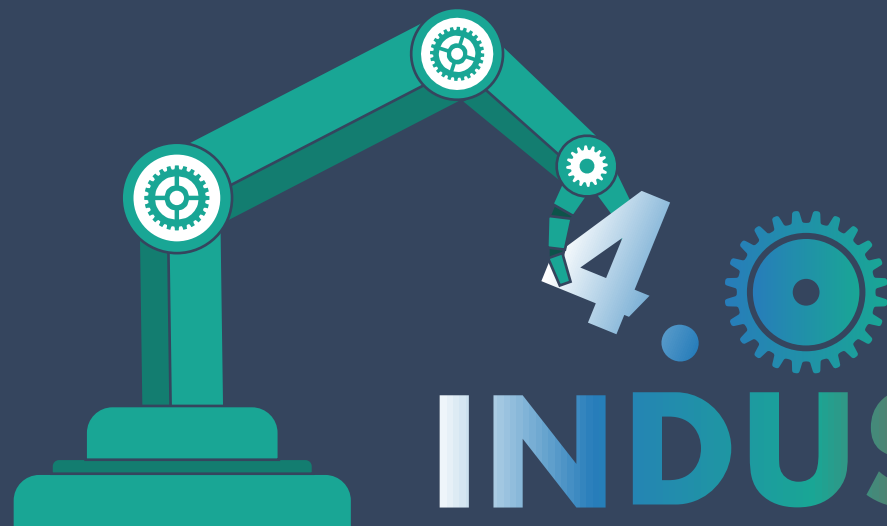


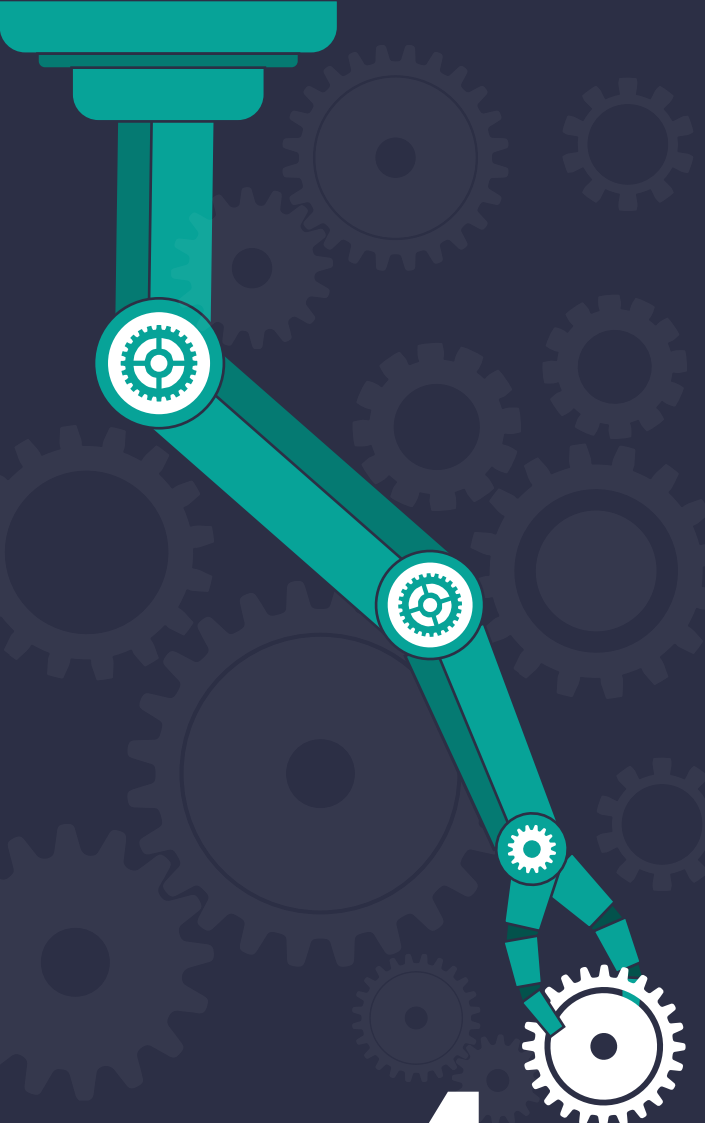


INDUSTRY ROBOTICS

第6單元：角動量陀螺儀設計

教學目標:

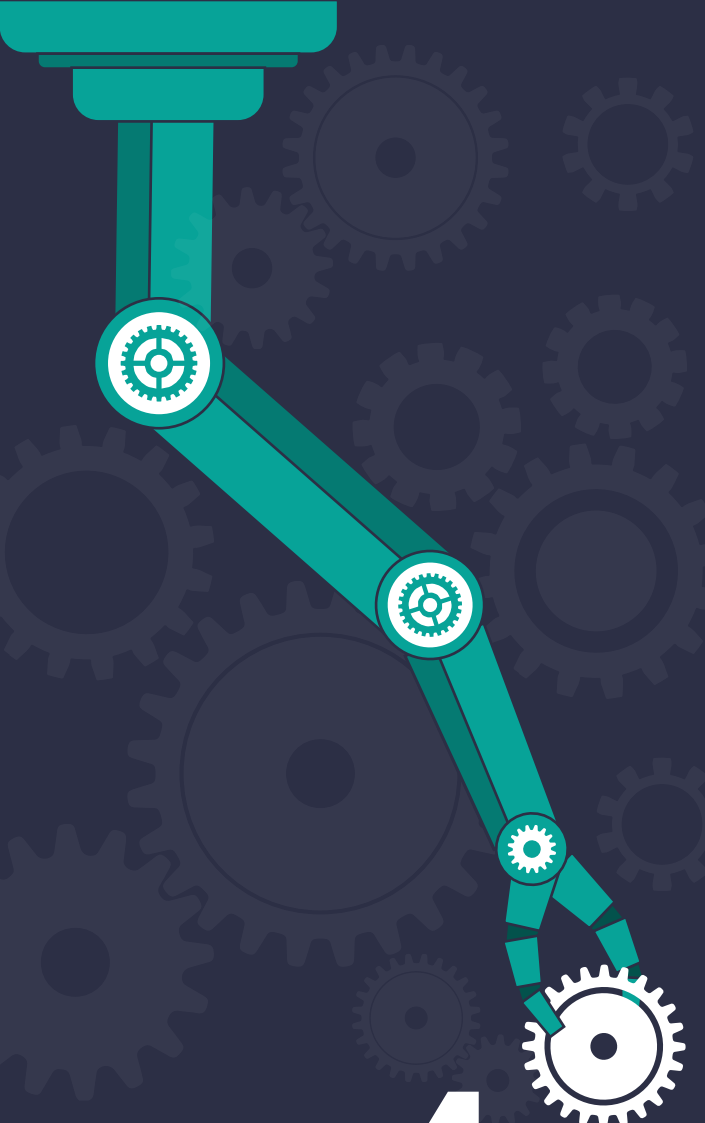
- 瞭解角動量理論概要。
- 馬達的使用
- 齒輪的搭配

A stylized teal robotic arm with three joints, each marked with a gear icon. The arm is positioned diagonally from the top left towards the bottom right. The background is dark blue with faint, larger gear patterns.

4.
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這個單元我們將學到:

- 運用齒輪的搭配
- 馬達的使用製作傳統機械的陀螺儀
- 進而了解角動量的基本原理

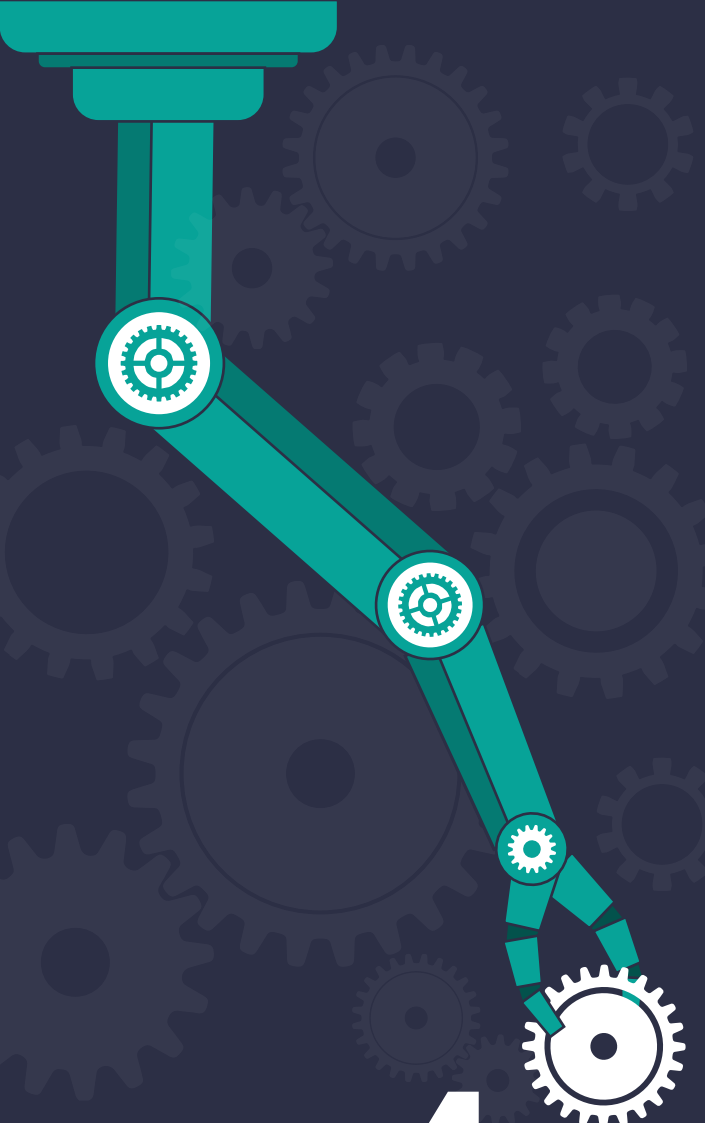
A stylized teal robotic arm with three joints, each featuring a gear icon. The arm is positioned diagonally from the top left towards the bottom right. The background is dark blue with faint, larger gear patterns.

4.
INDUSTRY

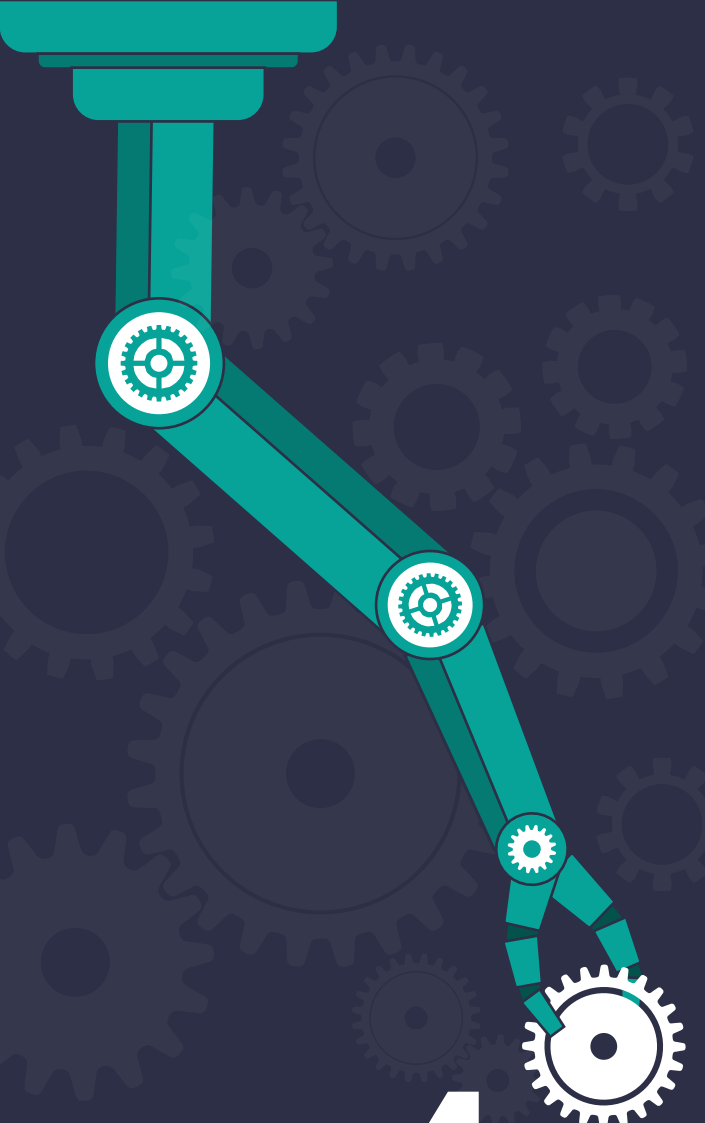
起因~~~

小明:昨天看了奧運滑冰比賽，選手們穿著華麗舞衣翩翩起舞，但是小明發現了一個問題，為什麼選手在旋轉的時候伸長腿跟收起膝蓋時，轉起來的速度好像不太一樣？

小華:對阿，昨天坐在旋轉椅上，手拿兩瓶水，弟弟幫我轉。當我手縮起來的時候頭特別暈，手伸直比較不暈。



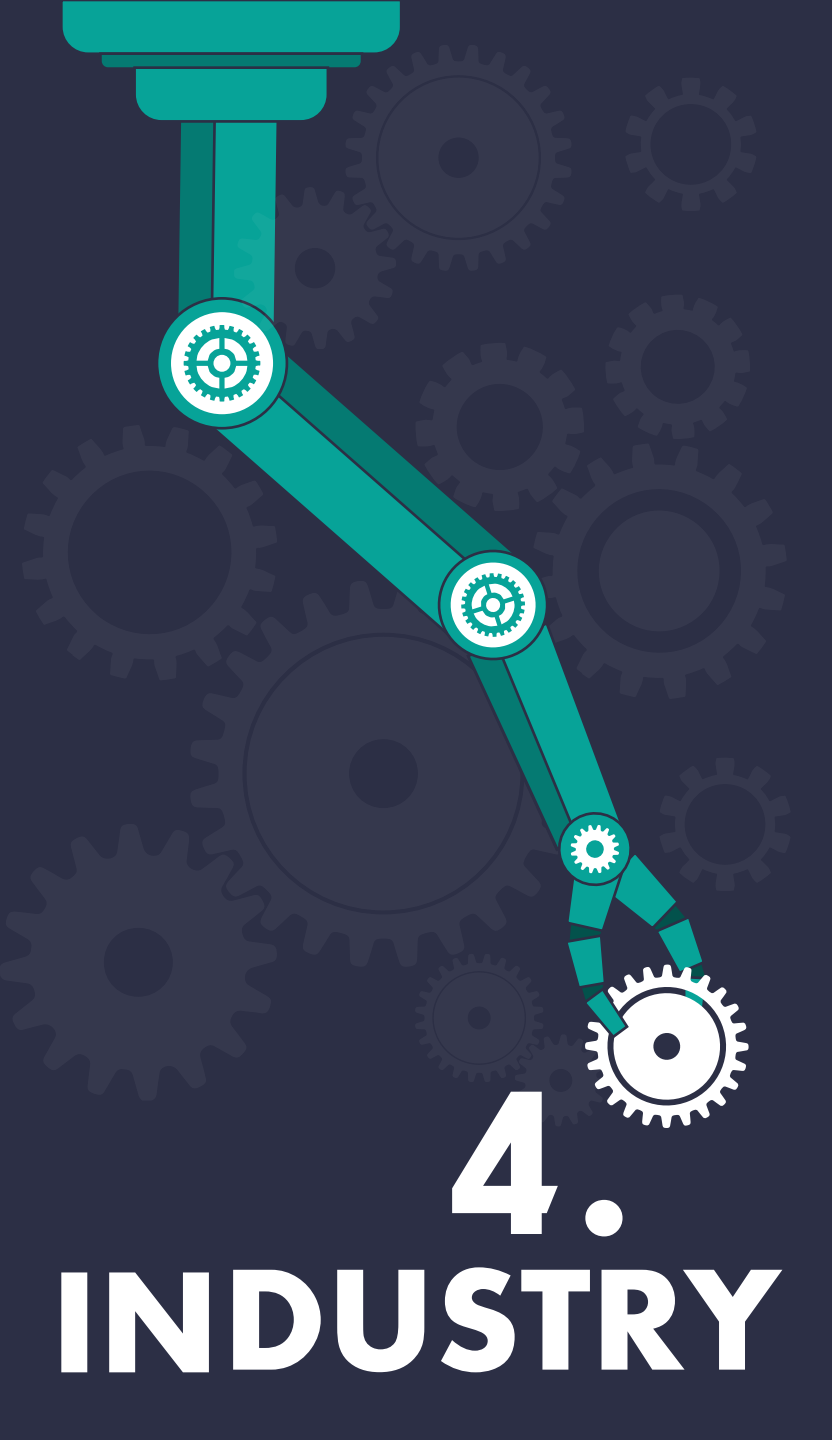
4. INDUSTRY



4. INDUSTRY

當陀螺轉動時，就會擁有的一種物理量，然後不論轉何種**角度**陀螺不會倒下去，而且陀螺的半徑長短會影響轉速喔，這就是所謂的**角動量**。
接下來為了做這個好玩的實驗，我們必須先製作出一個動力基座，如下圖。



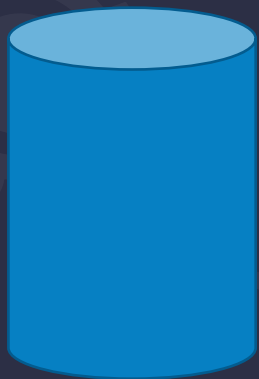


動力機構中，影響速度的原因有以下三種

- 軟體設定的馬達轉速
- 硬體設備的馬達種類
- 硬體設備的齒輪比

在此我們先來初步講解齒輪比吧。

4.
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上圖大桶水一次能加滿兩中桶。
下圖小水桶必須加兩次能滿一個中桶。
加滿一個中桶誰比較快？



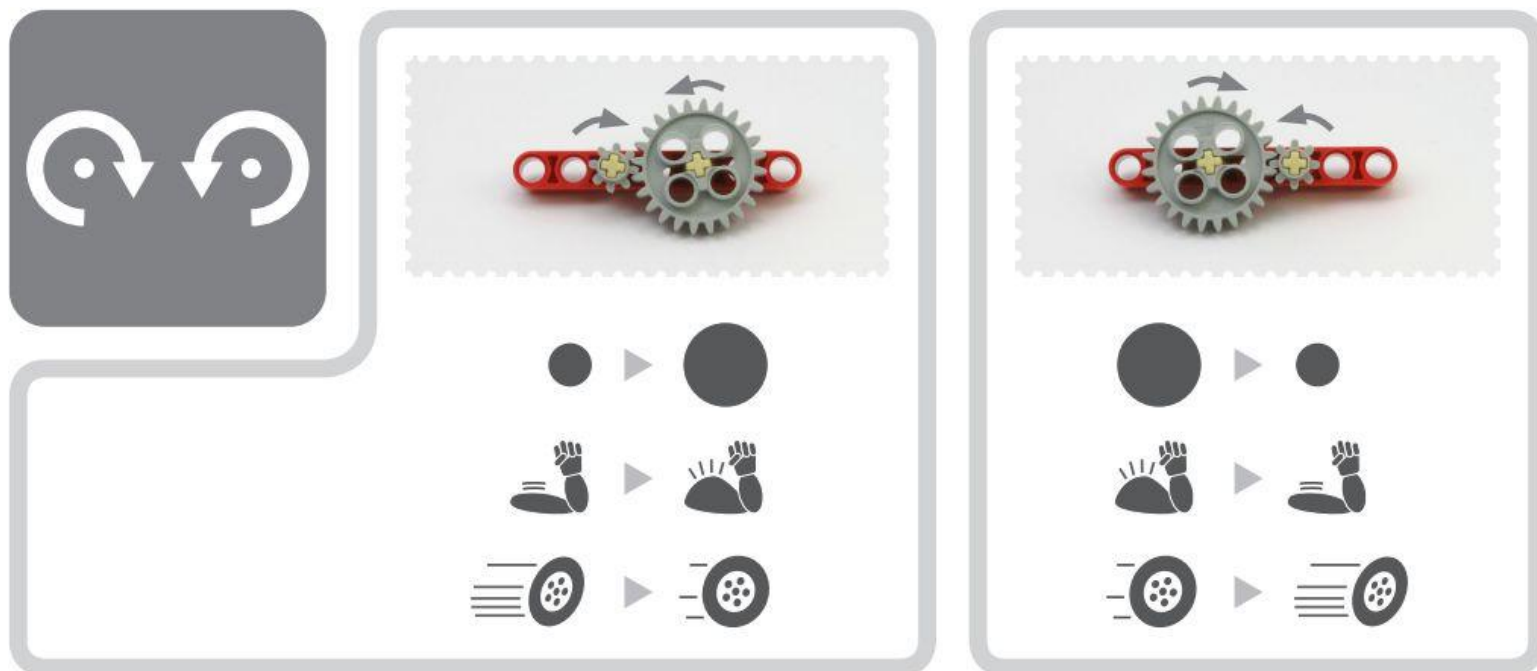
4. INDUSTRY

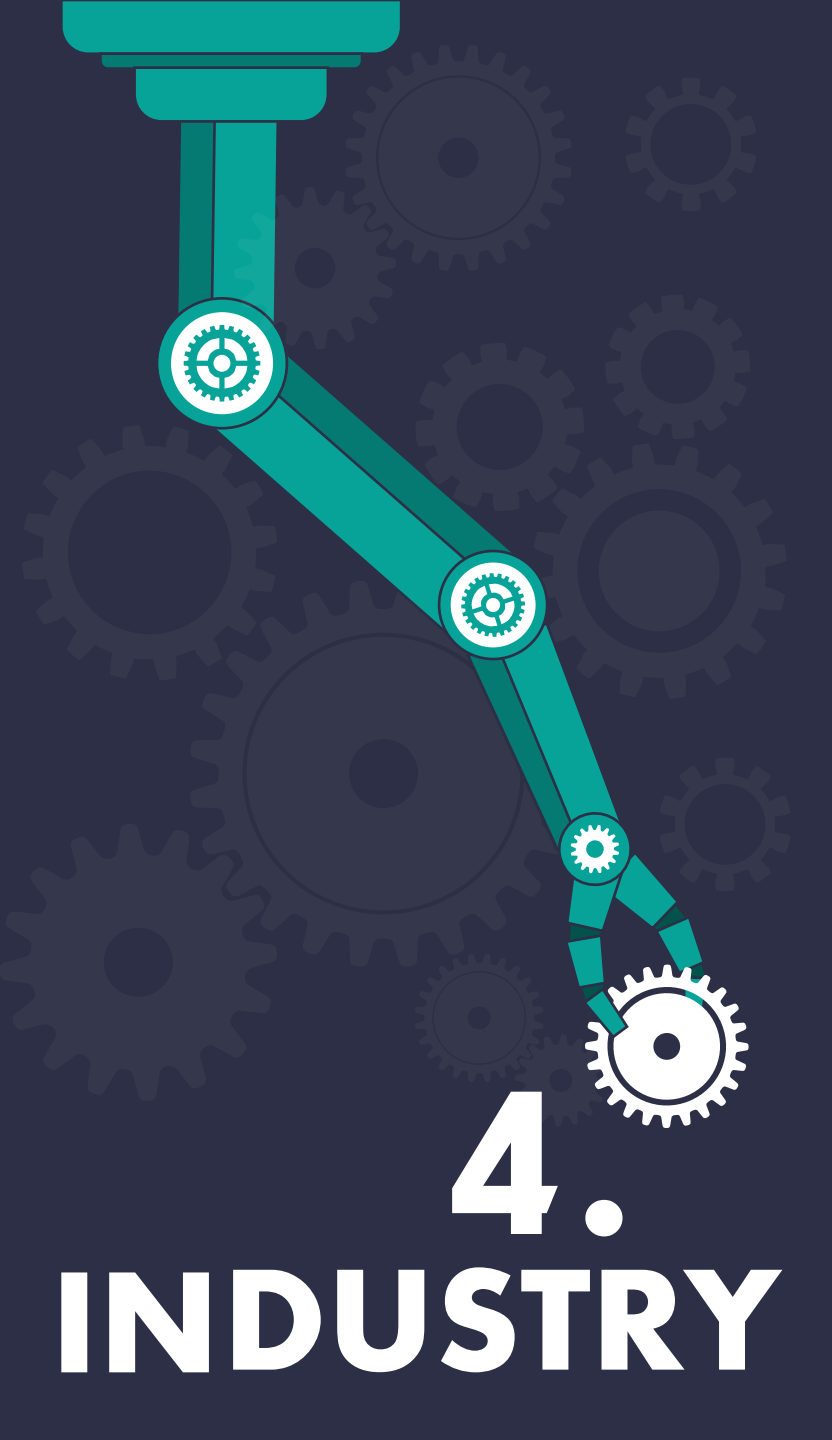
齒輪說明:

下列的圖示二個齒輪的齒數不一樣，所以轉動主動齒輪時，從動齒輪的**速度**會不一樣，轉動的**方向**相反。

當齒數少的齒輪帶動齒數多的齒輪，**力量會變大**，**速度會變慢**；

當齒數多的齒輪帶動齒數小的齒輪，**力量會變小**，**速度會變快**；





齒輪配說明：

說明 當40齒的**大齒輪**轉動一圈，則8齒的**小齒輪**轉動5圈（ $40/8 = 5$ ）

分析 1

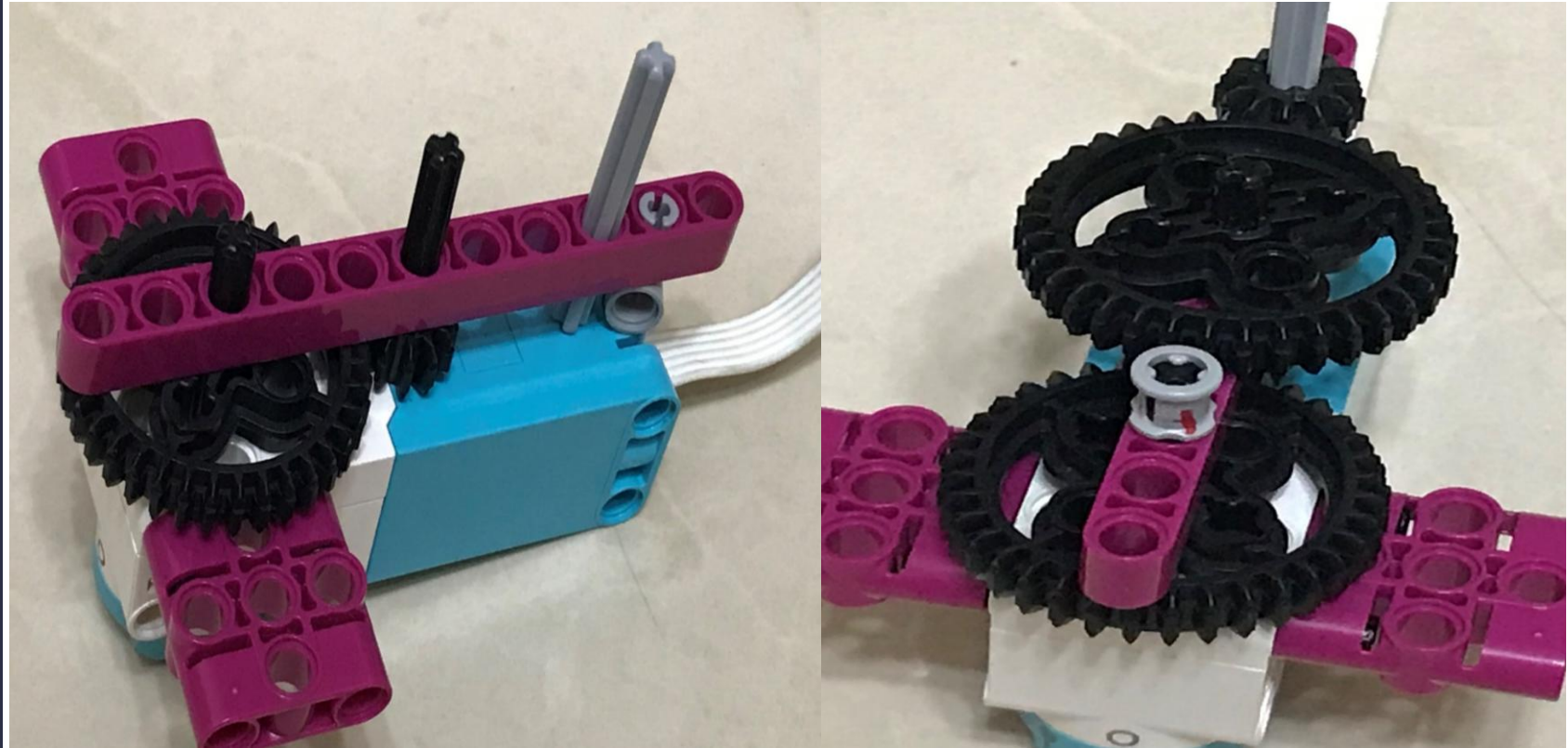
$$\text{被動輪轉速比} = \frac{\text{驅動輪（如：馬達）}}{\text{被動輪（如：輪子）}}$$

$$\text{被動輪轉速比} = \frac{40}{8} = 5$$

分析 2

比較效果	帶動方式	
	大齒輪帶小齒輪	小齒輪帶大齒輪
傳遞動力（產生扭力）	小	大
轉動速度	快	慢
轉動方向	順（逆）時鐘	逆（順）時鐘
施力狀況	費力	省力

此單元運用複合齒輪的搭配



第一層齒輪比
 $36:12=3:1$

第二層齒輪比
 $36:12=3:1$

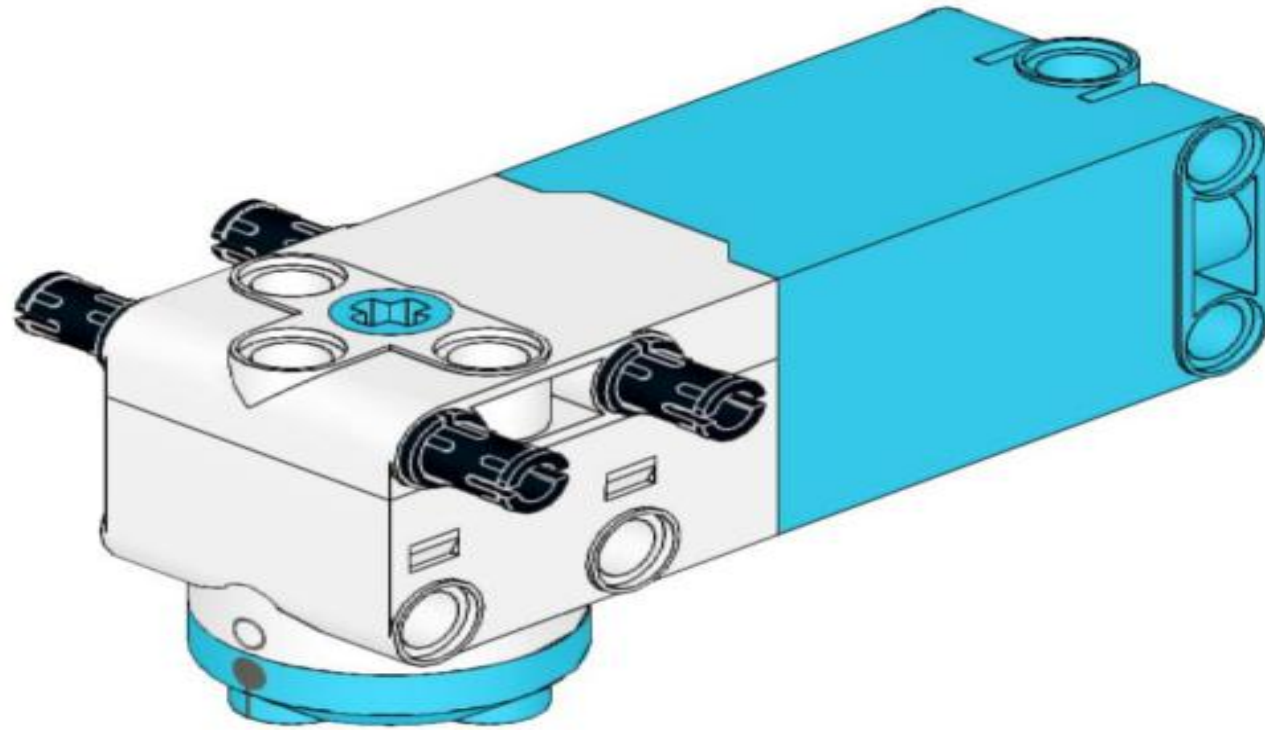
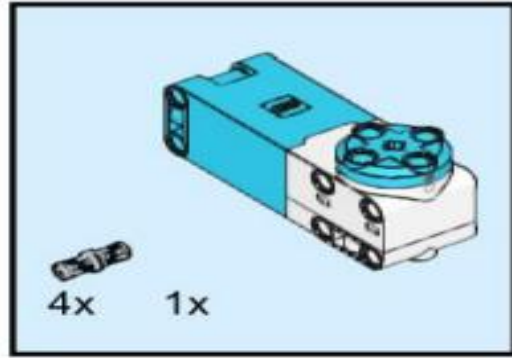
第一層齒輪比 3倍速
第二層齒輪比 3倍速

上下兩層組合後齒輪比 ➡ 9倍速

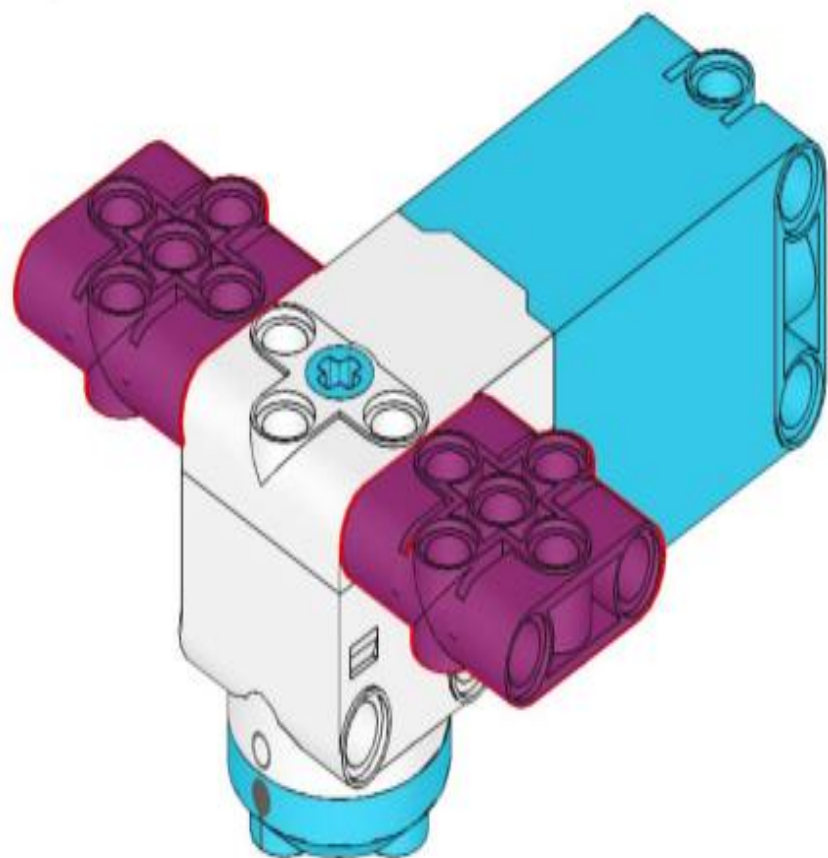
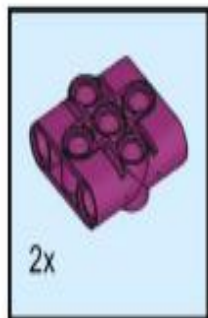
4. INDUSTRY

組立

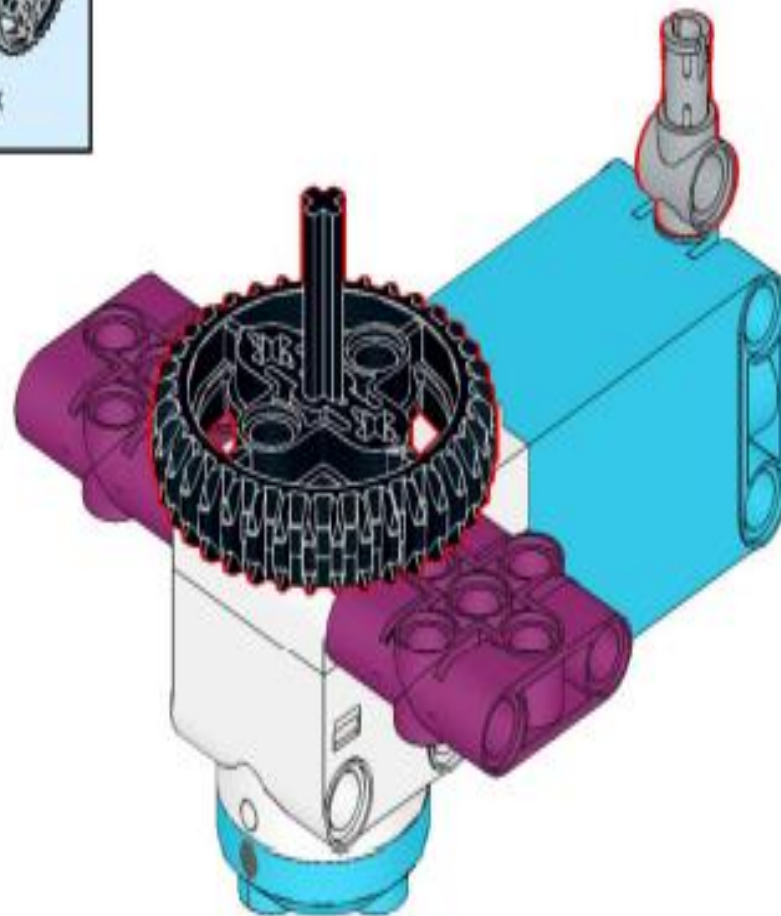
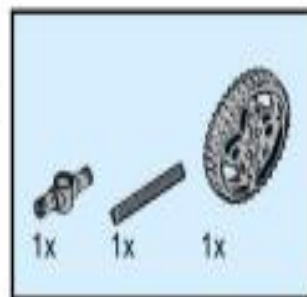
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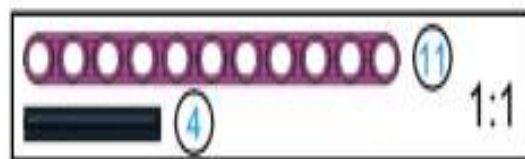
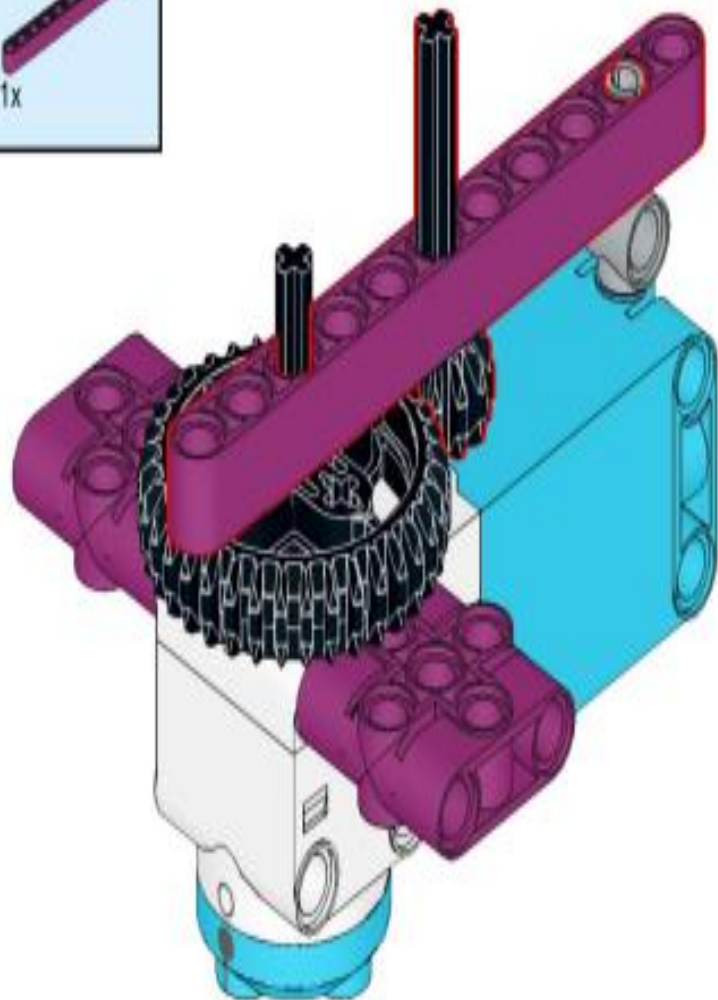
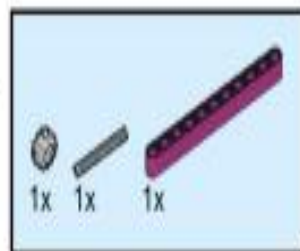
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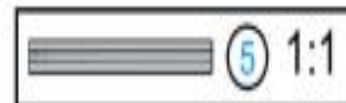
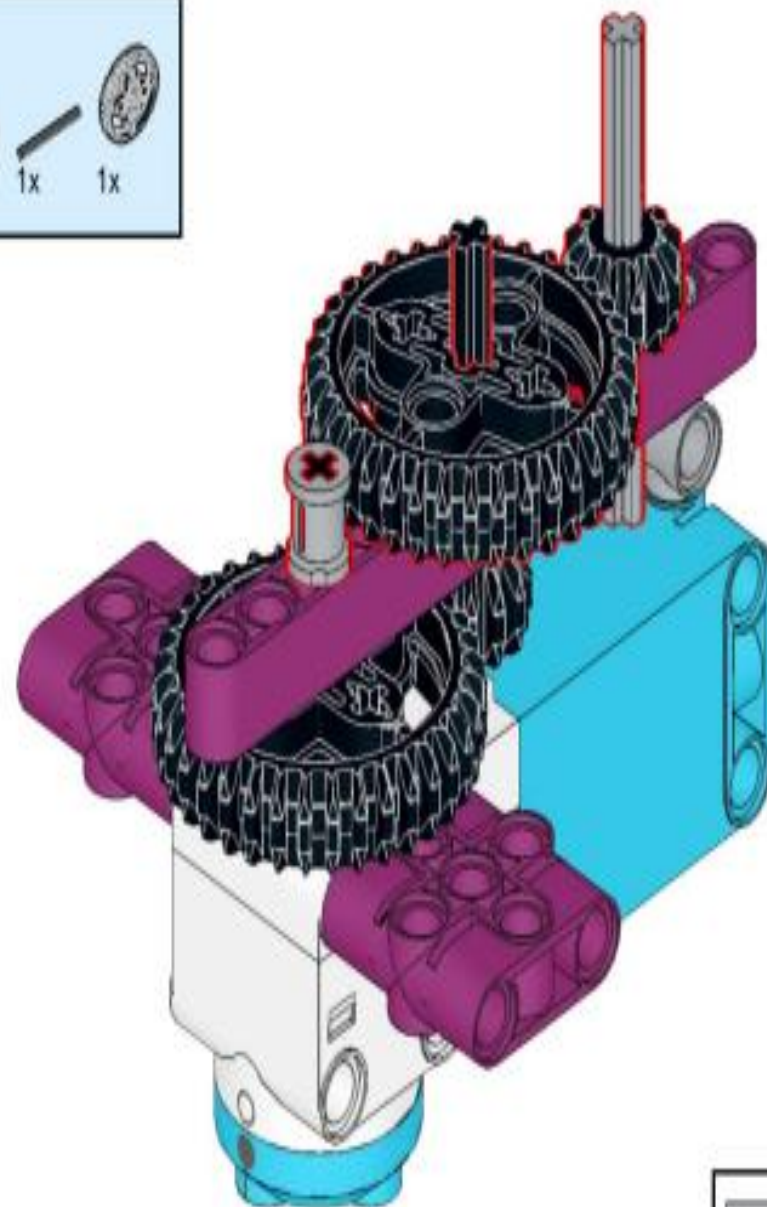
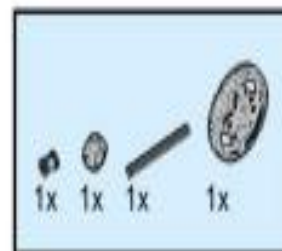
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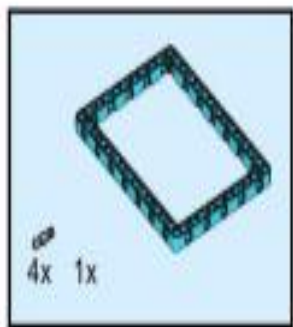
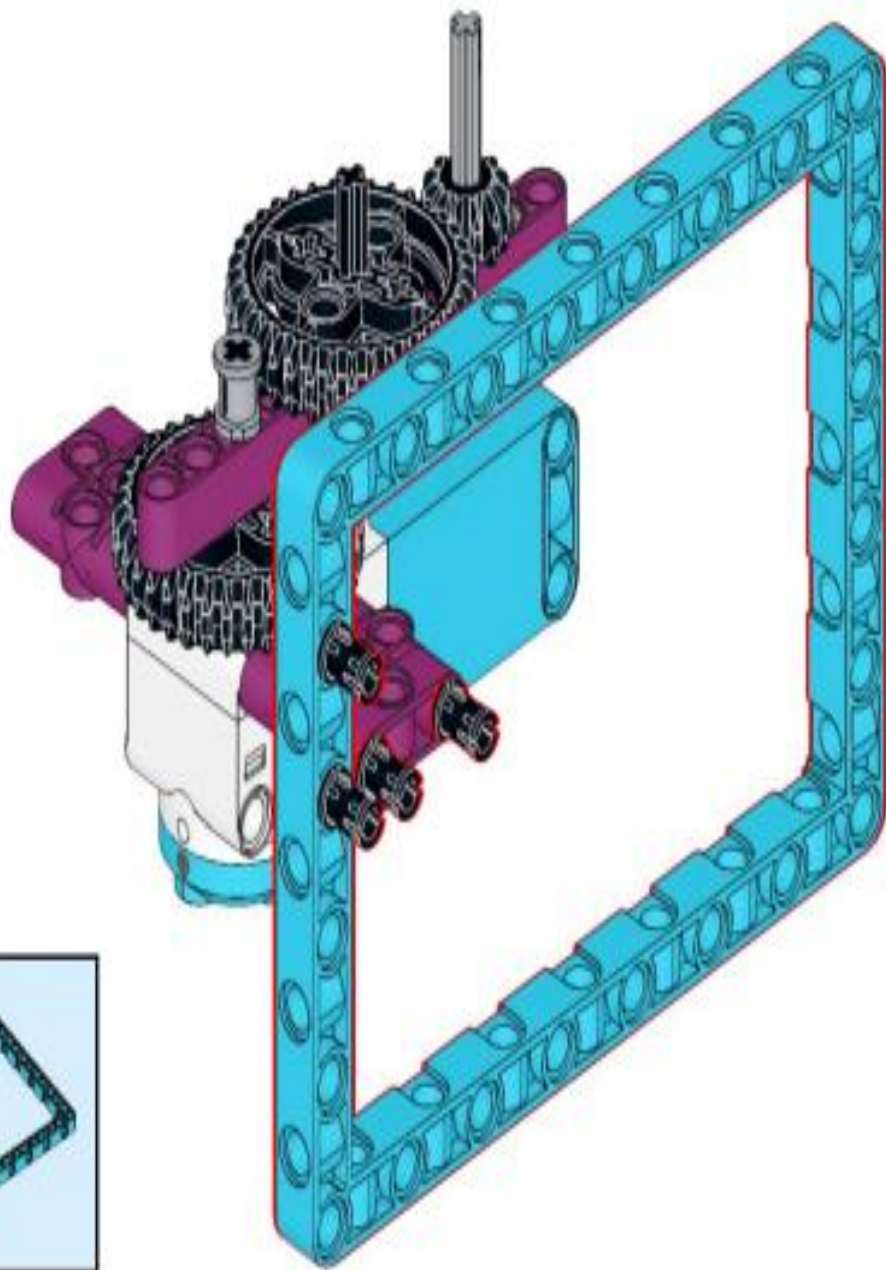
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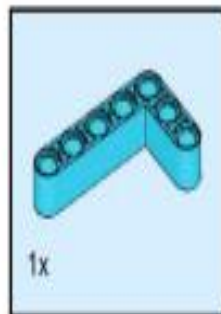
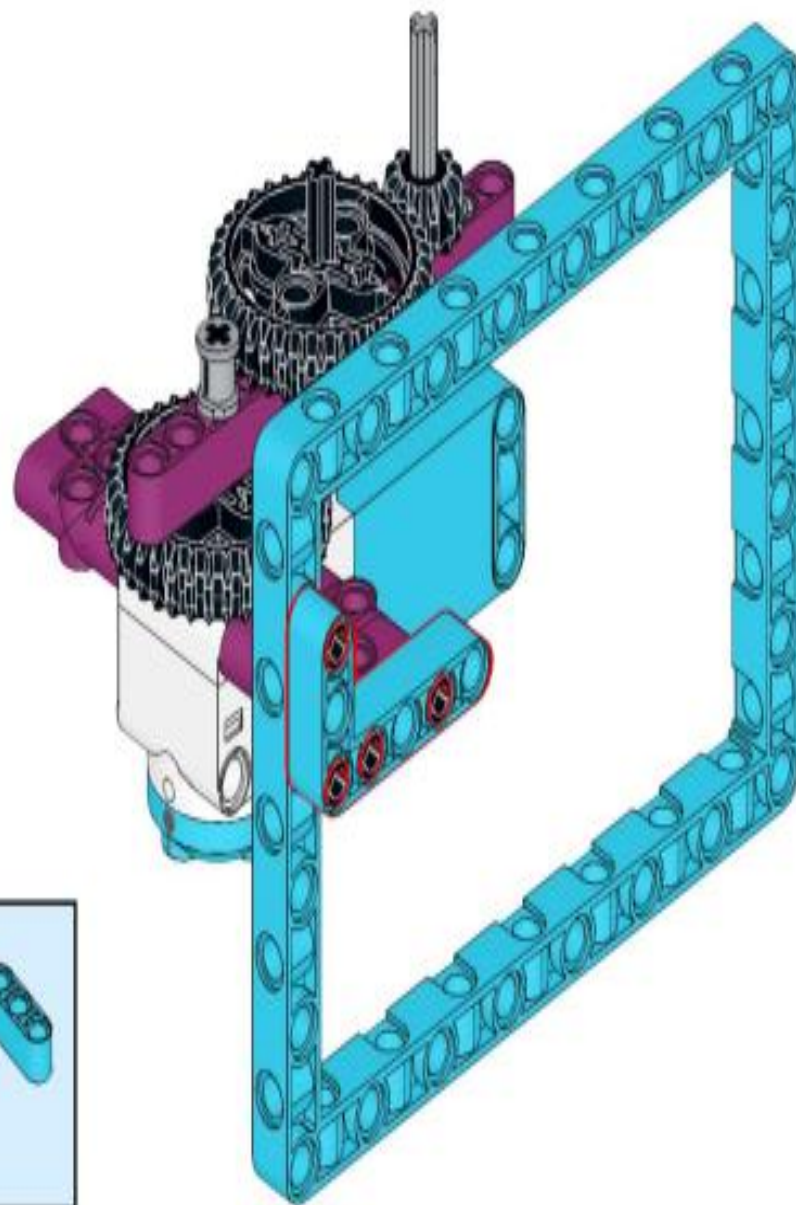
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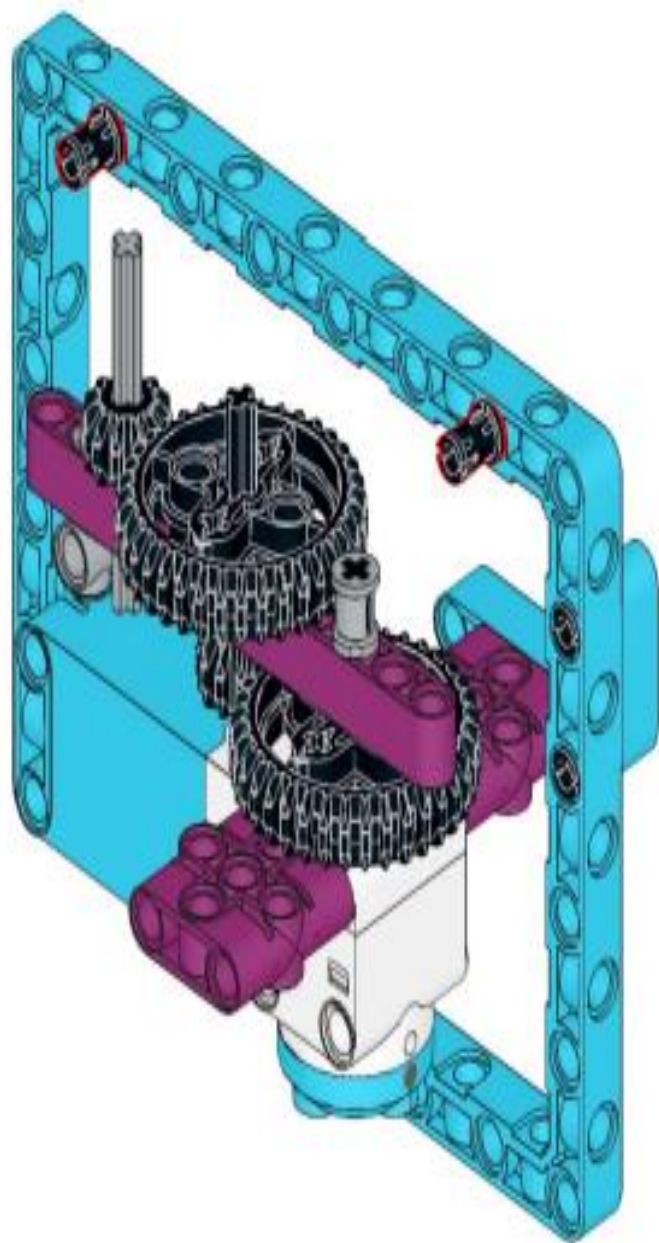
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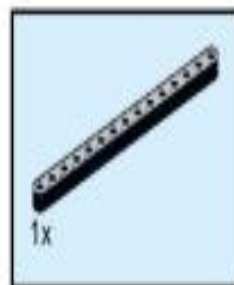
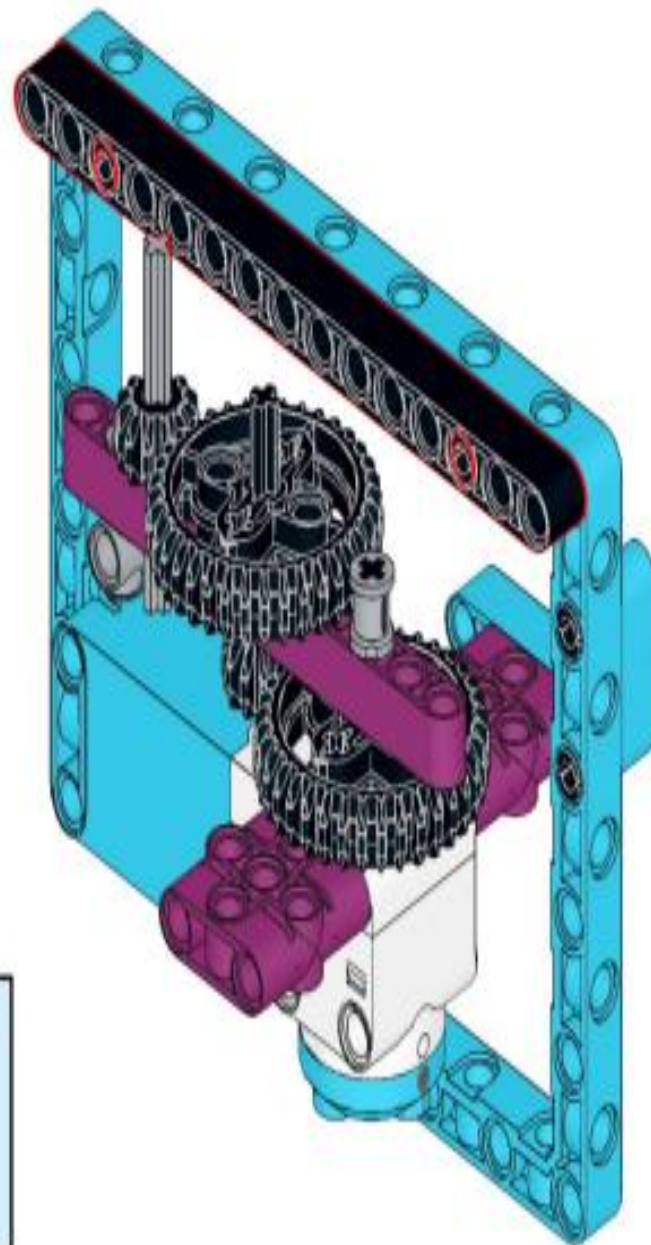
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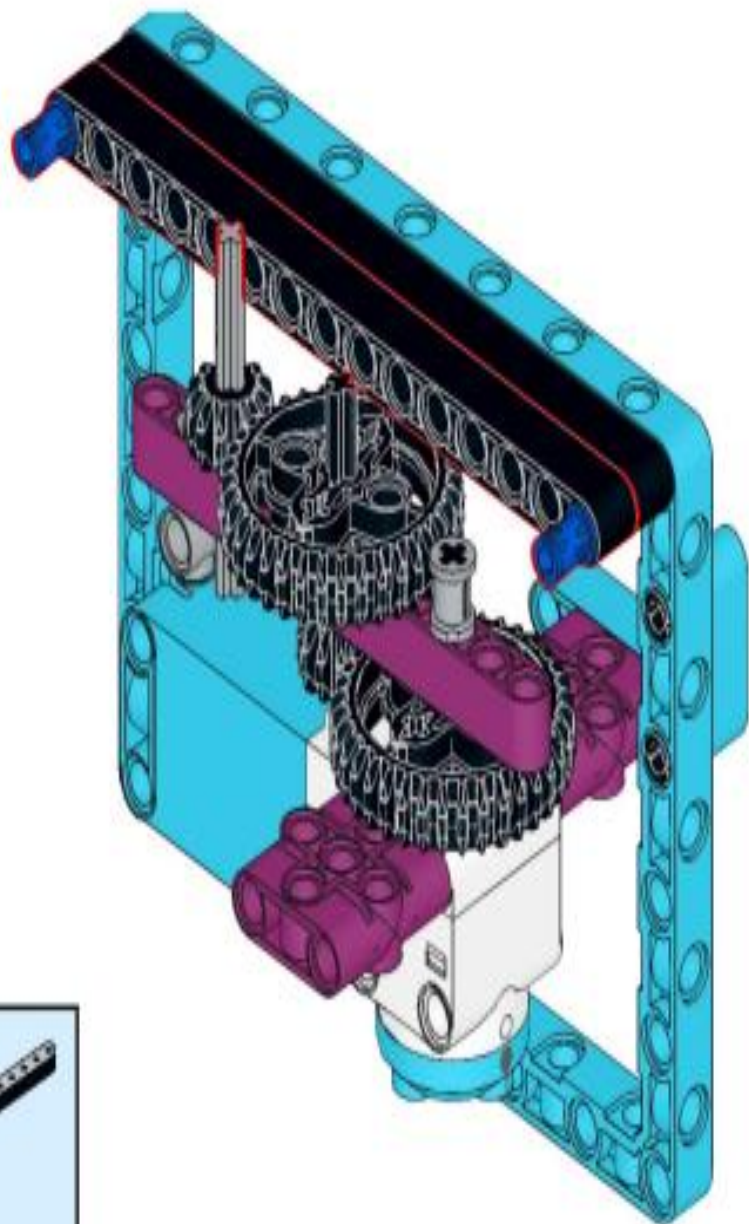
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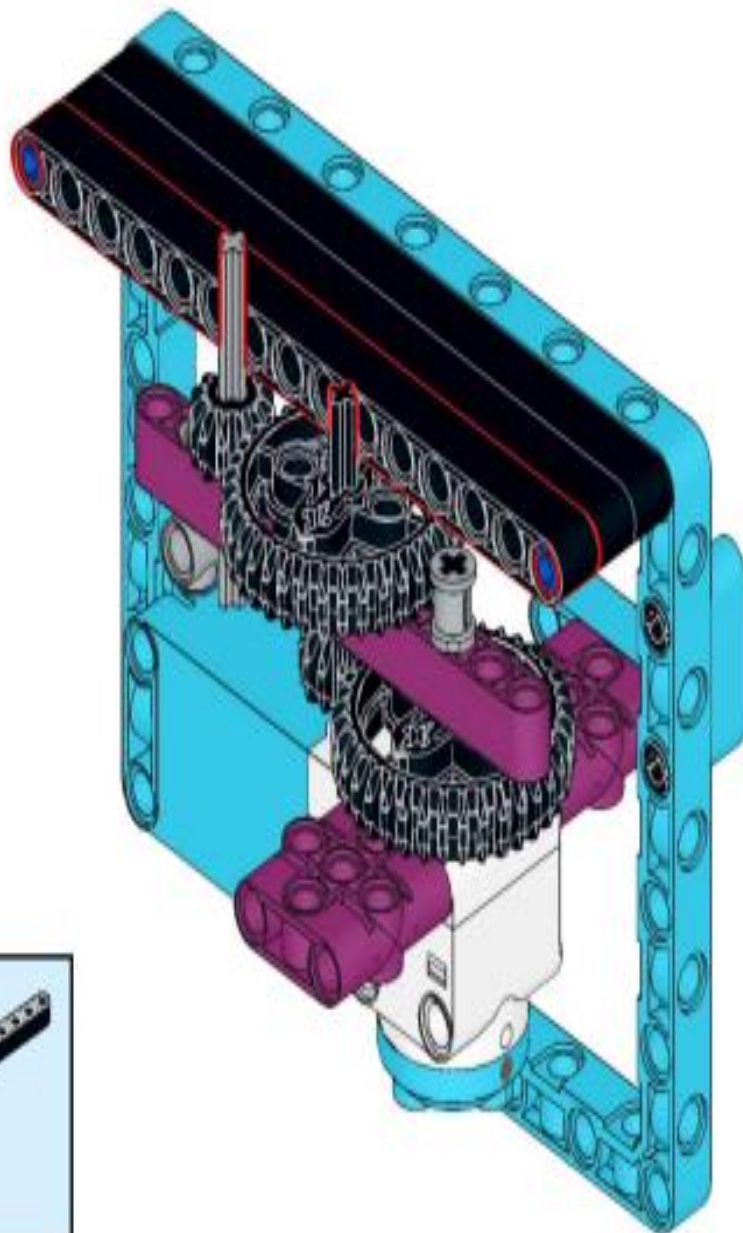
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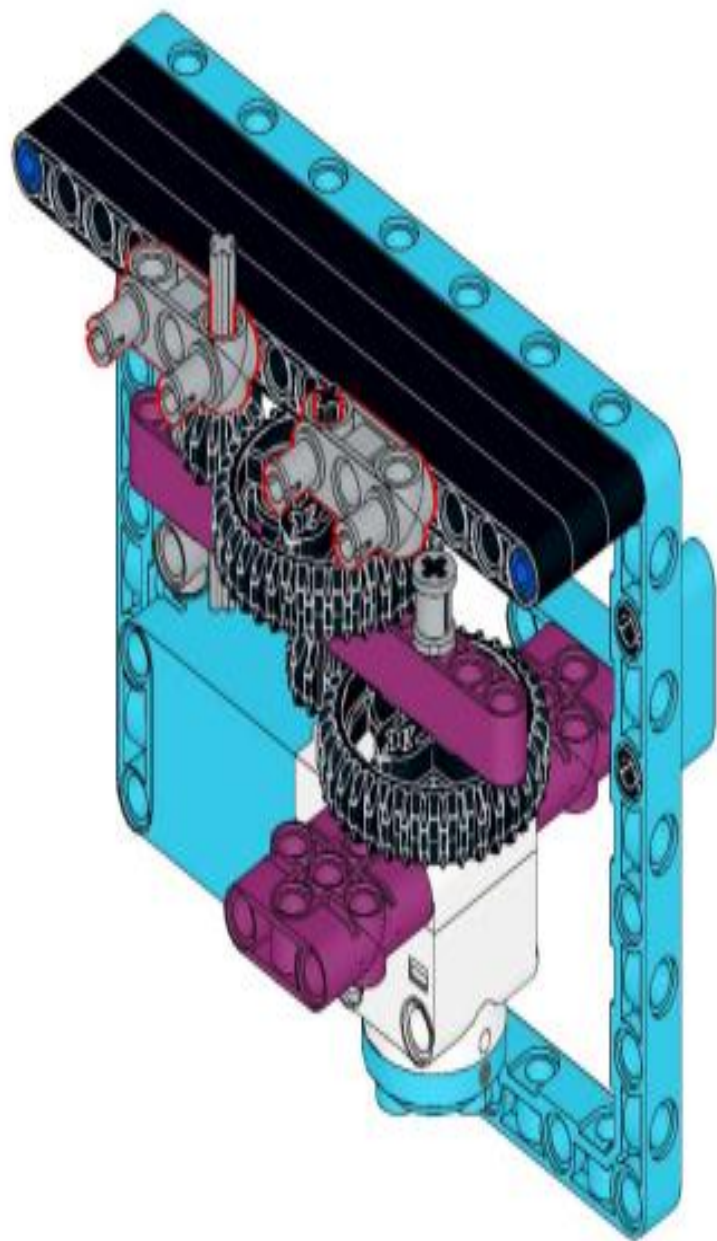
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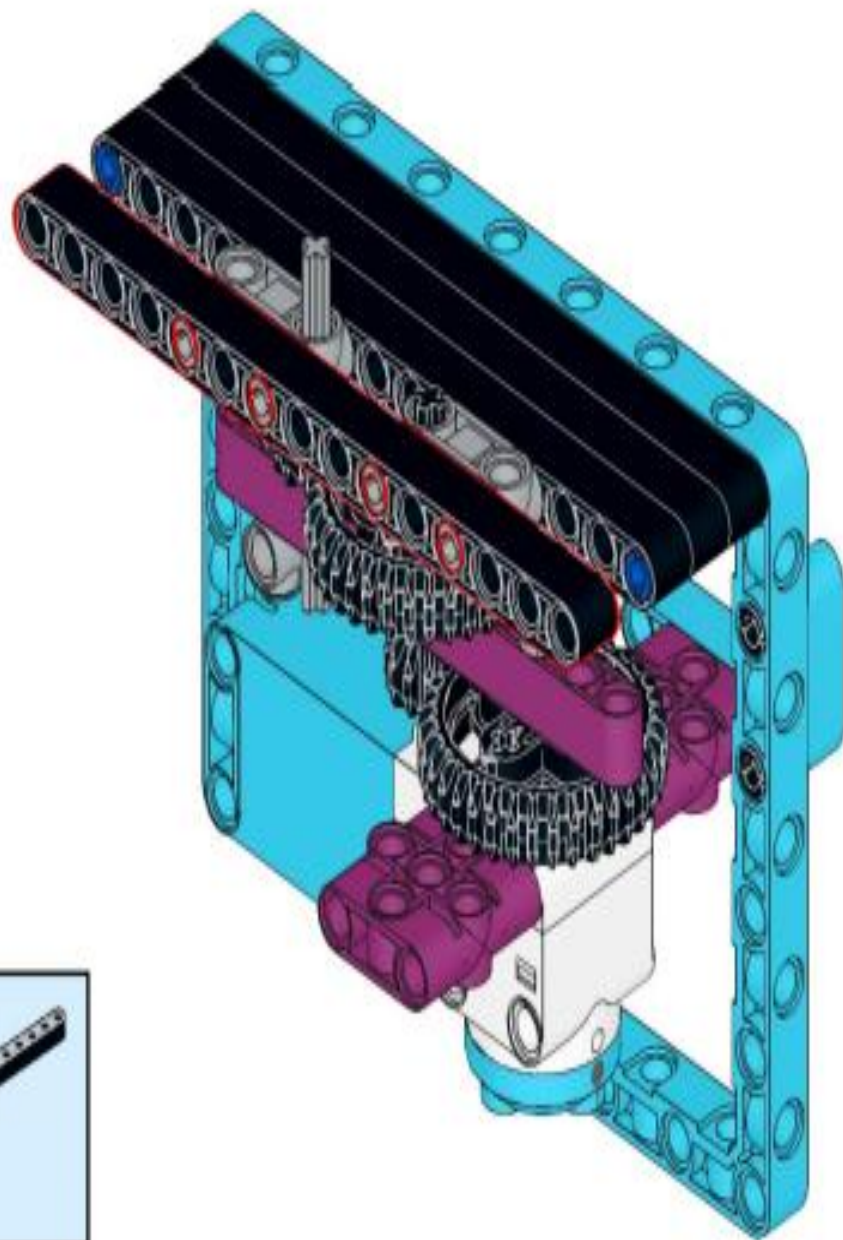
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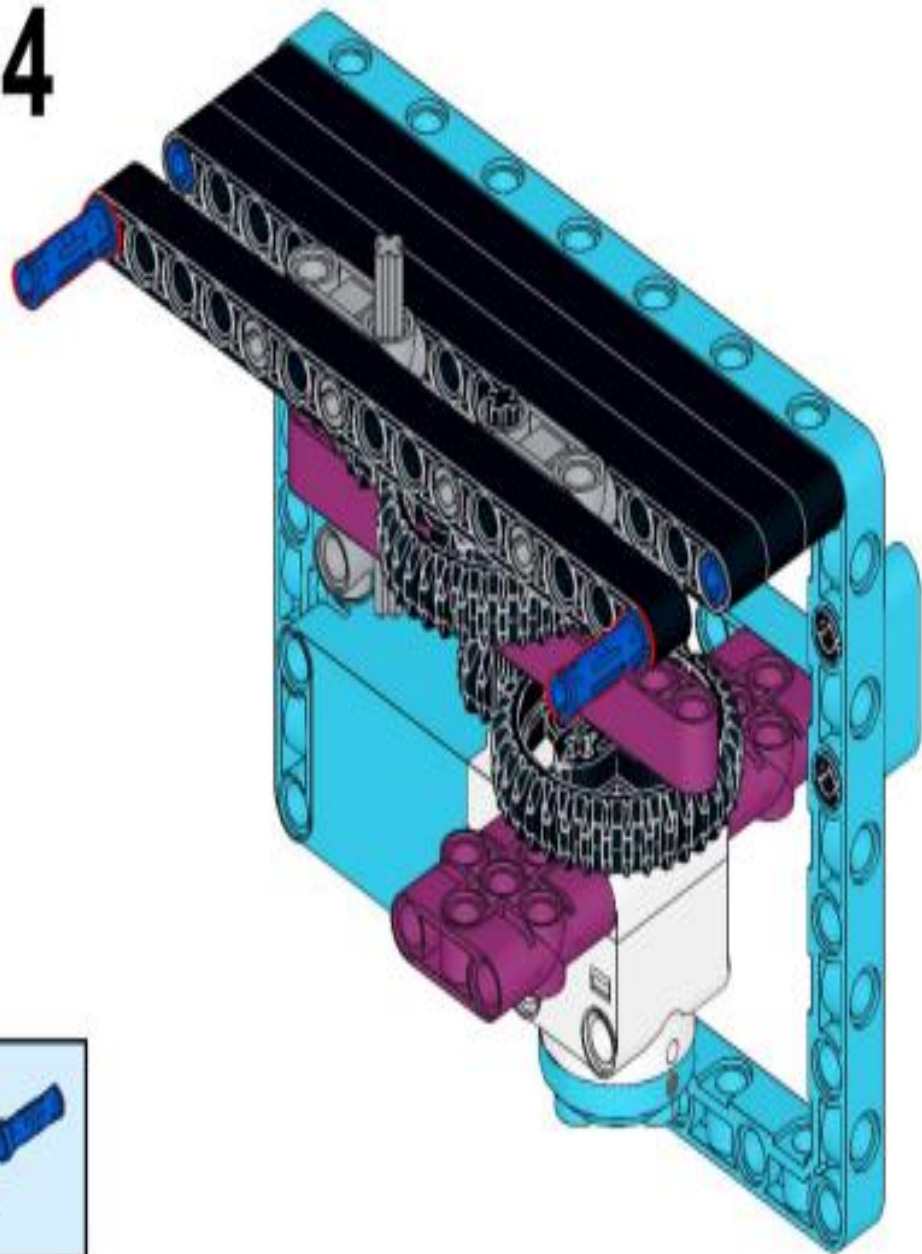
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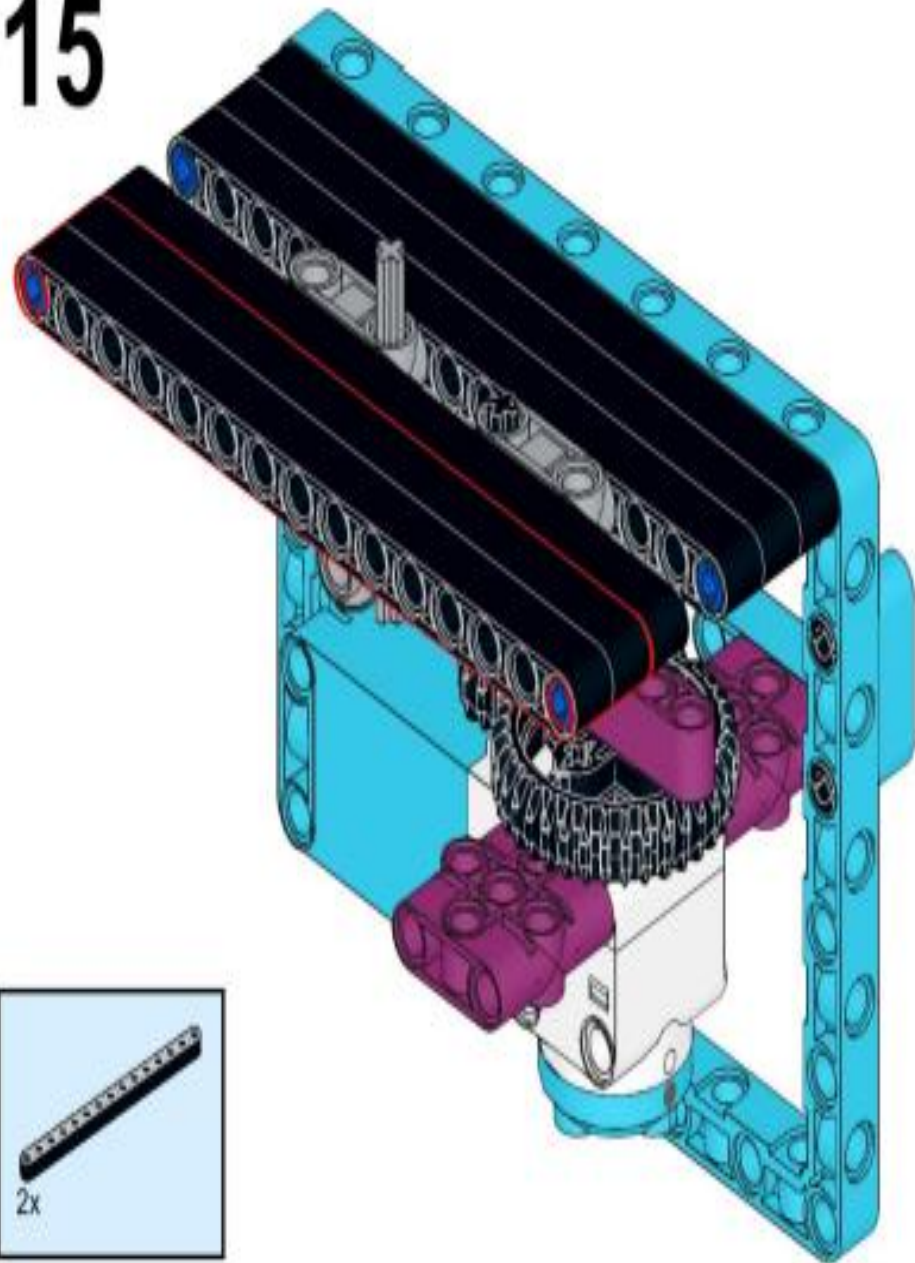
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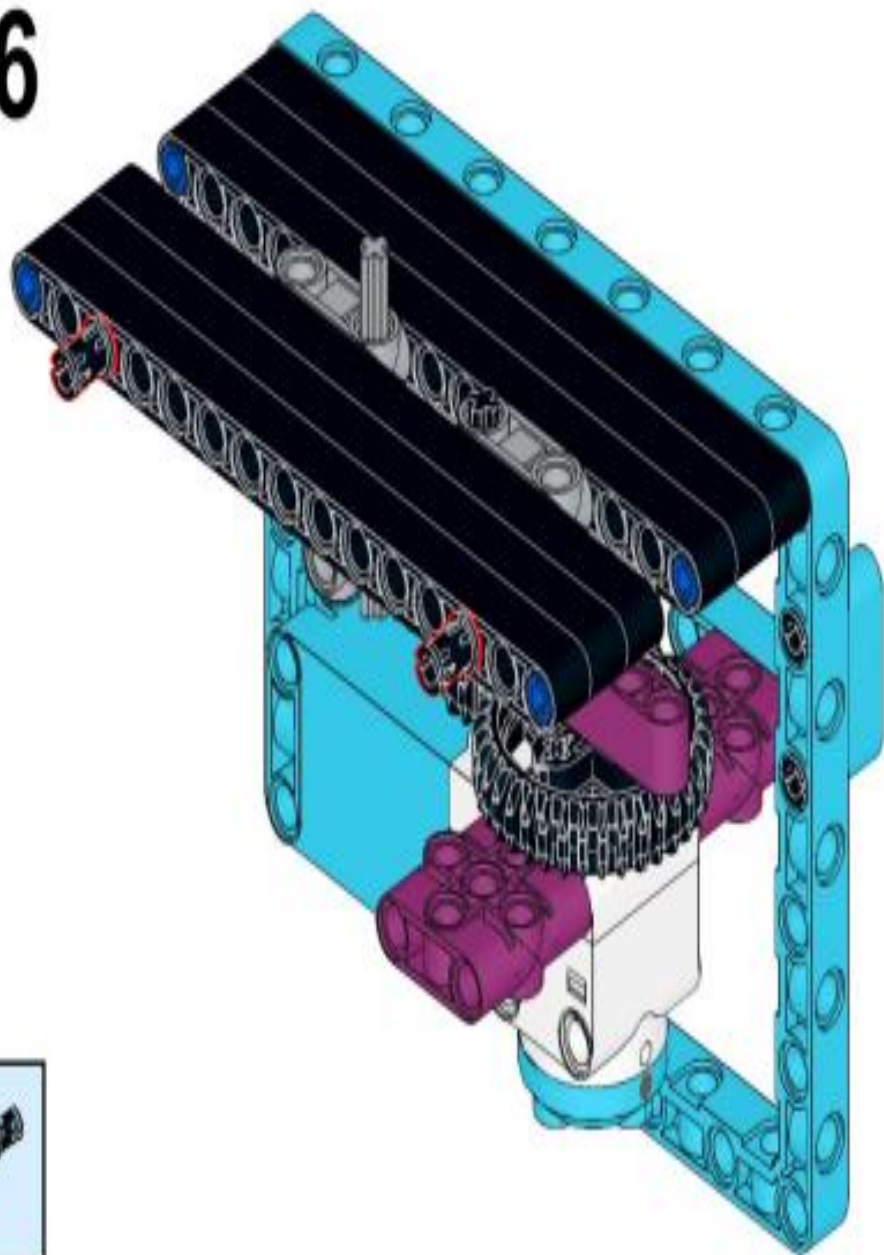
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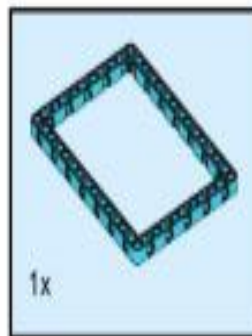
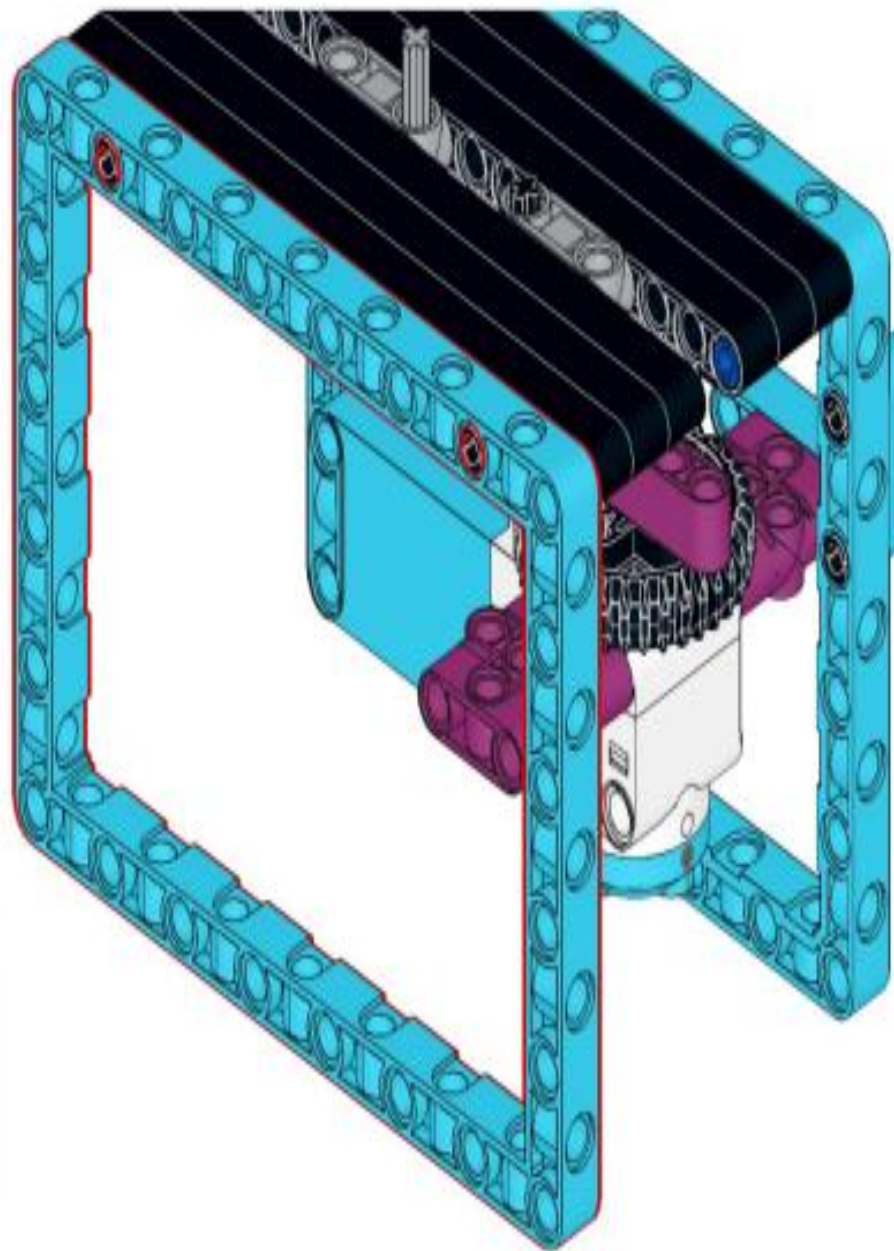
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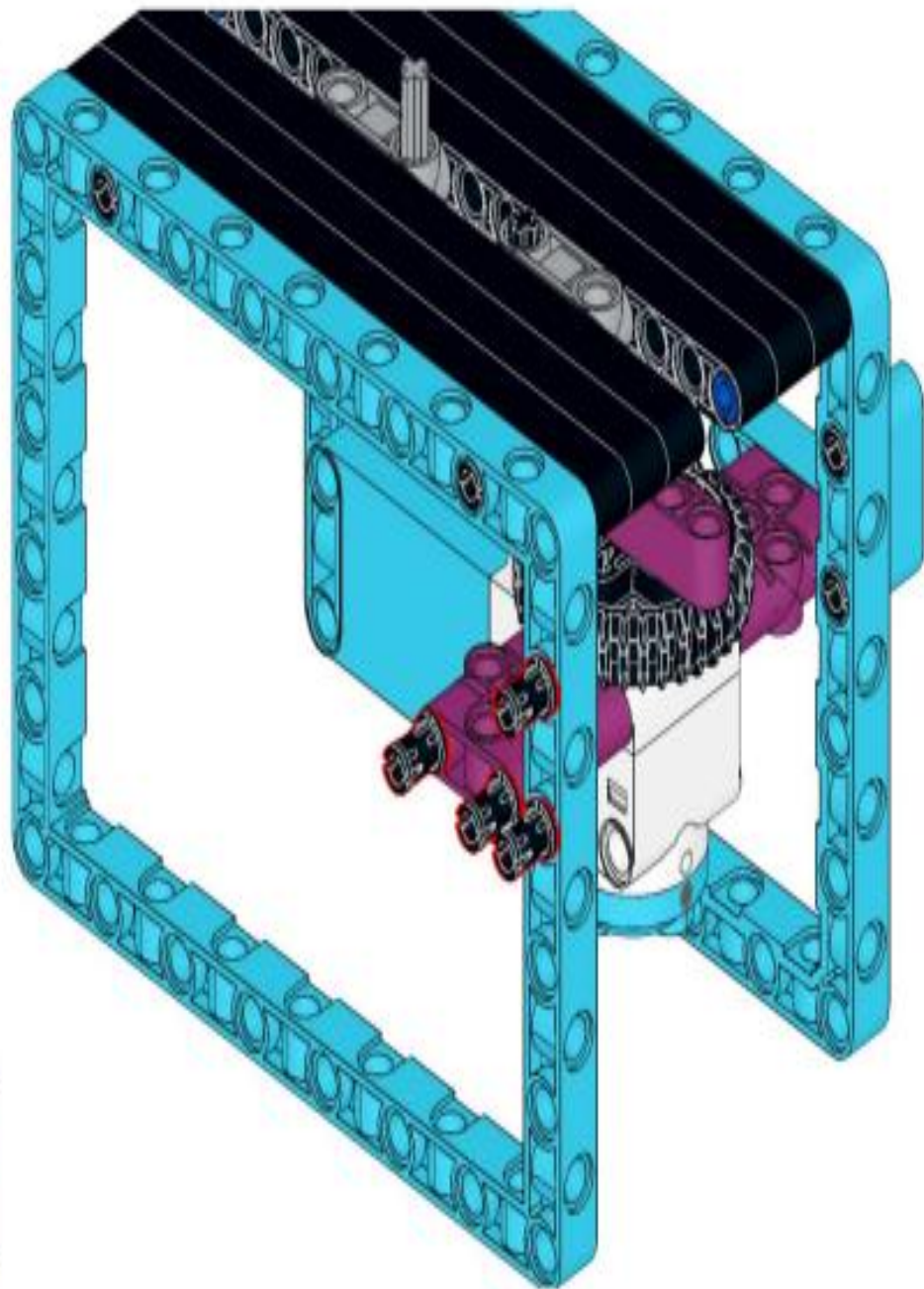
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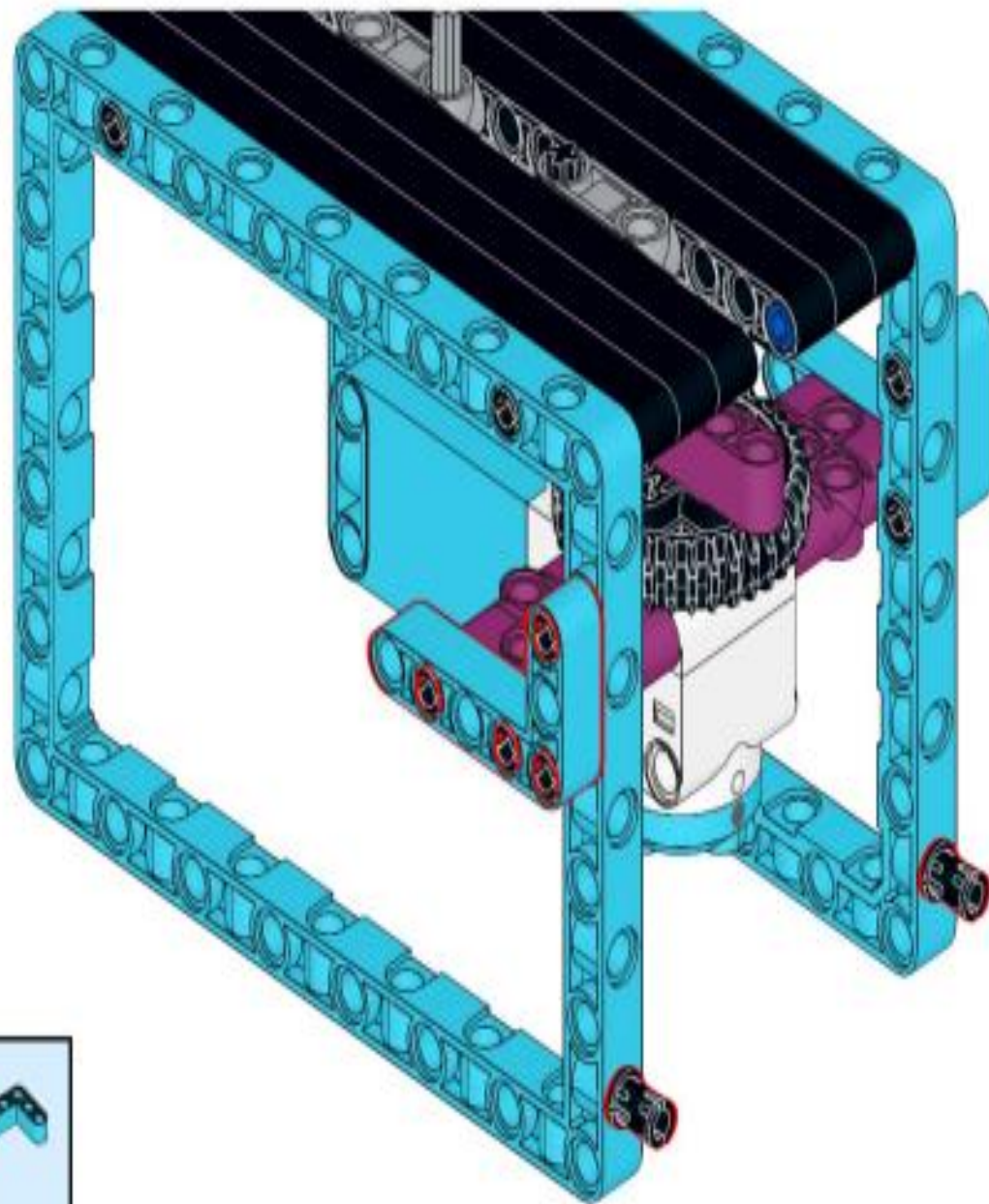
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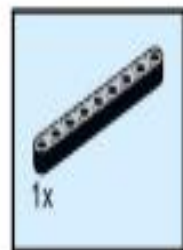
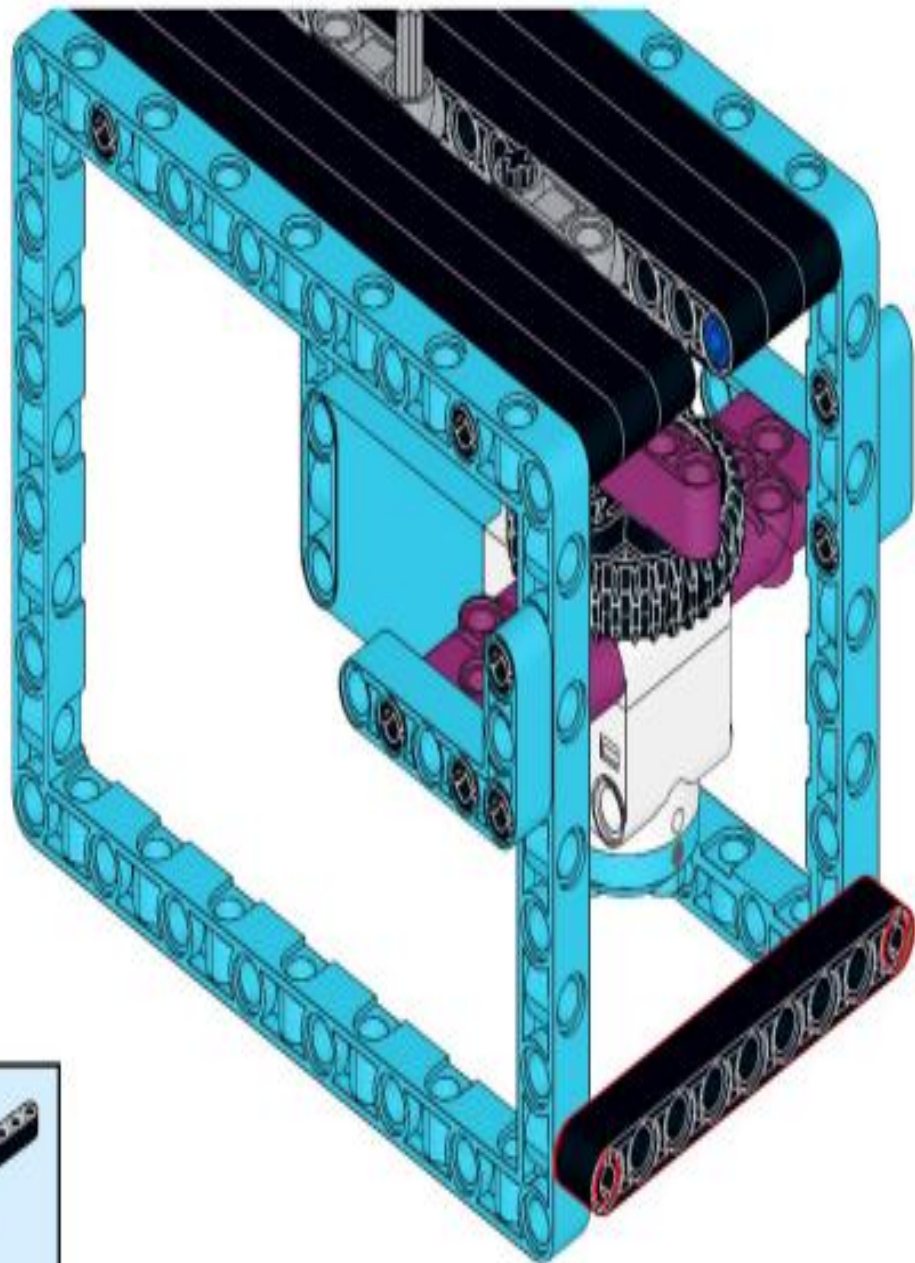
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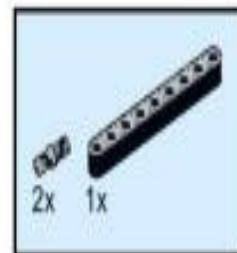
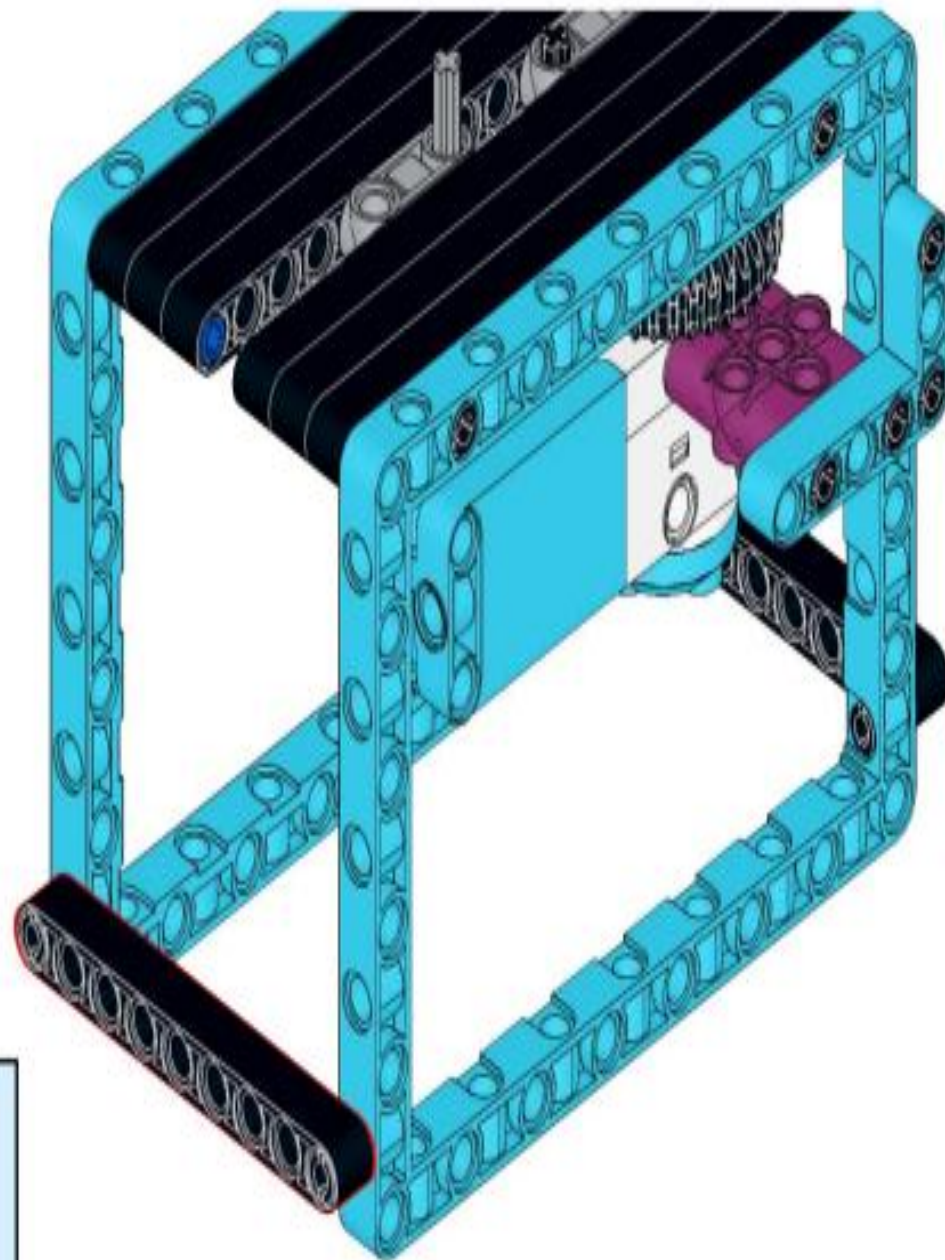
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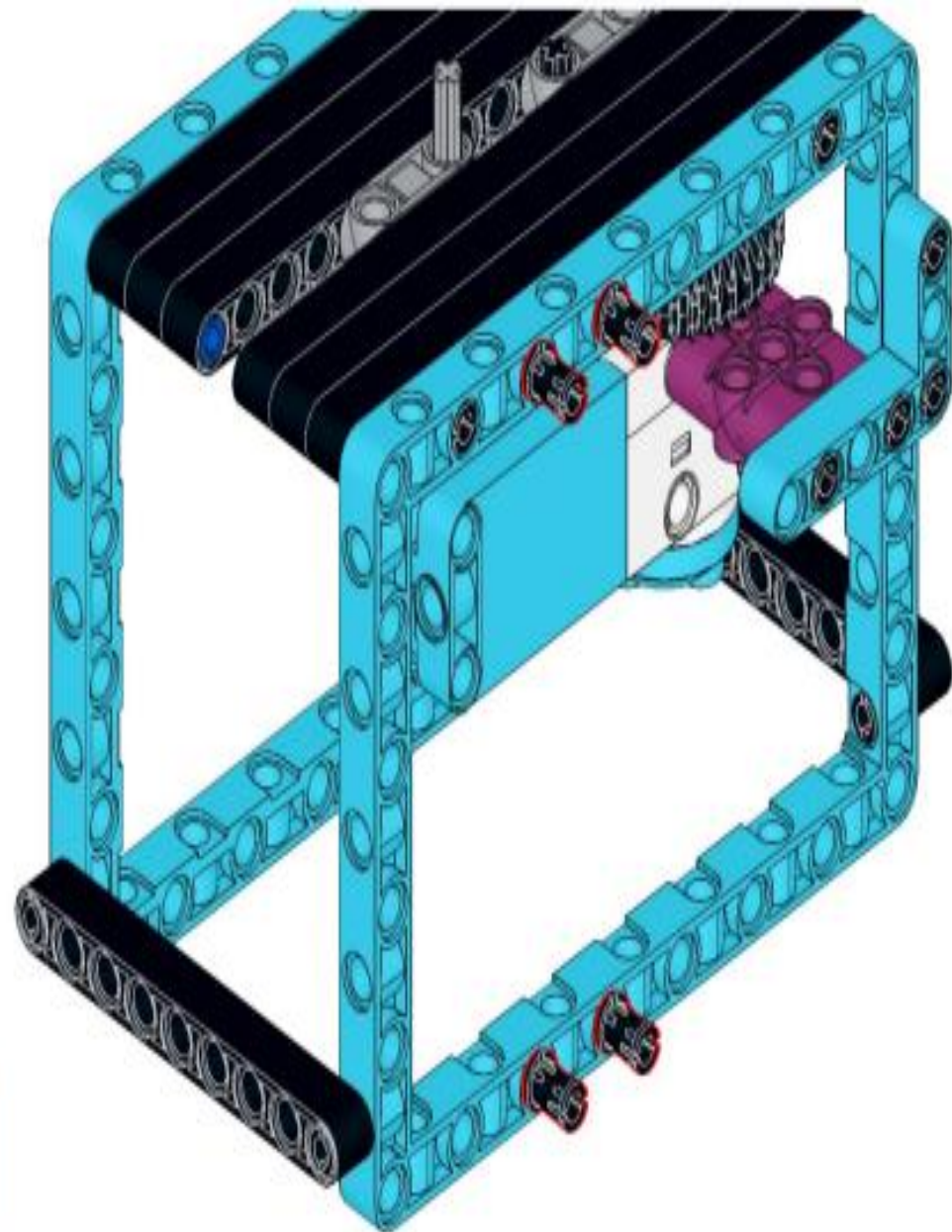
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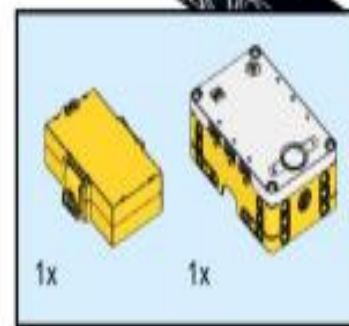
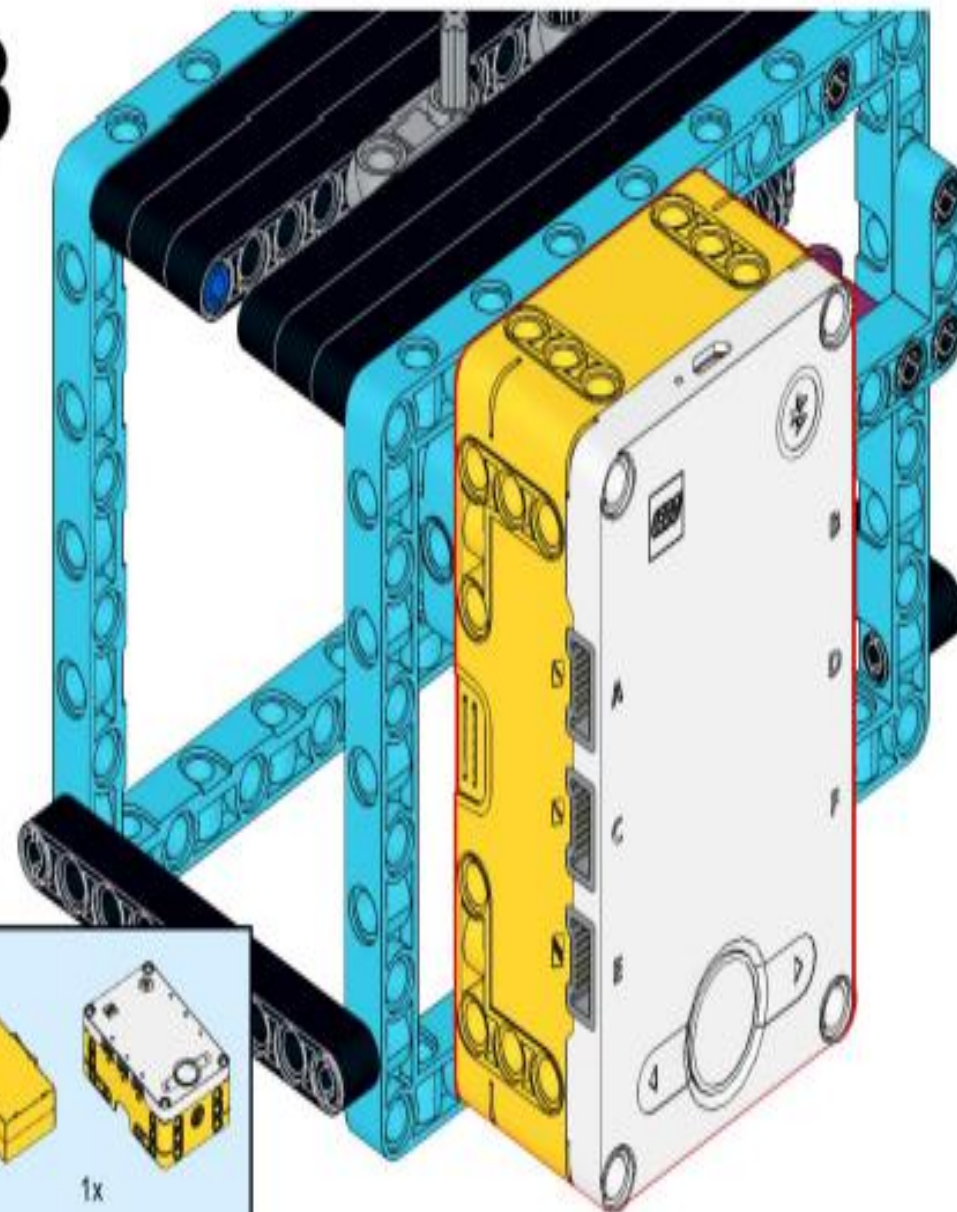
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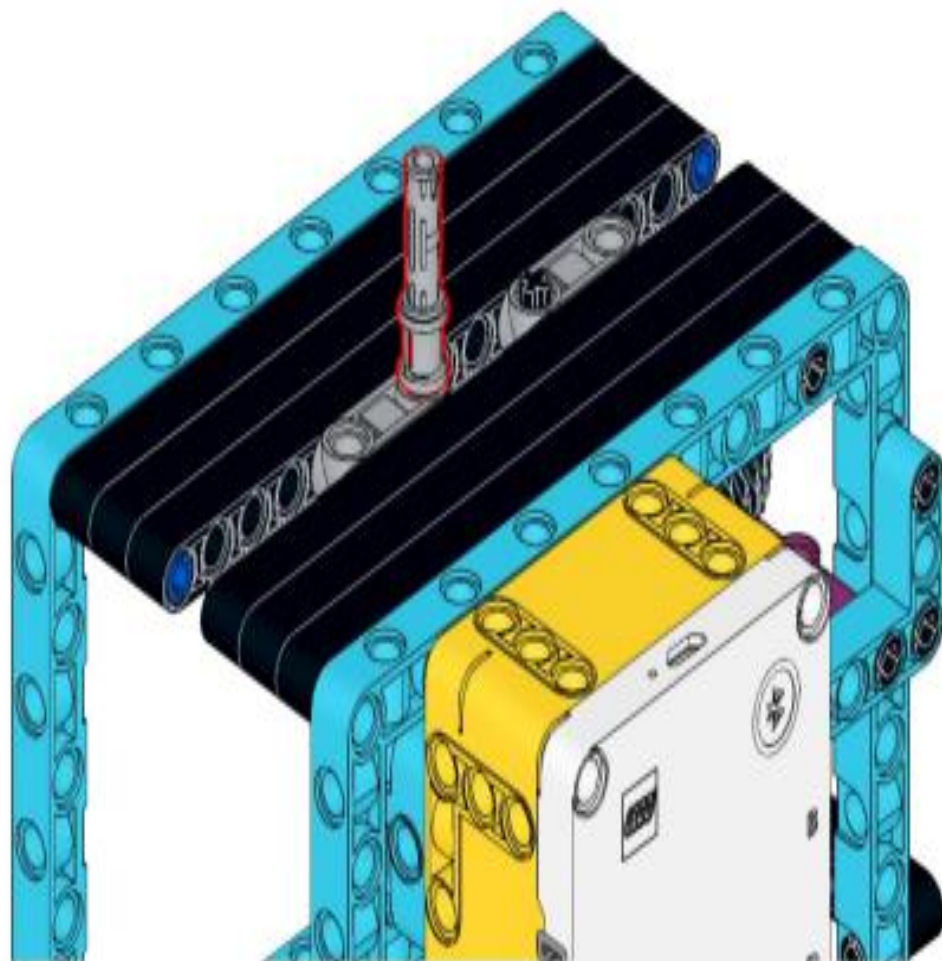
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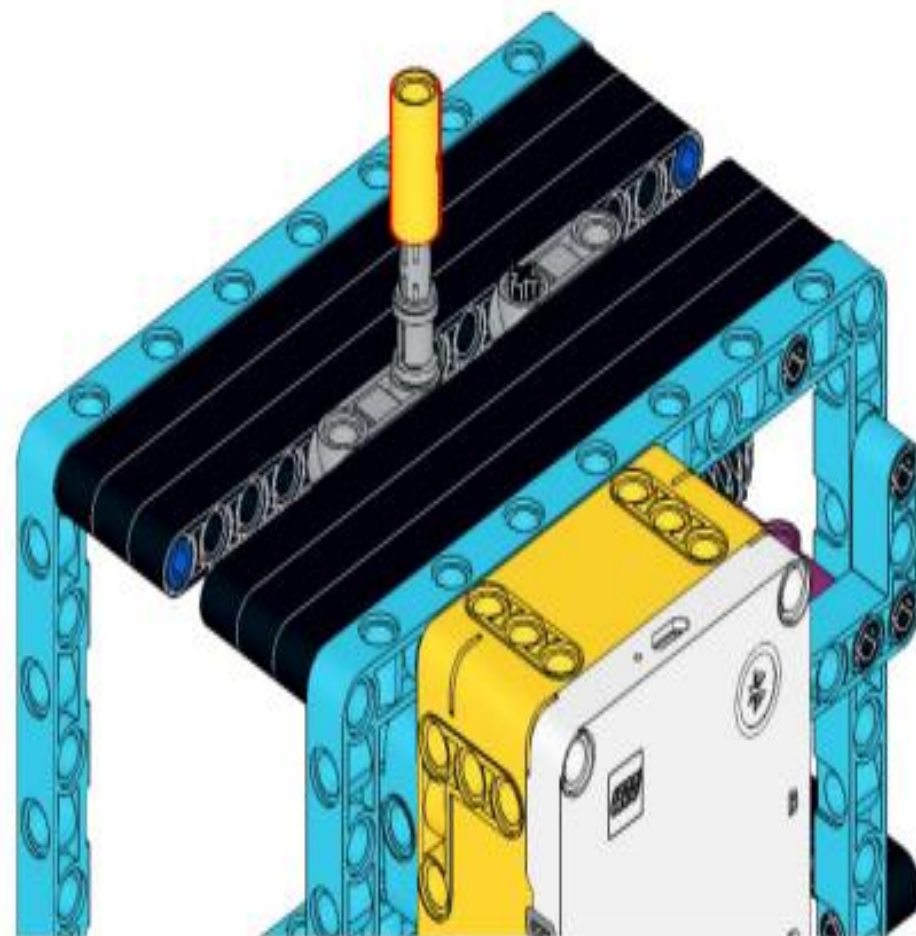
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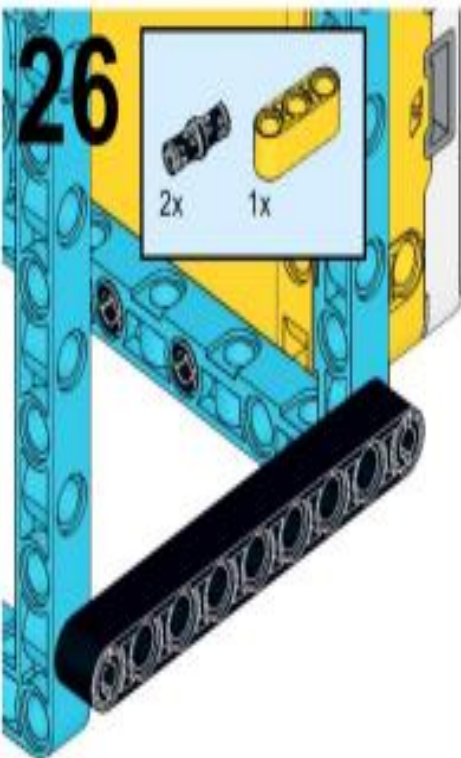


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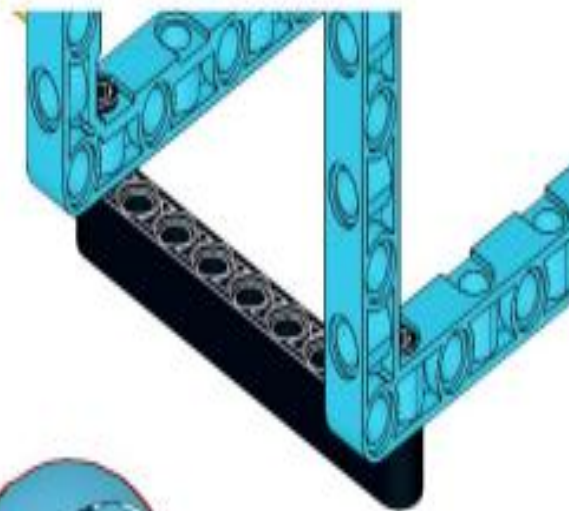
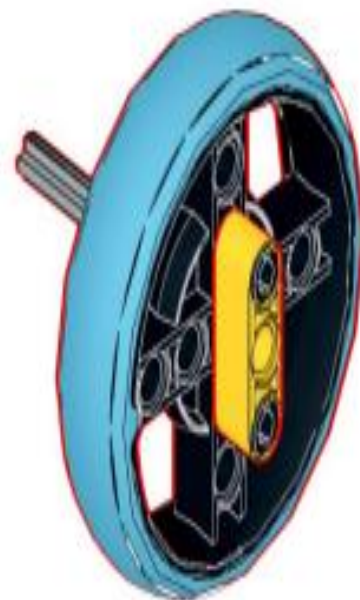


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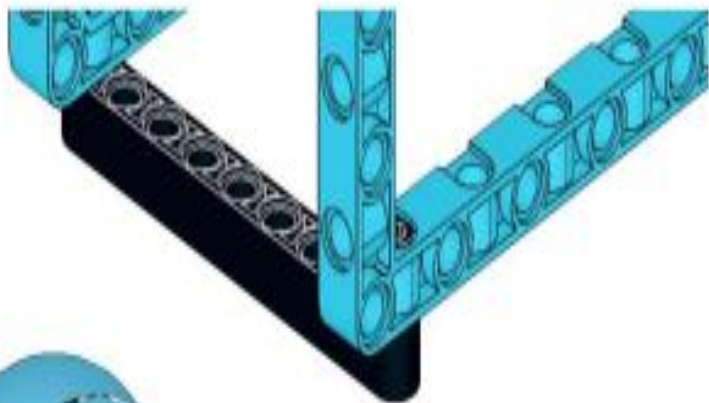
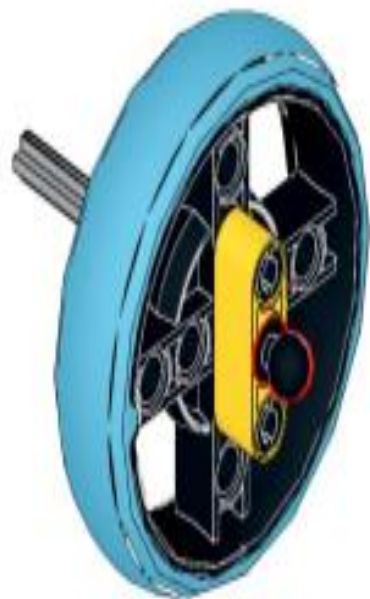




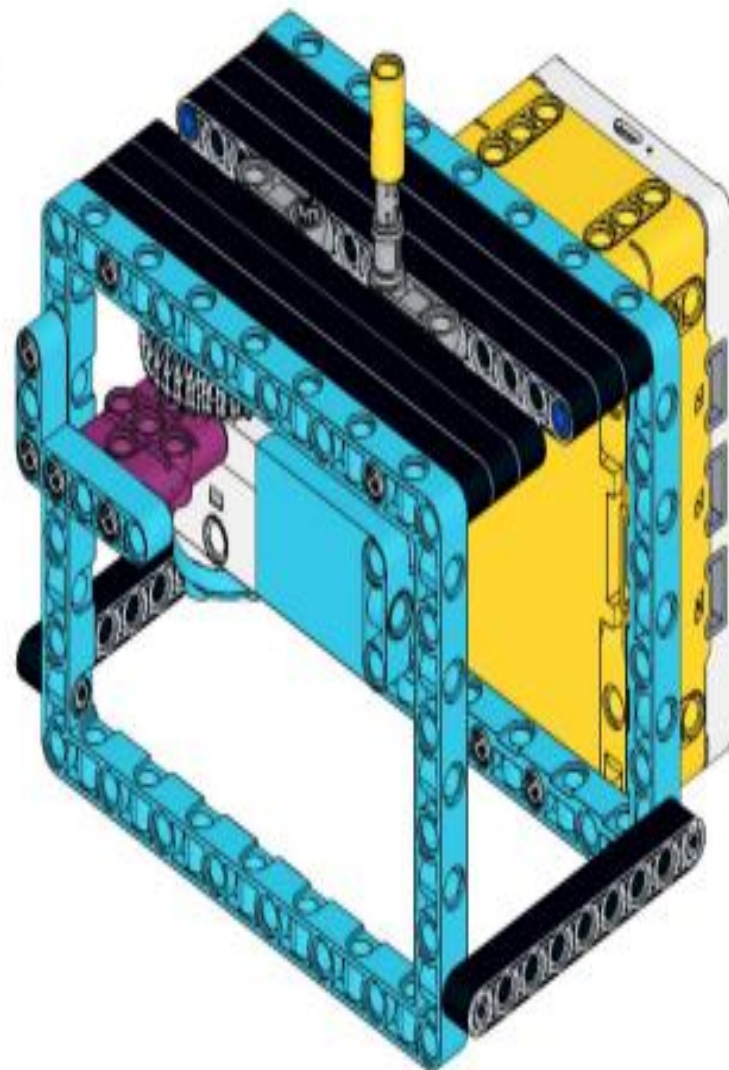
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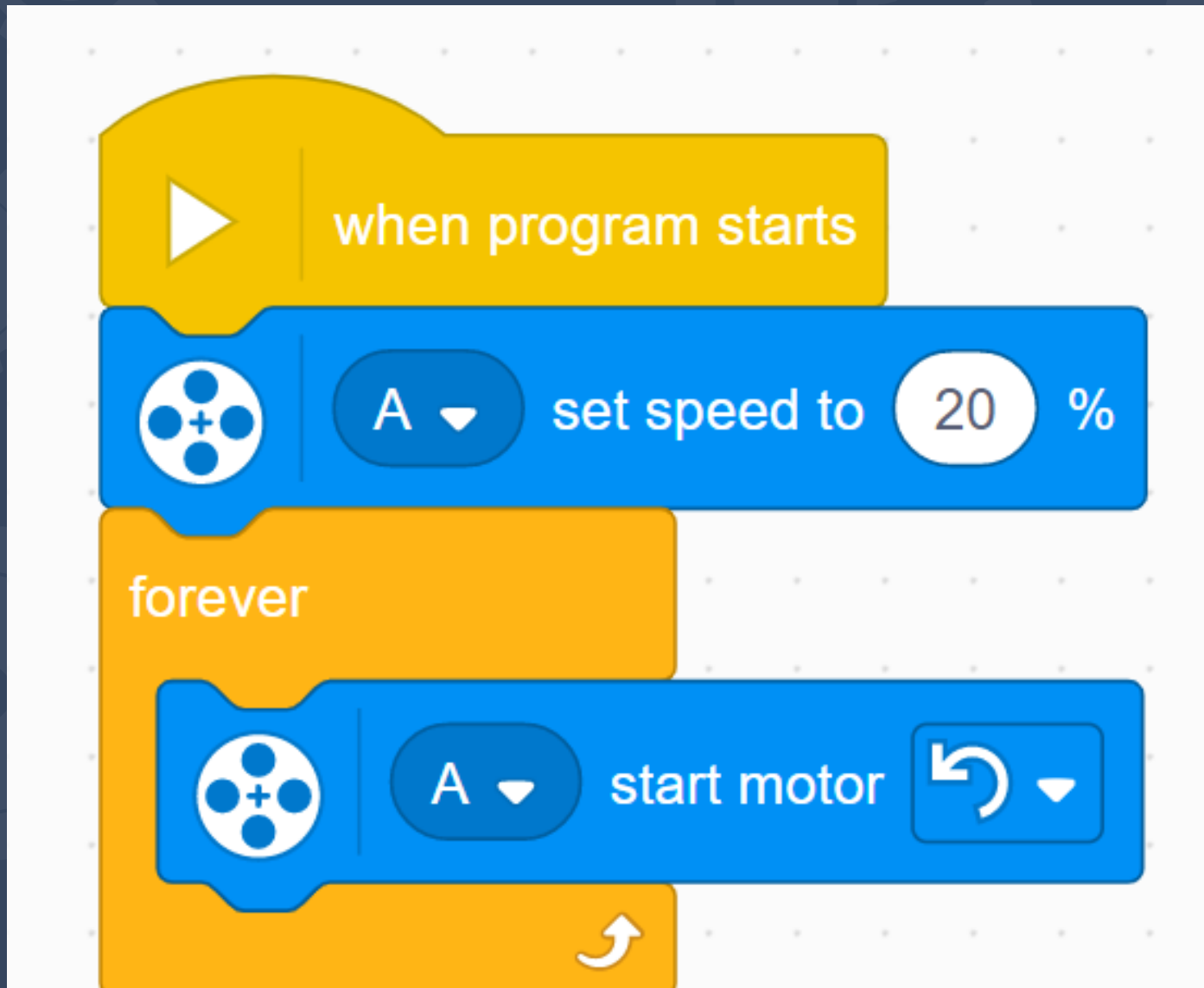
28



29



程式



旋轉的速度
1~100%

順時針
也可調逆時針

來試試看在馬達同樣轉速下

- 陀螺半徑 長與短有什麼影響？
- 將動力基座頃斜後陀螺會發生什麼事？

如果馬達轉速不同又會有什麼影響？

正反轉有差異嗎？