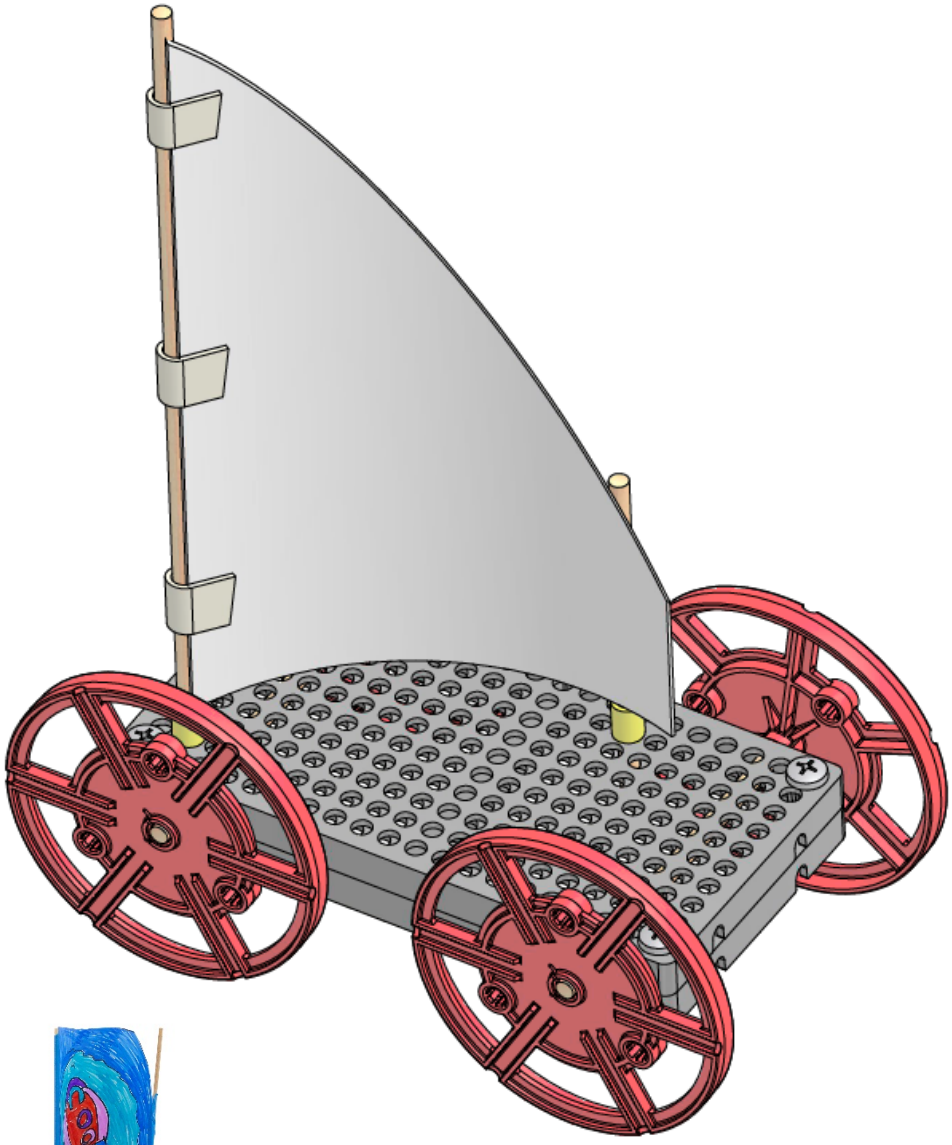
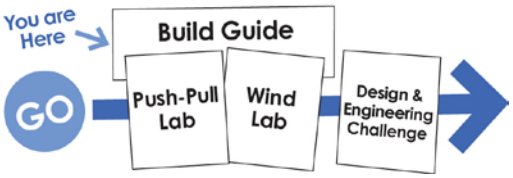
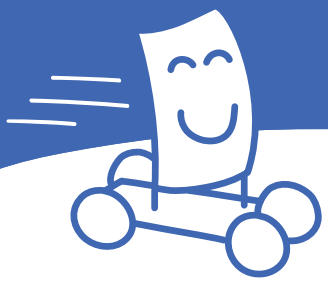
Build Guide & Labs
Sail Car





Start by building the example Sail Car, then turn it into your own unique design.

For use with TeacherGeek Sail Car Activity Pack, or Maker Cart. Find documents and activity materials at teachergeek.com.



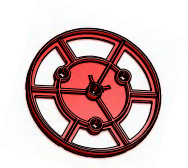
Sail Car Build Guide

This guide will take you through the simple process of creating a Sail Car.
It is recommended that this step is done with the adult assistance/supervision.

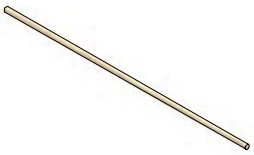
TeacherGeek Components

For One Sail Car

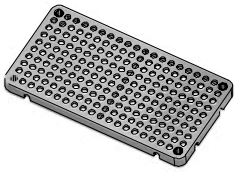
Below is the list of "ingredients" you'll need to build a Sail Car. It includes some extra components to allow you to create your own unique design.



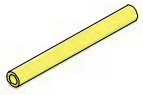
4 Wheels



3 Dowels



2 Hole Plates



Slide Stop
(enough to cut two 1cm (3/8in) sections)

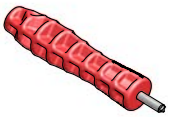
4 Screws
(1in #10 Screws)

TeacherGeek Tools You'll Need

Easy to Share in Groups

These are the tools you will need for the Sail Car Body Build.

Multi-Cutter
SKU 1823-81
Or anything else that can cut dowels & slide stop



Reamer
SKU 1823-87

Phillips Screwdriver
SKU 1823-90

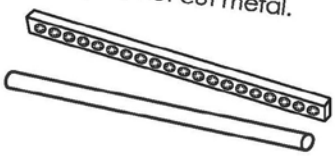
Hammer (optional)
SKU 1824-41

Caution: Tools are to be used by ages 13+, or with close adult supervision.

Sail Car Build Guide

Cut

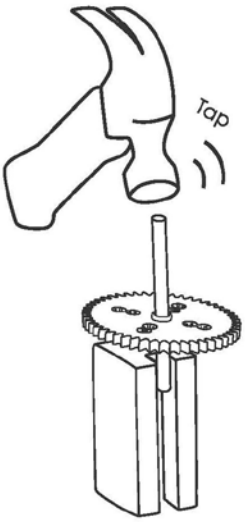
Multi-Cutters cut wood & plastic (like **dowels** and **connector strips**). They do not cut metal.



Push, Wiggle,

Push, wiggle or tap **dowels** into holes.

Tap



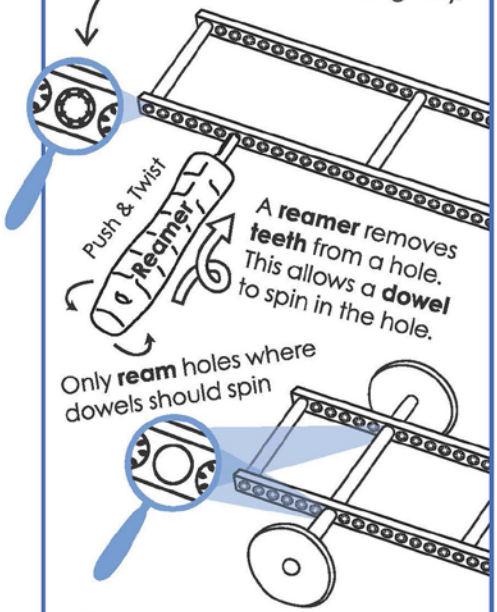
Use a **hammer** and **slider block** to tap **dowels** farther through holes.

Quick Tip!

Use a crayon, or soap on the end of a Dowel to make building easier.

Ream

Most parts have holes with **teeth**. The **teeth** hold **dowels** (keep dowels from falling out).



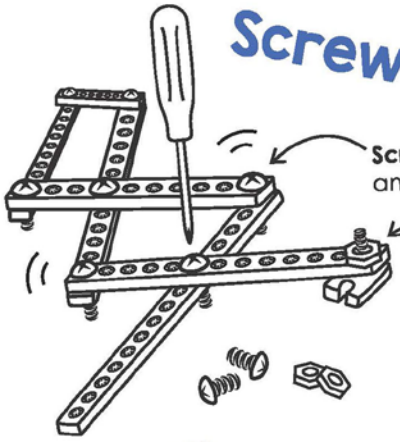
A **reamer** removes **teeth** from a hole. This allows a **dowel** to spin in the hole.

Only **ream** holes where dowels should spin

Never **ream pulleys, gears, wheels,** or any hole a **dowel** stays stuck into.

Screws & Nuts

Do not **ream** holes you will put **screws** into.



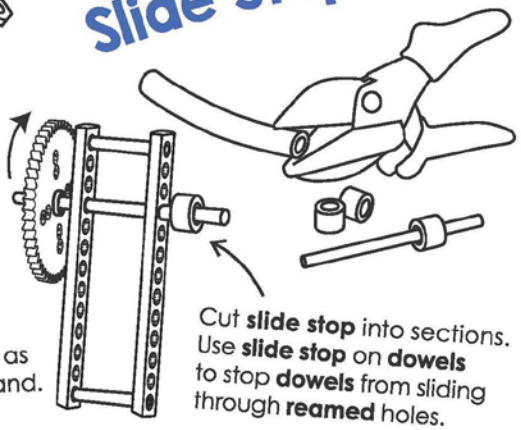
Screws (without nuts) can connect parts, and allow them to rotate.

Screws (with a nut) can connect parts, and keep them from rotating.

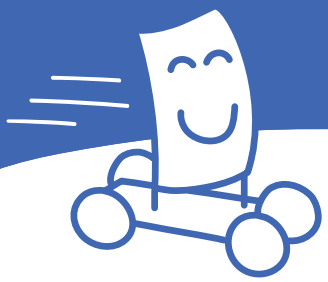
Stop Clip

Press a **stop clip** onto a **dowel** to keep it from sliding or use it as a hook for a string / rubber band. It takes little force to get it on.

Slide Stop



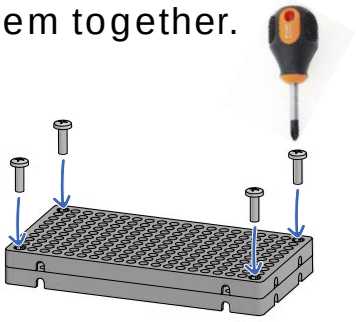
Cut **slide stop** into sections. Use **slide stop** on **dowels** to stop **dowels** from sliding through **reamed** holes.



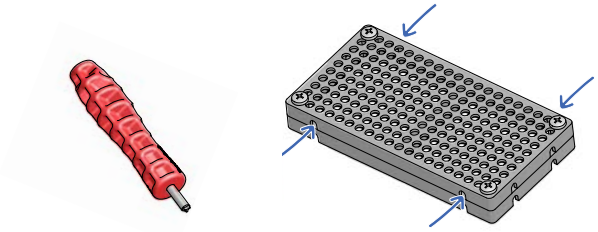
Sail Car Build Guide

Build the Body

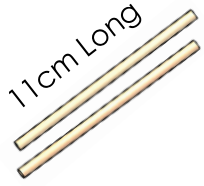
1. Stack two **hole plates** on top of each other. Use four **screws** to attach them together.



2. **Ream** the 4 holes that were created by attaching the two **hole plates**.

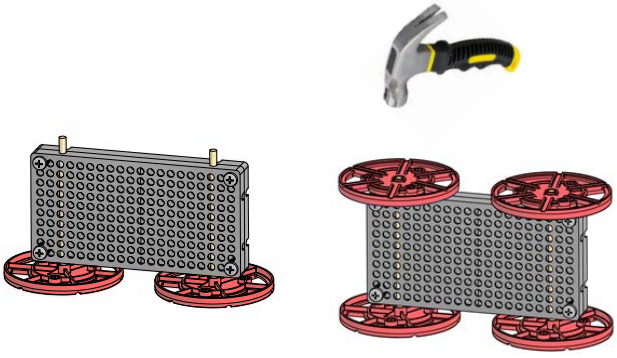


3. **Cut** two 11cm (4.25in) sections from one **dowel**. These will be your wheel axles.

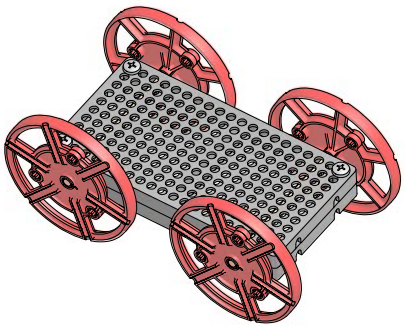


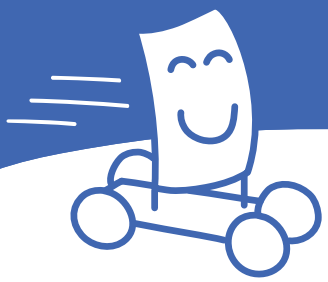
4. Push or tap the **dowels** from Step #3 into **wheels.**

5. Place the **wheels** with **dowels** from Step #4 into the reamed **hole plate** holes. Then push or tap on two more **wheels**.



6. **You're done!** Make sure the **wheels** spin easily. If not, try taking the **wheels** off and reaming the **hole plate** holes more.

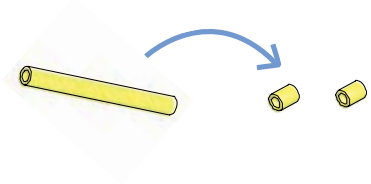




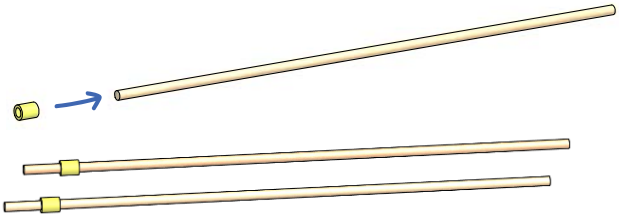
Sail Car Build Guide

Make the Masts

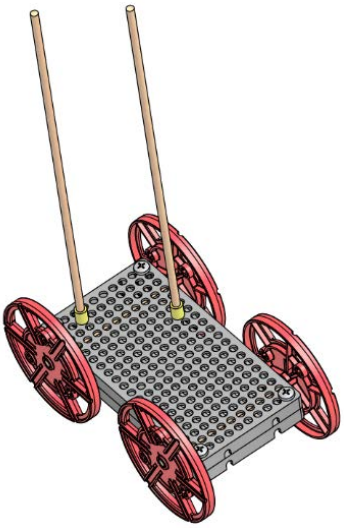
1. Cut two 1cm (3/8in) sections of **slide stop**.

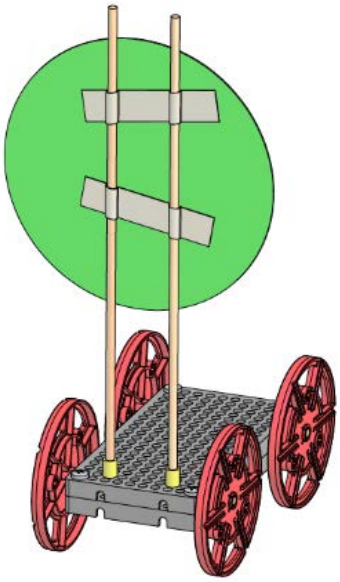


2. Place each **slide stop** section approximately 2cm (3/4in) onto an uncut **dowel**.



3. Place the masts into the Sail Car body. The masts will be used to attach the sails.



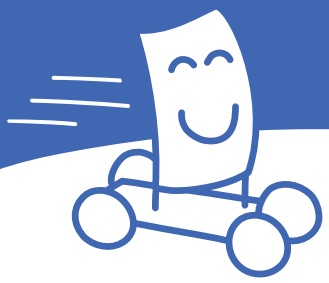


Up Next

It's time to make your Sail Car go.

Move on to the force and motion Labs on the next pages.

After you've finished, download the Design & Engineering Challenge documents at **teachegeek.com/learn** and take your Sail Car even further.

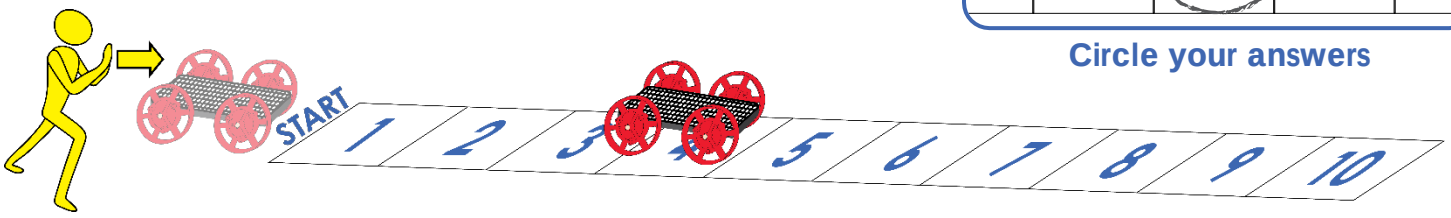


Sail Car Push-Pull Lab

Name: _____

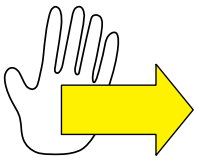
2	3	4	5	6

Circle your answers



Predict: Circle how far you *think* it will go?

1	2	3	4	5	6	7	8	9	10



Light Push

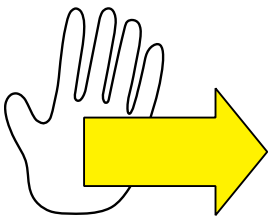
Test: Circle how far it goes?

1	2	3	4	5	6	7	8	9	10

?

Predict: Circle how far you *think* it will go?

1	2	3	4	5	6	7	8	9	10



Medium Push

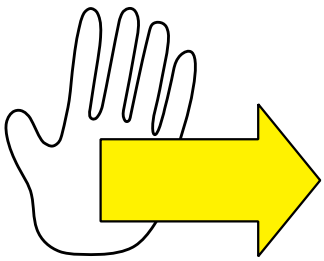
Test: How far did it go?

1	2	3	4	5	6	7	8	9	10

?

Predict: Circle how far you *think* it will go?

1	2	3	4	5	6	7	8	9	10

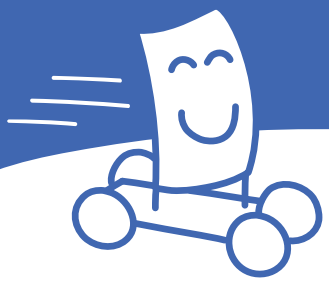


Strong Push

Test: How far did it go?

1	2	3	4	5	6	7	8	9	10

?

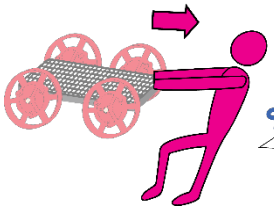


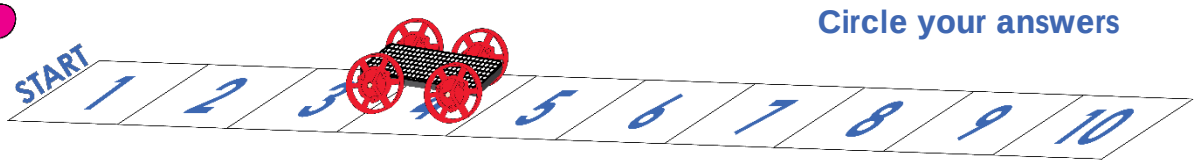
Sail Car Push-Pull Lab

Name: _____

2	3	4	5	6

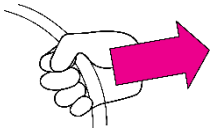
Circle your answers





Predict: Circle how far you *think* it will go?

1	2	3	4	5	6	7	8	9	10



Light Pull

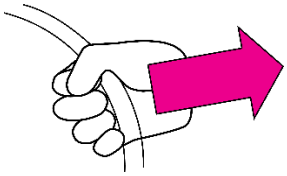
Test: Circle how far it goes?

1	2	3	4	5	6	7	8	9	10

?

Predict: Circle how far you *think* it will go?

1	2	3	4	5	6	7	8	9	10



Medium Pull

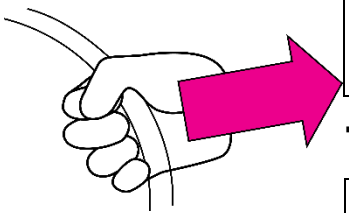
Test: How far did it go?

1	2	3	4	5	6	7	8	9	10

?

Predict: Circle how far you *think* it will go?

1	2	3	4	5	6	7	8	9	10

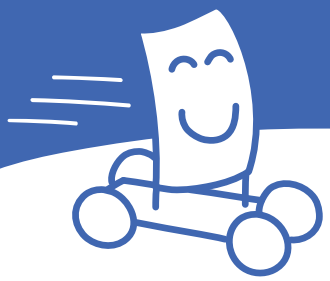


Strong Pull

Test: How far did it go?

1	2	3	4	5	6	7	8	9	10

?

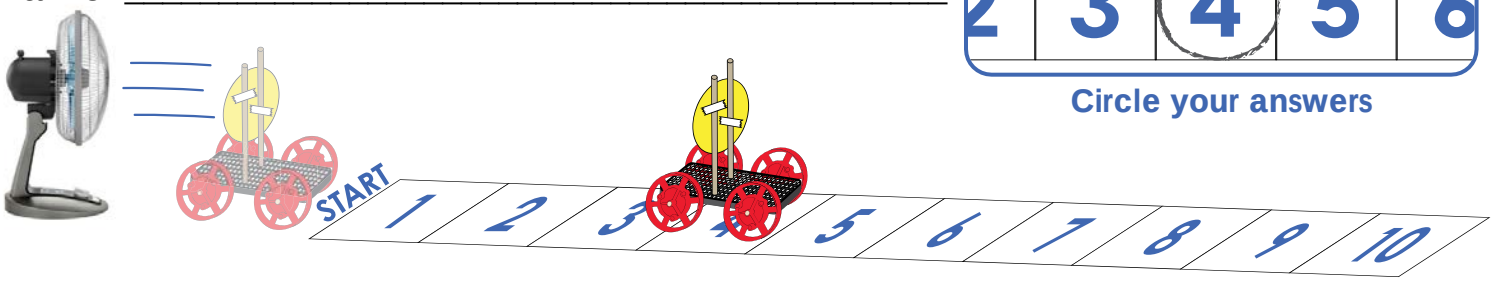


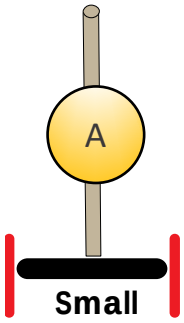
Sail Car Wind Lab

Name: _____

2	3	4	5	6

Circle your answers





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Test: Circle how far it goes?

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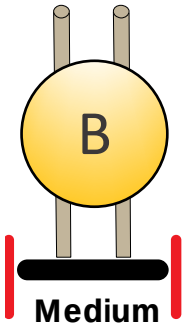

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Test: How far did it go?

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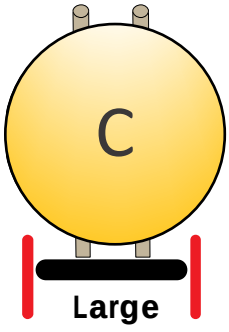

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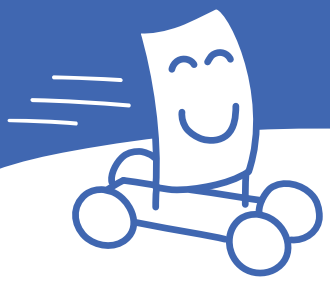

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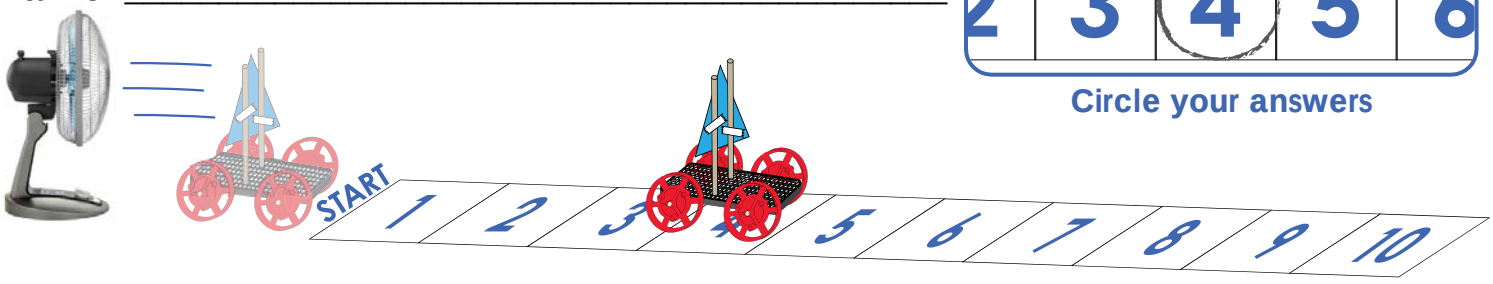

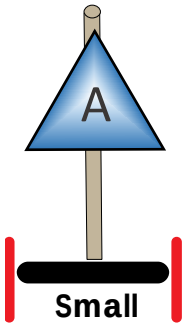

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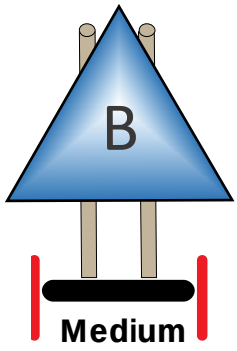

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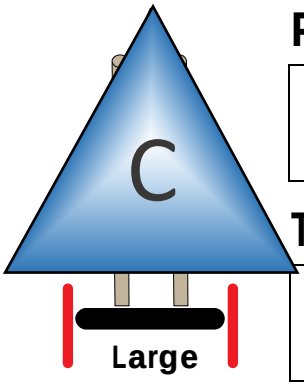

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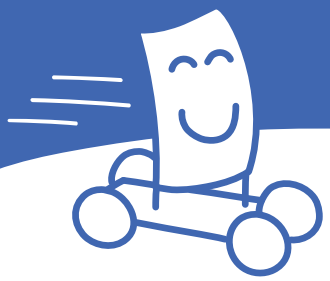

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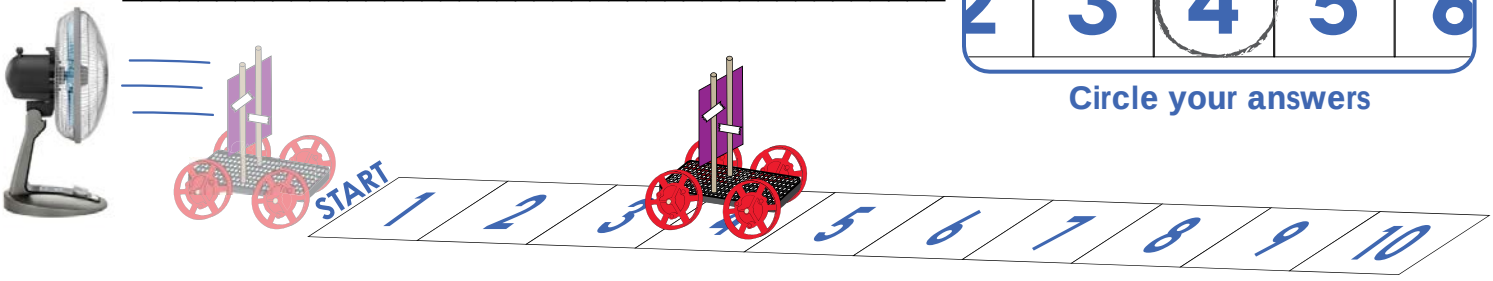
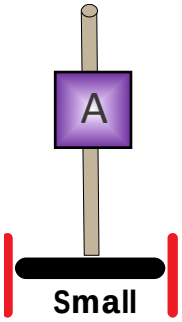
Circle your answers





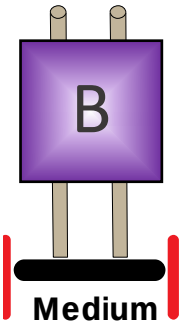
Predict: Circle how far you *think* it will go?

1	2	3	4	5	6	7	8	9	10

Test: Circle how far it goes?

1	2	3	4	5	6	7	8	9	10

?



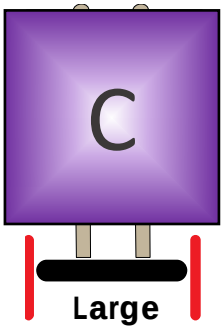
Predict: Circle how far you *think* it will go?

1	2	3	4	5	6	7	8	9	10

Test: How far did it go?

1	2	3	4	5	6	7	8	9	10

?



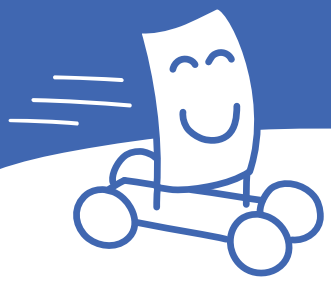
Predict: Circle how far you *think* it will go?

1	2	3	4	5	6	7	8	9	10

Test: How far did it go?

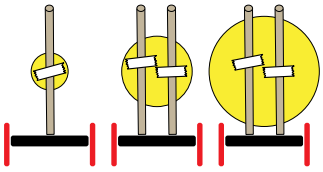
1	2	3	4	5	6	7	8	9	10

?



Sail Car Wind Lab

Cut the following sail shapes from cardstock, cardboard or stiff paper. The shapes can be re-used between sail car groups.

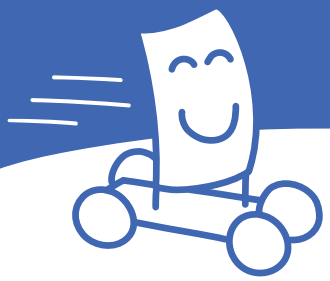


A

Small Circle Sail

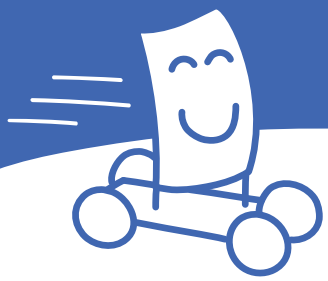
B

Medium Circle Sail

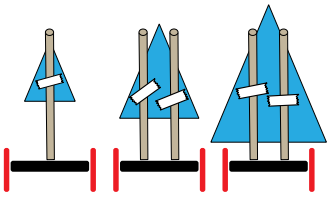


C

Large Circle Sail



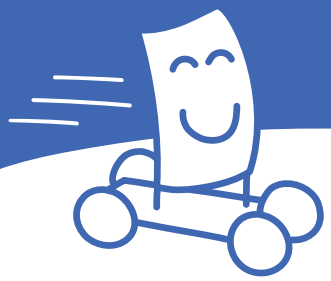
Sail Car Wind Lab



Interesting Note: The large sails have twice the area of the medium sails. The medium sails have twice the area of the small sails. If you're following the math... that makes the large sail FOUR times larger than the small sail.

C

Large Triangle Sail



Sail Car Wind Lab

A

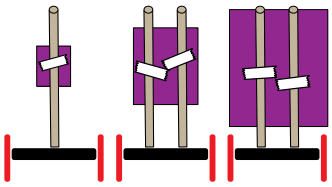
Small Triangle Sail

A

Small Square Sail

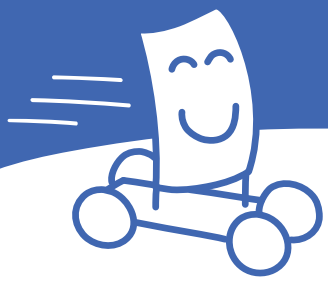
B

Medium Triangle Sail



B

Medium Square Sail



C

Large Square Sail