

1



Laboratorio di MECCANICA

AUTO DA CORSA

Costruzioni da 1 a 4

- 1 - Biella e pistone
- 2 - Differenziale
- 3 - Super buggy 4x4
- 4 - Auto da corsa



V43104

Manuale da leggere e
conservare per future
referenze.



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 **Clementoni**®

ELENCO DEI PEZZI

	Barra doppia 15 fori	pz. 4
	Barra doppia 11 fori	pz. 4
	Barra doppia 9 fori	pz. 4
	Barra doppia 7 fori	pz. 6
	Barra doppia 5 fori	pz. 6
	Barra doppia 3 fori	pz. 6
	Barra singola 15 fori	pz. 4
	Barra singola 13 fori	pz. 4
	Barra singola 9 fori	pz. 4
	Barra singola 7 fori	pz. 2
	Barra singola 5 fori	pz. 2
	Barra singola 3 fori	pz. 2
	Modulo ad angolo alto	pz. 2
	Modulo ad angolo basso	pz. 2
	Barra singola 7 fori	pz. 6
	Barra singola 5 fori	pz. 6
	Barra singola 3 fori	pz. 6
	Modulo ad angolo alto	pz. 6
	Modulo ad angolo basso	pz. 6
	Barra a 4 fori	pz. 2
	Barra T	pz. 2
	Barra ad angolo	pz. 4
	Astina 7 l. cm. 9,9	pz. 2
	Astina 6 l. cm. 11,7	pz. 2
	Astina 5 l. cm. 8,1	pz. 2
	Astina 4 l. cm. 7,2	pz. 2
	Astina 3 l. cm. 5,4	pz. 10
	Astina 2 l. cm. 3,6	pz. 4
	Astina 1 l. cm. 2,7	pz. 2
	Anello corto	pz. 12
	Anello lungo	pz. 12
	Vite senza fine	pz. 1
	Gabbia portasatelliti	pz. 1
	Ruota 32 denti	pz. 1
	Ruota 24 denti	pz. 1
	Ruota 12 denti	pz. 9
	Chiodino corto doppio	pz. 48
	Chiodino corto singolo	pz. 16
	Chiodino corto libero	pz. 48
	Chiodino lungo singolo	pz. 16
	Chiodino lungo libero	pz. 16
	Barra con chiodini	pz. 4
	Barra con perni	pz. 6
	Gancio	pz. 1
	Manovella	pz. 2
	Asta dentata	pz. 1
	Asta chiodo	pz. 2
	Volante	pz. 1
	Rocchetto	pz. 1
	Connettore astina	pz. 2
	Ruota 10 denti	pz. 2
	Ruota 18 denti	pz. 5
	Ruota 26 denti	pz. 1
	Ruota 41 denti	pz. 1
	Modulo di trasmissione	pz. 2
	Puleggia	pz. 4
	Pneumatico	pz. 4
	Cerchione	pz. 4
	Pannello N sx	pz. 1
	Pannello N dx	pz. 1
	Pannello I	pz. 1
	Pannello H dx	pz. 1
	Pannello H sx	pz. 1
	Pannello G dx	pz. 1
	Pannello G sx	pz. 1
	Pannello L	pz. 1
	Pannello D sx	pz. 1
	Pannello D dx	pz. 1
	Pannello E dx	pz. 1
	Pannello E sx	pz. 1
	Pannello M dx	pz. 1
	Pannello M sx	pz. 1

N.B.: far eseguire da un adulto la rimozione dei pezzi dai supporti in plastica. Eventuali residui pungenti devono essere smaltiti prontamente.



FATTI AIUTARE DA UN ADULTO!



Il motore a combustione interna

Il motore a combustione interna è una macchina capace di trasformare l'energia chimica in potenza meccanica.
Per generare la potenza meccanica abbiamo bisogno di:

Comburente:
ossigeno



Combustibile:
gas, benzina o
gasolio



Camera di combustione:

il contenitore in cui avviene la reazione di combustione tra combustibile e comburente

VALVOLA

CONDOTTO

PISTONE

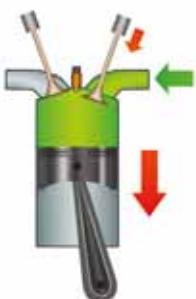
CILINDRO

BIELLA

ALBERO MOTORE



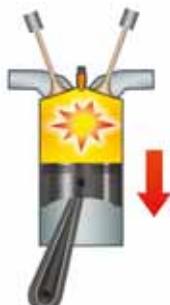
Come funziona? Le fasi che consentono la combustione sono in tutto 4:



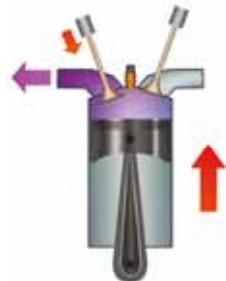
Aspirazione: il pistone
scende. L'aria o la miscela
aria/combustibile viene
risucchiata nel cilindro.



Compressione: il pistone
sale. La miscela aria/com-
bustibile viene compressa.
Inizia la combustione.



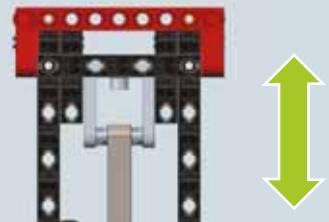
Accensione ed Espansione:
il pistone scende. Avviene
la combustione che porta
all'espansione istantanea
dei gas. Il pistone viene
spinto verso il basso.



Scarico: il pistone sale.
I residui della combus-
tione vengono espulsi dal
cilindro.

Ad ogni ciclo appena descritto corrispondono due rotazioni dell'albero motore, che di conseguenza trasmette il moto agli altri organi meccanici del veicolo.

**COSTRUISCI E PROVA IL MODELLO
DEL MOTORE A PAGINA 7**



Il differenziale

In meccanica, differenziale è un organo in grado di trasferire la potenza sviluppata dal motore, alla coppia di ruote motrici.

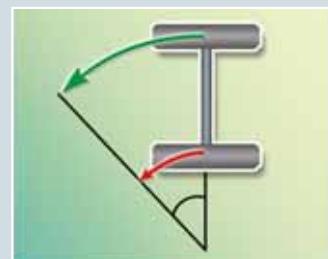


Componenti:

1. Pignone: trasferisce potenza dal motore alla corona e in ultimo alle ruote motrici.
2. Corona: vincolata alla gabbia porta satelliti, è accoppiata stabilmente al pignone.
3. Gabbia porta satelliti: è la scatola che racchiude gli ingranaggi.
- 4 Satelliti: ingranaggi vincolati alla gabbia.
- 5 Planetari: ingranaggi vincolati ai semiassi.
- 6 Semiasse: asse che collega le ruote motrici ai planetari.

E' progettato in modo da consentire alle due ruote di girare a velocità differenti in curva: nei tratti non rettilinei infatti, la ruota esterna alla curva percorre più strada rispetto a quella interna.

Grazie al differenziale, la ruota interna, che percorre una distanza minore, viaggia a una velocità inferiore; quella esterna, che percorre una distanza maggiore, viaggia a una velocità superiore.



COSTRUISCI E PROVA IL MODELLO DEL DIFFERENZIALE PAGINA 8

Grazie al differenziale, in curva, le ruote di una vettura girano a velocità differenti: la ruota interna, percorrendo una distanza minore, viaggia a una velocità inferiore; quella esterna, percorrendo una distanza maggiore, viaggia a una velocità superiore. Fai percorrere al modello una curva e osserva come il differenziale fa girare le ruote a velocità diverse.

Il pignone trasferisce la potenza del motore al differenziale e di conseguenza ai semiassi, azionando le ruote. Il pignone è più piccolo della corona del differenziale così da ottenere un'ulteriore riduzione. Agisci sull'ingranaggio da 18 per osservare come il modello si sposta avanti o indietro a seconda del verso di rotazione del pignone.

Su una strada dritta le ruote si muovono alla stessa velocità, perciò i satelliti non ruotano all'interno della gabbia, ma sono solidali ad essa. Ruota il modello e fai girare insieme le due ruote. Vedrai satelliti e gabbia ruotare come un blocco unico.



La trazione integrale

In caso di motori estremamente potenti o percorsi difficili da affrontare a causa della pendenza e del terreno sconnesso, 2 ruote motrici possono non bastare. È proprio per situazioni del genere che alcuni veicoli vengono equipaggiati con un sistema di trazione integrale, nel quale la potenza del motore viene distribuita a tutte e 4 le ruote e non solo alla coppia anteriore o posteriore.



La trasmissione della forza motrice a tutte e 4 le ruote viene di solito realizzata montando 2 differenziali, uno per la coppia di ruote anteriori e uno per la coppia di ruote posteriori. A seconda delle necessità, la trazione integrale può essere configurata in modi completamente diversi:

- per quelle auto che devono viaggiare su strade asfaltate, è necessario un terzo differenziale per ripartire al meglio la forza motrice.
- per quelle auto che affrontano gare su sterrato, si può addirittura fare a meno del differenziale.

**COSTRUISCI LA SUPER BUGGY 4X4
A PAGINA 10**



L'aerodinamica



Nel mondo delle corse è fondamentale progettare la forma del veicolo seguendo le leggi dell'aerodinamica. L'obiettivo dei costruttori è quello di sfruttare le forze che si generano quando un corpo solido (la macchina) si muove in un fluido (l'aria), con lo scopo di tenere il veicolo schiacciato a terra e aumentare di conseguenza l'aderenza e la manovrabilità. Per capire come agiscono tali forze dobbiamo prima analizzare i concetti di portanza e deportanza.

PORTANZA E DEPORTANZA

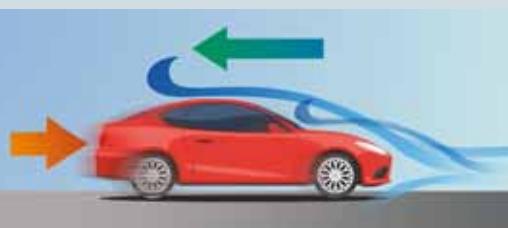
La portanza è la forza che contrasta la gravità generando una spinta verso l'alto. Prendiamo come esempio le ali di un aereo. Mentre l'aereo avanza, spinto dai motori, il flusso d'aria scorre con velocità diverse sulle due superfici dell'ala: più lentamente sul ventre e a velocità maggiore sul dorso. Il flusso più lento esercita una pressione maggiore, producendo una spinta verso l'alto. Se la portanza è la forza che spinge verso l'alto, la deportanza è il suo opposto, ovverosia una forza che genera una spinta verso il basso. Nel caso delle auto da corsa, elementi della carrozzeria come gli alettoni generano deportanza e schiacciano la macchina a terra sfruttando le leggi dell'aerodinamica.



La resistenza aerodinamica



Ogni volta che ci spostiamo a piedi, in bicicletta o in auto, l'aria che ci circonda oppone una forza contraria al nostro movimento, chiamata **resistenza aerodinamica**. La resistenza aerodinamica è quindi quella forza che tende a rallentare un corpo che si muove in un fluido (in questo caso l'aria). Se il fluido cambia la forza può aumentare o diminuire: acqua e aria sono due fluidi ma è molto più difficile camminare o correre in acqua che sulla terraferma, perché l'acqua oppone una maggiore resistenza.



Contrastare la resistenza aerodinamica è quindi un altro aspetto estremamente importante nel mondo delle corse, motivo per cui si studiano macchine con forme affusolate.

Le superfici curve e appuntite offrono meno resistenza delle superfici piatte e larghe, perciò il muso e la carrozzeria delle auto da corsa sono state disegnate e progettate seguendo criteri aerodinamici ben definiti. Alcuni veicoli, costruiti per battere ogni record di velocità a terra, somigliano a dei missili su quattro ruote.

La galleria del vento



Durante le fasi di progettazione e sviluppo, si utilizza spesso la galleria del vento, nella quale una potente ventola genera il flusso d'aria che investe il veicolo, tenuto fermo al centro del tunnel.

La galleria del vento permette quindi di simulare l'avanzamento della macchina anche se questa è ferma. Durante i test delle bocchette fumogene aiutano gli ingegneri a visualizzare i flussi d'aria che corrono lungo la carrozzeria, così da individuare le superfici aerodinamiche e apportare migliorie alla progettazione.

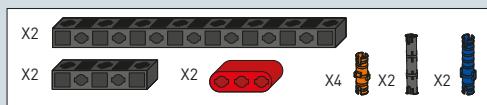
A causa dei costi troppo elevati, non vengono sempre usate le auto vere e proprie ma spesso si ricorre a modelli in scala all'interno di gallerie del vento più piccole.



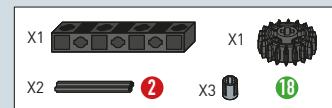
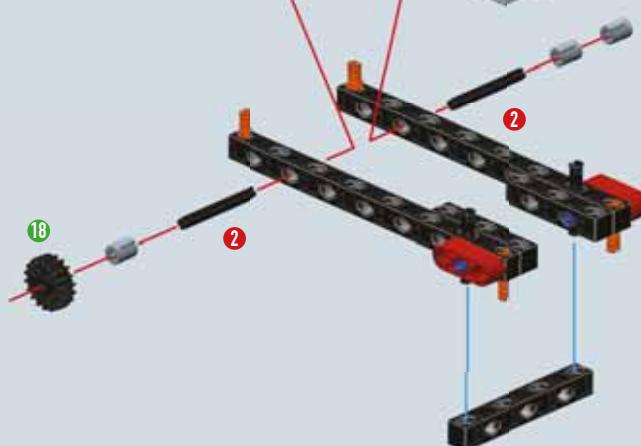
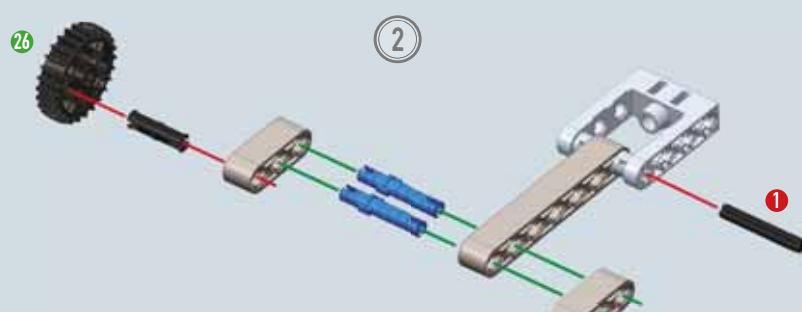
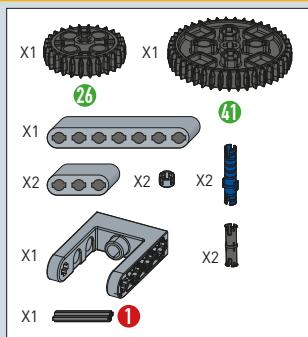
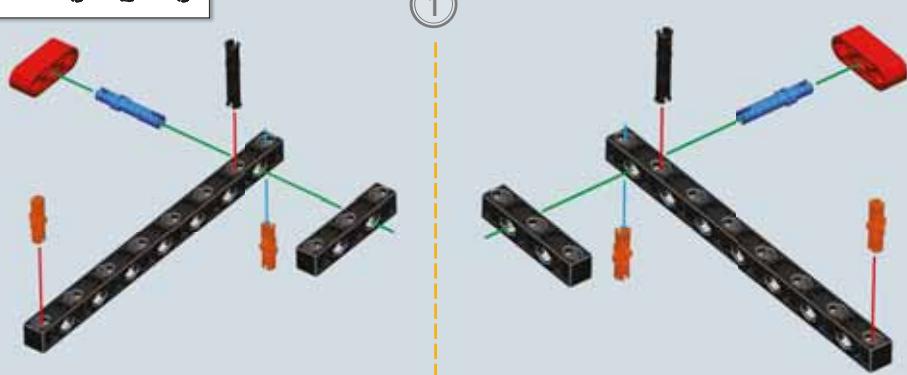
**COSTRUISCI
L'AUTO DA CORSA
A PAGINA 18**

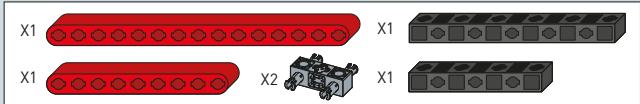
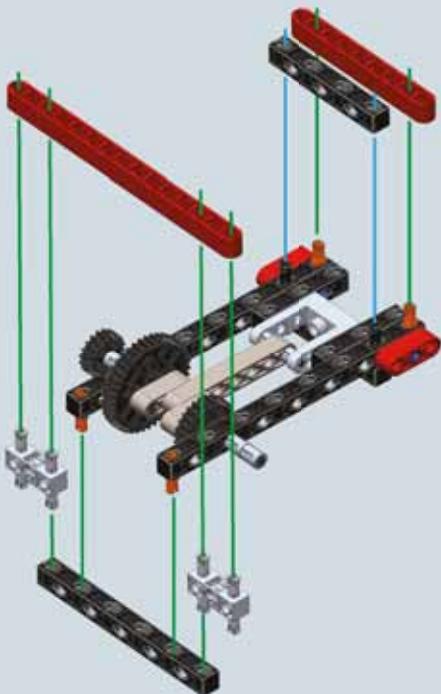


1 Biella e pistone

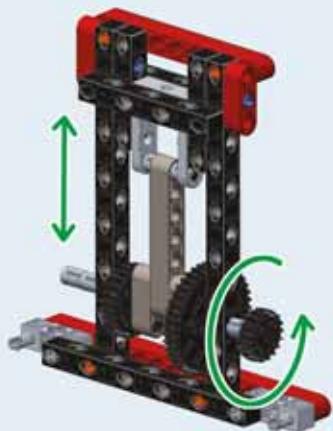


**ISTRUZIONI 3D INTERATTIVE NELL'APP
LABORATORIO DI MECCANICA**





Modello finale

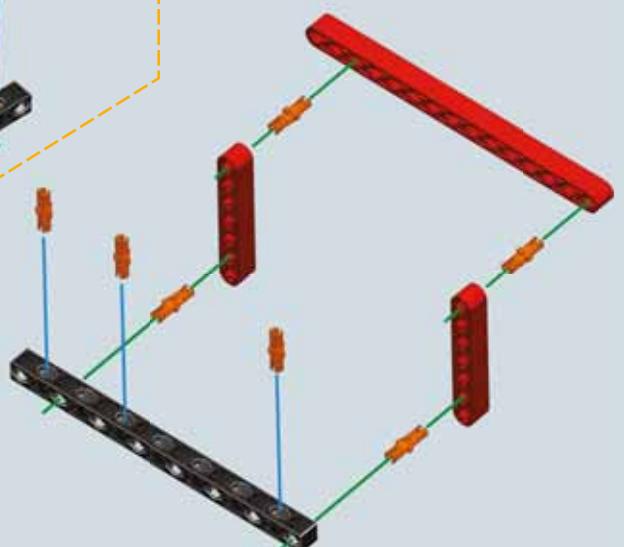
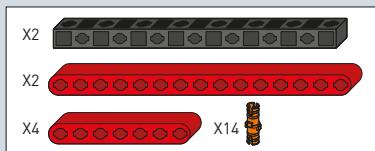
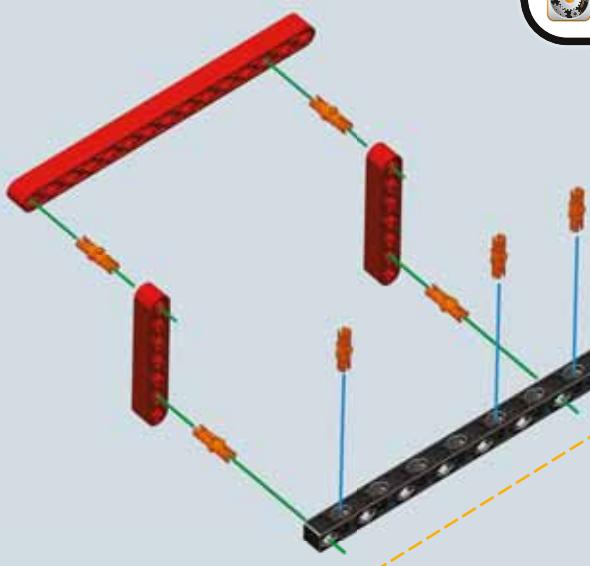


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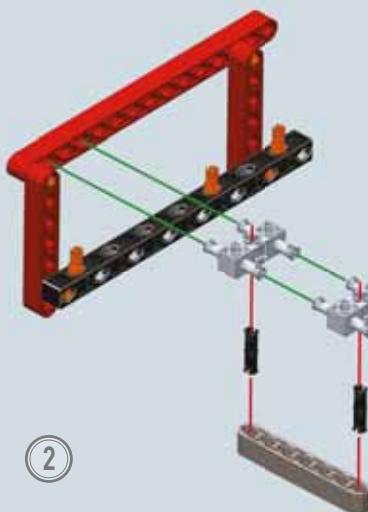
2 Differenziale



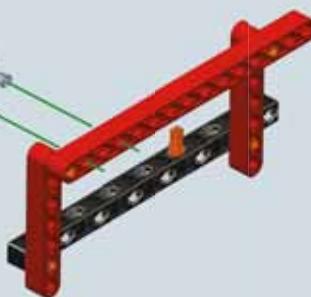
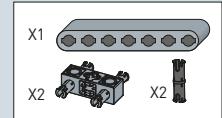
ISTRUZIONI 3D INTERATTIVE NELL'APP
LABORATORIO DI MECCANICA



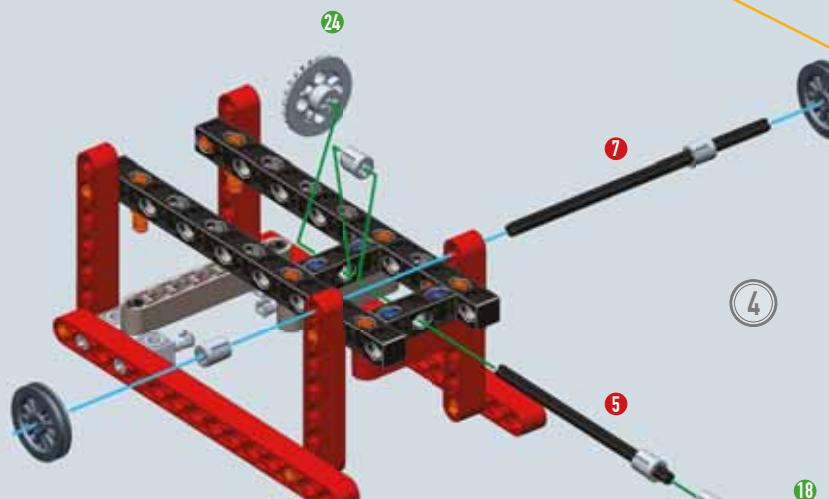
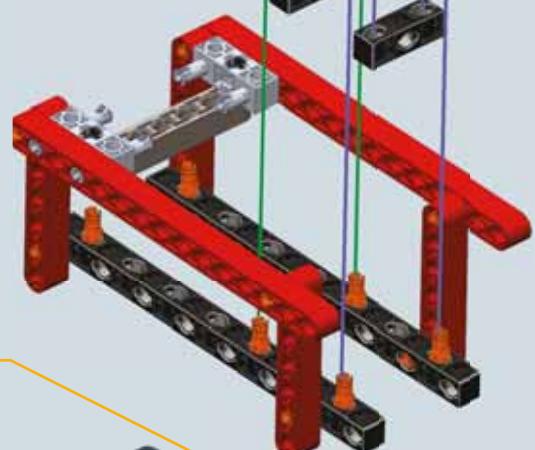
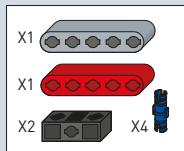
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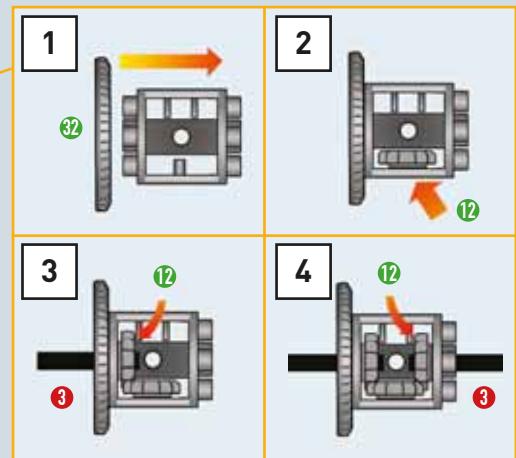
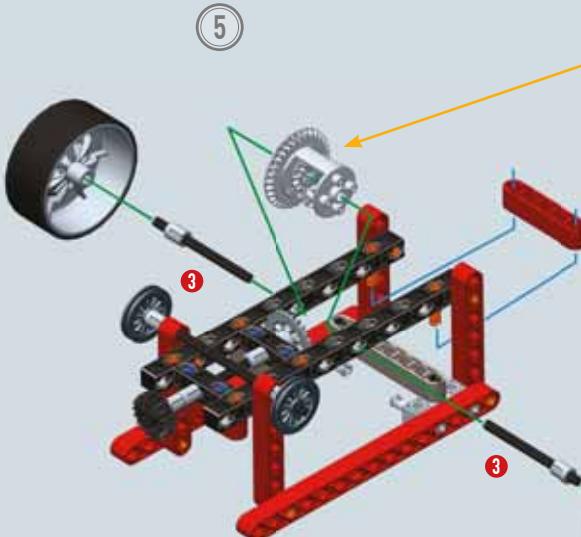


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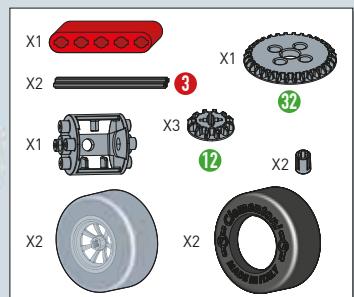


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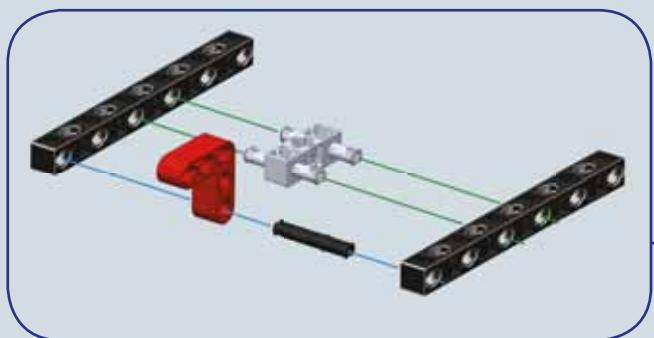


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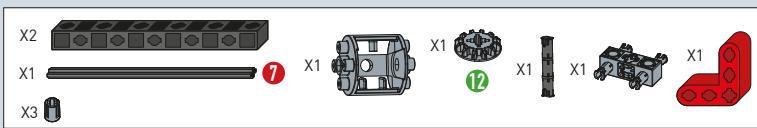


3 Super Buggy

ISTRUZIONI 3D INTERATTIVE NELL'APP
LABORATORIO DI MECCANICA

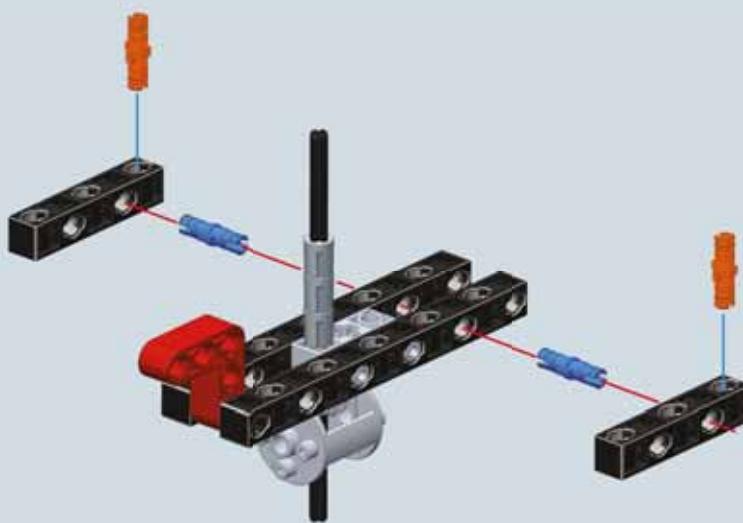


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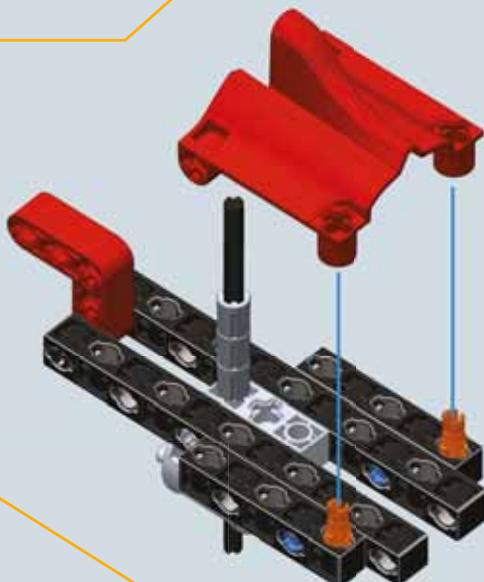
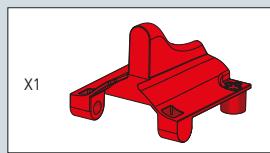


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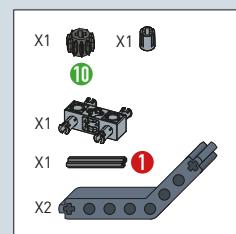
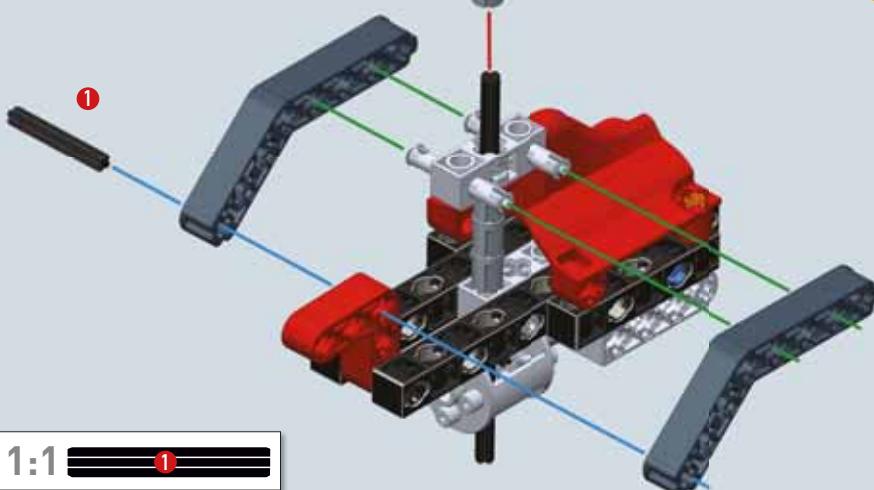




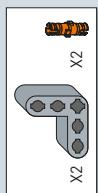
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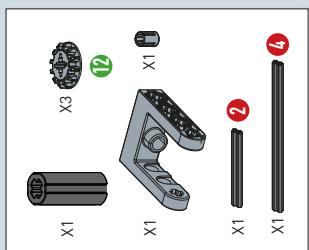
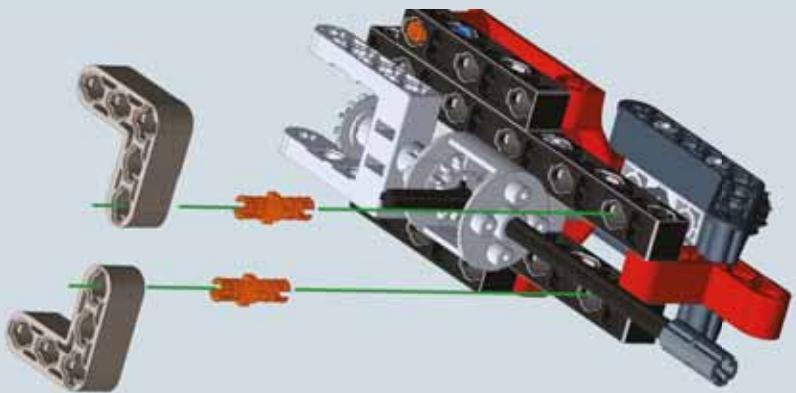
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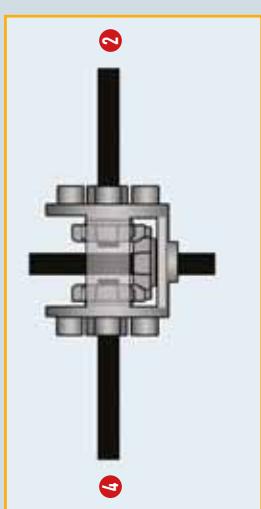
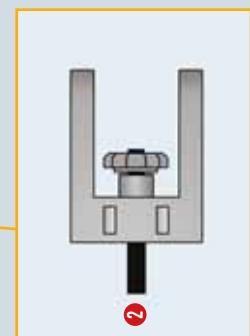
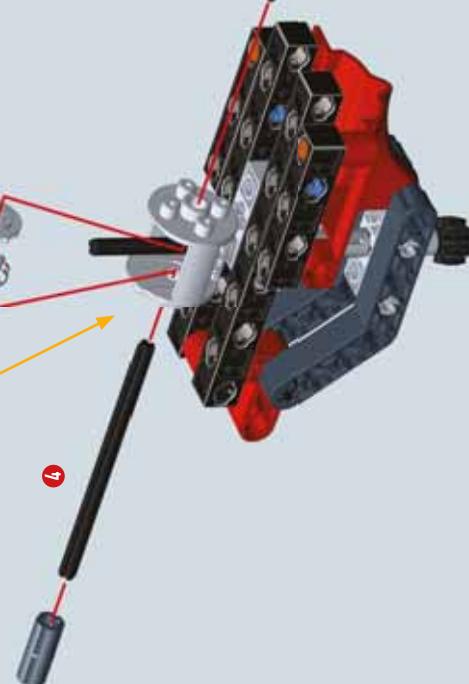
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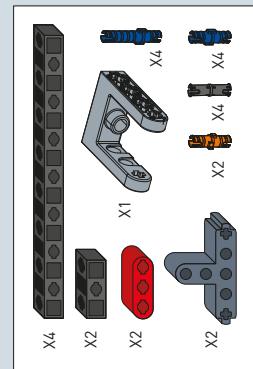
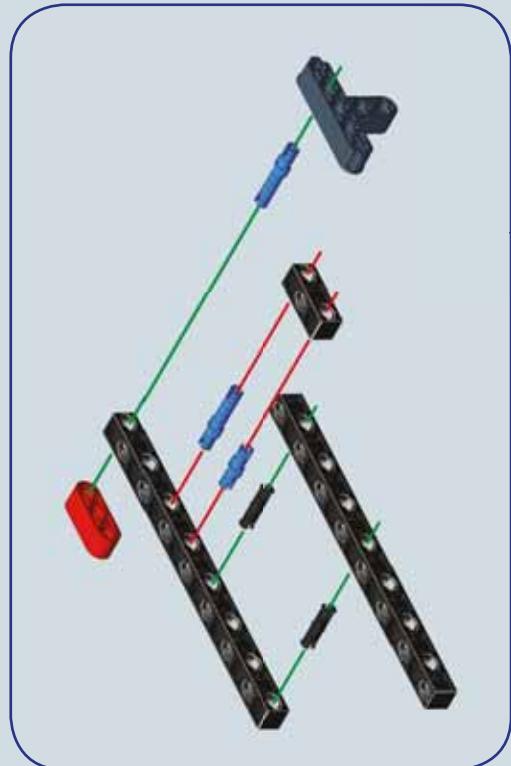


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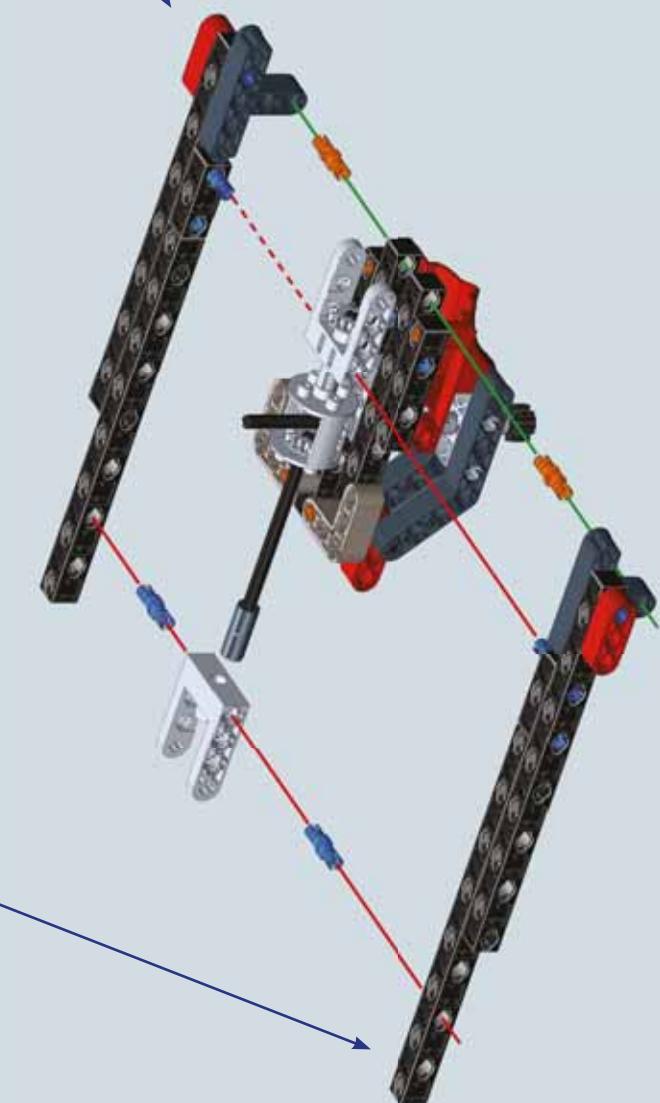
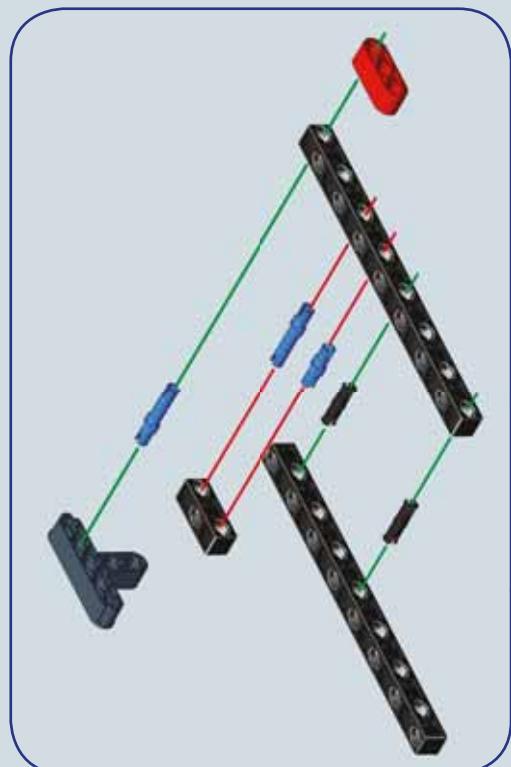


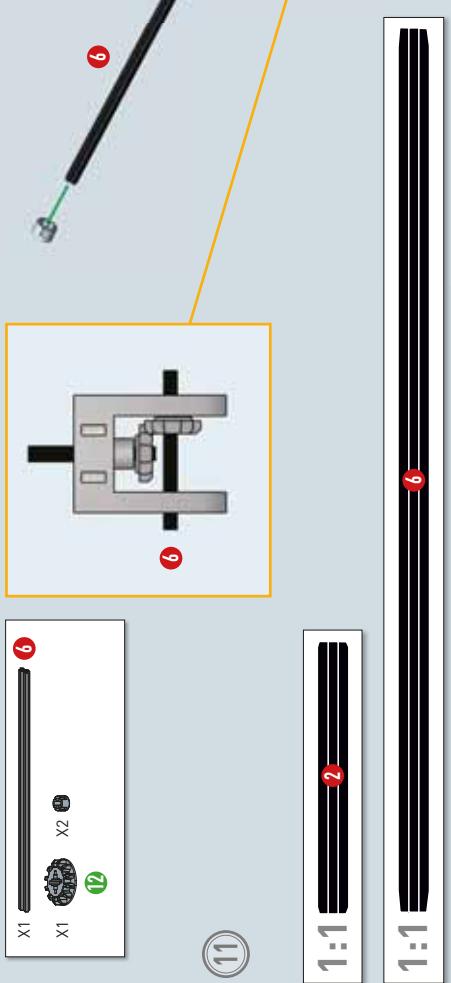
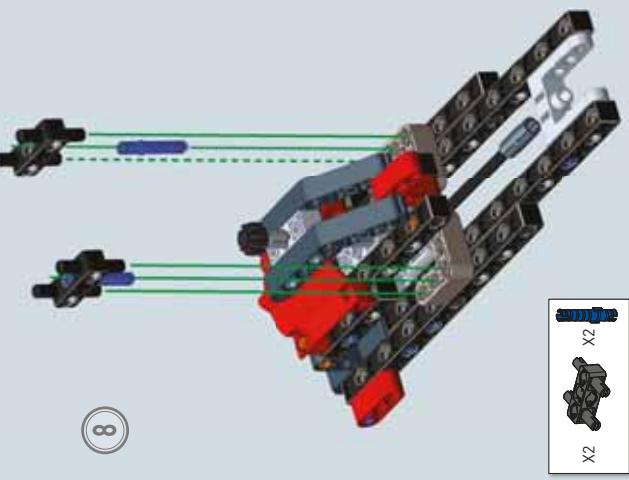
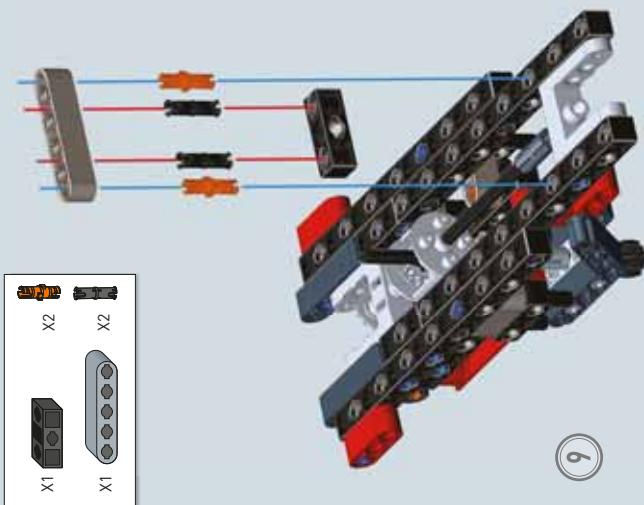
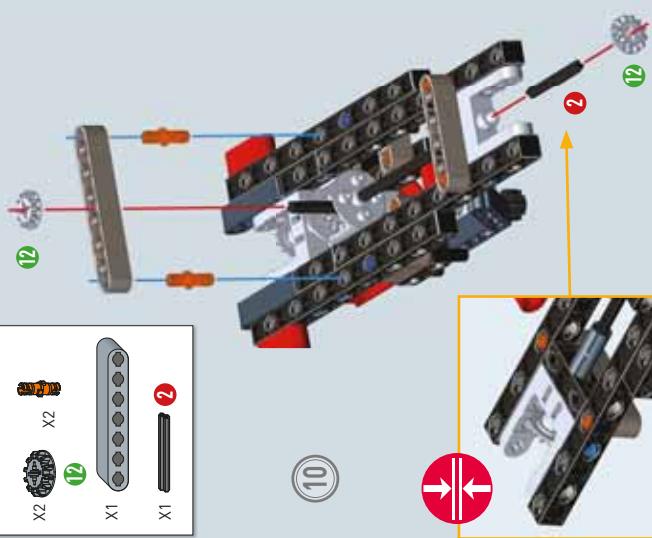
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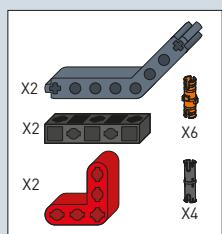
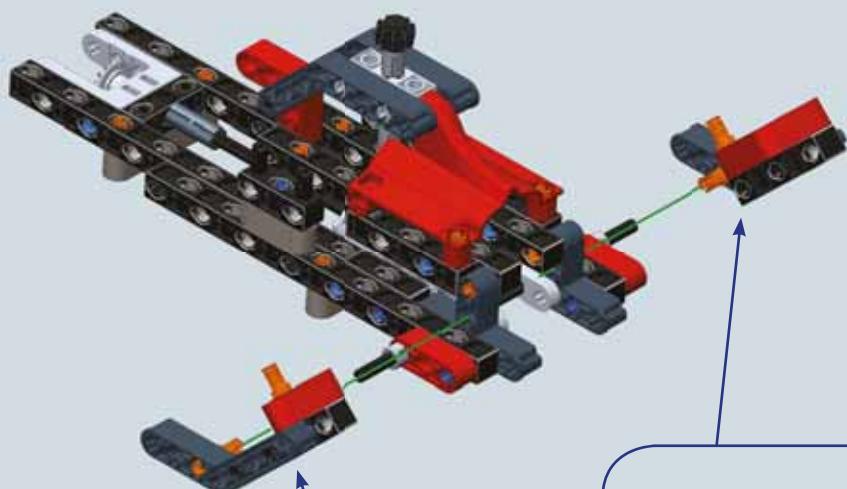
②
④



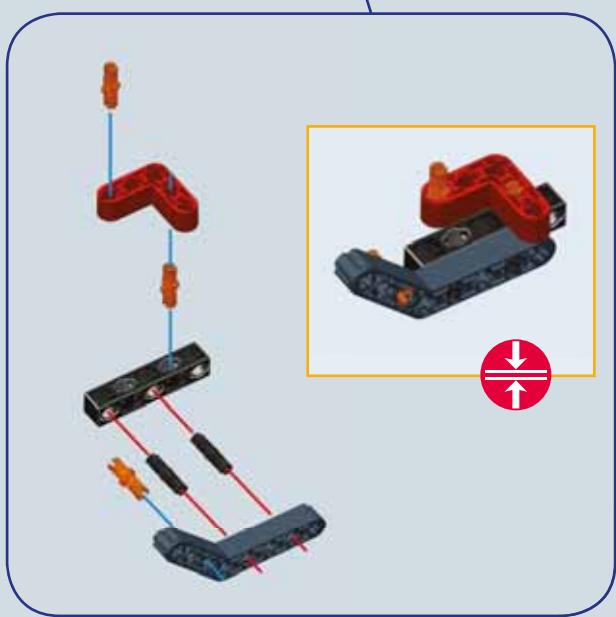
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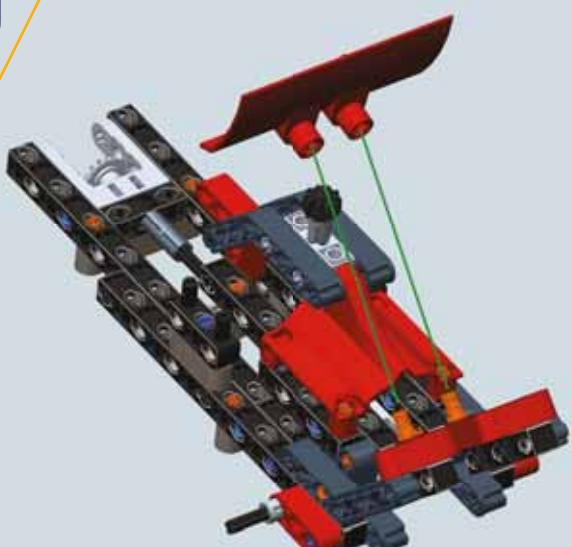




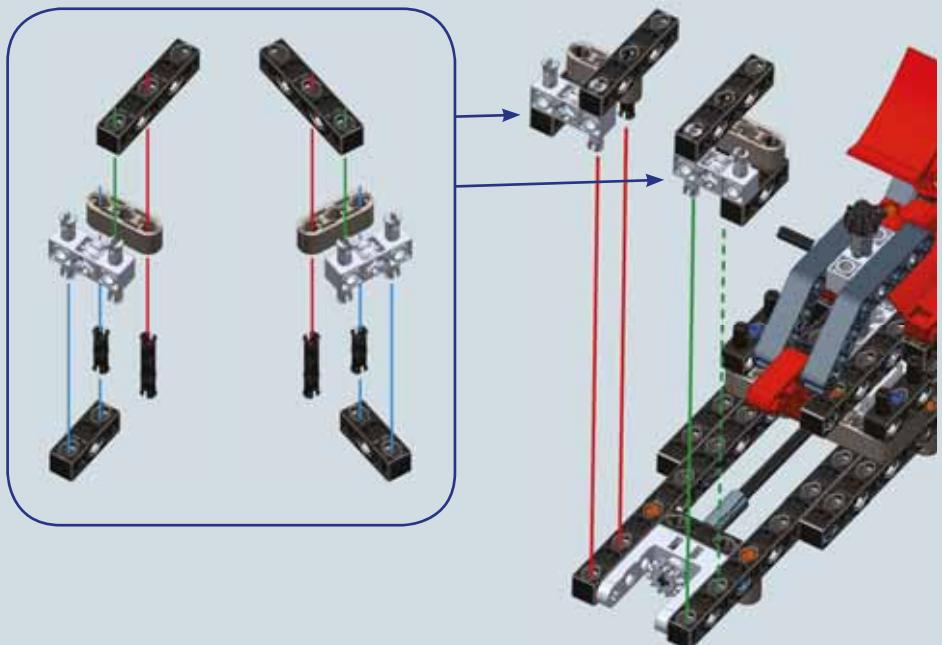
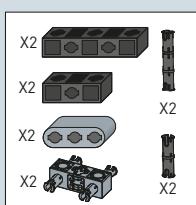
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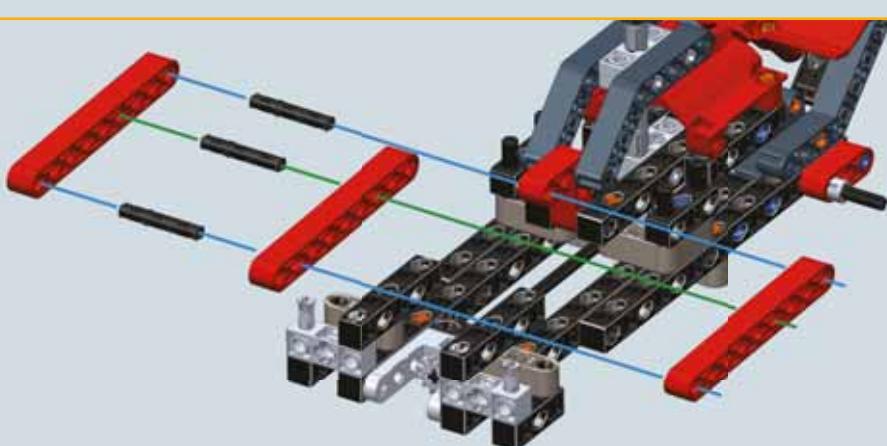
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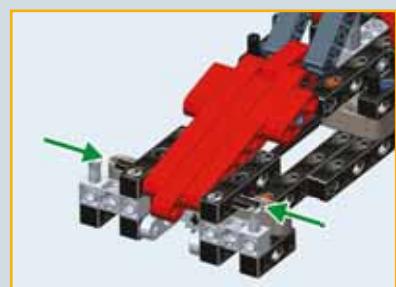
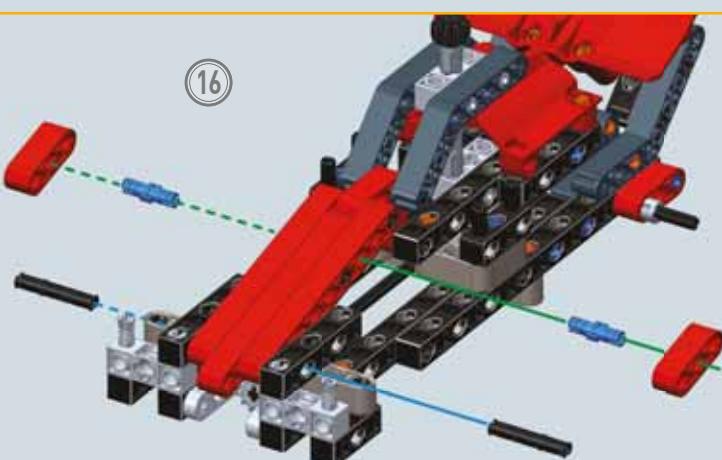
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⑮



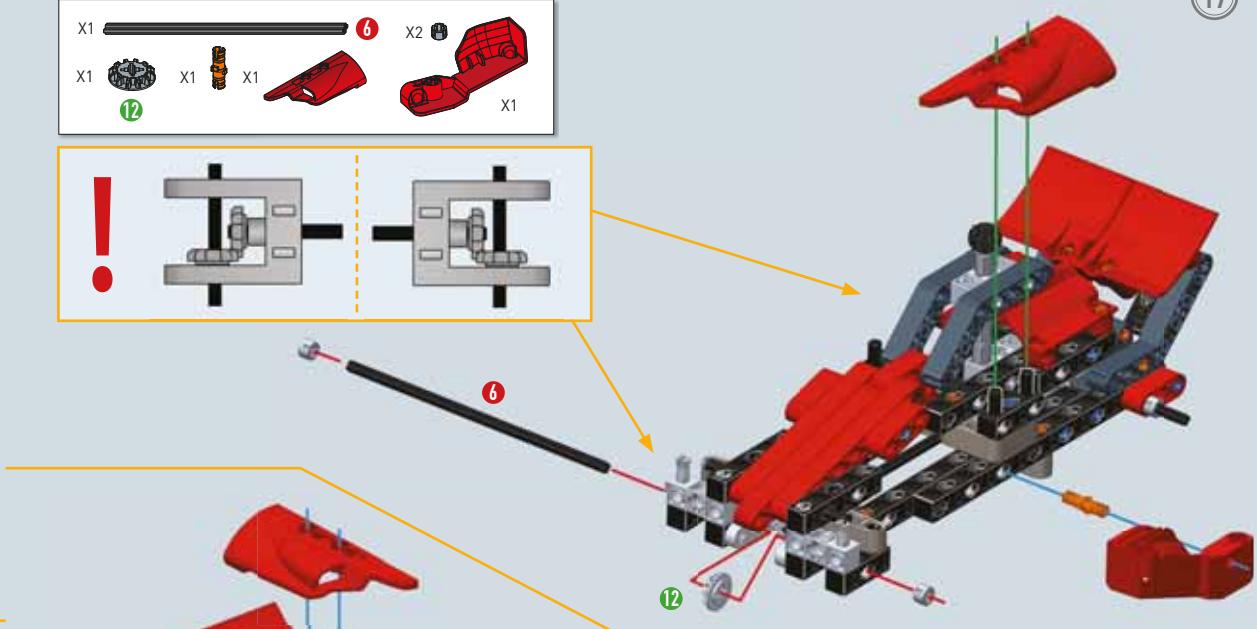
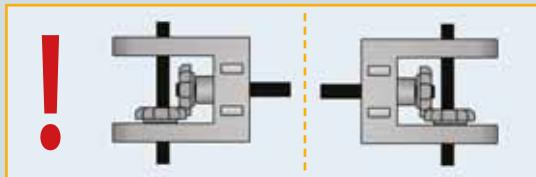
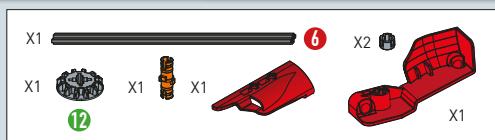
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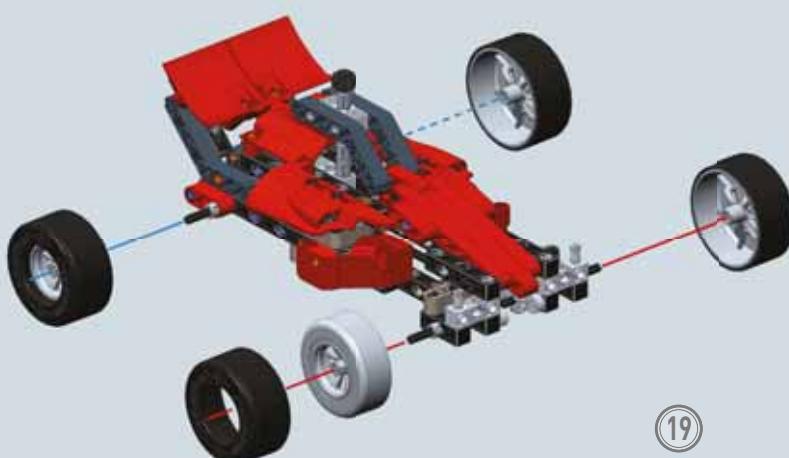
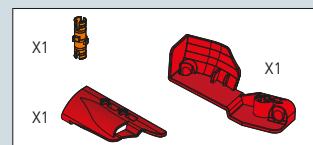
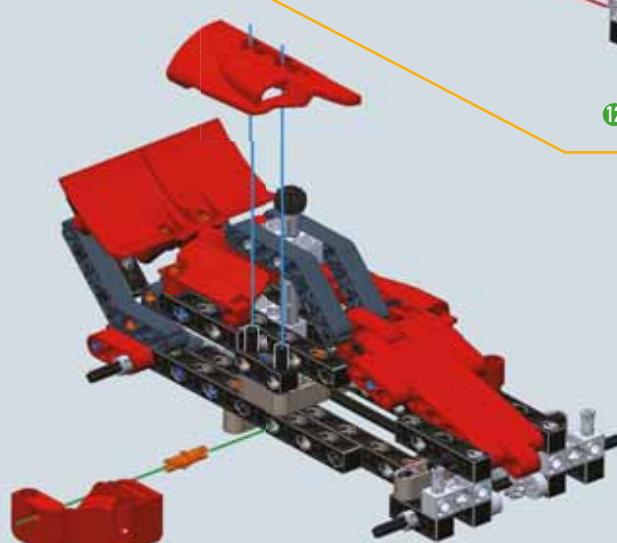
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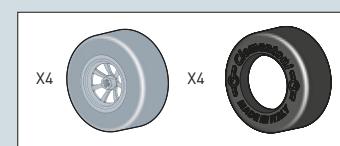
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18



Modello finale



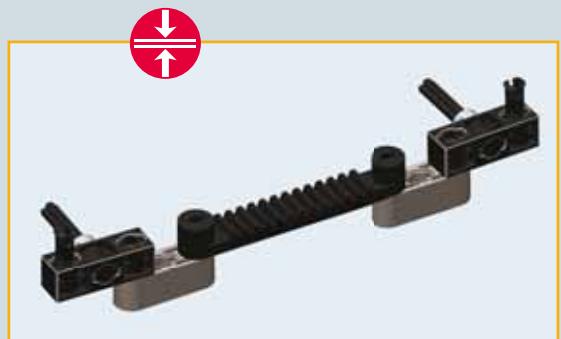
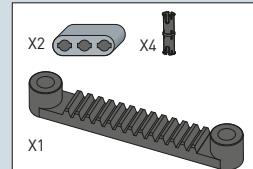
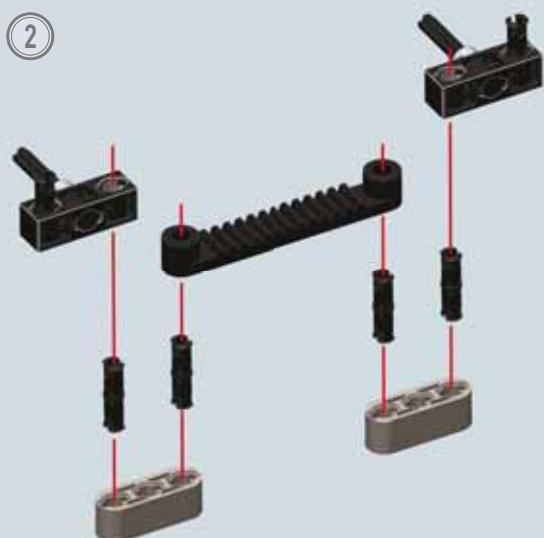
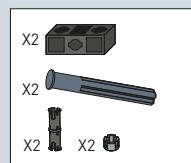
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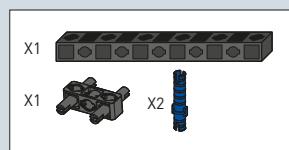
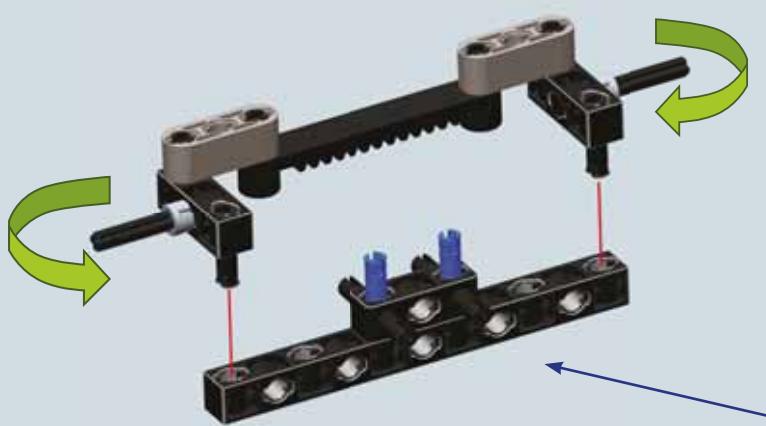
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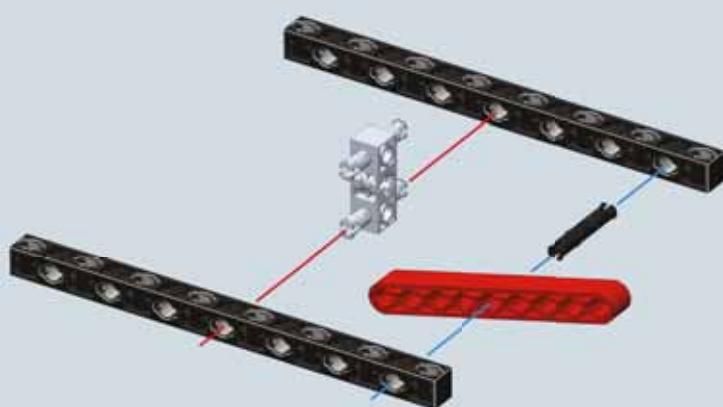
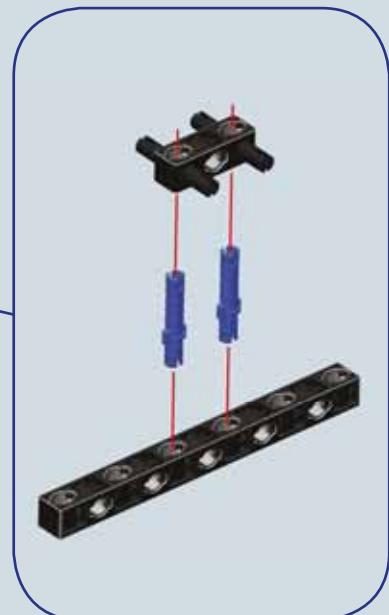
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LABORATORIO DI MECCANICA

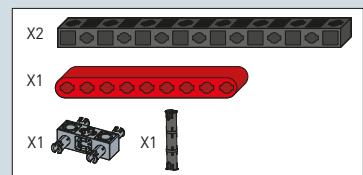


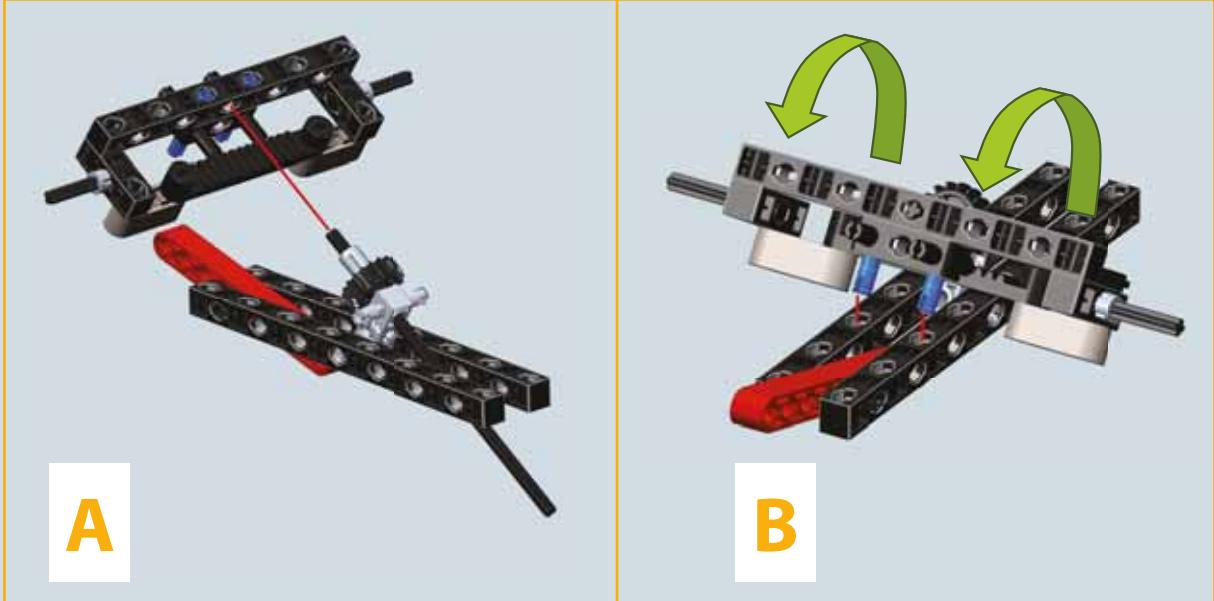


③



④



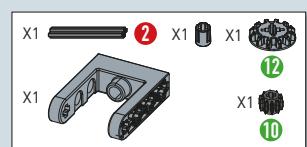
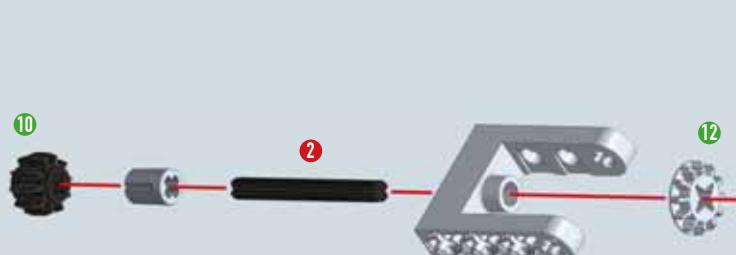


A

B



⑥

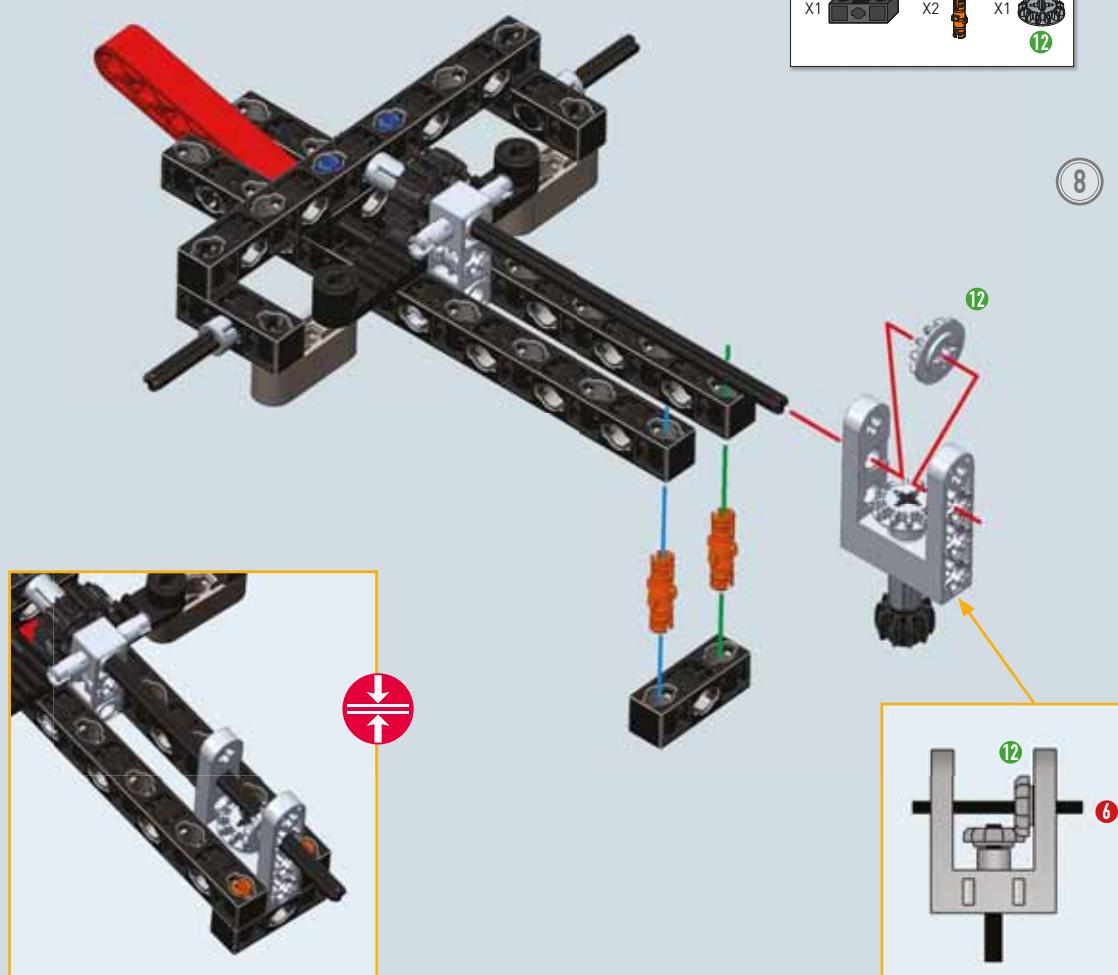


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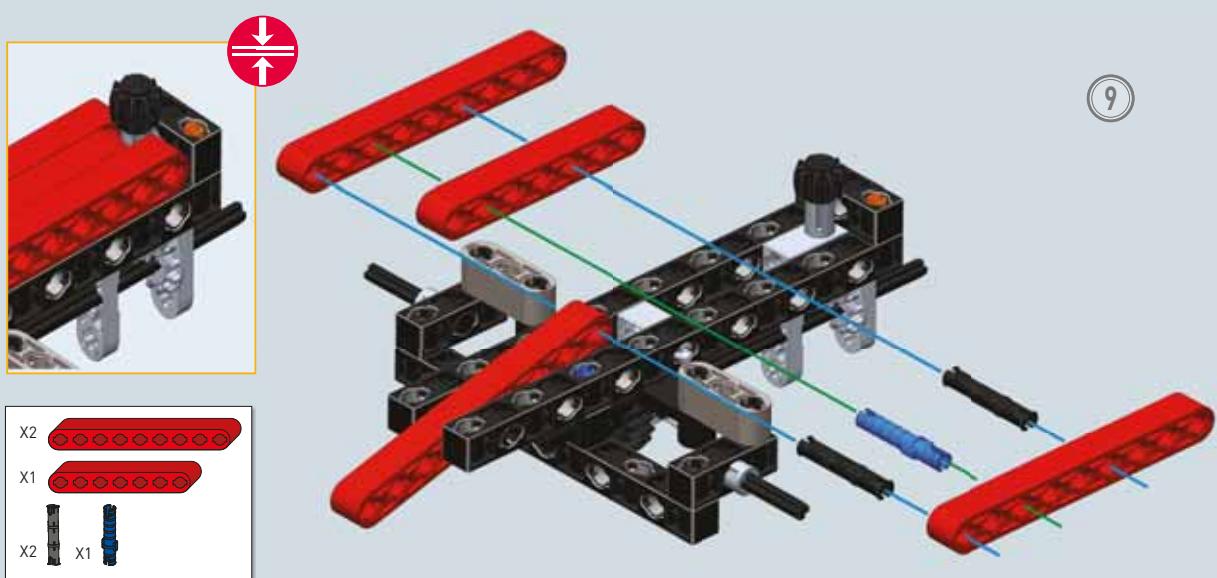
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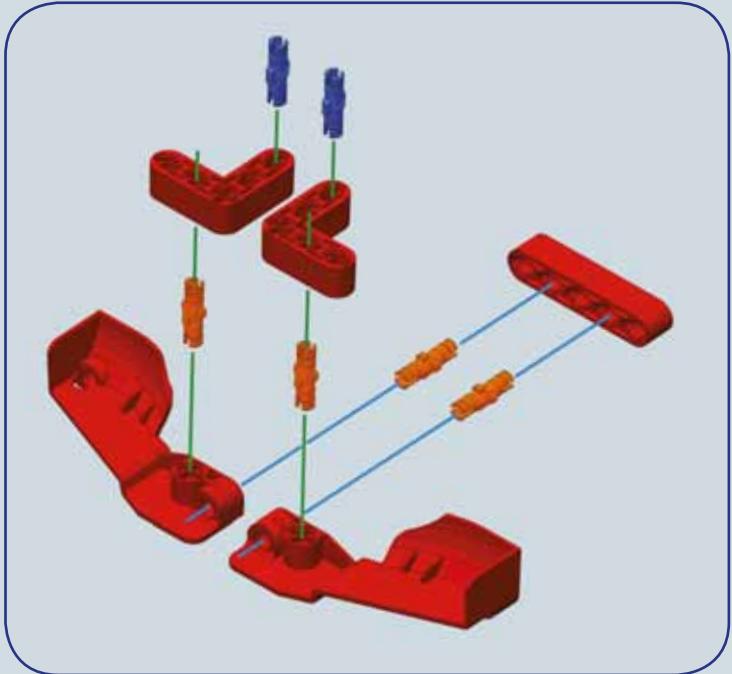


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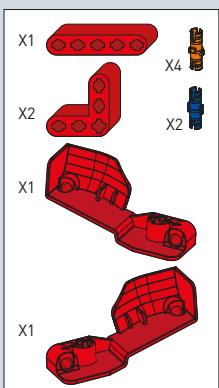
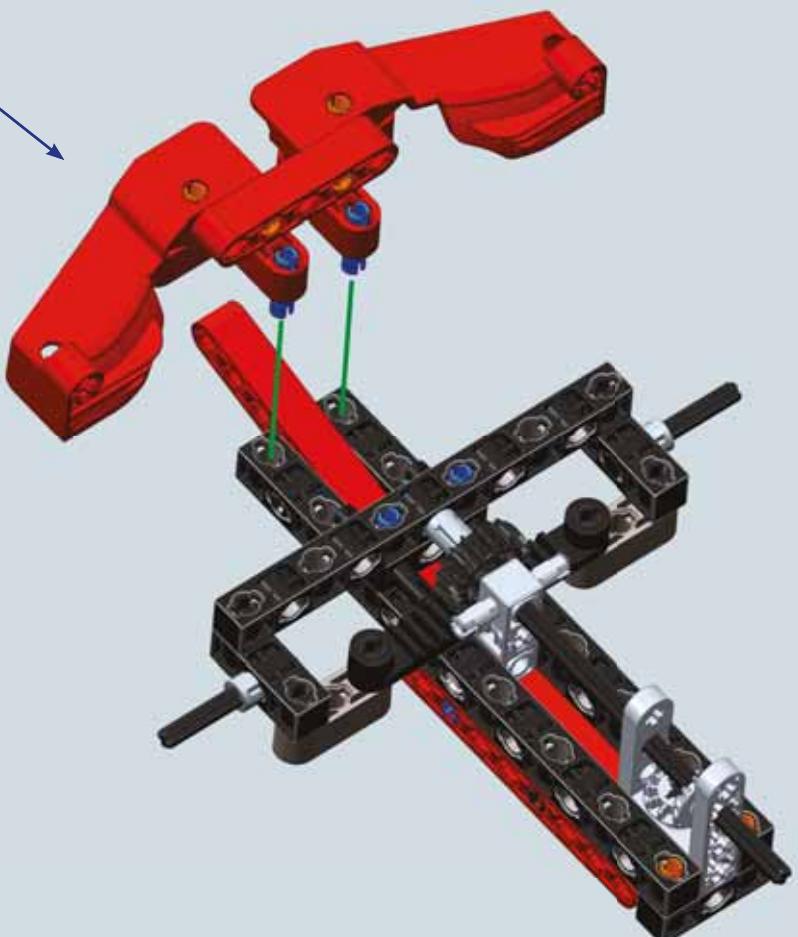


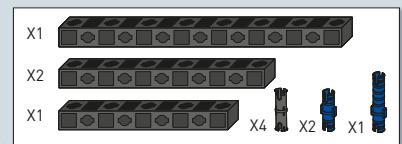
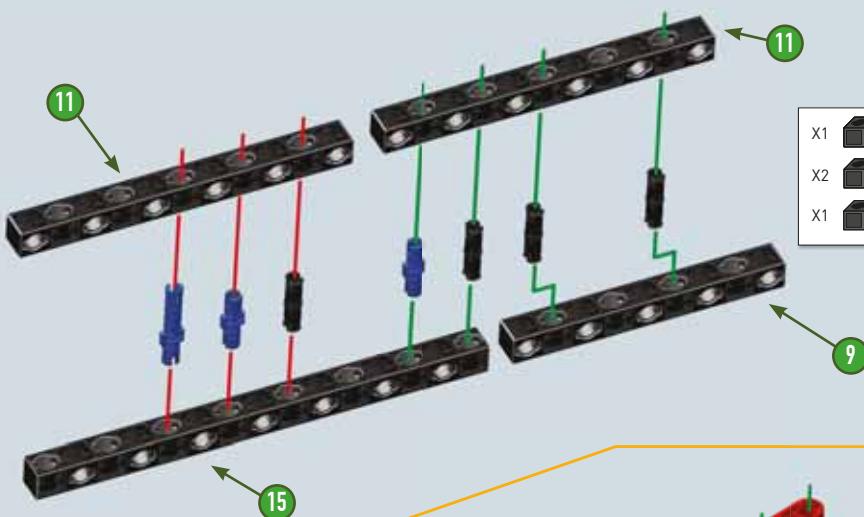
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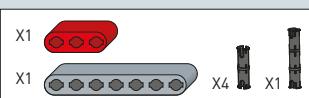
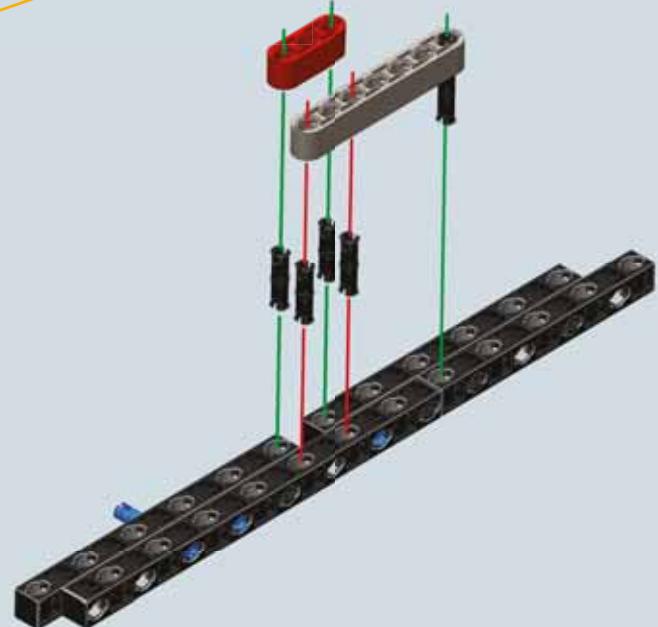


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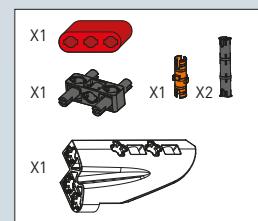
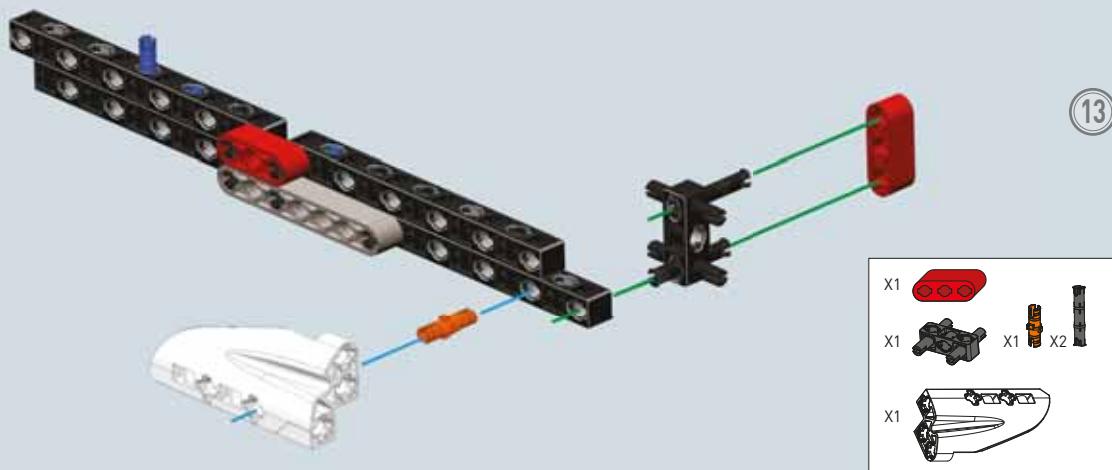




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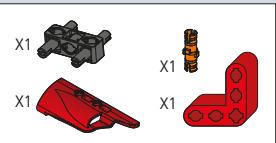


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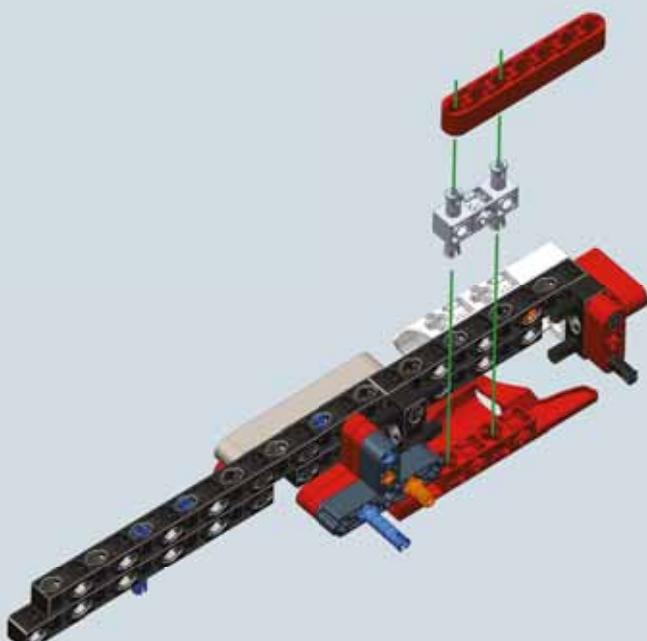
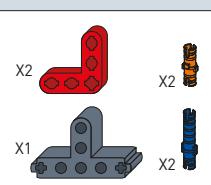
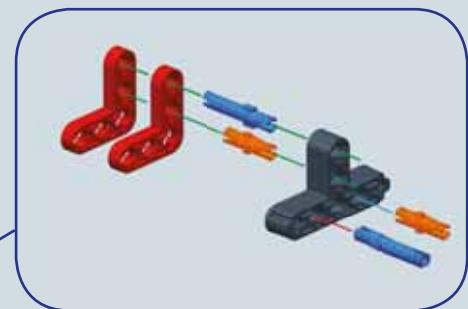
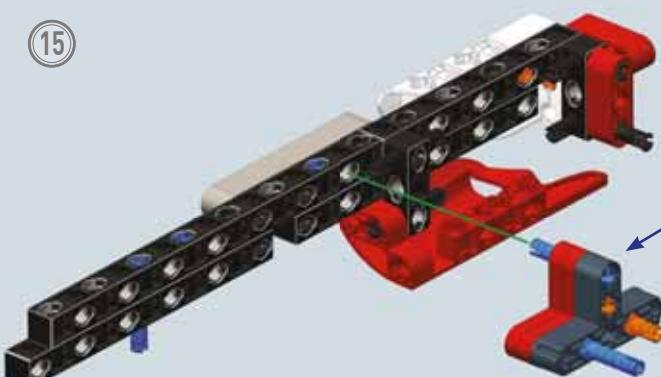


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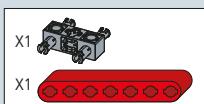
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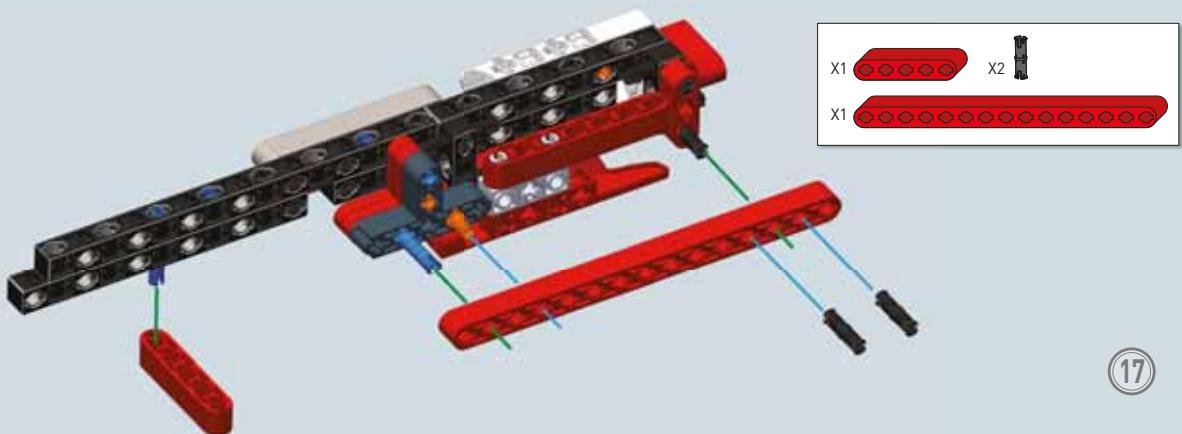


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(16)

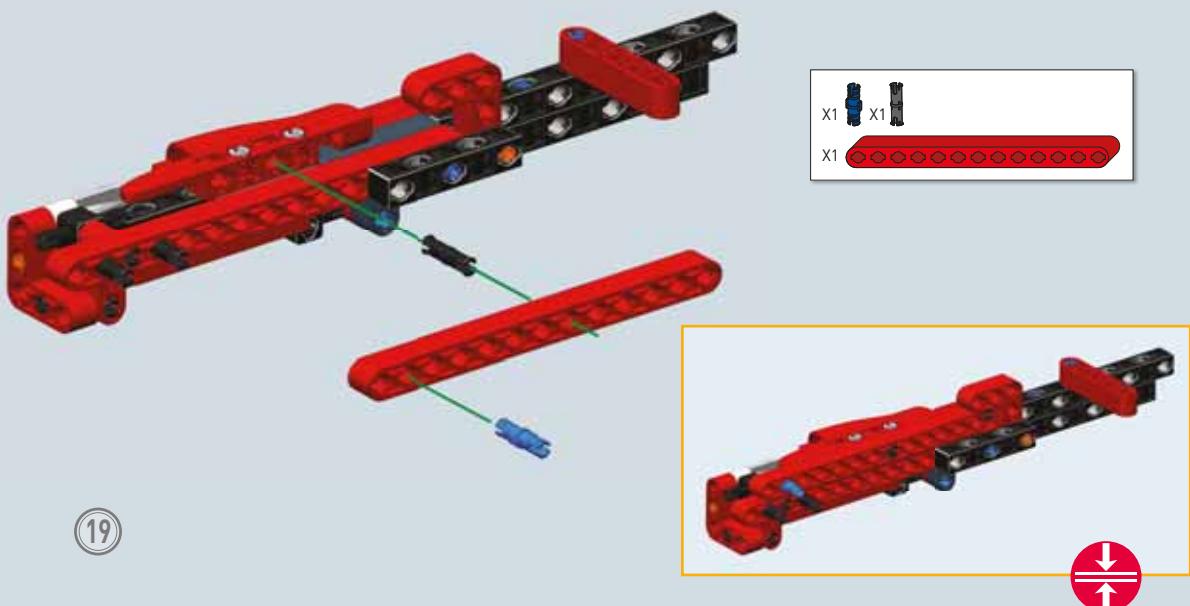




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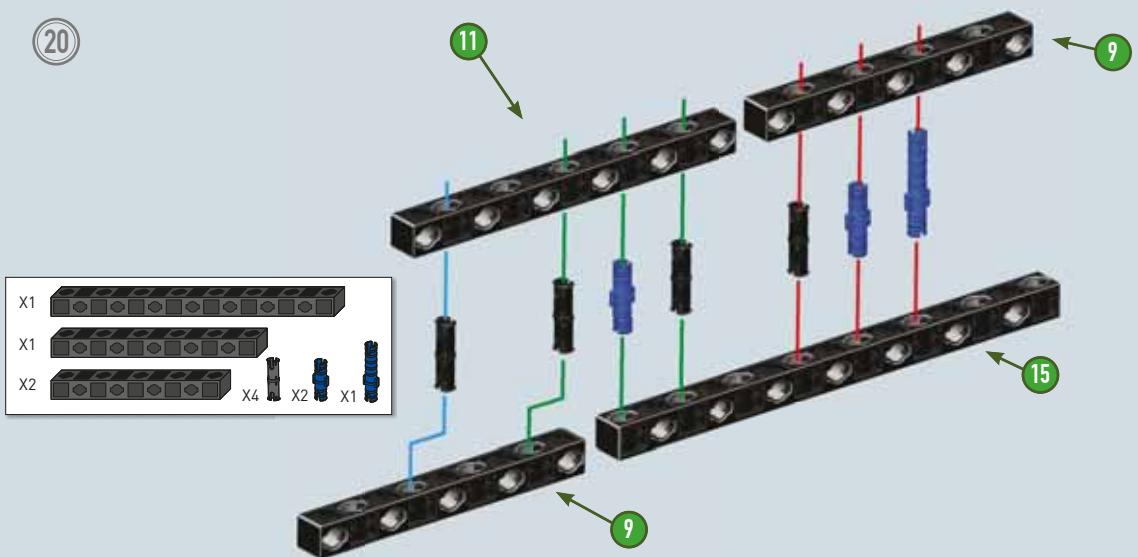
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(19)



⑳



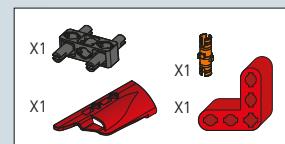
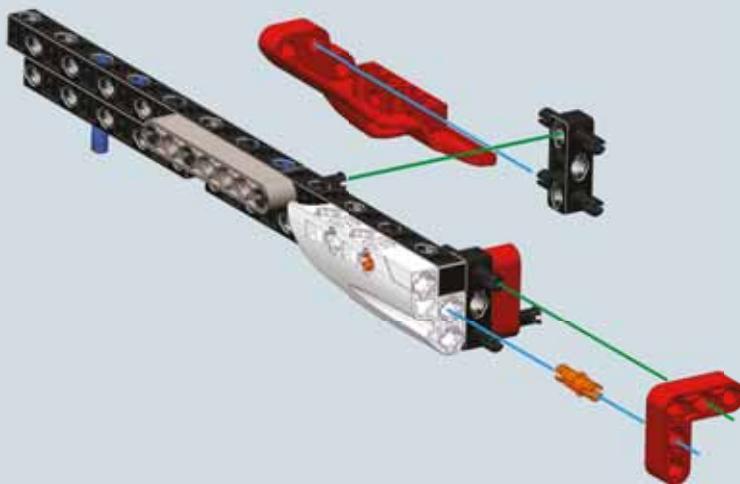
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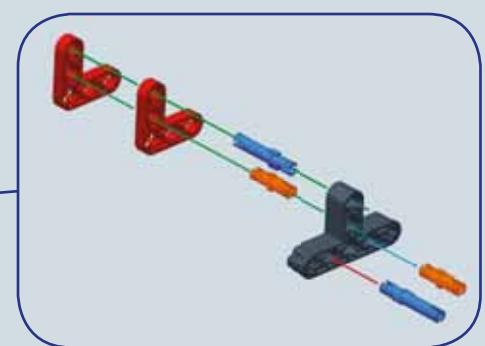
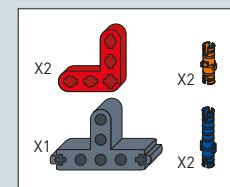
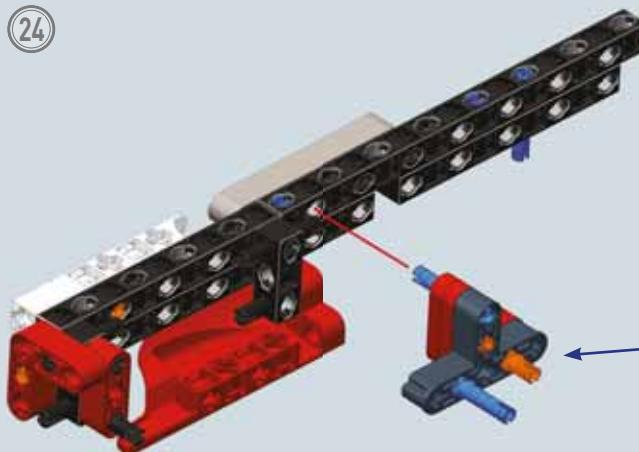
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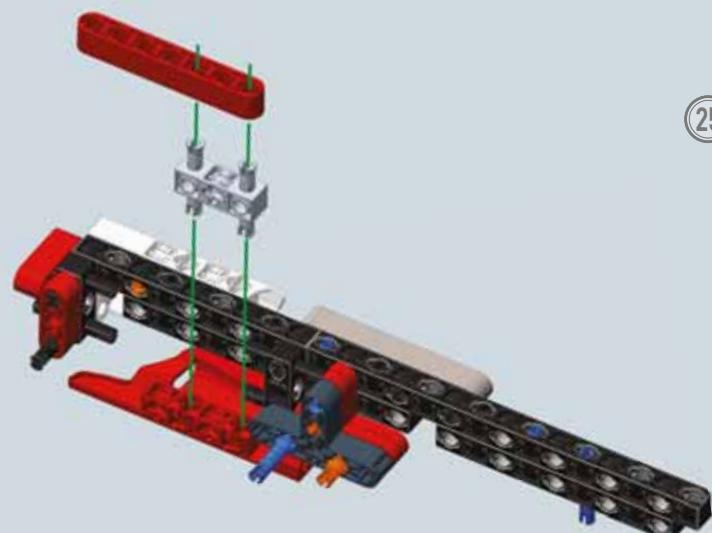
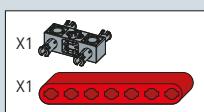
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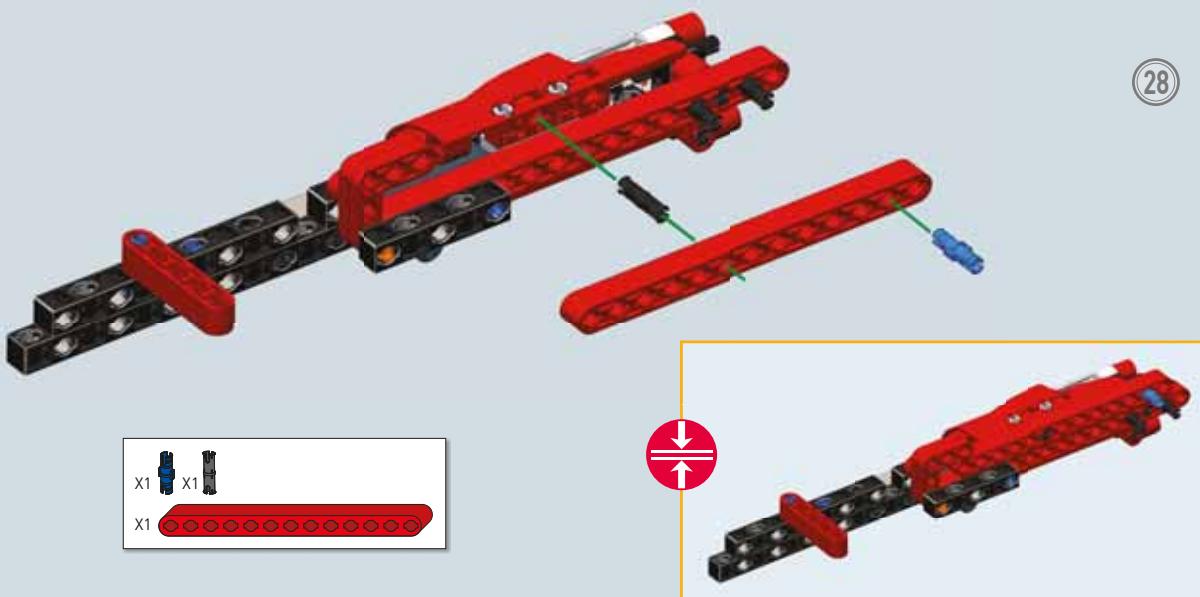
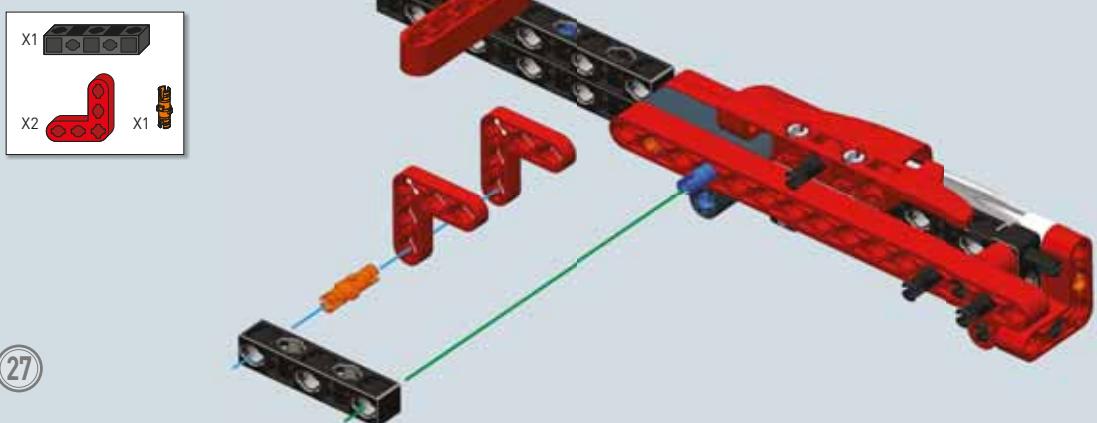
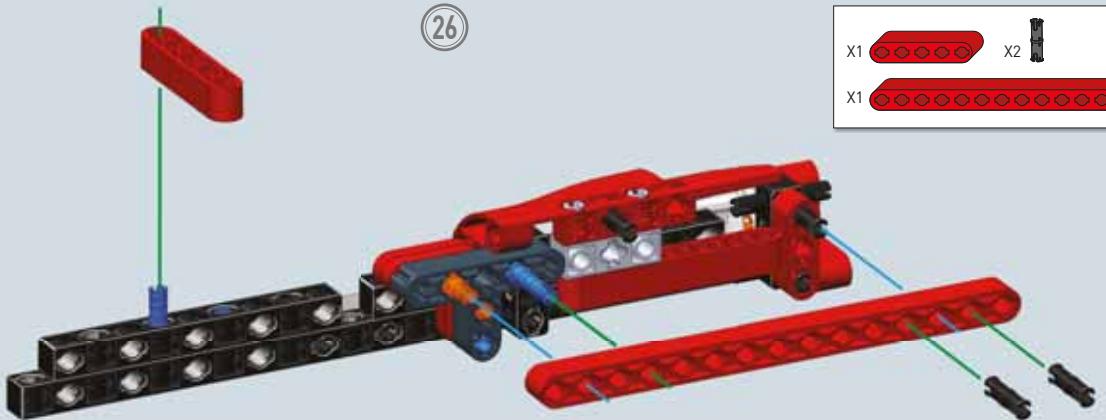


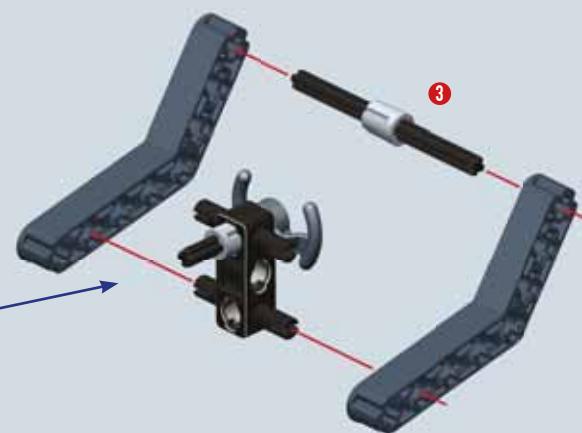
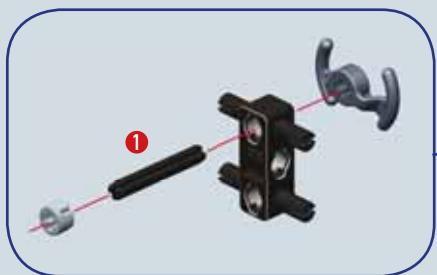
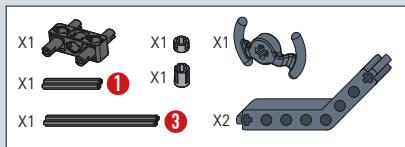
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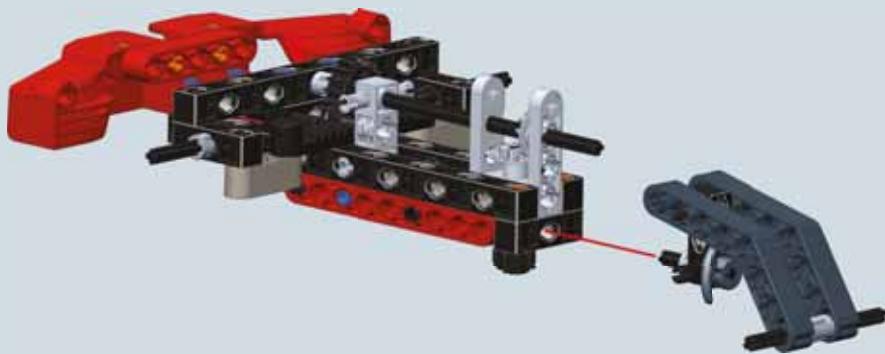




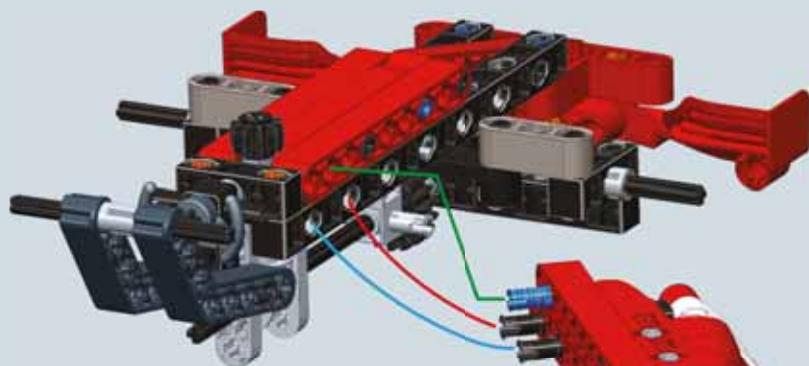
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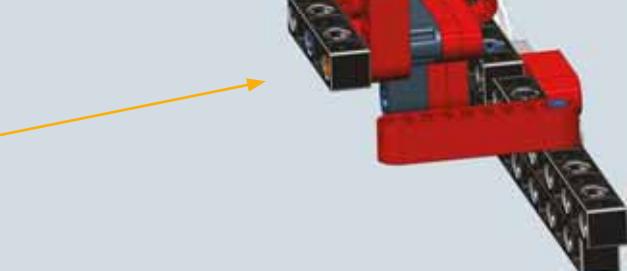
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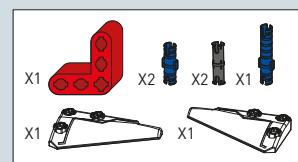
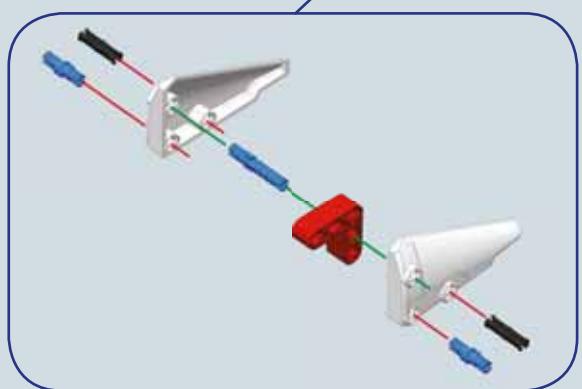
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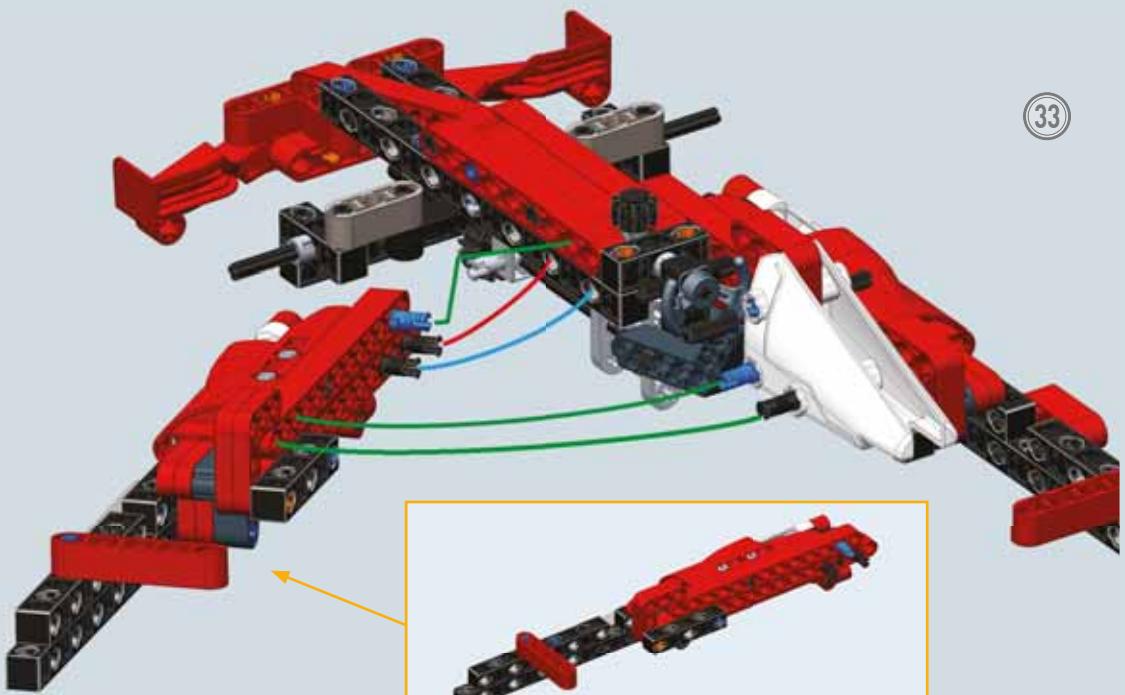
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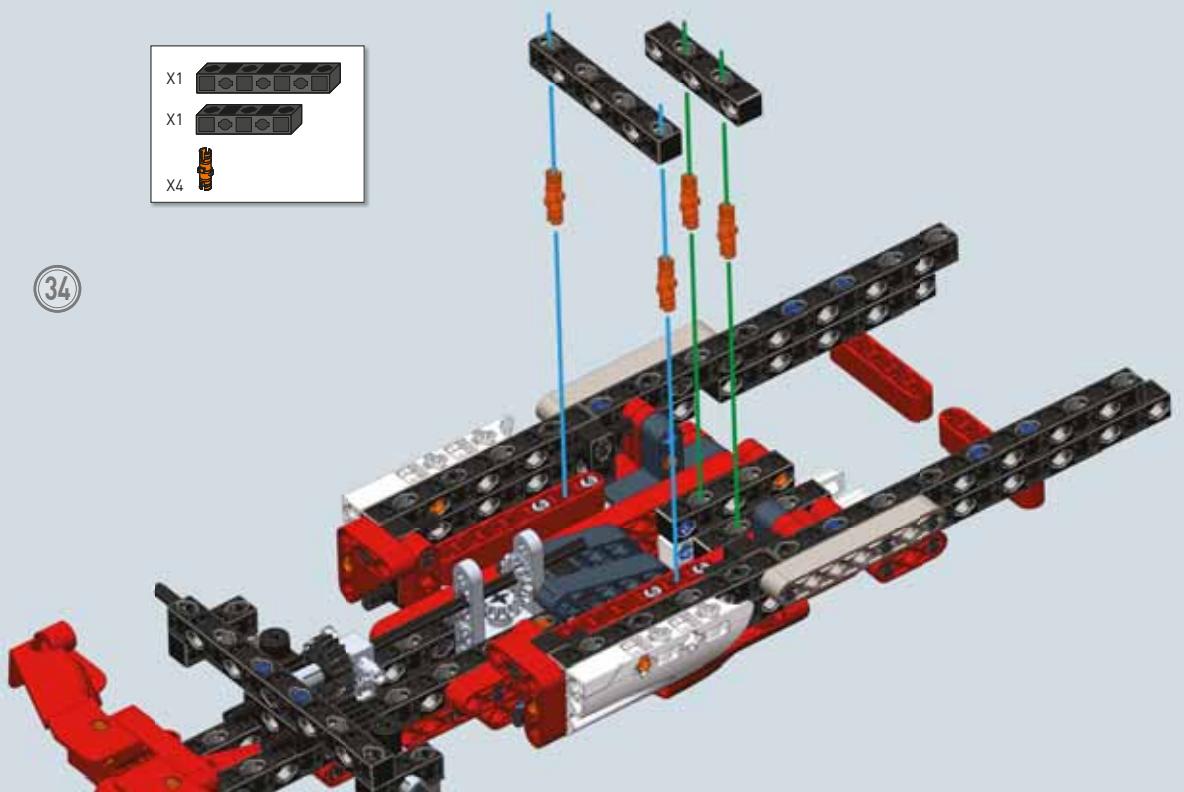
③2



③3



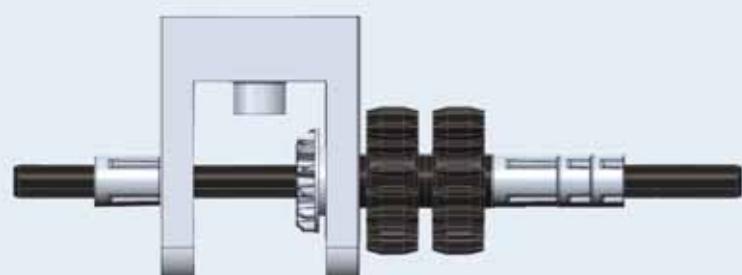
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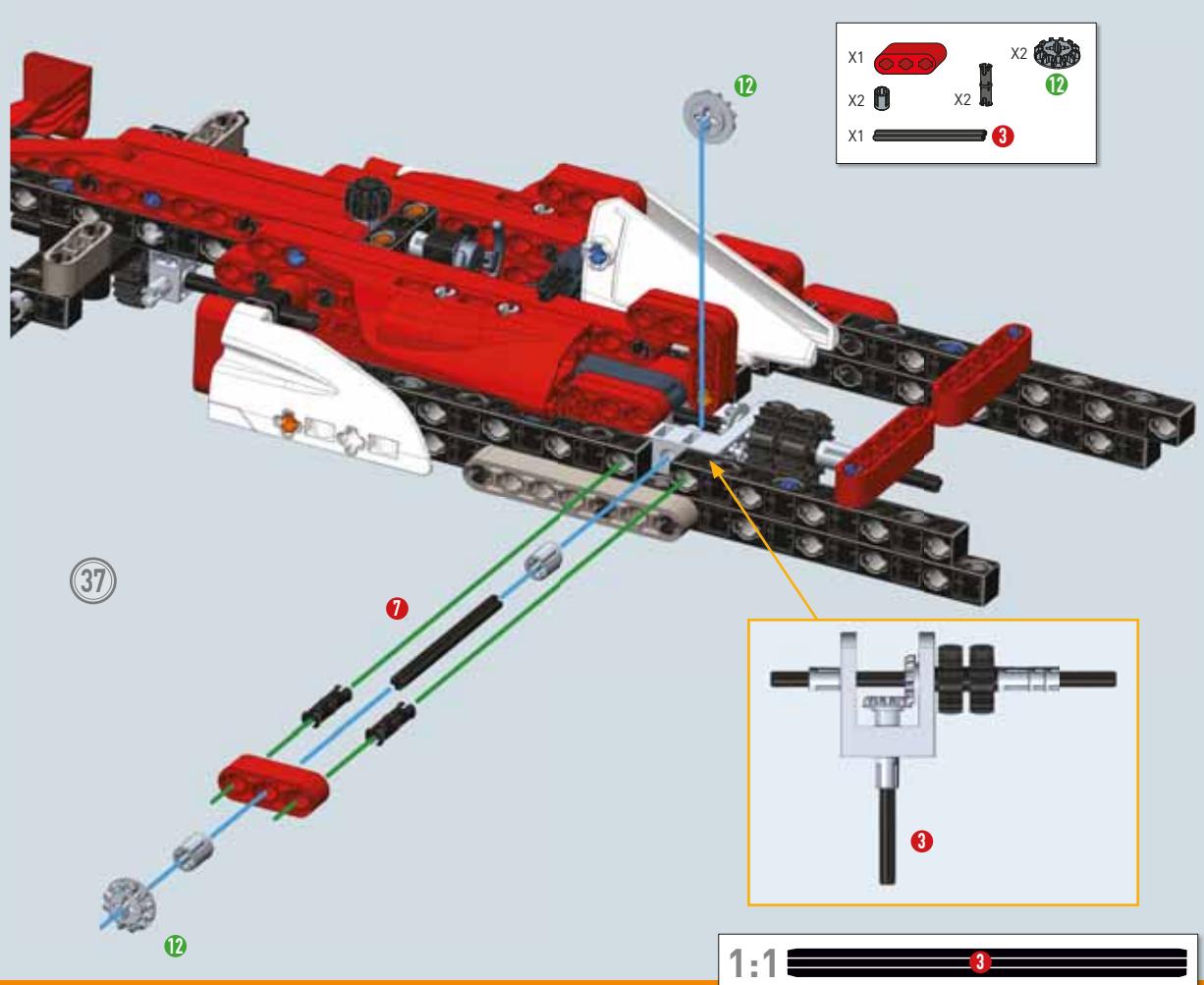
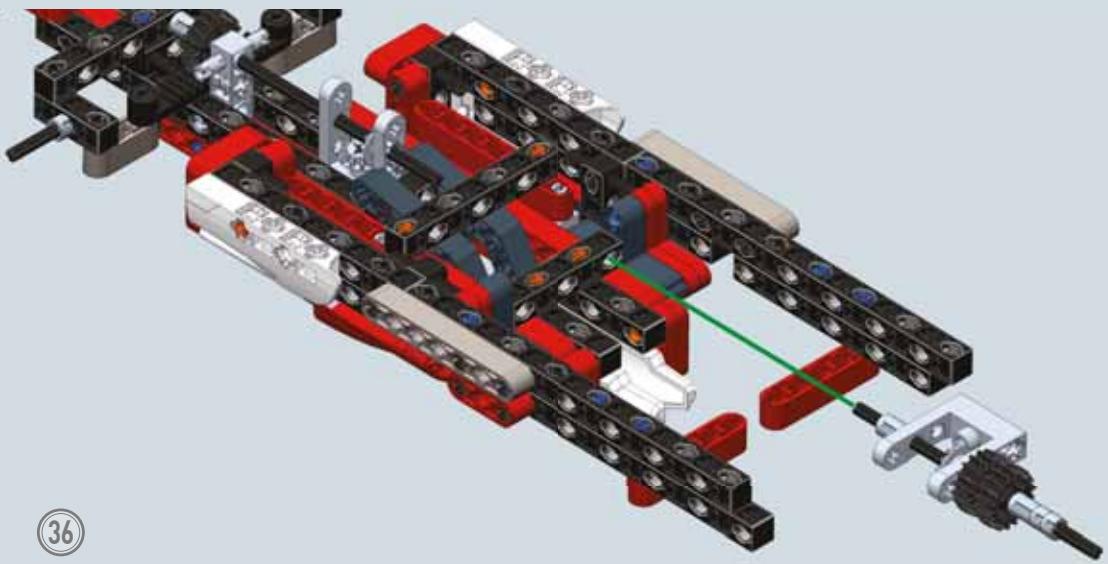
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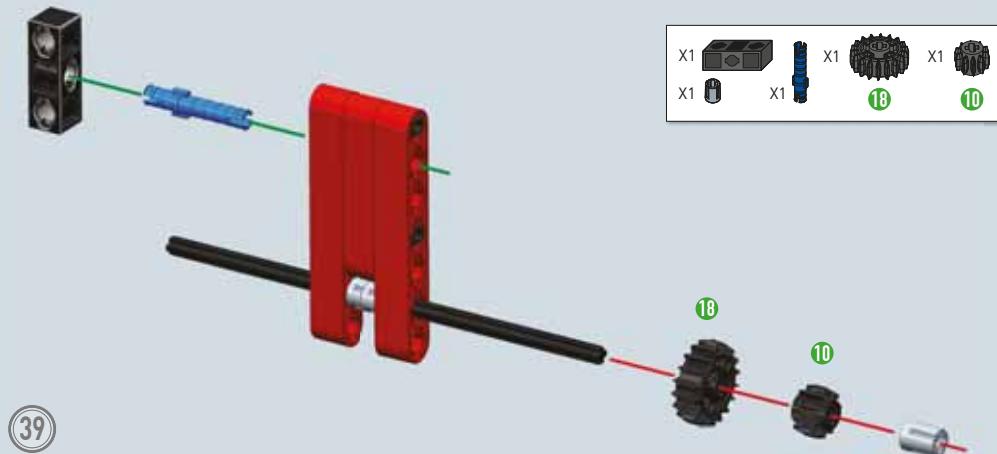
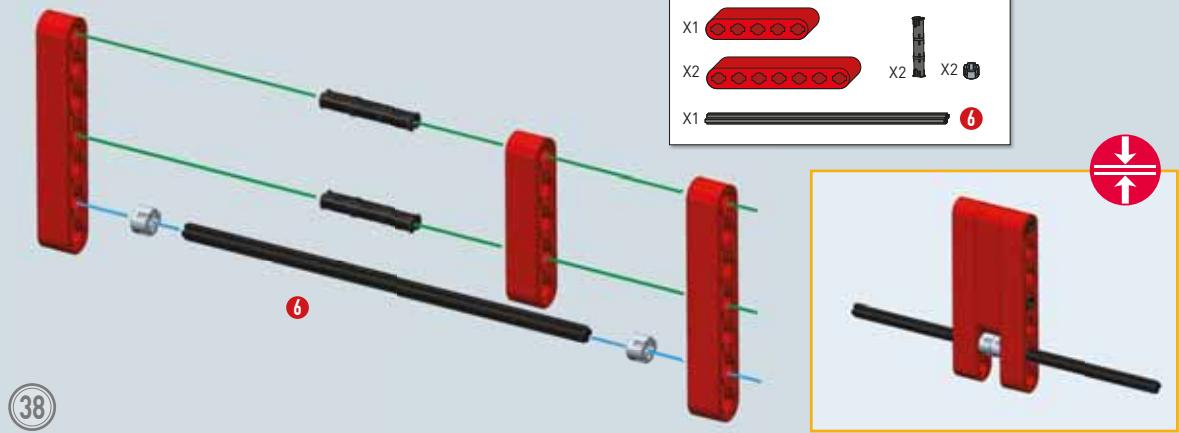
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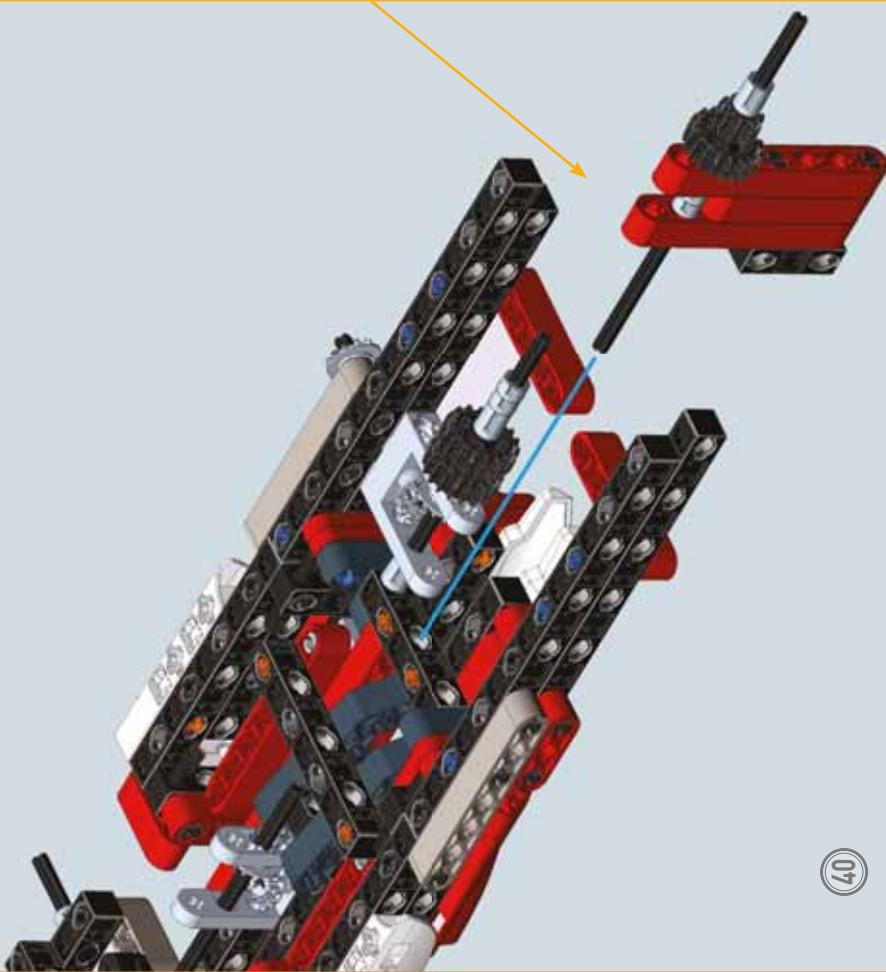
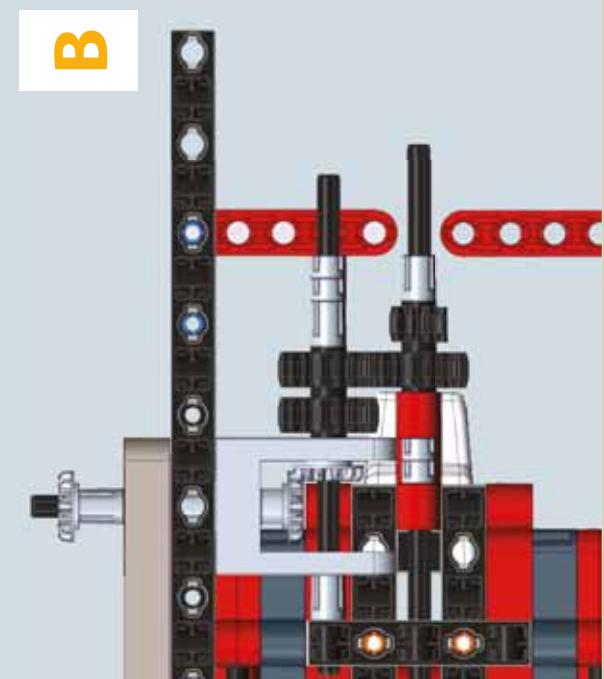
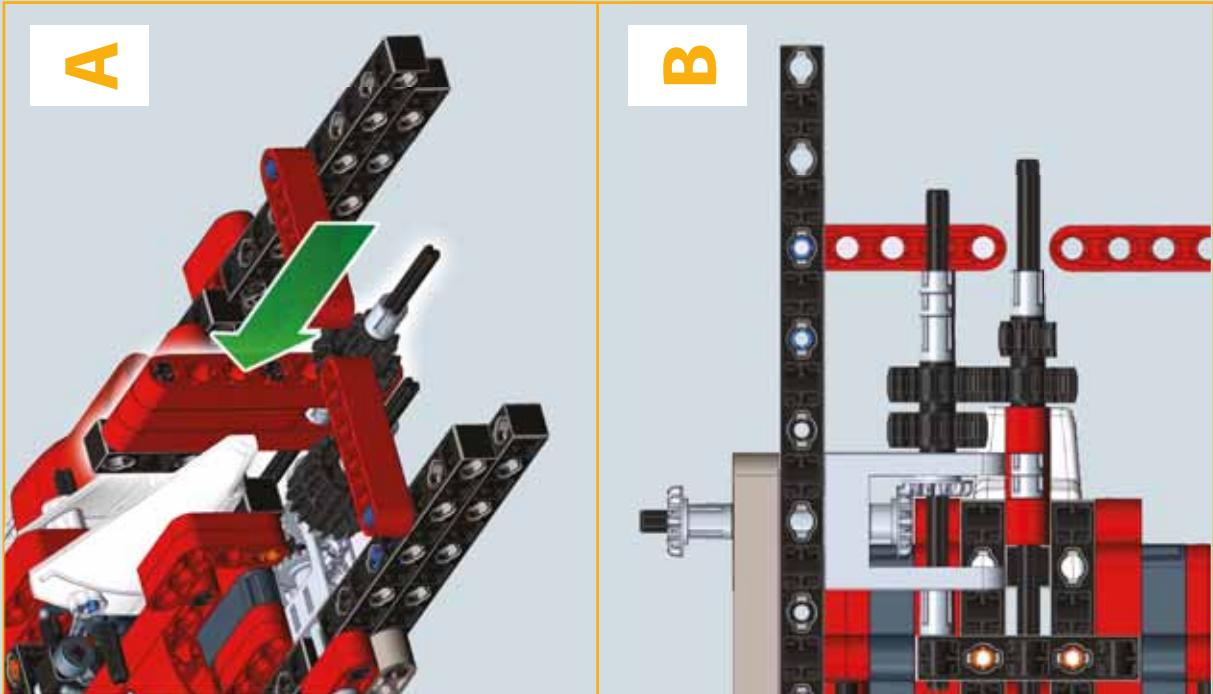


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1:1 3



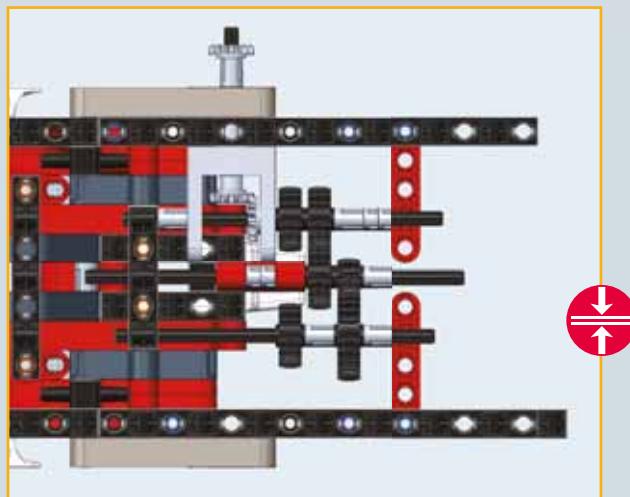
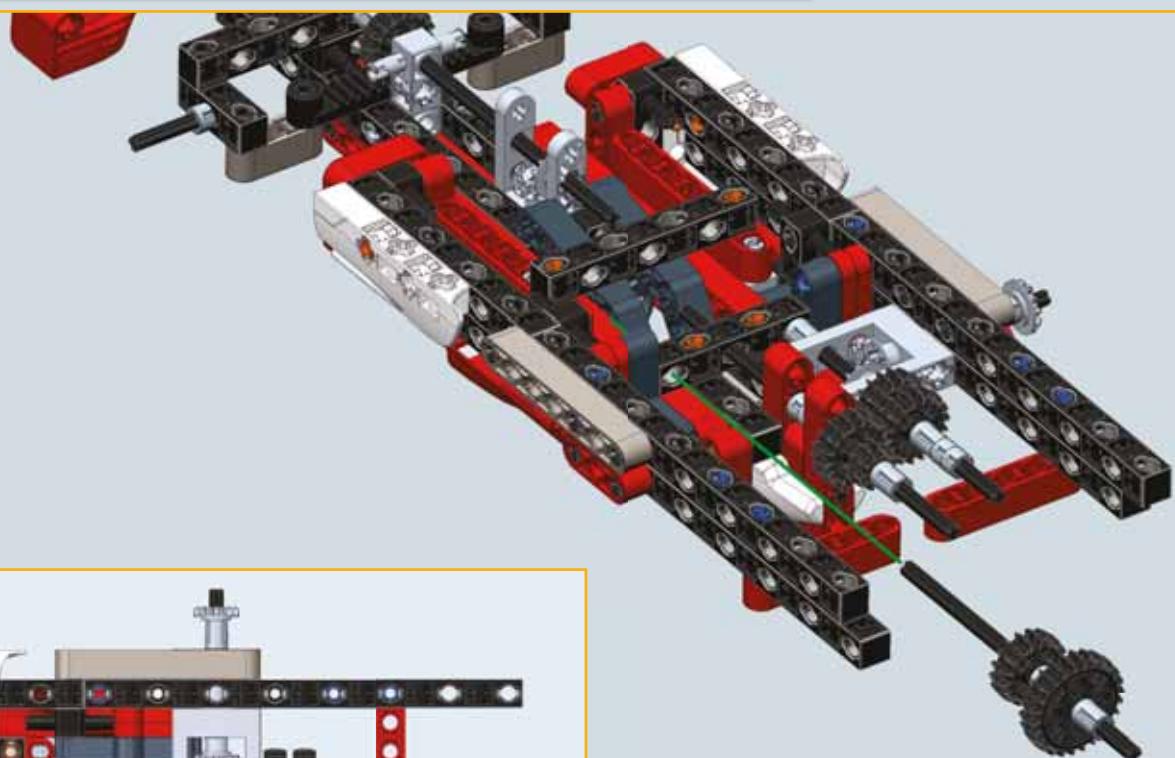




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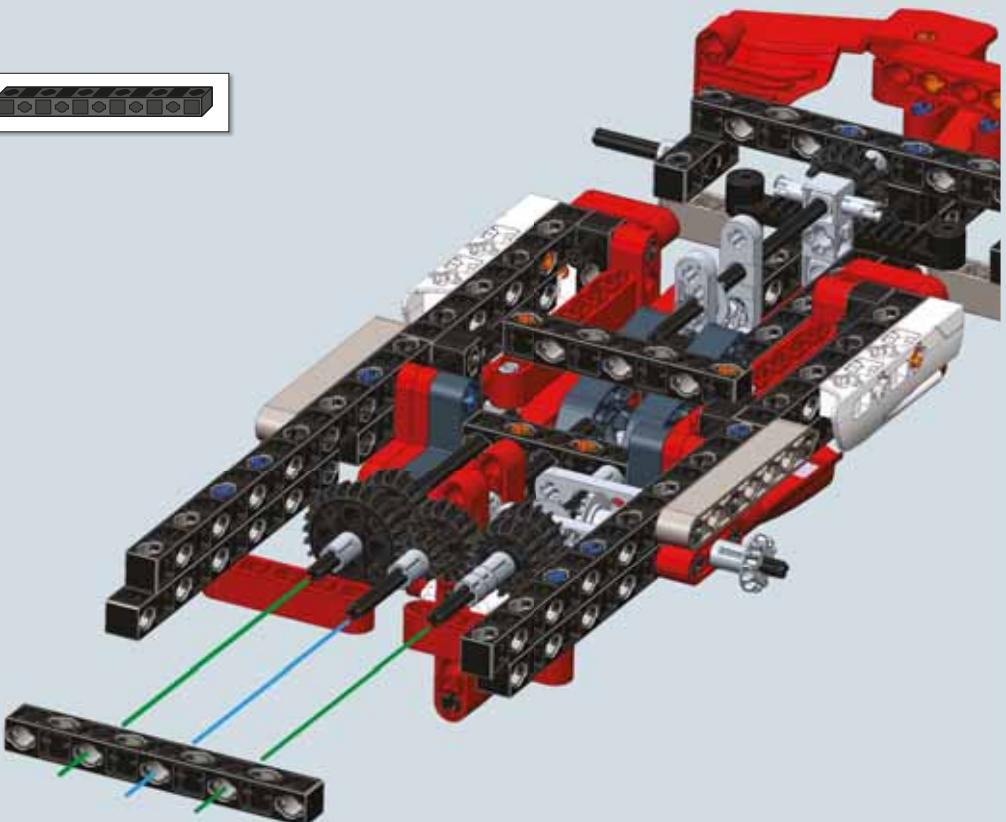
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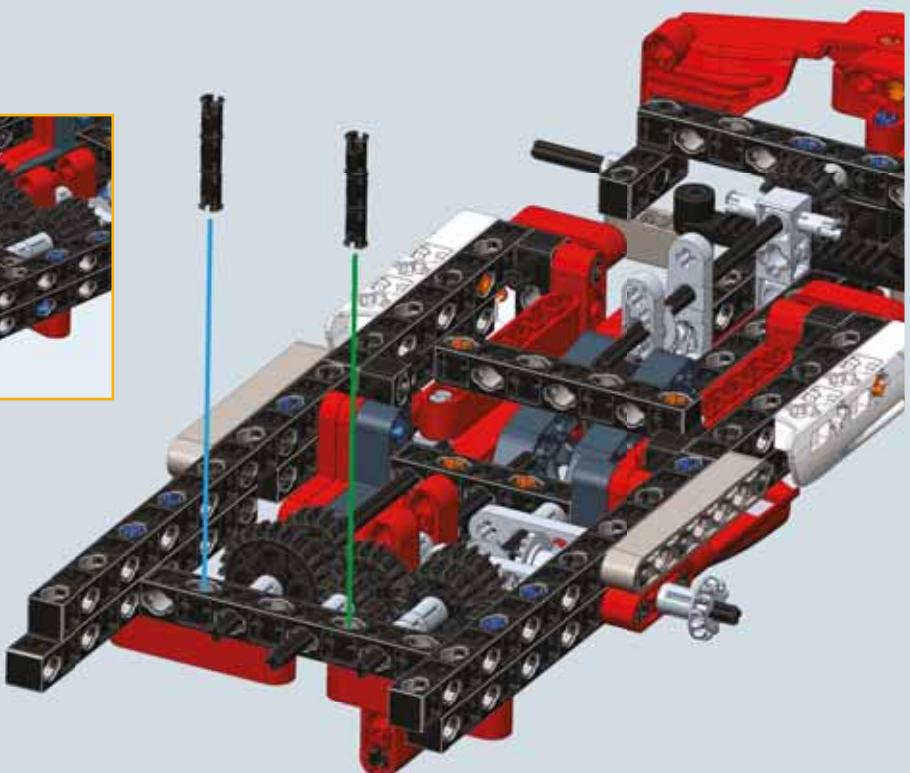
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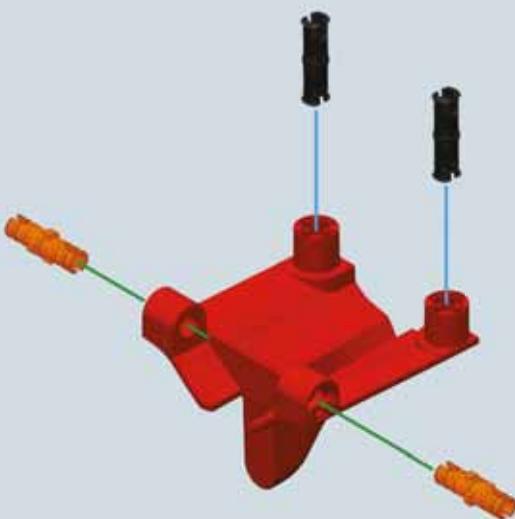


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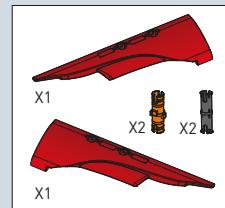
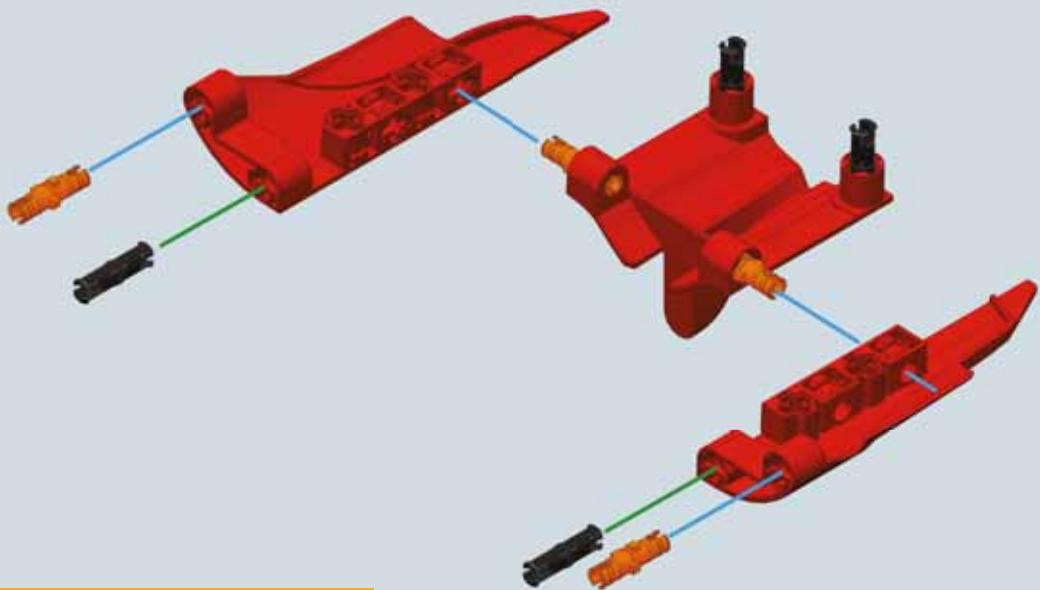
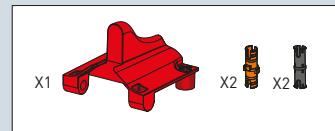


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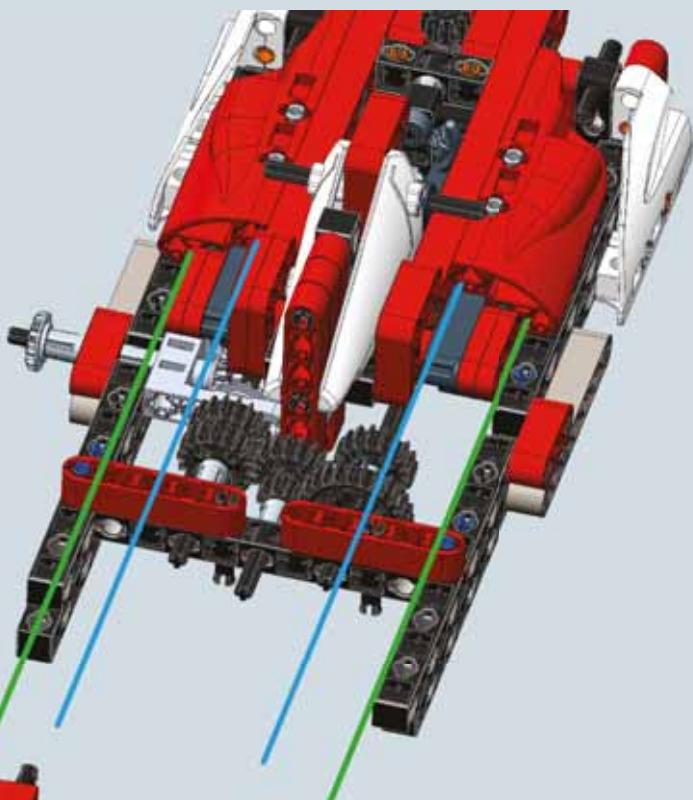




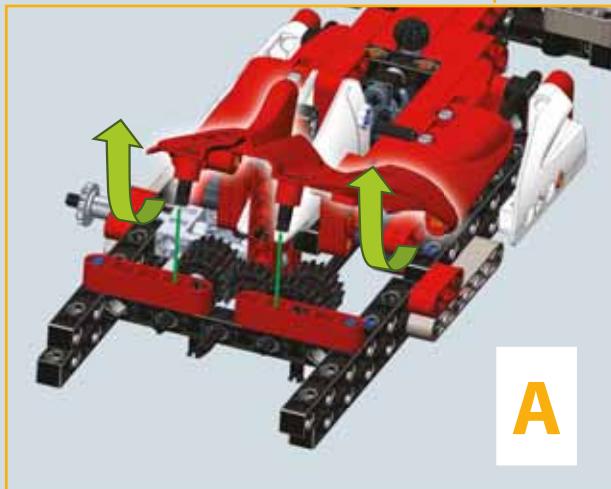
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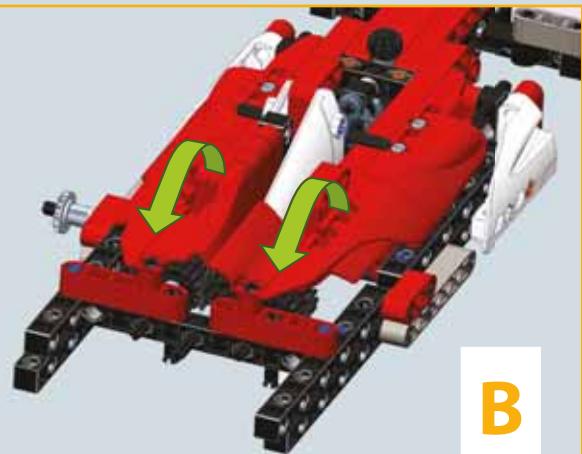
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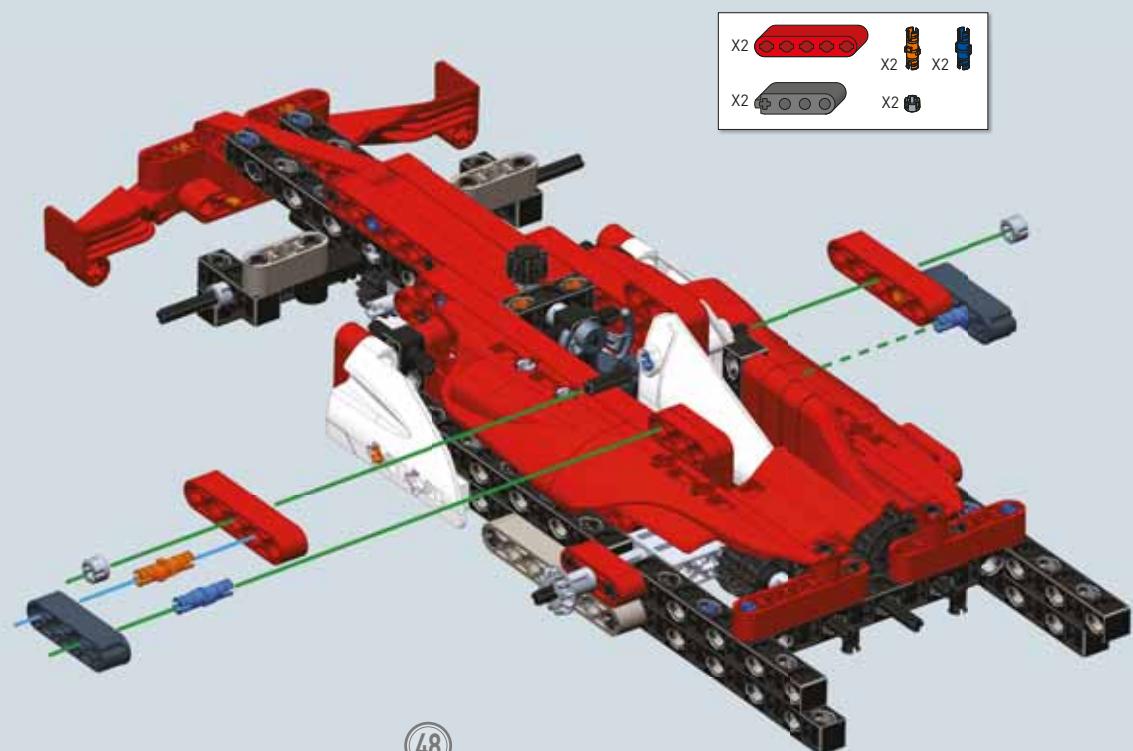
④7



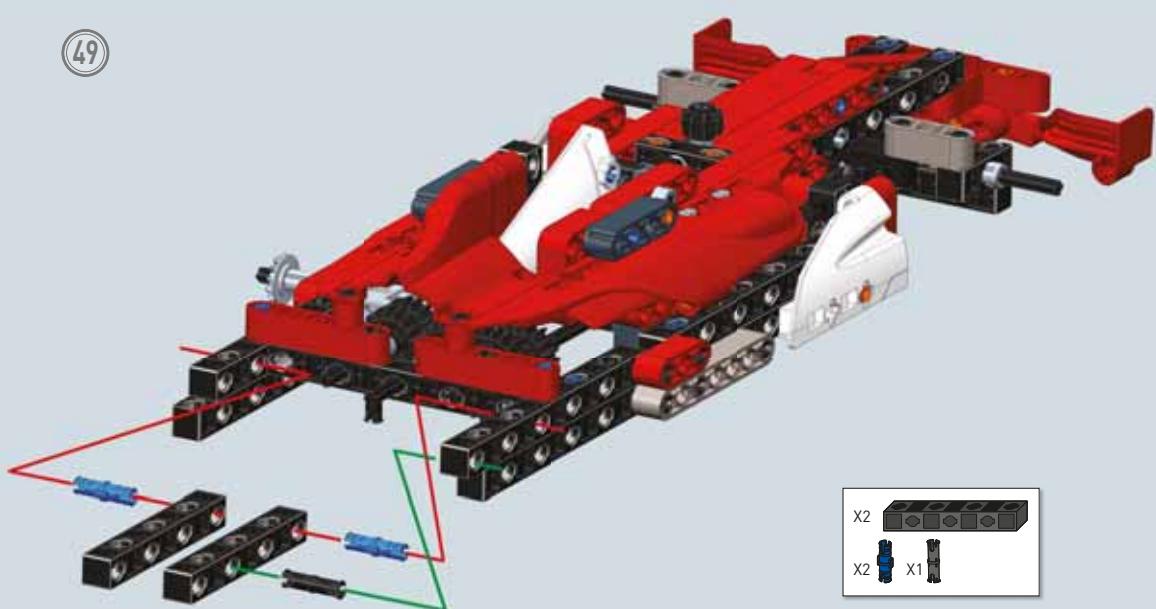
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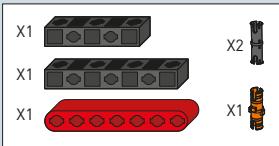
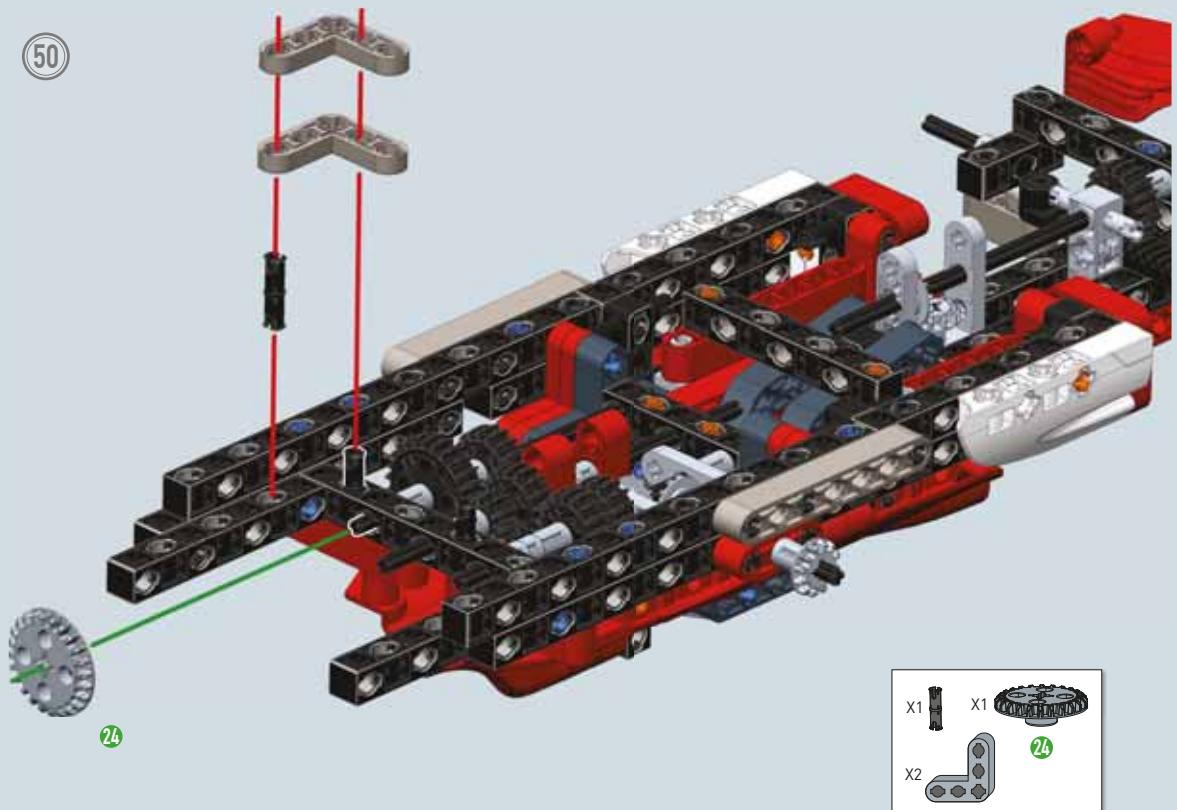
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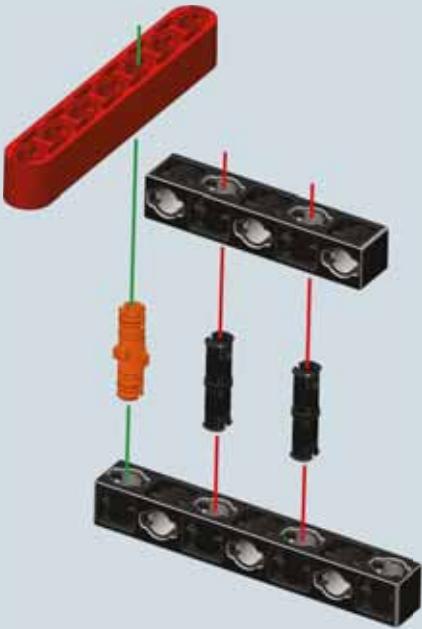
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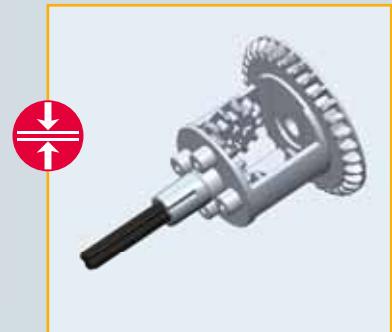
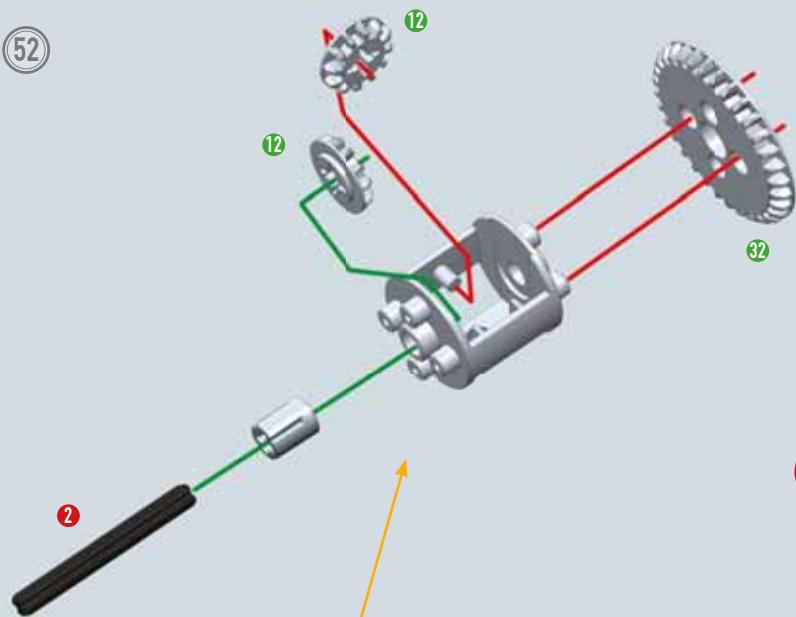
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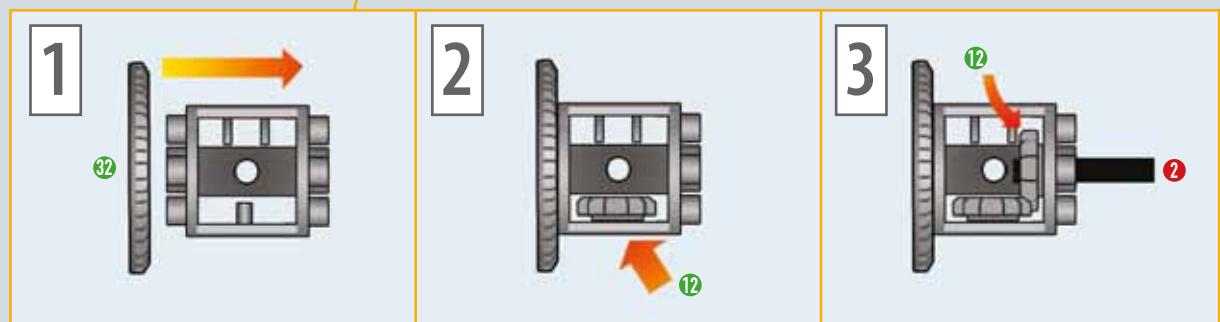
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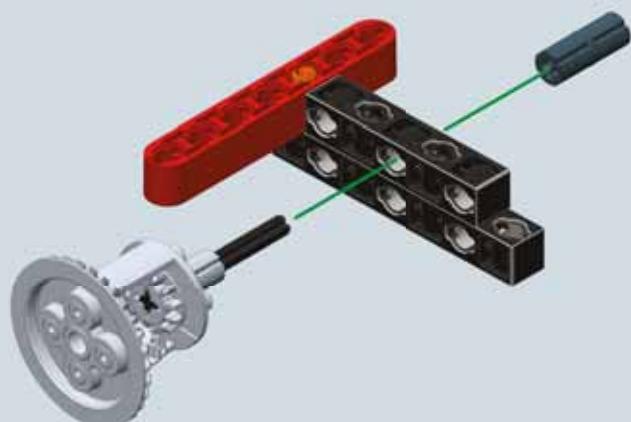
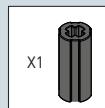
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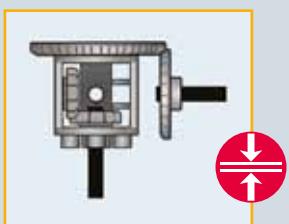


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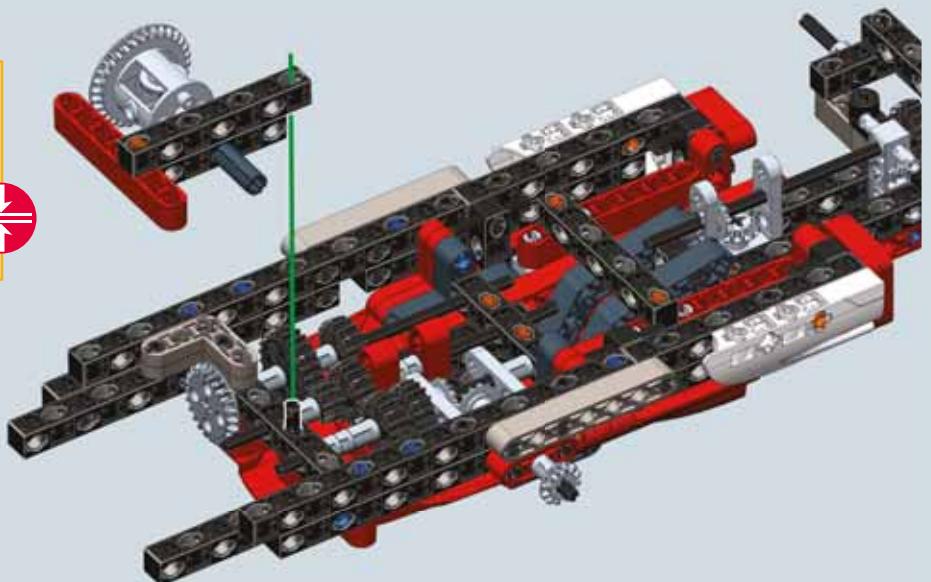


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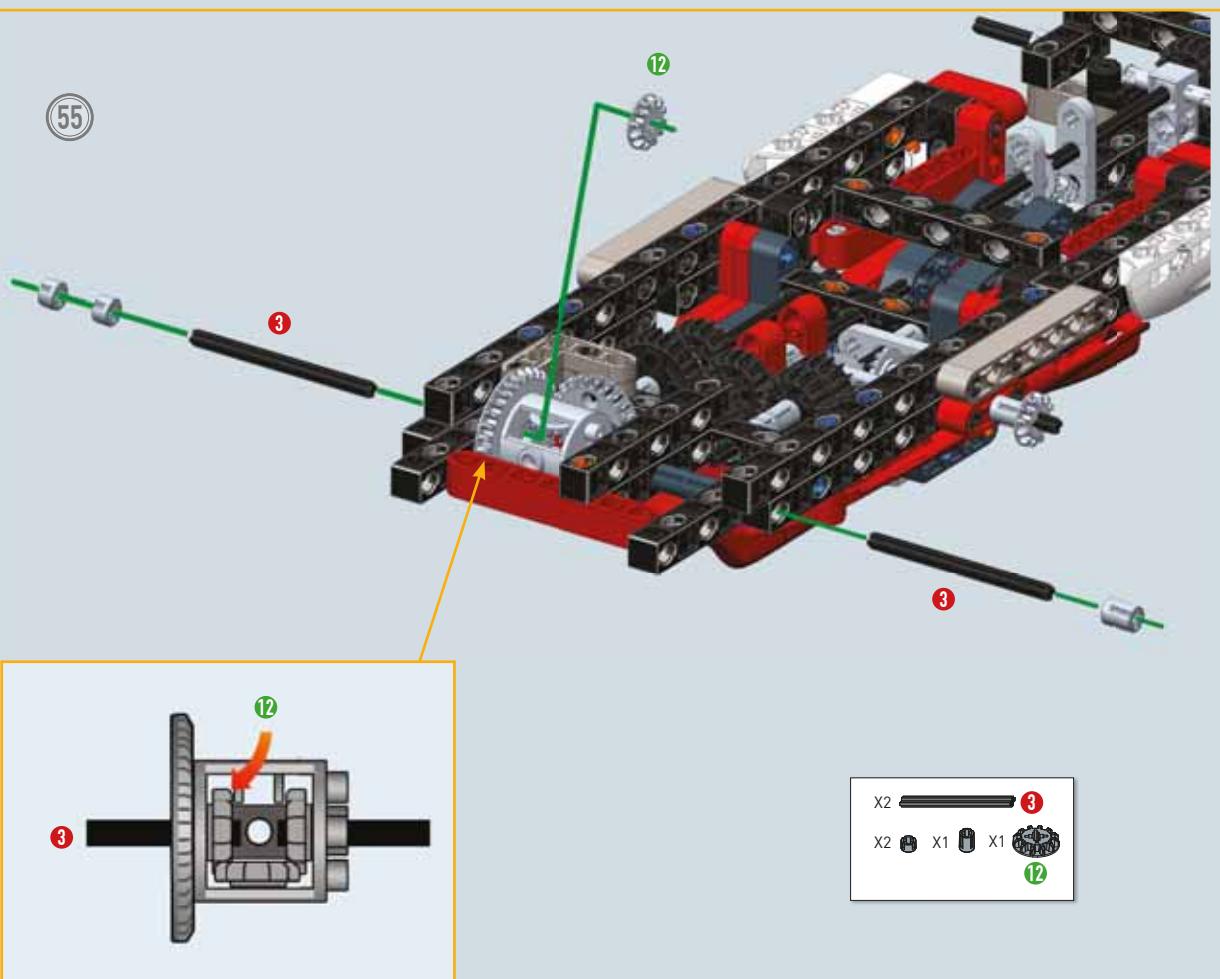




⑤4



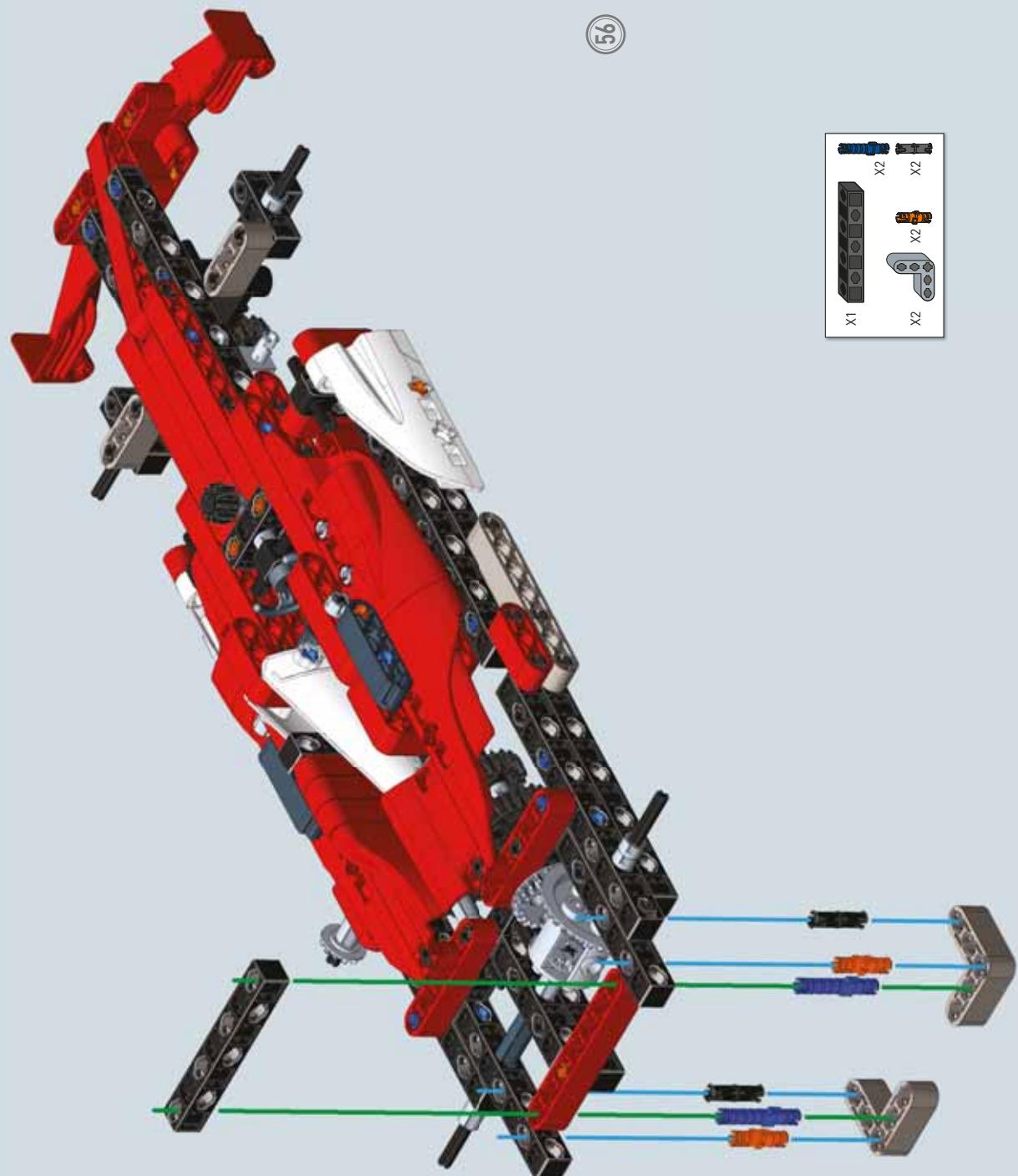
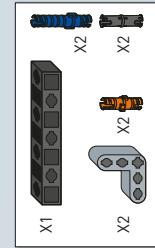
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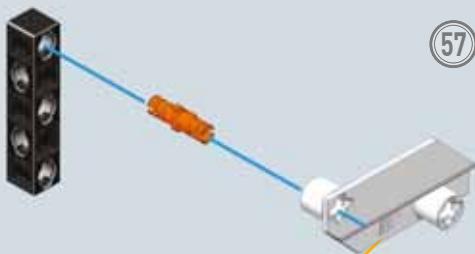


X2	3
X2	X1
X1	12

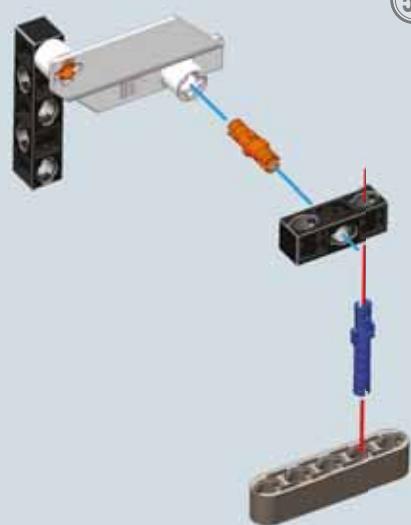
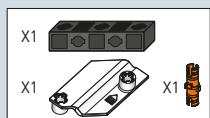
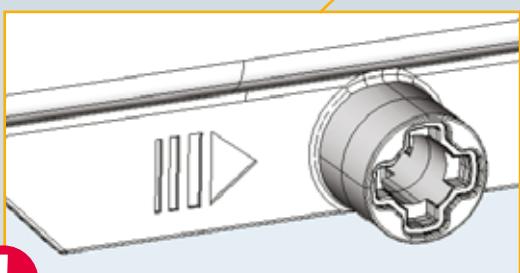
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⑤6

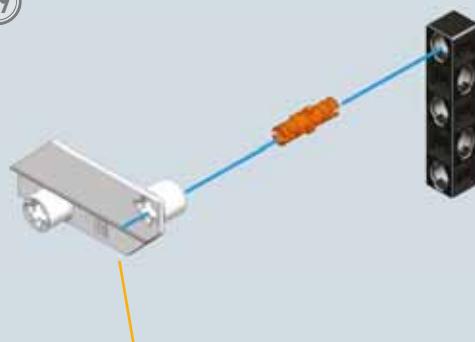
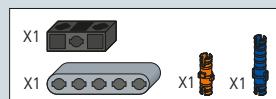




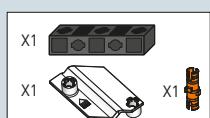
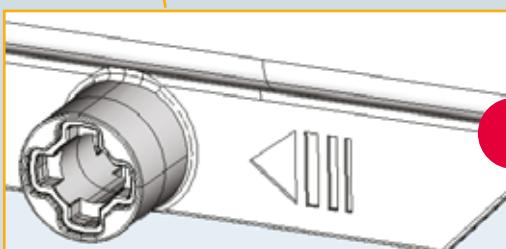
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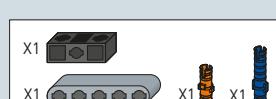
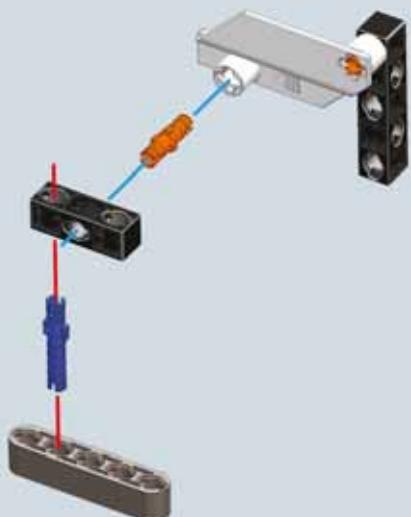
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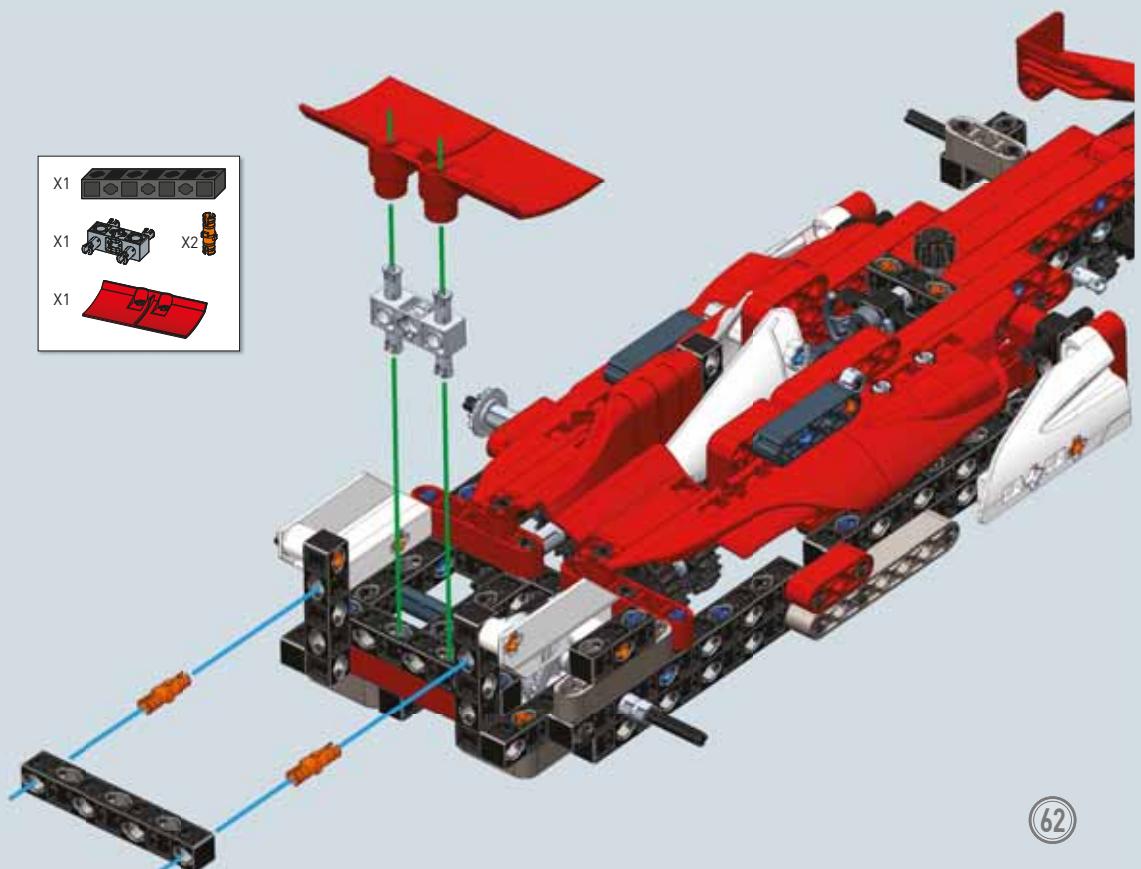
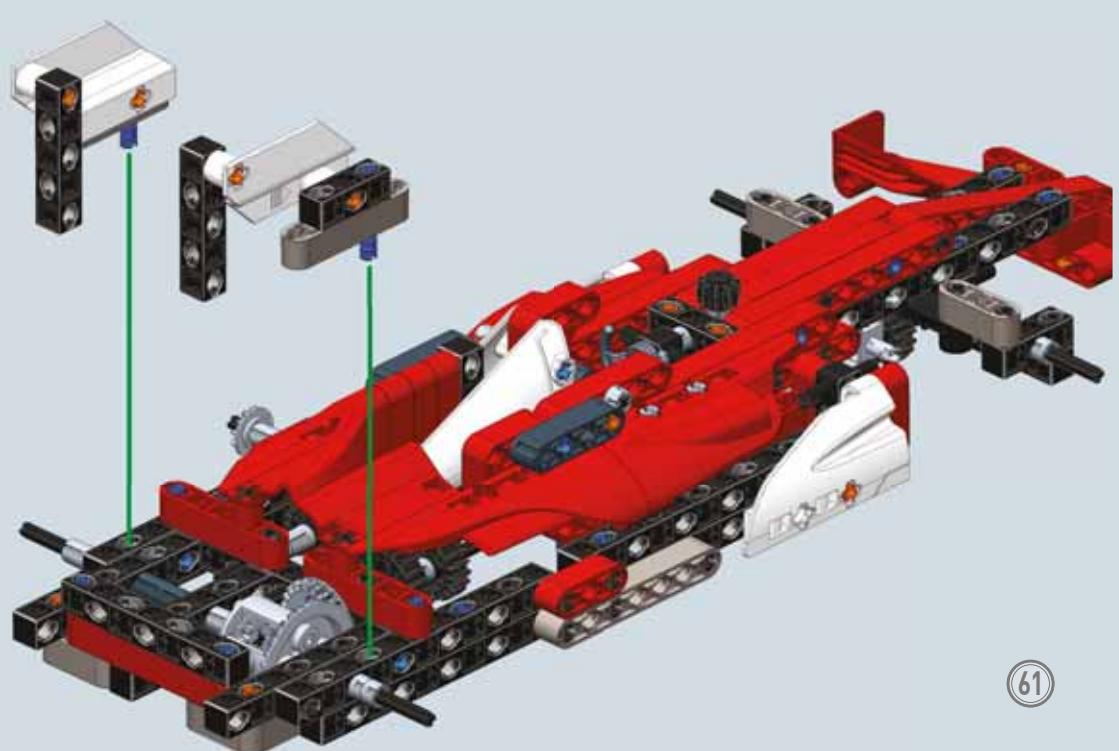


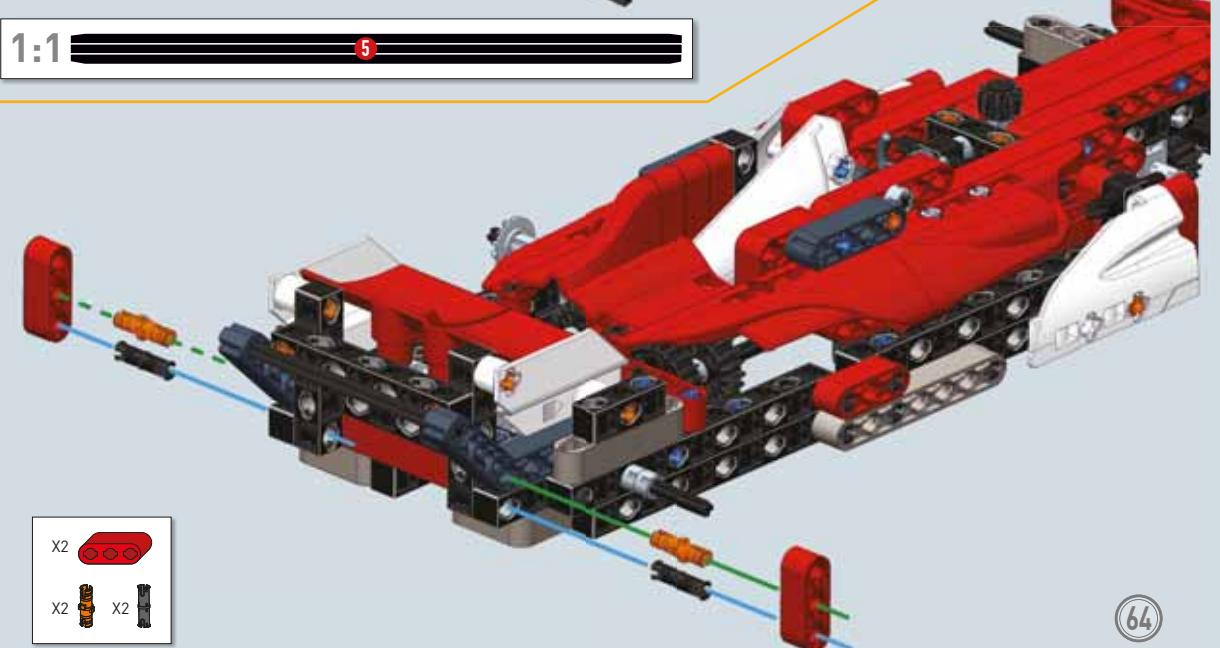
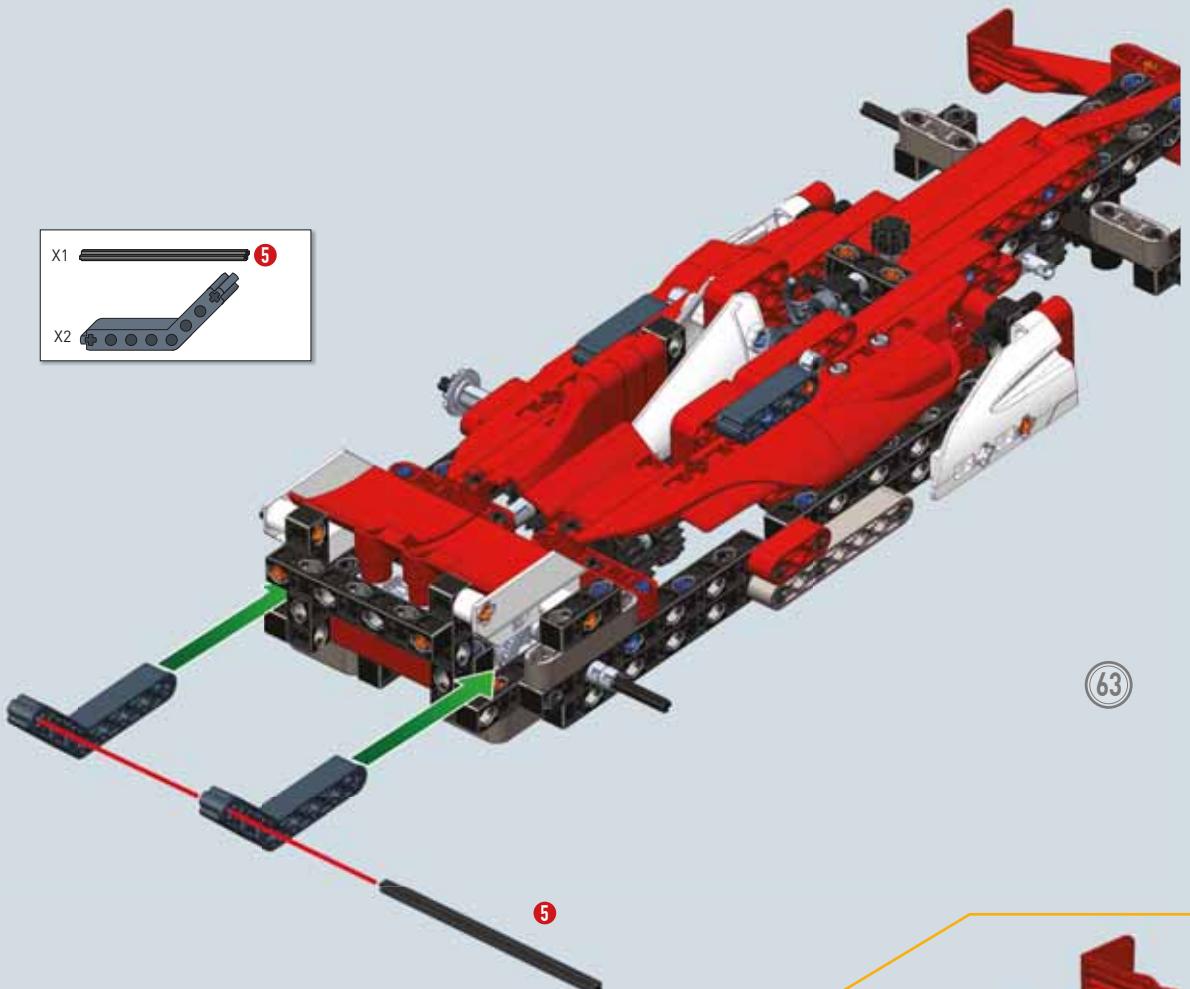
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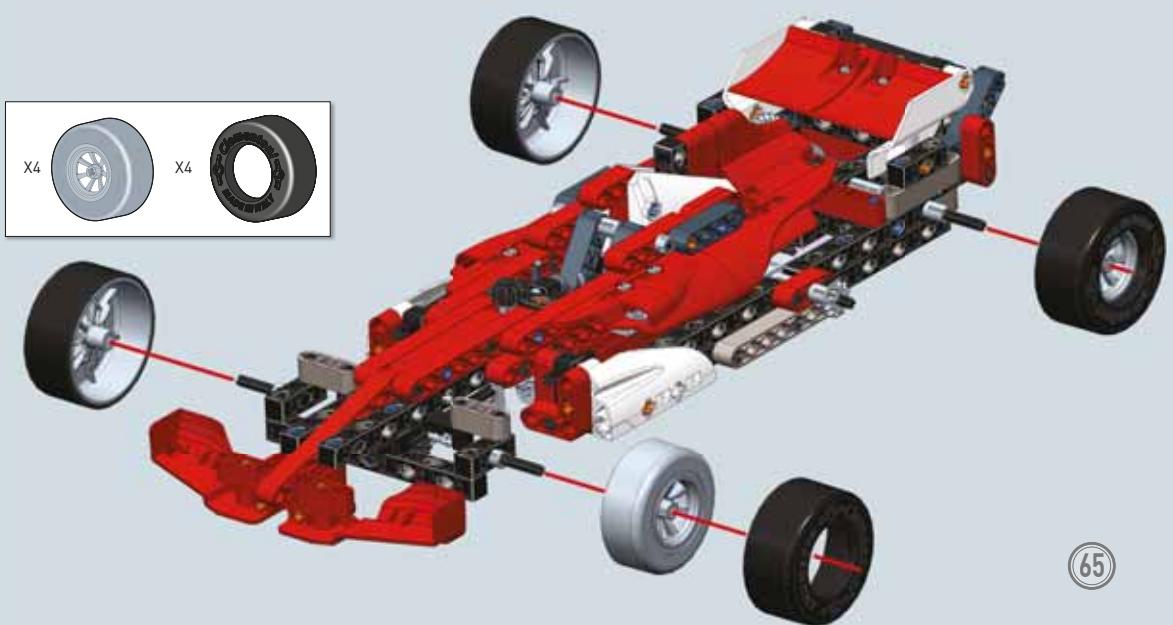


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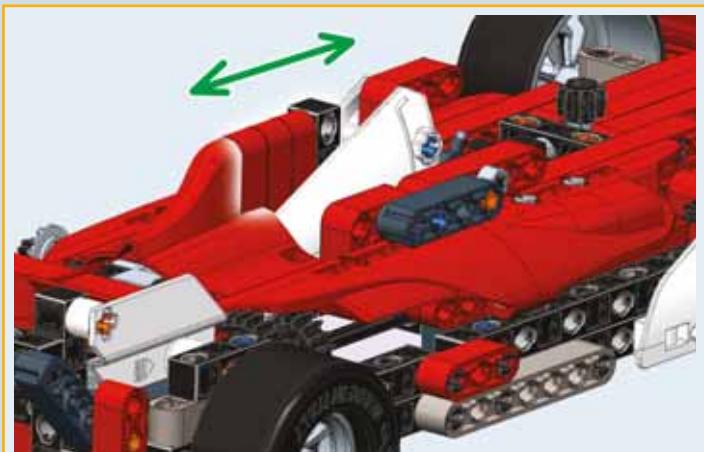




Modello finale



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