EXPERIMENT MANUAL

WindBots

6-IN-1 WIND-POWERED MACHINE KIT

Feel the Wind!
No motor or batteries required!

Build 6 awesome models
THAT MOVE WITH THE WIND

THAMES & KOSMOS

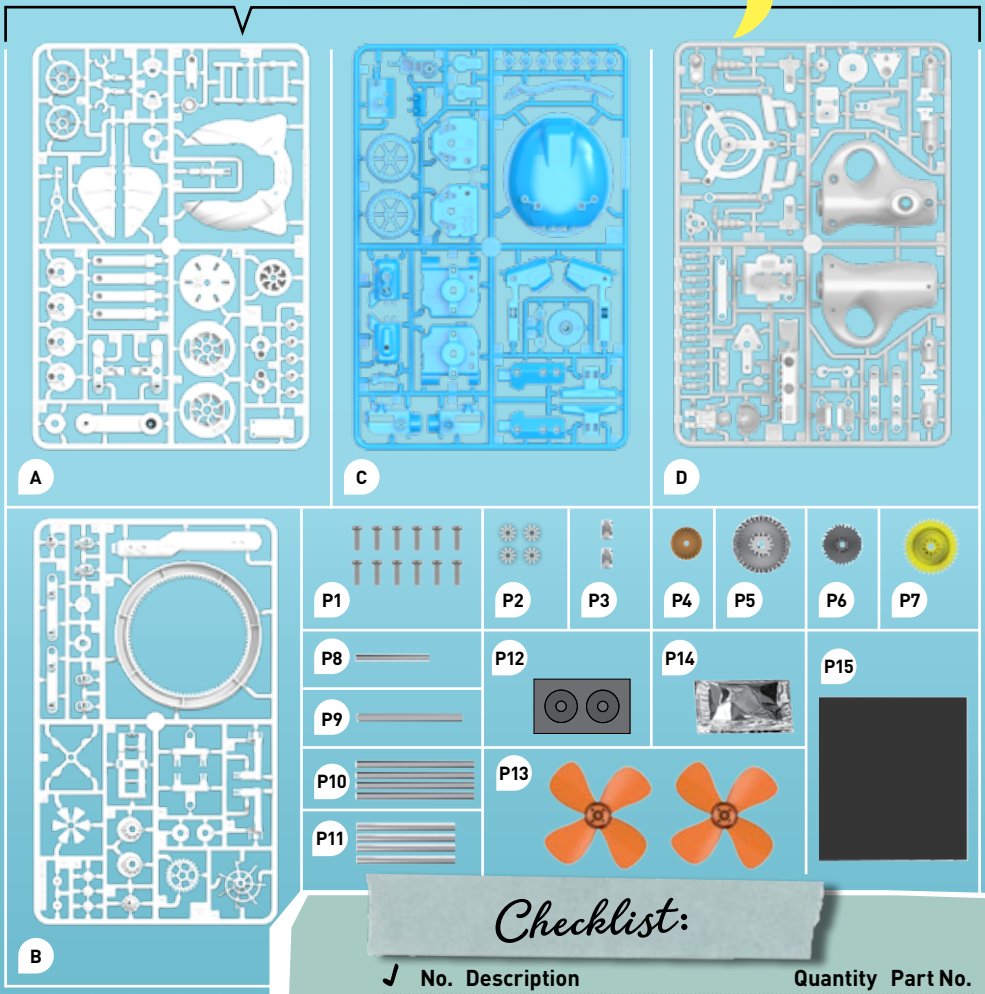
Franckh-Kosmos Verlags-GmbH & Co. KG, Pfizerstr. 5-7, 70184 Stuttgart, Germany | +49 (0) 711 2191-0 | www.kosmos.de
Thames & Kosmos, 89 Ship St., Providence, RI, 02903, USA | 1-800-587-2872 | www.thamesandkosmos.com

KIT CONTENTS

Good to know!

If you are missing any parts, please contact Thames & Kosmos customer service (see back cover).

What's inside your experiment kit:



Checklist:

✓	No.	Description	Quantity	Part No.
○	A	White plastic frame (parts A1 – A26)	1	725765
○	B	White plastic frame (parts B1 – B21)	1	725766
○	C	Blue plastic frame (parts C1 – C26)	1	725768
○	D	Grey plastic frame (parts D1 – D33)	1	725770
○	P1	Screw	12	725771
○	P2	Small gear, white	4	725771
○	P3	Worm gear, white	2	725771
○	P4	Gear, orange	1	725771
○	P5	Large gear, white	1	725771

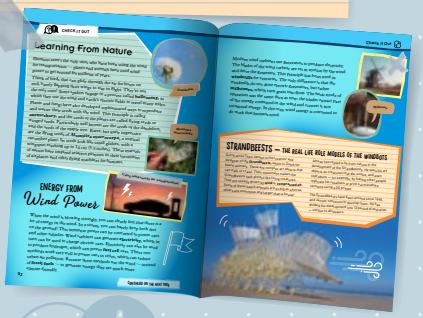
YOU WILL ALSO NEED:

Diagonal cutters or scissors, nail file, small Phillips-head screwdriver (size PH1), hammer, tissue paper, cotton swab, cup

CONTENTS

TIP

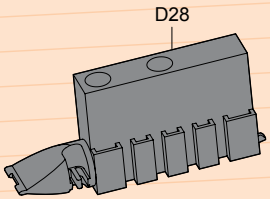
ADDITIONAL INFORMATION CAN BE FOUND IN THE CHECK IT OUT SECTIONS ON PAGES 21 AND 52.



TIP

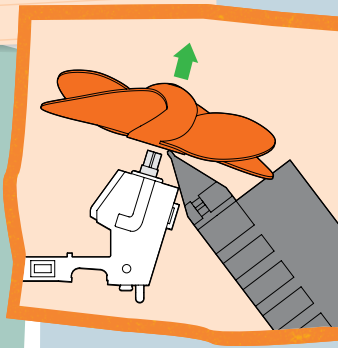
PART D28 IS A USEFUL TOOL.

YOU WILL FIND MORE INFORMATION ABOUT WHERE AND HOW TO USE IT ON PAGE 7 AND IN THE ASSEMBLY INSTRUCTIONS.



Some spare parts are included, so there may be unused parts at the end of assembly.

✓	No.	Description	Quantity	Part No.
○	P6	Gear, gray	1	725771
○	P7	Gear, yellow	1	725771
○	P8	Hexagonal axle, short	1	725771
○	P9	Hexagonal axle, medium	1	725771
○	P10	Hexagonal axle, long	4	725771
○	P11	Round axle	4	725771
○	P12	Foam pad	1	725774
○	P13	Fan blade	2	725775
○	P14	Oil packet	1	550047-A
○	P15	Foam sticker sheet	1	725772



WARNING

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

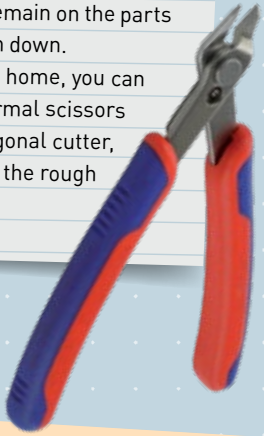
WARNING. This kit contains functional sharp edges or points. Do not injure yourself!

Keep the packaging and instructions as they contain important information.

Warning. Only to be used in water in which the child is within its depth and under adult supervision.

THE RIGHT TOOL

Using the right tool can make assembling your models easier and it can also make your models work better in the end. It is best to cut the plastic parts out of their frames with a small diagonal cutter (such as those used for electronics work) or model pliers. Using these tools, the parts can be precisely cut so that no burrs remain on the parts and there is no need to file them down.
If you don't have these pliers at home, you can use scissors and a nail file. Normal scissors do not cut as precisely as a diagonal cutter, so you may have to file some of the rough edges down with the nail file.

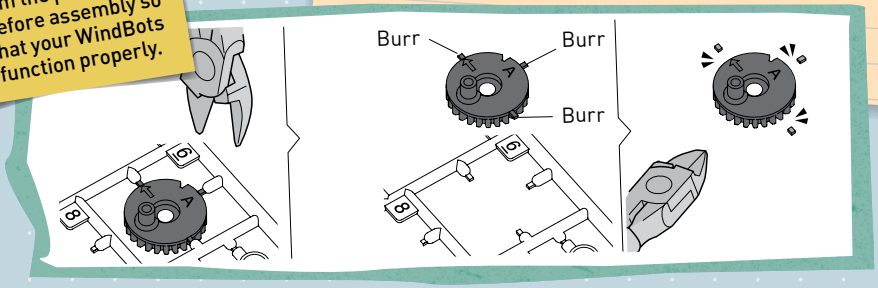


TIPS

IMPORTANT:

REMOVE THE PARTS FROM THE FRAMES ONLY WHEN THEY ARE NEEDED. REMOVE EXCESS MATERIAL BEFORE ASSEMBLY WITH THE HELP OF A DIAGONAL CUTTER OR A NAIL FILE.

Make sure that all burrs are removed from the plastic parts before assembly so that your WindBots function properly.



IMPORTANT INFORMATION

Dear Parents 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 and discuss the safety instructions.

Support your child with advice and a helping hand, especially during tricky assembly steps or experiments.

To prevent damage to the work surface on which your child is building and experimenting, provide them with a mat or other surface protection. When experimenting with water, it is a good idea to have some paper towels ready to wipe up spills.

When cutting the plastic parts out of the frames with the diagonal cutter or scissors, special care must be taken, not just because of the sharp edges on the tools, but also because the plastic parts can yield sharp edges or burrs. These can be removed with the help of the diagonal cutter or a nail file. Supervise your child when they are using the sharp tools until you trust that they can handle the tools independently.

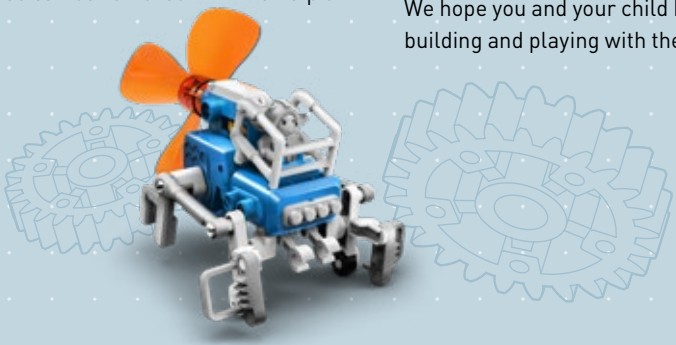
ASSEMBLY AND DISASSEMBLY

Some components are needed for all of the models, but some are only needed for one or two models. If your child wants to build a new model, help ensure that no parts get lost during disassembly by providing a container to collect parts.

When disassembling, most parts can be easily taken apart by hand.

However, some parts may be too tight to pull out by hand. Help your child by inserting the special part D28 as described on page 7.

We hope you and your child have a lot of fun building and playing with the WindBots.



HELLO! MY NAME IS LUCA AND I LIVE IN STORM CITY. THERE IS ALWAYS A STIFF BREEZE BLOWING HERE. THAT'S WHY WE CAN USE THE WIND FOR ALL OF THE ENERGY WE NEED IN OUR CITY.

I LOVE TO DESIGN NEW DEVICES AND BRING THEM TO LIFE.

I WOULD LIKE TO SHARE MY NEWEST INVENTIONS WITH YOU!

Surf Bot

P.23

This buoyant machine lets me explore the sea. The wind drives a fin that lets me swim like a fish.

Quadruped

P.33

This vehicle moves on four legs and is my first choice when I am taking a trip onto rough terrain.

Walker Bot

P.26

This two-footed robot uses wind energy to walk. The more headwind blows against me, the more progress I make.

Drill Dozer

P.29

The wind powers the drill and drives the dozer forward at the same time. It's a big help on the construction site.

Flying Machine

P.37

This machine can't really fly, but it imitates the flapping of a bird's wings. I like to sit up here and dream of flying.

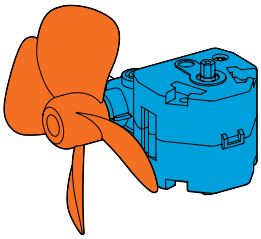
Big Wheel Tricycle

P.45

This tricycle is special because the extra-large rear wheel houses a fan. It's perfect for cruising in crosswinds.

THE MODULES

Before you start building the models, you will assemble the wind machine with hand crank and the various modules. These modules make it easier for you to build the models later, and they are useful when you want to convert one model into another because the modules do not have to be disassembled.

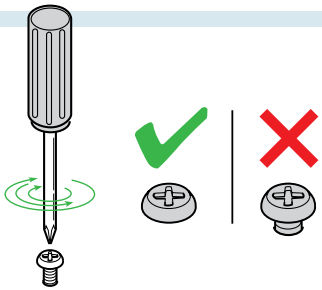


DISASSEMBLY

If you have built a model and then want to build another model, you will likely need to disassemble the first model, as parts you have used may be needed for the new model. For disassembly, you can simply follow the assembly steps in reverse order. The special part D28 can be helpful. Learn how to use it on the following page.

SCREWS

There are screws included in the set for assembling the modules. To tighten them, you will need a small Phillips-head screwdriver (preferably size PH1). Make sure that you tighten the screws all the way down. Loose screws may lead to malfunctions.

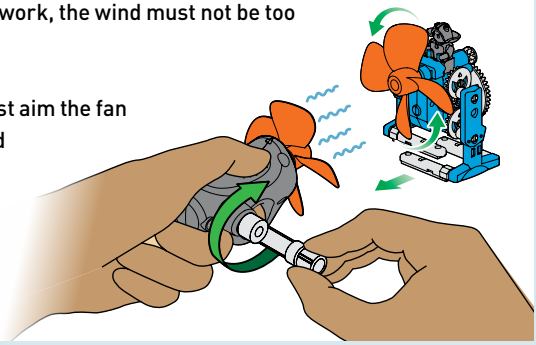


WIND

The most important thing your models need to move is wind. You have different options to generate wind. A wonderful option is to bring your models outside and let them be powered by naturally occuring wind. For this to work, the wind must not be too strong or too weak.

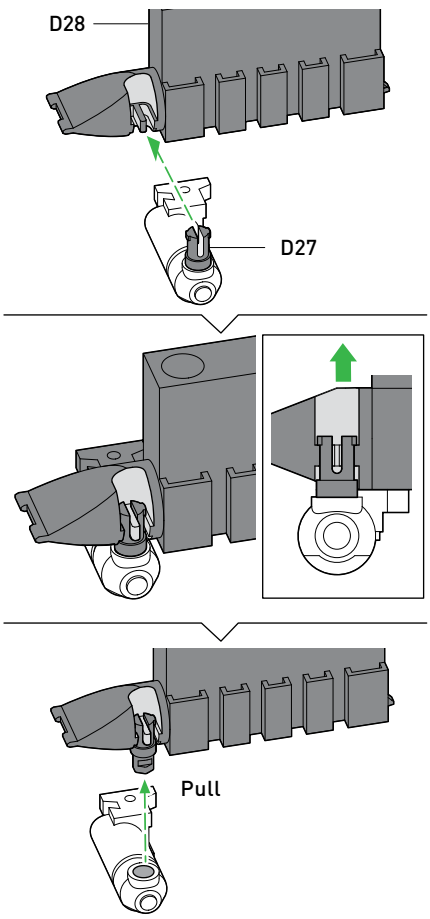
You can also use the included wind machine. Just aim the fan of the wind machine at the fan in your model and turn the crank.

Of course, you can also blow air from your lungs, but be careful because this can make you dizzy.

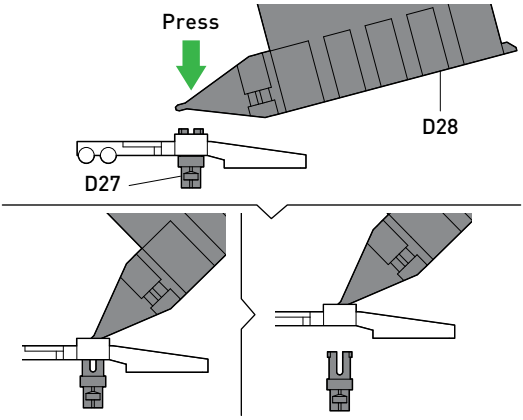


HOW TO USE PART D28

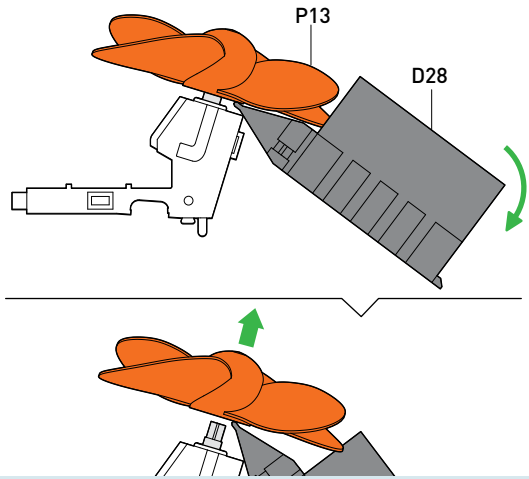
LOOSENING D27 (UPPER PART):



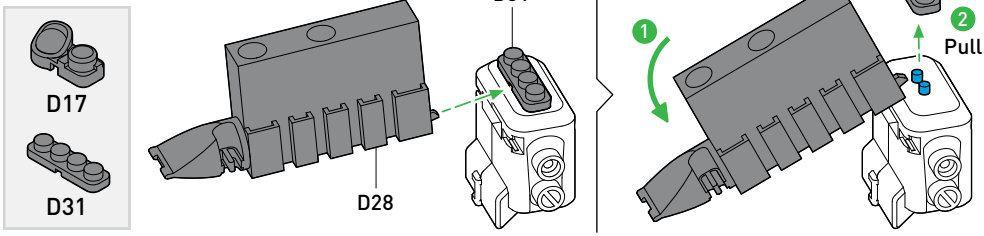
LOOSENING D27 (BOTTOM PART):



LOOSENING P13:



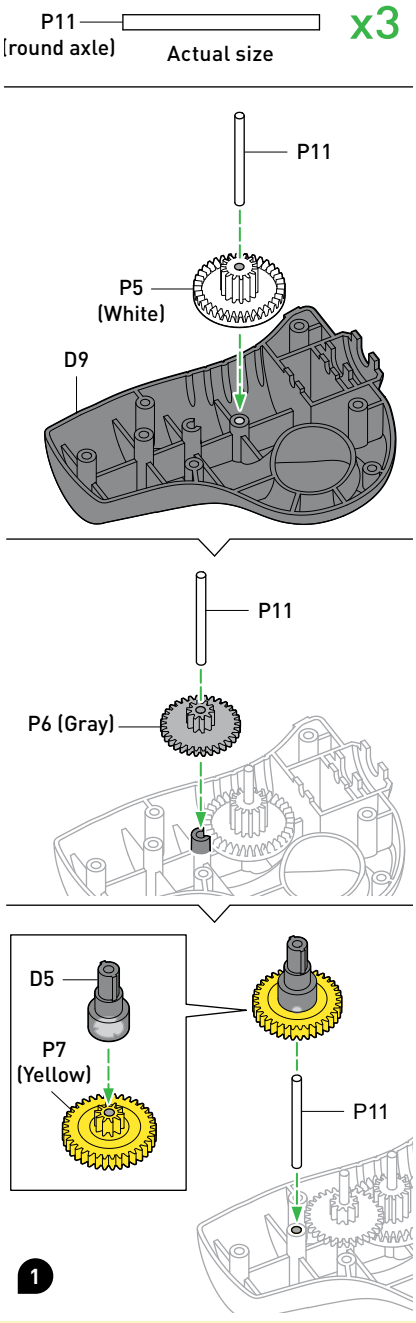
LOOSENING D27:

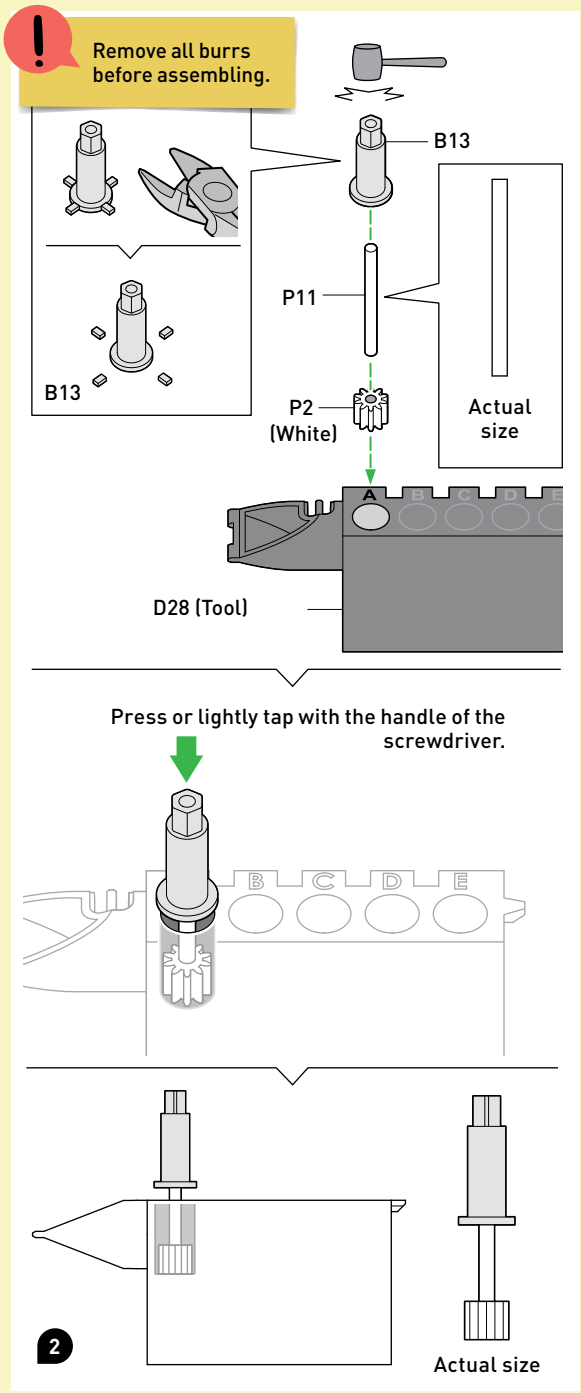


Assembling the modules

Before you start building the models, you will build various modules. These modules make it easier for you to build the models later, and they are very useful when you want to convert one model into another, as the modules will not have to be taken apart again.

ASSEMBLING THE WIND MACHINE

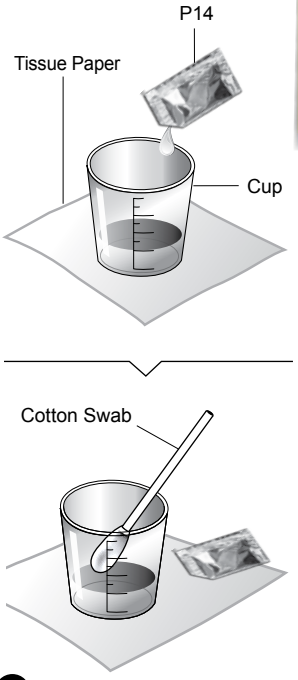




= Apply oil

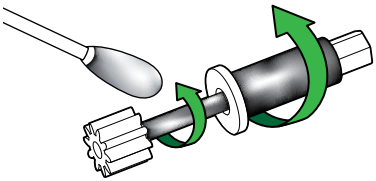
When you see this symbol, oil the parts as shown.
Do not put oil on other parts.

Place a cup on top of a piece of tissue paper. Pour the contents of the oil packet into the cup. Use a cotton swab to apply oil to the indicated parts.

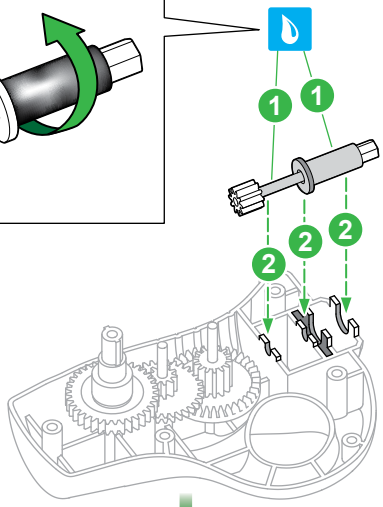


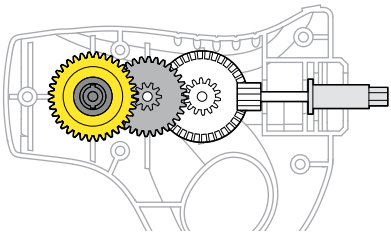
3

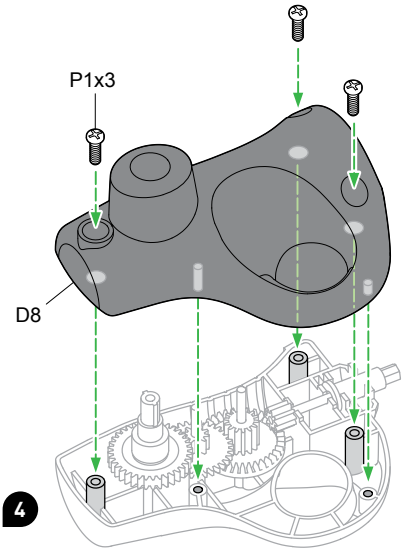
Oil the two areas as shown.
Do not put oil on any other parts.



Oil the two areas as shown. Then place into D9.







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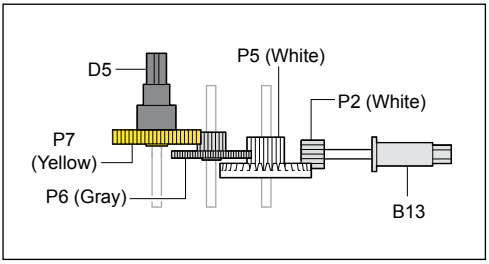

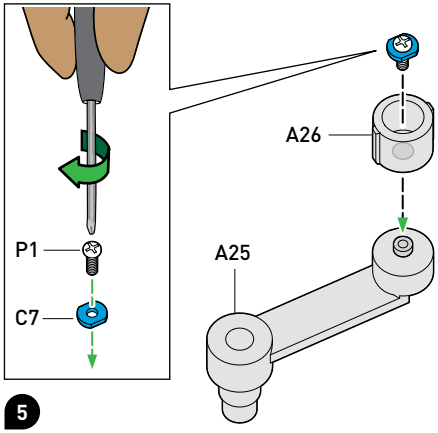

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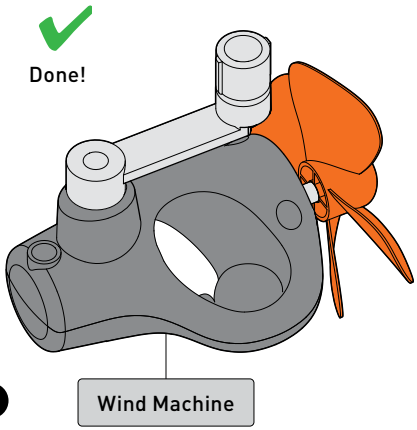

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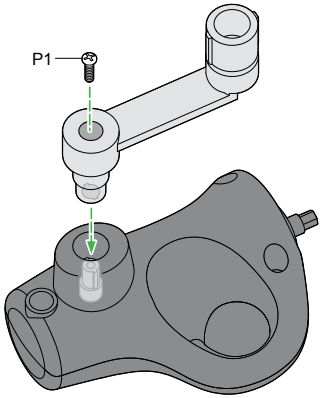
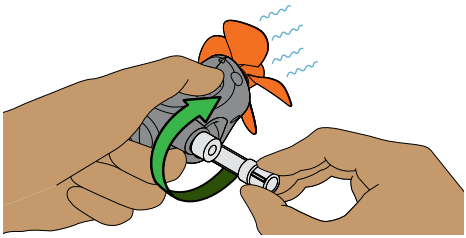


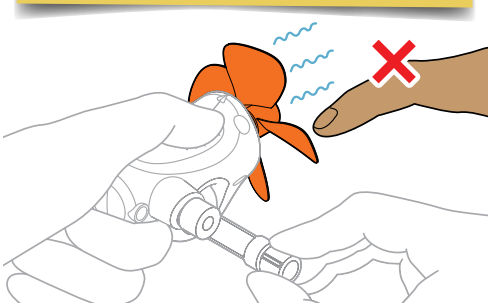
6

Turn the handle clockwise to create wind.

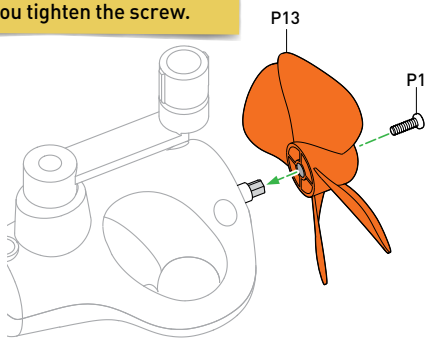


To avoid injuries, never allow the fan blades to come into contact with people or objects when turning the crank!

Please note that holding the fan blades while cranking the handle can cause the wind machine to malfunction.



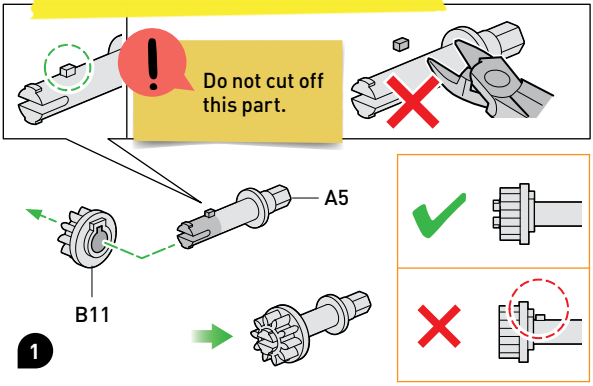
Hold the blades of the fan with your fingers while you tighten the screw.

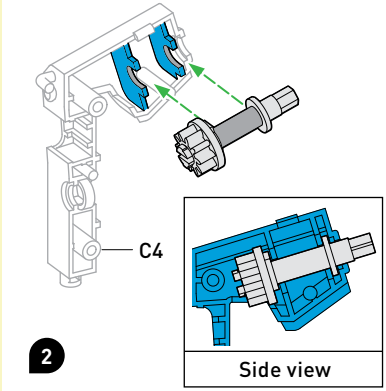


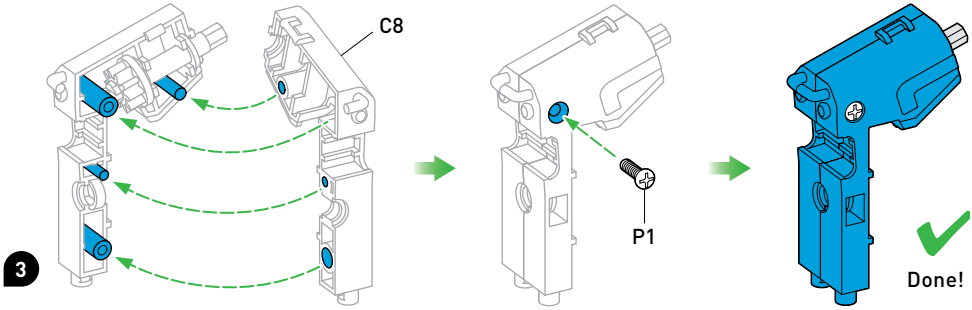
7

ASSEMBLING THE MODULES

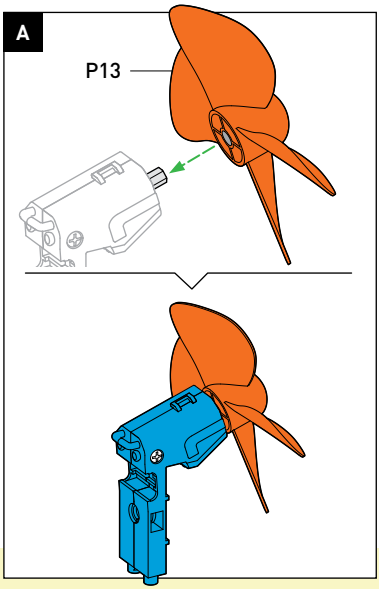
GEAR MODULE A

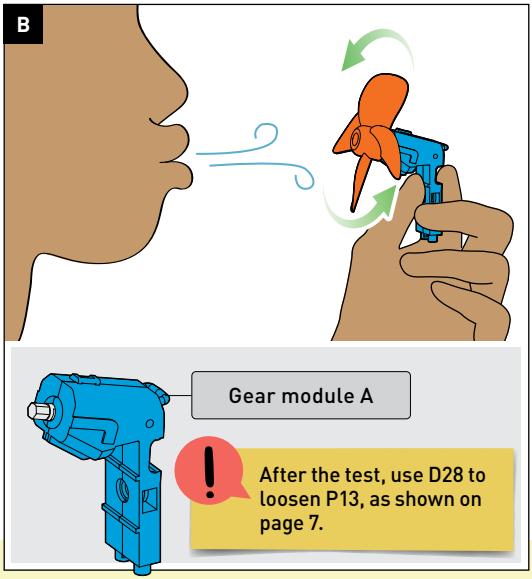






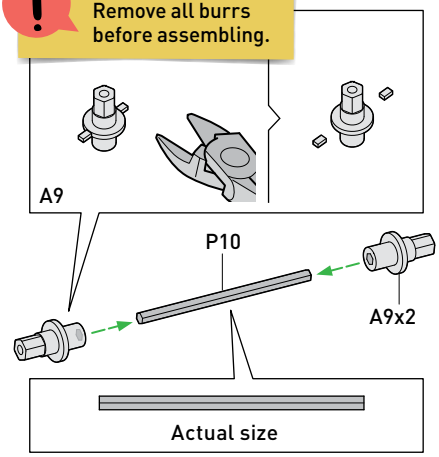
TEST GEAR MODULE A

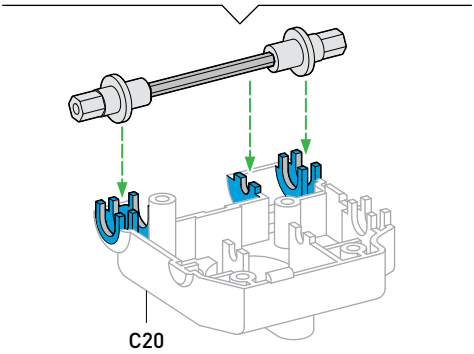


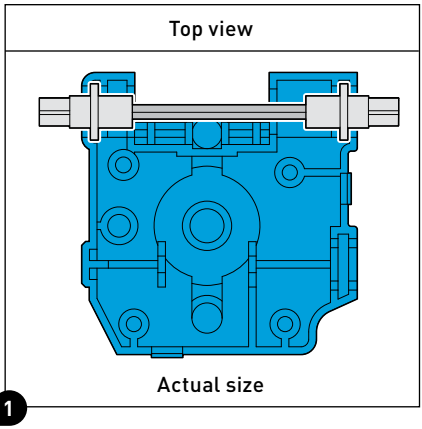


GEAR MODULE B

Remove all burrs before assembling.







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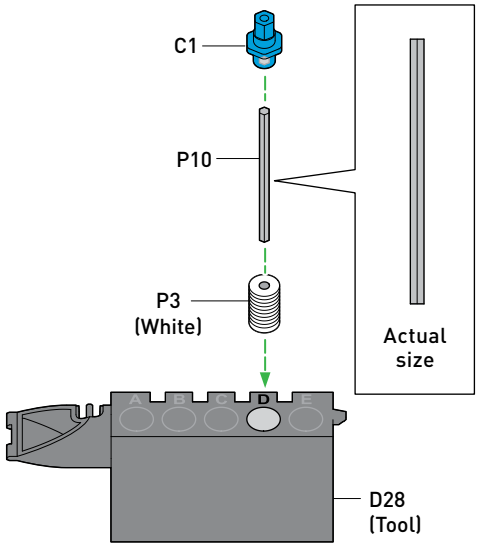

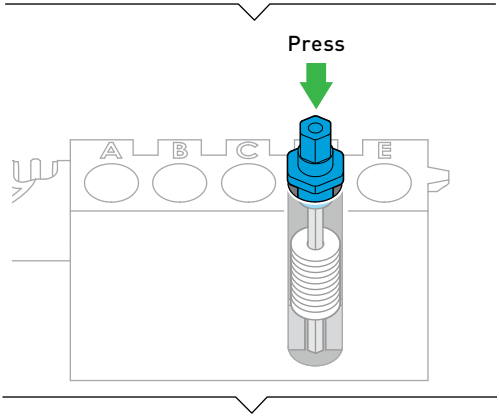

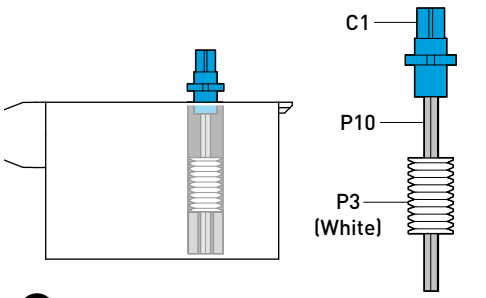

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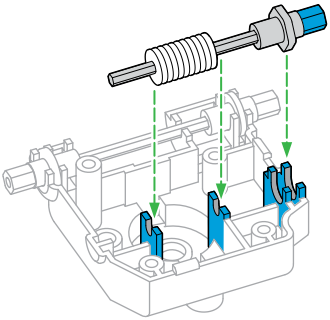
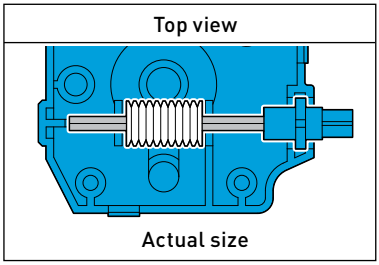
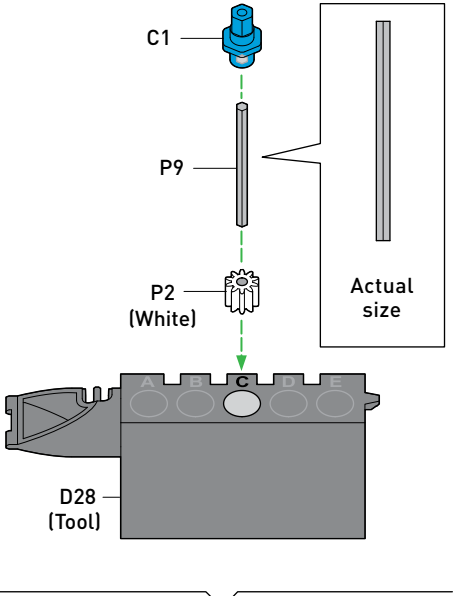
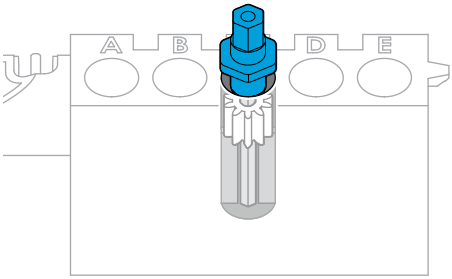


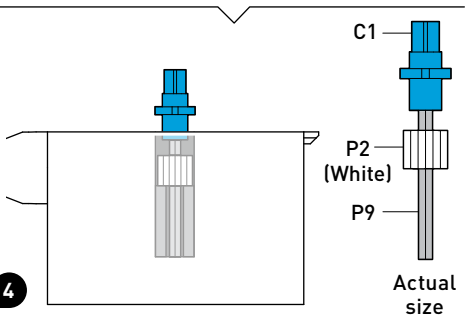

Top view
Actual size

3

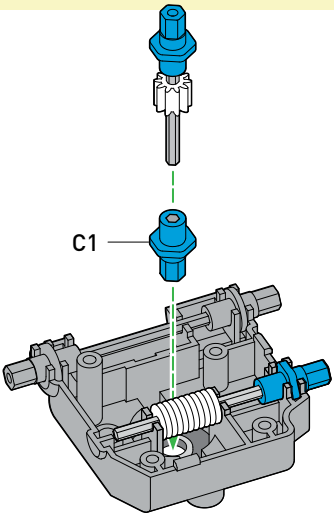

C1
P9
P2
(White)
Actual
size
A
B
C
D
E
D28
(Tool)

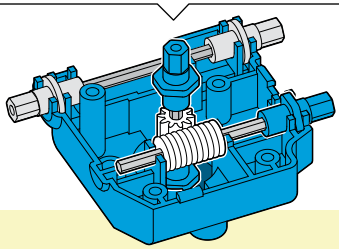
Press


A
B
D
E


C1
P2
(White)
P9
Actual
size

4


C1



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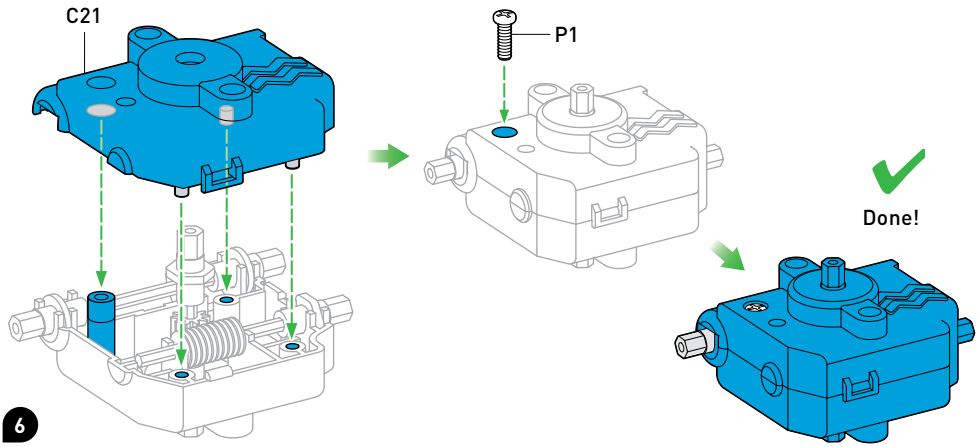
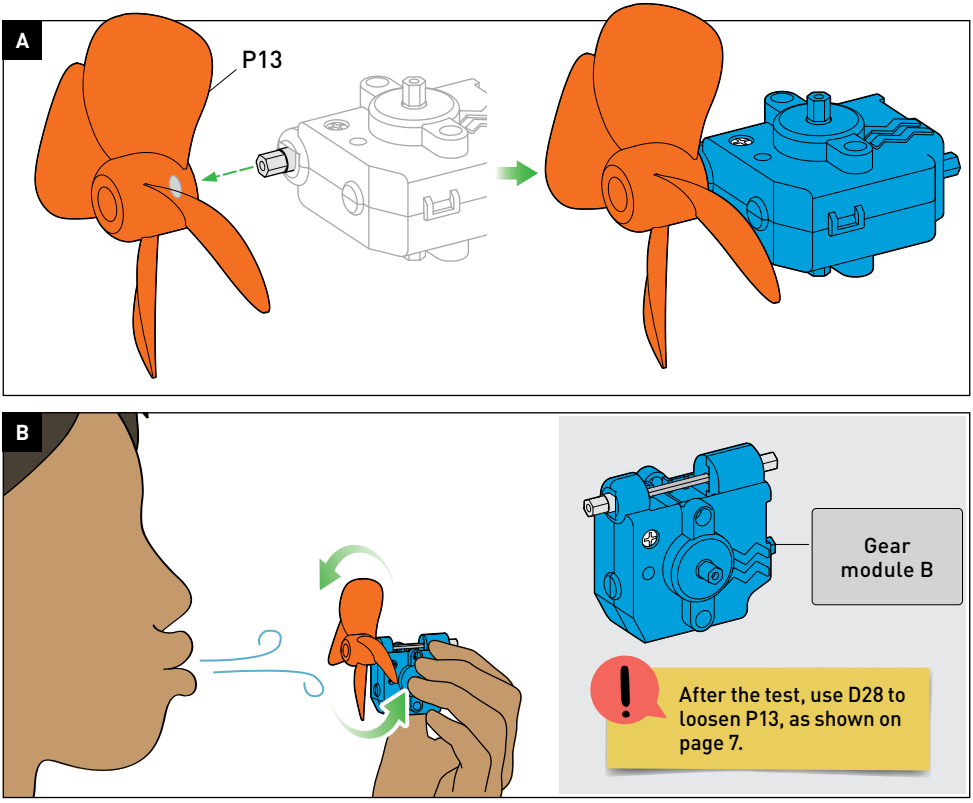
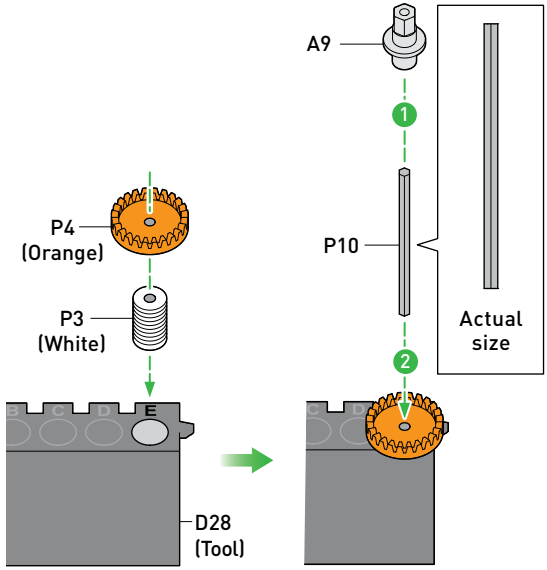


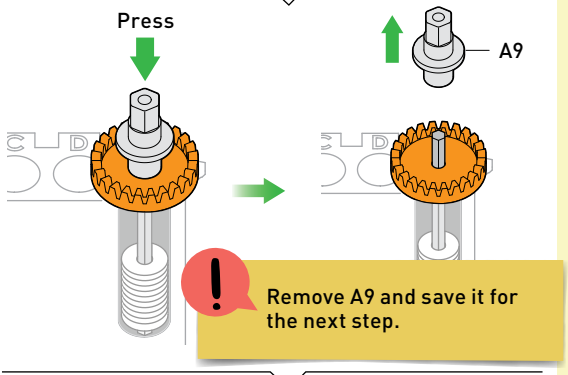
TEST GEAR MODULE B

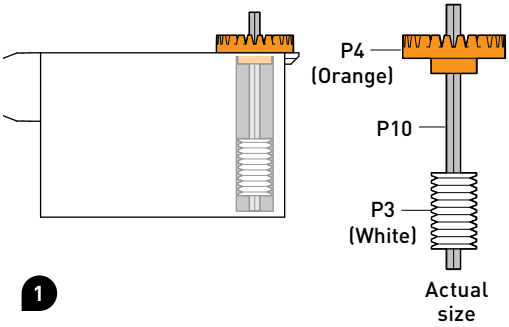


ASSEMBLING THE MODULES

GEAR MODULE C

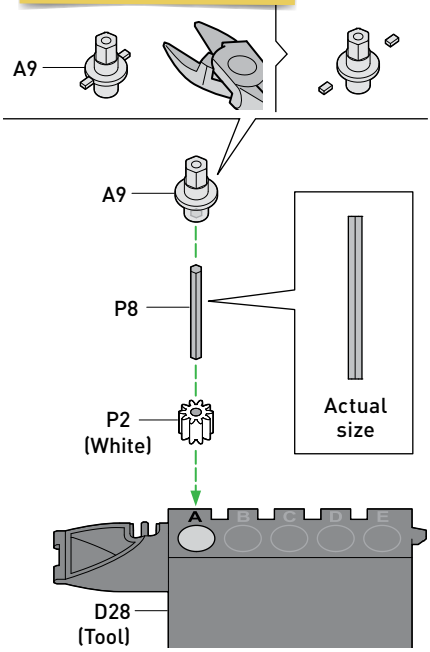


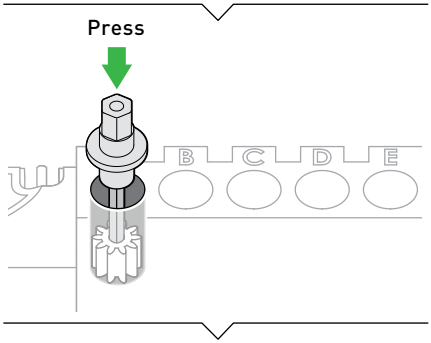


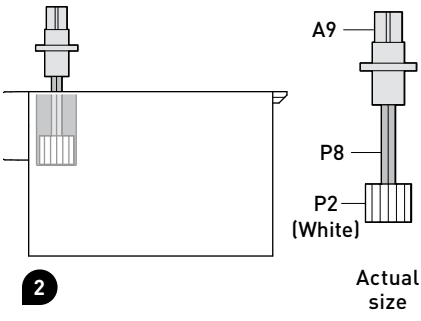


1

Remove all burrs before assembling.







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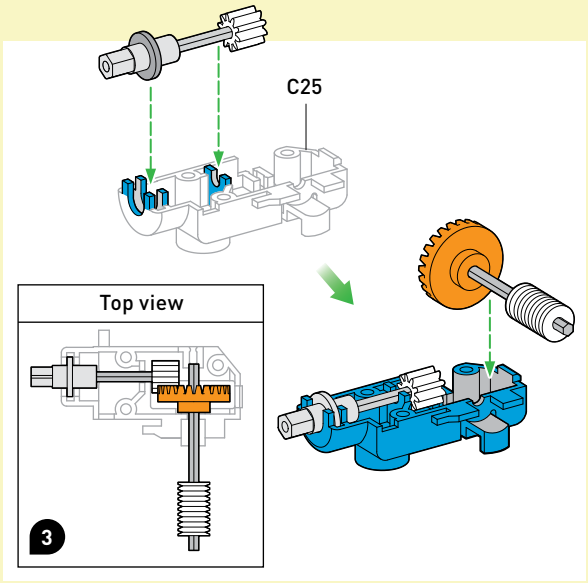
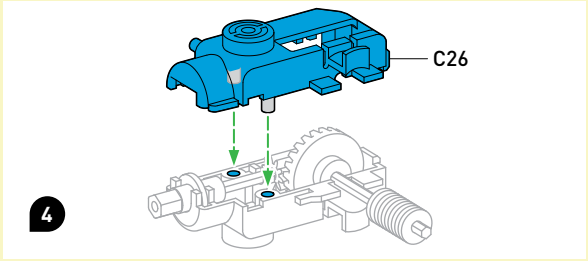

C25
Top view
3


C26
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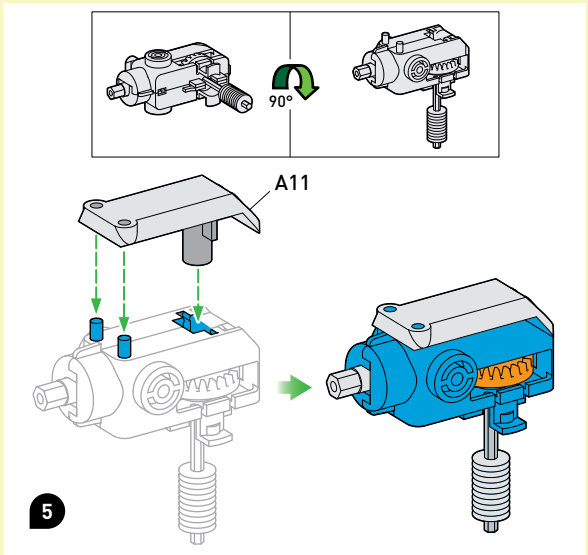
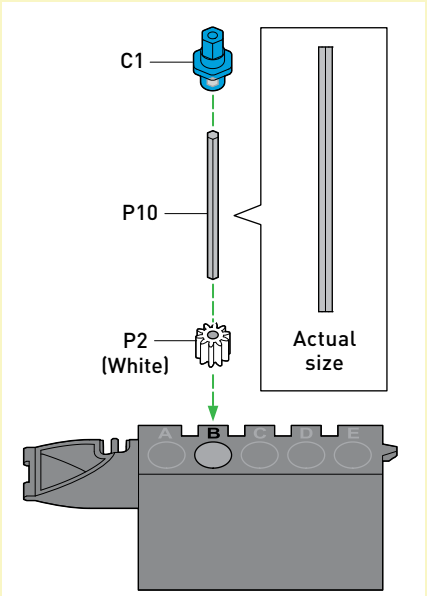
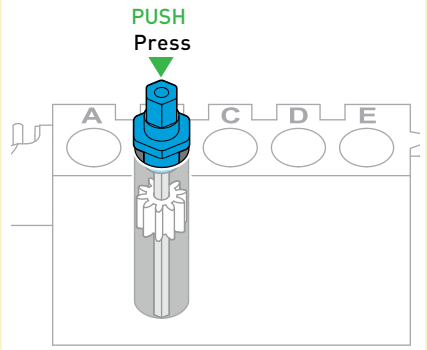
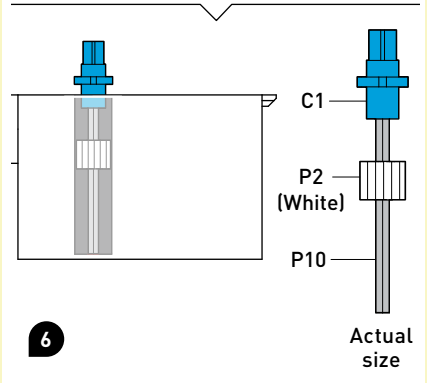
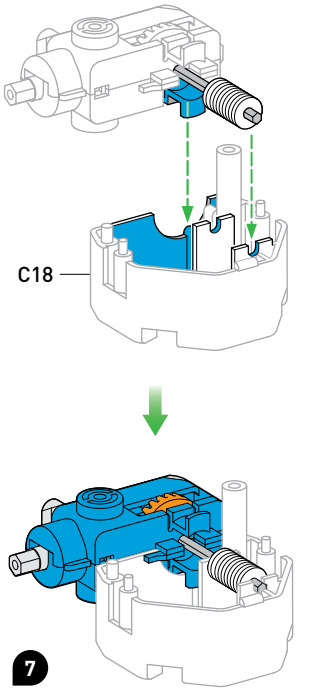
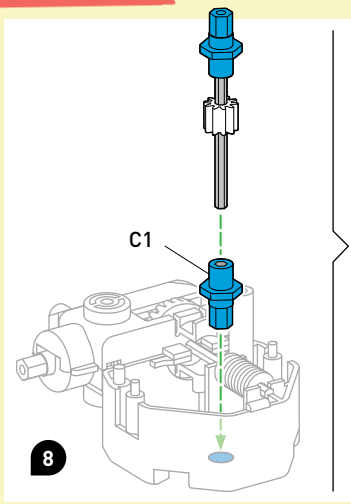

90°
A11
5

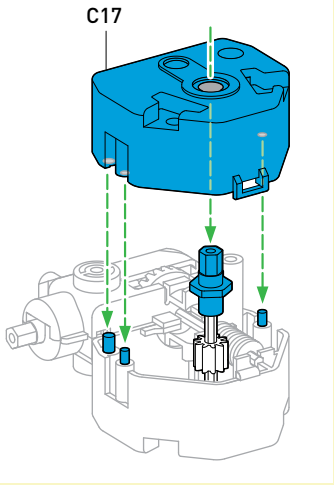

C1
P10
P2
(White)
Actual
size
A
B
C
D
E

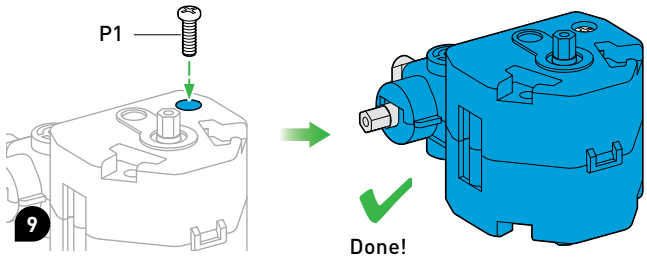

PUSH
Press
A
C
D
E


C1
P2
(White)
P10
Actual
size
6

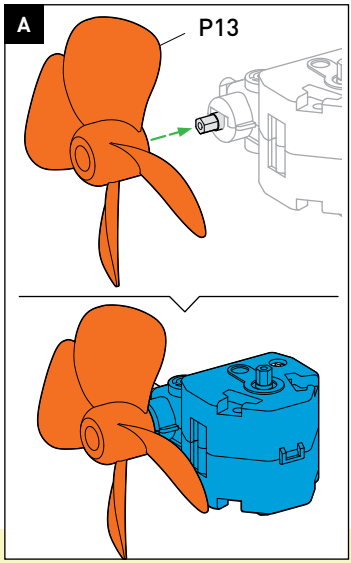


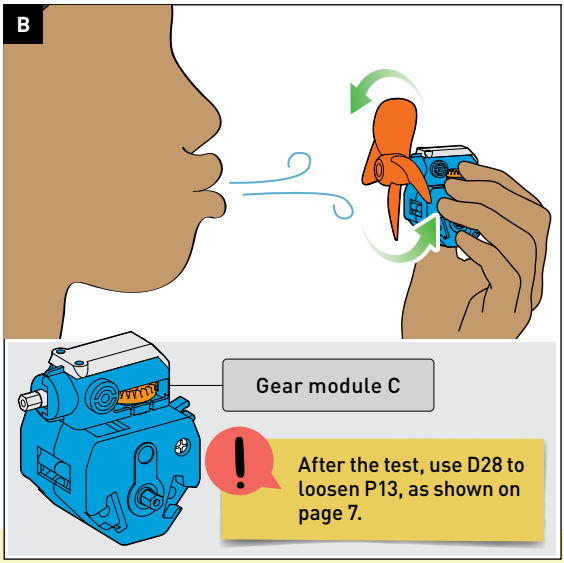




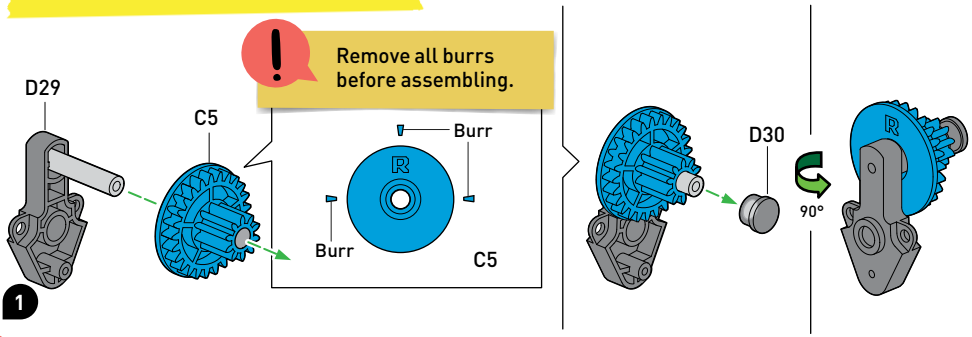


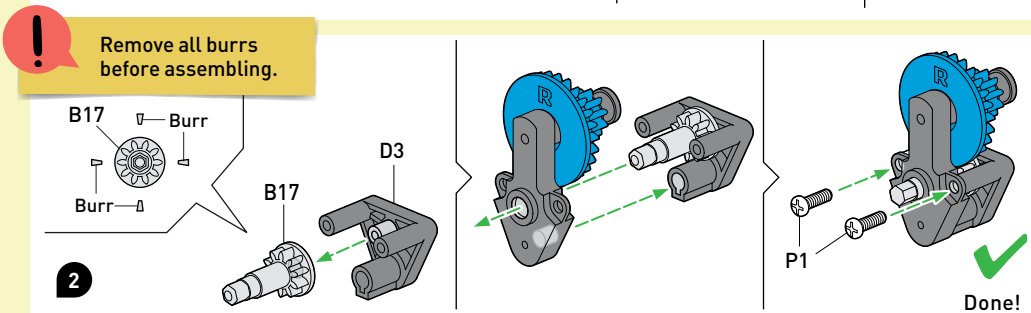
TEST GEAR MODULE C



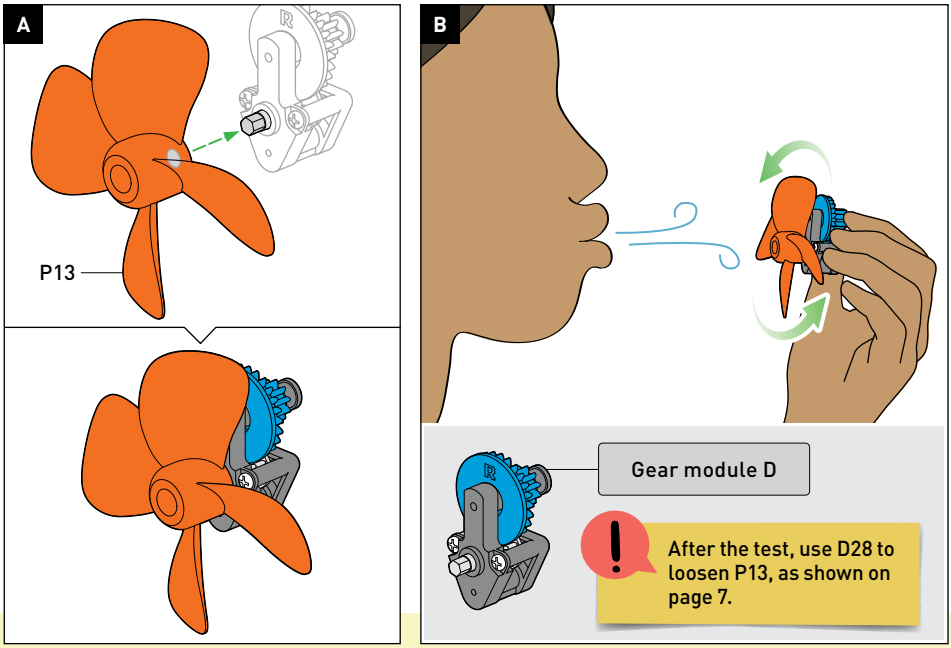


GEAR MODULE D



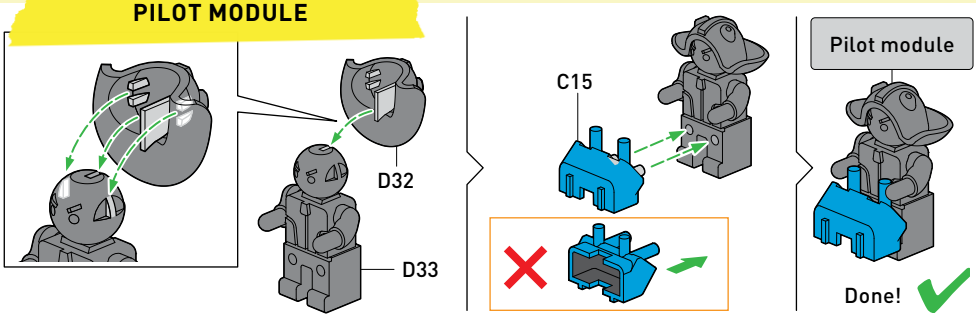


TEST GEAR MODULE D

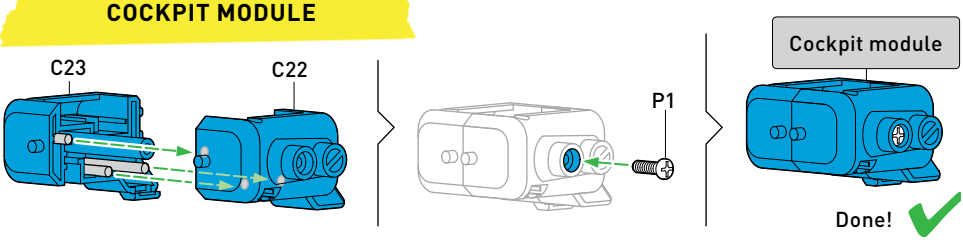


ASSEMBLING THE MODULES

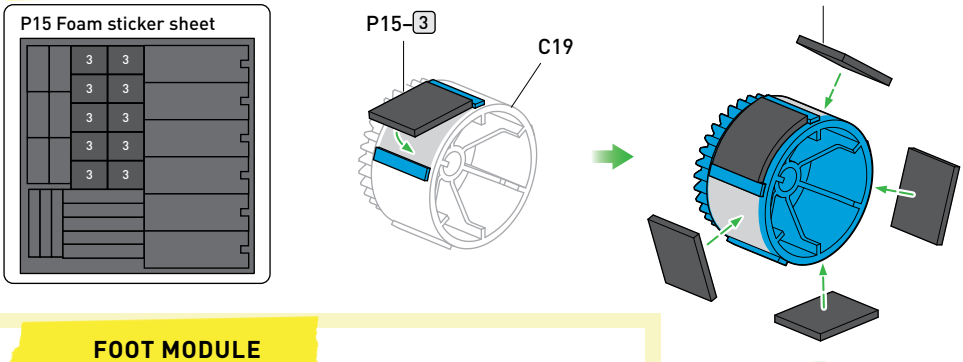
PILOT MODULE



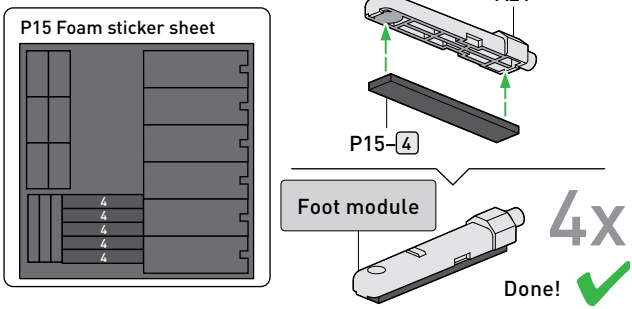
COCKPIT MODULE



WHEELS



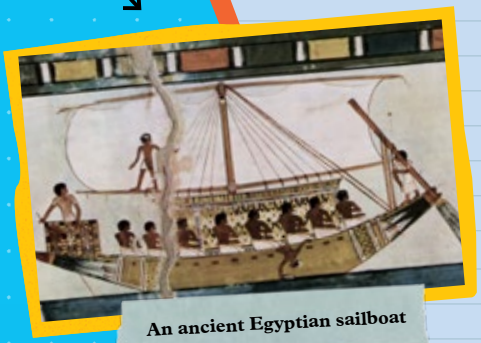
FOOT MODULE



CHECK IT OUT

Locomotion with Wind Power

Humans have been using the wind for a very long time to move boats across the water. The first known sail boats traveled on rivers or near the coast more than 7,000 years ago. Sailboats and wind power eventually enabled humans to travel across the globe.



An ancient Egyptian sailboat

The principle of a sail can also be applied to land vehicles. For sails to function properly, you need enough wind and a relatively large amount of open space around the sail. Bodies of water, therefore, offer ideal conditions for moving with sails. On land it looks a bit different. As you might imagine, a car with sails would not work very well in the city, and it would be stuck when there was no wind.

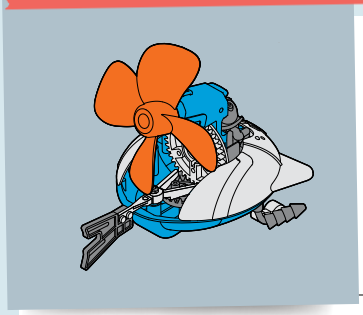
Modern beach sailer

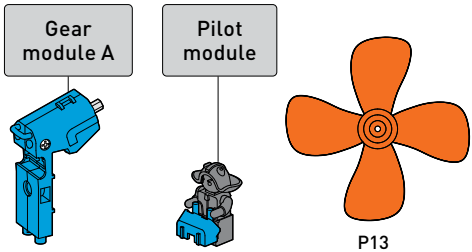
–> MORE INFORMATION ABOUT WIND POWER CAN BE FOUND ON PAGE 52.

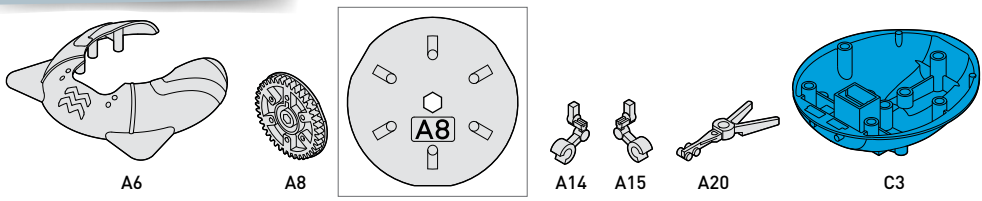
Step-by-step model assemblies

Now you can start building your models. The assembly steps are shown for one model after another. Be sure to read the helpful tips on pages 6 and 7 before you start.

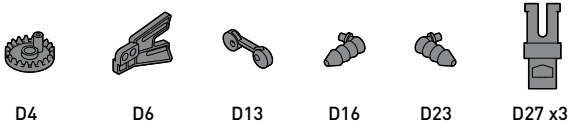
ASSEMBLING THE SURF BOT

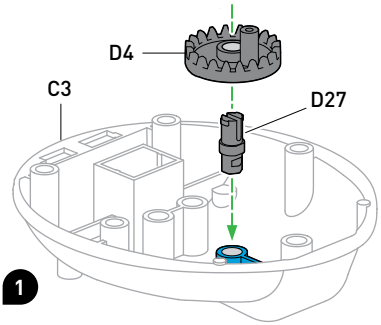


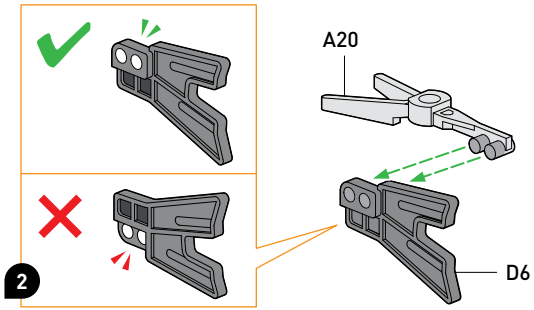


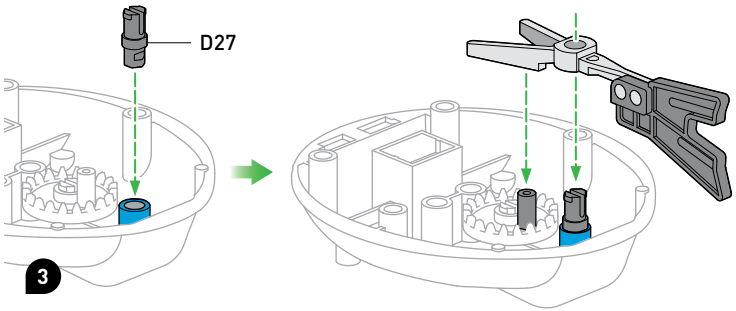


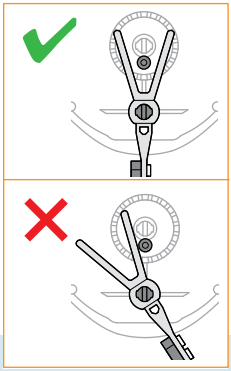
Actual size

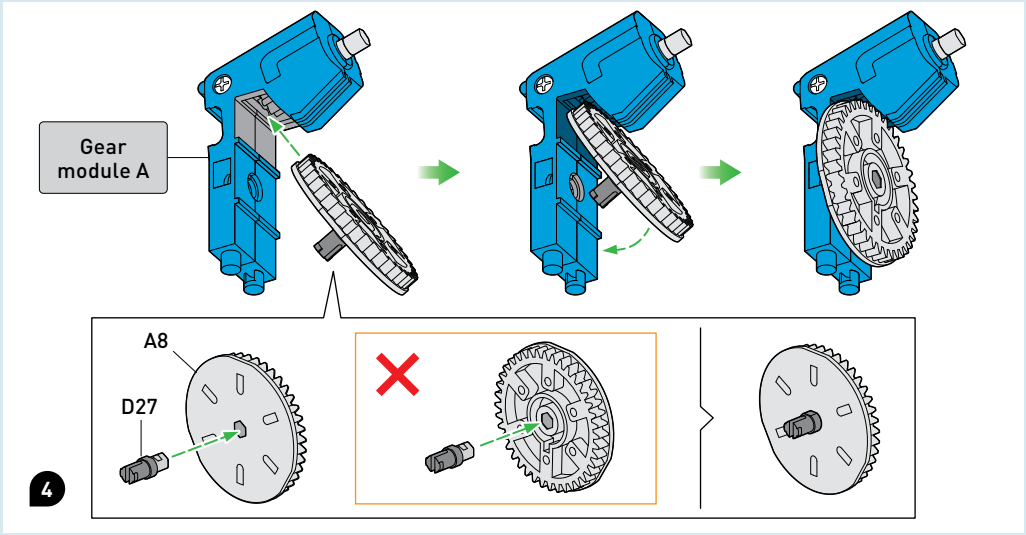


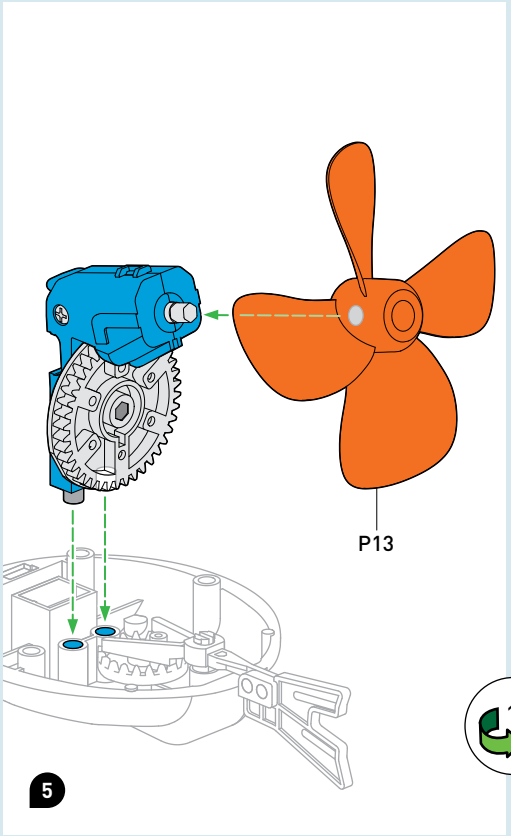


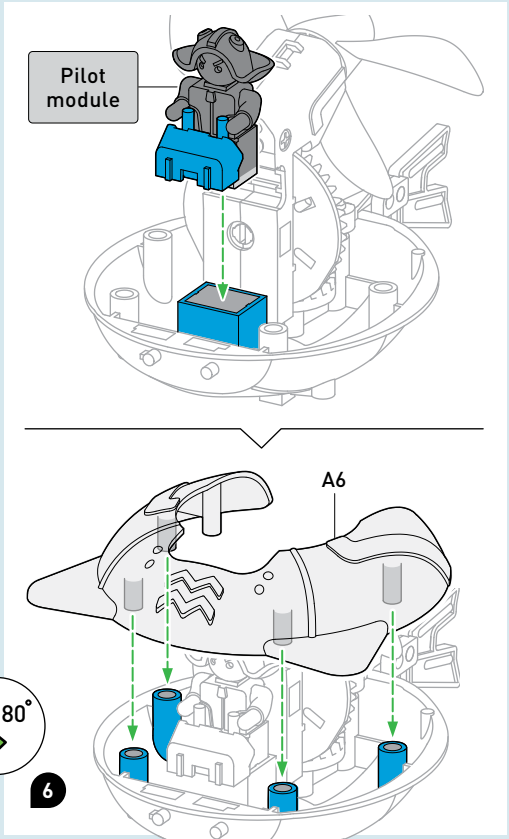


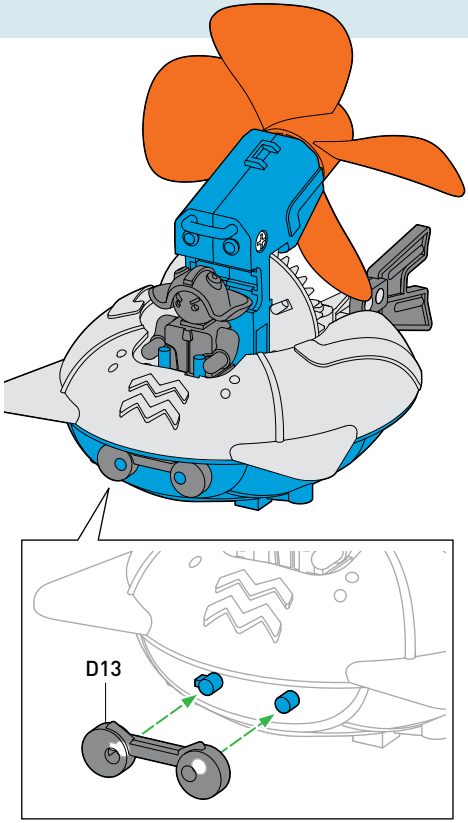




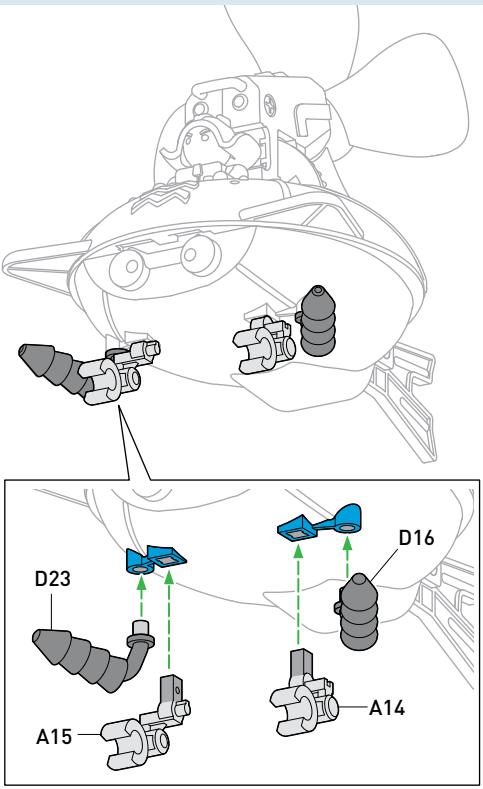

Gear module A
A8
D27
4


P13
5


Pilot module
A6
180°
6



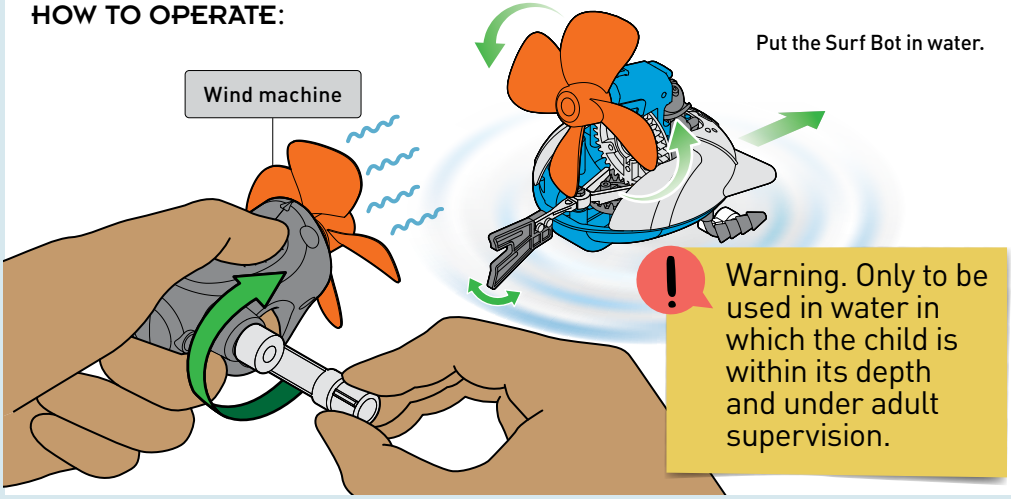
7



8

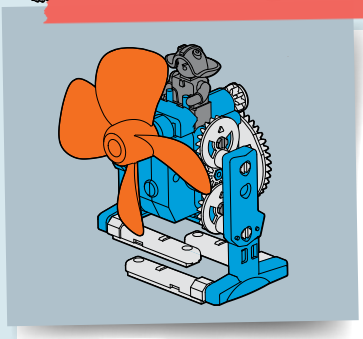
Done!

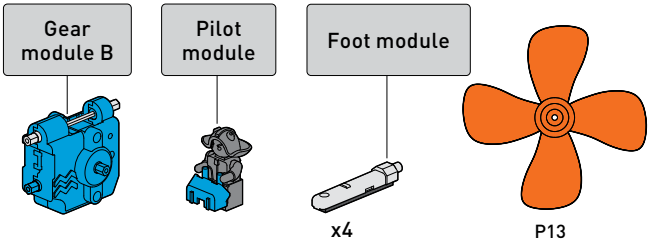
HOW TO OPERATE:

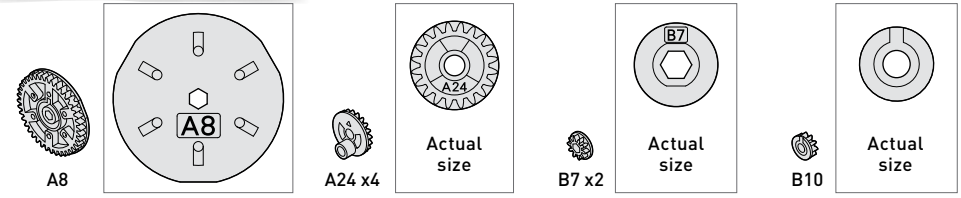


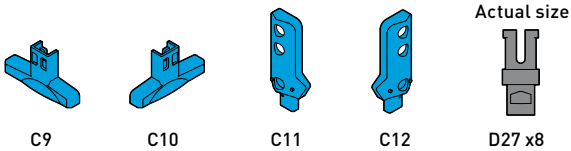
Warning. Only to be used in water in which the child is within its depth and under adult supervision.

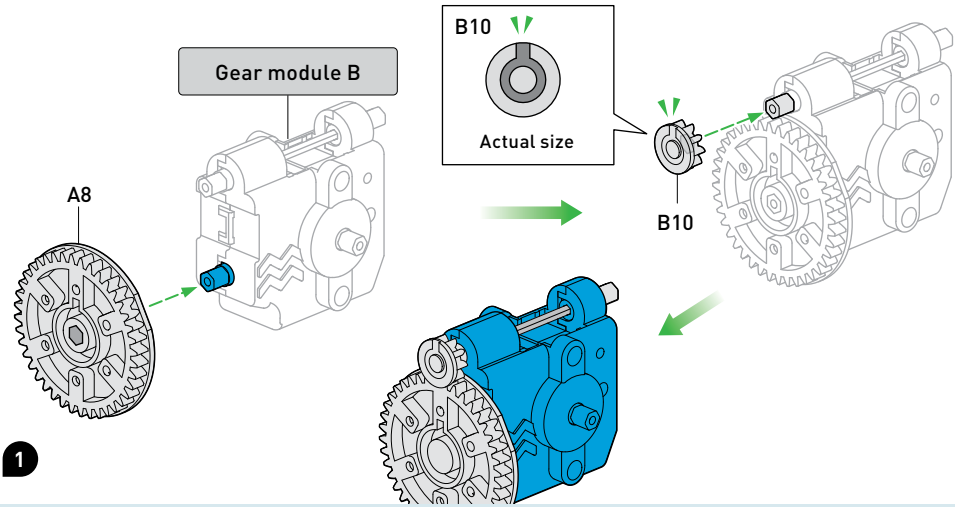
ASSEMBLING THE WALKER BOT





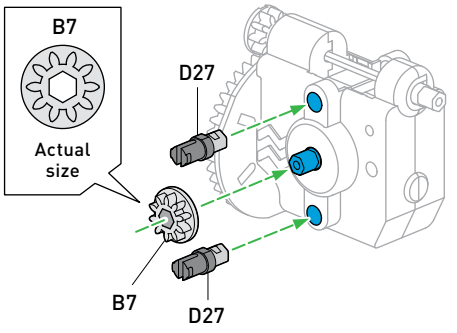


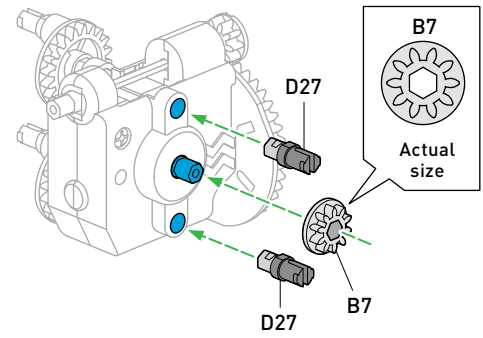


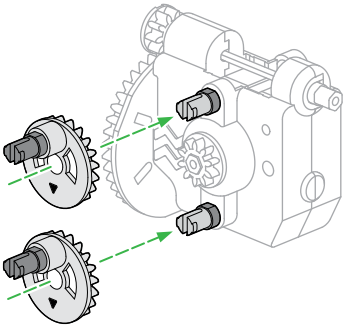


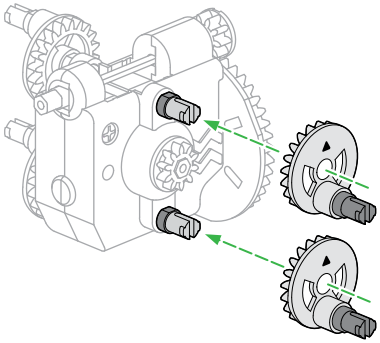
1

2

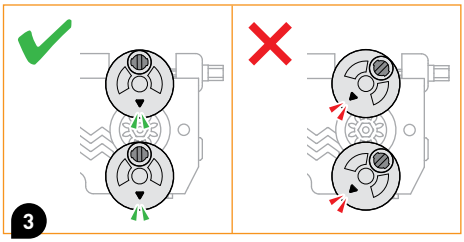

B7
Actual size
D27
B7
D27


B7
Actual size
D27
D27
B7






180°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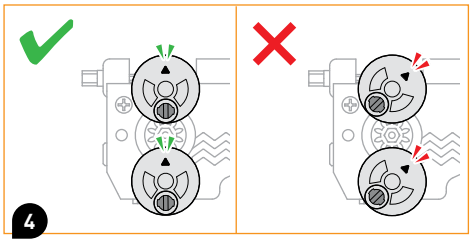
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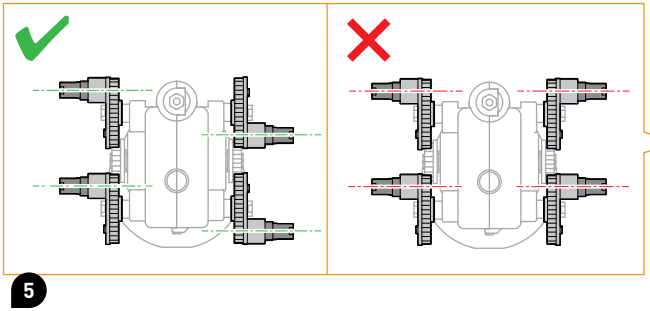
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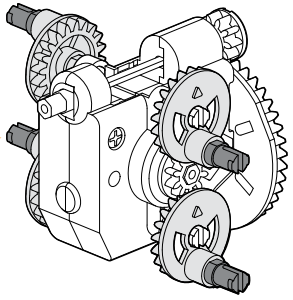
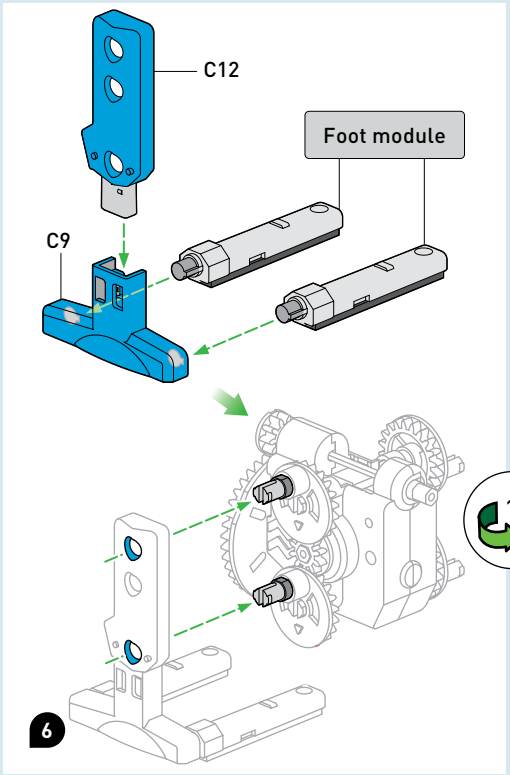
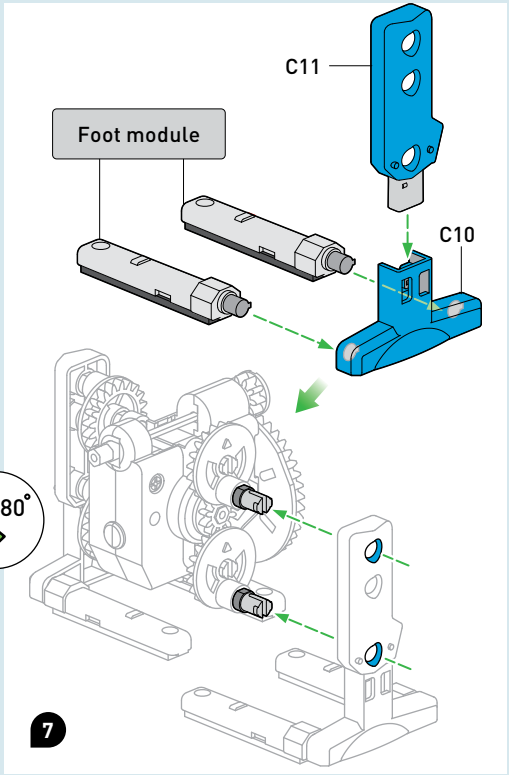
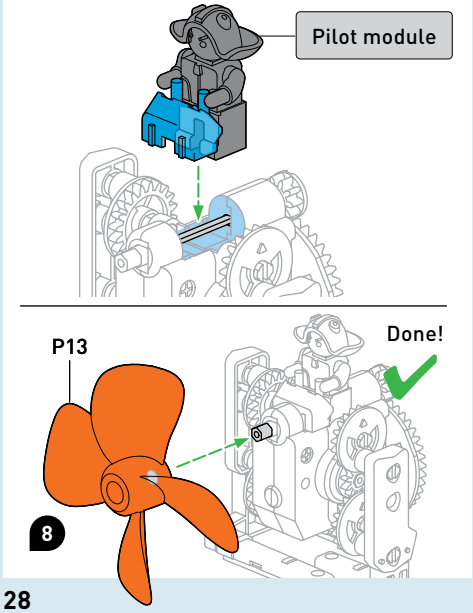
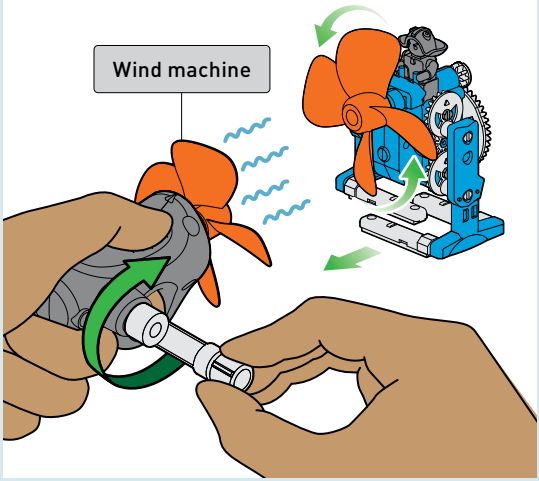




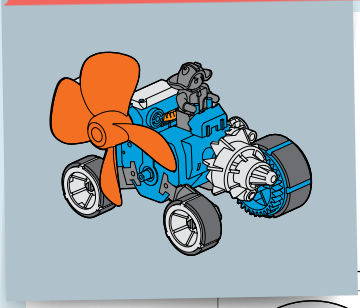


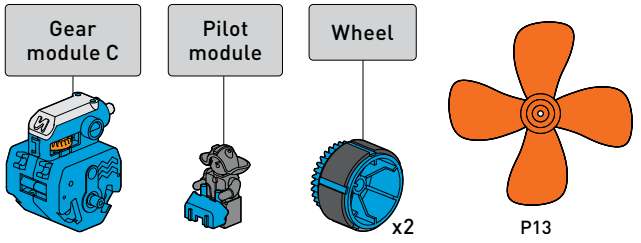


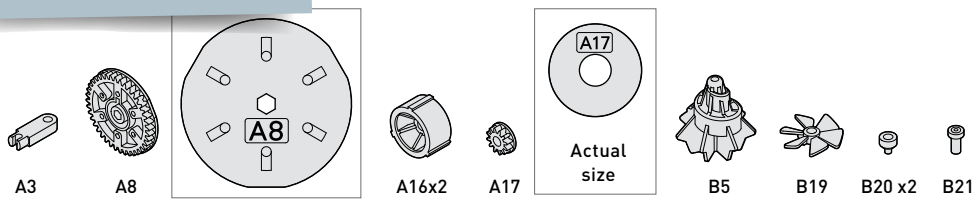
HOW TO OPERATE:

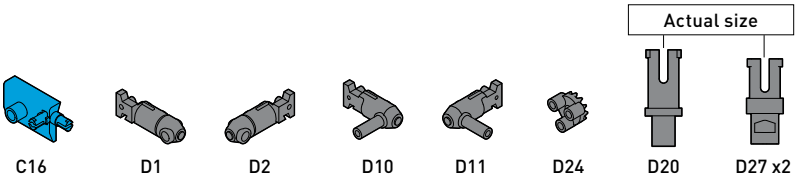


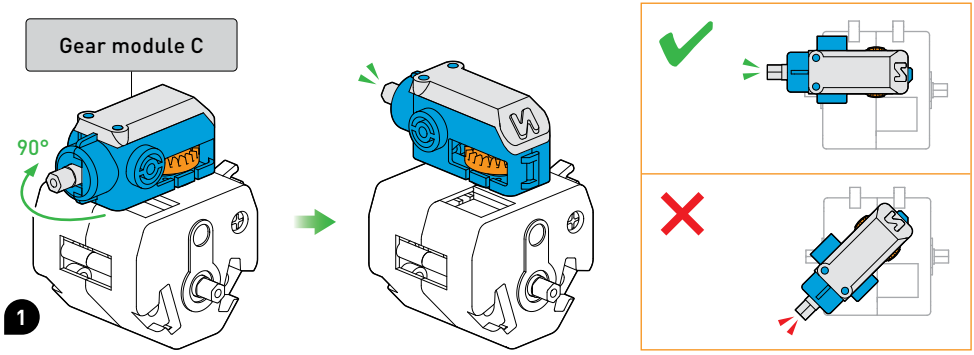
ASSEMBLING THE DRILL DOZER

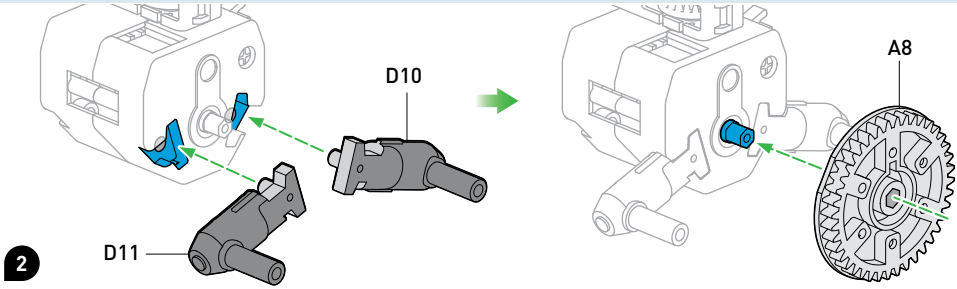


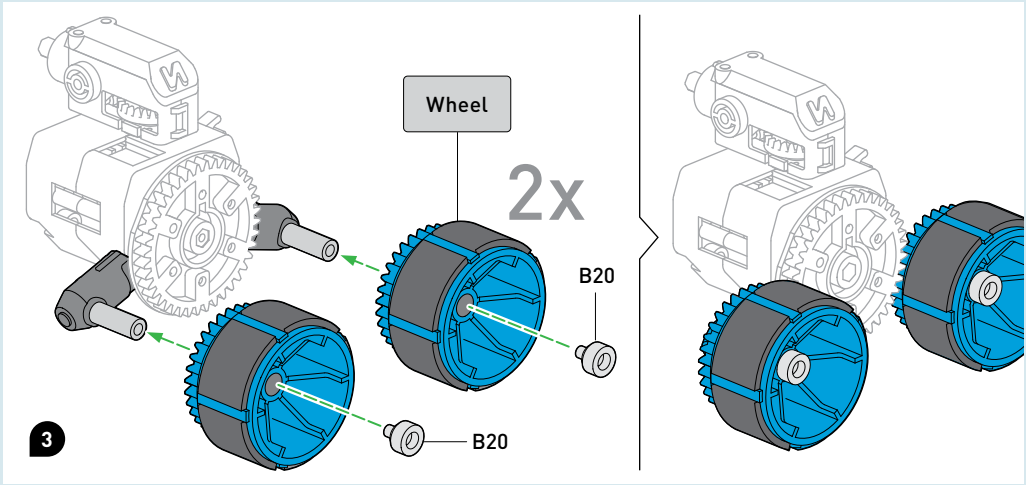


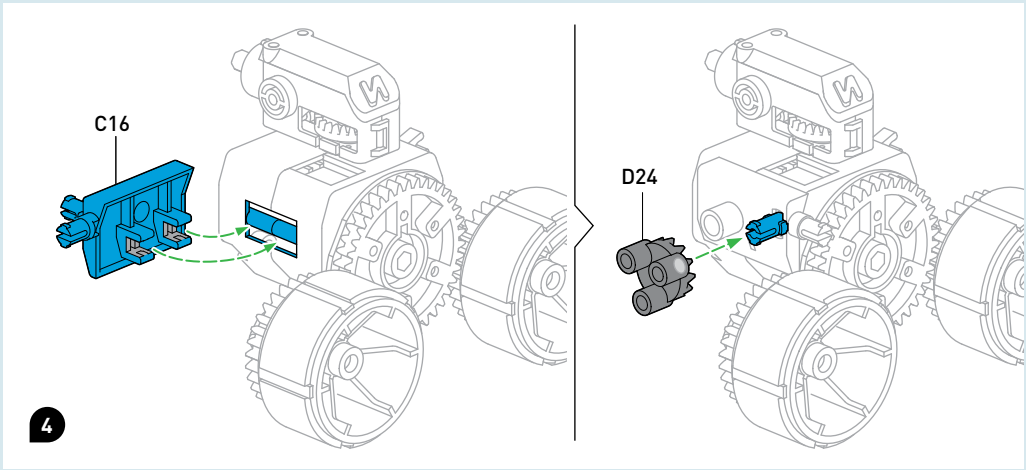


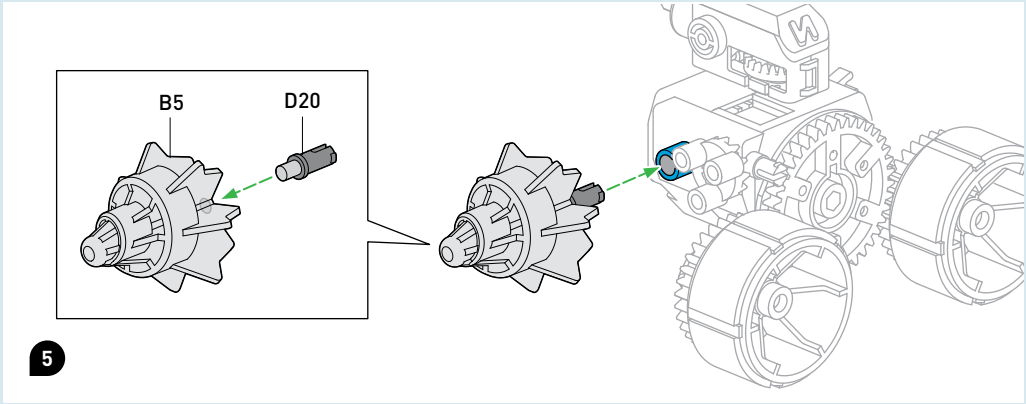


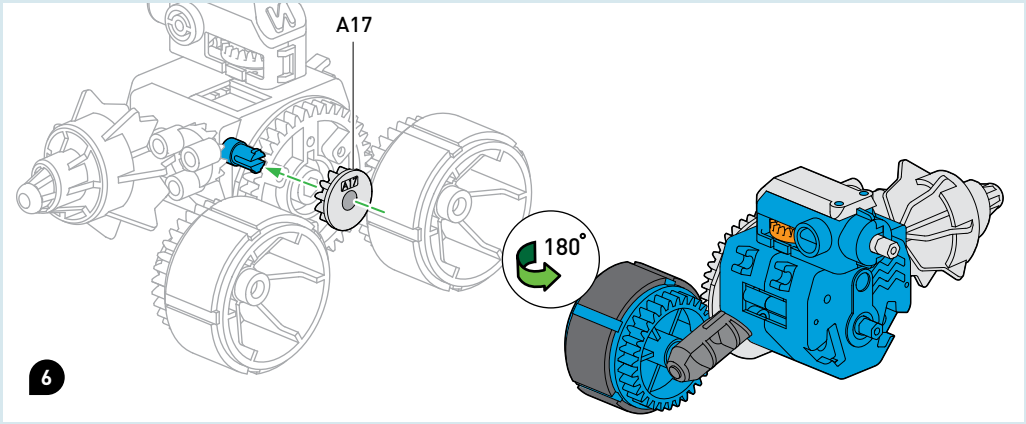


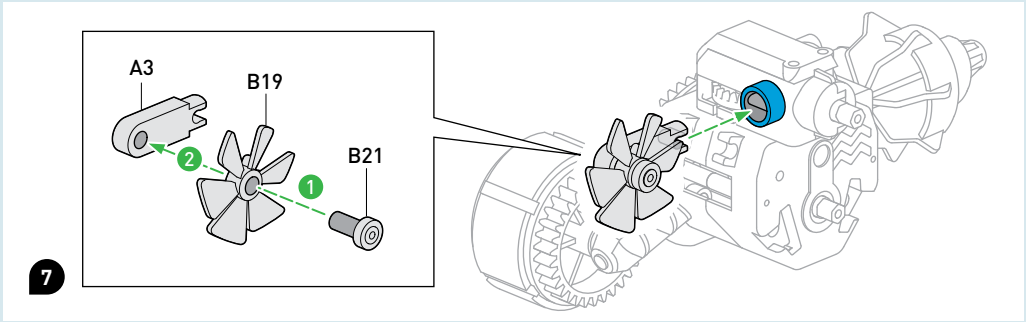


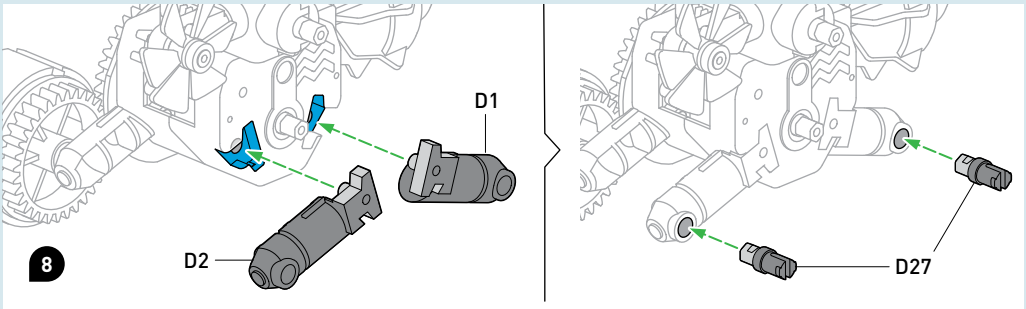

Wheel
2x
B20
B20
3

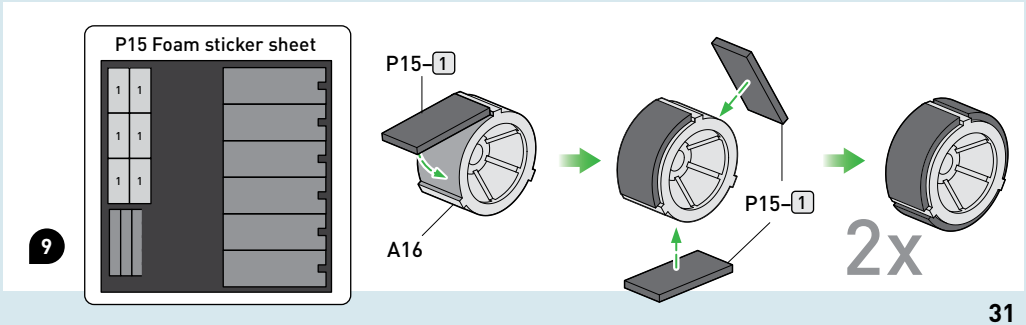

C16
D24
4

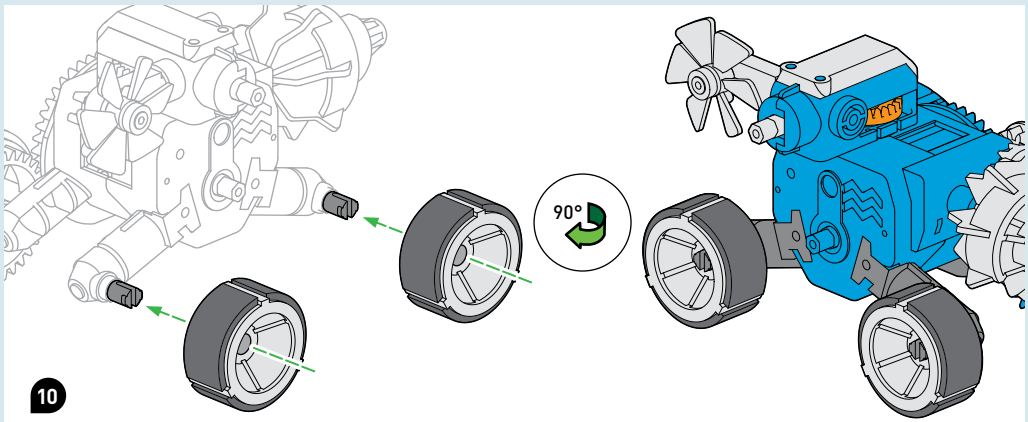

B5
D20
5


A17
180°
6


A3
B19
B21
2
1
7


D1
D2
D27
8


P15 Foam sticker sheet
1 1
1 1
1 1
P15–1
A16
P15–1
2x
9



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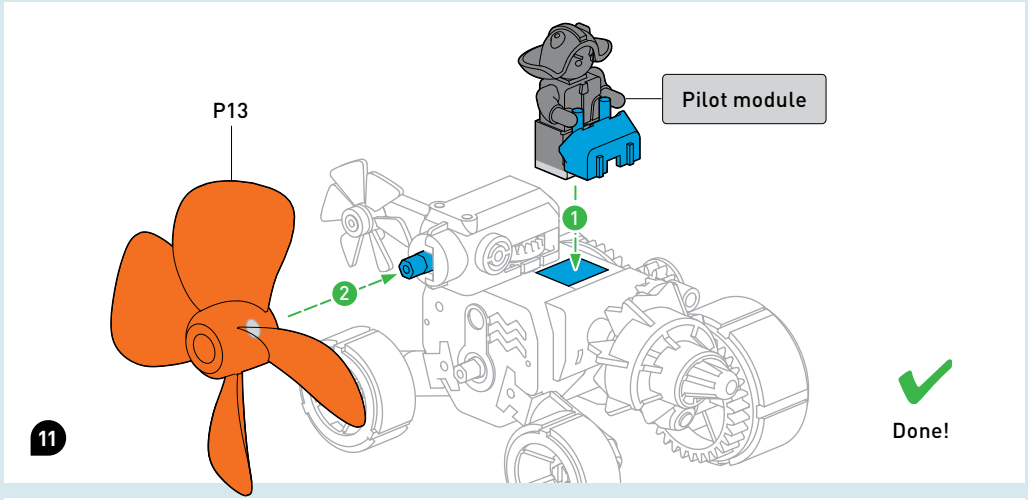
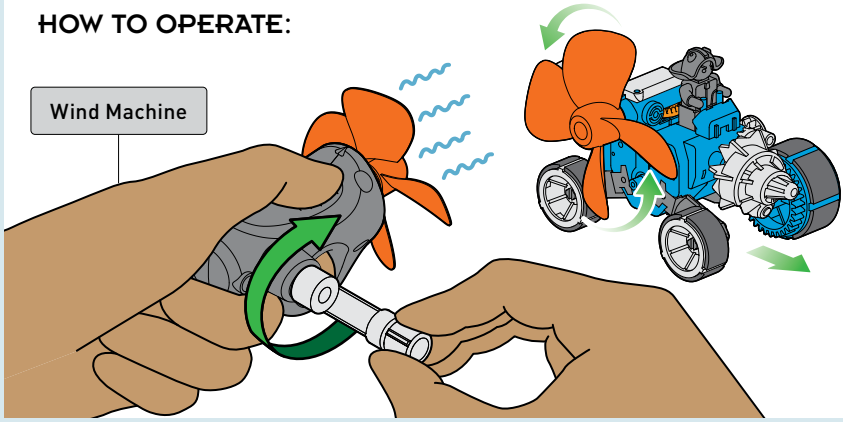


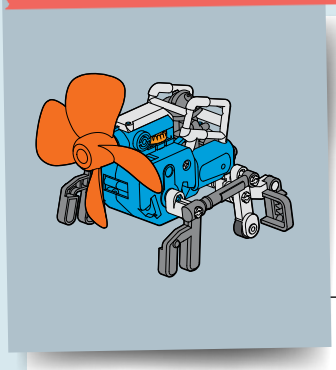
11

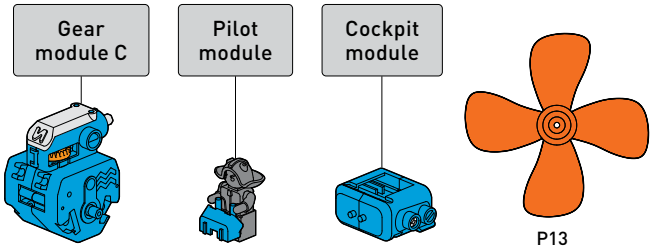
Done!

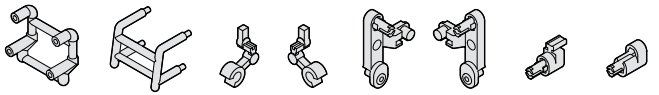
HOW TO OPERATE:

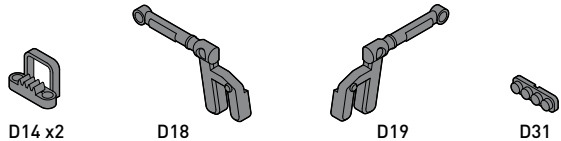


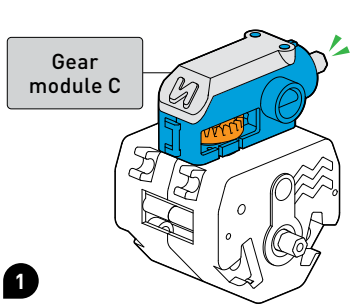
ASSEMBLING THE QUADRUPED

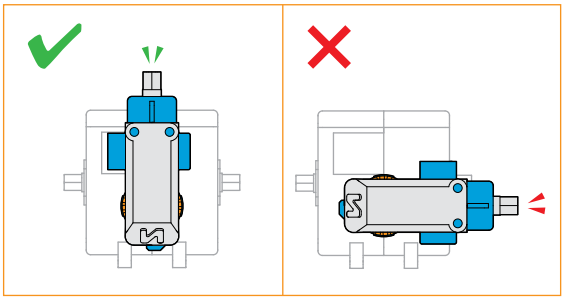


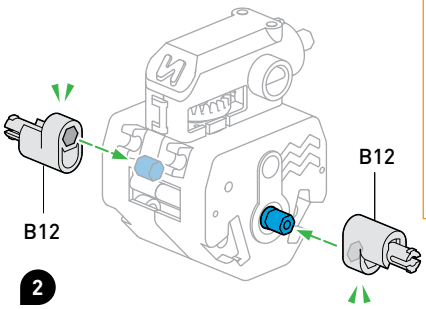


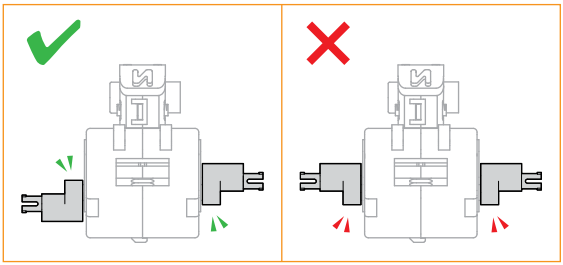


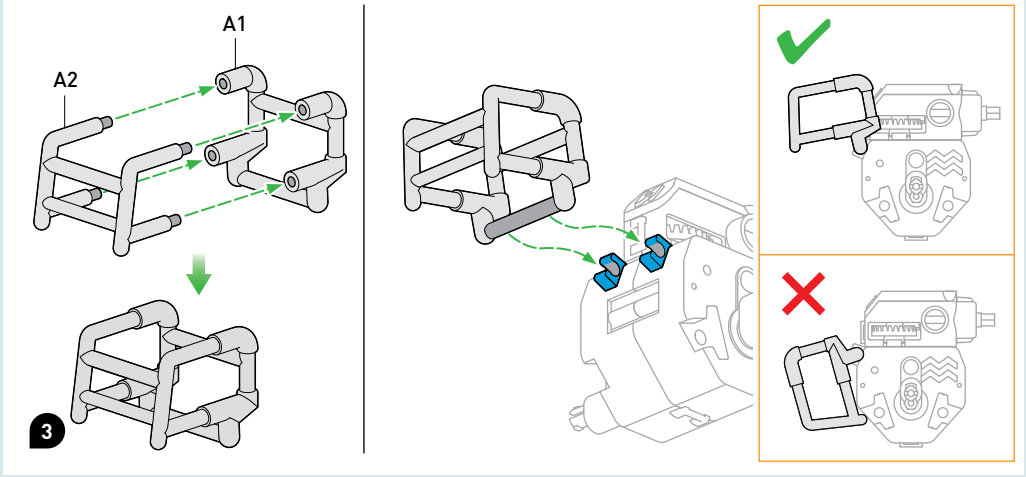


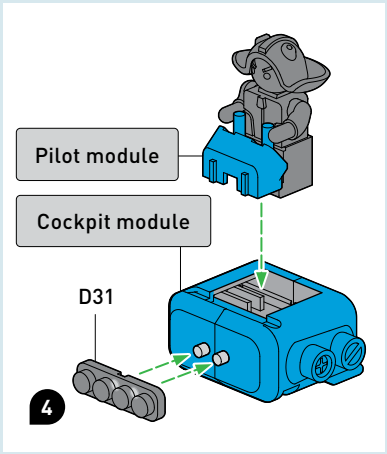


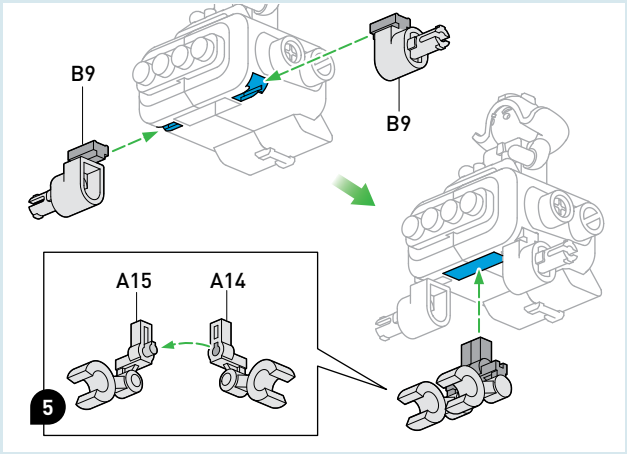


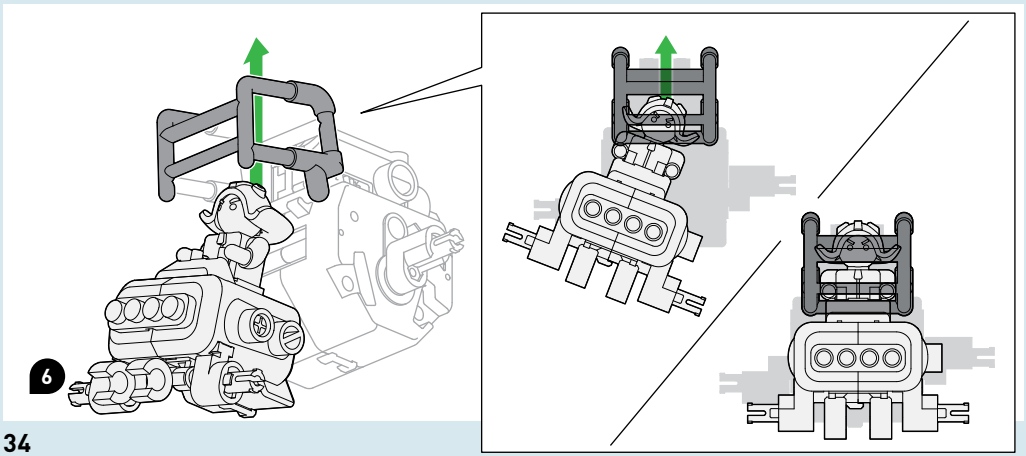





A1
A2
3


Pilot module
Cockpit module
D31
4


B9
B9
A15
A14
5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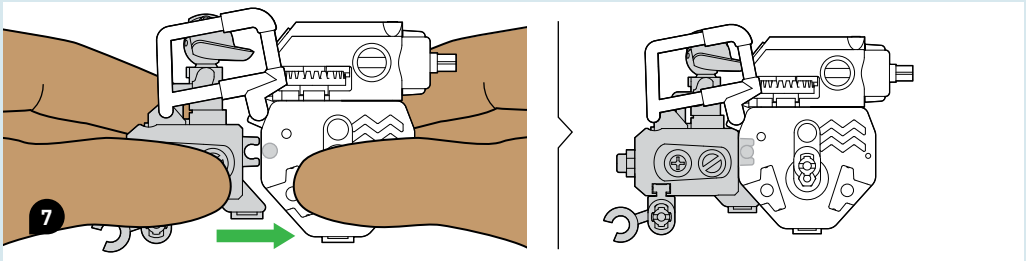
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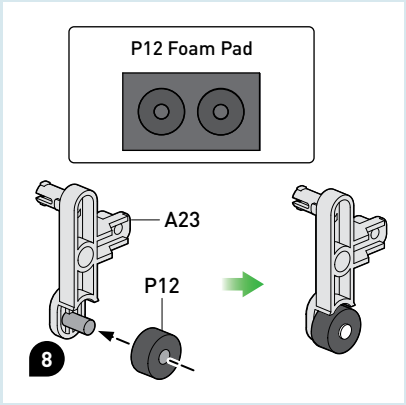
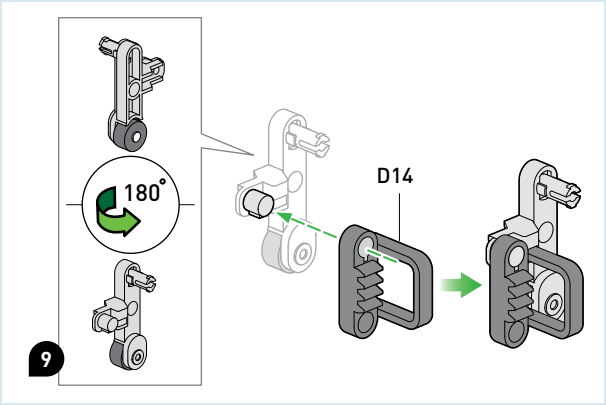
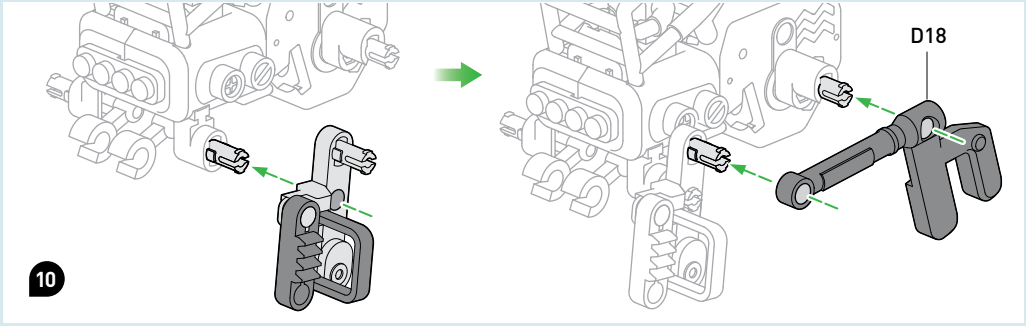
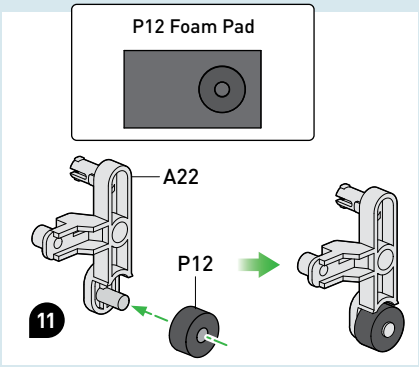
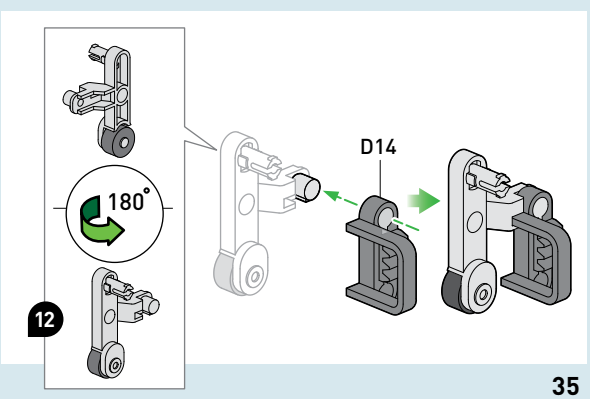
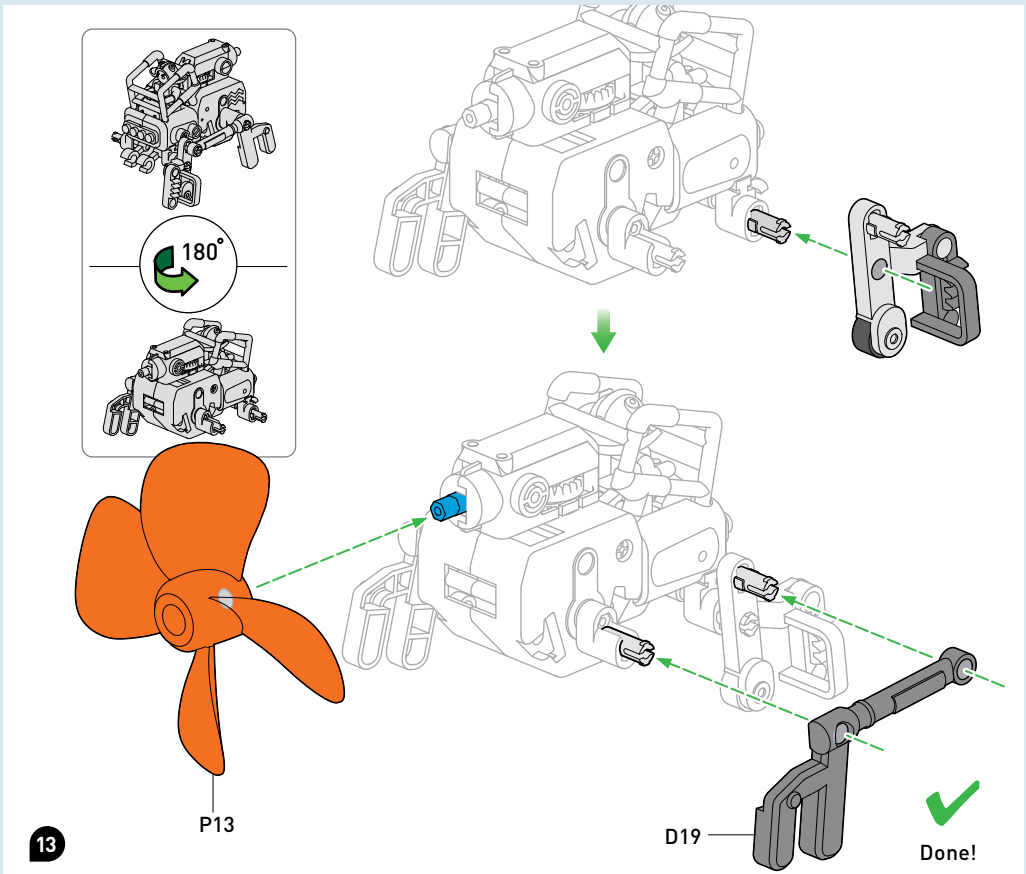

P12 Foam Pad
A23
P12
8


180°
D14
9

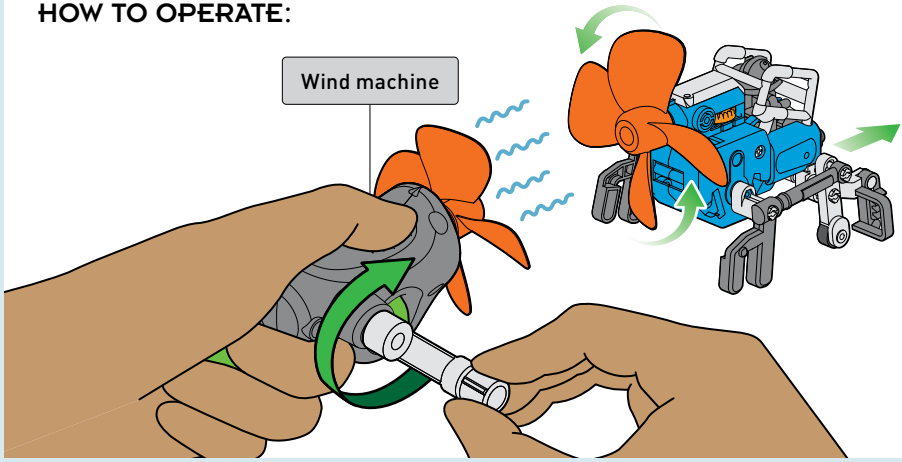

D18
10


P12 Foam Pad
A22
P12
11

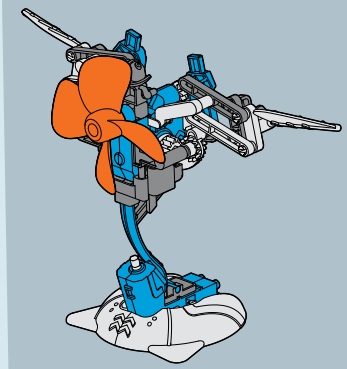

180°
D14
12

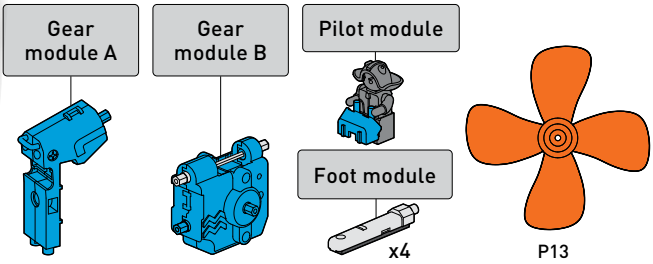


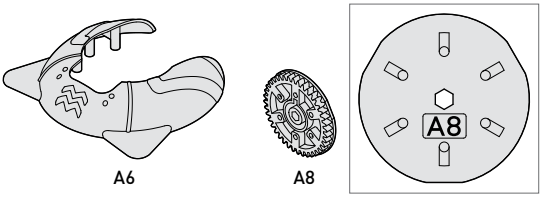
HOW TO OPERATE:

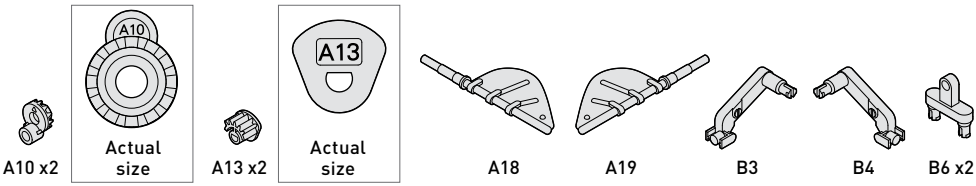


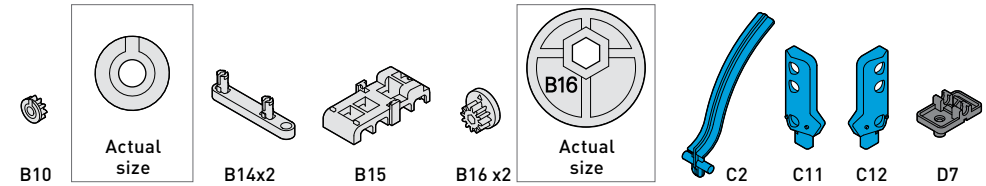
ASSEMBLING THE FLYING MACHINE

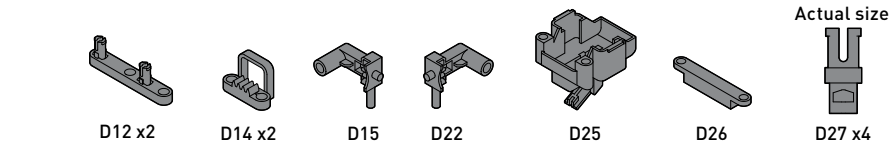


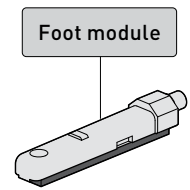












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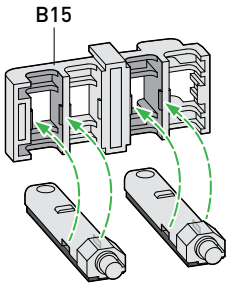
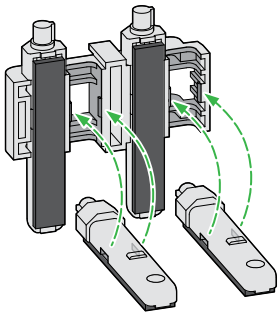
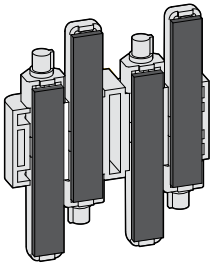
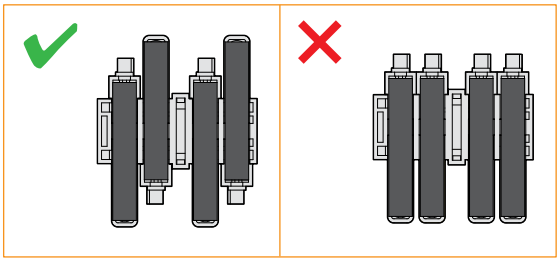


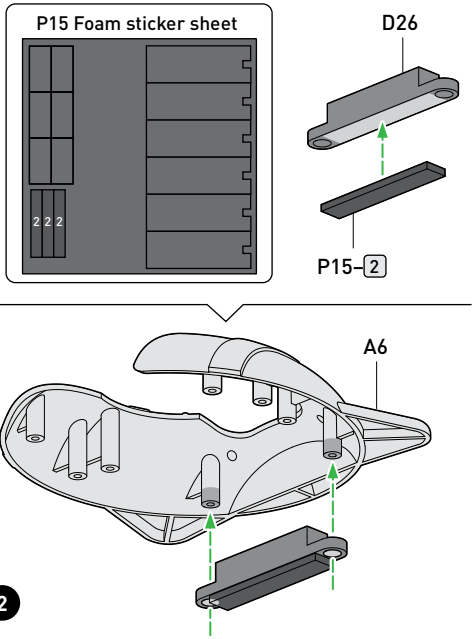


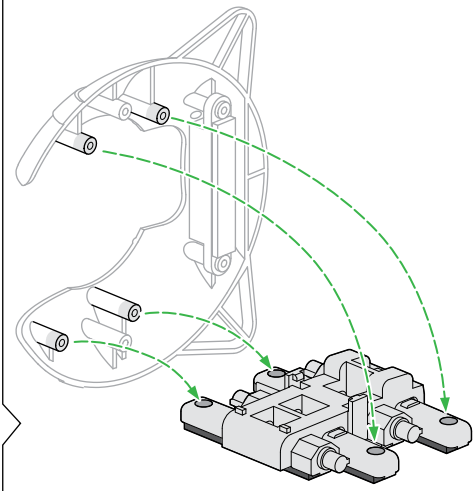
Note: Pay attention to the orientation of the foot modules. (See next page.)

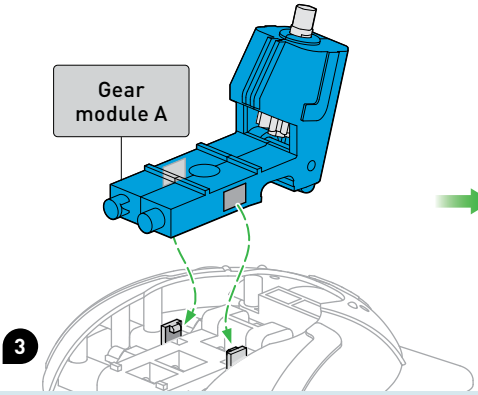
ASSEMBLING THE FLYING MACHINE

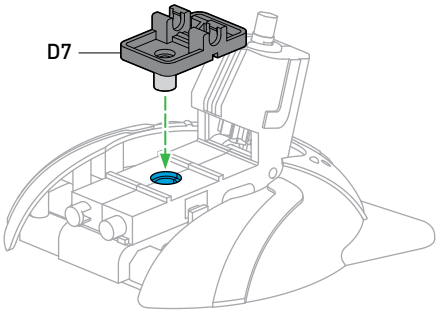


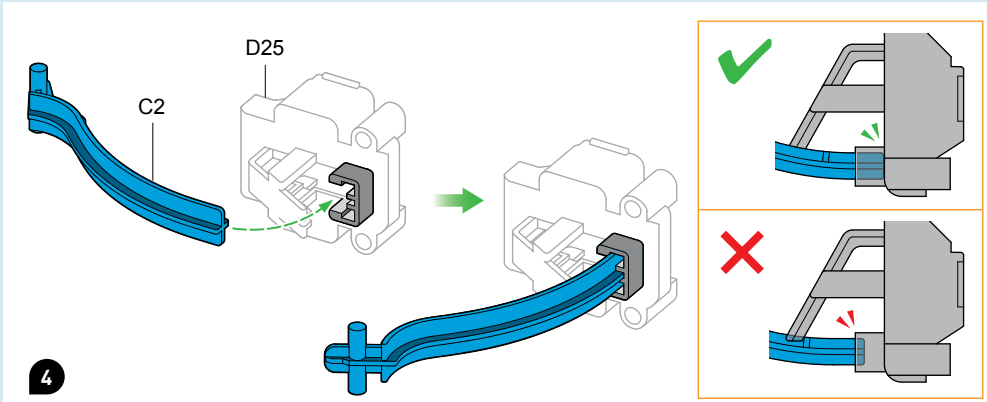


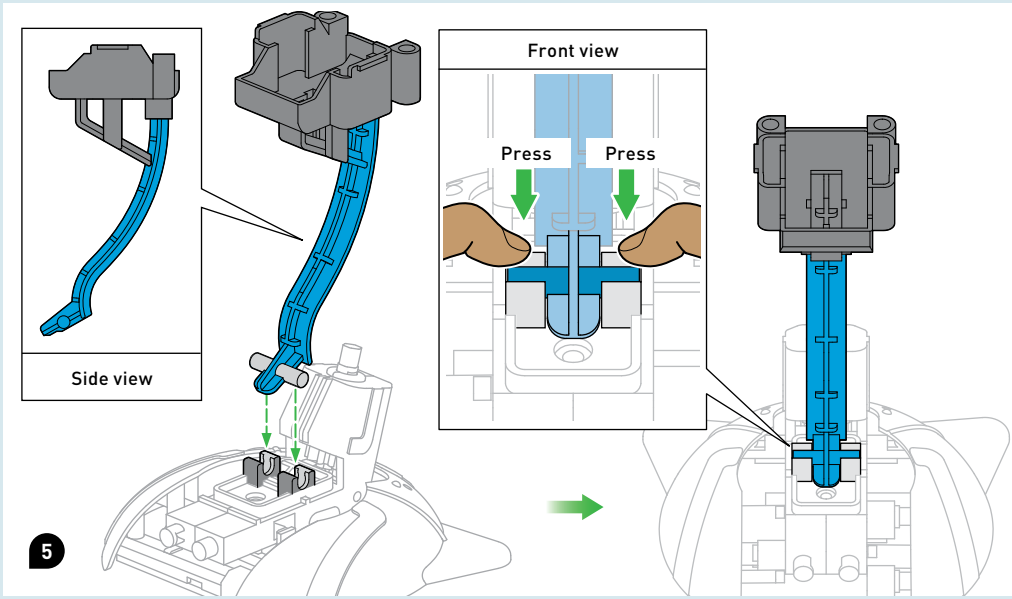


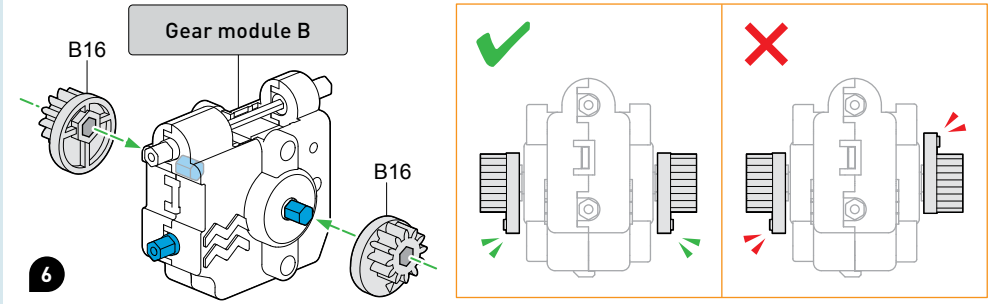


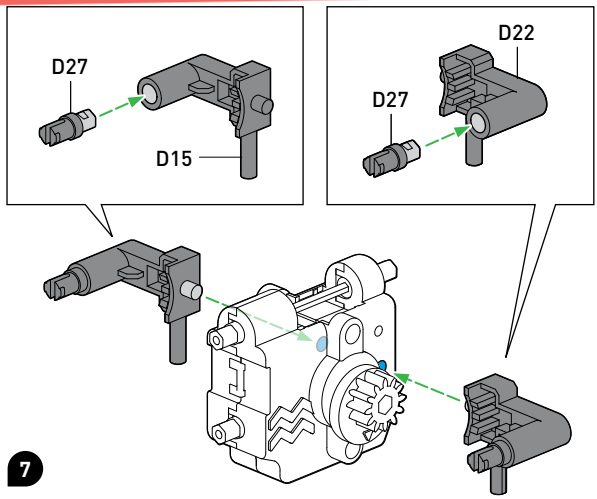





D25
C2
4


Side view
Front view
Press
Press
5


Gear module B
B16
B16
6



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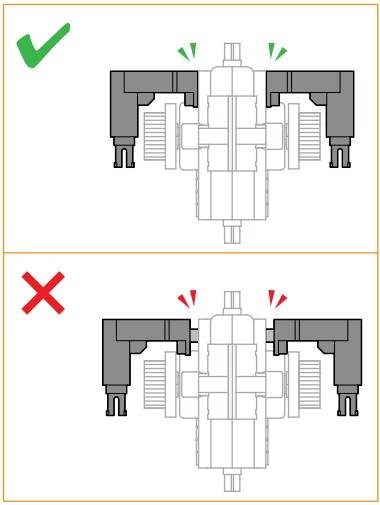

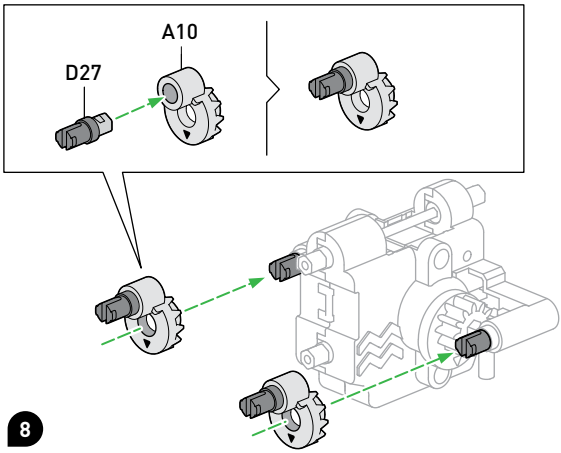

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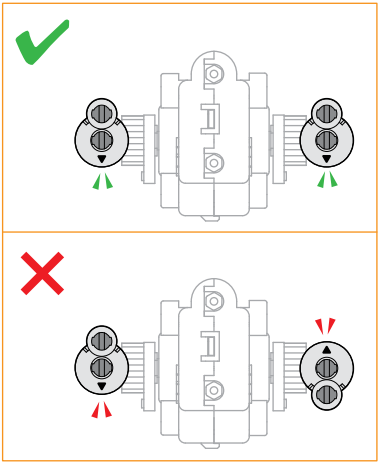

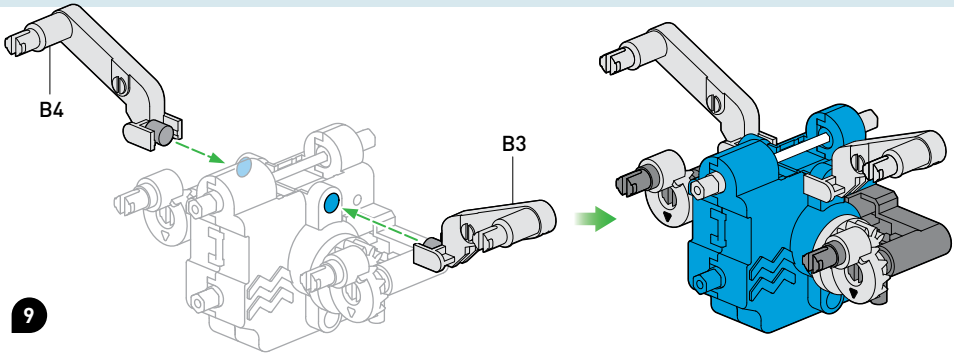

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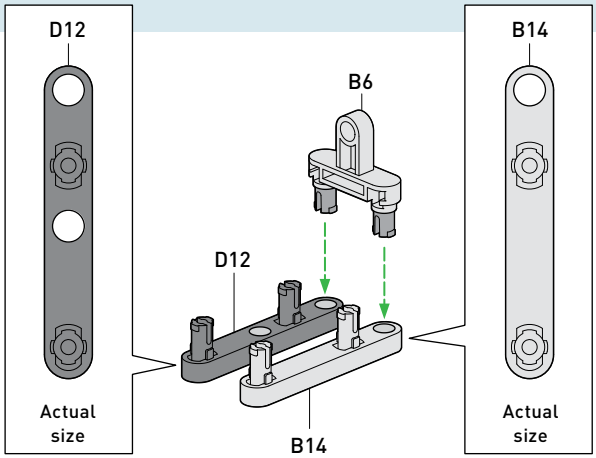
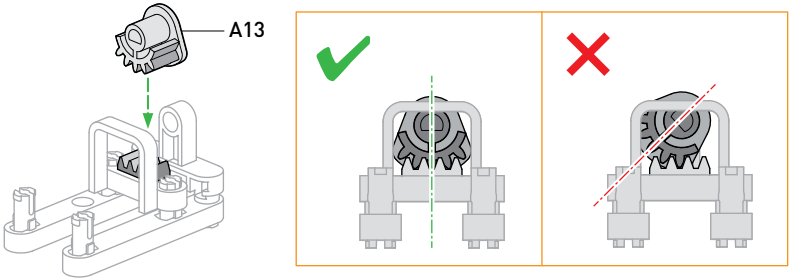
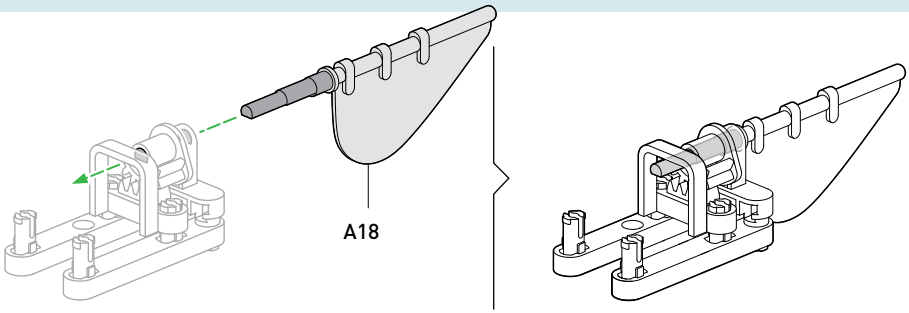

D12
Actual size
B6
D12
B14
B14
Actual size
D14

11


A13

12


A18

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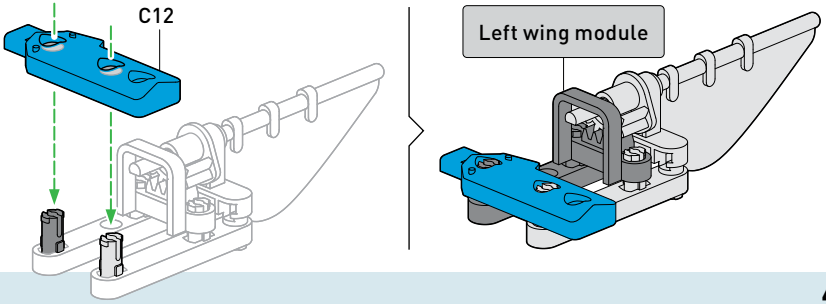
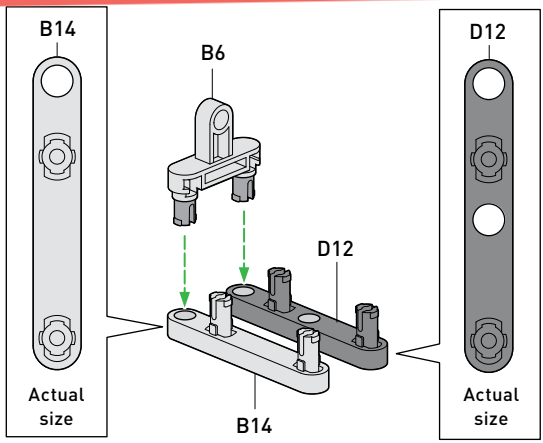
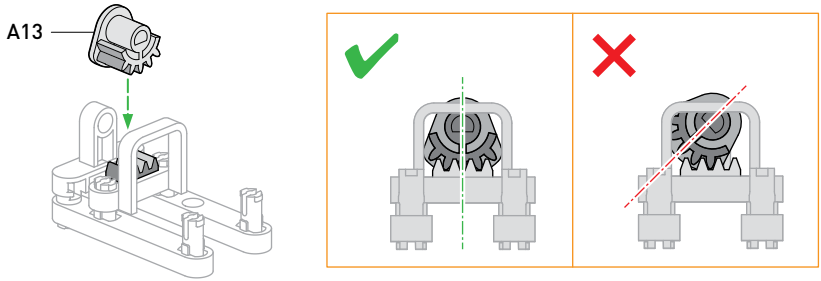

C12
Left wing module

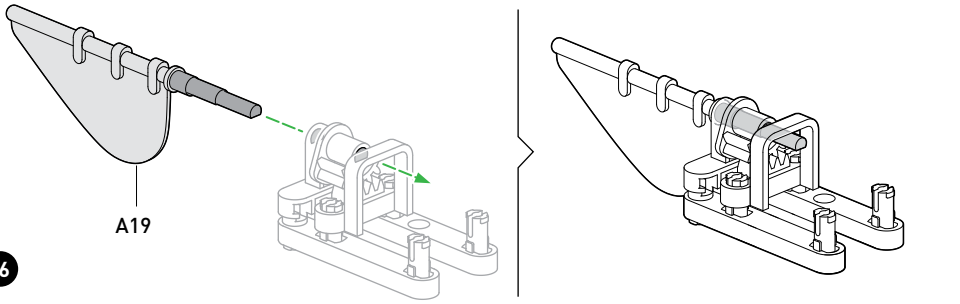
14


B14
B6
D12
D12
B14
Actual size
Actual size
D14

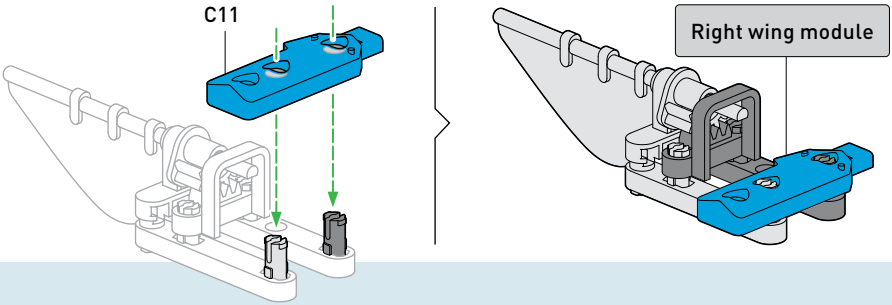
15

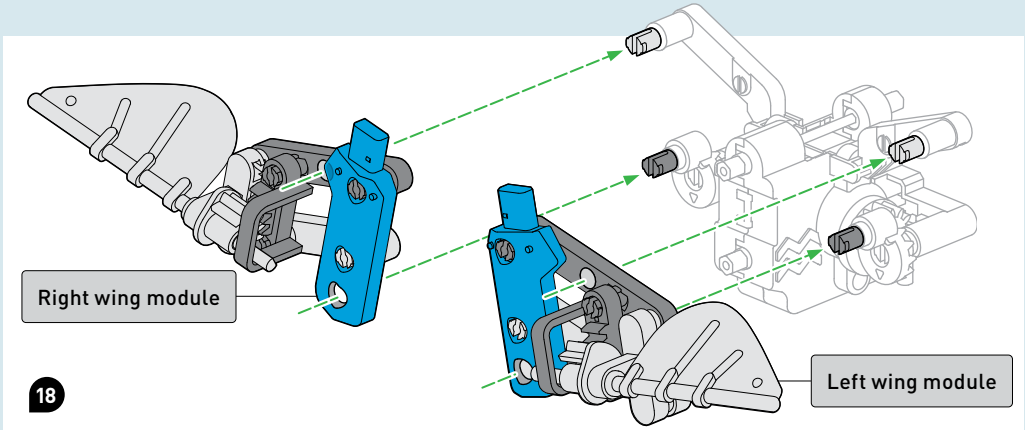

A13

16

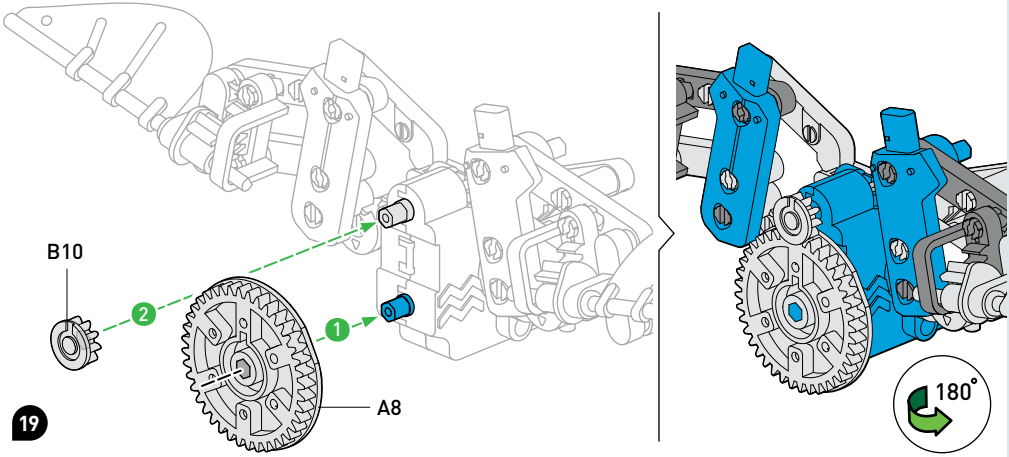

A19

17

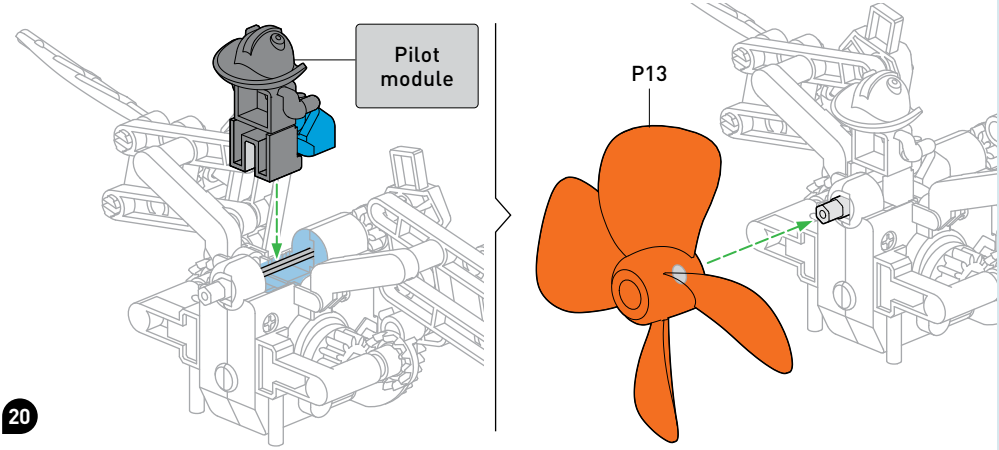

C11
Right wing module


Right wing module
Left wing module

18

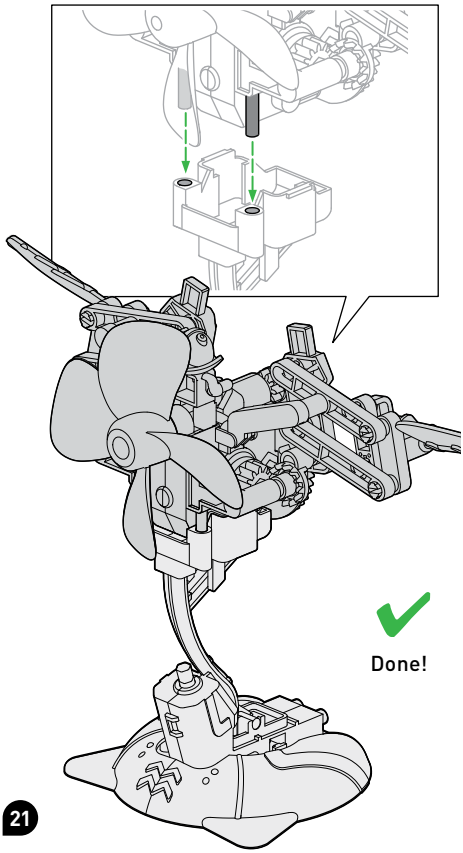

B10
2
1
A8
180°

19


Pilot module
P13

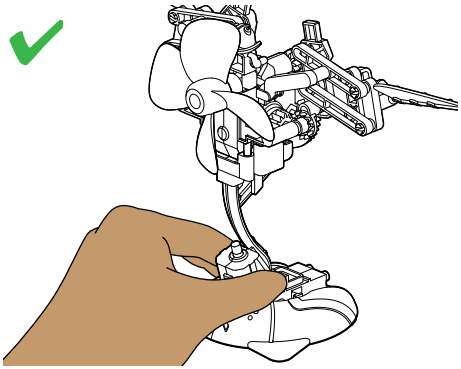
20

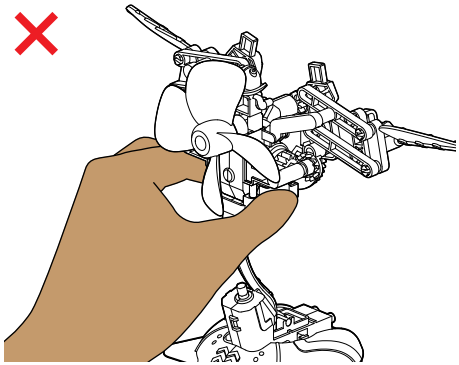
ASSEMBLING THE FLYING MACHINE



21

Pick up the flying machine from the base, not the top.





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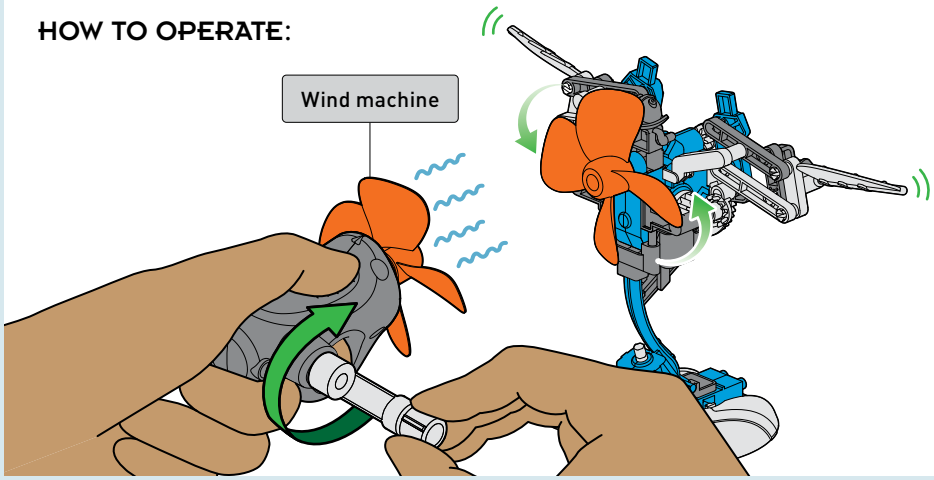
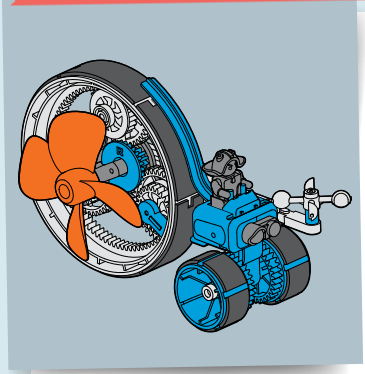
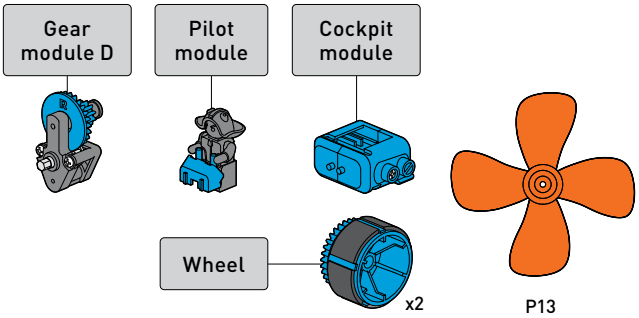
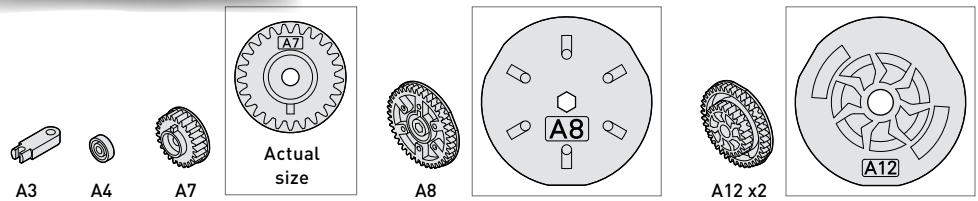
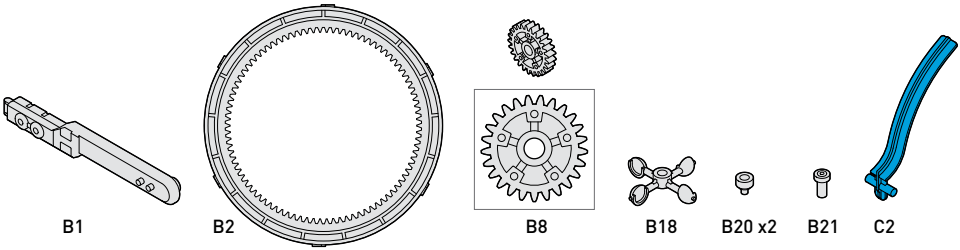


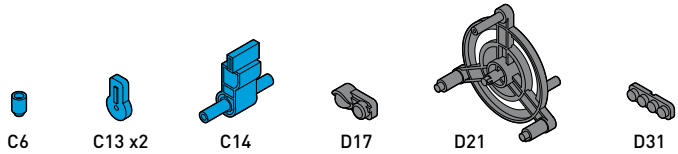
ASSEMBLING THE BIG WHEEL TRICYLE

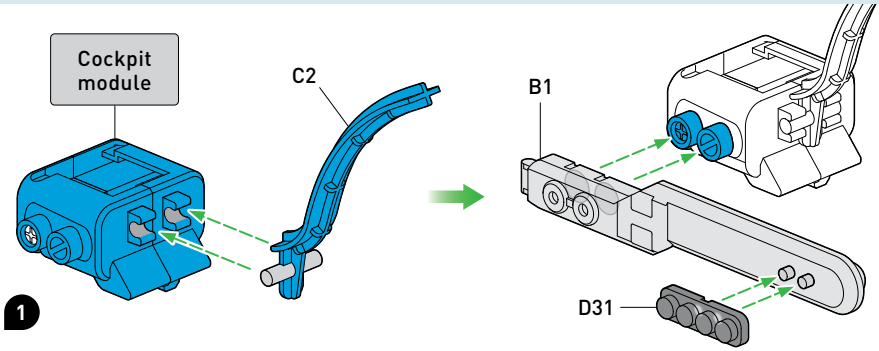


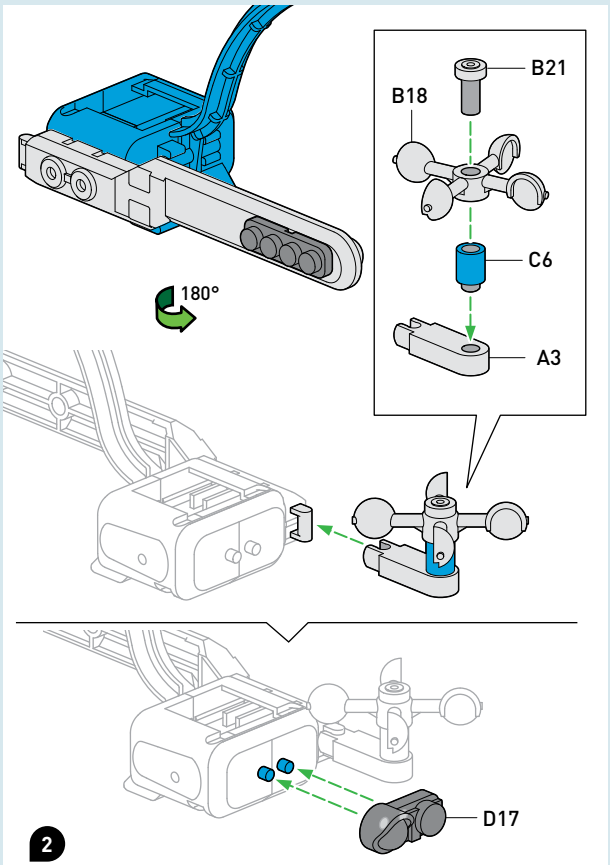


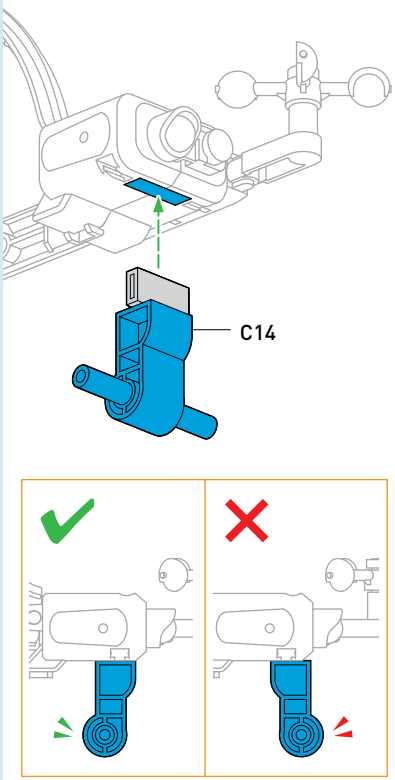


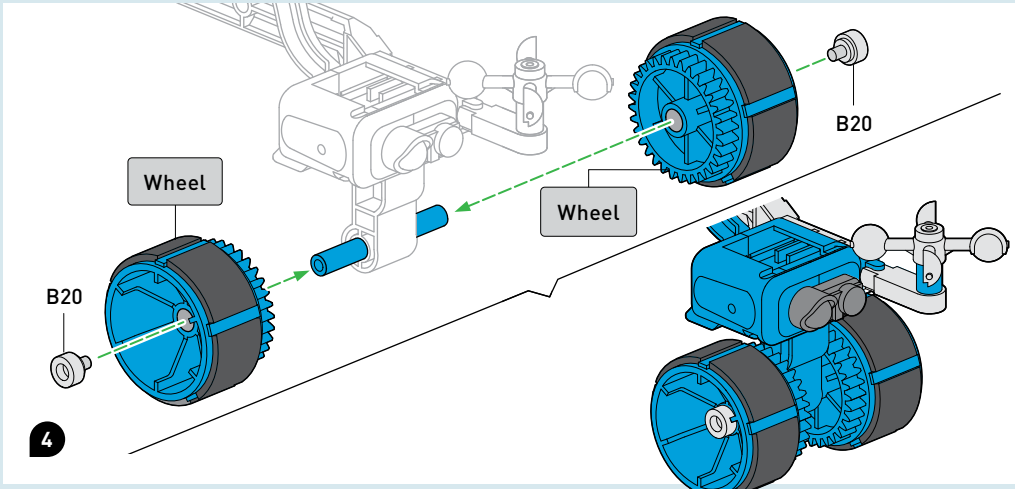


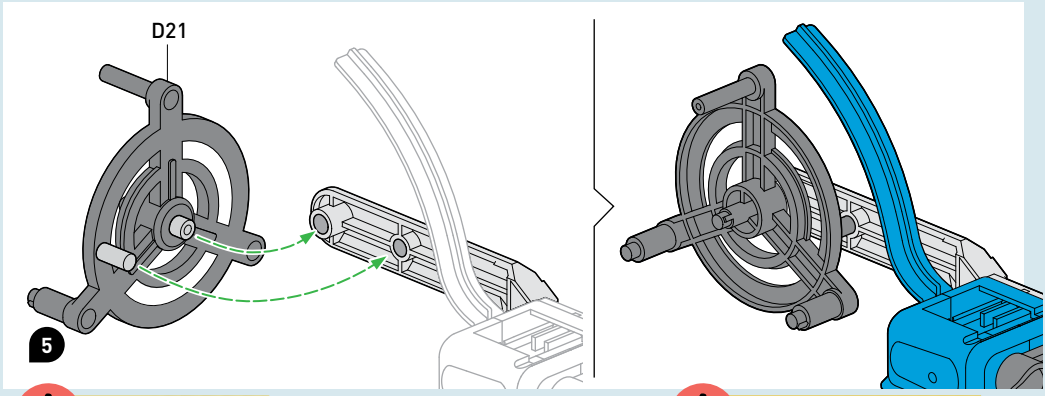


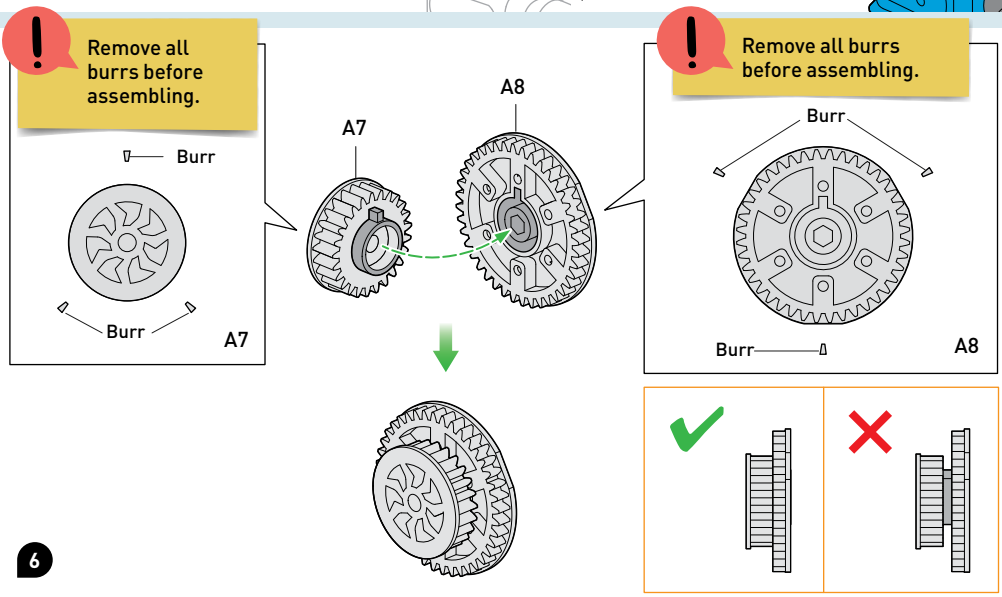


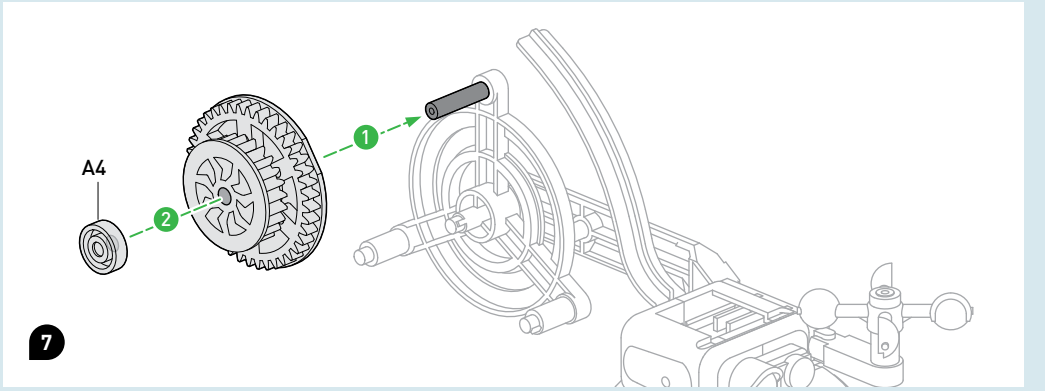

B21
B18
C6
A3
180°
D17
2


C14
3

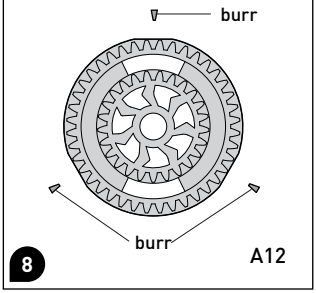

Wheel
Wheel
B20
B20
4


D21
5


Remove all burrs before assembling.
Burr
Burr
A7
A7
A8
Remove all burrs before assembling.
Burr
Burr
A8
6


A4
1
2
7

Remove all burrs before assembling.



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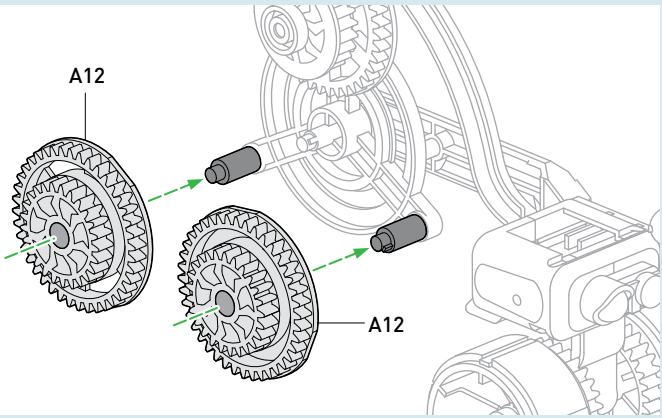

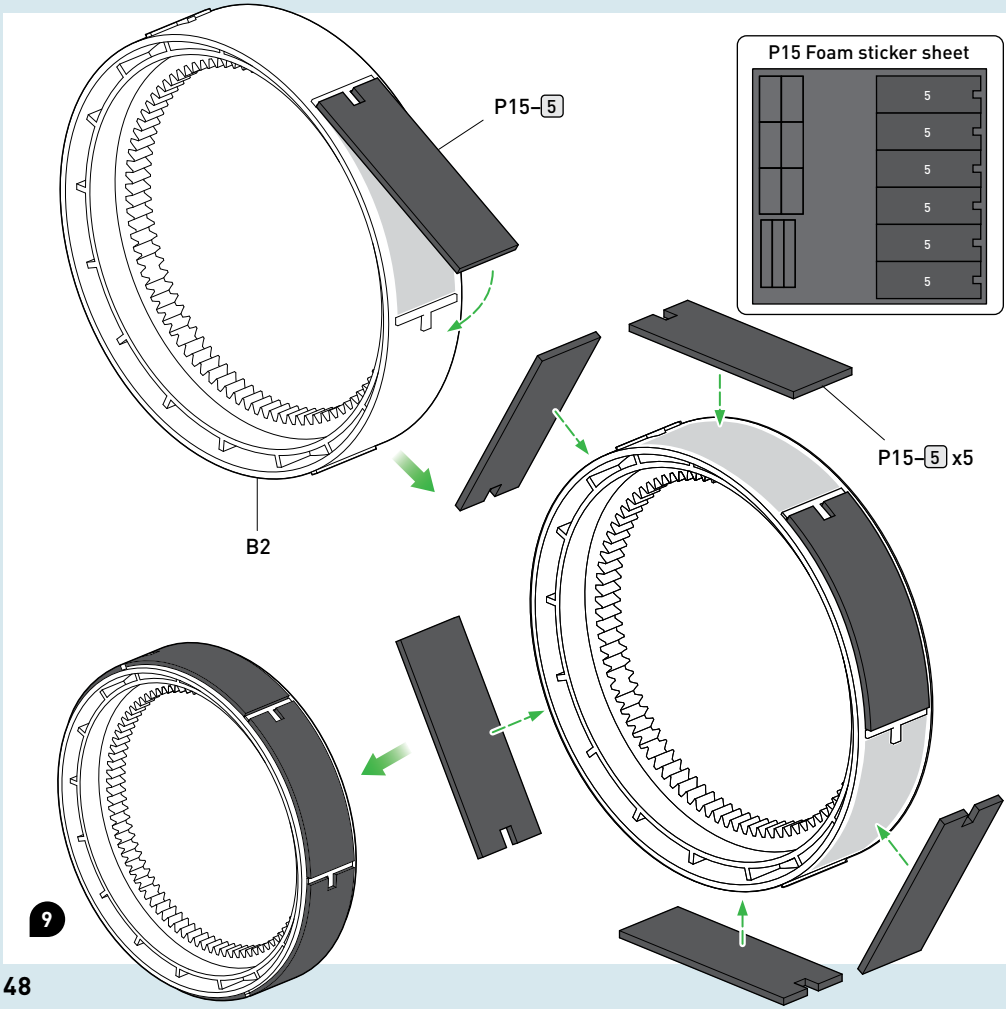

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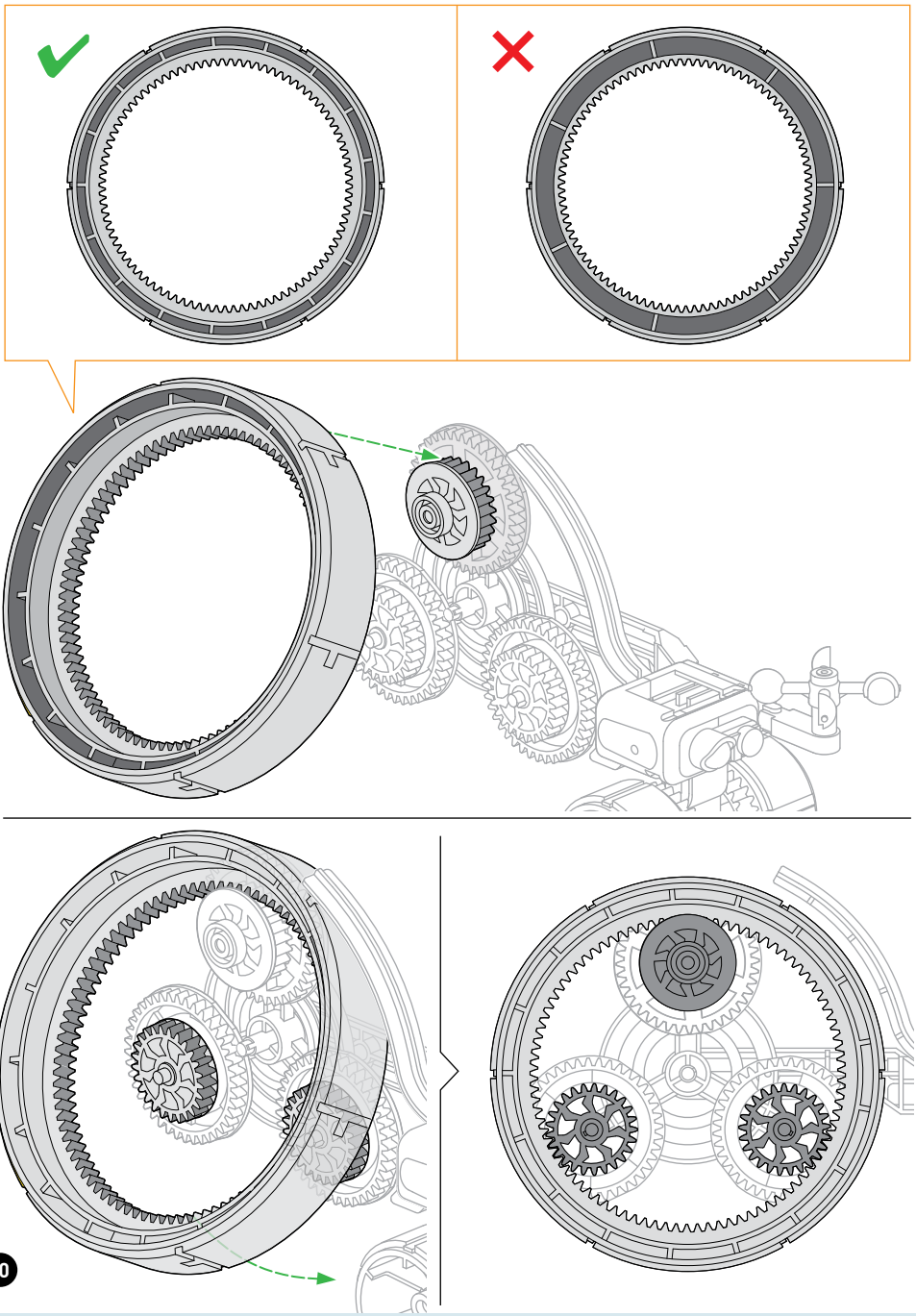

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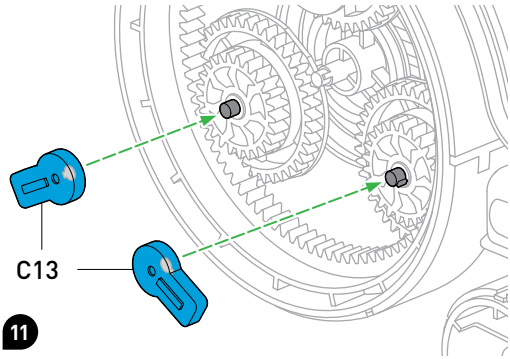

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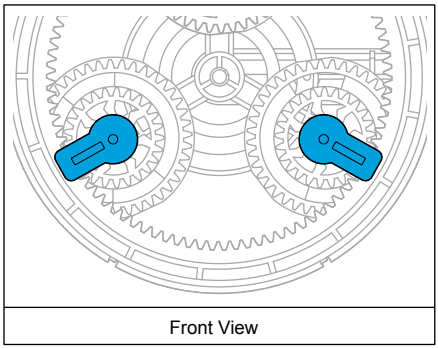
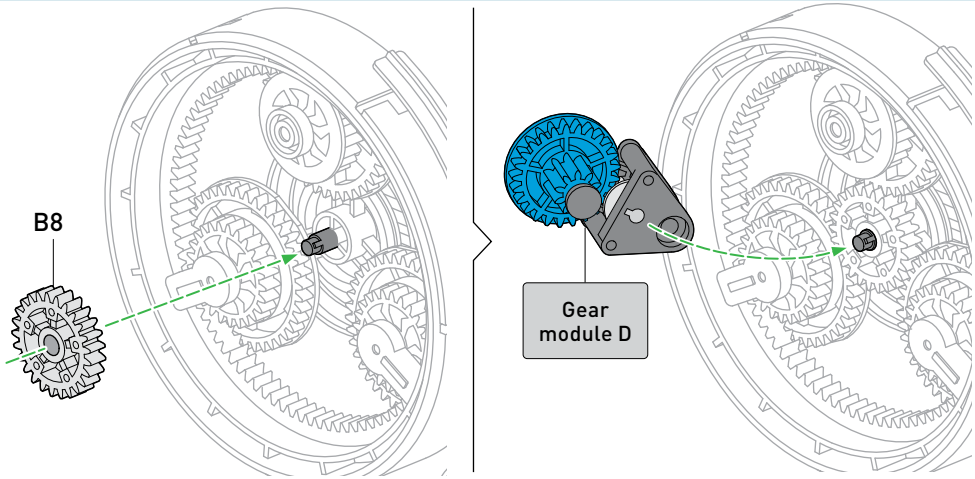
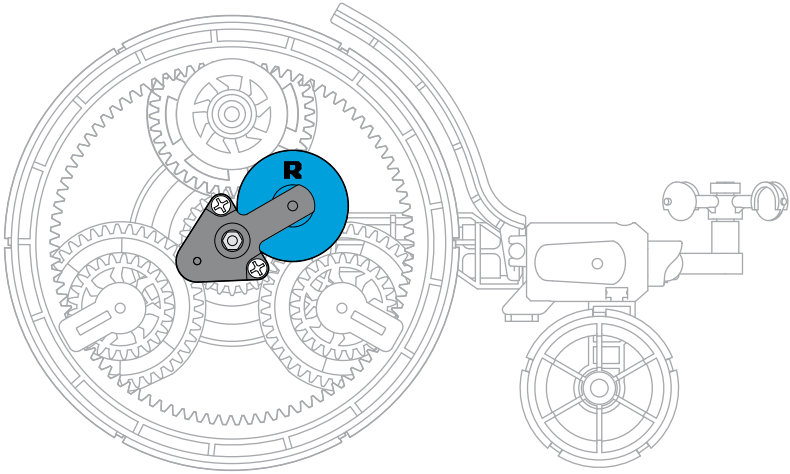


Front View





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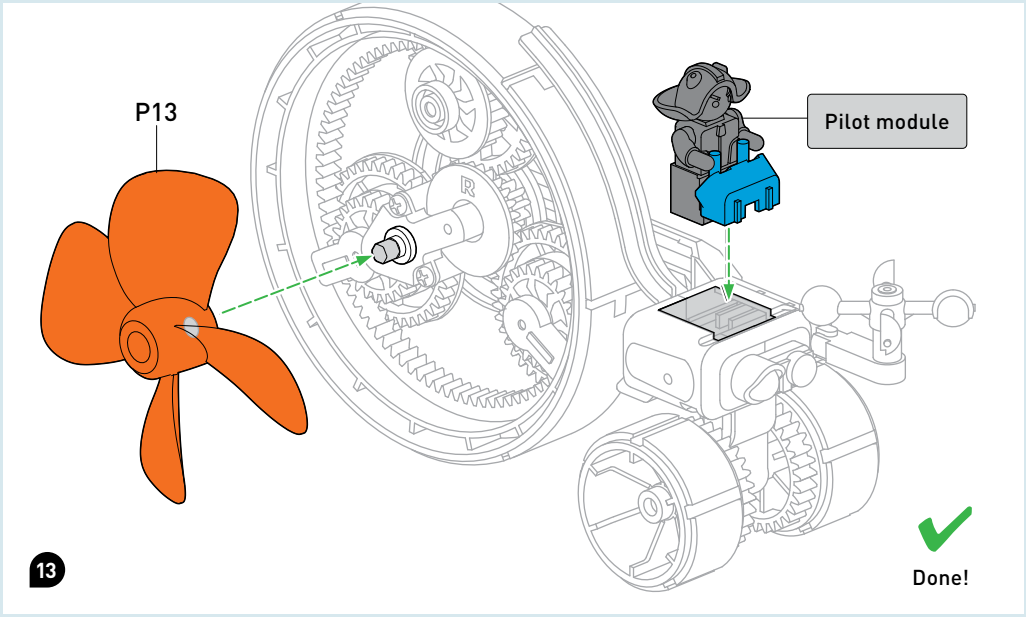

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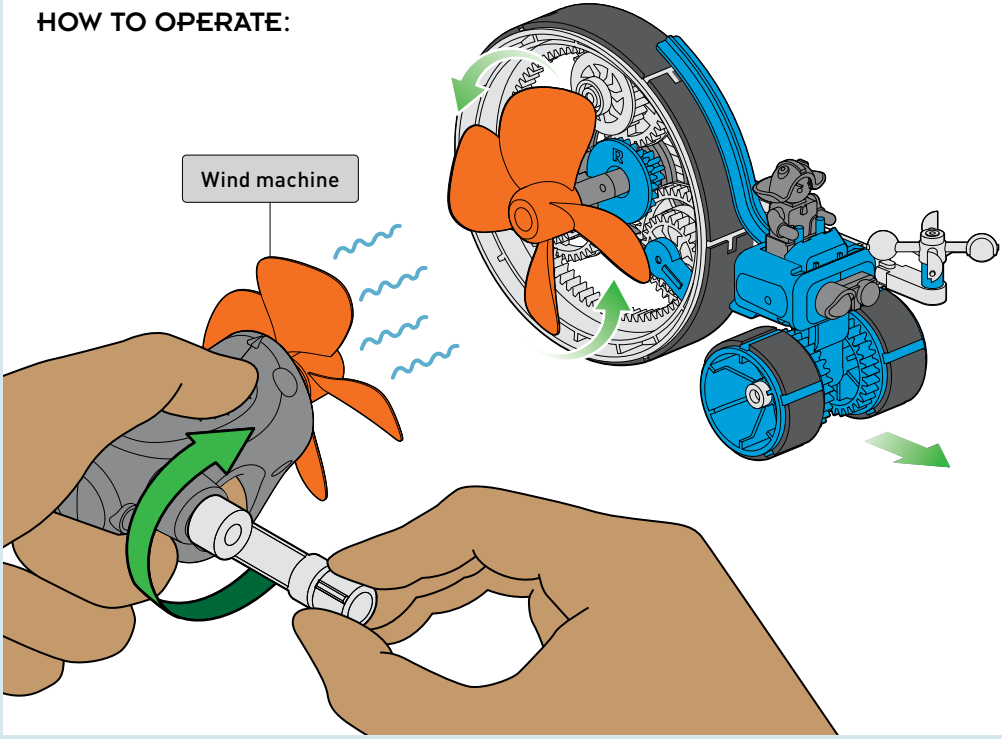


CHECK IT OUT

Learning From Nature

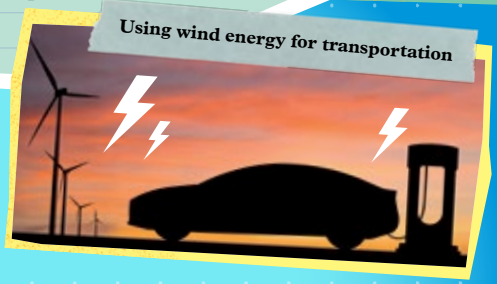
Dandelion

Humans aren't the only ones who have been using the wind for transportation — plants and animals have used wind power to get around for millions of years.

Think of birds that can glide through the air for hours on end, barely flapping their wings to stay in flight. They're not the only ones! Some spiders engage in a process called **ballooning,** in which they use the wind and Earth's electric fields to travel many miles.

Plants and fungi have also developed sophisticated ways to reproduce and scatter their seeds with the wind. This principle is called **anemochory,** and the seeds of the plants are called flying seeds or winged seeds. Particularly well known are the seeds of the dandelion and the seeds of the maple tree. Rarer, but quite impressive are the flying seeds of **Alsomitra macrocarpa,** a tropical cucumber plant. Its seeds look like small gliders, with a wingspan reaching up to 14 cm (5.5 inches). These marvels of nature have inspired aviation pioneers in their inventions of airplanes and other flying machines for humans.

Alsomitra macrocarpa



Using wind energy for transportation

ENERGY FROM *Wind Power*

When the wind is blowing strongly, you can clearly feel that there is a lot of energy in the wind. In a storm, you can barely keep both feet on the ground! This immense power can be converted to power cars and other vehicles. Wind turbines can generate **electricity,** which in turn can be used to charge electric cars. Electricity can also be used to produce hydrogen, which can power **fuel cell** cars. These two methods work very well to power cars in cities, which can reduce urban air pollution. Because these methods use the wind — instead of **fossil fuels** — to generate energy, they are much more climate-friendly.

CONTINUED ON THE NEXT PAGE

Modern wind turbines use generators to produce electricity. The blades of the wind turbine are set in motion by the wind and drive the generator. This principle has been used in **windmills** for centuries. The only difference is that the windmills do not drive electric generators, but rather **millstones,** which turn grain into flour. The basic mode of operation was the same then as now: the blades extract part of the energy contained in the wind and convert it into rotational energy. In this way, wind energy is converted to do work that humans need.

Millstone

STRANDBEESTS — THE REAL LIFE ROLE MODELS OF THE WINDBOTS

Dutch artist Theo Jansen is the inventor and designer of the **Strandbeests,** which is Dutch for beach animals. These are complex art objects that can walk or crawl on their own. Their movement makes the Strandbeests look almost like living creatures. They are usually driven by **wind** or **compressed air.** Some of the Strandbeests are as big as donkeys, while others are larger than a house!

Jansen mimics nature in the development of the Strandbeests. He sees his art objects as creatures that die, evolve, and even reproduce — for example, by having other people replicate his creations or print out miniature versions using a 3D printer.

The Strandbeests have been around since 1990, and Jansen continues to develop them. He has divided the development into 12 periods of evolution, similar to dinosaurs.

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