An education model to cultivate creative talents by fusing
Science · Technology · Engineering and Mathematics
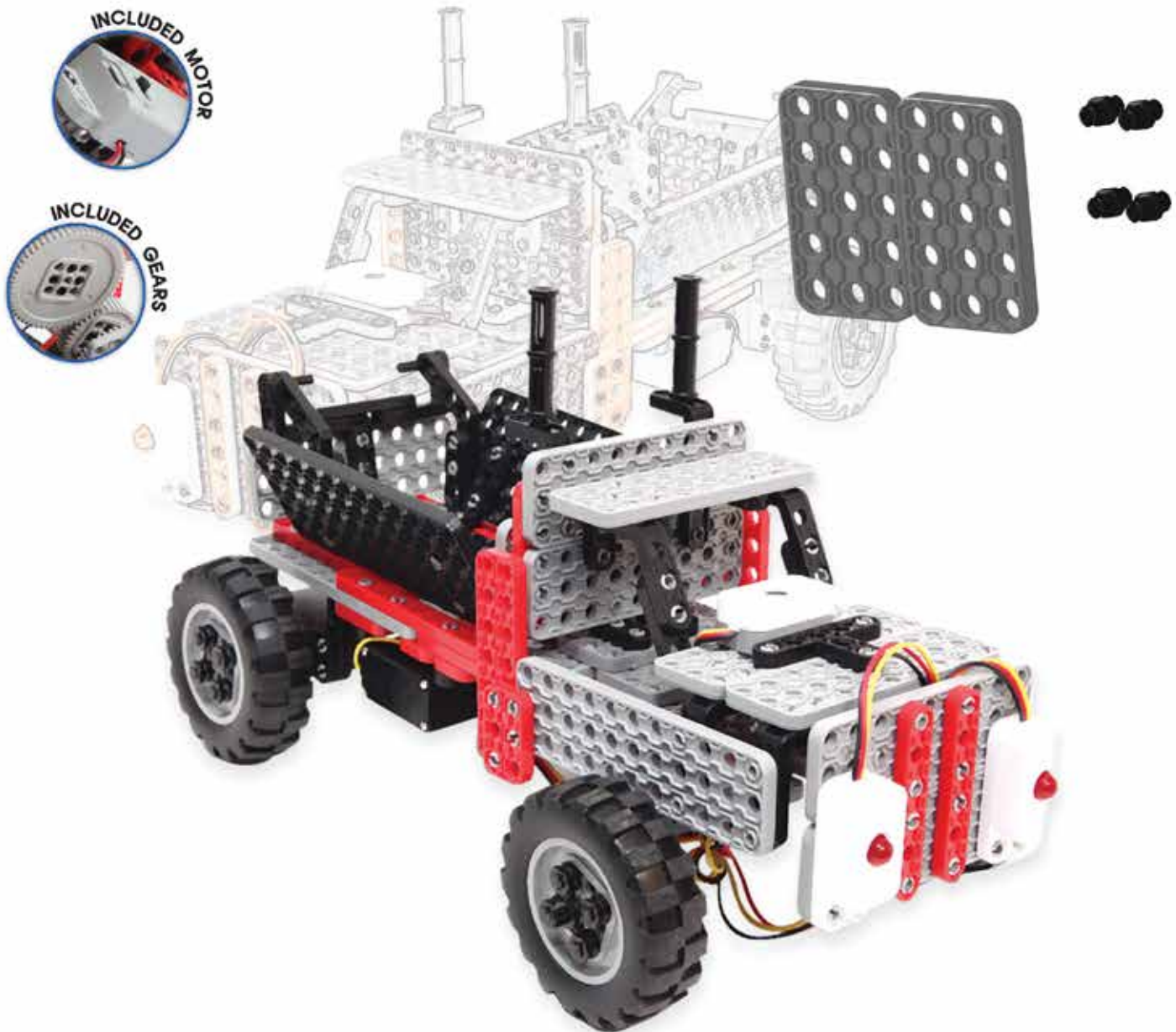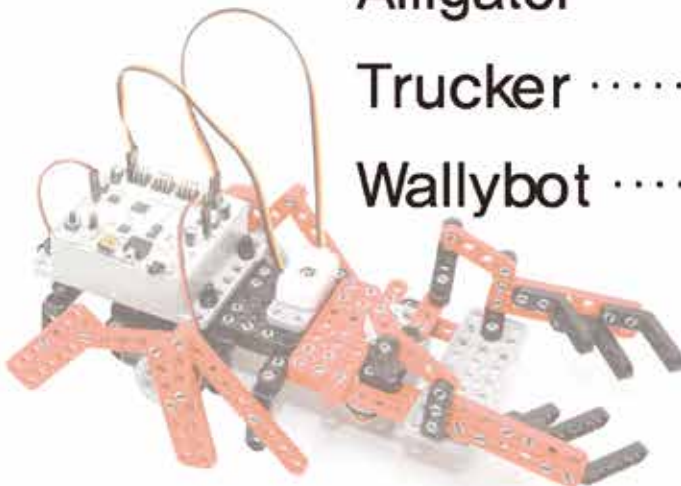
ROBO TAMI **Intelligent**

INCLUDED MOTOR

INCLUDED GEARS

robotron

Robot is my friend

Contents

Understanding the Robot Parts

Controller / Remote control / Motor / Module

Controller **X1**

Remote control **X1**

DC motor **X2**

SERVO motor **X1**

Or this shape

Infrared sensor module **X2**
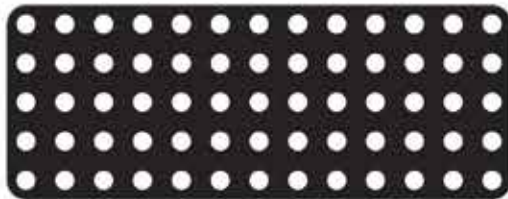
Remote control receiving module **X1**

LED module (Red) **X1**

LED module (Green) **X1**

Switch module **X2**

Frame / Panels

5X13 frame **X3**

3X5 panel **X8**

3X9 panel **X12**

3X11 panel **X4**

2X3 panel **X16**

2X7 panel **X7**

3 panel **X10**

4 panel **X9**

6 panel **X12**

9 panel **X6**

L-bracket **X48**

V-bracket **X12**

T-panel **X4**

V-panel **X7**

! Rod rivet / Support / Wheel guide / Gear

Support X12

30mm rod X10

50mm rod X3

70mm rod X4

3 pin cable X1

3 pin headerpin X3

Wheel X8

Wheel guide X3

Wheel screw X5

Gear(Large) X2

Gear(Small) X4

Tire X3

Disassembly tool X1

! Other parts

Wide Tire X4

Bushing X30

Download cable X1

Caterpillar X110

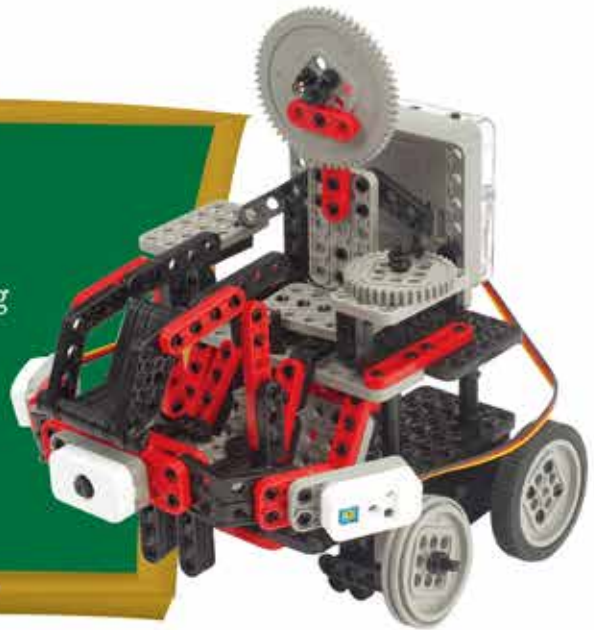Tronz Card V2 CD X1

Rivet X310+α

Rod rivet X22

Ball rivet X5

Rivet case X2

Avoiderbot

Learning subject

1. Let's learn about principles of avoiding obstacles.
2. Let's make Avoiderbot which moves and avoids obstacles in by itself.
3. Operate Avoiderbot order to escape from the maze.

1 Let's find out

When you play hide-and-seek with eyes closed, how do you know that there is something around?

You can recognize an object around you with the feeling of your fingertips, and when you touch a wall with your hands, you turn direction.
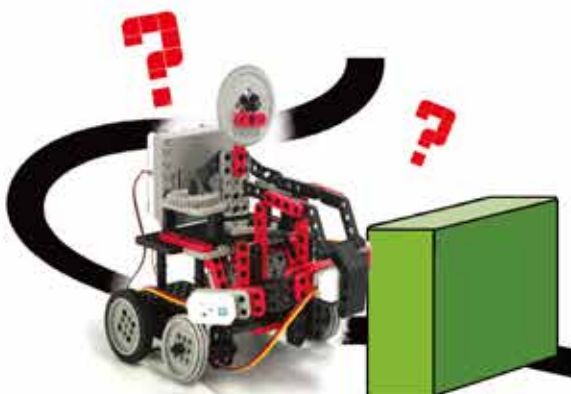
If a robot plays hide-and-seek game, how does it recognize that there is a wall ahead?

How does an ant that lives underground recognize an odject without light?

Insects like ants have eyes and antenna together. They use eyes under light to find ways or food and use antenna in dark area. While eyes need light to detect, antenna detects things by touch.

There are two types of sensors; one is a touch type that is activated by a physical touch and the other is a non-touch type. A non-touch type sensor uses light or sound mostly. Bats use non-touch type sensors. They find foods using ultrasonic wave in darkness.

Animal's antenna or skin is the touch type sensor. We can find objects in darkness by touch. Therefore, if we can utilize both touch type and non-touch type sensors for the robots, we can carry out missions more sucessfully.

2 Let's prepare

NO	Parts	Ea	NO	Parts	Ea
1	5×13 frame	3	17	30mm rod	2
2	3×11 panel	1	18	Bushing	11
3	3×9 panel	1	19	Rod rivet	13
4	3×5 panel	5	20	Rivet	192
5	2×7 panel	3	21	Wheel guide	2
6	2×3 panel	5	22	wheel	4
7	9 panel	2	23	Wheel screw	2
8	6 panel	5	24	Gear(L)	1
9	4 panel	6	25	Gear(S)	1
10	3 panel	1	26	Tire	2
11	L-bracket	25	27	Controller	1
12	V-bracket	12	28	DC motor	2
13	T-panel	2	29	Infrared sensor module	2
14	V-panel	6	30	Switch module	1
15	Support	6	31	3pin cable	1
16	50mm rod	1	32	3pin headerpin	1

3 Let's Build it

1

5X13
X2
X1
X4

5X13 frame

Insert rivet — 2X7 panel
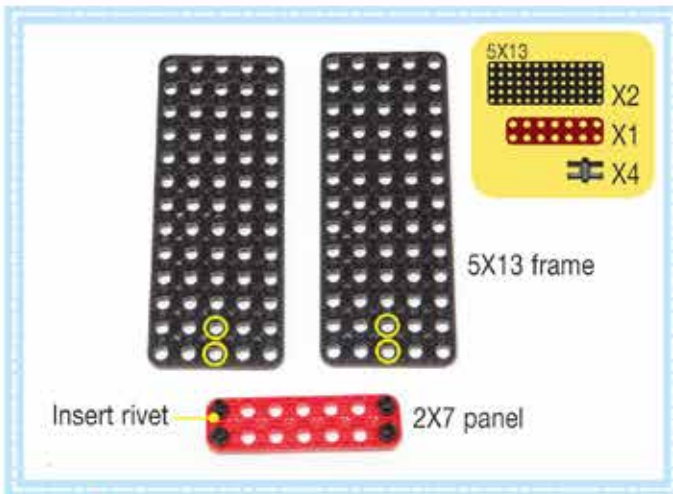
Assemble a 2X7 panel to a 5X13 frame.
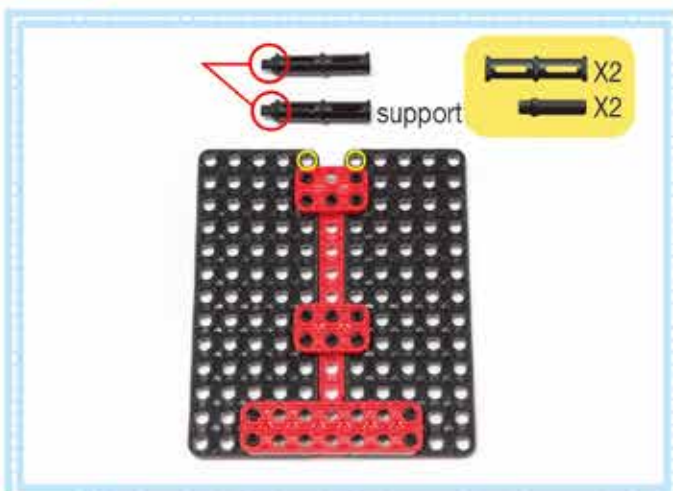
2

Assembled.

3

X1
X2 X3

9 panel

Insert rivet
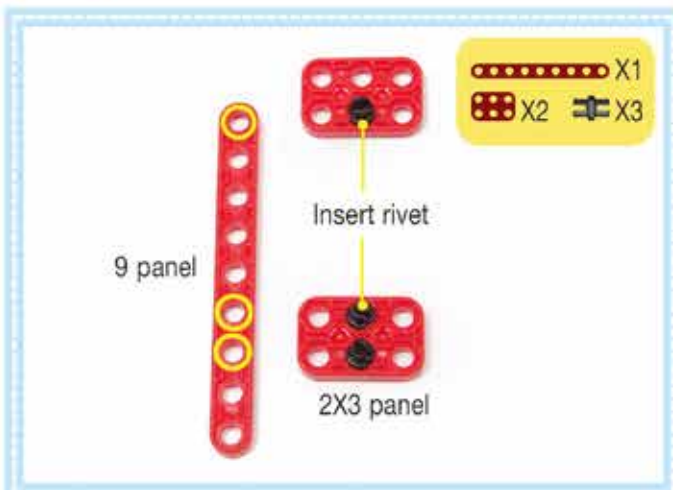
2X3 panel

Assemble a 9 panel to the rivets of 2X3 panels.

4

X8
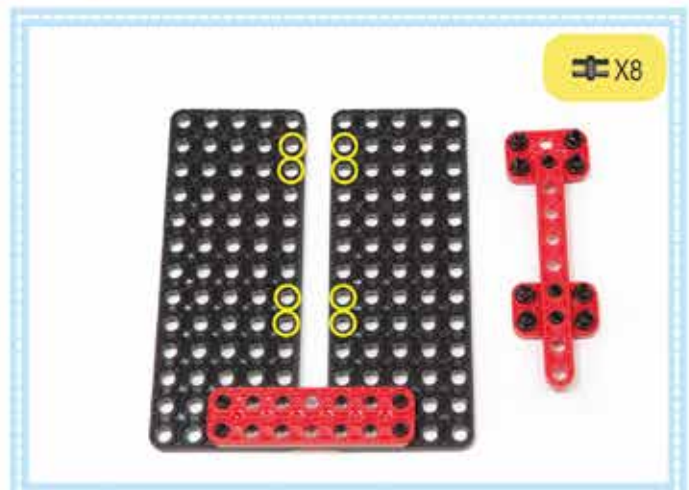
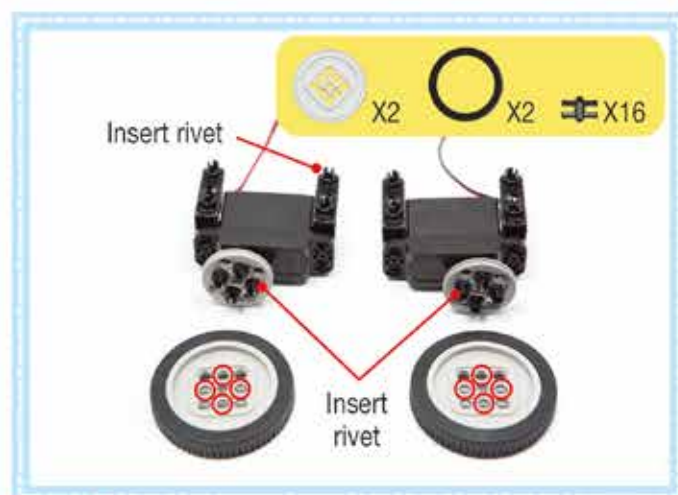Assemble the 2X3 panel to the spotted point of step **2** .

5
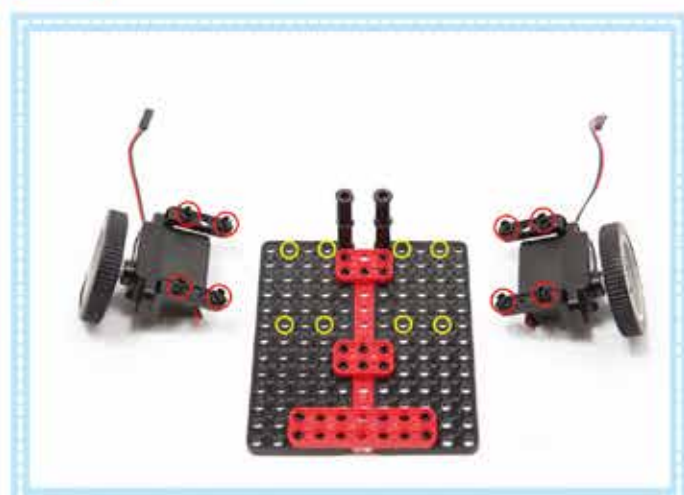
X2
support X2

Assemble rod rivets with supports to step **4** .

6

Assembled.
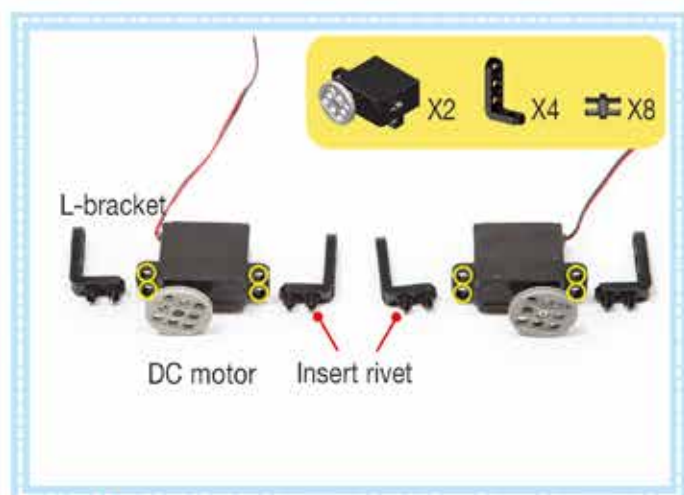
7 Assemble L-brackets to DC motors with wheel guide.

L-bracket

X2 X4 X8
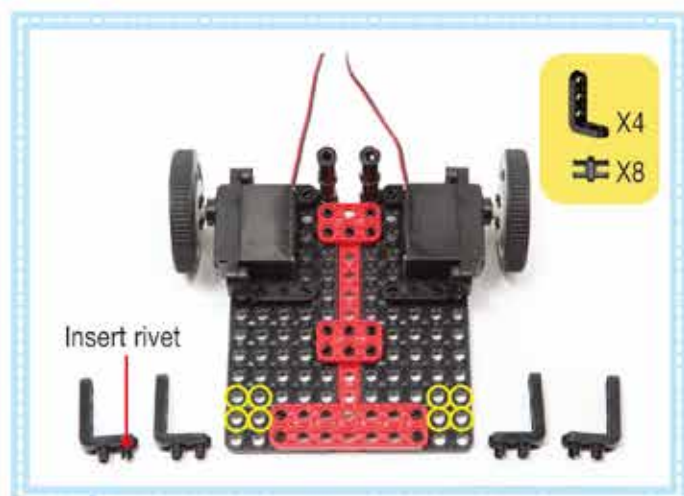
DC motor   Insert rivet

8 Assemble wheels with tire to the rivets of wheel guides.

Insert rivet

X2 X2 X16

Insert rivet

9 Assemble DC motors to step **6** as shown.
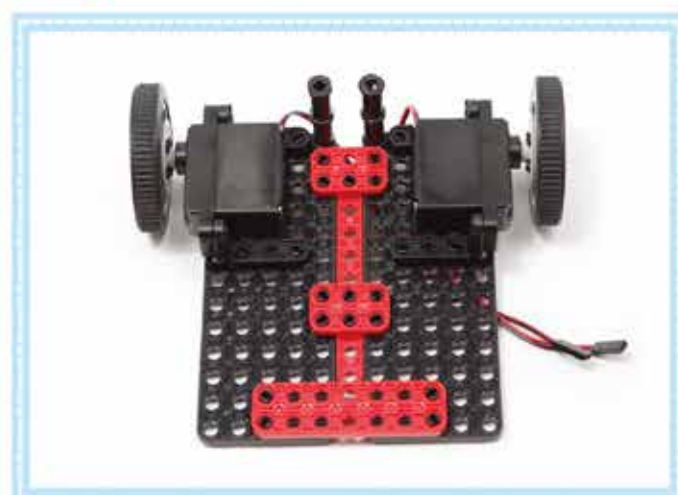
10 Assembled.

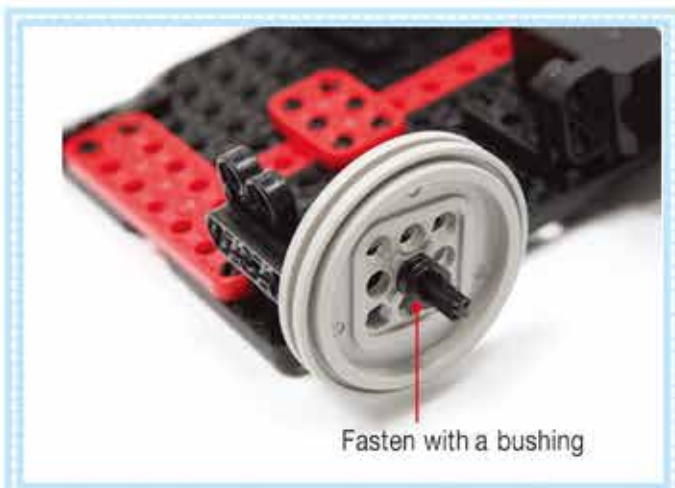**11** Assemble L-brackets to the 5X13 panels of step **10** .

X4
X8

Insert rivet

12 Assemble L-brackets to the spotted points.

X2
X4

Insert rivet

13 Insert a 30mm rod with a bushing into the L-bracket.

30mm X1
X1

Fit bushing with 30mm rod
30mm rod

14 Assemble a wheel to the 30mm rod and fasten it with a bushing.

X1
X1

15 Assembled.

Fasten with a bushing
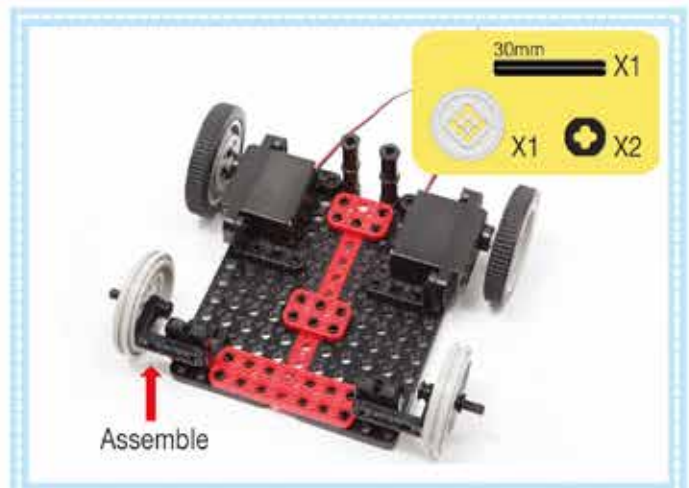
16 Assemble another wheel in the same way as the other side.

30mm X1
X1 X2
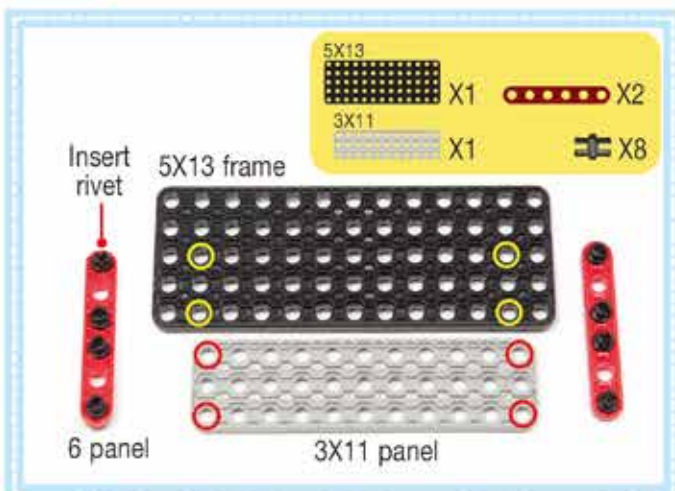
Assemble

17 Assemble 6 panels to a 5X13 frame and a 3X11 panel.

5X13 X1 X2
3X11 X1 X8

Insert rivet
5X13 frame
6 panel
3X11 panel
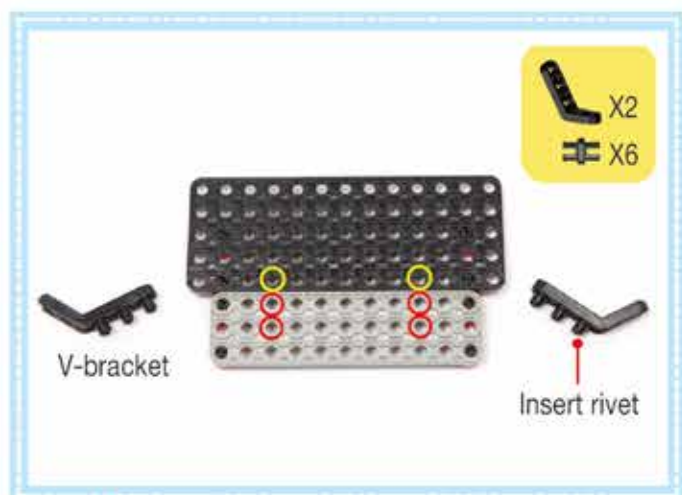
18 Assembled.

19 Assemble L-brackets to the opposite side of step **18**.

X2
X6

V-bracket

Insert rivet
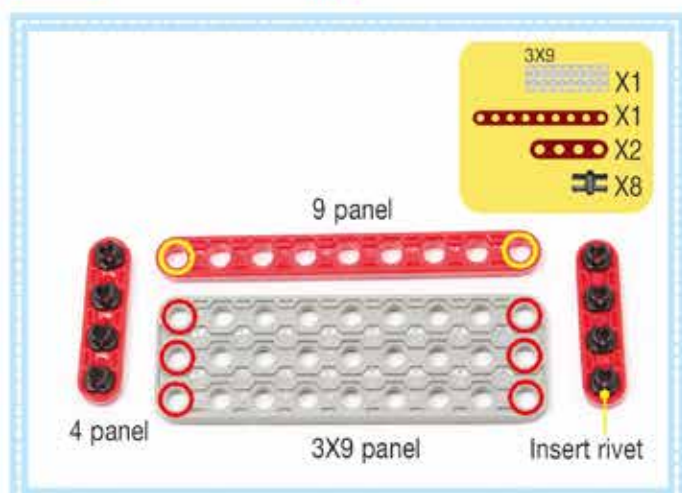
20 Assembled.

21 Assemble 4 panels to a 9 panel and a 3X9 panel.

3X9
X1
X1
X2
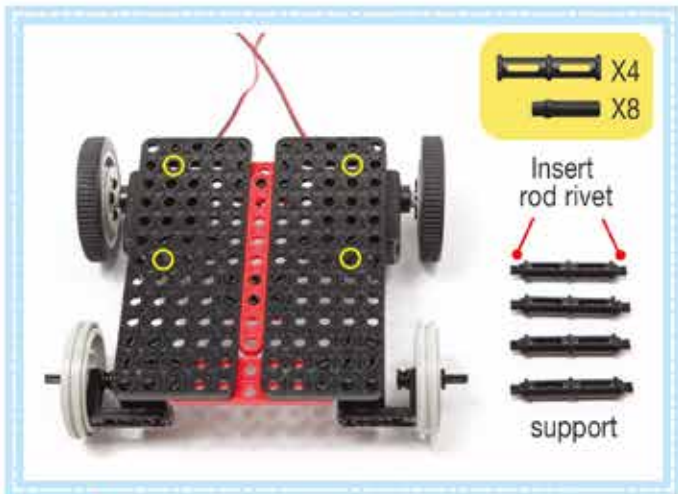X8

9 panel

4 panel

3X9 panel

Insert rivet

22 Assembled.

23 Assemble the L-brackets of step **20** to the opposite side of step **22**.

X4

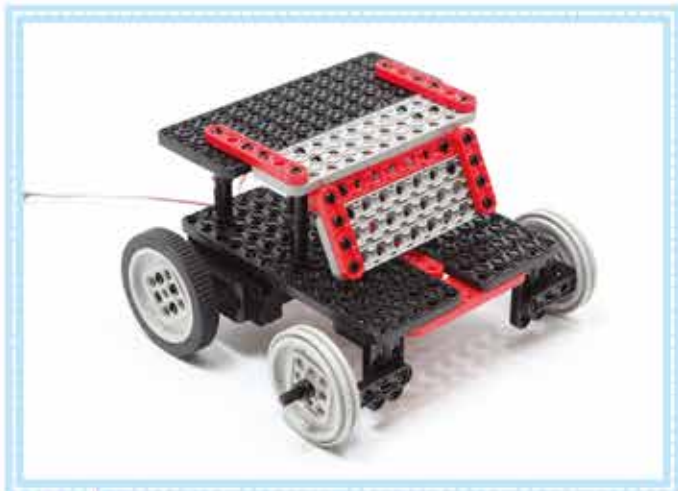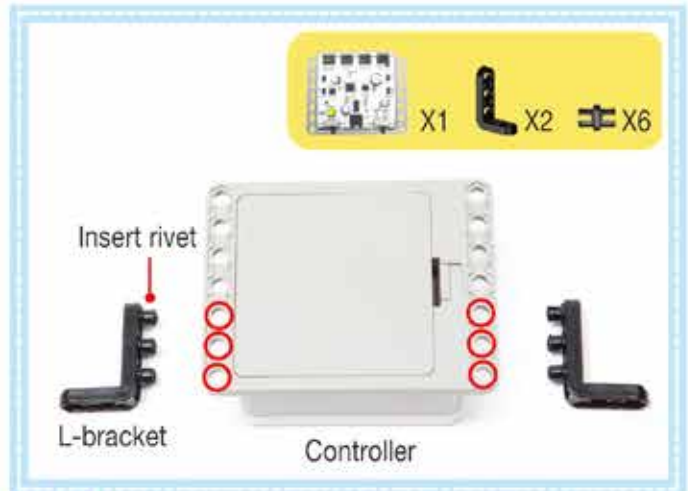Insert rivet

24 Assembled.

25 Assemble rod rivets with support to the opposite side of step **16**.
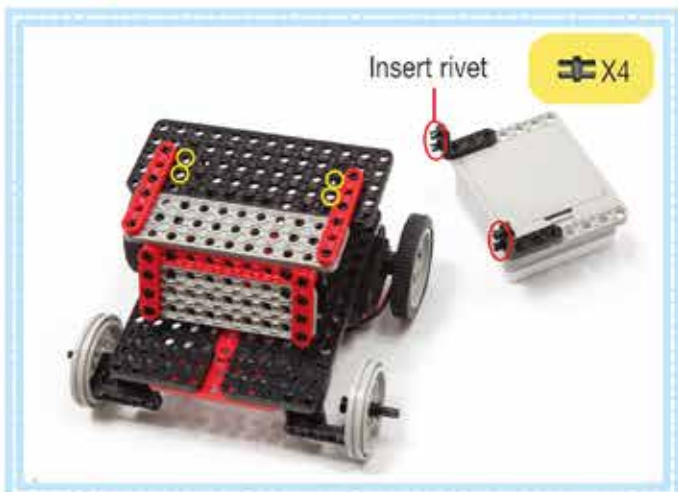
X4
X8
Insert rod rivet
support

26 Assemble the spotted points of step **24** to the rod rivets with support.

27 Assembled.

28 Assemble L-brackets to the controller.
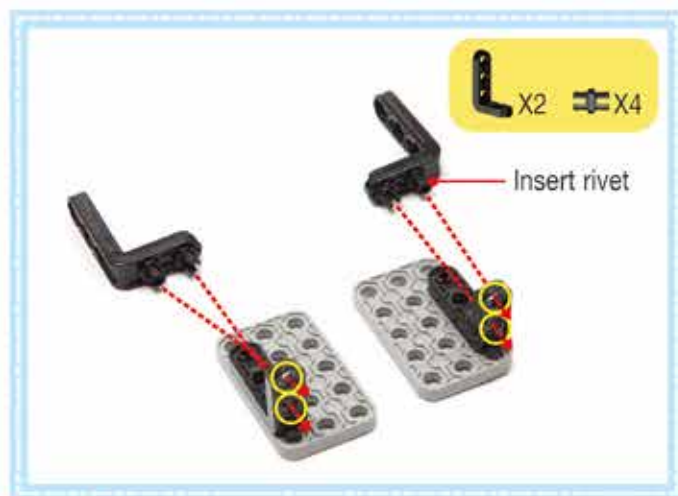
X1 X2 X6
Insert rivet
L-bracket
Controller

29 Assemble the controller to the 5X13 frame as shown.

Insert rivet X4

30 Assembled.

31 X2 | X2 | X4

Insert rivet
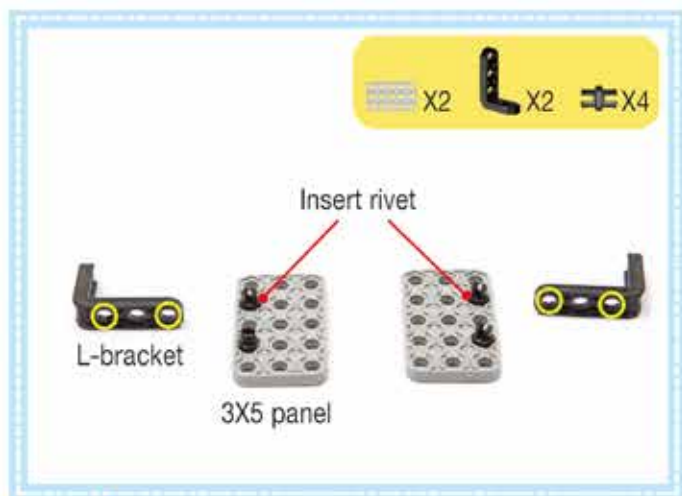
L-bracket

3X5 panel

Assemble L-brackets to 3X5 panels.

32 X2 | X4

Insert rivet

Assemble the L-brackets to the spotted points.

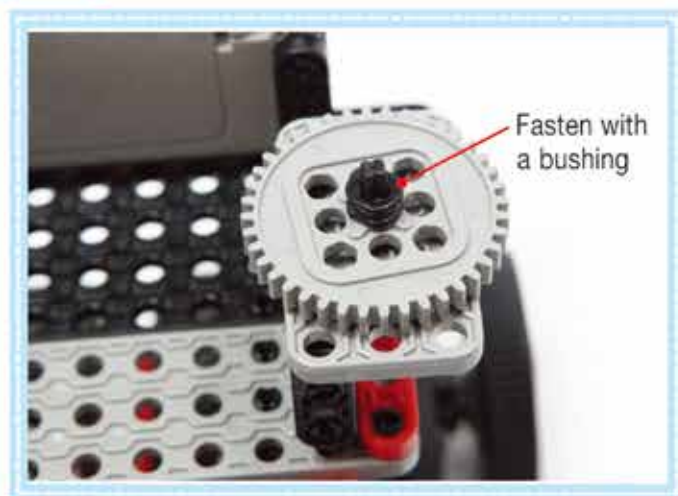**33** X4
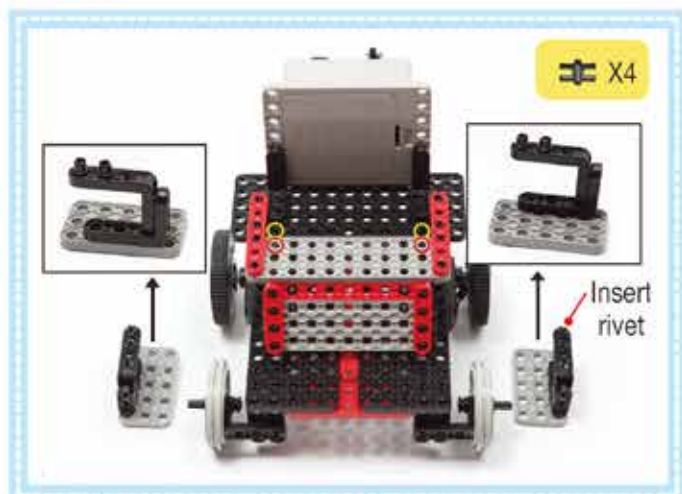
Insert rivet

Assemble step **32** to the spotted points of step **30** .

34

Assembled.

35 (S) X1 | X1 | X1
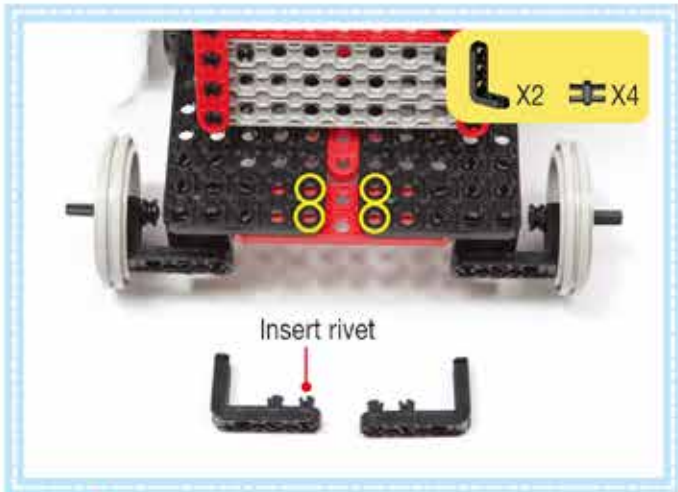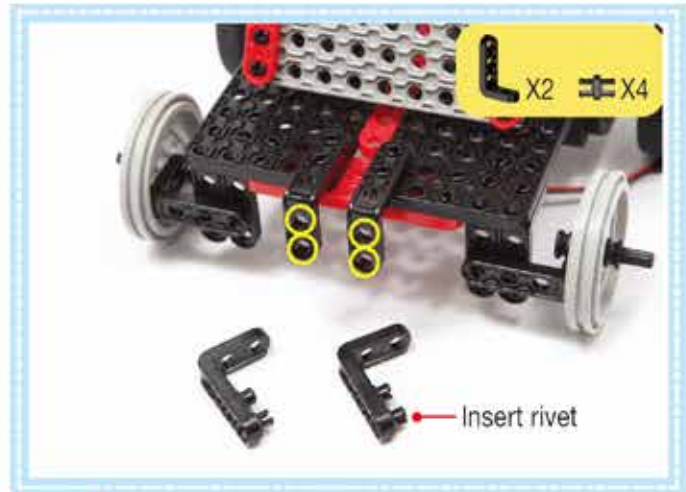
Insert a rod rivet into the spotted point of the 3X5 panel and fix a gear(s) to the rod rivet. Fasten it with a bushing.
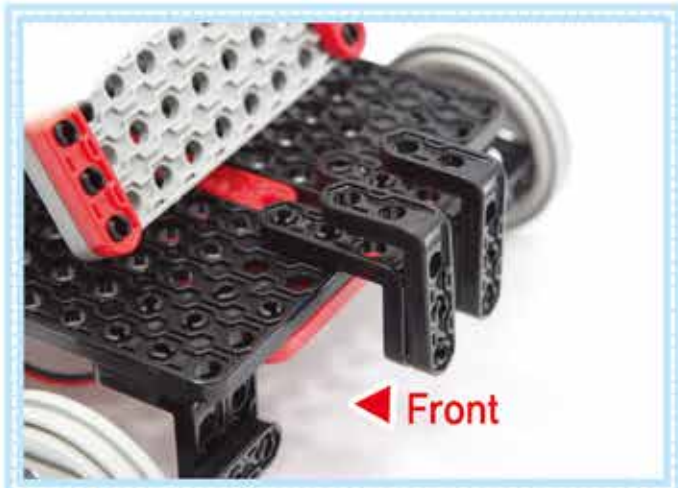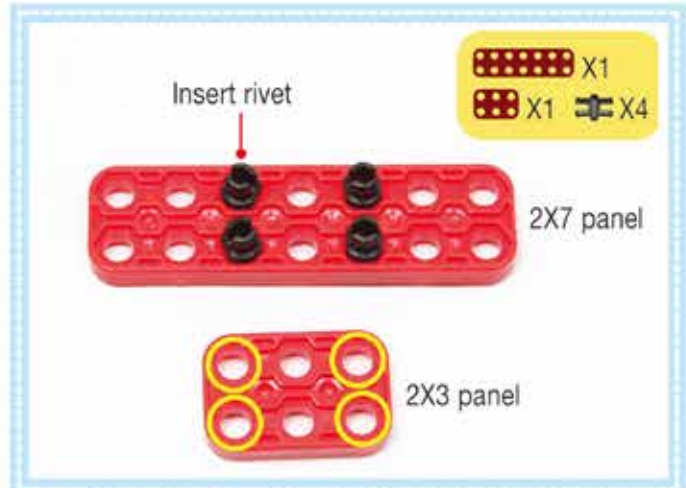
36

Fasten with a bushing

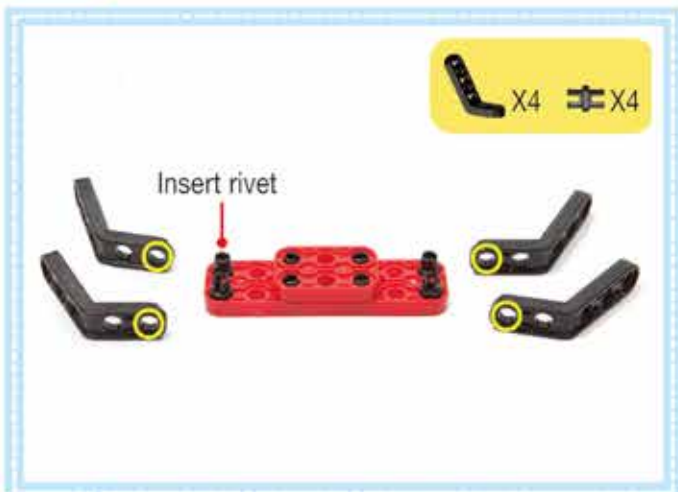Assembled.

37 Assemble L-brackets to the 5X13 frames of step **36**.

X2 X4

Insert rivet

38 Assemble L-brackets to the spotted points.

X2 X4

Insert rivet

39 Assembled.

◀ **Front**

40 Assemble a 2X3 panel to a 2X7 panel.

X1
X1 X4

Insert rivet

2X7 panel

2X3 panel

41 Assemble V-brackets to step **40**.

X4 X4

Insert rivet
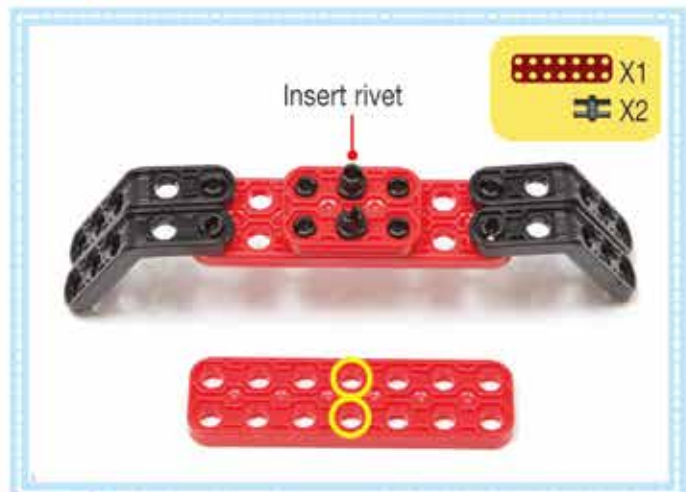
42 Assemble a 2X7 panel to the 2X3 panel as shown.

X1
X2

Insert rivet
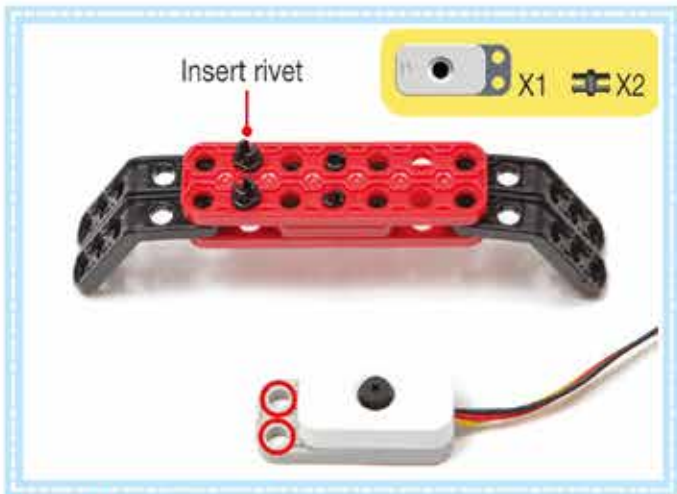
43 Assemble a switch module to the 2X7 panel.

Insert rivet

X1 X2

44 Assemble a 2X3 panel to the spotted points of the V-bracket.

X1 X2

Insert rivet

45 Assemble an Infrared sensor to the 2X3 panel.

X1 X2

Insert rivet

Infrared sensor module

46 Assembled.

47 Assemble a 2X3 panel to step 46.

X1 X2

Insert rivet

Insert rivet

48 Assemble an infrared sensor to 2X3 panel.

X1 X2

Insert rivet
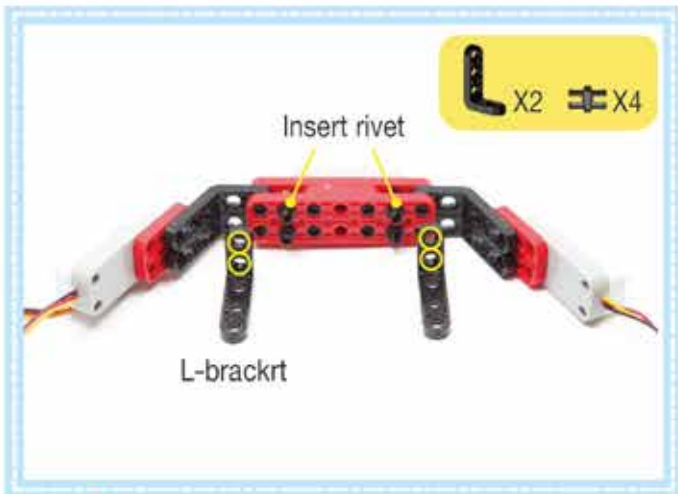
49 Assemble L-brackets to the 2X7 panel of step **48**.

Insert rivet
L-brackrt
X2 X4
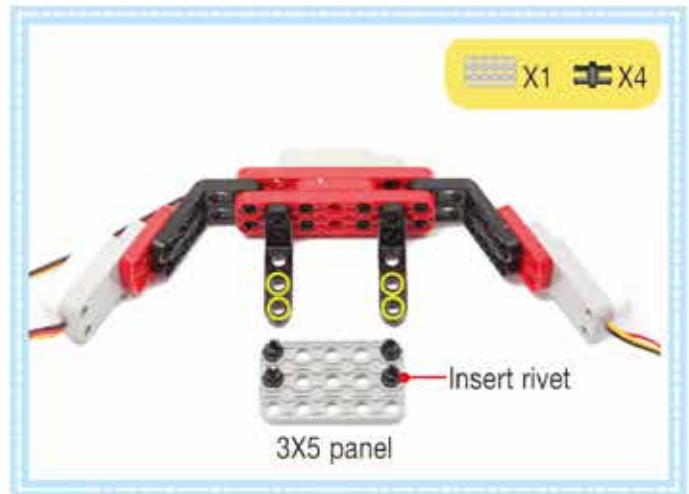
50 Assemble the L-brackets to the rivets of a 3X5 panel.

X1 X4
Insert rivet
3X5 panel
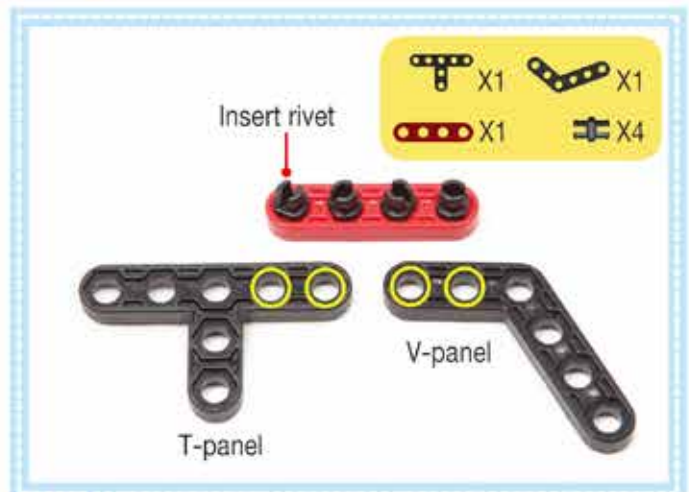
51 Assembled.

52 Assemble a T-panel and a V-panel to a 4 panel.

Insert rivet
X1 X1
X1 X4
V-panel
T-panel
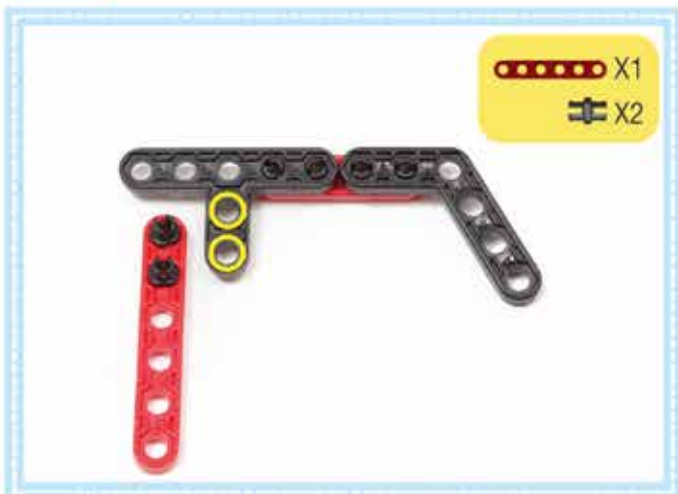
53 Assemble the T-panel to the rivets of a 6 panel.

X1
X2
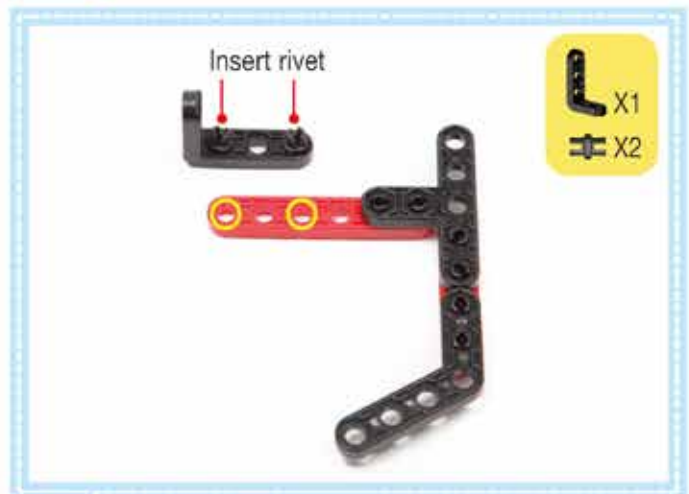
54 Assemble an L-bracket to the spotted points.

Insert rivet
X1
X2

X2

Insert rivet | Step 51
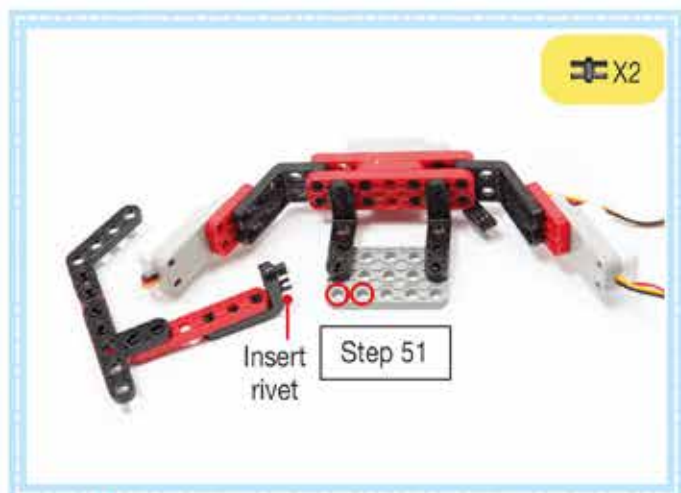
55 Assemble the L-bracket to the spotted points of step 51.

56 Assembled.

X1 **X1** **X2**

Insert rivet

Insert rivet
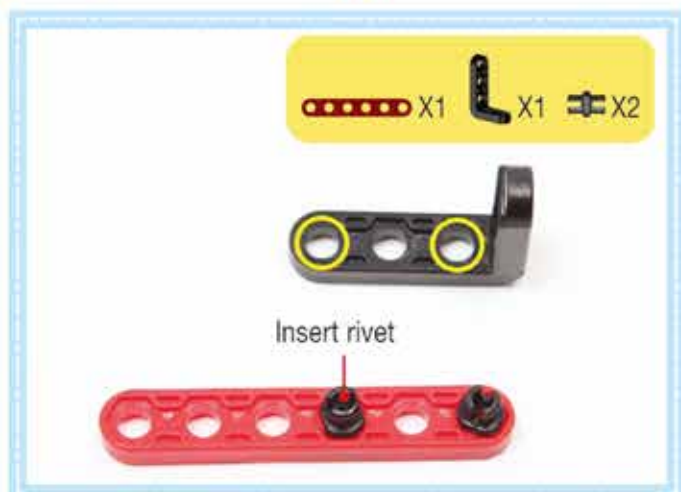
57 Assemble a 6 panel to an L-bracket.

X1 **X2**

Insert rivet
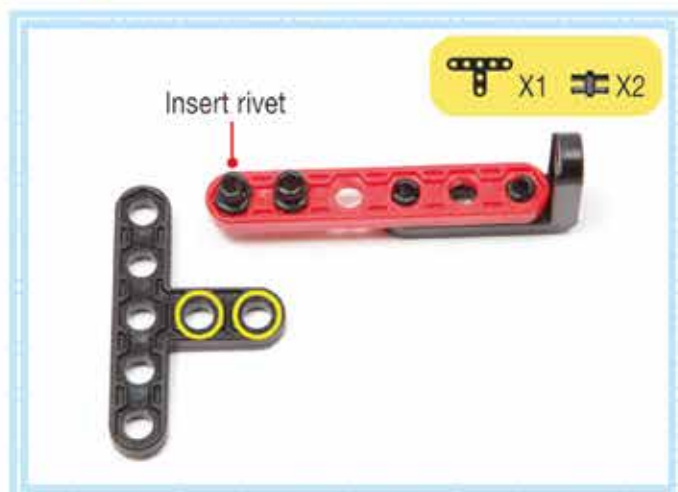
58 Assemble a T-panel to the rivets of the 6 panel.

X2

Insert rivet
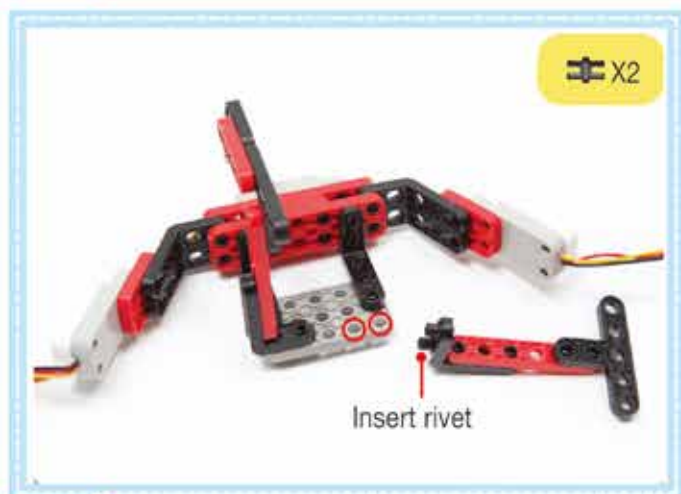
59 Assemble the L-bracket to the spotted points of step 56.

X4

Insert rivet
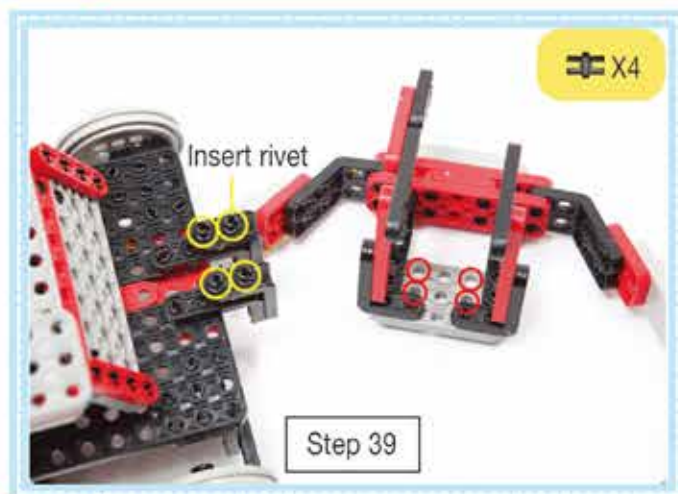
Step 39

60 Assemble the L-brackets of step 39 to the spotted points of step 59.
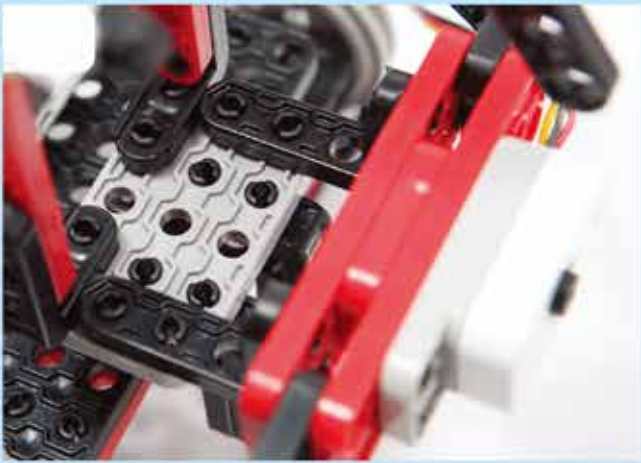
61 Assembled.
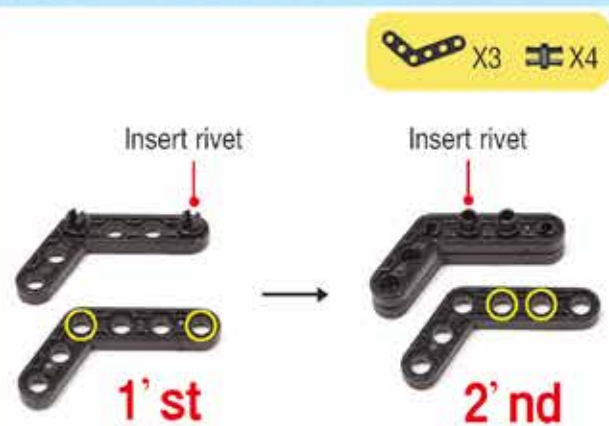
62 Assemble 3 V-panels as shown.

X3 X4

Insert rivet

Insert rivet

1'st

2'nd

63 Assemble a V-panel to step 62 .

X1 X2
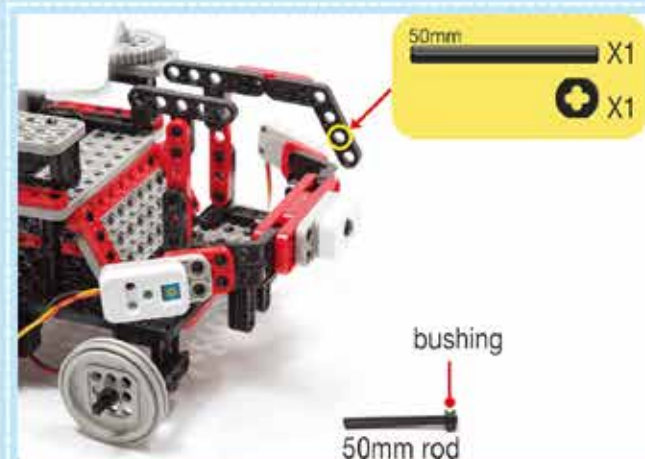
Insert rivet

64 Insert a 50mm rod with a bushing into the spotted point of the V-panel of step 61 .

50mm X1

X1
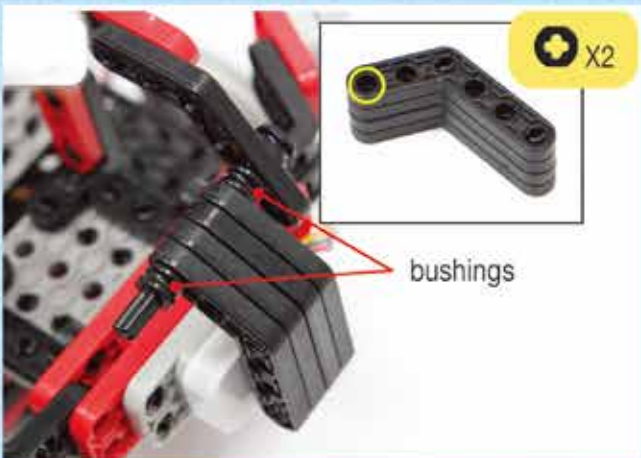
bushing

50mm rod

65 Put a bushing, V-panels and another bushing to the 50mm rod as shown.

X2

bushings

66 Put a V-panel to the 50mm rod and fasten it with a bushing.

X1

X1

67 Insert rivets to a 4 panel and assemble it to the spotted points of step **66**.

Insert rivet
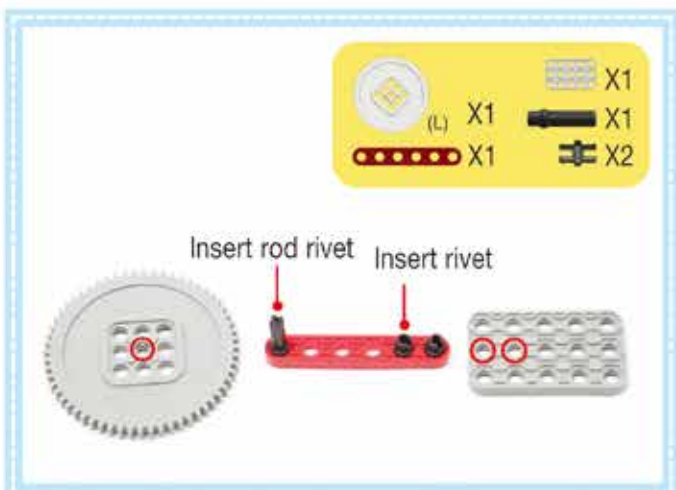
68 Assembled.

69 Assemble a gear(L) and a 3X5 panel to the rod rivet and the rivets of a 6 panel.

(L) X1

Insert rod rivet   Insert rivet

70 Assemble a 3 panel to the rivet of the gear(L).

Insert rivet

fasten it with a bushing

71 Assembled.

72 Assemble a 3X5 panel to the rivets of an L-bracket.

Insert rivet

73 Assemble step **71** to the rivets of the L-bracket.

X2

Insert rivet

74 Assemble V-brackets to the rivets of the 3X5 panel.

X2
X4

Back

Insert rivet

75 Assembled.

Jamming arm action
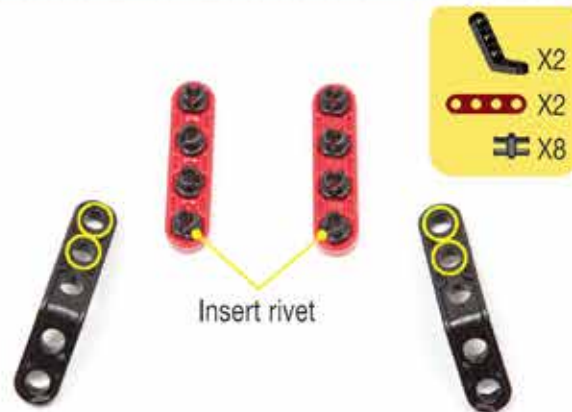
76 Assemble V-brackets to 4 panels.

X2
X2
X8

Insert rivet

77 Assemble V-brackets to the 4 panels.

X2
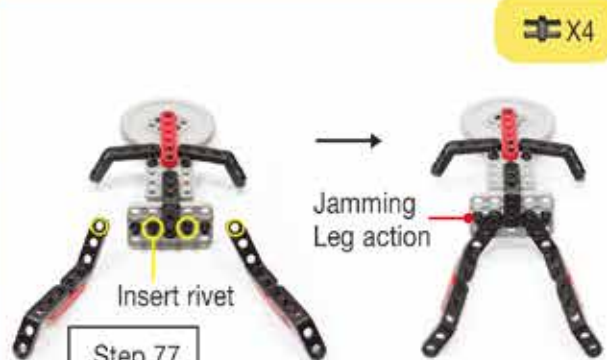
Step 76

78 Assemble the V-brackets to the rivets of the 3X5 panel of step **75**.

X4

Jamming Leg action

Insert rivet

Step 77

X1

Step 68

Insert rivet
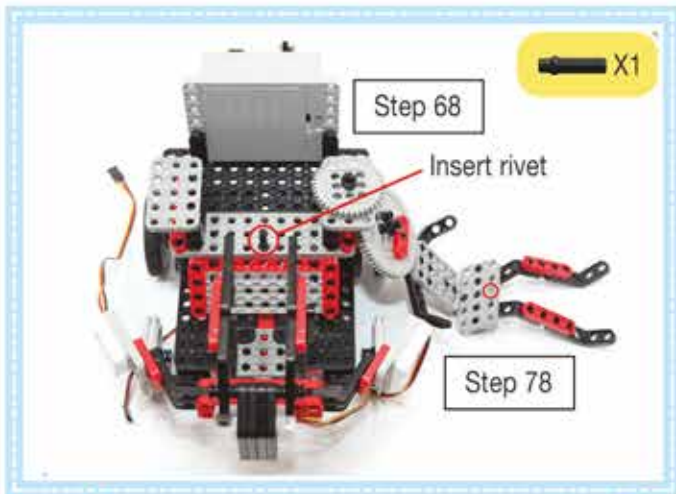
Step 78

79 Insert a rod rivet into the spotted point of step 68 and fix the spotted point of step 78 to the rod rivet with a bushing.

X1

fasten with a bushing
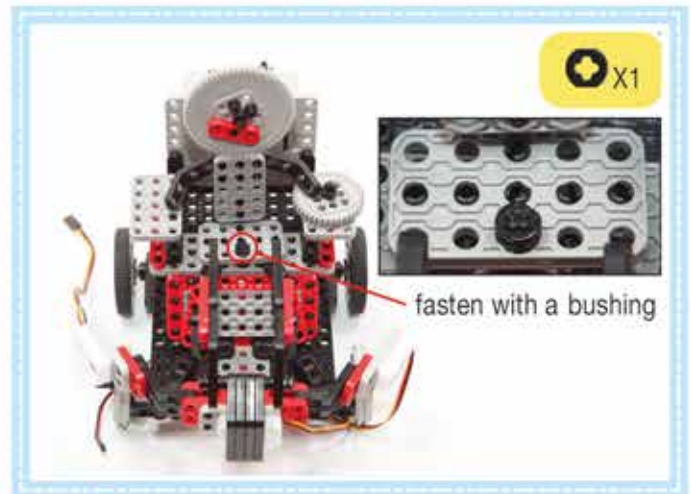
80 Assembled.
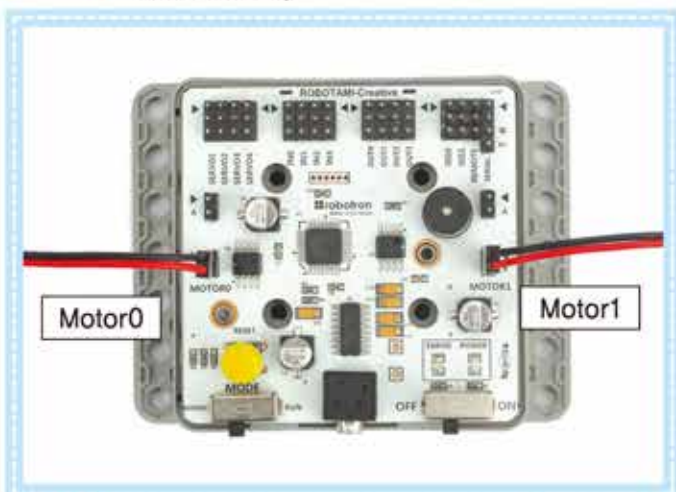
Motor0

Motor1

81 Connect the left DC motor to MOTOR0
Connect the right DC motor to MOTOR1.
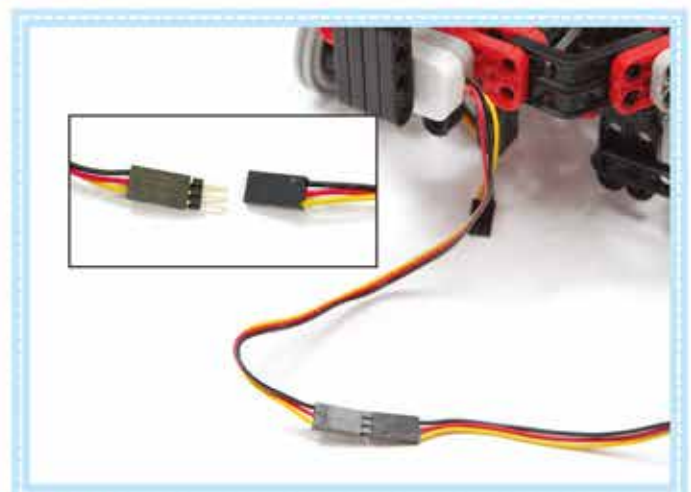
82 Insert a 3 pin headerpin into the cables of the switch module and connect it to a 3pin cable.

Connect to IN0
Connect to IN1
Connect to IN2

83 Connect the left Infrared sensor to IN2
Connect the middle Switch module to IN0
Connect the right Infrared sensor to IN1.
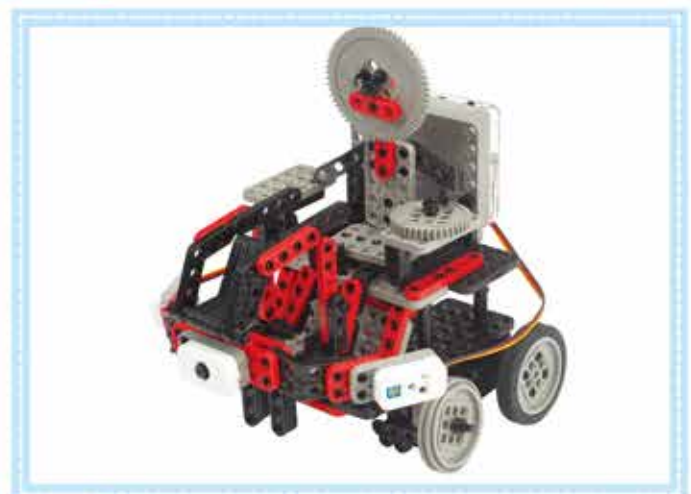
84 Completed Avoiderbot.

4 Solve mission

1 Move Avoiderbot forward for three seconds and stop it.

```
START
   ↓
GO=0
   ↓
DELAY=3
   ↓
STOP
   ↓
END
```

2 Repeat moving Avoiderbot forward for three seconds, backward for three seconds and stopping three times.

```
START
   ↓
FOR=3
   ↓
GO=0
   ↓
DELAY=3
   ↓
BACK=0
   ↓
DELAY=3
   ↓
NEXT
   ↓
END
```
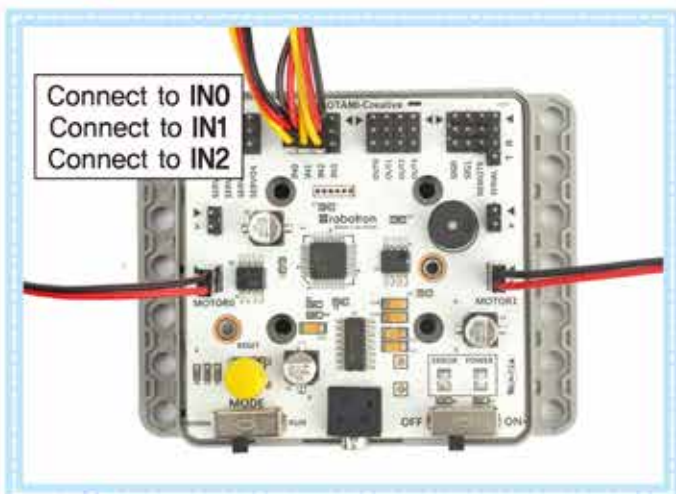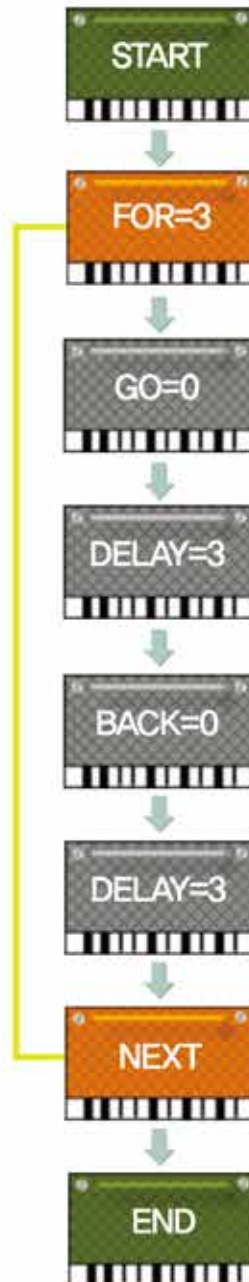
FOR command card should be placed in the beginning of what needs to be repeated and END command card should be placed at the end of what needs to be repeated. FOR command card decides how many times it will be repeated.

4

3 Move Avoiderbot forward for five seconds when it senses a touch.

START	STOP
LABEL=0	END IF
IN=0	GOTO=0
IF=0	END

STOP
IF=1
GO=0
DELAY=5
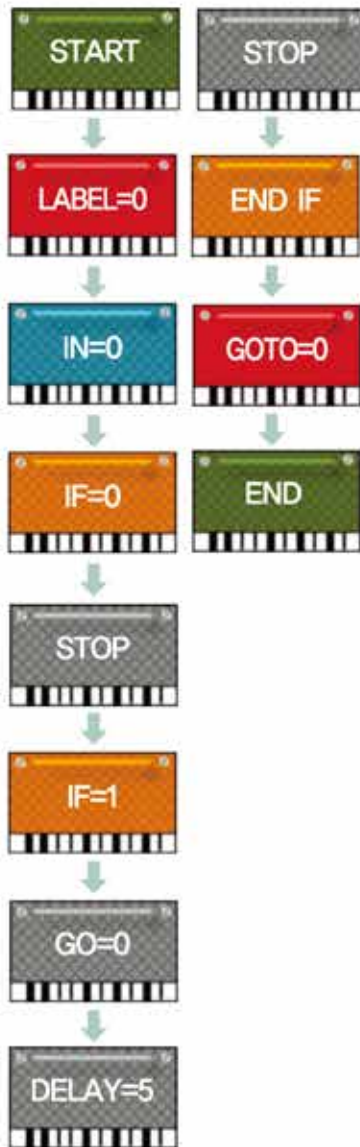
Put LABEL command card at the beginning of what to be repeated infinitely, and put GOTO command card at the end. Both the number of the LABEL command card and GOTO command card shall be identical.

Move Avoiderbot backward for twoseconds and turn left for 0.3 seconds when the switch sensor is triggered while moving forward, to the right when the left infrared sensor is triggered, and to the left when the right infrared sensor is triggered.

1)Refer to the port number of each sensor module.
2)Use the order card to move them back and left when a switch module is triggered, to the left or the right when the infrared module is triggered.
3)Use the location/movement card to repeat the process continuously.

START	GO=0	IF=2	END
LABEL=0	IF=1	LEFT=0	
IN=0	BACK=0	IF=4	
IN=1	DELAY=2	RIGHT=0	
IN=2	STOP	END IF	
IF=0	LEFT=3	GOTO=0	

Sensor value	Signal from the Input port	Input3	Input2	Input1	Input0
IF 0	No detected signals	0	0	0	0
IF 1	Detection at Input 0	0	0	0	1
IF 2	Detection at Input 1	0	0	1	0
IF 3	Detection at Input 0 and 1	0	0	1	1