my robot time

MRT3 Series

- MRT3 curriculum is developing for helping students(age 6 - 13+), through robotics, learn essential STEM (science, technology, engineering, and math) concepts.
- Step by step and systematic building instructions for MRT3 educational robot kits.

1 Foundation Level

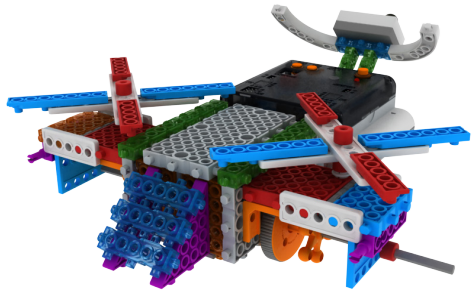
2 Beginner Level

3 Intermediate Level

4 Advanced Level

MRT3-1. Foundation Level

CONTENTS



Part List 4

Let's learn how to assemble each part and its function! 6

What are we going to learn? 10

○ Robot Making1--Piglet 12

○ STEM 1. Principles of a lever 14

○ Robot Making2--Multiple Gadget's Arm 15

○ Robot Making3--F—15 Fighter 17

○ Robot Making4--Three Wheels Bicycle 20

○ STEM 2. The use of weight and pulleys 24

○ Making my robots 25

○ STEM 3. What is a robot? 26

○ Robot Making5--Apache Helicopter 27

○ STEM 4. Kinds of Robots 31

○ Making my robots 32

○ STEM 5. The magic box of a robot「main board」..... 33

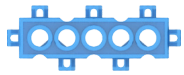
○ How to use the main board? 34

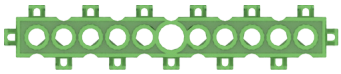
- Robot Making6--I am a Gymnast 36
- STEM 6.Brain of the robot—MCU 40
- STEM 7.Control of the robot—Remote Controller 41
- How to use the remote control? 42
- Robot Making7--Mini Racing Car 43
- Robot Making8--Avatar Helicopter 49
- Robot Making9--Knight and Donkey(Don Ki Ho Te) 57
- STEM 8. The principle of Remote Control 65
- STEM 9. Robot Development 66
- Robot Making10--X—SOCCER 67
- Robot Making11--Drummer baby bear 73
- STEM 10. The History of Robot 79
- STEM 11. The Power of a Robot—Electricity 80
- Robot Making12--Air sing sing Plane 81
- Robot Making13--Bumper Car 87
- Robot Making14--Boxing Robot 93
- Robot Making15--Battle Robot 99

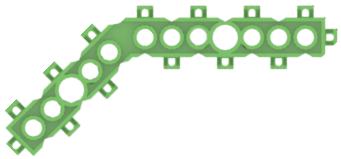
Part list

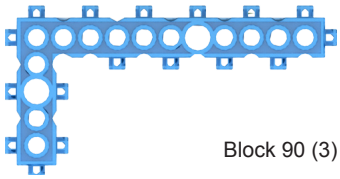
Block

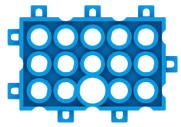
※ The form and color of some parts may be different when compared to actual parts due to continues improvement of production quality.

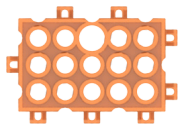

Block 15 (5)

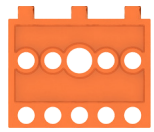

Block 111 (6)

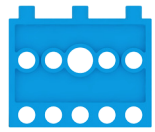

Block 135 (6)

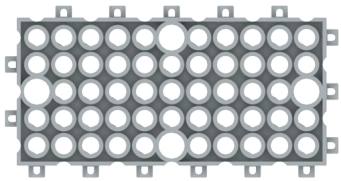

Block 90 (3)

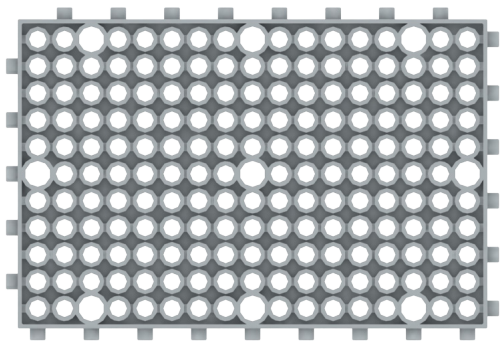

Block 35 (3)

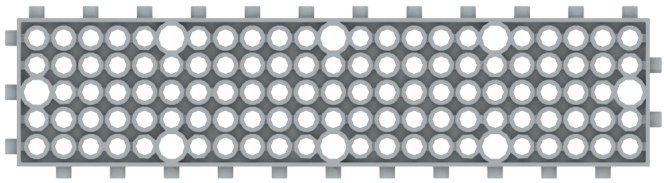

Block 35 (3)


Motor Mount (2)

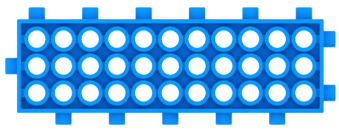

Motor Mount (2)

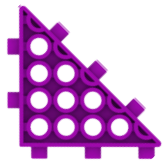

Block 511 (3)

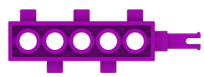

Block 117 (1)

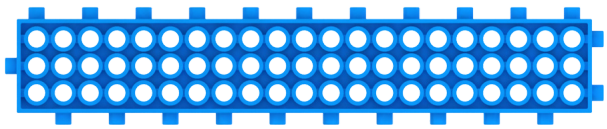

Block 523 (1)

Connect Black 2 (4)


Block 311 (4)

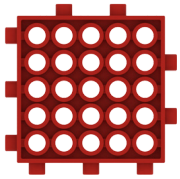

Triangle Block (4)


Shaft Block (4)

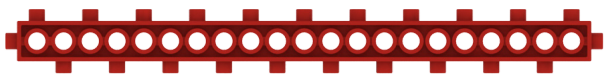

Block 321 (2)

Gear Block (4)

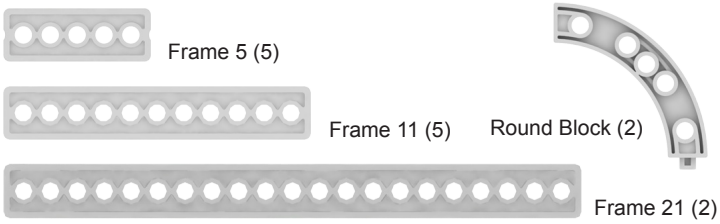
Crank Block (2)

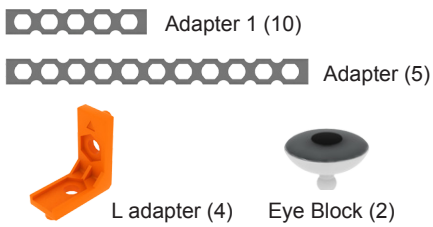

Block 55 (2)

Connect Block 1 (6)

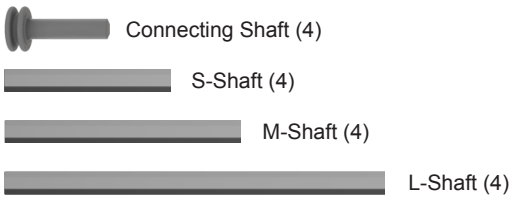

Block 121 (2)

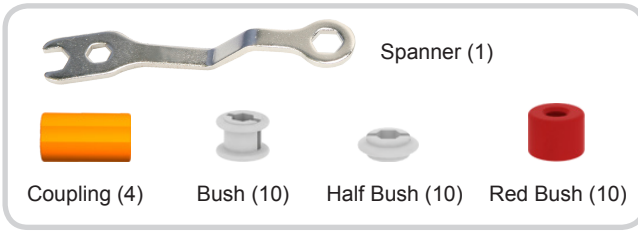
Frame / Adapter



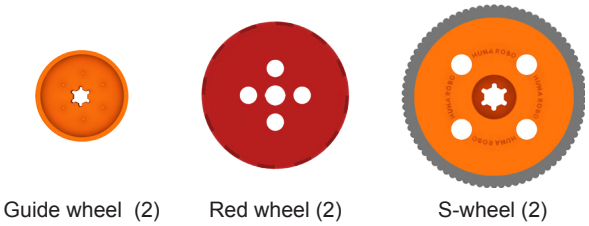


Shaft / Bush

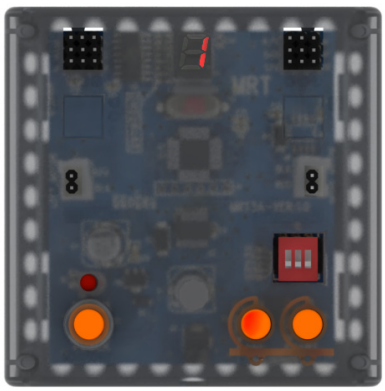


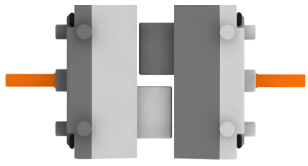


Gear / Wheel



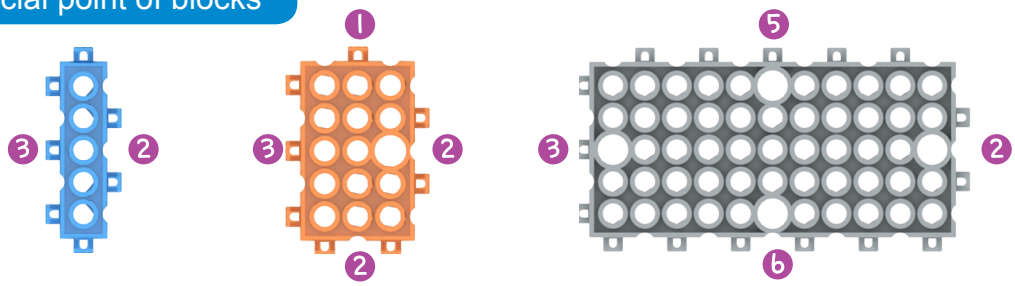
Electronic Parts





Let's learn how to assemble each part and its function!

Special point of blocks

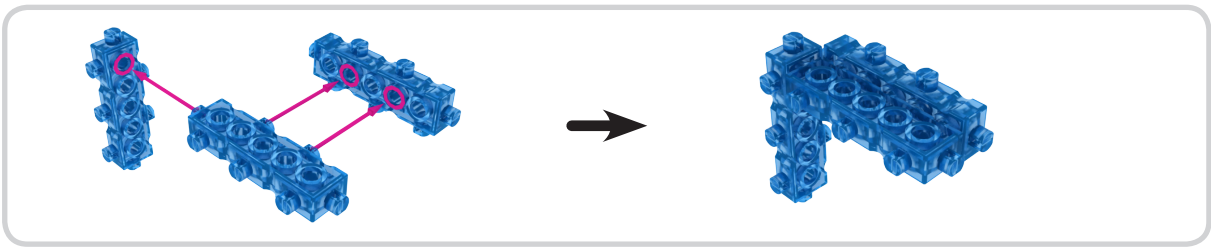


※ As shown above different blocks structure has different numbers of studs. Be careful the direction when assemble.

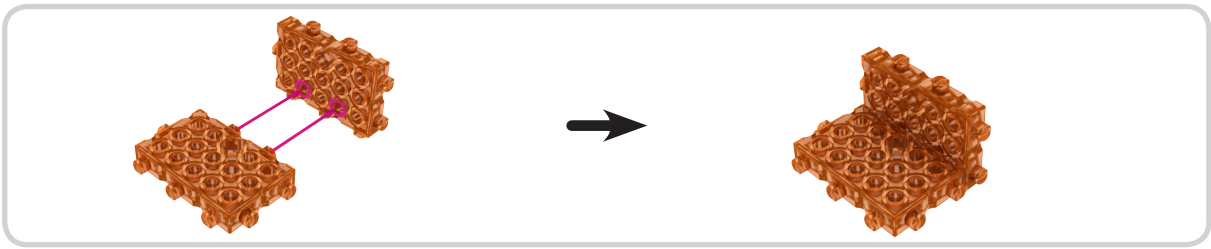
Assemble blocks

The blocks can be assembled in any structure.
(The middle hole can be used to assemble the DC motor)

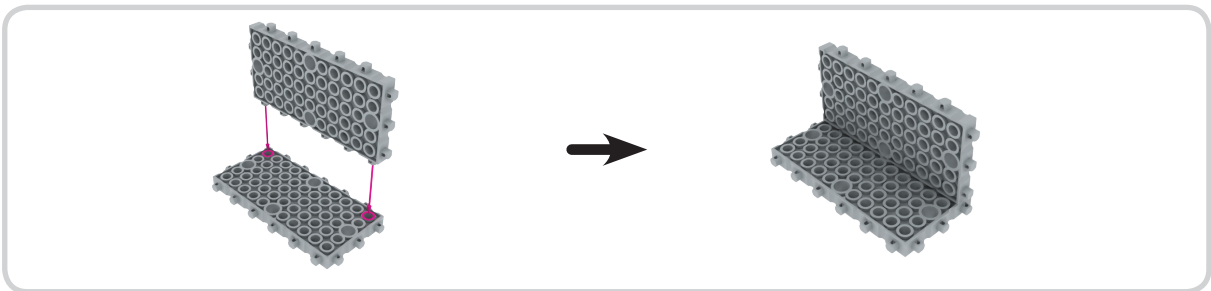
※ Block15 means that it has 5 holes in a row and the left column side has 3 studs, the other side has 2 studs.



※ Block35 means that it has 5 holes in three rows(total 15holes), also the block 35 has one side with 3 studs miss some words here.



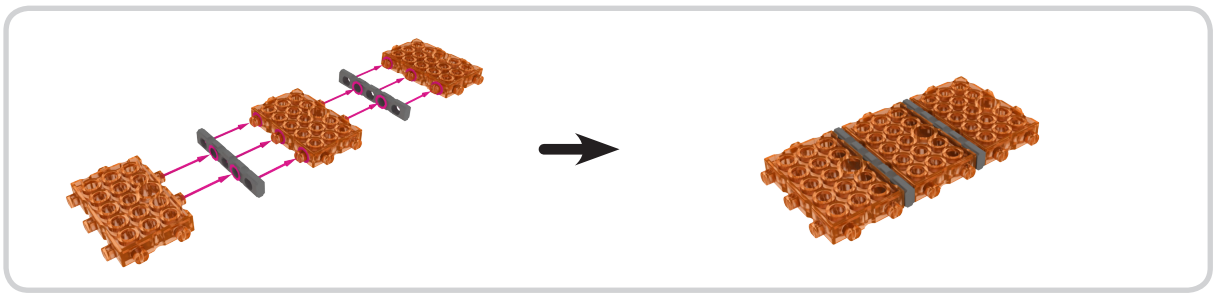
※ Block 511 means that it has 11 holes in five rows(total 55 holes), one side has 6 studs, the other side has miss some words here.



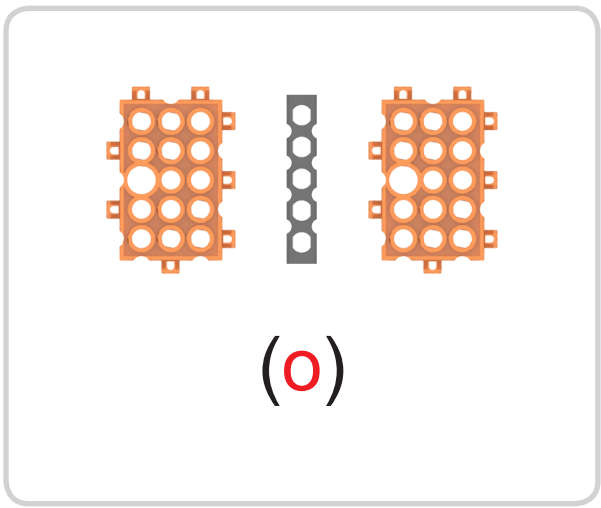
※ Block 90 means the block is in "L" shape with the angle of 90 degree.

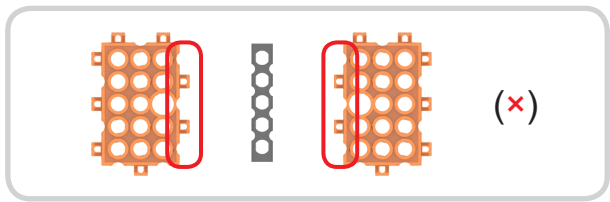
※ Block 135 means has an angle of 135 degrees.

Assemble using an adapter

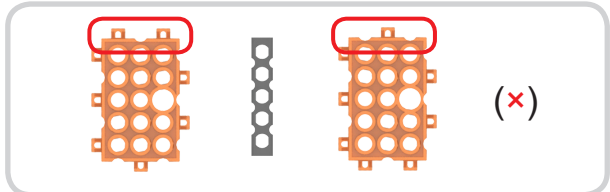


※ Some steps to take note when using the adapter.





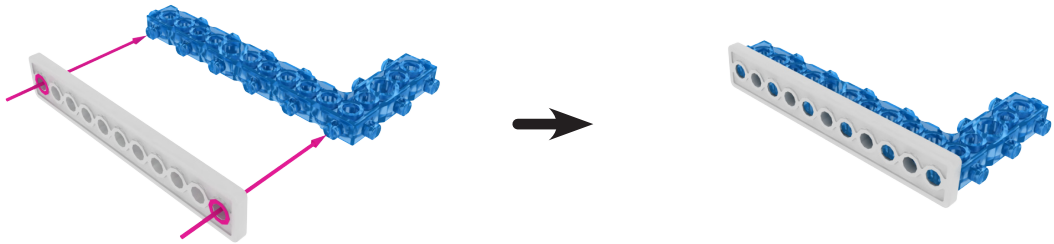
If both sides are odd or even, the block can't assemble with adapter.



Make sure that both upper and lowe of the block must has the equal studs, when assemble using adapter.

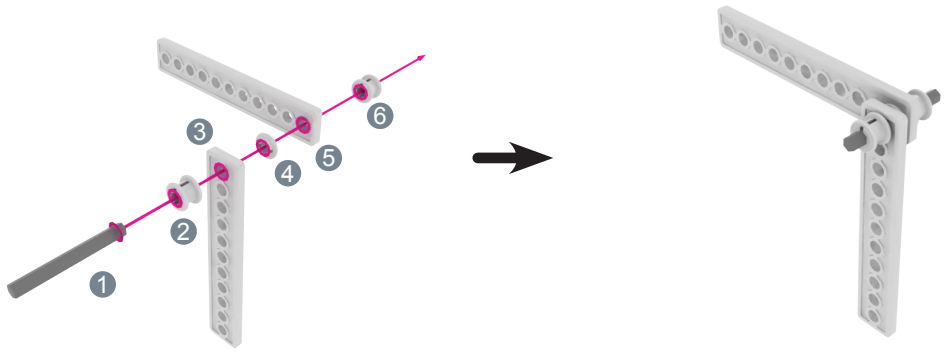
Assemble block and frame .

※ When assemble block and frame, make sure all the block's studs inserted into the frame's hole.



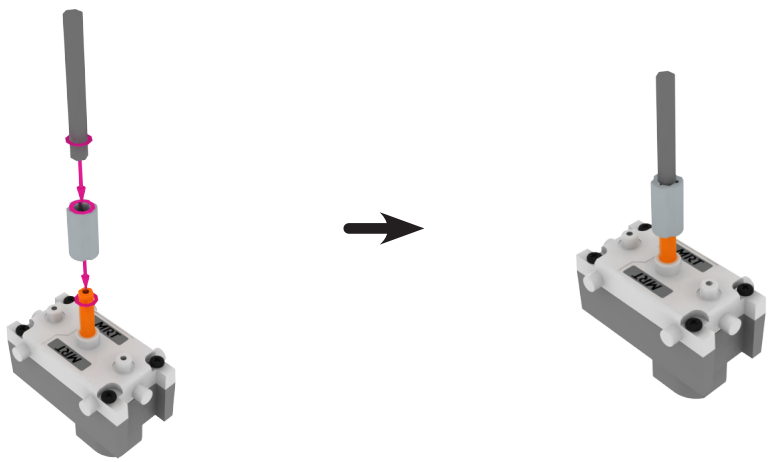
Assemble shaft and bush

※ Try to assemble in order.



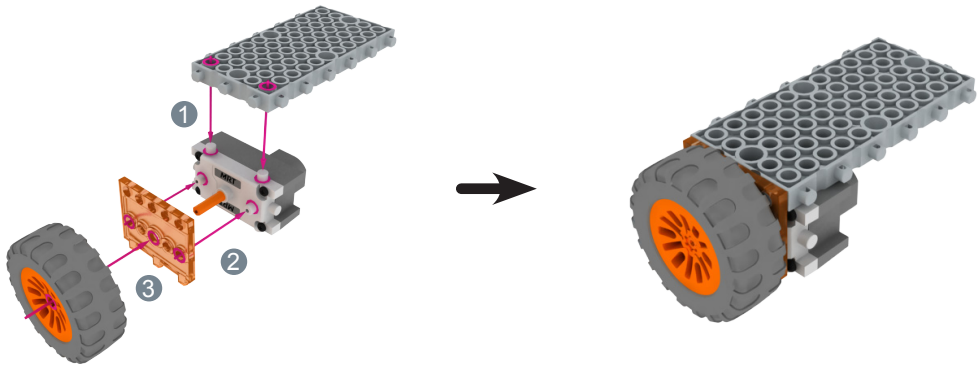
Assemble DC motor and coupling.

※ The coupling is used to join the shaft to the motor and can be used to make the shaft longer.



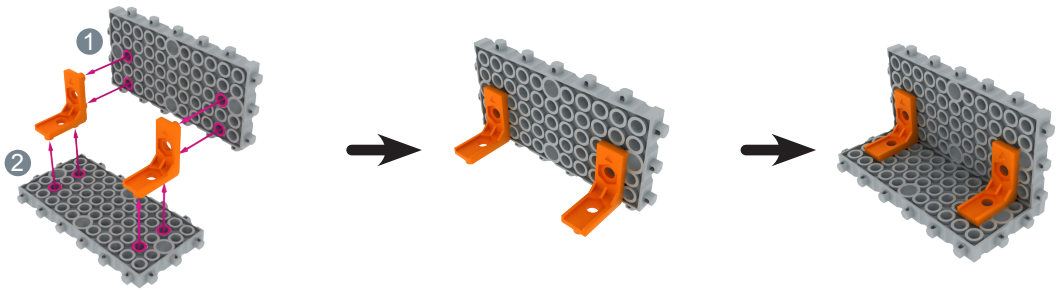
Assemble DC motor and wheel.

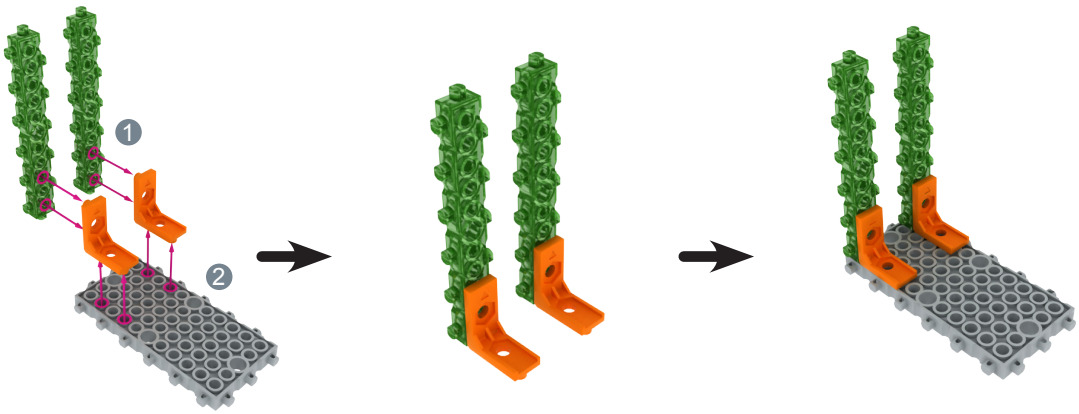
※ Try to assemble in order.



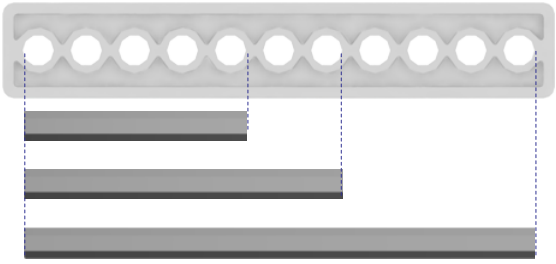
L Adapter

※ please assemble* (Arrow) direction first.





Shaft



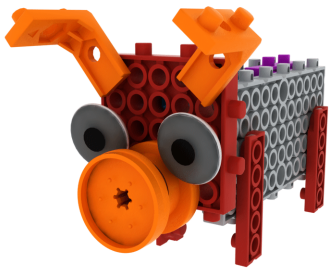
Frame 11

S--shaft (5 holes distance)

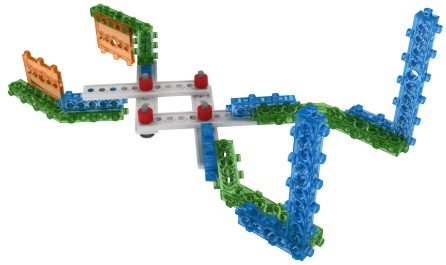
M--shaft (7 holes distance)

L--shaft (11 holes distance)

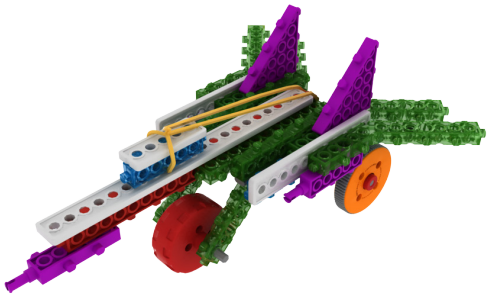
What robots are we going to assemble?



1. Piglet



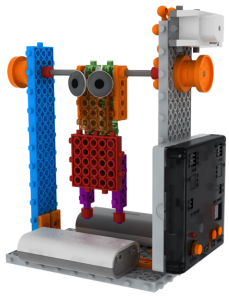
2. Multiple Gadget's Arm



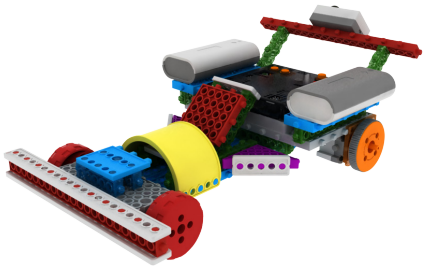
3. F—15 Fighter

4. Three Wheels Bicycle

5. Apache Helicopter

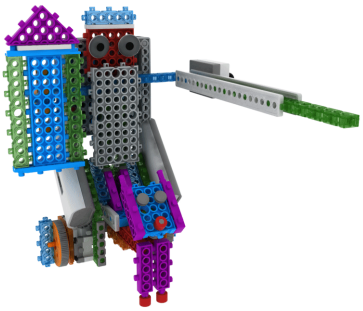


6. I am a Gymnast!

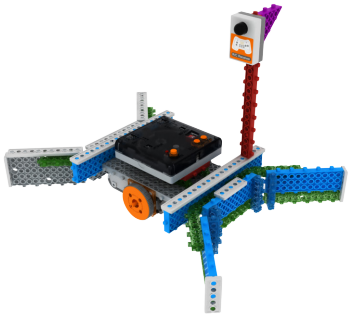


7. Mini Racing Car

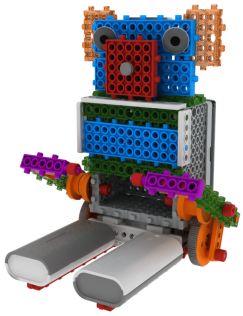
8. Avatar Helicopter



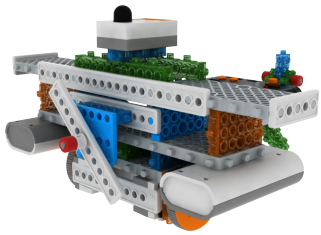
9. Knight and Donkey



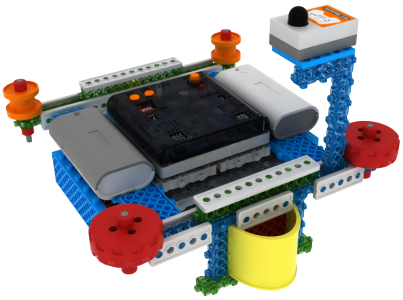
10. X—SOCCER



11. Drummer baby bear

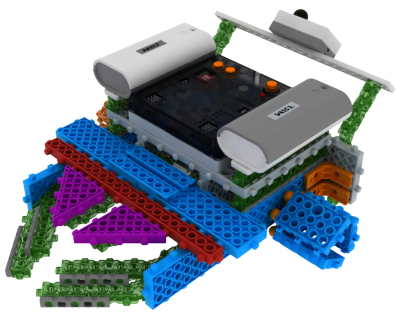


12. Air sing sing Plane



13. Bumper car

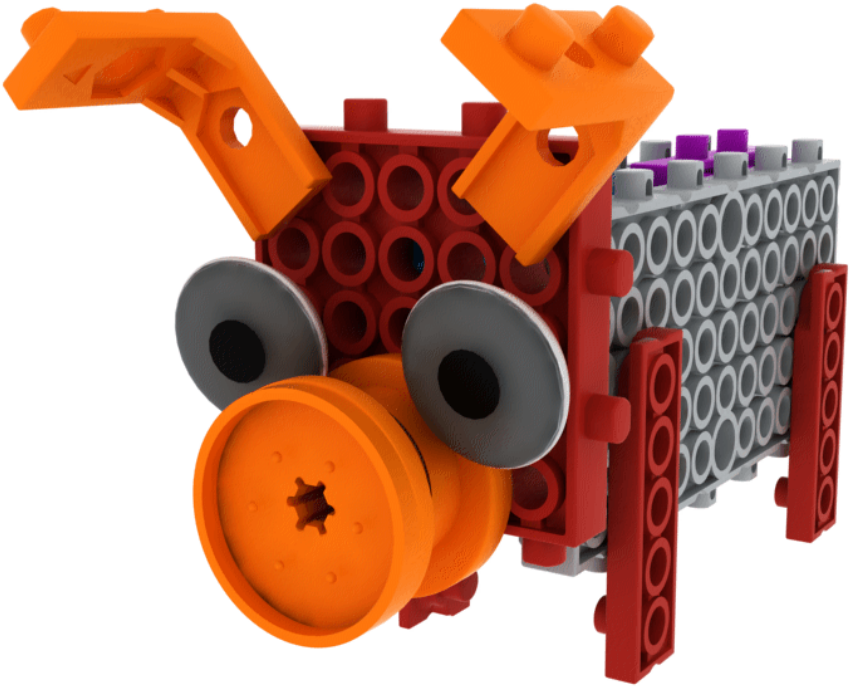
14. Boxing Robot



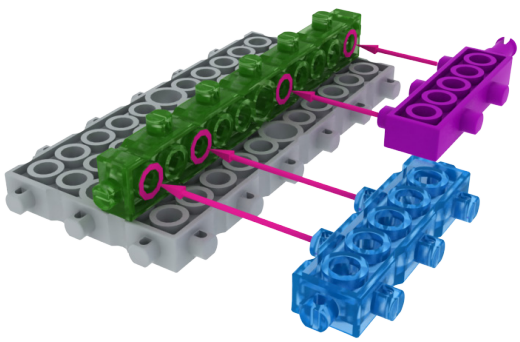
15. Battle Robot

Engineering Art

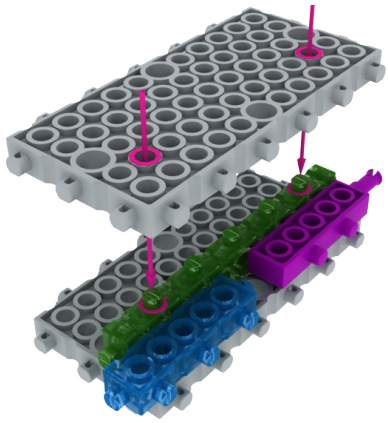
Robot Making1-Piglet



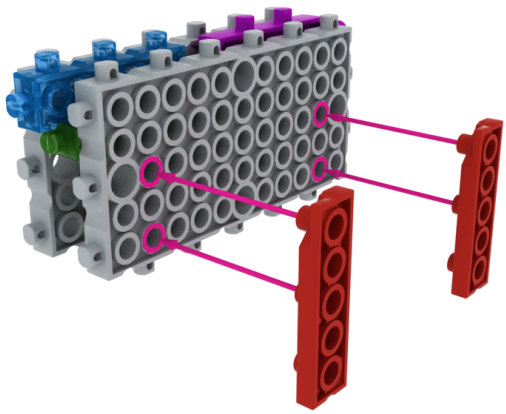
1



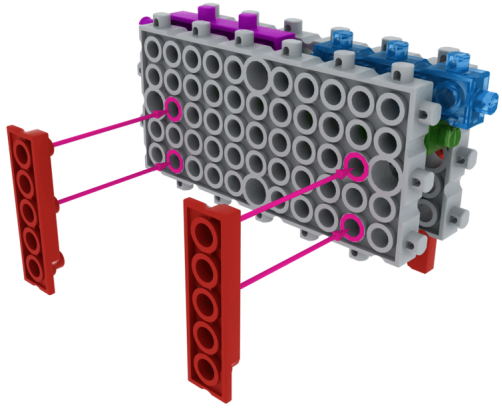
2



3

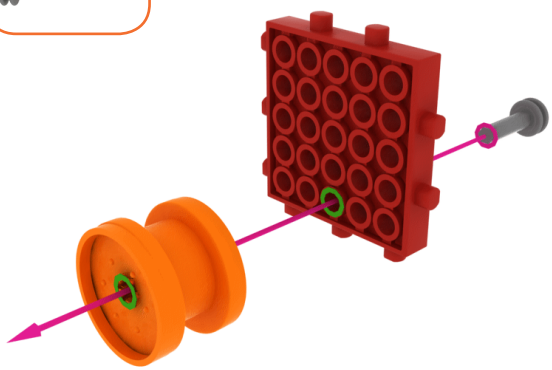


4

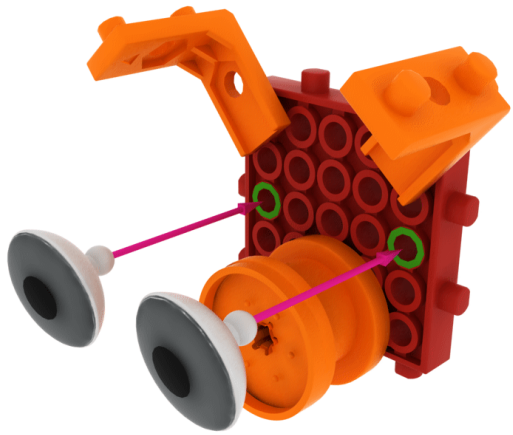


5

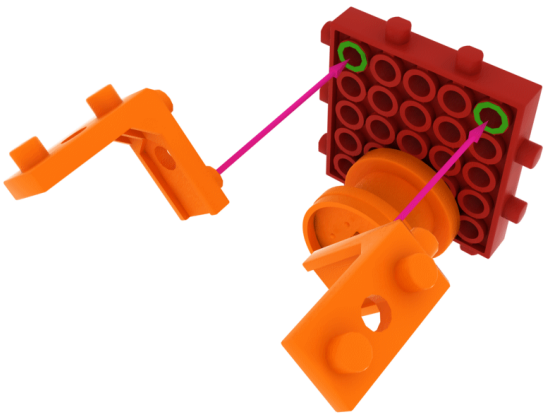
X1



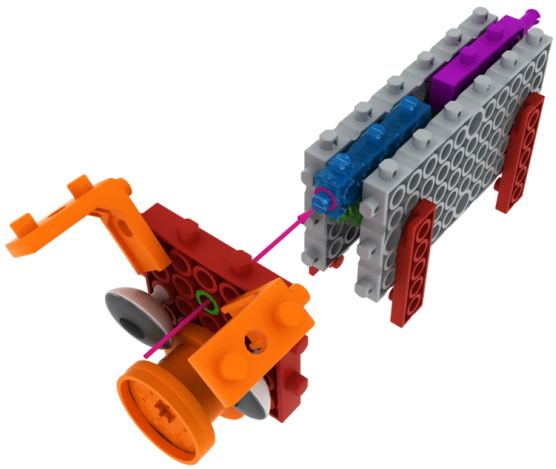
6



7

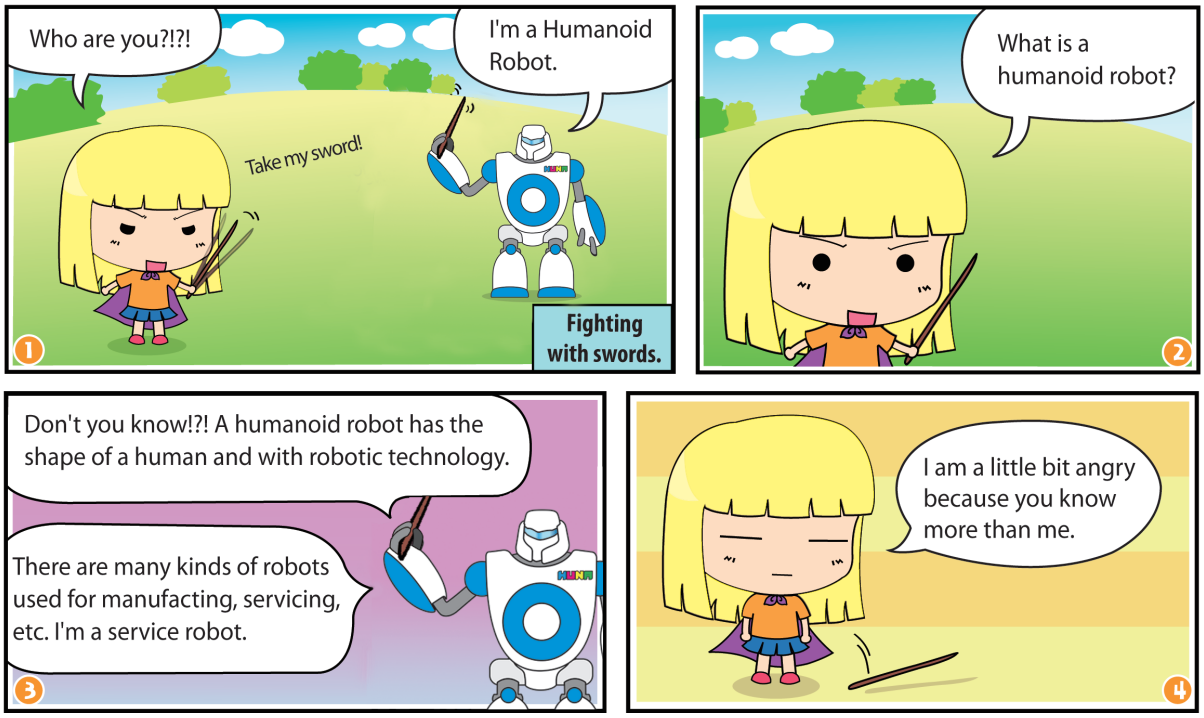


End



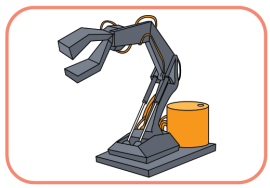
Science

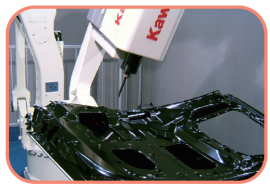
STEM 1. Kinds of Robots



1) Manufacturing Industry

Motorbike manufacturing

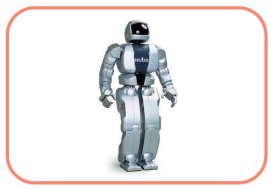

Electronics Manufacturing

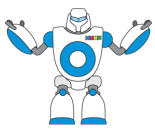

Car manufacturing

2) Servicing Robots

Cleaning Robot

Security Robot

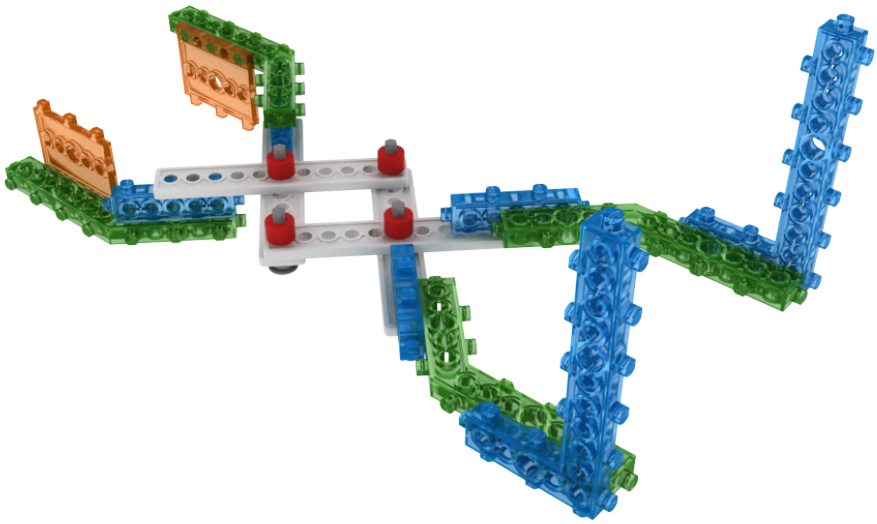

Humanoid Robot



Look around your house and list how many robots you can find!

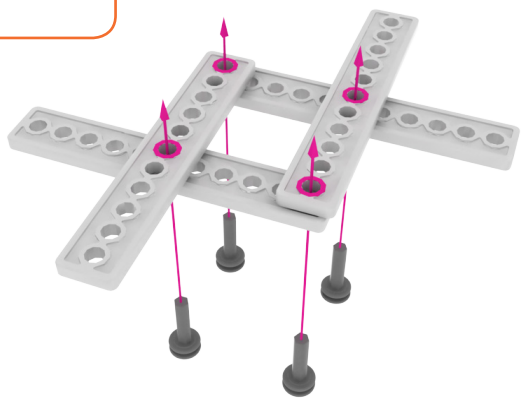
Science Engineering

Robot Making2 -Multiple Gadget's Arm



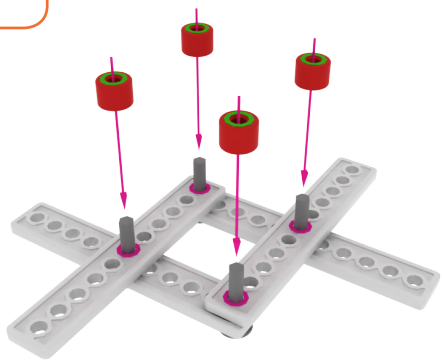
1

X4

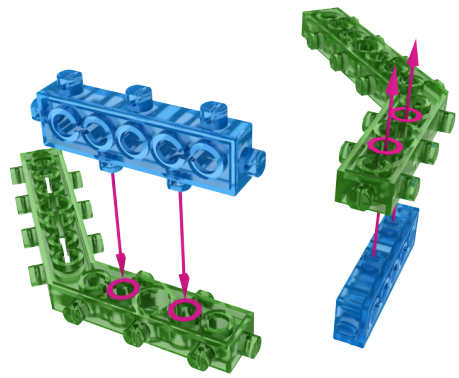


2

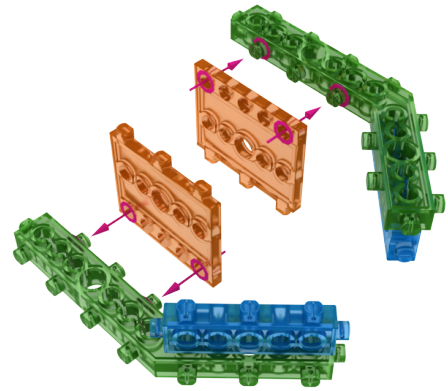
X4



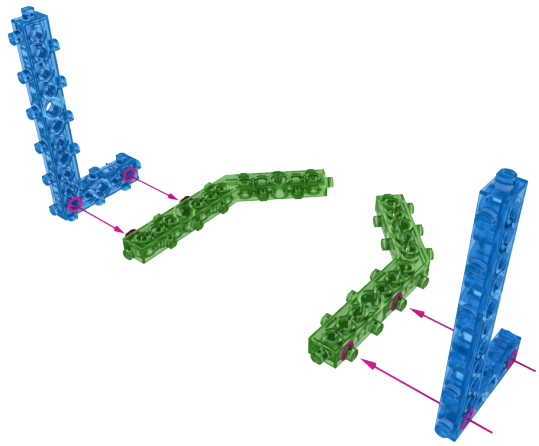
3



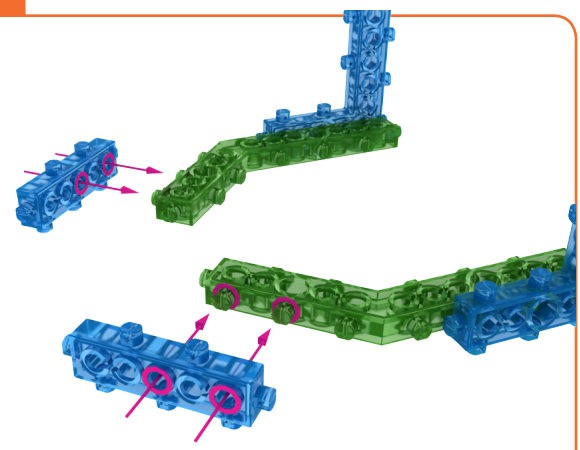
4



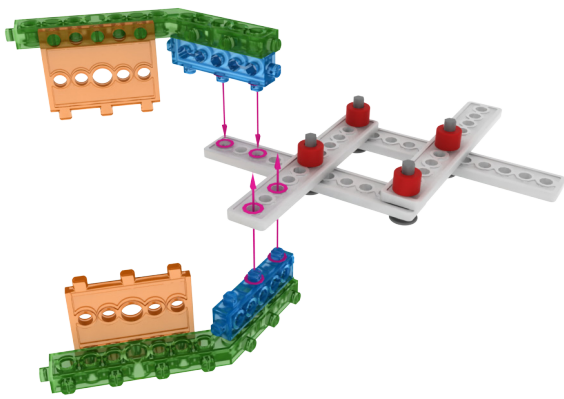
5



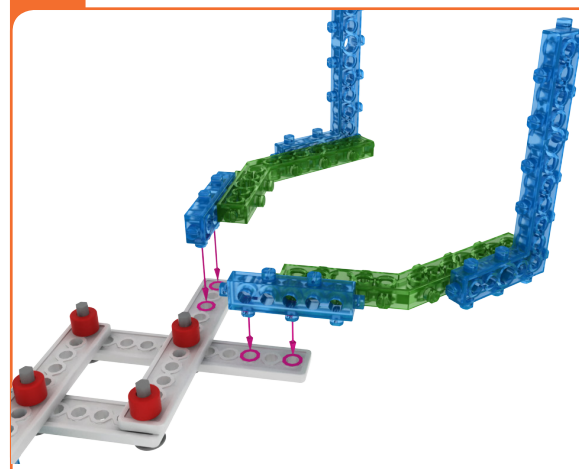
6



7

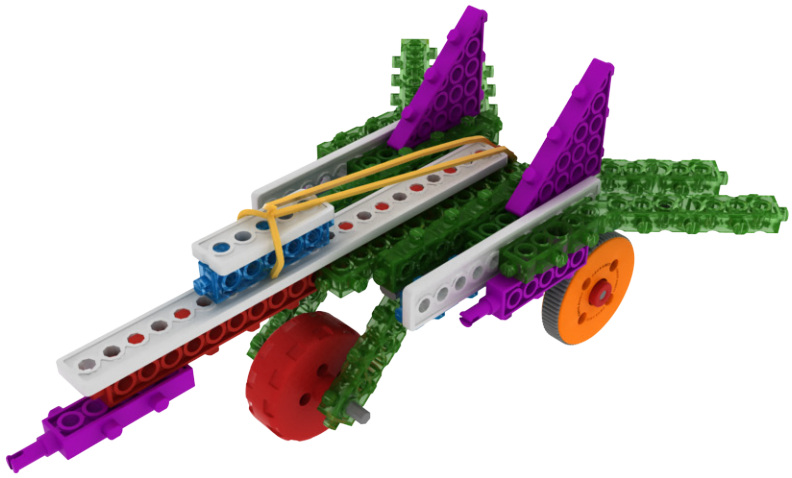


End

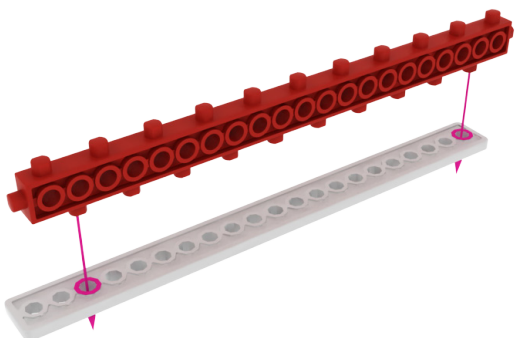


Engineering Art

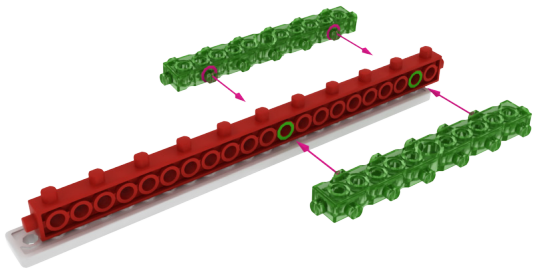
Robot Making3 -F—15 Fighter



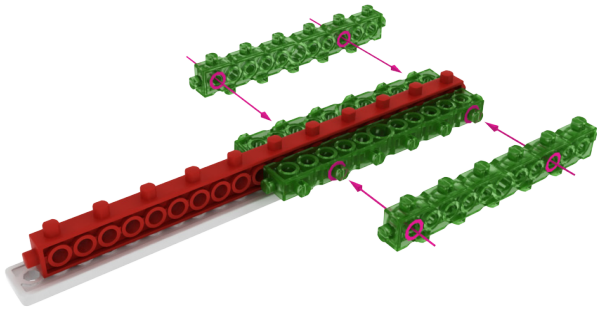
1



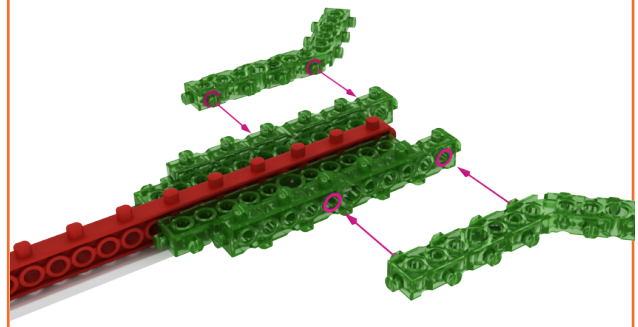
2



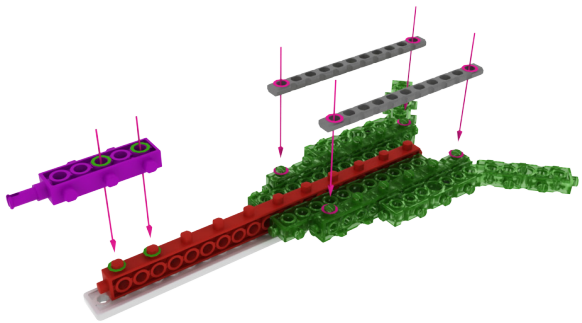
3



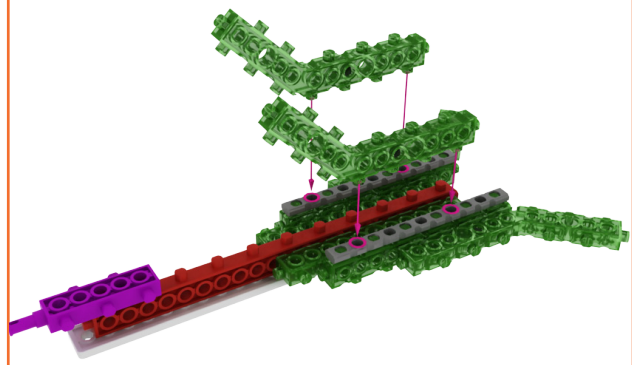
4



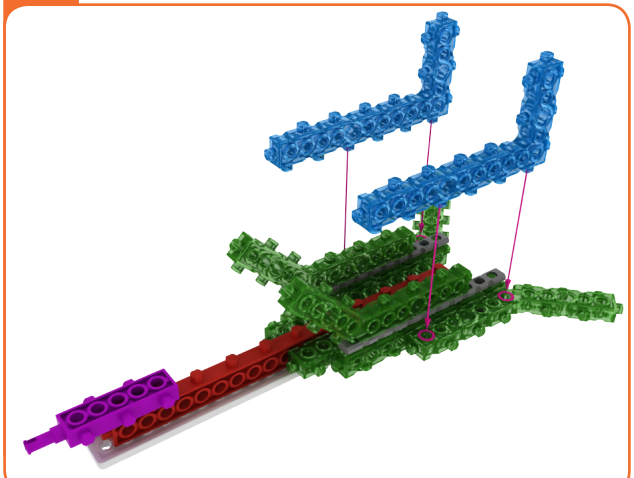
5



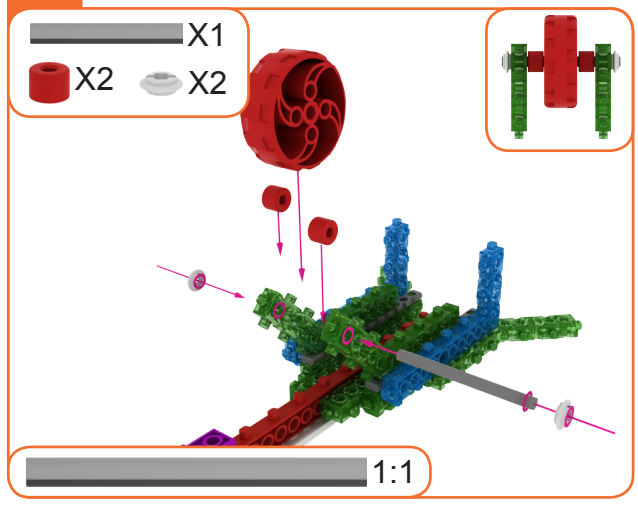
6



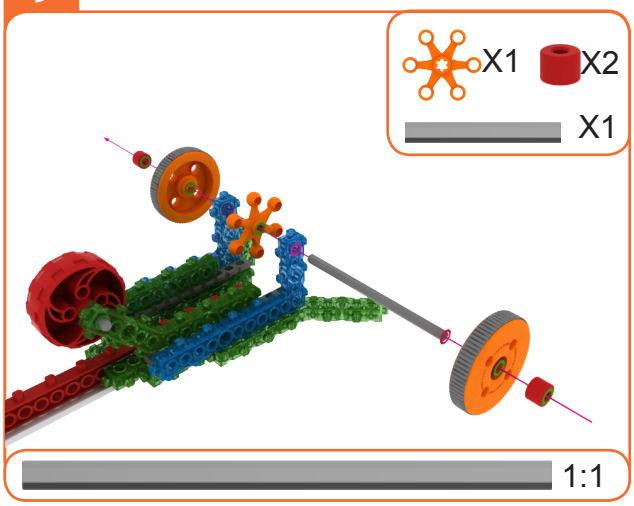
7



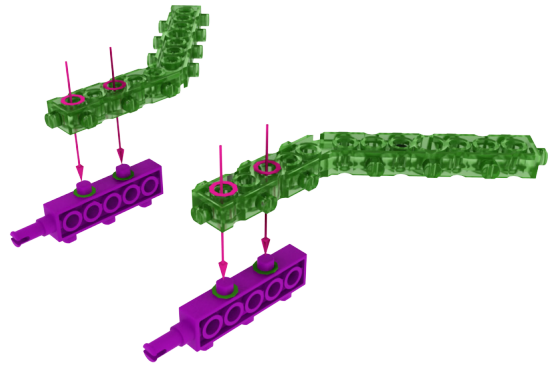
8



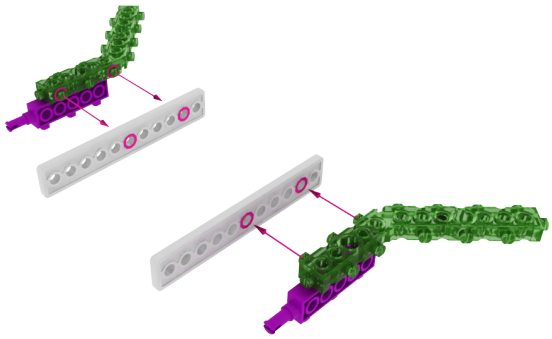
9



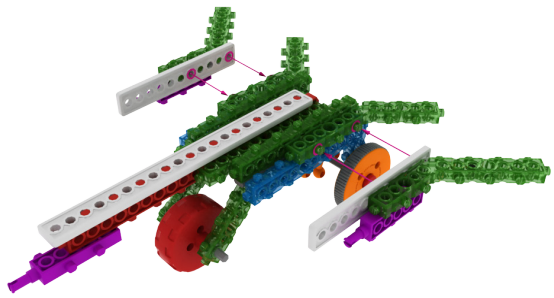
10



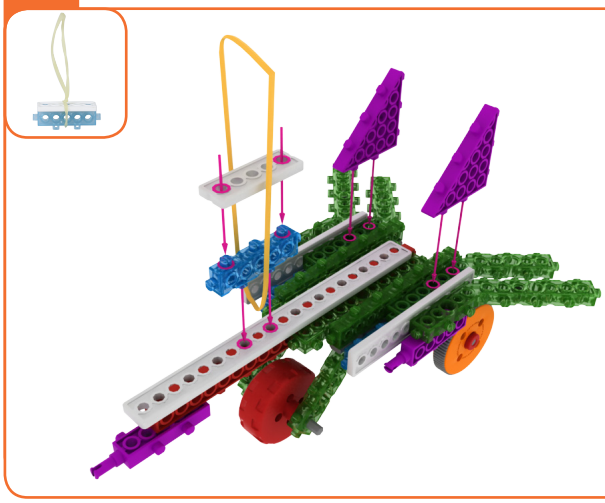
11



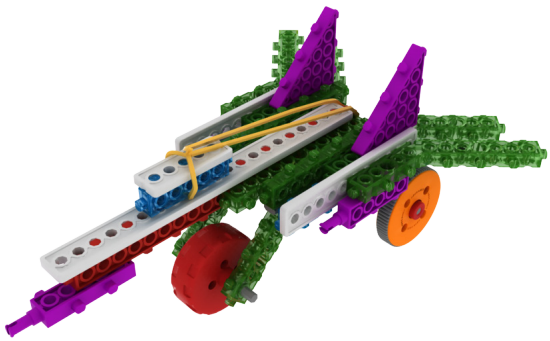
12



13



End

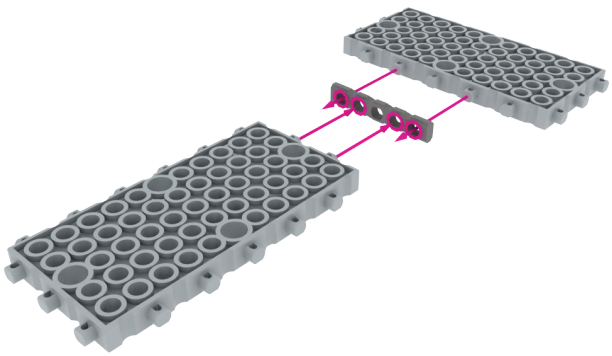


※ Pull back the rubber band and hang to the Gear Wheel, drag backward and put off your hand, the robot will move forward.

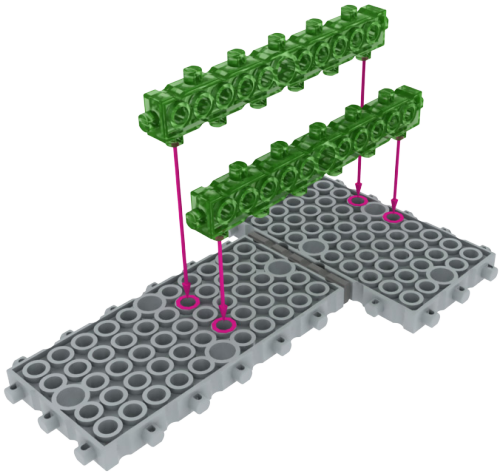
Technology Engineering

Robot Making4 -Three wheels Bicycle

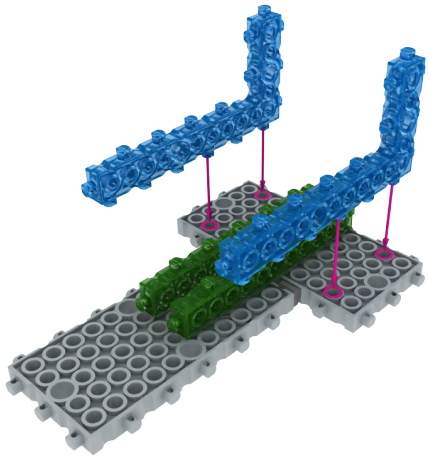
1



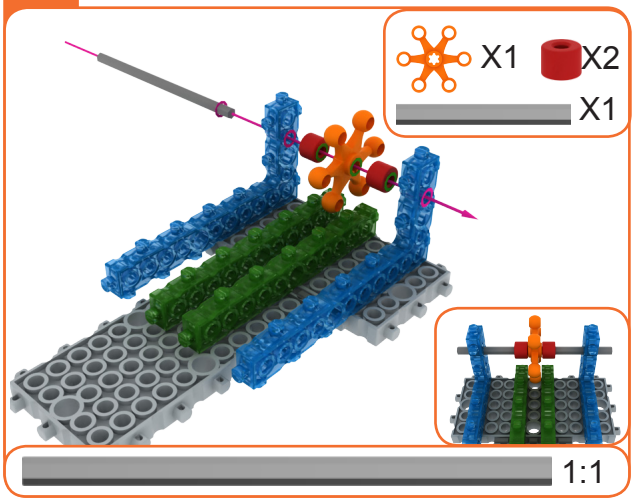
2



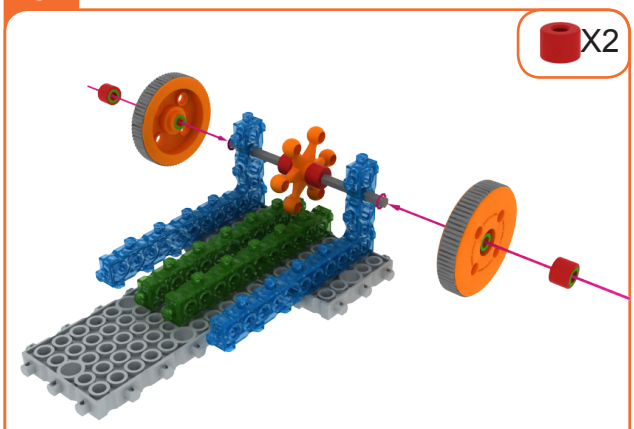
3



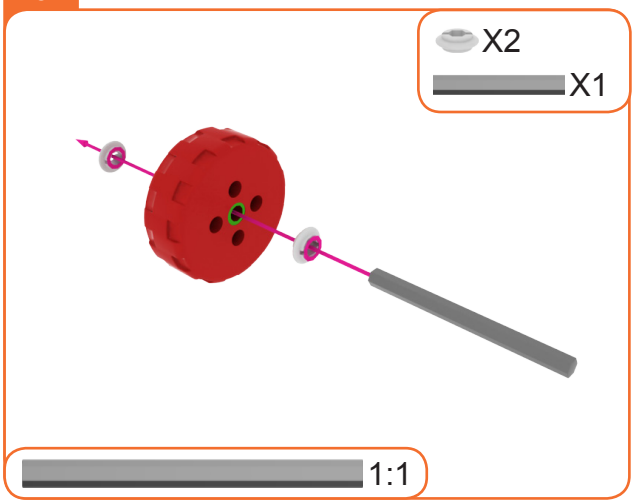
4



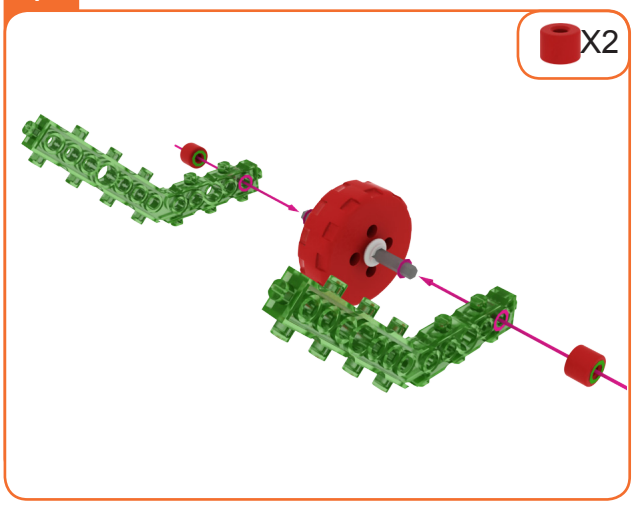
5



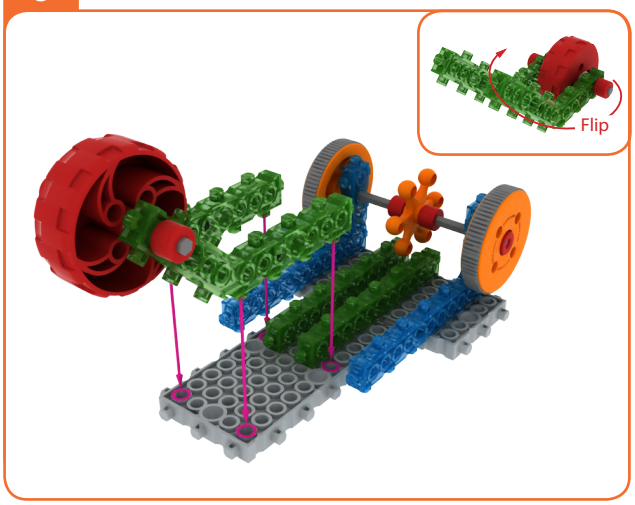
6



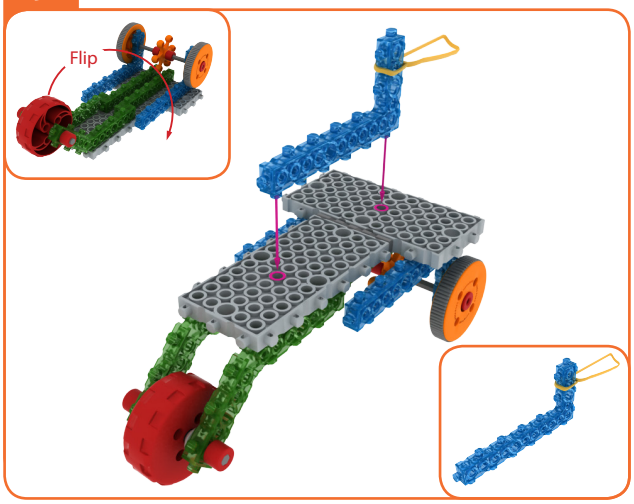
7



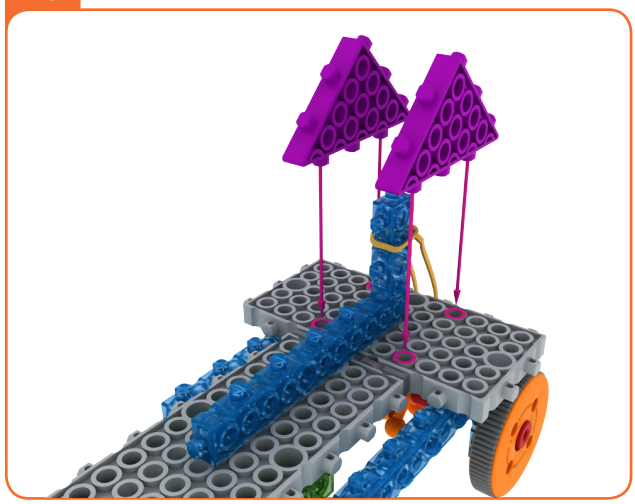
8



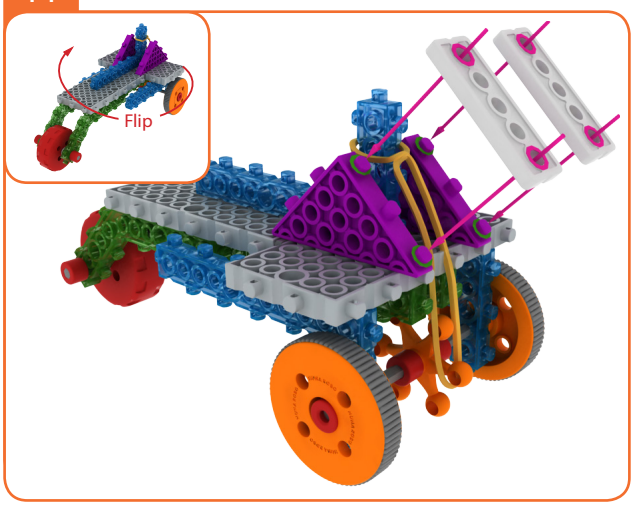
9



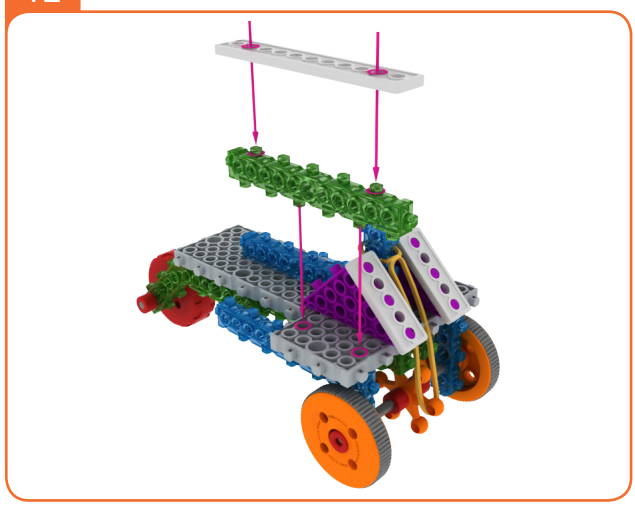
10



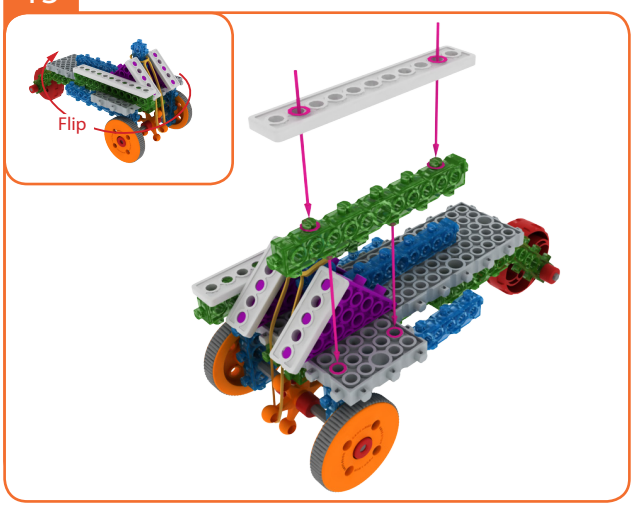
11



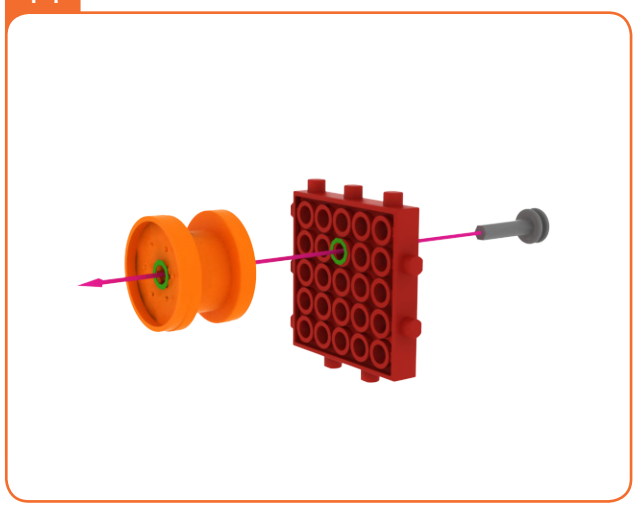
12



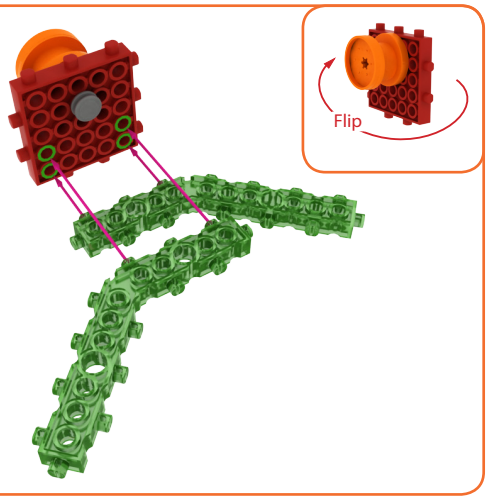
13



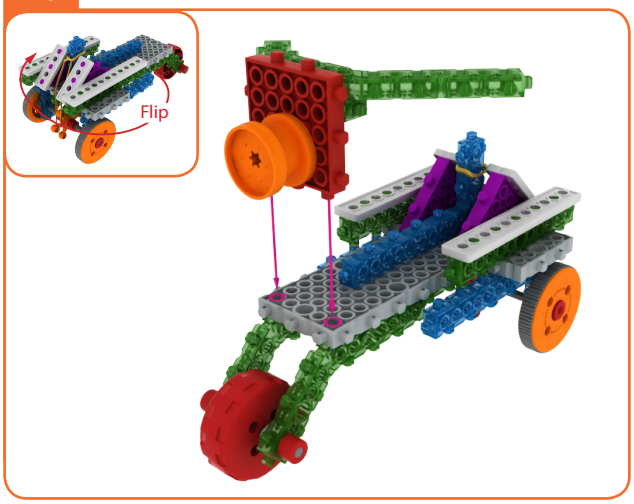
14



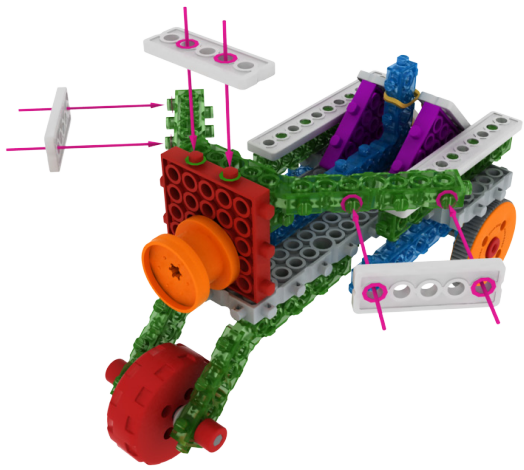
15



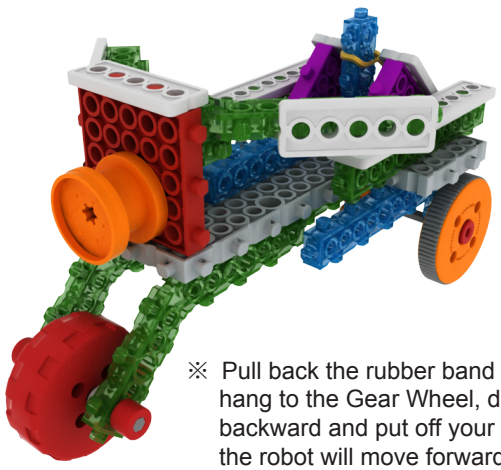
16



17



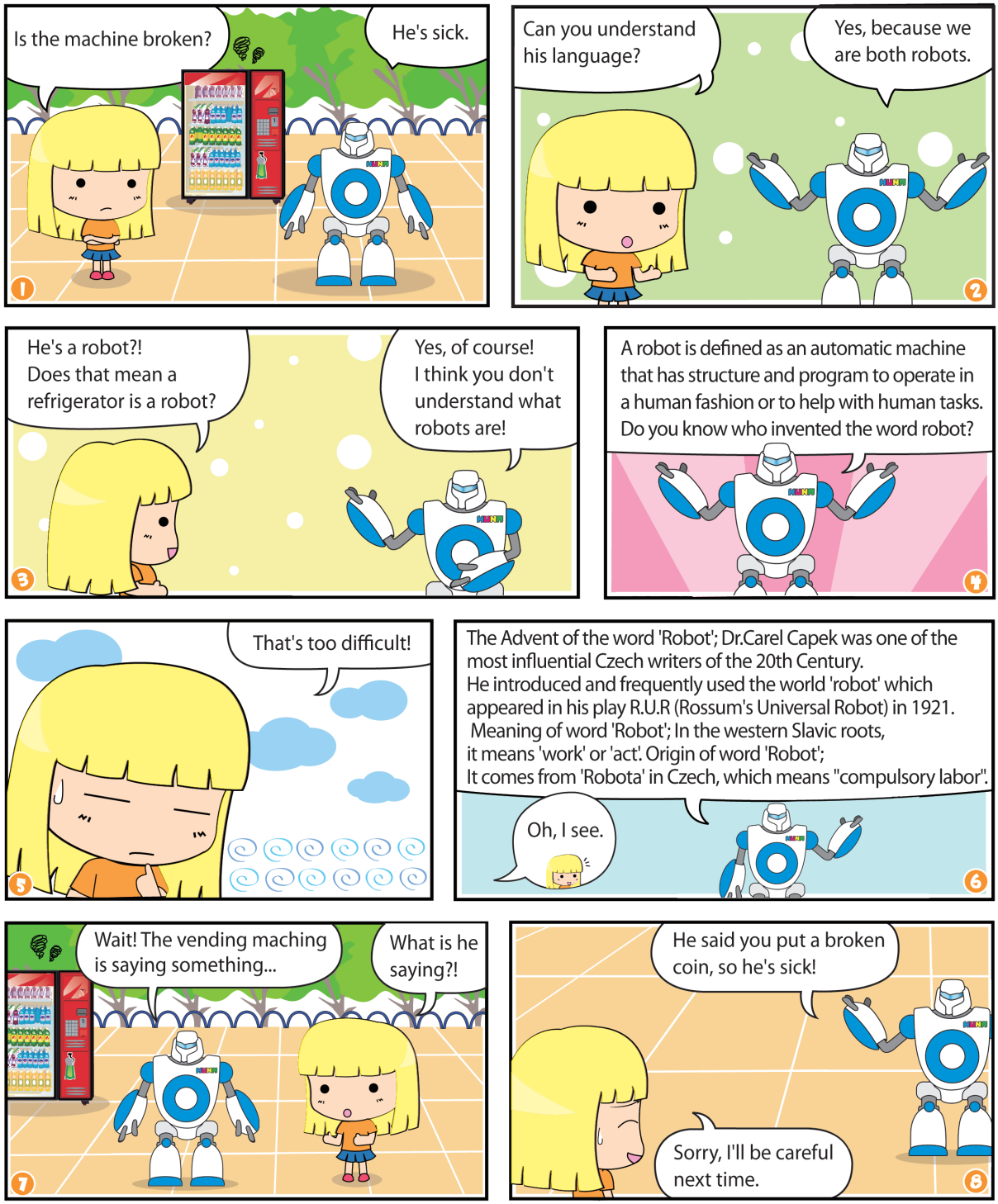
End



※ Pull back the rubber band and hang to the Gear Wheel, drag backward and put off your hand, the robot will move forward.

Science

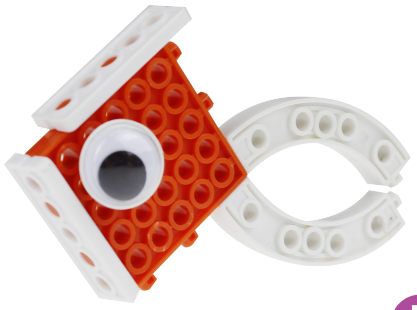
STEM 2. What's a Robot?



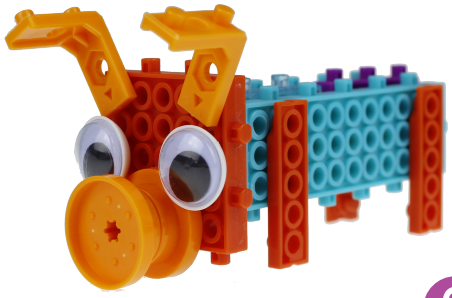
Art

Making My Robot

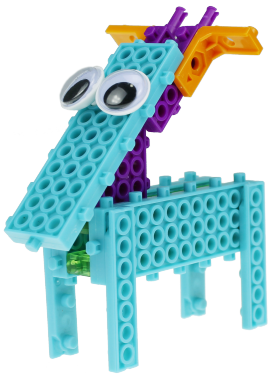
♣ Try to make the robots in the picture and talk about their shapes.



1



2



3

4

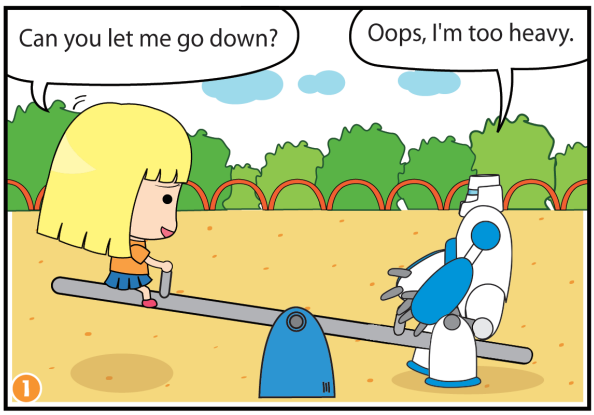
1

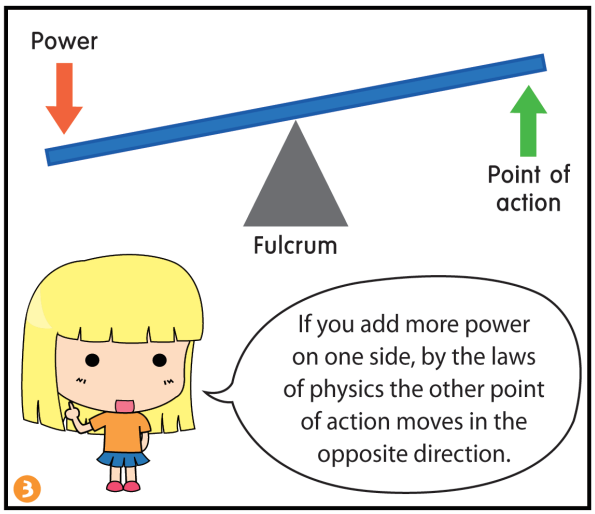
2

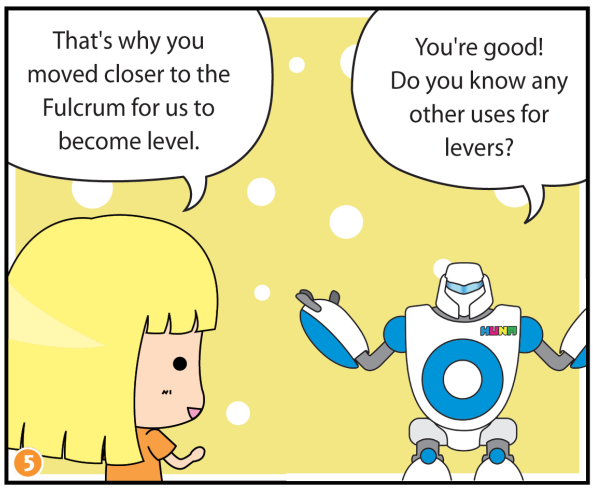
3

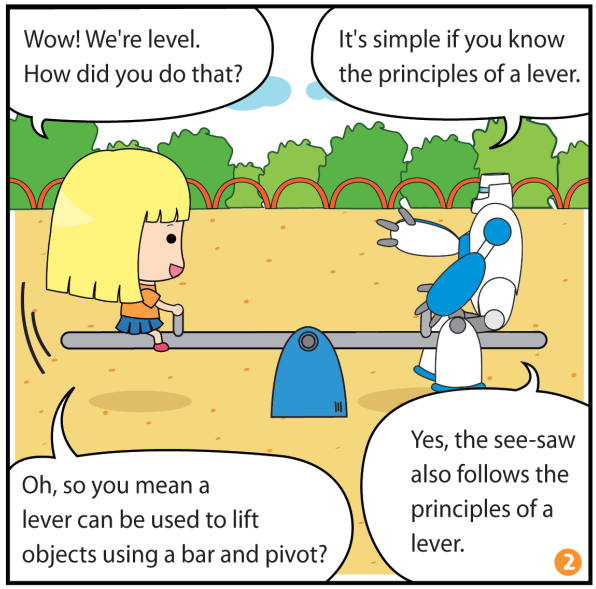
4

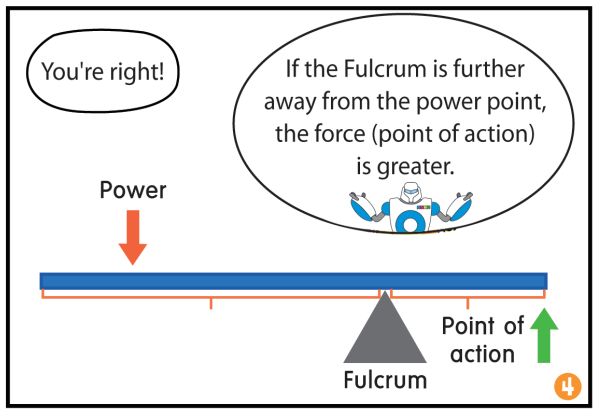
Technology Engineering STEM 3. Principles of a lever

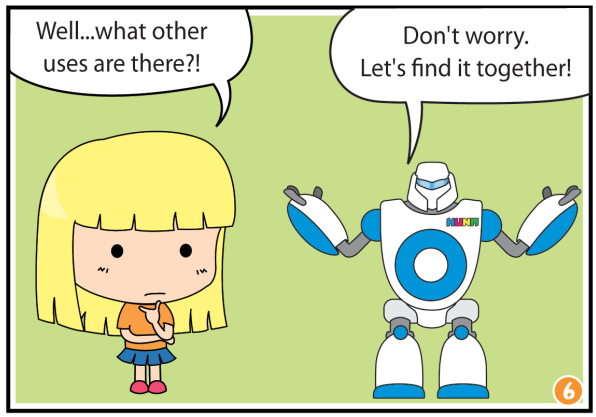








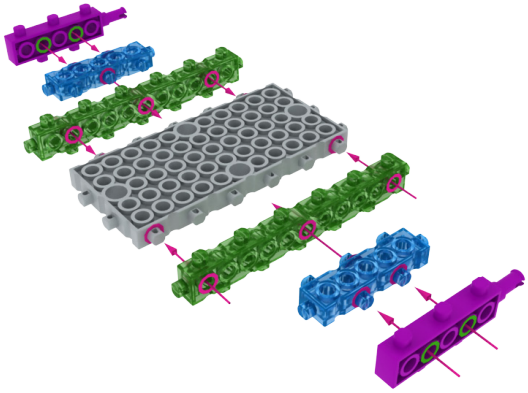




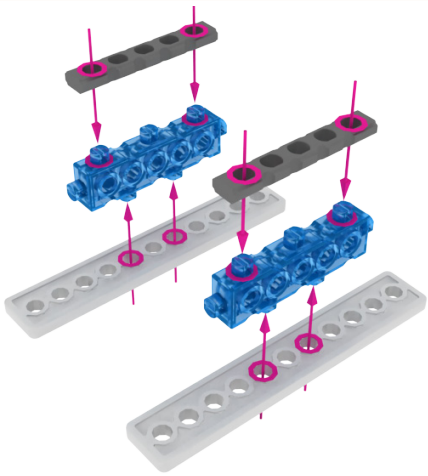
Engineering Art

Robot Making5 -Apache Helicopter

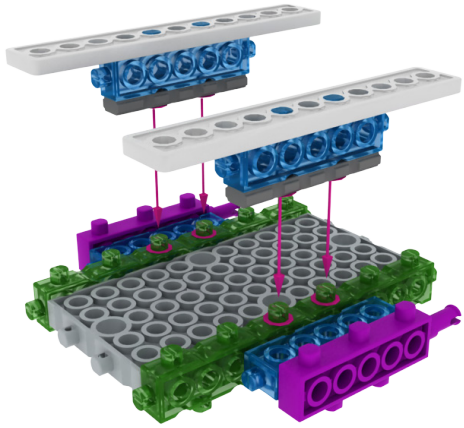
1



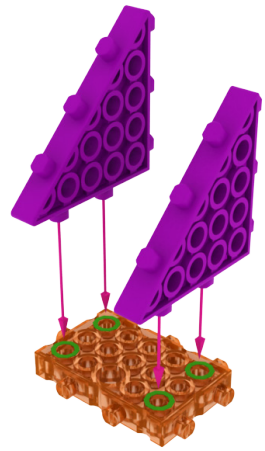
2



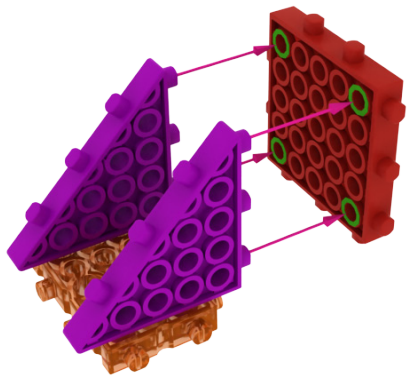
3



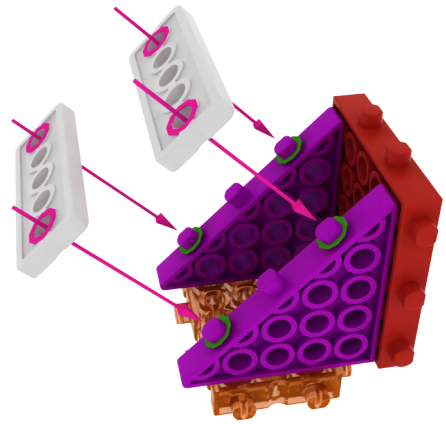
4



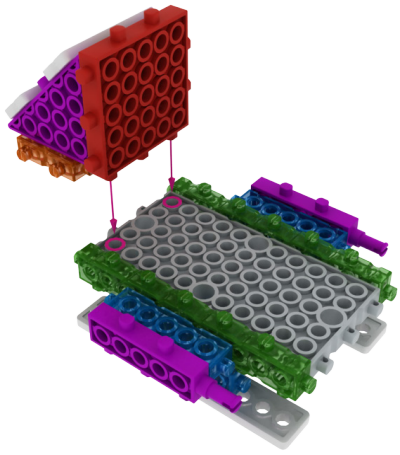
5



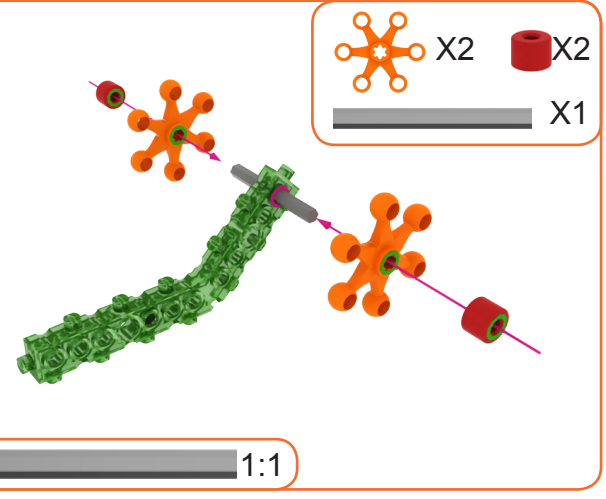
6



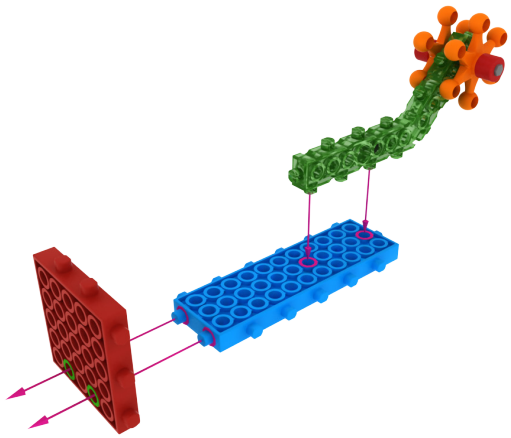
7



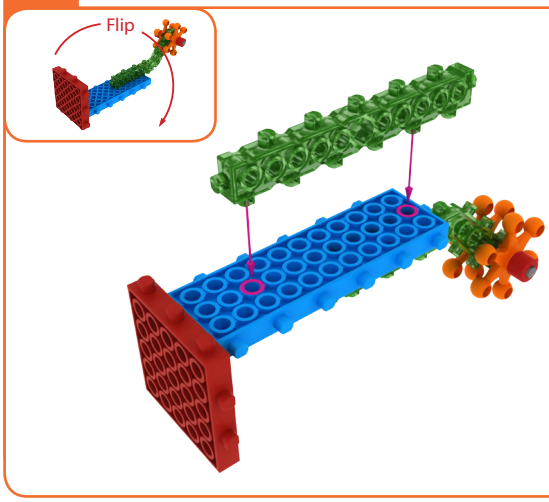
8



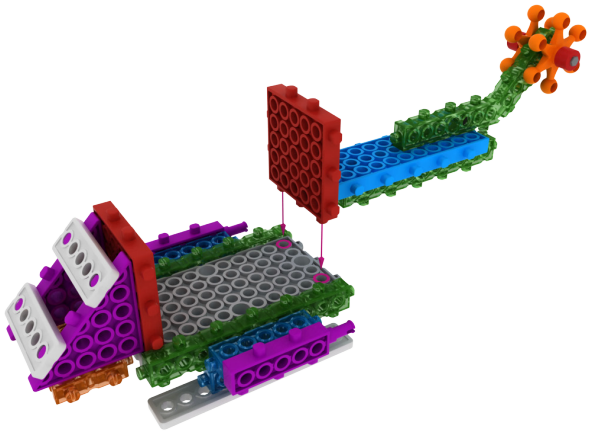
9



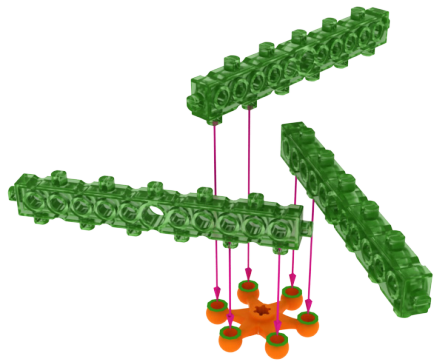
10



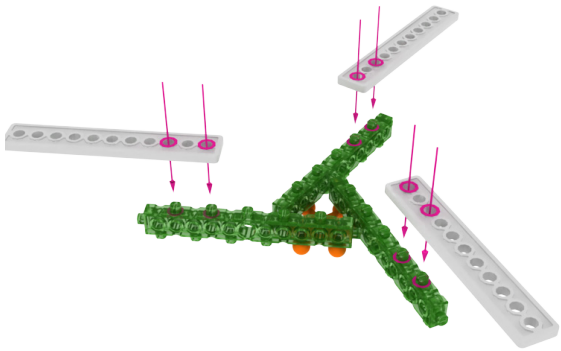
11



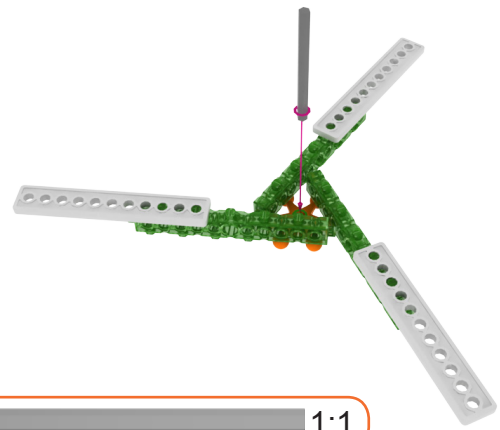
12



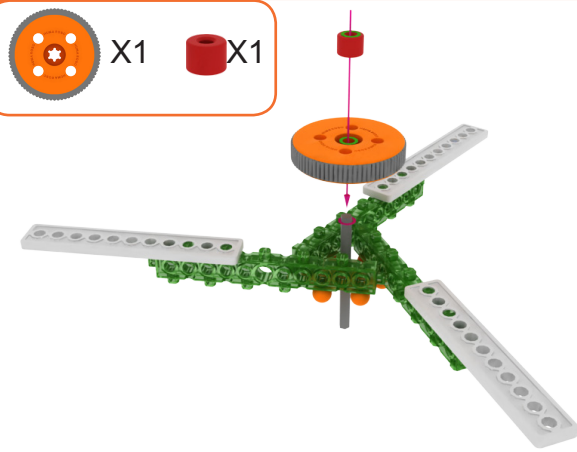
13



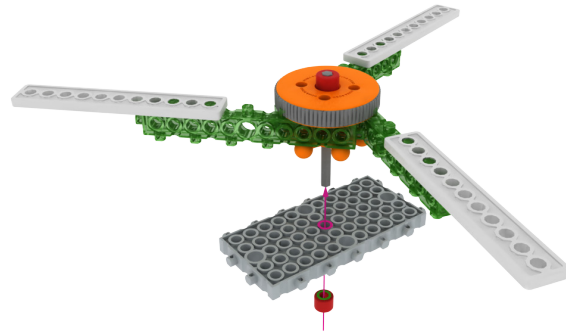
14



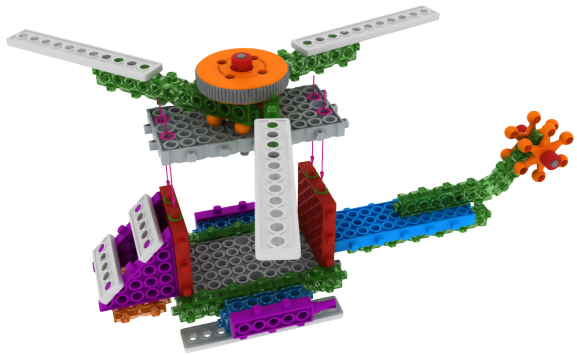
15



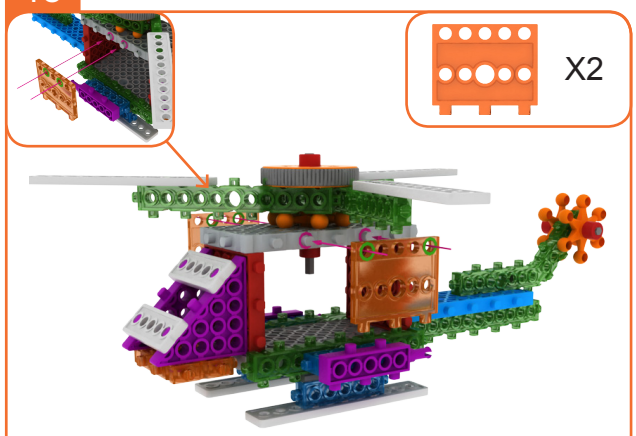
16



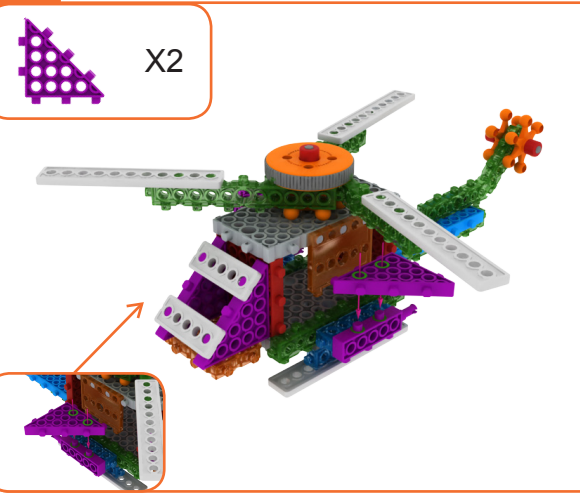
17



18



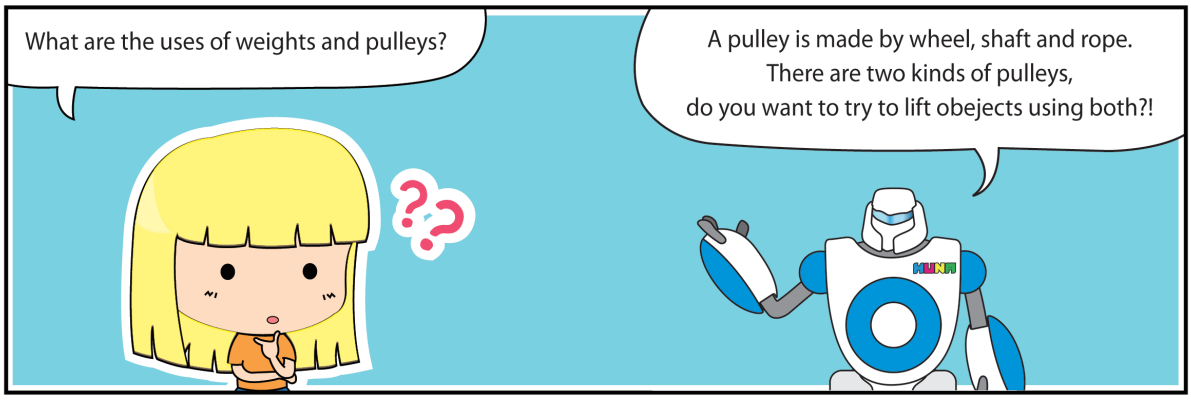
19

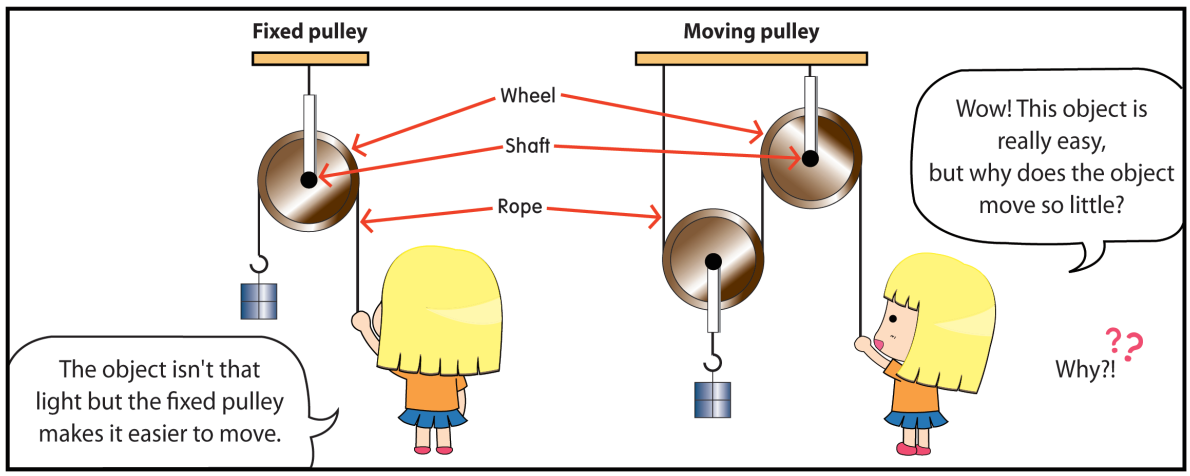


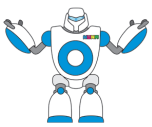
End

Technology Engineering

STEM 4. The use of weight and pulleys





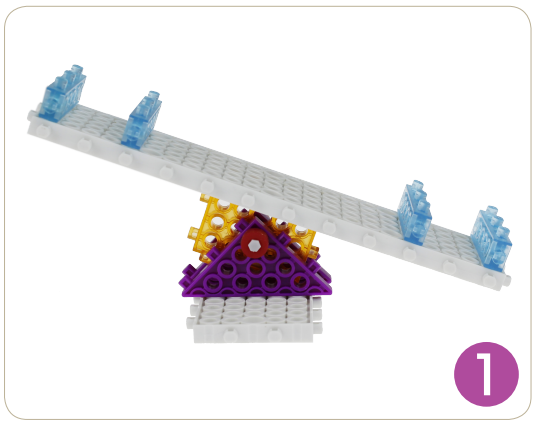


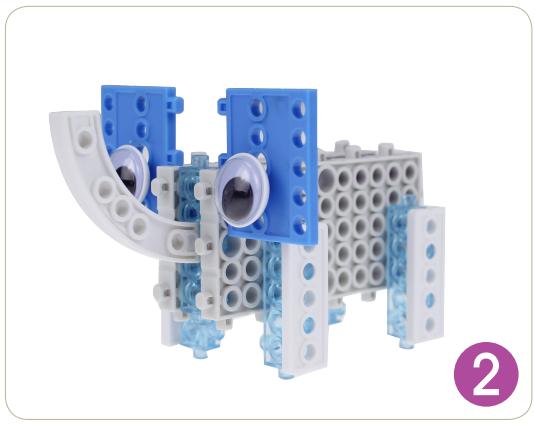
What is the difference between fixed and moving pulleys?

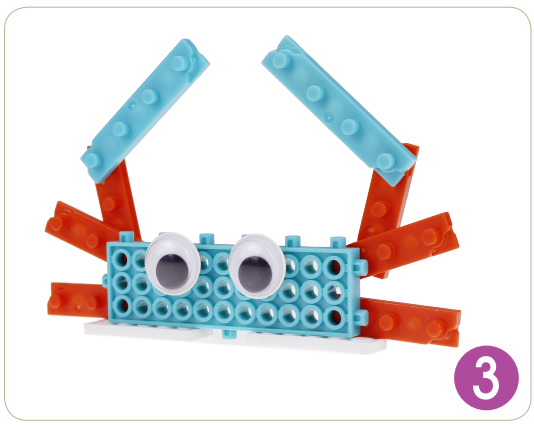
Art

Making My Robot

♣ Try to make the robots in the picture and talk about their shapes.







1

2

3

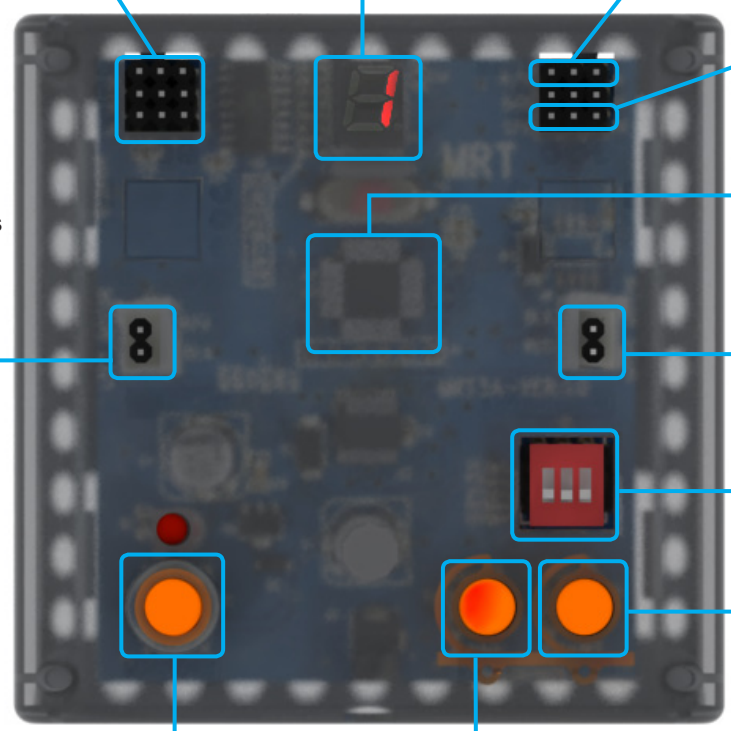
4

Technology STEM 5. The magic box of a robot-Main Board

Technology

How to use the electronic parts?

Mainboard assembly/Function of each feature



IR Sensor Input connector
This input coordinates the signals that are received from the IR sensor.

LCD Status Display
Display the status of 10 modes.

Remote Sensor Input connector
This input coordinates the signals that are received from the remote control.

Speaker Output
This output coordinates this signals that are received from the speaker sensor.

Left DC Motor connect
The output coordinates the functions of the left motor.

MCU IC is responsible
For saving and running program. (Acts in the role of the brain.)

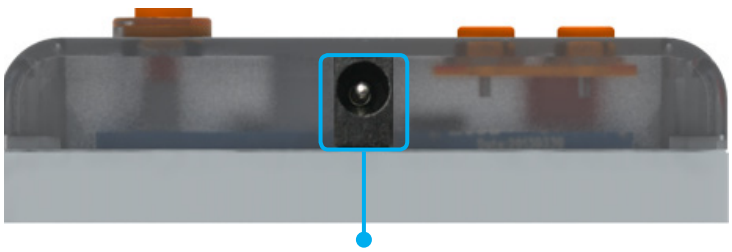
Right DC Motor connector
The output coordinates the functions of the right motor.

Modifying Remote Control ID Switch
This part is for setting remote control ID.

Program Start Button
Start button for each mode.

Power Switch
Power on/off switch.

MODE Settings
Modify modes of program.



Power Connector
Connects to the 6V battery packs.

Mode Setting

1. Press mode button and the LCD will be changed as below. Please select your favorite function.
2..After selecting your favorite mode, press start button and the robot will move.

MODE 1

Free Move

MODE 2

Remote control control

MODE 3

Line Tracer

MODE 4

Avoider

MODE 5

Stalker

MODE 6

Drop Checker

MODE 7

Touch

MODE 8

Remote Control + IR

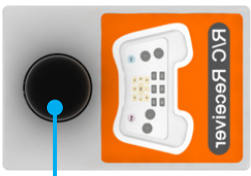
MODE 9

Remote Control + Touch

MODE 0

Remote Control(R)

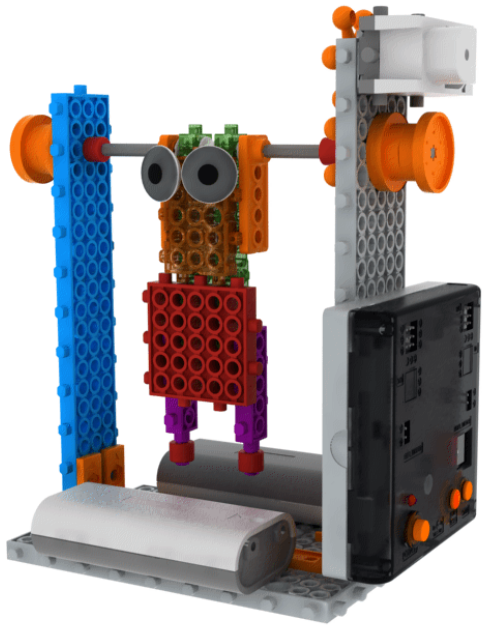
RC Receiver



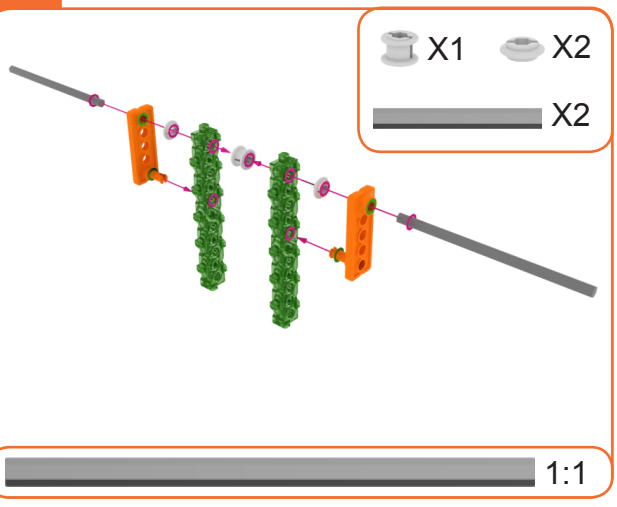
This Sensor receives IR signal from remote controller and converts them into input signal.

Technology Engineering

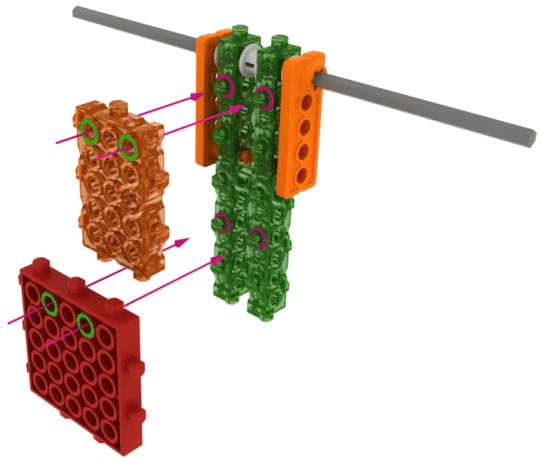
Robot Making6- I am a Gymnast!



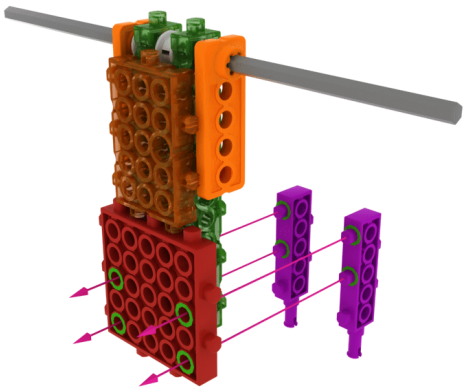
1



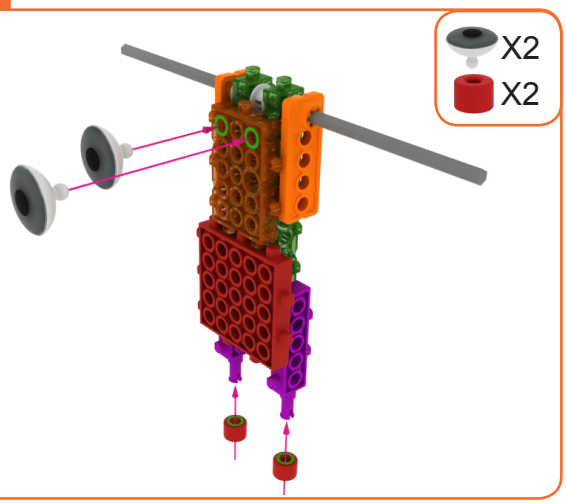
2



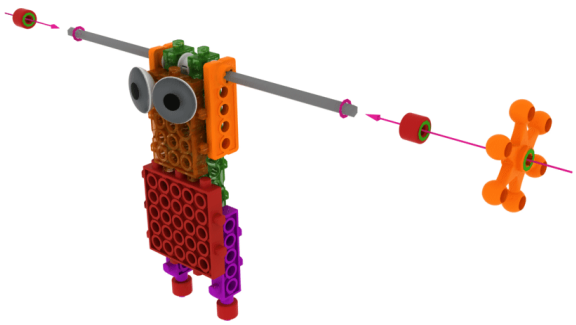
3



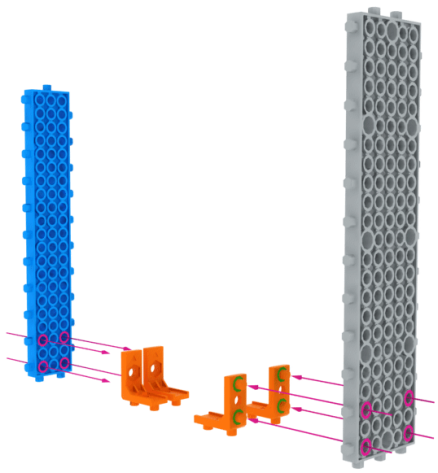
4



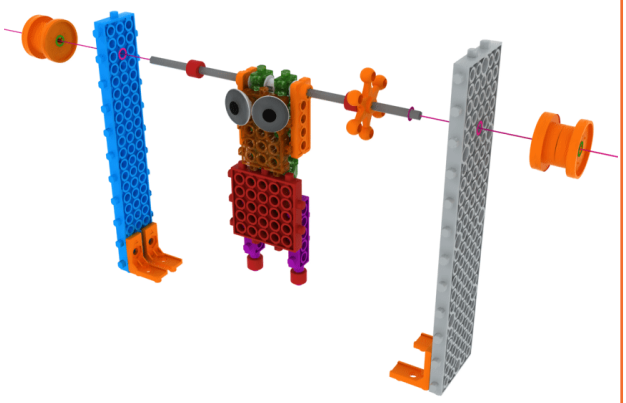
5



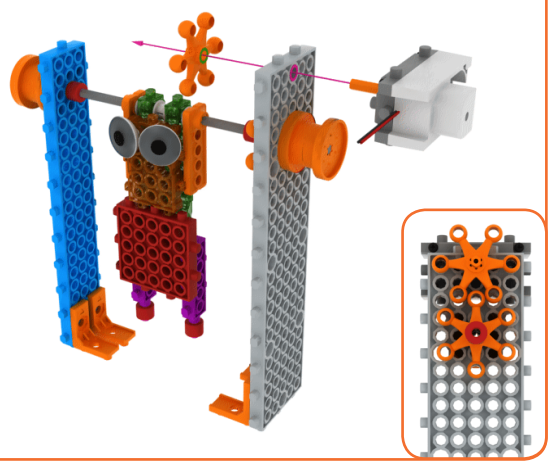
6



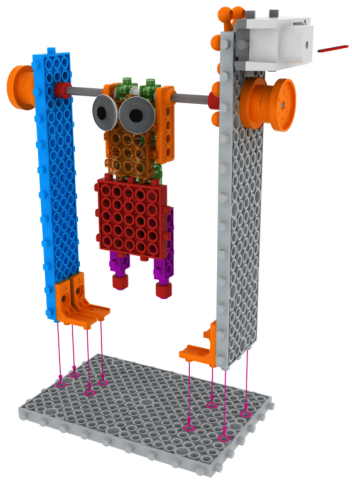
7



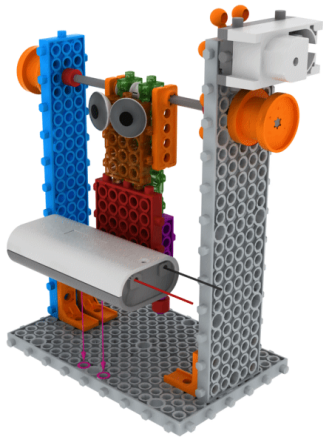
8



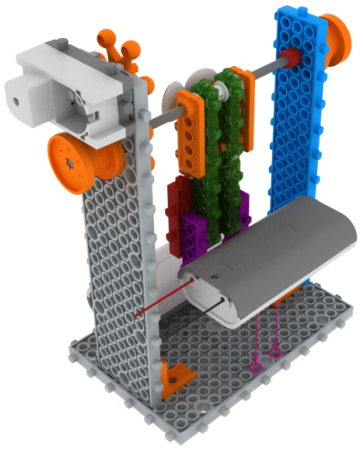
9



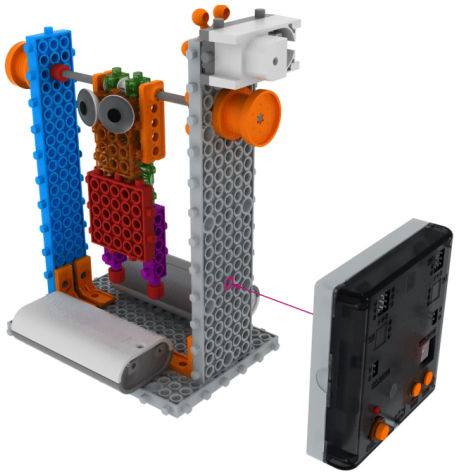
10



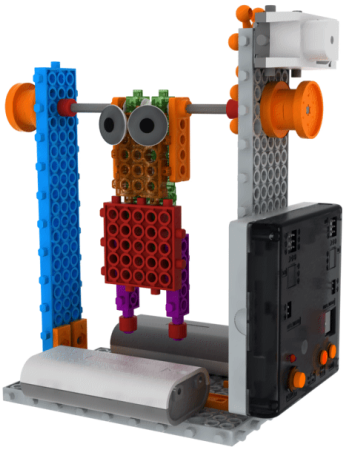
11



12

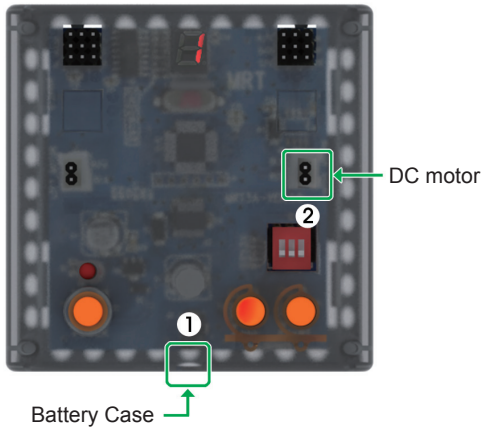


End



How to operate the Gymnast

Connecting the main board



Connecting in this order.

1. Connect battery case to Power connector.
2. Connect DC motor to the Right-motor connector.

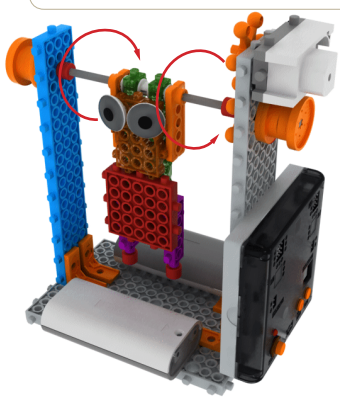
Setting mode

1. Ensure battery case/DC Motor Connector are connected.
2. Turn on the power.
3. Press the mode button and select as the follow mode.

MODE # 1		Free Move Mode

4. Press the START button.

How to make it move?

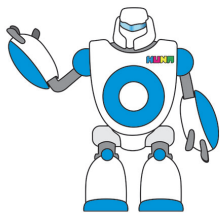


※ Press START button, the small robot will swing like a Gymnast.

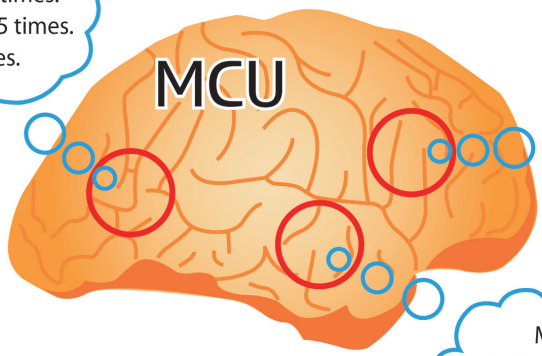
Technology

STEM 6. Brain of the robot-MCU

The MCU (Micro Controller Unit) is what makes the robot move. The MCU saves and runs programs to make the robot move in the desired way.



Mode #1:
Both wheels move forward 5 times.
Both wheels move backwards 5 times.
Right wheel moves 5 times.

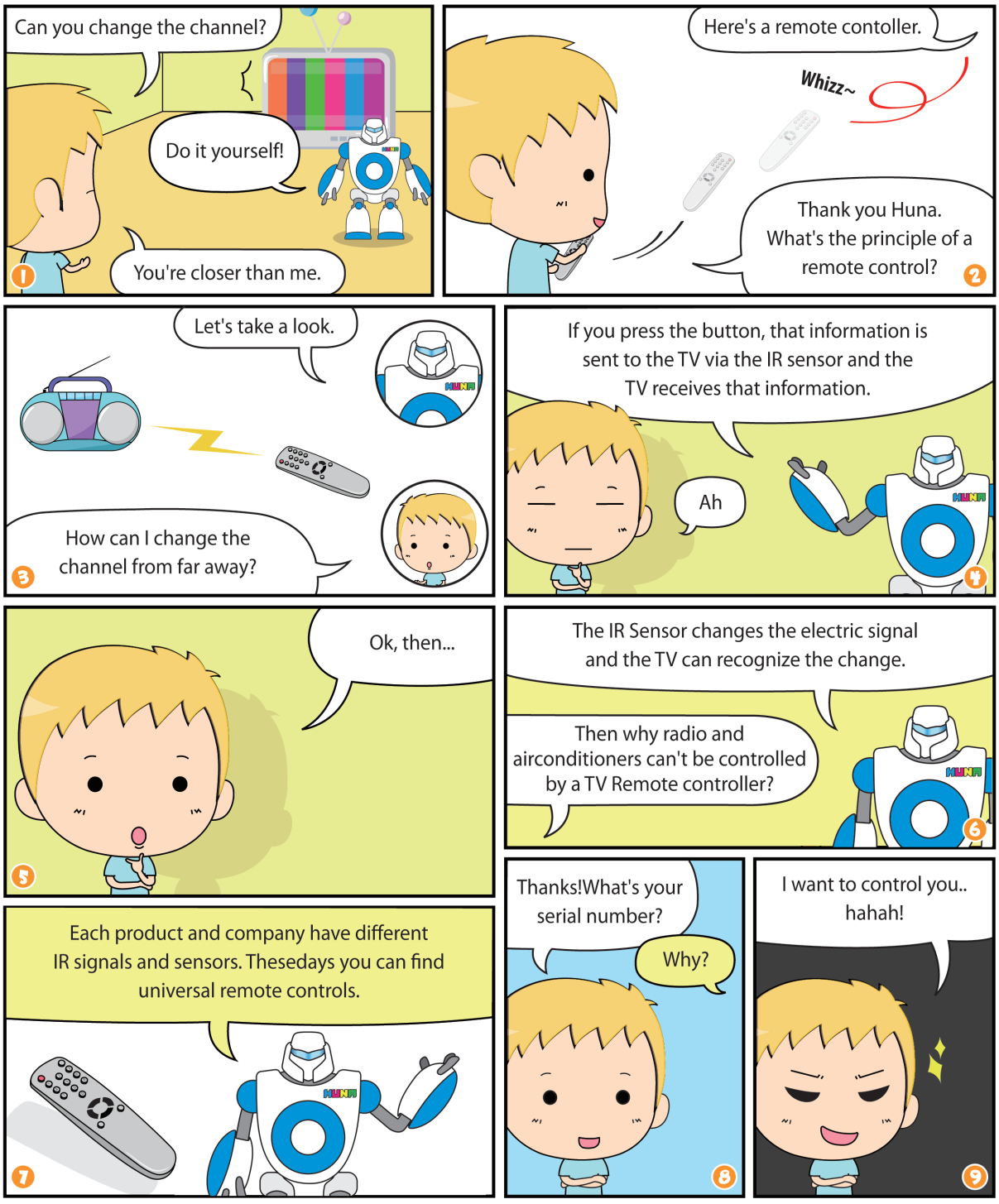


Mode #2:
Right wheel moves independently.

Mode #3:
Left wheel moves independently

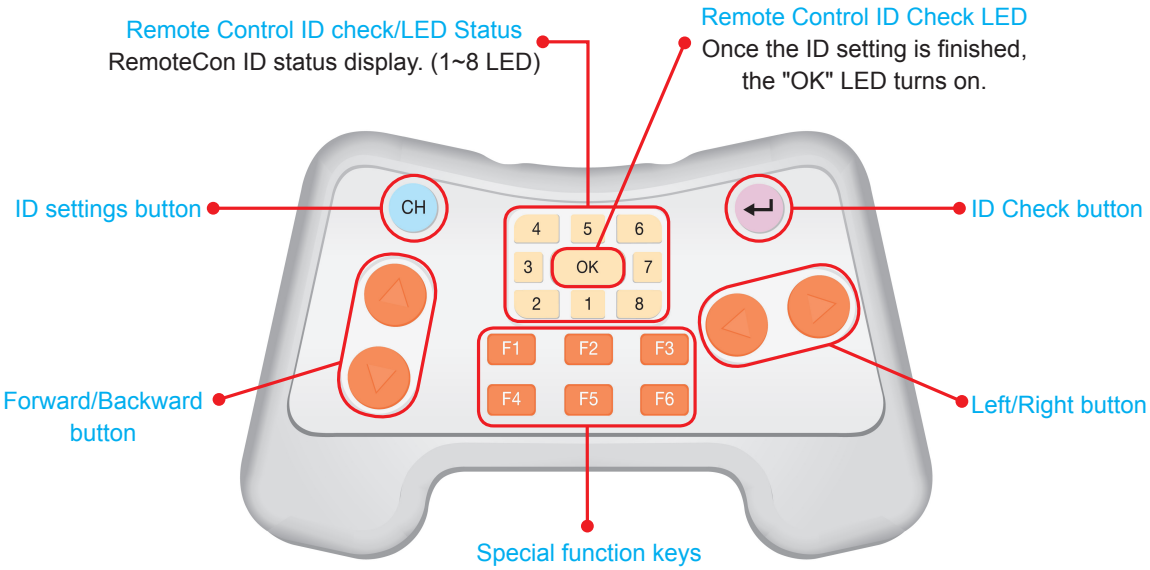
Make your own robot using a mainboard.

Technology STEM 7. Control of the robot -Remote Control



Technology Engineering — How to use the remote control?

Remote Control configuration



Setting remote control ID

① Turn on the robot.

② Select # 2 mode of robot.

③ Press CH button while holding ↵ button. The A panel ID LED turns on and shows you what mode you chose.

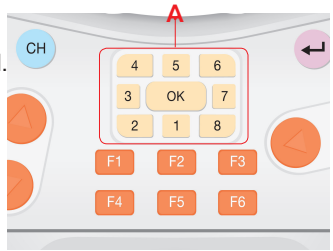
④ Press CH button while holding ↵ button and choose your ID. (Number 1~8)

⑤ After selecting ID, if you release ↵ Button and press CH button, ID will be selected.

⑥ The LED on the mainboard will blink 3 times and it will turn off automatically.
That means the ID Selection is finished.

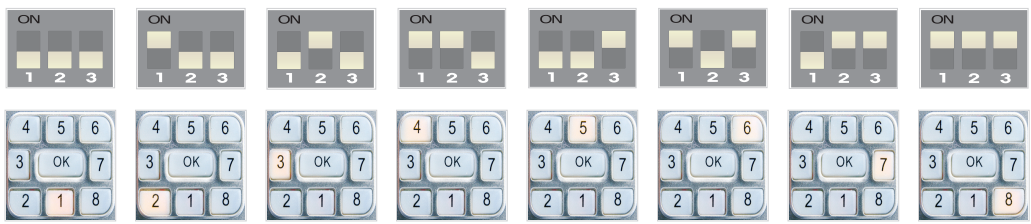
⑦ If you press ↵ button, you can see your selected ID.

※ If there is a problem, repeat steps 1-7 carefully.



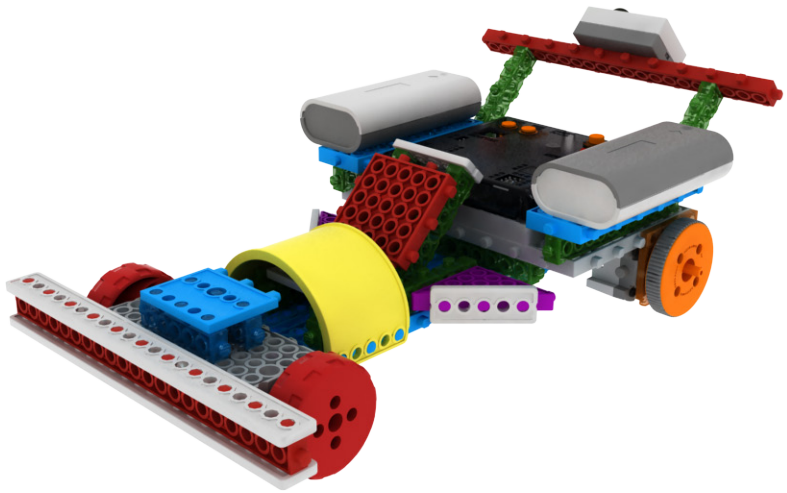
How to set up communication ID

※ The maximum number of channels can be set as shown below without interference.
Use the picture to assign the channels to the communication ID.

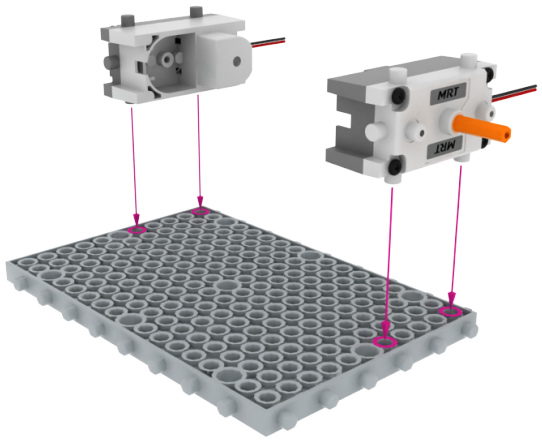


Technology Engineering

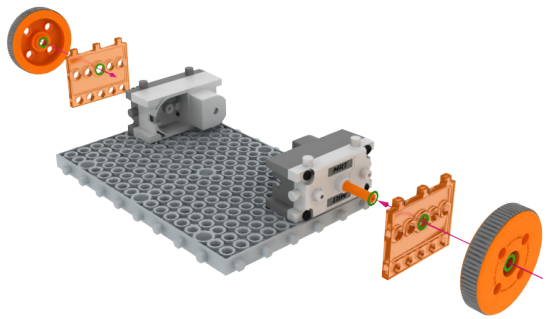
Robot Making7-Mini Racing Car



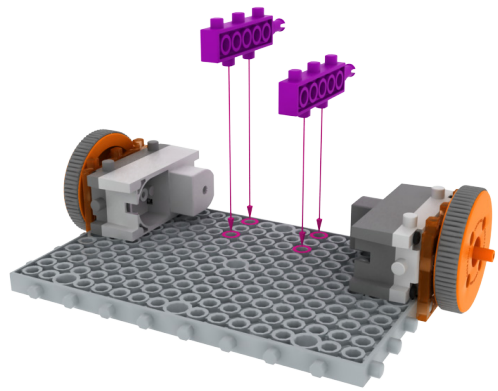
1



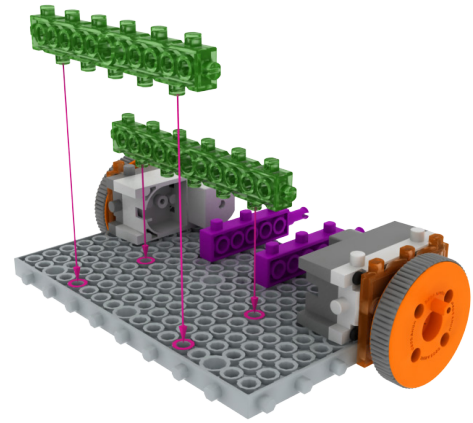
2



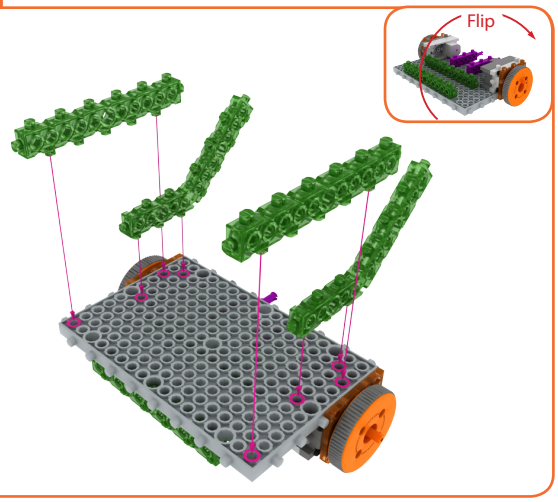
3



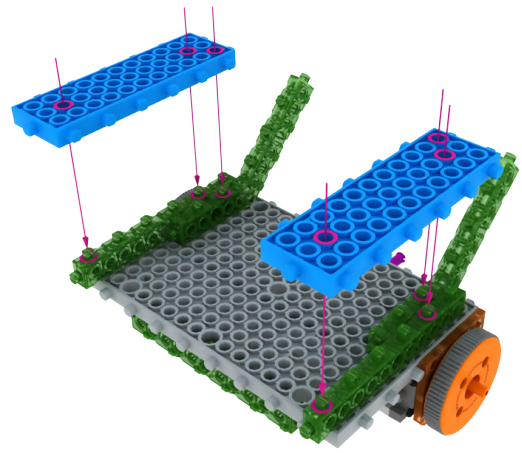
4



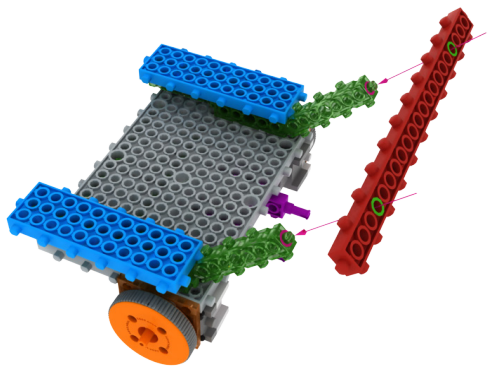
5



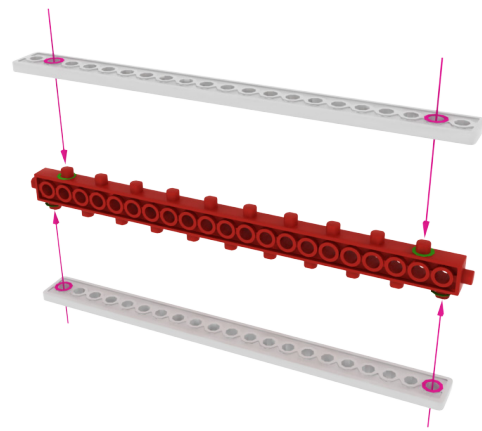
6



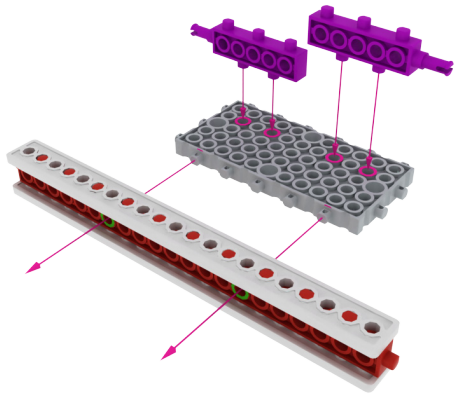
7



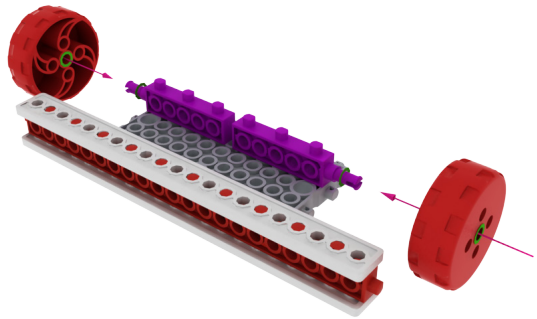
8



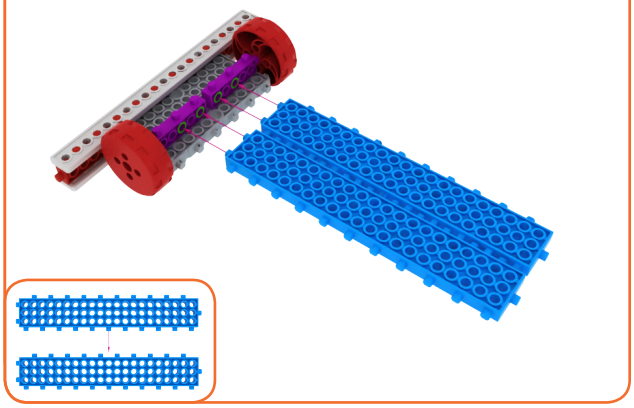
9



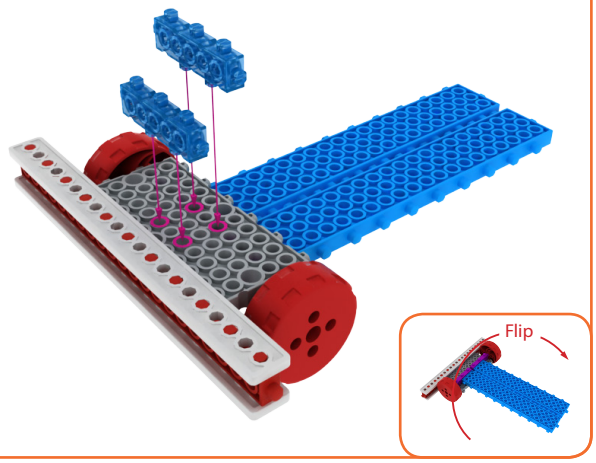
10



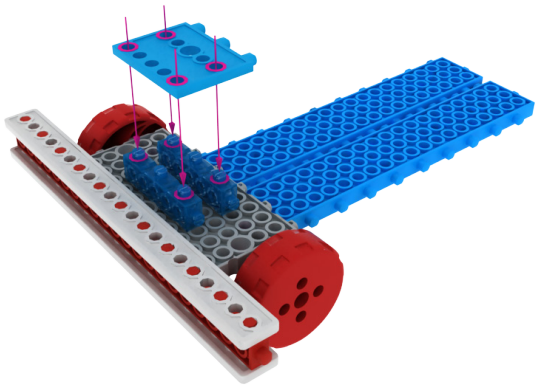
11



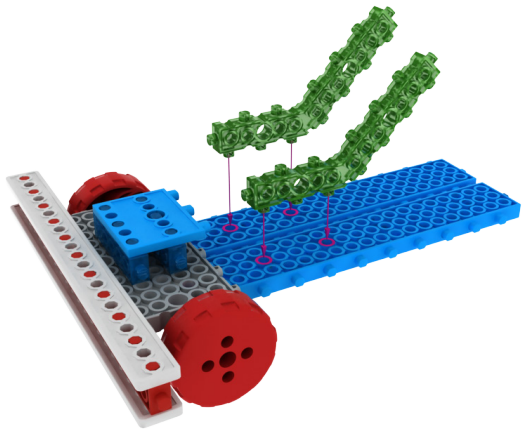
12



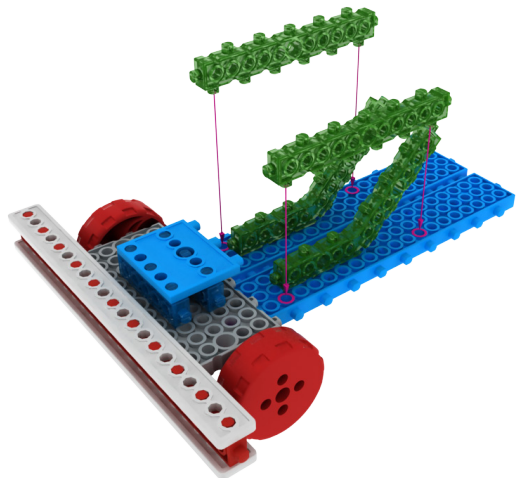
13



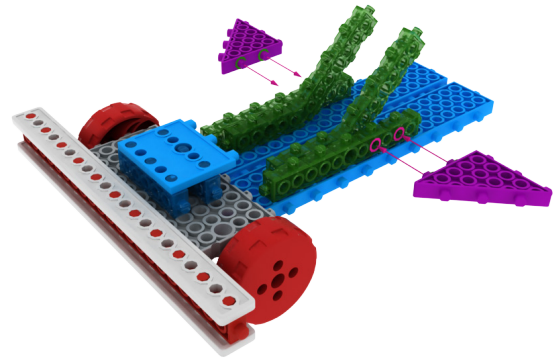
14



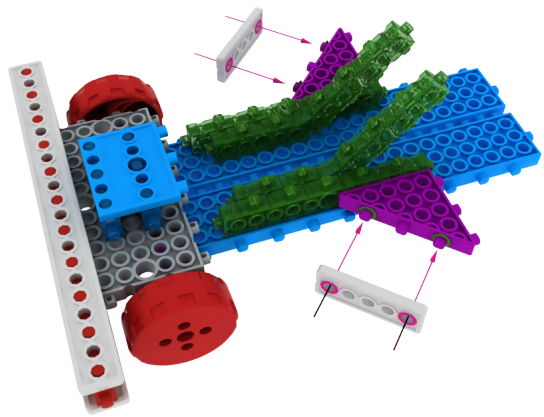
15



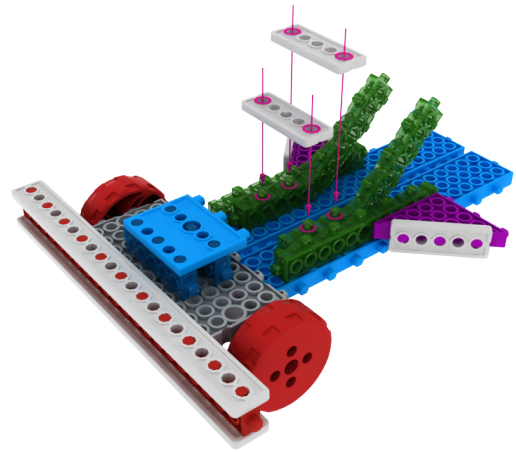
16



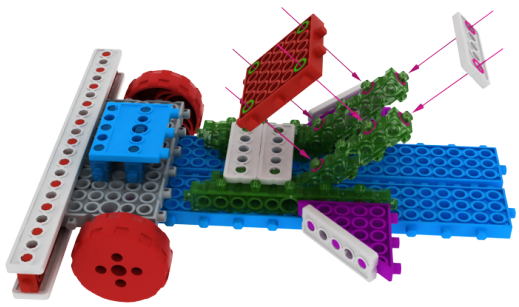
17



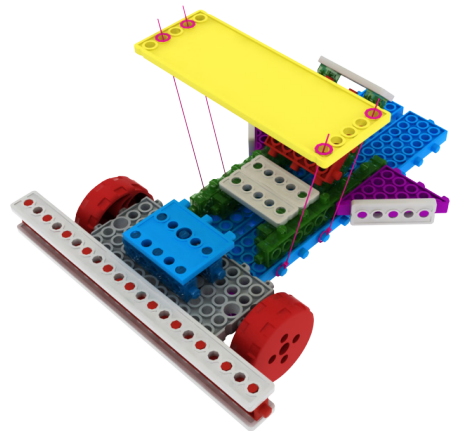
18



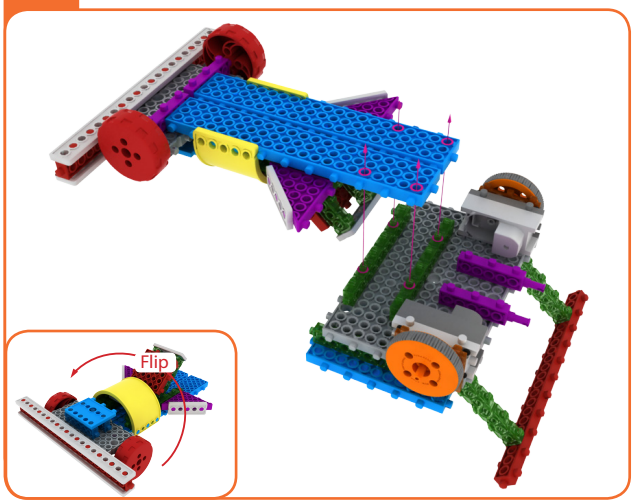
19



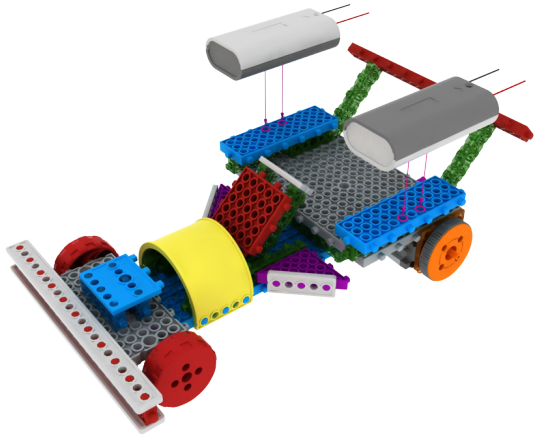
20



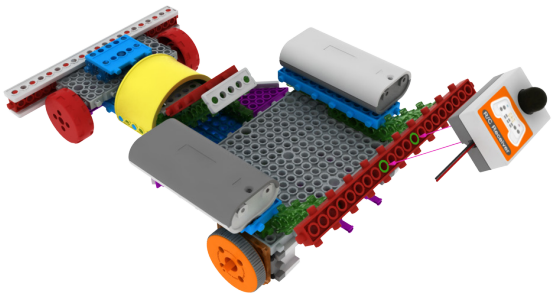
21



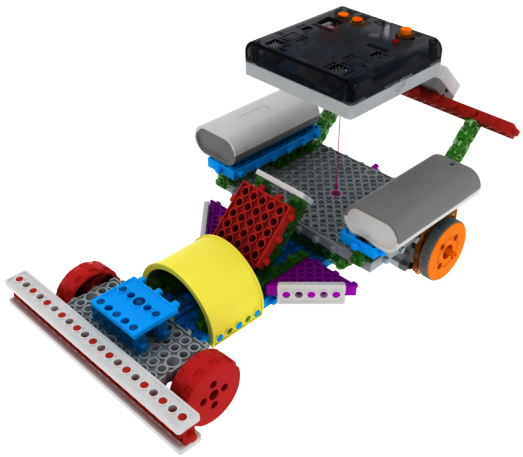
22



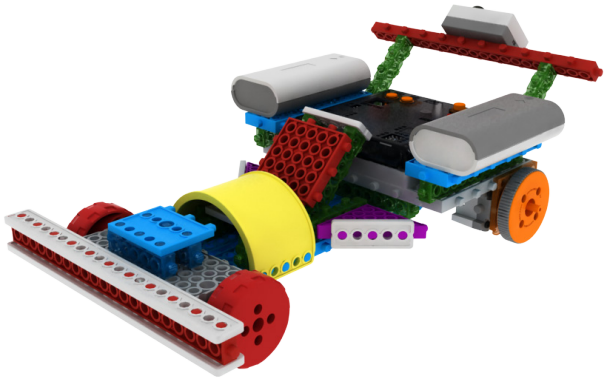
23



24

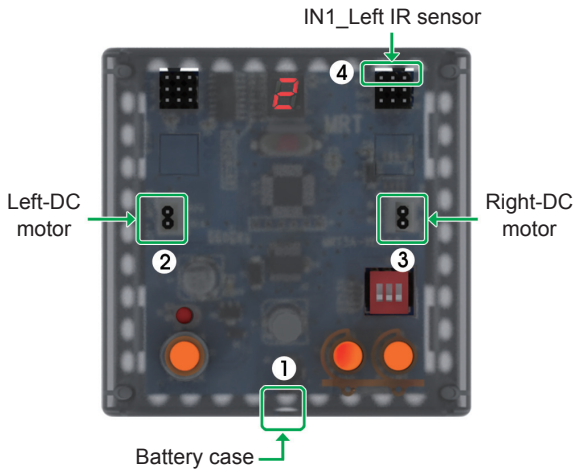


End



How to operate Mini Racing Car

Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect R/C receiver board to R/C connector.

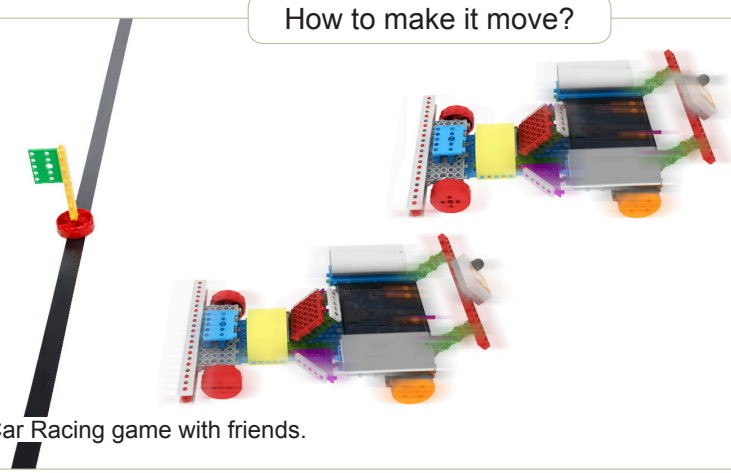
Setting mode

1. Ensure battery case/DC Motor Connector are connected.
2. Turn on the power.
3. Press the MODE button and select as the follow mode.

MODE # 2		Remote control Mode

4. Select Remote ID.
5. Press the START button.

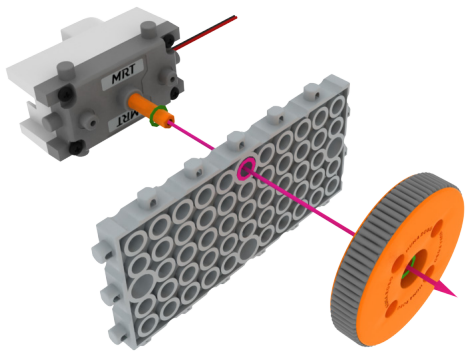
How to make it move?



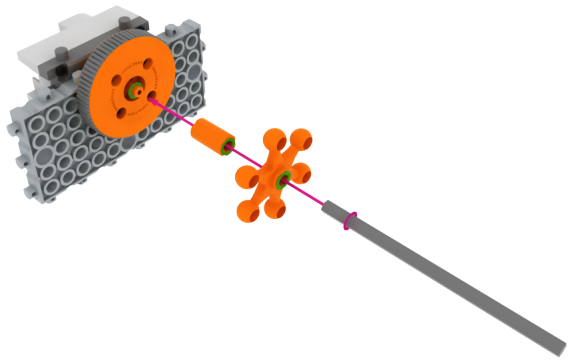
※ Let's play Car Racing game with friends.

Engineering Art — Robot Making8-Avatar Helicopter

1

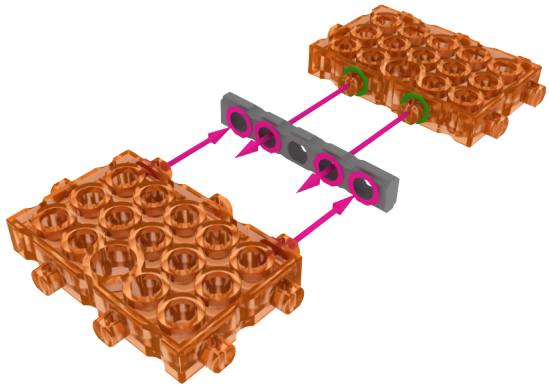


2

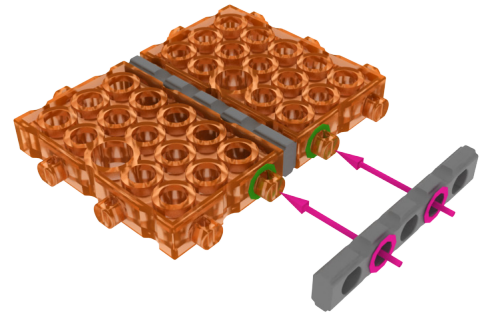


1:1

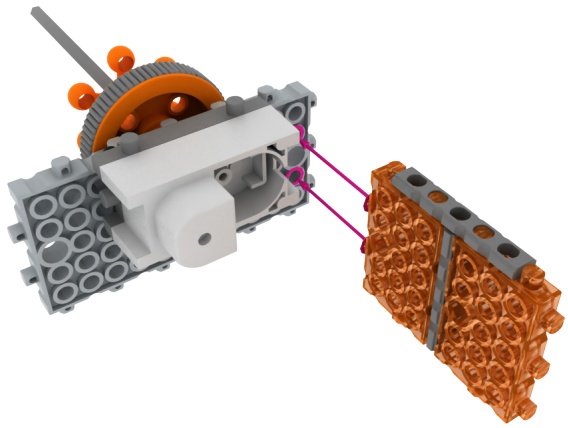
3



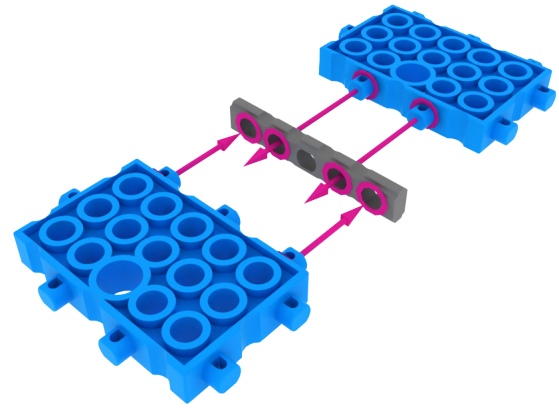
4



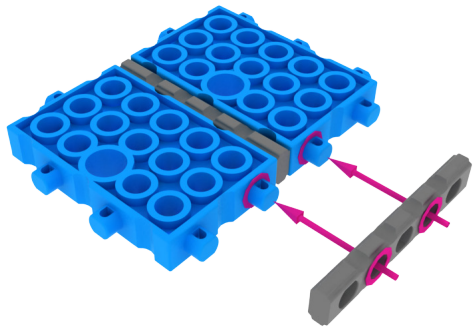
5



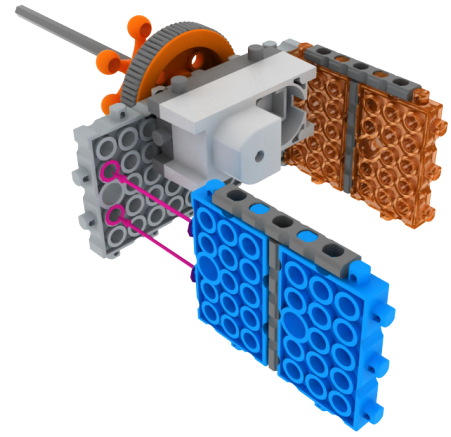
6



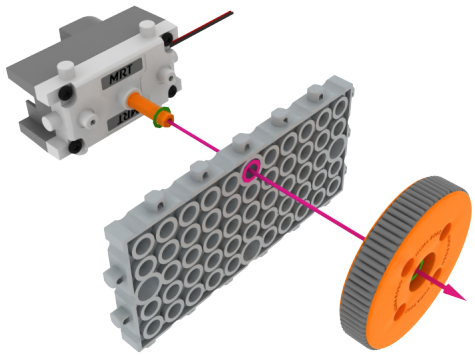
7



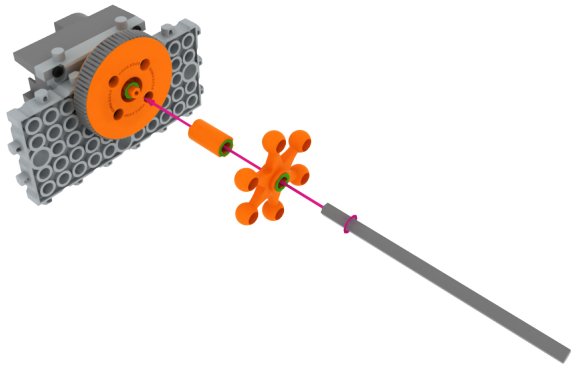
8



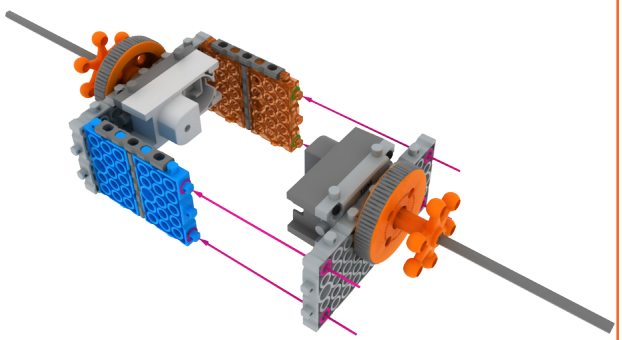
9



10

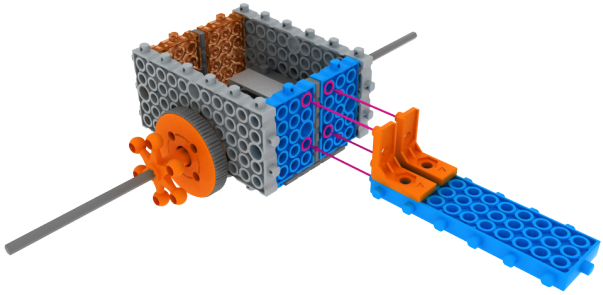


11

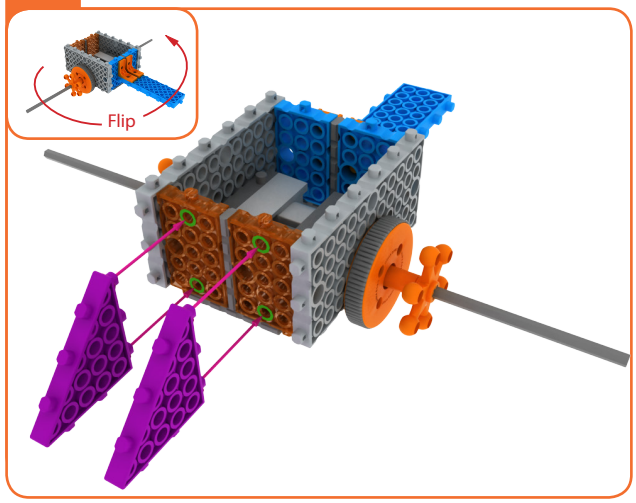


12

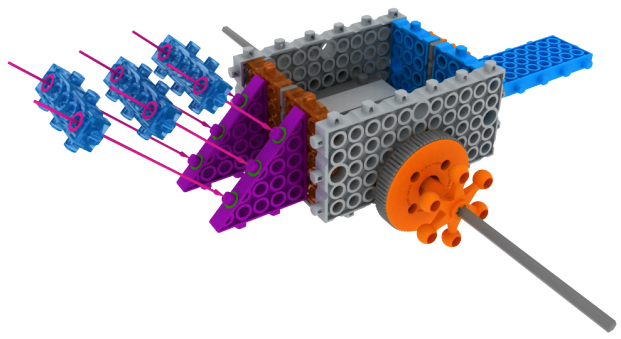
13



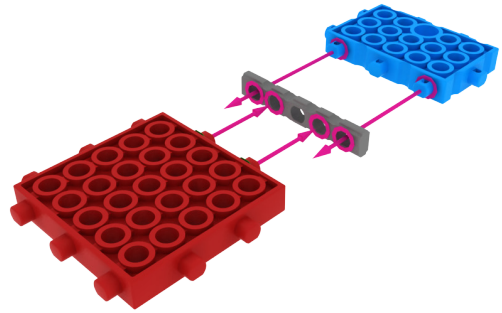
14



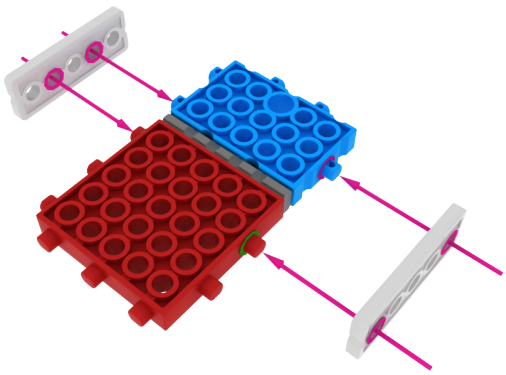
15



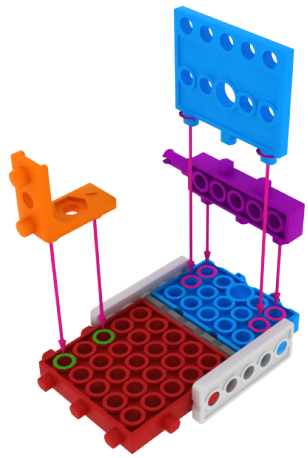
16



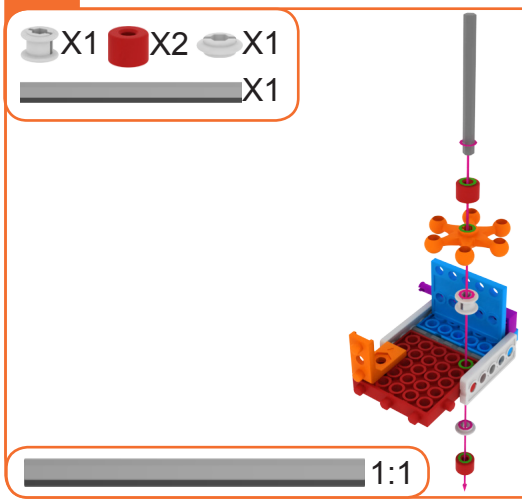
17



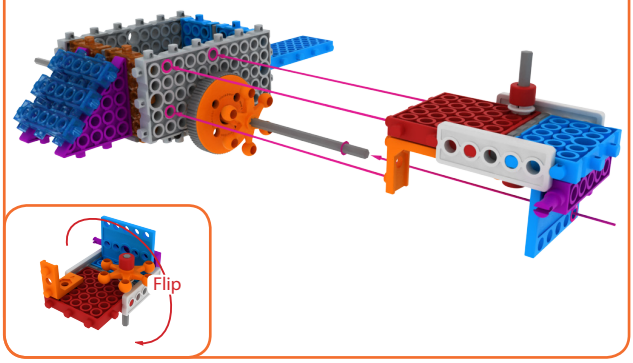
18



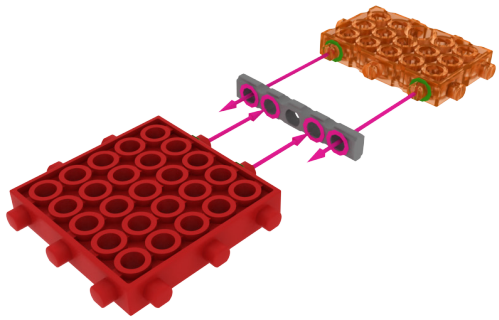
19



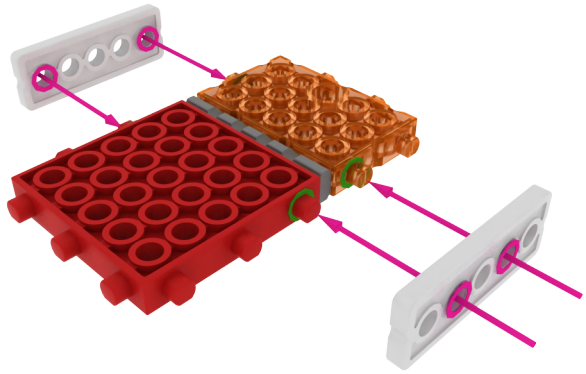
20



21



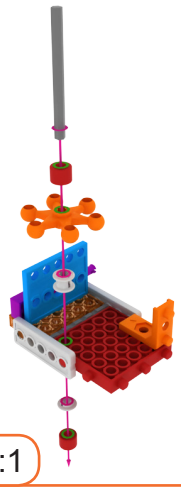
22



23

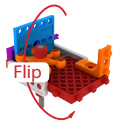
X1 X2 X1

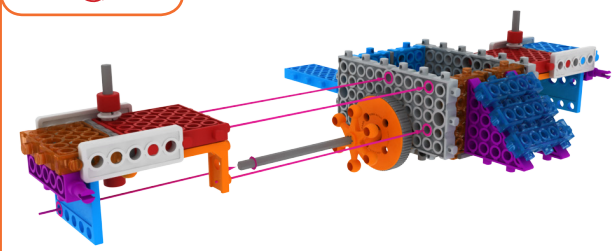
X1



1:1

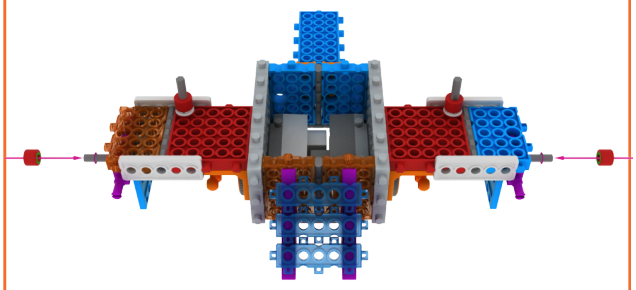
24



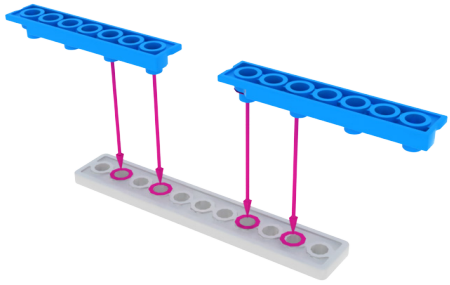


25

X2

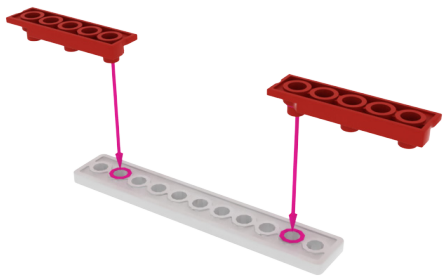


26



X2

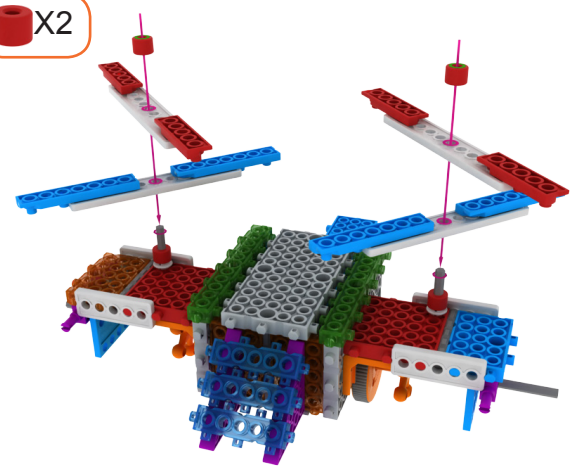
27



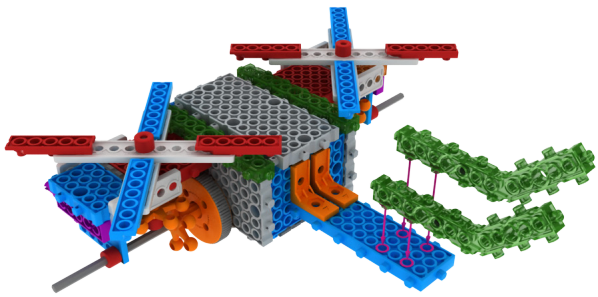
X2

28

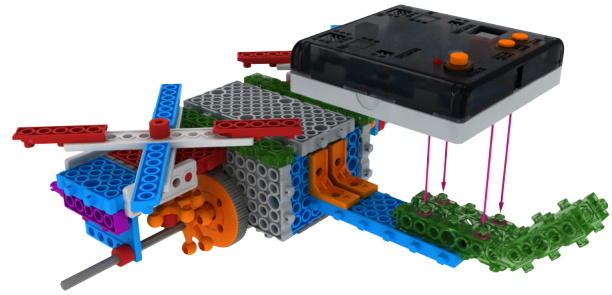
X2



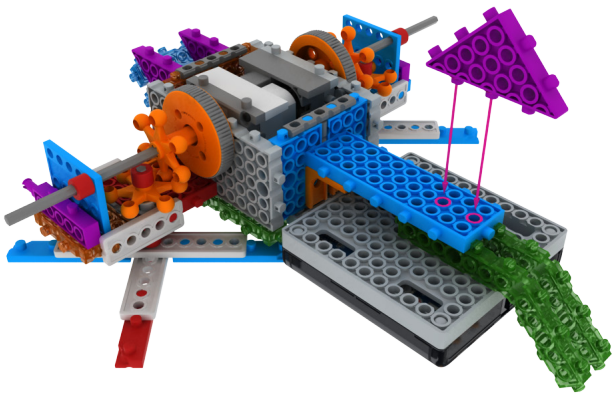
29



30



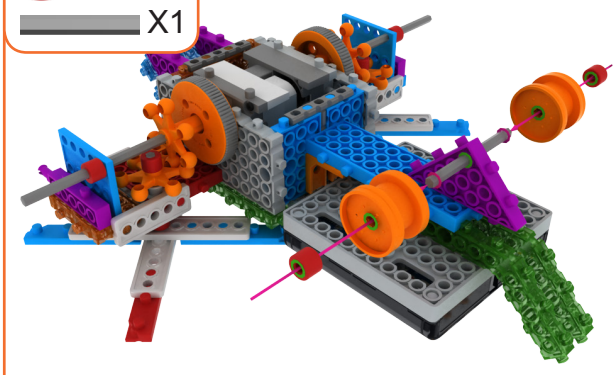
31



32

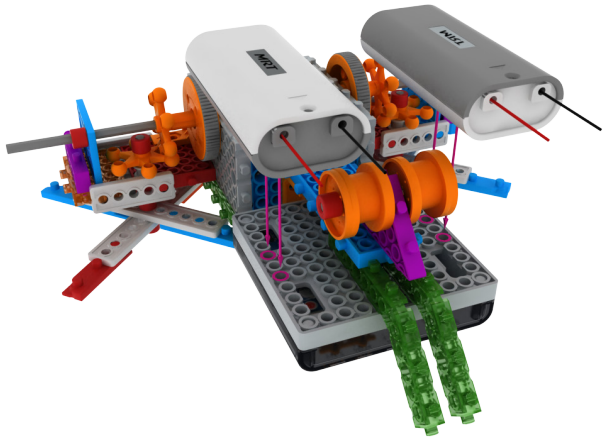
X2

X1

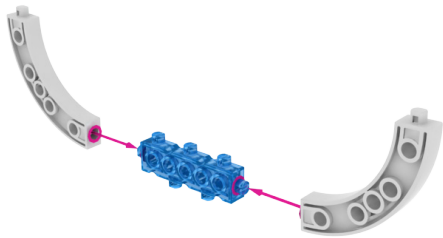


1:1

33

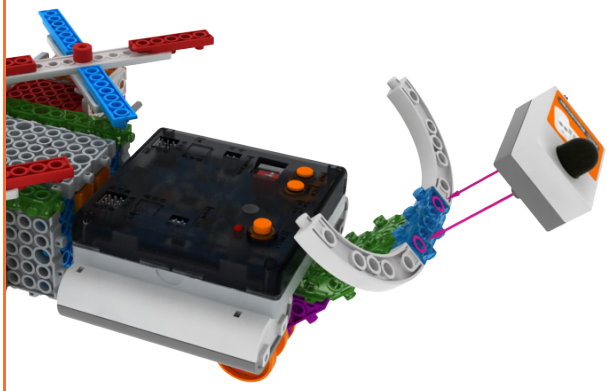


34



35

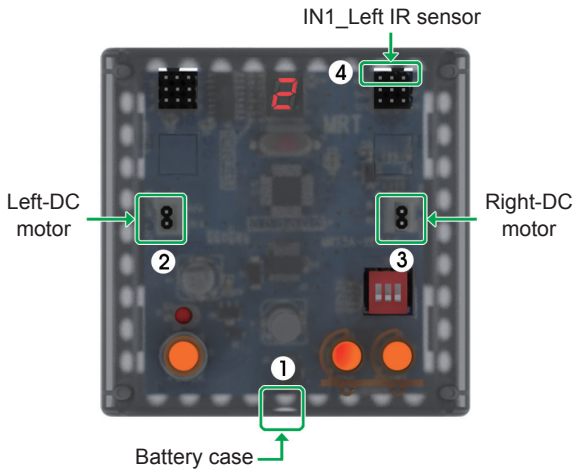
36



End

How to operate Avatar Helicopter

Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect R/C receiver board to R/C connector.

Setting mode

1. Ensure battery case/DC Motor Connector are connected.
2. Turn on the power.
3. Press the MODE button and select as the follow mode.

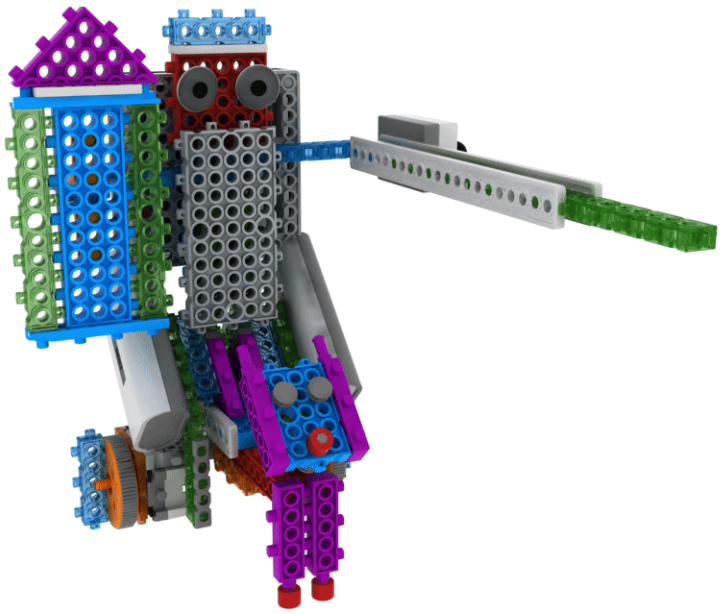
MODE # 2		Remote control Mode

4. Select Remote ID.
5. Press the START button.

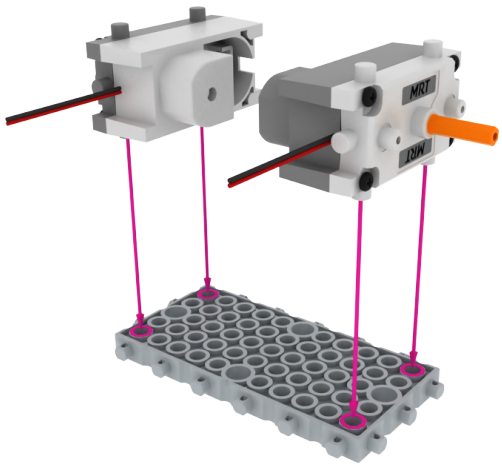
How to make it move?

Engineering Art

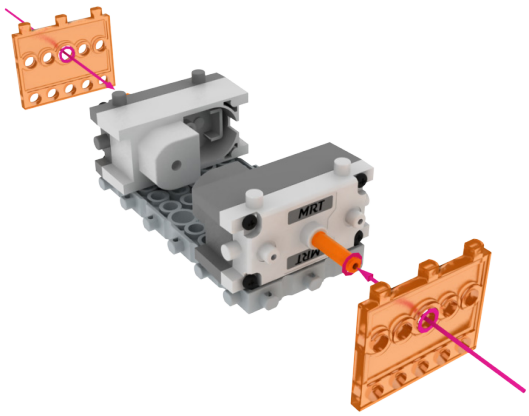
Robot Making9-Knight and Donkey (Don Ki Ho Te)



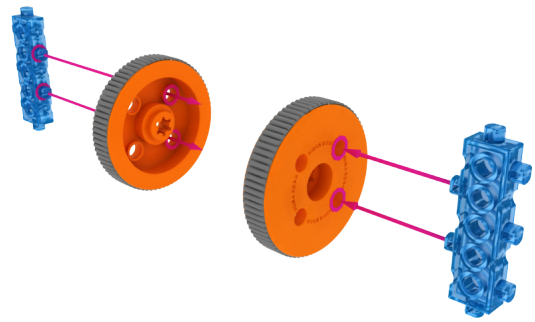
1



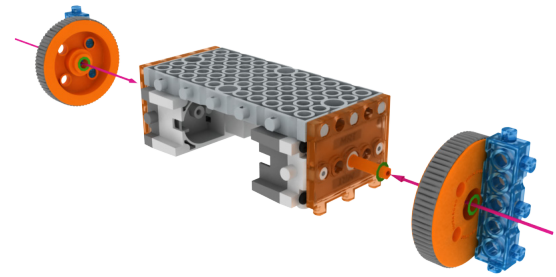
2



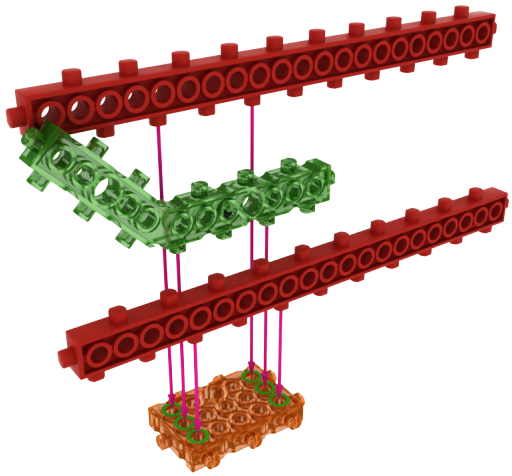
3



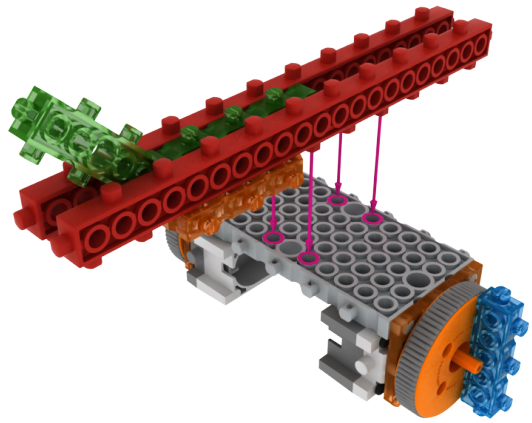
4



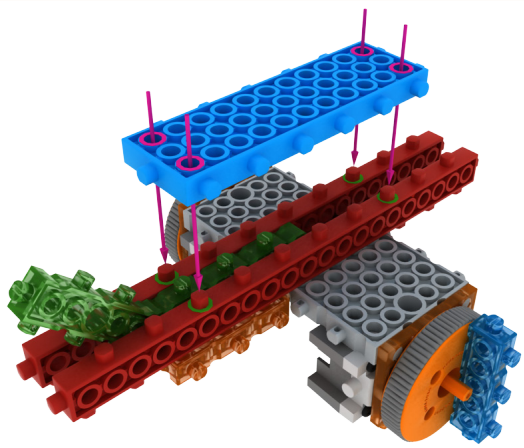
5



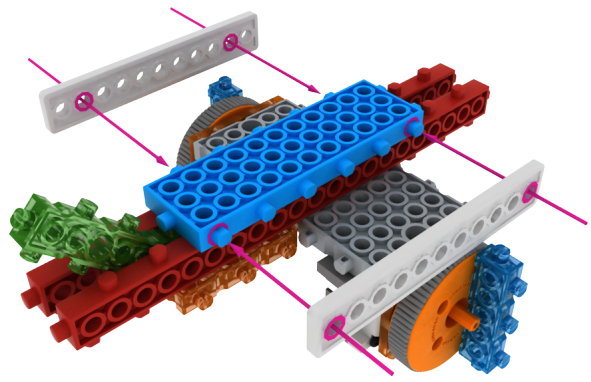
6



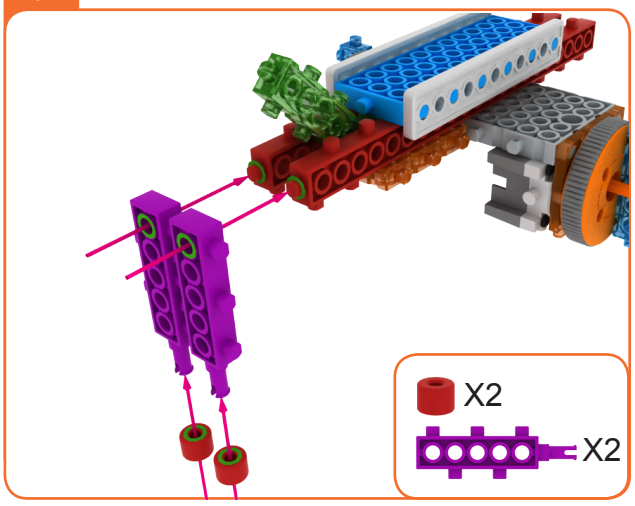
7



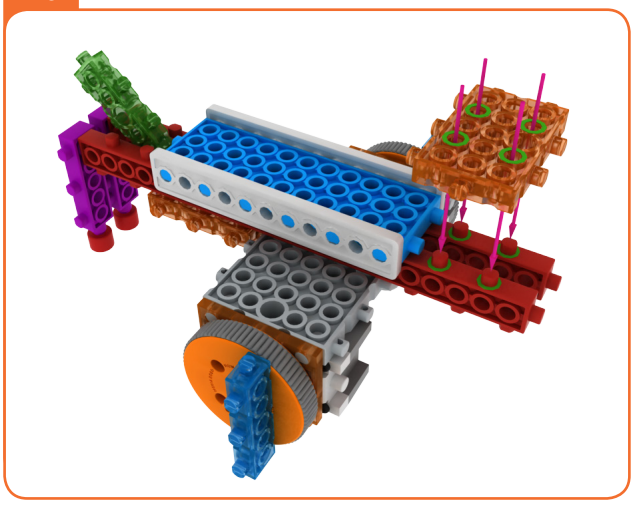
8



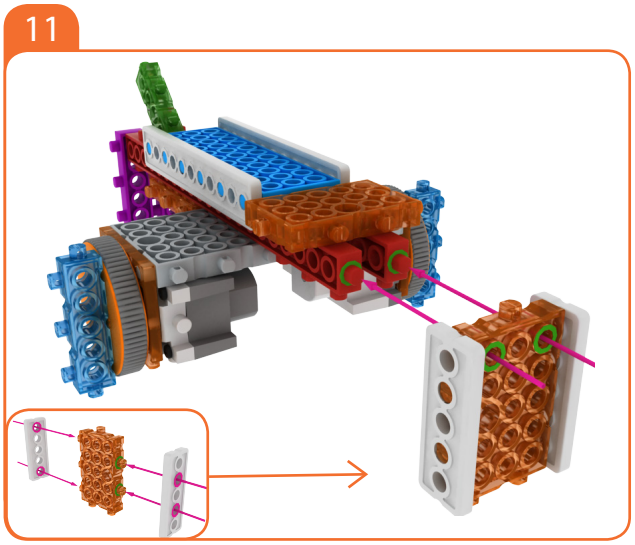
9



10

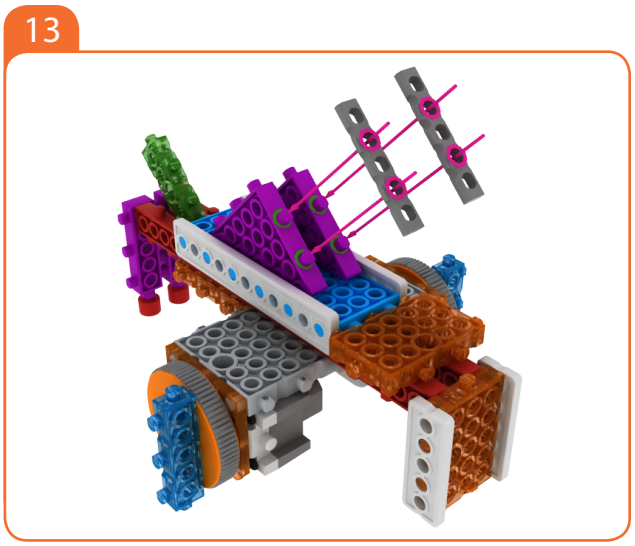


11

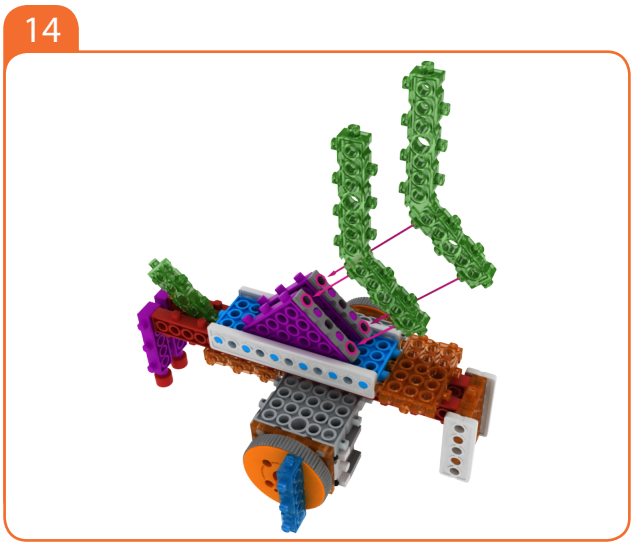


12

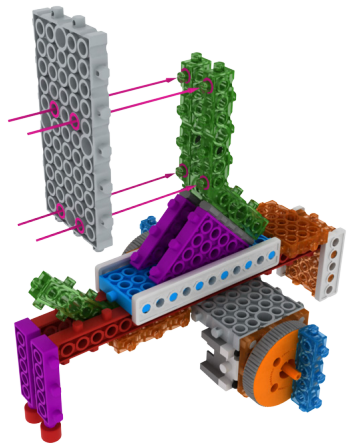
13



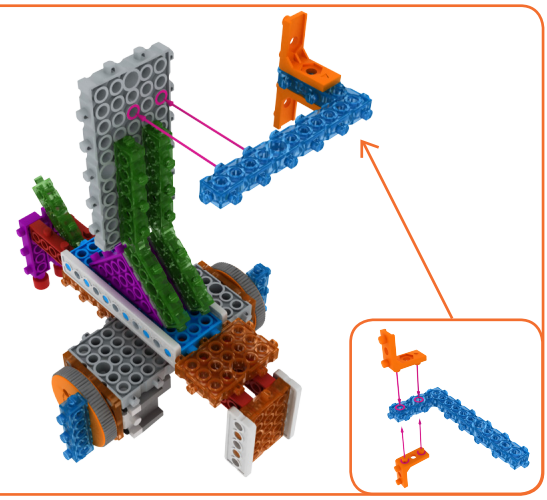
14



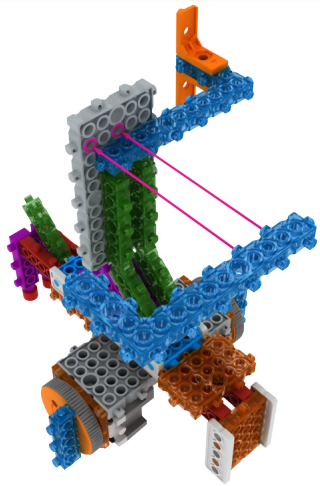
15



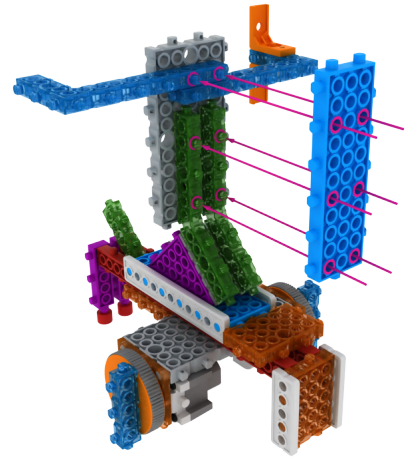
16



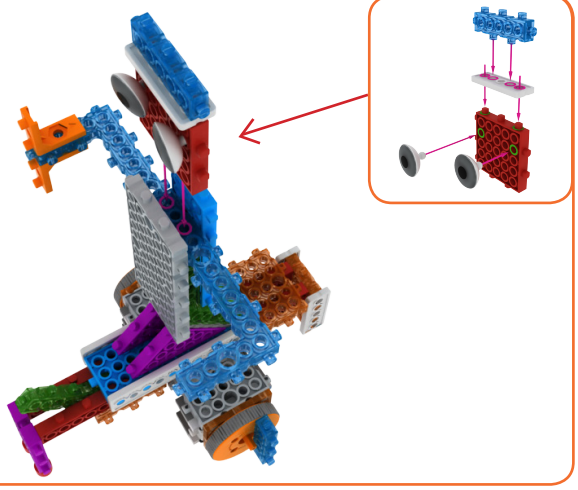
17



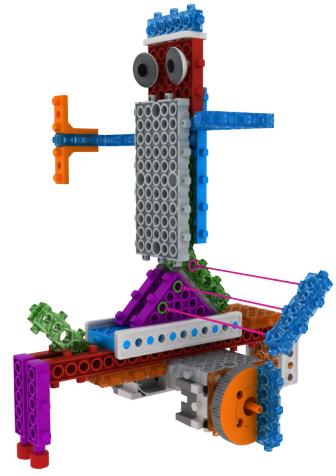
18



19

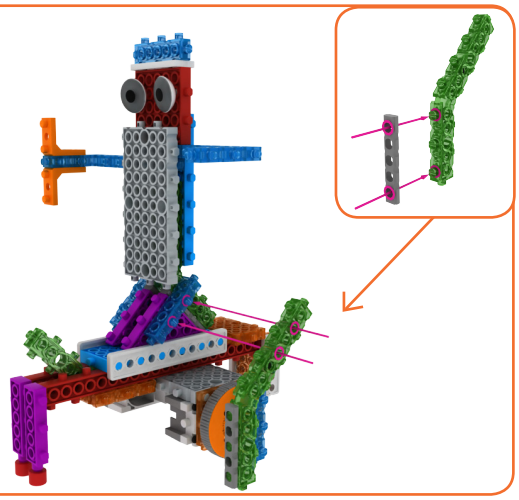


20

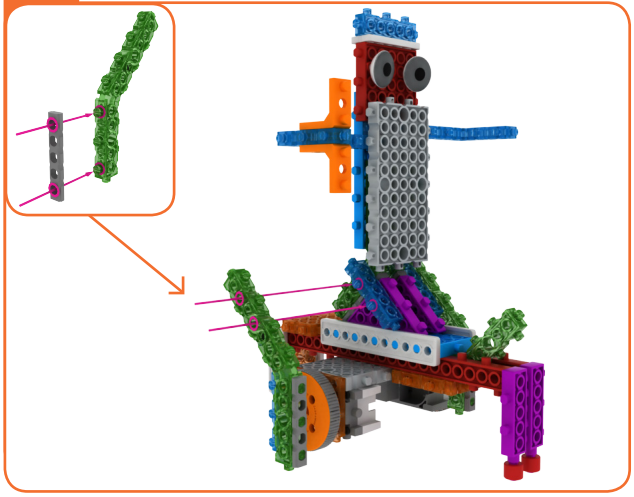


21

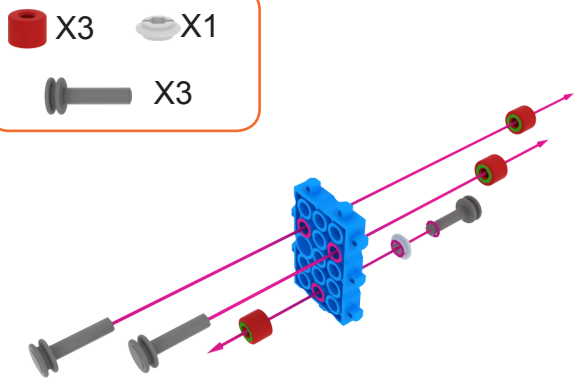
22



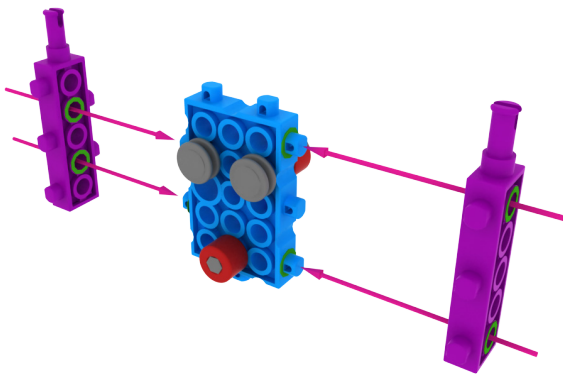
23



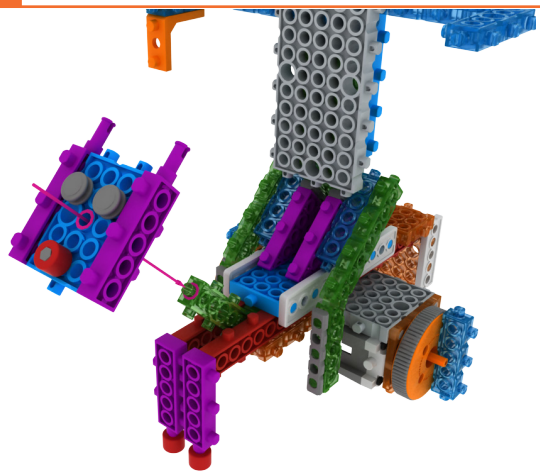
24



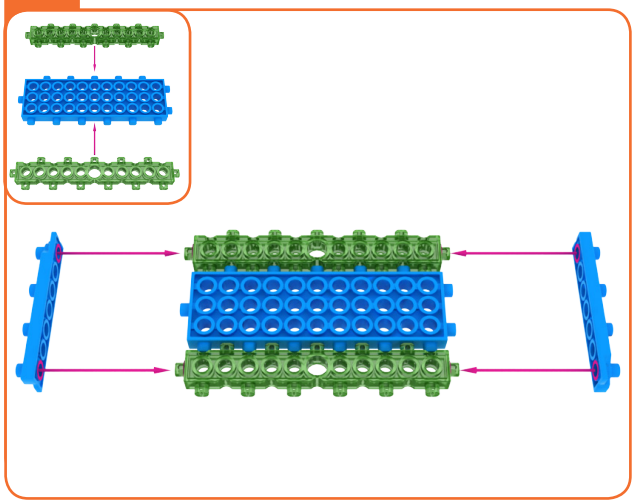
25



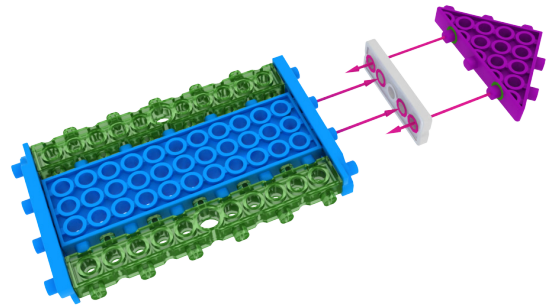
26



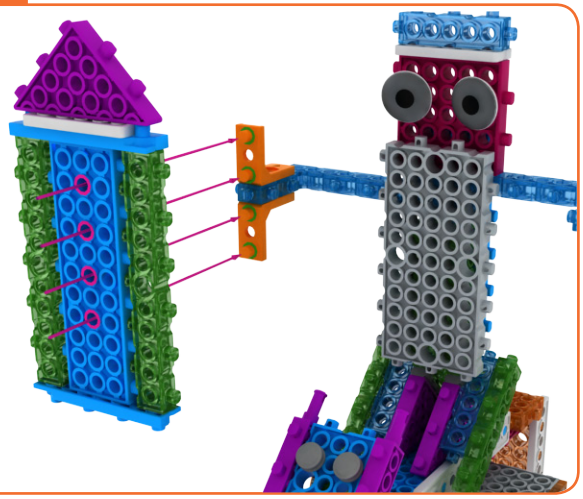
27



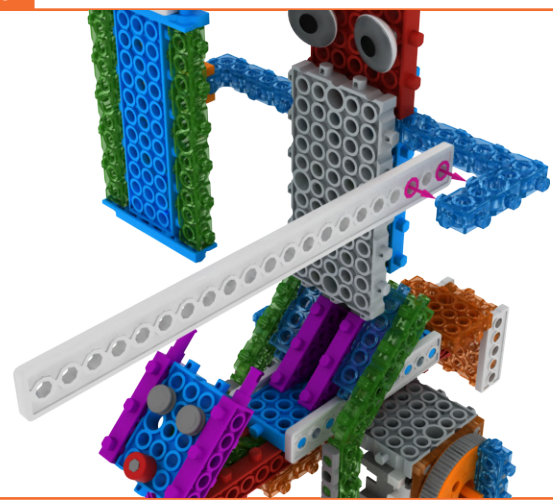
28



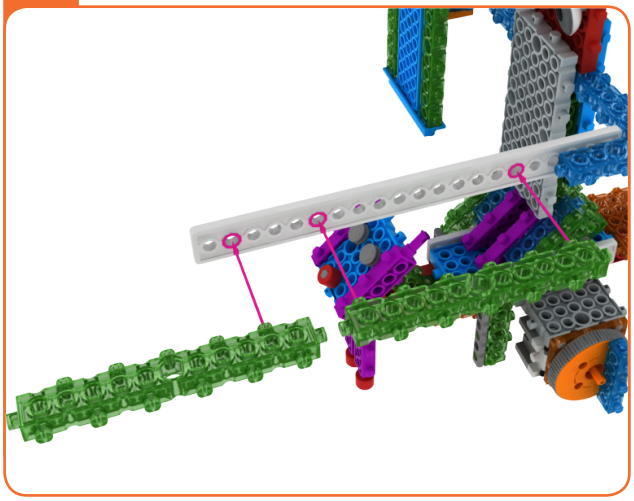
29



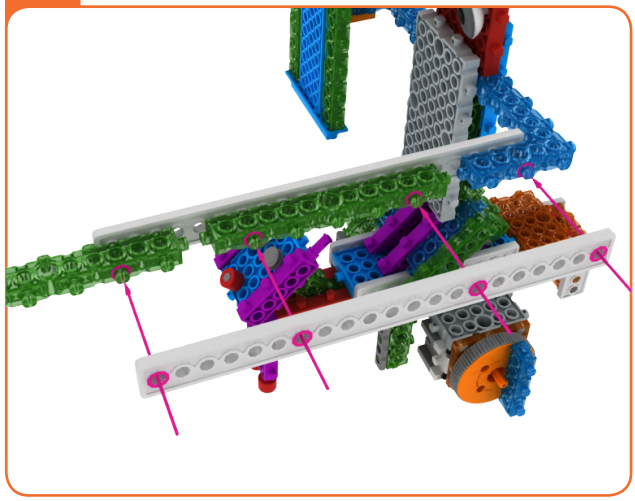
30



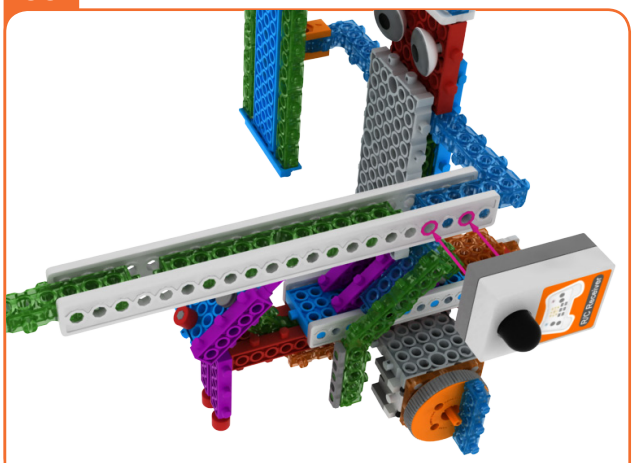
31



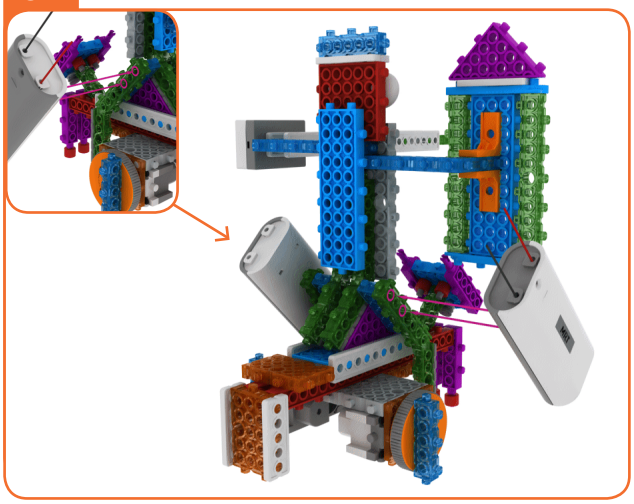
32



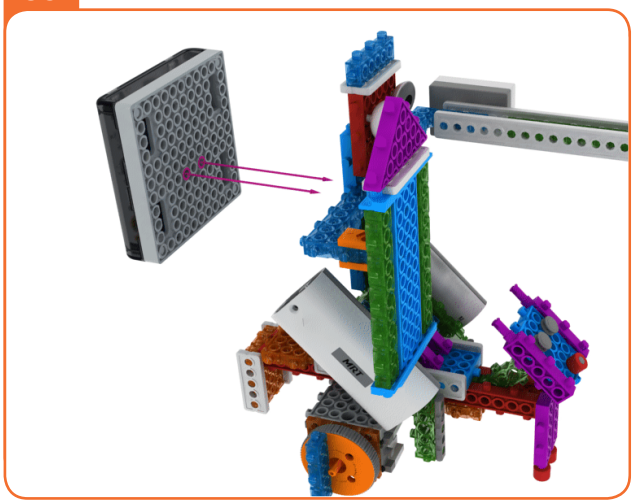
33



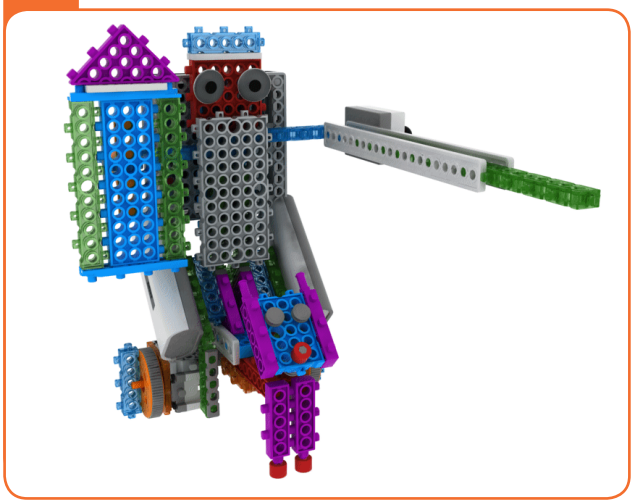
34



35

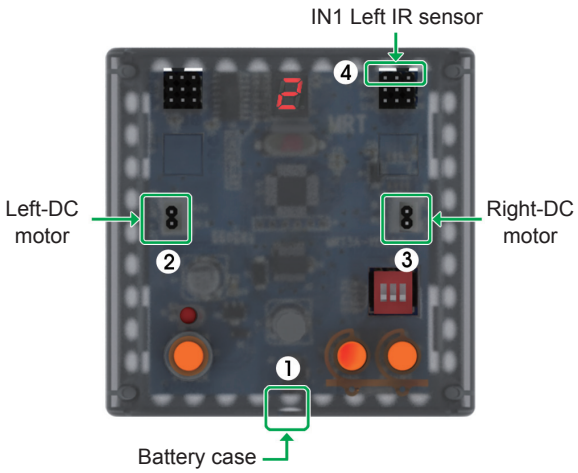


End



How to operate Knight and Donkey

Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect R/C receiver board to R/C connector.

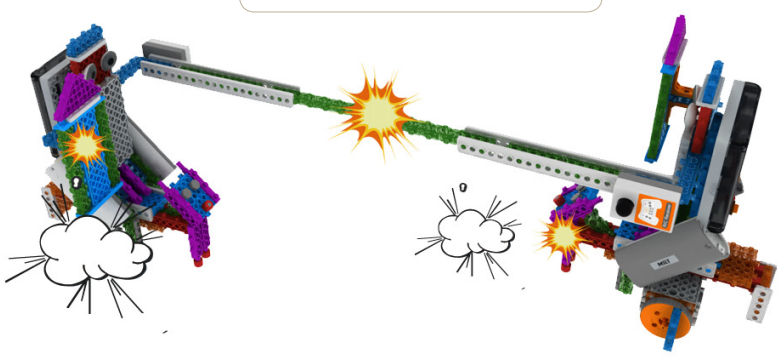
Setting mode

1. Ensure battery case/DC Motor Connector are connected.
2. Turn on the power.
3. Press the MODE button and select as the follow mode.

MODE # 2		Remote control Mode

4. Select Remote ID.
5. Press the START button.

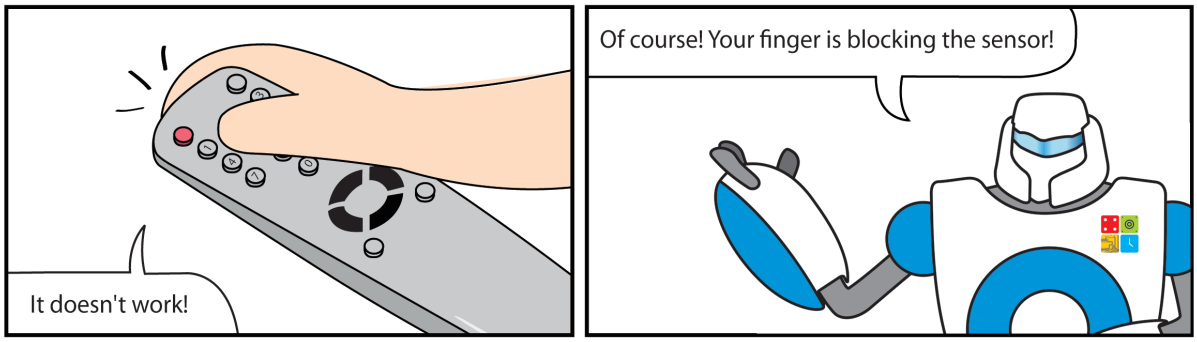
How to make it move?

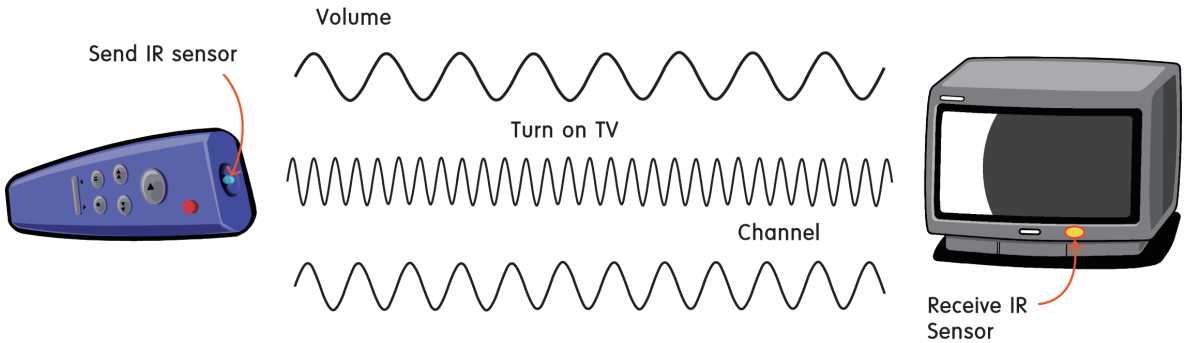


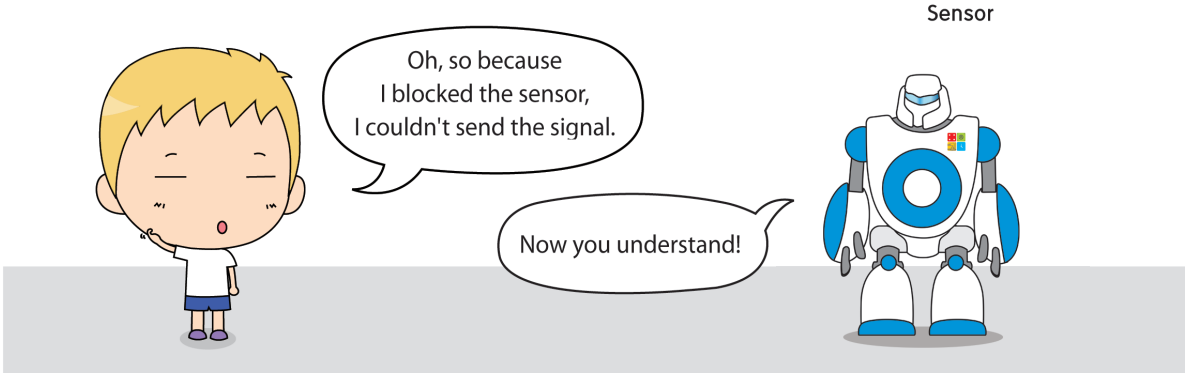
※ Let's play Robot fighting game with friends.

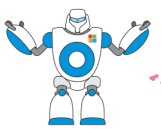
Science Technology

STEM 8. The principle of a remote control



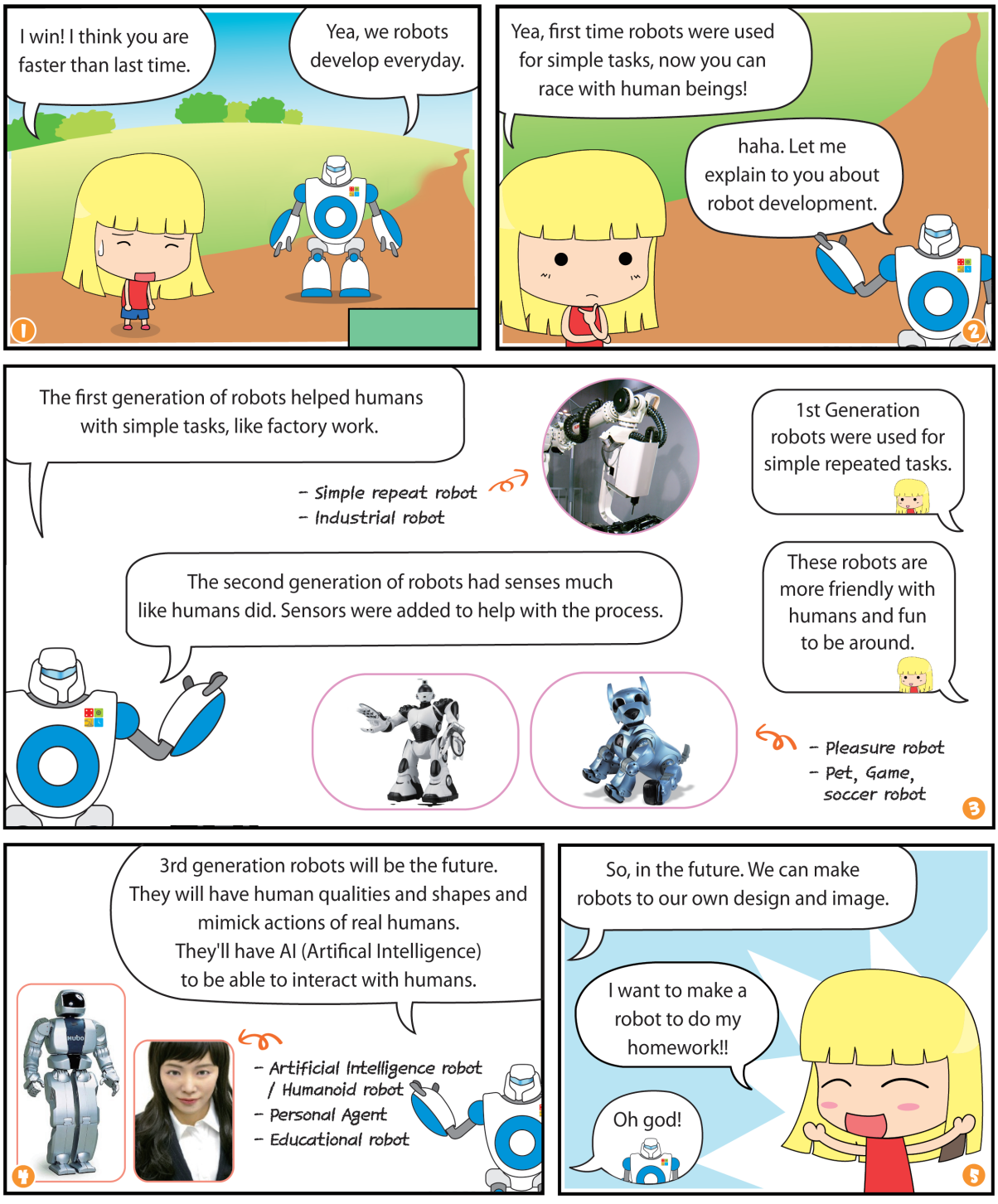






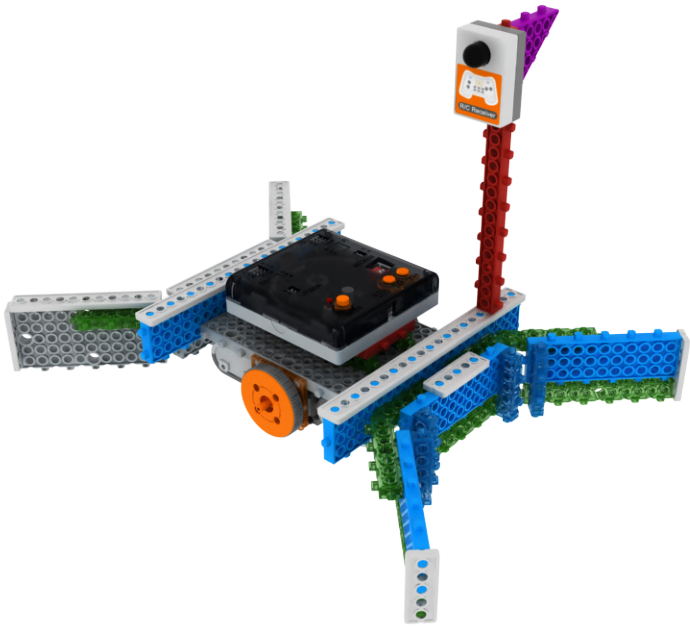
Using a remote control, what can you order a robot to do?

Technology Engineering STEM 9. Robot Development

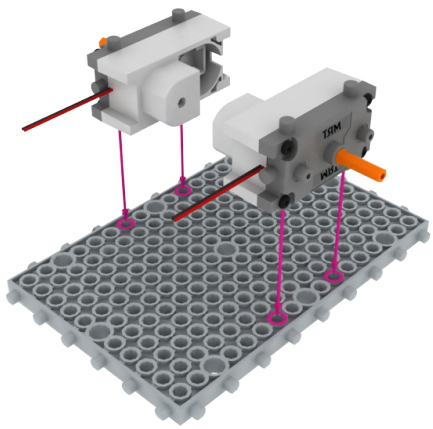


Engineering Art

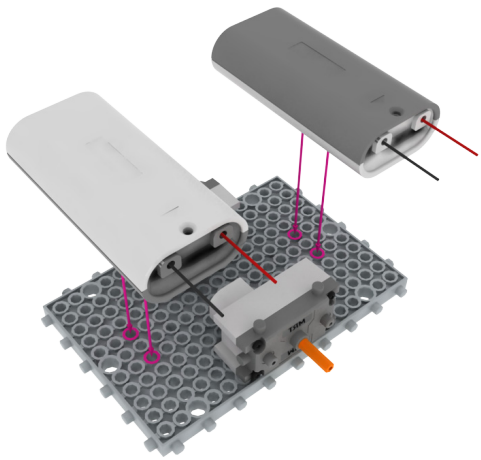
Robot Making10-X—Soccer



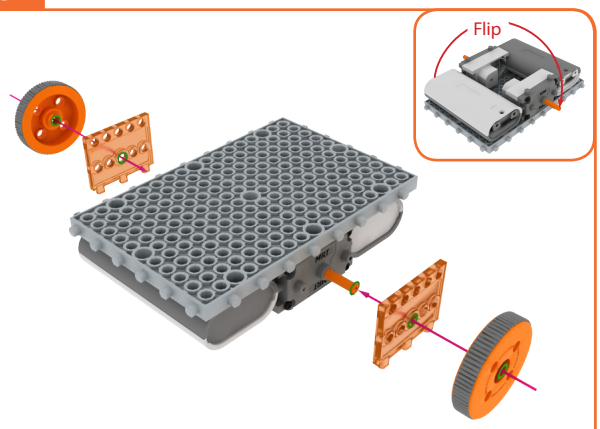
1



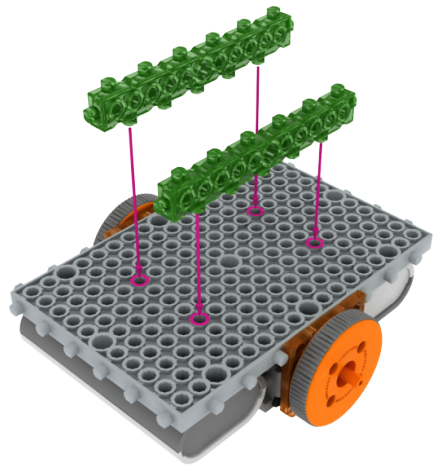
2



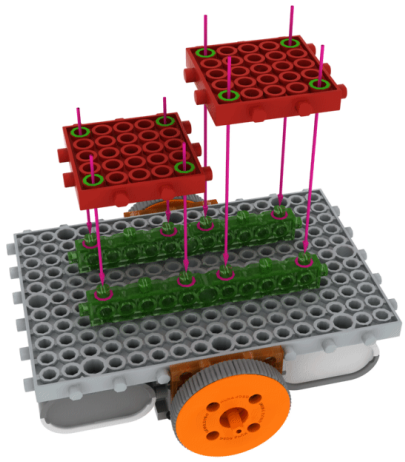
3



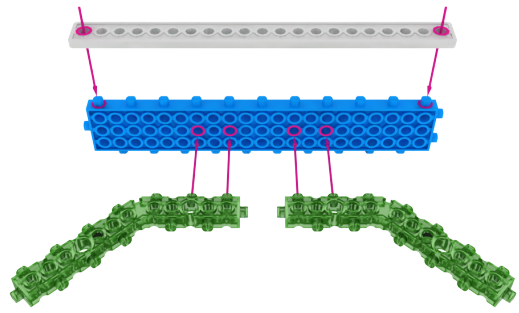
4



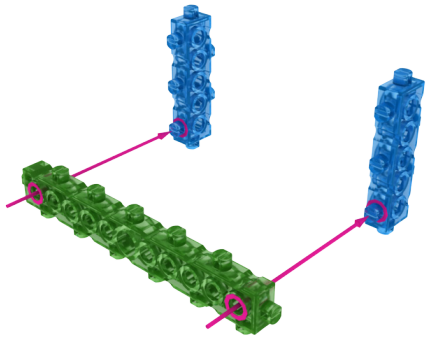
5



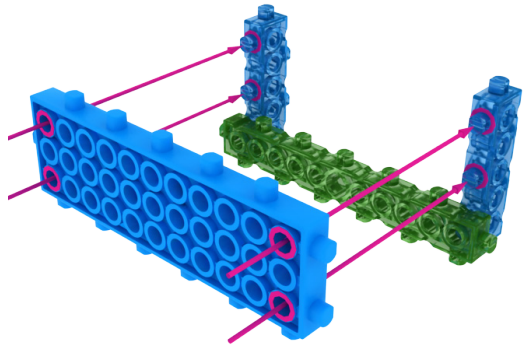
6



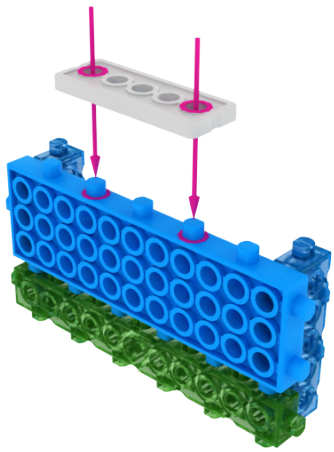
7



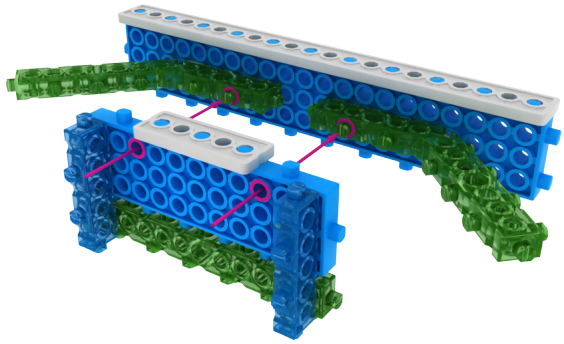
8



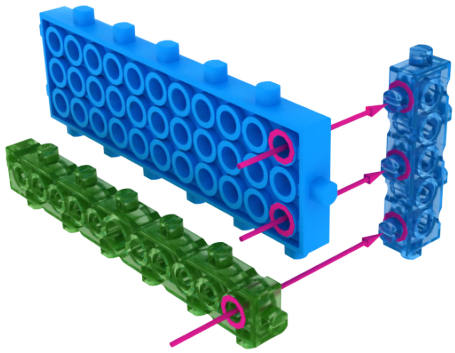
9



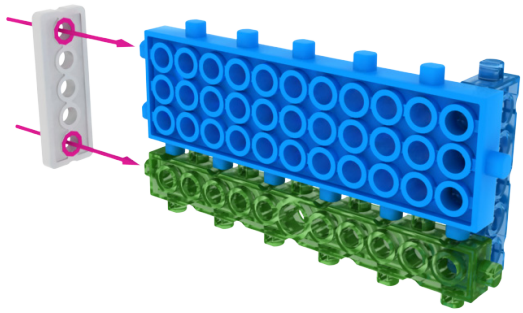
10



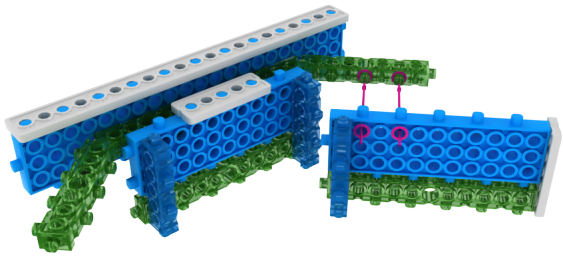
11



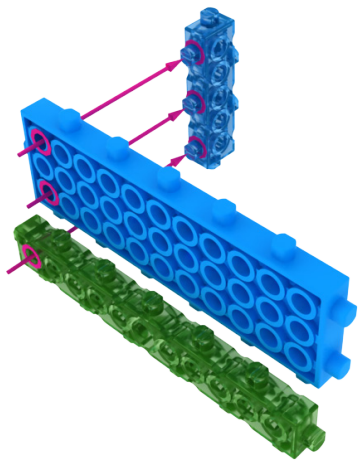
12



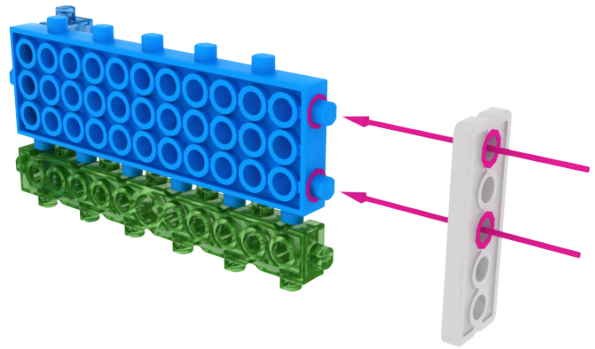
13



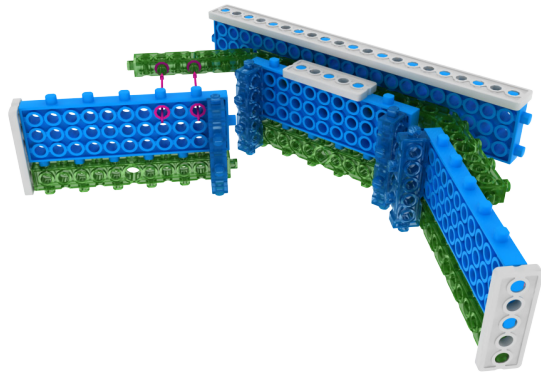
14



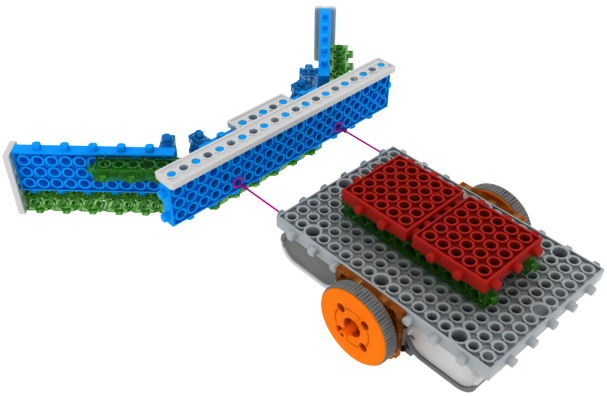
15



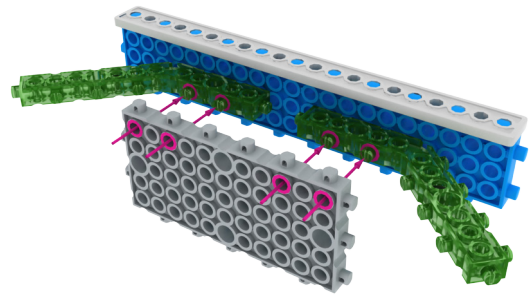
16



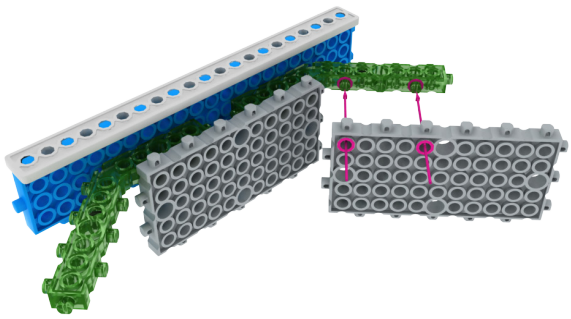
17



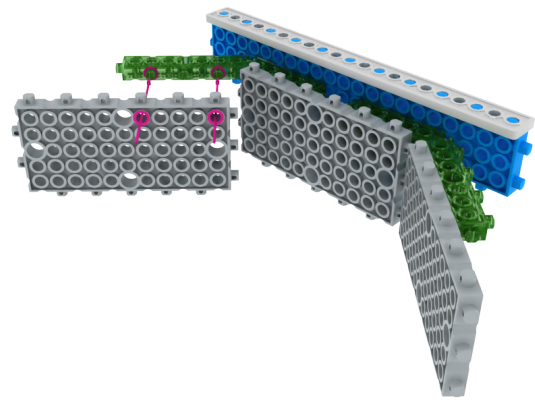
18



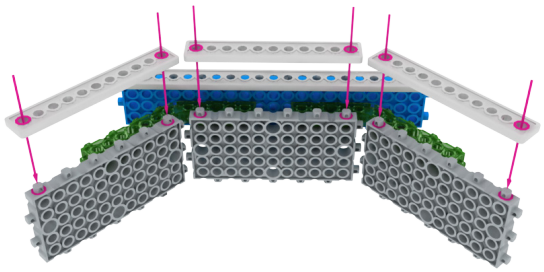
19



20

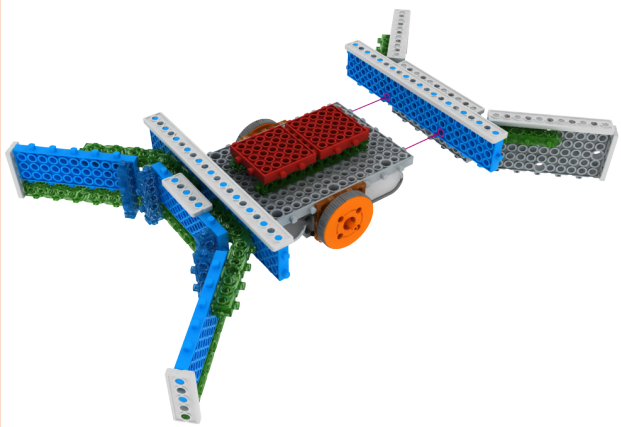


21

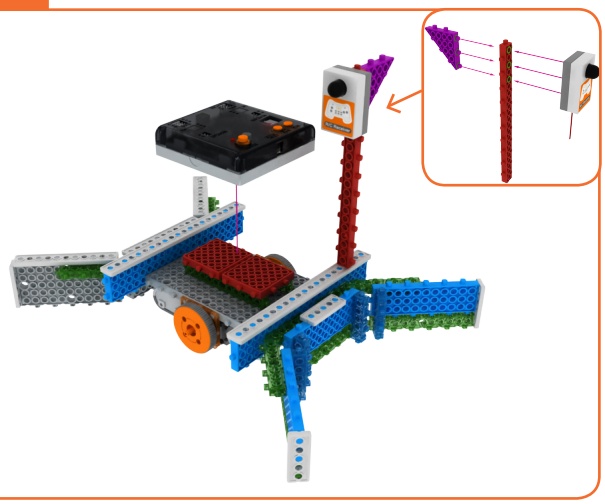


22

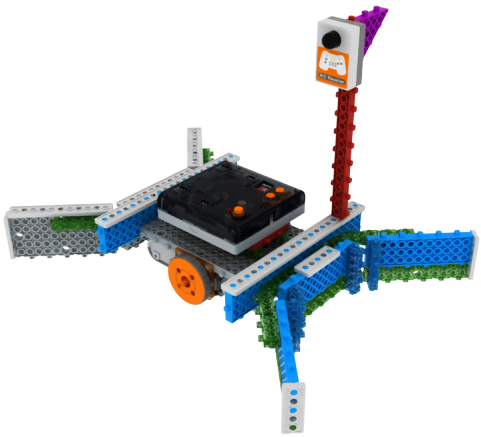
23



24

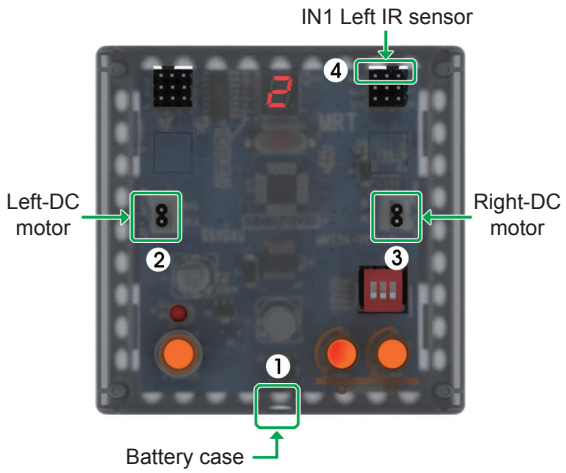


End



How to operate X--Soccer

Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect R/C receiver board to R/C Connector

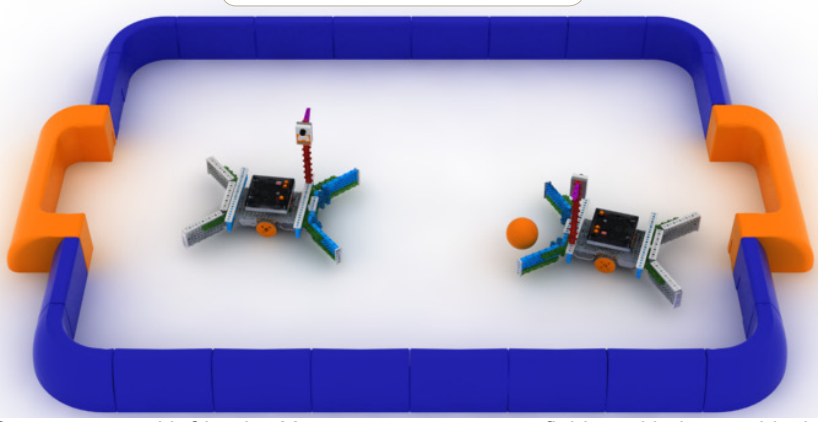
Setting mode

1. Ensure battery case/DC Motor Connector are connected.
2. Turn on the power.
3. Press the MODE button and select as the follow mode.

MODE # 2		Romote Control Mode

4. Select Remote ID.
5. Press the START button.

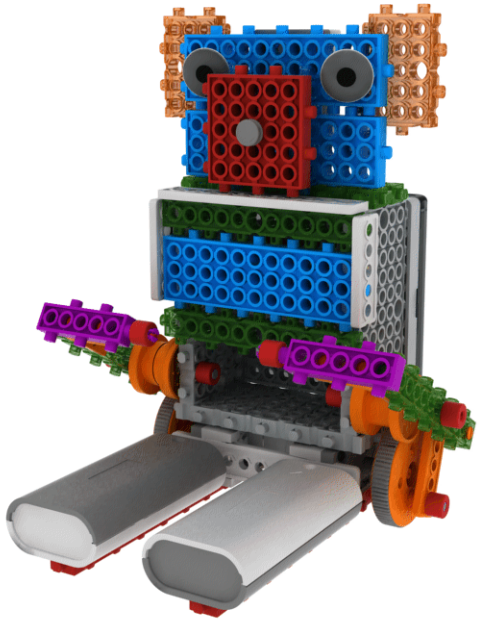
How to make it move?



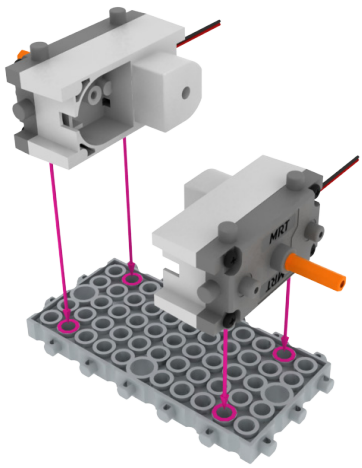
※ Let's play X- Soccer game with friends . You may use our soccer field or with the rest blocks and frames.

Engineering Art

Robot Making11-Drummer baby bear

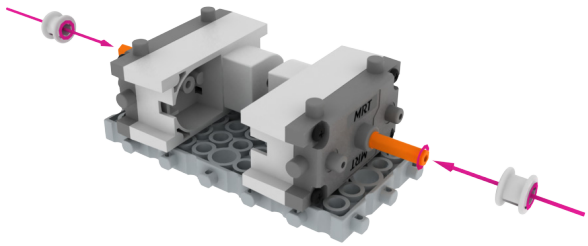


1

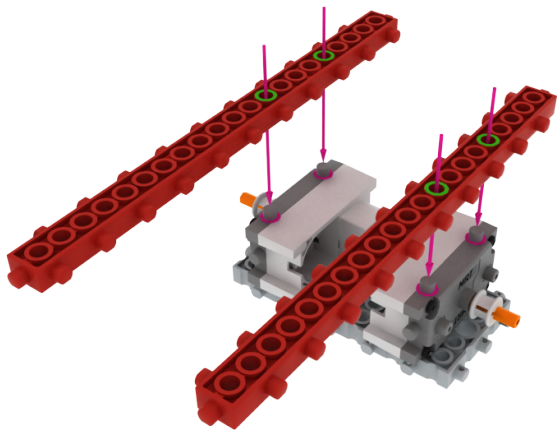


2

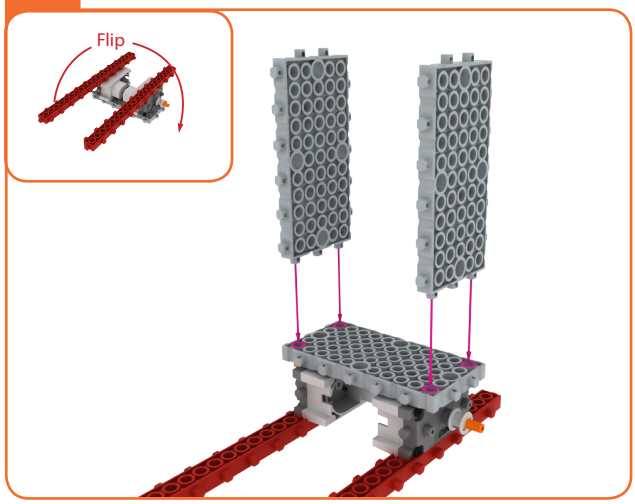
X2



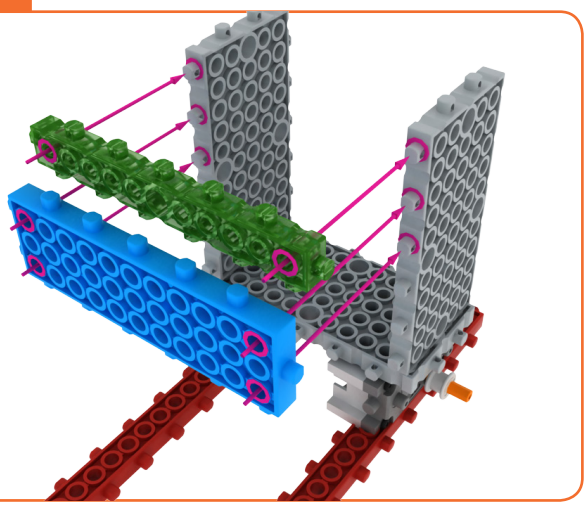
3



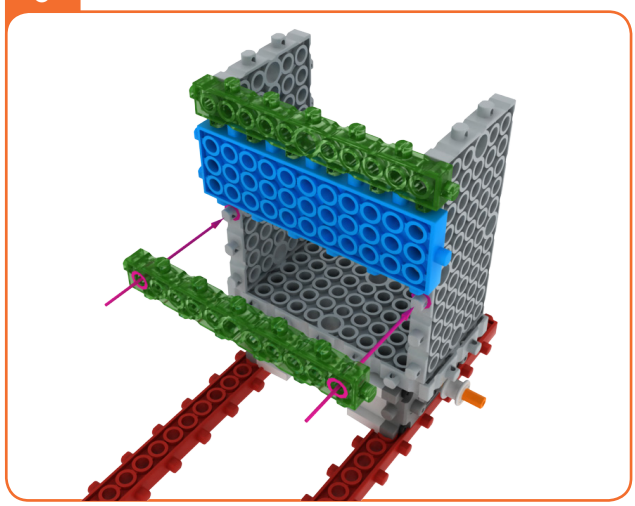
4



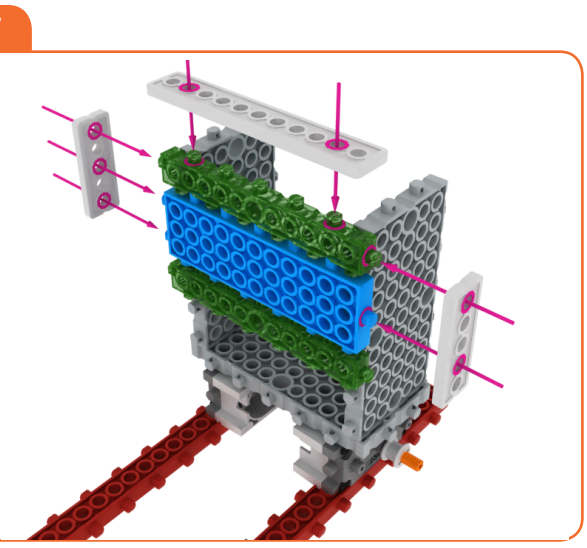
4



6

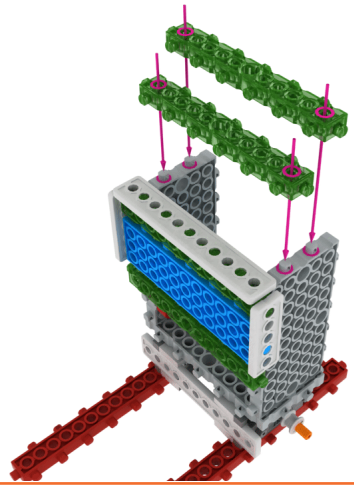


7

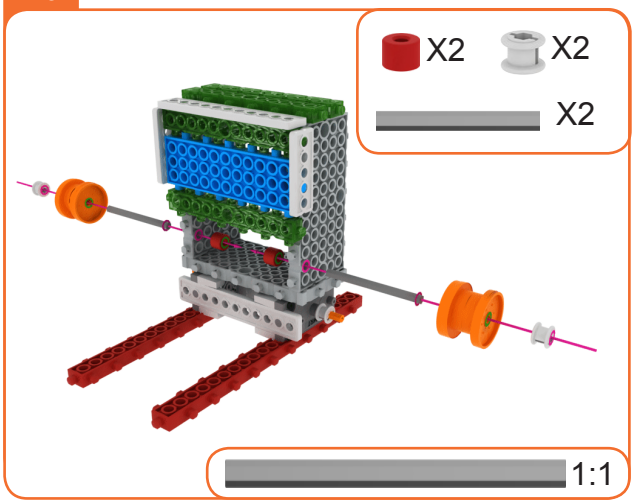


8

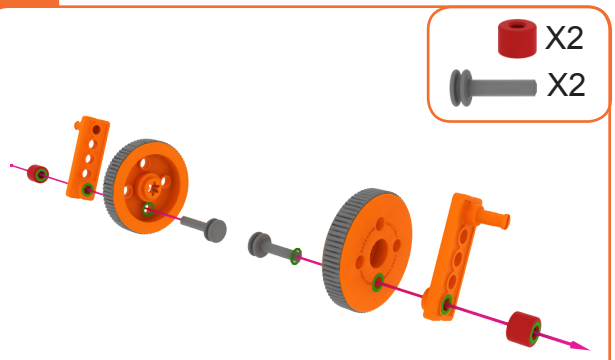
9



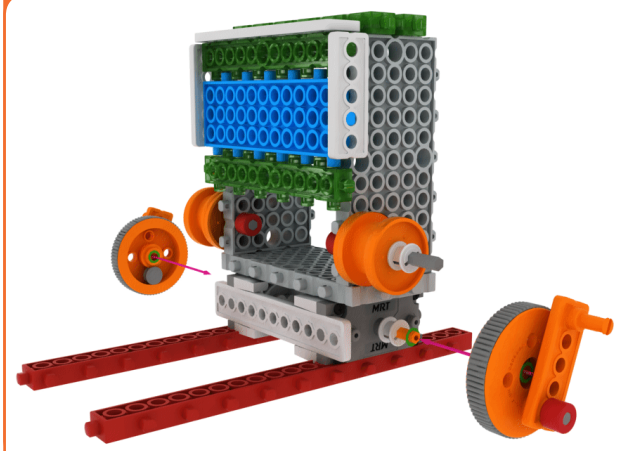
10



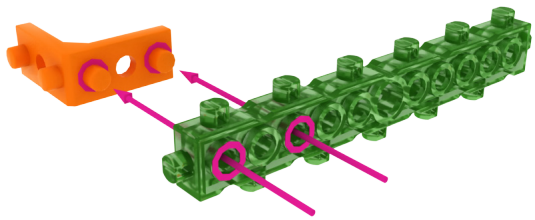
11



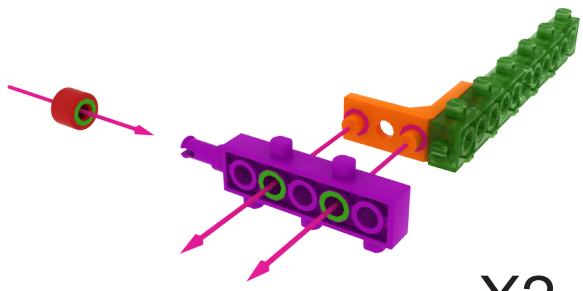
12



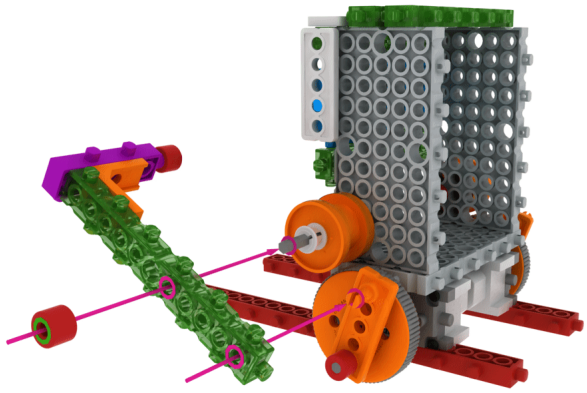
13



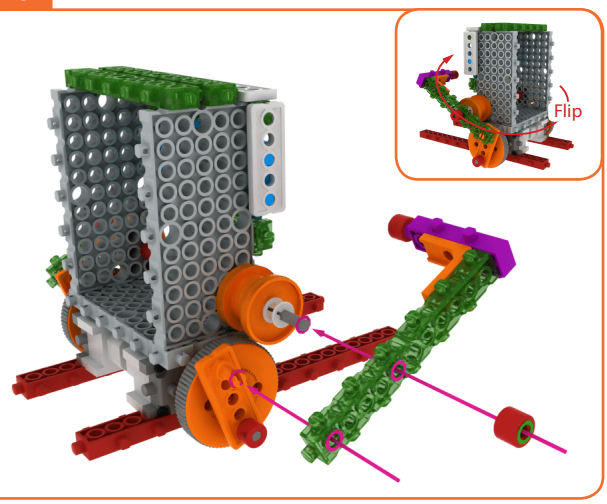
14



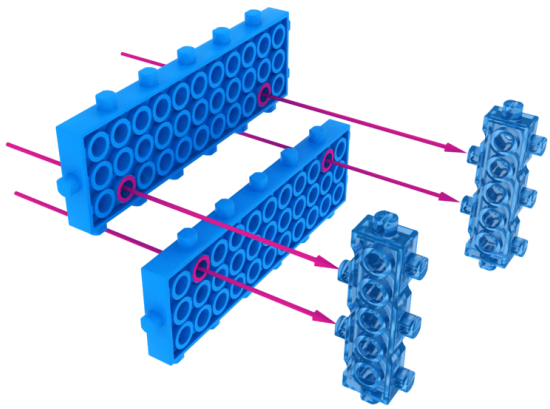
15



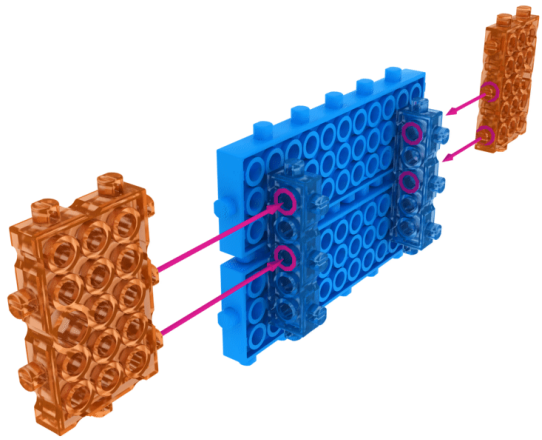
16



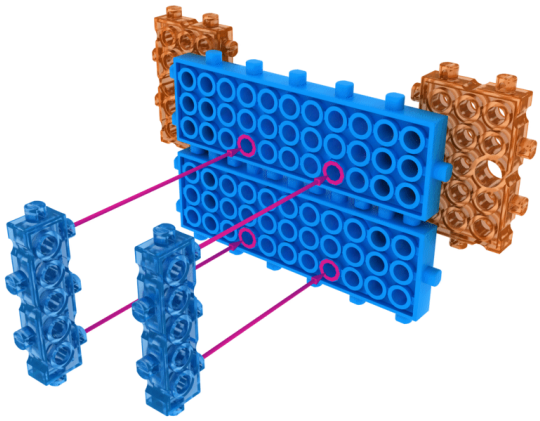
17



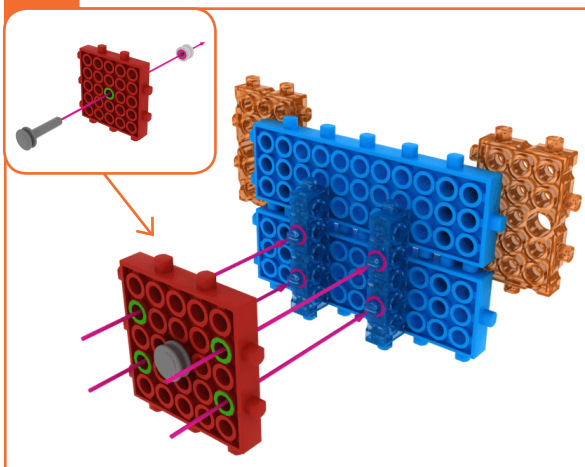
18



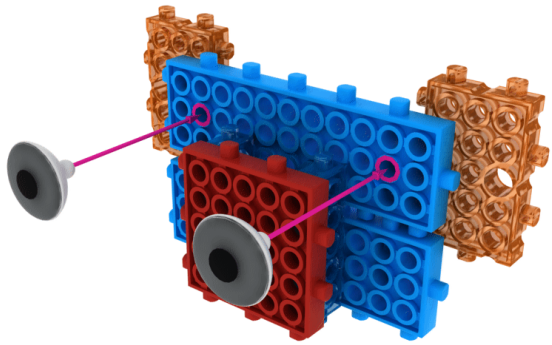
19



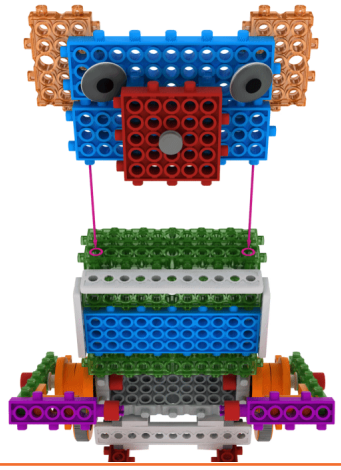
20



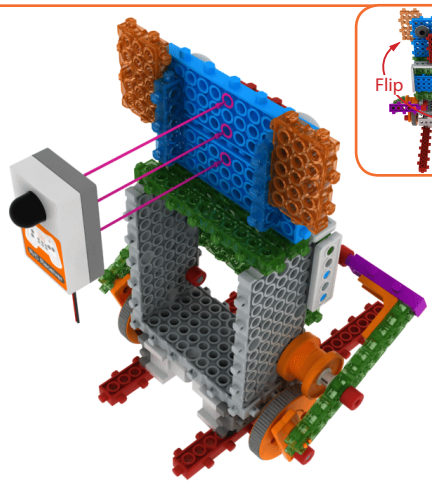
21



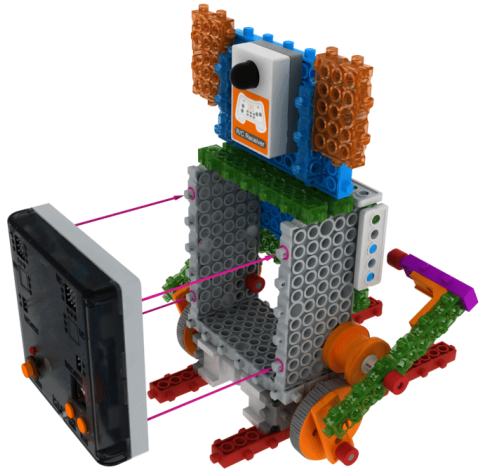
22



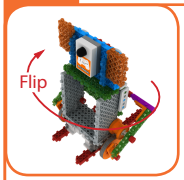
23

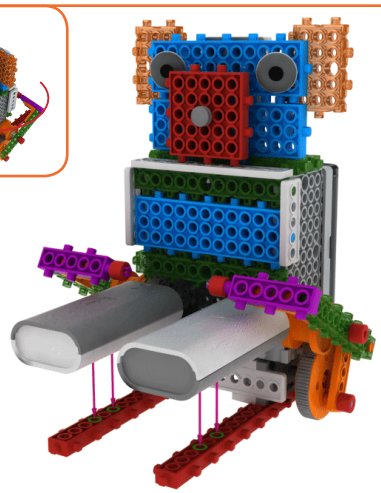


24

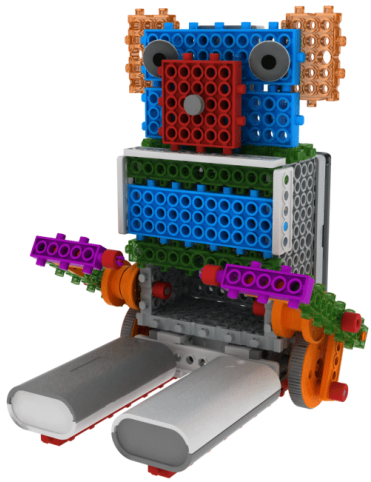


25



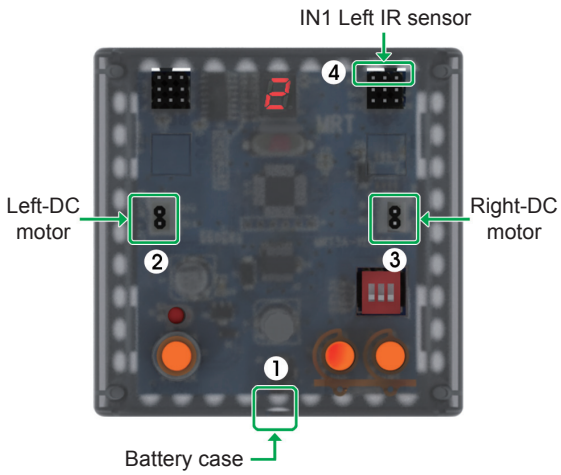


End



How to operate Drummer baby bear

Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect R/C receiver board to R/C Connector

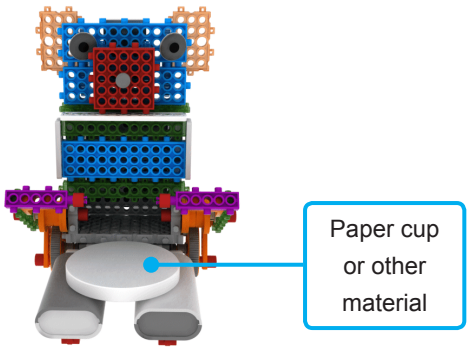
Setting mode

1. Ensure battery case/DC Motor Connector are connected.
2. Turn on the power.
3. Press the MODE button and select as the follow mode.

MODE # 2		Romote Control Mode

4. Select Remote ID.
5. Press the START button.

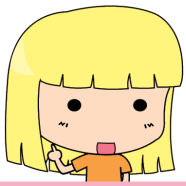
How to make it move?



※ Use paper cup to make a drum for baby bear.

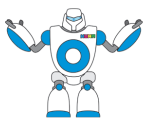
Technology

STEM 10. History of Robot



Let's look aroud history of robots.

	Past	Recent Past	Present	Furture
Culture	-They talked about it in literature. The oldest robot is a Giant BronzeTalus in Greek Mythology.	-In 1949, the author Jack Williams wrote in his book, "Humanoid" about the creation of a robot-human character.	-In 2003,WowWee Company made a humanoid robot toy. 1 year later ZMP made "Nuvo", a remote controlled robot.	
Technology	-In 18th century France, Jacquess de Vaucanson made an artifical duck capable of flapping its wings, quacking, eating and digesting food.	-In 1927, American, R.J Wensley made 'Telebox', and in England, Richard made Eric the robot.	-NASA made a remote controlled robot Robonaut and Anthony Gallo Company developed Mars Probe, which was a flying robot.	-MicroRobot, Service Robot, Farming Industry Robot, Space Robot, and Automatic (non-manned) Transportation and Entertainment robot will be forecsted for practical usage.



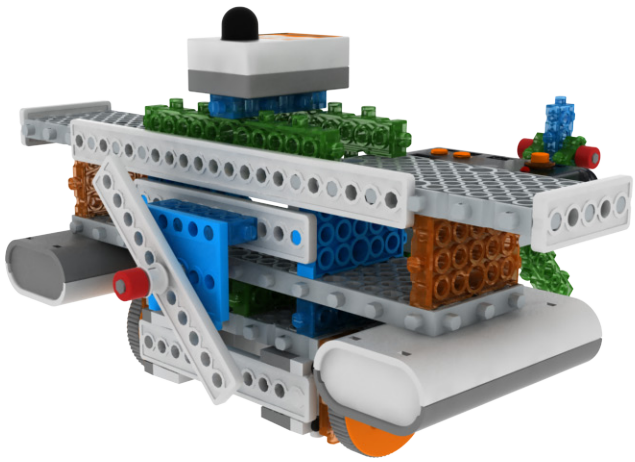
In the future, what robot will be produced?
Imagine your own robot and try to make it.

Science Technology

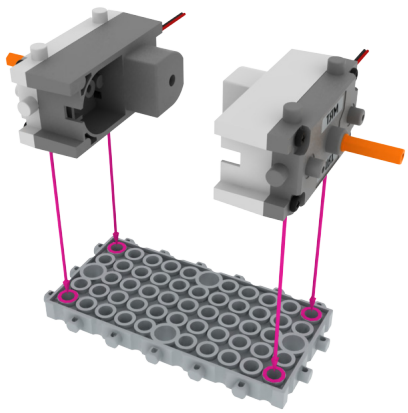
STEM 11. The Power of a Robot-Electricity

Engineering Art

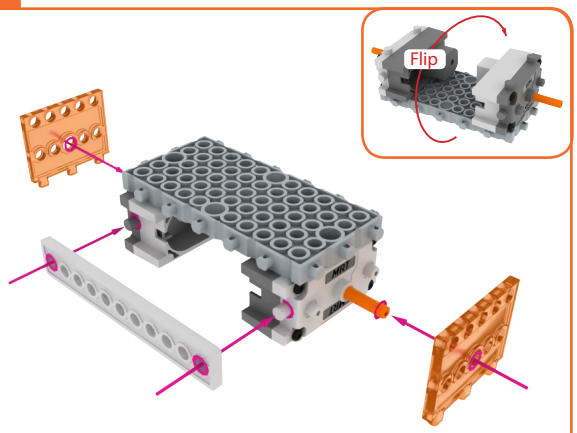
Robot Making12-Air sing sing Plane



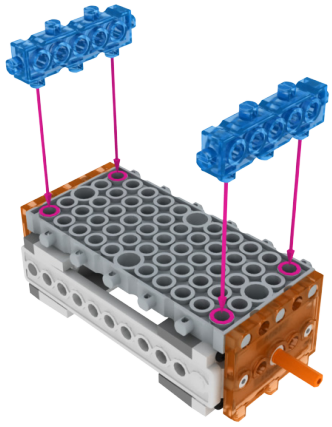
1



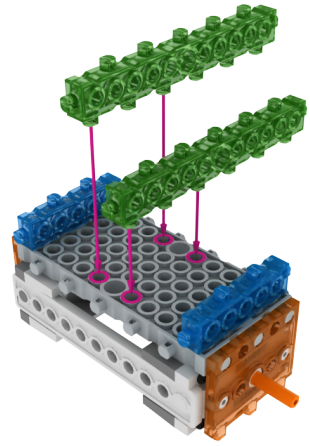
2



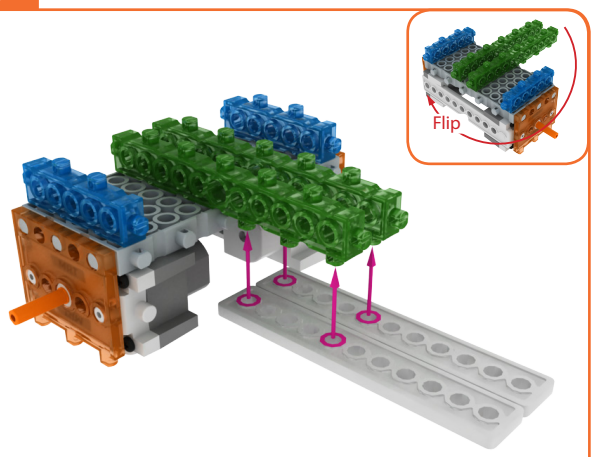
3



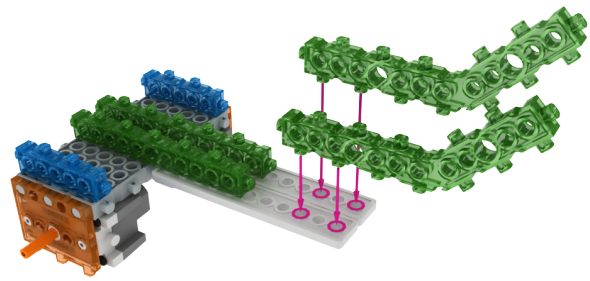
4



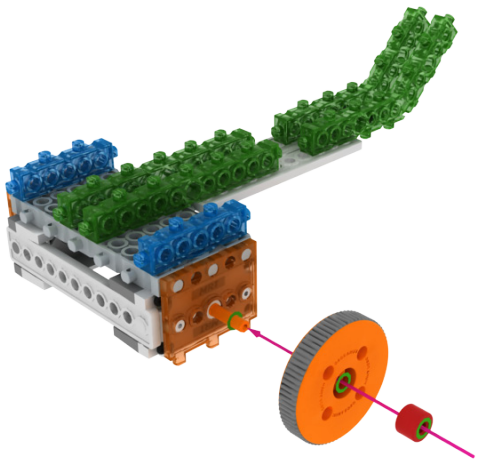
5



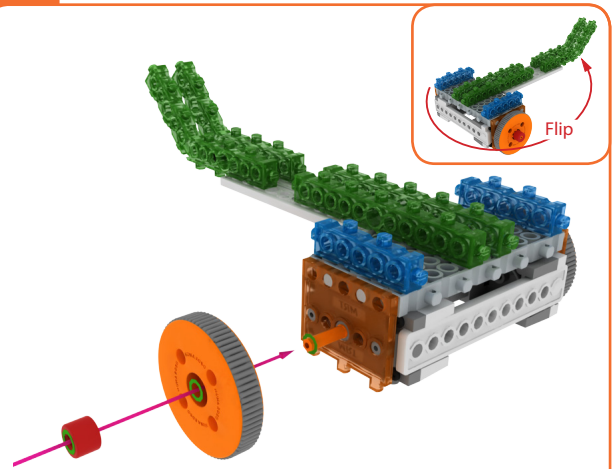
6



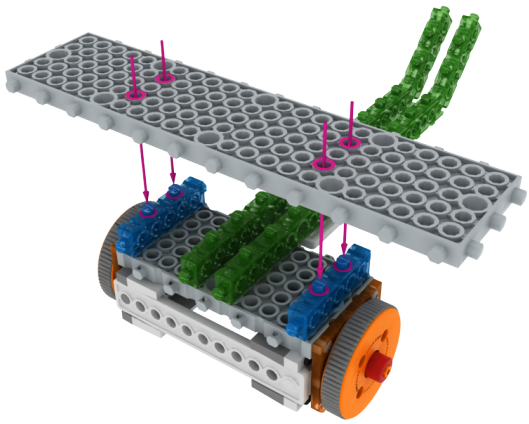
7



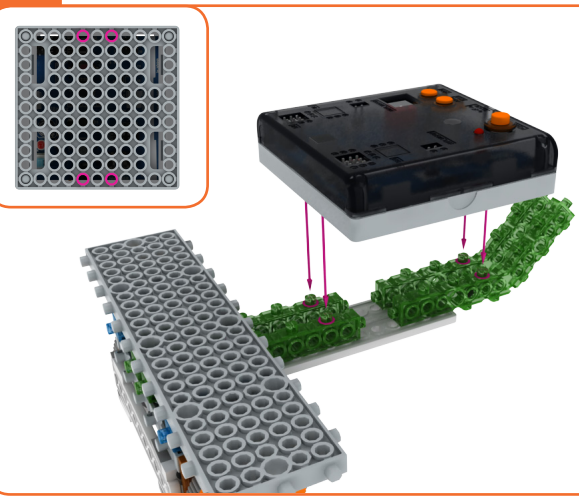
8



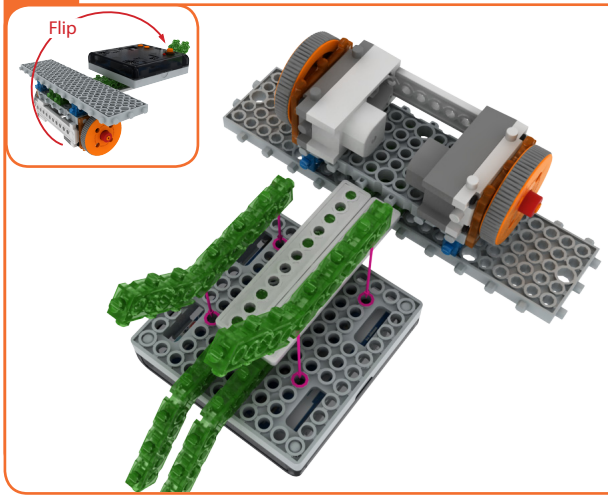
9



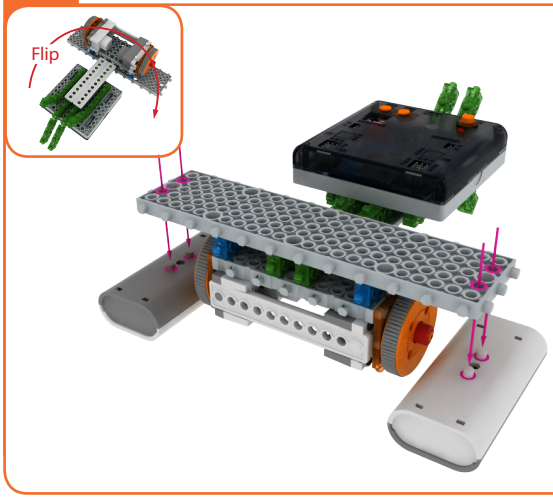
10



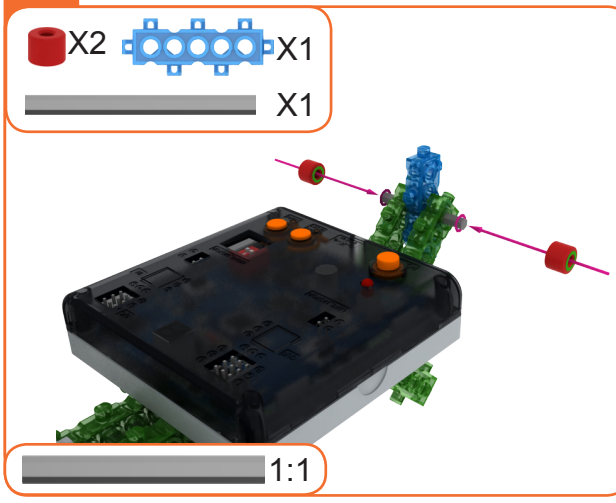
11



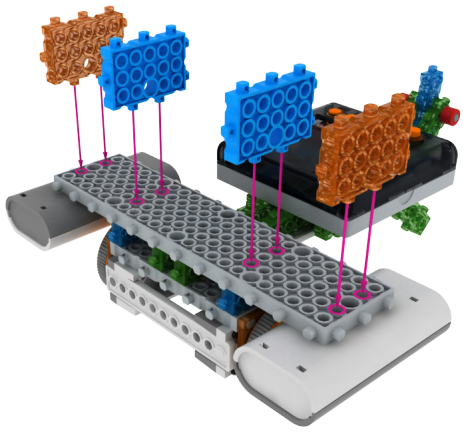
12



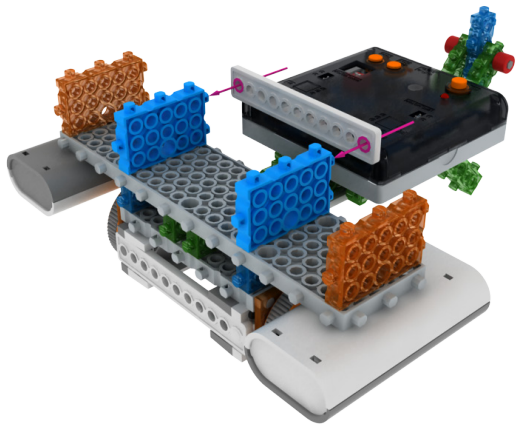
13



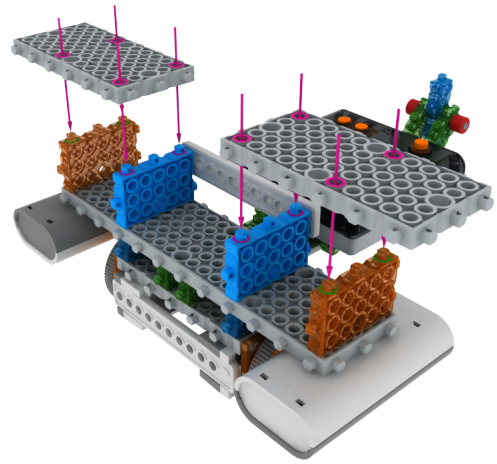
14



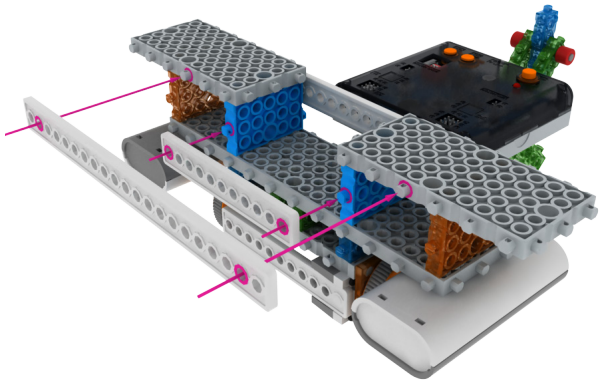
15



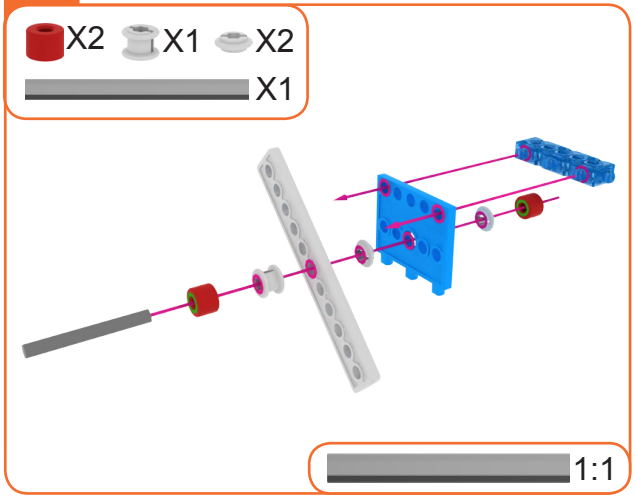
16



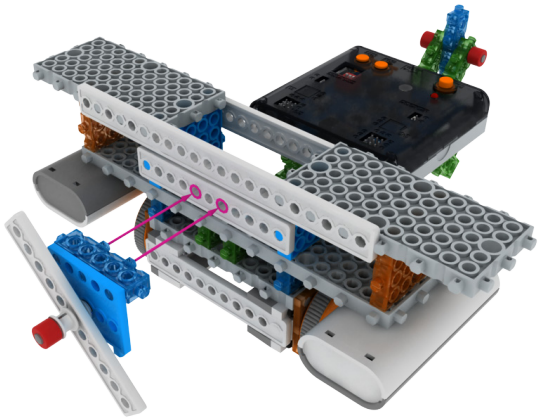
17



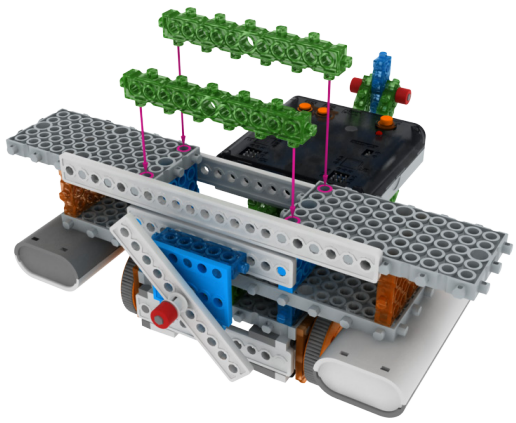
18



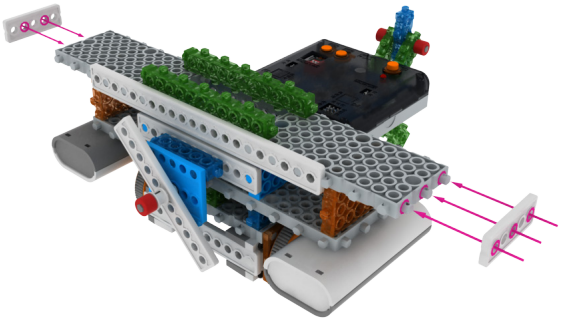
19



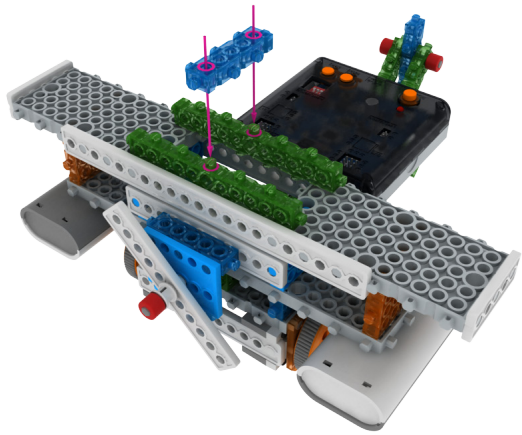
20



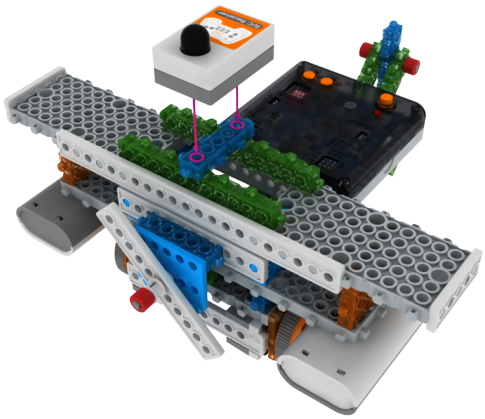
21



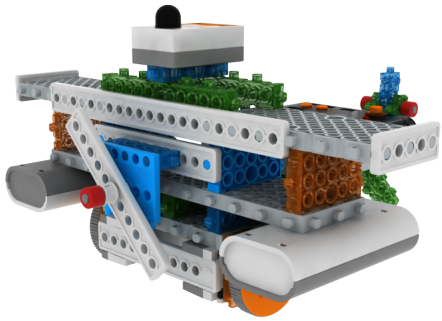
22



23

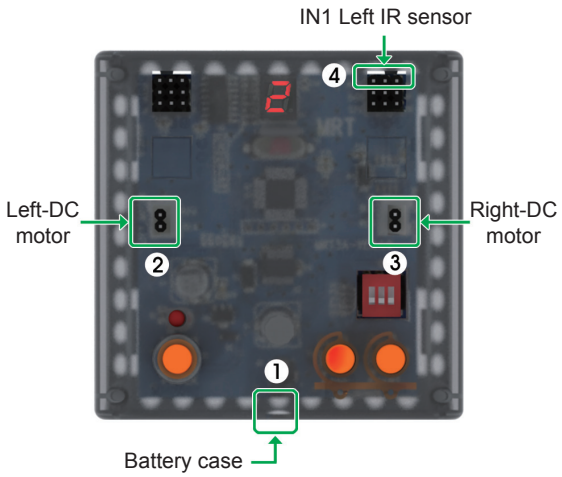


End



How to operate Air sing sing Plane?

Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect R/C receiver board to R/C Connector

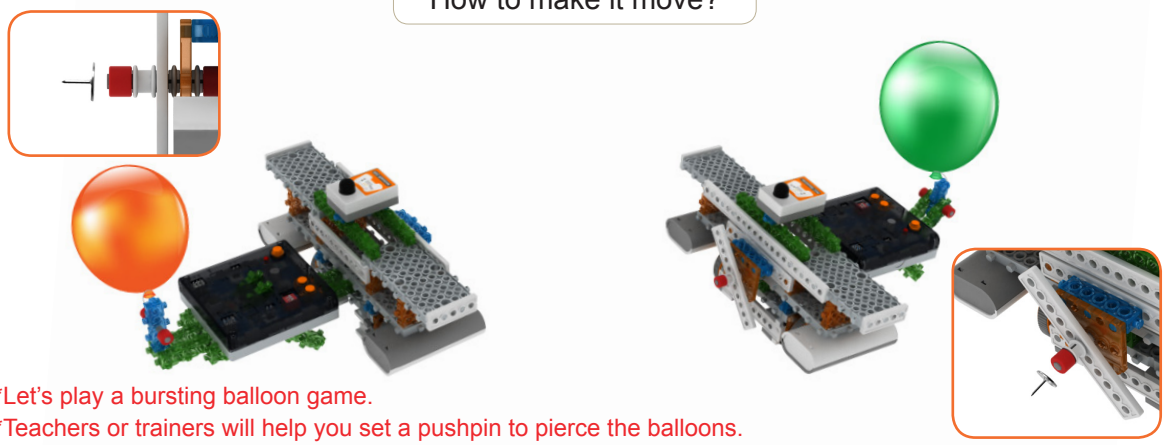
Setting mode

1. Ensure battery case/DC Motor Connector are connected.
2. Turn on the power.
3. Press the MODE button and select as the follow mode.

MODE # 2			Romote Control Mode

4. Select Remote ID.
5. Press the START button.

How to make it move?

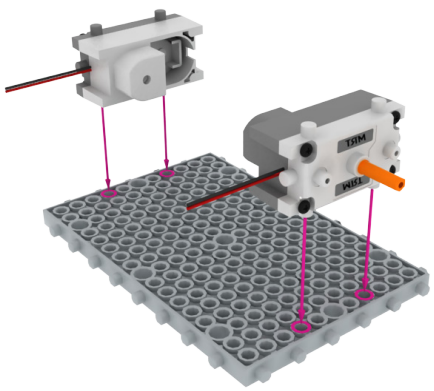


*Let's play a bursting balloon game.
*Teachers or trainers will help you set a pushpin to pierce the balloons.

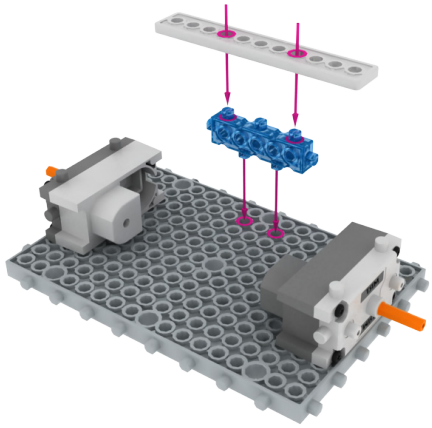
Engineering Art

Robot Making13-Bumper Car

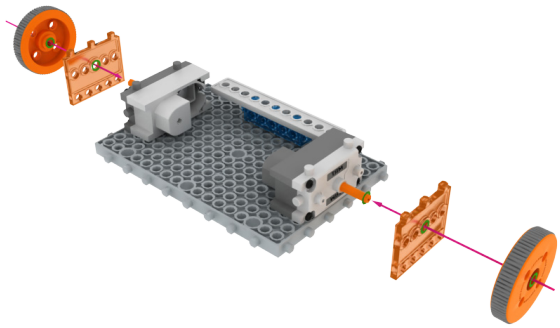
1



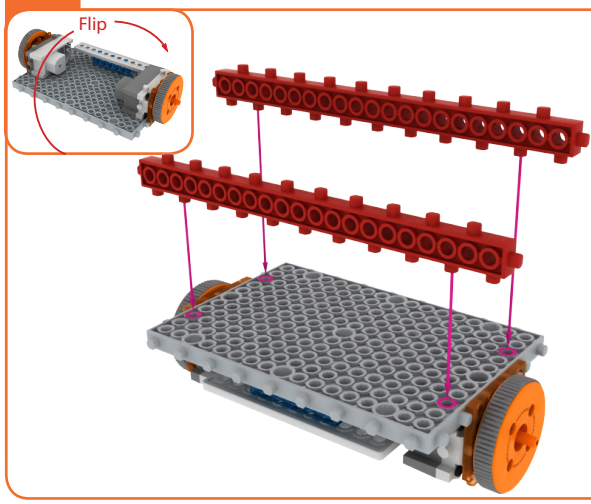
2



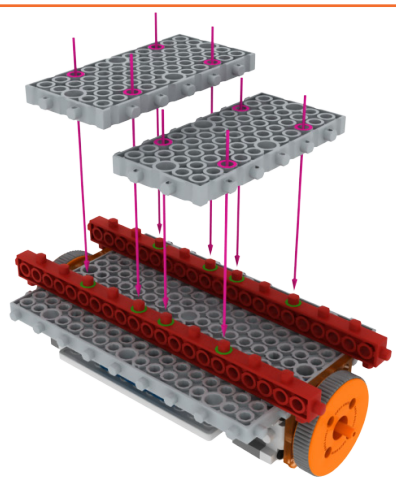
3



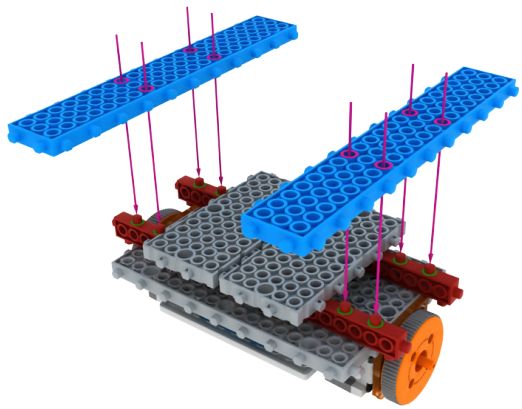
4



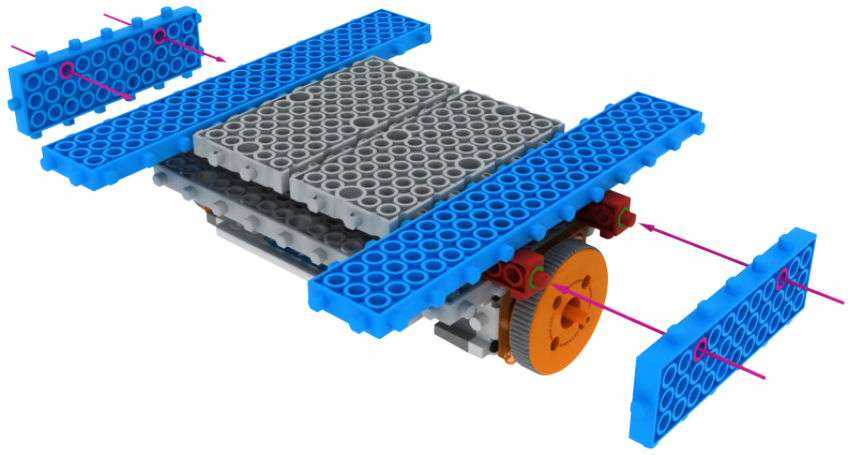
5



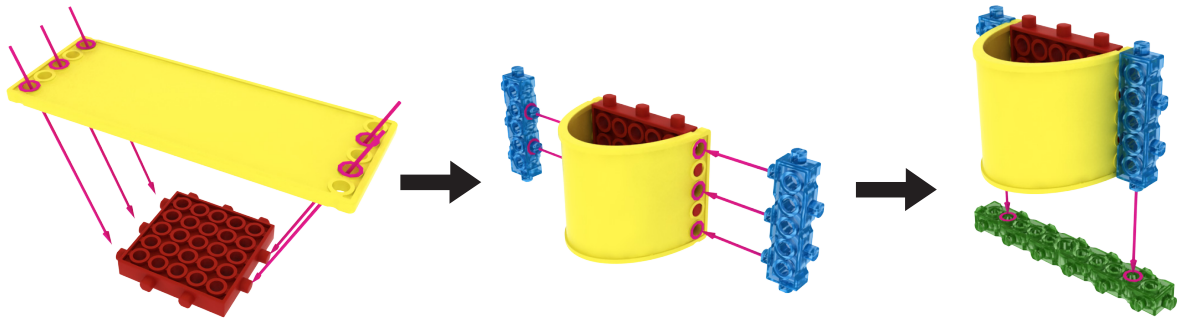
6



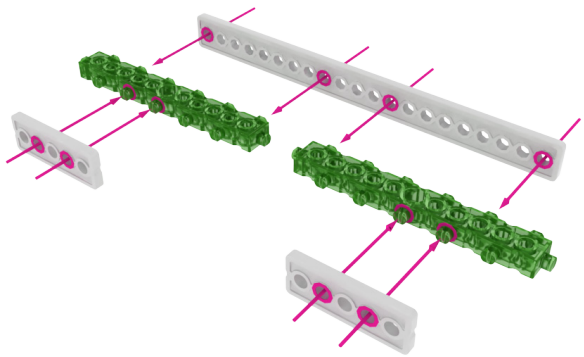
7



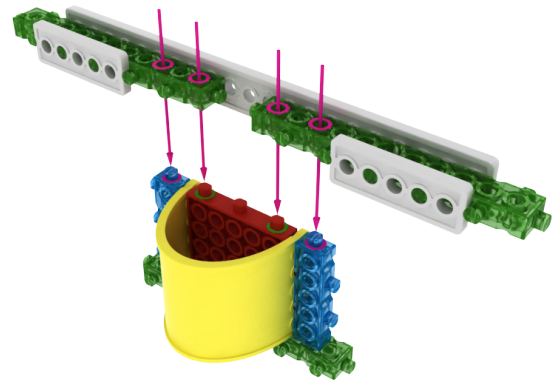
8



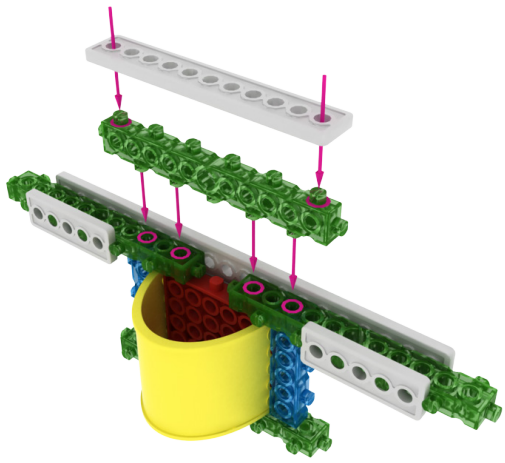
9



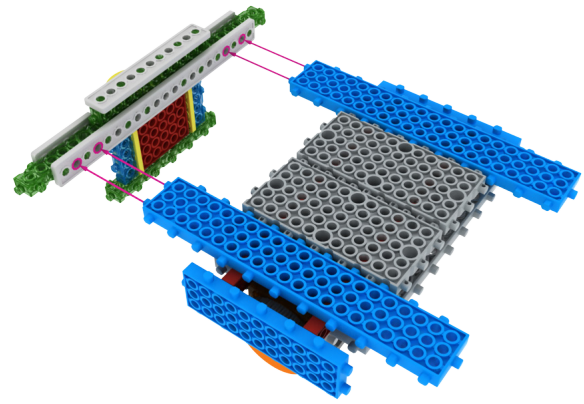
10



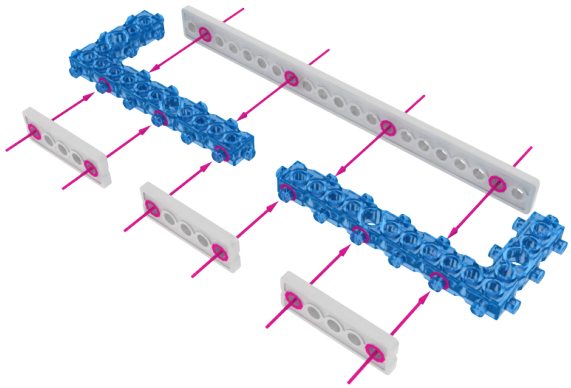
11



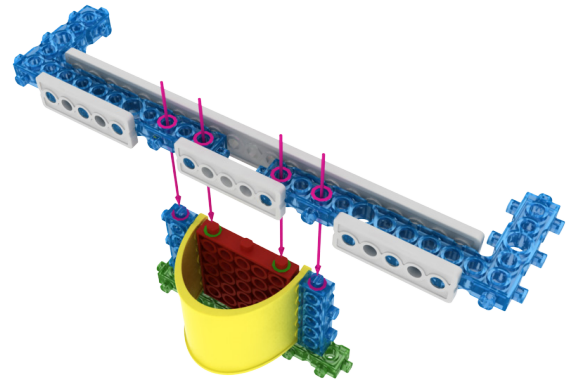
12



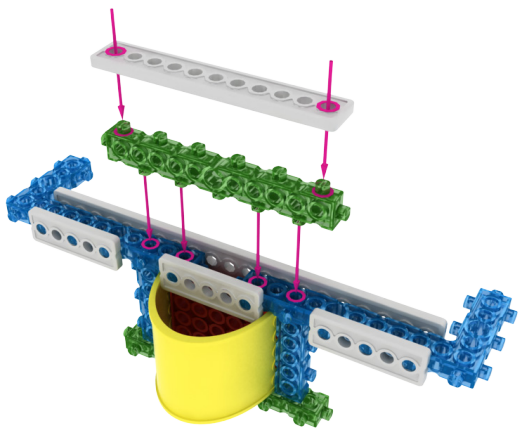
13



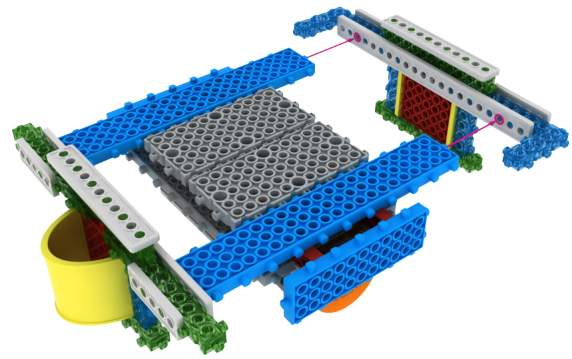
14



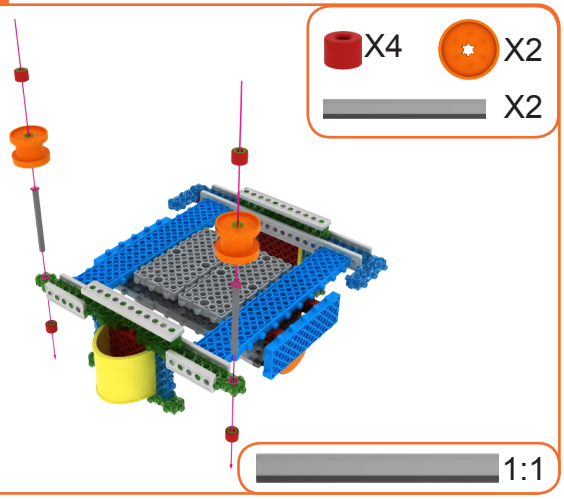
15



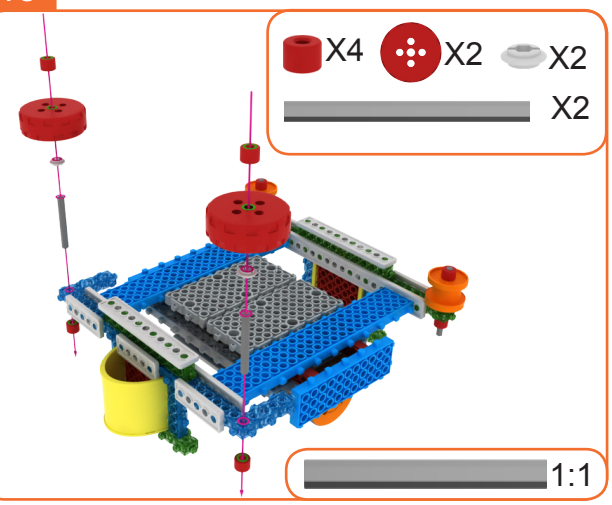
16



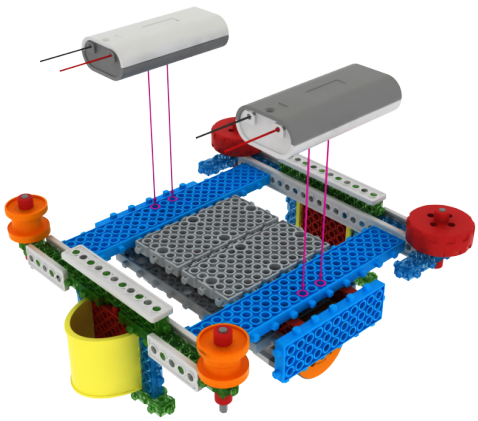
17



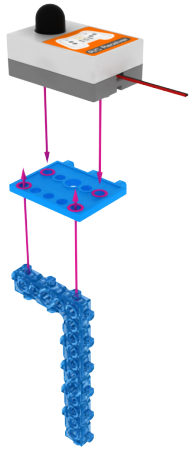
18



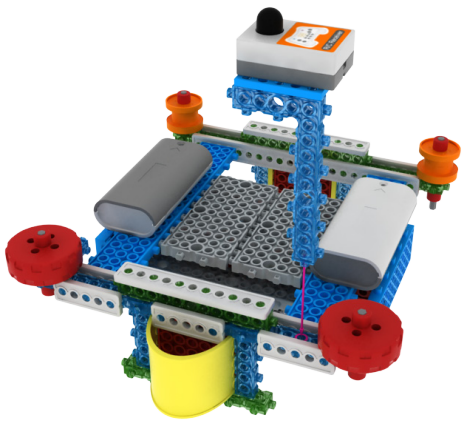
19



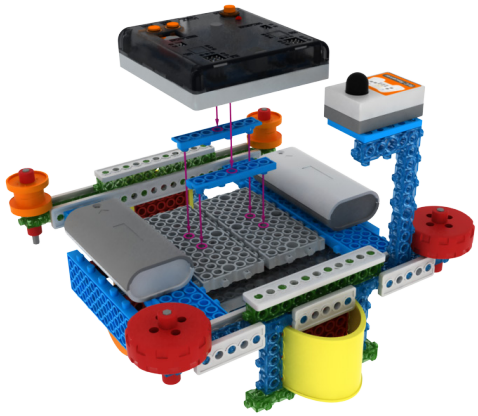
20



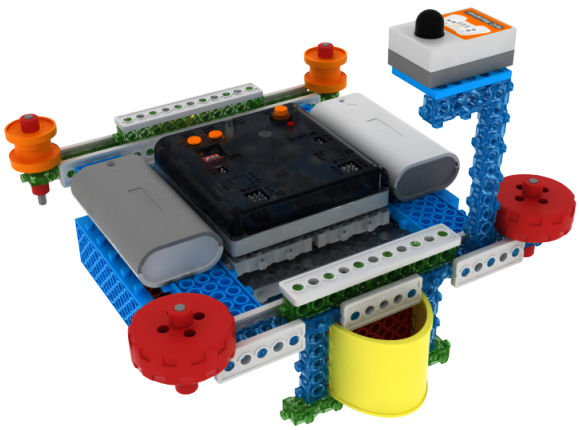
21



22

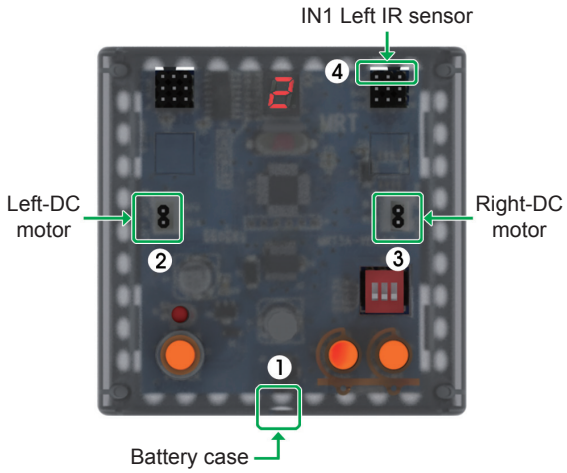


End



How to operate Bumper Car?

Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect R/C receiver board to R/C Connector

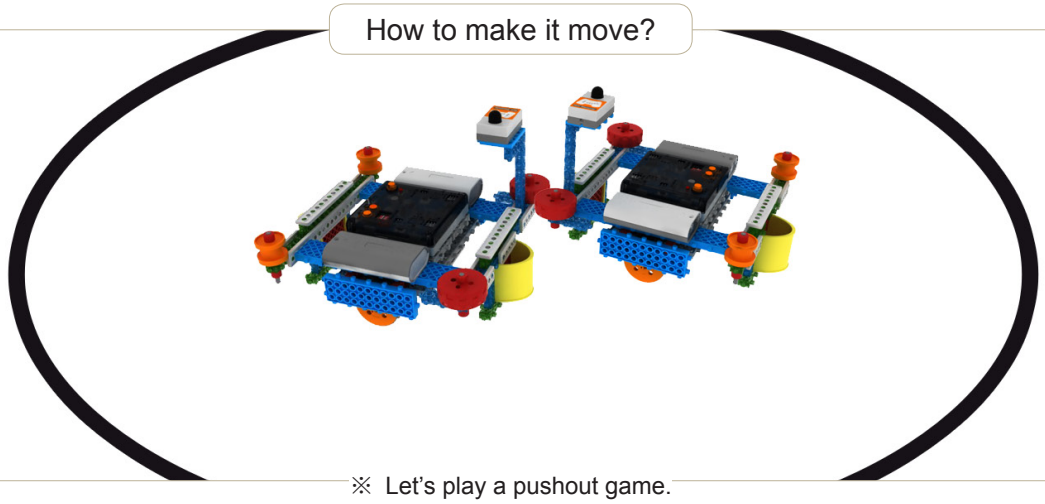
Setting mode

1. Ensure battery case/DC Motor Connector are connected.
2. Turn on the power.
3. Press the MODE button and select as the follow mode.

MODE # 2		Romote Control Mode

4. Select Remote ID.
5. Press the START button

How to make it move?

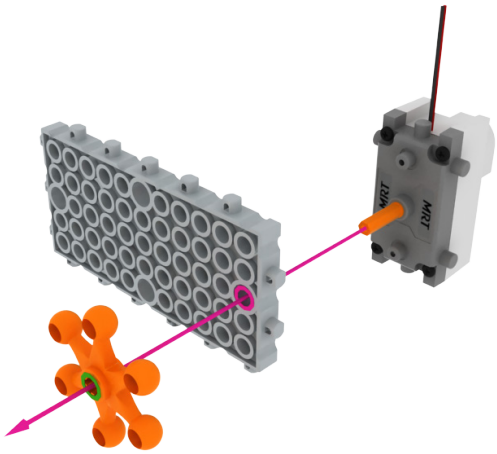


※ Let's play a pushout game.

Technology Engineering

Robot Making14 -Boxing Robot

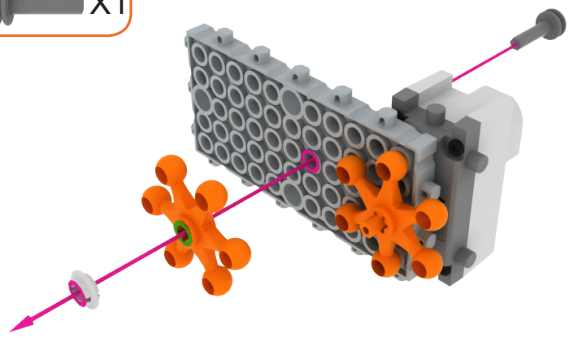
1



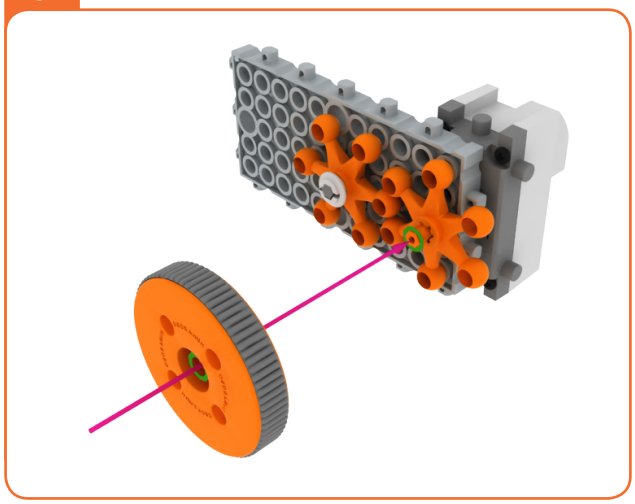
2

X1

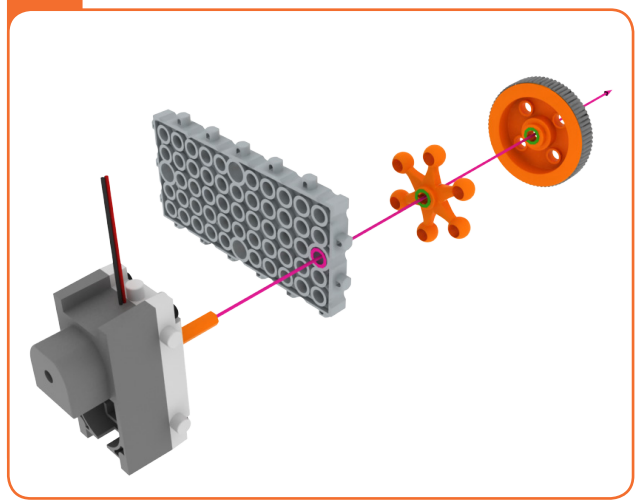
X1



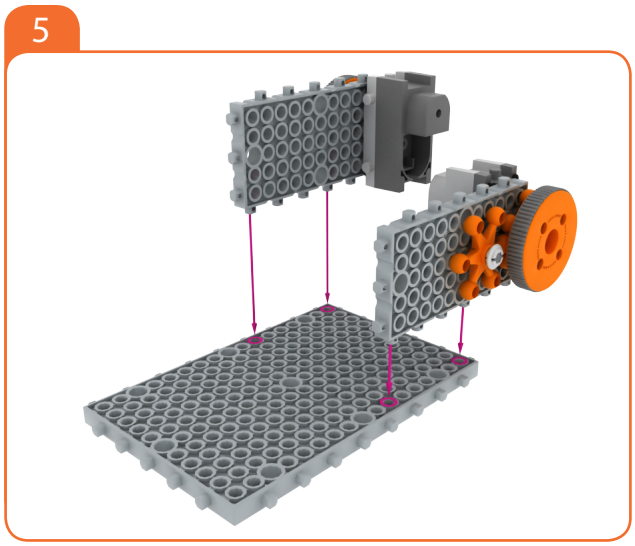
3



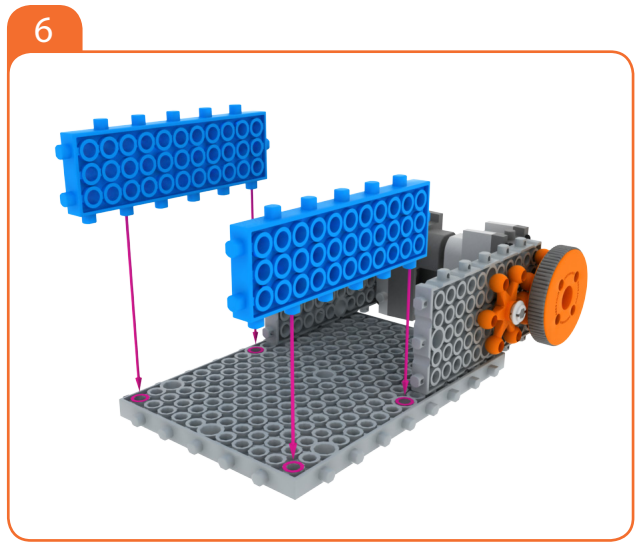
4



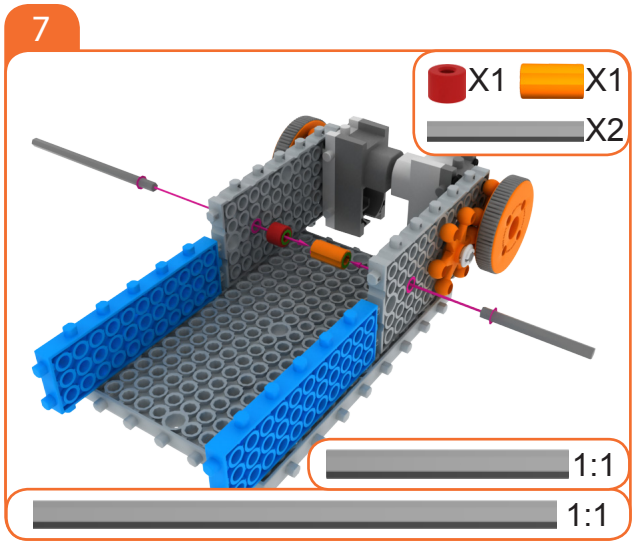
5



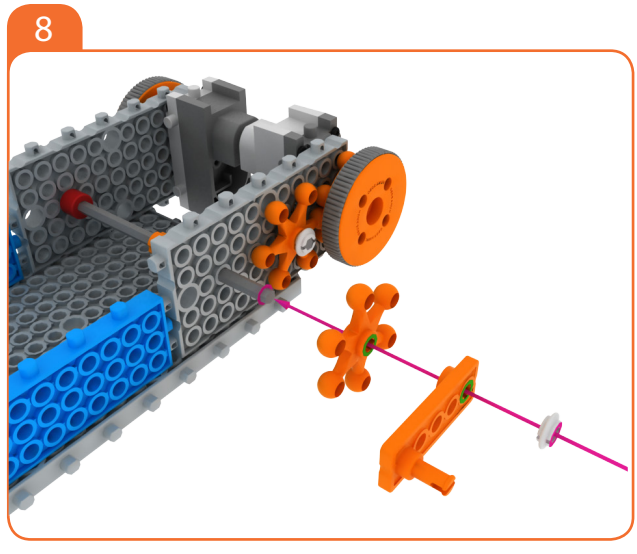
6



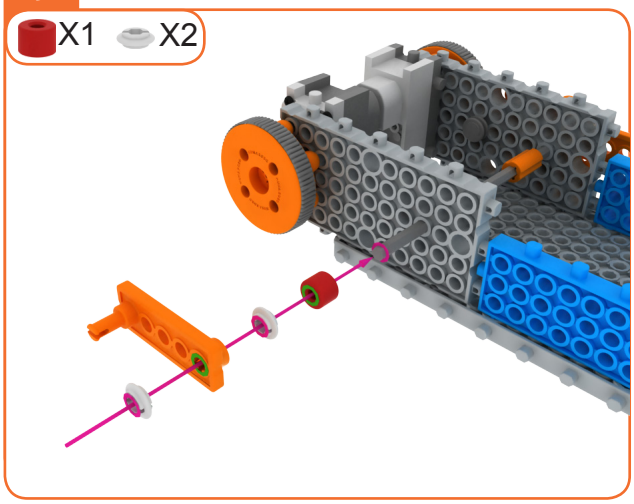
7



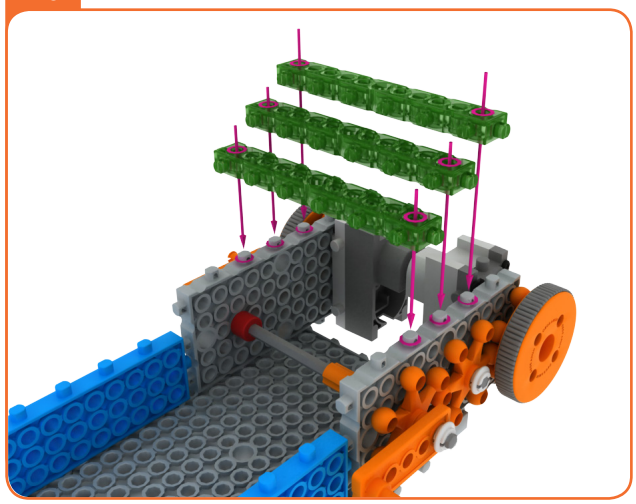
8



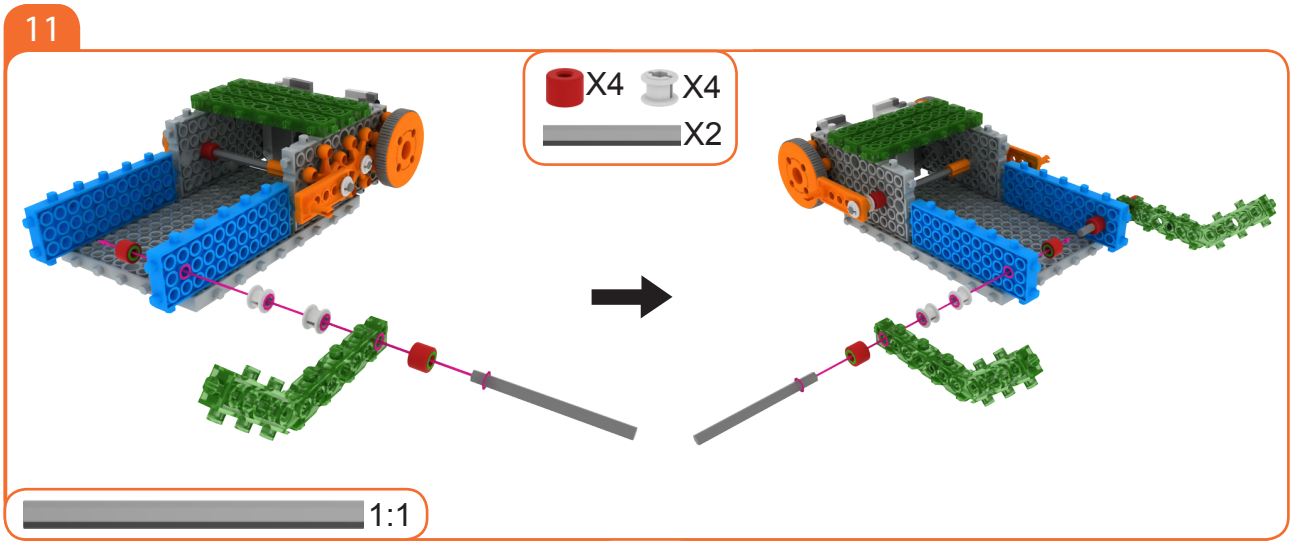
9



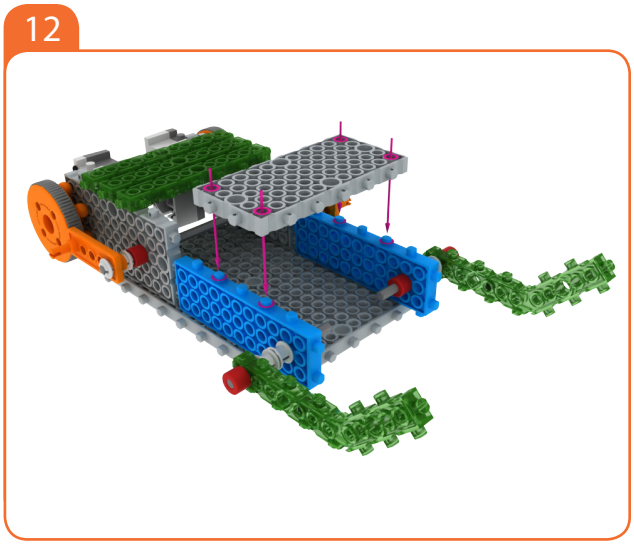
10



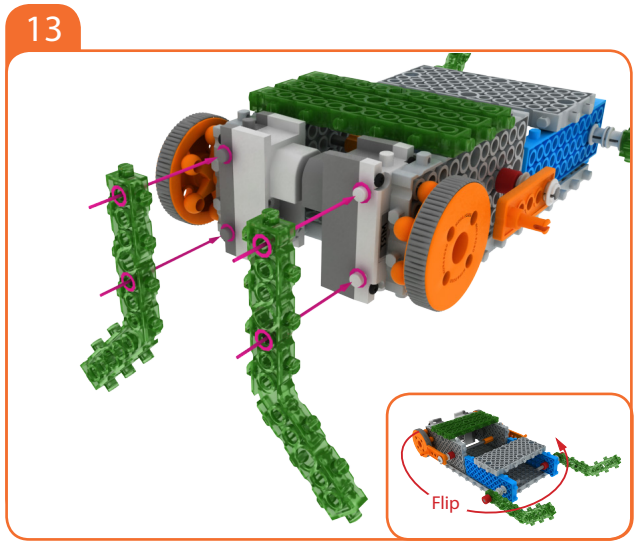
11



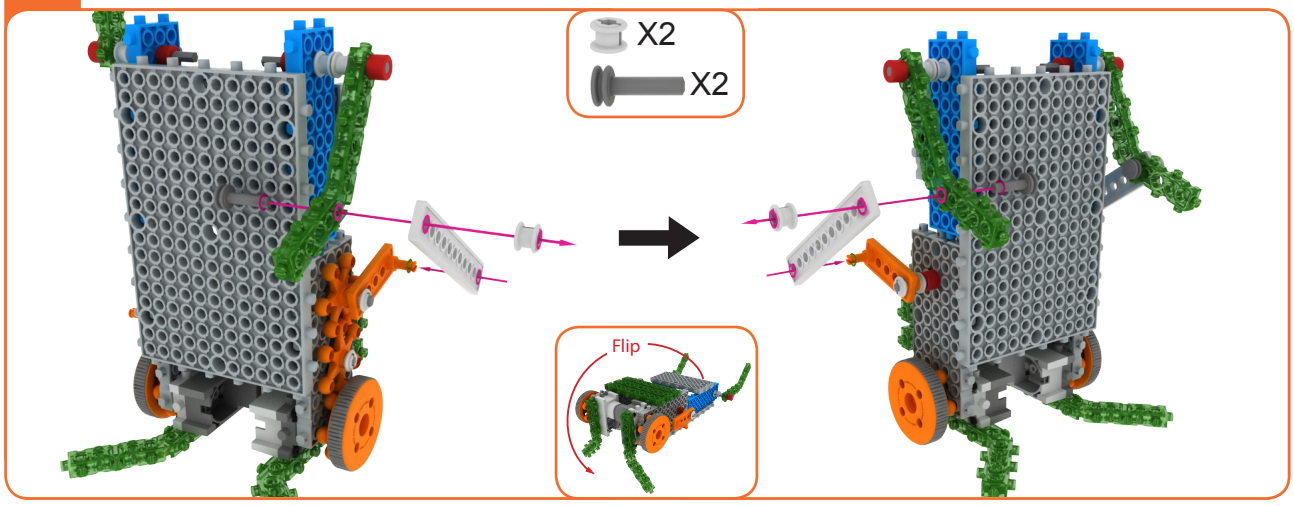
12



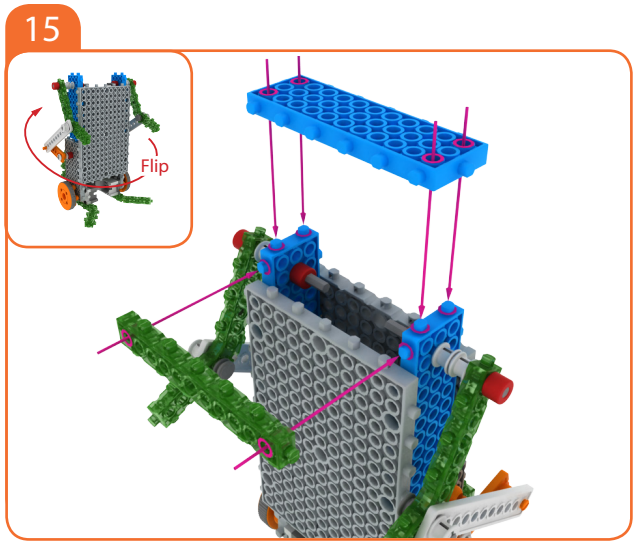
13



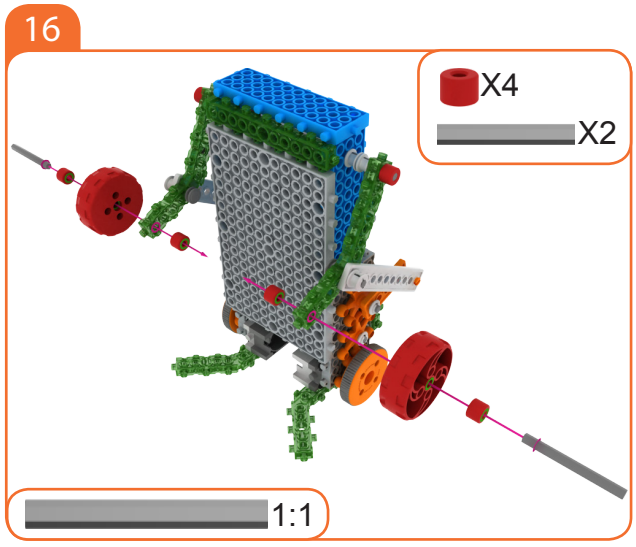
14



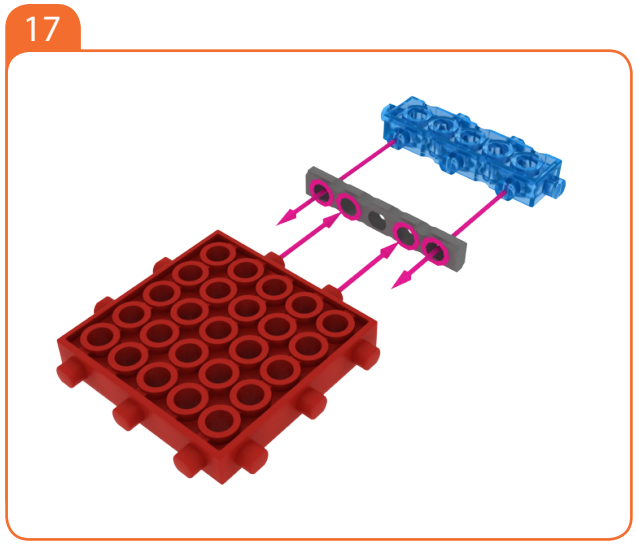
15



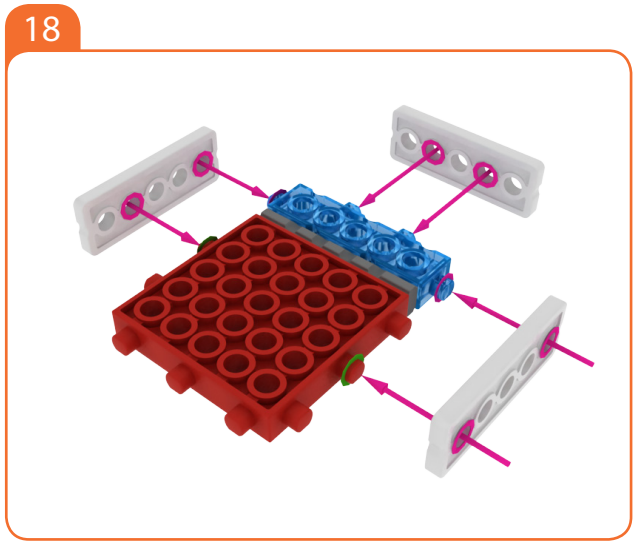
16



17



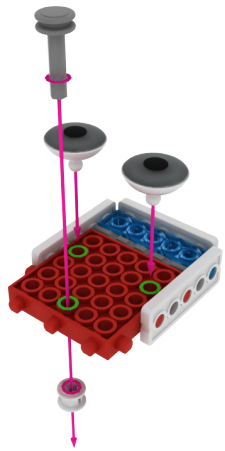
18



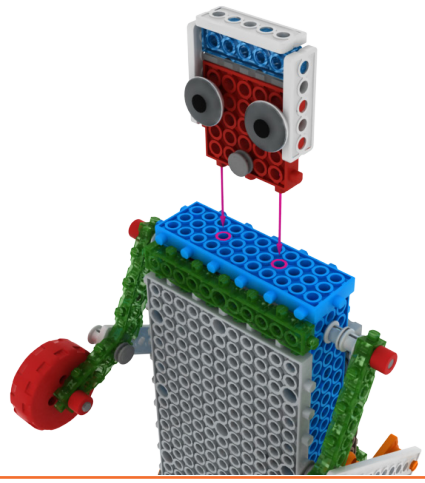
19

X1

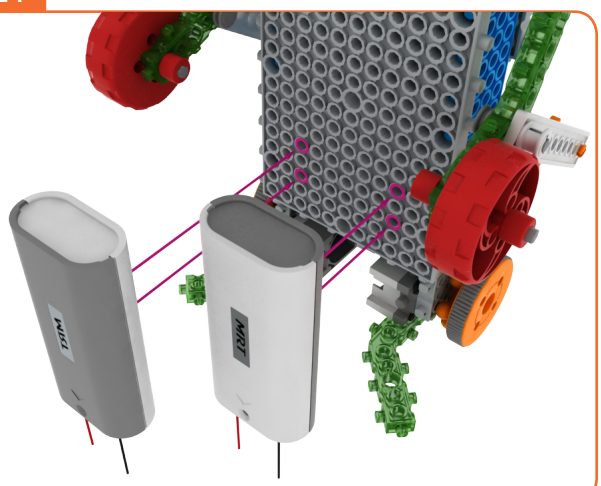
X1



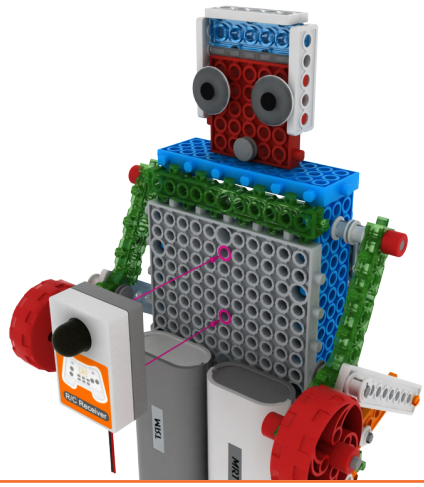
20



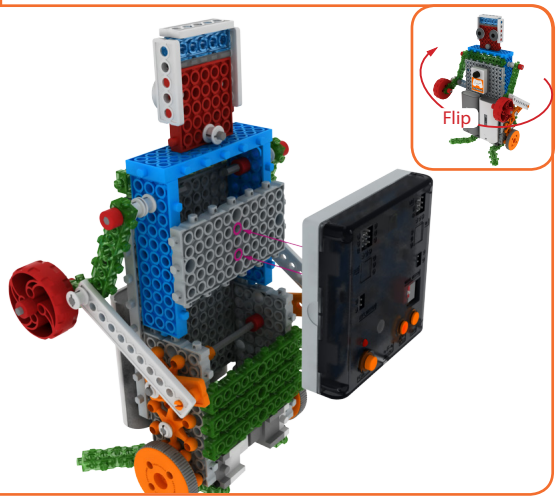
21



22



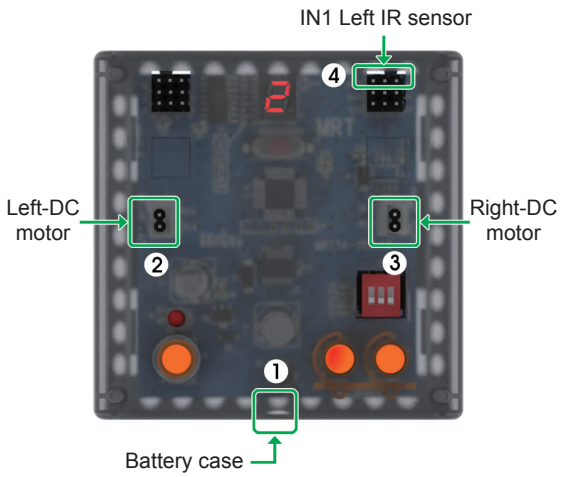
23



End

How to operate Boxing Robot?

Connecting the main board



Connect in this order.

1. Connect Battery cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect R/C receiver board to R/C Connector

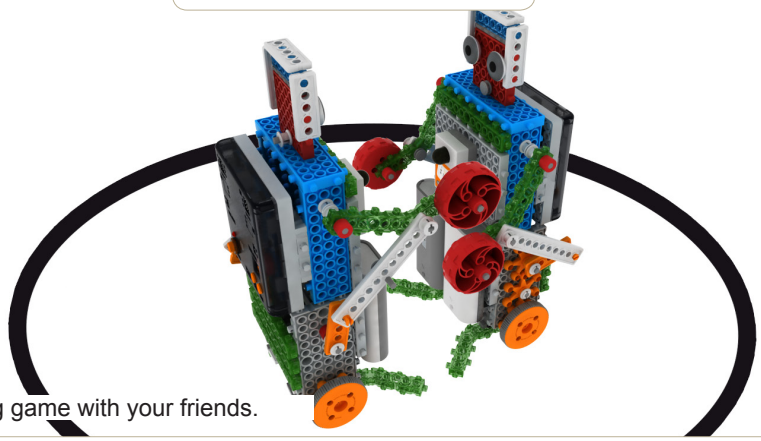
Setting mode

1. Ensure battery case/DC Motor Connector are connected.
2. Turn on the power.
3. Press the MODE button and select as the follow mode.

MODE # 2		Romote Control Mode

4. Select Remote ID.
5. Press the START button

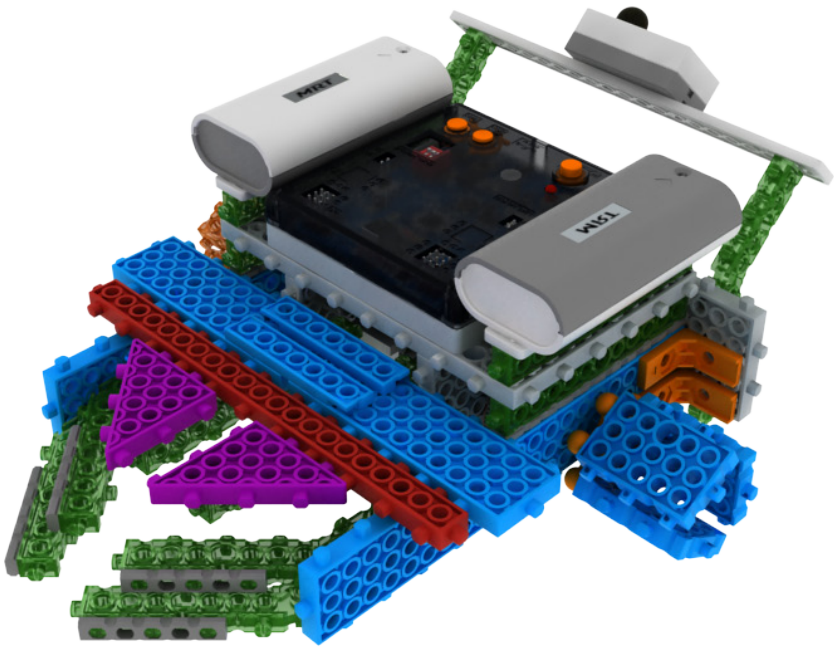
How to make it move?



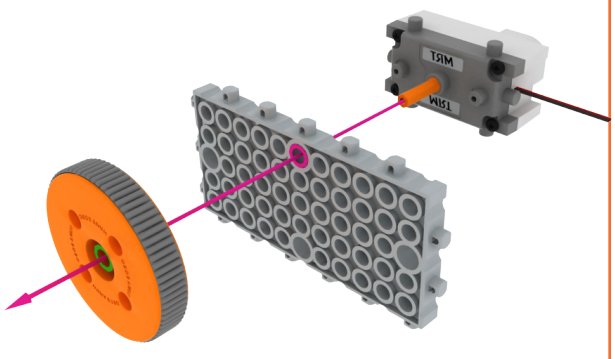
※ Lets play a boxing game with your friends.

Technology Engineering

Robot Making15 -Battle Robot



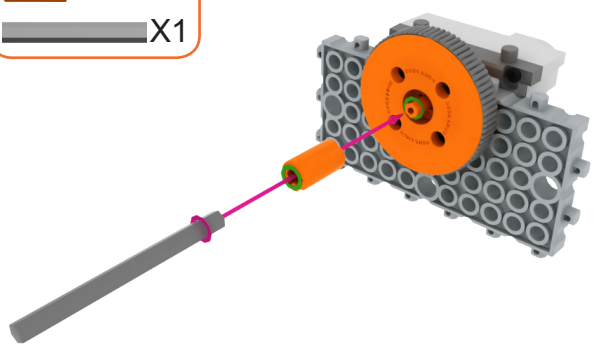
1



2

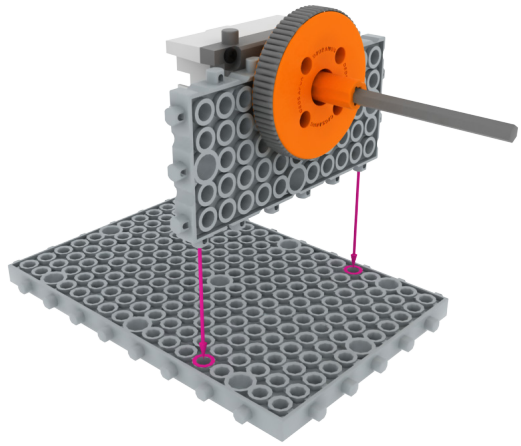
X1

X1

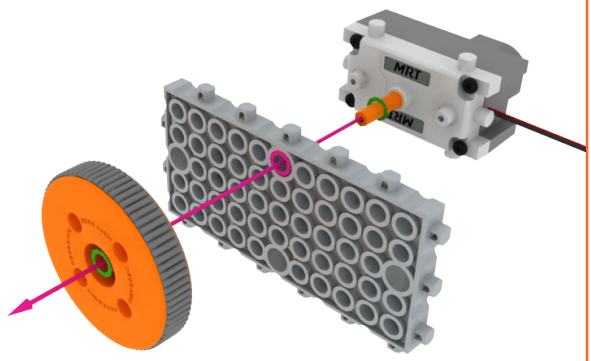


1:1

3



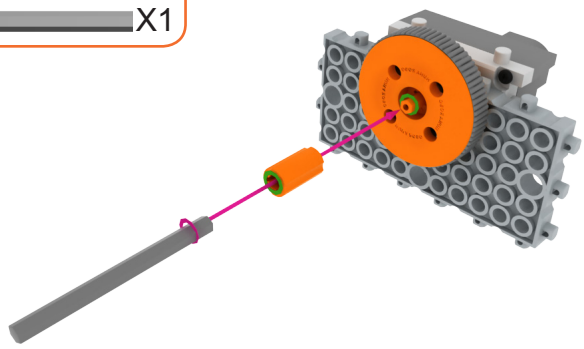
4



5

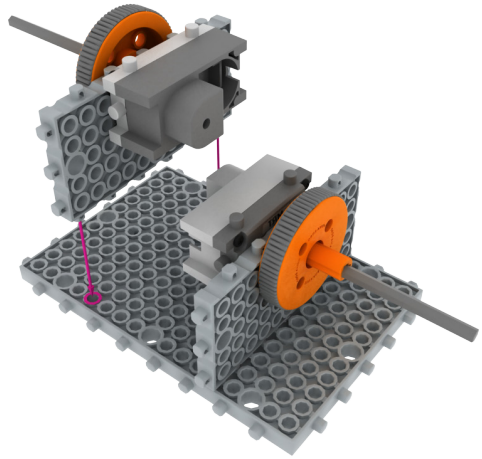
X1

X1

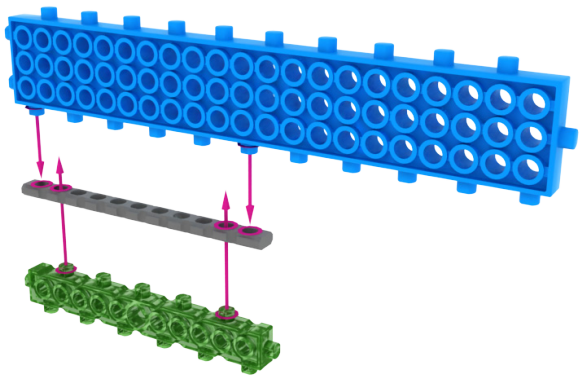


1:1

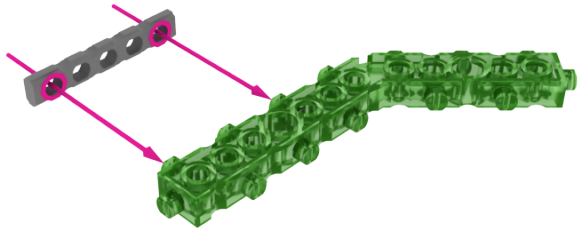
6



7

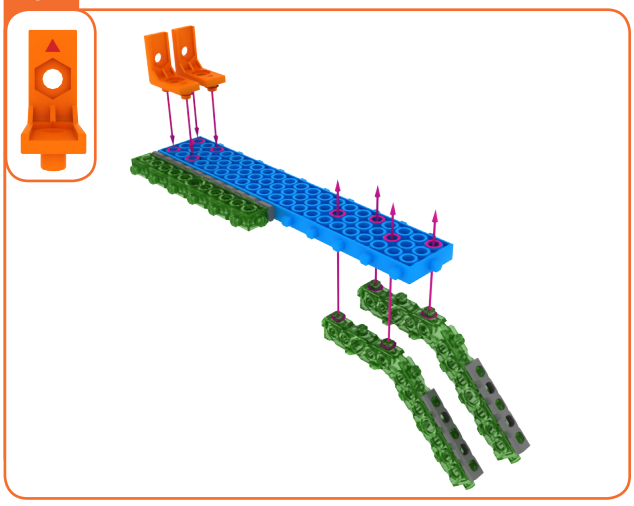


8

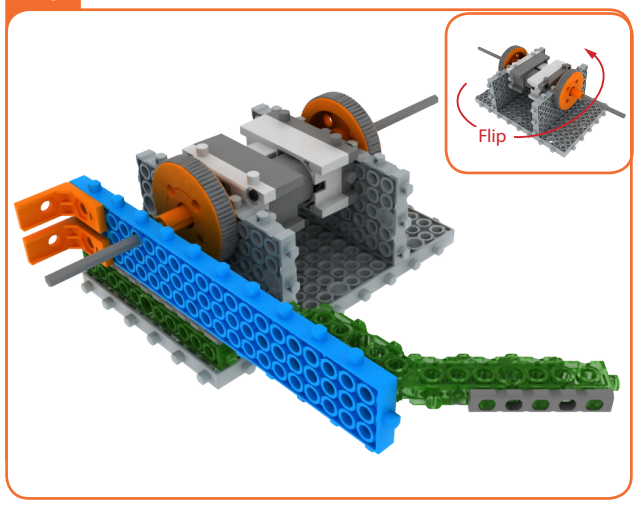


X4

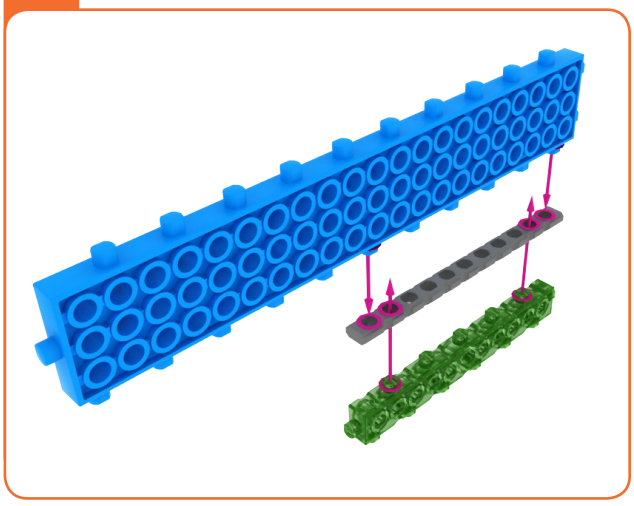
9



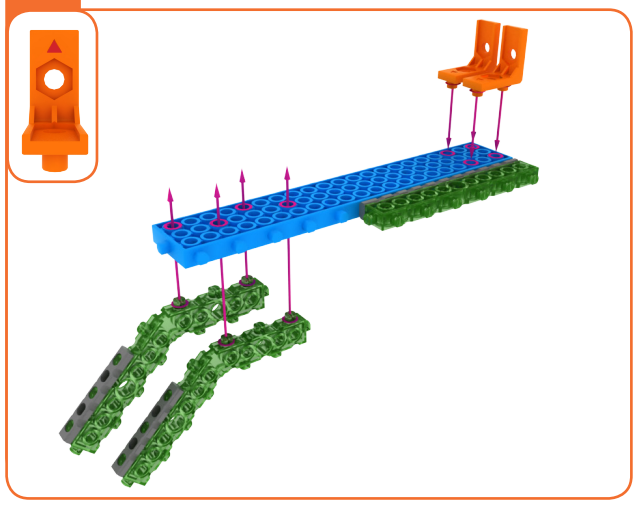
10



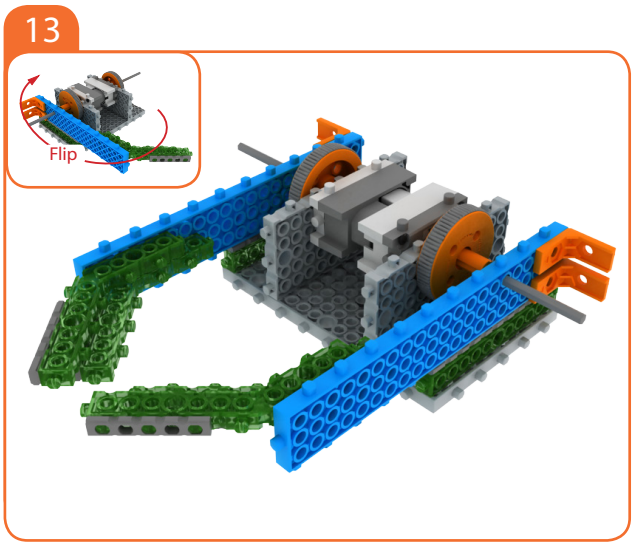
11



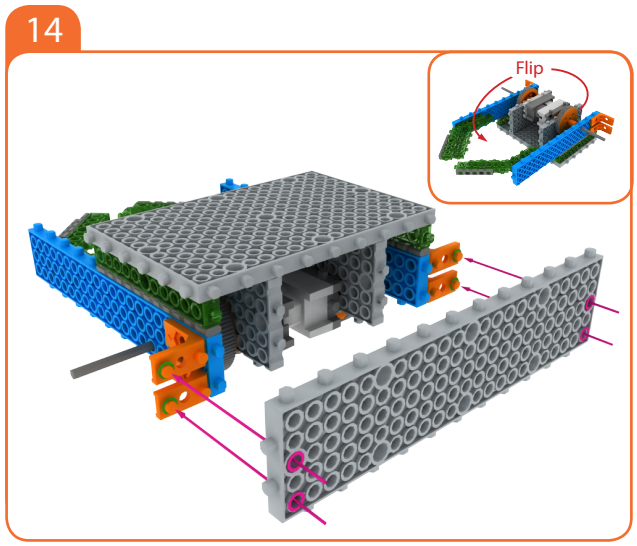
12



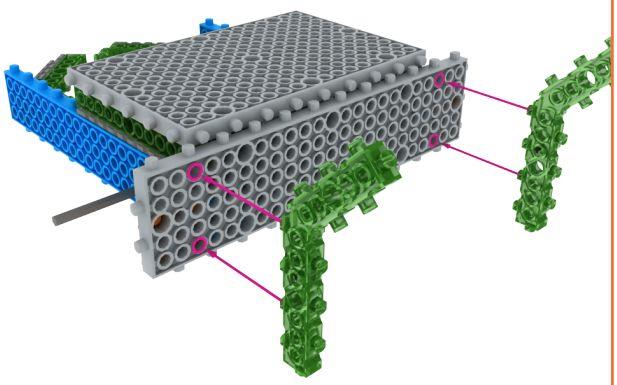
13



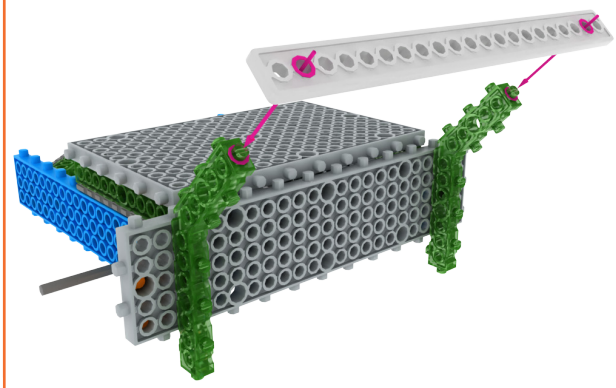
14



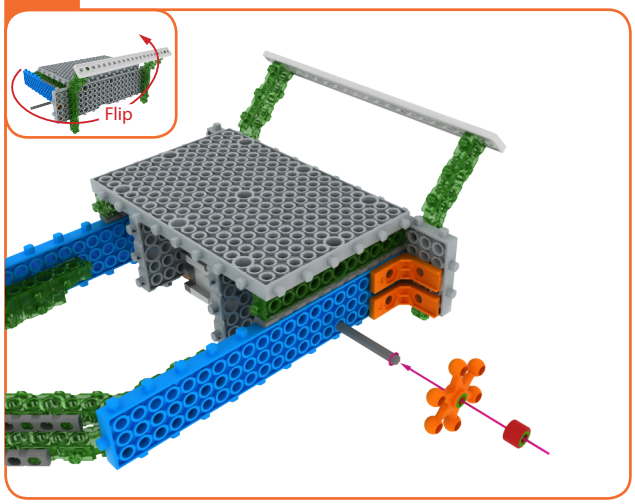
15



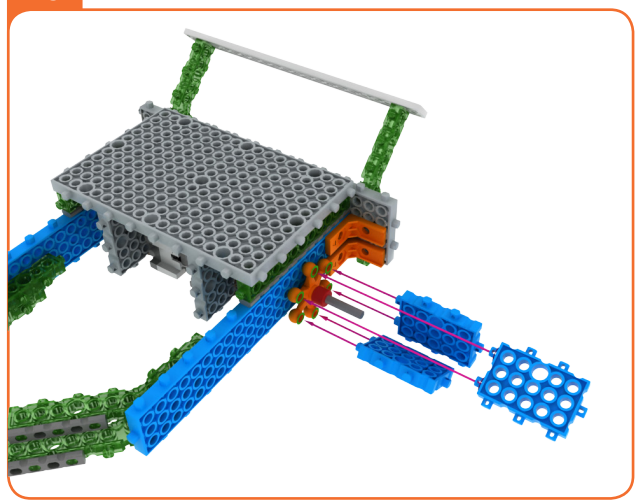
16



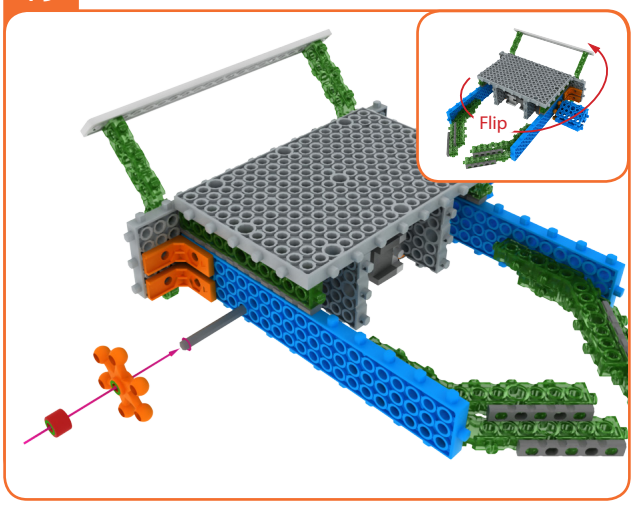
17



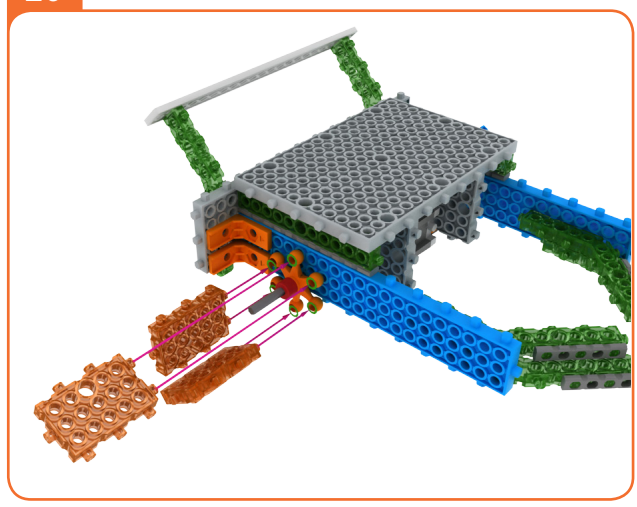
18



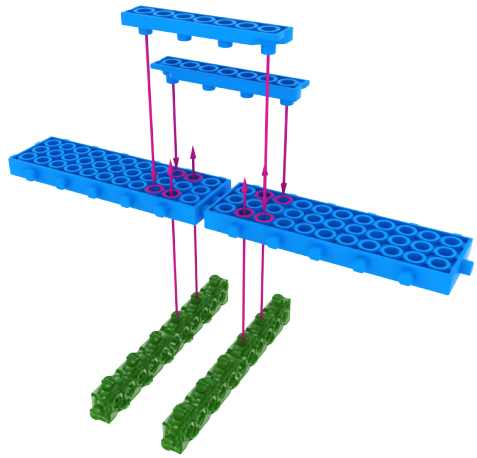
19



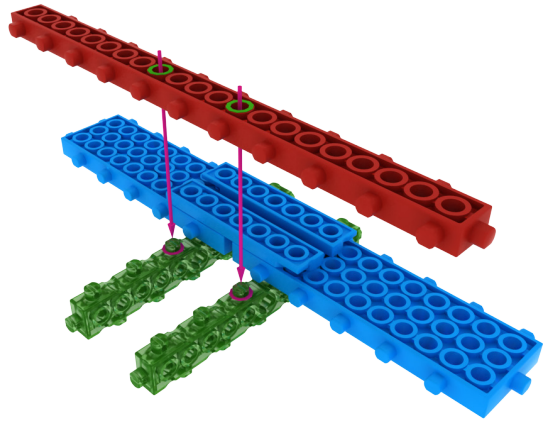
20



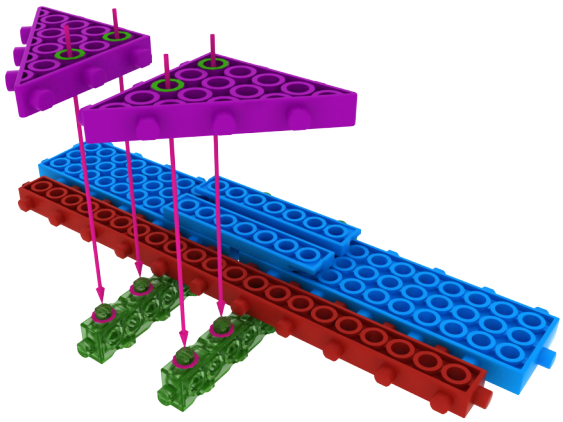
21



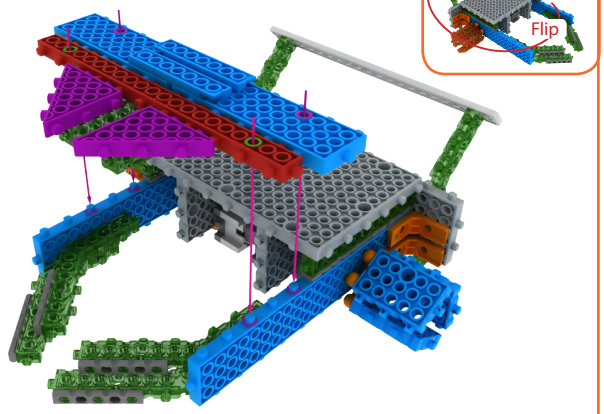
22



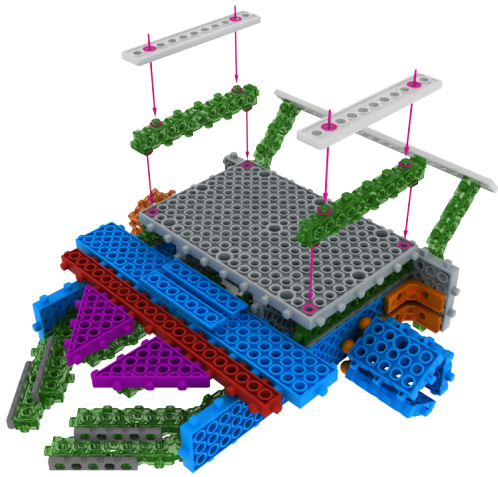
23



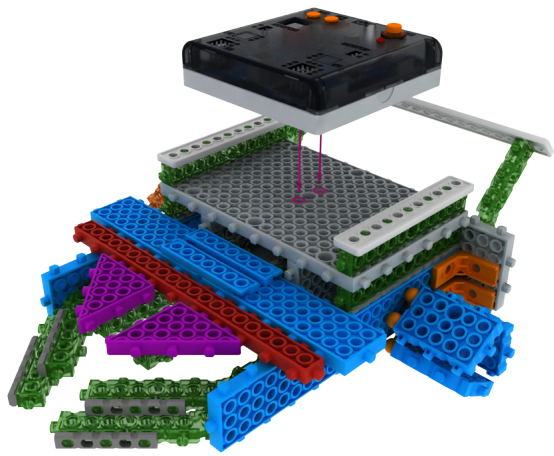
24



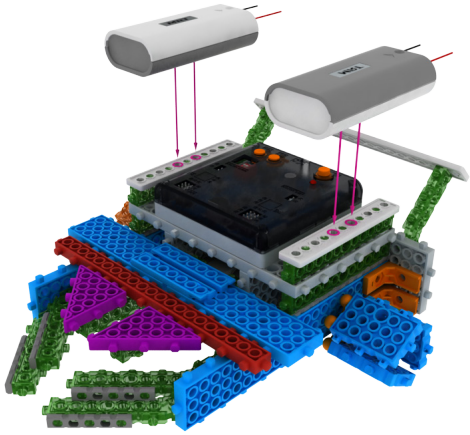
25



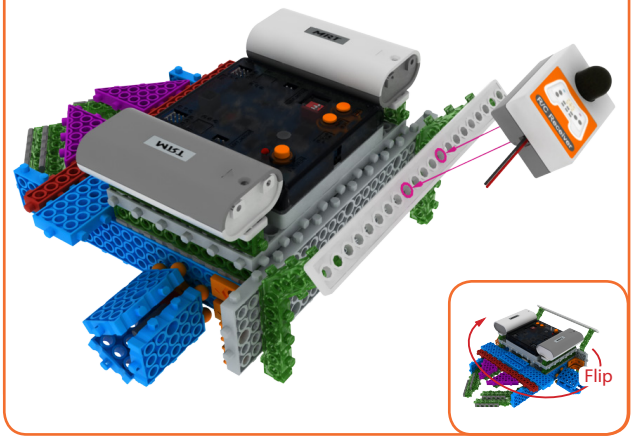
26



27



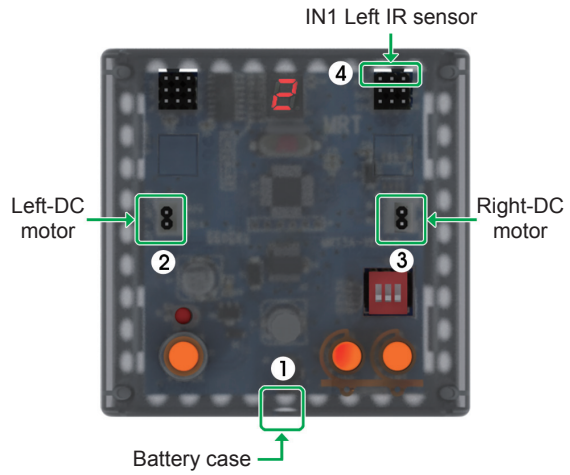
28



End

How to operate Battle Robot?

Connecting the main board



Connect in this order.

1. Connect Battery cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect R/C receiver board to R/C Connector.

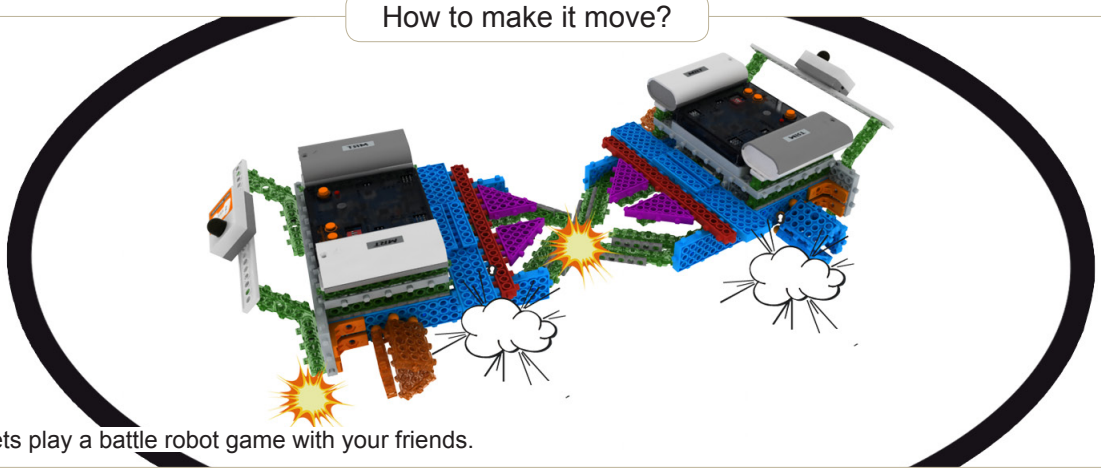
Setting mode

1. Ensure battery case/DC Motor Connector are connected.
2. Turn on the power.
3. Press the MODE button and select as the follow mode.

MODE # 2		Romote Control Mode

4. Select Remote ID.
5. Press the START button

How to make it move?



※ Lets play a battle robot game with your friends.

MRT3-1

Revised edition ◆ Aug.20.2013

Publisher ◆ MRT International Limited.

Address ◆ 512-15, Deung chon-Dong, Gang Seo-Gu, Seoul, Korea.

Web ◆ www.myrobottime.com

Art & Compile ◆ MRT ROBOTICS

Copyrights (c) 2013 MRT International Ltd.

※ Reproduction ,translation or audio-visual products of any part of this book without permission of the copyright owner is unlawful.