



THAMES
& KOSMOS

Remote-Control Robotics

Experiment Manual

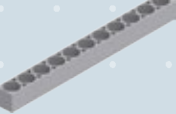
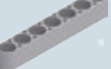
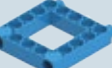
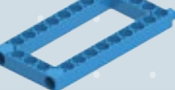
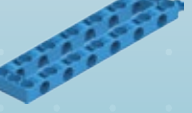


KIT CONTENTS

Good to know!

If you are missing any parts, please contact
Thames & Kosmos technical support.

What's inside your experiment kit:

1	2	3	4	5	6	7	8	9	10	11	12
											
1x	30x	3x	15x	7x	35x	4x	1x	12x	4x	4x	6x
13	14	15	16	17	18	19	20	21	22		
											
3x	6x	4x	1x	3x	5x	2x	2x	2x	2x		
23	24	25	26	27	28	29	30				
											
2x	3x	2x	4x	2x	4x	2x	2x				
31	32	33	34	35	36	37	38	39			
											
2x	1x	4x	6x	6x	9x	2x	2x	1x			
40	41	42	43	44	45	46	47	48			
											
8x	2x	2x	1x	2x	2x	1x	1x	2x			
49	50	51	52	53							
											
1x	1x	2x	1x	1x							

Wow!

That's a lot of
parts!

i YOU WILL ALSO NEED:

Small Phillips-head screwdriver, 6 AAA
batteries (1.5-volt, type LR03 or lithium-ion
rechargeable batteries), metal can, metal
spoon, keys

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Checklist:

✓ No.	Description	Quantity	Item No.
○ 1	Part separator tool	1	7061-W10-B1Y
○ 2	Short anchor pin, black	30	7344-W10-C2D
○ 3	Shaft plug, orange	3	7026-W10-H10
○ 4	Joint pin, yellow	15	7413-W10-T1Y
○ 5	Asymmetrical joint pin, gray	7	7413-W10-U1S
○ 6	Connector pin, gray	35	1187-W10-E1S2
○ 7	Connector tube	4	7066-W10-A1S
○ 8	Washer	1	3620-W10-B1
○ 9	Dual axis connector	12	7430-W10-B1S
○ 10	90-degree converter-X	4	7061-W10-X1D
○ 11	90-degree converter-Y	4	7061-W10-Y1D
○ 12	5-hole rod, gray	6	7413-W10-K2S3
○ 13	11-hole rod, gray	3	7413-W10-P1S2
○ 14	5-hole flat rounded rod, gray	6	7443-W10-C1S2
○ 15	7-hole flat rounded rod, gray	4	7404-W10-C3S
○ 16	String fixer	1	7410-W10-B1S
○ 17	3-hole rod, gray	3	7404-W10-C1S
○ 18	7-hole rod, gray	5	7404-W10-C2S
○ 19	60-degree elbow, left	2	7427-W10-B1S1
○ 20	60-degree elbow, right	2	7427-W10-B2S1
○ 21	120-degree elbow, left	2	7427-W10-C1S1
○ 22	120-degree elbow, right	2	7427-W10-C2S1
○ 23	5-hole cross rod, gray	2	7413-W10-R1S4
○ 24	9-hole cross rod, black	3	7407-W10-C2D
○ 25	Tire, plastic	2	7392-W10-G1D
○ 26	Wheel	4	7392-W10-H1S1

✓ No.	Description	Quantity	Item No.
○ 27	Tire, rubber	2	7413-W10-D1D
○ 28	5x5 square frame, blue	4	7413-W10-Q1B
○ 29	5x10 frame, blue	2	7413-W10-I1B
○ 30	5x15 frame, blue	2	7413-W10-J1B1
○ 31	3x13 dual frame, blue	2	7406-W10-A1B
○ 32	3-hole dual rod, blue	1	7413-W10-Y1B
○ 33	5-hole dual rod closed, blue	4	7413-W10-W1B
○ 34	5-hole dual rod, blue	6	7413-W10-X1B1
○ 35	30-mm axle, black	6	7413-W10-N2D
○ 36	70-mm axle, black	9	7061-W10-Q2D
○ 37	Shell, gray	2	7407-W10-D1S
○ 38	Trapezoid frame, gray	2	7408-W10-A1S
○ 39	Shell, blue	1	7392-W10-J1B
○ 40	Small gear (20T)	8	7026-W10-D2S
○ 41	Medium gear with hole (40T)	2	7408-W10-D2S1
○ 42	Large gear (60T), yellow	2	7026-W10-W5Y
○ 43	Extra large gear (80T), yellow	1	7328-W10-G2Y
○ 44	Worm gear, gray	2	7344-W10-A1S1
○ 45	Rod connector, yellow	2	7026-W10-L2Y
○ 46	145-degree crankshaft gear, A	1	7411-W10-C1S
○ 47	145-degree crankshaft gear, B	1	7411-W10-C2S
○ 48	Button pin, yellow	2	7061-W10-W1Y2
○ 49	Capsule ball, top	1	K41#7090
○ 50	Capsule ball, bottom	1	K41#7090-1
○ 51	50X planetary gear motor	2	7090-W85-C
○ 52	Motor and RC receiver	1	7090-W85-A
○ 53	Remote control	1	7090-W85-B

SAFETY INFORMATION



WARNING:

This toy is only intended for use by children over the age of 8 years, due to accessible electronic components. Instructions for parents or caregivers are included and shall be followed. Keep packaging and instructions as they contain important information.

WARNING!

Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled.

Store the experiment material and completed models out of the reach of small children.

Safety for Experiments with Batteries

- » Never perform experiments using household current! The high voltage can be extremely dangerous or fatal!
- » To operate the models, you will need six AAA batteries (1.5-volt, type LR03 or lithium-ion rechargeable batteries), which are not included in the kit.
- » Avoid short circuiting the batteries. A short circuit can cause the wires to overheat and the battery to explode.
- » The supply terminals are not to be short-circuited. A short circuit can cause the wires to overheat and the batteries to explode.
- » Different types of batteries or new and used batteries are not to be mixed.
- » Do not mix old and new batteries.
- » Do not mix alkaline, standard (carbon-zinc), or rechargeable batteries.
- » The batteries are to be inserted with the correct polarity (+ and -). Press them gently into the battery compartment (see page 4). The battery must be inserted by an adult.
- » Non-rechargeable batteries are not to be recharged. They could explode!
- » Batteries are only to be charged by persons of at least 8 years old.
- » Rechargeable batteries are to be removed from the toy before being charged (or they must be charged as described in the instructions).
- » Exhausted batteries are to be removed from the toy (e.g., if no experiments are to be carried out with them for a prolonged period of time).
- » The supply terminals are not to be short-circuited.
- » Dispose of used batteries in accordance with environmental provisions, not in the household trash.
- » Dispose of electrical device / electrical parts separately in accordance with environmental provisions.
- » Be sure not to bring batteries into contact with coins, keys, or other metal objects.
- » Avoid deforming the batteries.
- » Do not expose the toy to extreme heat or long periods of direct sunlight; protect it from heavy, persistent rain and frost.
- » As all of the experiments use batteries, have an adult check the models before use to make sure they are assembled properly. Always operate the motorized models under adult supervision.
- » The toy is not to be connected to more than the recommended number of power supplies. Use only the included battery case. Do not use any power supply other than included battery case.

Notes on Disposal of Electrical and Electronic Components

The electronic components of this product are recyclable. For the sake of the environment, do not throw them into the household trash at the end of their lifespan. They must be delivered to a collection location for electronic waste, as indicated by the following symbol: Please contact your local authorities for the appropriate disposal location.



FCC Part 15 Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC RF Exposure Statement

This device complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.

CAN ICES-3 (B)/NMB-3(B) IC Statement

This Class B digital apparatus complies with Canadian ICES-003. Cet appareil numérique de classe B est conforme à la norme NMB-003.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF Radiation Exposure Statement

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance 5 mm between the radiator and all persons.

Déclaration d'exposition aux radiations

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 5 mm de distance entre la source de rayonnement et toute personne.

EU Declaration of Conformity

Simplified EU Declaration of Conformity

Thames & Kosmos hereby declares that the radio communication unit "Remote-Control Robotics", model number 602405, conforms to Directive 2014/53/EU. The complete text of the EU conformity declaration is available at the following Internet address:

<http://thamesandkosmos.com/remotectlrobotics/declaration.pdf>

IMPORTANT INFORMATION

Dear Parents, Teachers, and Supervising Adults

Children want to explore, understand, and create new things.

They want to try things and do it by themselves. They want to gain knowledge!

They can do all of this with Thames & Kosmos experiment kits.

With every single experiment, they grow smarter and more knowledgeable.

Before building and experimenting, read the instructions together with your child or students and discuss the safety instructions.

Support children with advice and a helping hand, especially during tricky assembly steps. Some assembly and disassembly steps require more strength, which you may need to provide.

Do not insert the wire connectors and other components into any electrical sockets, which will cause serious damage. Only the recommended batteries are allowed for use with this kit.

To prevent damage to the work surface on which your child is building and experimenting, provide them with a mat or other surface protection.

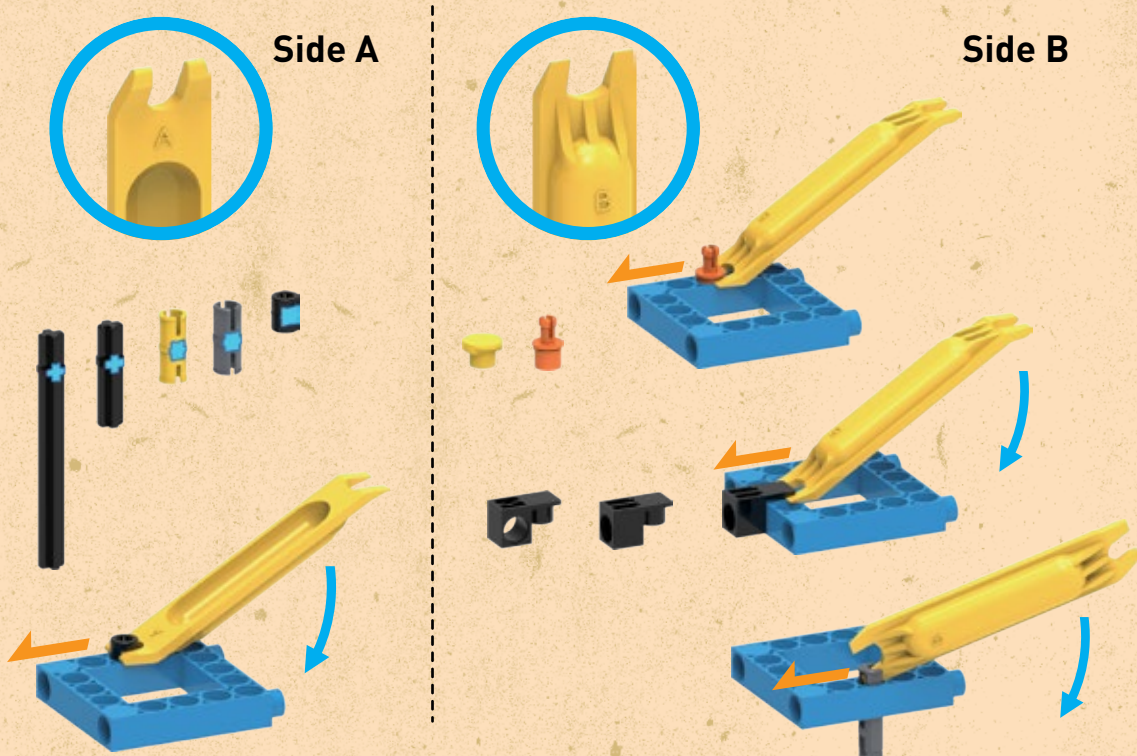
CLEANING: Before cleaning, remove the batteries. Use only a cloth that has been slightly dampened with water. Never use soap or detergent.

Children must be supervised when playing with the experiment kit.

We hope you have a lot of fun building and inventing with Remote-Control Robotics!

BUILDING TIPS

Use the part separator tool to quickly take apart your pieces and start your next awesome build!



INSERTING THE BATTERIES

1. Insert the batteries into the remote control.

(1) Turn it OFF! Slide the power switch to the OFF position (slide it to the left).



(2) Flip the remote over. Use a screwdriver to turn the screw **counter-clockwise** until it feels loose.



(3) Insert two AAA batteries with the correct polarity (+ and -). Then put the battery cover back on.



(4) Screw it tight: Use the screwdriver to turn the screw **clockwise** until it feels snug.



2. Insert batteries into the motor/remote control receiver.

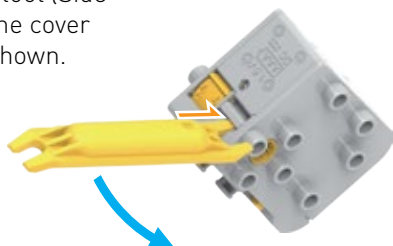
(1) Turn it OFF! Slide the power switch to the OFF position (slide it to the left).



(2) Flip the receiver over. Use a screwdriver to turn the screw **counter-clockwise** until it feels loose.



(3) Pop the cover! Use the part separator tool (Side B) to pry the cover open, as shown.



(4) Insert four AAA batteries with the correct polarity (+ and -). Then put the battery cover back on and press it down until you hear a click!



(5) Screw it tight: Use the screwdriver to turn the screw **clockwise** until it feels snug.



REMOTE AND MOTORS

1. Pair the remote and receiver.

(1) Turn on the remote only.

[O]: OFF
[I]: ON

The red light on the remote will flash. That means it is looking for a nearby receiver.



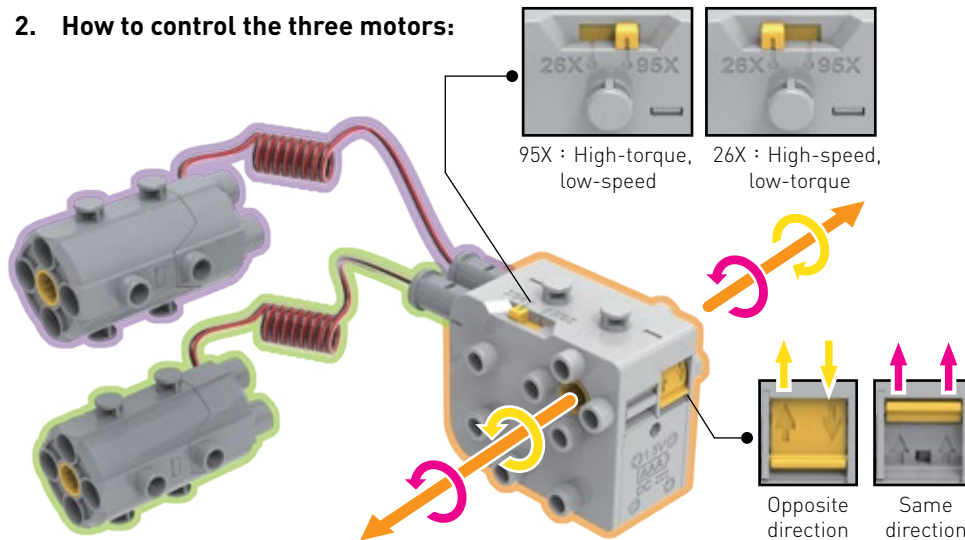
(2) Turn on the receiver.

The receiver's light will turn solid, and stay on. The remote's light will turn off.

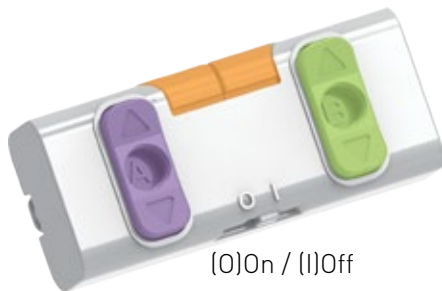


If the remote and receiver do not pair: Try these steps again, then double check that the batteries were inserted correctly.

2. How to control the three motors:



Push the switch all the way up or all the way down. Use the **part separator tool** if the switch is too difficult to move with your fingers.



Central Controls (Orange):

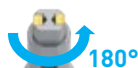
Two separate buttons that control the receiver motor.

Button A (Purple):

Two-way button that controls the motor plugged into Port A on the receiver.

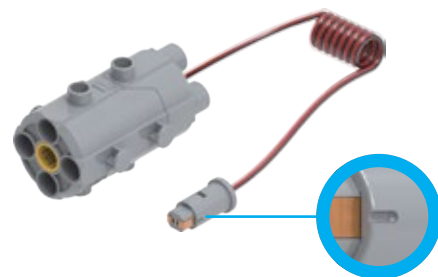
Button B (Green):

Two-way button that controls the motor plugged into Port B on the receiver.



Dual-Flat End Plug

Need to change direction? Simply turn the motor's plug 180 degrees and plug it back into the port.

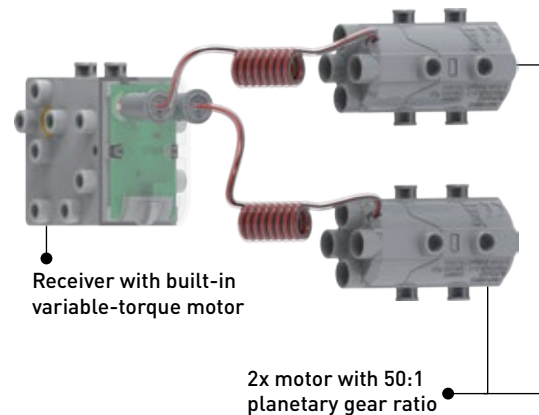


Make sure the groove symbol on the plug matches the picture in the building steps for each model. This keeps your motor spinning the right way!

After the receiver and remote control are successfully paired, the built-in control chip inside the receiver recognizes when a button is pressed and converts the command into an electrical signal.

The receiver is powered by four AAA batteries (1.5V each) installed inside. These batteries are connected in series to provide a stable 6V DC power supply for both the output ports and the built-in motor.

This 2.4GHz wireless remote control set includes two additional output ports on the receiver. You can connect up to two powerful planetary gear motors, with 50:1 gear ratios.



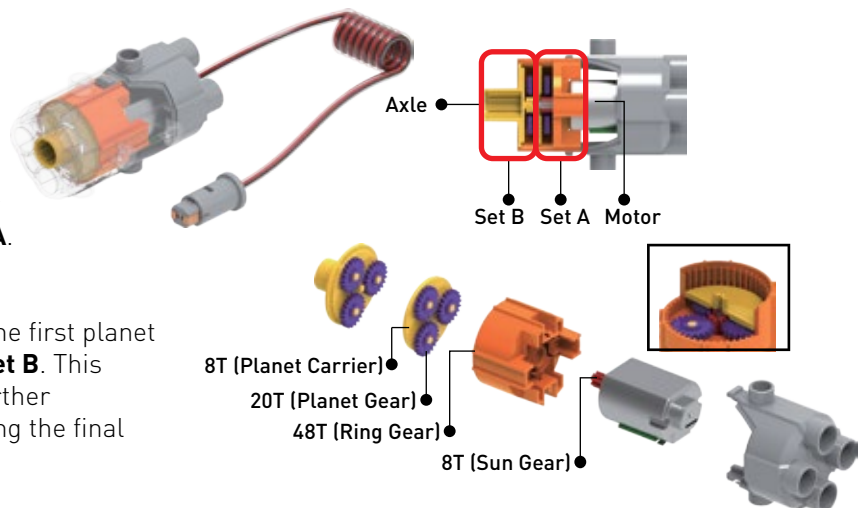
This manual provides step-by-step instructions to build 10 different models that showcase a variety of mechanisms and ways to create movement in robots. Each model can use up to three motors in total (including the motor built into the receiver). Depending on how the motors are installed and connected, the model can move forward, backward, turn, lift, or spin in place. We also encourage you to design your own creations and have your parents or teachers tag us on social media @thamesandkosmos.

After playing, remember to turn off the power. If the product will not be used for a long time, remove the batteries to prevent battery leakage and possible damage to the circuit board.

Planetary Gear Motor

This motor box utilizes a precision **double-stage** reduction structure, consisting of two gear groups.

The operation begins when the motor drives the 8-toothed sun gear of **Set A**. As the planet gears rotate within the fixed 48T ring gear, the power is condensed and transferred through the first planet carrier directly into the sun gear of **Set B**. This second stage repeats the process, further multiplying the torque before delivering the final output to the external axle.



Gear Ratio Calculation and Final Multiplier

The reduction ratio for a planetary gear set (where the ring gear is fixed) is calculated using the following formula:

$(R + S) / S$ (where **R** is the 48T Ring Gear and **S** is the 8T Sun Gear).

- Set A Reduction Ratio: $(48 + 8) / 8 = 7$
- Set B Reduction Ratio: $(48 + 8) / 8 = 7$
- Total Gear Ratio: $7 \times 7 = 49$

Conclusion: The precise total gear ratio of this system is 49:1. This means the internal motor spins 49 times for every 1 full rotation of the output axle. For ease of memory and communication, this is commonly referred to as the "**50x Planetary Gear Motor**."

ALL ABOUT GEARS

Gears are wheels with teeth on them. The teeth, or cogs, of one gear mesh with the teeth of another gear to transmit force between them. A combination of two or more gears is called a transmission, or gear train. You can see transmissions with meshing gears inside old toys or old clocks. Gearboxes can be found inside the transmission system of cars, which combine meshing gears of different sizes. This allows the car's driver to easily change between different speeds.

Do you know how gears work? You can learn how gears work and why they are useful by reading this manual and building the models in this kit that use gears. The building blocks in this kit were designed based on the number ten and its multiples, including the size of the components, the distance between the holes, or the unique gears. This makes it easy to both assemble the gears and also conveniently calculate the gear ratio or change the rotary speed. Different from other gear designs that use the number seven or eight as their fundamental number, these gears were created to be perfect for teaching science to kids because they are easy to assemble and they make it easy to calculate gear ratios (explained below).

We recommend a gradual learning process using these gears, which begins with very basic assemblies to understand how each of the components fit together. After you build all of the models in this instruction book and understand how to use gear trains, you can put your unlimited creativity to work and design vehicles and machines on your own. Let your imagination guide you!

Now let's look closely at gears and how we use them. Find the gears in this kit. The wheels that have many tooth-shaped objects sticking out of their edges are gears. Two gears can mesh with each other using the teeth on the edges. When one gear rotates, the other one will be driven to rotate as well. The intermeshing teeth of the two gears transmit torque (turning force) and rotation. The big gear has more teeth than the small gear. Despite the number of teeth or the size of the

gears, all of the teeth on all of the gears in the same gear system must all be the same size. In simple gear trains, the driver and driven gears will rotate in opposite directions. When a third gear is inserted between the driver gear and driven gear and makes them rotate in the same direction, it is called an idler gear.

The gears in this gear system come in four different sizes: 20T, 40T, 60T, and 80T.

The gear set contains both spur and bevel gears. This kit includes spur gears, which mesh in the same plane and are used to change the speed or direction of rotation of the shafts, and bevel gears, which have angled teeth and mesh at right angles to the original turning plane to change the direction of rotation.

Fig. 7 The intermeshing of gears can effectively transmit force to cause rotation. The red circle represents the actual diameter of the transmission, which is called the pitch diameter. The special shape of the teeth allows for smooth intermeshing and transmits power along the pitch.

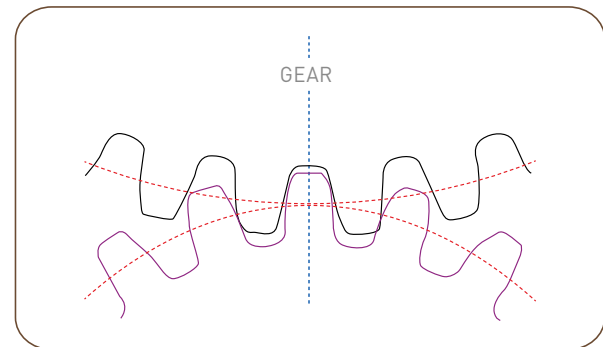


Fig. 8 Gear ratio calculation

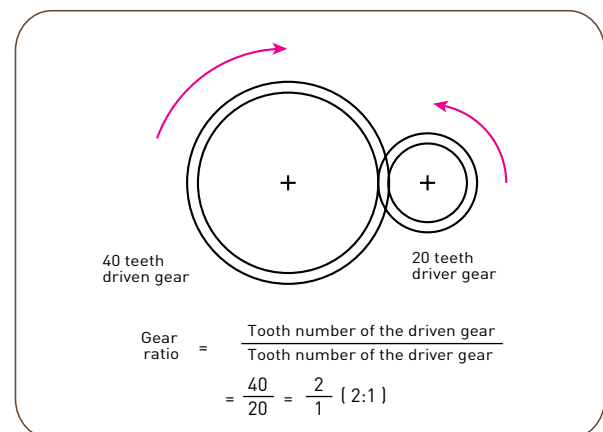
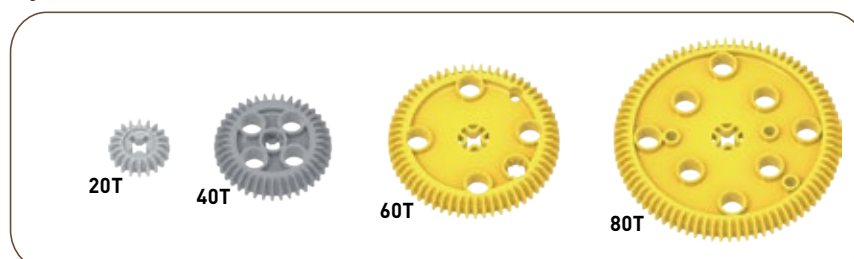


Fig. 9 Gears



The pitch diameter of the gears in this gear system is proportional to the number of gear teeth. In other words, the pitch diameter of the 20T gears is 20 millimeters while the pitch diameter of the 40T gears is 40 millimeters. The pitch diameters are the imaginary circles between the meshed gear teeth as shown in Figure 11.

In Fig. 11, the distance between the centers of the two gears is calculated like this:

$$R1+R2 = \frac{20\text{mm}}{2} + \frac{40\text{mm}}{2} = 30\text{mm}$$

Therefore you can easily place the two gears on a rod or frame so that they mesh together smoothly. The other sizes of gears are designed with the same elegantly simple concept, so that all of the gears can easily be assembled into working gear trains.

According to the instructions above, can you figure out how many holes there are between a 40T and a 60T gear when they are meshed?

Fig. 12.

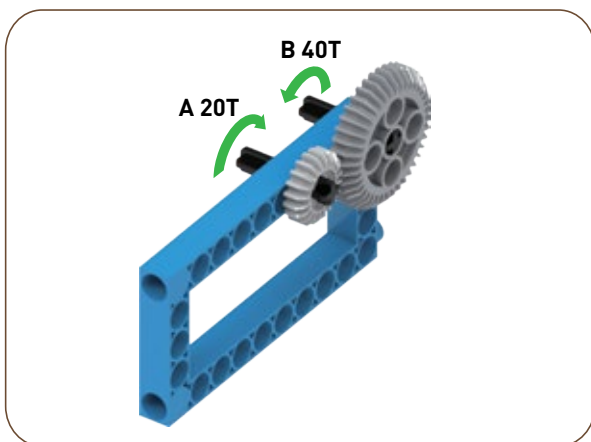


Fig. 13.

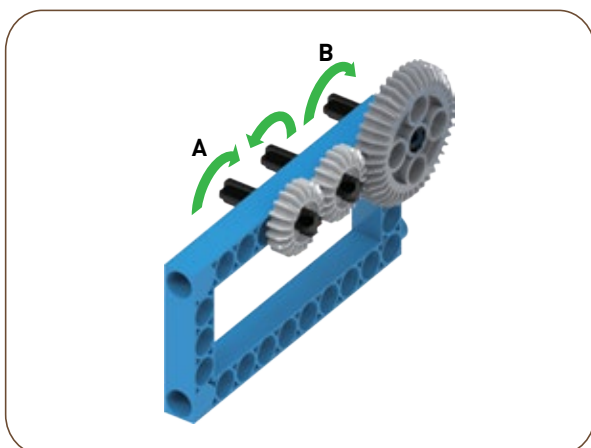


Fig. 10. A 40T gear in this system has 40 teeth and a pitch diameter of 40 millimeters.

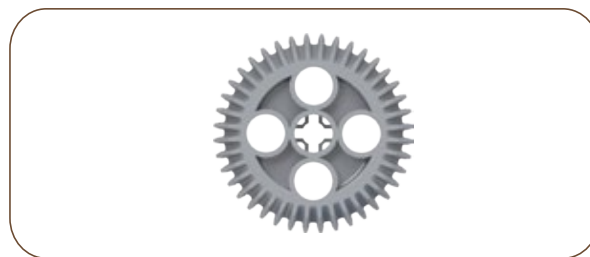
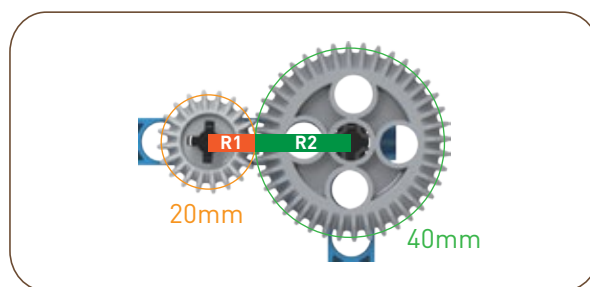


Fig. 11. The transmission between the pitches during the meshing of two gears.



UNDERSTANDING GEARS 1: GEAR RATIOS

1. Use a 20T gear, a 40T gear, and two small axles to assemble the structure shown in Fig. 12.
2. How many times do you need to turn gear A to make gear B rotate once?
3. You will see that when a 20T gear drives a 40T gear, the gear ratio is 2:1.
4. You will also see that as the teeth of the two gears mesh together, the two gears rotate in opposite directions.

UNDERSTANDING GEARS 2: IDLER GEARS

1. Use two 20T gears, one 40T gear, and three small axles to assemble the structure shown in Fig. 13.
2. How many times do you need to turn gear A to make gear B rotate once?
3. You will see that when a 20T gear drives a 40T gear, the gear ratio is 2:1, i.e. the gear ratio is the number of teeth on the driven gear divided by the number of teeth on the driver gear.
4. You will also see that as an idler gear is inserted in between the two gears, gears A and B now rotate in the same direction.

If you were to insert two idler gears in between gears A and B instead of just one, in which direction would A and B rotate?

UNDERSTANDING GEARS 3: COMPOUND GEARS

1. Use two 20T gears, two 60T gears, and three small axles to assemble the structure in Fig. 14.

2. How many times do you need to turn gear A to make gear D rotate once?

3. You will see that the gear ratio for the 20T gear A to drive the 60T gear B is 3:1, while the gear ratio for 20T gear C to drive 60T gear D is 3:1.

Therefore the overall gear ratio is:

$$\frac{60}{20} \times \frac{60}{20} = \frac{3}{1} \times \frac{3}{1} = \frac{9}{1} = (9:1)$$

4. You will also see that when the axle of compound gears (B and C) is inserted, the first (A) and the last (D) gears rotate in the same direction.

UNDERSTANDING GEARS 4: BEVEL GEARS

Figs. 15 and 16 show gears meshing as bevel gears at right angles. The calculations of gear ratio and the principles of rotary directions are the same as with spur gears.

Fig. 14.

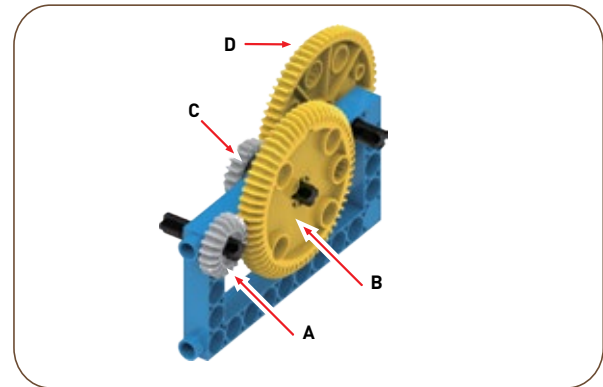


Fig. 15. Gears mesh as bevel gears at right angles.

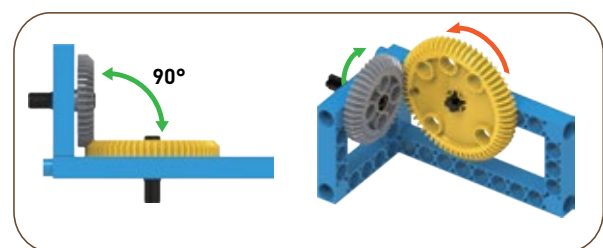


Fig. 16. The 80T Gear with the built-in pitch holes acts as a rotary stage here on which the frame structure can be built.

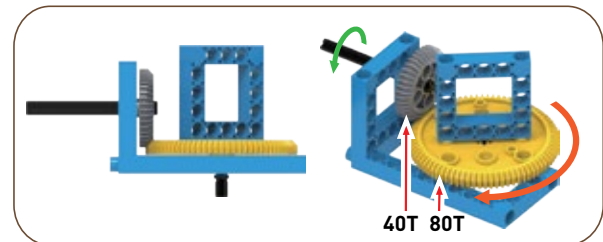
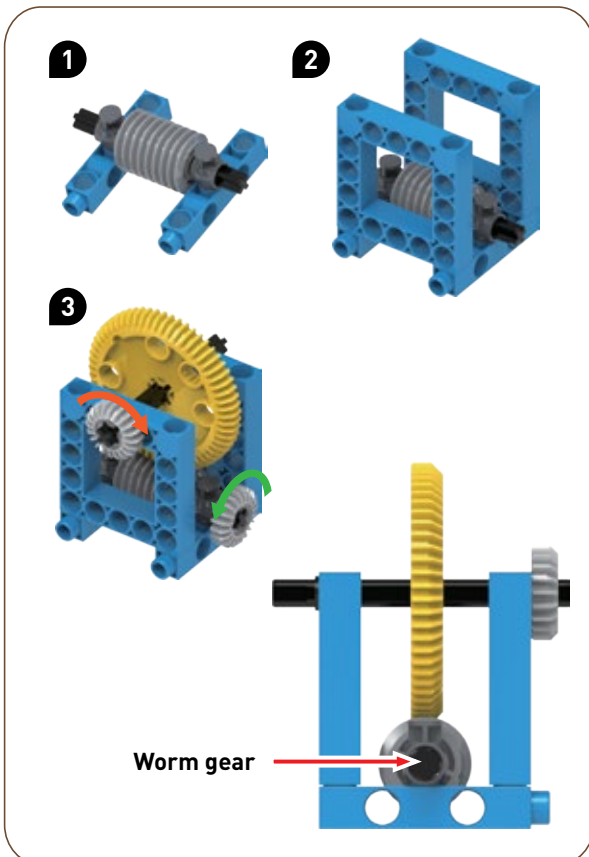


Fig. 17. Structure of a worm gearbox.



UNDERSTANDING GEARS 5: WORM GEARS

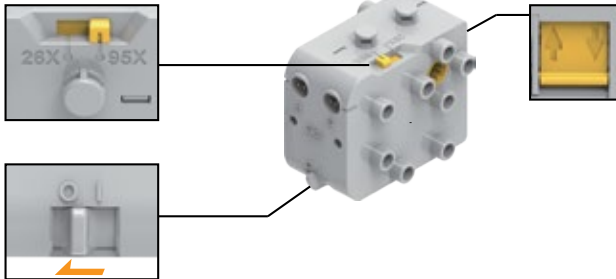
The gears in this kit can combine in yet another way. A worm gear and gear wheel are combined together as a worm gearbox. As the worm gear rotates once, the gear wheel turns only a one-tooth distance.

Take the 40-tooth yellow gear as an example: the gear ratio would reach 40:1 to achieve a huge speed reduction and torque increase. When friction is not considered, the speed reduction reaches 40 times, and the torque increases 40 times.

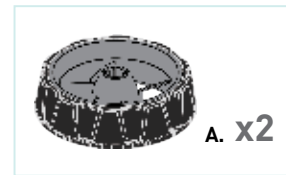
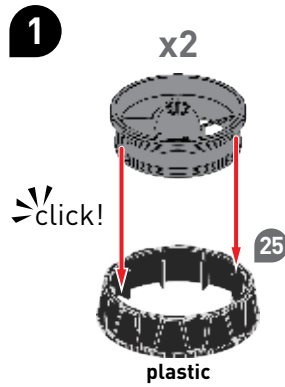
In addition, the structure of the worm gearbox also has another characteristic: the transmission can only be conducted from the worm gear to the gear wheel, but cannot be conducted in reverse. Because of this characteristic, the worm gearbox can only be used for speed reduction and not for speeding up. For this reason, it is used in model 10, the robotic arm, so that the claw does not open unexpectedly.

MODEL 1: CAR

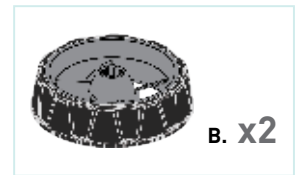
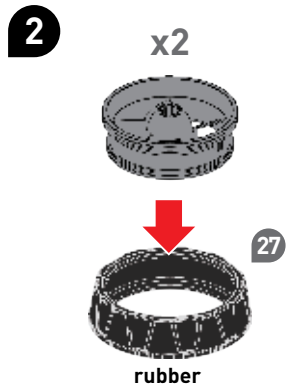
IMPORTANT!! Before starting assembly, ensure the battery is correctly installed and the following settings are configured.



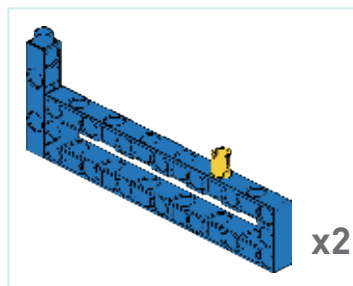
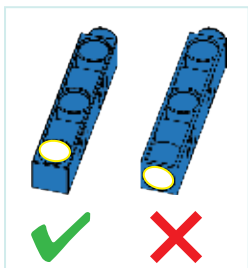
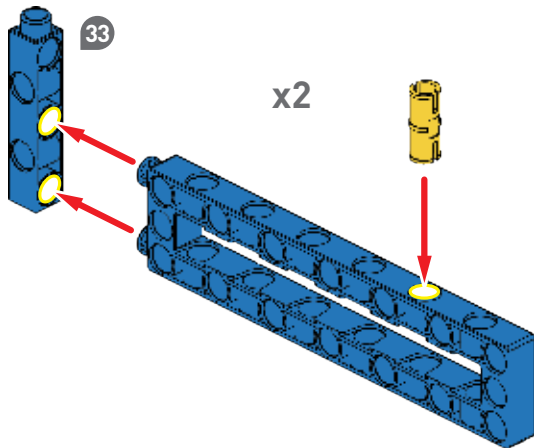
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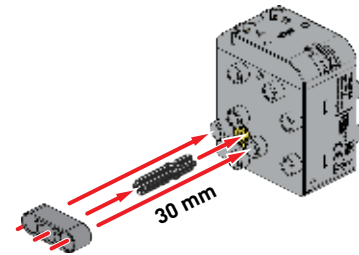
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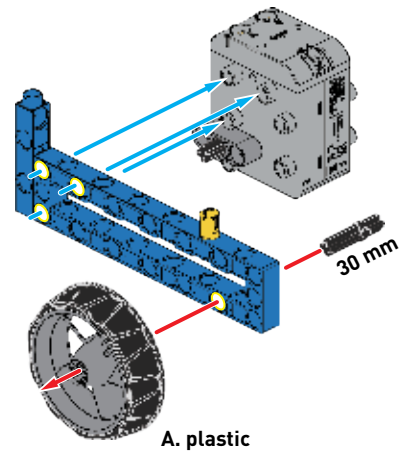
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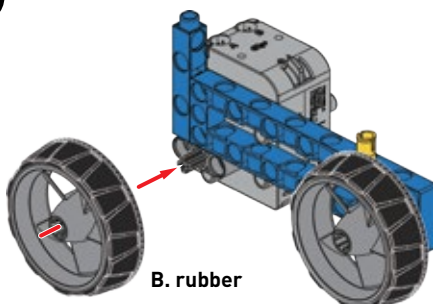
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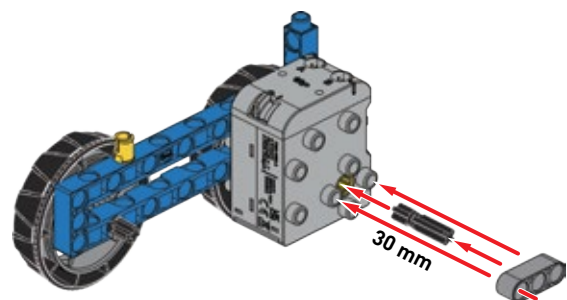
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6

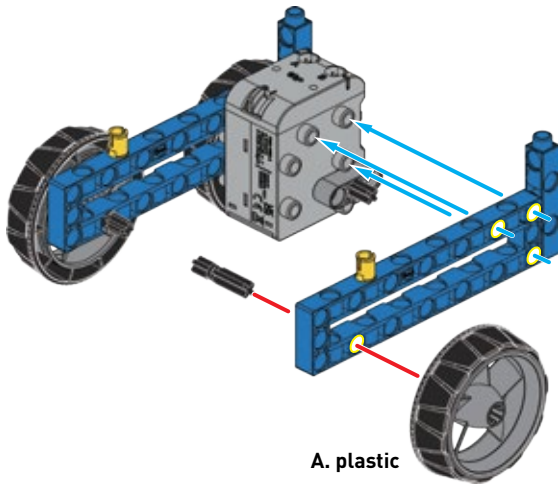


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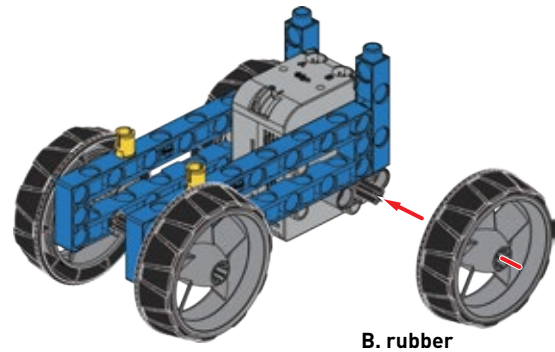




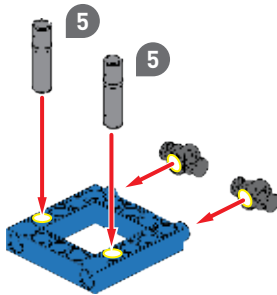
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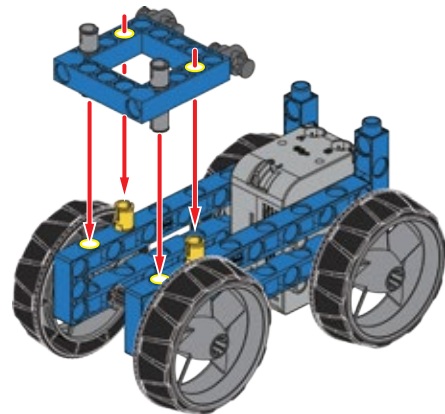
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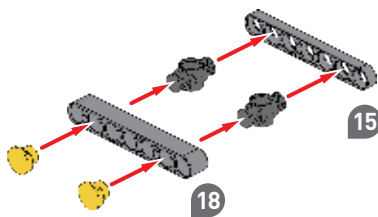
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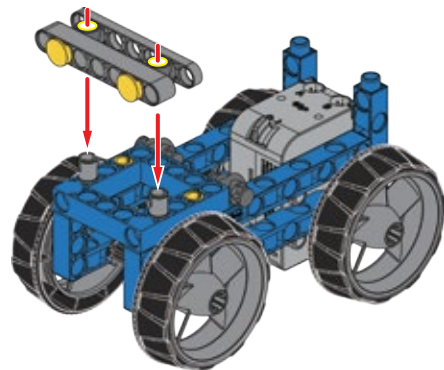
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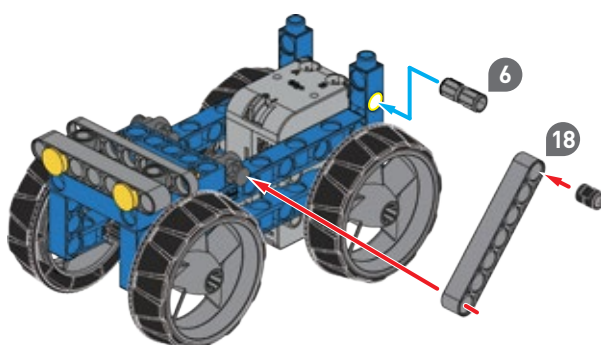
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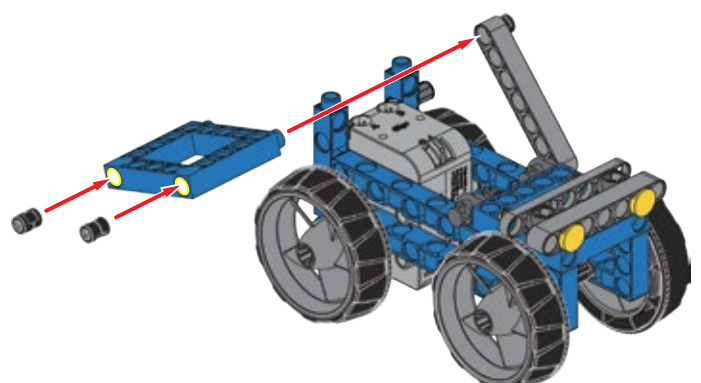
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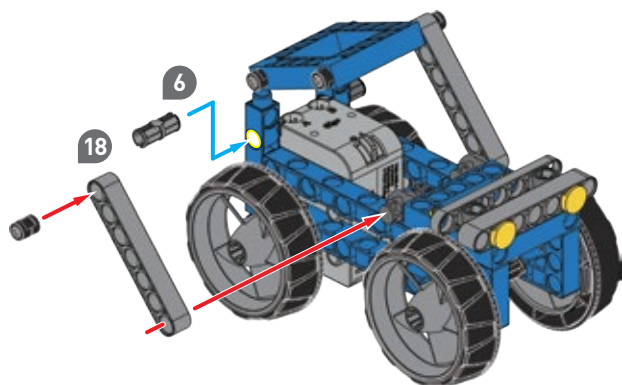
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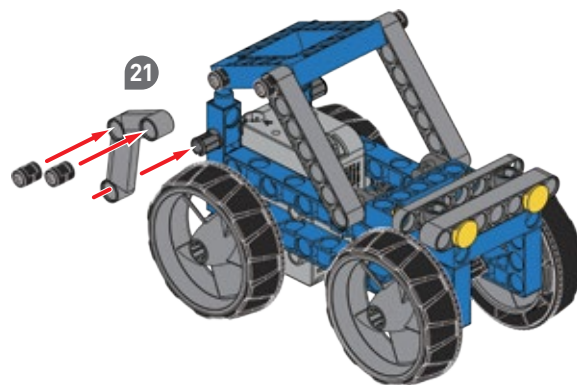
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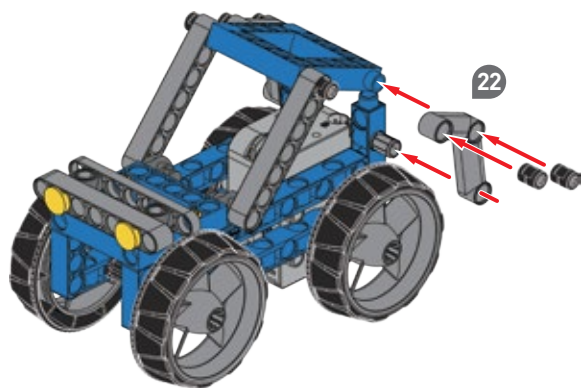
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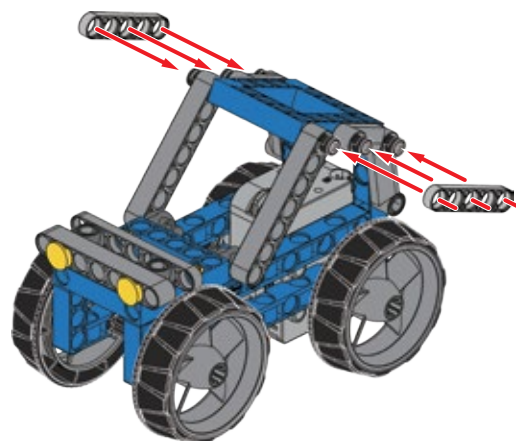
17



18

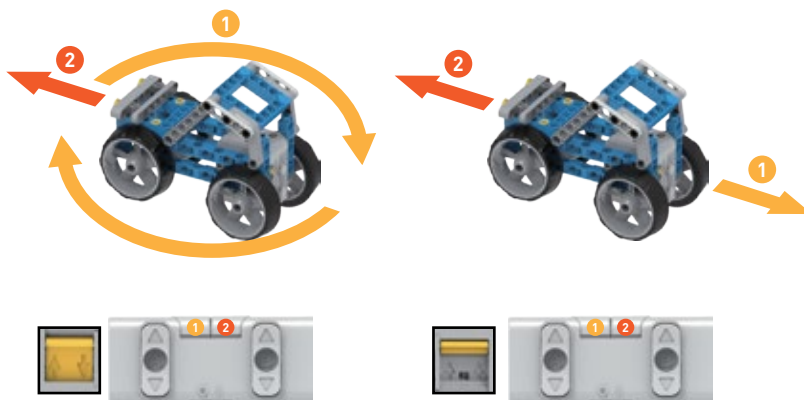


19



20

Done!



Experiment by changing speeds and directions:



95X : High-torque, low-speed



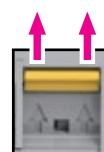
26X : High-speed, low-torque



Switch to Off, "0" state before making changes.



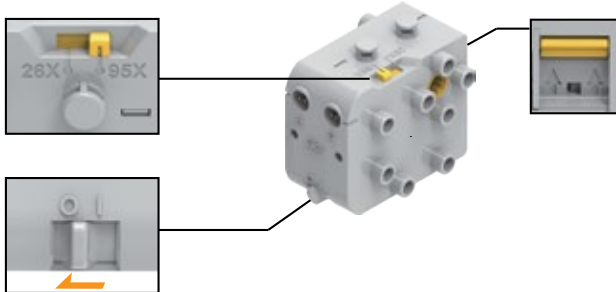
Opposite direction



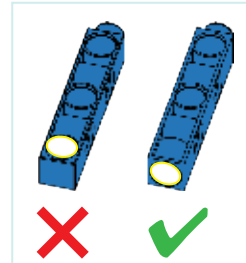
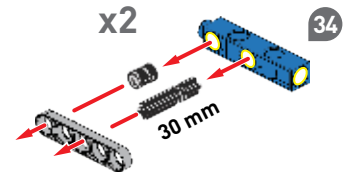
Same direction

MODEL 2: CLASSIC CAR

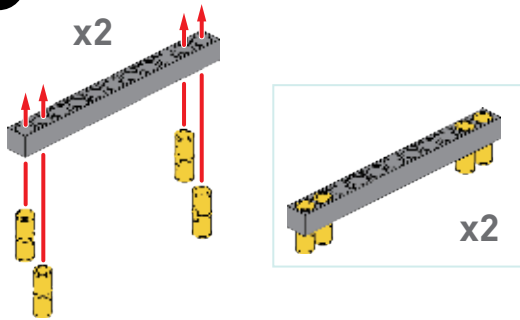
IMPORTANT!! Before starting assembly, ensure the battery is correctly installed and the following settings are configured.



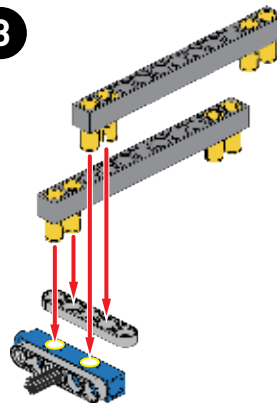
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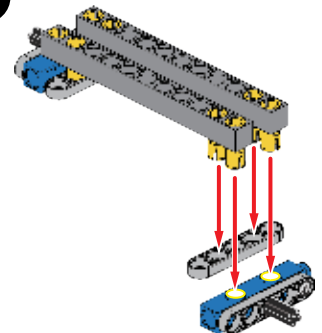
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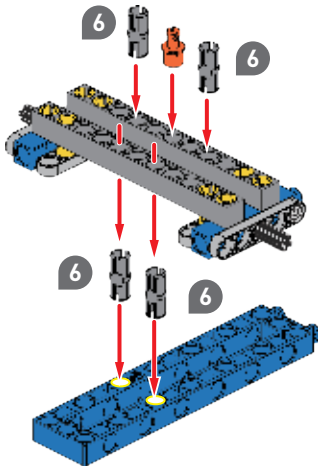
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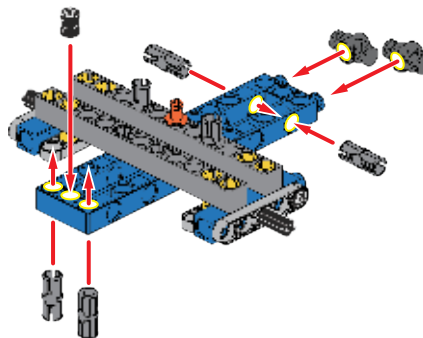
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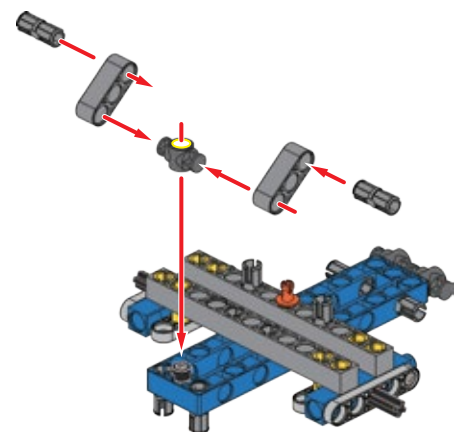
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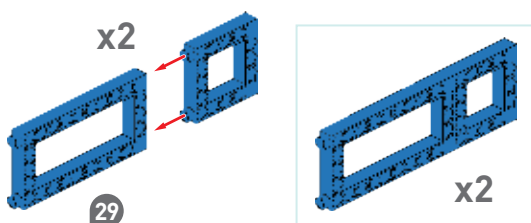
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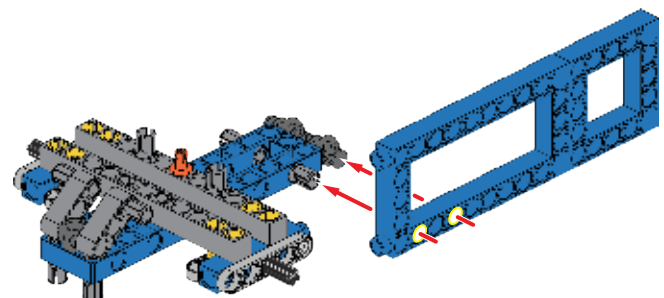
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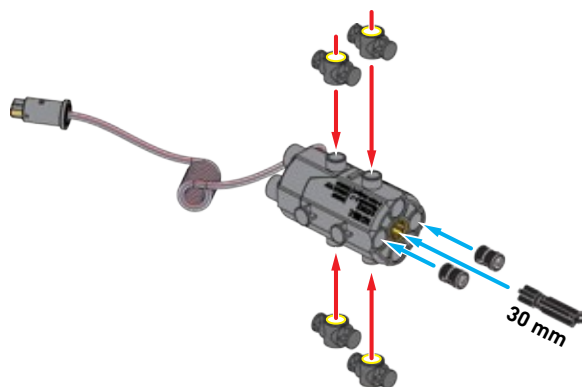
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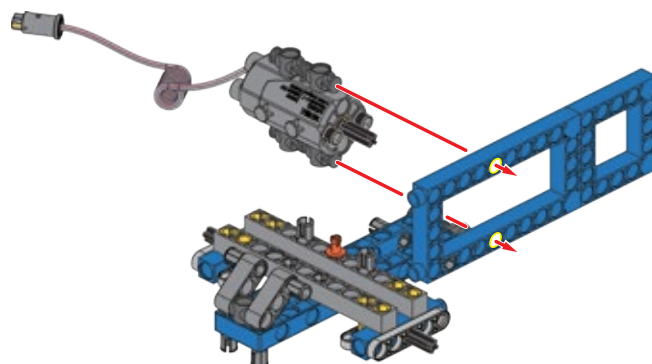
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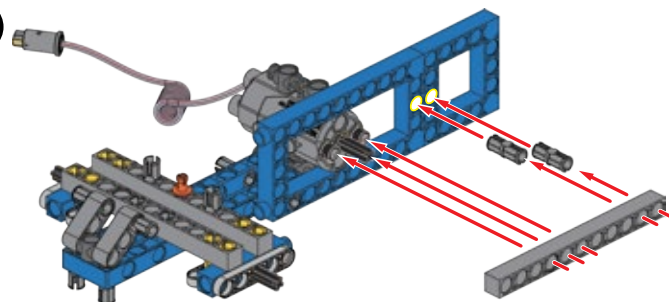
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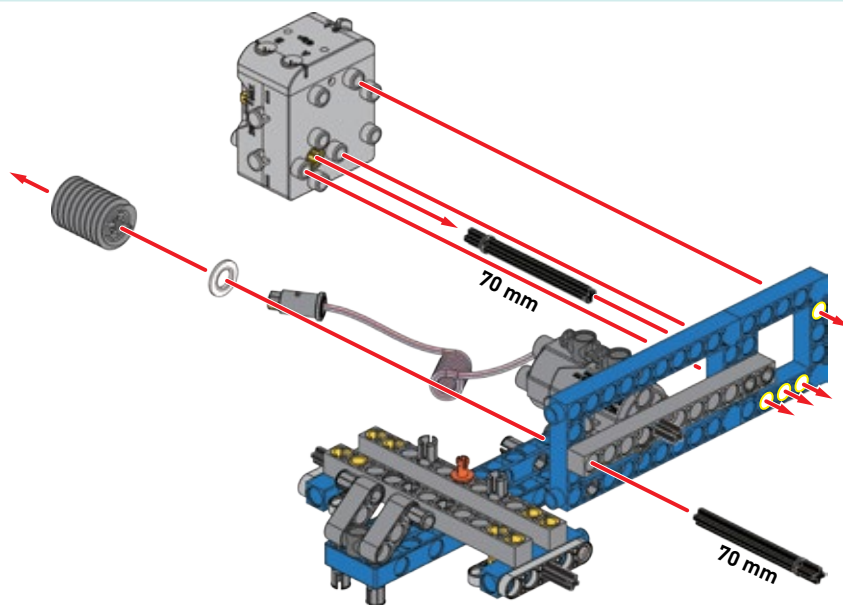
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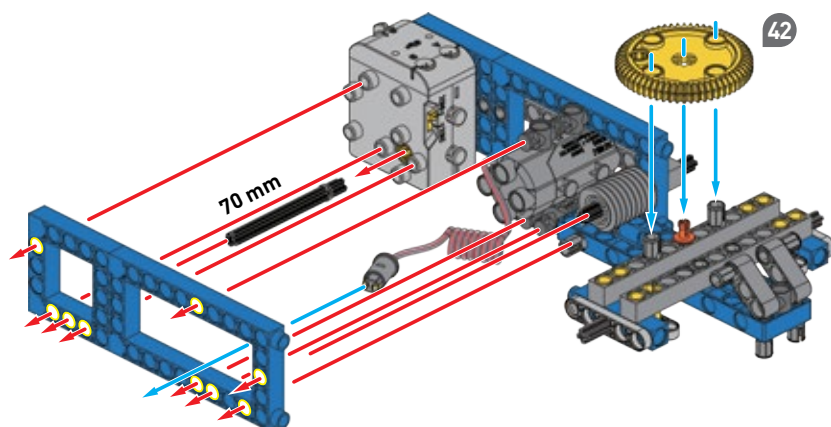
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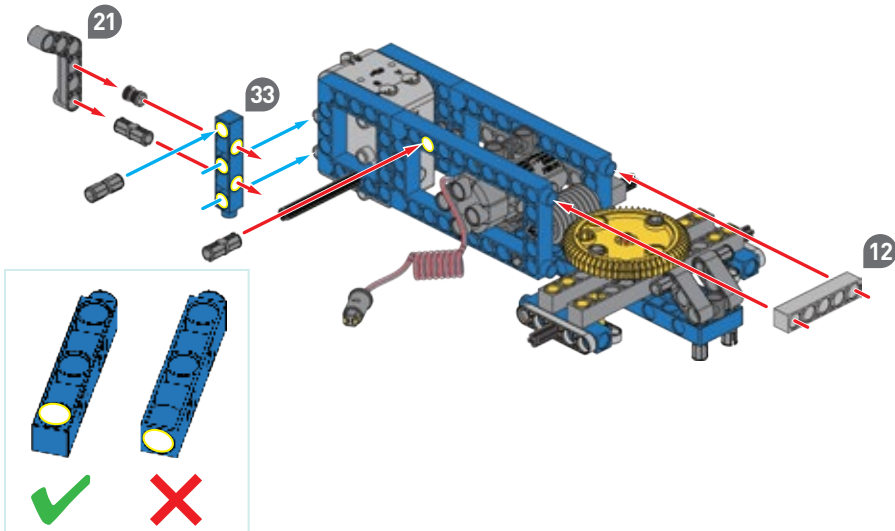


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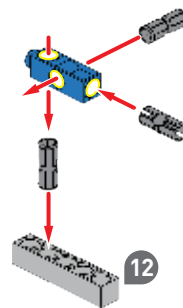




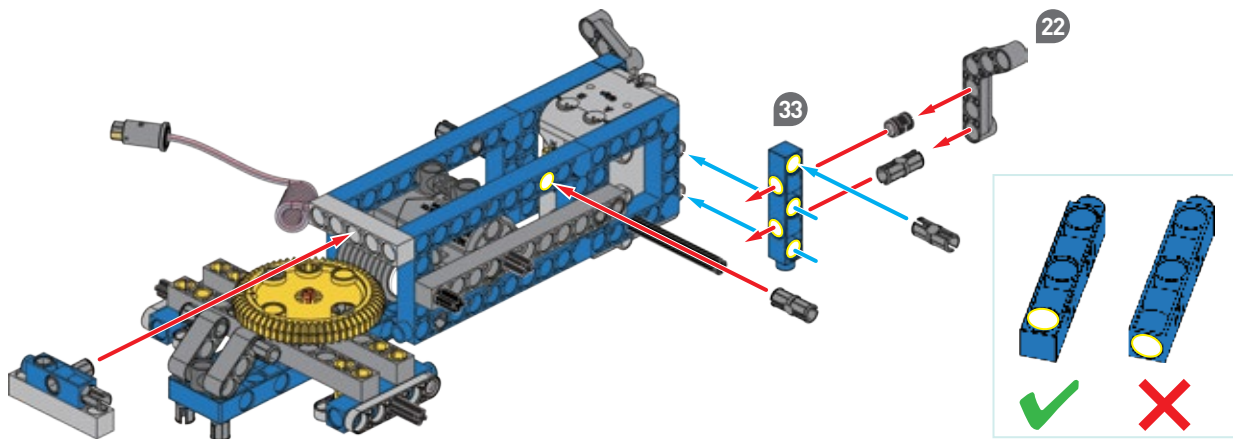
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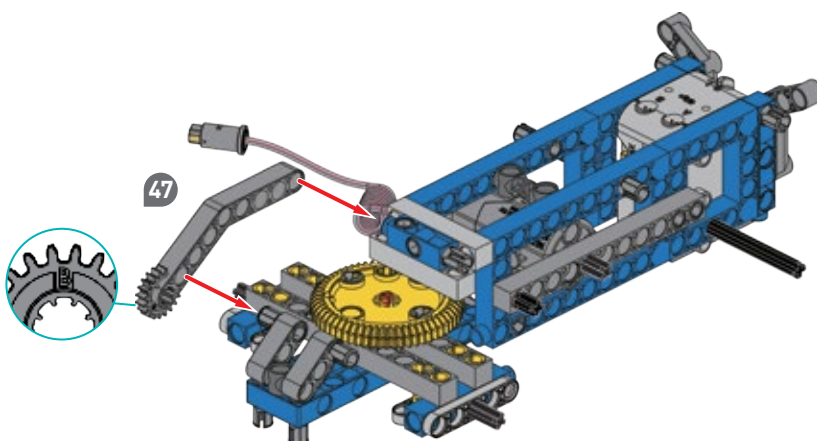
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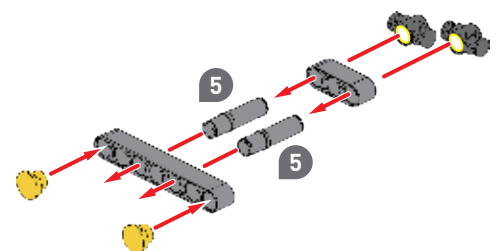
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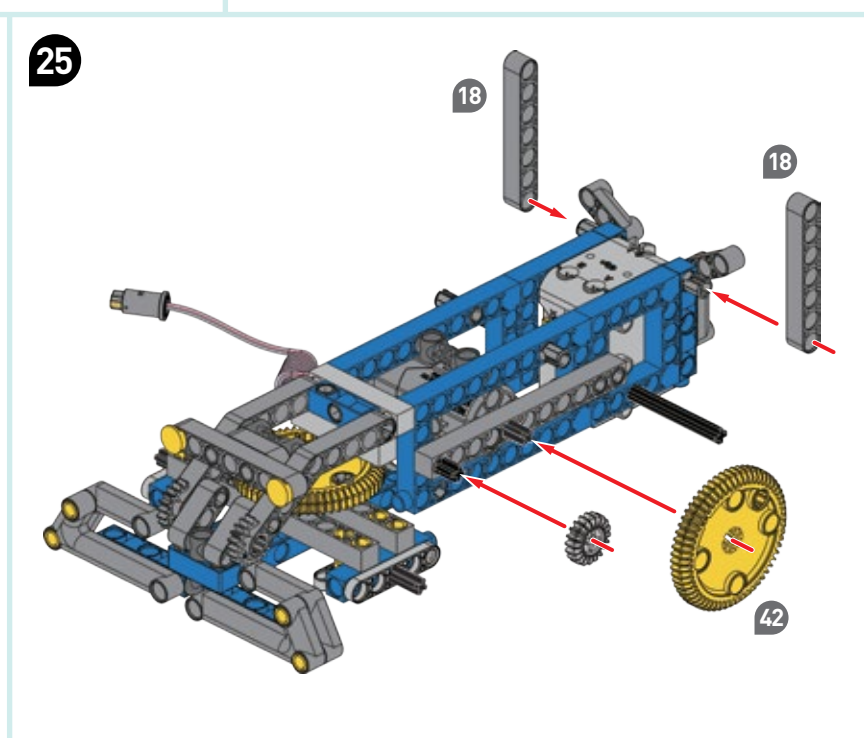
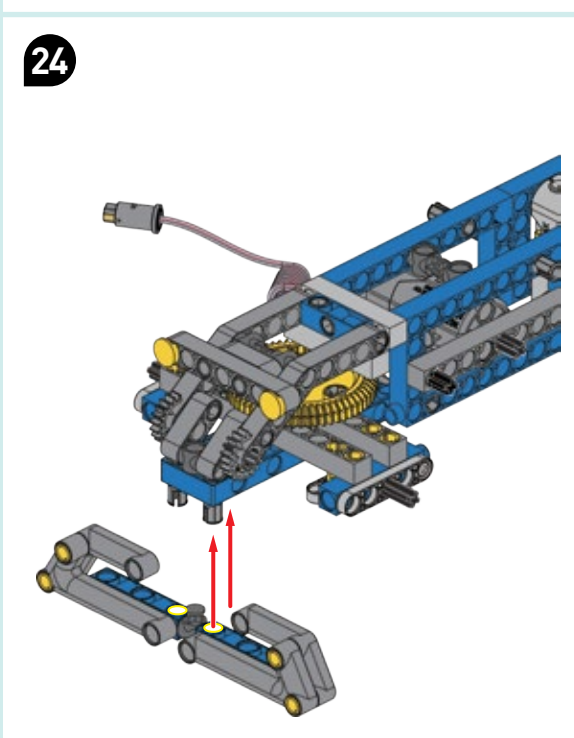
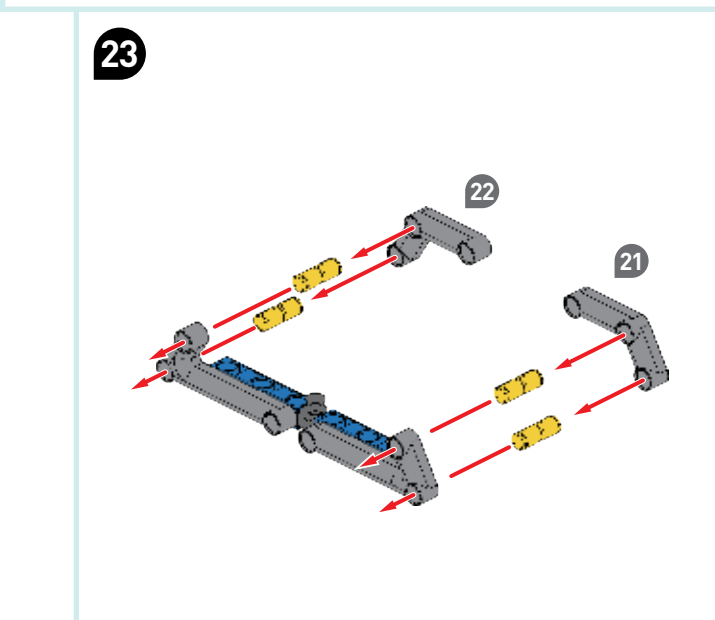
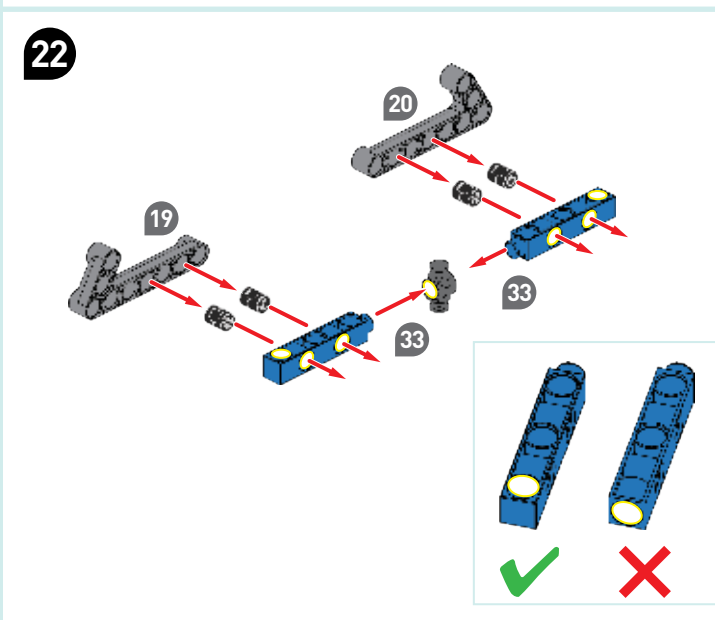
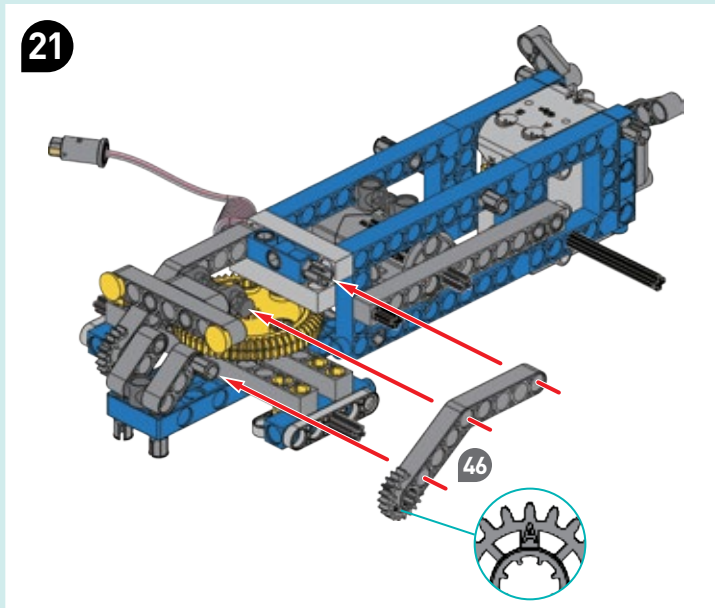
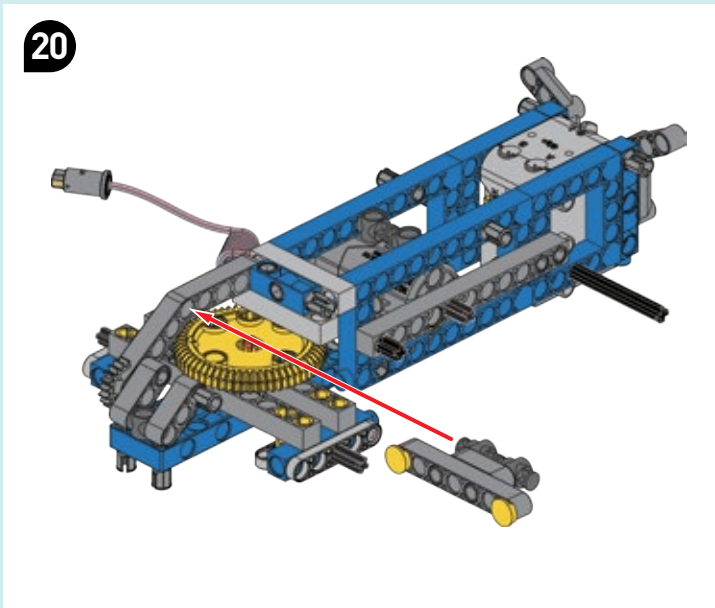


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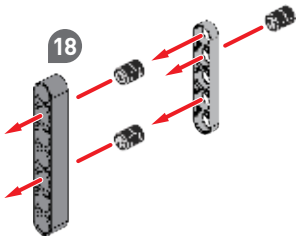
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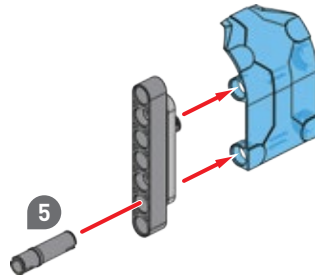




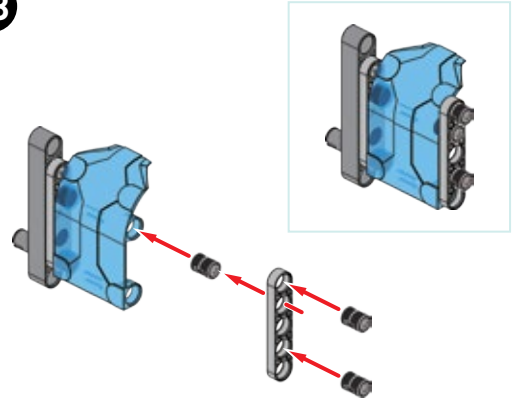
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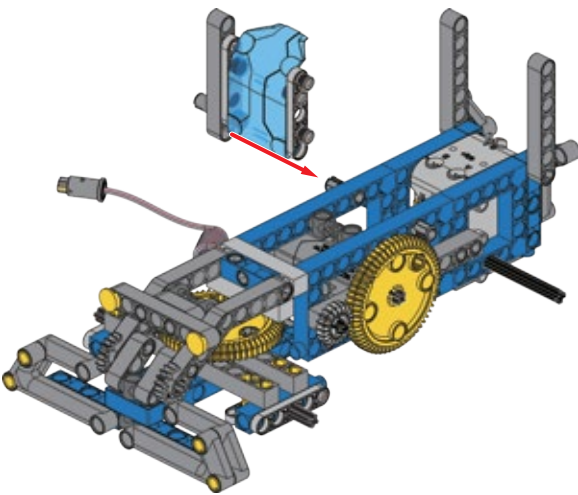
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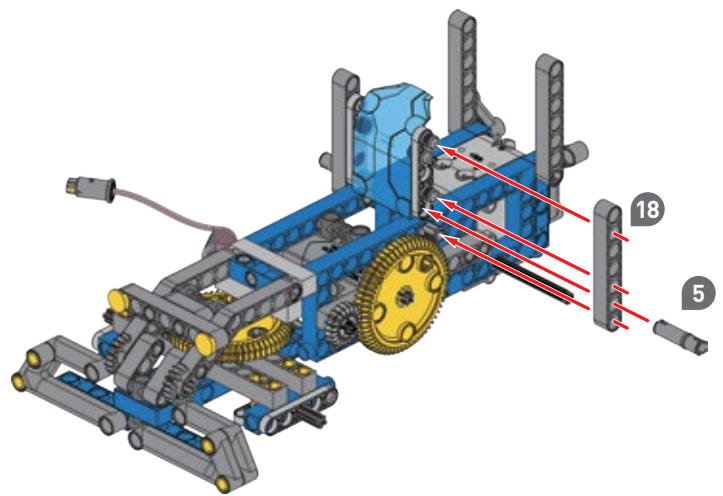
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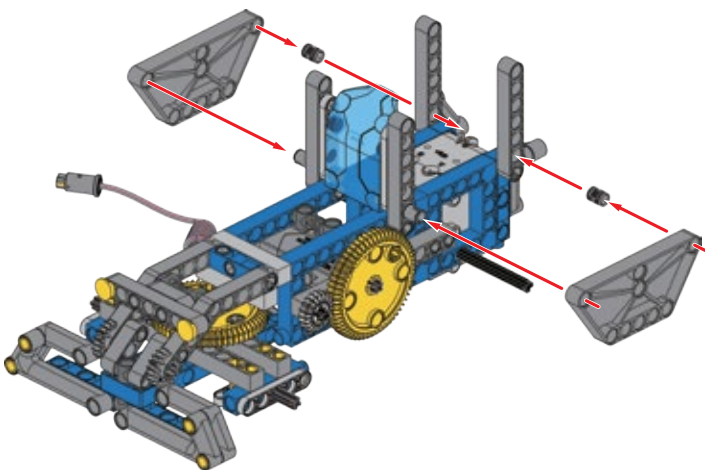
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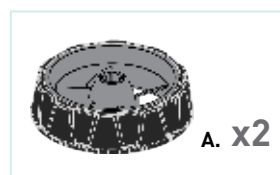
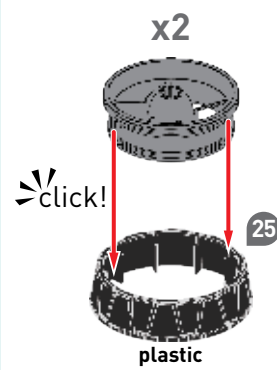
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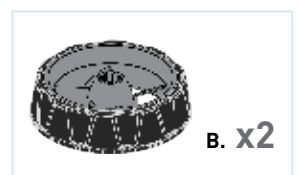
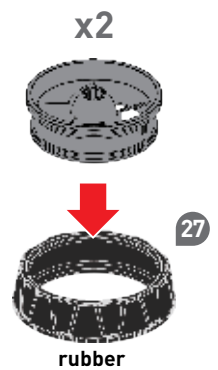
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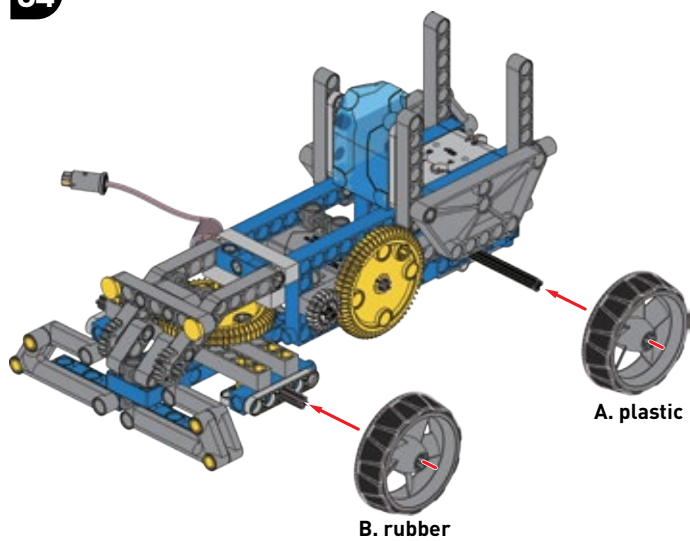
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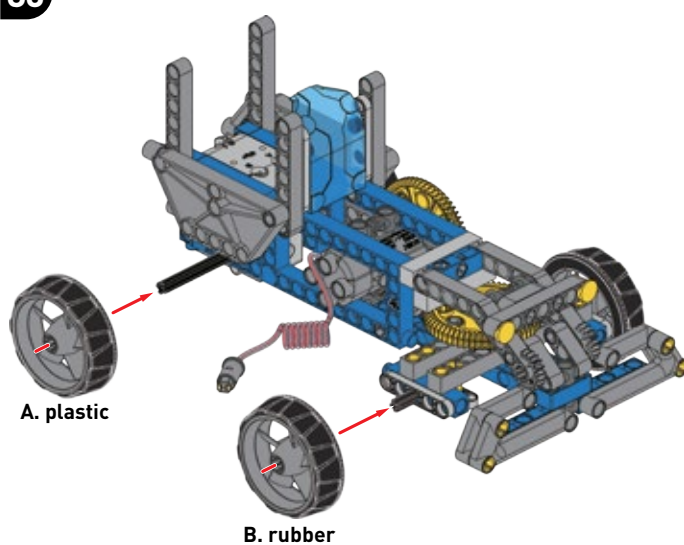
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34

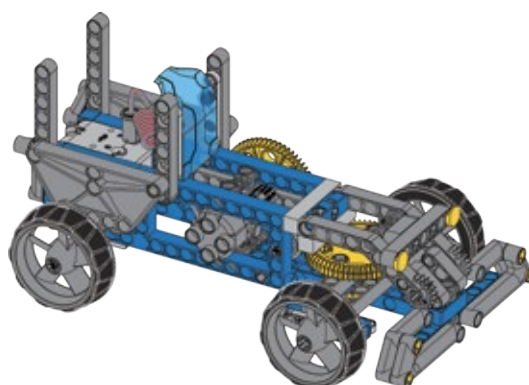
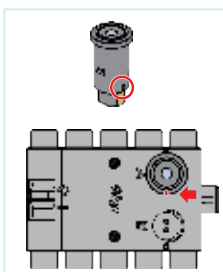
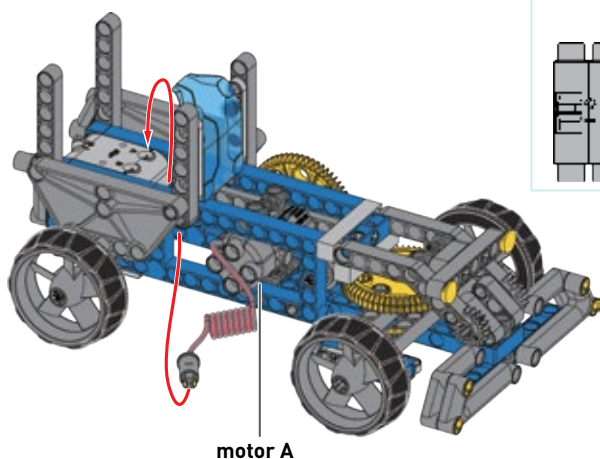


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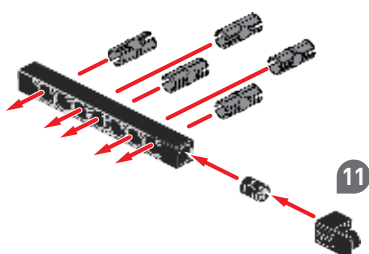
36

Look closely at the plug! Line up the small groove symbol on the plug with the red arrow before you push the plug in.

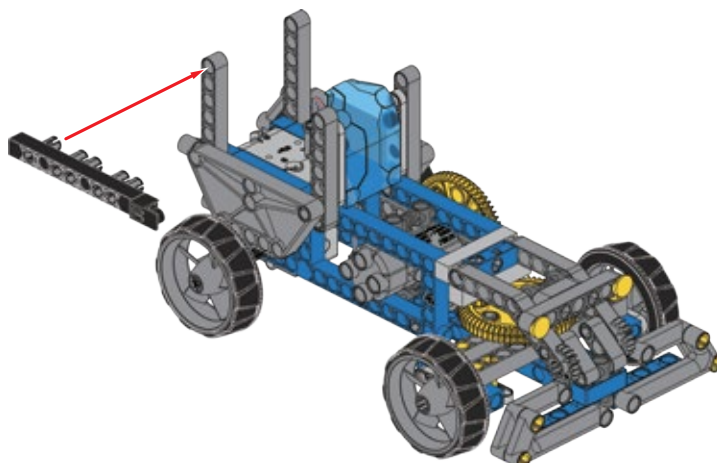


37

x2

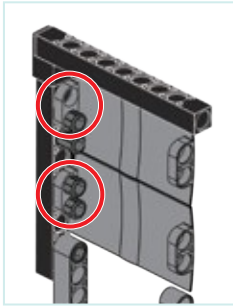


38

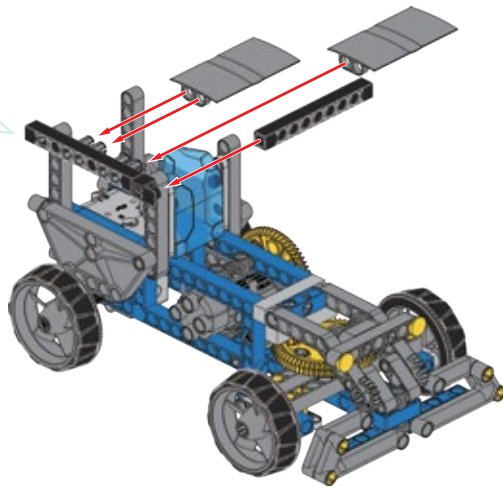




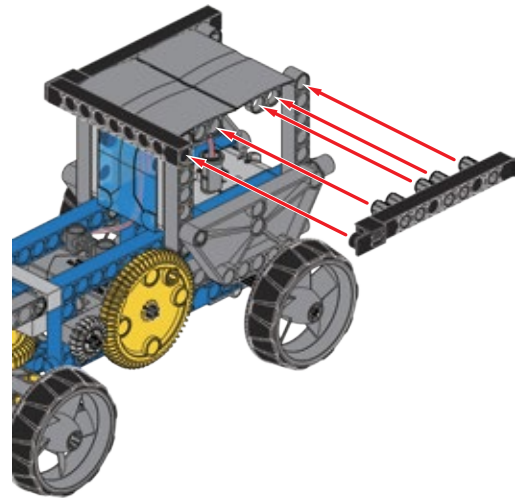
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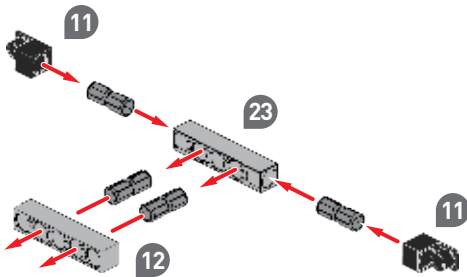
Note the assembly at the three points on the inside.



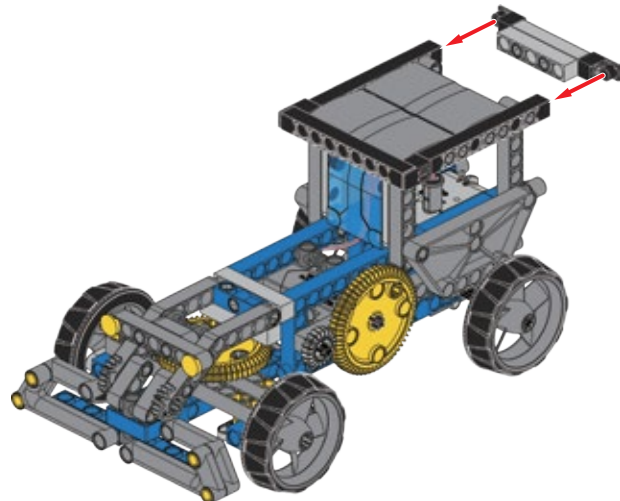
40



41

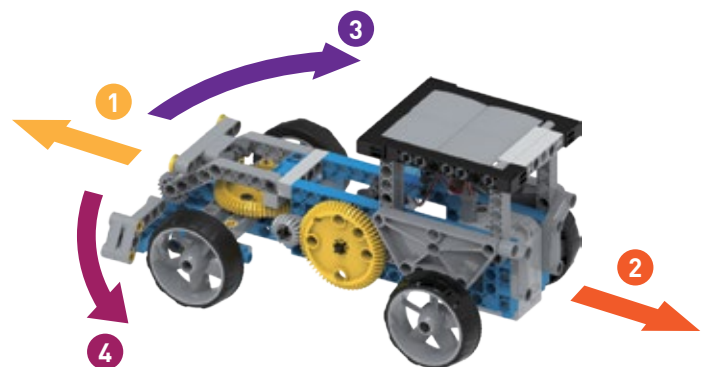
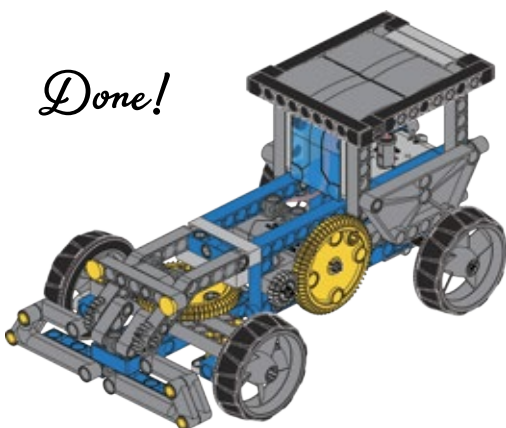


42



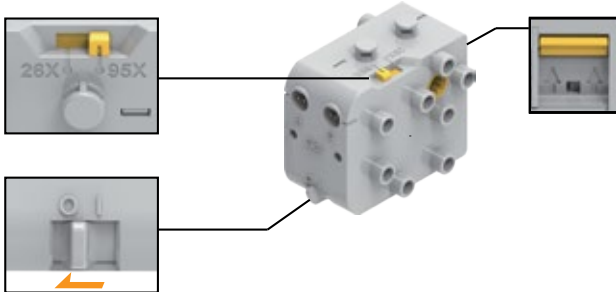
43

Done!

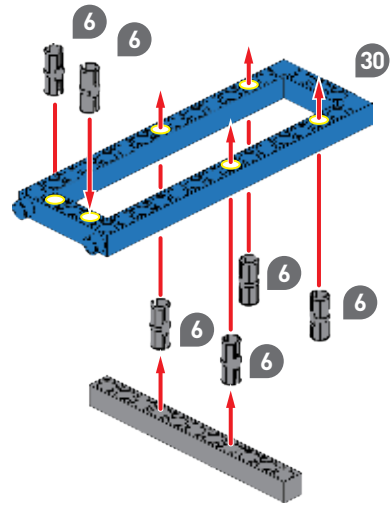


MODEL 3: FORMULA ONE RACER

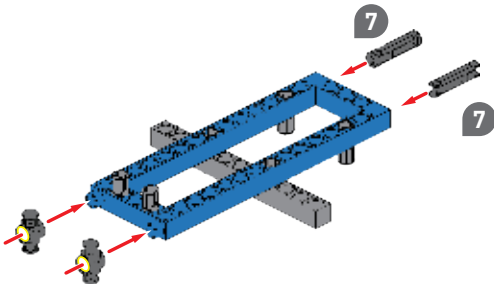
IMPORTANT!! Before starting assembly, ensure the battery is correctly installed and the following settings are configured.



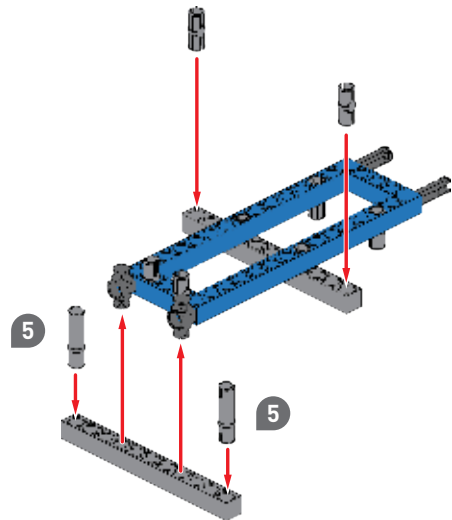
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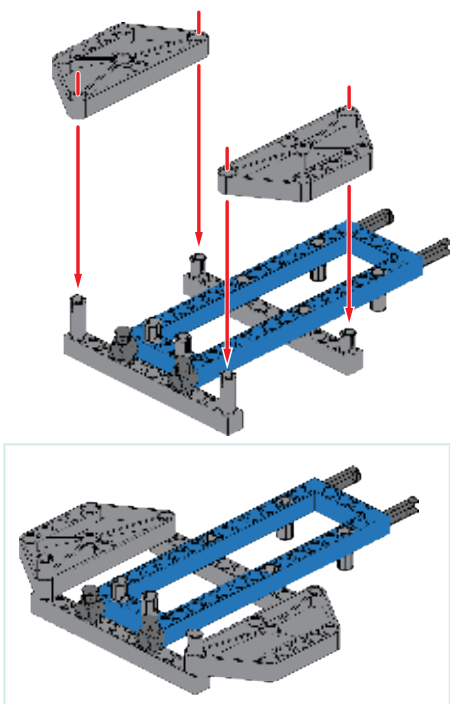
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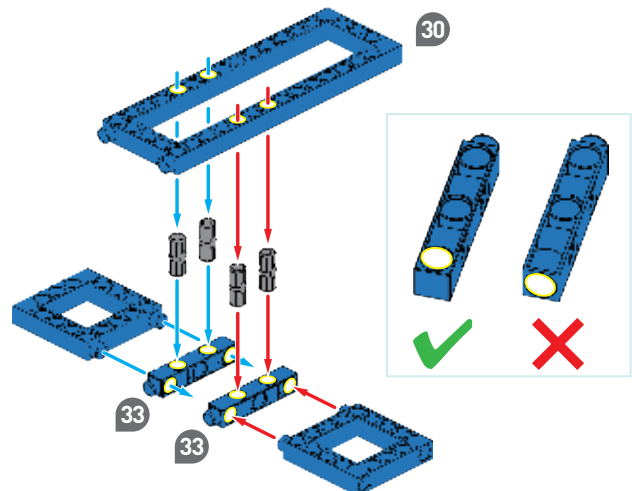
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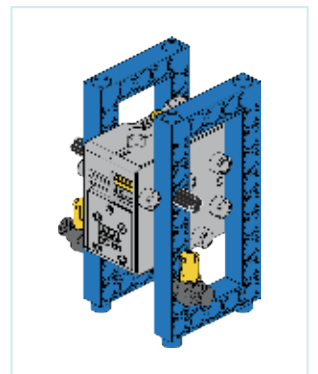
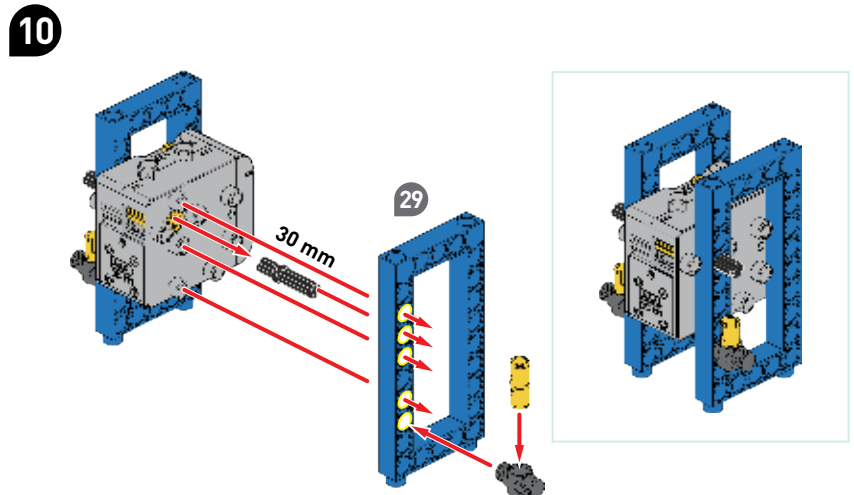
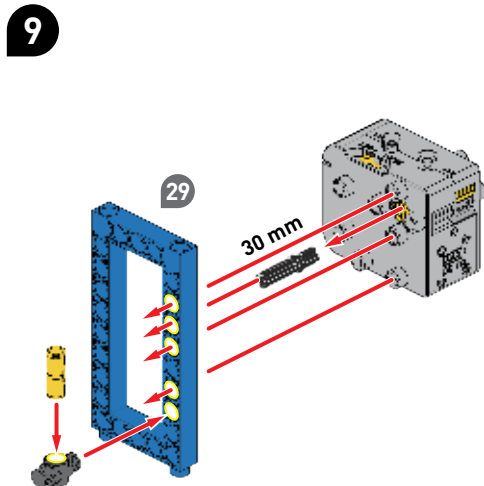
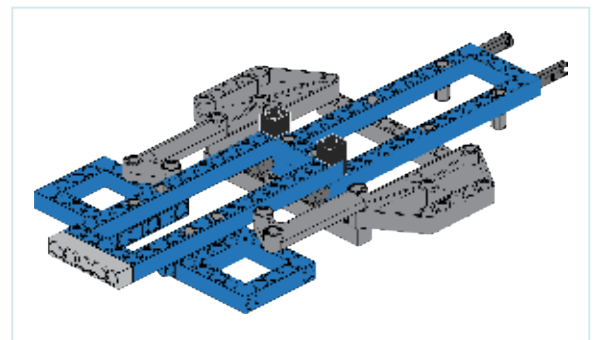
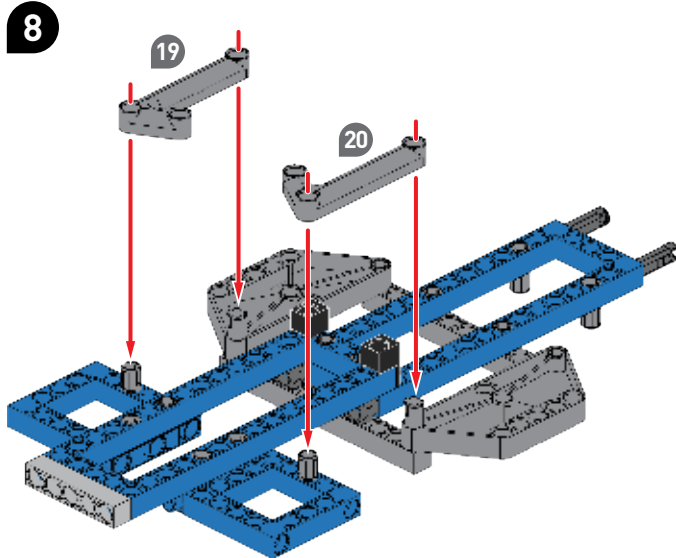
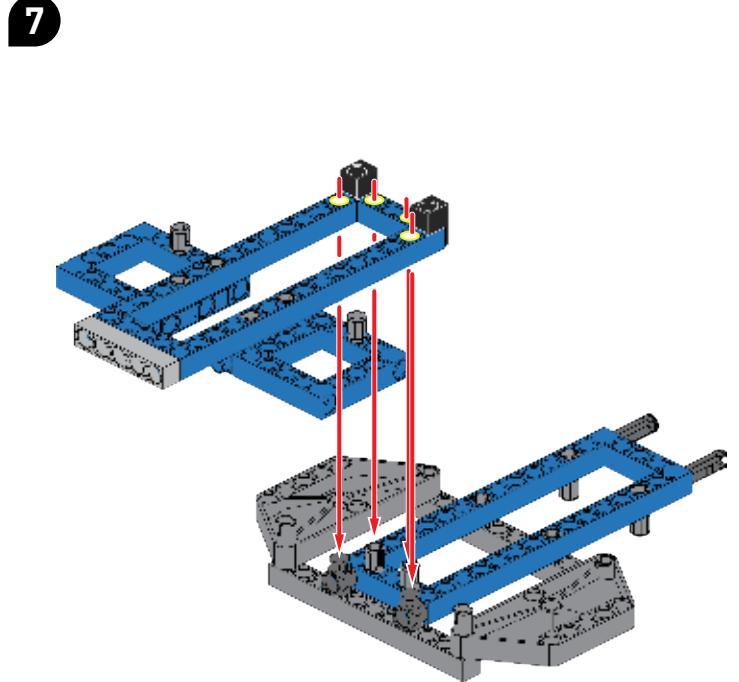
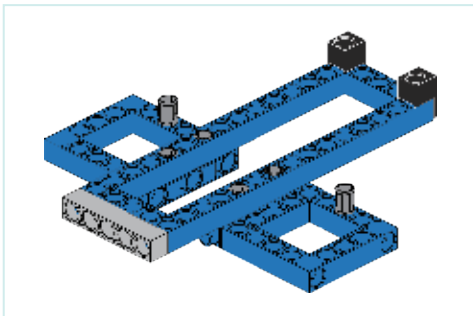
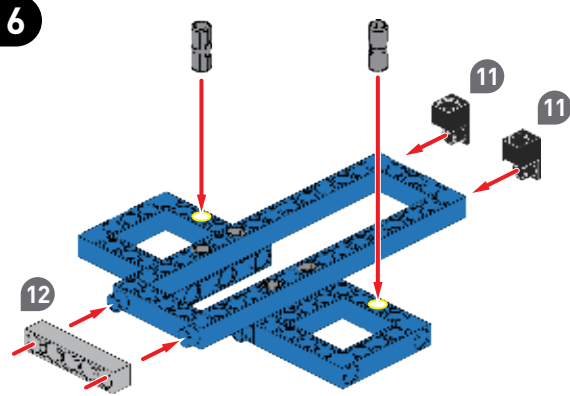


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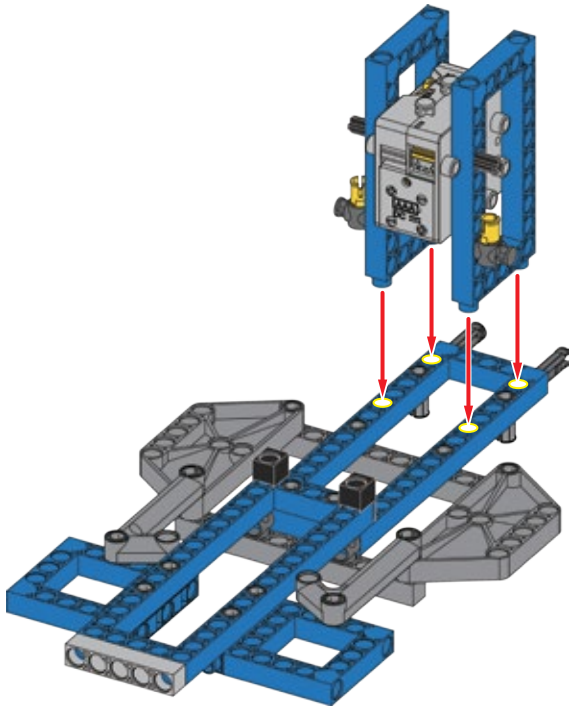


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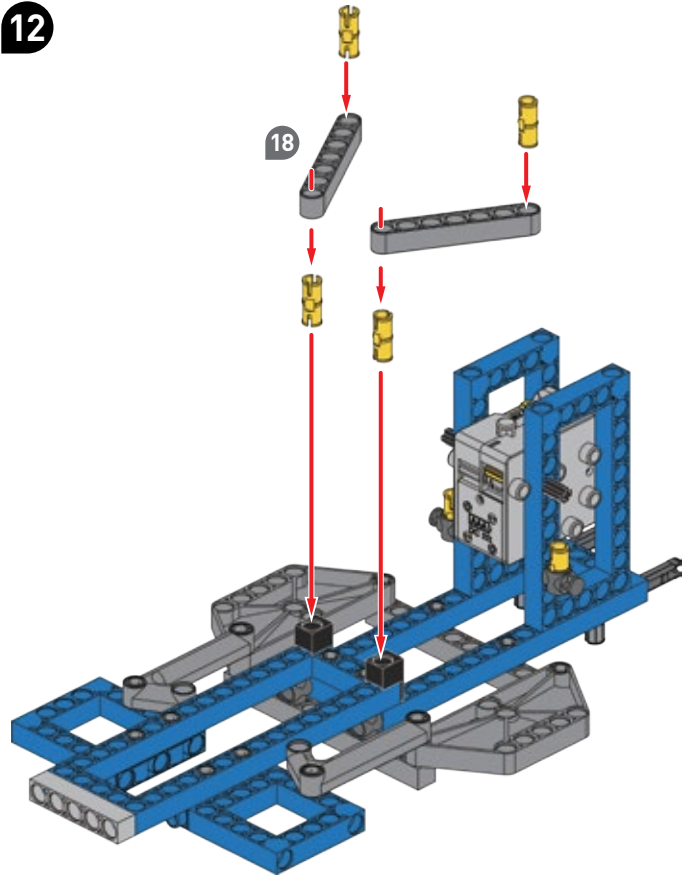




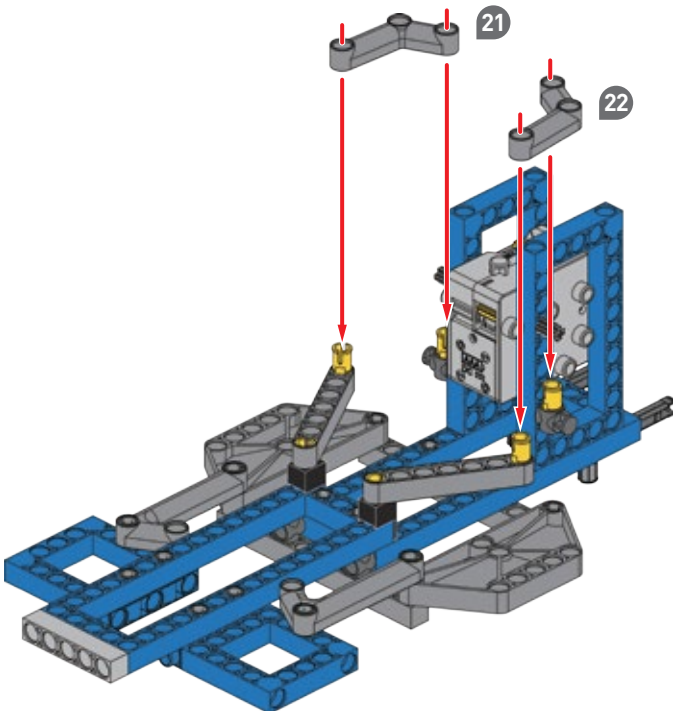
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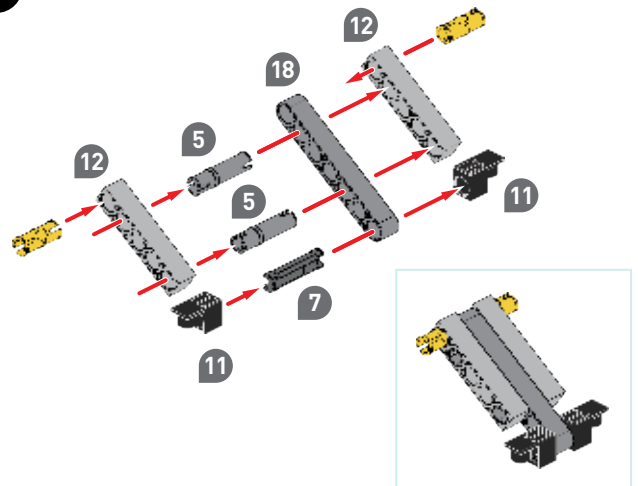
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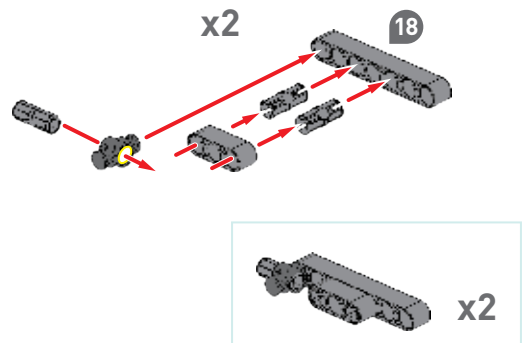
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14

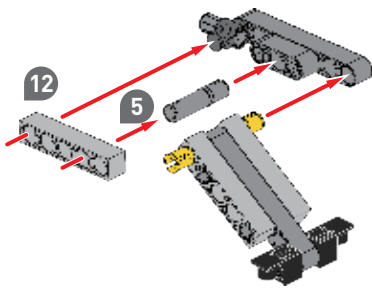


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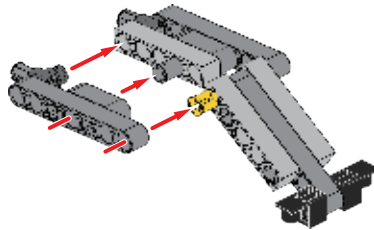




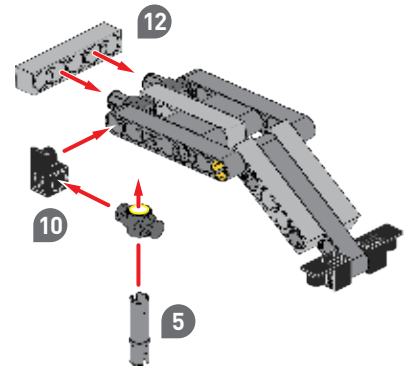
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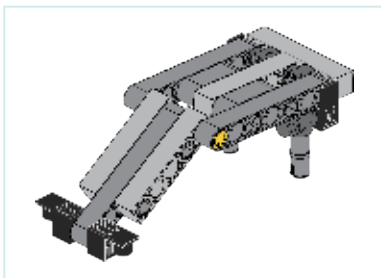
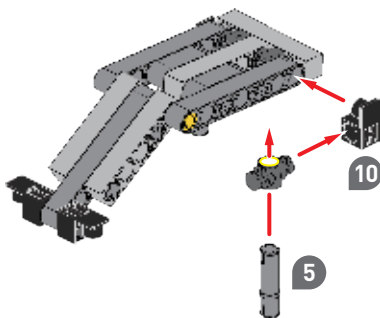
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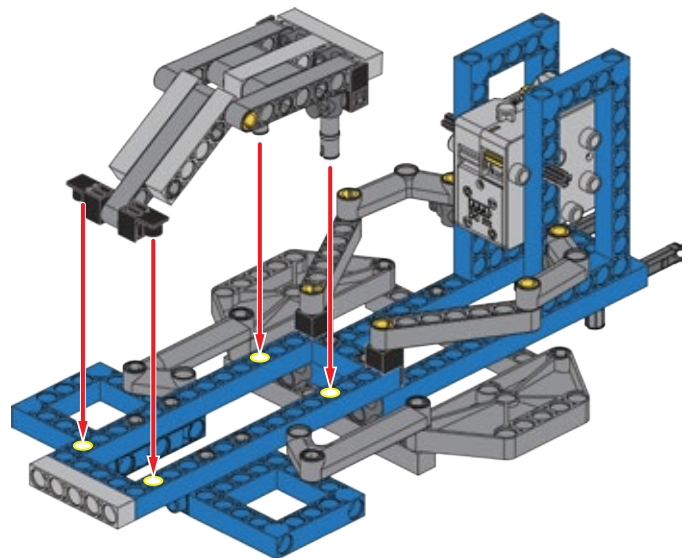
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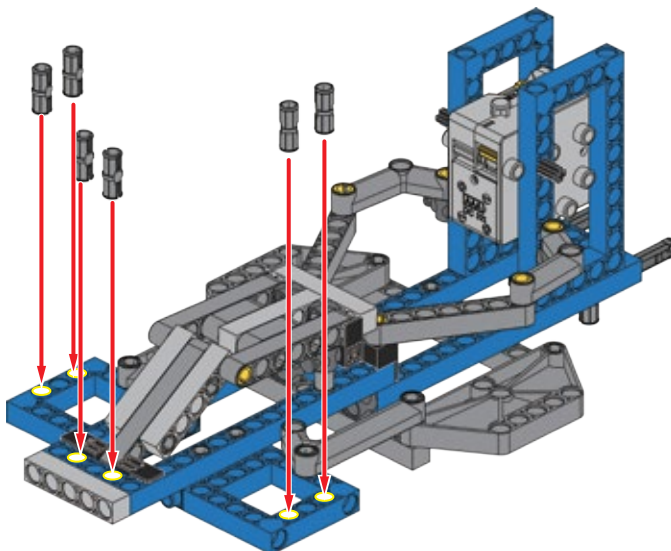
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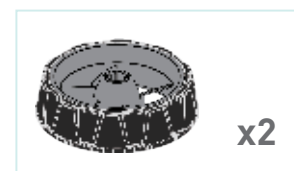
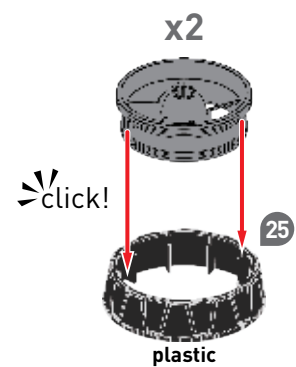
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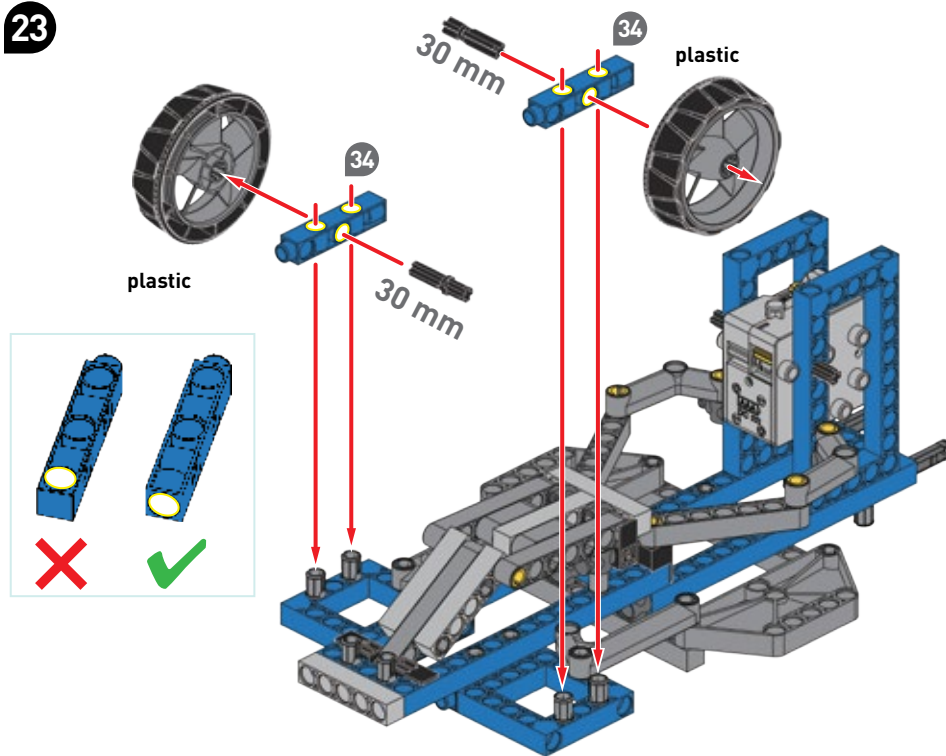
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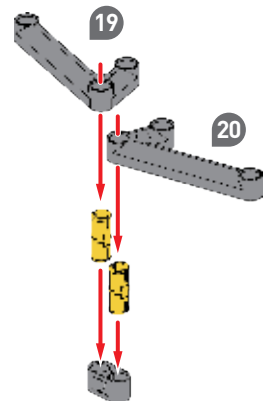
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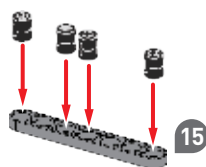


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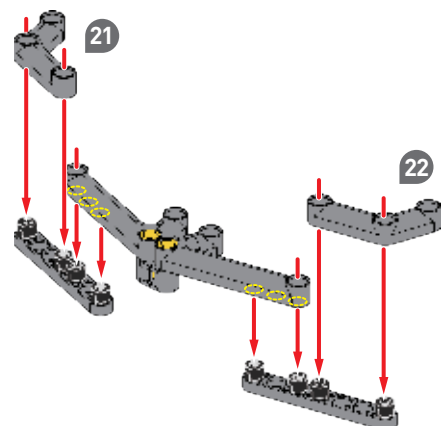


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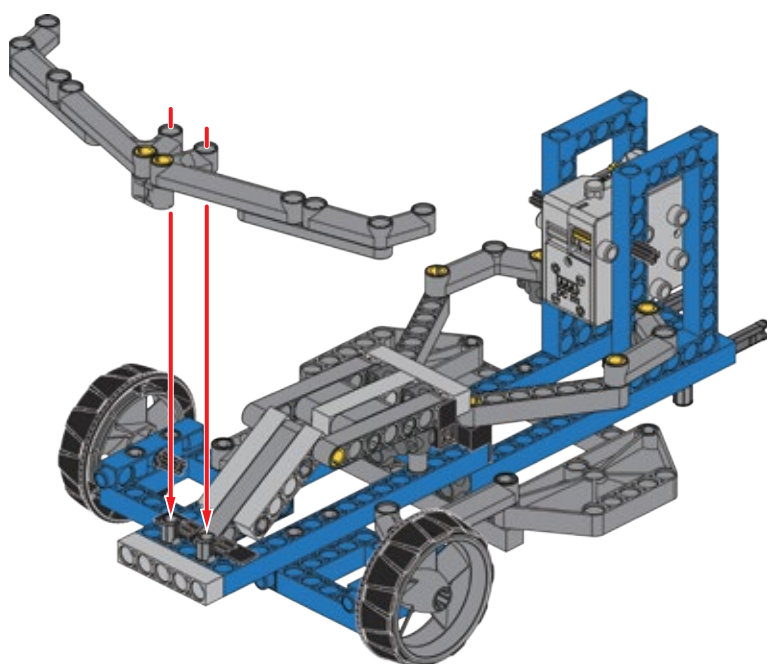
x2



26

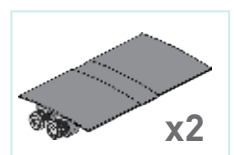
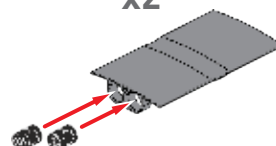


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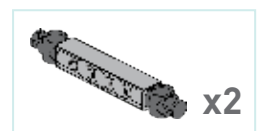
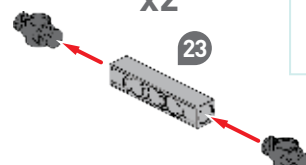
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x2



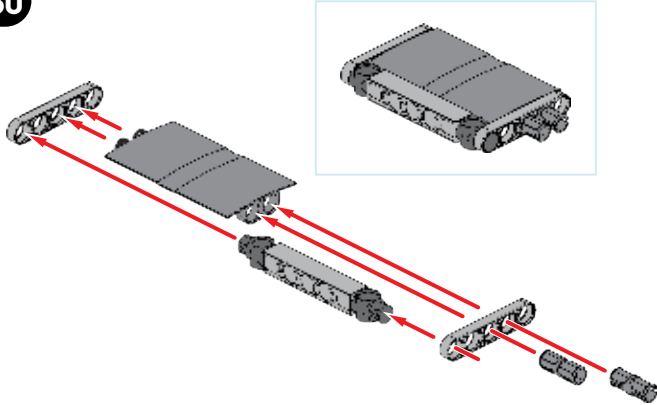
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x2

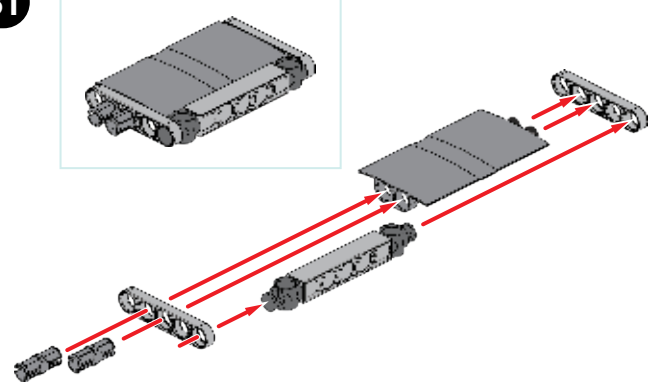




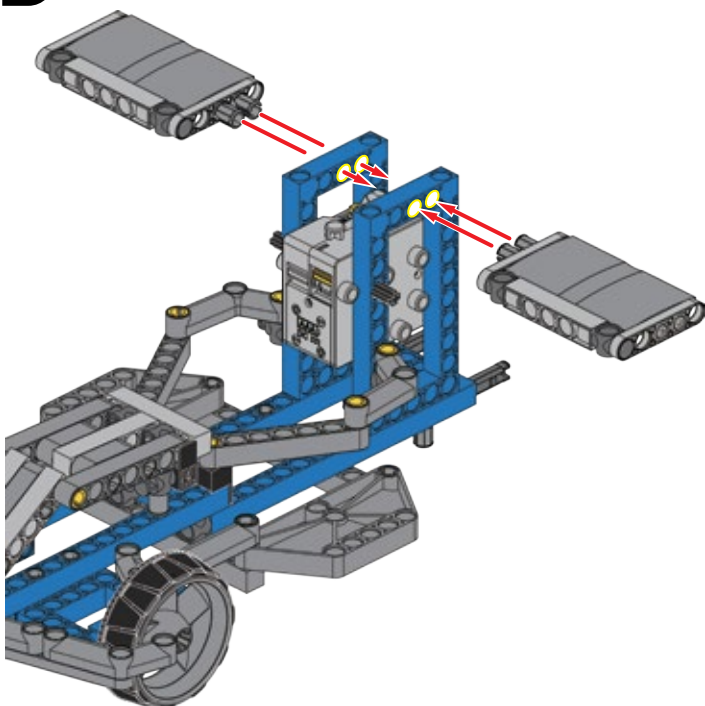
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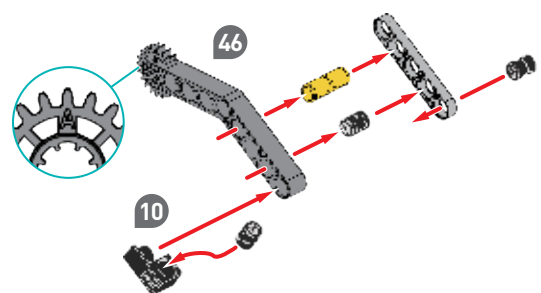
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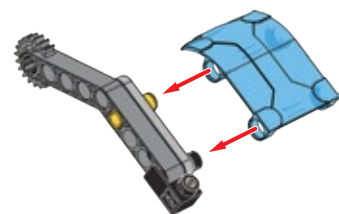
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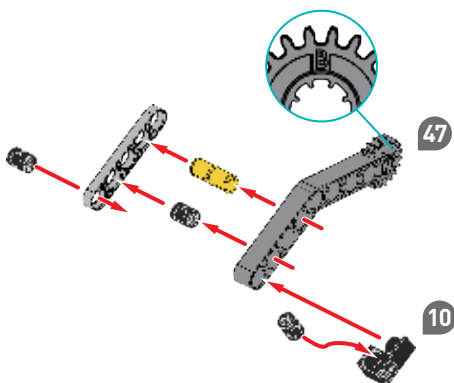
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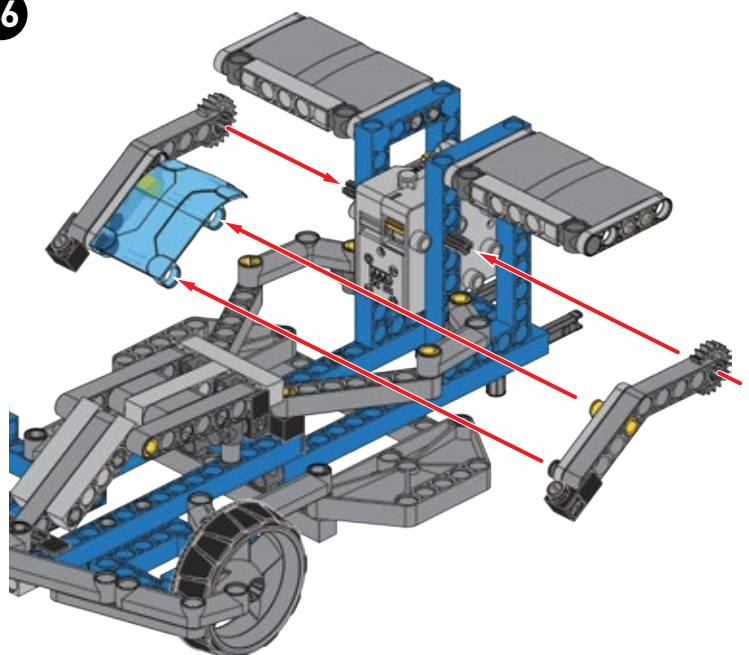
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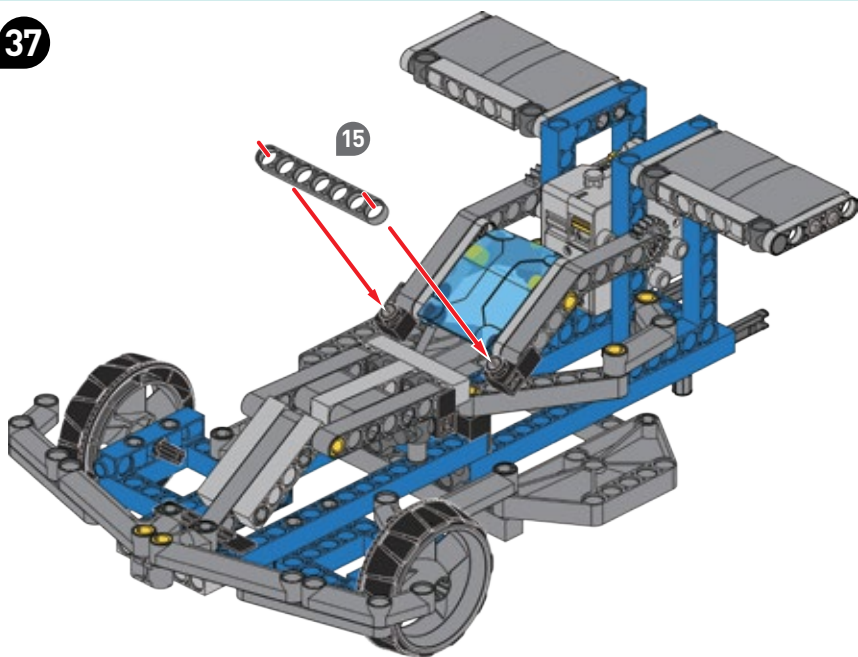
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36



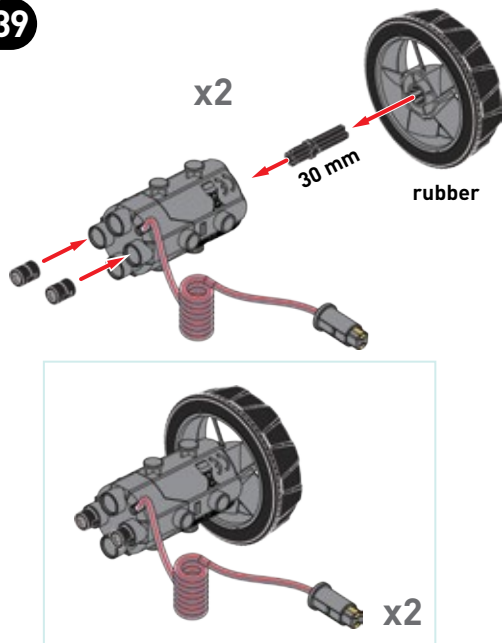
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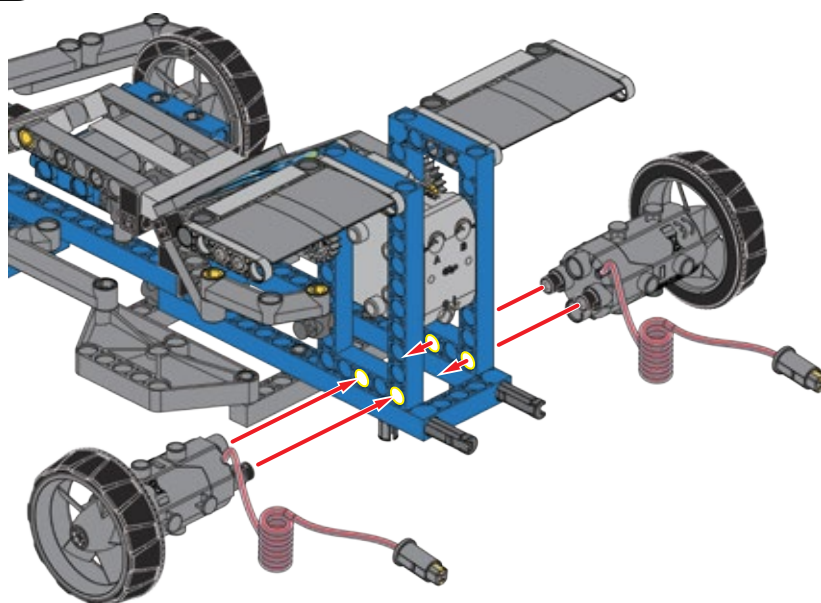
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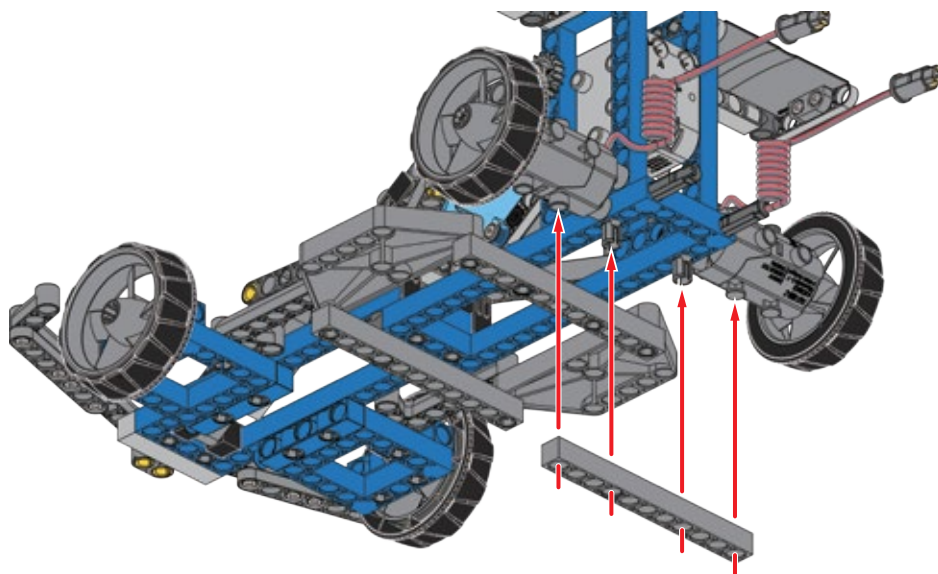
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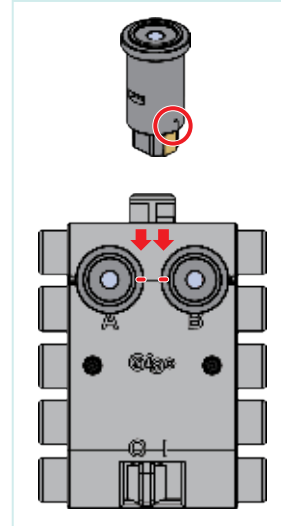
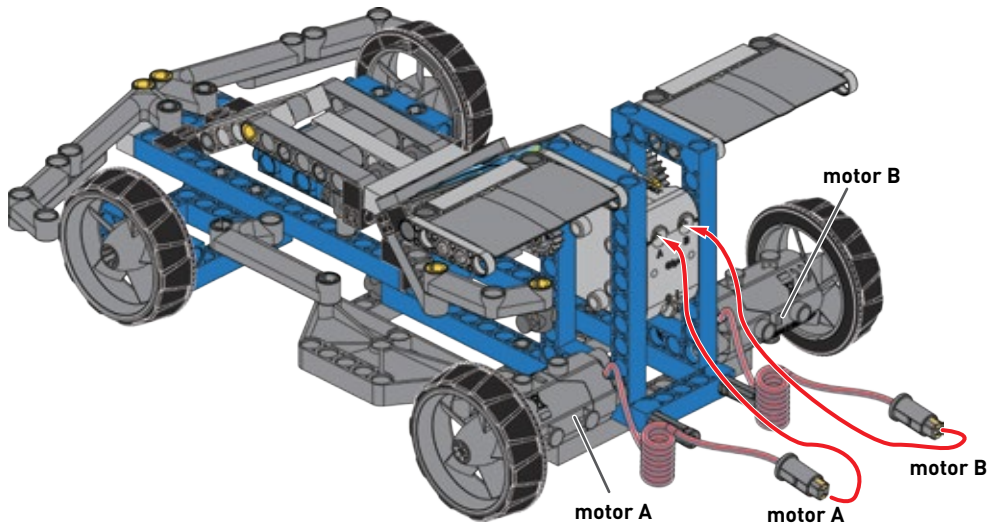
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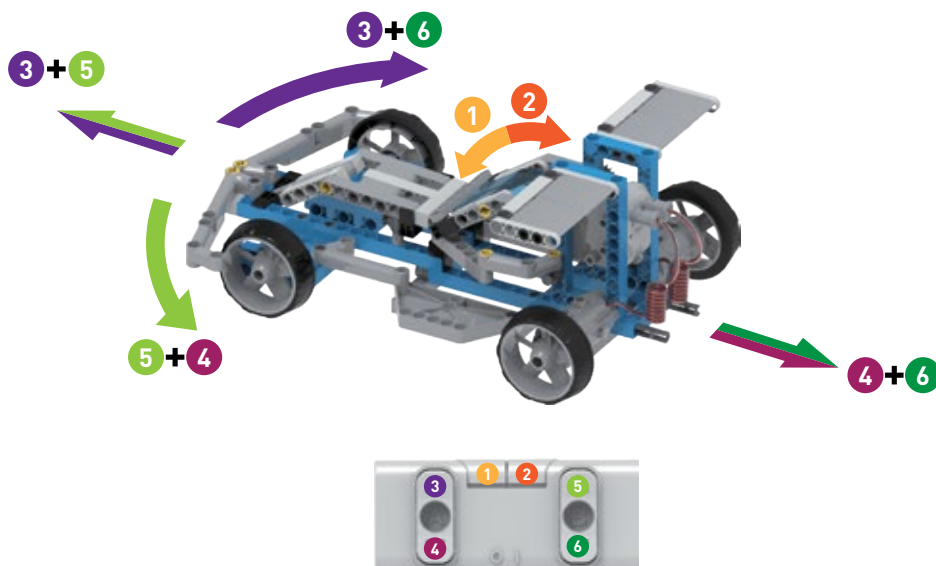
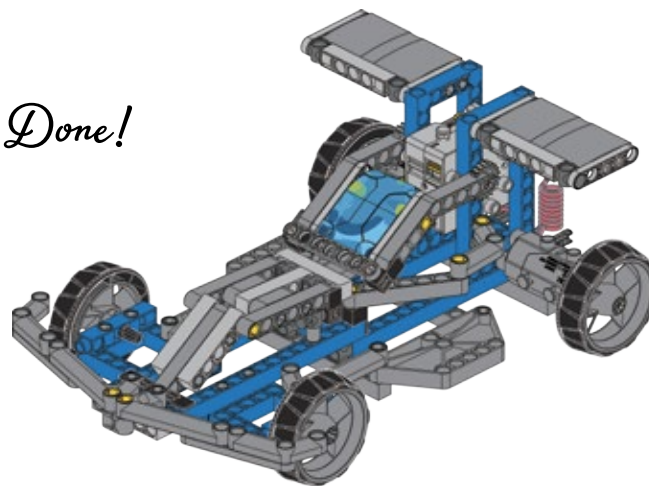
42

Look closely at the plug! Line up the small groove symbol on the plug with the red arrow before you push the plug in.



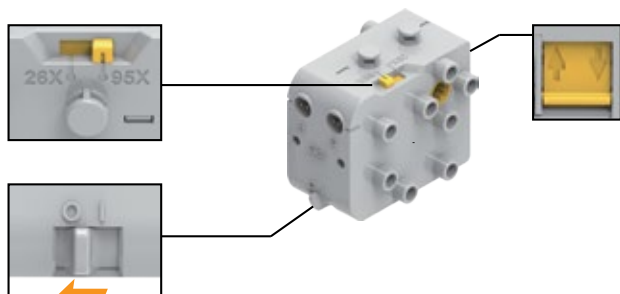
43

Done!

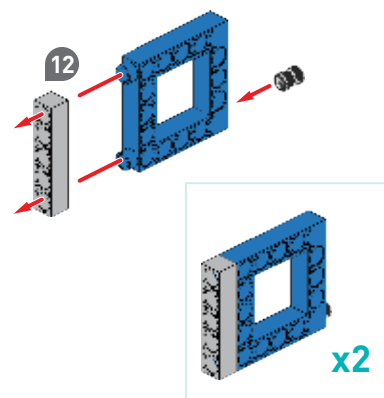


MODEL 4: CRANE

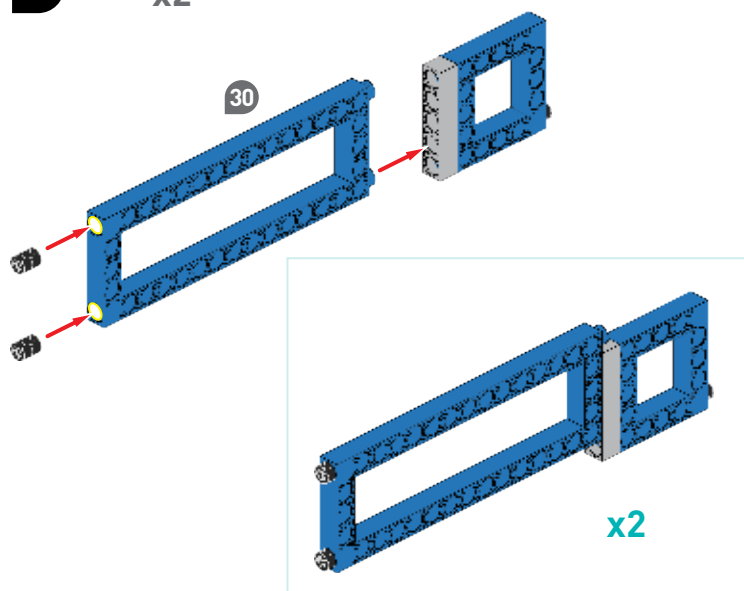
IMPORTANT!! Before starting assembly, ensure the battery is correctly installed and the following settings are configured.



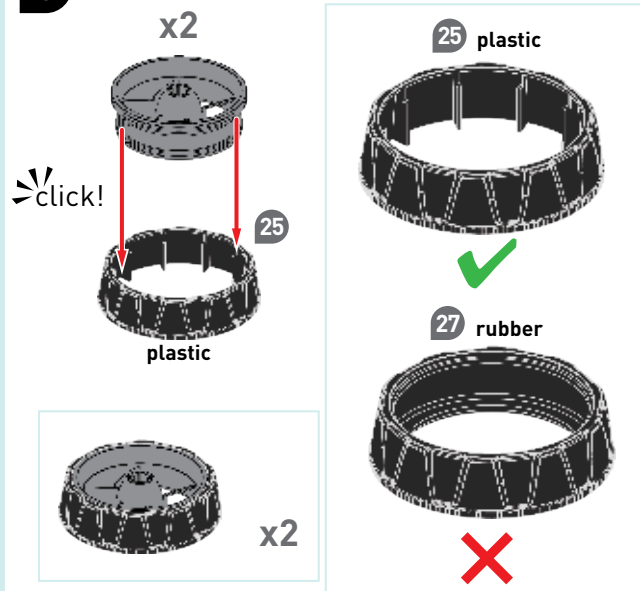
1 x2



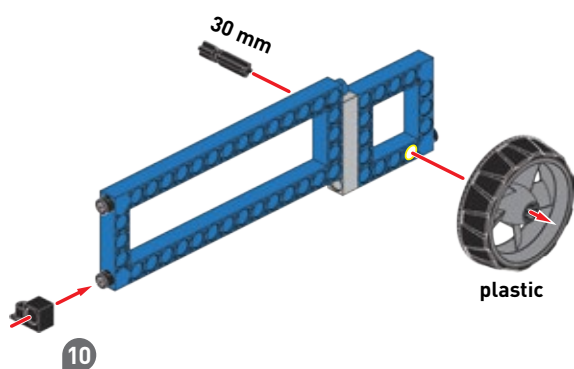
2 x2



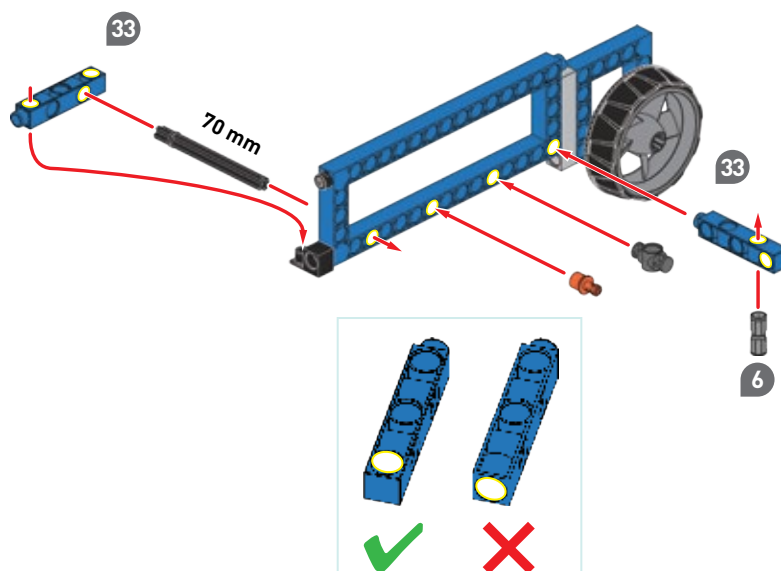
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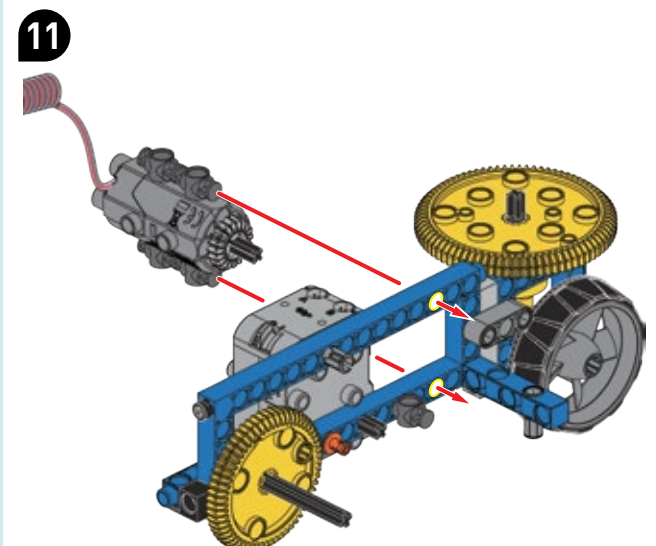
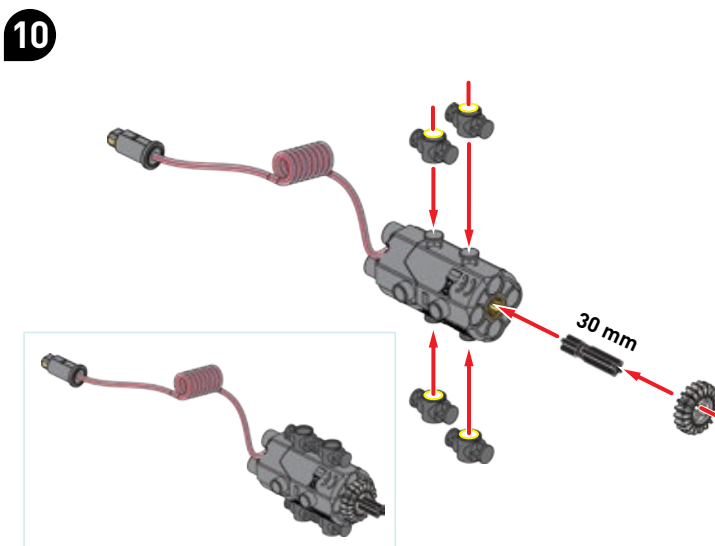
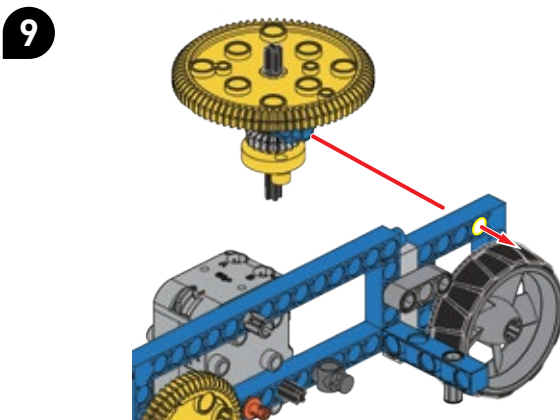
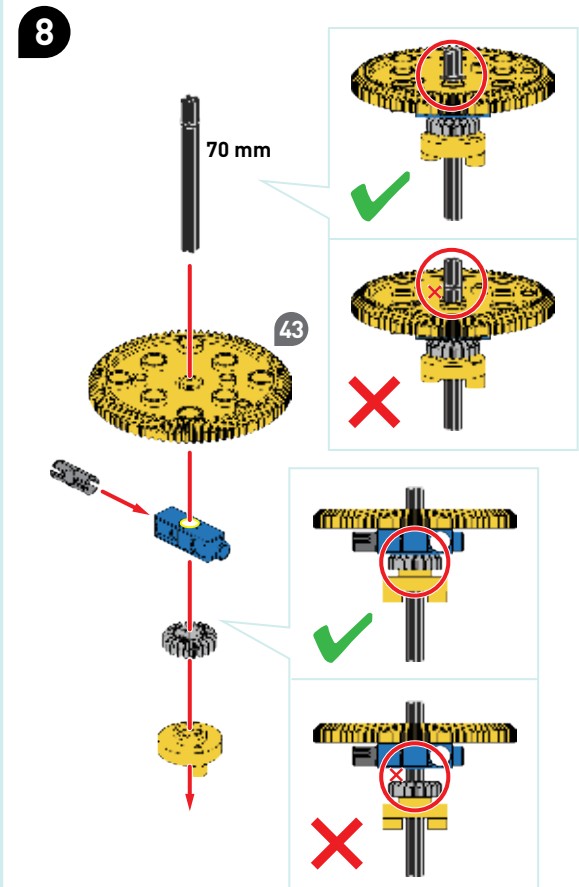
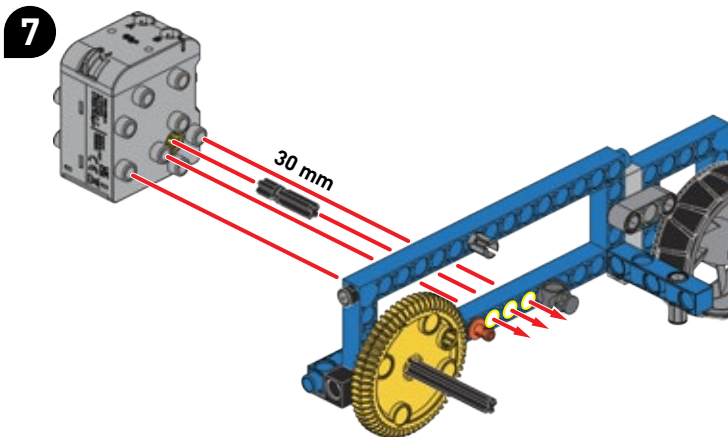
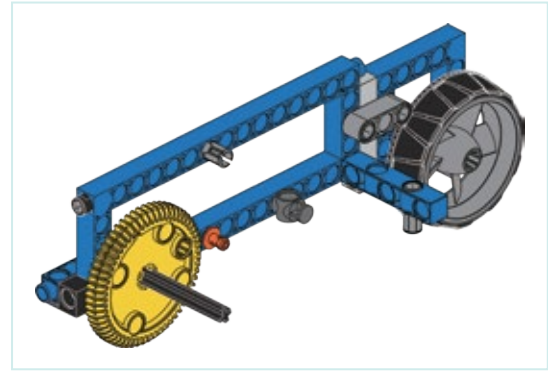
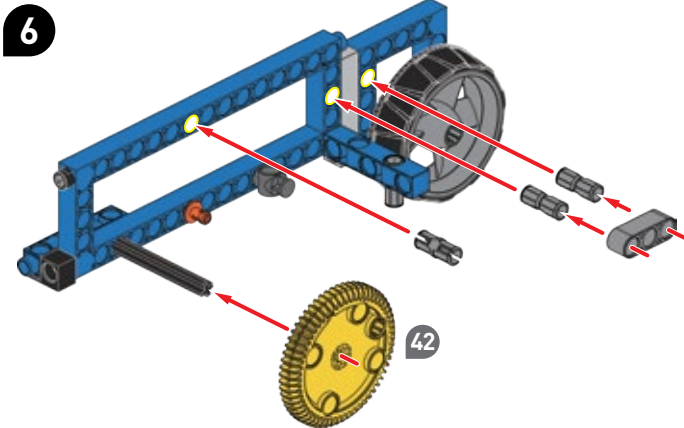


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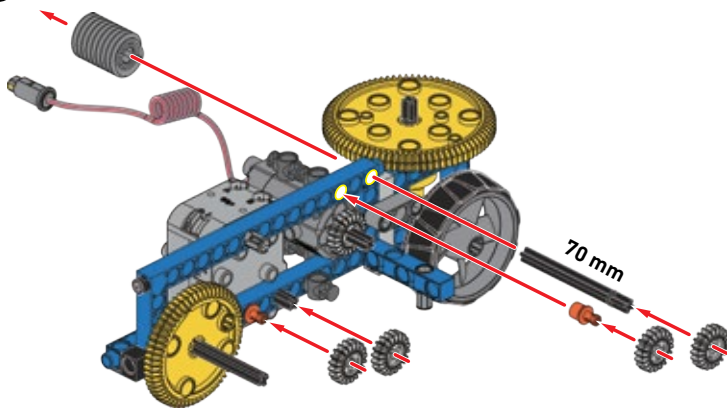


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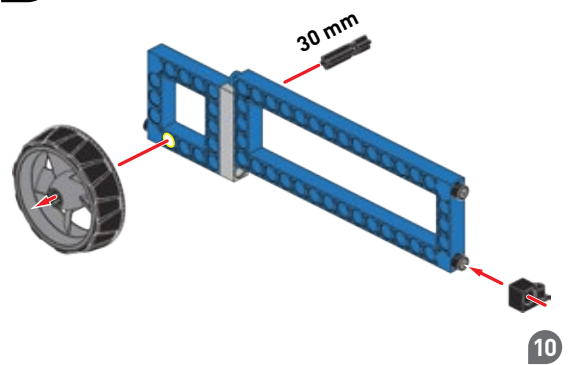




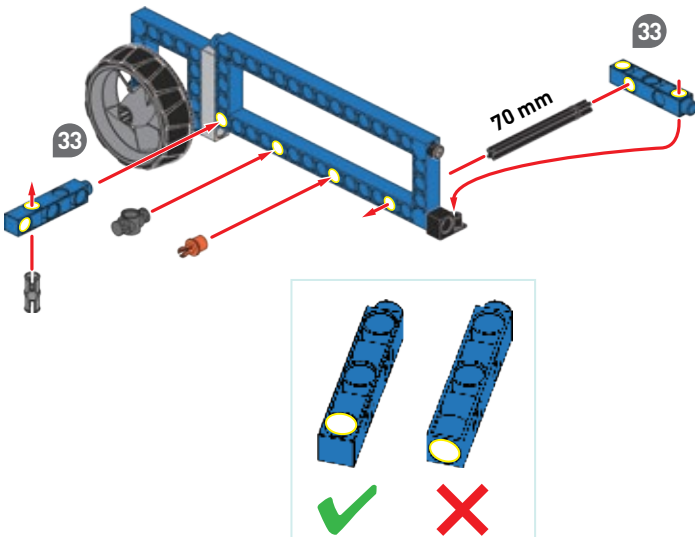
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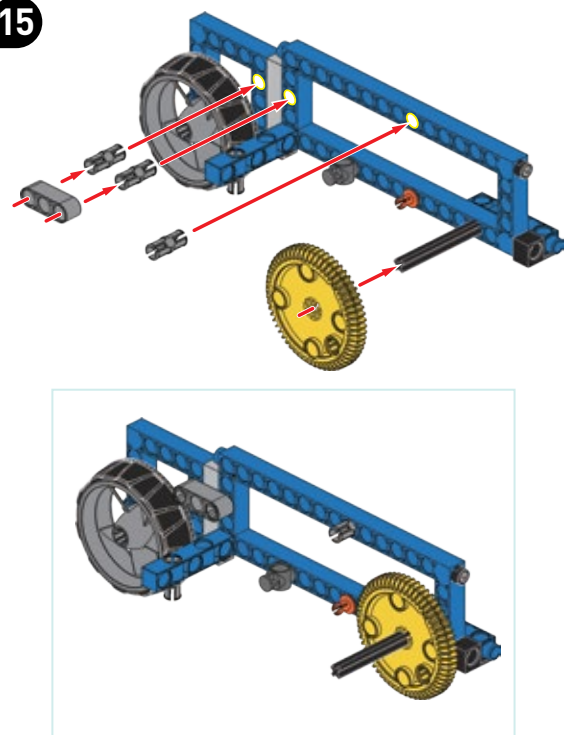
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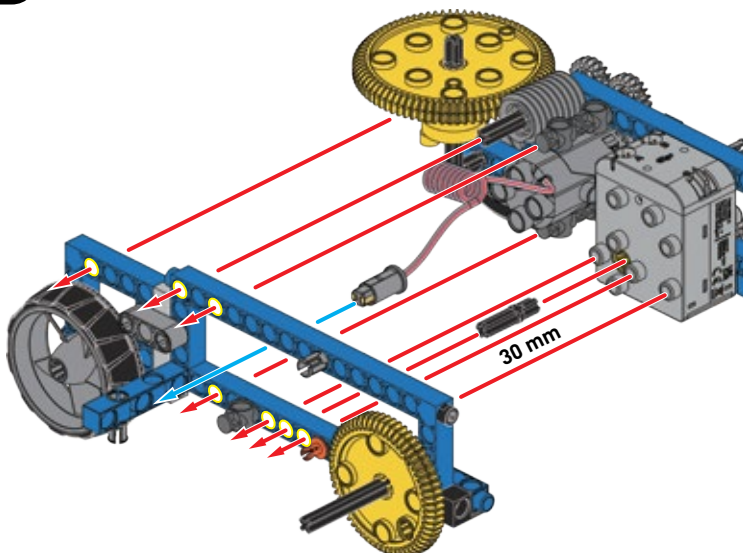
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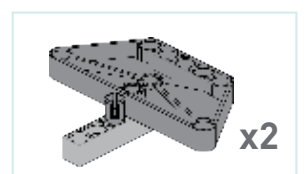
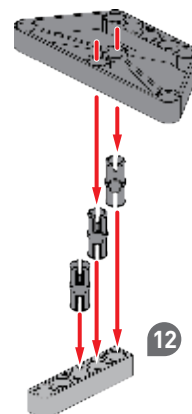


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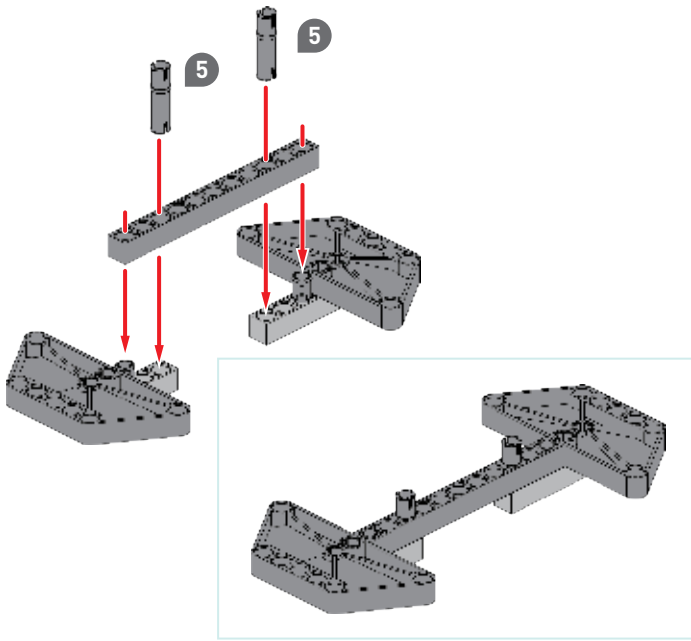


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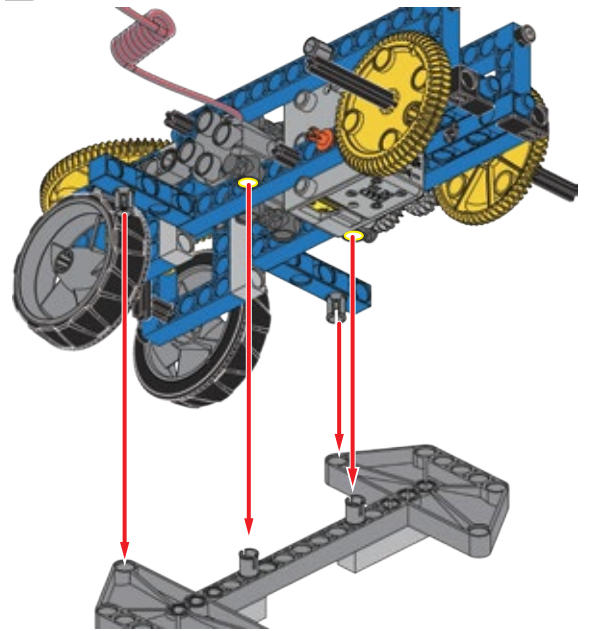
x2



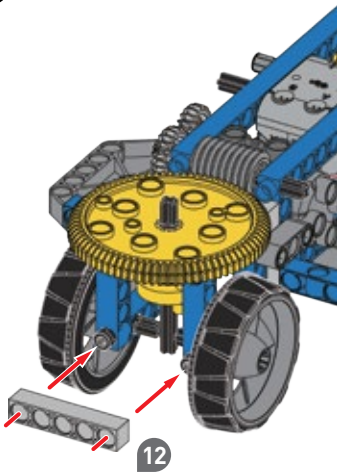
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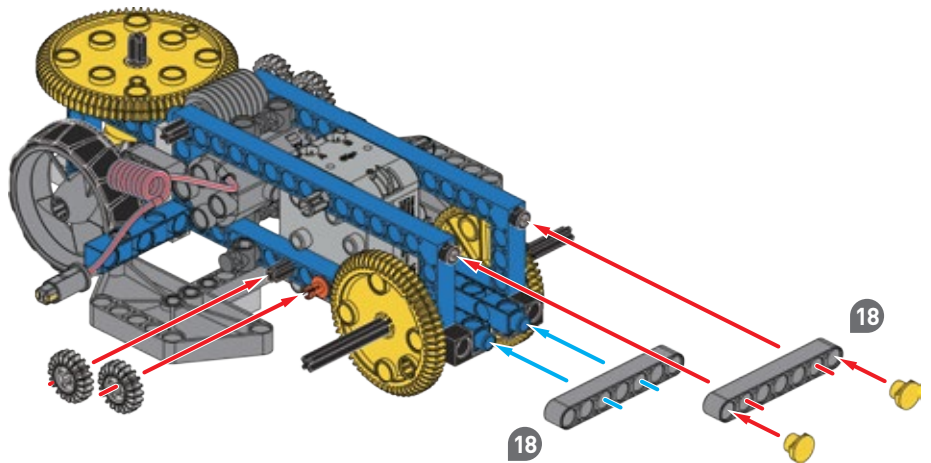
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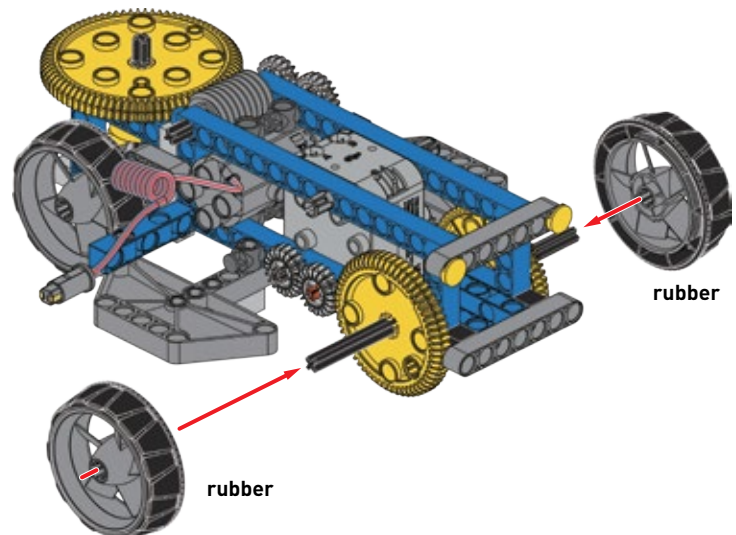
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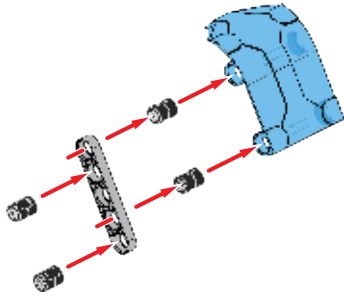
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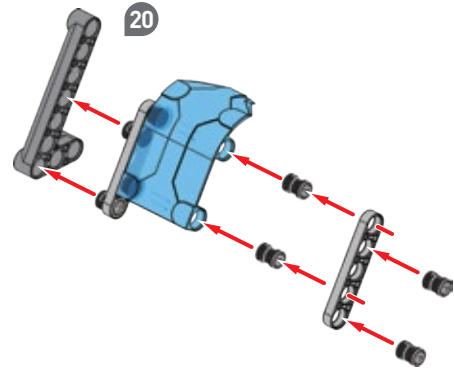
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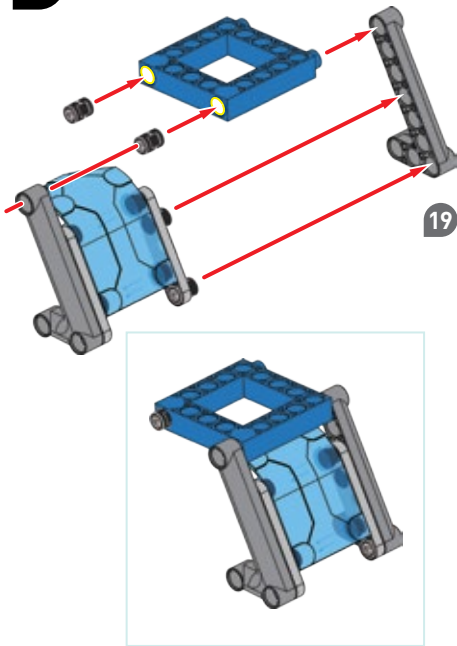
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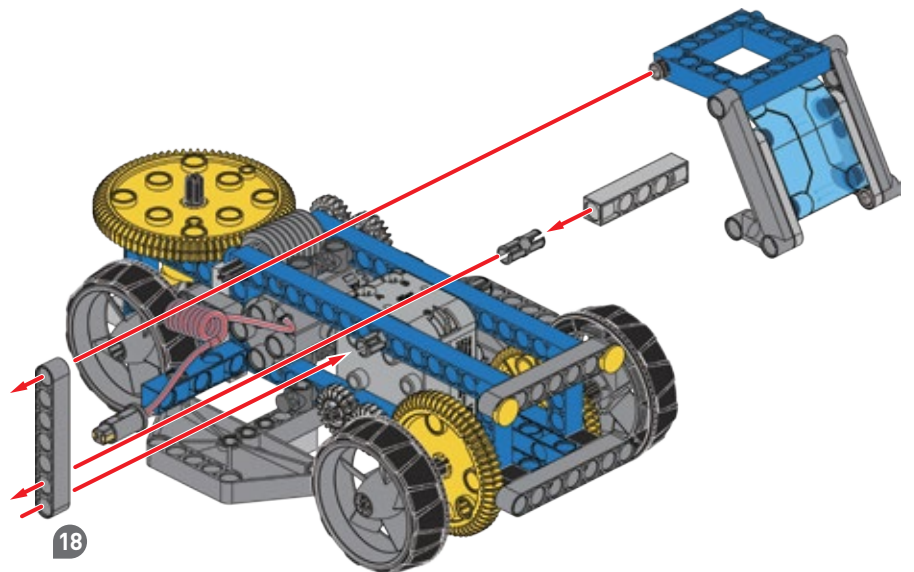
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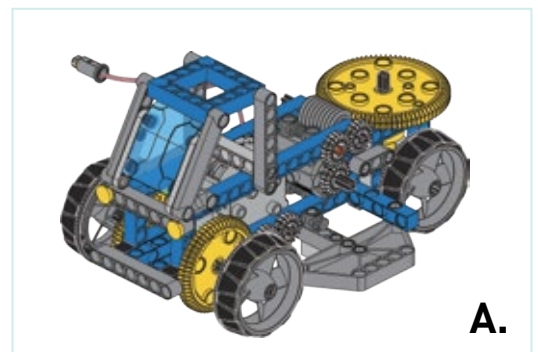
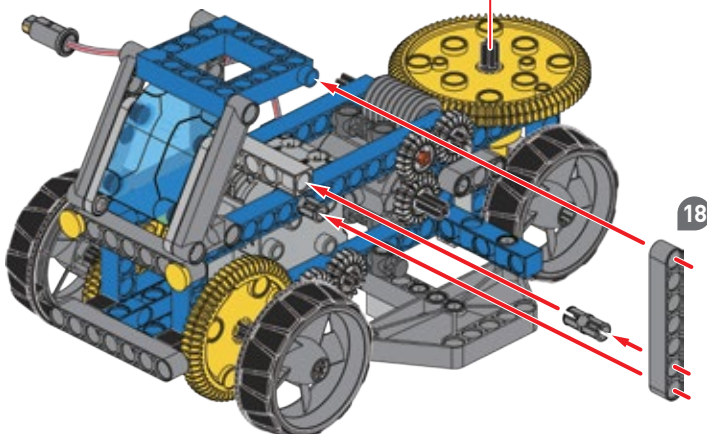
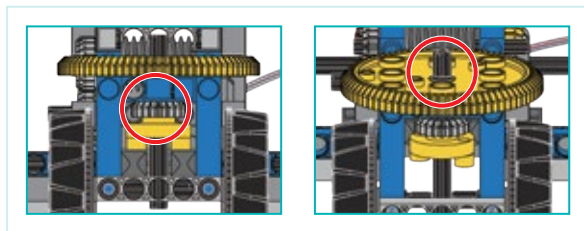
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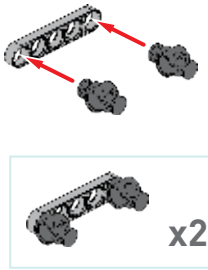
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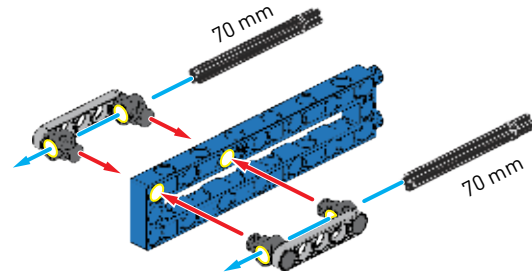
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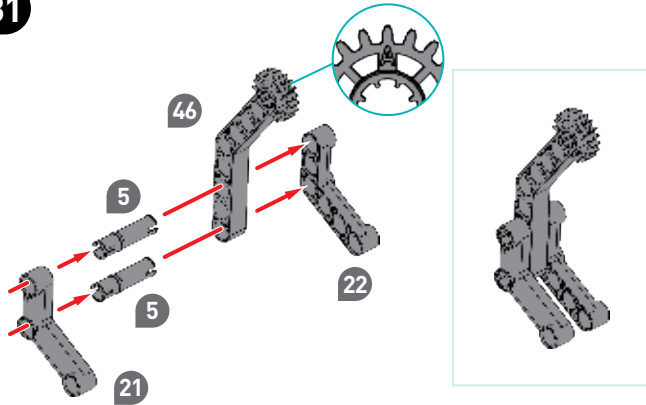
29 x2



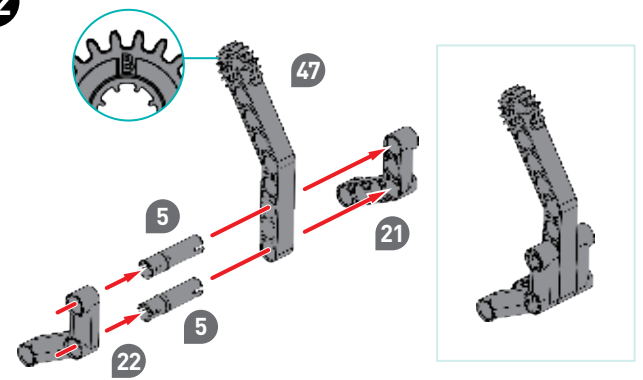
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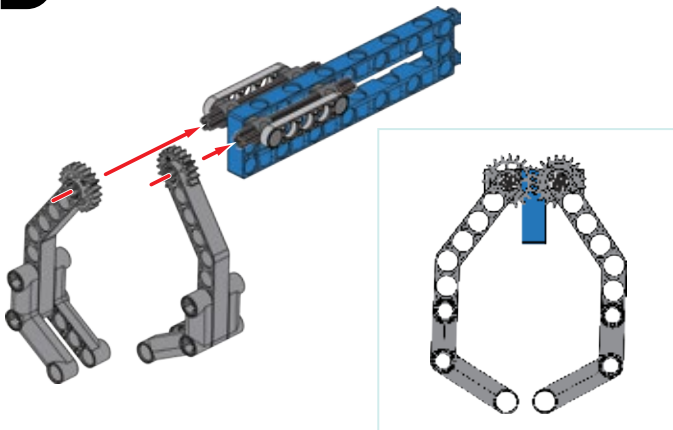
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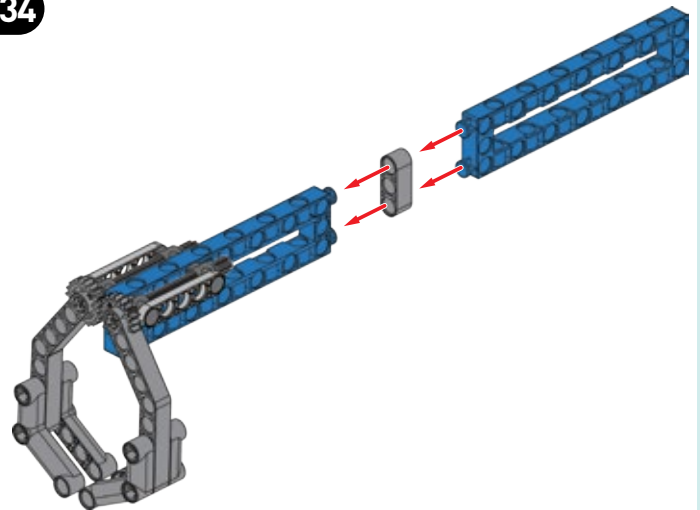
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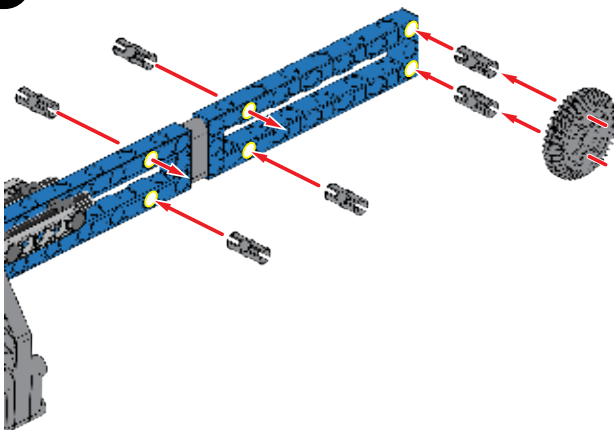
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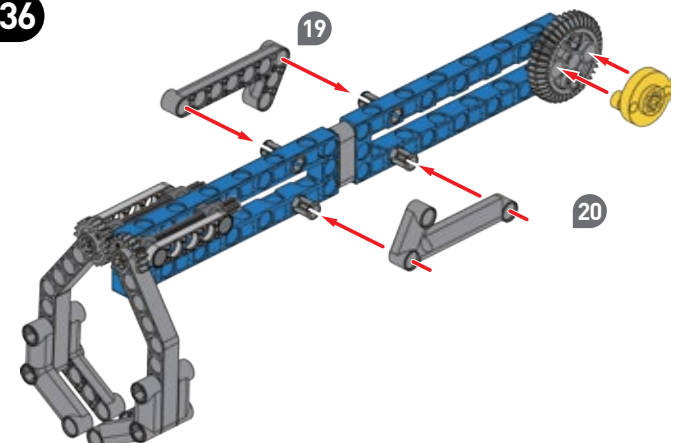
34



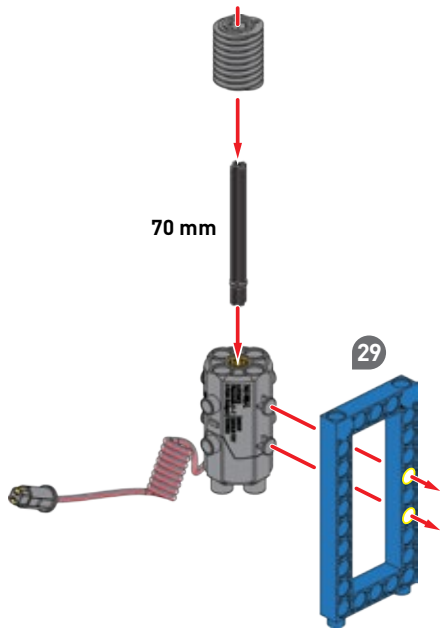
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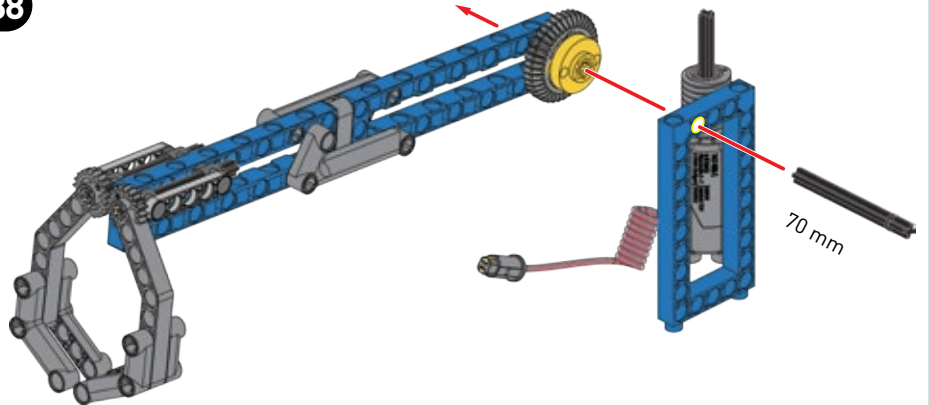
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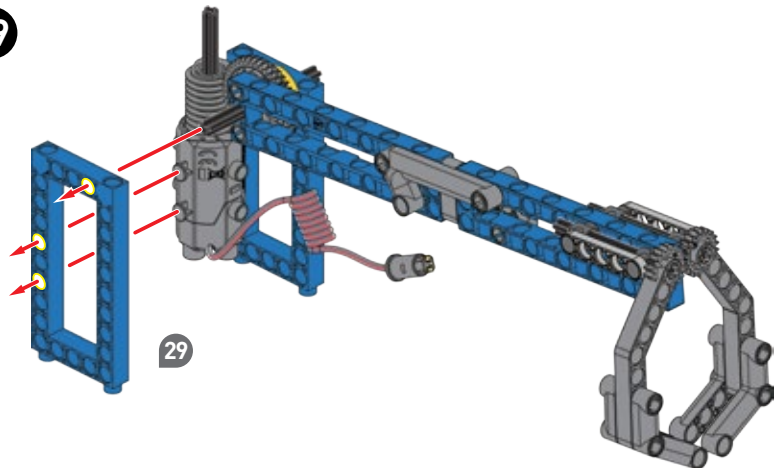
37



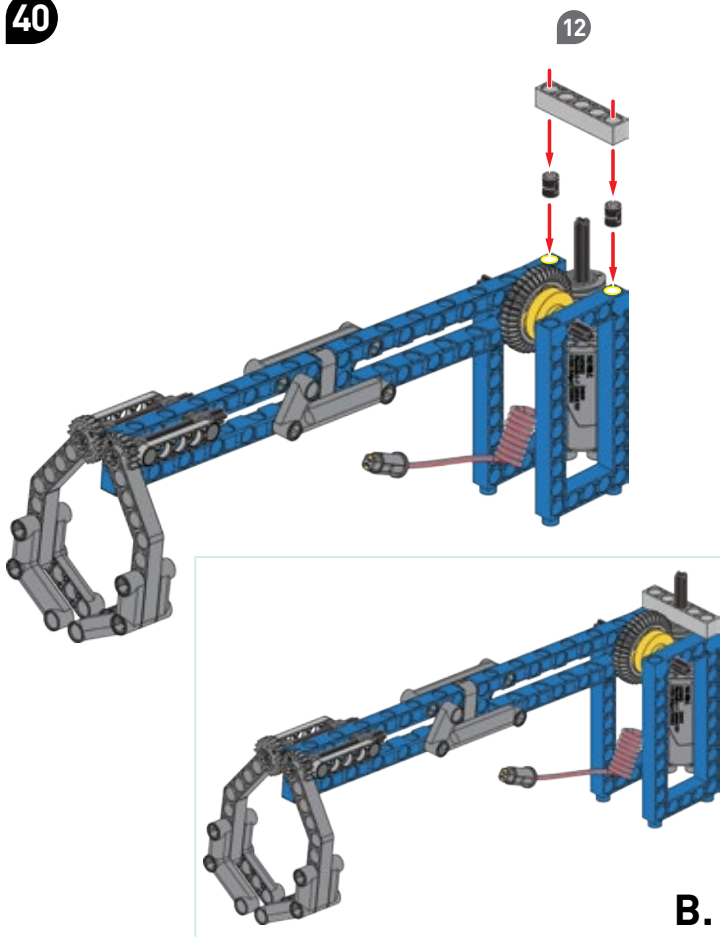
38



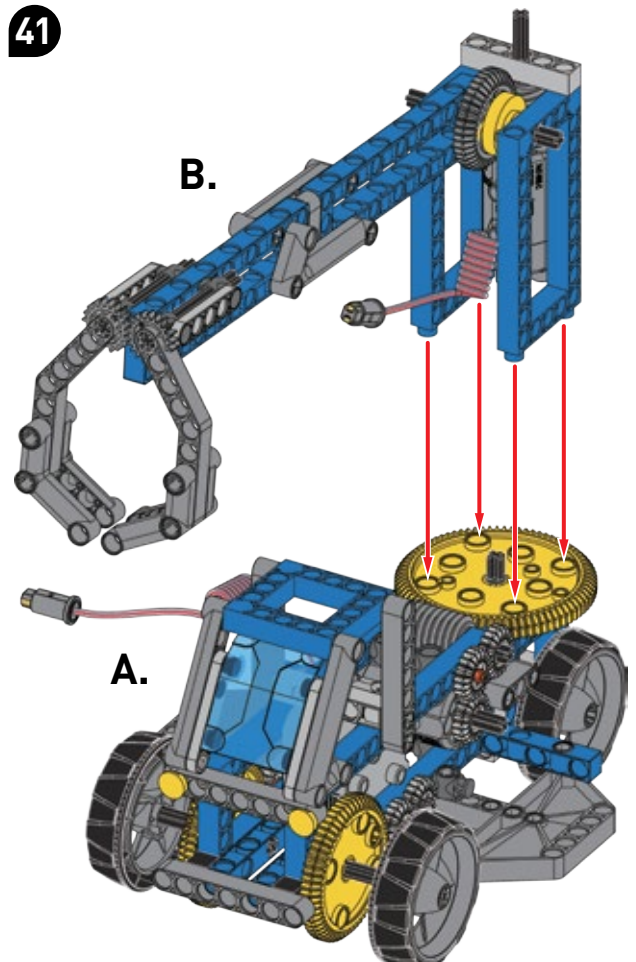
39



40

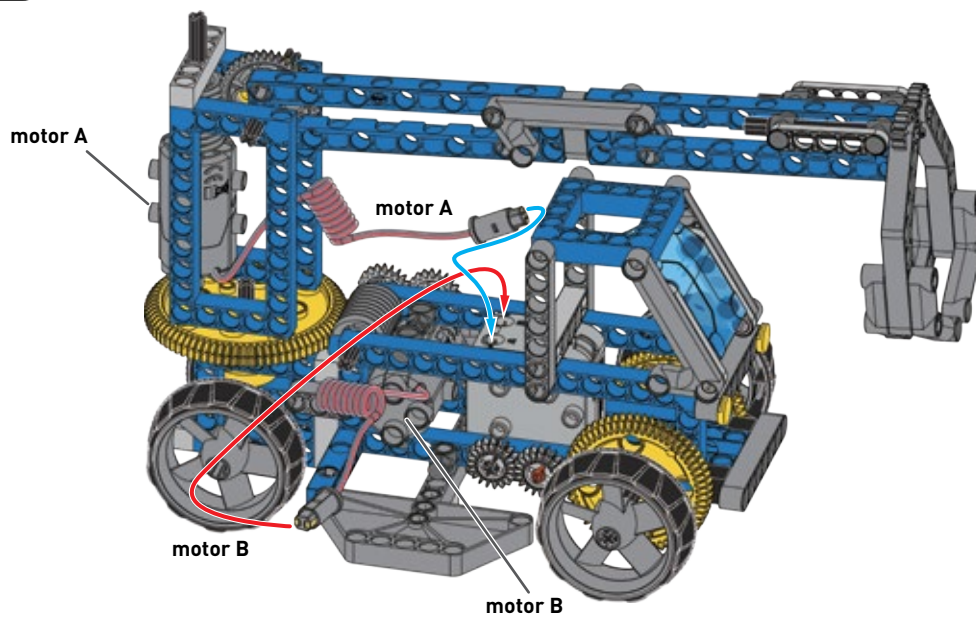


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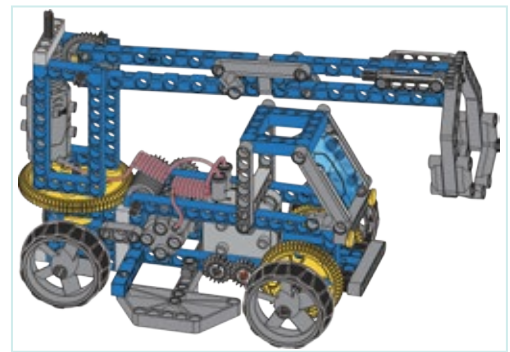
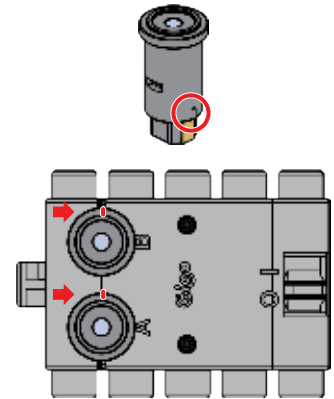




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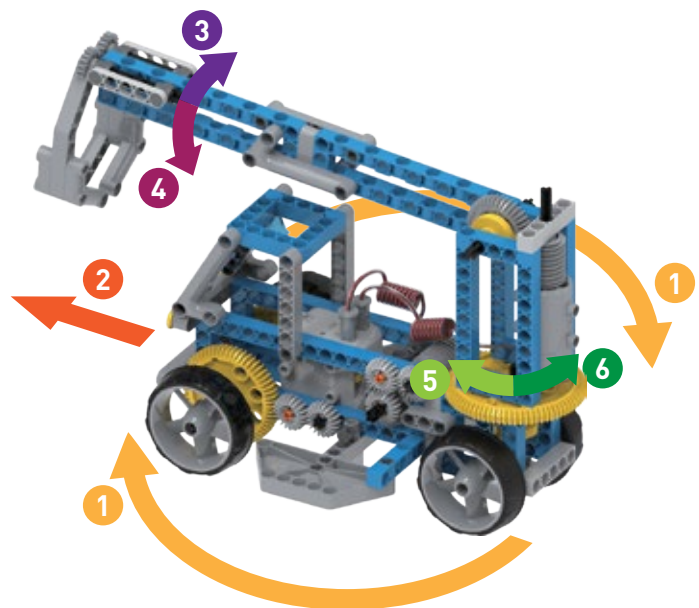
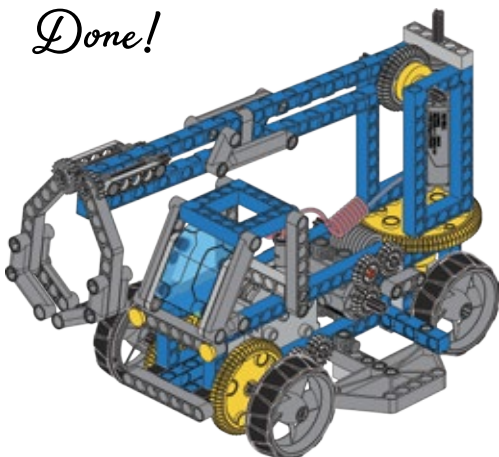


Look closely at the plug! Line up the small groove symbol on the plug with the red arrow before you push the plug in.



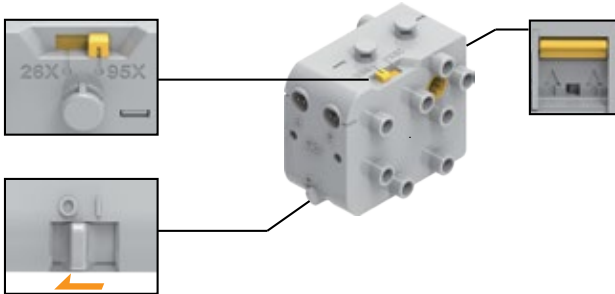
43

Done!

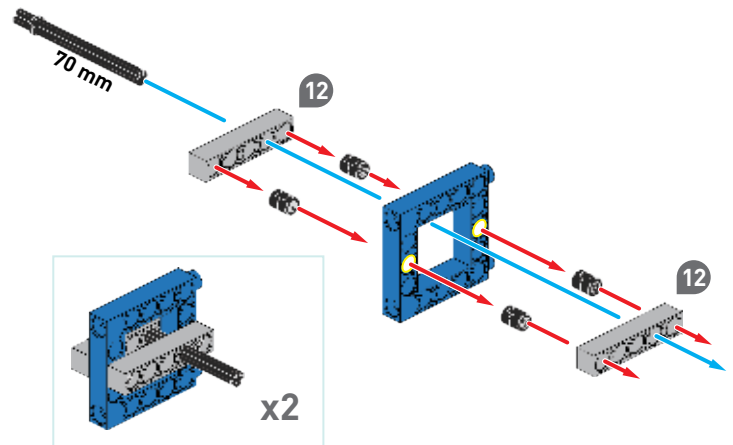


MODEL 5: BULLDOZER

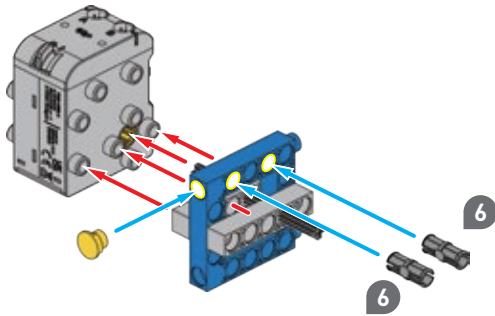
IMPORTANT!! Before starting assembly, ensure the battery is correctly installed and the following settings are configured.



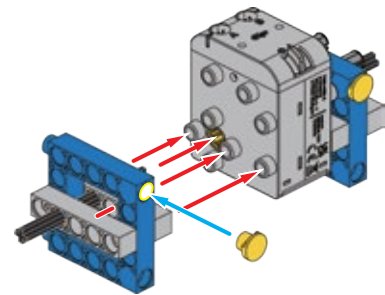
1 x2



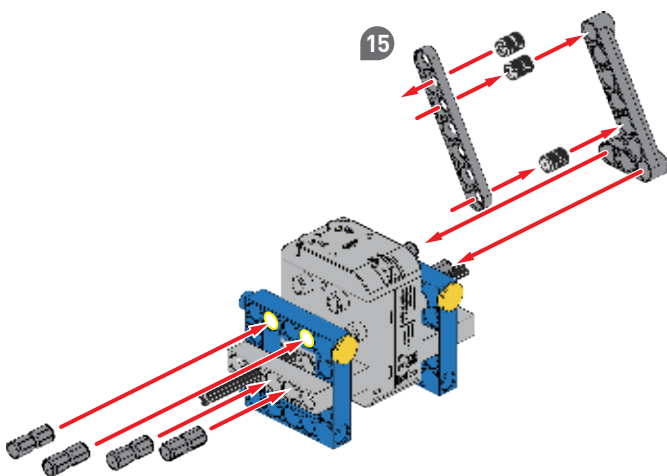
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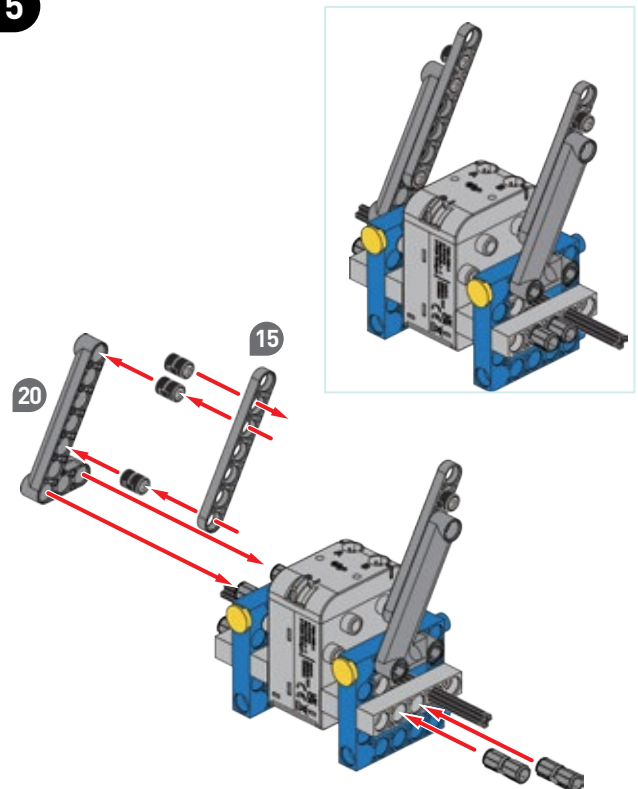
3



4

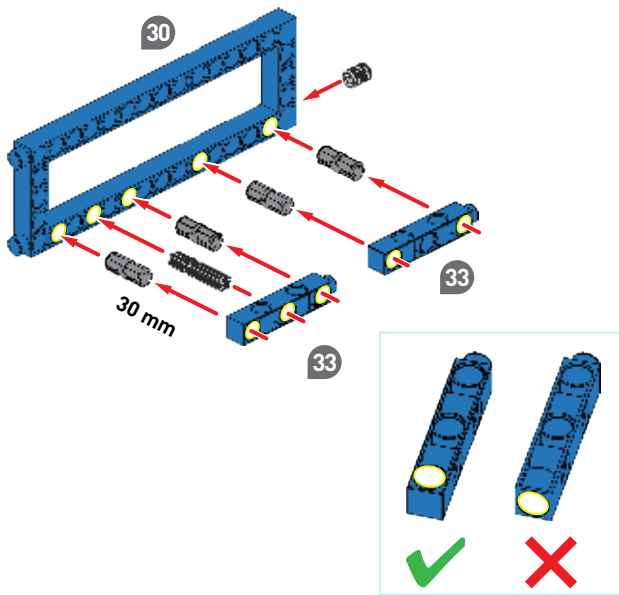


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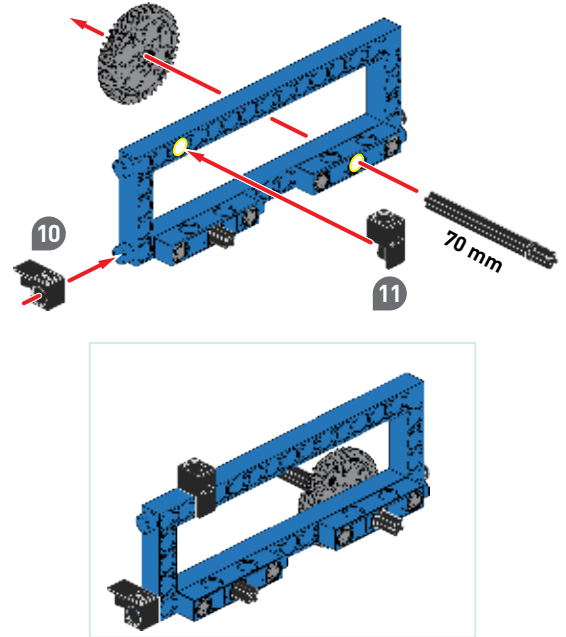




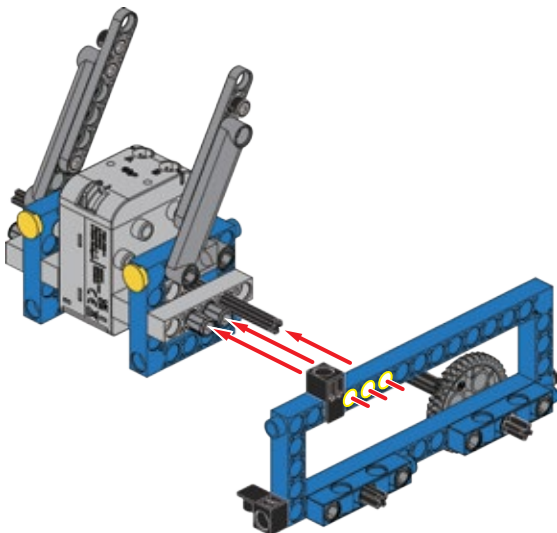
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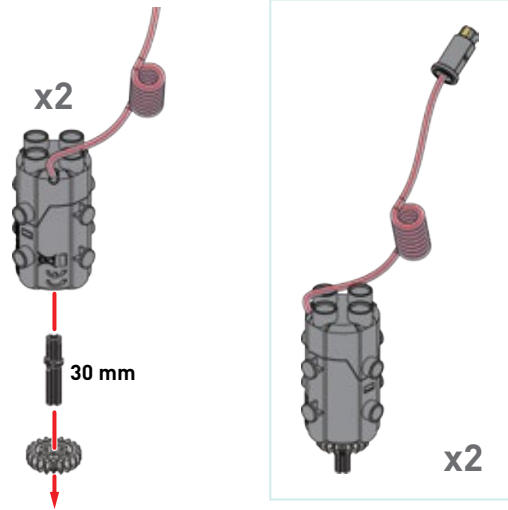
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8



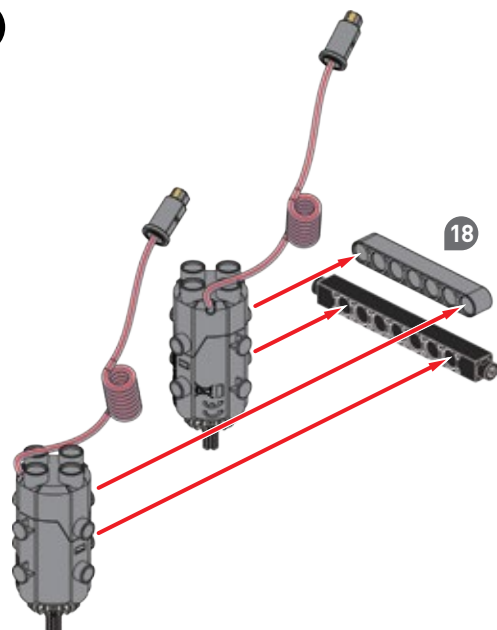
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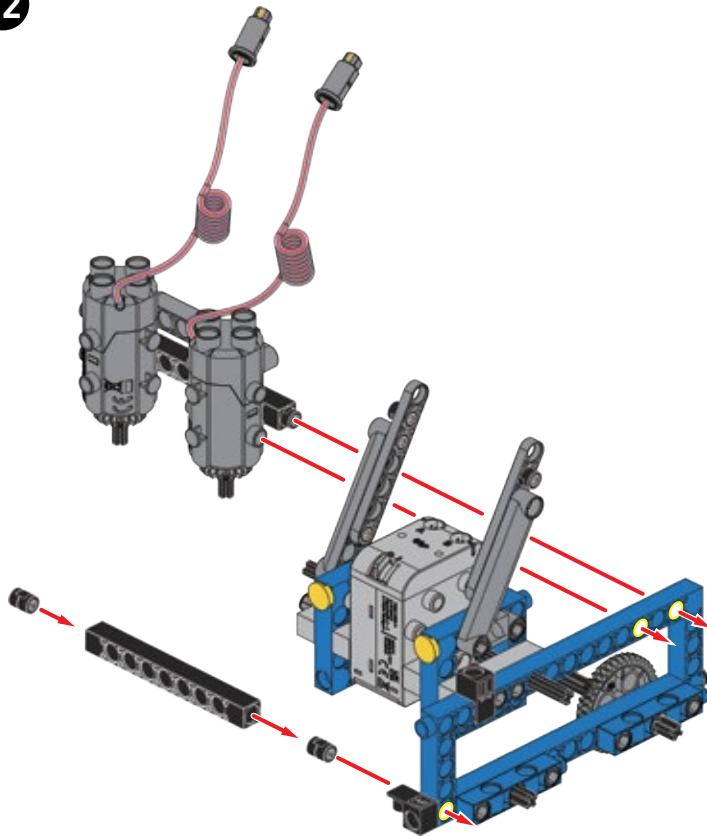
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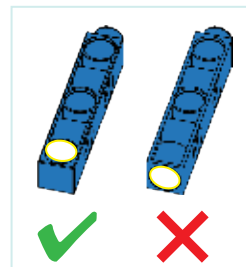
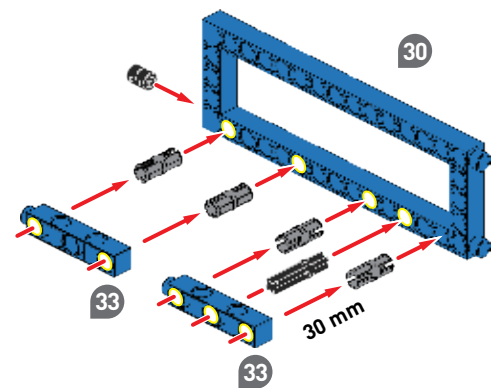
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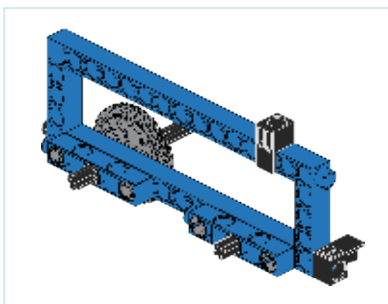
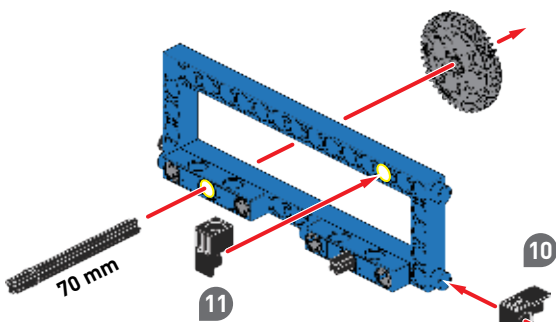
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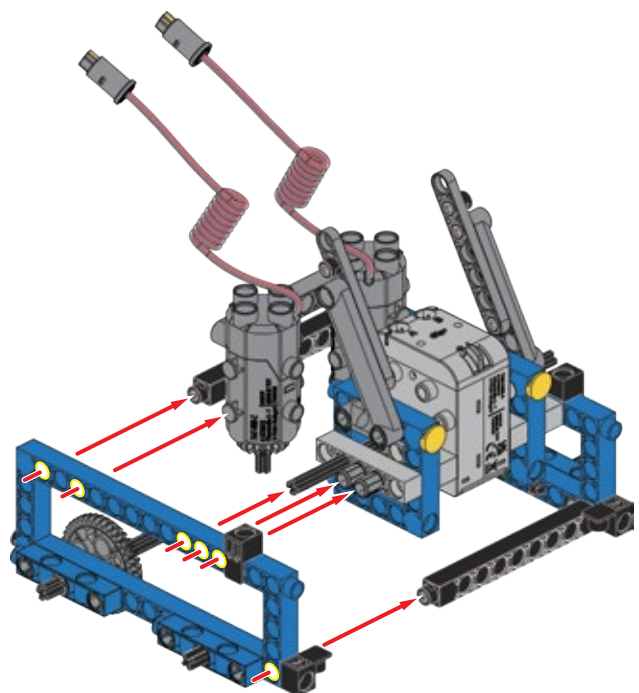
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14

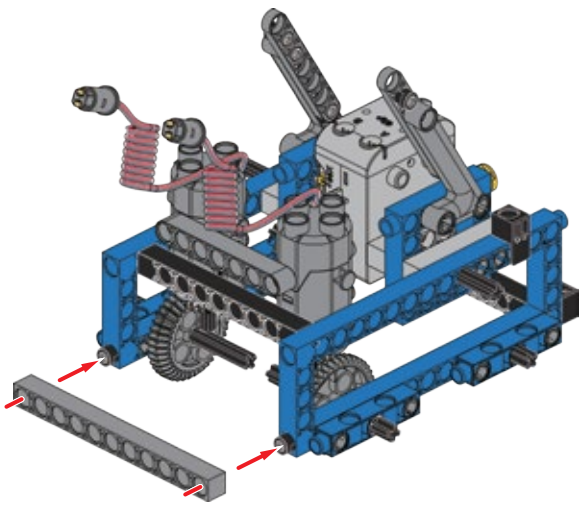


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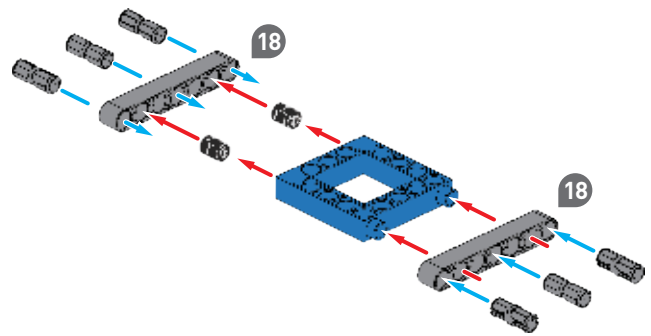




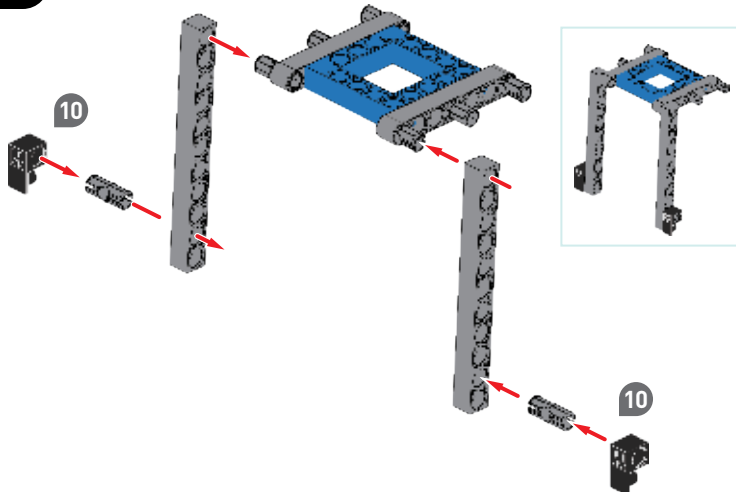
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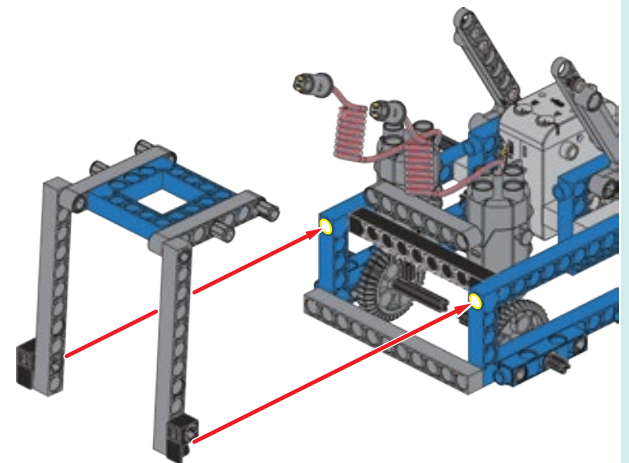
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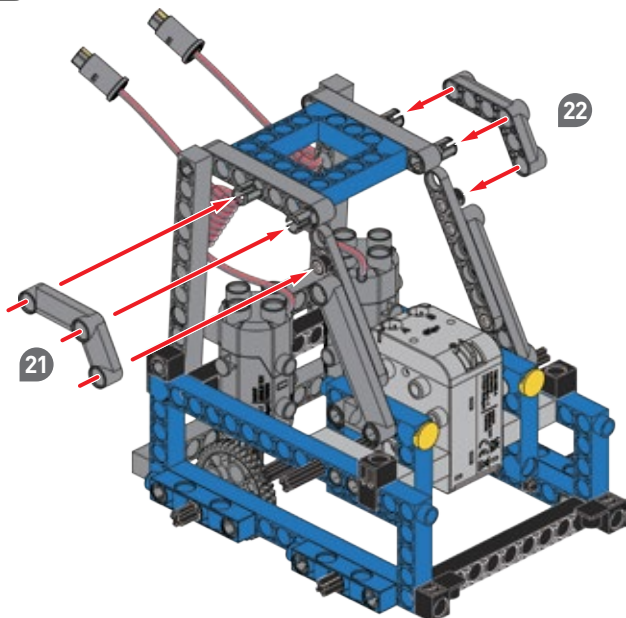
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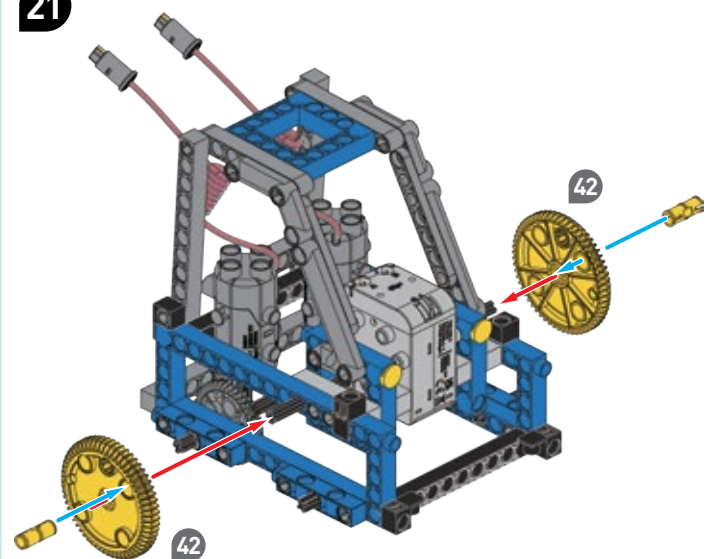
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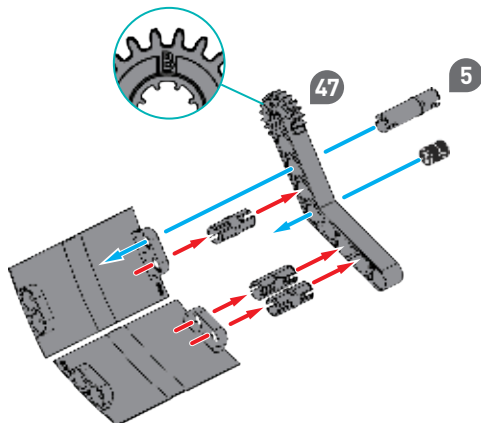
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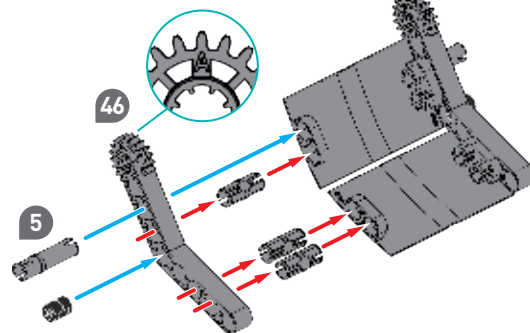
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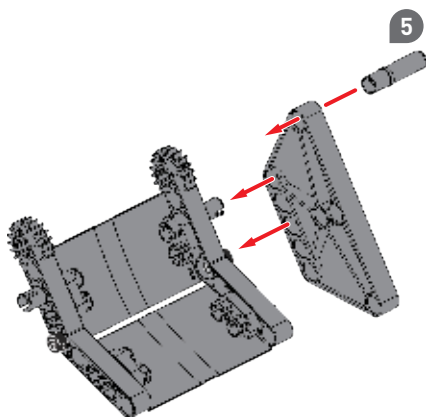
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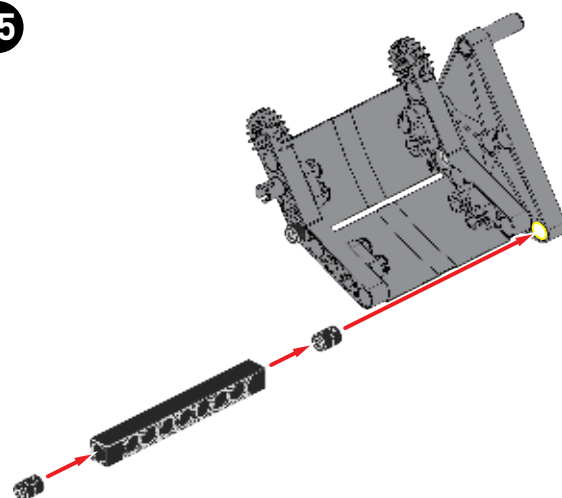
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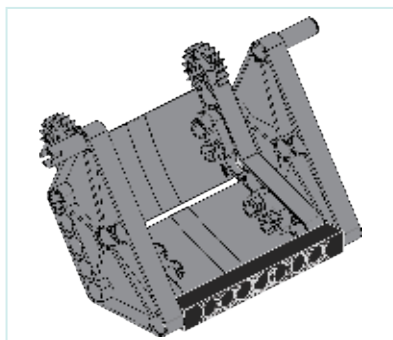
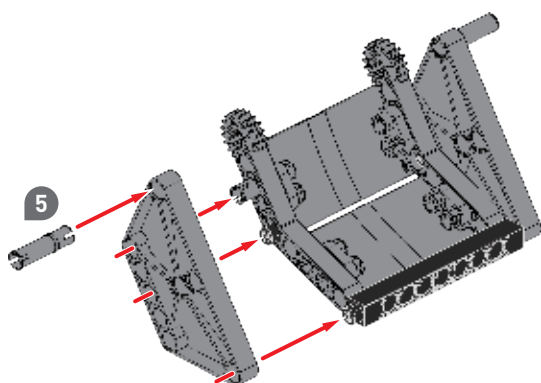
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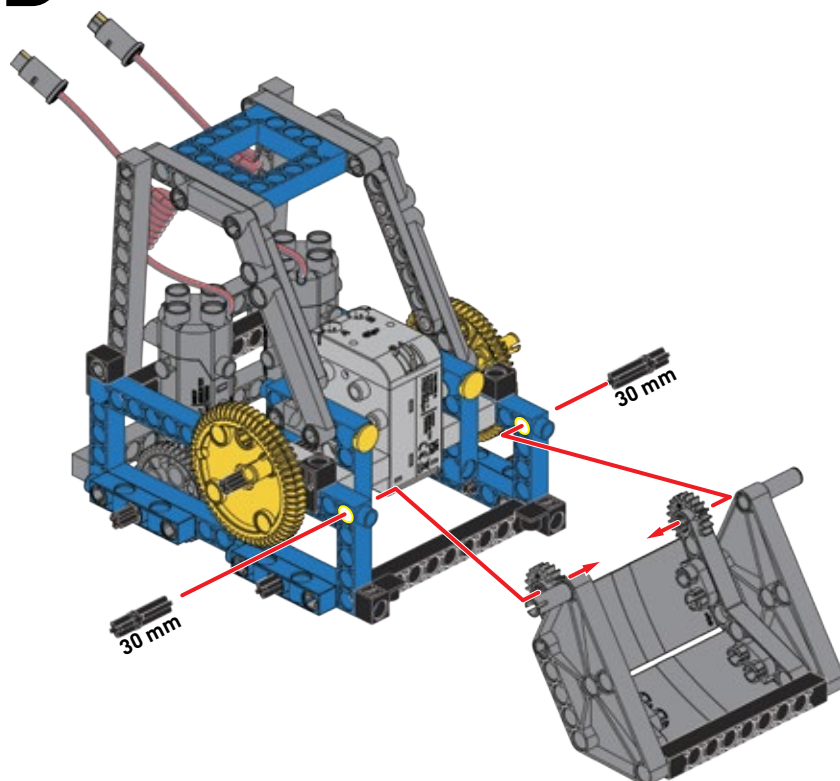
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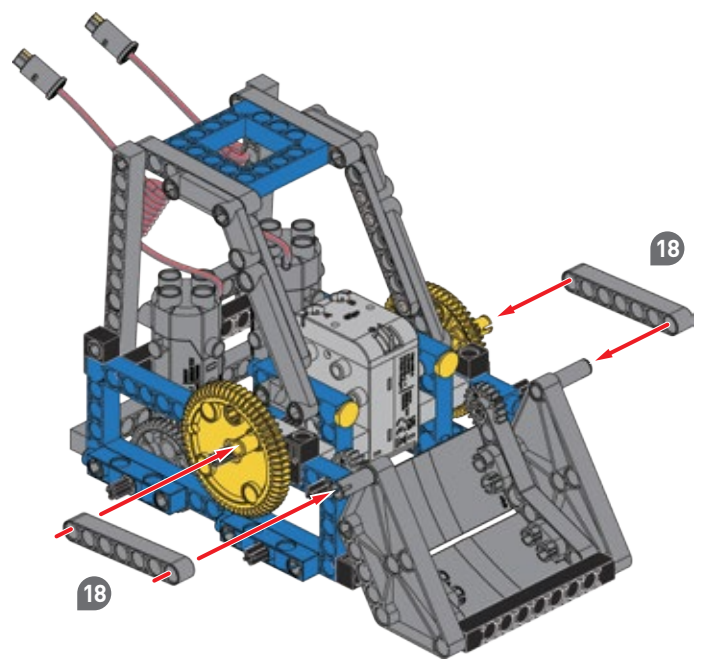
26



27



28



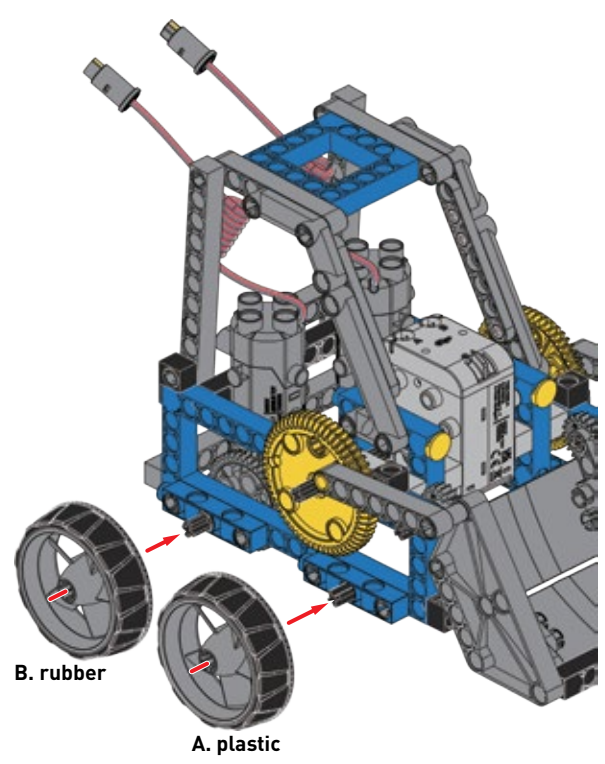
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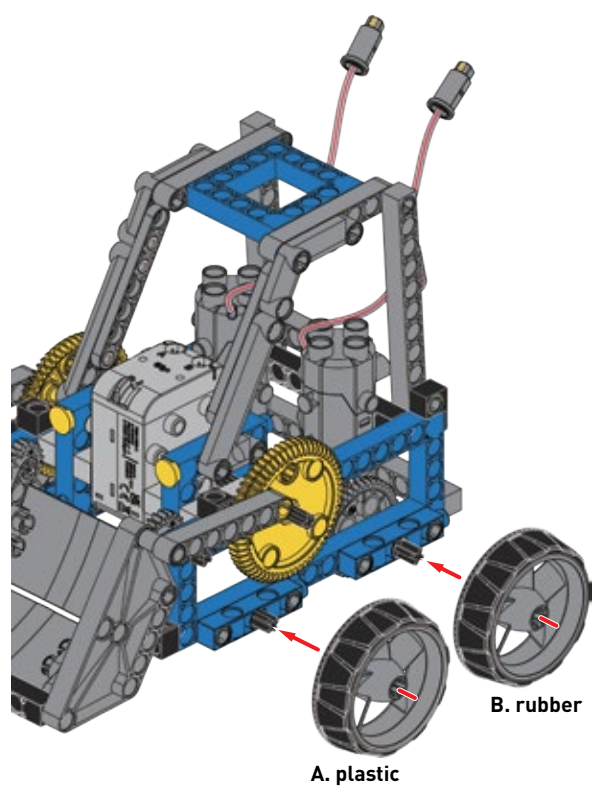
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31

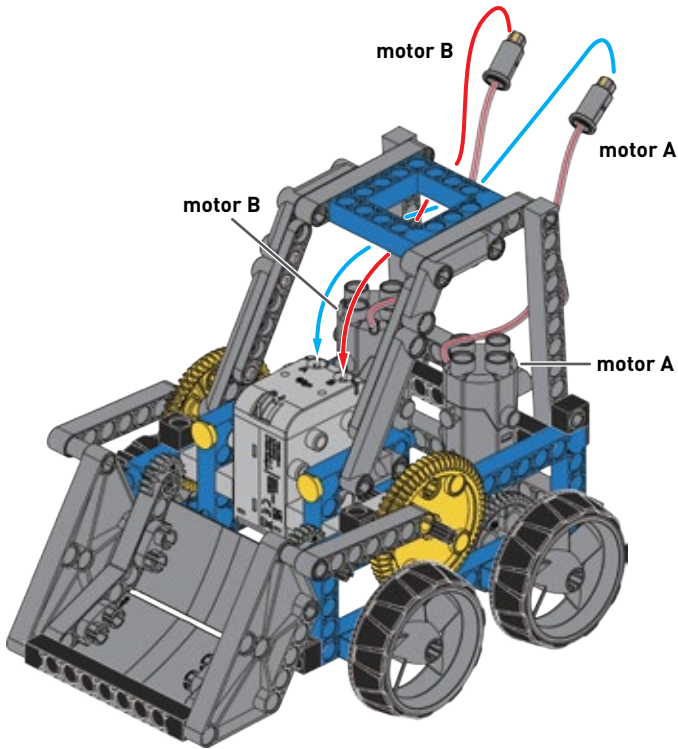
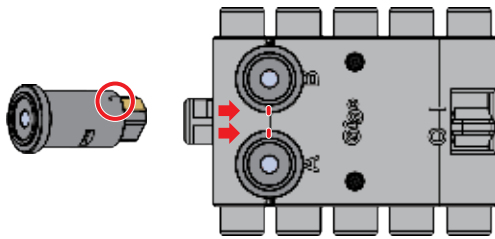


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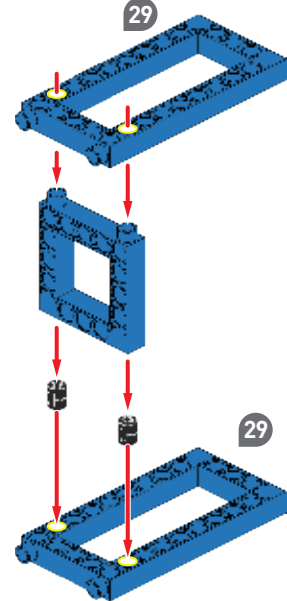


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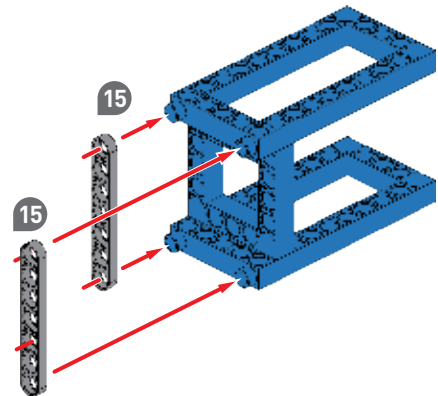
Look closely at the plug! Line up the small groove symbol on the plug with the red arrow before you push the plug in.



34

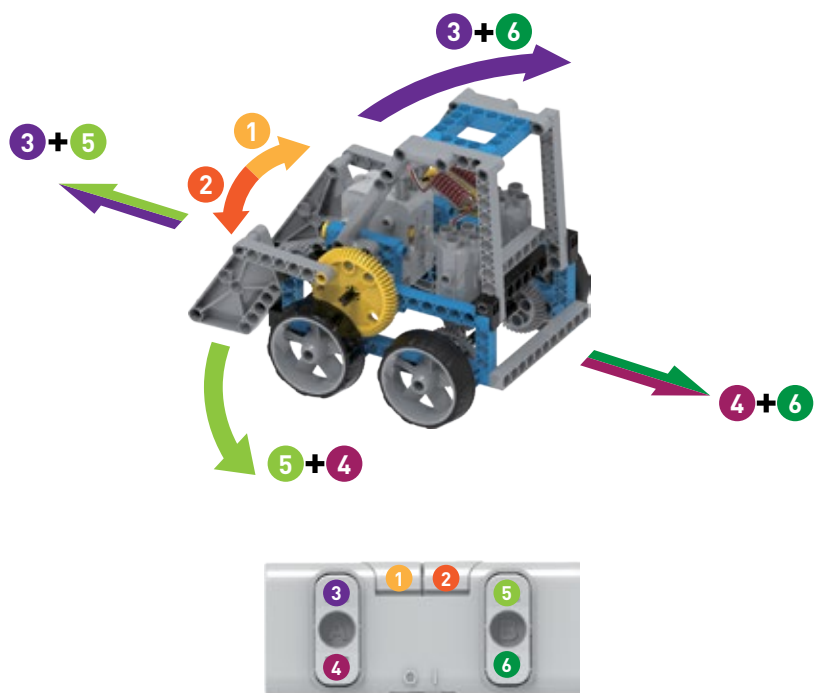
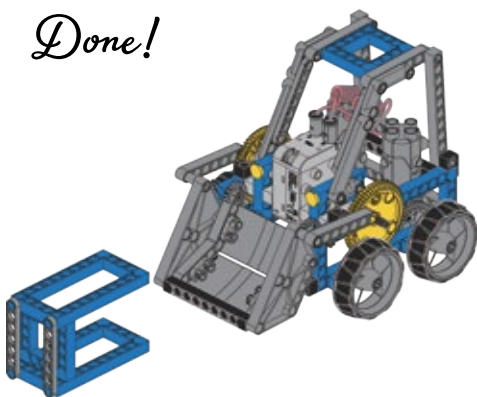


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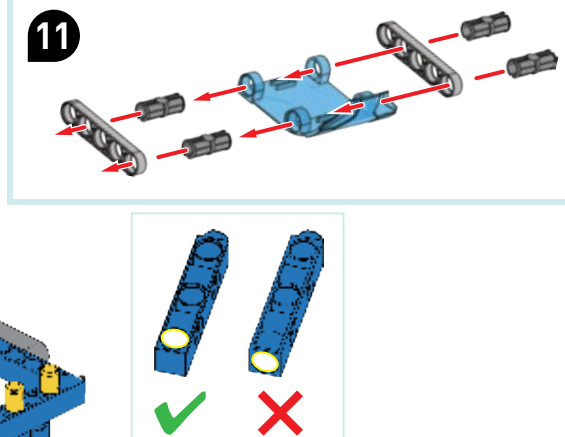
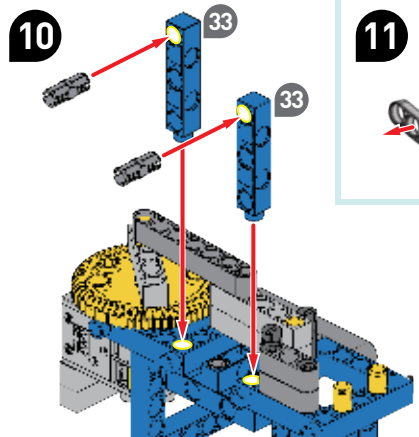
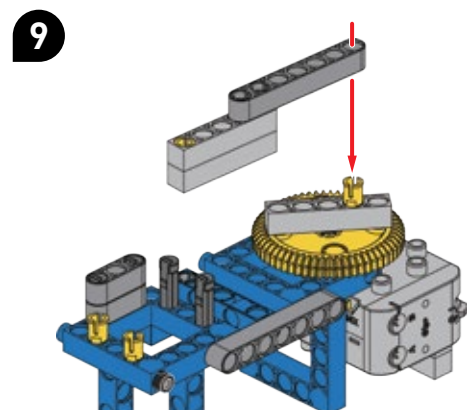
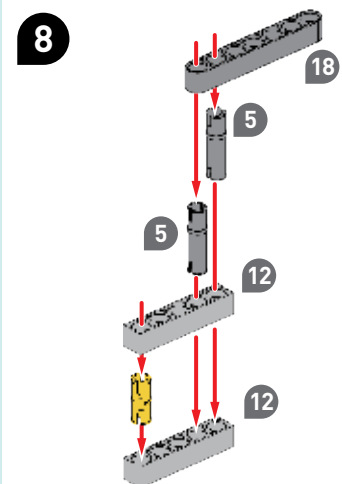
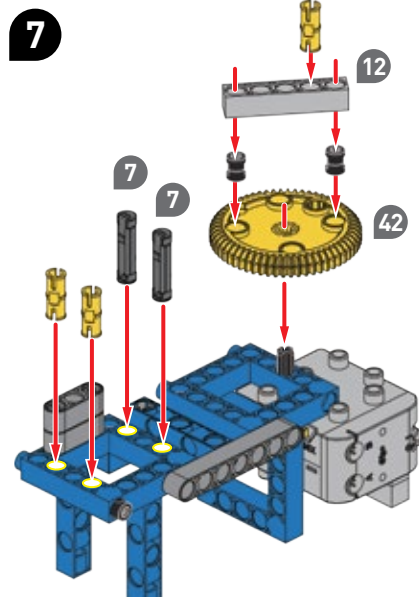
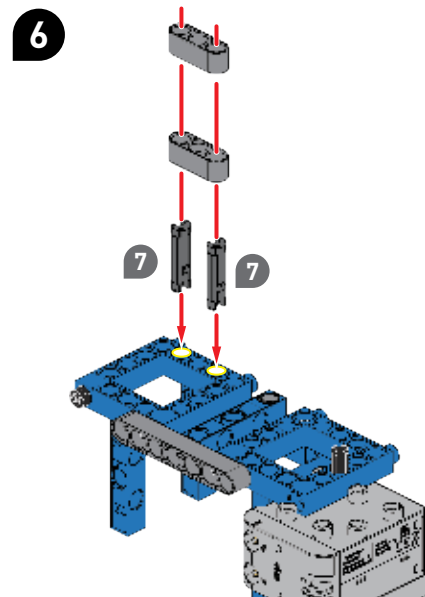
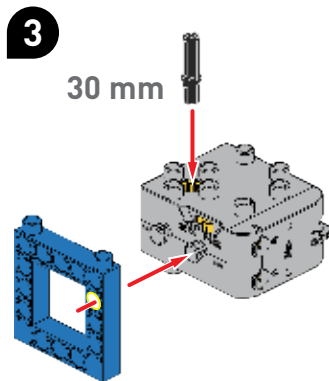
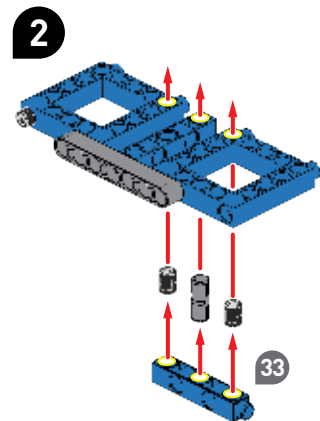
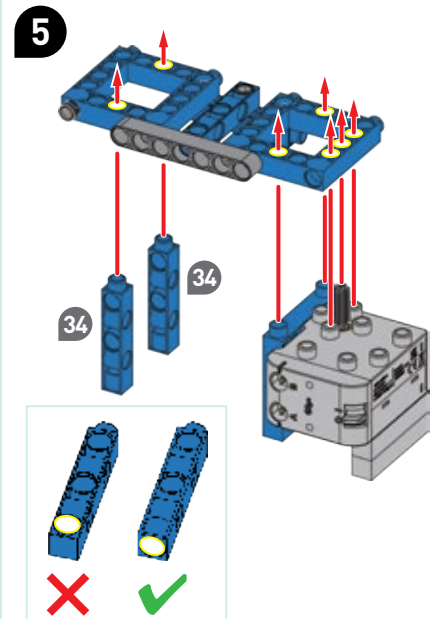
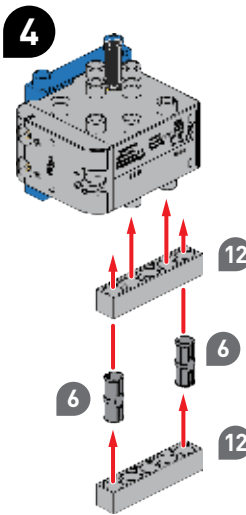
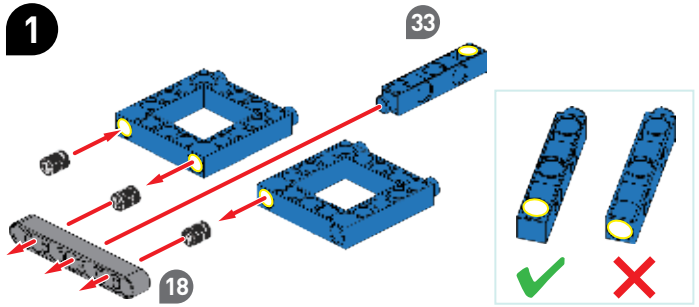
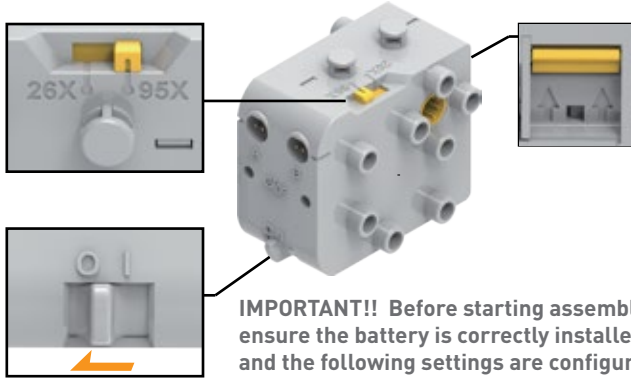
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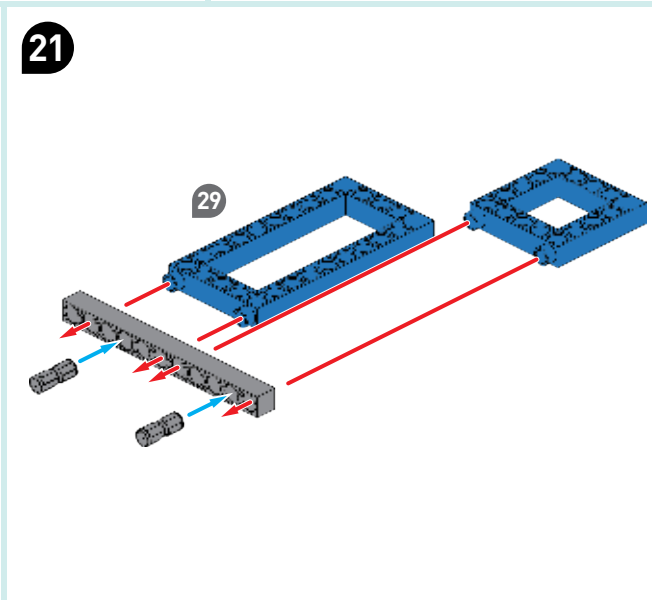
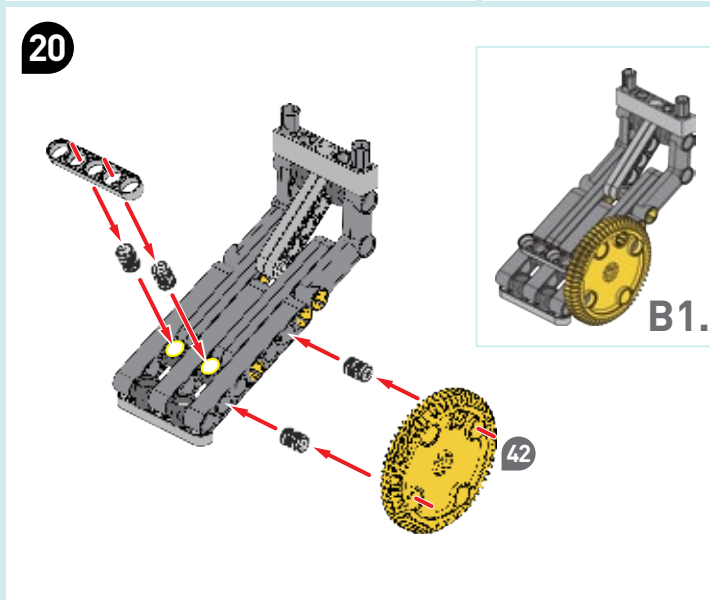
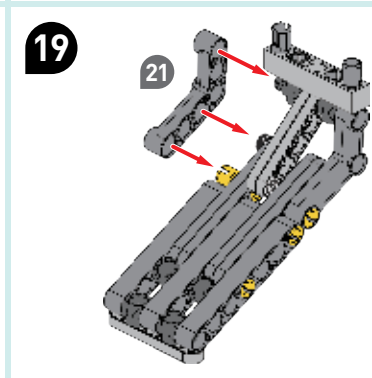
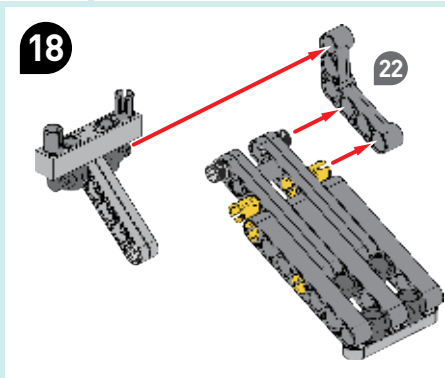
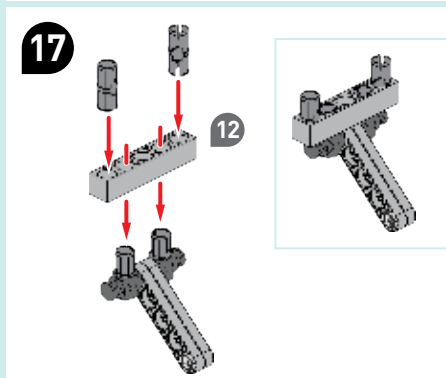
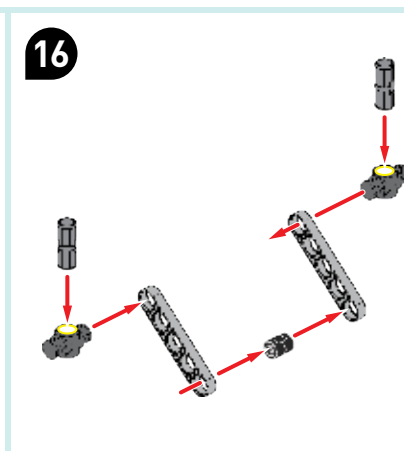
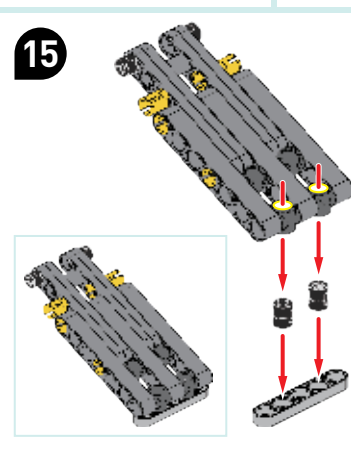
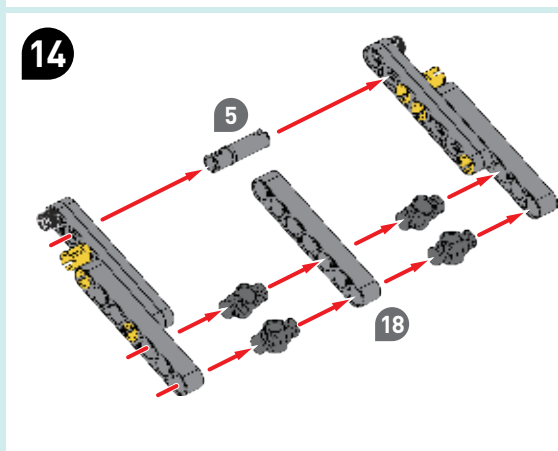
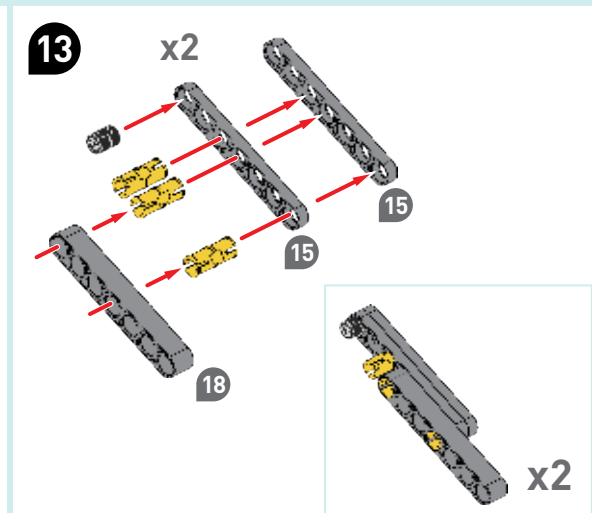
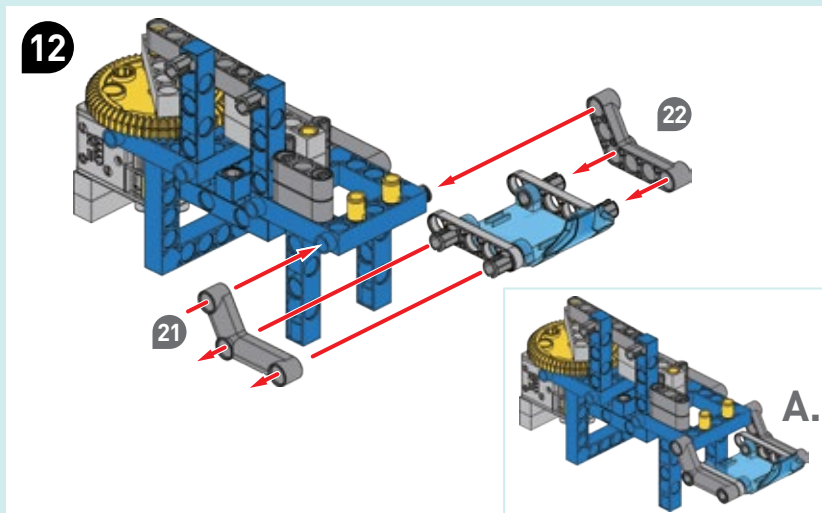
Done!

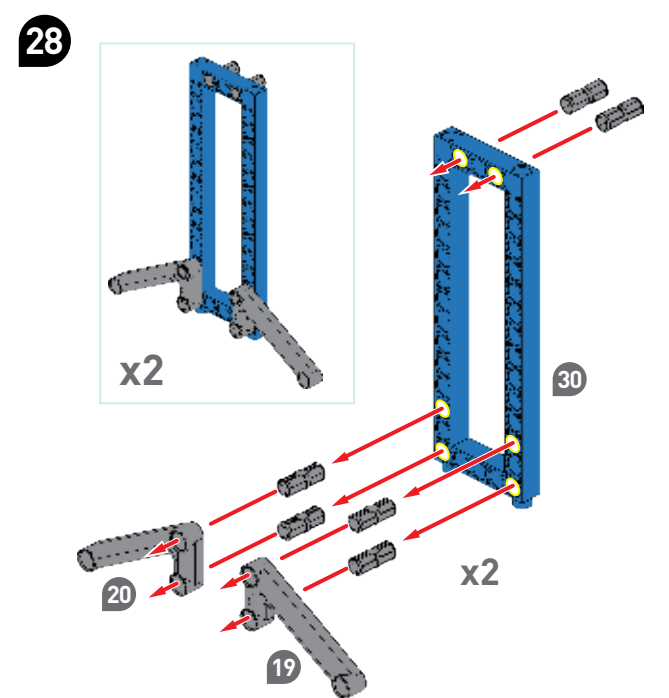
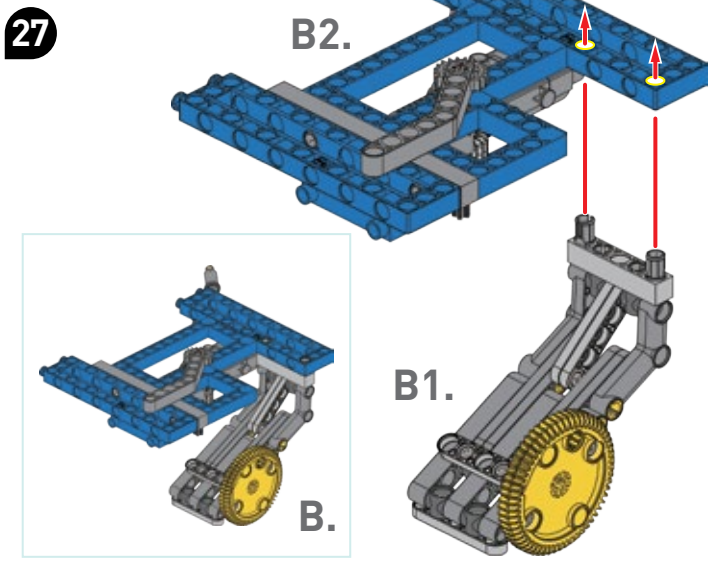
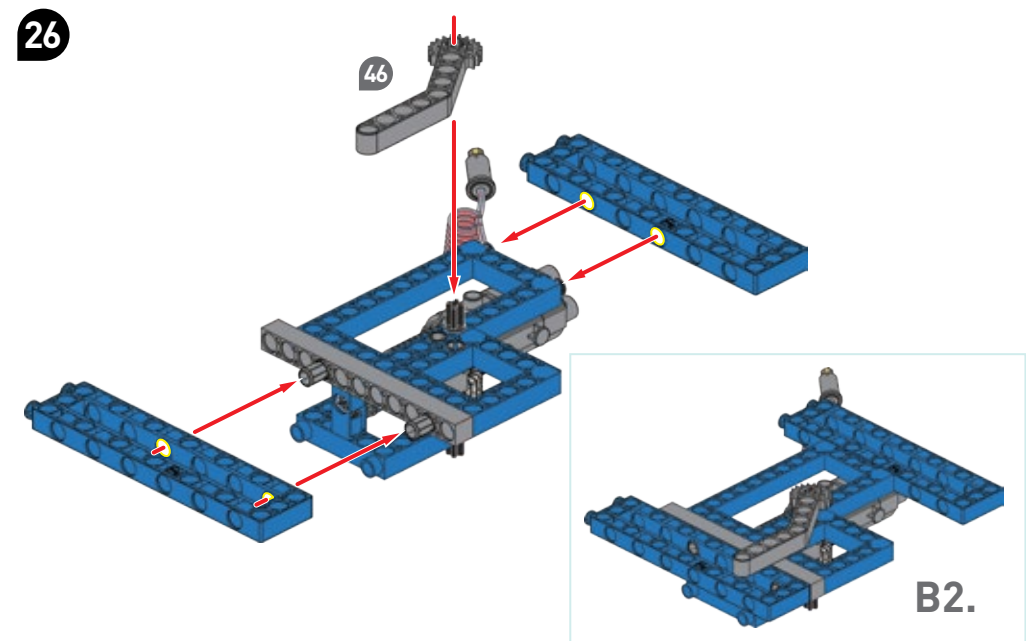
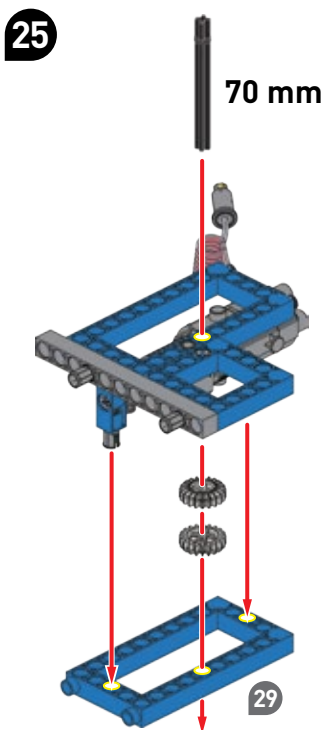
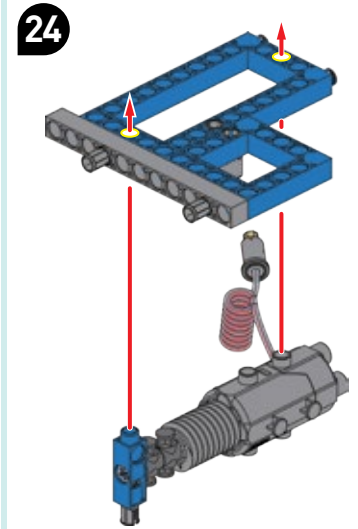
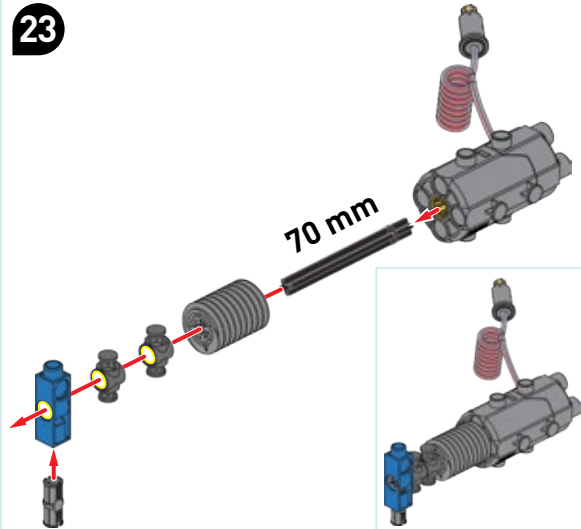
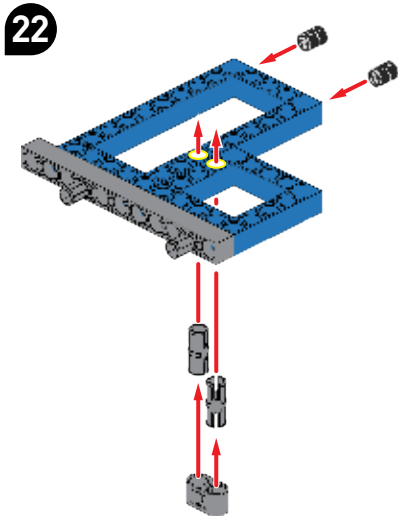




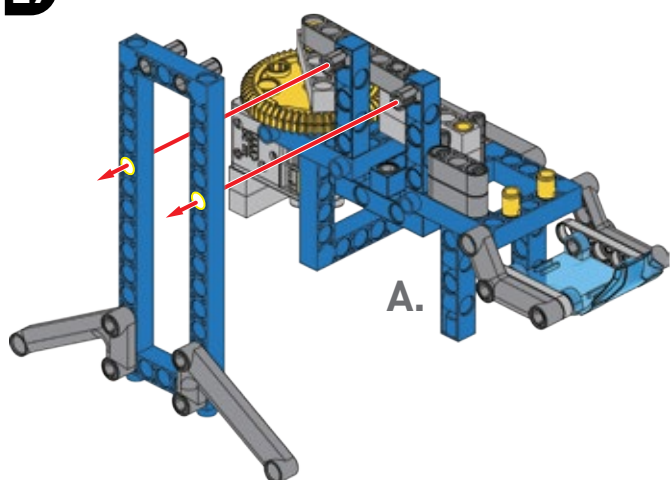
MODEL 6: CANDY DISPENSER



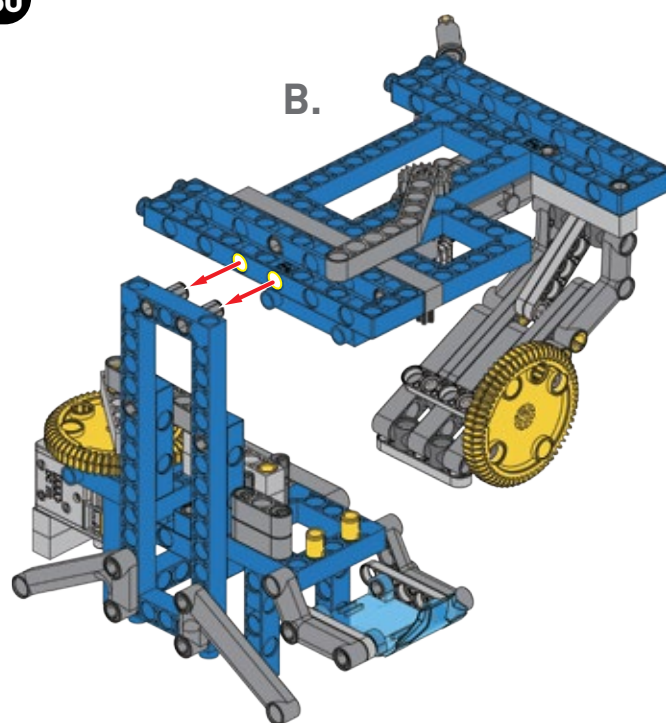




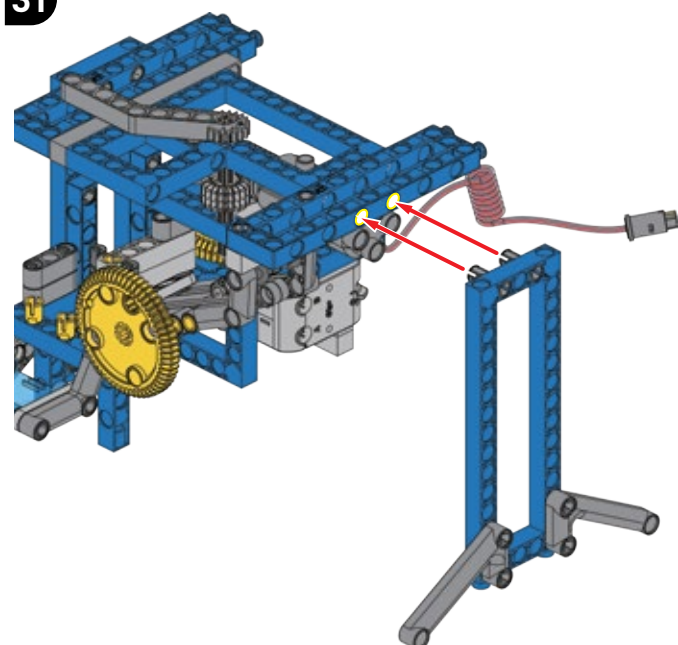
29



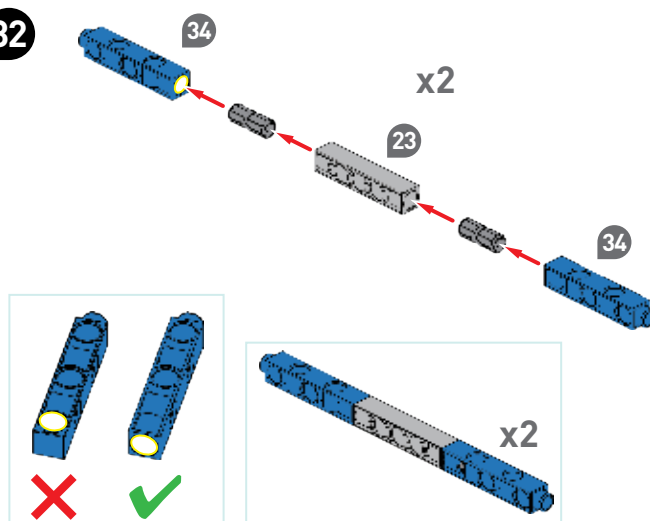
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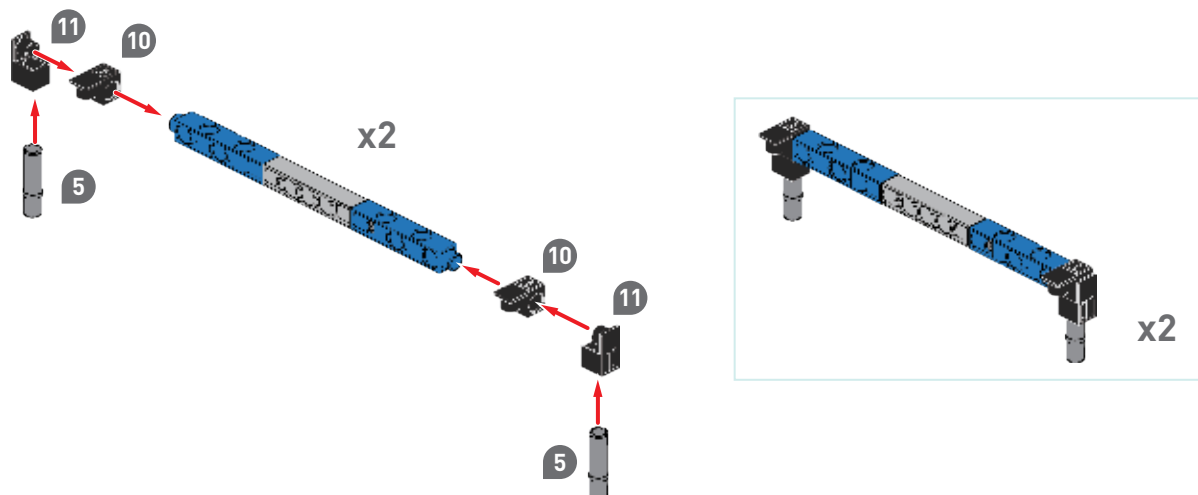
31



32

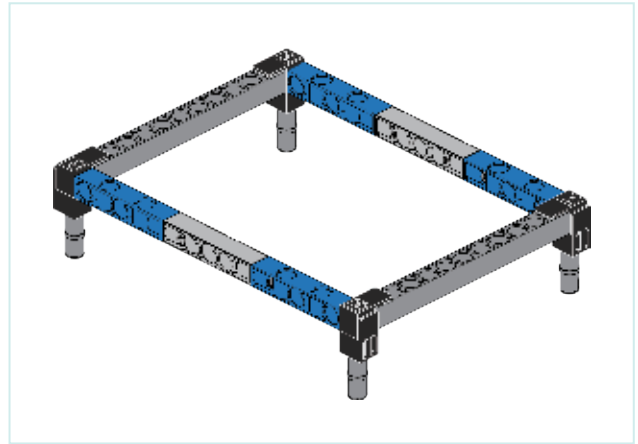
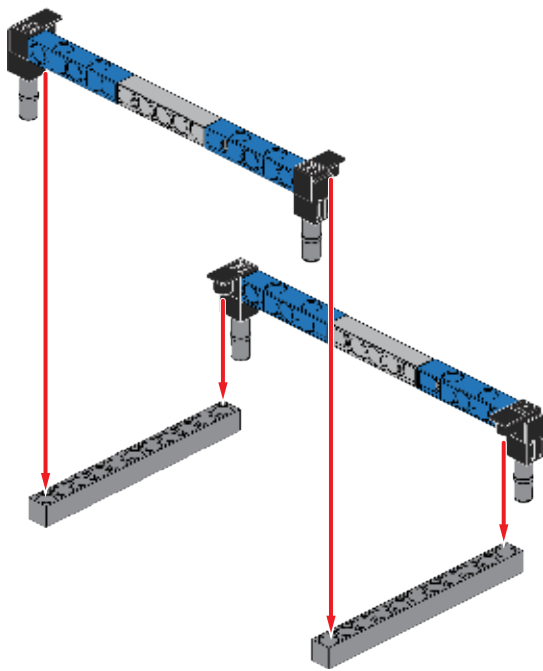


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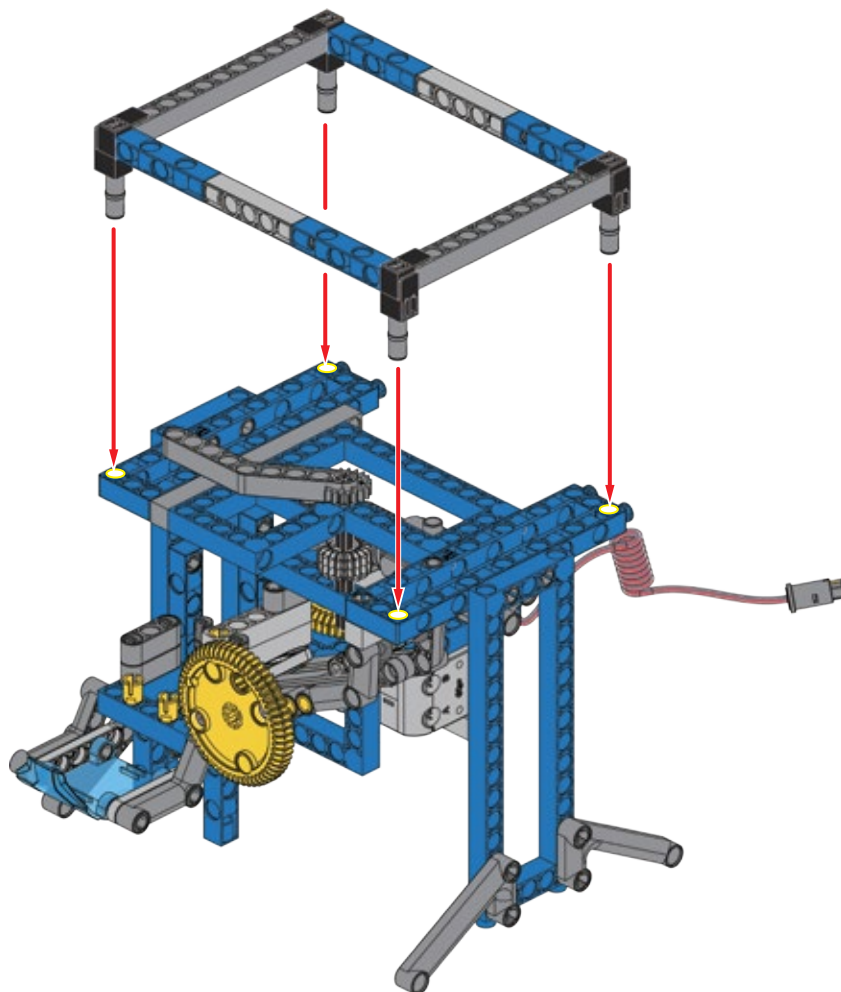




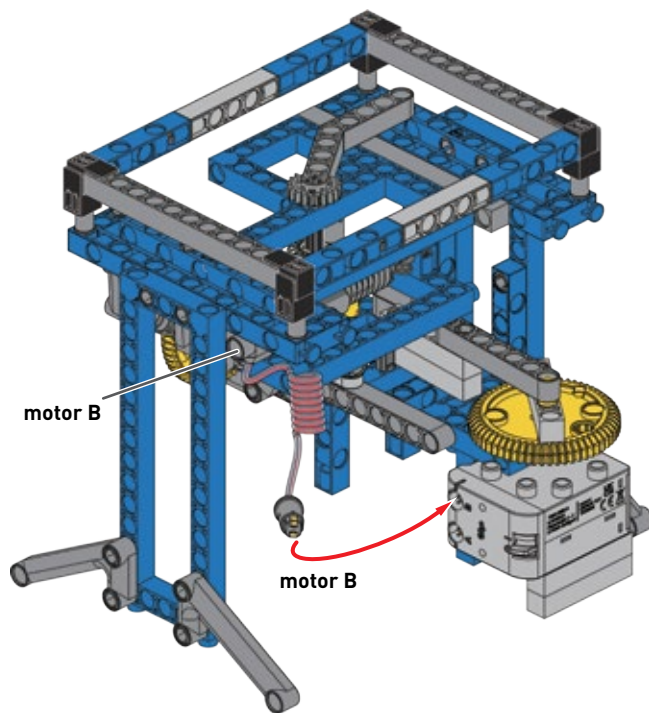
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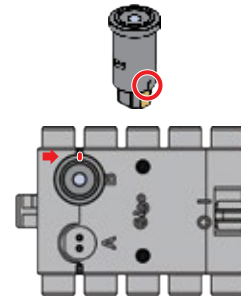
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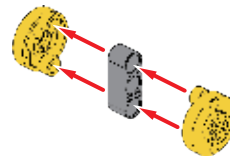
36



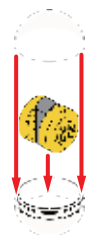
Look closely at the plug! Line up the small groove symbol on the plug with the red arrow before you push the plug in.



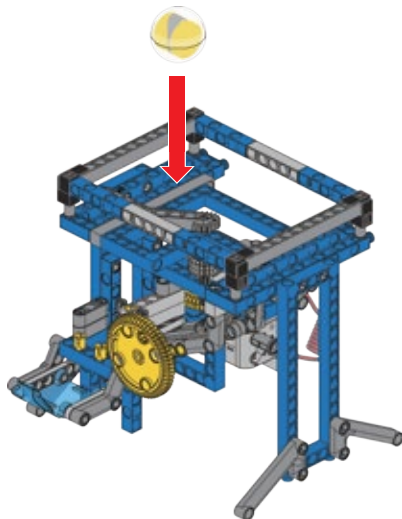
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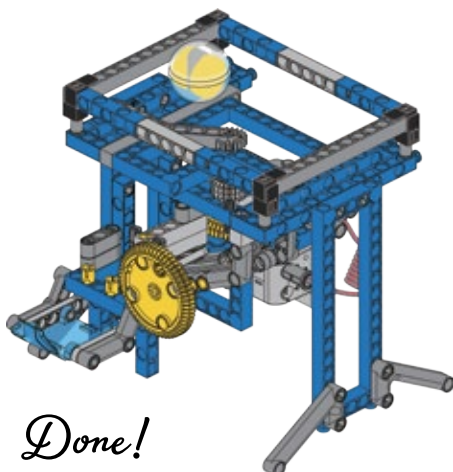
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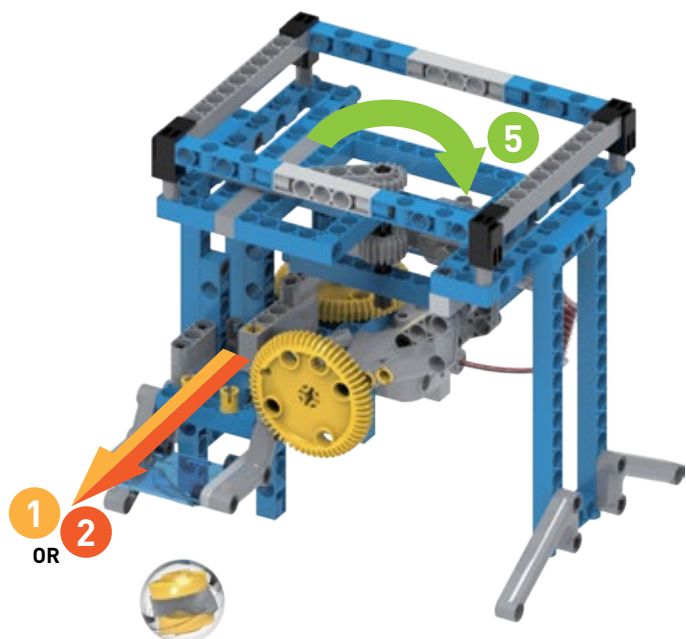
39



40



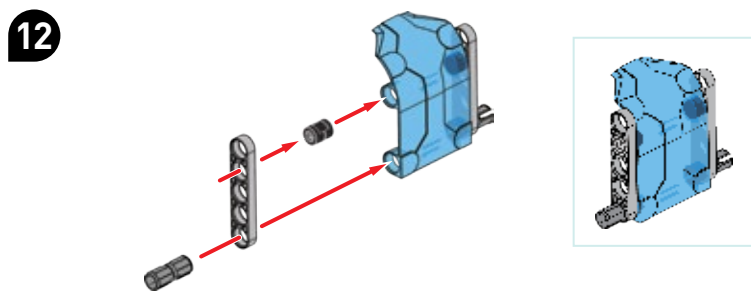
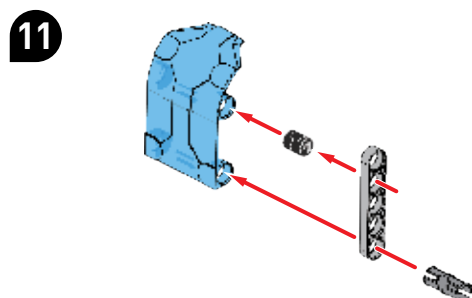
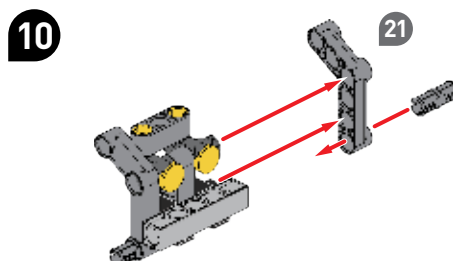
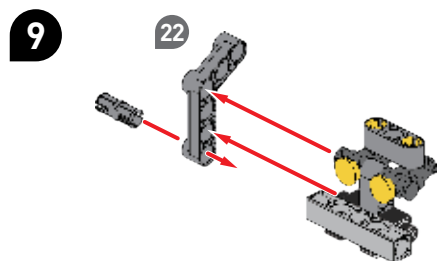
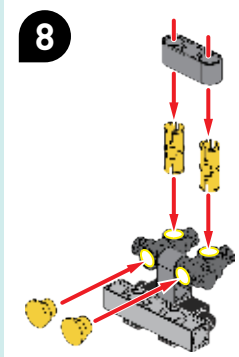
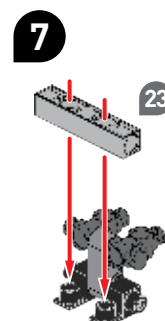
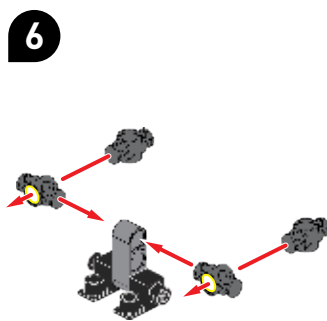
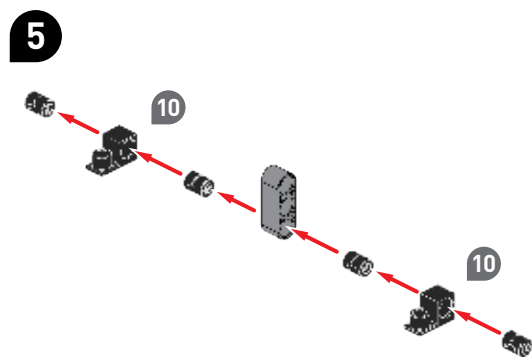
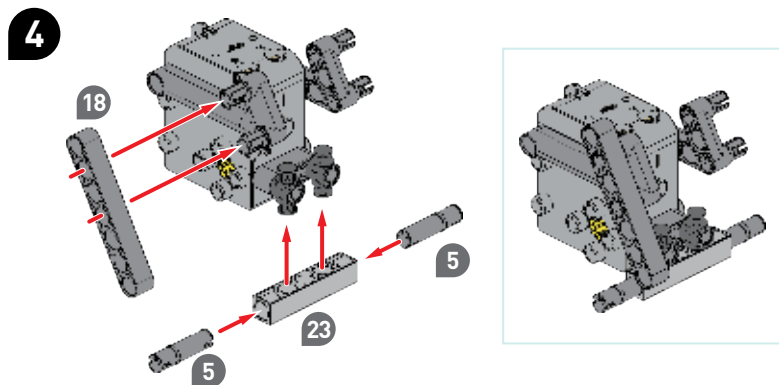
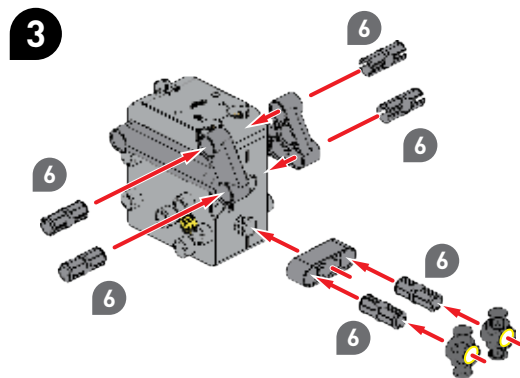
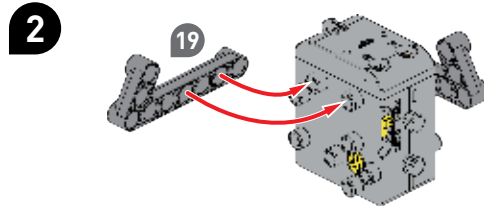
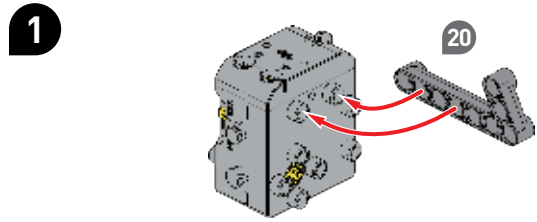
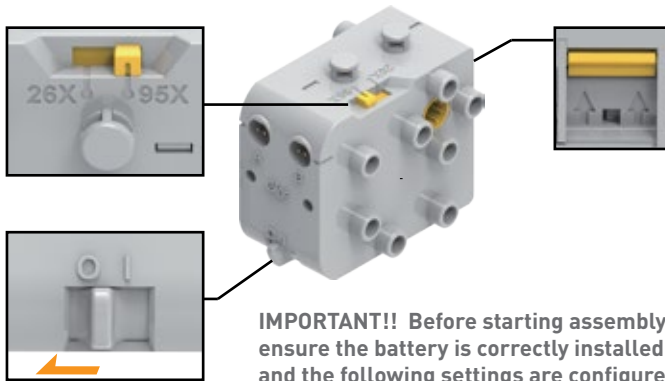
Done!



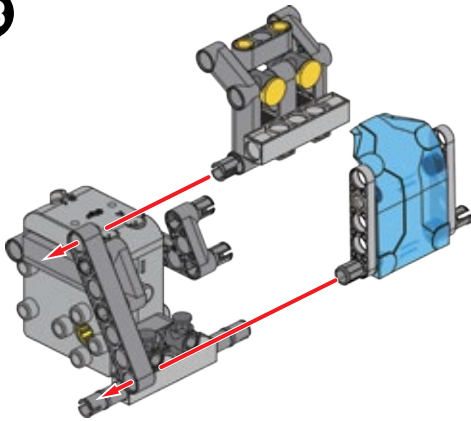
Button 1 or button 2 can trigger the linkage motion.



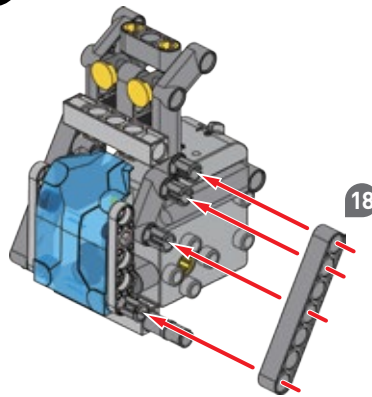
MODEL 7: ONE-ROBOT BAND



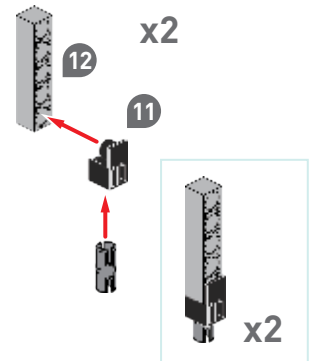
13



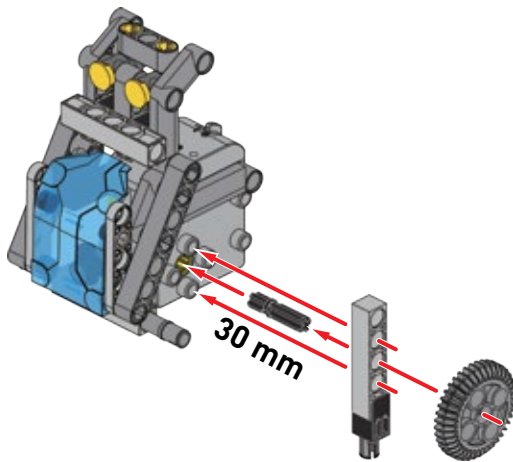
14



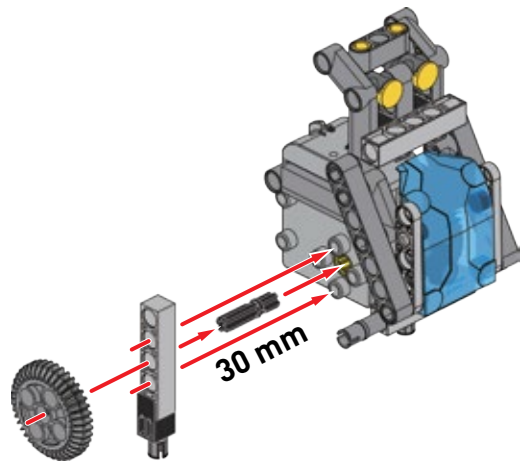
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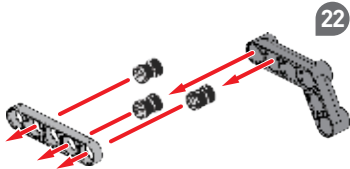
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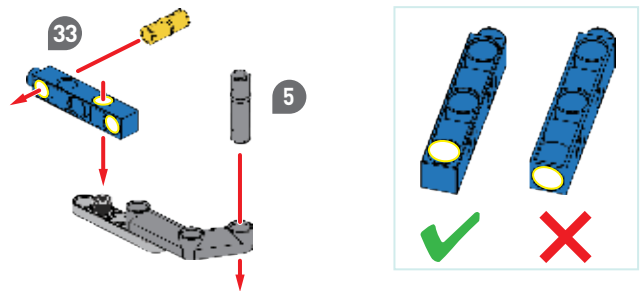
17



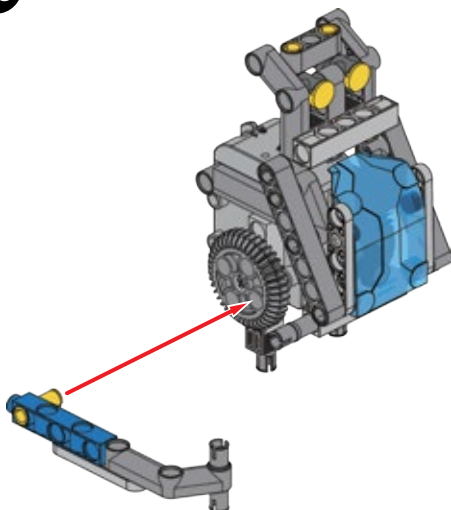
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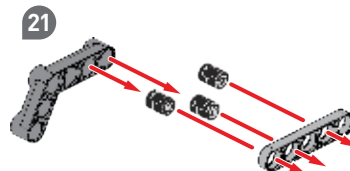
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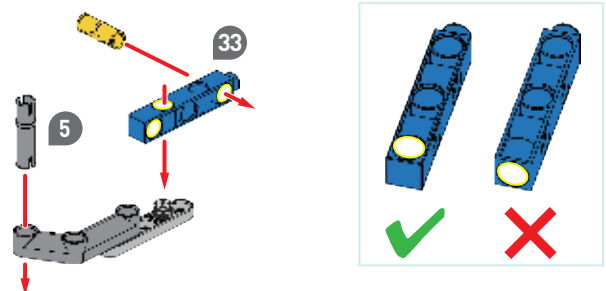
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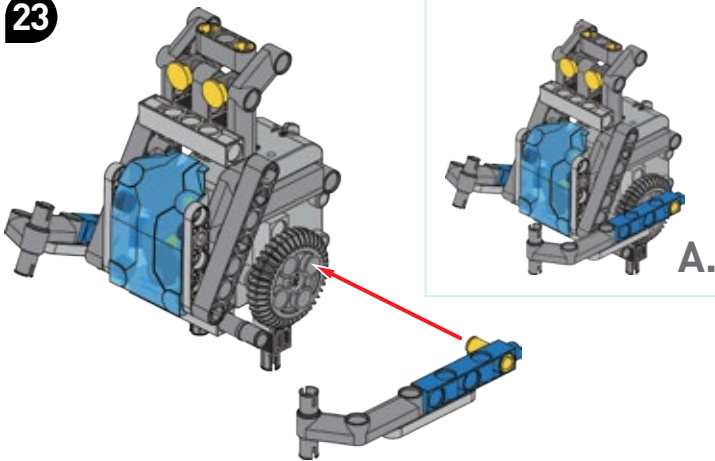


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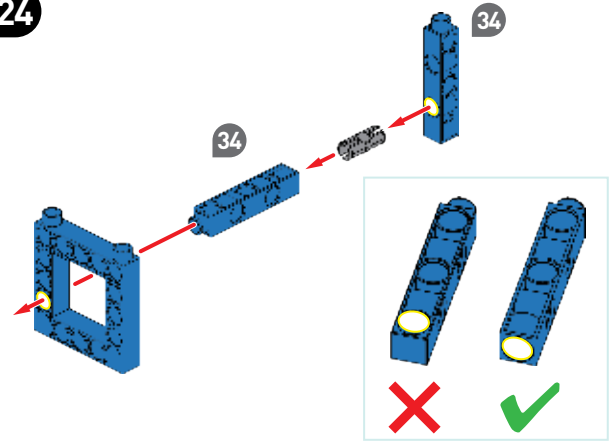




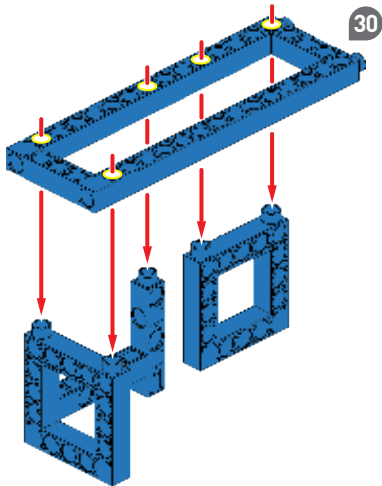
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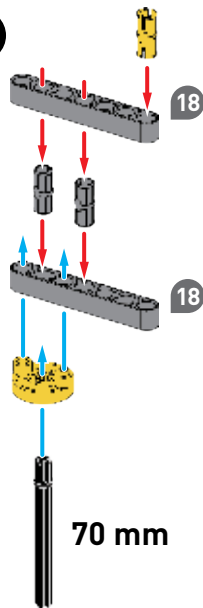
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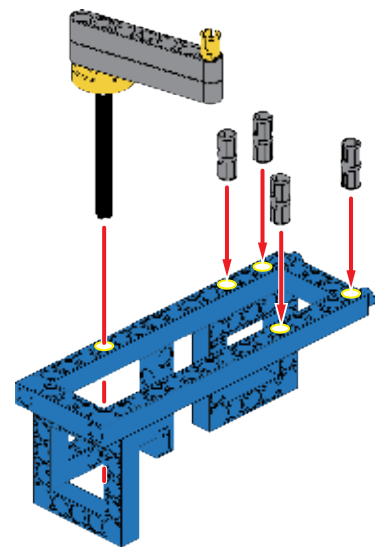
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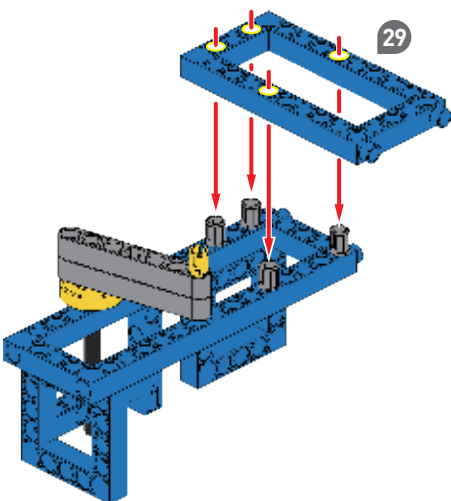
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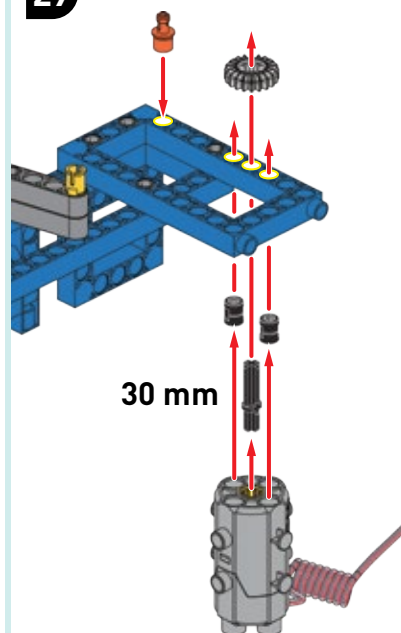
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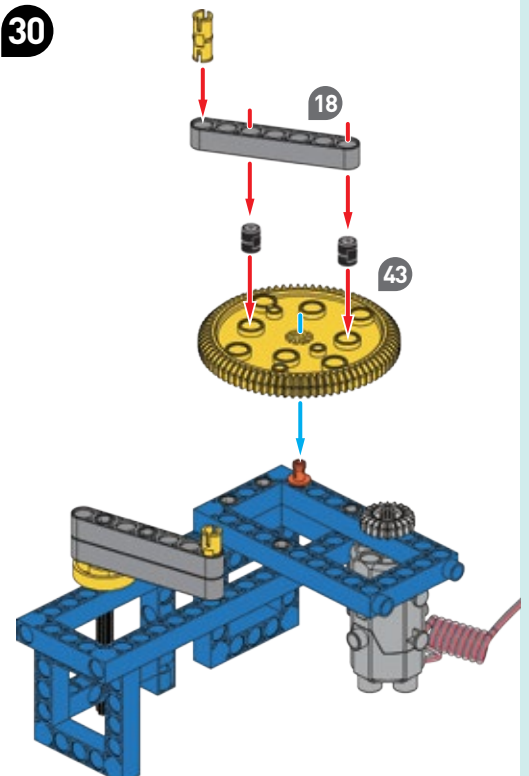
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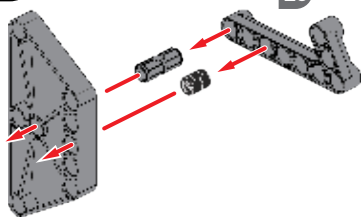
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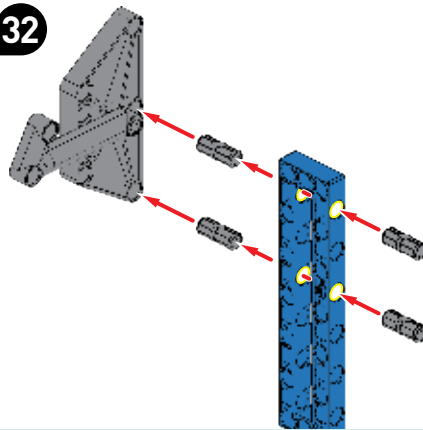
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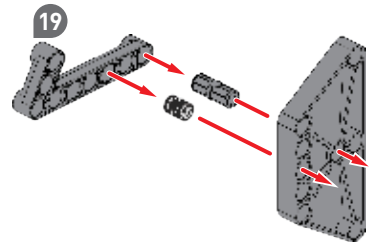
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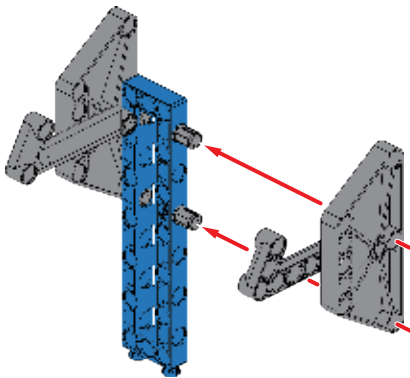
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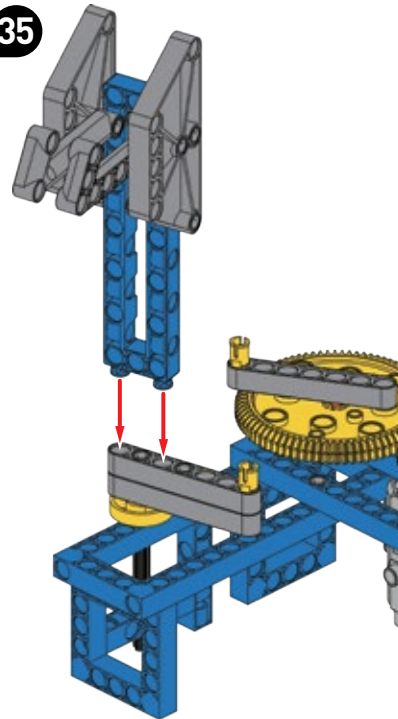
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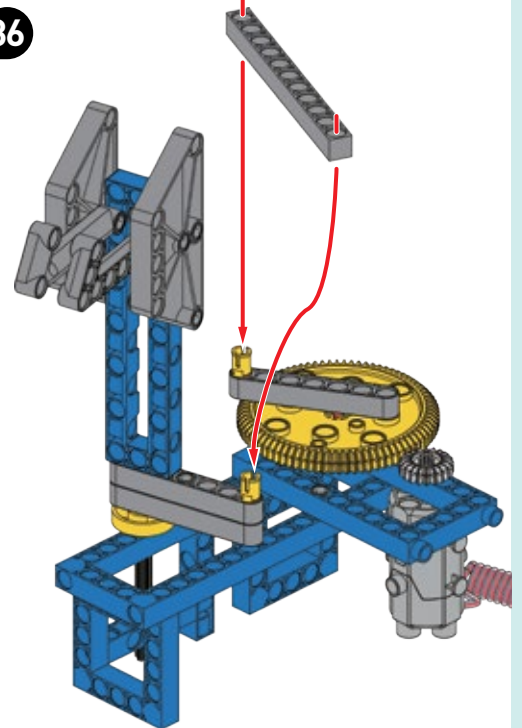
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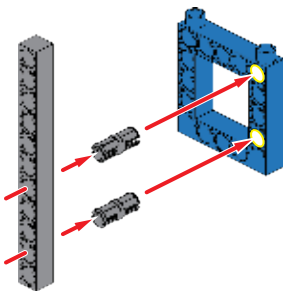
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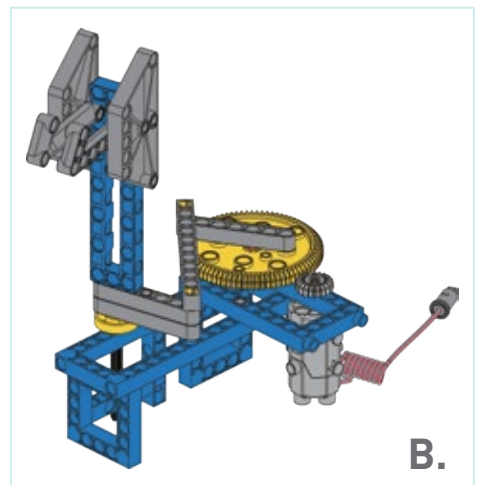
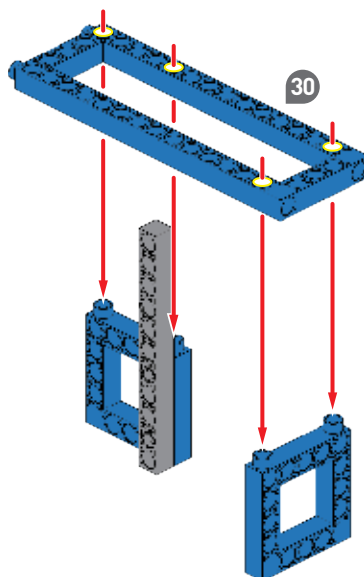
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37



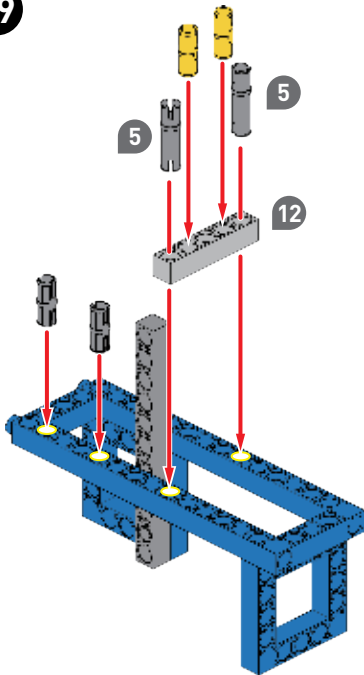
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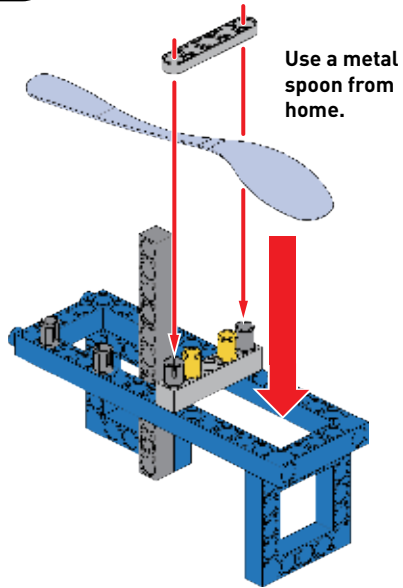
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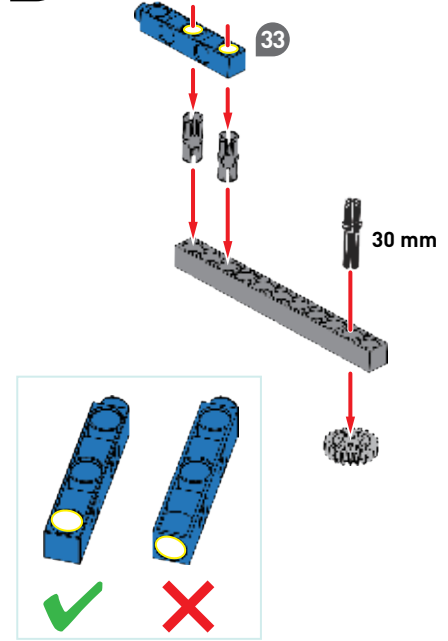
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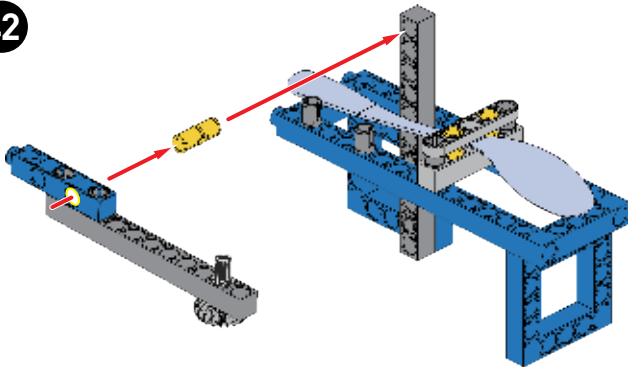
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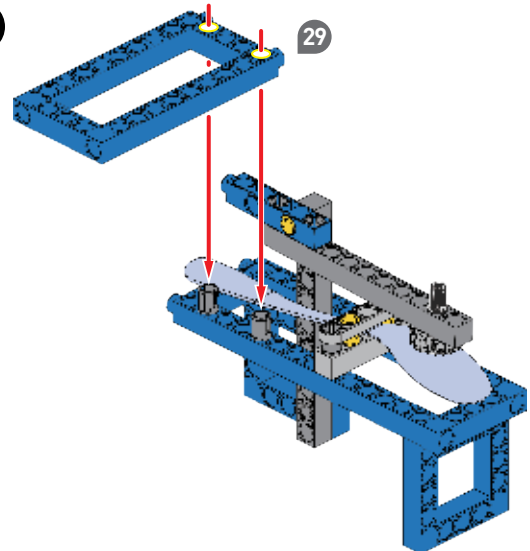
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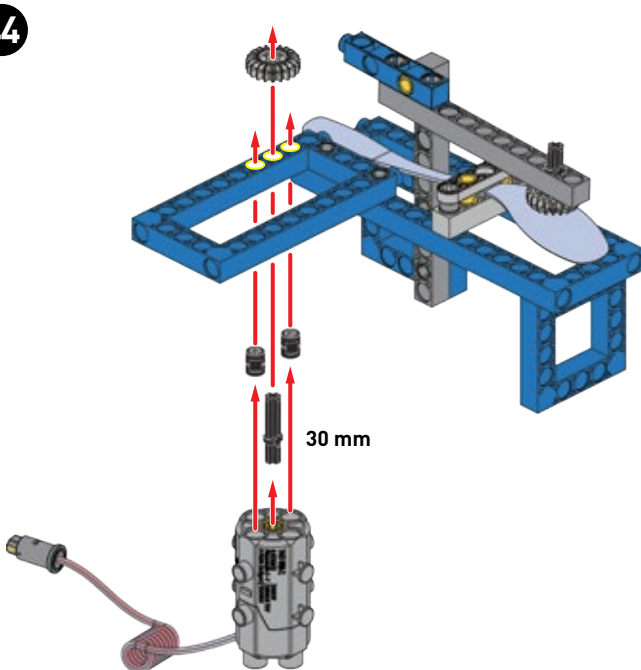
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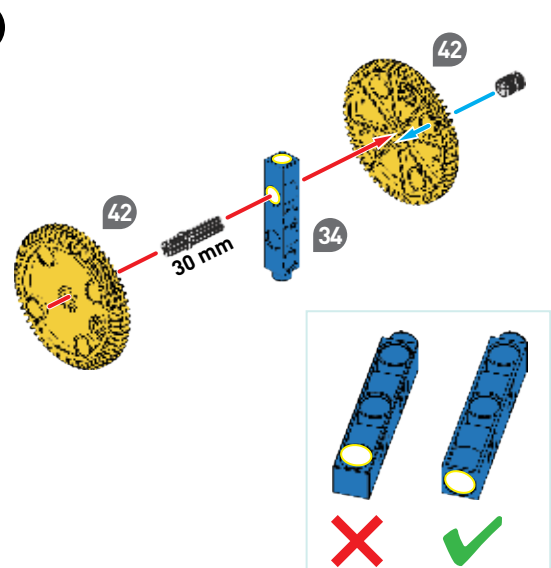
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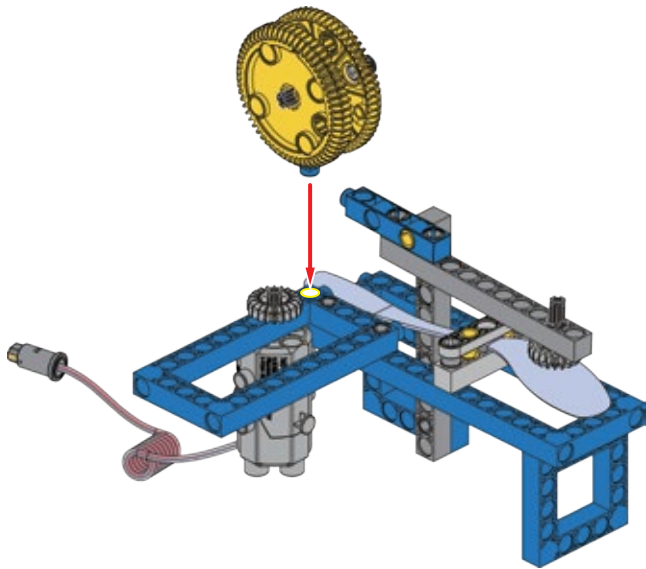
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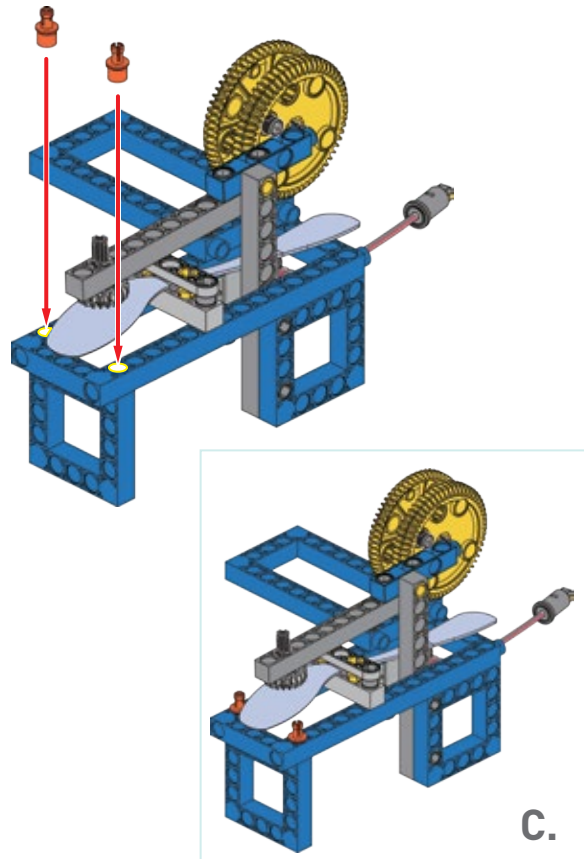
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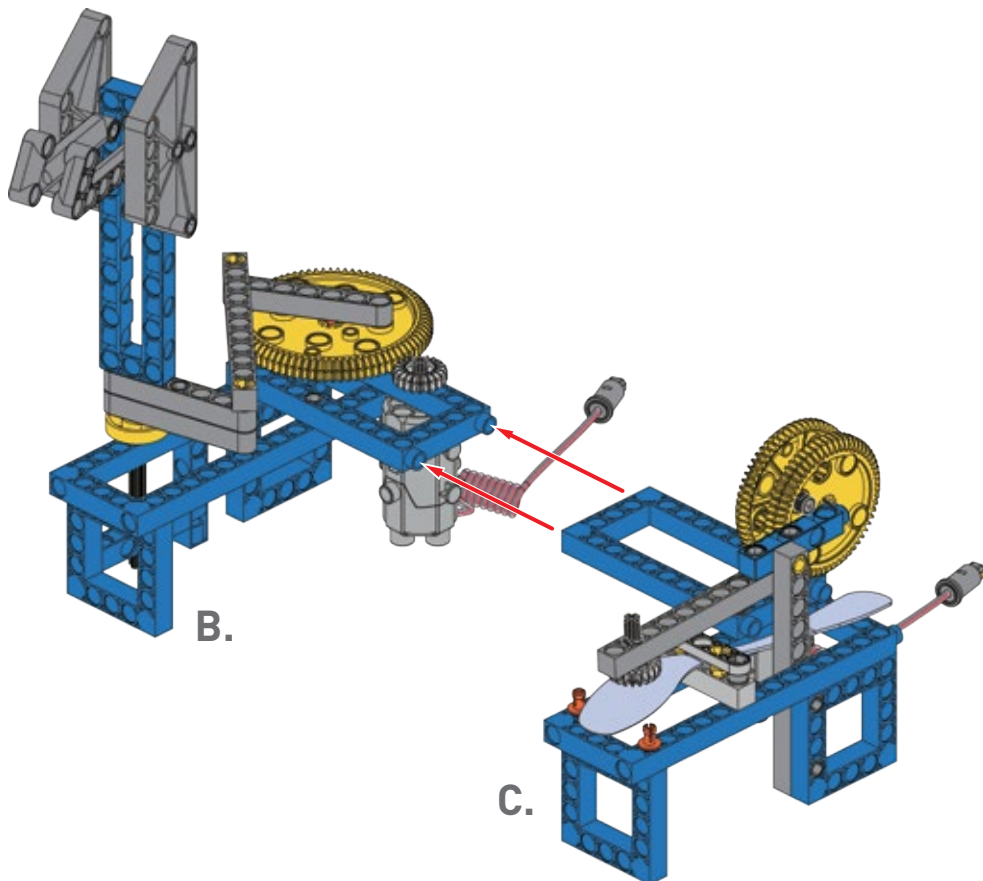
46



47

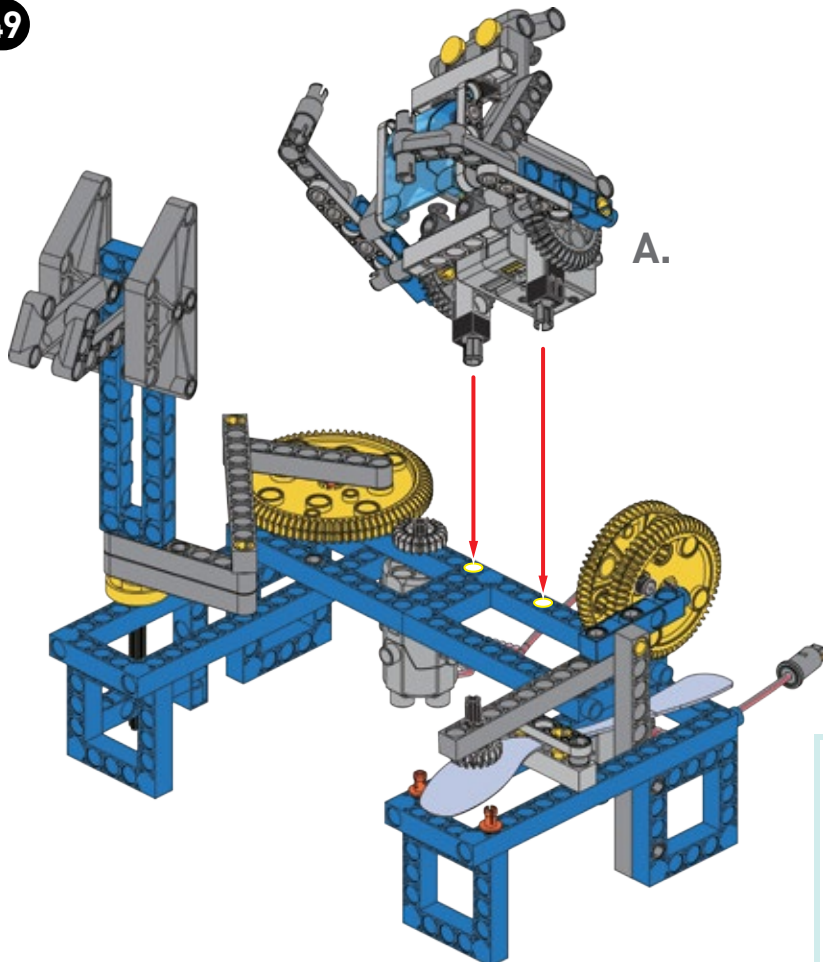


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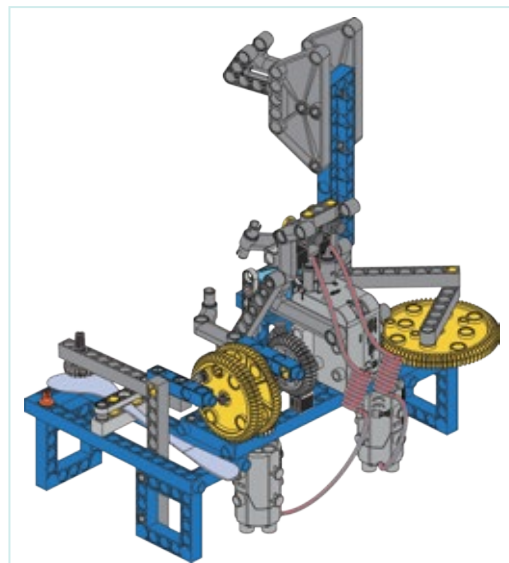
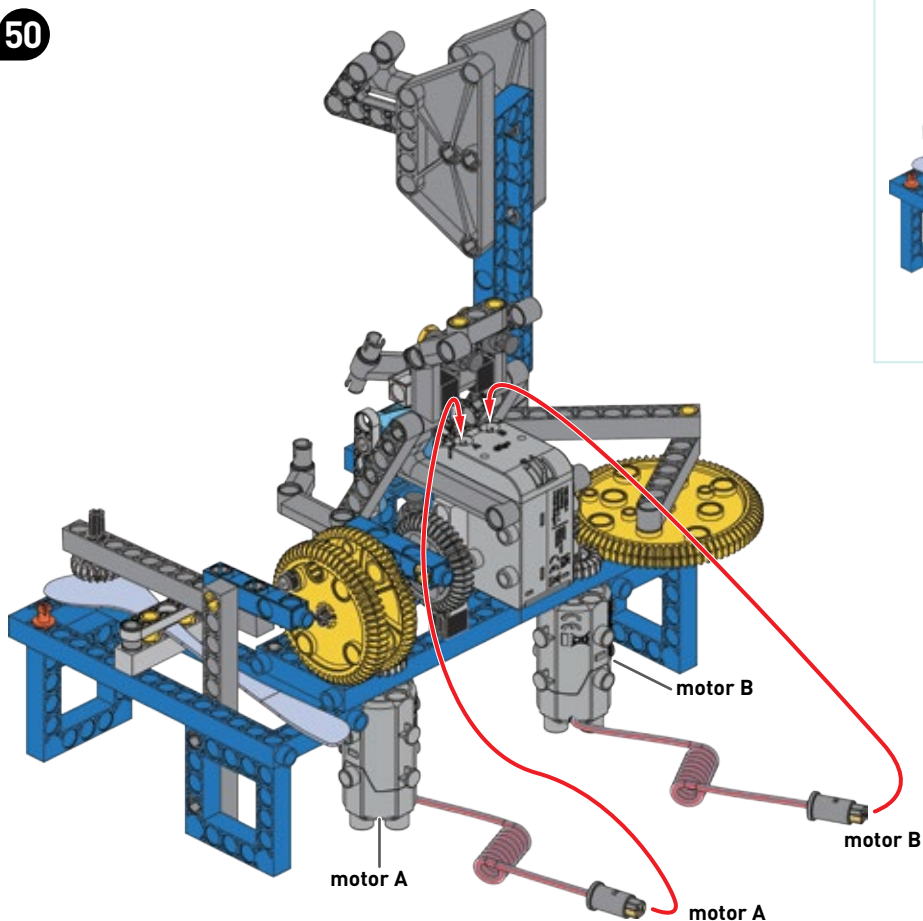




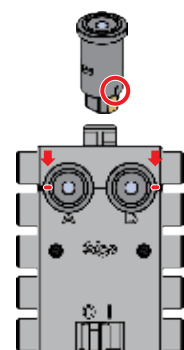
49



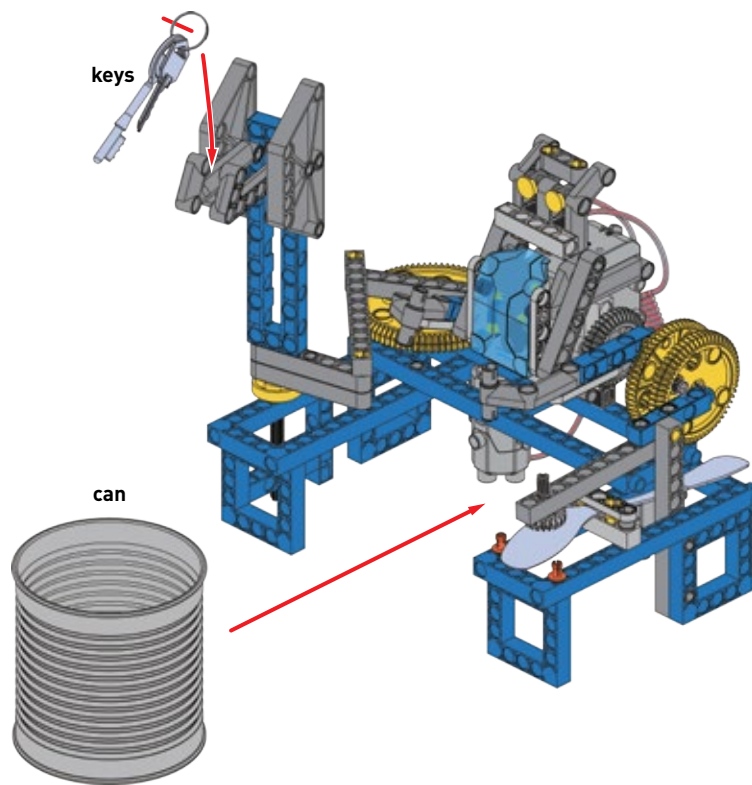
50



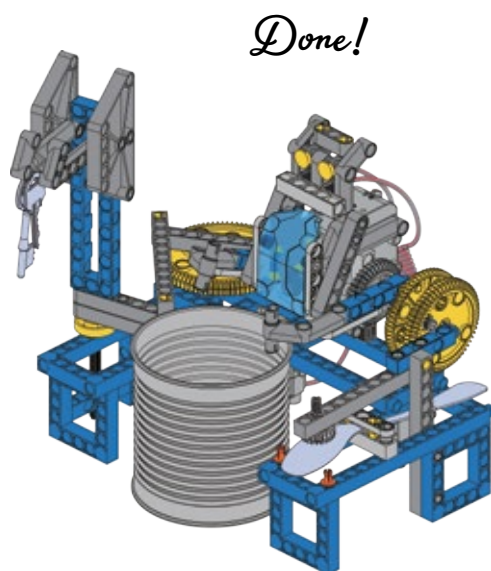
Look closely at the plug!
Line up the small groove
symbol on the plug with
the red arrow before you
push the plug in.



51

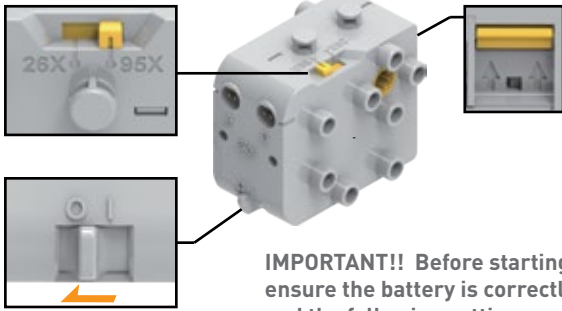


52

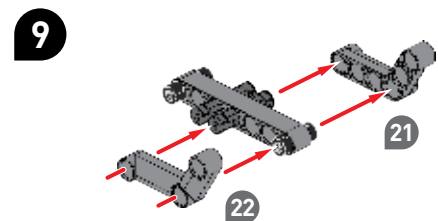
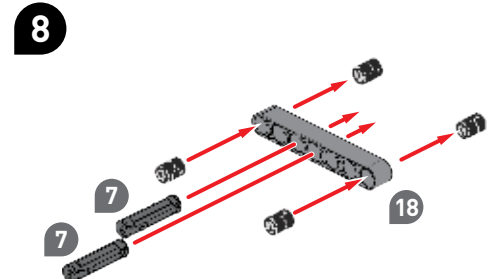
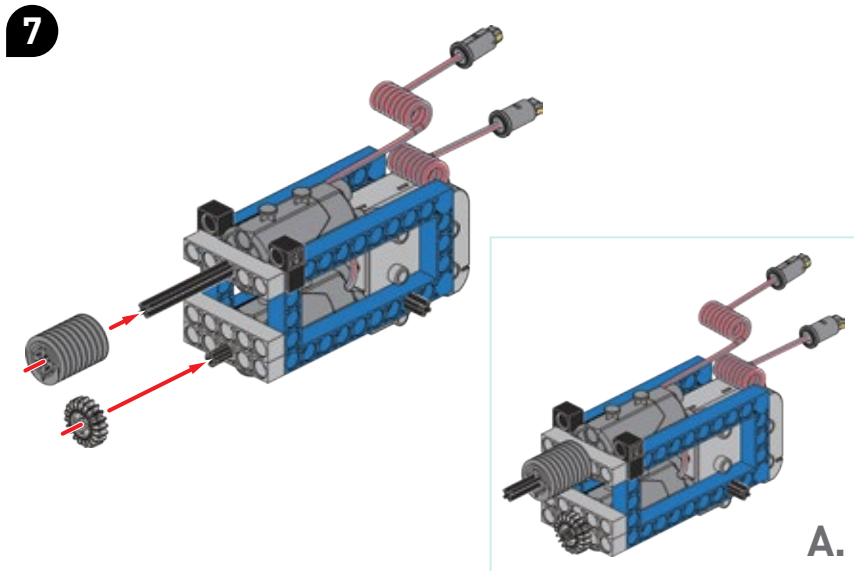
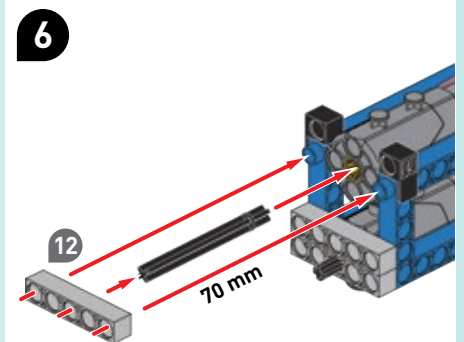
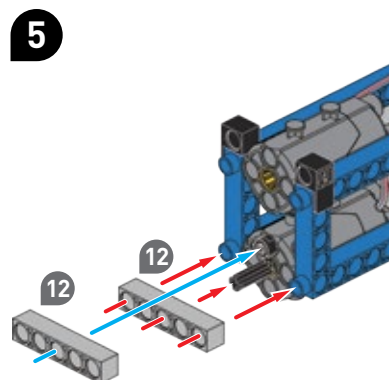
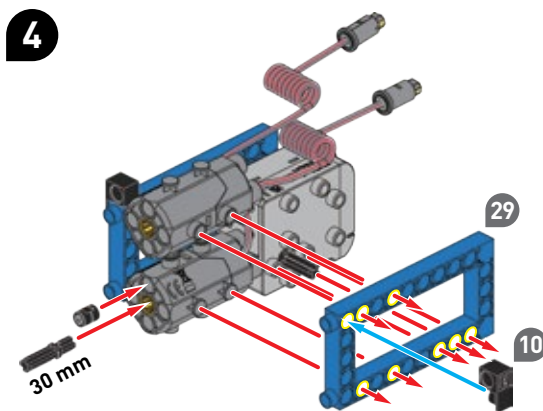
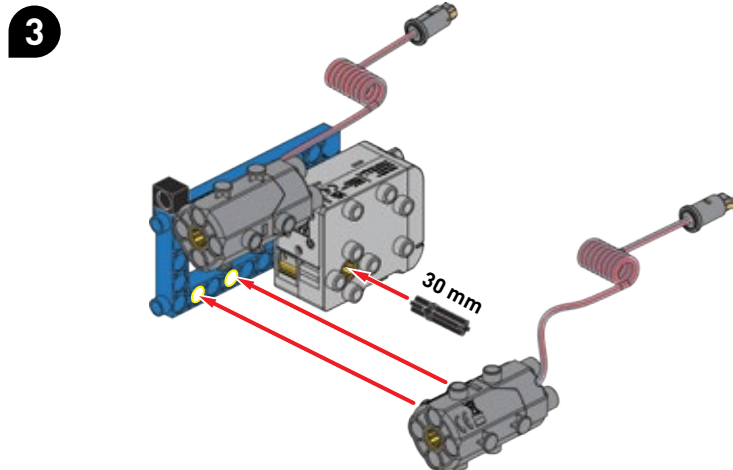
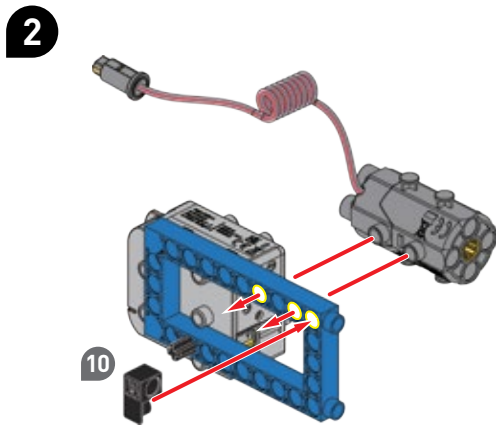
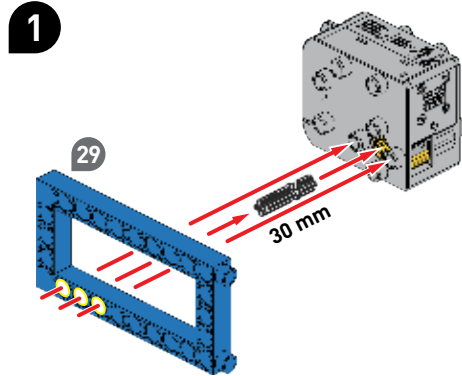


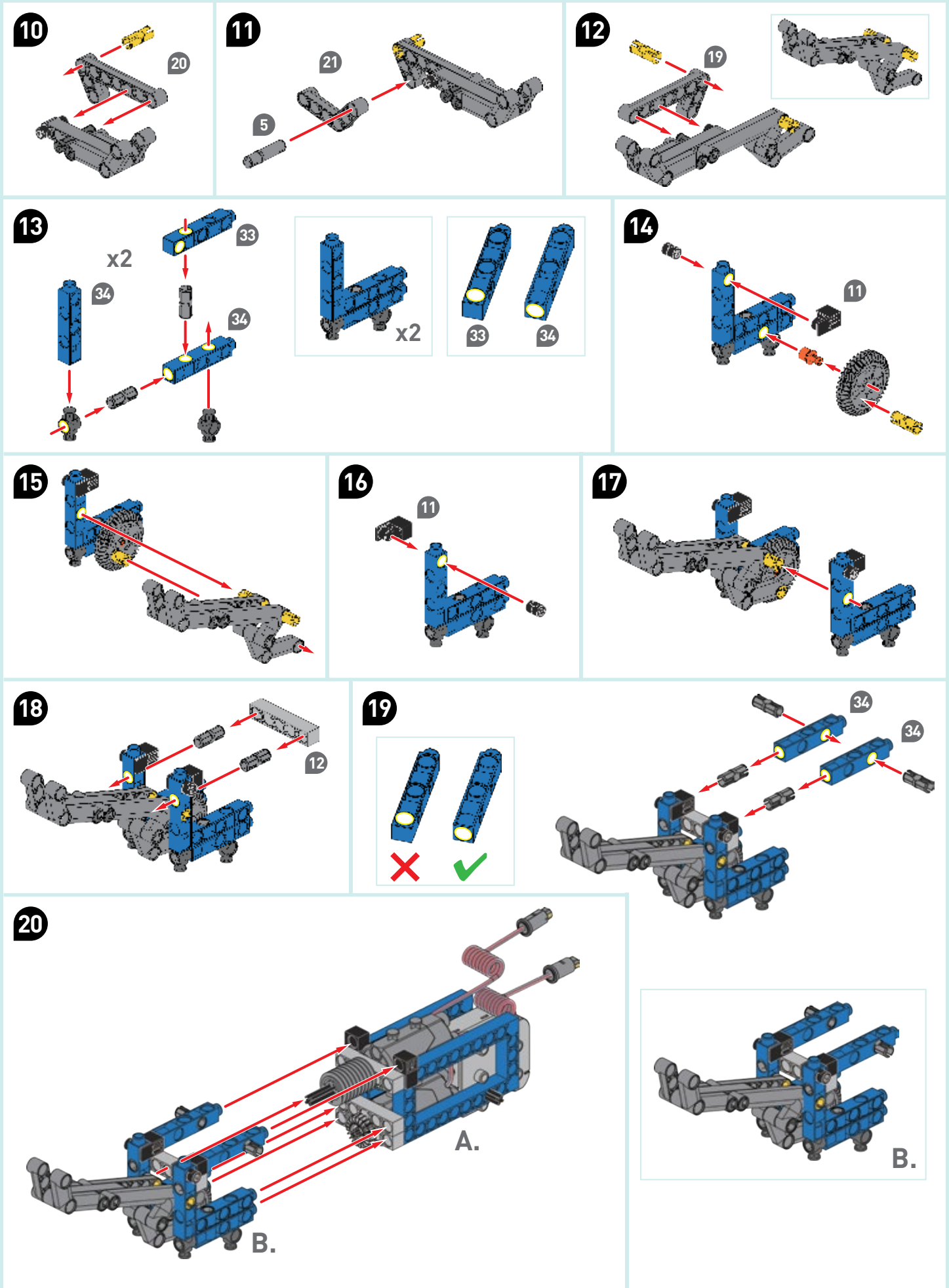


MODEL 8: ROBOTIC BEETLE



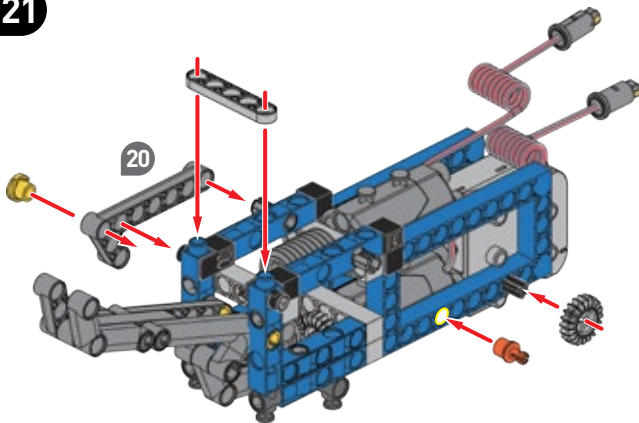
IMPORTANT!! Before starting assembly, ensure the battery is correctly installed and the following settings are configured.



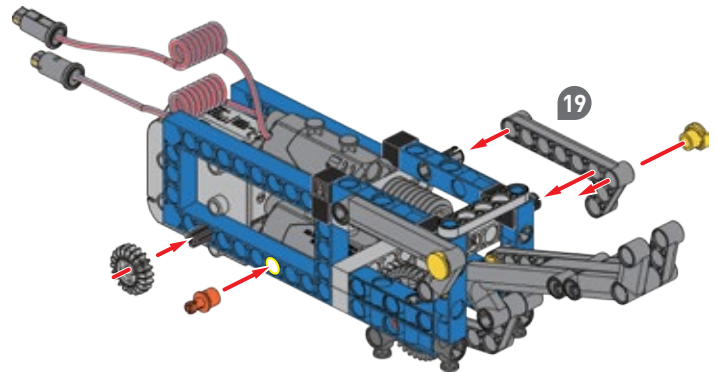




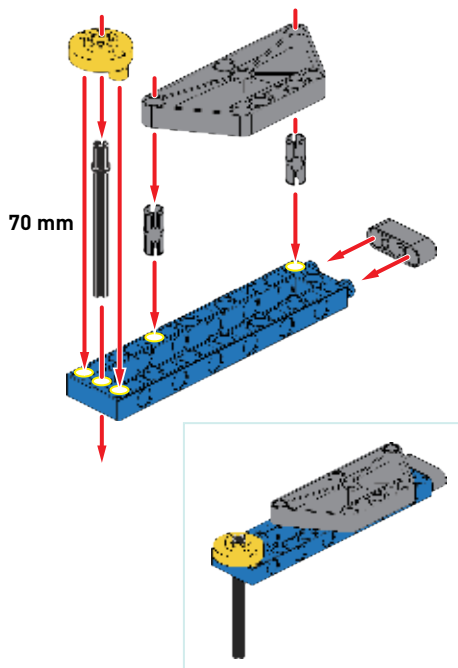
21



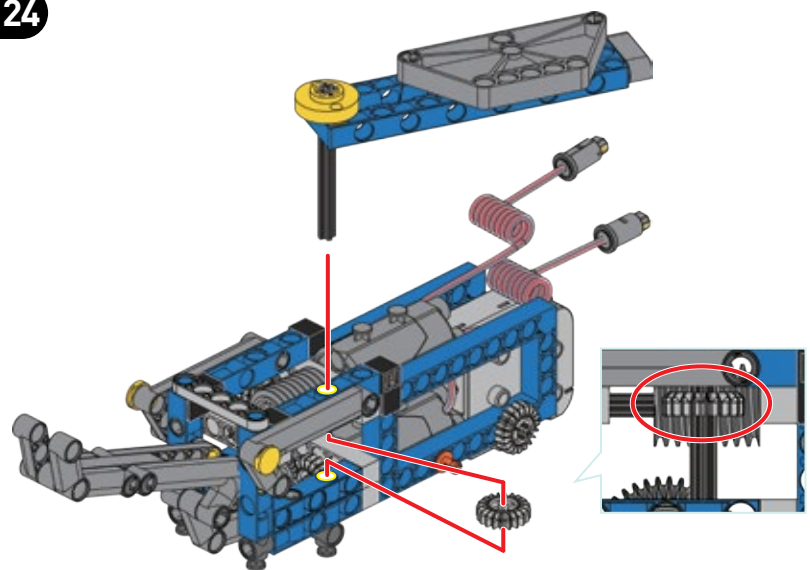
22



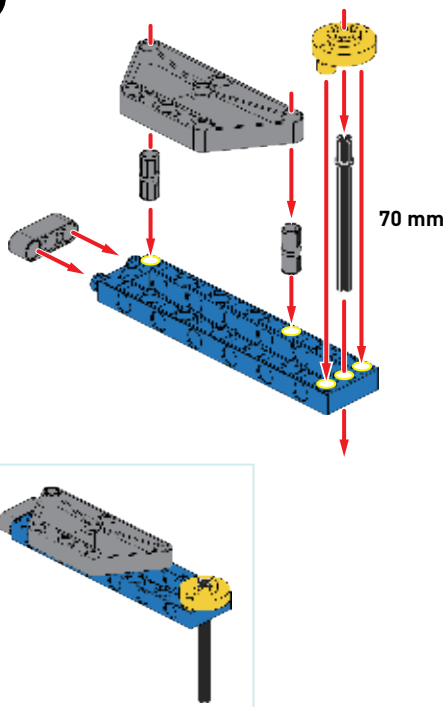
23



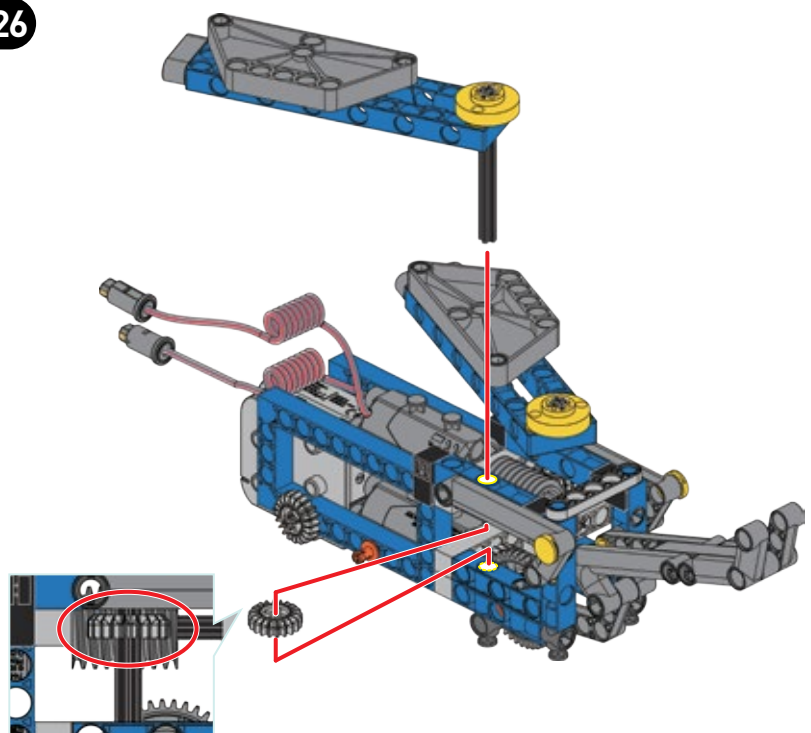
24

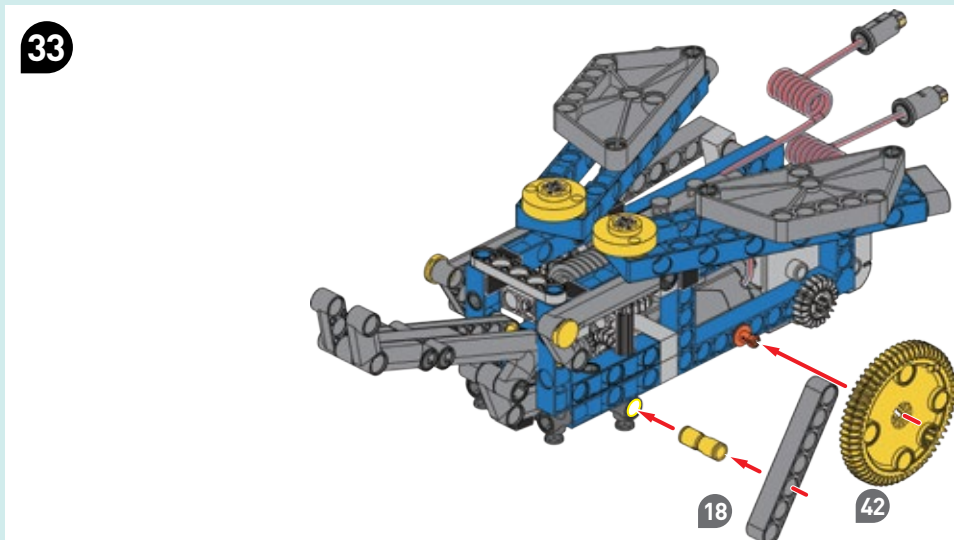
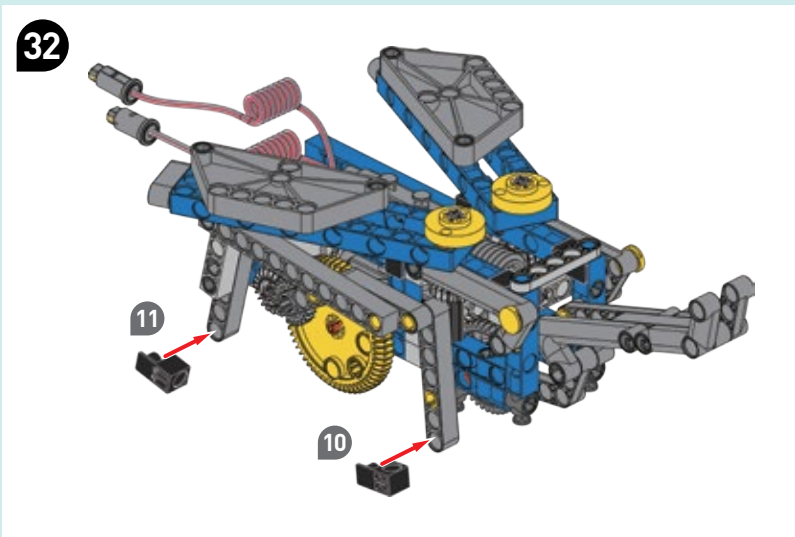
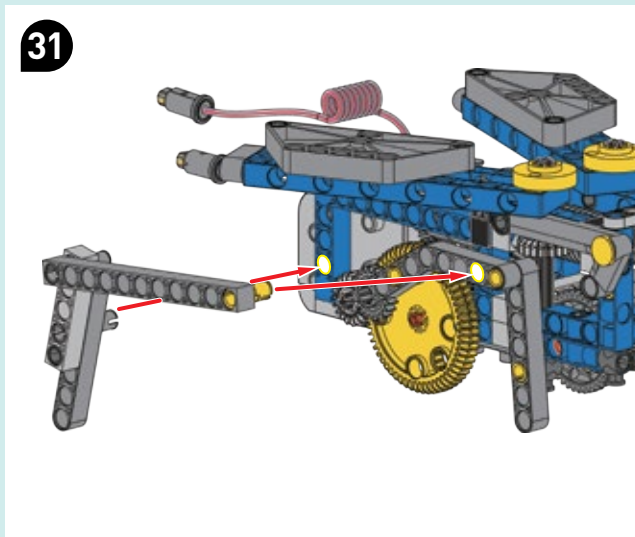
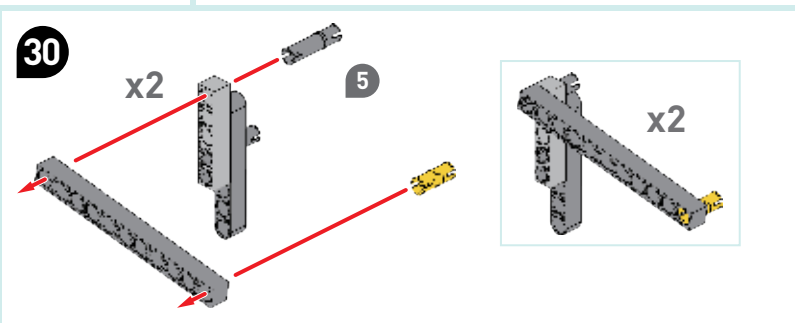
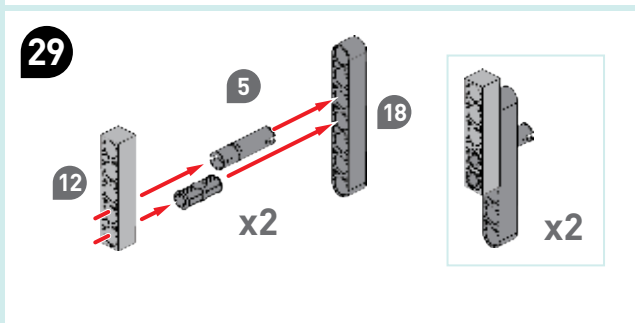
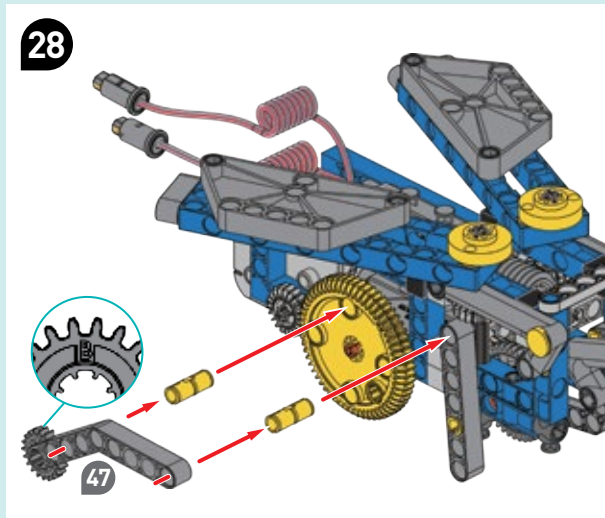
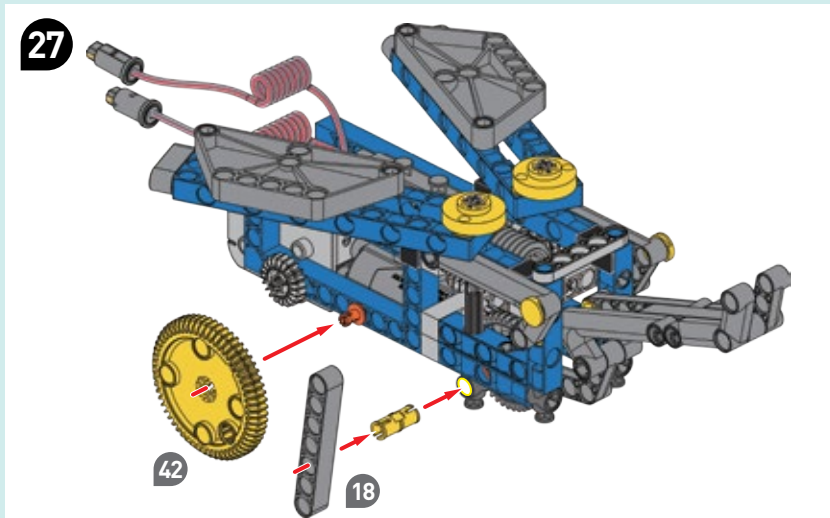


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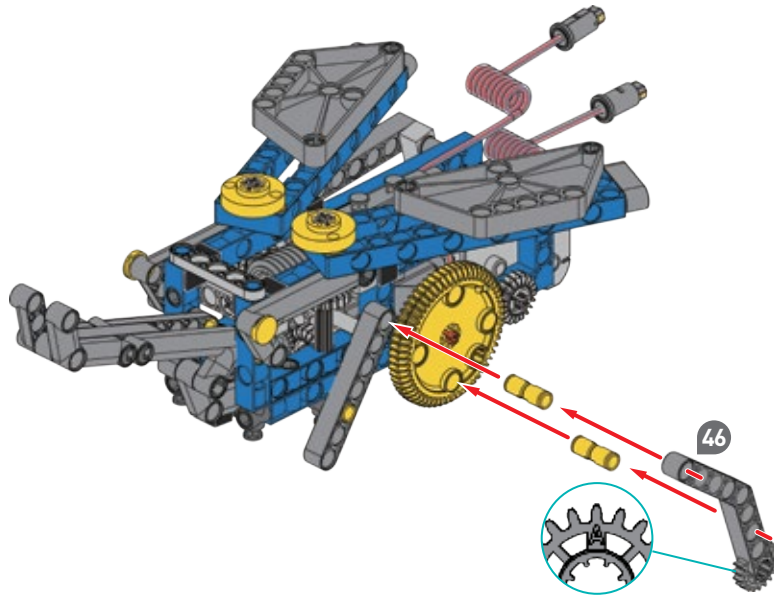
26



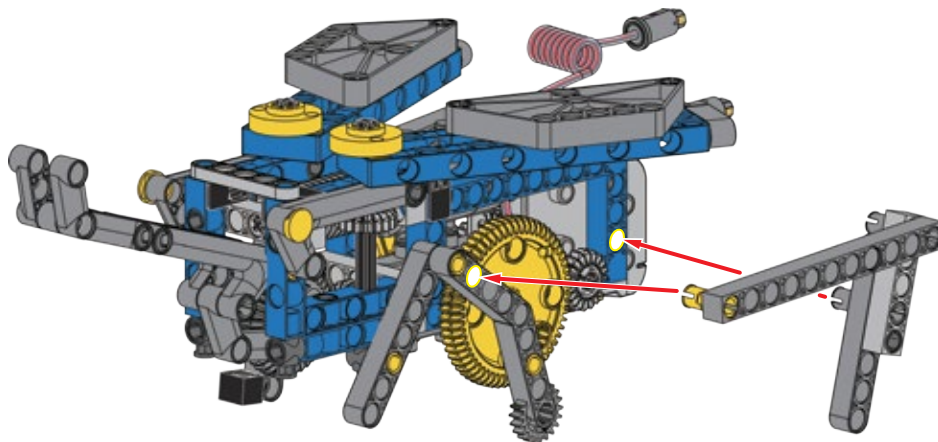




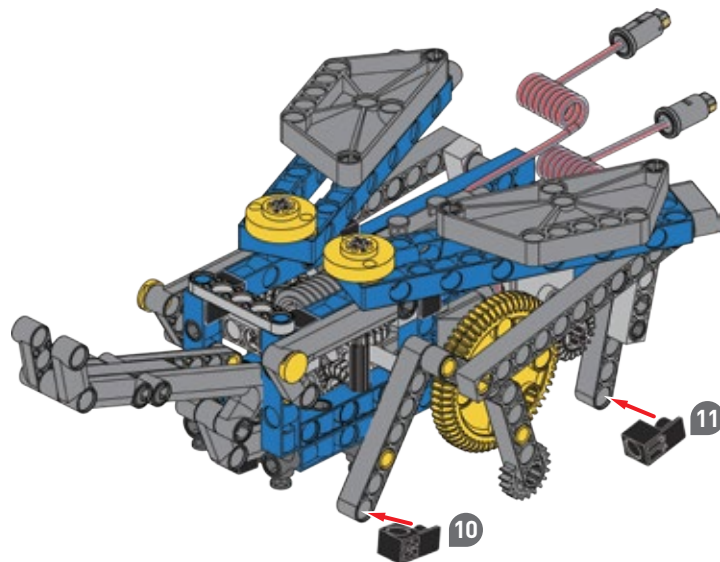
34



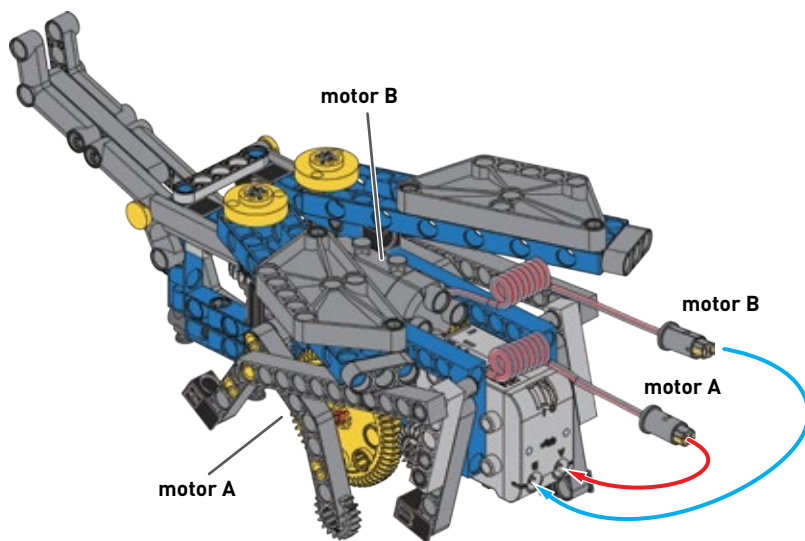
35



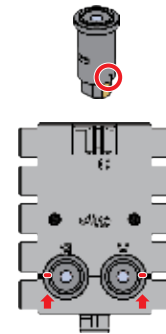
36



37

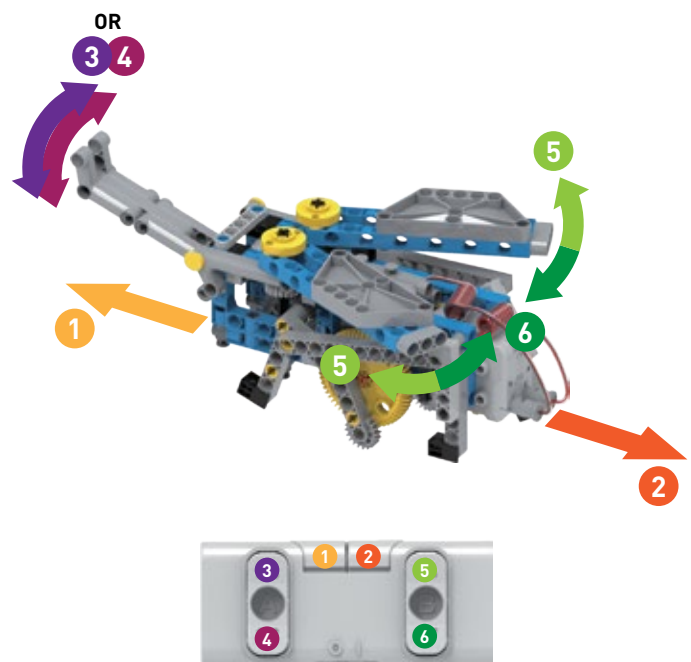
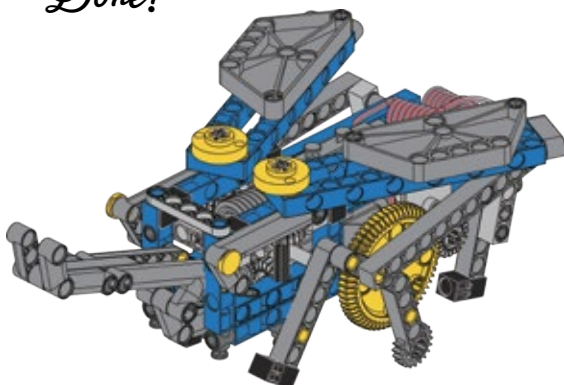


Look closely at the plug!
Line up the small groove
symbol on the plug with
the red arrow before you
push the plug in.

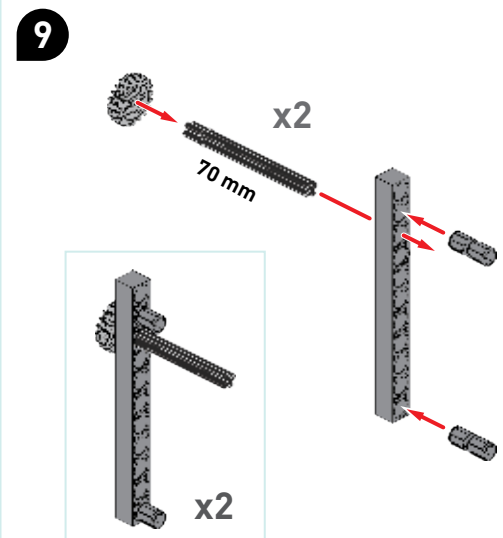
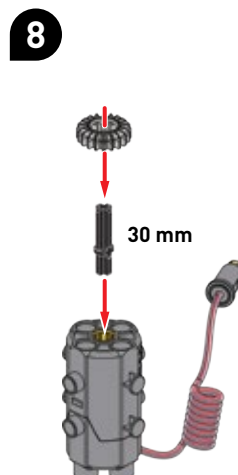
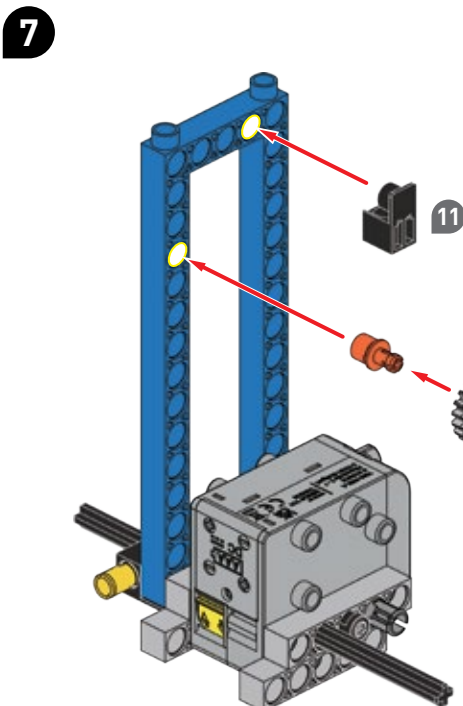
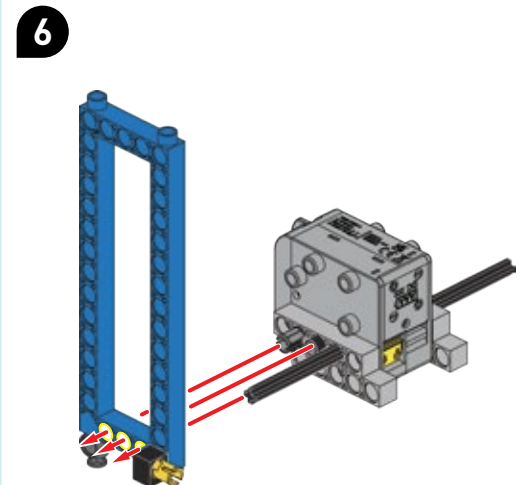
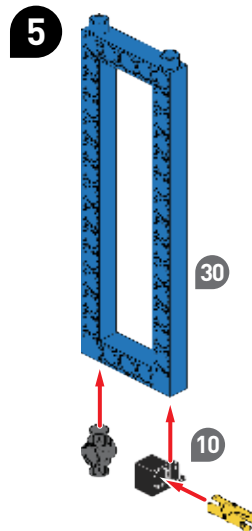
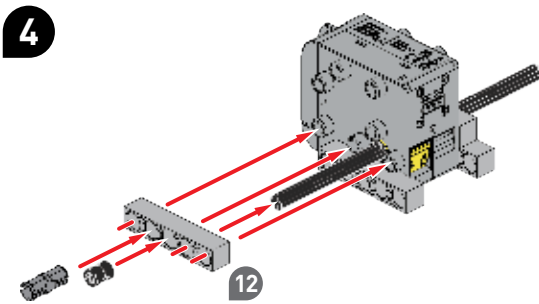
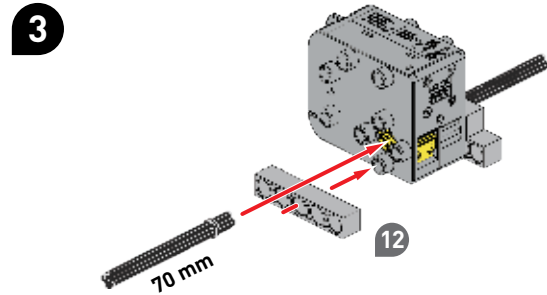
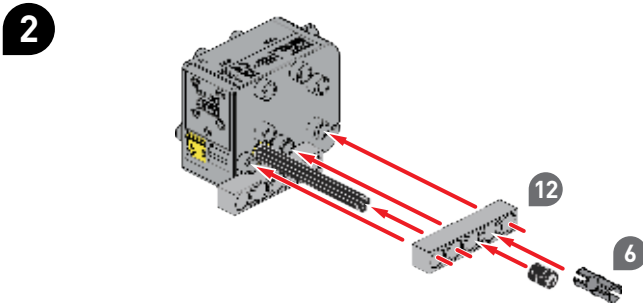
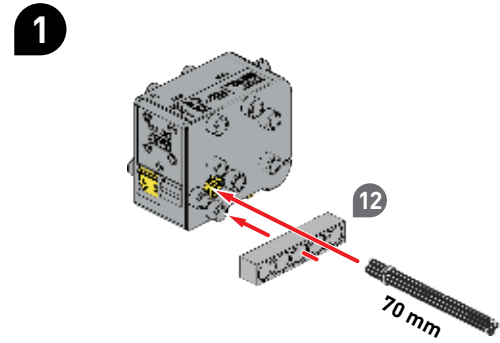
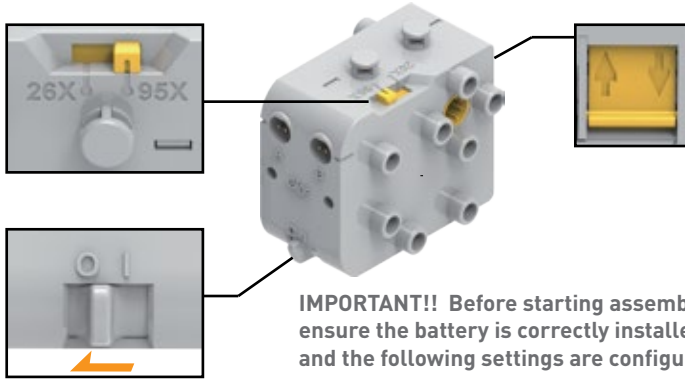


38

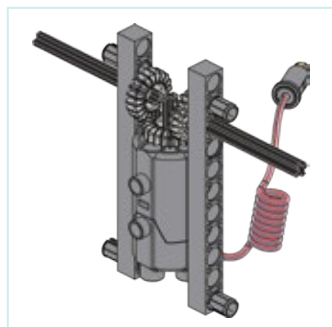
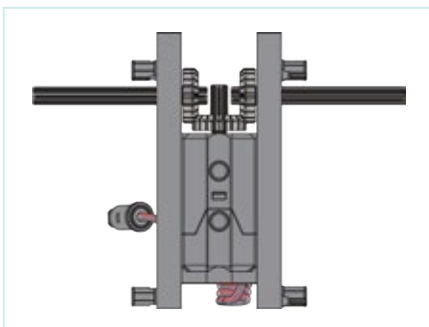
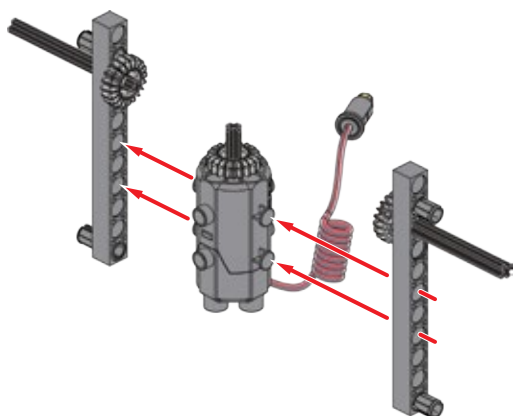
Done!



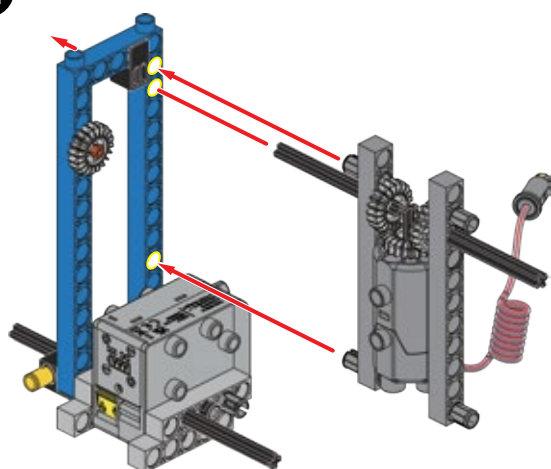
MODEL 9: DROID



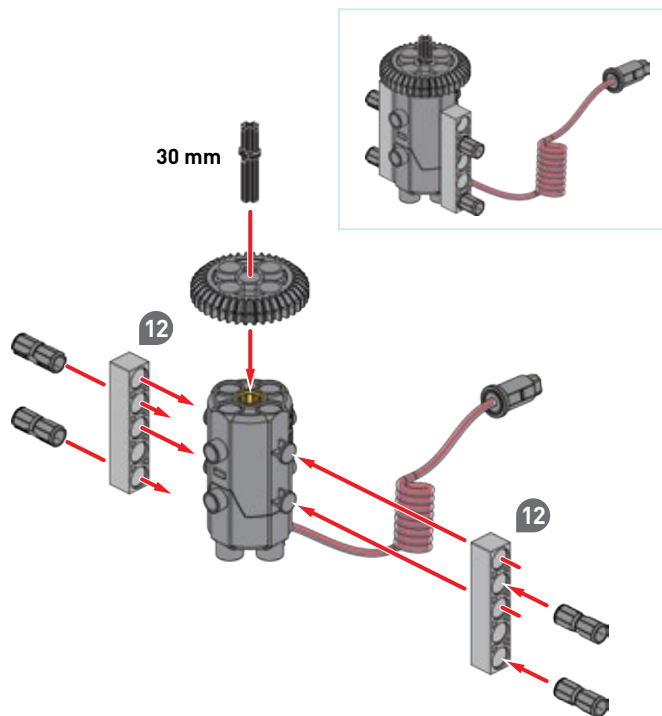
10



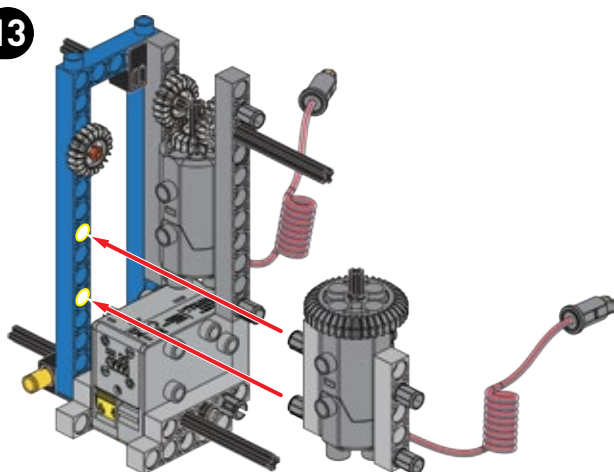
11



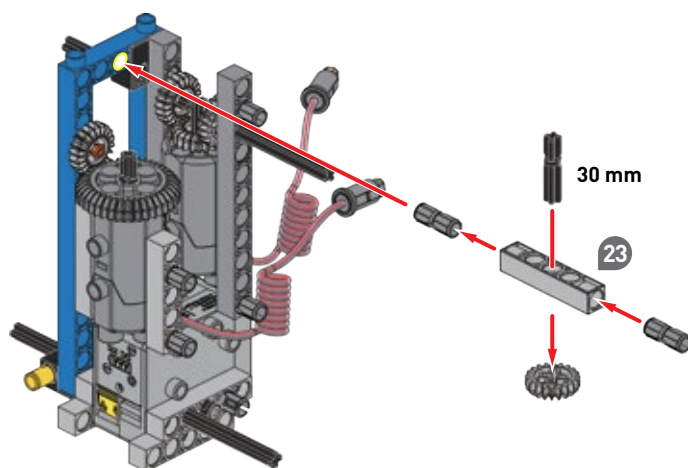
12



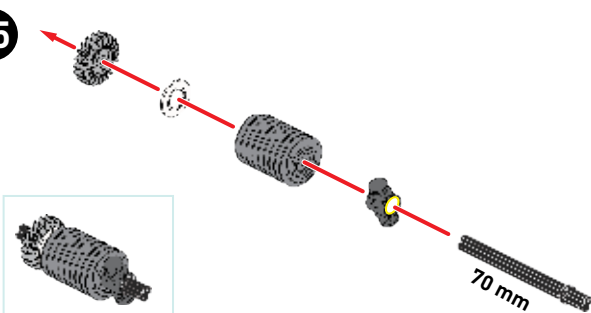
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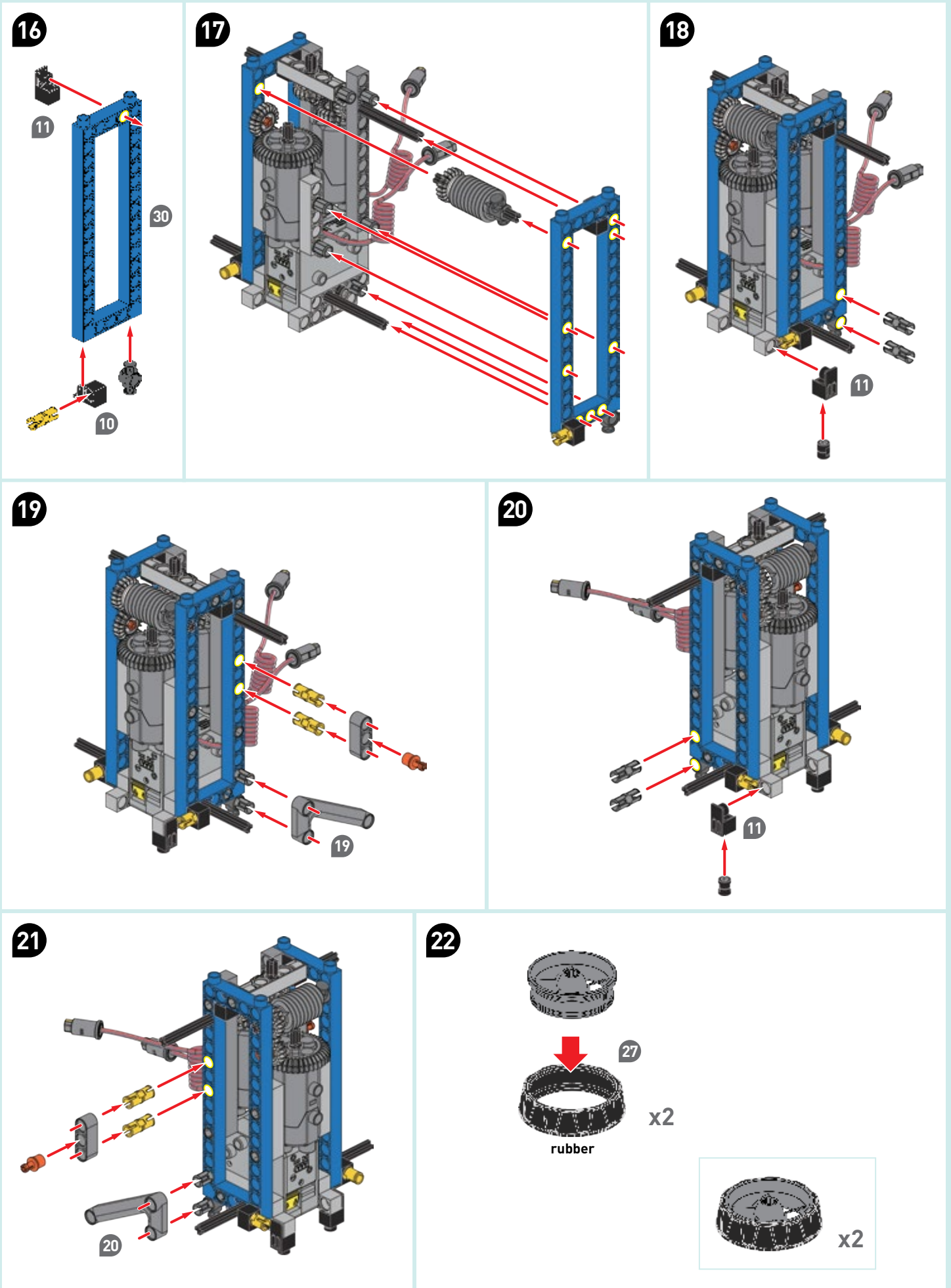


14

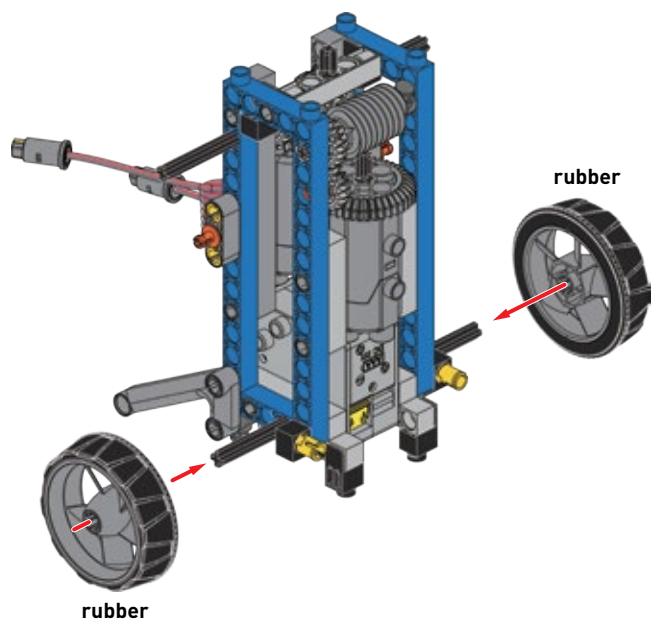


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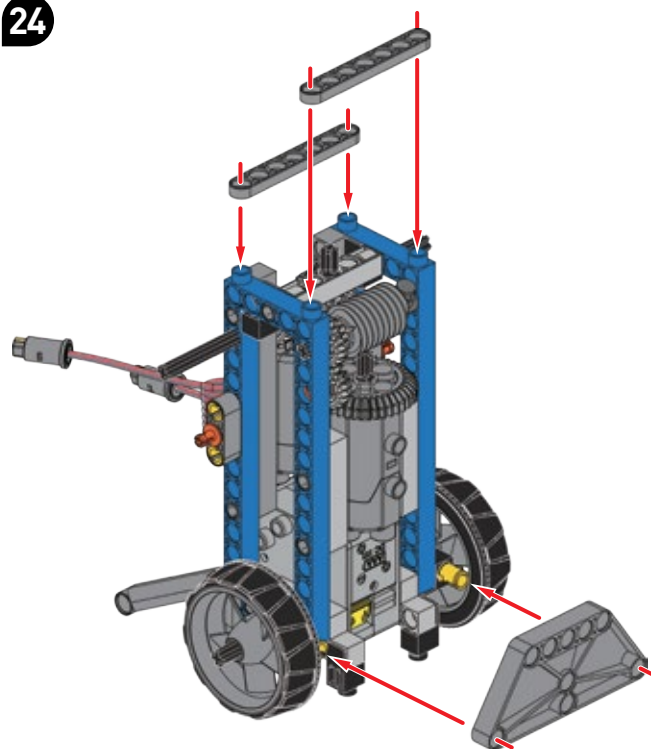




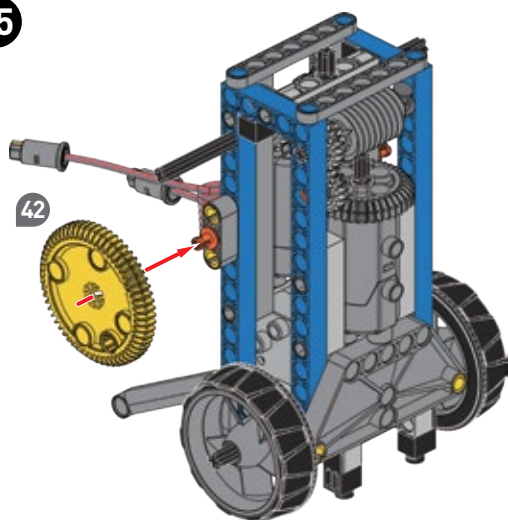
23



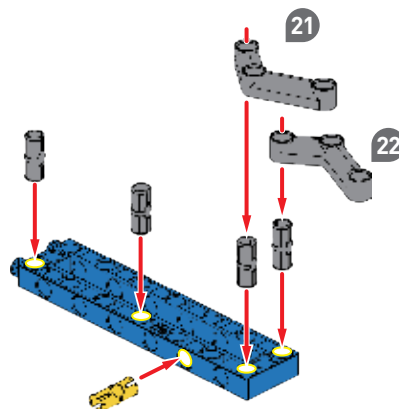
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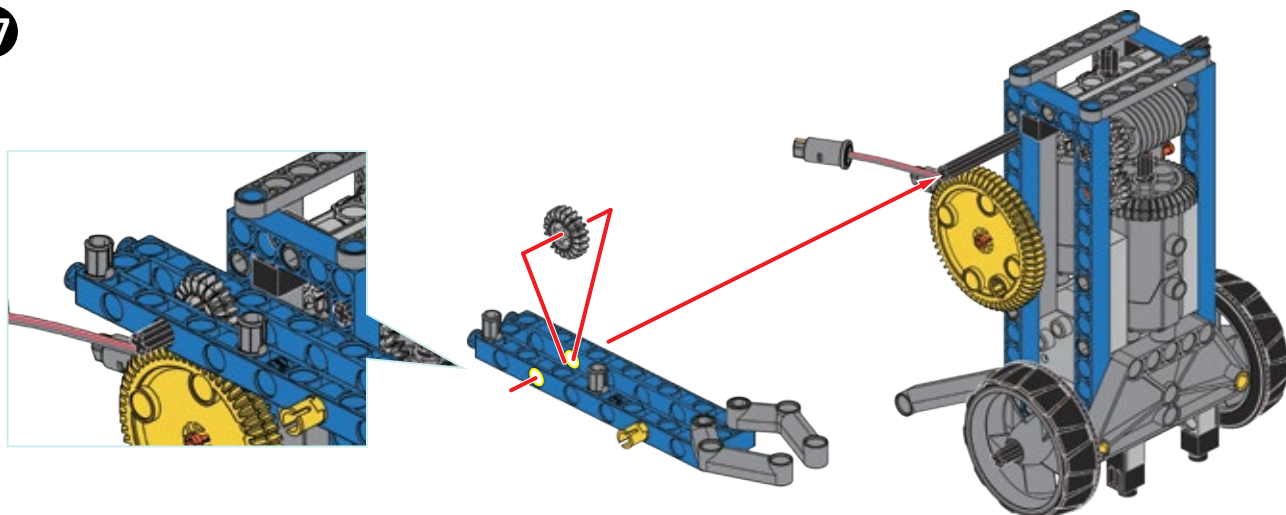
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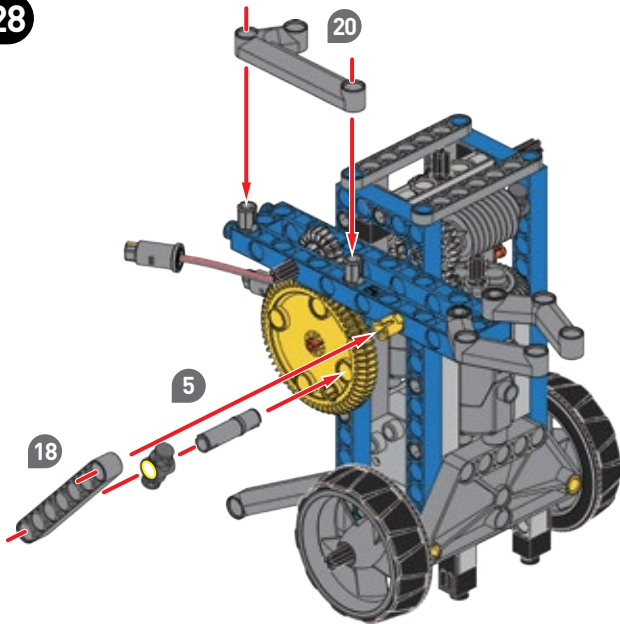


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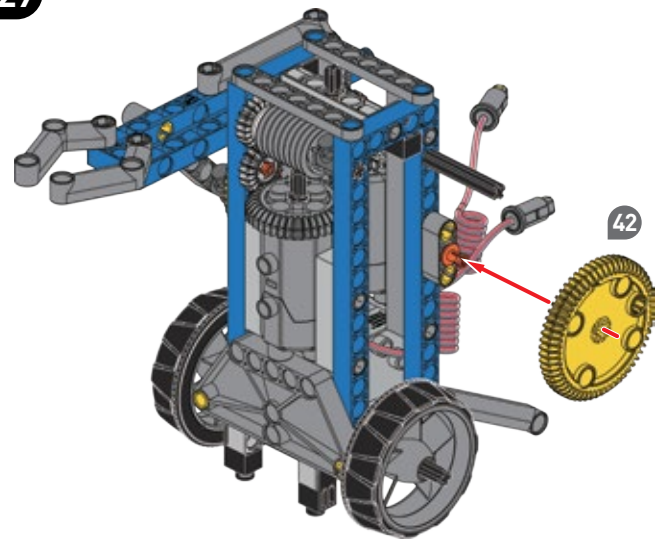




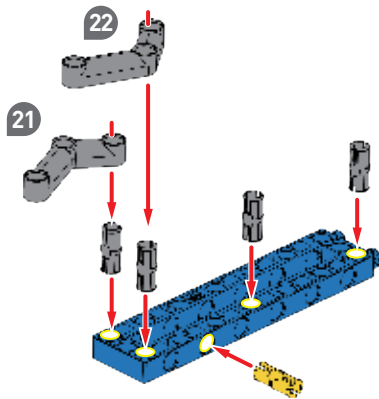
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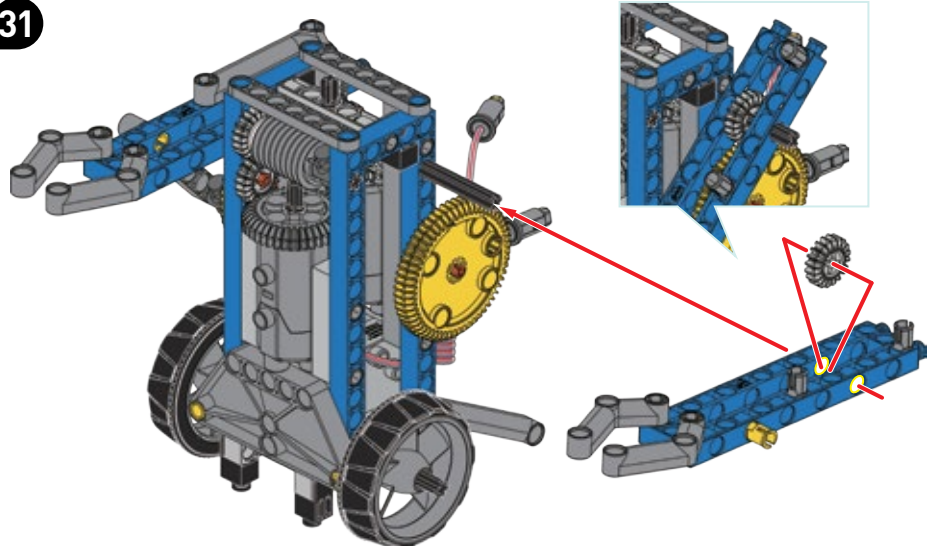
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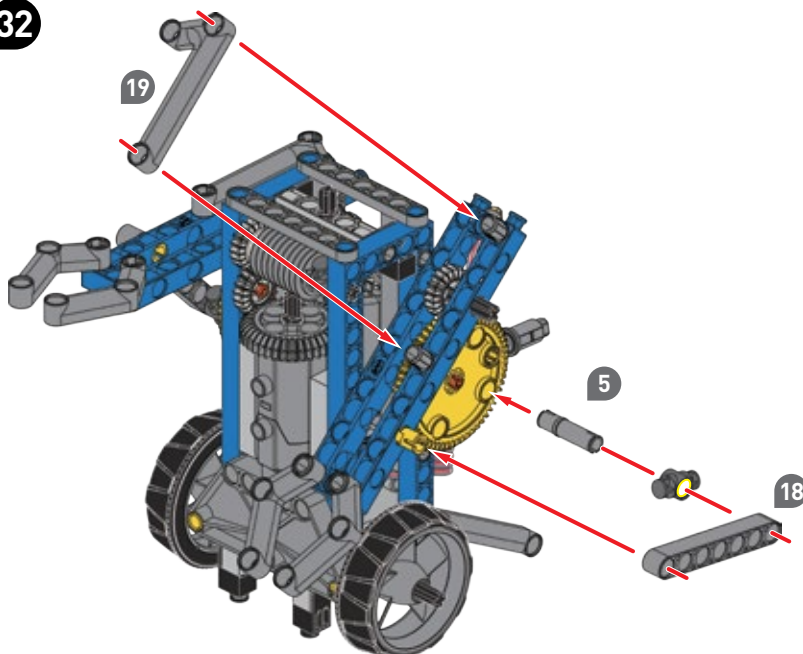
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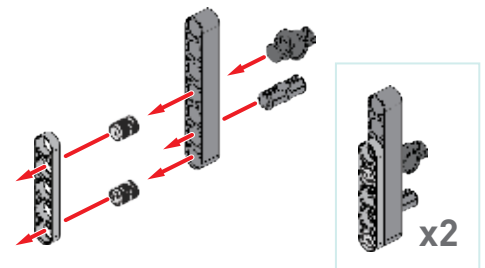
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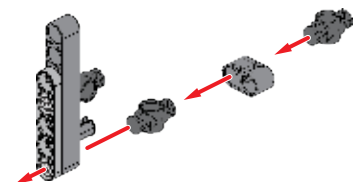
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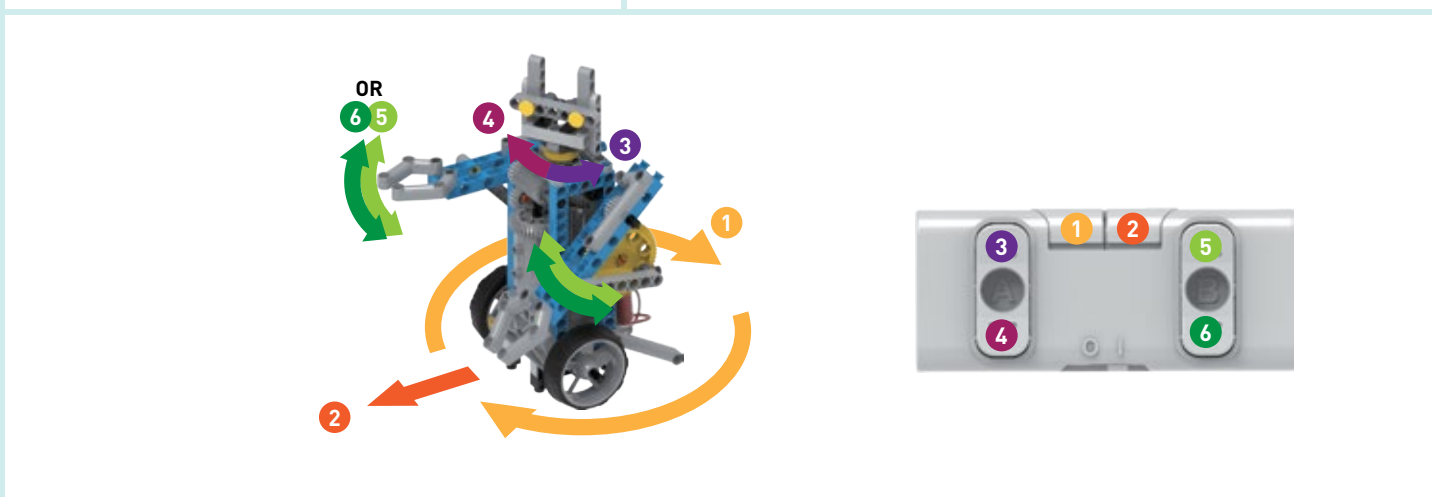
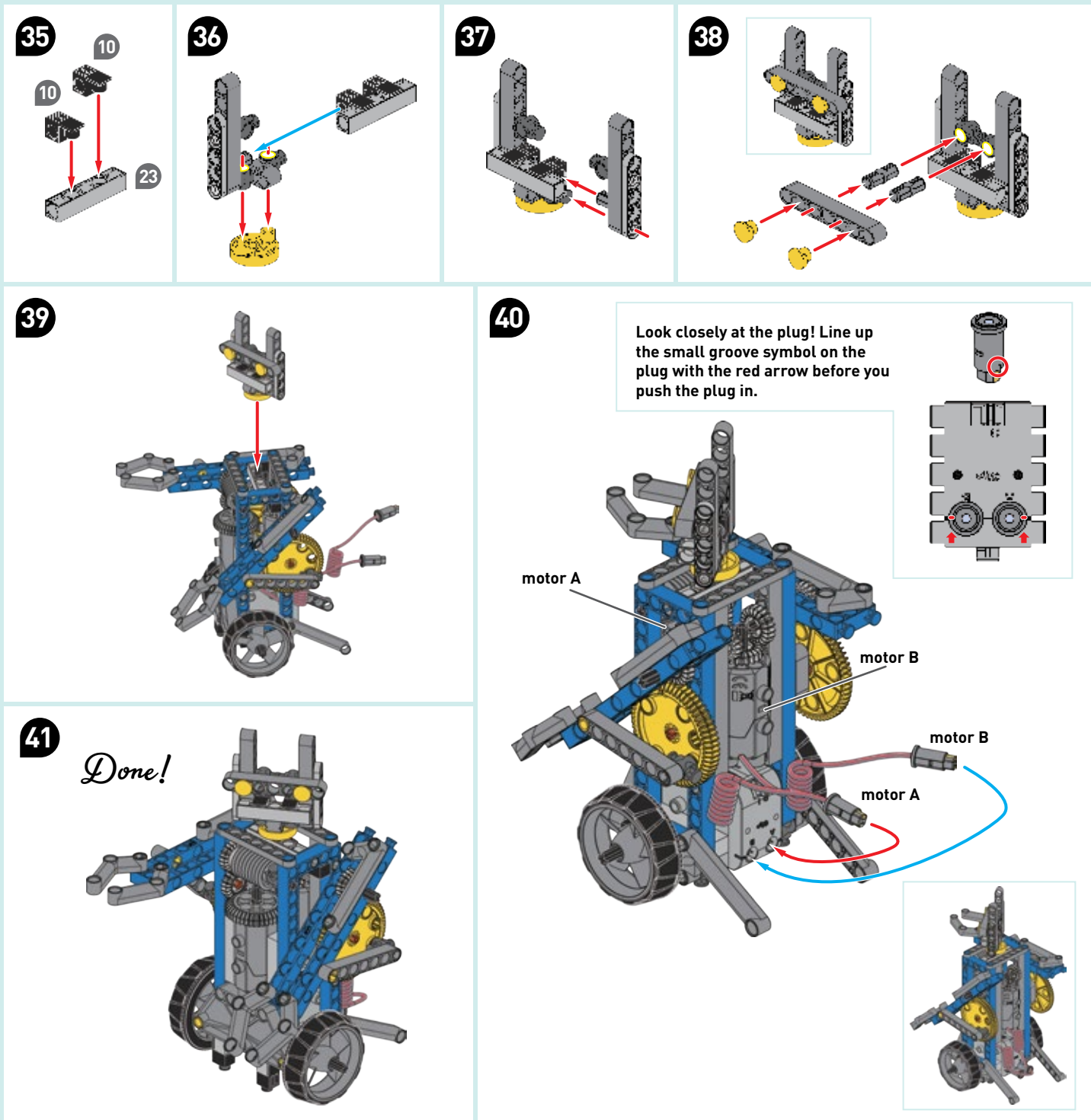


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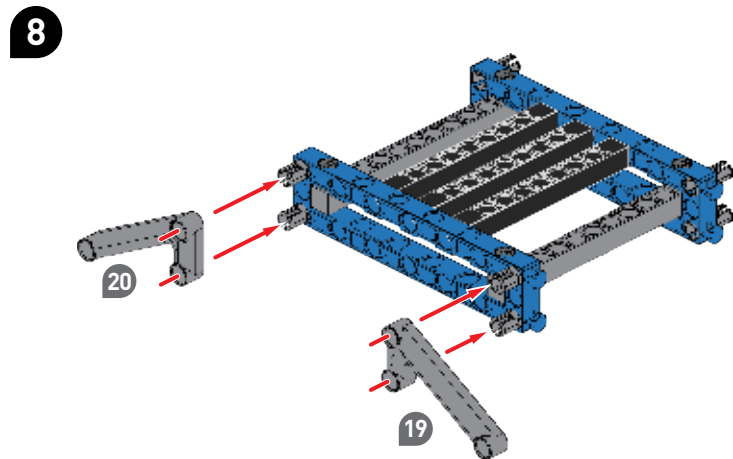
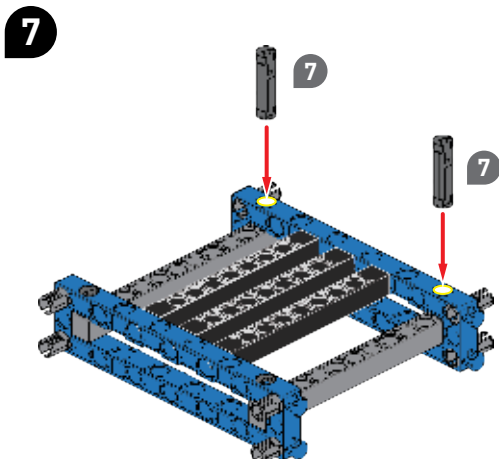
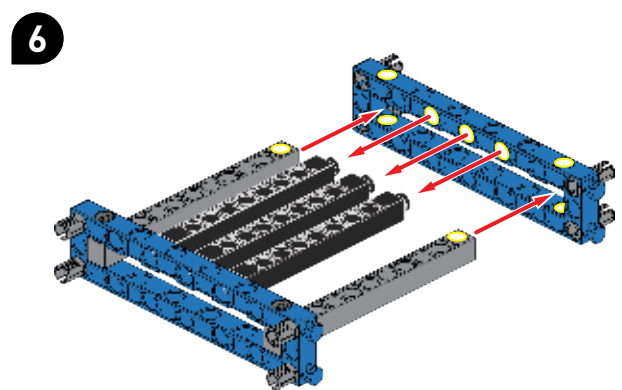
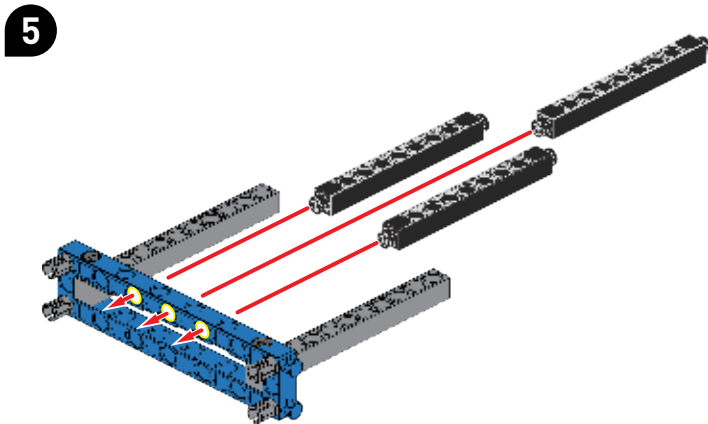
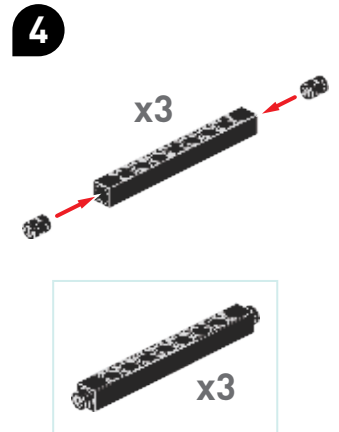
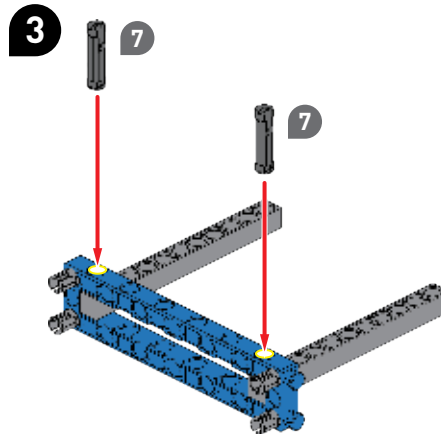
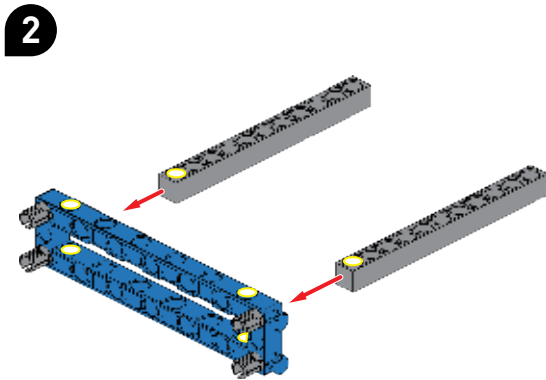
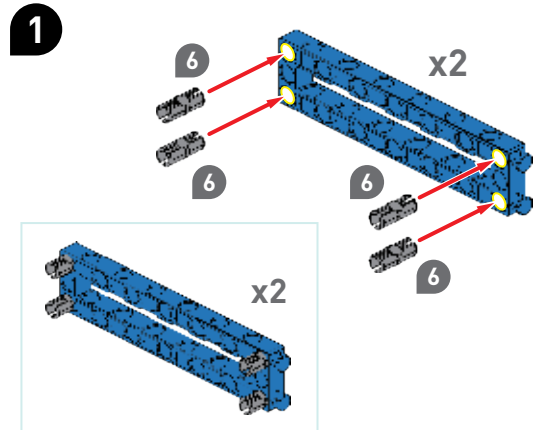
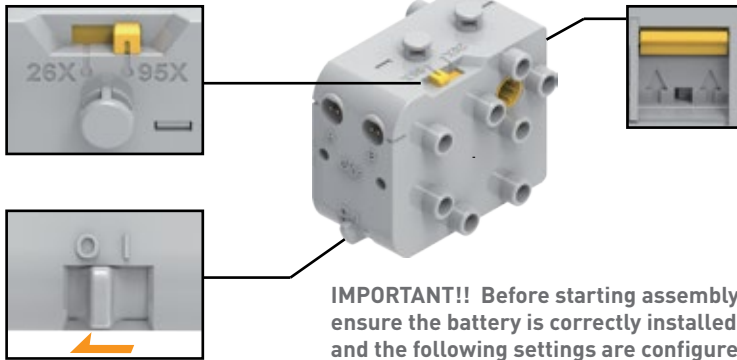
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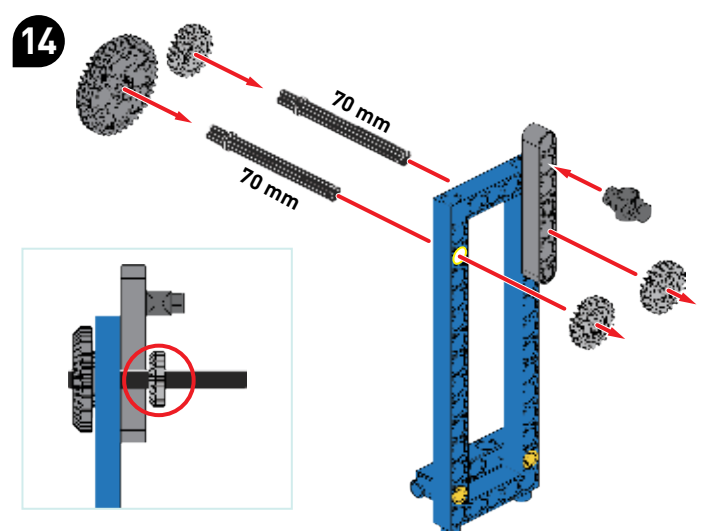
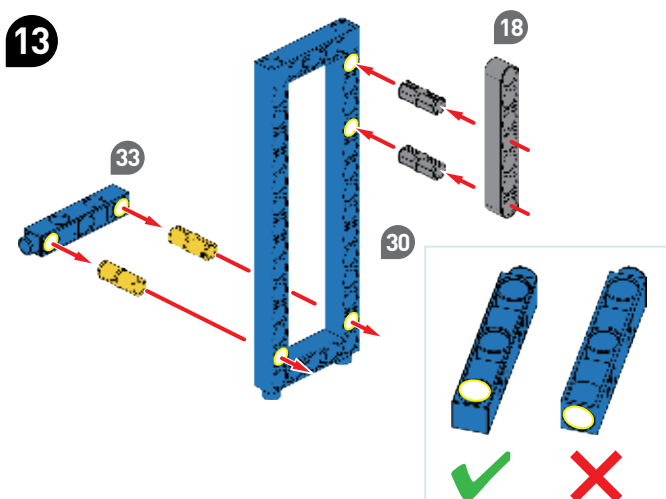
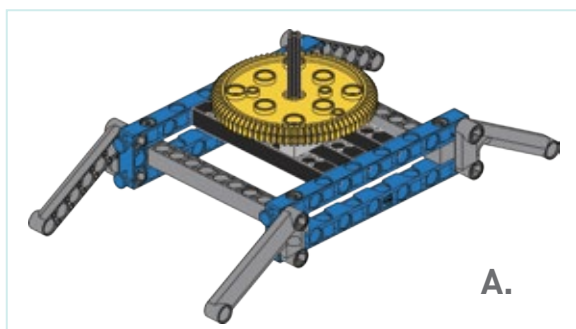
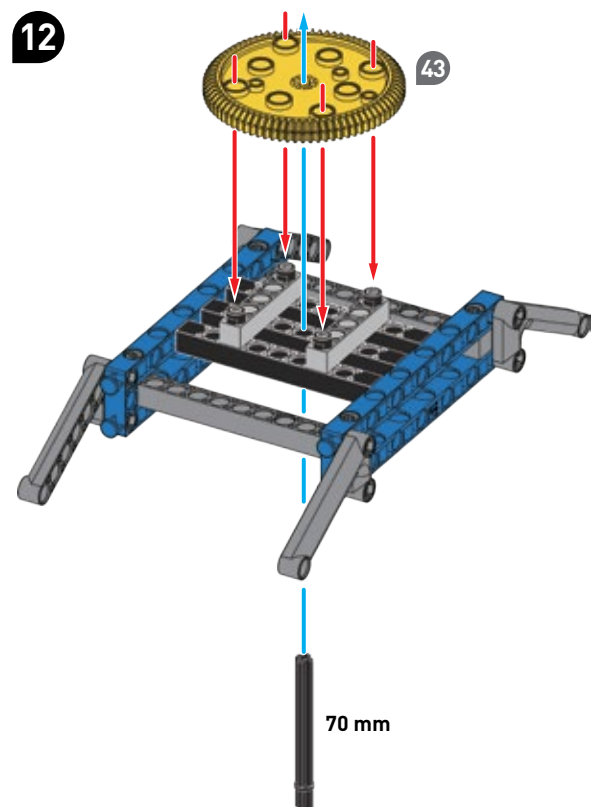
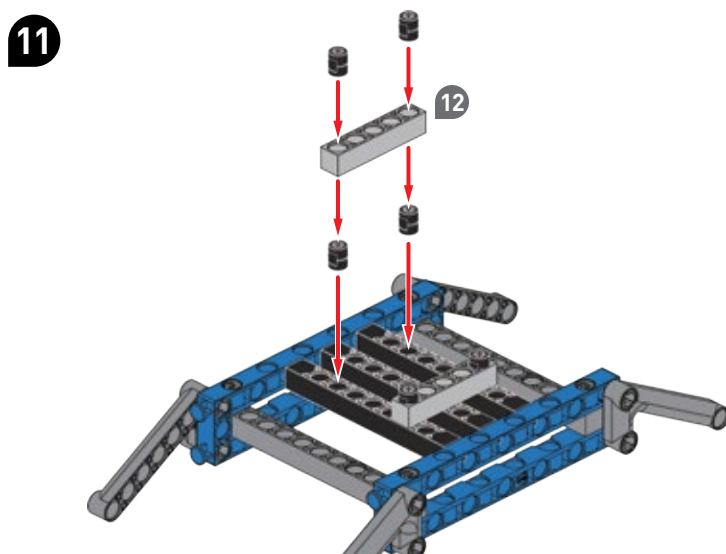
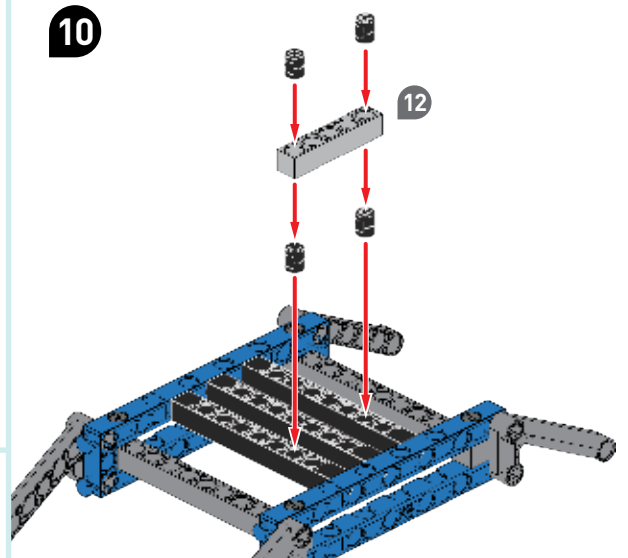
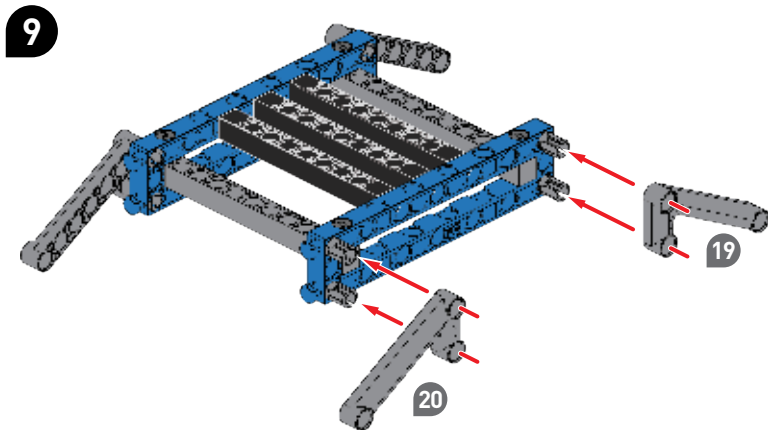






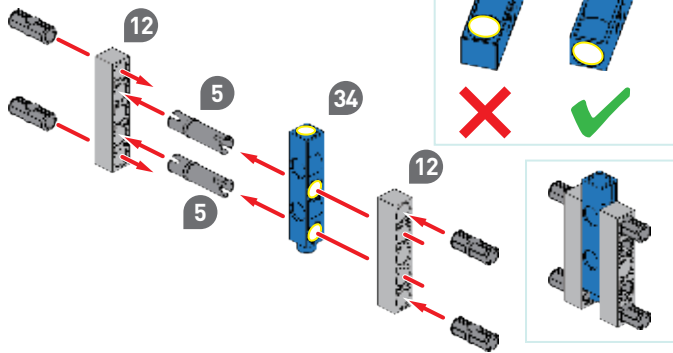
MODEL 10: ROBOTIC ARM



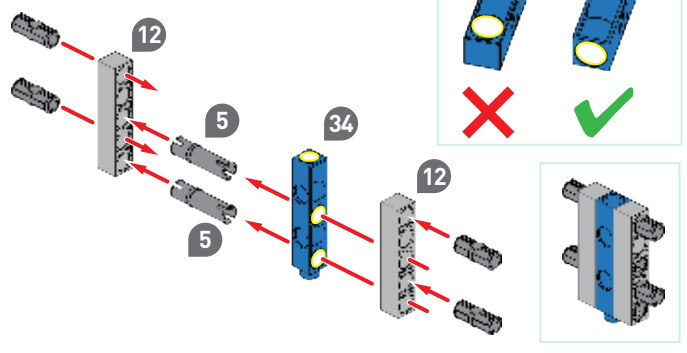




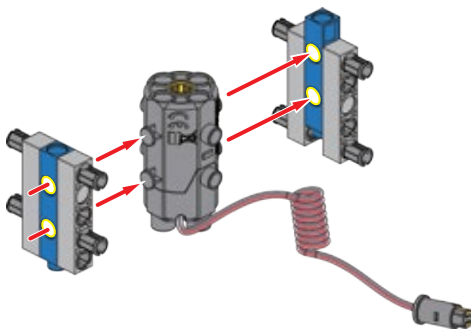
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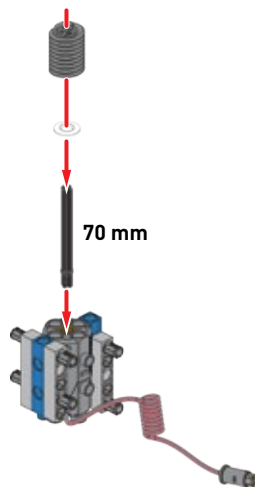
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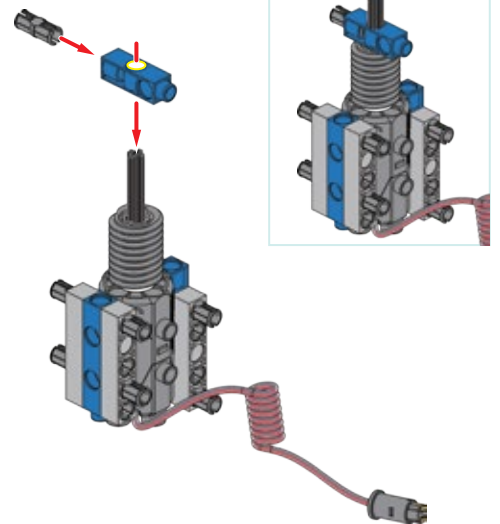
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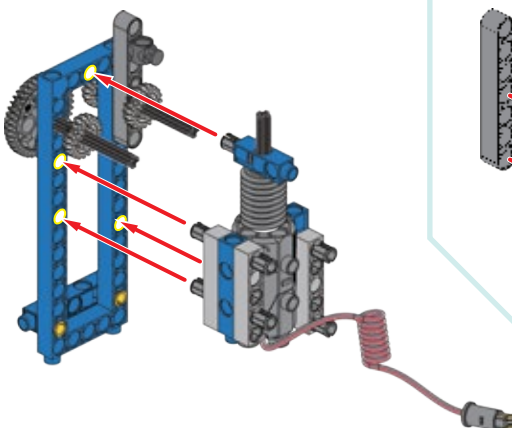
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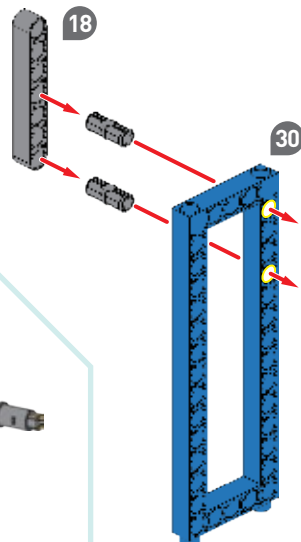
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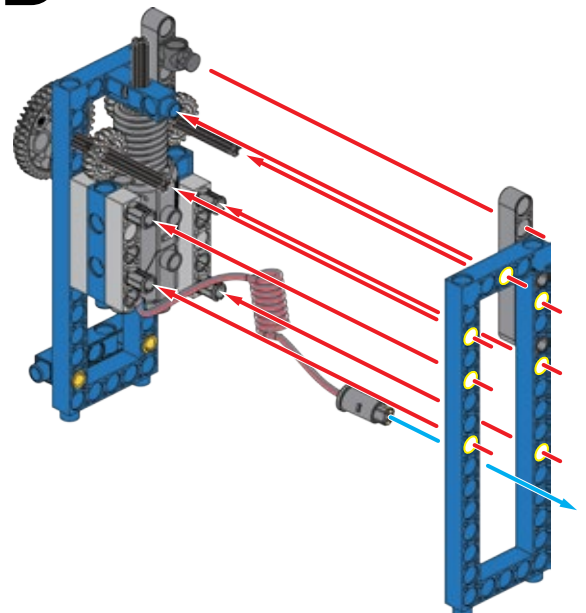
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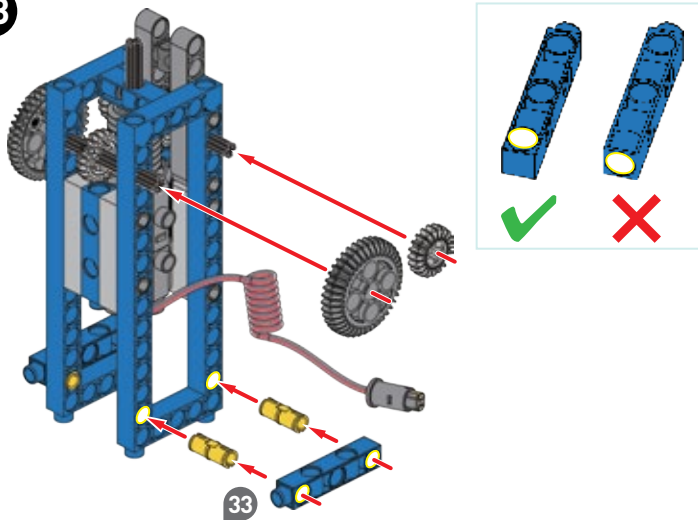
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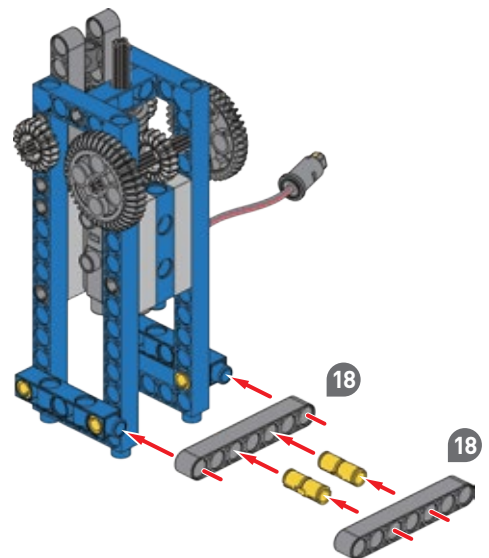
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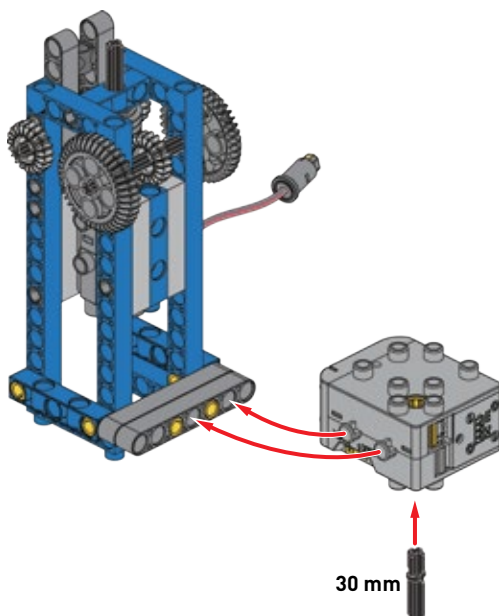
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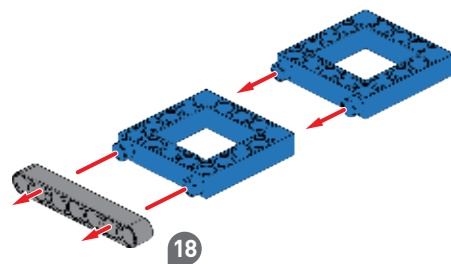
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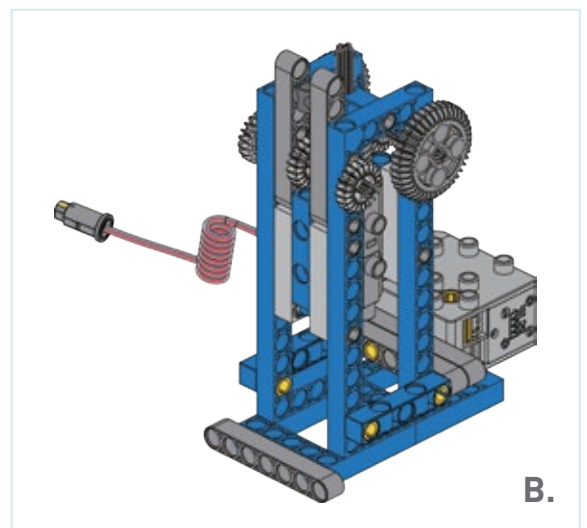
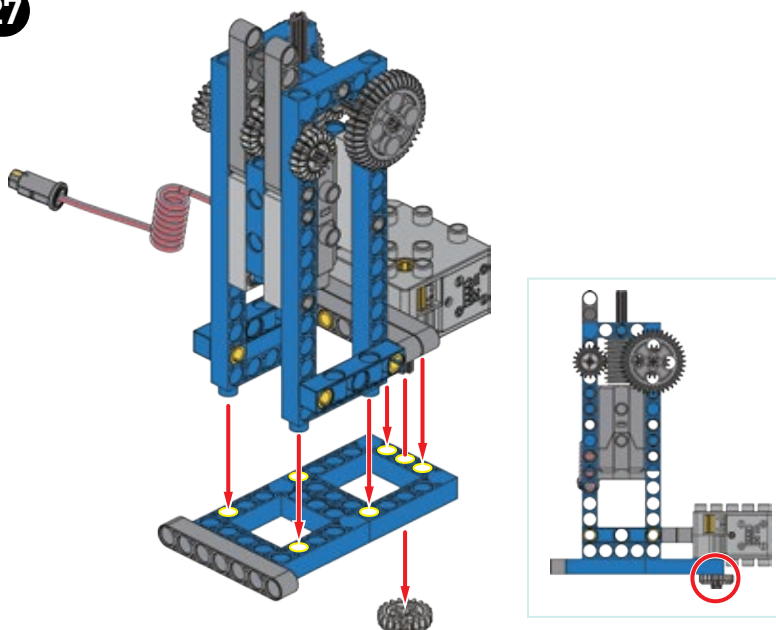
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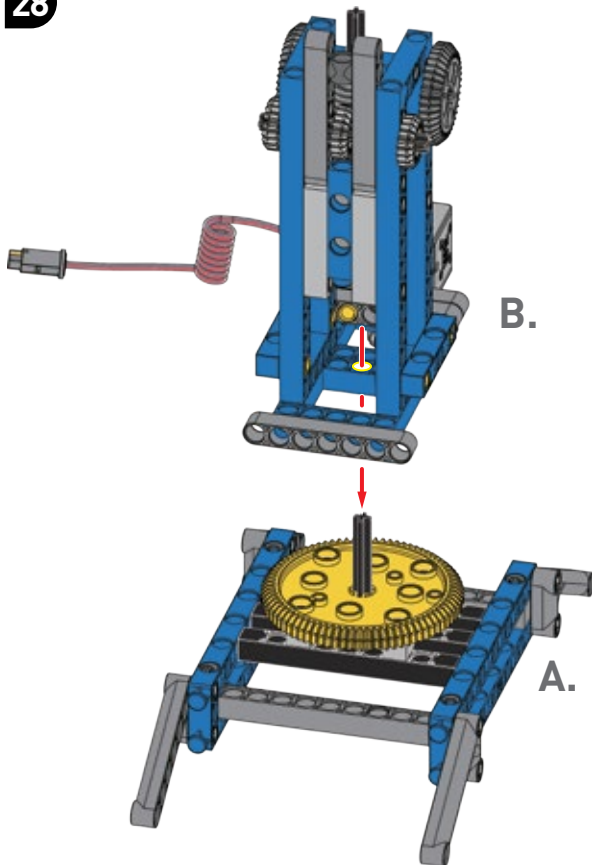
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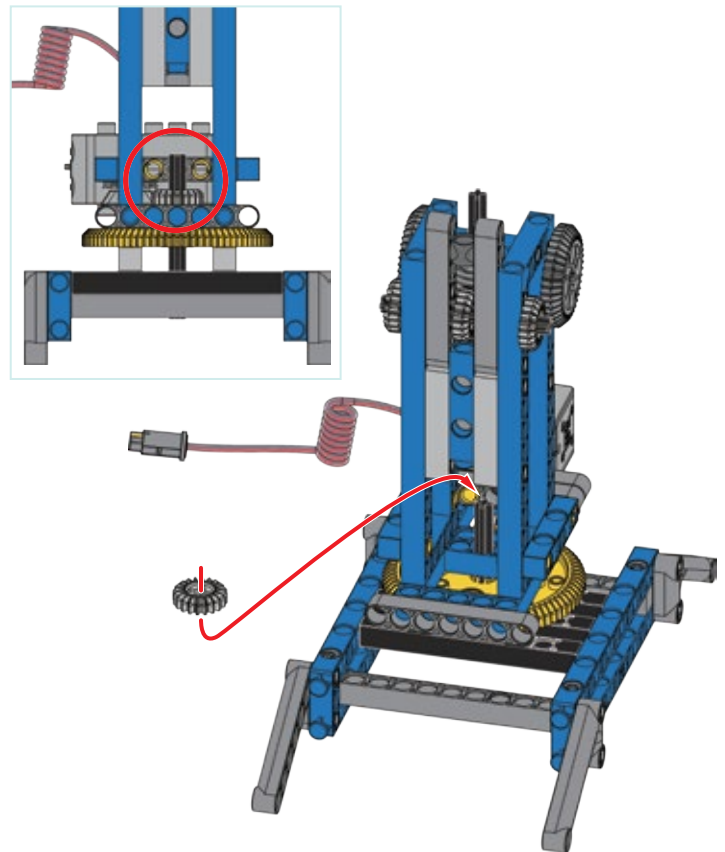
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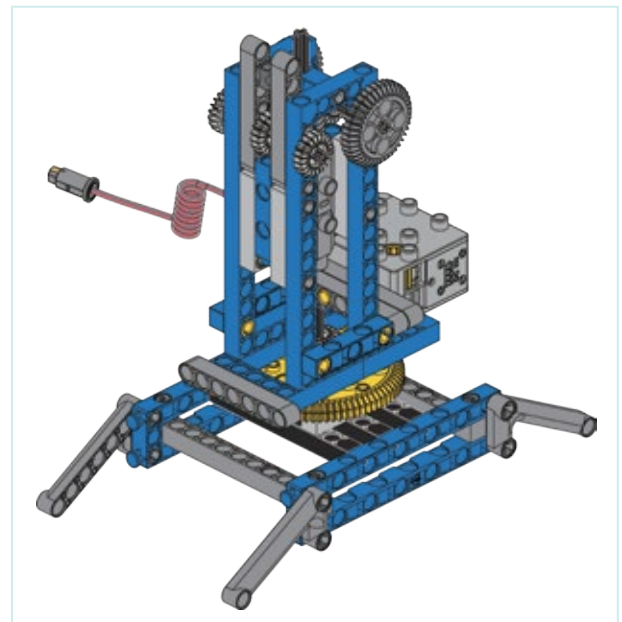
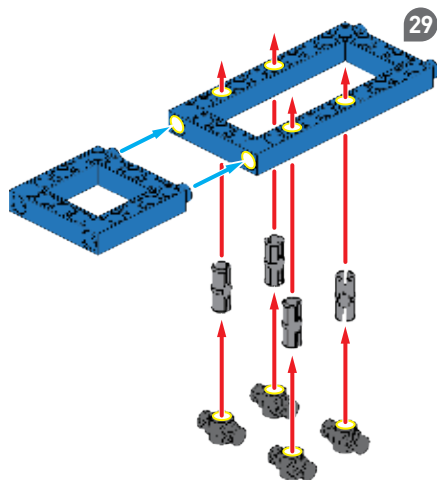
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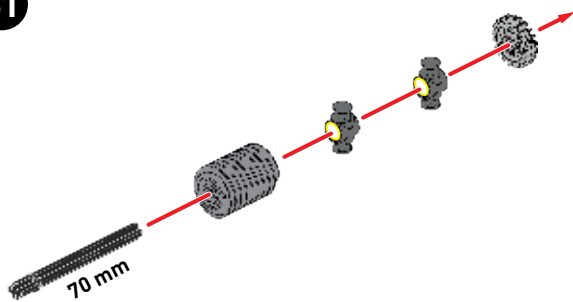
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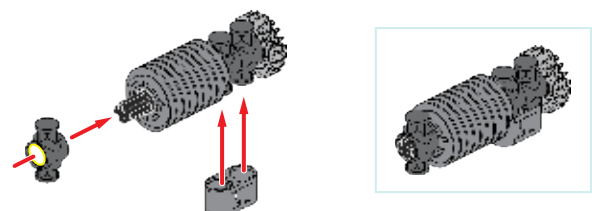
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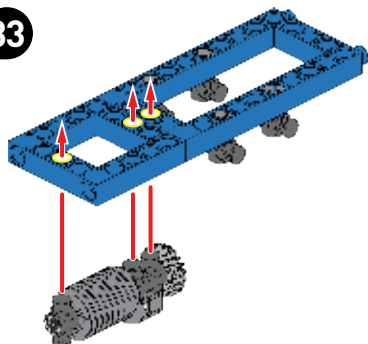
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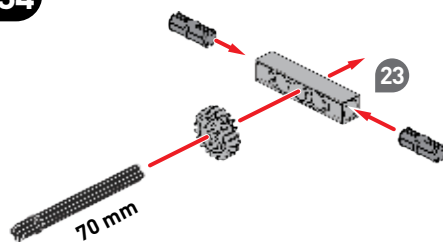
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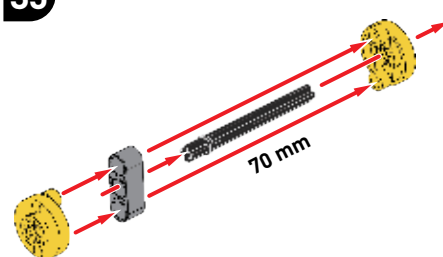
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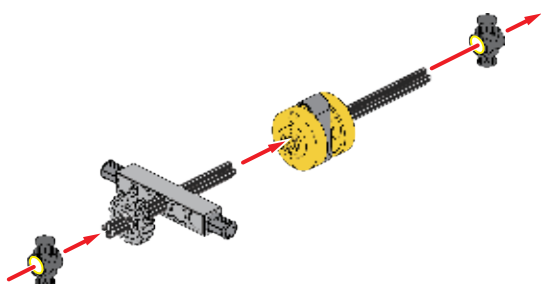
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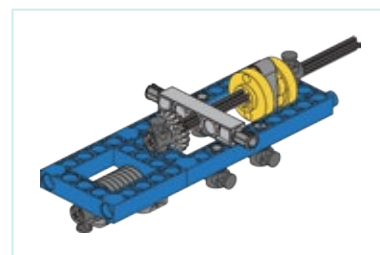
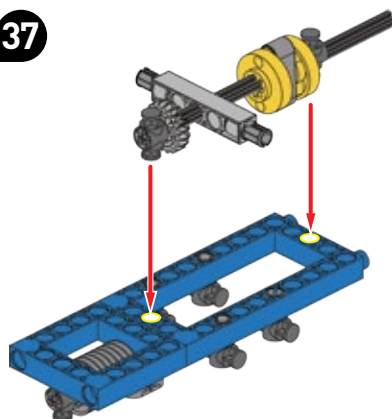
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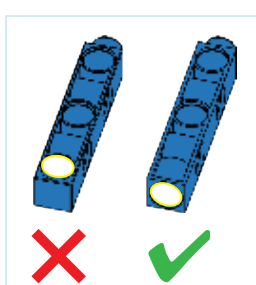
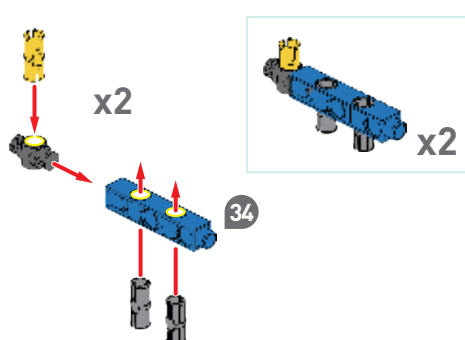
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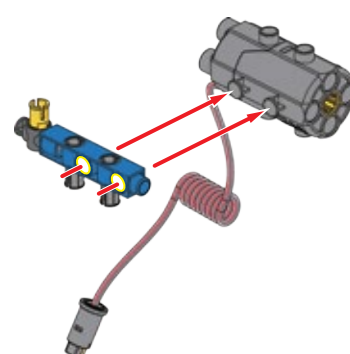
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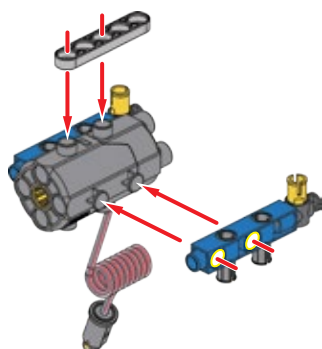
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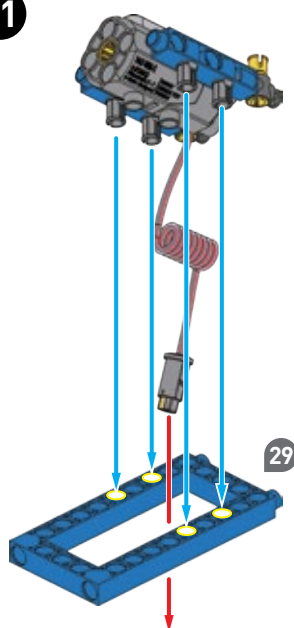
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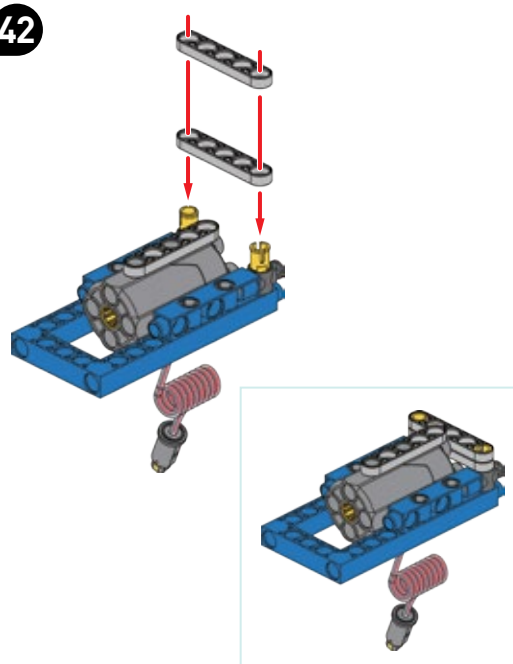
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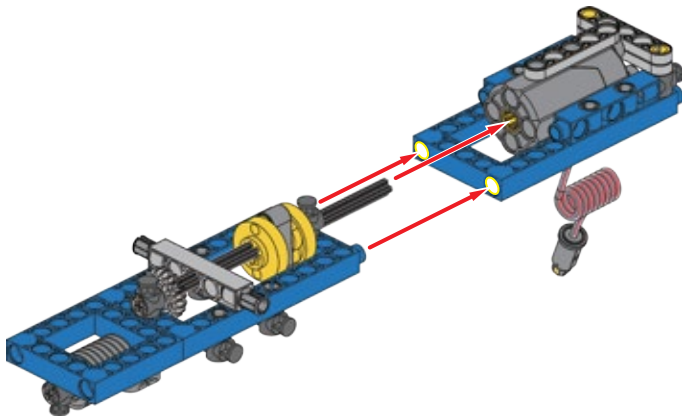


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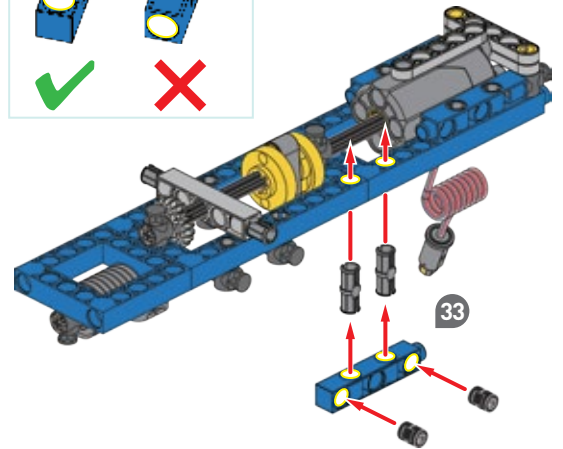
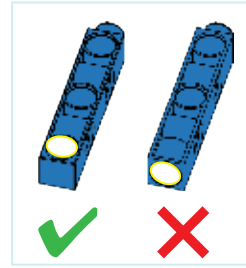




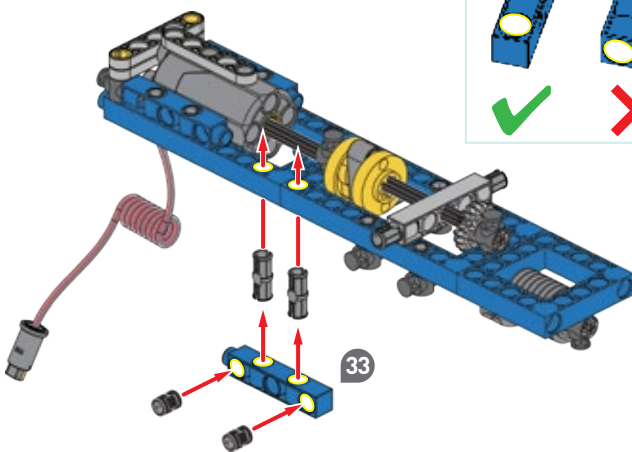
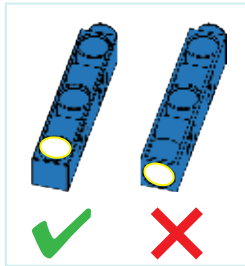
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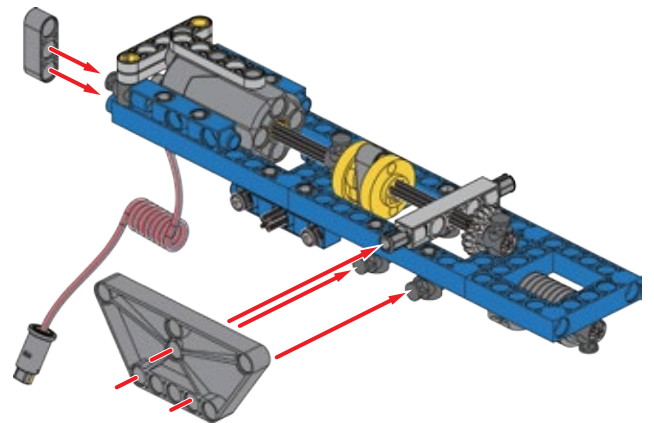
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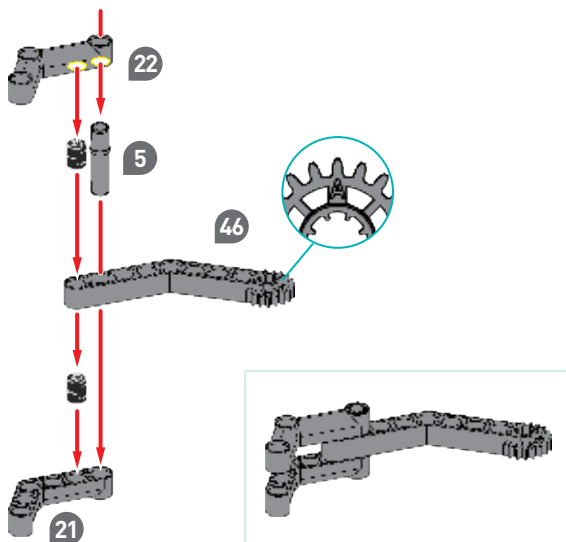
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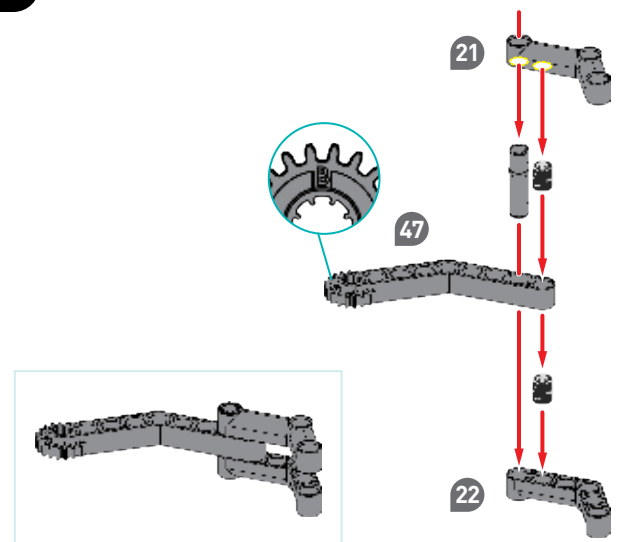
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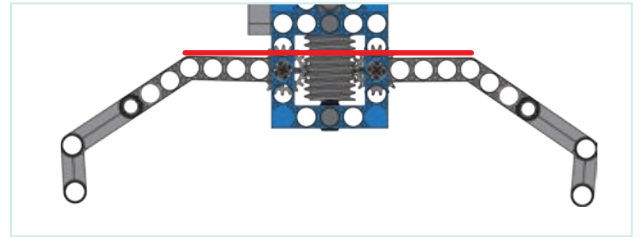
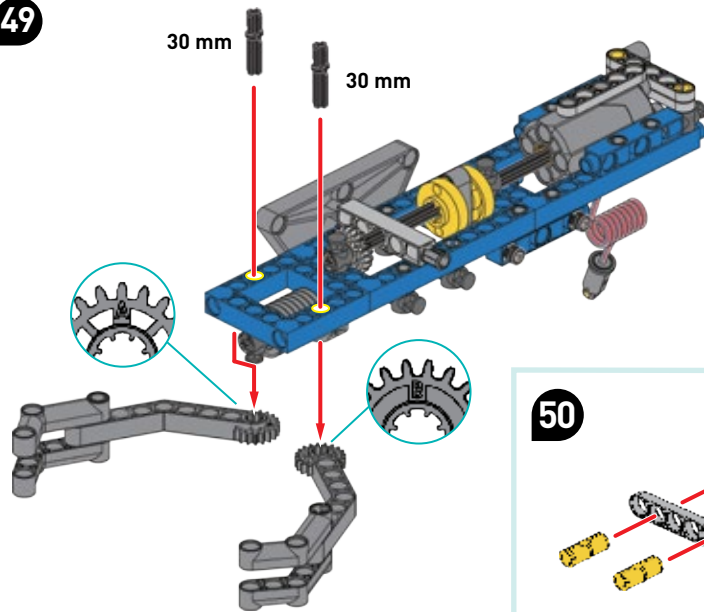
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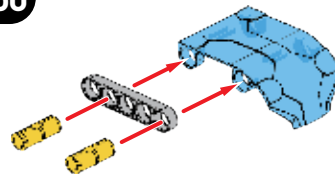
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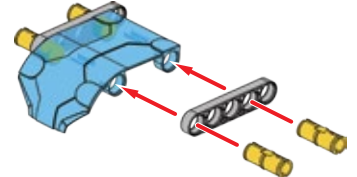
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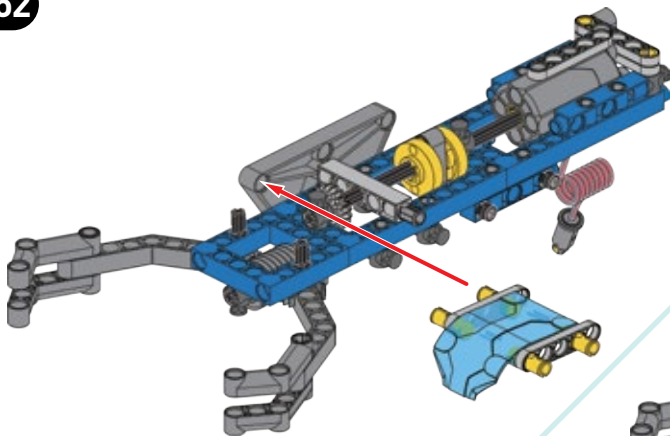
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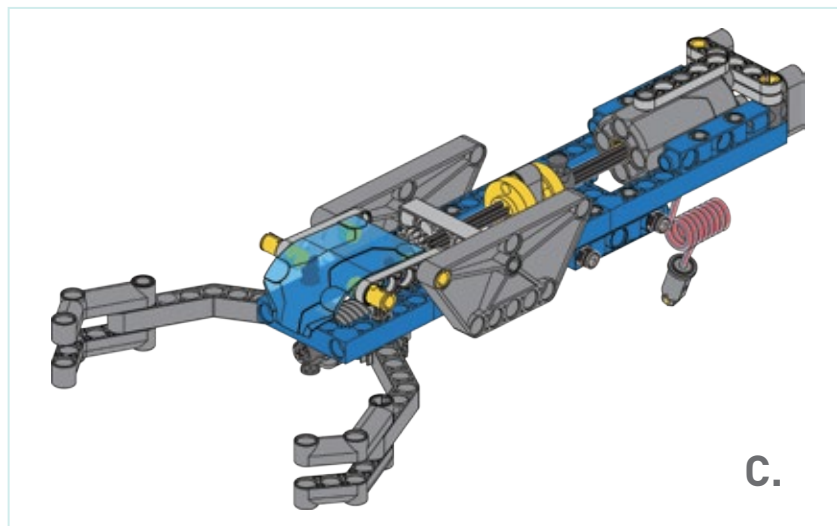
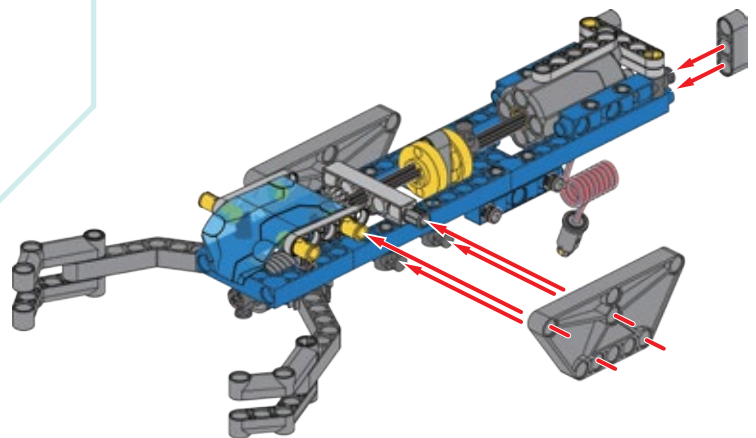
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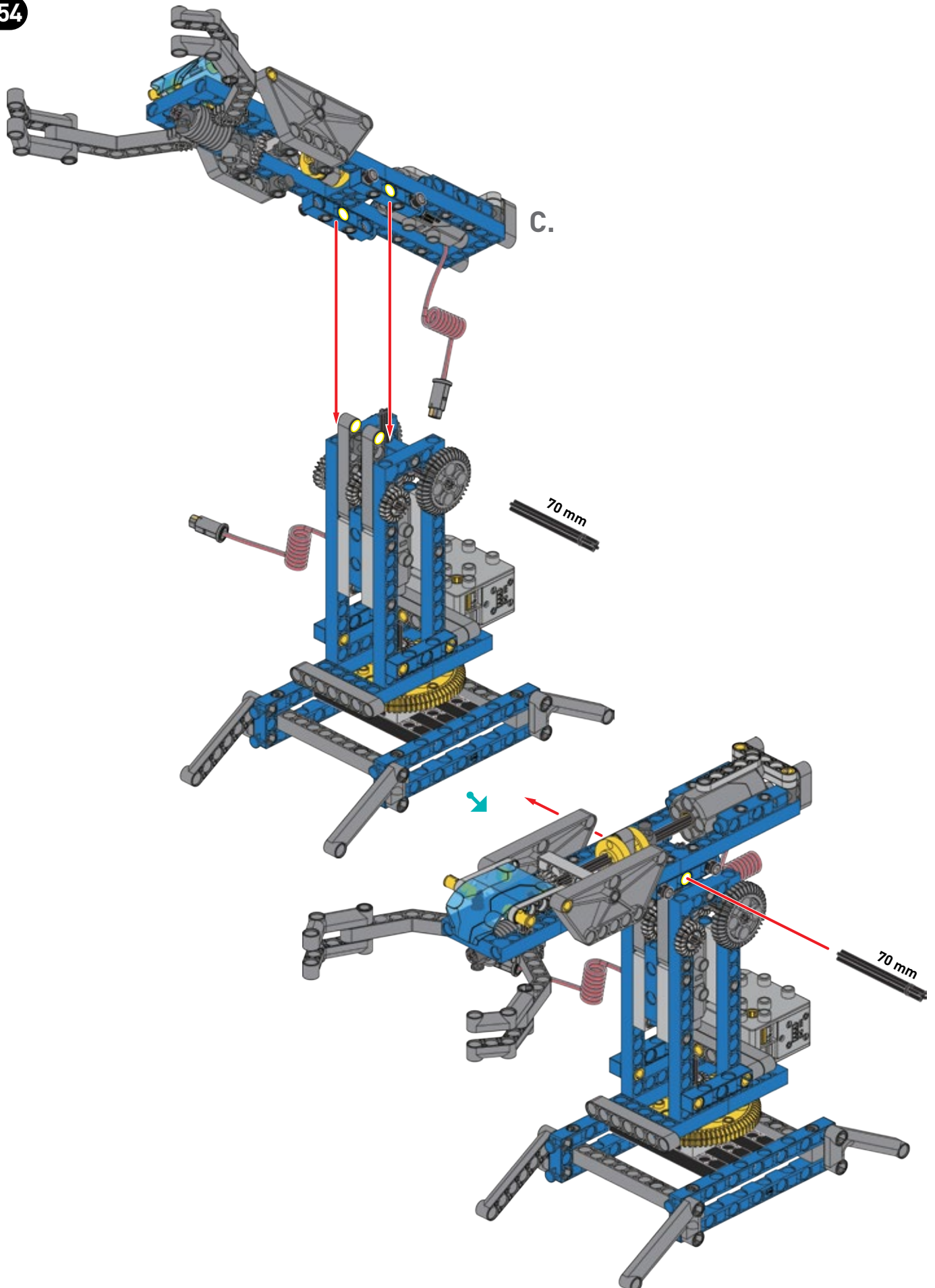


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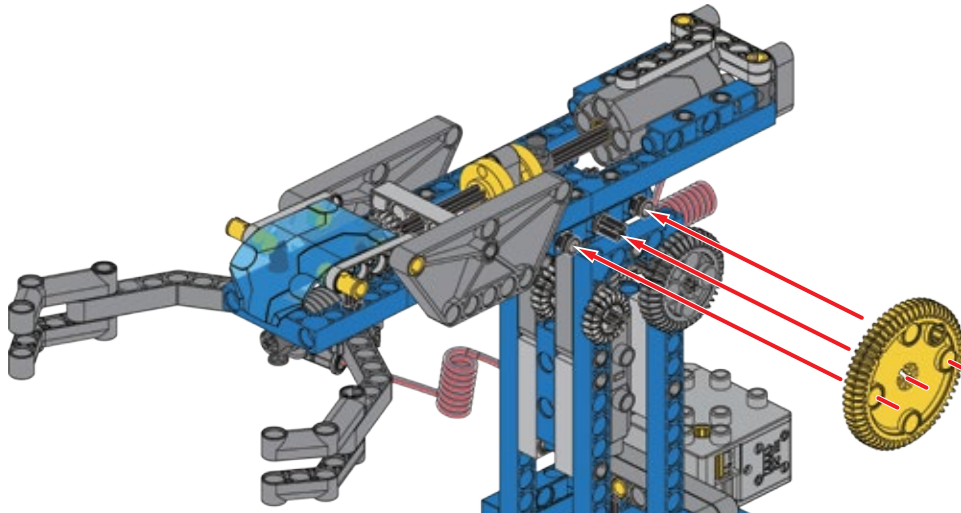




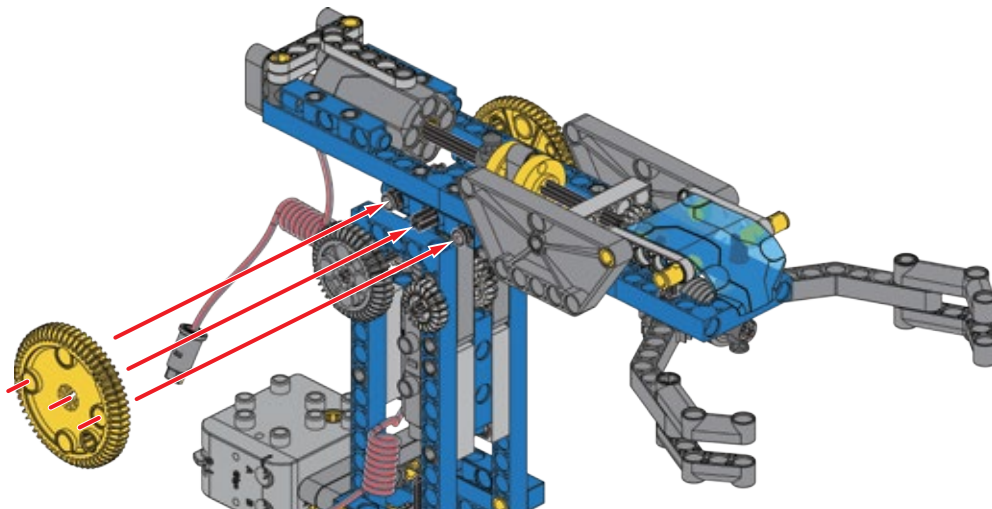
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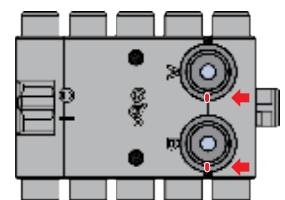
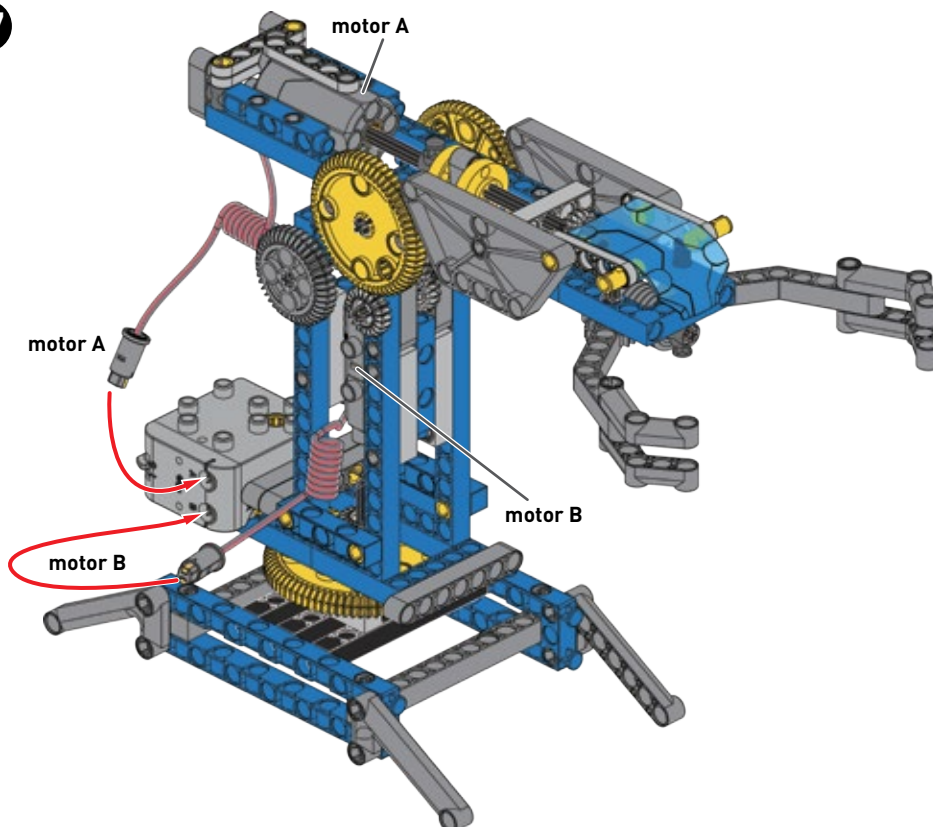
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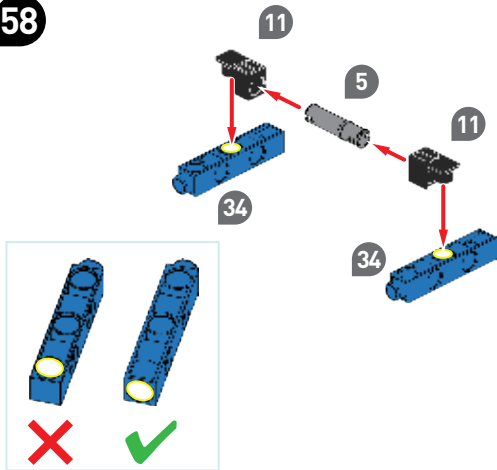
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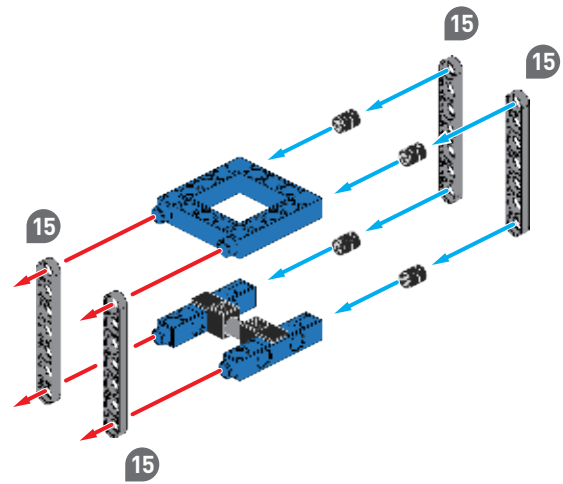
Look closely at the plug!
Line up the small groove
symbol on the plug with
the red arrow before you
push the plug in.



58

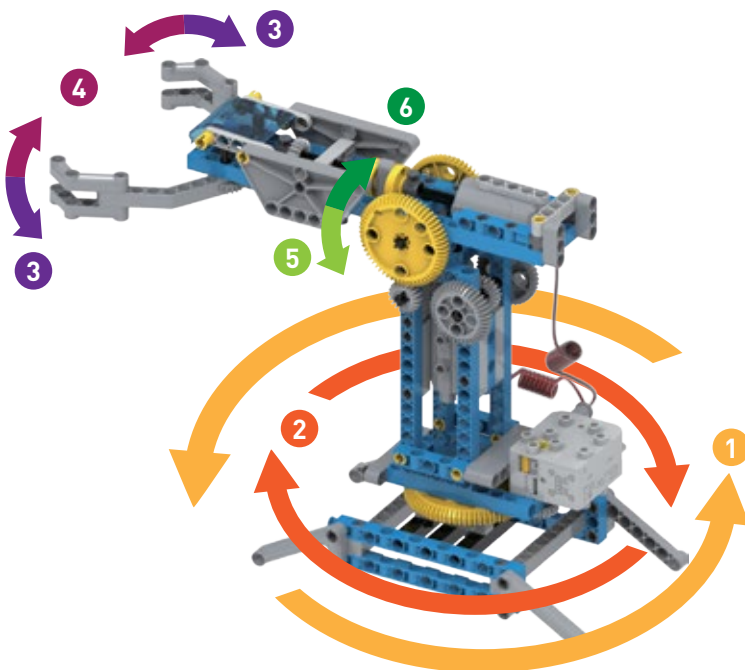
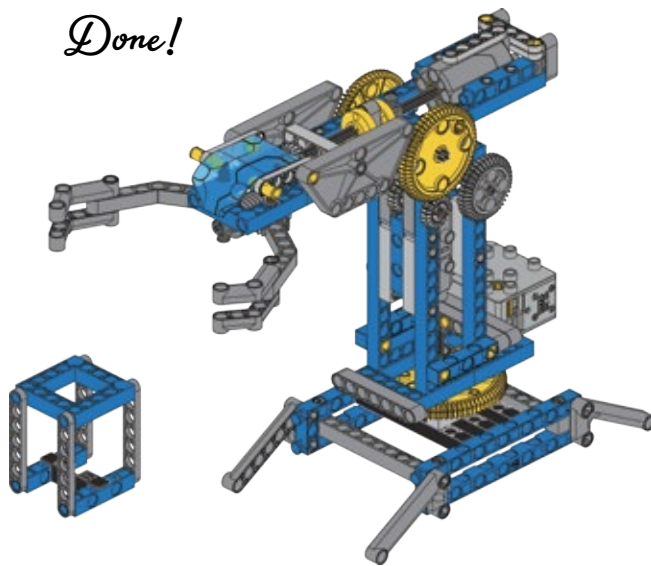


59



60

Done!



YOUR OWN ROBOTS

Now that you are familiar with the remote, receiver, and motors, and you have experience with lots of mechanical functions, **where do you go from here?**

Here are four open-ended prompts to inspire your own creations. Proud of something you built? We'd love to see it! Have your parents or teachers tag us on social media @thamesandkosmos.com.

Rescue Rover

Design a robot that can pick up and move small objects (like a foam block or bottle cap) and bring them to a safer location.

Art Bot

Design a robot that can make art. Can it hold a paintbrush or marker and move it around a page?

A Tool for Everything

Explore and define a problem that you encounter in your everyday life, and develop a **tool** that addresses the problem.

Robotic Castle

Build a robotic castle with three mechanical functions, like raising/lowering a drawbridge, opening/closing a gate, rotating a turret, moving a flag, revealing a secret chamber, etc.

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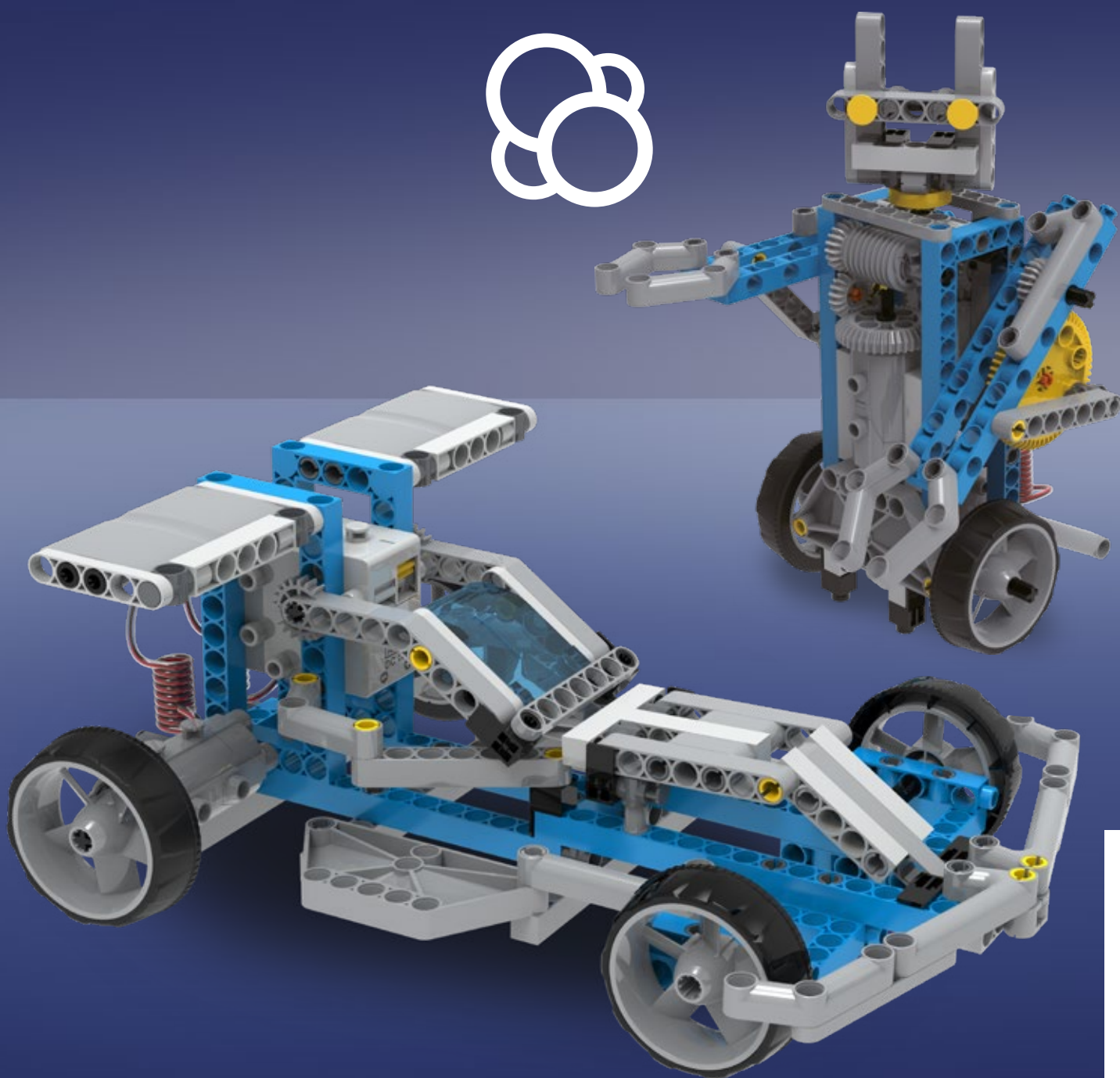
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Thames & Kosmos US

Email: support@thamesandkosmos.com

Phone: 1-800-587-2872

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Phone: 01580 713000