GYRO ROBOTS

ROBOTICS

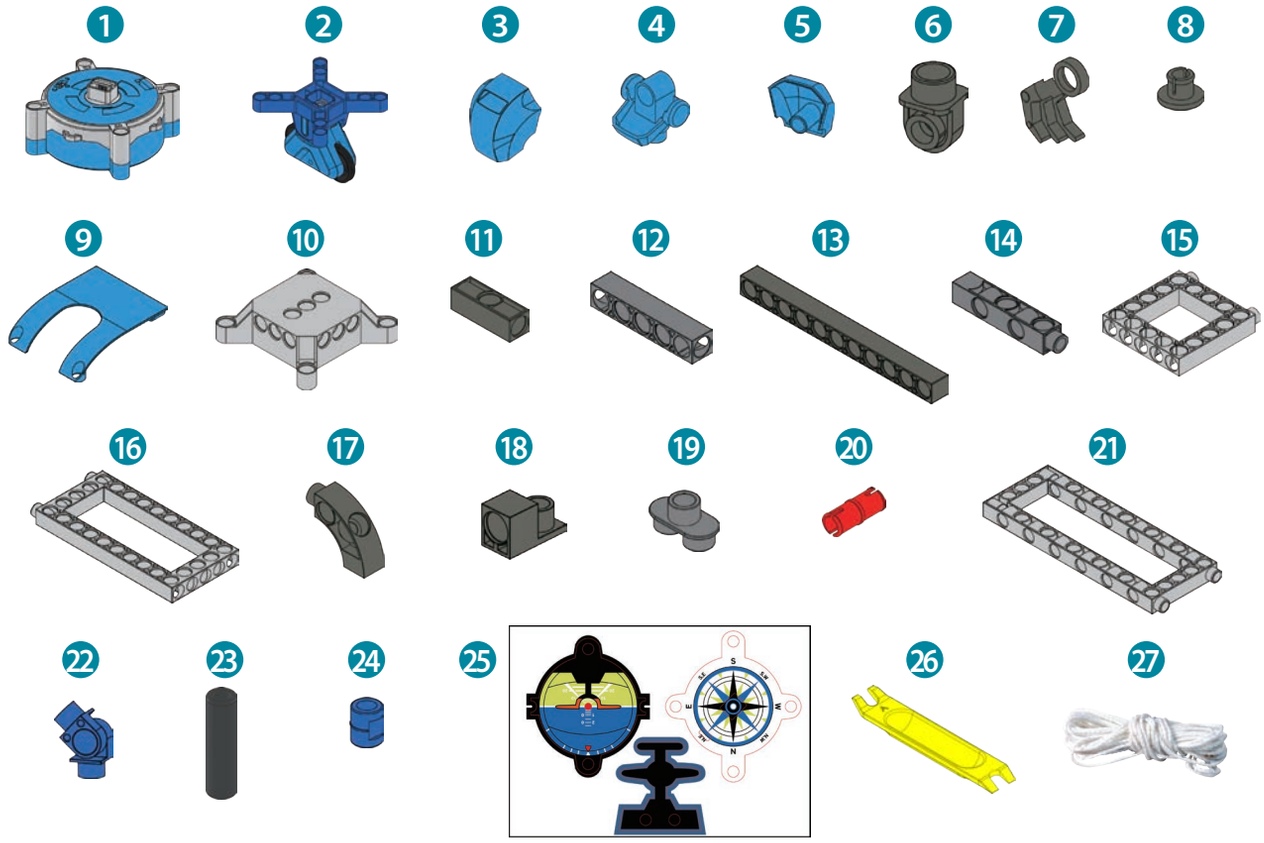
7+

#7396

102 pcs

7 EXPERIMENTS ARE INCLUDED

ROBOTICS Parts List

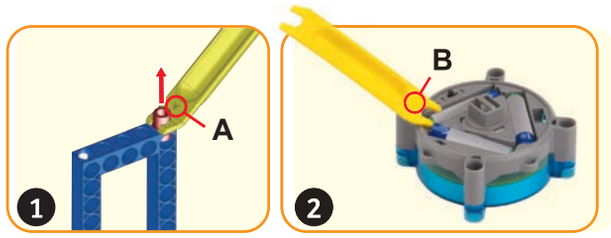


No.	Name	Qty.	No.	Name	Qty.
①	Gyro Motor	1	⑮	Square Frame	2
②	Gyro Wheels	1	⑯	Short Frame	2
③	Gyro Robot Head-1	1	⑰	Bent Rod	2
④	Gyro Robot Head-2	1	⑱	90 Degree Converter-R	4
⑤	Gyro Robot Head-3	1	⑲	2 in 1 Converter	6
⑥	Robot Palm-1	2	⑳	Axle Connector	4
⑦	Robot Palm-2	4	㉑	Dual Frame	1
⑧	Robot Palm-3	4	㉒	Hinge	8
⑨	Gyro Cloak	1	㉓	Hollow Tube 30mm	2
⑩	Gyro Frame	1	㉔	Extra Loose Peg	30
⑪	3-Hole Dual Rod (2 Side Holes)	6	㉕	Die-Cut Cardboard	1
⑫	5-Hole Rod	6	㉖	Peg/Axle Remover	1
⑬	Rod	5	㉗	Cotton String	1
⑭	Dual Rod	4			

Total : 102 pieces

How to Use the Peg/Axle Remover (3 x AAA batteries not included are needed)

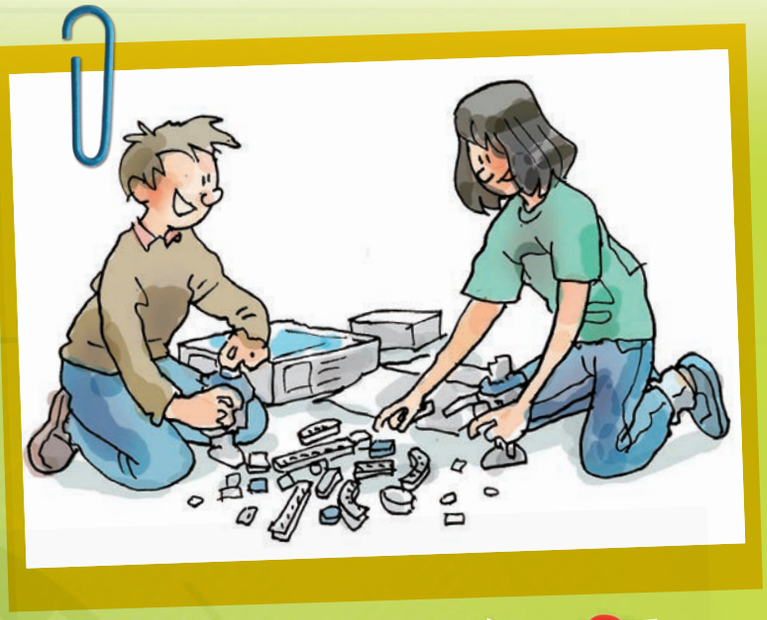
1. Use the "A" end of the peg/axle remover to pull off the peg.
2. Use the "B" end of peg/axle remover to remove the battery out of the holder.



GYRO ROBOTS

INTRO

Congratulations on your new toy! Robotic Gyro is one of Gigo's many science kits. With this kit, you can build and play with the gyro balancing robot in many ways. You can make the motor driven gyro spin before letting the robot go. It can hold its balance all by itself!
You can even let it drive on a tight rope and it still is able to keep its balance. It looks incredible!
How do you think it does this?
By playing with this kit, you will learn about the gyroscope, and how people have used this important technology in many everyday inventions.



Once you begin to study the phenomenon of gyroscopes even more, you shall discover the laws of rotational force called the Gyro Effect. The Robotic Gyro's transparent housing makes it very easy to observe how a high speed turning wheel can make the robot keep its balance in a gravity defying way. The Robotic Gyro is a gravity-defying humanoid that is able to keep its balance although it is driving on only two wheels. The objective for you is to explore how the forces in a high-speed gyroscope really work, and in the process discover how science can be fun and engaging at the same time!

From the kit, you can build seven different models, which allow you to explore how gyroscopes are used in the real world.
For each model, you will find a page with a brief introduction to the science that lies behind the model, plus a few experiments that you can do to explore the Gyro Effect, as well as some real-life examples of how gyroscopes are used today. For each model, you will also find detailed building instructions with easy step-by-step visuals demonstrating how to build each model.
It may look complicated, but you will soon realize that the models are easy to build, easy to understand, and fun to play with!

ROBOTICS

The gyroscopic effect occurs when an object - such as a flywheel- is set in a quick rotation. When the flywheel achieves a certain speed, the gyro effect begins to occur, and can be experienced as a force that keeps the wheel moving in its direction and orientation.
It is the gyro effect that causes a spinning top to keep its balance, and it's the gyro effect that makes it possible for a cyclist to be (almost) horizontal while taking a hard turn, without tipping over.
The gyro effect is used in many modern inventions, as well as many different toys, including yo-yo's and powerballs.

Power is transferred to wheels via gears.

In the same way that the gyro effect helps the models keep their balance, the wheels make the models drive forward.
These wheels have been specially developed by Gigo. Therefore, we are proud to be able to present these unique inline wheels, where the energy from the engine is transferred through the gears and 'knees', to wheels in order to perpetuate motion.
When the wheel are coupled with the gyro stabilizer via the drive shaft, the wheels automatically start to rotate without the gyro effect ceasing. The Robotic Gyro will drive forward while its balance is maintained.

The central unit of the Robotic Gyro consists of four parts:

- Battery
- Engine
- Gyro Stabilizer
- Wheels

Before assembling: Install the batteries correctly in the box.
For prolonged storage: Remove the batteries.
Always remember: When the unit is started - wait about 15 seconds - until the flywheel has reached its top speed.

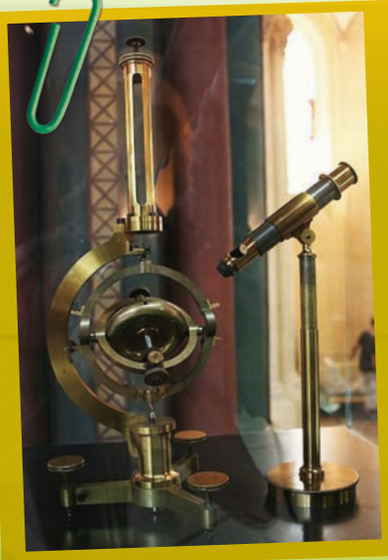
Robotic Gyro

GYRO ROBOTS

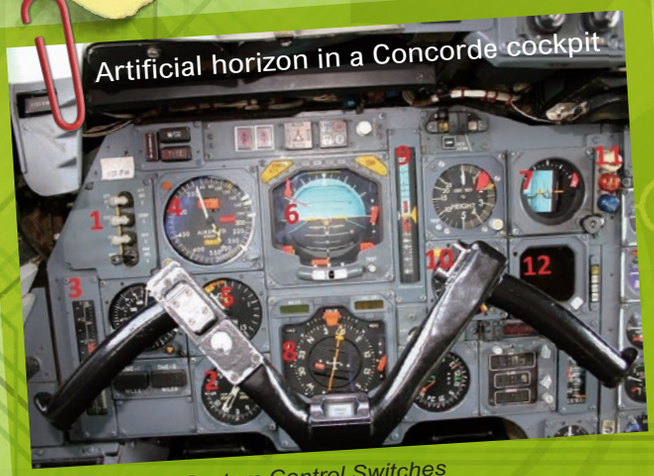
INTRO

The gyro was invented by the French scientist, J.B.L. Foucault in 1852. Foucault described the gyro as a mechanical apparatus that utilizes the principle that the axis of a rotating body with a large amount of inertia is extremely stable.

It took many years before the gyro had any practical use, except for toys. Not until the twentieth century, when the airplane was invented, did people begin to use the gyro effect in advanced instruments, such as gyrorectors, gyro compasses etc.



One of the first gyros



1. Navigation System Control Switches
2.Medium Frequency (MF) Radio Compass (ADF)
3. Incidence

Today's gyros are also used in the construction of gyro compasses, which often replaces the magnetic compasses on modern ships of a certain size.
In addition, gyros are used to help with stability in many ways. Examples of modern applications include:

- bicycles
- instruments for aeroplanes and rockets
- the Hubble Telescope
- tanks
- ships and other crafts

The gyro effect is also often used in many different types of toys.

Nobody can tell us what the future will bring; however, history tells us that people will always try to invent new and improved tools. As such, we are convinced that the gyro effect will be used for exciting new inventions in the future as well.
Scientists create inventions by conducting experiments.
With this kit, you can experiment like an inventor or a scientist. You can conduct tests and gain knowledge about the gyro effect. By playing with the fully functional models, you will be able to learn about the science that lies behind this technology and how a scientist works.

A Gyro-scooter

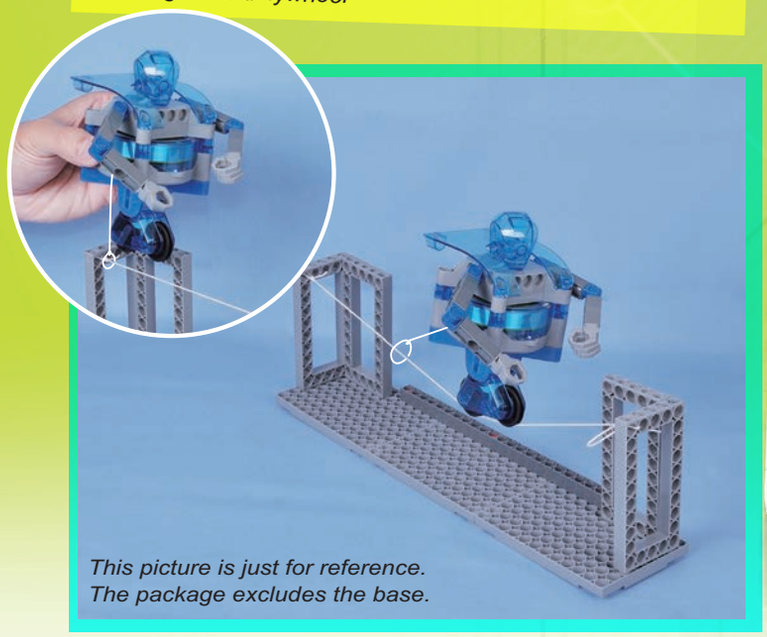
ROBOTICS

EXPERIMENT 1 : Robo Gyro

Try this:

Hold the gyroscope between two fingers of one hand. Turn the engine on the with the on-off switch. The flywheel inside the gyroscope will start to rotate.
Please wait 15 seconds for the flywheel to reach its top speed.
Then, gently try to tilt the gyroscope to the right, and then to the left. You will feel a force that makes it relatively difficult to tilt the gyroscope and change its direction. What you are observing is the gyro effect.
Try also to balance the gyroscope on tip of your finger. Try to tilt your finger from one side to the other. Remember, the gyroscope must be turned on when you attempt to balance it.

The Robo Gyro moves forward and keeps balance by using the engine and flywheel



This picture is just for reference. The package excludes the base.

Before you begin, make sure that the batteries are installed correctly in the gyro unit.

The Robotic Gyro can be switched on and off with the switch when the batteries are intstalled.

Good to know

The gyro-effect occurs when an object, such as a flywheel, rotates quickly. When the flywheel achieves a certain speed, the gyro effect can be felt as a force that keeps the wheel in the same direction and orientation.
It is also the gyro effect that keeps a spinning top in balance, as well as what makes it possible for a racing cyclist to almost lie down horizontally when racing in a curve.

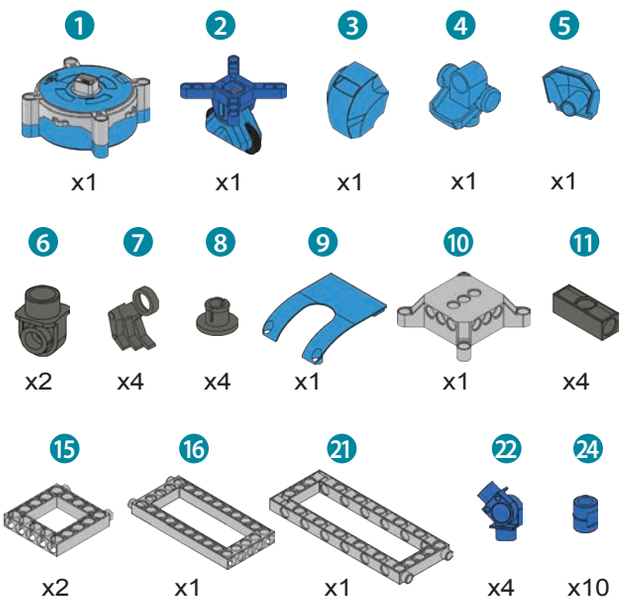
Try also this:

1) Tie a small string to the robot as a leash and attach it to a tight rope (see the photo at the left). So if the robot stops and falls that it won't hit the ground.
2) Turn on the motor and make sure it rotates for about 15 seconds.
3) Place the Robotic Gyro on the rope and make it balance (see also experiment 5).

GYRO ROBOTS

Model assembly steps

Parts List:



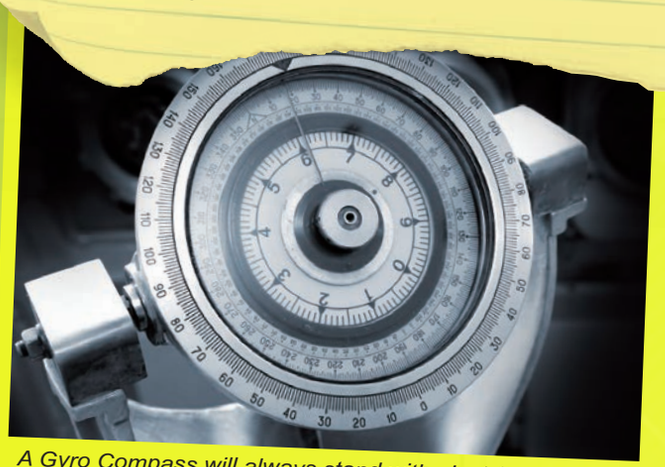
ROBOTICS

EXPERIMENT 2 : Gyro Compass

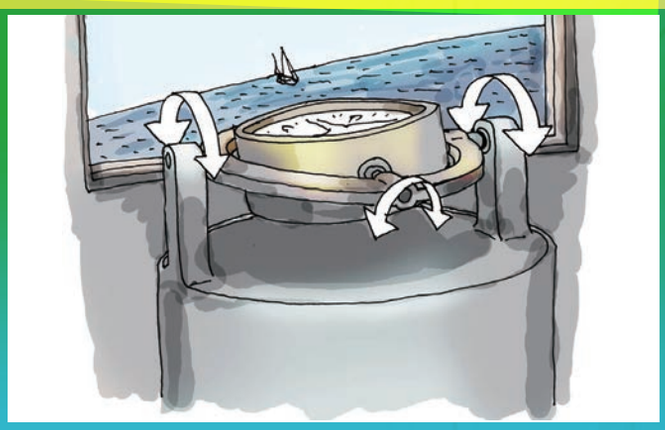
Try this:

Hold the Gyro Compass model in the outer frame work. Imagine now that you are on board a “ship” that rocks in the ocean by tossing and turning the model gently up and down and from side to side at the same time.
You shall experience that the “Compass” disk is also moving up and down and from side to side. It is not stable.
Now try to turn on the engine by pushing the “on” button, so the flywheel begins to rotate. When the flywheel after a few seconds has reached its top speed, you can feel the strong force of the Gyro effect.
Then you repeat the movements from before by tipping the model from side to side and from down to up as well.
Can you notice the difference?
The effect you shall get is that the Gyro force helps keeping the compass rosette in a stable horizontal position.
This Gyro Compass model is now having 2 axels of “freedom”. A horizontal and a vertical direction, but If you have more GIGO components you can try yourself to build one more axel of freedom (top/bottom rotation) and experience what happens when you begin to turn the “ship” in new directions.

The Gyro Compass dial always stays horizontal.



A Gyro Compass will always stand with pivot (compass needle) in north-south direction



The Gyro Compass is secured at both ends of the flywheel axis of rotation.

Good to know

A gyro compass is a gyroscope which is held horizontally and is suspended at both ends in a frame that is rotatable perpendicular to the axis of rotation.
Because of the earth's rotation, the gyrocompass will always adjust to the rotational axis pointing north.
On big ships, gyrocompasses are more common today than magnetic compasses. This is because the gyrocompass is not affected by the ship's own magnetic field and other interferences.

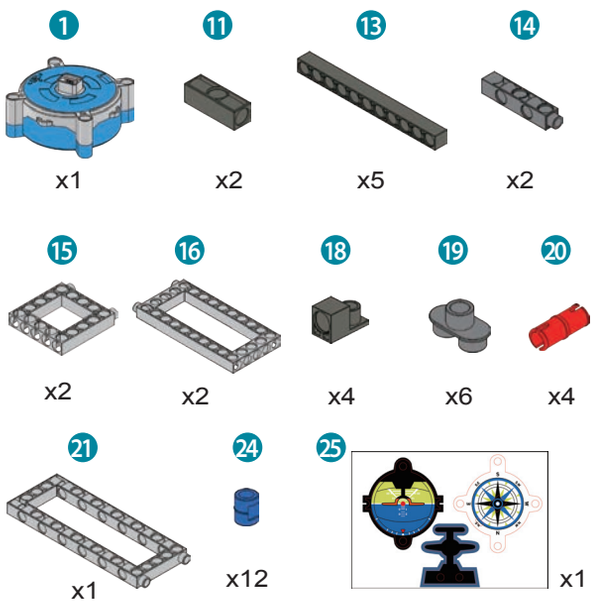
Build your own Gyro Compass

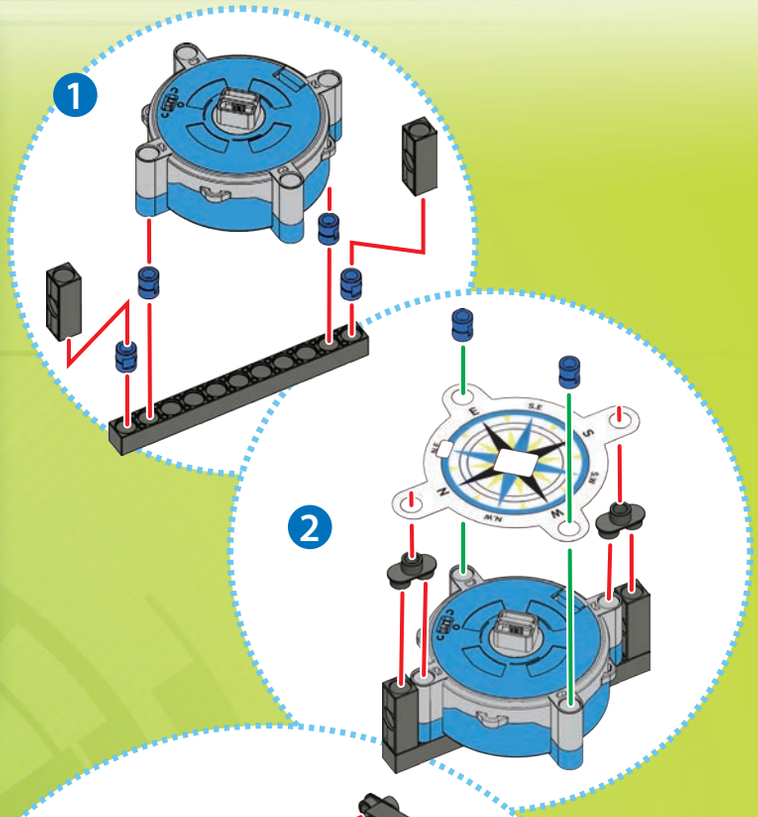
With this kit, you can build a display model of gyro compass.
It is important that you get the gyroscope suspended, so it is attached only at the points of rotation. Do not switch on this display model.
The building instructions can be found on the following pages.

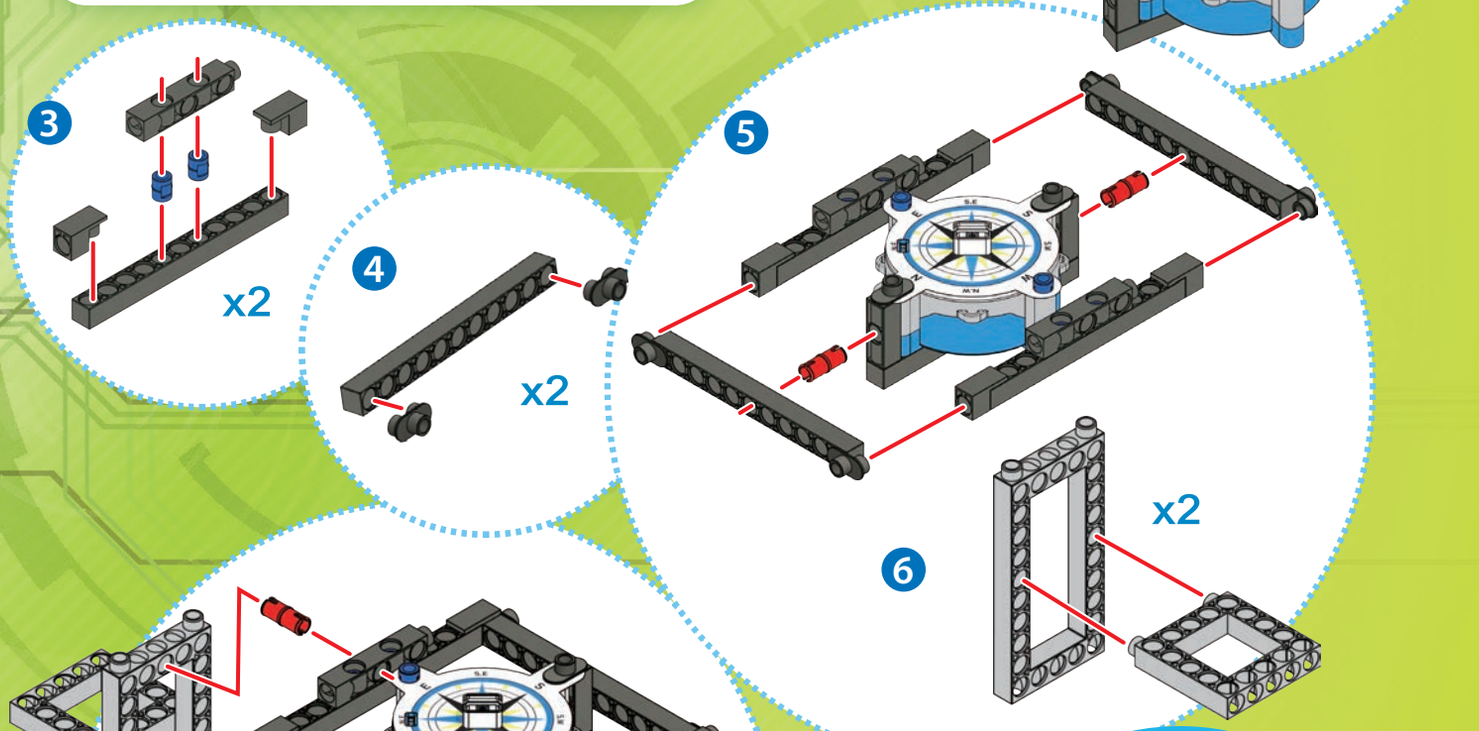
GYRO ROBOTS

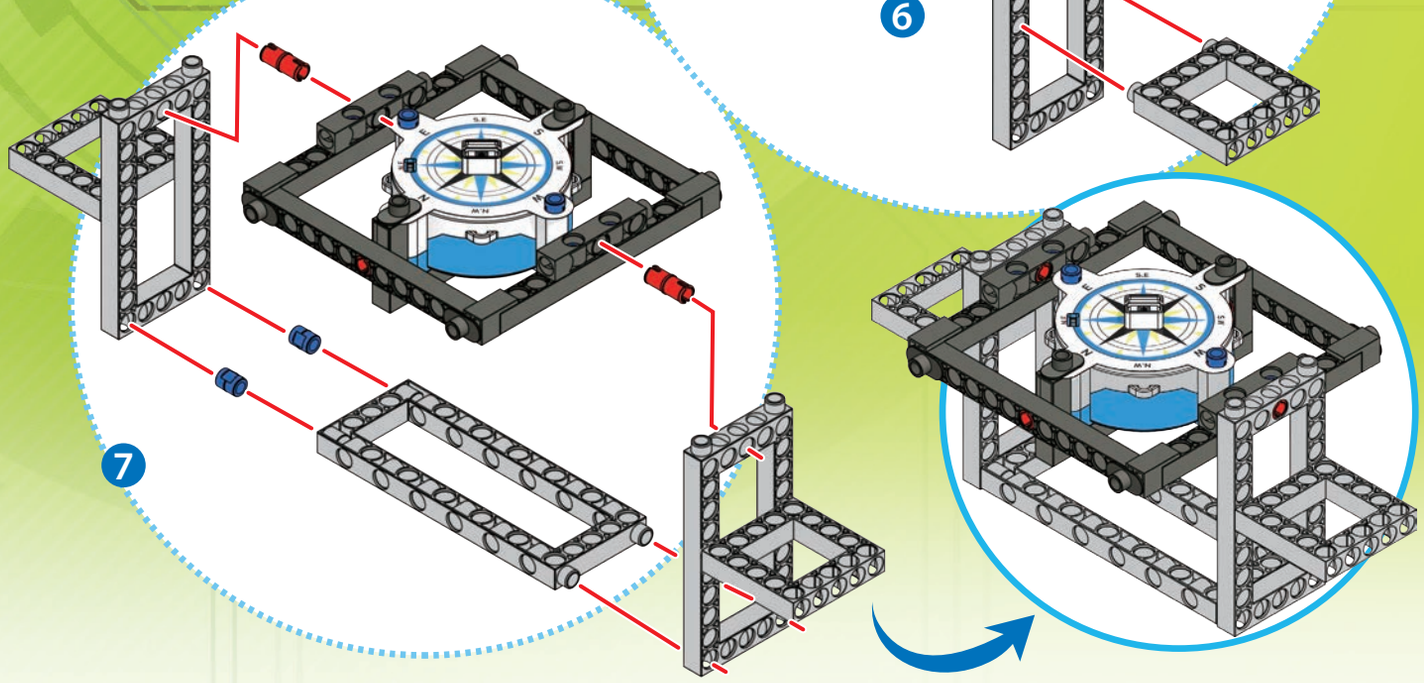
Model assembly steps

Parts List:





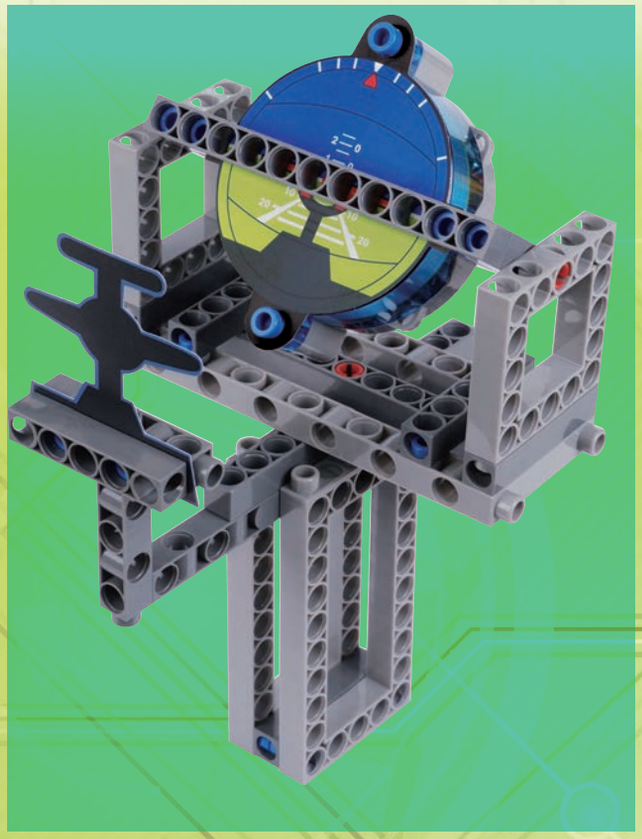




EXPERIMENT 3 : Gyrorector

Try this:

Attach the artificial horizon line at the top of the gyroscope.
Then, hold gyroscope between two fingers of one hand. Horizon line must be kept horizontal.
Turn the engine on via the power button.
Please wait until the flywheel keeps steady at its top speed. Try to gently tilt the gyroscope to one side (as if "the plane turns").
Note that the gyro effect now being felt as a force that tries to keep the gyroscope with the artificial horizon line in the same position as before "banking".
Try then to tilt the gyro with the artificial horizon line at a greater angle than before .
Note that the larger the tilt becomes, the greater the gyro effect you will feel.



Artificial Horizon

Good to know

All aircrafts have a gyrorector. This is an instrument that indicates an aircraft's deviation from the horizontal plane.
A gyrorector consists of an artificial horizon line that is kept in the horizontal plane by using a gyroscope.
When the plane banks to one side, the gyro effect of the gyroscope keeps the artificial horizon line in the same position as before.
The pilot will always know where the real horizontal line lies.

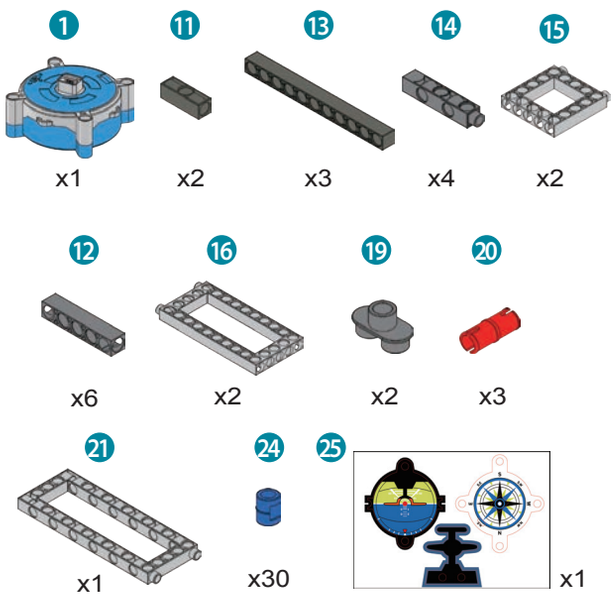
Build your own Gyrorector

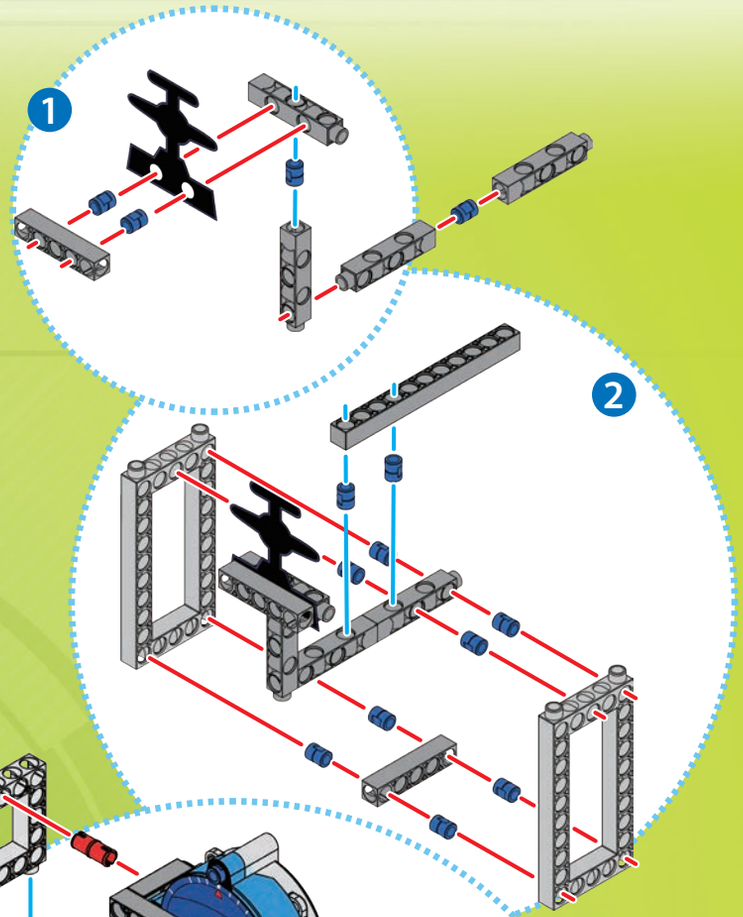
If a gyroscope with an artificial horizon line is hung so that it can freely rotate in all planes, then you have a gyrorector.
This kit also includes mountings that allow you to build a display model of gyrorector.
Do not turn on this display model.
The building instructions can be found on the following pages.

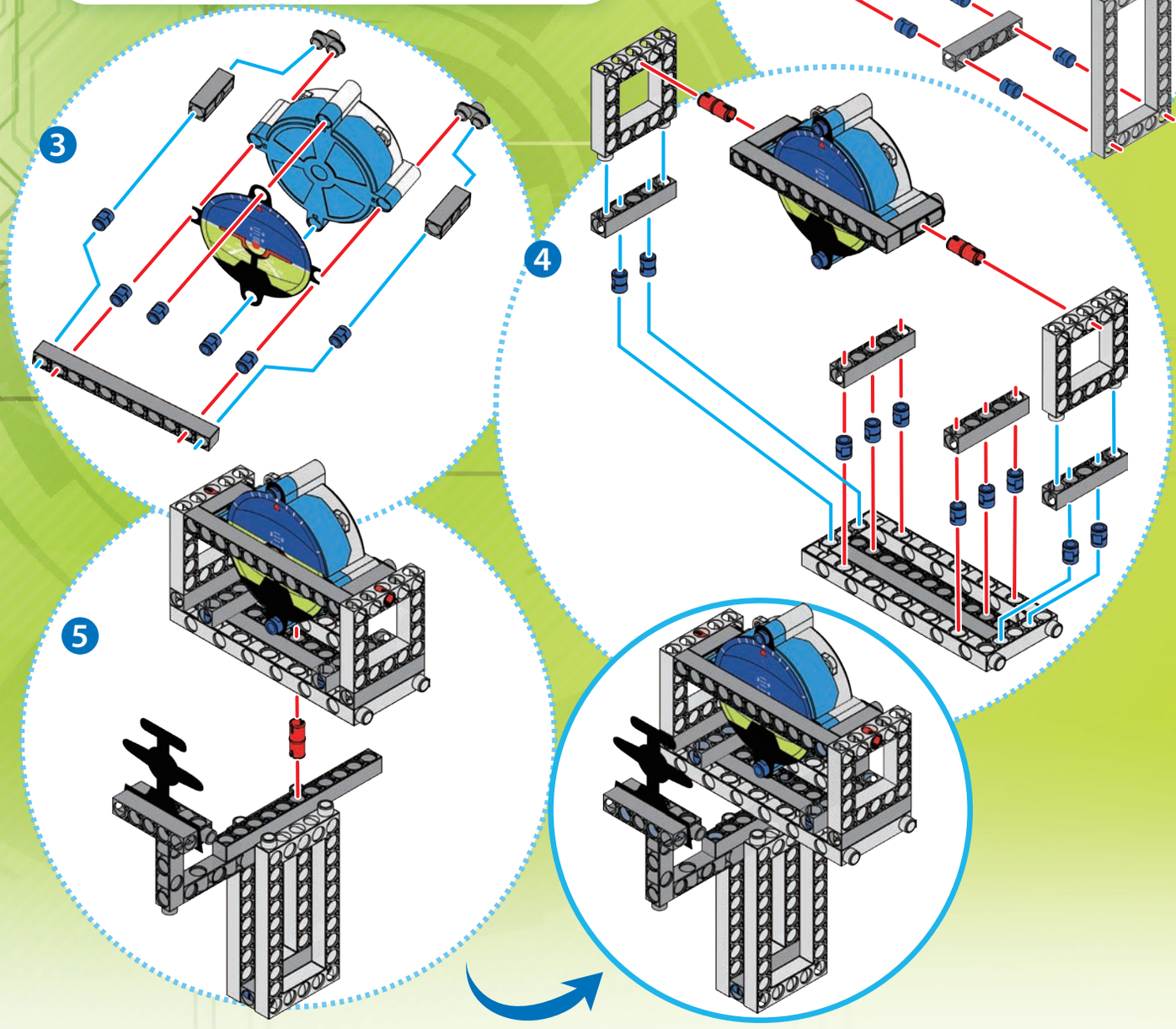
GYRO ROBOTS

Model assembly steps

Parts List:







EXPERIMENT 4 : Segway

Try this:

Attach the two inline wheels on the underside of the gyroscope.
Then hold the gyroscope between two fingers of one hand. Turn the engine on by using the power button.
Please wait 15 seconds for the flywheel to reach its top speed. Place the entire unit on the table or floor in front of you so the gyroscope is on its wheels and keeps its balance.
Note that the gyroscope wheel starts to run forward while maintaining its balance. It is the gyro effect that causes the gyroscope wheel to keep the balance.
The gyroscope is moving forward, because one of the wheels is connected to the motor with gear wheels. In that way it converts some of the energy from the engine to the movement of the wheels.

Segway – a human transporter

Good to know

A segway is an electric vehicle that is controlled by a T-shaped control rod.
When a segway is turned on, a gyro effect is caused by 5 rapidly spinning flywheels inside the engine block.
The gyro effect is used to control the two motor's speed. The more you lean your body in one direction, the faster the segway runs in that direction.

Build a model of a Segway

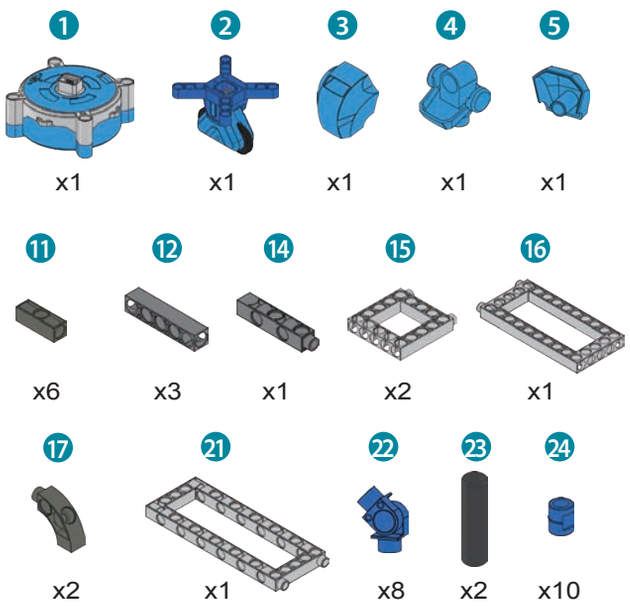
With this kit, you can build a model of a segway that can run almost like the real thing.
Your model will only differ on these points:
-Your segway will have inline wheels.
-Your segway will only be able to move forward.
-Your segway is driven by one gyroscope

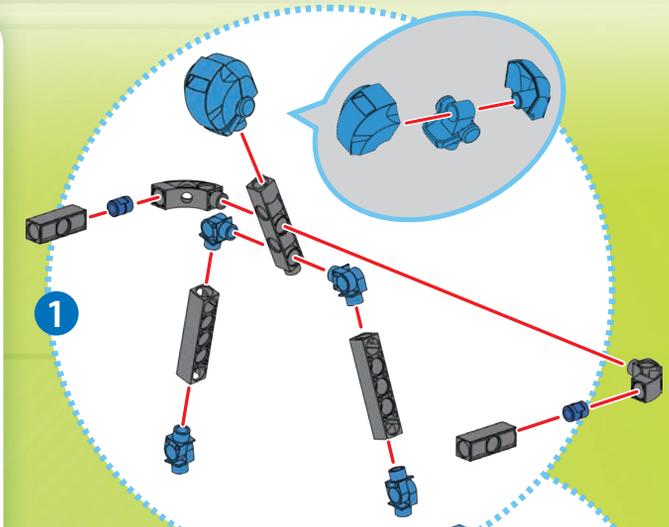
The building instructions can be found in the following pages.

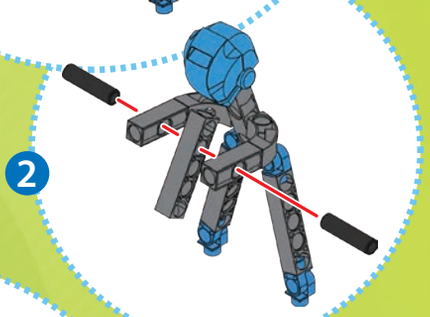
GYRO ROBOTS

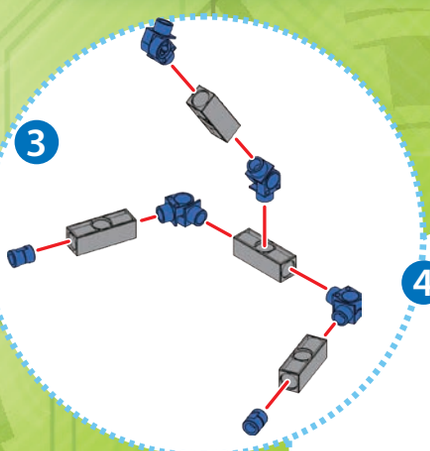
Model assembly steps

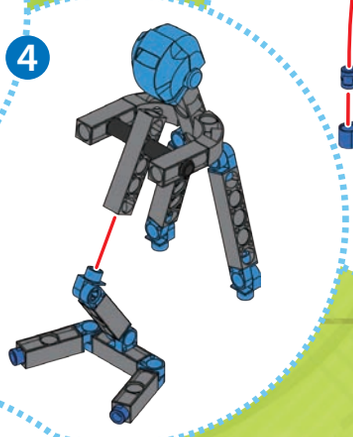
Parts List:

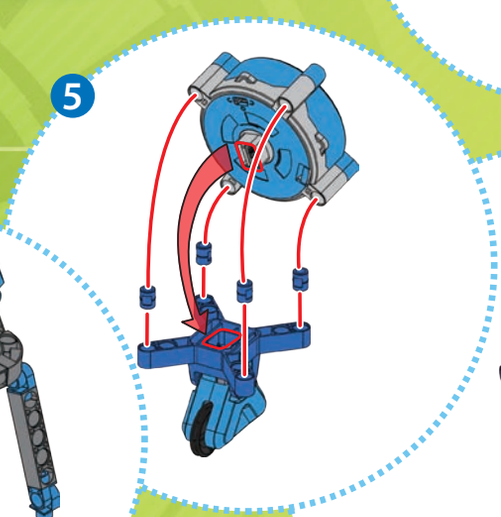


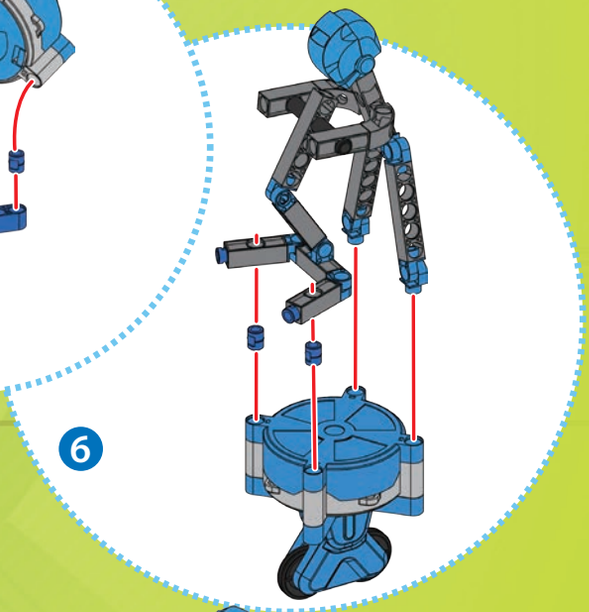


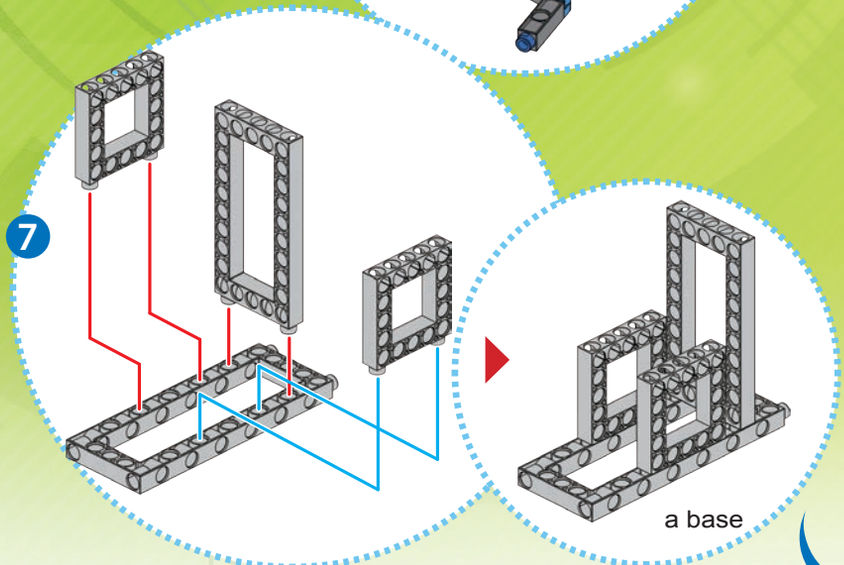


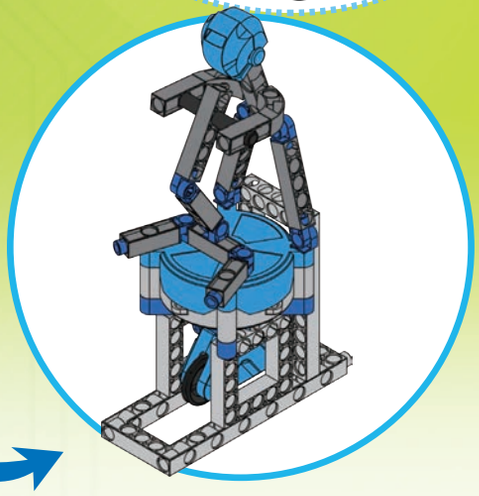












EXPERIMENT 5 : Rope Walker

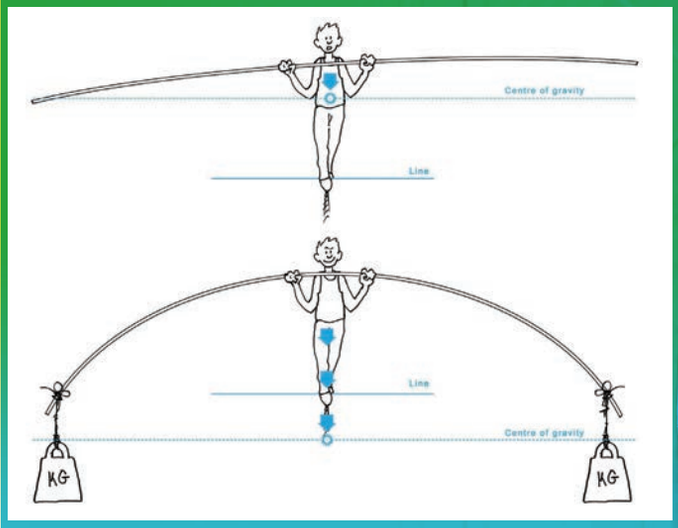
Try this:

Center of Gravity, or very often referred as Center of Mass, is the unique point where the distribution of mass that constitutes an object is well balanced. Every rigid body has one center of gravity.

The center of mass may be located within the physical body, such as in a rock; or outside the physical body when it is hollow or open-shaped, such as a horseshoe.

You may be able to balance an object with your finger from different points of contact, but there is always only one center of gravity. However, the position of center of gravity may shift as the body changes its shape, such as when a rope walker gets panic and is about to lose balance.

It requires concentration, courage and sense of balance.



The long balance pole helps Rope Walkers keep balance.

The wheels have a notch in them that allow them to drive on a tightly stretched string.

Good to know

It is easier for a rope walker to keep balance with a long balancing pole. Small changes in the center of gravity can be counteracted by tipping the balance bar. In this way, the weight is shifted to the side tilted downwards.
Remember: Lever principle
Force torque © = mass(M) x arm (A)
Therefore, a large and easy-to-balance bar is very useful.
With a gyroscope, the rope walker can achieve double the safety as before as a result of the gyro effect, which acts as a counterweight to changes in balance.

Build your own Rope walker

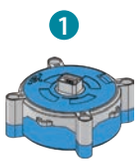
With this kit, you can build a rope walker that can balance on a line.
Tie a level string very tightly between two very secure objects, (e.g. a door knob or a heavy chair). Don't try to make it too long, a few feet should do.
When you set up the rope walker on the string, make sure to put pillows or padding under it so that it doesn't break when it falls.
Your rope walker could pass deep gorges and inaccessible places. You might even be able to use your rope walker to send messages from one place to another.

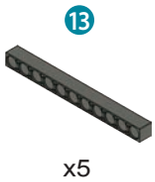
The building instructions can be found on the following page.

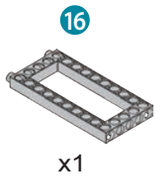
GYRO ROBOTS

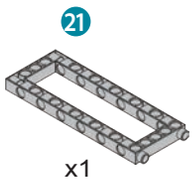
Model assembly steps

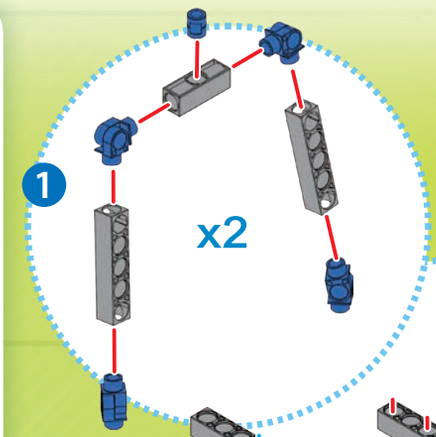
Parts List:

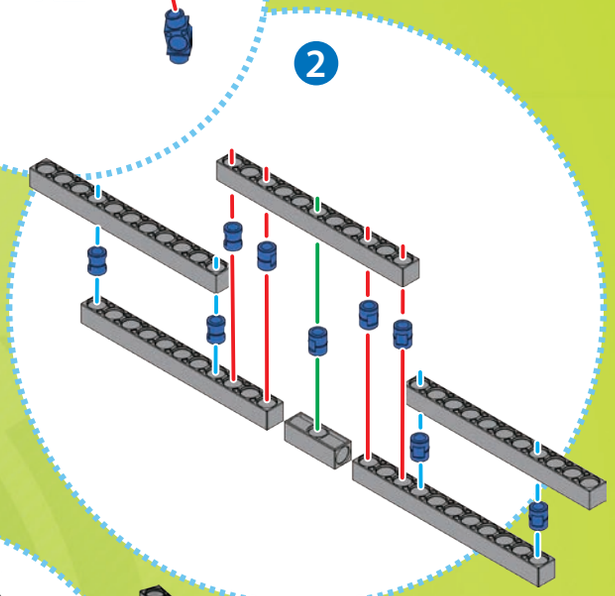


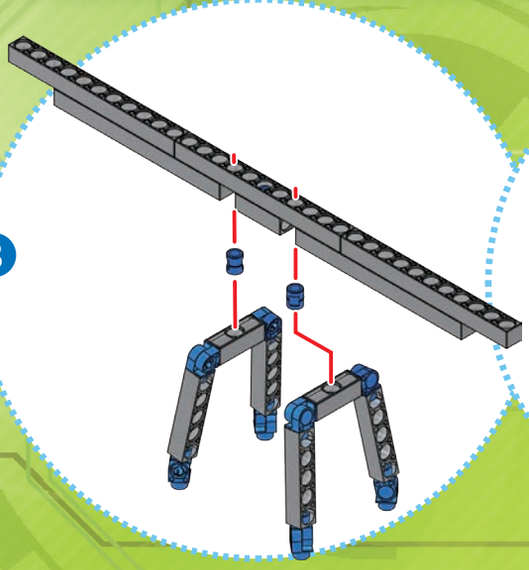


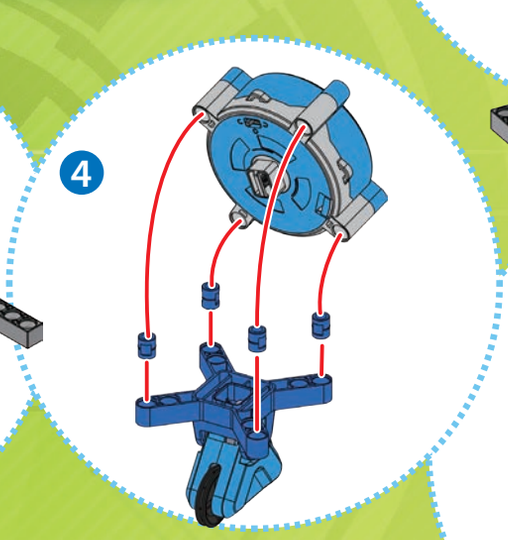


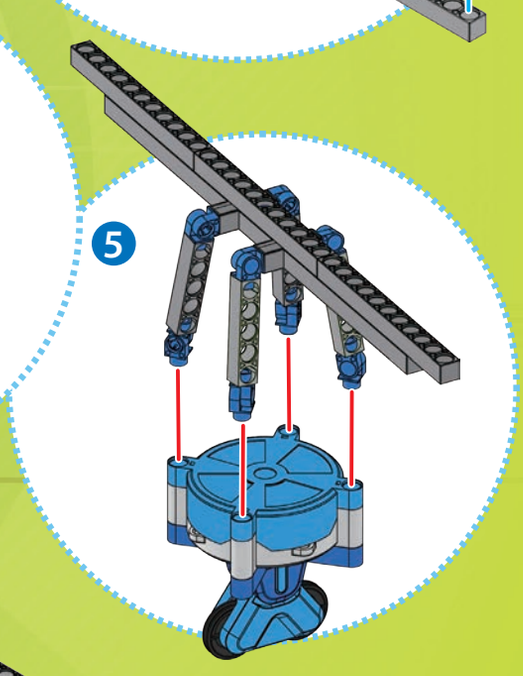


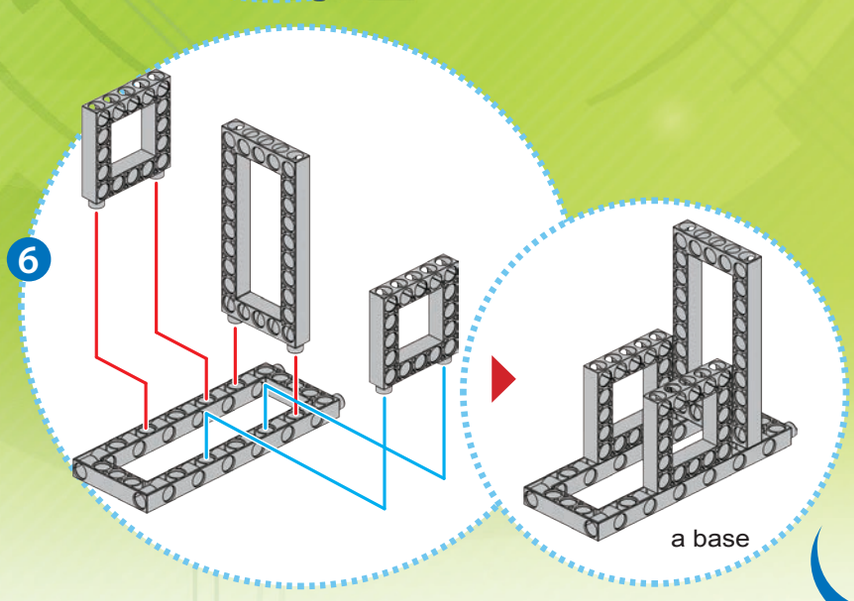


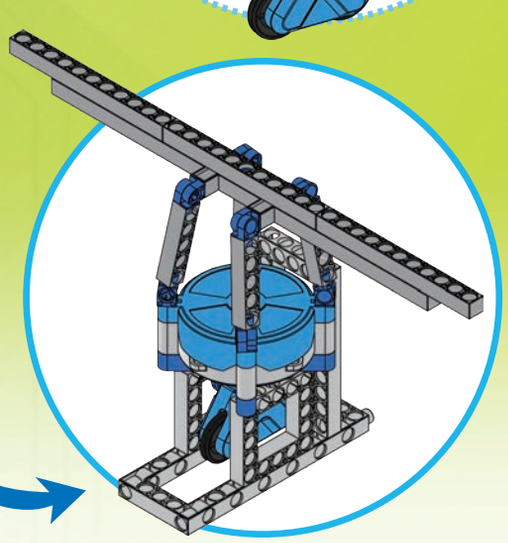












EXPERIMENT 6 : Balance Game

Try this:

Build a random, simple figure using some of the blocks and rods from the kit. Then, try to get the figure to balance on an outstretched finger. Then, insert one or more additional blocks to the figure.
Try again to find the new balance point on your finger. Where is it now? Has it moved? By how much? Why or why not?

Also, try to balance the gyroscope while it is turned off. Is it easy to do? Turn on the gyroscope and hold it for 15 seconds so the flywheel can achieve its top speed. Is it easier to balance with a running gyroscope? Why or why not?

Each time you build on a new block in the figure the center of gravity will shift.

It can be difficult to find the center of gravity.

Each time you add an additional block onto the figure, the gyro effect from the flywheel gets the figure to tilt slightly to the opposite side – in that way it will keep its balance.

Good to know

All figures and objects have a center of gravity. The center of gravity is the point in an object where its weight is equal on all sides.
Remember the lever principle:
Force torque [C] = Mass (M) x arm(A)
Therefore, you can still find balance despite one side of an object being heavier (with a shorter distance to the center of gravity), and the other side being lighter (with a longer distance to the center of gravity).
With a gyroscope on wheels, the job gets even easier as the gyro effect will cause the figure to balance itself.

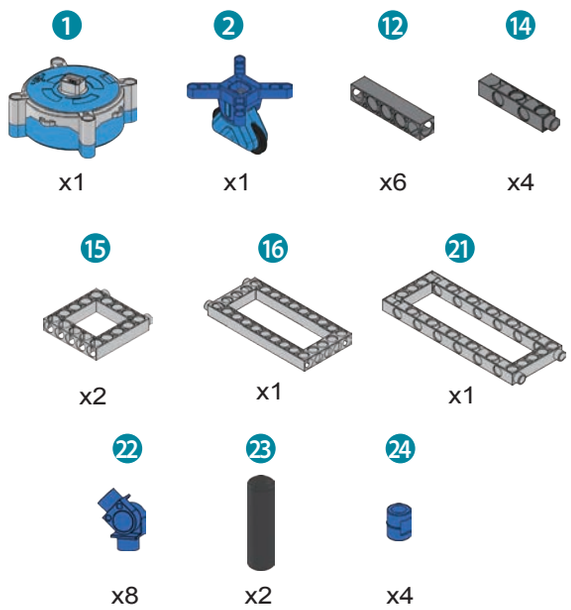
Build your own Balance Game

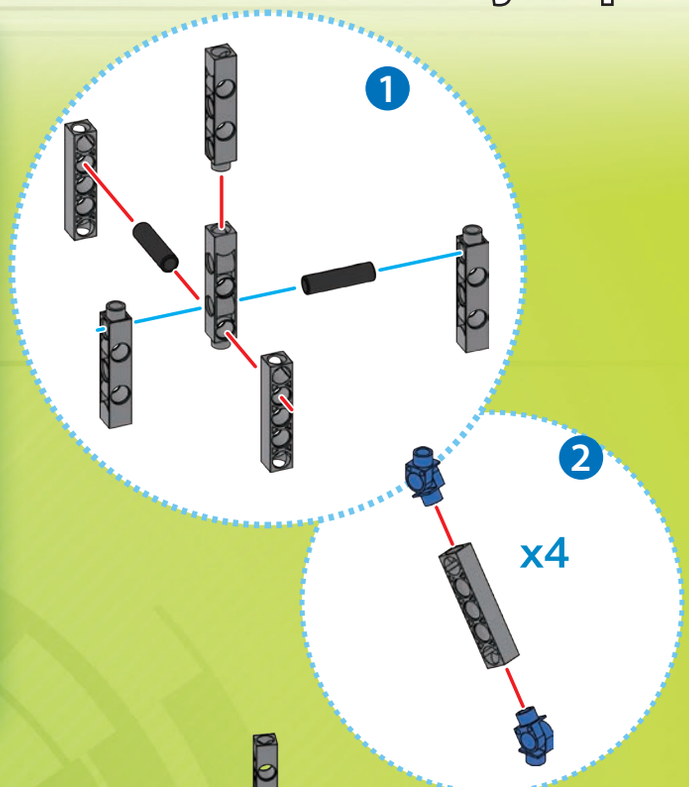
With this kit, you can create your own balance game.
Your task: Create a figure with as many blocks and bars as possible while still balancing on the inline wheels under the gyroscope. Once an extra part is added, the center of gravity of the entire unit shifts to a new spot, and the gyro effect helps regain the balance.
The building instructions can be found on the following page.

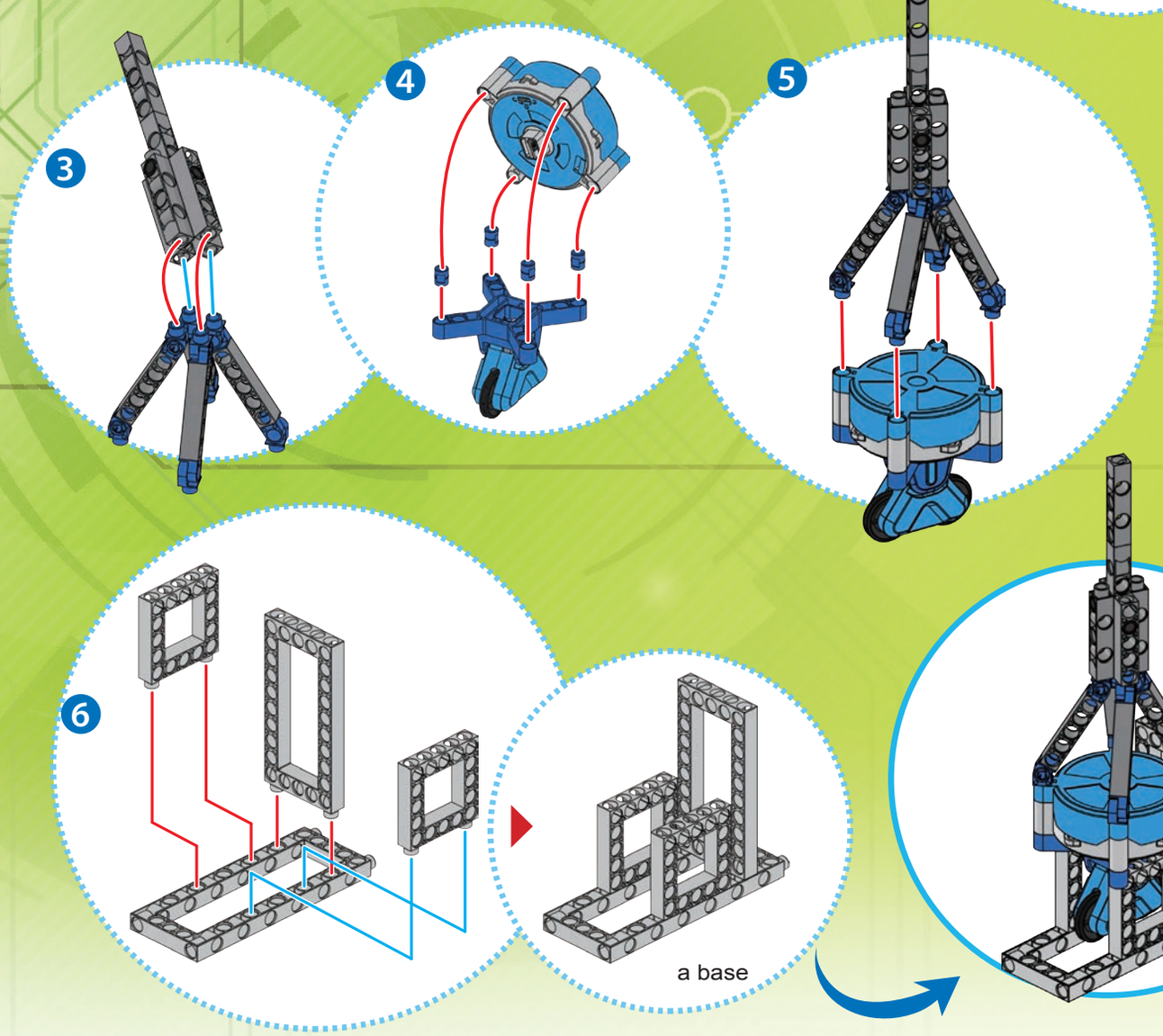
GYRO ROBOTS

Model assembly steps

Parts List:





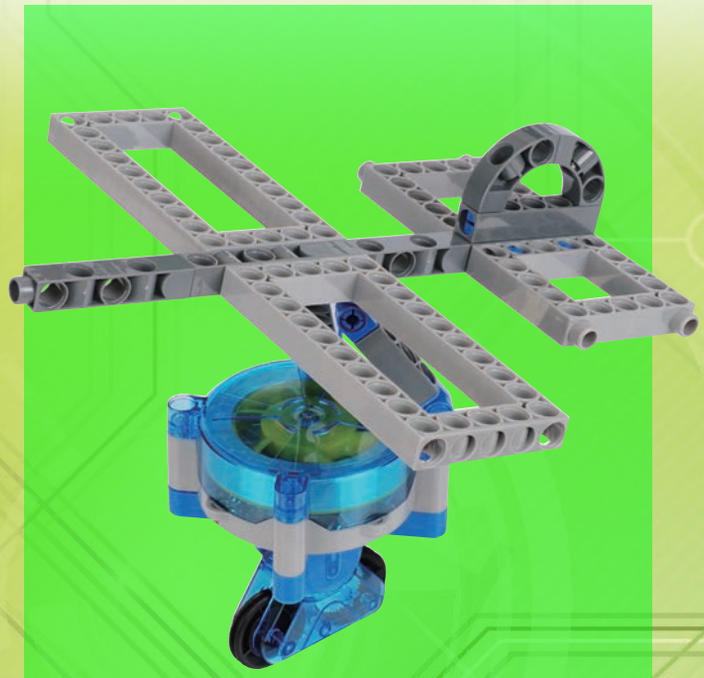


EXPERIMENT 7 : Flight Simulator

Try this:

Attach the two inline wheels on the underside of the gyroscope as show in the right-hand image. Then, hold the gyroscope so it stands with its wheels on the table or floor. Turn the engine on by using the power button. Note that the flywheel begins to rotate and that one wheel starts to run.

Turn the gyroscope on its side with the wheels facing right or left. Then turn the gyroscope on its head with the wheels facing up. You can now study the sprocket and the knee, which makes it possible to transfer some of the energy from the motor to the movement of the one wheel.



The flight simulator is on the ground, but it will run along the runway.

Since the 1930's, we have been using flight simulators for training pilots.

Good to know

A flight simulator is a device that is designed to train pilots before they can grapple with a real plane.
Today, an advanced flight simulator can move realistically in all directions, and even reproduce visibility from the cockpit in real time.
This small model of a flight simulator may only simulate aircraft movements of driving on the runway, and in addition, provide an understanding of the gyroscope operation.

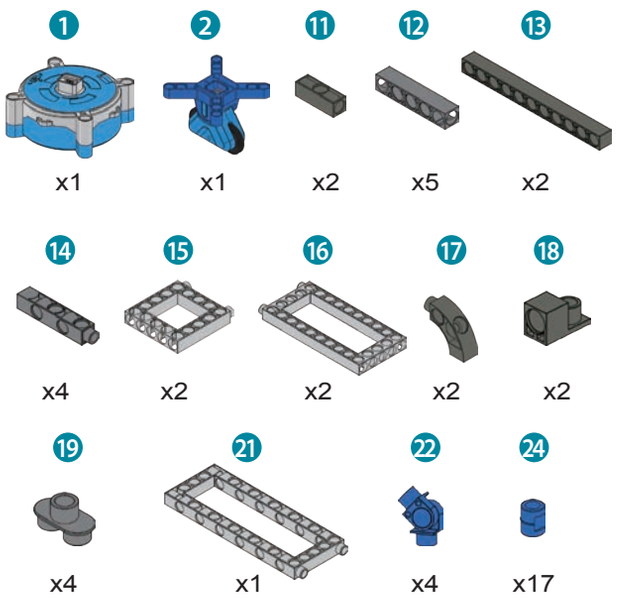
Build your own Flight Simulator

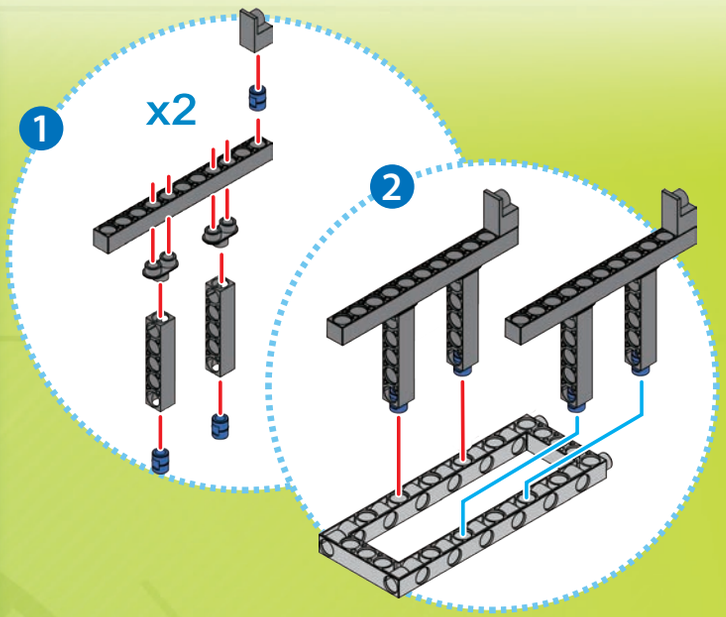
With this kit, you can build a flight simulator that can run along a runway, a table, or on the floor without losing its balance. The gyroscope will make sure that the plane is running, and moves like a real plane.
The building instructions can be found on the following page.

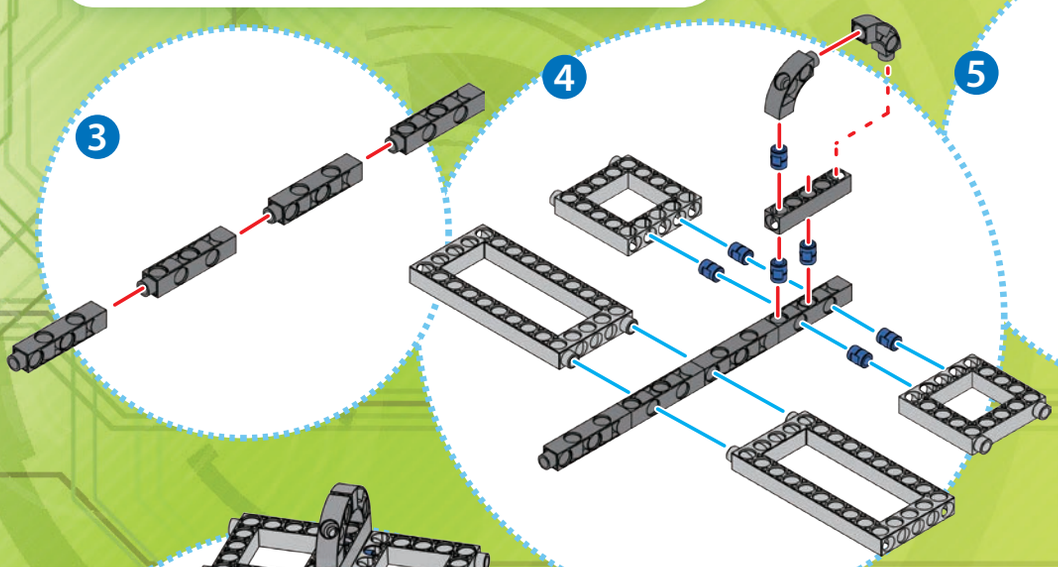
GYRO ROBOTS

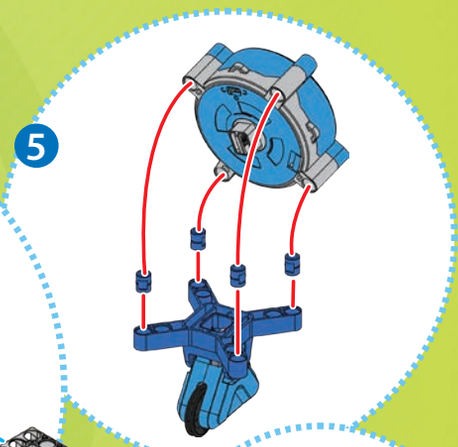
Model assembly steps

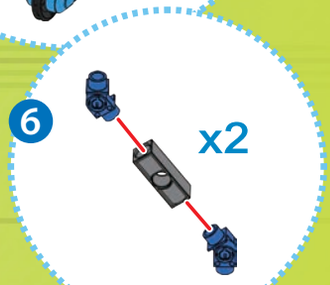
Parts List:

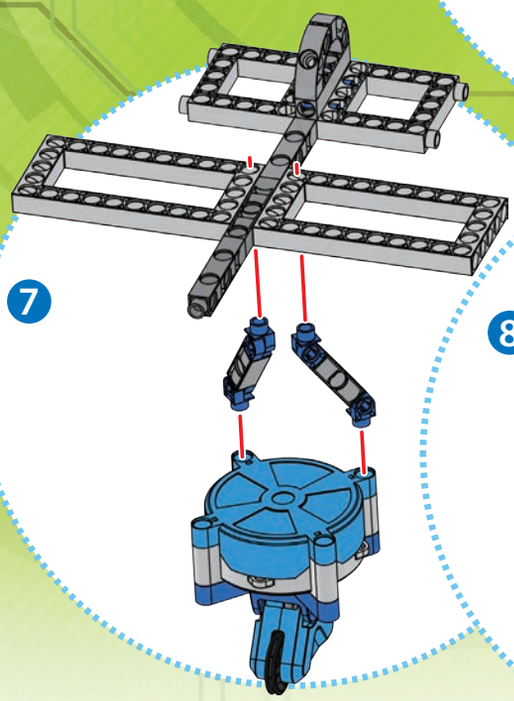


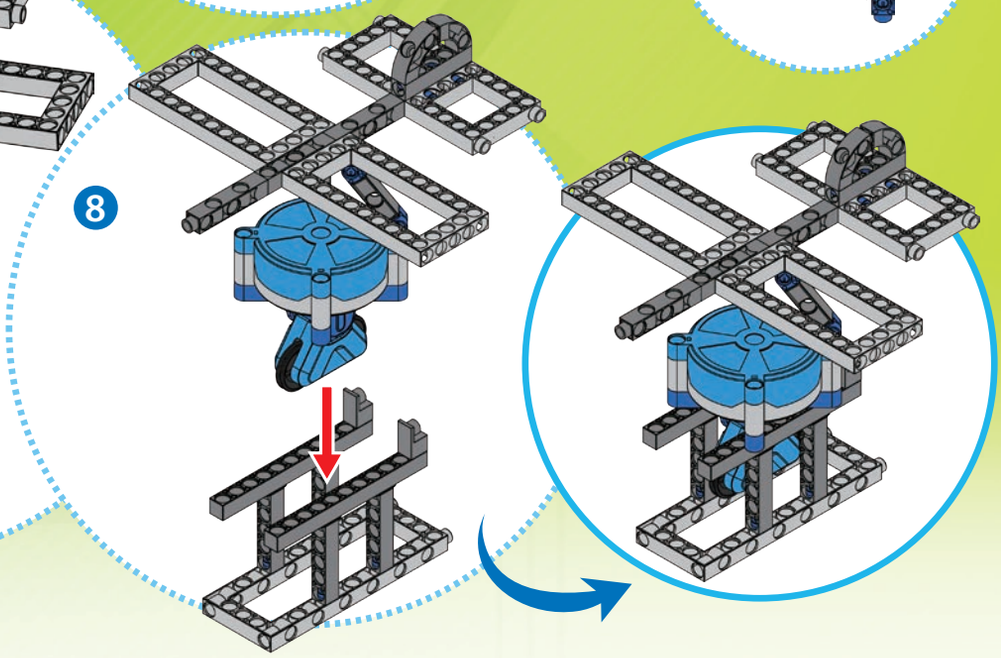












Parts are **interchangeable** with other **Gigo Green Energy** models

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