

Learn about projectile motion by designing and building your very own Launcher!



Check out our [activity videos](#) by scanning the QR Code or going to teachergeek.com/launcher2.0

You Are Here

Go Guide

Start here! Build your launcher, evolve your design, and begin the Bullseye Challenge!

Optional Labs

- Precision & Accuracy Lab (Ages 13+)
- Hit the Target Lab (Ages 13+)

Optional Challenges

- Moving Target Challenge*
- Distance Challenge*
- Siege Challenge*

*See Page 5

Supplies

TEACHERGEEK PARTS

These are the parts you need to build one launcher, plus some extras, so you can make your own unique designs.

NAME	QTY	PICTURE
Hole Plates SKU 1821-32	1	
Strips 30 cm (12 in) SKU 1821-31	2	
Blocks SKU 1821-34	7	
Screws 2.5 cm (1 in) SKU 1821-22	8	
Screws 5 cm (2 in) SKU 1821-27	1	
Nuts #10 Hex SKU 1821-25	8	
Rubber Bands SKU 1823-41	8	
Ping Pong Balls SKU 1821-44	1	You will need to supply these if using a Maker Cart.
Protractors	3	Protractors & rulers are on the last page, or you can print them from teachergeek.com/launcher2.0
Rulers	1	
Paperclip	1	You can also use 10 cm (4 in) of steel building wire if you have a Maker Cart.
Dowels various sizes SKU 1821-20	8	Dowel Sizes 6x 30 cm (12 in) 2x 10 cm (4 in)

Have a Maker Cart?
Use Multi-Cutters to cut your own dowels.



MATERIALS YOU SUPPLY

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



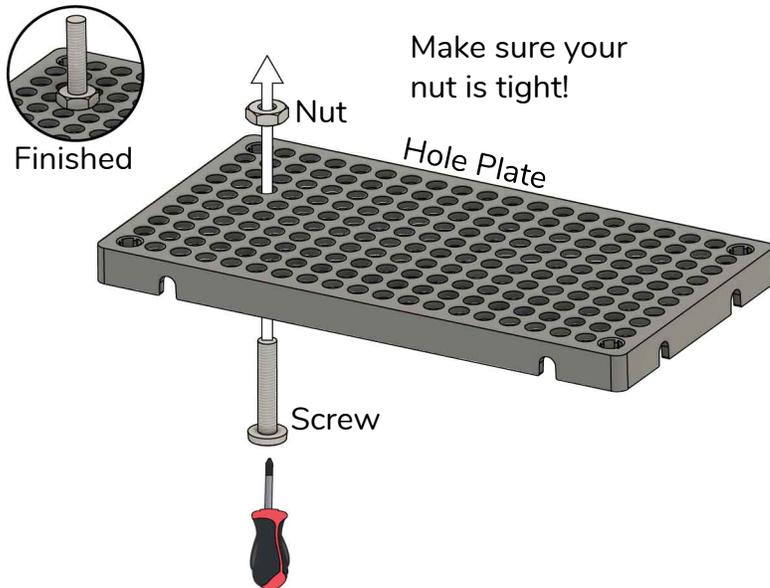
Optional Tools



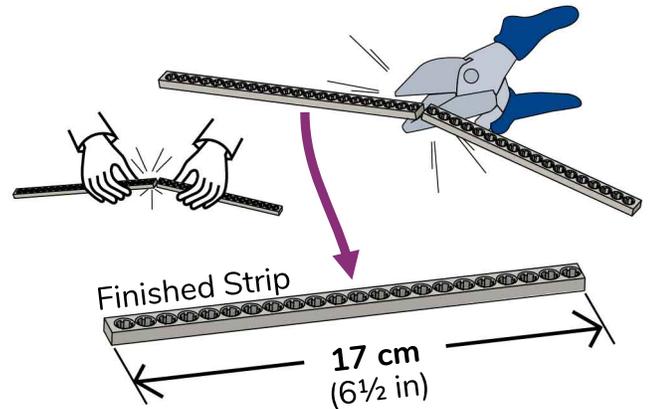
Modify materials to make even more creative designs with the **Maker Tool Set** SKU 1823-84

Build the Kicker

- 1 Push a **screw** through your **hole plate** and **tighten** a **nut** on top.

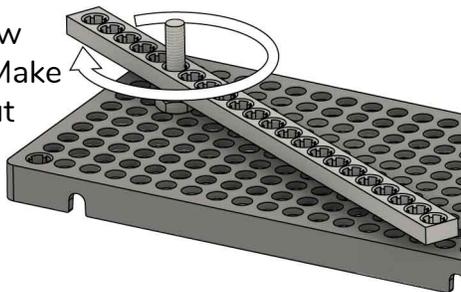


- 2 Cut or snap a **17 cm (6½ in)** strip.

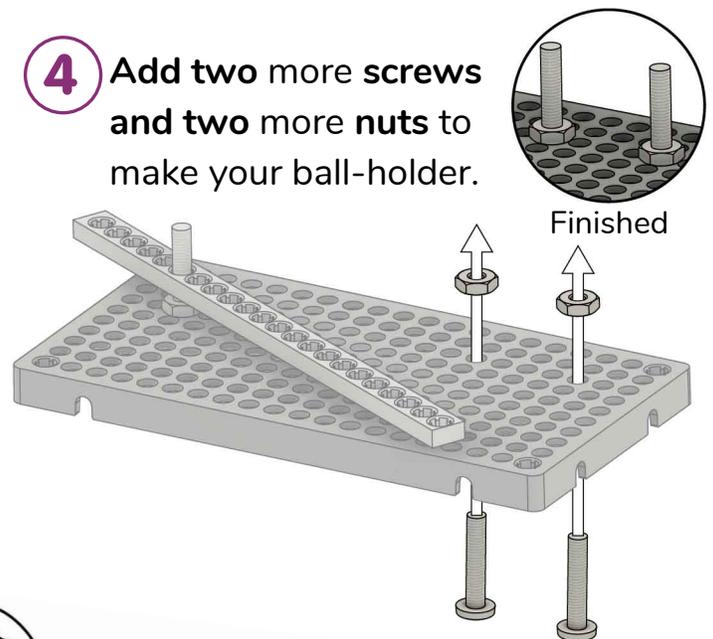


- 3 Spin the strip from Step 2 onto the screw. Don't make it too tight – the strip should be able to spin.

Is your screw spinning? Make sure that nut from #1 is tight!

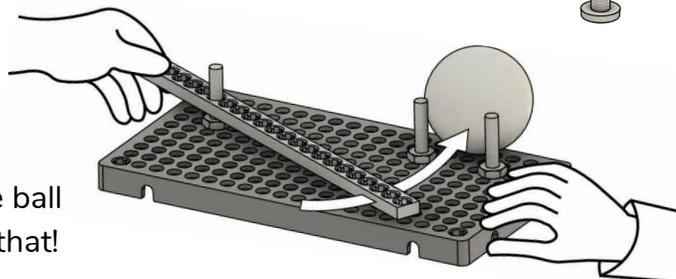


- 4 Add **two** more screws and **two** more nuts to make your ball-holder.



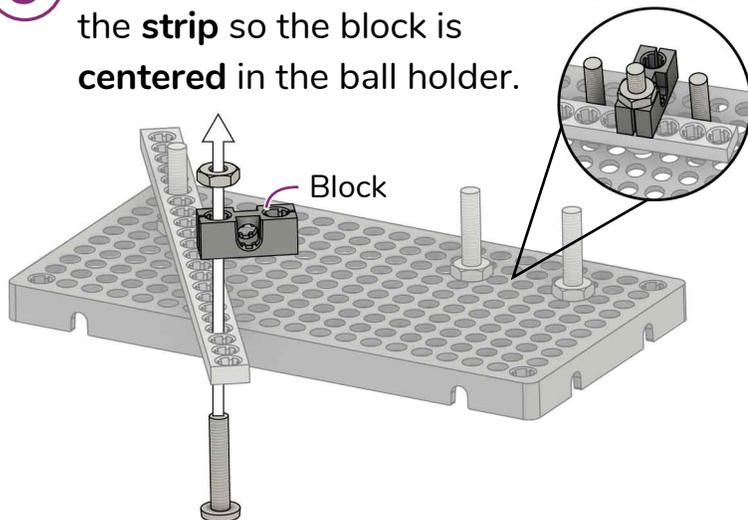
- Your kicker is done! Test it out.**
Next, we'll add power.

Your kicker won't hit the ball every time, but we'll fix that!

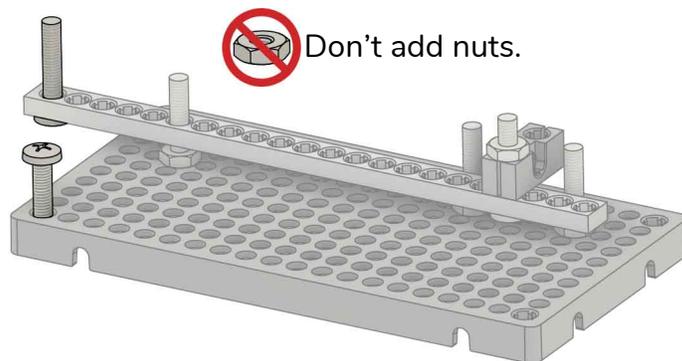


Power Up!

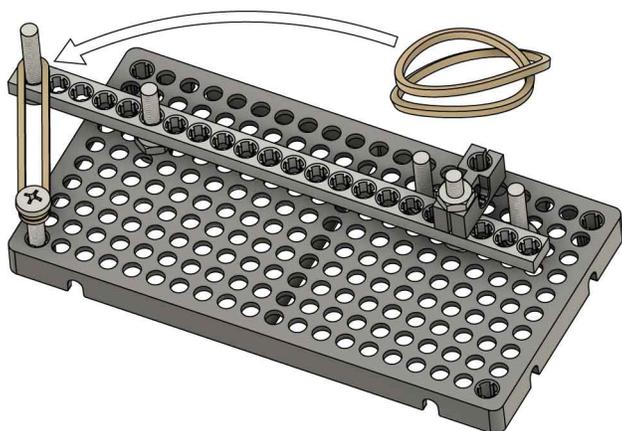
- 5** Screw a block and nut to the strip so the block is centered in the ball holder.



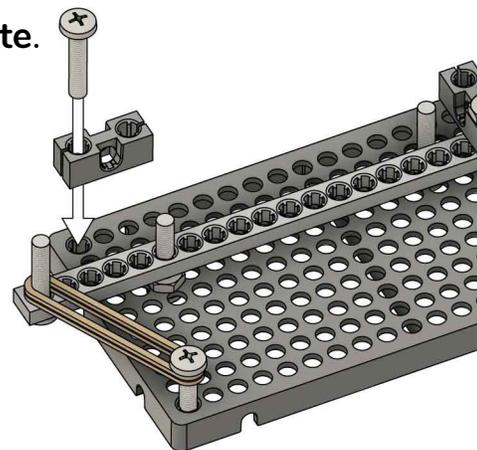
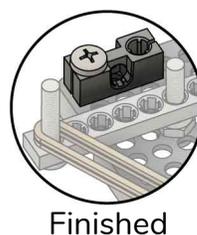
- 6** Add two more screws. They will hold rubber bands.



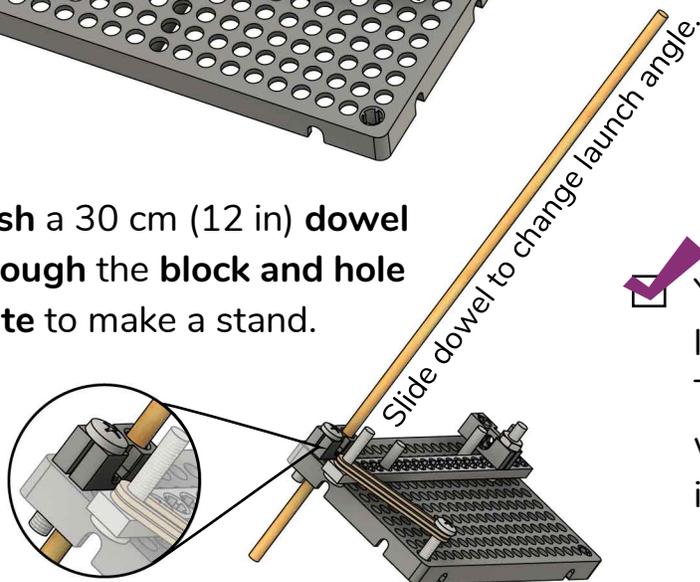
- 7** Add a rubber band! Double it over if it's too loose.



- 8** Screw a block into the corner of the hole plate.



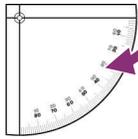
- 9** Push a 30 cm (12 in) dowel through the block and hole plate to make a stand.



- You're ready to launch – test it out! Test it out. Next, we're going to make it easier to aim.

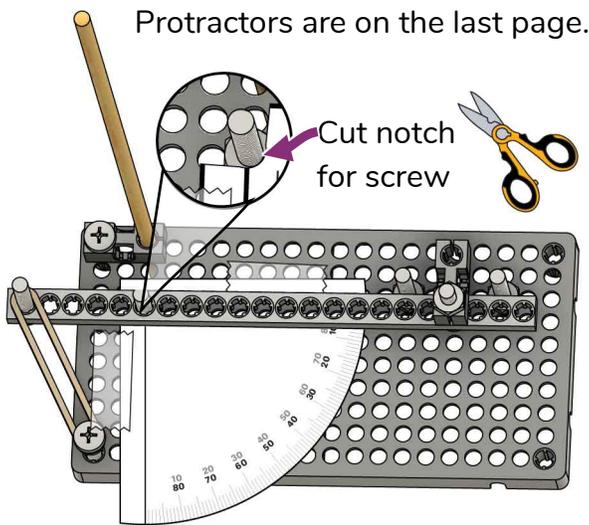


Add Protractors

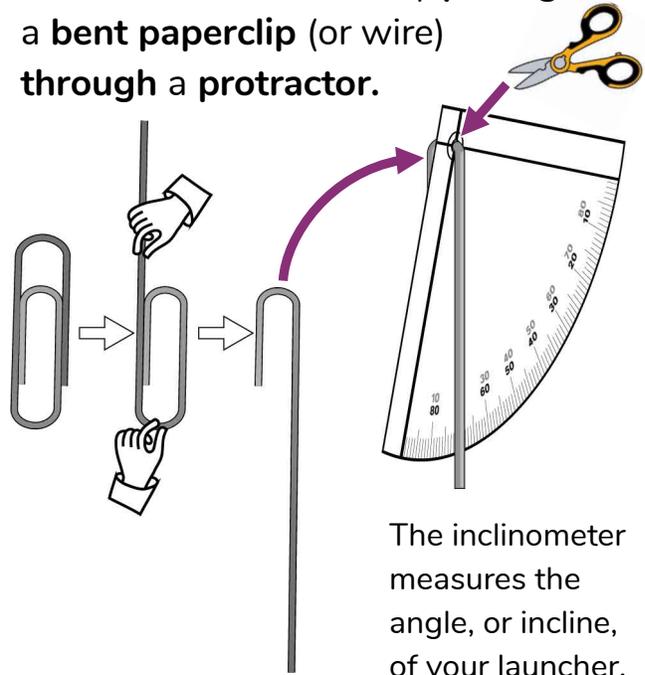


Protractors let you measure the Wind-Up and Launch Angle so you can hit targets more consistently.

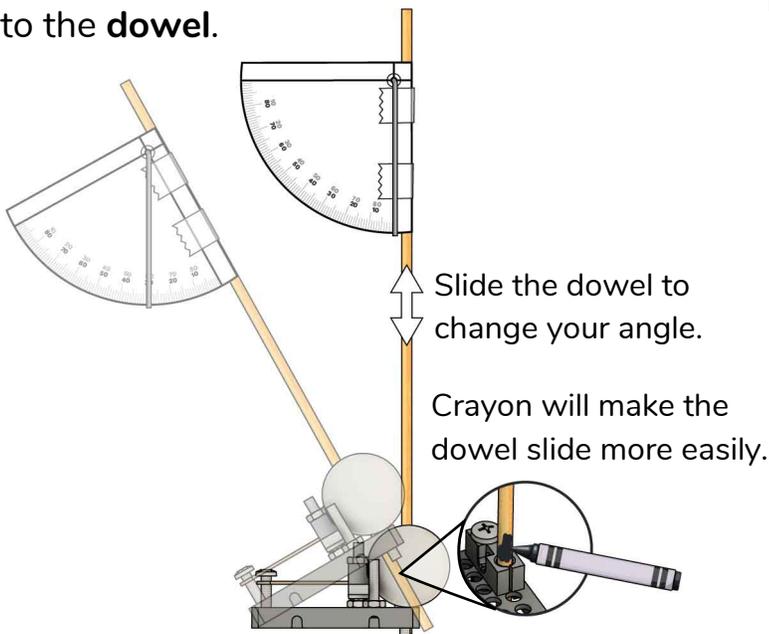
- 10** Tape a protractor under the kicker. This lets you measure your wind-up.



- 11** Make an inclinometer by poking a bent paperclip (or wire) through a protractor.



- 12** Tape the inclinometer, from Step 11, to the dowel.



Your launcher is done, but you aren't... Make it better, try a lab, or start a challenge!

Optional Labs:

[Precision & Accuracy Lab \(Ages 13+\)](#)

[Hit the Target Lab \(Ages 13+\)](#)



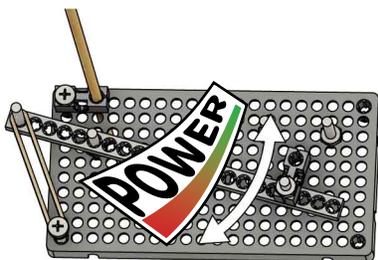
Get the labs at teachergeek.com/launcher2.0

Tune Your Launcher

There are tons of ways to adjust your launcher! Here are a few variables you can tinker with.

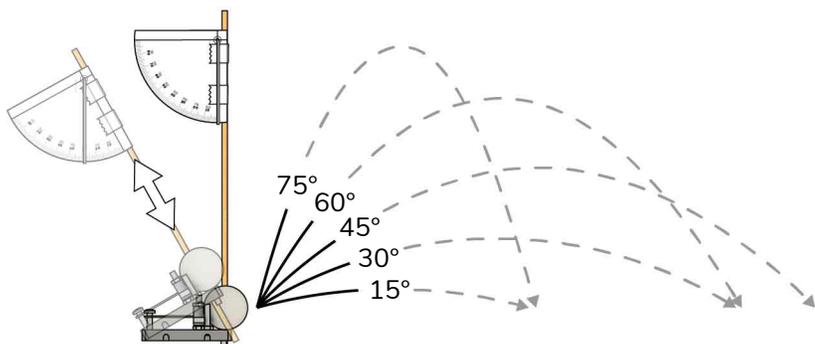
Wind Up

The farther you wind up your launcher, the farther the ball goes! Use the protractor to keep track of your wind-up angle.



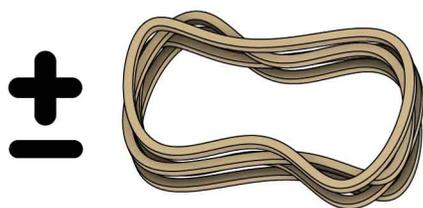
Launch Angle

Change the distance and trajectory by adjusting the launch angle, which you can measure with the inclinometer.



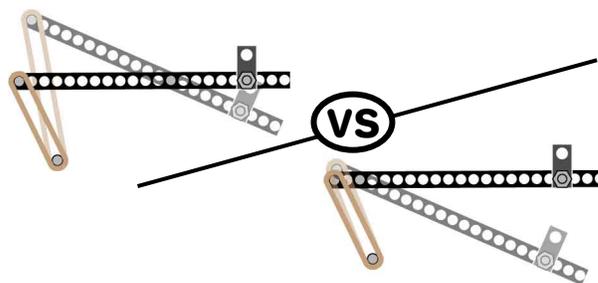
Rubber Bands

Adjust the power by changing the number of rubber bands, where they're attached, or how they're attached (doubled up, tripled up, etc.).



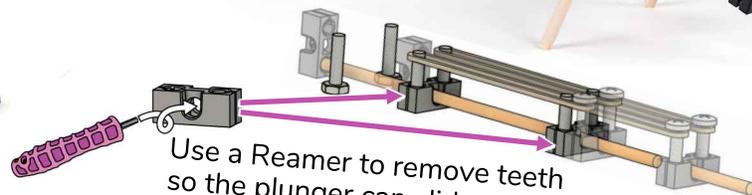
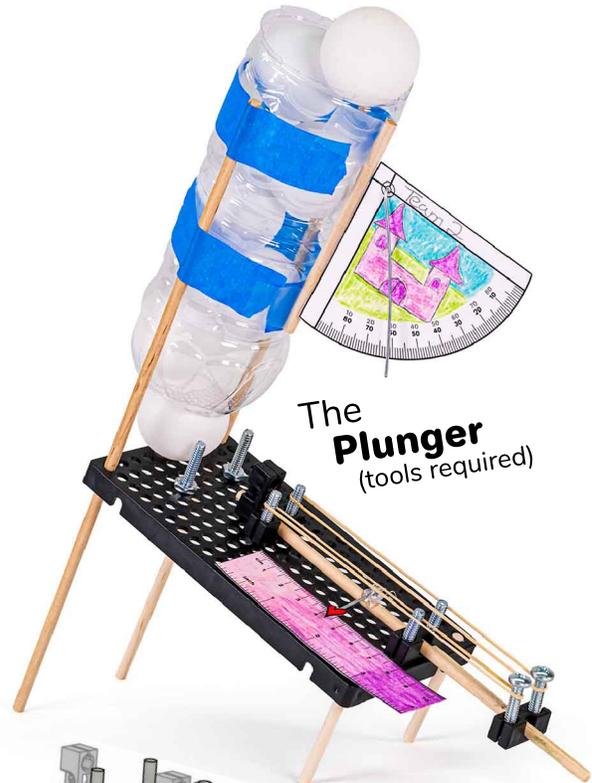
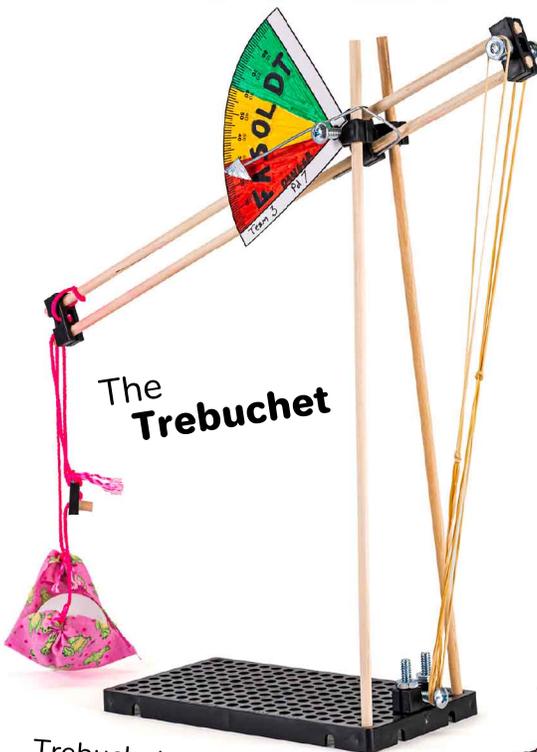
Fulcrum

Change the fulcrum, or pivot point, for your kicker. Like all levers, moving the fulcrum will trade between speed and torque.



Redesign Your Launcher

The kicker is just a design to get you started – there are much better designs! What will **your** launcher look like?



Use a Reamer to remove teeth so the plunger can slide.

Trebuchets are very tricky to make, but it can be done!

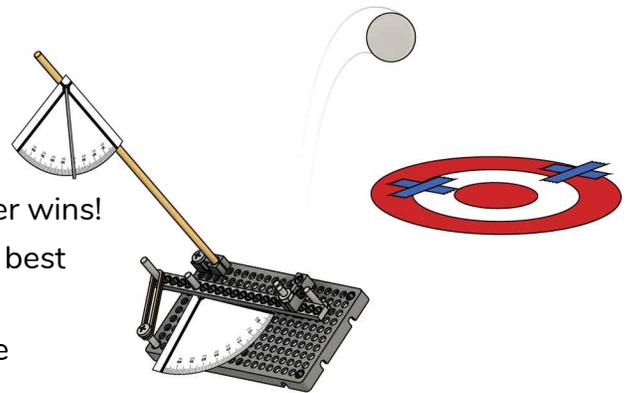
Bullseye Challenge

The most accurate launcher wins!

Criteria:

(what your design must do)

- The launcher that hits closest to the center wins!
- Each team gets three launches – only the best launch counts.
- Each launcher must launch from the same position towards the same target.



Constraints:

(rules and limits for your design)

- You may use no more than 8 rubber bands to power your launcher.
- You may only use the supplies listed on Page 1.
- There is no limit on recycling bin materials.



Additional Challenges

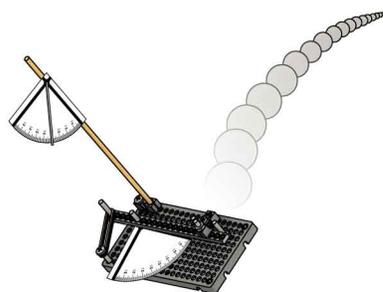
Use the constraints above for these challenges.

Moving Target Challenge



Complete 3 rounds, moving the target each time. Measure each shot's distance from the bullseye, and add them at the end. The launcher with the least total distance wins!

Distance Challenge



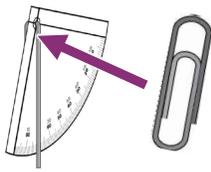
The launcher that sends the ball the greatest distance wins!

Siege Challenge

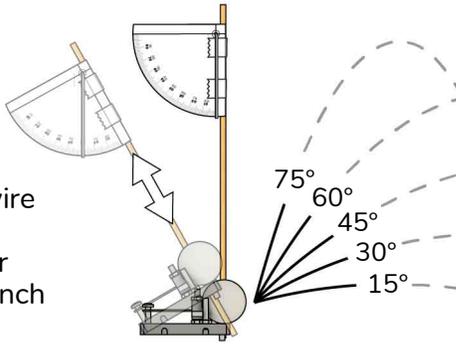


One team stacks disposable cups to make a wall, and another shoots it down. The launcher that knocks every cup down in the shortest time wins!

Cut out the rulers and protractors to add more precision to your design!



Add a paperclip or wire to the protractor to make an inclinometer (which measures launch angle). See Page 4.



Use the protractor or ruler to measure wind-up distance.

