

ZEPHYR

More Than Just Play



STEM
EDUCATION
SCIENCE, TECHNOLOGY, ENGINEERING, MATH



**MOTORIZED
GEARBOX**



**QUICK
CONSTRUCTION**



**RACK & PINION
MECHANISM**



**2 WAY
CONTROL**

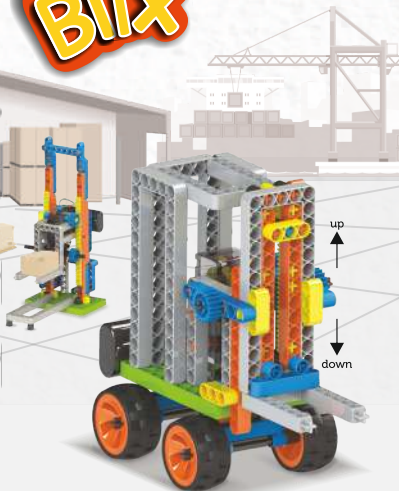
AGE
8+

MODELS
6

**150+
PIECES**

Blix

RACK & PINION



Do - it yourself manual

- 1 Read all instructions carefully before constructing.
- 2 Place all the pieces used in a step on the side before starting.
- 3 Always remove batteries when not in use.

How to construct



I - CL2 - Use this connector to loosely connect 2 pieces.



II - CT2 - Use this connector to attach 2 pieces.



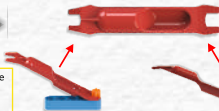
III - CT3 - Use this connector to attach 3 pieces.



During assembly ensure position of collar is same as in the image in manual.

How to dismantle

- Narrow edge to remove connectors
- Fit the tool into narrow side of connector collar

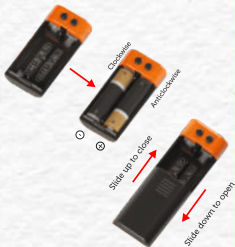


- Broad edge to split two pieces



Safety Guidelines

- Do not mix old and new batteries.
- Do not mix alkaline, standard (Carbon-Zinc) or rechargeable (Nickel-Cadmium) batteries.
- Batteries are to be inserted by matching (+) and (-) polarity markings as shown in the image.
- Non-rechargeable batteries are not to be charged.
- Rechargeable batteries are to be removed before being charged.
- Exhausted batteries are to be removed from toy.
- The supply terminals are not to be short-circuited.
- The kit is not intended for children under 3 years old.
- Remove batteries before cleaning any part of the toy.
- Prevent wire from coming in contact with the wheels and tracks, by using wire clip.



Add 2 x 1.5 V "AA" size batteries

What is Rack and Pinion?



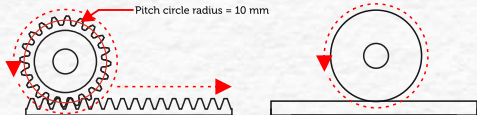
Rack and pinion is a common mechanism used to convert rotational motion into linear motion. This means that this mechanism is suitable if you have an input that creates motion in a circular direction (like an engine or motor), but you want an output where the motion is in a straight line (like a garage door opening up).

How does it work:

This mechanism is not that different from the wheels of a car turning and moving the car forward. Similarly, a pinion is a small gear that turns like wheels and creates a linear motion on the rack.

A rotating wheel can slip, but a rack and pinion's teeth mesh and are capable of transferring much more force.

You might have seen roller coasters using this mechanism to climb slopes. The metal wheels do not have enough friction, and the wheels by themselves would slip. Therefore, they place a rack on the slope and pinion on the car for it to climb.



How can we calculate speed of rack?

Distance travelled by rack = Circumference of pinion
in one rotation

$= 2\pi r$ ('r' is pitch circle radius of pinion gear which is 10 mm for this application)

$= 2\pi \times 10$ ($\pi = 3.14$)

$= 62.8$ mm per rotation of pinion

Distance travelled by rack = 62.8 x R.P.M. of pinion
in one second

$= 62.8 \times 70$ R.P.M.

$= 4396$ mm per minute

$= 4.4$ meter per minute (1 meter = 100 centimeter = 1000 millimeter)

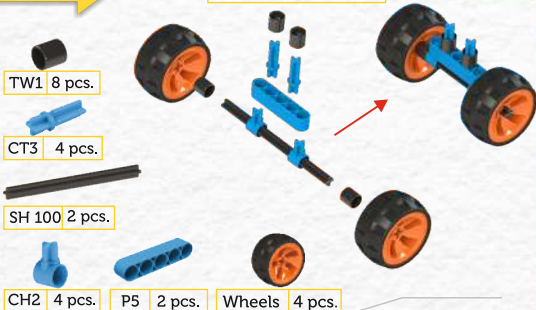
$= 0.07$ meter per second (1 minute = 60 seconds)

MODEL 1 - FORK LIFT

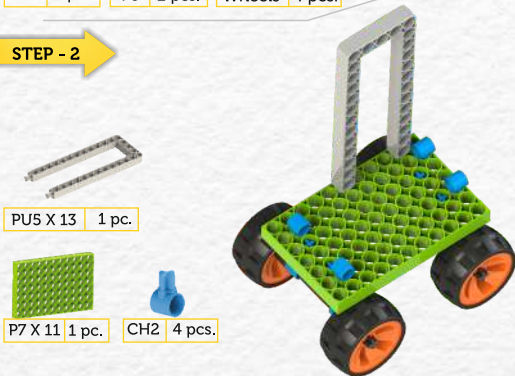
Blix

STEP - 1

Make 2 sets of this step.



STEP - 2



STEP - 3



TW1 1 pc.



CT2 2 pcs.



G(20) 1 pc.



Motor With Battery
Box 1 pc.

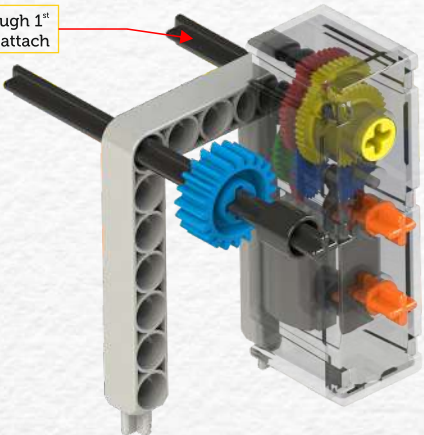


SH 100 1 pc.



PU5 X 7 1 pc.

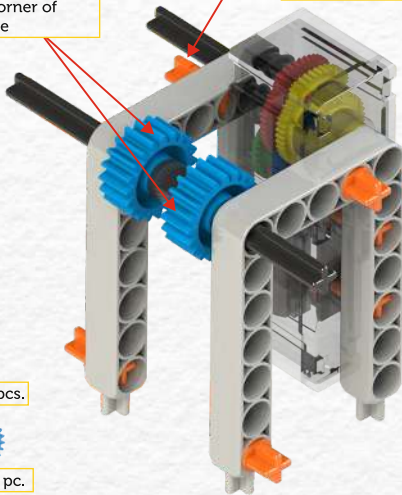
Pass through 1st
hole and attach



STEP - 4

Shift the gears G(20) to the corner of both side

Attach CT2 on 2nd Hole



CT2 4 pcs.



G(20) 1 pc.



PU5 X 7 1 pc.

STEP - 5

Blix

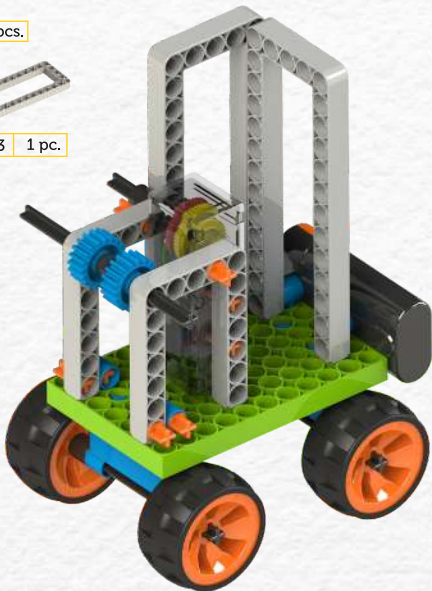
Assembly of step 4 & step 2



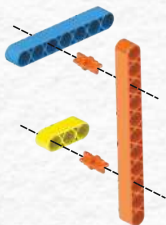
CT2 2 pcs.



PU5 X 13 1 pc.

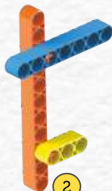
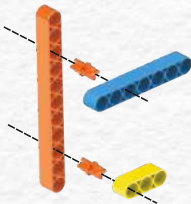


STEP - 6



1

Left side assembly



2

Right side assembly



P3 2 pcs.



CT2 4 pcs.



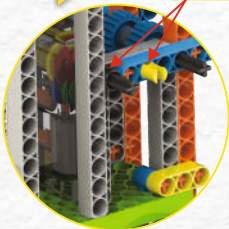
P7 2 pcs.



P11 2 pcs.

STEP - 7

Add TW1 & CL2



Left side view



TW1 1 pc.



CL2 1 pc.



PU5 X 7 1 pc.



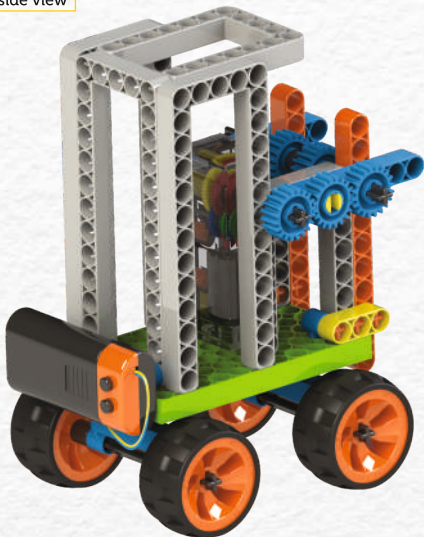
PU5 X 13 1 pc.



STEP - 8

Blix

Left side view



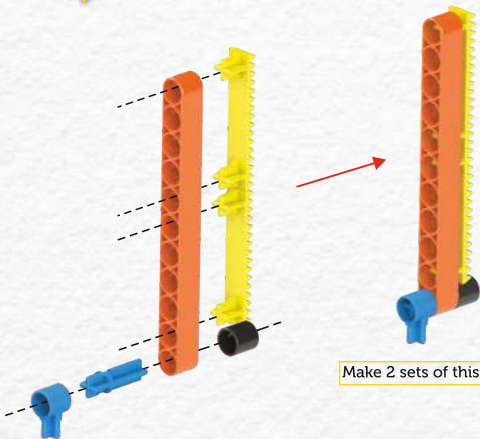
G(20) 2 pcs.



G(20) Idler 1 pc.

STEP - 9

Blix



Make 2 sets of this step.

TW1 2 pcs.

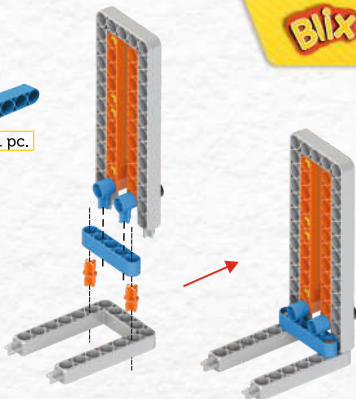
CH2 2 pcs.

CT3 2 pcs.

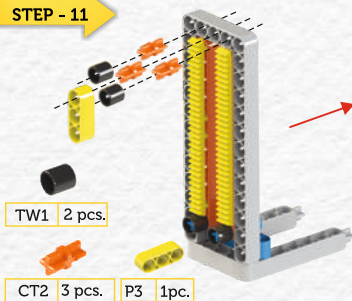
Rack 4 pcs.

P11 2 pcs.

STEP - 10



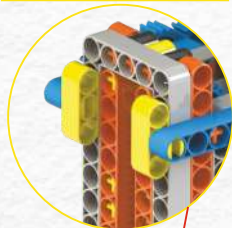
STEP - 11



Back side view

STEP - 12

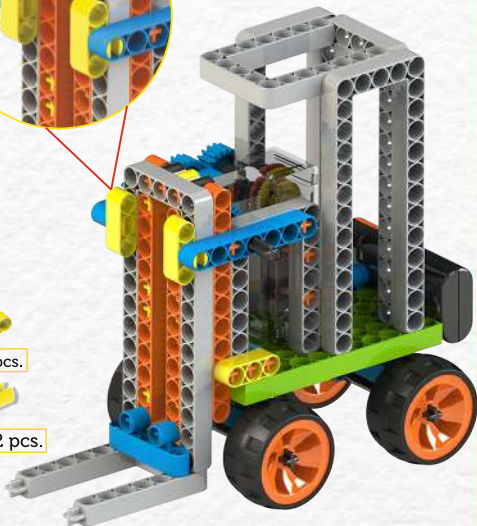
Assembly of step 11 & step 8



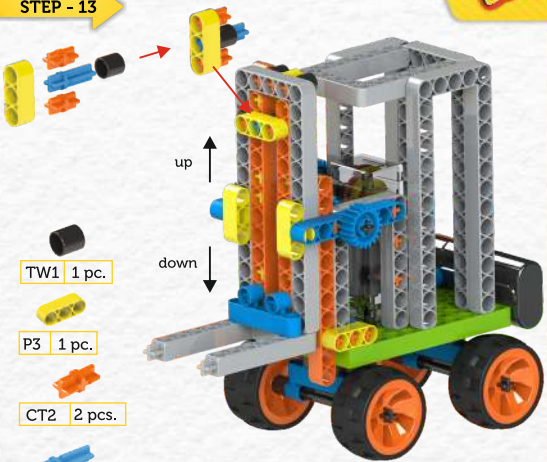
P3 2 pcs.



CL2 2 pcs.



STEP - 13



TW1 1 pc.

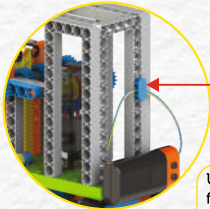
P3 1 pc.

CT2 2 pcs.

CT3 1 pc.

G(20) 1 pc.

CT1 X 2 1 pc.



Use CT1 x 2 to prevent wire from coming in contact with moving parts

MODEL 2 - LIFT

Blix

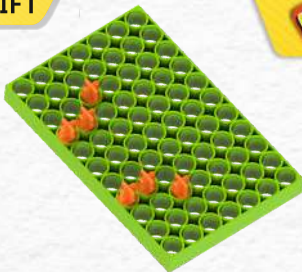
STEP - 1



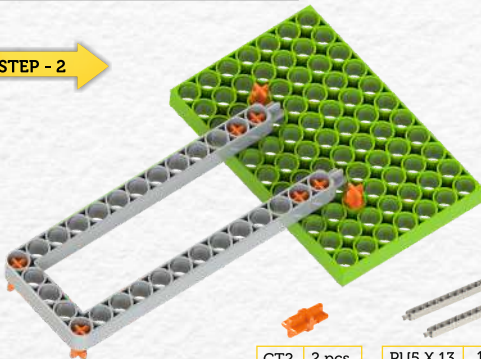
CT2 6 pcs.



P7 X 11 1 pc.



STEP - 2



CT2 2 pcs.

PU5 X 13 1 pc.

STEP - 3



TW1 4 pcs.

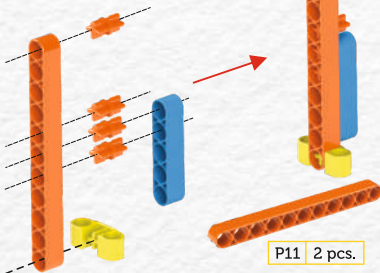


CT2 4 pcs.



STEP - 4

Make 2 Sets of this step



CT2 8 pcs.



PC 3 2 pcs.



P5 2 pcs.

P11 2 pcs.

STEP - 5

Assembly of Step 4 & 3

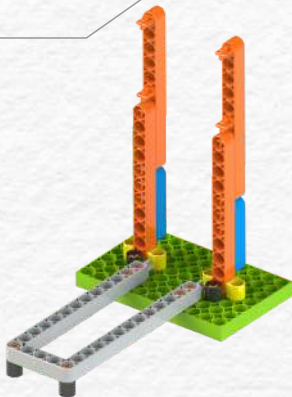


STEP - 6

CT2 4 pcs.



P11 2 pcs.



STEP - 7



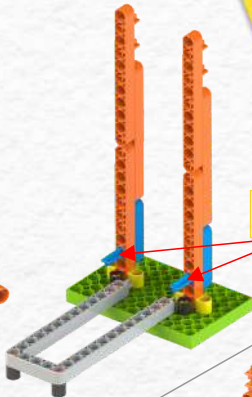
CT2 4 pcs.



CT3 2 pcs.



P11 2 pcs.



Attach CT3 on 3rd hole

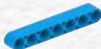
STEP - 8



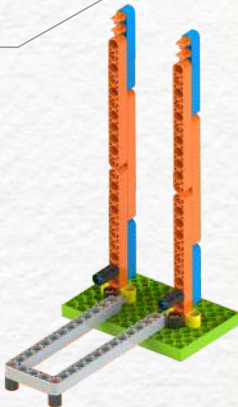
CT2 4 pcs.



TW1 4 pcs.



P7 2 pcs.



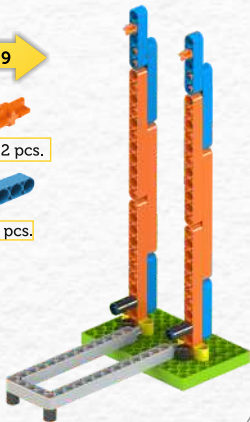
STEP - 9



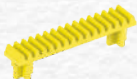
CT2 2 pcs.



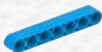
P5 2 pcs.



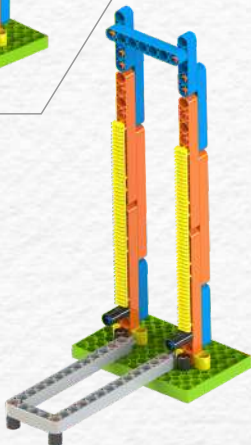
STEP - 10



Rack 6 pcs.



P7 1 pc.



STEP - 11



Motor With Battery
Box 1 pc.



CT2 1 pc.



SH60 1 pc.



CH2 1 pc.



STEP - 12

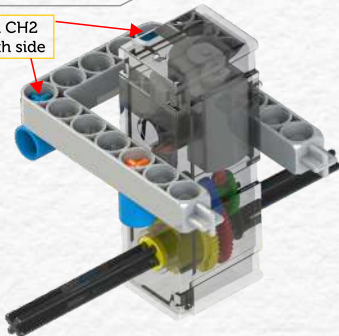


CH2 2 pcs.



PU5 X 7 1 pc.

Attach CH2
on both side



STEP - 13

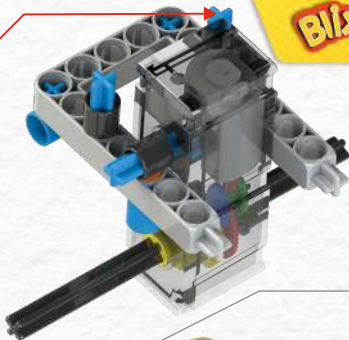
Attach CT3 & TW1 on 3rd hole



TW1 3 pcs.



CT3 3 pcs.



STEP - 14

TW1 2 pcs.



CH2 2 pcs.



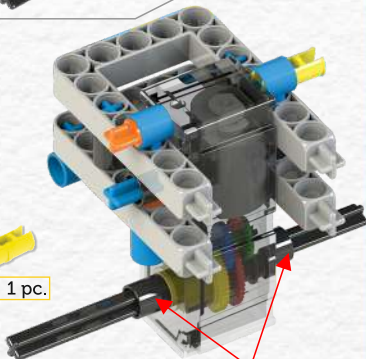
CT2 1 pc.



CL2 1 pc.

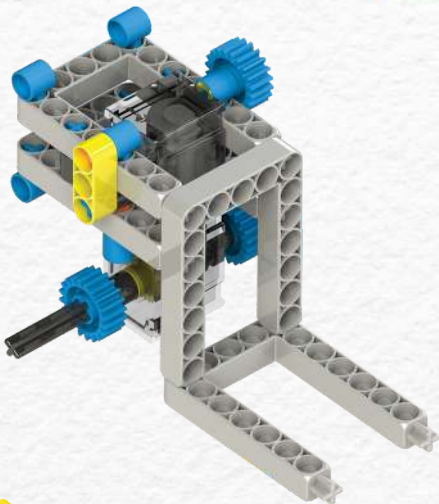


PU5 X 7 1 pc.



Add TW1 on both sides

STEP - 15



P3 1 pc.



CH2 2 pcs.



G(20) 2 pcs.



G(20) Idler 1 pc.



PU5 X 7 2 pcs.

STEP - 16

Assembly of step 15 & step 10



CT2 4 pcs.



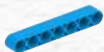
CT3 4 pcs.



STEP - 17



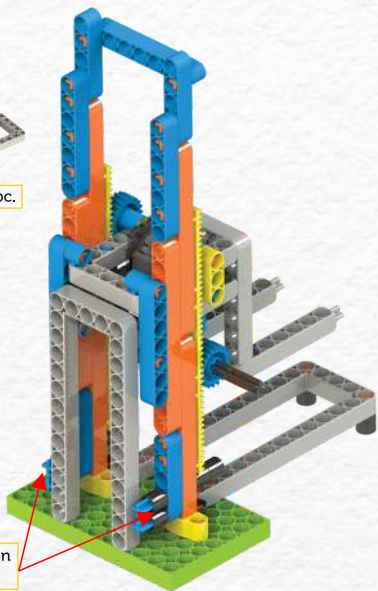
TW1 4 pcs.



P7 2 pcs.



PU5 X 13 1 pc.



Add TW1 on both sides

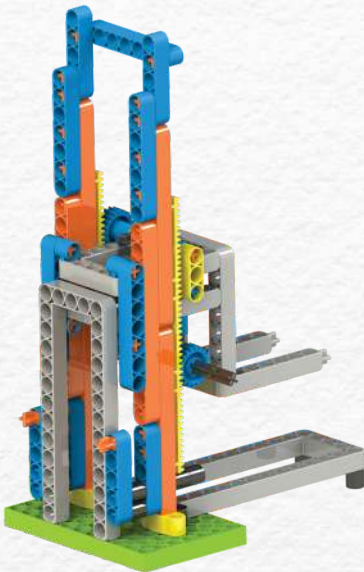
STEP - 18



CT2 2 pcs.

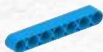


P5 2 pcs.



STEP - 19

Blix



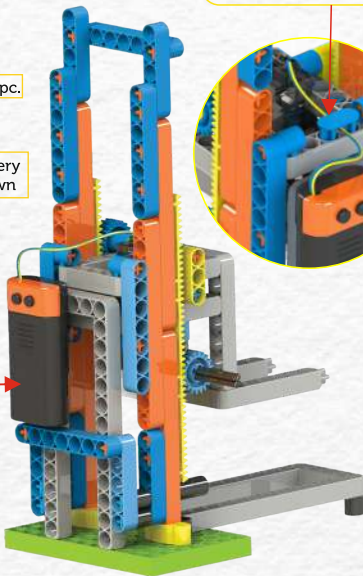
P7 1 pc.



CT 1 X 2 1 pc.

Attach battery box as shown

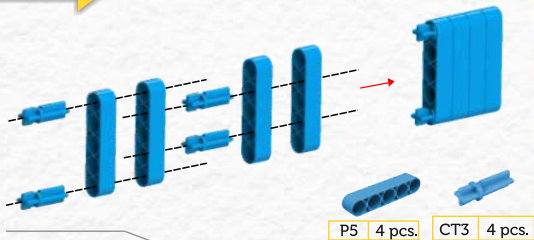
Use CT1 x 2 to prevent wire from coming in contact with moving parts



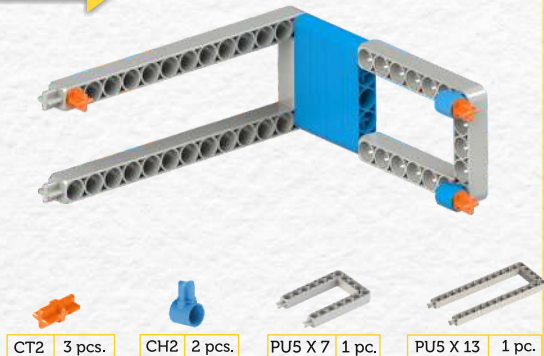
MODEL 3 - Vertical Gate

Blix

STEP - 1

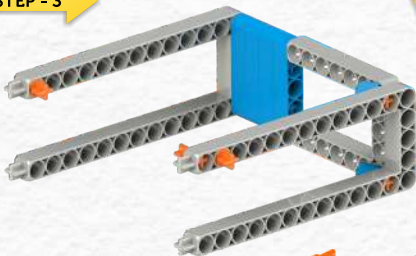


STEP - 2



STEP - 3

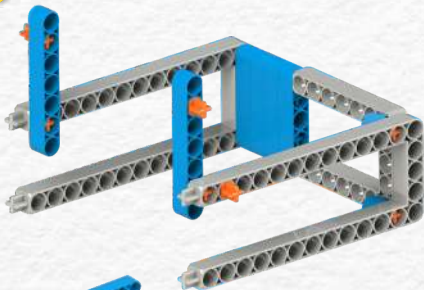
Blix



CT2 2 pcs.

PU5 X 13 1 pc.

STEP - 4



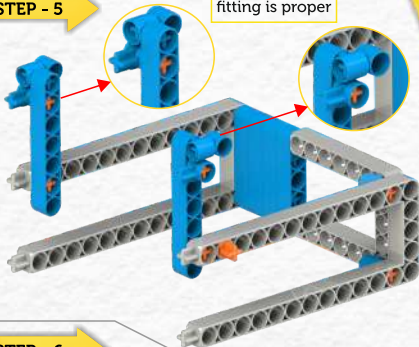
CT2 2 pcs.

P7 2 pcs.

STEP - 5

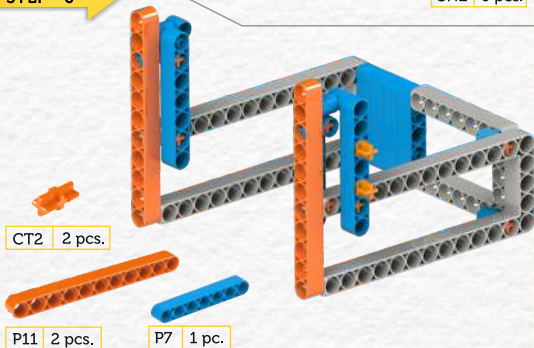
Make sure this fitting is proper

Blix



STEP - 6

CH2 6 pcs.



STEP - 7

Add 5 TW1 here



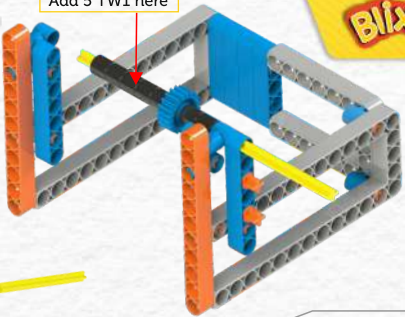
TW1 7 pcs.



G(20) 1 pc.



SH(170) 1 pc.



STEP - 8

Maintain the proper distances between both P11 to attach step 10



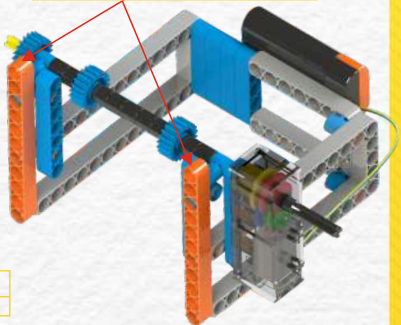
TW1 2 pcs.



G(20) 2 pcs.

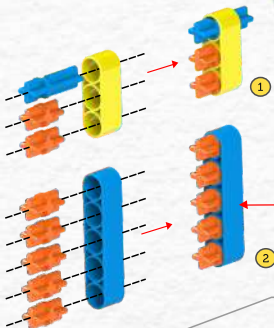


Motor With Battery
Box 1 pc.

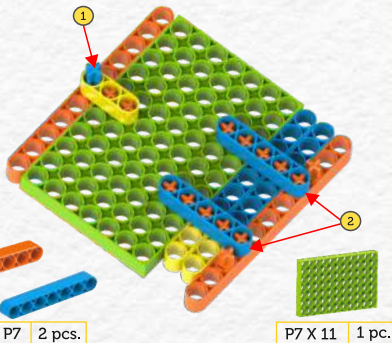
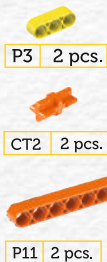


STEP - 9

Blix



STEP - 10



STEP - 11

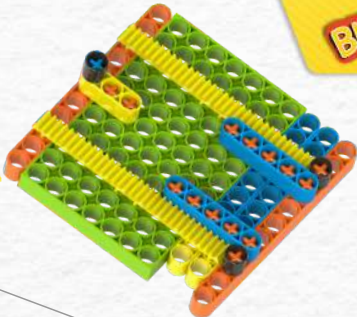
Blix



TW1 3 pcs.



Rack 4 pcs.

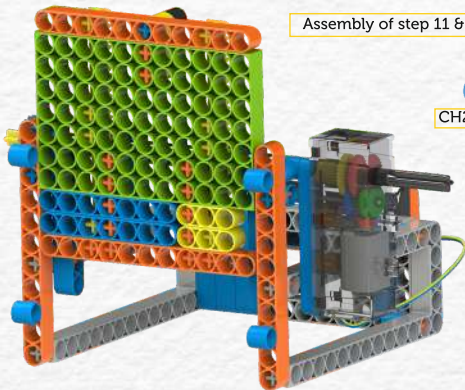


STEP - 12

Assembly of step 11 & step 8



CH2 4 pcs.



STEP - 13

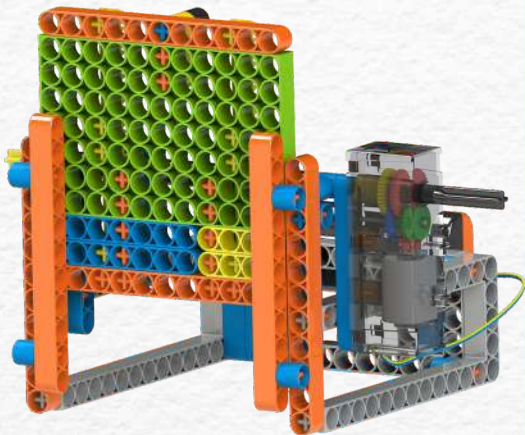
Blix



CT2 4 pcs.

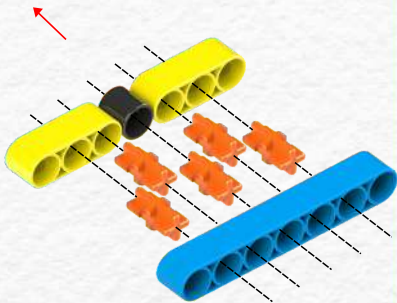
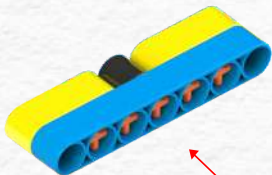


P11 2 pcs.



STEP - 14

Blix



TW1 1 pc.

CT2 5 pcs.

P3 2 pcs.

P7 1 pc.

STEP - 15

Blix



TW1 4 pcs.



SH60 2 pcs.



STEP - 16



Wheels 4 pcs.

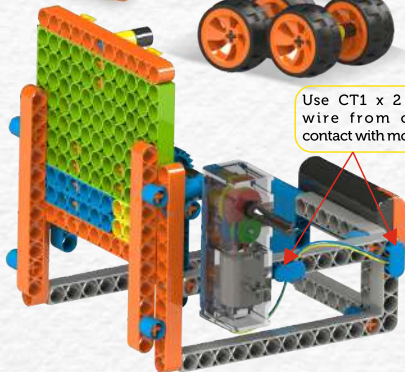


STEP - 17

Blix



CT 1 X 2 2 pcs.

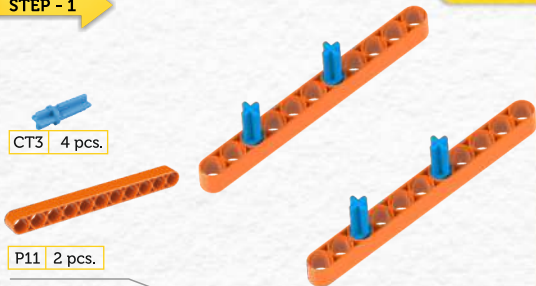


Use CT1 x 2 to prevent wire from coming in contact with moving parts

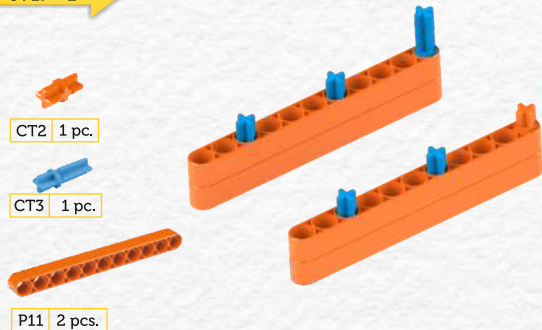
MODEL 4 - Grinding Machine

Blix

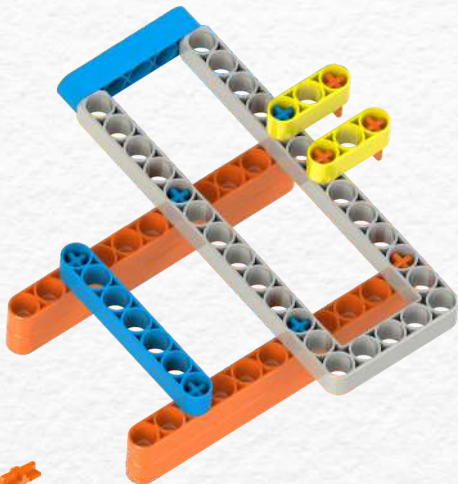
STEP - 1



STEP - 2



STEP - 3



CT2 3 pcs.

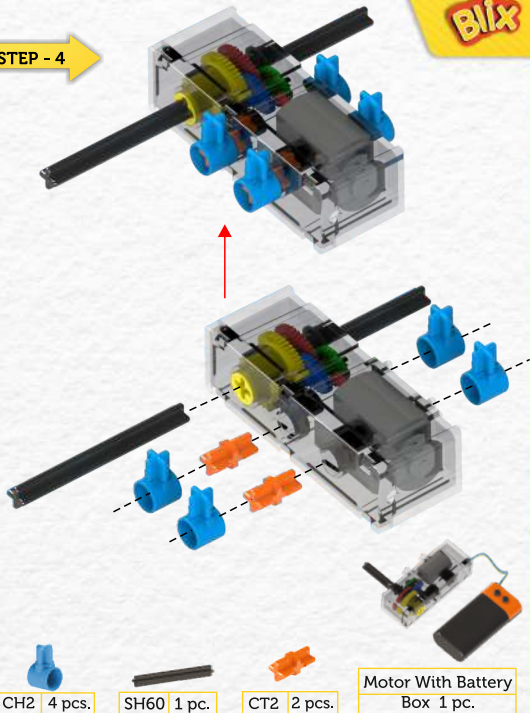
P3 2 pcs.

P5 1 pc.

P7 1 pc.

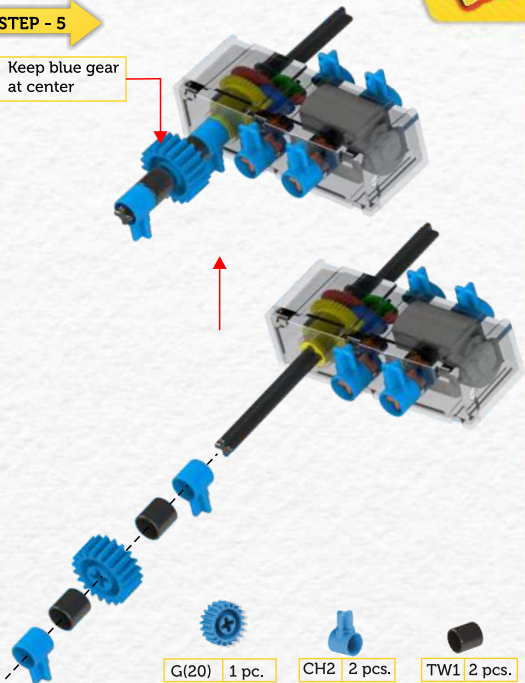
PU5 X 13 1 pc.

STEP - 4



STEP - 5

Keep blue gear
at center

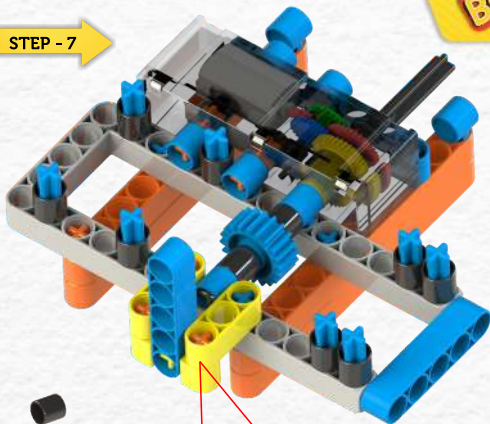


G(20) 1 pc.

CH2 2 pcs.

TW1 2 pcs.

STEP - 7



TW1 8 pcs.



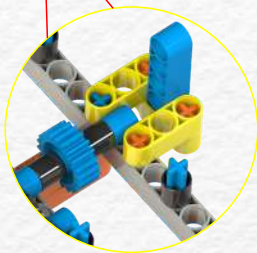
CT3 8 pcs.



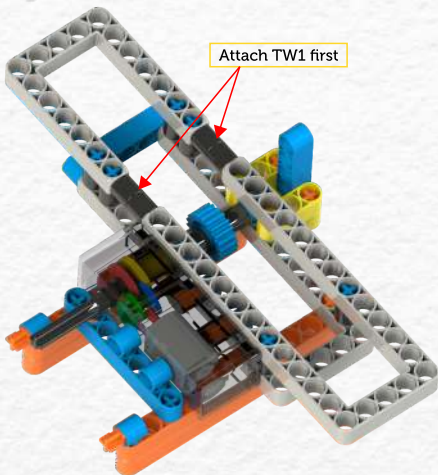
CH2 2 pcs.



P5 1 pc.



STEP - 8



TW1 4 pcs.



CT2 2 pcs.



PU5 X 7 1 pc.



PU5 X 13 1 pc.

STEP - 9



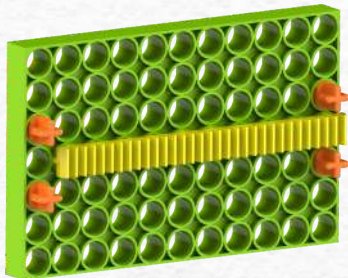
CT2 4 pcs.



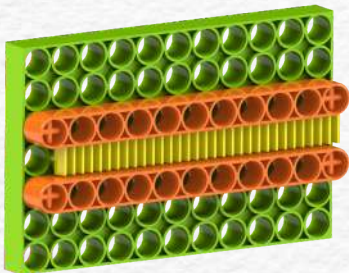
P7 X 11 1 pc.



Rack 2 pcs.



STEP - 10

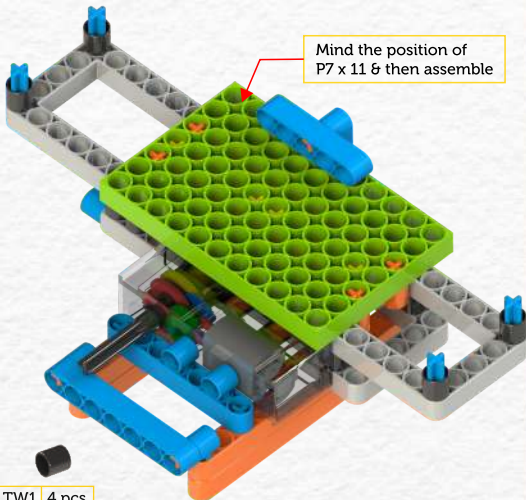


P11 2 pcs.

STEP - 11

Assembly of step 10 & step 8

Mind the position of
P7 x 11 & then assemble



TW1 4 pcs.



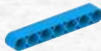
CT2 1 pc.



CT3 4 pcs.

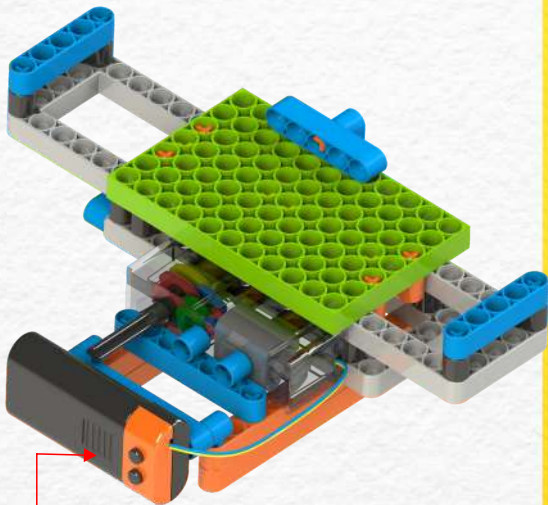


P5 1 pc.



P7 1 pc.

STEP - 12

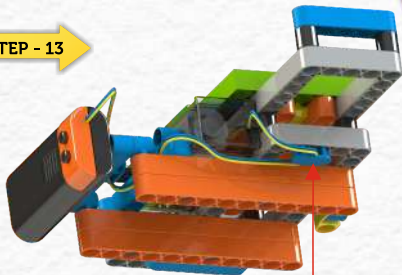


Attach battery box

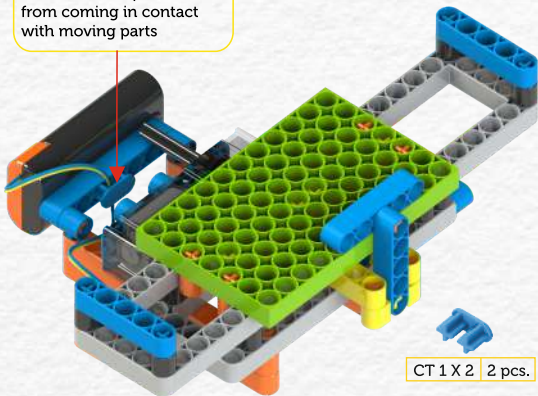


P5 2 pcs.

STEP - 13



Use CT1 x 2 to prevent wire from coming in contact with moving parts

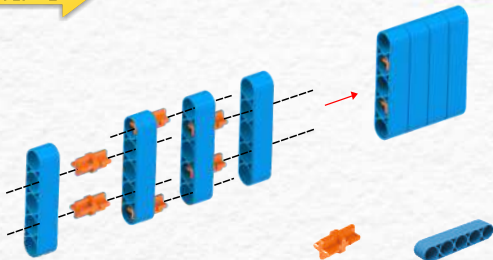


CT 1 X 2 2 pcs.

MODEL 5 - Horizontal Gate

Blix

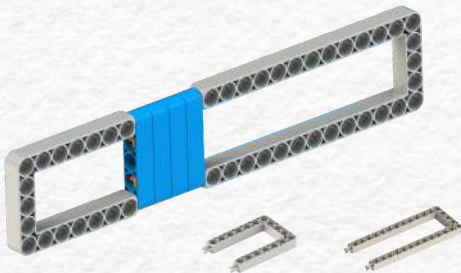
STEP - 1



CT2 6 pcs.

P5 4 pcs.

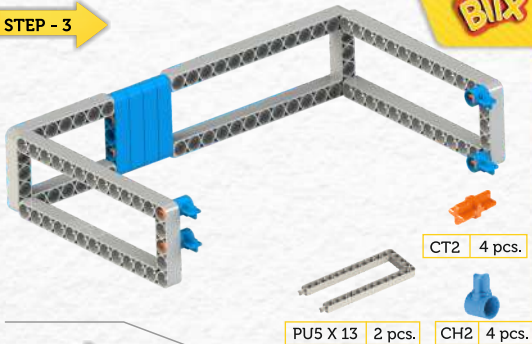
STEP - 2



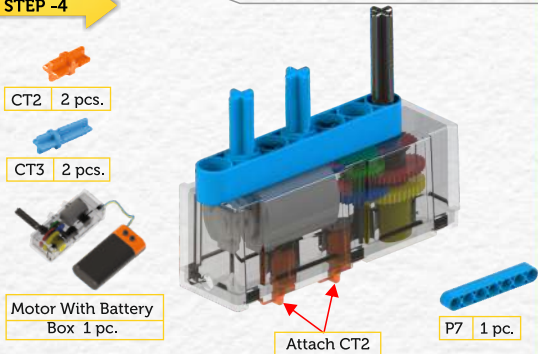
PU5 X 7 1 pc.

PU5 X 13 1 pc.

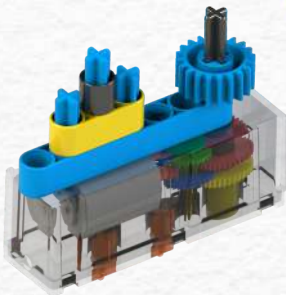
STEP - 3



STEP - 4



STEP -5



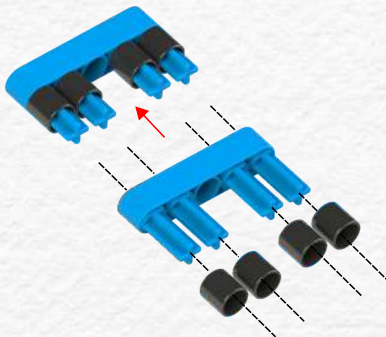
TW1 1 pc.

CT3 1 pc.

P3 1 pc.

G(20) 1 pc.

STEP -6

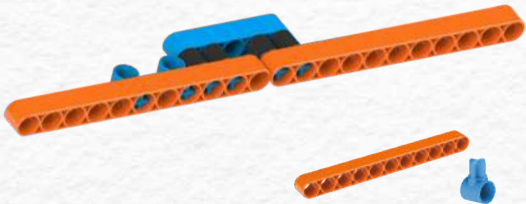


TW1 4 pcs.

CT3 4 pcs.

P5 1 pc.

STEP -7

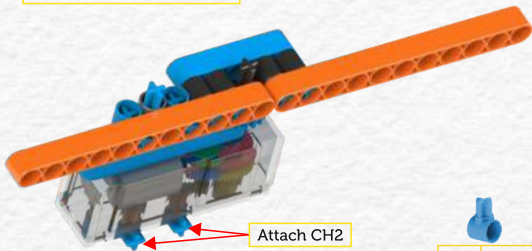


P11 2 pcs.

CH2 2 pcs.

STEP - 8

Assembly of step 7 & step 5

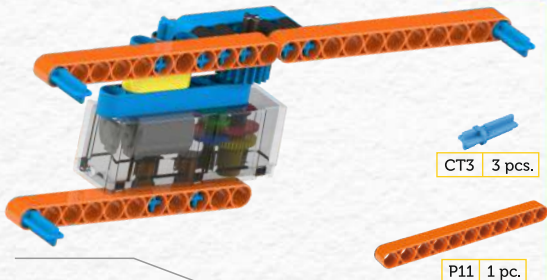


Attach CH2

CH2 2 pcs.

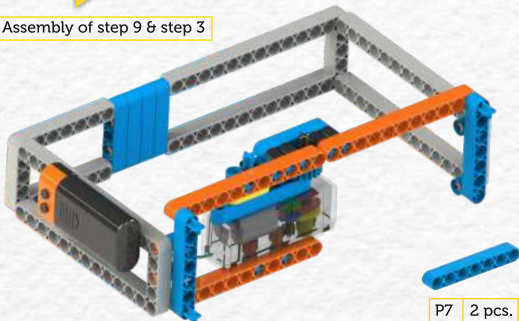
STEP -9

Blix

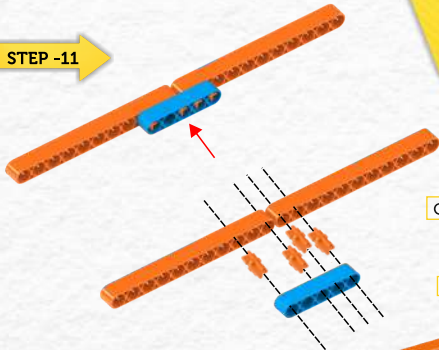


STEP - 10

Assembly of step 9 & step 3



STEP -11



CT2 4 pcs.



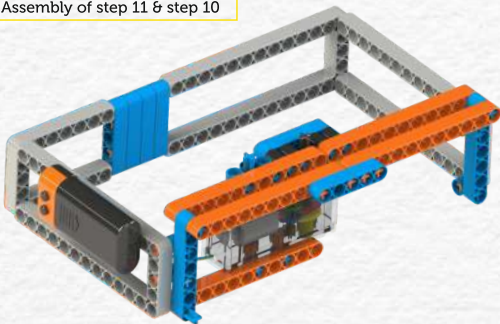
P5 1 pc.



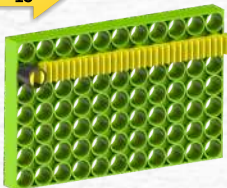
P11 2 pcs.

STEP - 12

Assembly of step 11 & step 10



STEP -13



TW1 1 pc.



CL2 1 pc.



Rack 2 pcs.

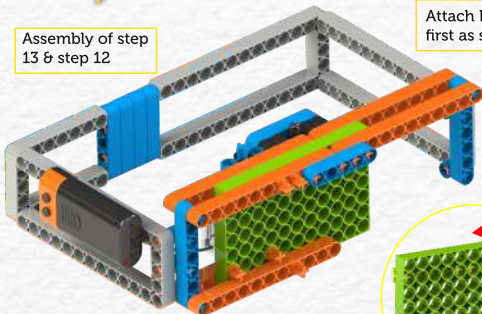


P7 X 11 1 pc.

STEP - 14

Assembly of step 13 & step 12

Attach P7 x 11 first as shown



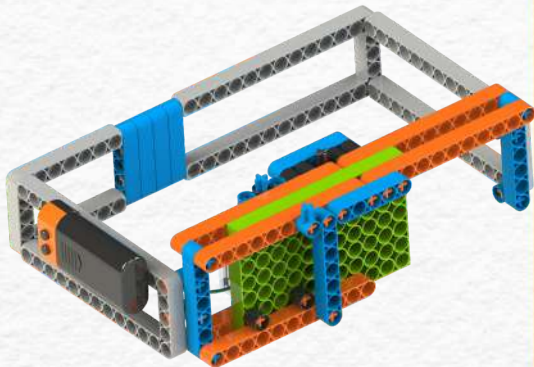
CT2 5 pcs.



P11 1 pc.

STEP -15

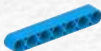
Blix



TW1 2 pcs.



CH2 1 pc.



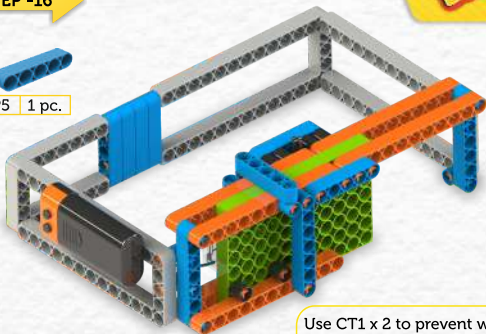
P7 1 pc.

STEP -16

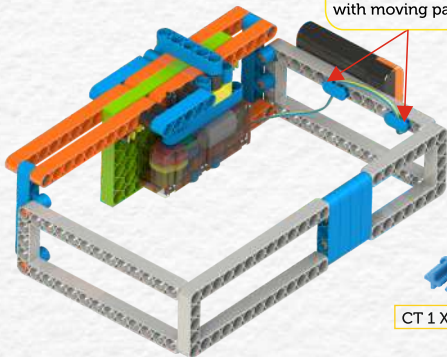
Blix



P5 1 pc.



Use CT1 x 2 to prevent wire from coming in contact with moving parts

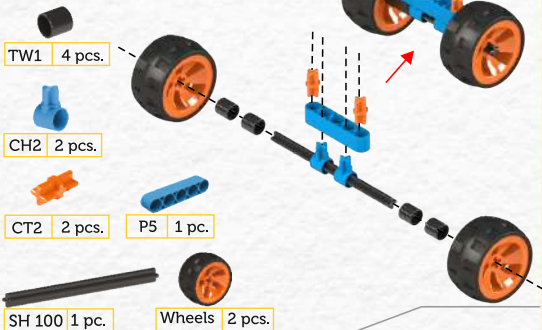


CT1 X 2 2 pcs.

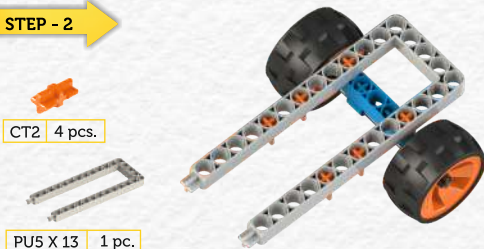
MODEL 6 - Steering Car

Blix

STEP - 1



STEP - 2



STEP - 3



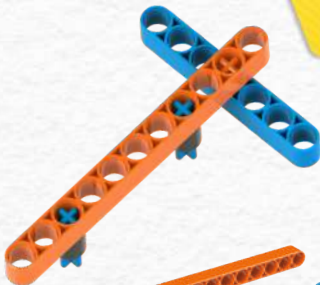
TW1 2 pcs.



CT2 1 pc.



CT3 2 pcs.

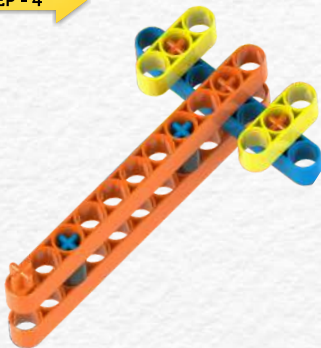


P11 1 pc.



P7 1 pc.

STEP - 4



P3 2 pcs.



CT2 3 pcs.

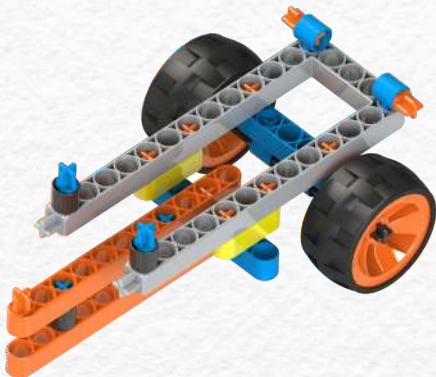


P11 1 pc.

STEP - 5

Blix

Assembly of step 4 & step 2



TW1 2 pcs.



CT2 2 pcs.



CH2 2 pcs.

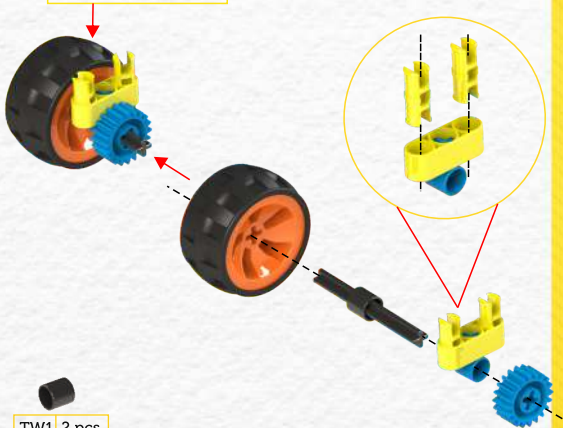


CT3 2 pcs.

STEP - 6

Blix

Make two assemblies



TW1 2 pcs.



CL2 4 pcs.



P3 2 pcs.



Wheels 2 pcs.



G(20) 2 pcs.

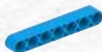
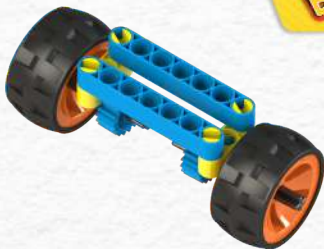


SH60 2 pcs.



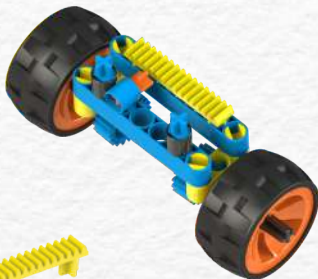
CH2 2 pcs.

STEP - 7



P7 2 pcs.

STEP - 8



TW1 2 pcs.



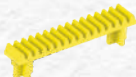
CT2 1 pc.



CH2 1 pc.



CT3 2 pcs.



Rack 1 pc.

STEP - 9

Assembly of step 8 & step 5

Attach here



STEP - 10



CT3 4 pcs.



PU5 X 7 1 pc.

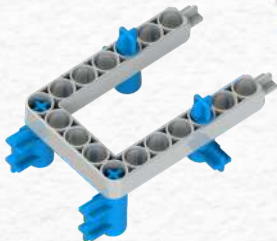


Blix

STEP - 11

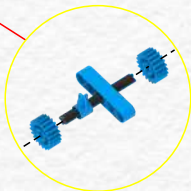
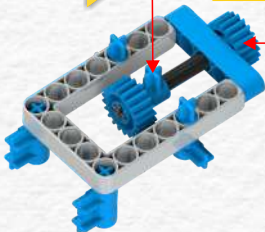


CH2 6 pcs.



STEP - 12

Mind the position of CH2



P5 1 pc.



CH2 1 pc.



G(20) 2 pcs.



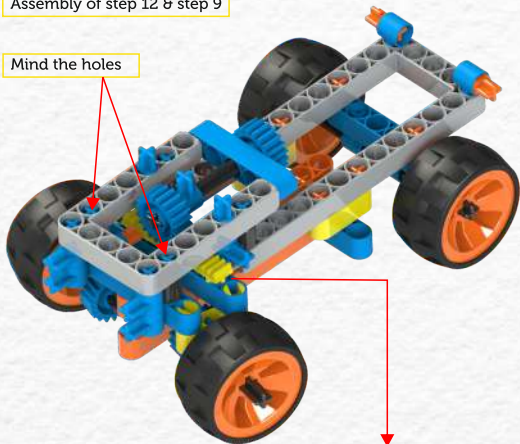
SH60 1 pc.

STEP - 13

Blix

Assembly of step 12 & step 9

Mind the holes



STEP - 14

Blix



TW1 2 pcs.



P5 1 pc.



P7 1 pc.

STEP - 15

Blix



P5 4 pcs.

STEP - 16

Blix



Back side View

CT 1 X 2 4 pcs.



P11 2 pcs.

STEP - 17

Blix



CT2 4 pcs.



CH2 4 pcs.

STEP - 18

Blix



P7 X 11 1 pc.



ZEPHYR

More Than Just Play

Blix

RACK & PINION



CT2 45 pcs.



CT3 20 pcs.



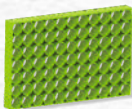
CL2 6 pcs.



CH2 20 pcs.



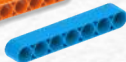
TW1 20 pcs.



P7 X 11 1 pc.



P11 6 pcs.



P7 6 pcs.



P5 7 pcs.



P3 6 pcs.



PC 3 2 pcs.



SH60 3 pcs.



SH 100 3 pcs.



SH 170 1 pc.



CT 1 X 2 4 pcs.



G(20) 5 pcs.



G(20) Idler
2 pcs.



Rack 6 pcs.



Wheels 4 pcs.



PU5 X 7 4 pcs.



PU5 X 13 4 pcs.



Motor With Battery
Box 1 pc.



Remover Tool 1 pc.