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# BUILDER



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# Artista, artesano, arquitecto y pionero de la aviación

Leonardo da Vinci (1452-1519) es el maestro de la innovación renacentista por excelencia. Poseedor de formidables talentos, una insaciable curiosidad y un carácter extravagante, Da Vinci era respetado por sus contemporáneos y, aún en nuestros días, sigue siendo merecidamente aclamado por su visión e ingenio creativo. Dedicó su vida a explorar y desafiar todo límite en el arte, la anatomía humana y animal, la física y la ingeniería impulsado por su pasión y determinación excepcionales y sus notables destrezas manuales. Sus magistrales creaciones pictóricas, como *La Gioconda* o *La última cena*, fueron su catapulta a la fama mundial en un primer momento, aunque su persistente fascinación por el vuelo humano no genera un menor grado de admiración.





“El placer más noble es el  
júbilo de comprender”.

*Leonardo da Vinci*



# Inspiración para volar como las aves

Aunque la historia oficial registra que los inventos aeronáuticos de Leonardo da Vinci no se materializaron en su época, siglos después, sus ideas, diseños y estudios tuvieron un papel fundamental en la creación de la primera aeronave capaz de volar. El ornitóptero es una de sus obras más famosas, pero todas ellas se basan en la misma idea de una sola persona al mando de un artefacto mecánico con alas. Usando la fuerza de su propio cuerpo, el piloto debía tirar de palancas y cuerdas o empujarlas para mover las alas hacia arriba y hacia abajo.



**“La simplicidad es la máxima sofisticación”.**

*Leonardo da Vinci*

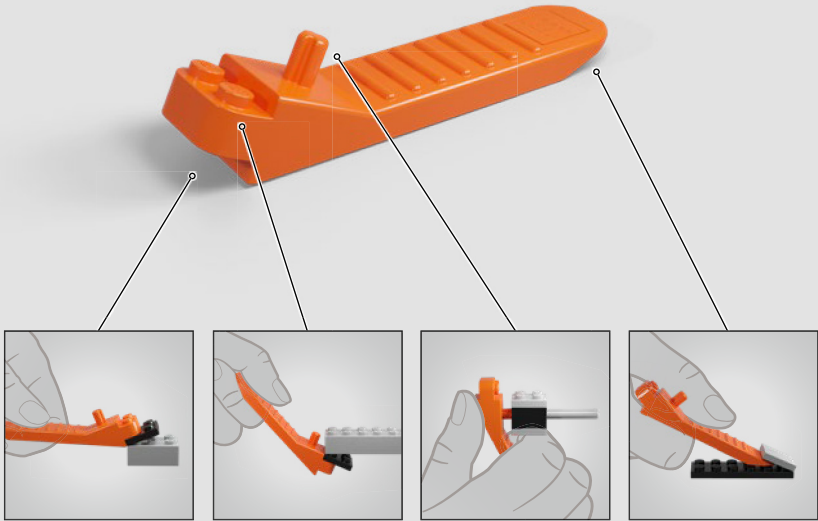


## Impresiones del equipo de diseño de LEGO®

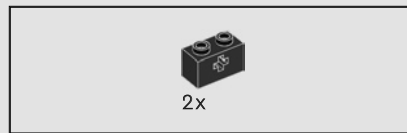
“Este fue el punto de partida de nuestro concepto: crear una máquina cuyas partes móviles, en su totalidad, estuvieran interconectadas y se activaran mediante la tracción de cordeles o, en este caso, de un solo cordel. Se trata de un modelo aparentemente simple, aunque representa un gran desafío de ingeniería LEGO®. Se diseñó para que pareciera estar hecho de madera, lino y cuerda. La cola y las alas tienen un esqueleto construido con ladrillos, y en las alas de tela se puede distinguir un patrón impreso. ¡Incorporar el cordel textil como elemento principal del mecanismo de aleteo requirió de un considerable esfuerzo! Los componentes mecánicos del modelo se dejan descubiertos para resaltar las partes funcionales y la visión de Leonardo, así como para dar oportunidad de emprender el vuelo a nuestra propia interpretación del diseño original”.

**Antica Bracanov**

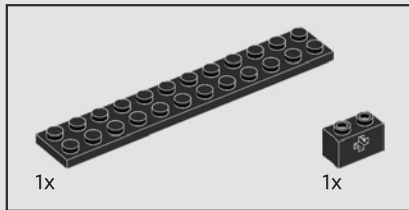
Diseñadora sénior de LEGO®



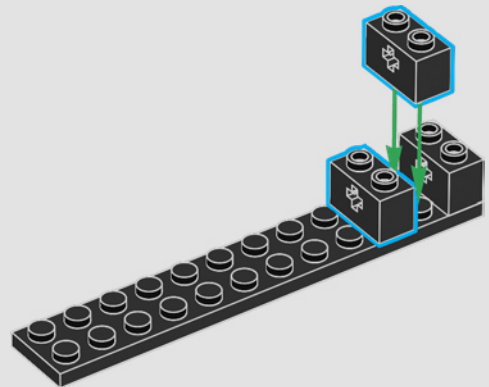
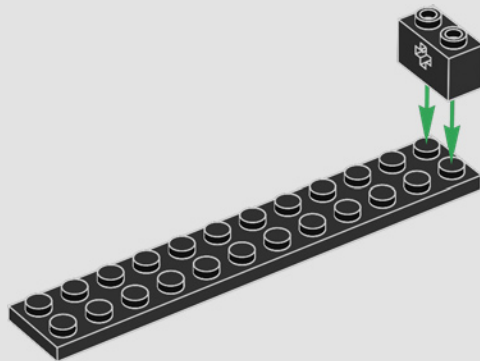


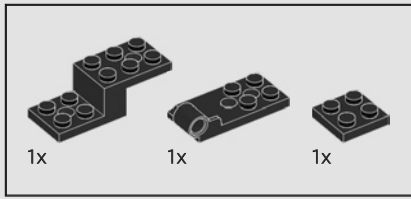


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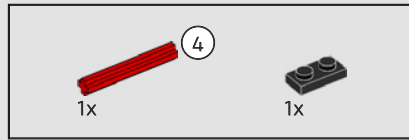
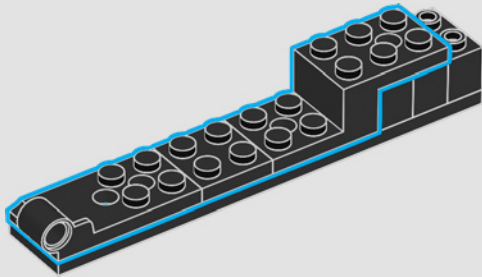


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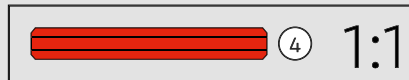
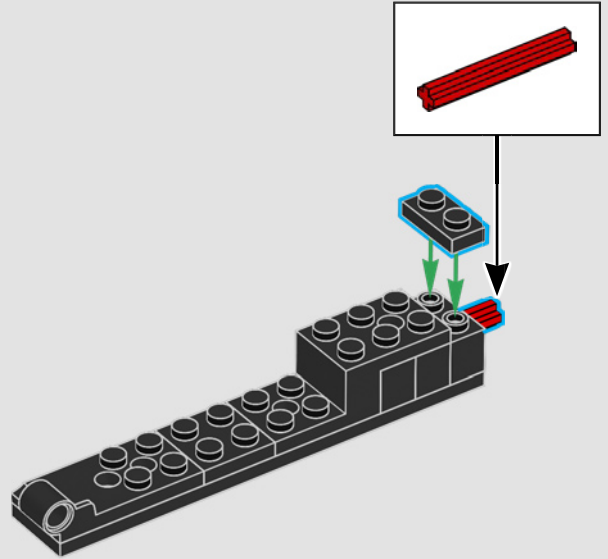


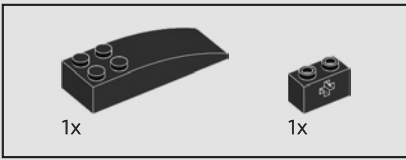


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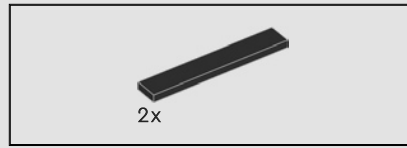
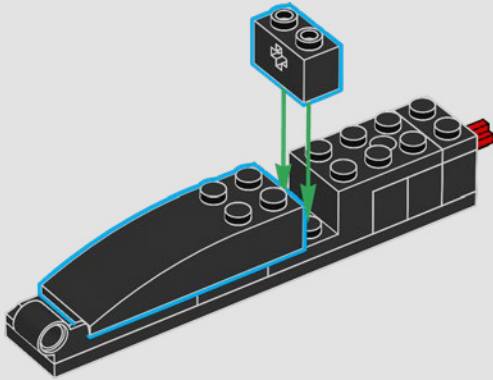


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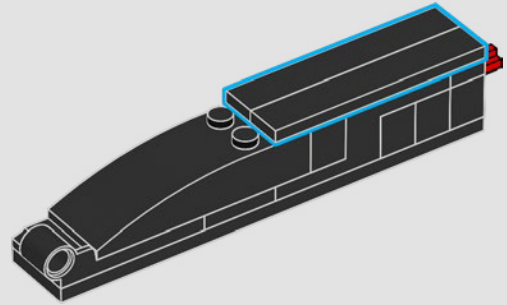


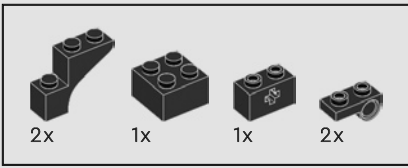


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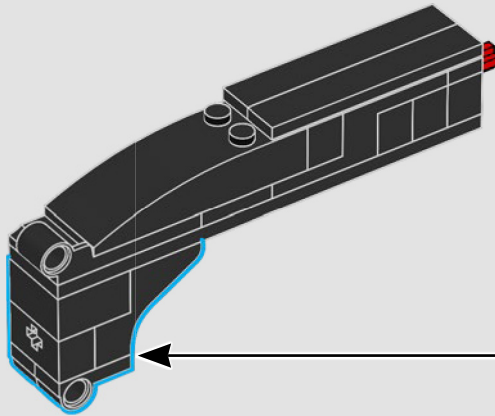
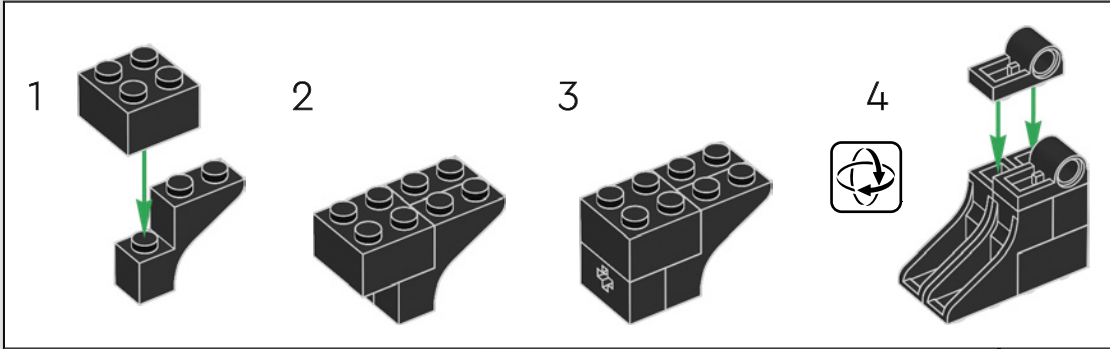


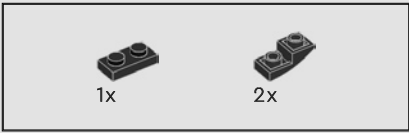
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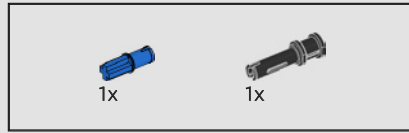
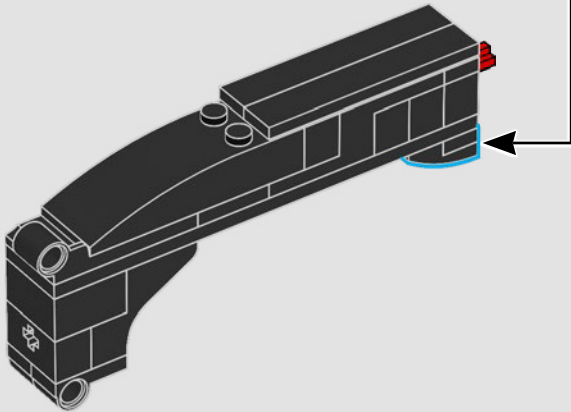
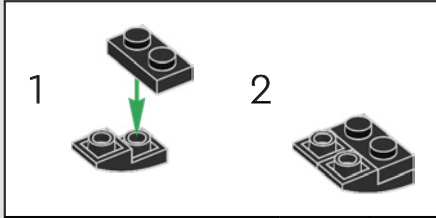


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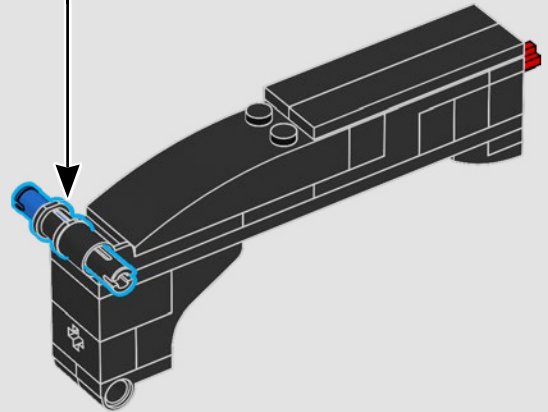
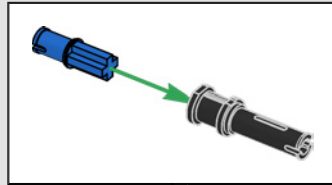


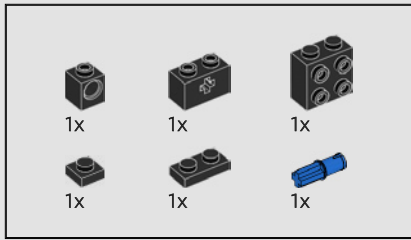


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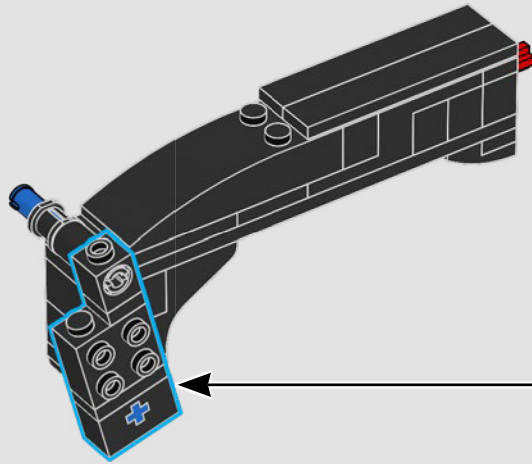
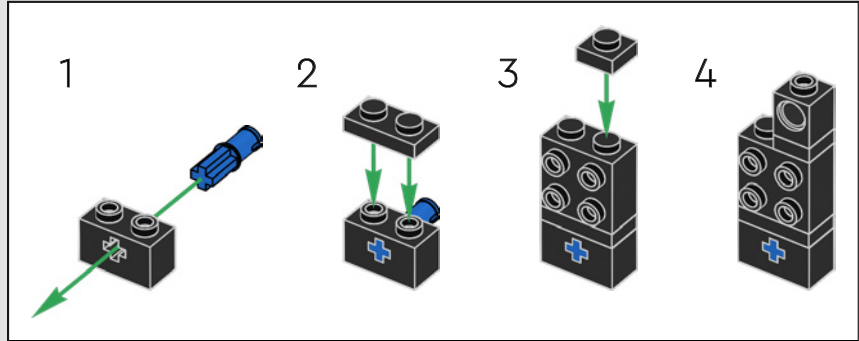


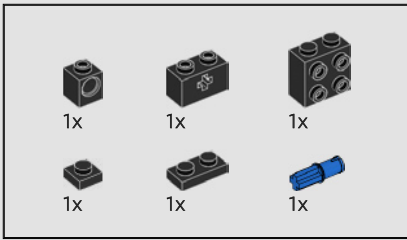
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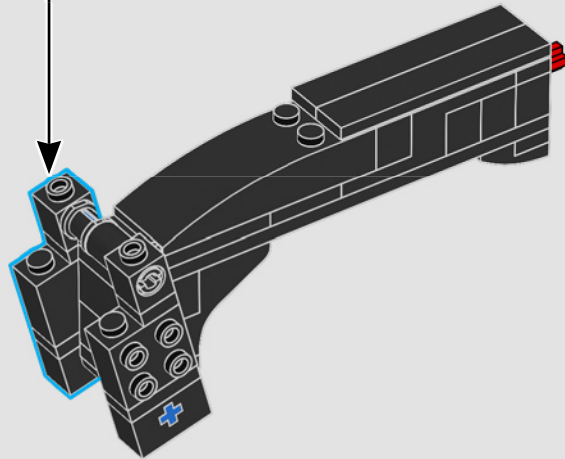
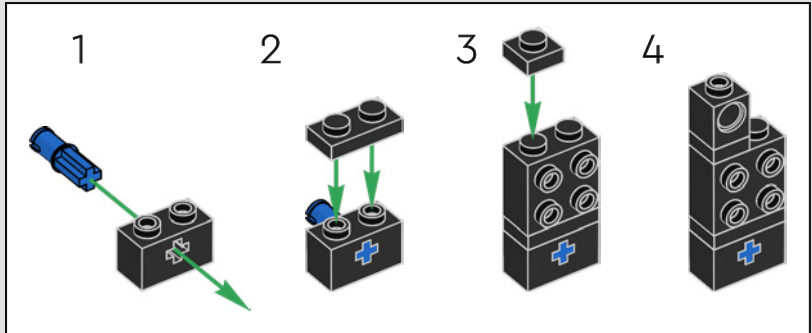


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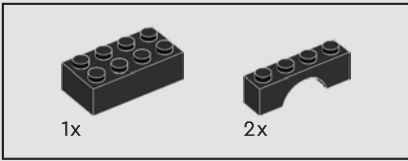




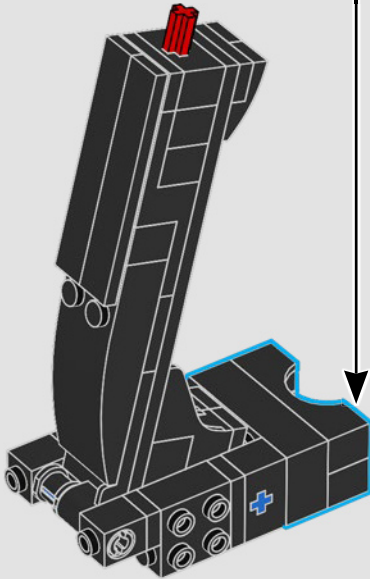
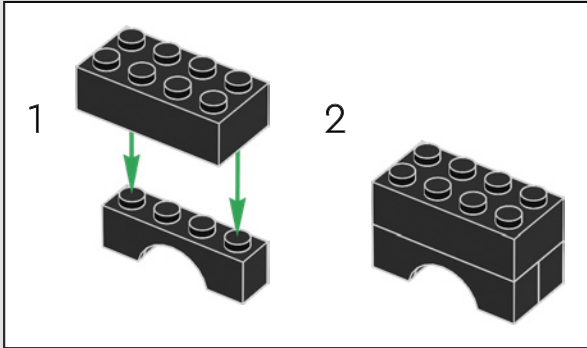
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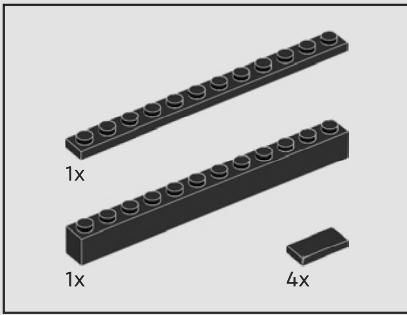
Una de las máquinas de Da Vinci, la conocida como *Il grande nibbio*, se inspiró y nombró en honor de un ave de la familia *Accipitridae*: el milano.



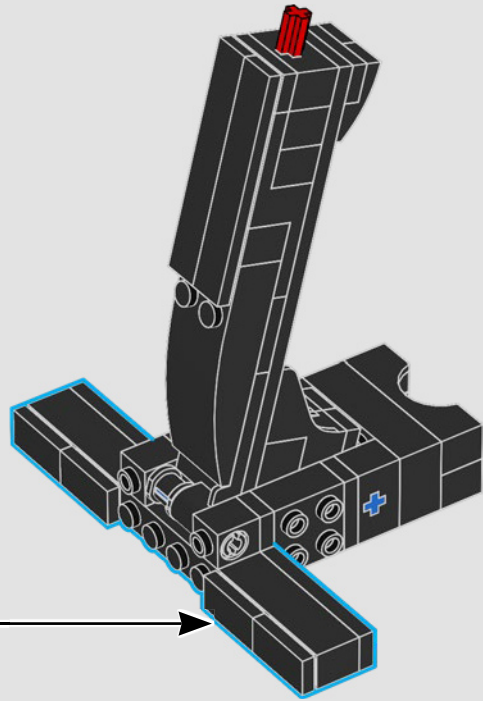
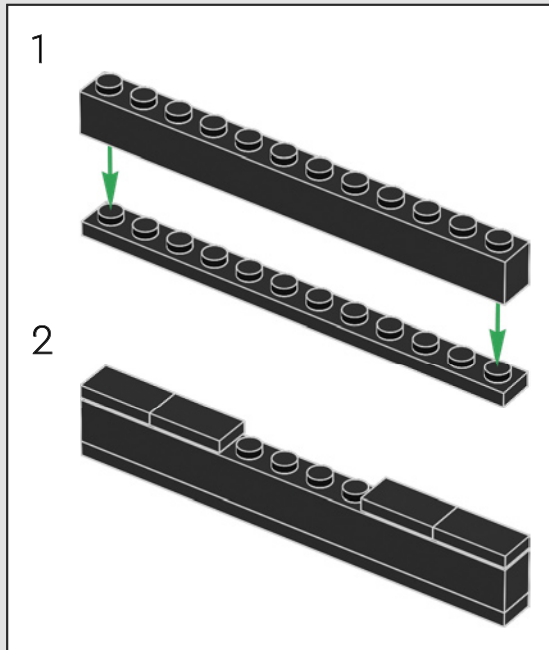
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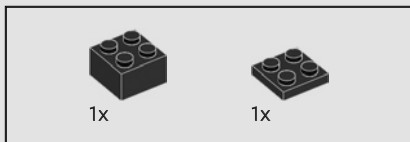




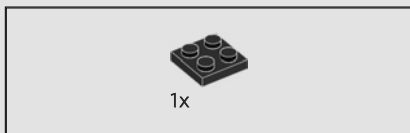
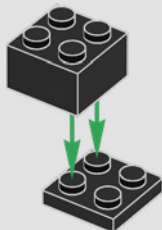


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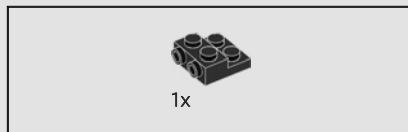
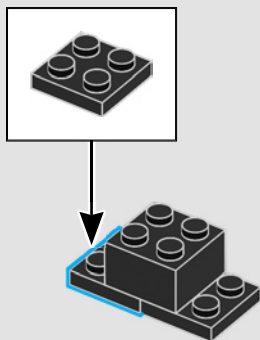




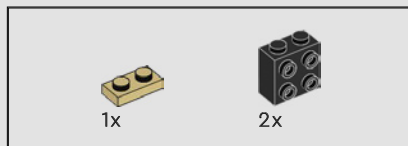
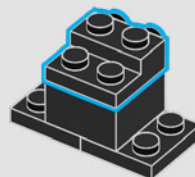
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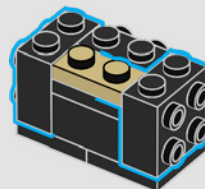
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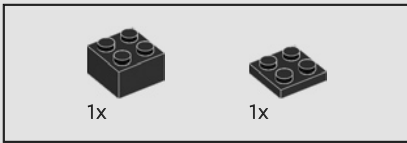


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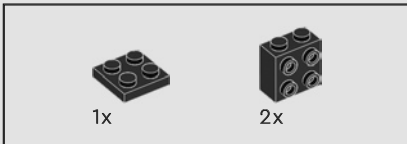
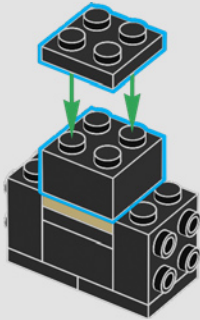


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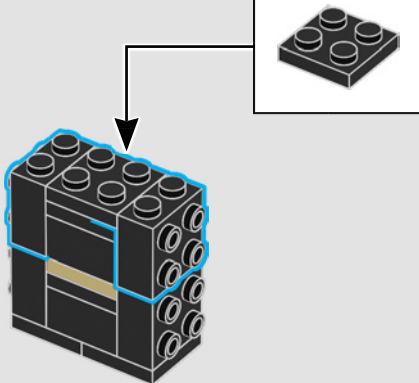




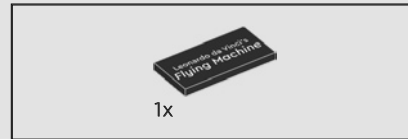
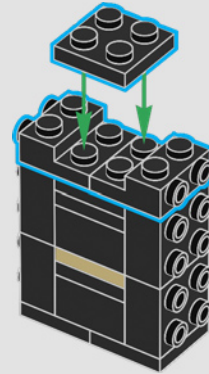
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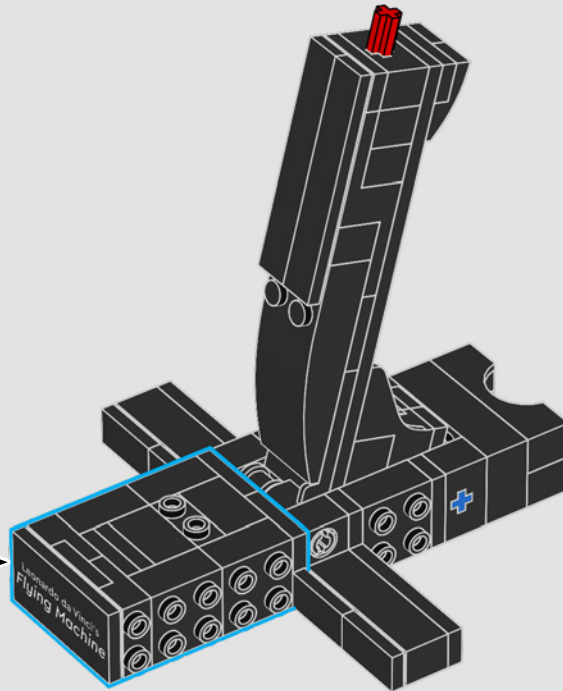
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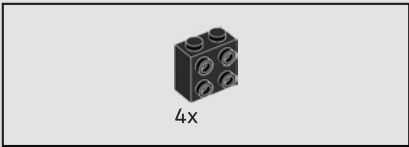




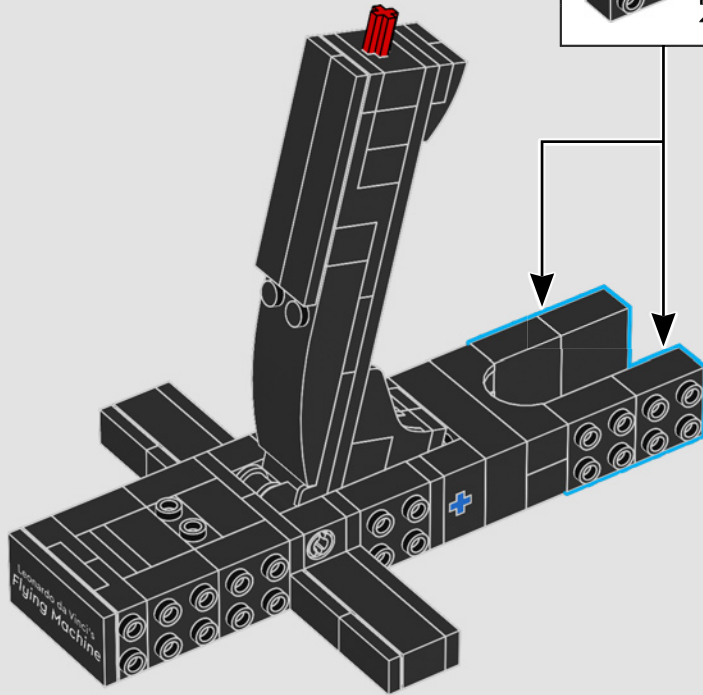
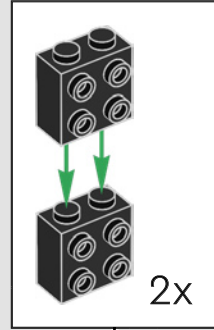
Se sabe que Da Vinci escribía en sentido inverso en sus cuadernos. Para poder leer sus notas manuscritas, hay que reflejar la página en un espejo.

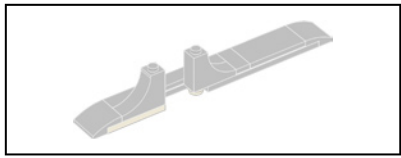
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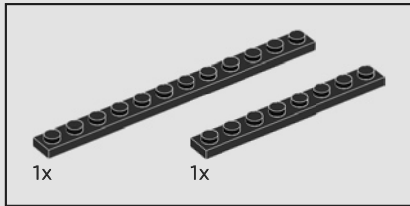


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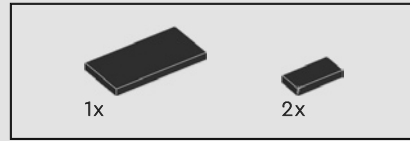
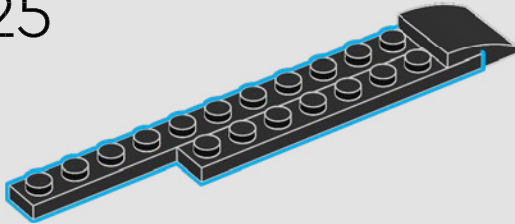




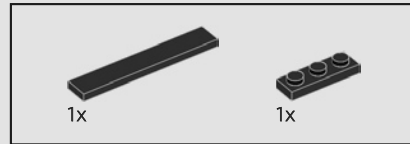
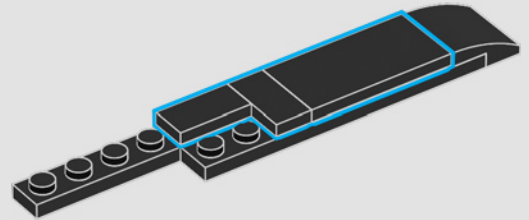
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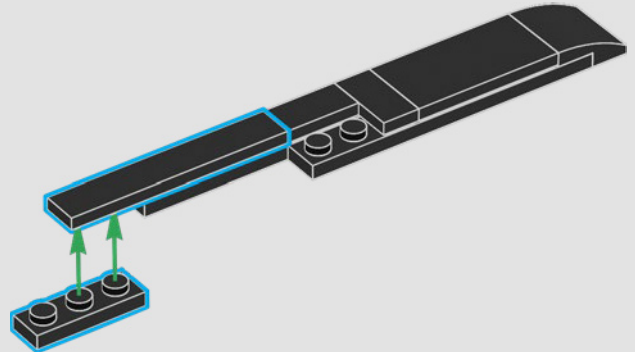
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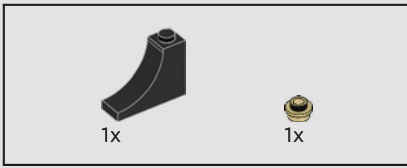


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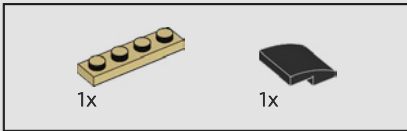
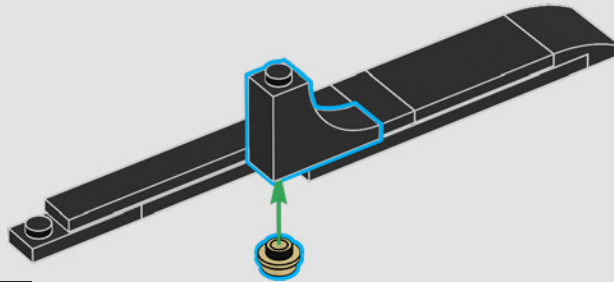


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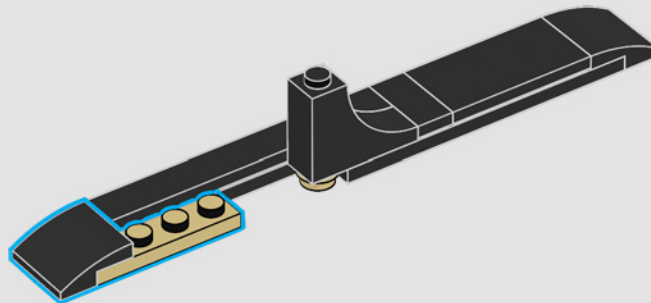


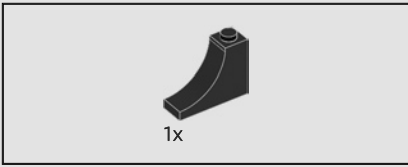


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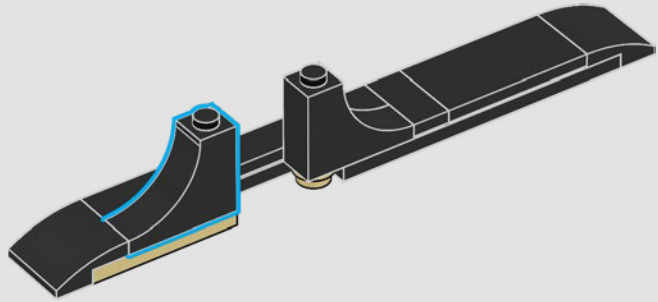


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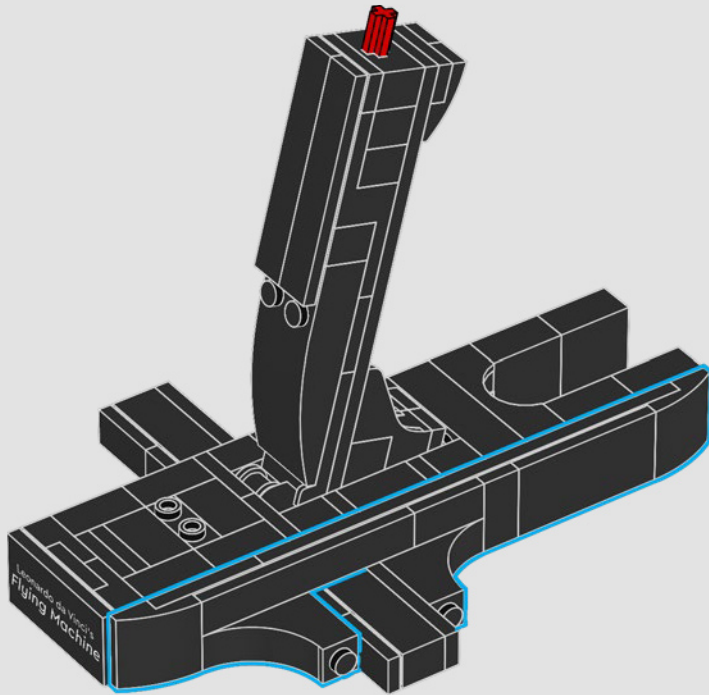




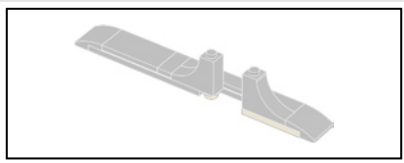
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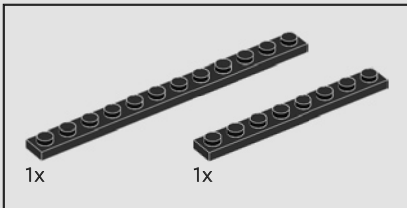
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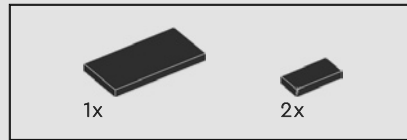
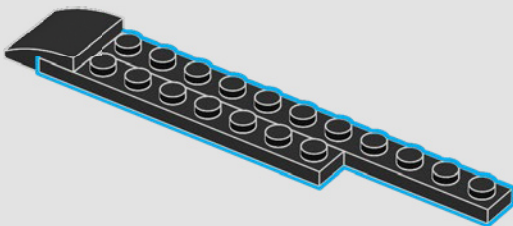




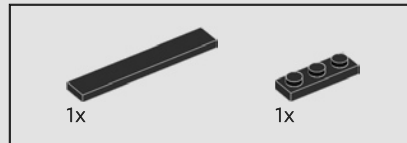
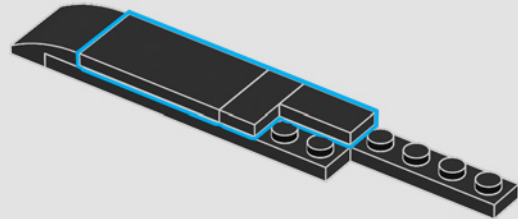
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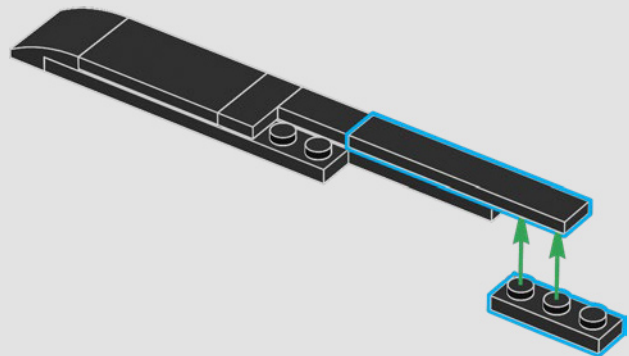
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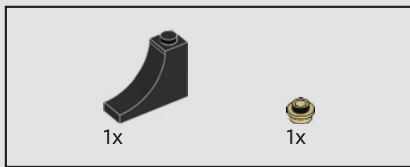


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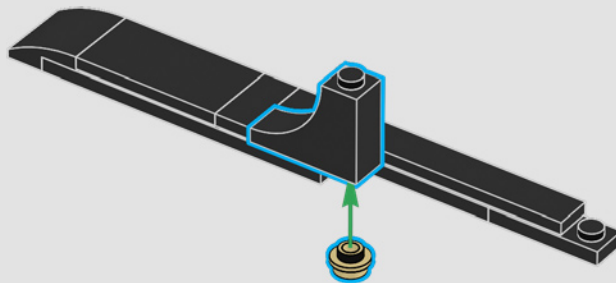


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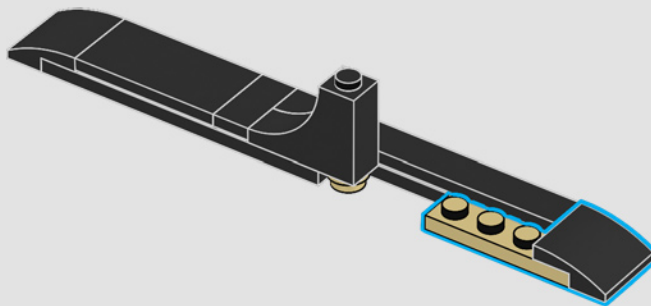


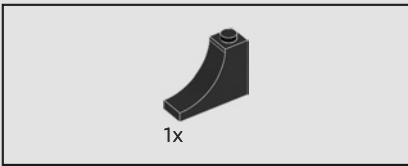


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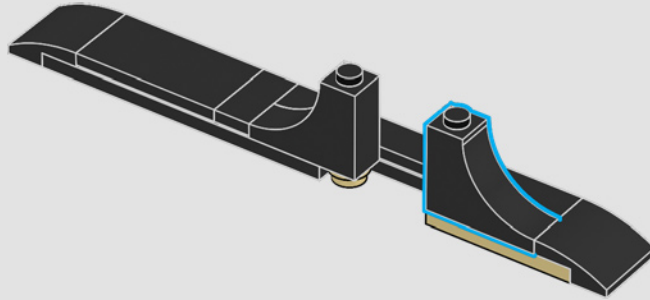


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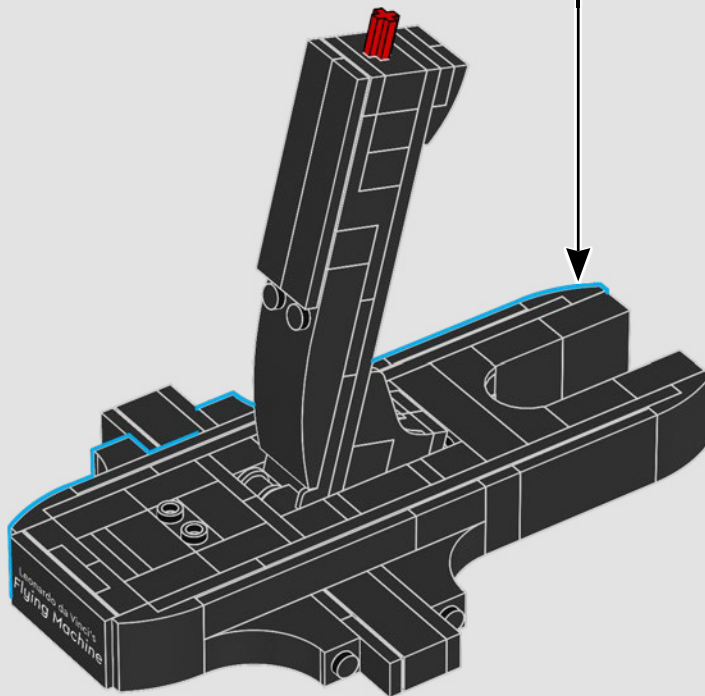




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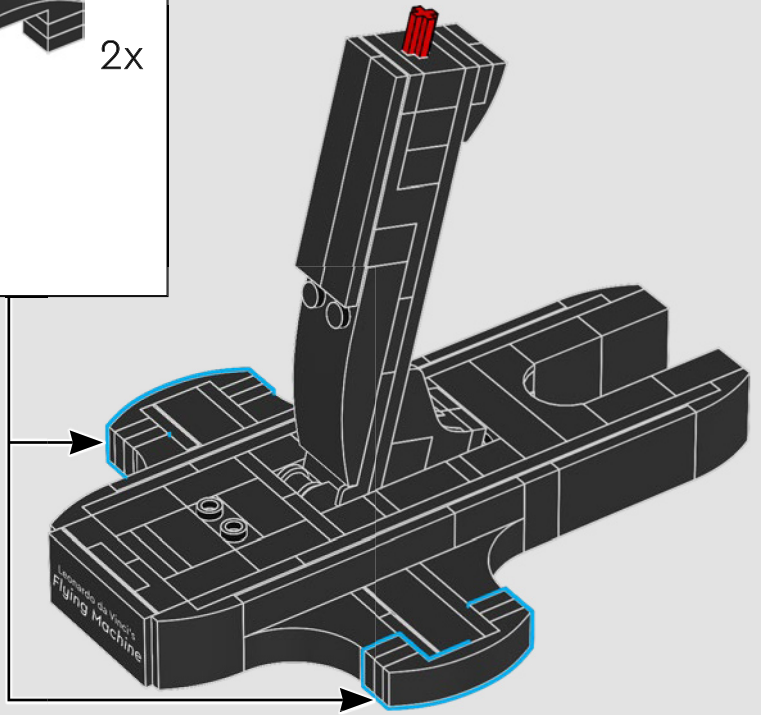
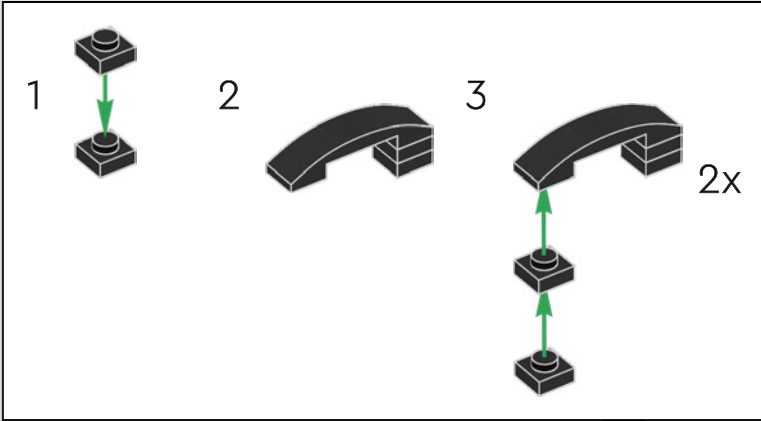




Es conocido que Leonardo da Vinci escribió más de 35.000 palabras e hizo más de 500 bocetos relacionados con el vuelo y las máquinas voladoras.

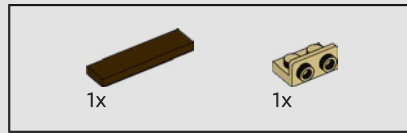
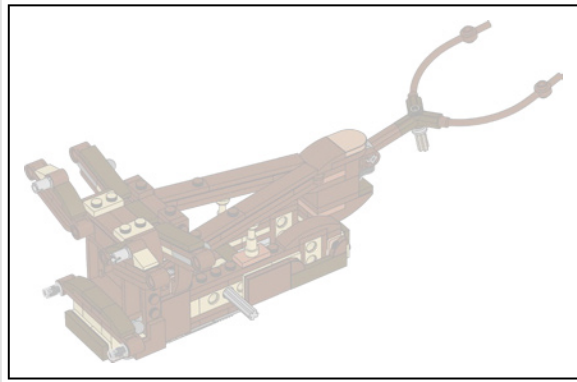
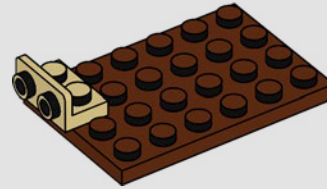


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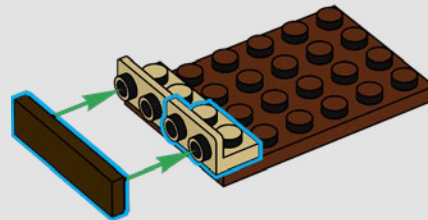


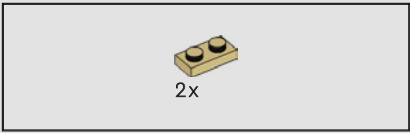


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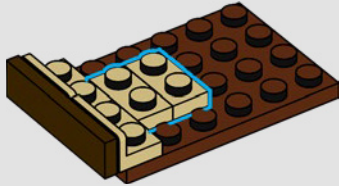


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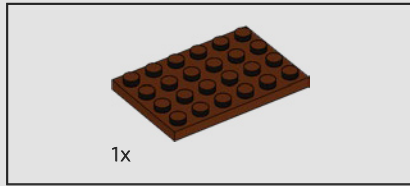
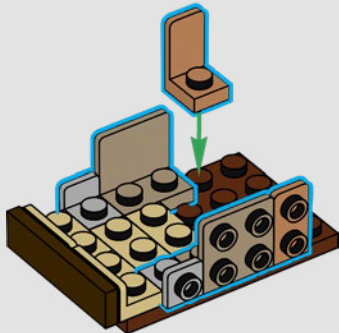




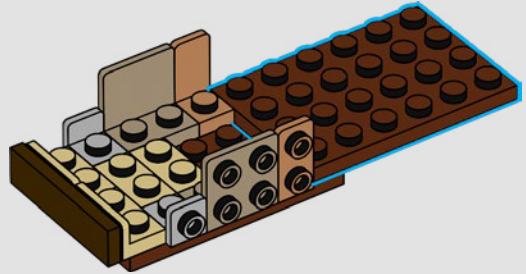
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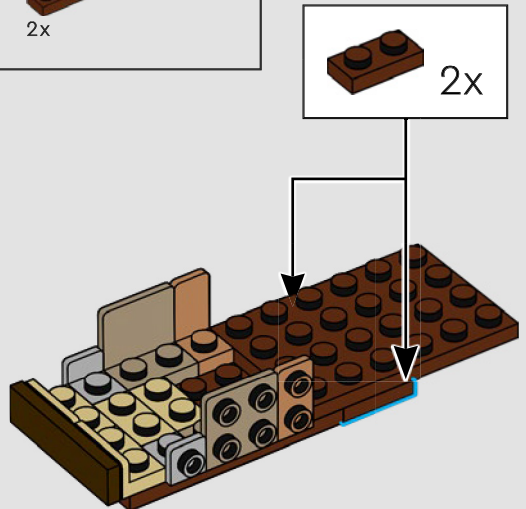
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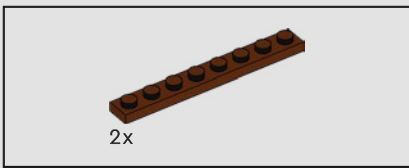


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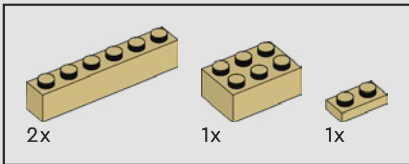
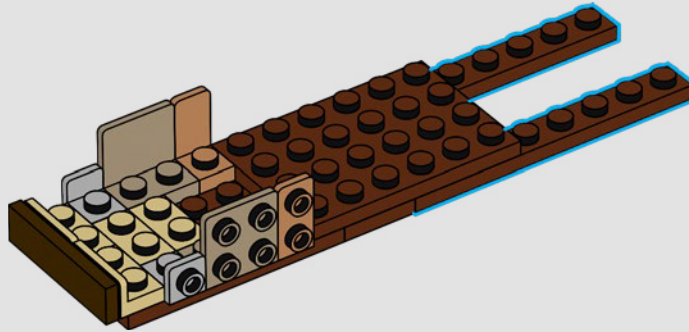


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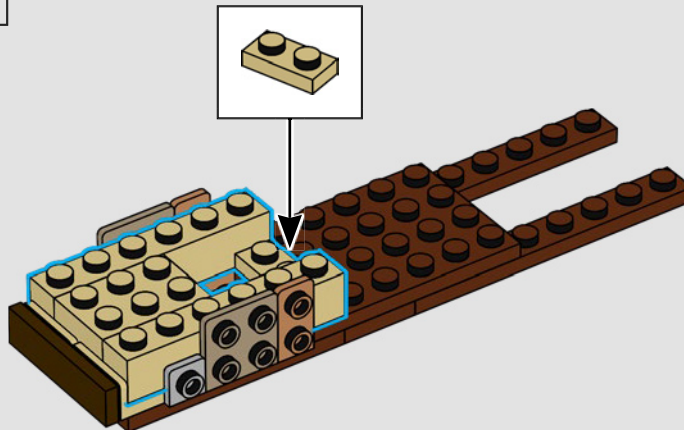




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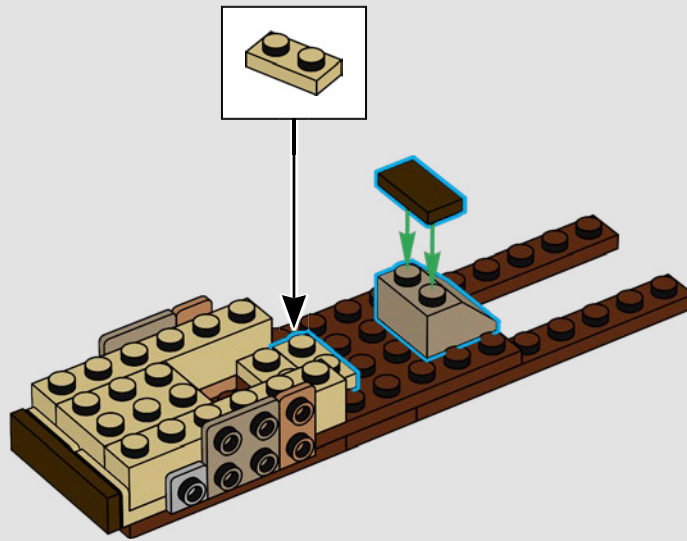


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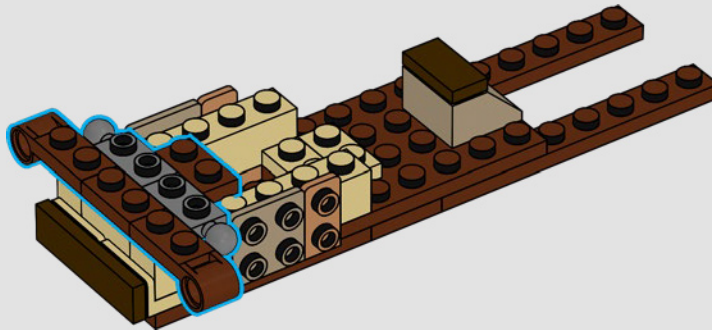




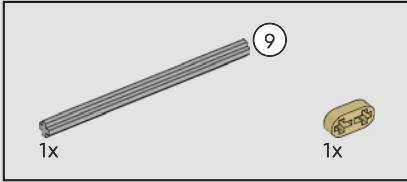
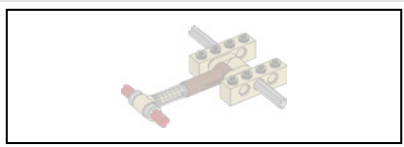
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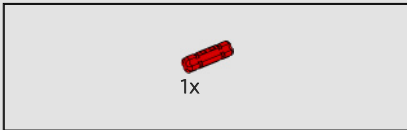
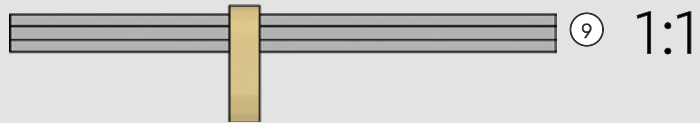
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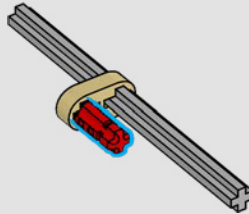


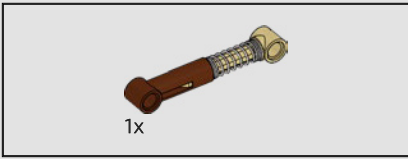


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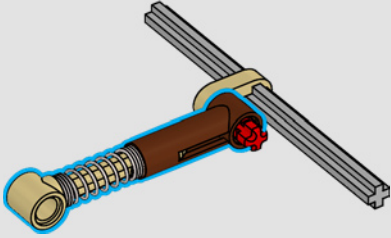


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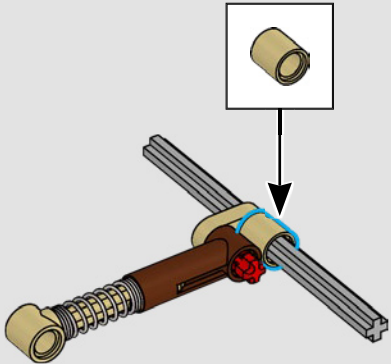




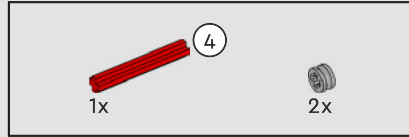
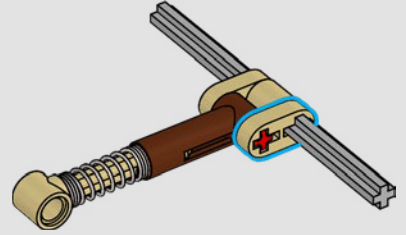
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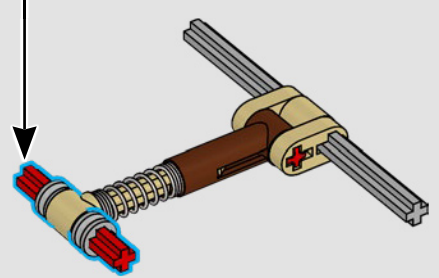
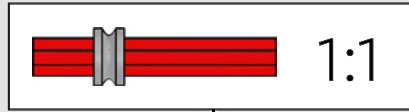
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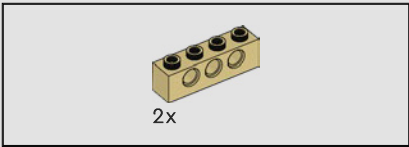


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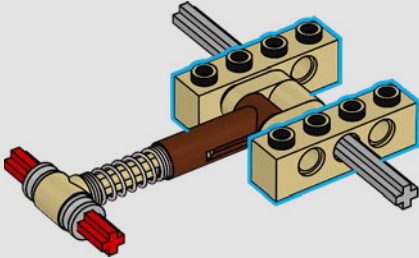


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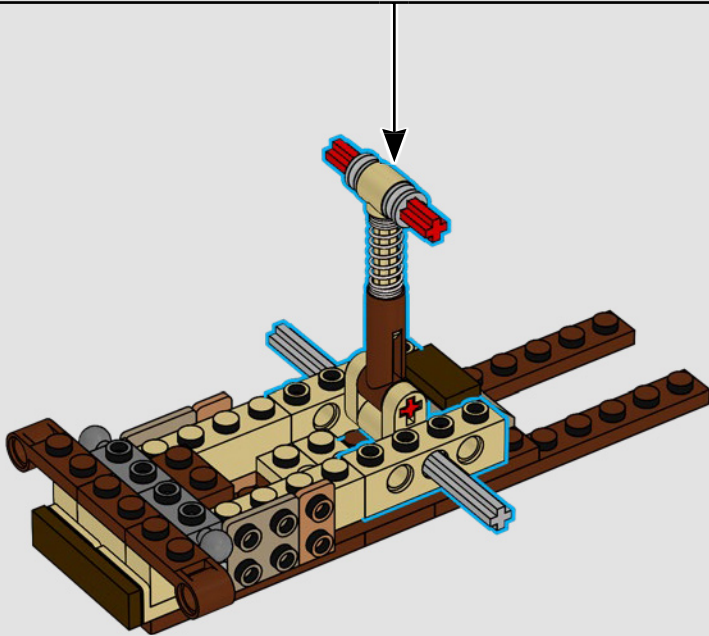




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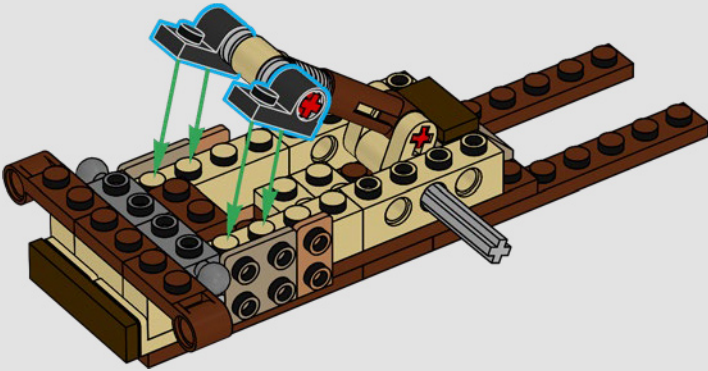


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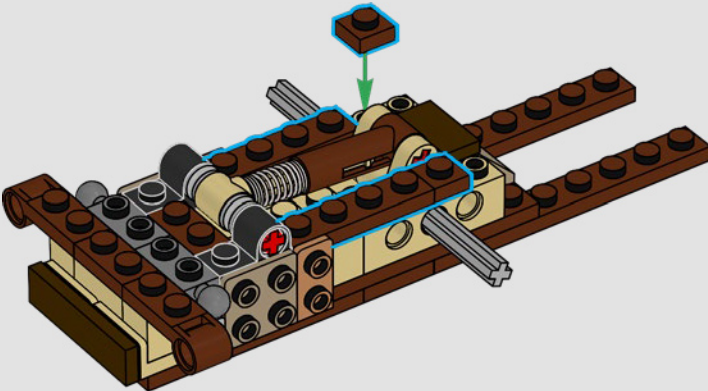




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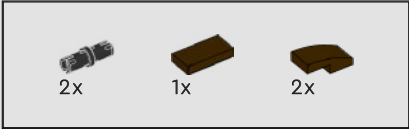
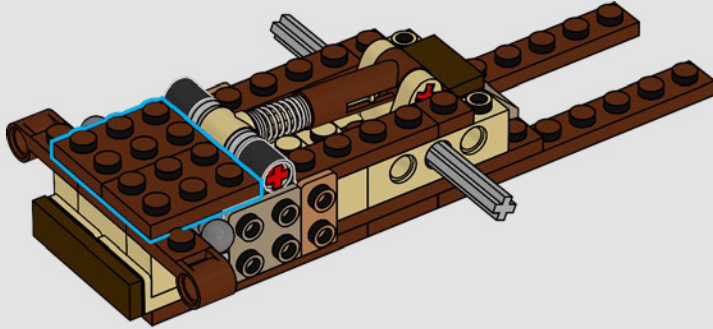


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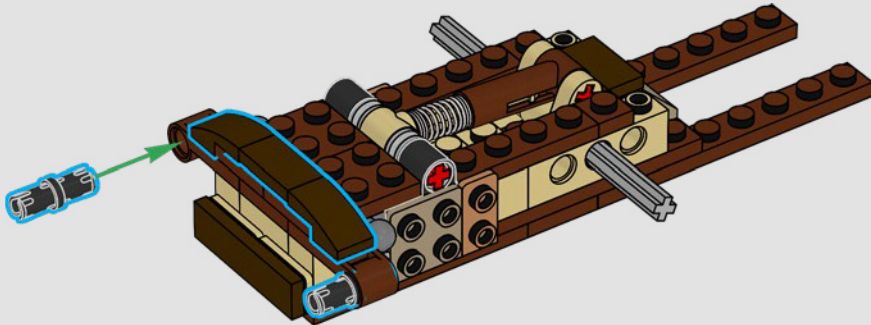


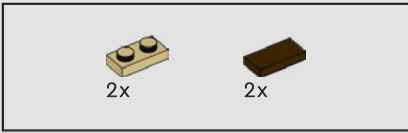


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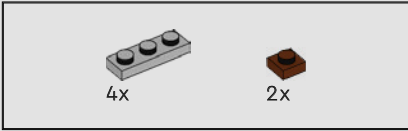
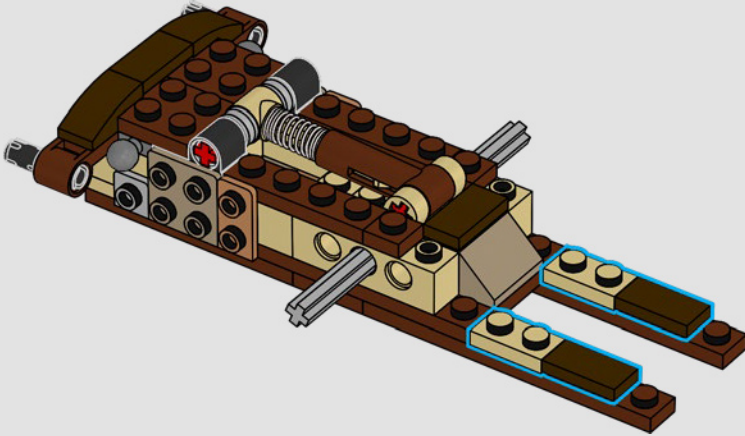


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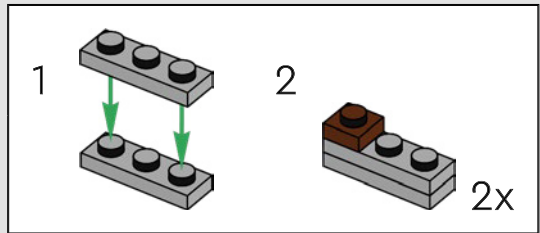
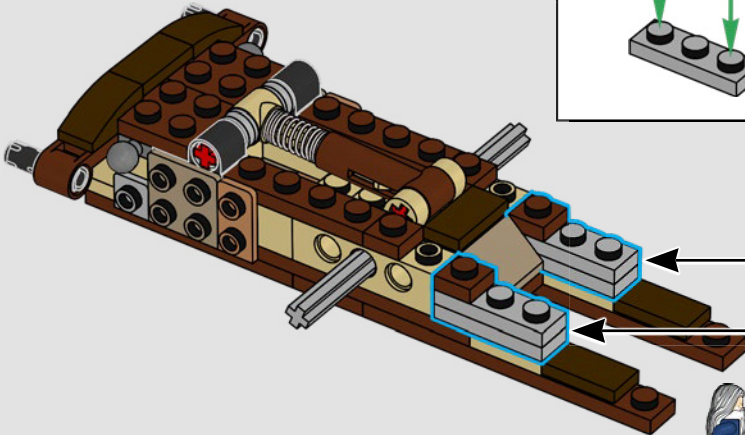


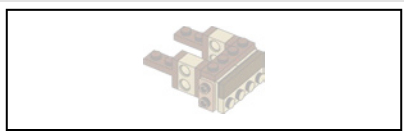


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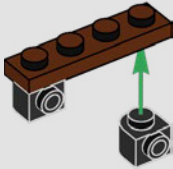


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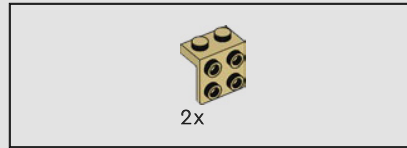
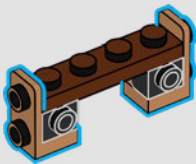




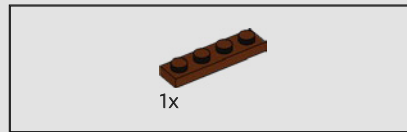
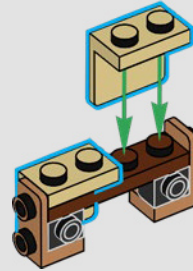
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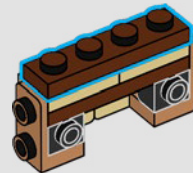
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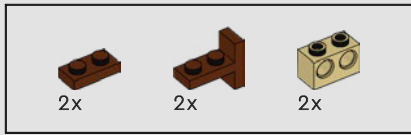


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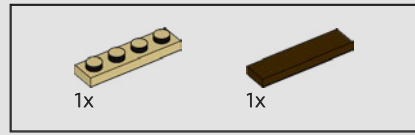
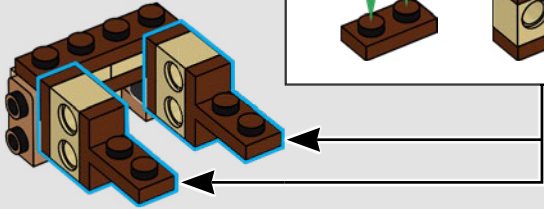
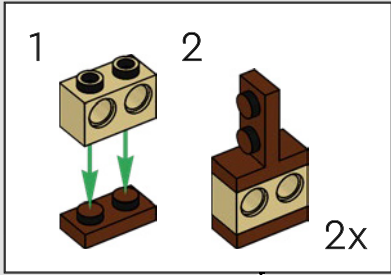


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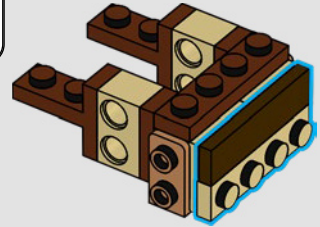




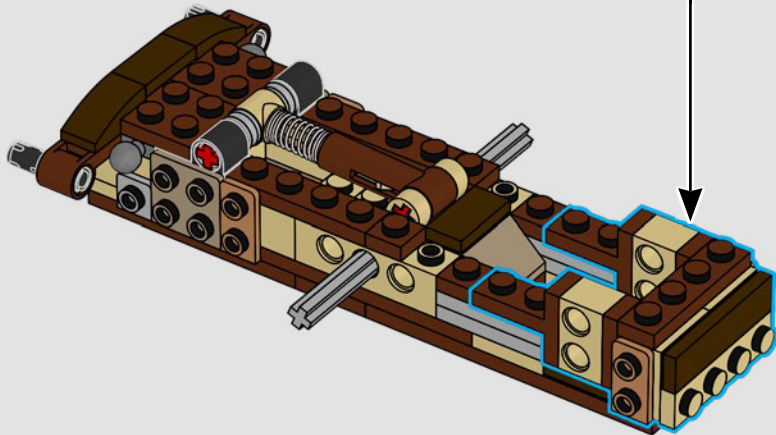
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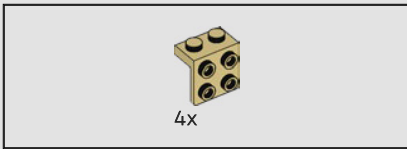
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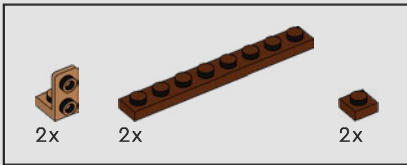
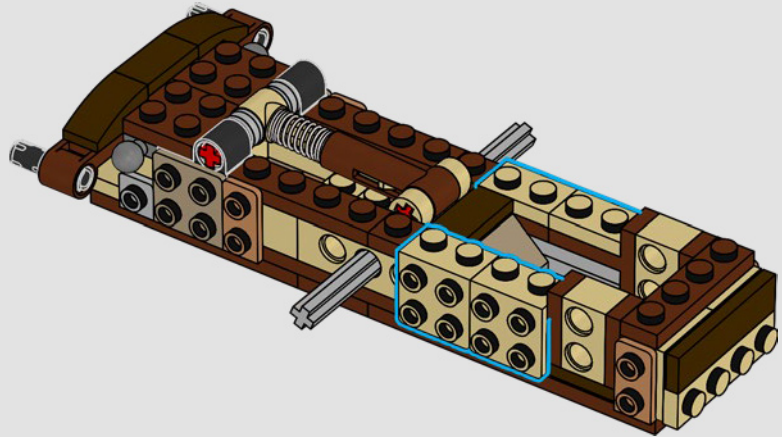
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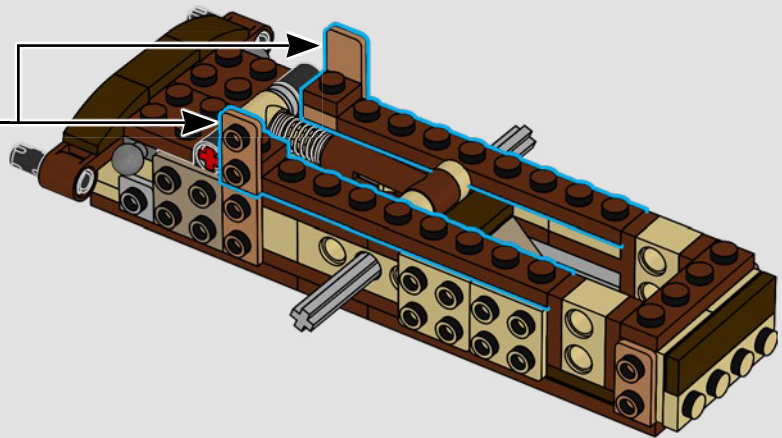
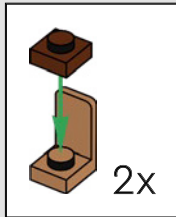


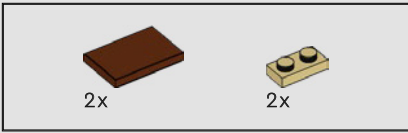


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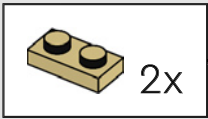
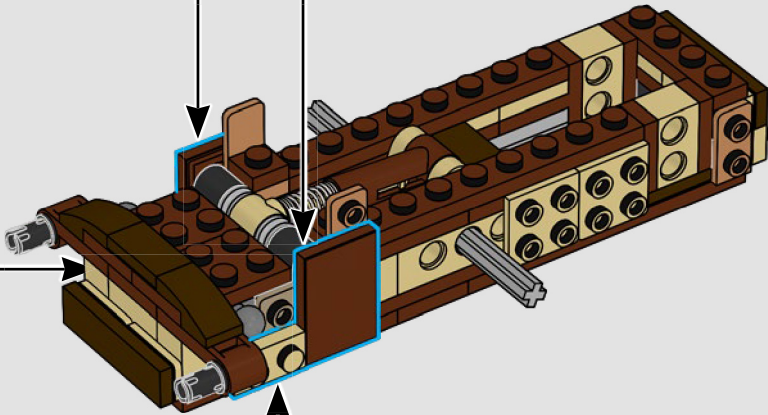
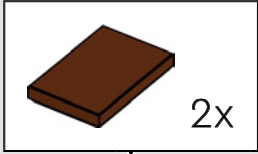


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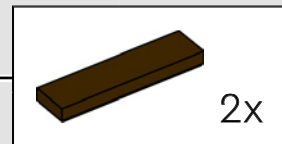
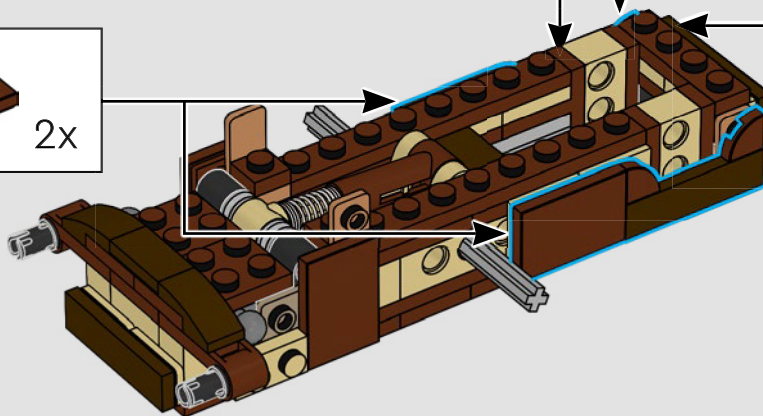


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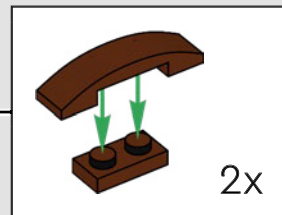
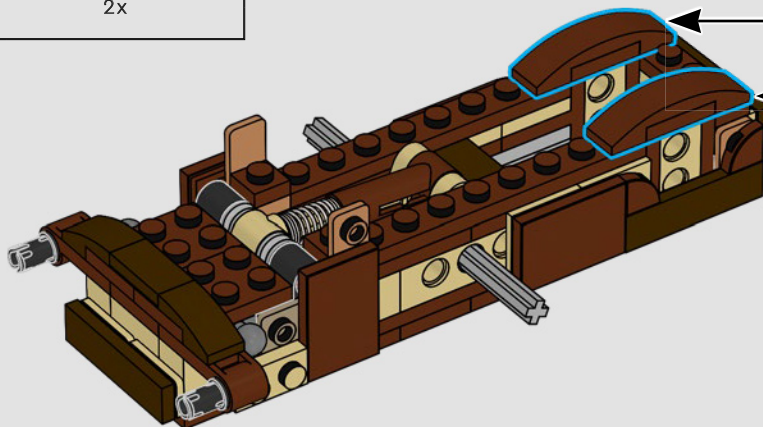


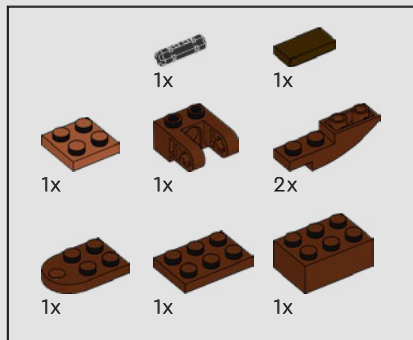


75



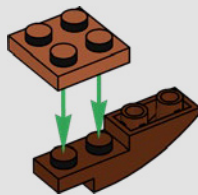
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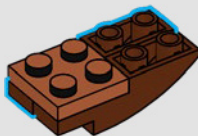


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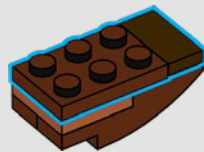
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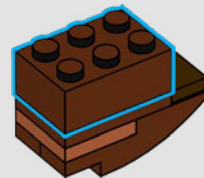
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3



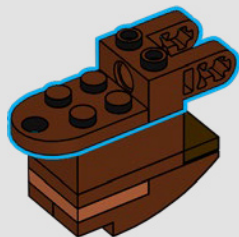
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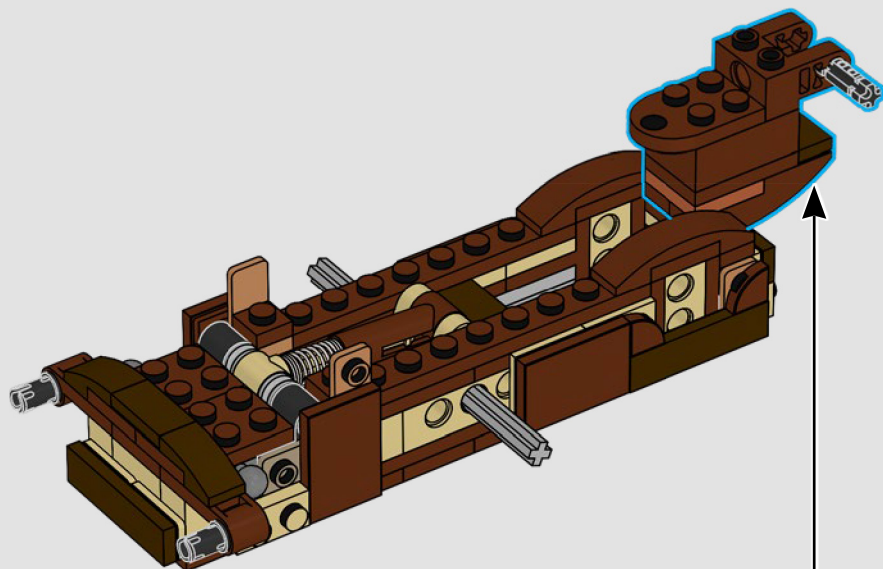


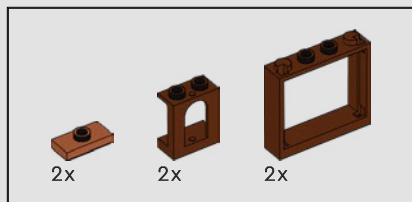
El ornitóptero de Leonardo, construido para un amigo del artista dispuesto a pilotarlo a baja altura, no resultó del todo exitoso. La máquina se estrelló y el amigo de Da Vinci se rompió una pierna.

5

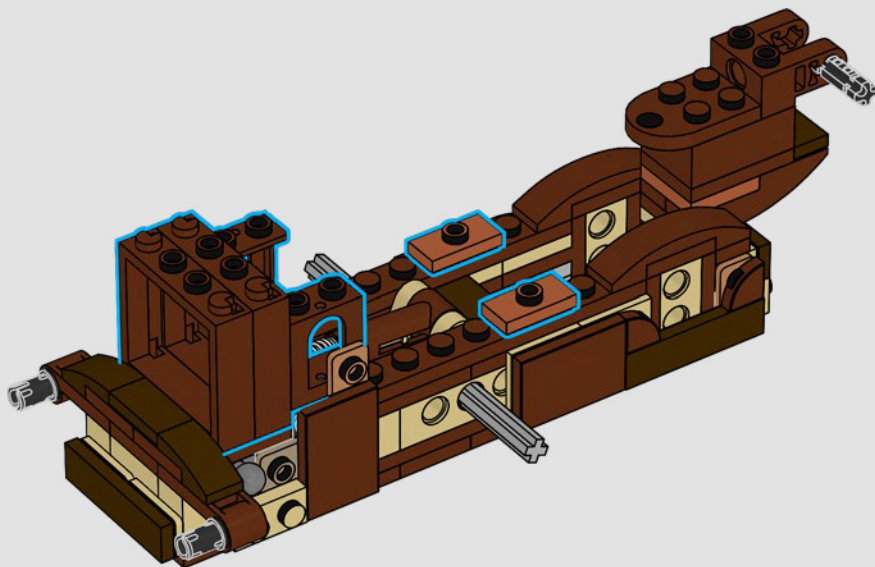


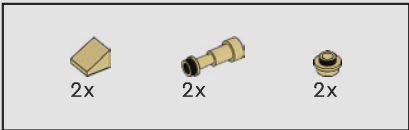
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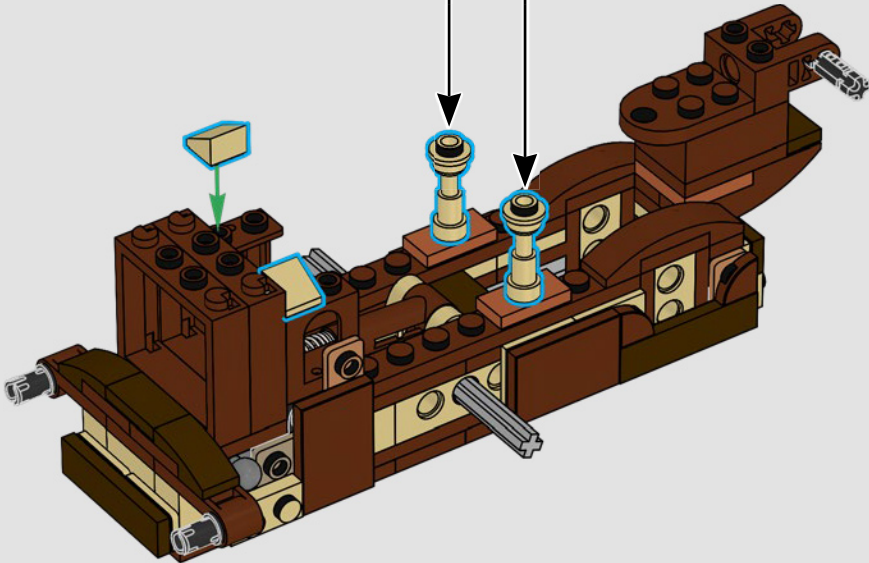
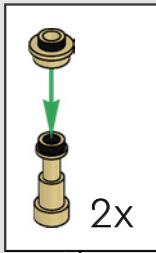


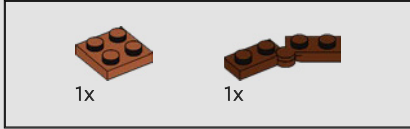
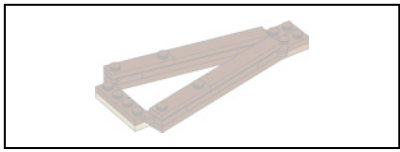
78



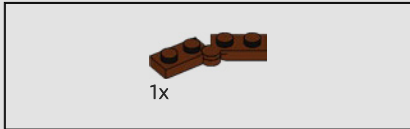
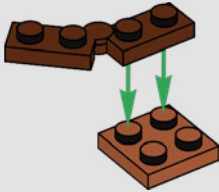


79

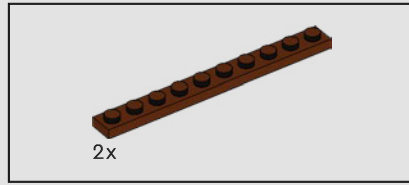
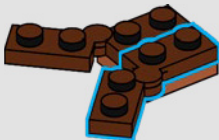




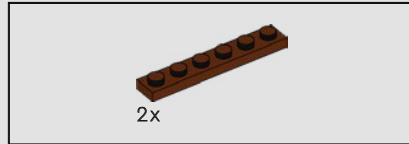
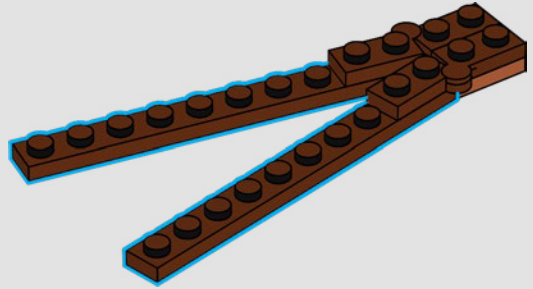
80



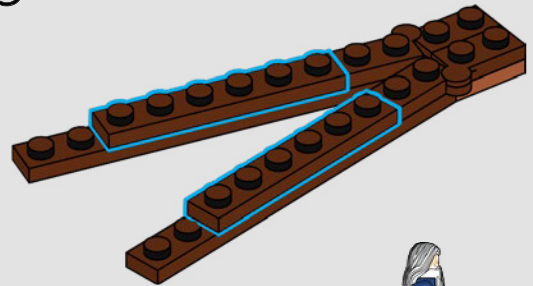
81



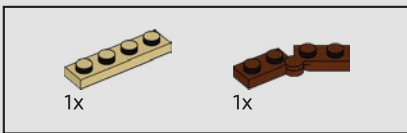
82



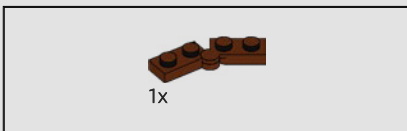
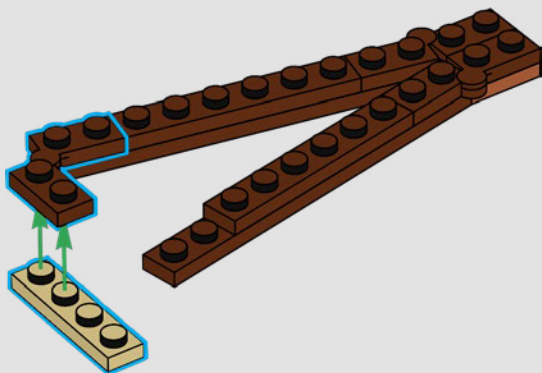
83



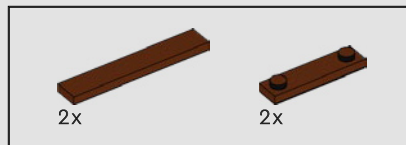
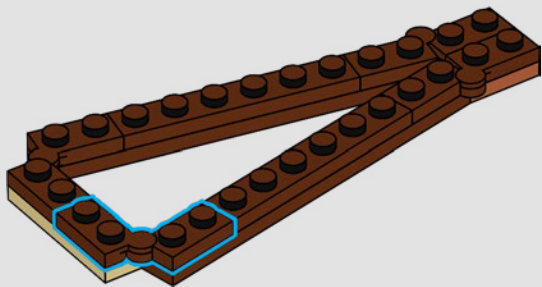




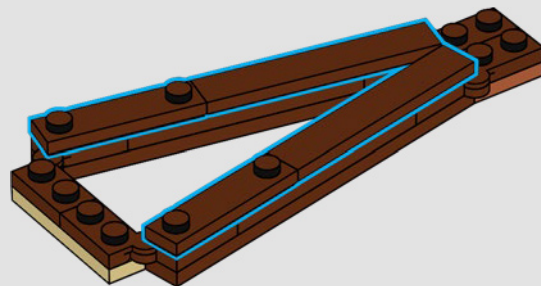
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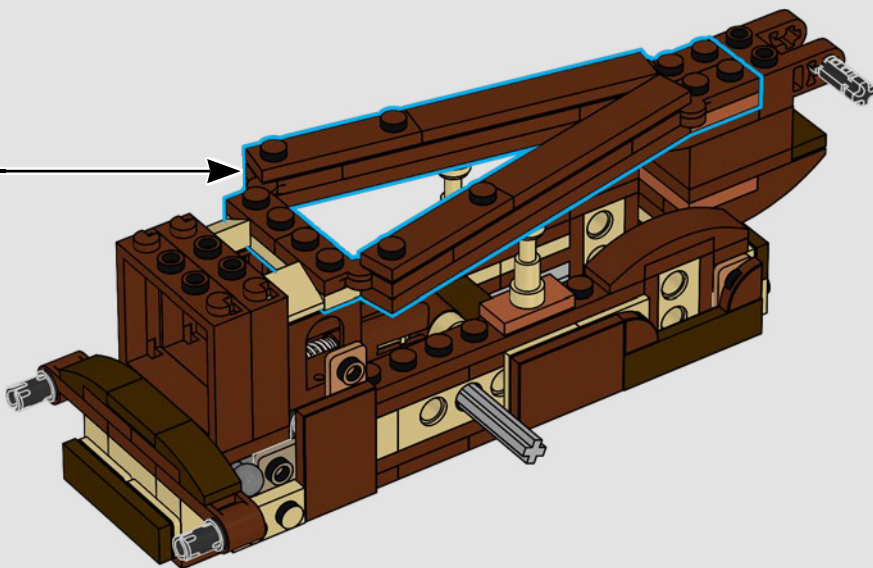
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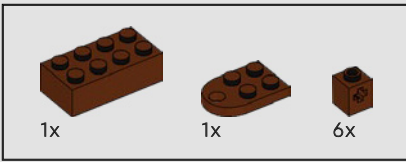


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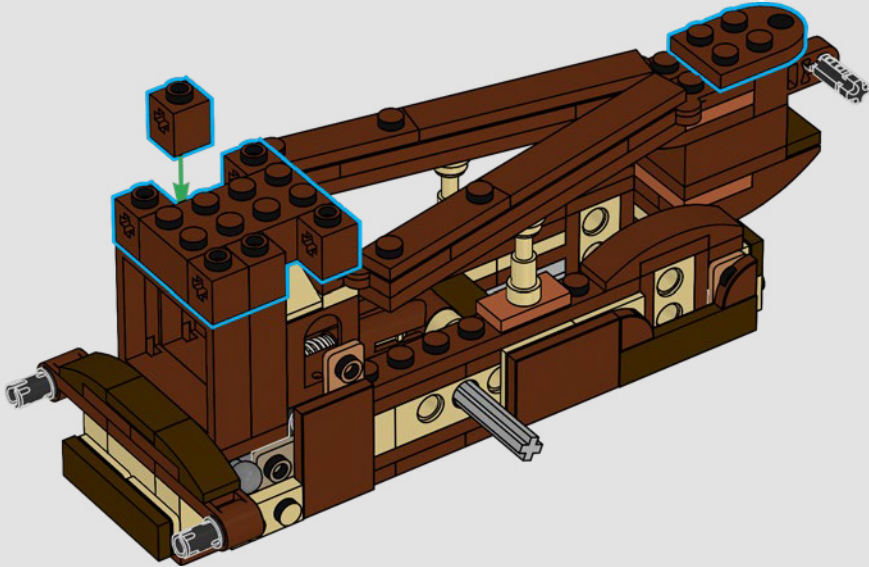
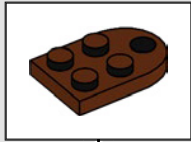


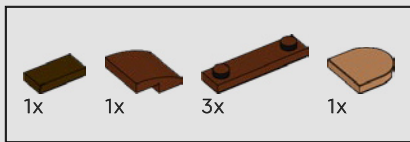
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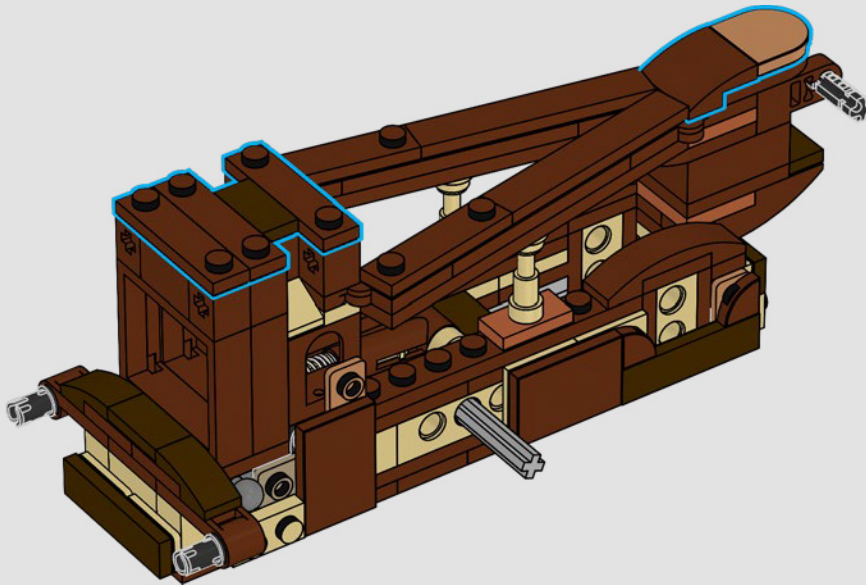


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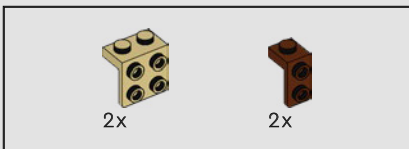


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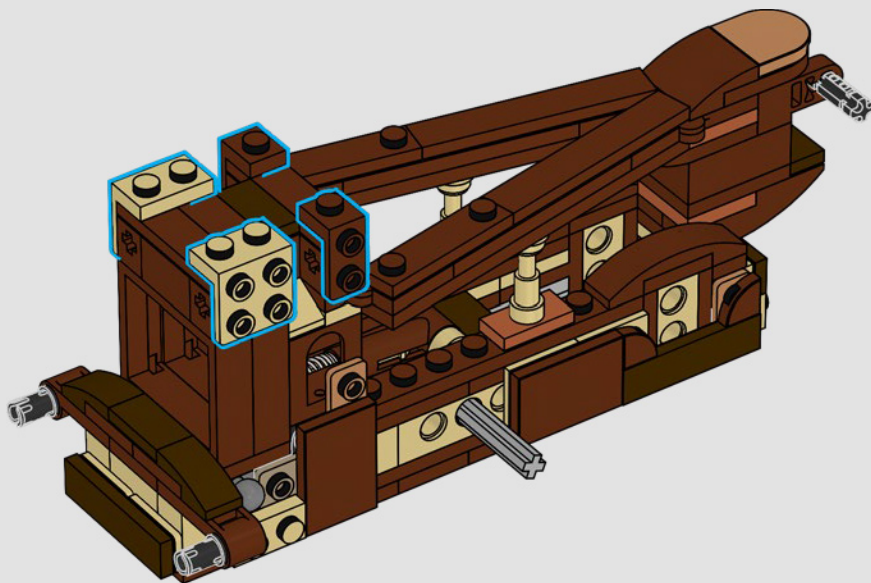


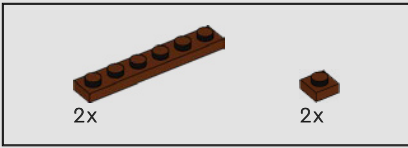


Leonardo da Vinci persistió en su idea de que el cuerpo humano podía producir la energía suficiente para impulsar una máquina voladora.

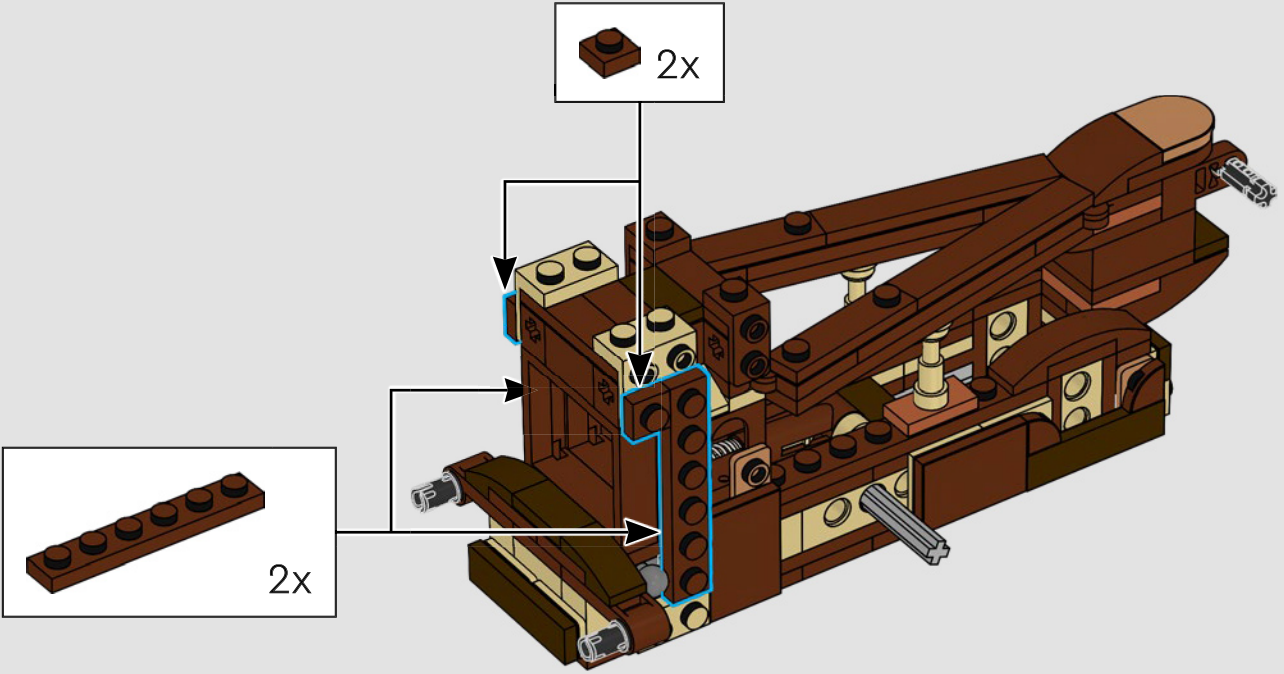


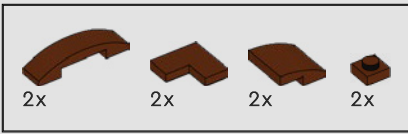
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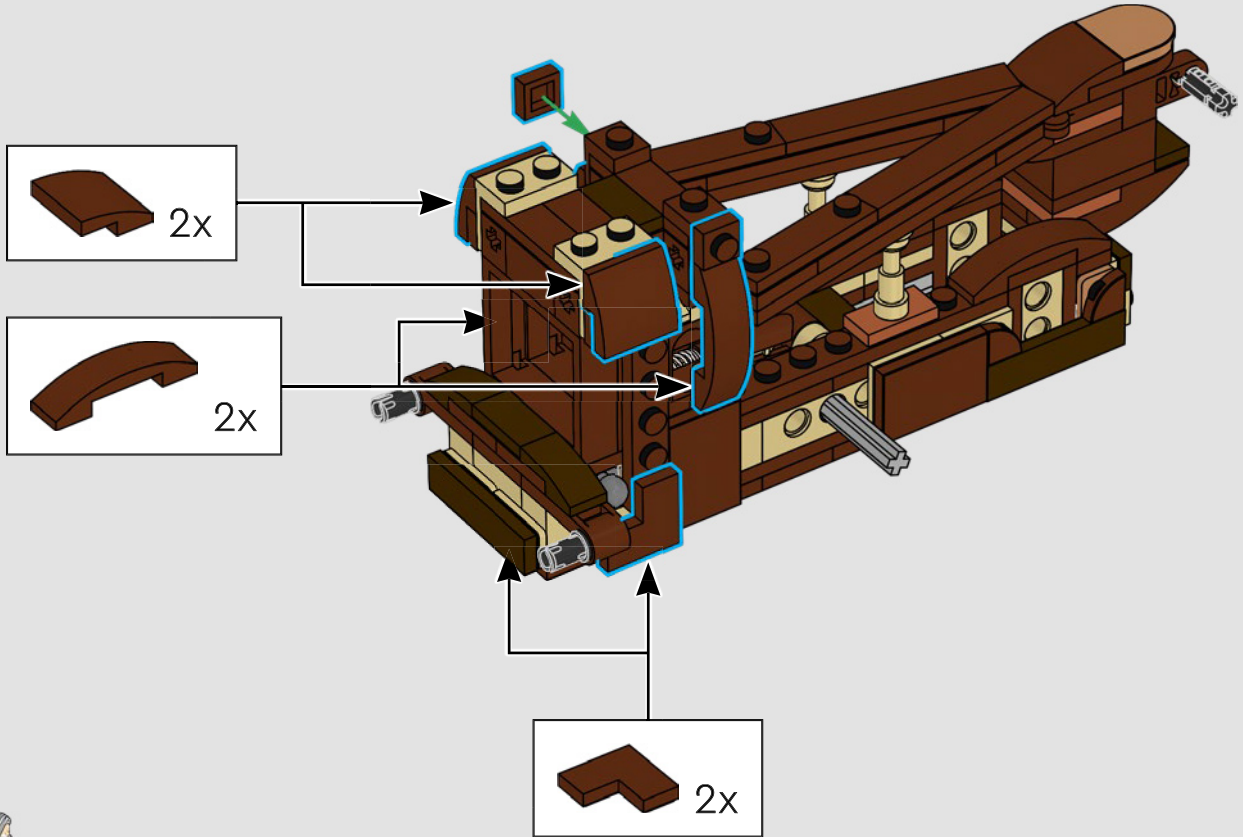


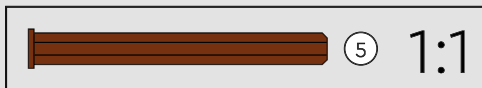
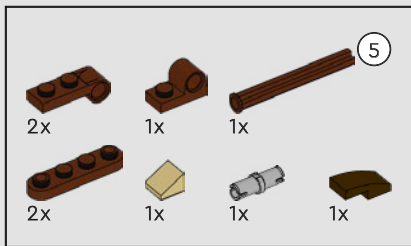
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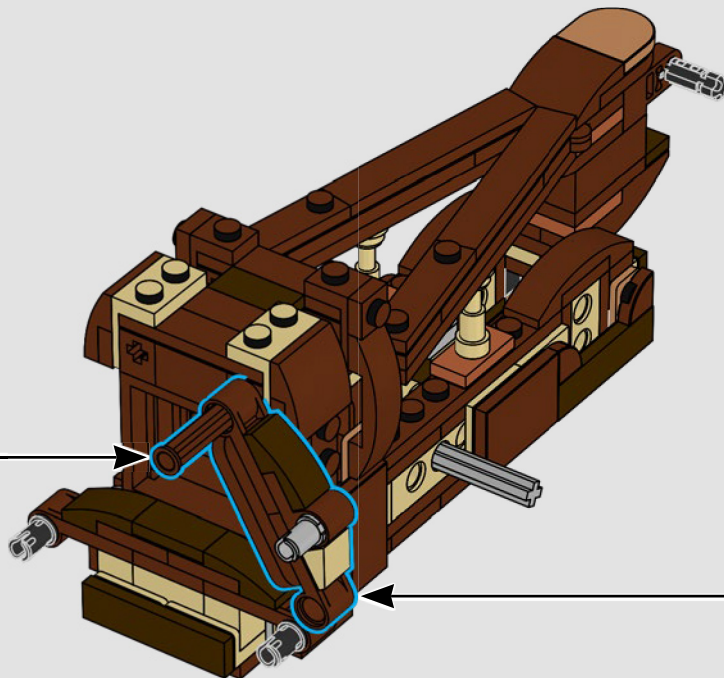
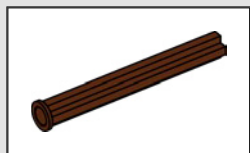
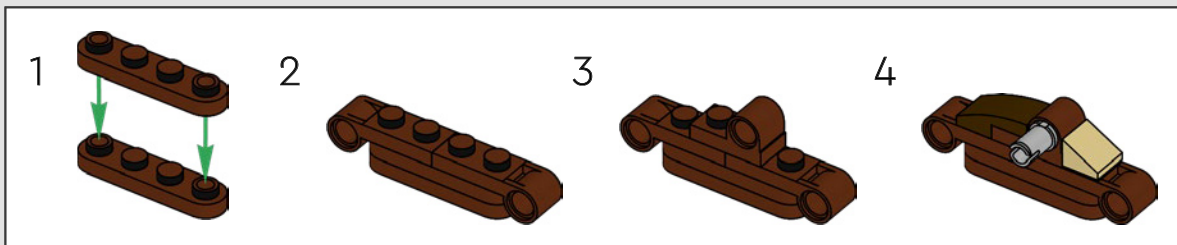


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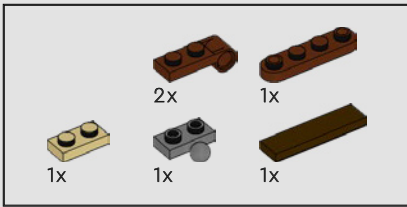




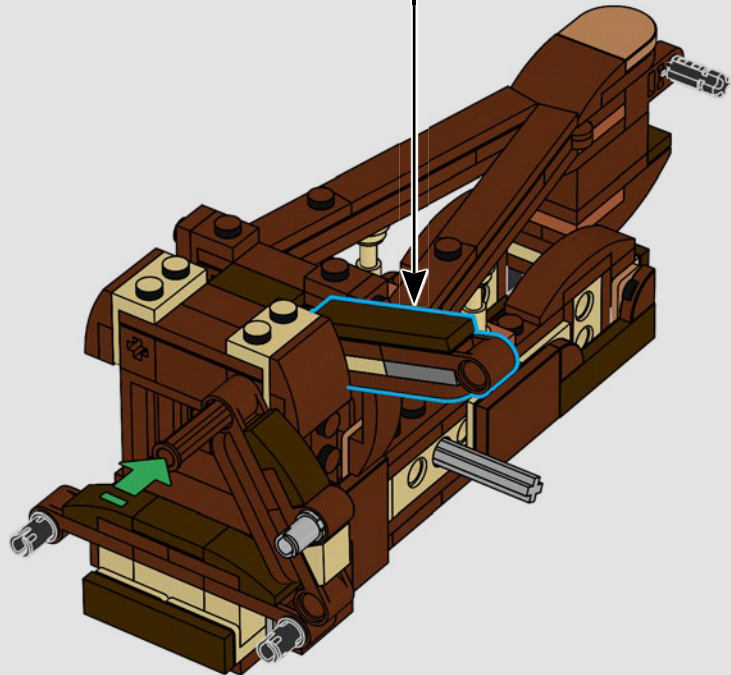
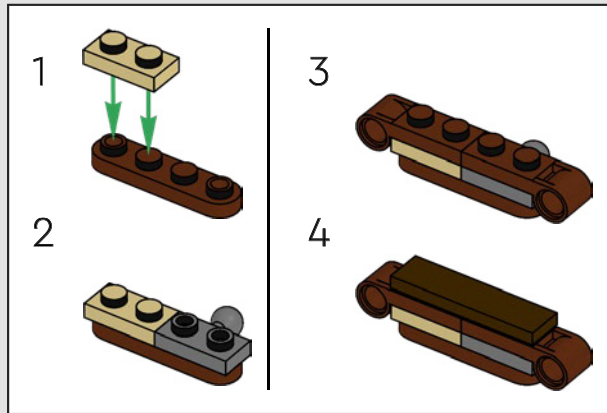
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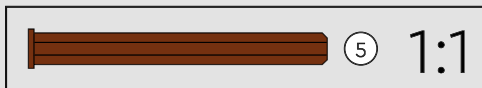
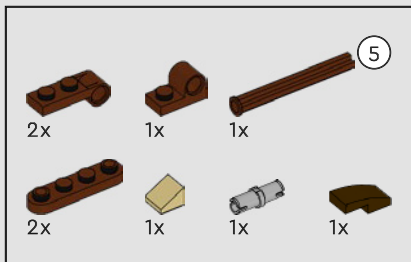




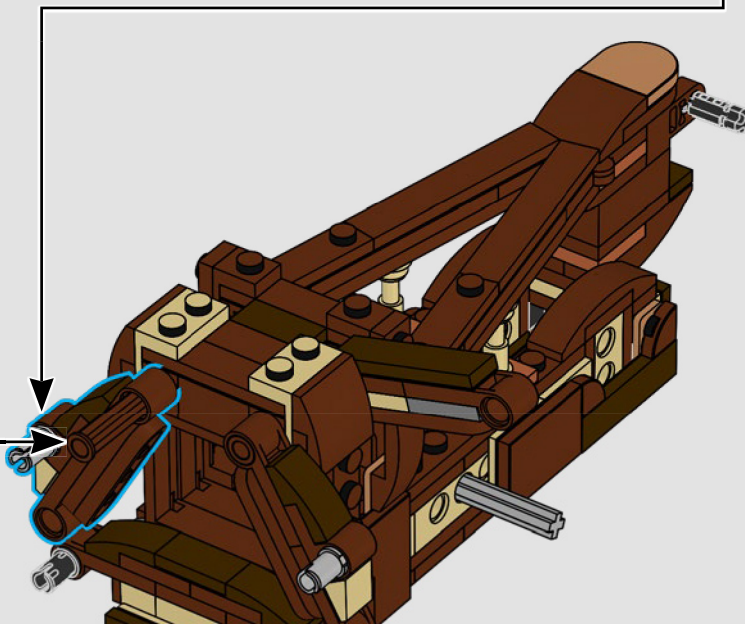
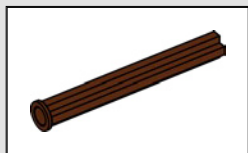
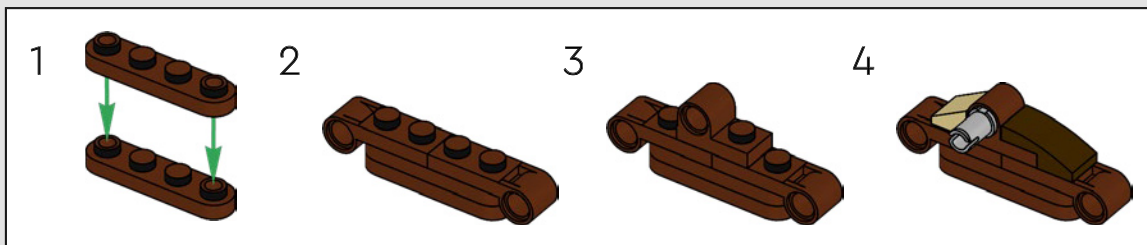


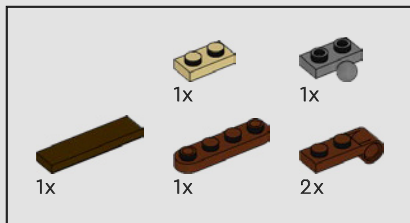
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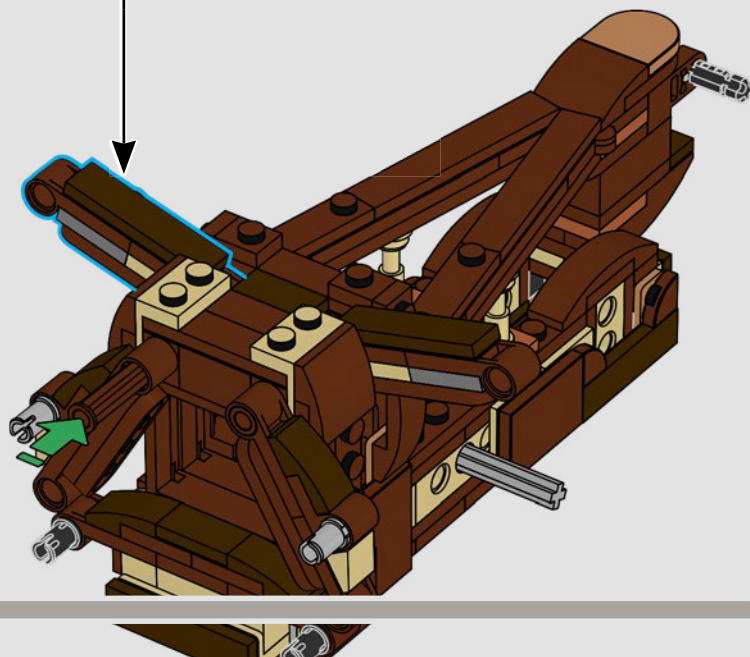
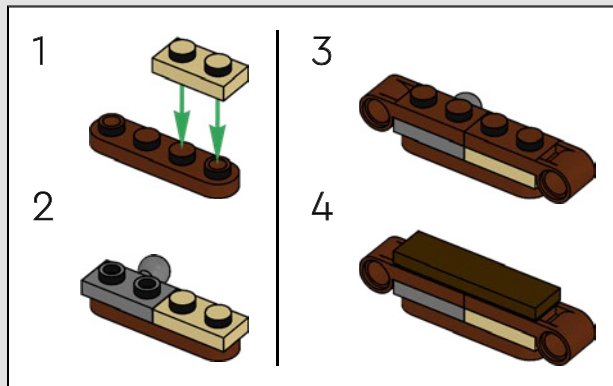


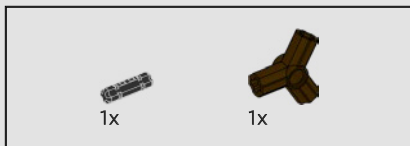
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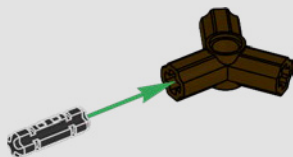


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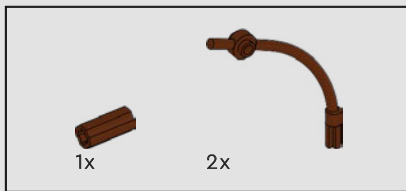




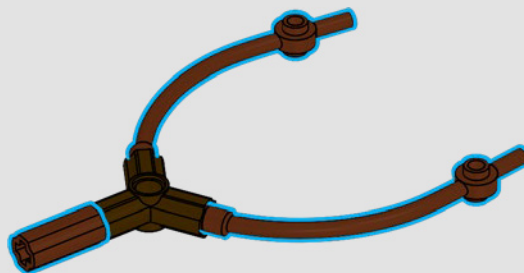
97



Los bocetos de Leonardo da Vinci muestran distintas máquinas voladoras controladas por un piloto que usa diversos mecanismos de propulsión, como las piernas o una combinación de las piernas y los brazos. Algunas de ellas incluso contemplan timones conectados a la cabeza de su tripulante.

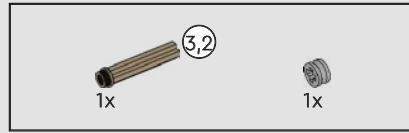
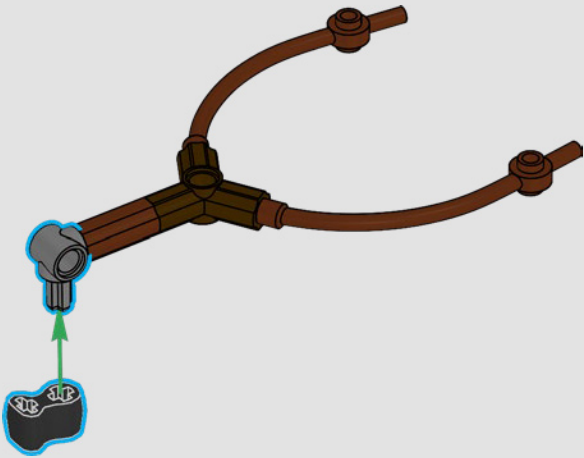


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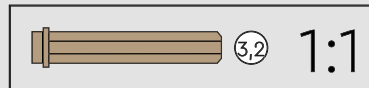
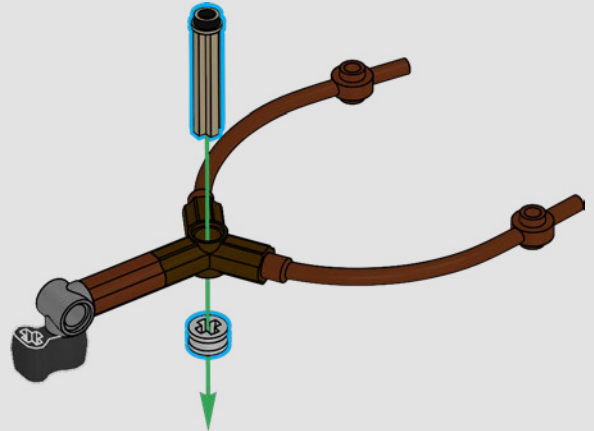




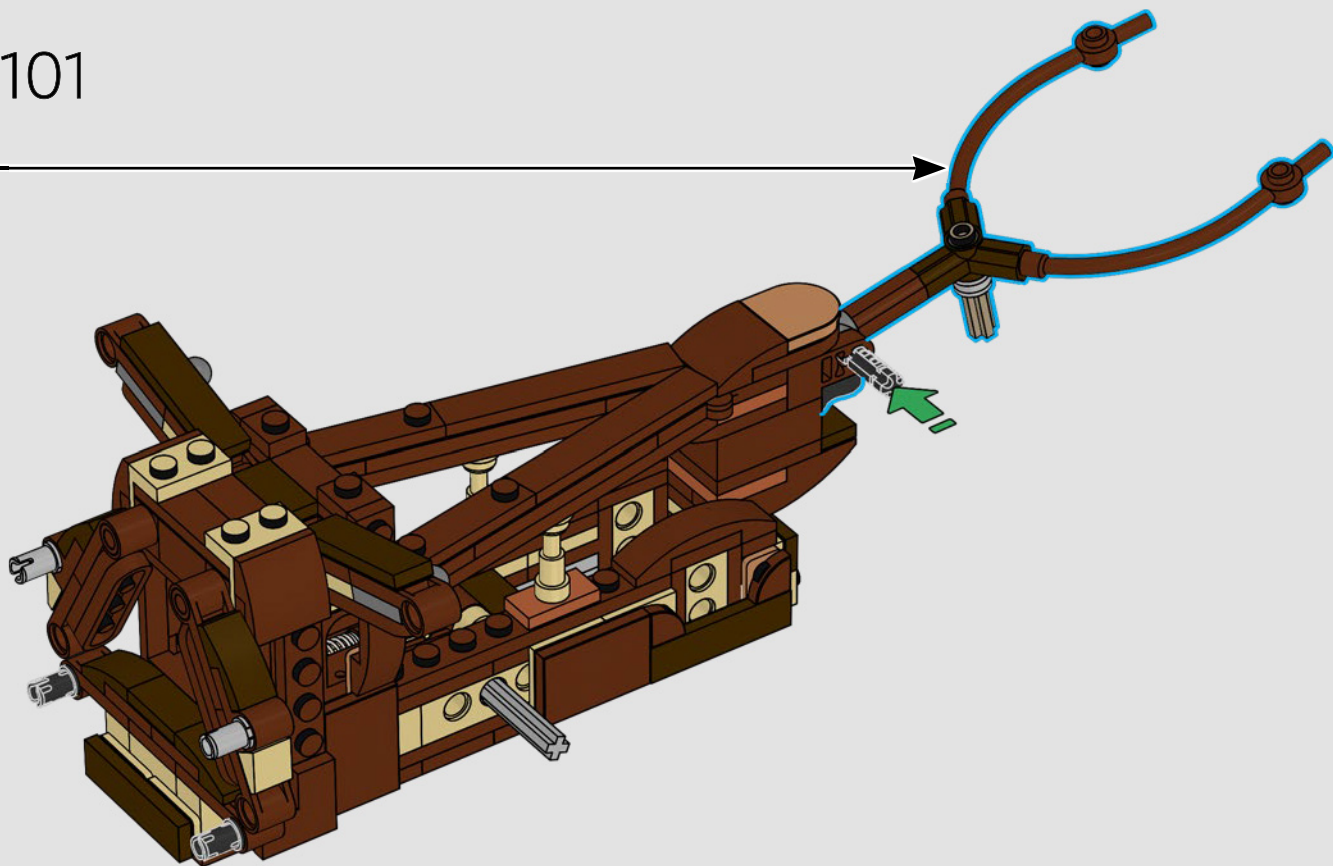
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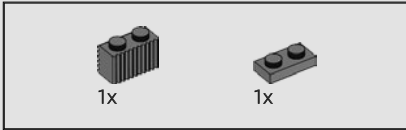
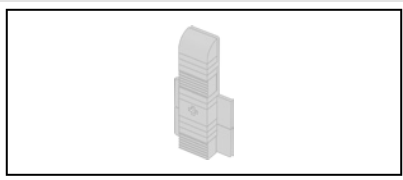


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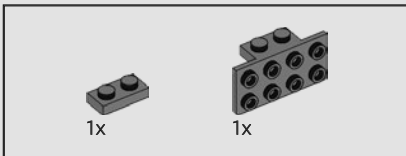
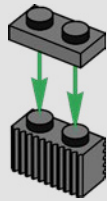


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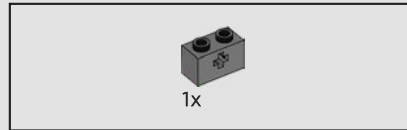
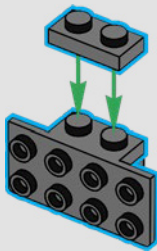




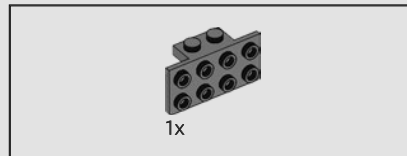
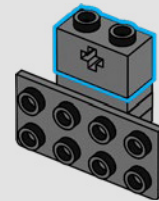
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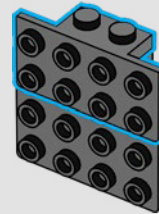
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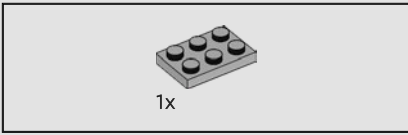


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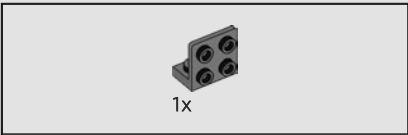
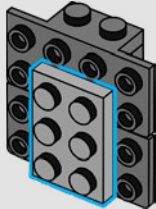


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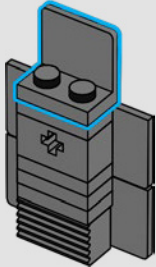




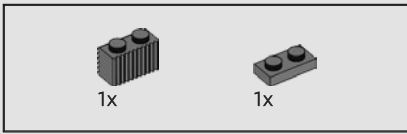
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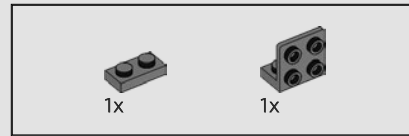
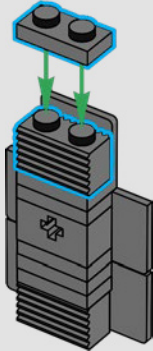
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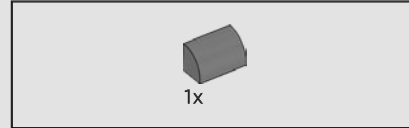
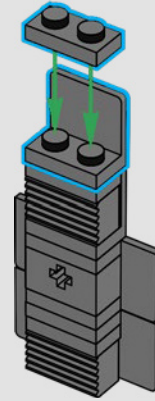




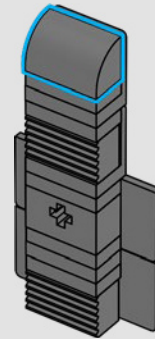
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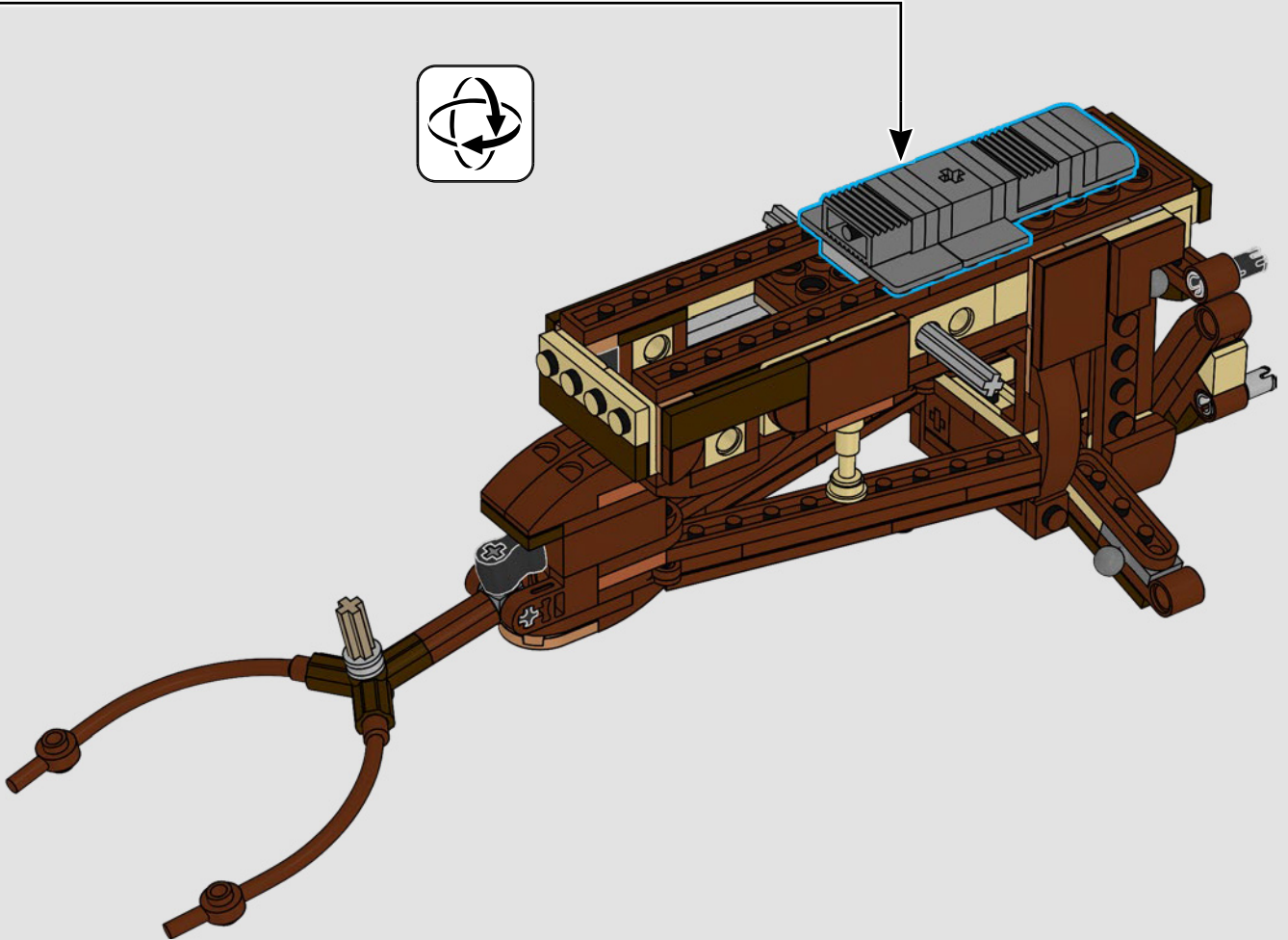


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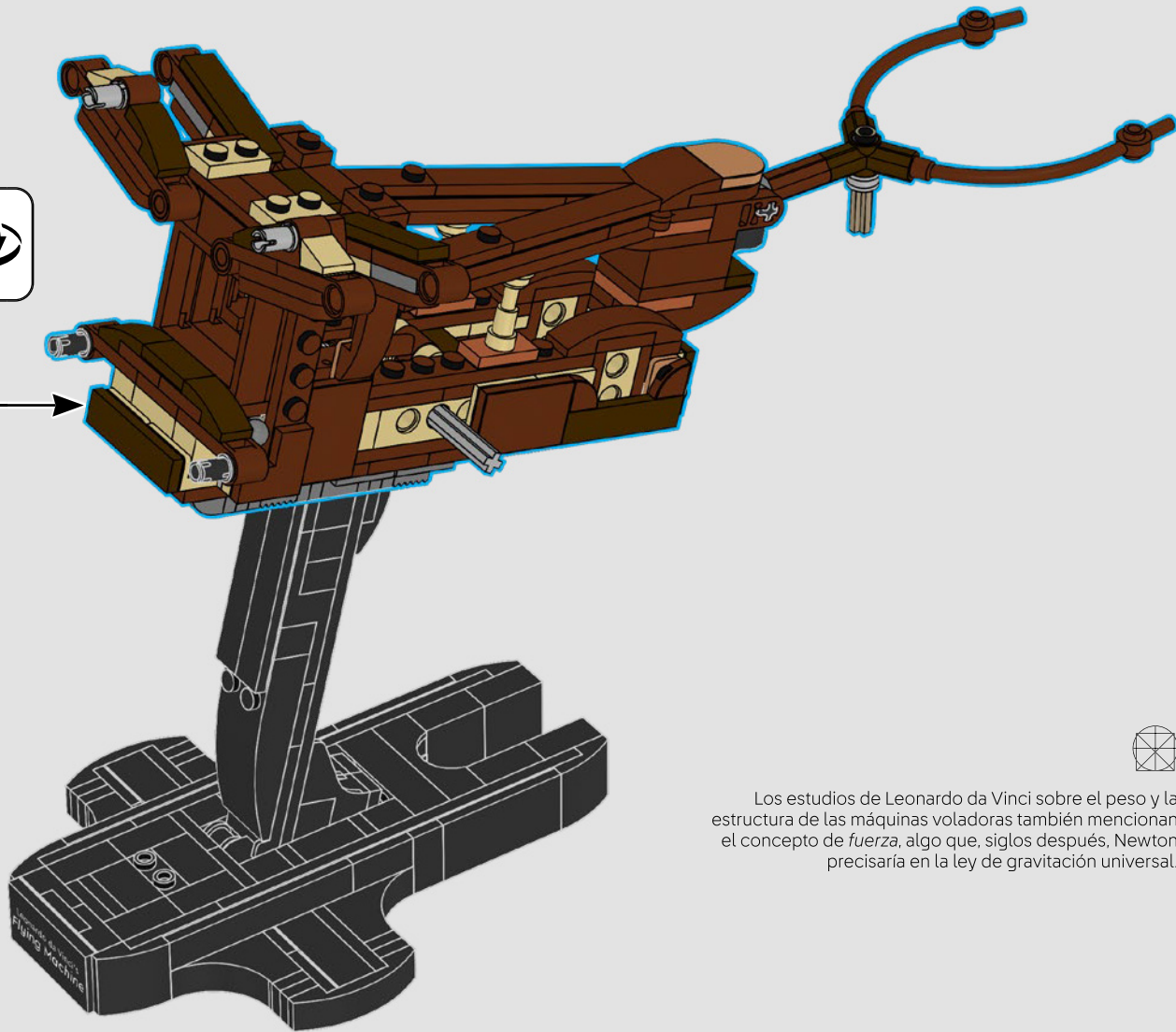
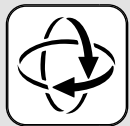


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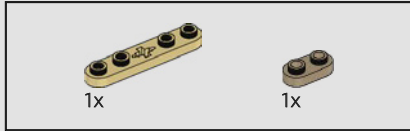
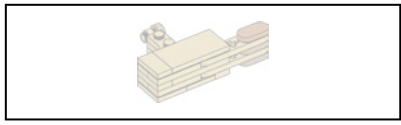


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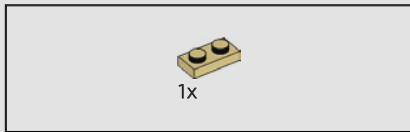
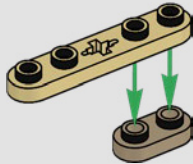


Los estudios de Leonardo da Vinci sobre el peso y la estructura de las máquinas voladoras también mencionan el concepto de *fuerza*, algo que, siglos después, Newton precisaría en la ley de gravitación universal.

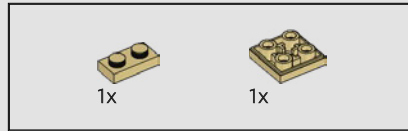
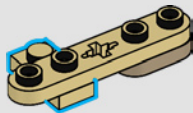




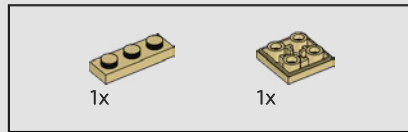
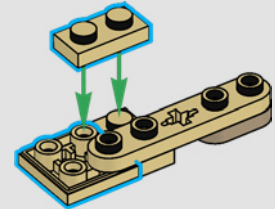
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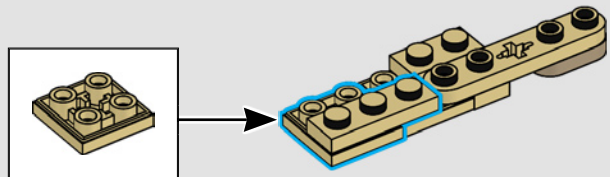
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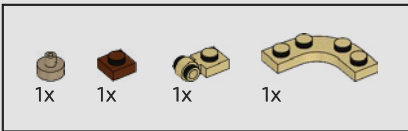


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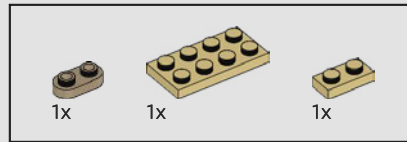
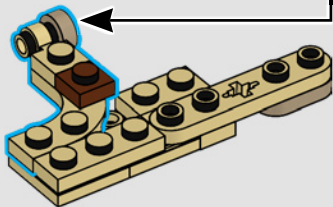
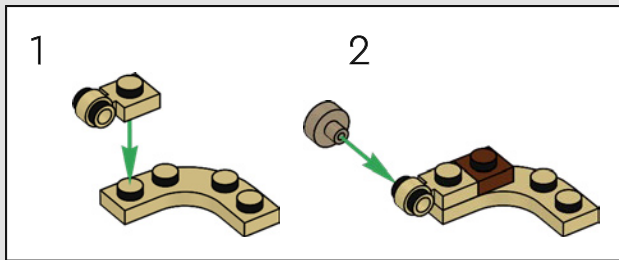


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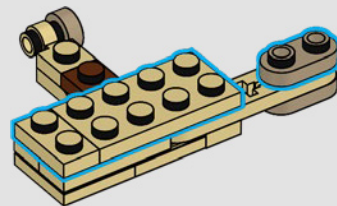


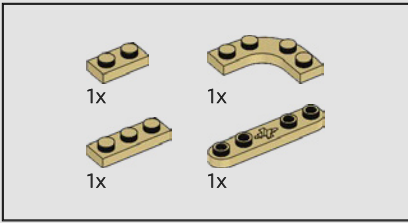


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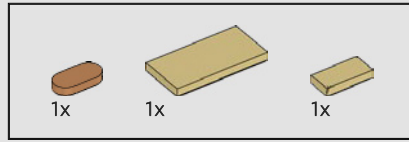
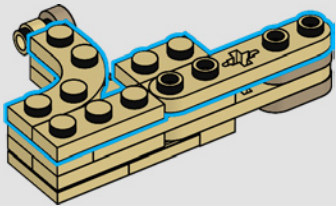


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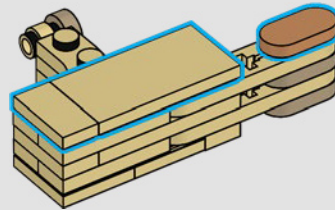


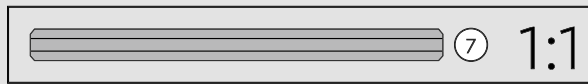
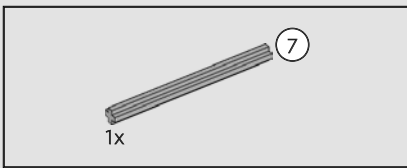


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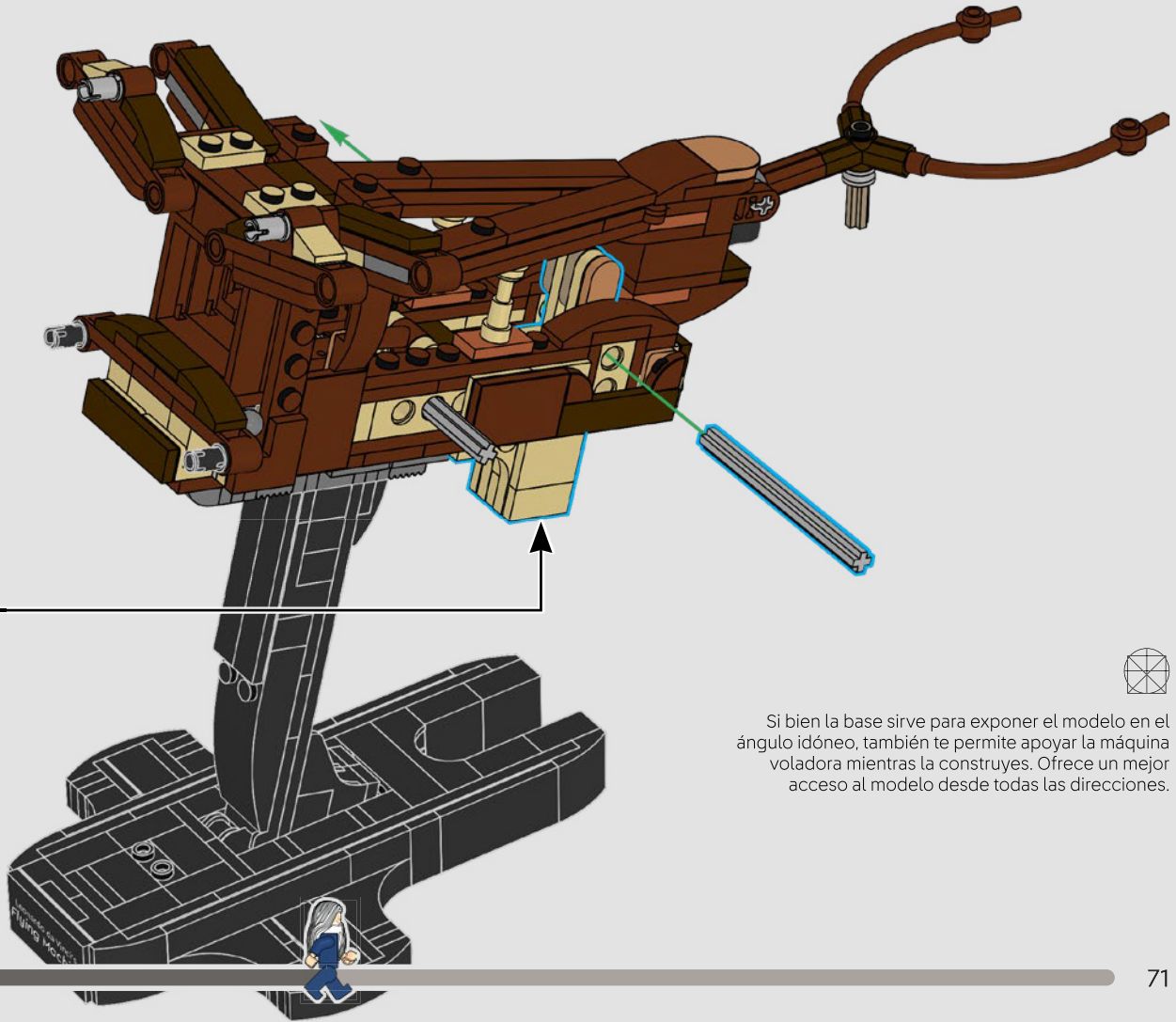


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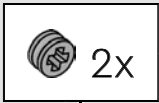
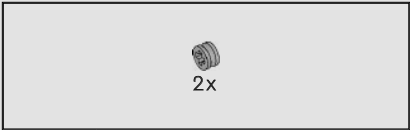




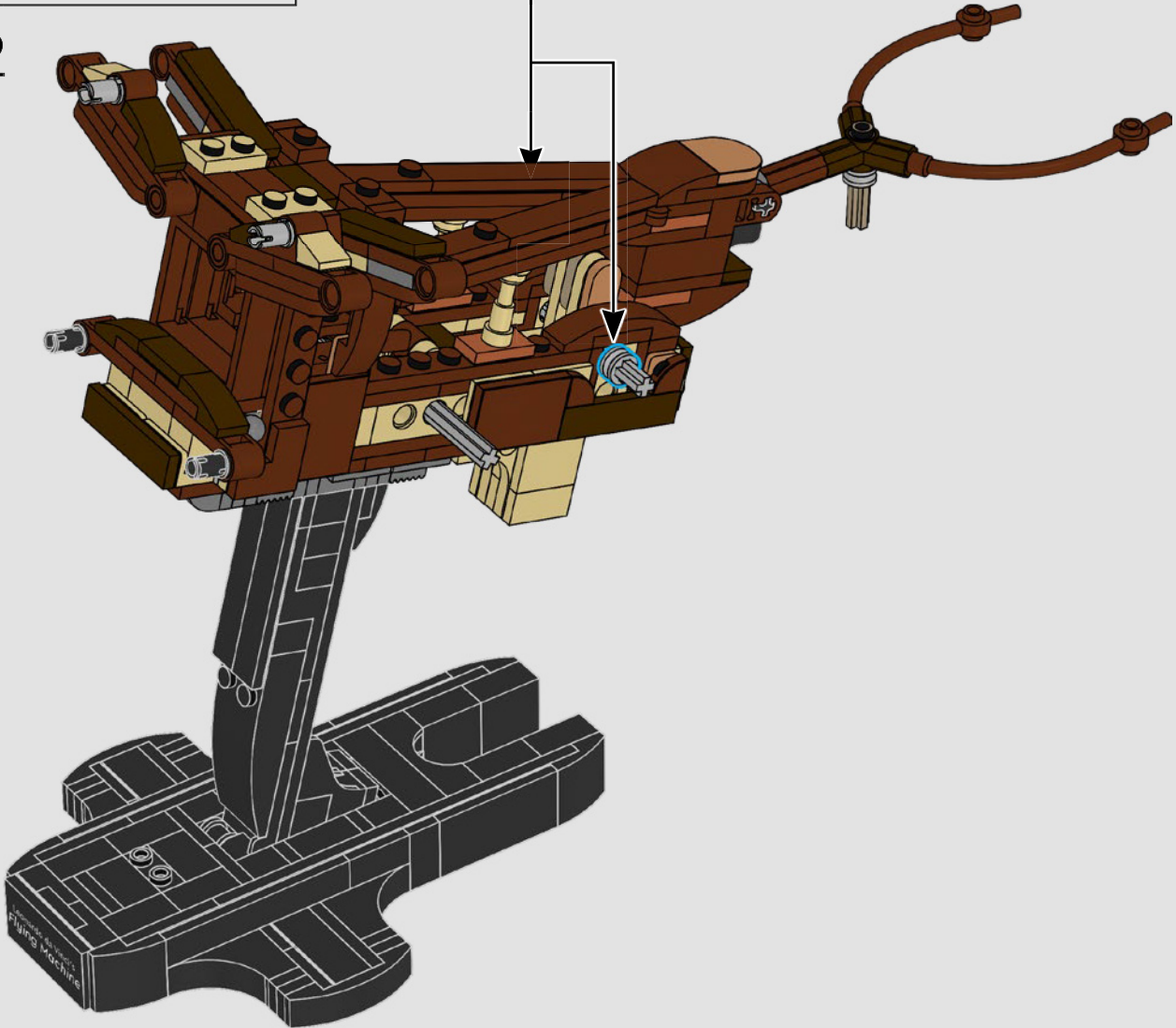
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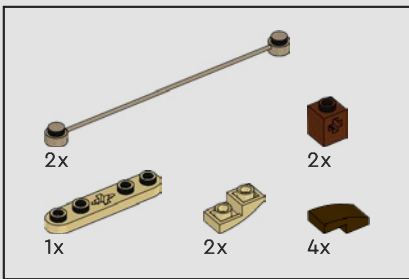
Si bien la base sirve para exponer el modelo en el ángulo idóneo, también te permite apoyar la máquina voladora mientras la construyes. Ofrece un mejor acceso al modelo desde todas las direcciones.



122

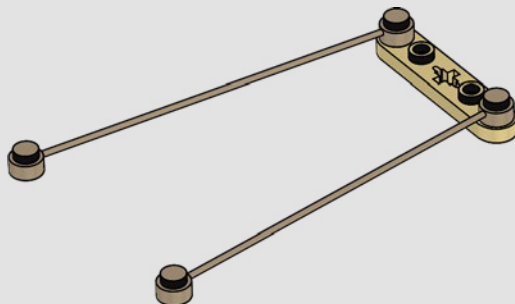




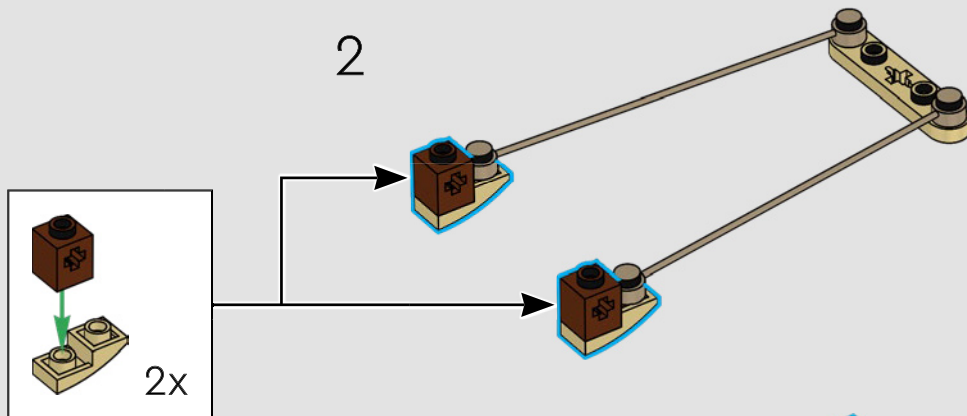


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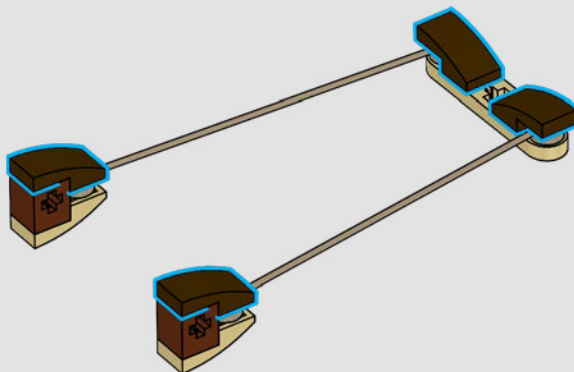
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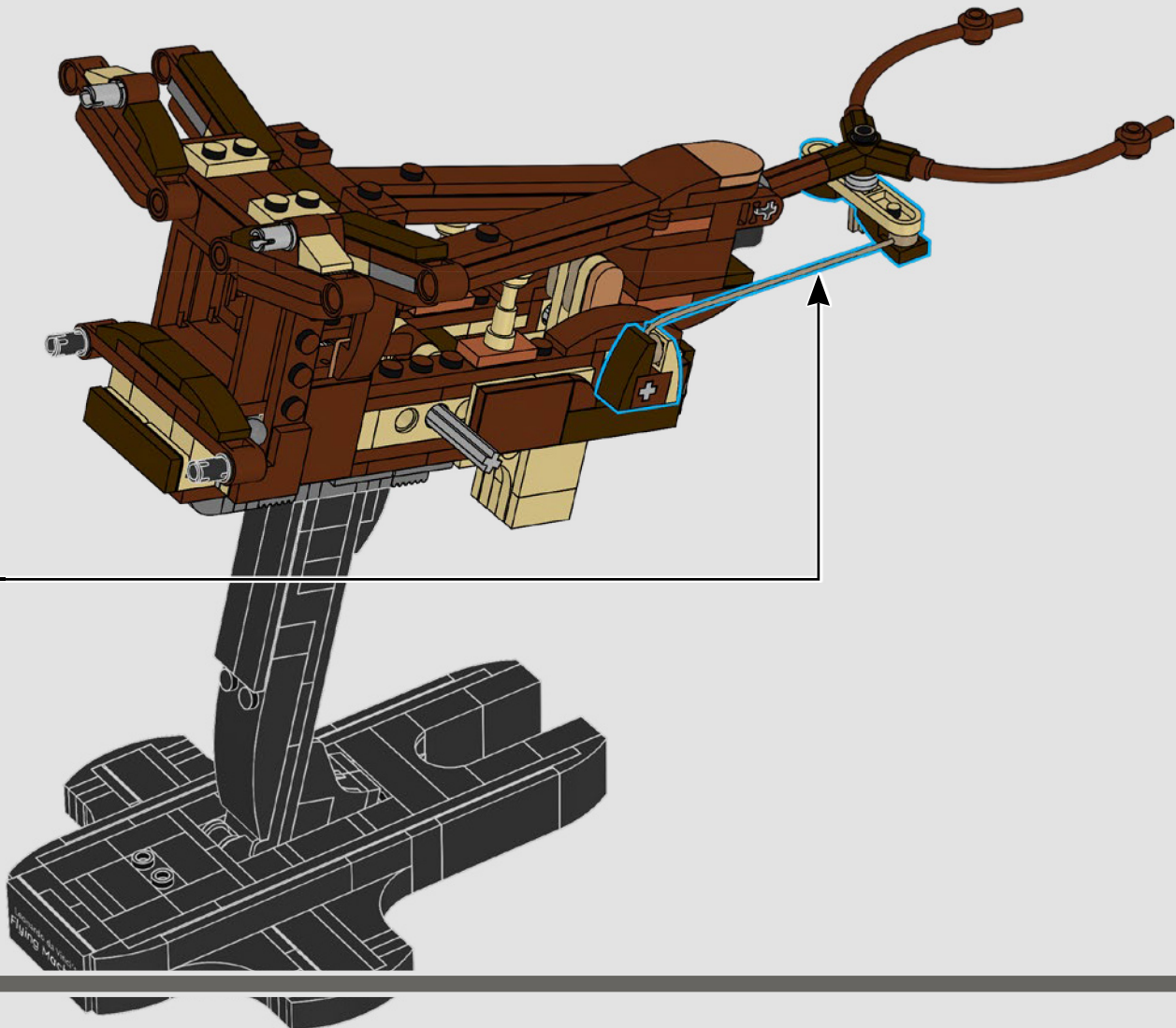


2



3

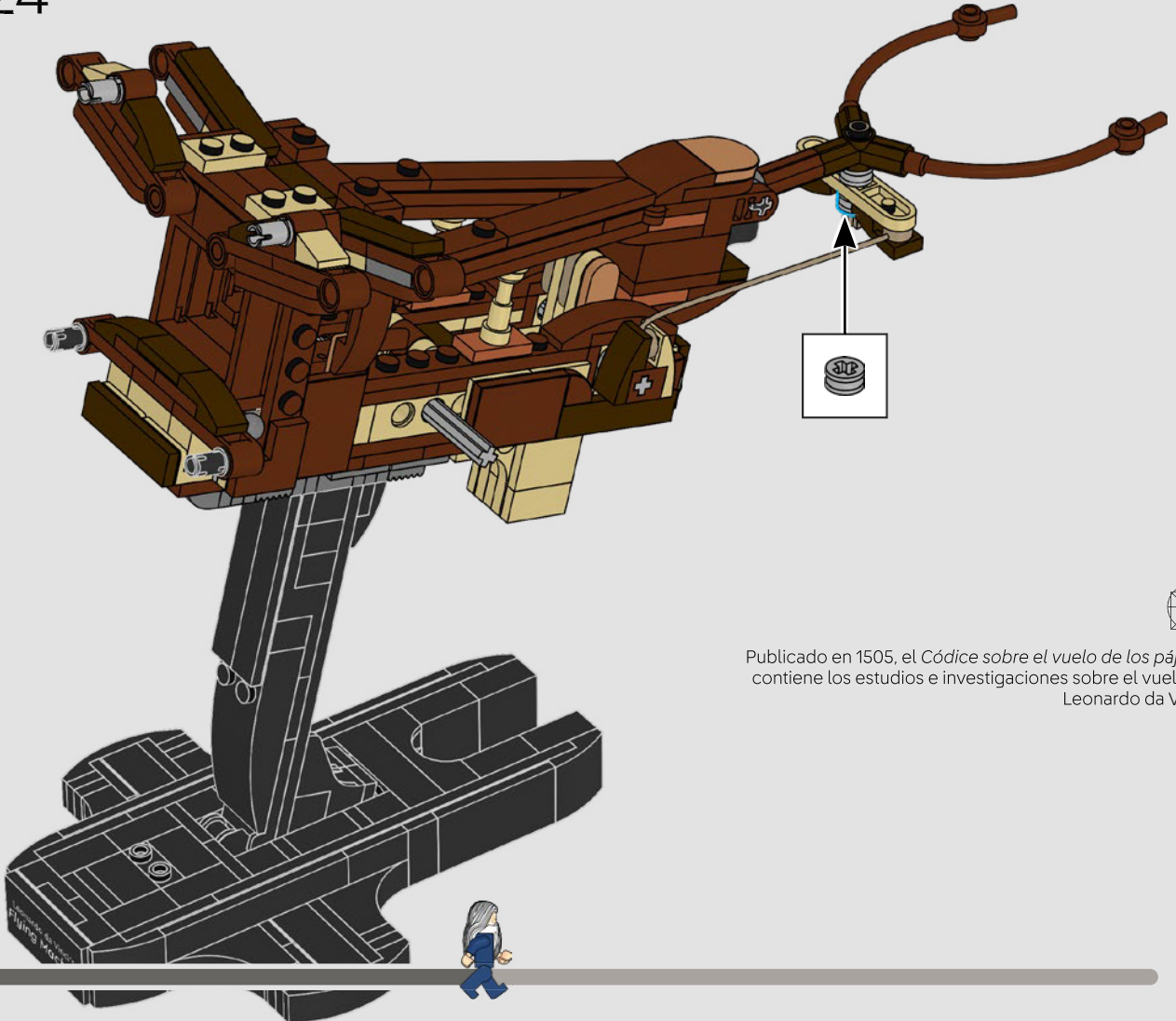




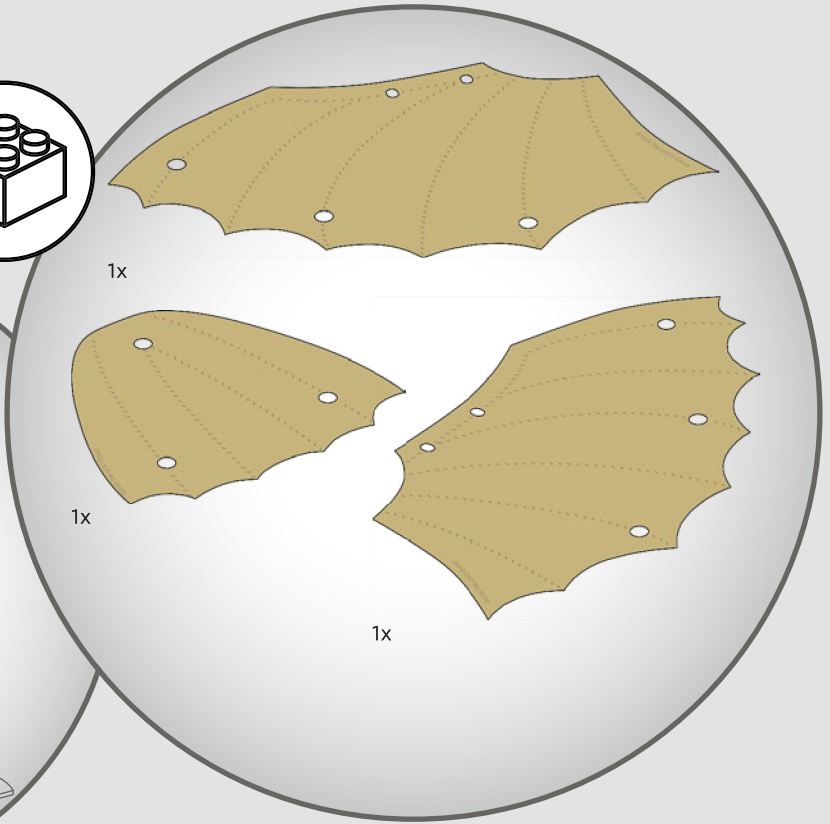
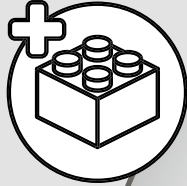
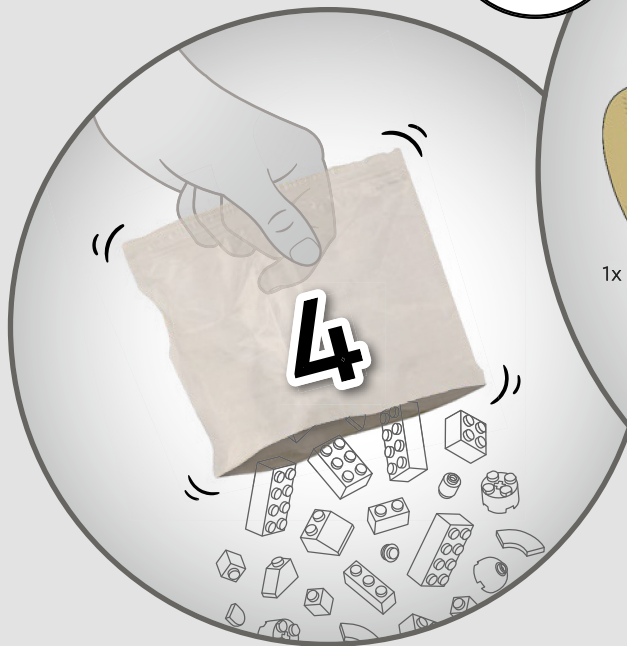


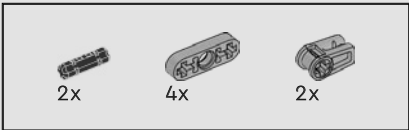
1x

124

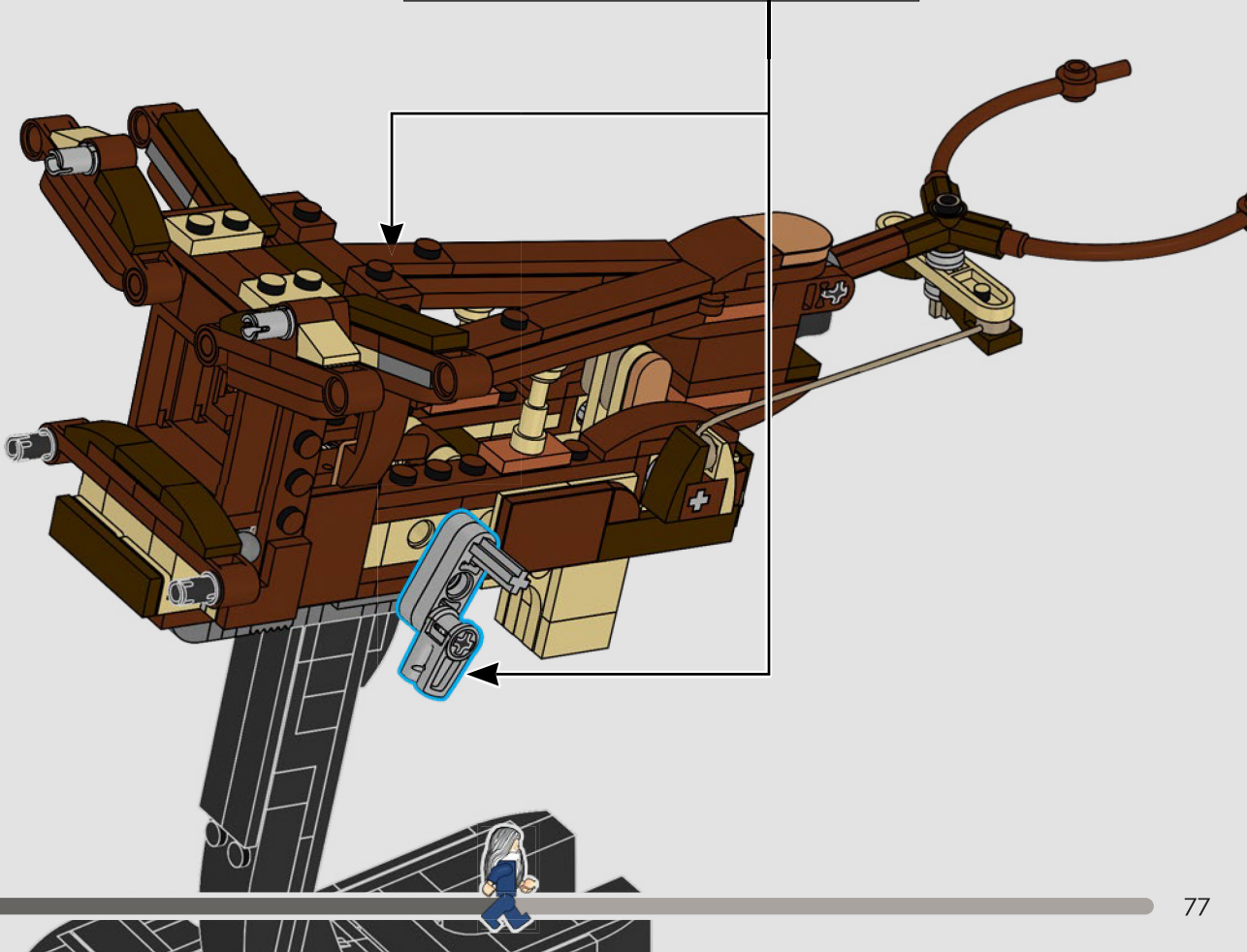
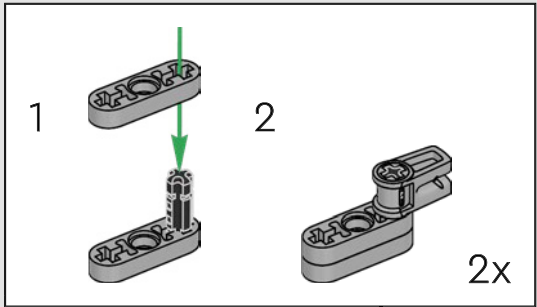


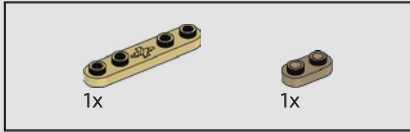
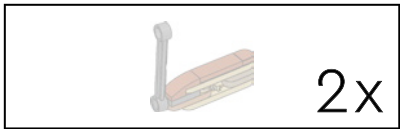
Publicado en 1505, el *Códice sobre el vuelo de los pájaros* contiene los estudios e investigaciones sobre el vuelo de Leonardo da Vinci.



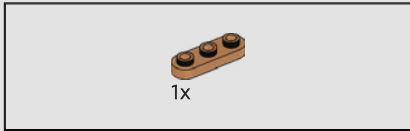
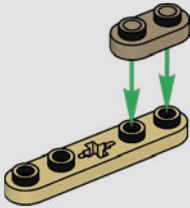


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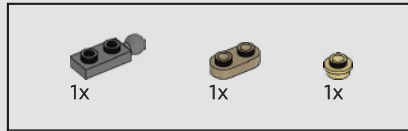
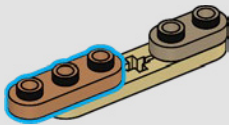




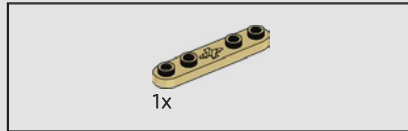
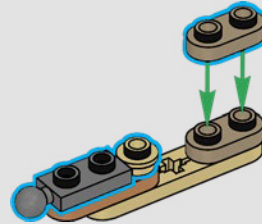
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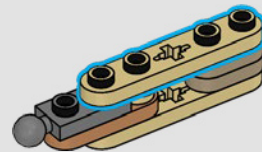
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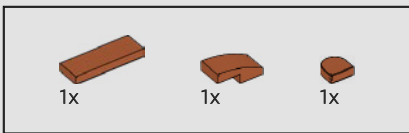


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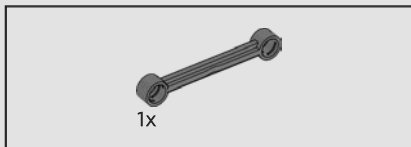
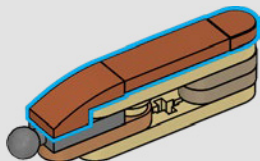


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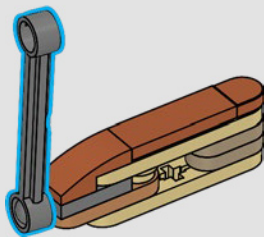




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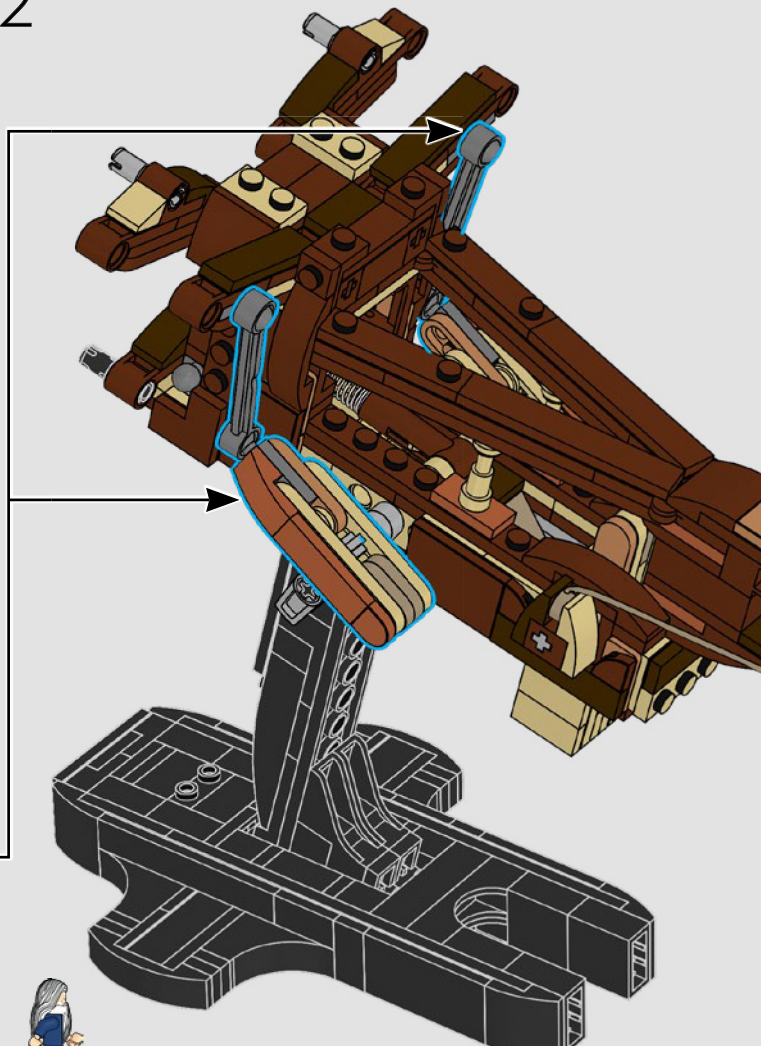


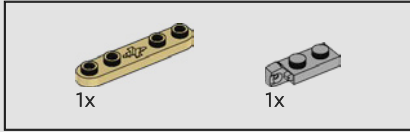
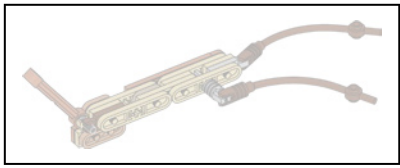
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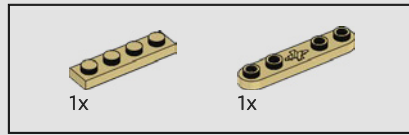
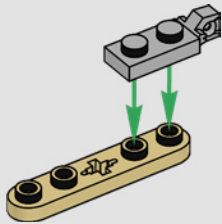
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132

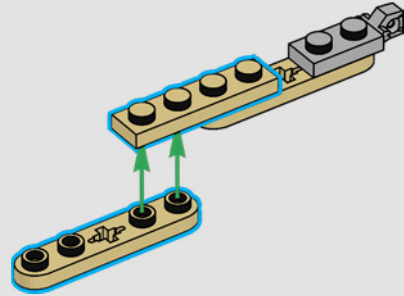




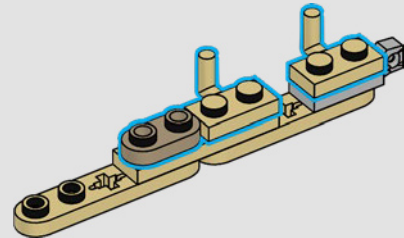
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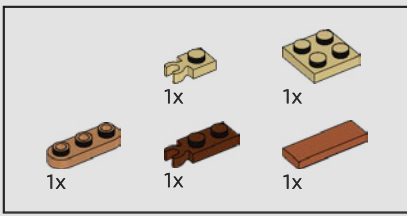
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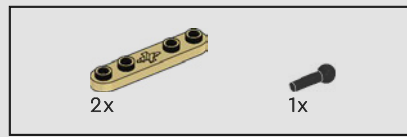
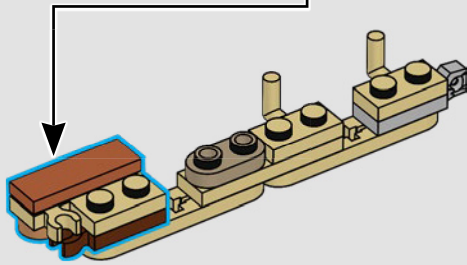
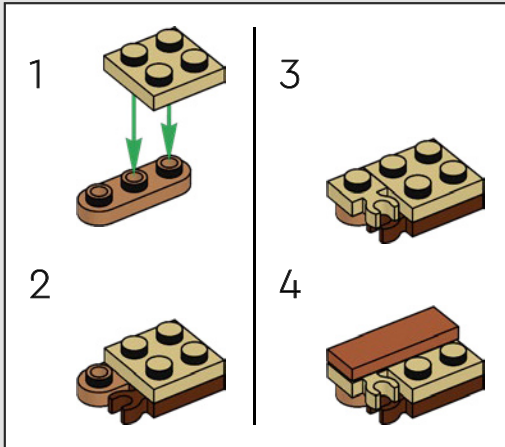
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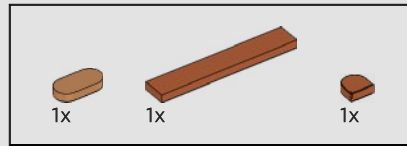
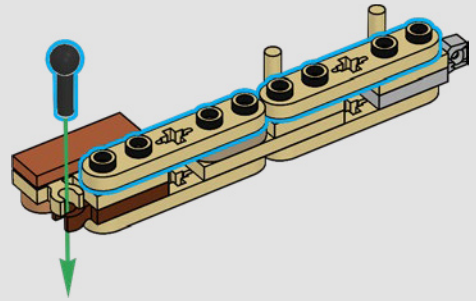




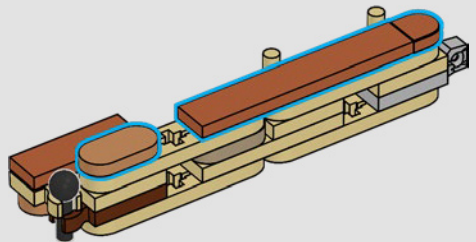
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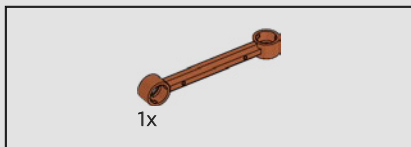


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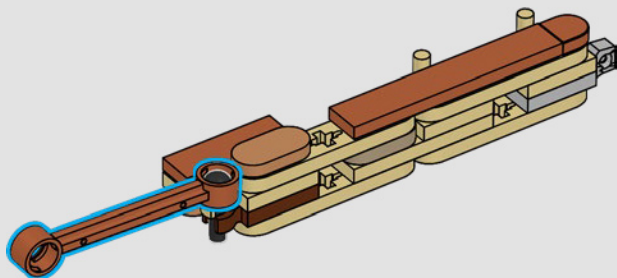


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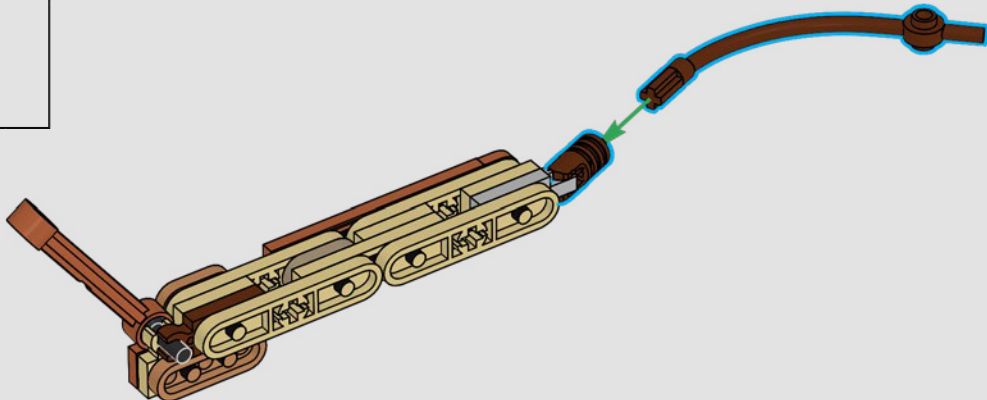
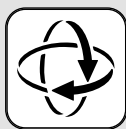


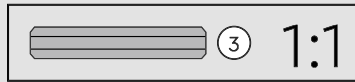
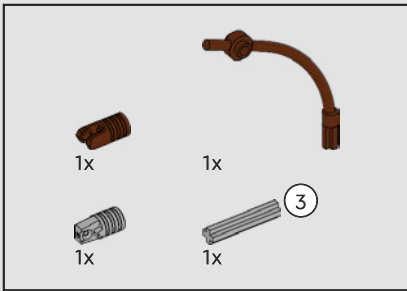


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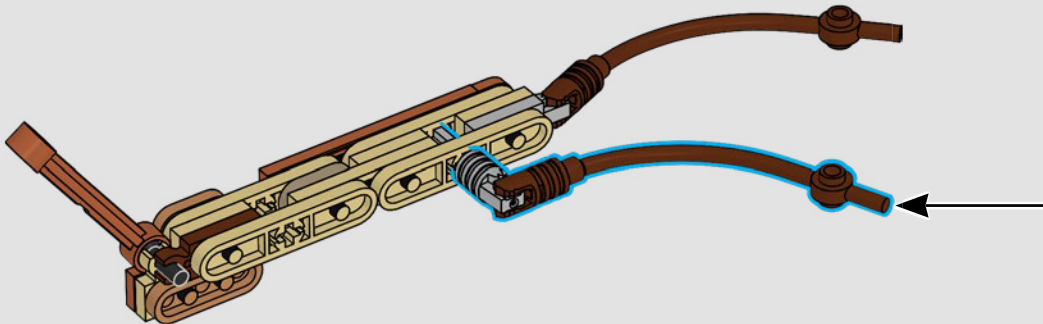
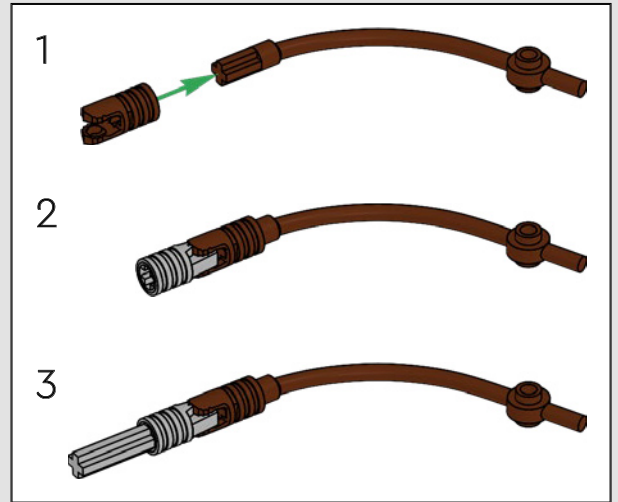


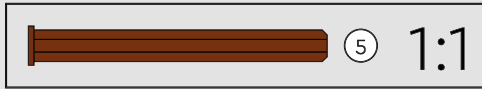
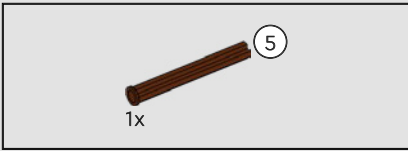
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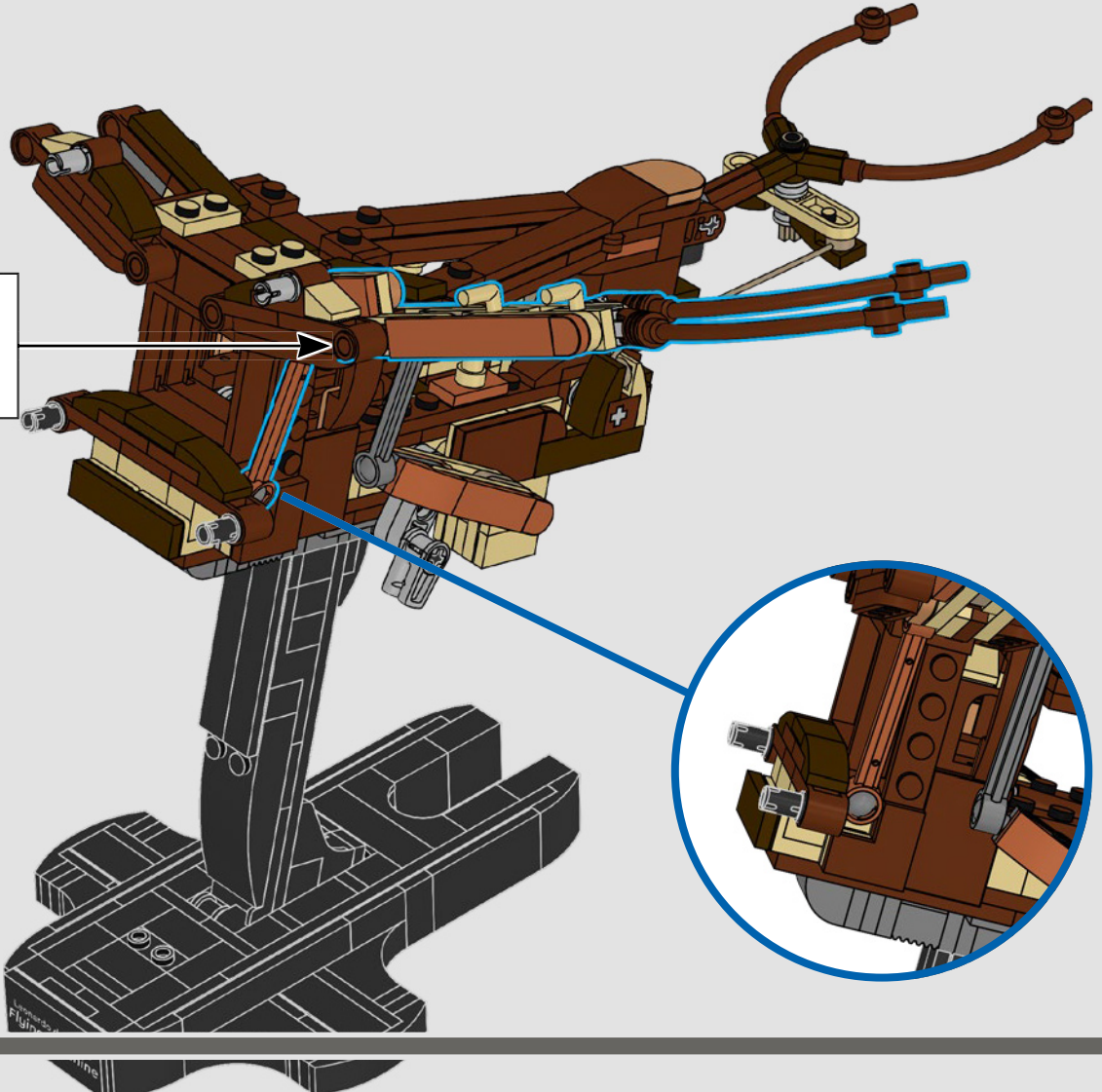
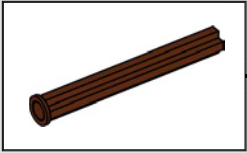


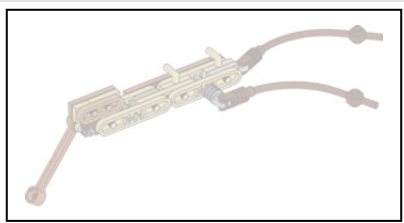
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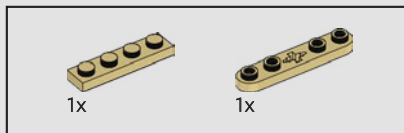
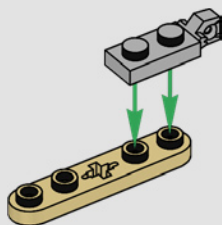


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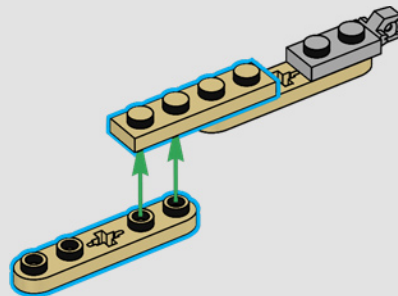




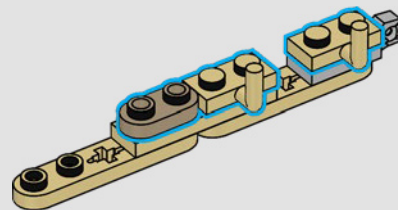
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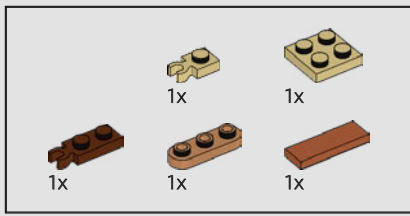


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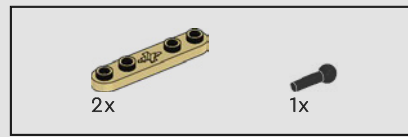
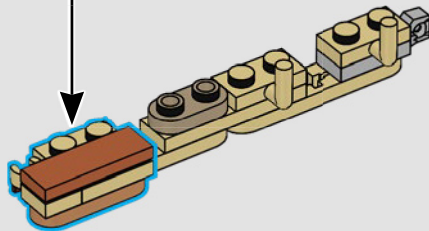
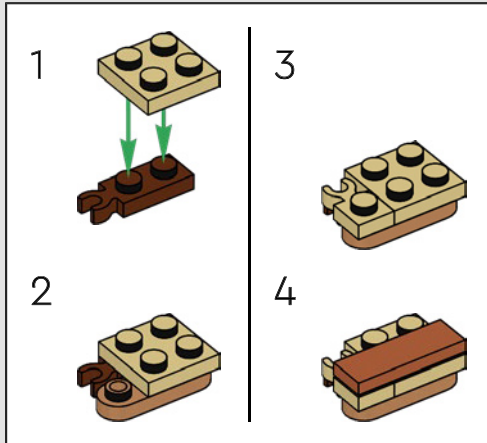


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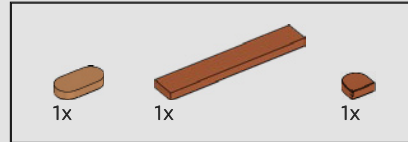
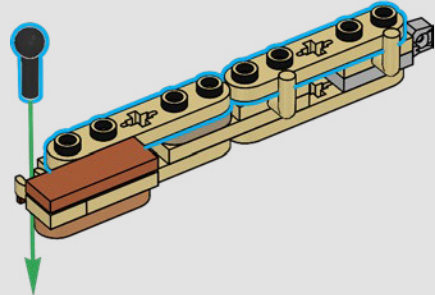




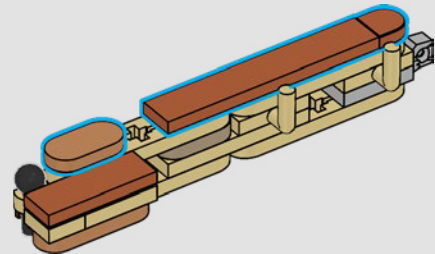
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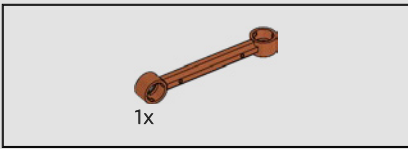


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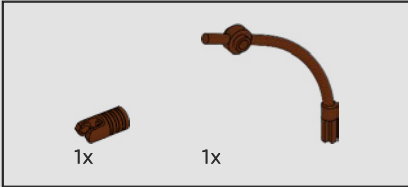
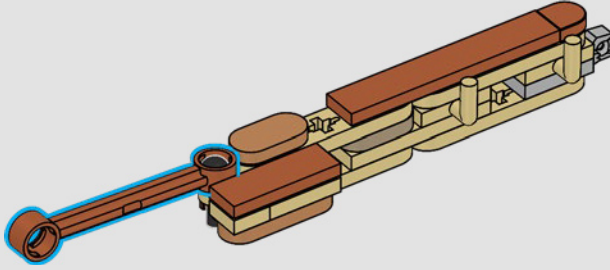


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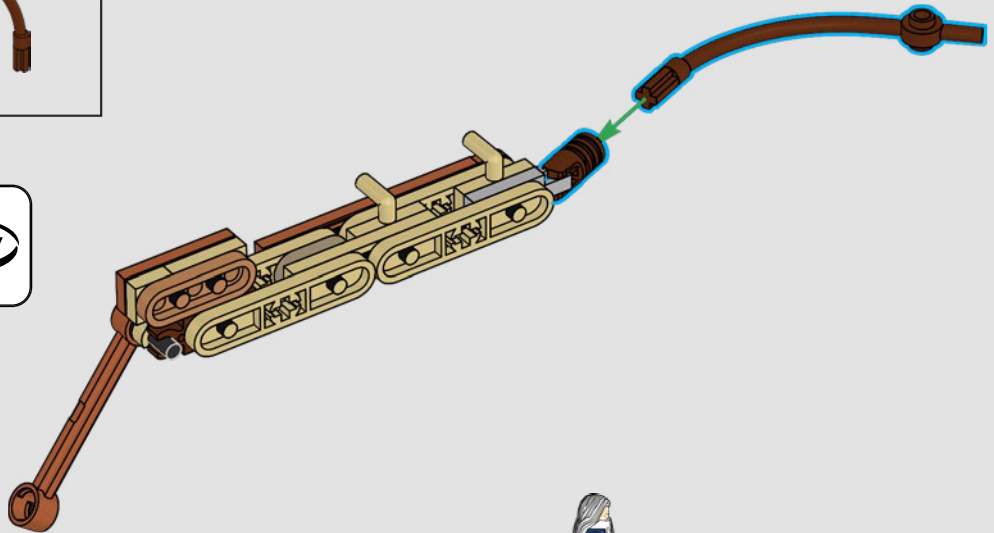


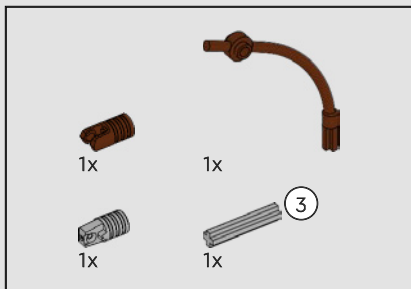


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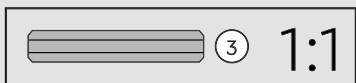
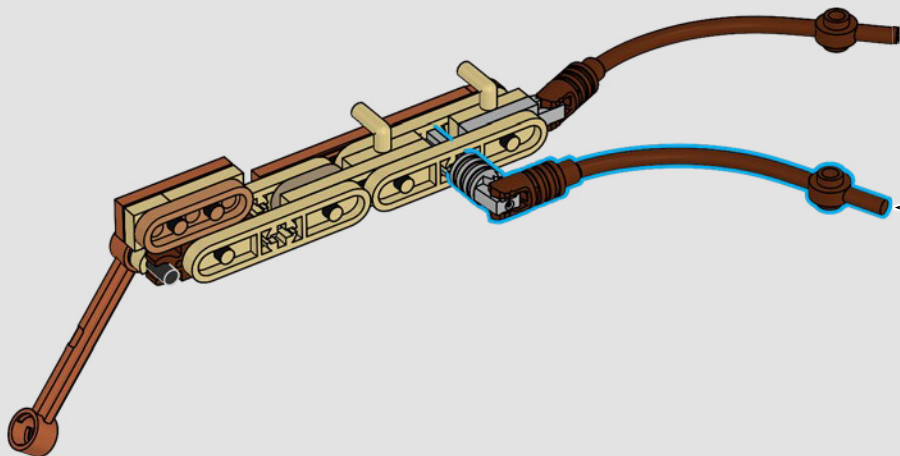
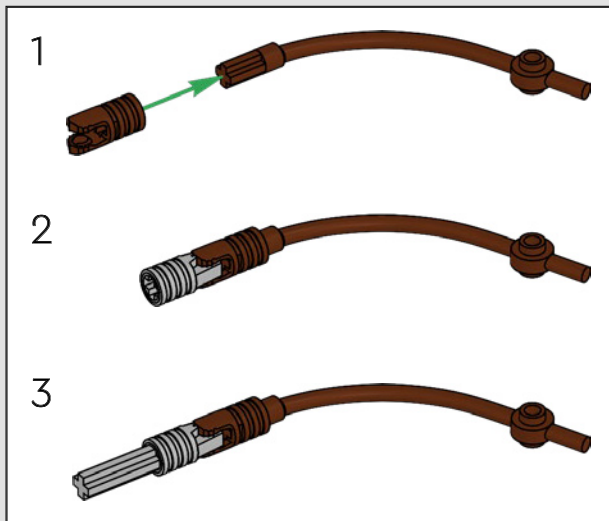


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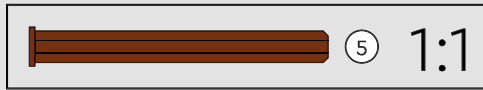
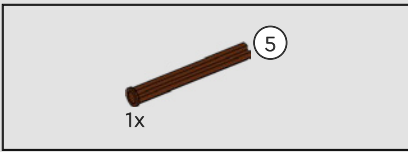




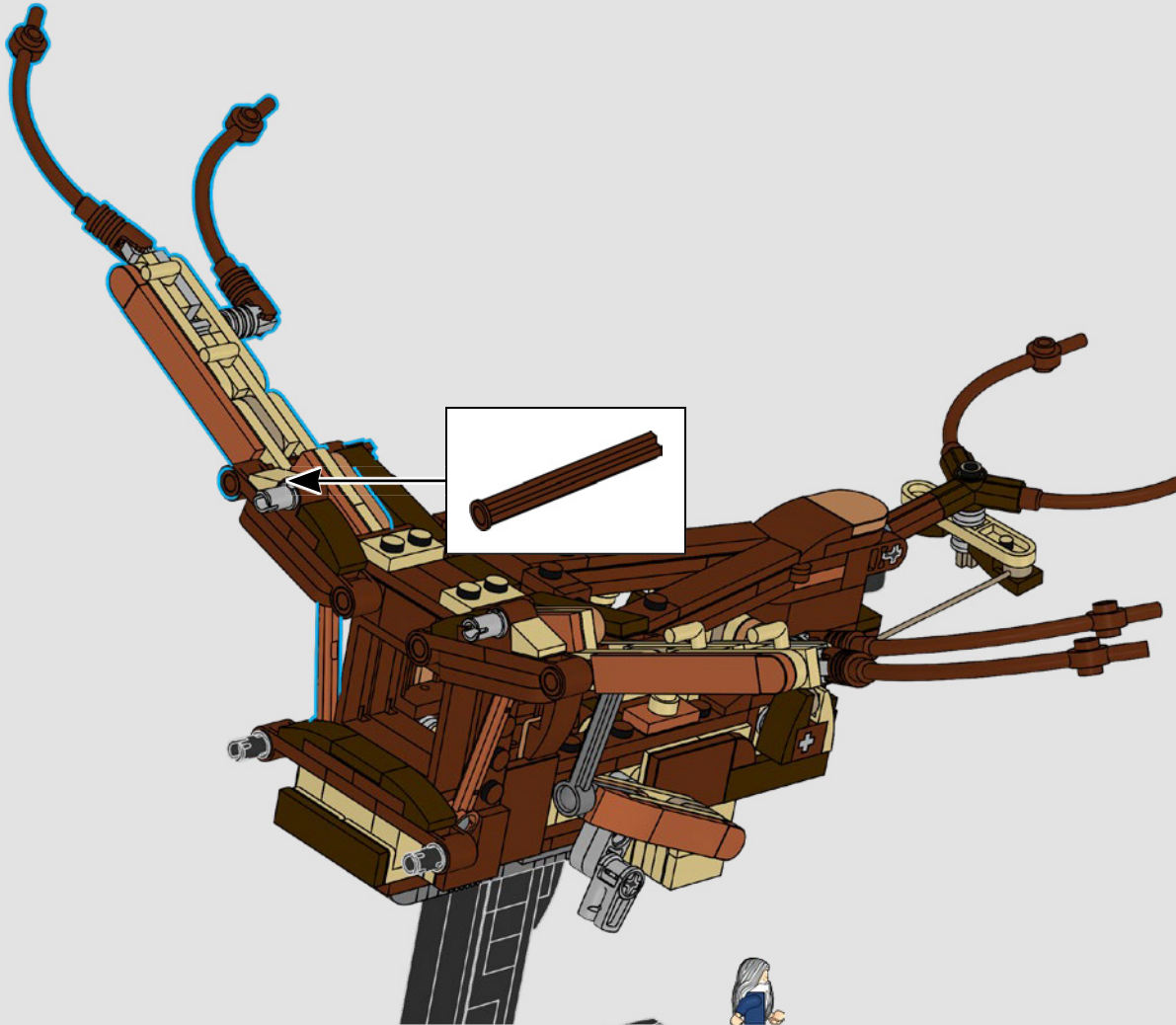
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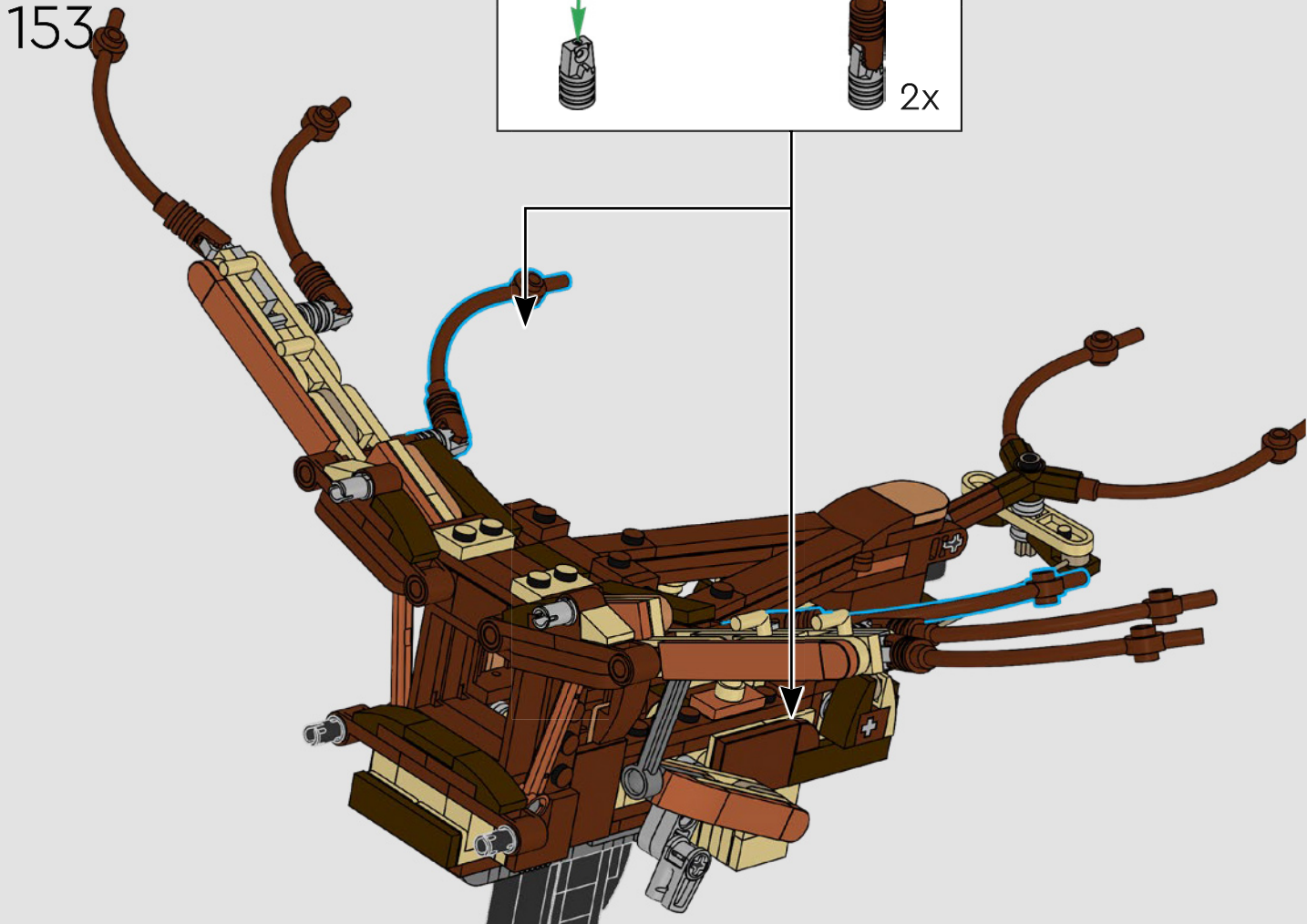
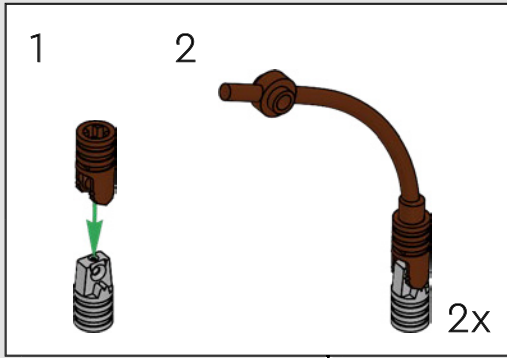
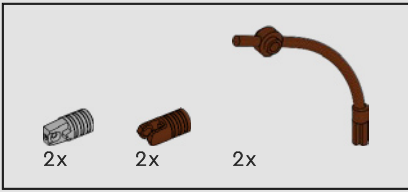


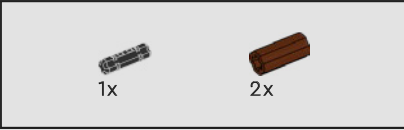




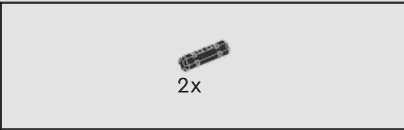
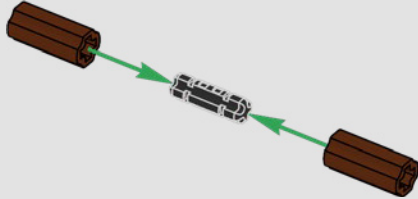
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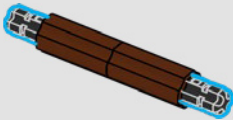




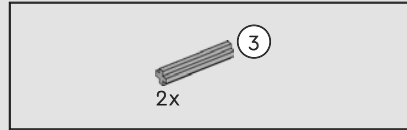
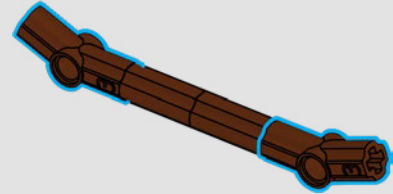
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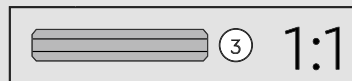
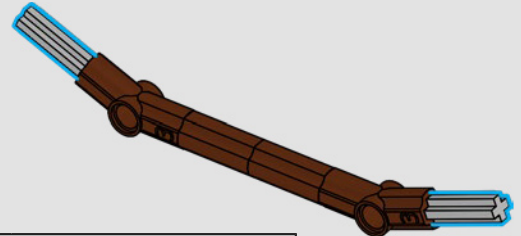
155



156

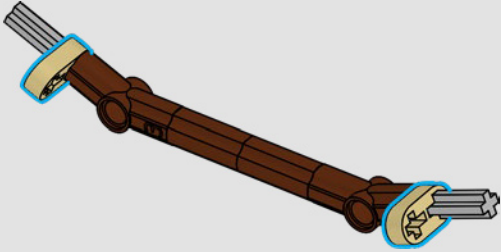


157

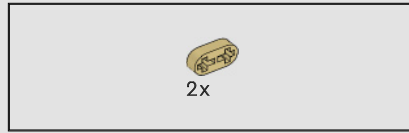
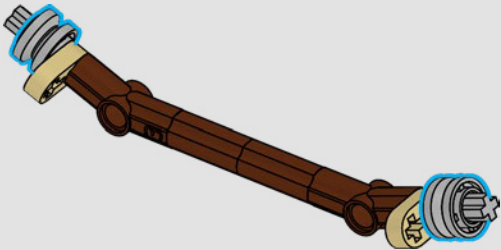




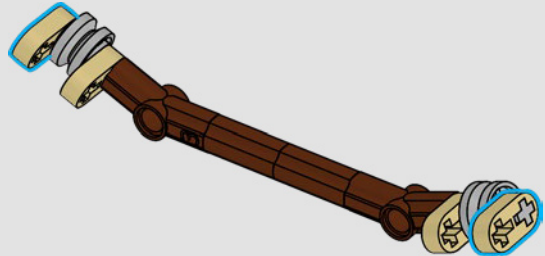
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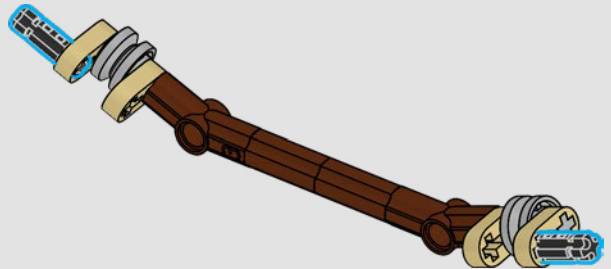
159



160



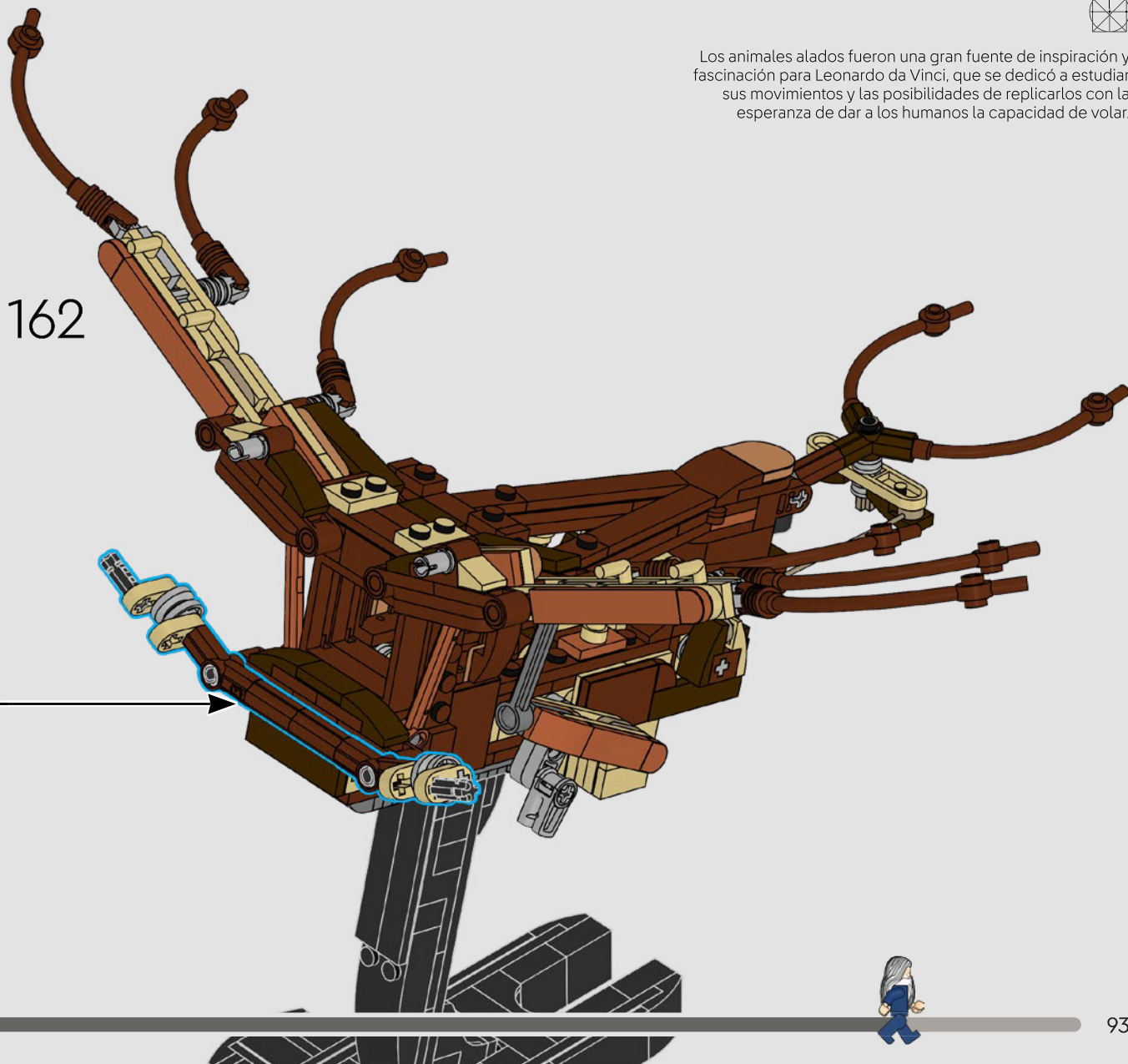
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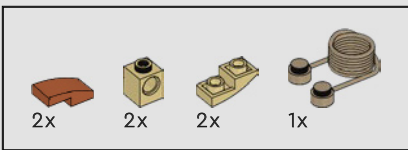




Los animales alados fueron una gran fuente de inspiración y fascinación para Leonardo da Vinci, que se dedicó a estudiar sus movimientos y las posibilidades de replicarlos con la esperanza de dar a los humanos la capacidad de volar.

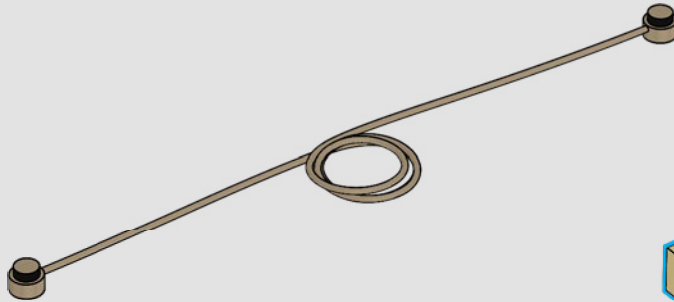
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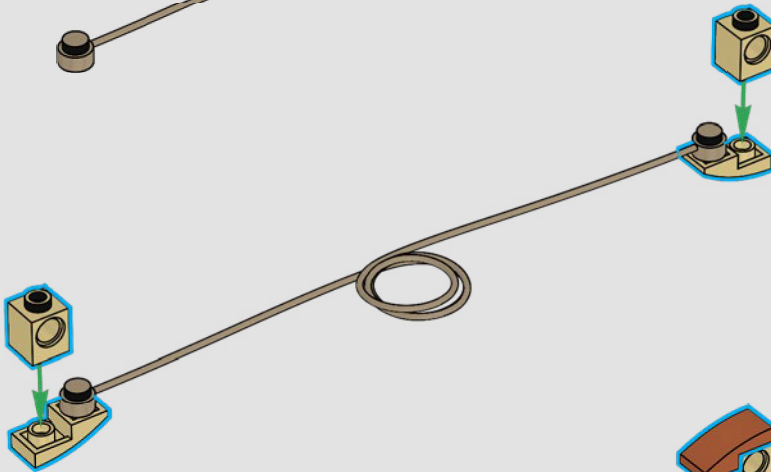


163

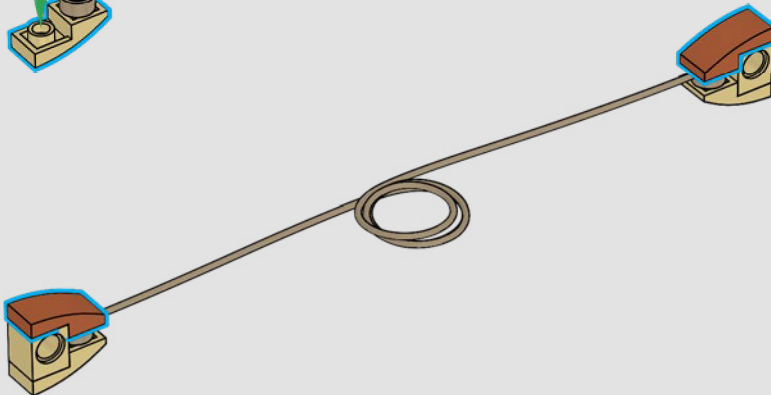
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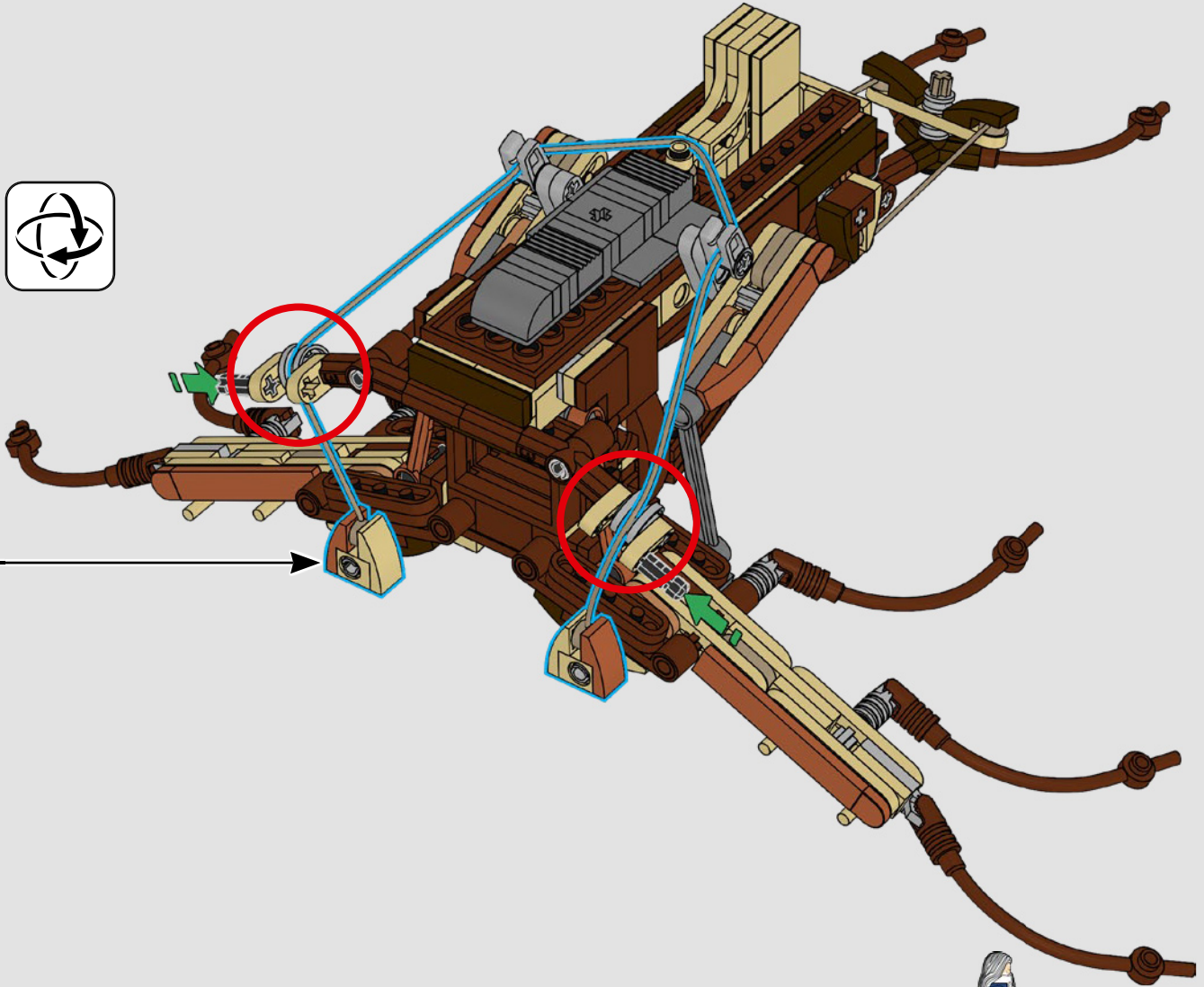


2



3

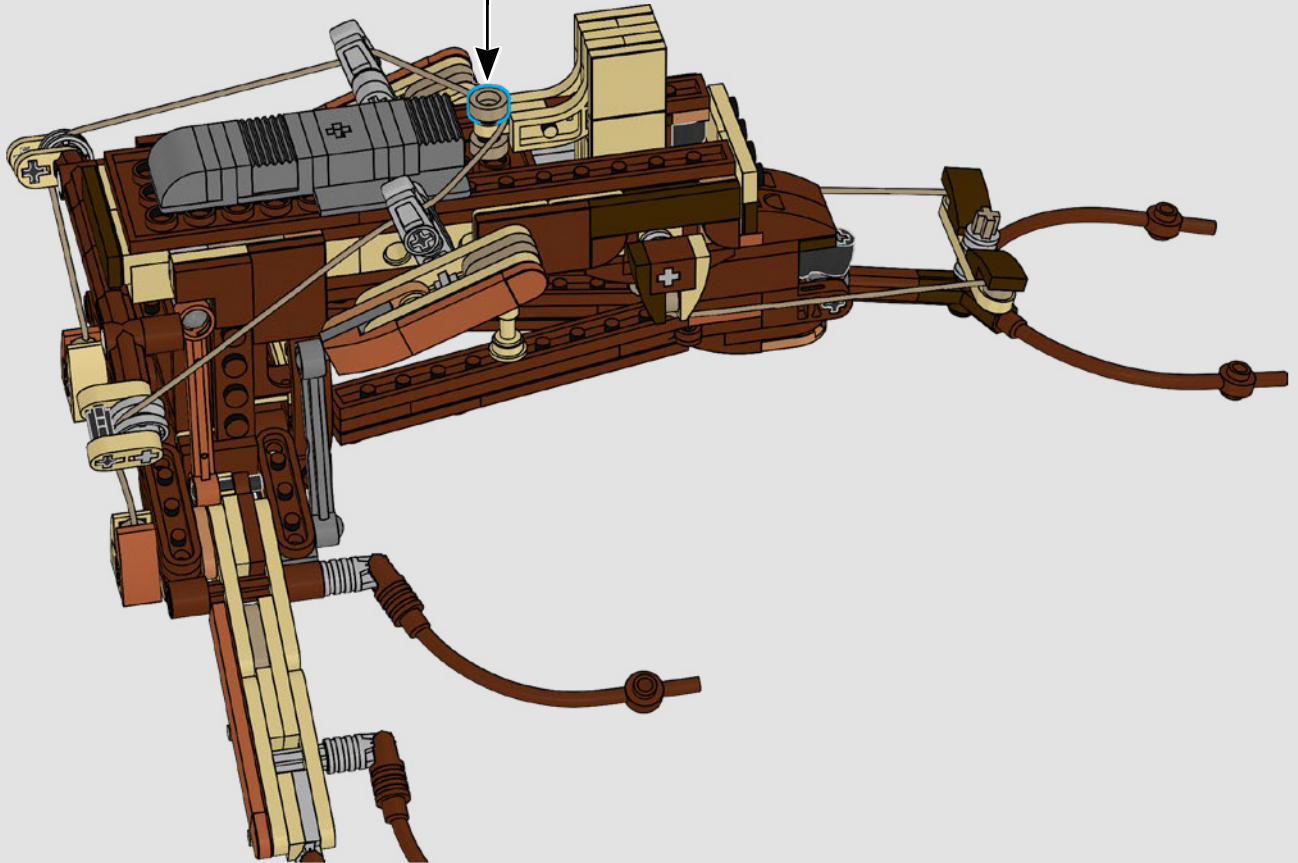
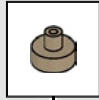






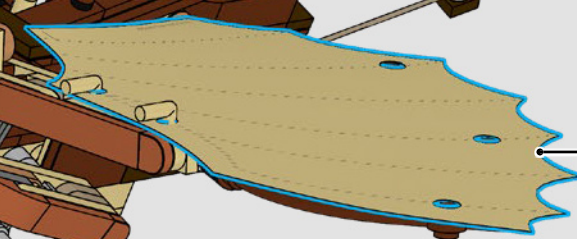
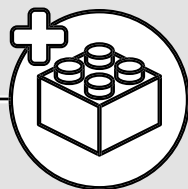
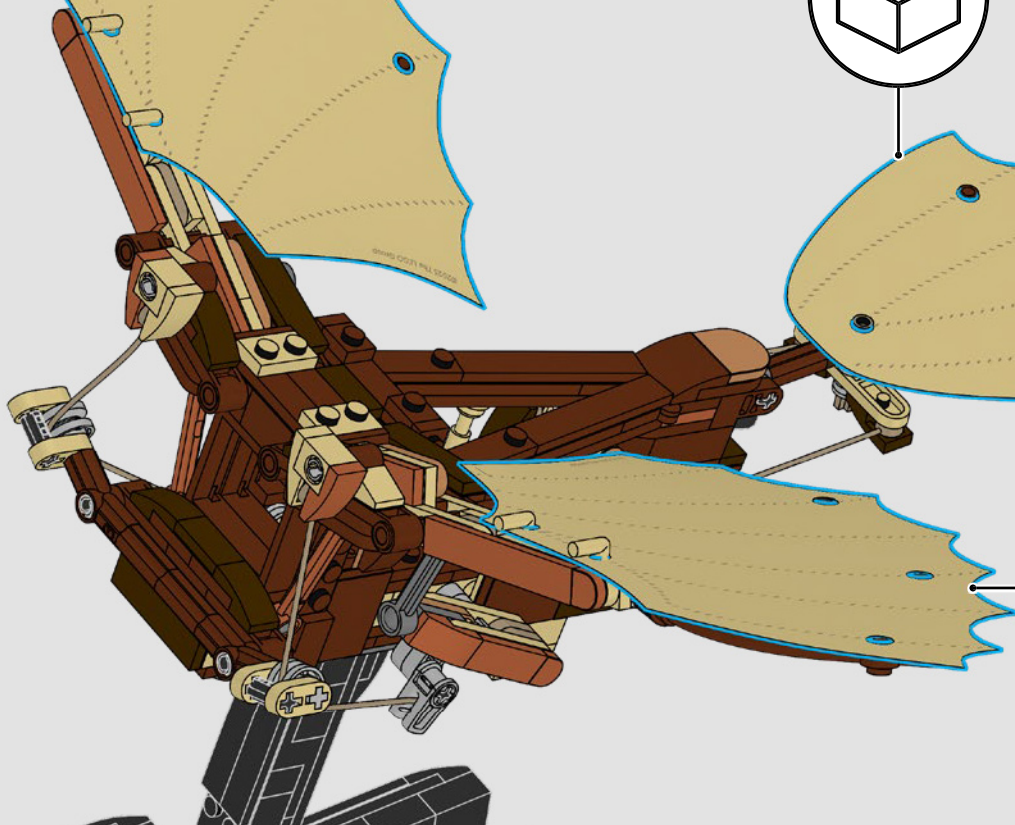
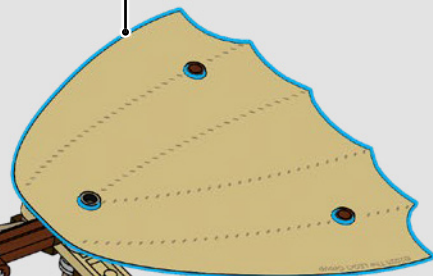
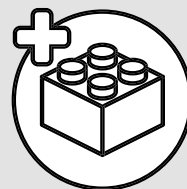
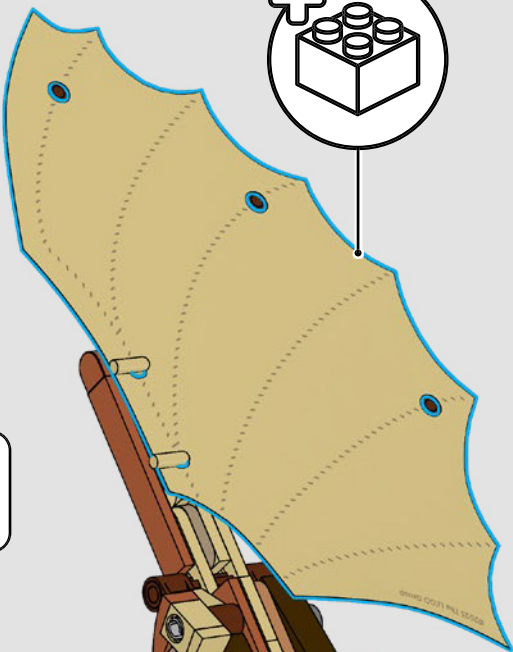
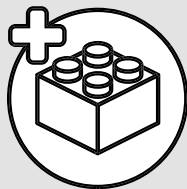
1x

164





165



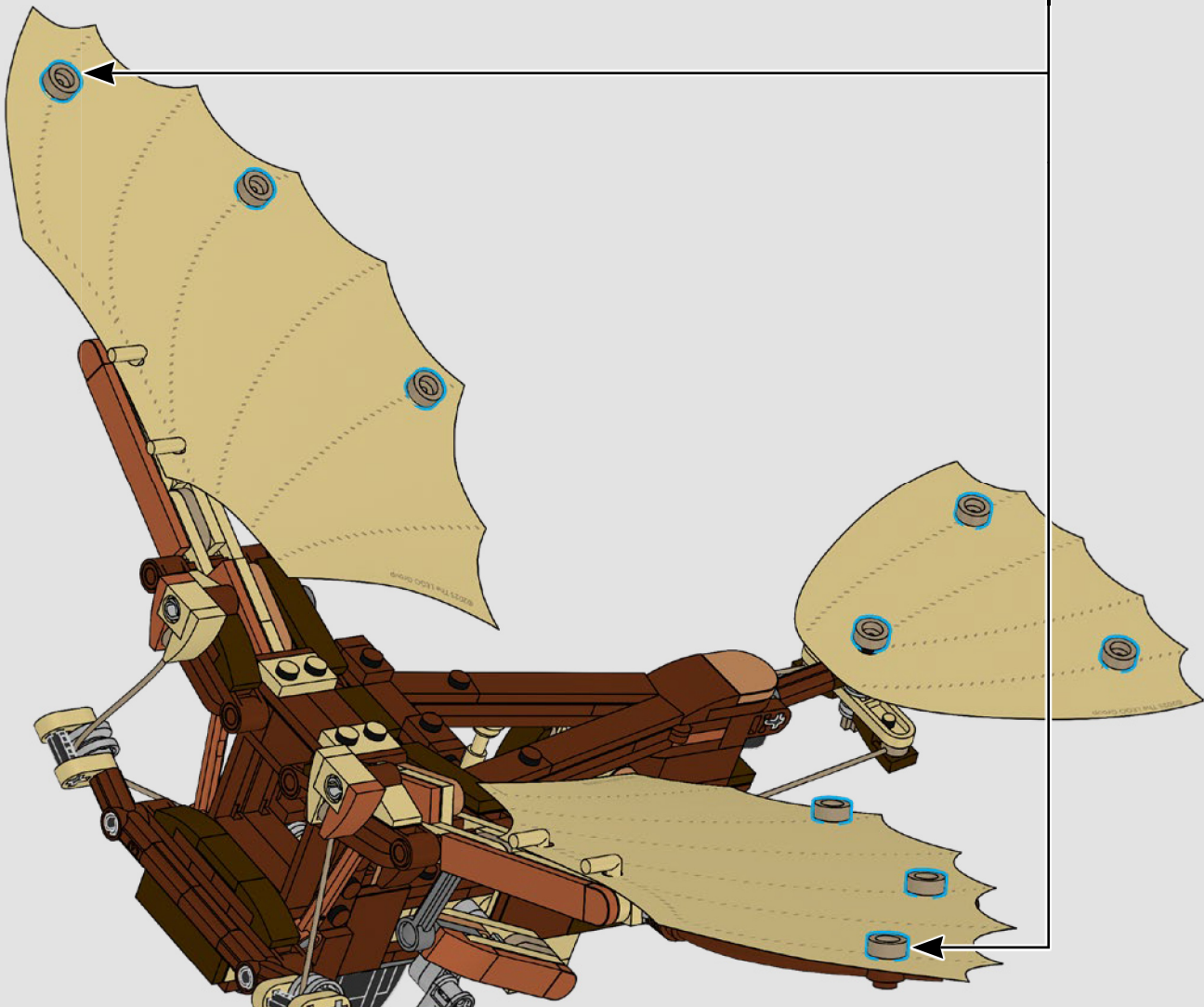


9x



9x

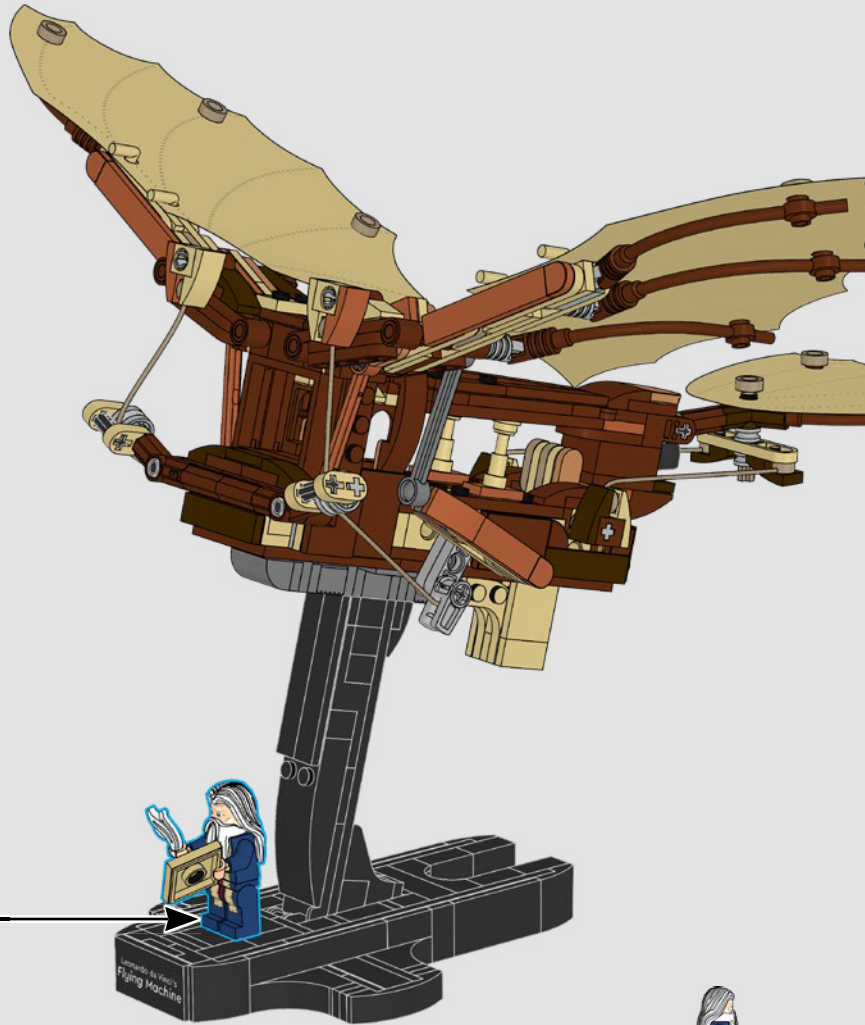
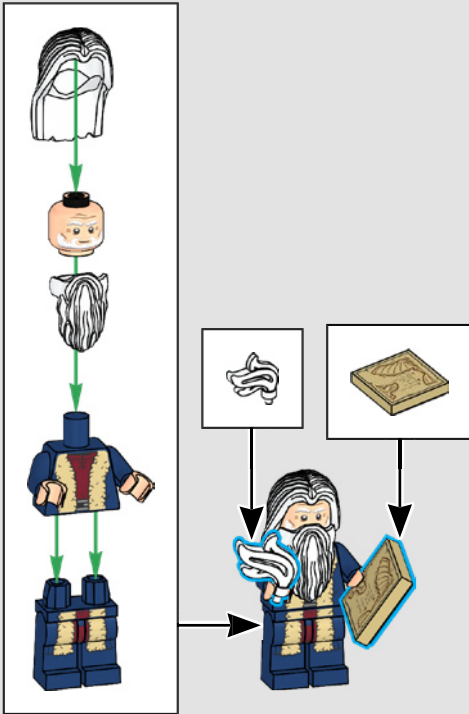
166





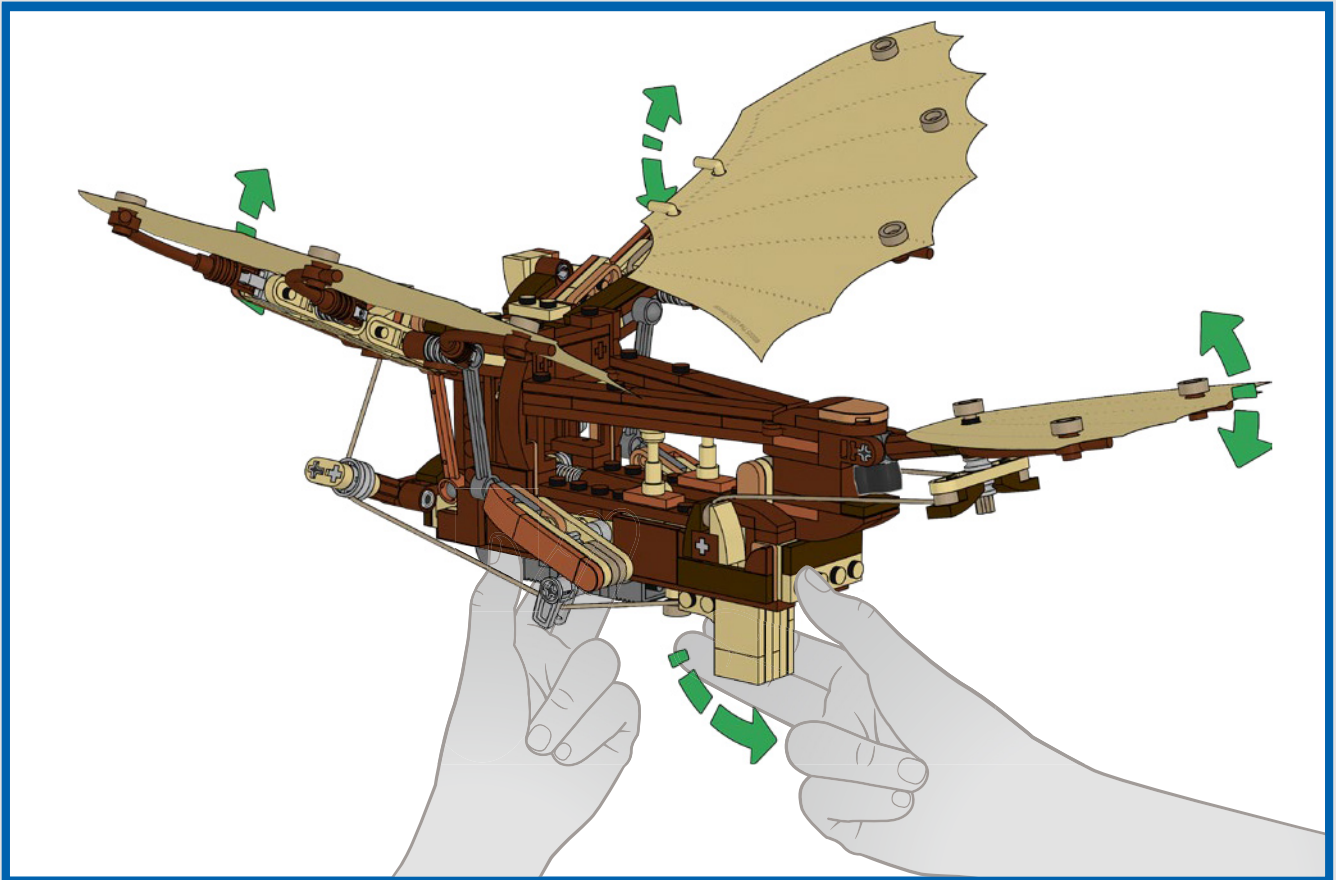
El diseño permite accionar el gatillo con el modelo en, al menos, tres situaciones distintas: apoyado en la base, sujeto con una mano y manipulado a dos manos (sosteniéndolo con una y accionando el gatillo con la otra).

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Uno de los desafíos del diseño fue decidir dónde colocar el gatillo de la función de aleteo a fin de que las manos del constructor no interfirieran con ninguna parte del mecanismo ni con el cordel.



2x  
6424674

2x  
654126

10x  
302426

2x  
6509664

9x  
4109810

2x  
6279875

1x  
4198367

2x  
6114987

7x  
6178922

4x  
302326

8x  
306926

10x  
6275806

2x  
6192309

2x  
6147050

6x  
302226

3x  
300326

4x  
6053077

3x  
6469445

1x  
6321745

2x  
4581280

4x  
6154860

2x  
365926

2x  
4613153

1x  
6258904

1x  
300126

2x  
4560182

2x  
362326

1x  
6562781

1x  
6533639

4x  
663626

1x  
4180548

2x  
346026

3x  
4514845

1x  
611226

1x  
244526

1x  
6523326

1x  
6530674

6x  
6380634

3x  
6507790

1x  
6513939

4x  
6492538

3x  
4206482

1x  
4142865

2x  
6129995

6x  
6443061

1x  
6167923

4x  
4516055

2x  
4179771

6x  
6376461

2x  
6352222

1x  
6281995

15x  
4113917

2x  
4523145

4x  
6261357

4x  
6251252

1x  
4114026

2x  
6060850

2x  
6313611

8x  
6117975

2x  
4114084

2x  
6013081

1x  
6523327

2x  
4121921

1x  
4159739

2x  
4234365

6x  
4113233

2x  
6397561

15x  
6311104

1x  
4114309

1x  
6122047

2x  
4112982

1x  
6519042

1x  
6522105

1x  
6522103

1x  
6522097

4

- 4x 6359273
- 2x 6092602
- 4x 6186009
- 2x 4615606
- 4x 6340118
- 2x 6523583
- 2x 6359696
- 1x 6315564
- 1x 6289366
- 1x 6353972
- 11x 6300320
- 8x 6231386
- 2x 6330148
- 1x 6184880
- 1x 6031821
- 1x 6532367
- 2x 6533185
- 1x 6240515

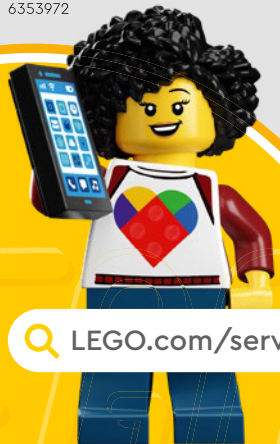
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- 4x 6149677
- 8x 6397610
- 2x 6472546
- 6x 6503738
- 3x 4531751
- 8x 4211150
- 2x 6138664
- 2x 6063447
- 2x 6502370
- 2x 6459597
- 2x 6221608
- 3x 6146858

- 2x 6261388
- 10x 6415991
- 1x 6534905
- 2x 6172636
- 6x 6463591
- 4x 6311441
- 3x 4211189
- 1x 4216668
- 4x 4211190
- 4x 4658005
- 5x 6257604
- 2x 4595889

- 2x 6092566
- 4x 6416695
- 1x 4211201
- 4x 6159763
- 8x 6516553
- 4x 4221590
- 2x 4211204
- 4x 4629920
- 4x 4216945
- 2x 4271874
- 2x 4223683

- 1x 6005331
- 2x 4210636
- 4x 4211063
- 1x 6302690
- 1x 6178919
- 2x 6039479
- 2x 6308045
- 4x 6123814
- 2x 6118832
- 2x 4629920
- 6x 4566688
- 8x 6046943
- 1x 6273219
- 6x 6313874

- 1x 6523324
- 6x 6271165
- 2x 6335328
- 2x 4211758
- 4x 6265704
- 2x 4211807
- 2x 6471951
- 4x 6360043
- 2x 6266231
- 4x 4211815
- 4x 4211429
- 1x 4211396
- 1x 4211805
- 1x 4535768



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7

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