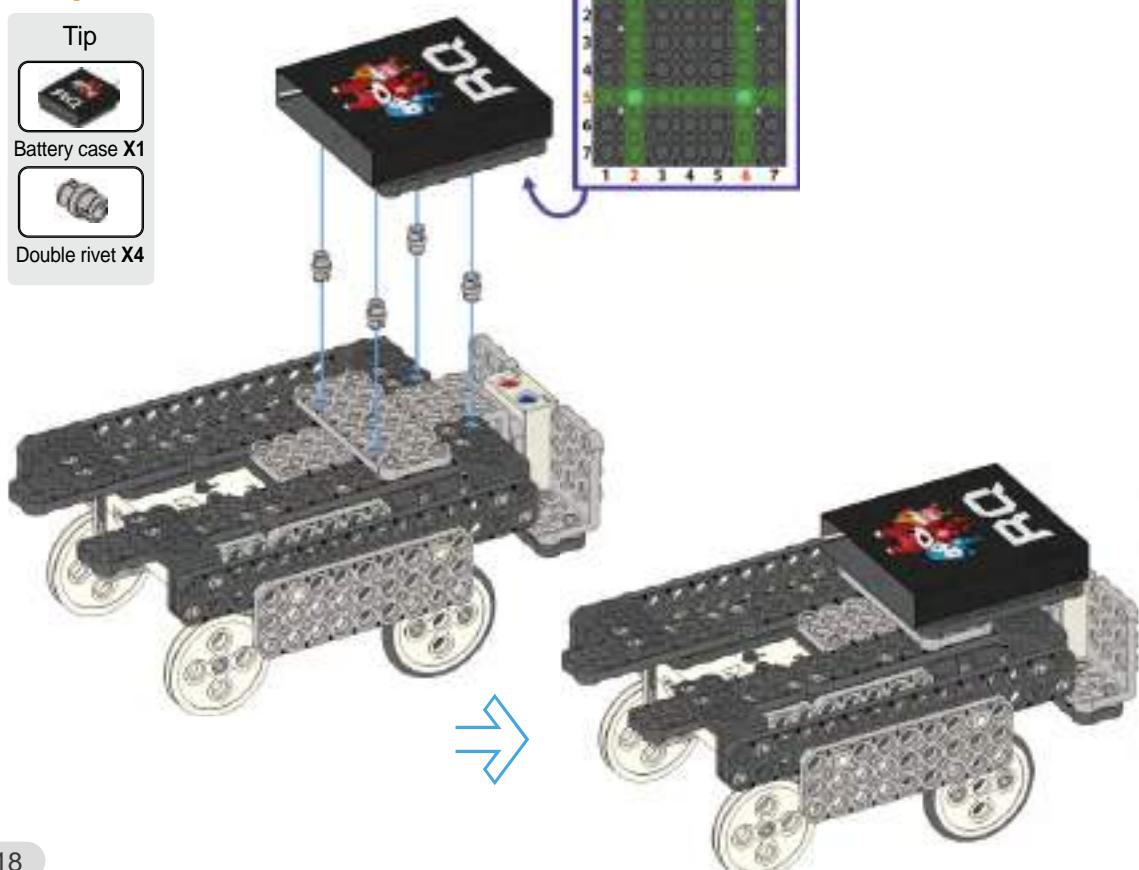
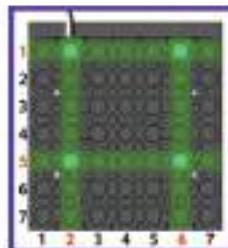
Tip



Battery case X1



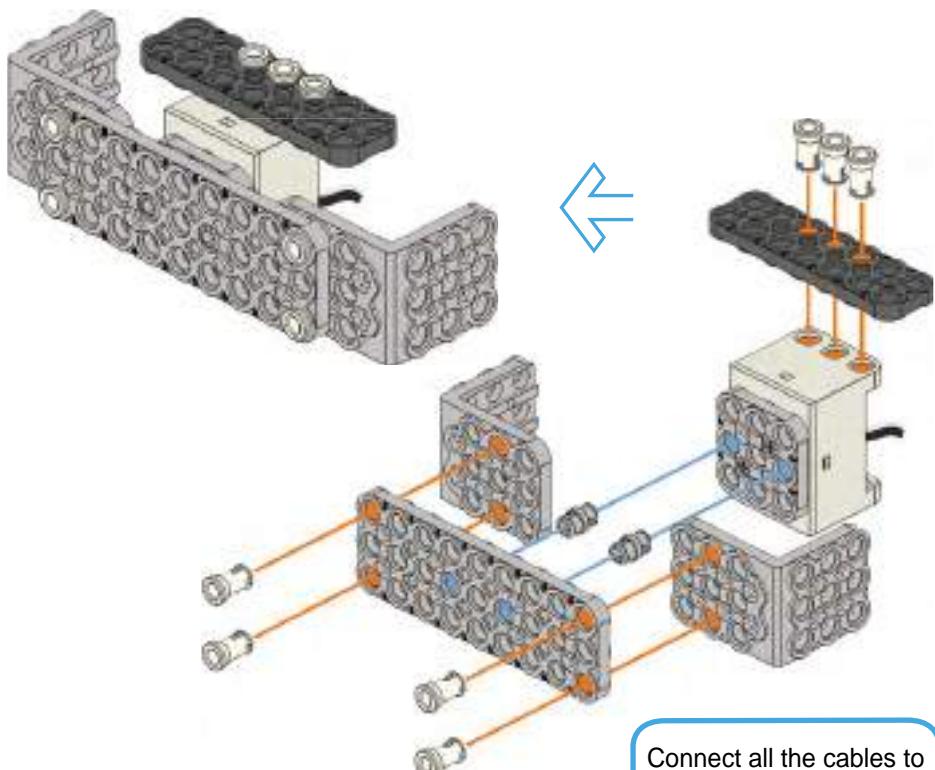
Double rivet X4



Step 13

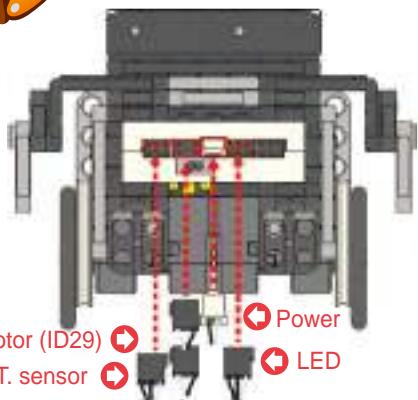
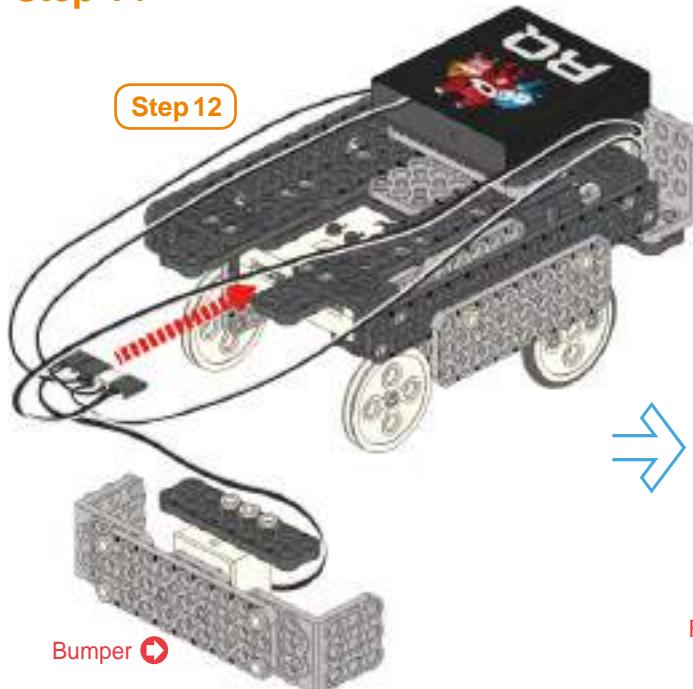
Tip

- Touch sensor X1
- 2x7 frame X1
- 3x9 frame X1
- 3x6 L frame X2
- 2s rivet X7
- Double rivet X2



Step 14

Step 12



R. motor (ID29)
T. sensor
Power
LED
R. motor (ID30)

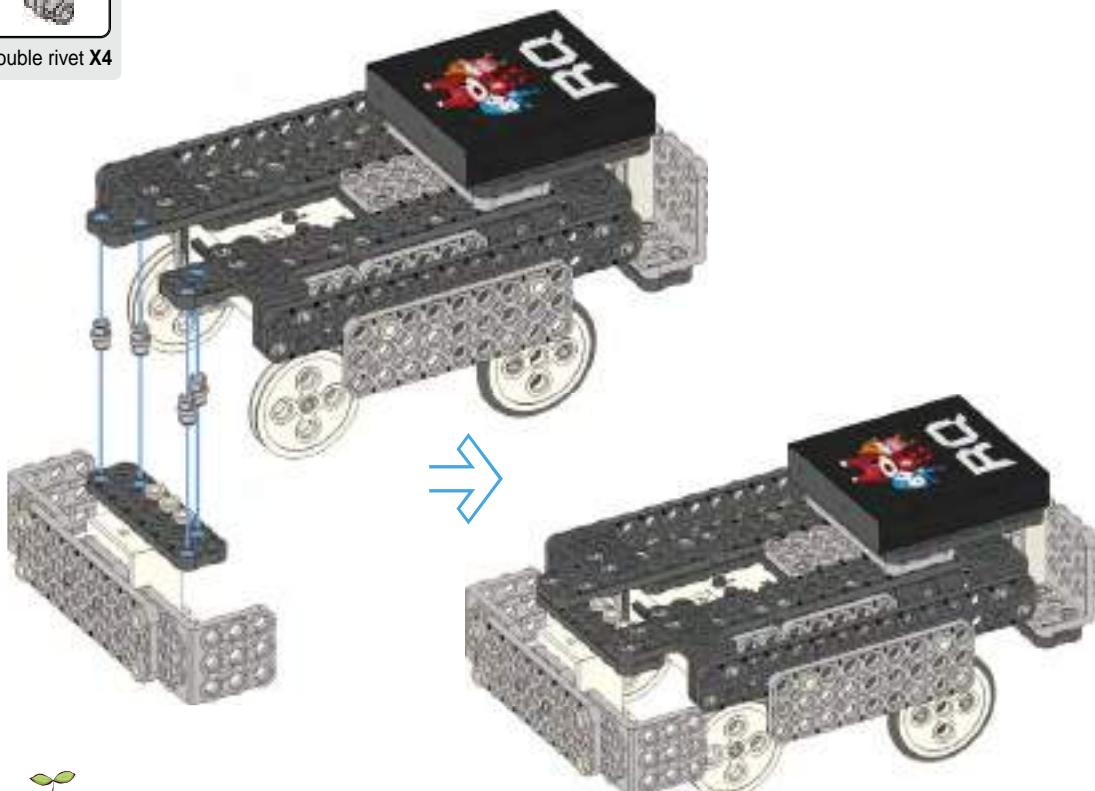
Step 15

Tip

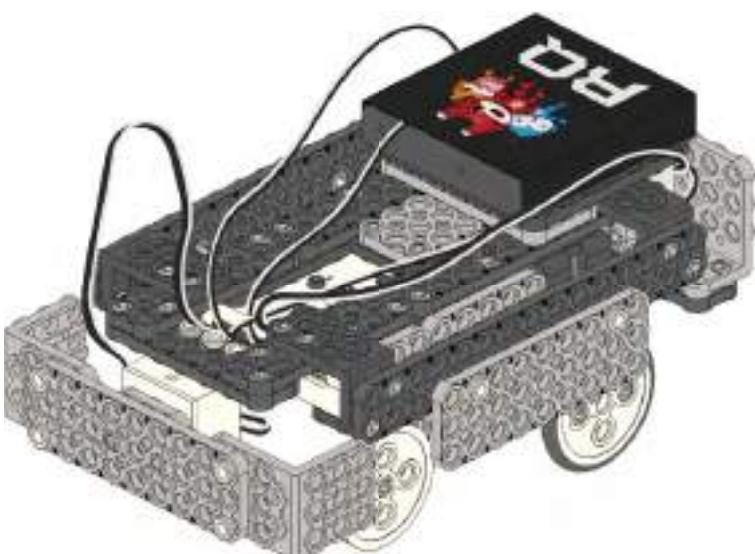
《Cable connection status》



Double rivet X4



★ 'Bumper car' ready! ★



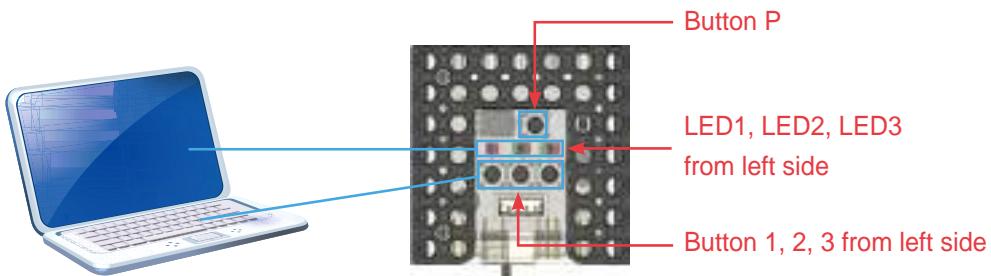


Robot Experience



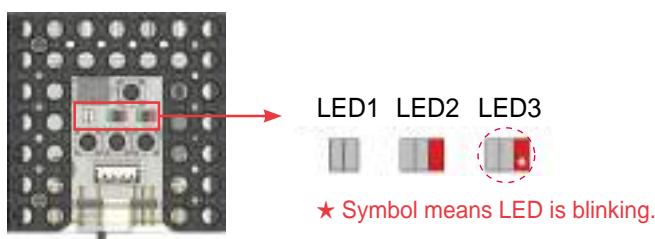
Set-up 'Bumper car' robot model.

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 'Bumper car' 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 properly, check the following.

1. When rotation motor is not moving :
 - ▶ Check if rotation motor ID29, ID30 are connected correctly.
2. When touch sensor is not working :
 - ▶ Check if touch sensor is connected to sensor port #1.



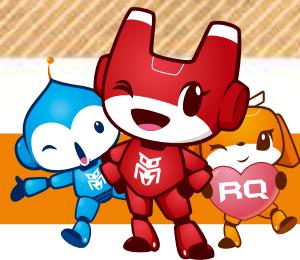
Check movement and assembly.

1. Write 'O' for true and 'X' for false.



- (1) ① button : Move forward towards the left. ()
- (2) ② button : Move forward fast and stop fast. ()
- (3) ③ button : Move forward towards the right. ()
- (3) # + ① button : Move forward/backward if touch sensor detects object. ()
- (5) # + ② button : Move forward slowly and stop slowly. ()
- (6) # + ③ button : Move forward and stop when sensor detects an object. ()

Robot Play

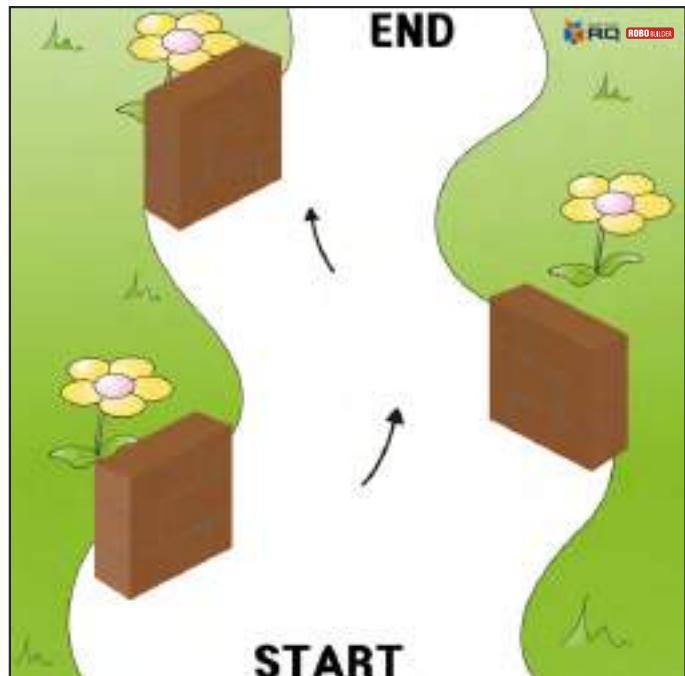


Avoid obstacles.

Play 'avoid obstacles' game as by controlling the bumper car robot.

- Start from 'START' point, and move to 'END' point.
- Whoever arrives to 'END' point by avoiding obstacles wins game.
- If the bumper car gets out of the road, stop for 2 seconds.

- Game panel
- Obstacle
- Rule for robot control
- Robot stop time
- Make your own rules!



◆ Describe your 'Bumper Car' robot.

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





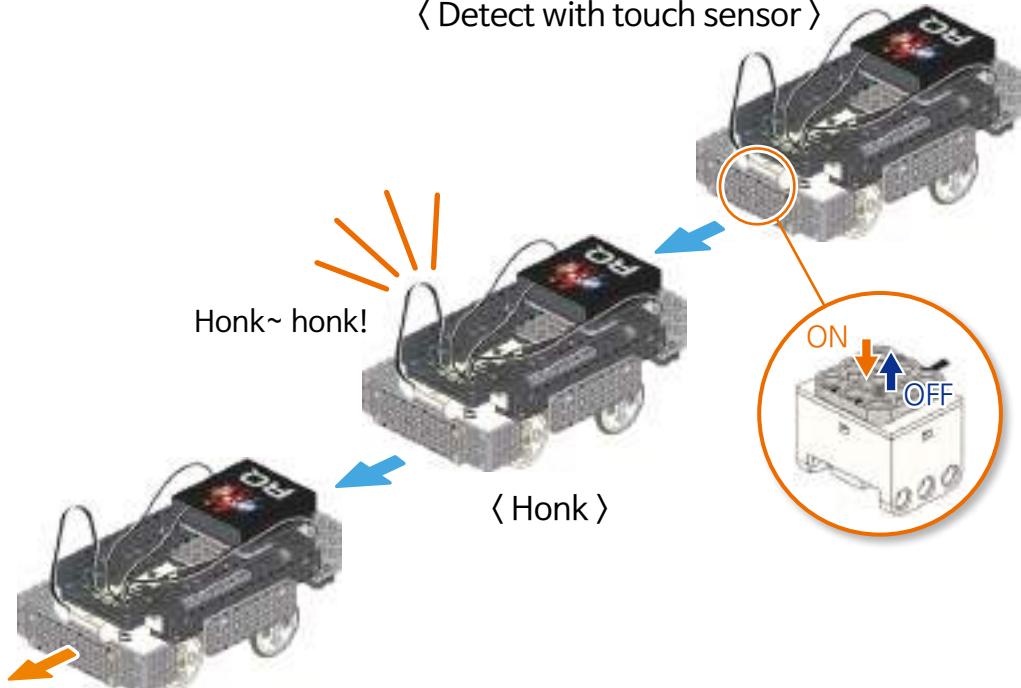
Robot coding with Scratch



Coding Mission

Bumper Car **honks** → moves straight → **stops** when the front bumper is pressed.

⟨ Detect with touch sensor ⟩



⟨ Move straight and stop ⟩

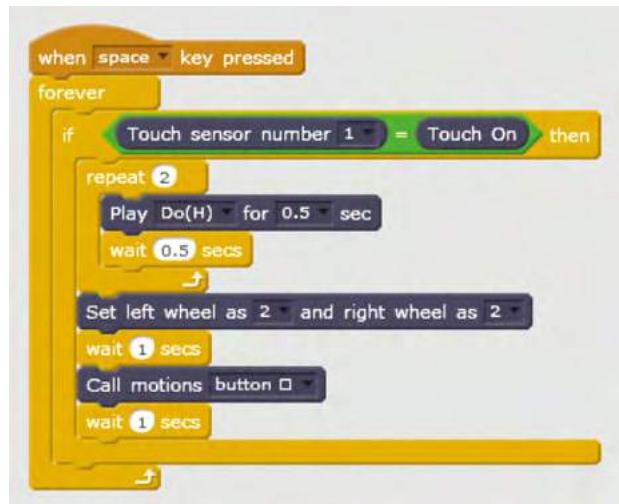
◆ Check before Coding Mission

- Check if Scratch Builder is installed before Coding Mission.
- Download Scratch Builder from the Robobuilder site and install.
(Download the most recent version in Support-Software at www.robobuilder.net.)
- Download other detailed explanation at the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



Making a Scratch block

Create a Scratch block as below and run by pressing the spacebar on the keyboard.



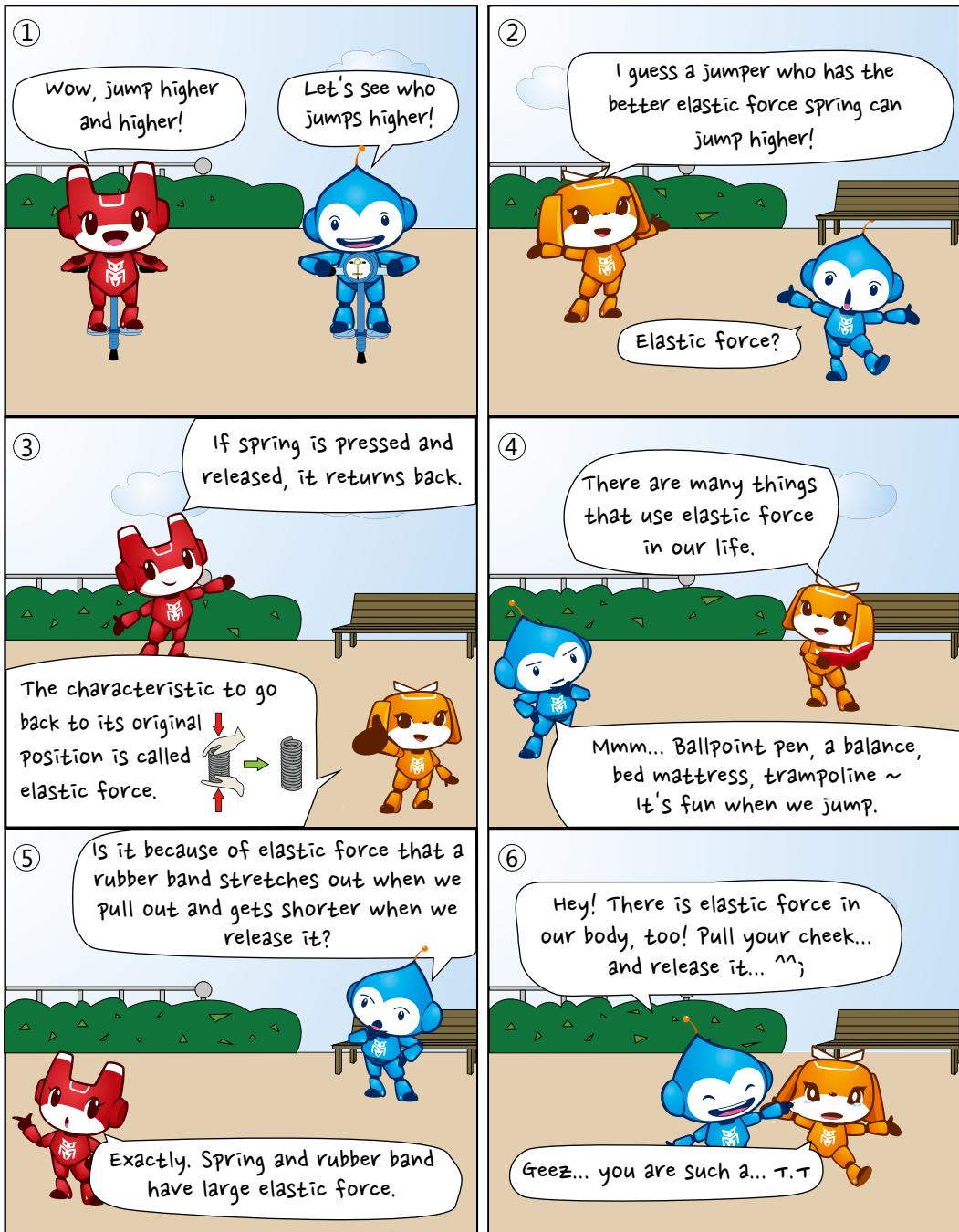
Save the block on Scratch and upload to the robot using Scratch Builder to run without the communication cable (**press # + 4 button** on the remote to run the uploaded code).

❖ Any questions about Coding Mission?

- For any questions about robot coding mission, visit Support-Technical support at www.robobuilder.net.
- Download the 'Scratch Builder' manual on the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)

8. Bowling Bot

Stretch-and-shrink



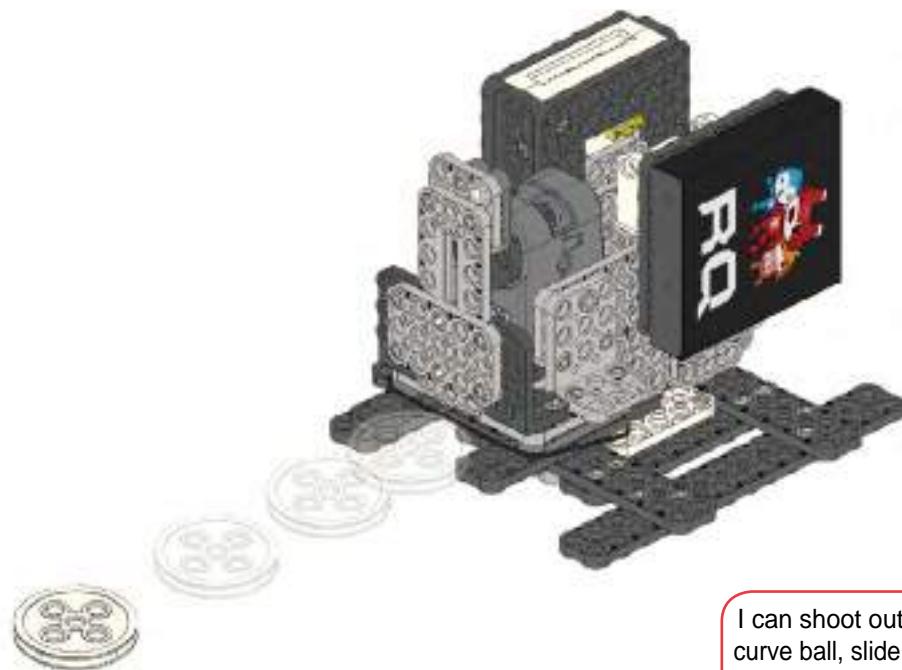


Today's Robot Classss



Rubber band can stretch and shrink because of elastic force. We see various household items with elastic force such as rubber balloon, rubber gloves, spring, ballpoint pen, scales and bows.

Bowling Bot can fire objects by utilizing elastic force. Let's bowl after we build a Bowling Bot robot.



I can shoot out a curve ball, slide or down ball.



'Pitching machine' is used for baseball practice. It throws balls automatically with the rotating wheel's turning force and rubber elastic force.





Robot Assembly



Prepare robot parts.



Smart controller X1 R. motor (ID29,30) X2 Battery case X1 Touch sensor X1 1x3 frame X2



1x5 frame X2



2x7 frame X2



2x9 frame X2



2x15 frame X4



3x3 frame X1



3x5 frame X4



3x7 frame X4



3x9 frame X3



5x5 frame X1



3x8 slide frame X1



2x5 L frame X2



3x5 L frame X2



3x6 L frame X1



2s rivet X5



3s rivet X10



Double rivet X75

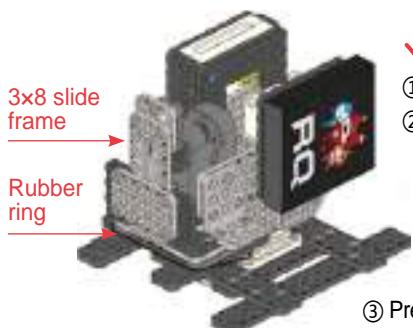


Rubber ring X1



Tips.

Check below when you attach wheels to Bowling Bot.



① Enter <standby mode> for Bowling Bot.

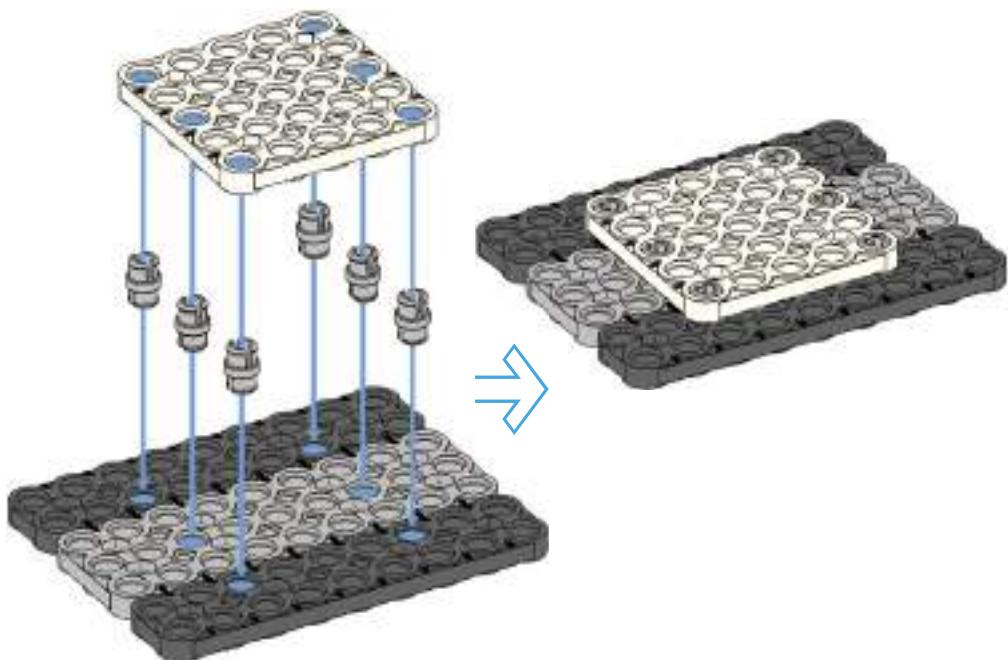
- ② Lift 3x8 slide frame after pressing button 2 on the IR remote controller.
- ③ Insert a rubber ring into the wheel furrow, then push inside of Bowling Bot.



- ④ Press button 2 on the IR remote controller to bring 3x8 slide frame down.

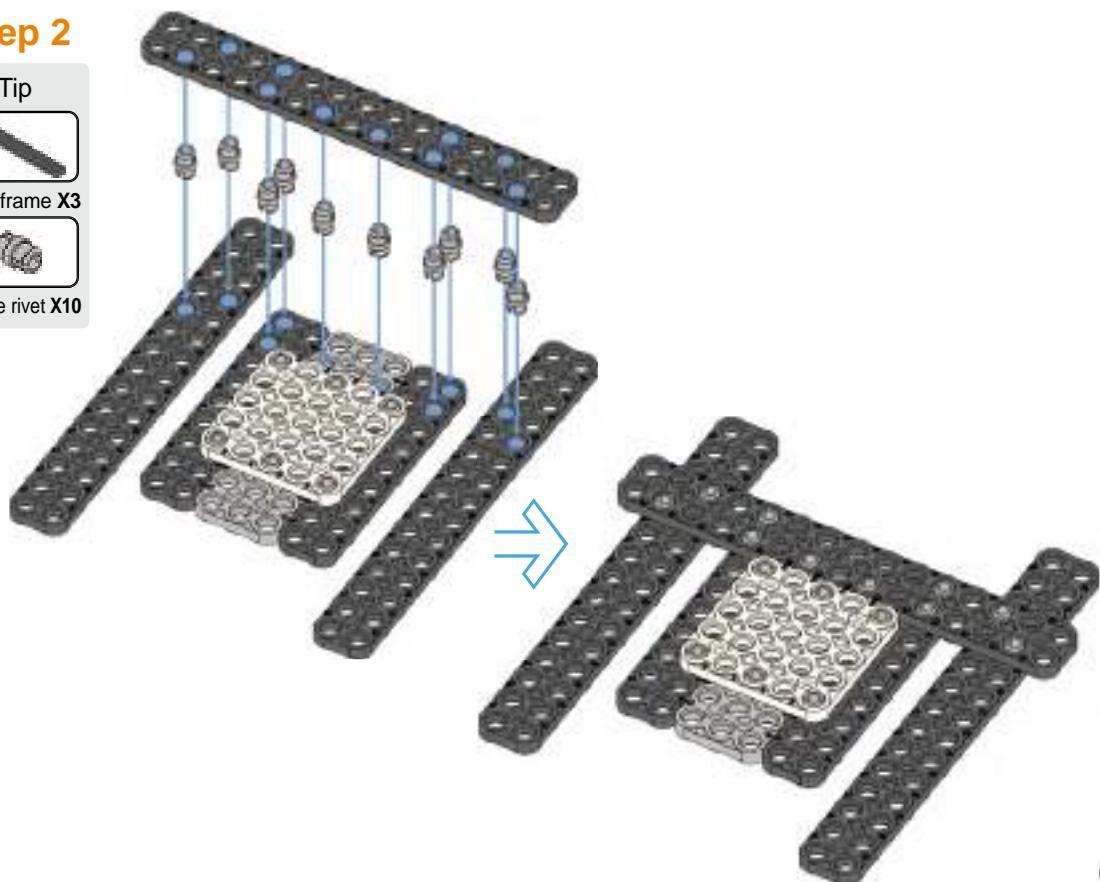
Step 1

- Tip
- 2x9 frame X2
 - 3x9 frame X1
 - 5x5 frame X1
 - Double rivet X6



Step 2

- Tip
- 2x15 frame X3
 - Double rivet X10



Step 3

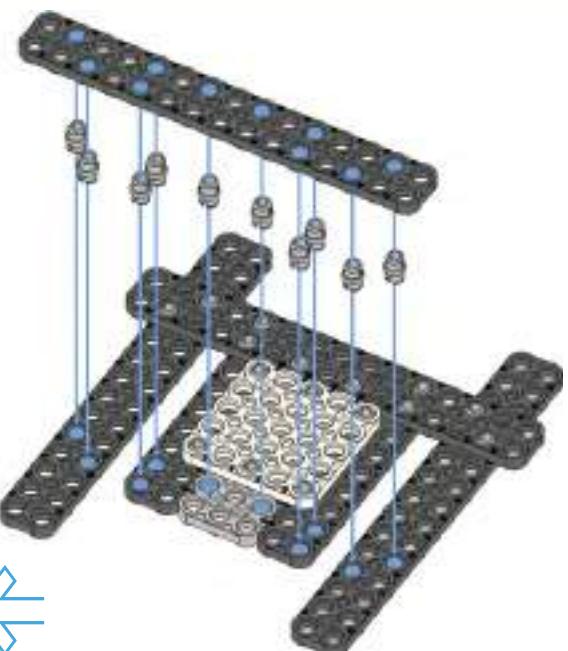
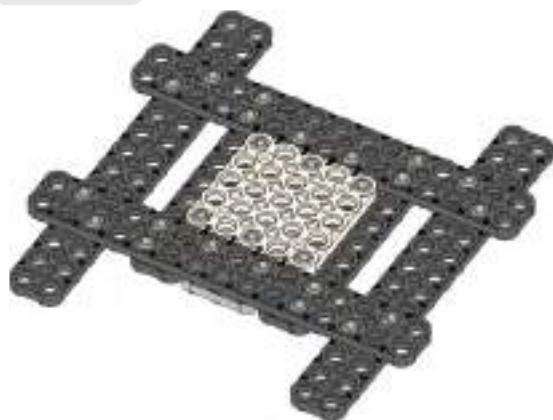
Tip



2x15 frame X1



Double rivet X10



Step 4

3x6 L frame has two different sides. !

Tip



R. motor (ID30) X1



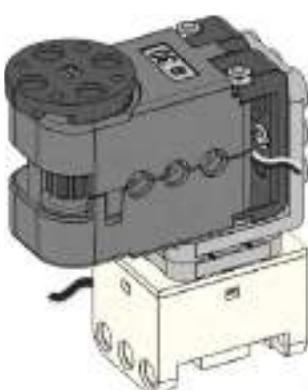
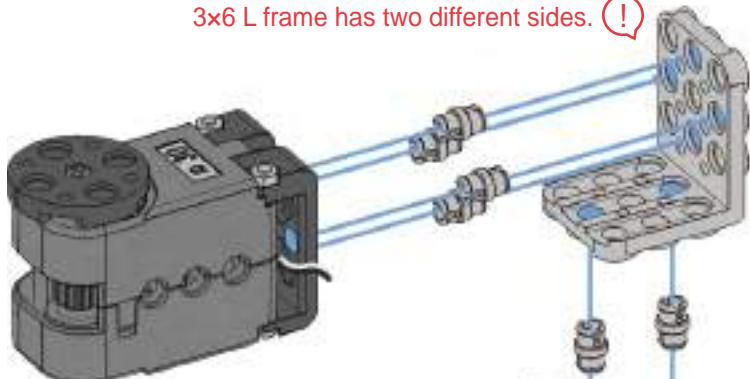
Touch sensor X1



3x6 L frame X1



Double rivet X6

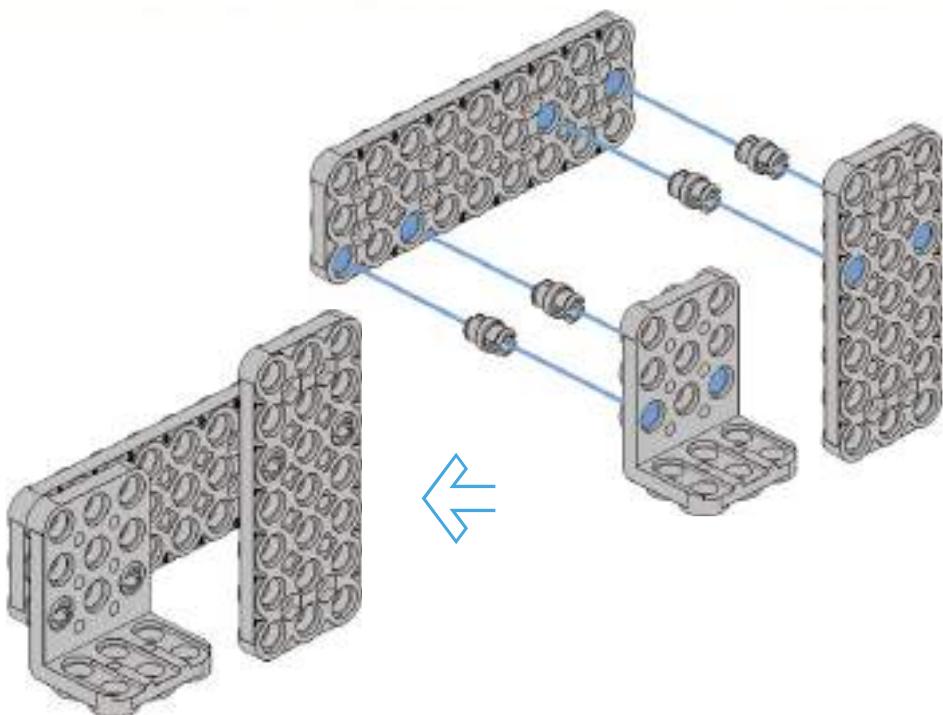


Use a
rotation motor.



Step 5

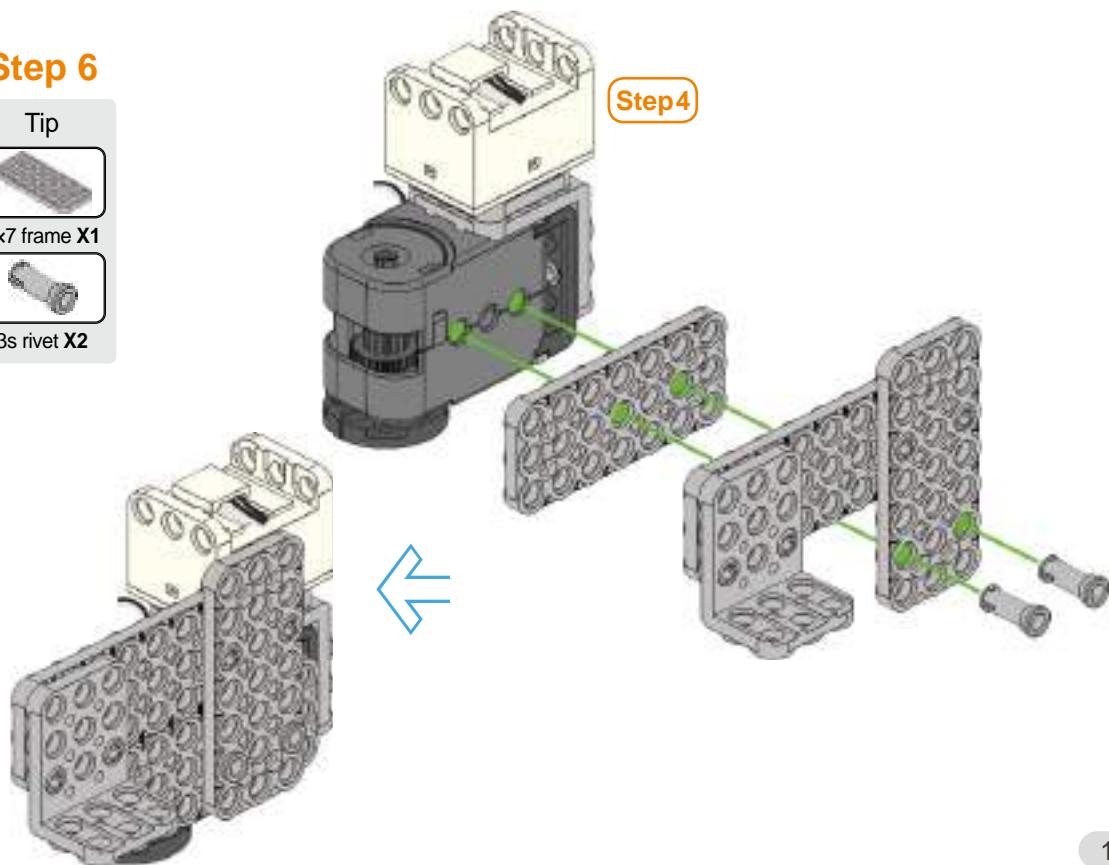
Tip
3x7 frame X1
3x9 frame X1
3x5 L frame X1
Double rivet X4



Step 6

Tip
3x7 frame X1
3s rivet X2

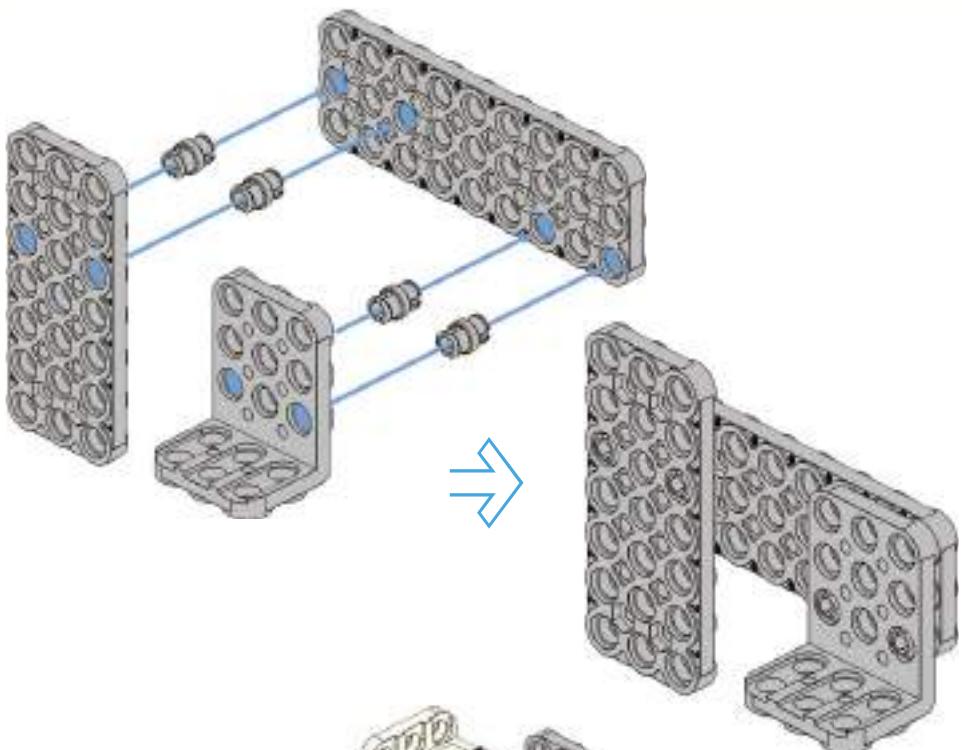
Step 4



Step 7

Tip

- 3x7 frame X1
- 3x9 frame X1
- 3x5 L frame X1
- Double rivet X4

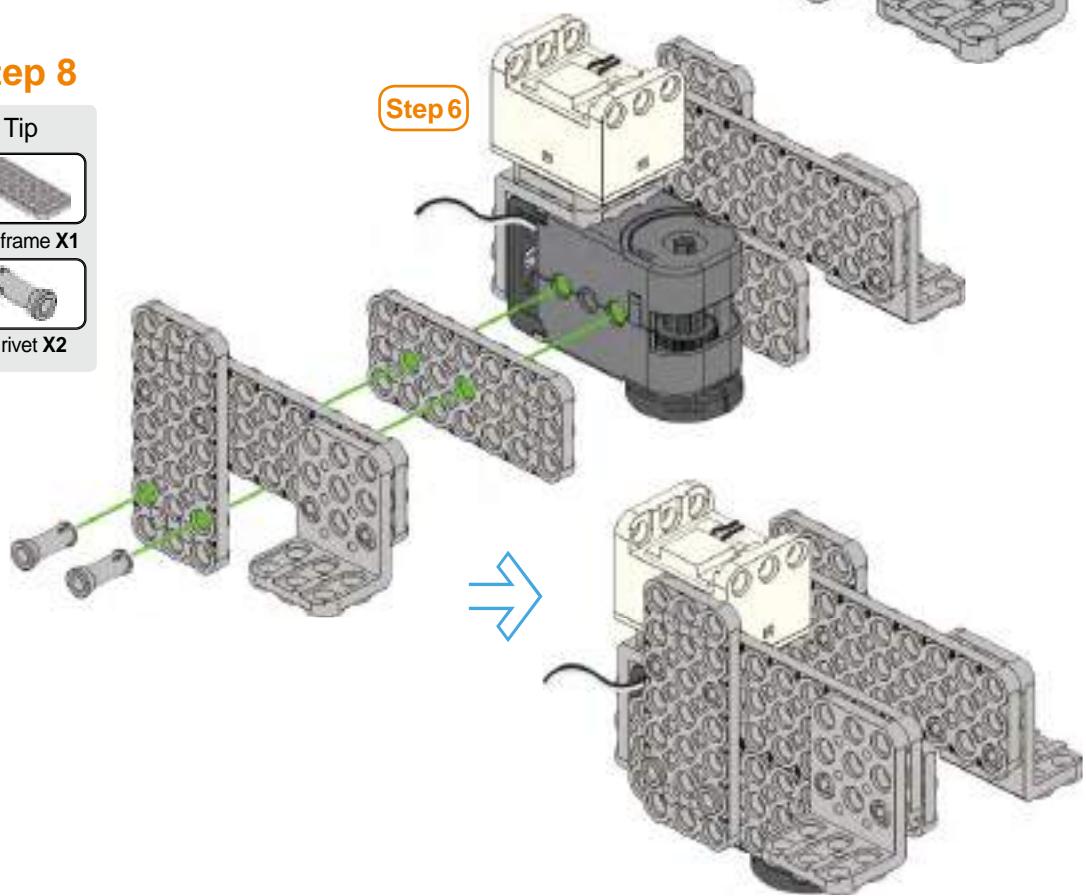


Step 8

Tip

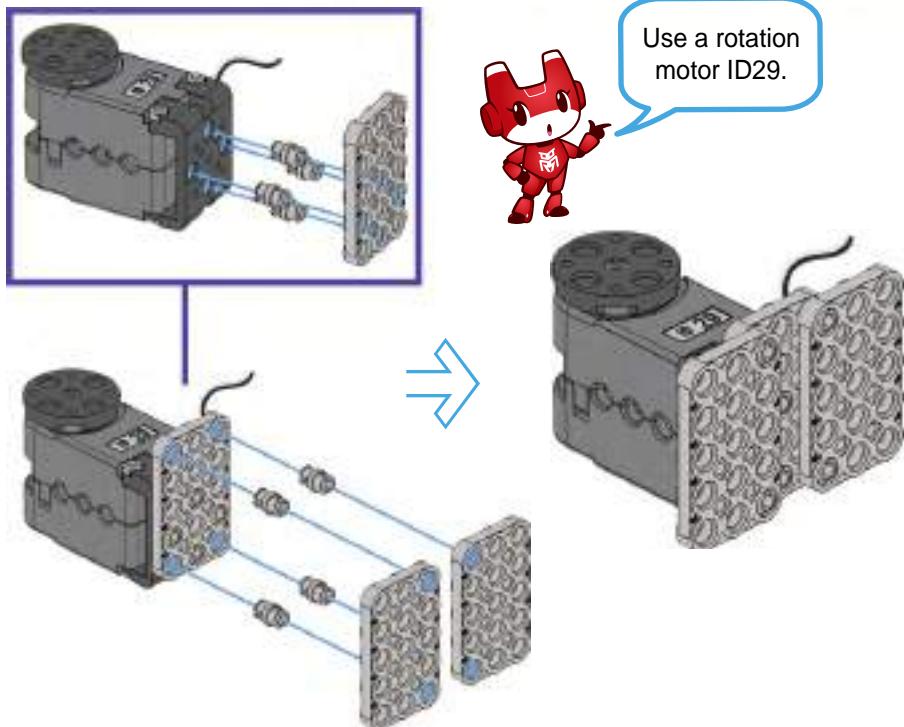
- 3x7 frame X1
- 3s rivet X2

Step 6



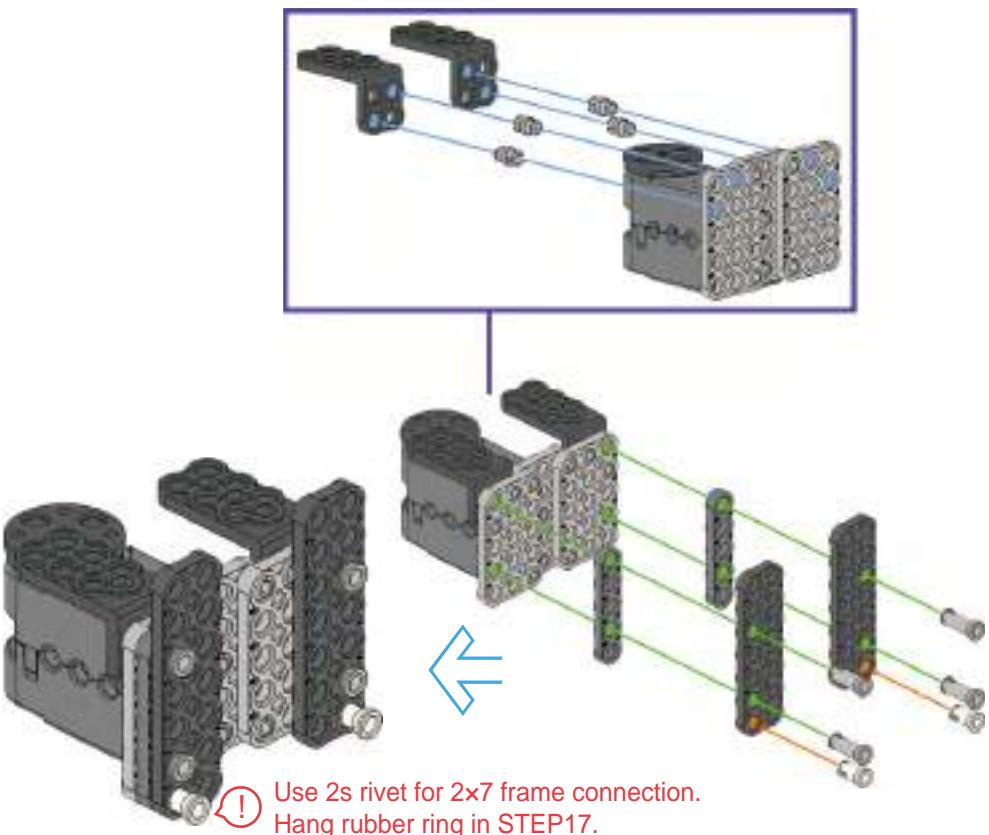
Step 9

Tip
R. motor (ID29) X1
3x5 frame X3
Double rivet X8



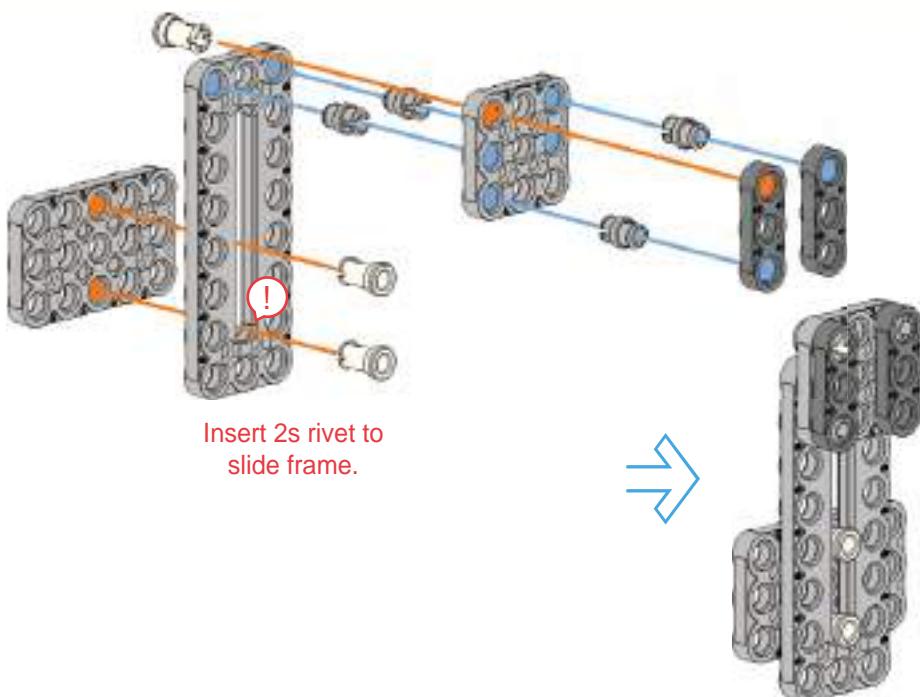
Step 10

Tip
1x5 frame X2
2x7 frame X2
2x5 L frame X2
2s rivet X2
3s rivet X4
Double rivet X4



Step 11

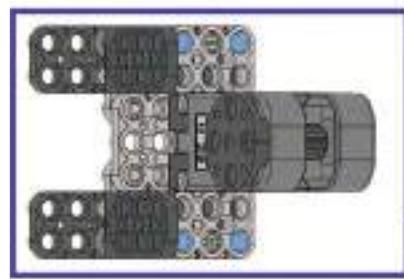
Tip
1x3 frame X2
3x3 frame X1
3x5 frame X1
3x8 slide frame X1
2s rivet X3
Double rivet X4



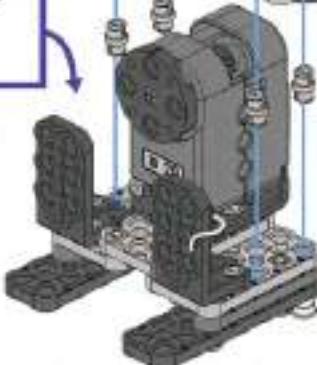
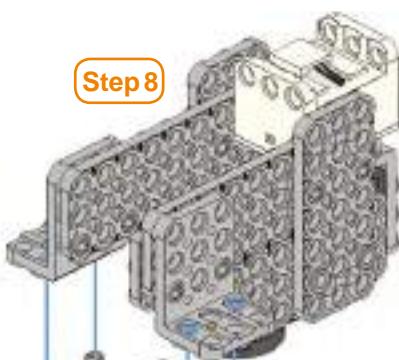
Insert 2s rivet to slide frame.

Step 12

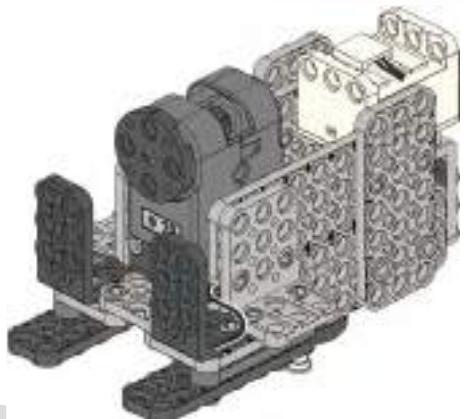
Tip
Double rivet X4



Step 8



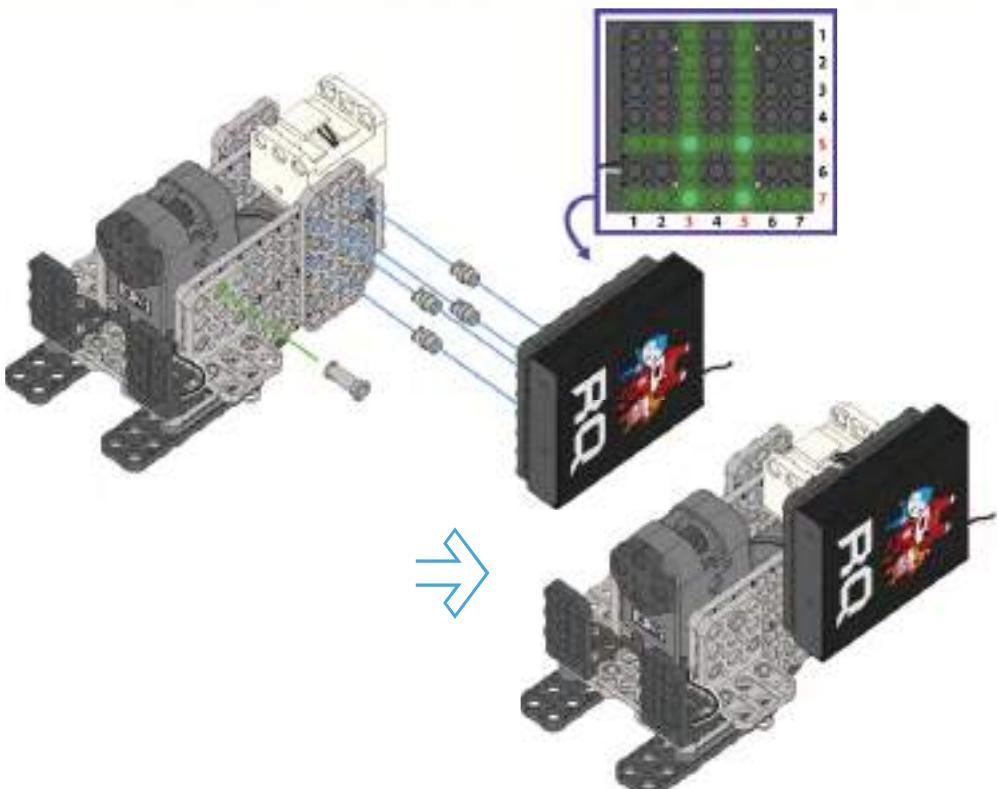
Step 10



Step 13

Tip

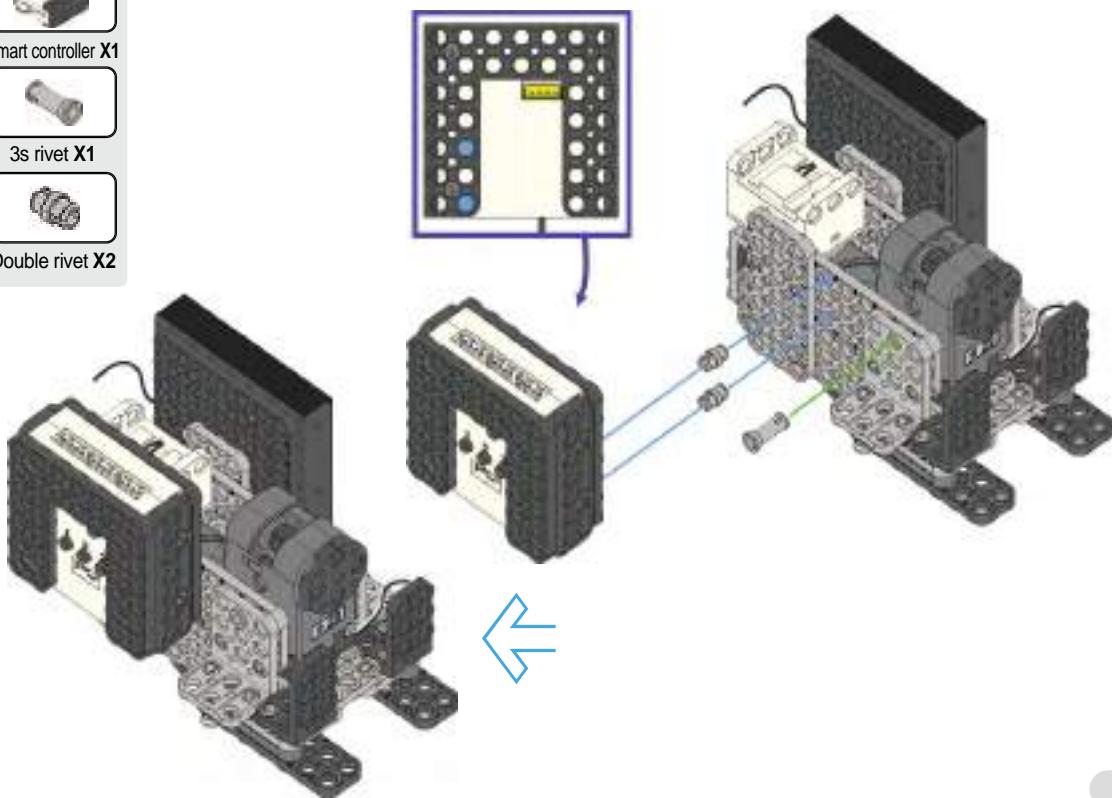
- Battery case X1
- 3s rivet X1
- Double rivet X4



Step 14

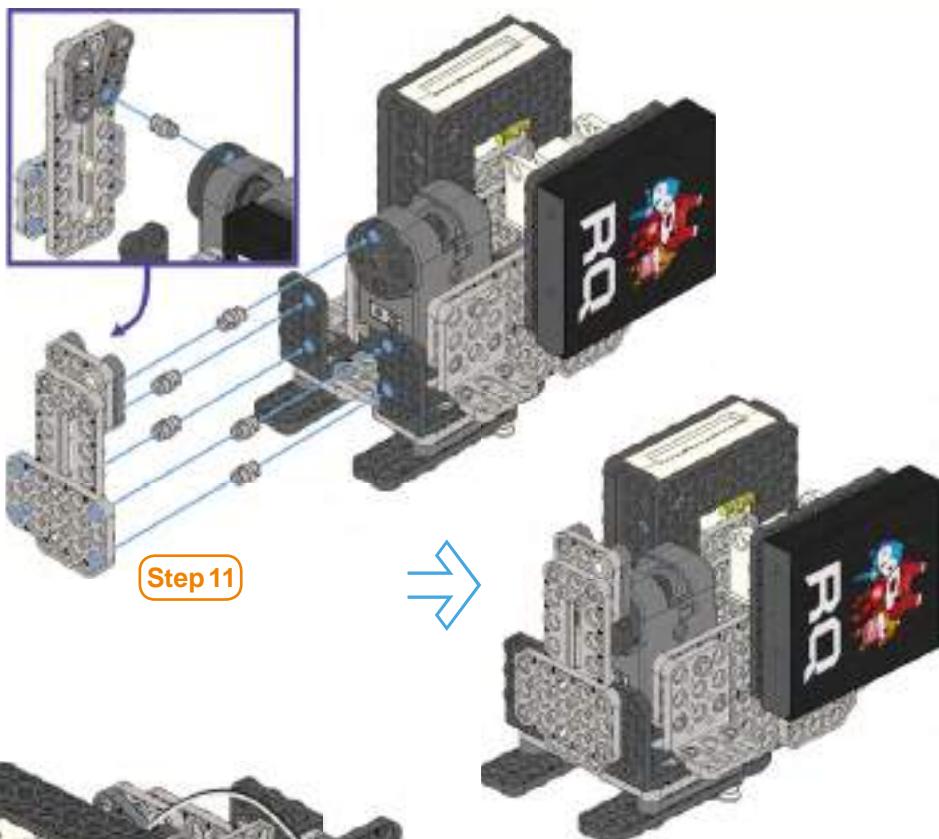
Tip

- Smart controller X1
- 3s rivet X1
- Double rivet X2

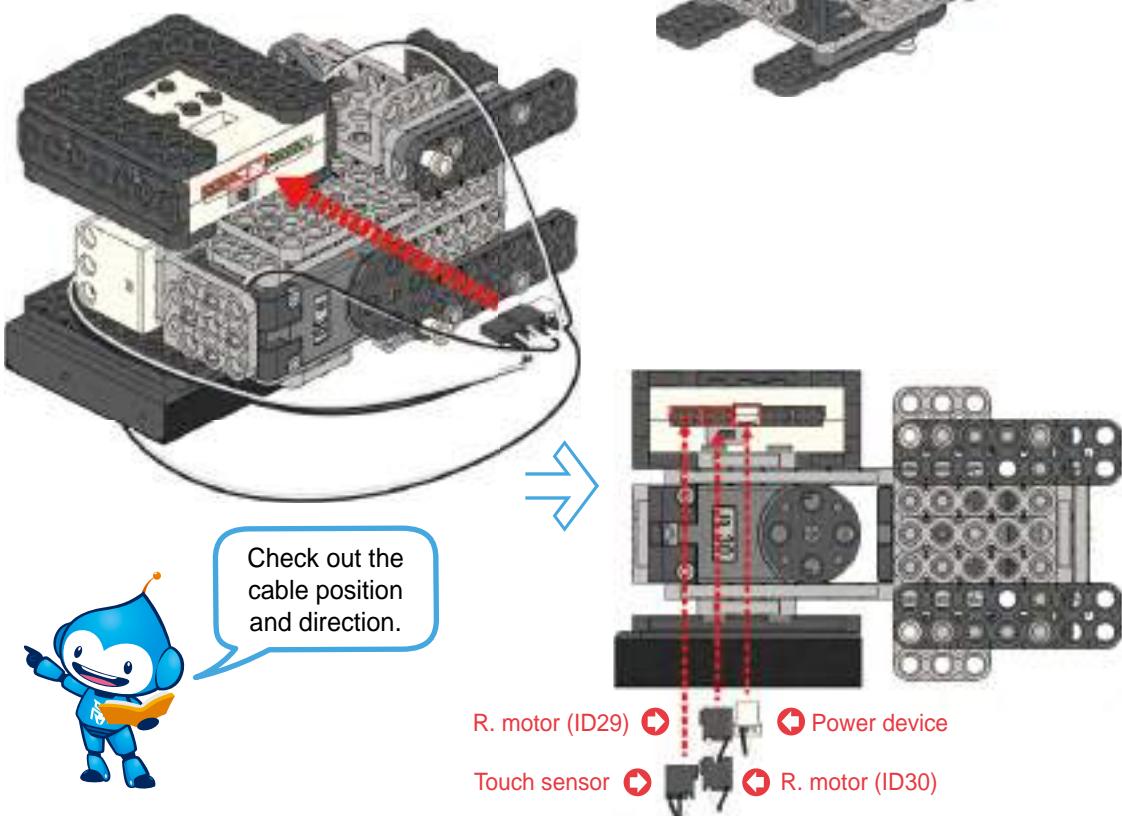


Step 15

Tip
Double rivet X5



Step 16



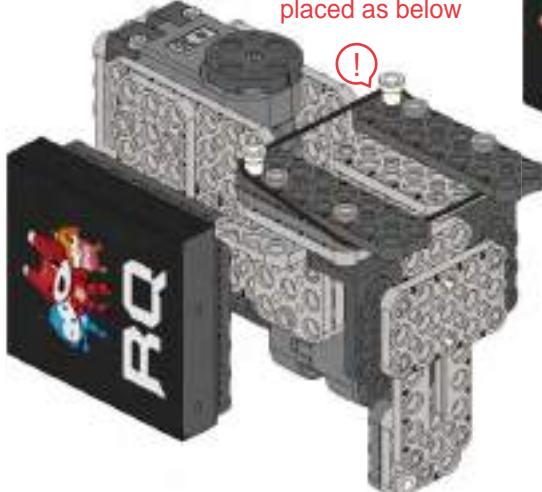
Step 17

Tip



Rubber ring X1

Rubber ring should be placed as below

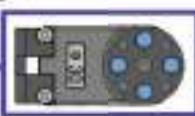
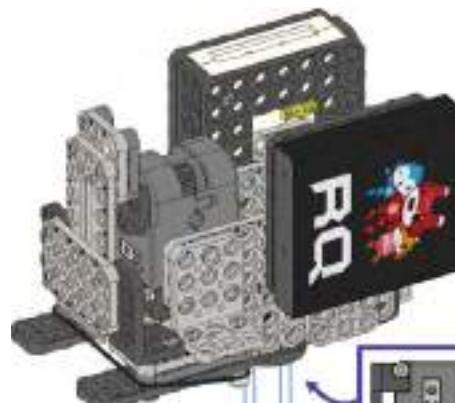


Step 18

Tip



Double rivet X4

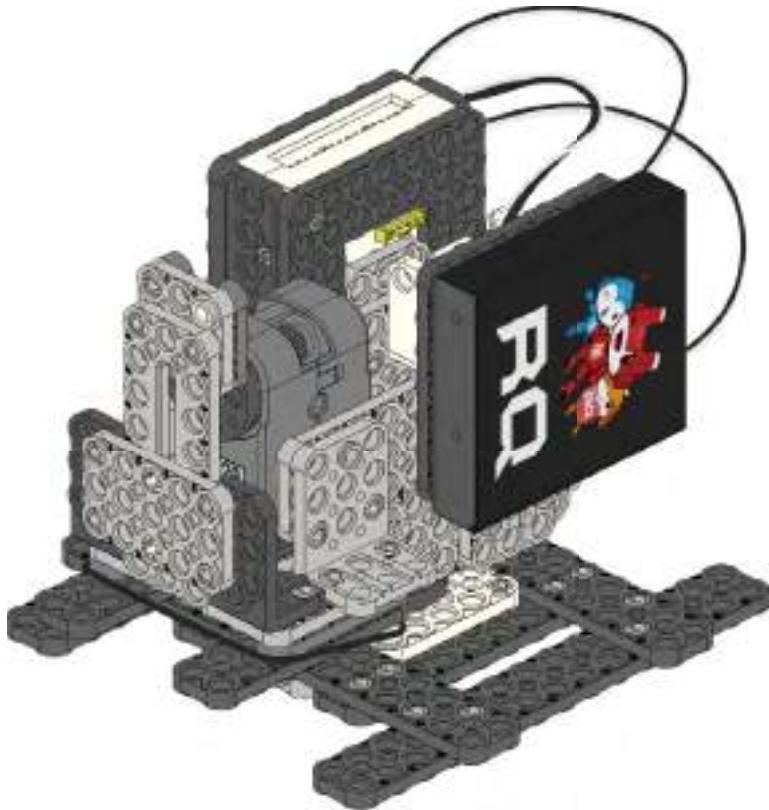


Step 3





★ 'Bowling Bot' ready! ★



- Select mode A when you control the Bowling Bot!



In order to change from mode B to mode A, turn off and on the RQC, then press button '#' and button 'A' together.

'Do, Re, Mi' sound is played when it switches into mode A.



Tips.

When you control the other robot models, select mode B based on page 17.

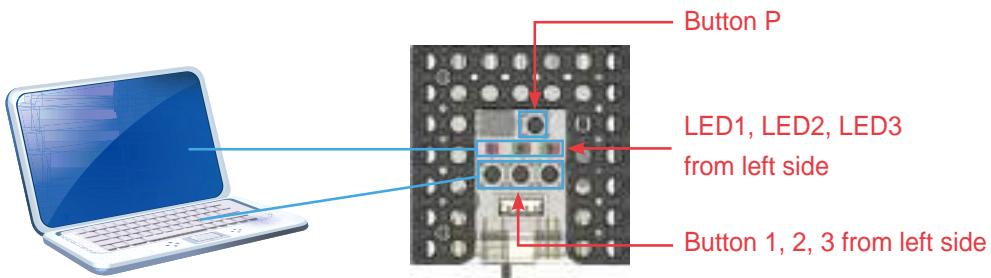


Robot Experience



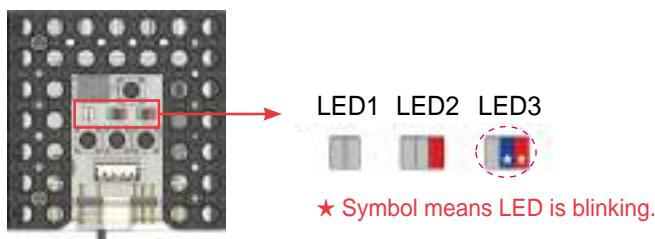
Set-up 'Rolling Bot' robot model.

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 'Bowling 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 properly, check the following.

1. When Bowling Bot is not working well :
 - ▶ Check the power device (battery case, power S/W) and other electronic parts connection carefully.
2. When wheel is not shot from Bowling Bot :
 - ▶ Check the 3x8 slide frame and rotation motors (ID29, ID30) assembly status and rubber ring.



Check movement and assembly.

1. Write which button on the IR remote controller to press in order to command the Bowling Bot.



- (1) Bowling Bot turns right.



button _____

- (2) Bowling Bot turns left.



button _____

- (3) Bowling Bot turns round slowly and stops slowly.



+

button _____

- (4) Shoot wheel when sound is detected.



+

button _____

- (5) Shoot wheel when touch sensor is pressed.



+

button _____



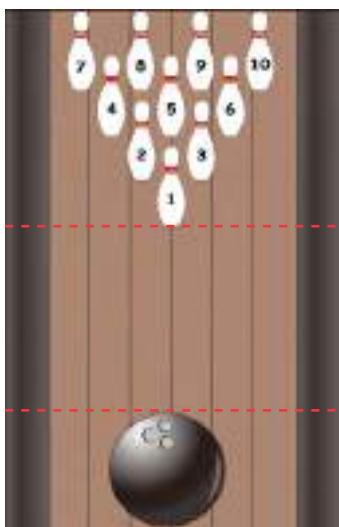
Robot Play



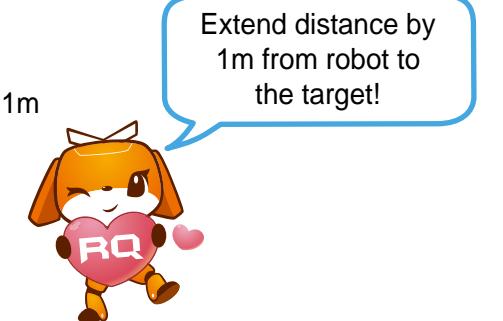
Mini bowling game

Shoot out to target objects as you control the Bowling Bot. Discuss with your friends to make new rules to make the game more exciting. Bring more friends to play with as you can make teams.

- As below, place your Bowling Bot where the bowling ball is. Place 10 pieces of 2x5 L frame in as bowling pins.
- Shoot wheel two times towards the 2x5 L frames.
- Whoever strikes more 2x5 frames wins game.
- Discuss with friends to decide on the number of frames and the distance between the bowl and the pins.



※ Set 2x5 L frames as below.



Extend distance by
1m from robot to
the target!

◆ Describe your 'Bowling Bot'.

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



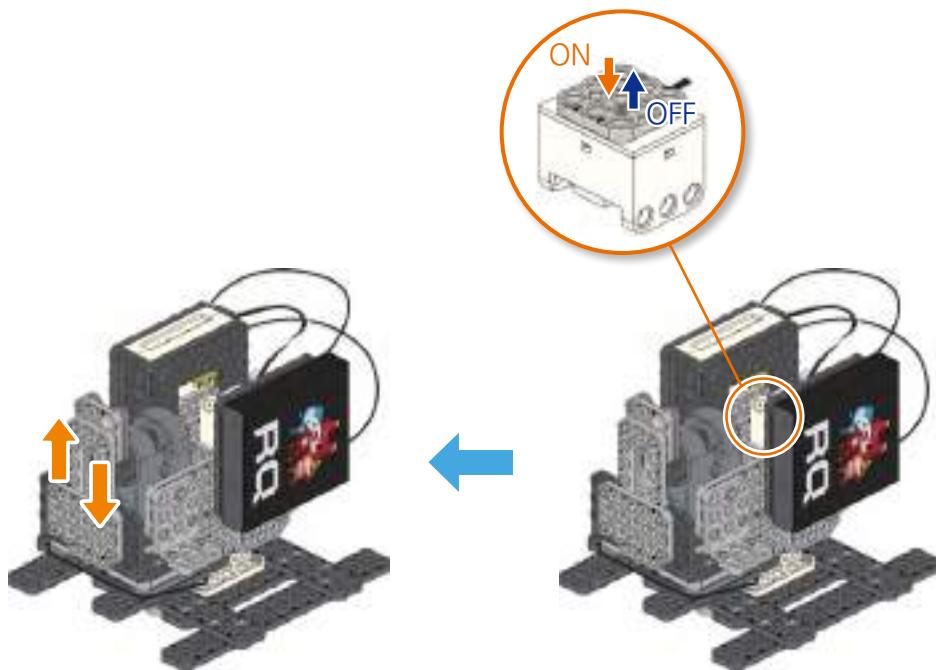


Robot coding with Scratch



Coding Mission

Bowling Bot discharges and then charges when the touch sensor is pressed.



⟨ Repeat shooting or loading ⟩

⟨ Detect with touch sensor ⟩

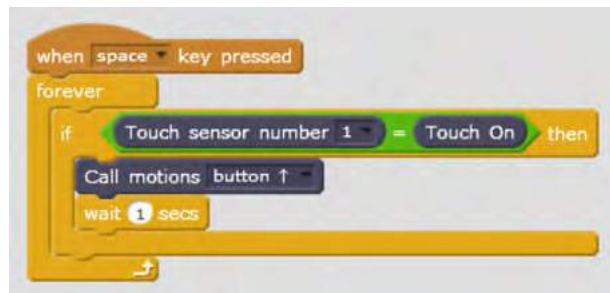
◆ Check before Coding Mission

- Check if Scratch Builder is installed before Coding Mission.
- Download Scratch Builder from the Robobuilder site and install.
(Download the most recent version in Support-Software at www.robobuilder.net.)
- Download other detailed explanation at the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



Making a Scratch block

Create a Scratch block as below and run by pressing the spacebar on the keyboard.



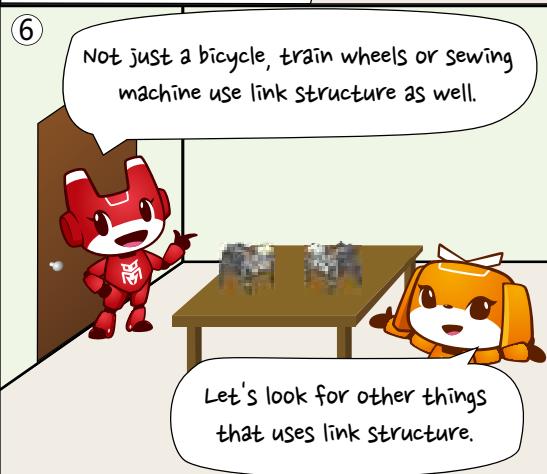
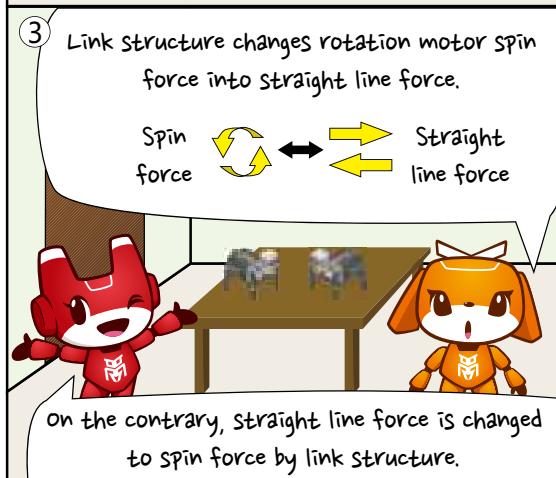
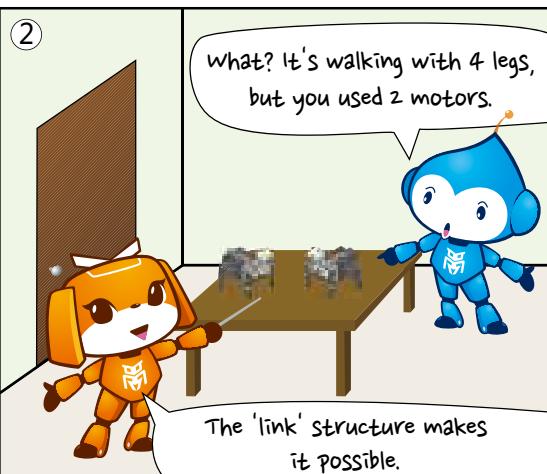
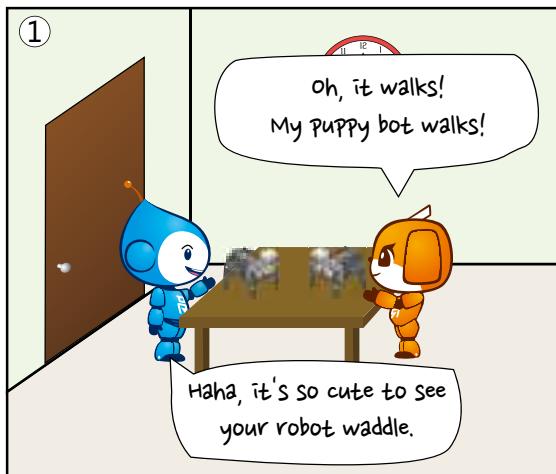
Save the block on Scratch and upload to the robot using Scratch Builder to run without the communication cable (**press # + 4 button** on the remote to run the uploaded code).

❖ Any questions about Coding Mission?

- For any questions about robot coding mission, visit Support-Technical support at www.robobuilder.net.
- Download the 'Scratch Builder' manual on the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)

9. Puppy Bot

Walk with four legs.





Today's Robot Class



Puppy Bot can walk with four legs. It only uses two rotation motors, but the link structure makes it possible to move four legs. Link structure changes the motor spin power to walk device, such as bicycle, sewing machine and wiper for cars.

* 4 legs walking: walk with four legs.



Look at the wagging tail!
Means feel so good!



'AIBO', developed by SONY, Japan, is world's first intelligent puppy robot. This robot can express various feelings like happy, sad, and angry. It sometimes entertains people happy with other functions.





Robot Assembly



Prepare robot parts.



Smart controller **X1**



R. motor (ID29,30) **X2**



Battery case **X1**



LED **X1**



1x3 frame **X4**



1x5 frame **X3**



1x12 frame **X2**



2x7 frame **X3**



2x9 frame **X4**



3x5 frame **X4**



3x7 frame **X1**



2x4 L frame **X4**



3x5 L frame **X3**



3x6 L frame **X1**



Hinge A **X2**



Hinge B **X1**



2s rivet **X13**



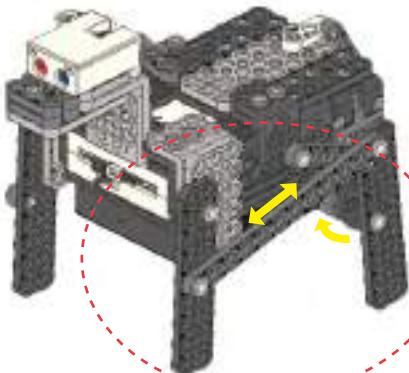
3s rivet **X12**



Double rivet **X40**



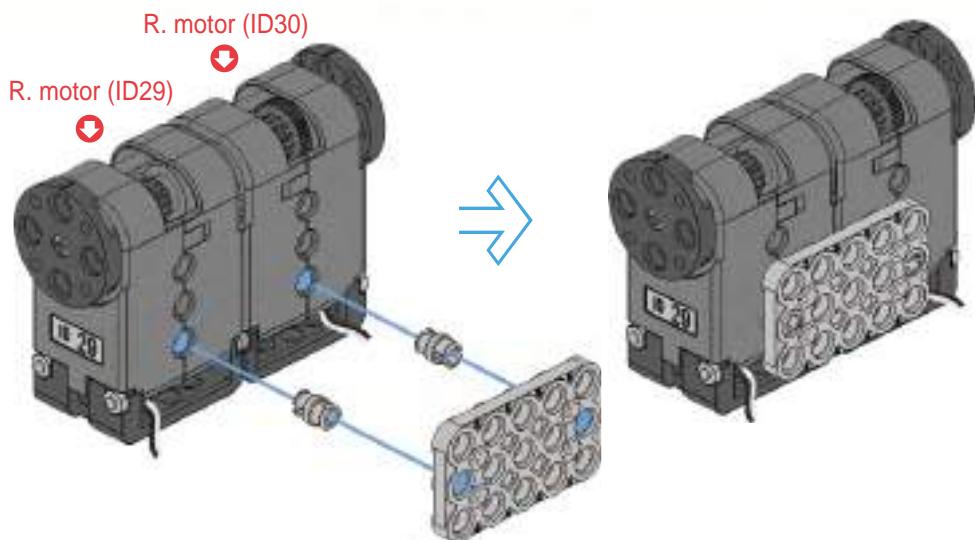
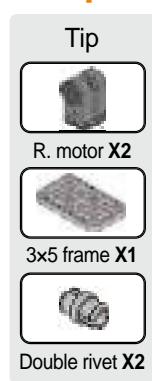
Tips.



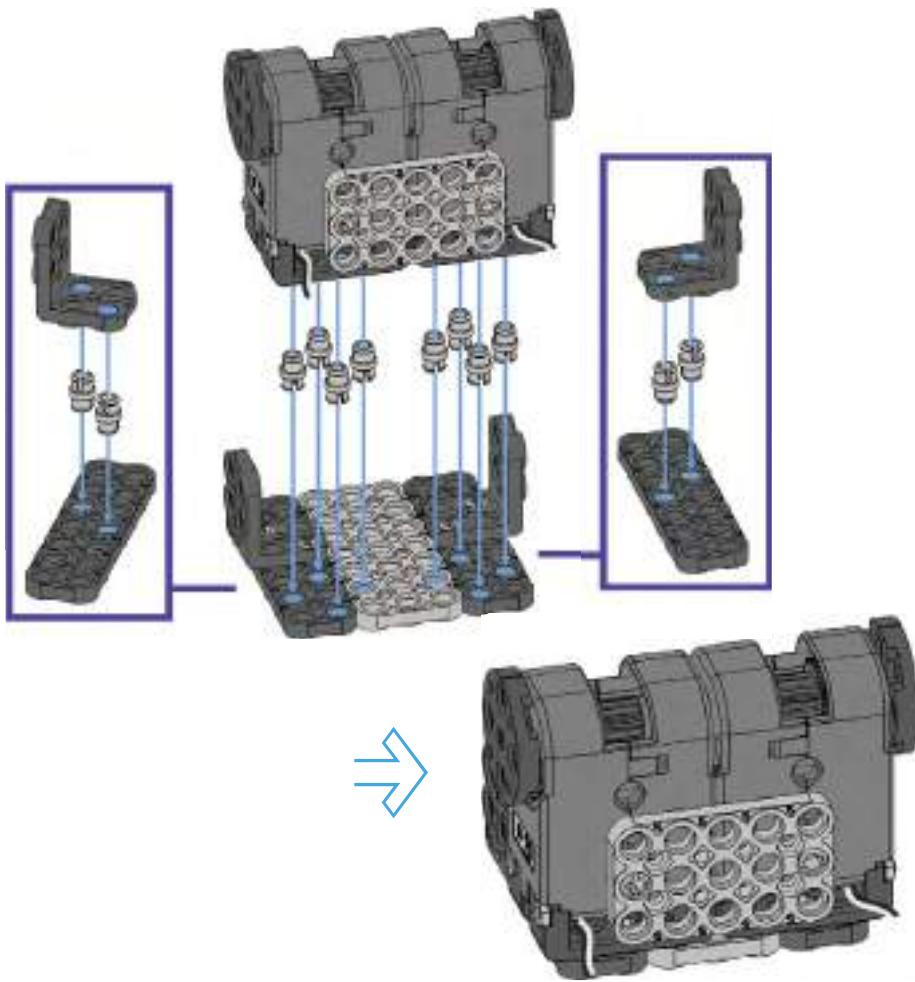
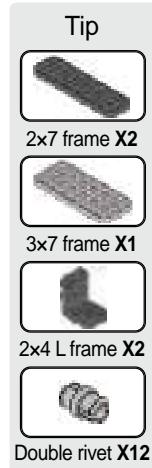
Puppy Bot uses a link structure that enables it to walk with four legs. The rotation motor spin power is changed into straight line motion to have the robot walk on four legs.

Refer to the STEP12 and STEP14 for rotation motor and frame connection.

Step 1



Step 2



Step 3

Tip



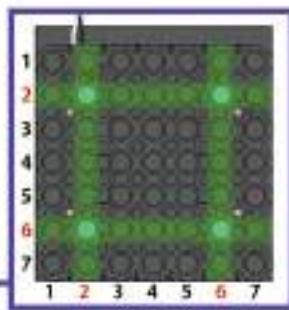
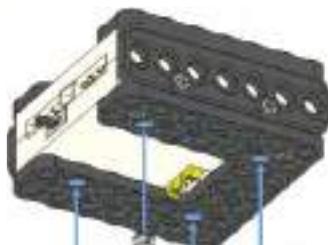
Smart controller X1



Battery case X1



Double rivet X4

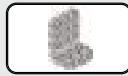


Step 4

Tip



2x7 frame X1



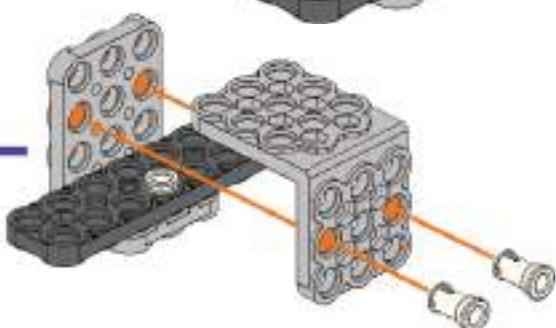
3x5 L frame X1



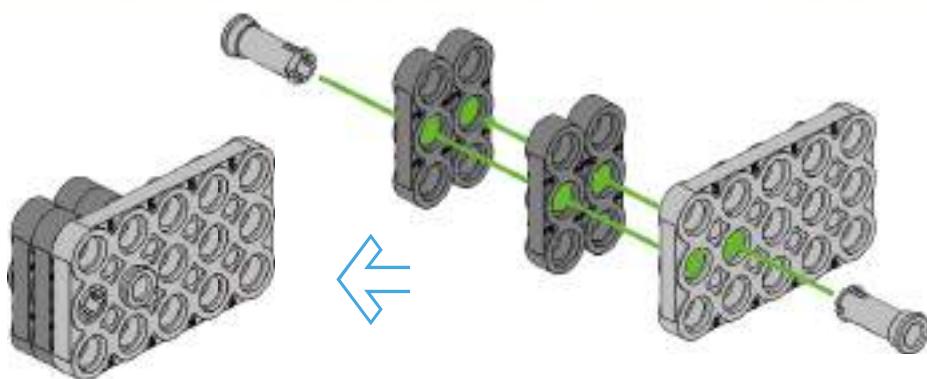
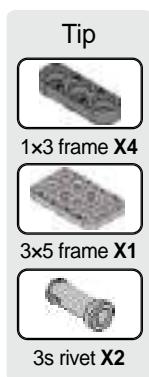
3x6 L frame X1



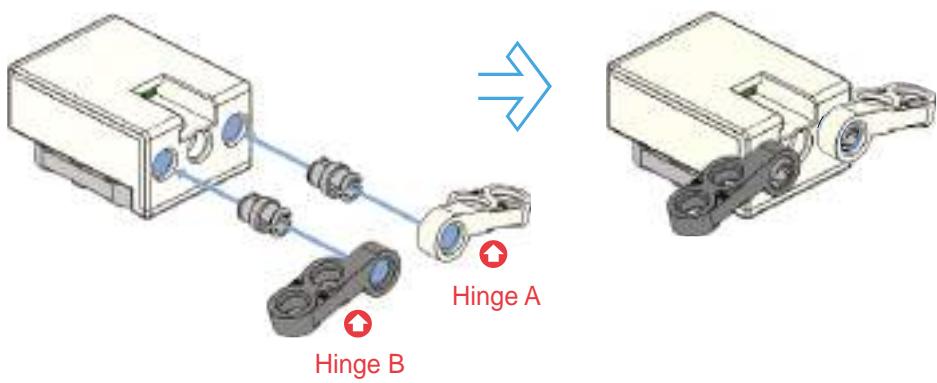
2s rivet X3



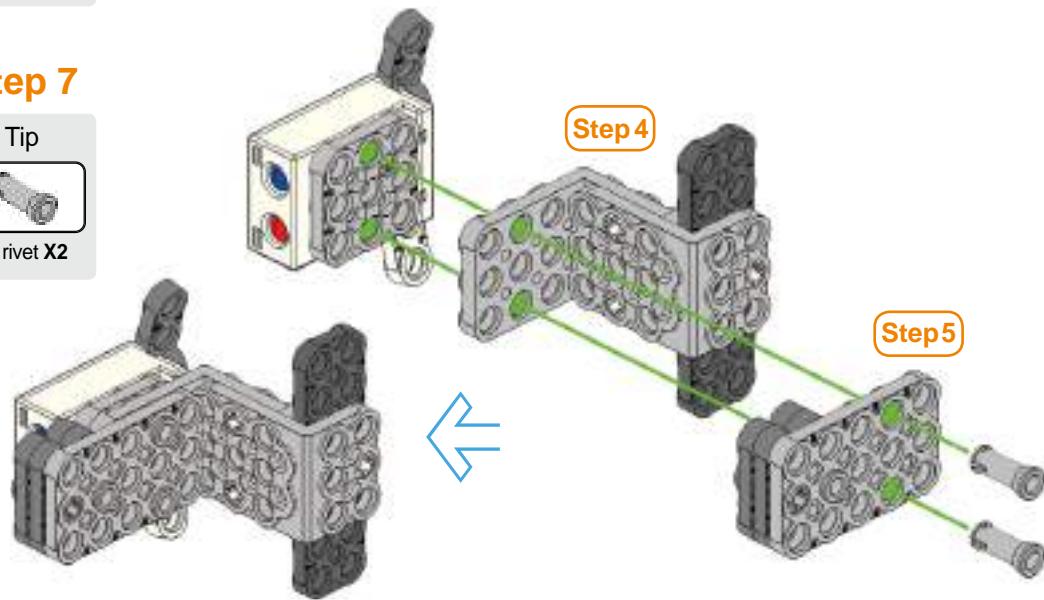
Step 5



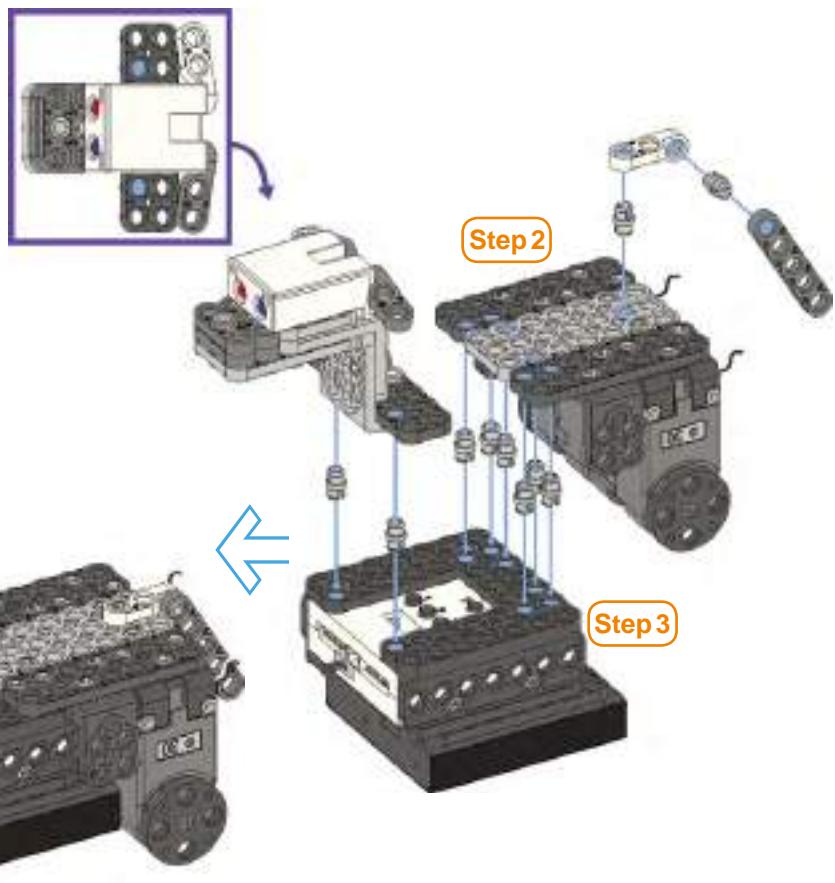
Step 6



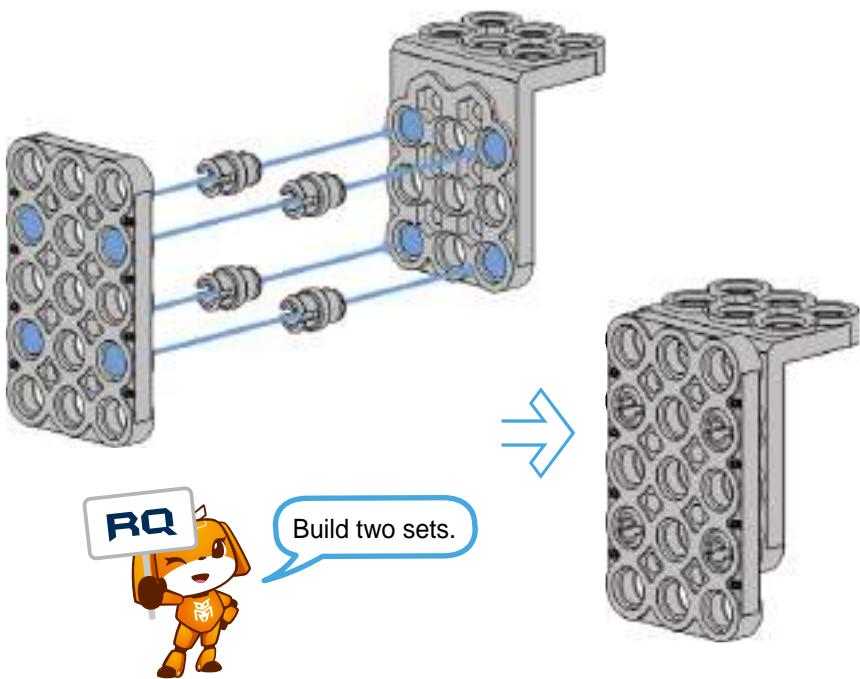
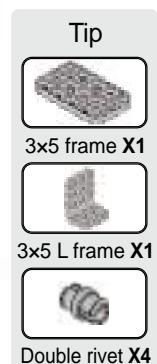
Step 7



Step 8

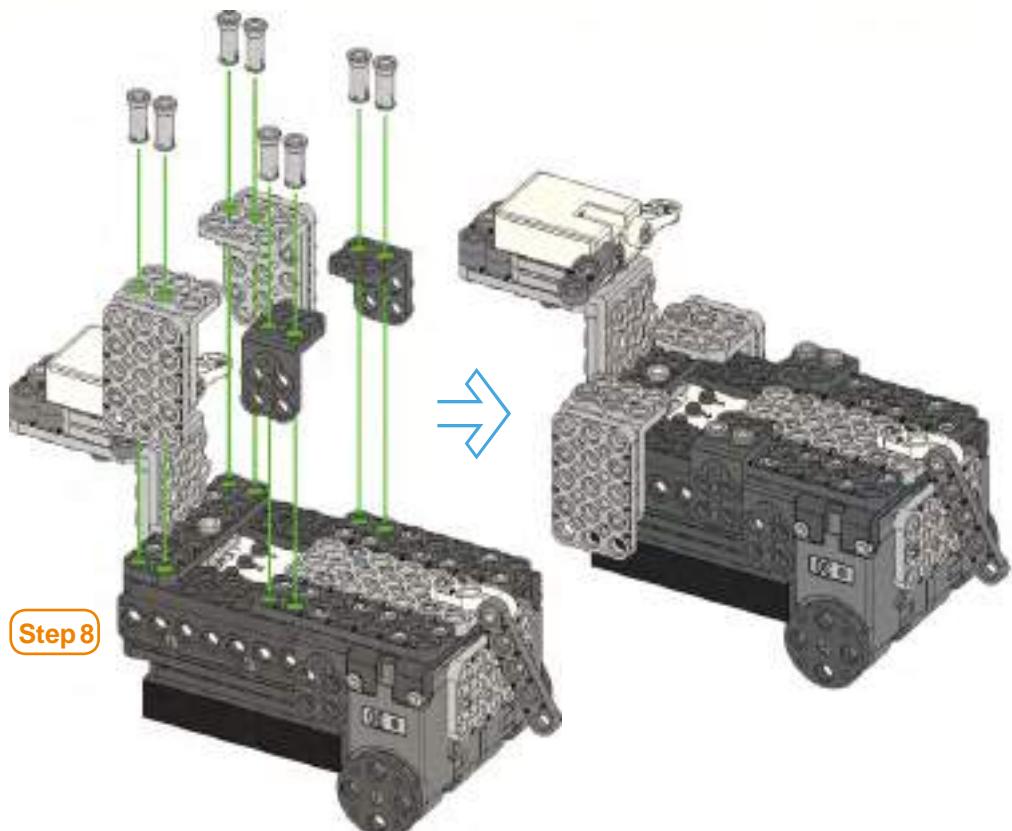
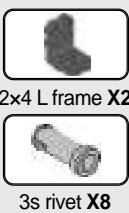


Step 9 (X2)



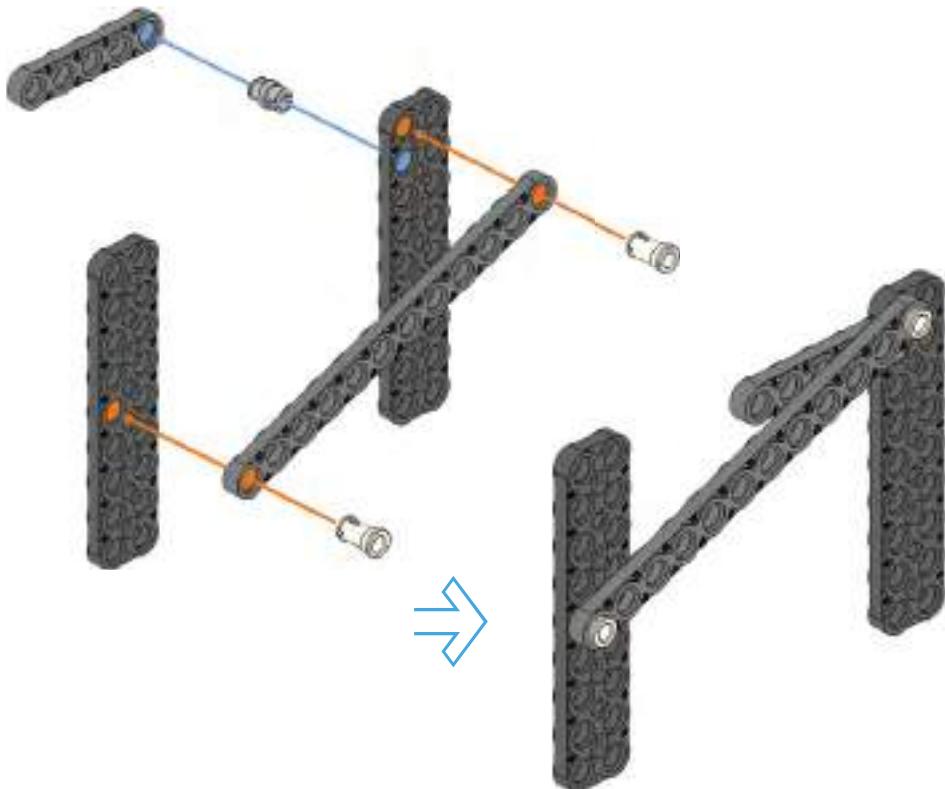
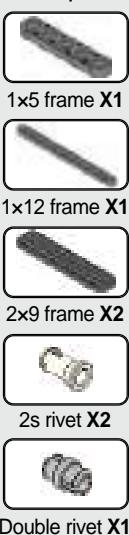
Step 10

Tip



Step 11

Tip

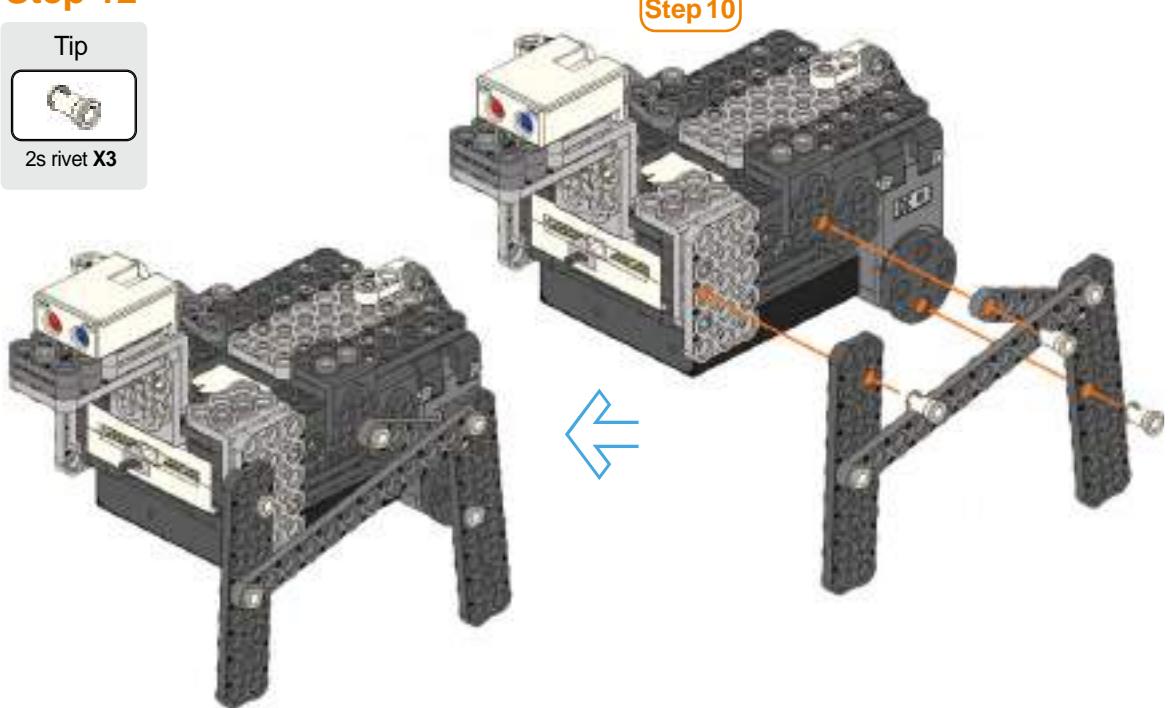


Step 12

Tip



2s rivet X3



Step 13

Tip



1x5 frame X1



1x12 frame X1



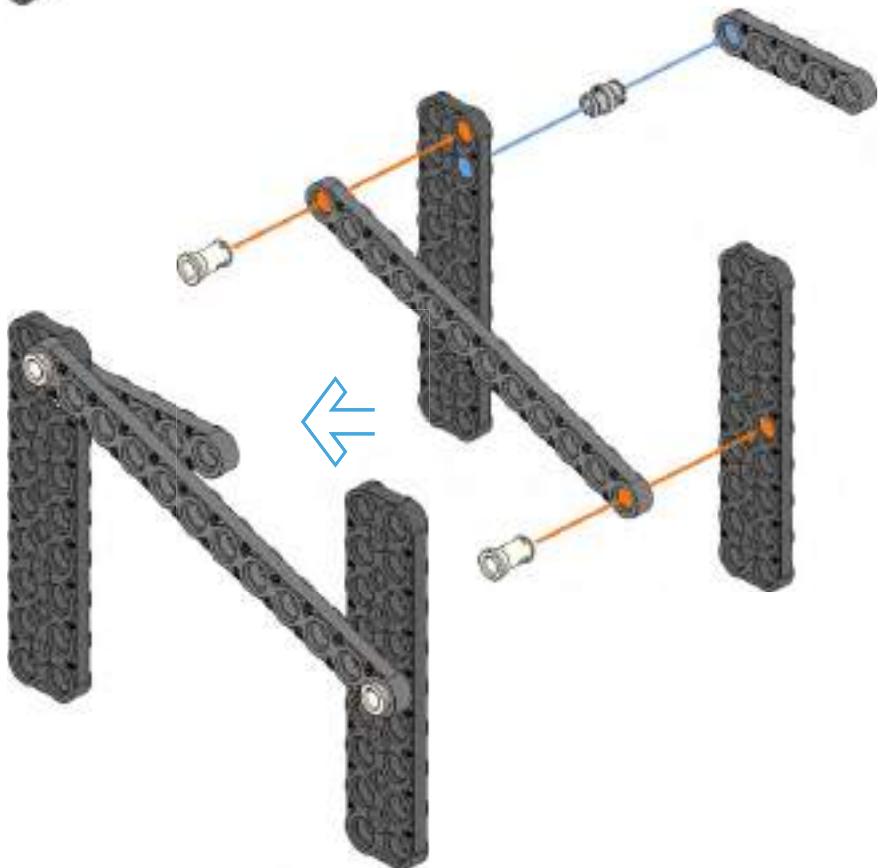
2x9 frame X2



2s rivet X2



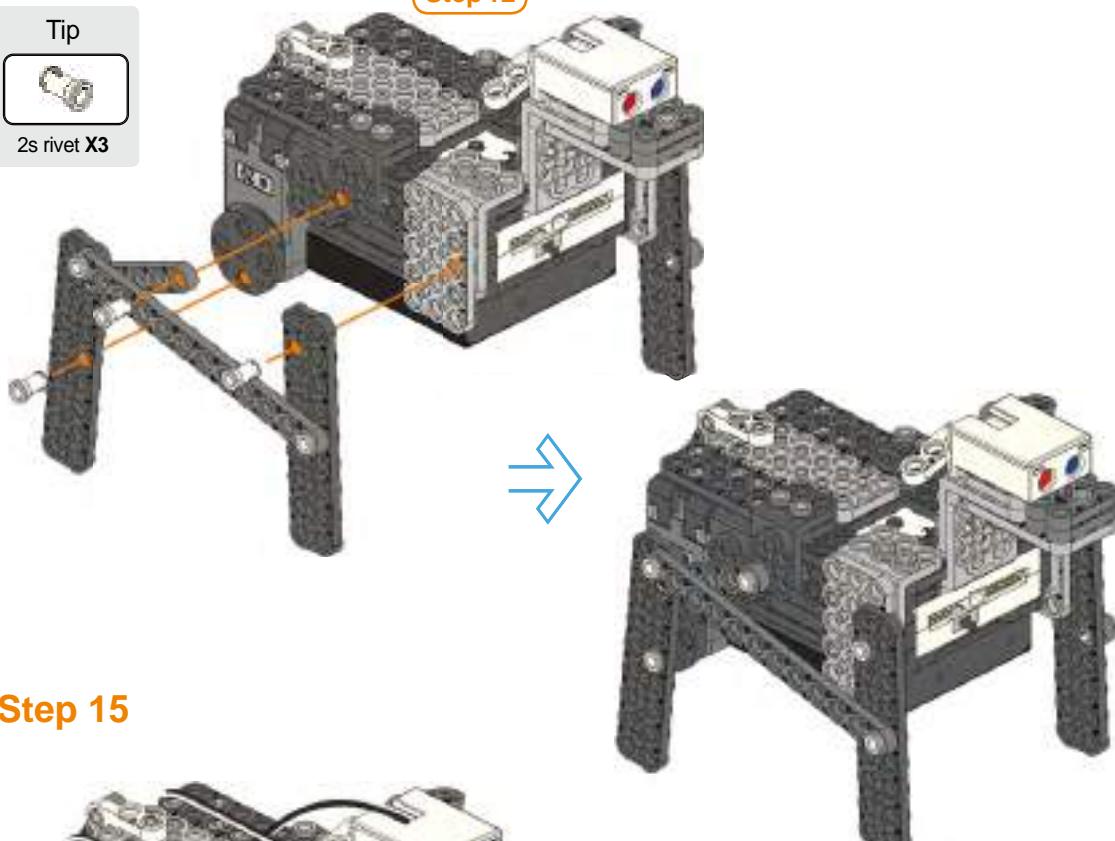
Double rivet X1



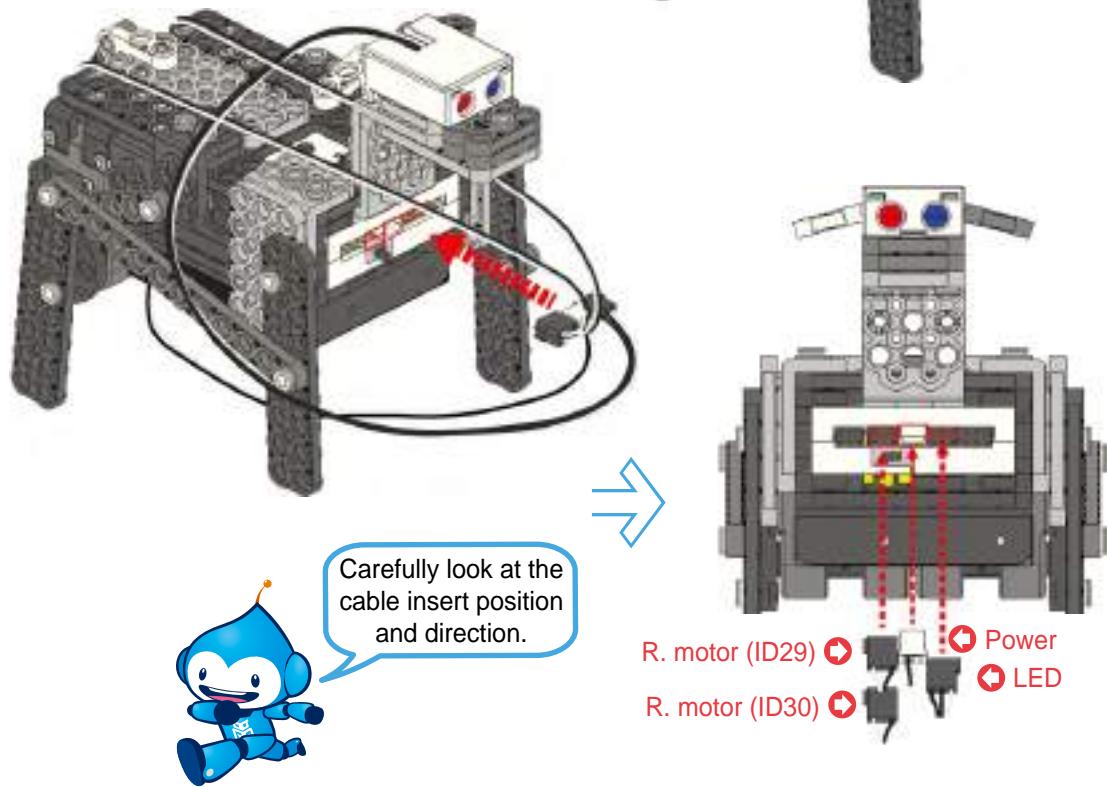
Step 14

Tip
2s rivet X3

Step 12

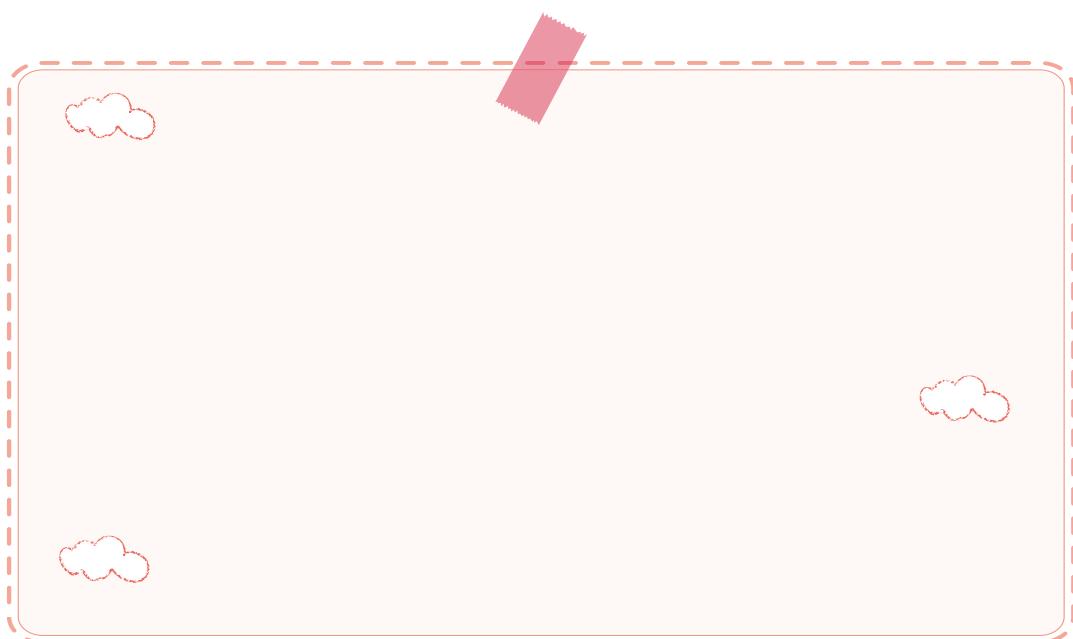
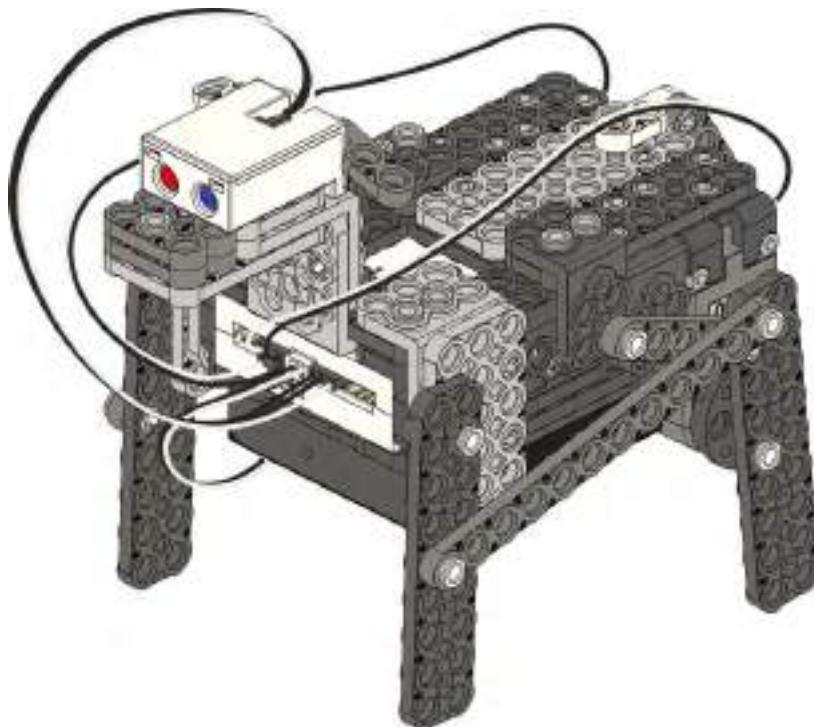


Step 15





★ 'Puppy Bot' ready! ★



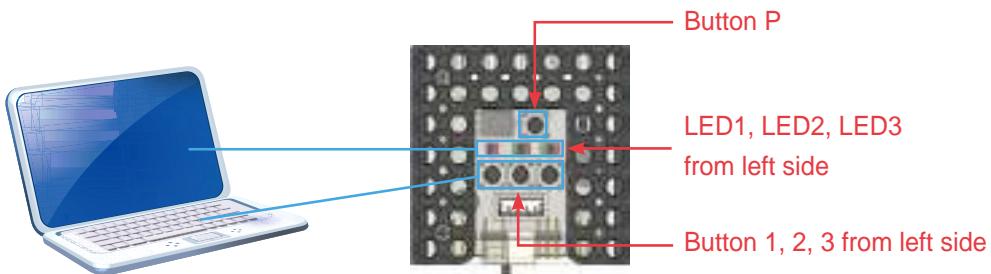


Robot Experience



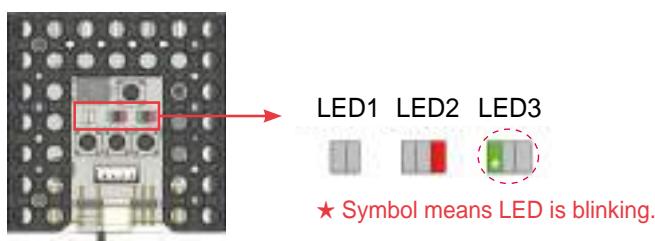
Set-up 'Puppy Bot' robot model.

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 'Puppy 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 properly, check the following.

1. When rotation motor is not moving :
 - ▶ Check whether the rotation motors ID29, ID30 are connected to the smart controller.
2. When four legs walking is not working well :
 - ▶ Refer to STEP12 and STEP14 for link structure assembly status.



Check movement and assembly.

1. Who has the correct information on Puppy Bot's movement?



- (1) : Button ① : It walks from right leg to left leg in order to go forward.



- (2) : Button ② : It repeatedly goes forward and backward.



- (3) : Button ③ : It walks from left leg to right leg in order to go backward.



2. Read below and mark 'O' for correct answer.

- (1) # + ① buttons (



).

- Ⓐ Go forward when sound is detected.

- Ⓑ Move slowly, and stop slowly.

- Ⓒ Go backward when sound is detected.

- (2) # + ② buttons (



).

- Ⓐ Go forward when sound is detected.

- Ⓑ Move slowly, and stop slowly.

- Ⓒ Go backward when sound is detected.

- (3) What happens when you press # + ③ together?



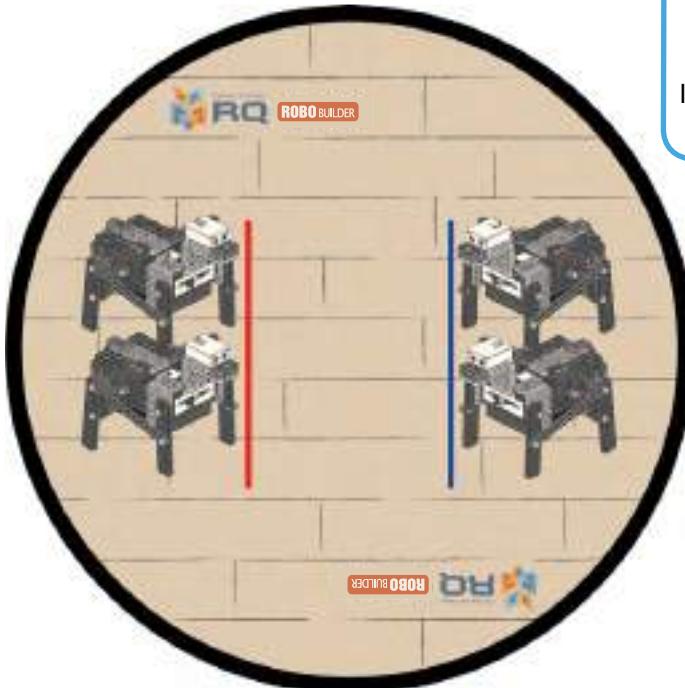
Robot Play



Yo-ho~ Yo-ho~ Push it out.

Play 'Push' game as you control the Puppy Bot. On the game board, play 2 vs. 2 with your friends. If you push your friend's robot out of the board, you win.

- Play 2 vs. 2, or 3 vs. 3 with your friends.
- Each game is 3 minutes long. Whoever pushes out the opponent first wins.
- Make rules with your friend.



How about we place obstacles inside of the board game panel?
If you touch it, you can't play for 5 seconds.



◆ Describe your 'Puppy Bot'.

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





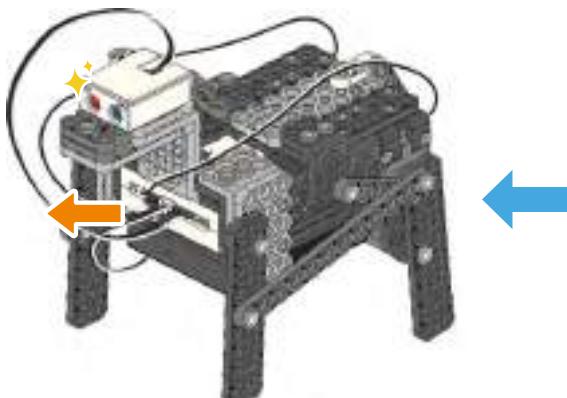
Robot coding with Scratch



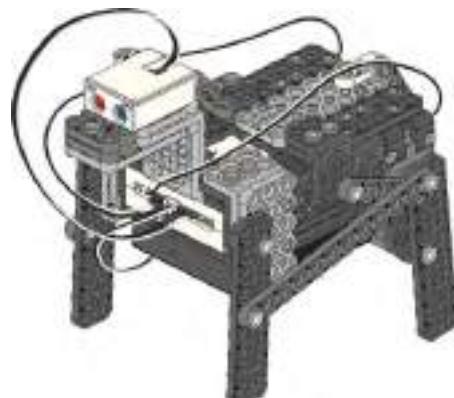
Coding Mission

Puppy Bot blinks its eyes and moves forward when it hears voice.

Go forward!



⟨ Move straight and stop ⟩



⟨ Detect voice ⟩

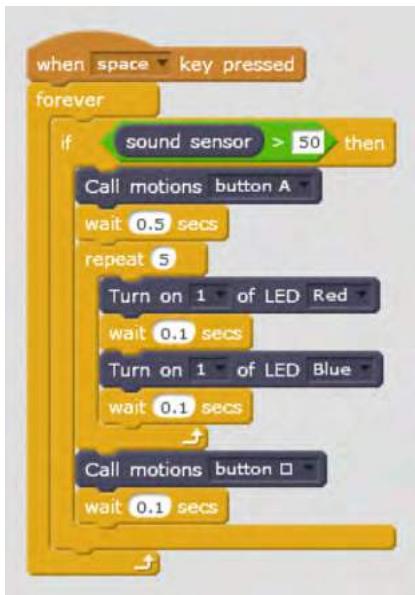
◆ Check before Coding Mission

- Check if Scratch Builder is installed before Coding Mission.
- Download Scratch Builder from the Robobuilder site and install.
(Download the most recent version in Support-Software at www.robobuilder.net.)
- Download other detailed explanation at the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



Making a Scratch block

Create a Scratch block as below and run by pressing the spacebar on the keyboard.



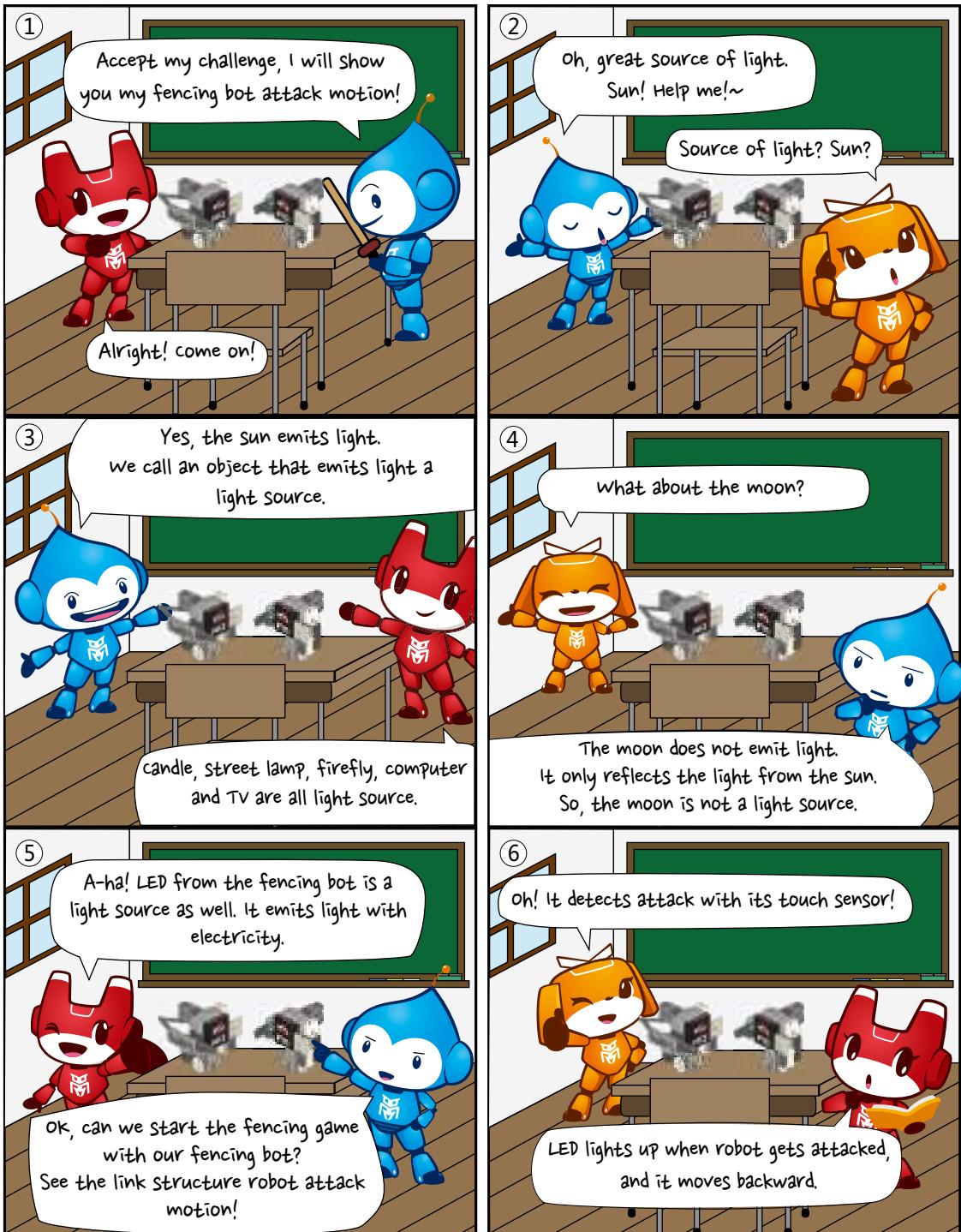
Save the block on Scratch and upload to the robot using Scratch Builder to run without the communication cable (**press # + 4 button** on the remote to run the uploaded code).

❖ Any questions about Coding Mission?

- For any questions about robot coding mission, visit Support-Technical support at www.robobuilder.net.
- Download the 'Scratch Builder' manual on the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)

10. Fencing Bot

Twinkle, twinkle.

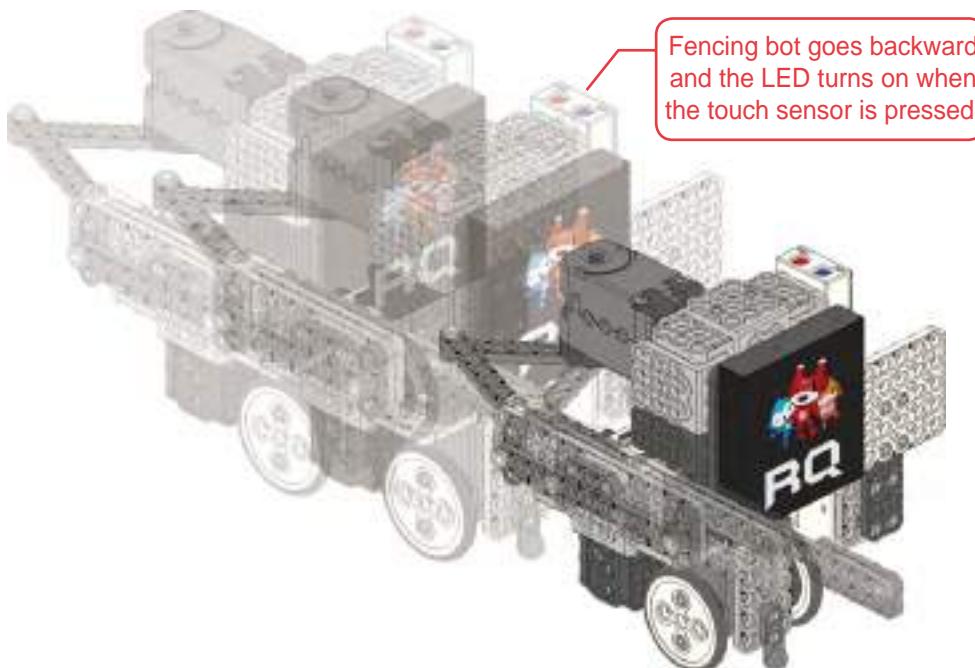




Today's Robot Class



Fencing Bot moves forward, backward and moves its sword with two rotation motors. One rotation motor makes it move forward and backward, and the other rotation motor makes the sword move by using the link structure.



Fencing bot goes backward
and the LED turns on when
the touch sensor is pressed.



Fencing is a sport in which two competitors fight each other using very thin swords. The ends of the swords are covered and the competitors wear protective clothes, so that they do not hurt each other!



Jacket and helmet are made of steel to protect fencing player!



Robot Assembly



Prepare robot parts.



Smart controller X1



R. motor (ID29,30) X2



Battery case X1



LED X1



Touch sensor X1



1x3 frame X3



1x8 frame X3



1x12 frame X1



2x5 frame X1



2x7 frame X1



2x9 frame X1



3x5 frame X4



3x7 frame X3



3x9 frame X3



5x5 frame X1



3x8 slide frame X1



2x5 L frame X4



3x5 L frame X3



3x6 L frame X3



Ball frame X2



Wheel X2



Rubber ring X2



X1



Front horn X1



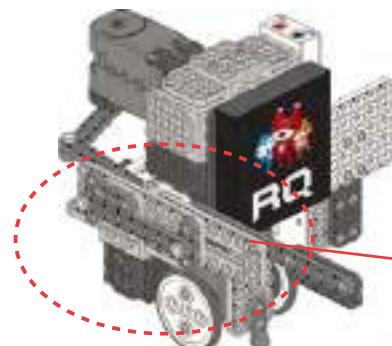
2s rivet X11



Double rivet X89



Tips.



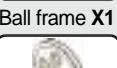
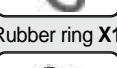
Fencing Bot and previous robot model 'Bowling Bot' use a 3x8 slide frame. This means all these robot models use link structure.

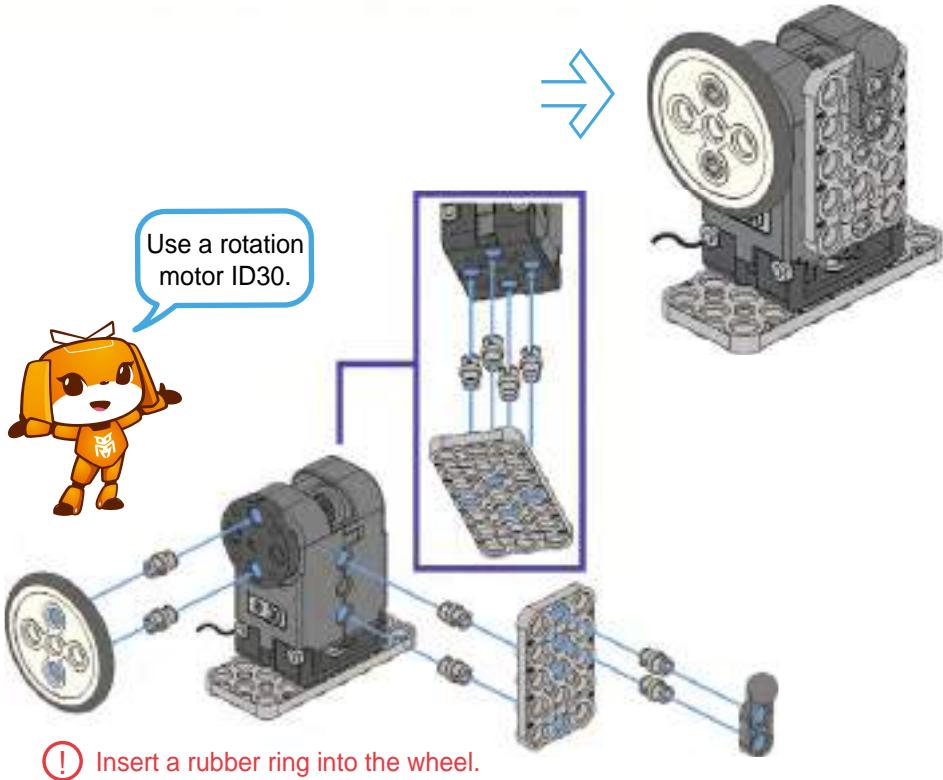
Link structure helps changing motor spin power to straight line movement for special motions.

Fencing Bot's 3x8 slide frame makes straight line movement, or the attack motion, possible.

Step 1

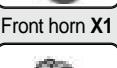
Tip

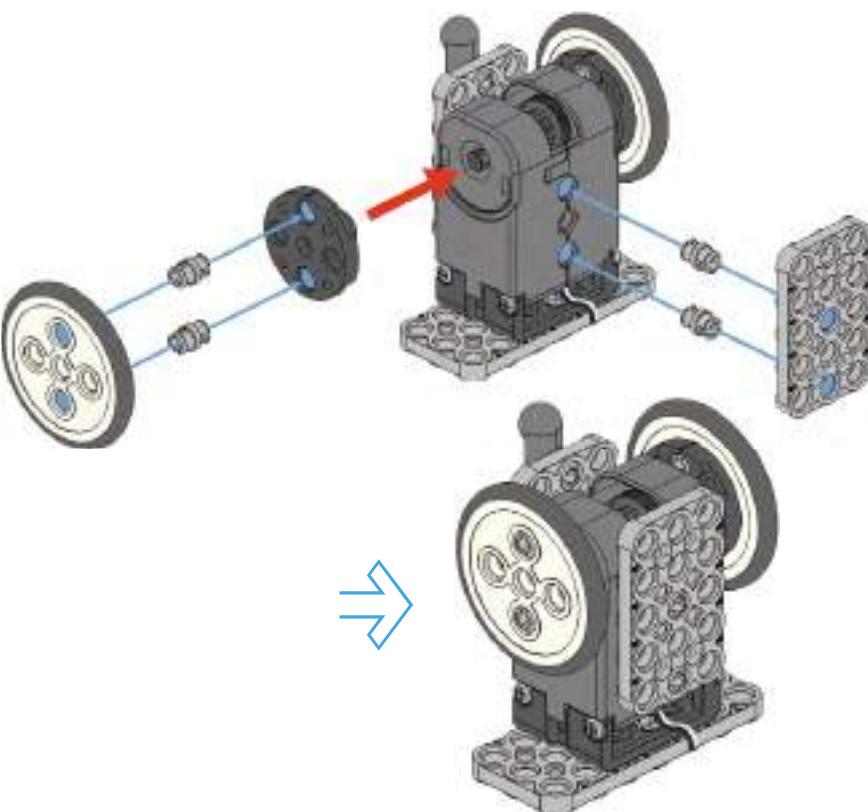
-  R. motor (ID30) X1
-  3x5 frame X1
-  3x7 frame X1
-  Ball frame X1
-  Wheel X1
-  Rubber ring X1
-  Double rivet X10



Step 2

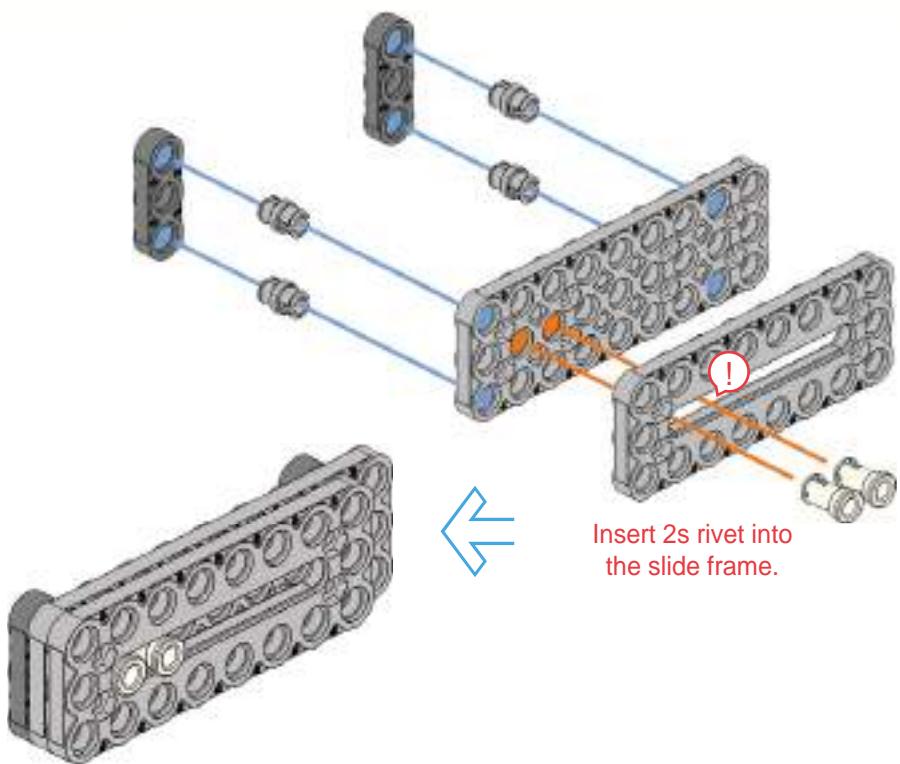
Tip

-  3x5 frame X1
-  Wheel X1
-  Rubber ring X1
-  Front horn X1
-  Double rivet X4



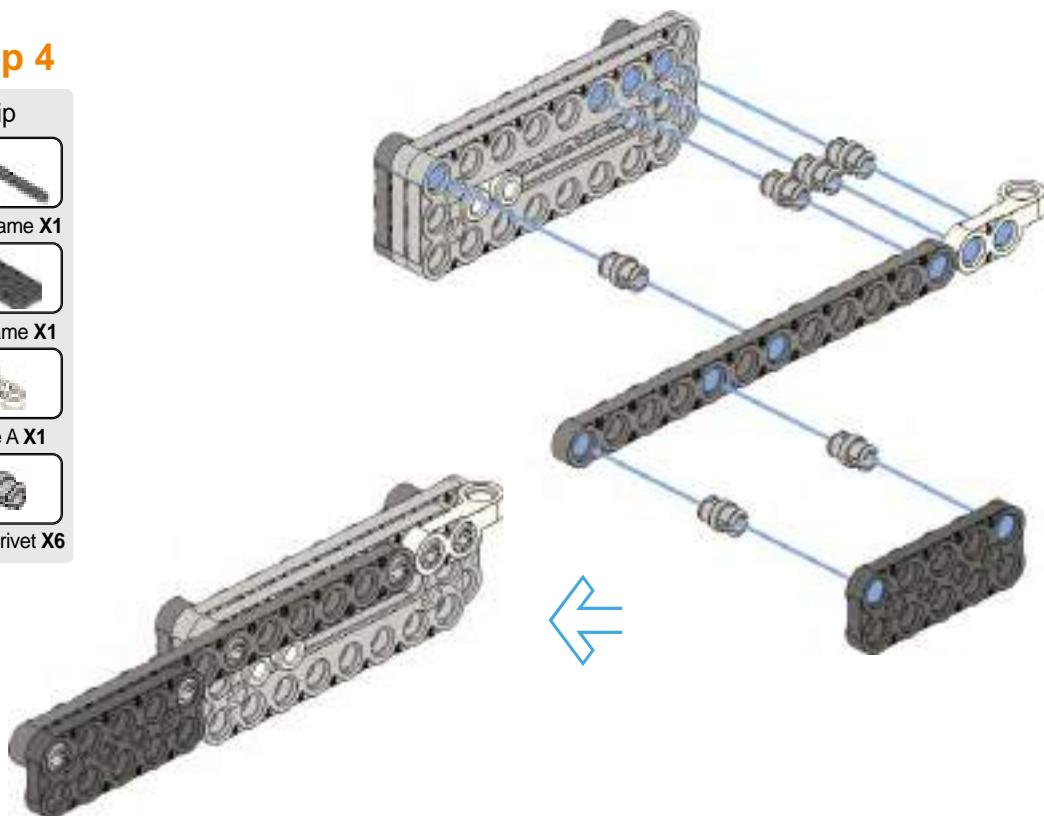
Step 3

Tip
1x3 frame X2
3x9 frame X1
3x8 slide frame X1
2s rivet X2
Double rivet X4



Step 4

Tip
1x12 frame X1
2x5 frame X1
Hinge A X1
Double rivet X6

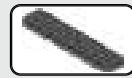


Step 5

Tip



1x3 frame X1



2x9 frame X1



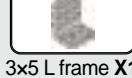
3x5 frame X1



3x9 frame X1



2x5 L frame X1



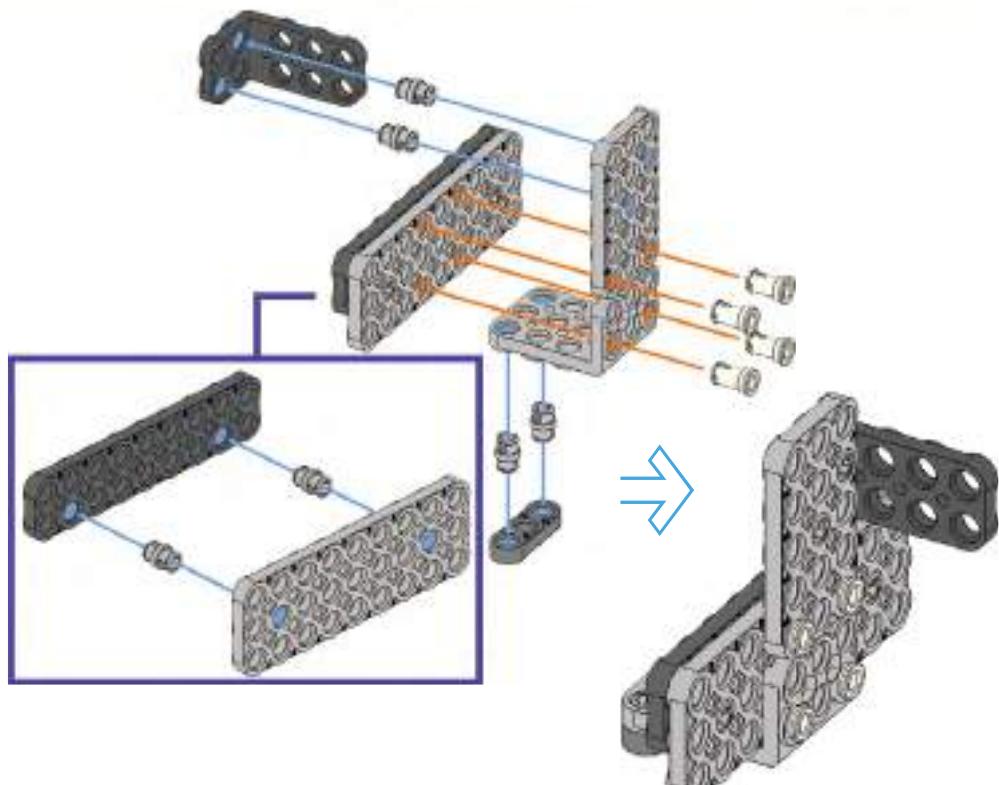
3x5 L frame X1



2s rivet X4



Double rivet X6



Step 6

Tip



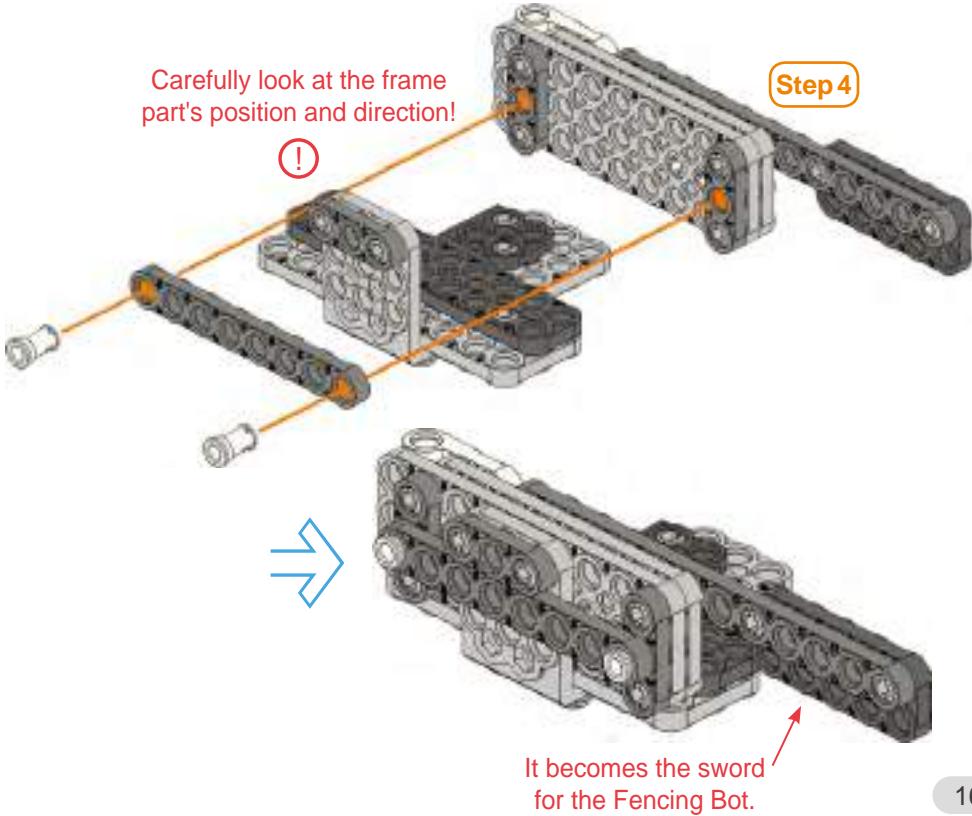
1x8 frame X1



2s rivet X2

Carefully look at the frame part's position and direction!

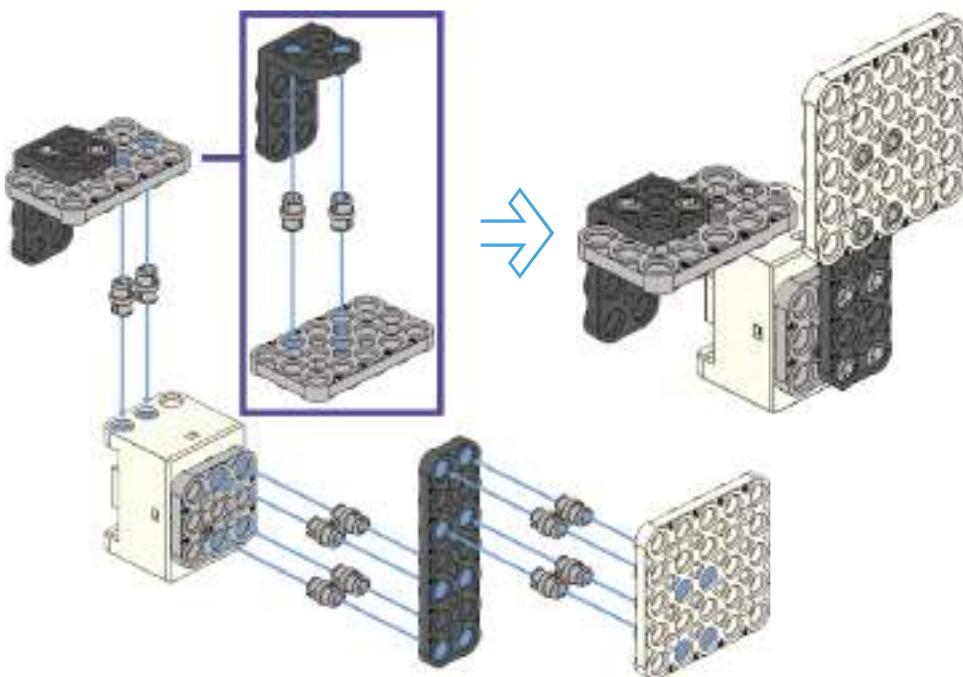
Step 4



Step 7

Tip

- Touch sensor X1
- 2x7 frame X1
- 3x5 frame X1
- 5x5 frame X1
- 2x5 L frame X1
- Double rivet X12



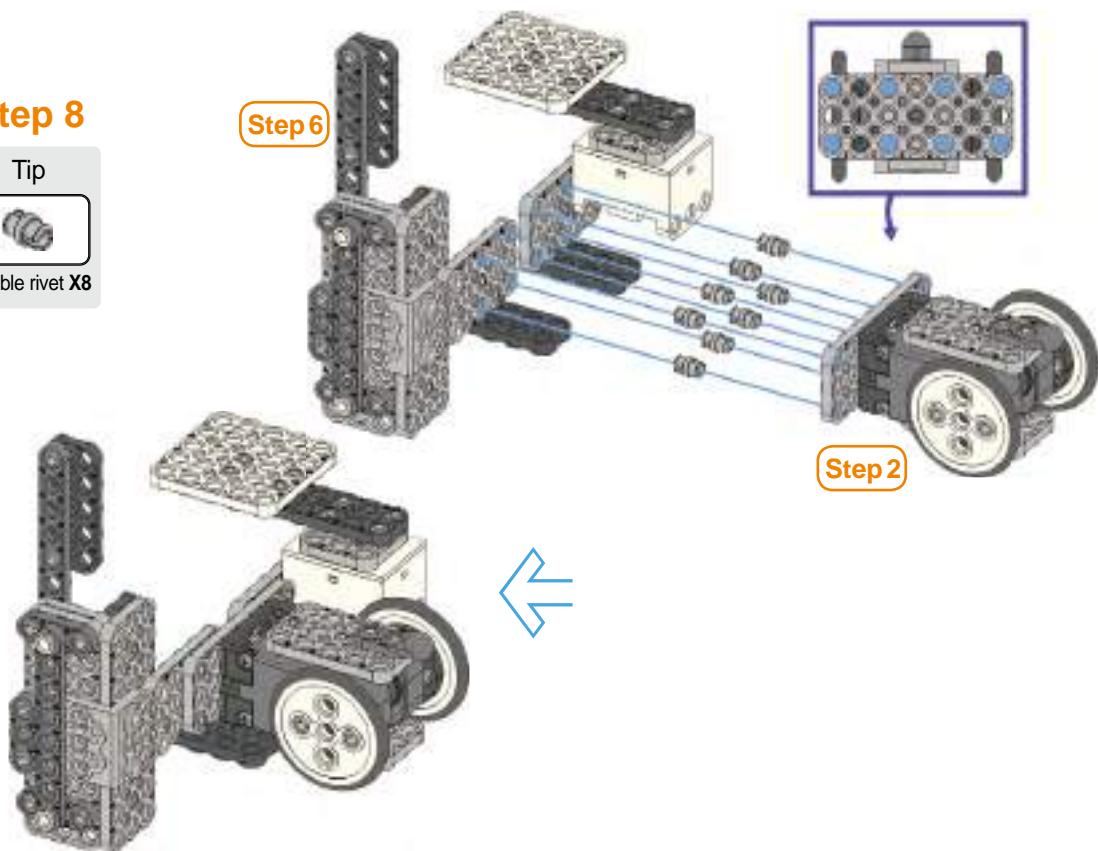
Step 8

Tip

- Double rivet X8

Step 6

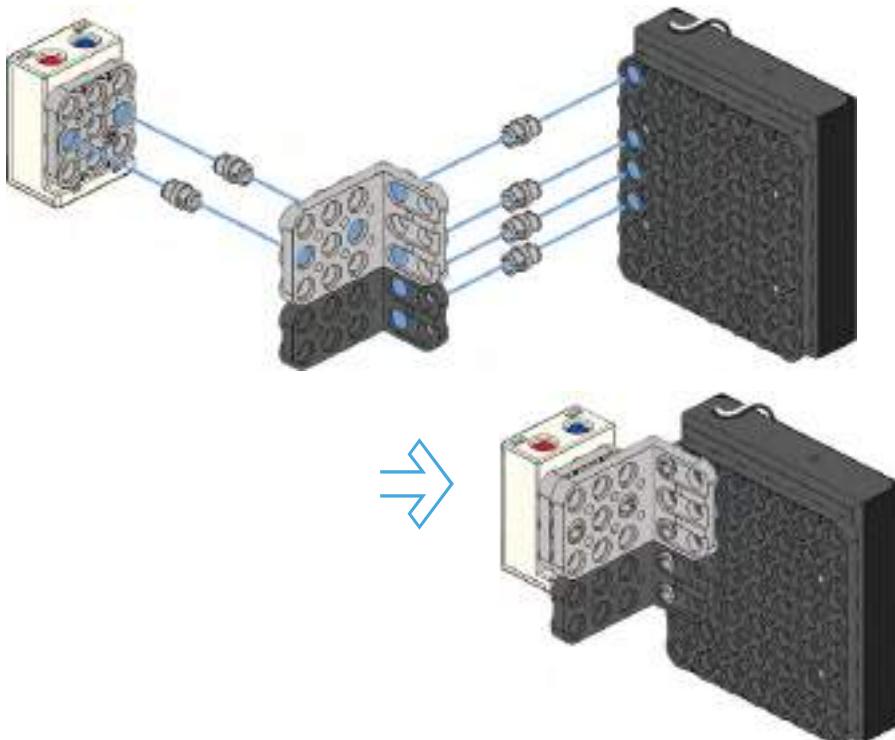
Step 2



Step 9

Tip

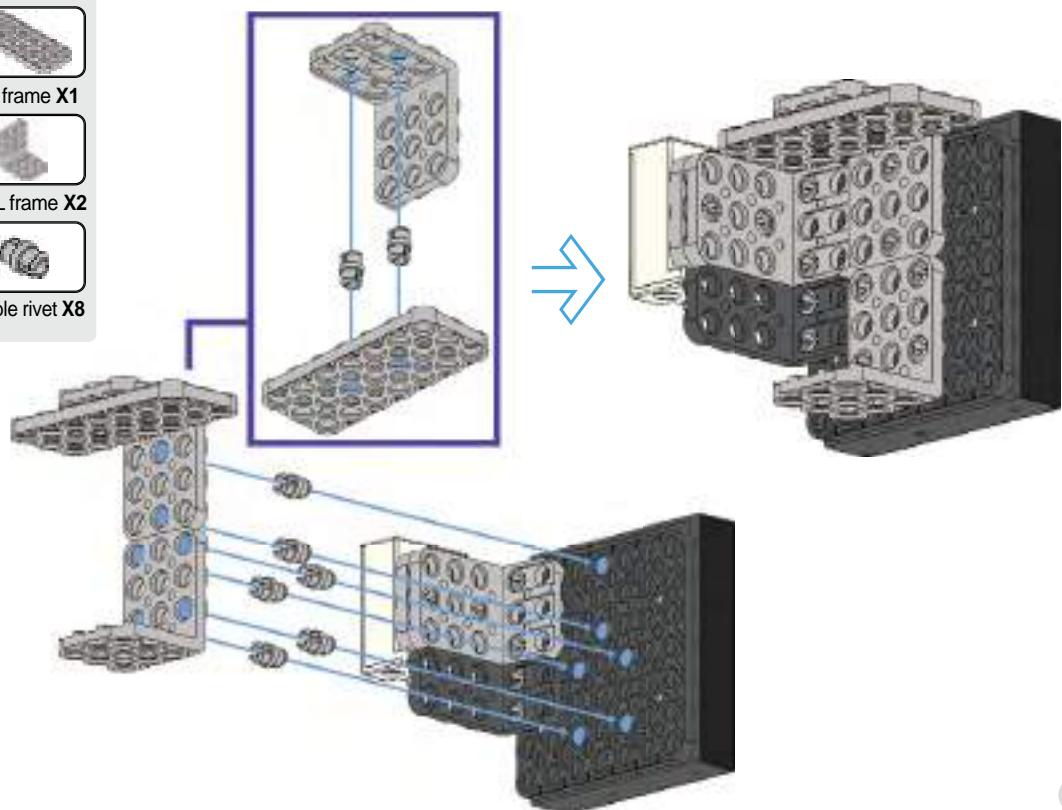
-  Battery case X1
-  LED X1
-  2x5 L frame X1
-  3x5 L frame X1
-  Double rivet X6



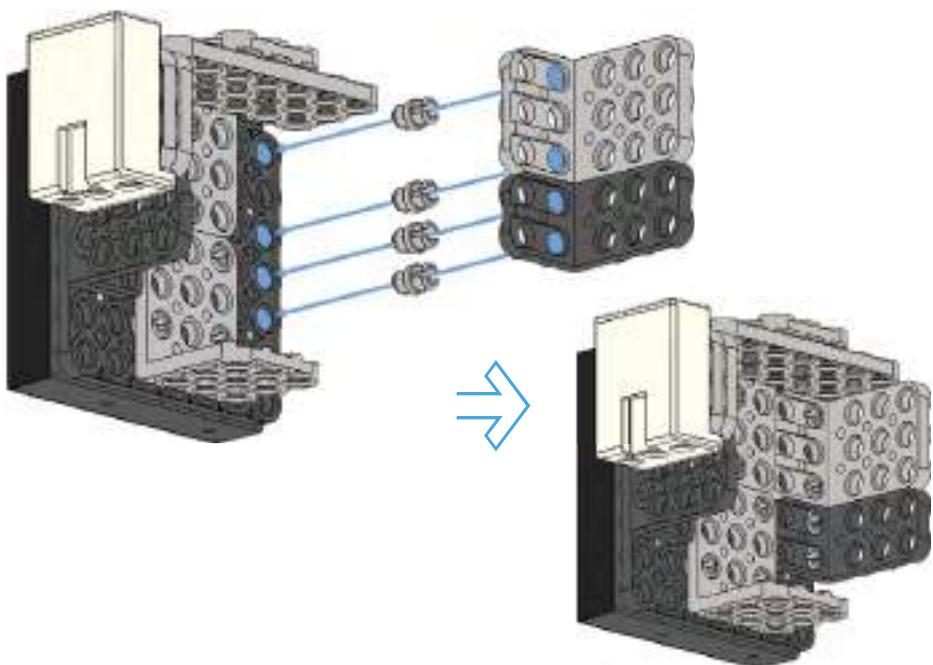
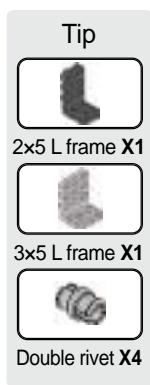
Step 10

Tip

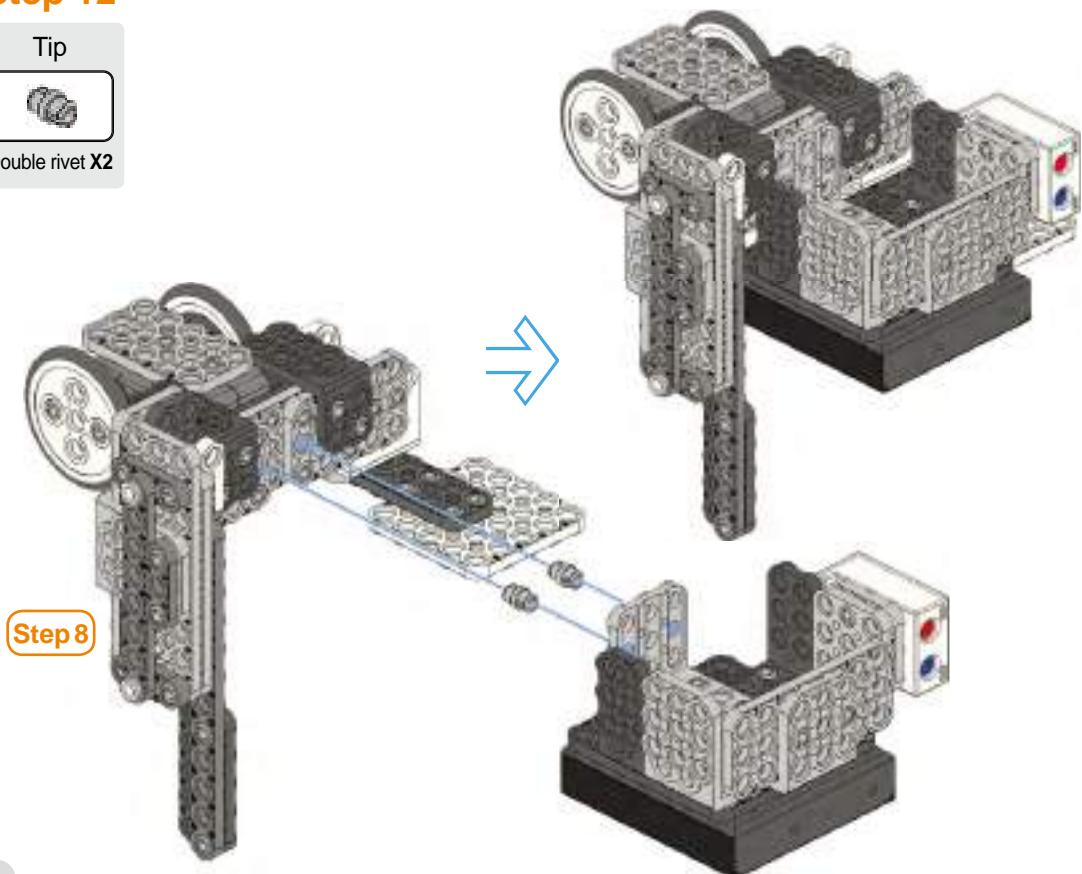
-  3x7 frame X1
-  3x6 L frame X2
-  Double rivet X8



Step 11



Step 12

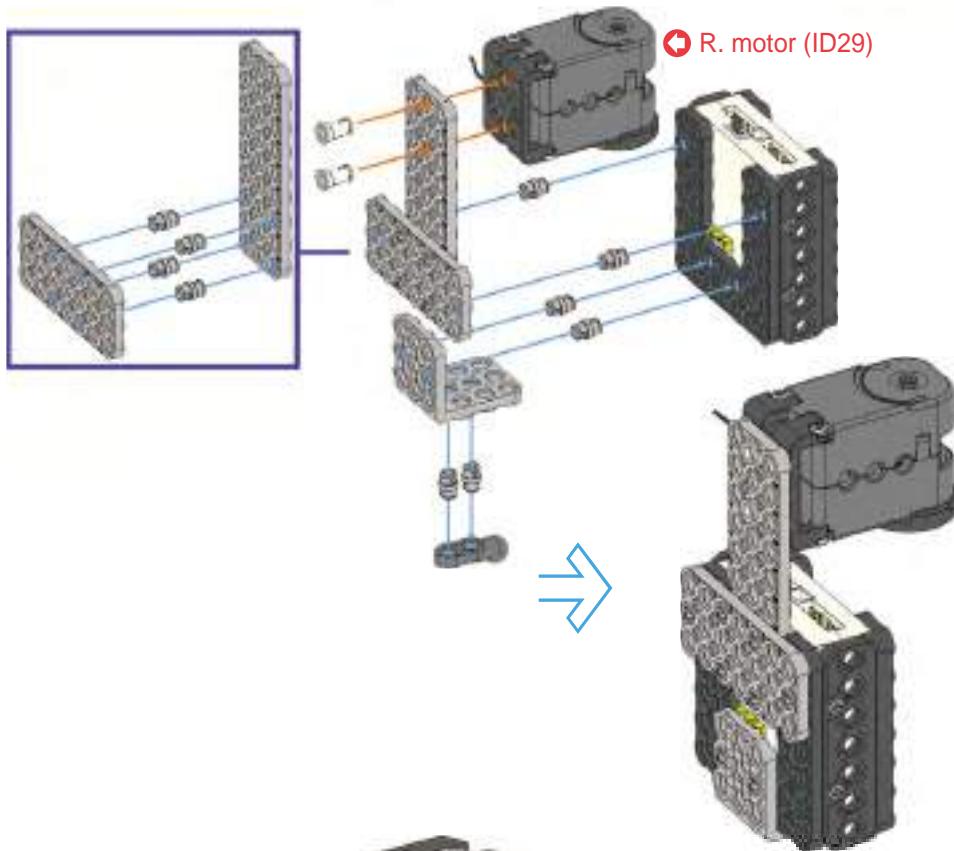


Step 8

Step 13

Tip

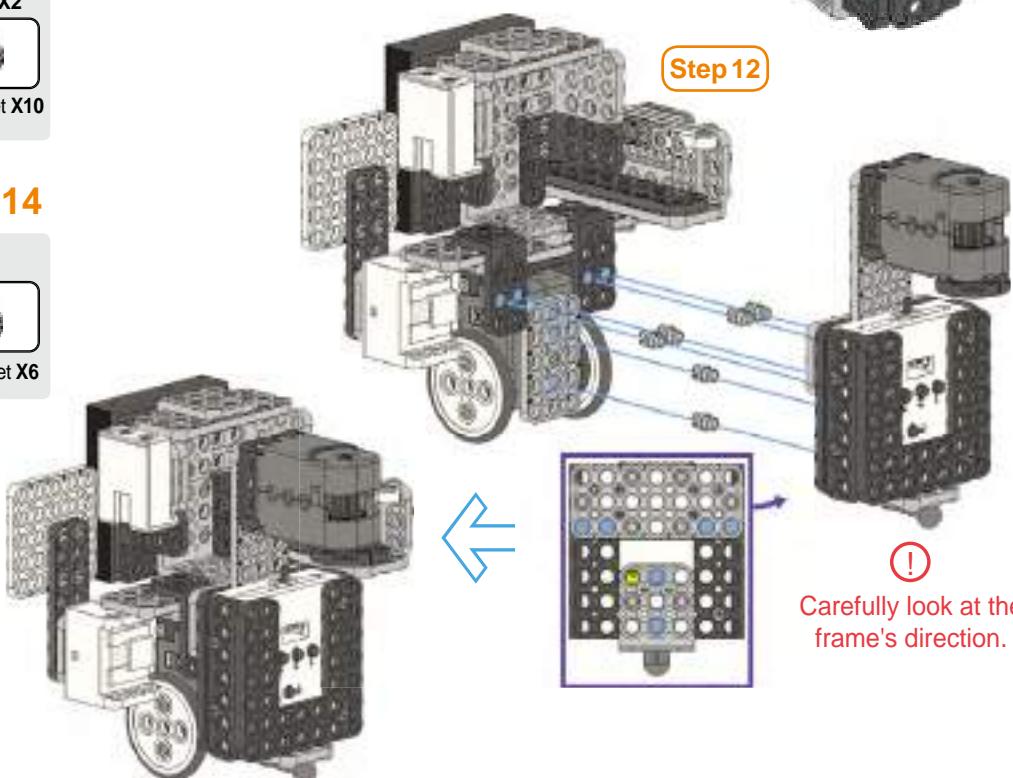
-  Smart controller X1
-  R. motor (ID29) X1
-  3x7 frame X1
-  3x9 frame X1
-  3x6 L frame X1
-  Ball frame X1
-  2s rivet X2
-  Double rivet X10



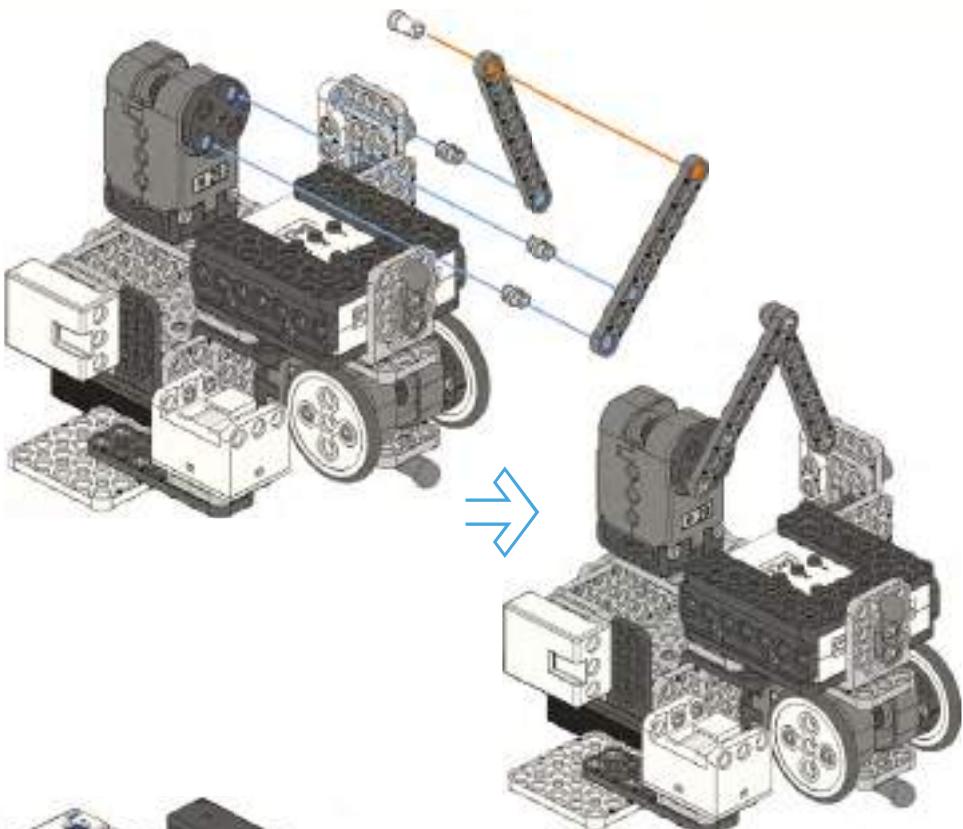
Step 14

Tip

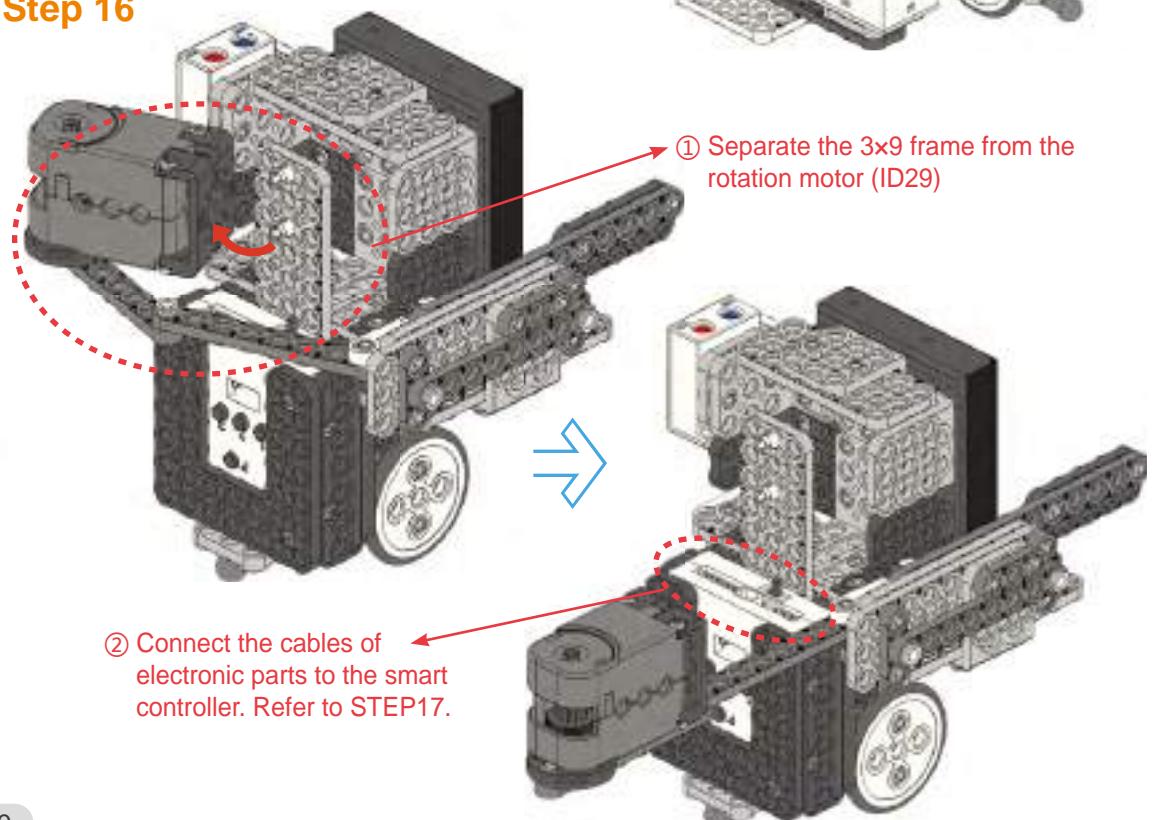
-  Double rivet X6



Step 15

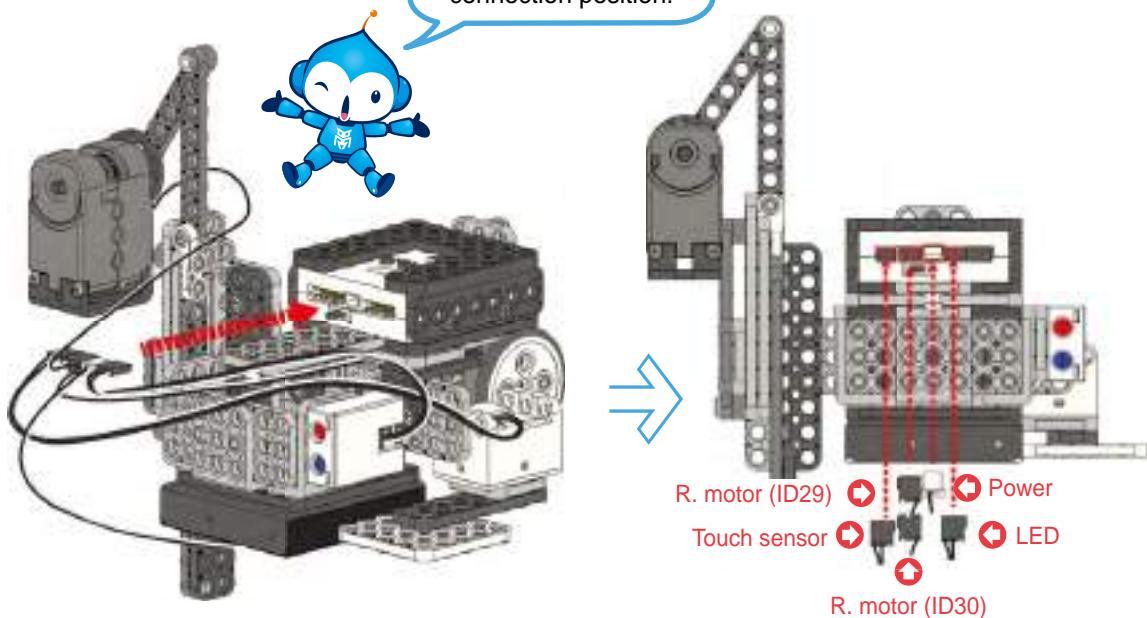


Step 16



Step 17

Carefully look at the cable connection position!



! Refer to STEP16 after connecting all cables to the smart controller.



★ 'Fencing Bot' ready! ★



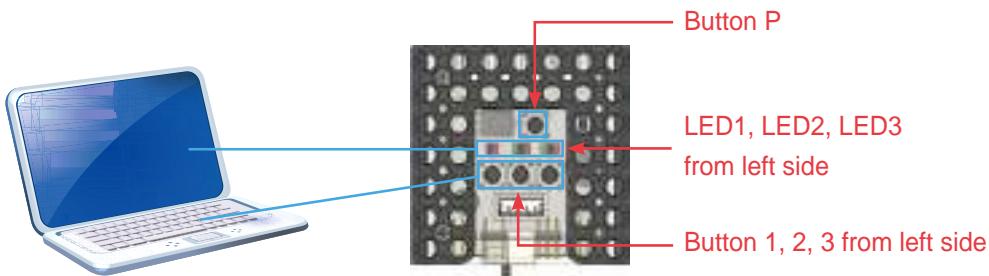


Robot Experience



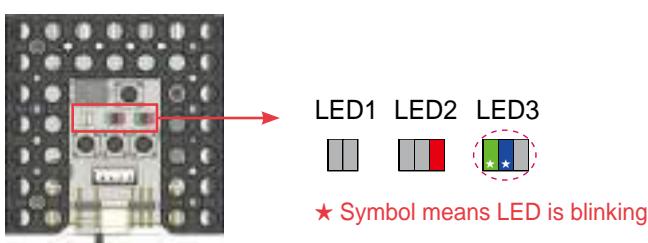
Set-up 'Fencing Bot' robot model.

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 'Fencing 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>.

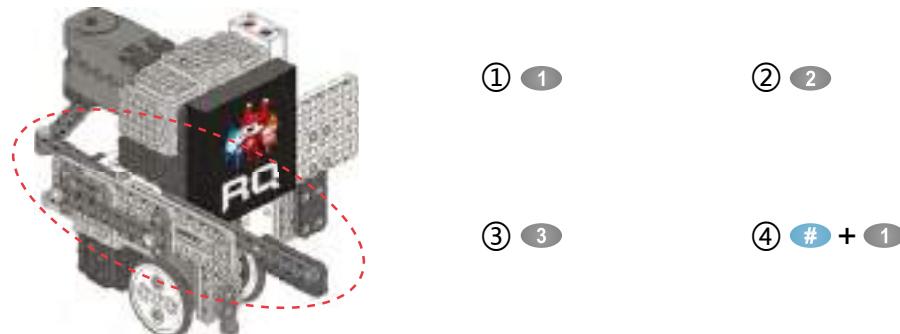
When robot is not working properly, check the following.

1. When Fencing Bot touch sensor is not working :
 - ▶ Check whether the rotation motors ID29, ID30 are connected to the smart controller.
2. When the sword of Fencing Bot is not working :
 - ▶ Check the 3X8 slide frame (STEP3~STEP4) assembly, and connection of rotation motor ID29, ID30.



Check movement and assembly.

1. What button on the IR remote controller should be pressed to make the Fencing Bot attack?



2. Circle the correct button that matches the command.

► Press (①, ②, ③) button for move forward.



► Press (①, ②, ③) button for move backward.



3. Write what movement the robot makes when each button combination is pressed.



(1) # + 2 button :

(1) # + 3 button :



Robot Play

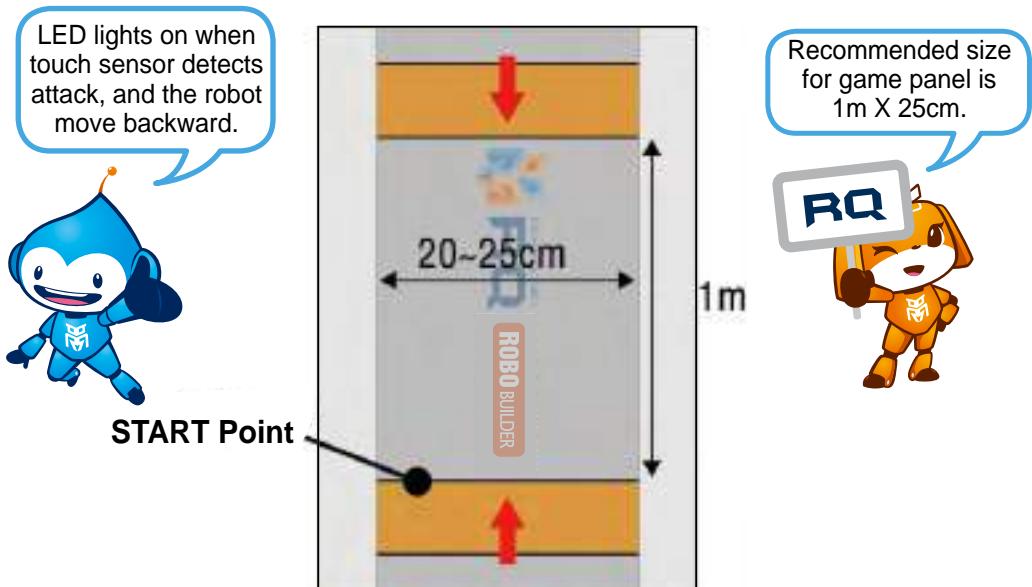


Fencing game

Place two Fencing Bots facing each other, and play a fencing game.

Whoever touches the opponent's touch sensor first wins.

- Place two Fencing Bots in 'START' position facing each other.
- Control the robots to move forward, backward and attack to get 3 points first.
- Use the sword of Fencing Bot and attack the opposite robot's touch sensor to get 1 point.
- You can get 1 additional point when the opposite robot falls or goes out the boundary.
- Place the robots back to 'START' position whenever a robot earns a point.



◆ Describe your 'Fencing Bot'.

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



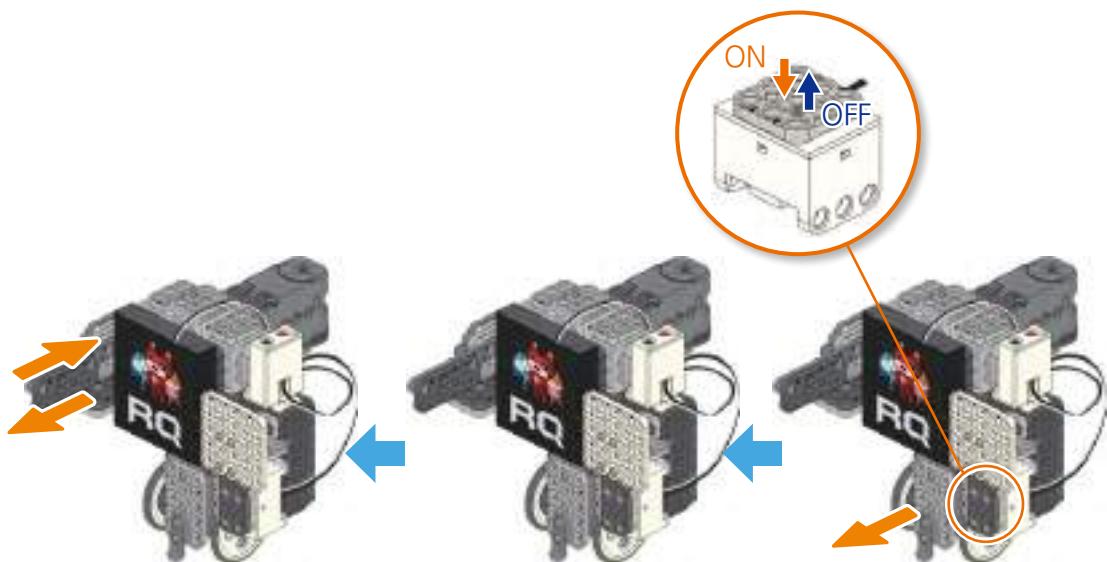


Robot coding with Scratch



Coding Mission

Fencing Bot moves straight → stops → attacks when the touch sensor is pressed.



⟨ Attack ⟩

⟨ Stop ⟩

⟨ Detect with touch sensor and move straight ⟩

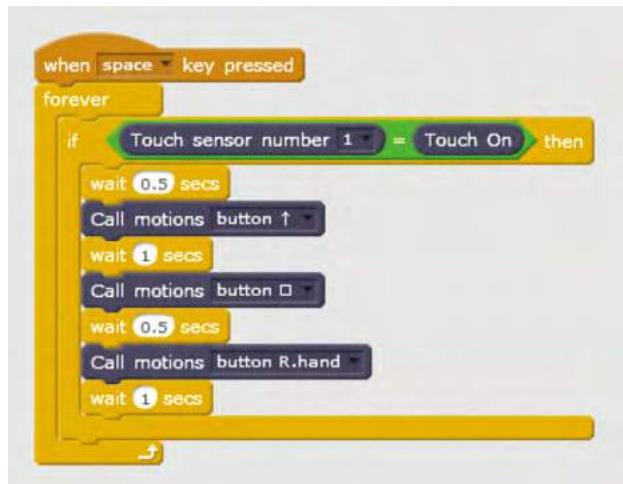
◆ Check before Coding Mission

- Check if Scratch Builder is installed before Coding Mission.
- Download Scratch Builder from the Robobuilder site and install.
(Download the most recent version in Support-Software at www.robobuilder.net.)
- Download other detailed explanation at the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



Making a Scratch block

Create a Scratch block as below and run by pressing the spacebar on the keyboard.



Save the block on Scratch and upload to the robot using Scratch Builder to run without the communication cable (**press # + 4 button** on the remote to run the uploaded code).

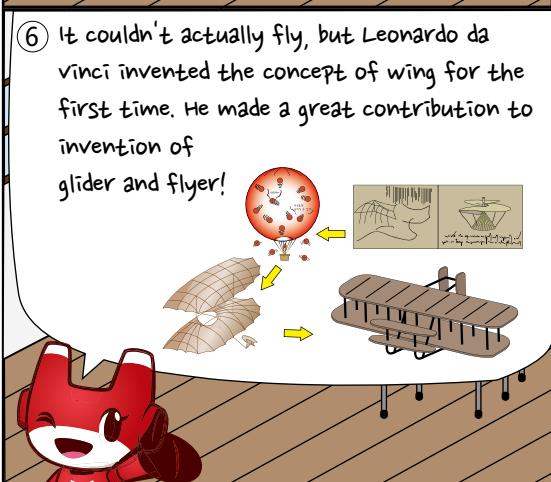
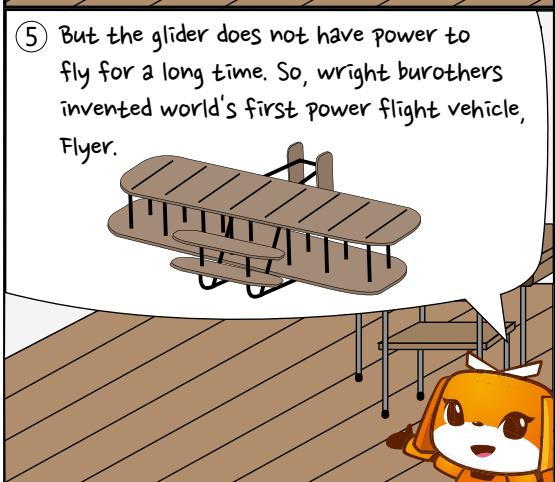
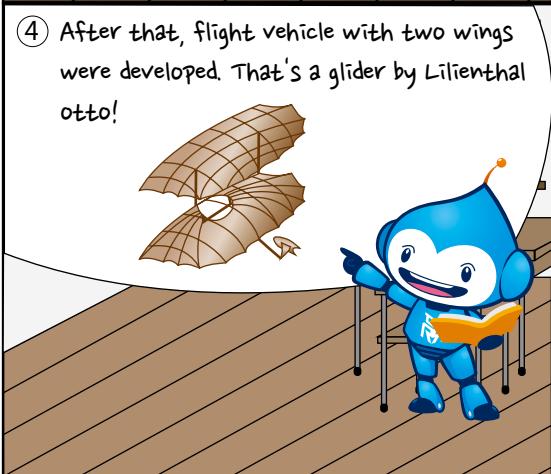
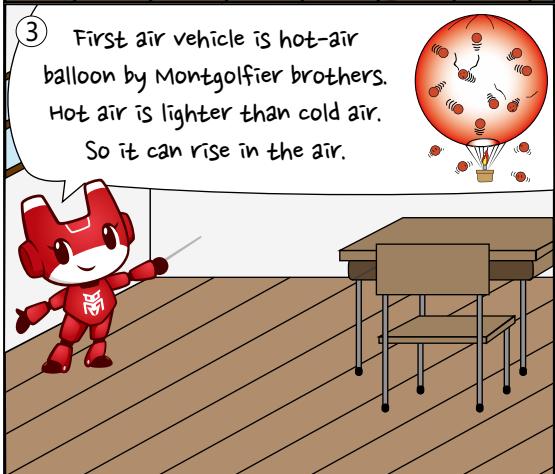
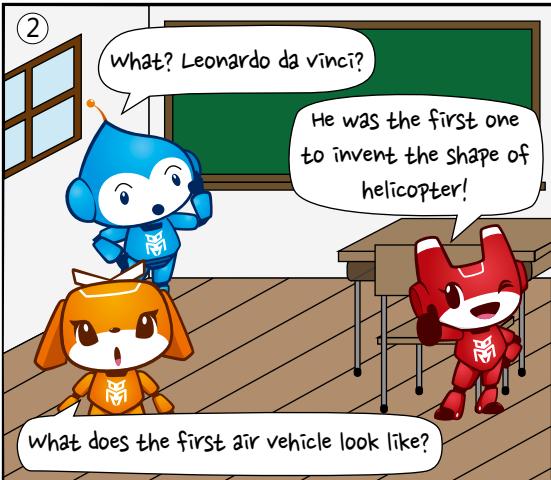
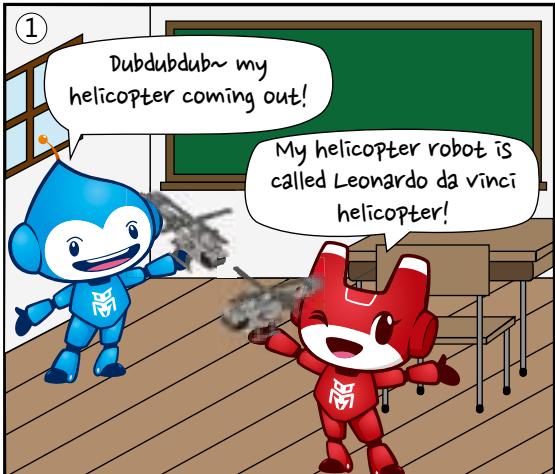
❖ Any questions about Coding Mission?

- For any questions about robot coding mission, visit Support-Technical support at www.robobuilder.net.
- Download the 'Scratch Builder' manual on the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



11. Helicopter

Fly to the sky.



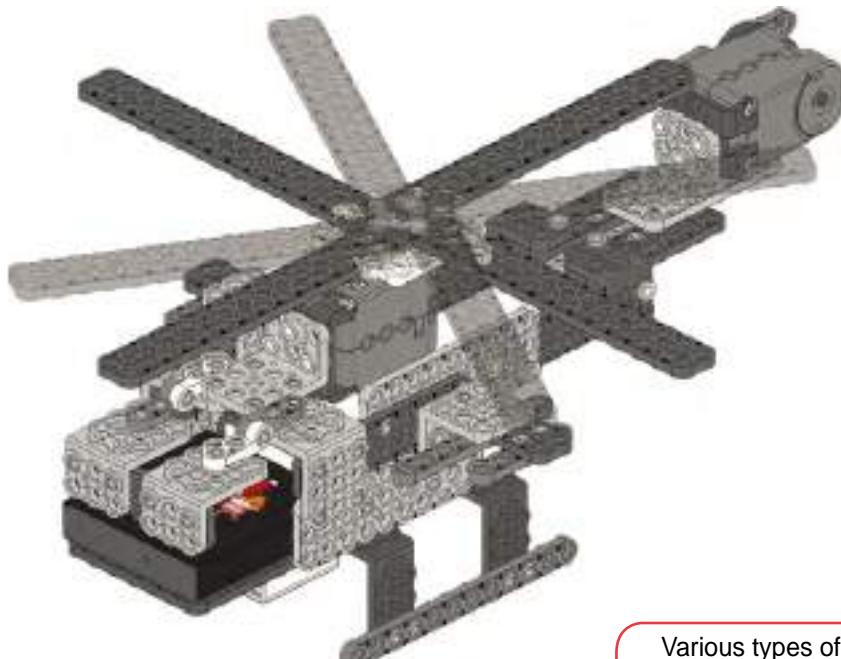


Today's Robot Class



A helicopter is an aircraft with long blades on top that go round very fast, but the speed is a bit slower than regular airplanes.

It can stay still in the air and move straight upwards or downwards. And this makes it very useful for small place.



Various types of helicopter are found in our life.



Helicopter is used for saving humans or fighting fires, military purposes. In addition, it is used to spray agricultural pesticide or even film a movie.





Robot Assembly



Prepare robot parts.



Smart controller X1



R. motor (ID29, 30) X2



Battery case X1



LED X1



1x3 frame X2



1x5 frame X3



1x8 frame X2



1x12 frame X2



2x5 frame X2



2x7 frame X3



2x9 frame X4



2x15 frame X4



3x5 frame X1



3x7 frame X1



3x9 frame X4



5x5 frame X2



2x4 L frame X2



2x5 L frame X4



3x5 L frame X4



3x6 L frame X4



Hinge A X2



Hinge B X2



2s rivet X21



3s rivet X10



Double rivet X82



Tips.



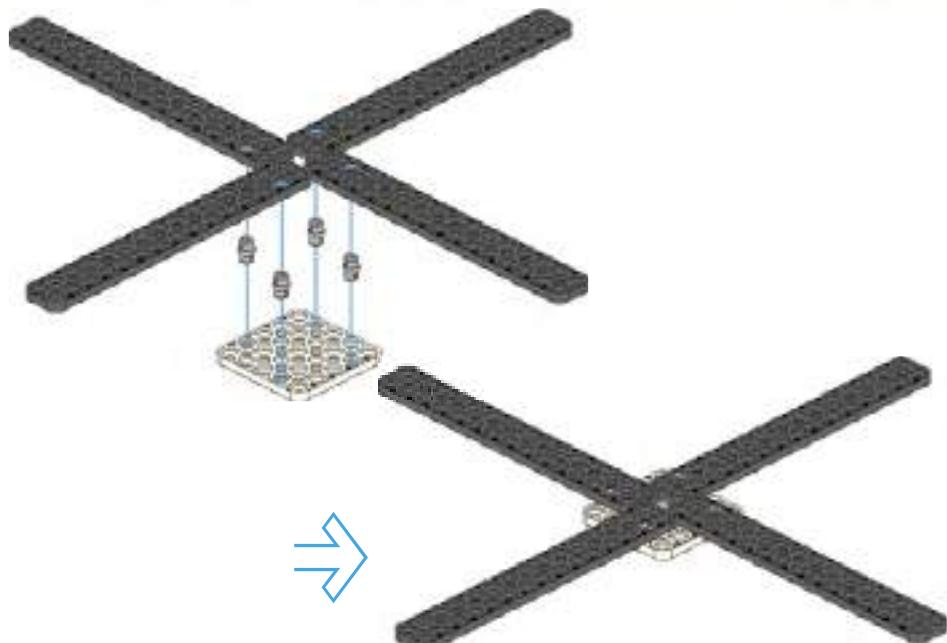
Be careful when you use battery.

- Do not use peeled off or damaged battery. This could lead to burning or fire.
- Do not use an old battery with new battery.
- Turn off power S/W of smart controller because there is still electric current in set-up or standby mode.

Step 1

Tip

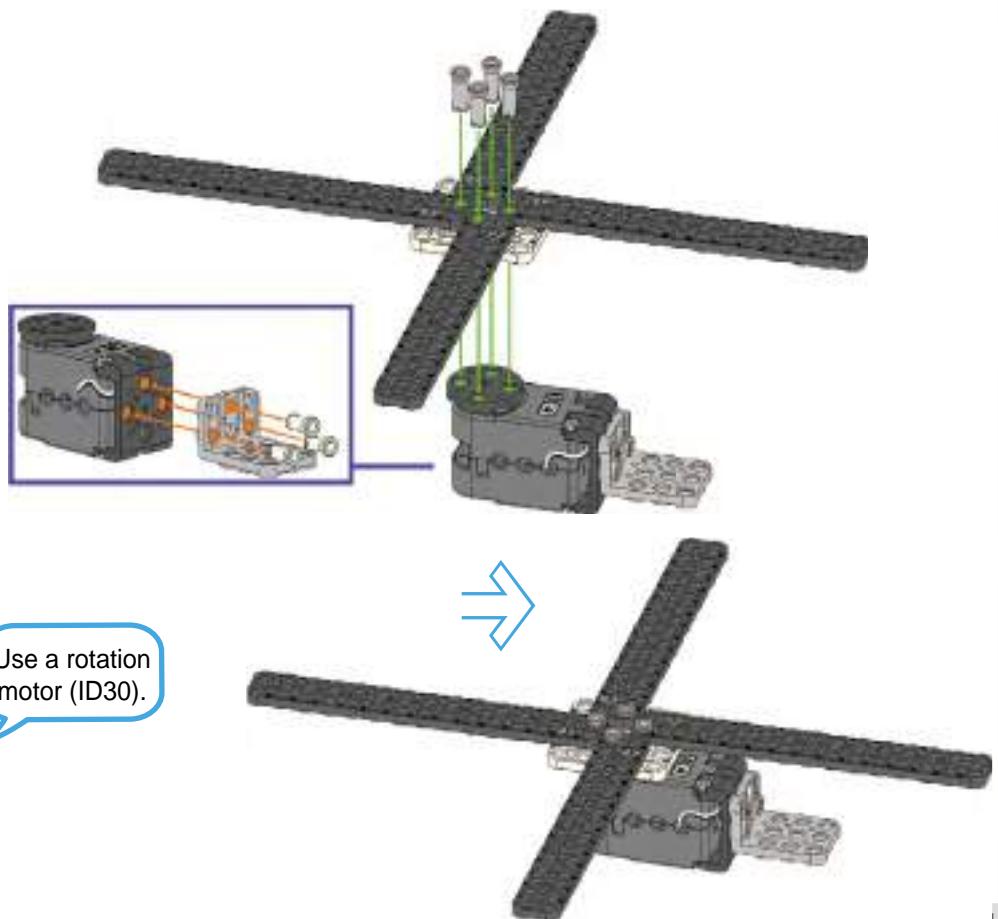
- 2x15 frame X4
- 5x5 frame X1
- Double rivet X4



Step 2

Tip

- R. motor (ID30) X1
- 3x5 L frame X1
- 2s rivet X3
- 3s rivet X4

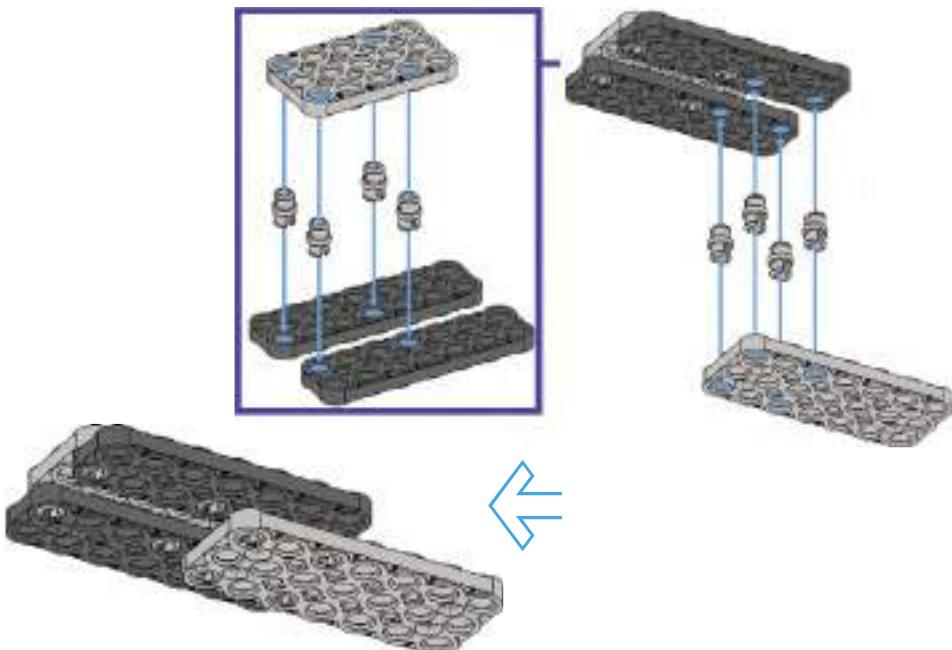


Use a rotation
motor (ID30).

Step 3

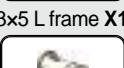
Tip

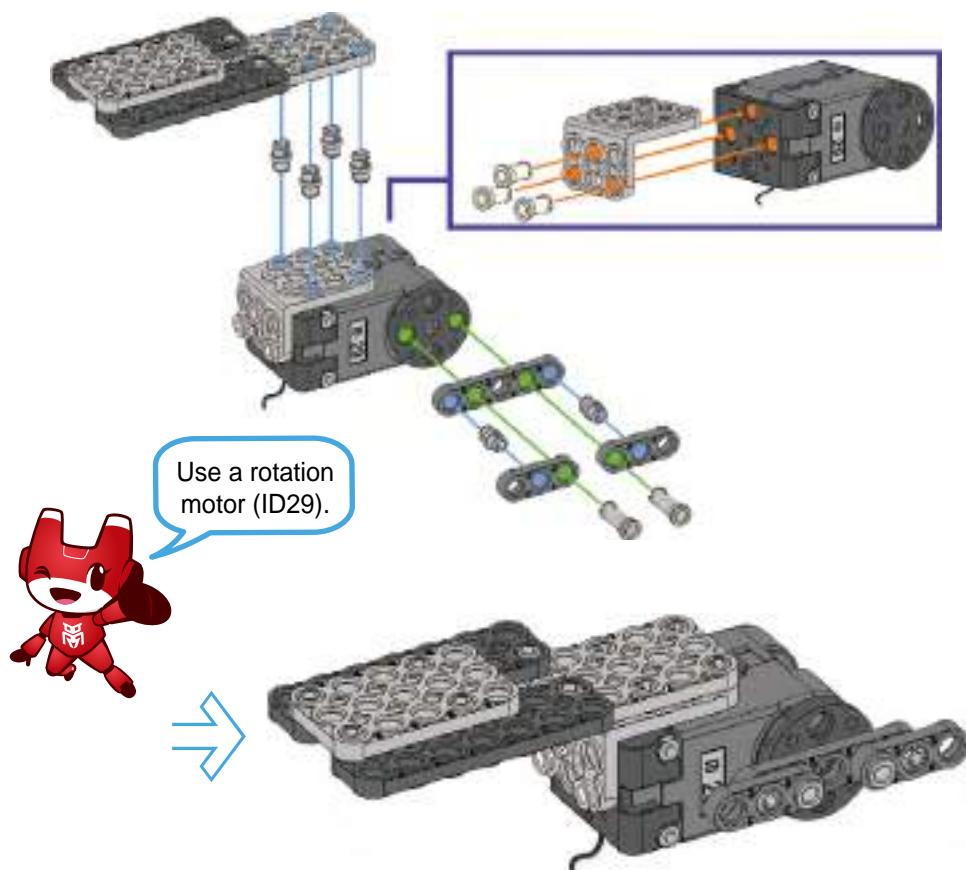
-  2x7 frame X2
-  3x5 frame X1
-  3x7 frame X1
-  Double rivet X8



Step 4

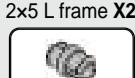
Tip

-  R. motor (ID29) X1
-  1x3 frame X2
-  1x5 frame X1
-  3x5 L frame X1
-  2s rivet X3
-  3s rivet X2
-  Double rivet X6

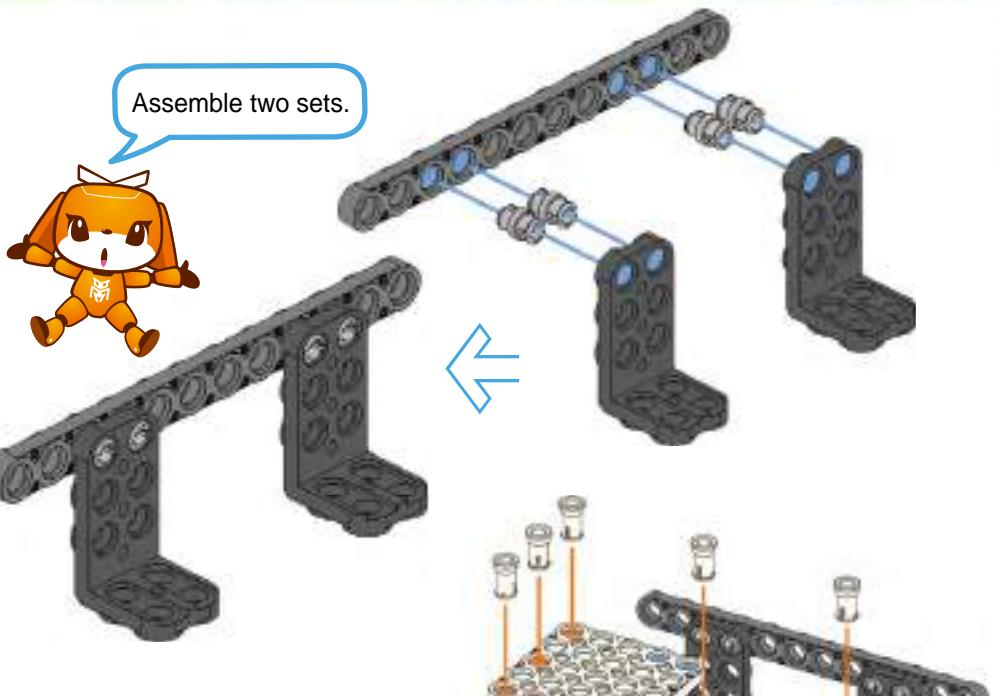


Step 5 X2

Tip

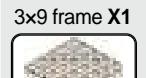
- 
- 1x12 frame X1
- 
- 2x5 L frame X2
- 
- Double rivet X4

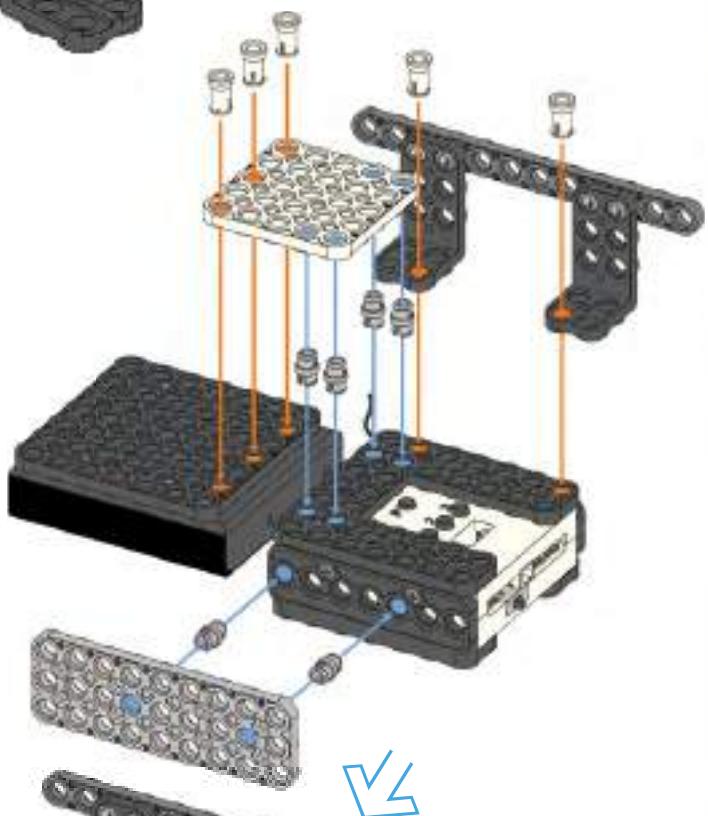
Assemble two sets.



Step 6

Tip

- 
- Smart controller X1
- 
- Battery case X1
- 
- 3x9 frame X1
- 
- 5x5 frame X1
- 
- 2s rivet X5
- 
- Double rivet X6



Step 7

Tip



LED X1



3x9 frame X1

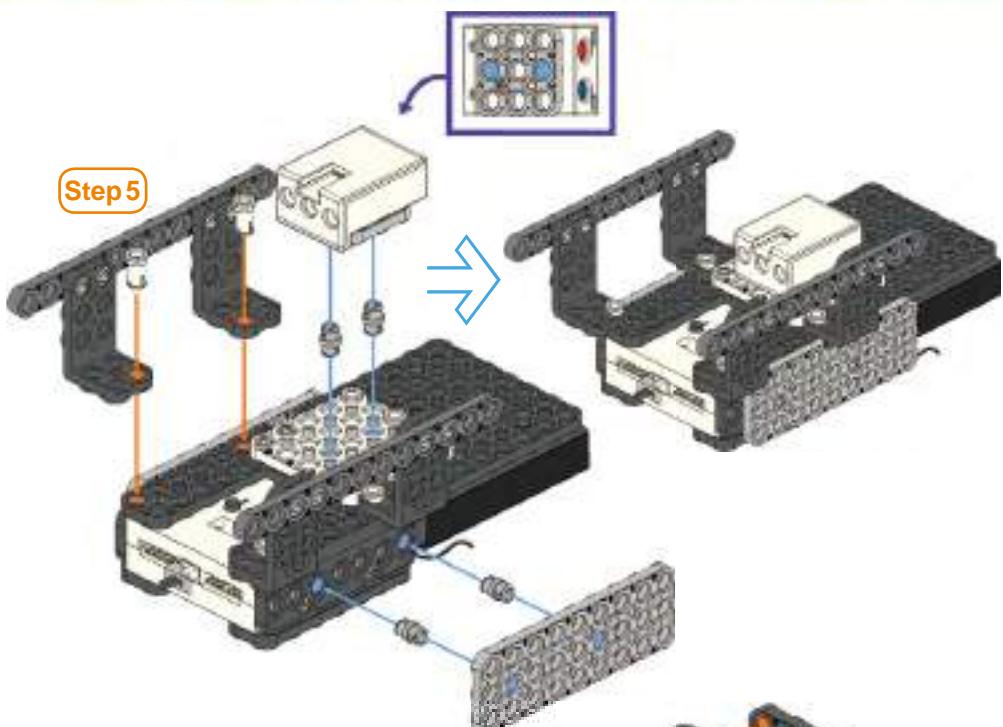


2s rivet X2



Double rivet X4

Step 5



Step 8

Tip



2x9 frame X2



3x9 frame X1



2x4 L frame X1



3x6 L frame X2



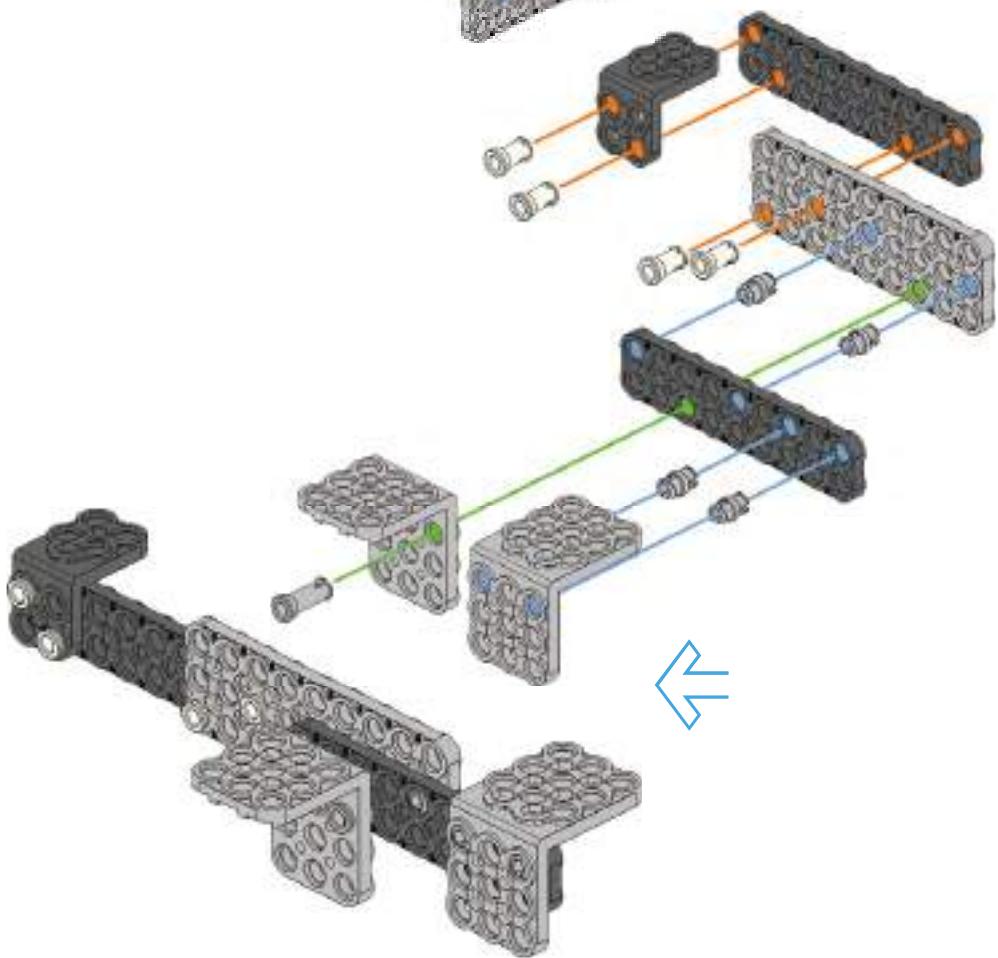
2s rivet X4



3s rivet X1



Double rivet X4

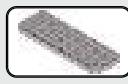


Step 9

Tip



2x9 frame X2



3x9 frame X1



2x4 L frame X1



3x6 L frame X2



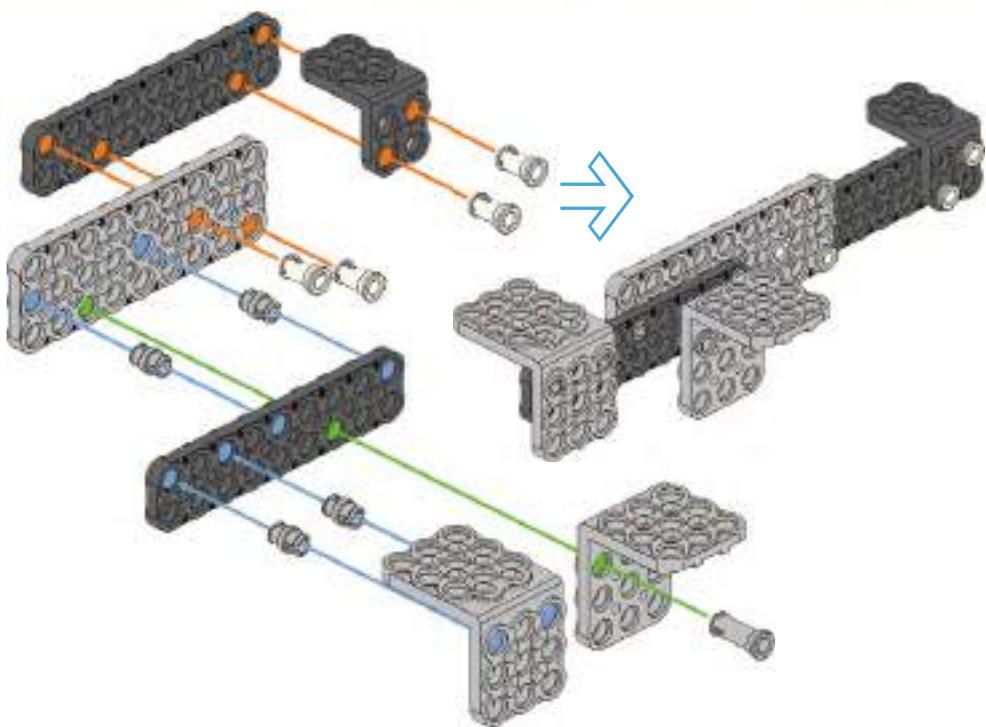
2s rivet X4



3s rivet X1

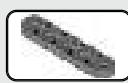


Double rivet X4



Step 10

Tip



1x5 frame X1



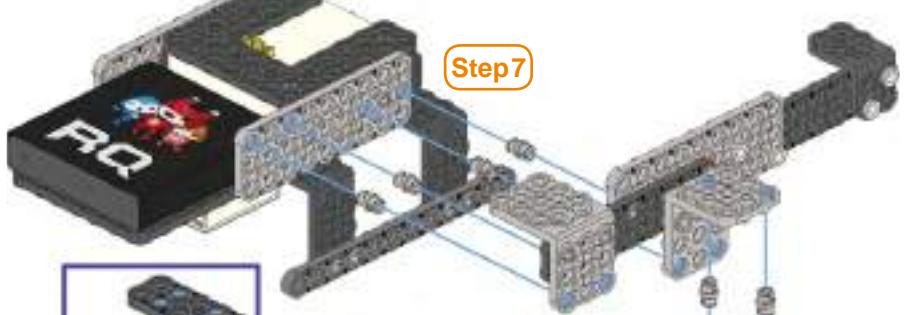
1x8 frame X1



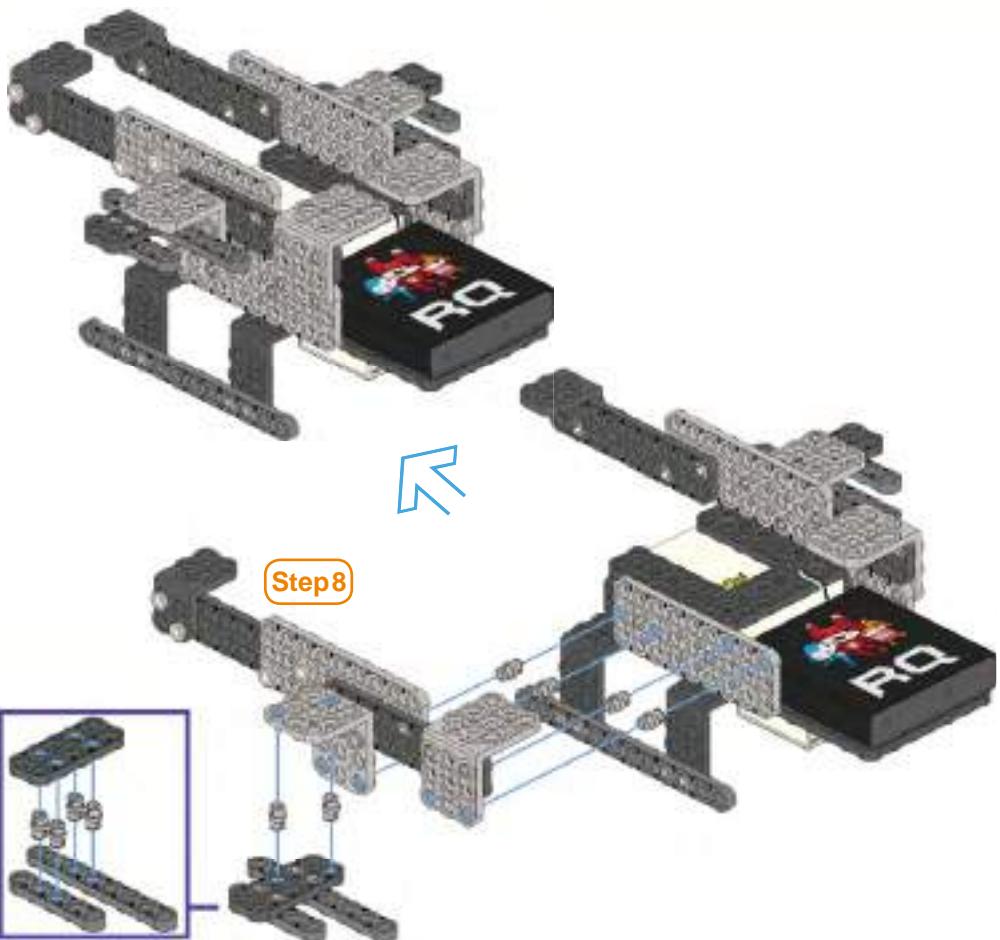
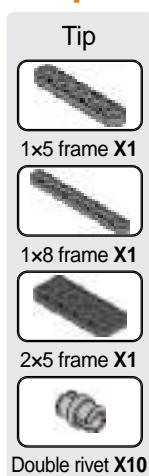
2x5 frame X1



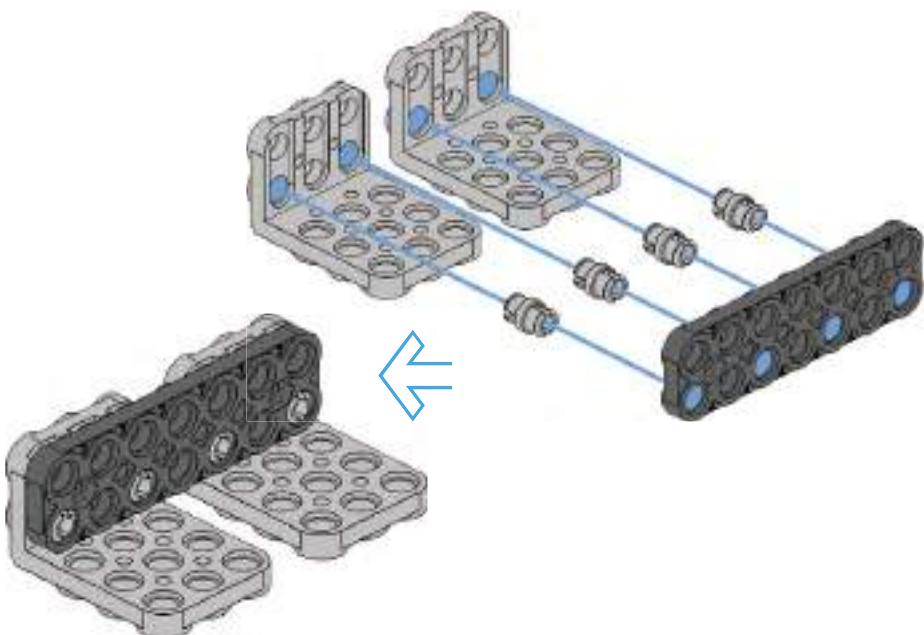
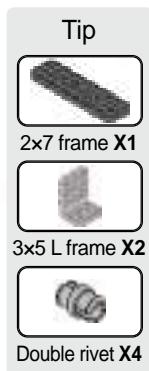
Double rivet X10



Step 11



Step 12



Step 13

Tip



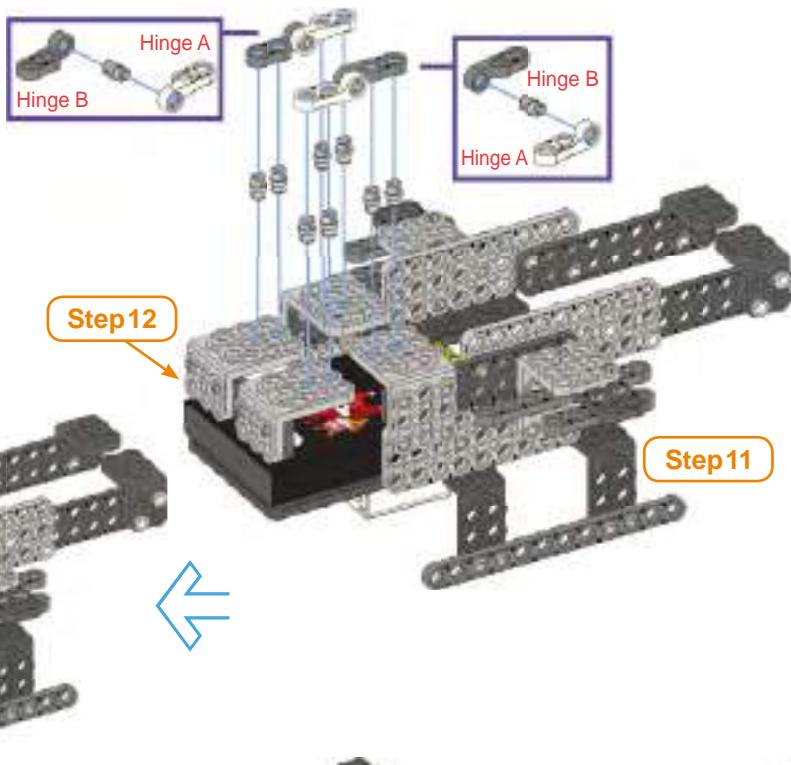
Hinge A X2



Hinge B X2



Double rivet X10



Step 14

Tip

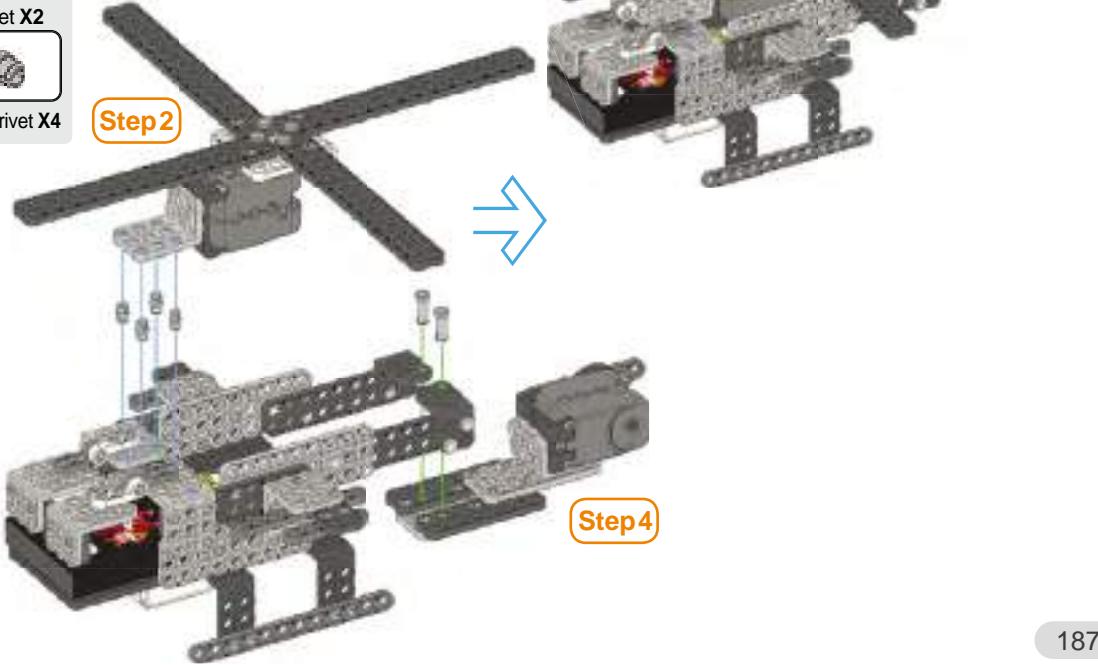


3s rivet X2



Double rivet X4

Step 2



Step 15



Carefully look at the cable position and direction!



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



★ 'Helicopter' ready! ★



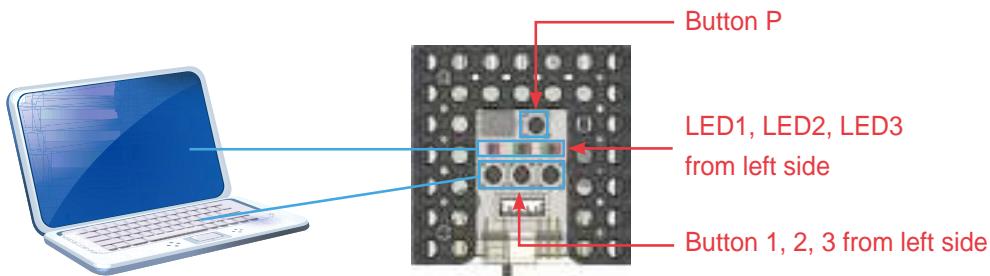


Robot Experience



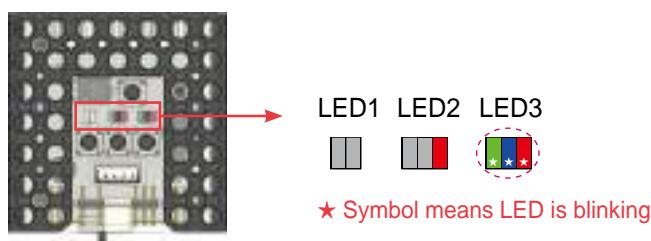
Set-up 'Helicopter' robot model.

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 'Helicopter' 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 properly, check the following.

1. When rotation motor is not moving :
 - ▶ Check whether the rotation motors ID29, ID30 are connected to the smart controller.
2. When LED light does not turn on :
 - ▶ Check if the LED 3 pins cable is connected to the smart controller.



Check movement and assembly.

1. Press **1** button, or **3** button, to see how it moves.
How are the movements similar or different?



(1) Similarity :

(2) Difference :

2. Match the buttons on the IR remote controller to corresponding motions.

+ 1 •



Helicopter wing rotates to the right and the left repeatedly.

+ 2 •



Helicopter wing rotates and stops slowly.

+ 3 •



Helicopter wing rotates when the touch sensor detects sound.

Robot Play



Helicopter game

Place 'Helicopter' robot on the center. Put the arrow symbol on one side of Helicopter wing as below, then control the helipcopter to attack or defend.

- Stop the helicopter wing, and attack or defense according to the command the arrow points.
- Each helicopter robot starts from 20 points.
- You can attack the opposite helicopter when the arrow points a '+' value. You subtract the number from the opponent's score.
- You can defend yourself from attack when your arrow points a '-' value.

(ex)

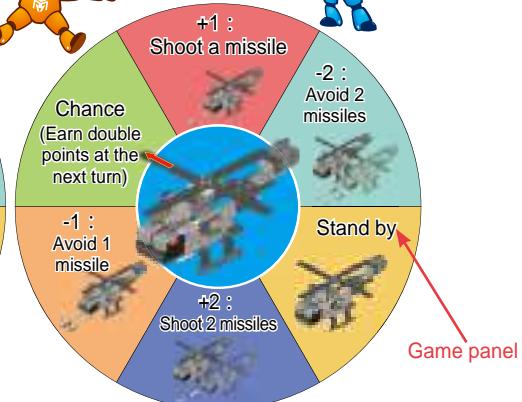
When you land on '+2', fire two missiles to the opposite player!

When I land on '-1', I can't attack. But I can defend myself from the opposite player's one missile.

As the result, your score is '-1' point.



Put 'arrow' mark on wing.



◆ Describe your 'Helicopter' robot.

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



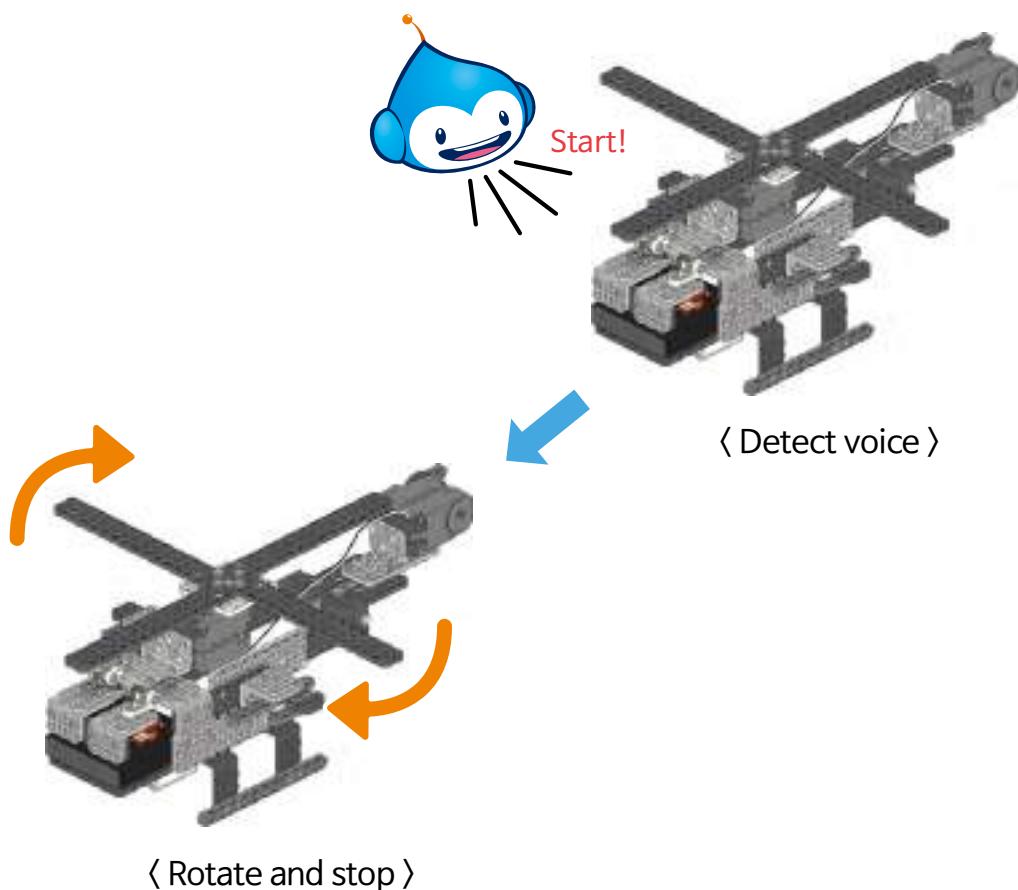


Robot coding with Scratch



Coding Mission

Helicopter moves the propeller when it hears voice.



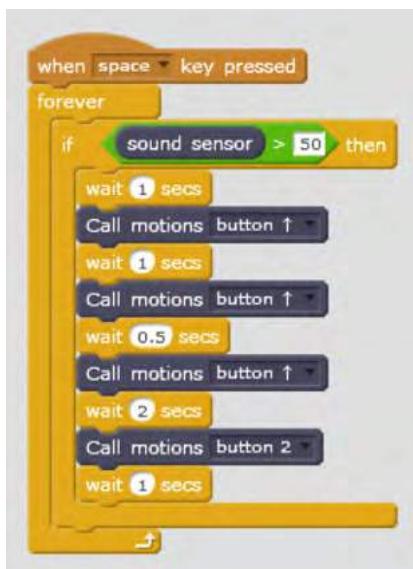
◆ Check before Coding Mission

- Check if Scratch Builder is installed before Coding Mission.
- Download Scratch Builder from the Robobuilder site and install.
(Download the most recent version in Support-Software at www.robobuilder.net.)
- Download other detailed explanation at the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)



Making a Scratch block

Create a Scratch block as below and run by pressing the spacebar on the keyboard.



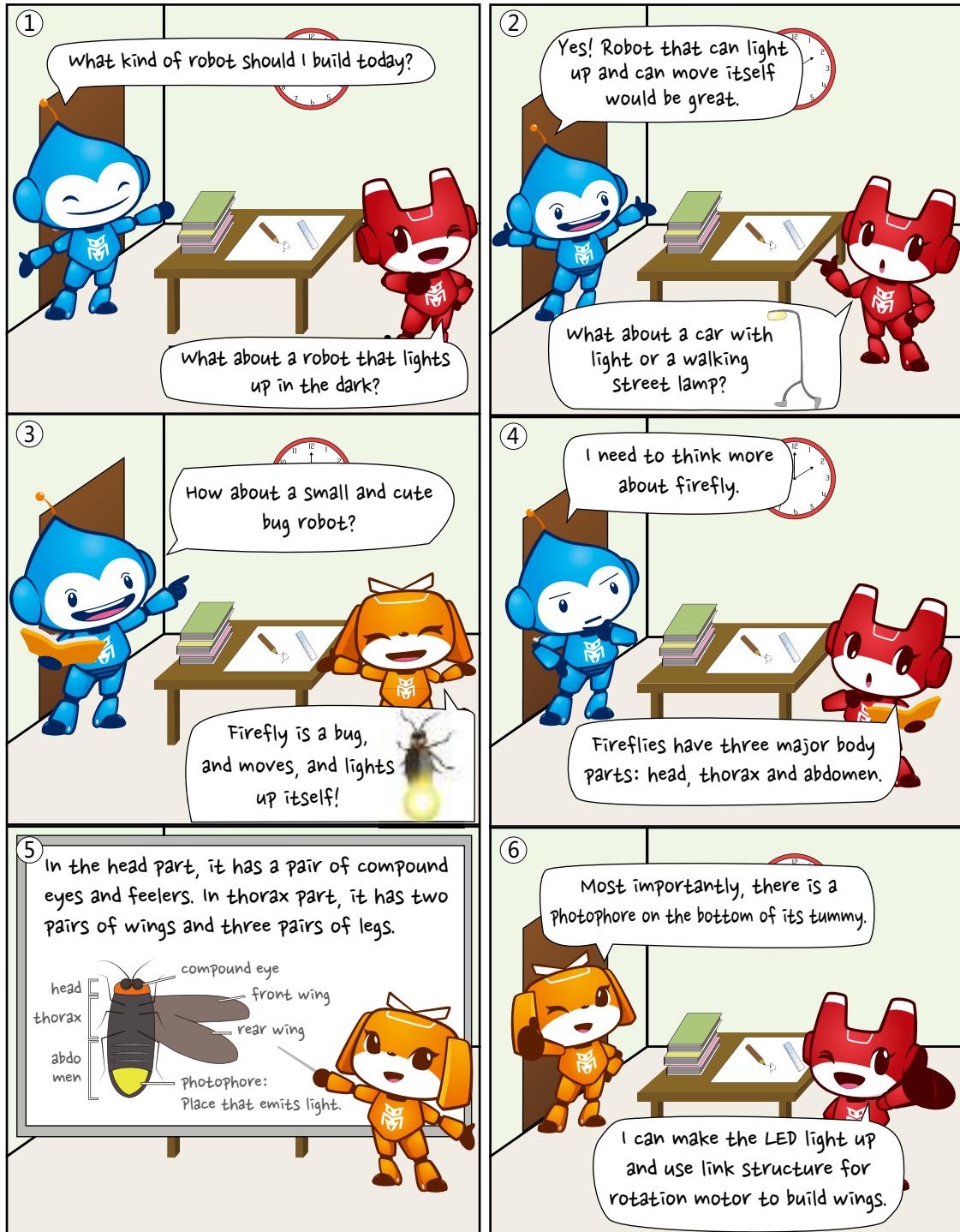
Save the block on Scratch and upload to the robot using Scratch Builder to run without the communication cable (**press # + 4 button** on the remote to run the uploaded code).

❖ Any questions about Coding Mission?

- For any questions about robot coding mission, visit Support-Technical support at www.robobuilder.net.
- Download the 'Scratch Builder' manual on the website.
(Download the Scratch Builder manual in Support-Manual at www.robobuilder.net.)

12. Imagine Robot.

My own robot PART 2



Creative Robot Class



Write a report on <My own robot PART 2>.

★ 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.



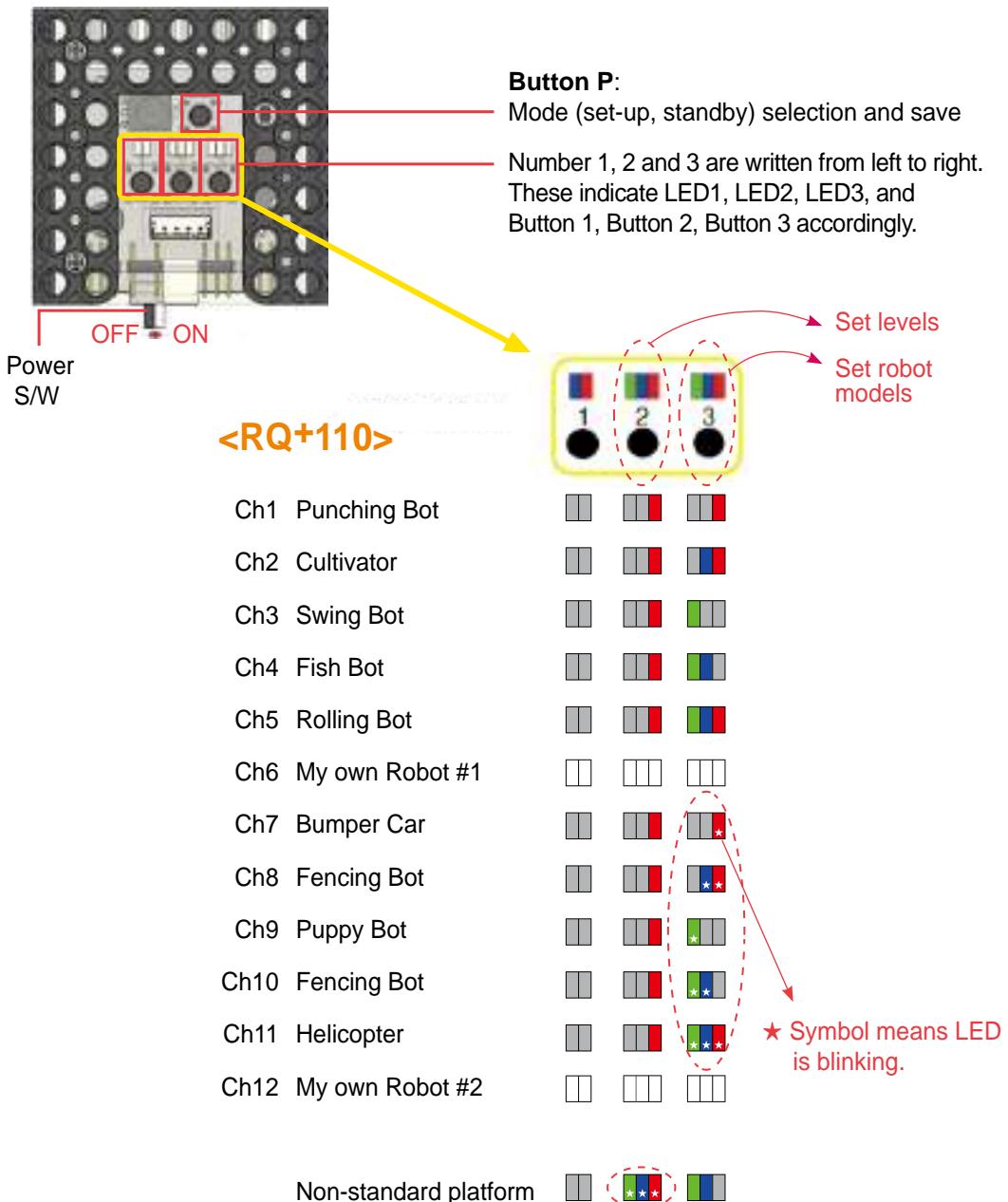
◆ Describe your own robot.

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



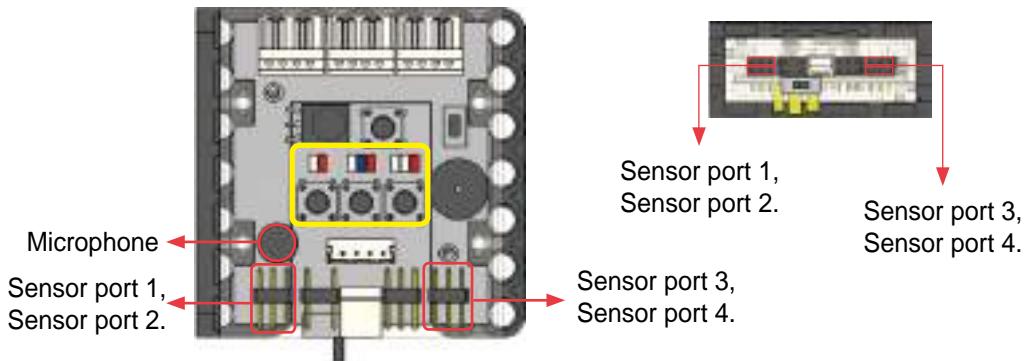
Set-up RQ+ robot project model

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.



Set-up RQ+ robot sensor

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



Sensor port 1



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)

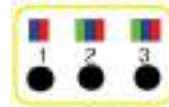
ON

ON (High sensitivity)

ON

ON (Highest sensitivity)

Sensor port 2



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 3

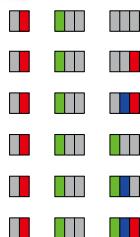


■ LED off

■ 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)

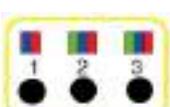
ON

ON (High sensitivity)

ON

ON (Highest sensitivity)

Sensor port 4

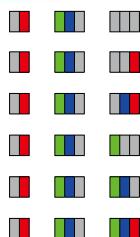


■ LED off

■ 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)

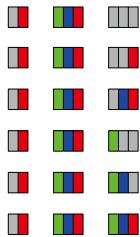


■ LED off

■ 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

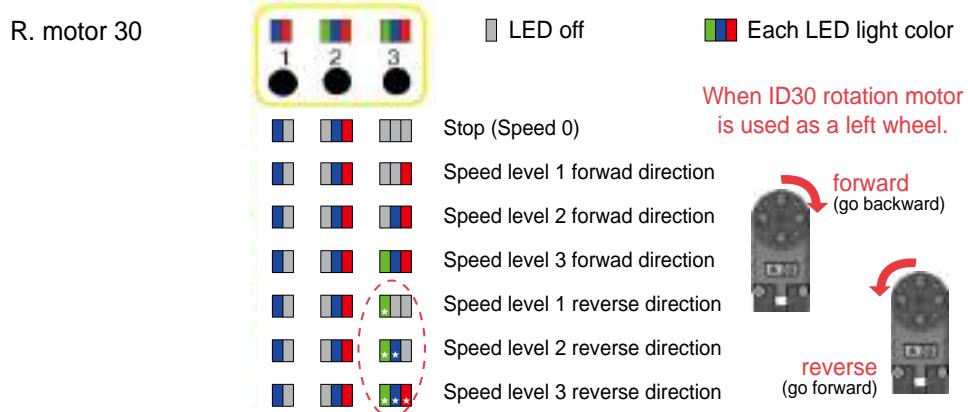
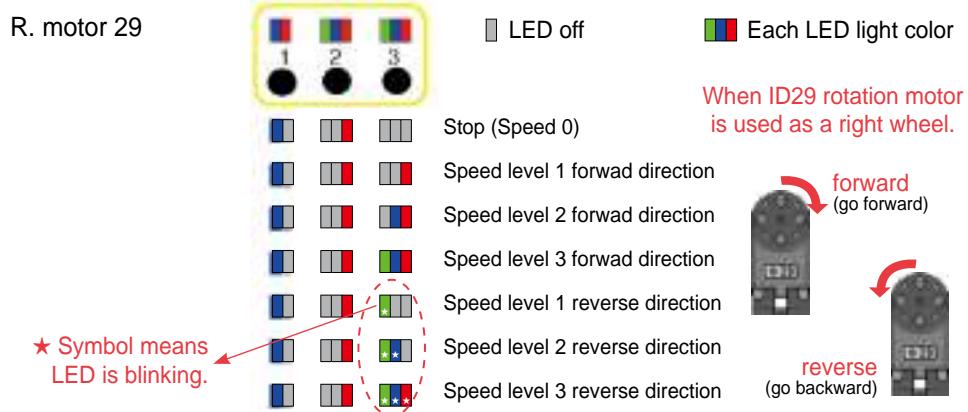
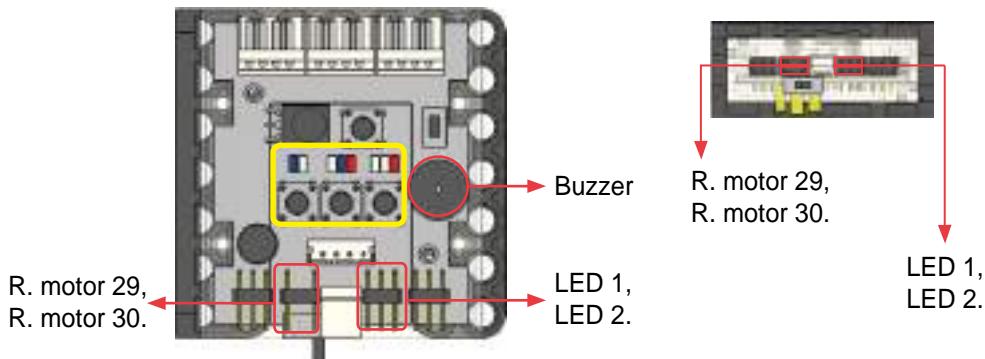
ON (High sensitivity)

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.



LED1



LED off



   LED OFF

 LED red ON

LED blue ON

   LED red and blue ON

LED2



LED off



 LED OFF

LED red ON

LED blue ON

LED red and blue ON

Buzzer (Melody)



LED off



Melody OFF

A row of three small horizontal bars. The first bar is blue, the second is green, and the third is red.

Ten Little Indians

 Hello

A row of decorative icons used as bullet points. From left to right, they include: a blue square with a white triangle, a grey square with a white triangle, a green square with a white triangle, a blue square with a white triangle, a red square with a white triangle, a green square with a white triangle, and a grey square with a white triangle.

Twinkle, twinkle little stars

Head Shoulder Knee and Foot

For Elise

 Minuet (Bach)

Congratulations!

↳ [Learn more about the birth date](#)

Figure 1. Schematic diagram of the experimental setup. The top panel shows the optical path from the laser source to the sample stage. The bottom panel shows the sample stage with the sample and the beam splitter.

3

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 electronic parts 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.



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