

Constructopedia

-beta version 1 (1/29/04)-

Tufts University, 2004

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**Models Contributed by Kaitlyn Conroy, Paul Nangeroni,
Meghan Cain, David Adamek**

Stationary Legos

HOW TOKey Words:

- Build a sturdy Structure
- Brace your Structure
- Change Axis on your structure

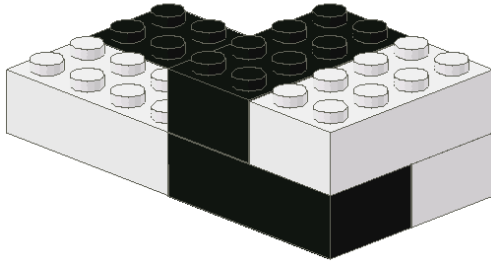
Building a Sturdy Structure

The keys to building a Sturdy Structure are as follows:

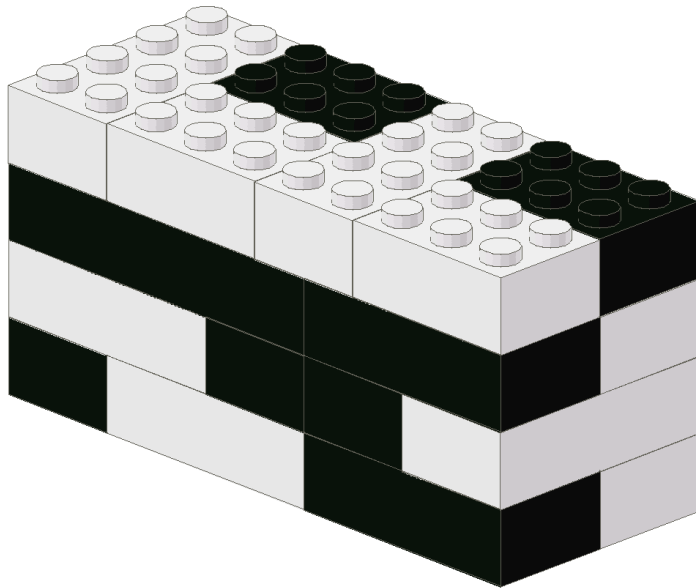
1. Use Interconnecting bricks-when you interconnect your bricks, the structure will not fall apart when you move it.
2. Flick Test: Test the durability of your structure with a simple flick of your finger. If the structure falls apart, look at the structure you built and see what was the weakest point, try to mend this problem simply. (This step should be repeated throughout the building process).
3. Drop Test: Finally test your project by dropping it (knee high, waist high, chest high). Making this into a competition is often fun for children to see who can build the strongest structure, but make sure that you discuss why the structure that won was strong. (Also be sure to take some pictures before conducting this test as losing work is often tragic if you do not have any sort of back up).

Step 1 – Interconnecting beams

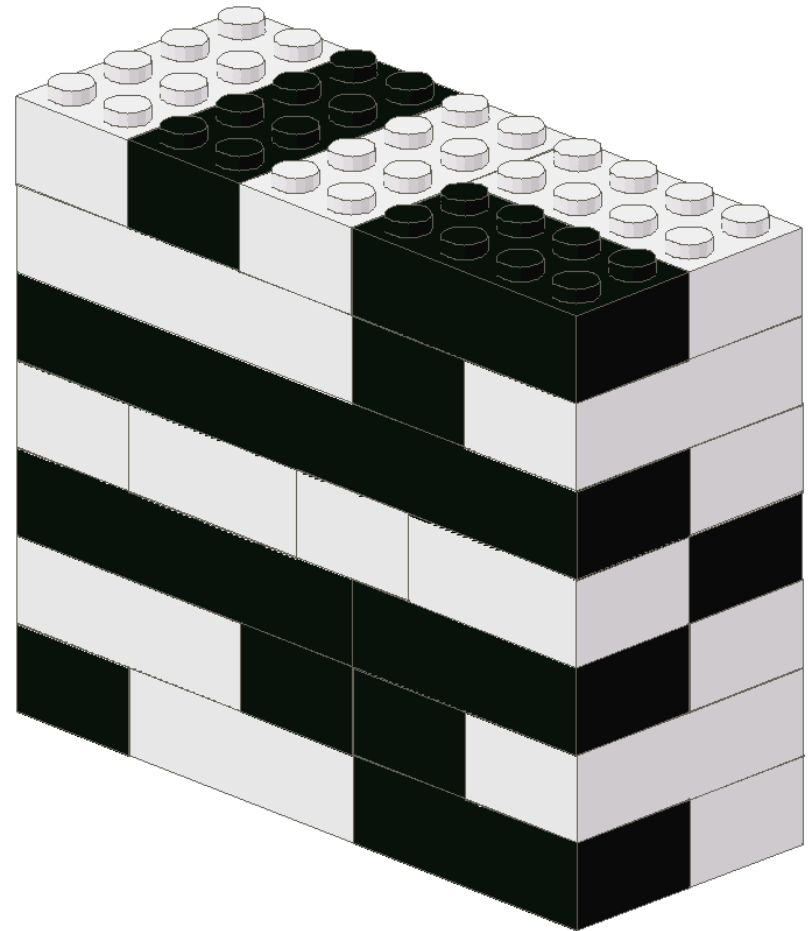
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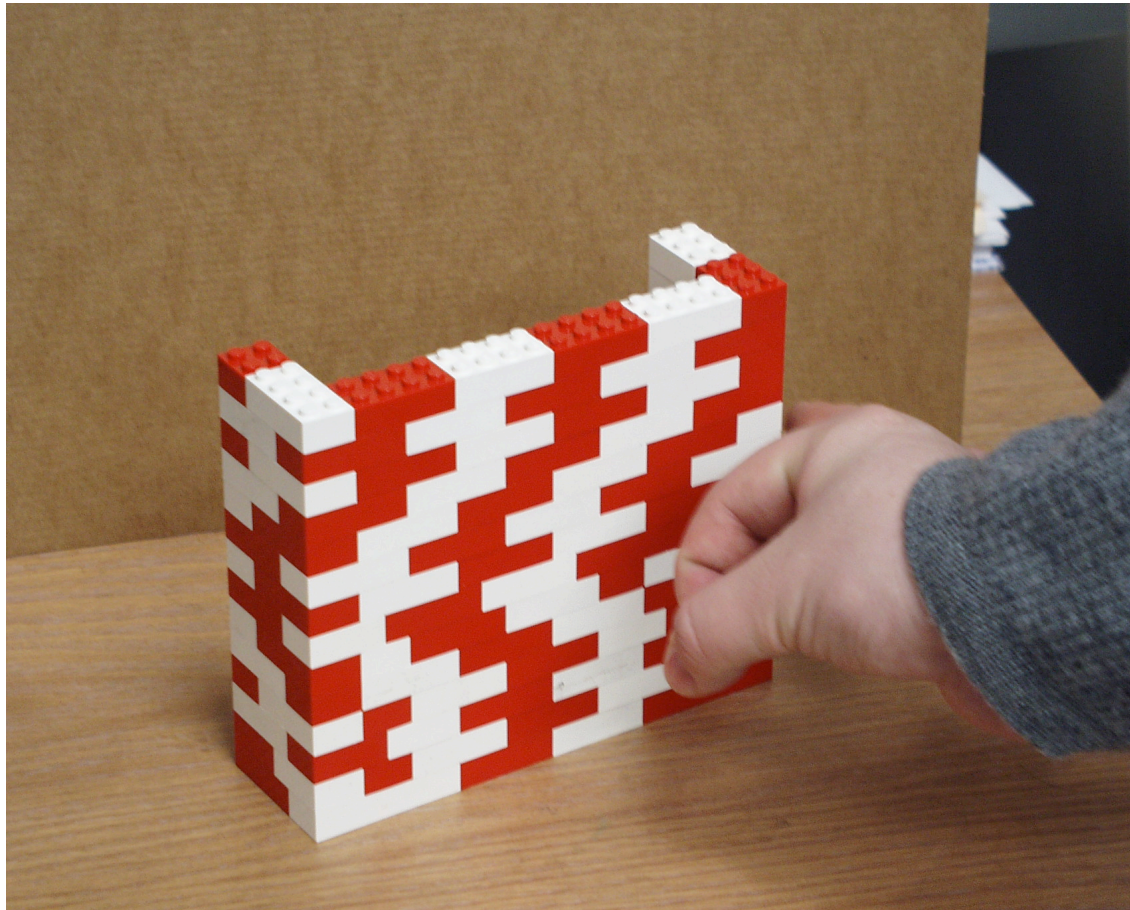
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Building a Sturdy Structure



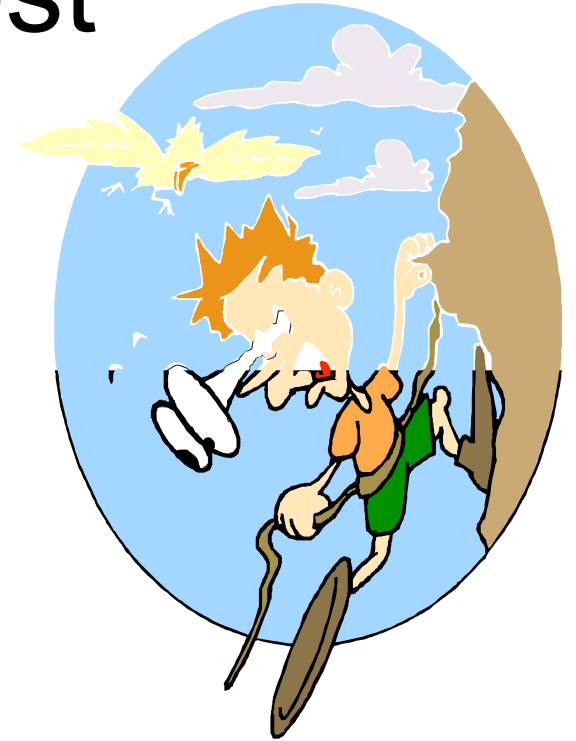
Step 2 – Flick Test



Building a Sturdy Structure

Stationary Legos

Step 3 – Drop Test

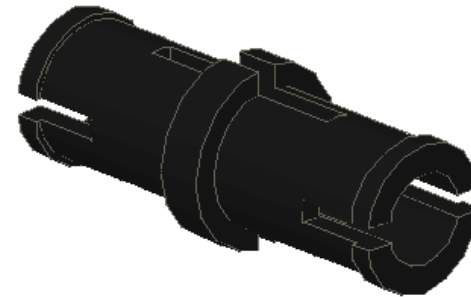
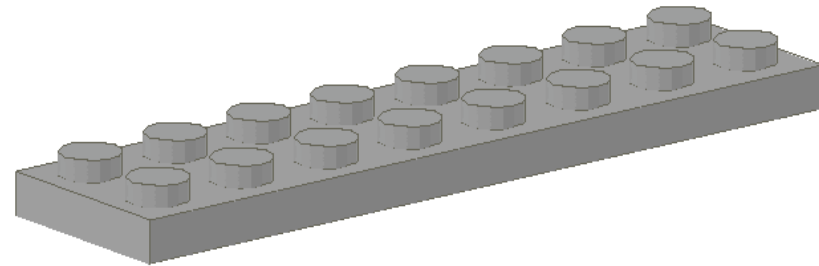


Building a Sturdy Structure



Bracing

In order to sufficiently brace your structure you want to use 2X plates to keep the structure square. Also using black (with friction) or gray connectors will help to keep your beams together.

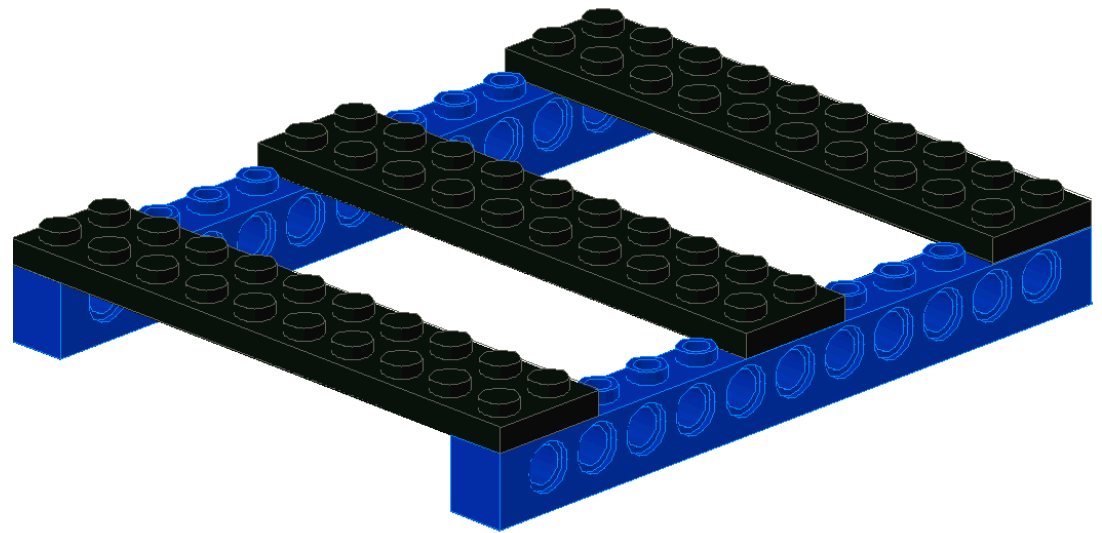
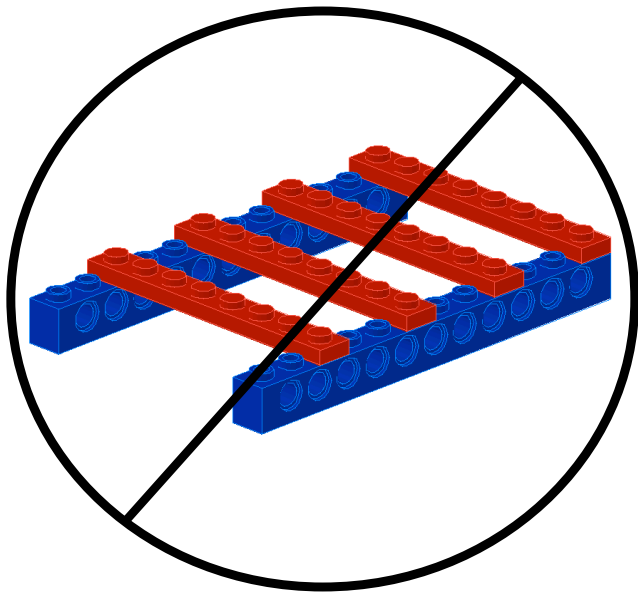


Key Words:

2X plates, Black/gray connectors

Bracing

Each stud on the plate or beam acts like a finger, and the more fingers you have touching the part, the better your grip!

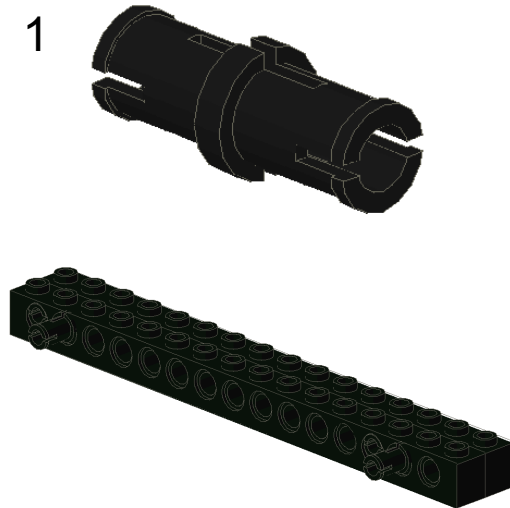


Key Words:

2X plates

Bracing

Black connector pegs are used when you do not want the beams to slide back and forth and you want the structure to remain square. Gray connector pegs do not have friction so they can slide within the hole in the beam.



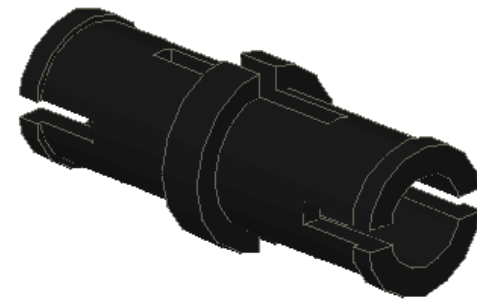
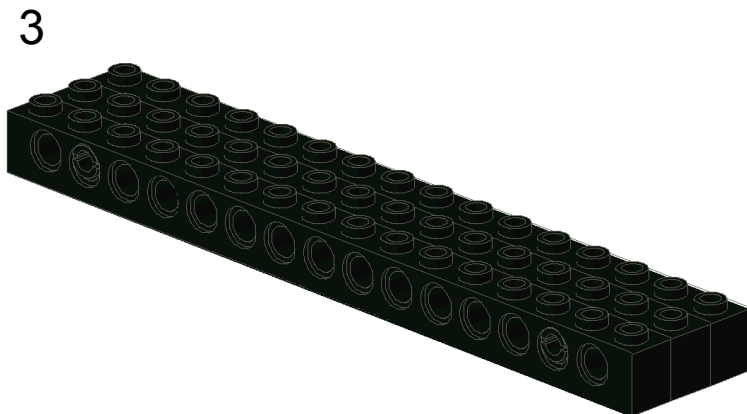
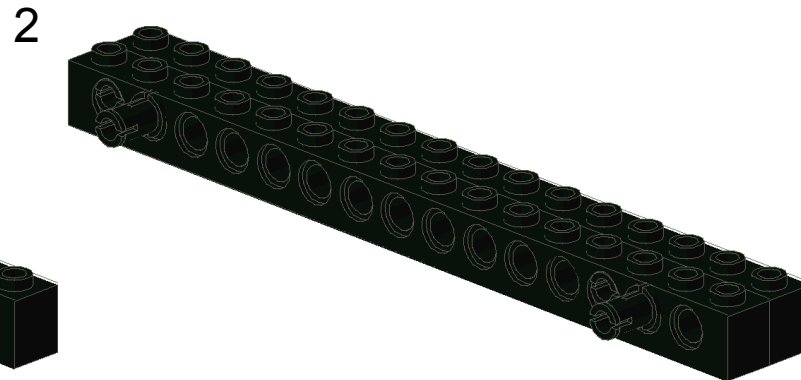
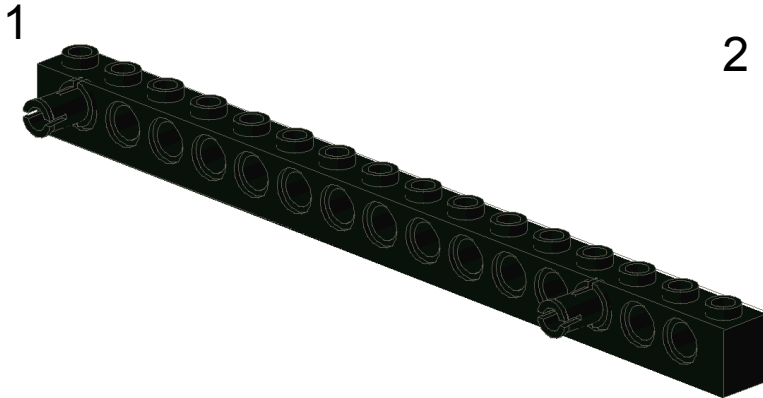
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Key Words:

Black/gray connectors

Bracing



Using black connector pegs keeps your beams together firmly without adding anything to the top or bottom of the beam structure.

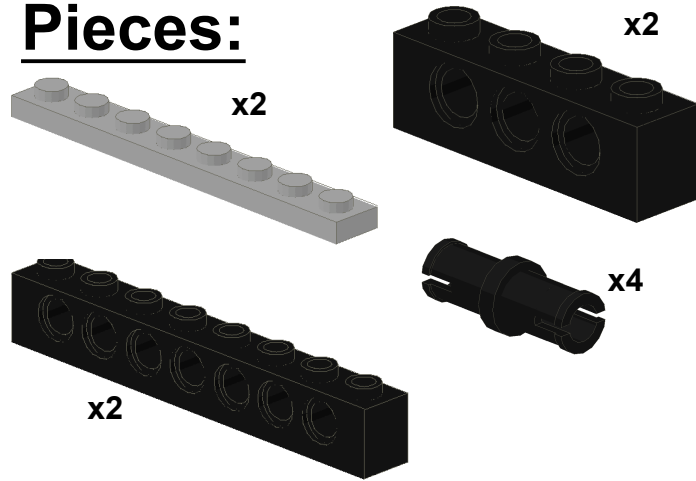
Key Words:

Black/gray connectors

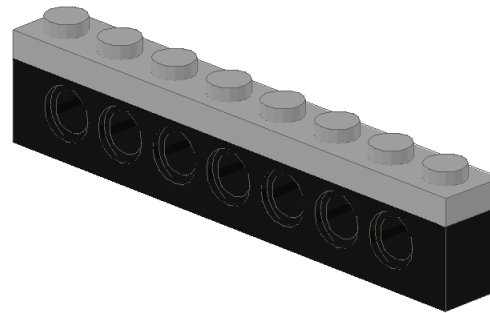
Sturdy Structures:

Bracing with beams

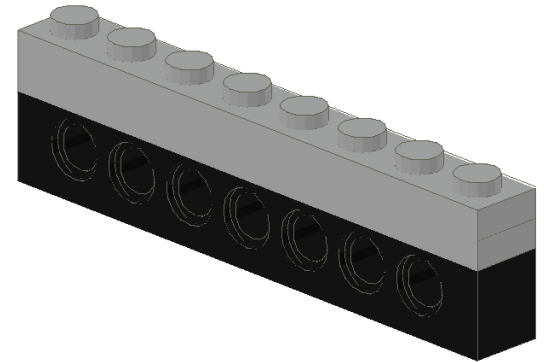
Pieces:



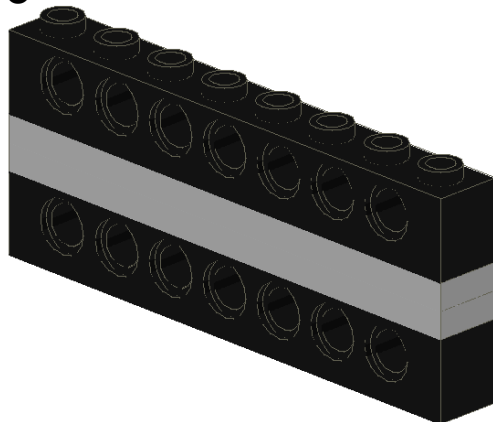
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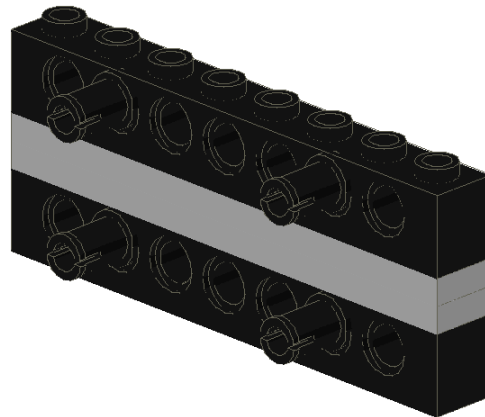
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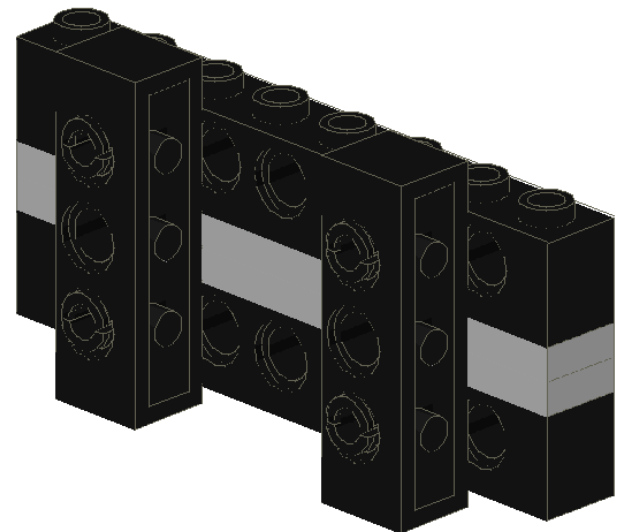
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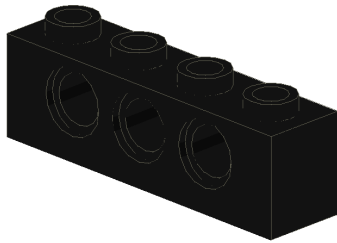


Sturdy Structures:

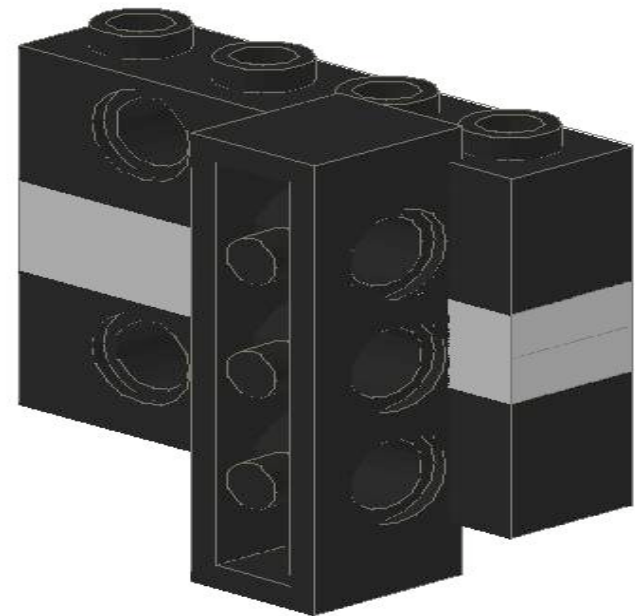
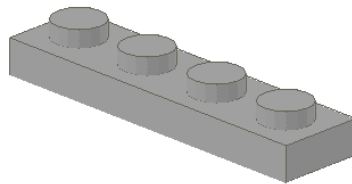
Bracing with beams

Pieces:

x3

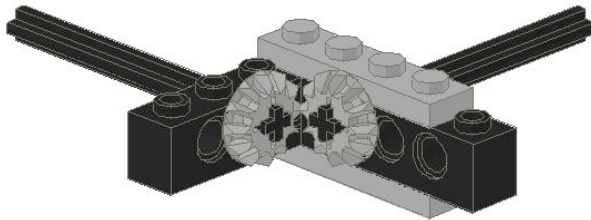


x2



Changing Axis

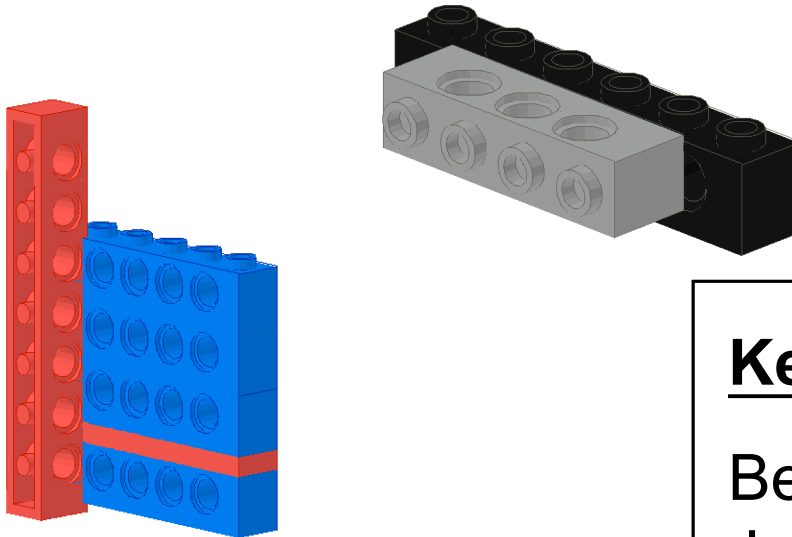
Bevel Gear



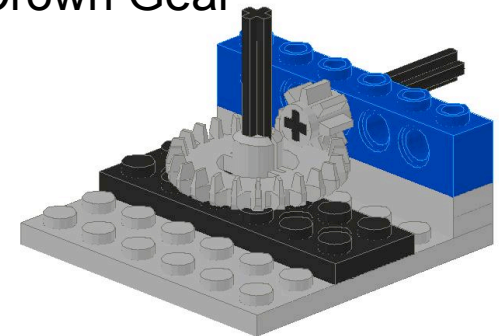
Toggle Joint



Changing axis with beams



Crown Gear



Key Words:

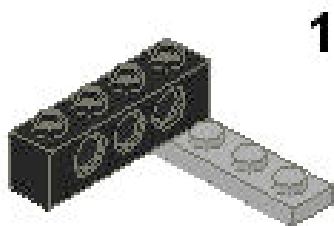
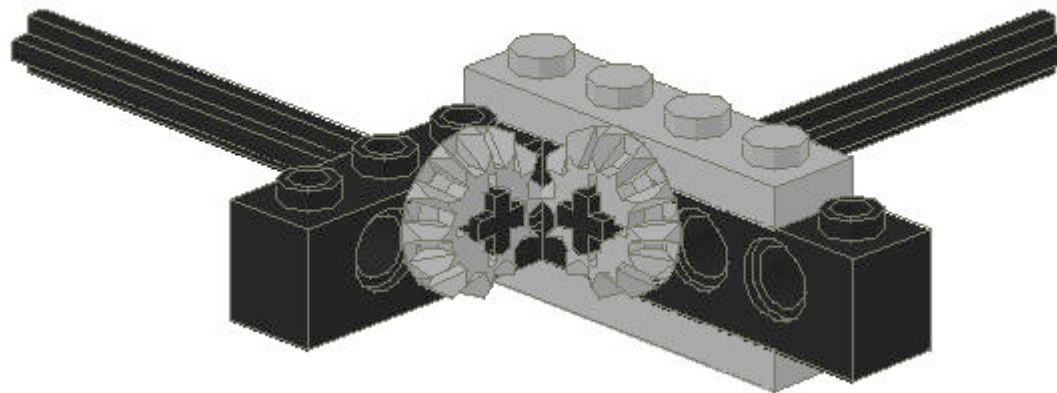
Bevel Gear, Crown Gear, Toggle Joints, Beams

Changing Axis:

Stationary Legos

Bevel Gear

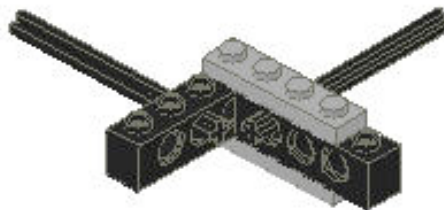
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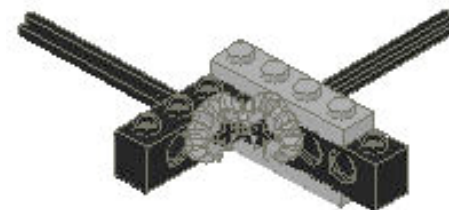
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Key Words:

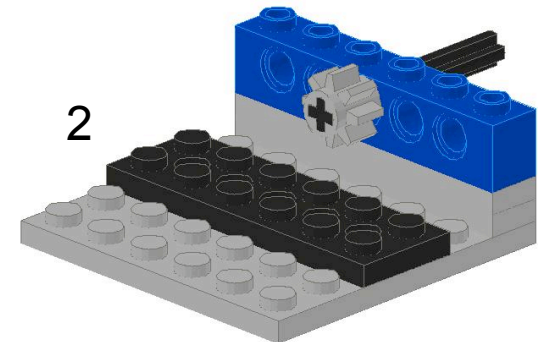
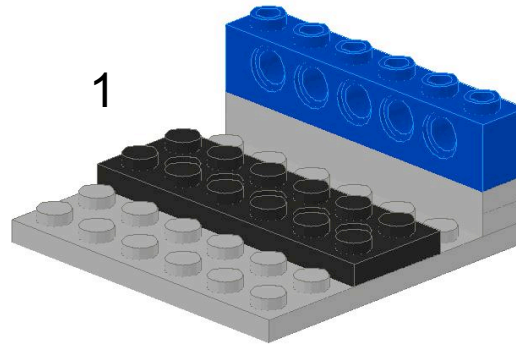
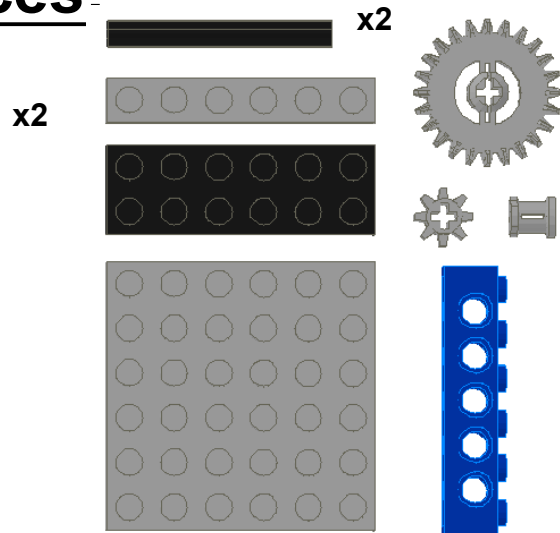
Bevel

Changing Axis:

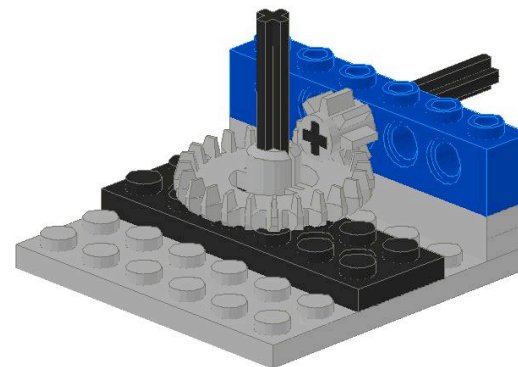
Stationary Legos

Crown Gear

Pieces:



3



Key Words:

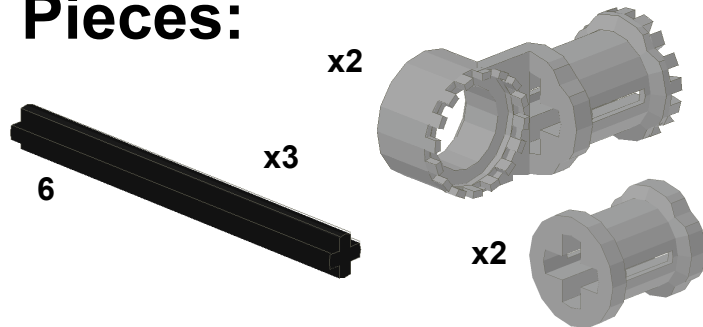
Crown Gear

Changing Axis:

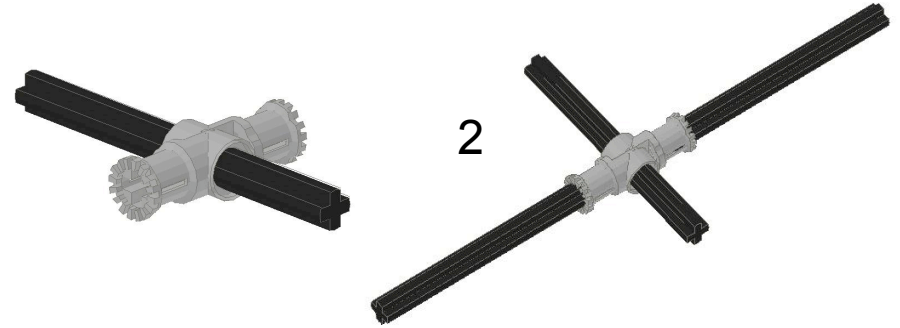
Stationary Legos

Toggle Joint

Pieces:



Type
1Key
Word\$:



3

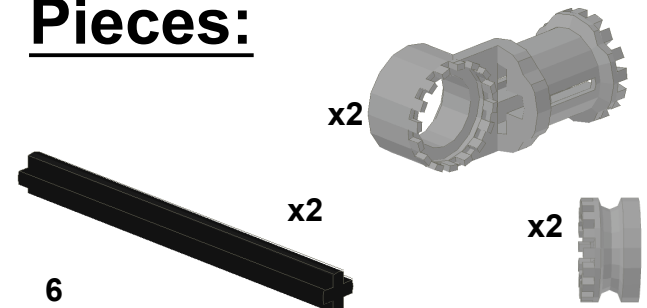


Type
2Key
Words:

Note: This type of toggle joint can lock into position at an arbitrary angle.

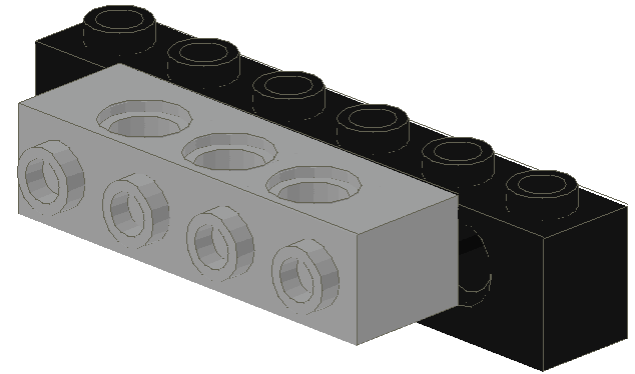
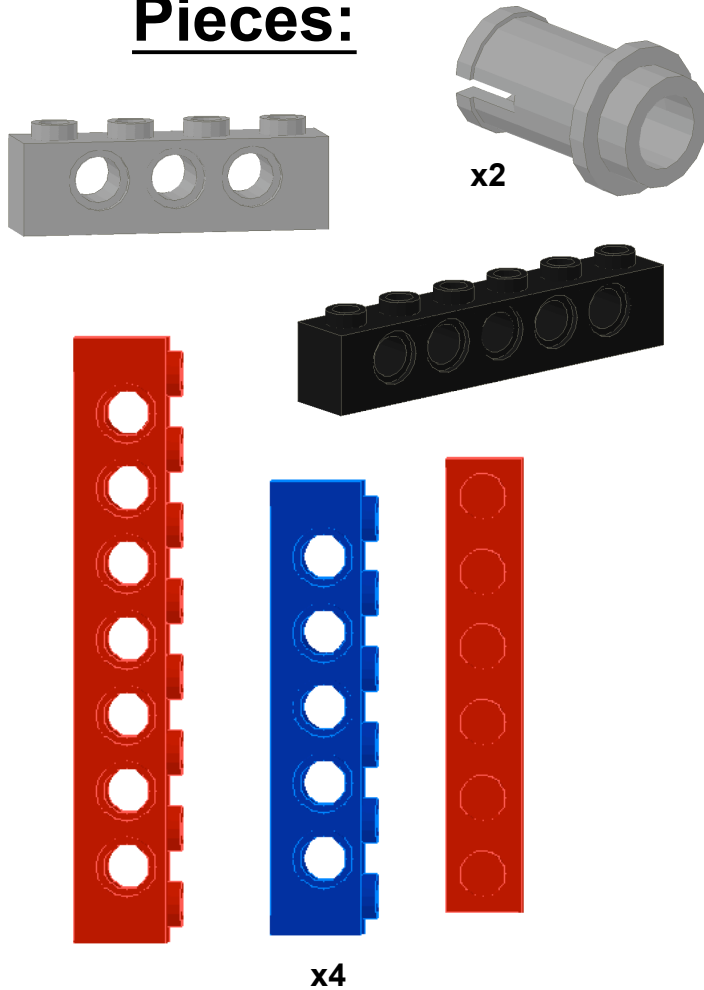


Pieces:

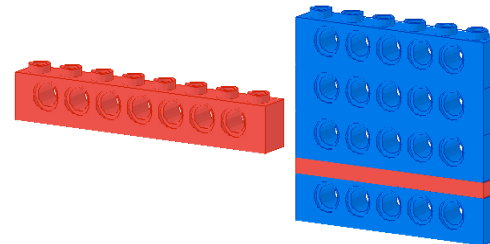


Changing Axis Using Beams

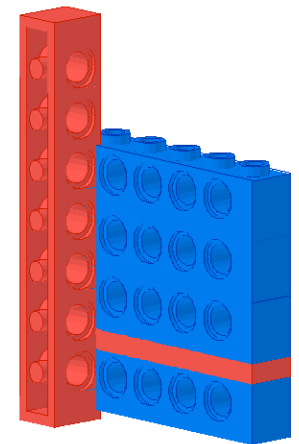
Pieces:



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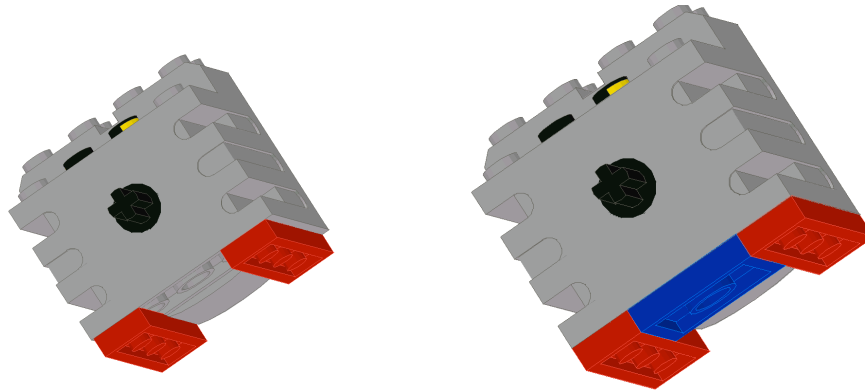
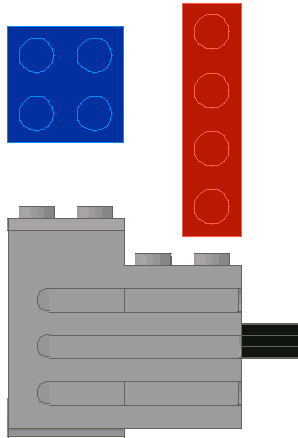


Moving Parts

- Building Vehicles
- Building Animals
- Artistic Lego Adventures
- Smart Structures
- Miscellaneous

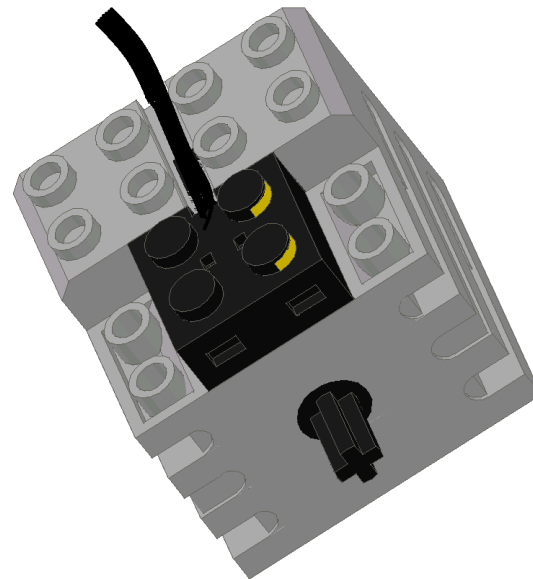
How to Attach Motors

Pieces:



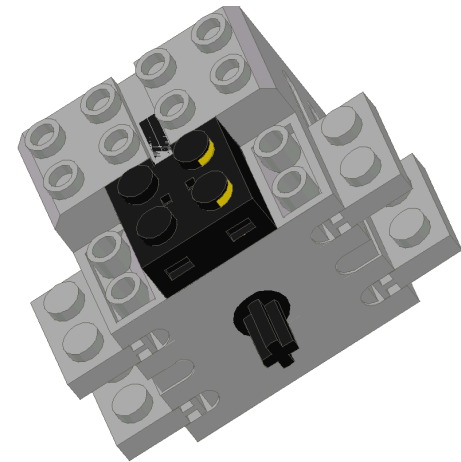
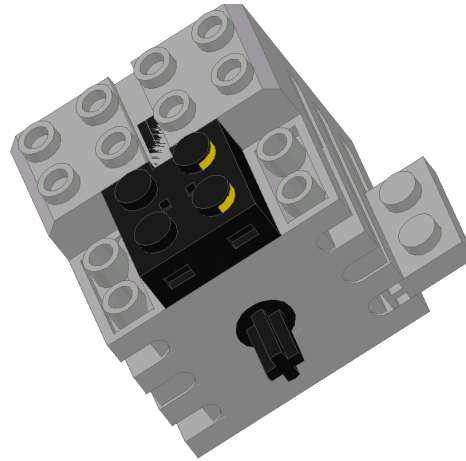
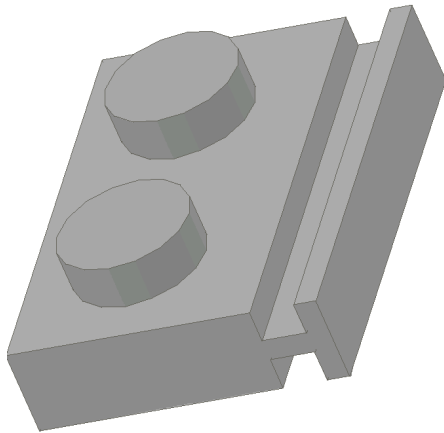
Due to the curved bottom of the motor it is sometimes difficult to build structures with motors. For this reason we have constructed a typical motor “housing” as shown above.

Also when adding motors to a project you want to be sure to attach the wires before building on top of the motor. The top of each motor has a wire gulley which the wire should fit through and still be able to have a lego piece on top.



How to Attach Motors

Pieces:



On either side of the motor there are slots which are very helpful when you do not have room to build the motor housing shown previously. Instead you can slide in the piece shown at the right which then connects to any lego piece above or below it.

Wheels:

How to choose the right wheel for the right job

Add tractor
treads



Wheels:

How to choose the right wheel for the right job



- Medium wheel: This is a great all purpose tire. Well suited for most building projects.



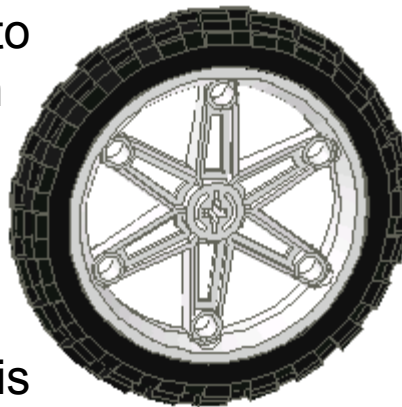
- Small wheels: These are best for small cars, but can be used in place of a medium wheel if need be.



- Wide wheel: This tire is good for traction. In general the wider the tire, the better grip it has to the road. This is helpful when pulling loads or climbing hills.



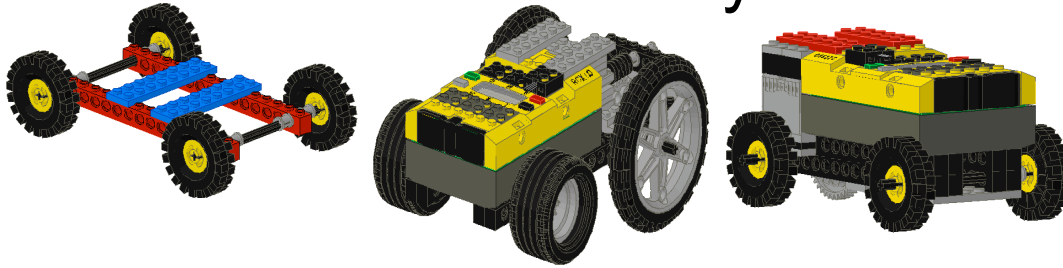
- Thin wheels and skid plates: These work best when there is little weight on them. Skid plates are especially helpful in stabilizing 2 wheel cars



- Large wheels: These wheels are great for big projects, or to make fast cars. In general, the larger the wheel the faster the car will go, however, larger wheels also have slower acceleration.

Wheels:

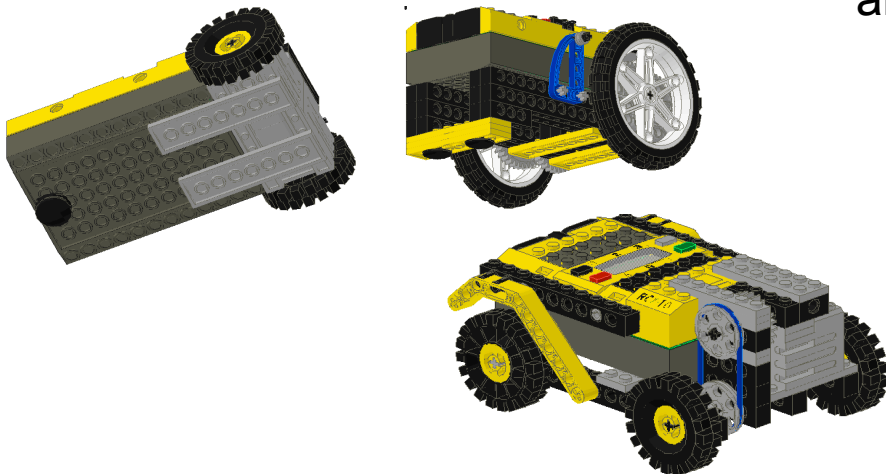
How many wheels should I use?



2 Wheels: Use two wheels and a skid plate when you want your vehicle to turn easily and it is not too heavy that the skid plate would cause too much friction.

4 Wheels: Use four wheels when your vehicle will only be going forward. Do not use four wheels if you want your vehicle to turn easily. (ex. Snail Car Race).

3 Wheels: Use three wheels with a swivel wheel in the front or back when you want your structure to turn easily. While swivel wheels can be hard to construct, the benefits due to the turning ability and the ability to hold more weight is great.

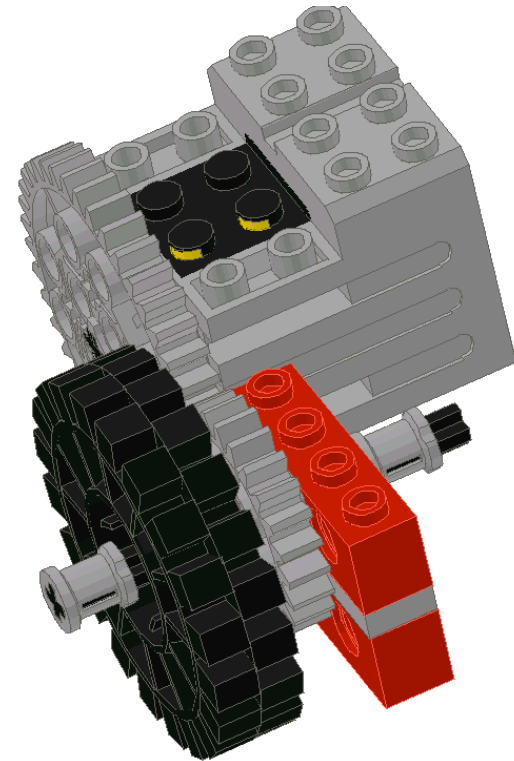
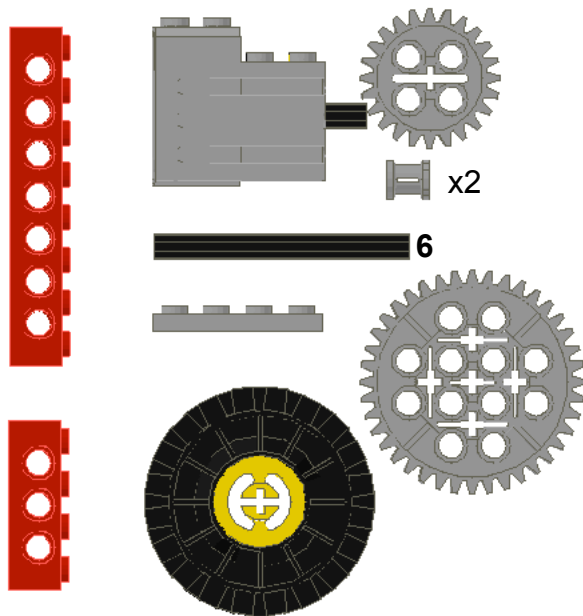


Note: When trying to build a car that turns both directions, goes in reverse, and can turn on a dime; you want to use two motors.

If your car only needs to go forward or reverse, one motor is sufficient.

Gearing Up

Pieces:

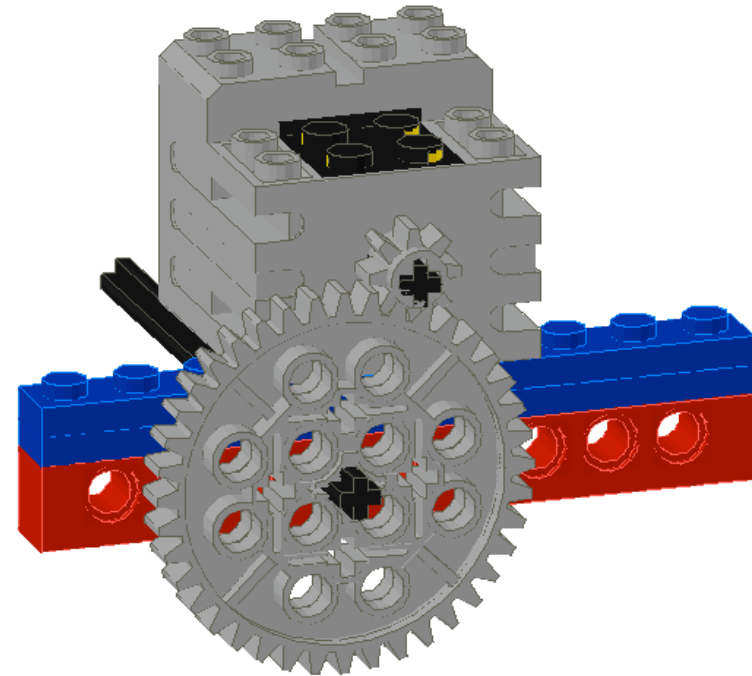
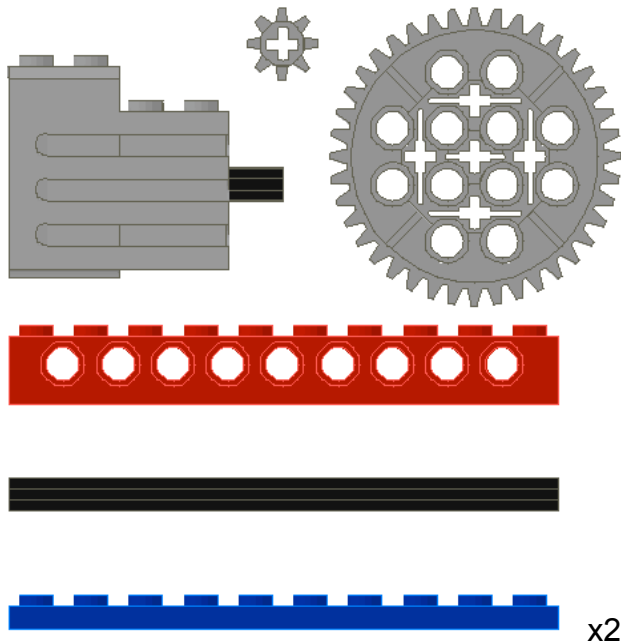


Key Words:

Gearing up, Driver, Follower

Gearing Down

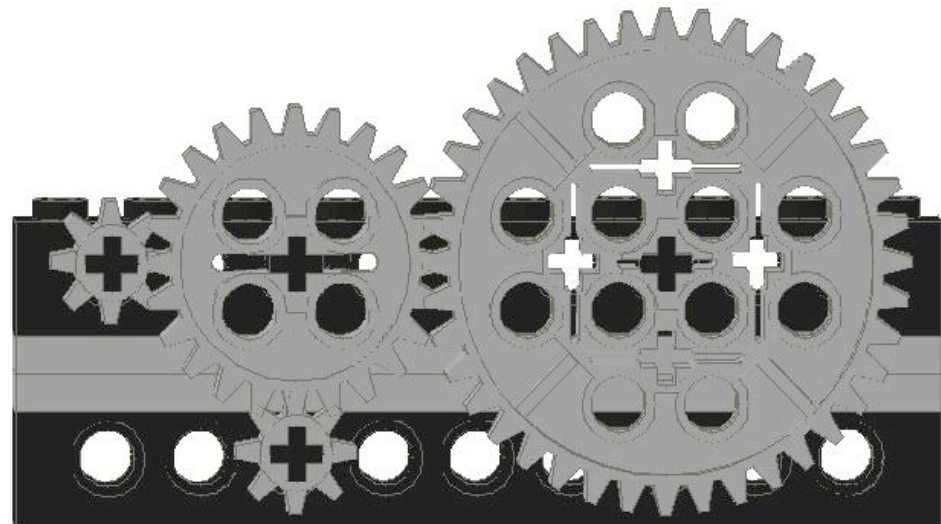
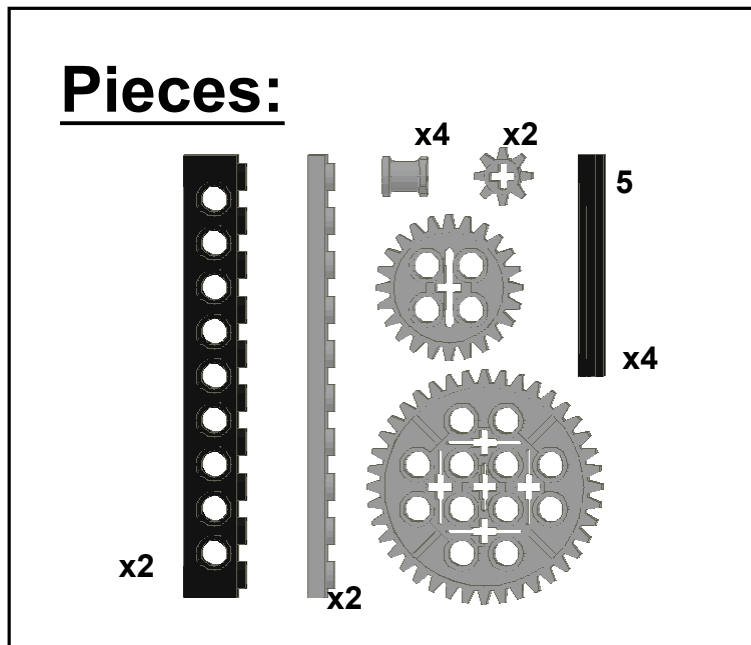
Pieces:



Key Words:

Gearing down, Driver, Follower

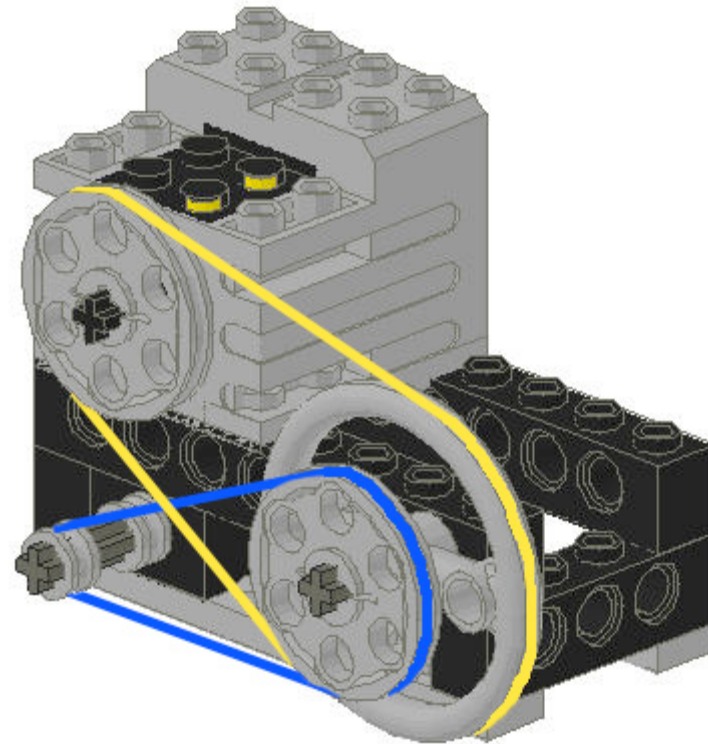
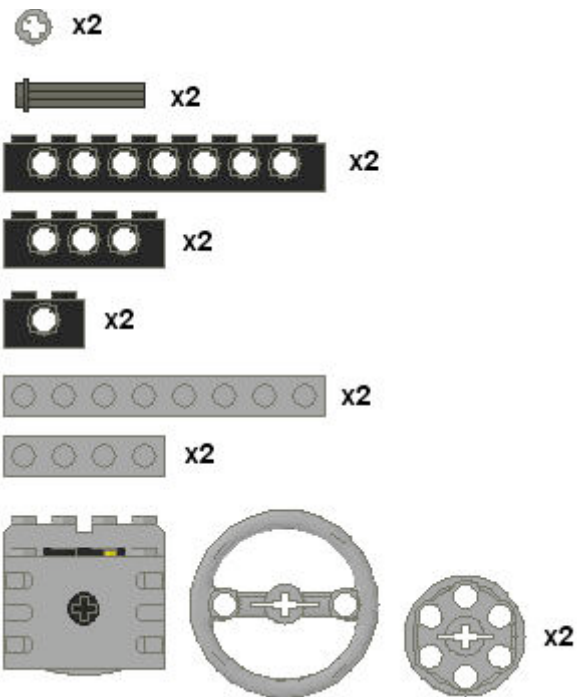
Multiple Gears



Note: Here's an example of how some of the more common gears mesh together. There are many other options for meshing these gears as well.

Pulley

Pieces:

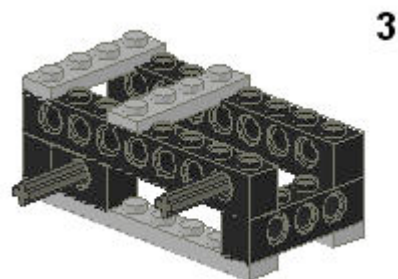
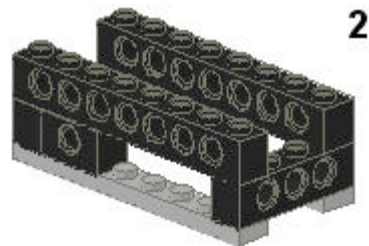
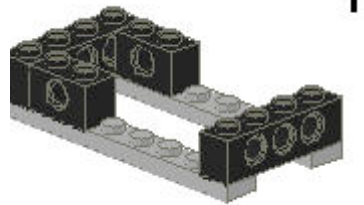
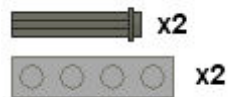
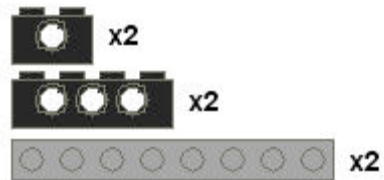


USES:

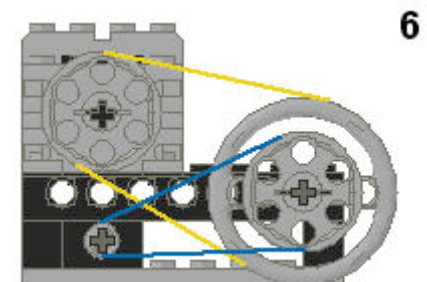
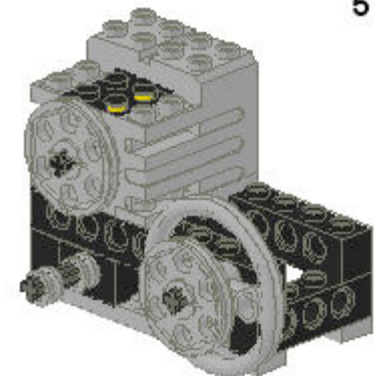
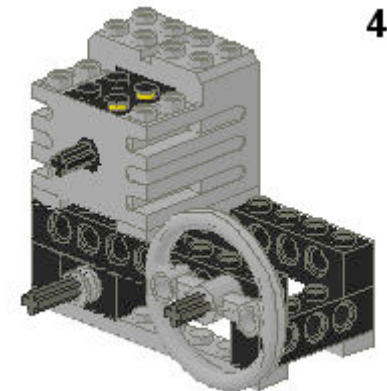
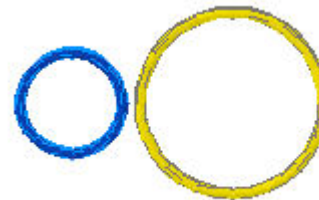
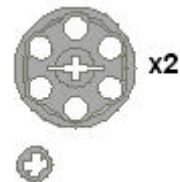
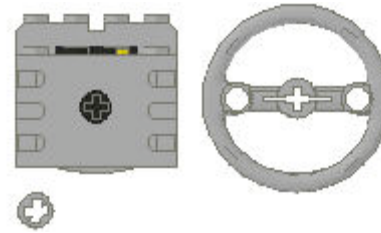
Pulleys, like gears, can be used to change axle speeds. In fact, pulleys can sometimes be an easier to use than gears, if the axles they connect to are in hard to reach places.

Pulley

Pieces:



Pieces:

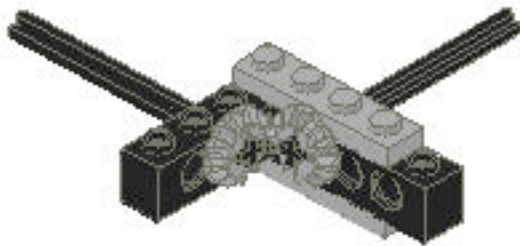


Building a Vehicle

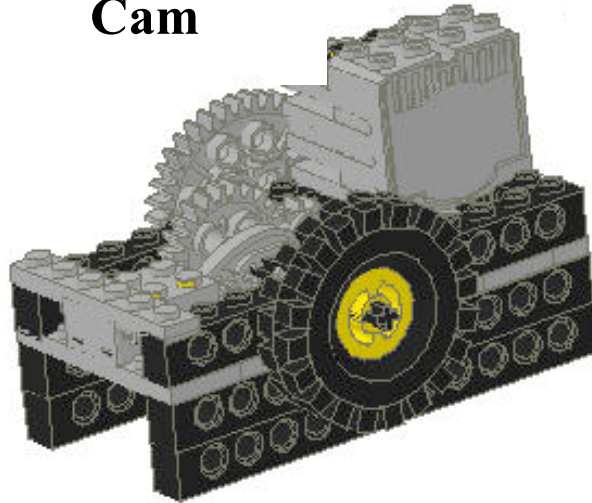
Special Gears

Moving Parts

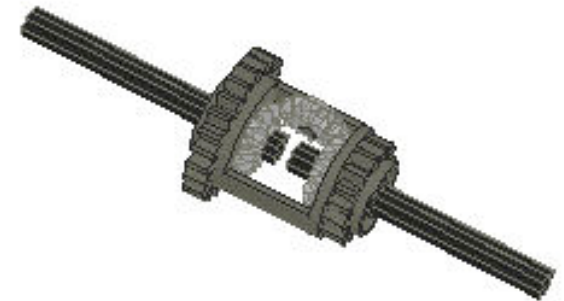
Bevel Gear



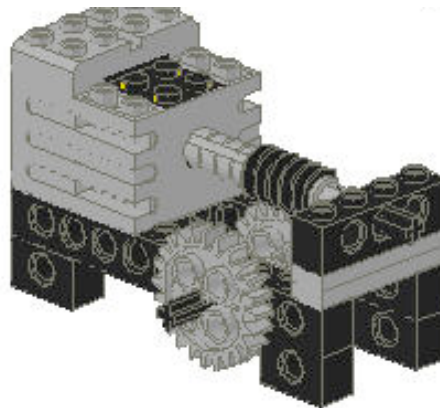
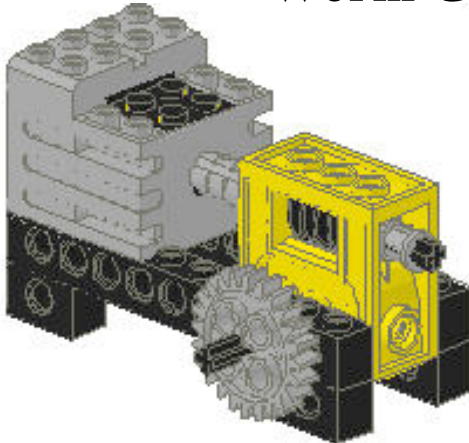
Cam



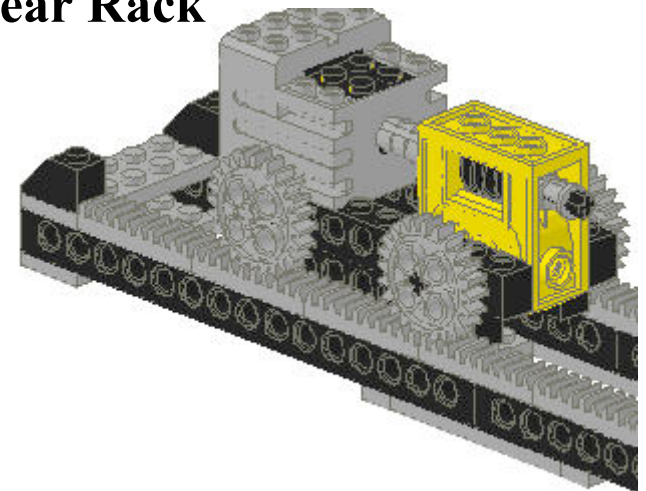
Differential



Worm Gear

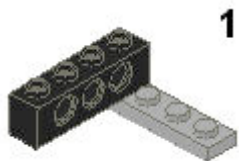
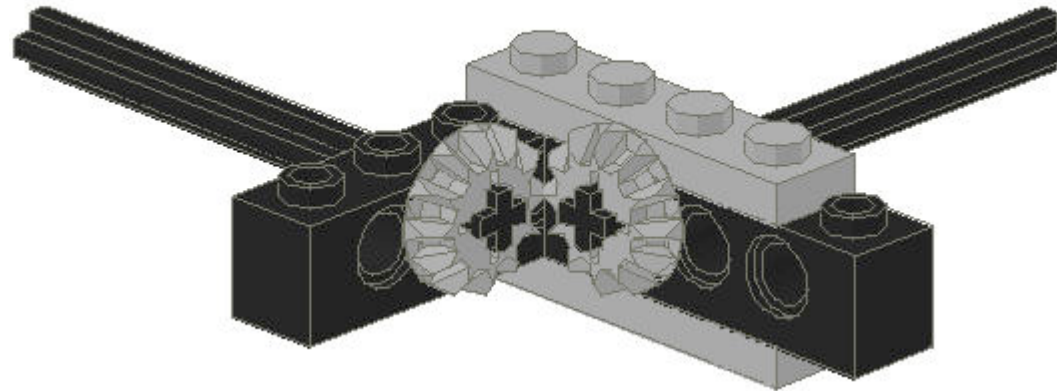


Gear Rack



Bevel Gear

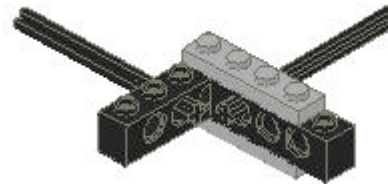
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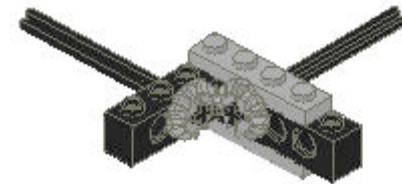
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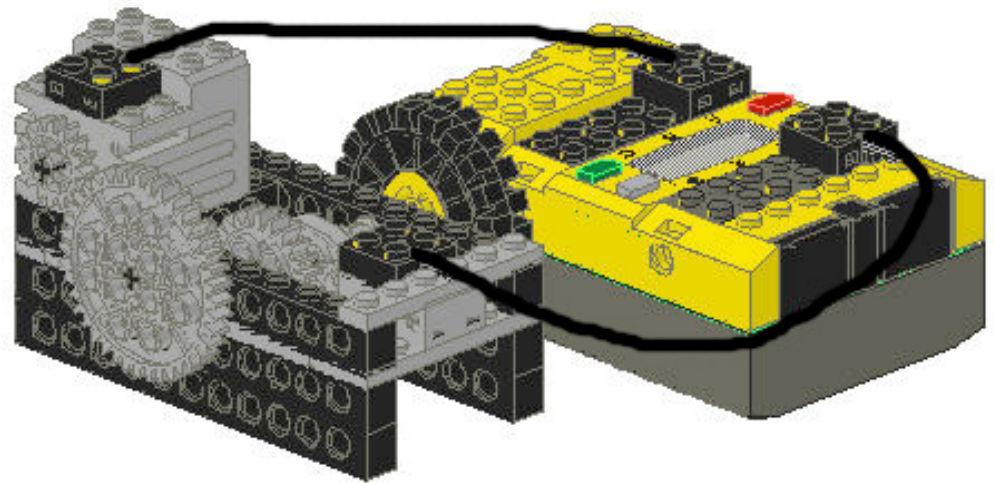
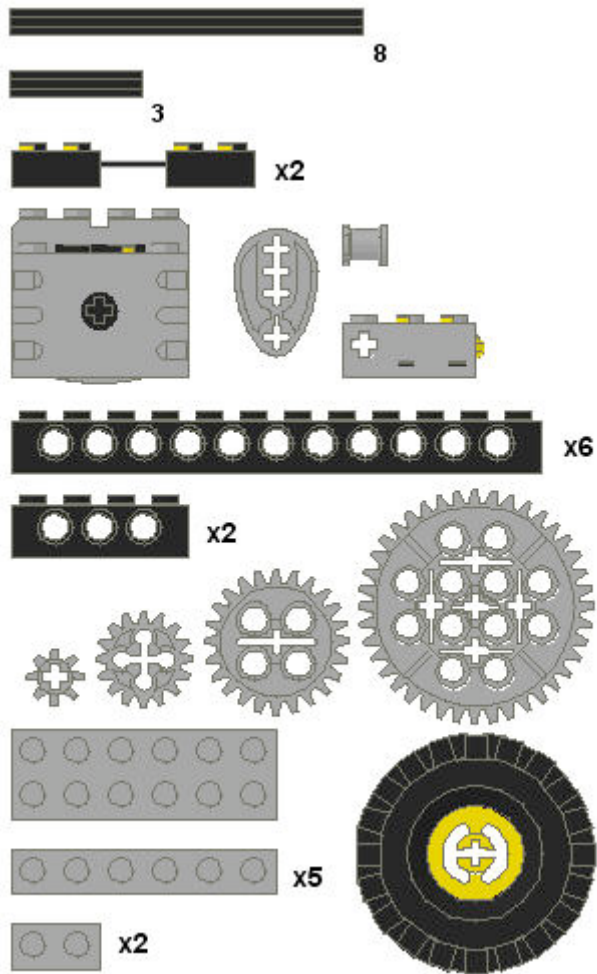
4

Key Words:

Bevel

Cam

Pieces:

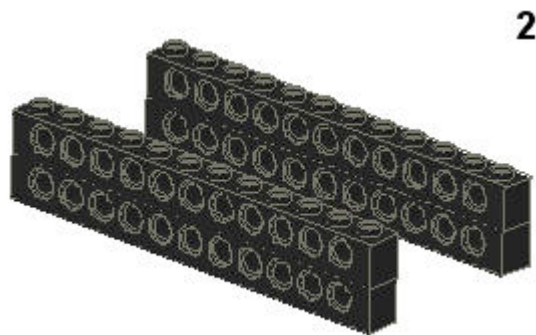


Cam

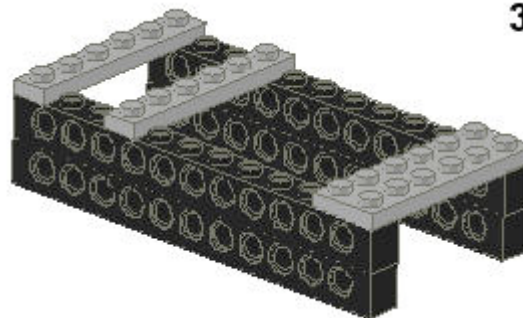
Pieces:



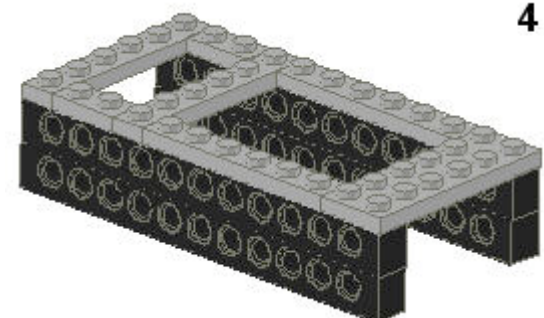
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2



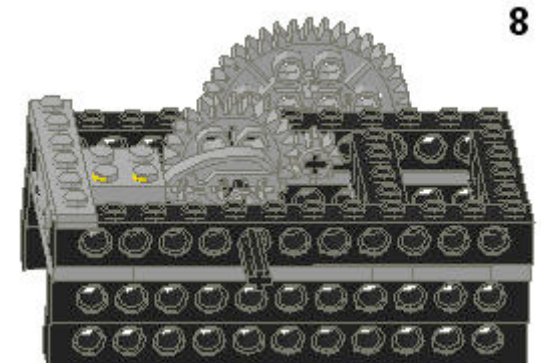
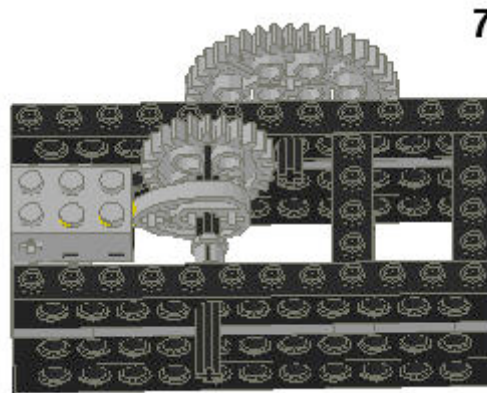
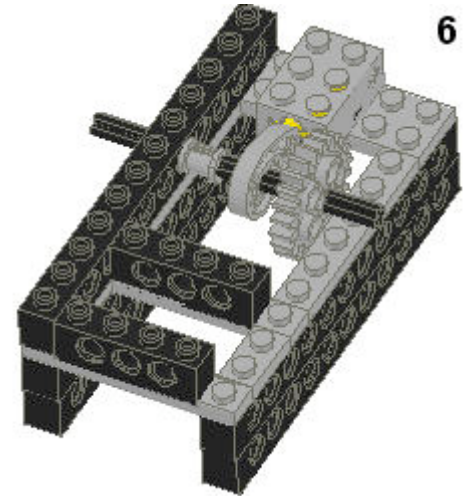
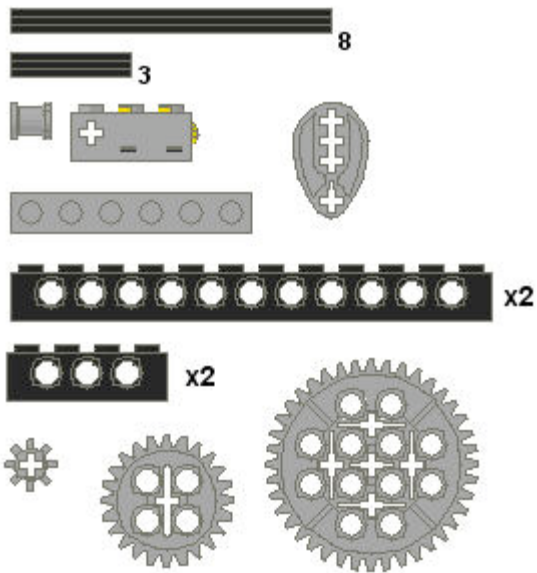
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4

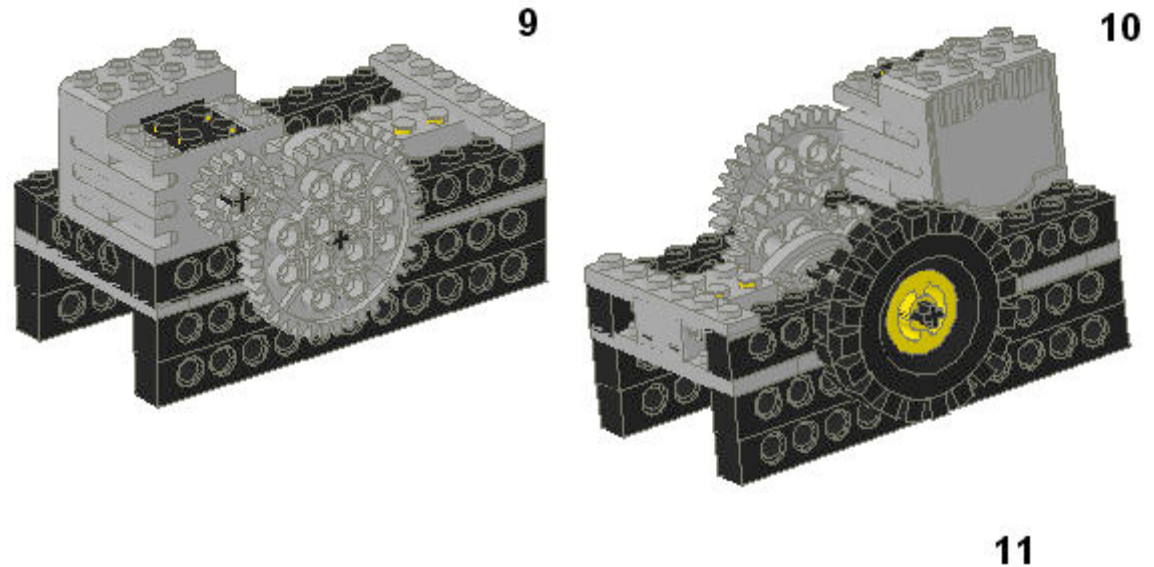
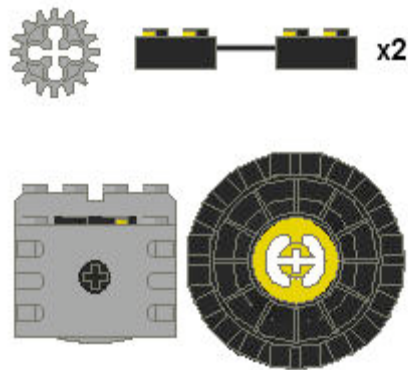
Cam

Pieces:



Cam

Pieces:

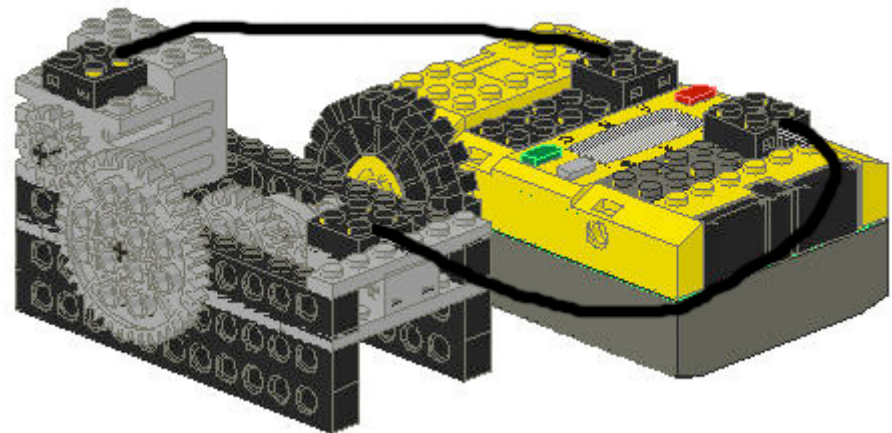


11

RoboLab ProgramKey

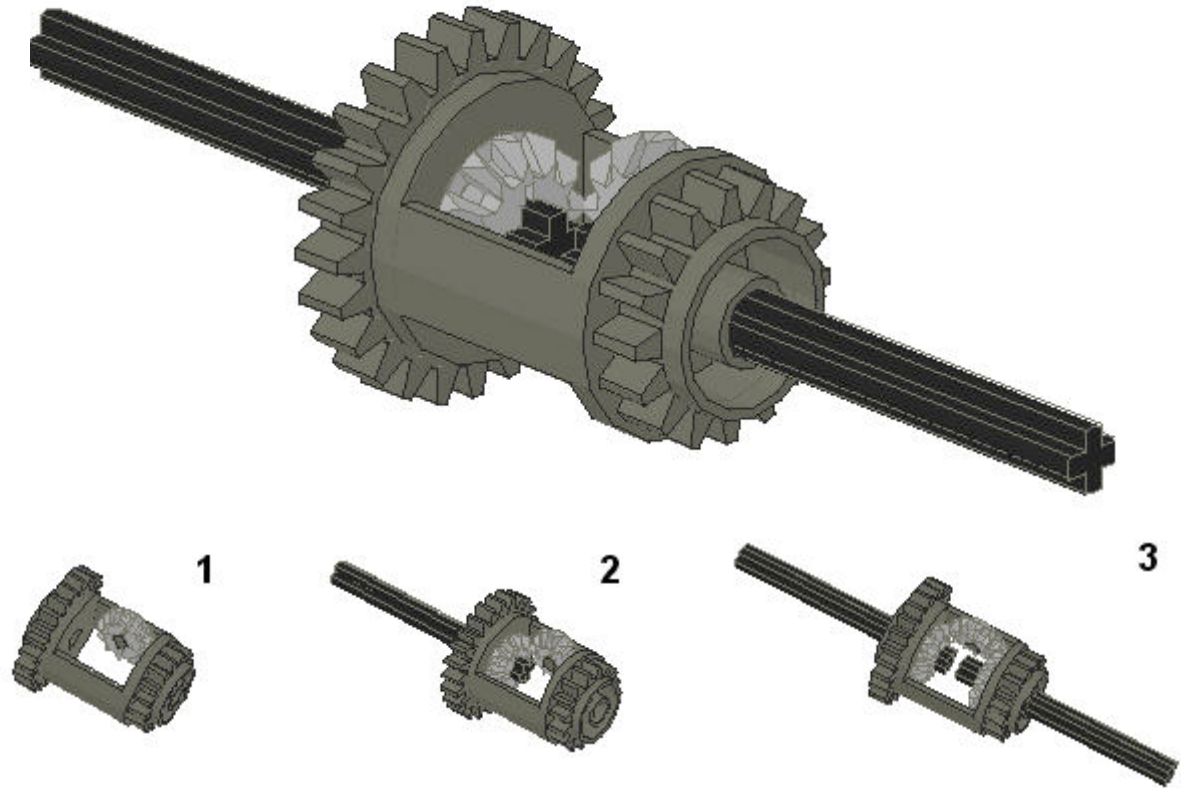
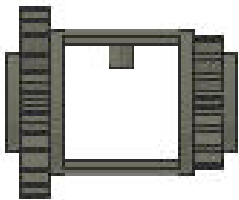


This program switches the direction wheel spins every time the touch sensor is pressed.



Differential

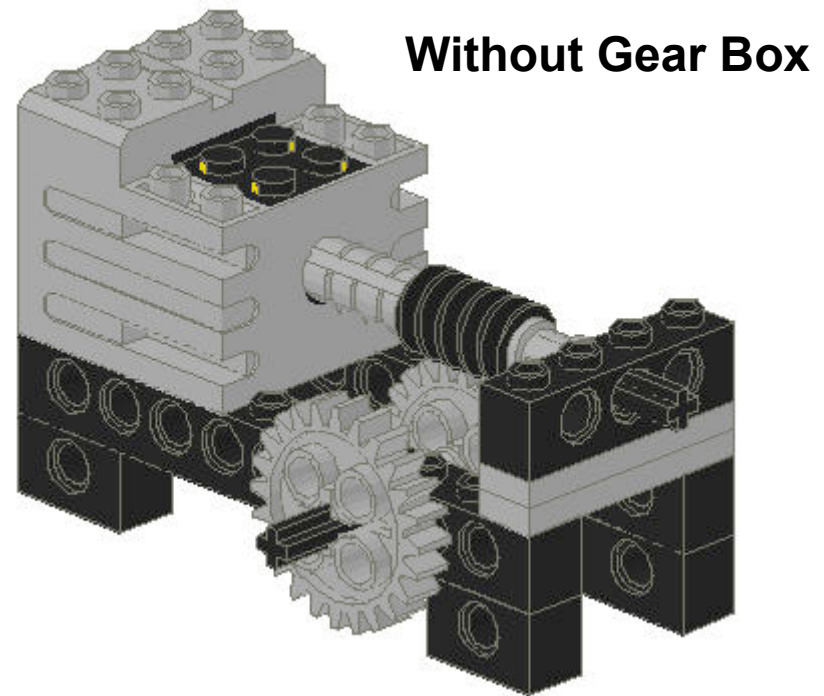
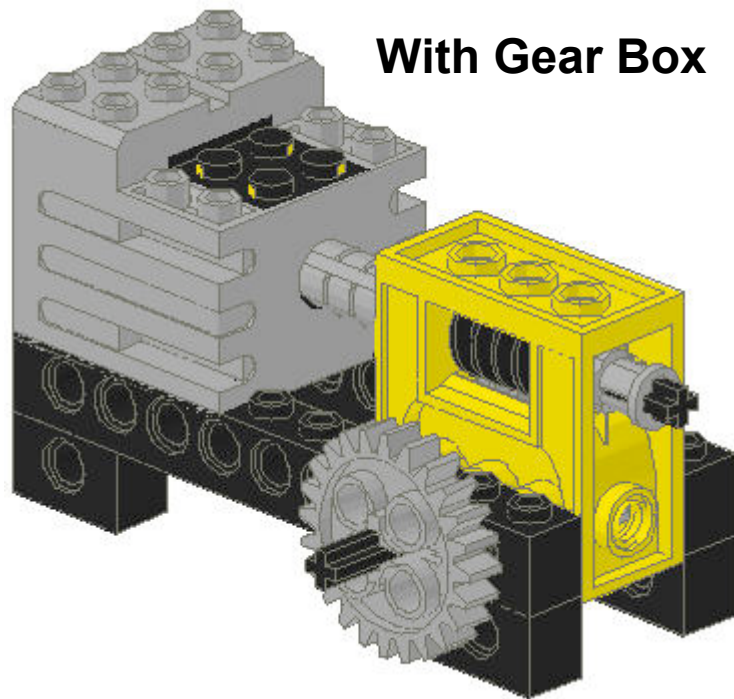
Pieces:



Uses: With wheels attached to each axle of the differential, a device is made that turns more easily. If other gears and a motor are attached to the differential itself, a mechanical gear selector can be made.

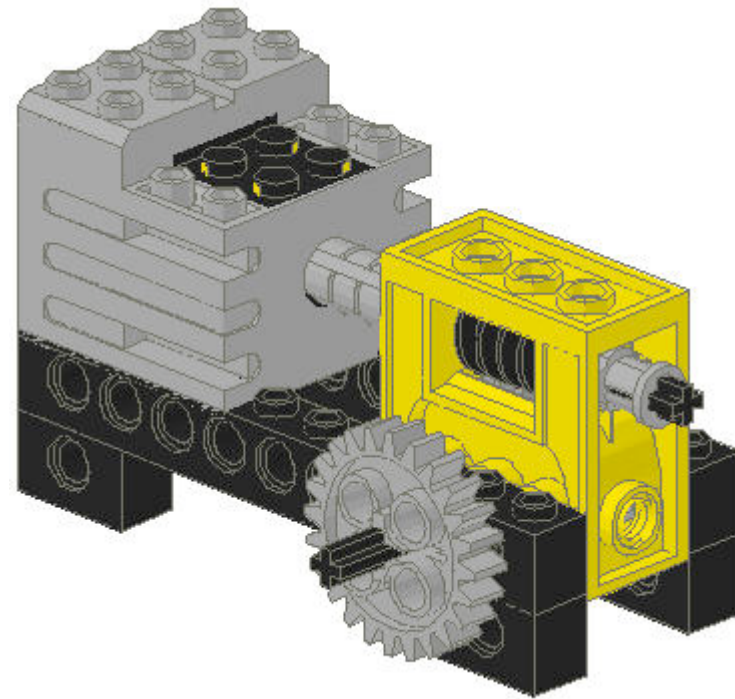
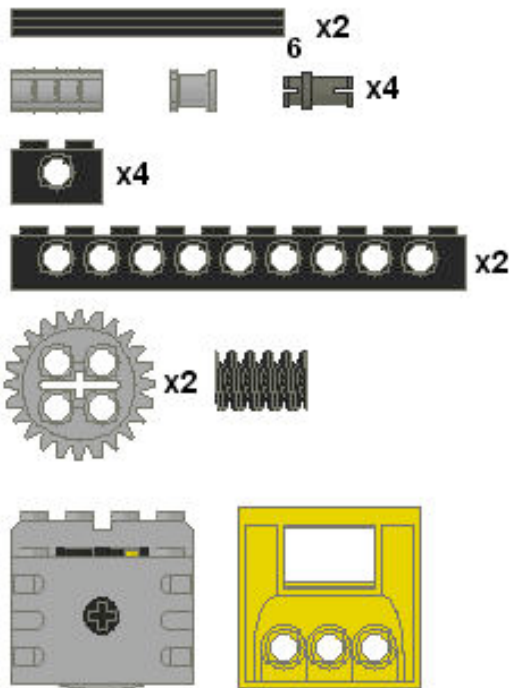
Worm Gear

Two easy ways to use the worm gear:



Worm Gear: With Gear Box

Pieces:



Uses: The worm gear generates lots of torque. Therefore, even though it turns slowly it can be used to lift heavy loads, or move big cars.

Worm Gear: With Gear Box

Pieces:



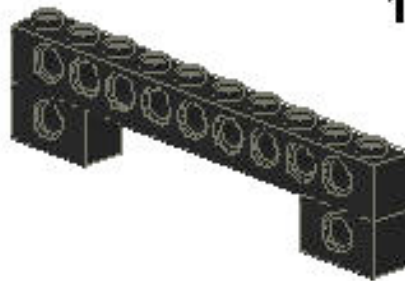
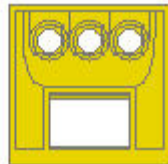
6



x4



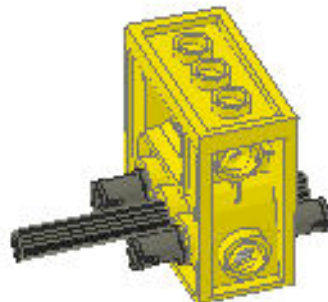
x2



1



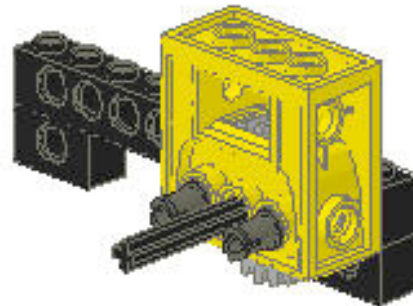
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3



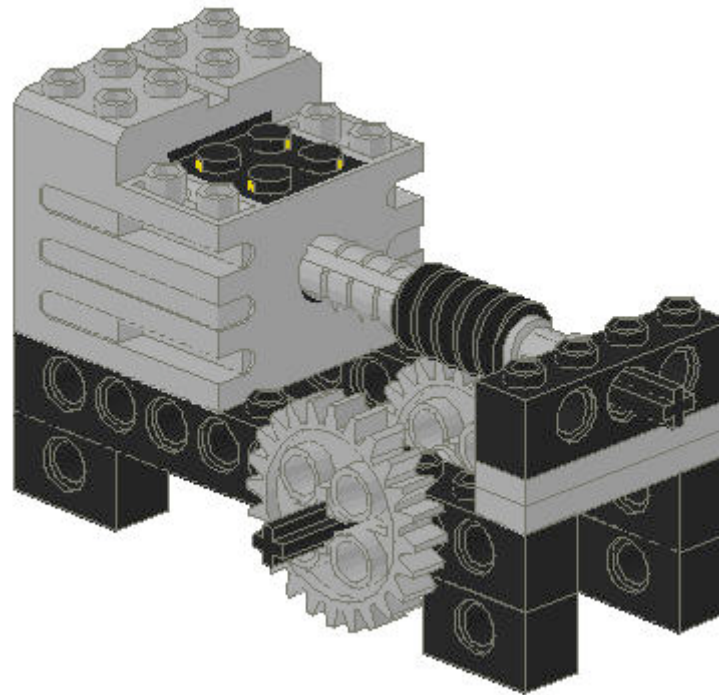
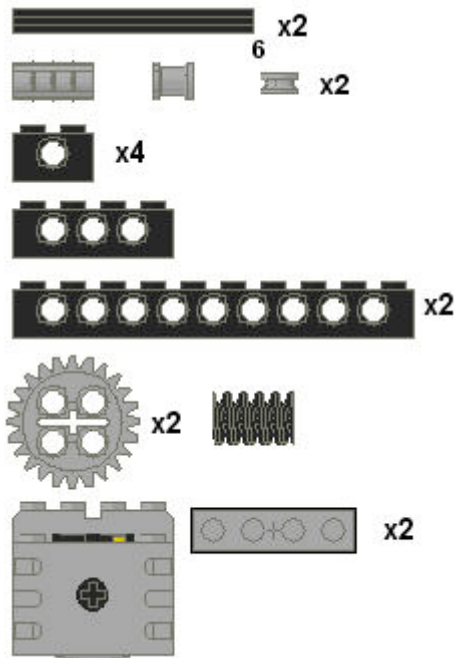
x4



4

Worm Gear: Without Gear Box

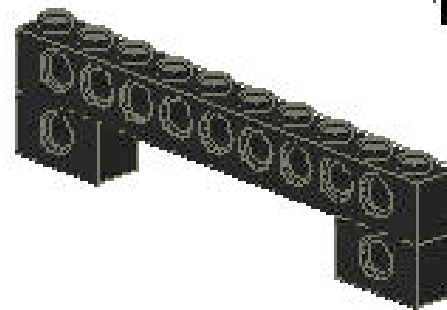
Pieces:



Uses: The worm gear generates lots of torque. Therefore, even though it turns slowly it can be used to lift heavy loads, or move big cars.

Worm Gear: Without Gear Box

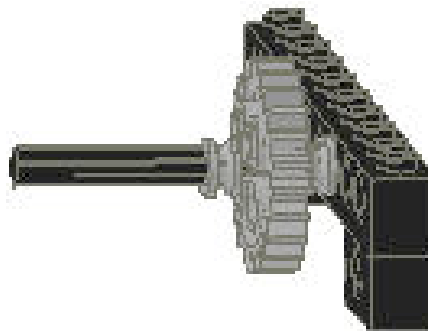
Pieces:



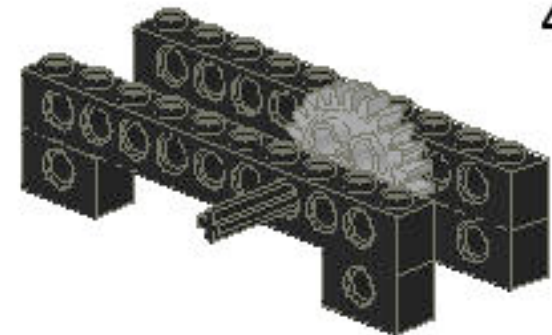
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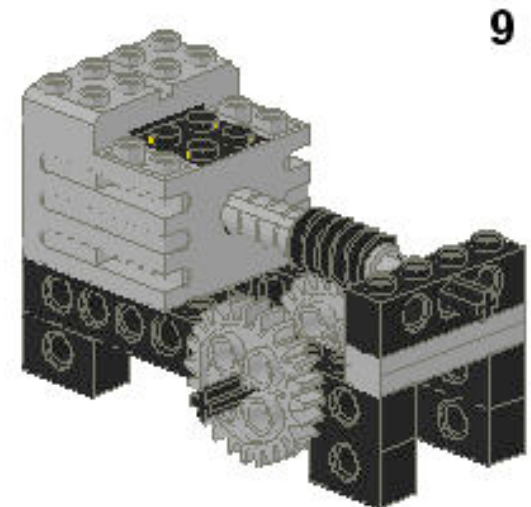
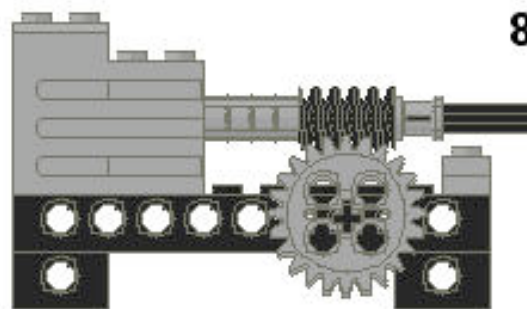
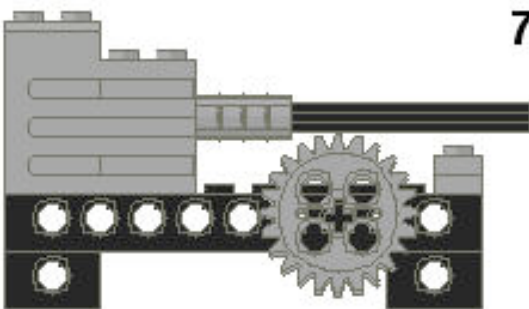
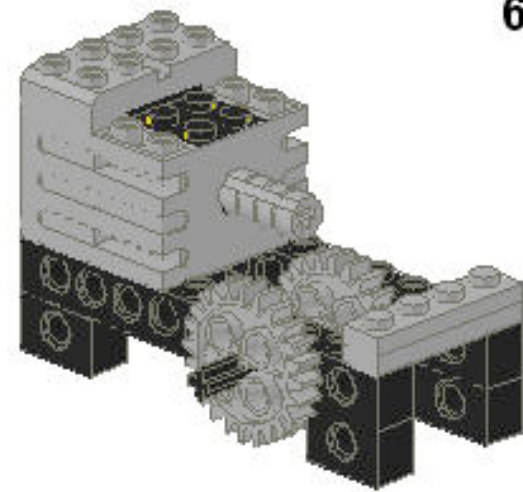
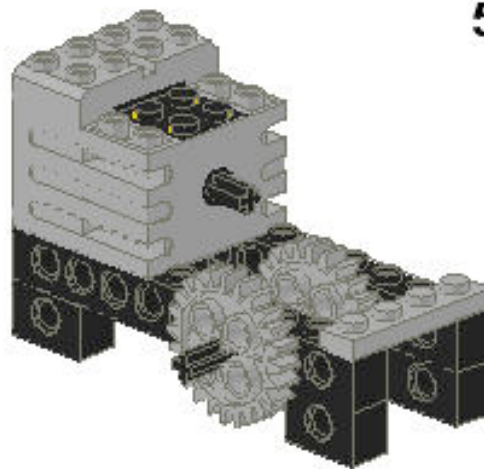
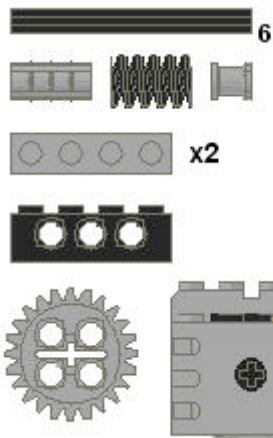
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4

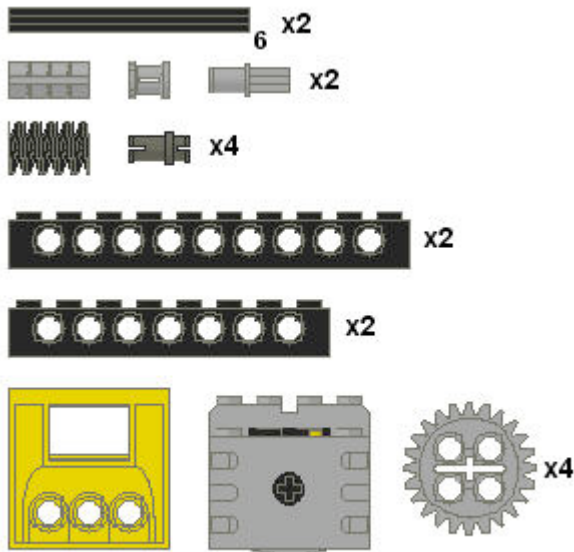
Worm Gear: Without Gear Box

Pieces:

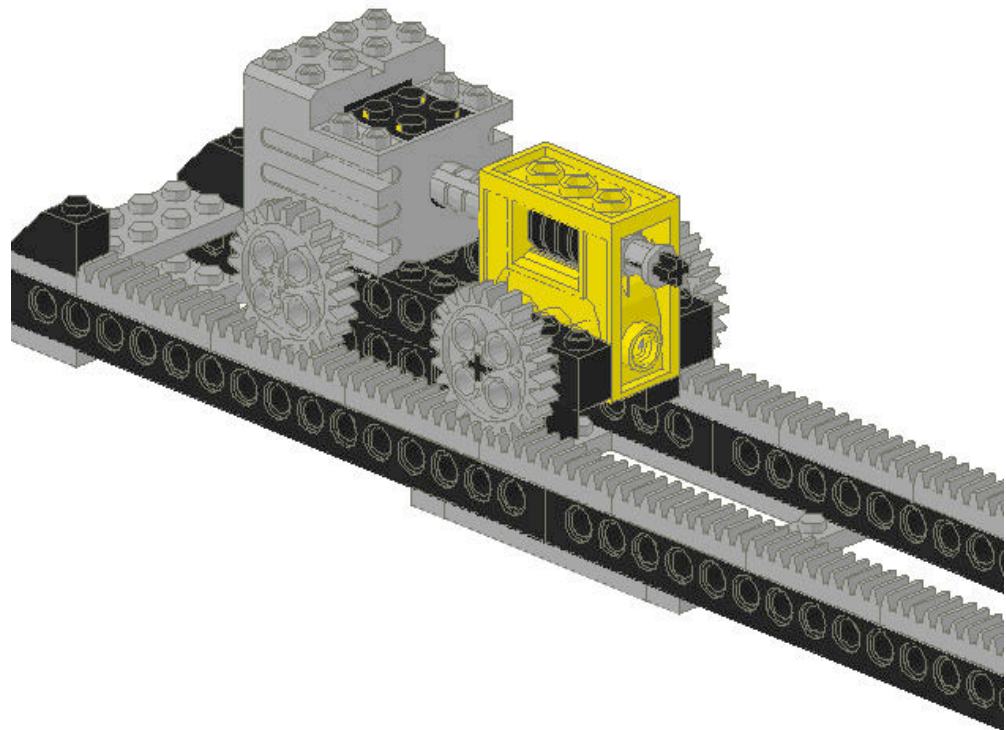
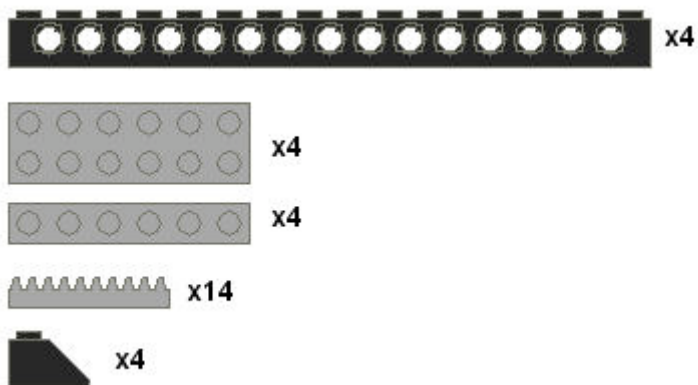


Gear Rack

Train Pieces:



Track Pieces:



Uses: The gear rack can be used, often with a worm gear, to make trains, move arms, or lift objects.

Gear Rack: Train

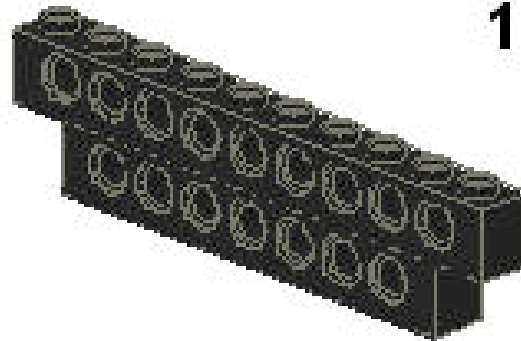
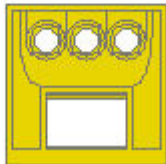
Train Pieces:



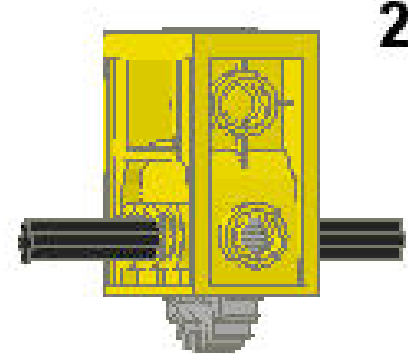
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x4



1



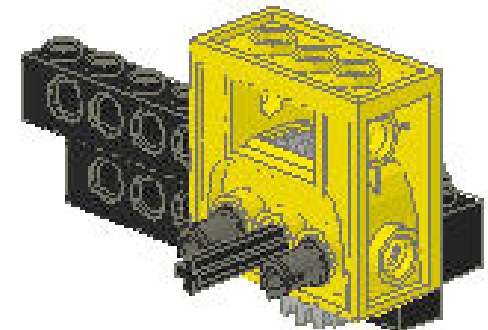
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3



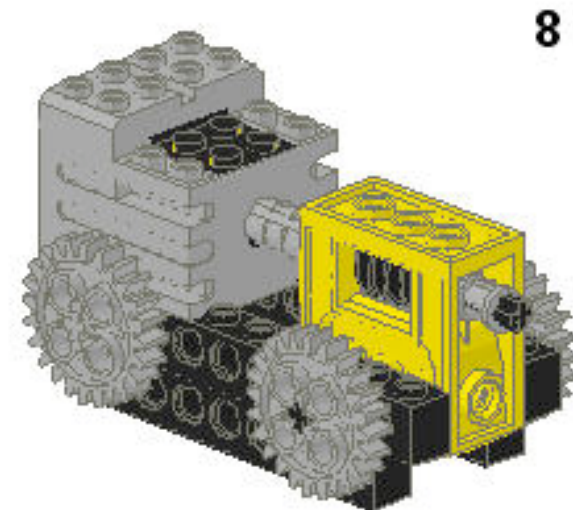
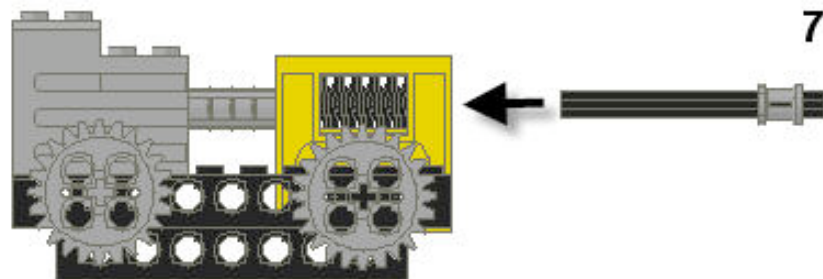
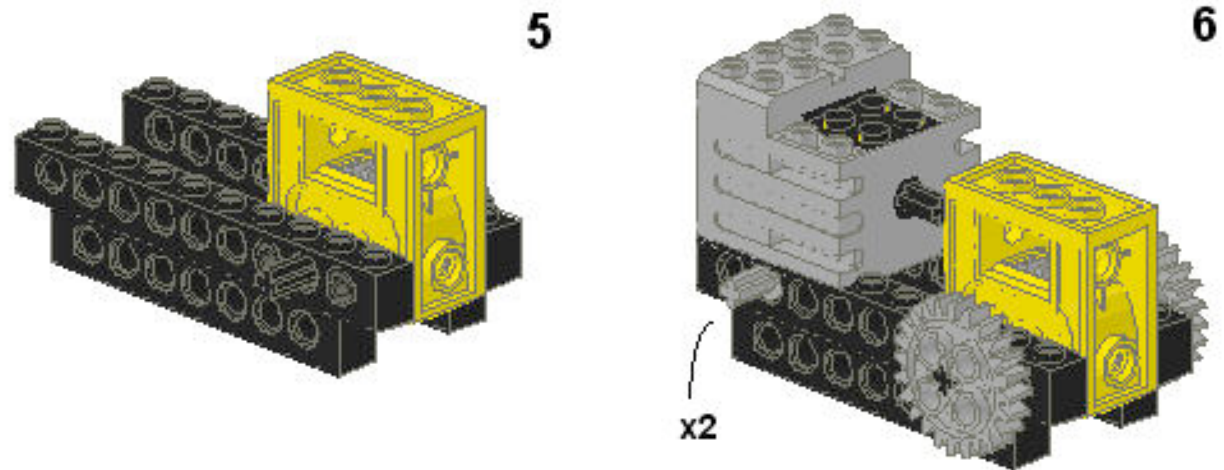
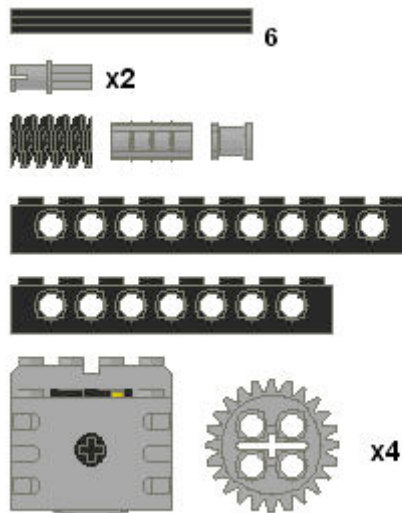
x4



4

Gear Rack: Train

Train Pieces:



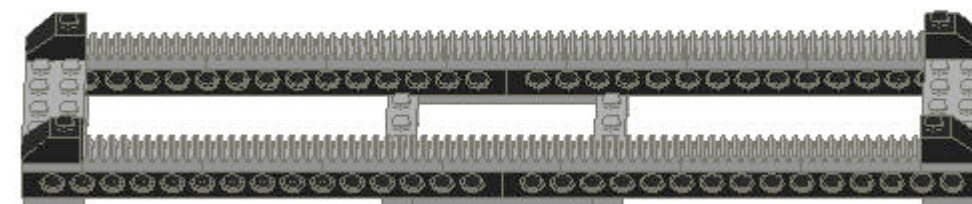
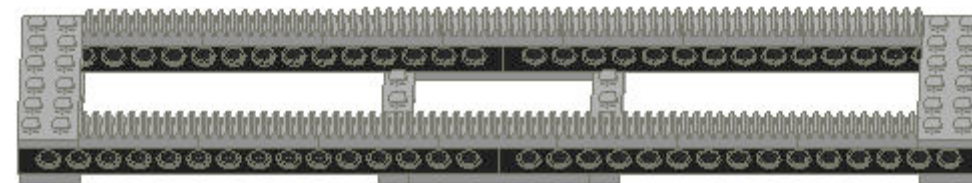
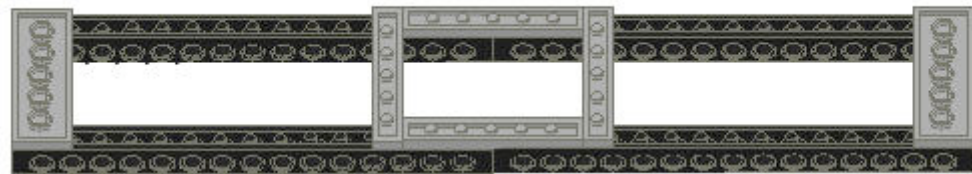
Gear Rack: Track

Track Pieces:



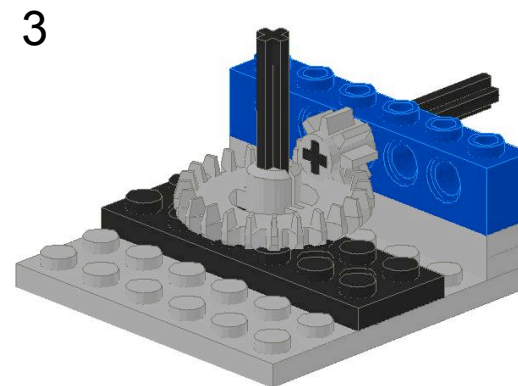
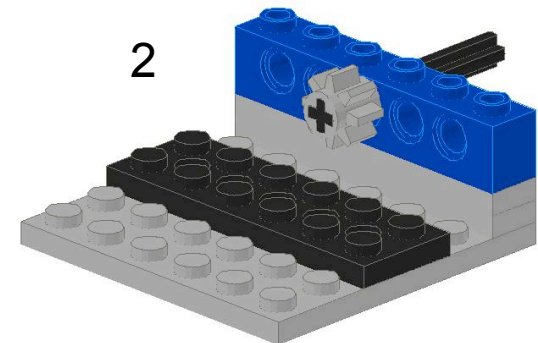
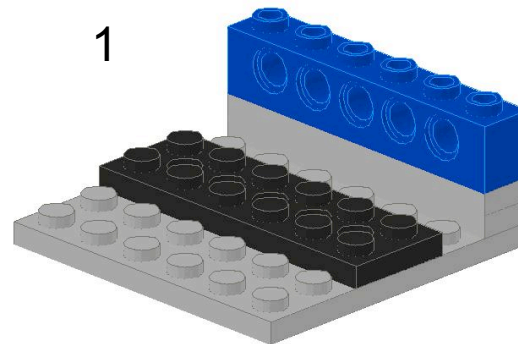
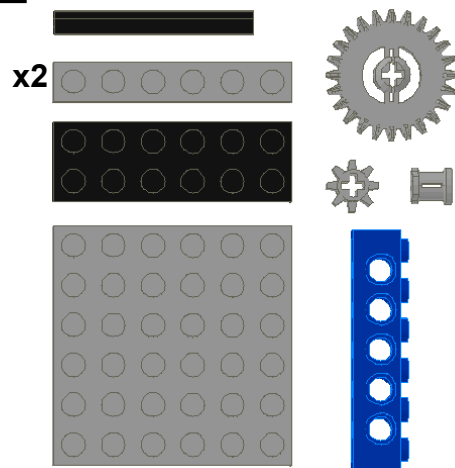
Key Words:

Put the train on the track,
attach an RCX, and watch it
go!



Crown Gear

Pieces:



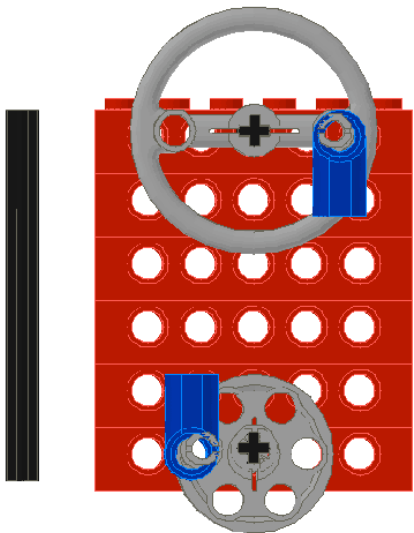
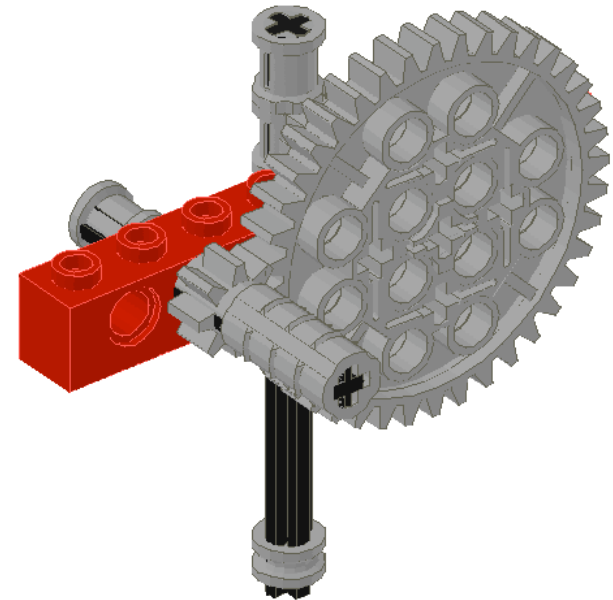
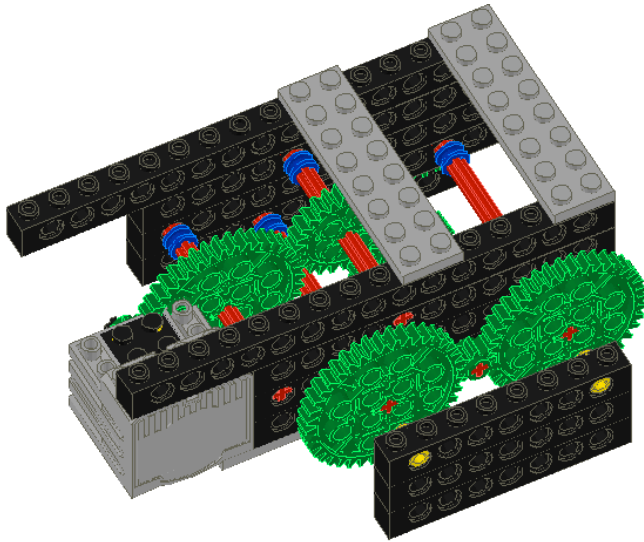
Key Words:

Crown Gear

Building an Animal

Moving Parts

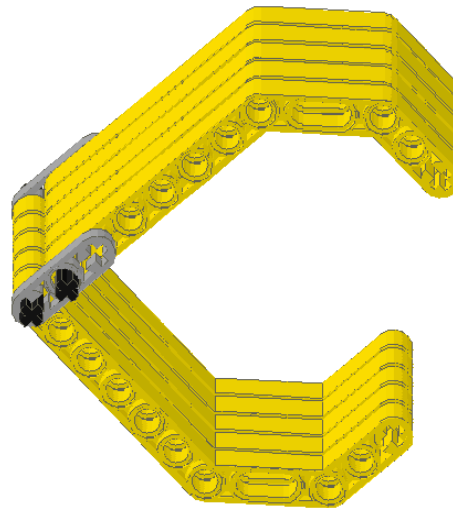
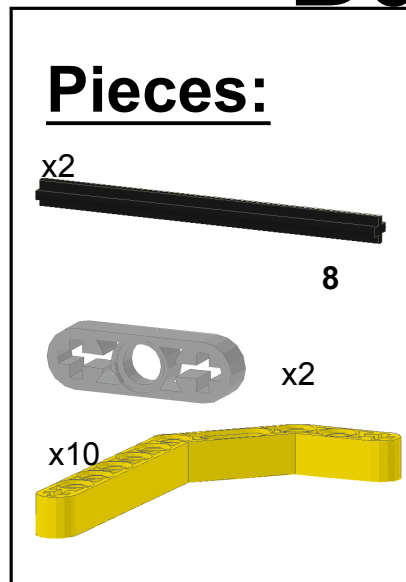
Animal Parts



Key Words:

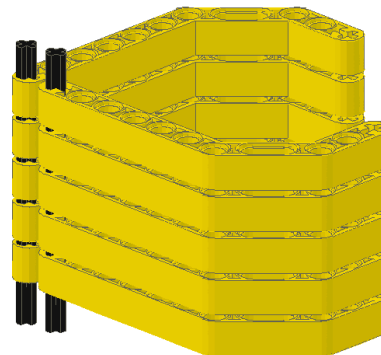
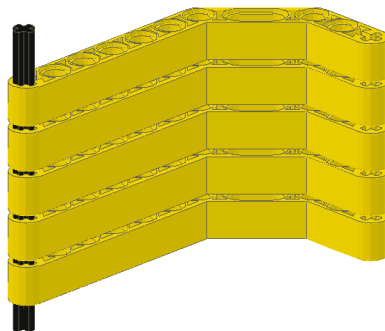
Flywheel, crank, gear rack, pulley,
(football shaped gear)

Building a beak or jaws

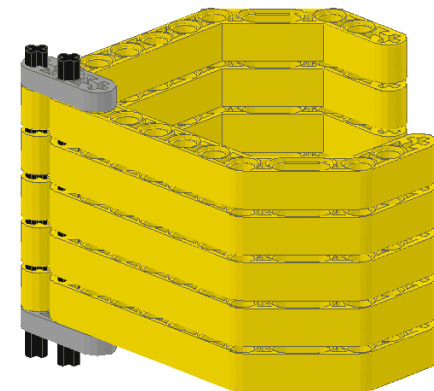


2

1



3



Building an Animal

Moving Parts

Making Wings

Pieces:

Key Words:

Flywheel, crank, gear rack, pulley,
(football shaped gear)

Walking Legs

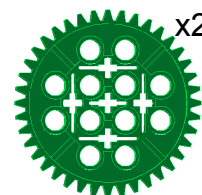

Pieces:

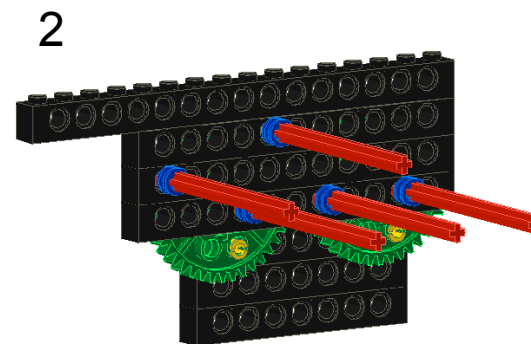
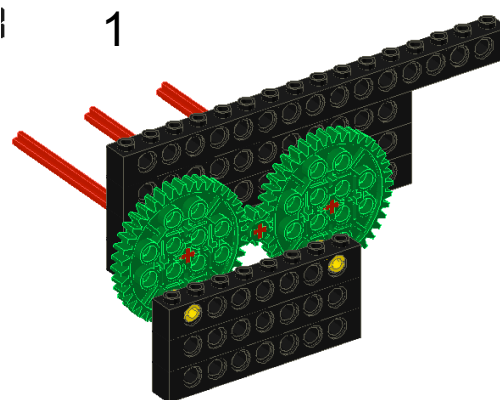
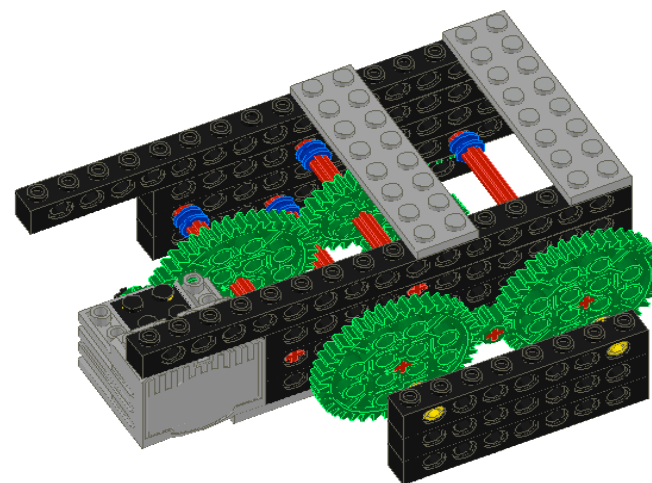
 x5



 x3

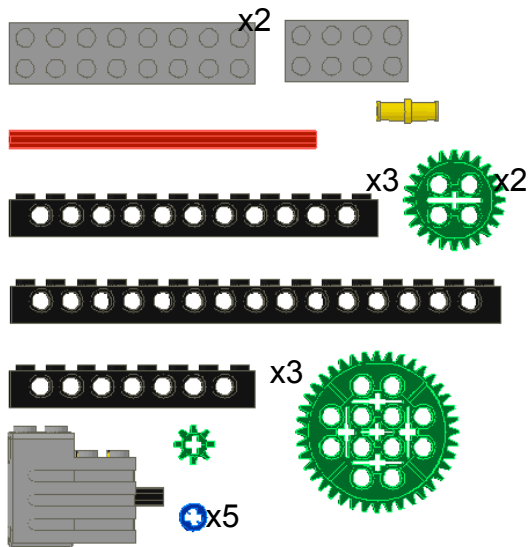
 x3  x2  x5

 x2 

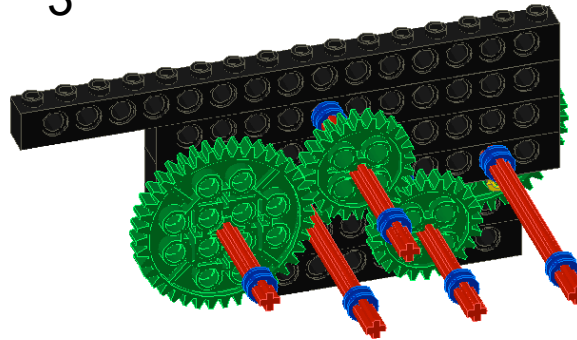


Walking Legs

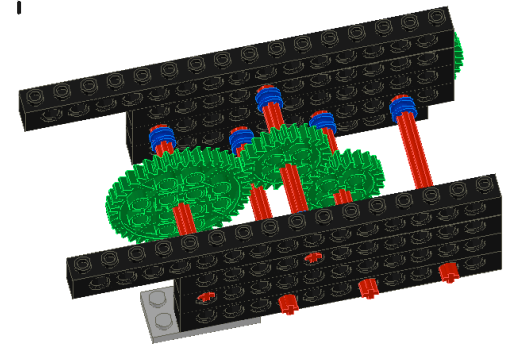
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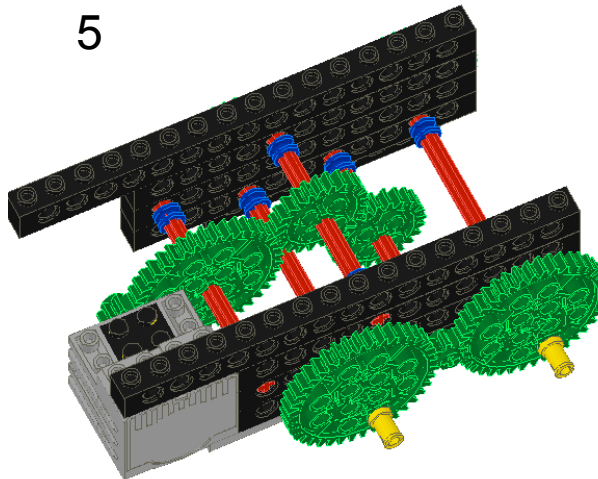
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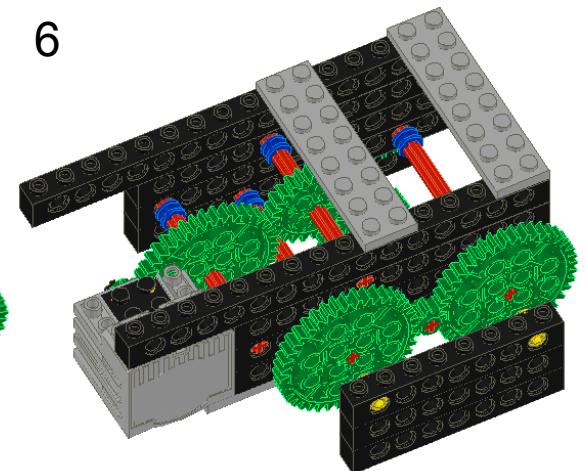
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5

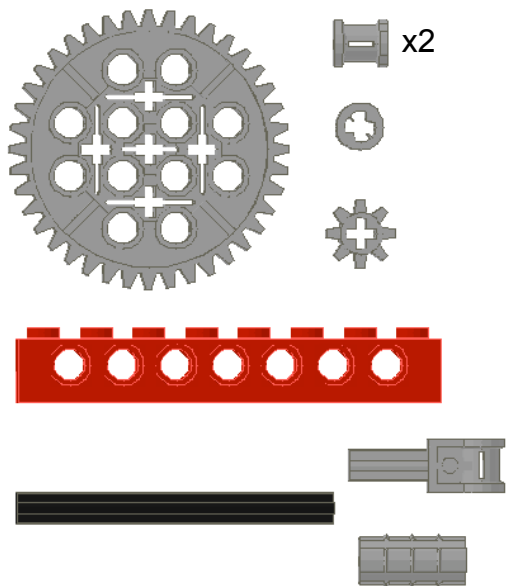


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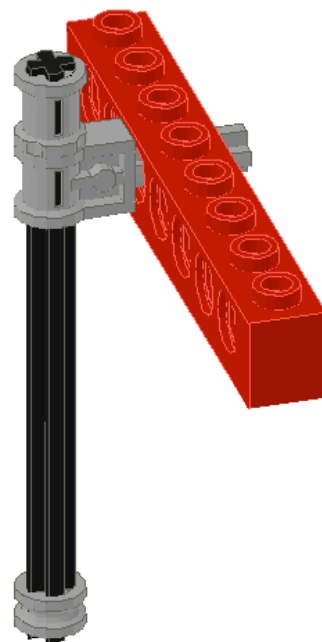


Making a Tail

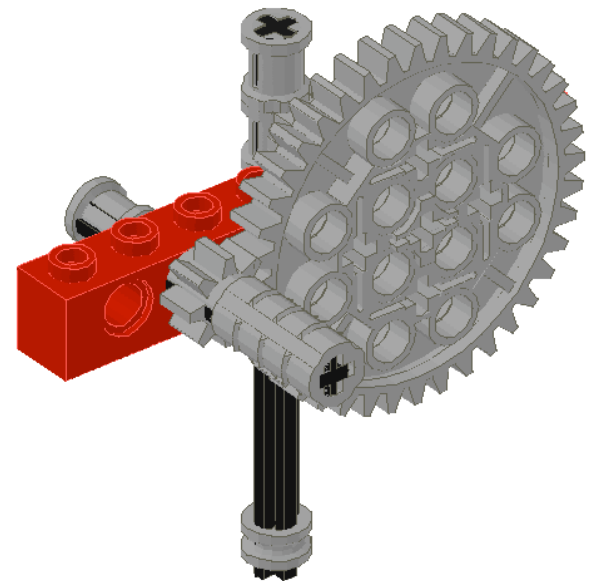
Pieces:



1

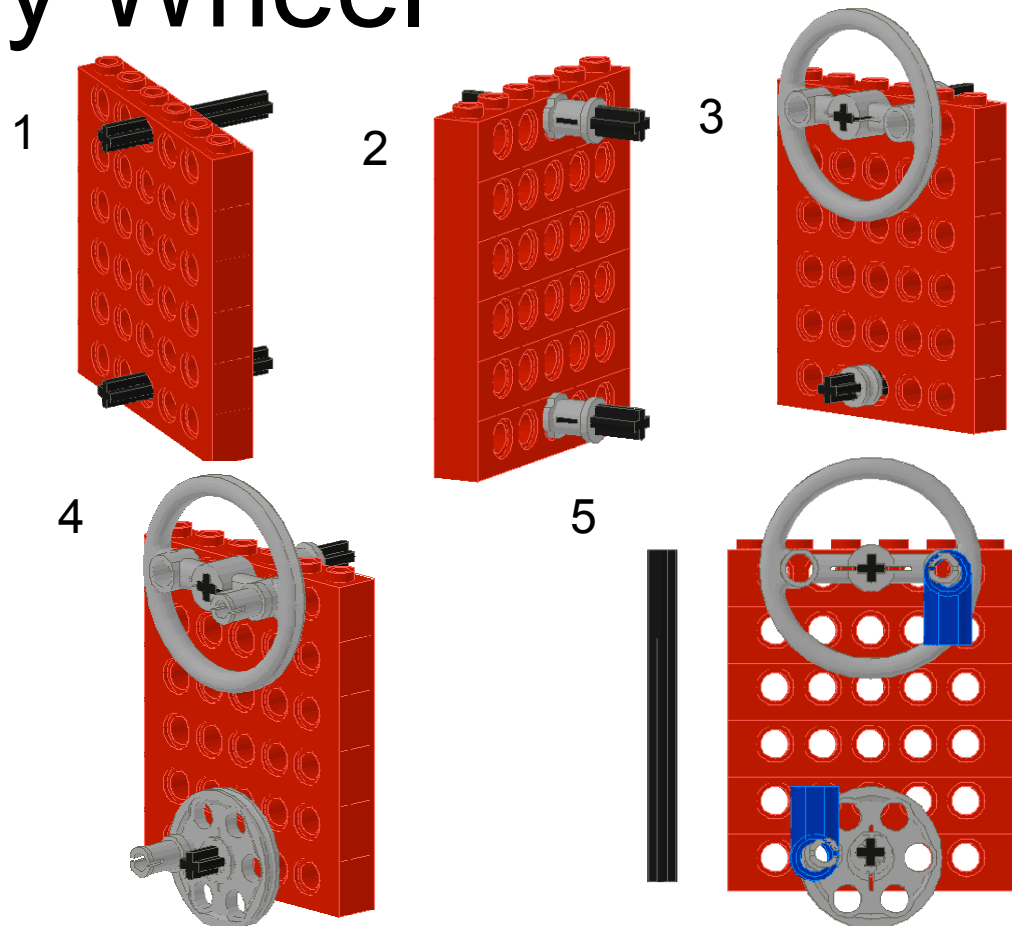
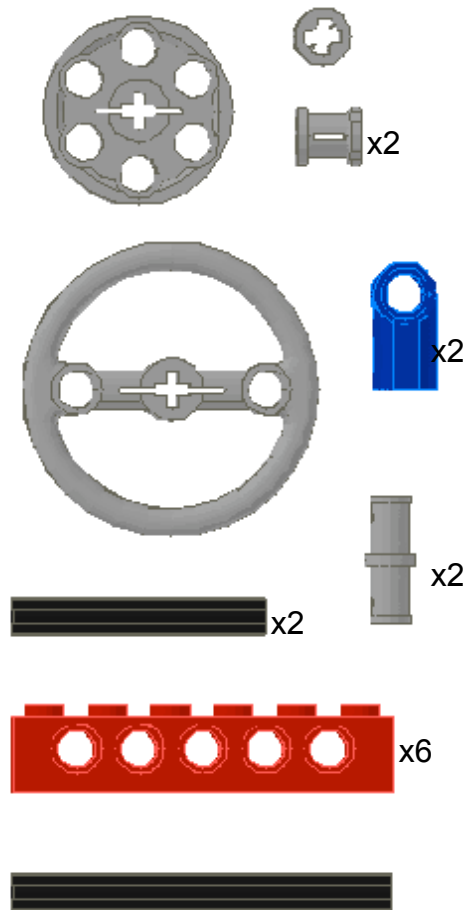


2



Fly Wheel

Pieces:

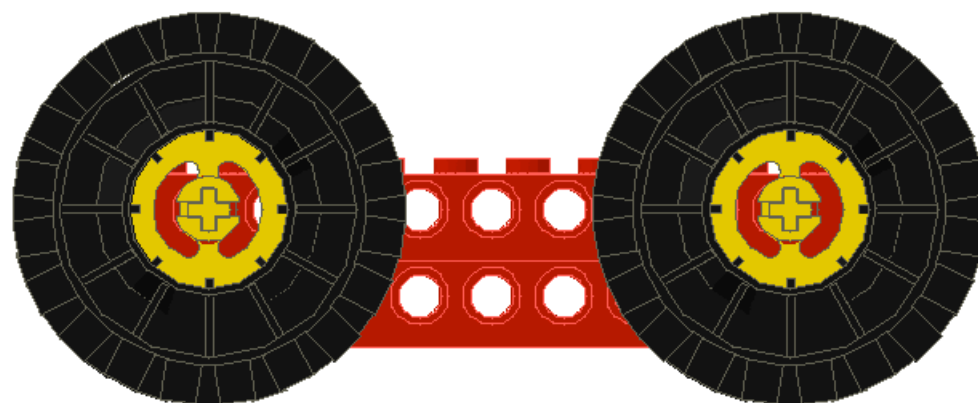
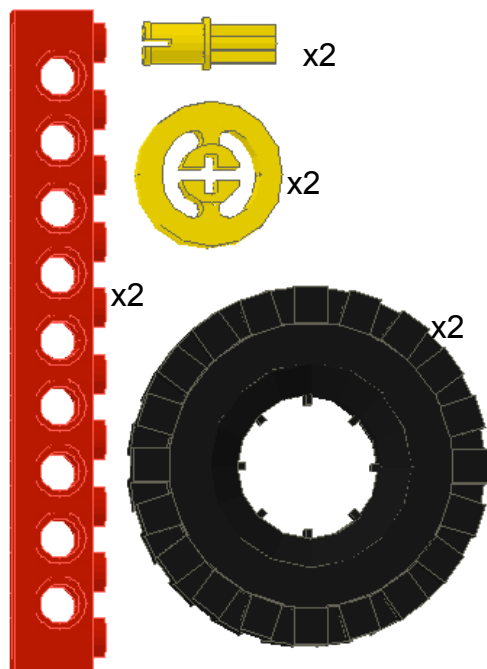


Key Words:

Flywheel

Making Eyes

Pieces:



Building an Animal

Moving Parts

Building a tongue

Pieces:

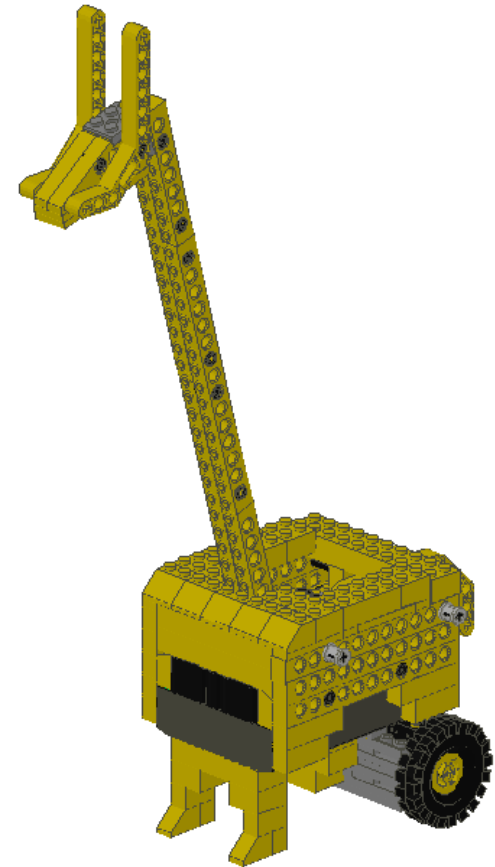
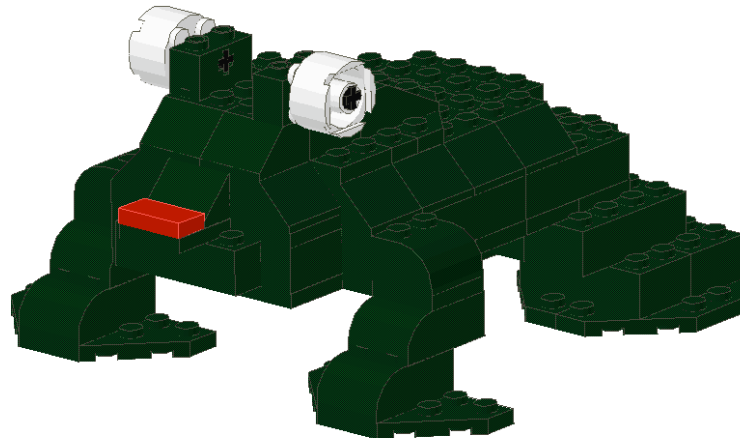
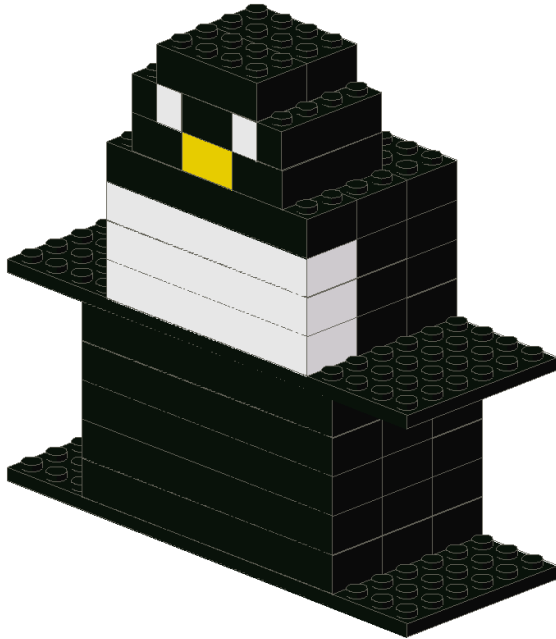
Key Words:

Flywheel, crank, gear rack, pulley,
(football shaped gear)

Building an Animal

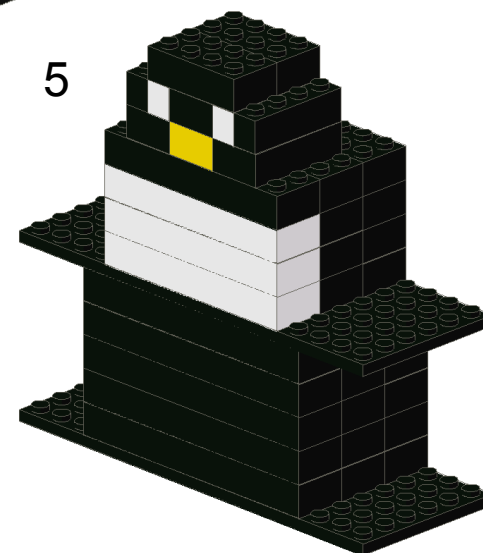
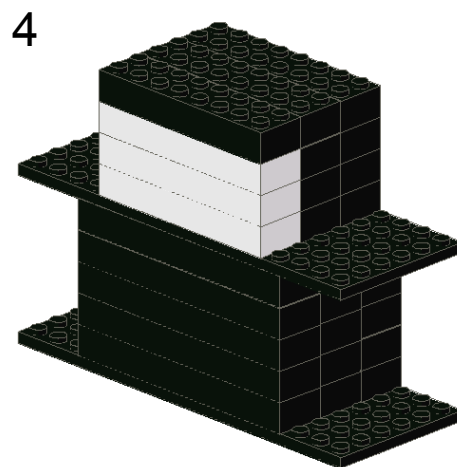
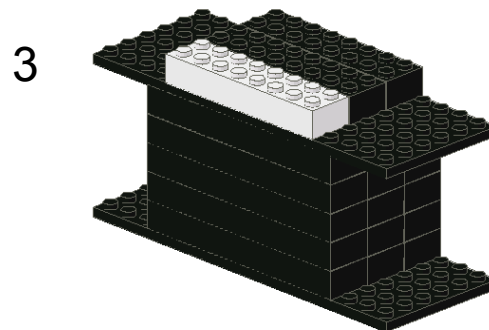
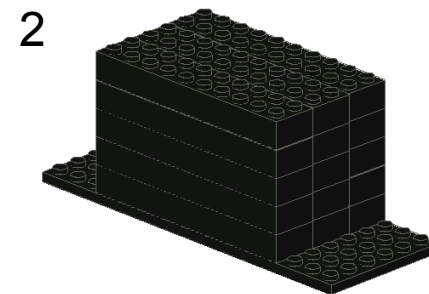
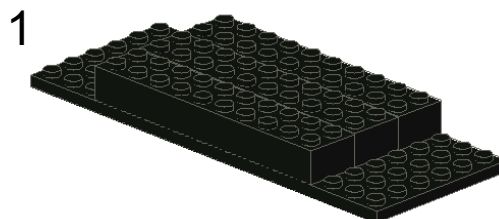
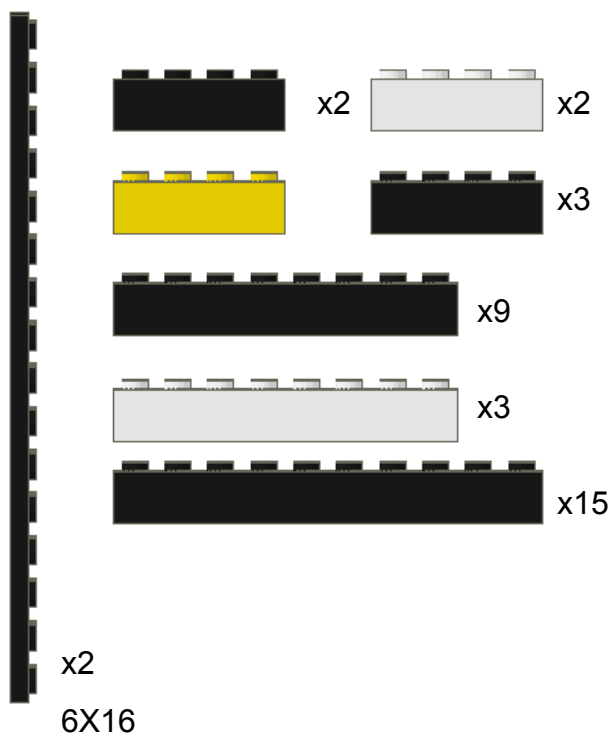
Moving Parts

Common Animals



Building a Penguin

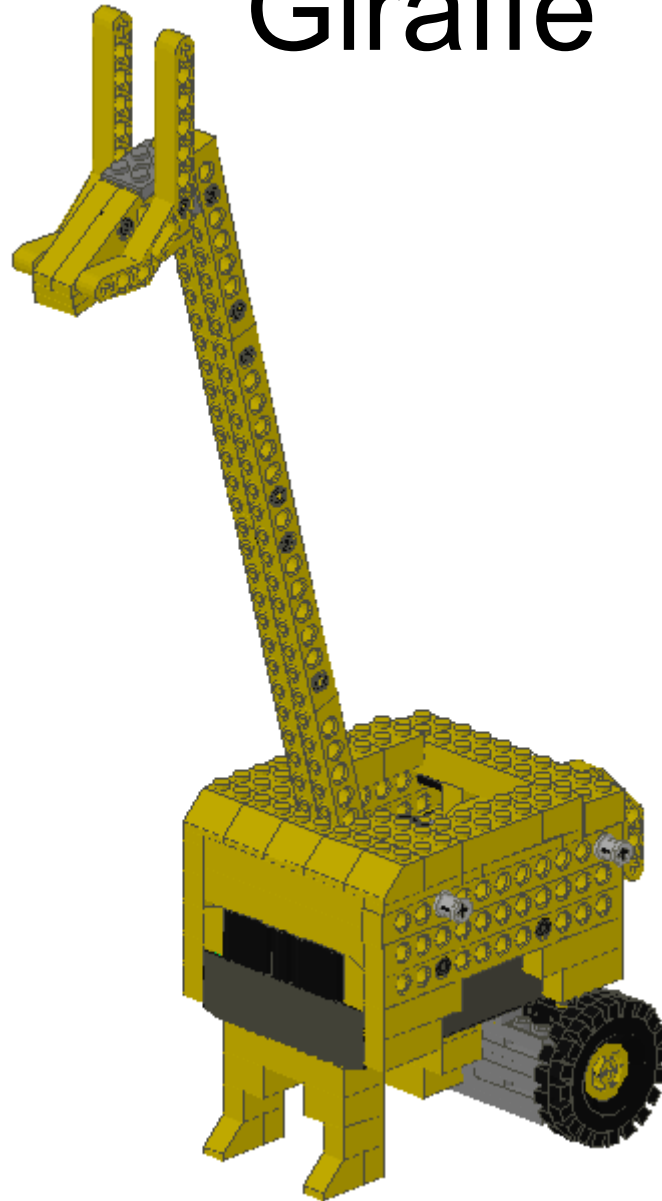
Pieces:



Building an Animal

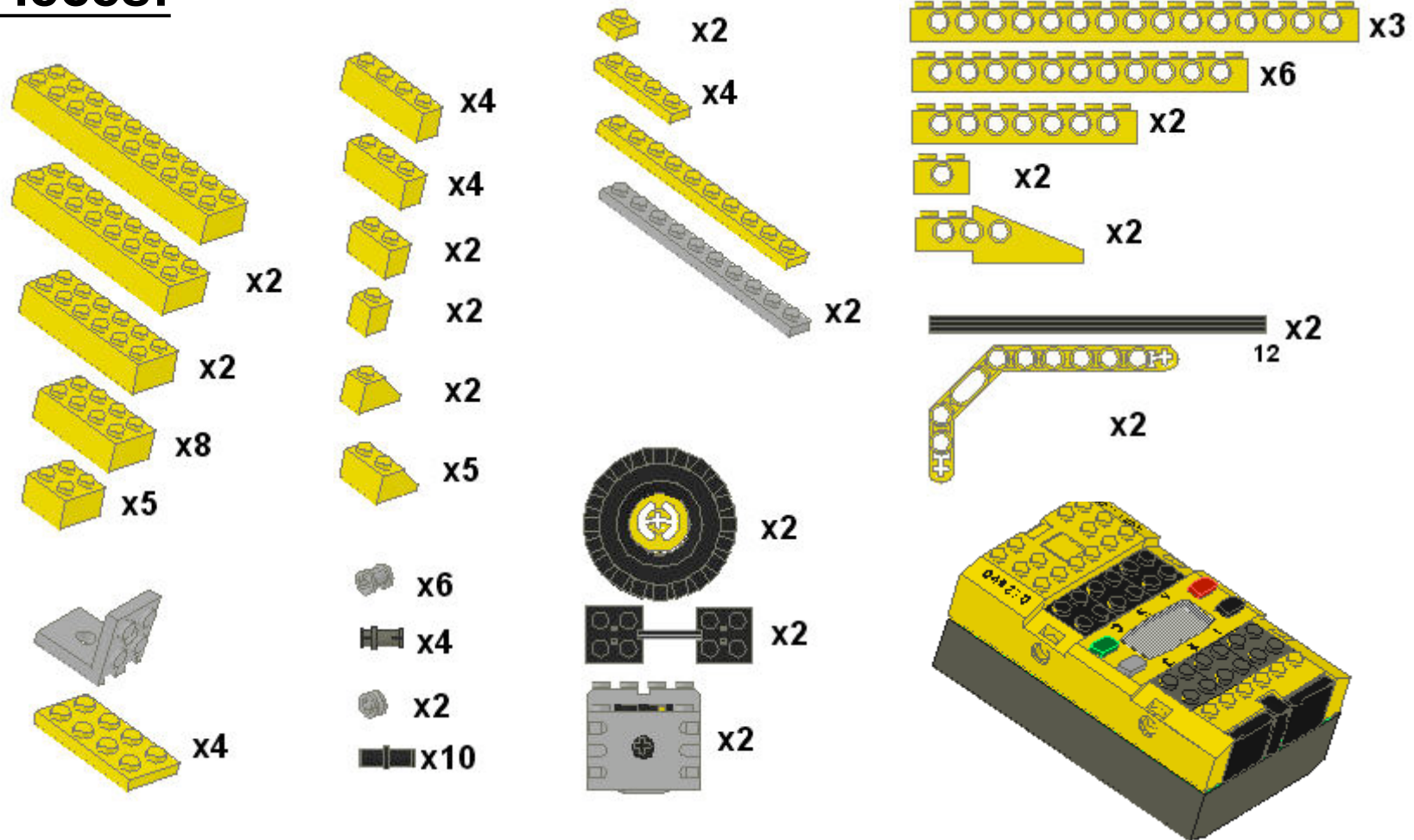
Giraffe

Moving Parts



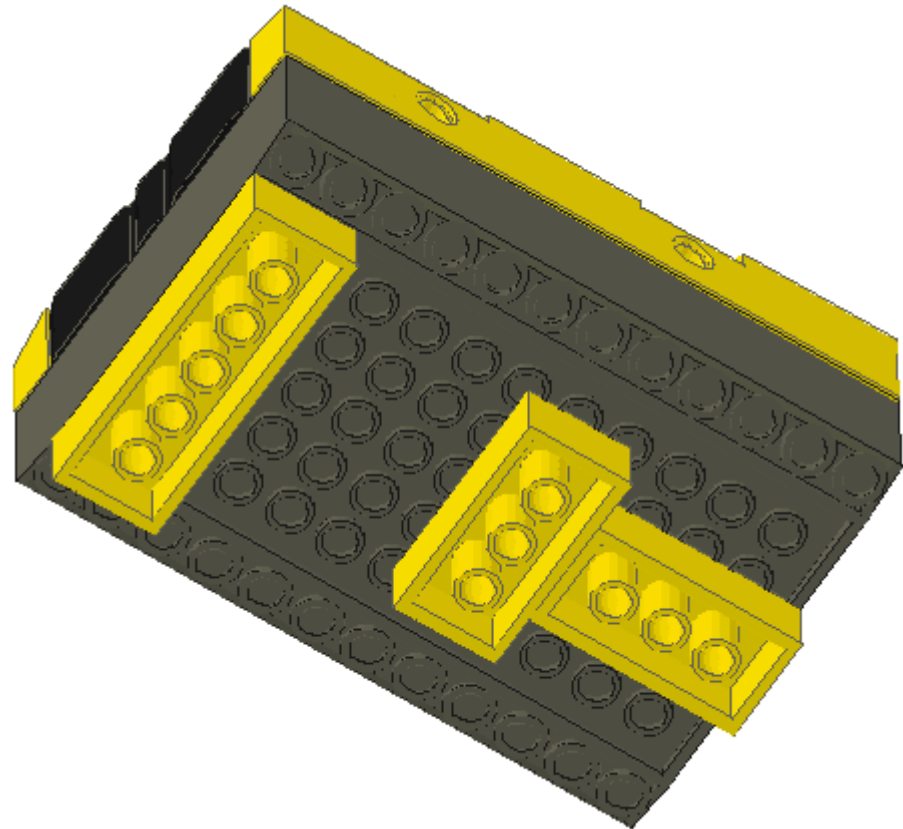
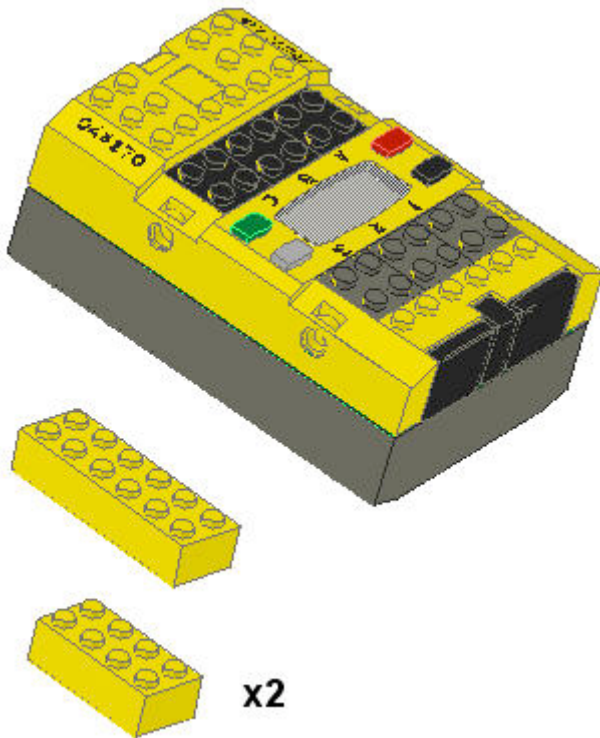
Giraffe

Pieces:



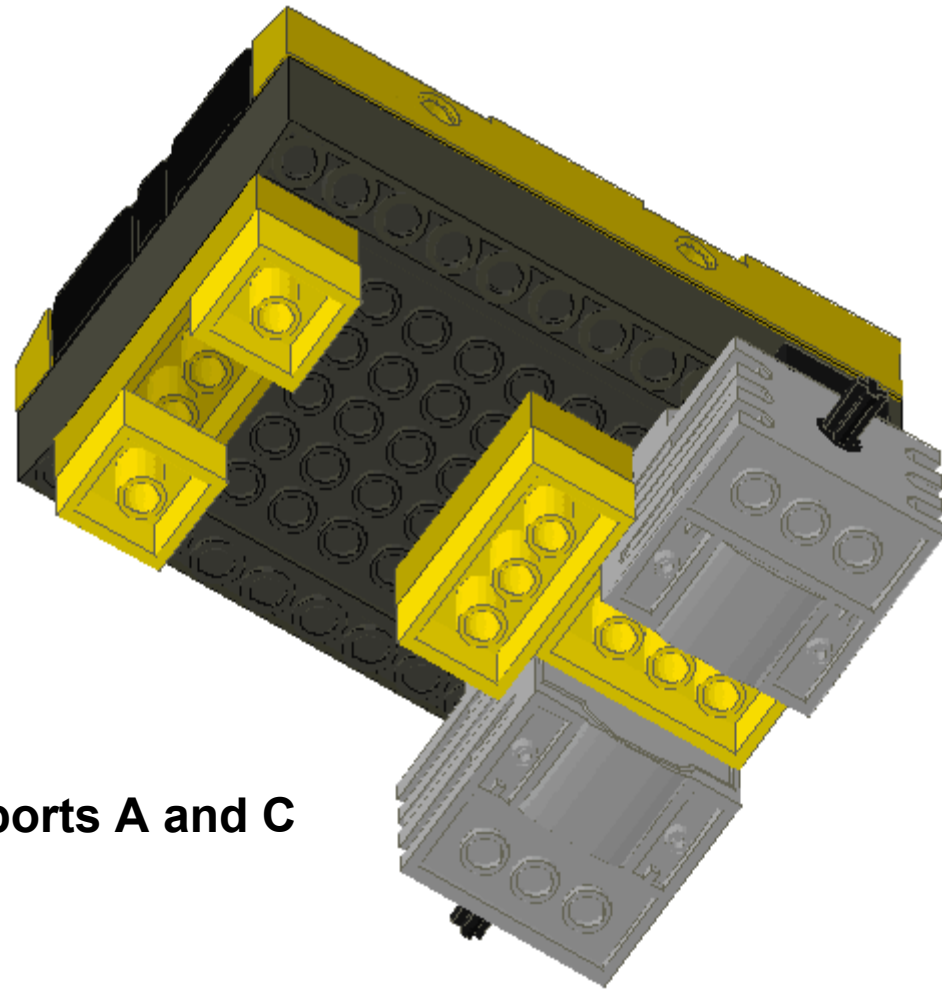
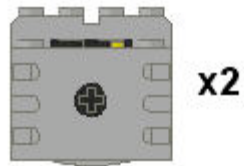
Giraffe

Pieces:



Giraffe

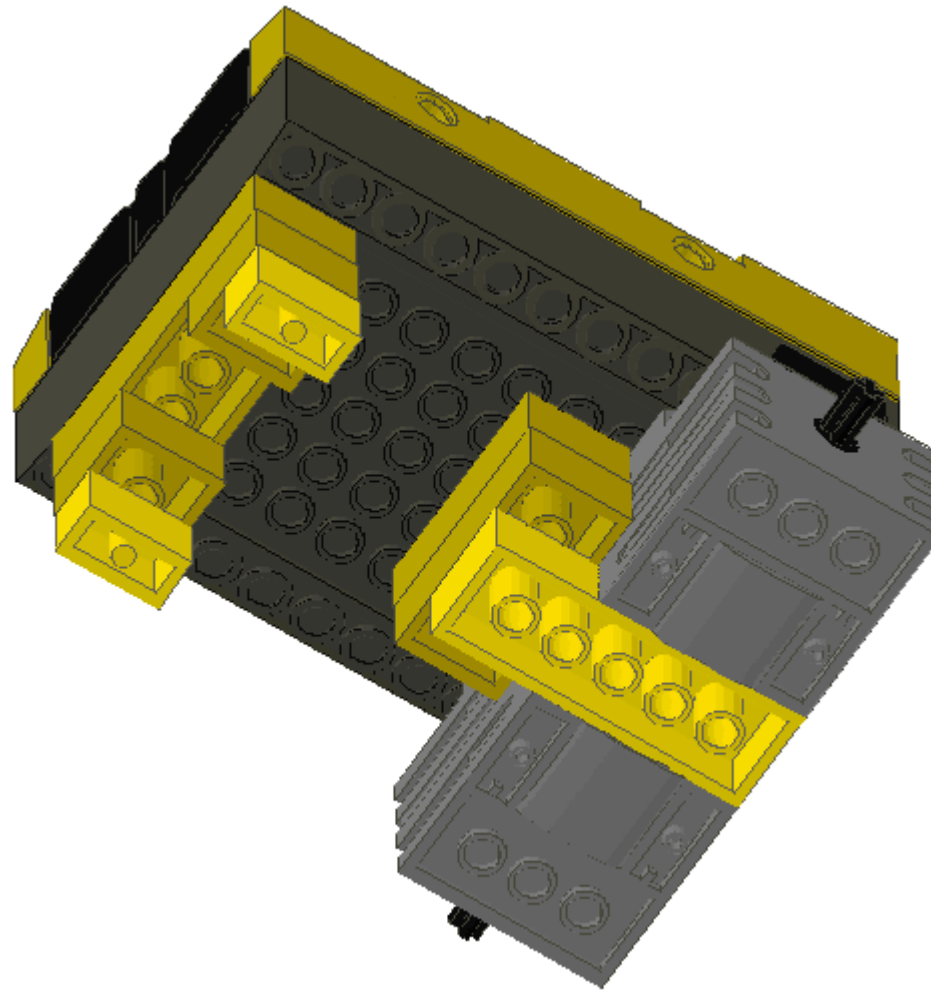
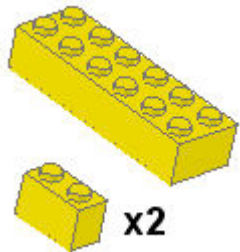
Pieces:



Connect wires to ports A and C

Giraffe

Pieces:

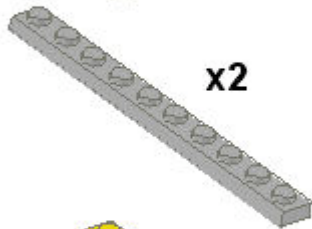


Giraffe

Pieces:



x2



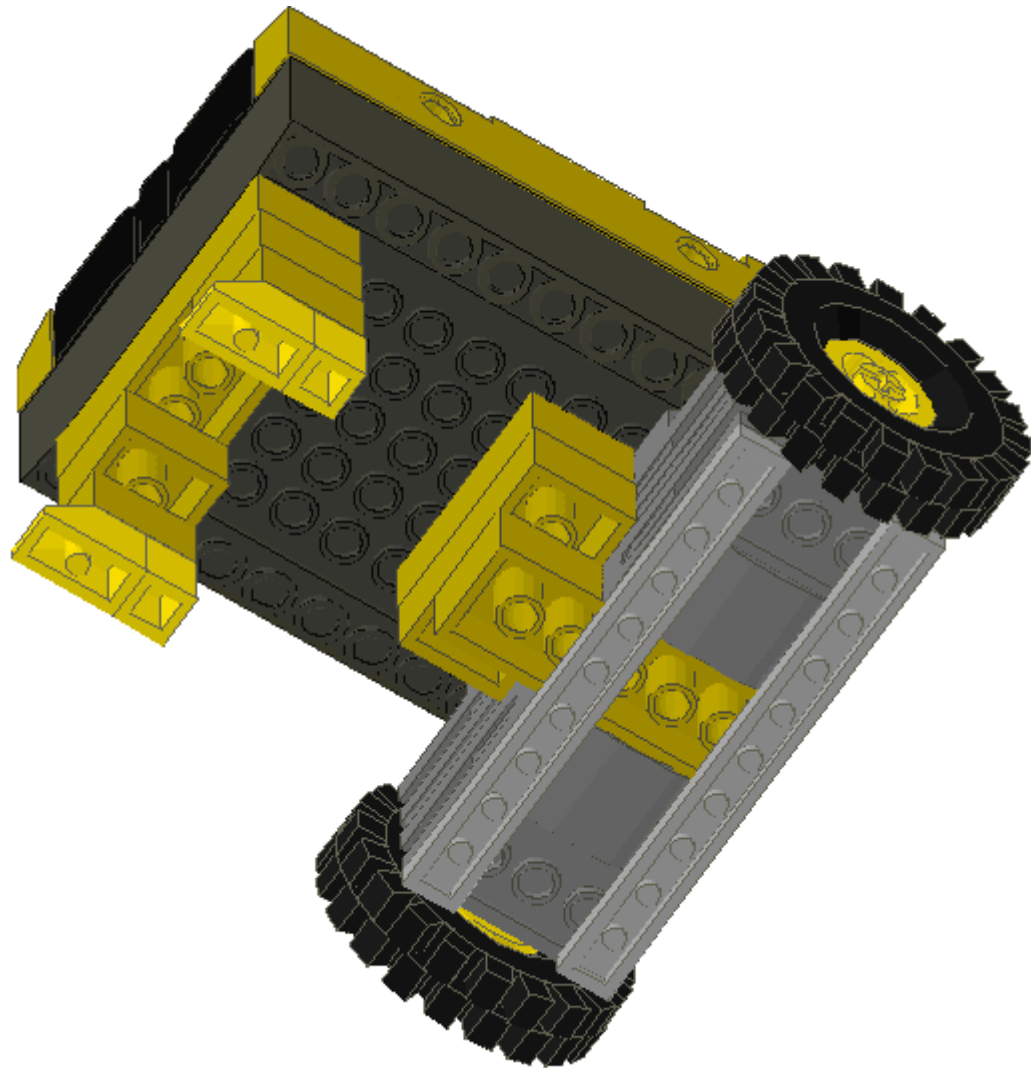
x2



x2



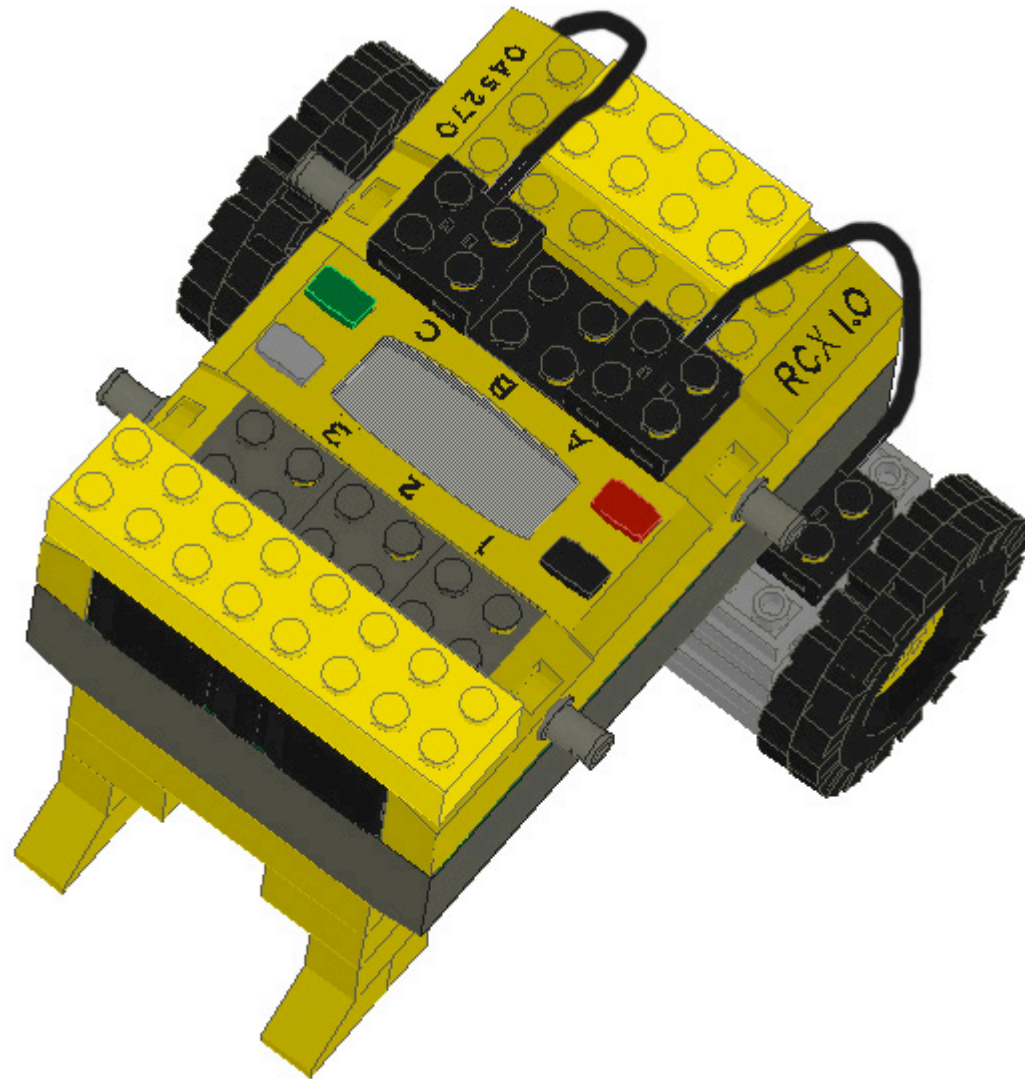
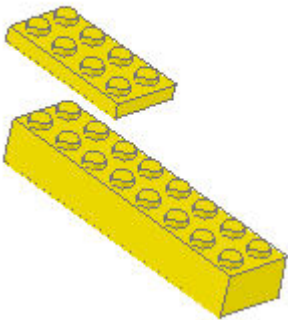
x2



Giraffe

Pieces:

 x4



Giraffe

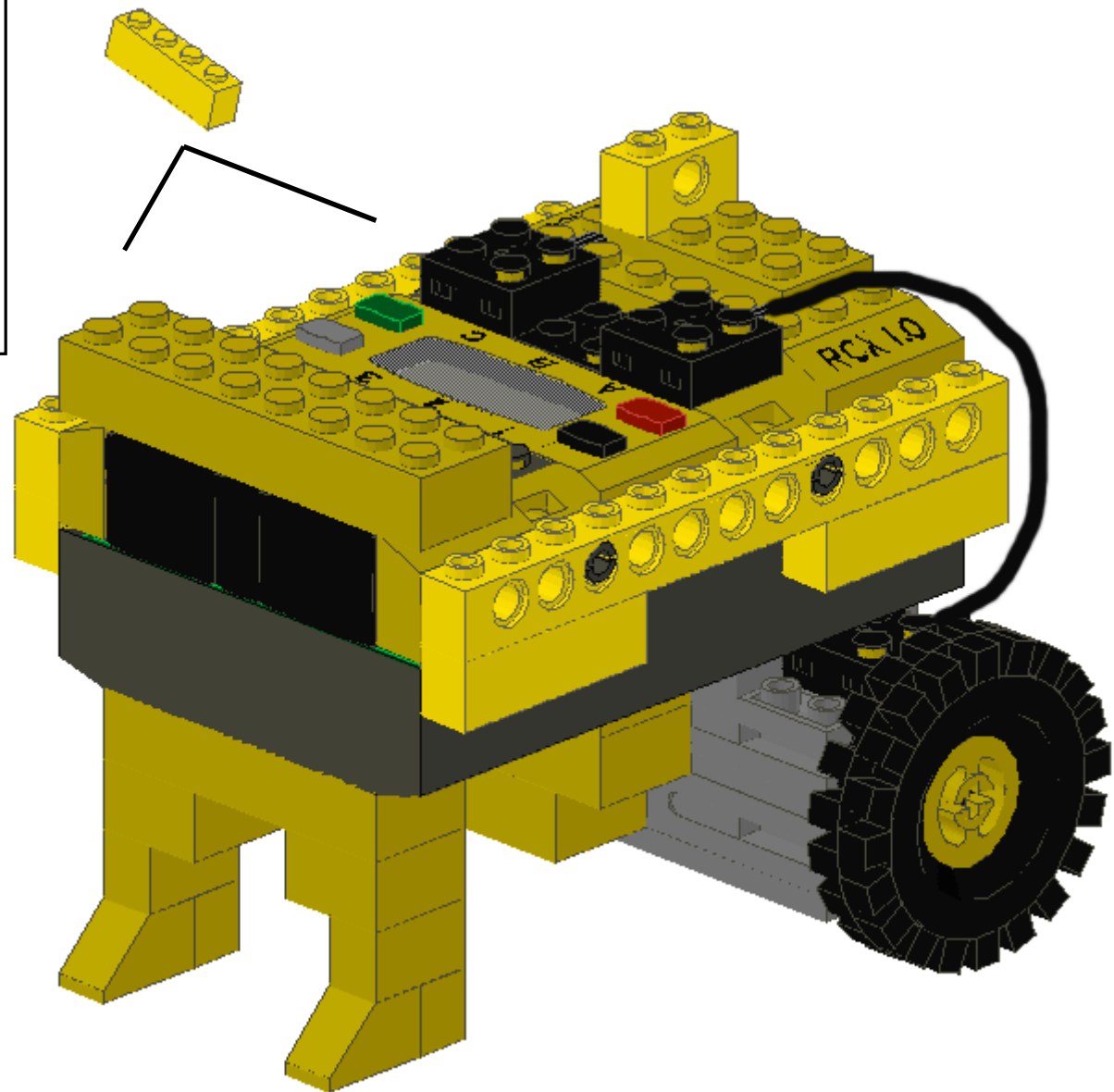
Pieces:



x2

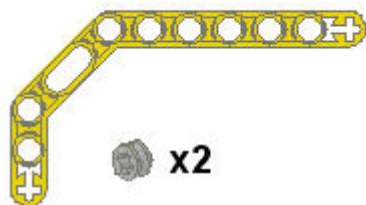


x4

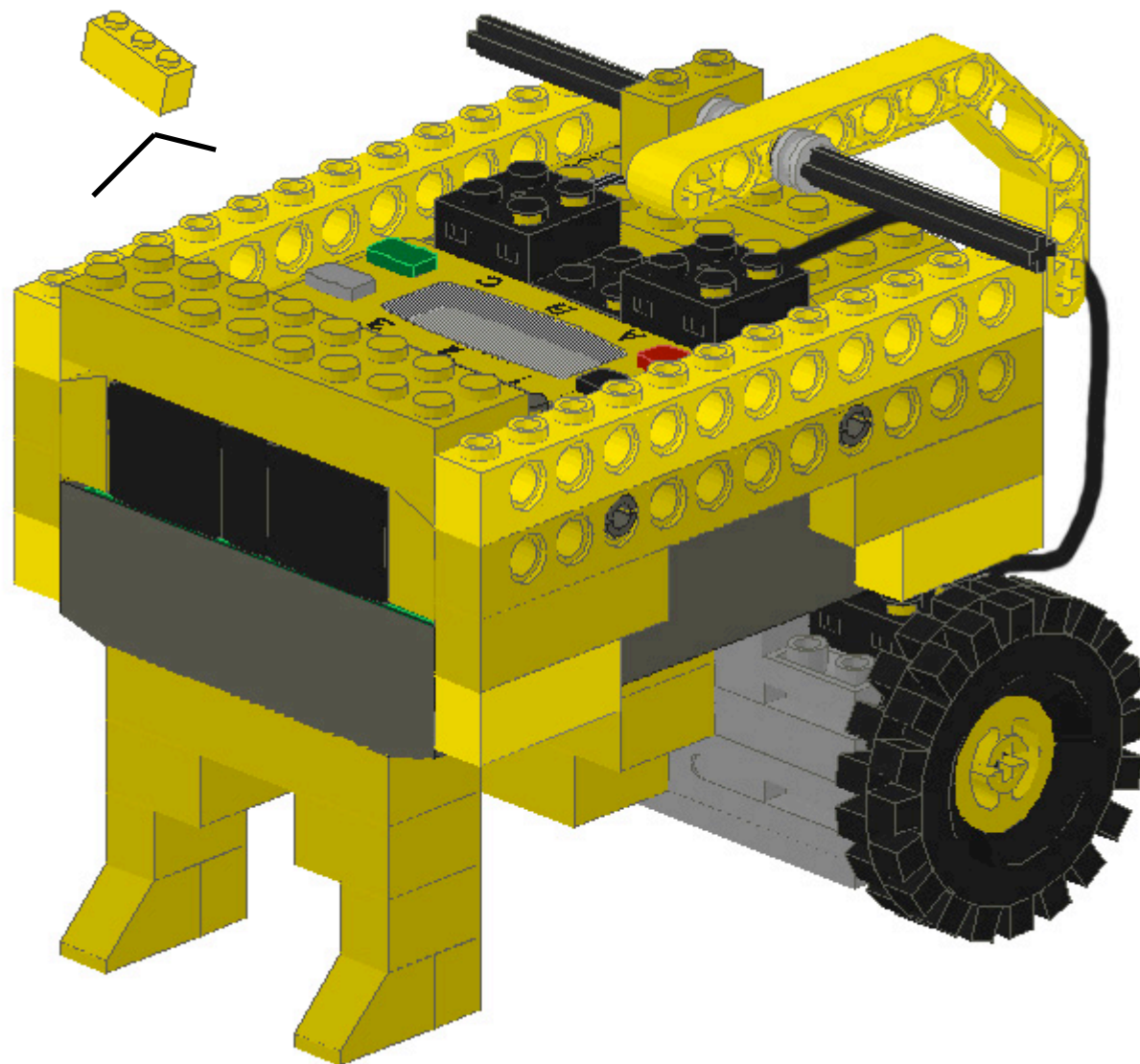


Giraffe

Pieces:



x2

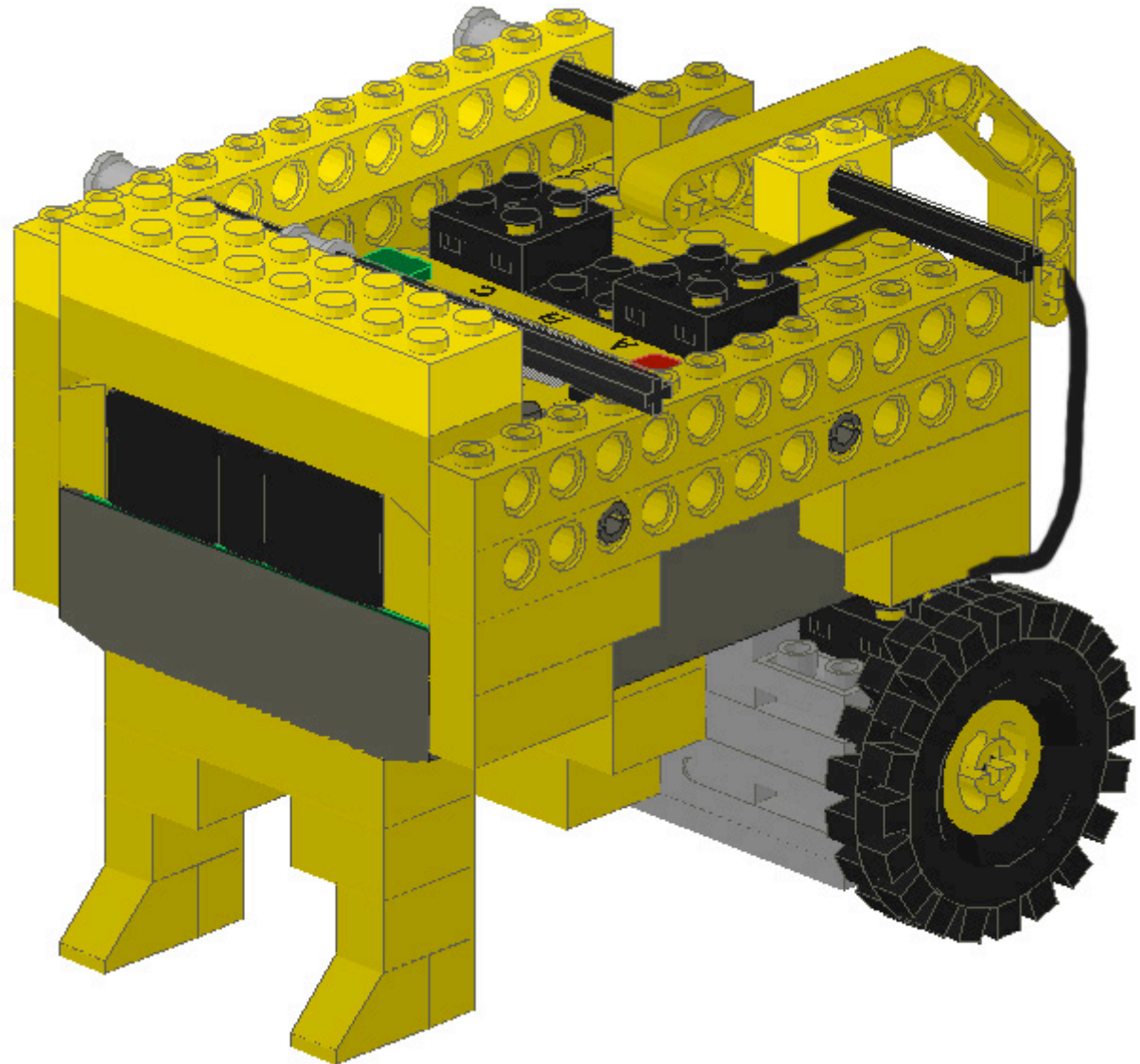
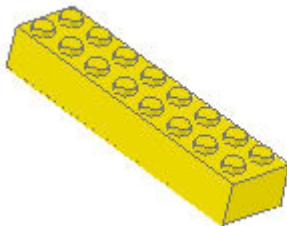


Pieces:



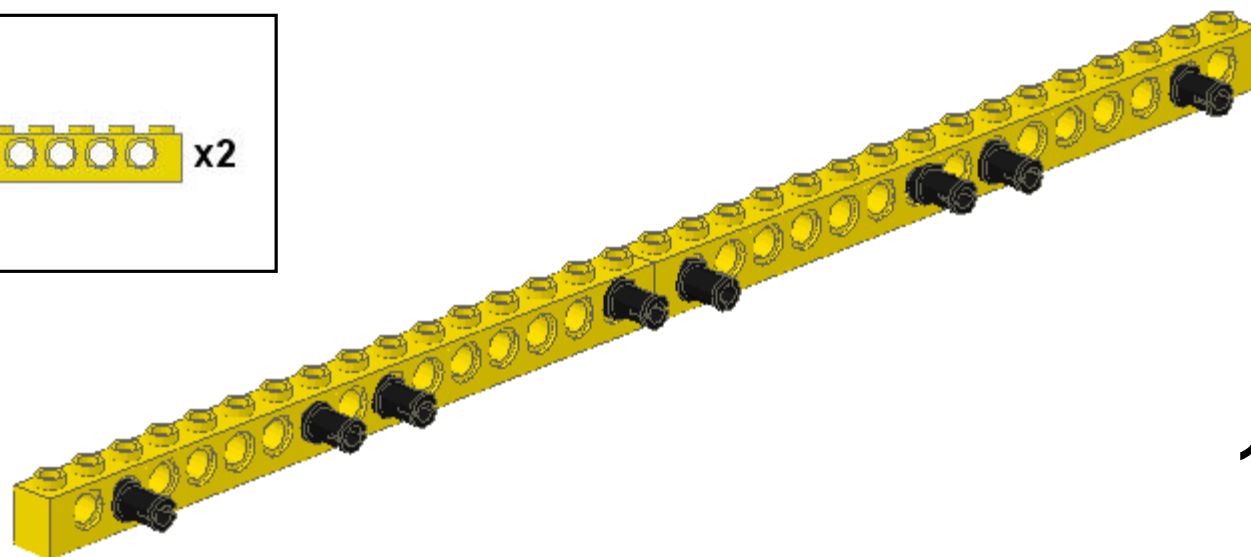
x3

12



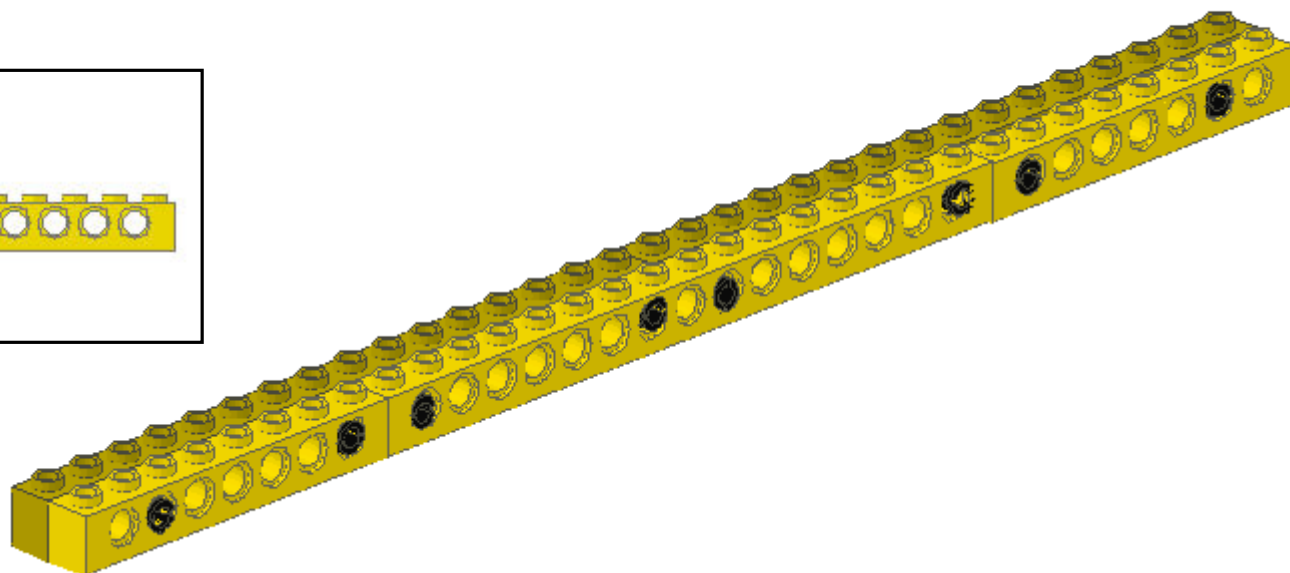
Giraffe

Pieces:



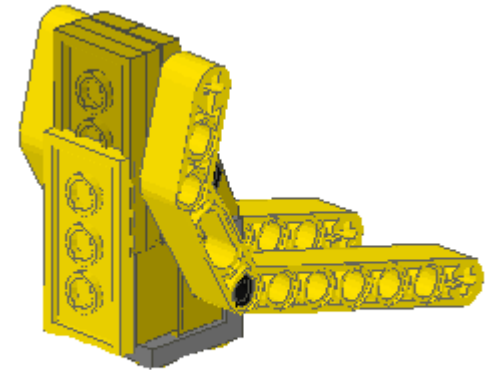
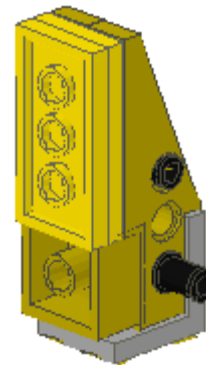
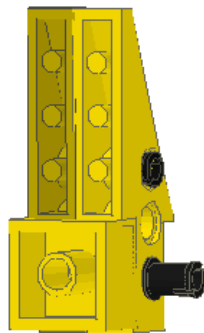
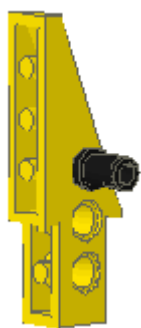
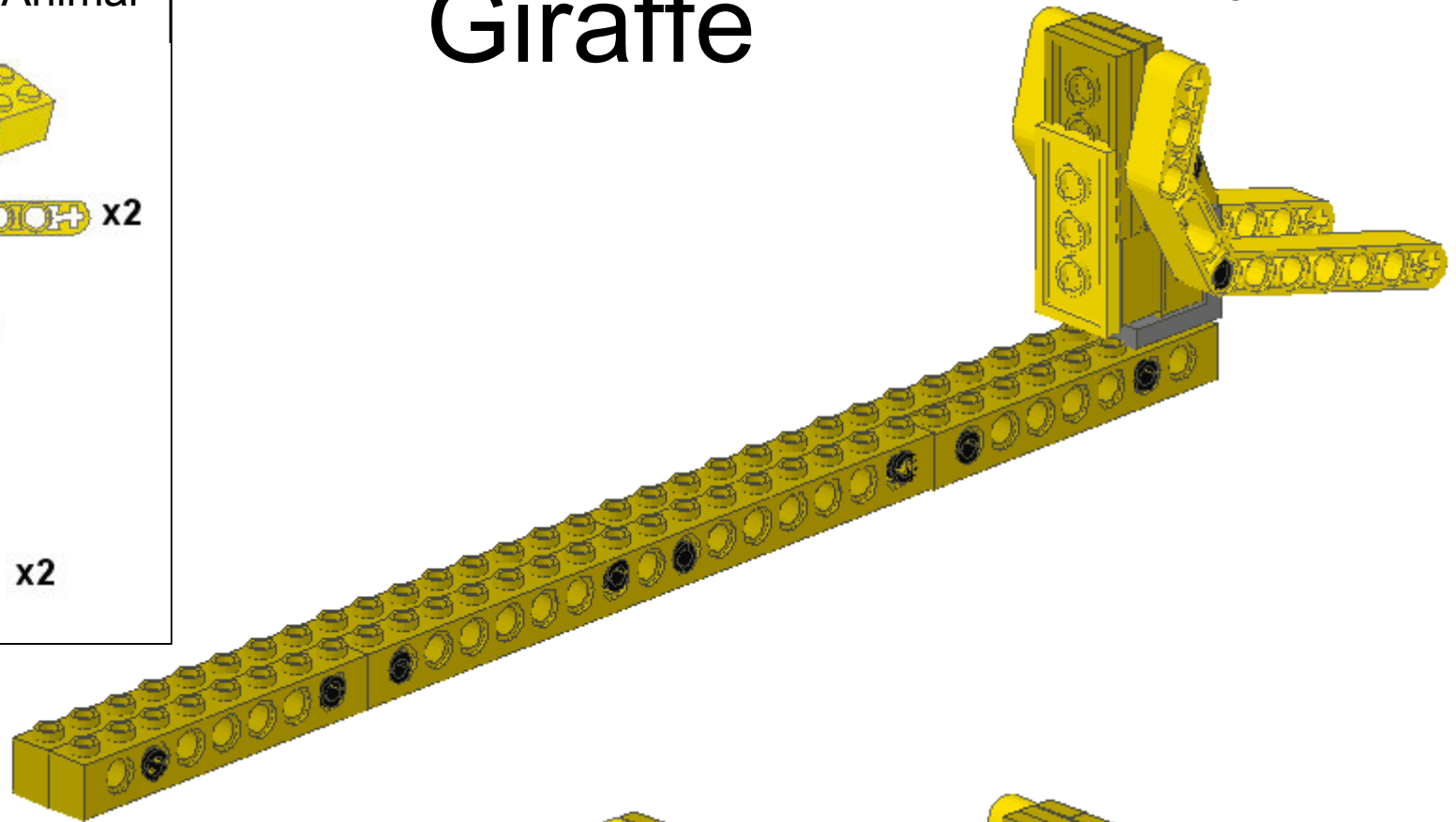
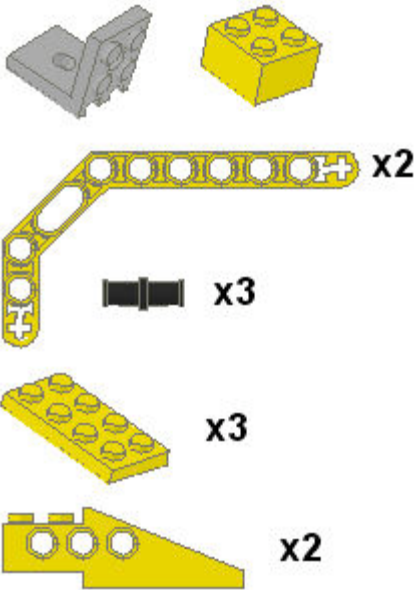
10

Pieces:

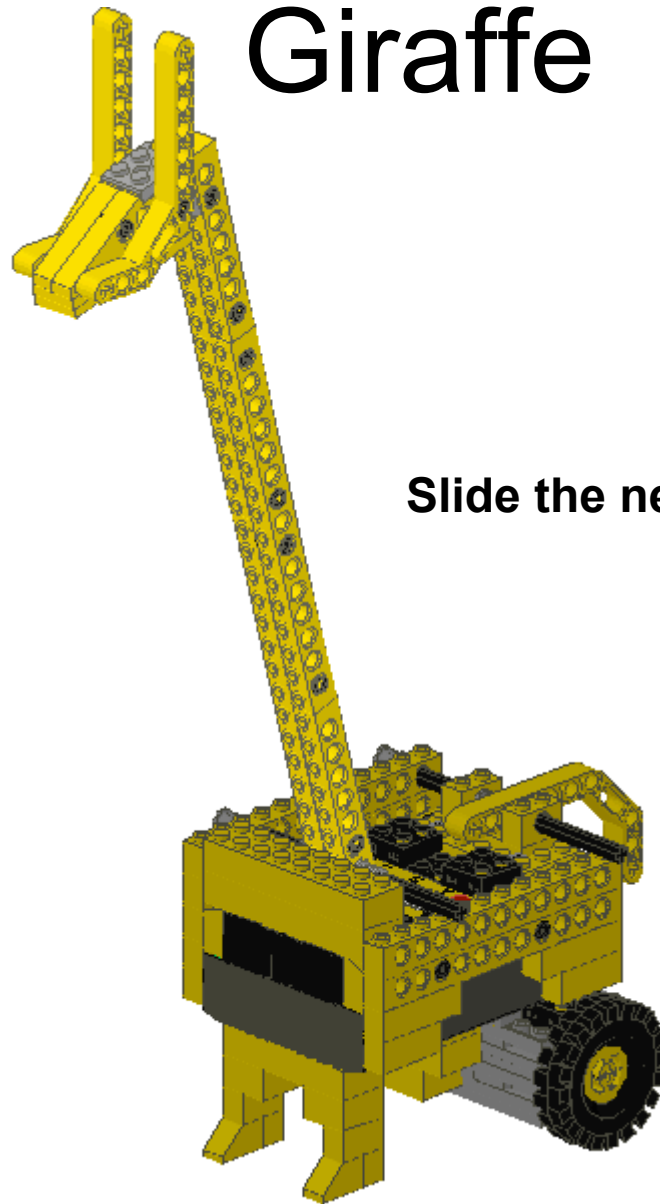


Giraffe

Building an Animal
Pieces:



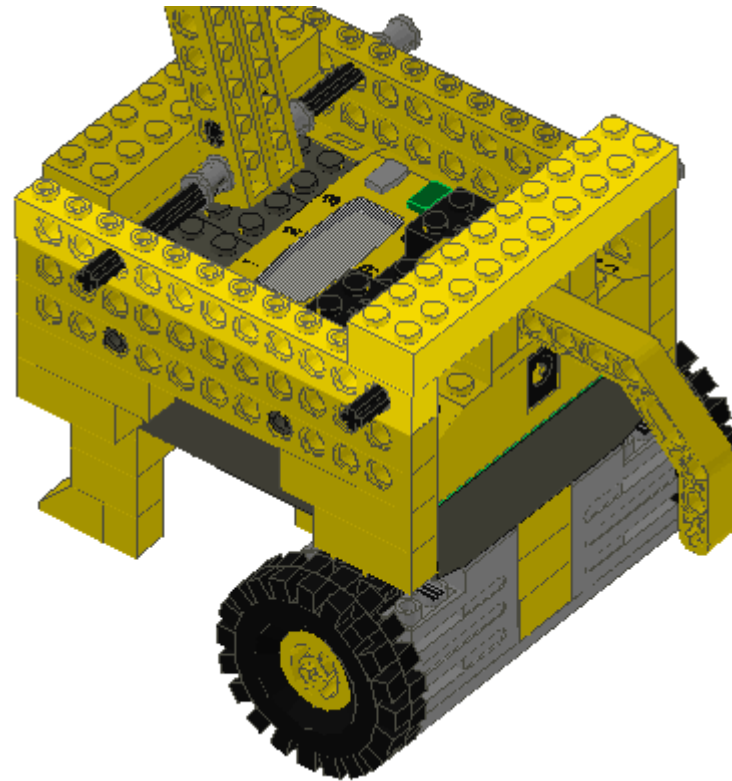
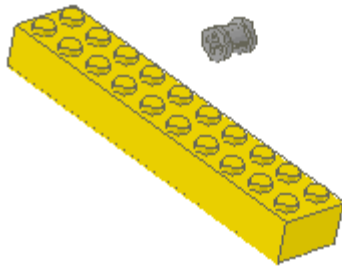
Giraffe



Slide the neck onto the axle

Giraffe

Pieces:



Giraffe

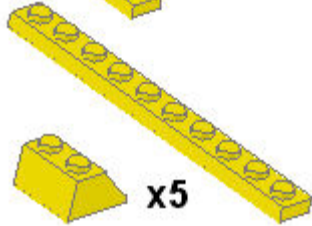
Pieces:



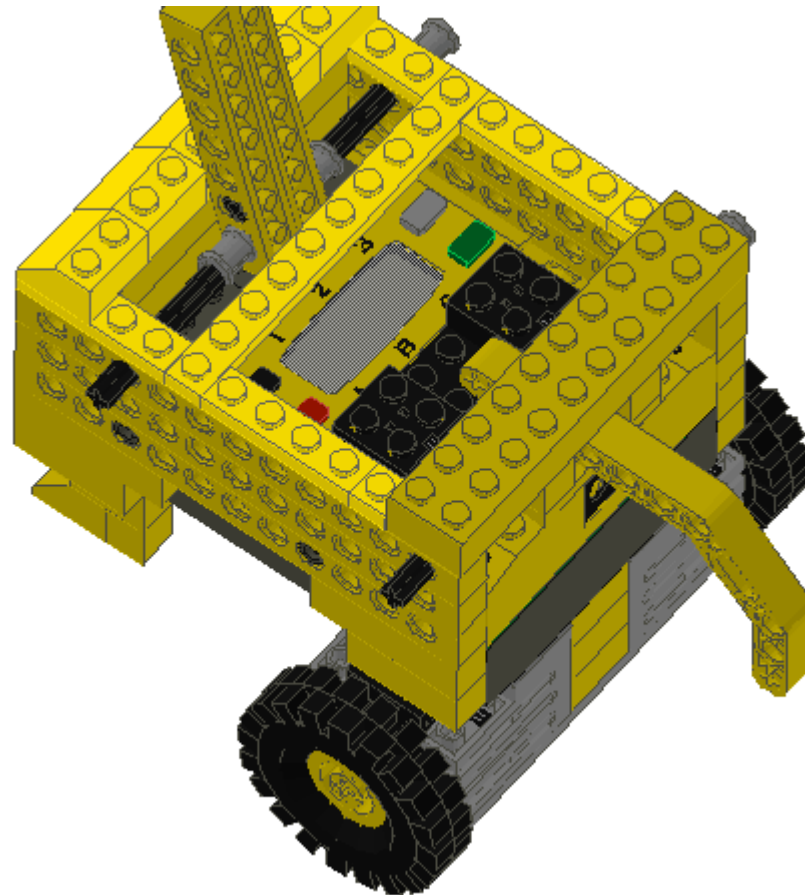
x2

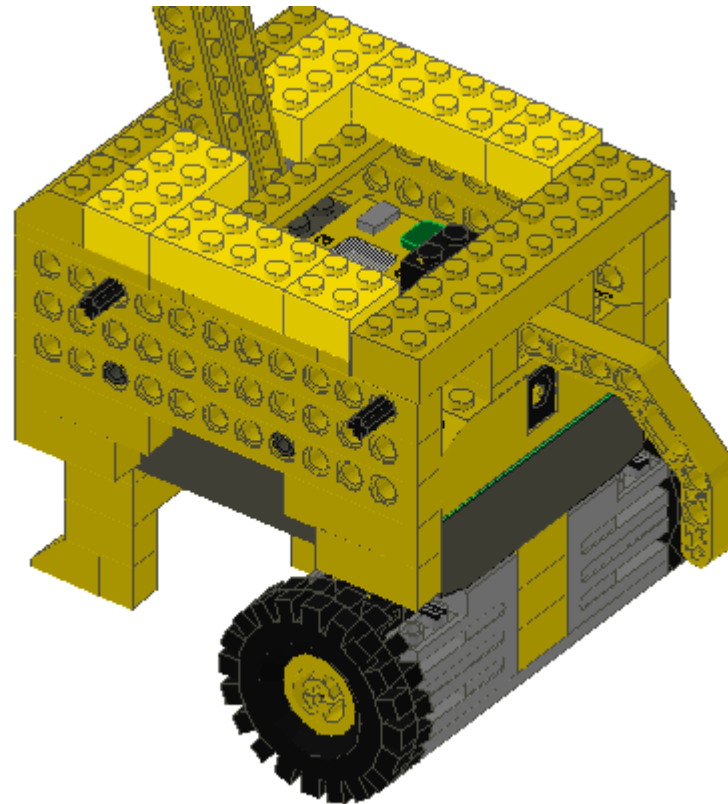
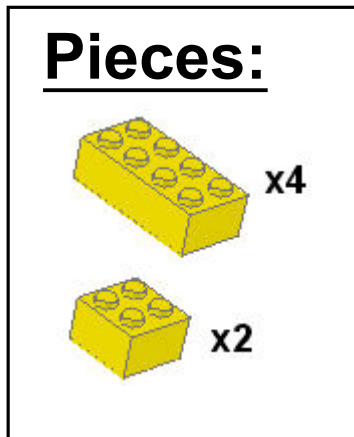


x4



x5





Giraffe

Pieces:

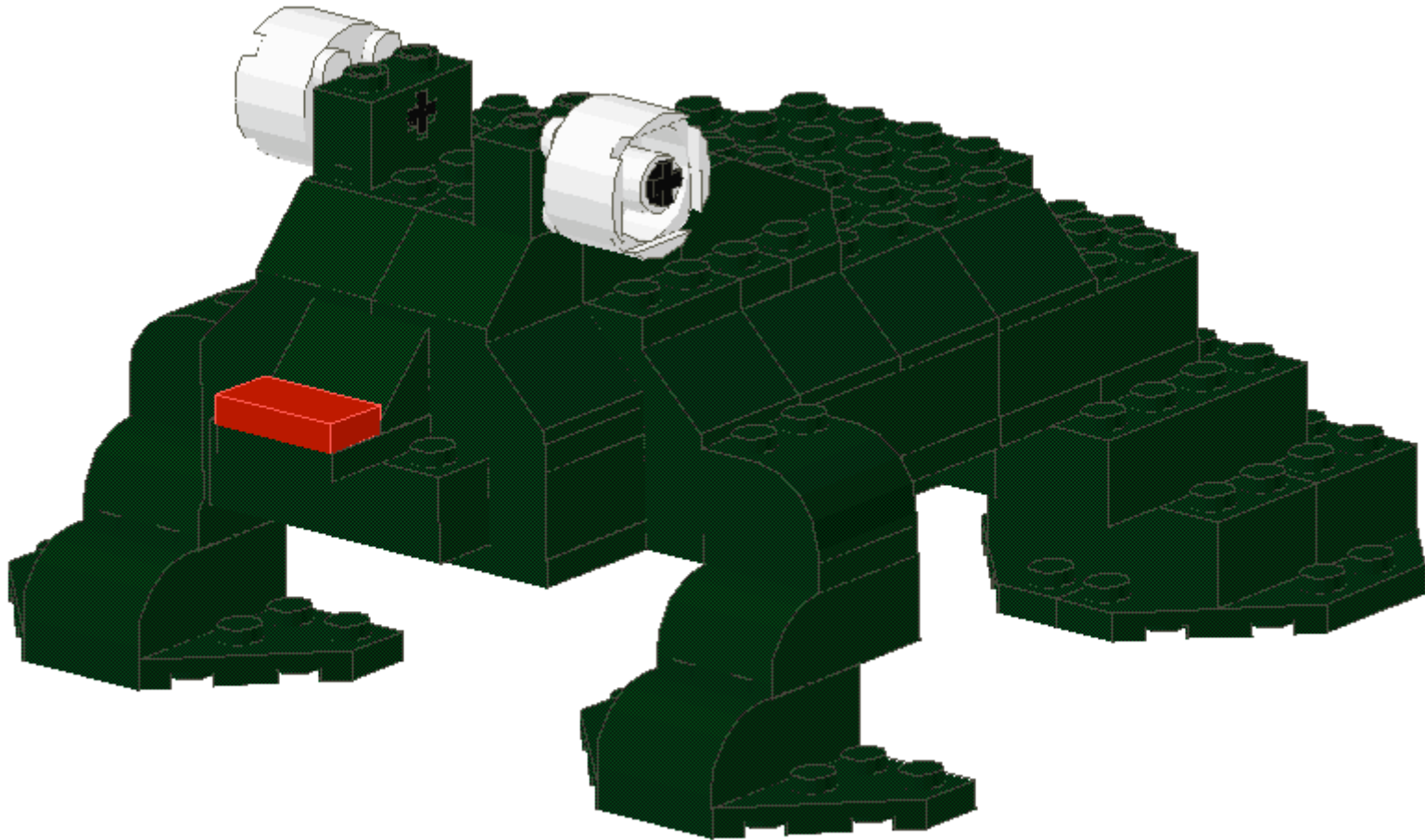
 x2



Building an Animal

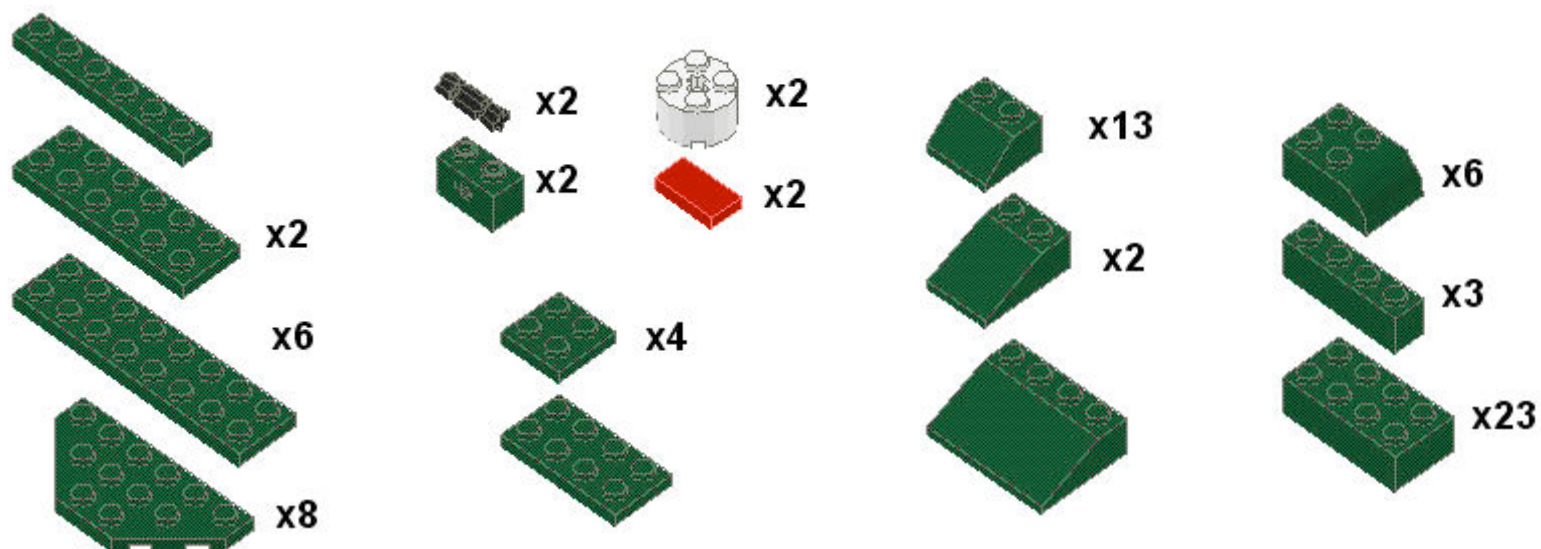
Frog

Moving Parts

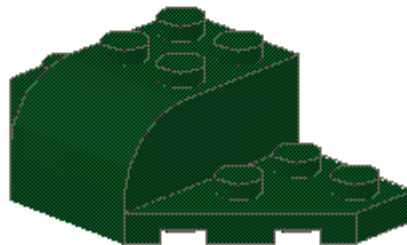
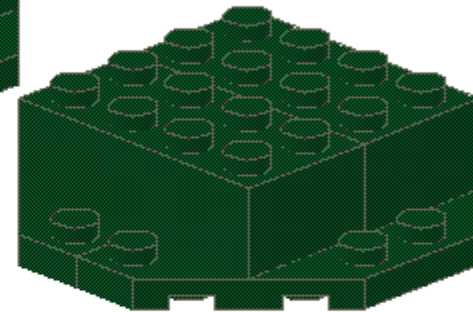
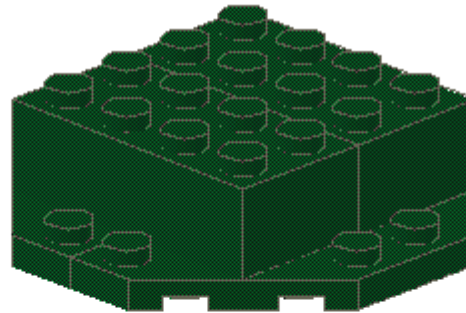
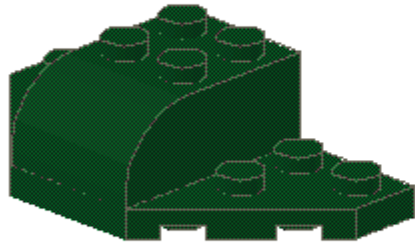


Frog

Pieces:



Frog



Pieces:



x4

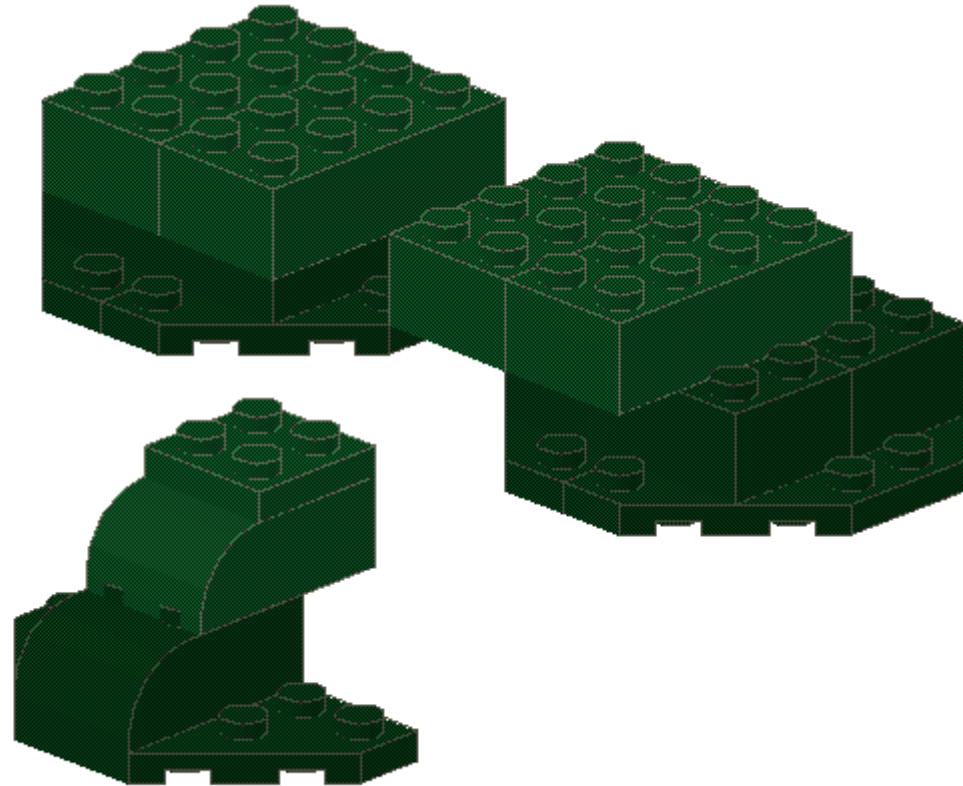
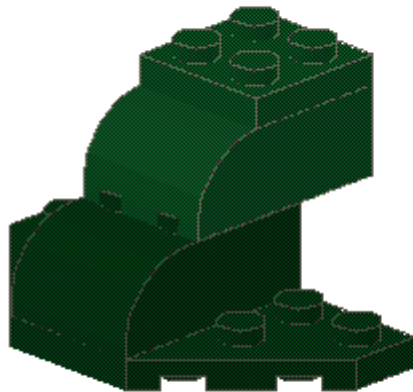


x2



x6

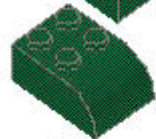
Frog



Pieces:



x4

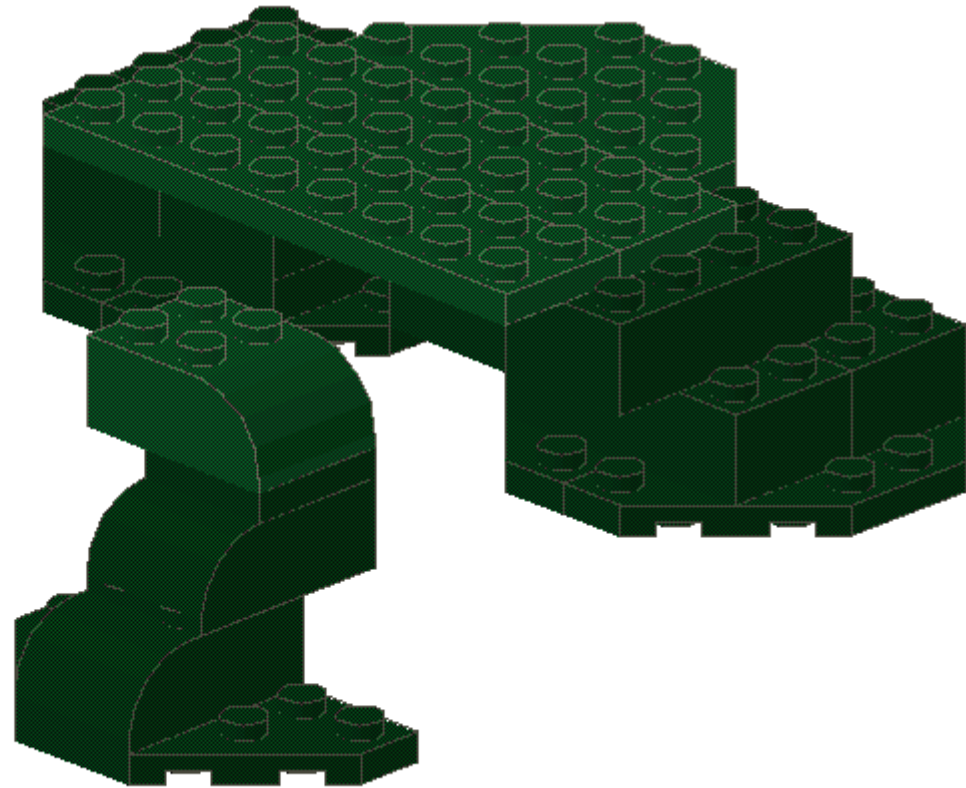
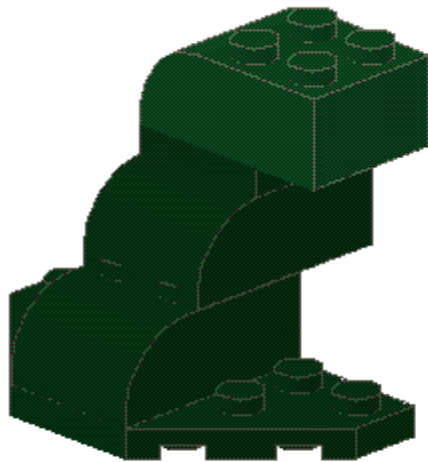


x2

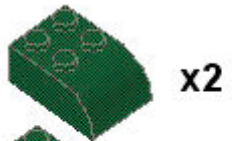


x2

Frog



Pieces:

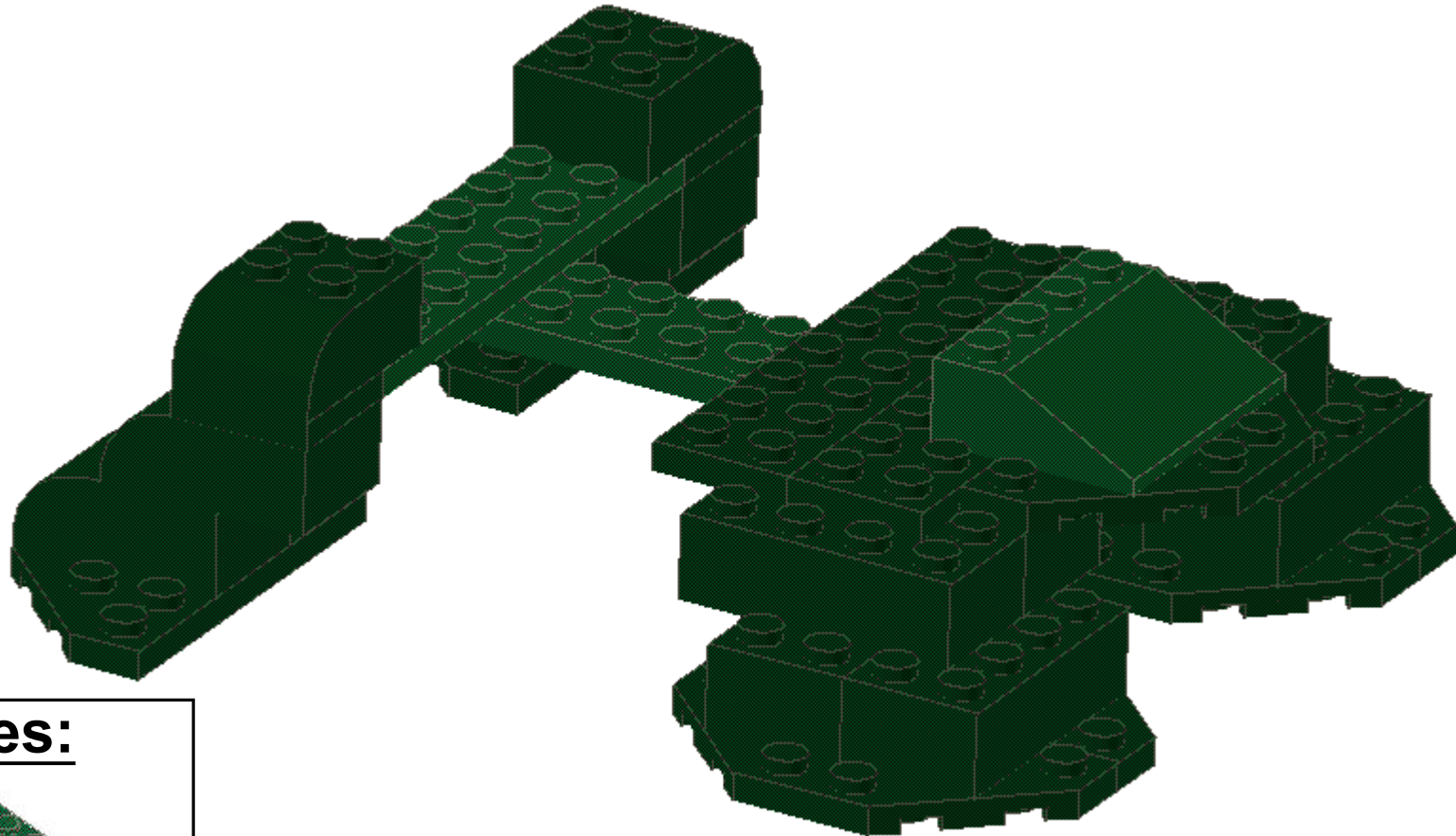


x2

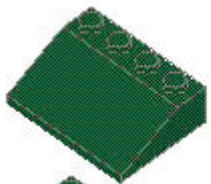


x2

Frog



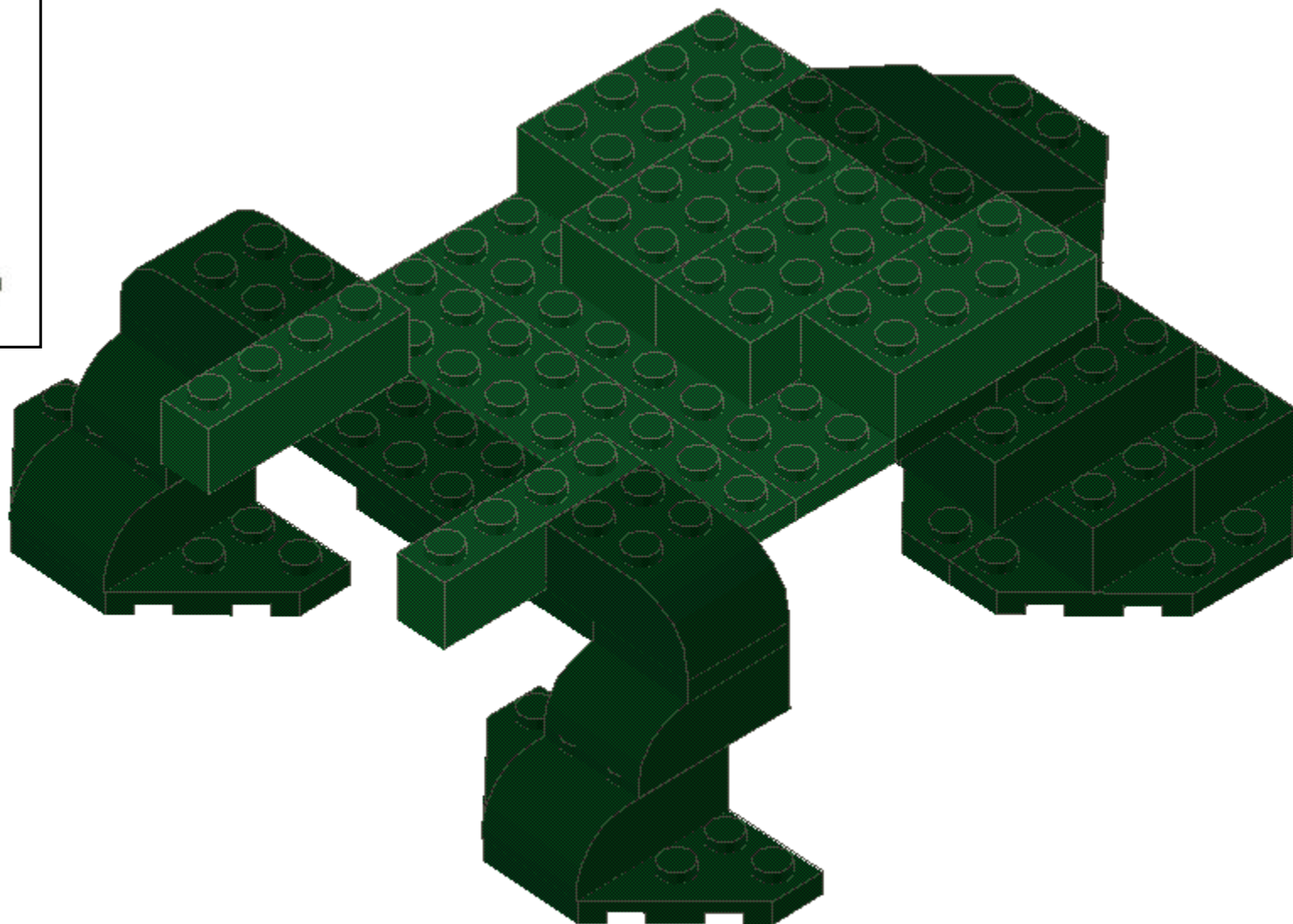
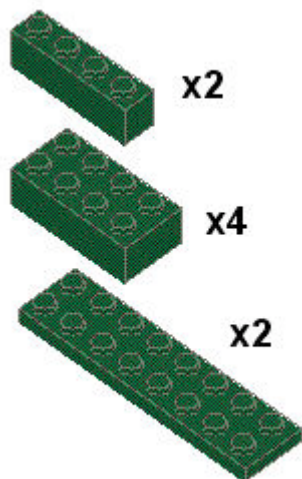
Pieces:



x2

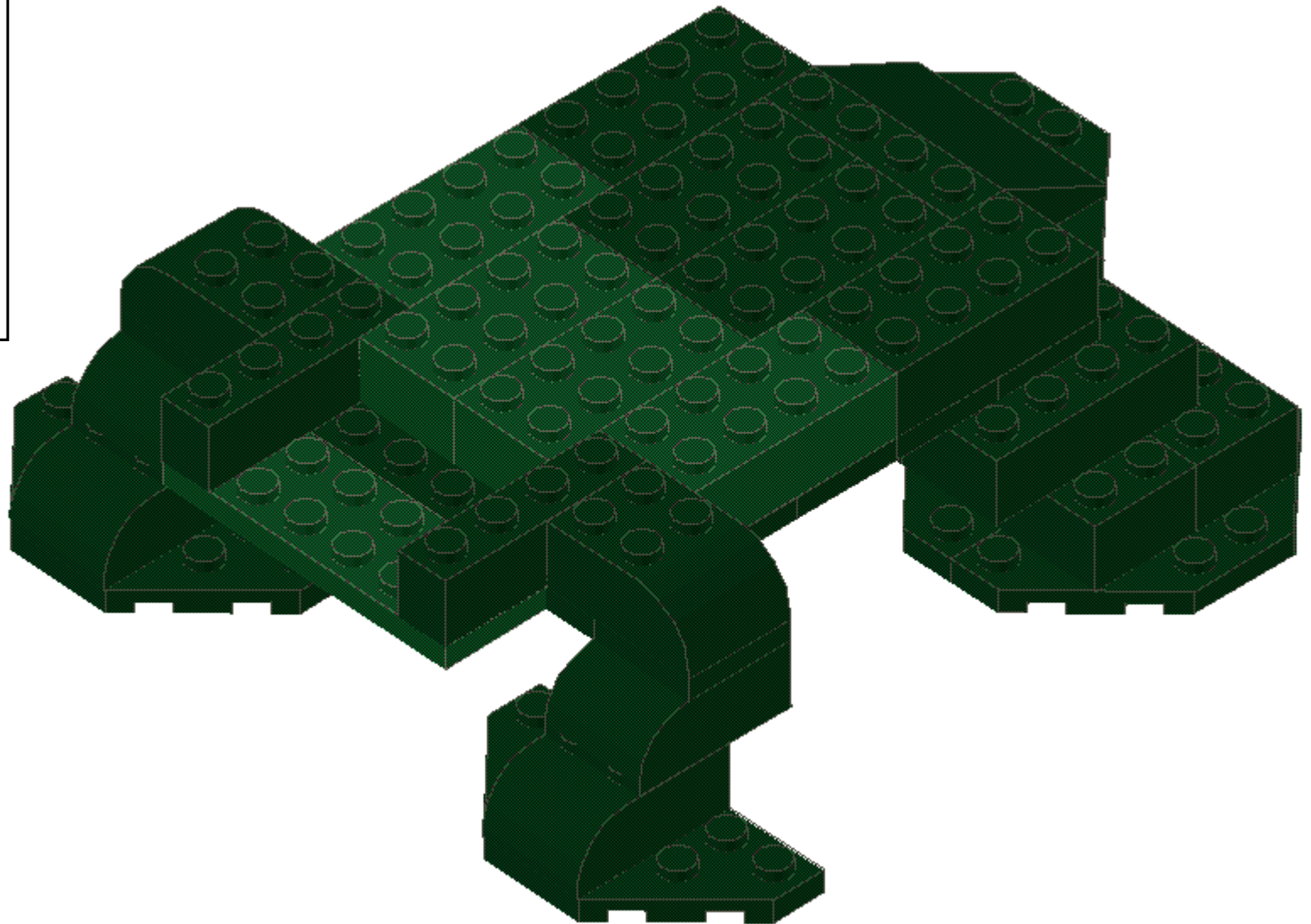
Frog

Pieces:



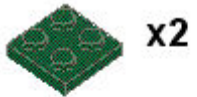
Frog

Pieces:

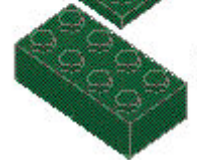


Frog

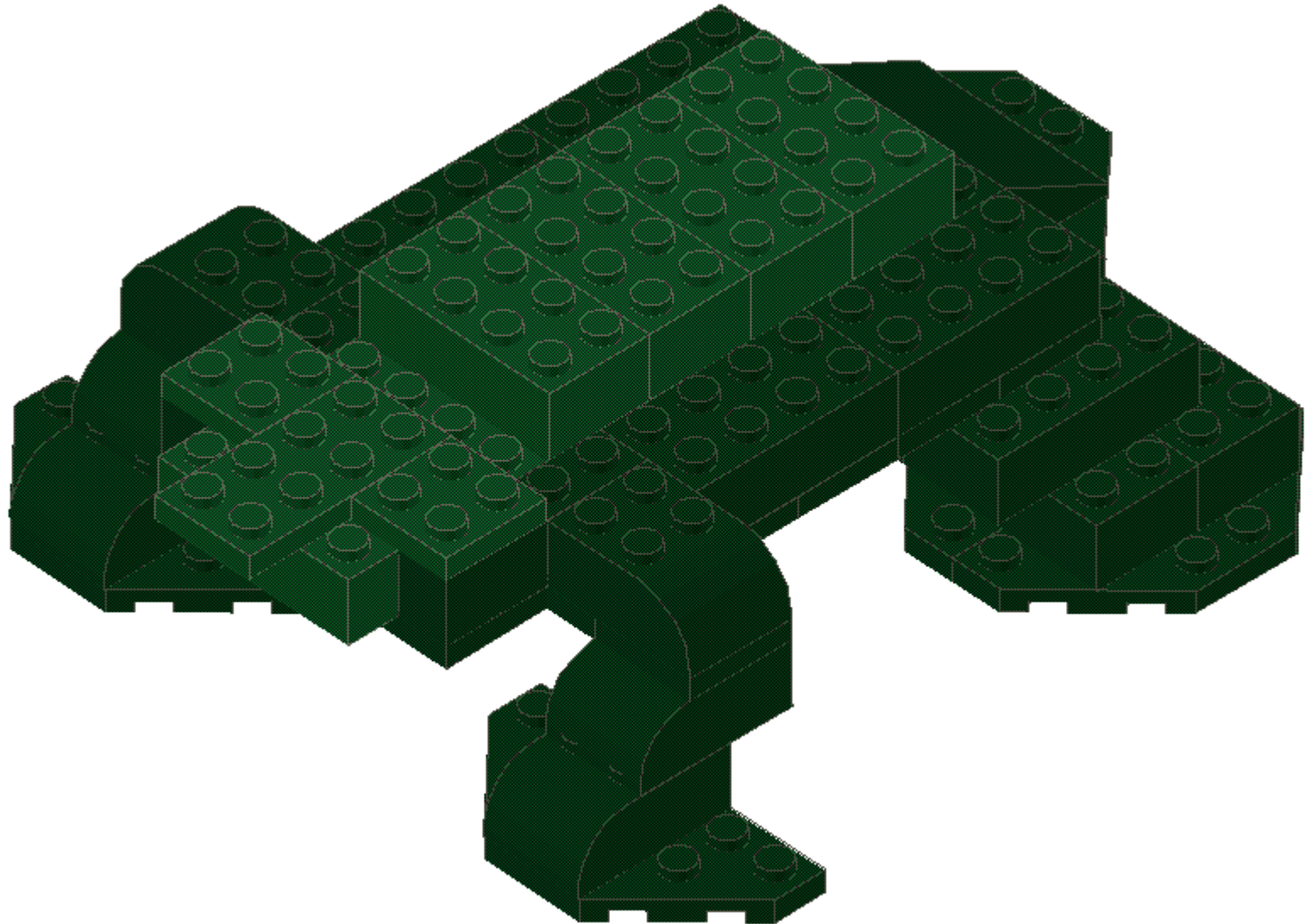
Pieces:



x2

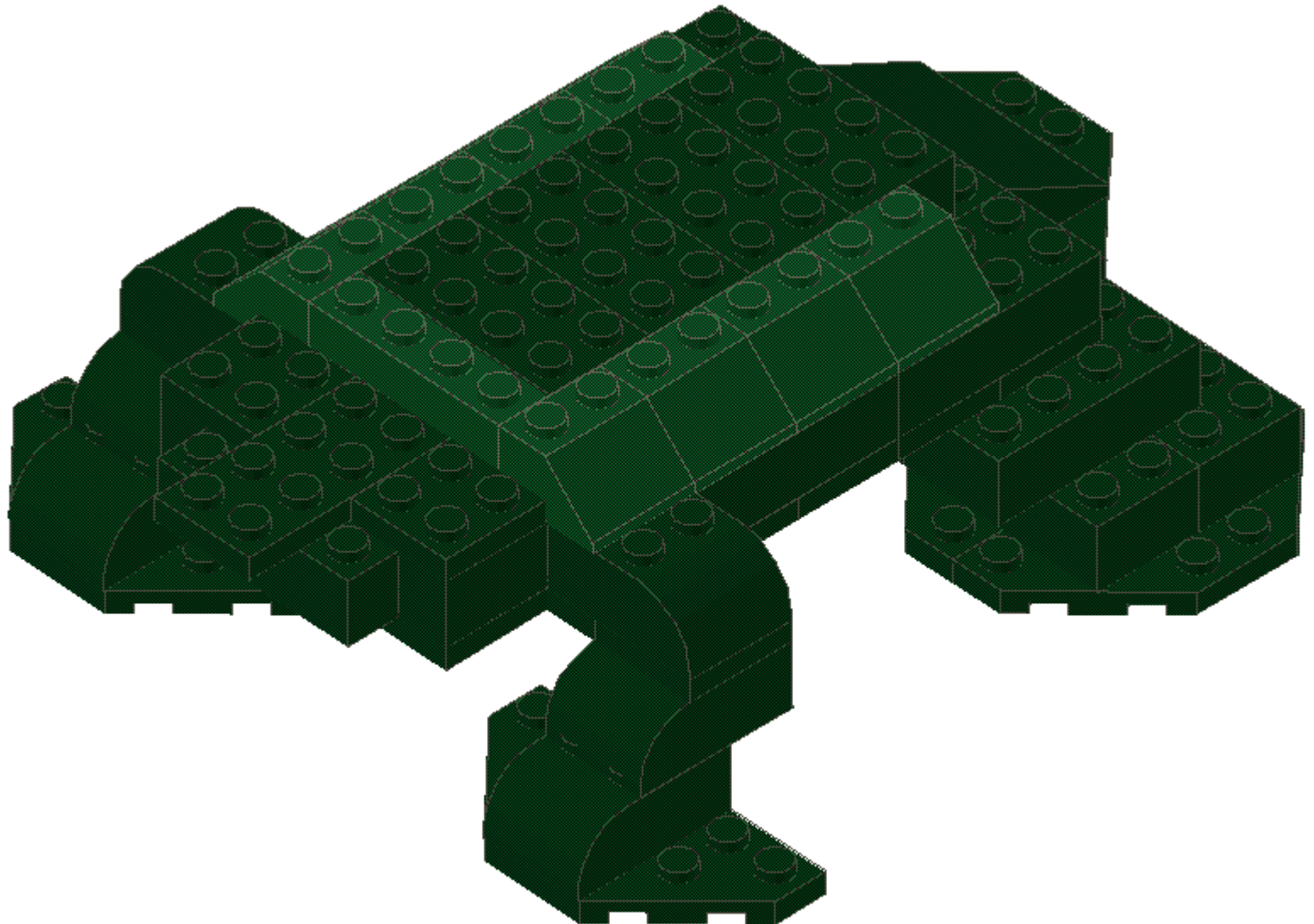
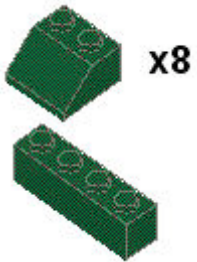


x6



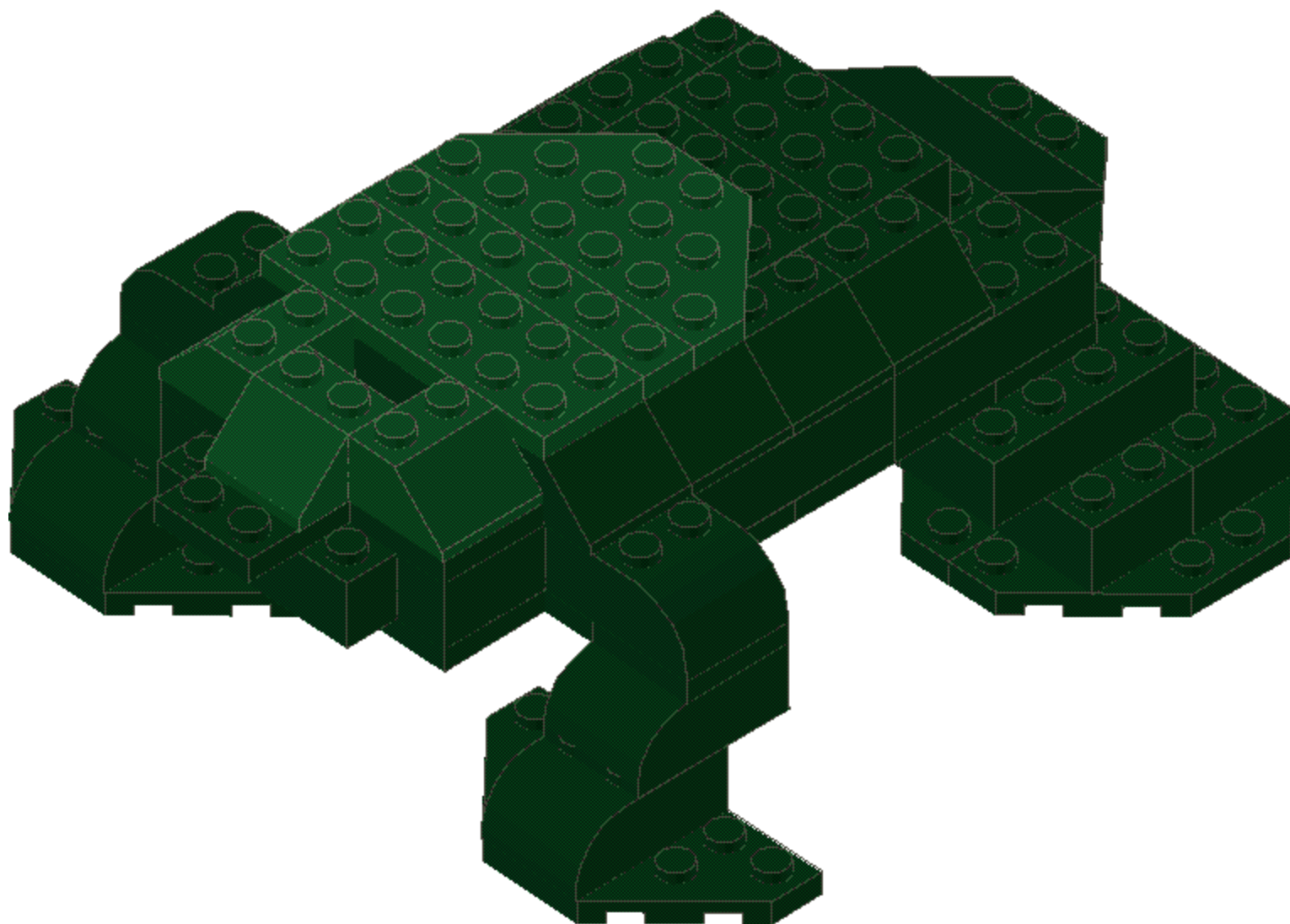
Frog

Pieces:



Frog

Pieces:



Frog

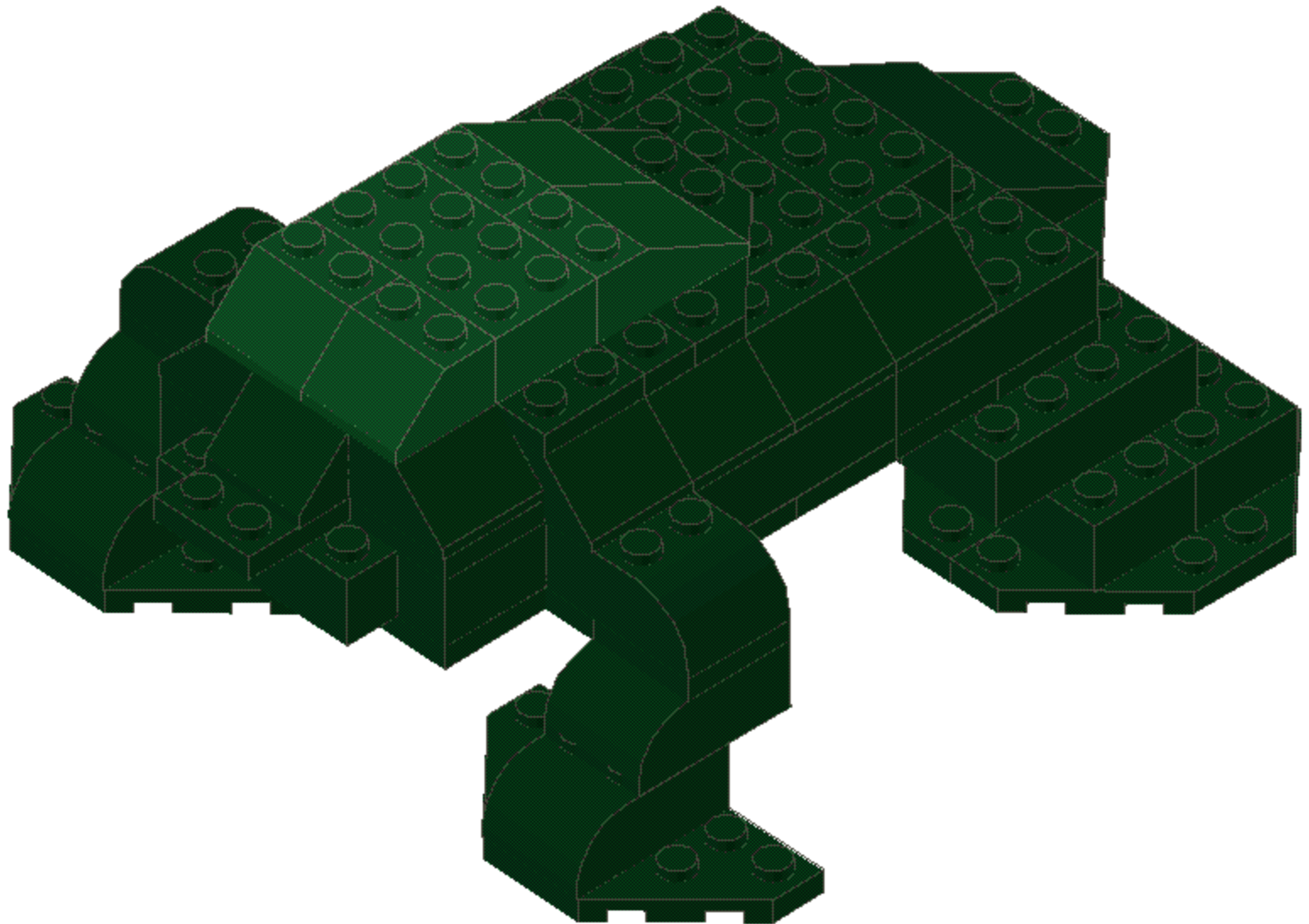
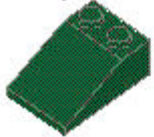
Pieces:



x2



x2



Frog

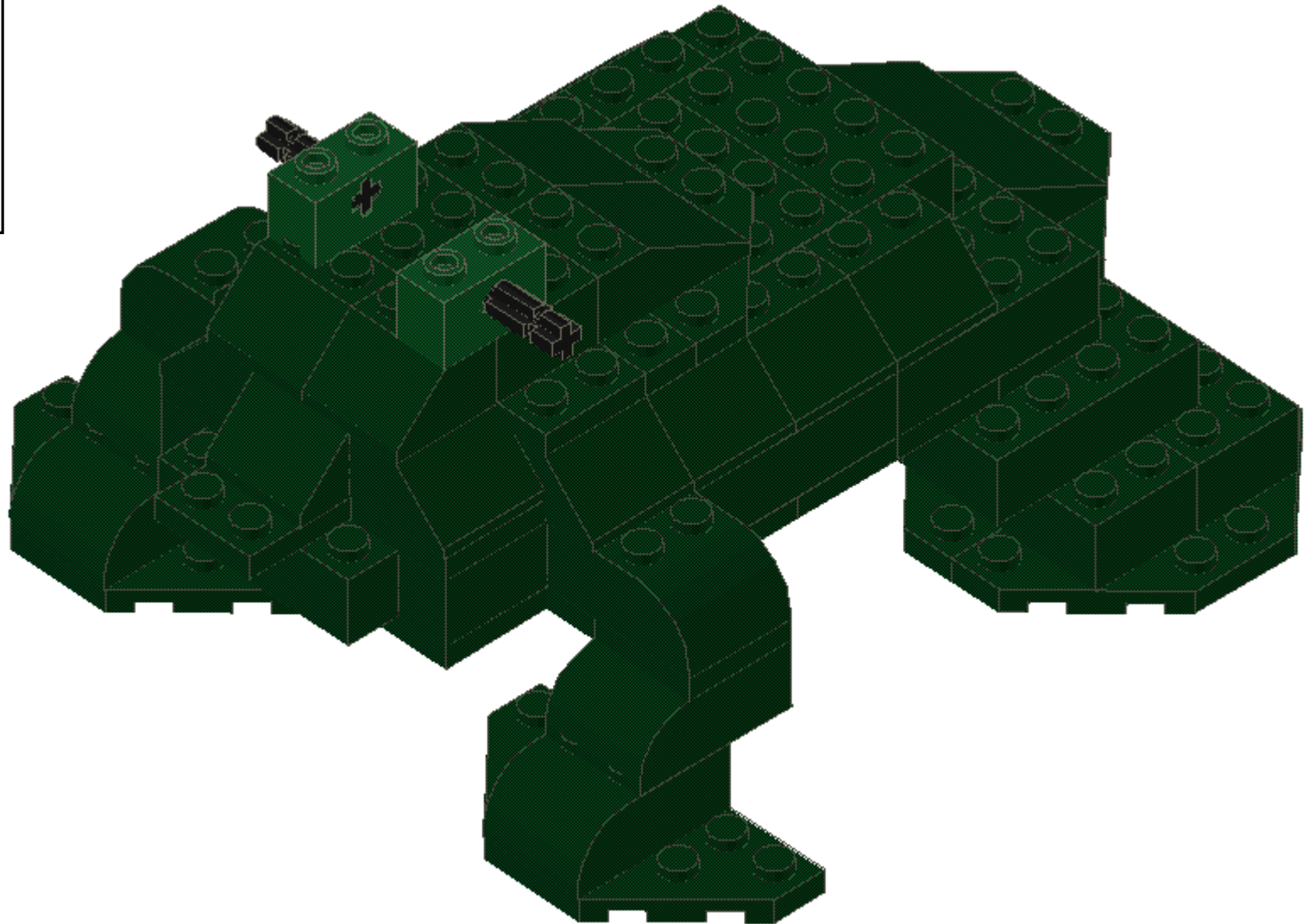
Pieces:



x2



x2



Frog

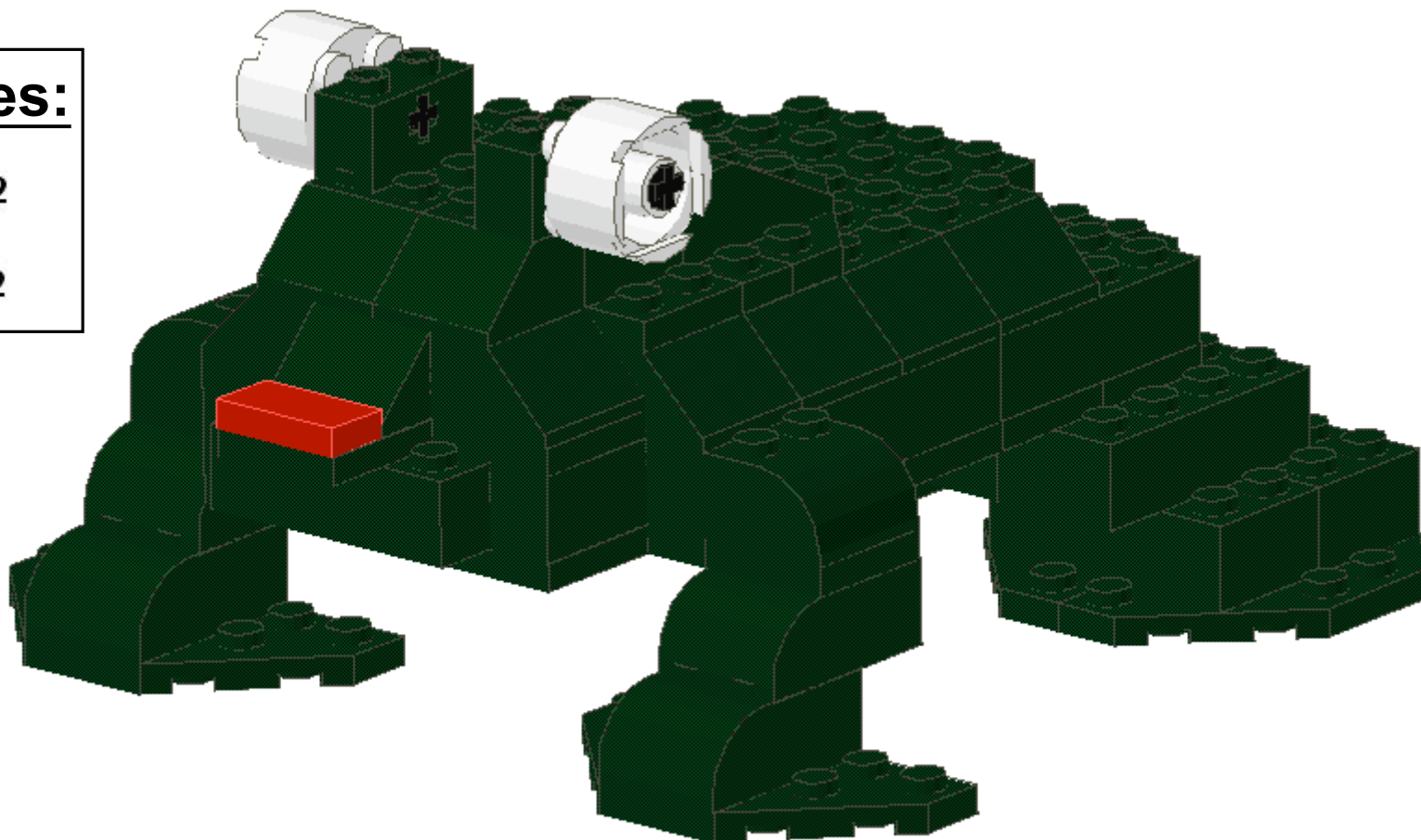
Pieces:



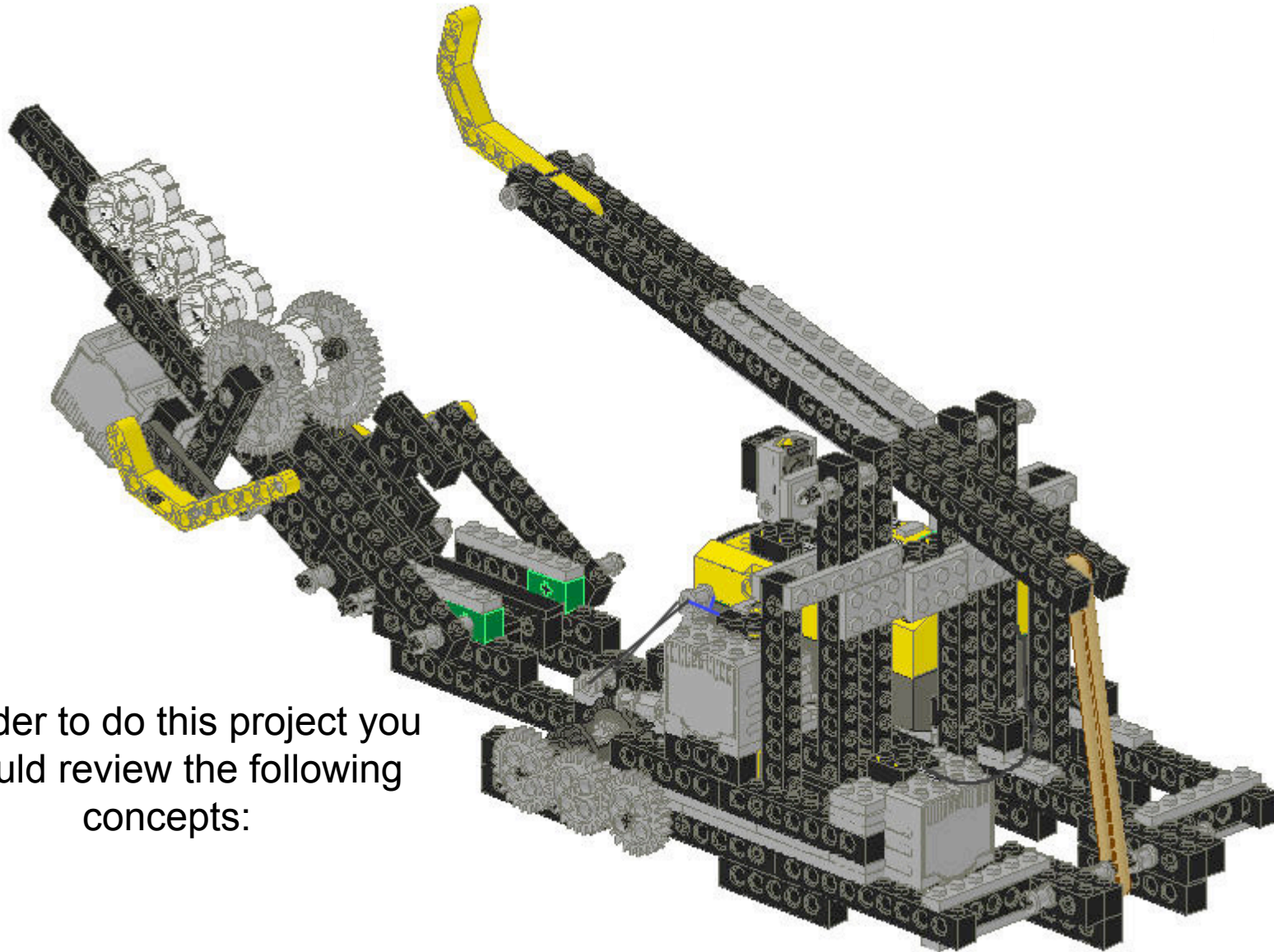
x2



x2

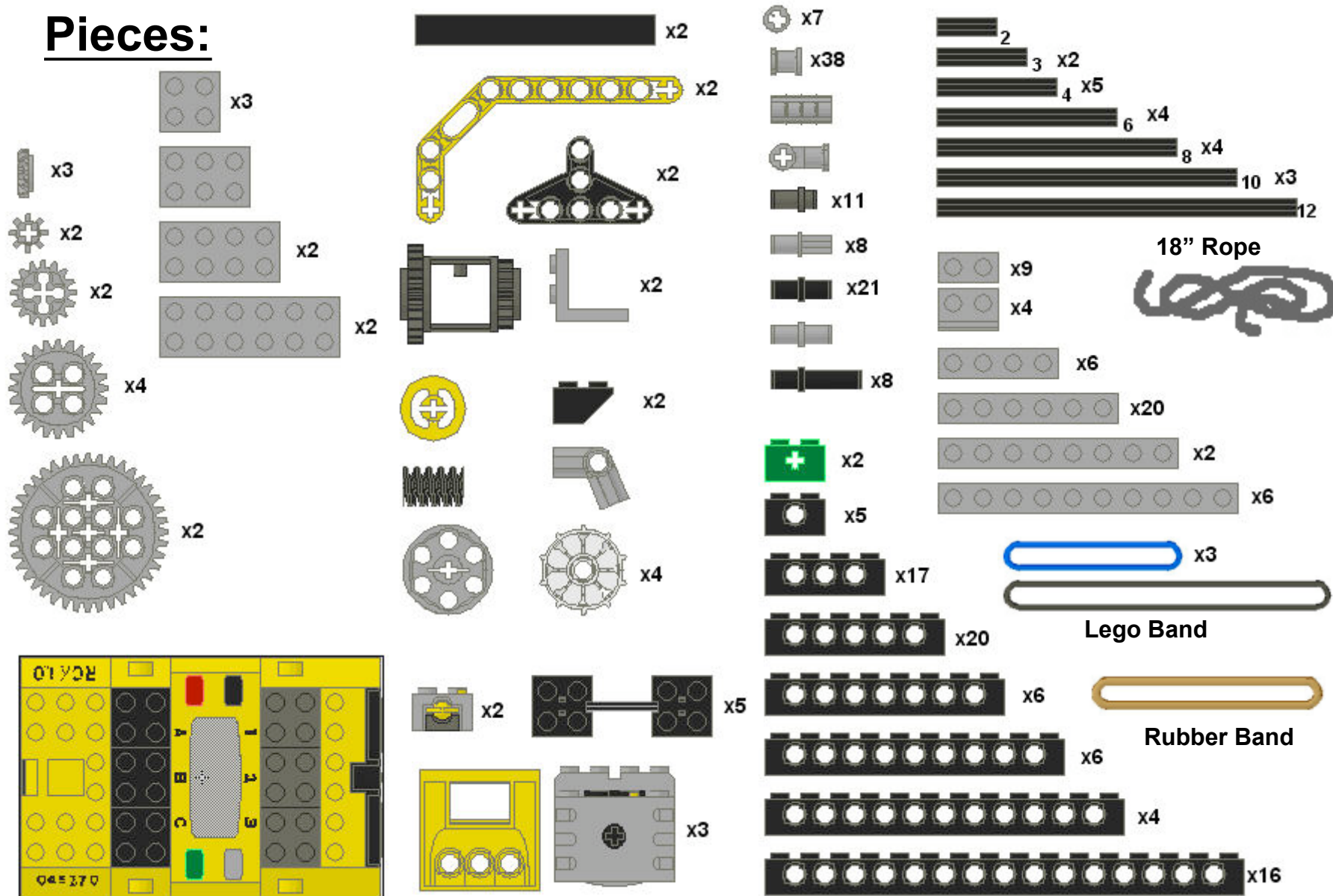


Catapult



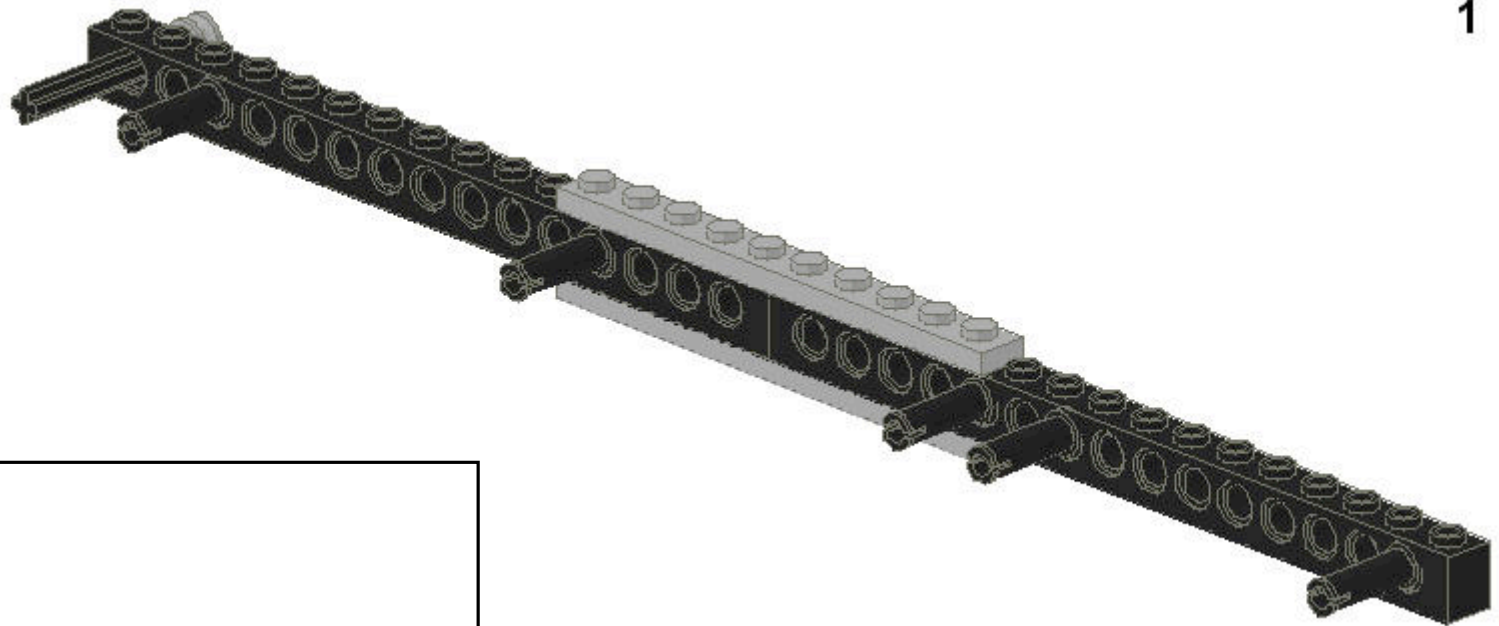
In order to do this project you should review the following concepts:

Pieces:



Catapult: Arm

1



Pieces:



4



x5



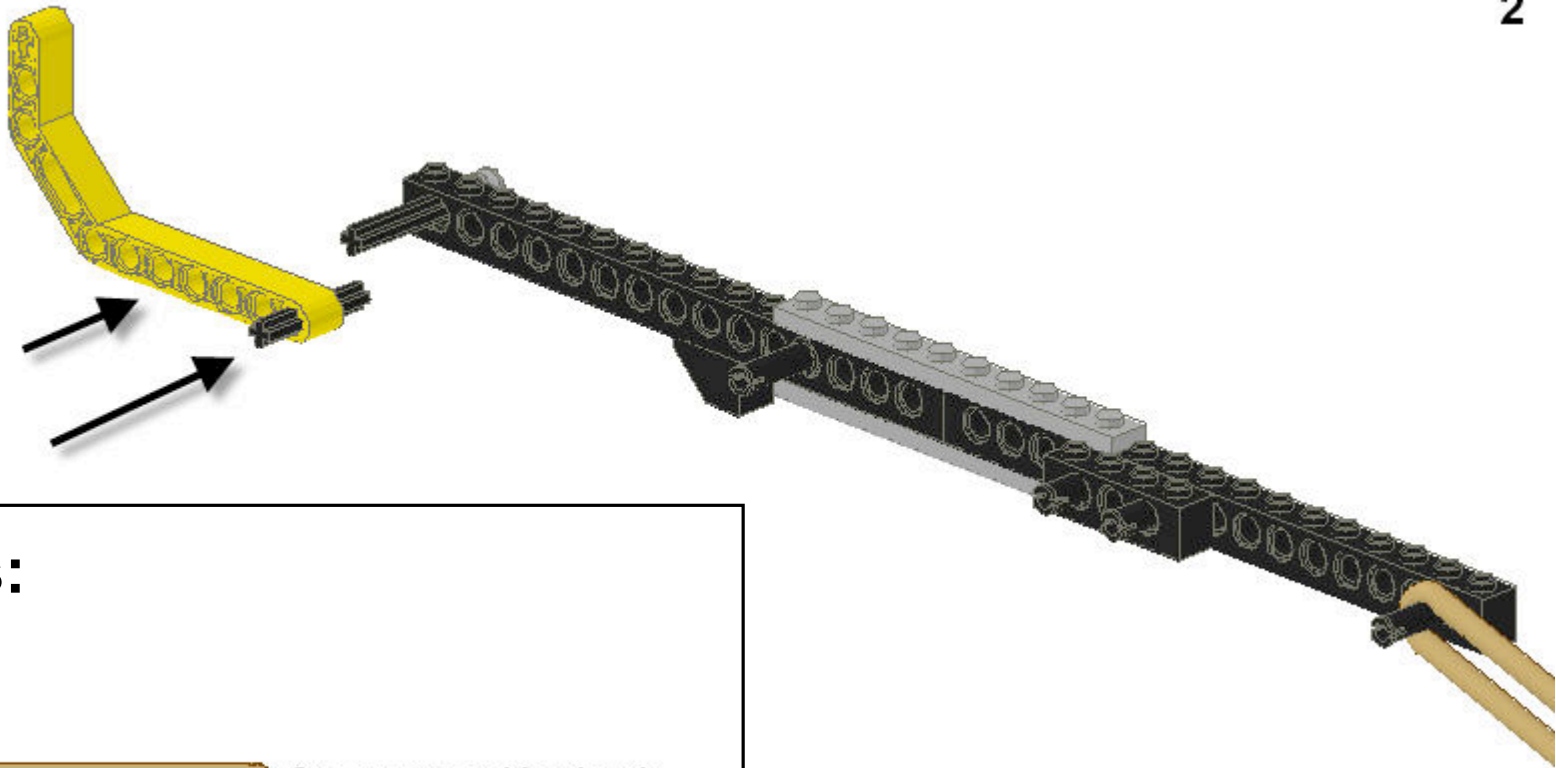
x2



x2

Catapult: Arm

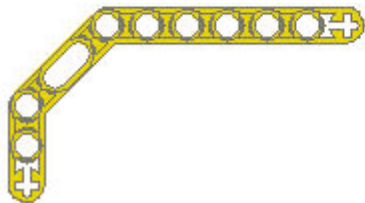
2



Pieces:

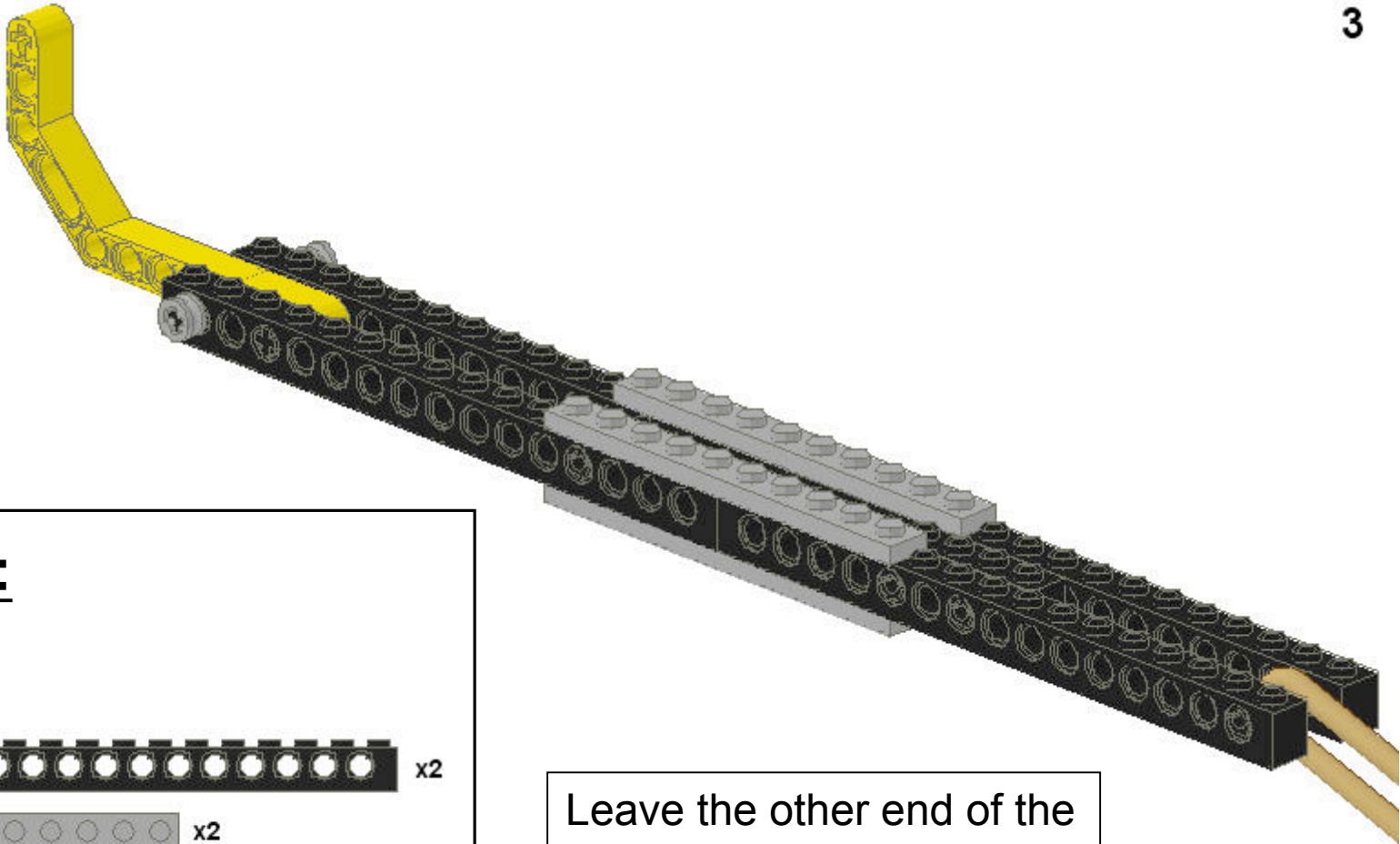


One or more rubber bands,
about 2-3 inches long.



Catapult: Arm

3



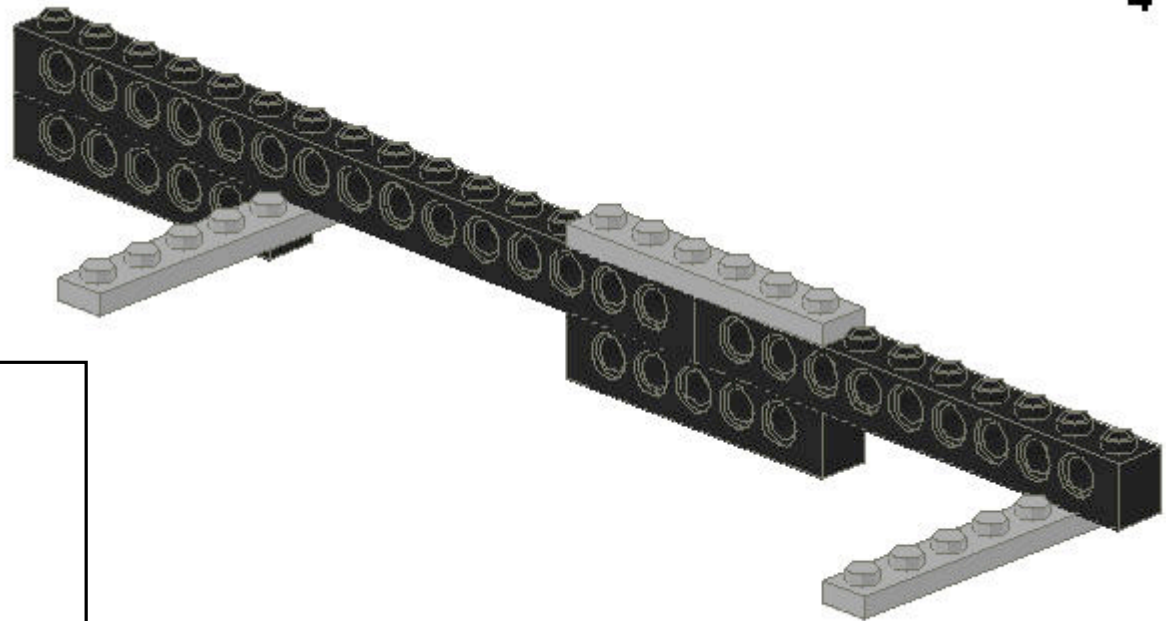
Pieces:



Leave the other end of the rubber band loose for now

Catapult: Right Side

4



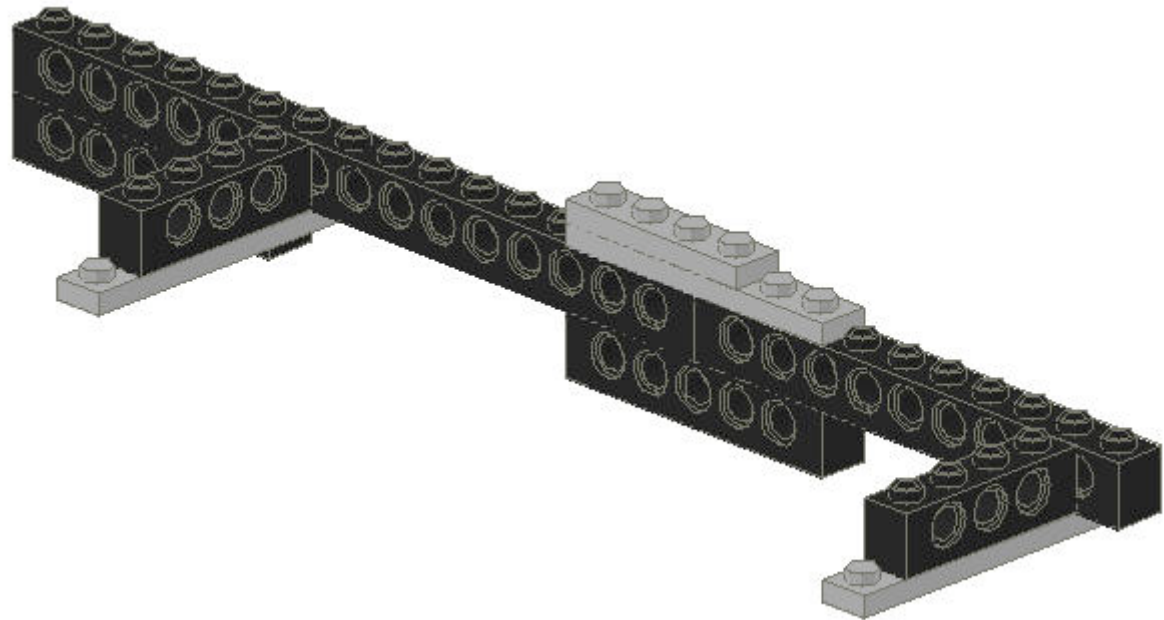
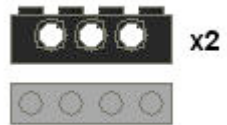
Pieces:



Catapult: Right Side

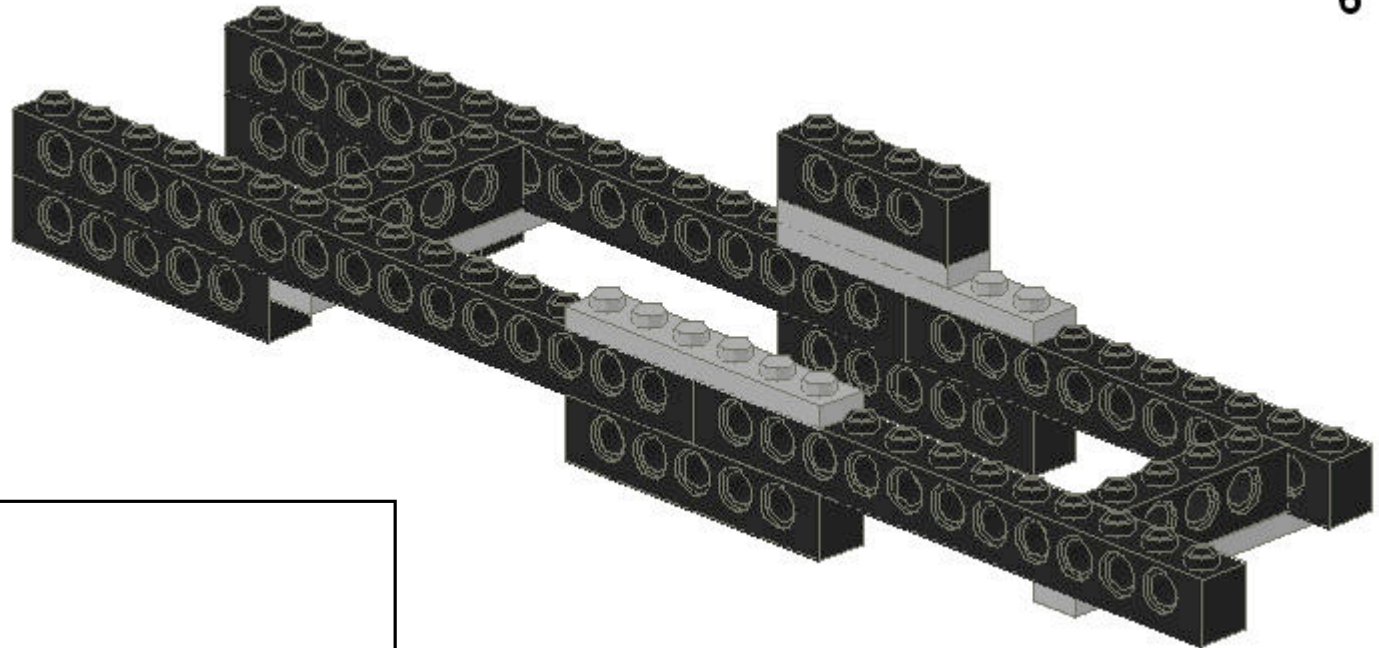
5

Pieces:



Catapult: Right Side

6



Pieces:

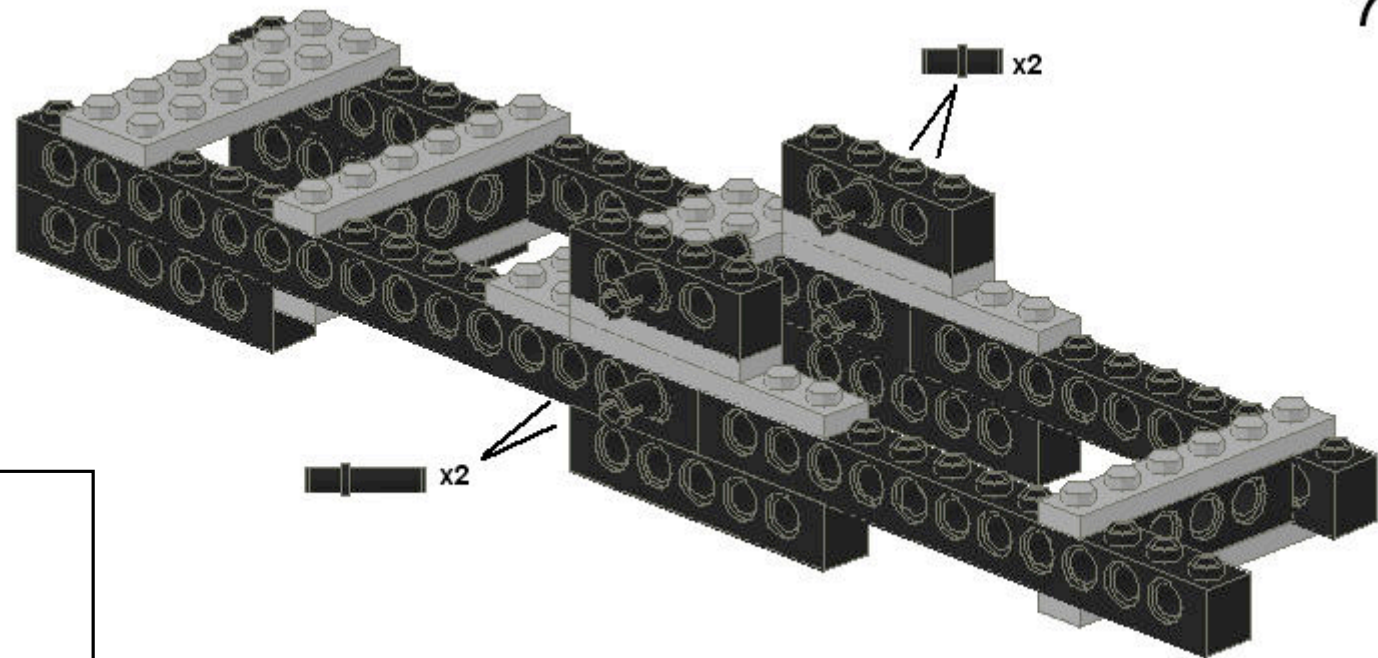


x2



Catapult: Right Side

7



Pieces:

 x2

 x2



 x2

 x2

Catapult: Right Side

8

Pieces:



6



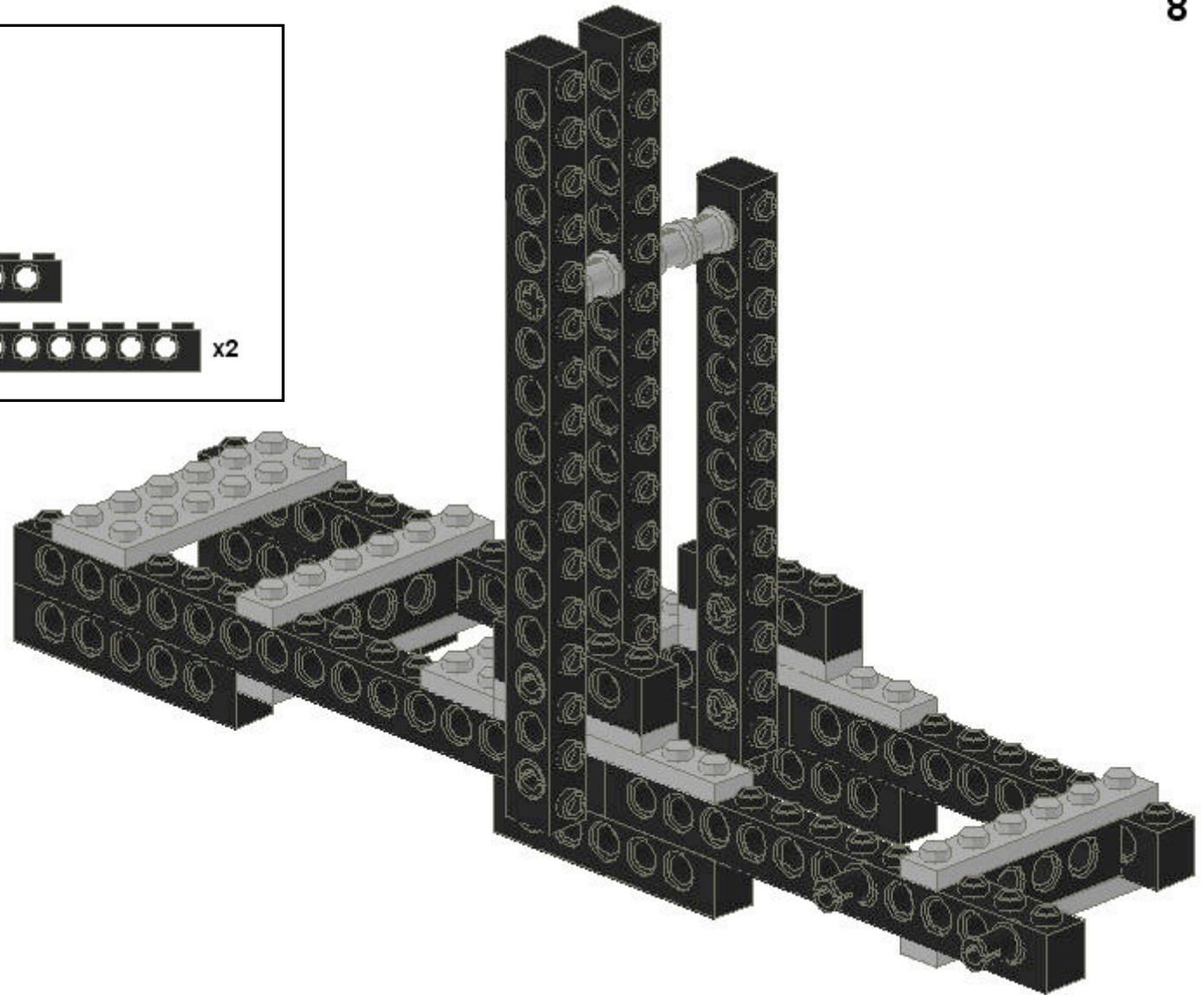
x3



x2



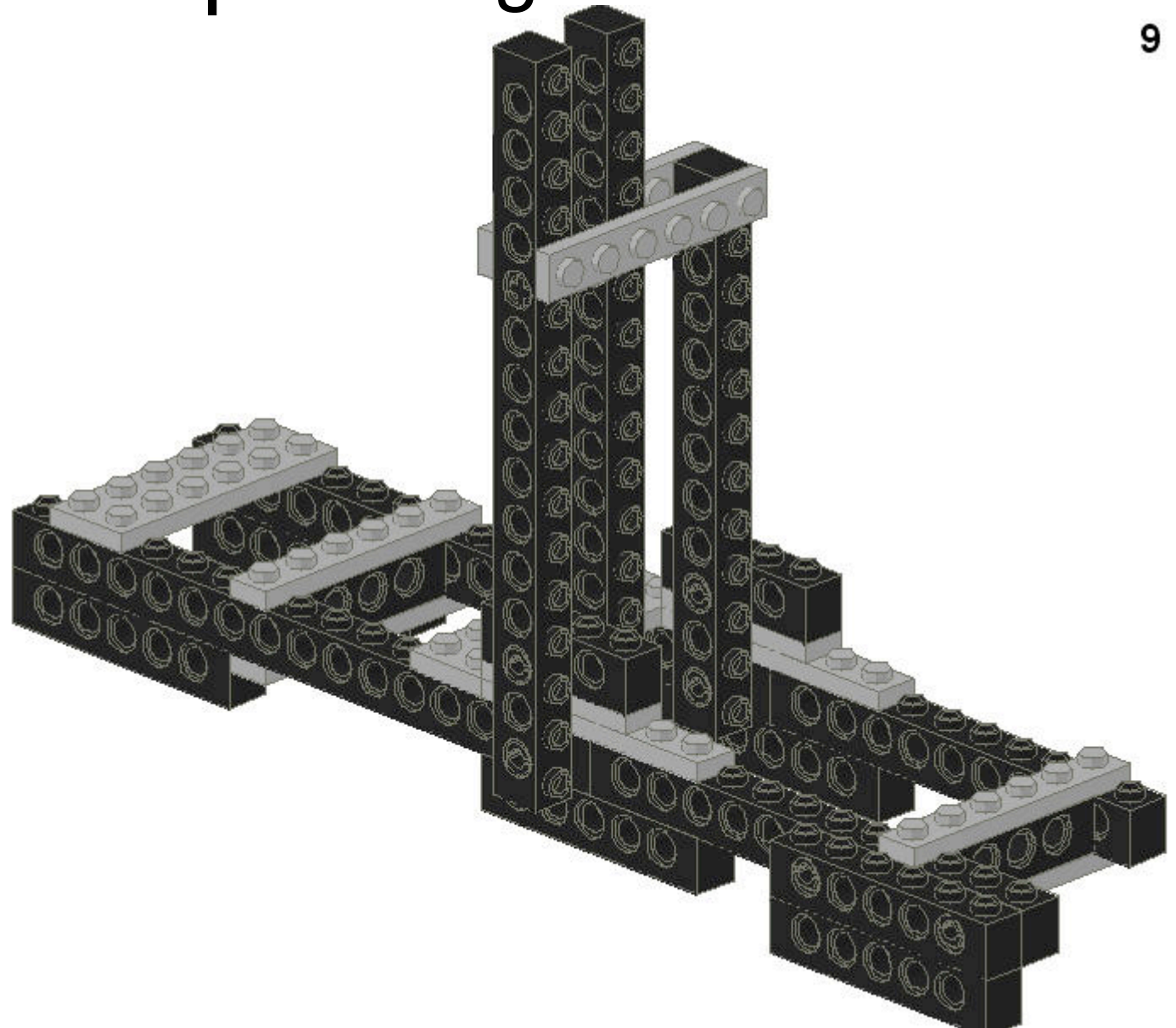
x2



Catapult: Right Side

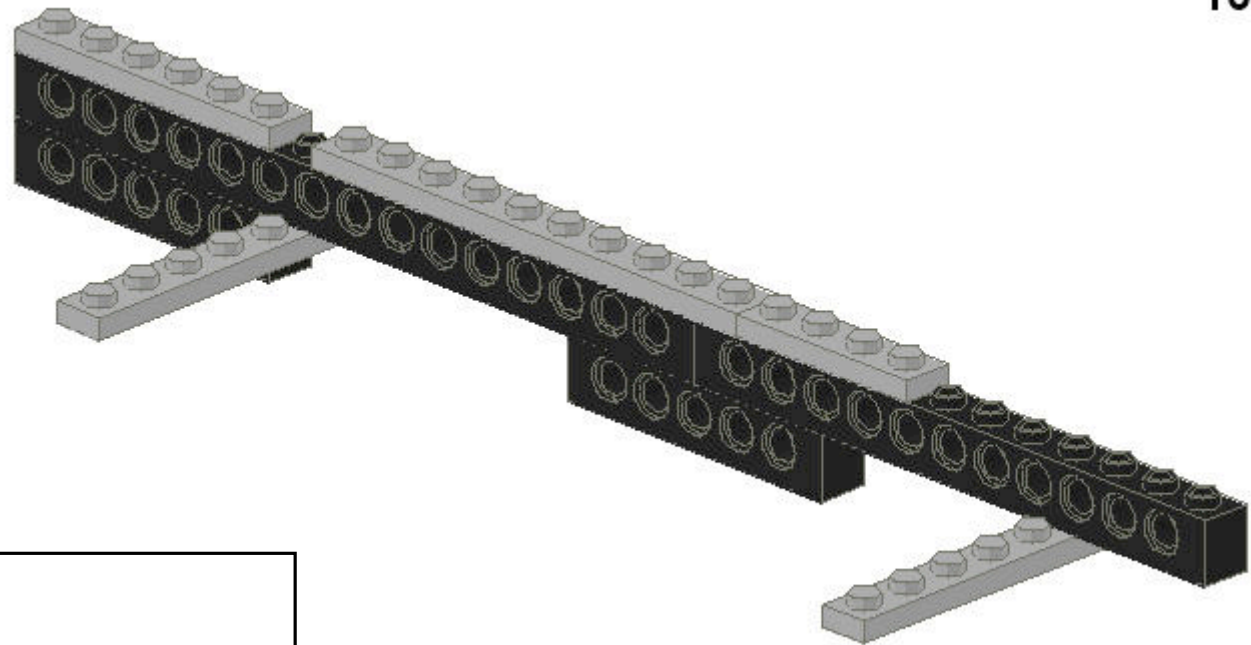
9

Pieces:



Catapult: Left Side

10

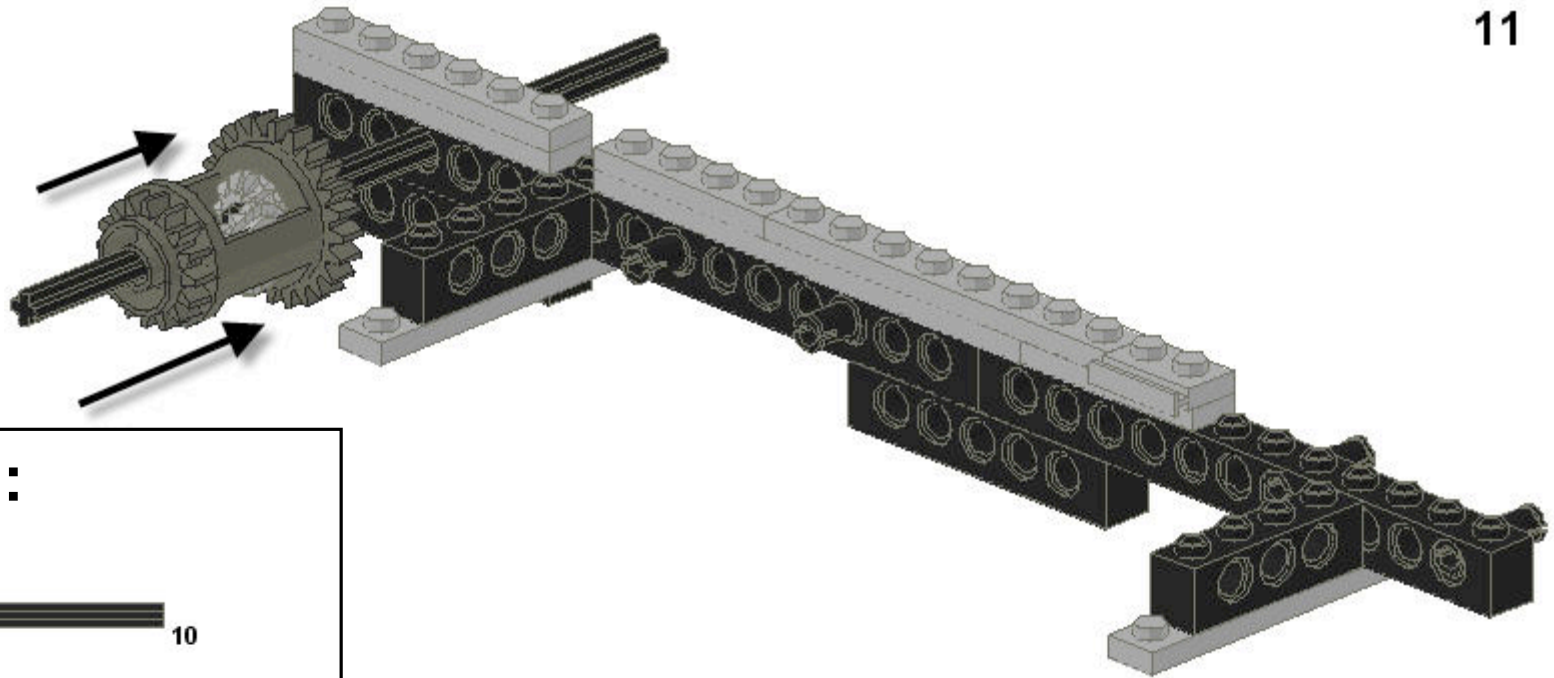


Pieces:

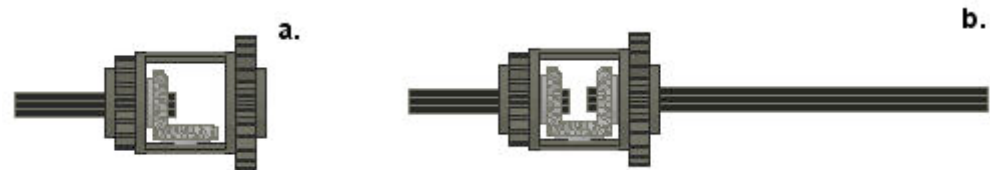
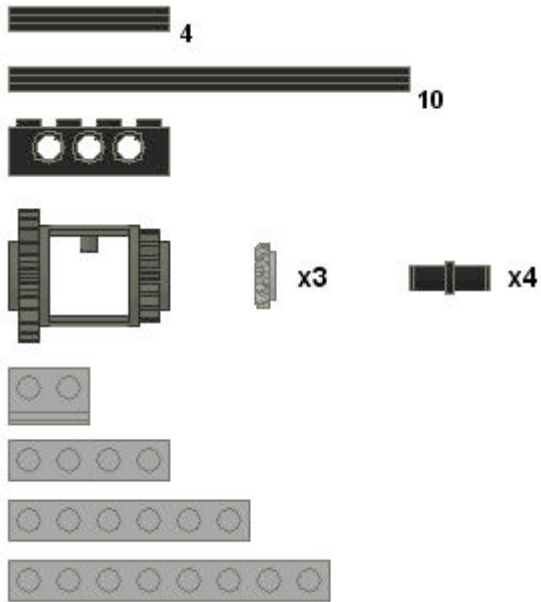


Catapult: Left Side

11

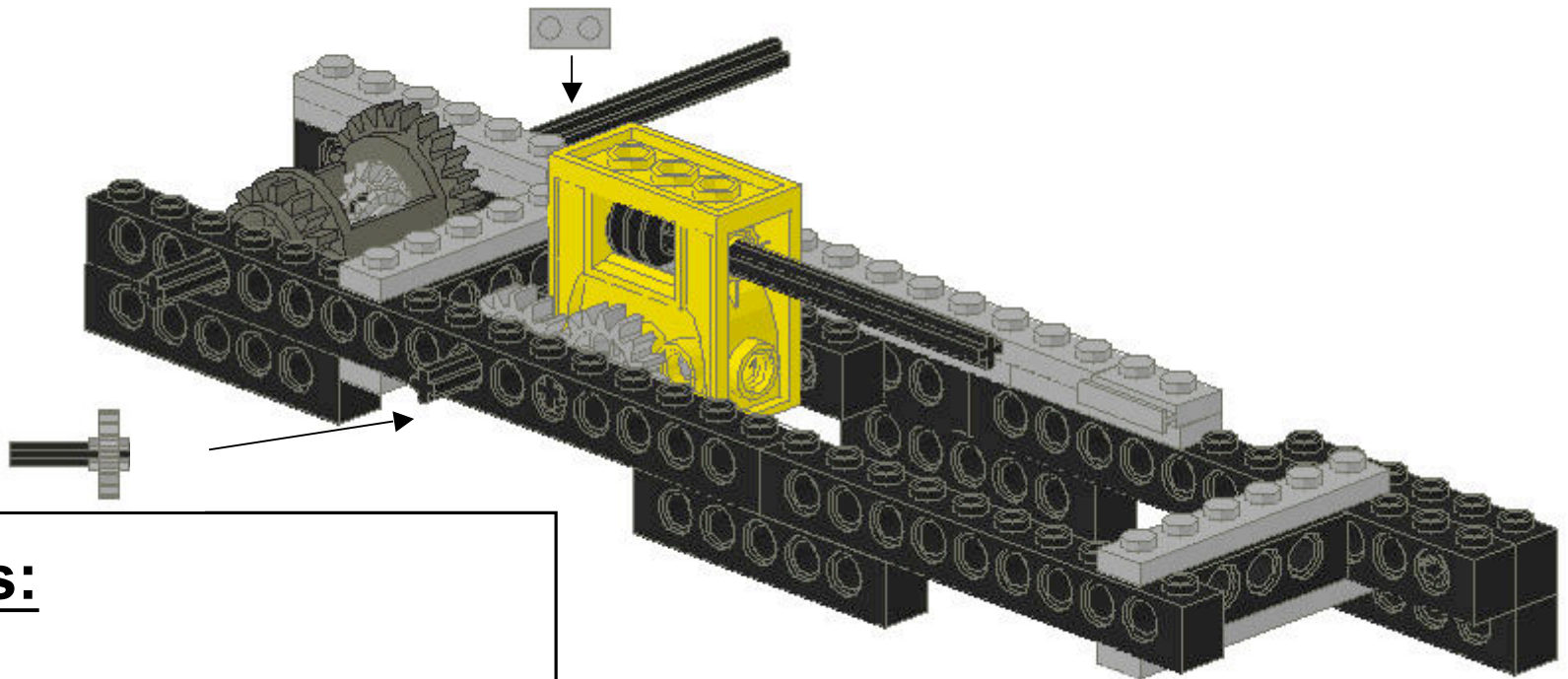


Pieces:



Catapult: Left Side

13



Pieces:



3



x2

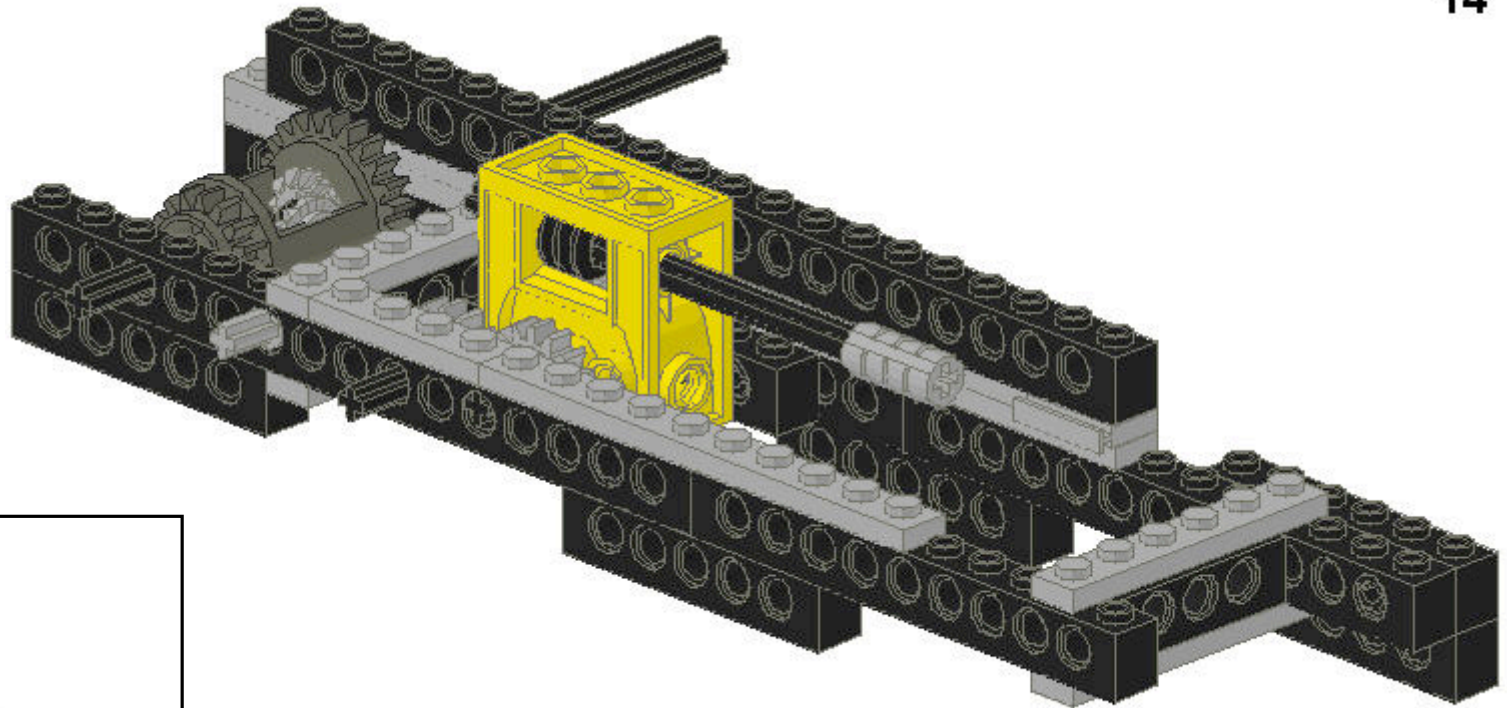


x2



Catapult: Left Side

14

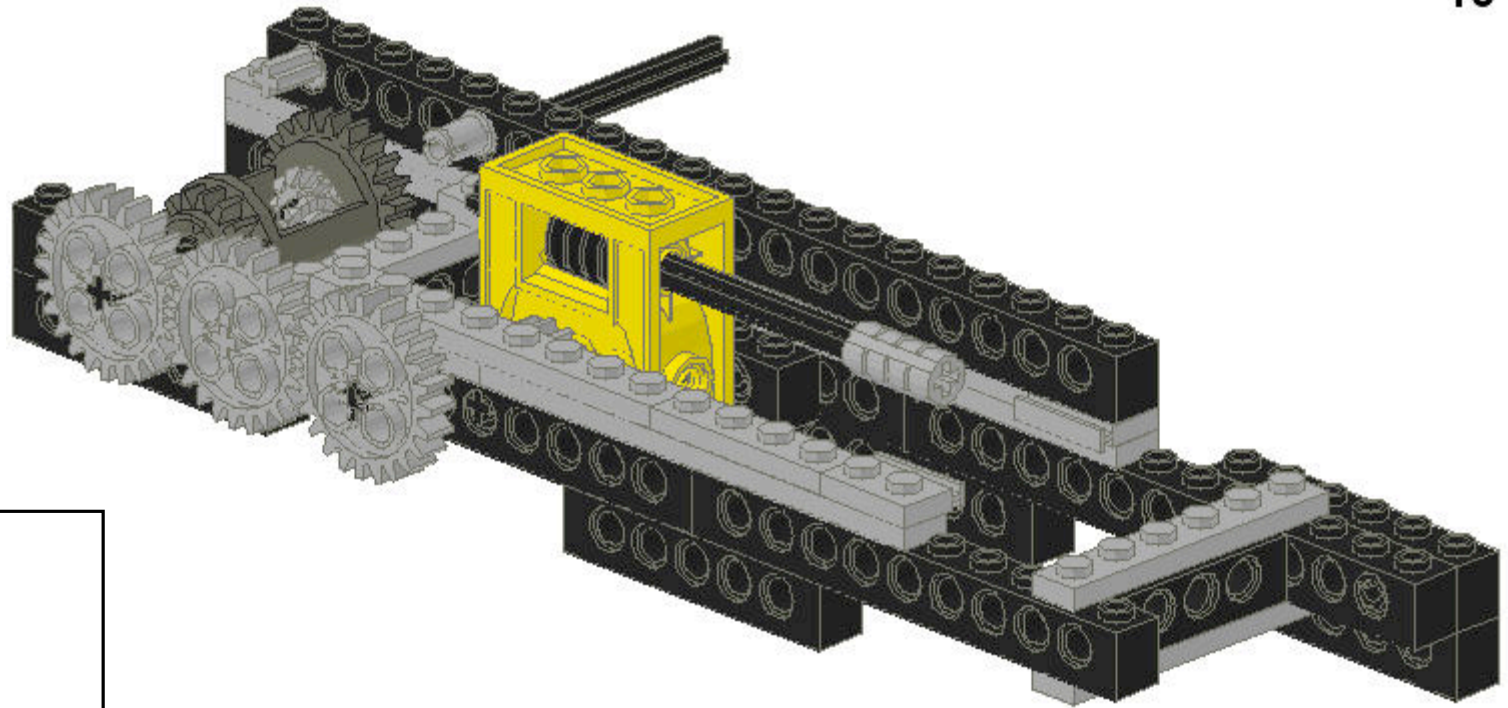


Pieces:



Catapult: Left Side

15



Pieces:



x3



Catapult: Left Side

17

Pieces:

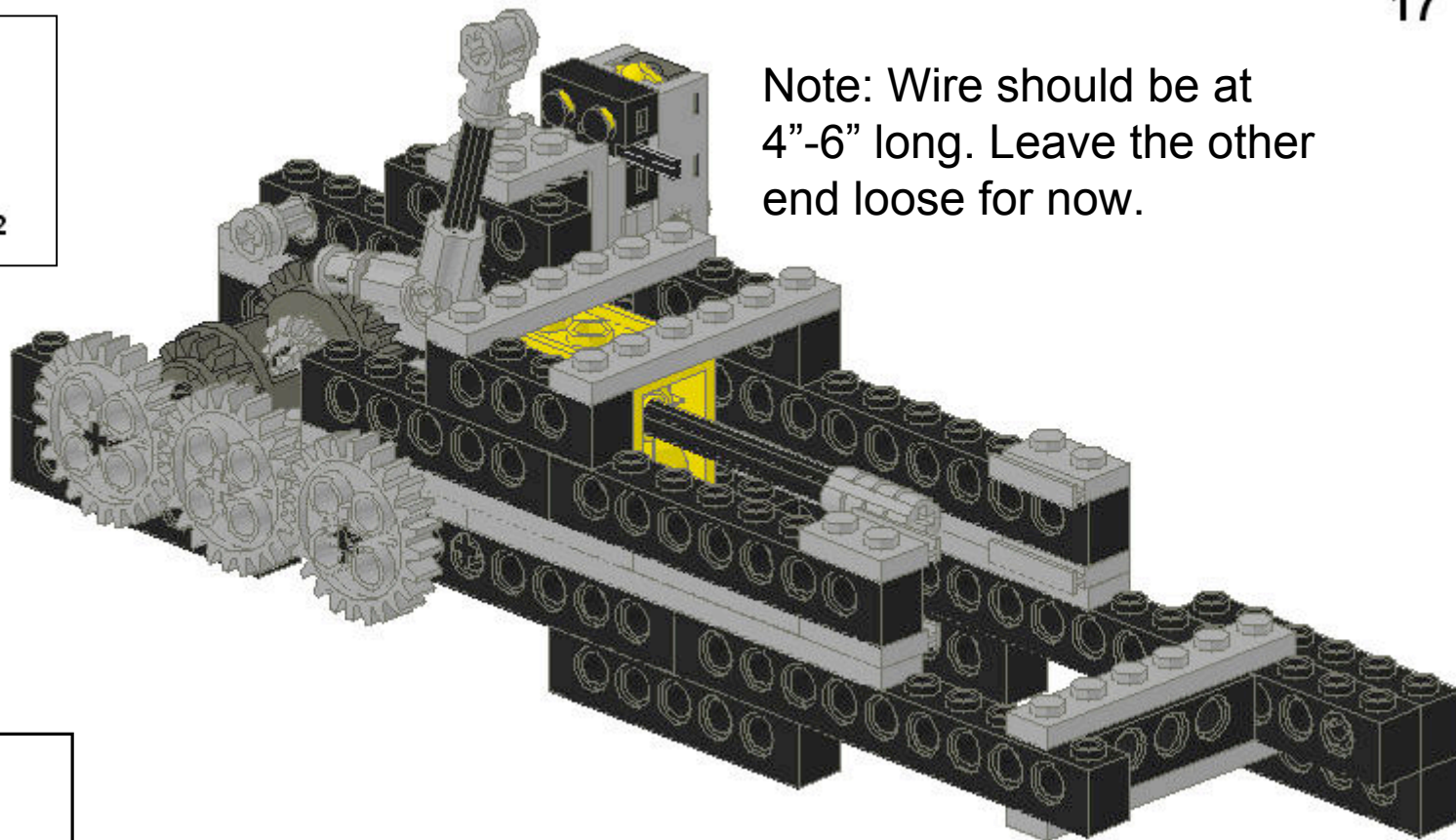


x2



x2

Note: Wire should be at 4"-6" long. Leave the other end loose for now.



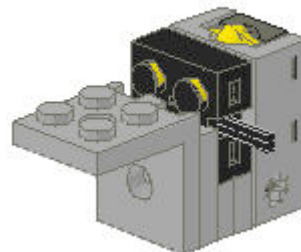
Pieces:



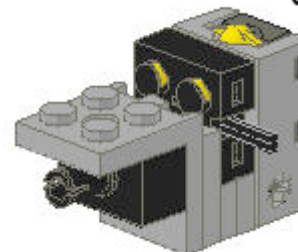
x2



a.



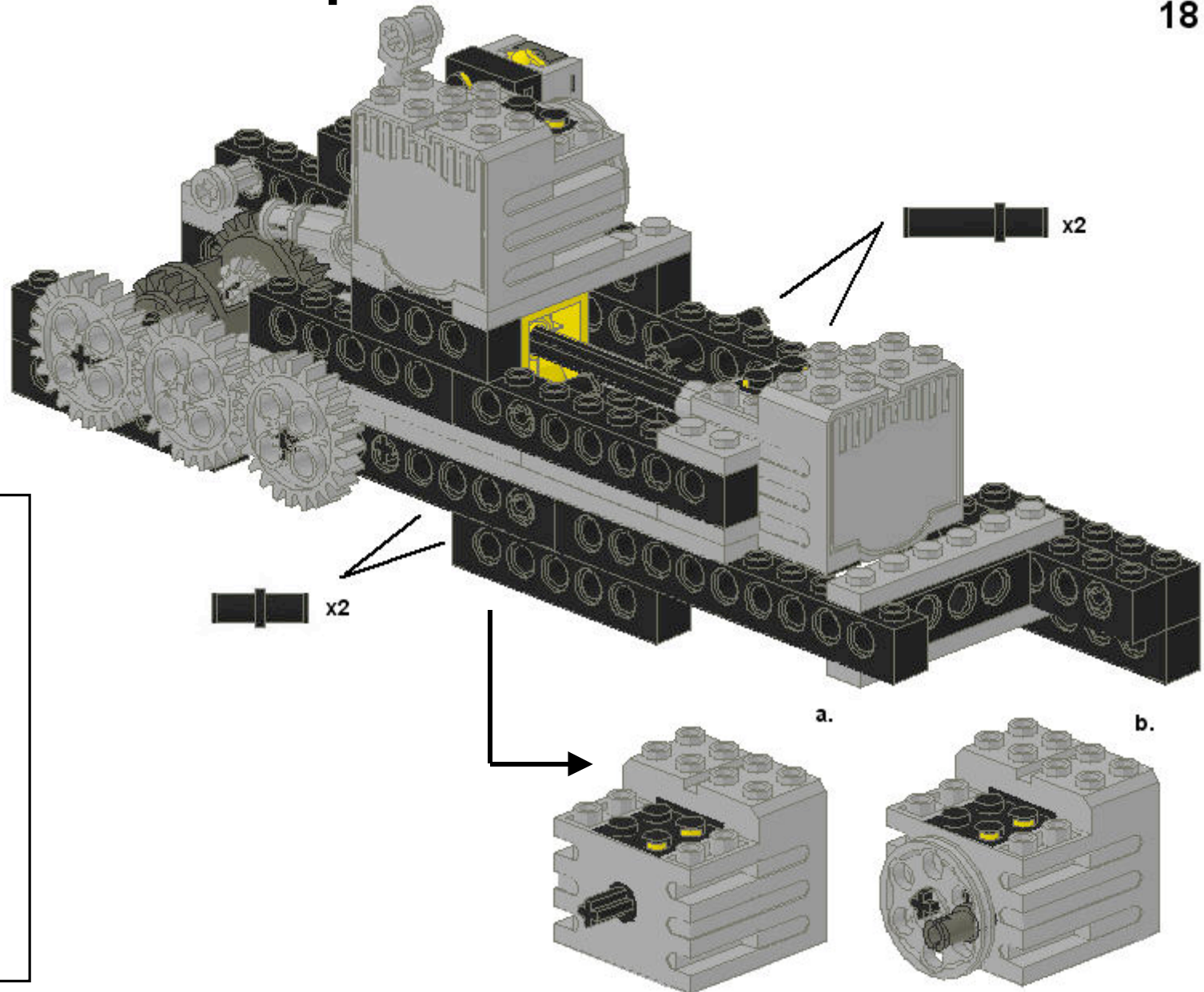
b.



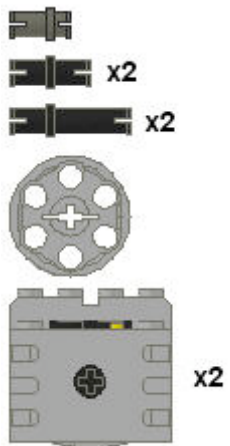
c.

Catapult: Left Side

18



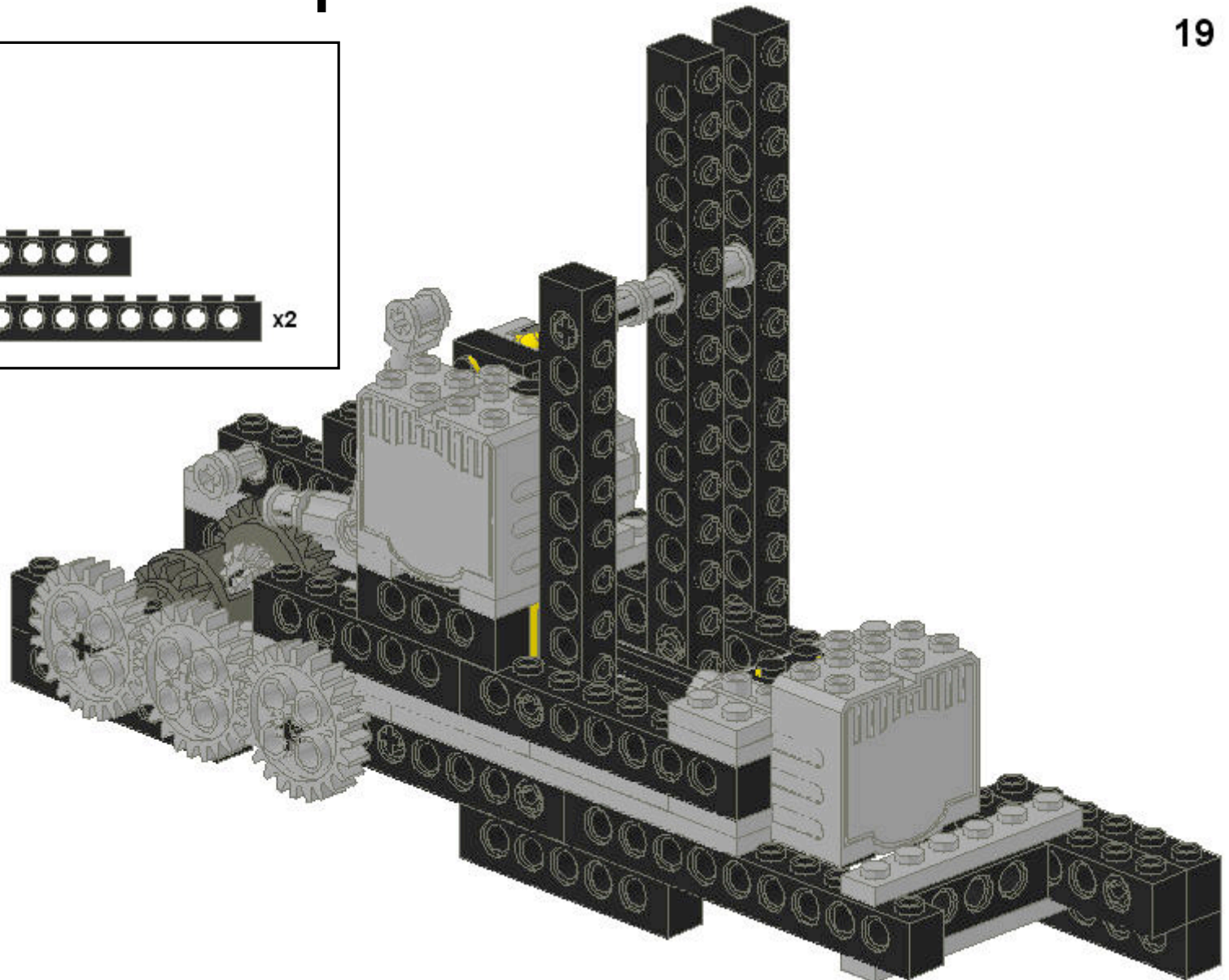
Pieces:



Catapult: Left Side

19

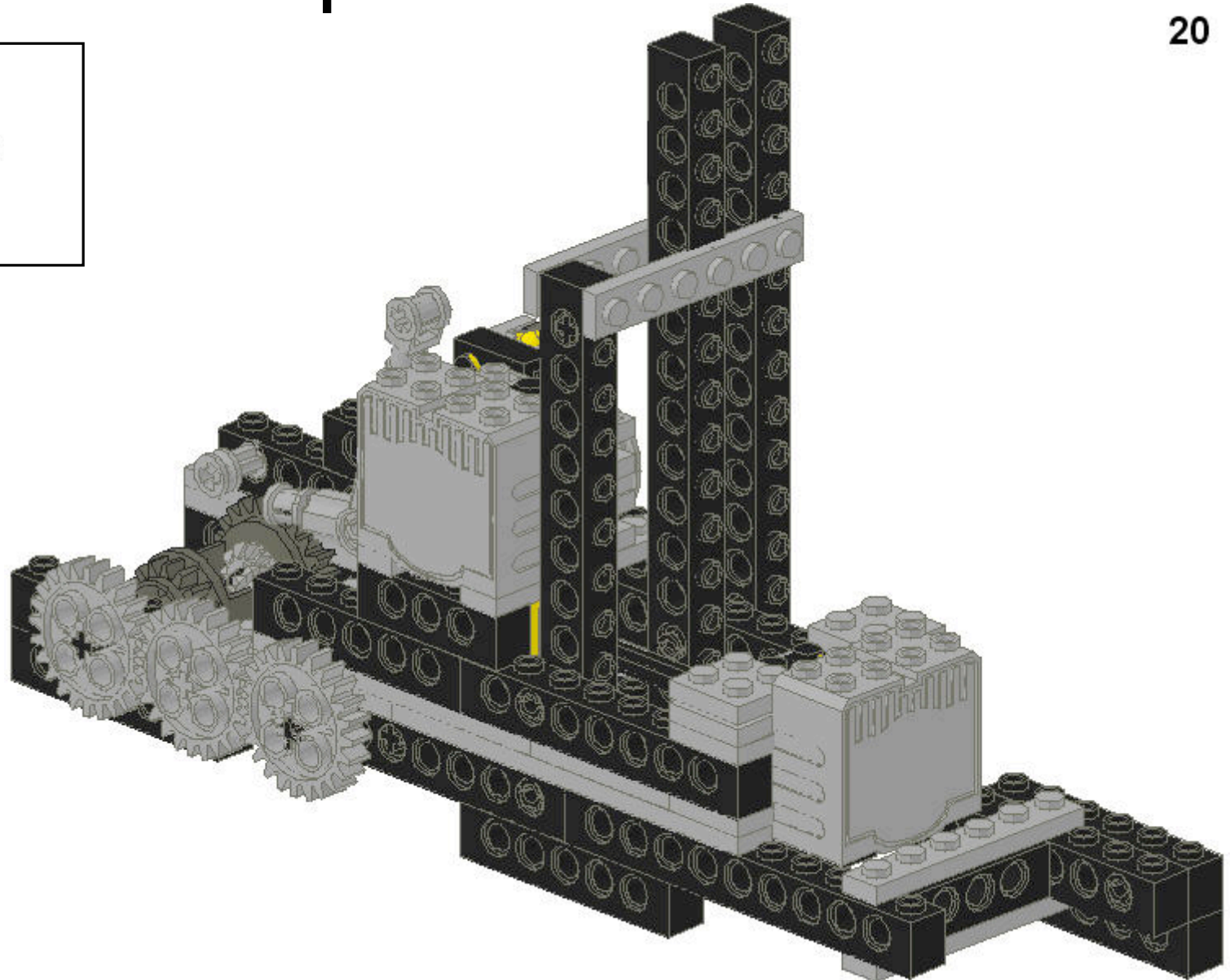
Pieces:



Catapult: Left Side

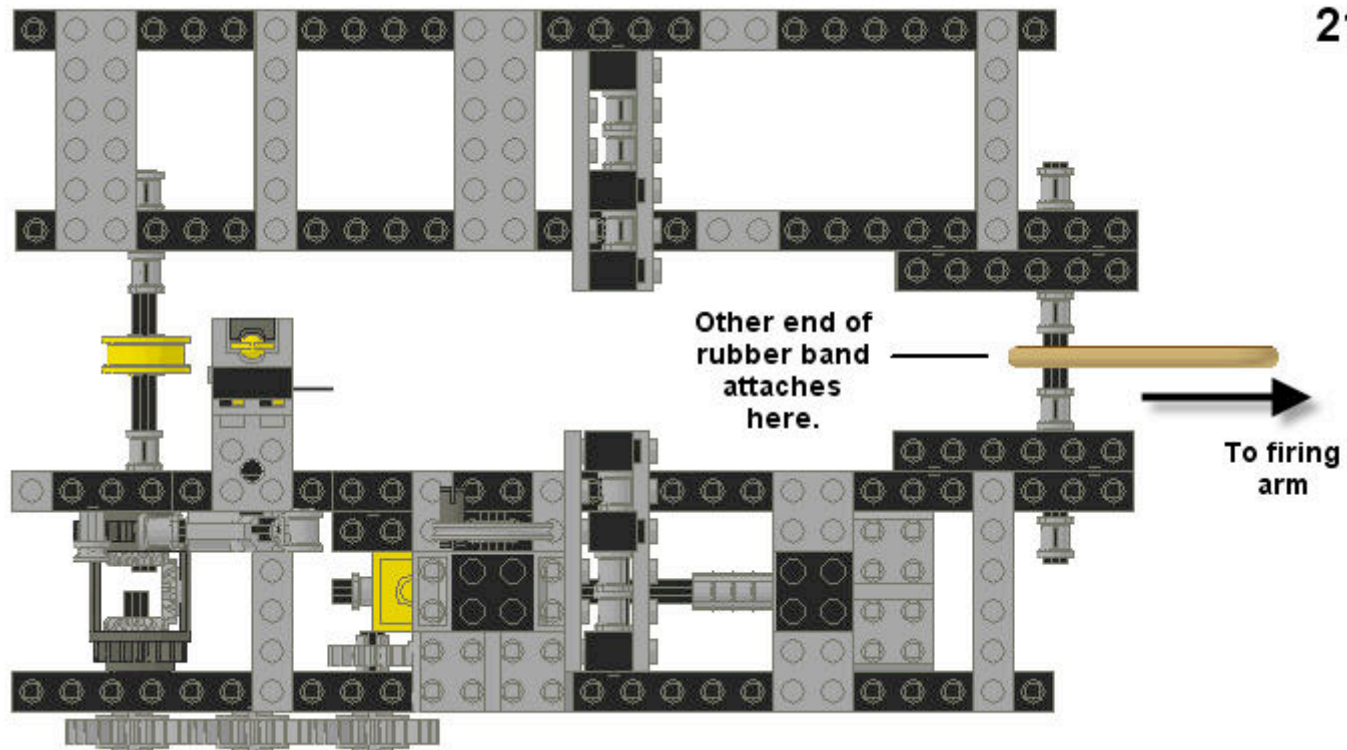
20

Pieces:



Catapult: Assembly

21



Pieces:

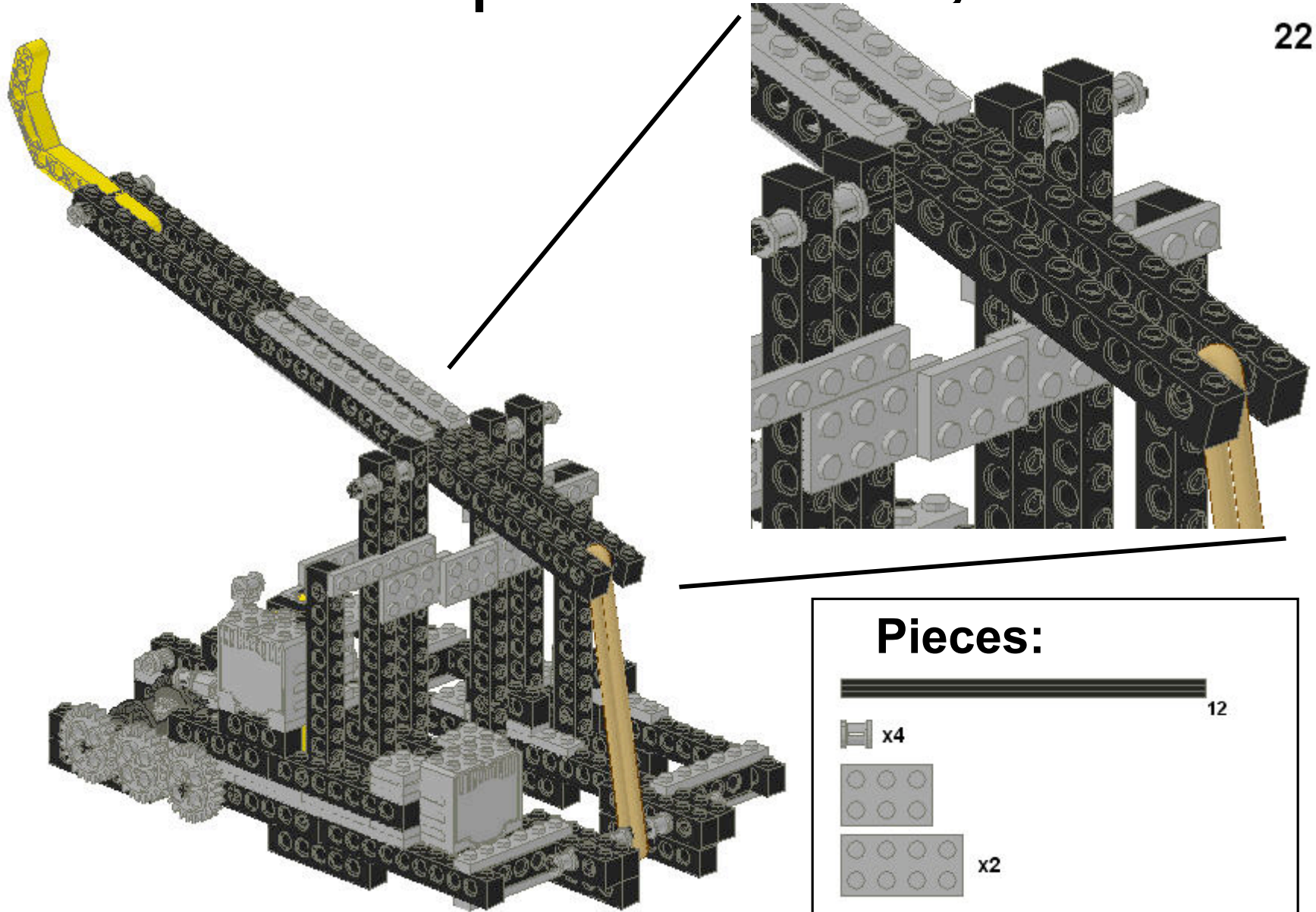
10 x2

x7



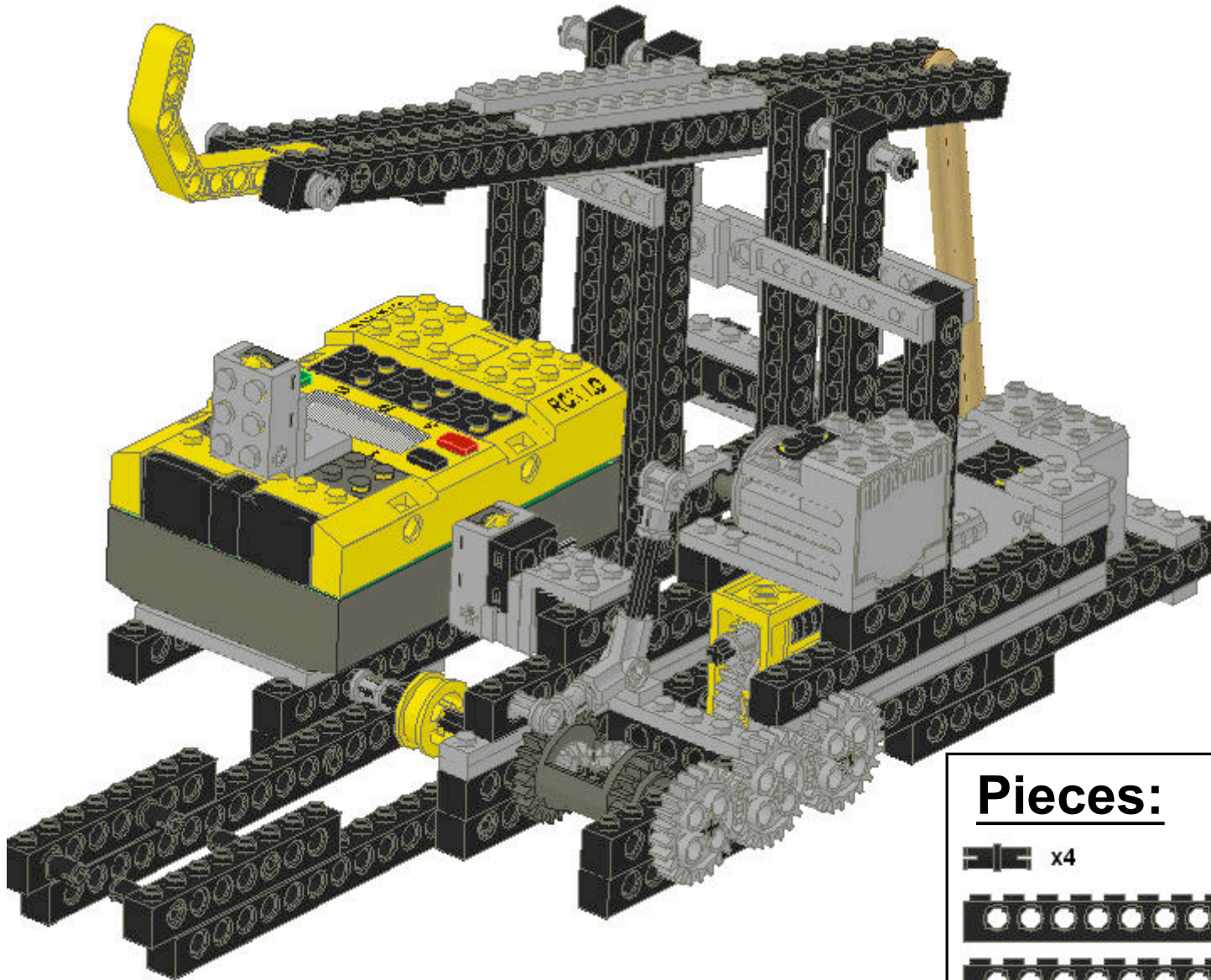
Catapult: Assembly

22



Catapult: Ammo Loader

24



Pieces:

 x4

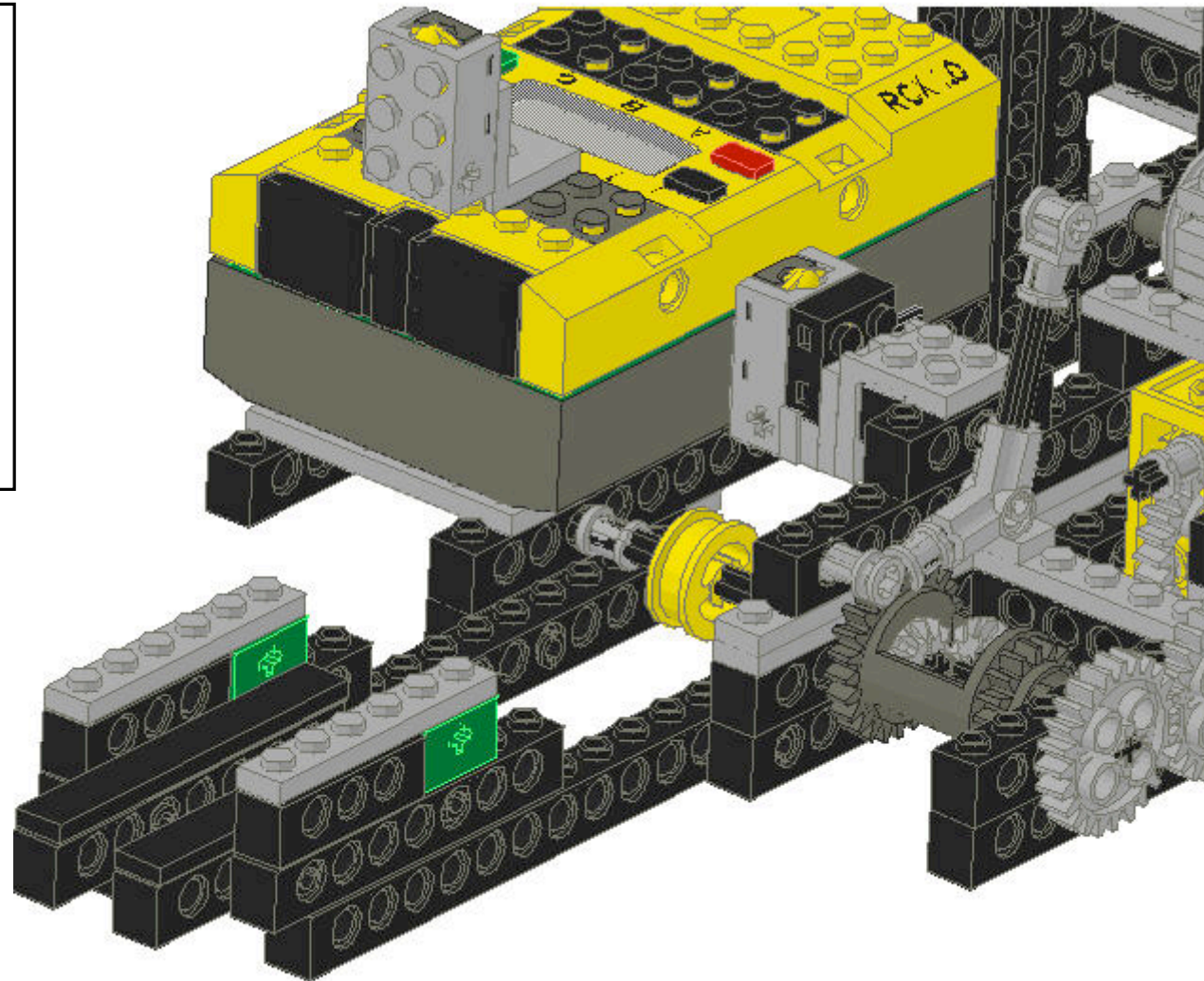
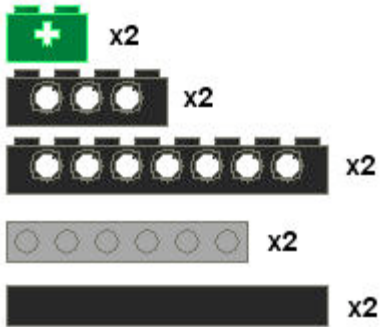
 x2

 x2

Catapult: Ammo Loader

25

Pieces:



Catapult: Ammo Loader

Pieces:

8 x3

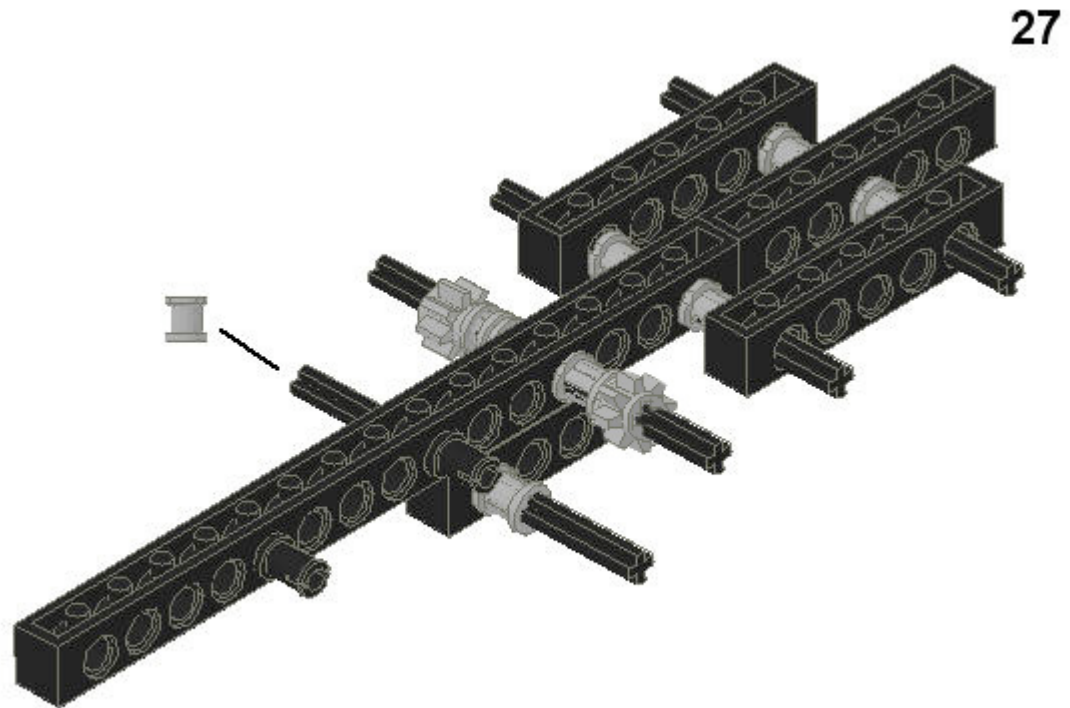
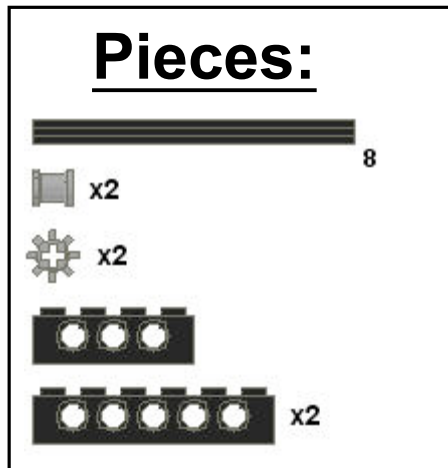
x5

x2

x2



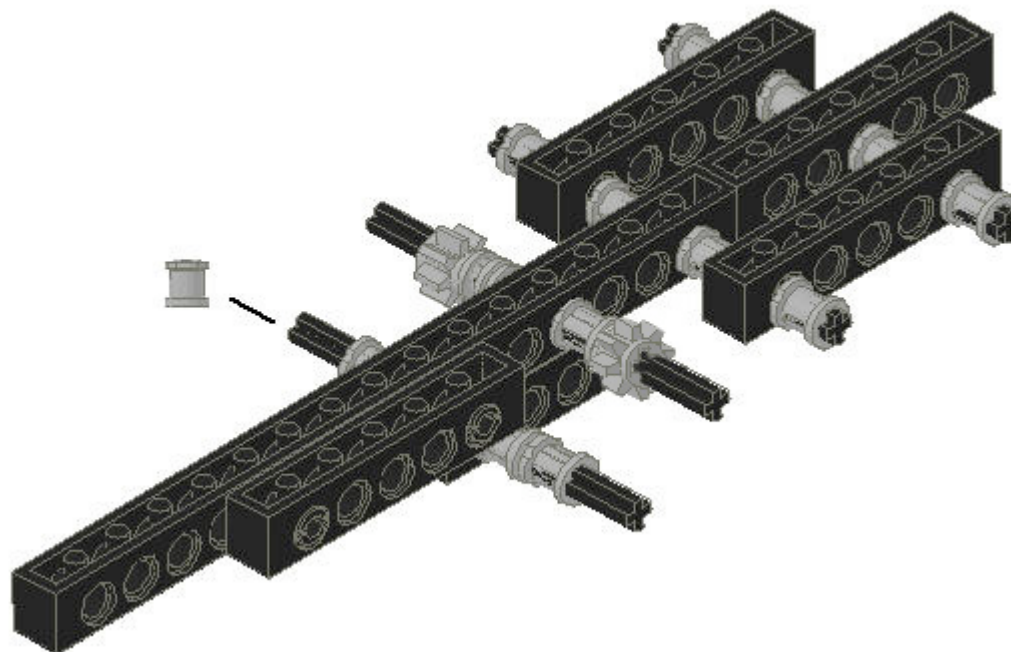
Catapult: Ammo Loader



Catapult: Ammo Loader

28

Pieces:

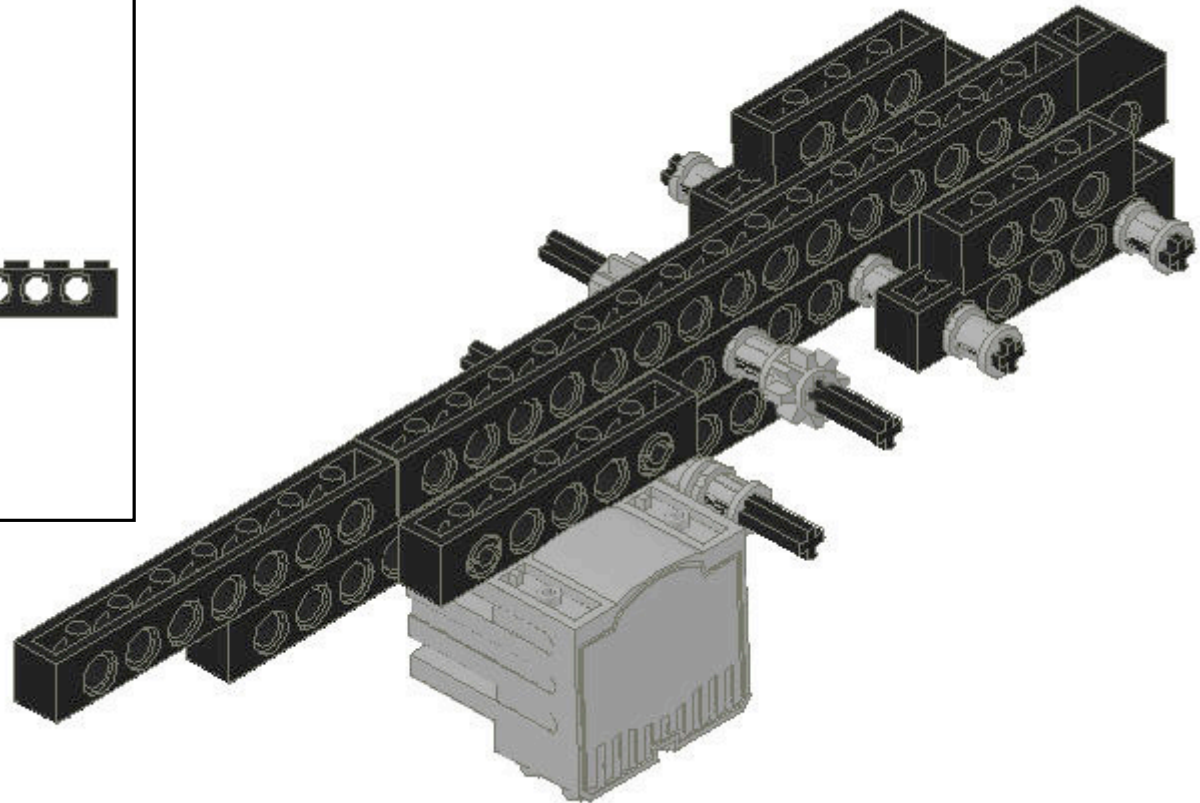


Catapult: Ammo Loader

Pieces:



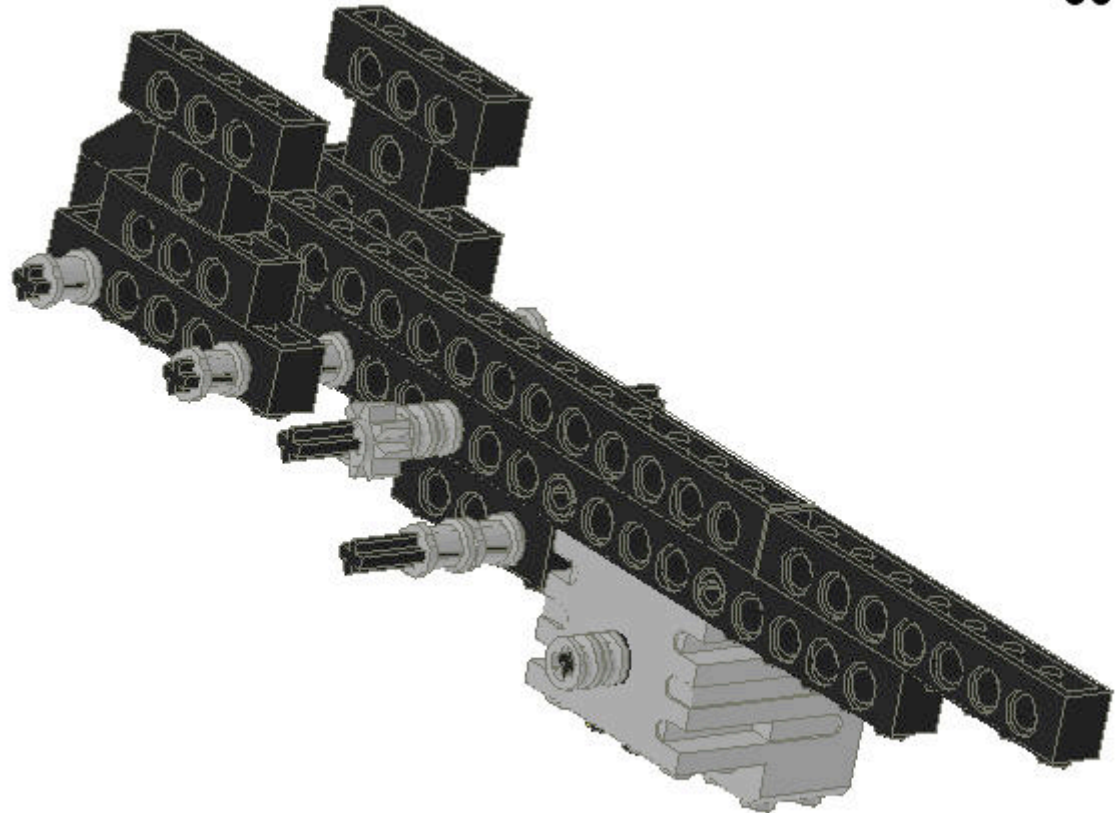
x2



Catapult: Ammo Loader

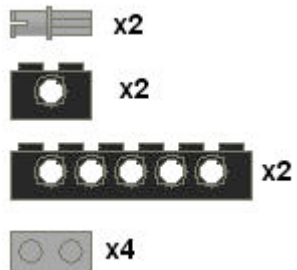
30

Pieces:



Catapult: Ammo Loader

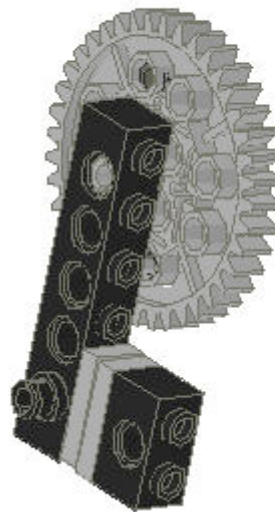
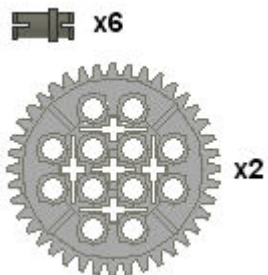
Pieces:



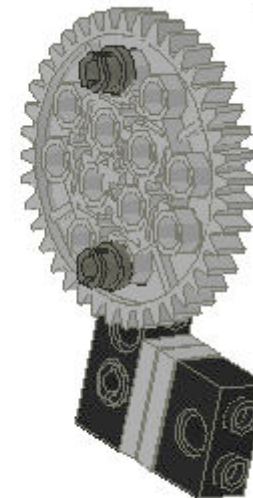
31



Pieces:



32



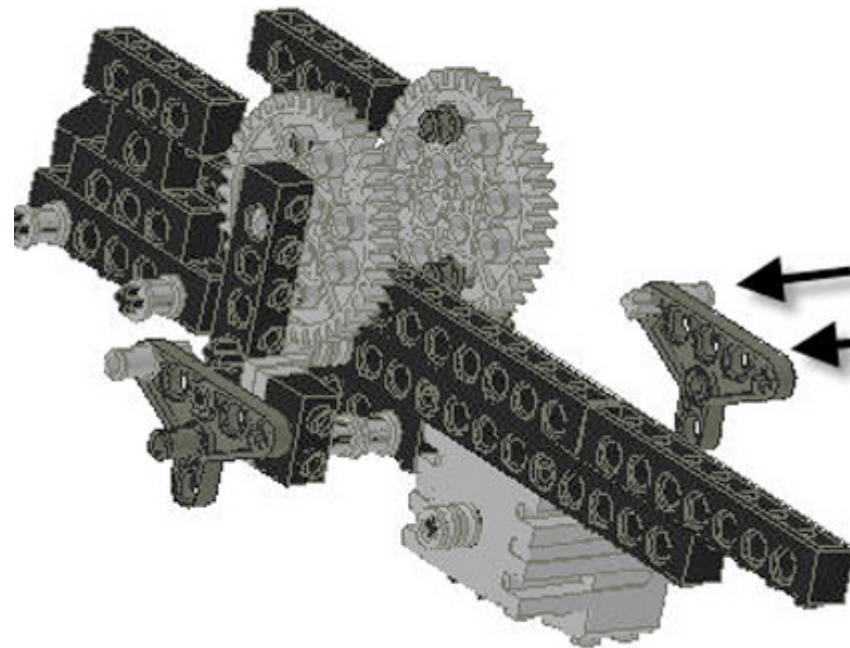
Catapult: Ammo Loader

33

Pieces:

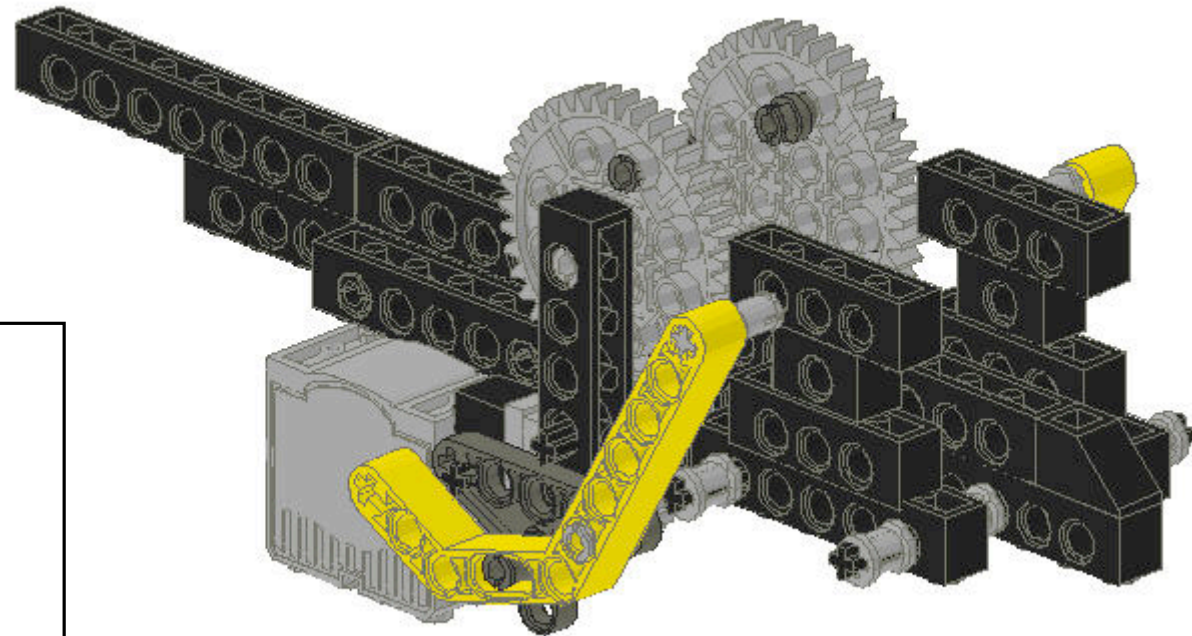
 x2

 x2



Catapult: Ammo Loader

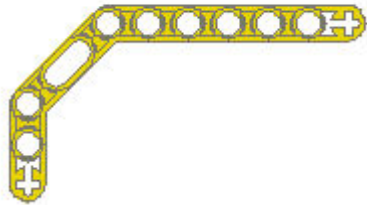
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Pieces:



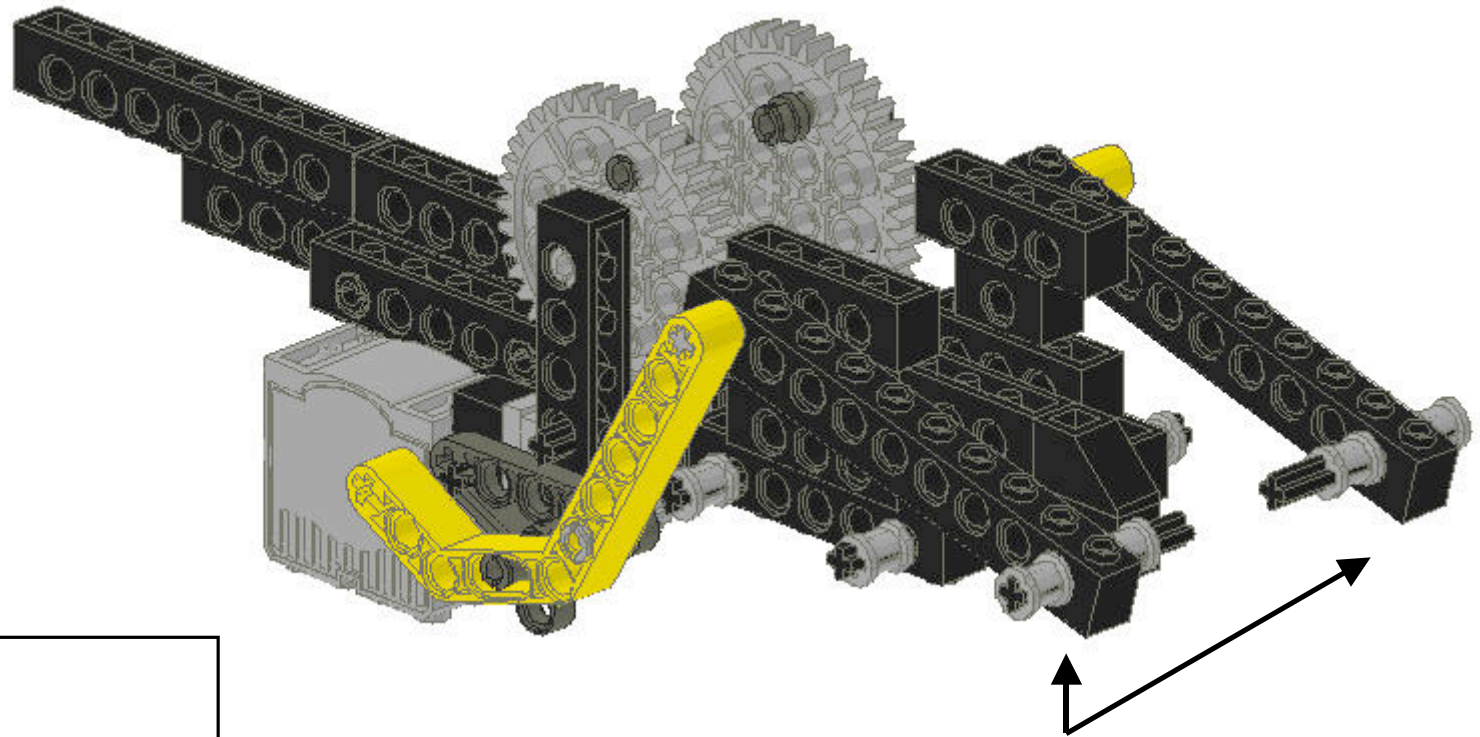
x2



x2

Catapult: Ammo Loader

35



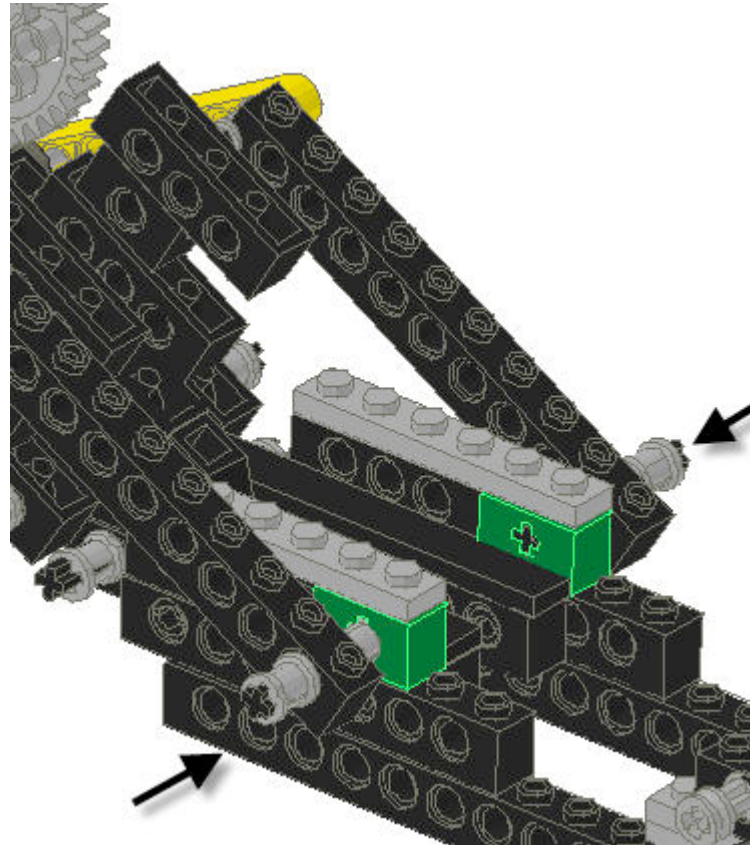
Pieces:

 x2 x4 x2

These arms will connect the ammo loader to the rest of the catapult.

Catapult: Assembly

36



Insert the axles from the arms of the ammo loader into the green bricks on the back of the catapult

Catapult: Assembly

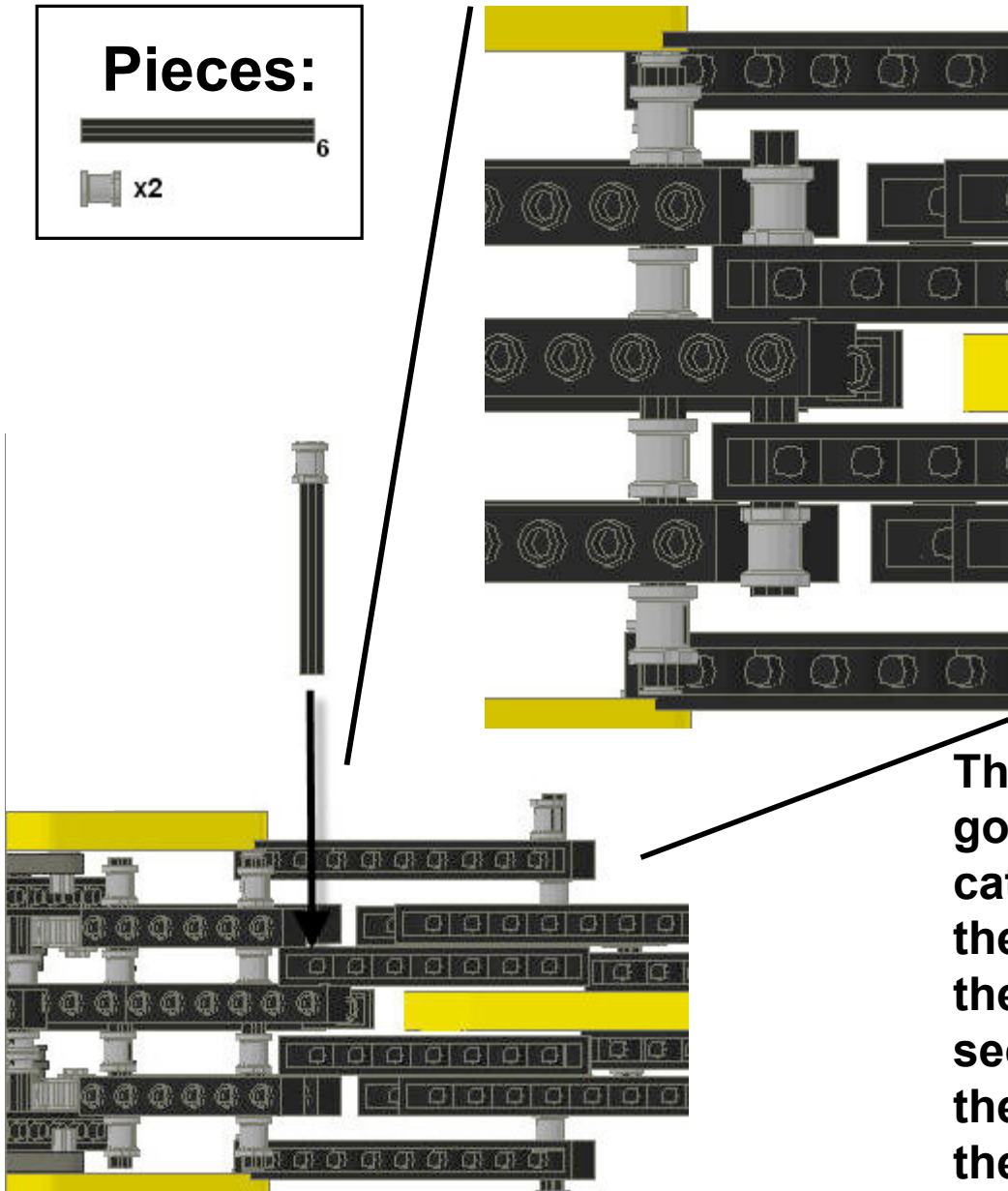
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Pieces:

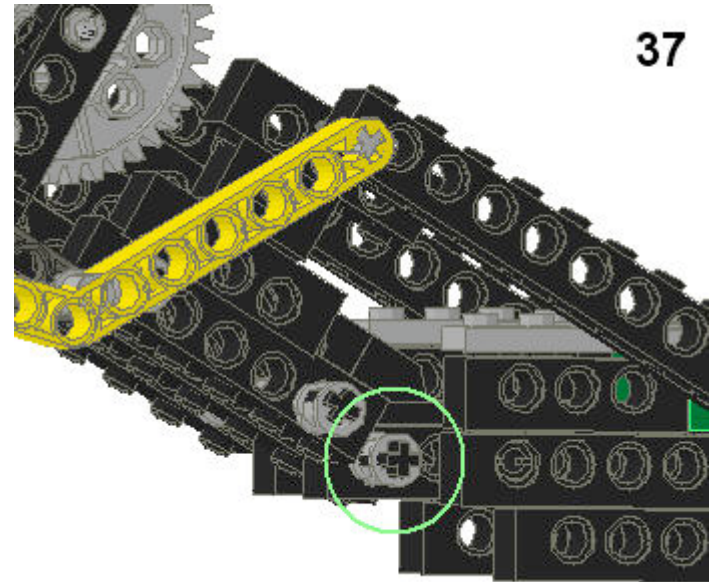
6



x2

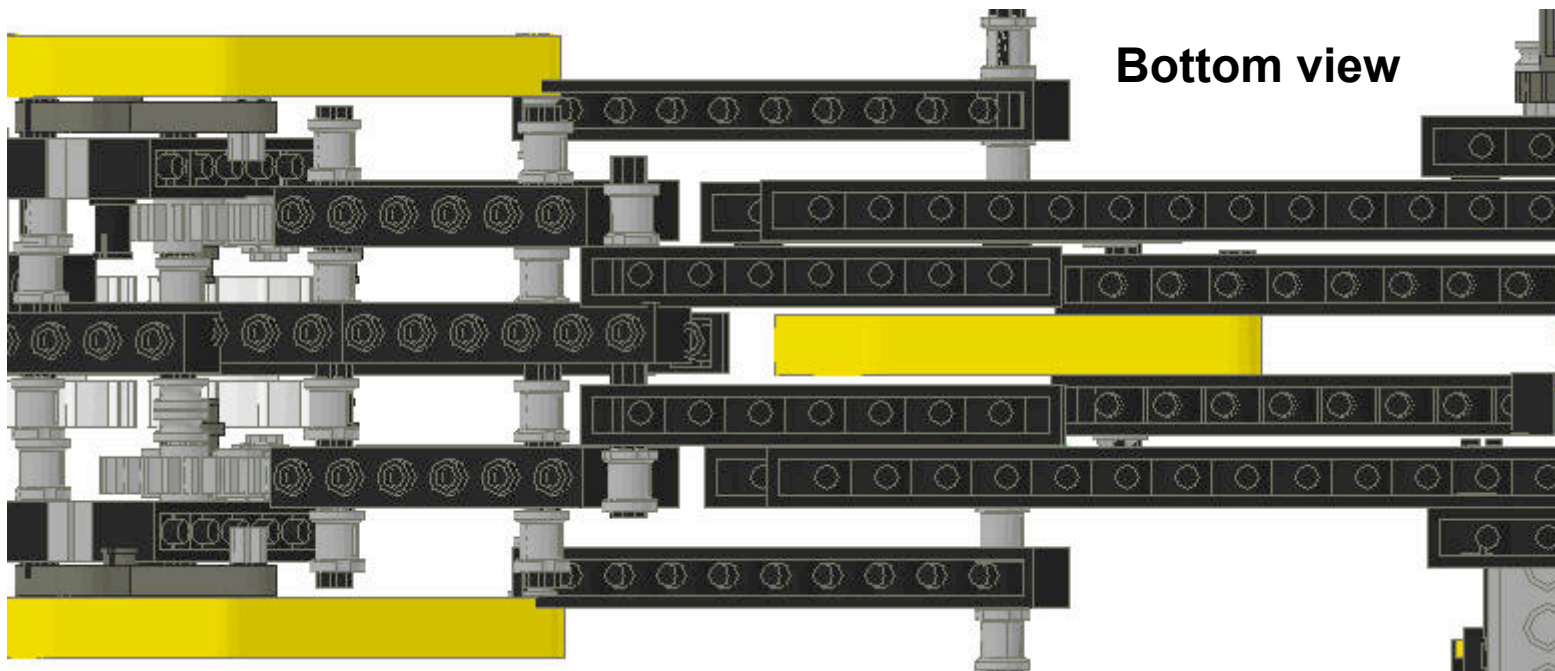
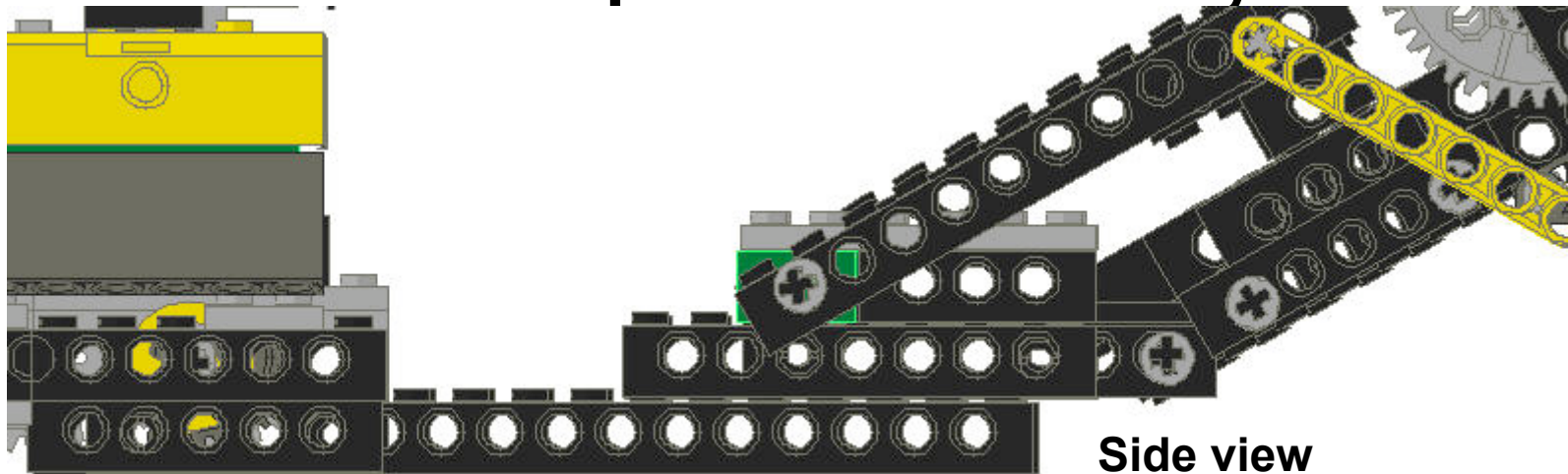


The final pin to attach the ammo loader goes through the last hole on the catapult just below the smooth plates to the hole on the ammo loader just below the sloped brick. When connected and secured on each end with a bushing, the ammo loader will be at an angle to the rest of the catapult.



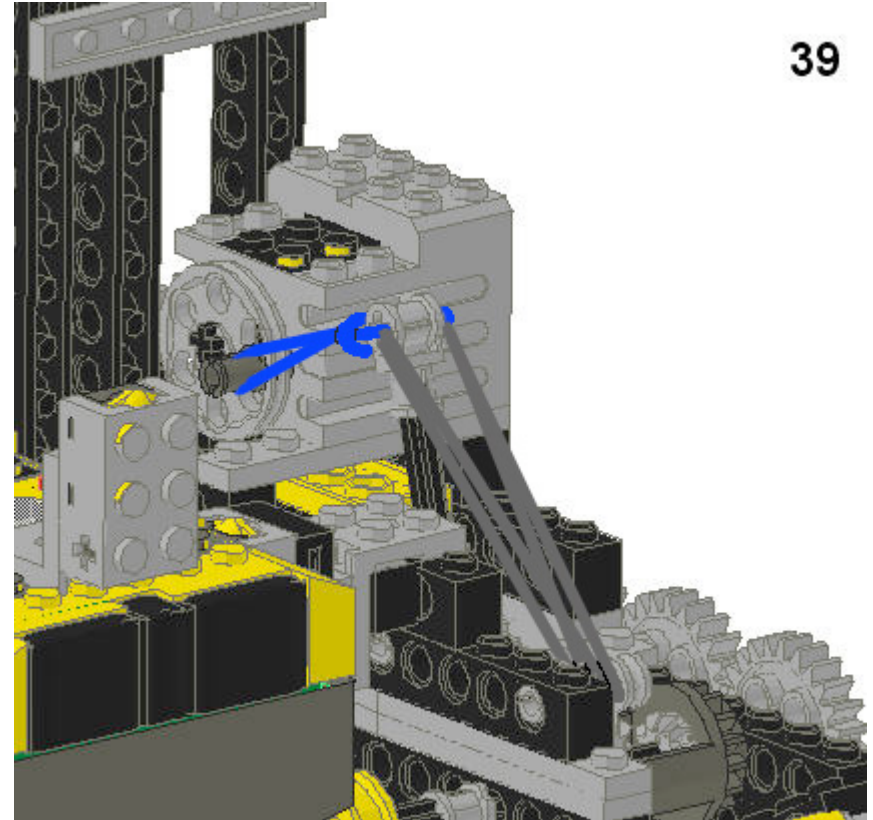
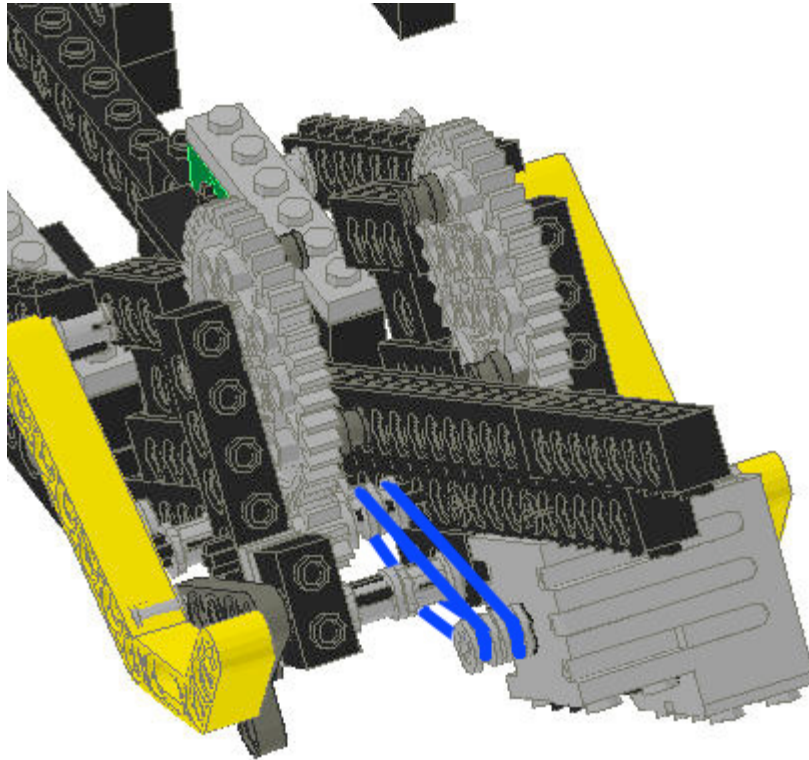
Catapult: Assembly

38



Catapult: Assembly

39



Pieces: Lego rubber bands

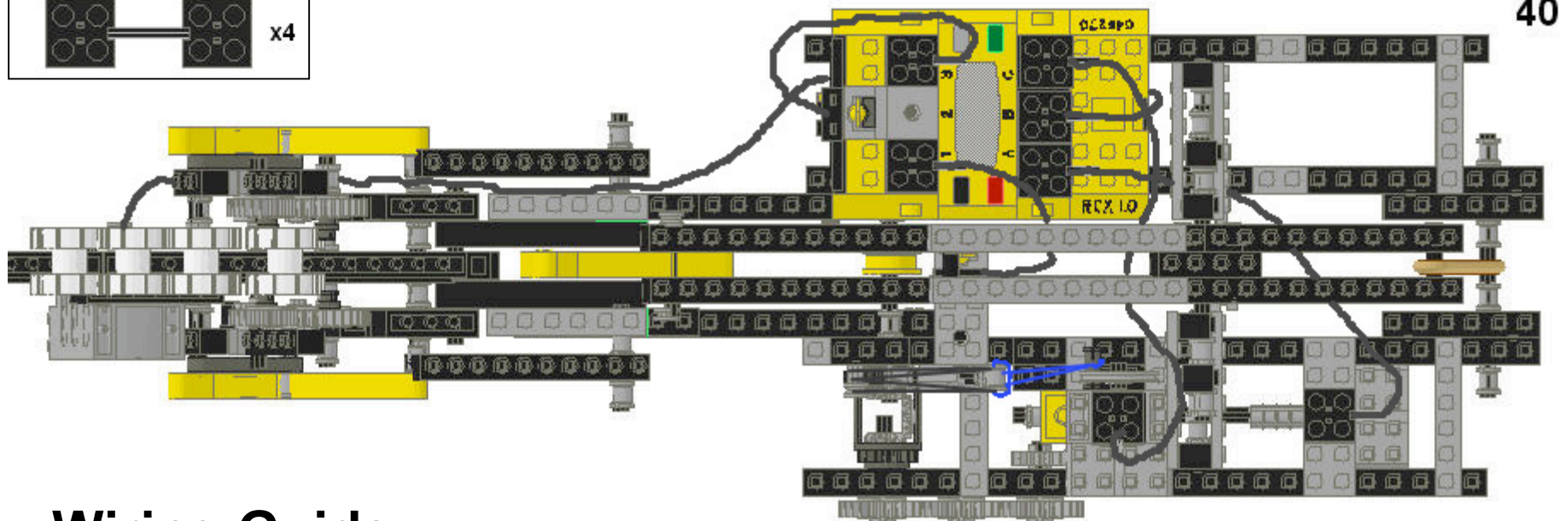
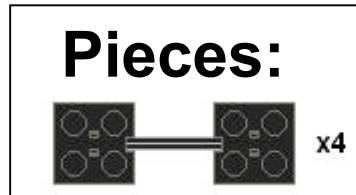


x3



Note: When the motor is in the position above, the lever arm should be locked into the differential gear. When the motor is turned halfway, the lever should be free from the differential. If this is not the case, readjust the bands.

Catapult: Wiring



Wiring Guide

Port 1 connects to the touch sensor under the arm.

Port 3 connects to the touch sensor on the rcx.

Port A connects to the motor on the front of the catapult.

Port B connects to the motor on the ammo loader

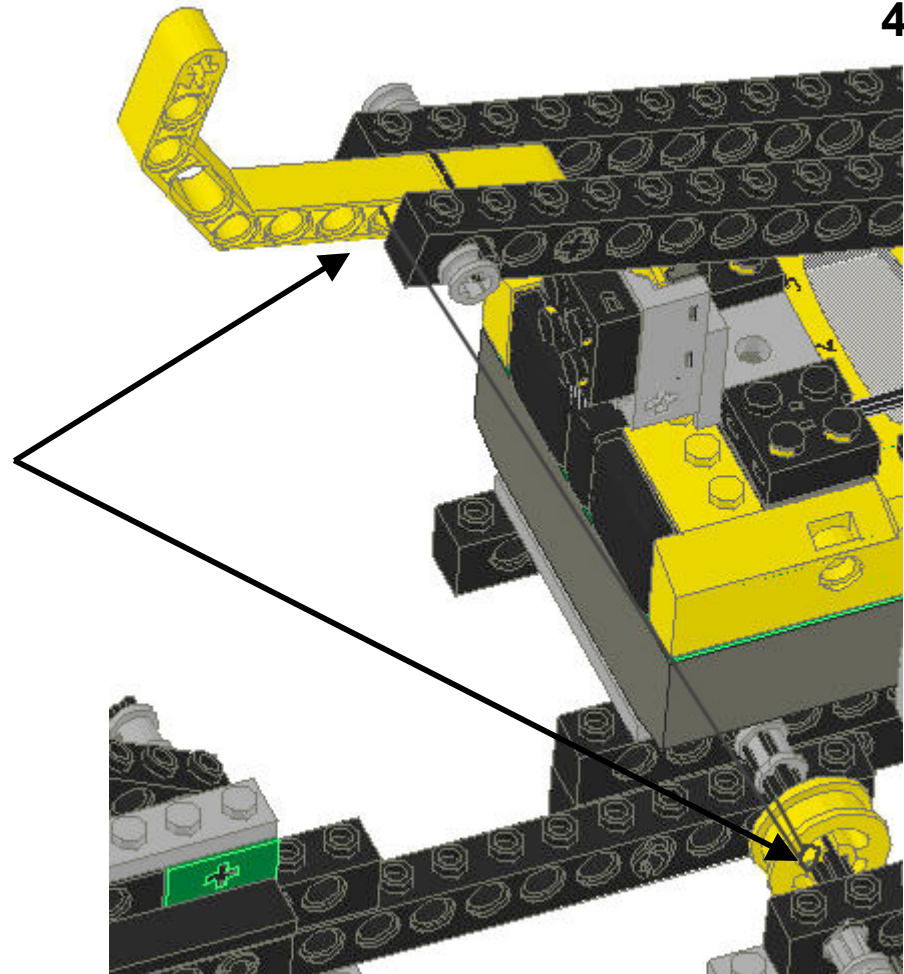
Port C connects to the motor on the middle of the catapult

Catapult: Assembly

Pieces:

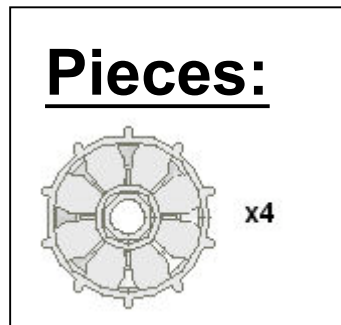
18" string

The sting is tied at one end to the angled arm and at the other end to the yellow cylinder.

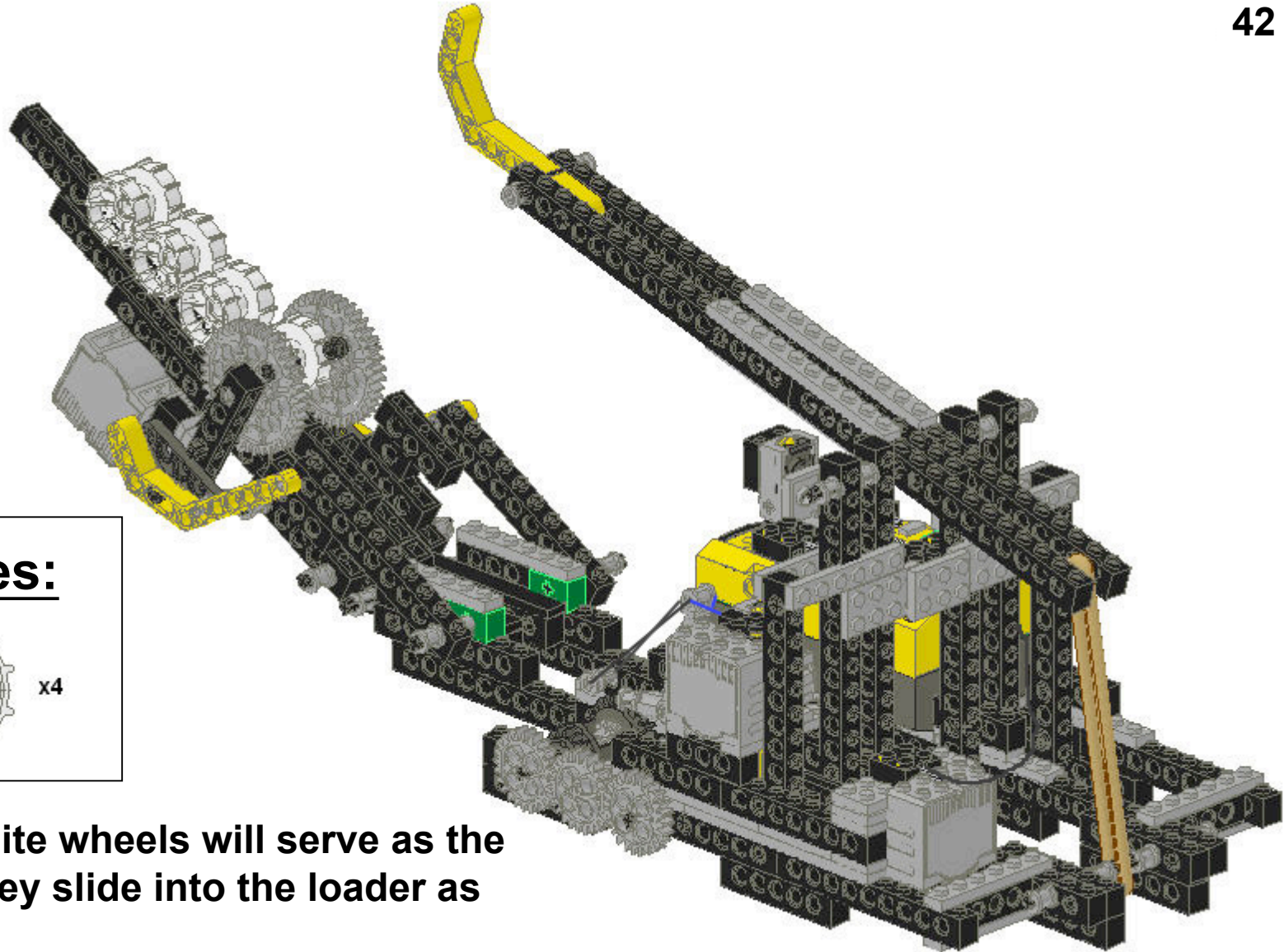


Catapult: Assembly

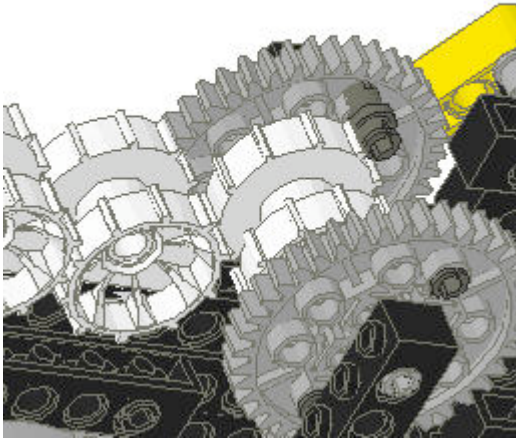
42



These white wheels will serve as the ammo, they slide into the loader as shown.



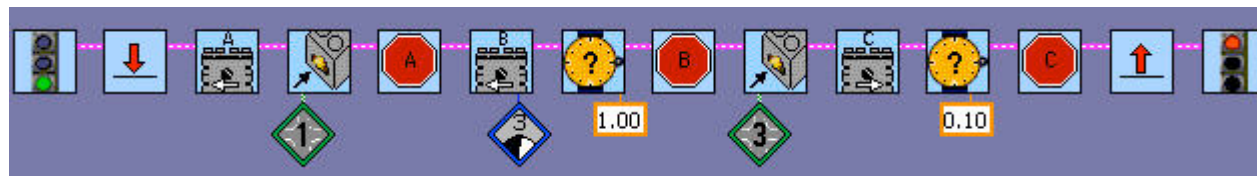
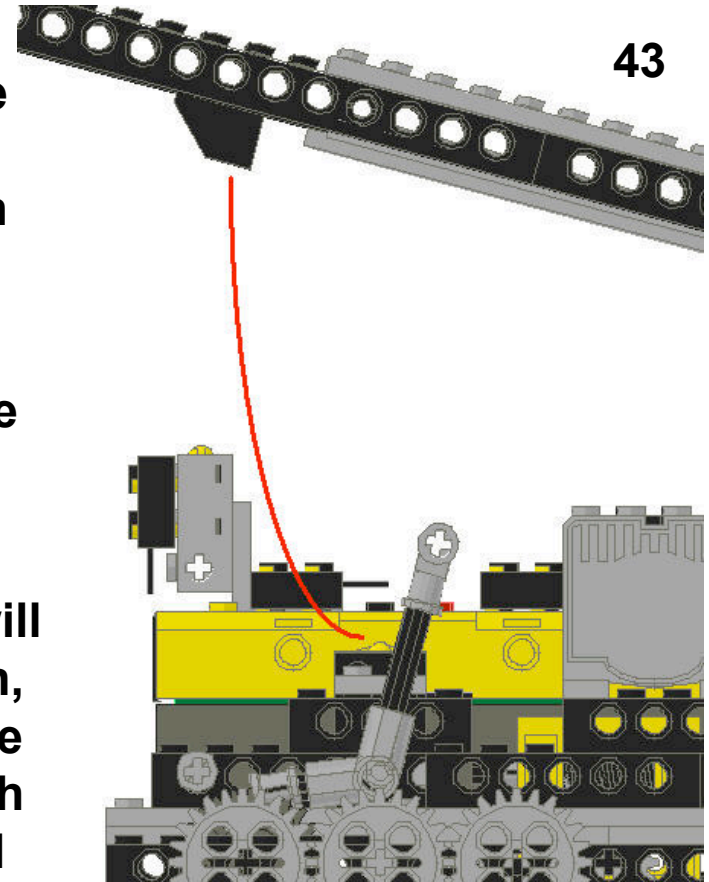
Catapult: Final Notes



1. Make sure that when the arm is pulled down, the sloped brick hits the touch sensor.
2. The gears on the ammo loader work best if they are in the position shown.

How it works:

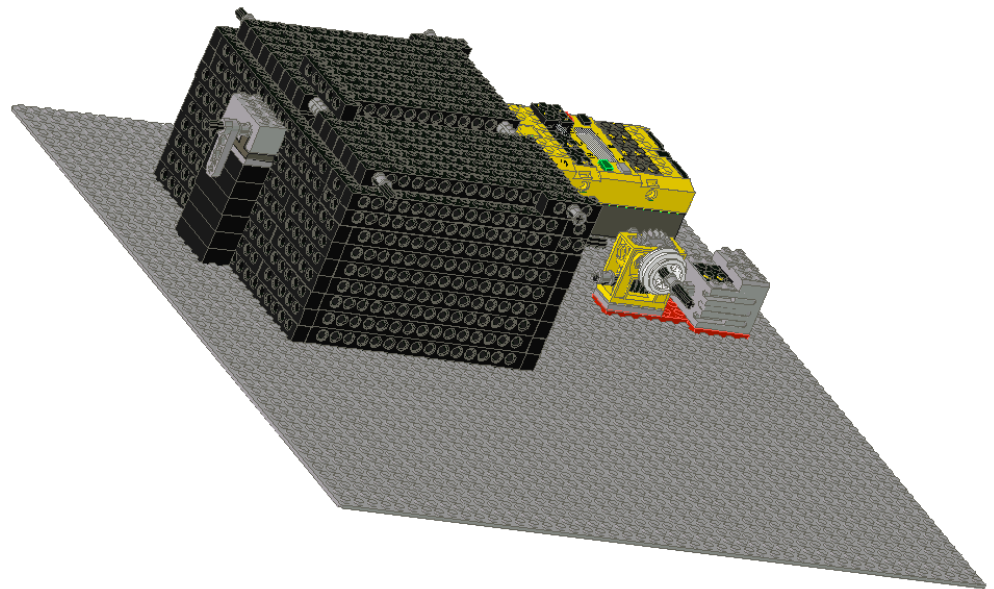
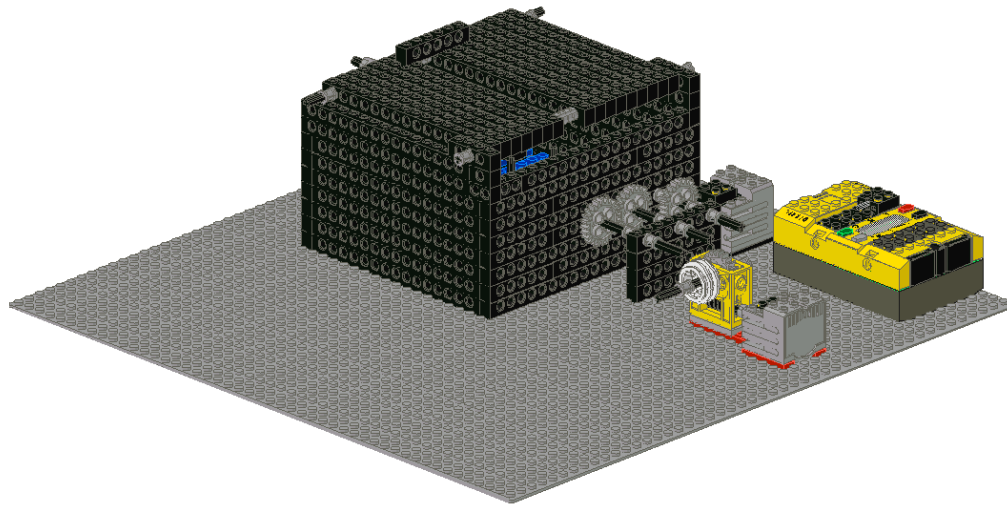
When the program below is run, the firing arm will wind down until touch sensor 1 is pressed. Then, motor A will stop and a single white wheel will be moved from the loader onto the arm. When touch sensor 2 is pressed, motor C will move. This will pull the firing lever, and release the arm. The catapult will then reload itself automatically.



Building Kinetic Sculptures

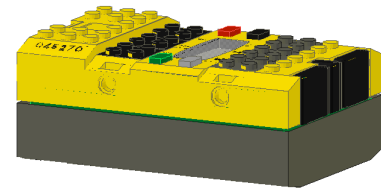
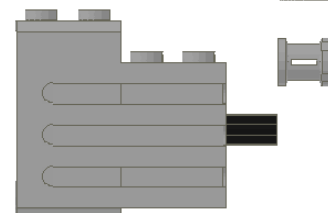
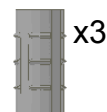
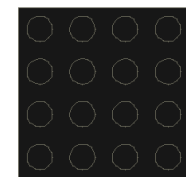
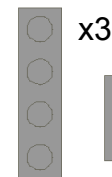
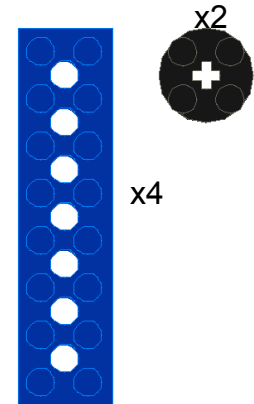
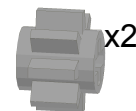
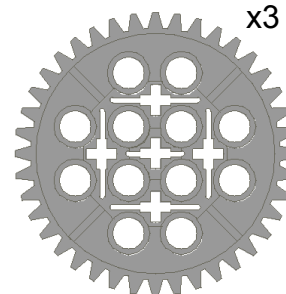
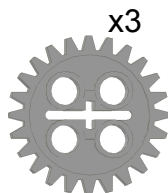
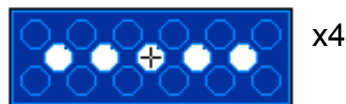
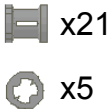
Moving Parts

Building a Music Box



Building a Music Box

Pieces: BOX



Building a Music Box

Pieces:



x16



x17

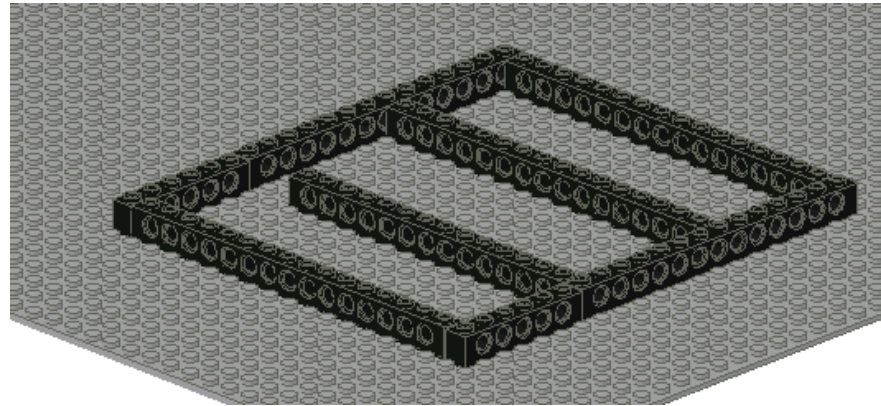


x17

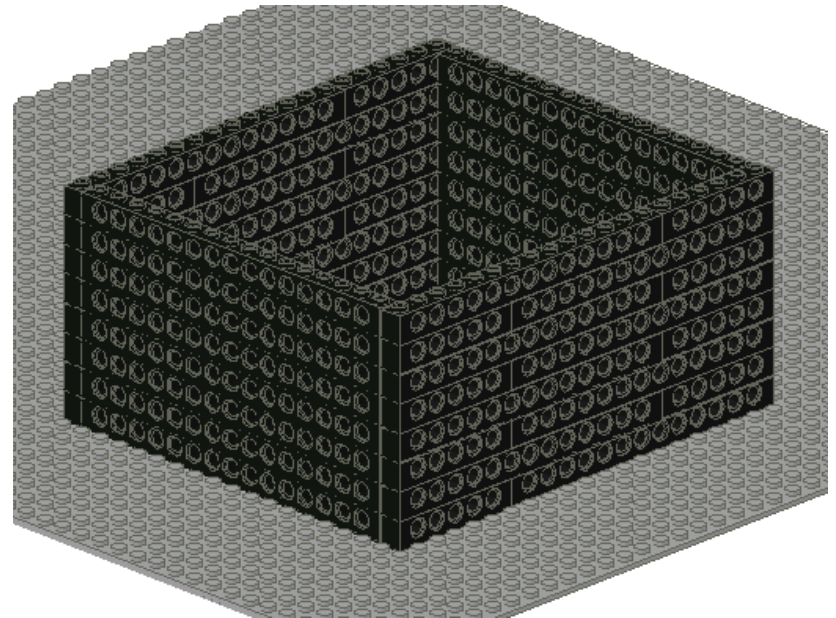


48X48 plate

1

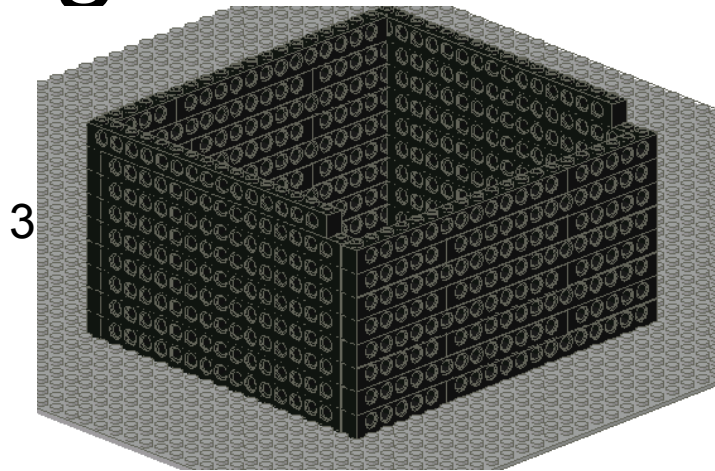
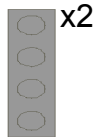


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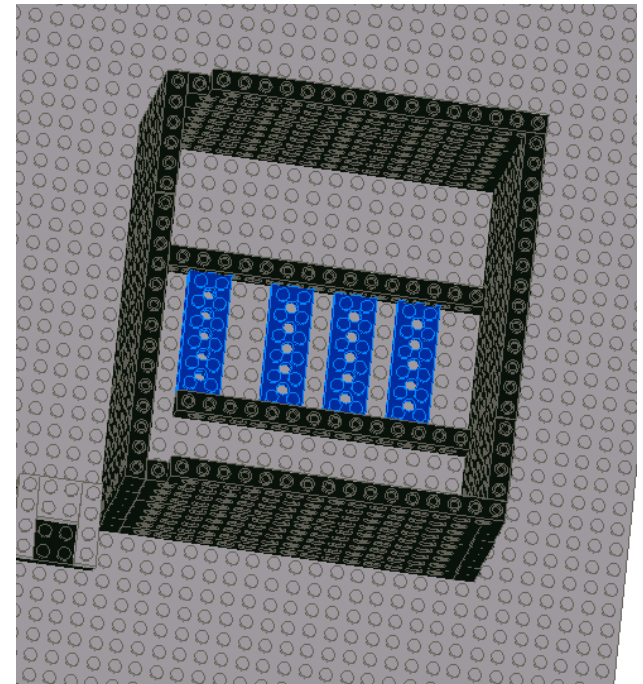


Building a Music Box

Pieces:

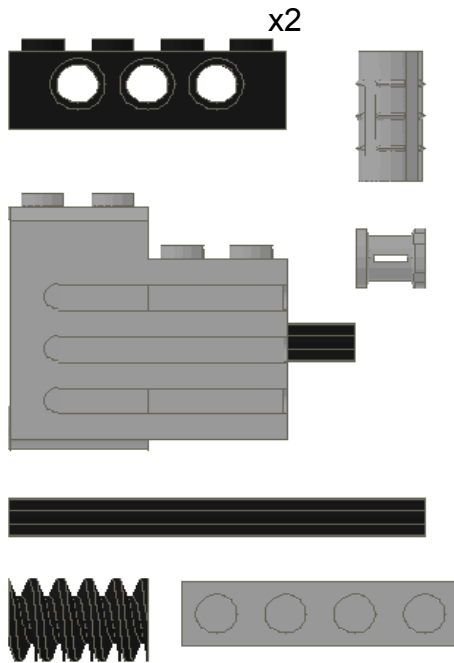


4

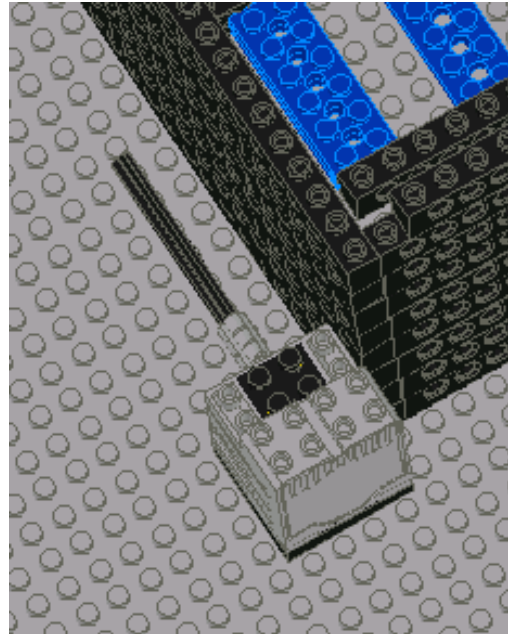


Building a Music Box

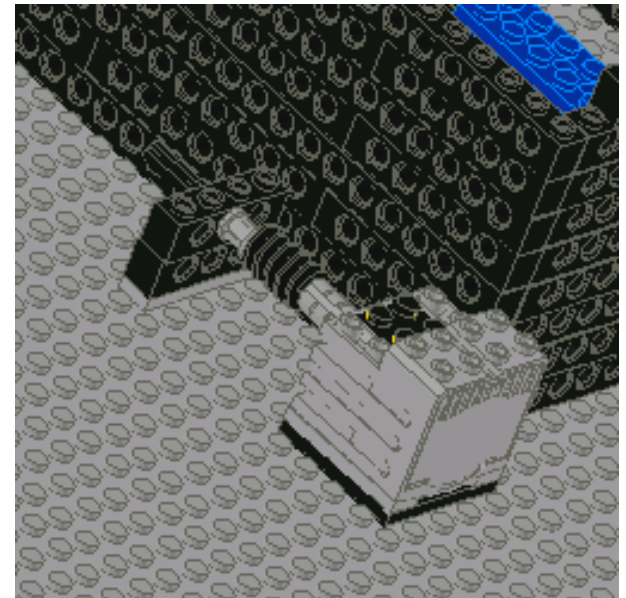
Pieces:



5



6



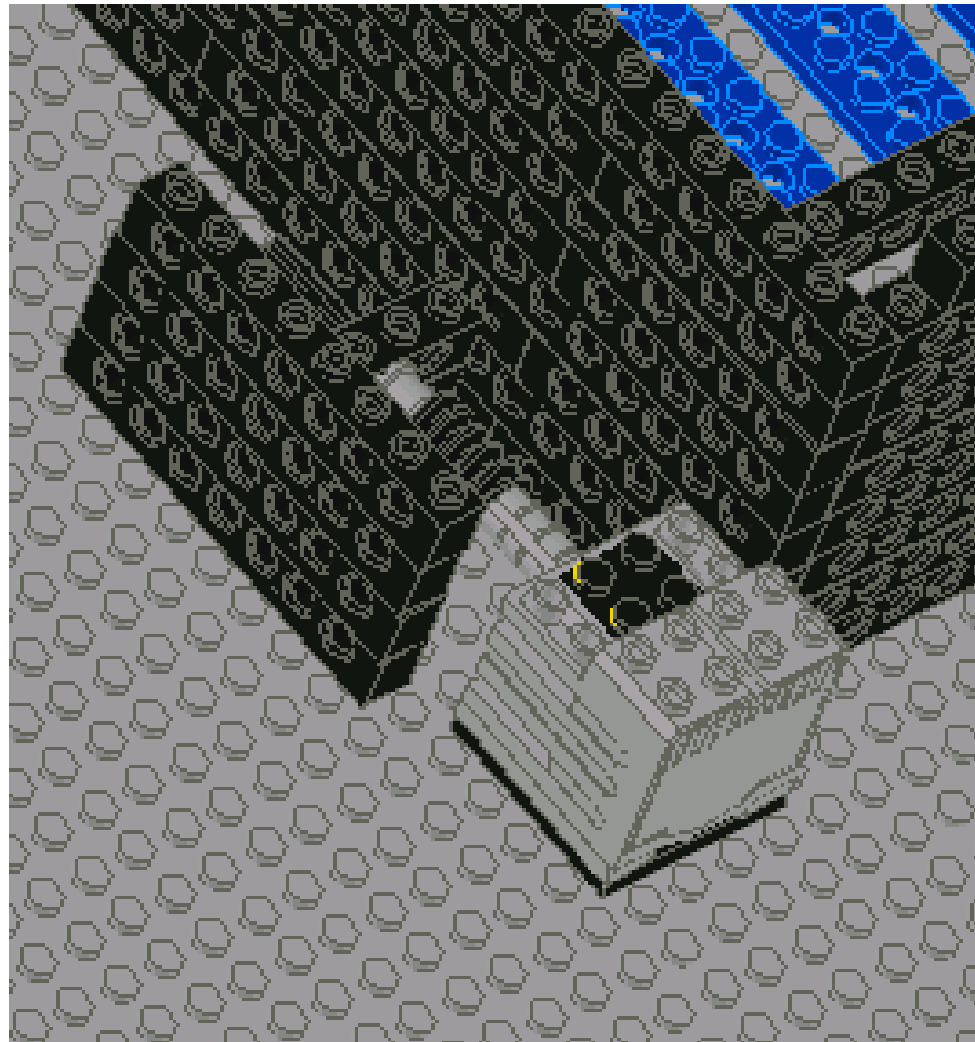
Building a Music Box

Pieces:



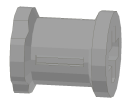
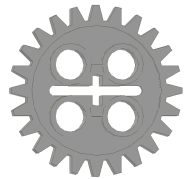
x4

7

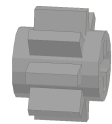


Building a Music Box

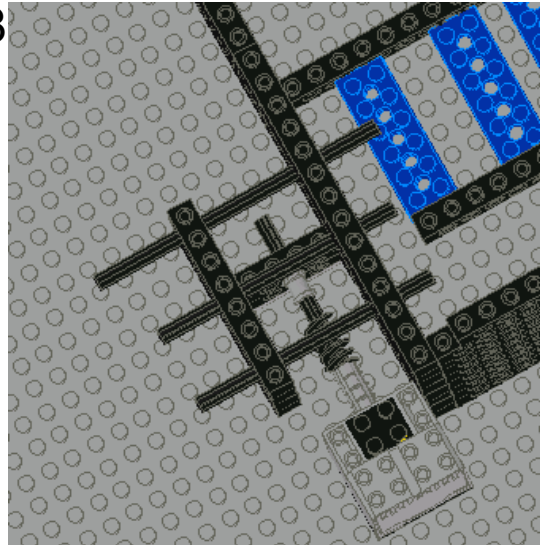
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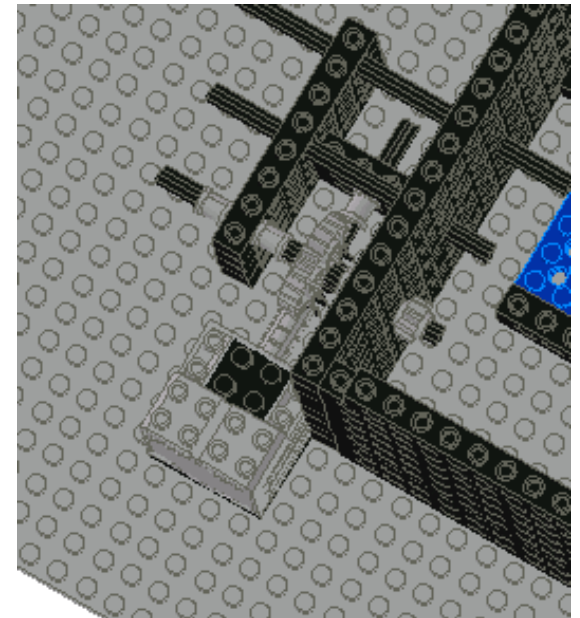
x3



8

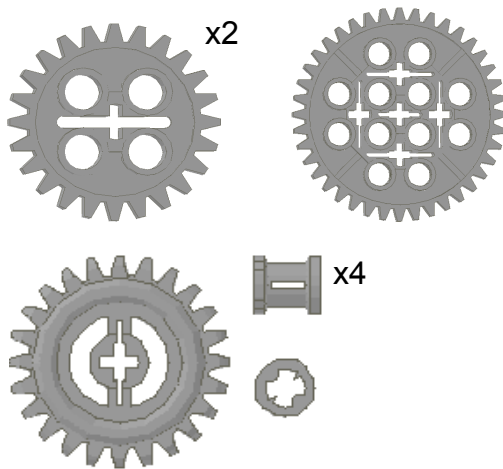


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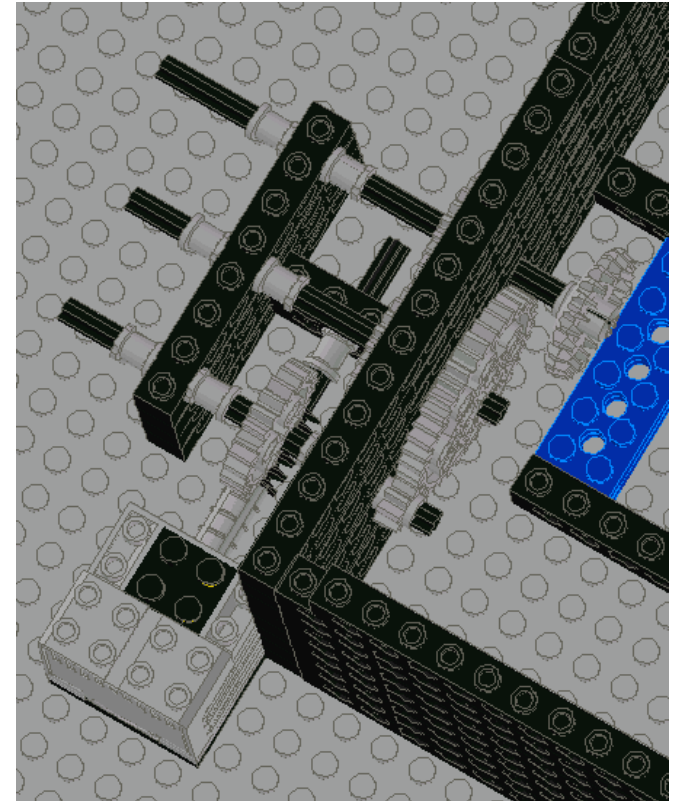
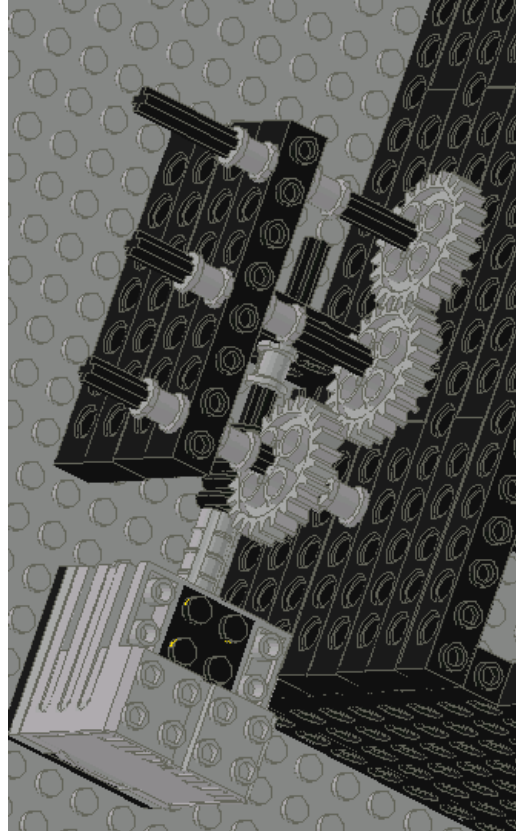


Building a Music Box

Pieces:



10



2 views

Building a Music Box

Pieces:



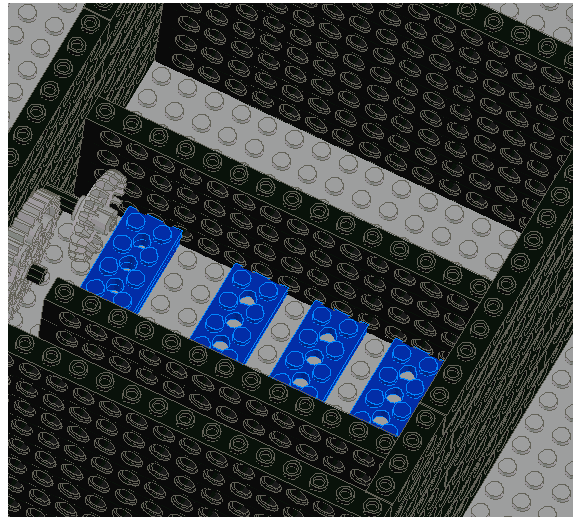
x2



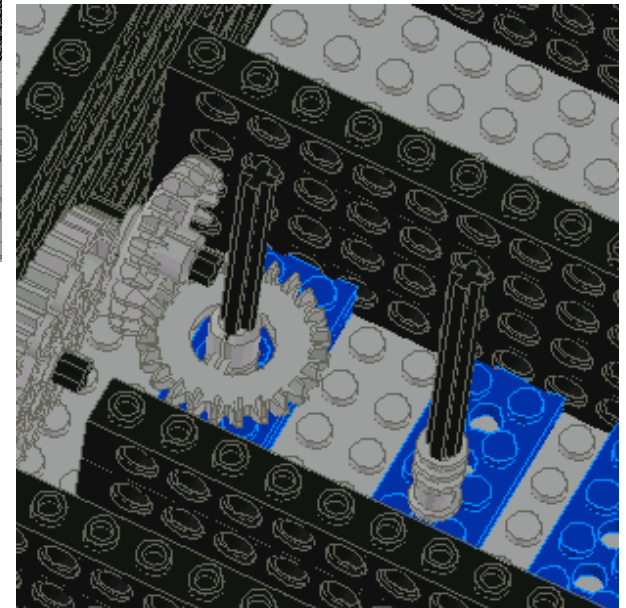
x2

x2

11

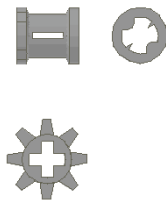
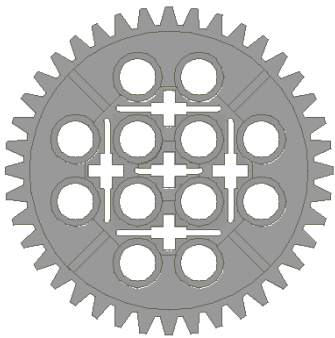


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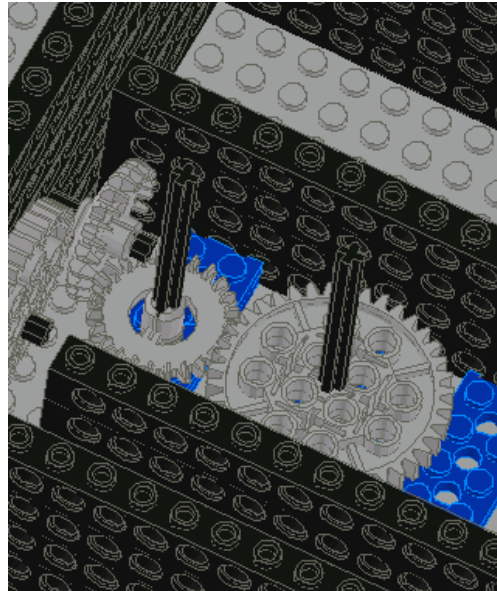


Building a Music Box

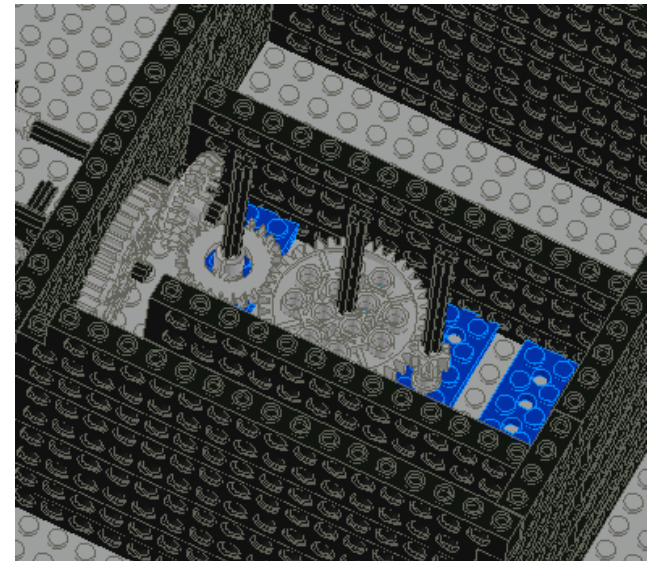
Pieces:



13



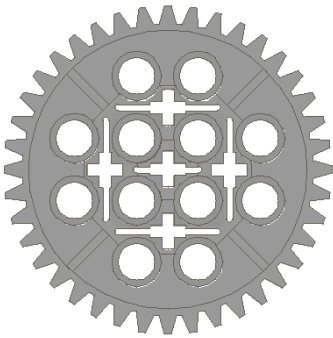
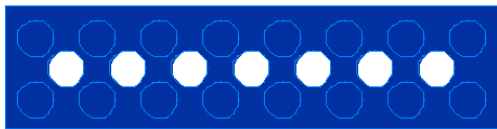
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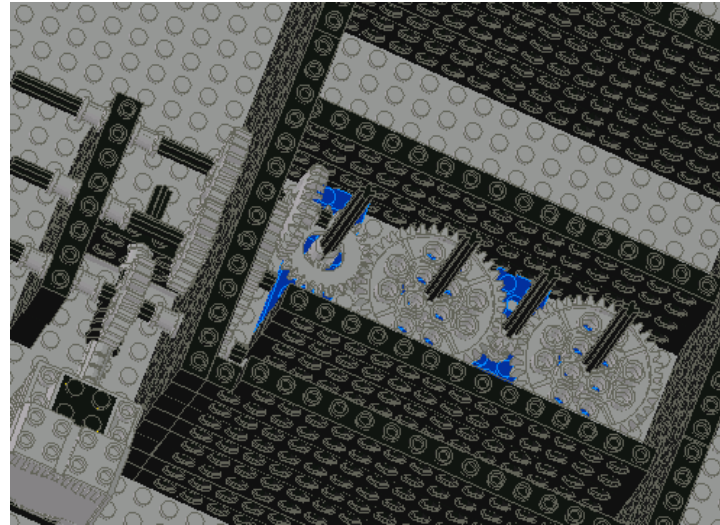
Building a Music Box

Pieces:

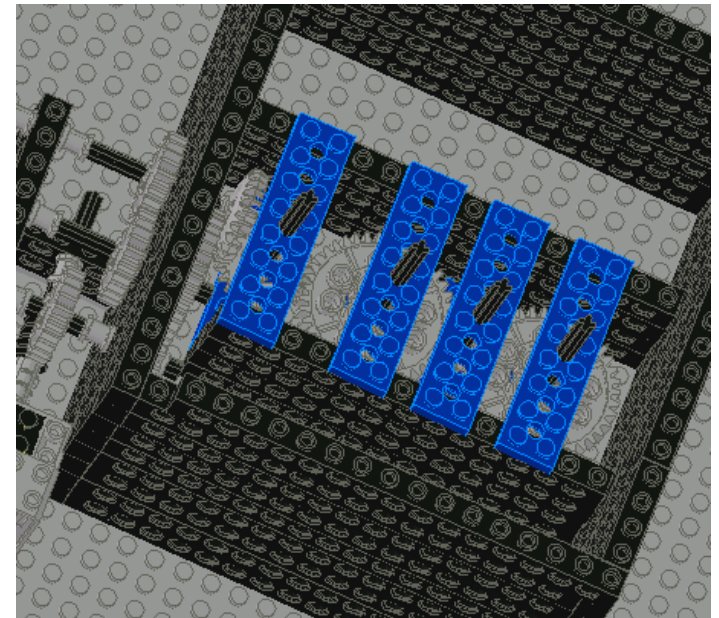
x4



15



16



Building a Music Box

Pieces:

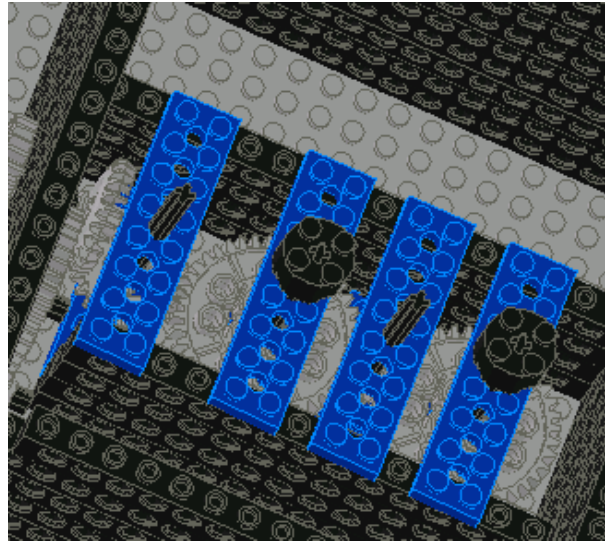


x2

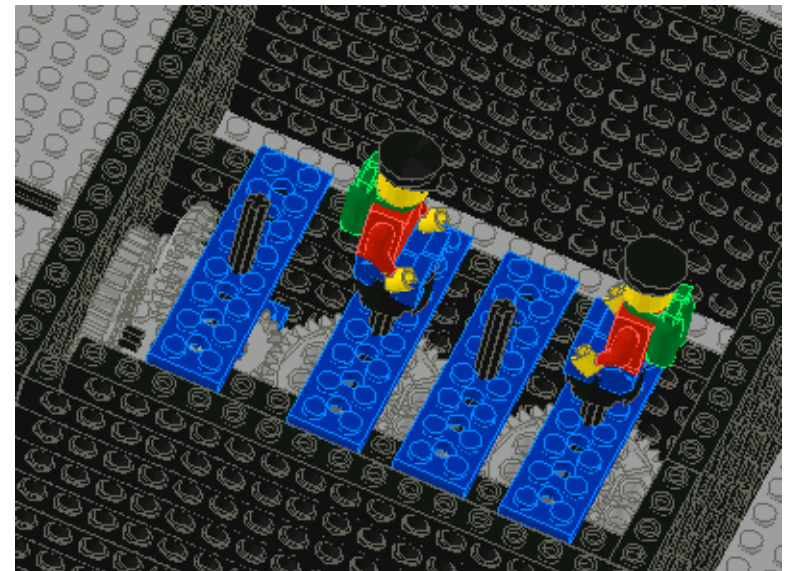


x2

17

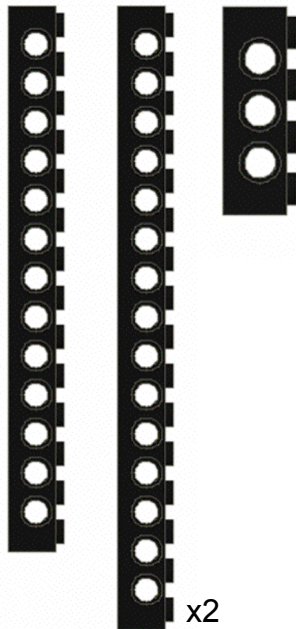


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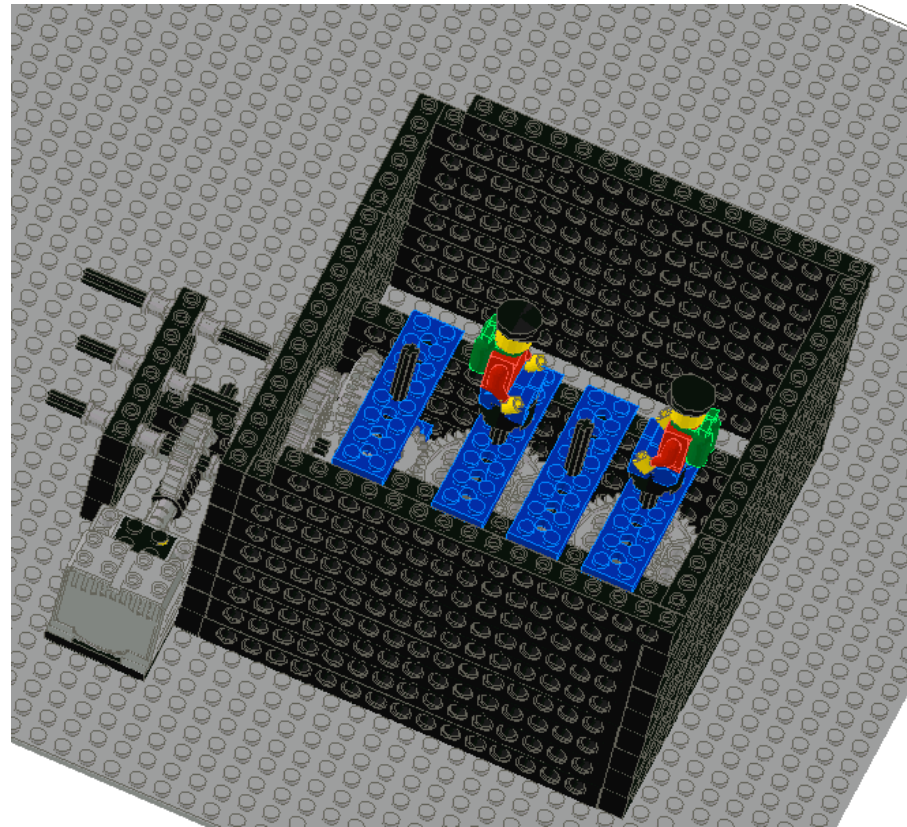


Building a Music Box

Pieces:



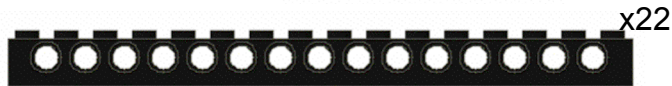
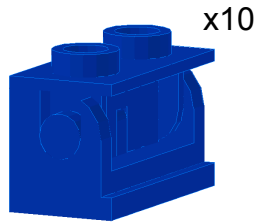
19



Note: From this point, you can build one of two tops. The first top will just open and the second top is motorized to open when the music box has been cranked.

Building a Music Box

Pieces: TOP #1



Building a Music Box

Pieces:

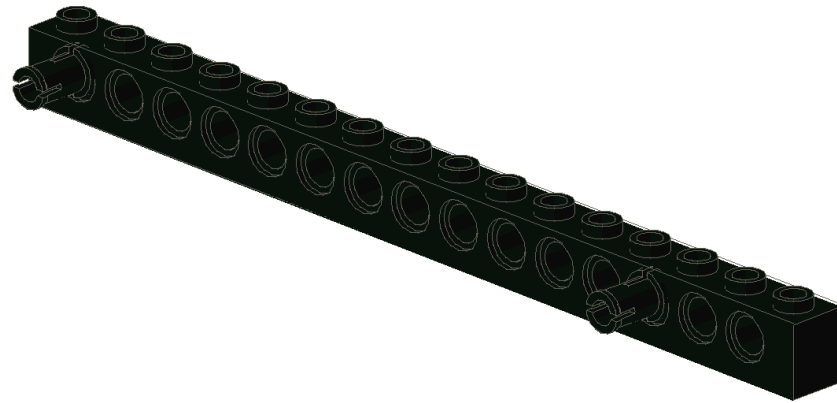


x20

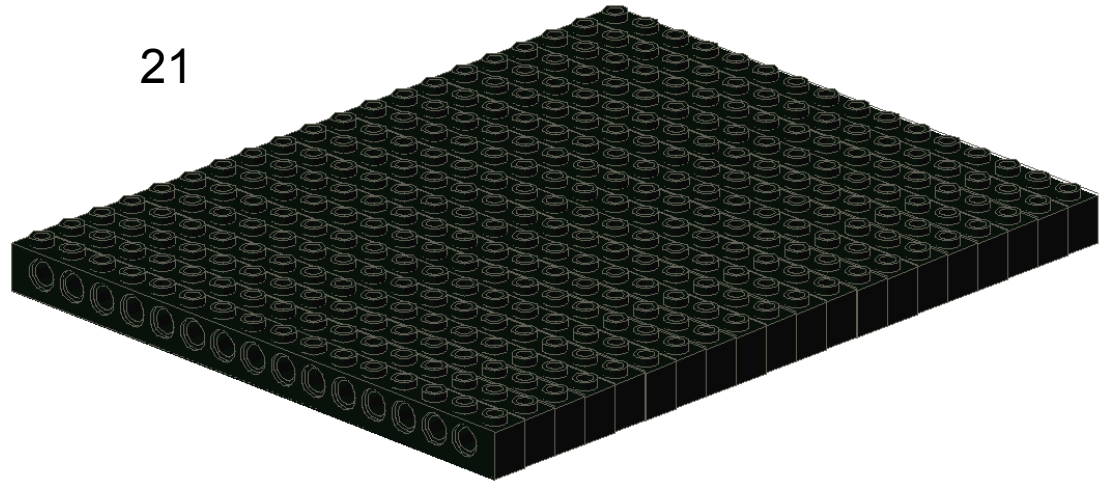


x36

20

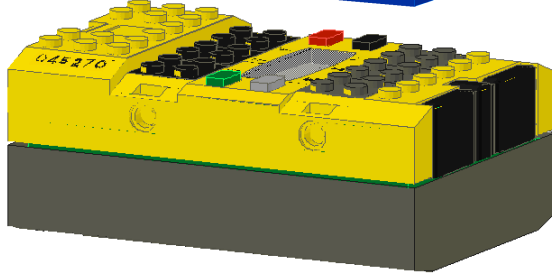
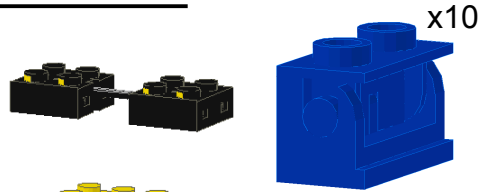


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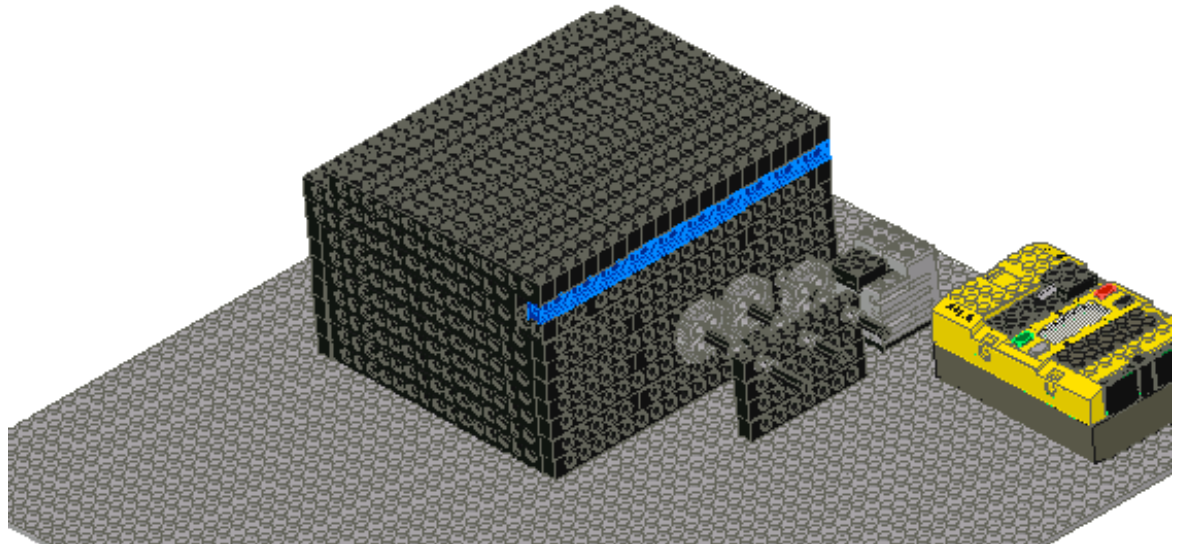


Building a Music Box

Pieces:

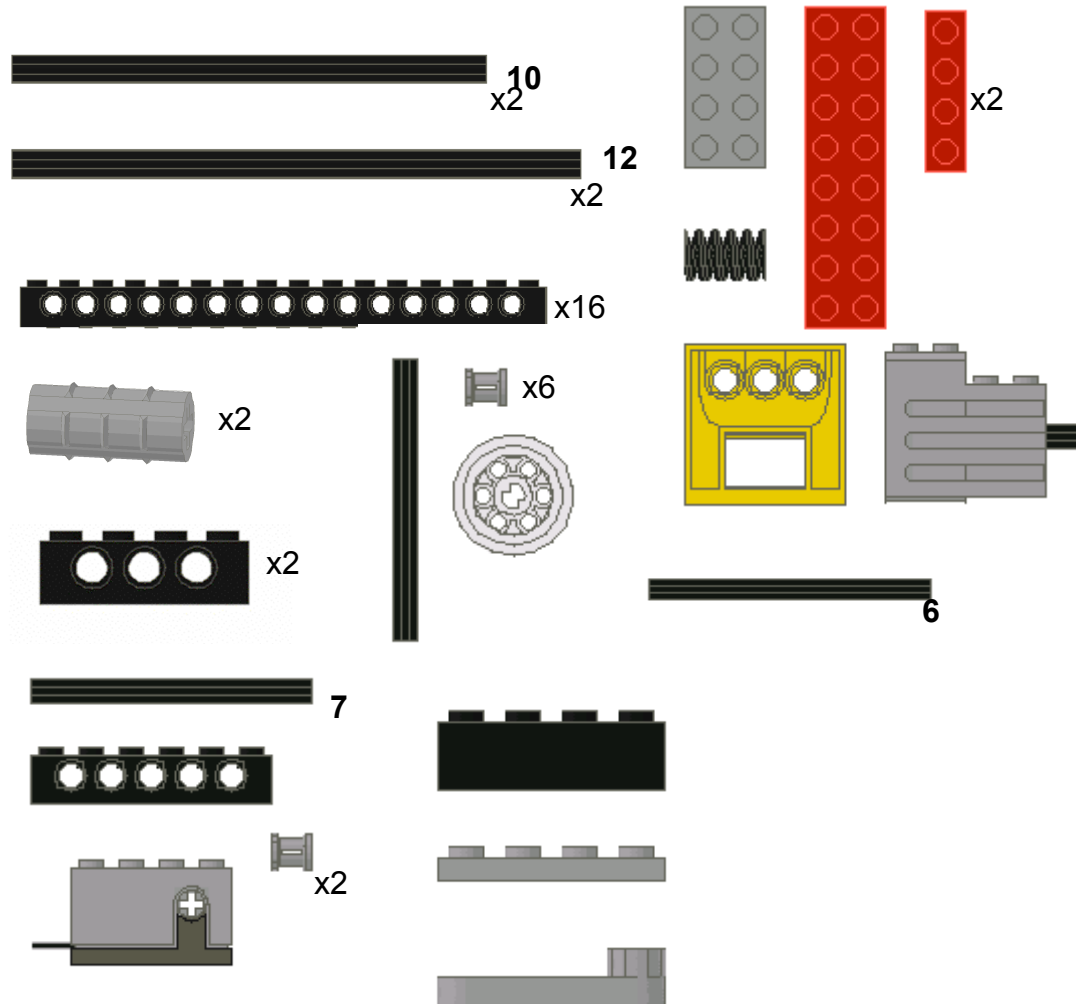


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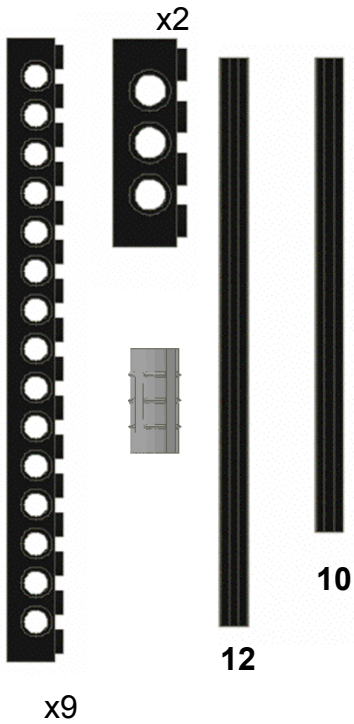
Building a Music Box

Pieces: TOP #2

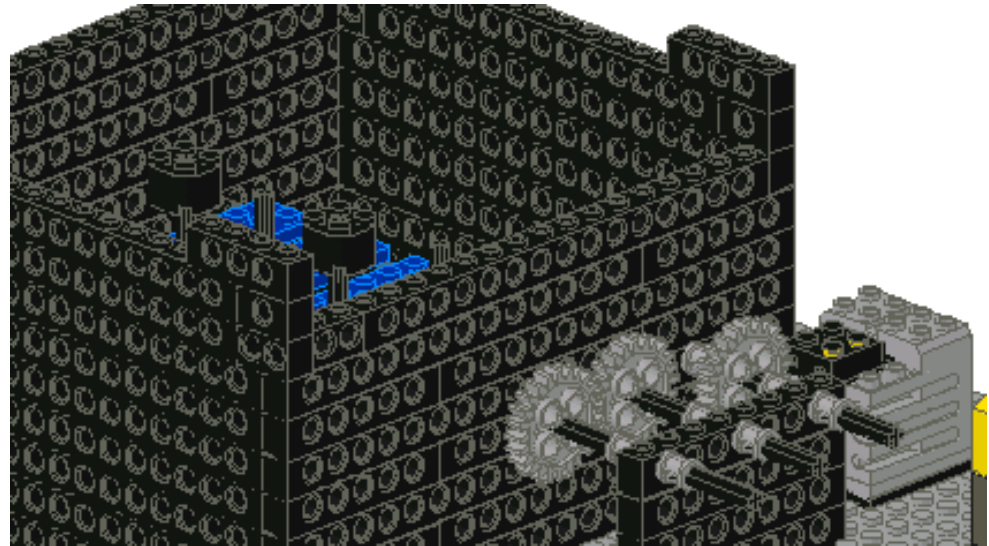


Building a Music Box

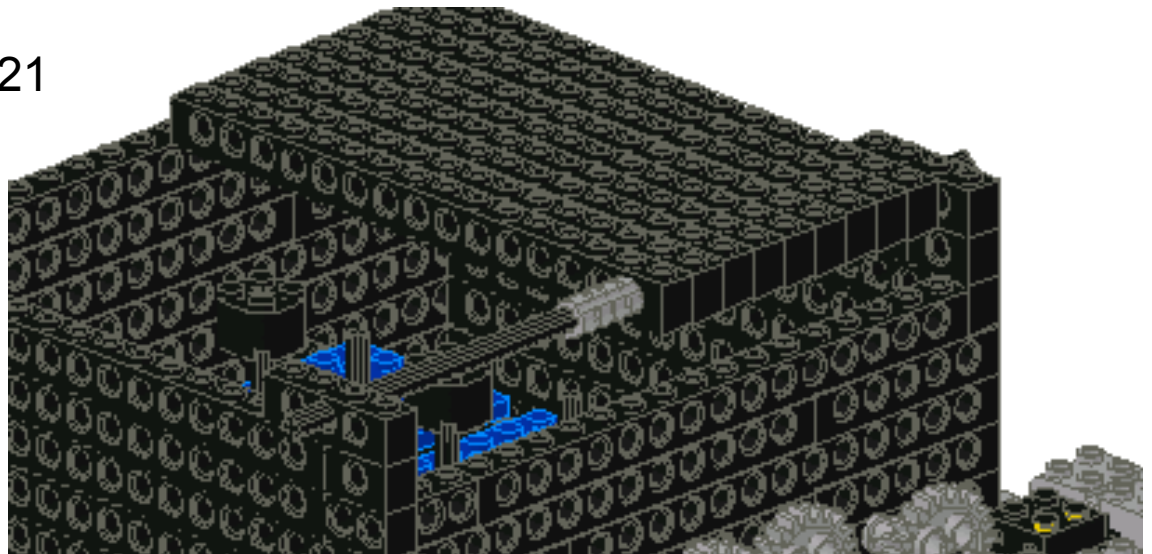
Pieces:



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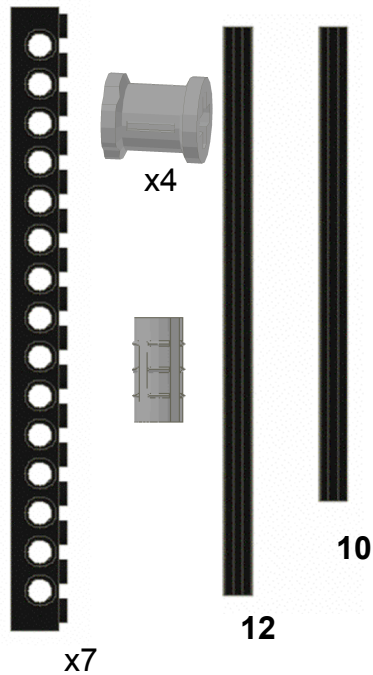


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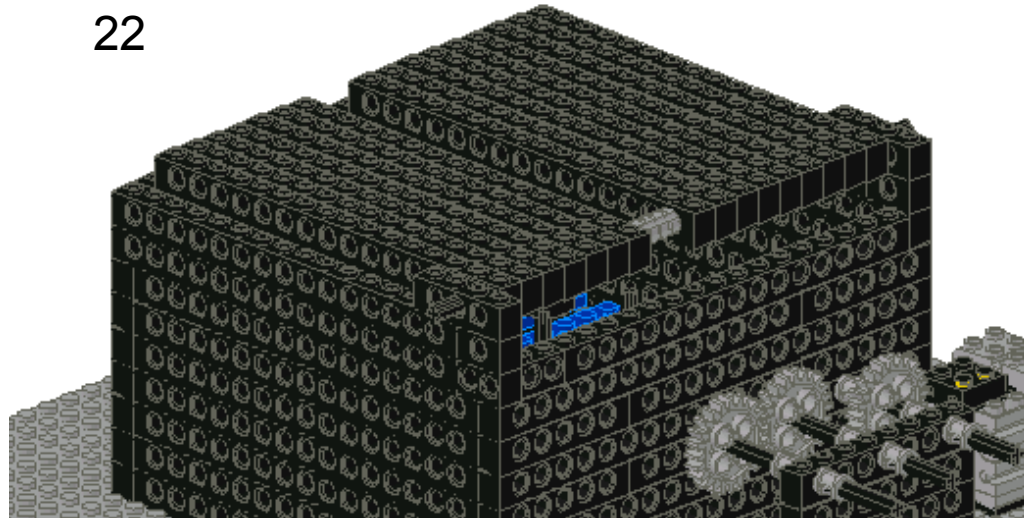


Building a Music Box

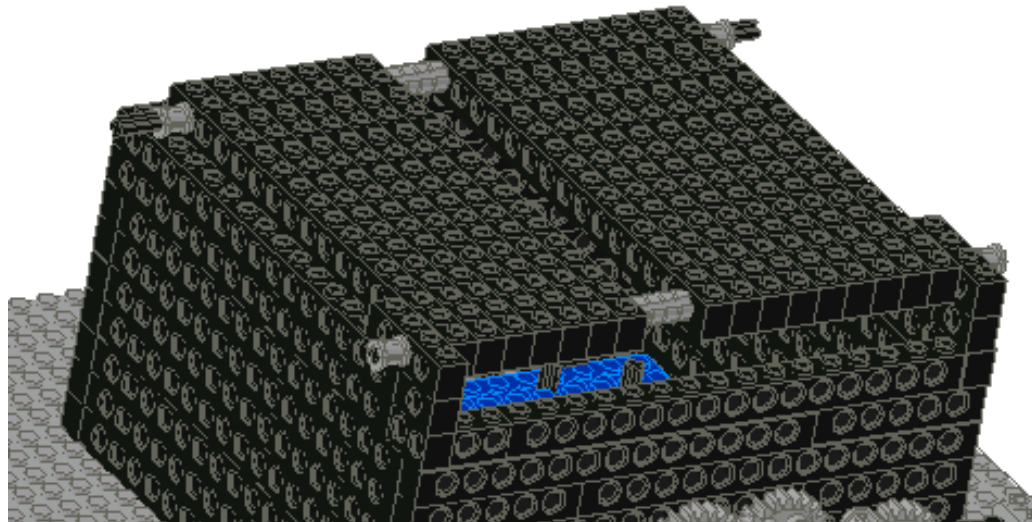
Pieces:



22

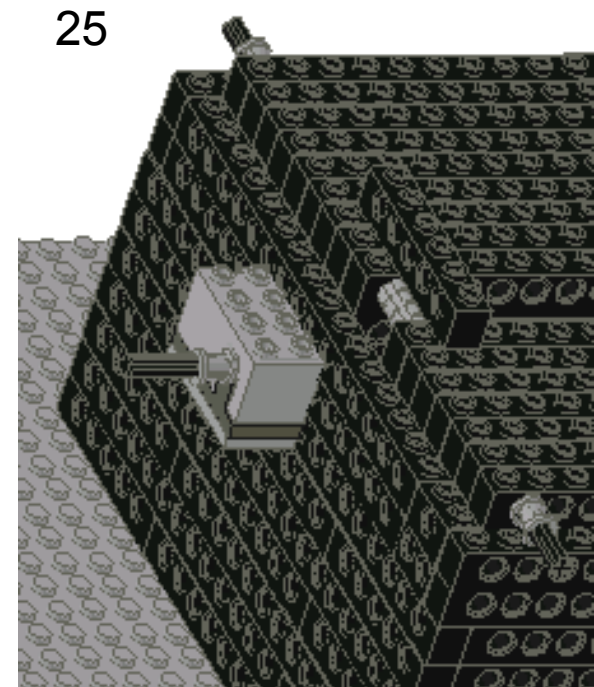
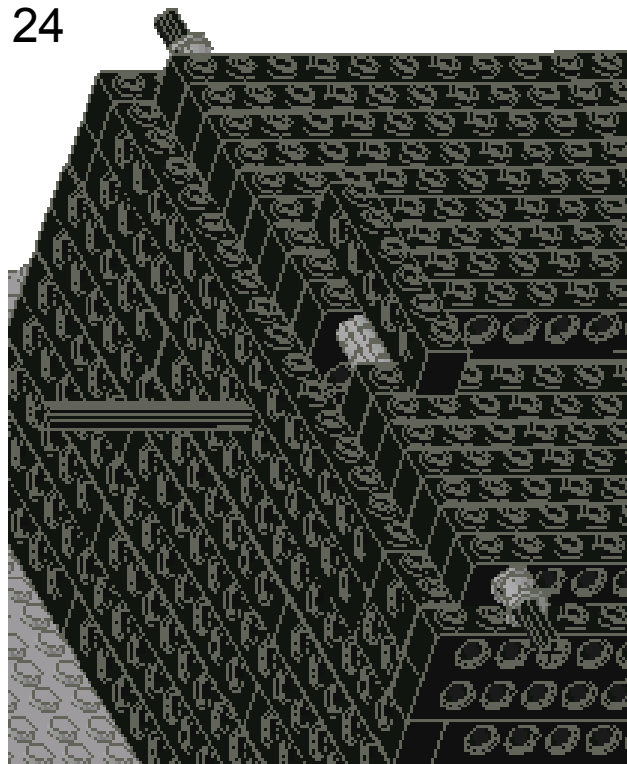
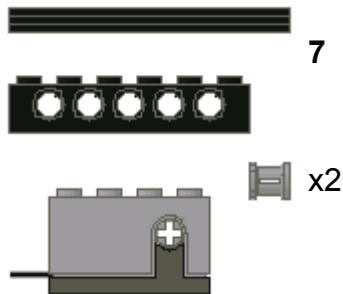


23



Building a Music Box

Pieces:



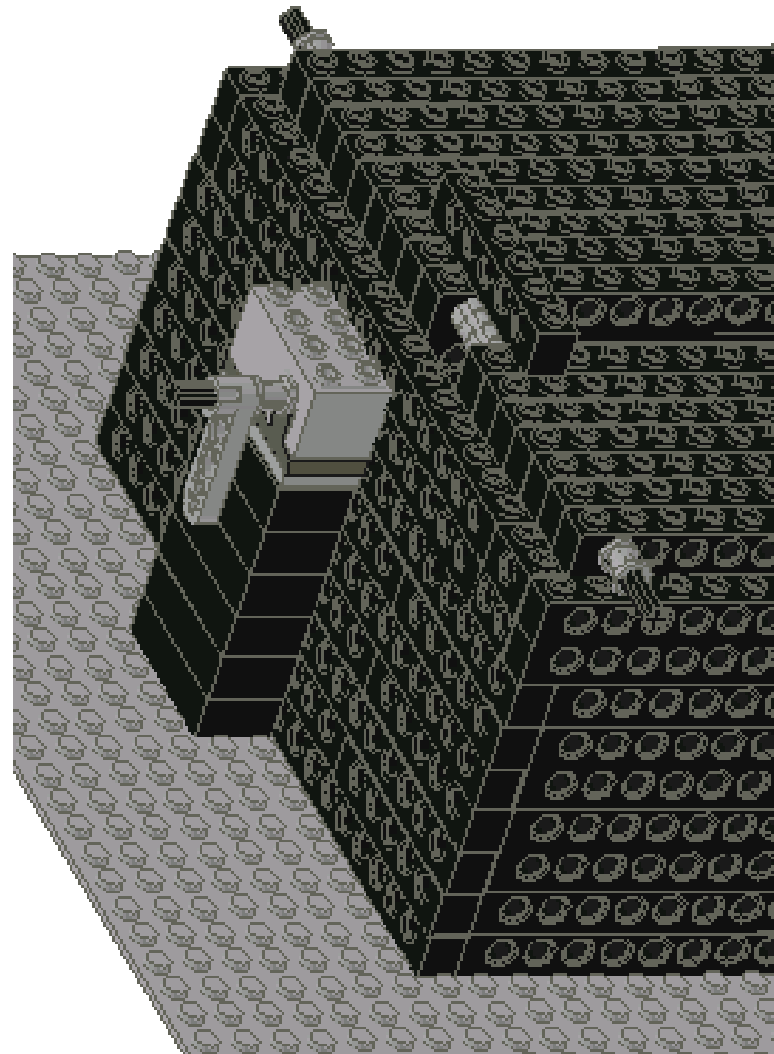
Key Words:

Rotation Sensor

Building a Music Box

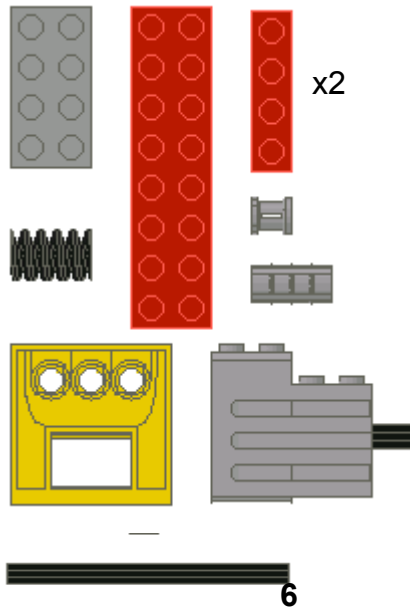
26

Pieces:

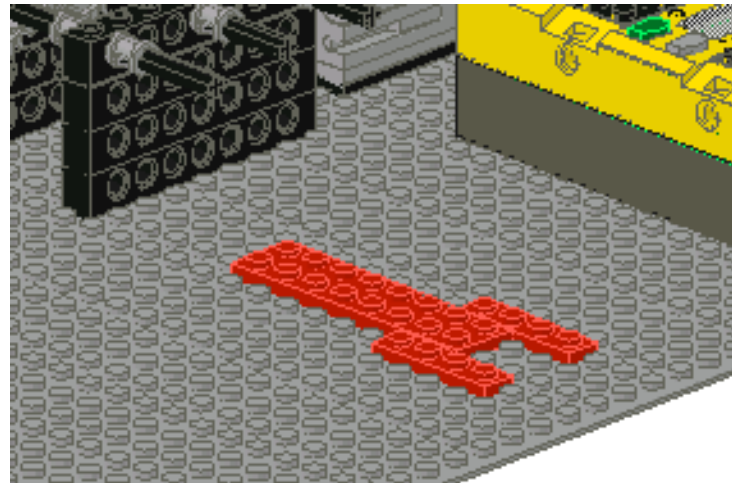


Building a Music Box

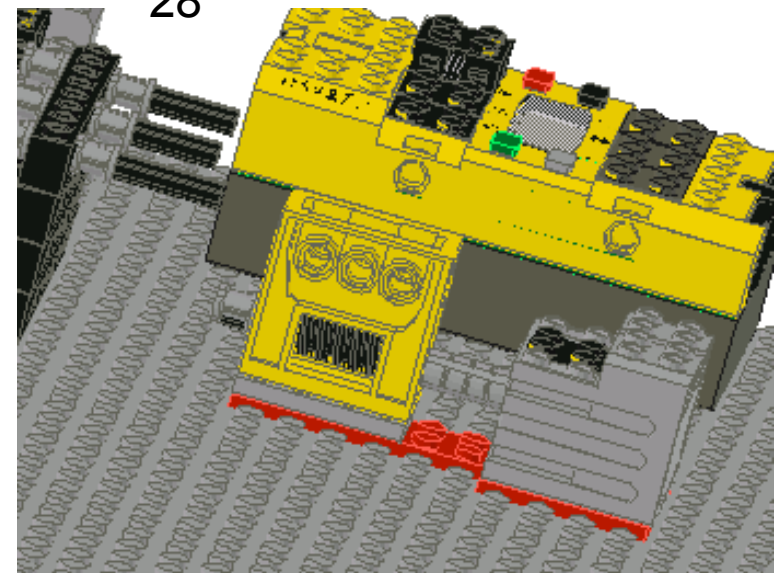
Pieces:



27



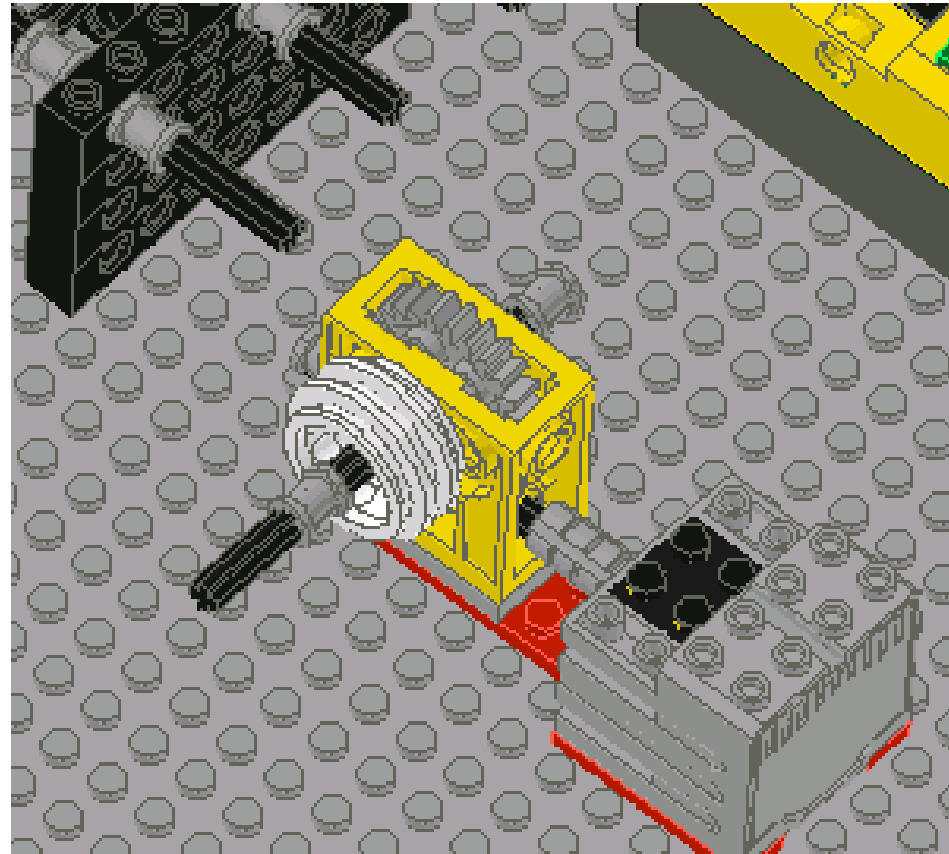
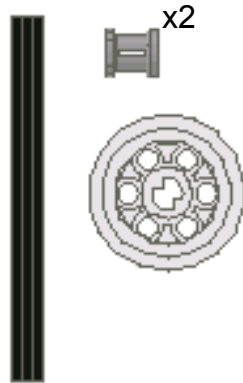
28



Building a Music Box

29

Pieces:



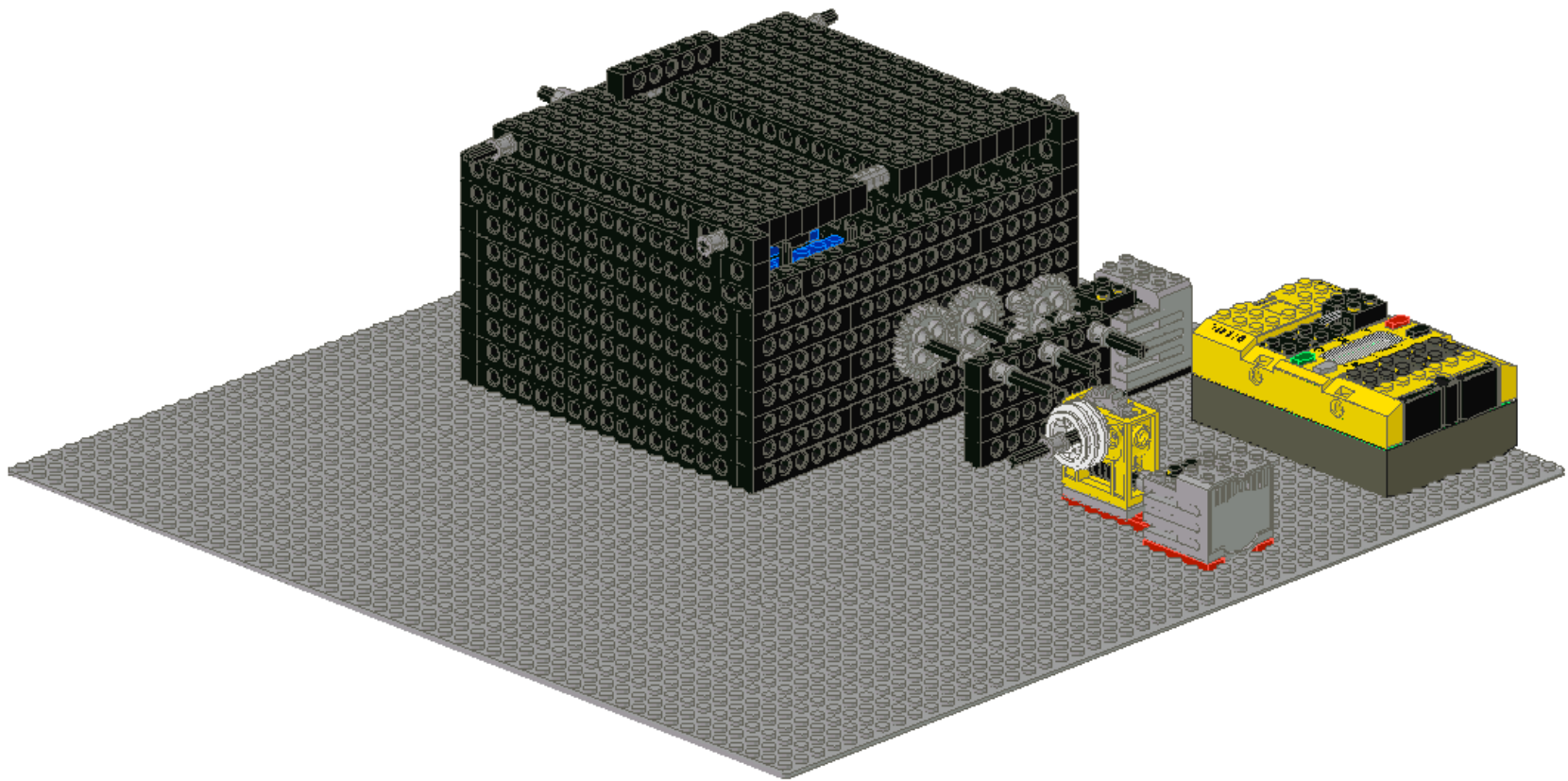
Note:

At this point, tie a piece of string from the wheel to the 6 stud beam on the top.

Building Kinetic Sculptures

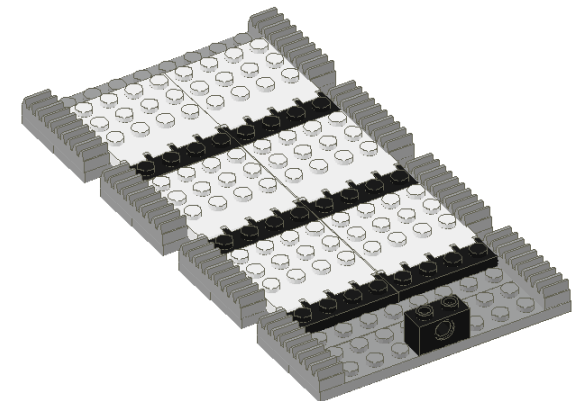
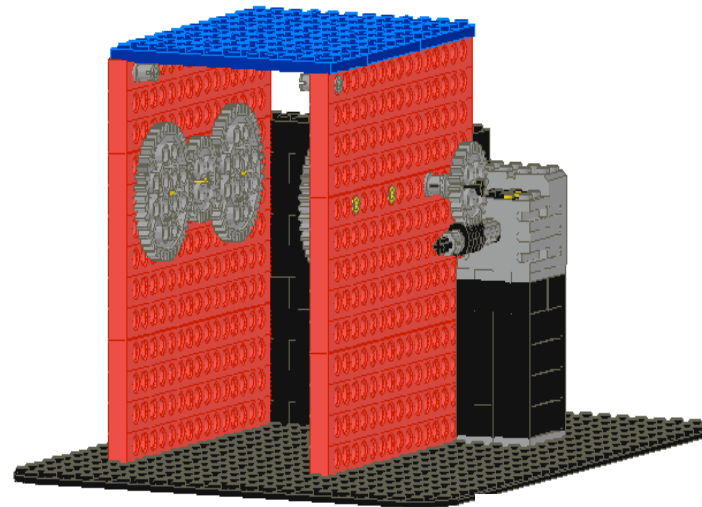
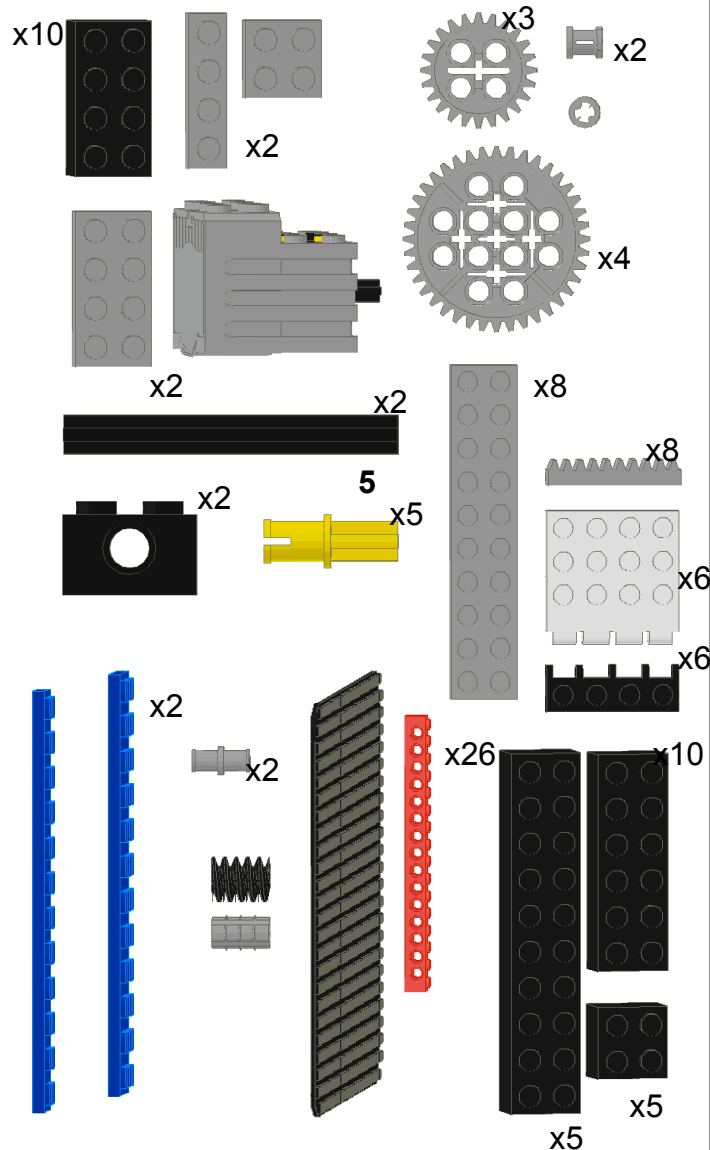
Moving Parts

Building a Music Box



Garage

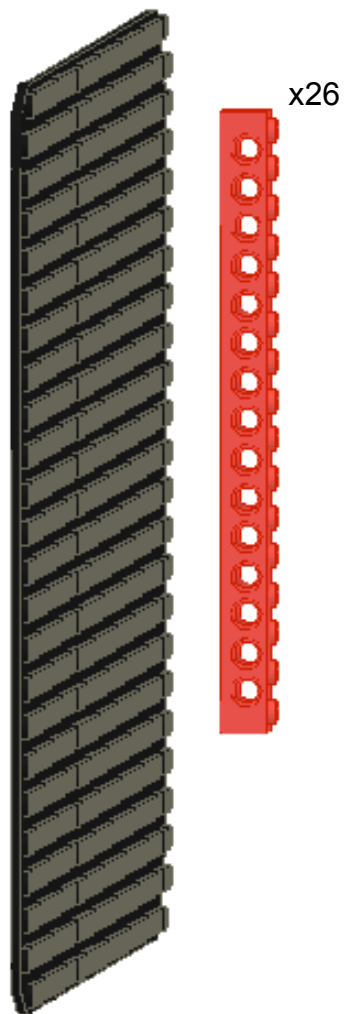
Pieces:



Key Words:

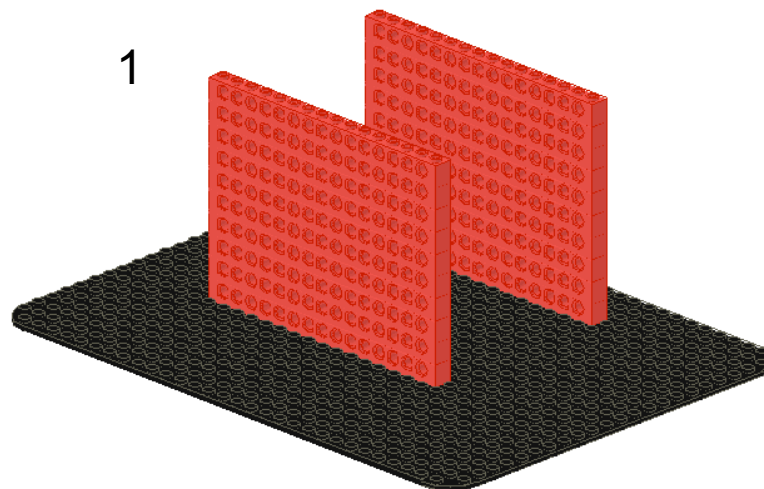
Gear rack

Pieces:

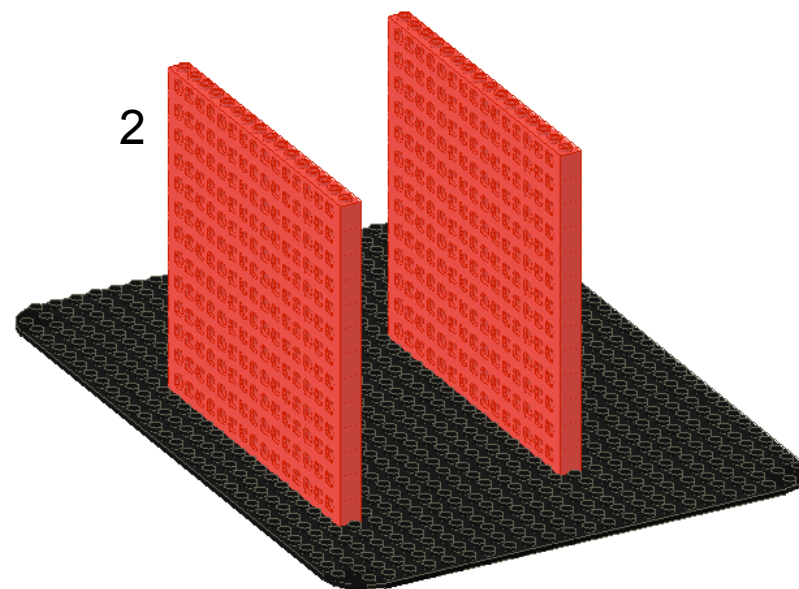


Garage

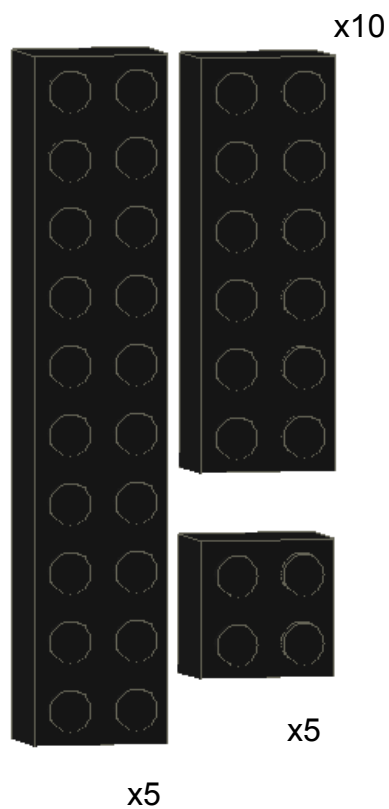
1



2

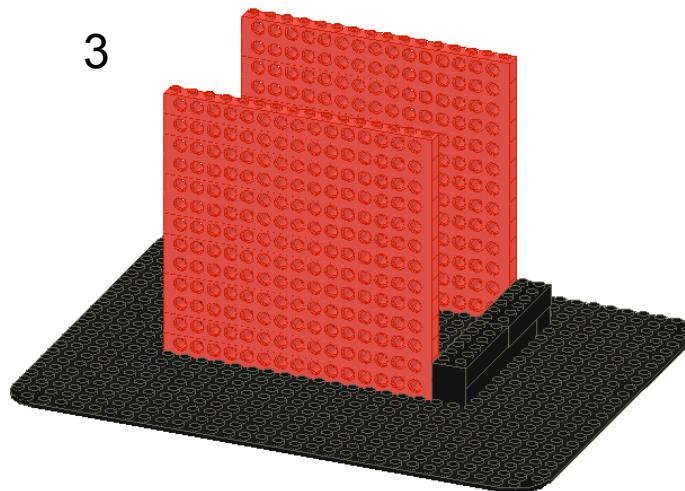


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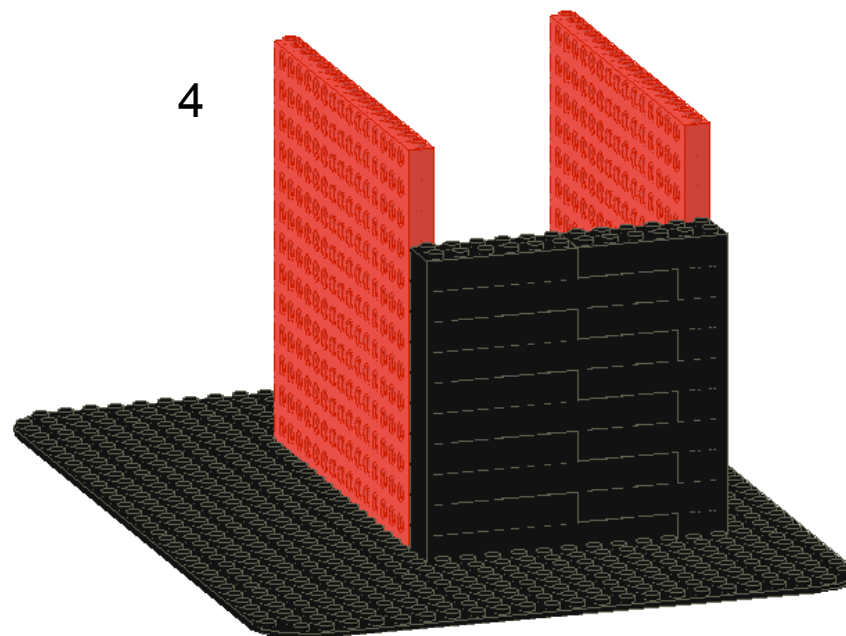


Garade

3

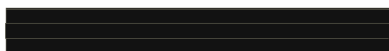


4



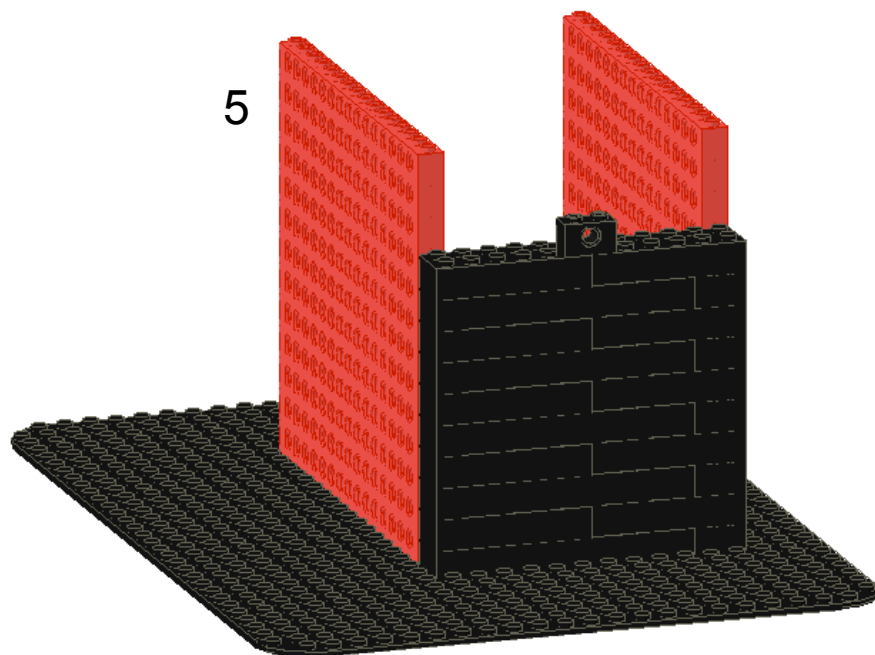
Garage

Pieces:

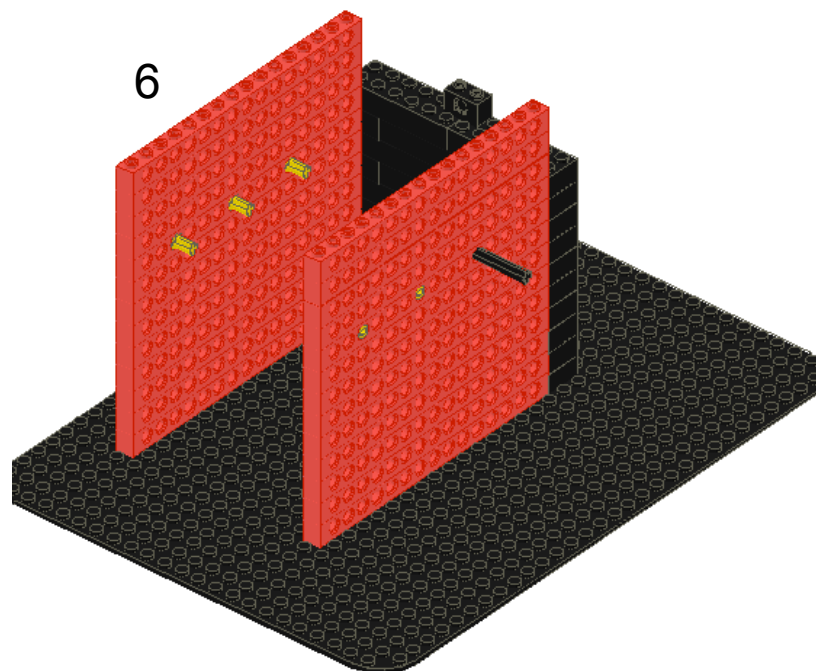


x5

5

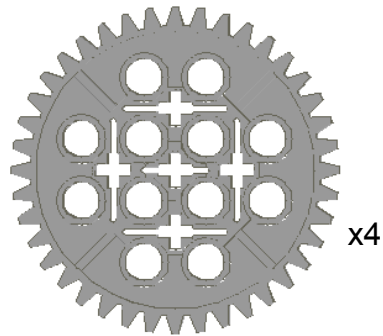
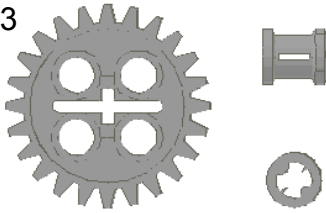


6



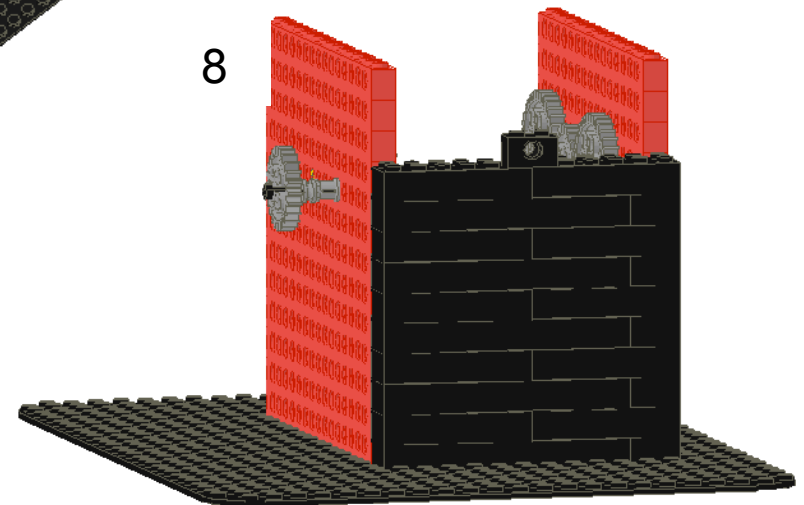
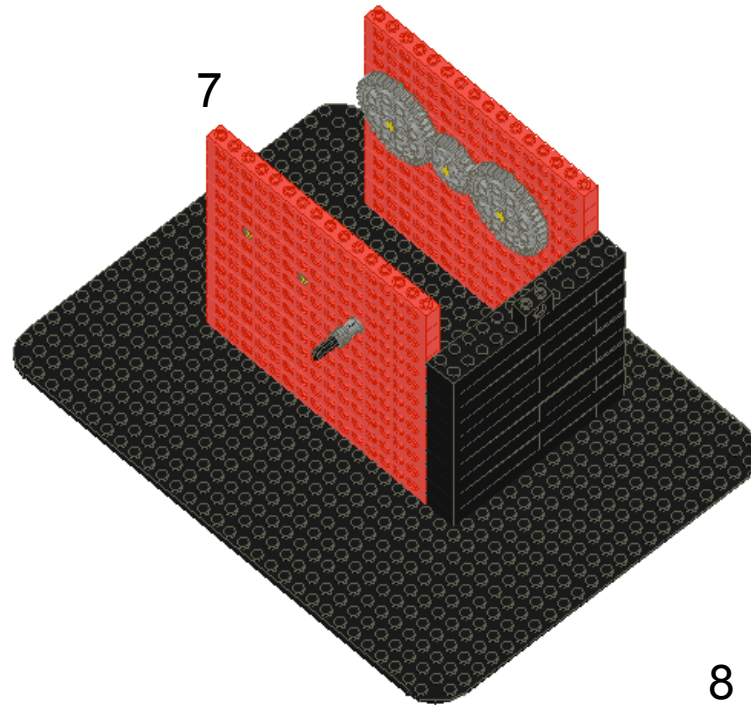
Pieces:

x3

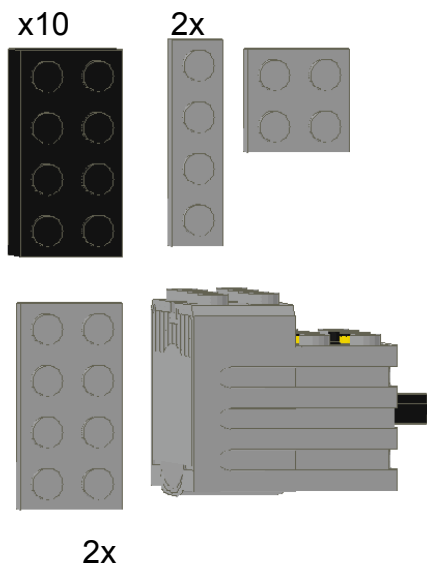


x4

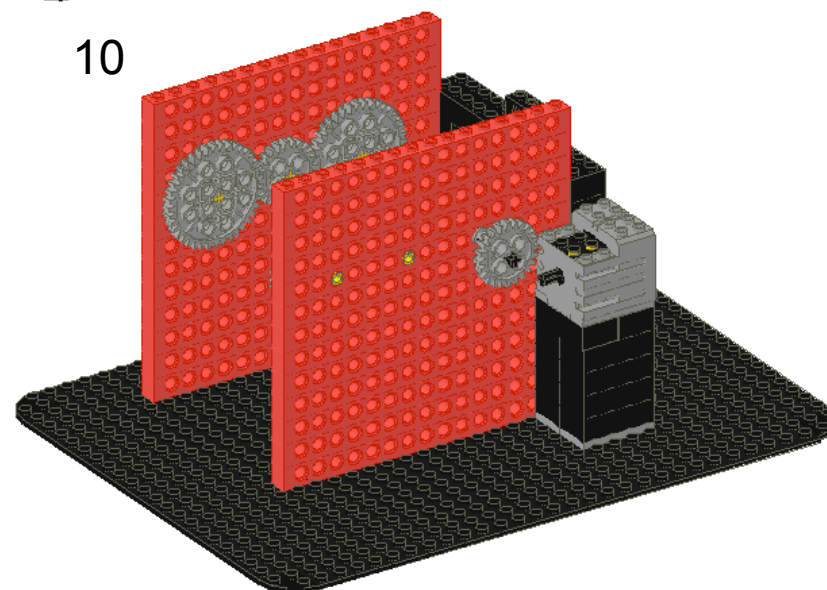
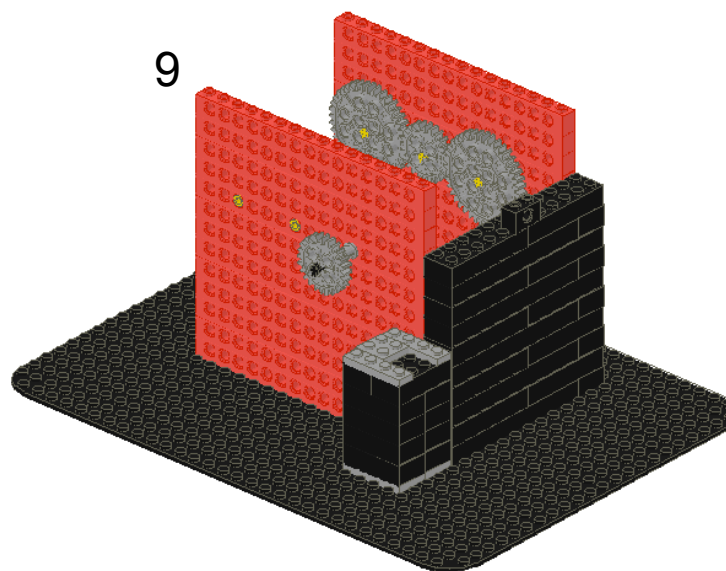
Garage



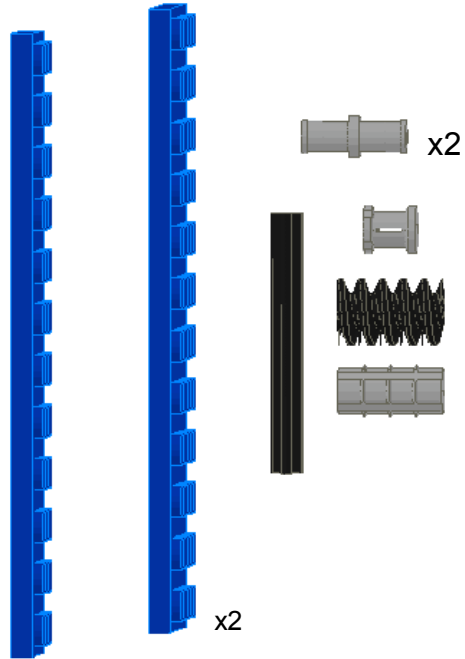
Pieces:



Garage

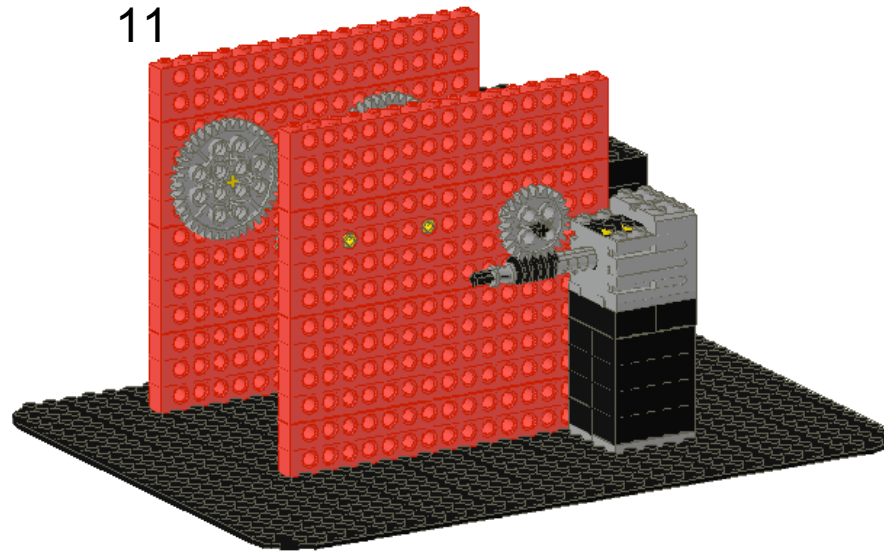


Pieces:

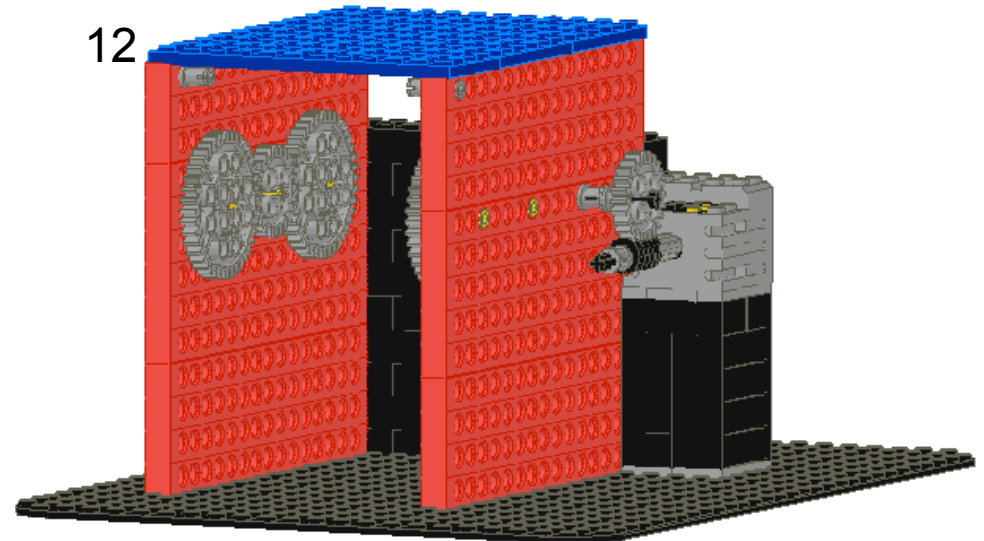


Garage

11

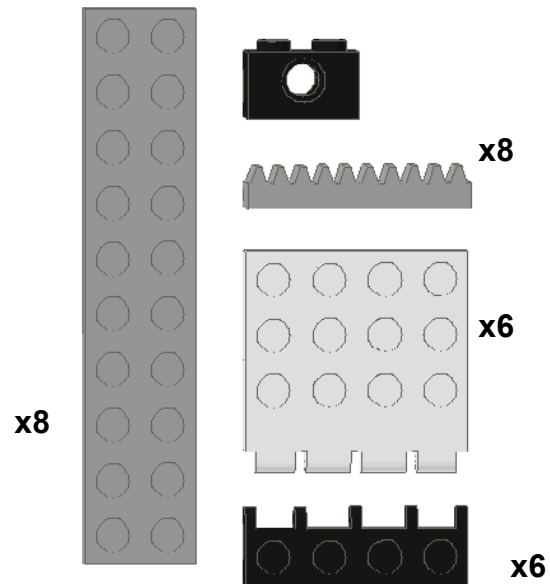


12



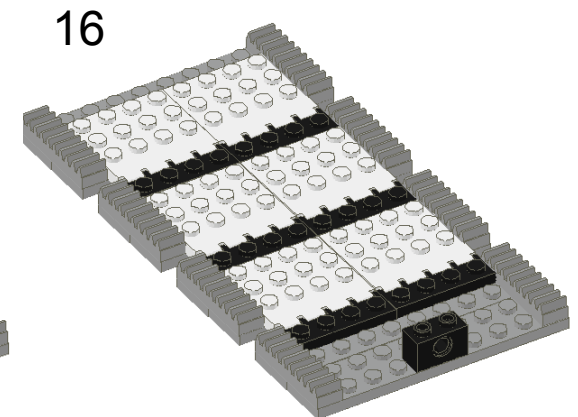
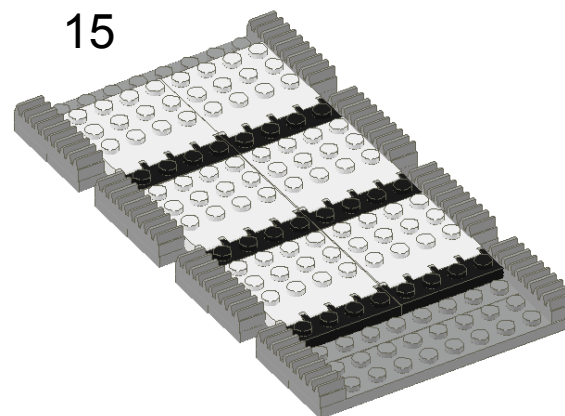
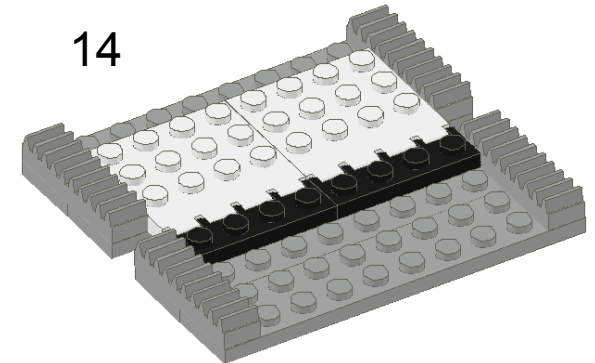
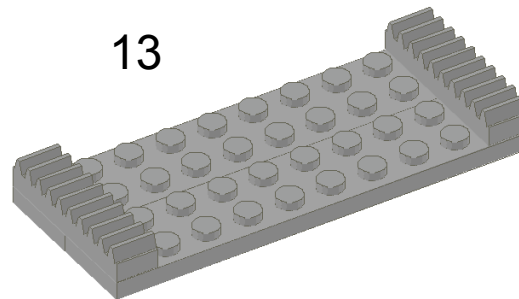
Garage Door

Pieces:



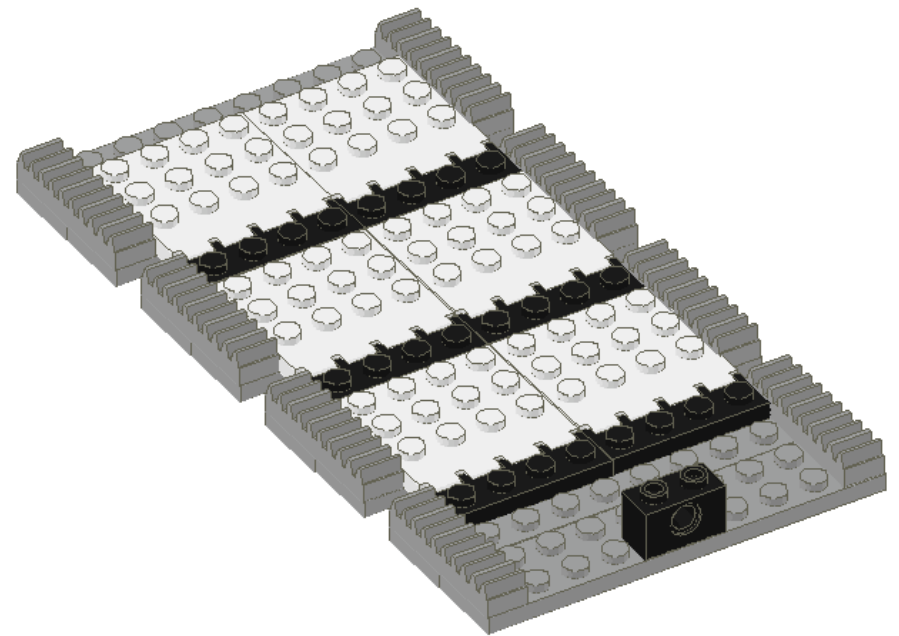
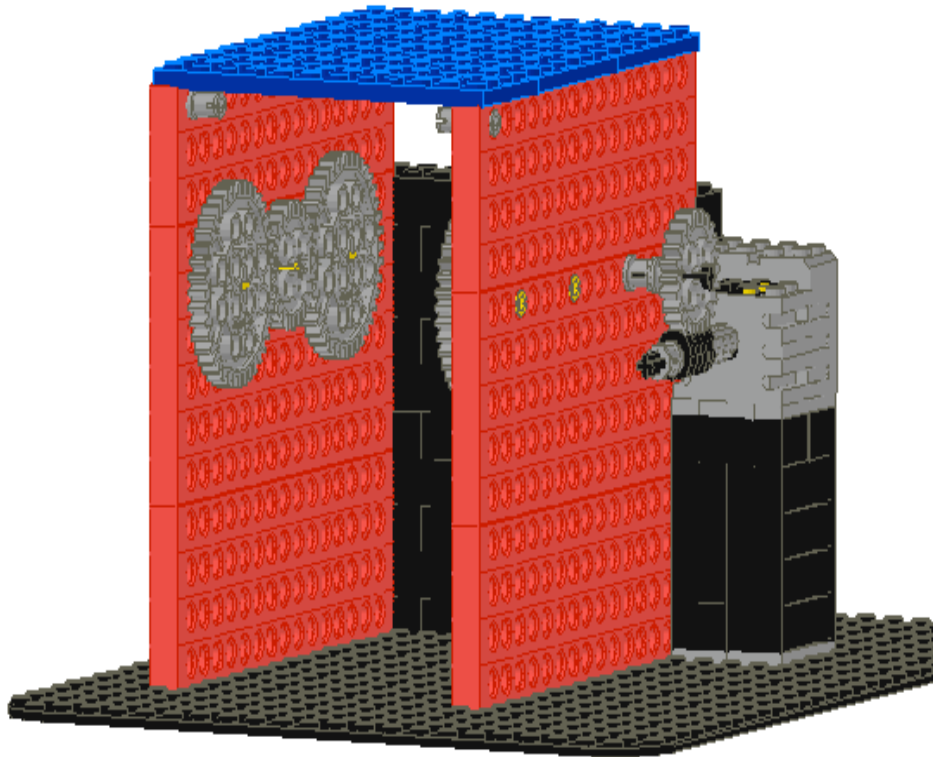
Key Words:

Gear Rack

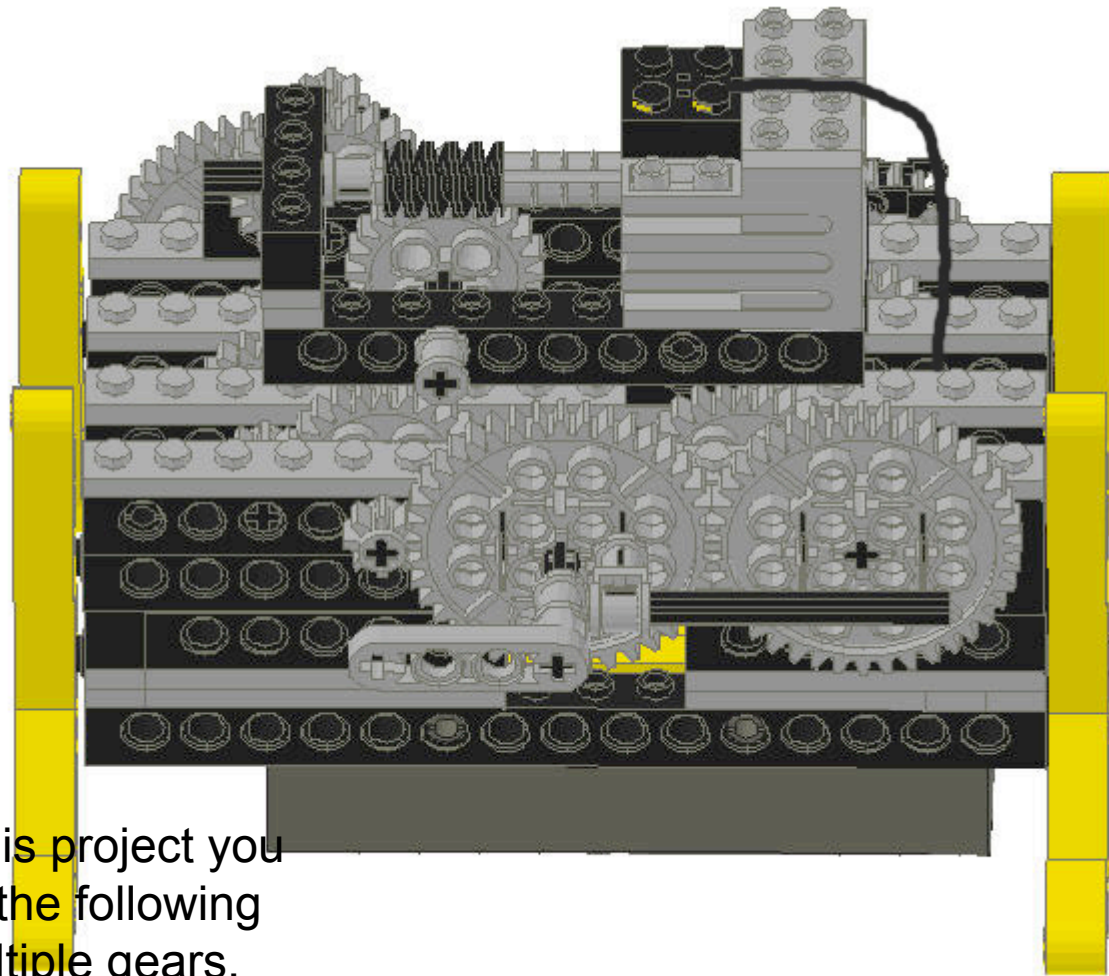


Garage

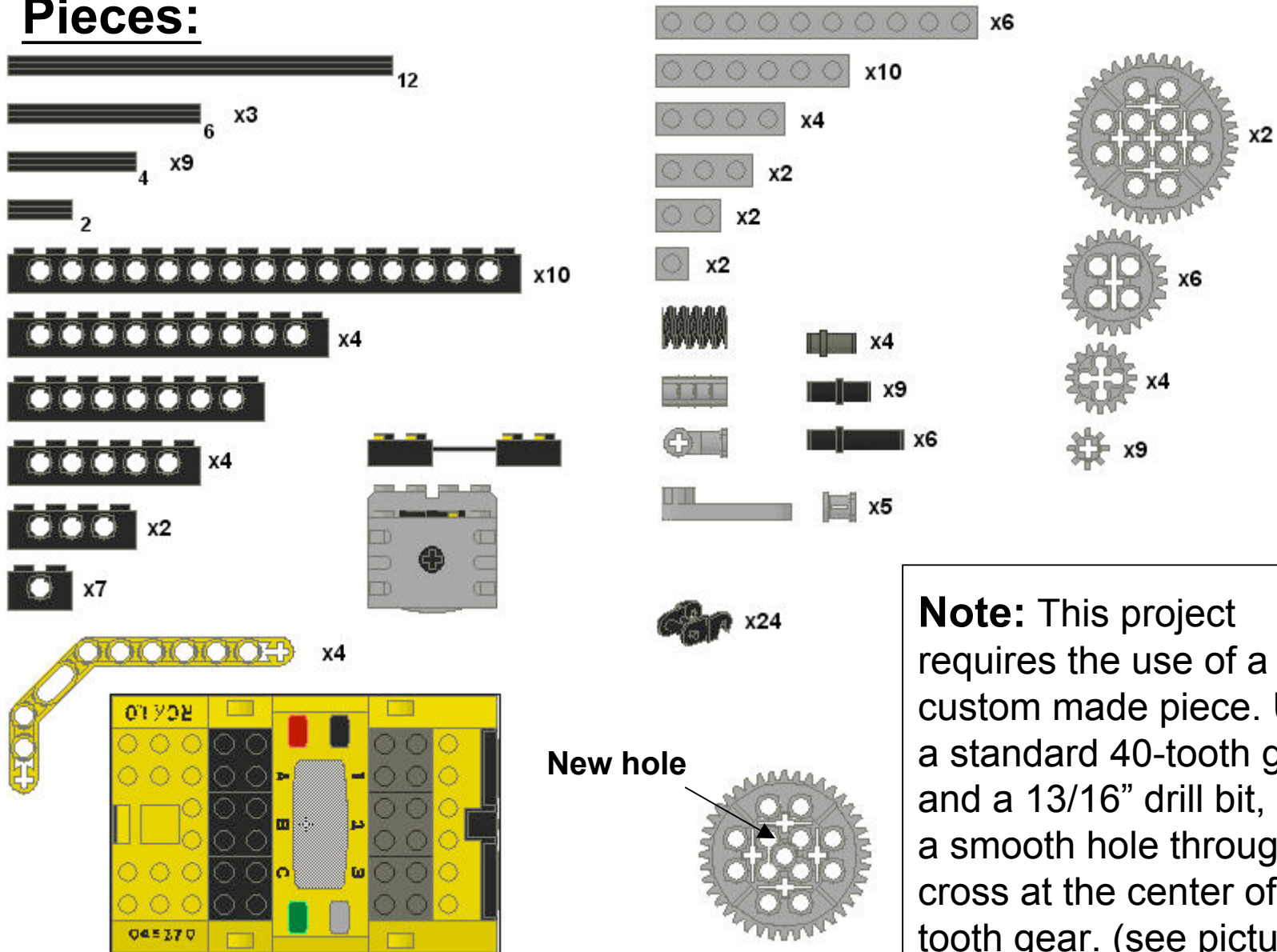
17



Clock



In order to do this project you should review the following concepts: multiple gears, using a worm gear, gearing down

Pieces:

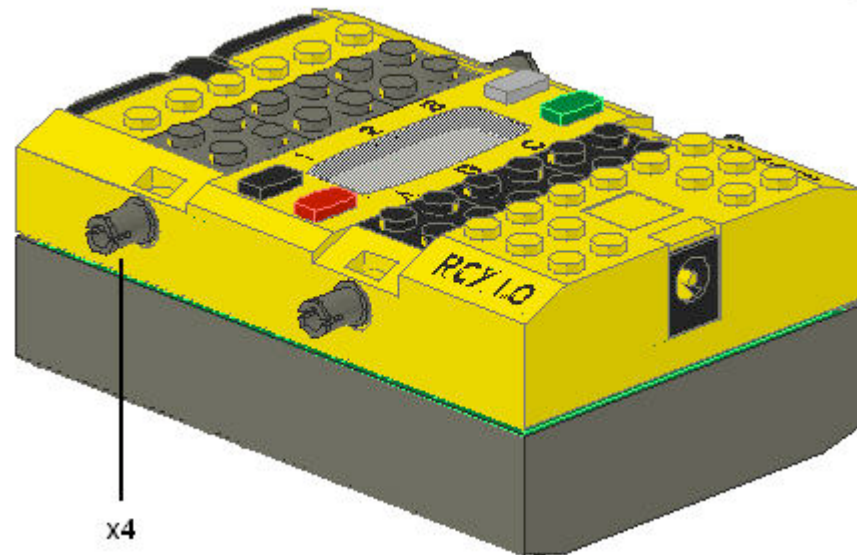
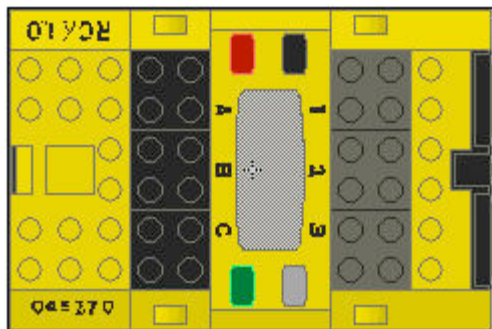
New hole

Note: This project requires the use of a custom made piece. Using a standard 40-tooth gear and a 13/16" drill bit, make a smooth hole through the cross at the center of a 40 tooth gear. (see picture)

Clock: Housing

Pieces:

 x4

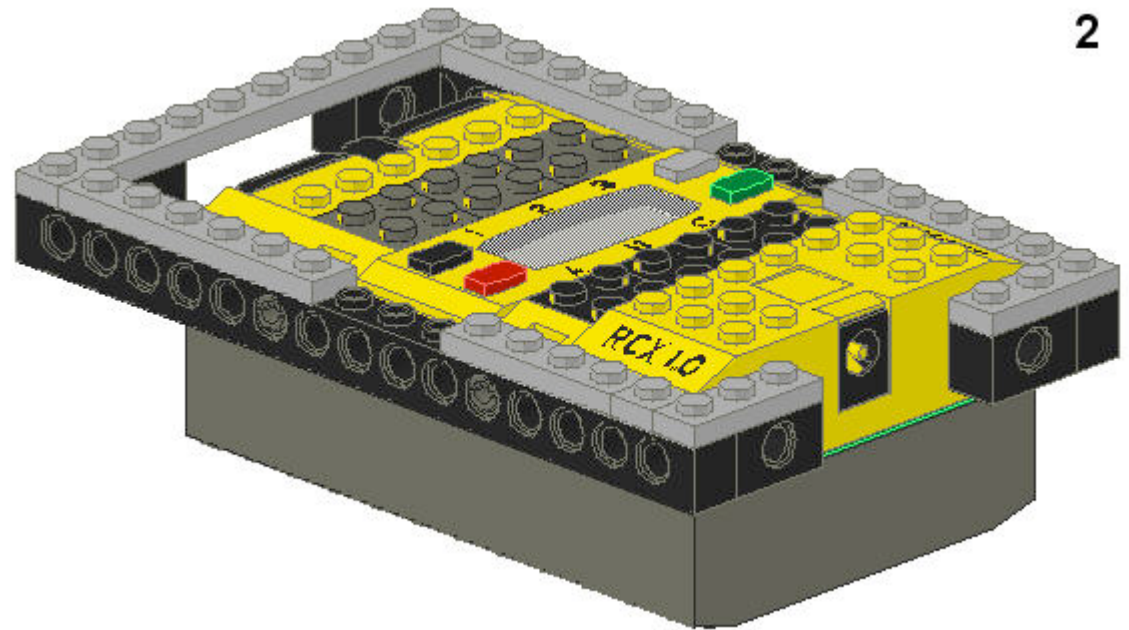
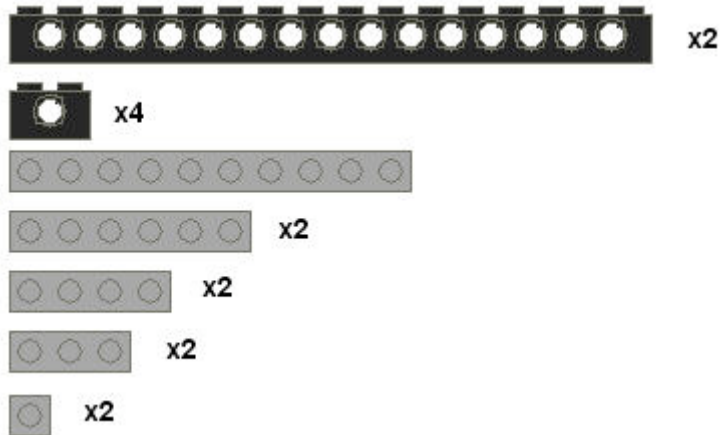


1

Clock: Housing

2

Pieces:



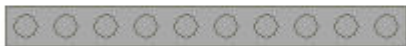
Clock: Housing

3

Pieces:



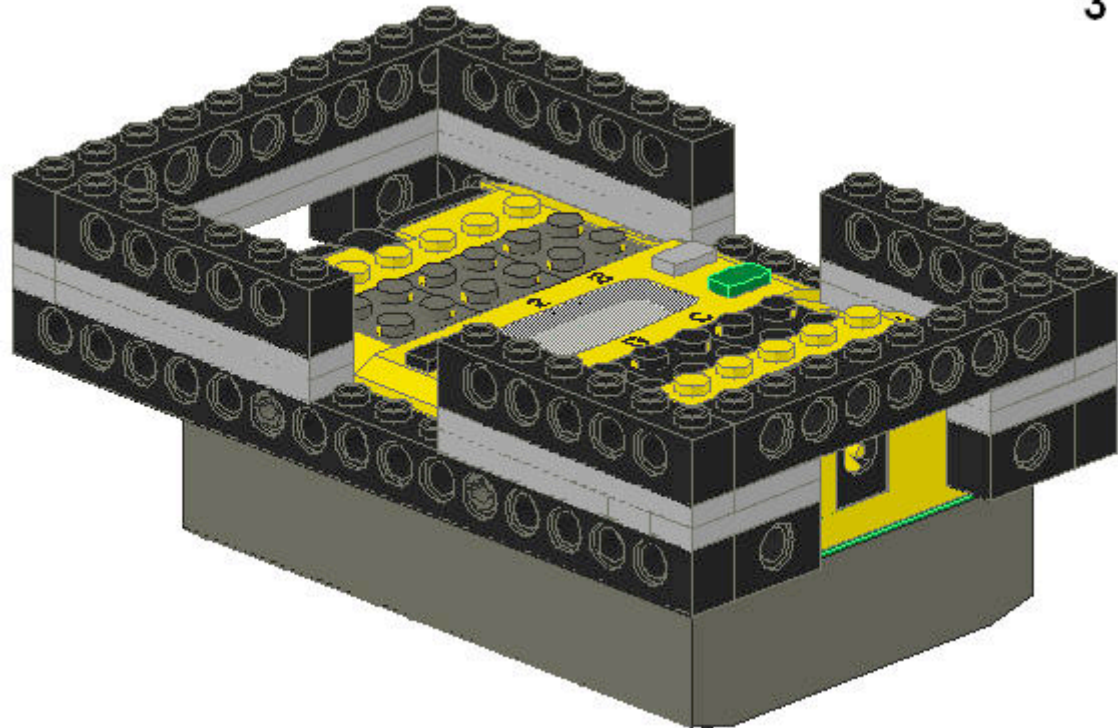
x4



x4



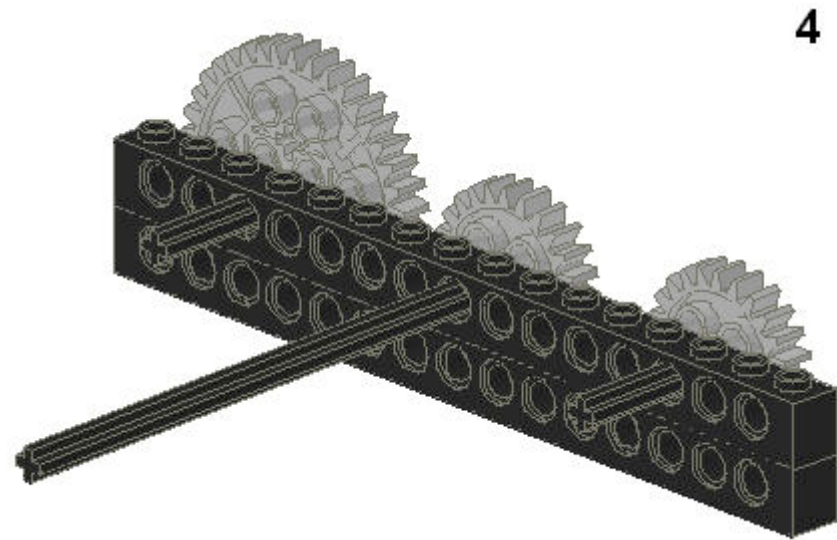
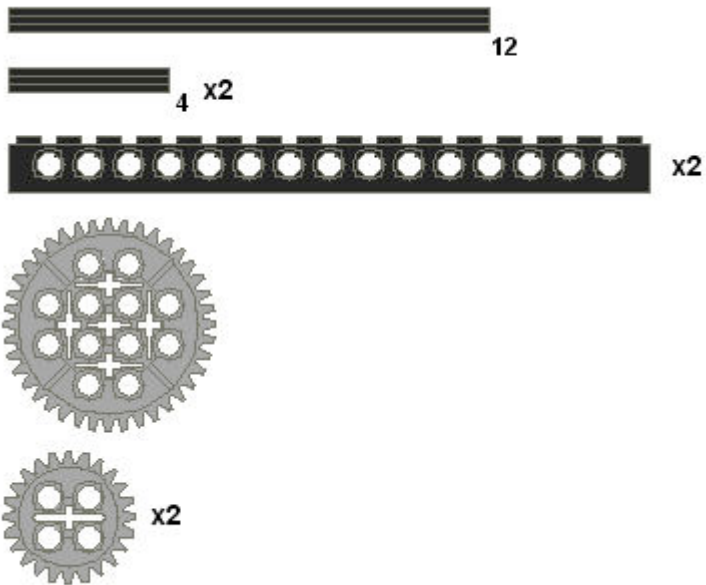
x2



Note: Attach one end of the wire to port A at this time, leave the other end loose for now.

Clock: Gearing

Pieces:



Clock: Gearing

Pieces:

 x2

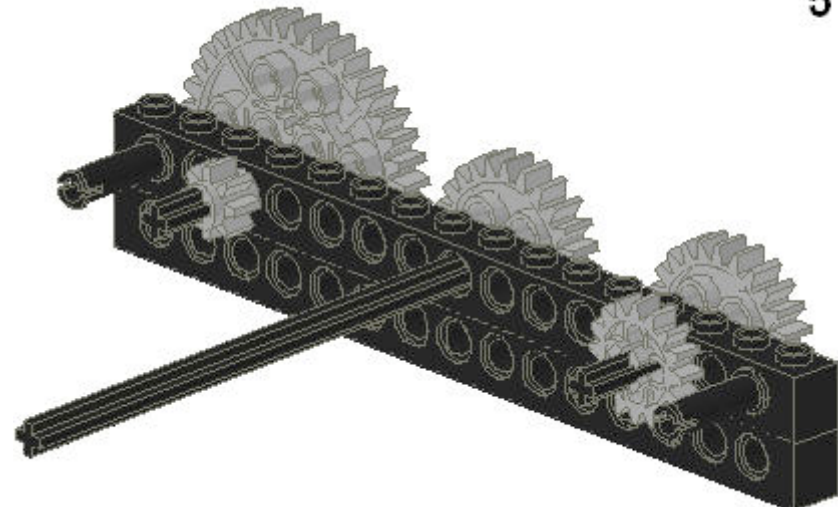


Pieces:

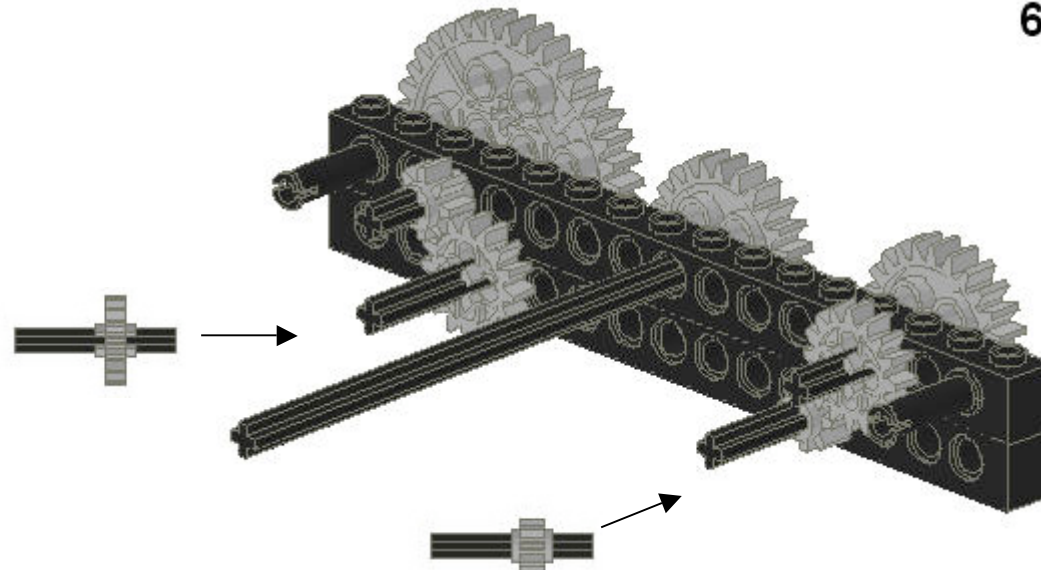
 x2
4



5

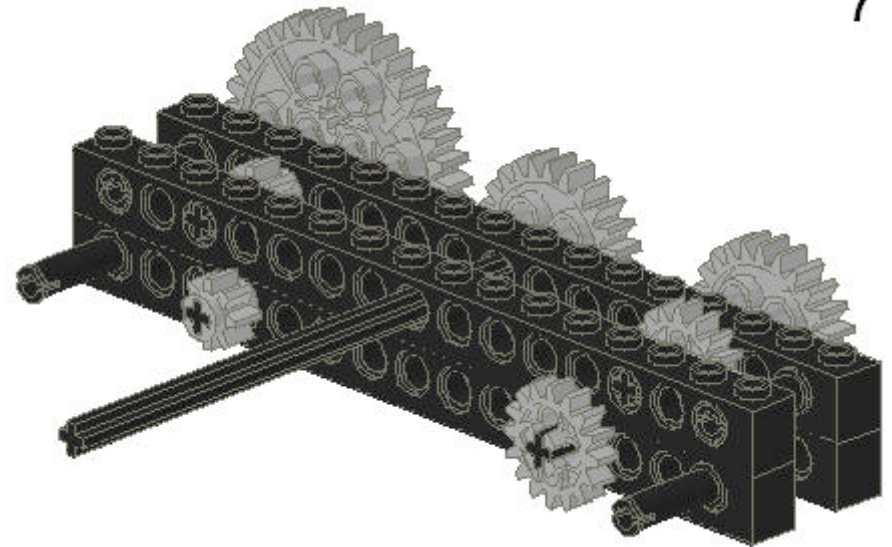
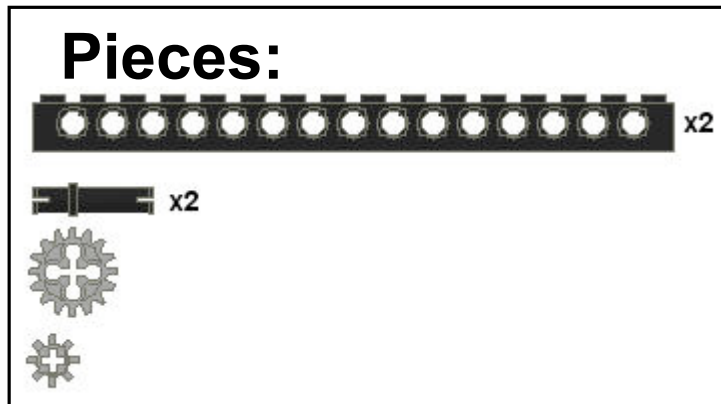


6

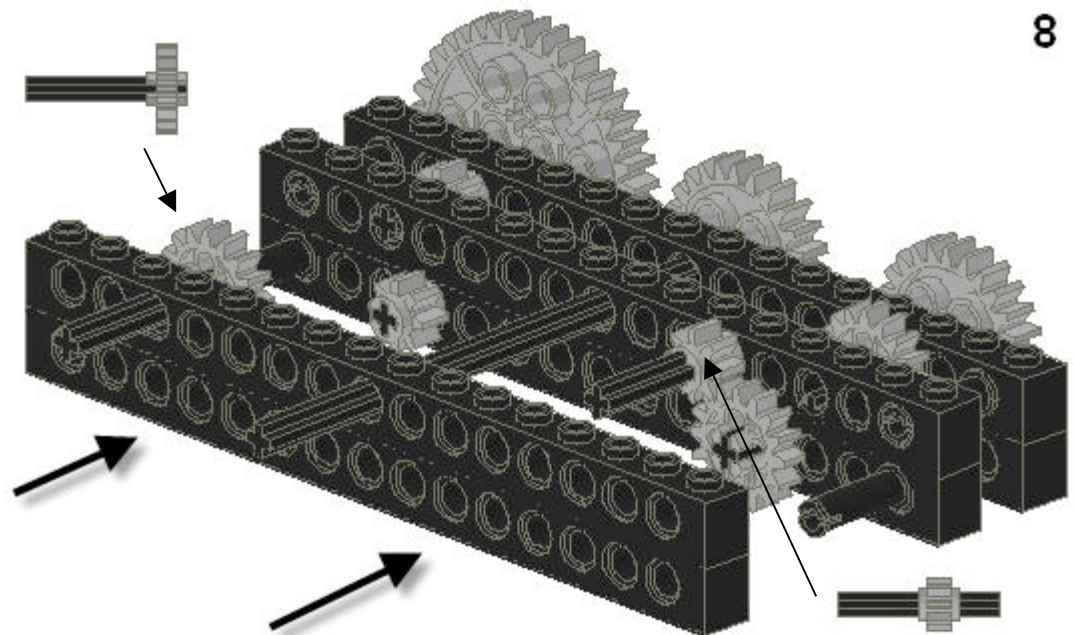
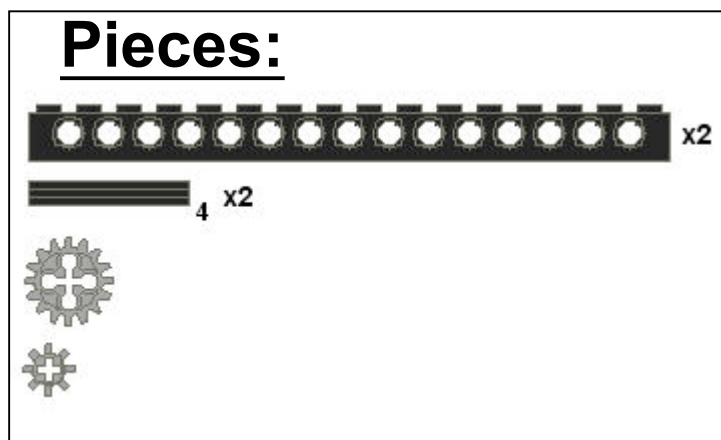


Clock: Gearing

7

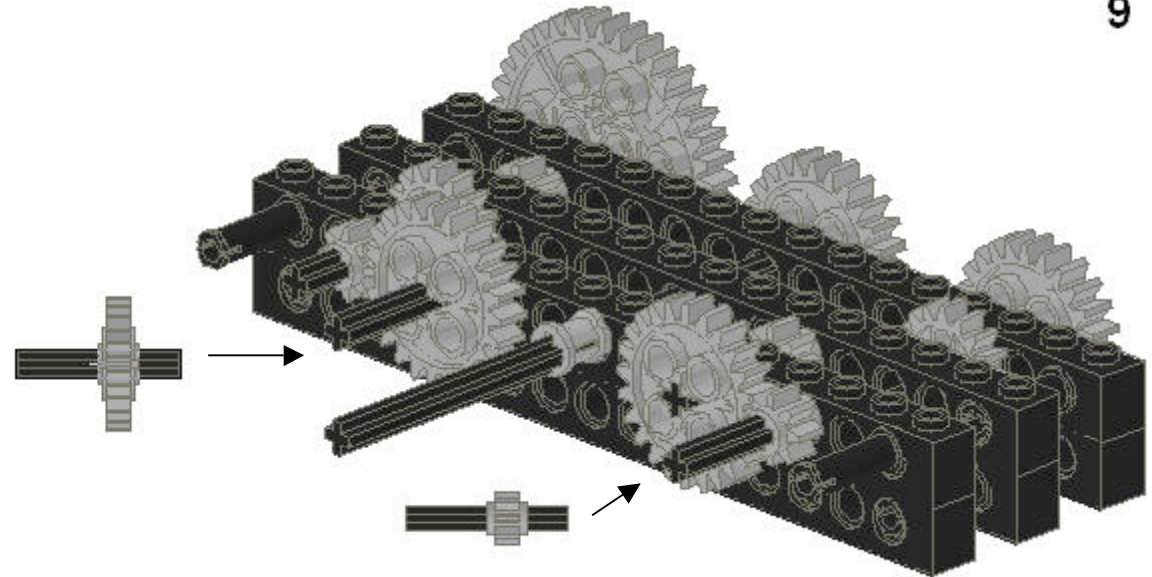


8



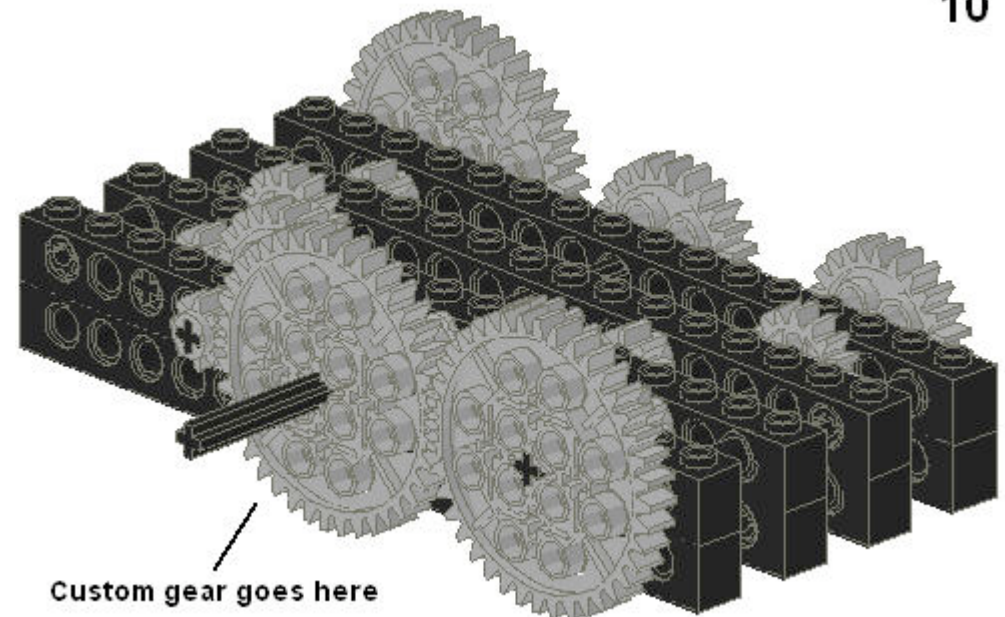
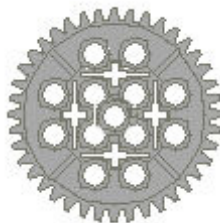
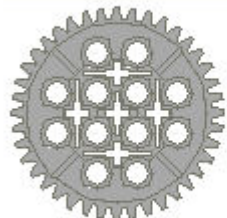
Clock: Gearing

Pieces:



9

Pieces:



10

Clock: Gearing

11

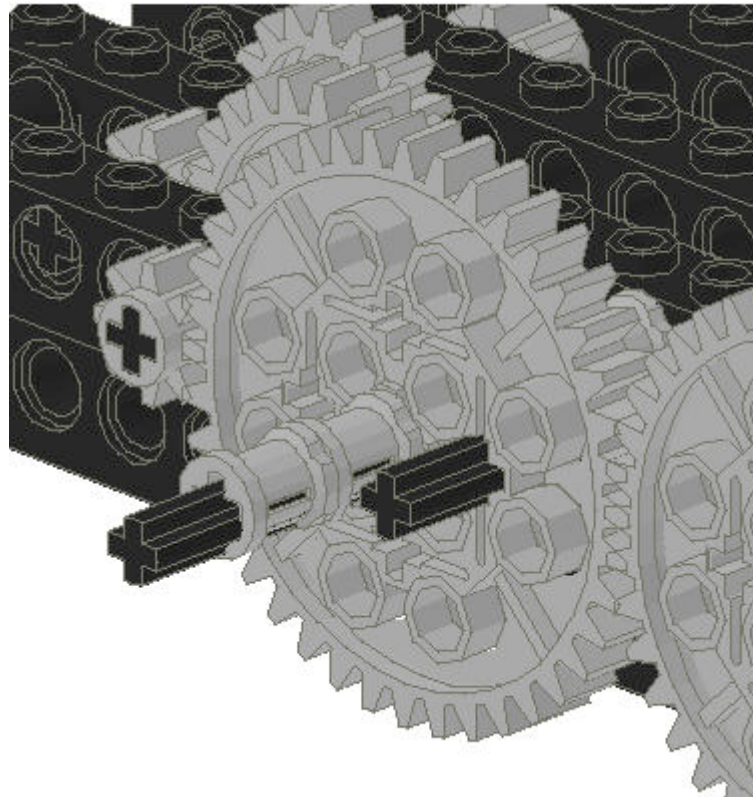
Pieces:



2



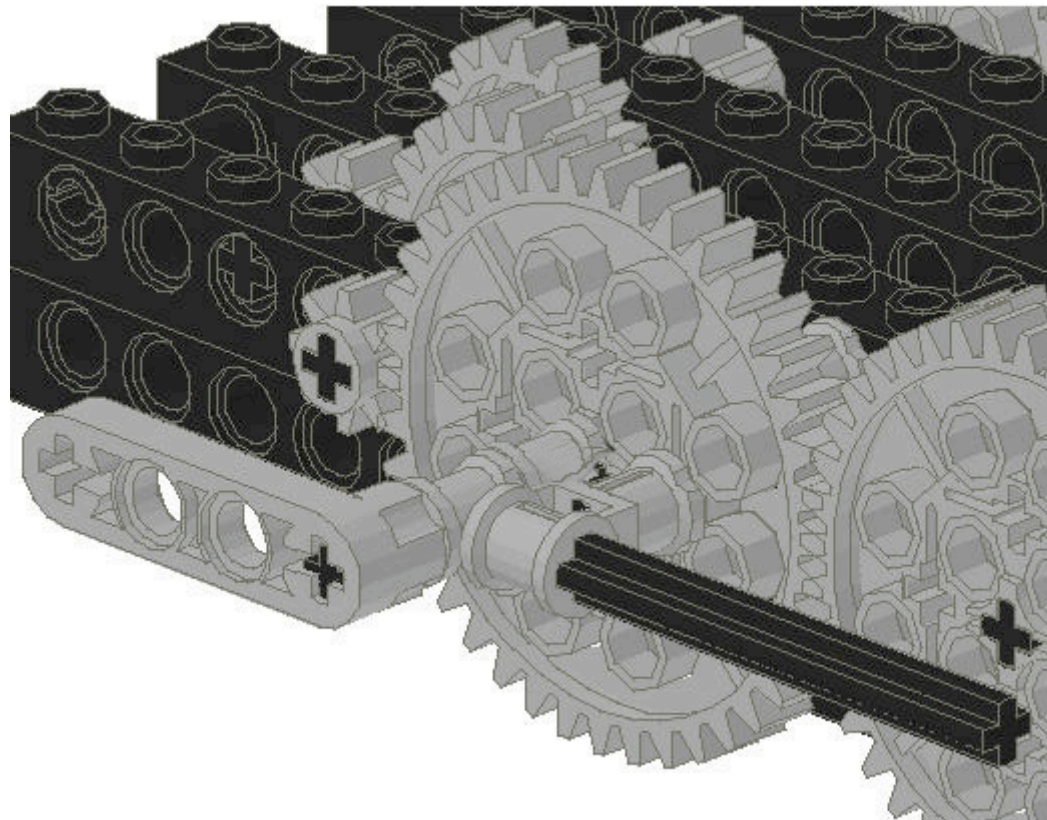
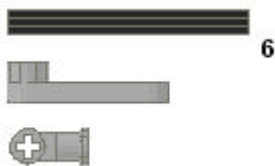
x2



Clock: Gearing

12

Pieces:



Clock: Gearing

Pieces:



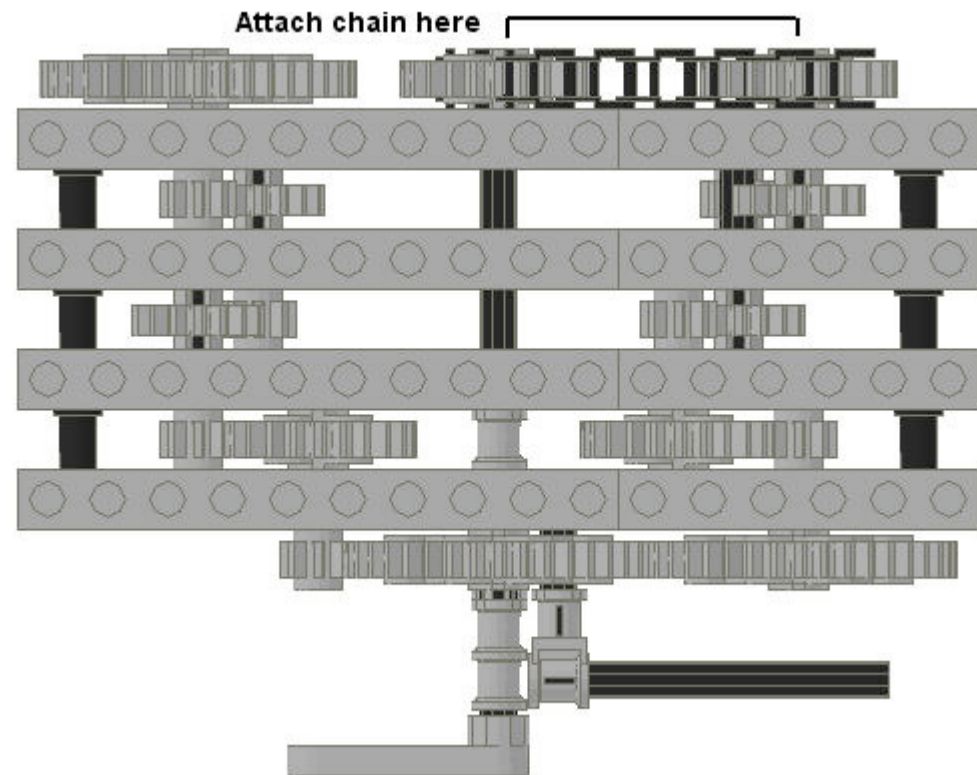
x4



x4



x24

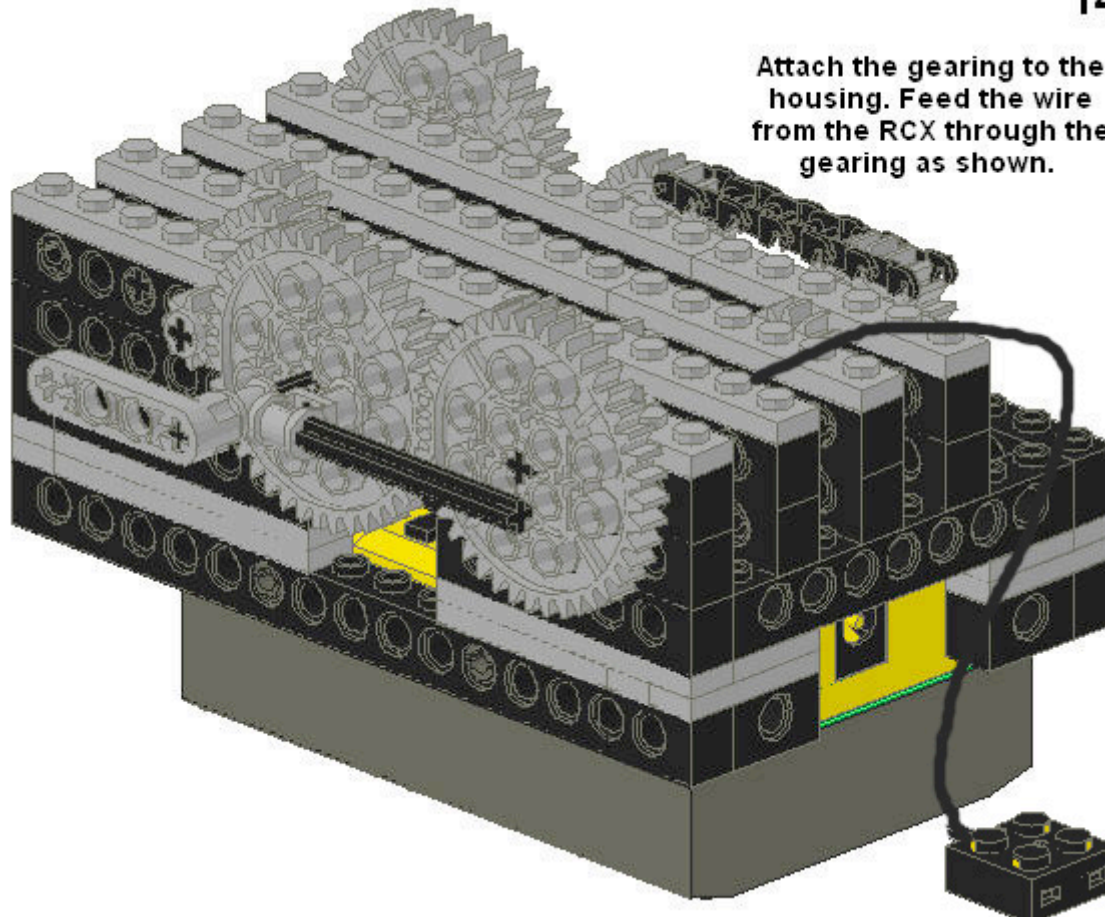


13

Clock

14

Attach the gearing to the housing. Feed the wire from the RCX through the gearing as shown.

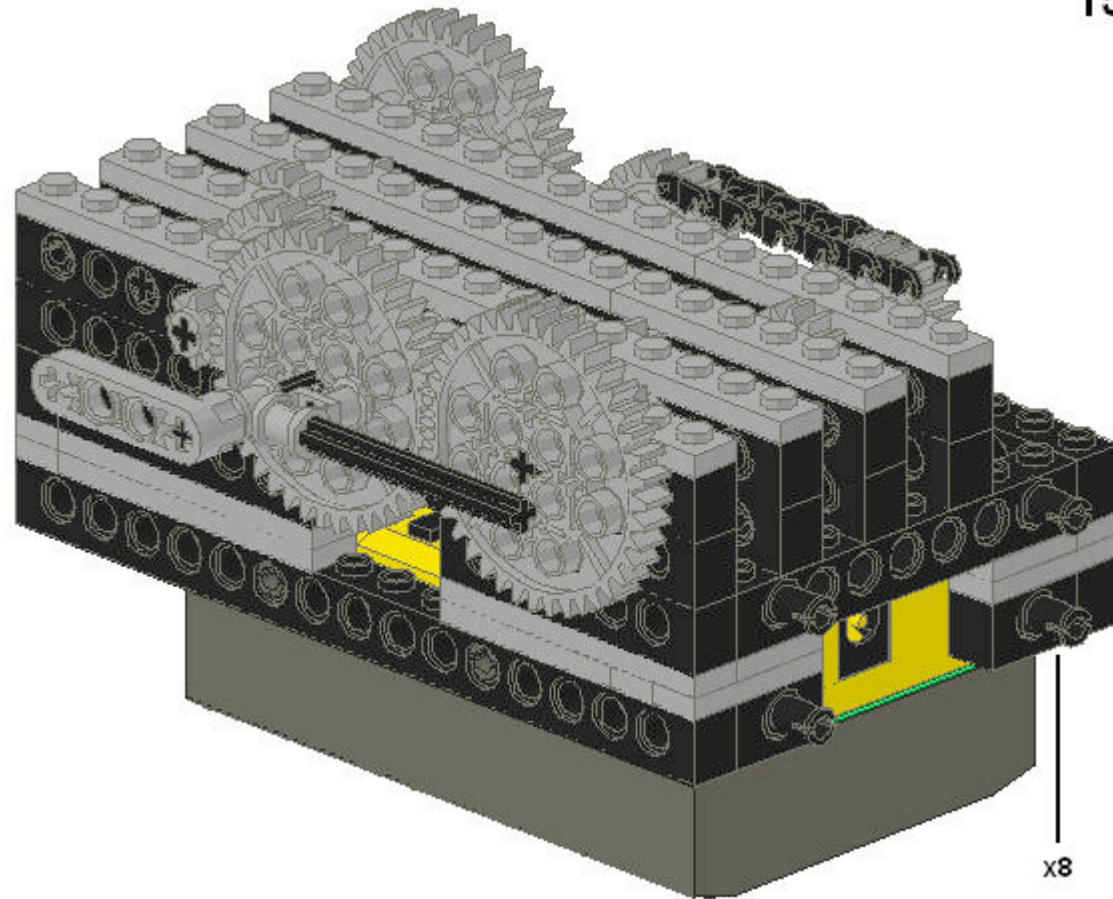


Clock

15

Pieces:

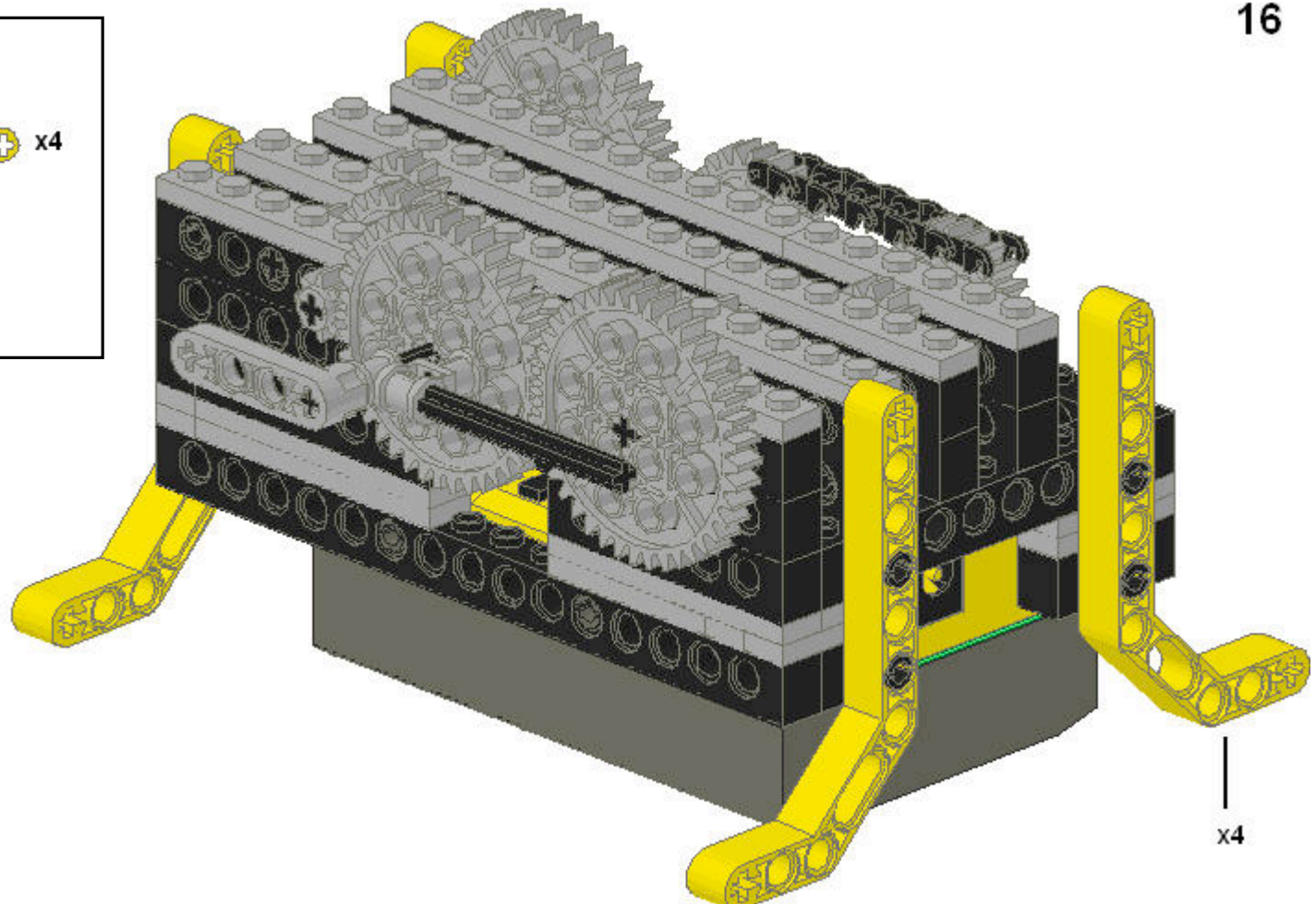
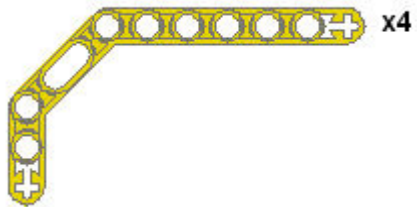
 x8



Clock

16

Pieces:

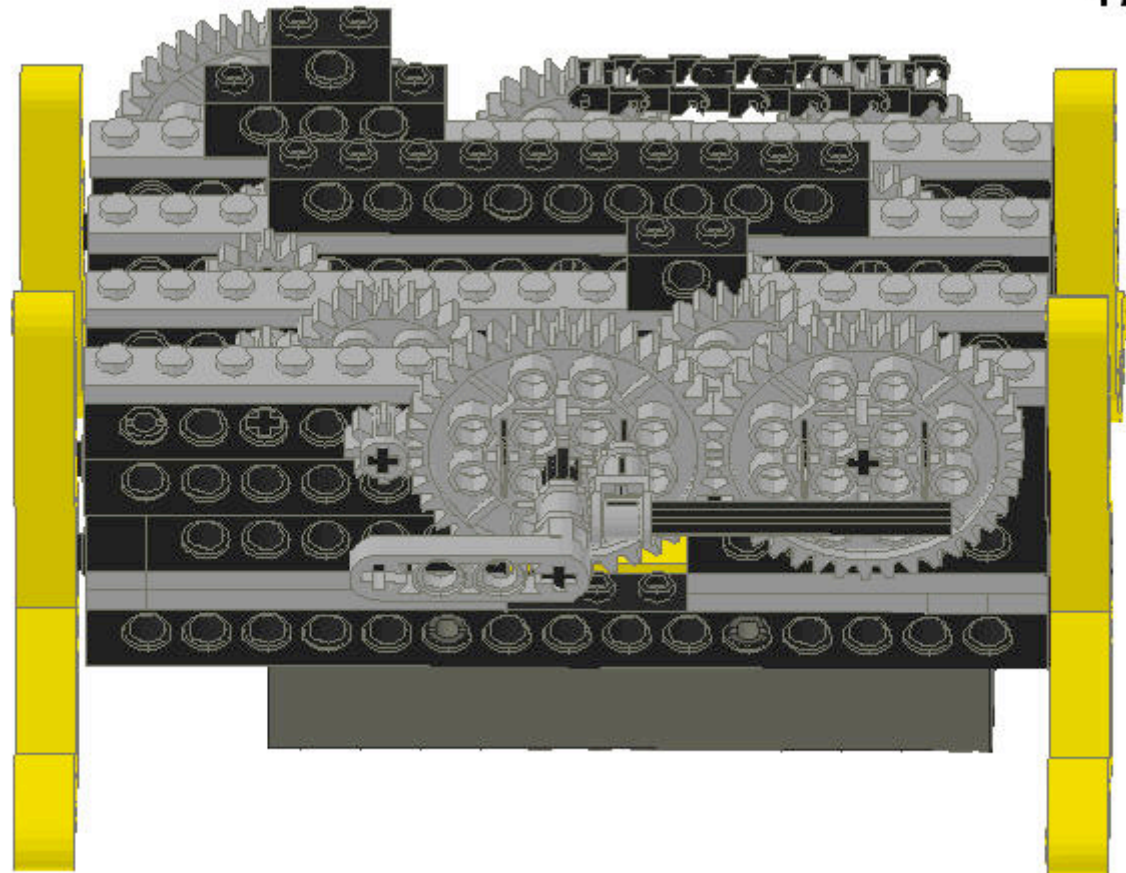


Clock

Pieces:



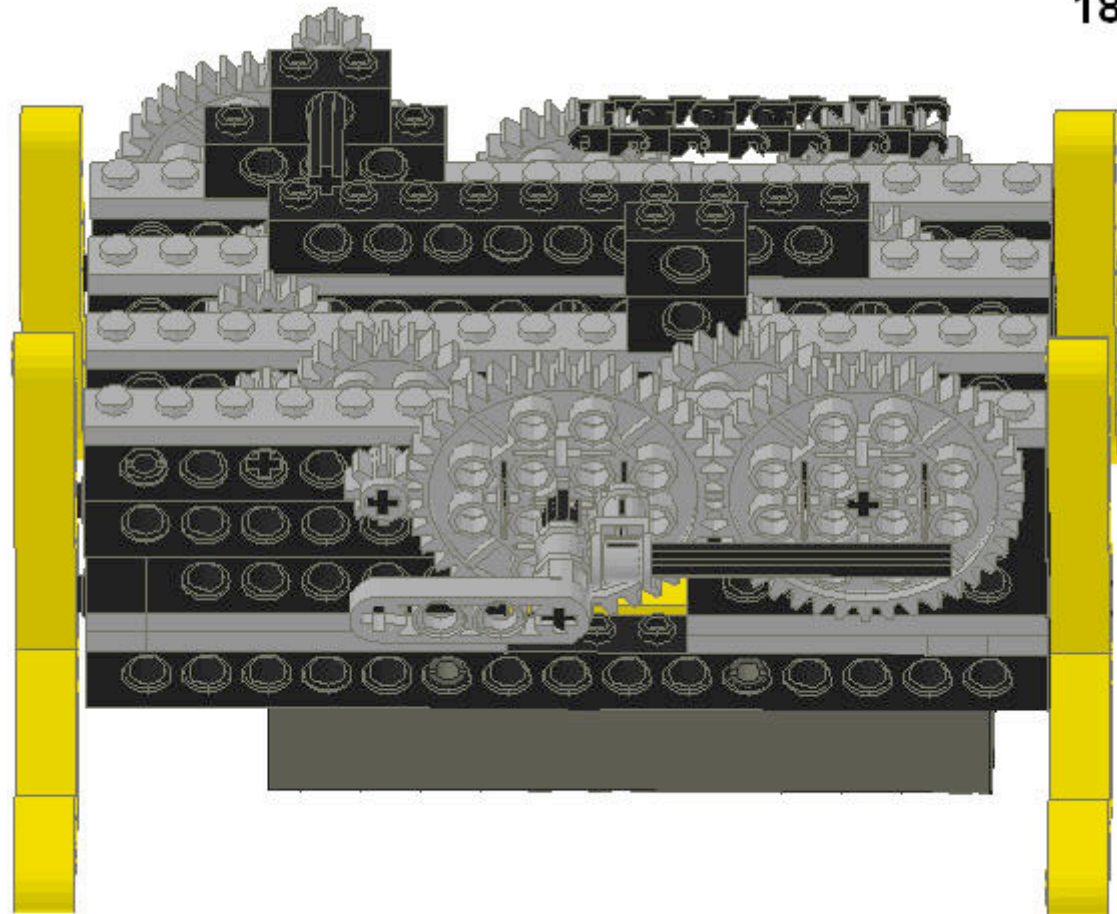
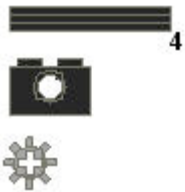
x2



Clock

18

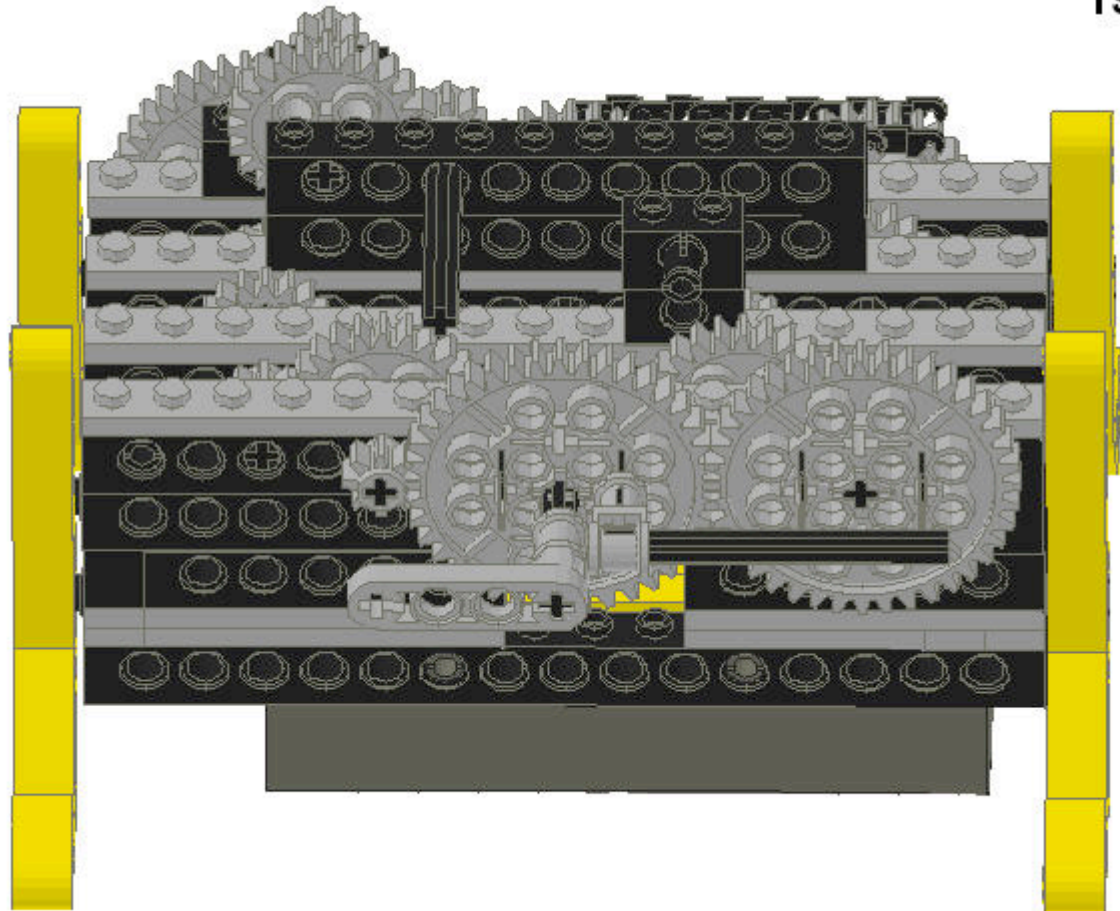
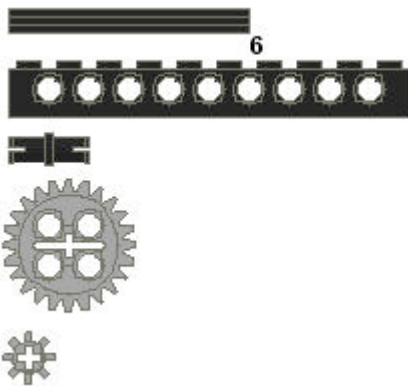
Pieces:



Clock

19

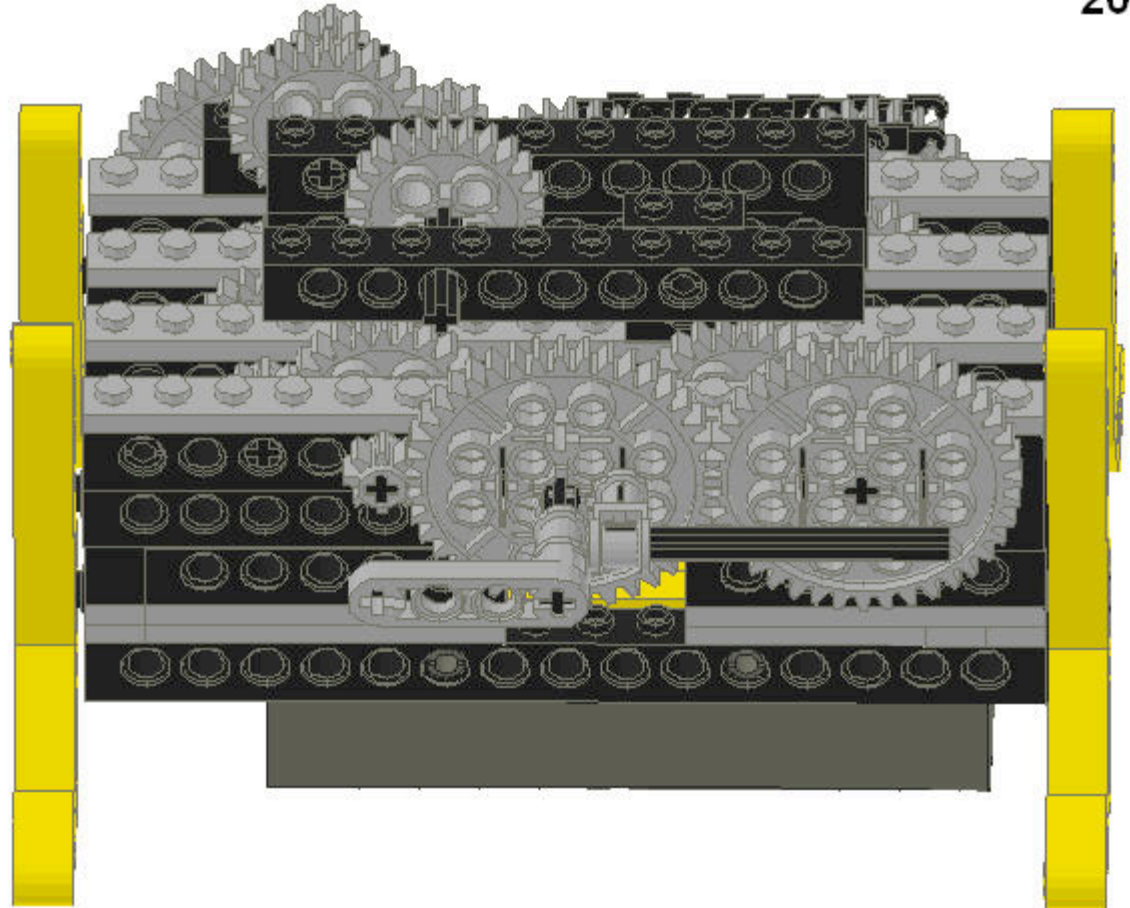
Pieces:



Clock

20

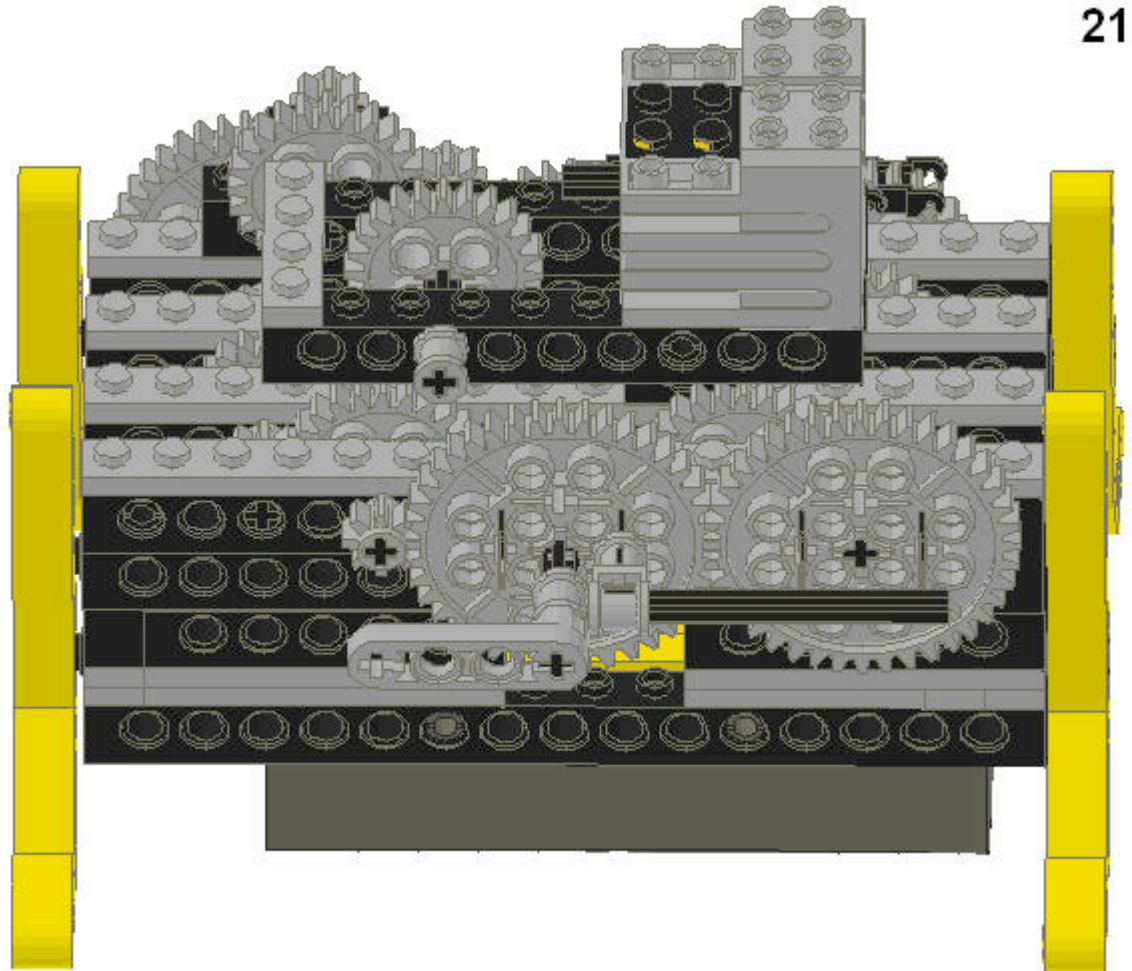
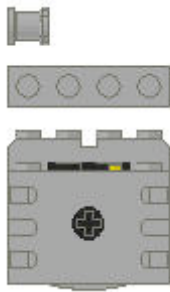
Pieces:



Clock

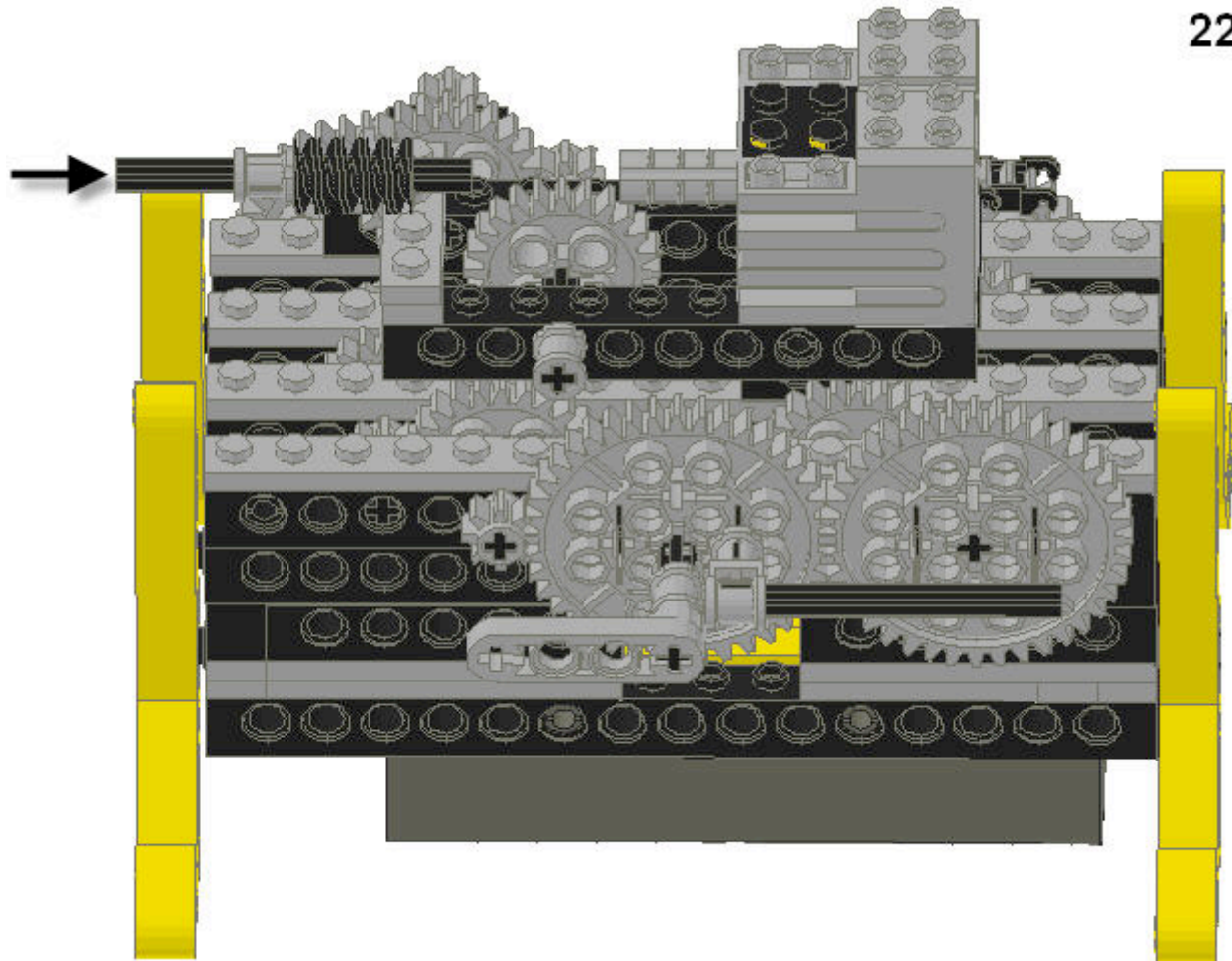
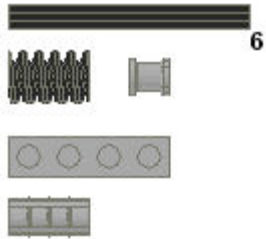
21

Pieces:



Clock

Pieces:



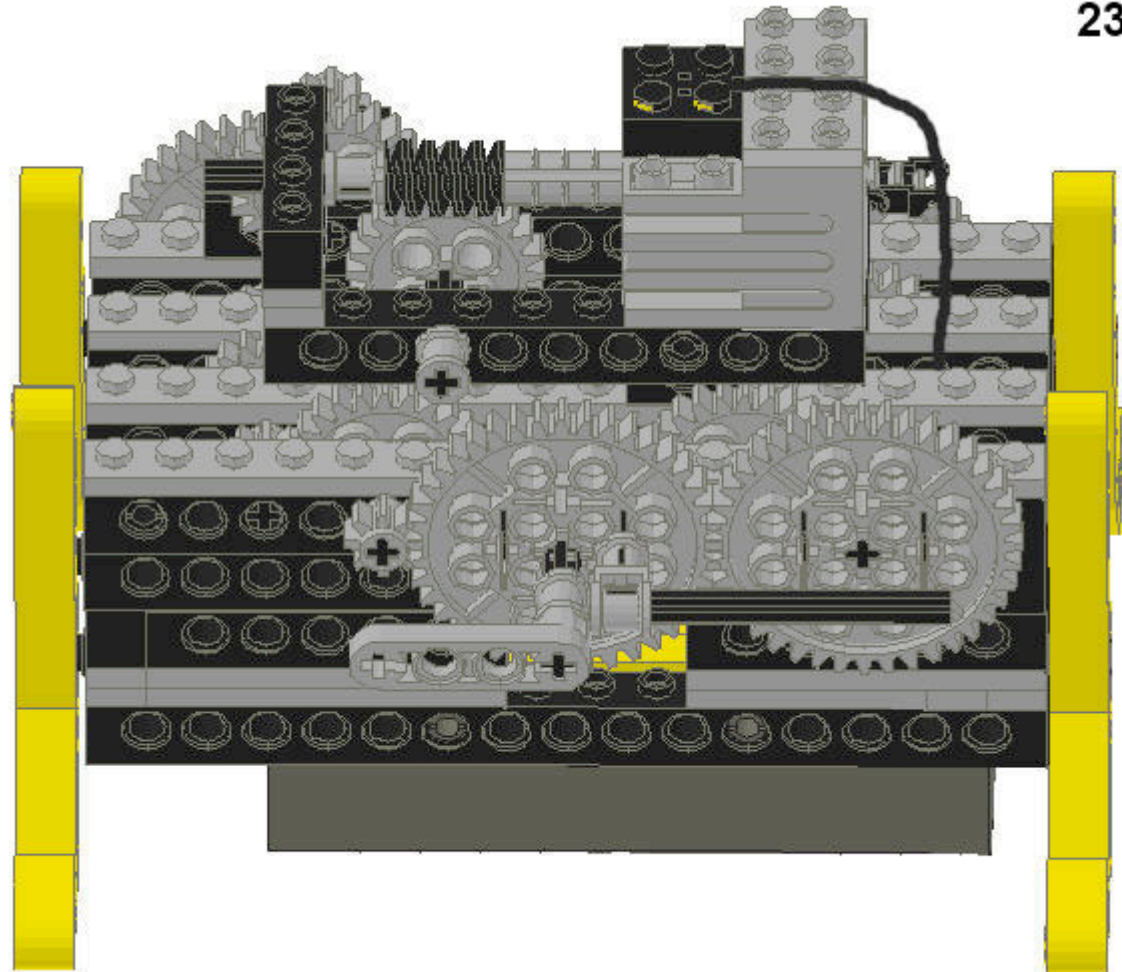
Clock

Pieces:



Attach the other end of the wire to the motor.

23

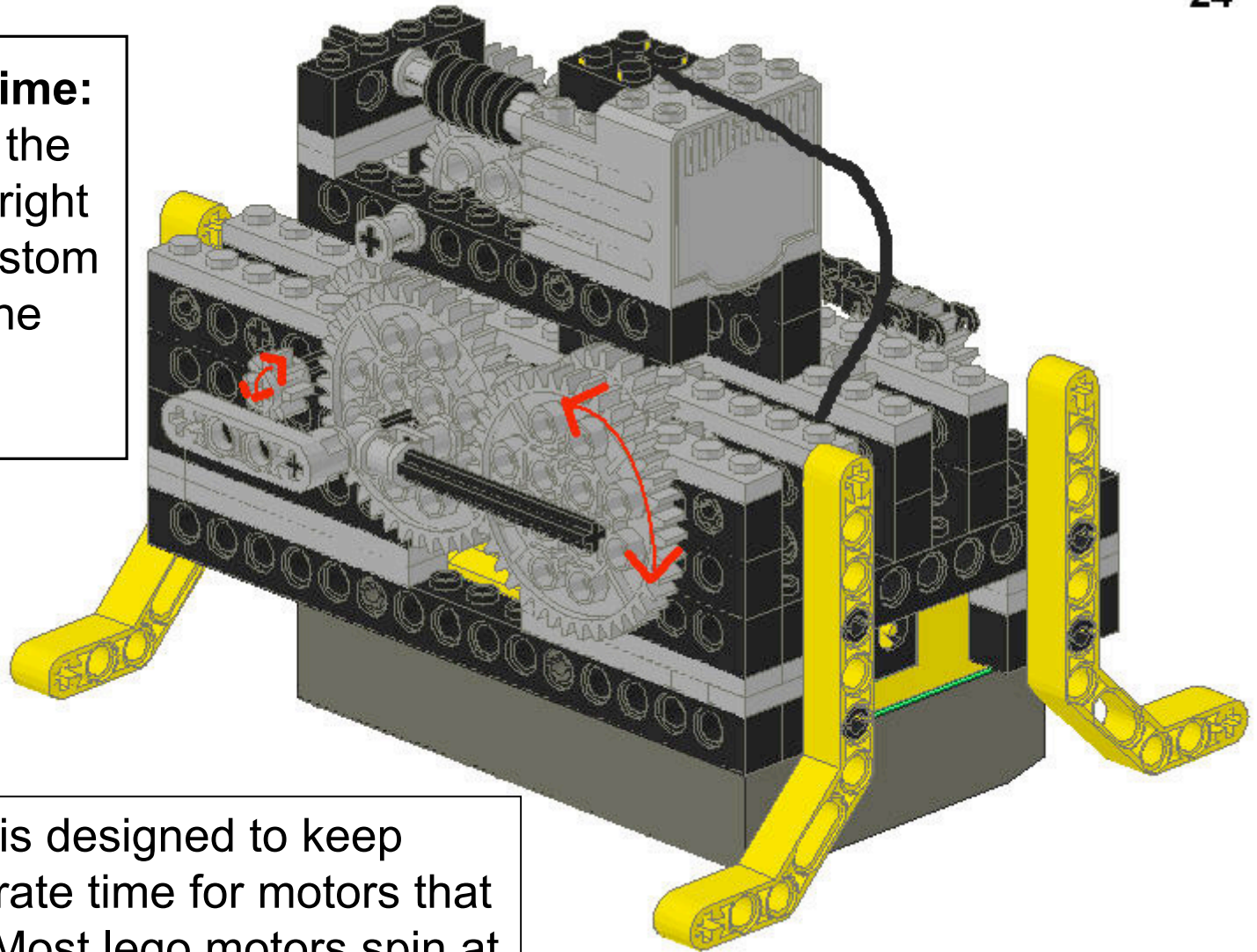


Clock

24

To change the time:

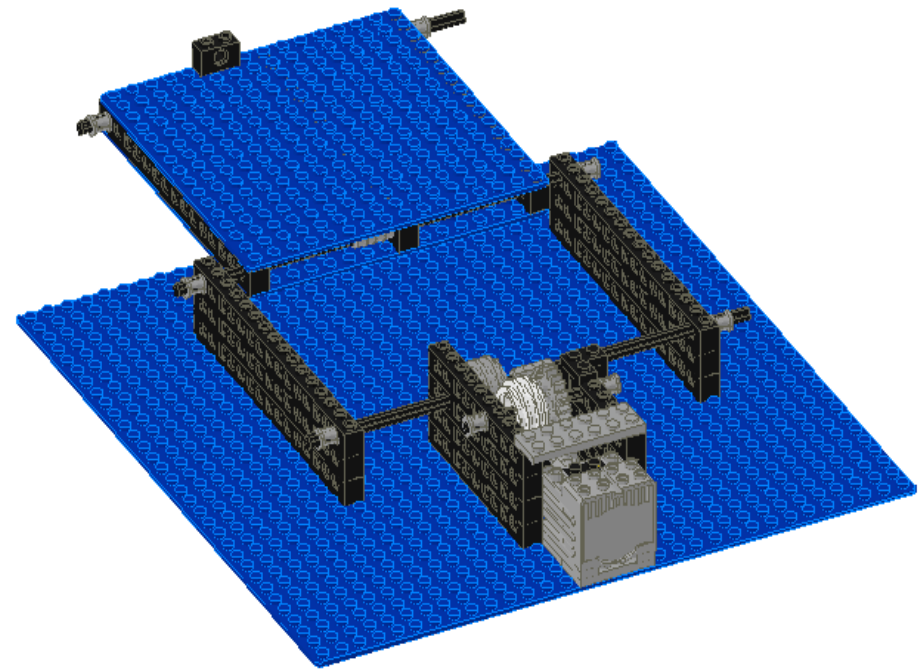
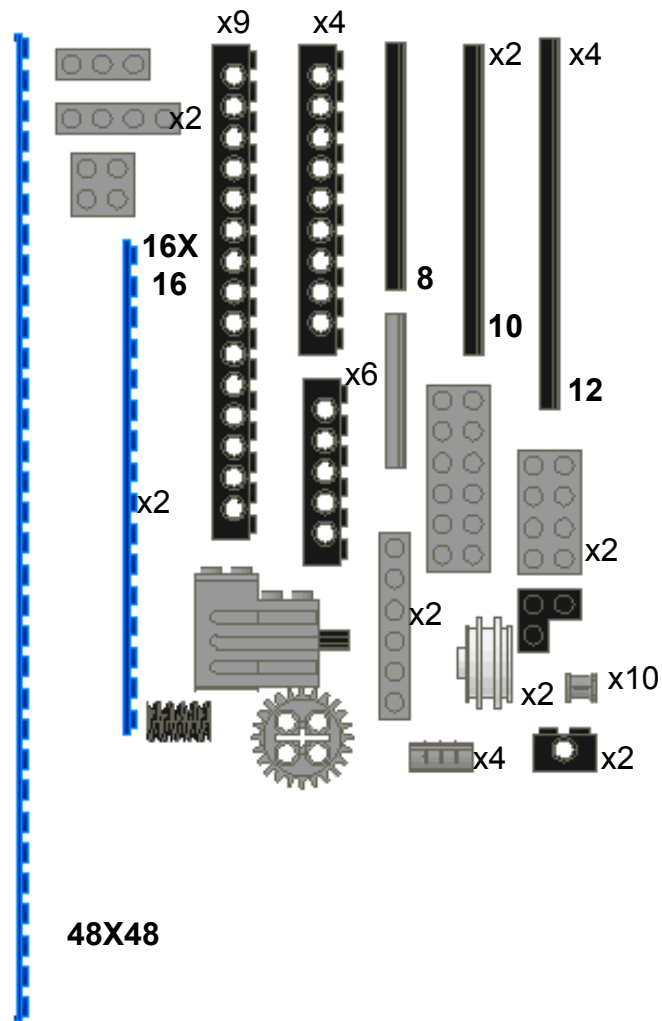
Pull out and turn the two gears to the right and left of the custom gear to change the hour and minute hands.



Note: This clock is designed to keep reasonably accurate time for motors that spin at 360rpm. Most lego motors spin at this speed, however, some may vary.

Creating a Drawbridge

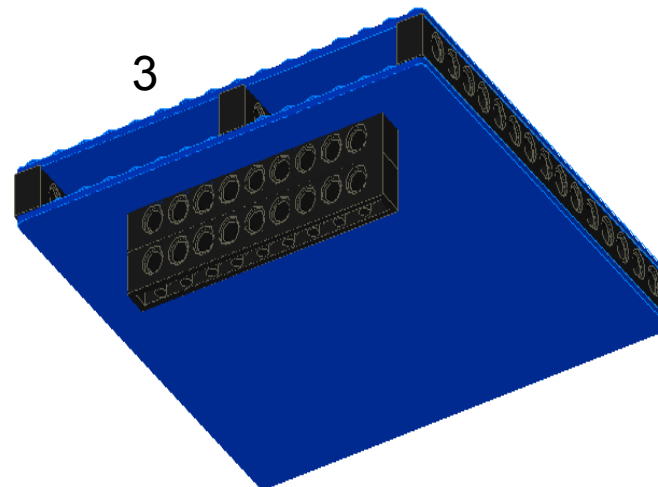
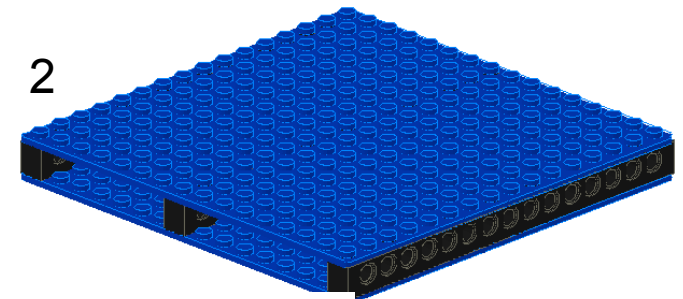
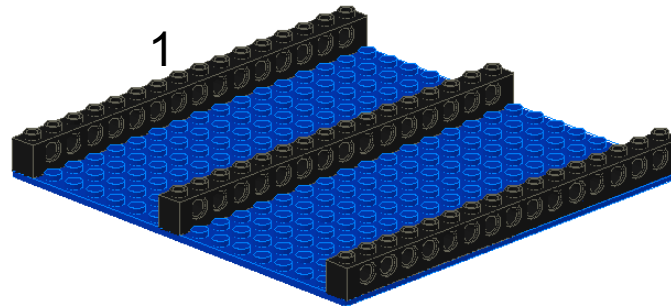
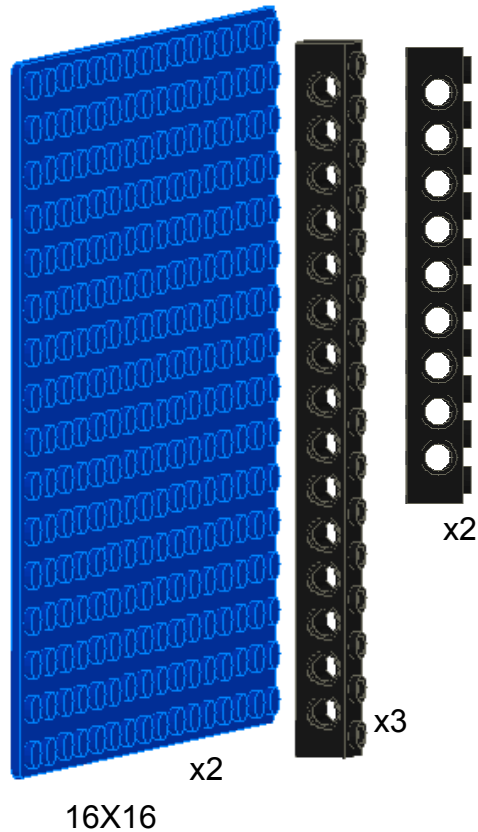
Pieces:



Key Words:

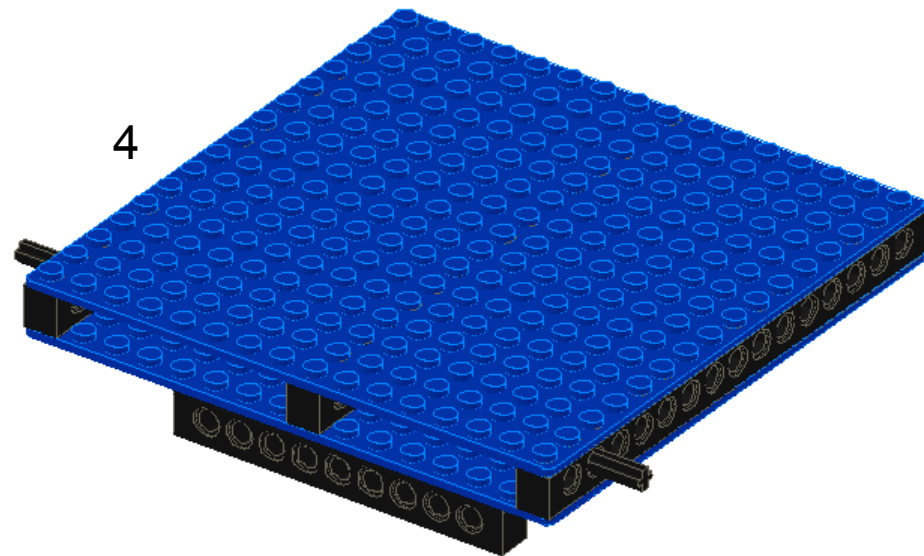
Creating a Drawbridge

Pieces:

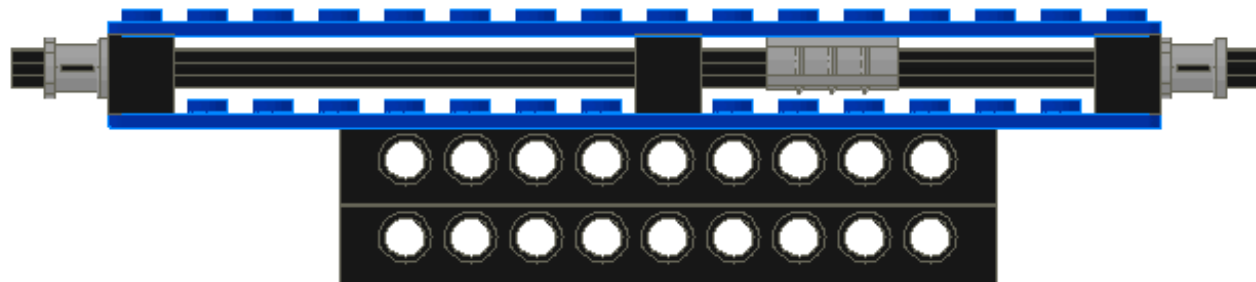


Creating a Drawbridge

Pieces:

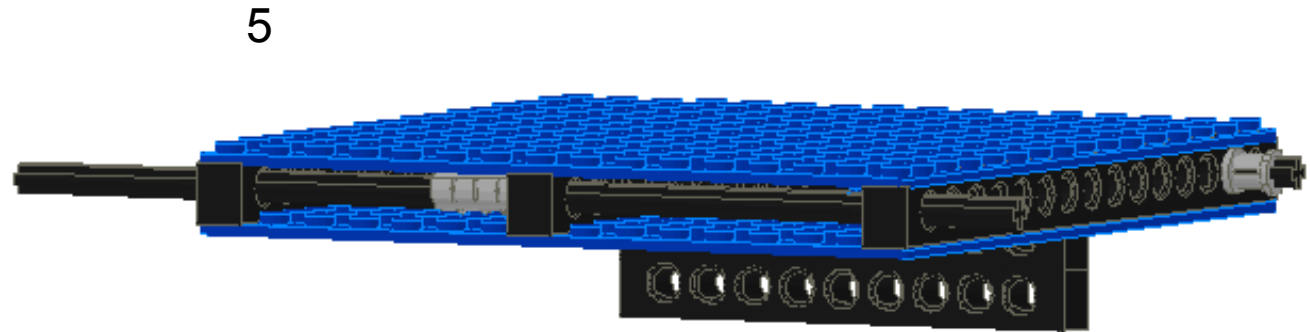
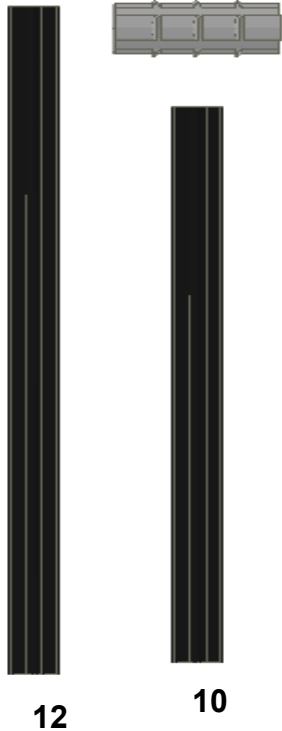


2 views

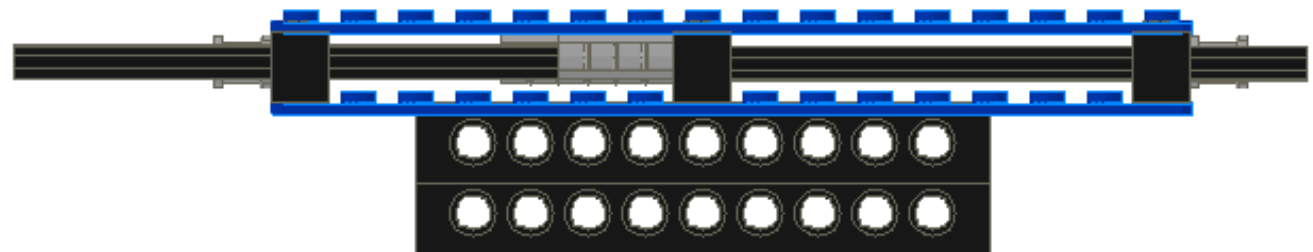


Creating a Drawbridge

Pieces:

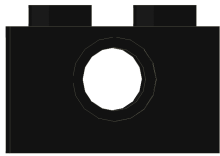


2 views

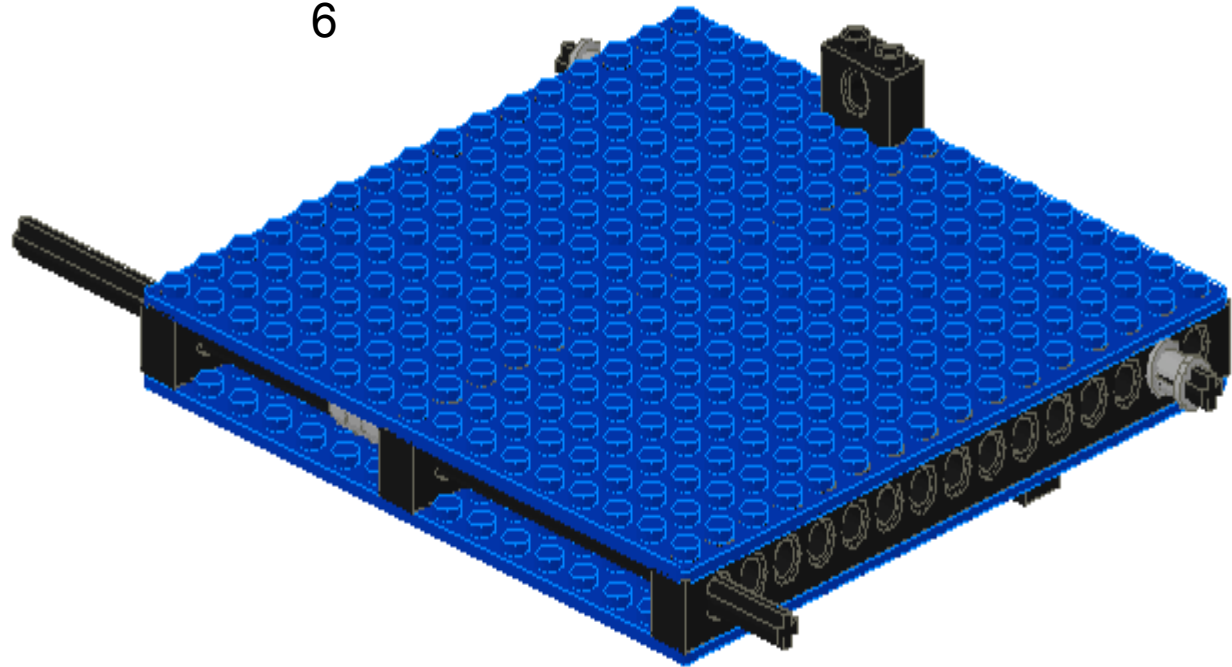


Creating a Drawbridge

Pieces:

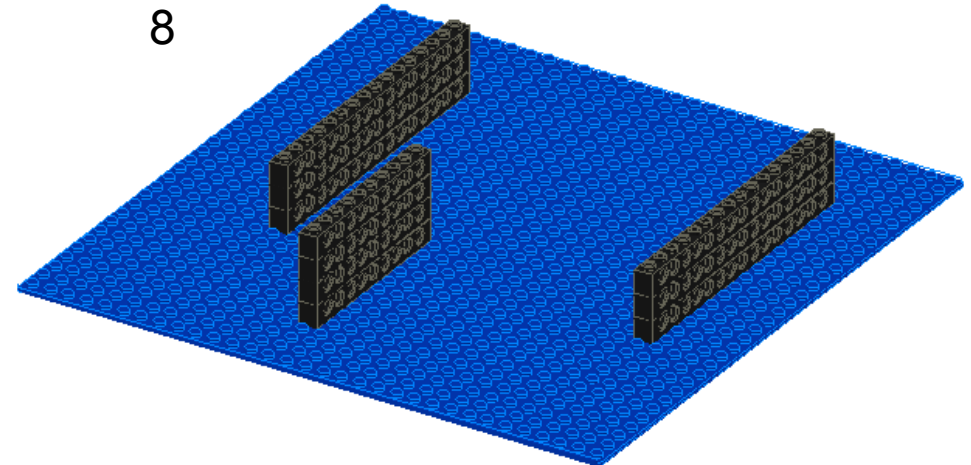
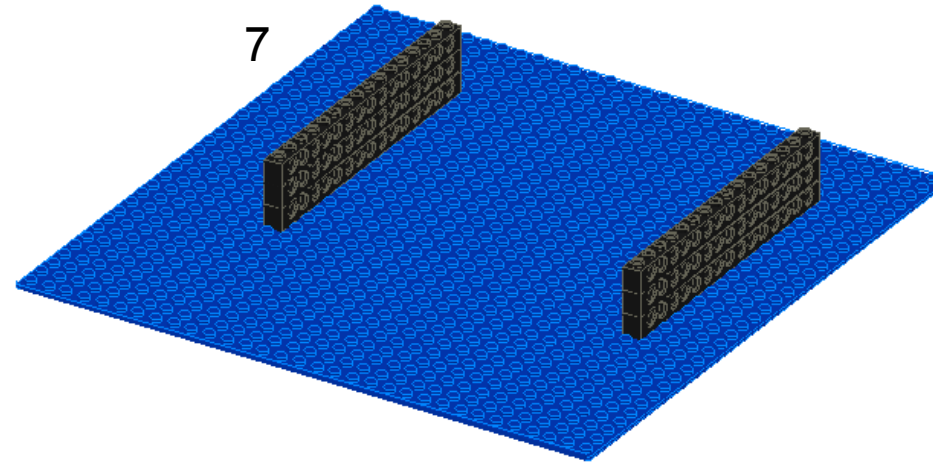
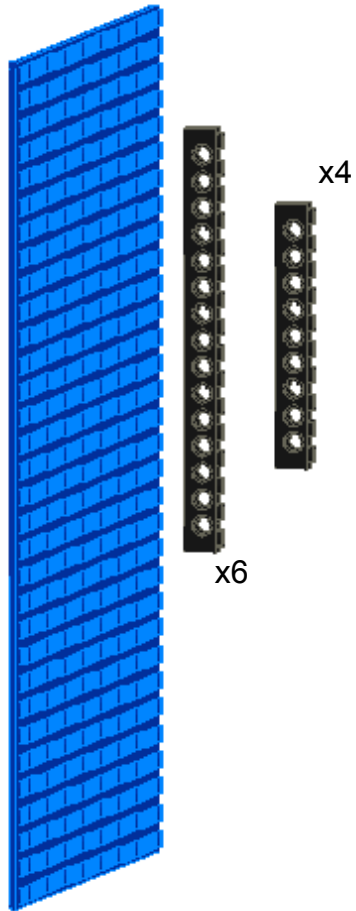


6



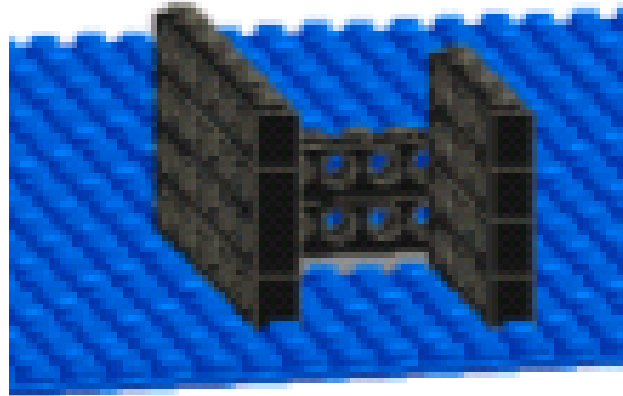
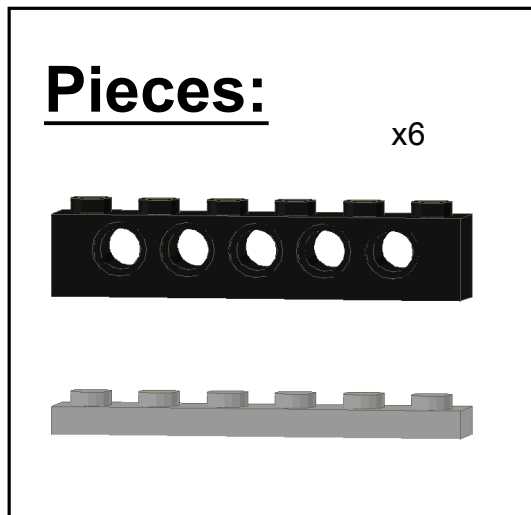
Creating a Drawbridge

Pieces:

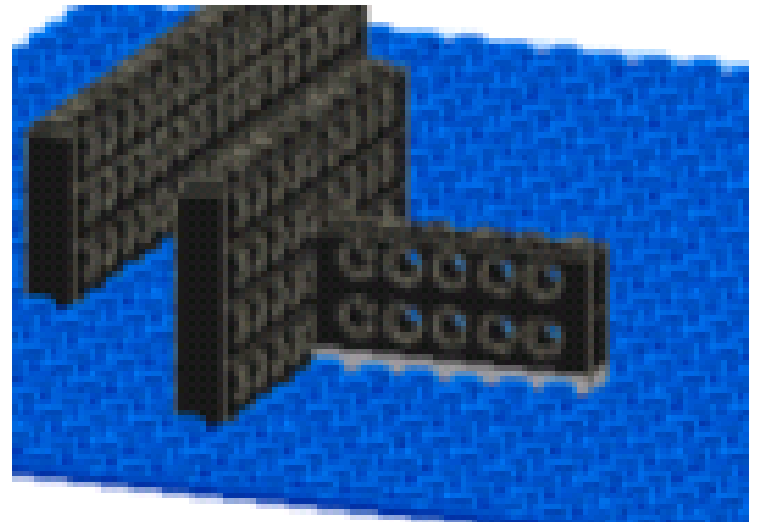


Creating a Drawbridge

9

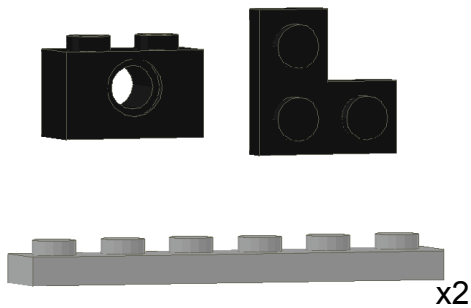


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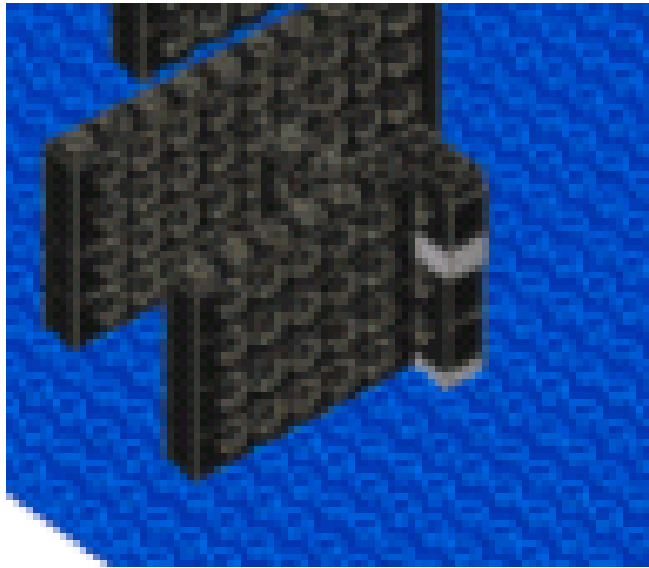


Creating a Drawbridge

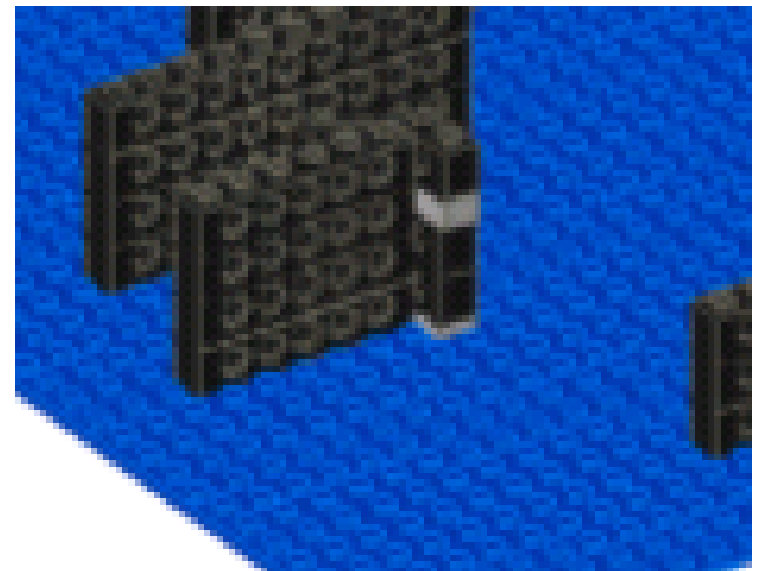
Pieces:



11

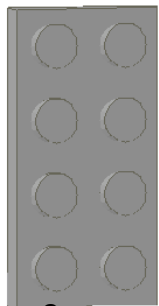


12



Creating a Drawbridge

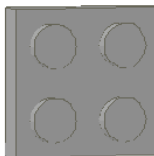
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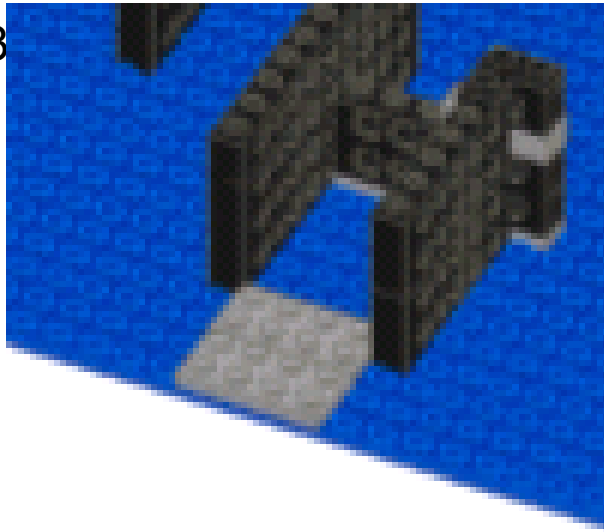
x2



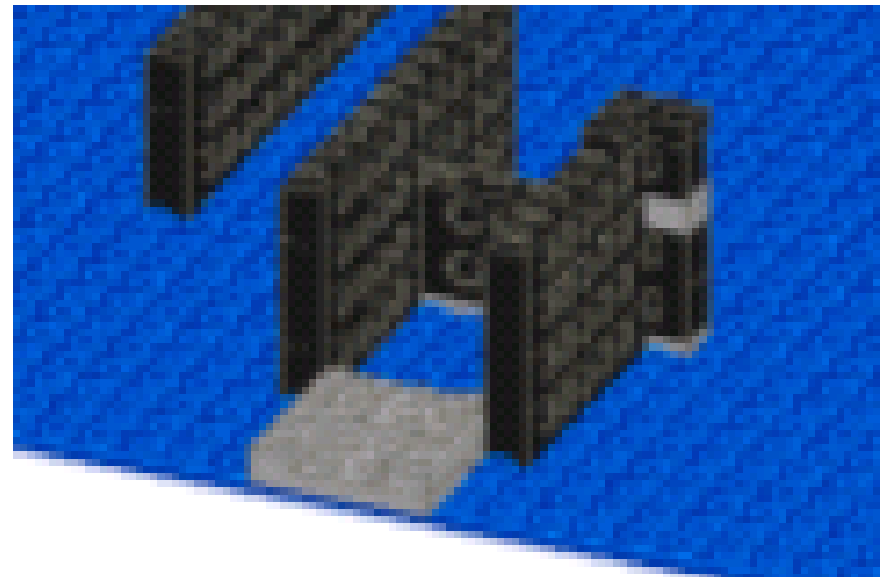
x2



13



14

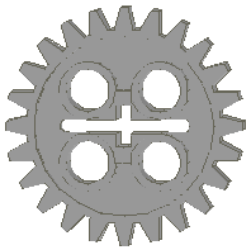
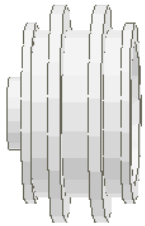


Creating a Drawbridge

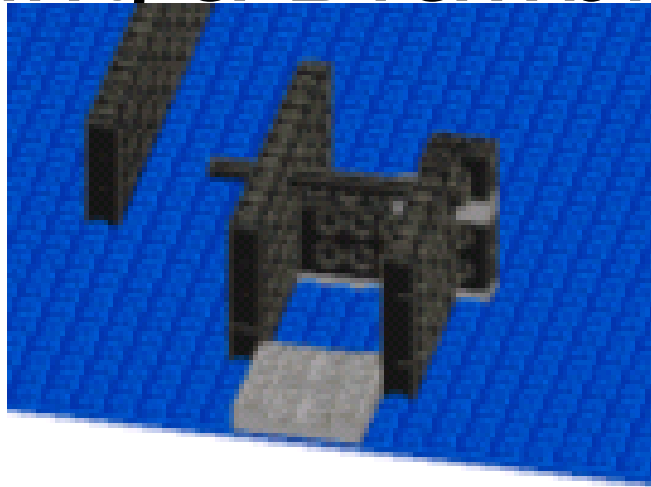
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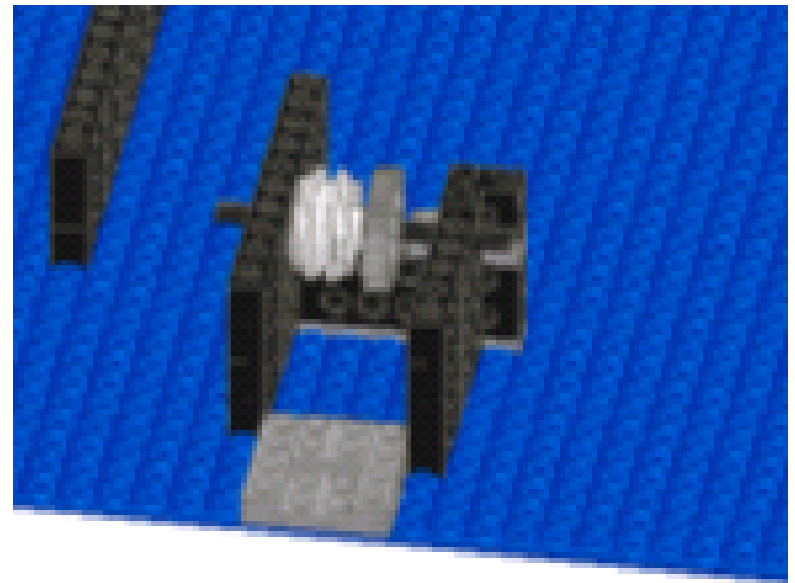
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15

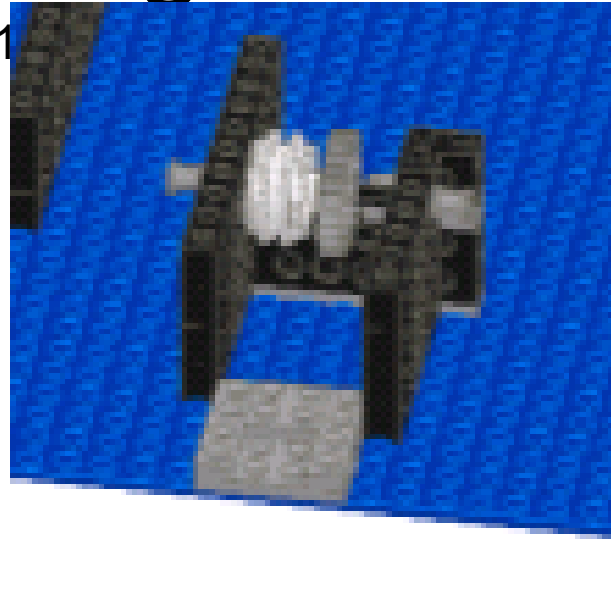
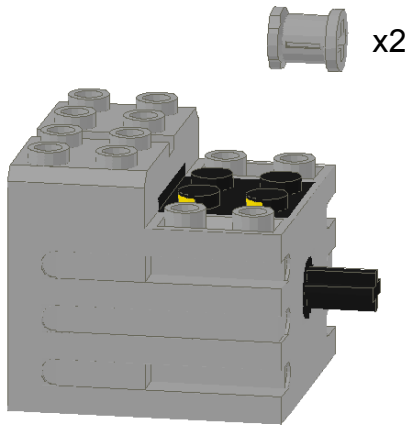


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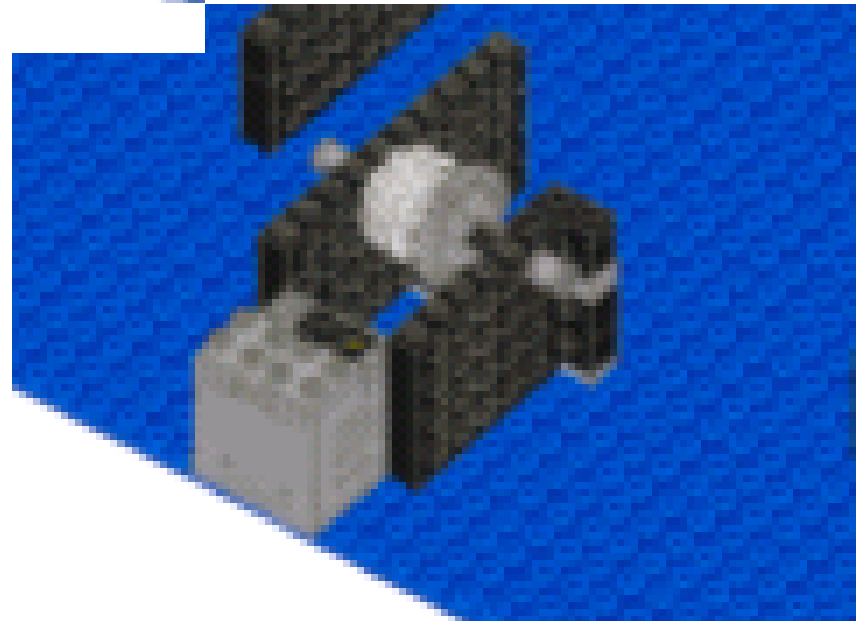


Creating a Drawbridge

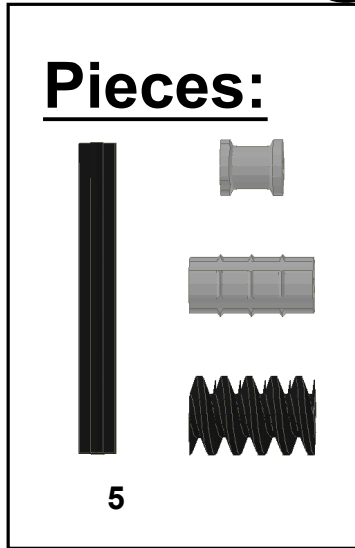
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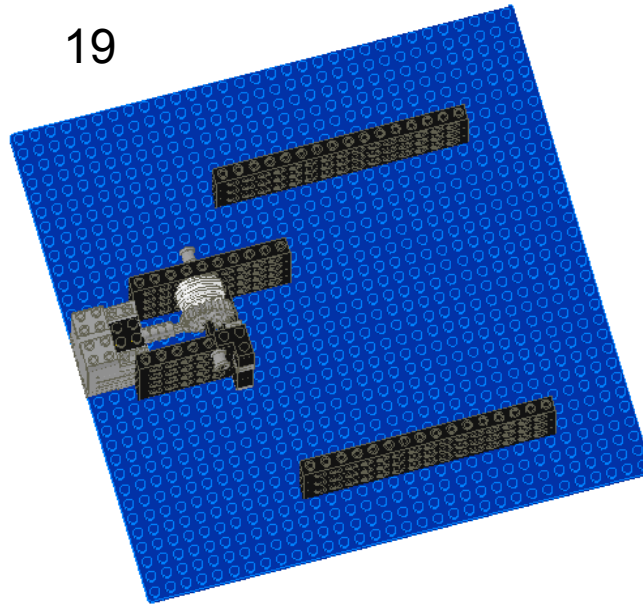
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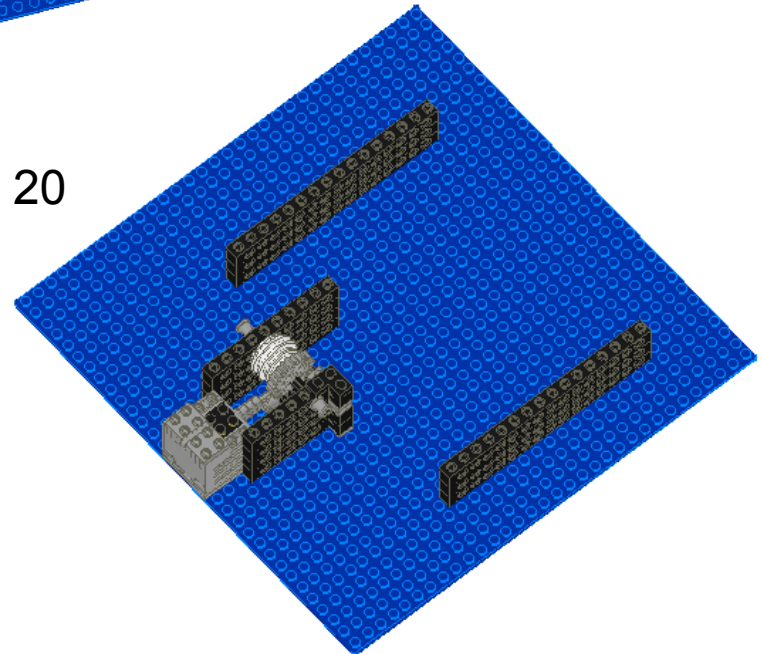
Creating a Drawbridge



19



20



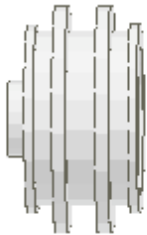
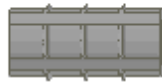
Creating a Drawbridge

Pieces:

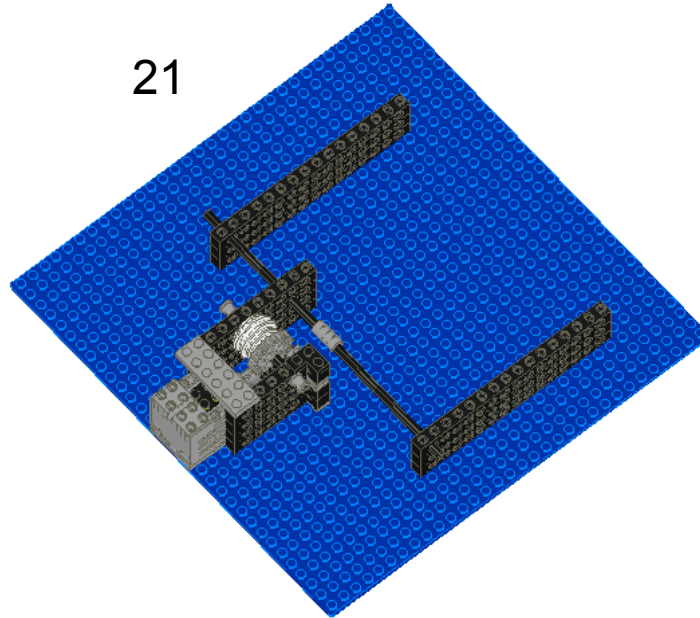


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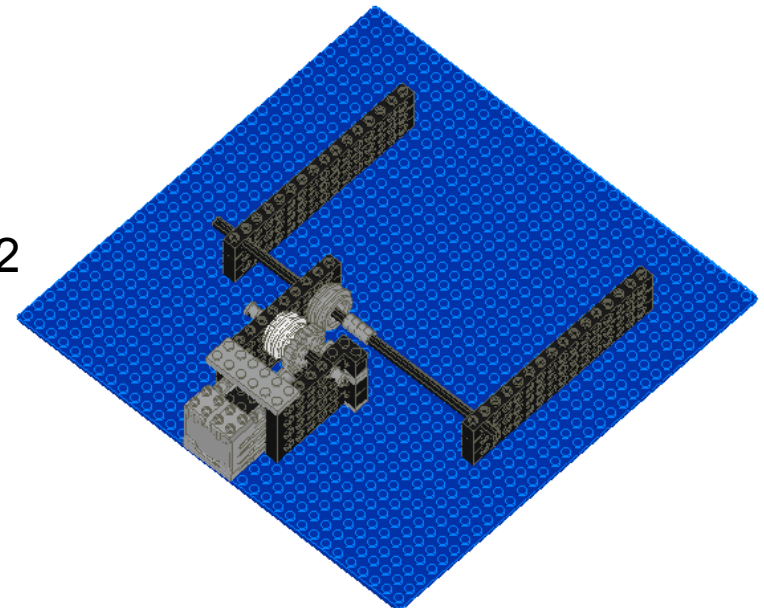
x2



21

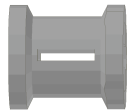


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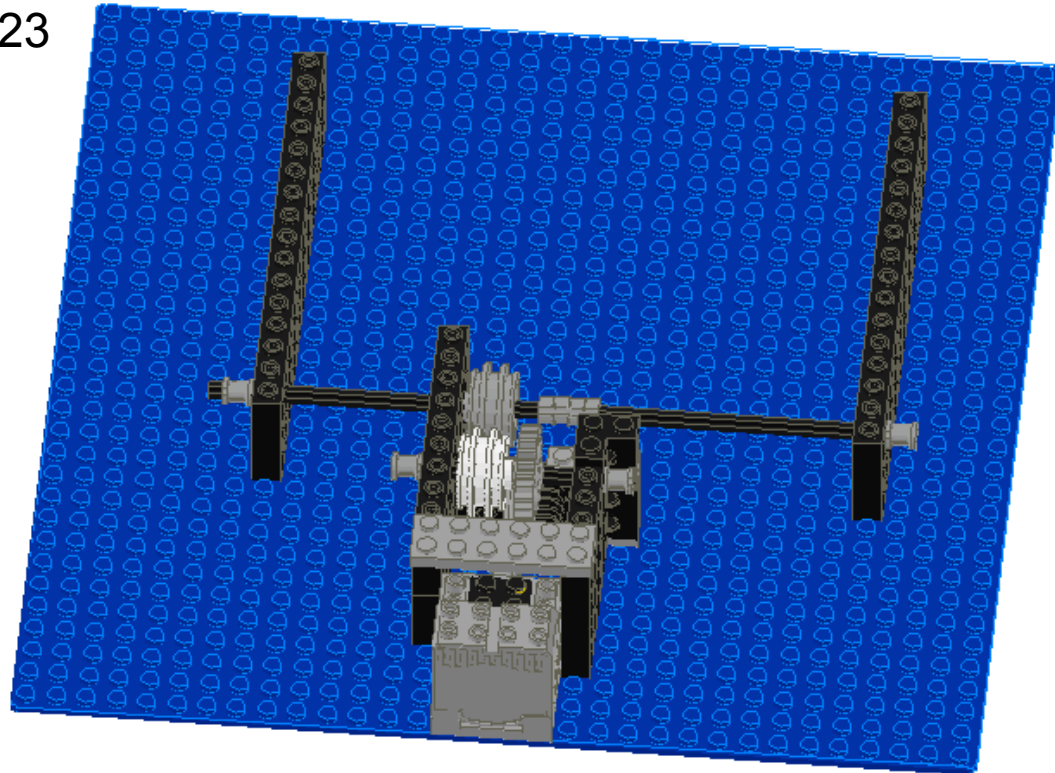
Creating a Drawbridge

Pieces:



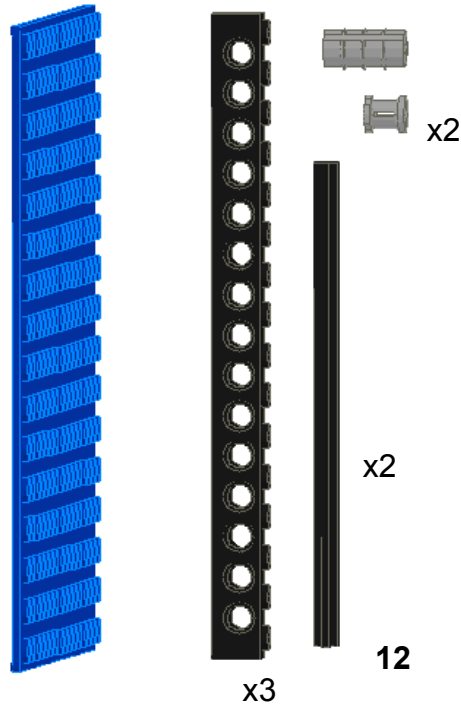
x2

23

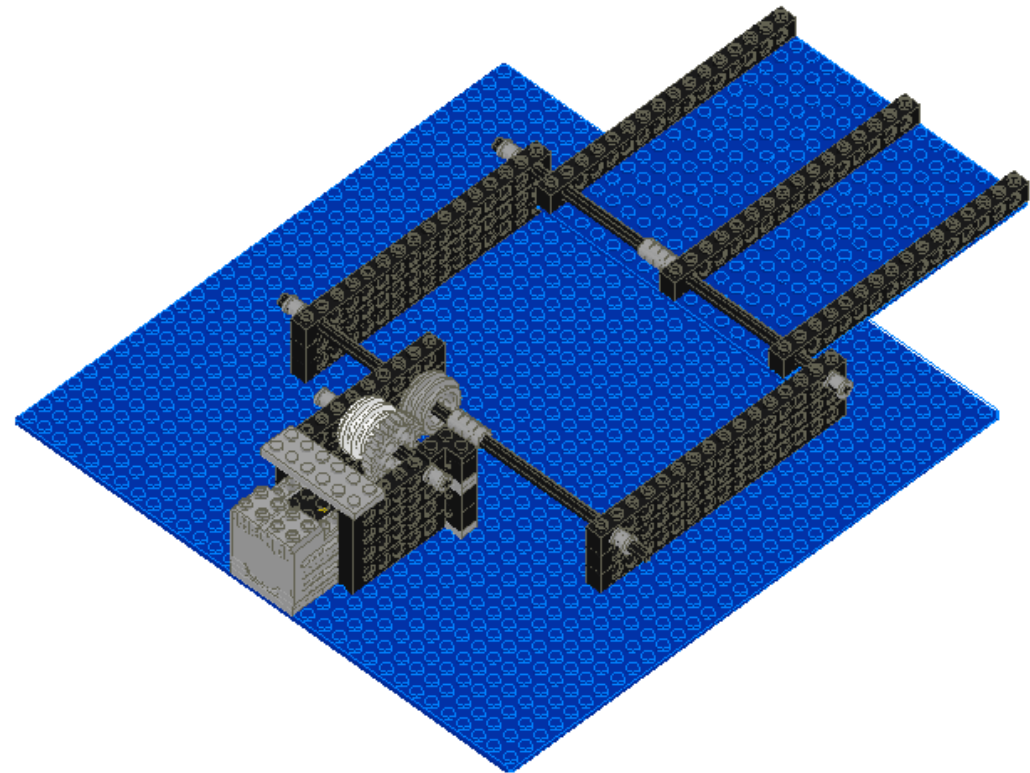


Creating a Drawbridge

Pieces:



24



Creating a Drawbridge

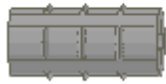
Pieces:



x2



12

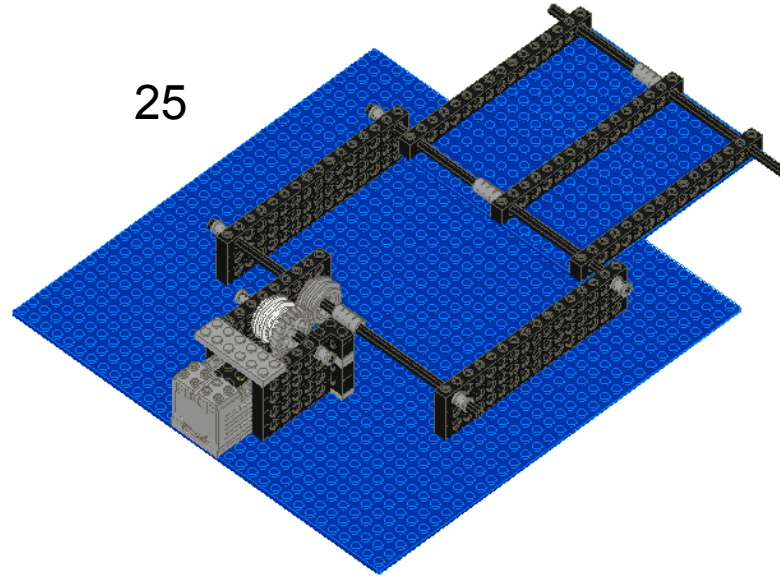


x2

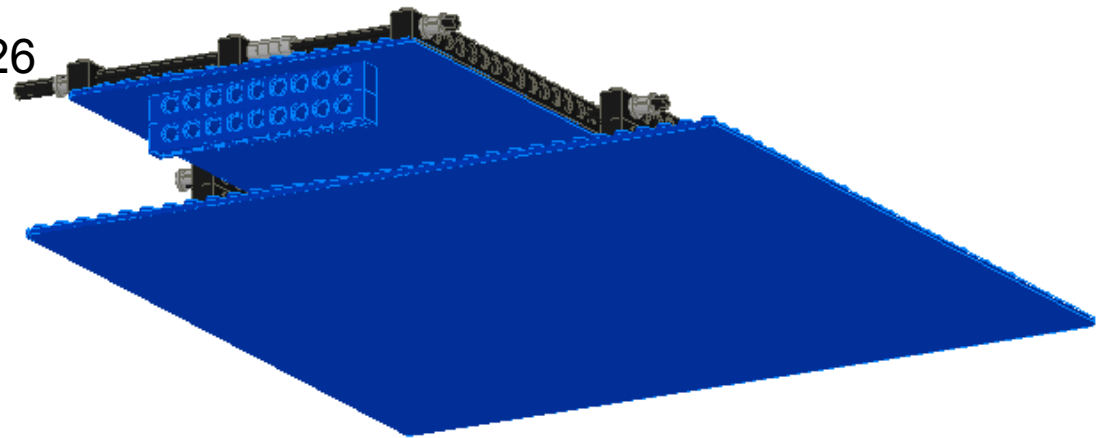


8

25

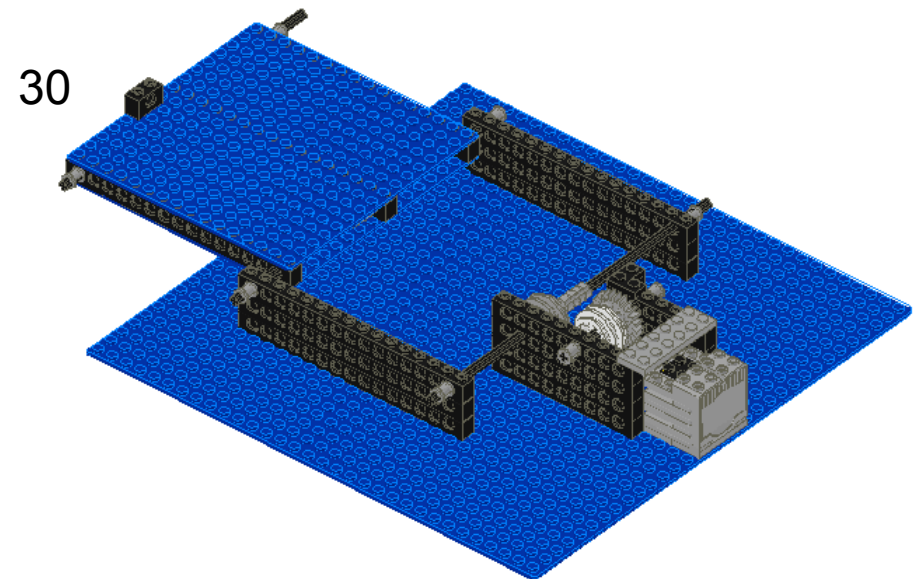
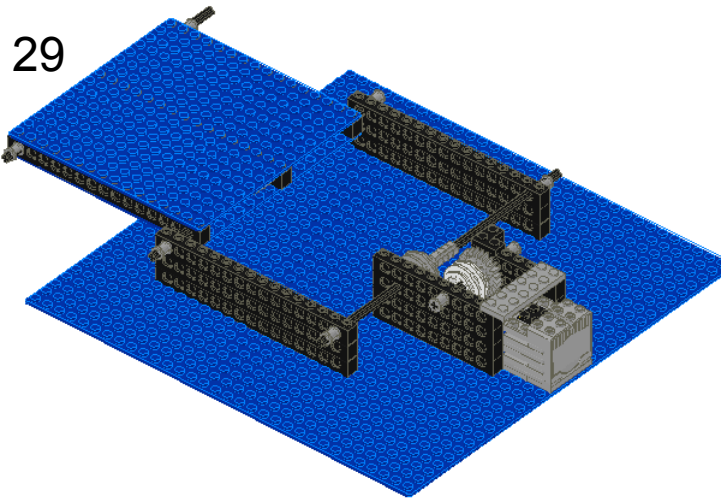
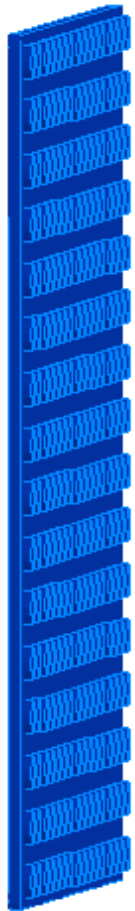


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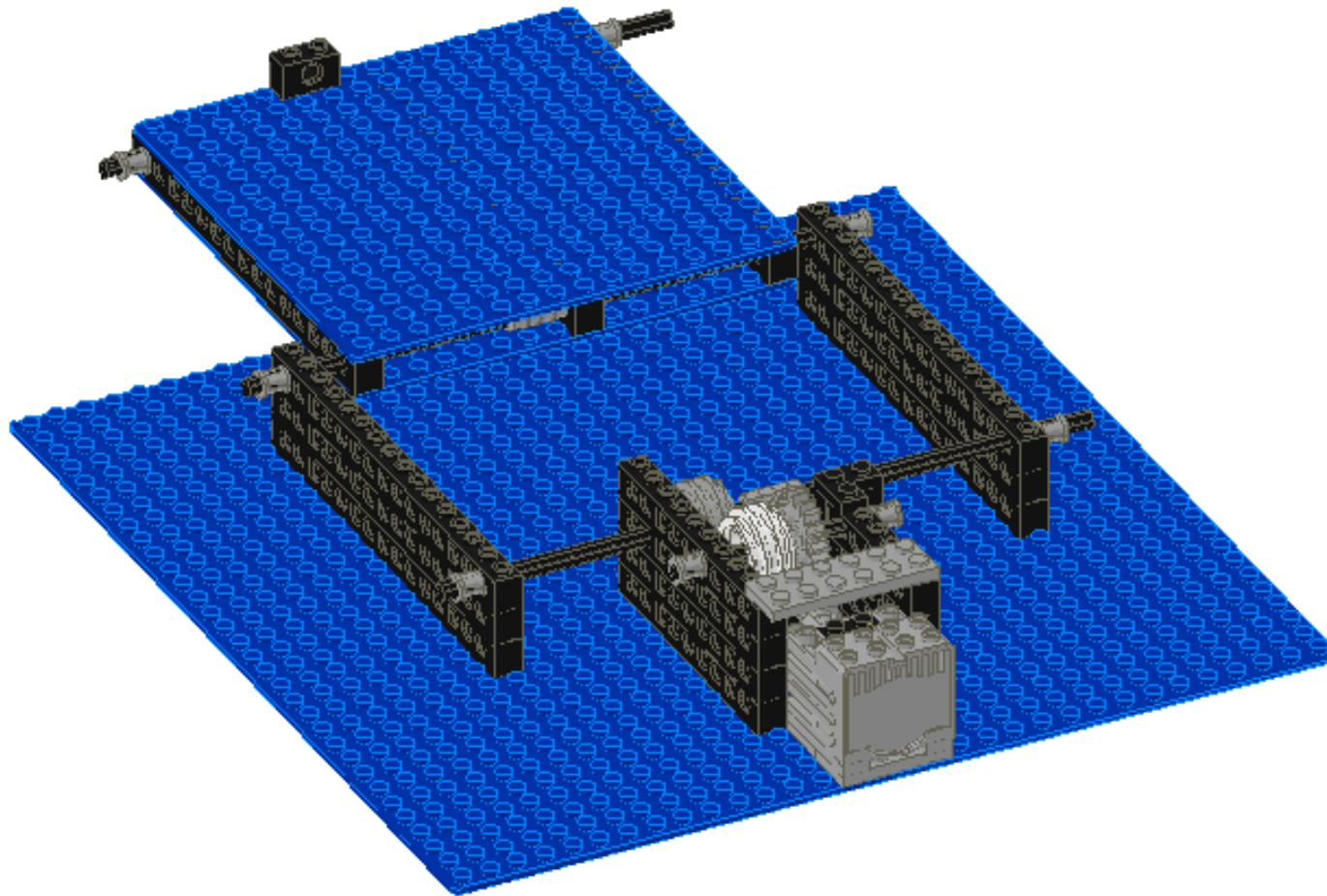
Creating a Drawbridge

Pieces:



Creating a Drawbridge

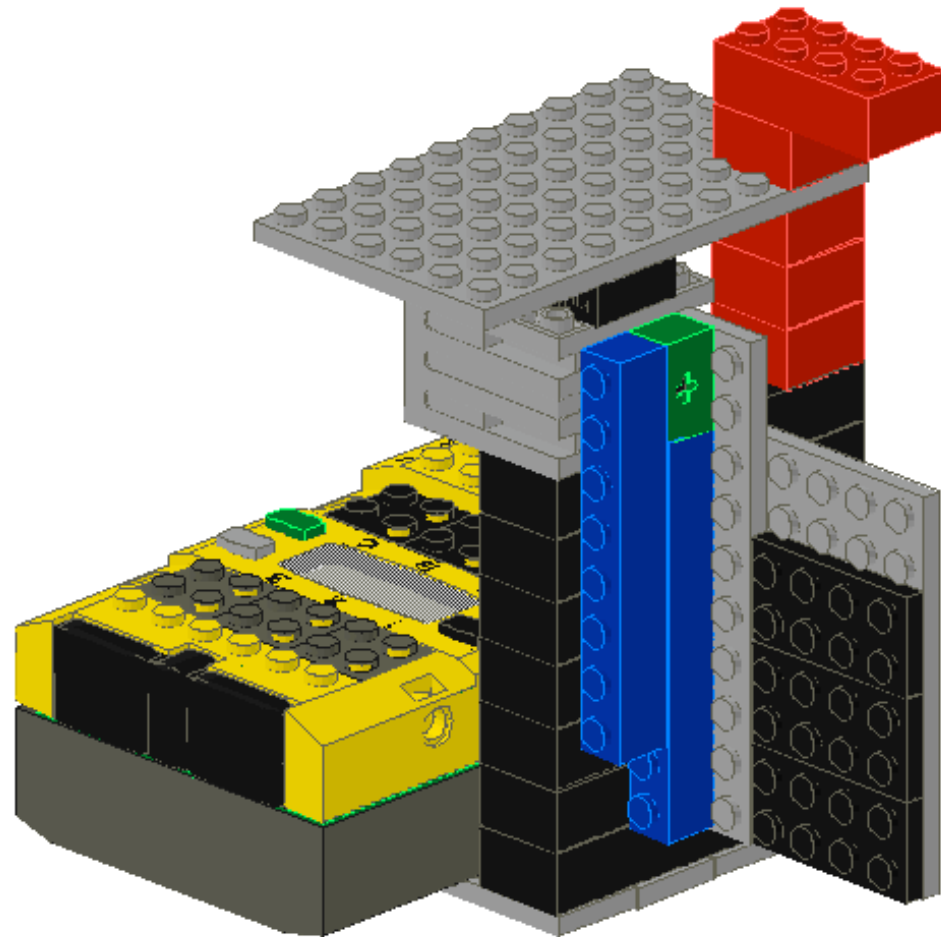
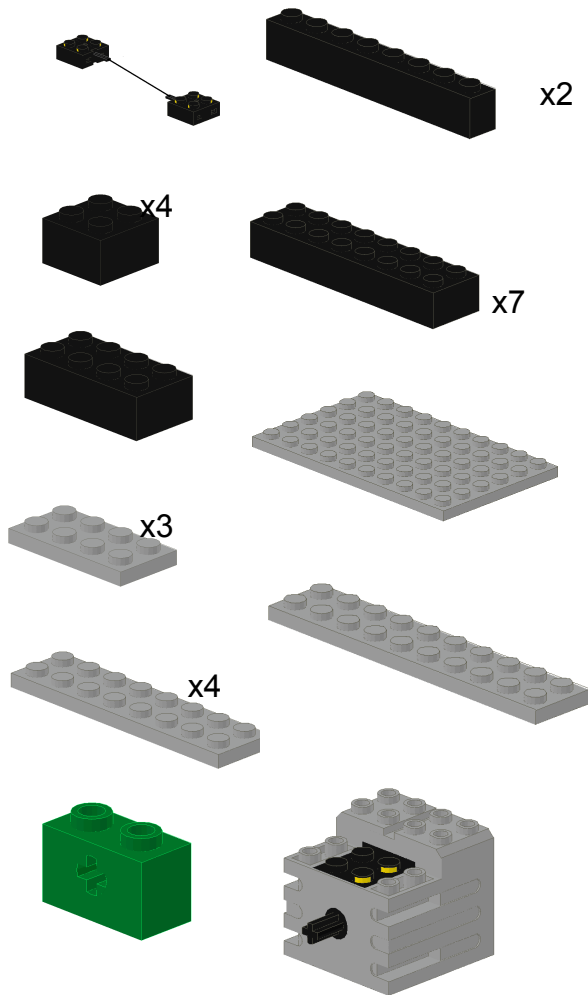
31



How to build a putter

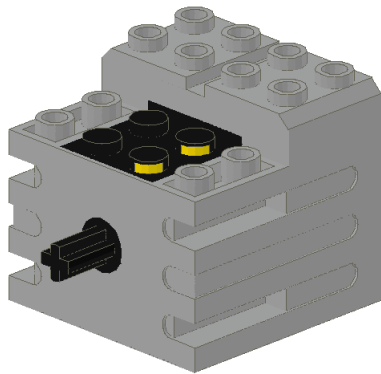
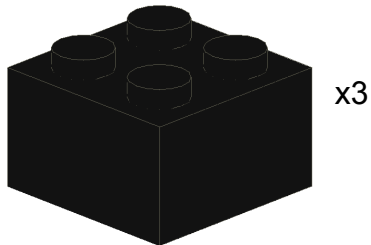
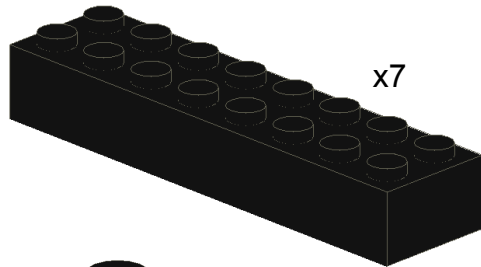


Pieces:



How to build a putter

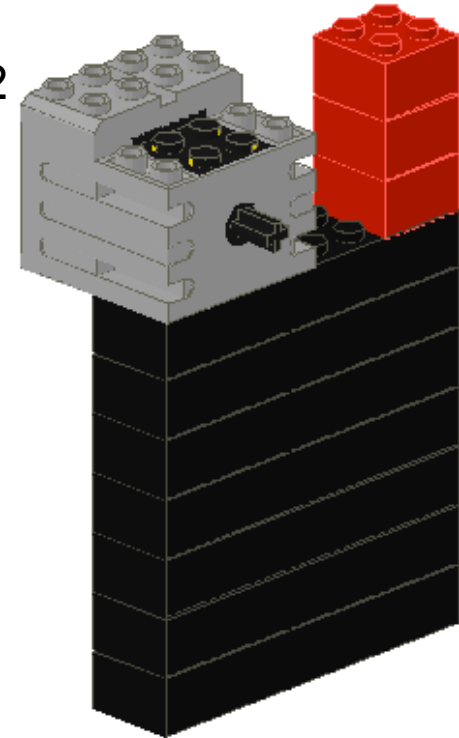
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1

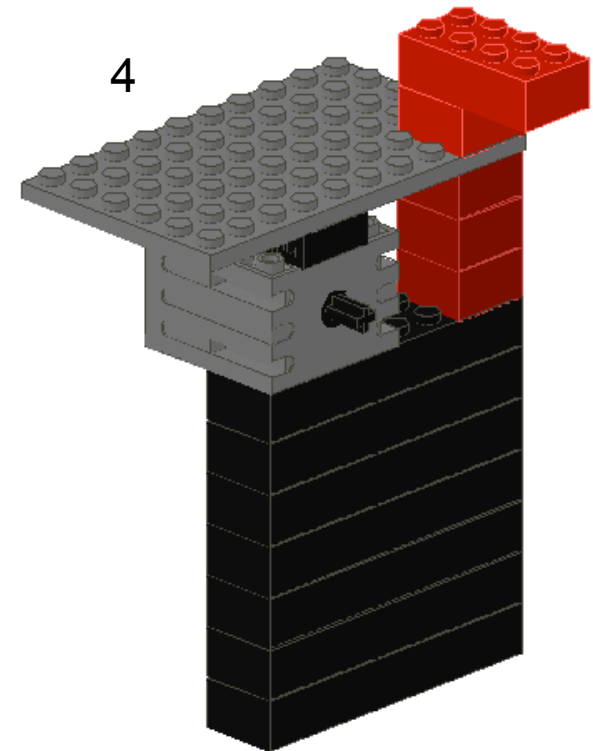
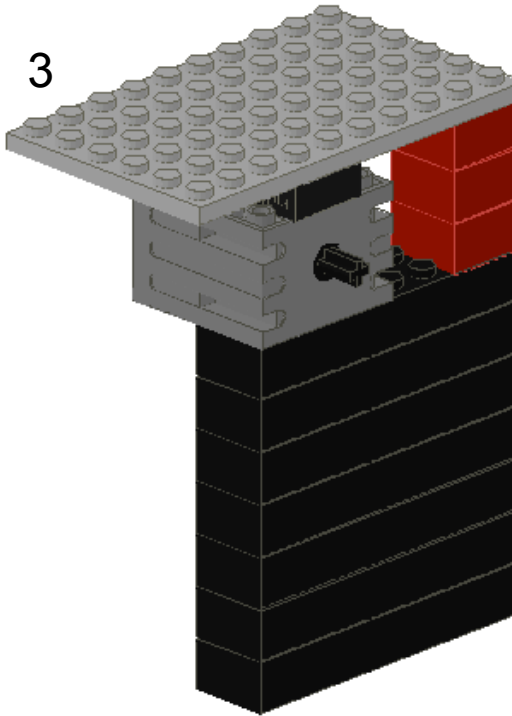
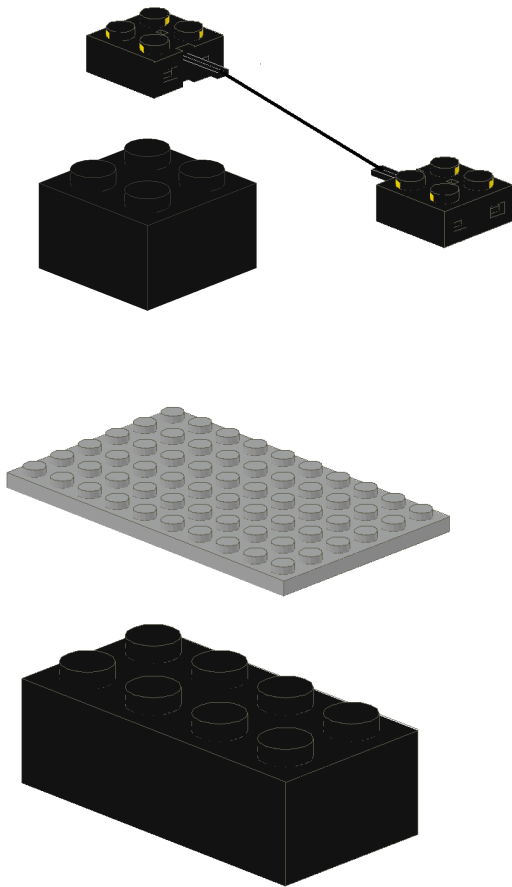


2



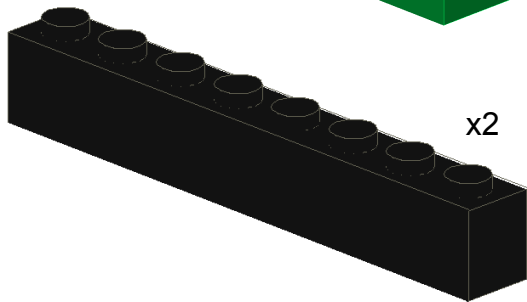
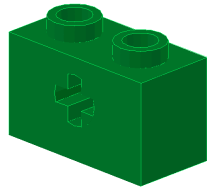
How to build a putter

Pieces:

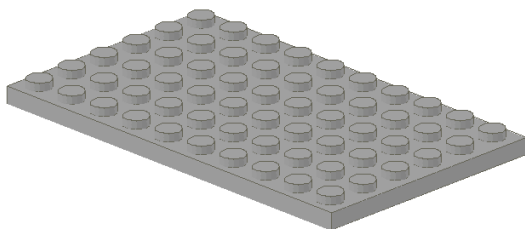
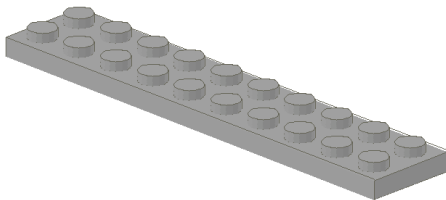


How to build a putter

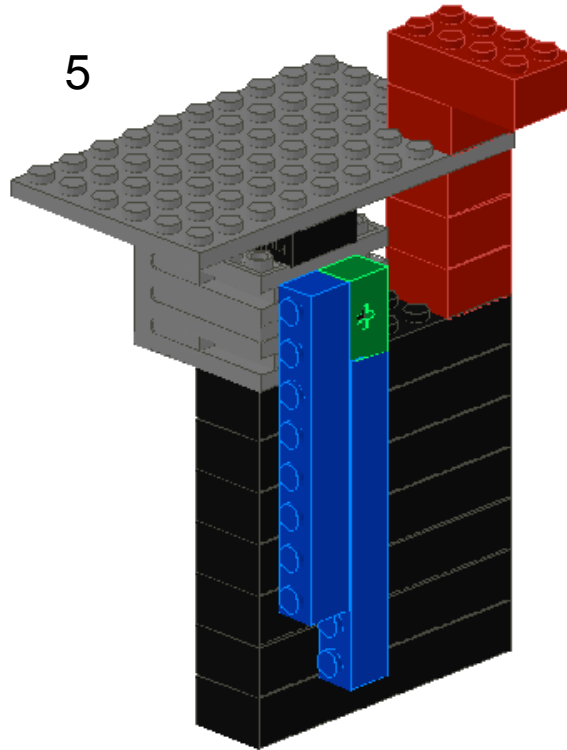
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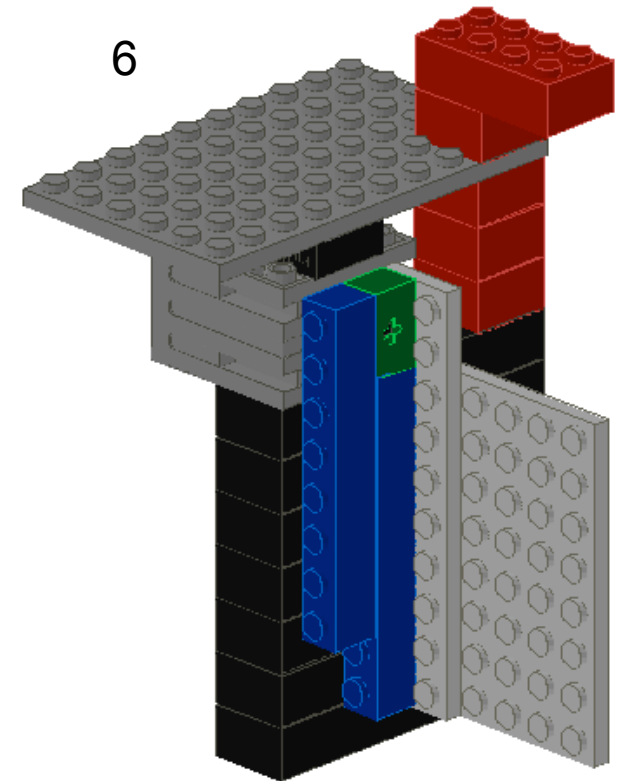
x2



5

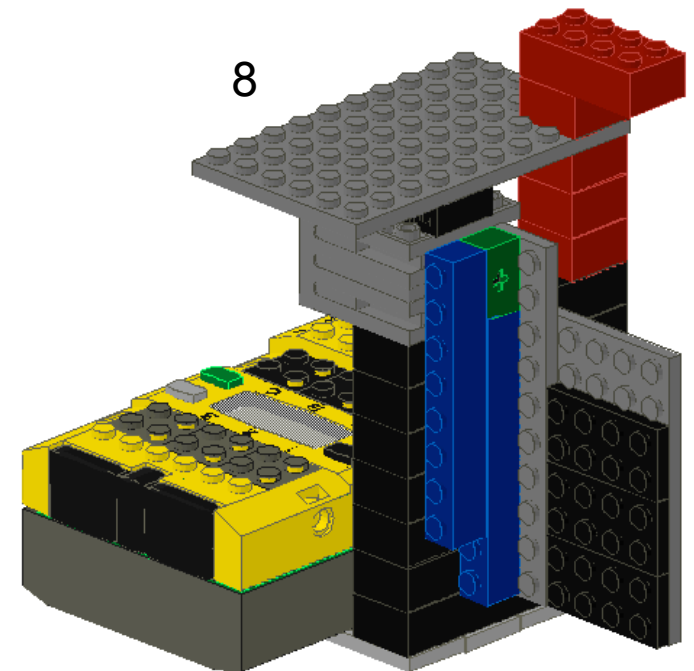
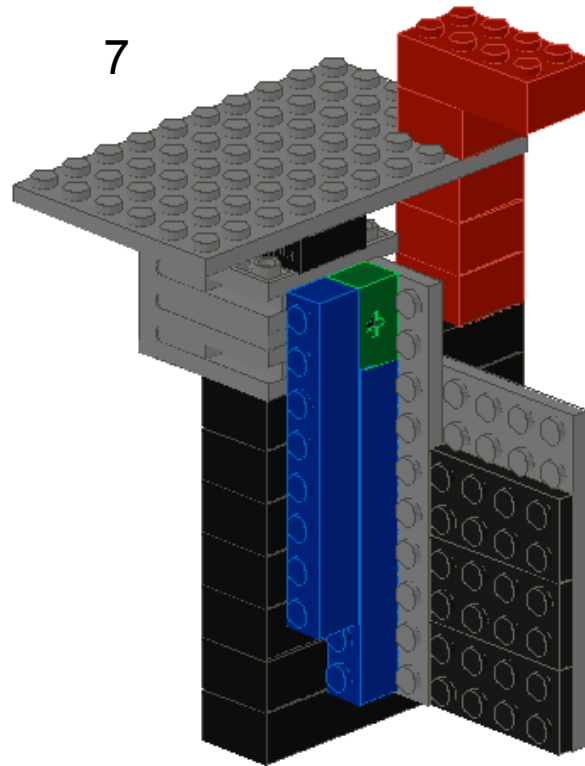
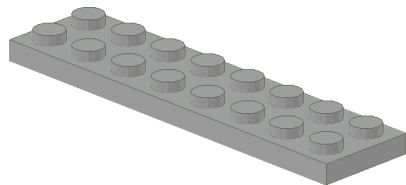
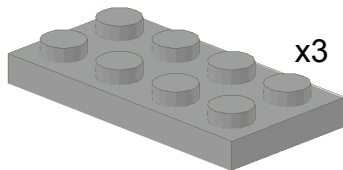


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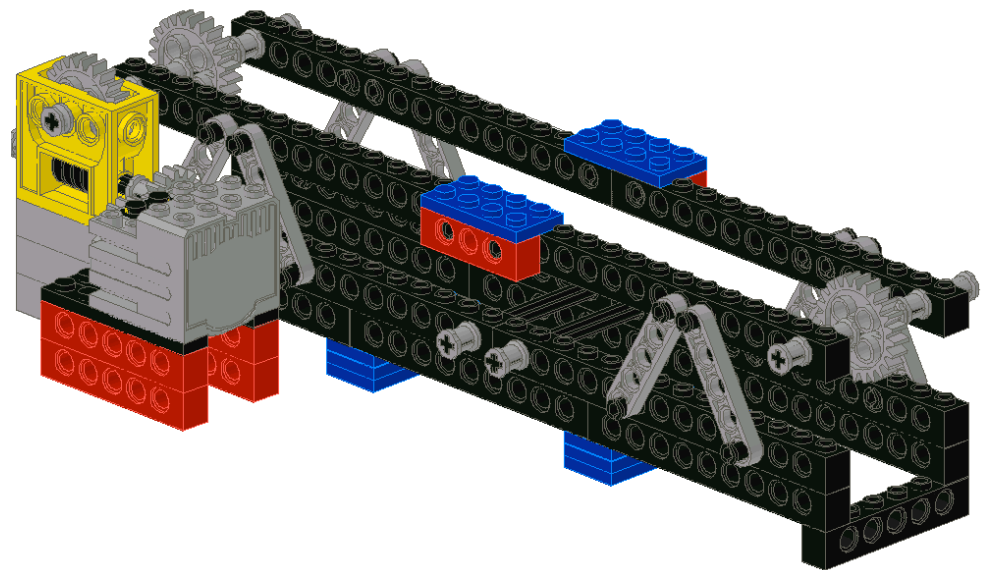
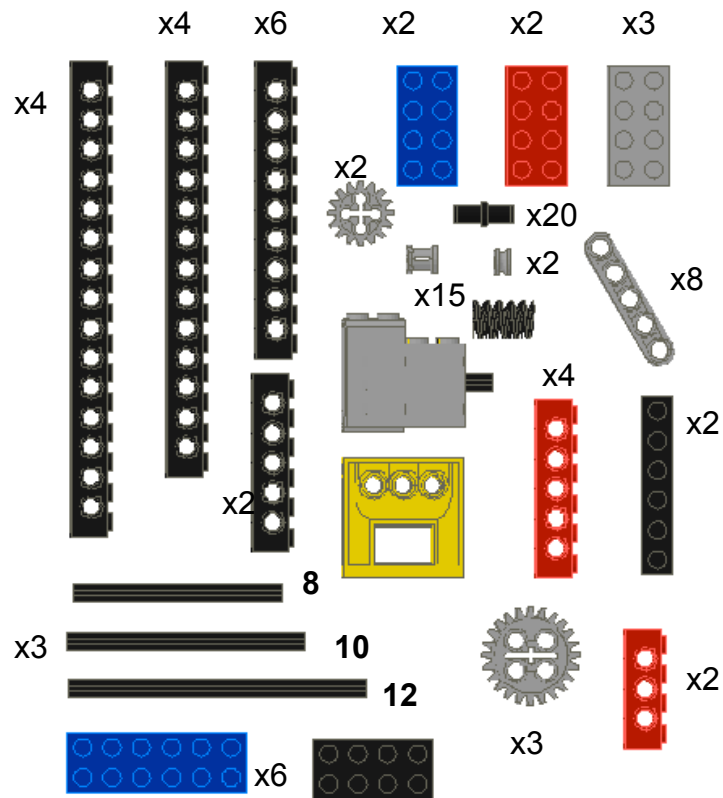
How to build a putter

Pieces:



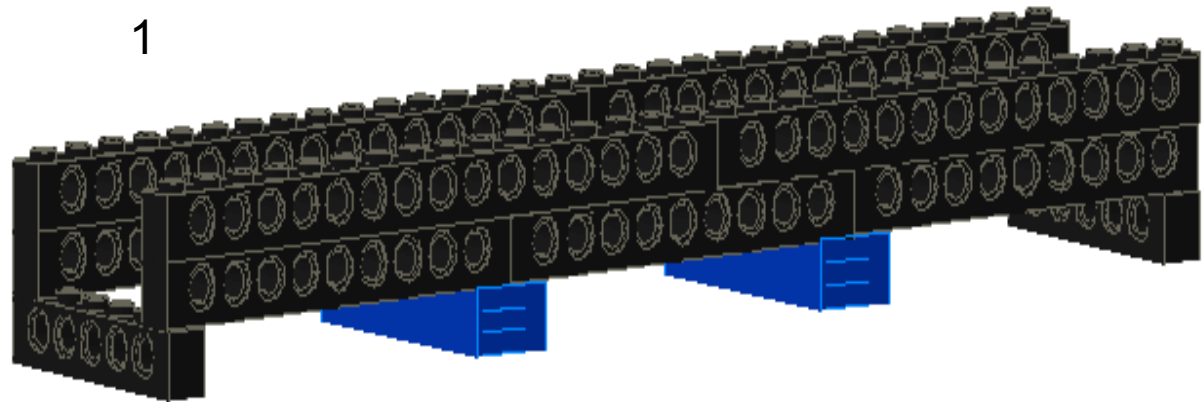
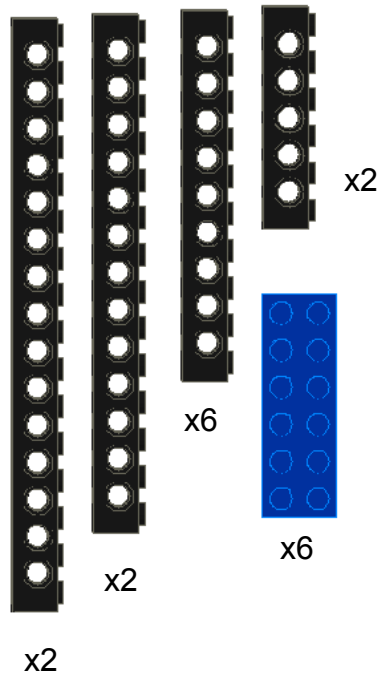
Building a Conveyor Belt

Pieces:



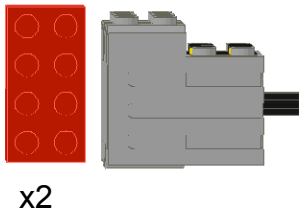
Building a Conveyor Belt

Pieces:



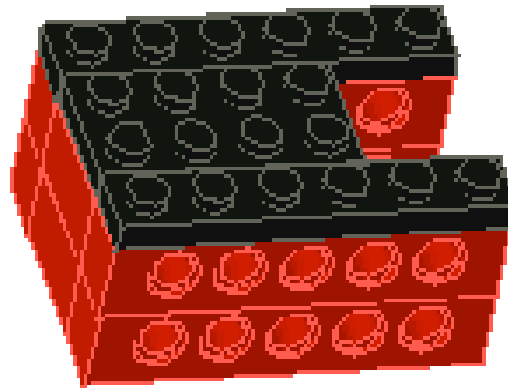
Building a Conveyor Belt

Pieces:

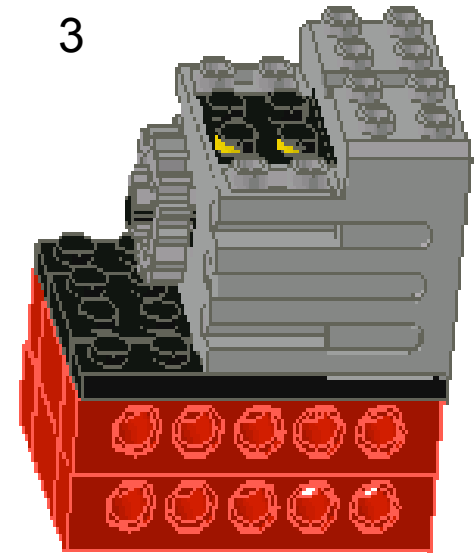


x2

2

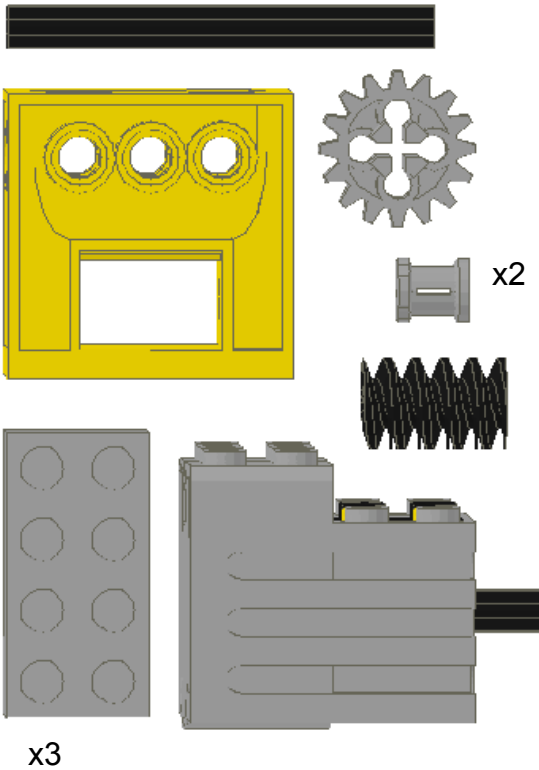


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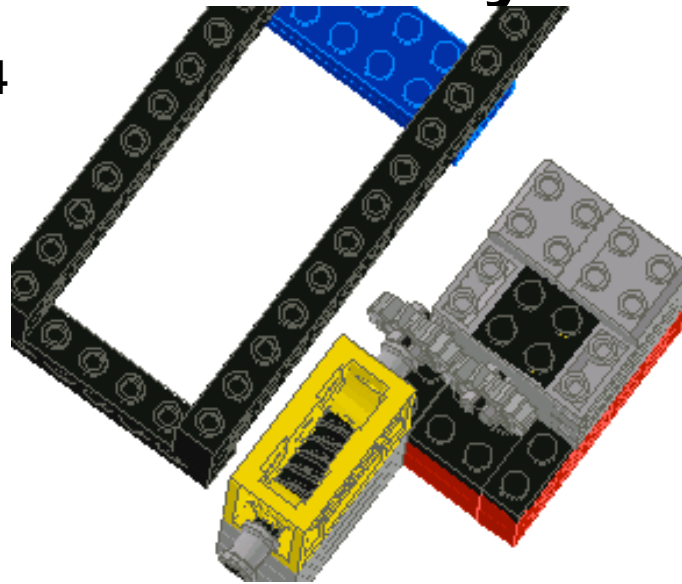


Building a Conveyor Belt

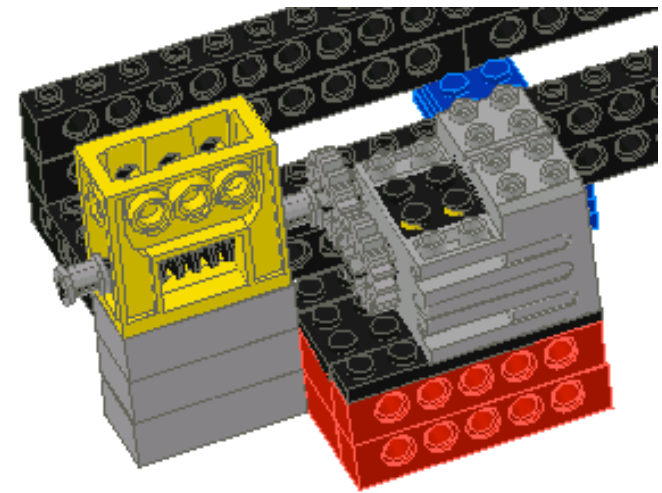
Pieces:



4

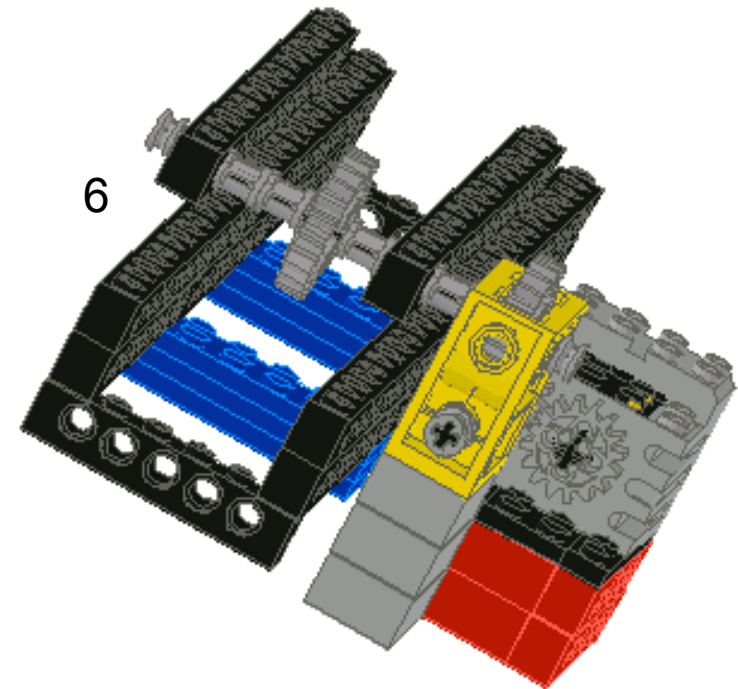
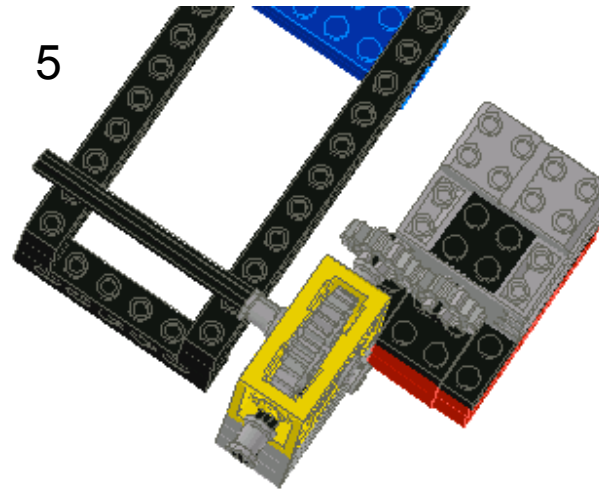
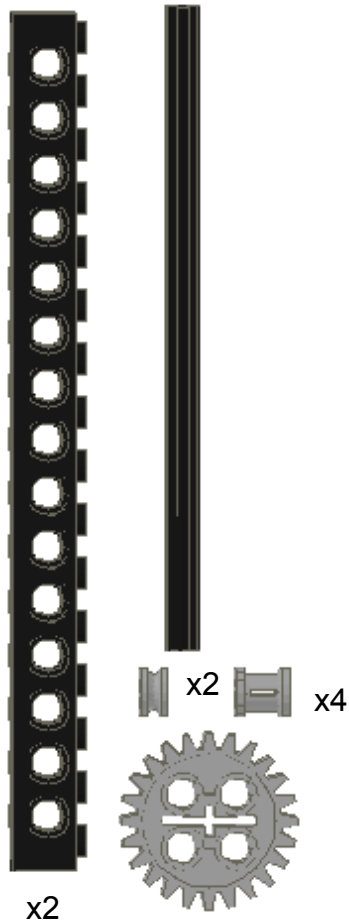


2 views



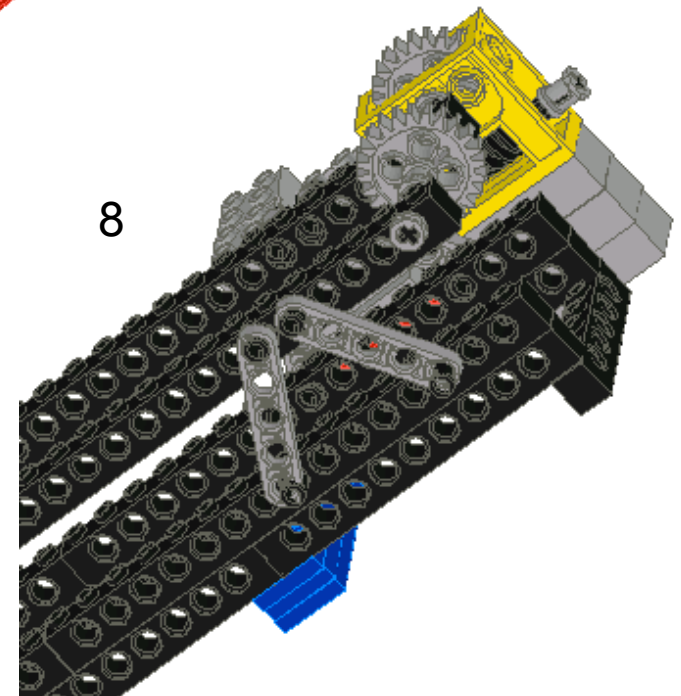
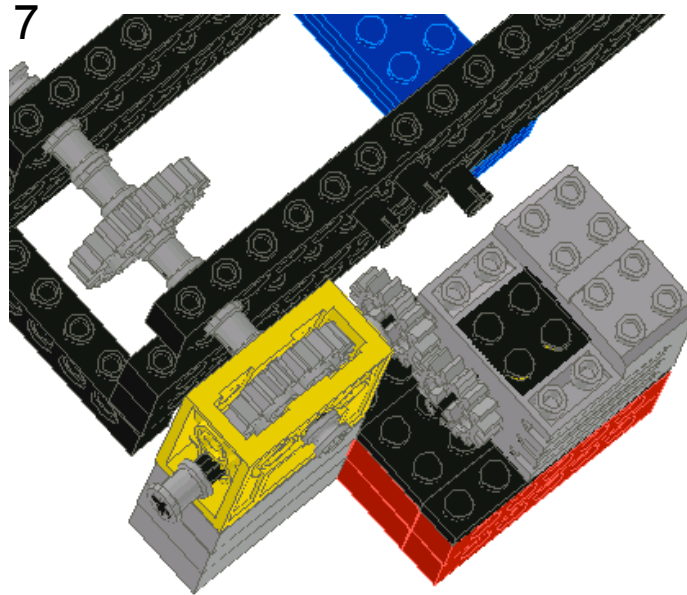
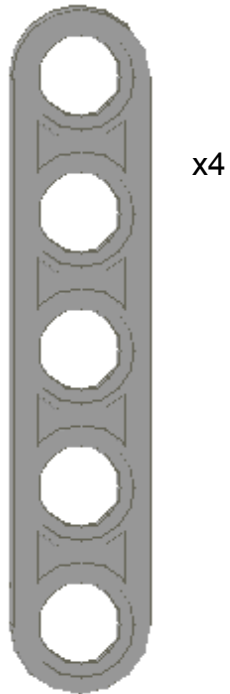
Building a Conveyor Belt

Pieces:



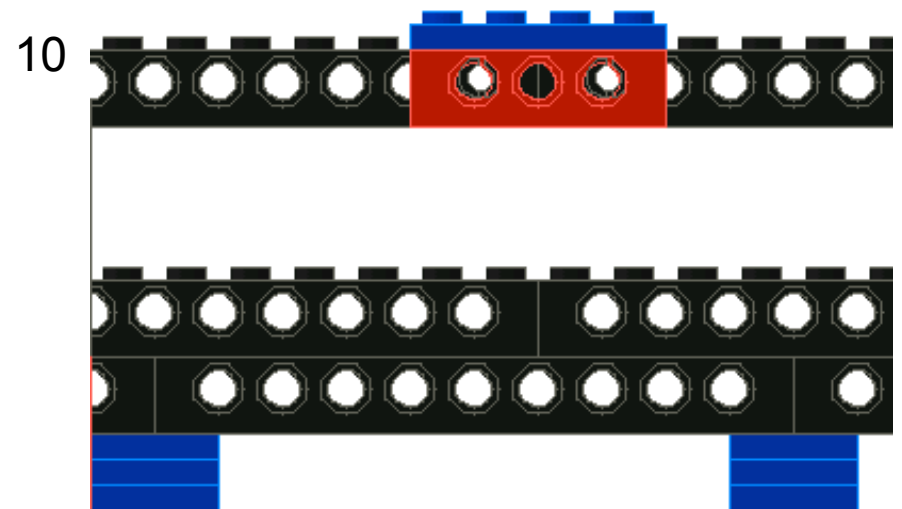
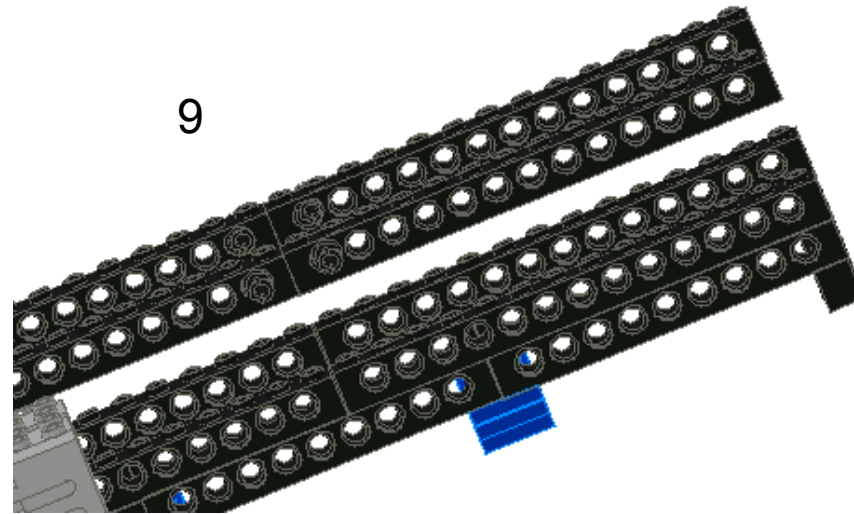
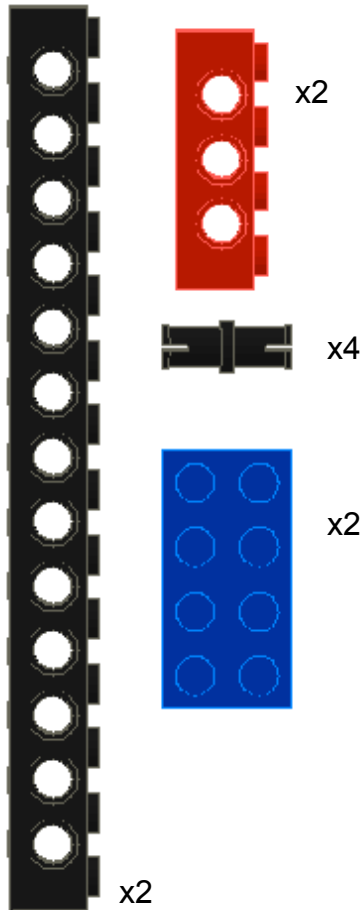
Building a Conveyor Belt

Pieces:



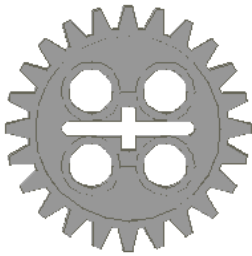
Building a Conveyor Belt

Pieces:



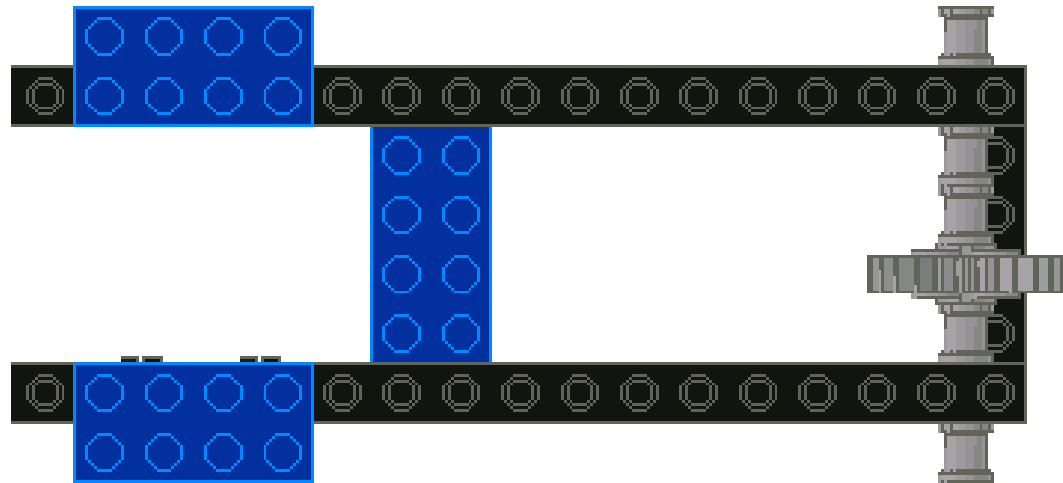
Building a Conveyor Belt

Pieces:



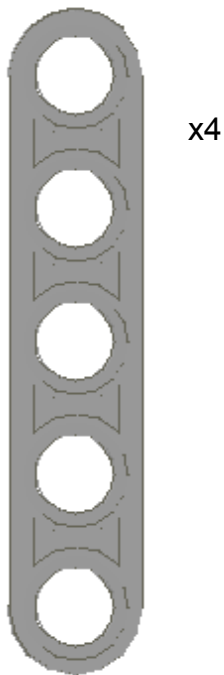
x5

11

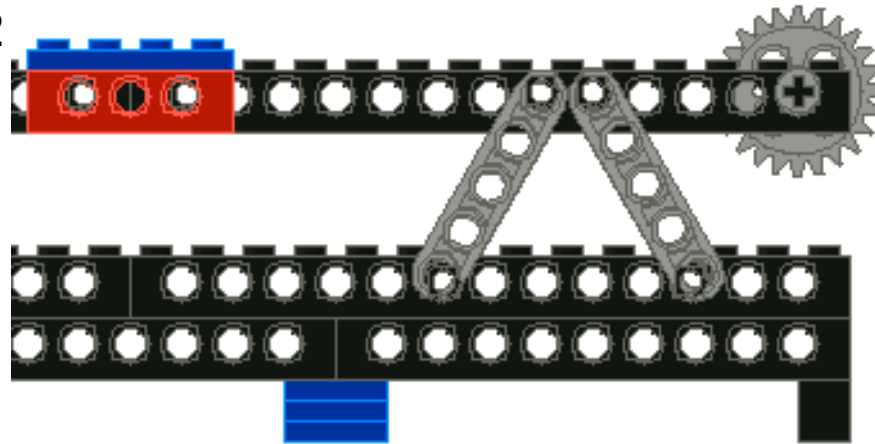


Building a Conveyor Belt

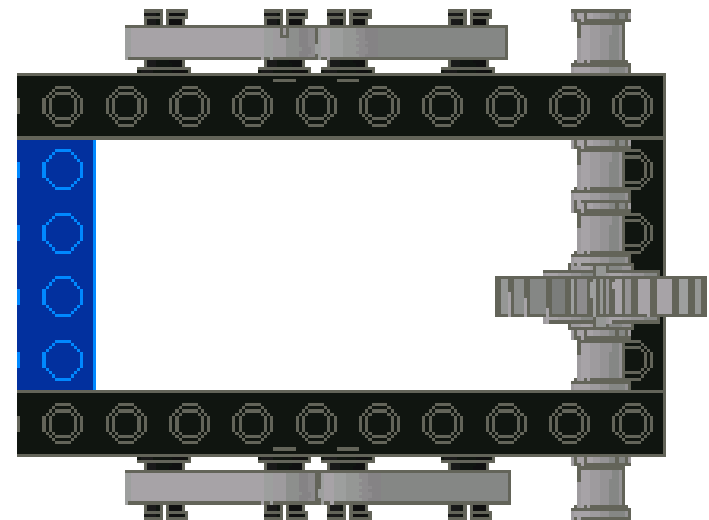
Pieces:



12



2 views



Building a Conveyor Belt

Pieces:

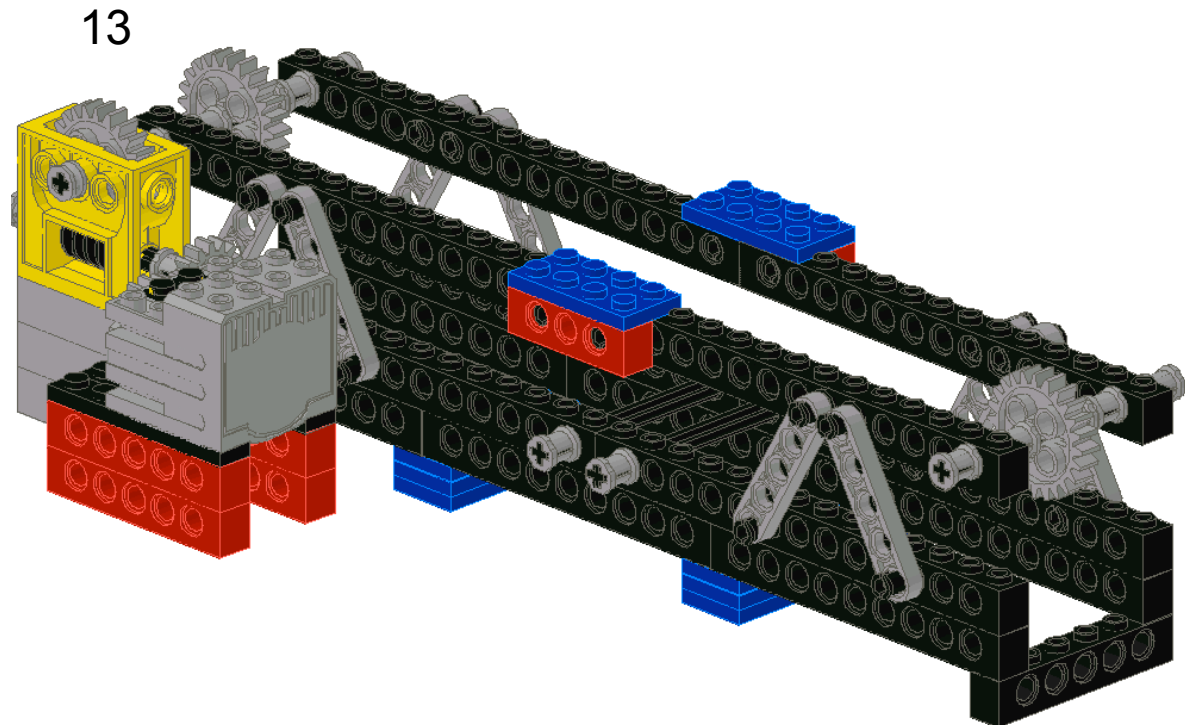


x2

10



x4



Note:

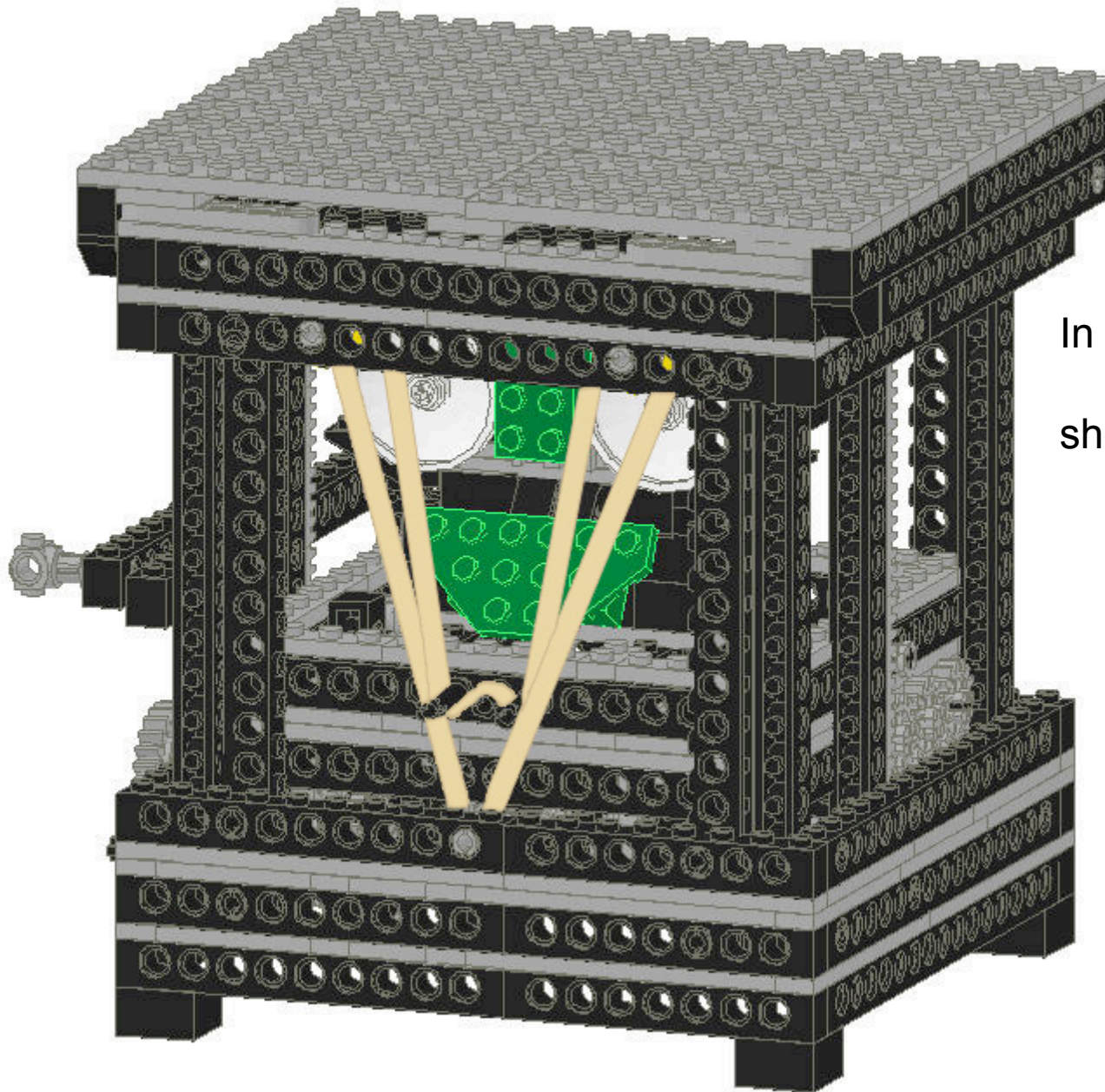
Add a wide chain between the two 24-tooth gears going under the 10 stud axles.

Making an Alarm

Pieces:

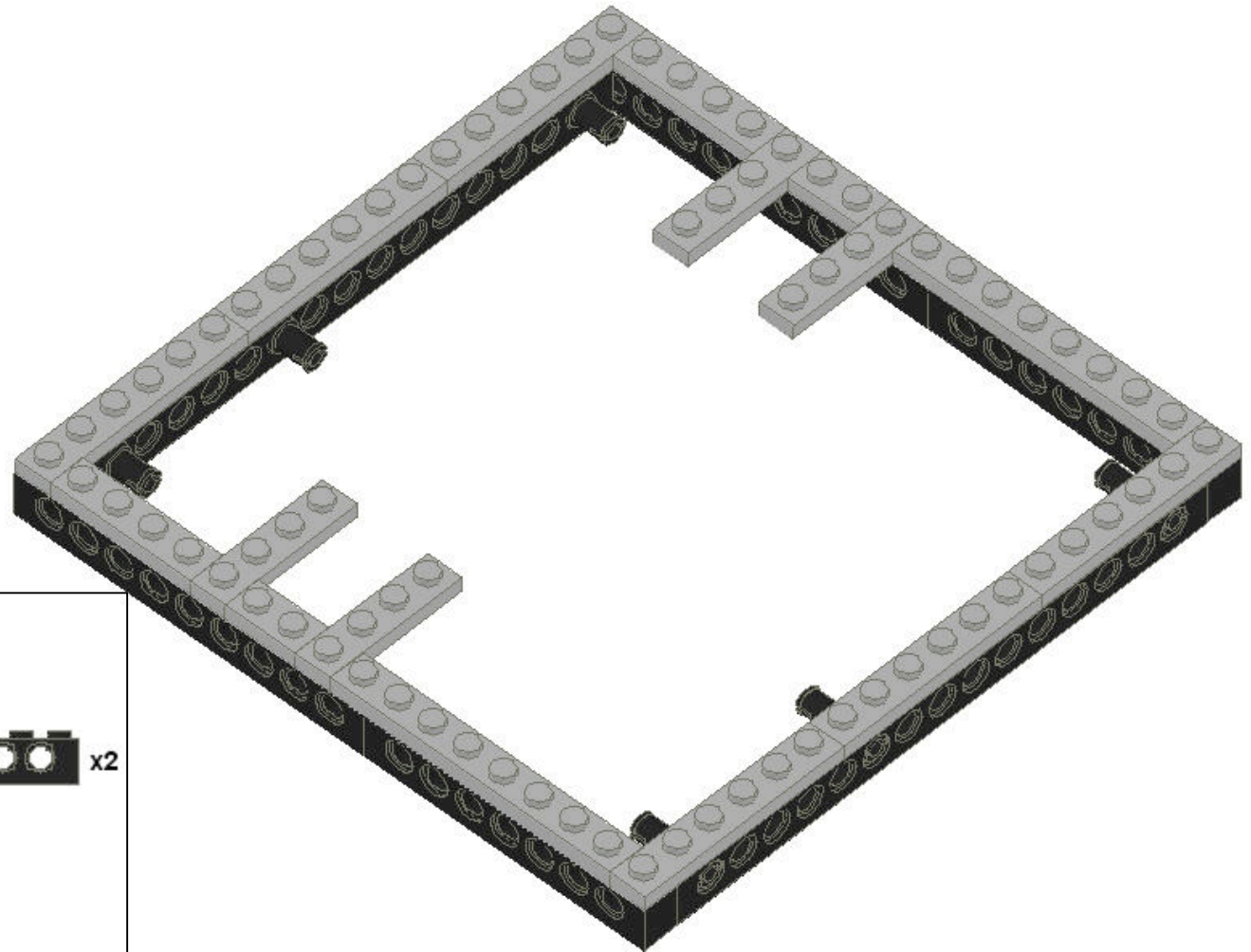
Key Words:

Jack and the Box



In order to do this project you should review the following concepts:

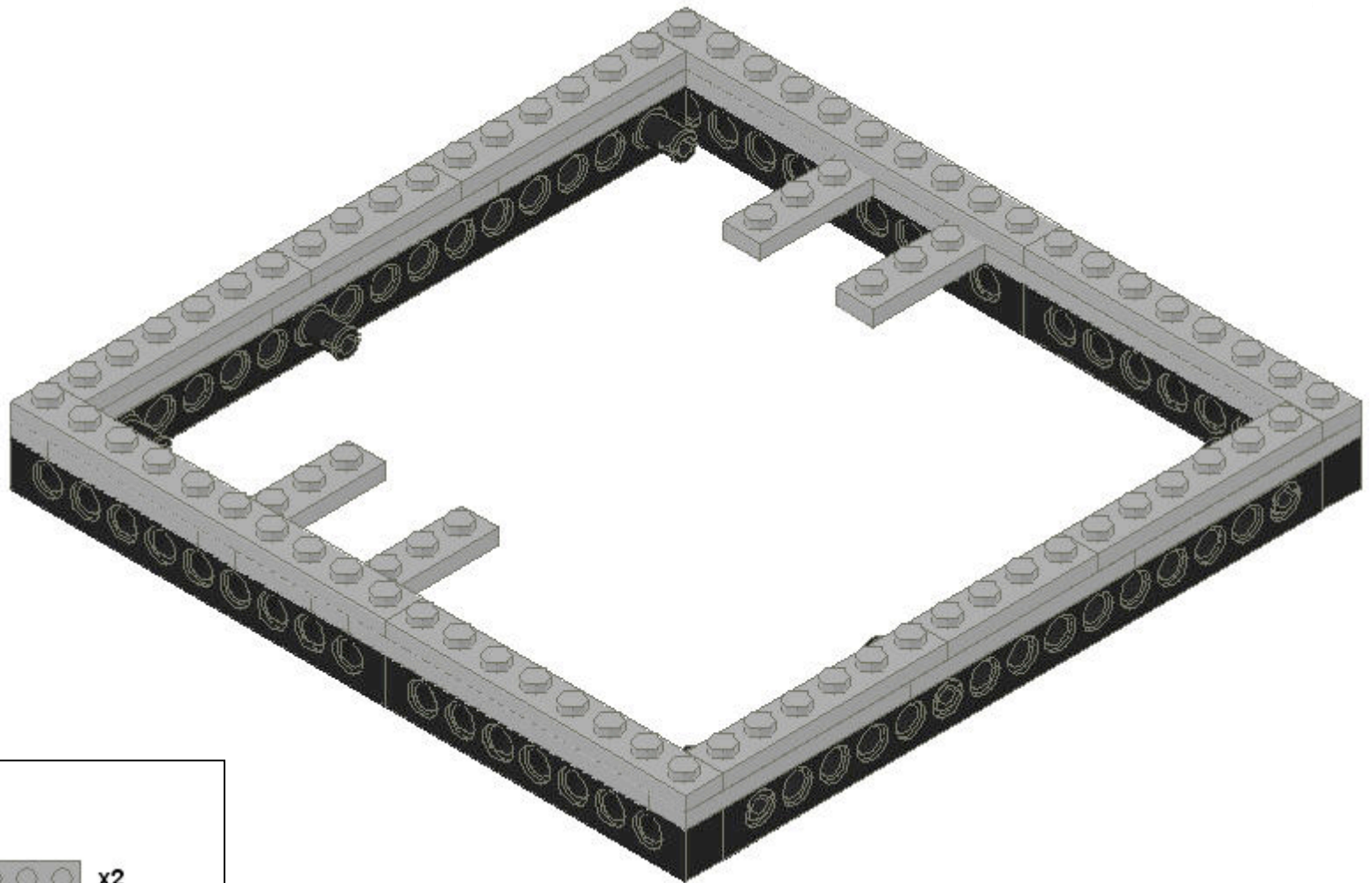
Jack and the Box: The Box



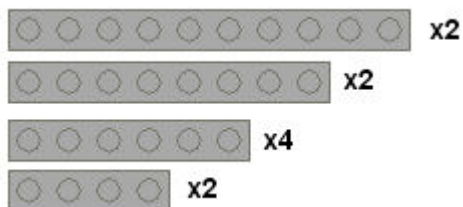
Pieces:

 x6 x2 x2 x2 x2 x6 x6 x2

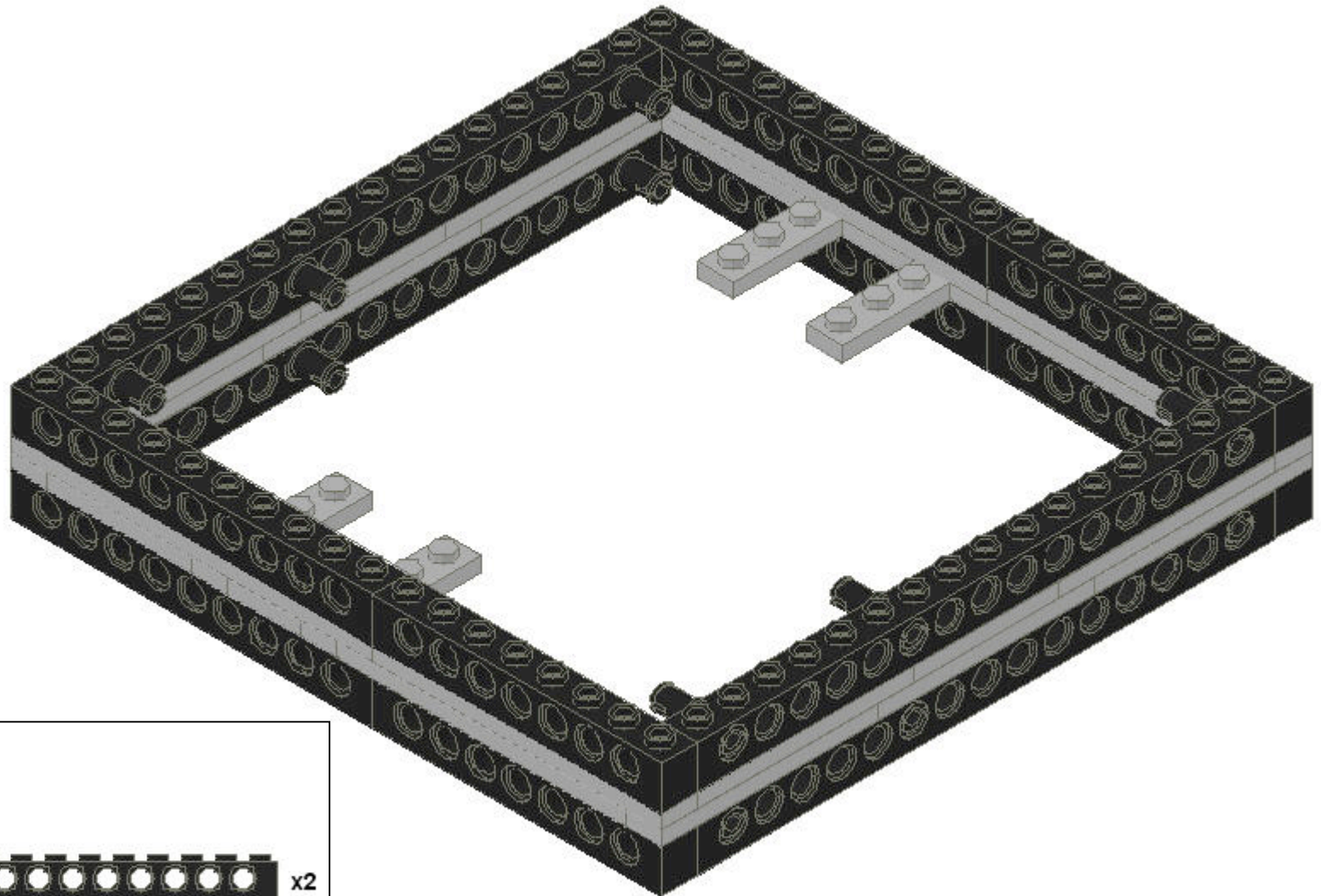
Jack and the Box: The Box



Pieces:



Jack and the Box: The Box



Pieces:

 x6

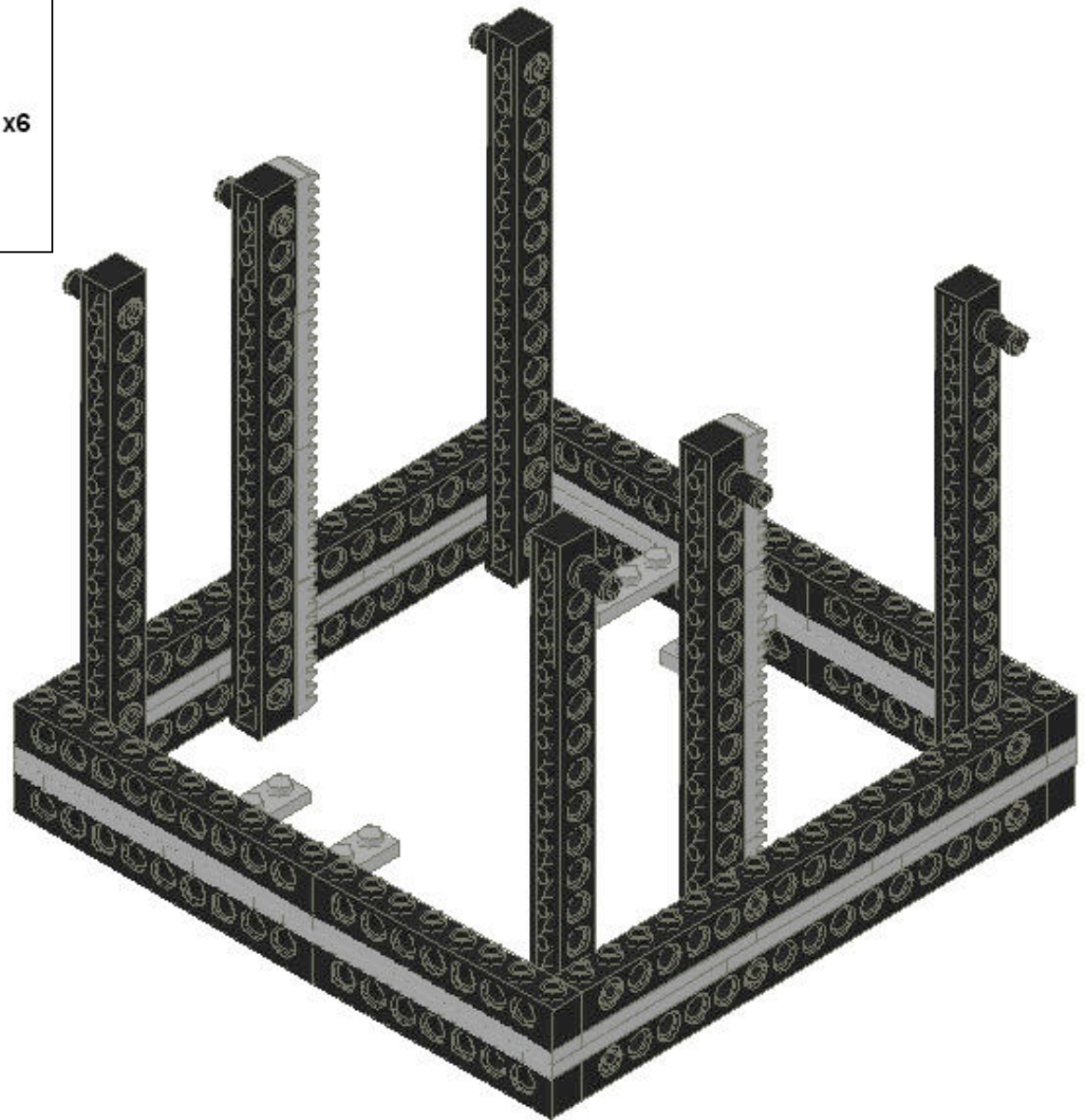
 x2

 x2

 x2

Jack and the Box: The Box

Pieces:

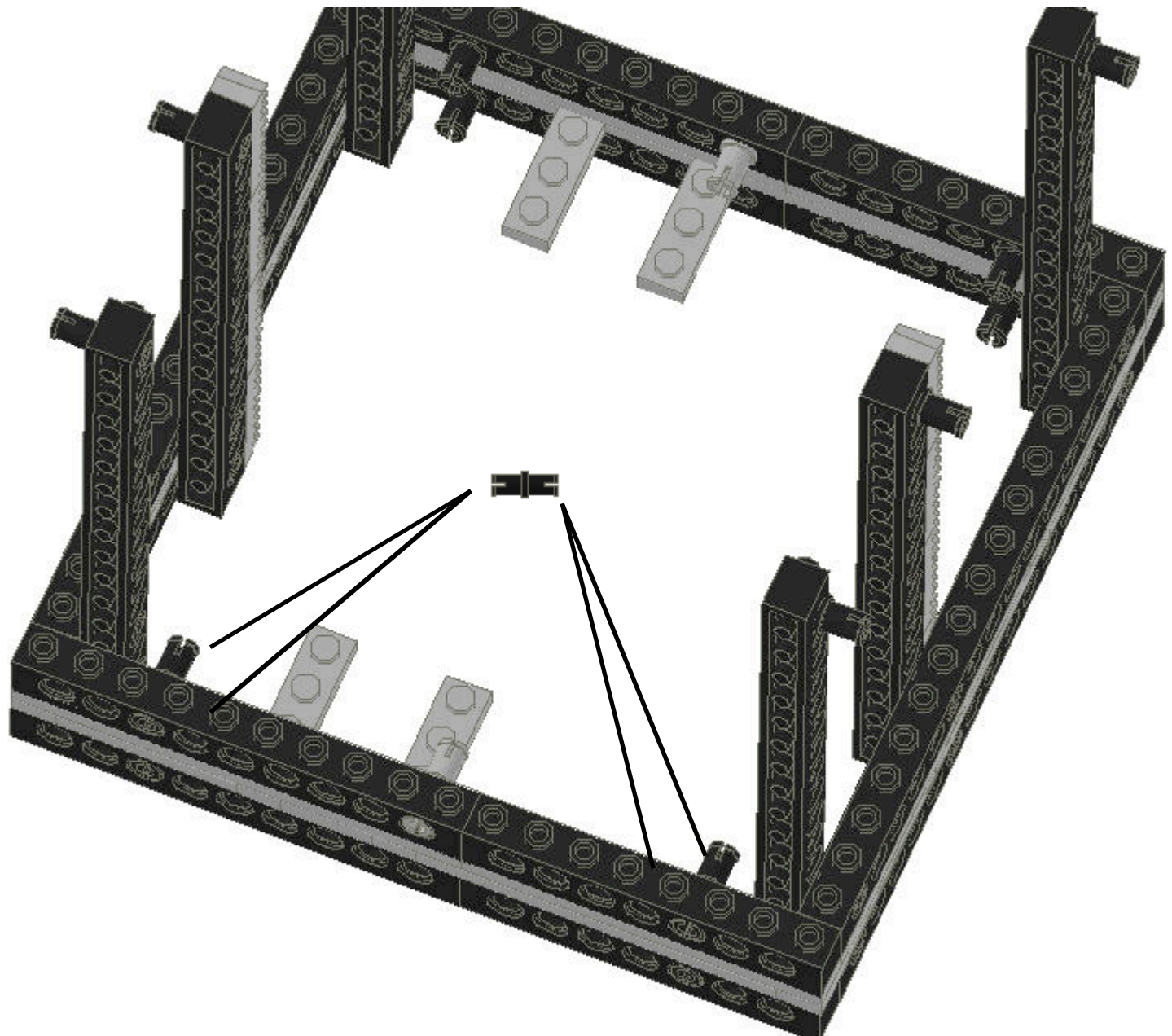
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Jack and the Box: The Box

Pieces:

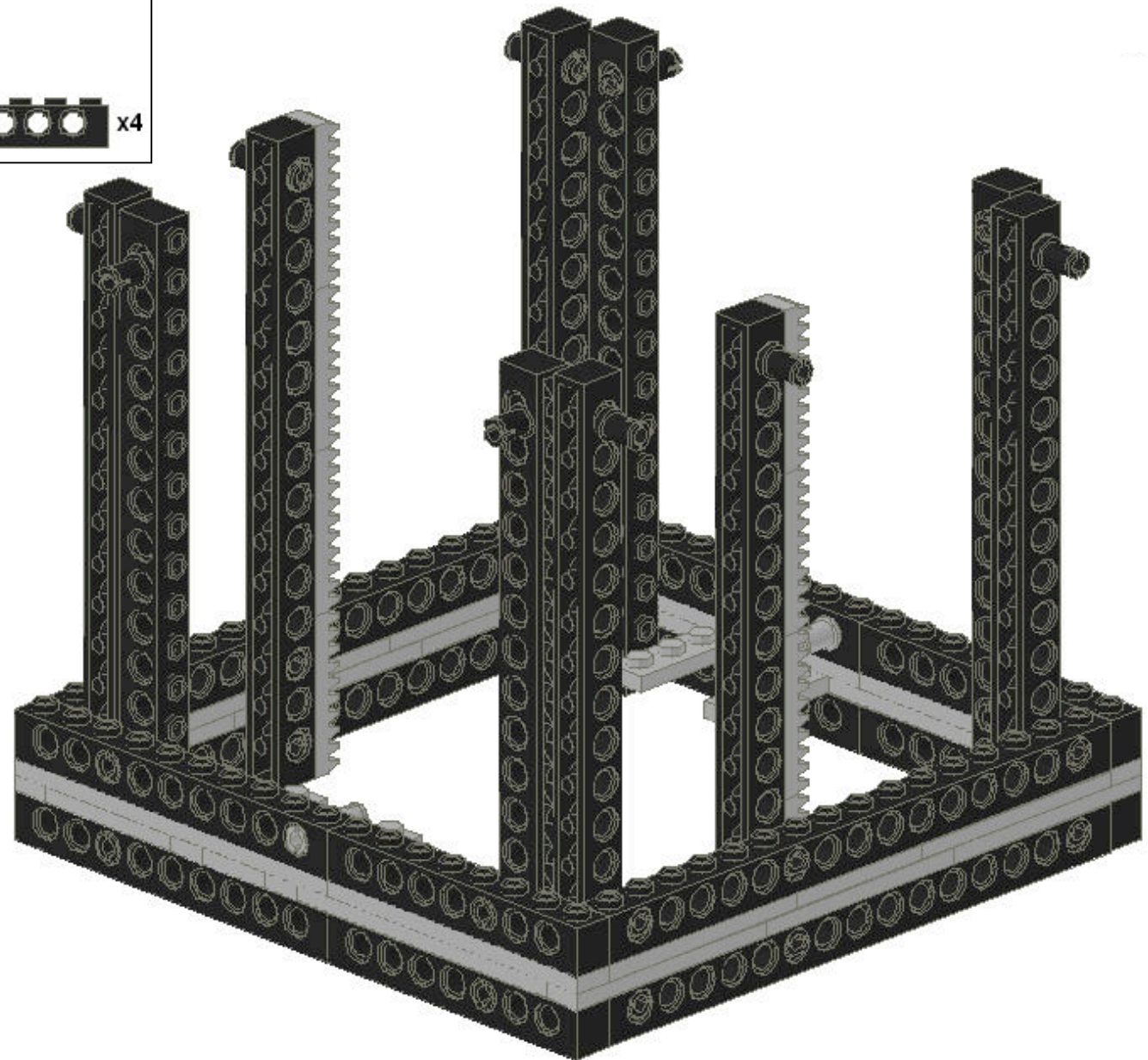
 x2

 x8



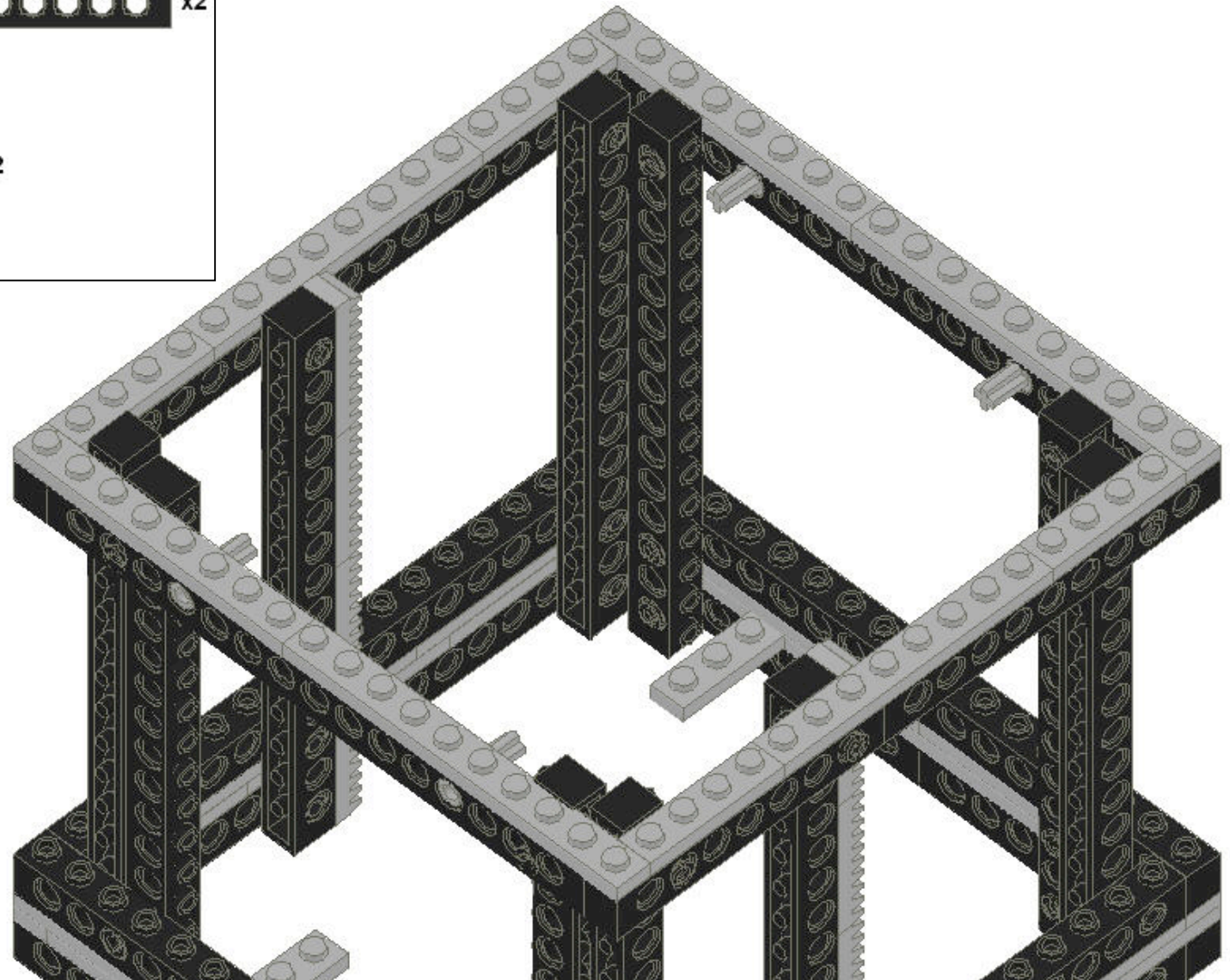
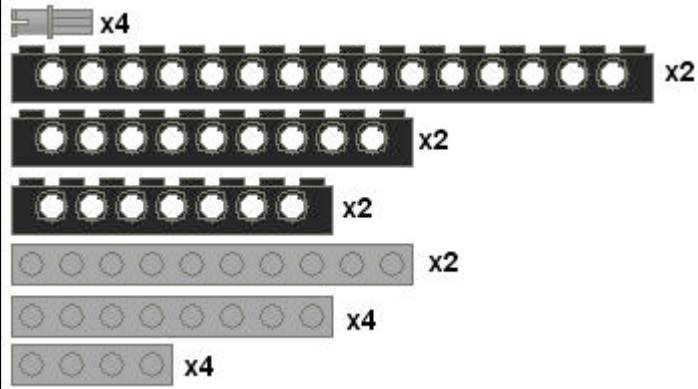
Jack and the Box: The Box

Pieces:

 x4 x4

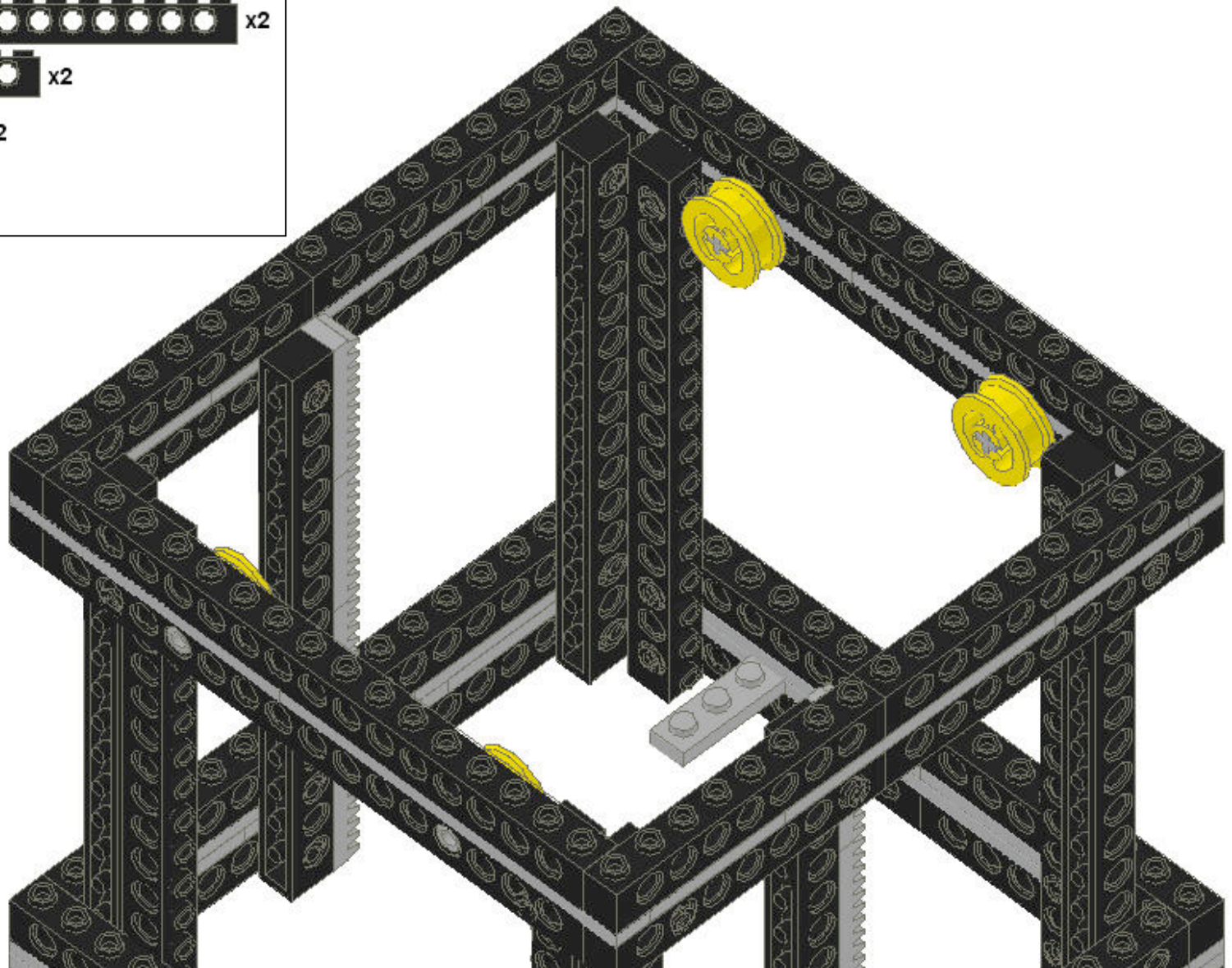
Jack and the Box: The Box

Pieces:



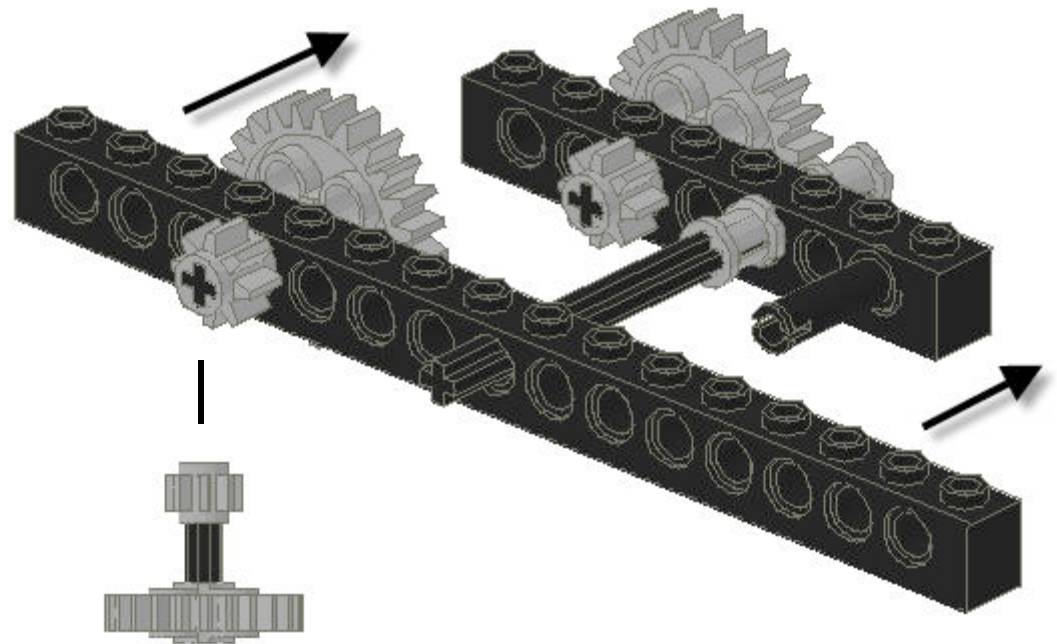
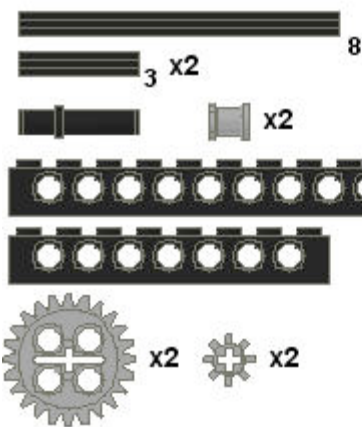
Jack and the Box: The Box

Pieces:



Jack and the Box: The Box

Pieces:



Jack and the Box: The Box

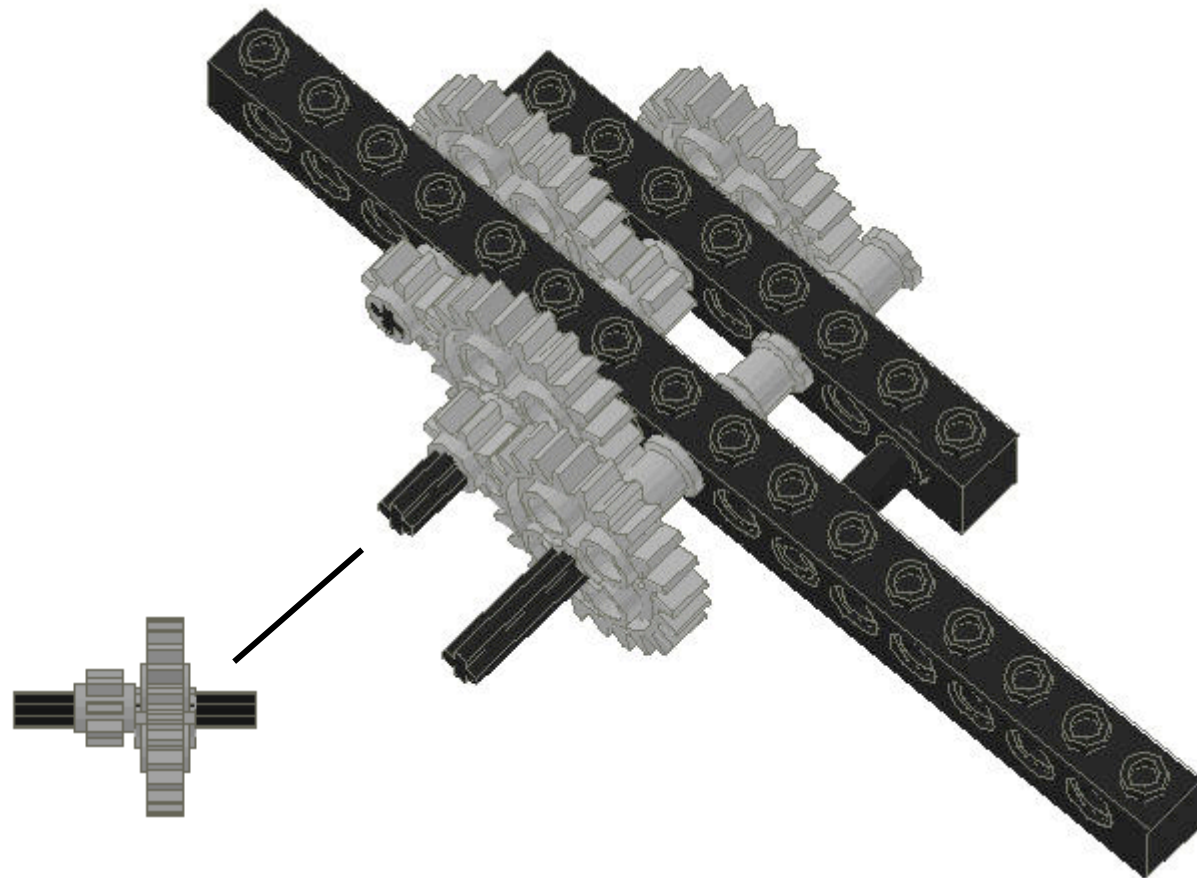
Pieces:



4

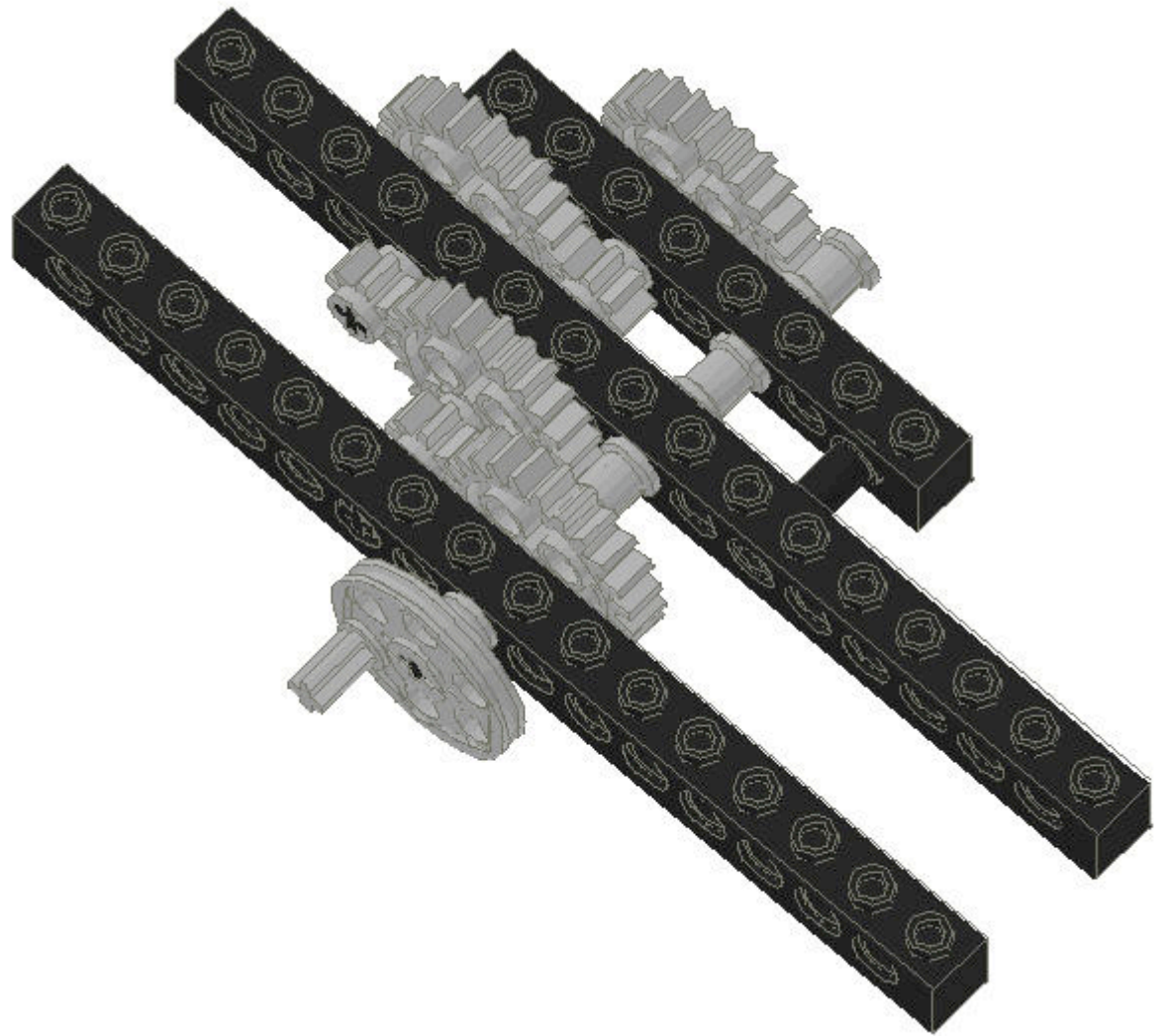


x2



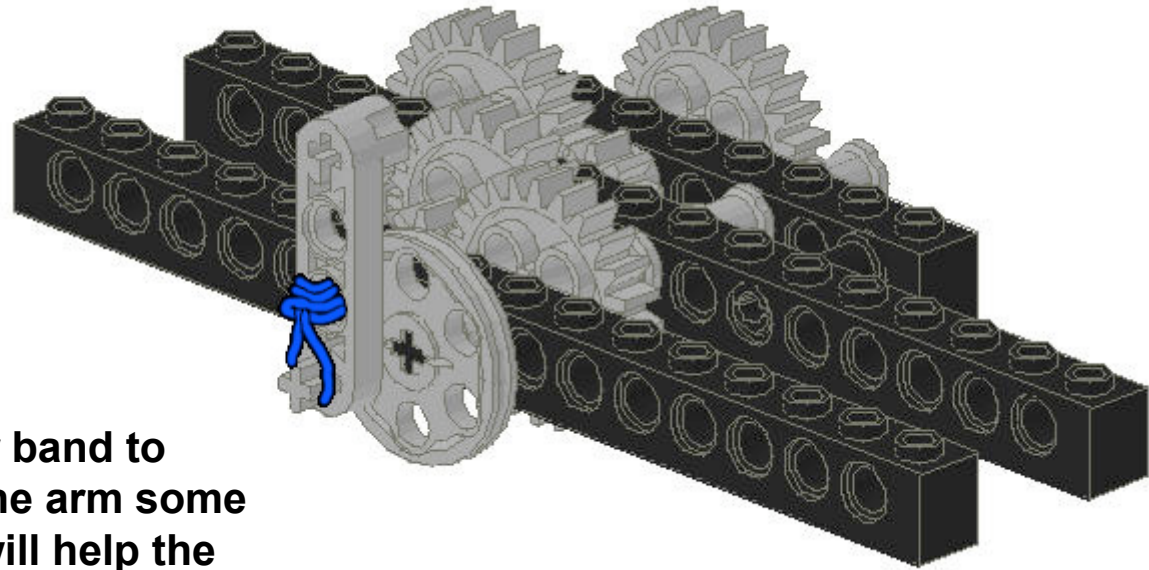
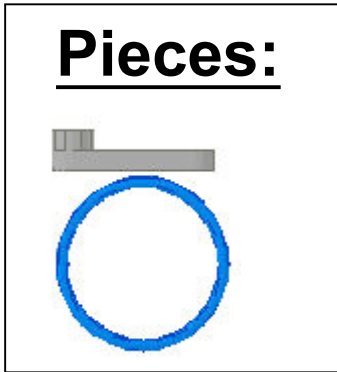
Jack and the Box: The Box

Pieces:



Jack and the Box: The Box

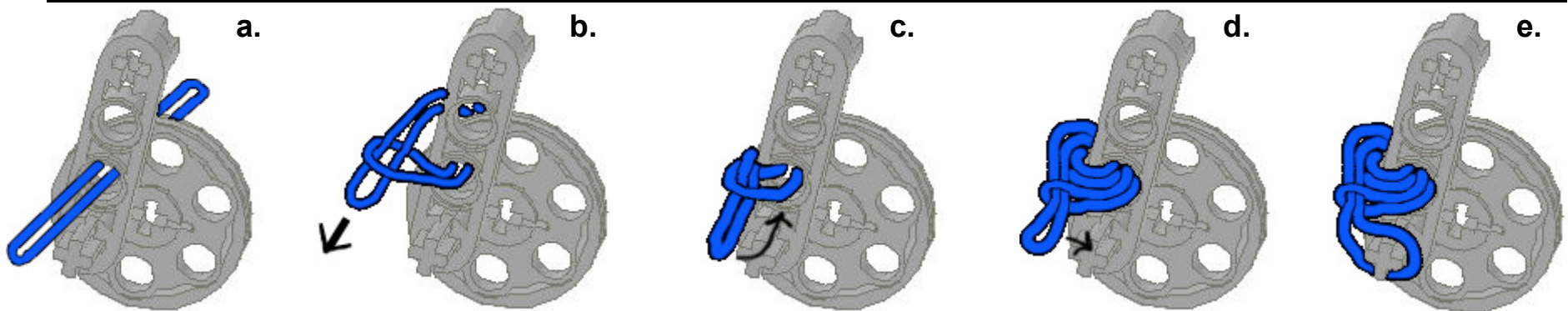
Pieces:



Why not just fasten it?

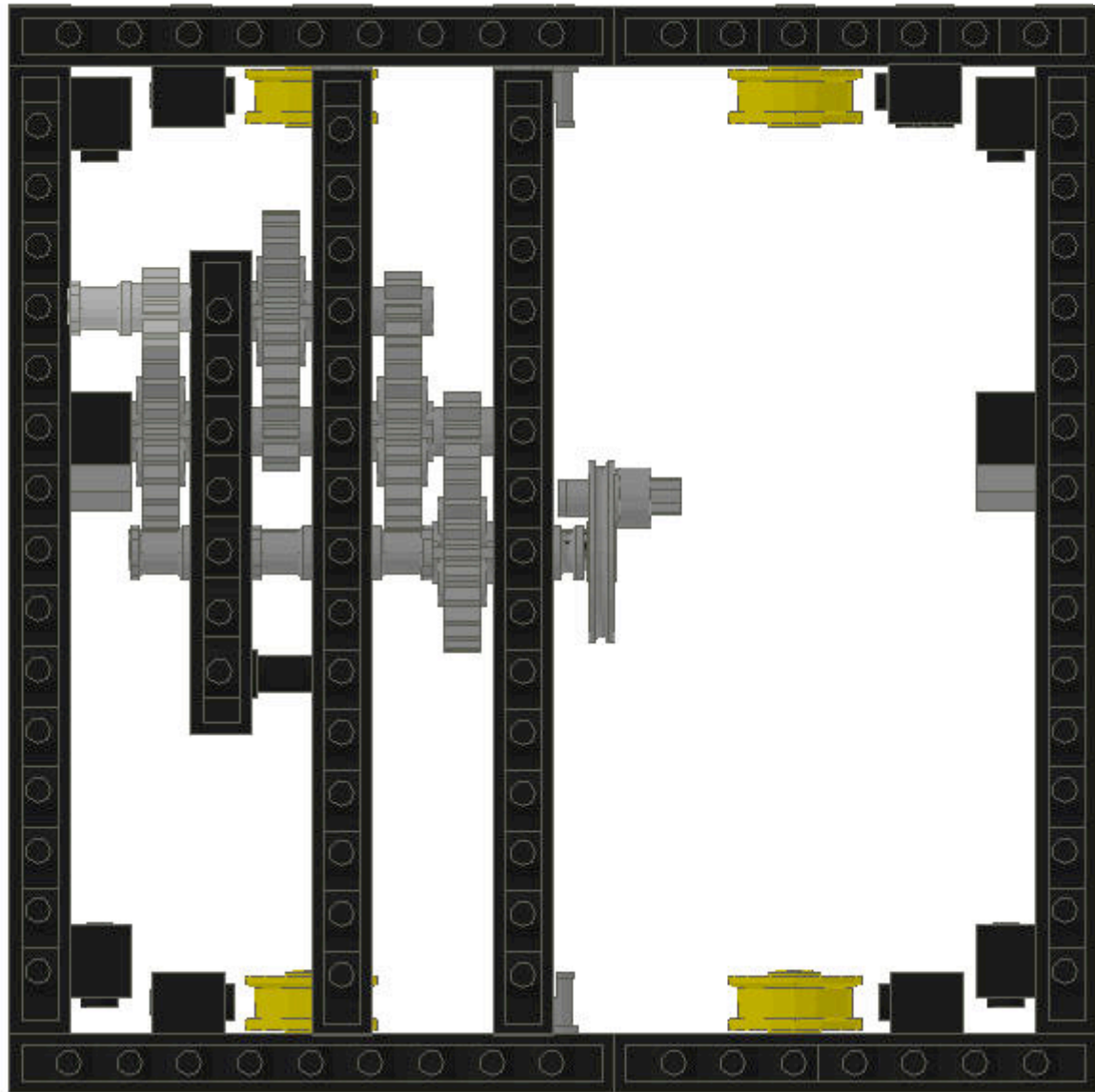
The reason for using a rubber band to fasten the liftarm is to allow the arm some flexibility when in use. This will help the Jack in the Box work correctly.

Note: Below is a suggested way to attach the rubber band. Any way however will work, so long as the band is attached tightly.



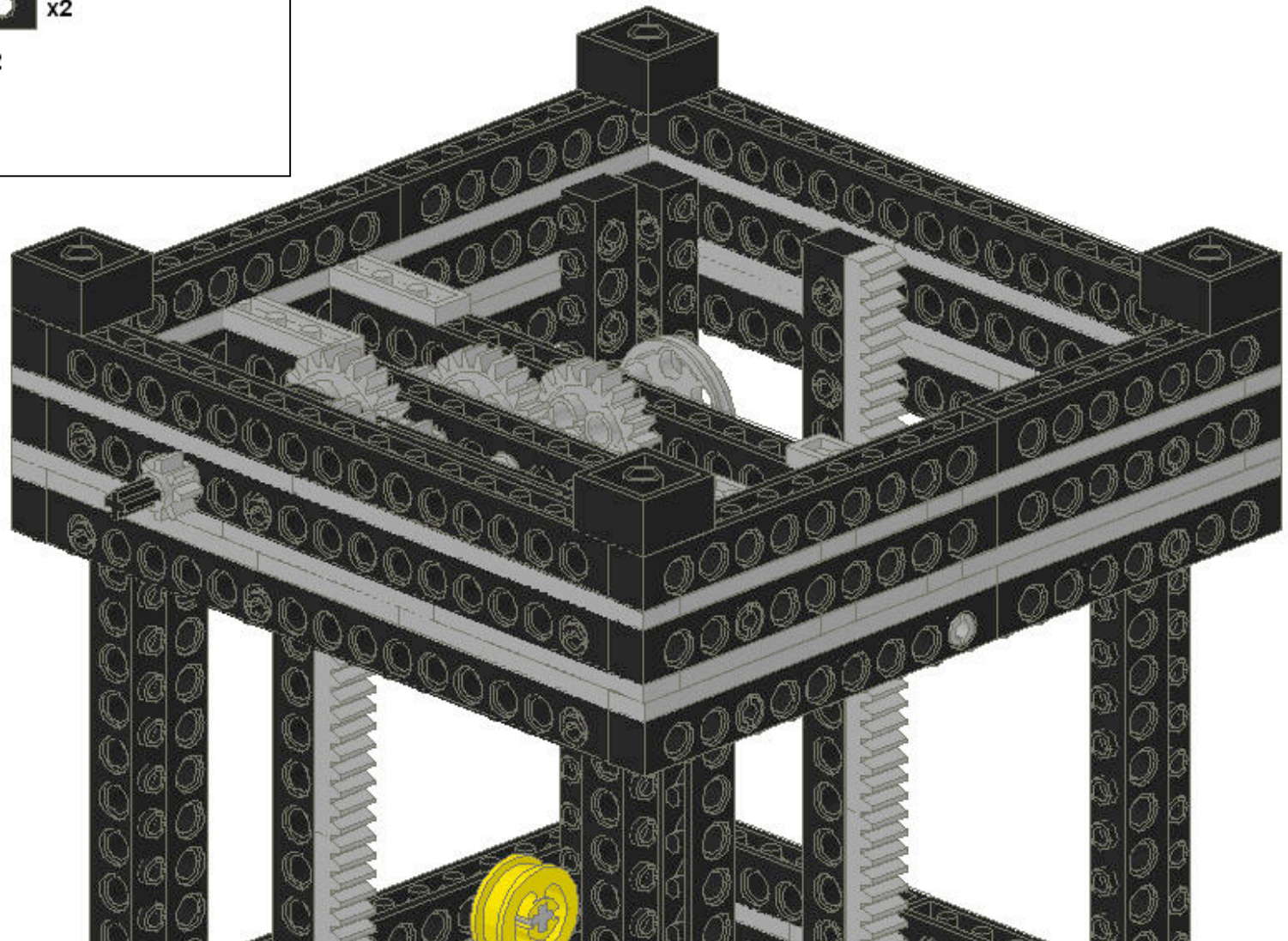
Jack and the Box: The Box

Pieces:



Jack and the Box: The Box

Pieces:

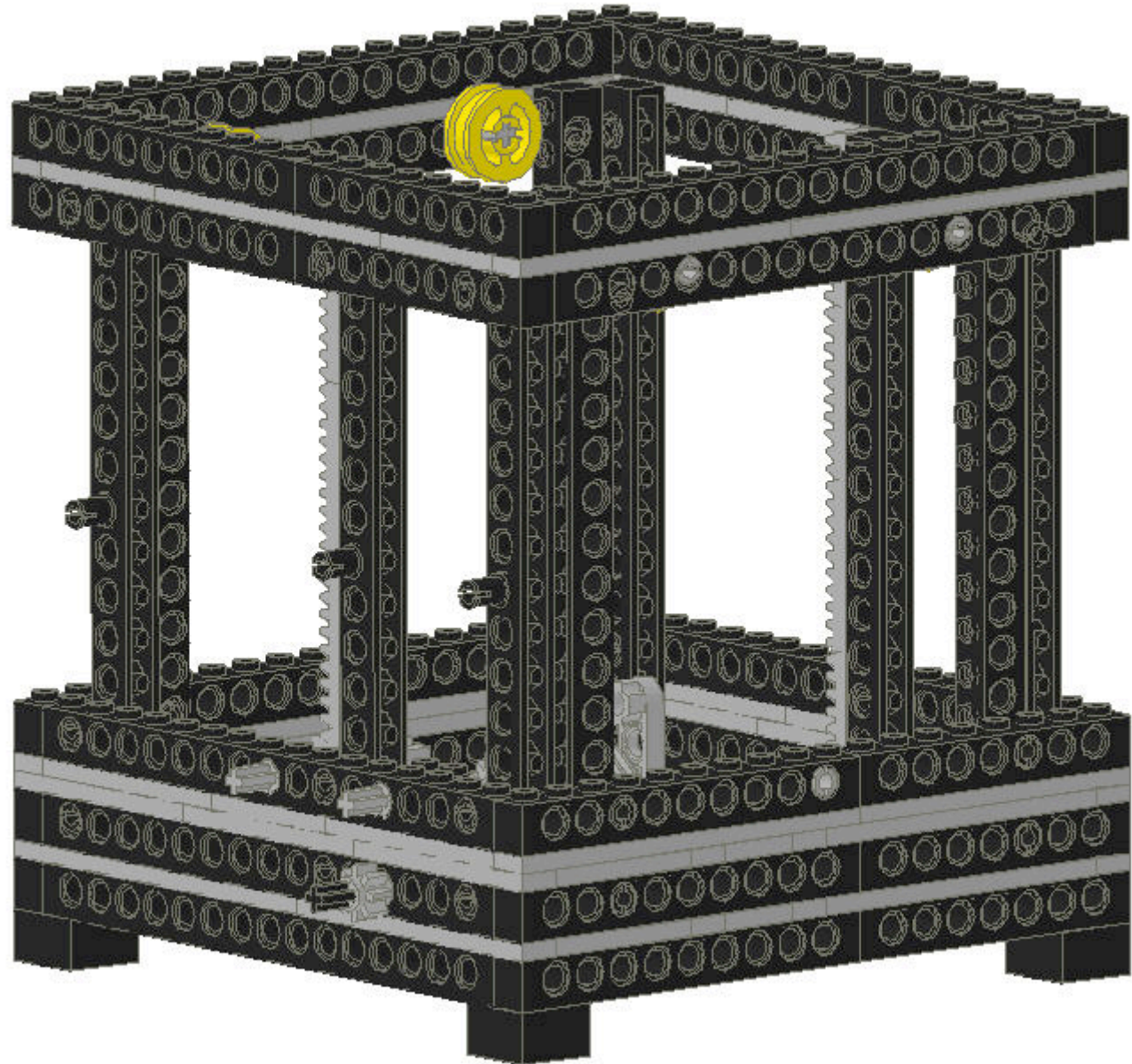


Jack and the Box: The Box

Pieces:

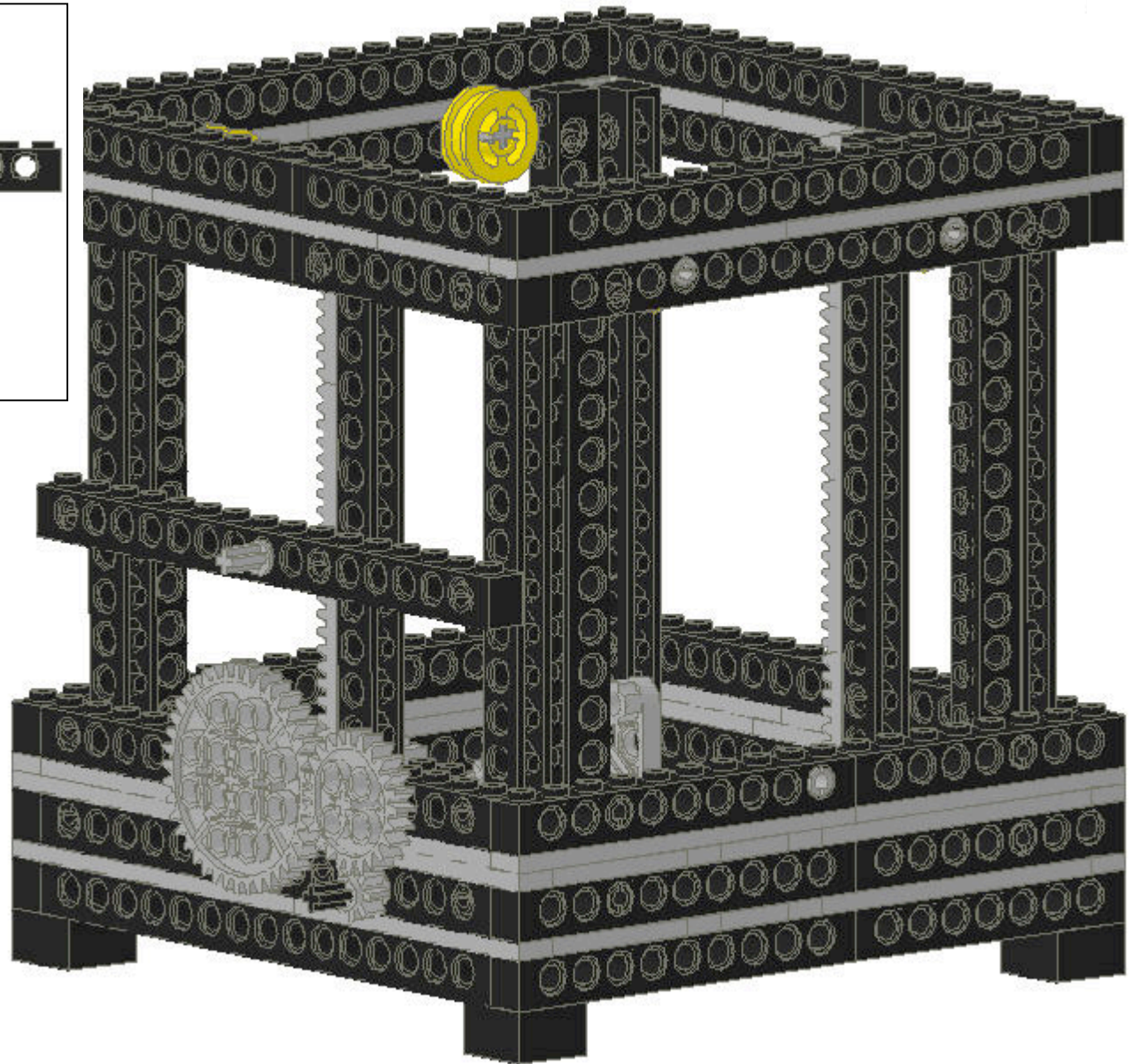
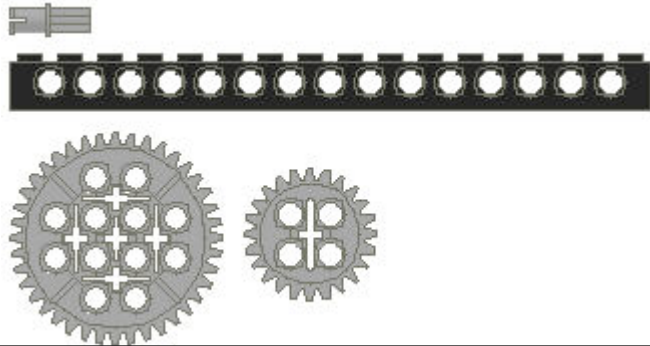
 x3

 x2



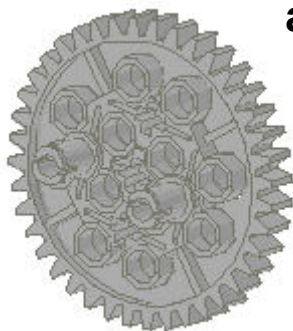
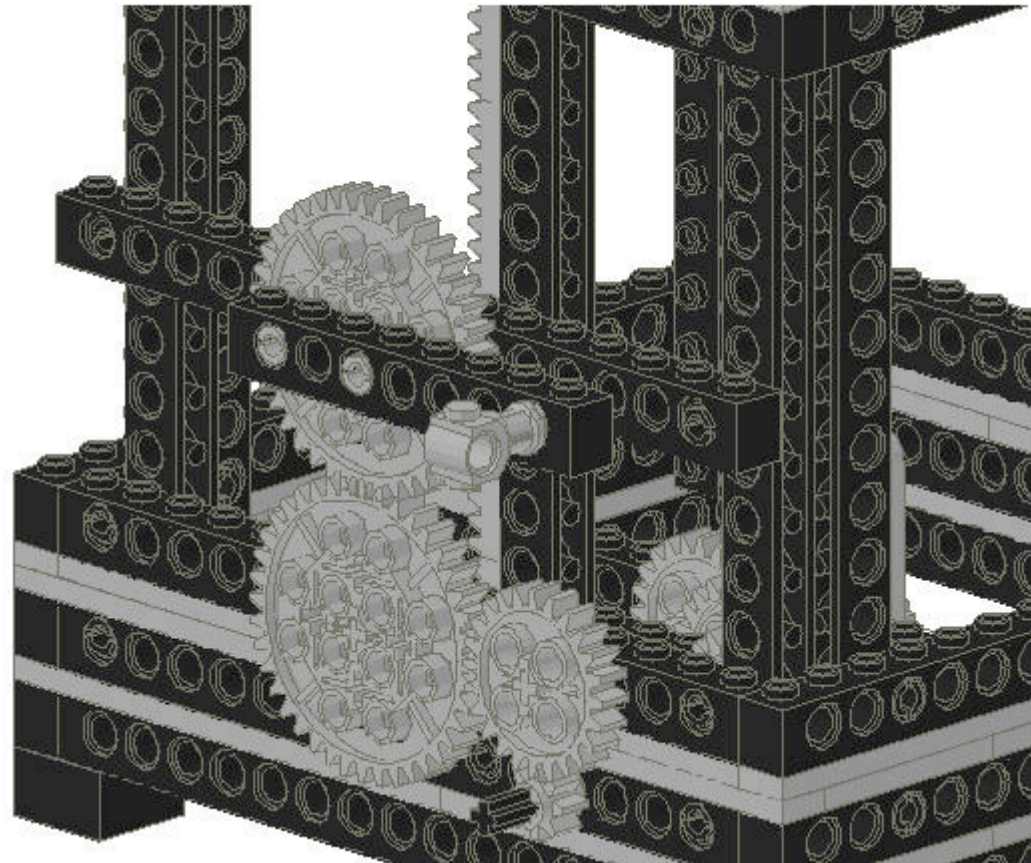
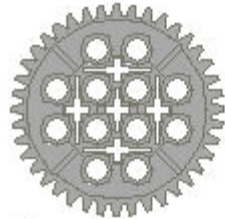
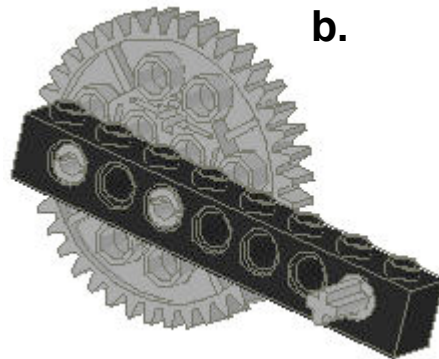
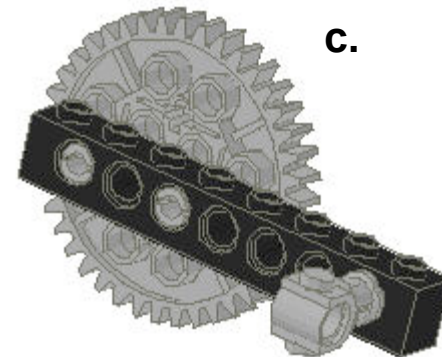
Jack and the Box: The Box

Pieces:

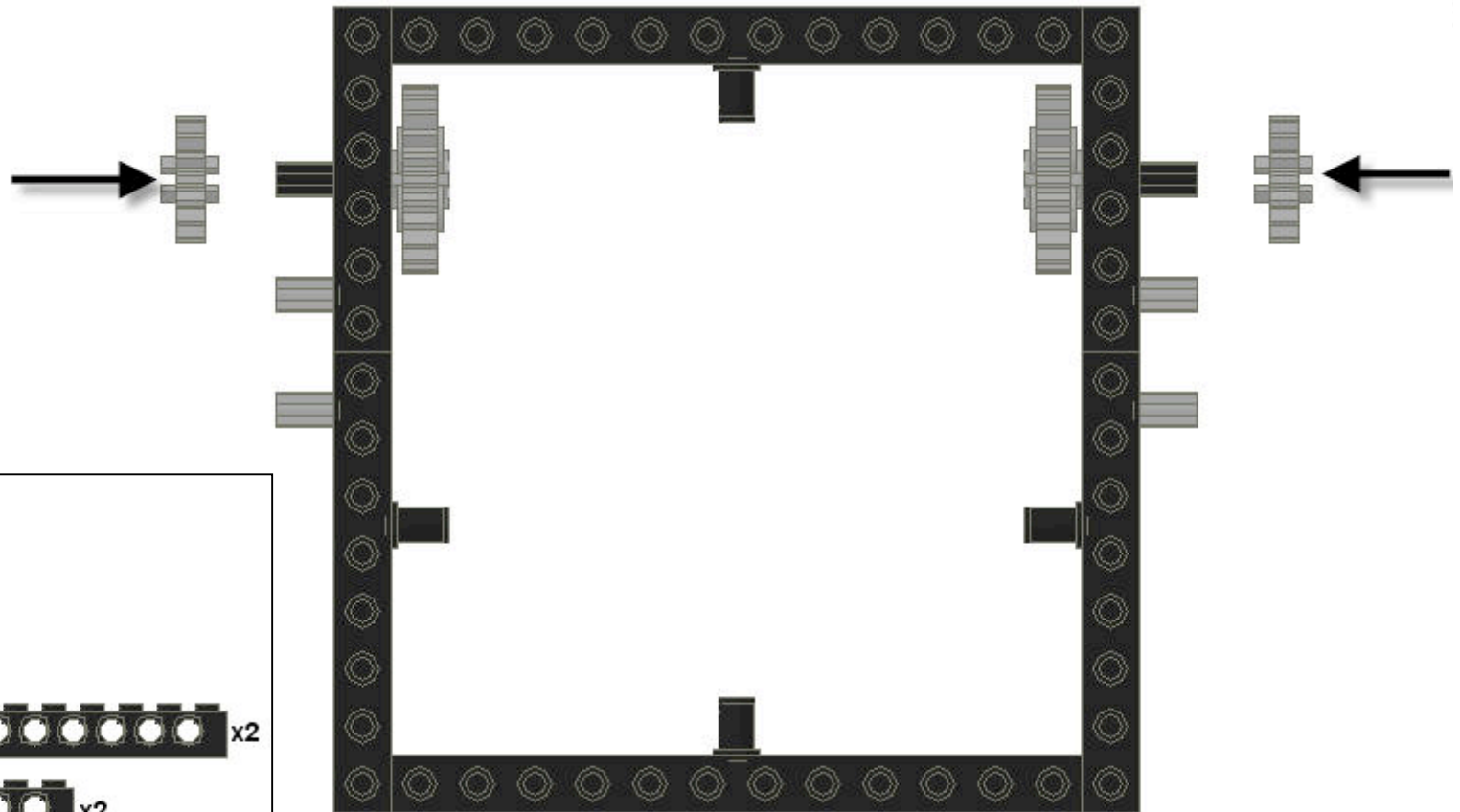


Jack and the Box: The Box

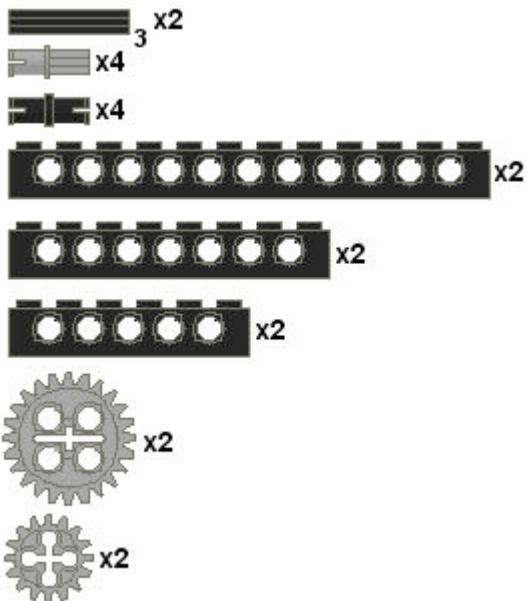
Pieces:

 x3**a.****b.****c.**

Jack and the Box: The Platform

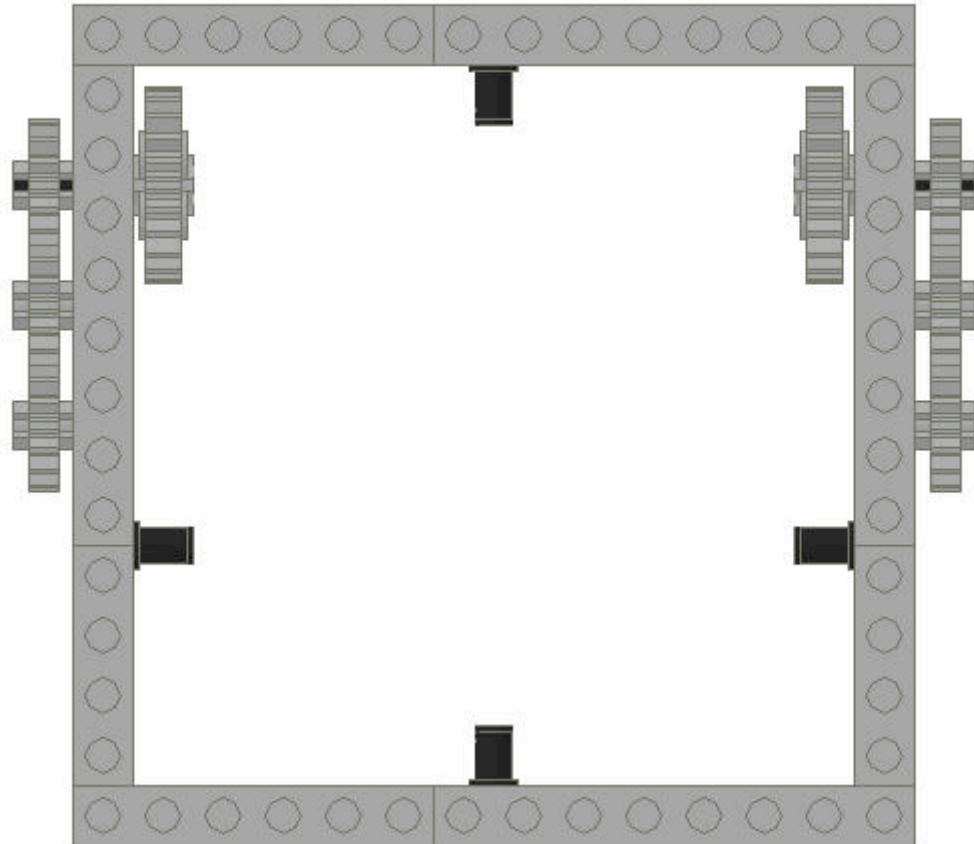


Pieces:

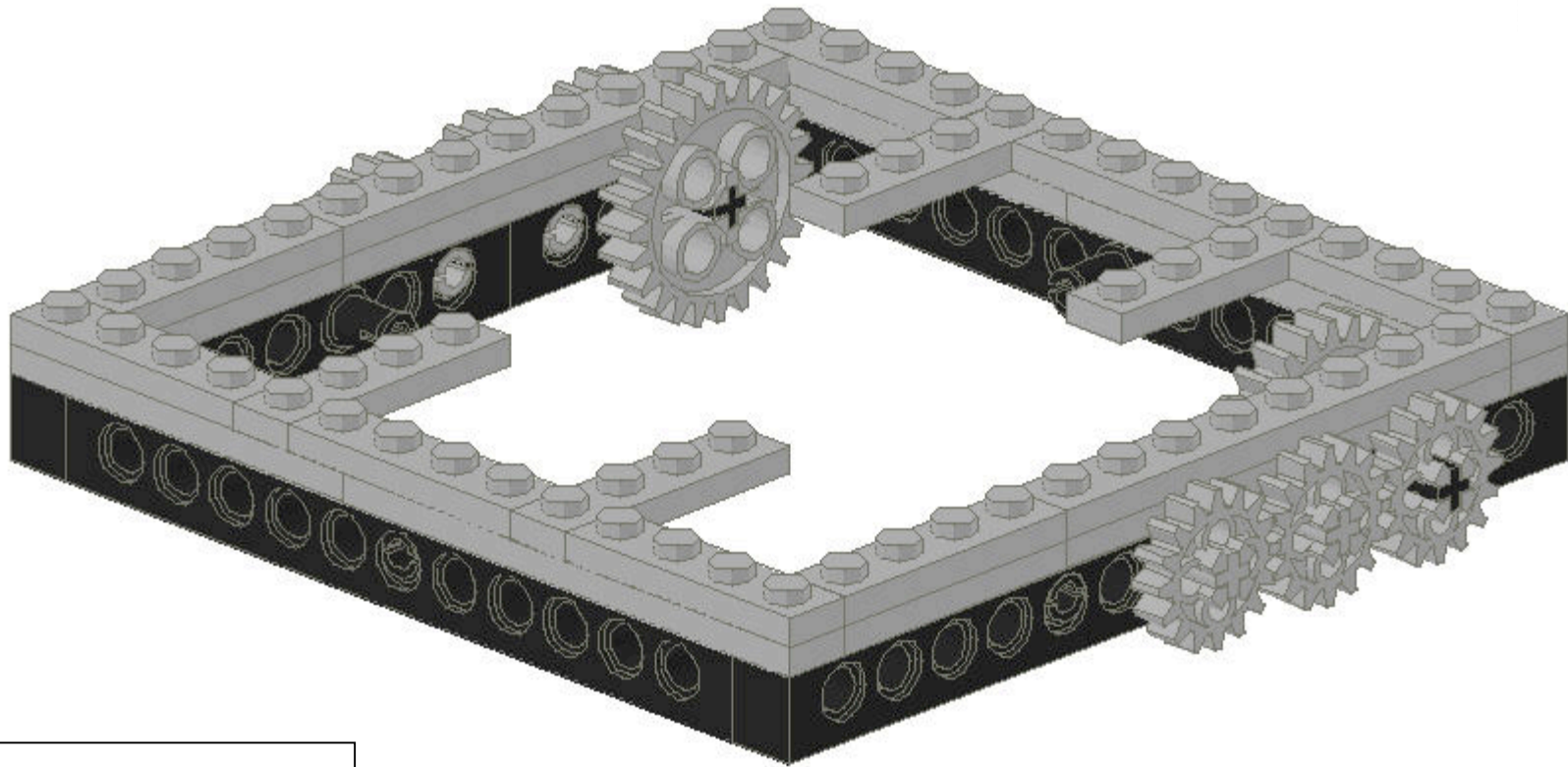


Jack and the Box: The Platform

Pieces:



Jack and the Box: The Platform

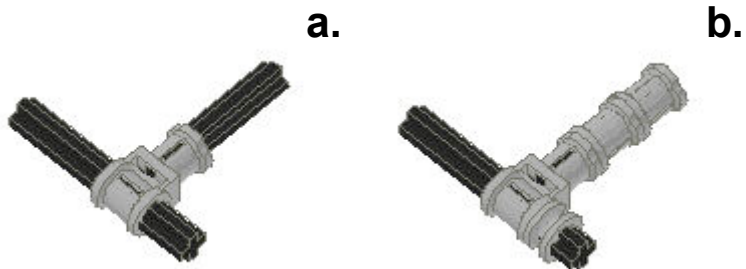
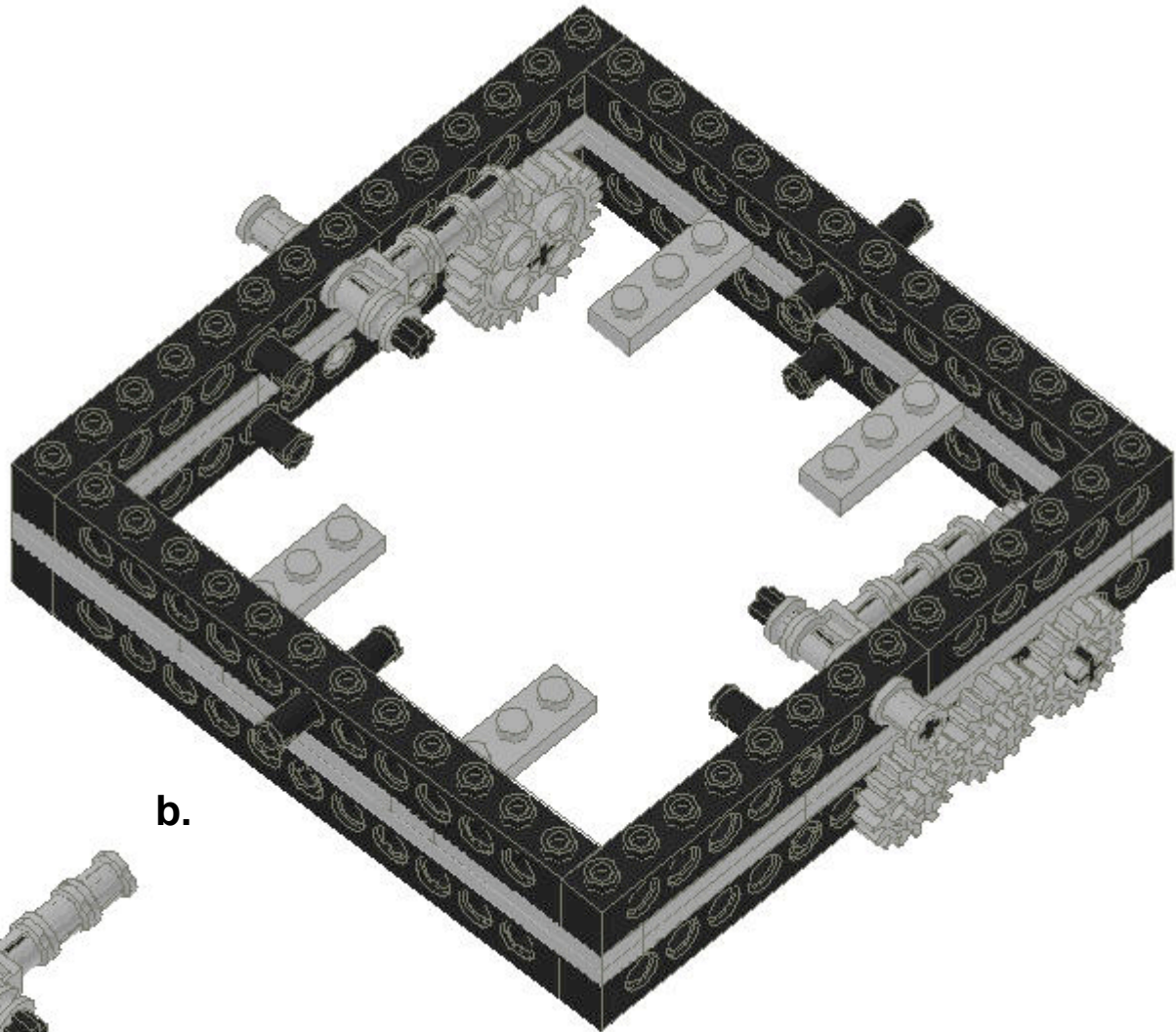
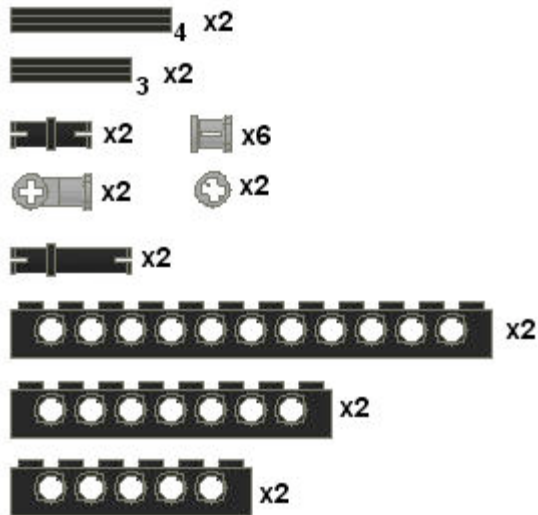


Pieces:



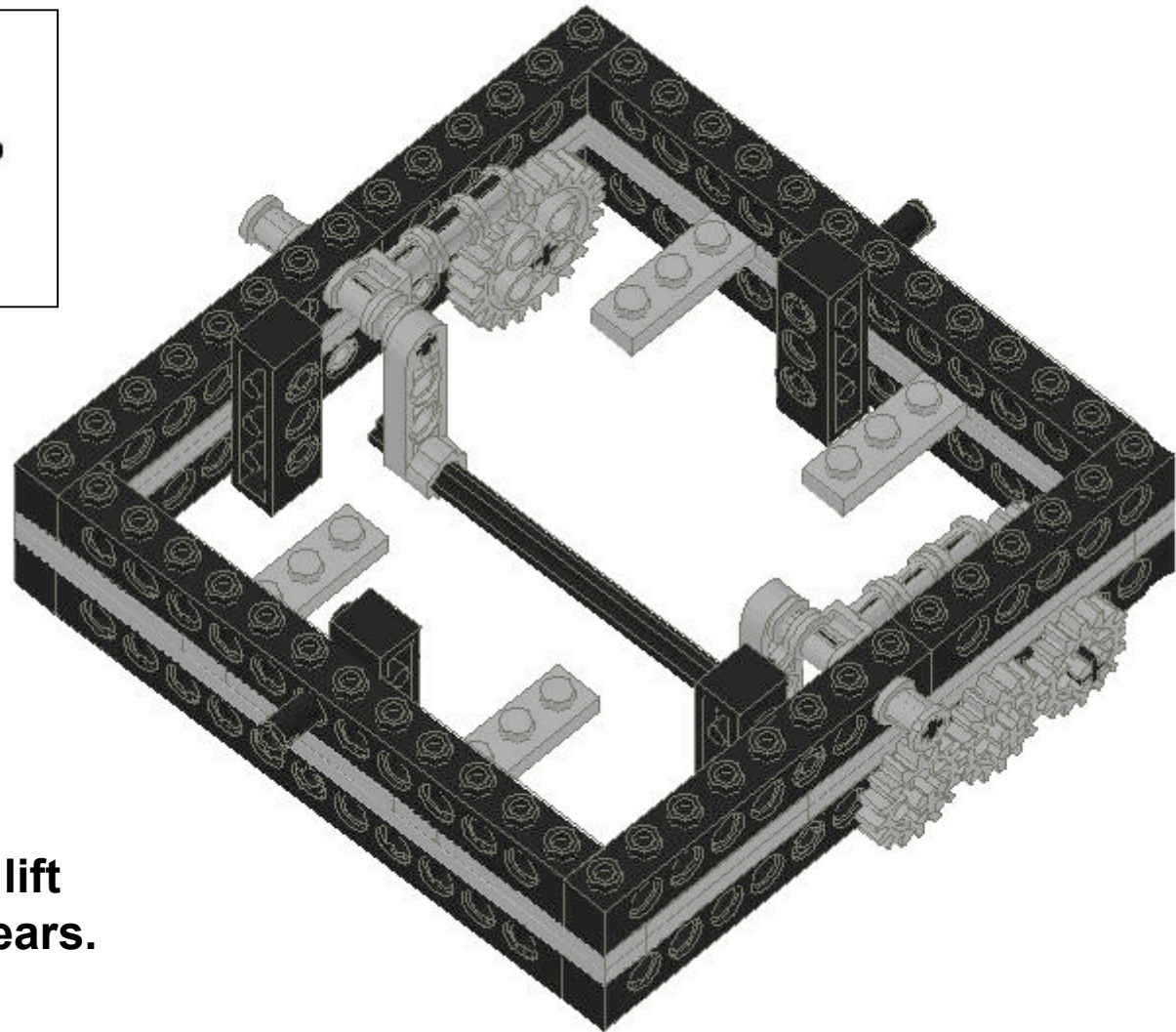
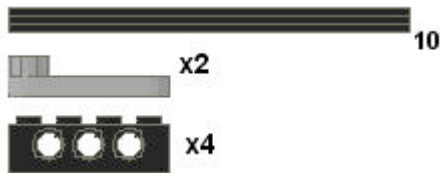
Jack and the Box: The Platform

Pieces:



Jack and the Box: The Platform

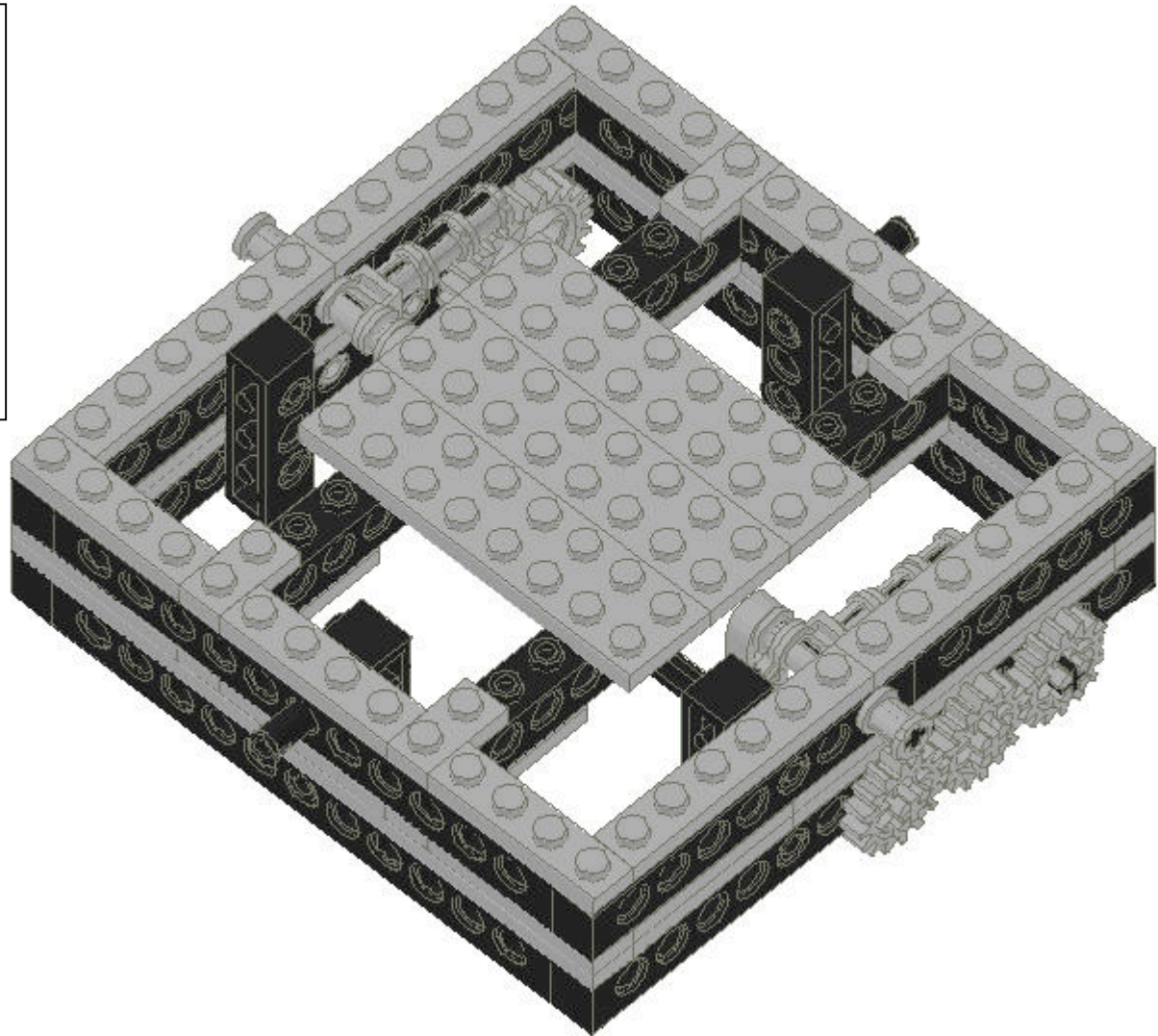
Pieces:



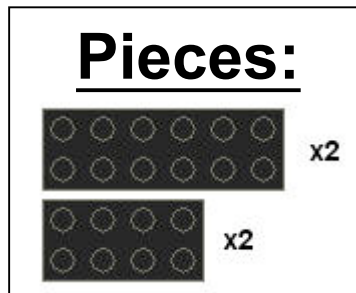
Note: Make sure the lift arm locks into the gears.

Jack and the Box: The Platform

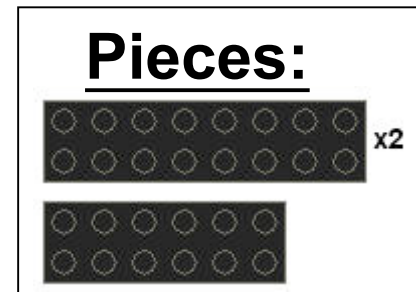
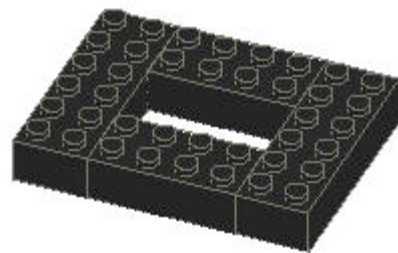
Pieces:



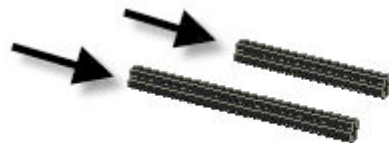
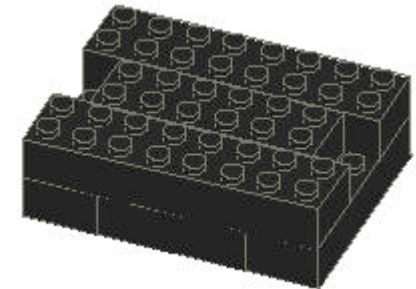
Jack and the Box: Jack



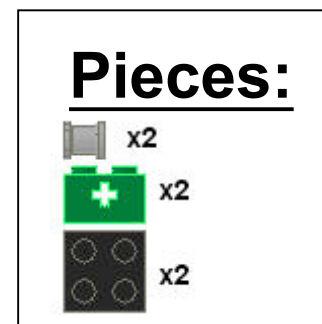
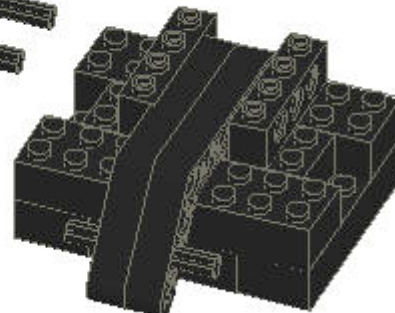
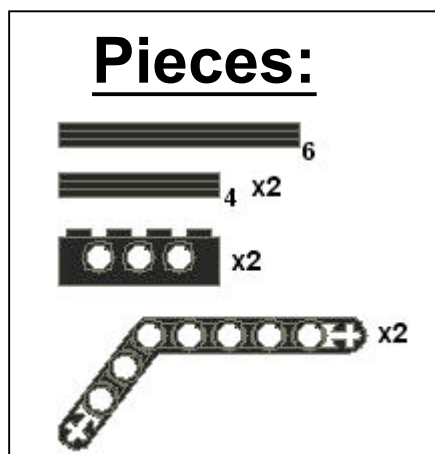
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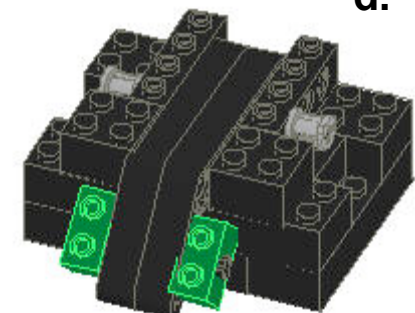
b.



c.

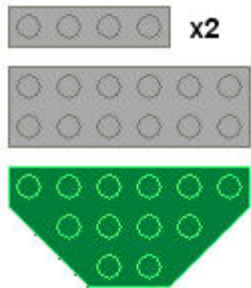


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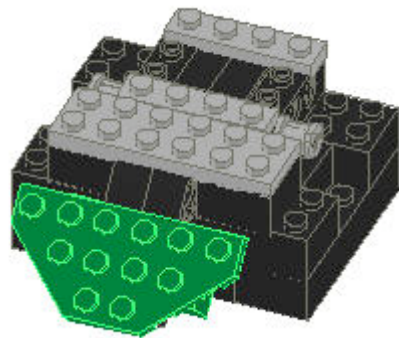


Jack and the Box: Jack

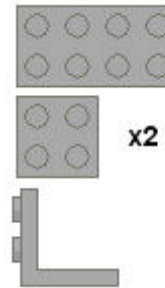
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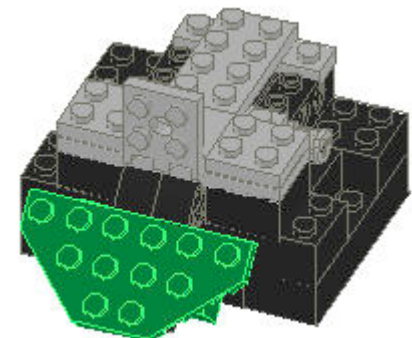
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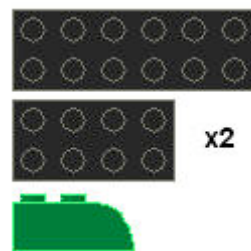
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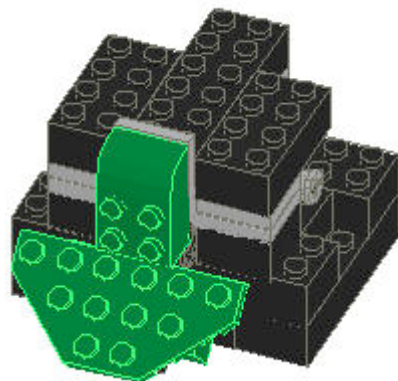
f.



Pieces:



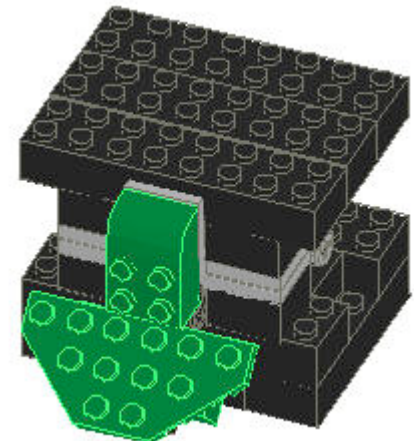
g.



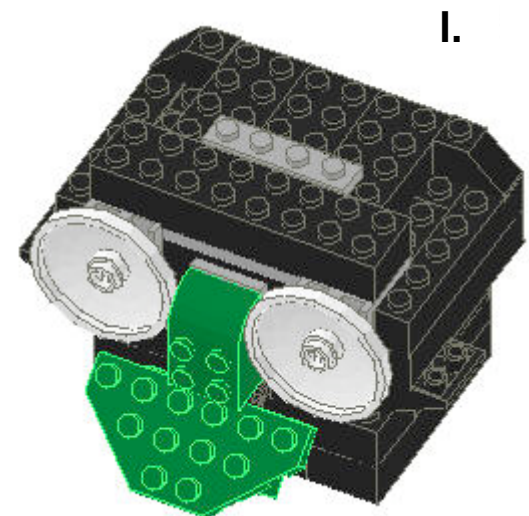
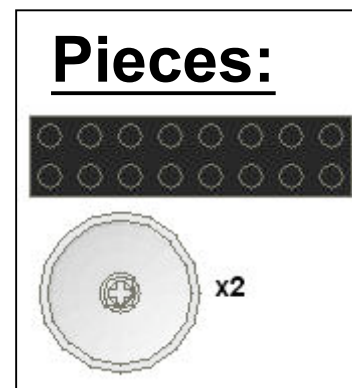
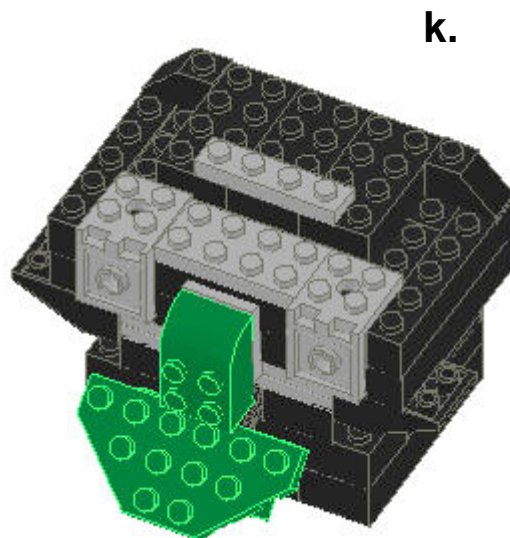
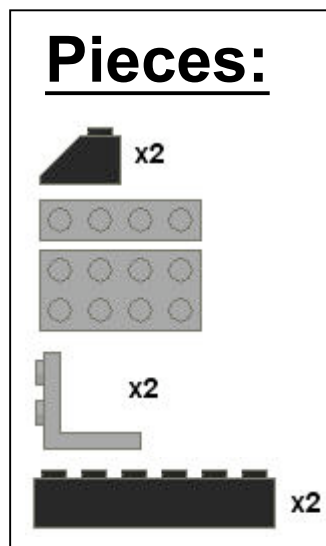
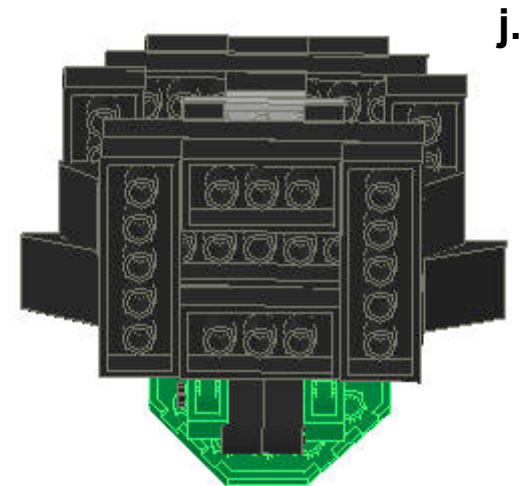
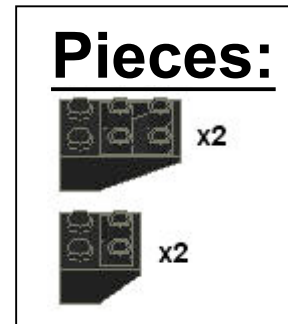
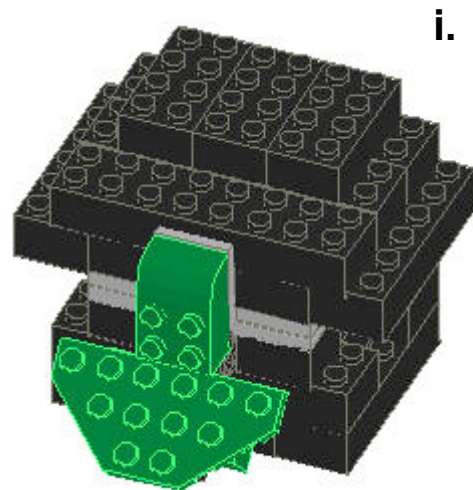
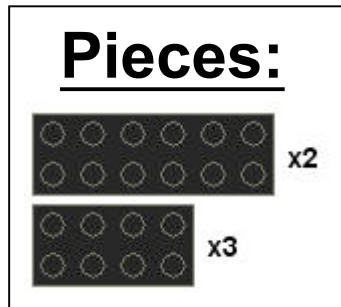
Pieces:



h.

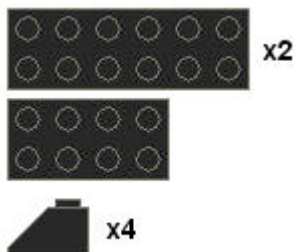


Jack and the Box: Jack

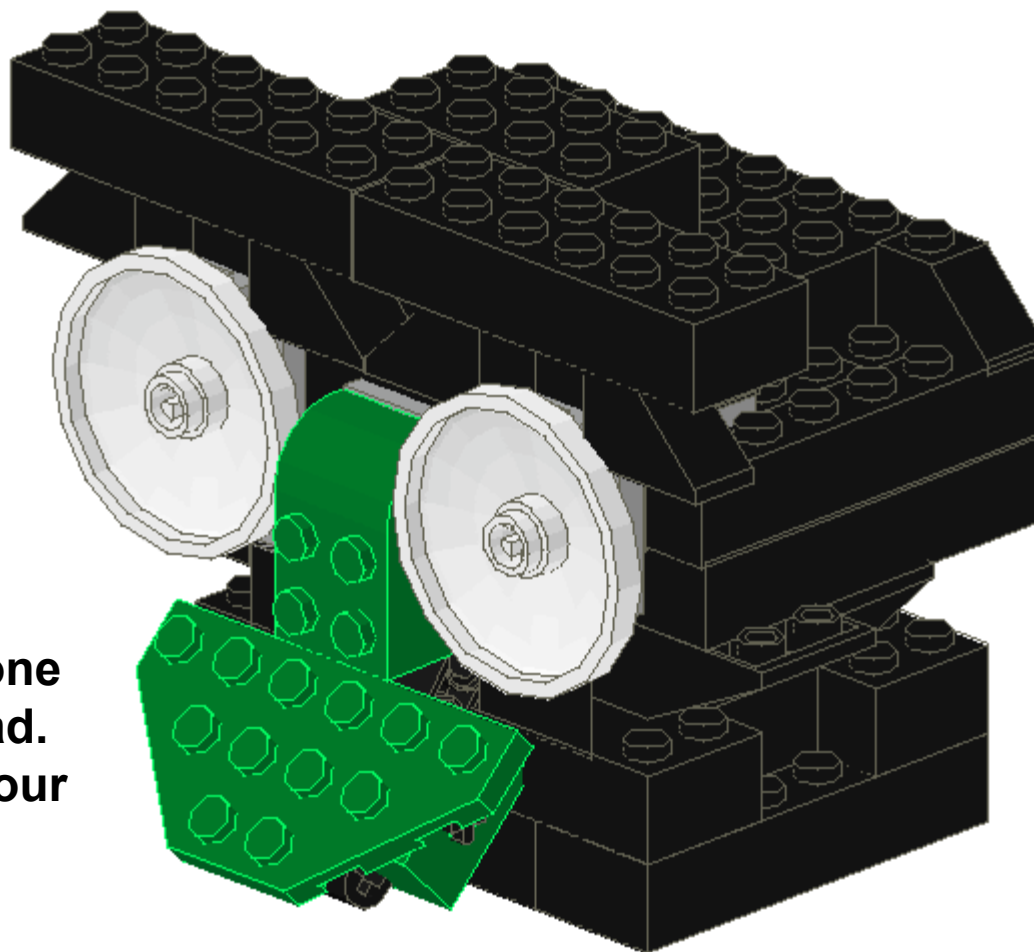


Jack and the Box: Jack

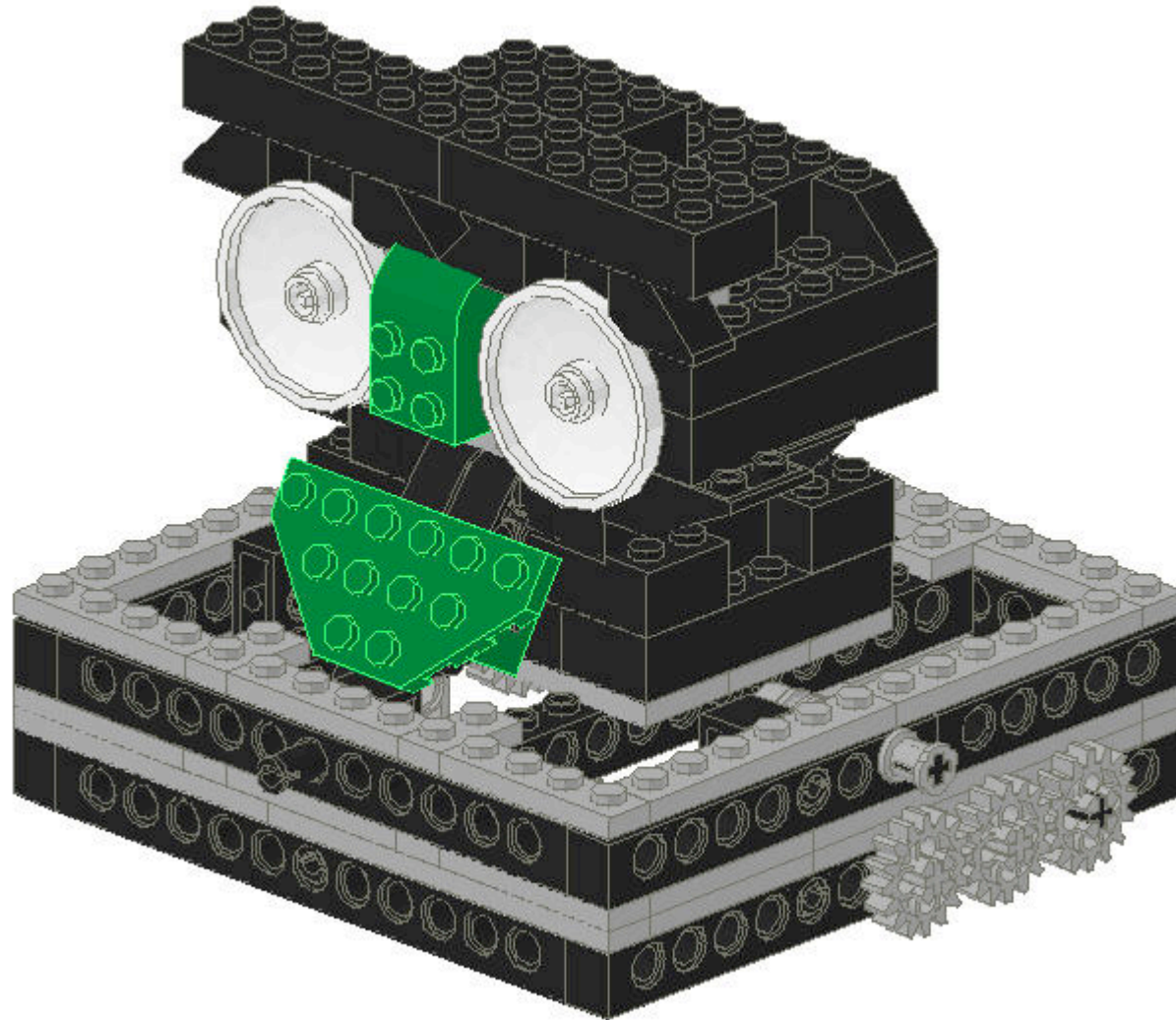
Pieces:



Note: This is just one idea for Jack's head. Be creative! Use your own design.



Jack and the Box: Jack



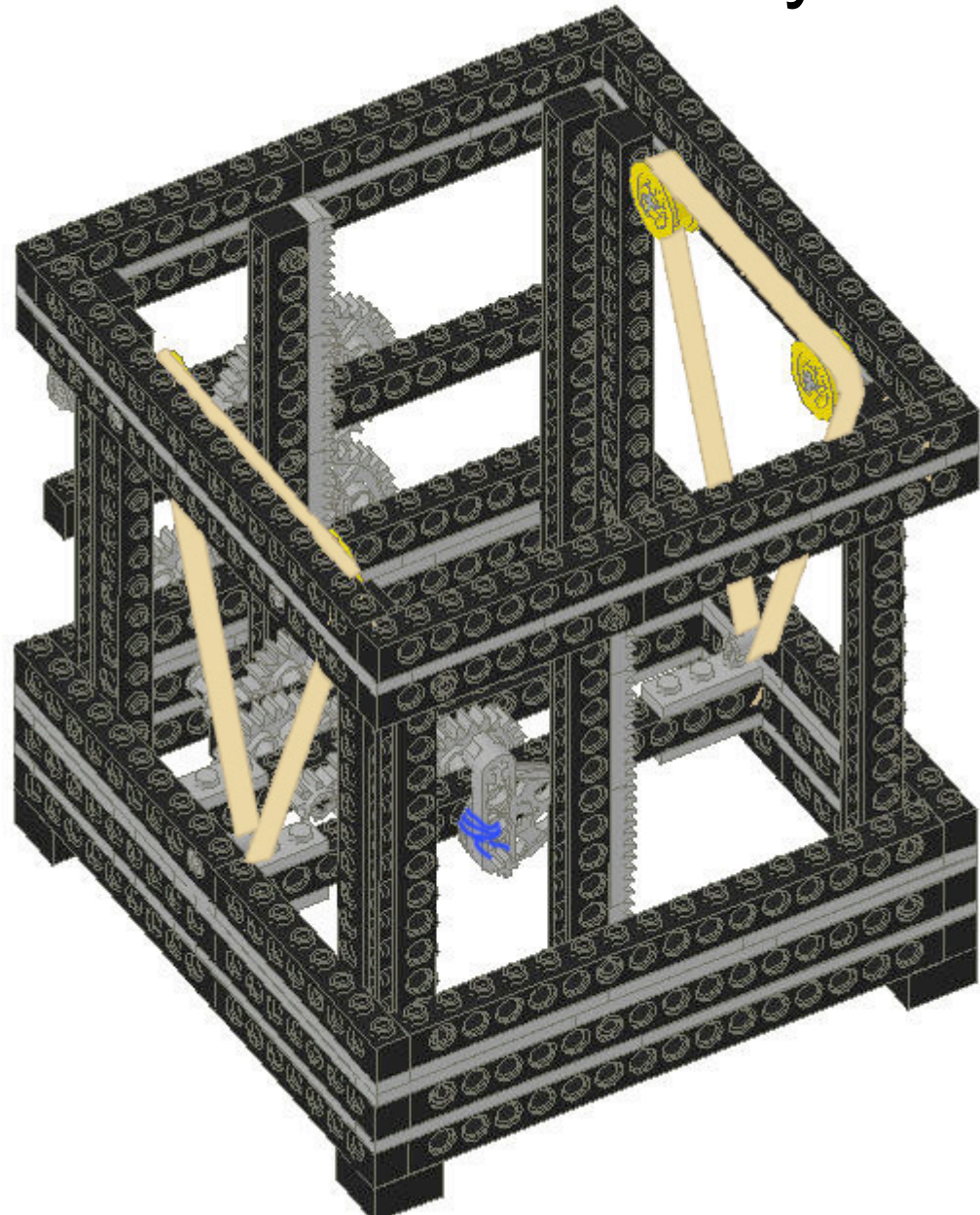
Jack and the Box: Assembly

Pieces:



x2

2-3" long Rubber Bands



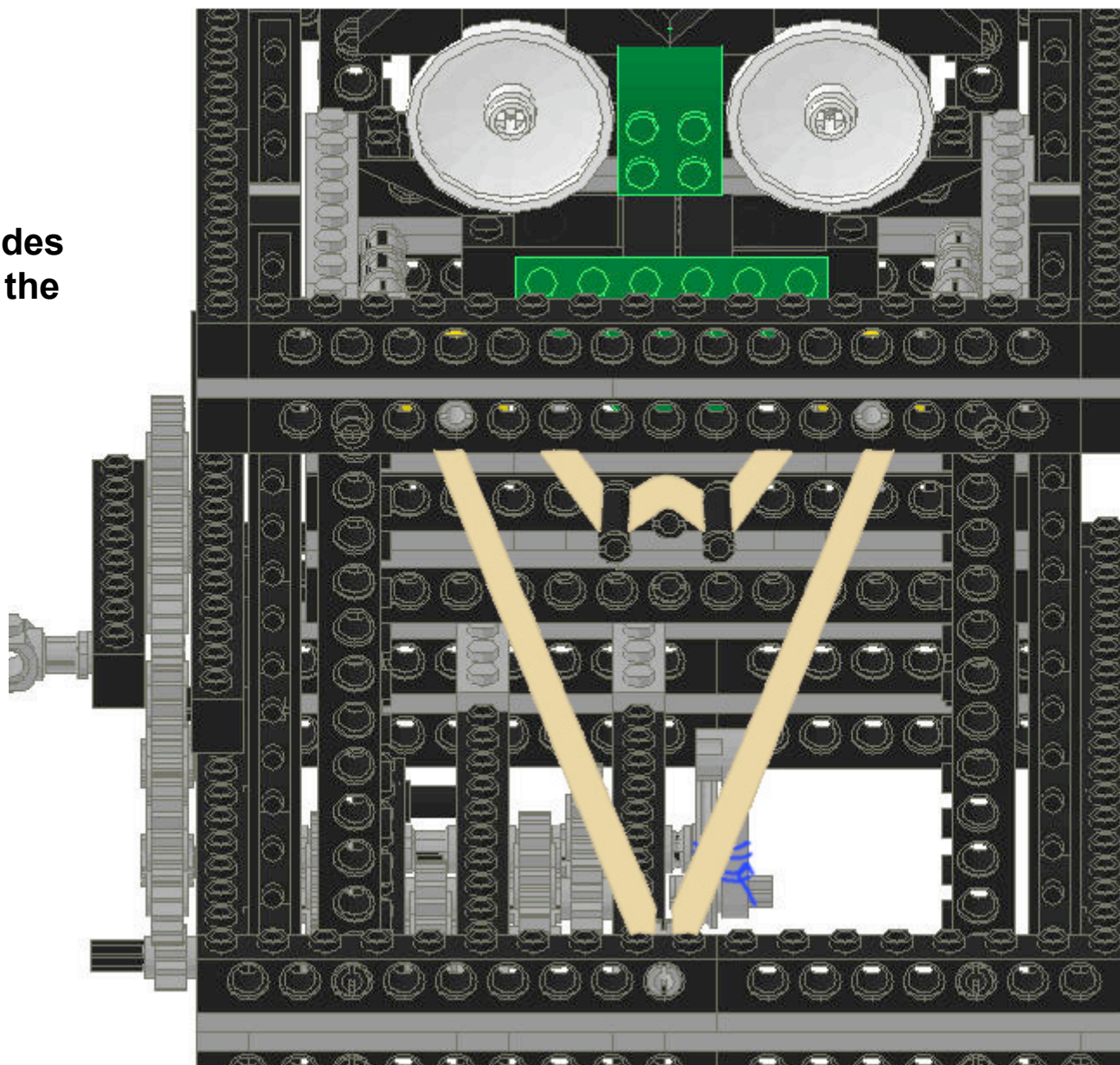
Jack and the Box: Assembly

Pieces:



x2

Note: After Jack slides into his box, insert the pegs as shown.



Jack and the Box: Assembly

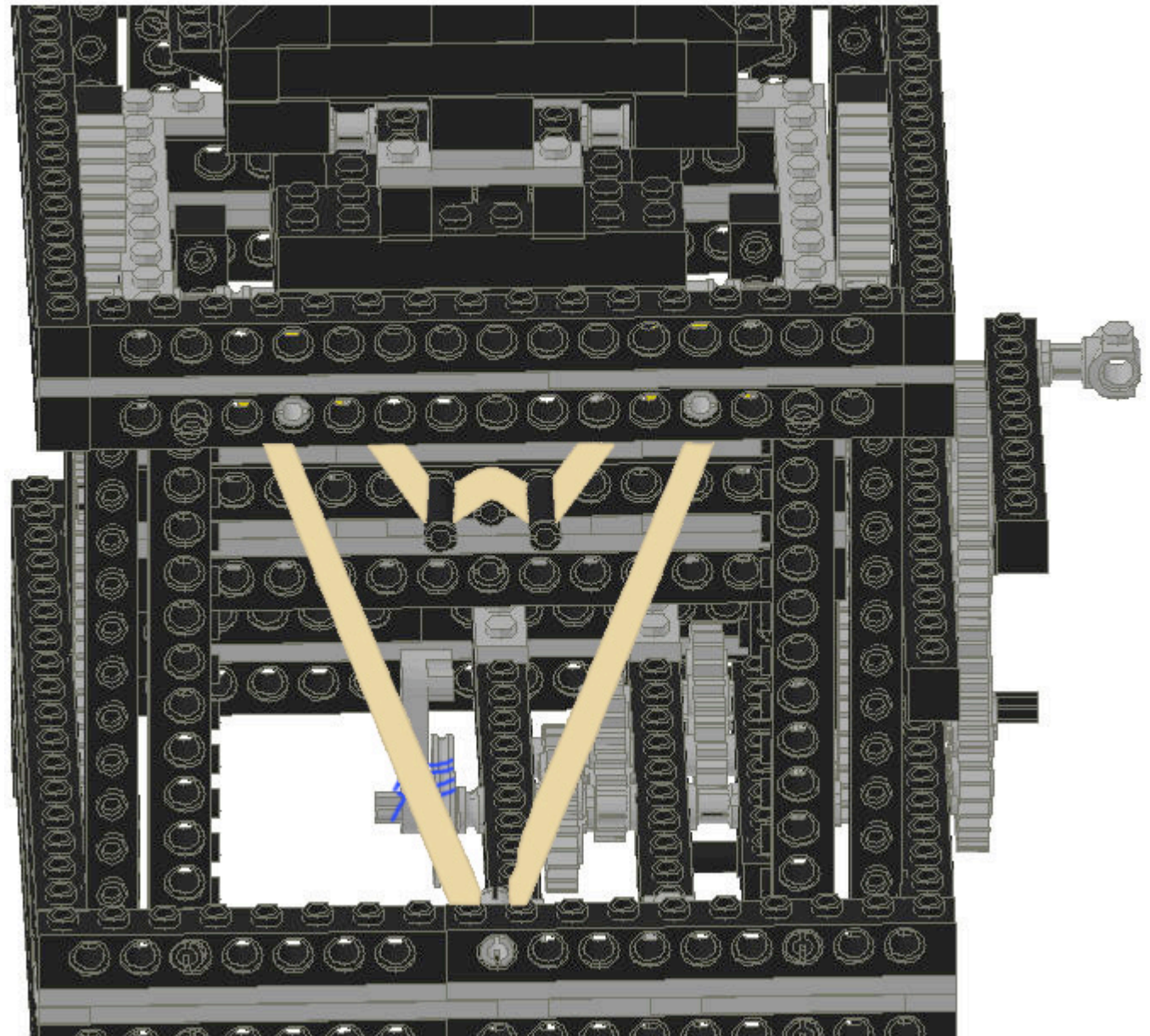
Pieces:



x2

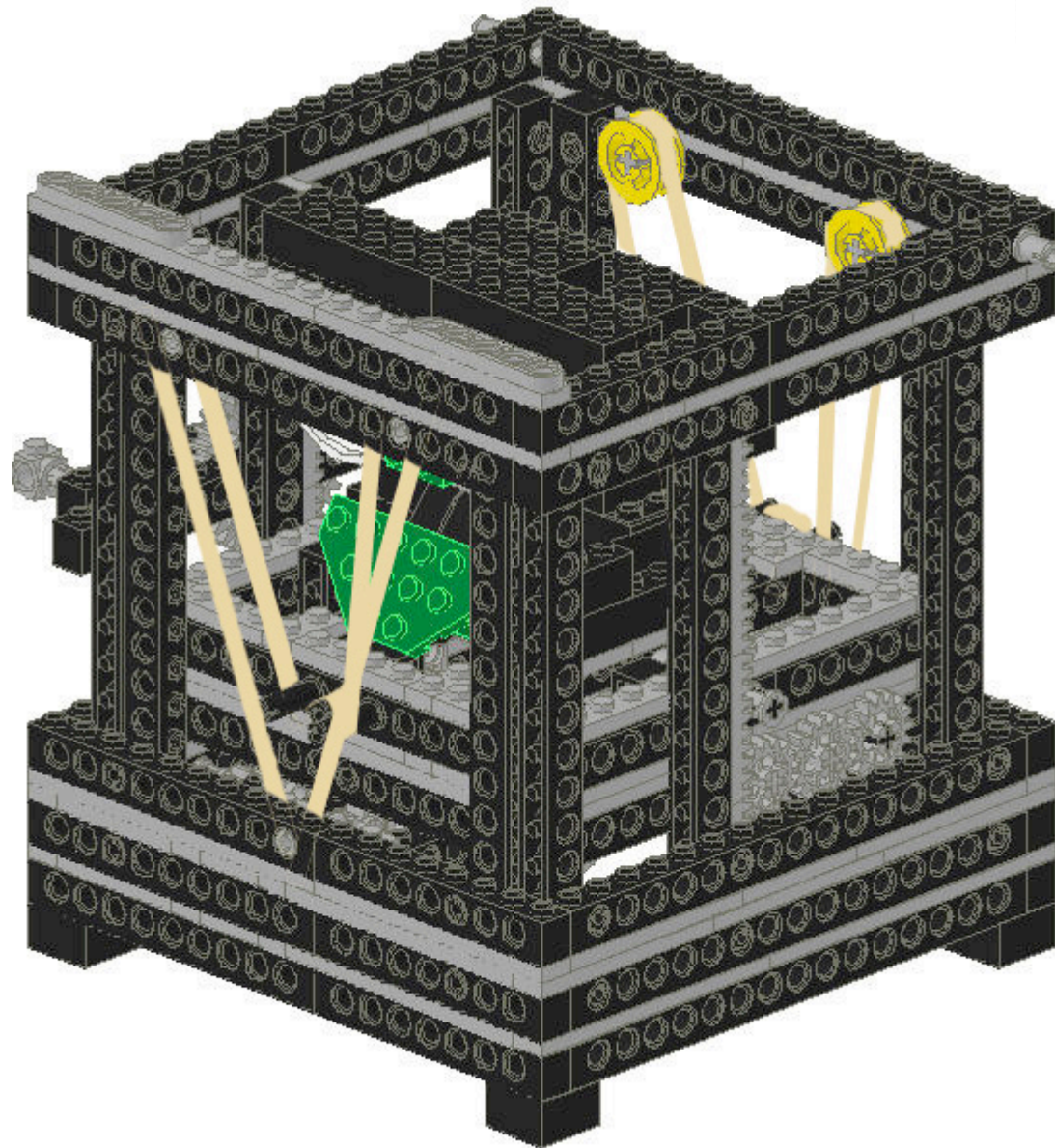
This is the same procedure as step 31, but on the other side.

After both rubber bands are attached to Jack, test everything out. As you push Jack down, the gears should lock him in place. He will need to be pushed all the way down in order to be triggered by the crank. Make sure you understand how everything works before you proceed.



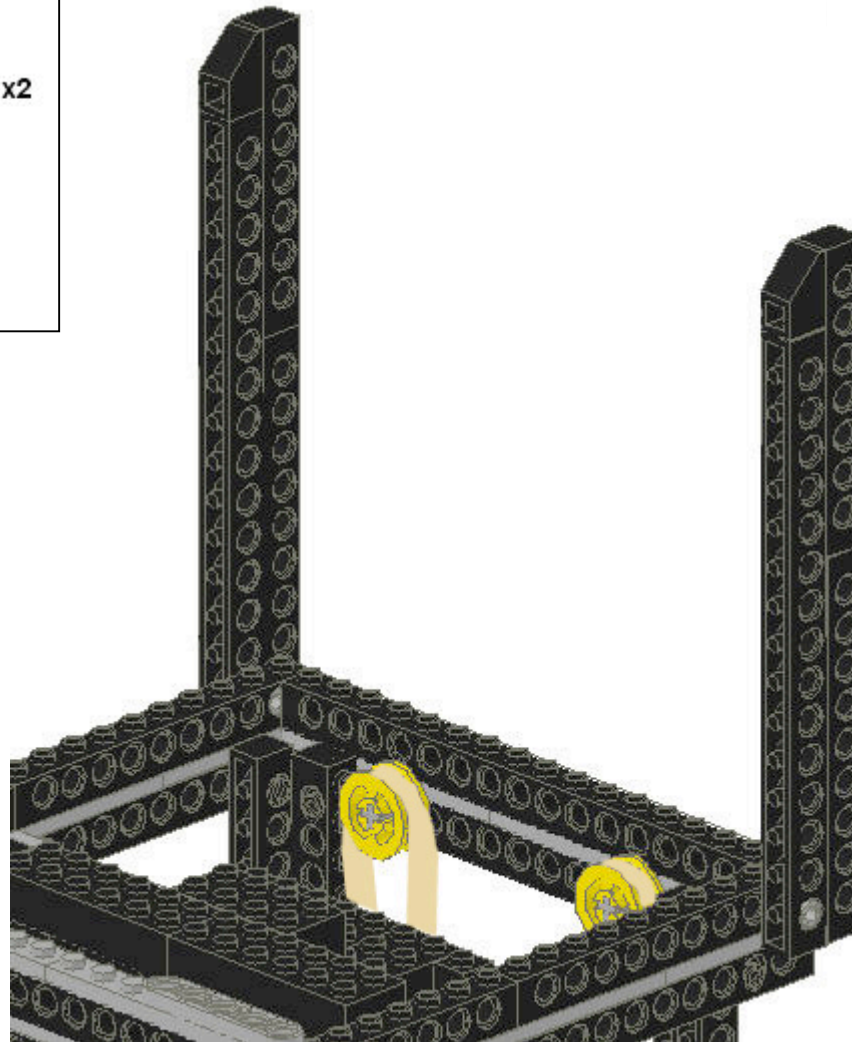
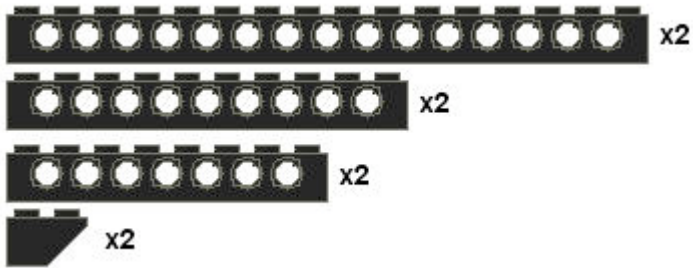
Jack and the Box: Assembly

Pieces:



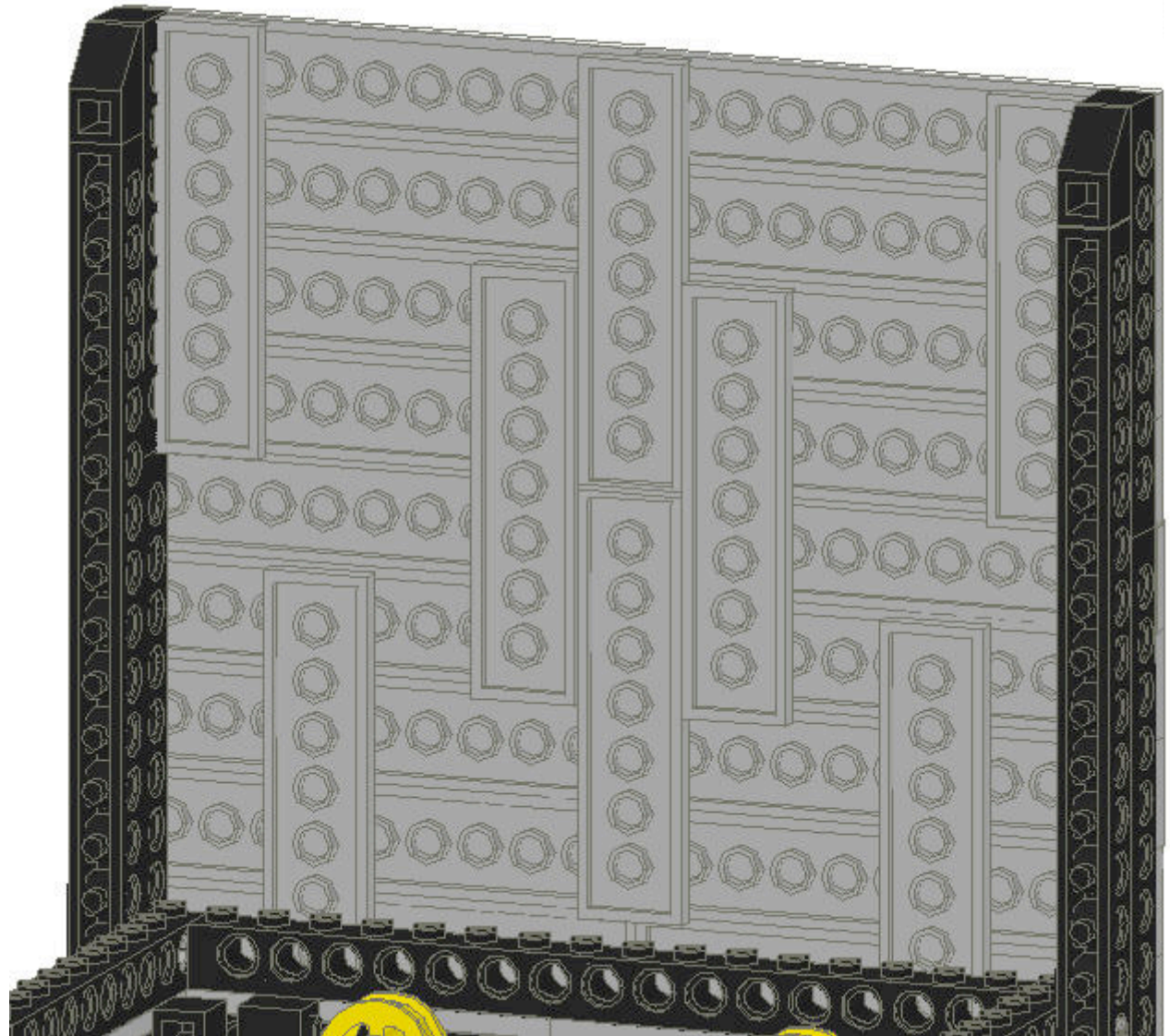
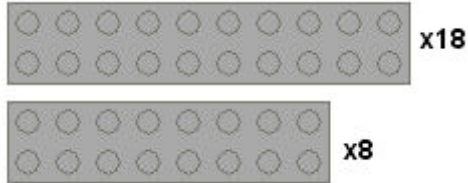
Jack and the Box: Assembly

Pieces:



Jack and the Box: Assembly

Pieces:

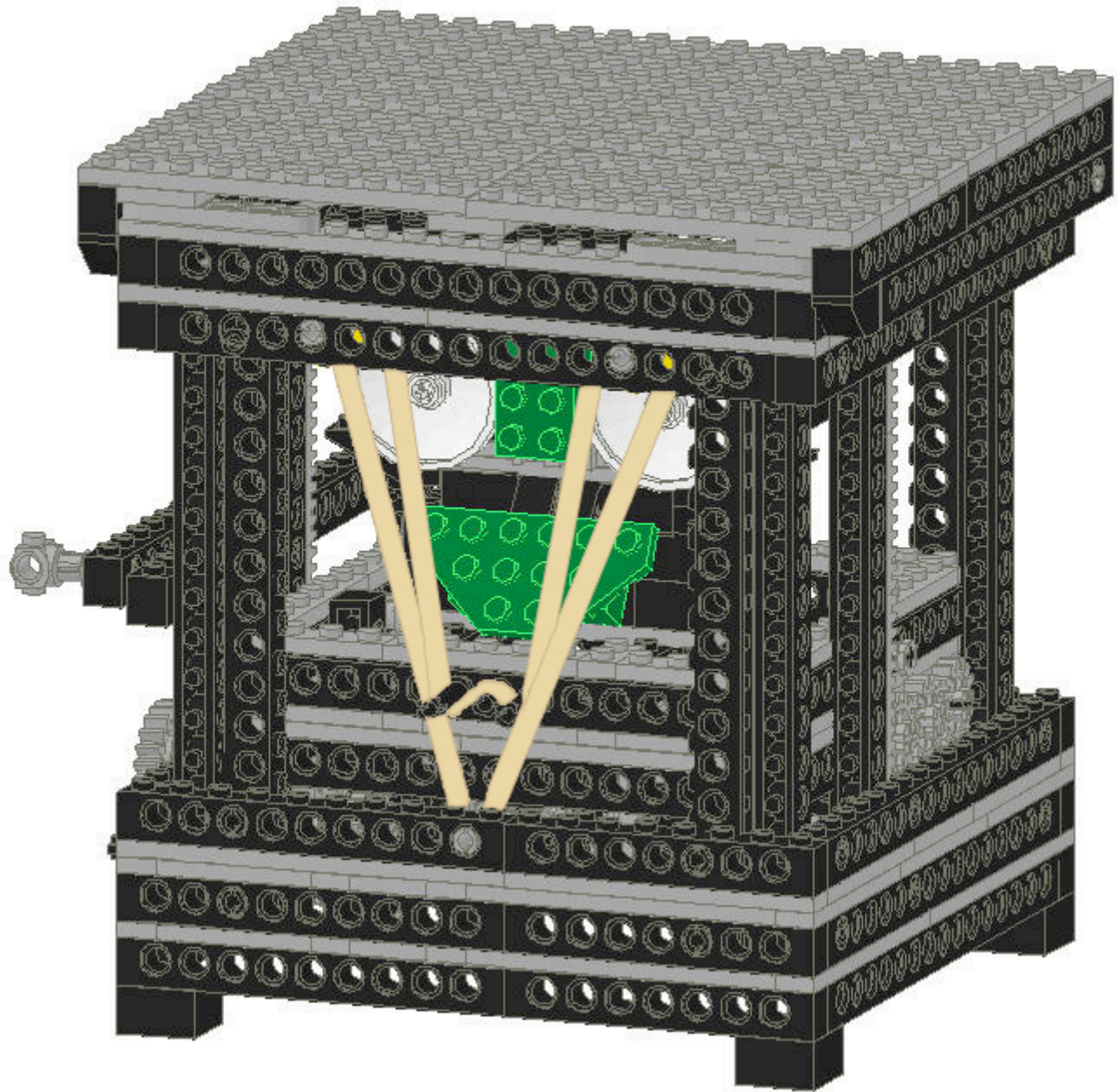


Jack and the Box: Assembly

Troubleshooting:

If Jack doesn't shoot up:

- Make sure that the crank is triggering Jack
- Add Stronger rubber bands
- Try looking underneath as the crank turns to make sure all the gears are turning.



Building Smart Structures

Moving Parts

How to build a stair Climber

Pieces:

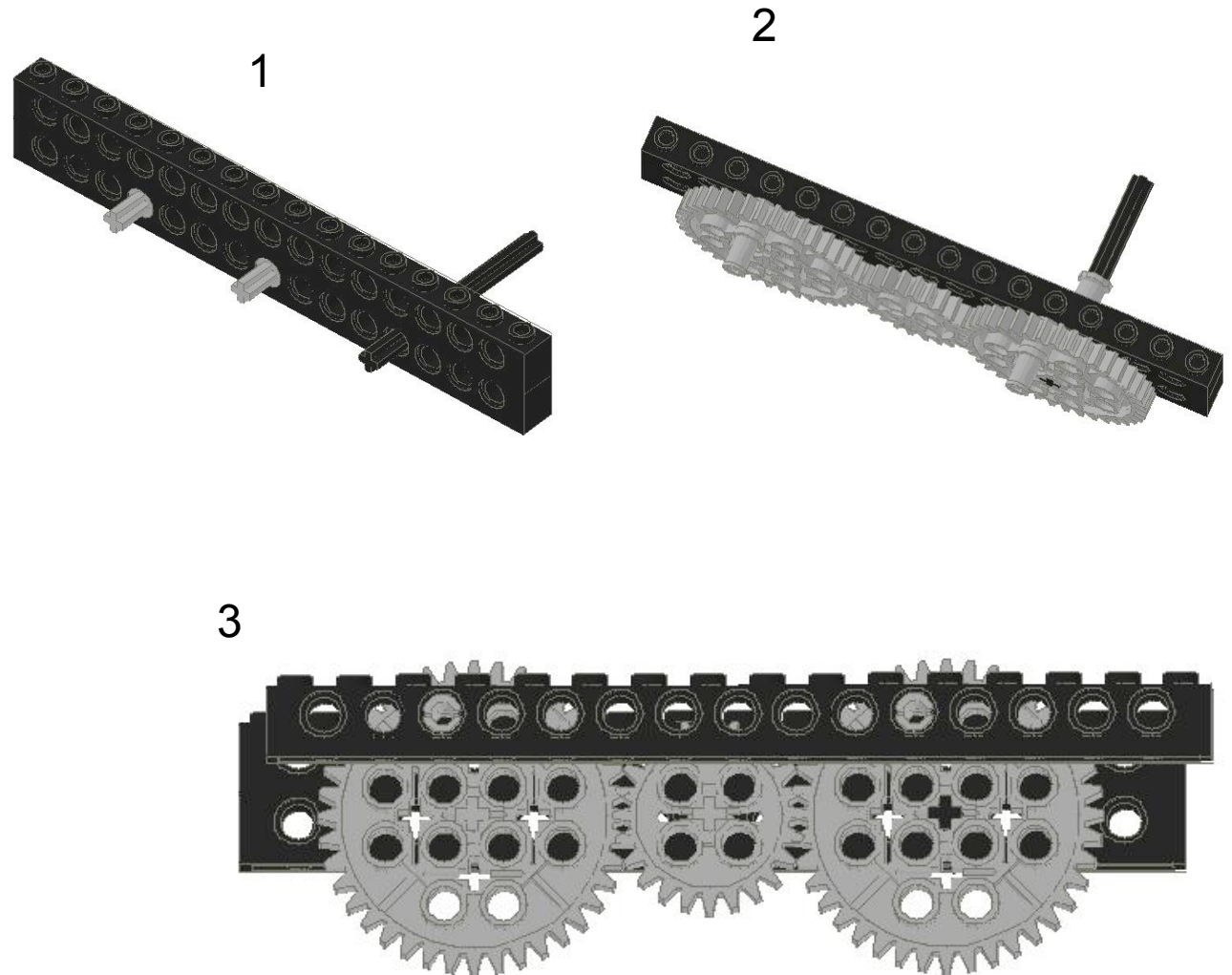
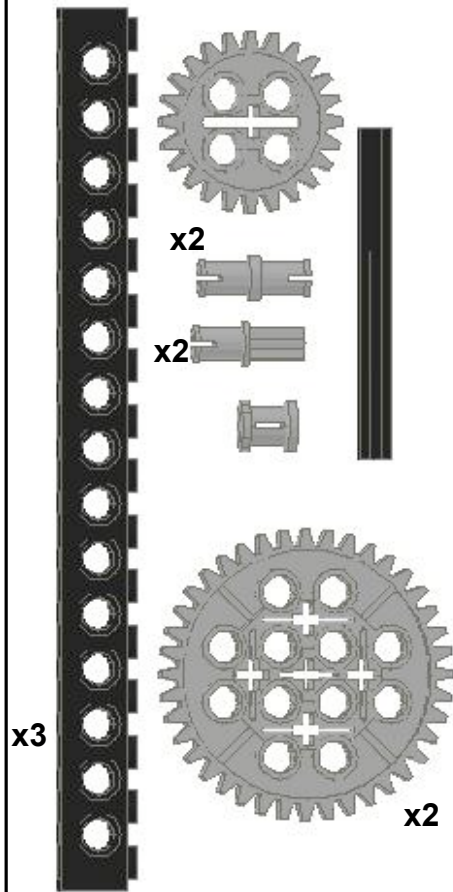
Key Words:

Miscellaneous

Moving Parts

Train Wheels

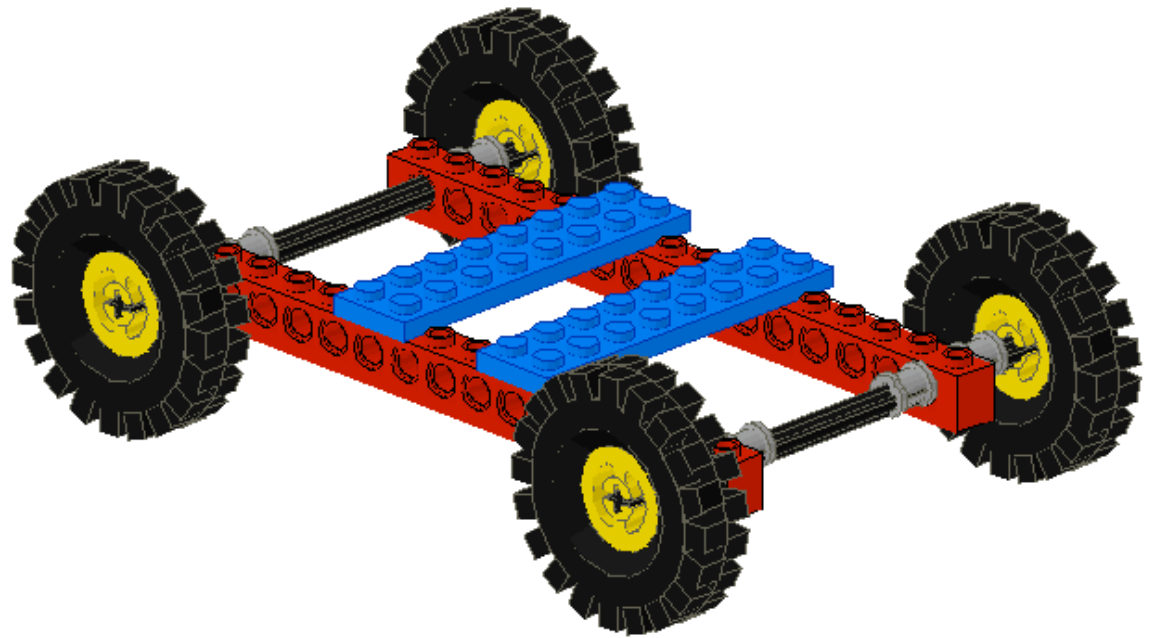
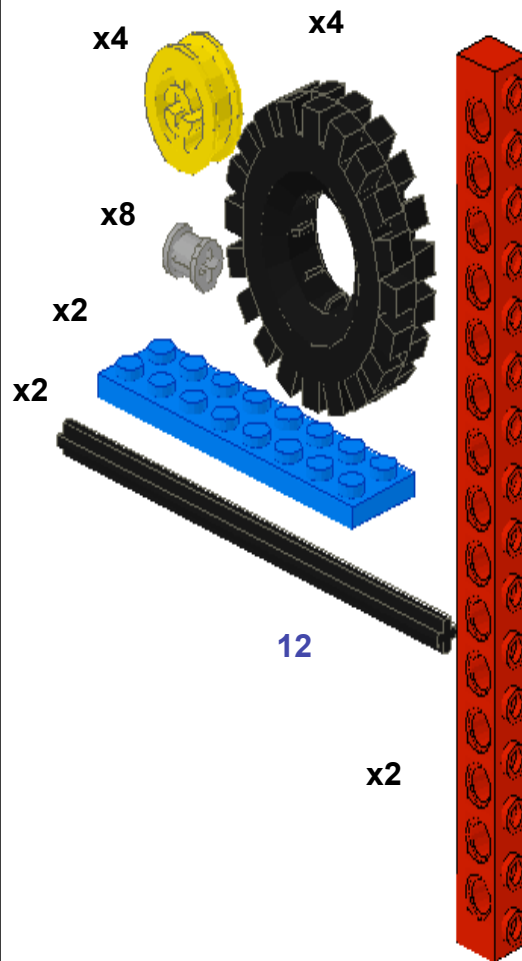
Pieces:



Our Favorite Things

Basic Lego Car (no motors)

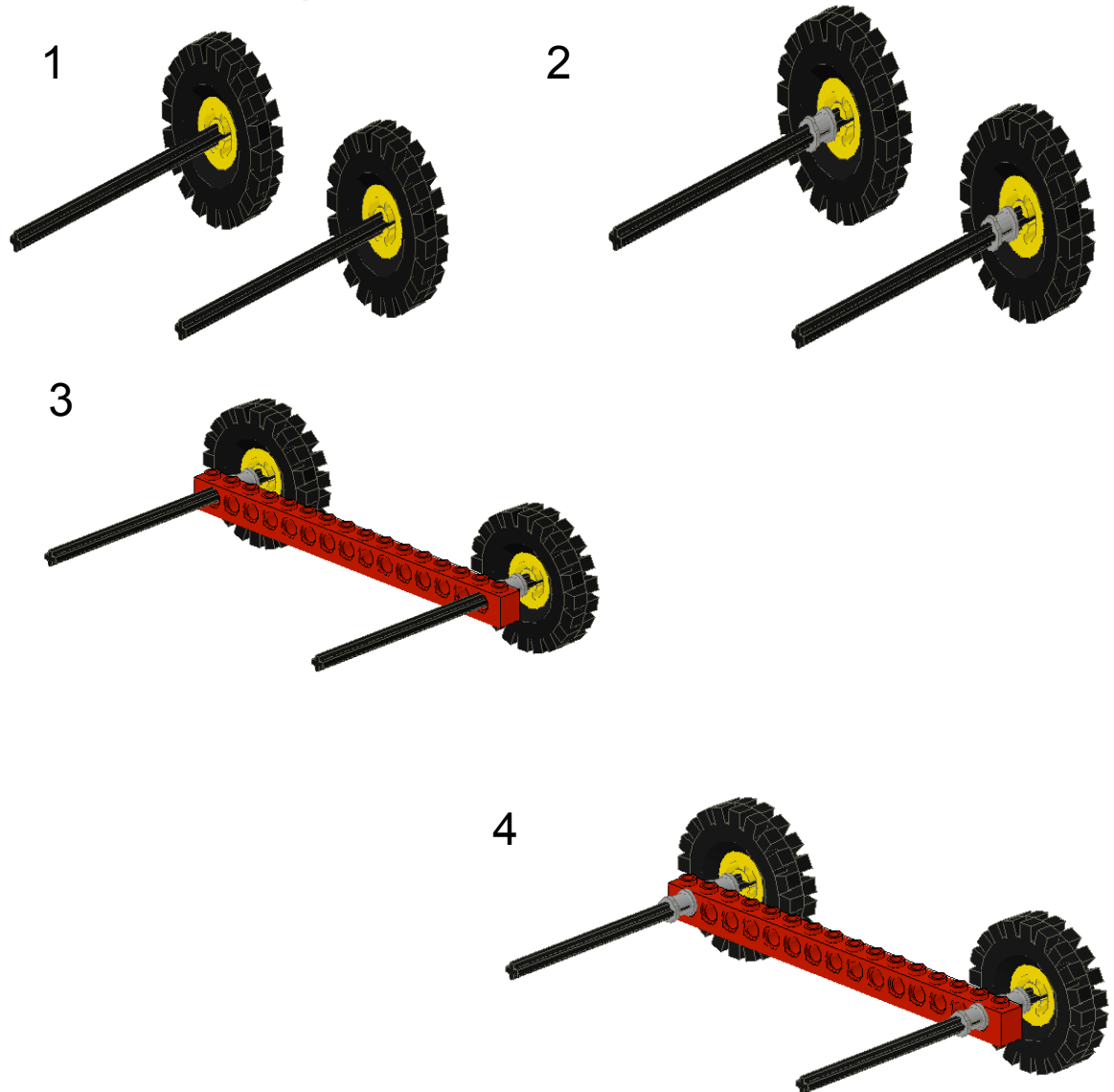
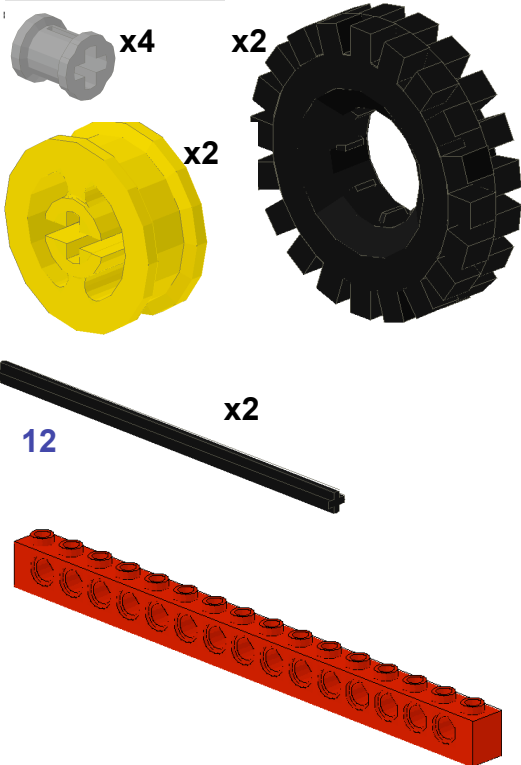
Pieces:



Our Favorite Things

Basic Lego Car

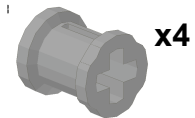
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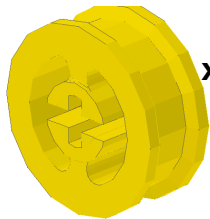
Our Favorite Things

Basic Lego Car

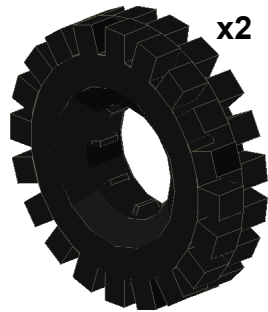
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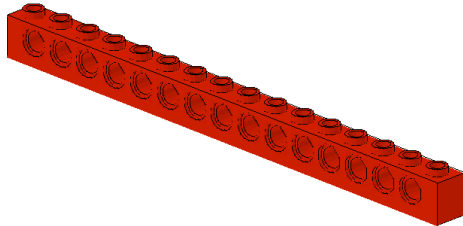
x4



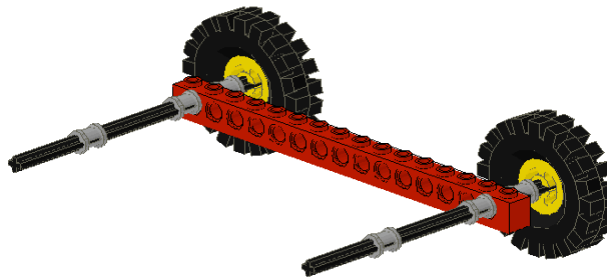
x2



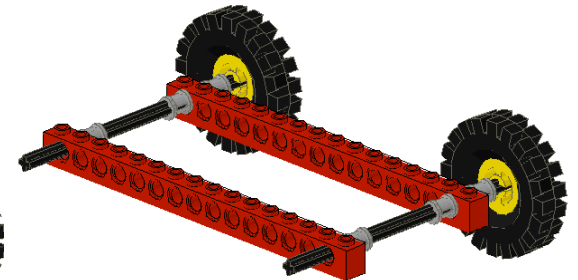
x2



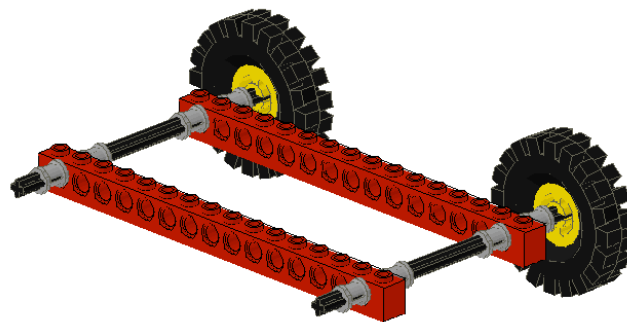
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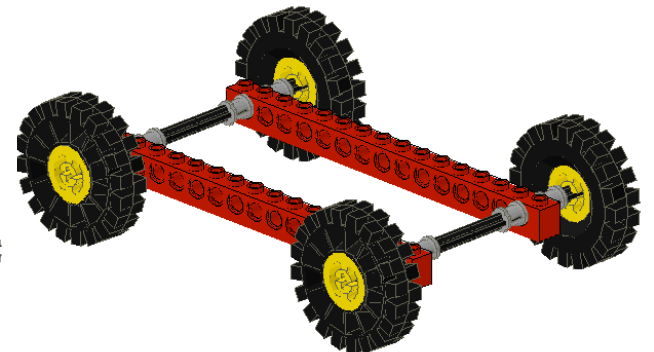
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7



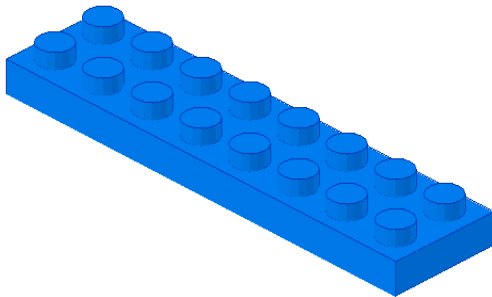
8



Our Favorite Things

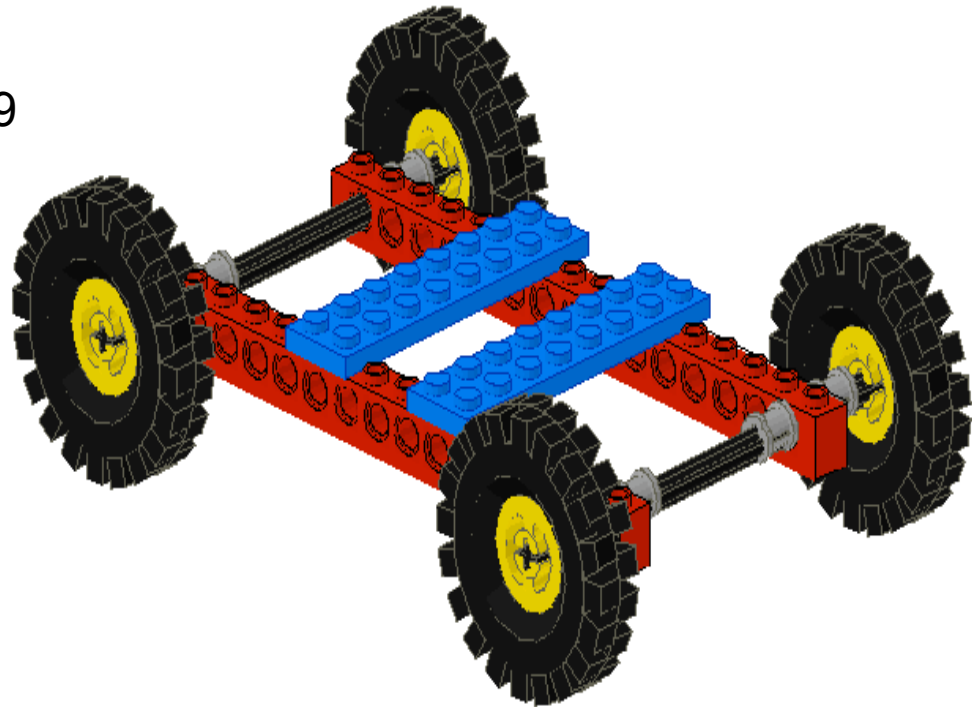
Basic Lego Car

Pieces:



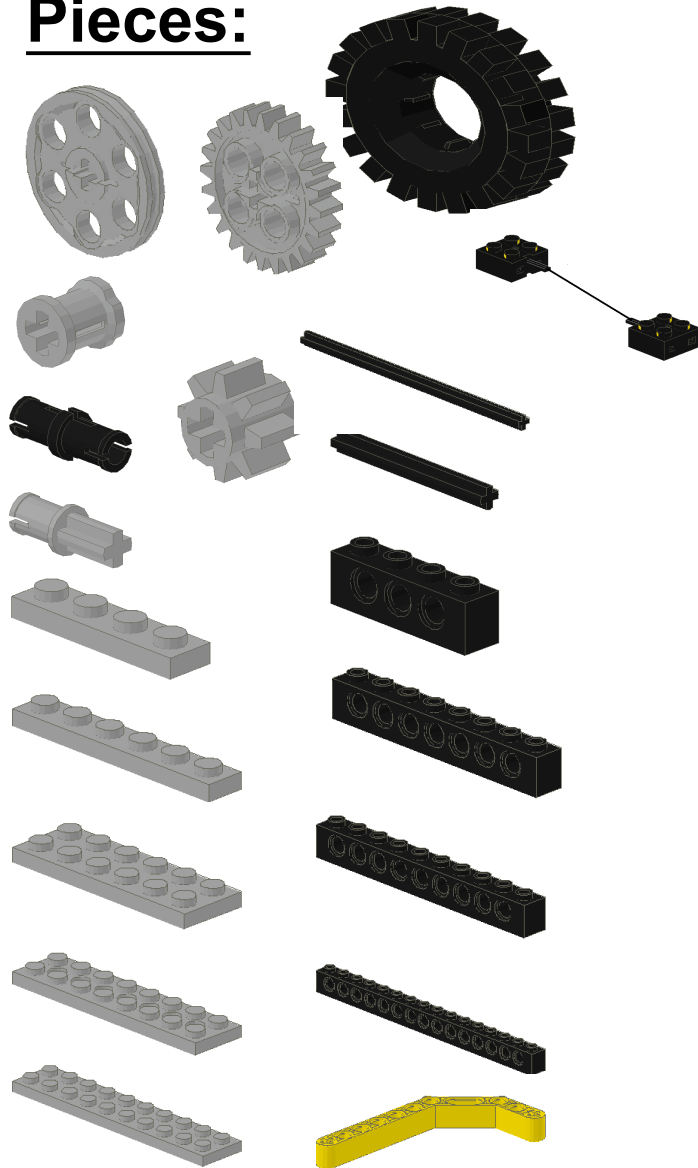
x2

9

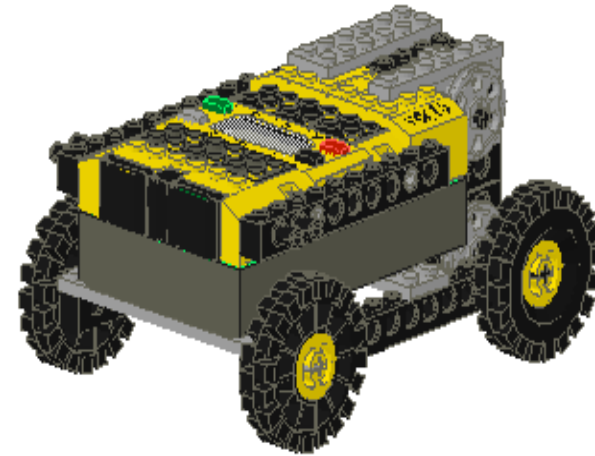


Our Favorite Things

Pieces:



Pulley Car



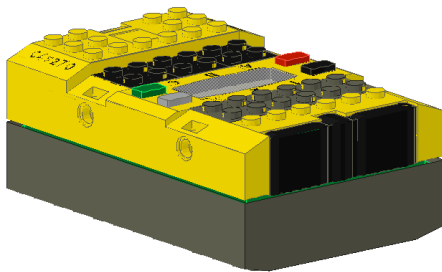
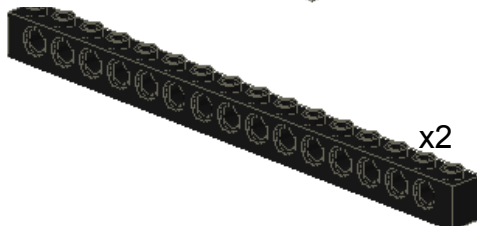
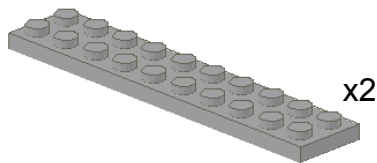
Note: In order to do this project you should review the following concepts: Pulleys

Key Words:

Pulley

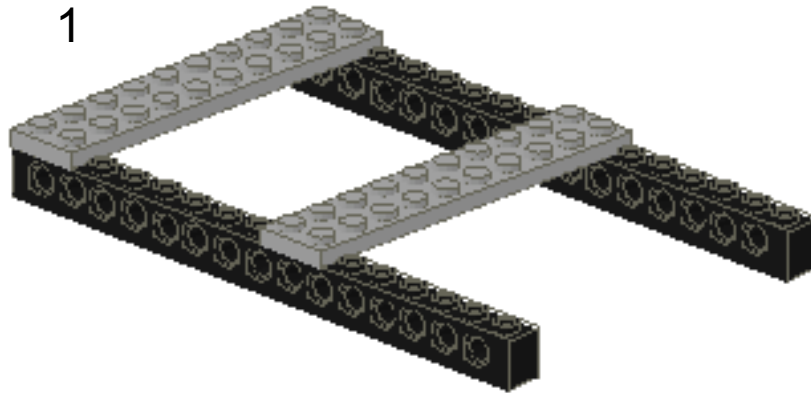
Our Favorite Things

Pieces:

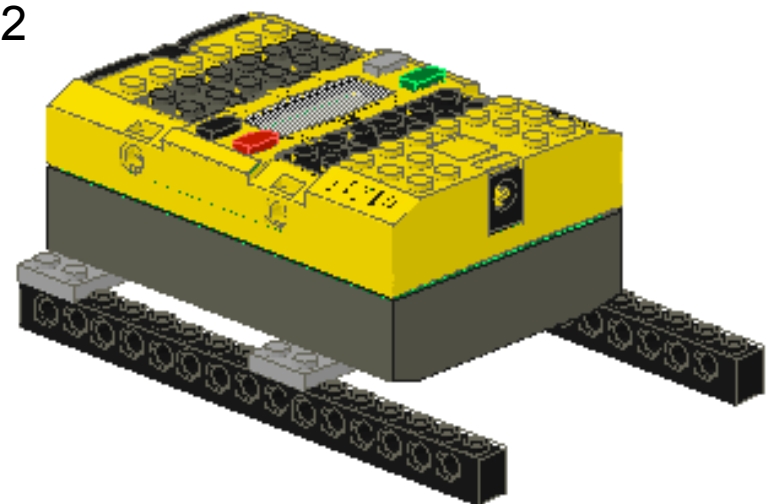


Pulley Car

1

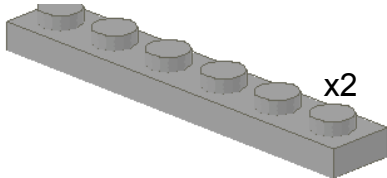
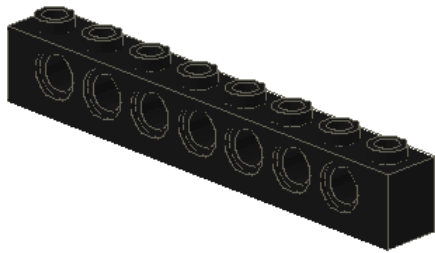


2



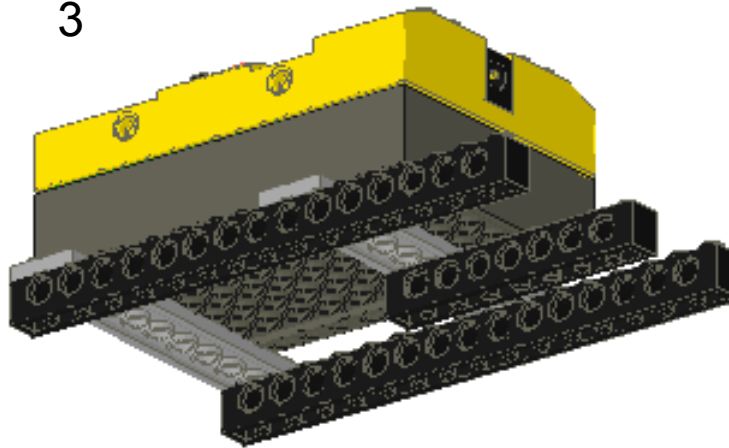
Our Favorite Things

Pieces:

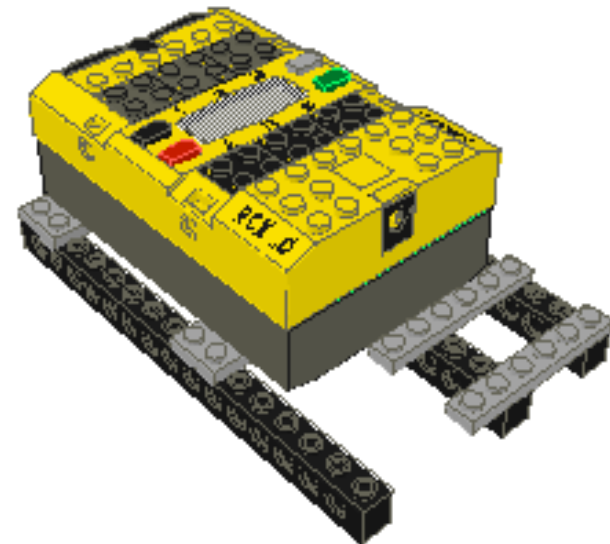


Pulley Car

3

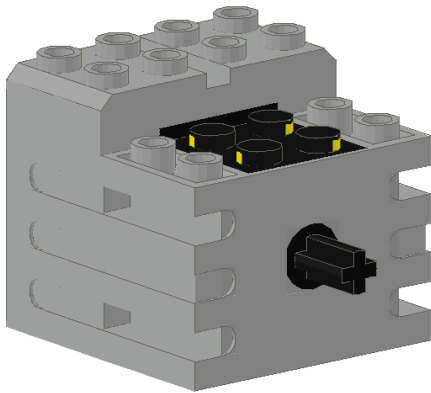
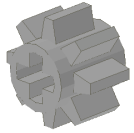


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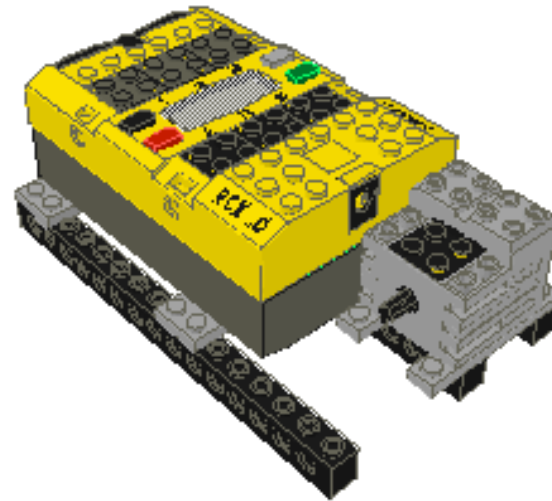
Our Favorite Things

Pieces:

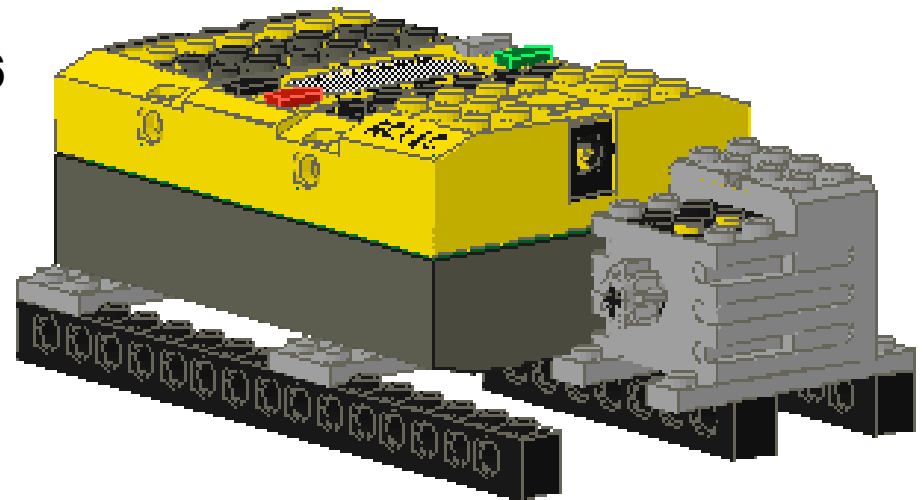


Pulley Car

5

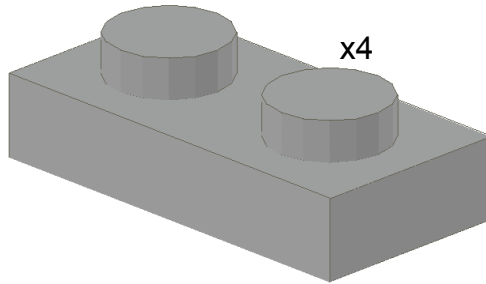


6



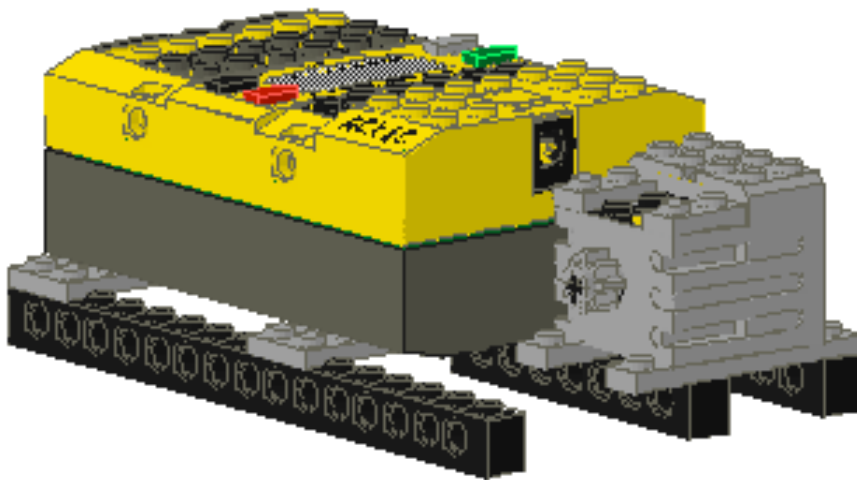
Our Favorite Things

Pieces:

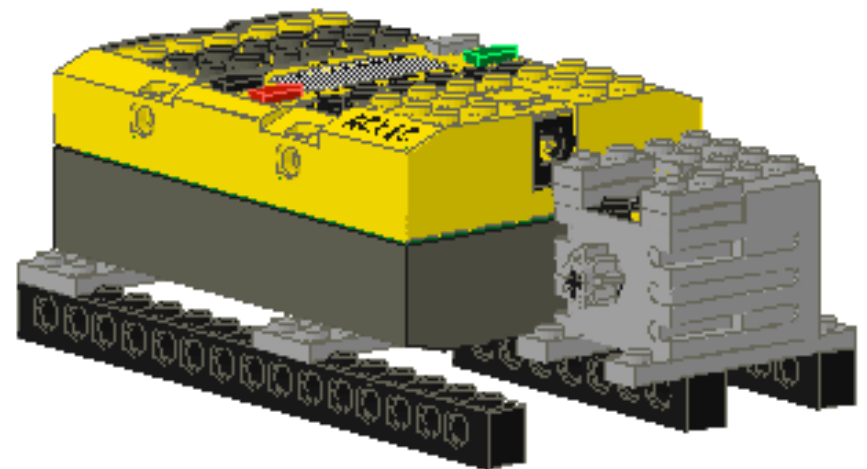


Pulley Car

7

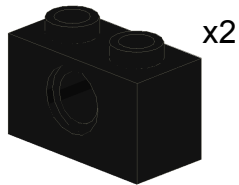
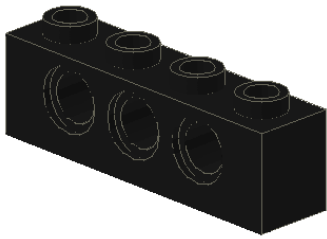


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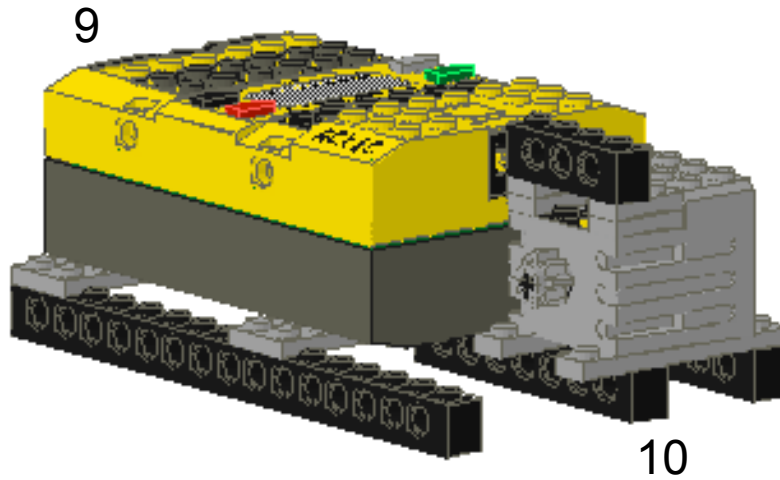
Our Favorite Things

Pieces:



x2

Pulley Car

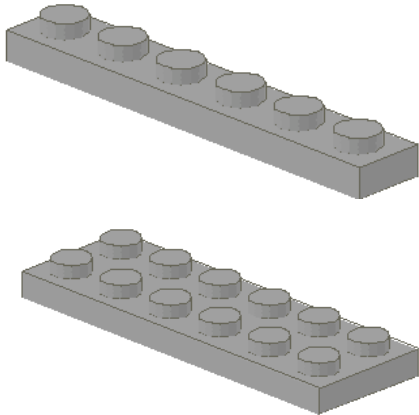


10



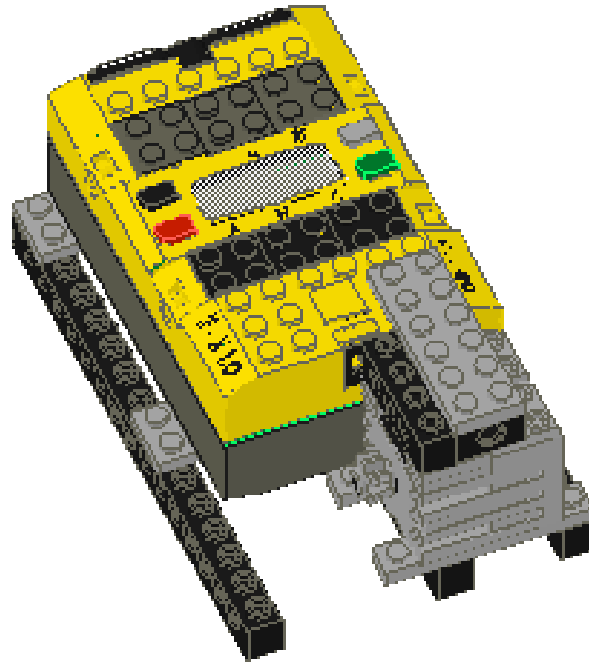
Our Favorite Things

Pieces:

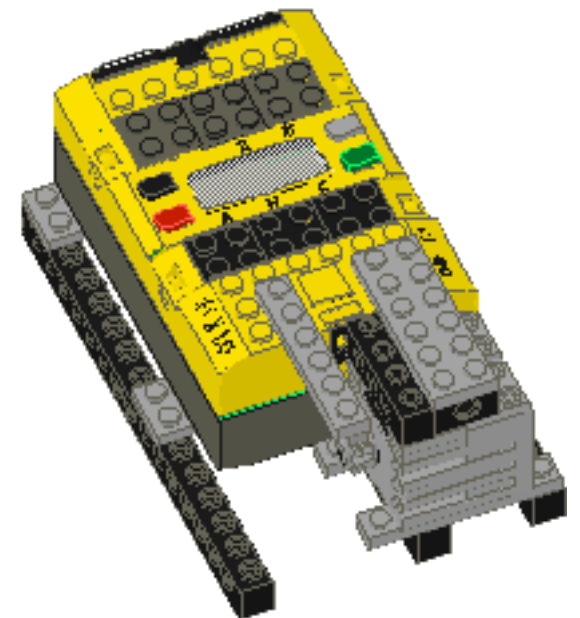


Pulley Car

11

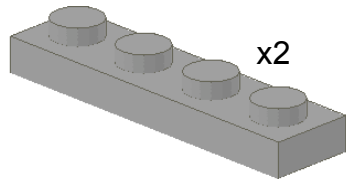


12



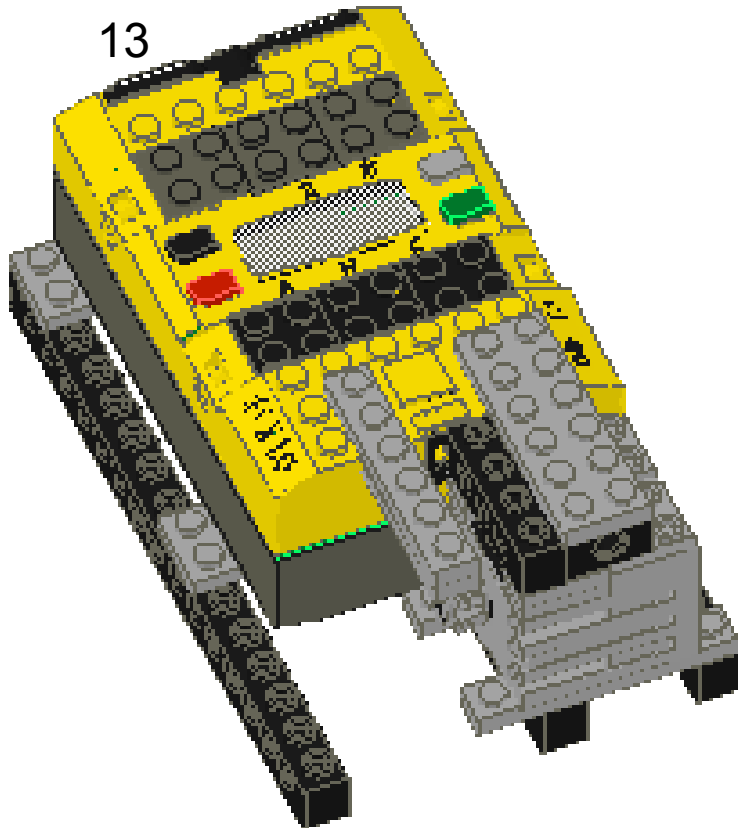
Our Favorite Things

Pieces:

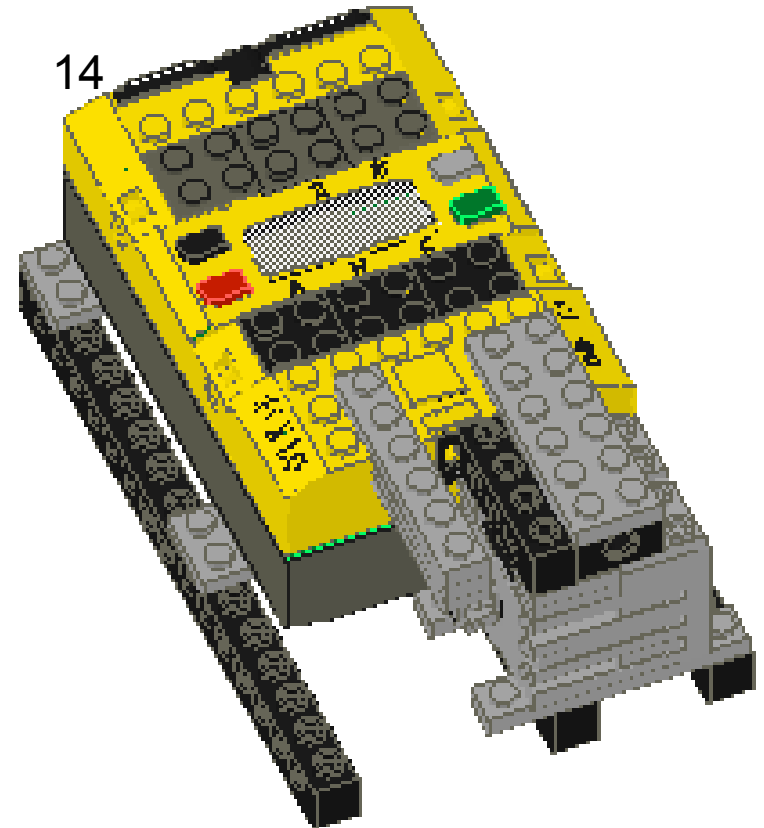


Pulley Car

13

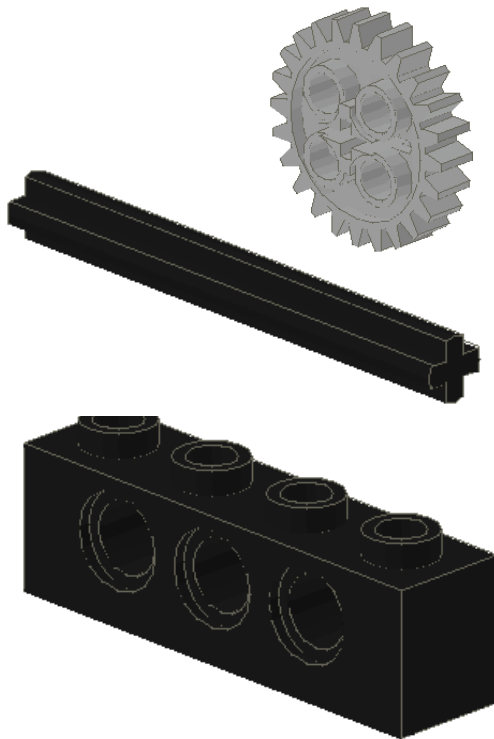


14



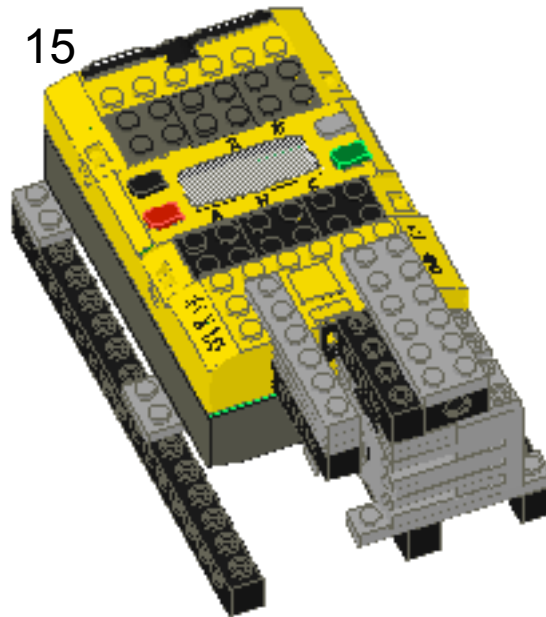
Our Favorite Things

Pieces:

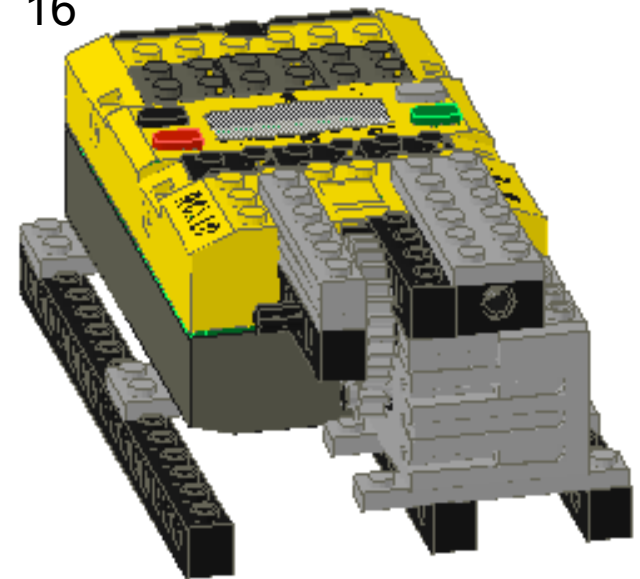


Pulley Car

15

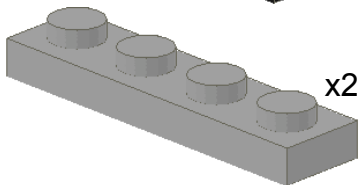
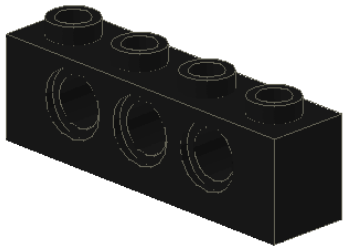


16



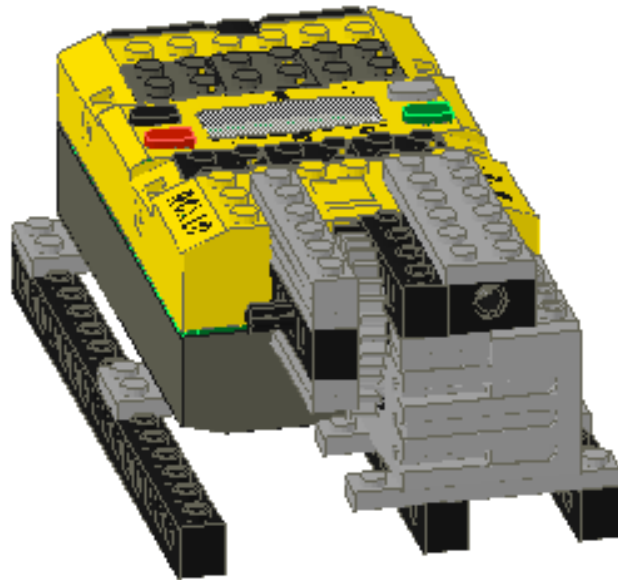
Our Favorite Things

Pieces:

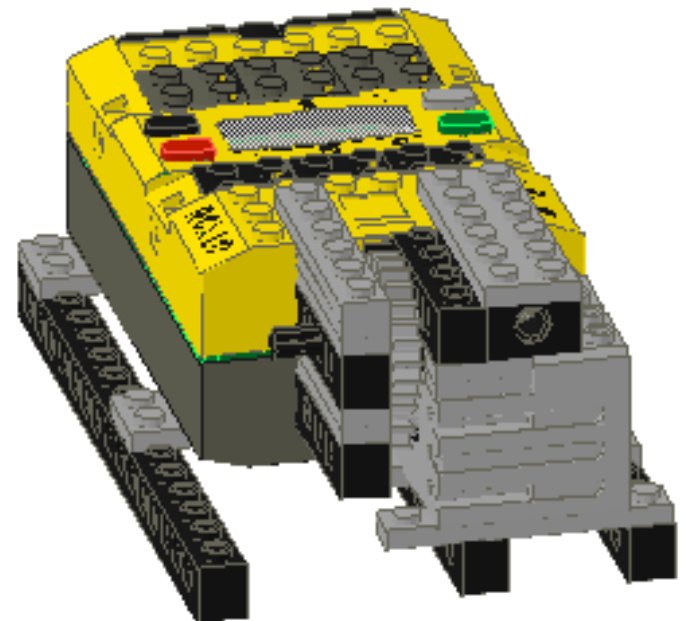


Pulley Car

17

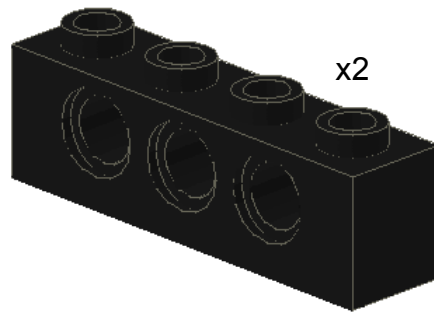


18



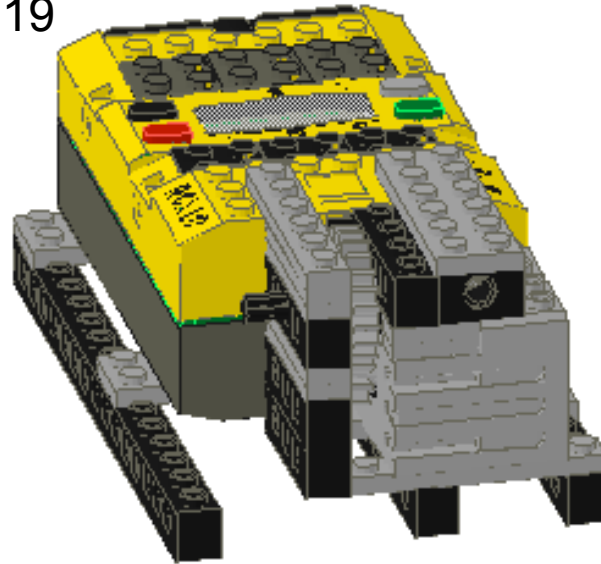
Our Favorite Things

Pieces:

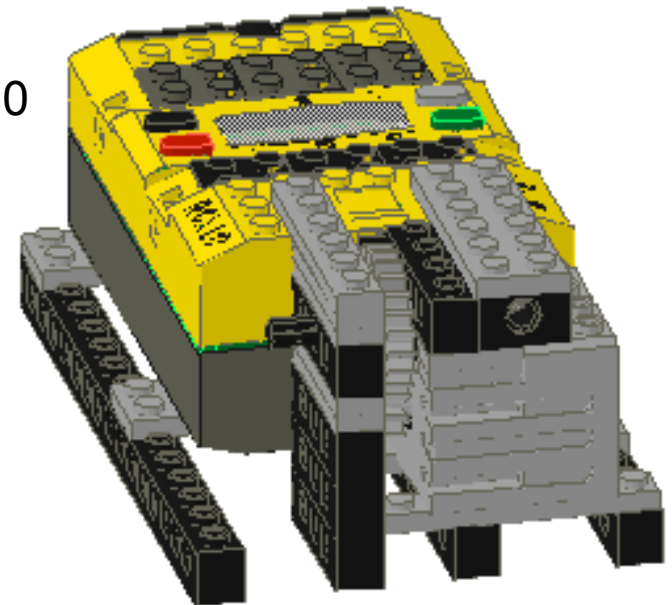


Pulley Car

19

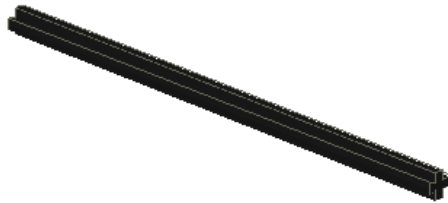
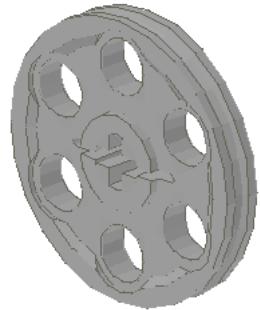


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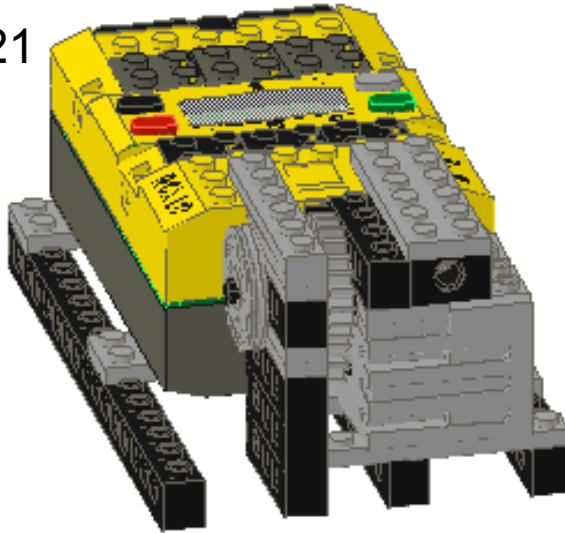
Our Favorite Things

Pieces:

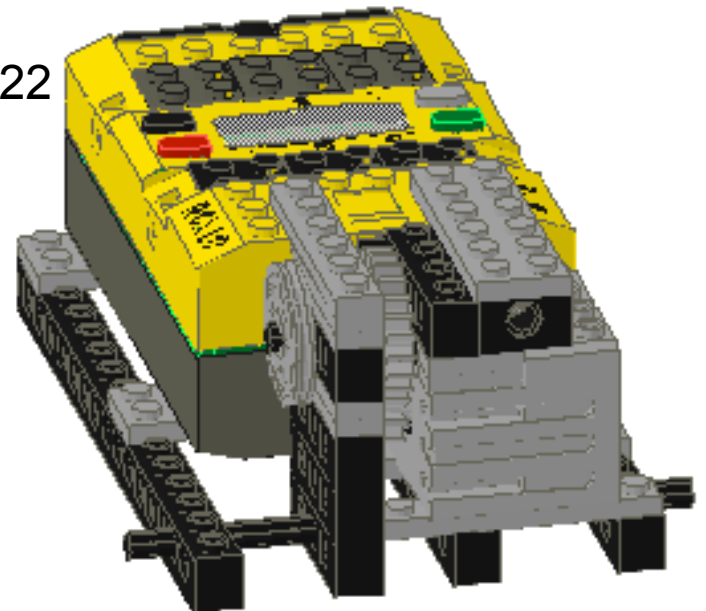


Pulley Car

21

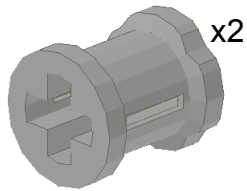
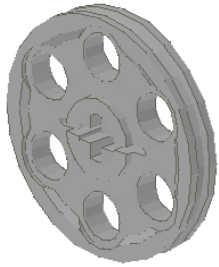


22

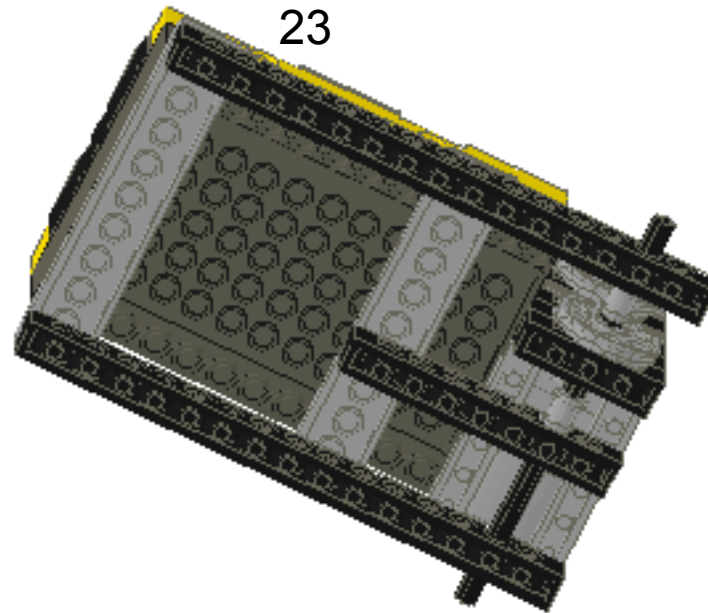


Our Favorite Things

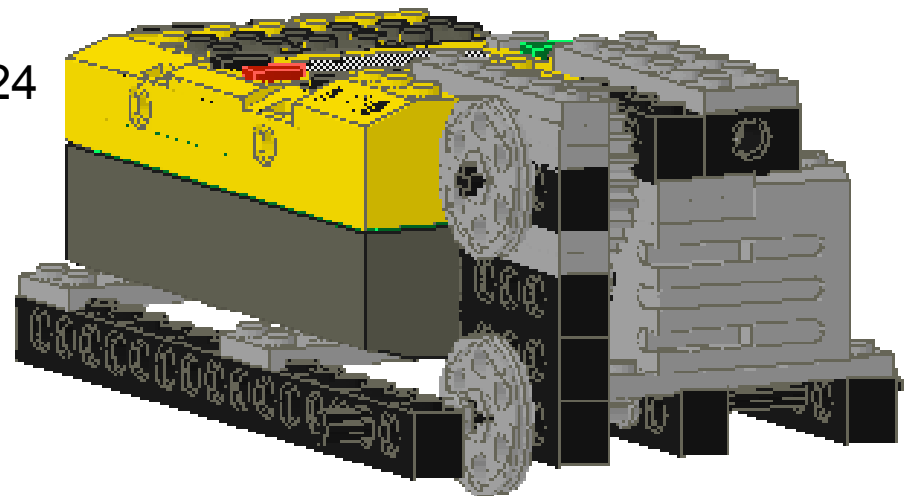
Pieces:



Pulley Car

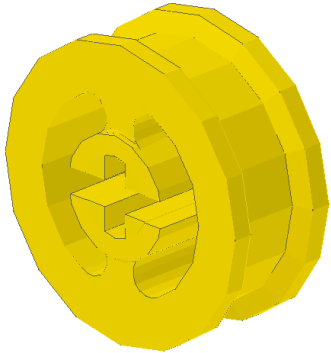
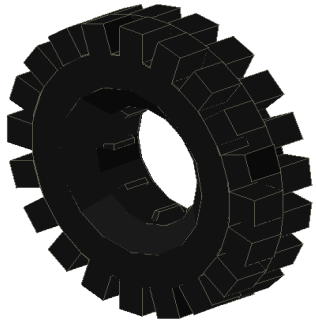


24



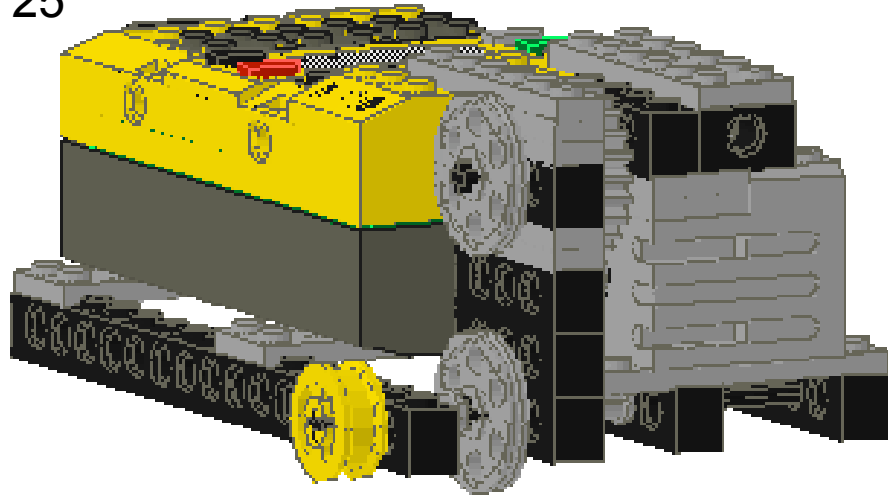
Our Favorite Things

Pieces:

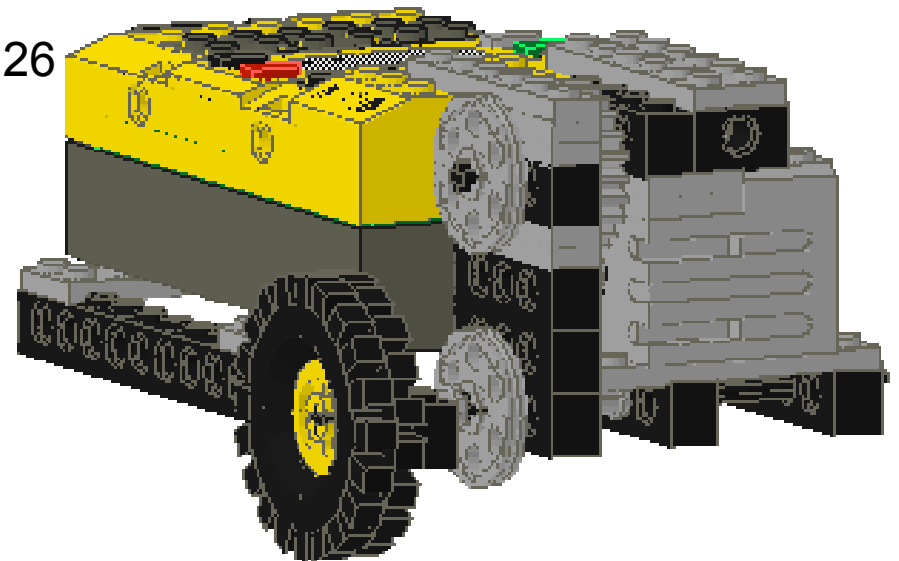


Pulley Car

25

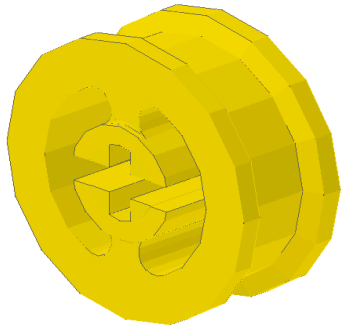
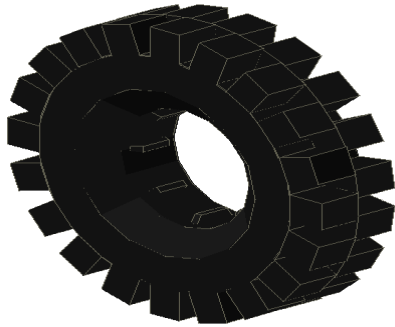


26



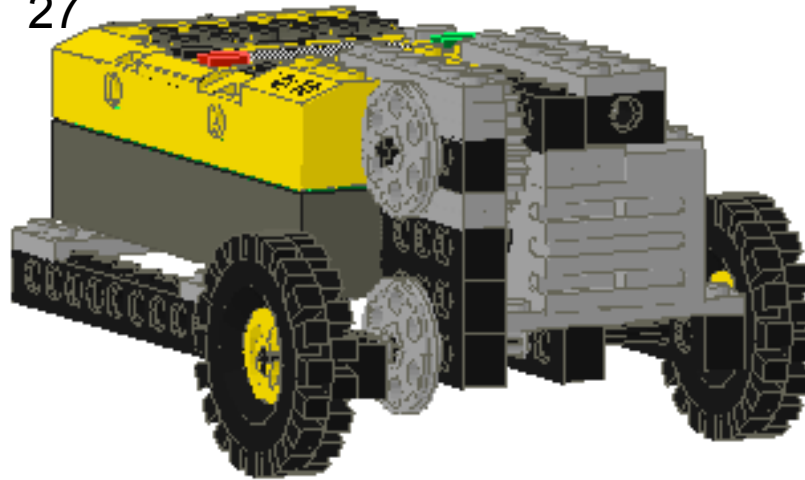
Our Favorite Things

Pieces:

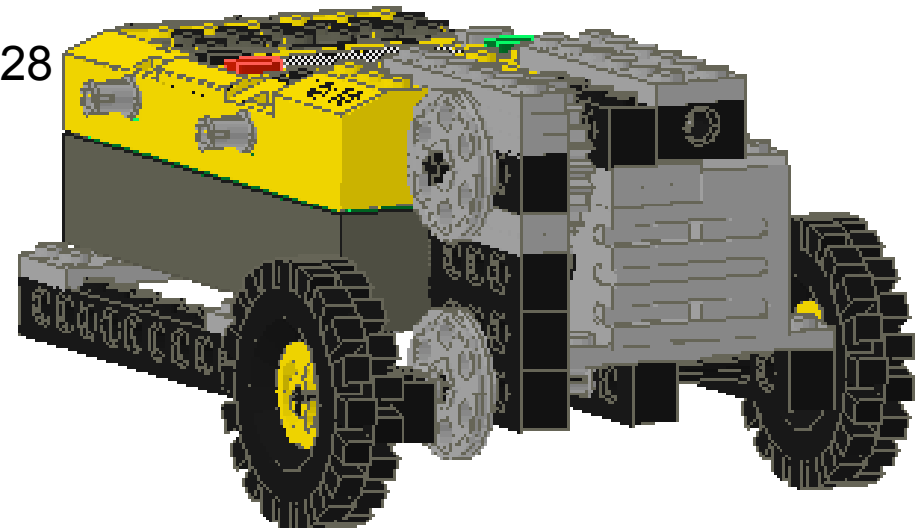


Pulley Car

27

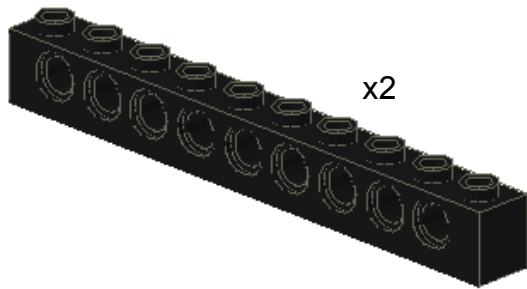


28



Our Favorite Things

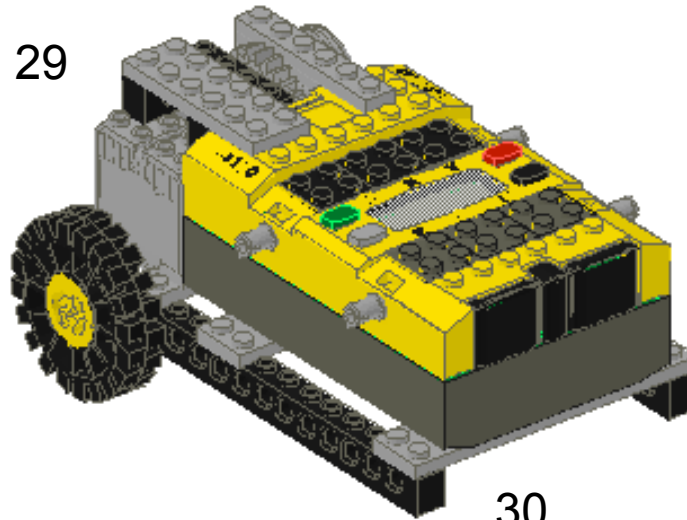
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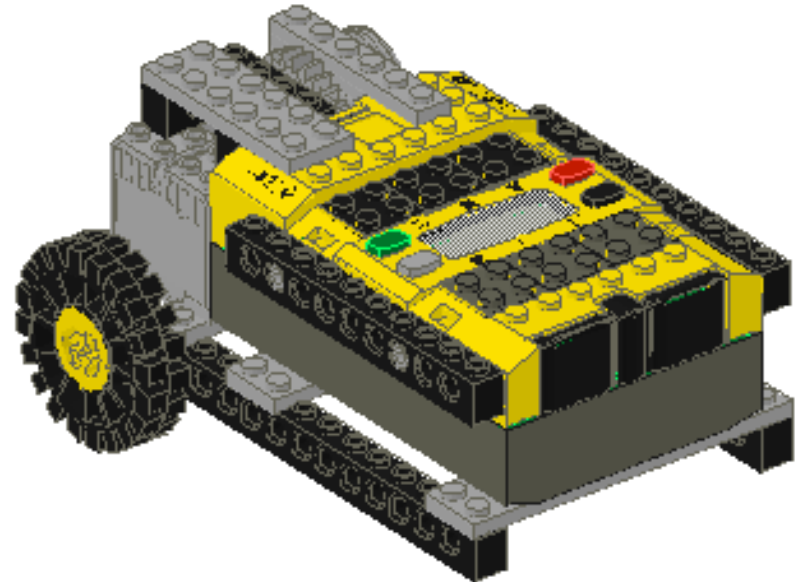
x2

Pulley Car

29



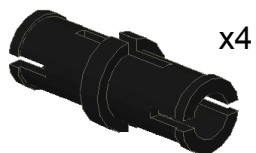
30



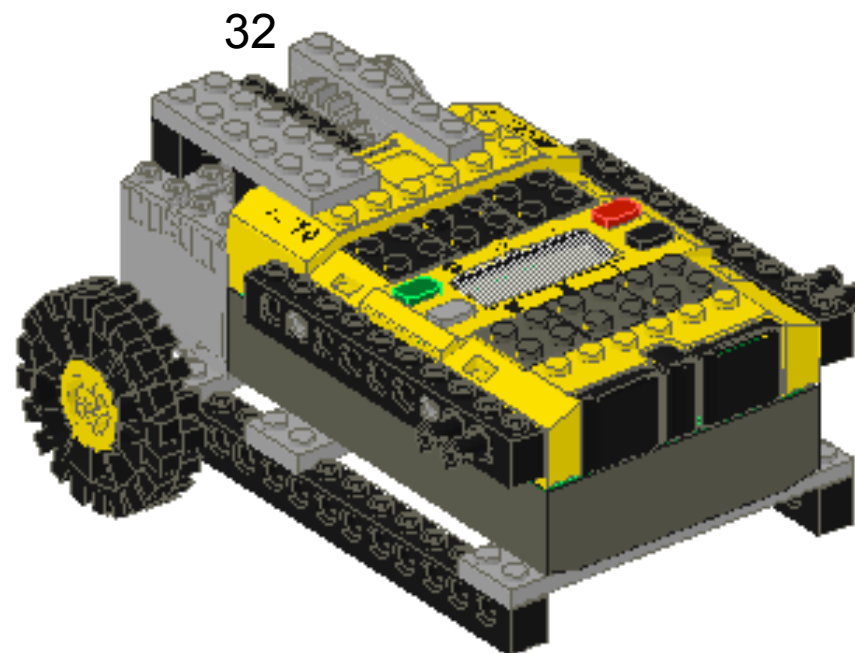
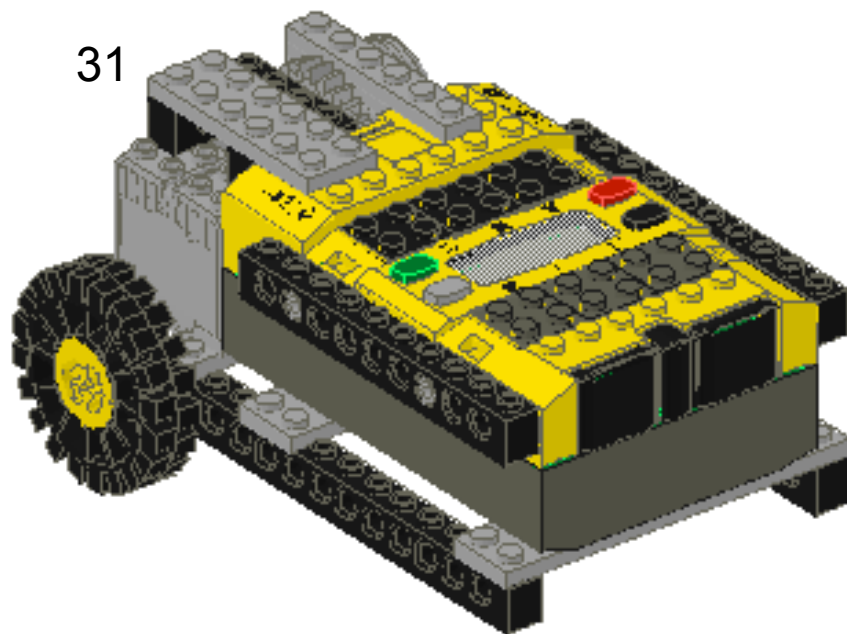
Our Favorite Things

Pulley Car

Pieces:

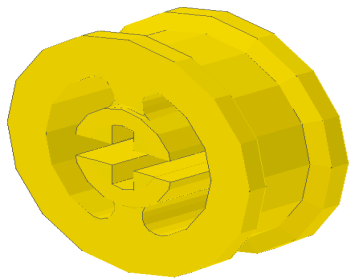
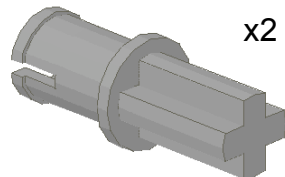


x4



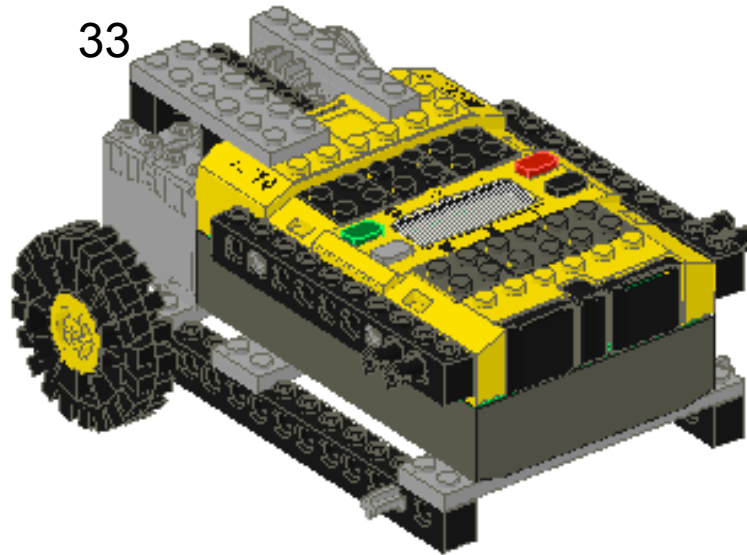
Our Favorite Things

Pieces:

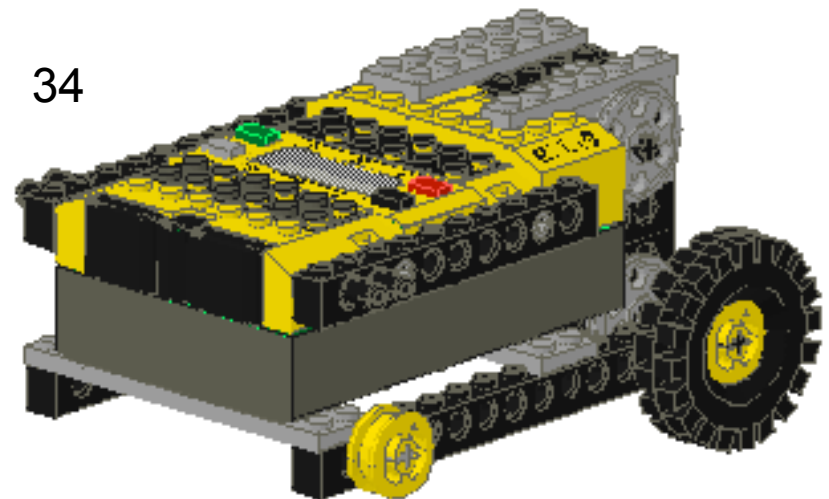


Pulley Car

33

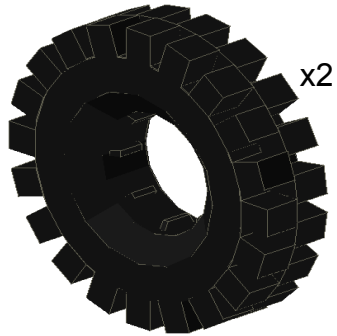


34

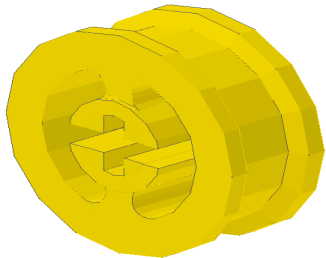


Our Favorite Things

Pieces:

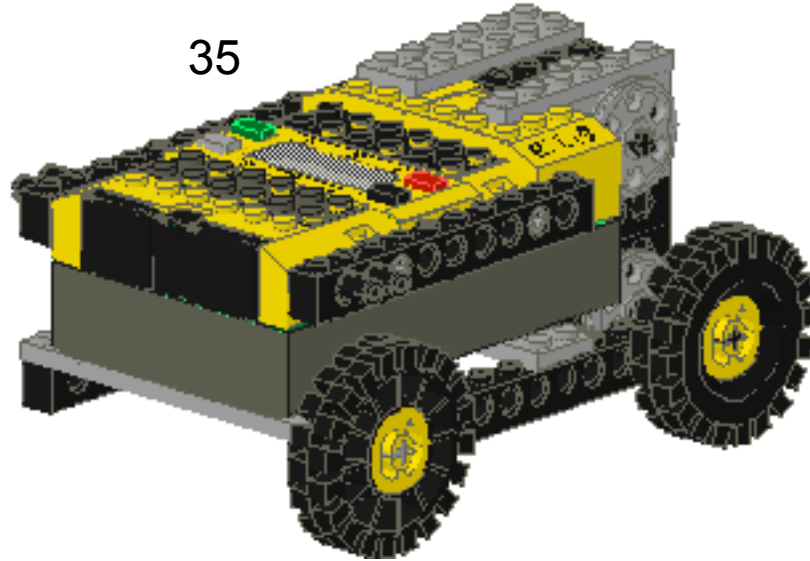


x2

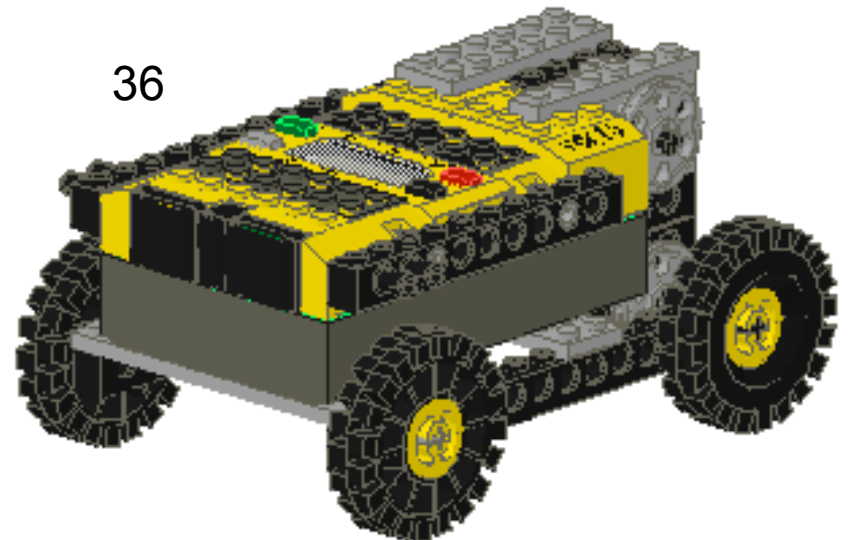


Pulley Car

35



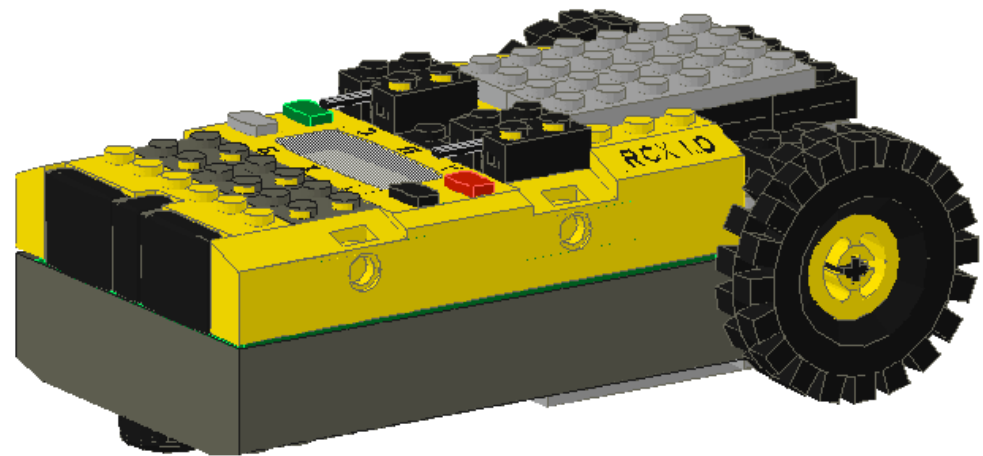
36



Our Favorite Things

Simple Two Motor Car

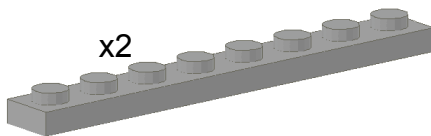
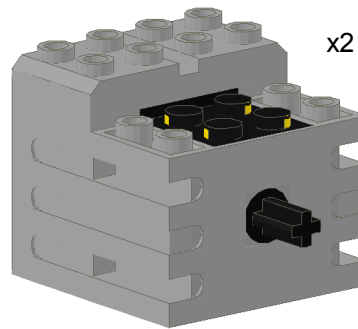
Pieces:



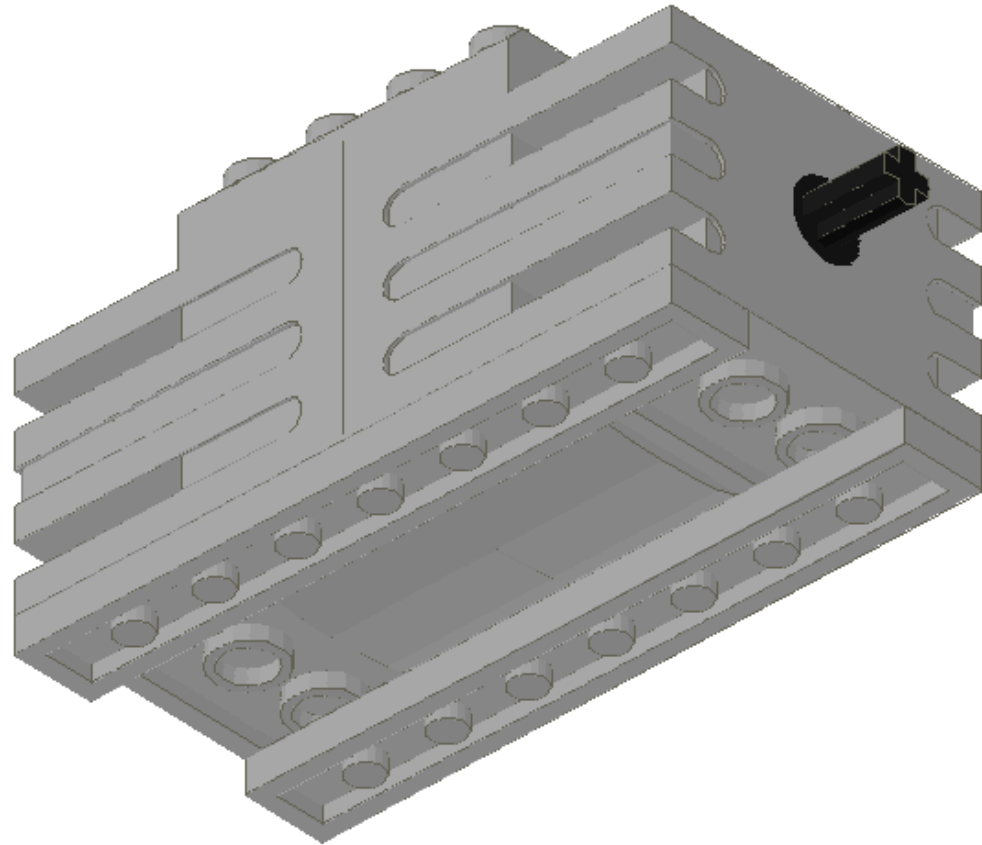
Our Favorite Things

Simple Two Motor Car

Pieces:



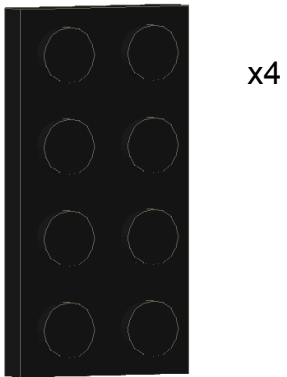
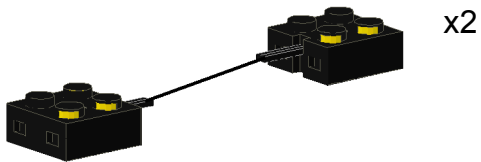
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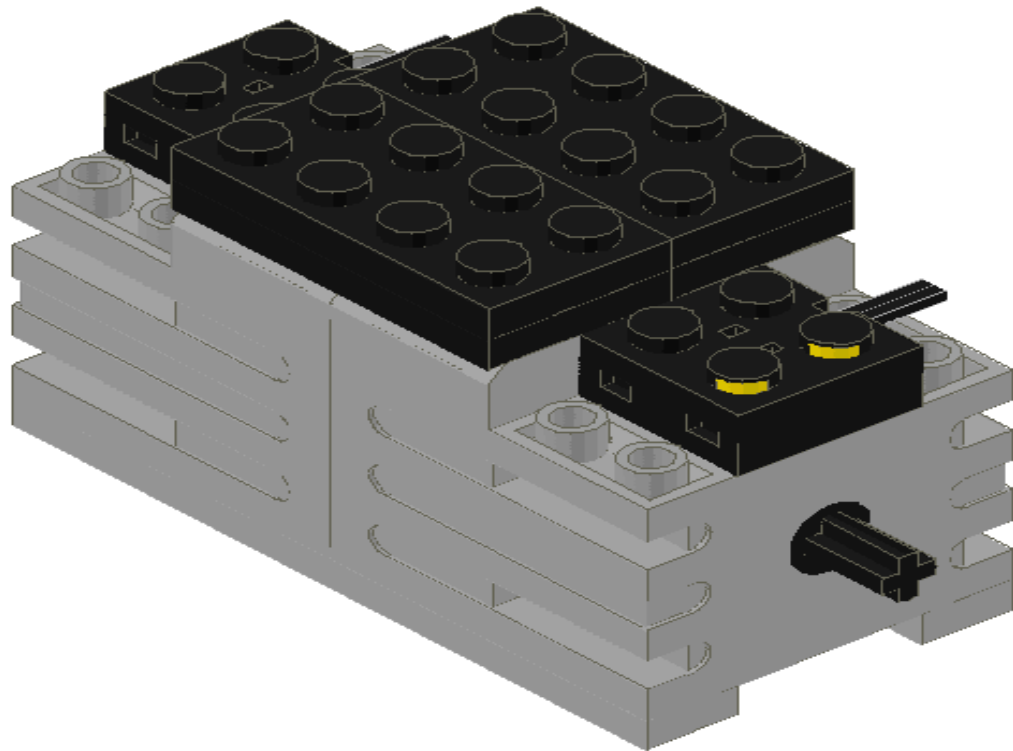
Our Favorite Things

Simple Two Motor Car

Pieces:



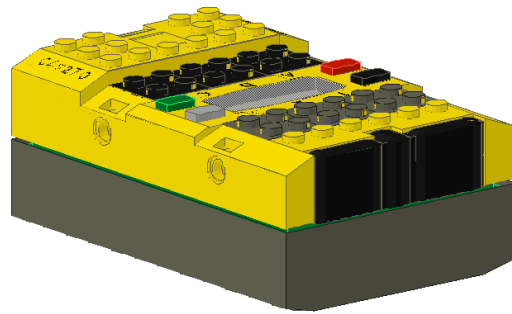
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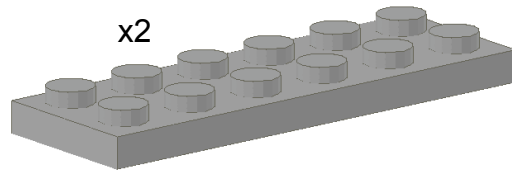
Our Favorite Things

Simple Two Motor Car

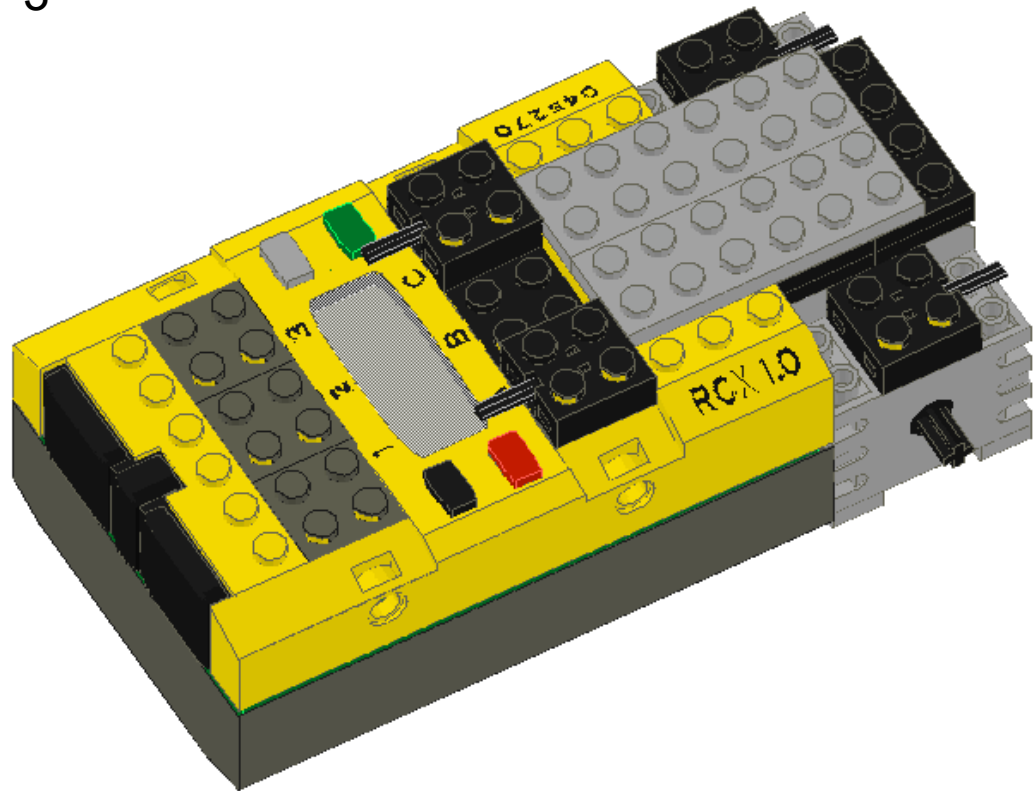
Pieces:



x2



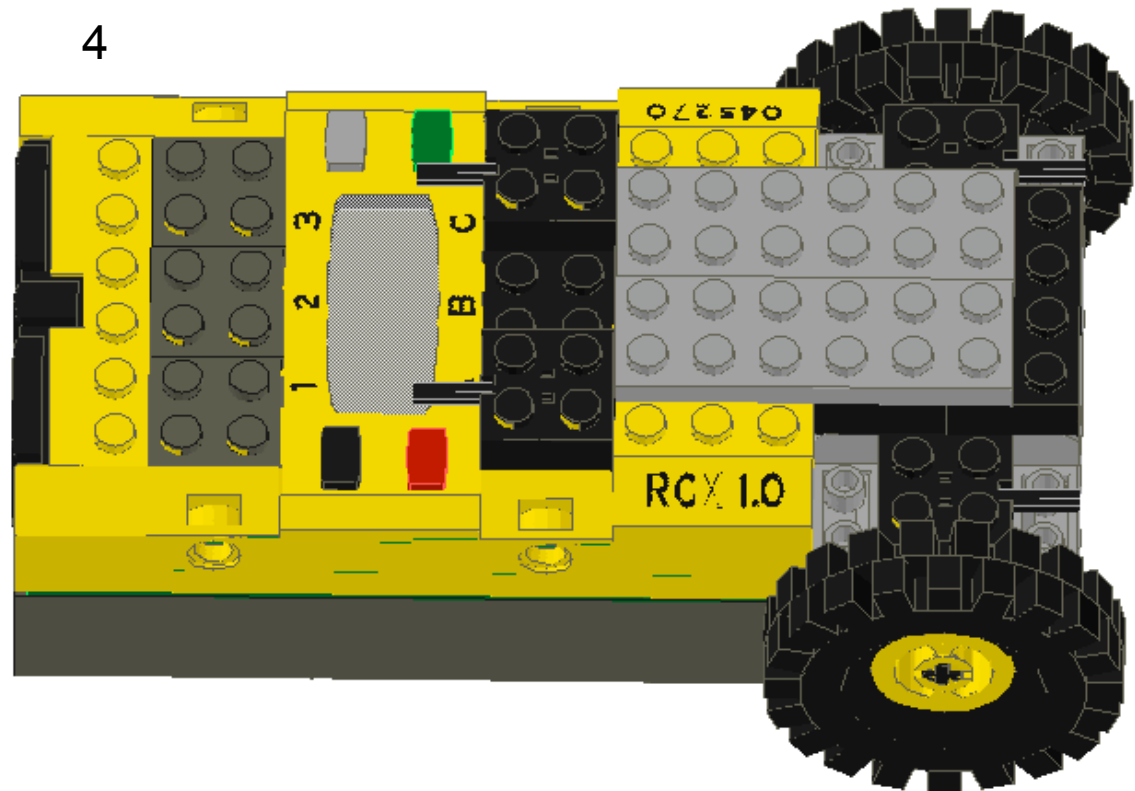
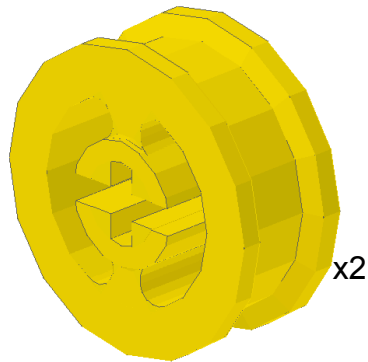
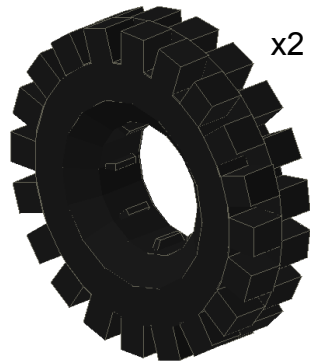
3



Our Favorite Things

Simple Two Motor Car

Pieces:

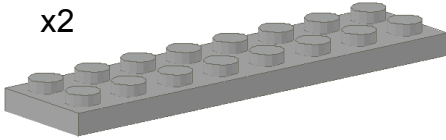


Our Favorite Things

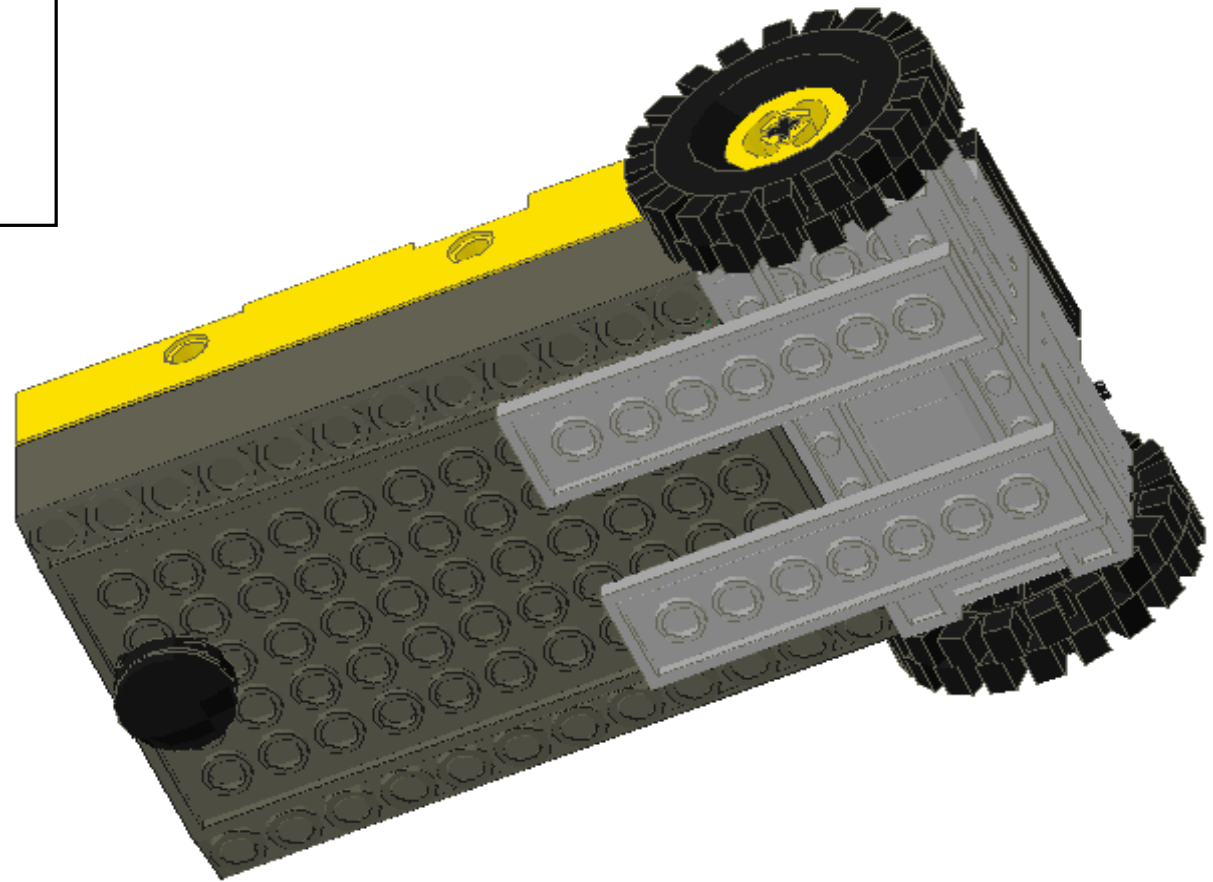
Simple Two Motor Car

Pieces:

x2



5

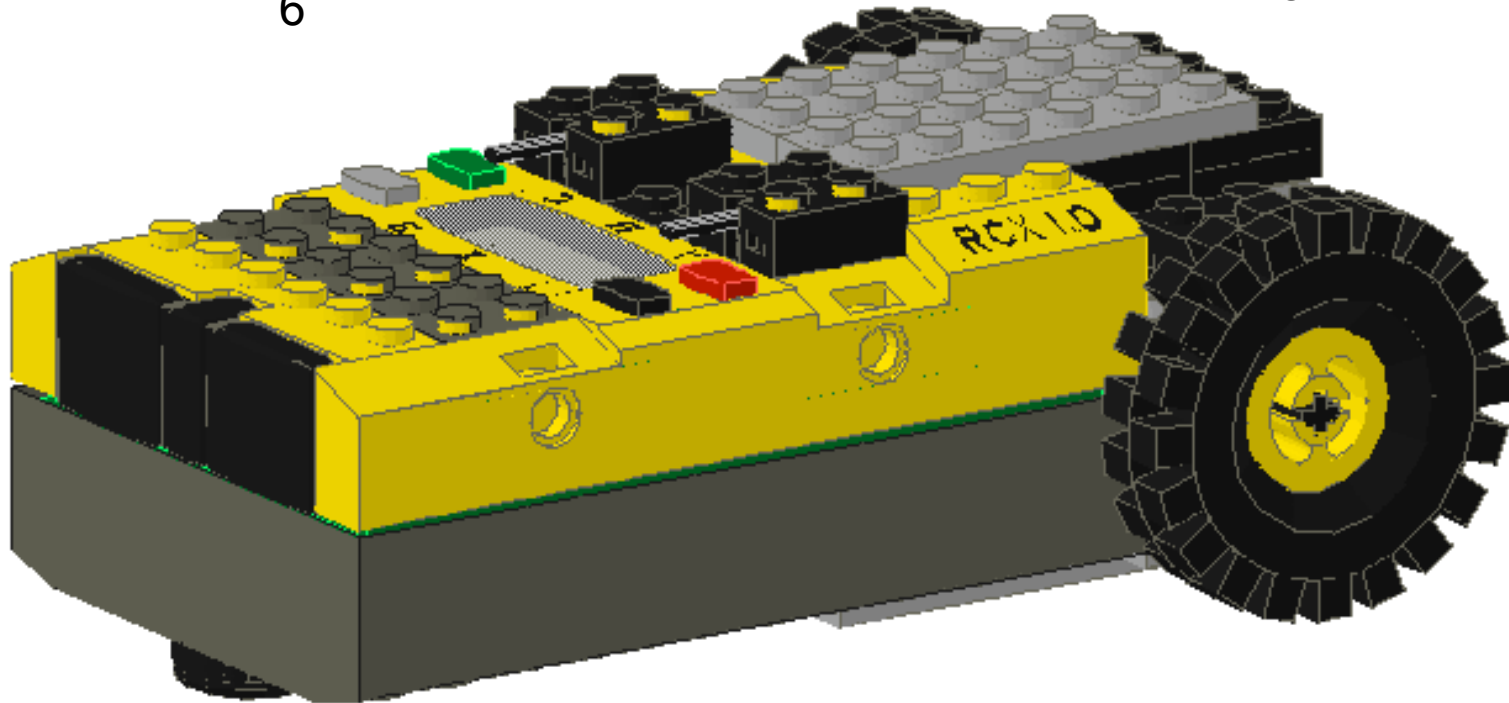


Our Favorite Things

Simple Two Motor Car

Note: To make your car turn easily program it so that the motors turn in opposite directions when the car is turning.

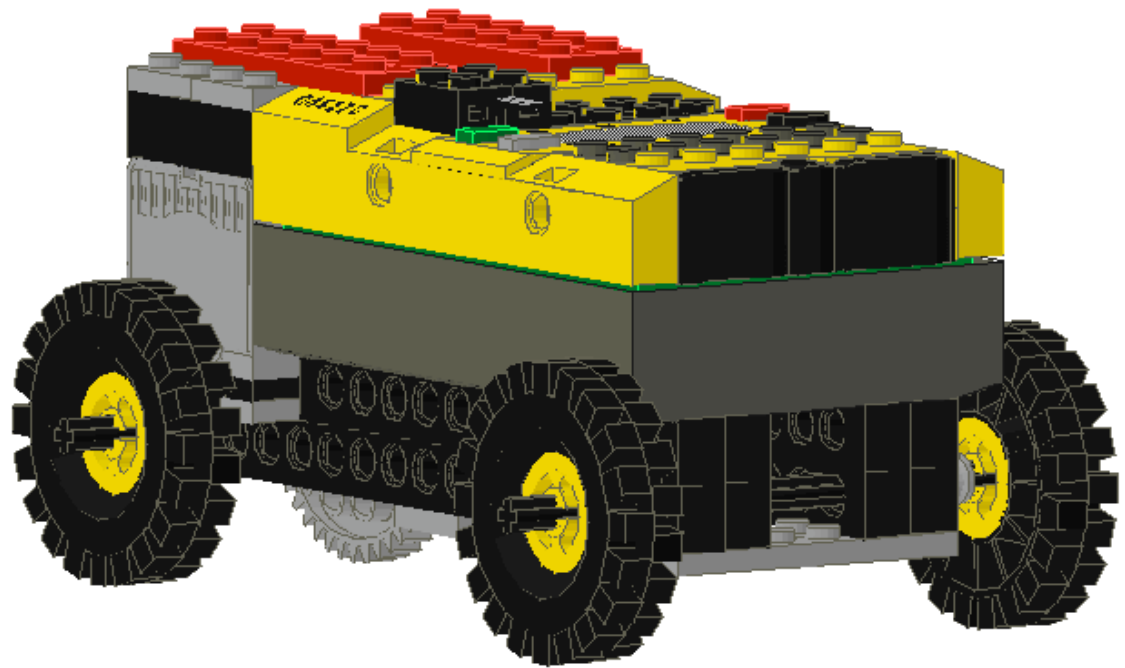
6



Our Favorite Things

Sturdy One Motor Car

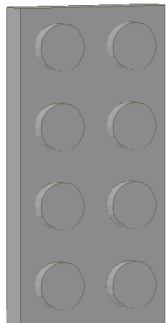
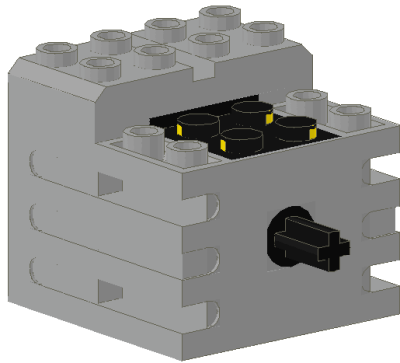
Pieces:



Our Favorite Things

Sturdy One Motor Car

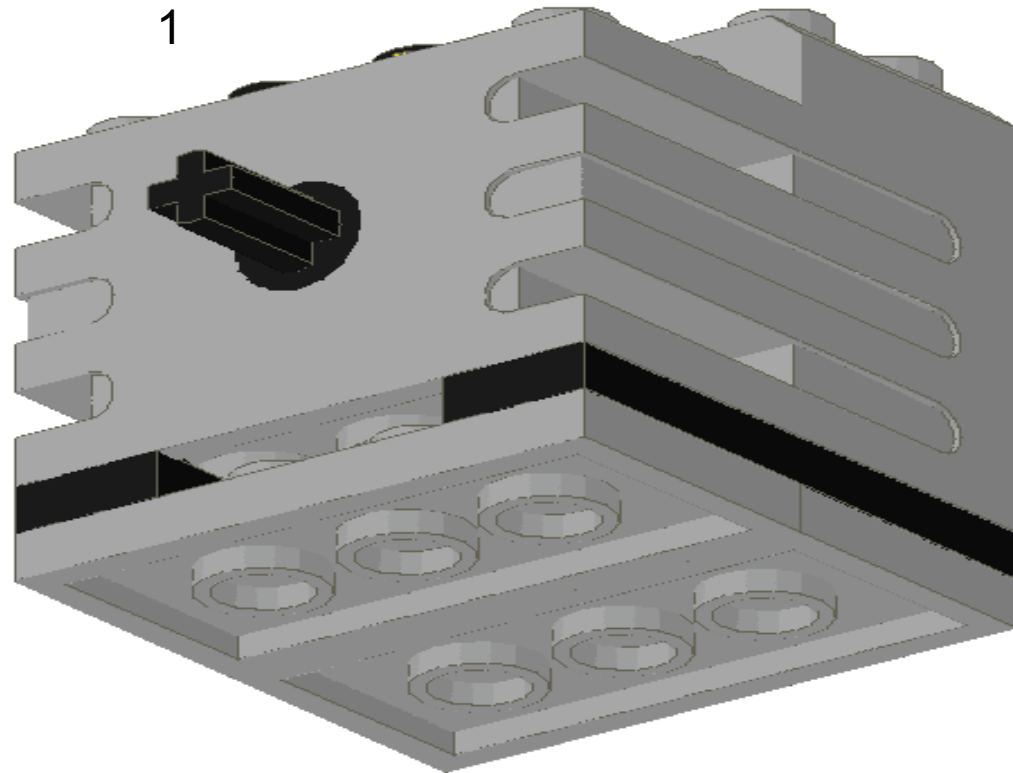
Pieces:



x2



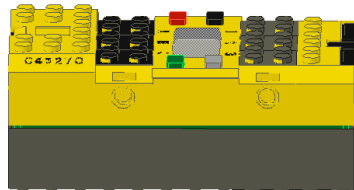
x2



Our Favorite Things

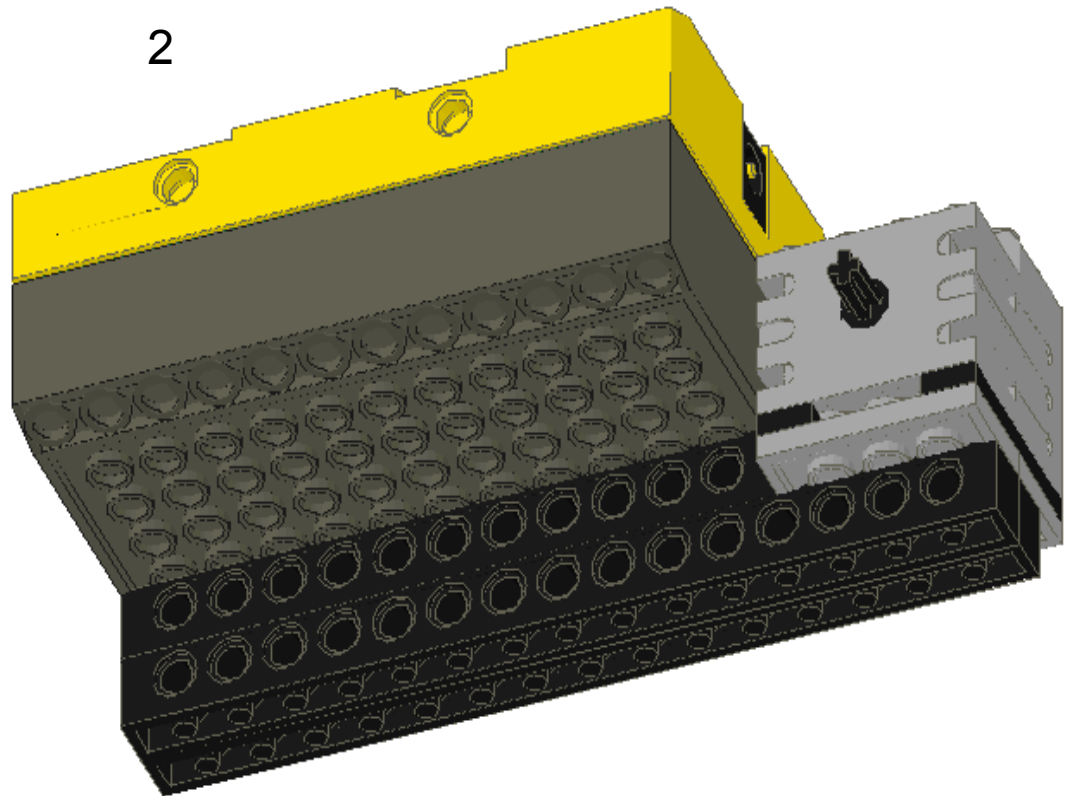
Sturdy One Motor Car

Pieces:



x2

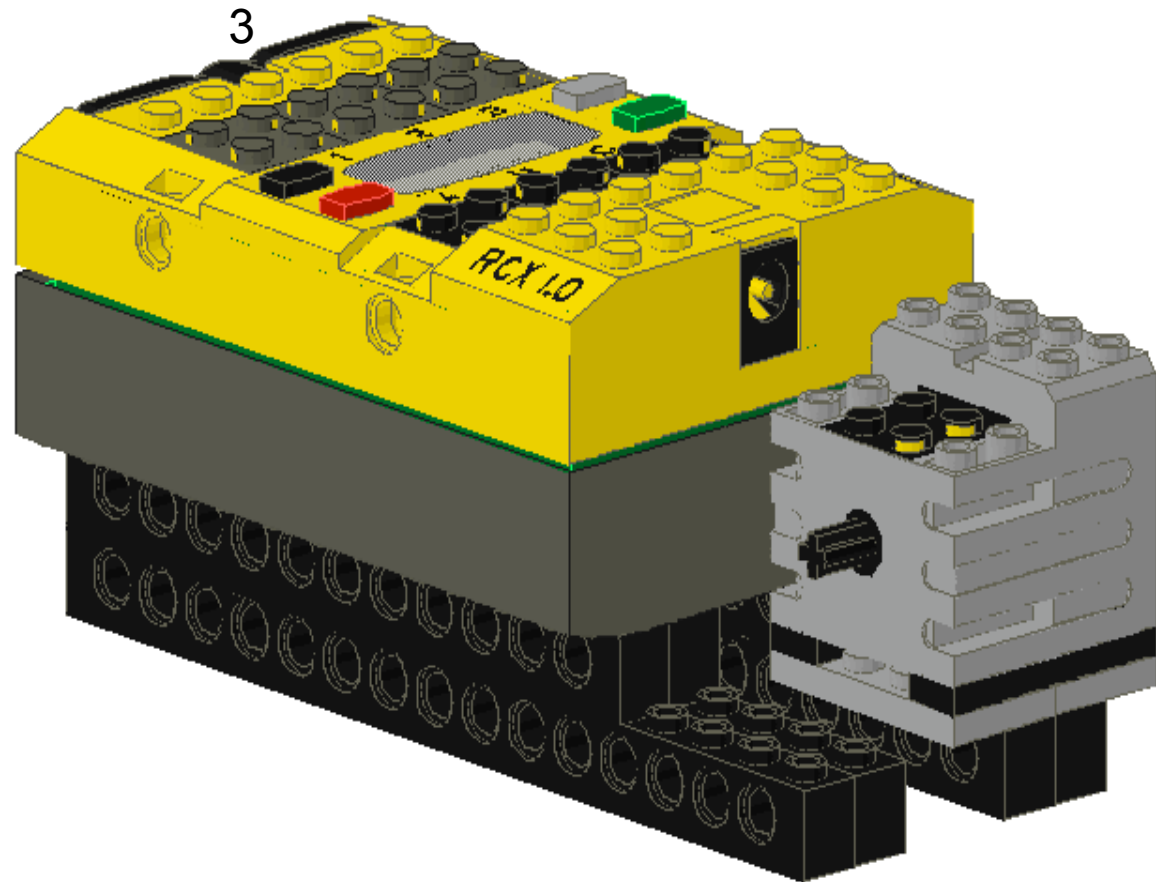
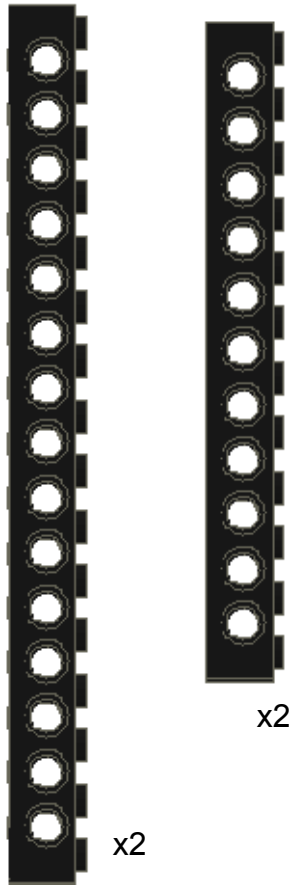
x2



Our Favorite Things

Sturdy One Motor Car

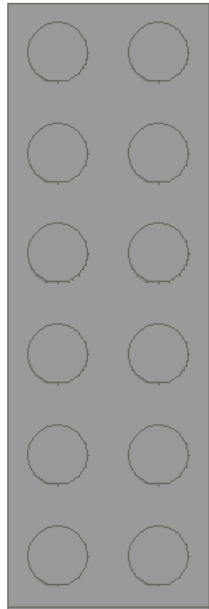
Pieces:



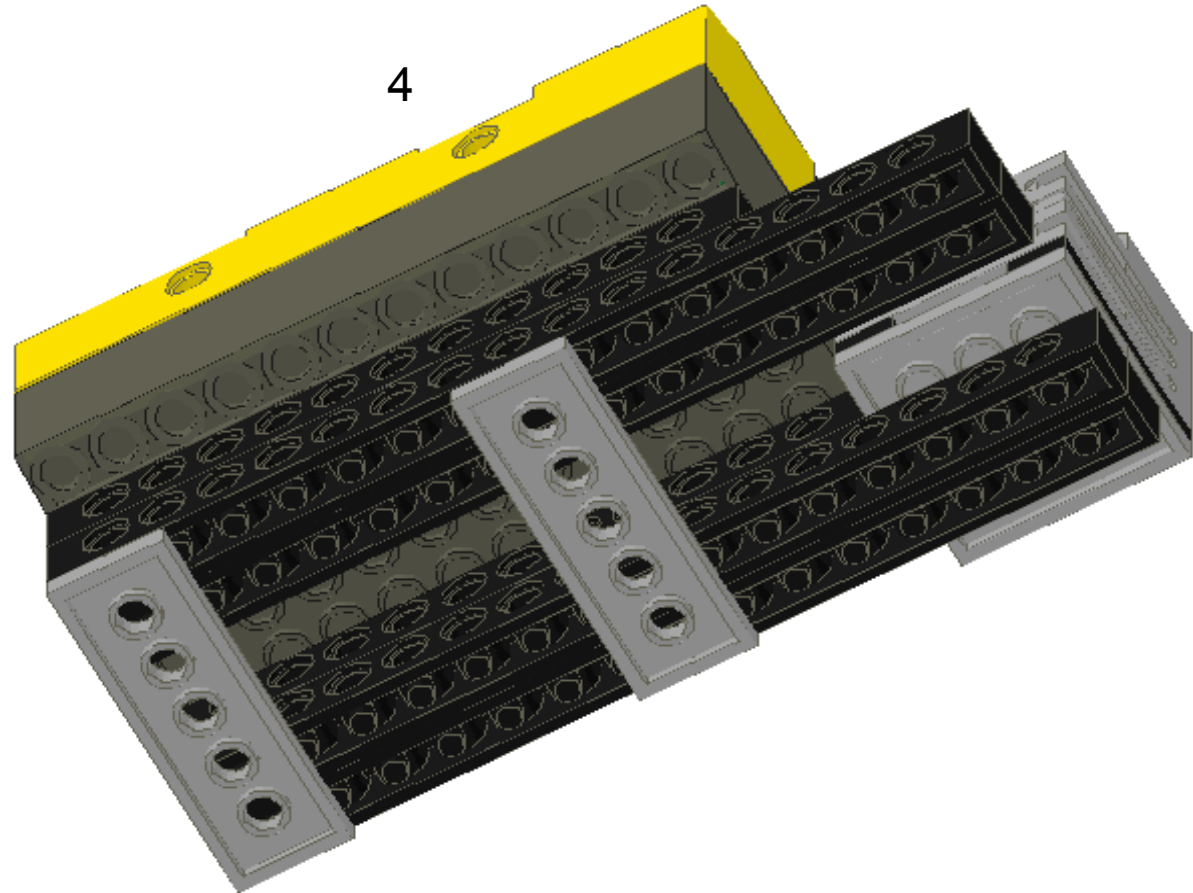
Our Favorite Things

Sturdy One Motor Car

Pieces:



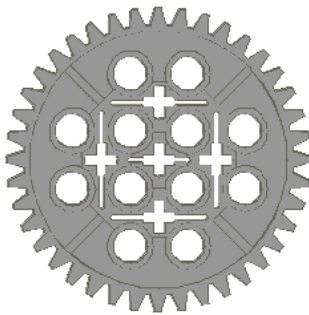
x2



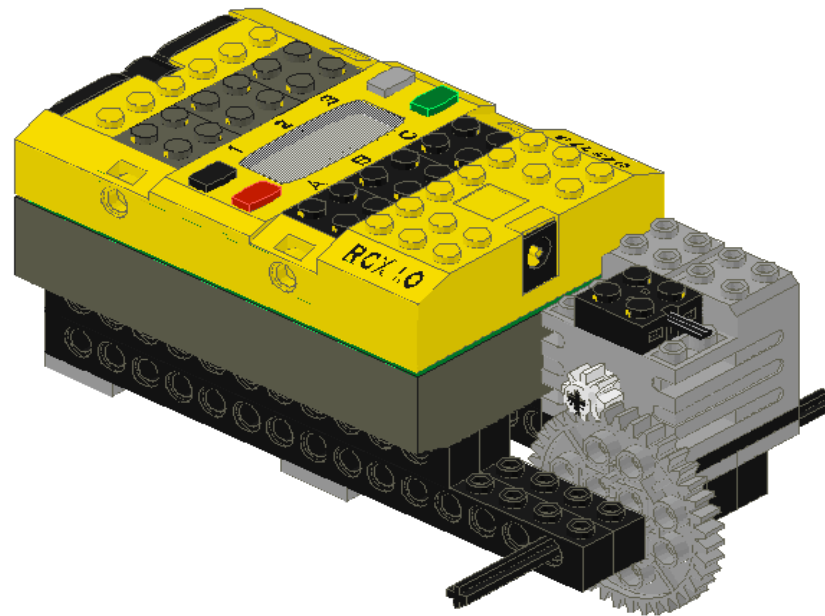
Our Favorite Things

Sturdy One Motor Car

Pieces:



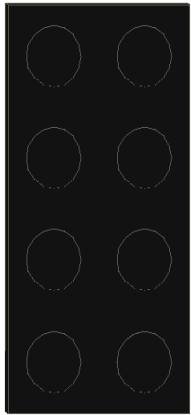
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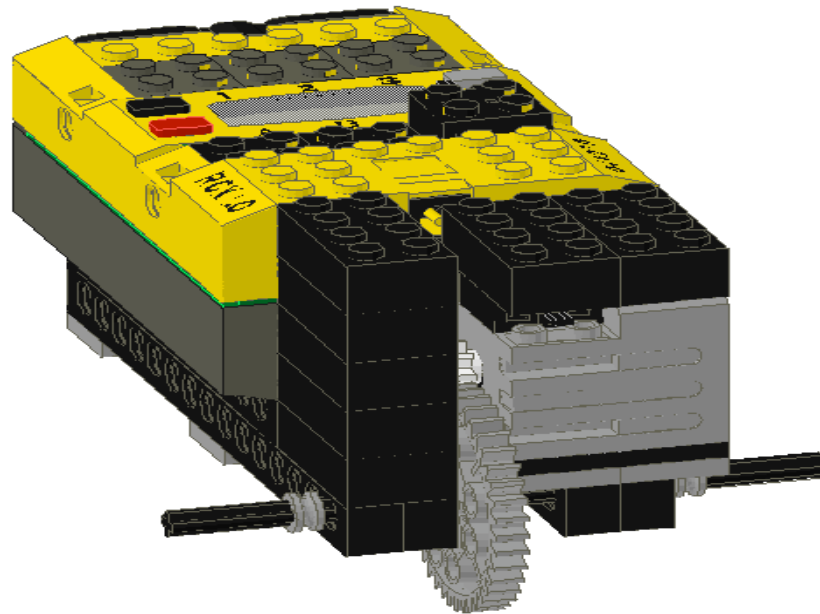
Our Favorite Things

Sturdy One Motor Car

Pieces:



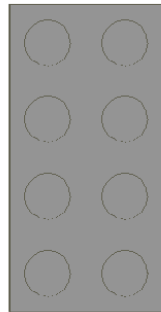
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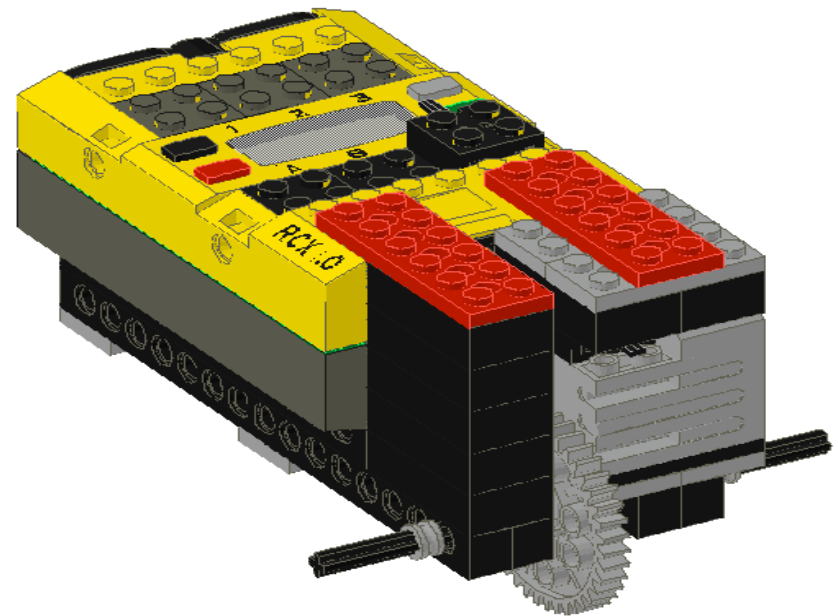
Our Favorite Things

Sturdy One Motor Car

Pieces:



7

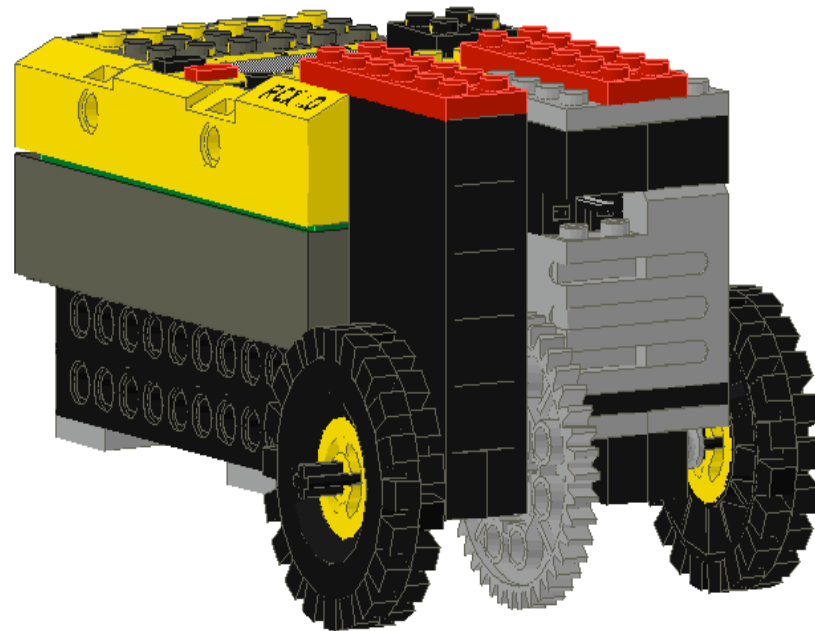
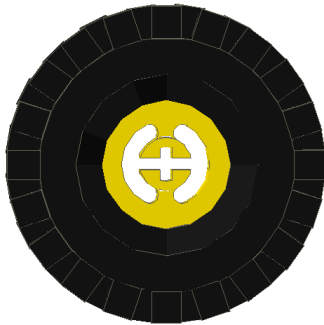


Our Favorite Things

Sturdy One Motor Car

Pieces:

8

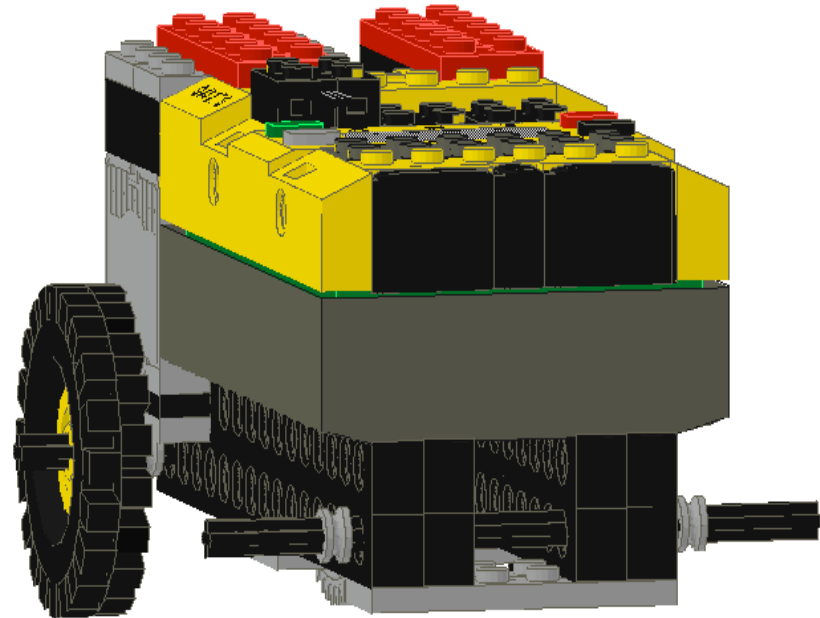
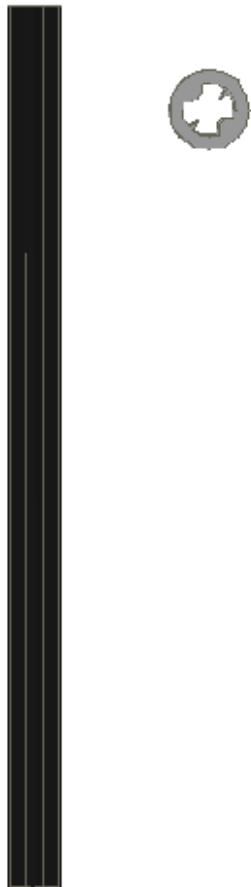


Our Favorite Things

Sturdy One Motor Car

Pieces:

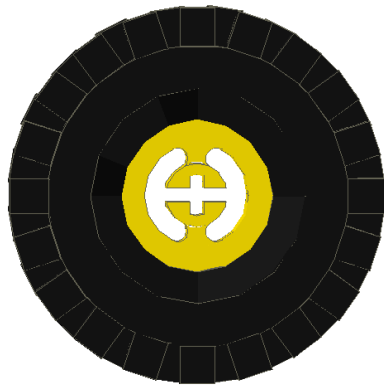
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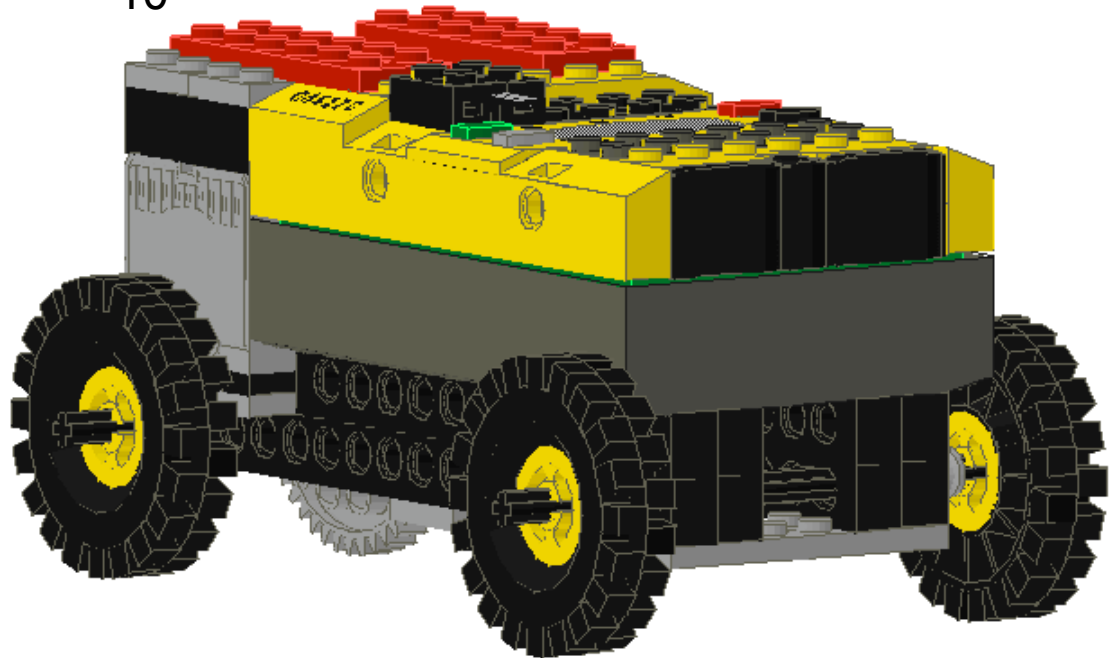
Our Favorite Things

Sturdy One Motor Car

Pieces:



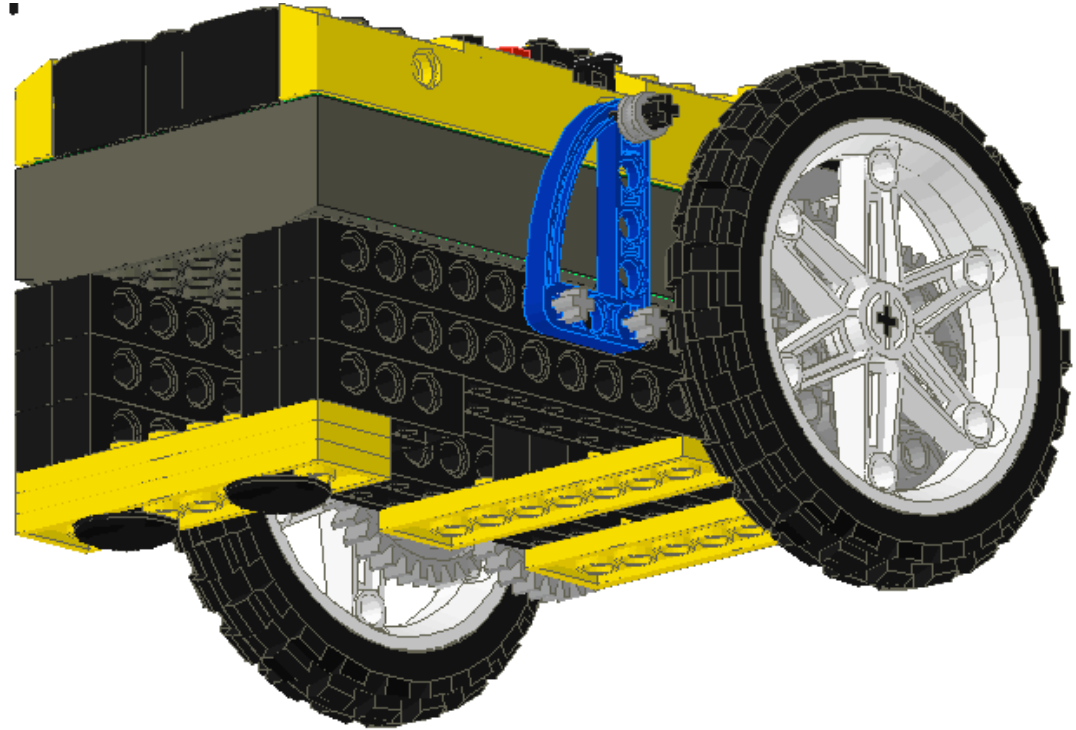
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Our Favorite Things

Solar System ROVer

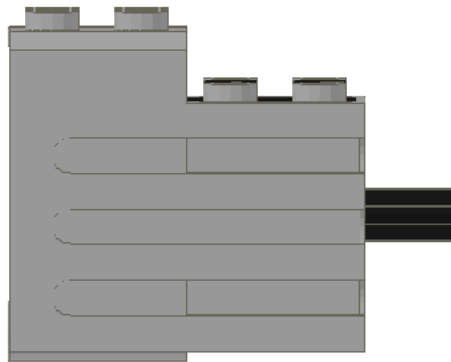
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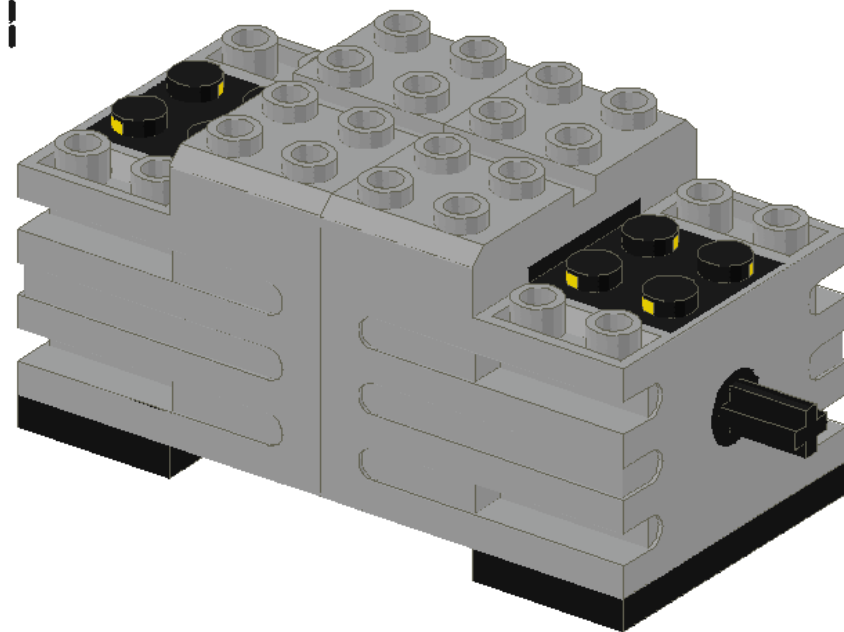
Our Favorite Things

Solar System ROVer

Pieces:



1



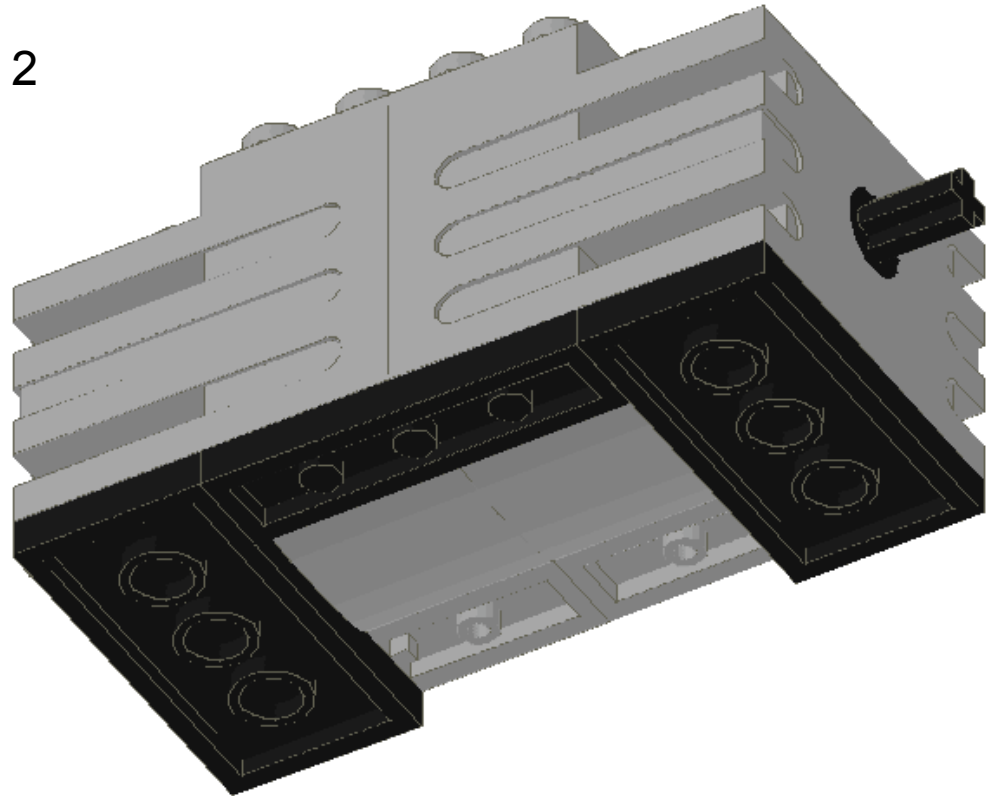
Our Favorite Things

Solar System ROVer

Pieces:



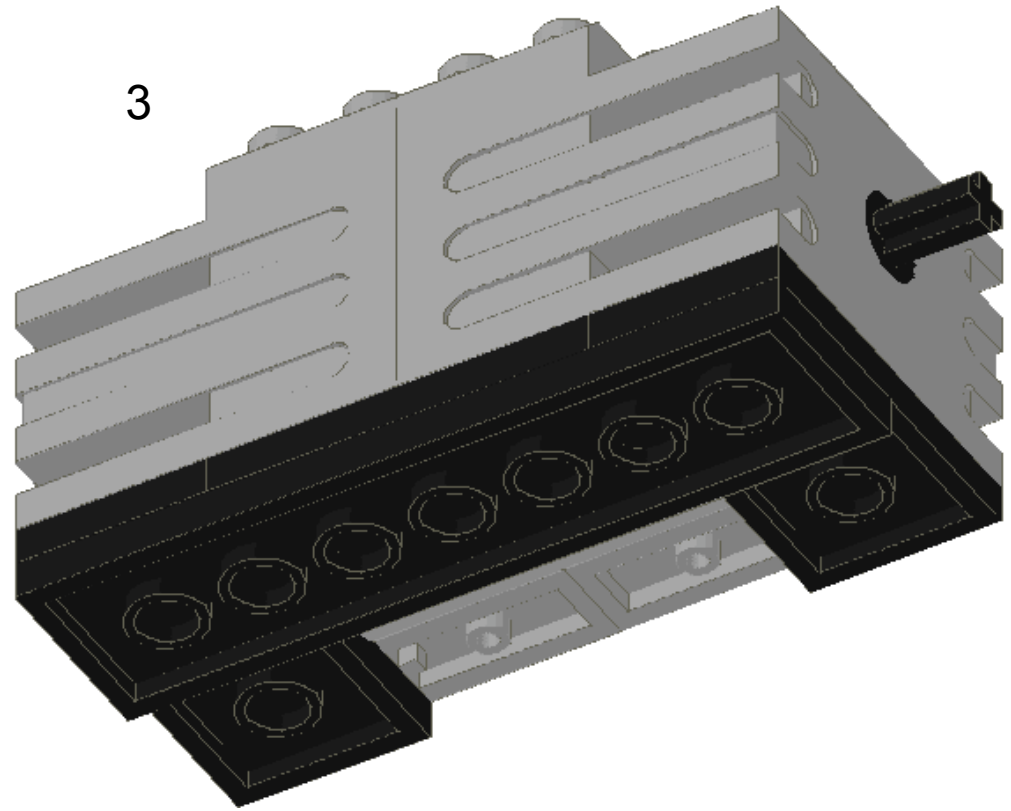
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Our Favorite Things

Solar System ROVer

Pieces:



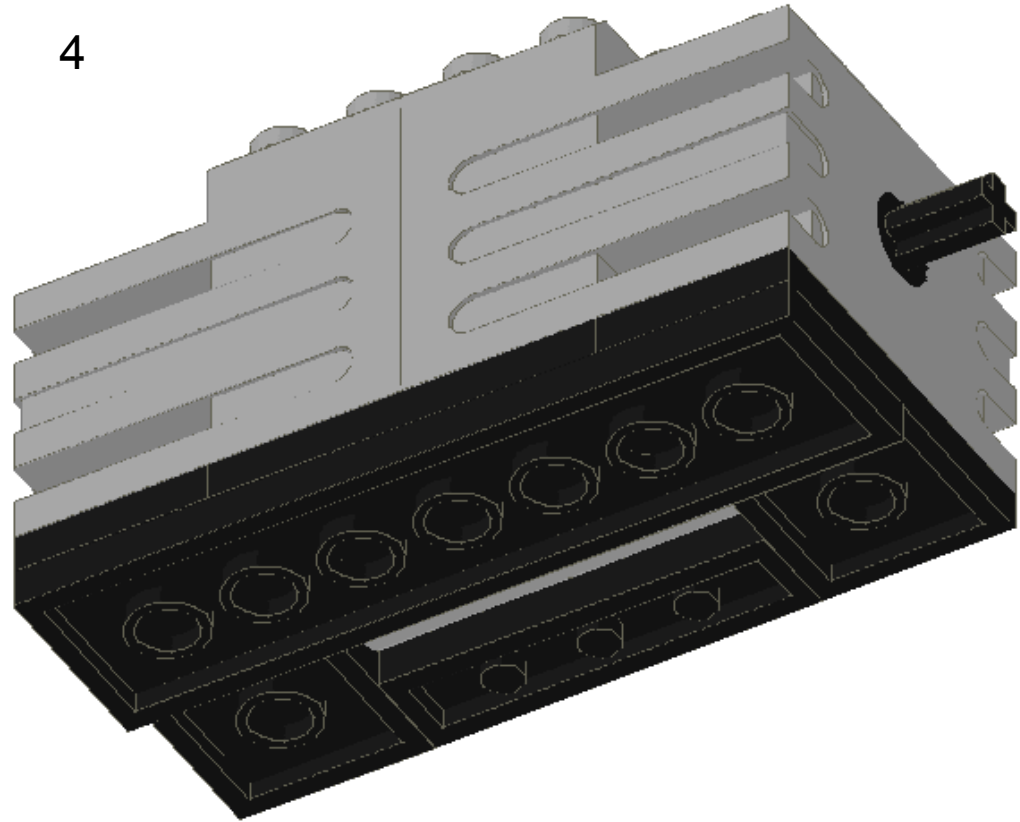
Our Favorite Things

Solar System ROVer

Pieces:



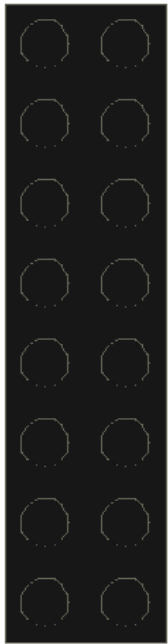
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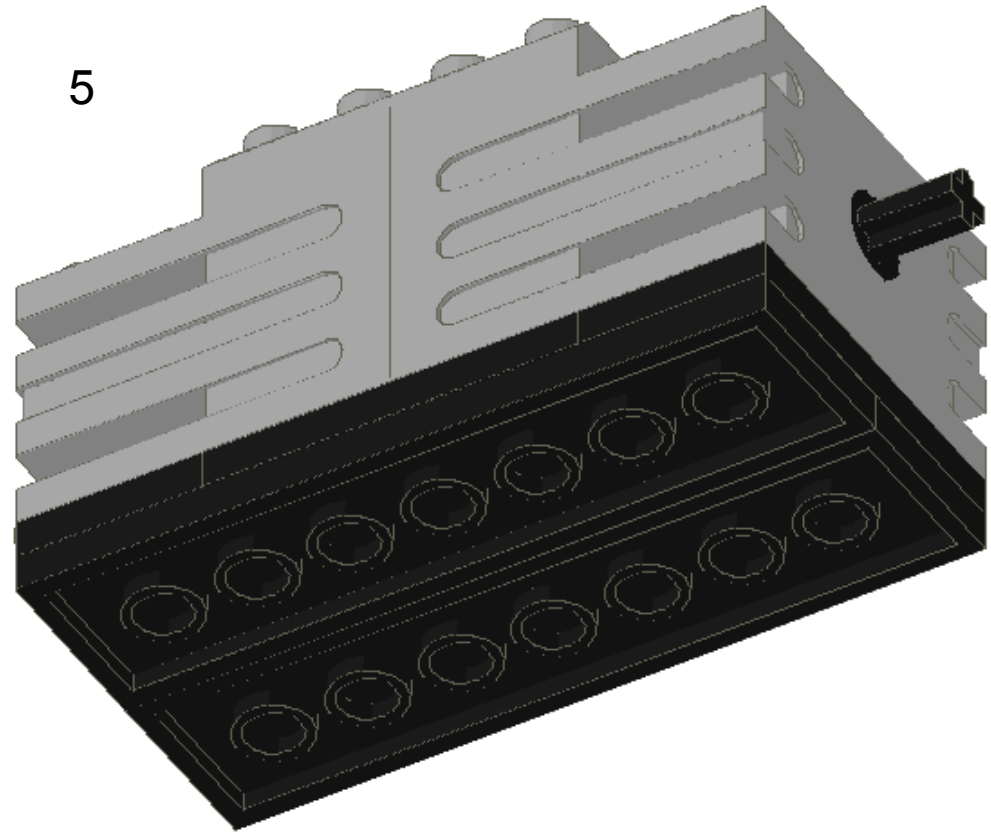
Our Favorite Things

Solar System ROVer

Pieces:



5



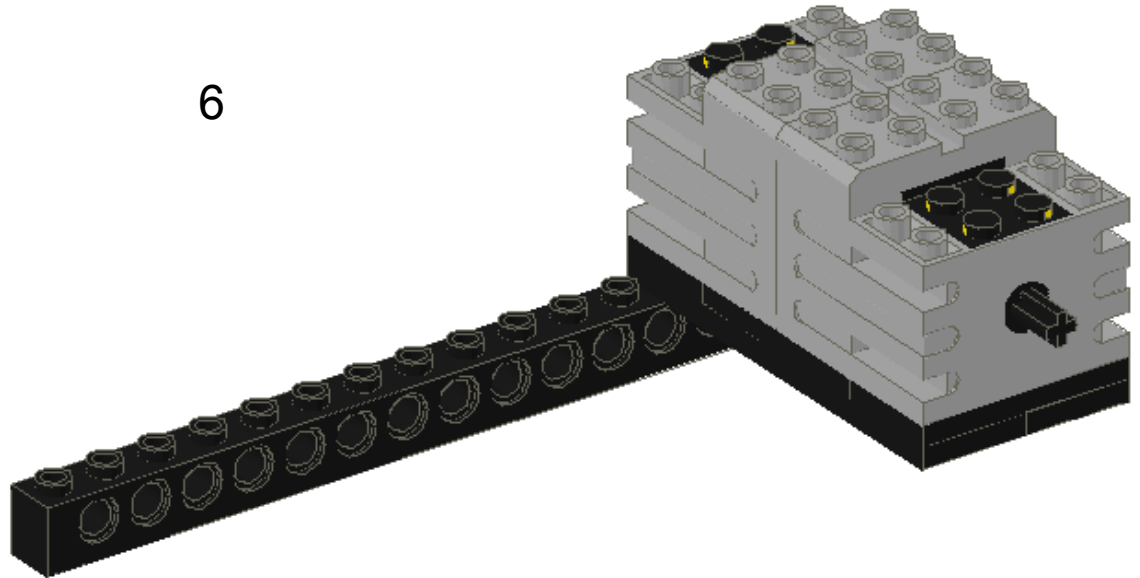
Our Favorite Things

Solar System ROVer

Pieces:



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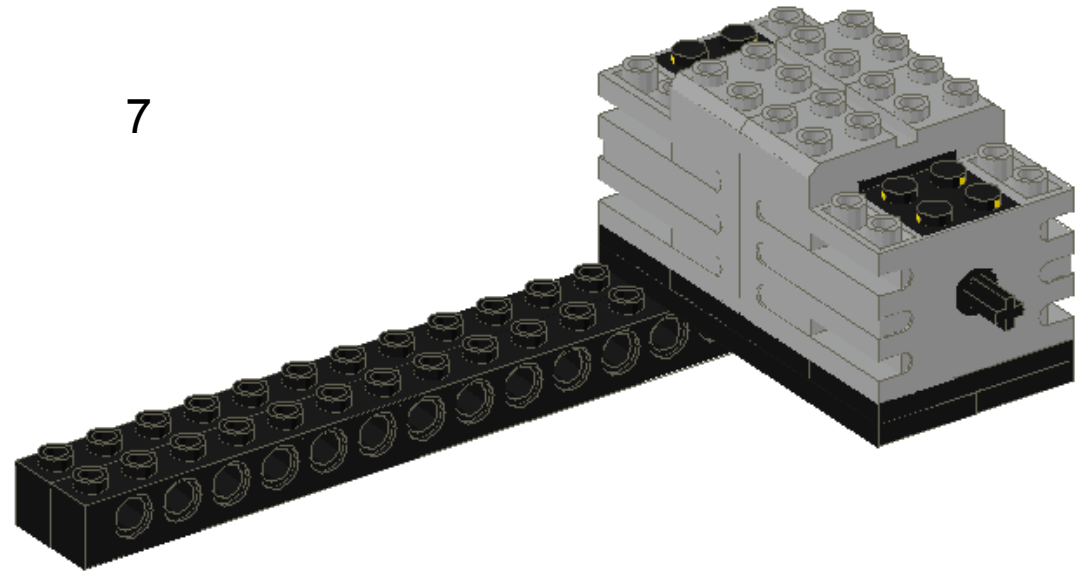
Our Favorite Things

Solar System ROVer

Pieces:



7



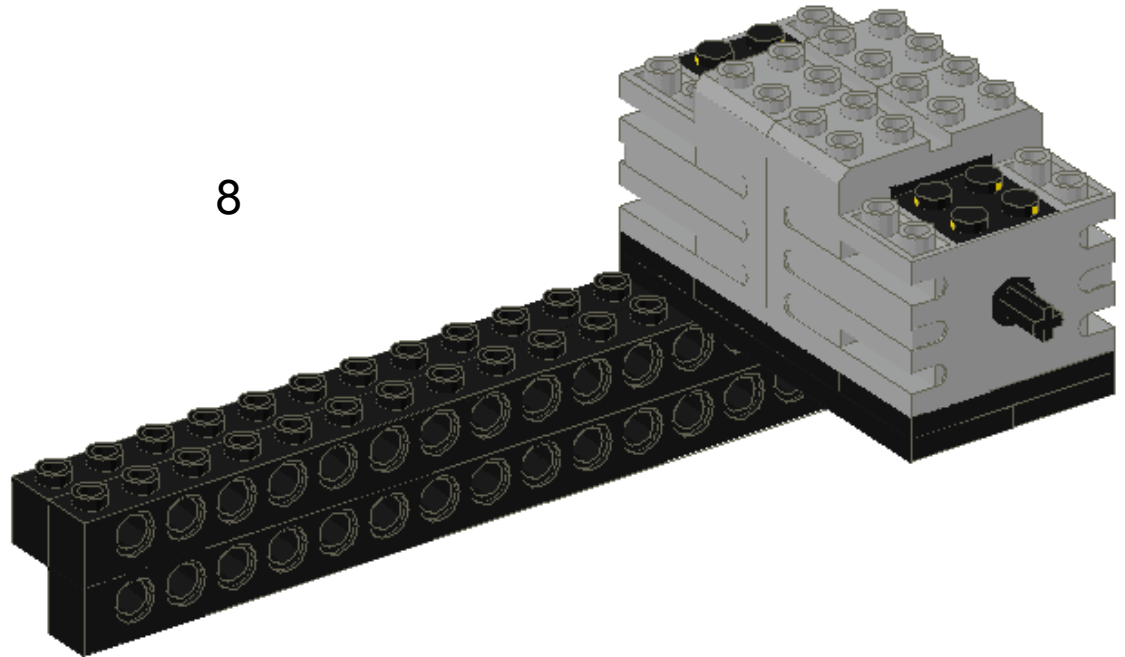
Our Favorite Things

Solar System ROVer

Pieces:



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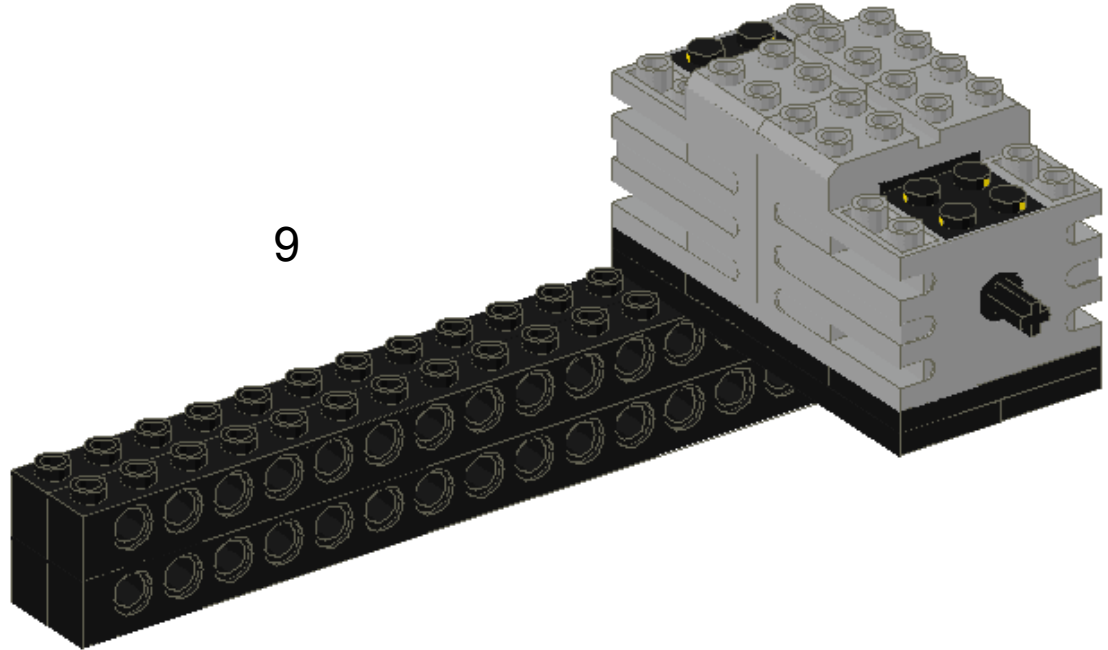
Our Favorite Things

Solar System ROVer

Pieces:



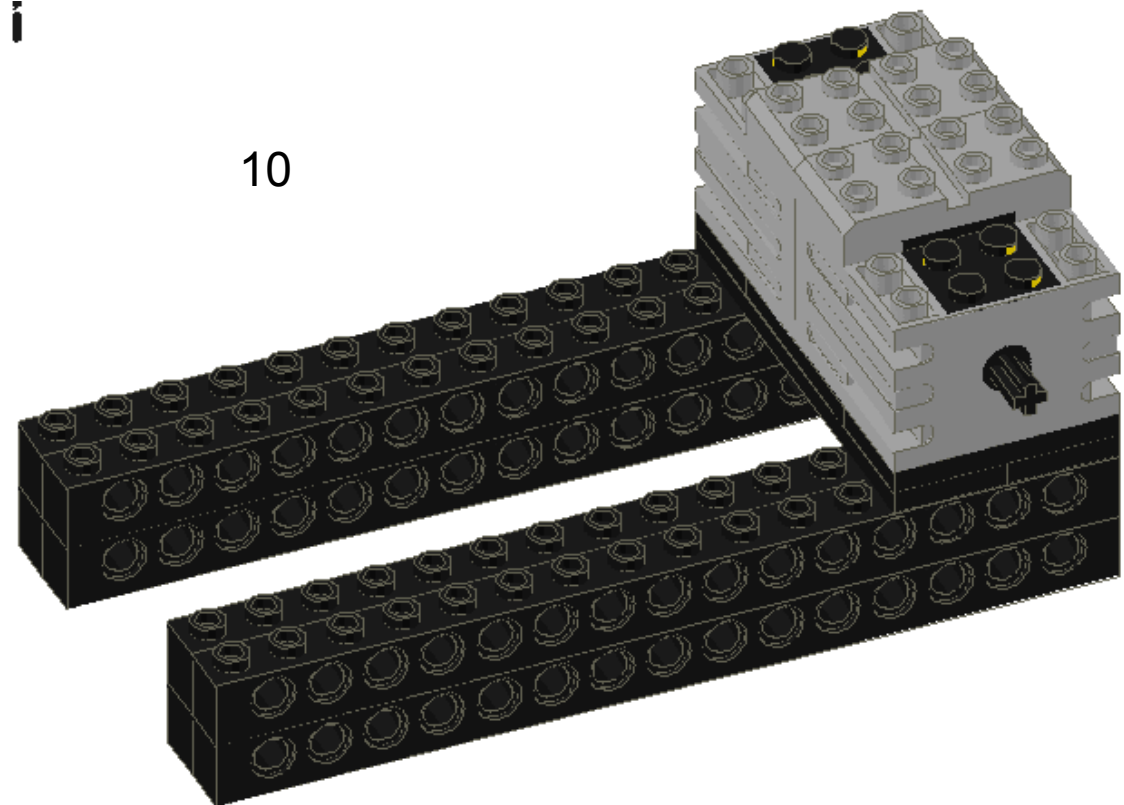
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Our Favorite Things

Solar System ROVer

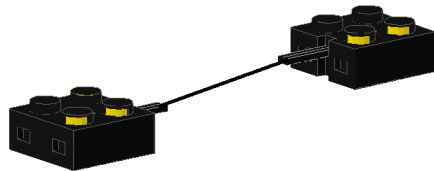
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Our Favorite Things

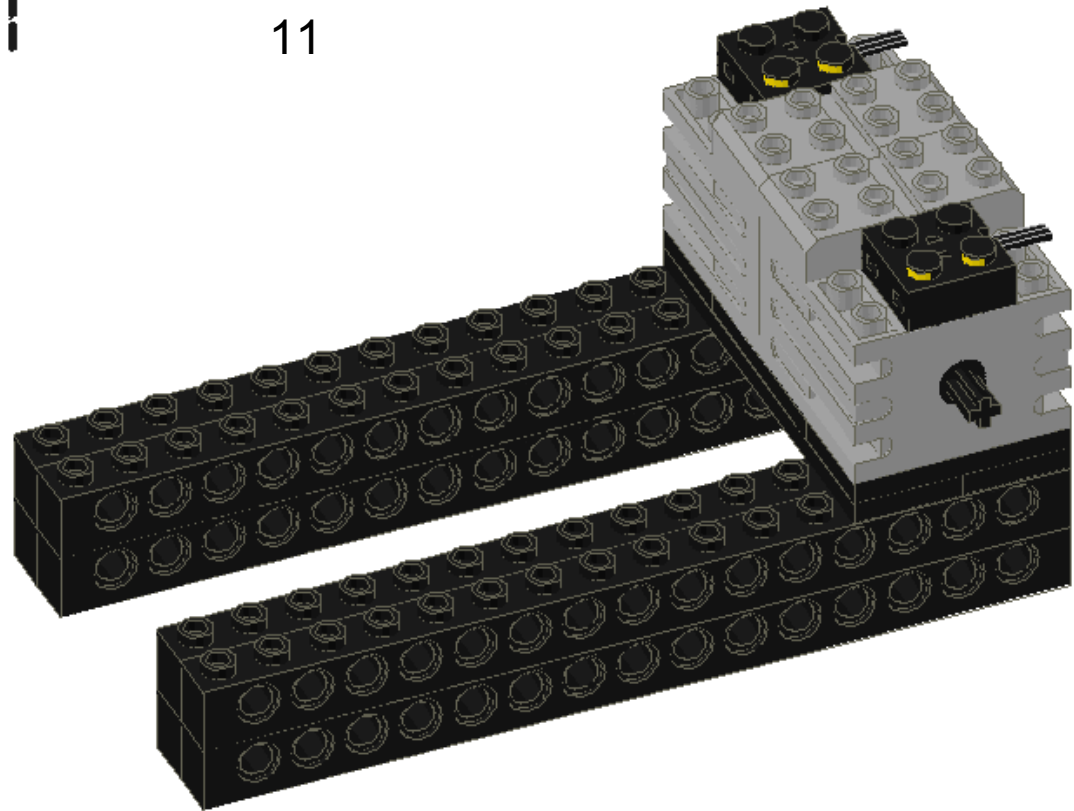
Solar System ROVer

Pieces:



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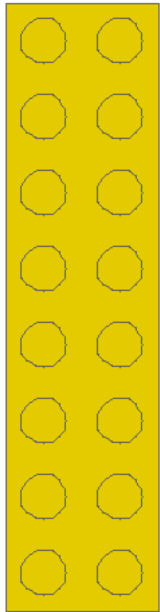
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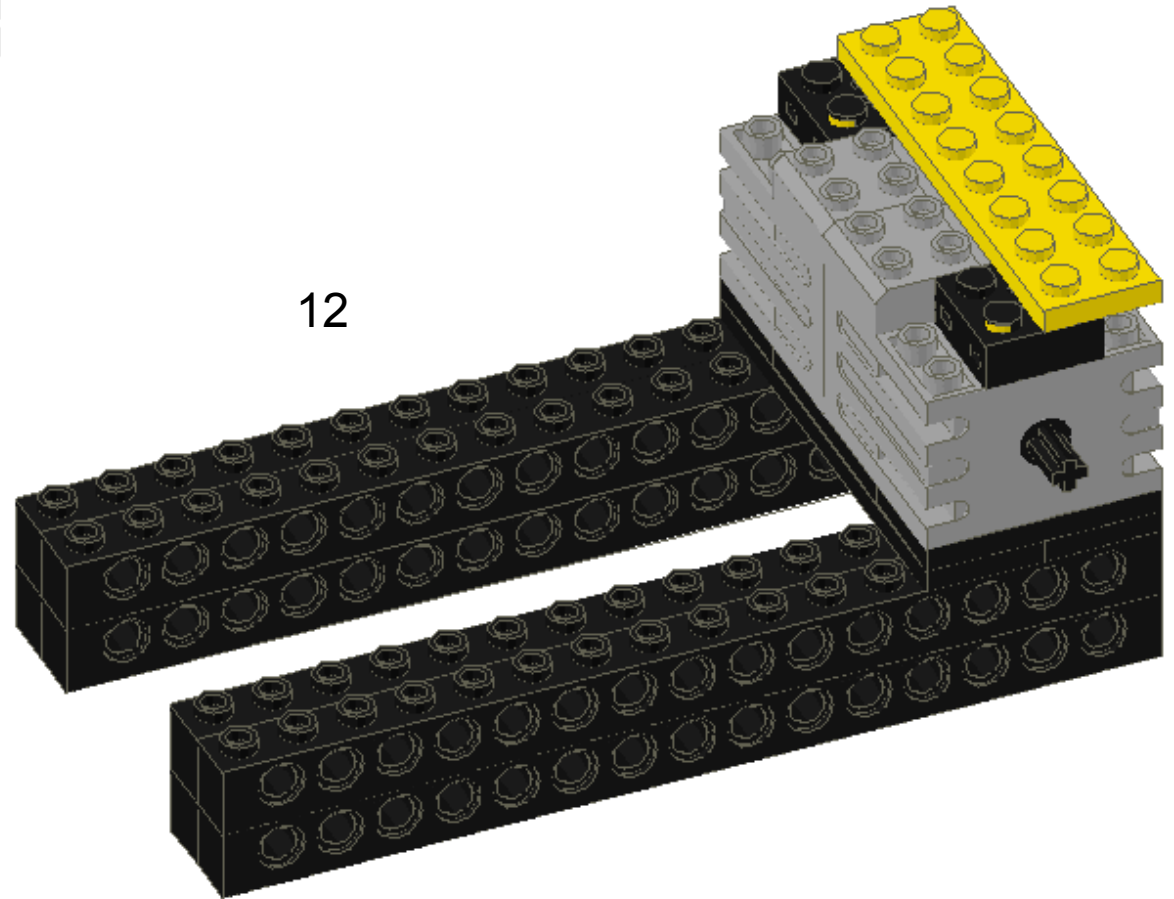
Our Favorite Things

Solar System ROVer

Pieces:



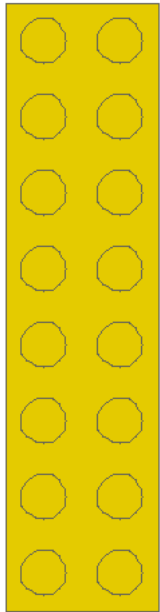
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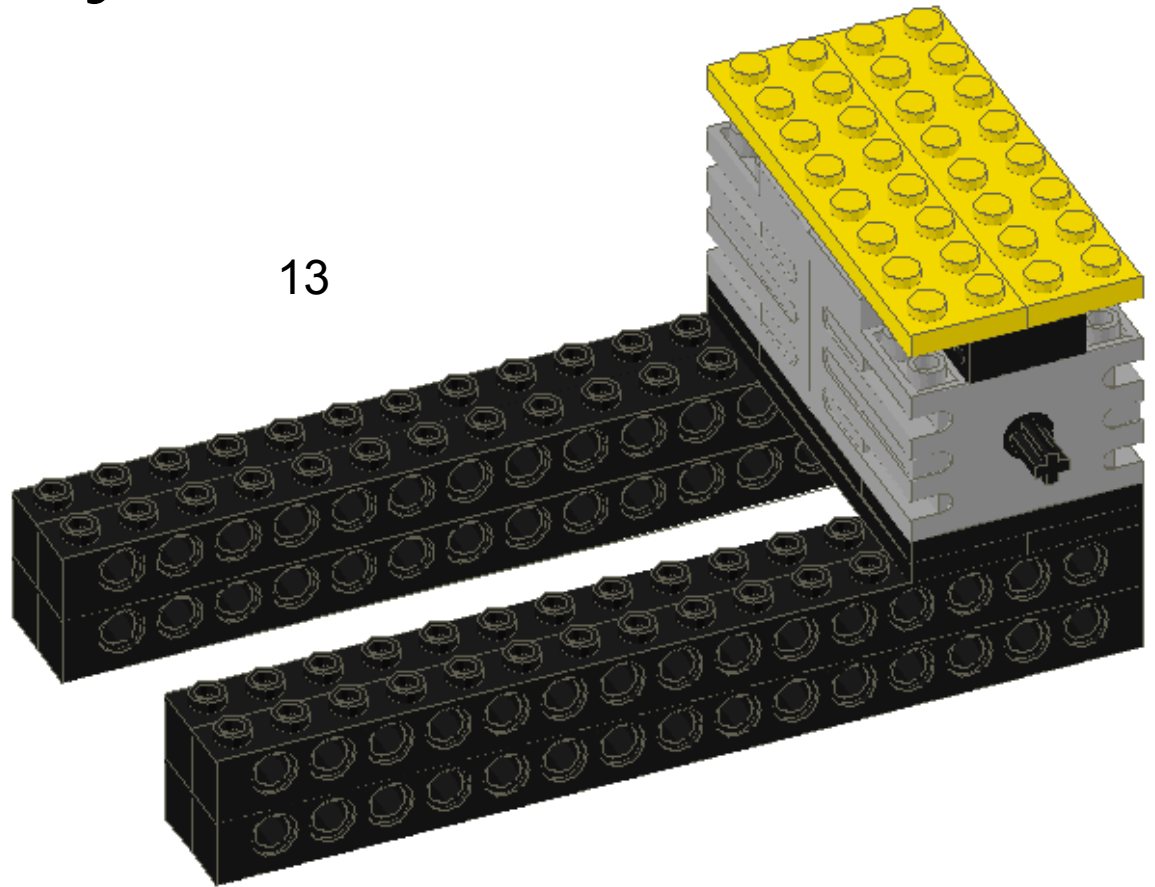
Our Favorite Things

Solar System ROVer

Pieces:



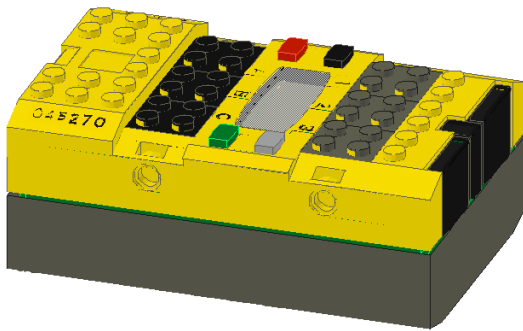
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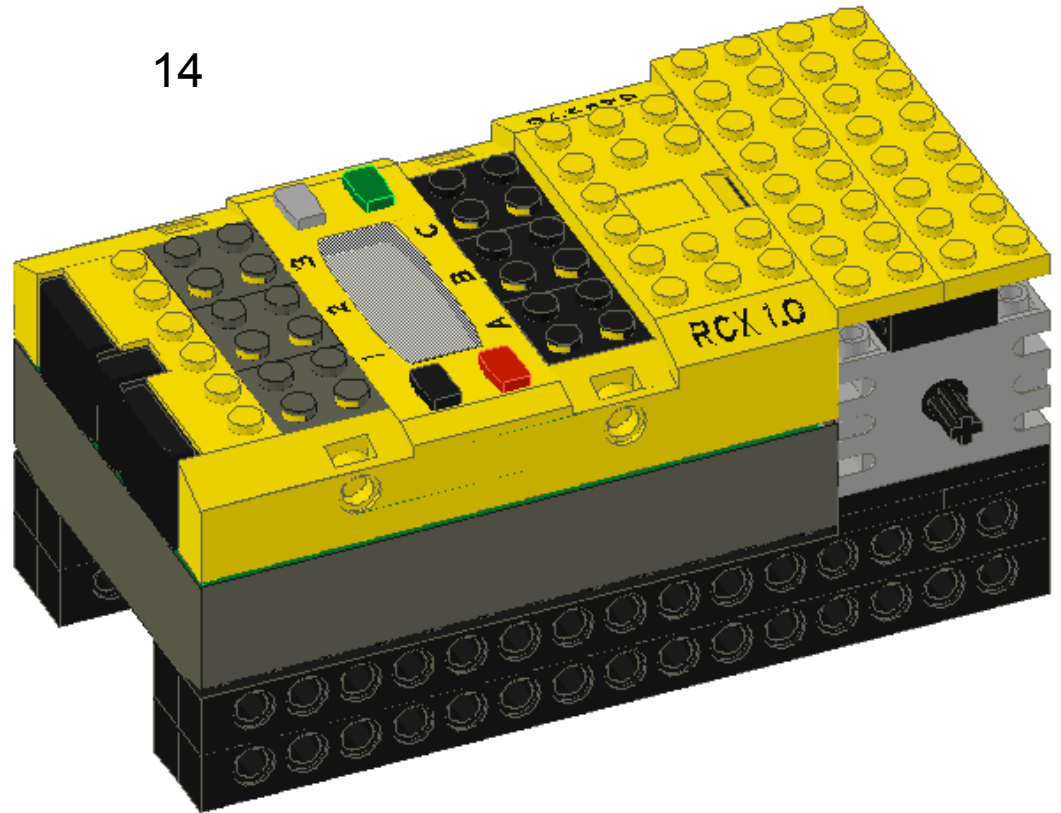
Our Favorite Things

Solar System ROVer

Pieces:



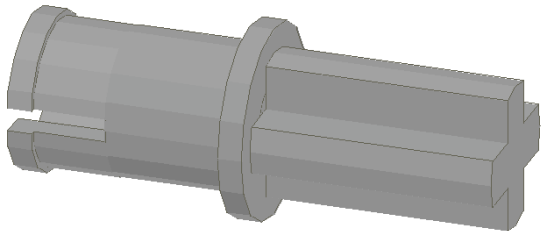
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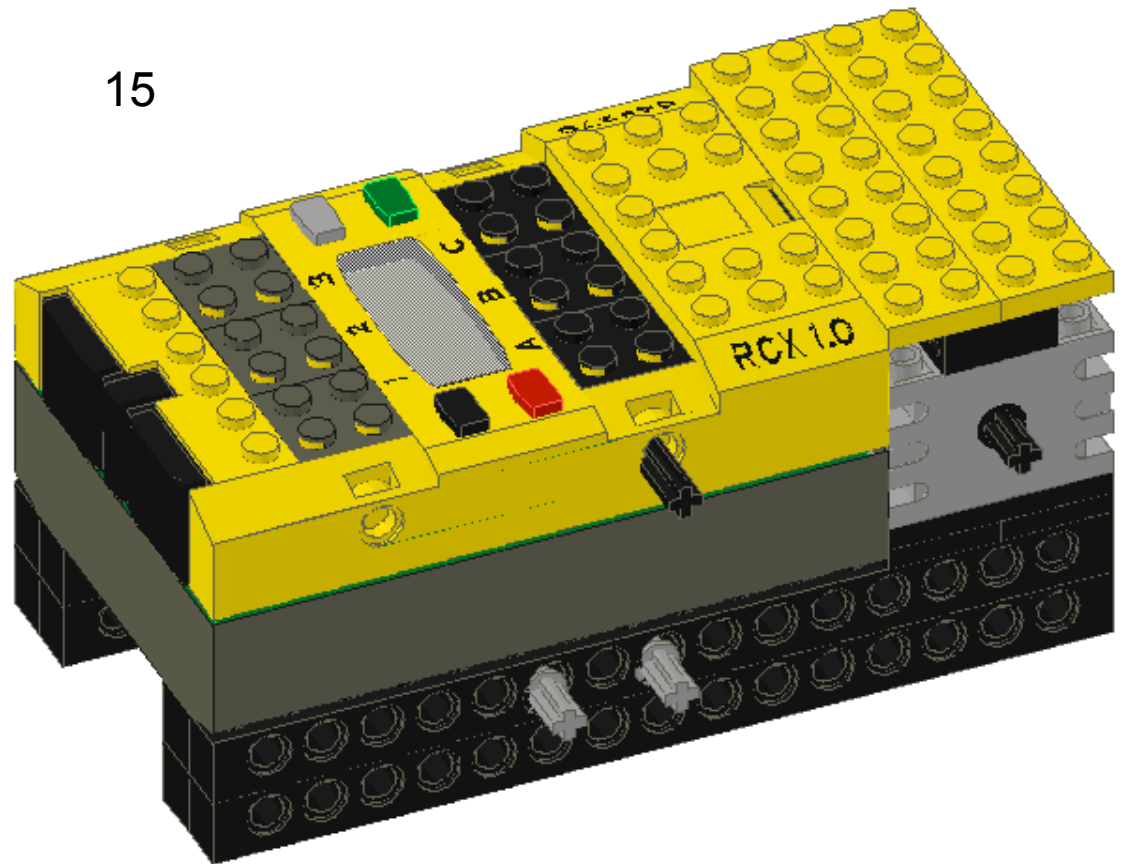
Our Favorite Things

Solar System ROVer

Pieces:



15



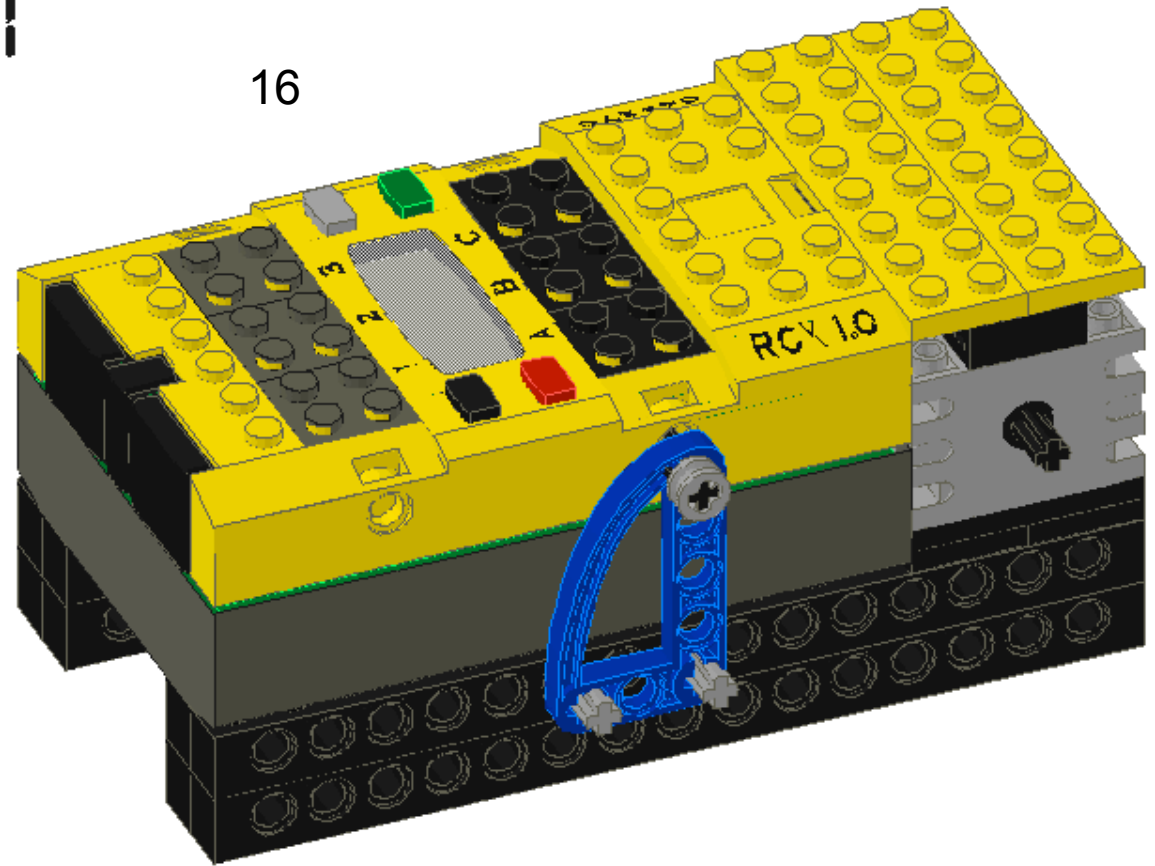
Our Favorite Things

Solar System ROVer

Pieces:



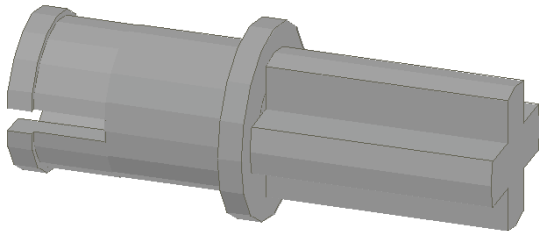
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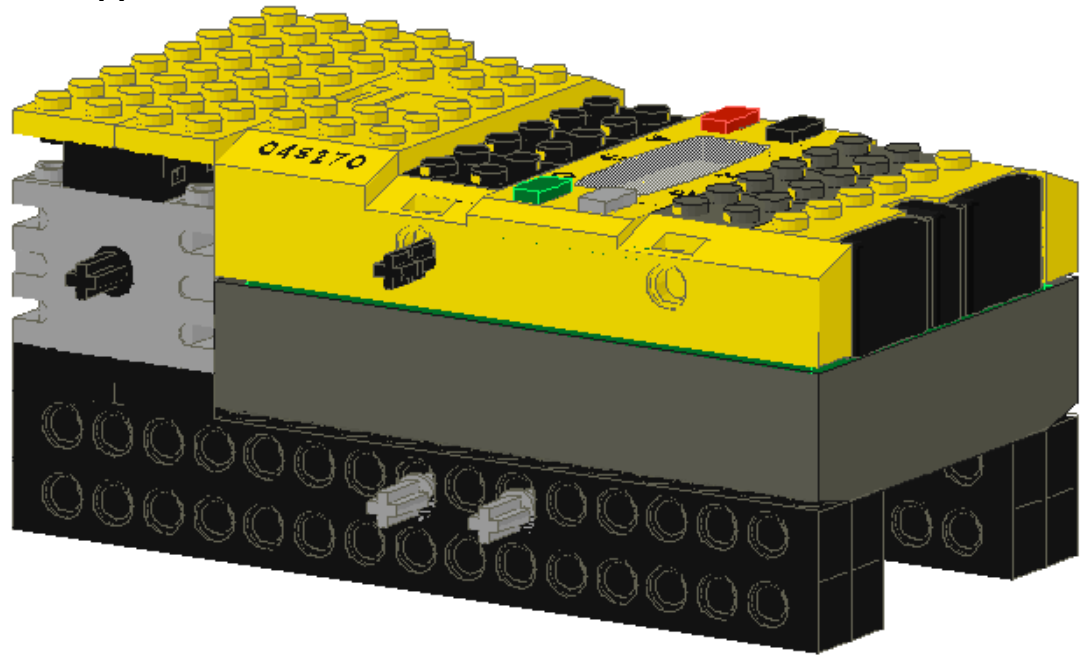
Our Favorite Things

Solar System ROVer

Pieces:



17



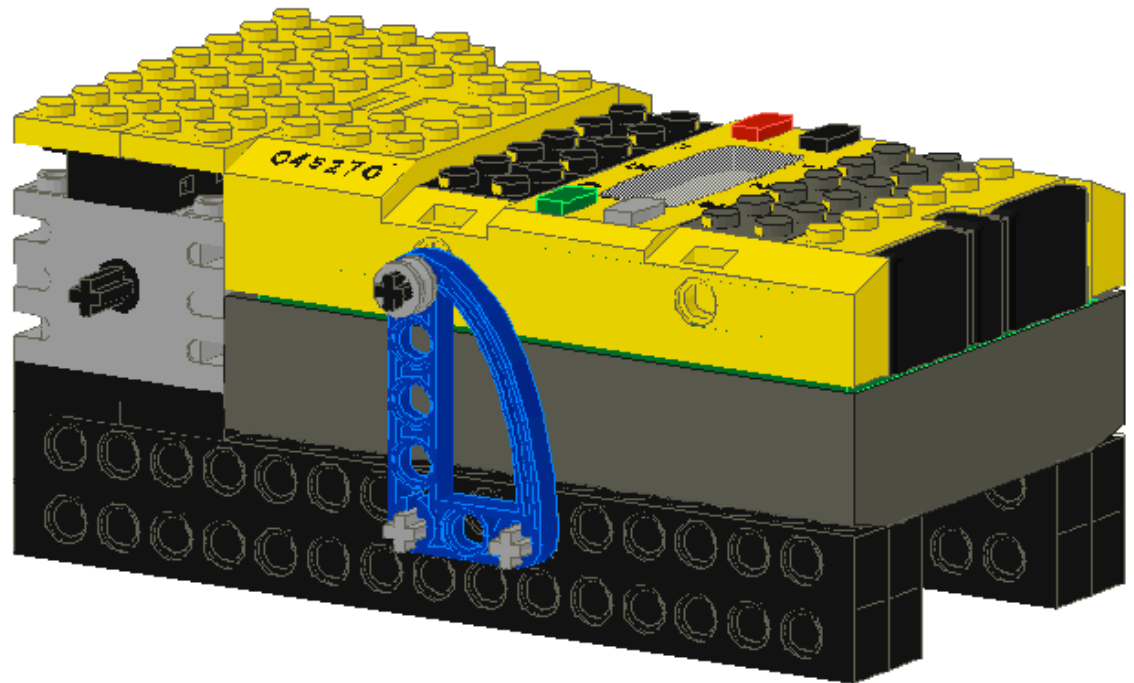
Our Favorite Things

Solar System ROVer

Pieces:



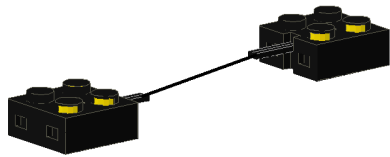
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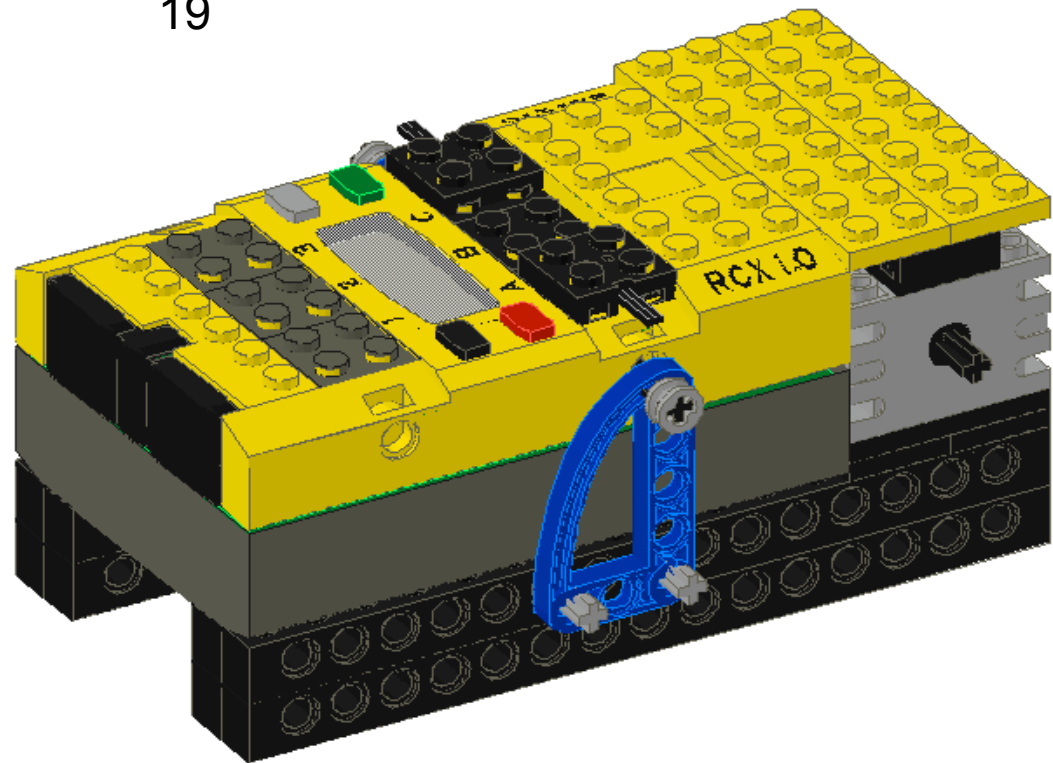
Our Favorite Things

Solar System ROVer

Pieces:



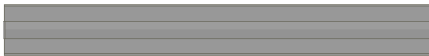
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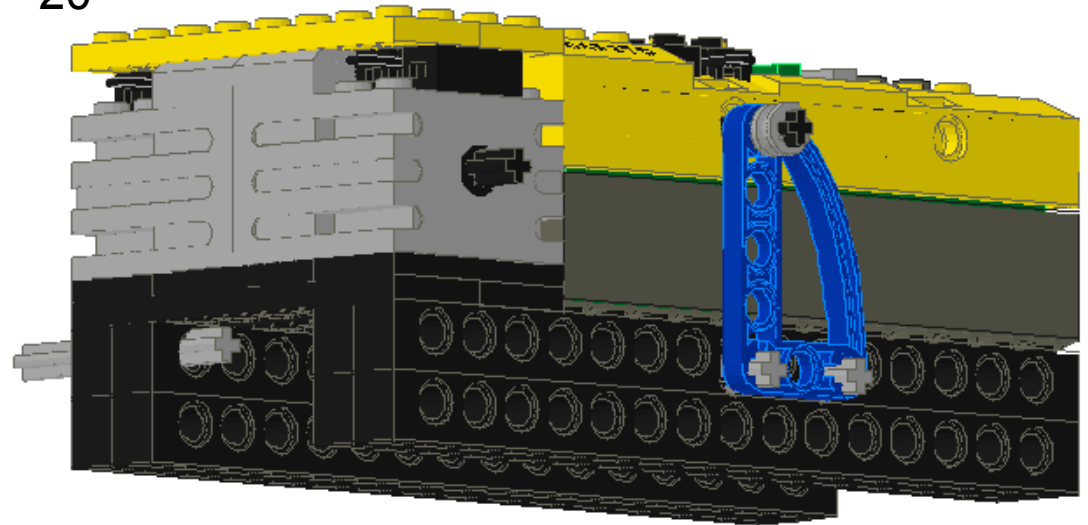
Our Favorite Things

Solar System ROVer

Pieces:



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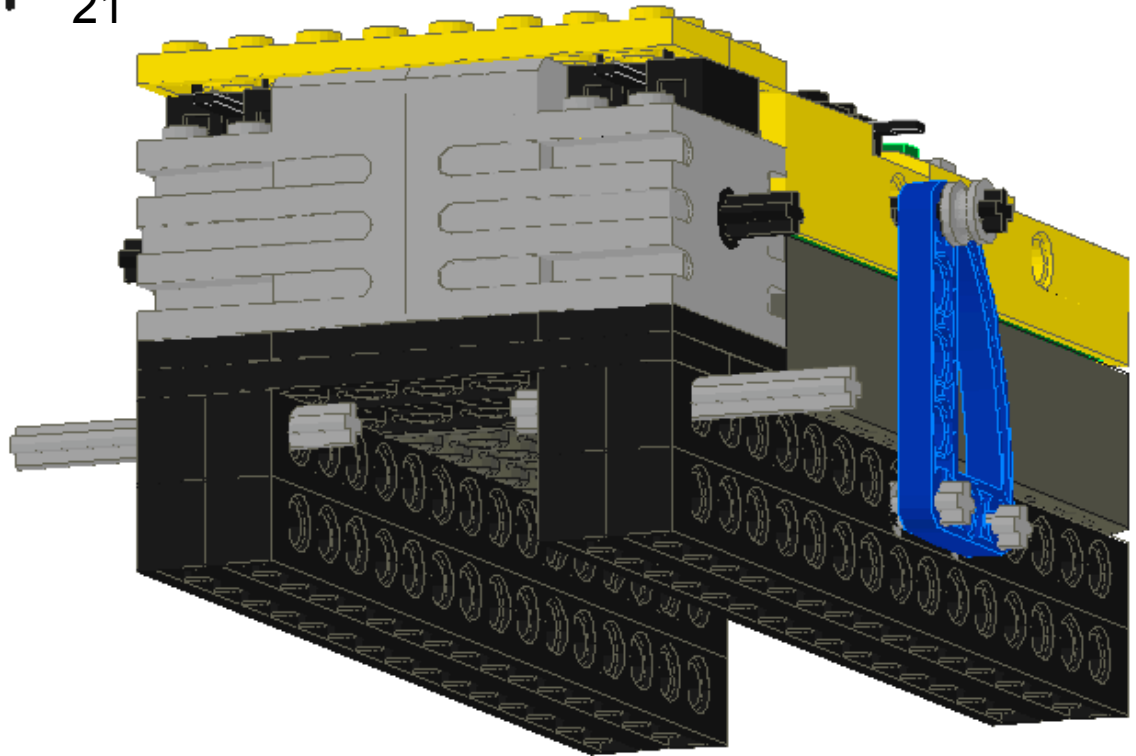
Our Favorite Things

Solar System ROVer

Pieces:



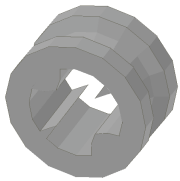
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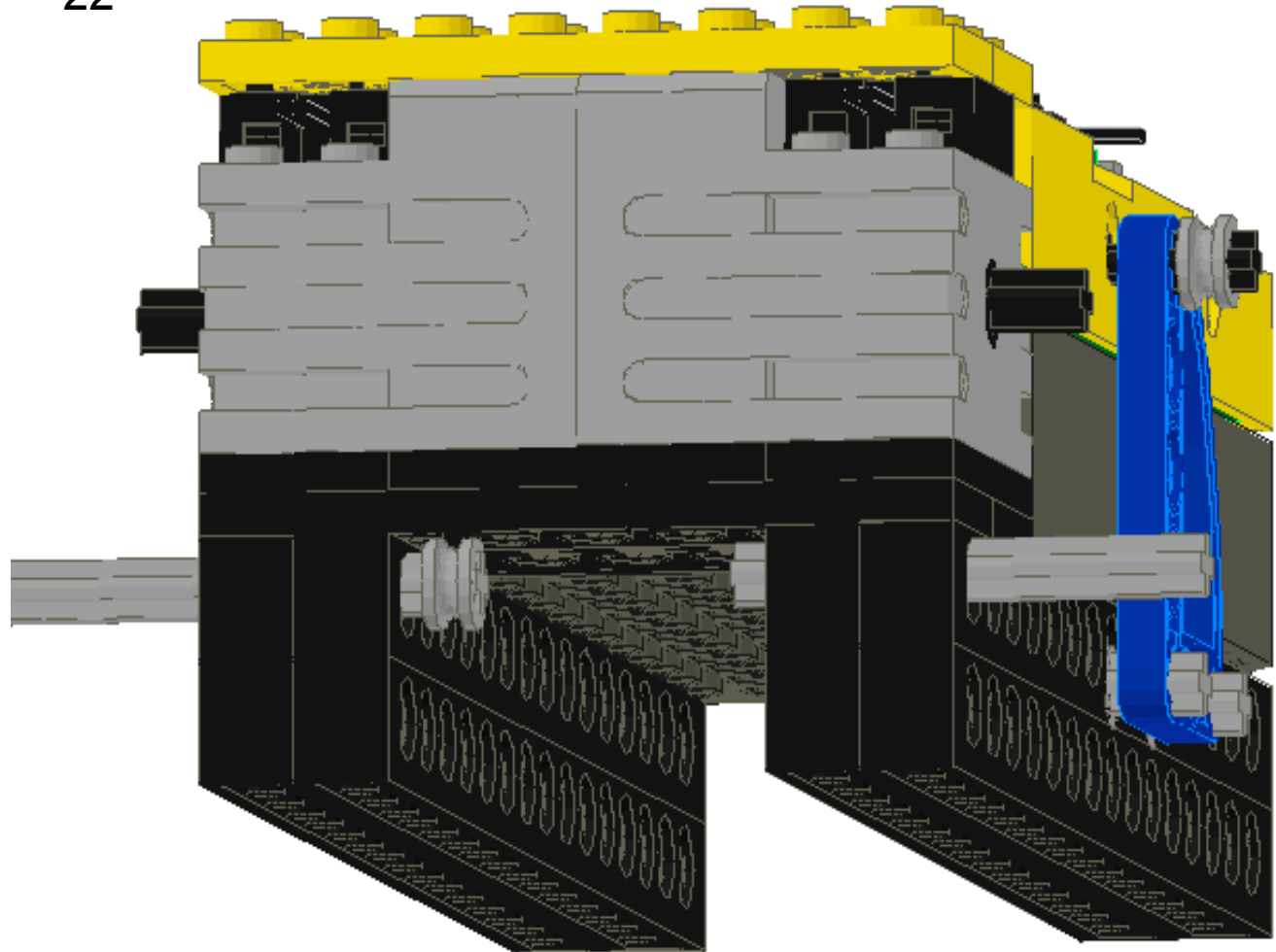
Our Favorite Things

Solar System ROVer

Pieces:



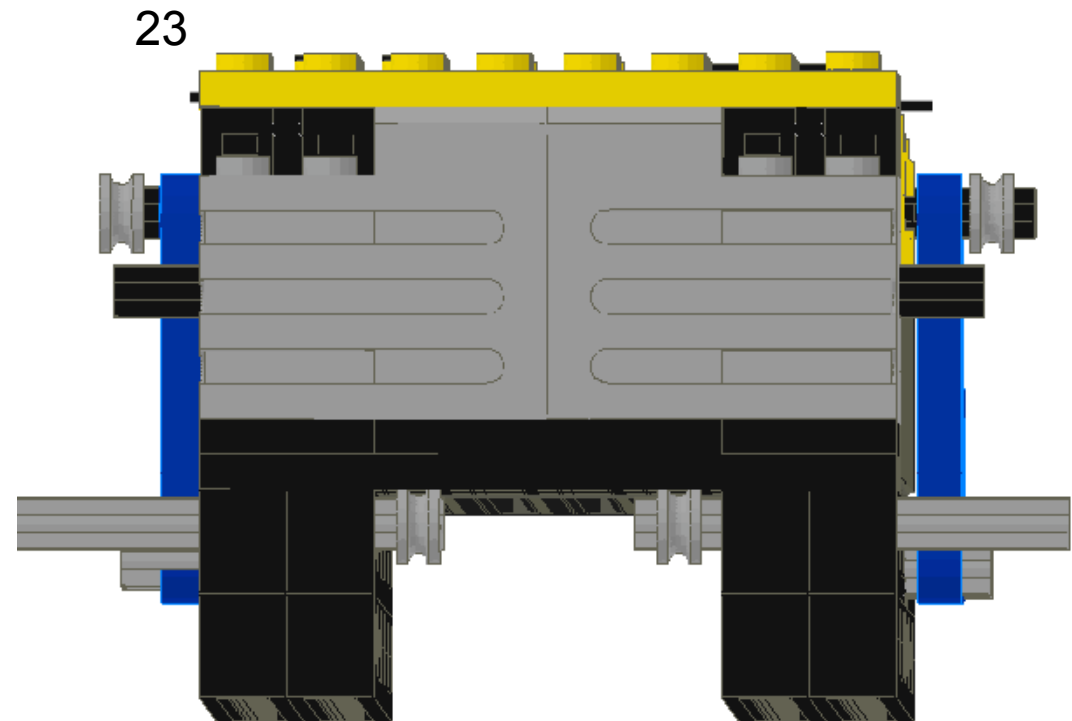
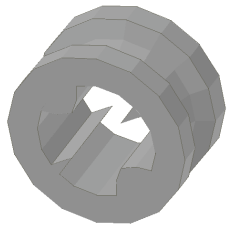
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Our Favorite Things

Solar System ROVer

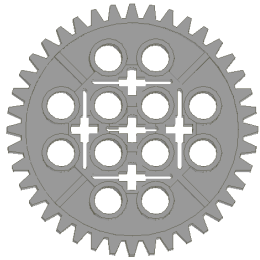
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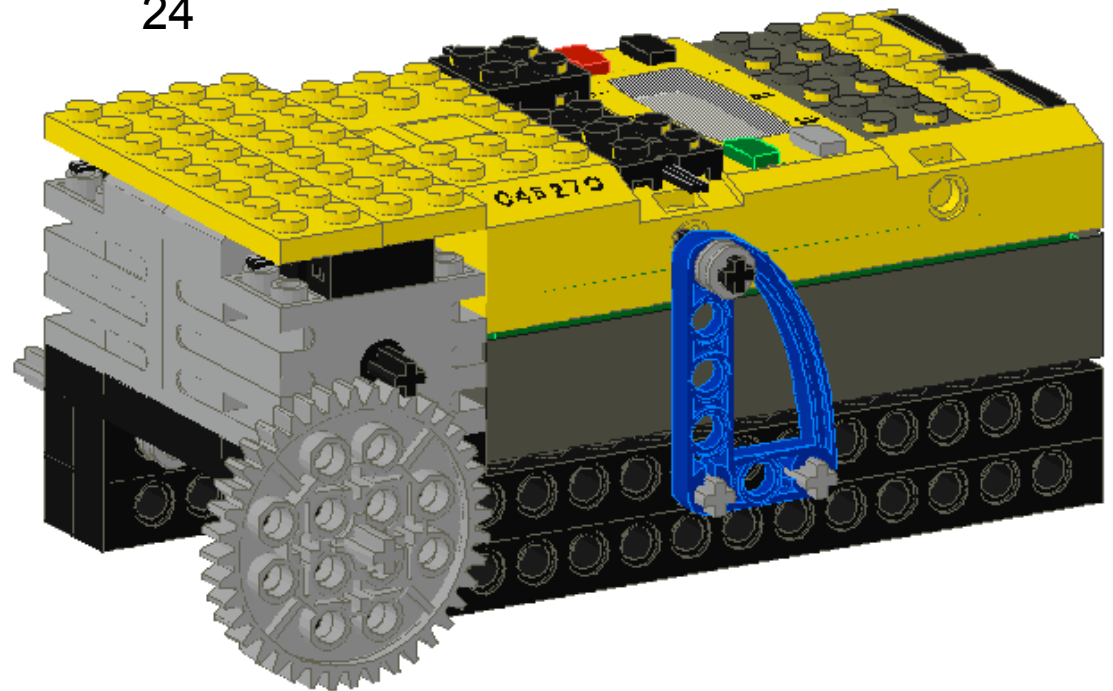
Our Favorite Things

Solar System ROVer

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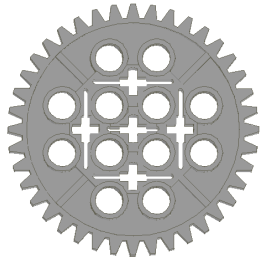
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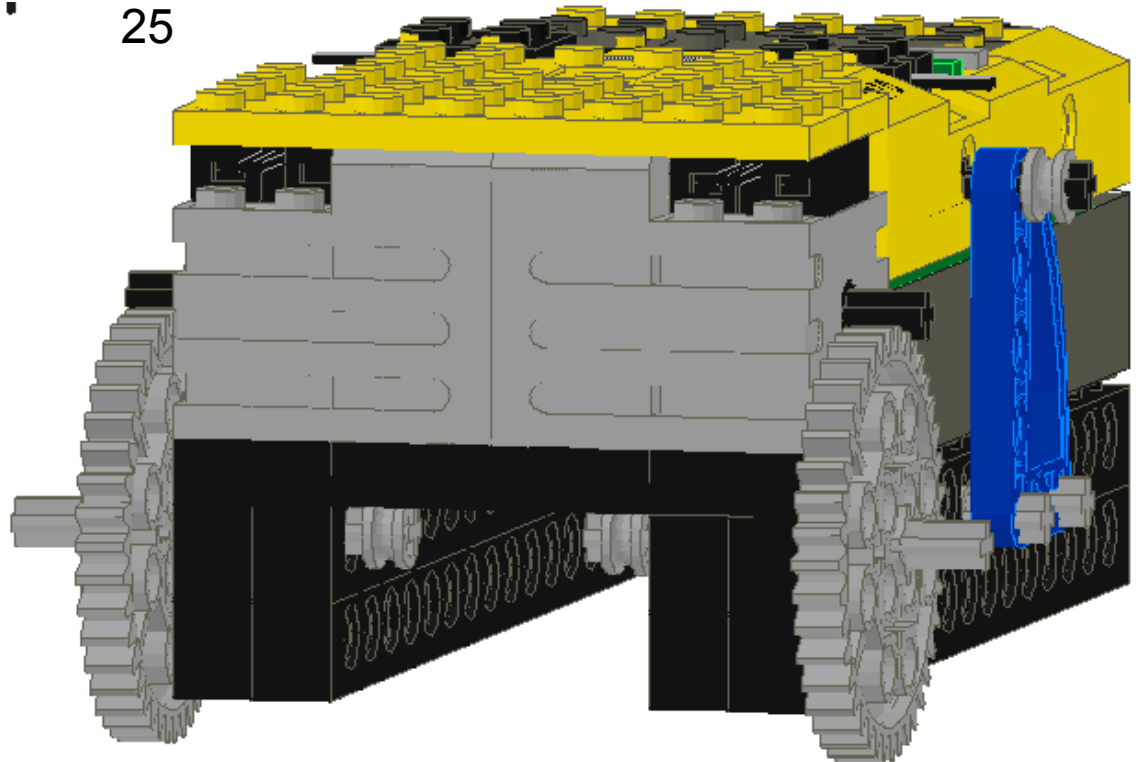
Our Favorite Things

Solar System ROVer

Pieces:



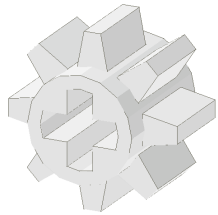
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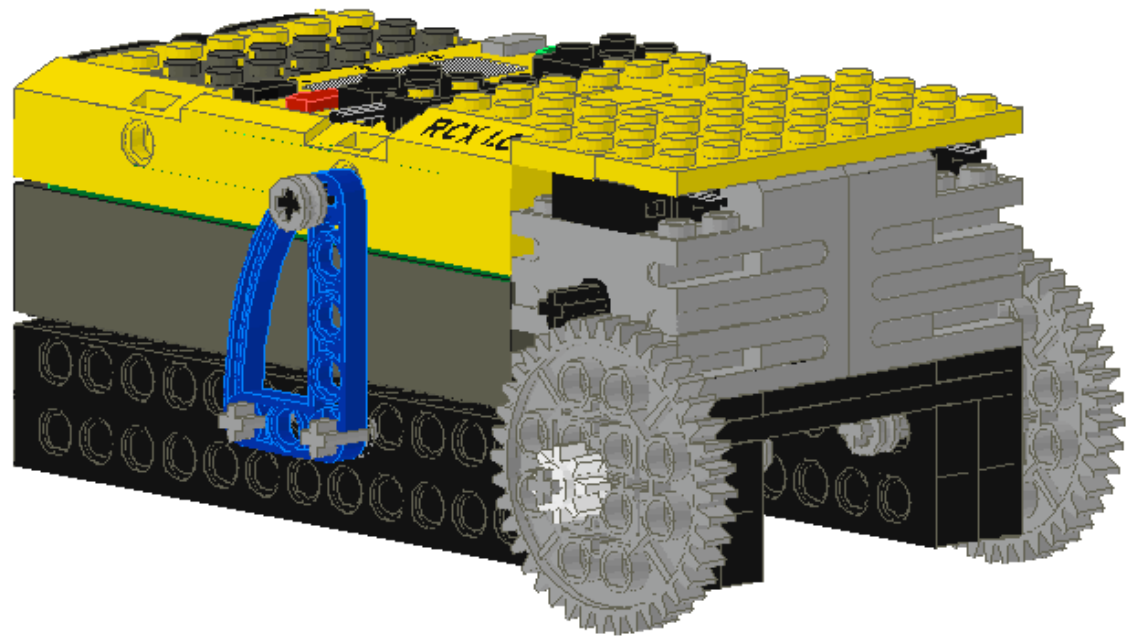
Our Favorite Things

Solar System ROVer

Pieces:



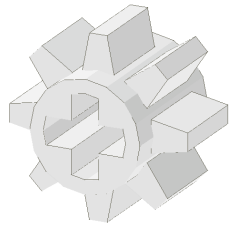
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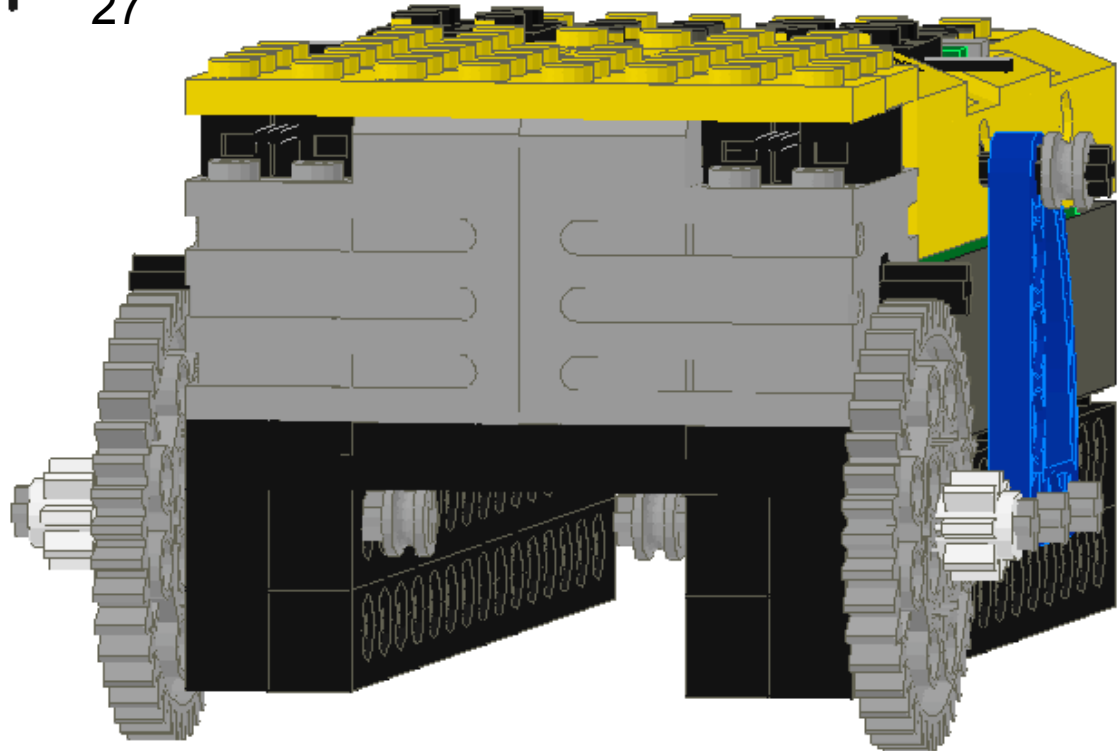
Our Favorite Things

Solar System ROVer

Pieces:



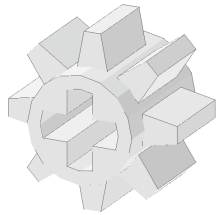
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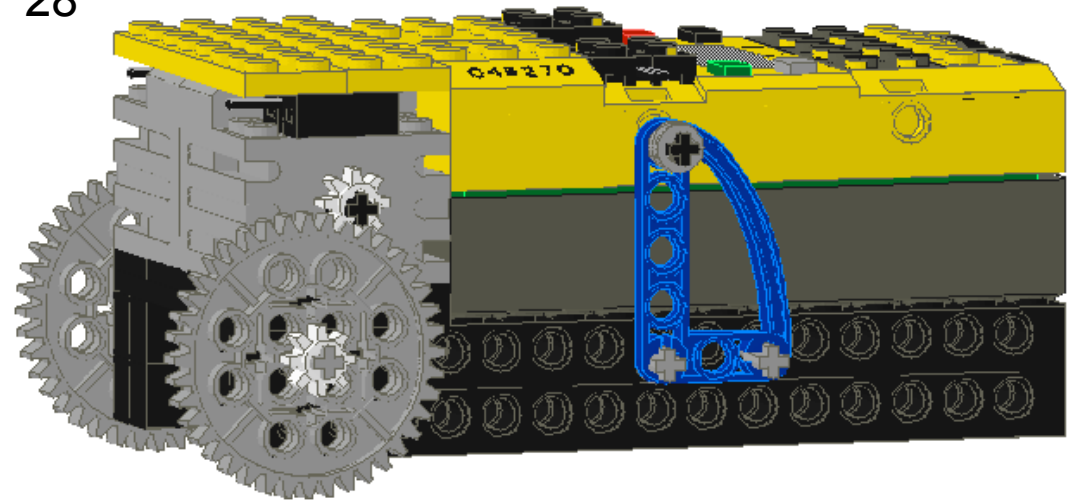
Our Favorite Things

Solar System ROVer

Pieces:



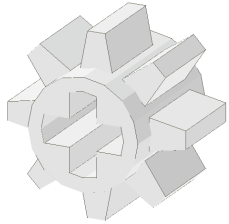
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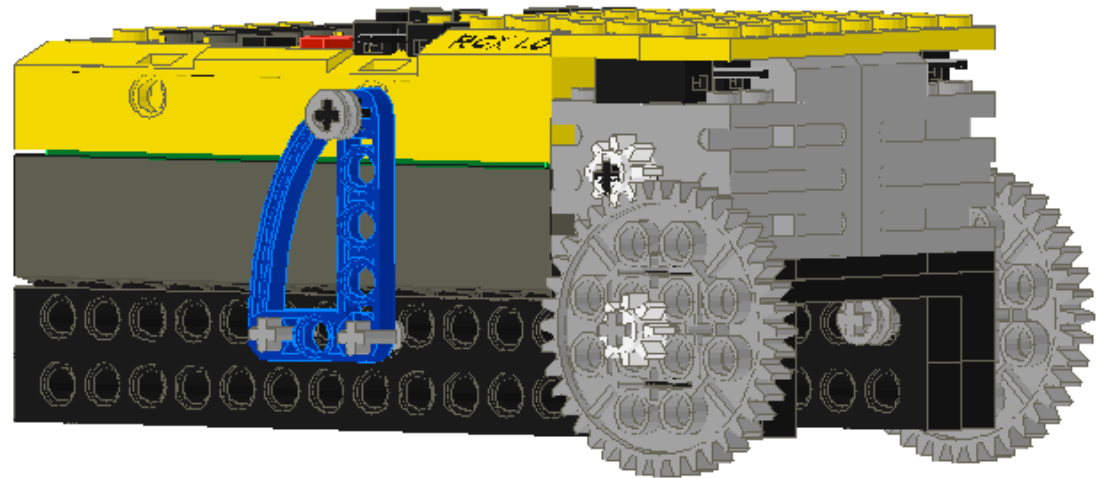
Our Favorite Things

Solar System ROVer

Pieces:



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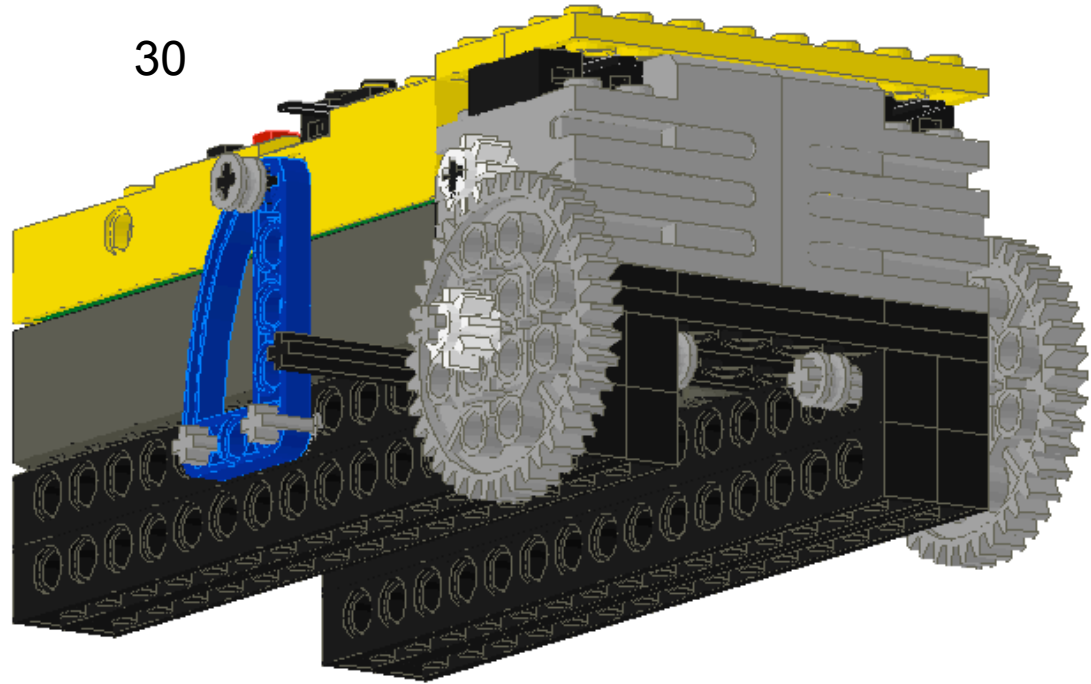
Our Favorite Things

Solar System ROVer

Pieces:



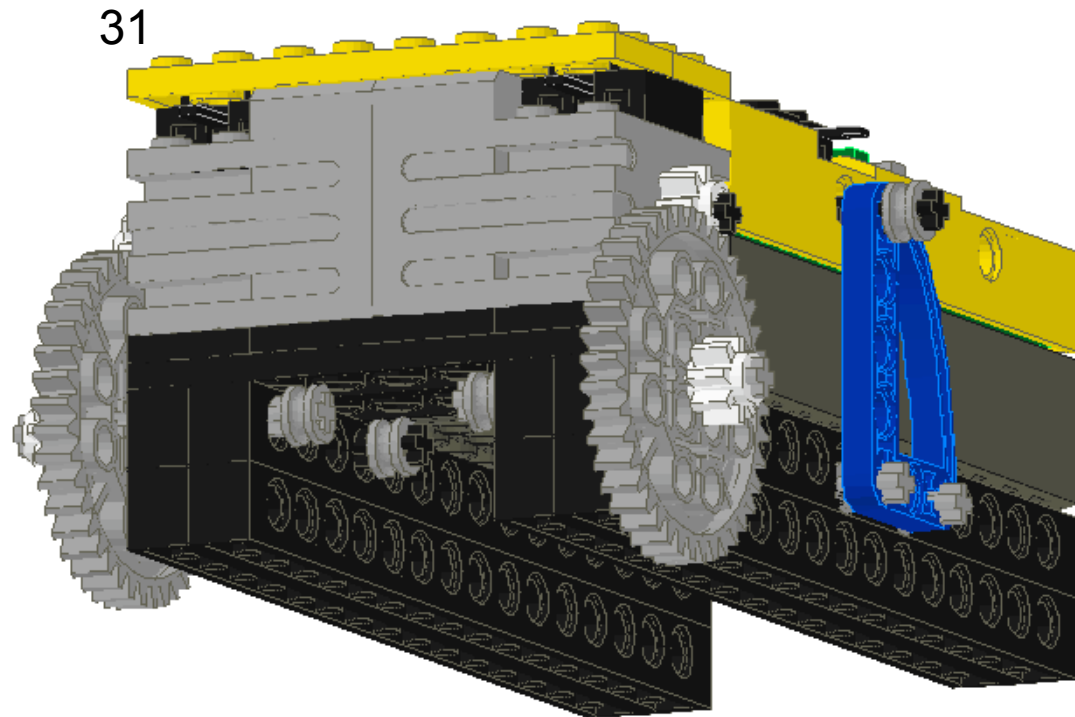
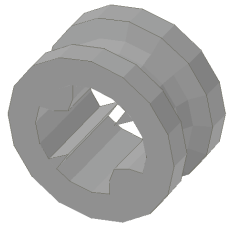
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Our Favorite Things

Solar System ROVer

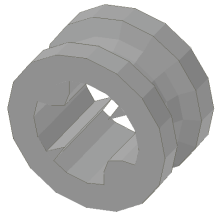
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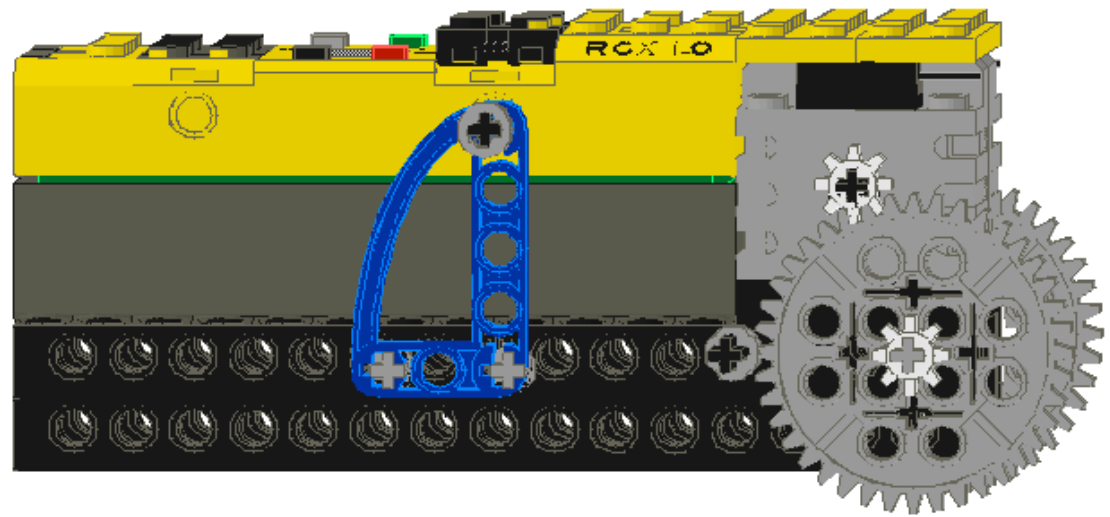
Our Favorite Things

Solar System ROVer

Pieces:



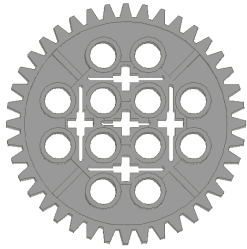
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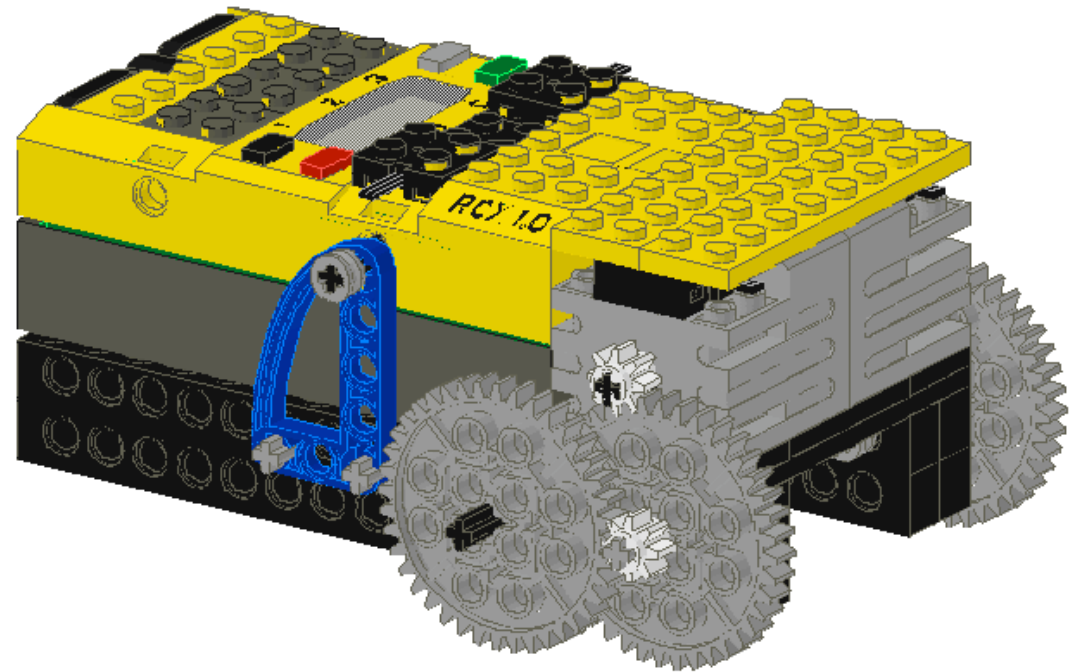
Our Favorite Things

Solar System ROVer

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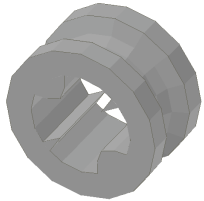
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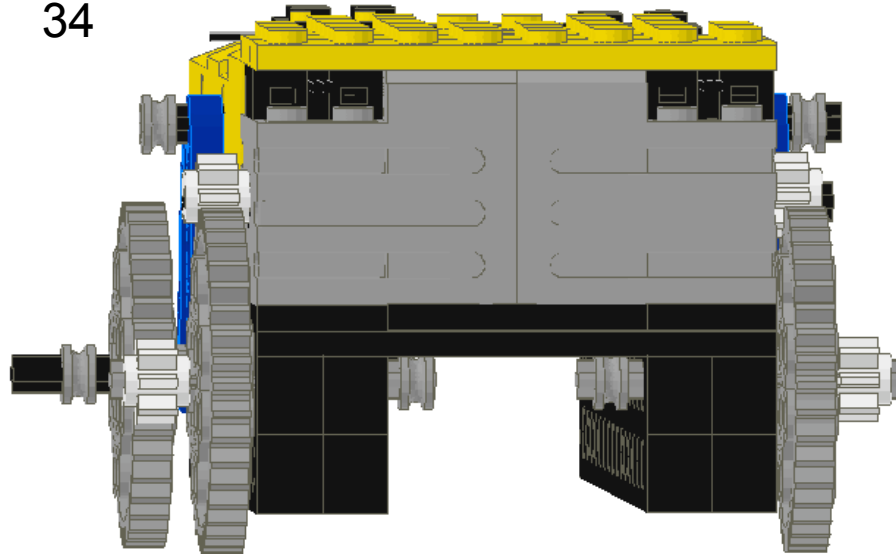
Our Favorite Things

Solar System ROVer

Pieces:



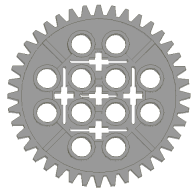
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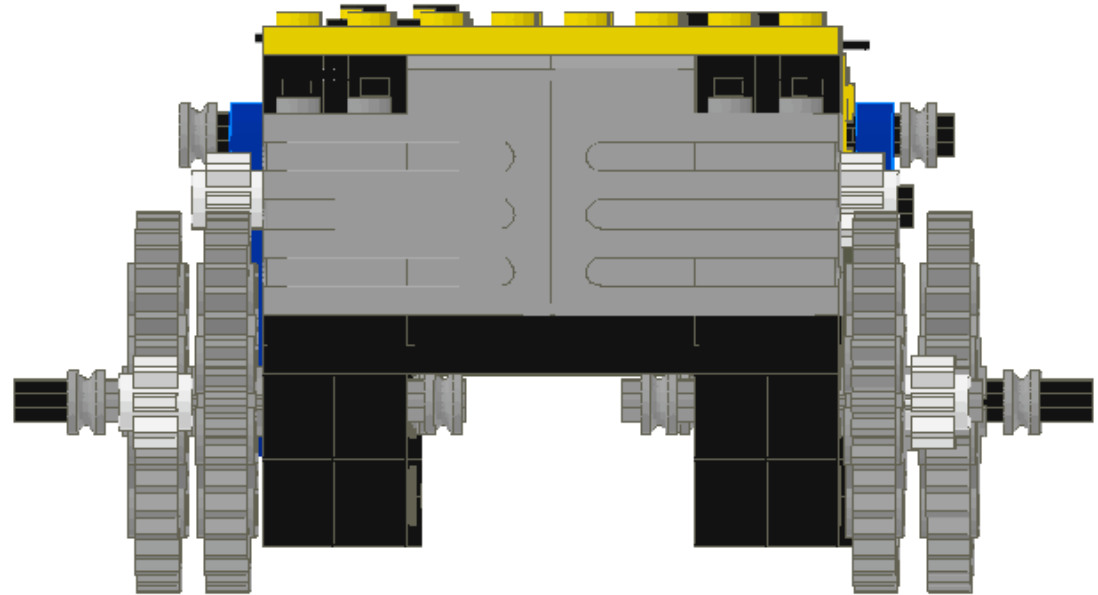
Our Favorite Things

Solar System ROVer

Pieces:



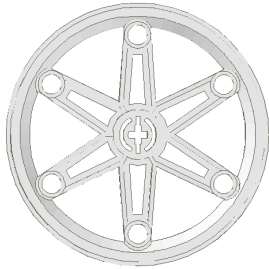
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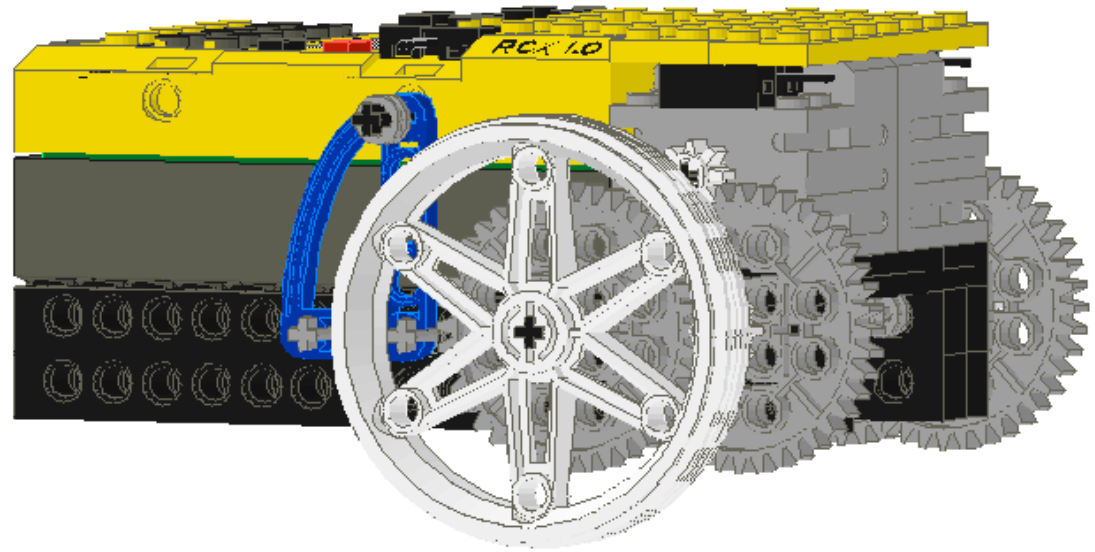
Our Favorite Things

Solar System ROVer

Pieces:



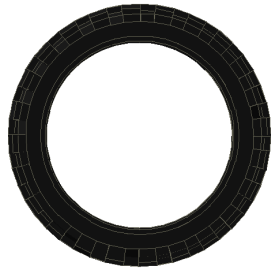
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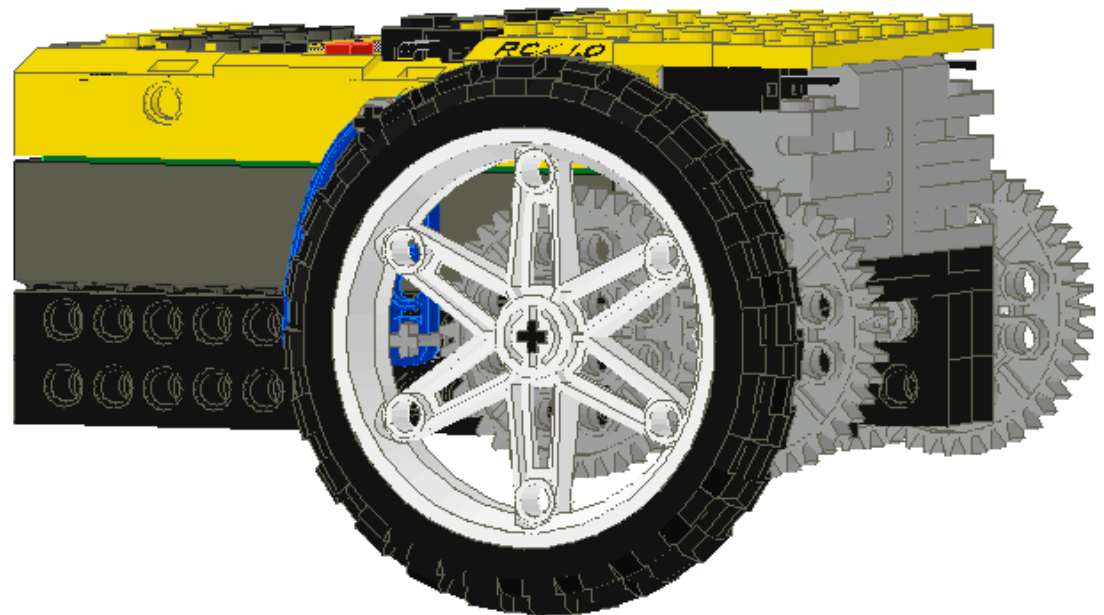
Our Favorite Things

Solar System ROVer

Pieces:



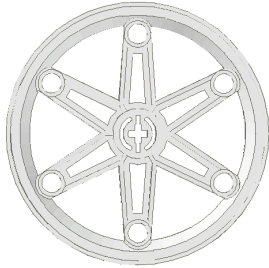
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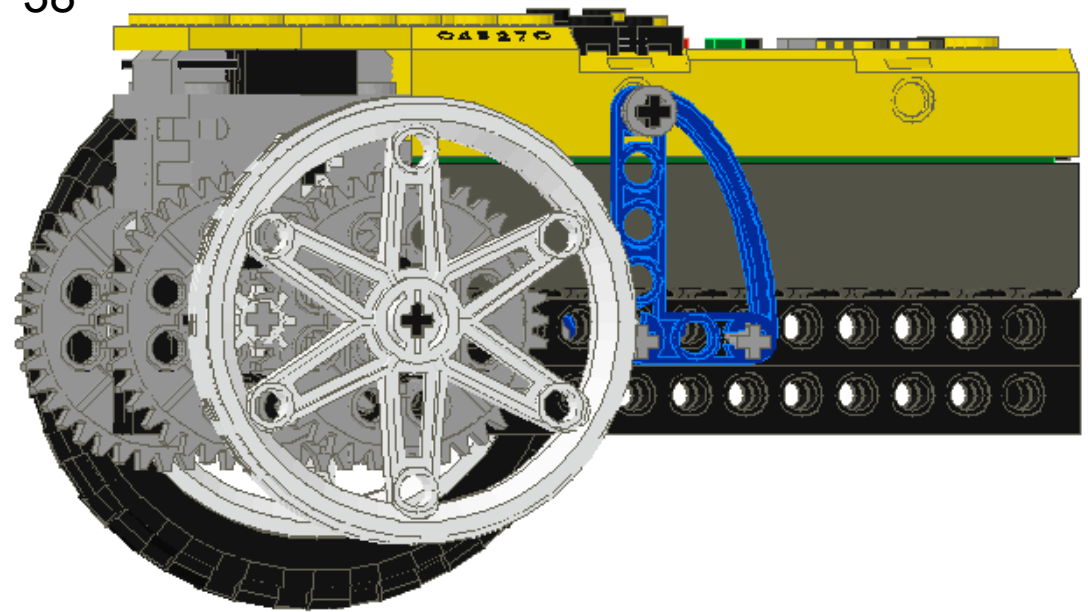
Our Favorite Things

Solar System ROVer

Pieces:



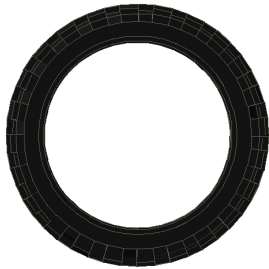
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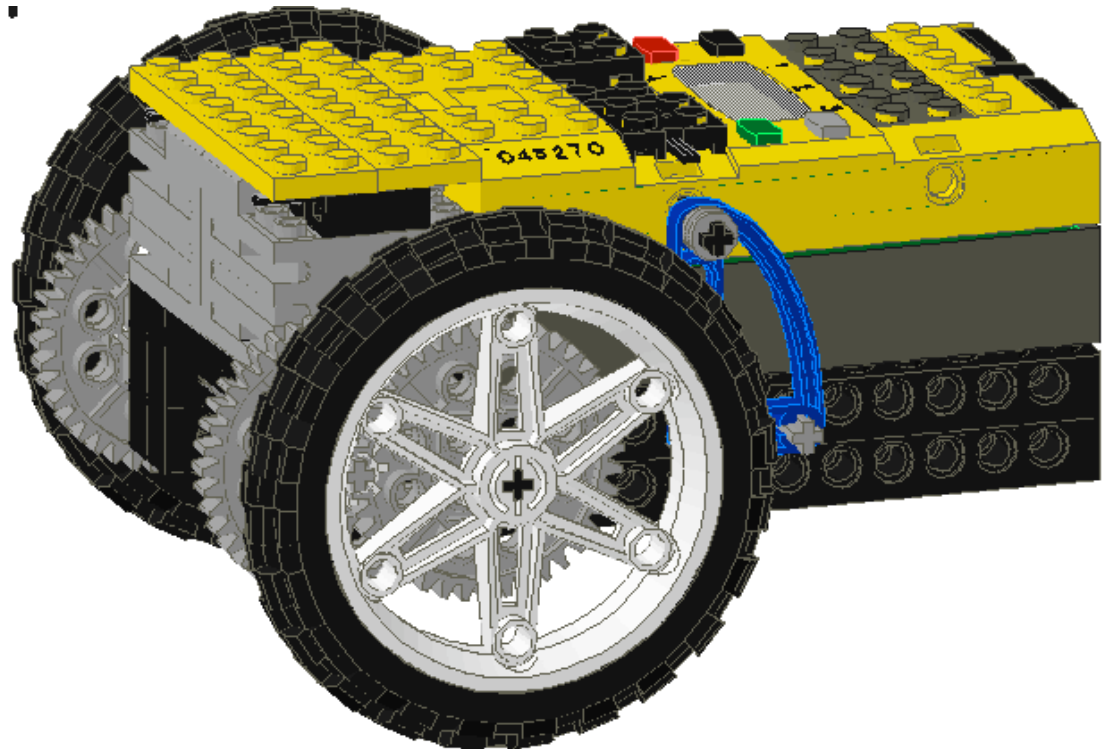
Our Favorite Things

Solar System ROVer

Pieces:



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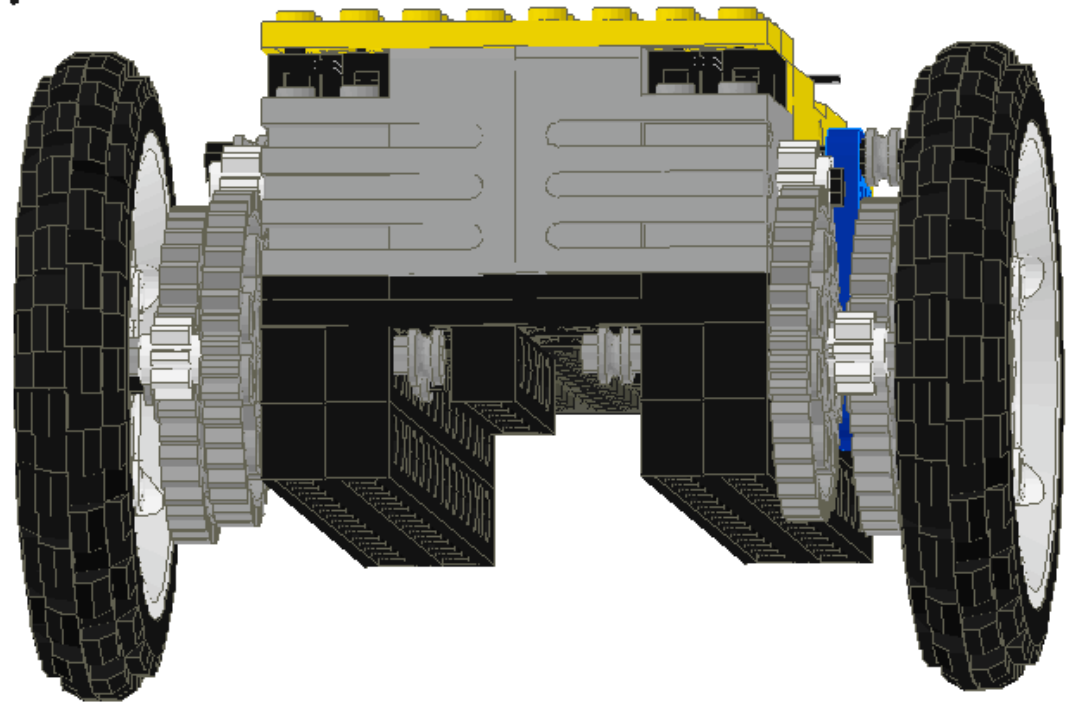
Our Favorite Things

Solar System ROVer

Pieces:



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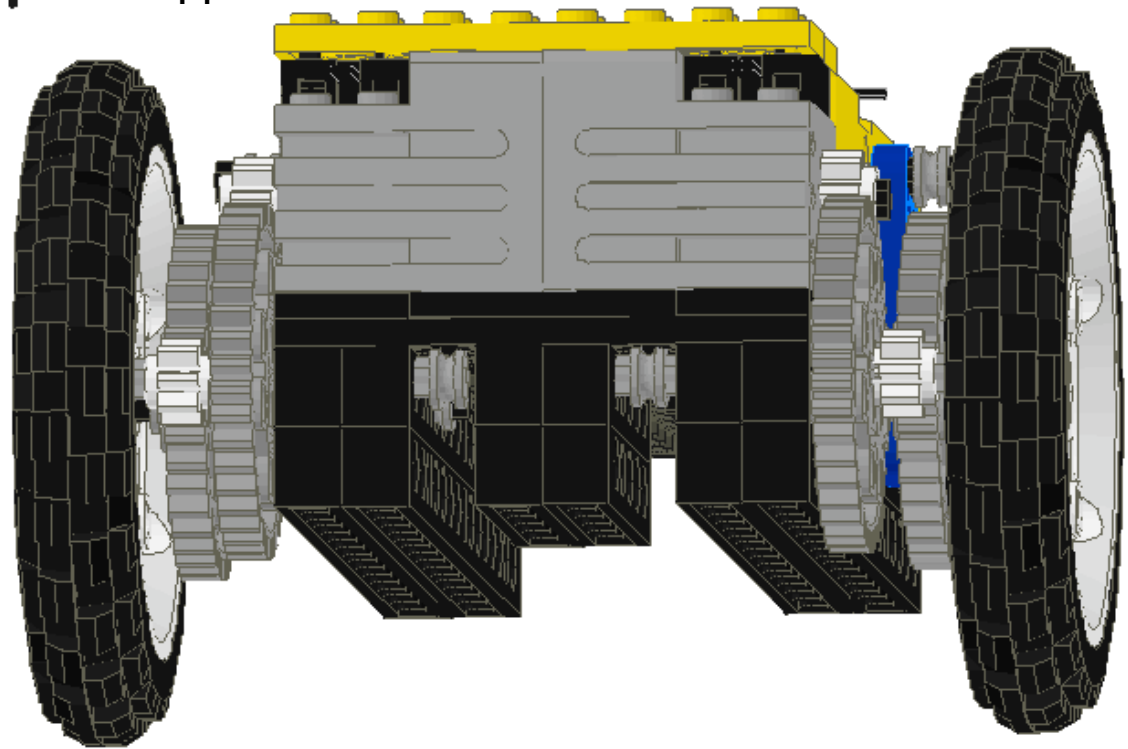
Our Favorite Things

Solar System ROVer

Pieces:



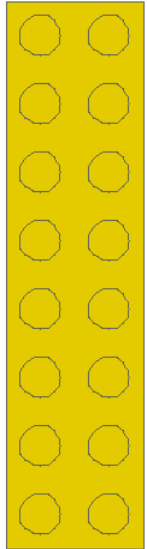
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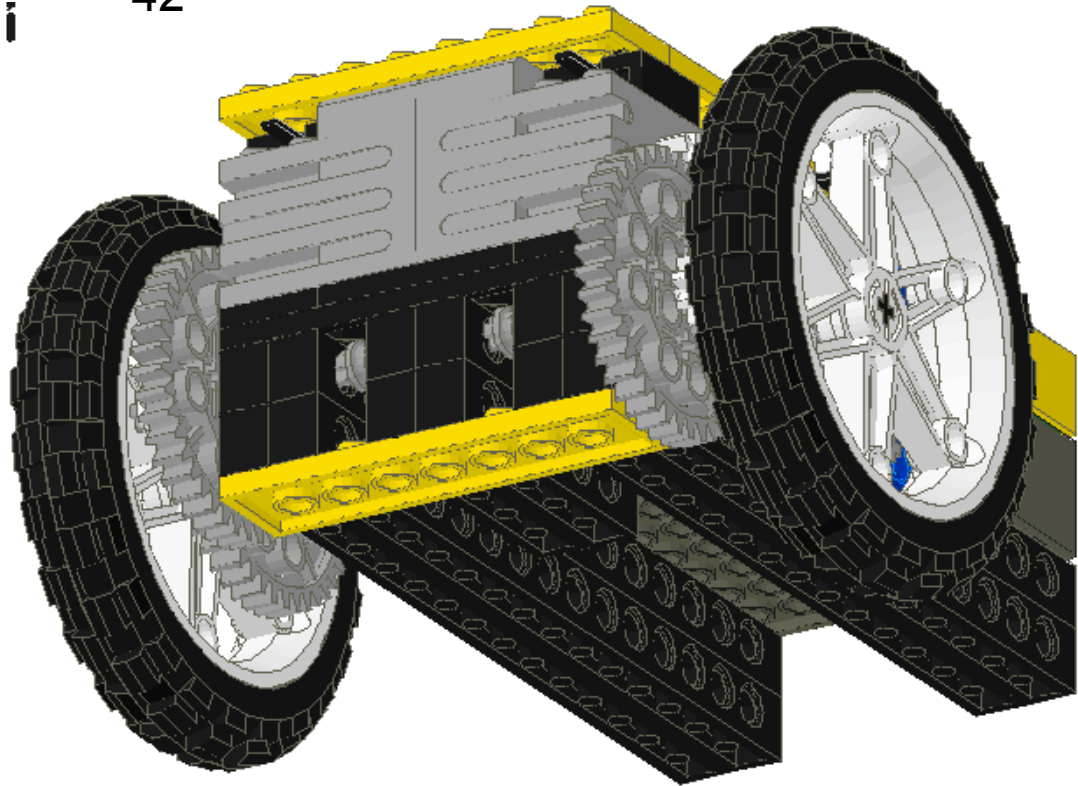
Our Favorite Things

Solar System ROVer

Pieces:



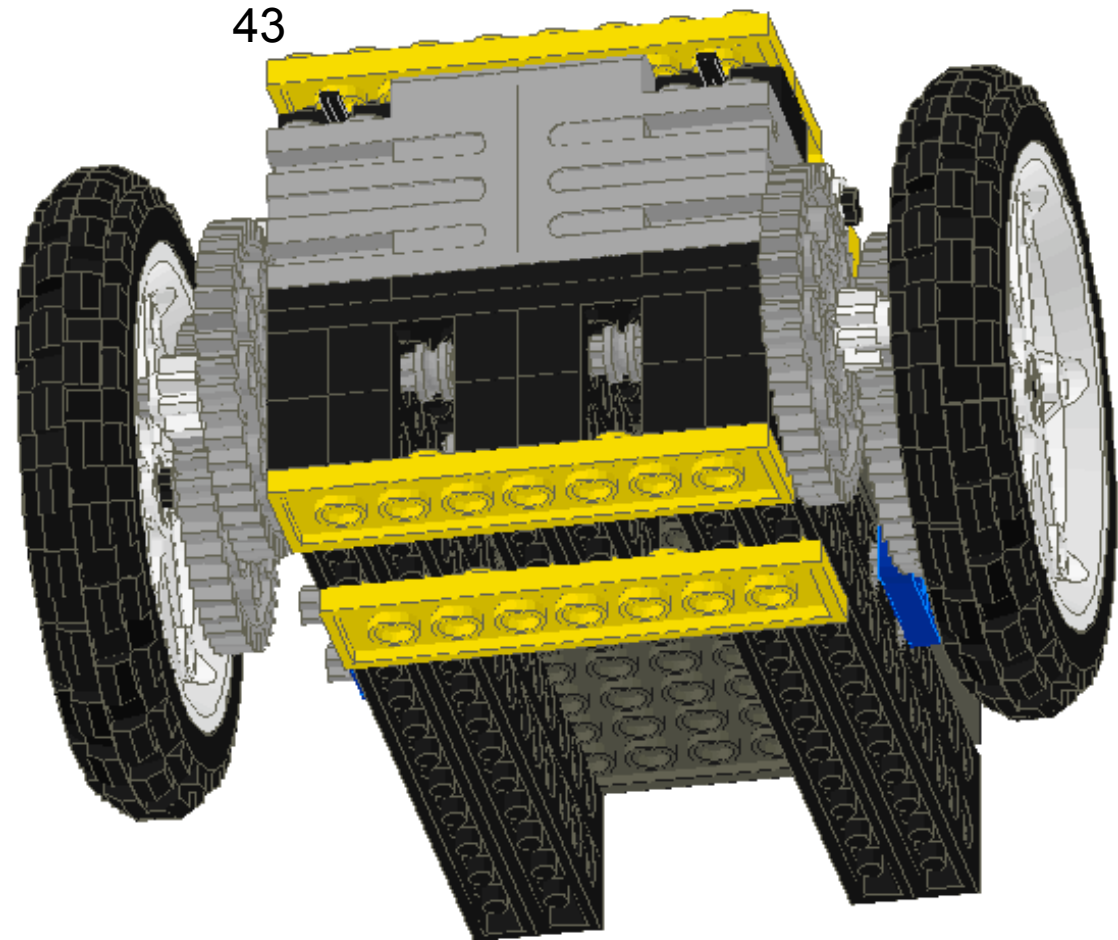
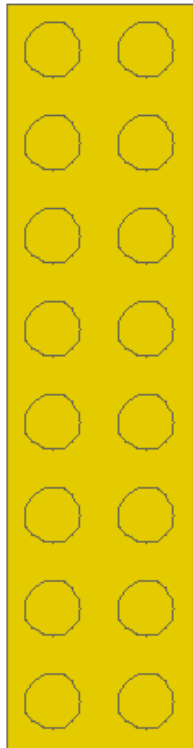
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Our Favorite Things

Solar System ROVer

Pieces:



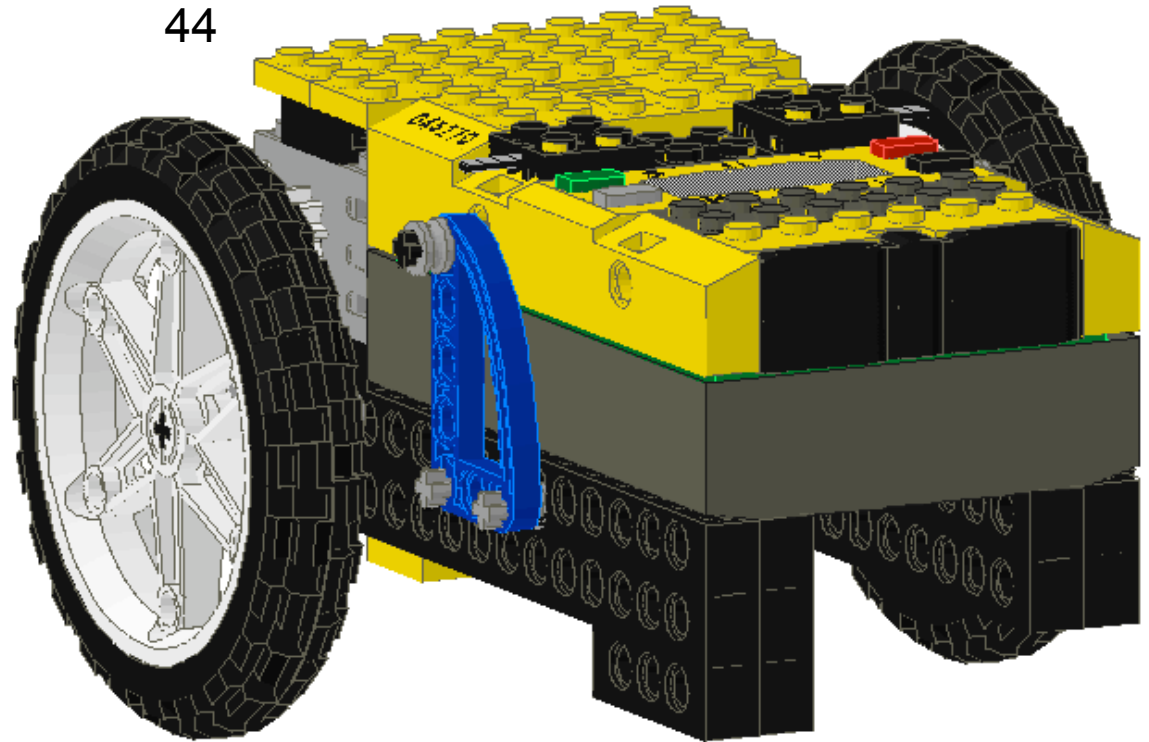
Our Favorite Things

Solar System ROVer

Pieces:



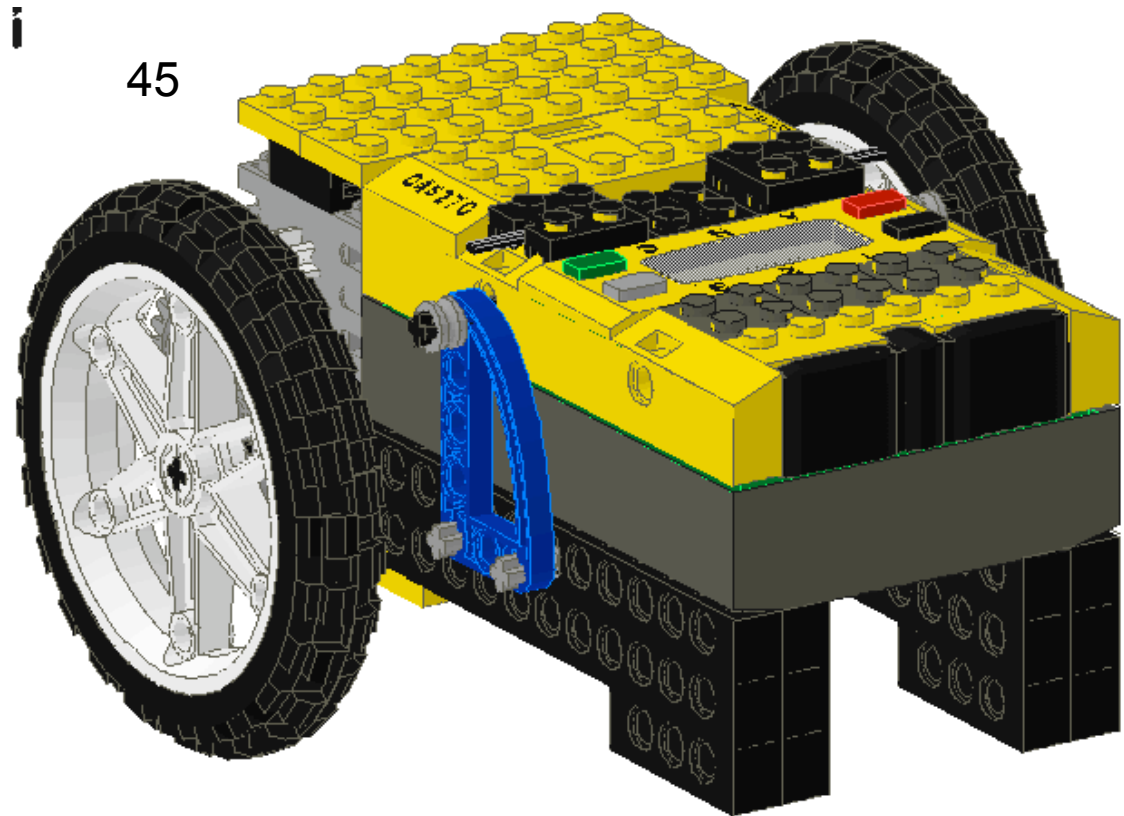
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Our Favorite Things

Solar System ROVer

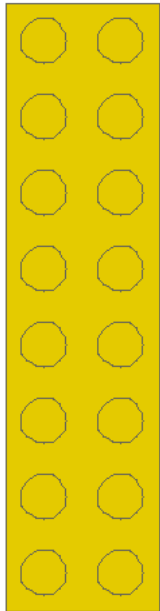
Pieces:



Our Favorite Things

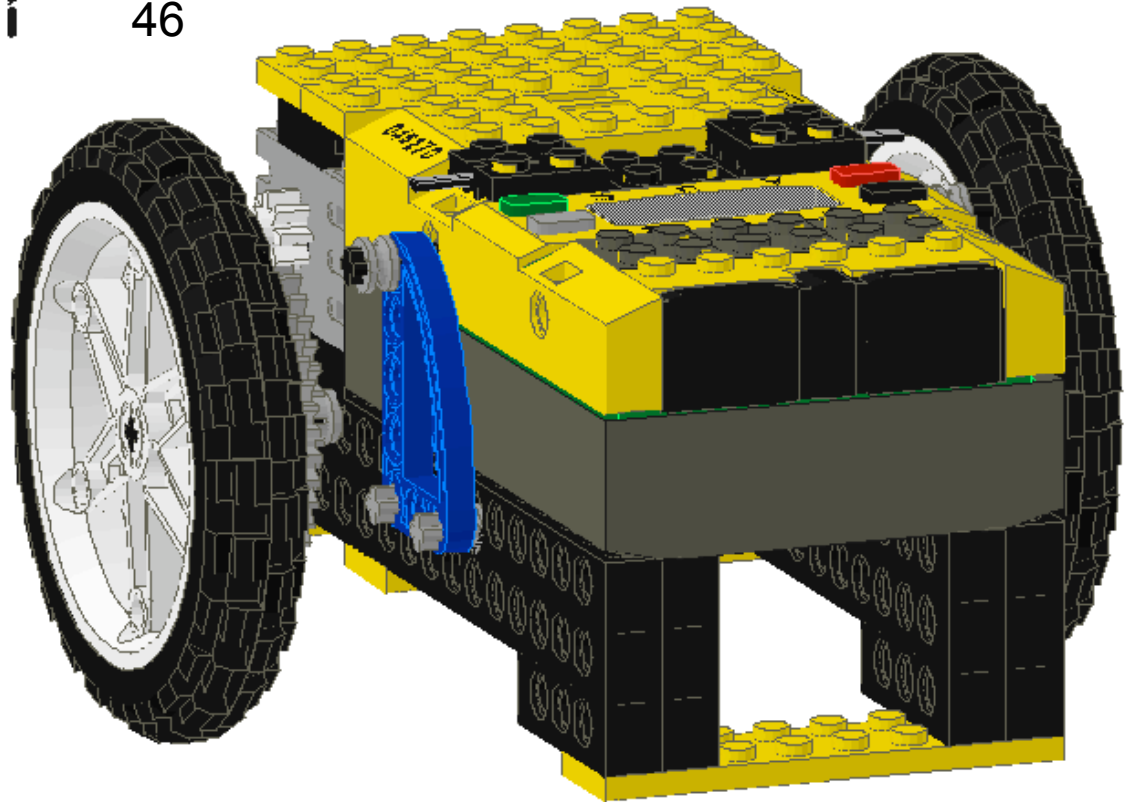
Solar System ROVer

Pieces:



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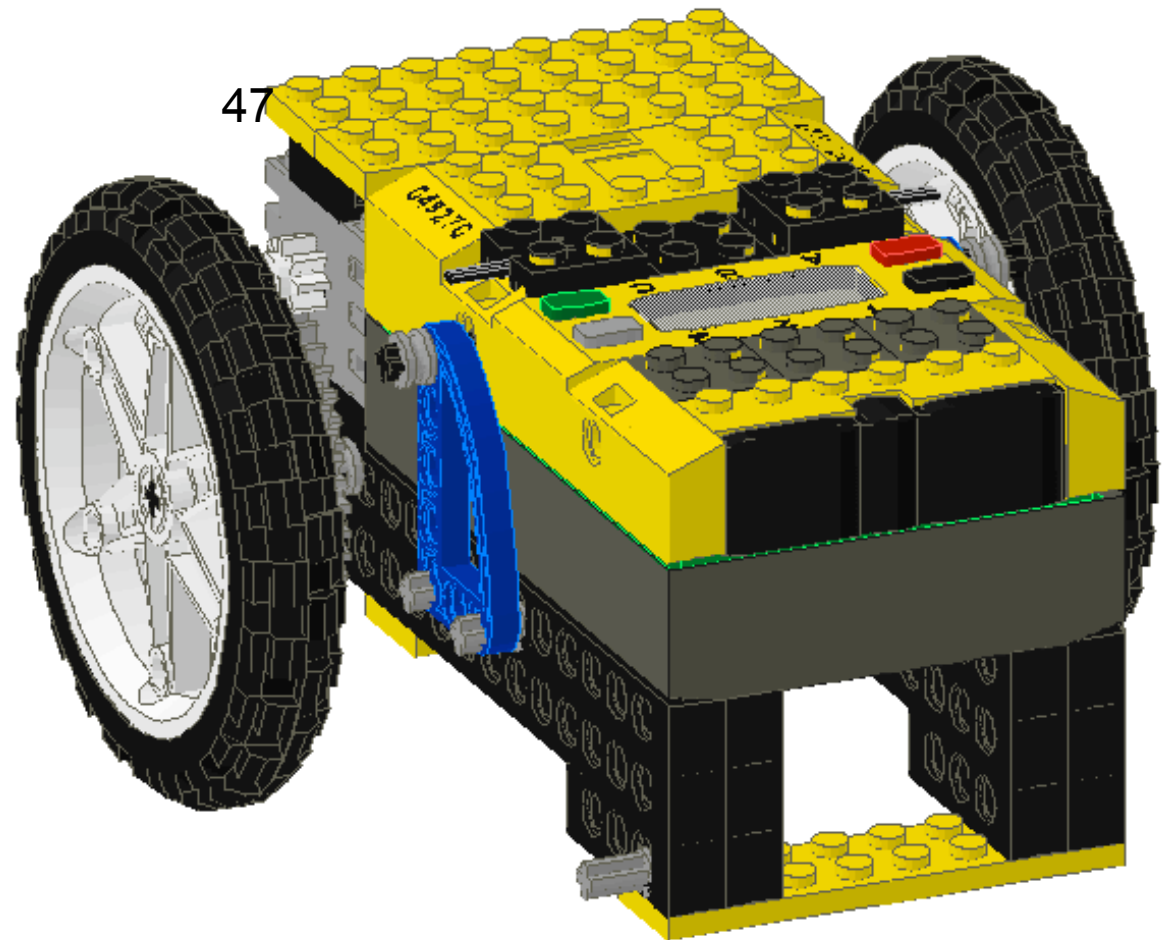
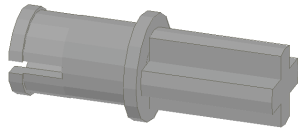
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Our Favorite Things

Solar System ROVer

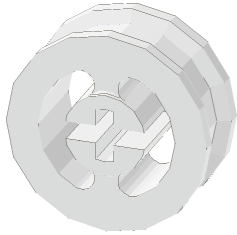
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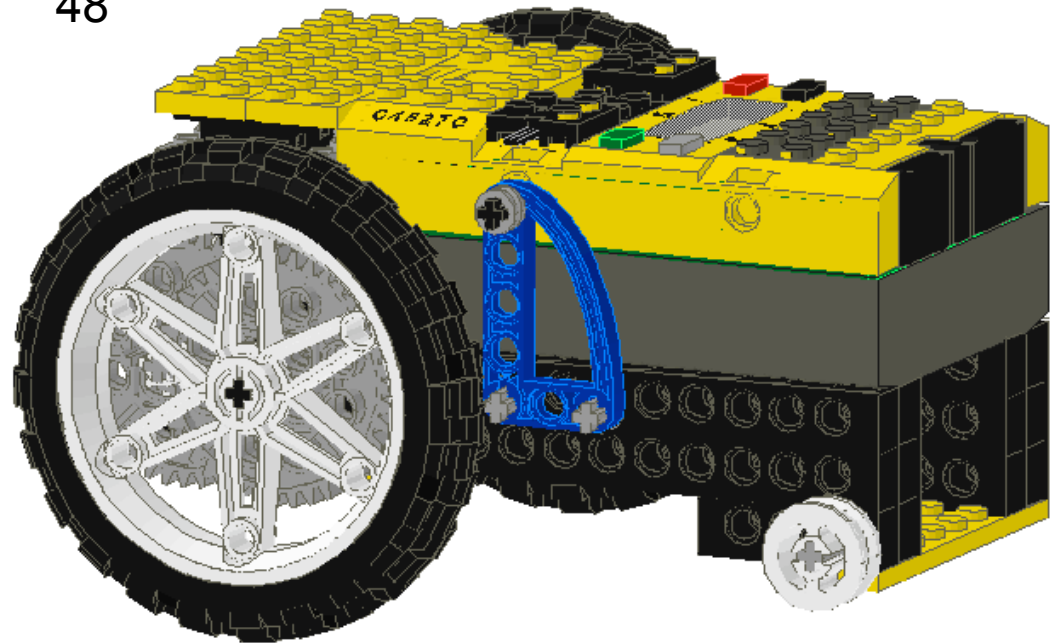
Our Favorite Things

Solar System ROVer

Pieces:



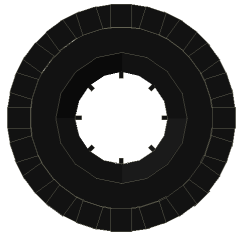
48



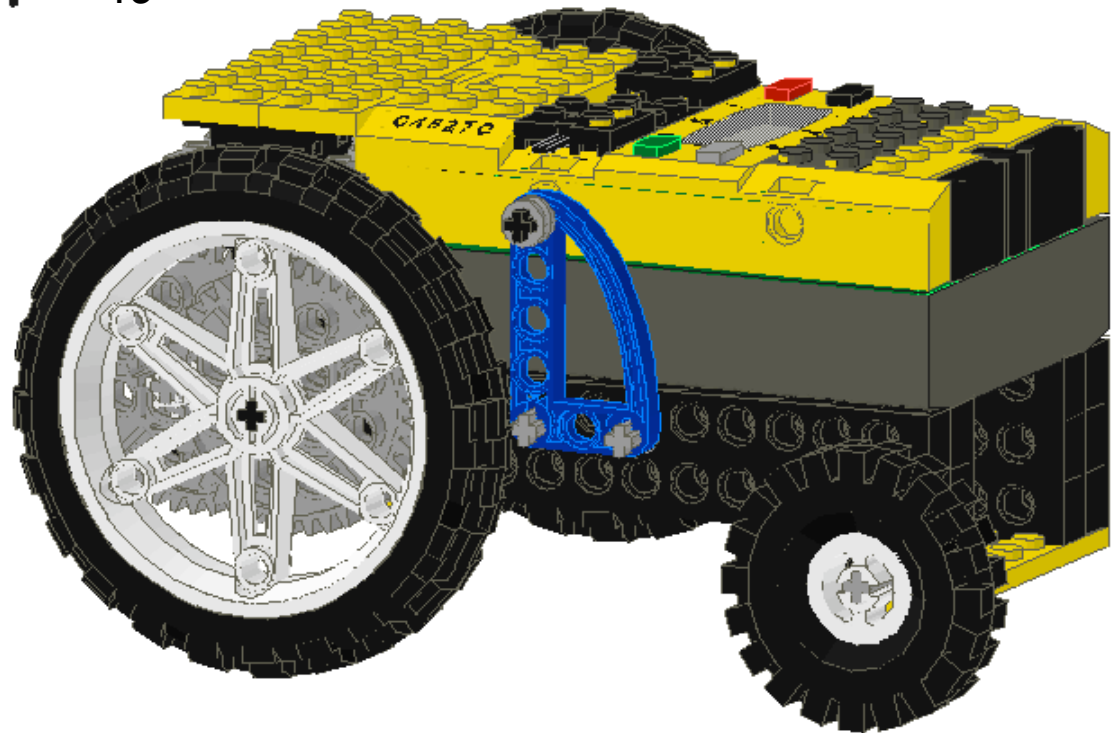
Our Favorite Things

Solar System ROVer

Pieces:



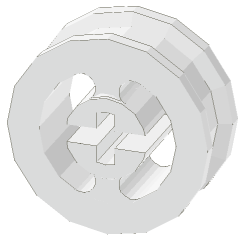
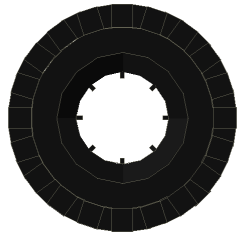
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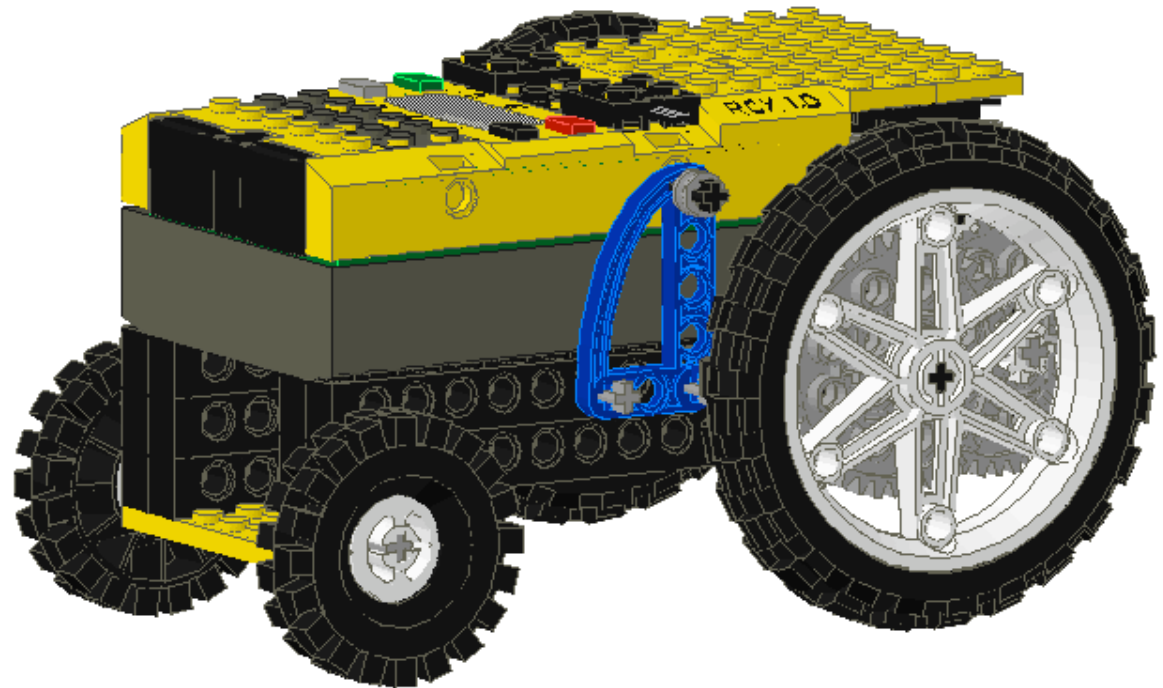
Our Favorite Things

Solar System ROVer

Pieces:



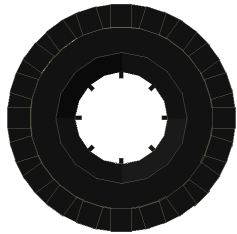
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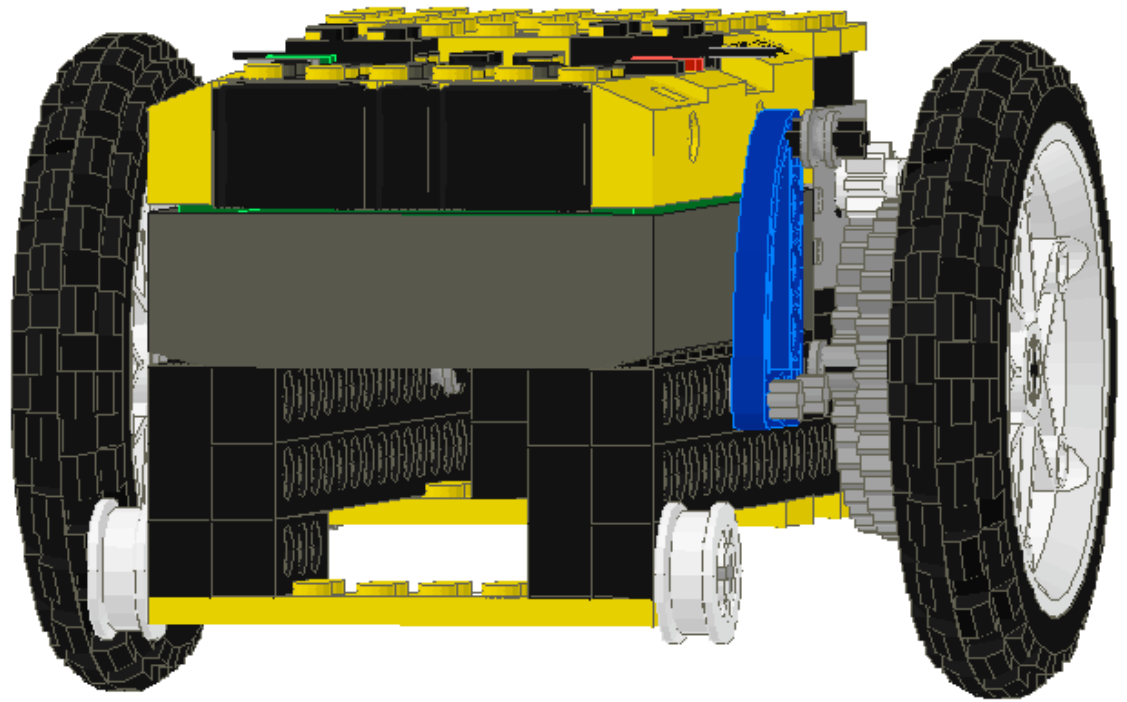
Our Favorite Things

Solar System ROVer

Pieces:



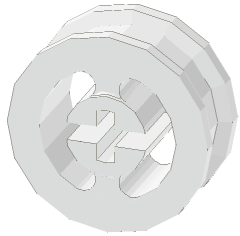
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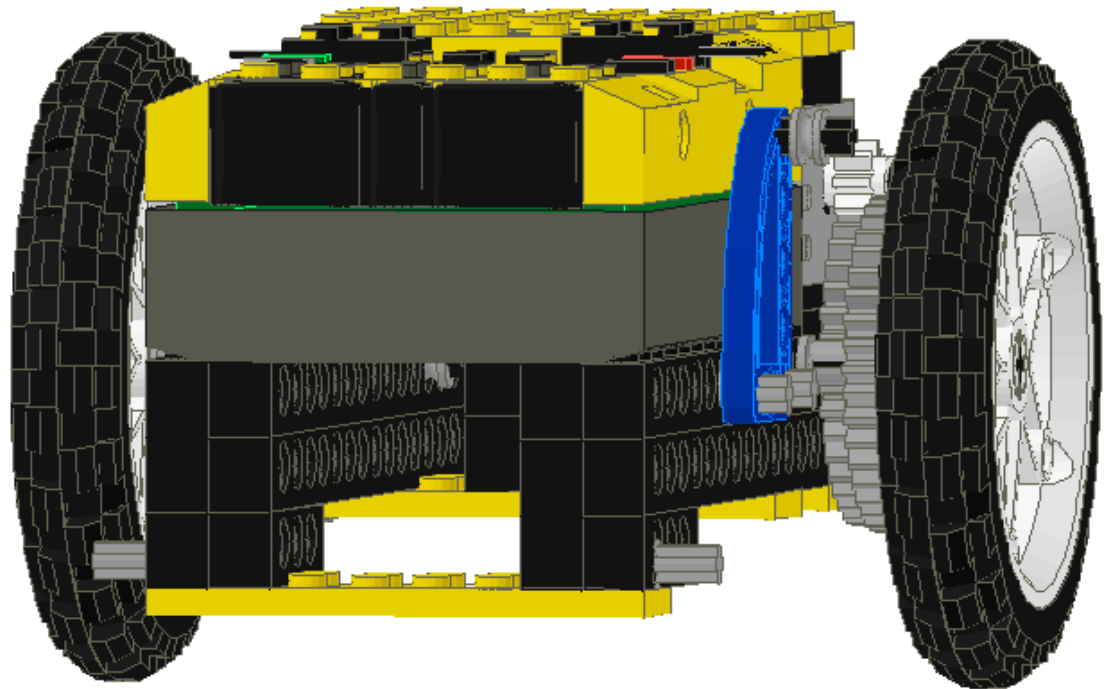
Our Favorite Things

Solar System ROVer

Pieces:



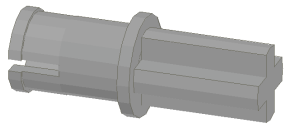
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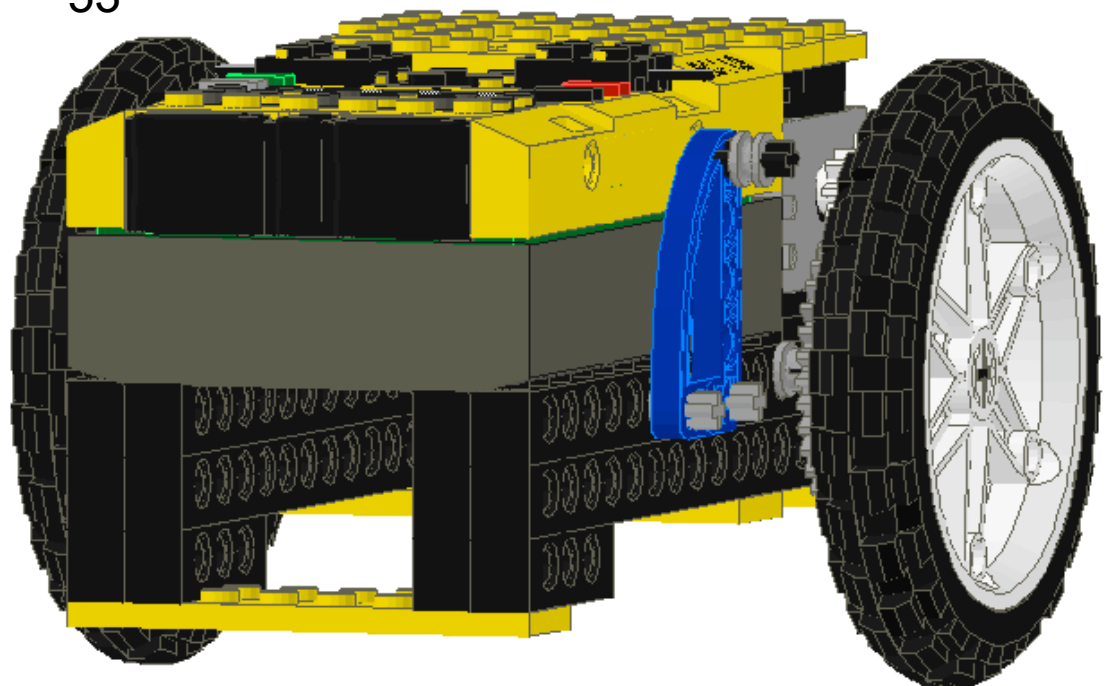
Our Favorite Things

Solar System ROVer

Pieces:



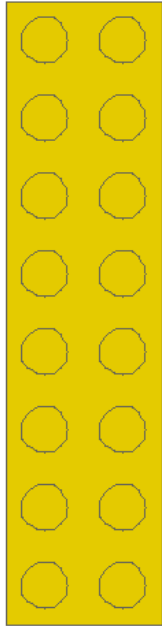
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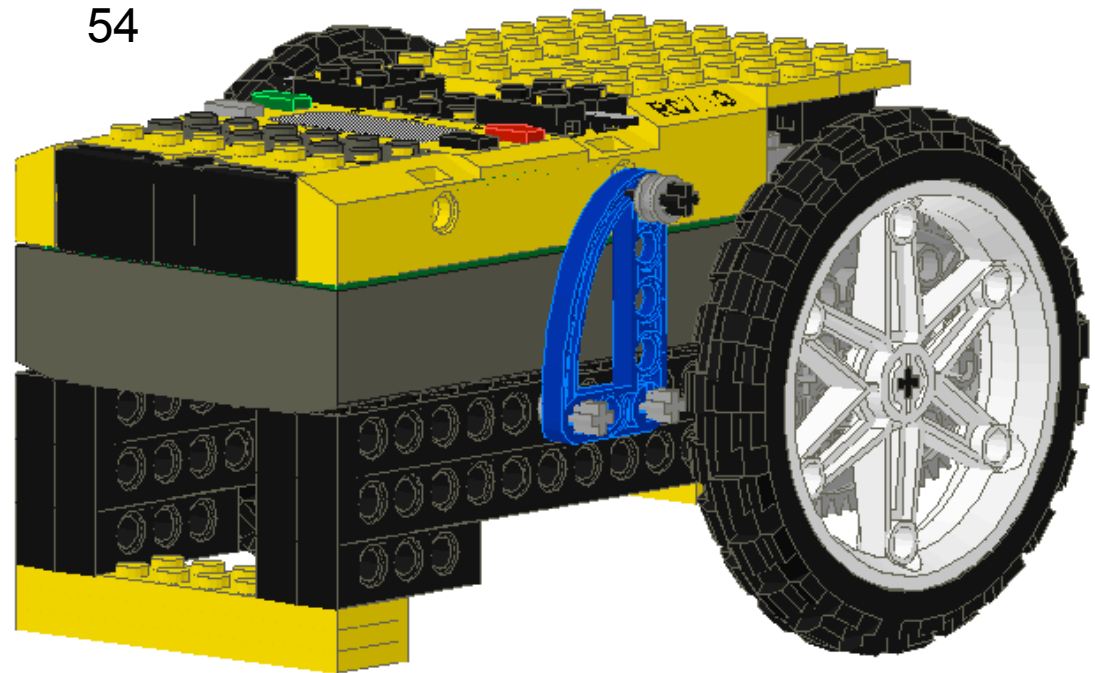
Our Favorite Things

Solar System ROVer

Pieces:



54

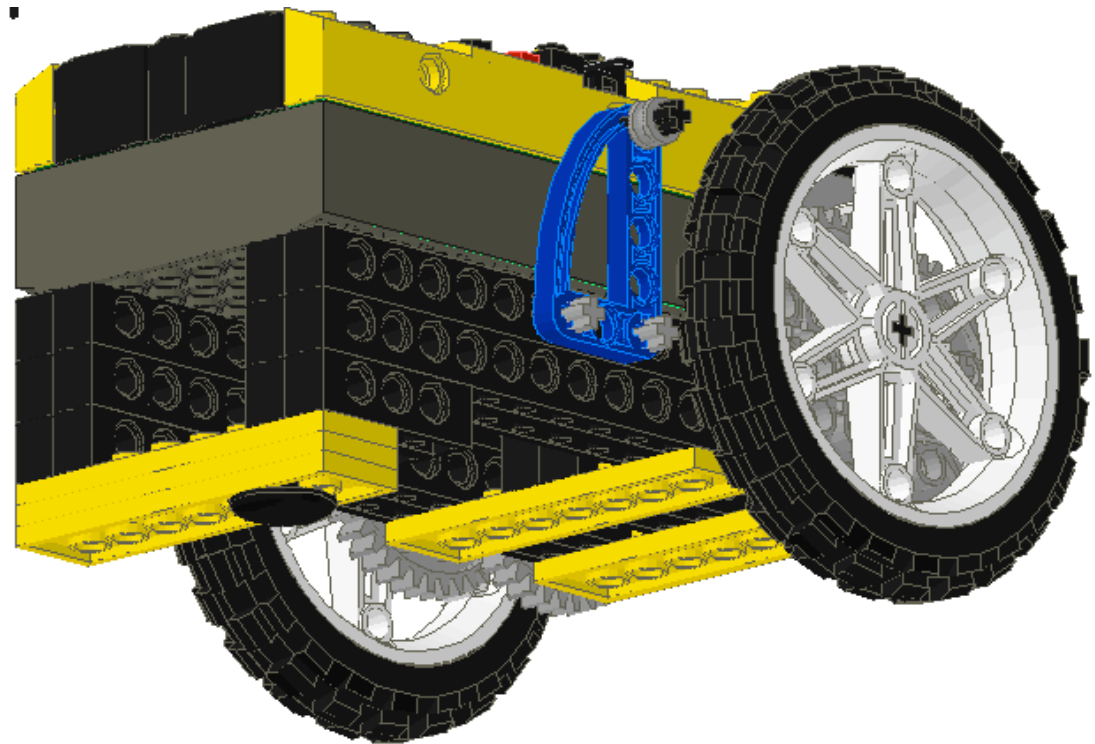


Our Favorite Things

Solar System ROVer

Pieces:

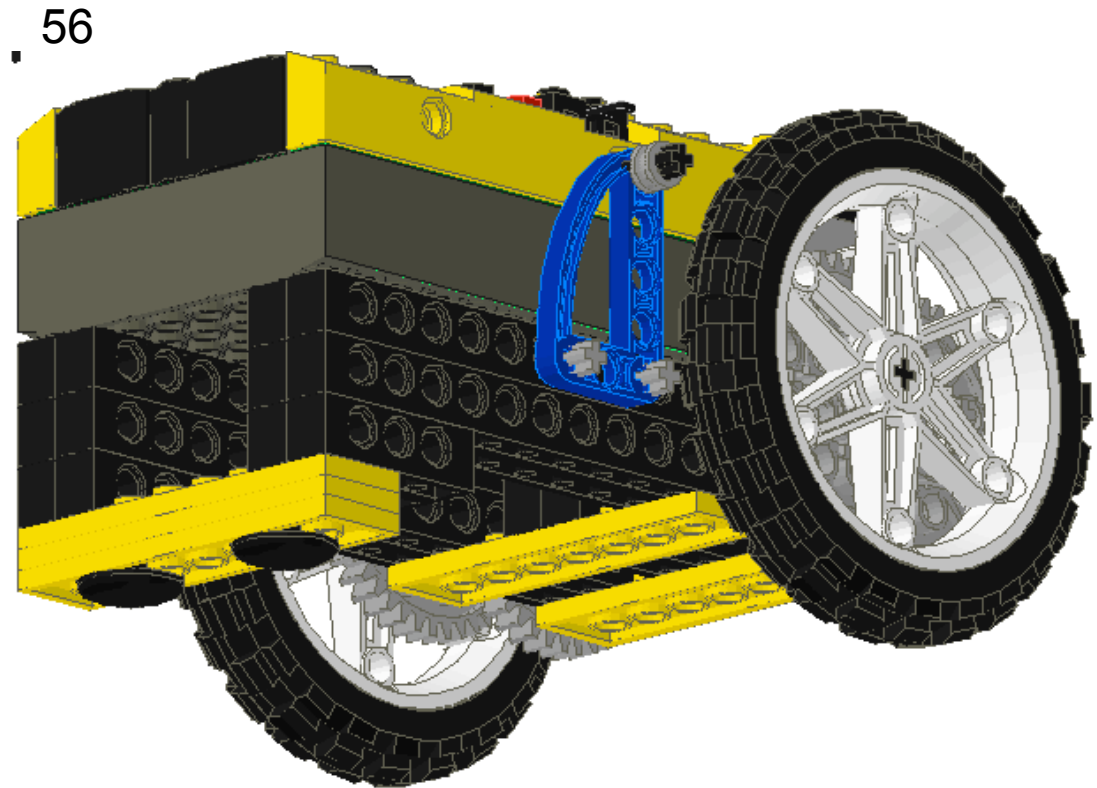
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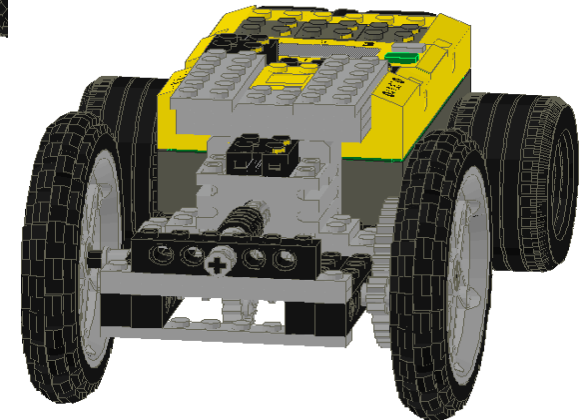
Our Favorite Things

Solar System ROVer

Pieces:



Snail Car

[illegible]

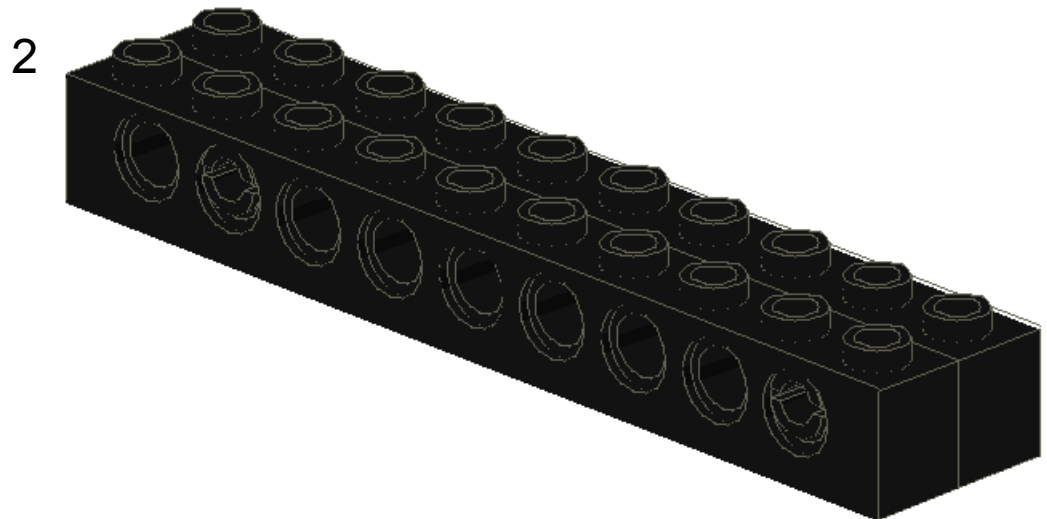
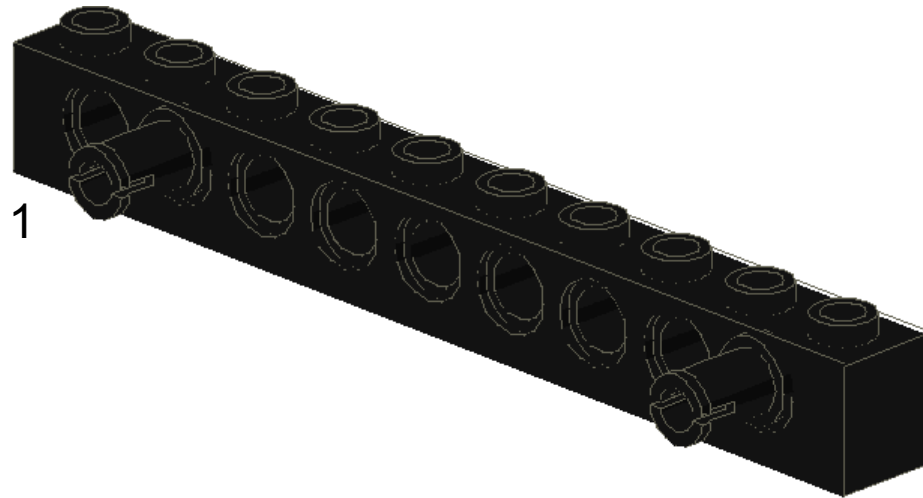
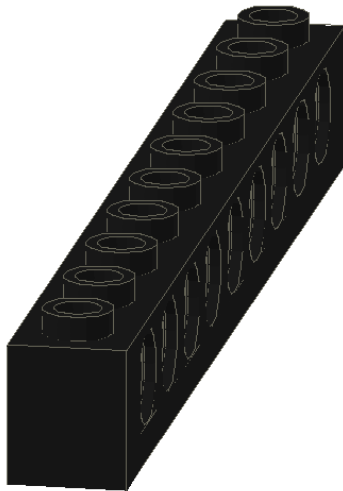
Key Words:

Gearing Down, Gear Ratios

Our Favorite Things

Snail Car

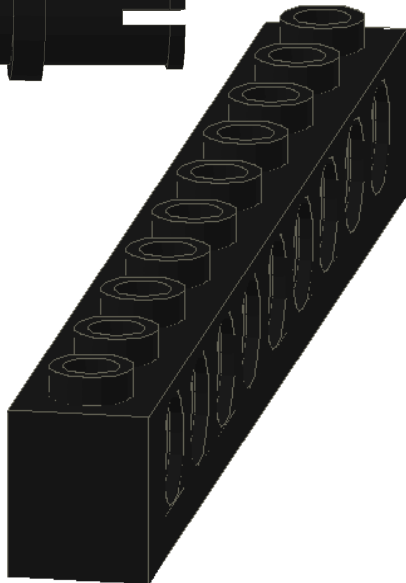
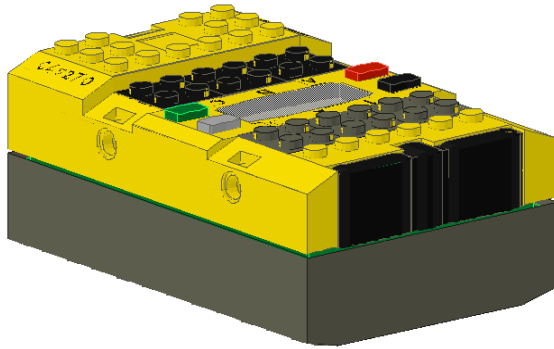
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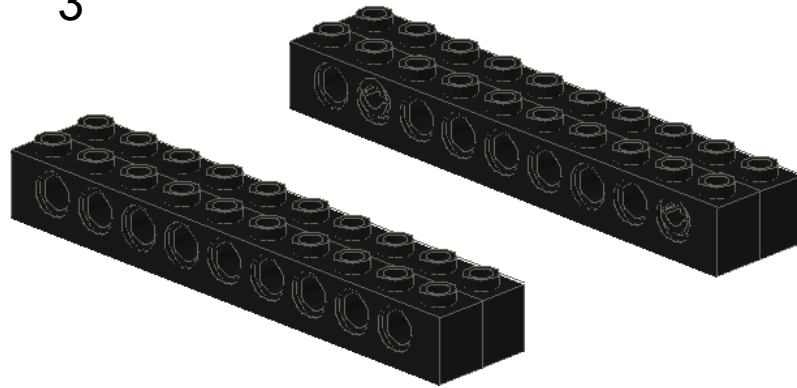
Our Favorite Things

Snail Car

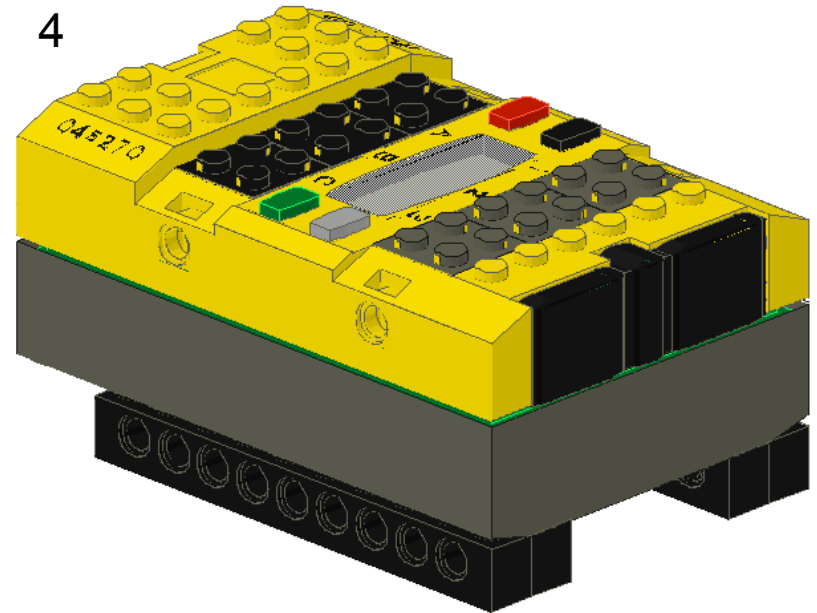
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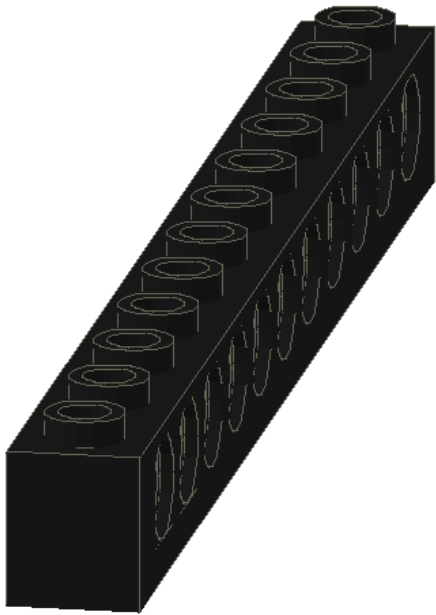
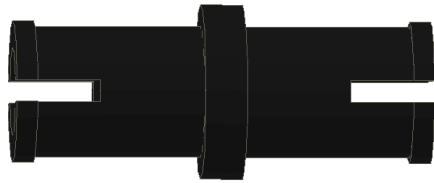
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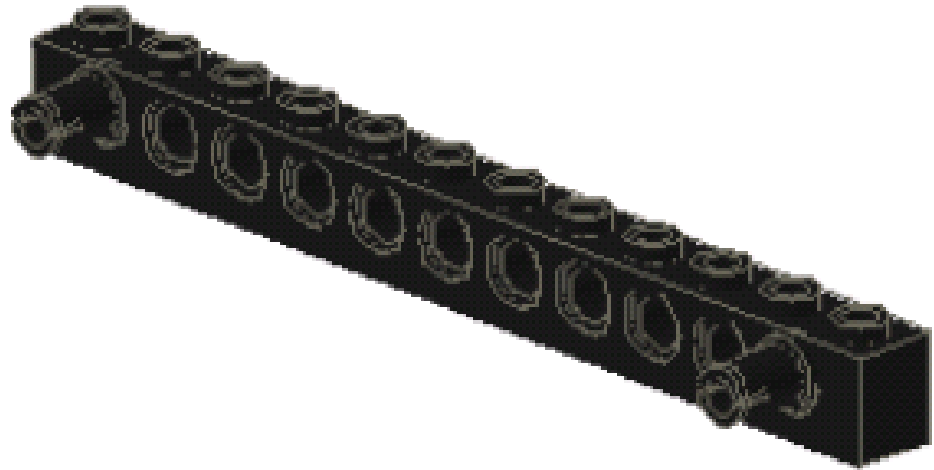
Our Favorite Things

Snail Car

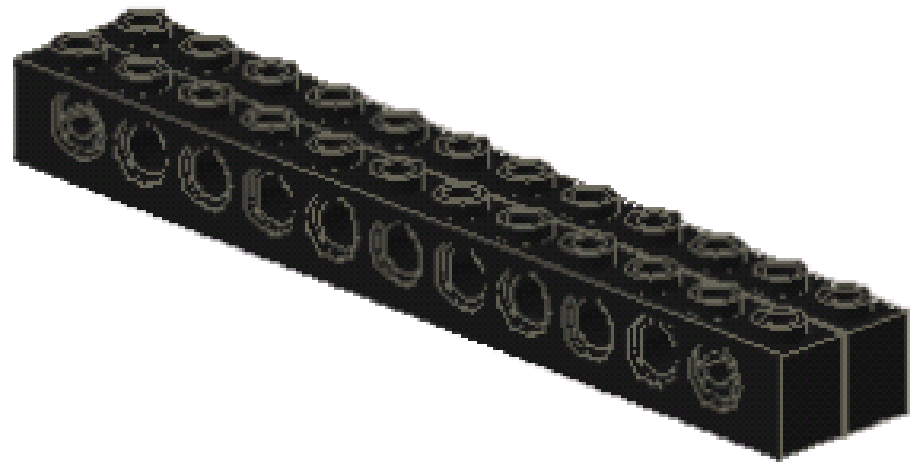
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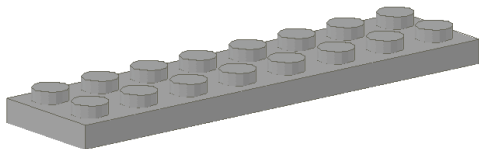
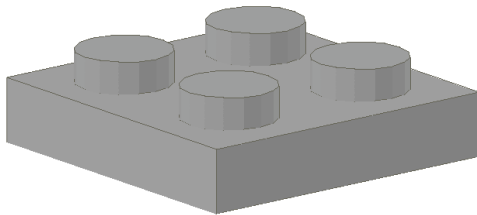
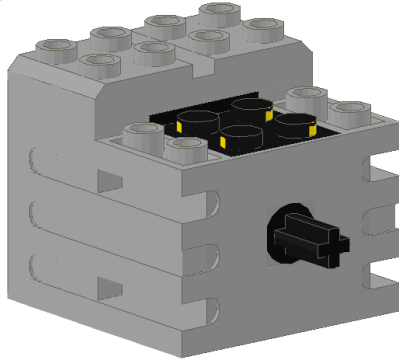
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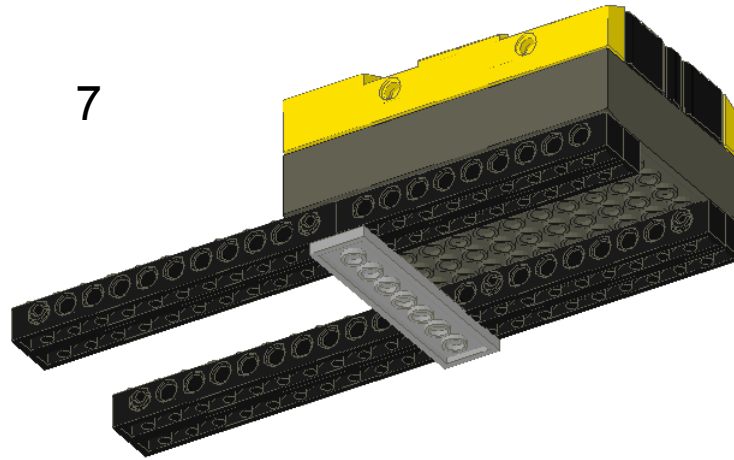
Our Favorite Things

Snail Car

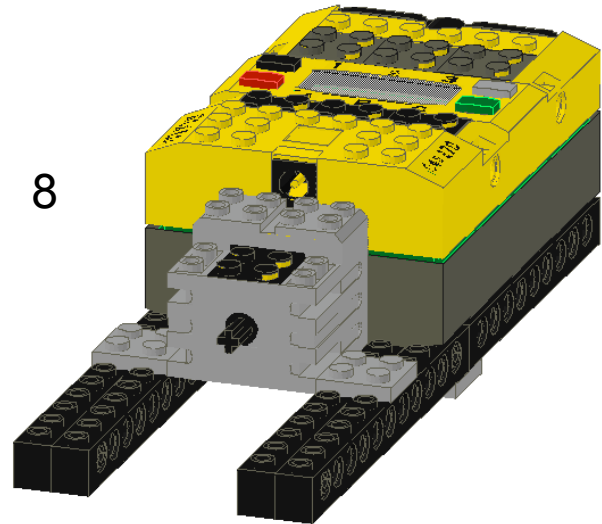
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7



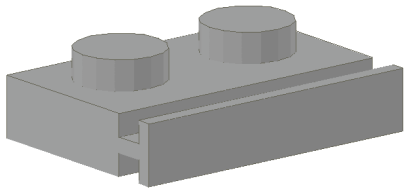
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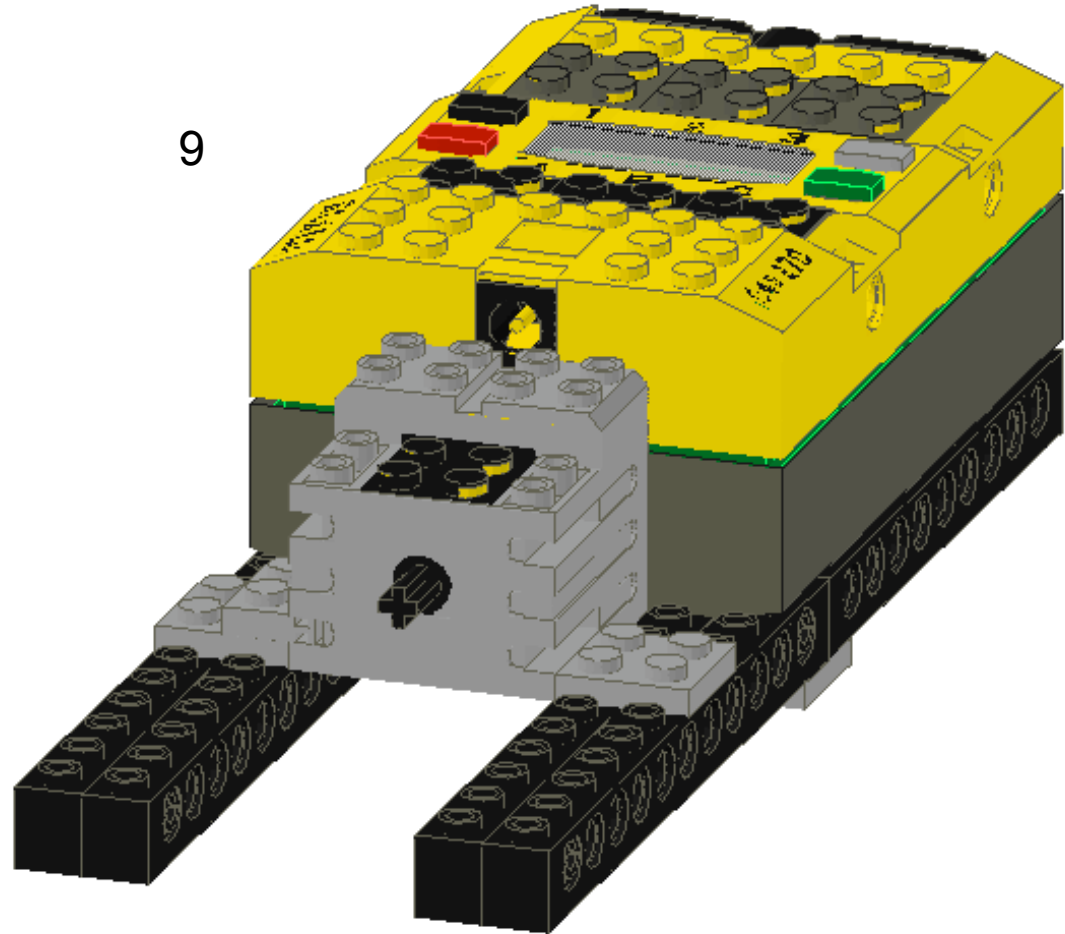
Our Favorite Things

Snail Car

Pieces:



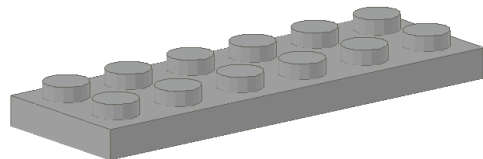
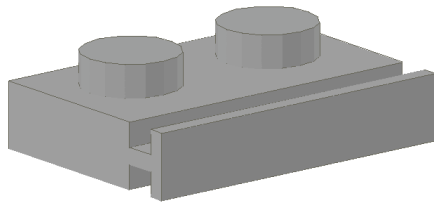
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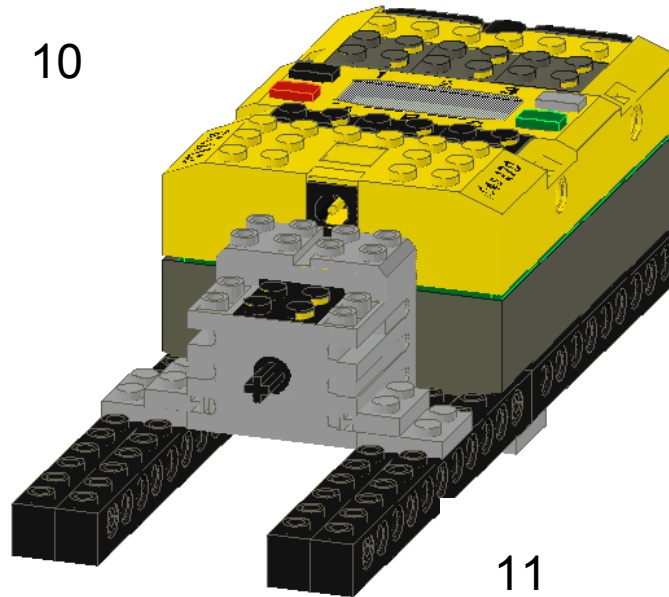
Our Favorite Things

Snail Car

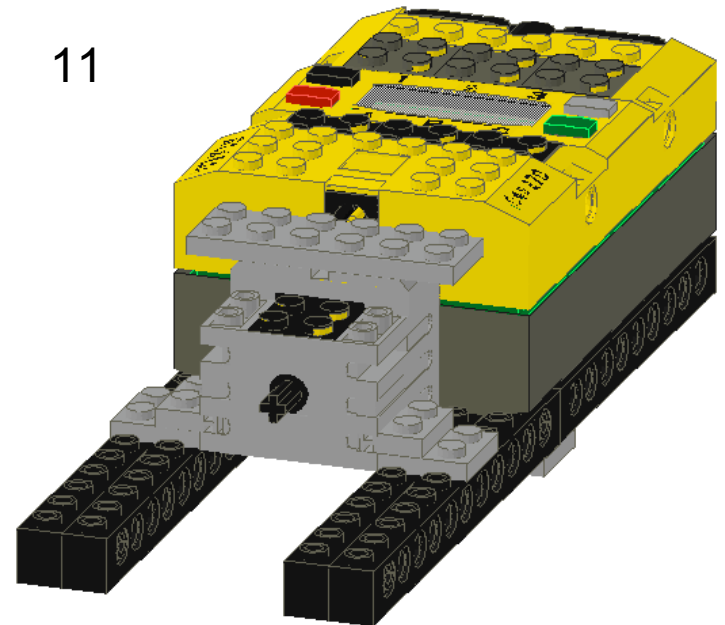
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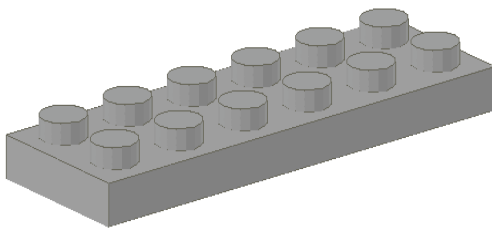
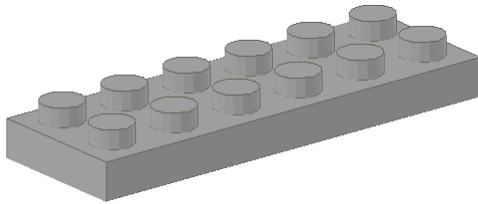


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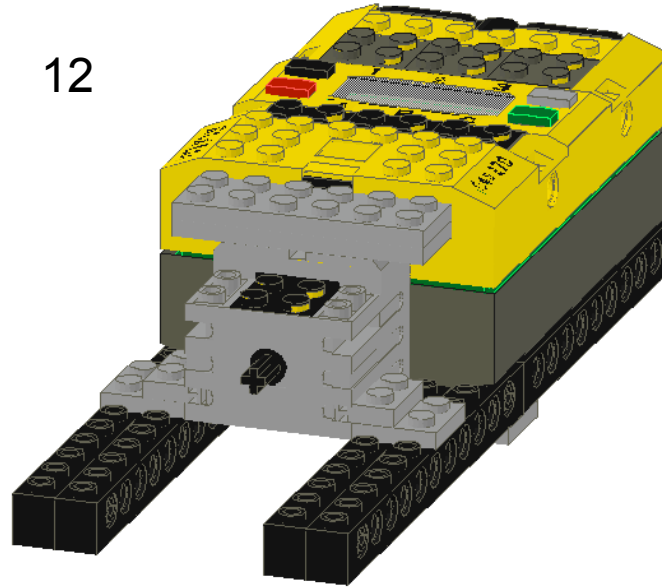


Snail Car

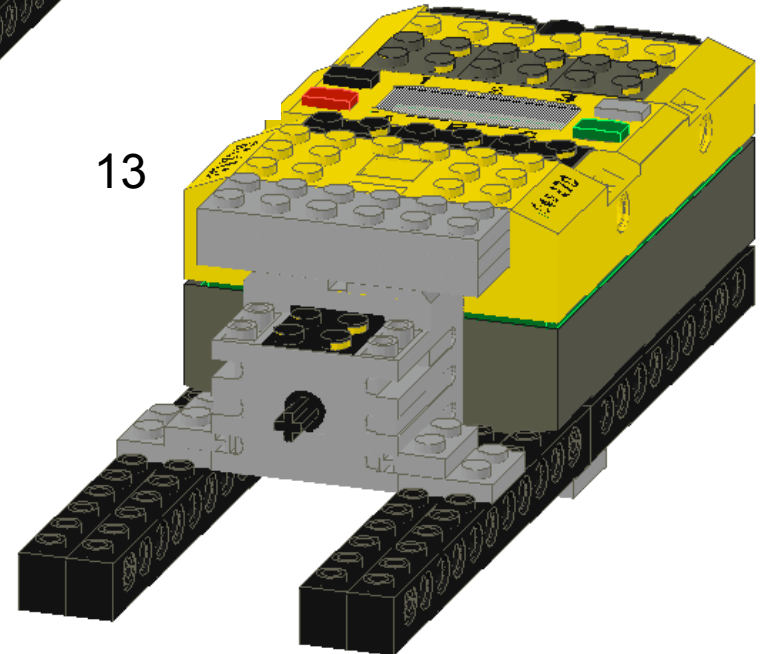
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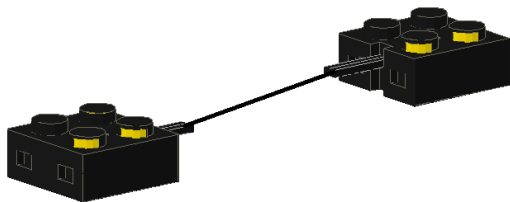
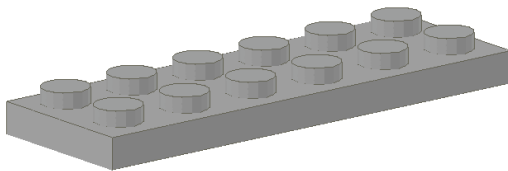
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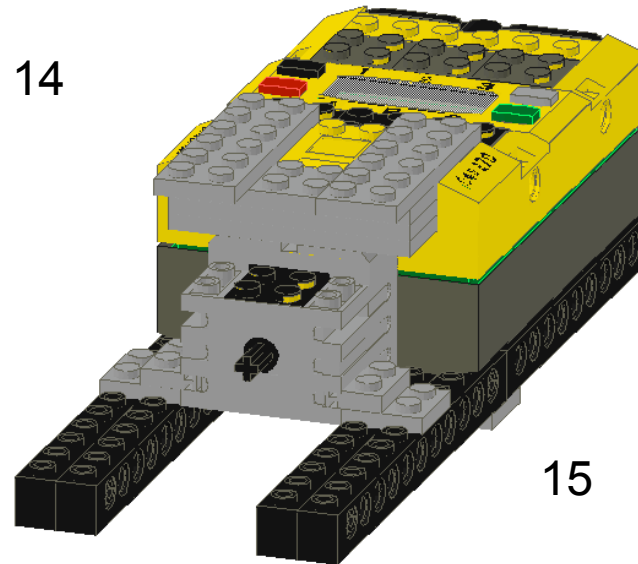
Our Favorite Things

Snail Car

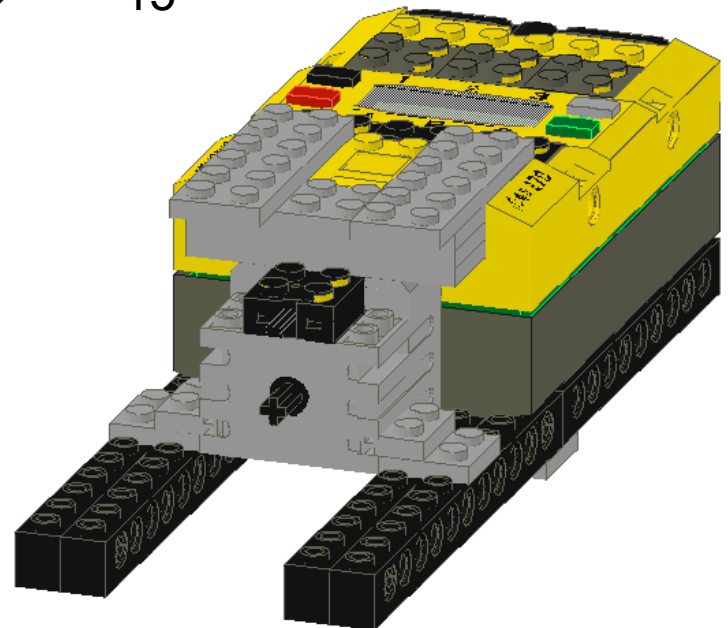
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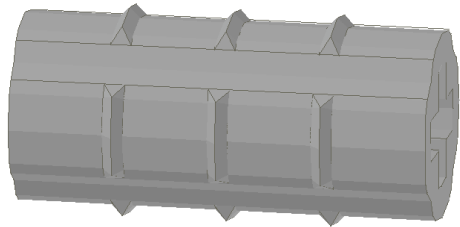
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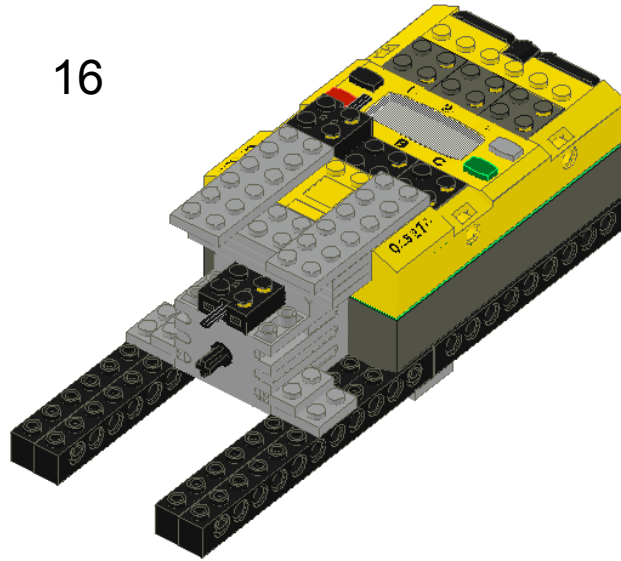
Our Favorite Things

Snail Car

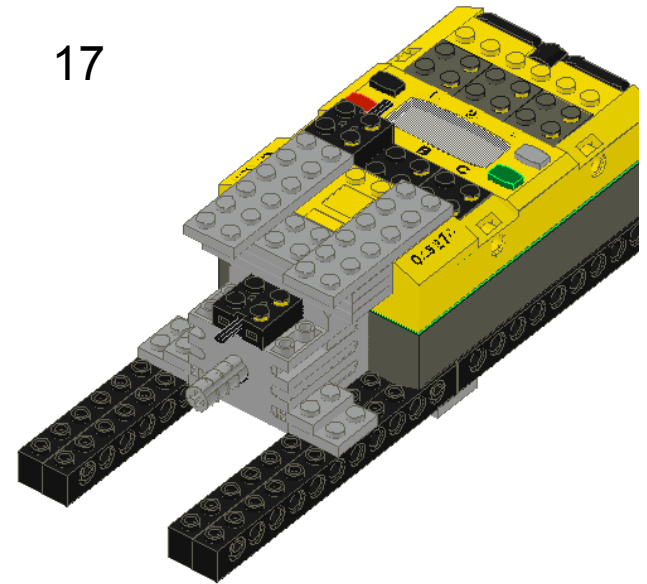
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16



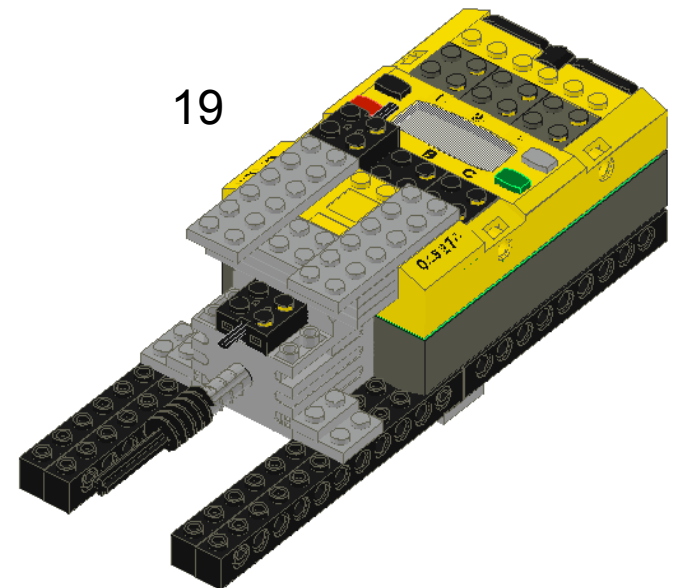
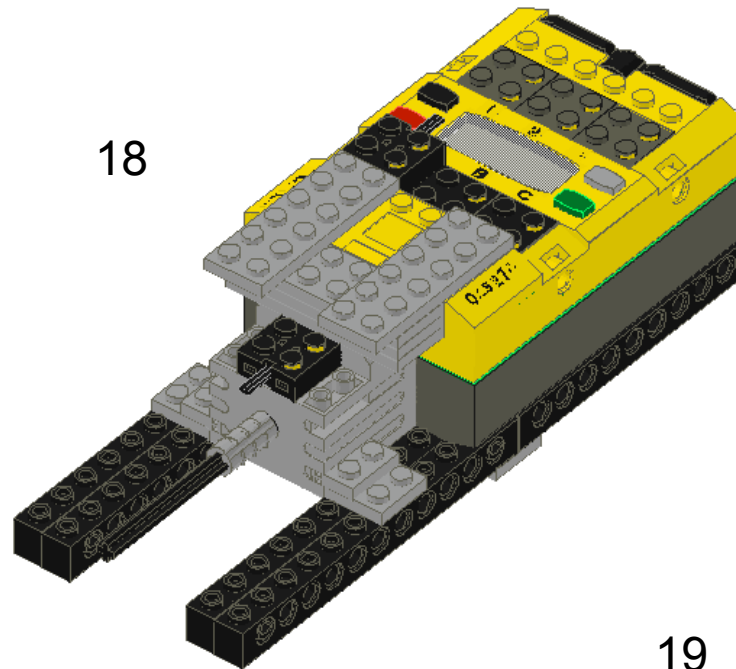
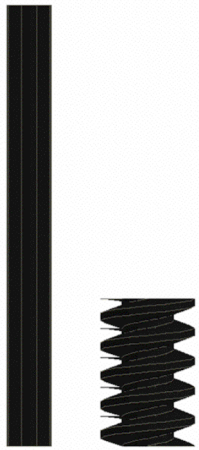
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Our Favorite Things

Snail Car

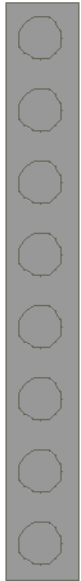
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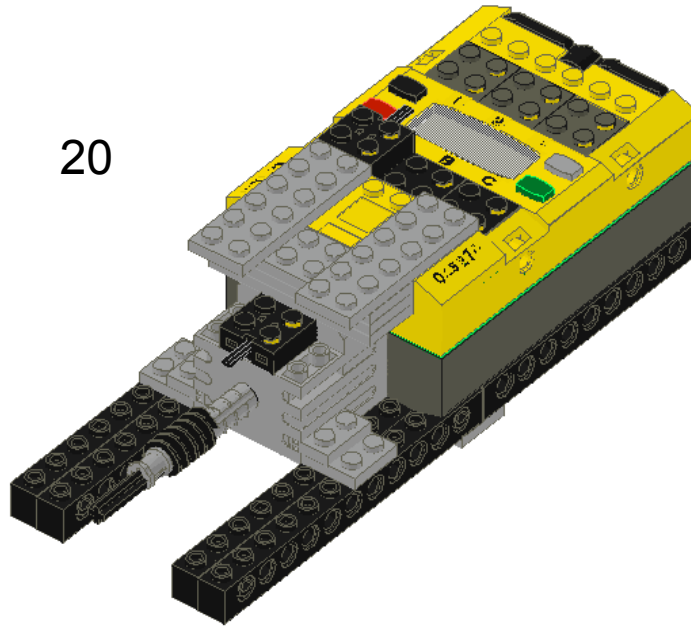
Our Favorite Things

Snail Car

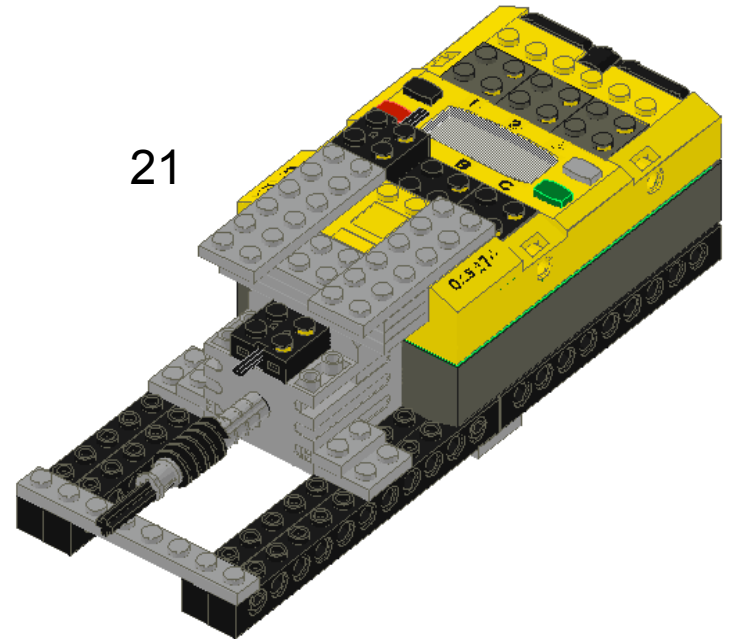
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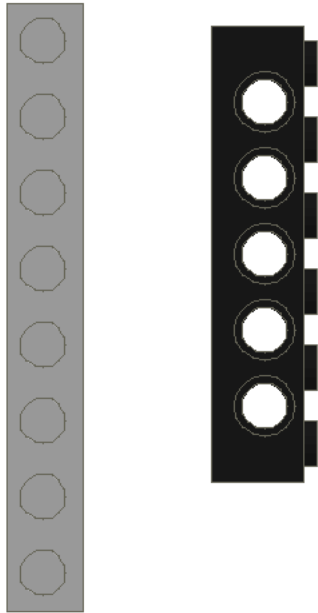
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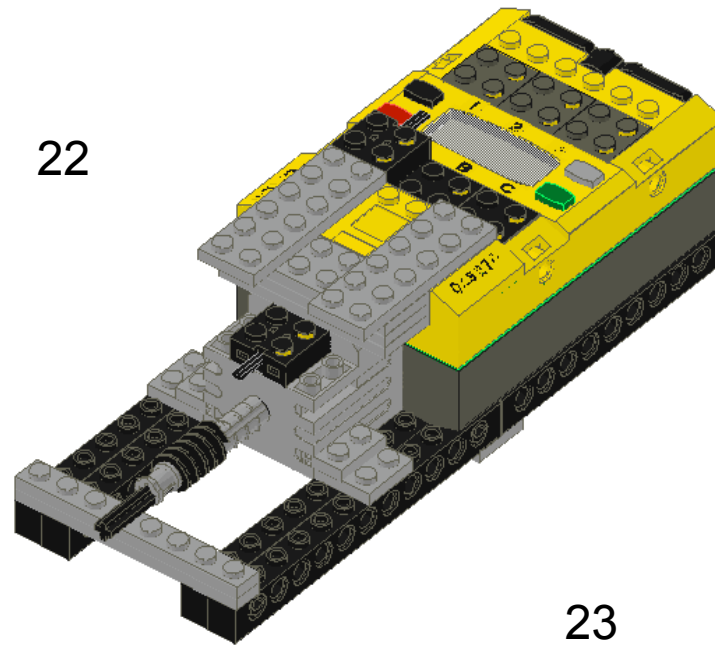
Our Favorite Things

Snail Car

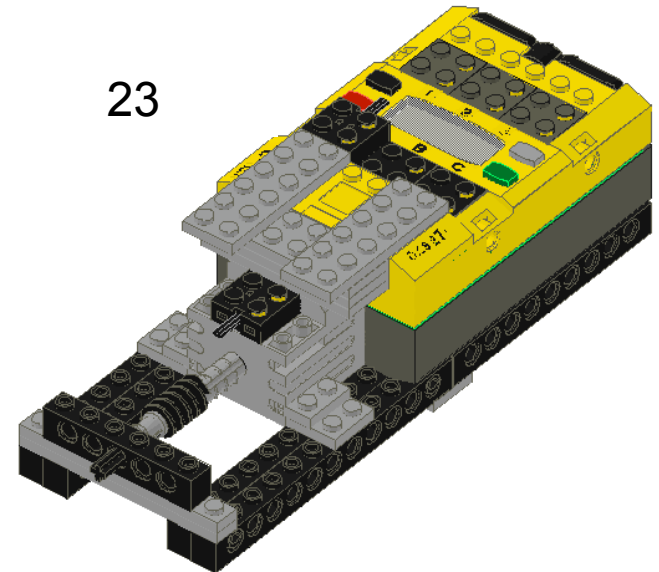
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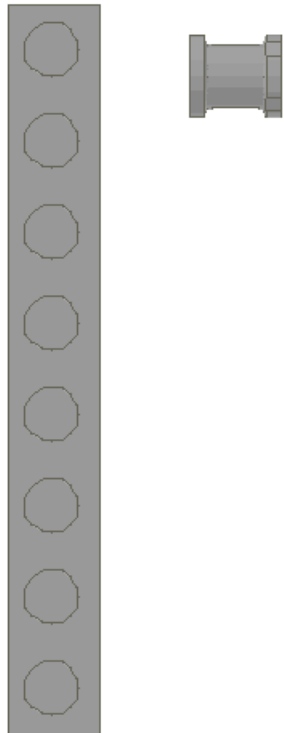
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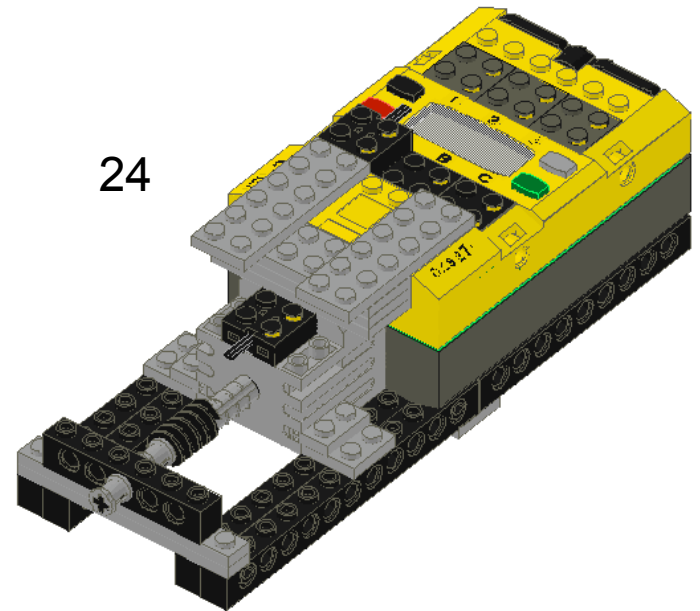
Our Favorite Things

Snail Car

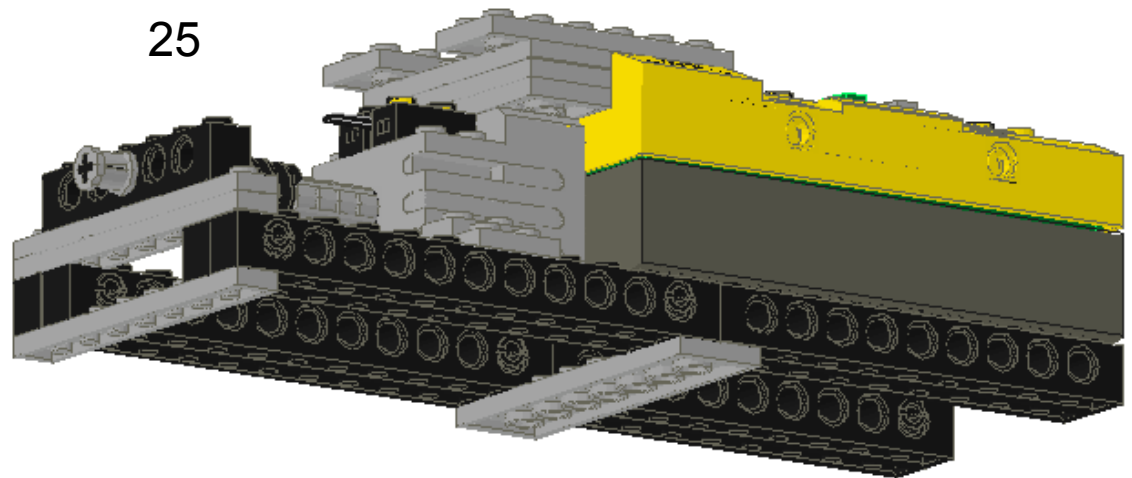
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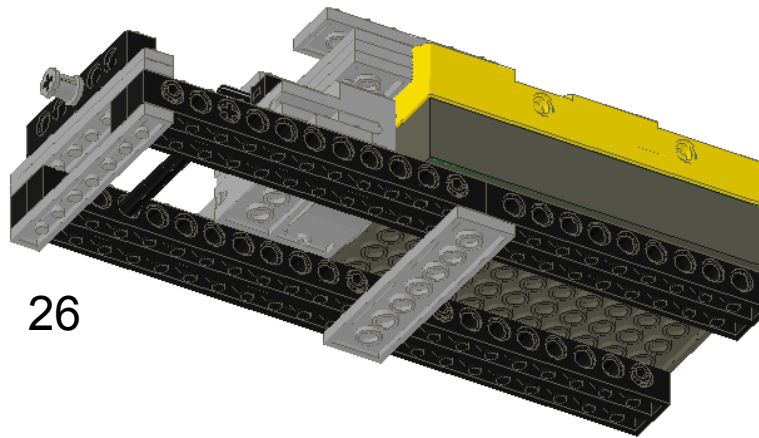
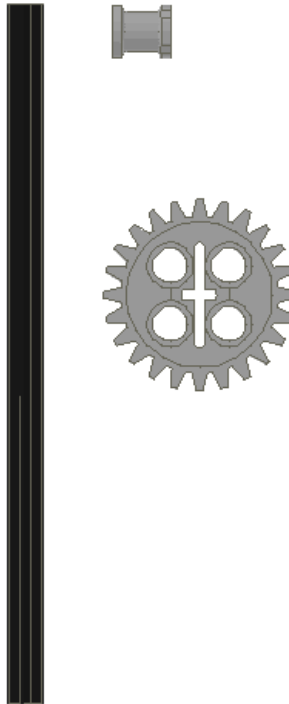
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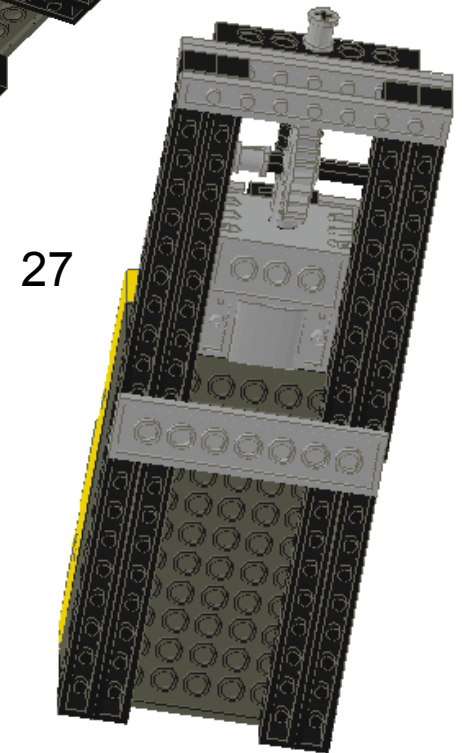
Our Favorite Things

Snail Car

Pieces:



26

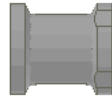
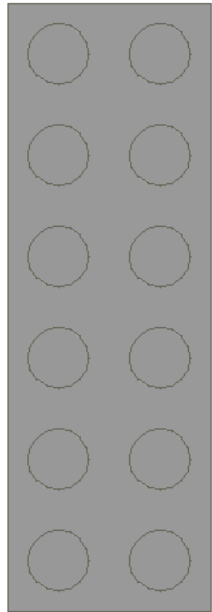


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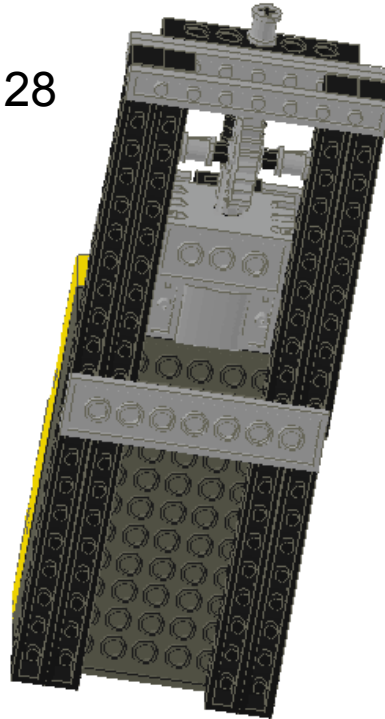
Our Favorite Things

Snail Car

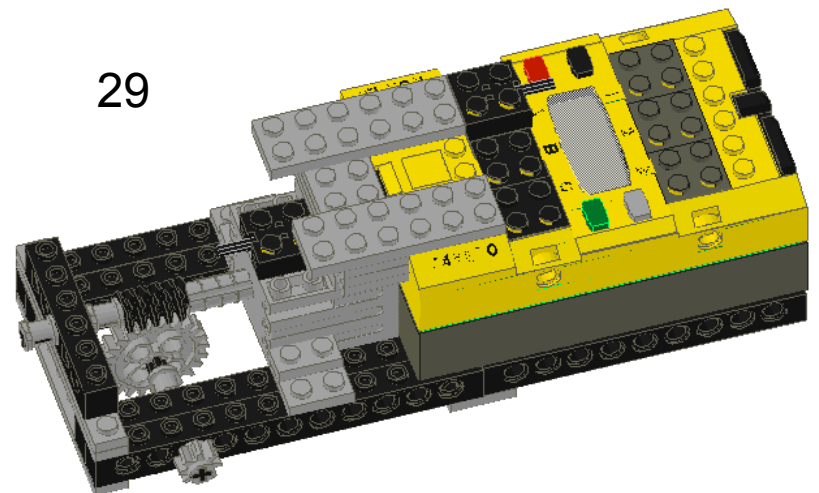
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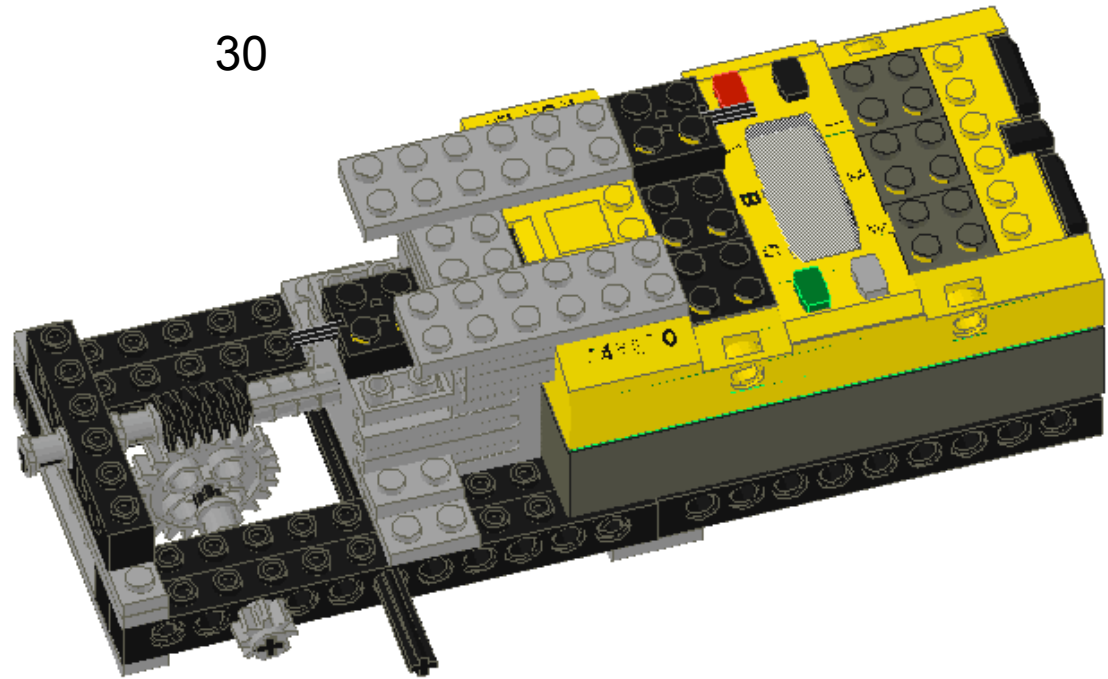
Our Favorite Things

Snail Car

Pieces:



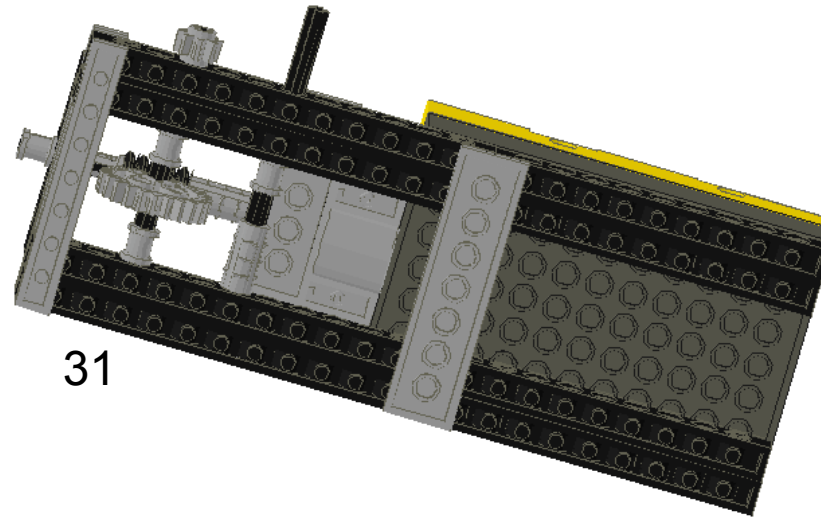
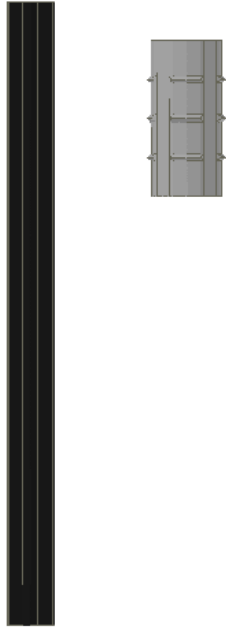
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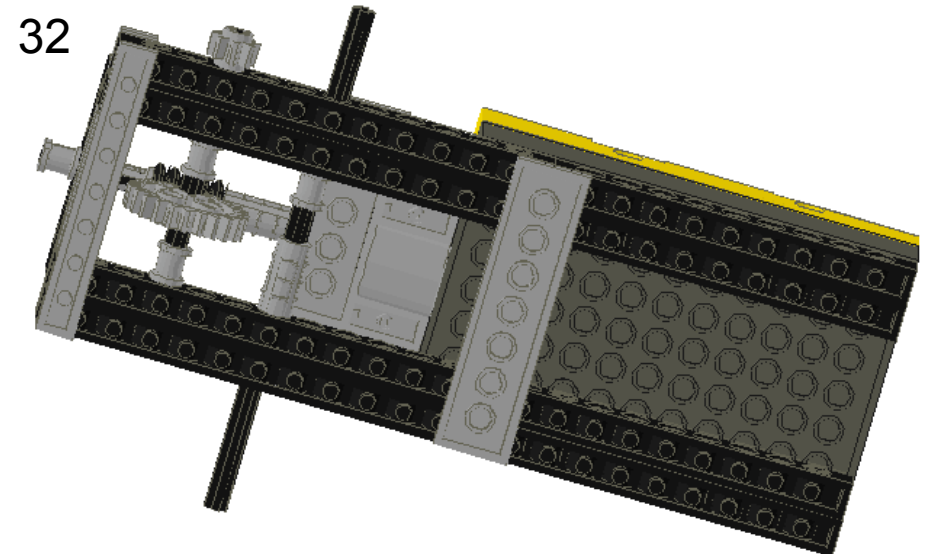
Our Favorite Things

Snail Car

Pieces:



31

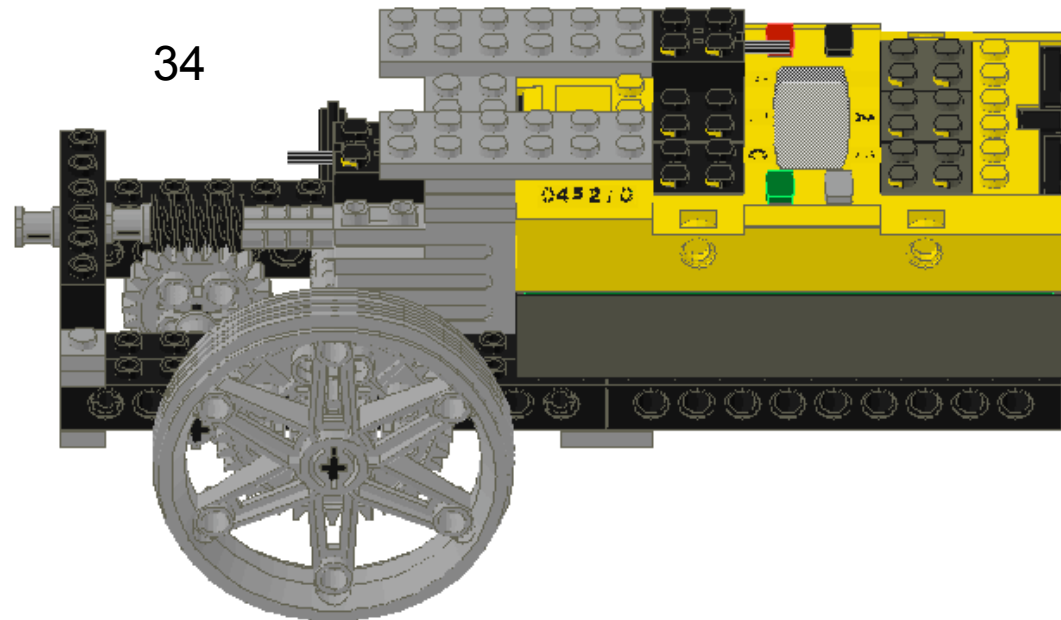
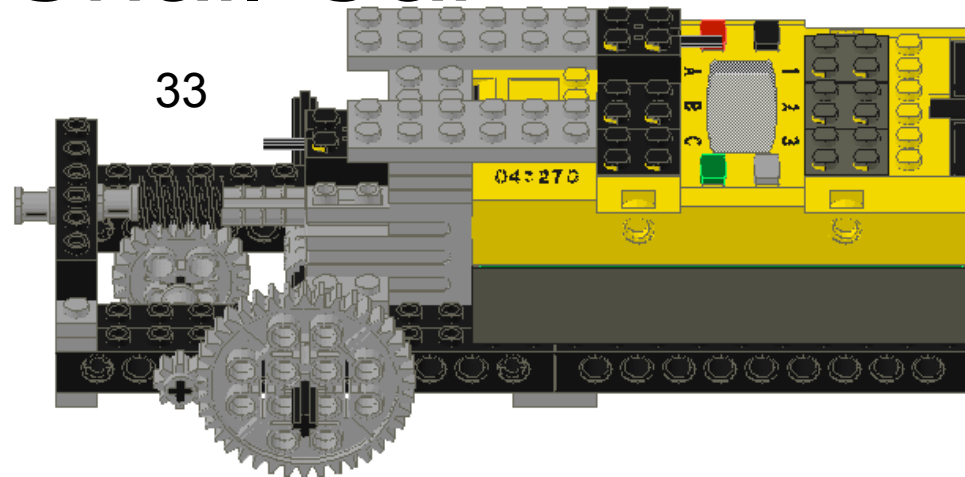
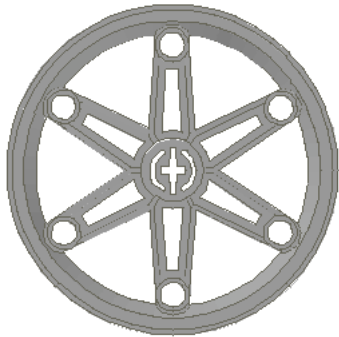
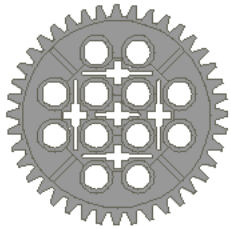


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Our Favorite Things

Snail Car

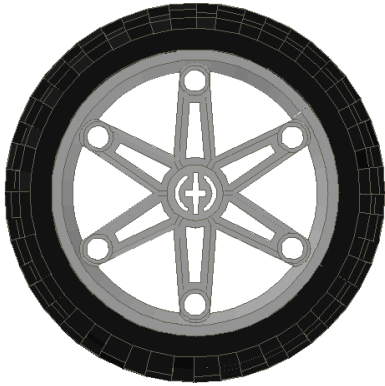
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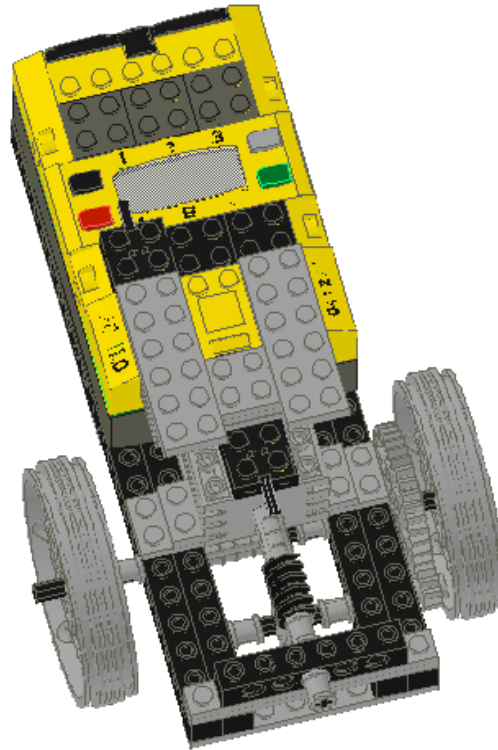
Our Favorite Things

Snail Car

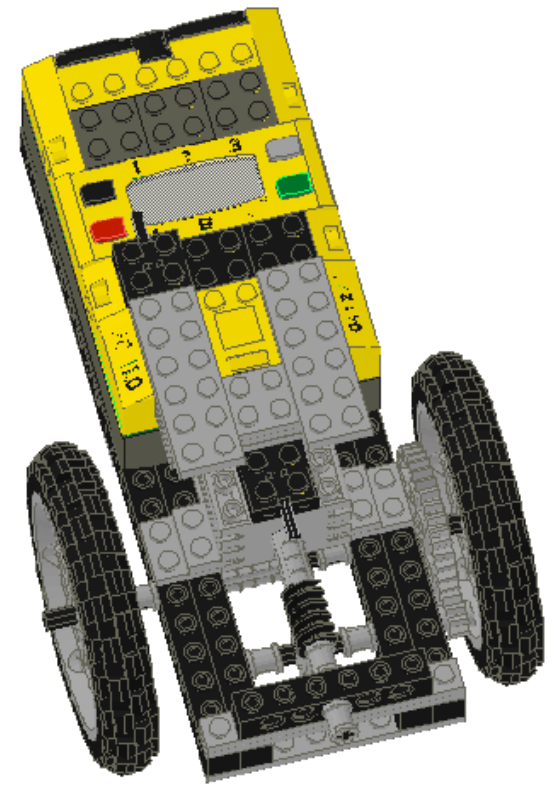
Pieces:



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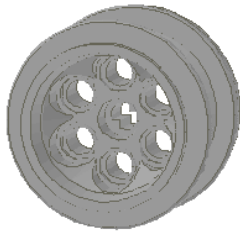
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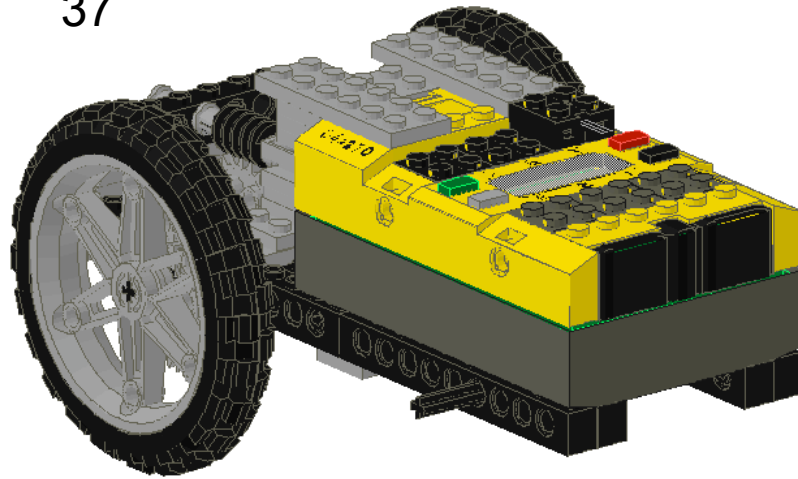
Our Favorite Things

Snail Car

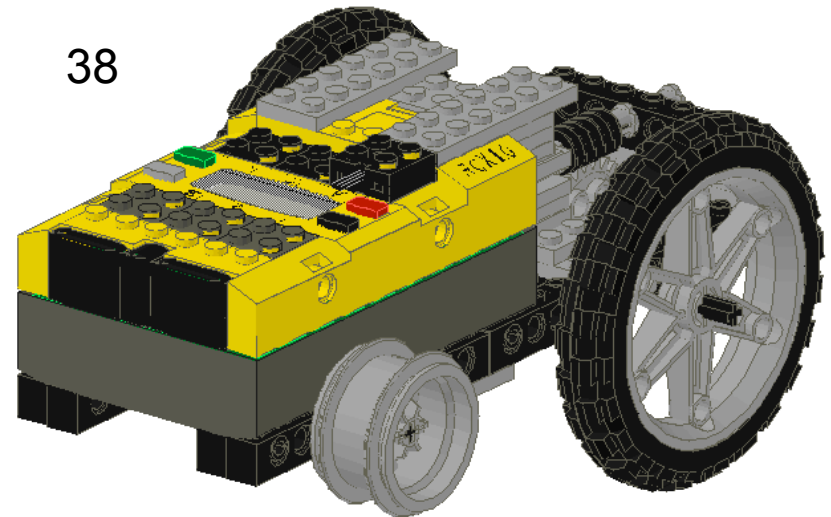
Pieces:



37



38



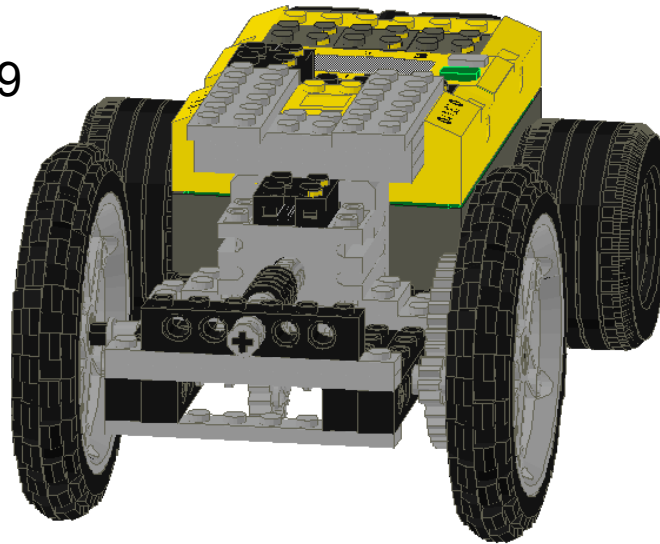
Our Favorite Things

Snail Car

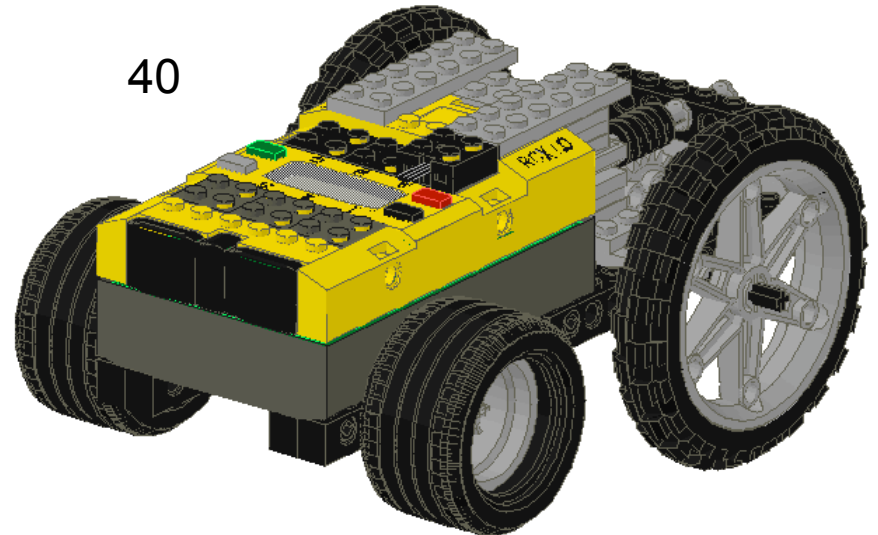
Pieces:



39

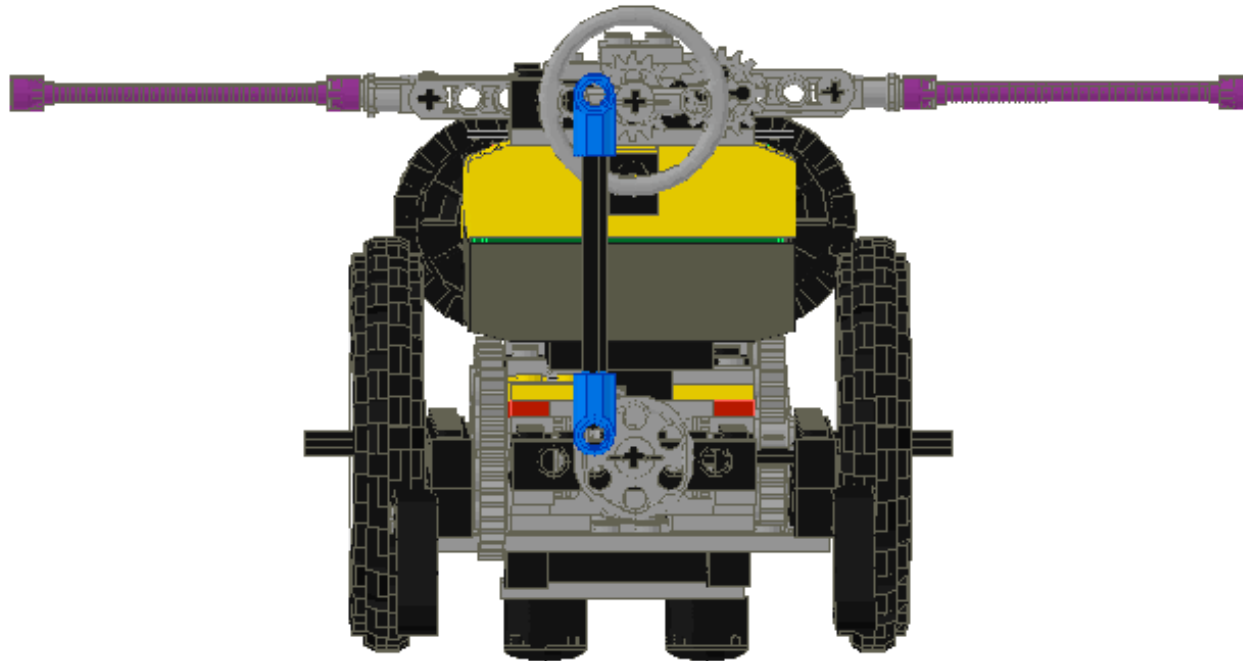


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Our Favorite Things

BUG



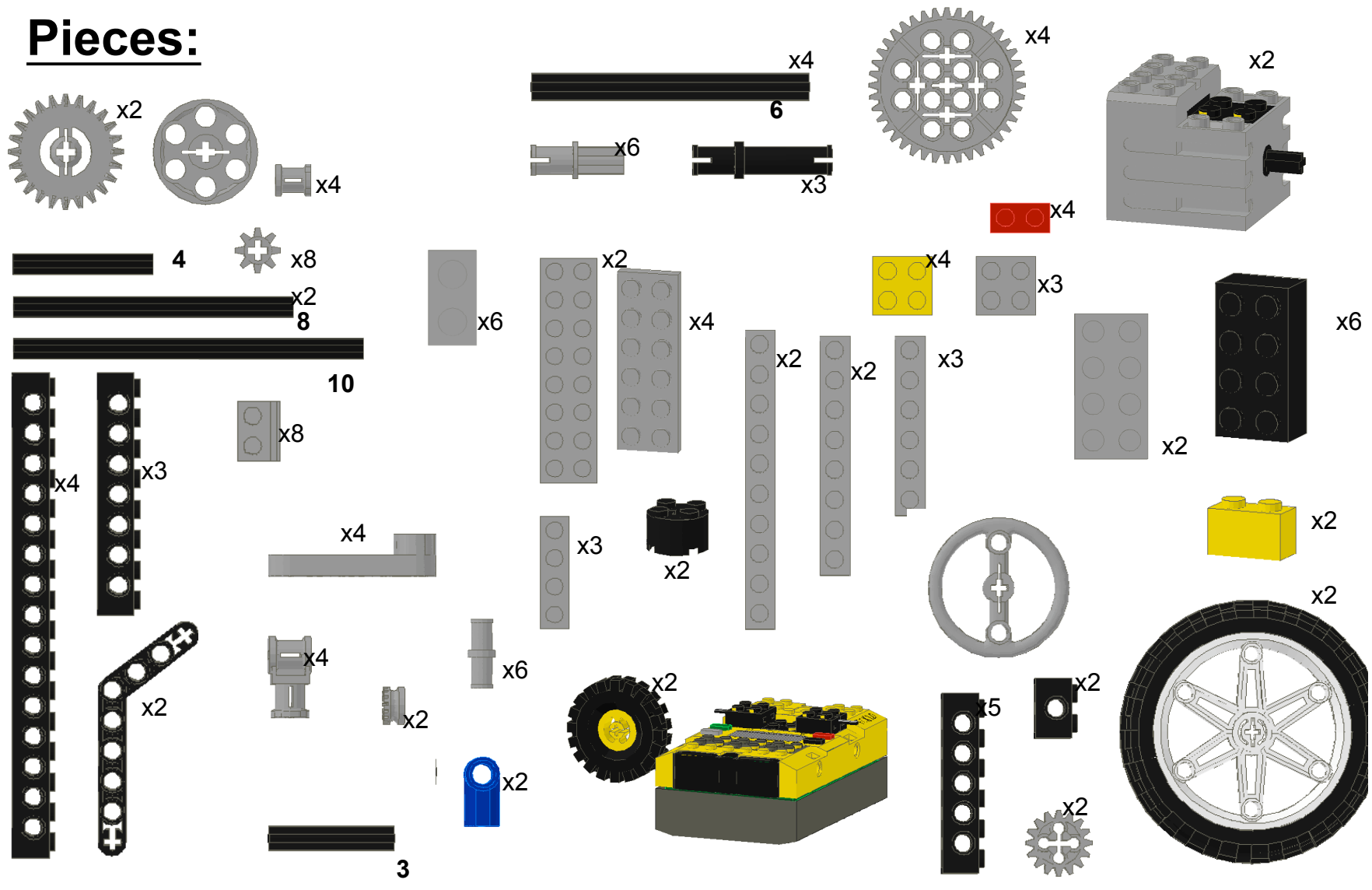
Key Words:

Flywheel

Our Favorite Things

BUG

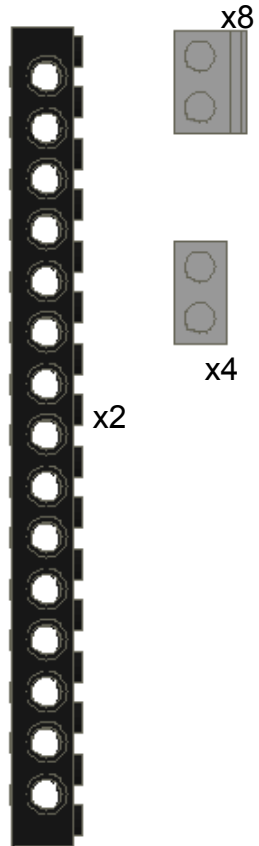
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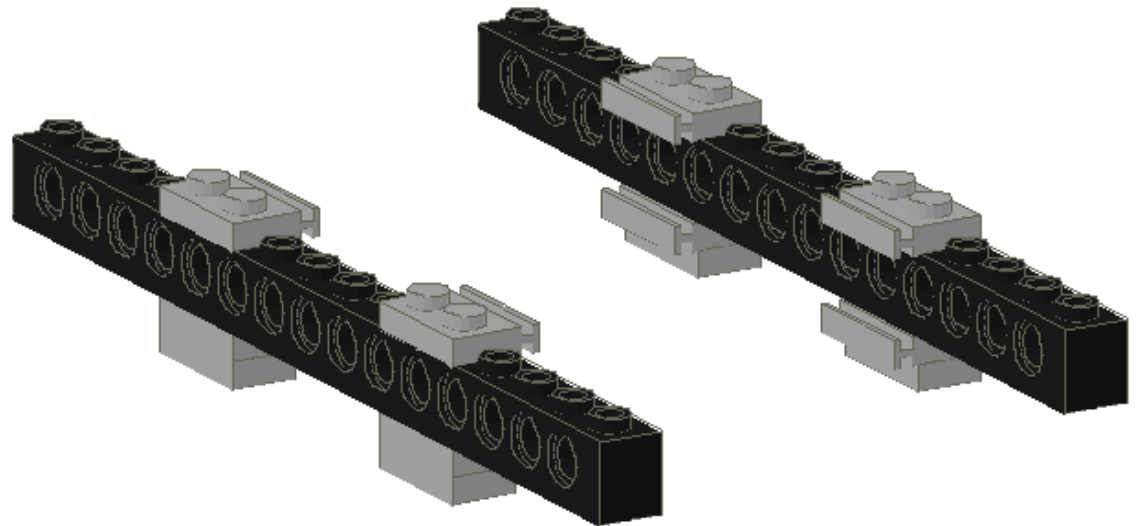
Our Favorite Things

BUG

Pieces:



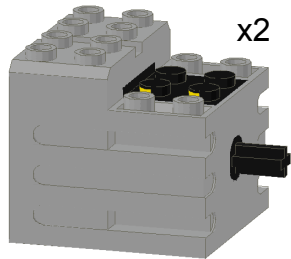
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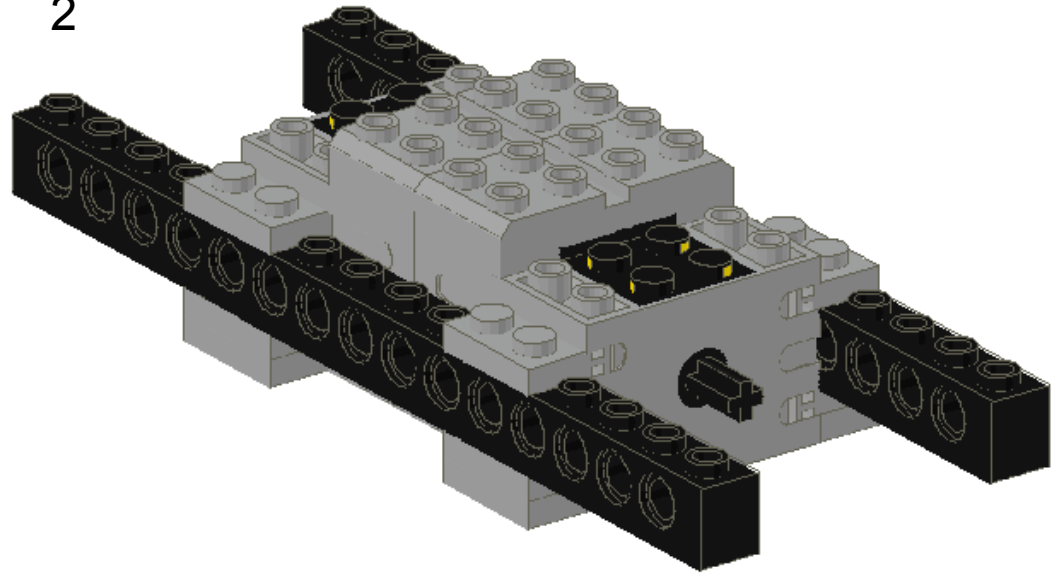
Our Favorite Things

BUG

Pieces:



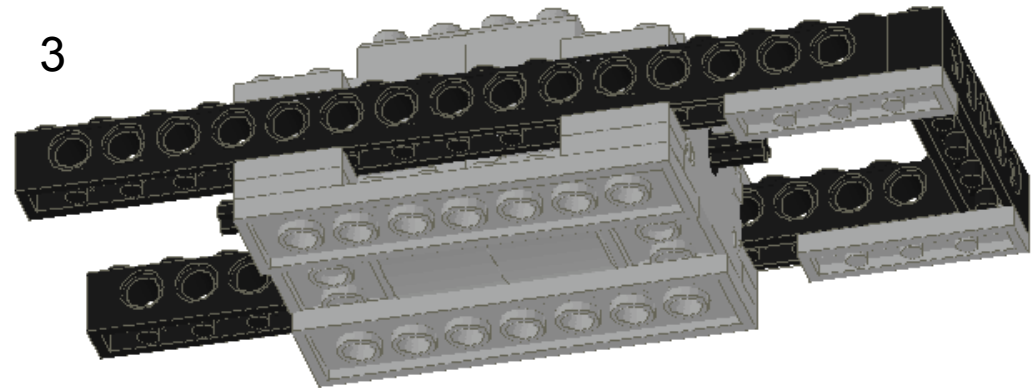
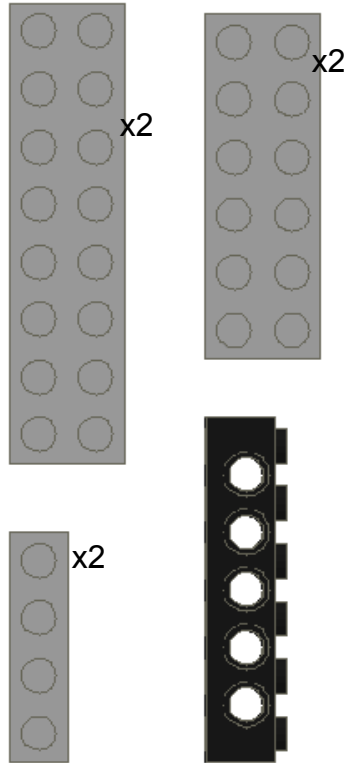
2



Our Favorite Things

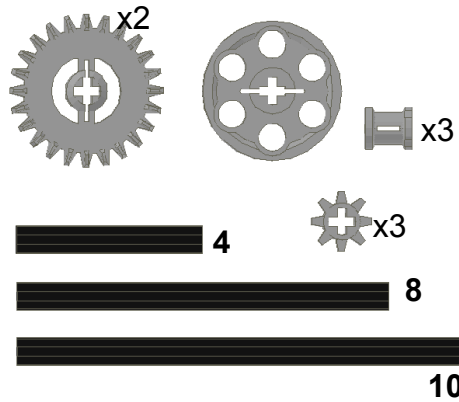
BUG

Pieces:



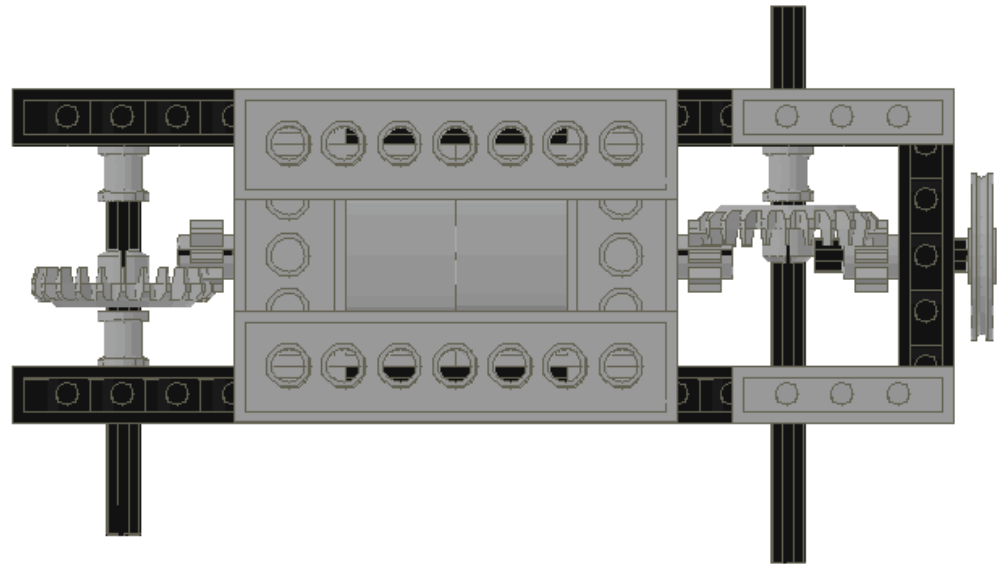
Our Favorite Things

Pieces:



BUG

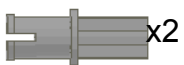
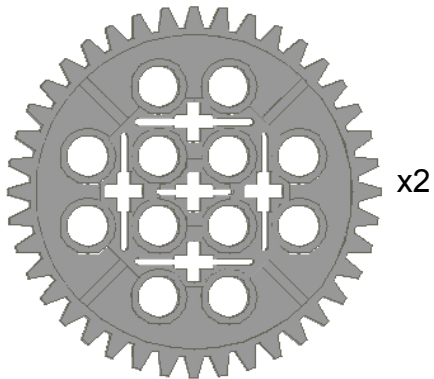
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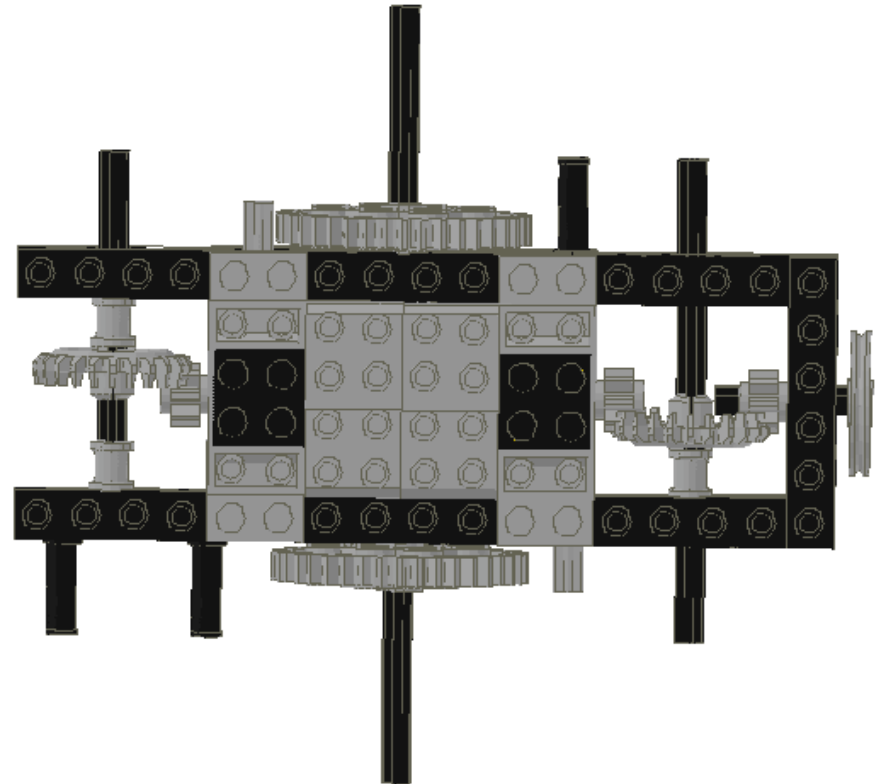
Our Favorite Things

BUG

Pieces:

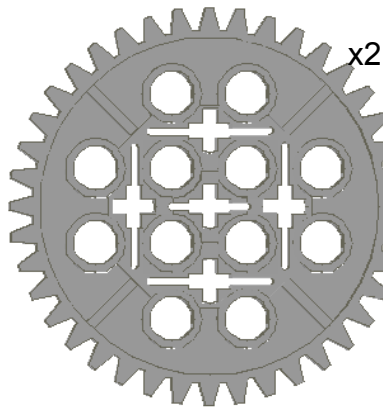


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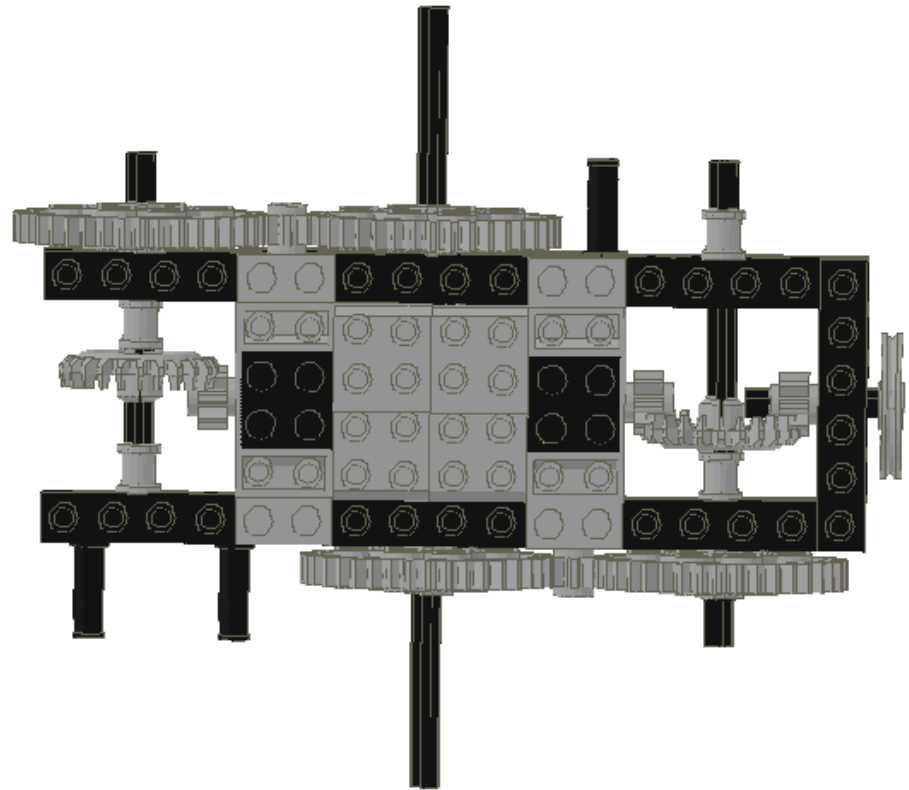
Our Favorite Things

Pieces:



BUG

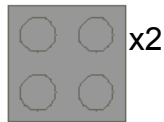
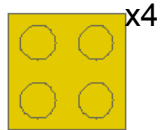
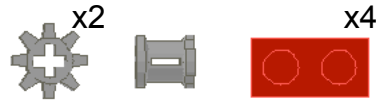
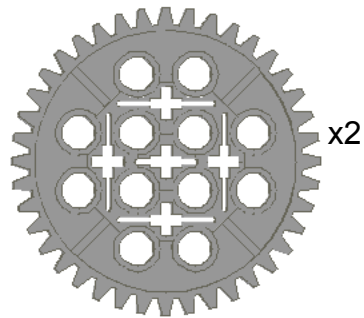
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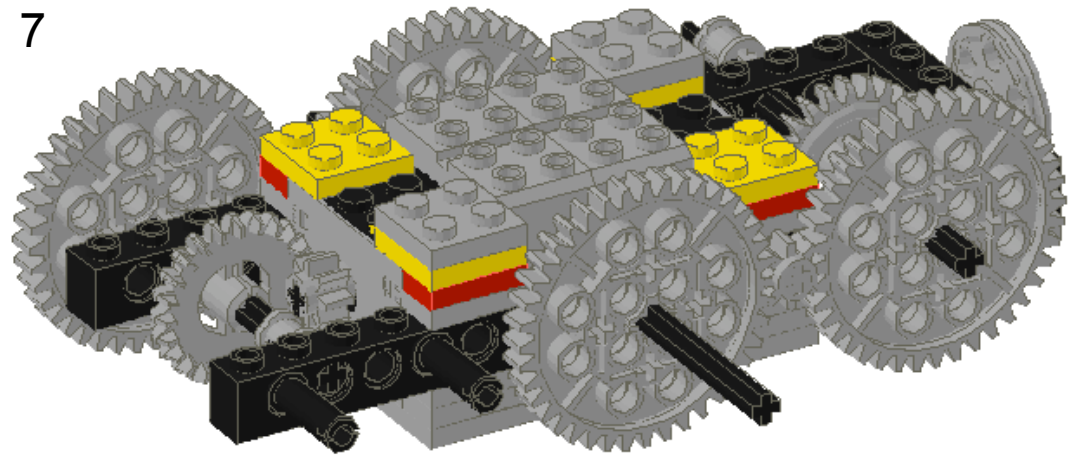
Our Favorite Things

BUG

Pieces:



7

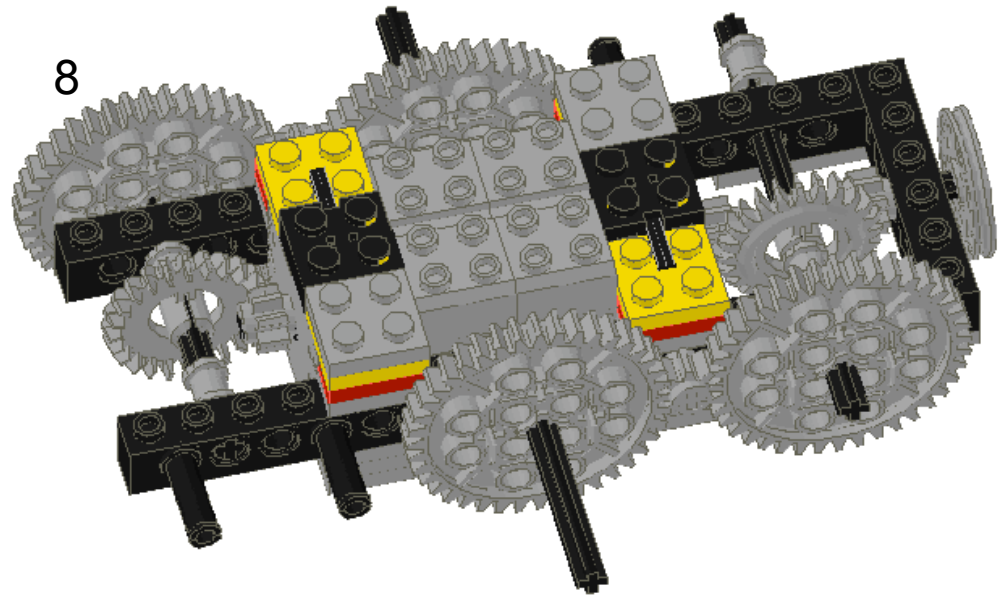


Our Favorite Things

BUG

Pieces:

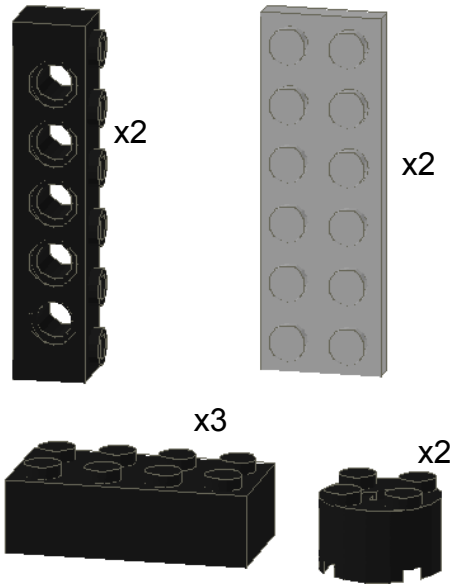
Wires



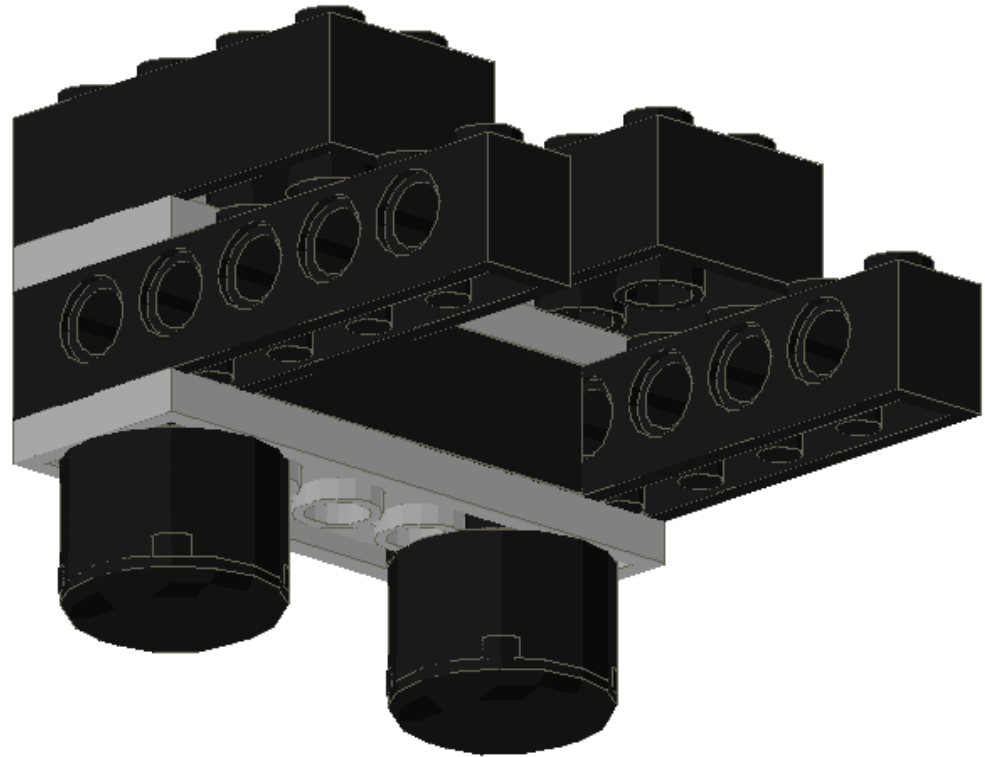
Our Favorite Things

BUG

Pieces:



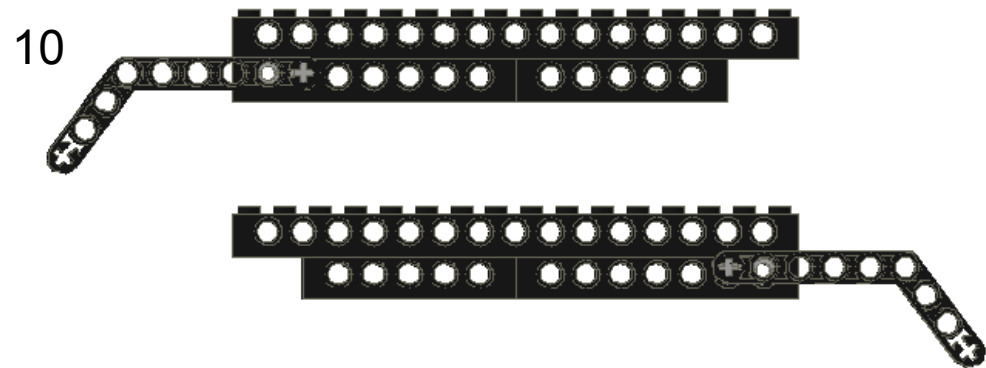
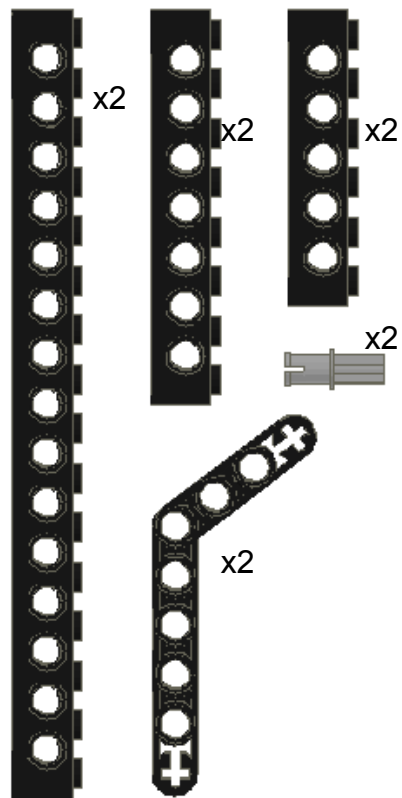
9



Our Favorite Things

BUG

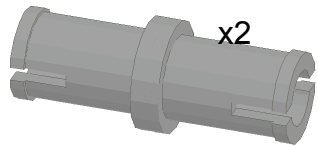
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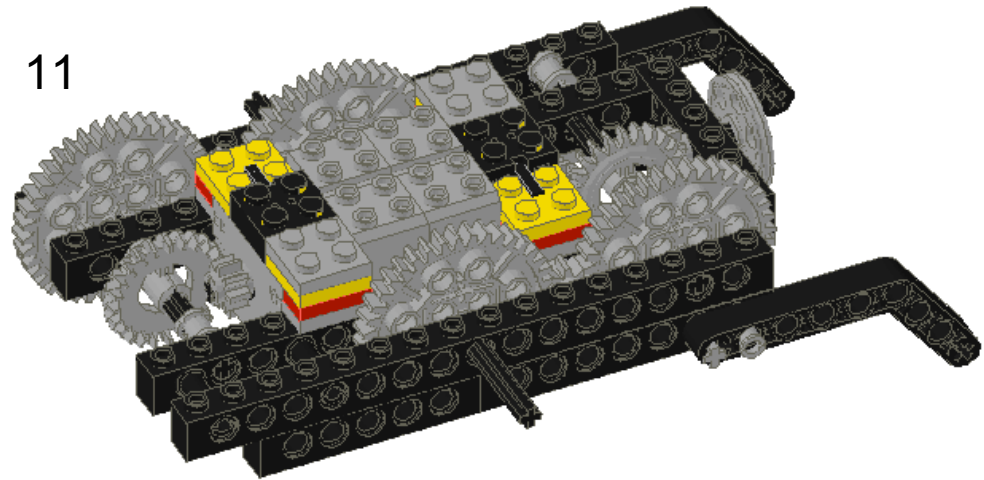
Our Favorite Things

BUG

Pieces:

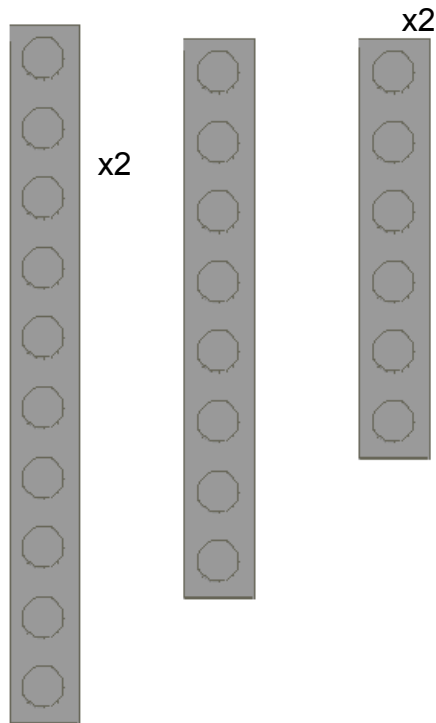


11

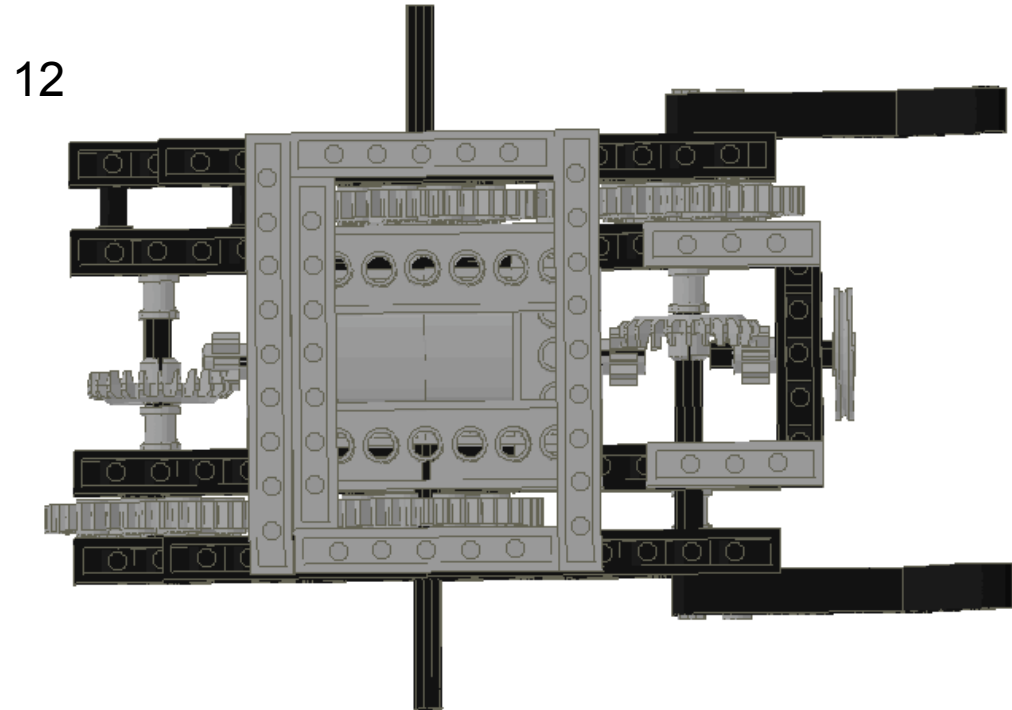


Our Favorite Things

Pieces:



BUG

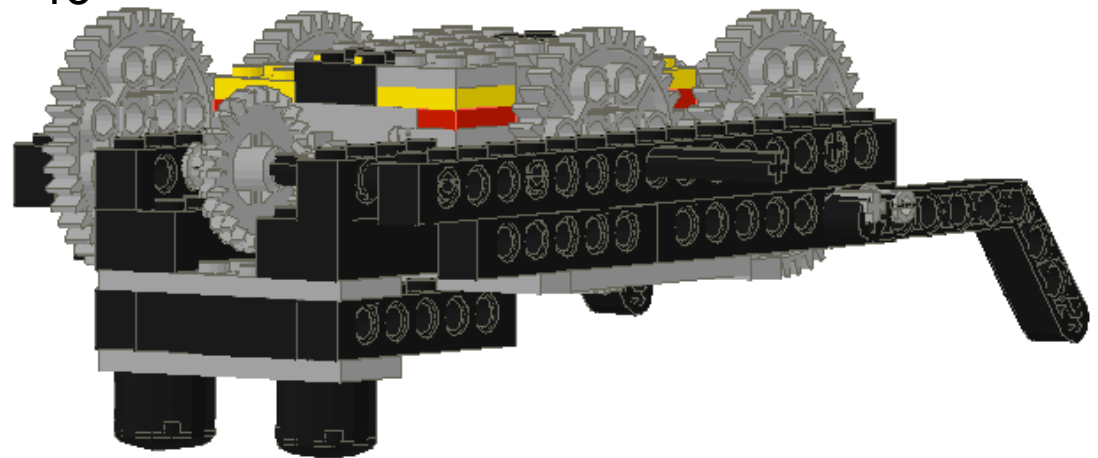


Our Favorite Things

BUG

Pieces:

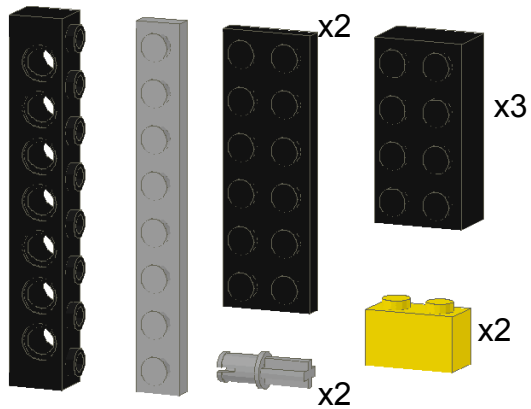
13



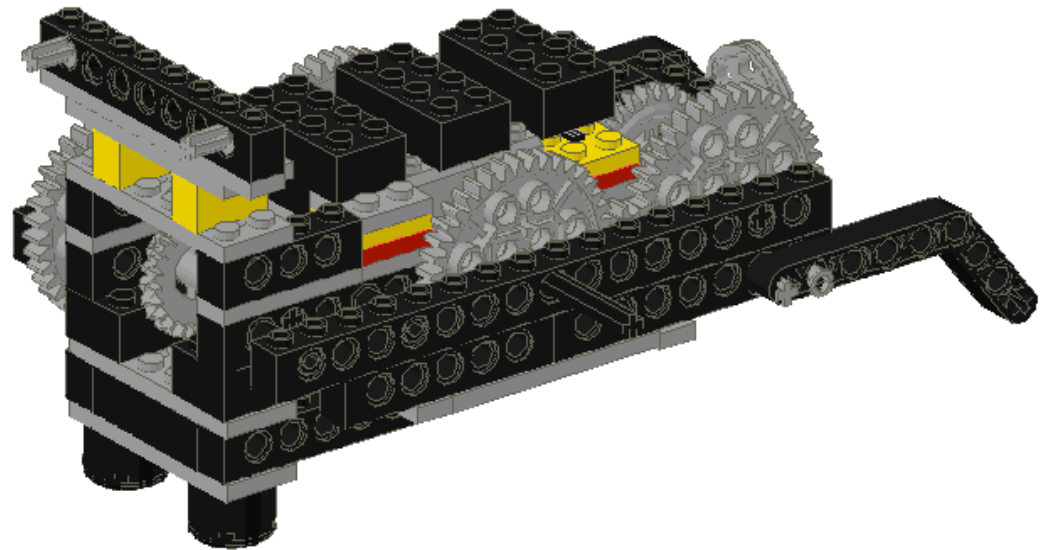
Our Favorite Things

BUG

Pieces:



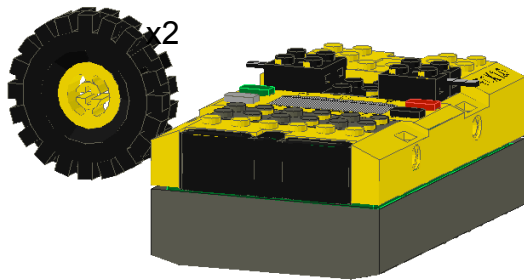
14



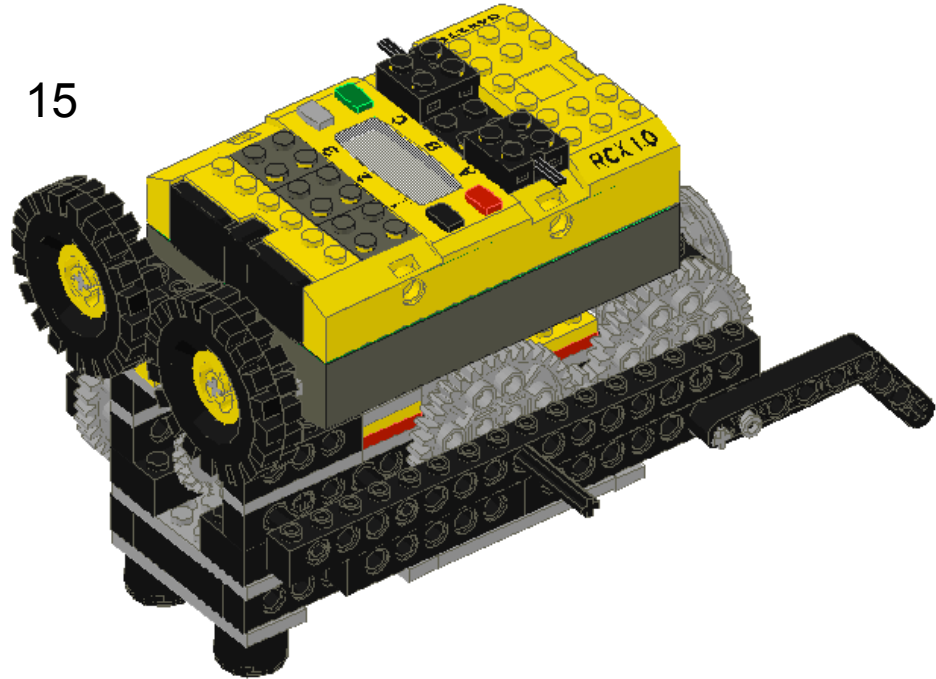
Our Favorite Things

BUG

Pieces:



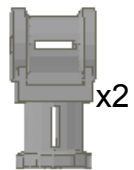
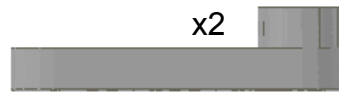
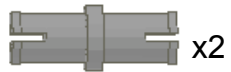
15



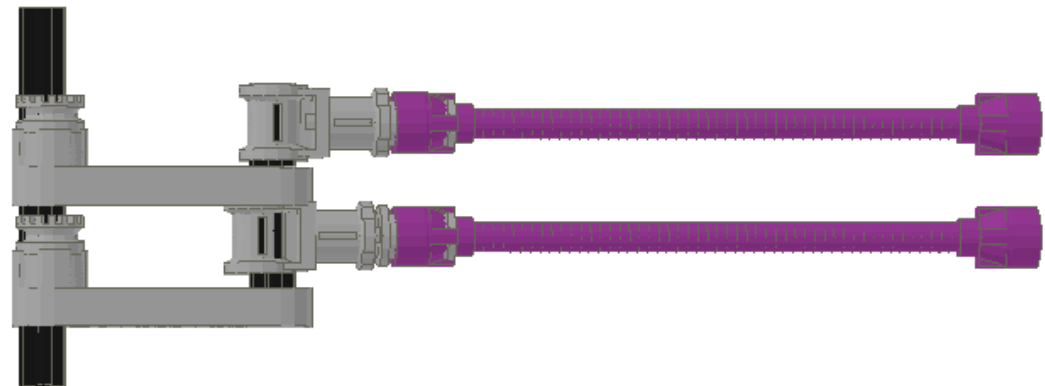
Our Favorite Things

BUG

Pieces:



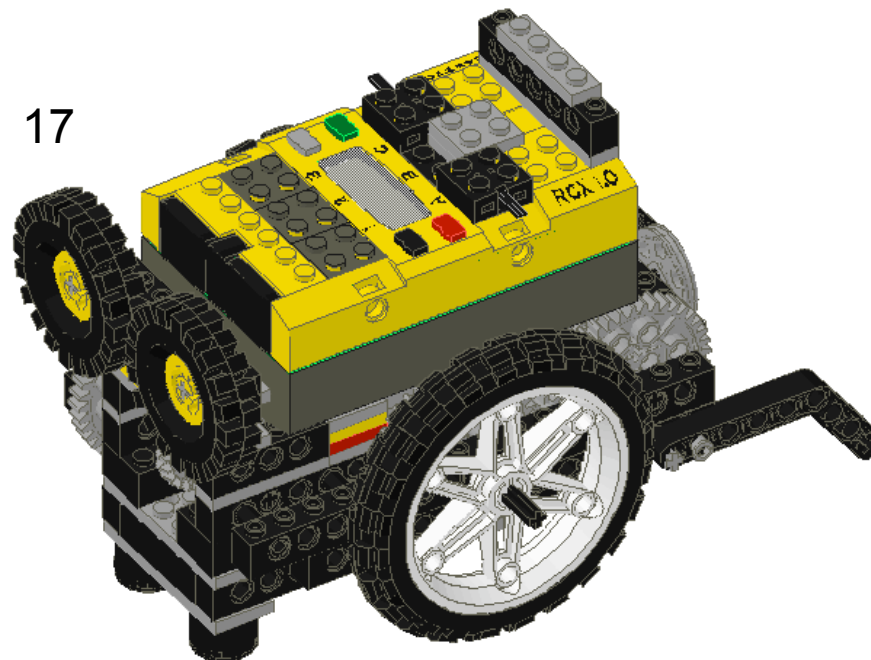
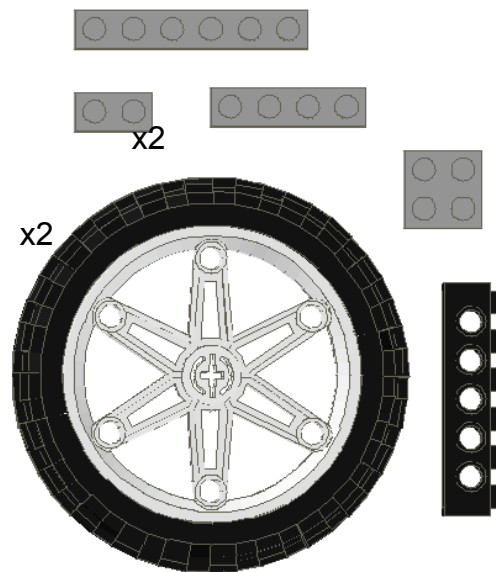
16



Our Favorite Things

BUG

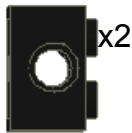
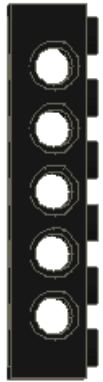
Pieces:



Our Favorite Things

BUG

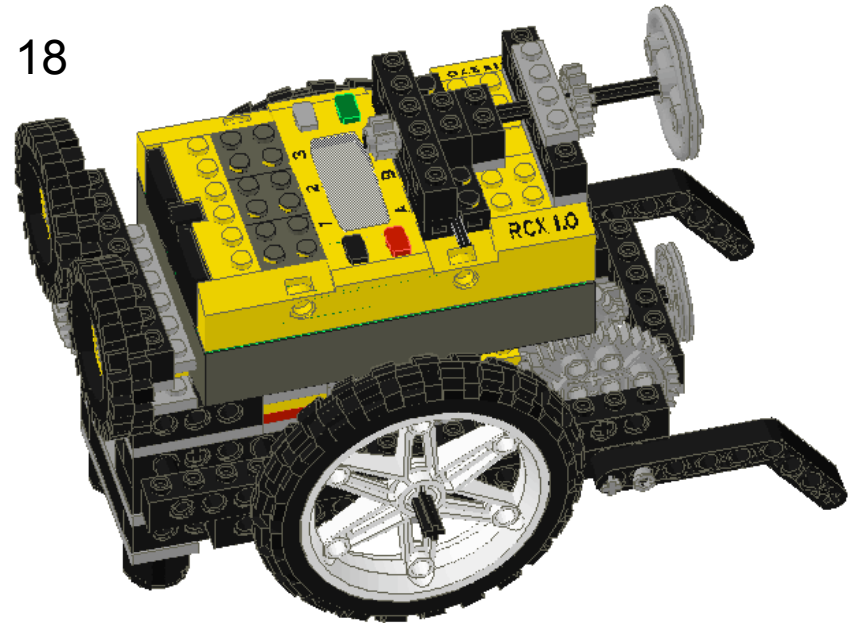
Pieces:



x2



18



Our Favorite Things

BUG

Pieces:



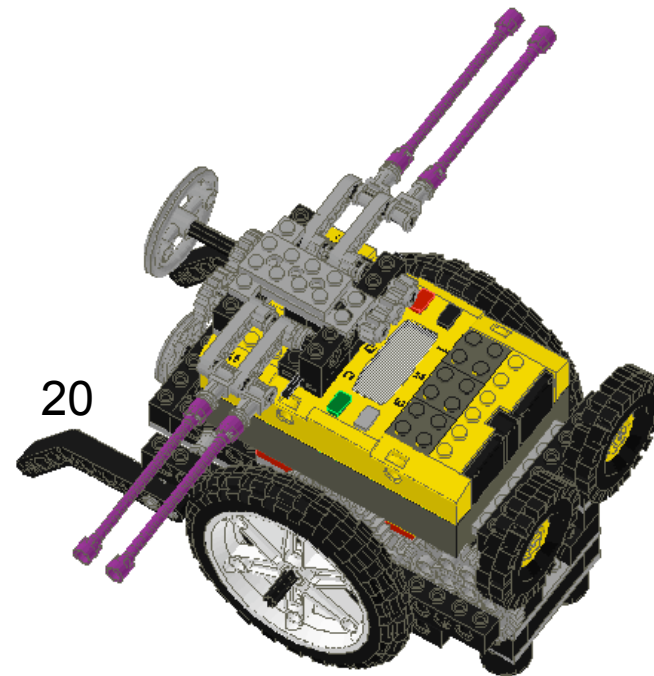
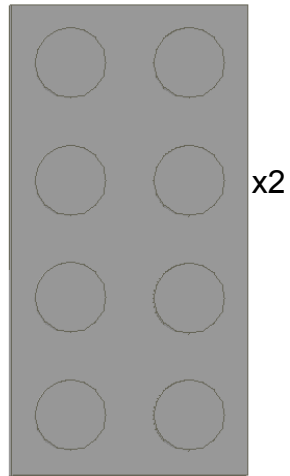
19



Our Favorite Things

BUG

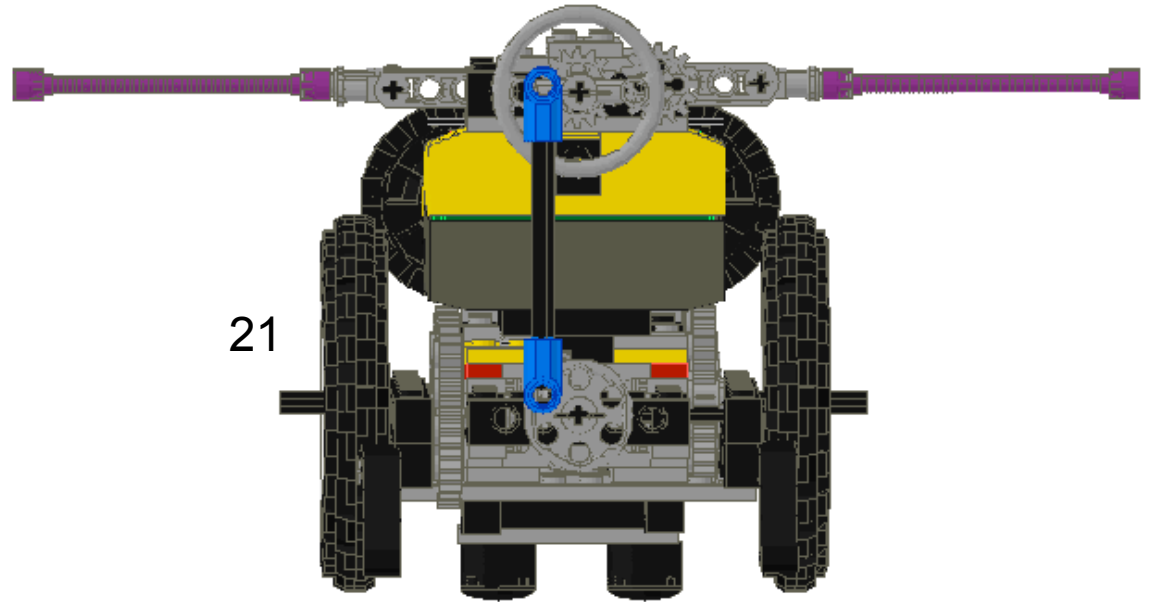
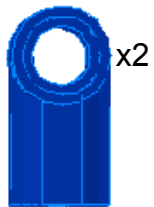
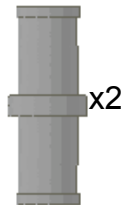
Pieces:



Our Favorite Things

BUG

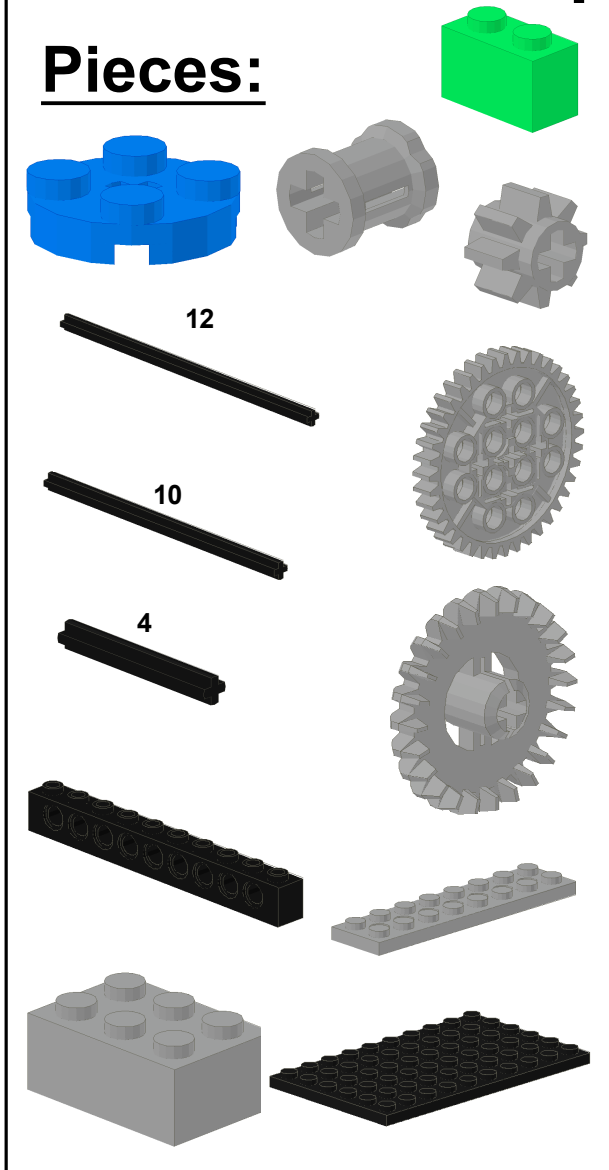
Pieces:



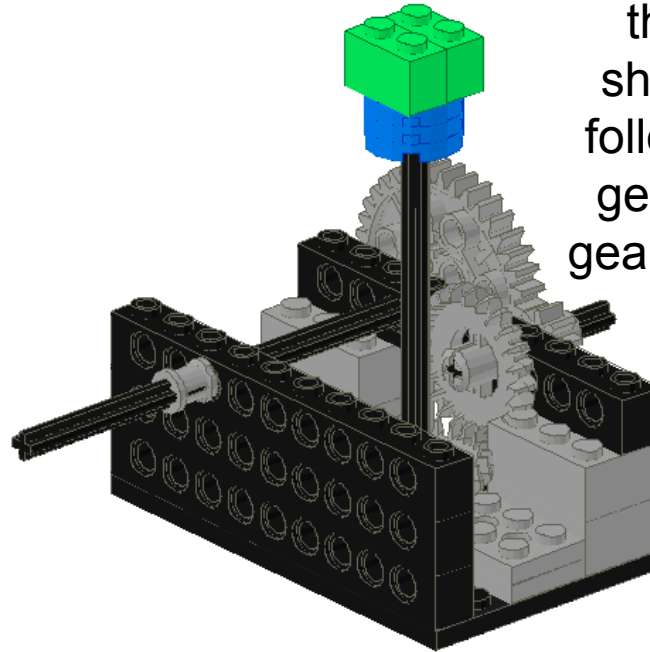
Our Favorite Things

Optical Illusions

Pieces:



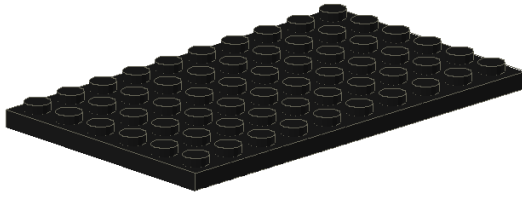
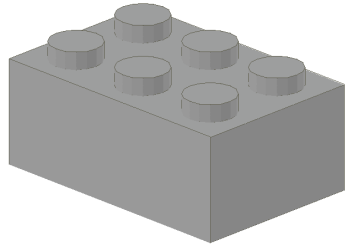
Note: In order to do this project you should review the following concepts: gearing up, crown gears, changing axis of rotation



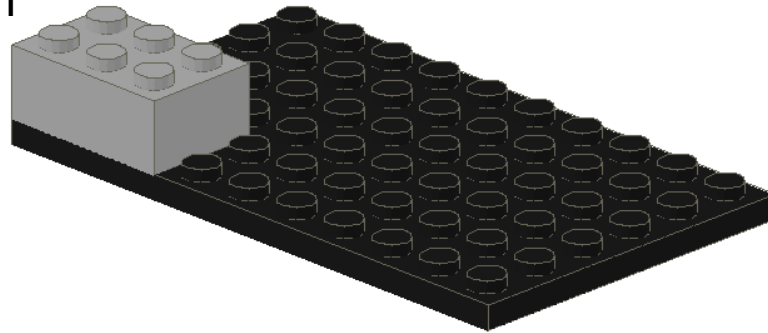
Our Favorite Things

Optical Illusions

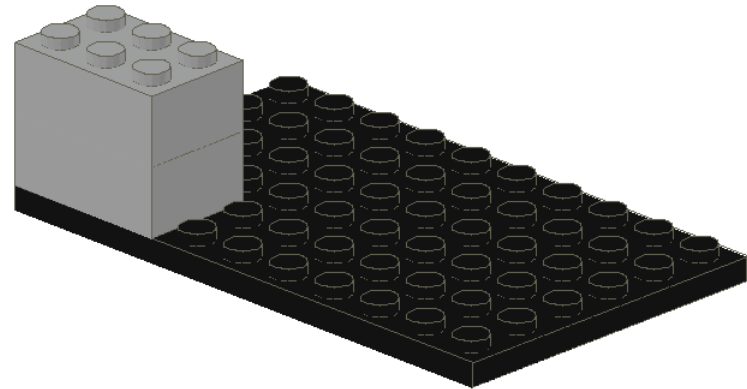
Pieces:



1



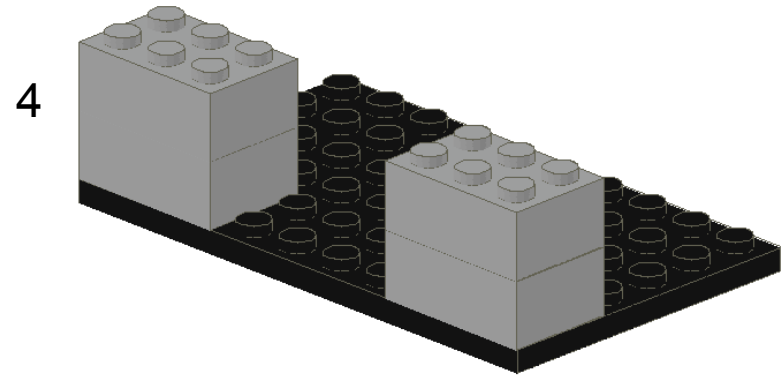
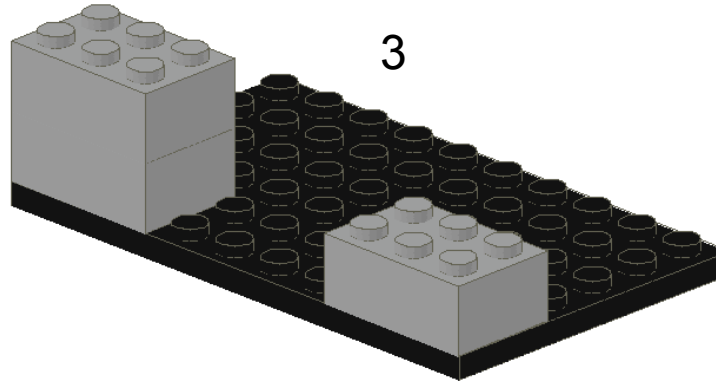
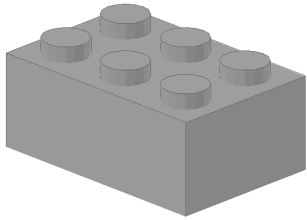
2



Our Favorite Things

Optical Illusions

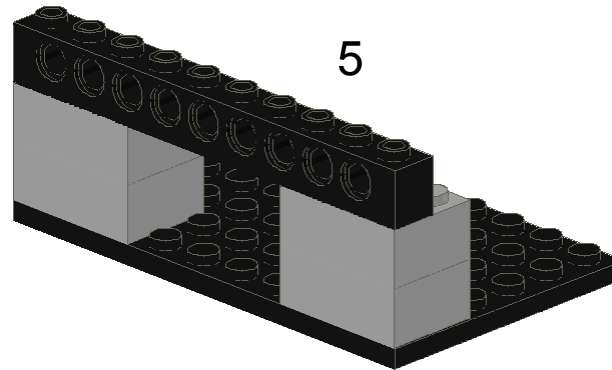
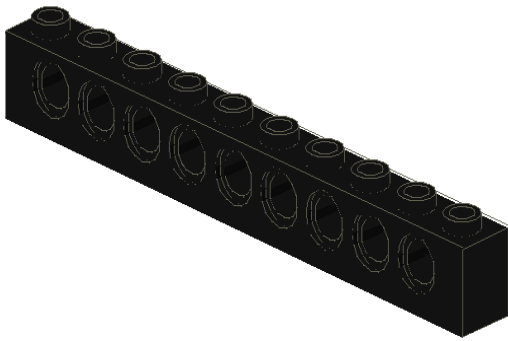
Pieces:



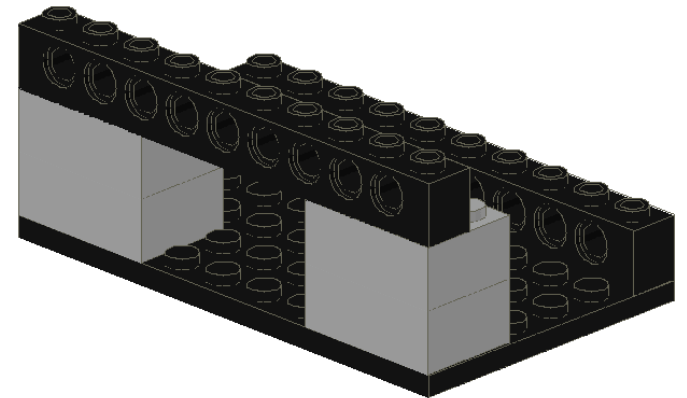
Our Favorite Things

Optical Illusions

Pieces:



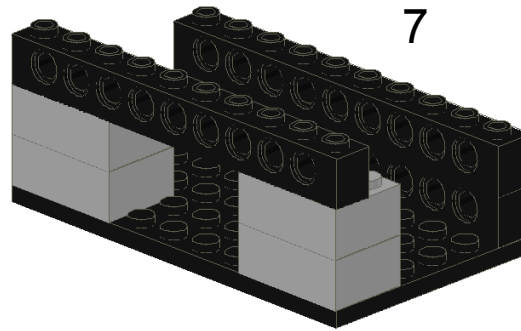
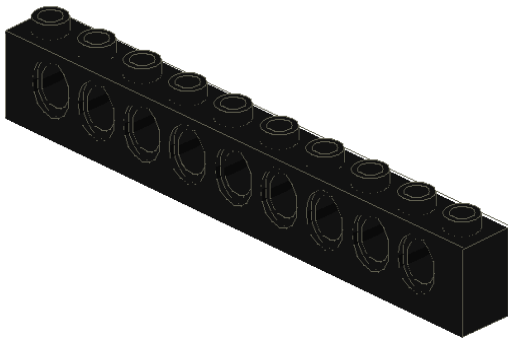
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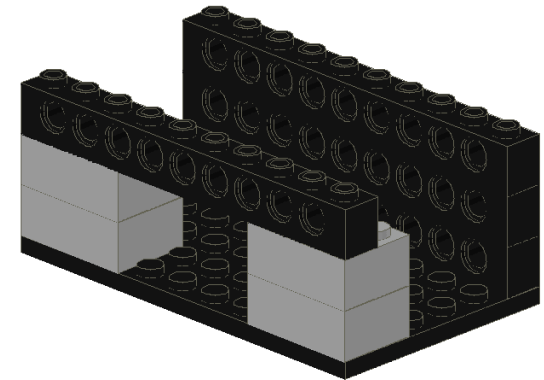
Our Favorite Things

Optical Illusions

Pieces:



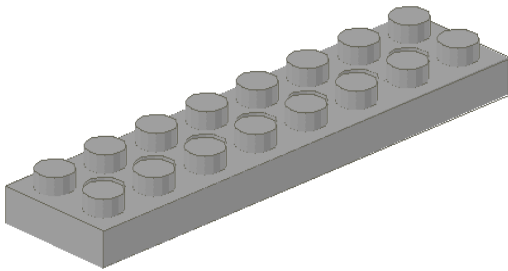
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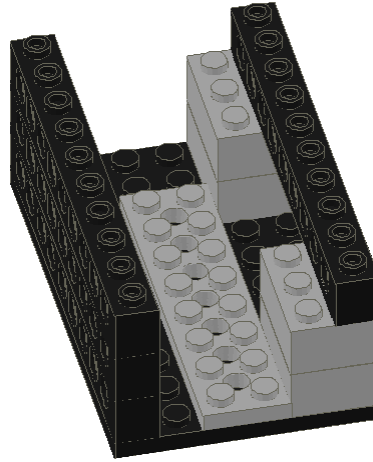
Our Favorite Things

Optical Illusions

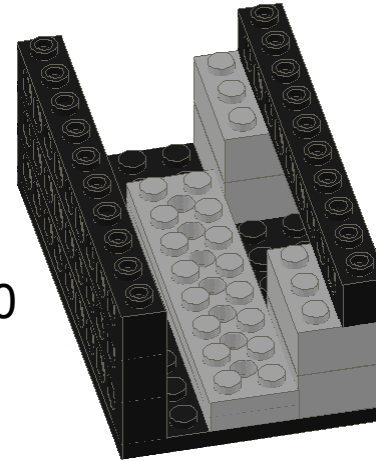
Pieces:



9



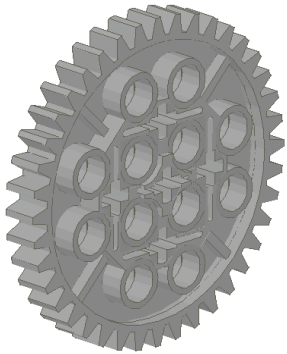
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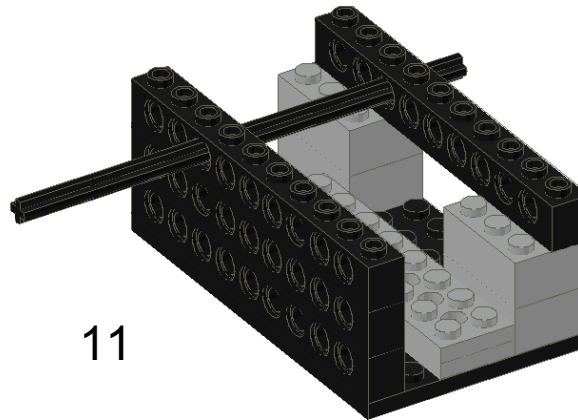
Our Favorite Things

Optical Illusions

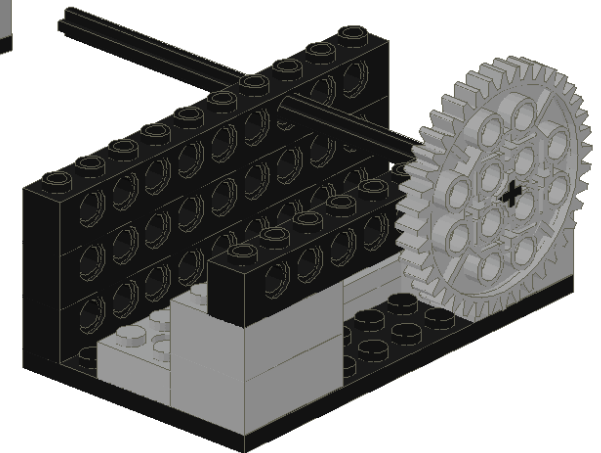
Pieces:



12



11

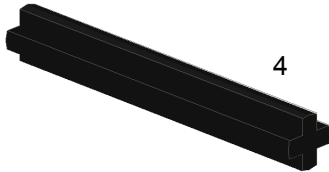
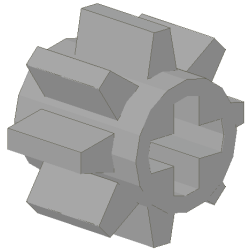


12

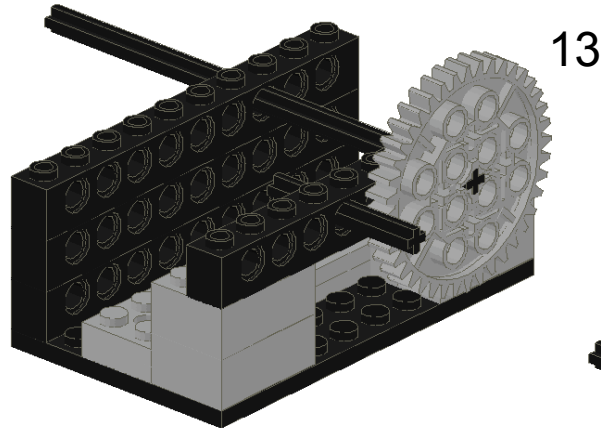
Our Favorite Things

Optical Illusions

Pieces:

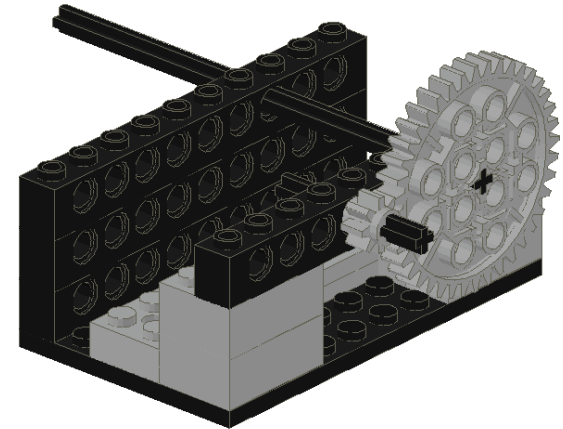


4



13

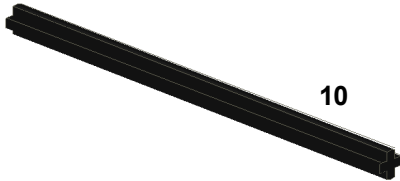
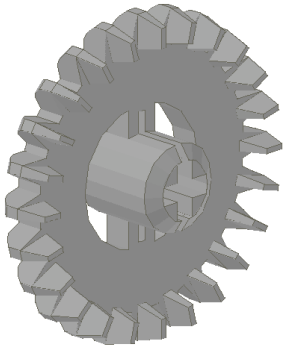
14



Our Favorite Things

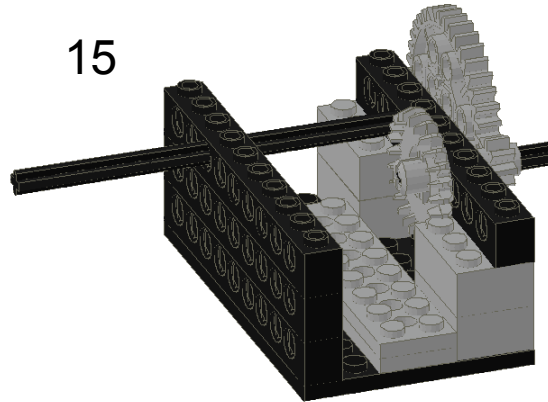
Optical Illusions

Pieces:

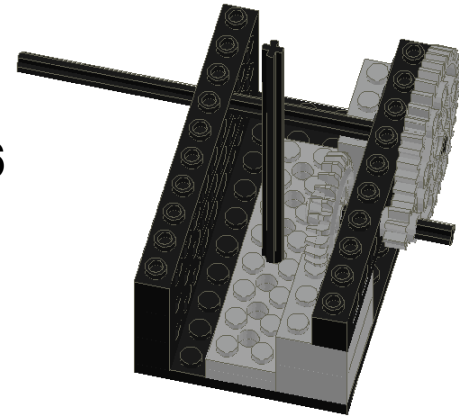


10

15



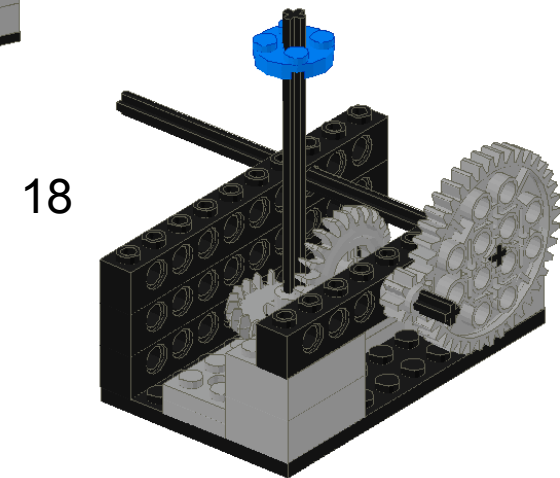
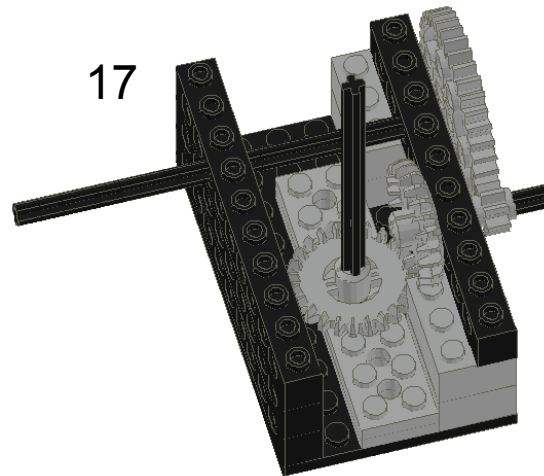
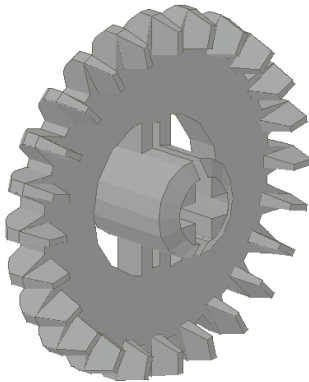
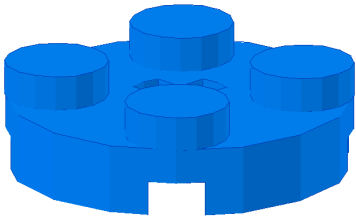
16



Our Favorite Things

Optical Illusions

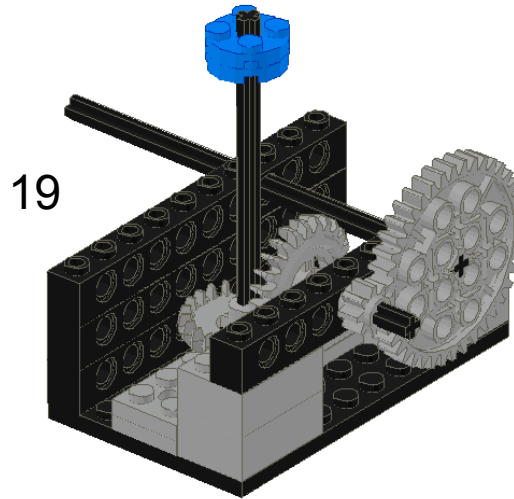
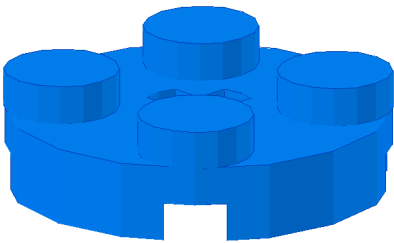
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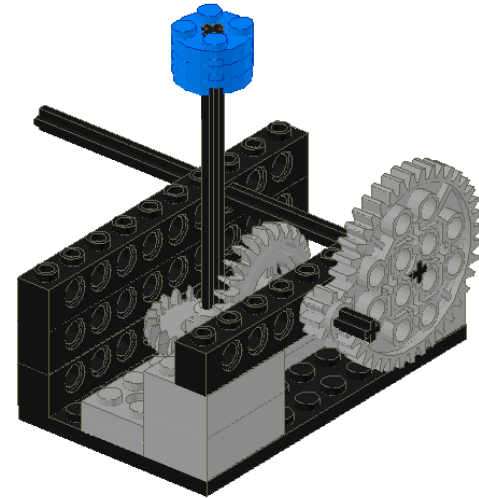
Our Favorite Things

Optical Illusions

Pieces:



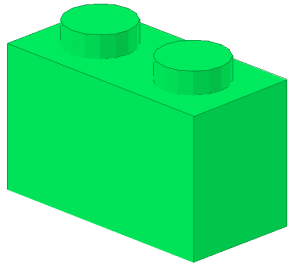
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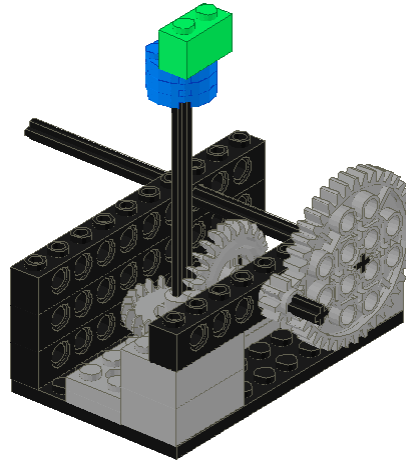
Our Favorite Things

Optical Illusions

Pieces:



21



22

