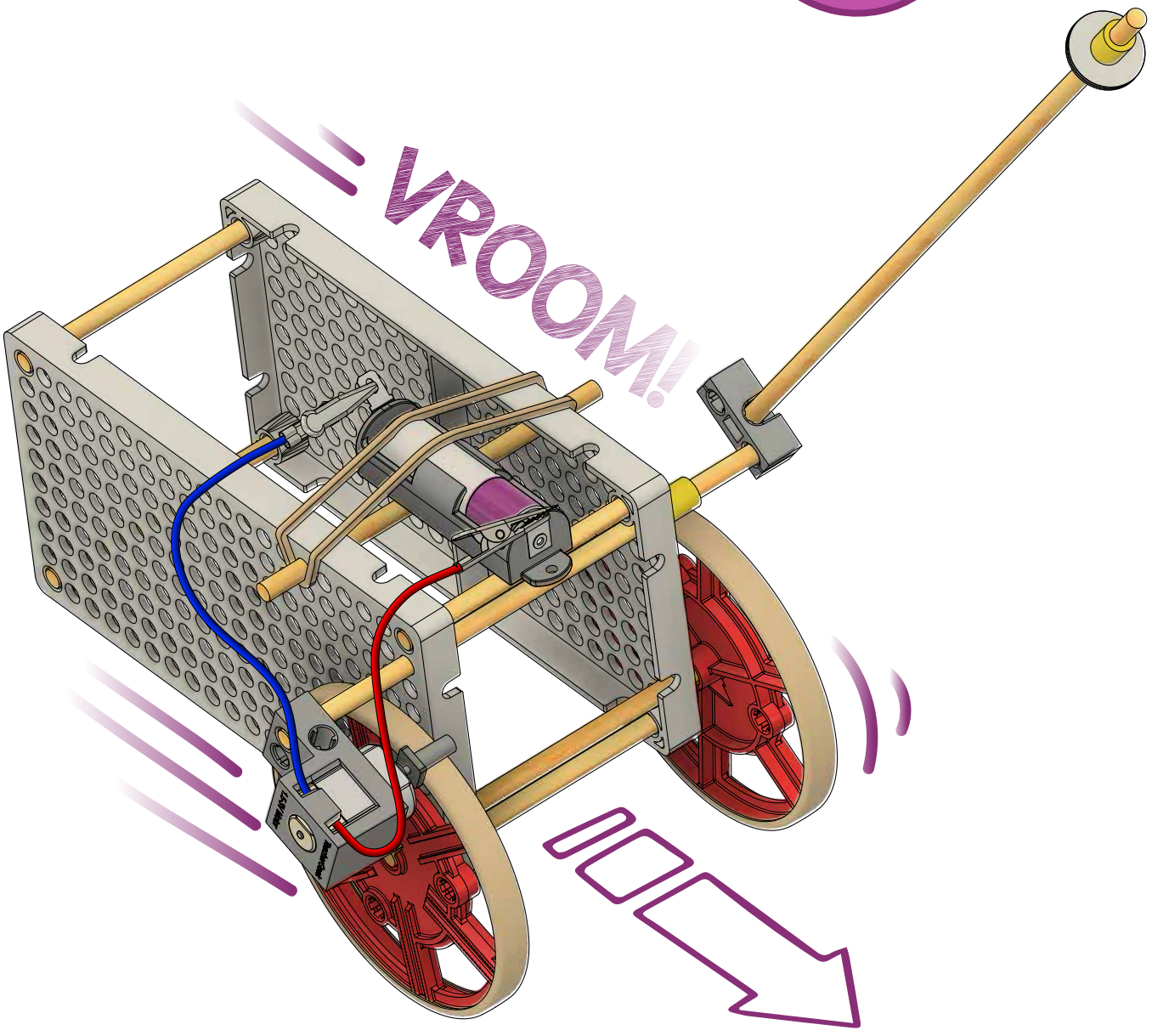
Go Guide

Dragster

Learn about friction by engineering and re-engineering your very own Dragster!



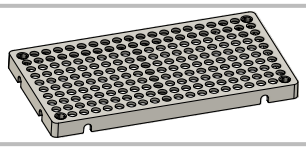
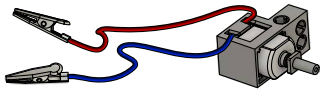
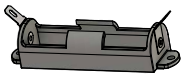
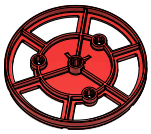
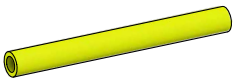
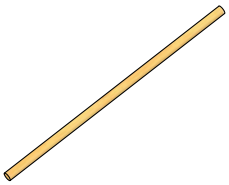
Go Guide Dragster

Supplies

Did you print this yourself? The ruler is only accurate if you printed at 100% scale.

CONTRAPTION PARTS

These are the parts you need to build one Contraption, plus some extras, to make your own unique designs!

NAME	QTY	PICTURE
Hole Plates SKU 1821-32	**2**	
Blocks SKU 1821-34	**3**	
Motor With Leads SKU 1821-01	**1**	
Battery Holder Single AA SKU 1821-01	**1**	
Wheels SKU 1821-30	**2**	
Sm. Rubber Bands SKU 1821-39	**3**	
Slide Stop 8 cm (3 in) SKU 1821-49	**1**	
Washers #10 Fender SKU 1824-54	**8**	
Tire Rubber Bands SKU 1821-64	**2**	
Dowels various sizes SKU 1821-20	**2** - 5 cm (2 in) **5** - 8 cm (3 in) **4** - 10 cm (4 in) **3** - 15 cm (6 in) **2** - 30 cm (12 in)	

MATERIALS YOU SUPPLY

- Scissors
- Tape
- Recycling Bin Materials (optional - to incorporate into your designs)

Optional Tools

Modify materials to make even more creative designs with the **Maker Tool Set** SKU 1823-84

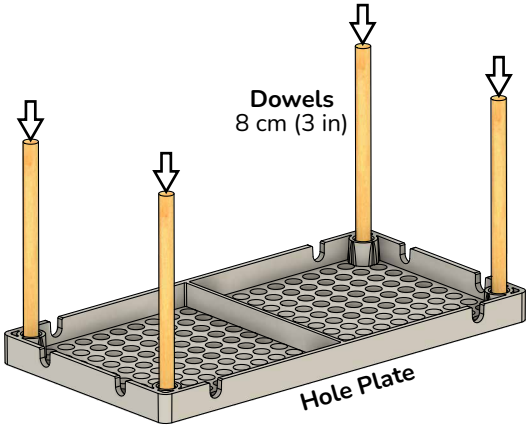
Using a Maker Cart?

You'll need to cut your own dowels.

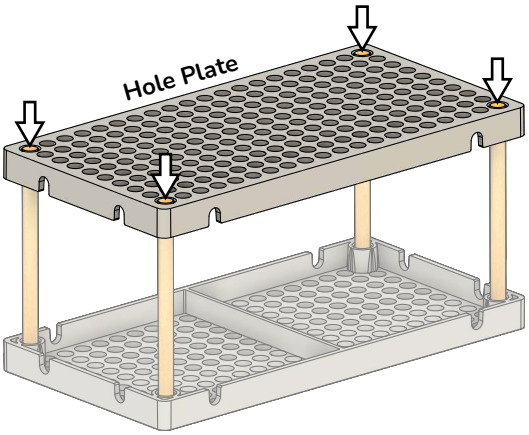
Kids will need about 7 full length dowels (30 cm/12 in), if you aren't precutting dowels.

Frame Build

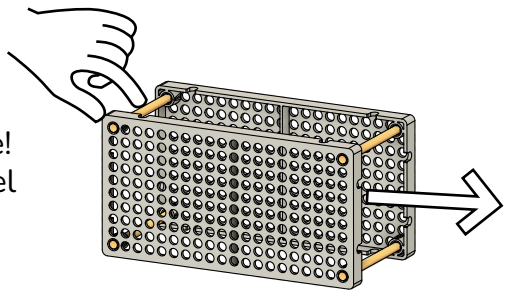
1. Wiggle or tap dowels into the corner holes of an upside-down hole plate.



2. Push or tap a hole plate onto the top of the dowels.

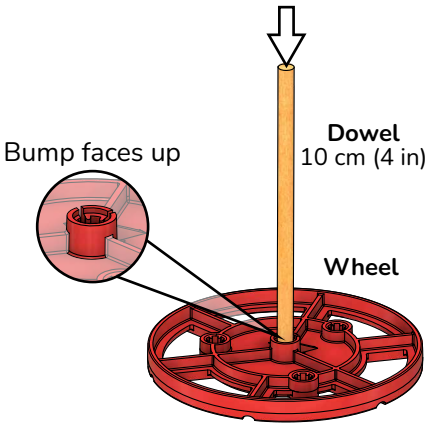


☑ Your frame is done! Push it. Do you feel the friction?

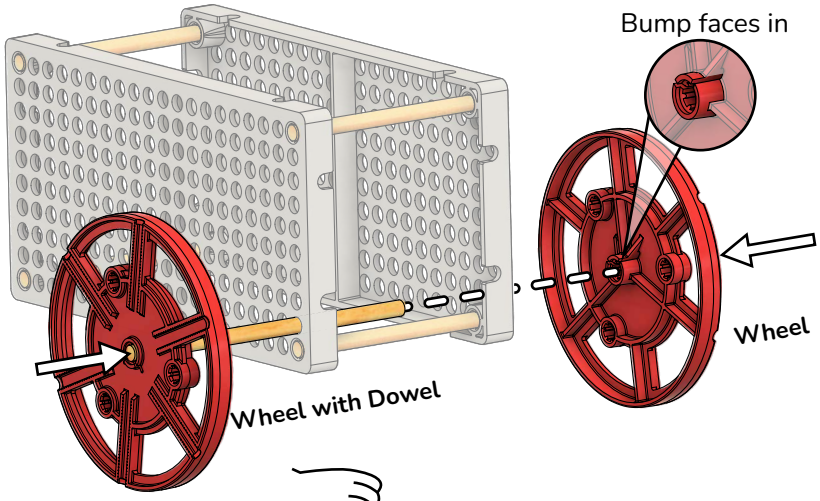


Add Wheels

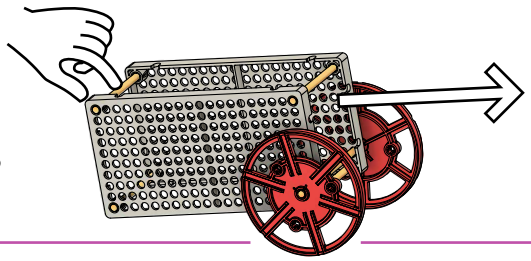
3. Tap or wiggle a dowel into one wheel.



4. Slide the dowel, from Step 3, through your frame and into another wheel.

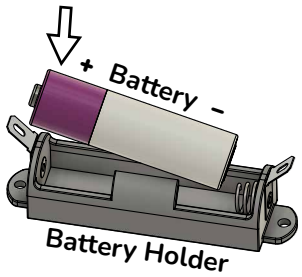


☑ Your wheels are on, give it a push! How do the wheels affect the friction?

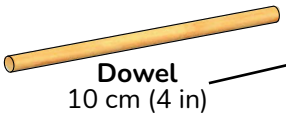


Battery On

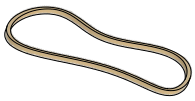
5 Add a battery to the battery holder.

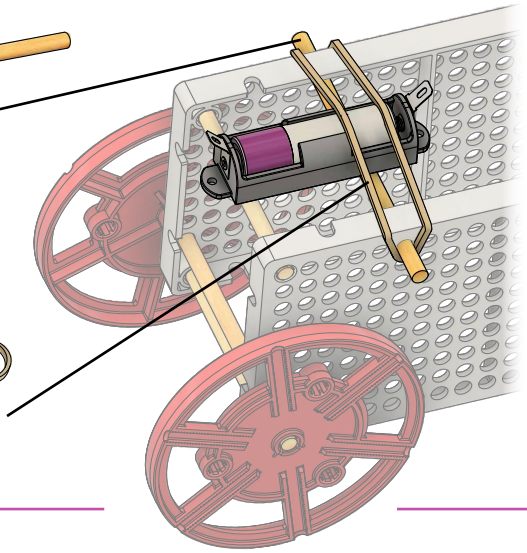


6 Slide a dowel into the frame.



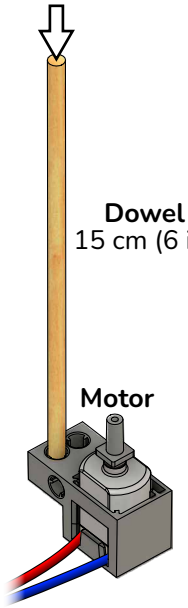
7 Secure the battery with a rubber band.

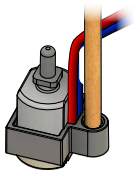




Motor Build

8 Wiggle or tap a dowel into your motor.

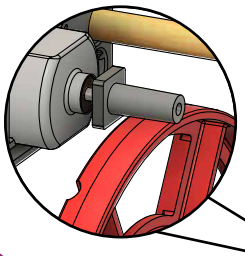




Using a Maker Cart or Bulk Components?

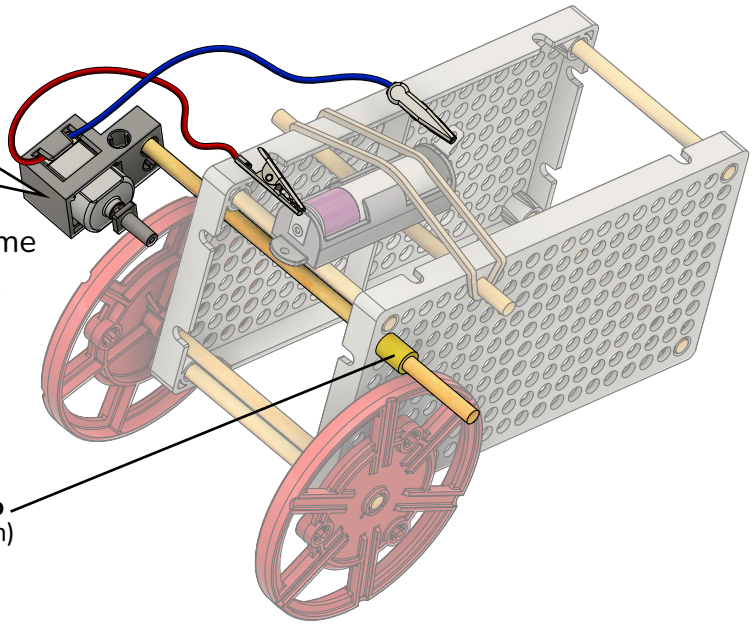
Your motor may look like this, instead.

Power Up!

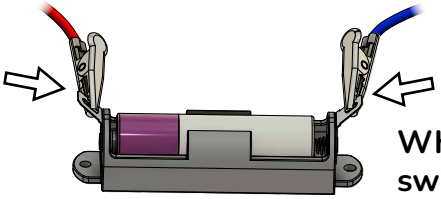


9 Slide your motor's dowel into the frame so the motor shaft lays on the wheel.

10 Add slide stop to secure the motor.



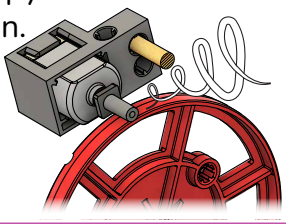
11 Test it! Connect the battery to power up your motor.



What happens if you switch the leads (wires)?

Why doesn't it work!?!

Your motor isn't grippy! It needs more friction. You'll fix that next.



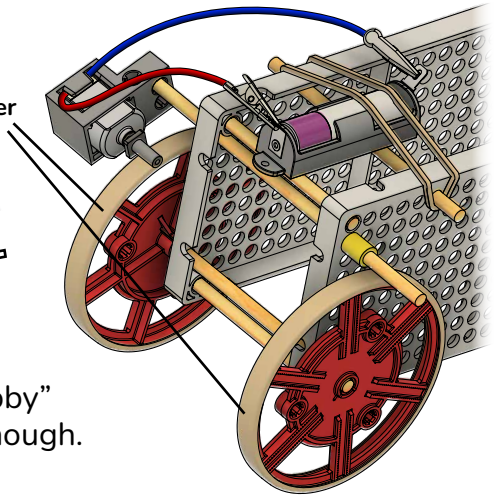
Tires On

Rubber tires increase friction, giving your wheels more grip.

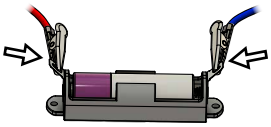
11 Add tires to your wheels.

Tip: Remove the wheels to make it easier

Tire Rubber Bands



12 Reconnect your battery to retest your car.



It's better, but not there yet...
Tires made your wheels more "grabby" by increasing friction. But it's not enough. Next, you'll add even more friction!

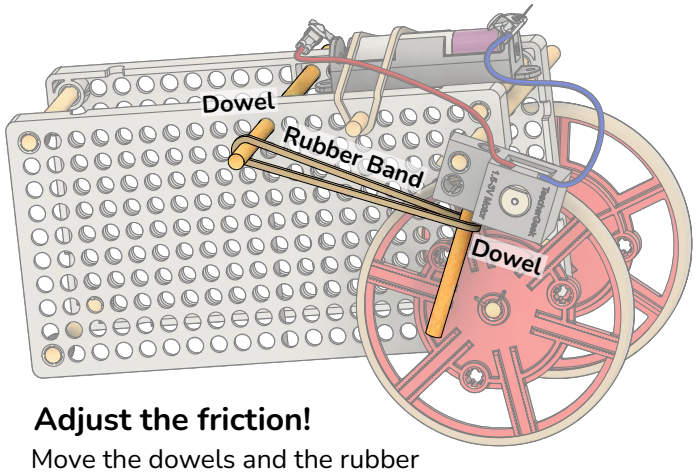
More Friction!

Force the motor into the wheel to create more friction! Be careful - too much friction makes your motor stop.

Option 1:

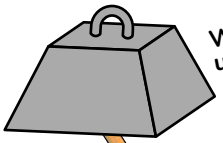
Use a Rubber Band

The rubber band pulls the motor into the wheel to increase friction.



Adjust the friction!
Move the dowels and the rubber band to get the friction just right!

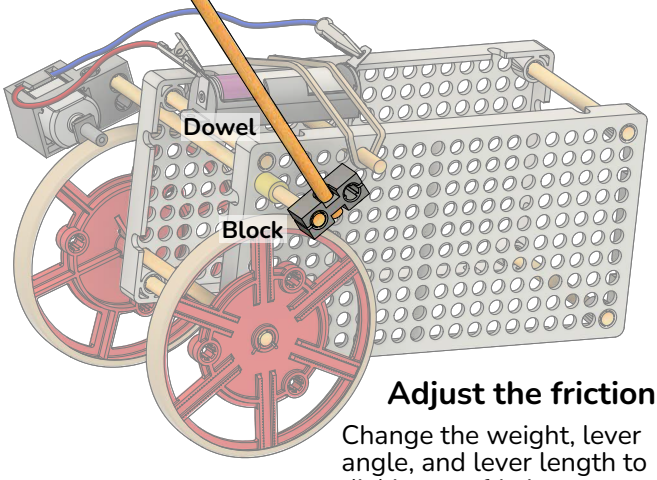
OR



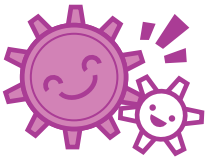
Option 2:

Use a Lever

The lever pushes the motor into the wheel to increase friction.



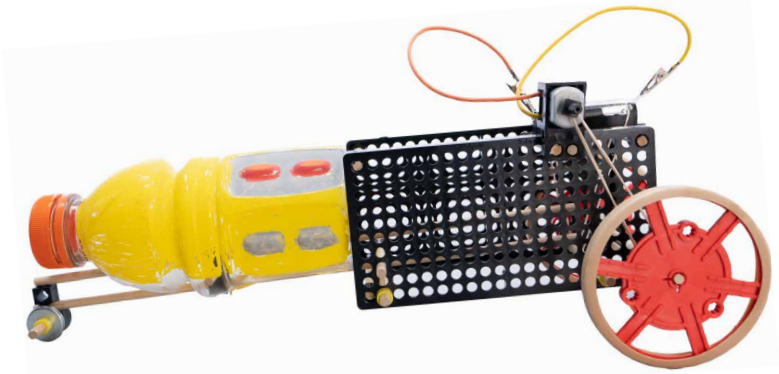
Adjust the friction!
Change the weight, lever angle, and lever length to dial in your friction.



Congratulations! Your example build is done, but you aren't... It's time to make your own unique design!

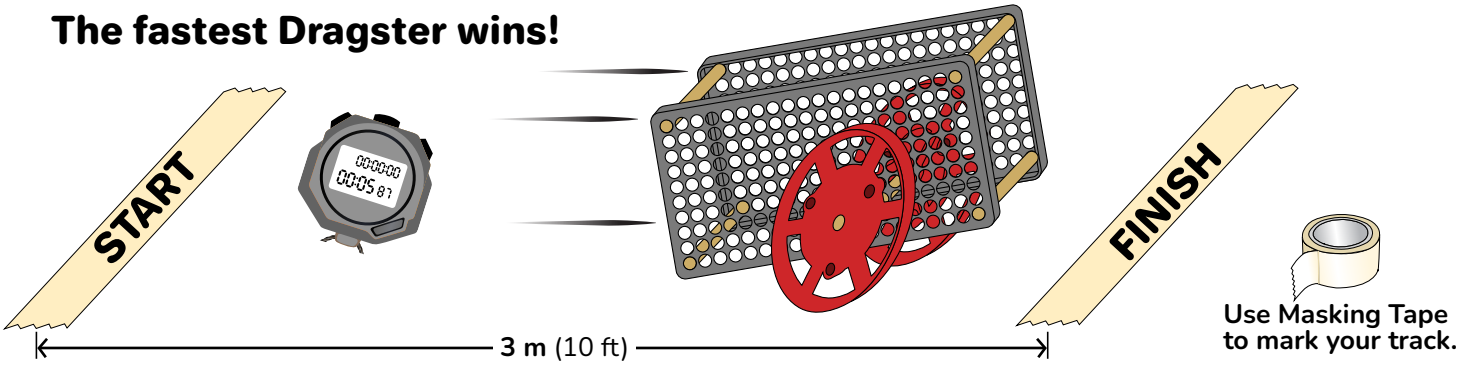
Time for a challenge!

Re-engineer your Dragster to complete a challenge.



Drag Race Challenge

The fastest Dragster wins!



Criteria

(what your design must do)

Your Dragster must travel down the 3 m (10 ft) track in the fastest time to win!

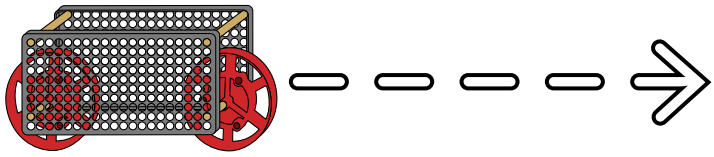
Constraints

(rules & limits for your design)

Your vehicle may only be powered by 1 AA battery and 1 motor.

Optional Challenges

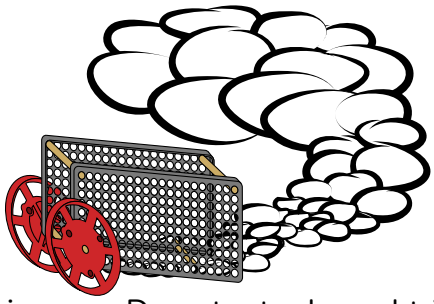
Distance Challenge



Design a Dragster to go the greatest distance possible while staying inside a 60 cm (2 ft) wide track.

The Dragster that goes the farthest without going outside the track wins!

Trick My Ride Challenge



Customize your Dragster to do cool tricks. Do wheelies, donuts, make it hop, and more!

Friction

Friction can help or hurt your Dragster. Increase or decrease it to get it just right.

Increase Friction

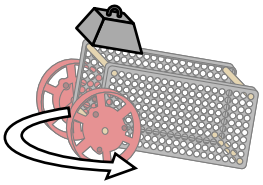
-Grippy materials
-Objects forced together (heavy weights, tight rubber bands)

Decrease Friction

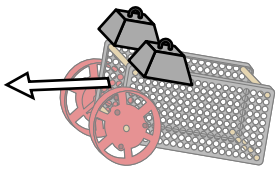
-Slippery materials
-Objects lightly touch (little weight, loose rubber bands)

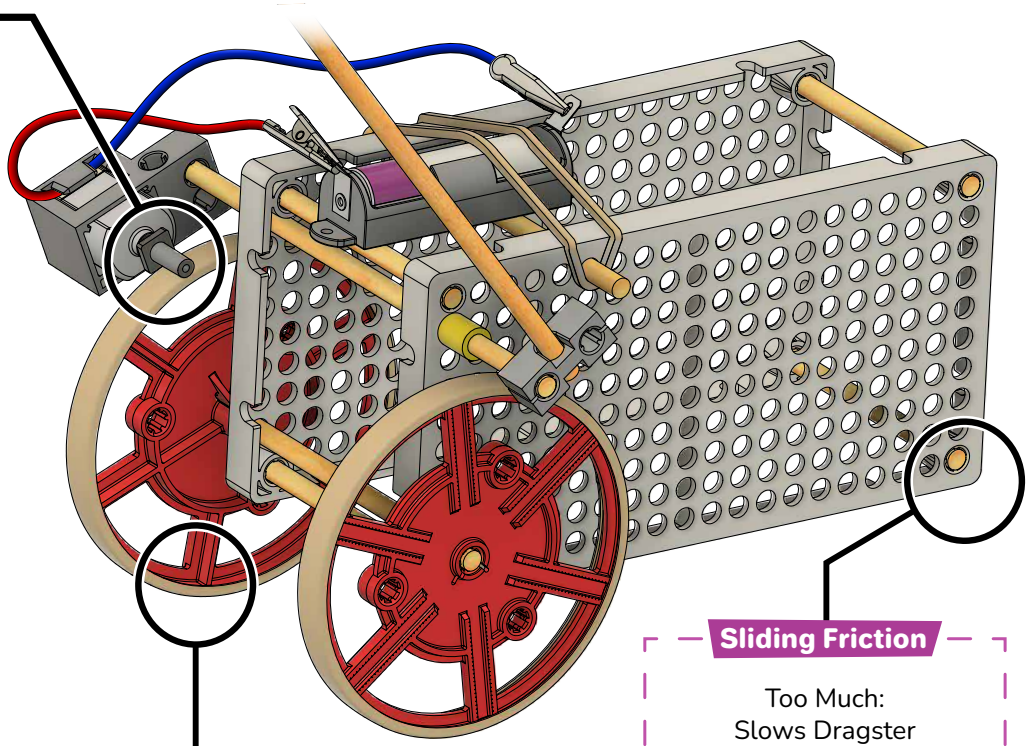
Weight Balance

Off-Balance: Dragster May Turn



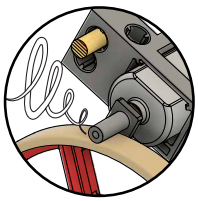
Balanced: Dragster Goes Straight



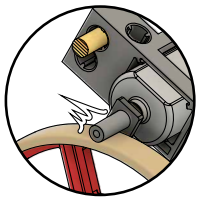


Motor Friction

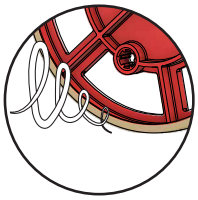
Too Little: Motor Slips



Too Much: Motor stops



Traction

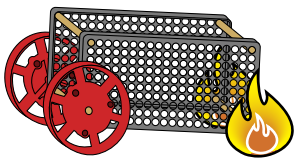


Too Little: Wheel slips

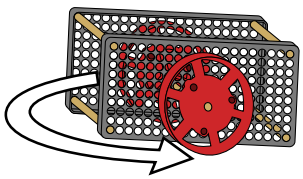
Too Much: Slows Dragster

Sliding Friction

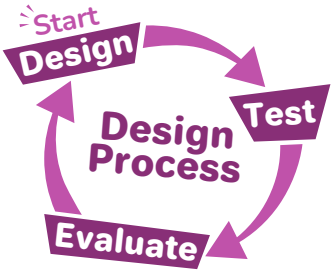
Too Much: Slows Dragster



Too Little: Dragster may turn



Make Your Own Unique Design!

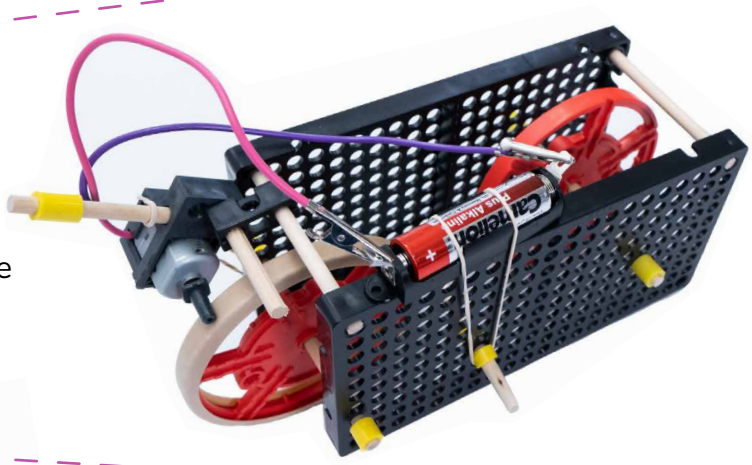


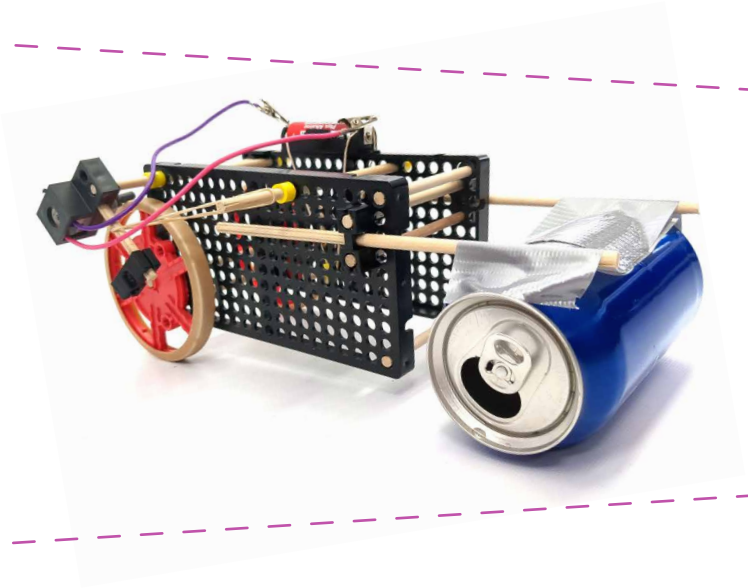
Re-engineering your Dragster and try totally unique designs!

The Engineering Design Process never ends. There is no perfect design.

Move Your Wheels

Front, middle, back, or inline, the location of your wheels can have a big efect on friction and tracking (going straight).





Try Different Materials

Raid the recycling bin! What can you use to lower friction, steer your Dragster, or improve your design?

Try A Pulley-Drive

Put your rubber band directly on the motor shaft (behind the black pin), then run it around your axle. Make your axle bigger with slide stop or tape to adjust the torque (turning force).