



ENGINEERING MAKERSPACE

OFF-ROAD ROVERS

創客工程 動能履帶車

EXPERIMENTS



7446

118 PCS

6+

STEAM

LEARN ABOUT BELT DRIVES
AND TANK TREADS

了解皮帶傳動和履帶



10

MODELS
TO BUILD



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On page 8~9 you can see all the models at a glance.

在第 8 - 9 頁上，您可以一目了然地看到所有模型。



On page 41 learn interesting facts about tracked vehicles.

學習有關履帶車輛的有趣事實，參見第 42 頁。

Store the experiment materials and assembled models out of the reach of small children.

The models are intended for indoor use. Do not use your models in a sandbox.

請將實驗材料和組裝模型存放在幼童無法取得之處。

請在室內環境中遊玩，勿在沙坑中使用本套組的模型。





SAFETY INFORMATION 安全資訊

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

Keep the packaging and the instructions as they contain important information.

Warning! Do not aim at eyes or face.

Caution! This model is designed to discharge a paper airplane.

Do not use with any other objects. There is a risk of injury.

Safety Advice for Batteries

- »» Two AA batteries (1.5-volt, type LR6) are required for operation.
- »» 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 (e.g., rechargeable and standard) 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 (nickel-cadmium) batteries.
- »» Batteries are to be inserted with the correct polarity. Press them gently into the battery compartment. See page 6.
- »» Always close the battery compartment with the lid.

Dear Parents and Supervising Adults,

Before starting the experiments, read through the instruction manual together with your child and discuss the safety information. Check to make sure the models have been assembled correctly, and assist your child with the experiments.

We hope you and your child have a lot of fun with the experiments!

- »» Non-rechargeable batteries are not to be recharged. They could explode!
- »» Rechargeable batteries are only to be charged under adult supervision.
- »» Rechargeable batteries are to be removed from the toy before being charged.
- »» Exhausted batteries are to be removed from the toy.
- »» Dispose of used batteries in accordance with environmental provisions, not in the household trash.
- »» Be sure not to bring batteries into contact with coins, keys, or other metal objects.
- »» Avoid deforming the batteries.
- »» Please remove the batteries if the toy is likely to be unused for a long time.

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.





SAFETY INFORMATION 安全資訊

警告！本套組不適合3歲以下的幼童使用。其中包含細小零件可能被幼童吞嚥或吸入，產生窒息危險。

因內含重要訊息，請將包裝盒與說明書妥善保存。

警告！不要瞄準眼睛或臉。

注意！在玩此模型時請僅用紙飛機。若用其他物件彈射，可能會有受傷的風險。

電池的安全建議

- ›› 操作需要兩個AA電池（1.5伏特，LR6型）。
- ›› 供電終端不得短路。短路會導致導線過熱並導致電池爆炸。
- ›› 不同類型的電池（如可充電電池和標準電池）或新電池和舊電池不得混用。
- ›› 請勿混用舊電池和新電池。
- ›› 請勿混用鹼性，標準（碳鋅）或可充電（鎳鎘）電池。
- ›› 電池將以正確的極性插入。輕輕地將它們按入電池盒。見第6頁。
- ›› 請務必用蓋子關閉電池盒。
- ›› 非充電電池不能被充電。若強行充電，可能會導致電池爆炸！
- ›› 請在成人監督下，對充電電池進行充電。
- ›› 在充電前，請將充電電池從電池盒取出。
- ›› 請將耗盡的電池從電池盒中取出。
- ›› 請按照環保規定處理廢舊電池，勿將廢舊電池丟入家庭的一般垃圾桶。
- ›› 請勿將電池與硬幣，鑰匙或其他金屬物體接觸。
- ›› 請避免電池變形。
- ›› 如果長時間不使用本套組的模型，請取出電池。

親愛的父母：

在實驗開始之前，請仔細閱讀使用說明書並和您的孩子一起討論安全資訊。請仔細檢查模型以確保有將模型正確組裝，並協助您的孩子進行實驗。

我們希望您和您的孩子在使用本套組時能獲得樂趣與完成有趣的實驗！

電子及電氣設備廢棄物處理說明

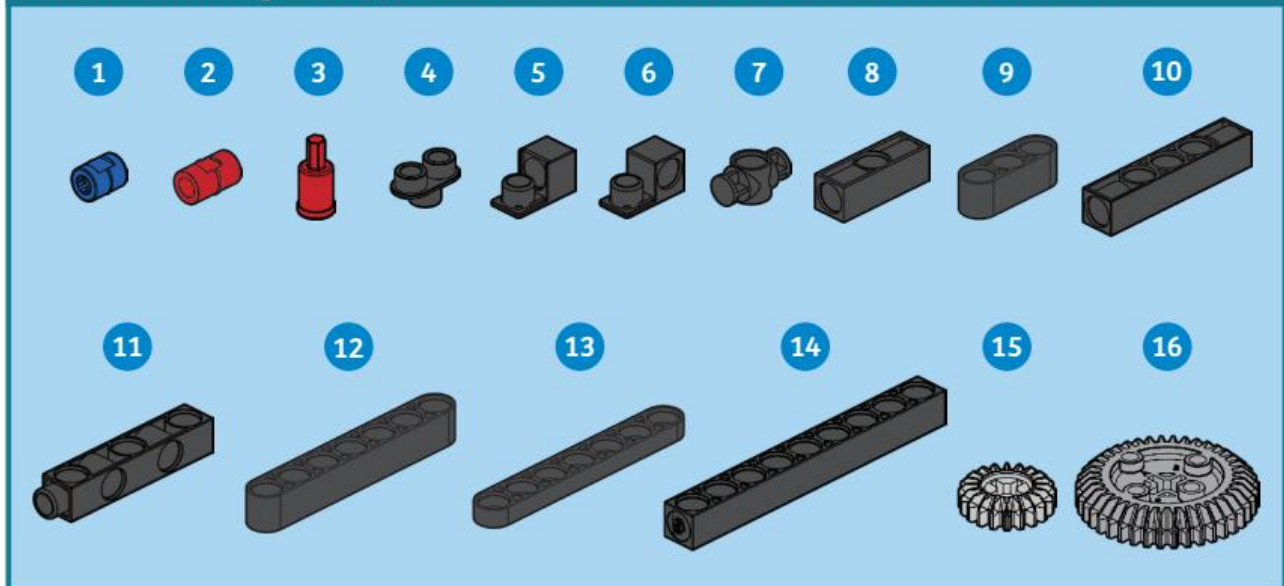
該產品的電子設備屬於可回收利用的垃圾。為了環保，在電子設備壽命結束時，請不要把它們丟入家庭一般垃圾。必須將其交付給電子垃圾回收站，如右圖所示：

請聯繫當地政府的相關處理場所。



KIT CONTENTS 包裝內容

What's inside your experiment kit: 你的實驗包裡面有什麼零件呢？



Checklist: Find – Inspect – Check off 清單：查找 - 檢查 - 核對

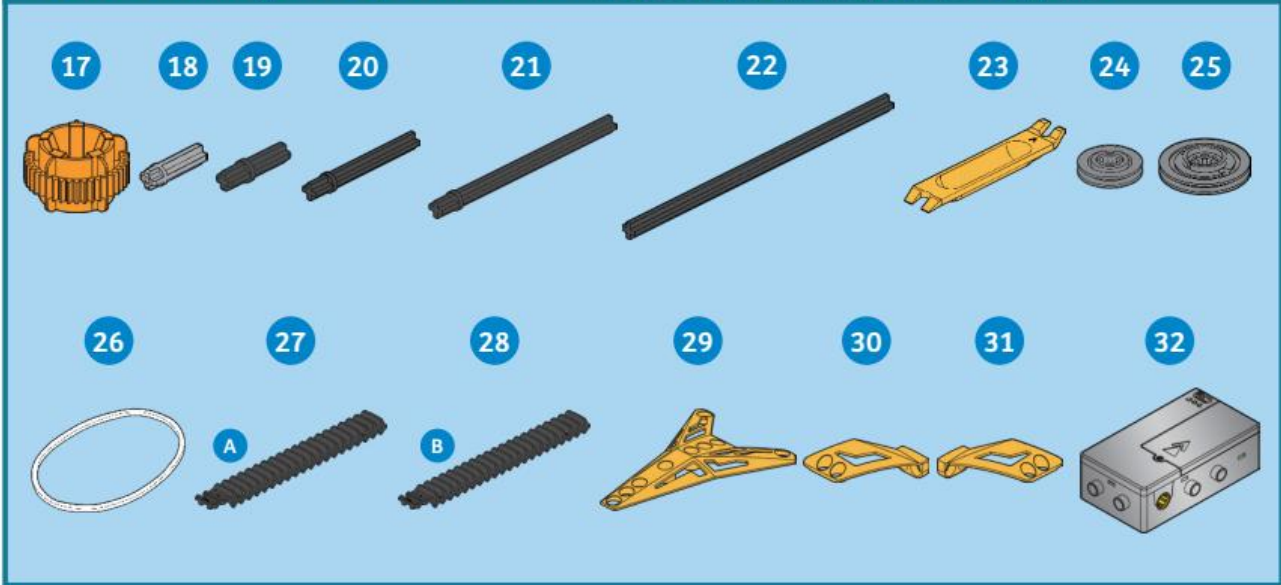
✓ NO. 號碼	Description	零件名稱	QTY. 數量	ITEM NO. 品號
<input type="radio"/>	1 B-SHORT PEG	B- 短結合鍵	30	7344-W10-C2B
<input type="radio"/>	2 C-LONG PEG	C- 長結合鍵	10	7061-W10-C1R
<input type="radio"/>	3 C-CAM CONNECTOR	C- 凸輪連結鍵	2	7413-W10-S1R
<input type="radio"/>	4 C-TWO-IN-ONE CONVERTER	C- 二合一結合鍵	6	7061-W10-G1D
<input type="radio"/>	5 C-FRONT CONVERTER	C- 單向轉接鍵	4	7061-W10-Y1D
<input type="radio"/>	6 C-LATERAL CONVERTER	C- 雙向轉接鍵	4	7061-W10-X1D
<input type="radio"/>	7 C-1 HOLE CONNECTOR	C-2 凸單孔轉向結合器	6	7430-W10-B1D
<input type="radio"/>	8 C-3 HOLE ROD FRONT CLOSED	C-3 孔長條側有孔	3	7026-W10-X1D
<input type="radio"/>	9 C-3 HOLE ROUND ROD	C-3 孔圓角長條	2	7404-W10-C1D
<input type="radio"/>	10 C-5 HOLE ROD FRONT CLOSED	C-5 孔長條側有孔	4	7413-W10-R1D
<input type="radio"/>	11 C-5 HOLE DUAL ROD BOTTOM CLOSED	C-5 孔超長條底無孔	2	7413-W10-W1D
<input type="radio"/>	12 C-7 HOLE ROUND ROD	C-7 孔圓角長條	2	7404-W10-C2D
<input type="radio"/>	13 C-7 HOLE PROLATE ROD	C-7 孔圓角扁長條	2	7404-W10-C3D
<input type="radio"/>	14 C-9 HOLE ROD	C-9 孔長條	4	7407-W10-C1D
<input type="radio"/>	15 C-20T GEAR	C-20T 齒輪	2	7026-W10-D2S
<input type="radio"/>	16 C-40T GEAR	C-40T 齒輪	2	7346-W10-C1S



KIT CONTENTS 包裝內容

You will also need: 2 x AA batteries (1.5 Volt, type LR6)
您還需要：2 個 AA 電池（1.5 伏特，LR6 型）

What's inside your experiment kit: 你的實驗包裡面有什麼零件呢？



Checklist: Find – Inspect – Check off 清單：查找 - 檢查 - 核對

✓ NO. 號碼	Description	零件名稱	QTY. 數量	ITEM NO. 品號
<input type="checkbox"/>	17 C-40T WHEEL FRAME	C-40T 輪殼	4	7446-W10-B10
<input type="checkbox"/>	18 C-MOTOR AXLE	C-27mm 馬達短軸	1	7026-W10-L1S1
<input type="checkbox"/>	19 C-30mm AXLE II	C-30mm II 軸	2	7413-W10-N1D
<input type="checkbox"/>	20 C-60mm AXLE II	C-60mm II 軸	1	7413-W10-M1D
<input type="checkbox"/>	21 C-100mm AXLE II	C-100mm II 軸	2	7413-W10-L2D
<input type="checkbox"/>	22 C-150mm AXLE I	C-150mm I 軸	1	7026-W10-P1D
<input type="checkbox"/>	23 B-PEG REMOVER	B- 扳手	1	7061-W10-B1Y
<input type="checkbox"/>	24 C-OD23mm PULLEY	C-OD23mm 滑輪	2	7344-W10-N3S1
<input type="checkbox"/>	25 C-OD33mm PULLEY	C-OD33mm 滑輪	2	7344-W10-N2S1
<input type="checkbox"/>	26 C-70mm RUBBER BAND	C-70mm 橡皮筋	4	R10-02
<input type="checkbox"/>	27 C-20T BELT	C-20 齒履帶	4	7446-W10-C1D
<input type="checkbox"/>	28 C-21T BELT	C-21 齒履帶	2	7446-W10-C2D
<input type="checkbox"/>	29 C-LARGE BODY PIECE A	C-N 型飾片	2	7446-W10-A1Y
<input type="checkbox"/>	30 C-SMALL BODY PIECE LEFT	C-O 型飾片 (左)	2	7446-W10-A2Y
<input type="checkbox"/>	31 C-SMALL BODY PIECE RIGHT	C-O 型飾片 (右)	2	7446-W10-A3Y
<input type="checkbox"/>	32 C-28X MOTOR WITH SWITCH	C-28 倍開關馬達盒	1	7441-W85-A

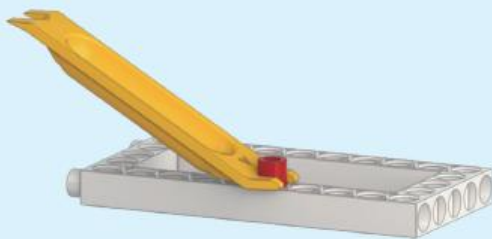
KIT CONTENTS 組裝訣竅

TIPS FOR ASSEMBLY
組裝小技巧

For more assembly tips,
please refer to
更多組裝小技巧，請參考

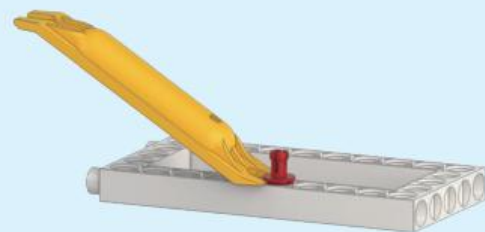


PEG REMOVER 扳手



Side A of the lever can be used to easily remove pegs.

扳手的 **A** 面可以用來輕鬆拆卸結合鍵。

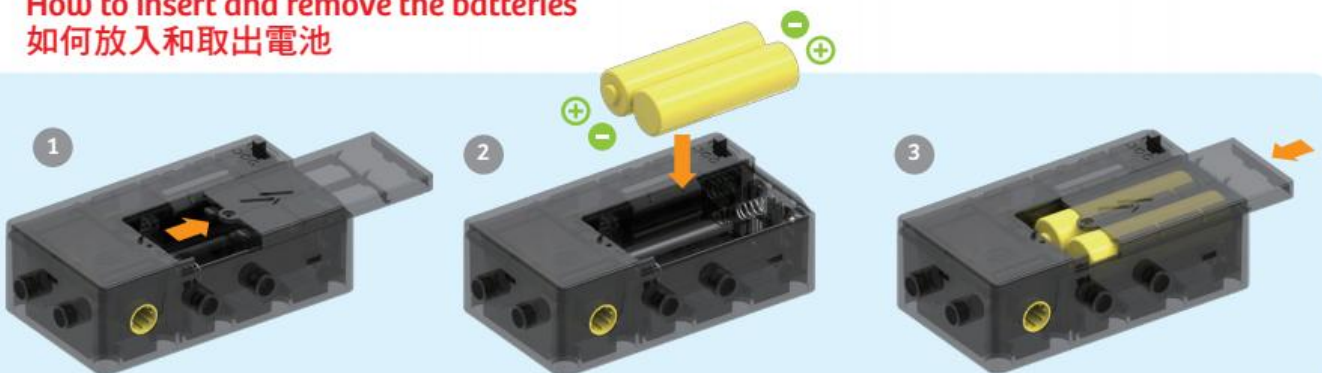


Side B can be used to loosen firmly inserted parts, such as axle.

B 面可用於鬆開牢固插入的部件，如自轉軸鍵。

BATTERIES 電池

How to insert and remove the batteries
如何放入和取出電池



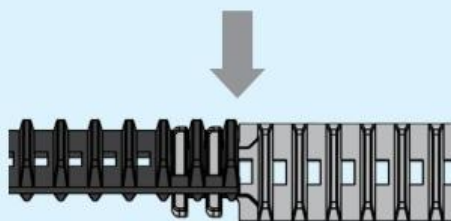
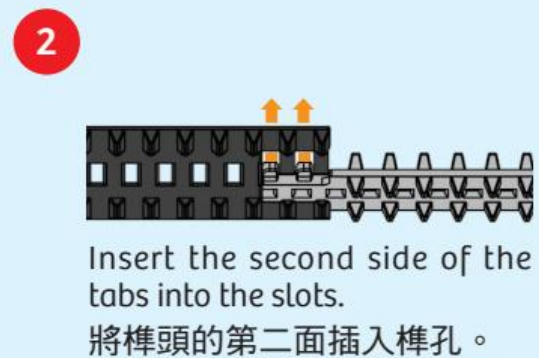
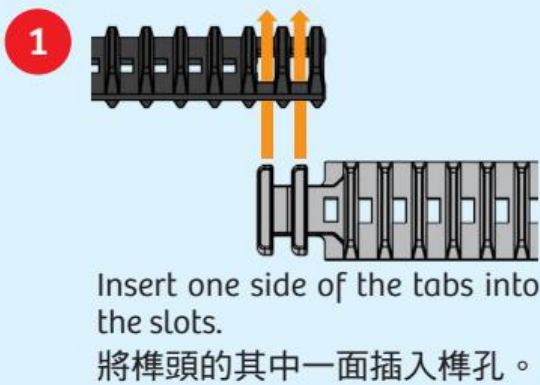
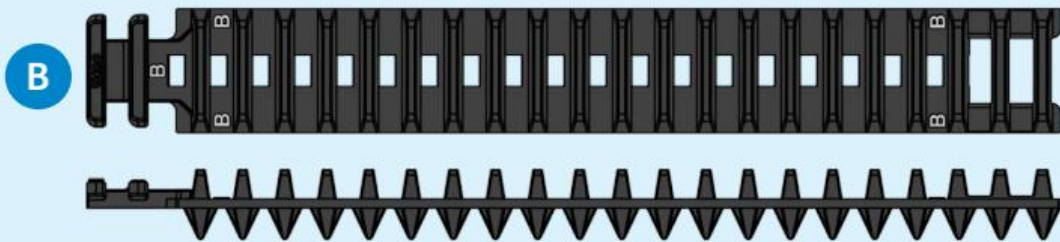
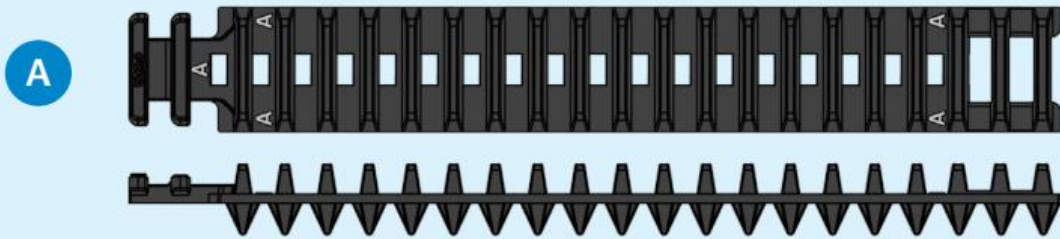
Open the battery compartment by sliding the lid open. Insert two batteries. Make sure you fit the positive and negative ends into the compartment in the direction indicated (with the correct polarity). Then close the compartment. When it is time to replace the batteries, remove the old batteries and insert the new ones with the correct polarity.

打開蓋子，才能打開電池盒。插入兩塊電池。確保按照指示的方向，符合正確極性，將正極和負極端裝入電池倉。然後關上蓋子。當需要更換電池時，請取出舊電池並以正確的極性放入新電池。



KIT CONTENTS 組裝訣竅

HOW TO CONNECT THE BELTS 如何連接皮帶



OVERVIEW 概述

ATV 4WD
越野沙灘車



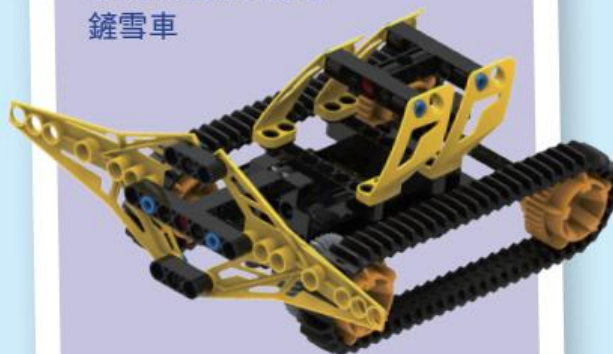
Dune Racer
沙丘賽車



Stair Walker
爬階車



Snowcat Plow
鏟雪車



**Build these
functional models
one at a time!**

同時打造出這些不同功能的
模型！

Snow Scooter
滑雪車





OVERVIEW 概述

Future Truck
未來卡車



Bandsaw Machine
帶鋸機



Conveyor Belt
輸送帶



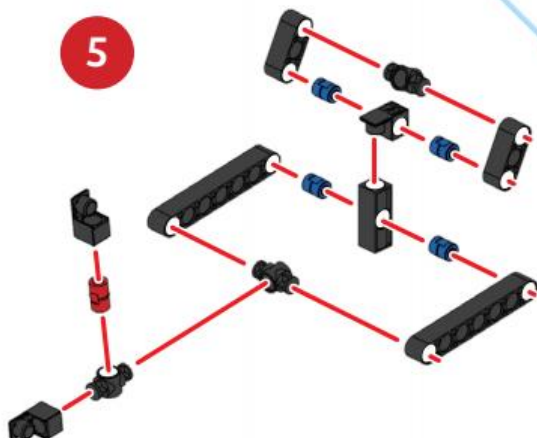
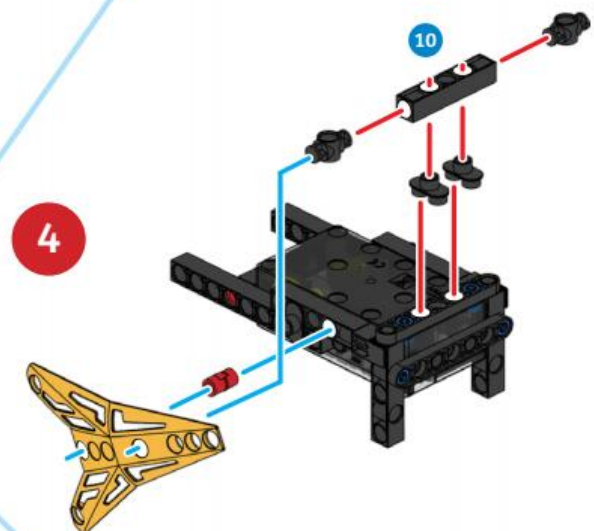
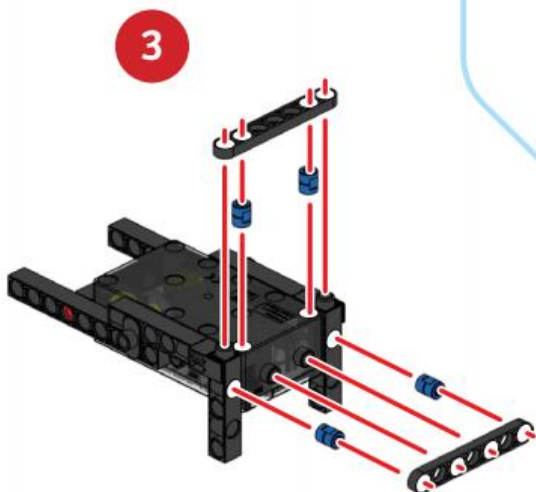
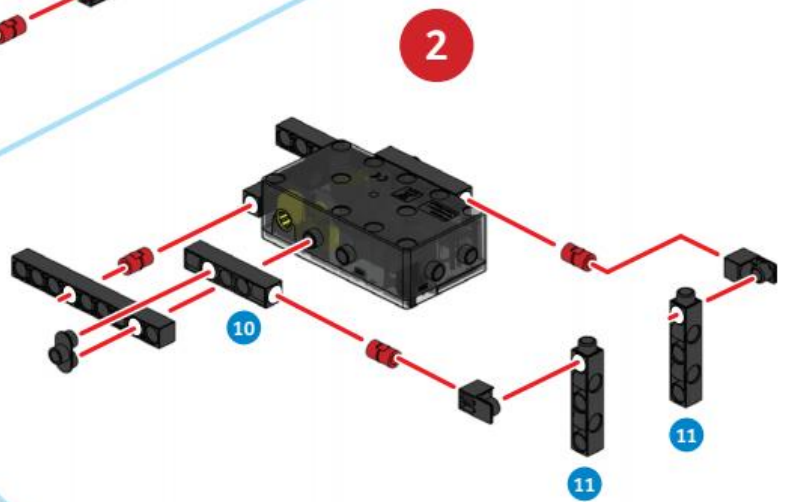
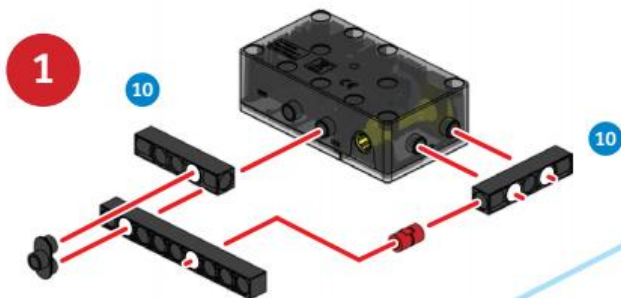
Belt Sander
帶式砂光機



Paper Plane Launcher
紙飛機發射器

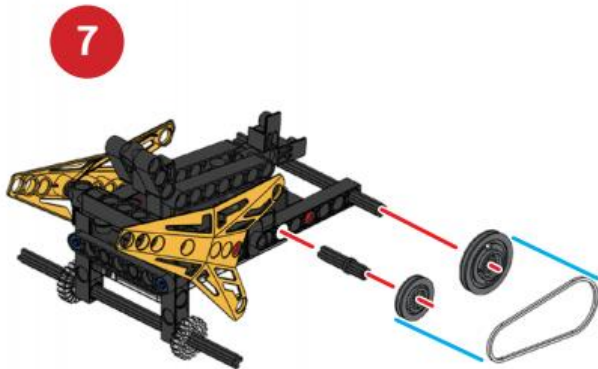
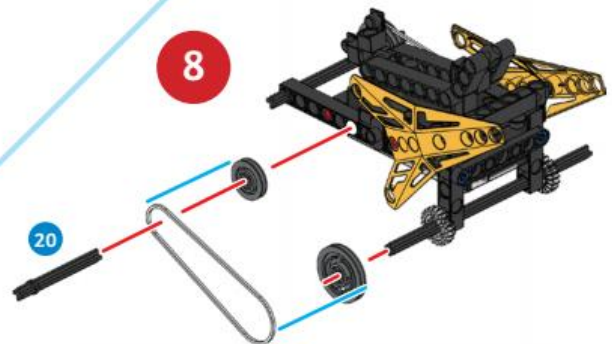
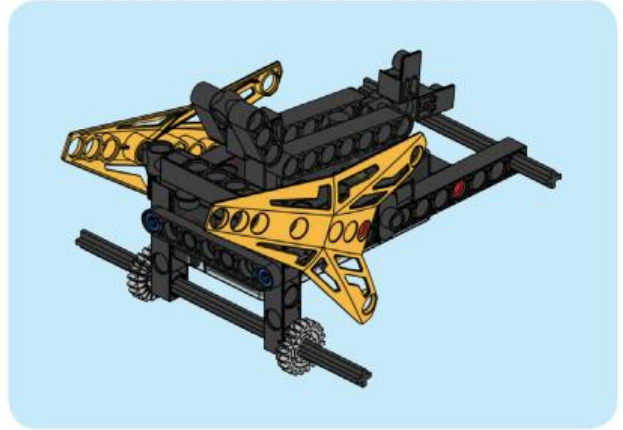
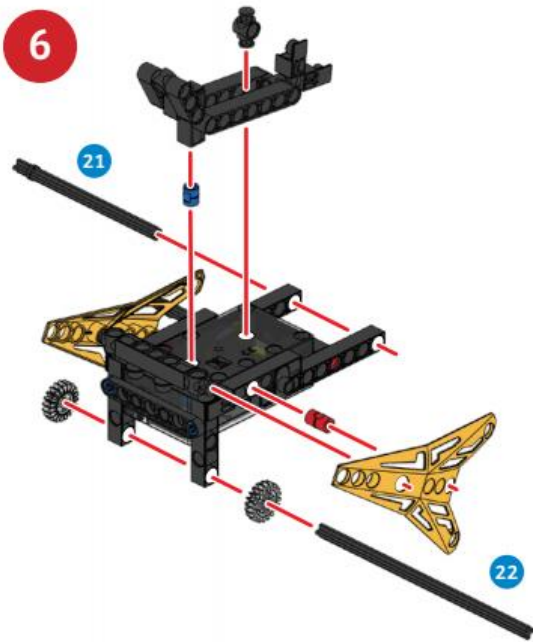


Model 模型 1 ATV 4WD 越野沙灘車

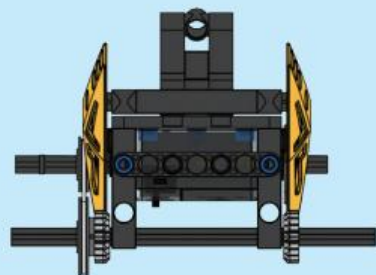




ATV 4WD 越野沙灘車 Model 模型 1



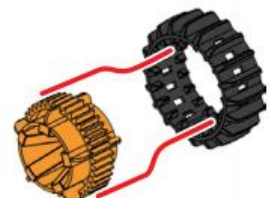
Rear view 後視圖



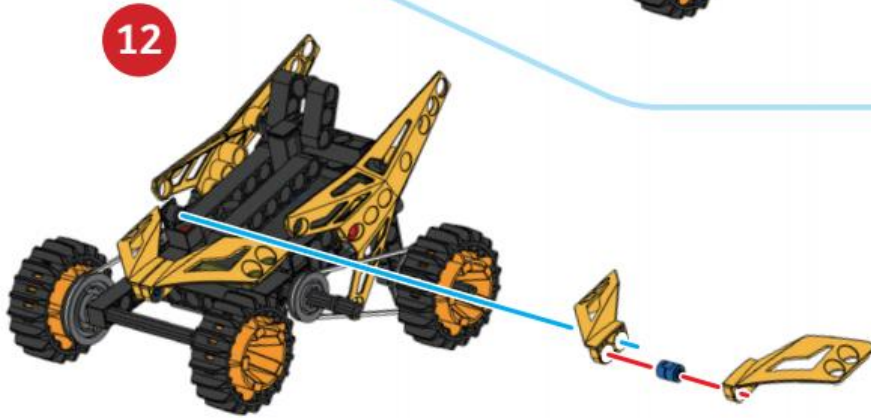
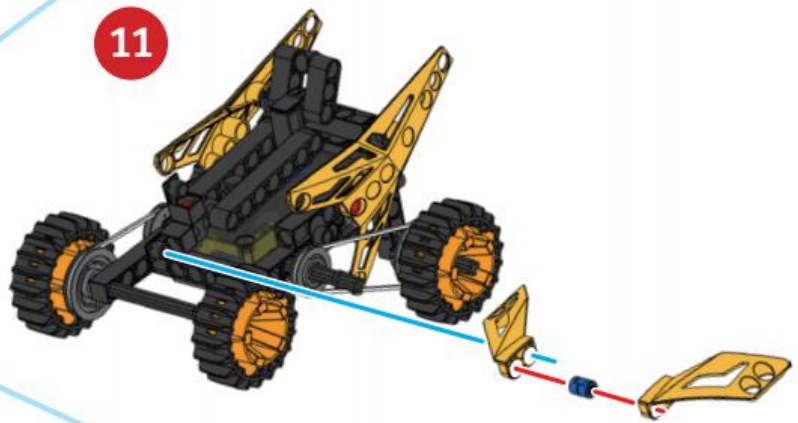
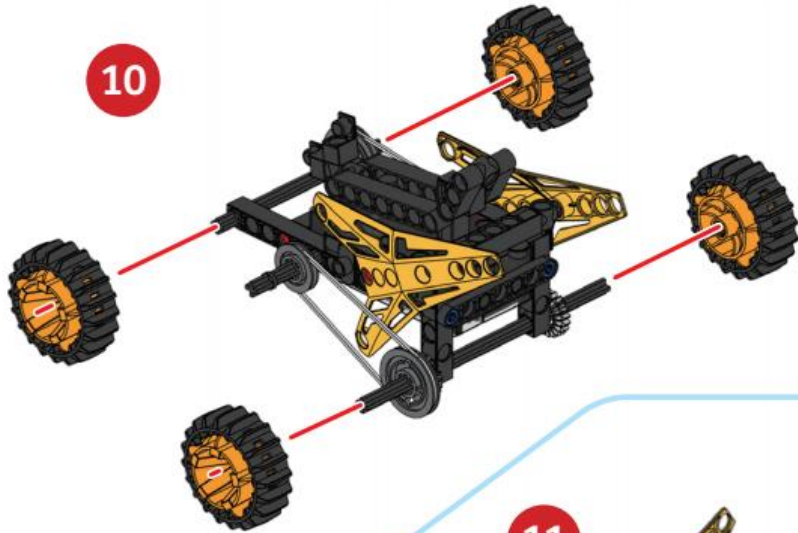
Keep a 1-mm gap between the gears and the rods on each side.
齒輪和兩側的長條之間，請保持 1 公釐的間隙。

9 × 4

A



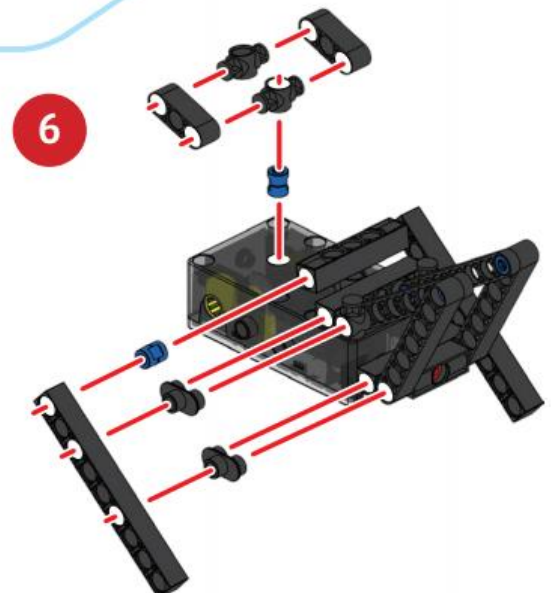
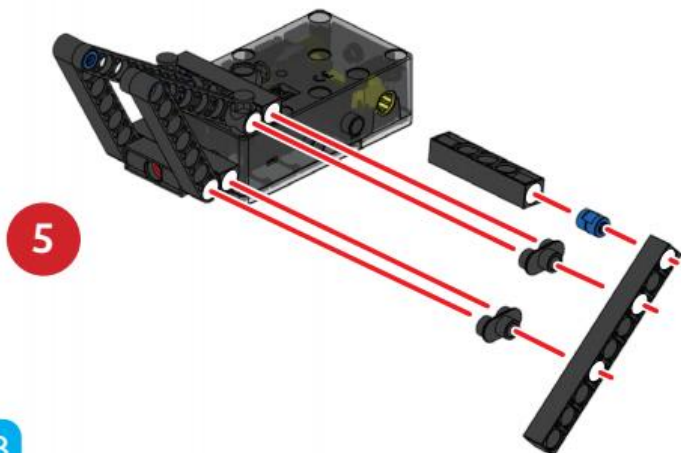
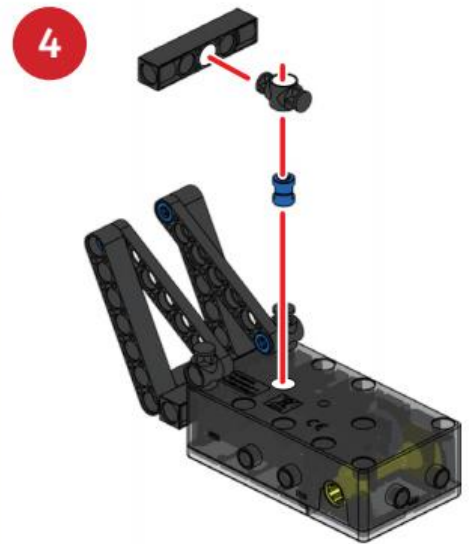
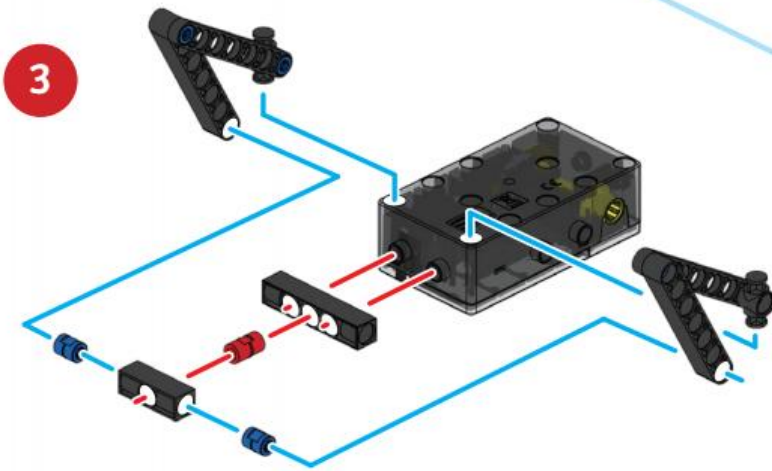
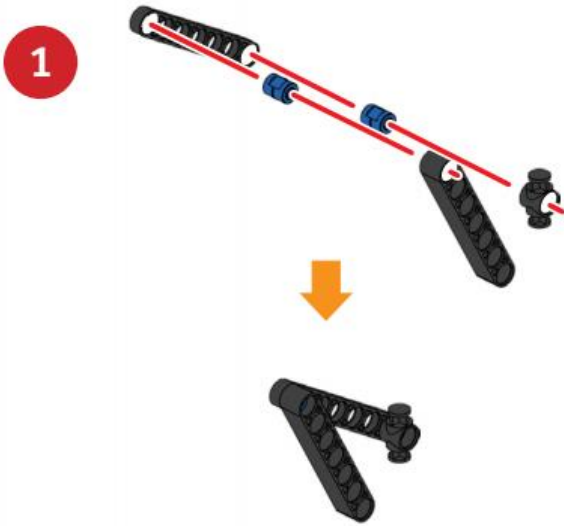
Model 模型 1 ATV 4WD 越野沙灘車



Done!
完成!

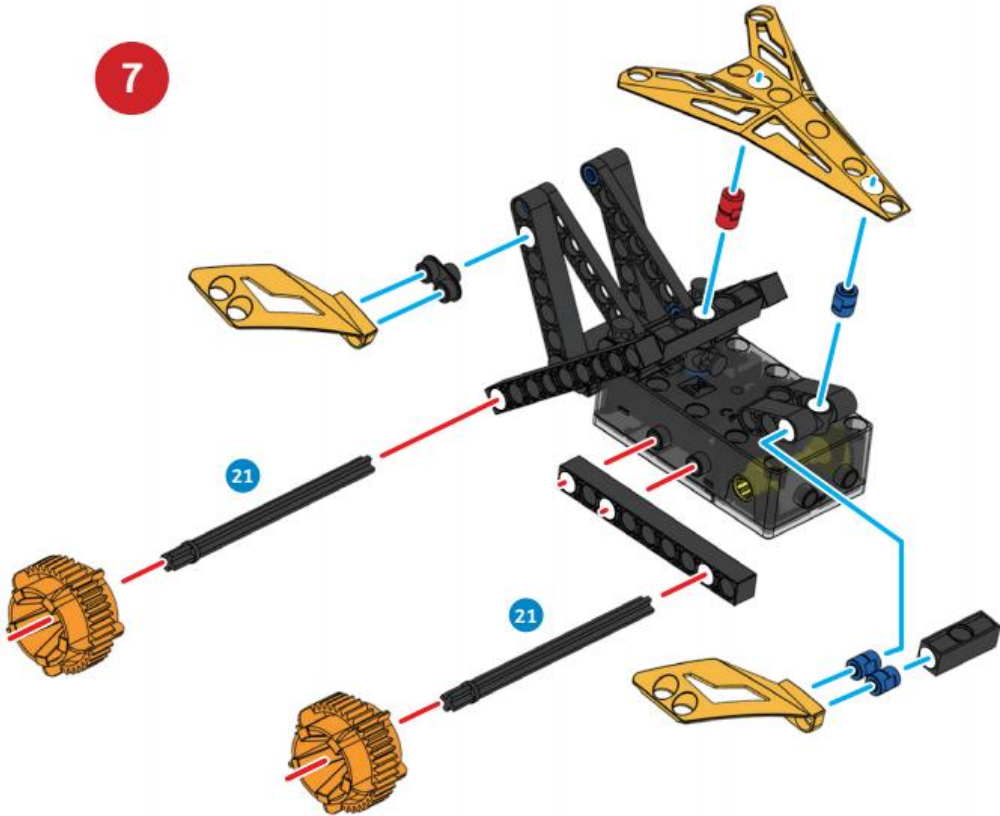


Dune Racer 沙丘賽車 Model 模型 2

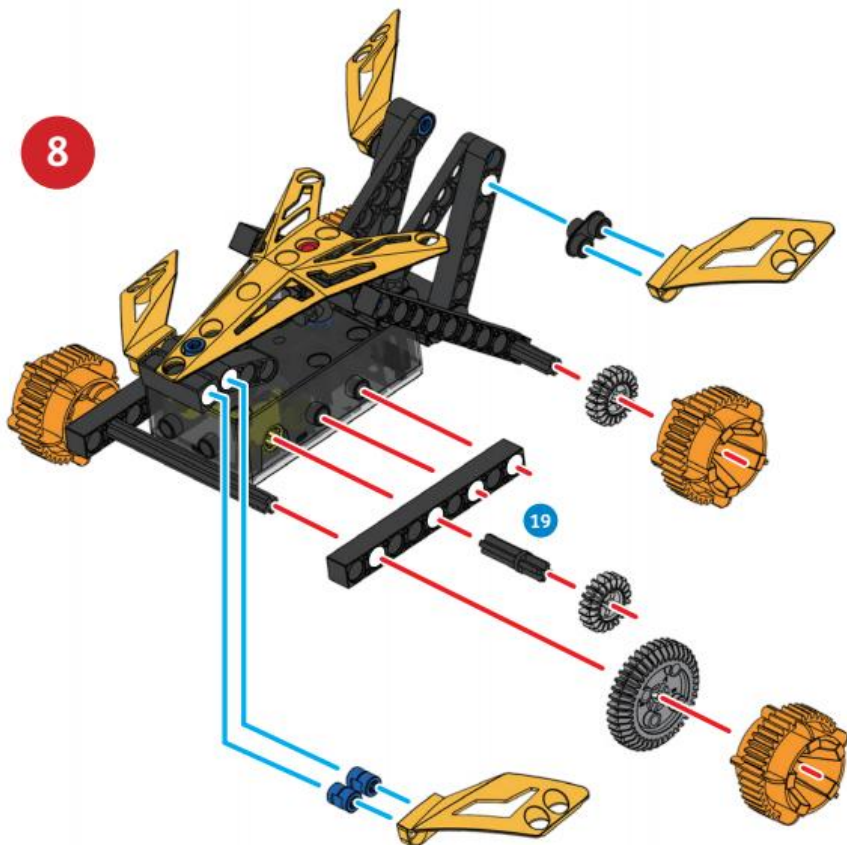


Model 模型 2 Dune Racer 沙丘賽車

7



8





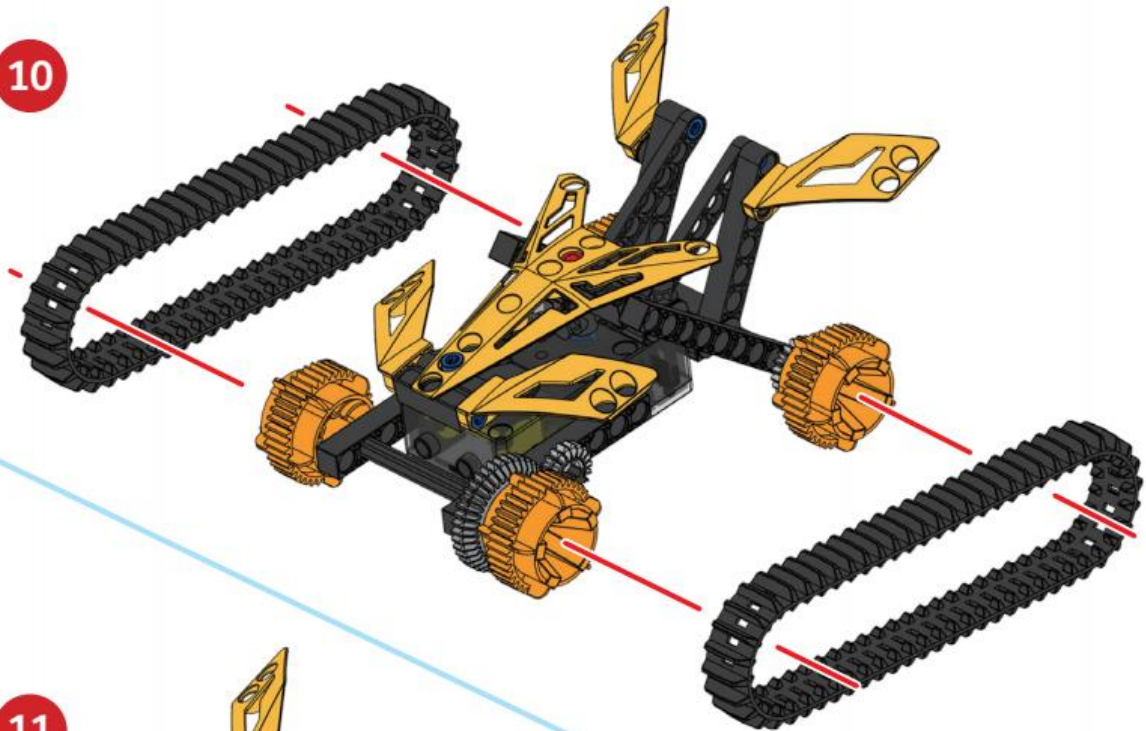
Dune Racer 沙丘賽車 Model 模型 2

A × 2 

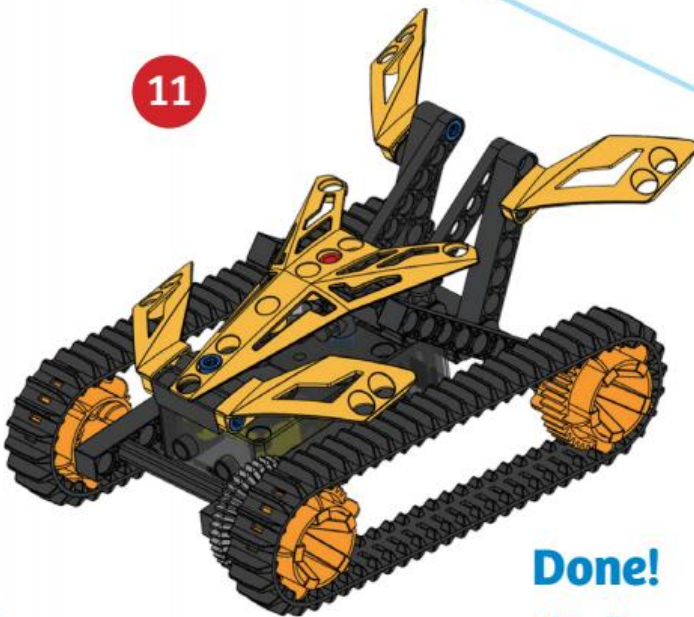
B × 1 



10



11

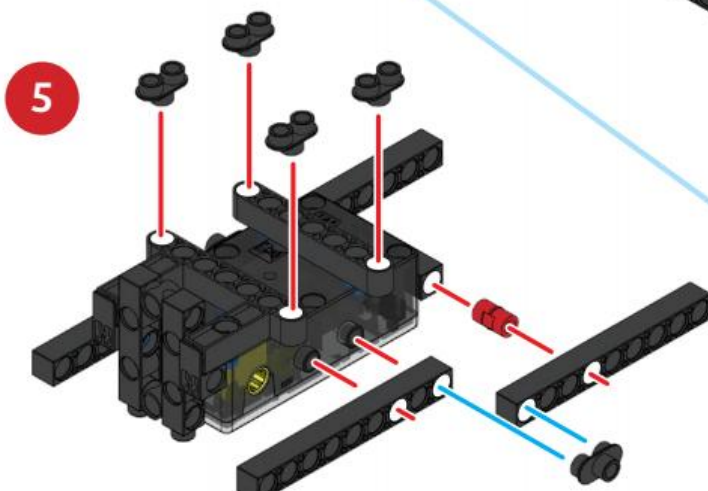
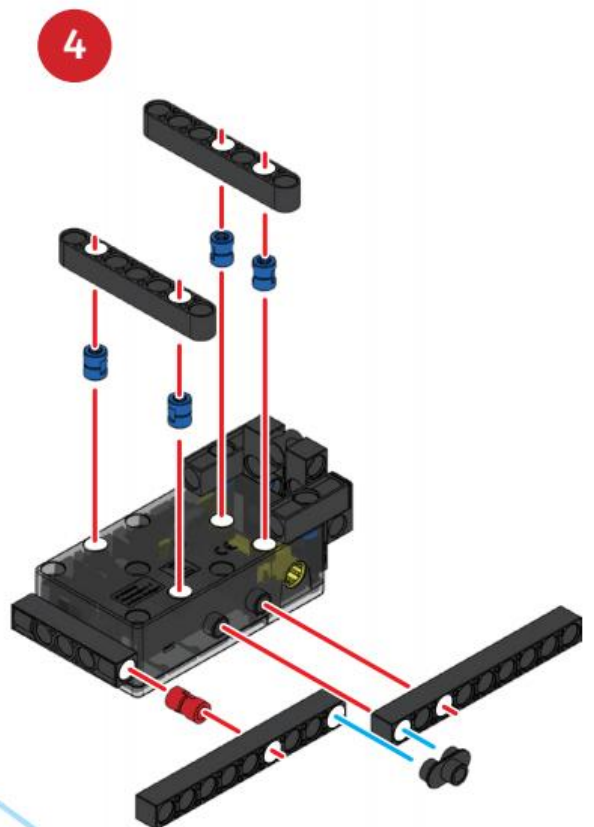
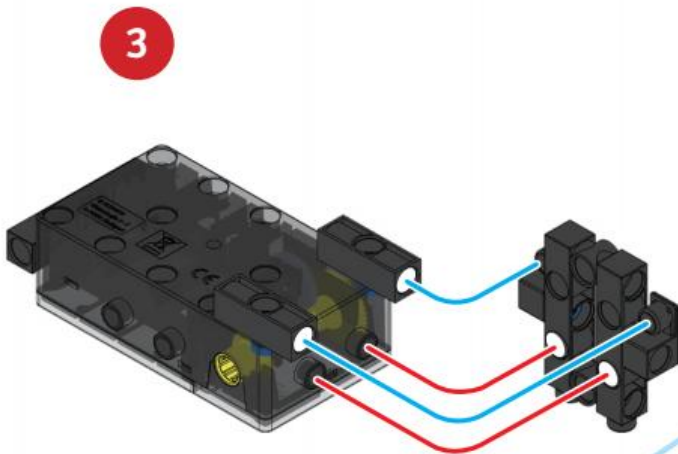
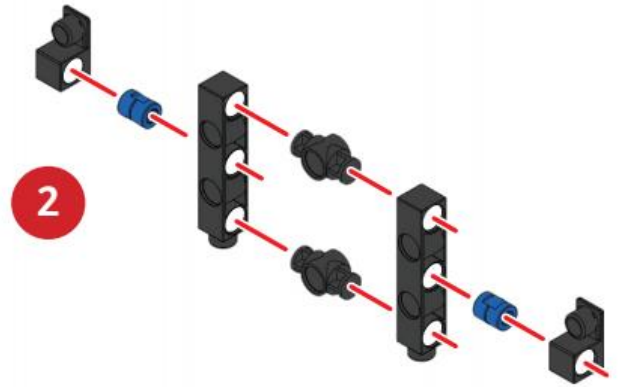
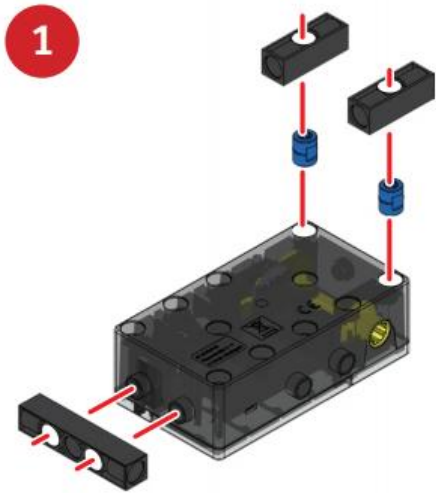


Done!
完成!

Set up a ramp and experiment to see if your dune racer can drive up the ramp. At what angle is the ramp too steep for your dune racer to climb the ramp?

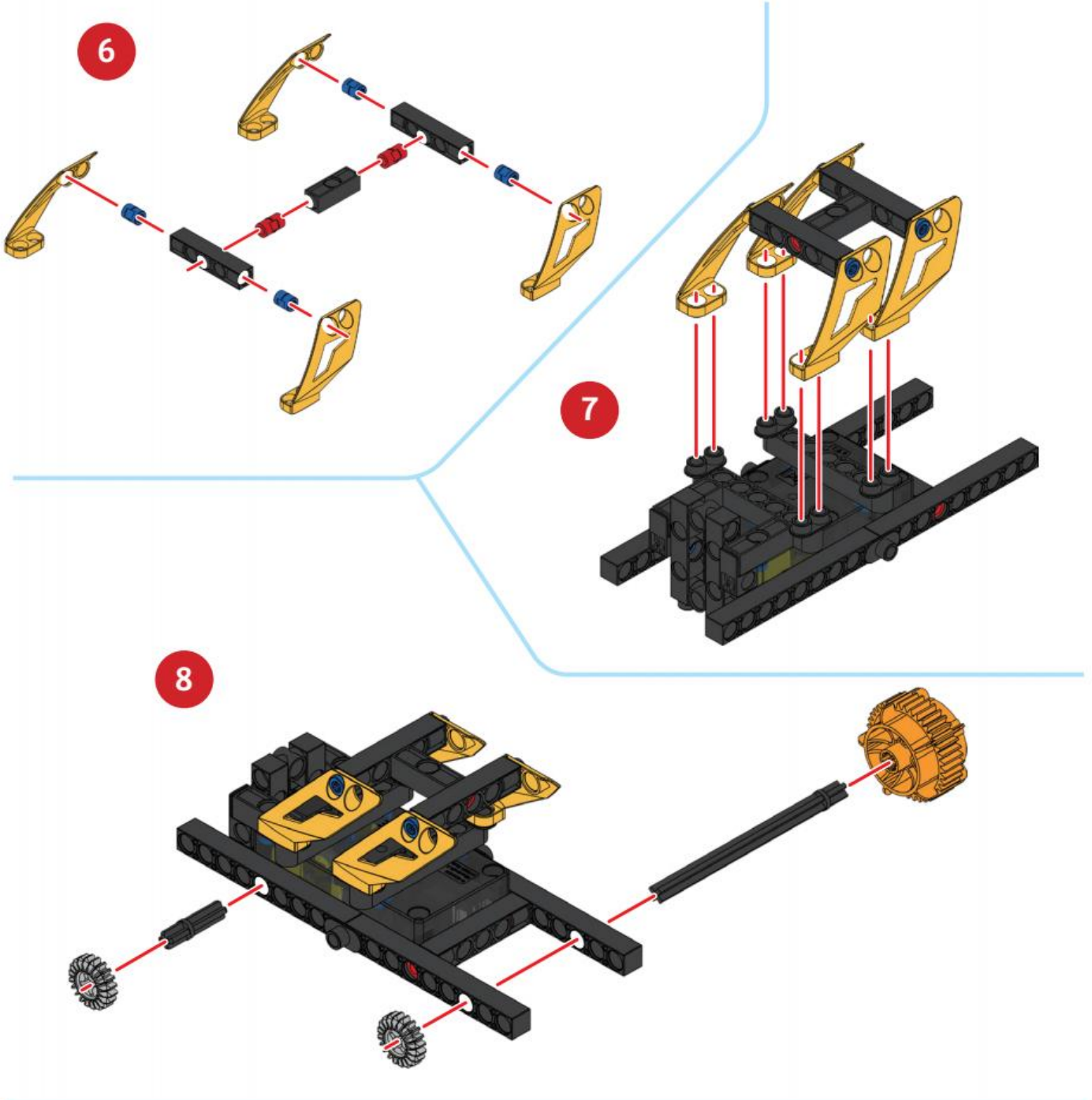
設置一個坡道並進行實驗，看看你的沙丘賽車是否可以順利爬坡。你的沙丘賽車爬坡的最大坡度是多大度？

Model 模型 3 Snowcat Plow 鏟雪車





Snowcat Plow 鏟雪車 Model 模型 3



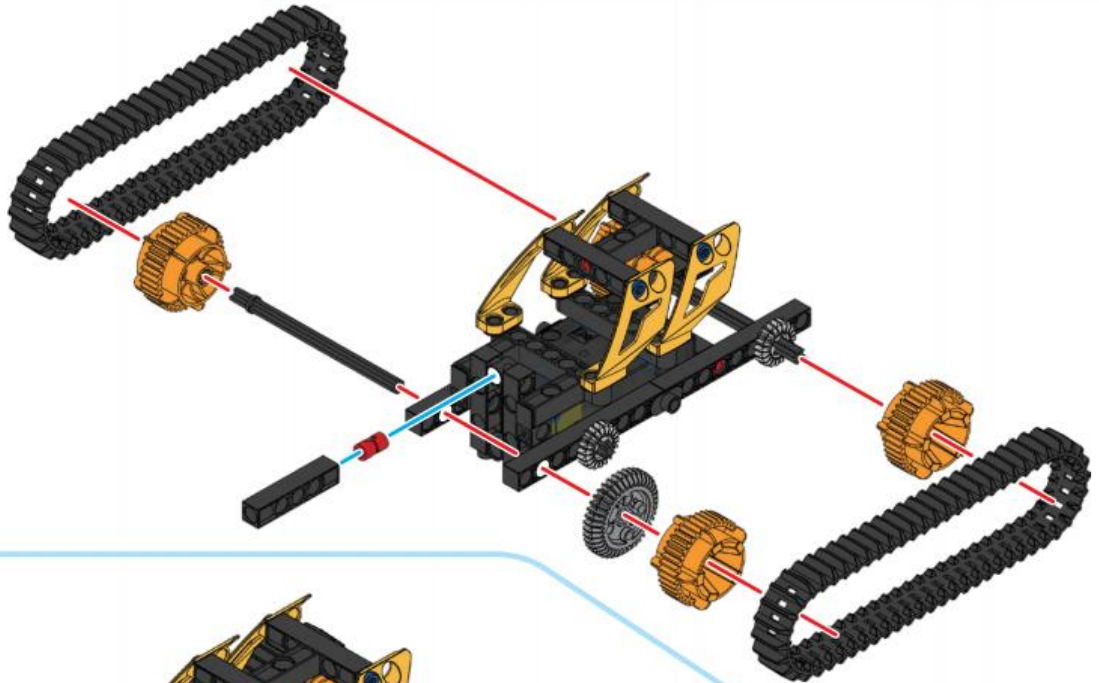
- A × 2
- B × 1

9 × 2

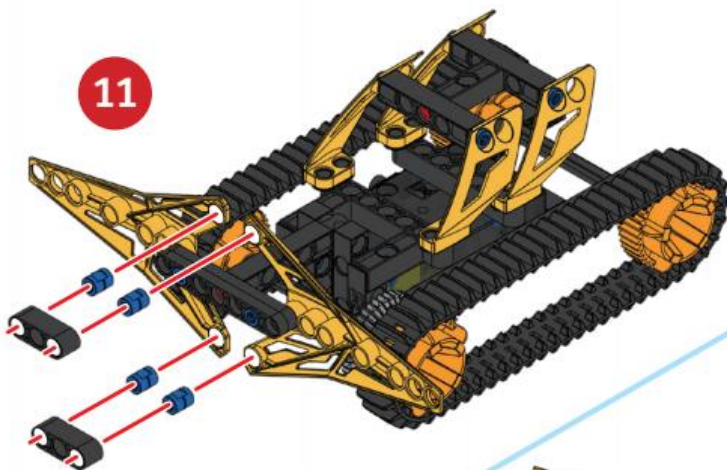


Model 模型 3 Snowcat Plow 鏟雪車

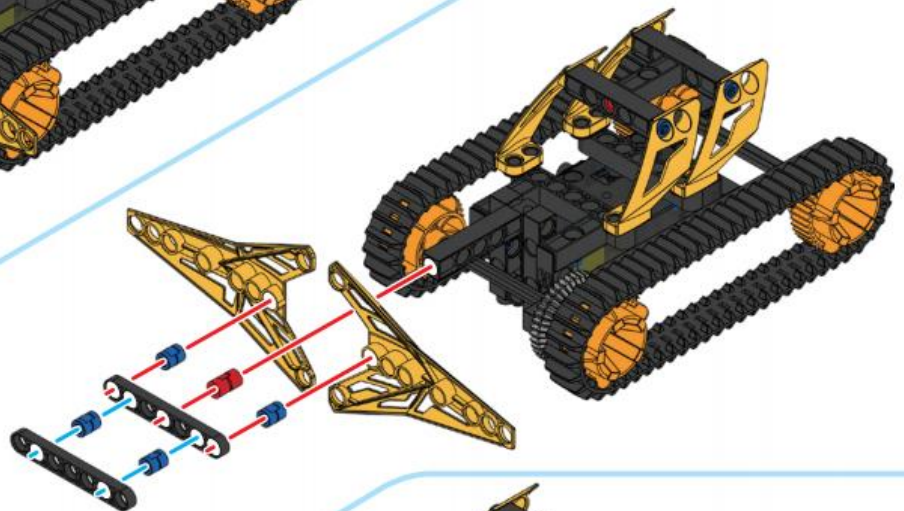
10



11



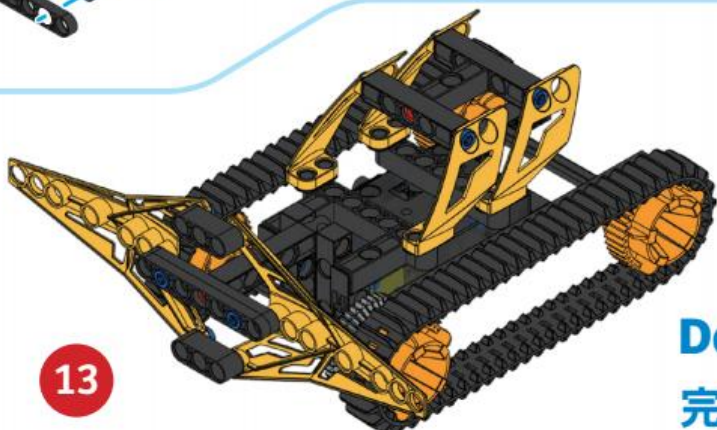
12



Place small objects in front of your snowcat plow!

在鏟雪車前放置一些小東西！

13



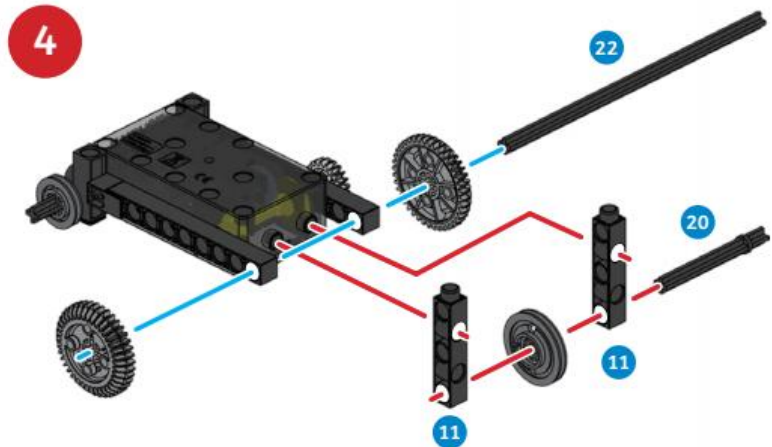
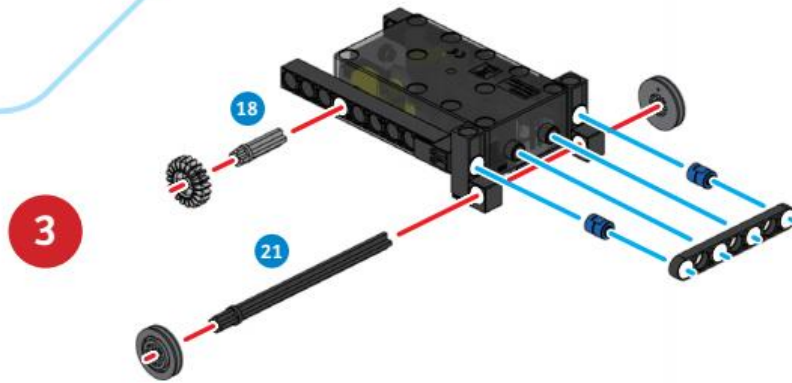
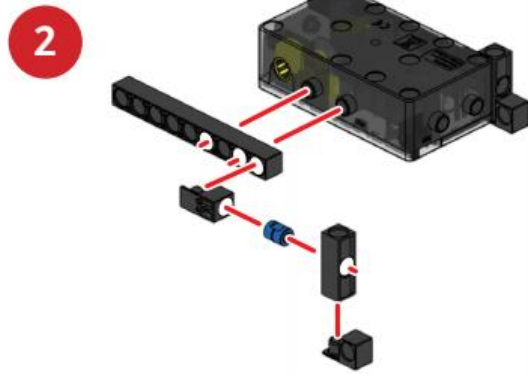
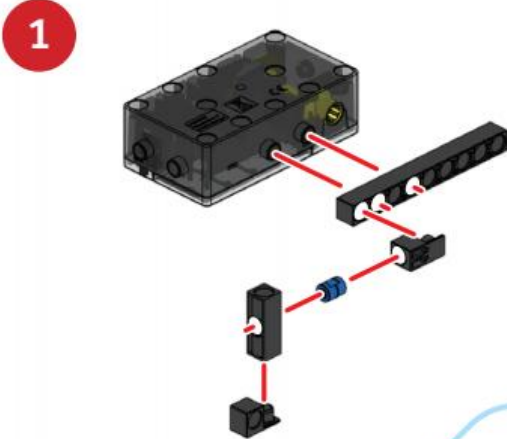
Done!

完成！

18

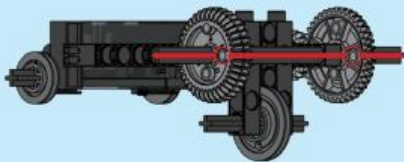


Stair Walker 爬階車 Model 模型 4



Perform the steps with the red lines first!

參考紅線完成組裝步驟！



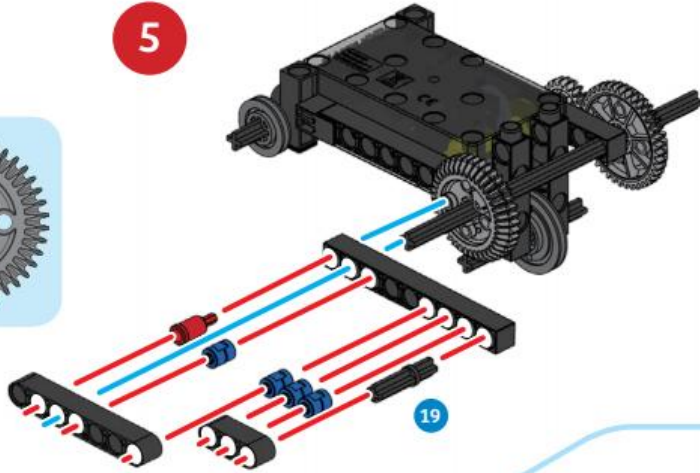
Align the holes marked B on the same level.

將標記為 B 的所有孔洞對齊在同一水平面上。



Model 模型 4 Stair Walker 爬階車

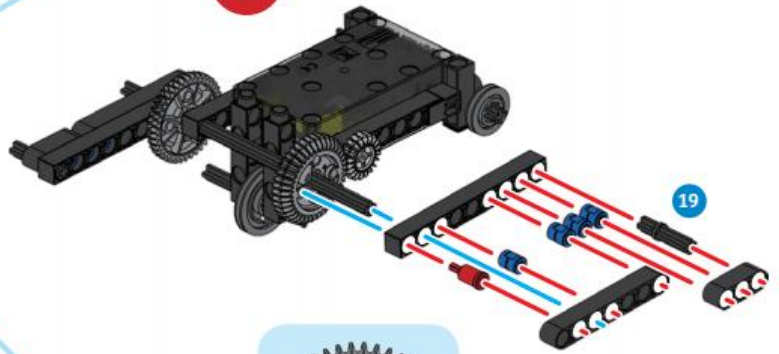
5



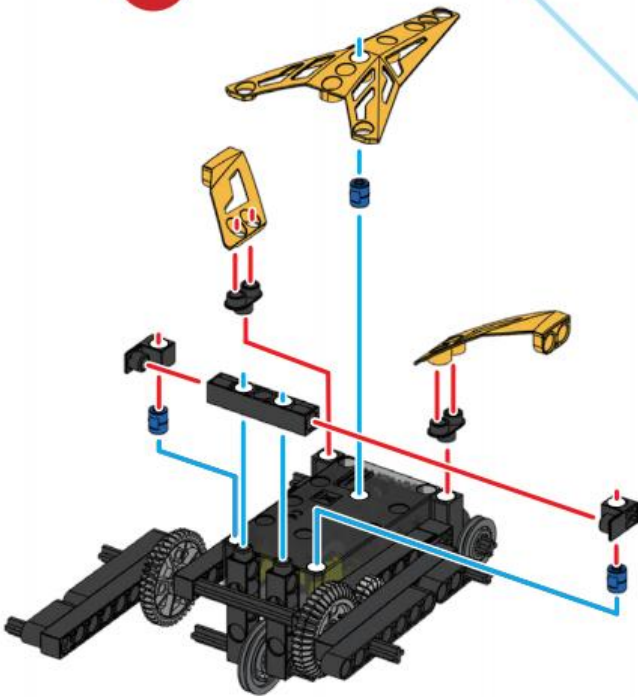
Perform the steps with the red lines first!

參考紅線完成組裝步驟！

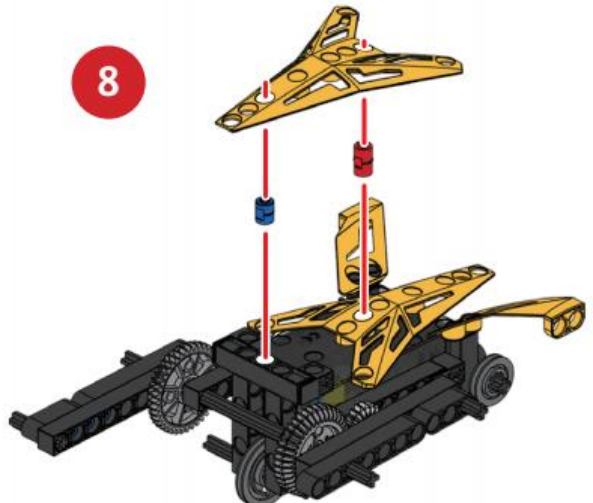
6



7



8





Stair Walker 爬階車 Model 模型 4

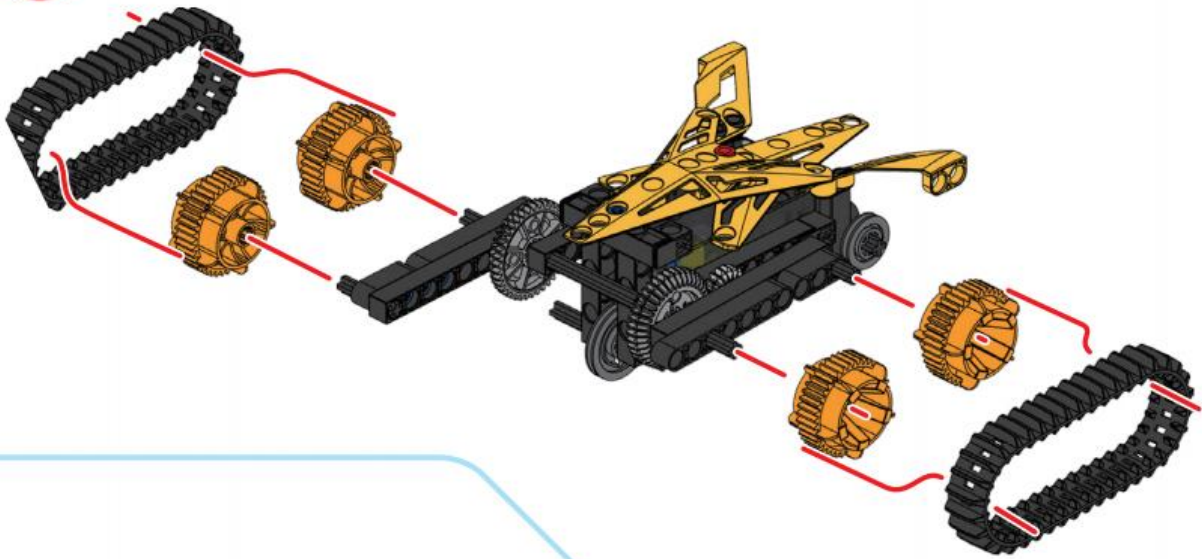
A × 1 

B × 1 

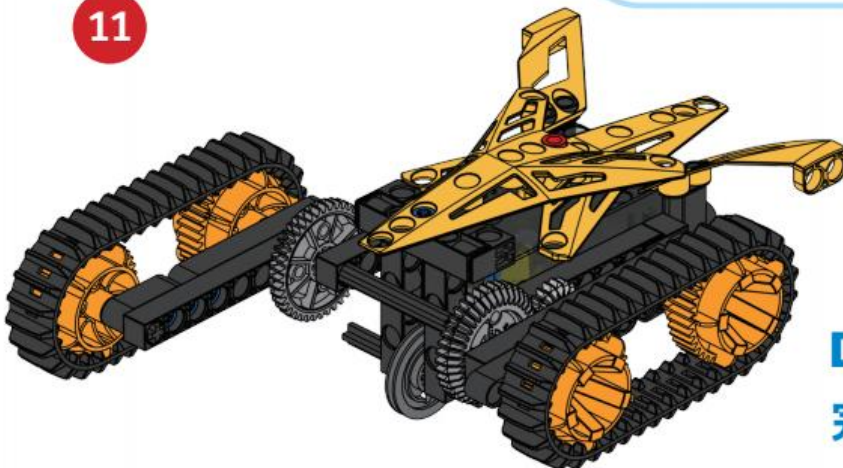
9 × 2



10

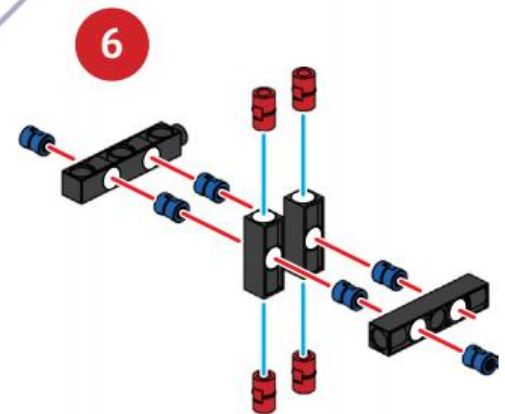
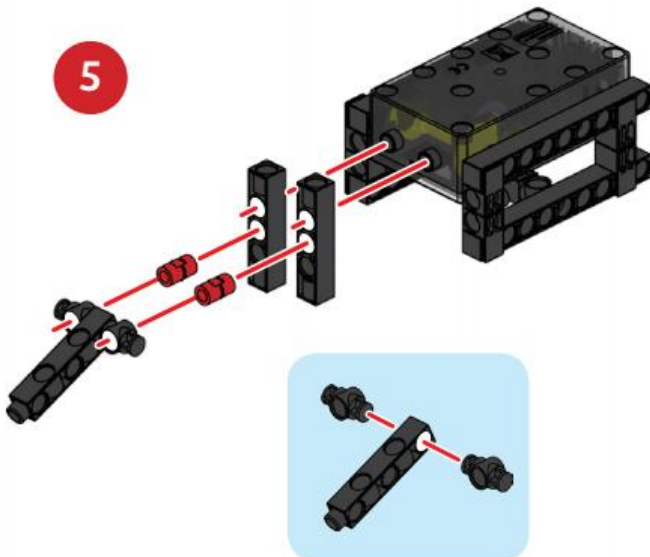
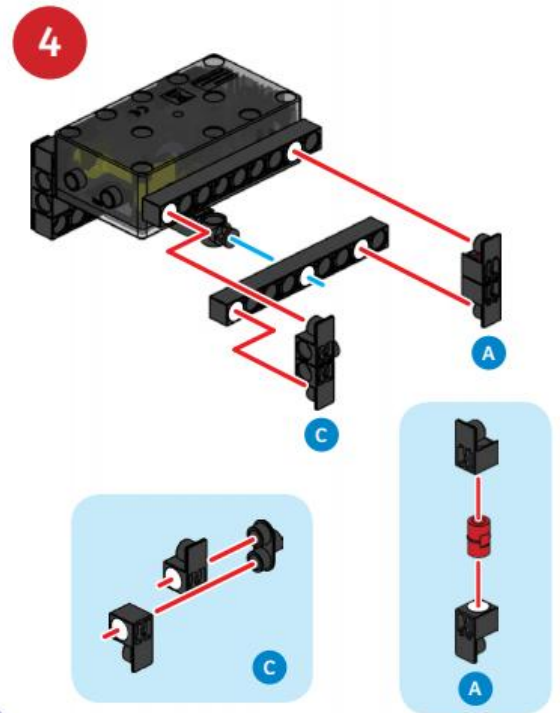
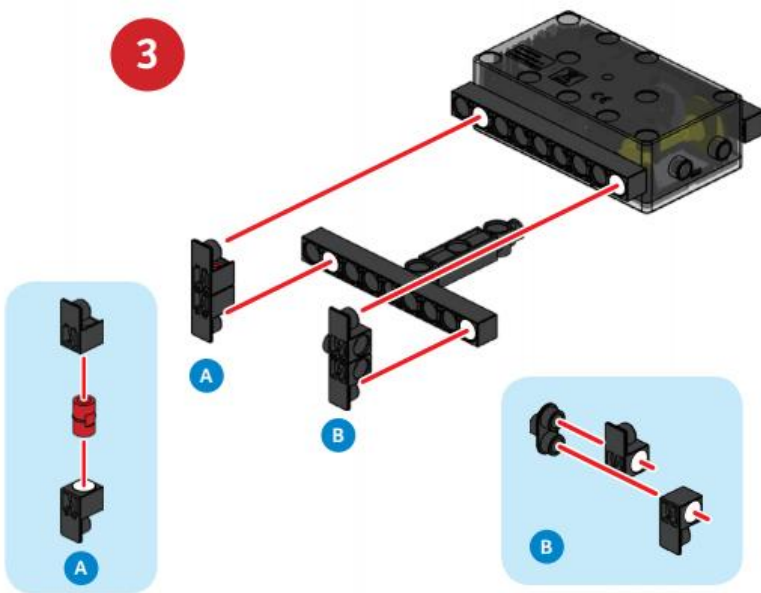
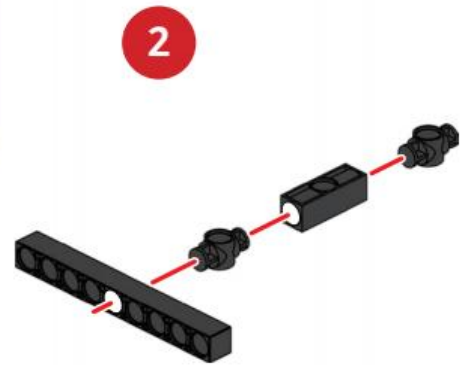
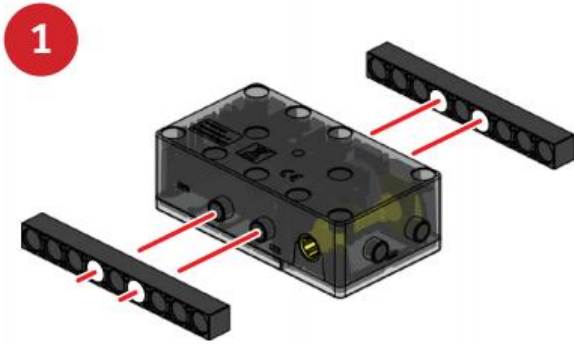


11



Done!
完成!

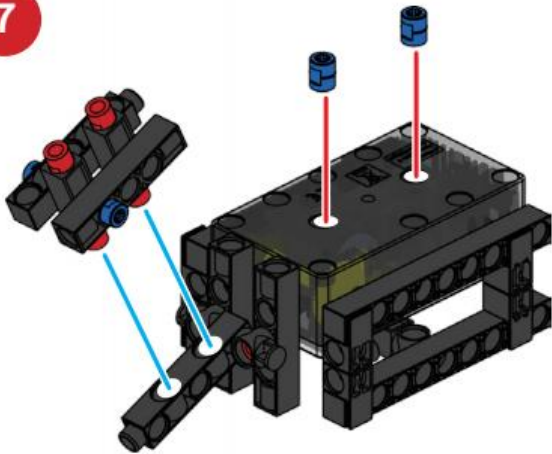
Model 模型 5 Snow Scooter 滑雪車



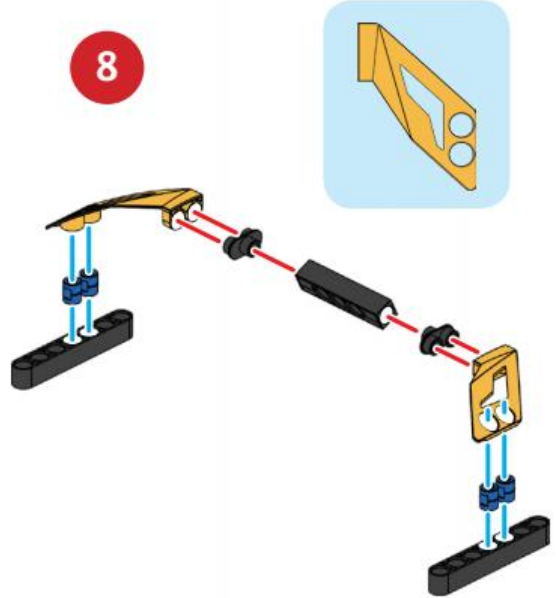


Snow Scooter 滑雪車 Model 模型 5

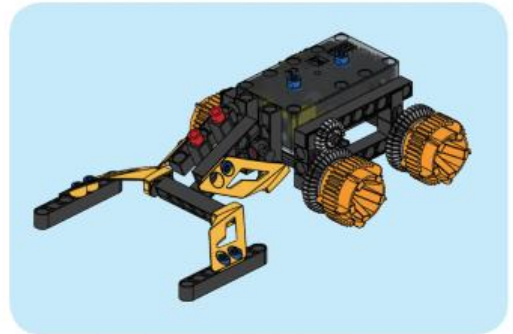
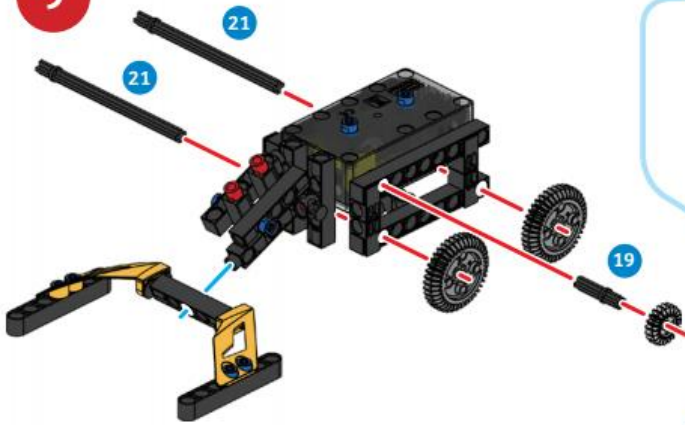
7



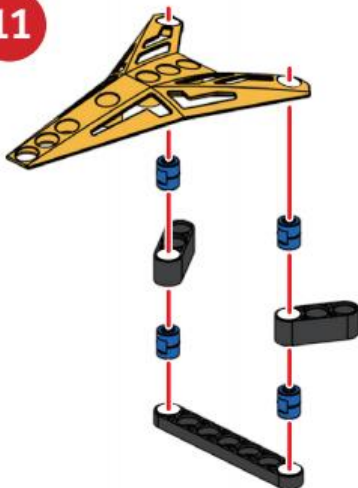
8



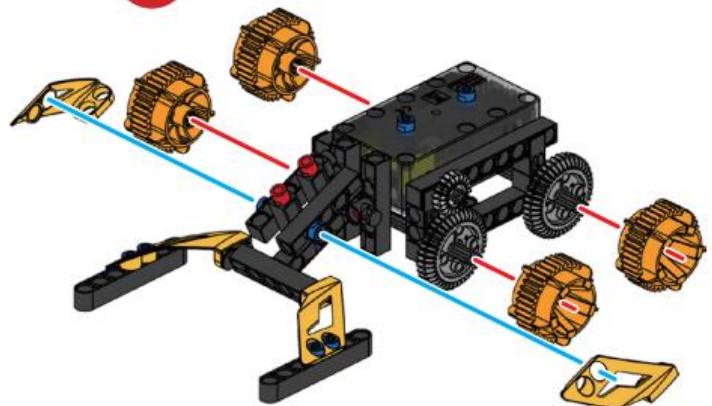
9



11

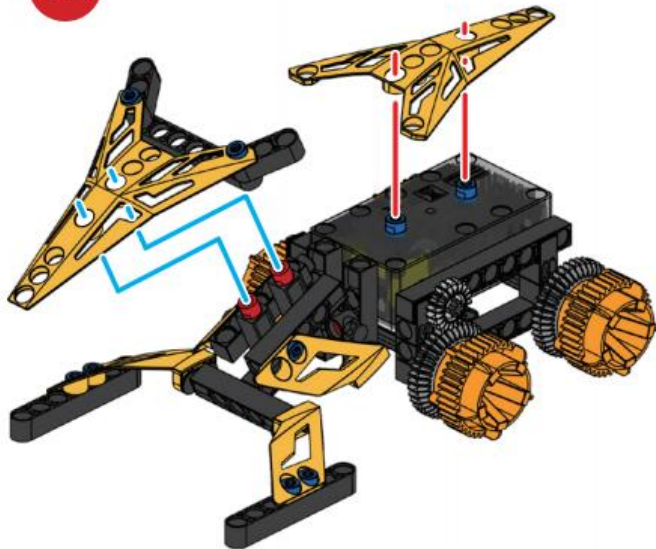


10



Model 模型 5 Snow Scooter 滑雪車

12



A × 1

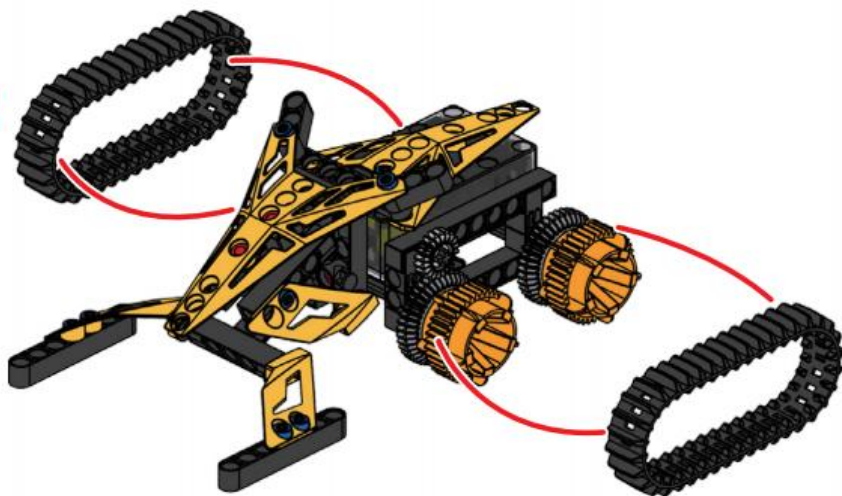
B × 1



13 × 2



14



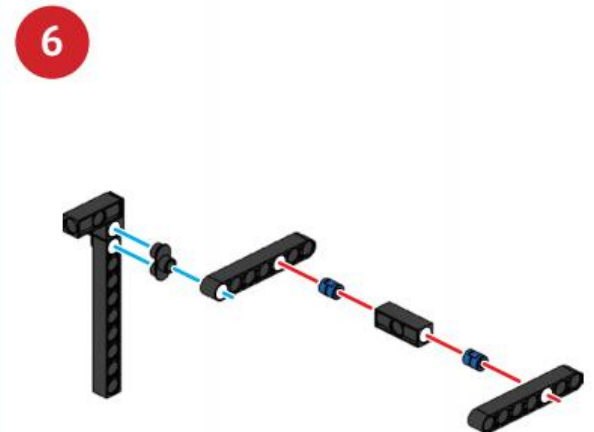
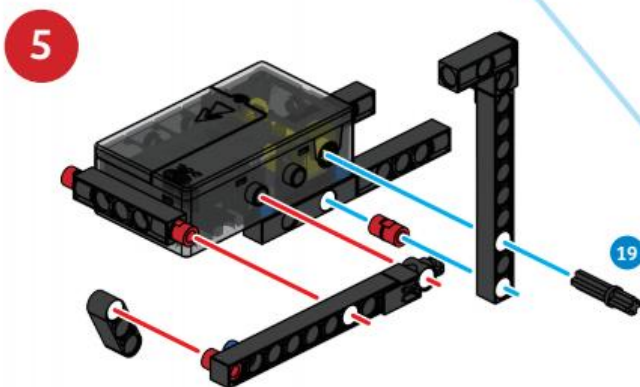
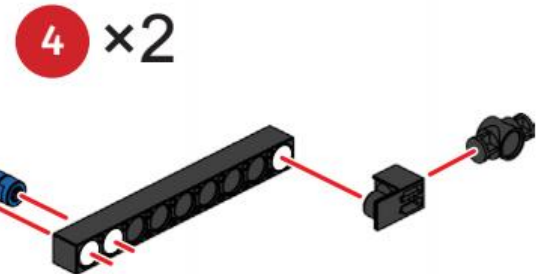
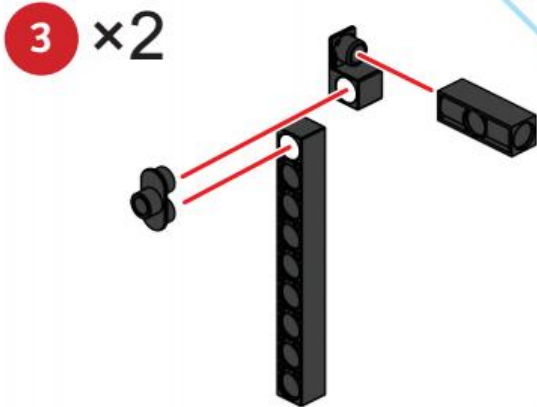
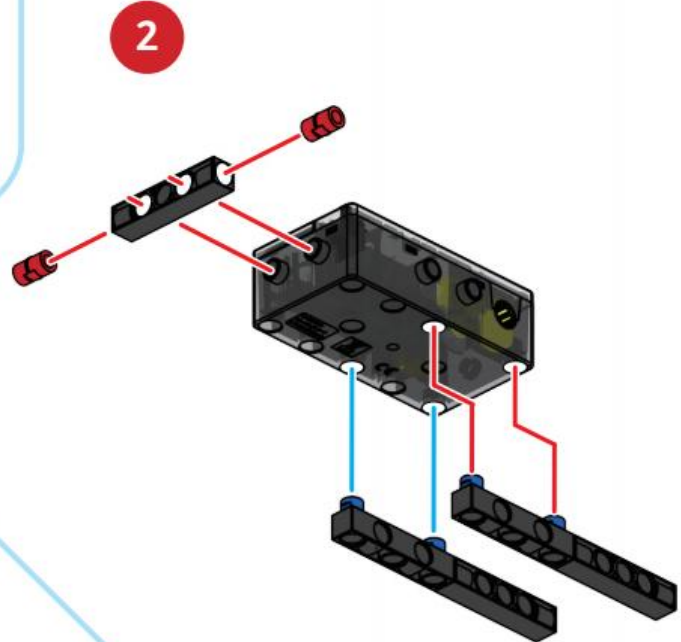
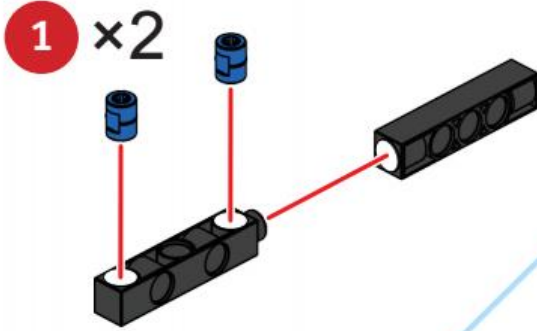
15



Done!
完成!



Future Truck 未來卡車 Model 模型 6



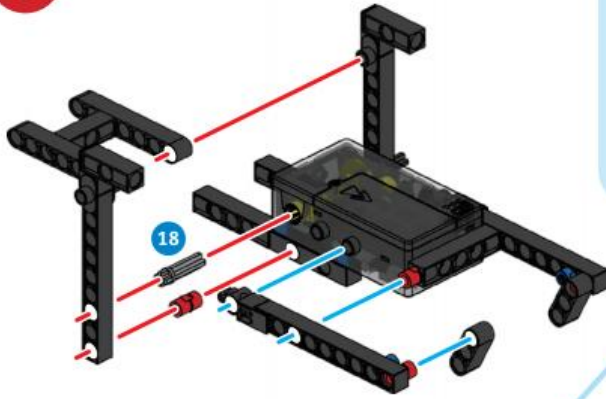
Lean the 3-hole wide rounded rod on the short anchor pin.

傾斜短結合鍵靠在 3 孔圓角長條上。



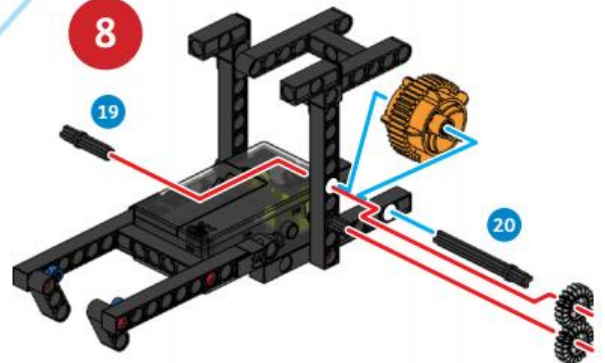
Model 模型 6 Future Truck 未來卡車

7

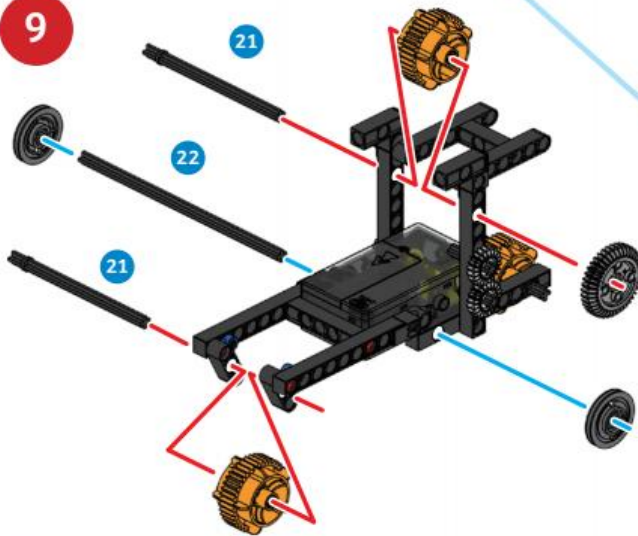


Lean the 3-hole wide rounded rod on the short anchor pin.
傾斜短結合鍵靠在 3 孔圓角長條上。

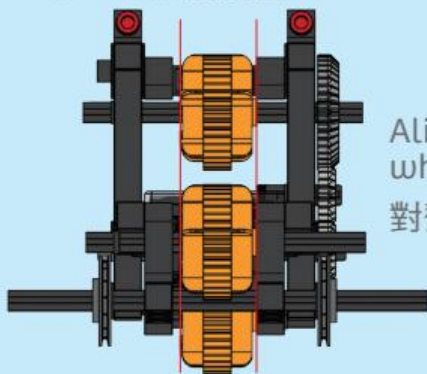
8



9



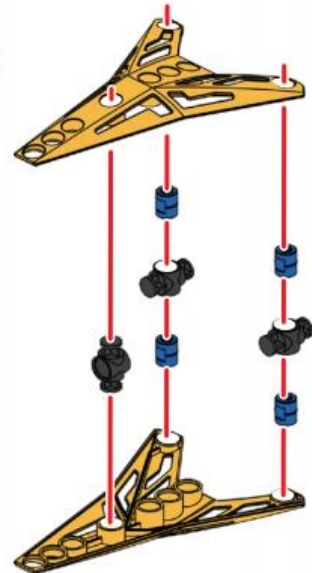
Rear view 後視圖



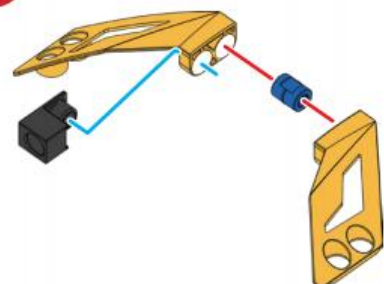
Align the three wheels.
對齊三個輪子。

Pay attention to the gaps, so that the wheels can turn freely.
注意需保留空隙，以便輪子可以自由轉動。

10

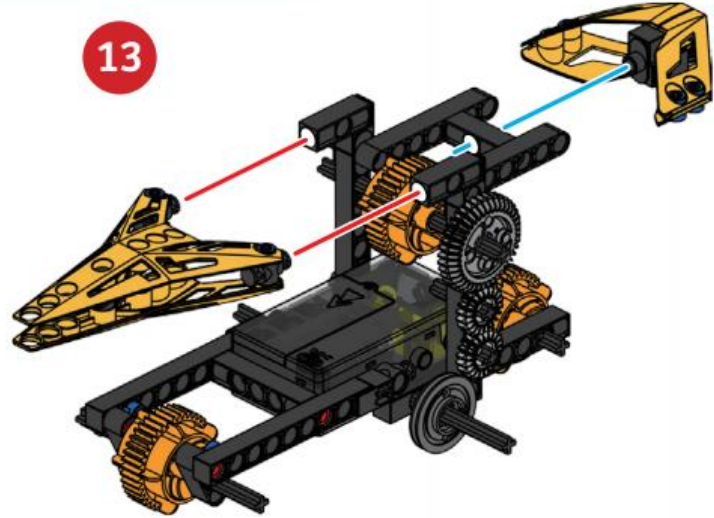
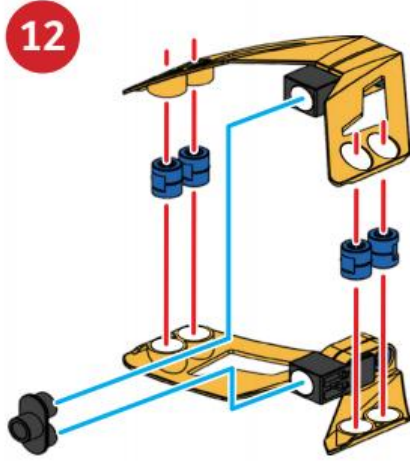


11 x 2

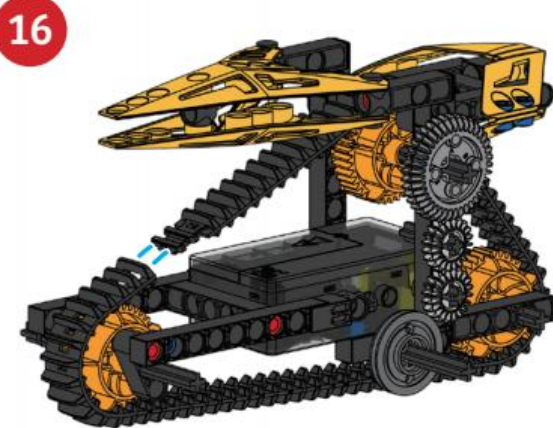
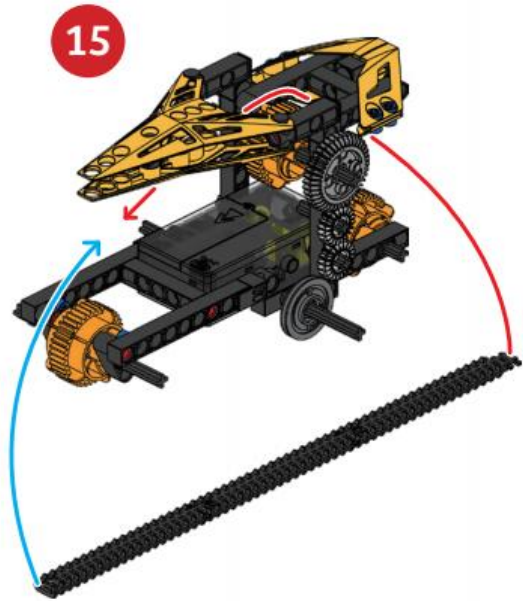




Future Truck 未來卡車 Model 模型 6



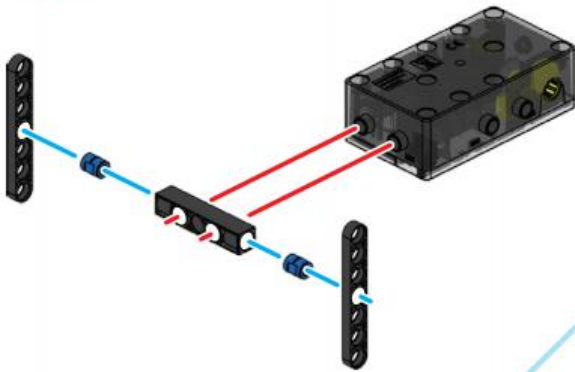
A ×4



Done!
完成!

Model 模型 7 Conveyor Belt 輸送帶

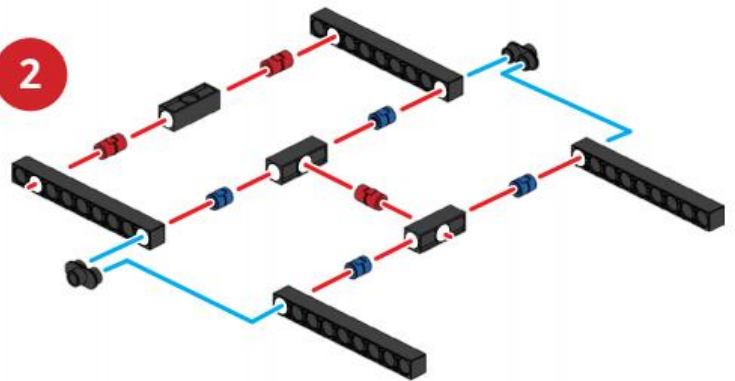
1



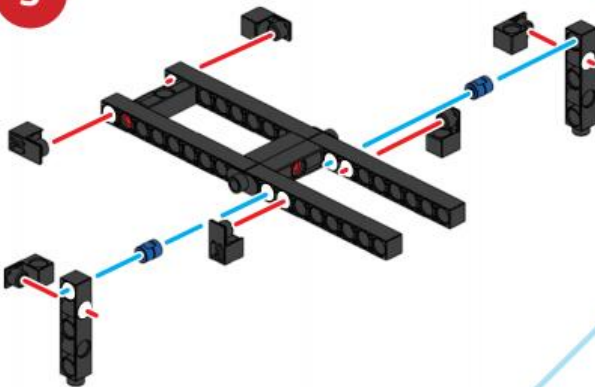
Perform the steps with the red lines first!

參考紅線完成組裝步驟！

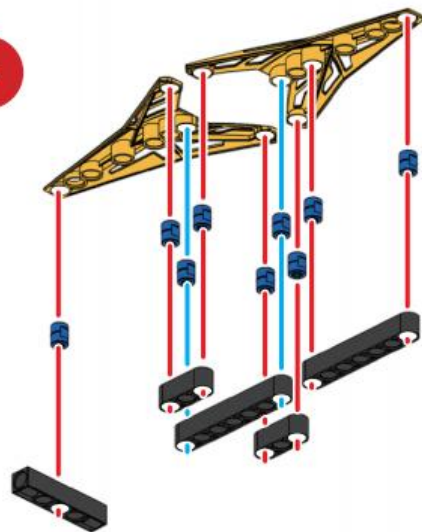
2



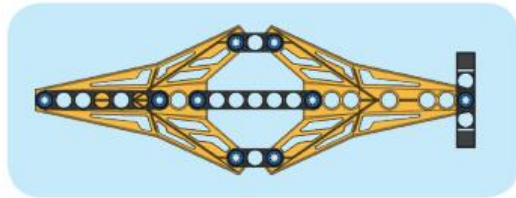
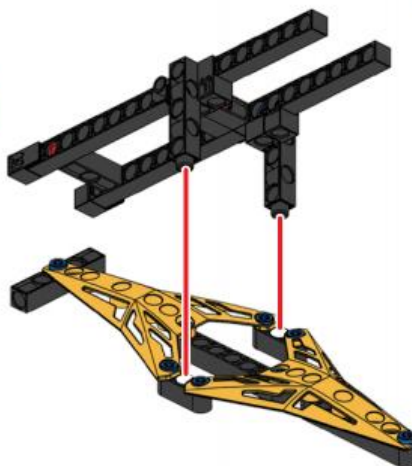
3



4

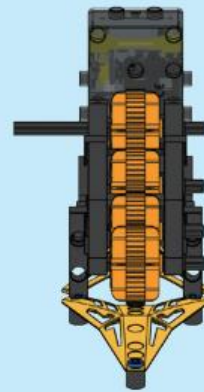
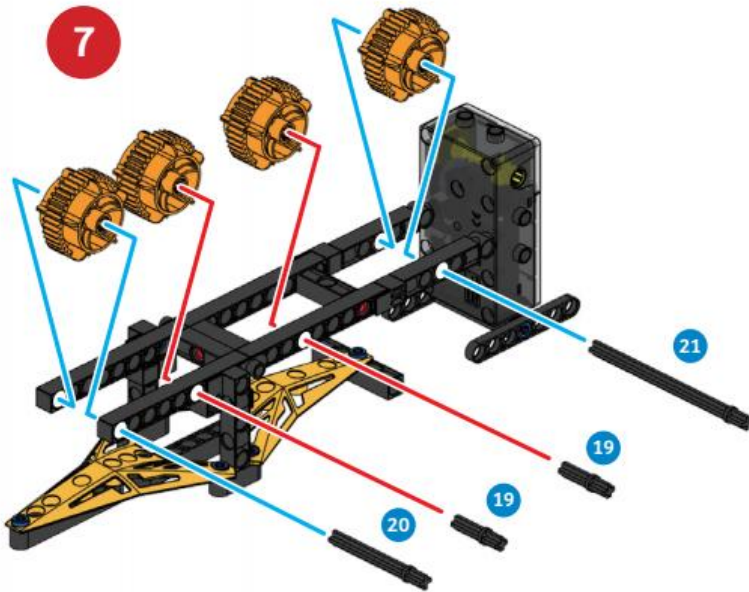
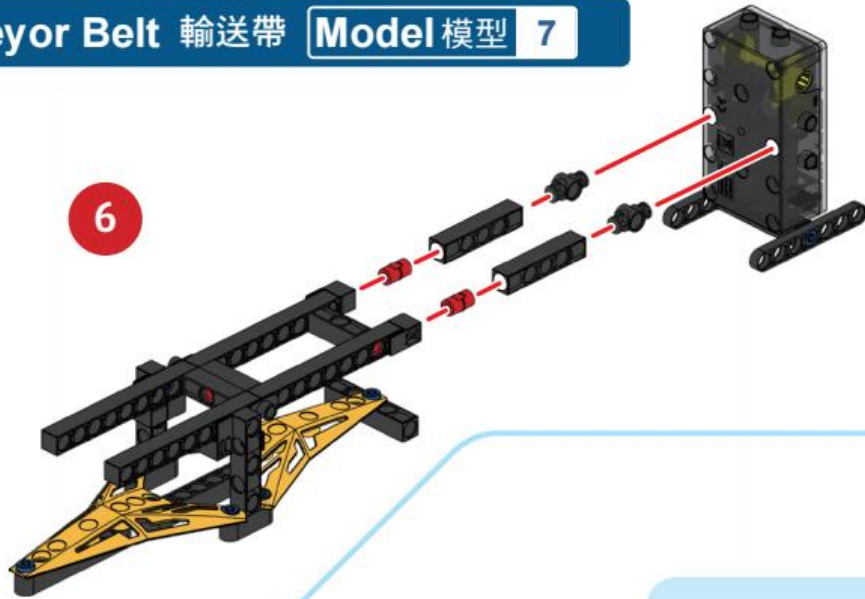


5





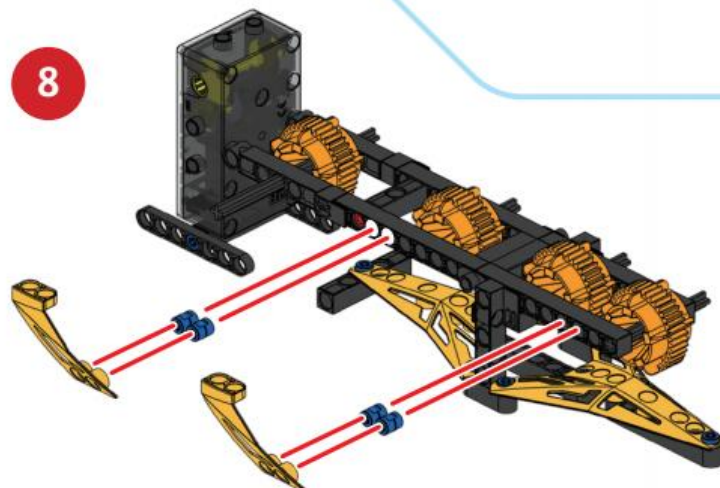
Conveyor Belt 輸送帶 Model 模型 7



Align all four wheels!
對齊所有四個輪子！

Pay attention to the gaps, so that the wheels can turn freely.

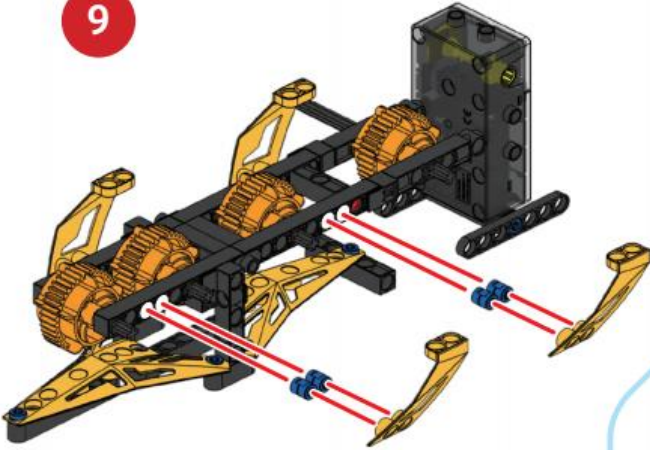
注意需保留空隙，以便輪子可以自由轉動。





Model 模型 7 Conveyor Belt 输送带

9

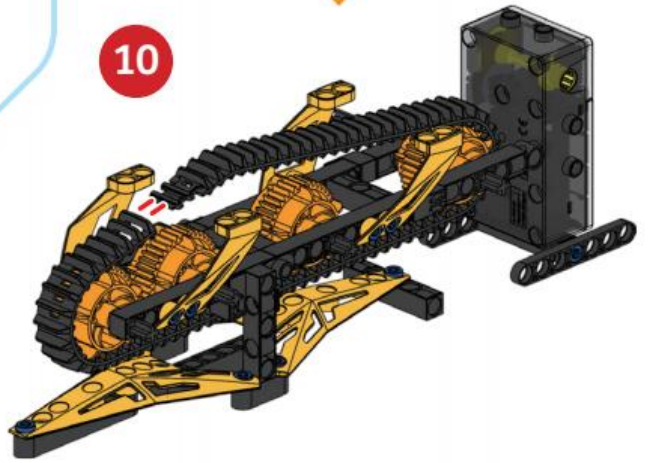


A × 2

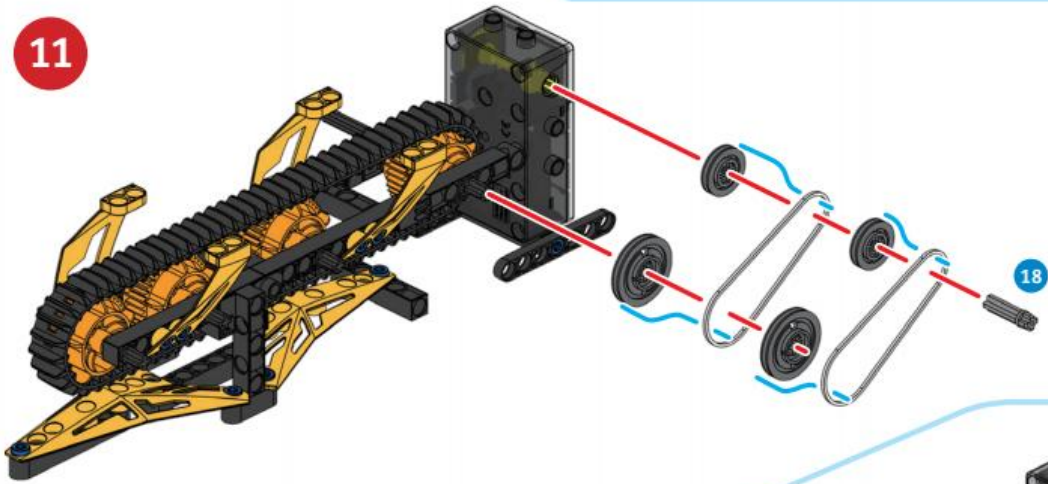
B × 2



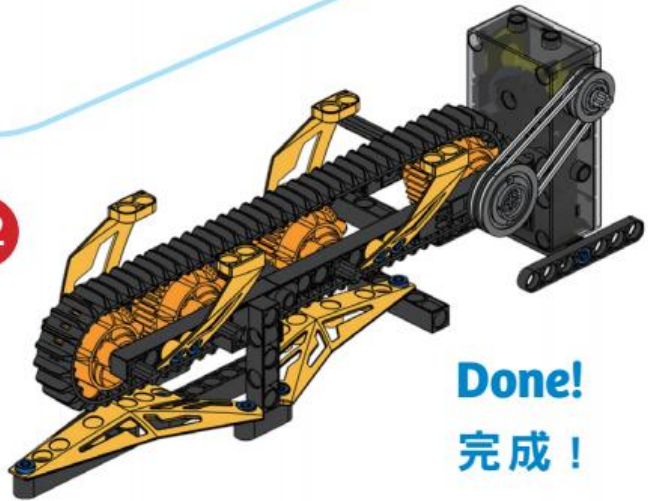
10



11



12

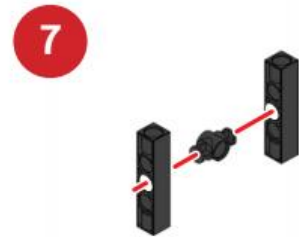
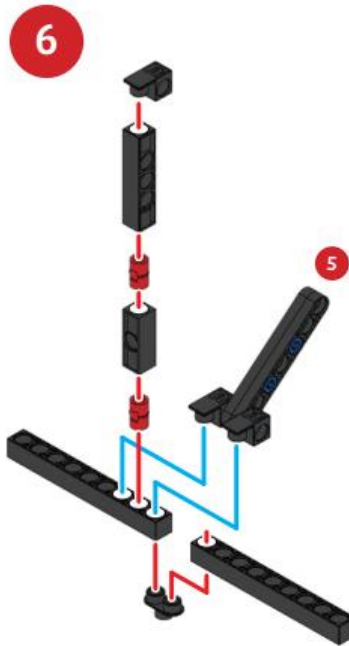
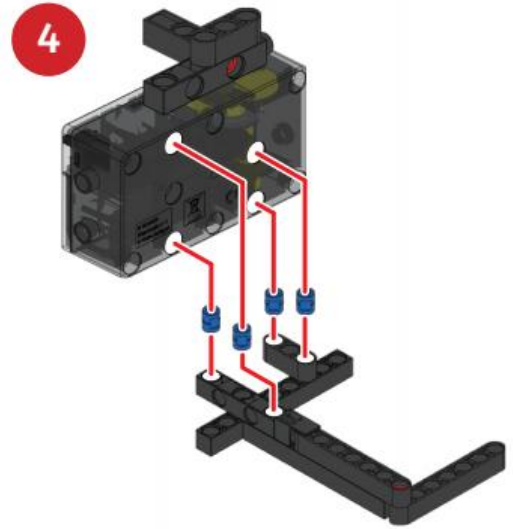
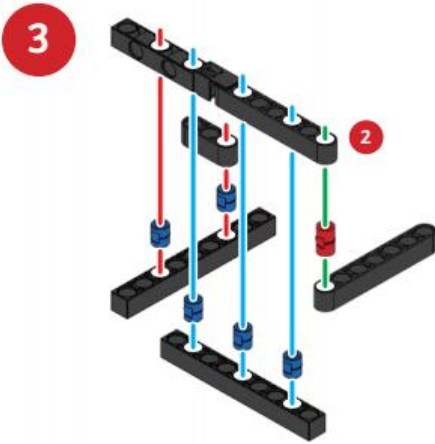
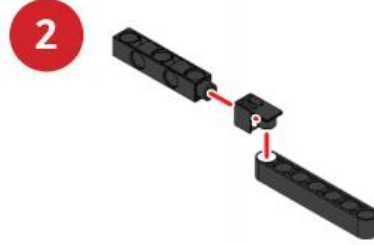
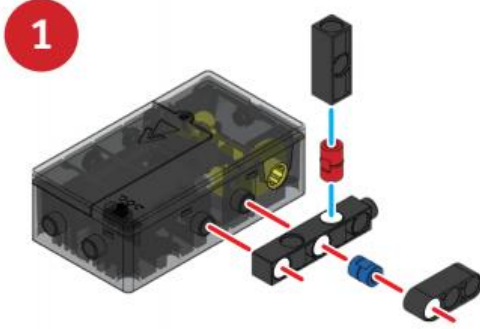


Put a few small objects on your assembly line!
 在你的输送带的皮带上放几个小物件！

Done!
完成！

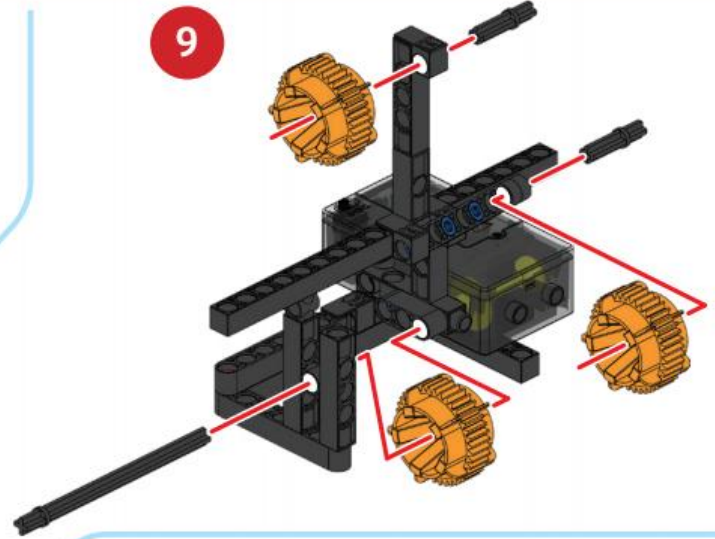
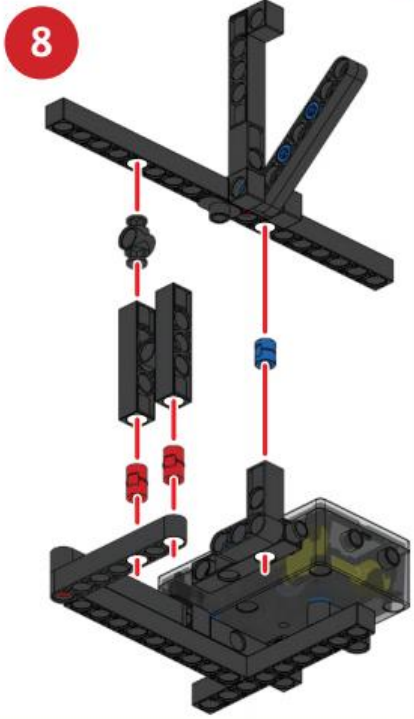


Bandsaw Machine 帶鋸機 Model 模型 8

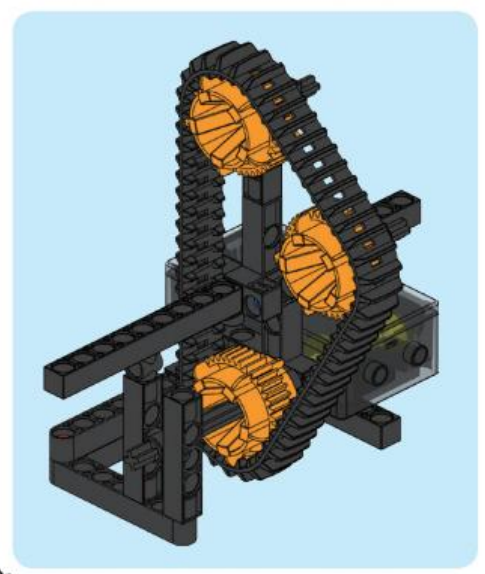
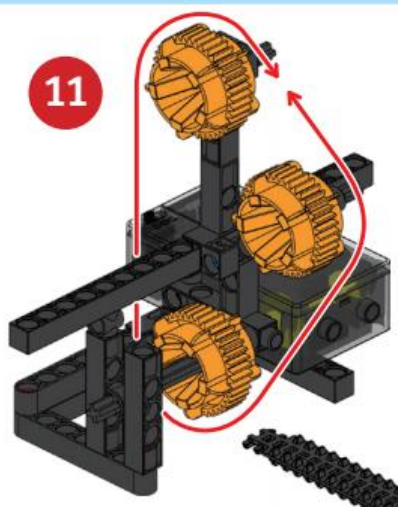
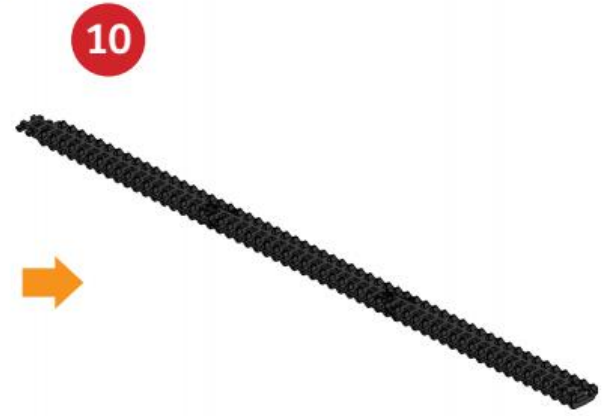




Model 模型 8 Bandsaw Machine 帶鋸機



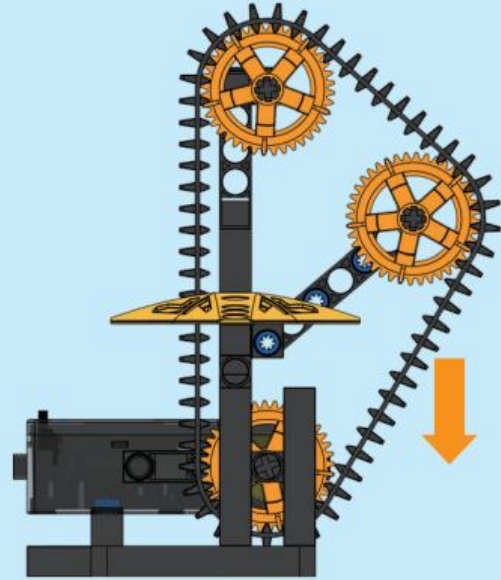
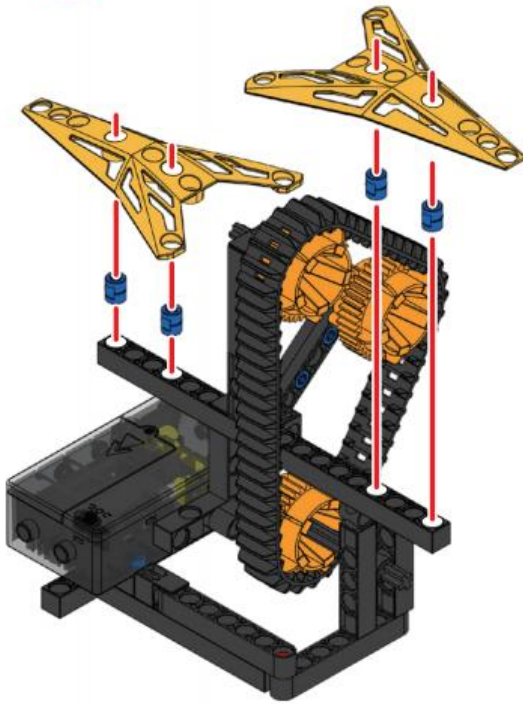
- A × 2
- B × 1





Bandsaw Machine 帶鋸機 Model 模型 8

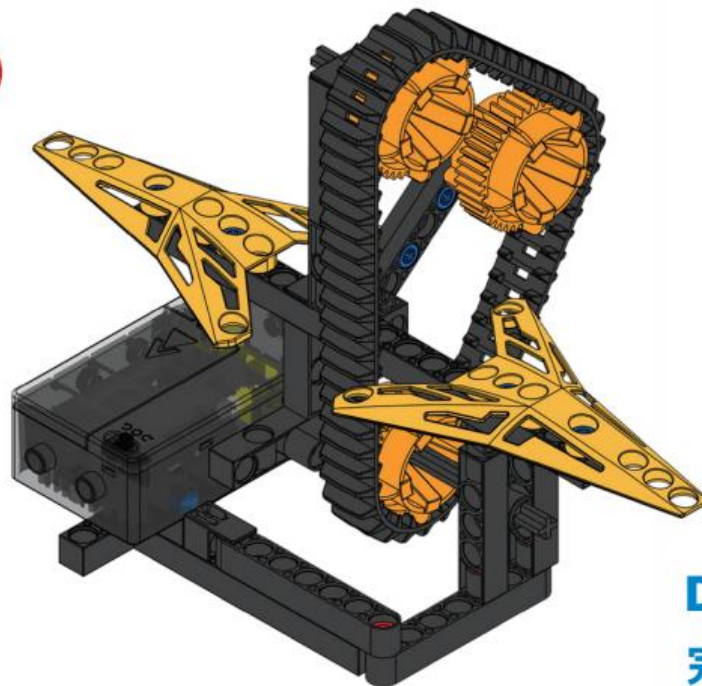
12



Move the middle wheel down to tighten the belt.

向下移動中間輪，以擰緊皮帶。

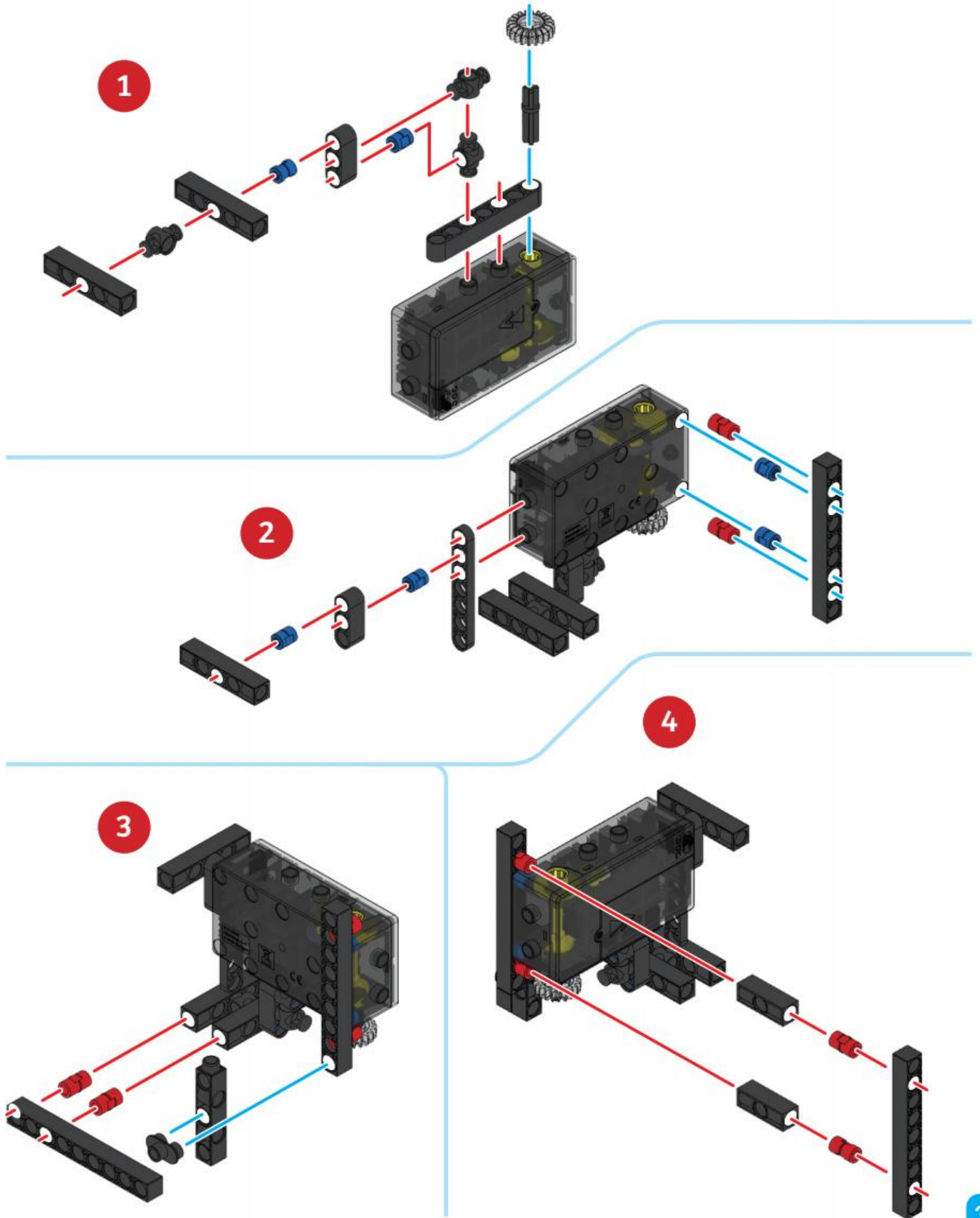
13



Done!

完成！

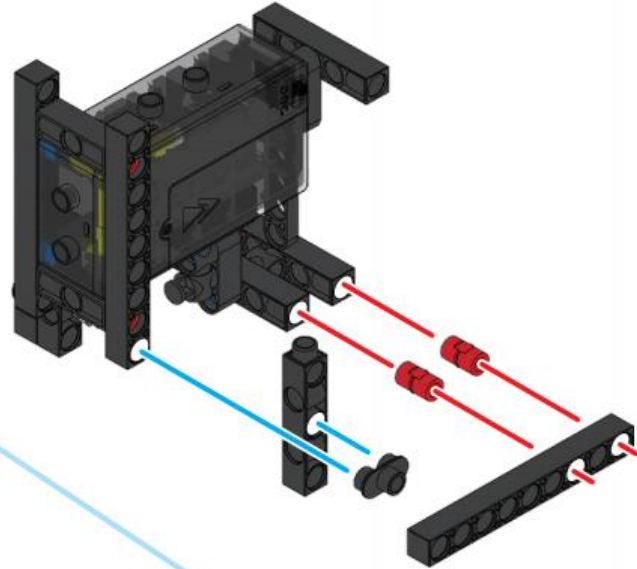
Model 模型 9 Belt Sander 帶式砂光機



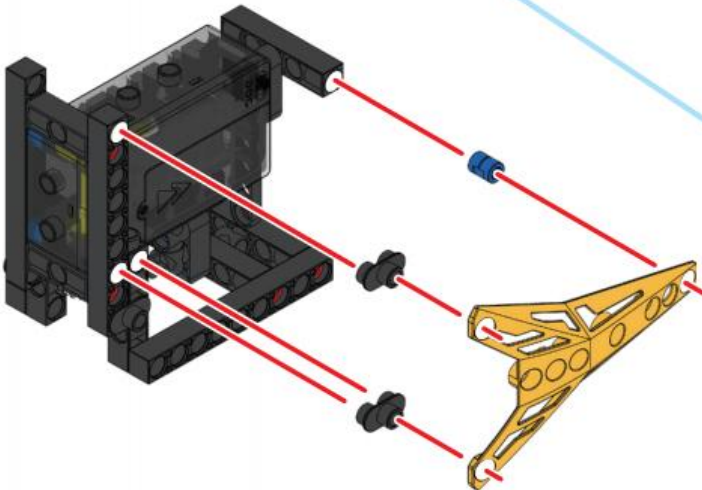


Belt Sander 帶式砂光機 Model 模型 9

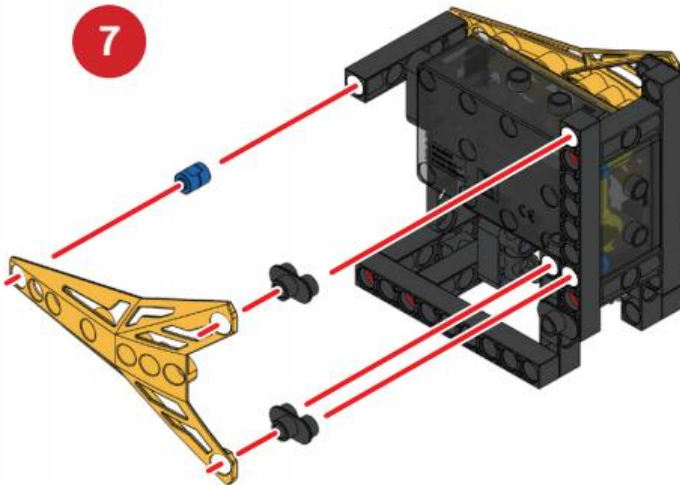
5



6



7



A × 1

B × 1



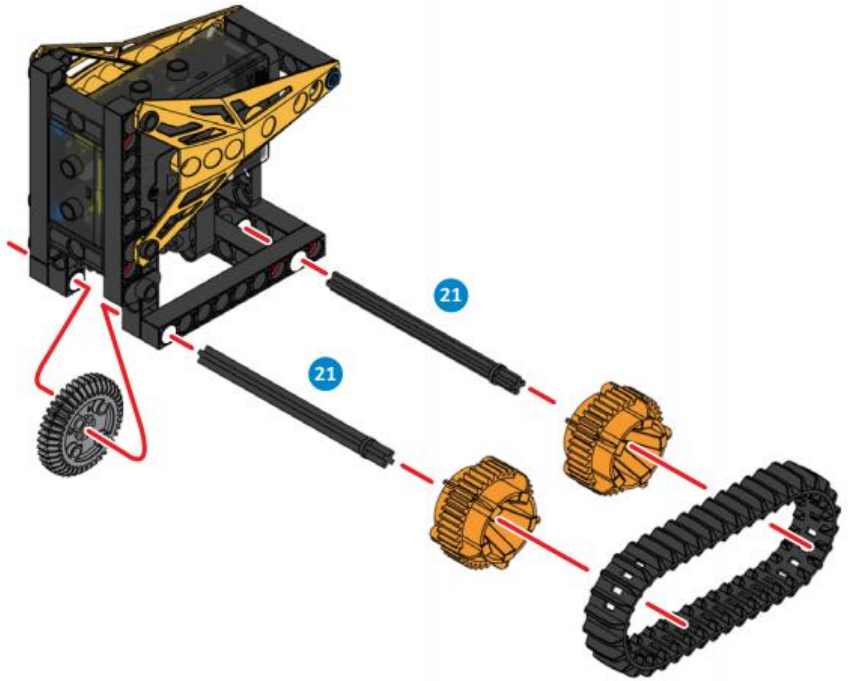
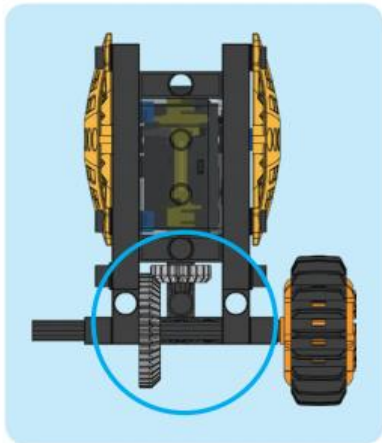
8 × 2



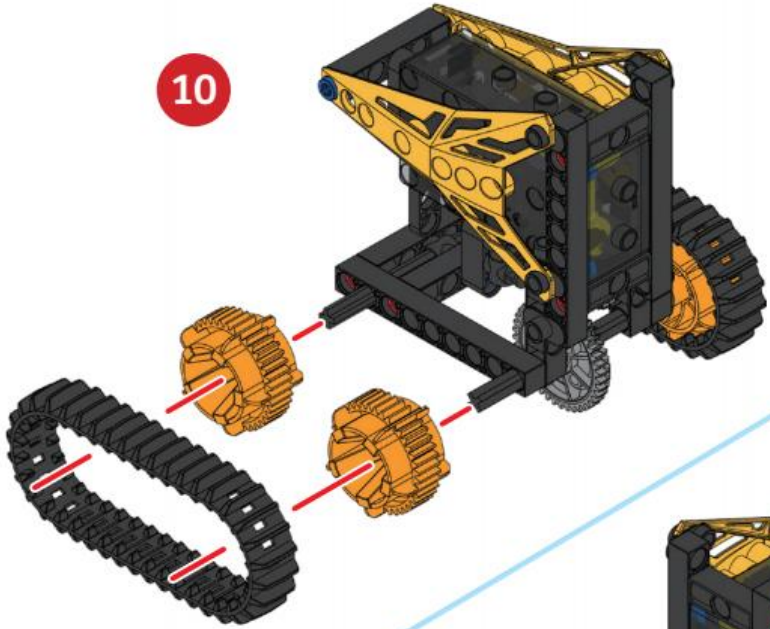


Model 模型 9 Belt Sander 帶式砂光機

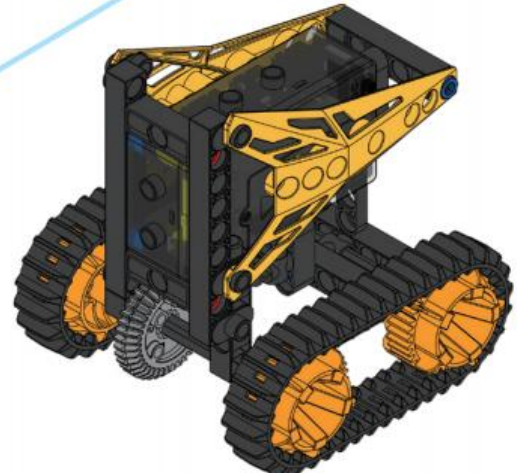
9



10



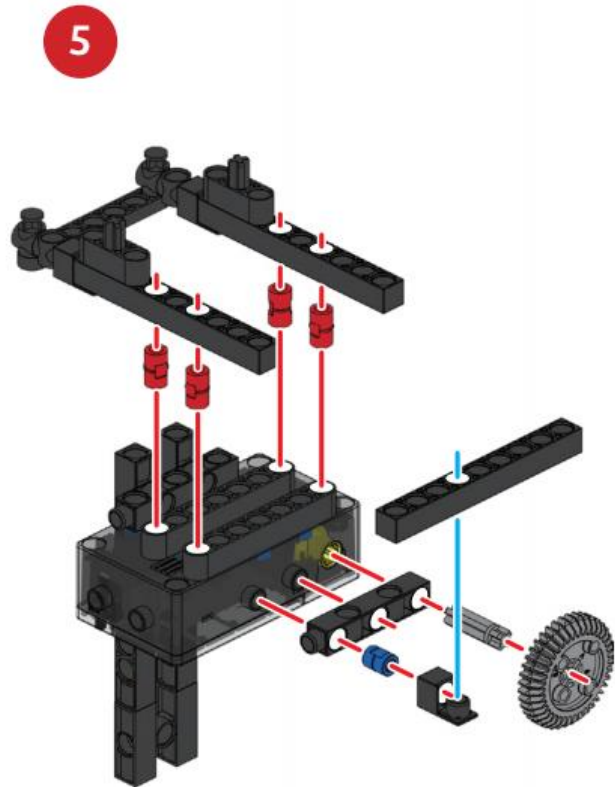
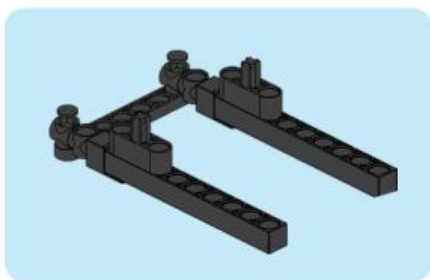
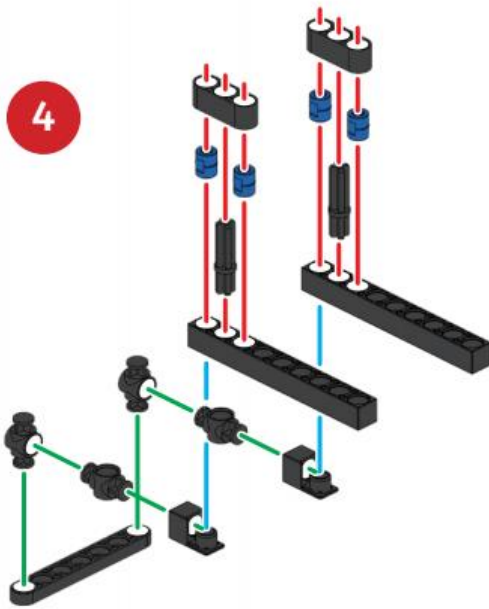
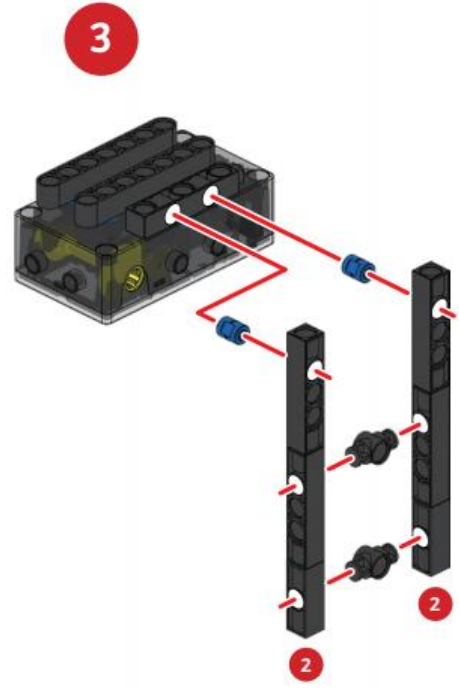
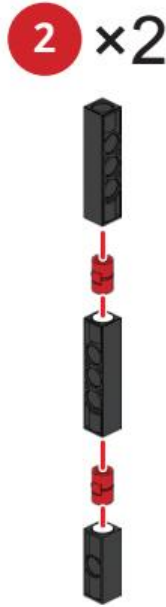
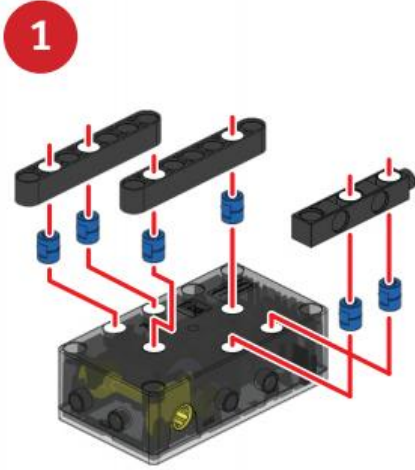
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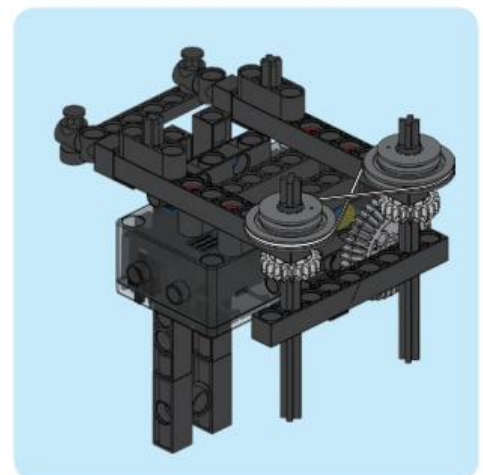
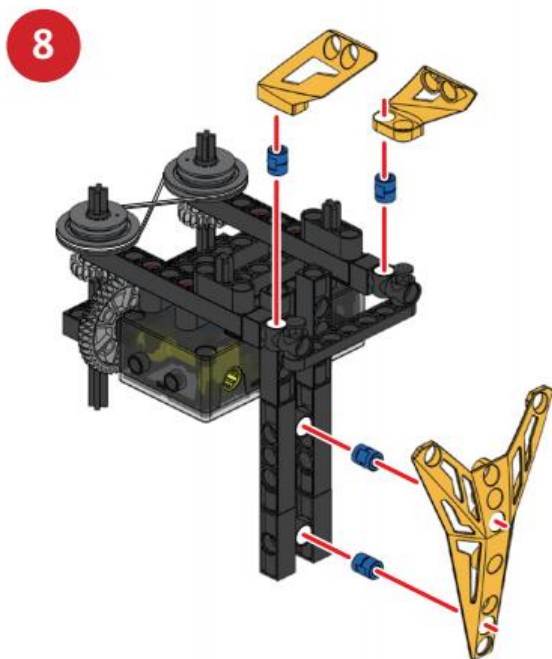
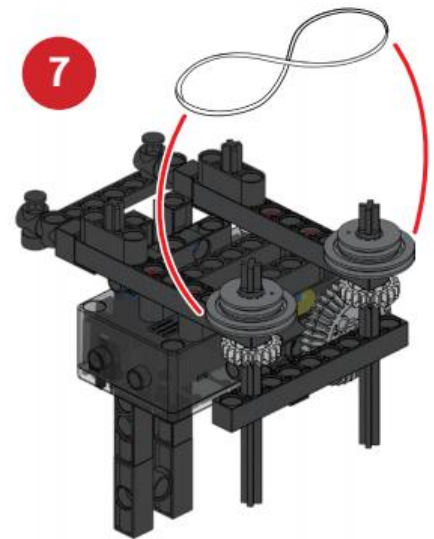
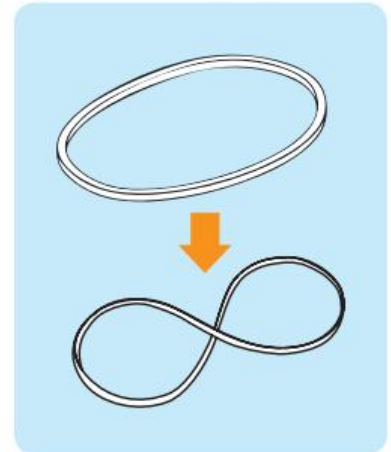
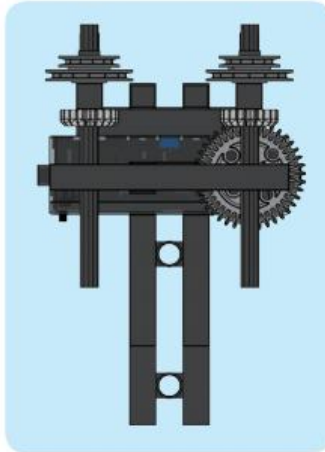
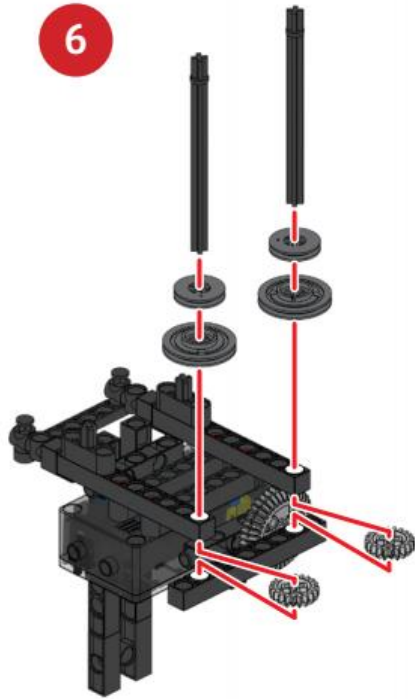
Done!
完成!



Paper Plane Launcher 紙飛機發射器 Model 模型 10



Model 模型 10 Paper Plane Launcher 紙飛機發射器

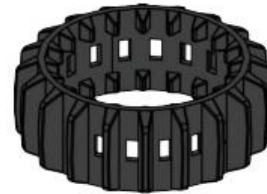




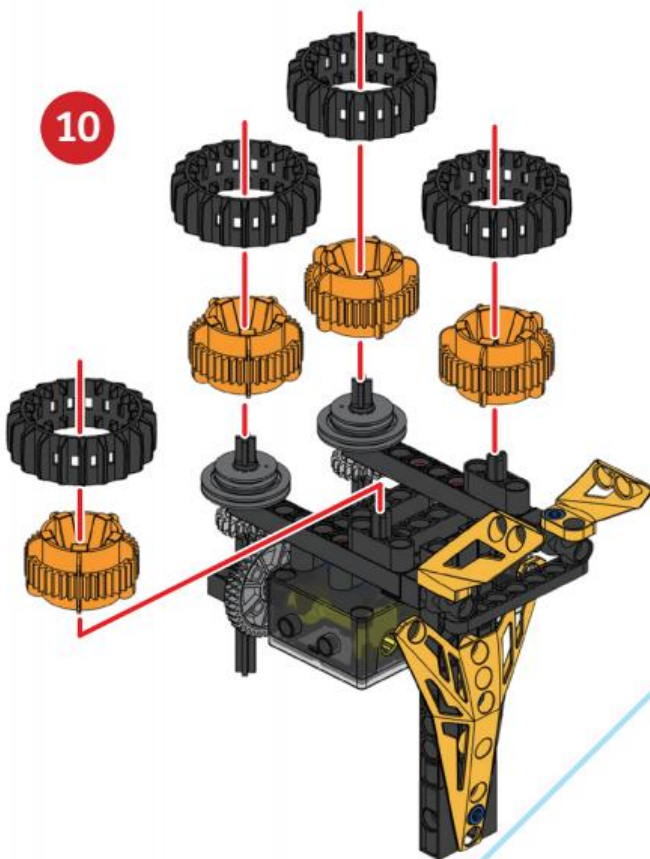
Paper Plane Launcher 紙飛機發射器 Model 模型 10



9 × 4



10



Caution! This model is designed to discharge the paper airplane.

Do not use with any other objects. There is a risk of injury.

Make sure the trajectory of your plane is clear — do not aim at people or objects!

注意！在玩此模型時請僅用紙飛機。若用其他物件彈射，可能有受傷的風險。

確保你的飛機在前進時有足夠的空間。請勿瞄準人或物體！

11



Done!

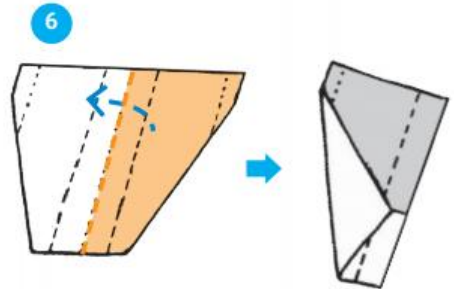
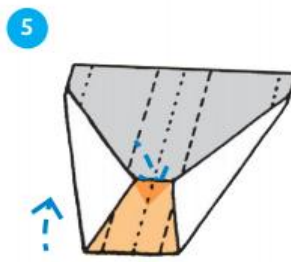
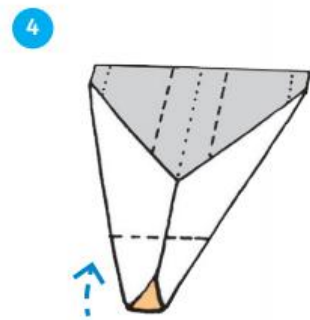
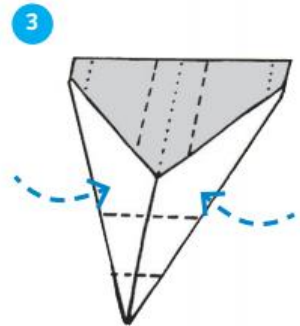
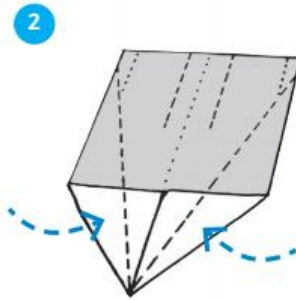
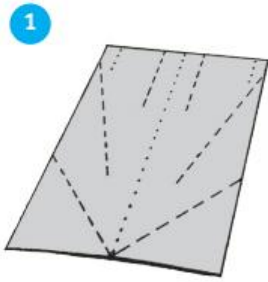
完成！

Switch on the motor and push the paper plane through the wheels from the back. Let go and watch the plane take off!

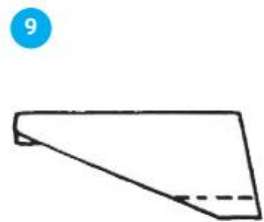
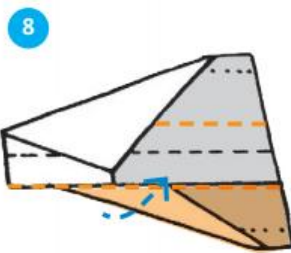
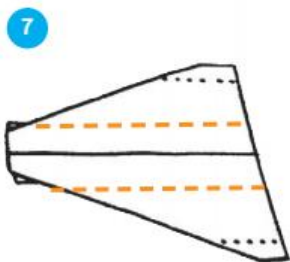
打開馬達，將紙飛機由後方往前推動，使紙飛機穿過車輪。放手，飛機起飛了！

Model 模型 10 Paper Plane Launcher 紙飛機發射器

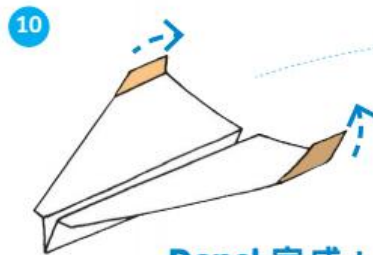
INSTRUCTIONS FOR MAKING A PAPER AIRPLANE 摺紙飛機的方法



Turn the plane over and fold down the middle.
把飛機翻過來，對摺。



Please use A4 paper.
建議使用 A4 大小的紙張。



Done! 完成!



CHECK IT OUT 知識補給站



Riding a bike on a smooth road surface is much more fun than riding on a sandy path, because on sand the tires sink in and get stuck.

The same is true for any type of vehicle with wheels. Unless it carries its own “road” along with it — like a **tracked vehicle** does. Its wheels roll along on two tracks that turn in an endless loop.

The lower part of these wide tracks rests firmly on the ground and supports the wheels — and thus the load of the vehicle. At the rear, the track’s chain links, which are usually made of metal, are lifted off the ground and carried to the front to be used again.

>>> Tracked vehicles have many advantages in off-road locations.

The weight of a wheeled vehicle without tracks can push its wheels deep into soft ground. The tracks, on the other hand, have a much larger surface area than the



wheels. This spreads the weight of the vehicle over a larger surface area, so it does not sink in as easily. This large surface area also transfers the driving force to the ground better, so tracked vehicles can

move forward more easily on slippery surfaces and can even climb over small obstacles.

>>> However, tracked vehicles are much more technically complicated than ordinary vehicles.

They have more drive wheels and rollers, need an especially powerful motor, and the heavy track needs to be guided by stabilizing wheels. They are steered by controlling the running speed of each track individually. This means that a tracked vehicle can even turn around on the spot. A tracked vehicle can also brake very effectively.

Today, chain-drive tracks are commonly found on numerous **construction vehicles** that have to drive on soft ground, such as **excavators, bulldozers, and dump trucks**. Thanks to their crawler tracks, **snowmobiles** can also drive on ice and snow. And last but not least, **tanks** take advantage of chain-drive tracks because they need to be able to drive on any terrain despite weighing dozens of tons thanks to their thick metal bodies and ammunition.

CHECK IT OUT 知識補給站



在平順的路面上騎自行車比騎在沙地上感覺更輕鬆，因為在沙地上行駛時，輪胎可能會陷進去。

任何具有車輪的車輛都是如此。除非車輛有屬於自己的「道路」，就像履帶式車輛一樣。它的輪子在兩條履帶上一圈又一圈地滾動。這些寬履帶的下方可以牢固地靠在地面上並支撐車輪——從而支撐車輛的負載。在車輛的後半部，由金屬製成的履帶的鏈節會被抬離地面並被帶到前面，一圈一圈地循環。

>>> 履帶式車輛在越野行駛，比一般車輛具有優勢。

沒有履帶的輪式車輛因為車身的重量，它的車輪容易陷入軟地裡。然而，履帶式車輛的軌道的表面積比車輪更大，這分散了車輛的重量，因此履帶式車輛比較不容易下沉。這



個大面積的表面區域也可以更好地將動力傳遞到地面，因此履帶式車輛可以在光滑的表面上更輕易地前進，甚至可以爬越小障礙物。

>>> 但是，履帶式車輛在技術上比一般車輛複雜得多。

履帶式車輛通常有更多的車輪和滾輪，因此需要特別強大的馬達，而重型履帶需要有穩定車輪做引導。通過單獨控制每個履帶的運行速度來控制車輛。這意味著履帶式車輛甚至可以在現場轉身。履帶式車輛也可以非常有效地煞車。

現在，在許多於鬆軟地面行駛的**施工車輛**上通常找得到鍊條式履帶，例如**挖土機**、**推土機**和**砂石車**。由於具有爬行式履帶，**雪地摩托車**也可以在冰雪上行駛。最後，裝備著彈藥與厚實金屬車身的**坦克**，儘管坦克重達數十噸，也能運用鍊條式履帶的優勢得以在任何地形上行駛。

EXPERIMENTS



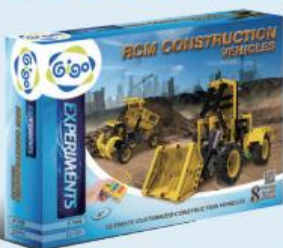
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