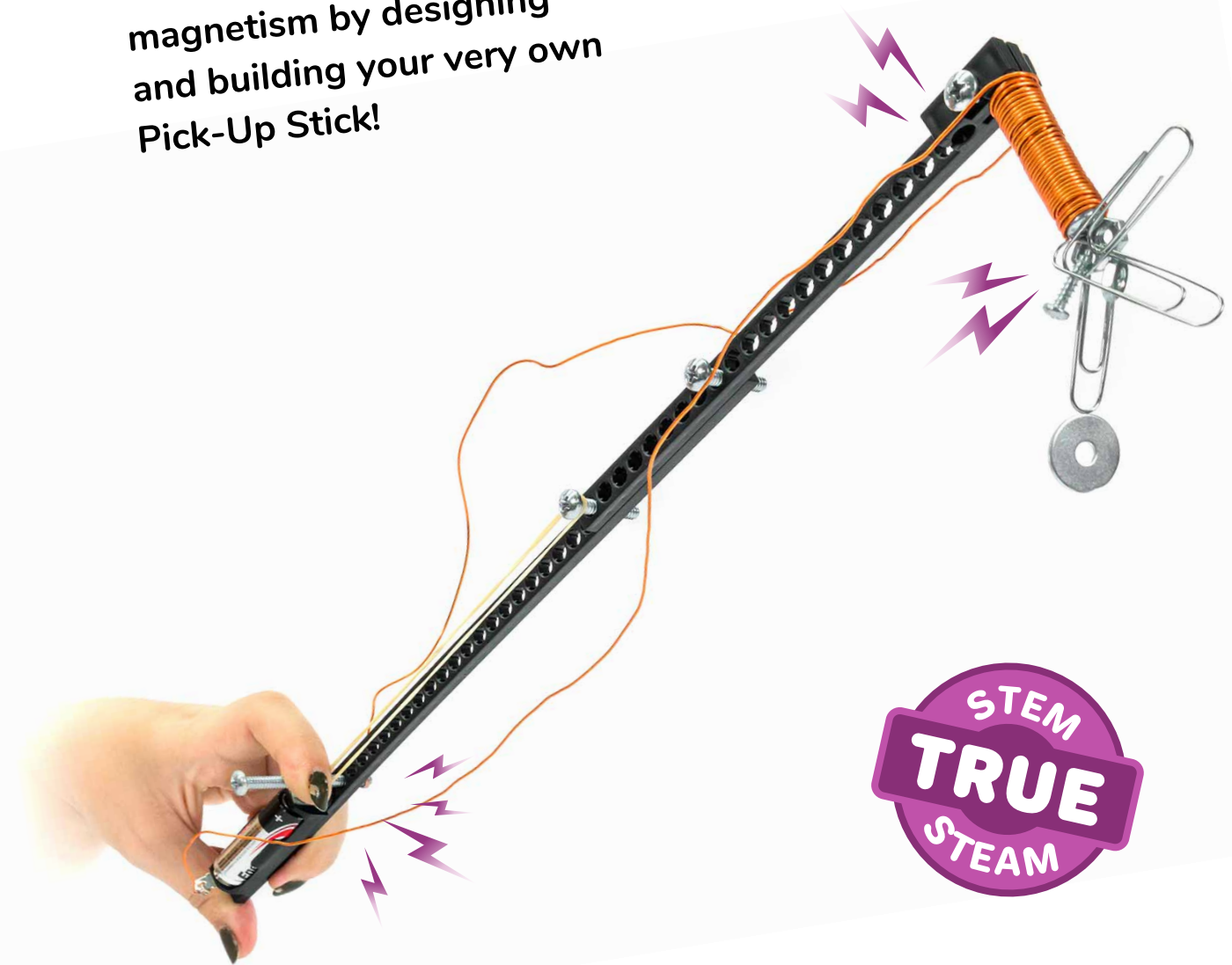


Go Guide

Pick-Up Stick



Learn about electricity and magnetism by designing and building your very own Pick-Up Stick!



You Are Here

Choose how you would like to complete this activity.

Download documents & videos at teachergeek.com/pickupstick

Go Guide

Start here! Build your Crane, evolve your design, and begin the In-The-Bucket Challenge!

Optional Lab

-Magnetic Materials Lab
(Ages 8+)

Optional Challenges



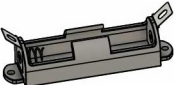







-Space Mining Challenge*
-Clip Hanger Challenge
-Super Sort Challenge

*See Page 9

Supplies

PICK-UP STICK PARTS

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

Name	Qty	Picture
Strips 30 cm (1 in) SKU 1821-31	3	
Blocks SKU 1821-34	2	
Battery Holder Single AA SKU 1821-62	1	
Screws 50 mm (2 in) SKU 1821-27	3	
Screws 25 mm (1 in) SKU 1821-22	5	
Mini-Hub Screws 16 mm (5/8 in) SKU 1821-19	4	
Nuts #10 SKU 1821-25	5	
Wire Roll 5 m (16.4 ft) SKU 1823-47	1	 Maker Cart Users: We recommend using Aluminum Wire for this activity (not included with Maker Carts until summer 2021).
String 60 cm (24 in) SKU 1823-47	1	
Rubber Bands Small SKU 1821-39	2	

MATERIALS YOU SUPPLY

- Phillips Screwdriver
- Pliers (optional)
- AA Battery
- Bowl
- Aluminum Foil (optional)
- Any two of: rice, beans, small candies, crumpled paper, etc. (for challenge on Page 9)
- Recycling Bin Materials

Optional Tools



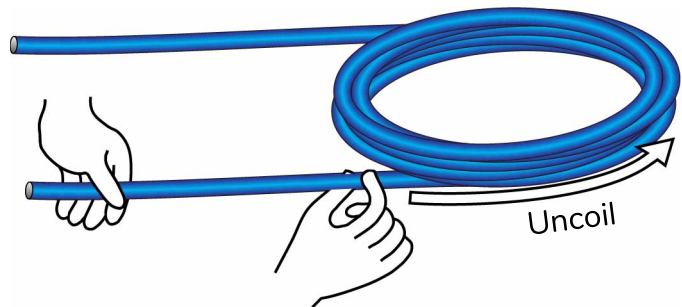
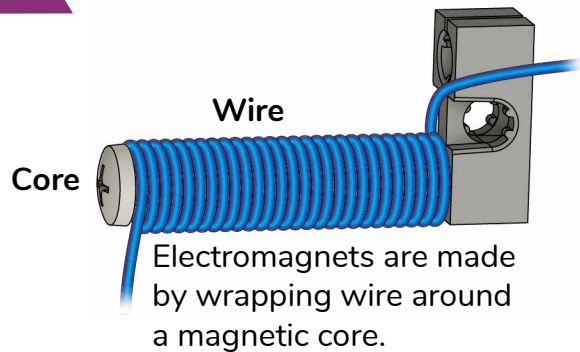
Modify materials to make even more creative designs with the **Maker Tool Set**
SKU 1823-84

Prepare the Parts

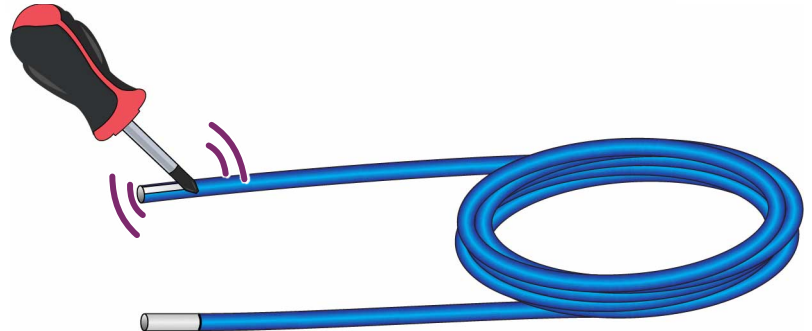
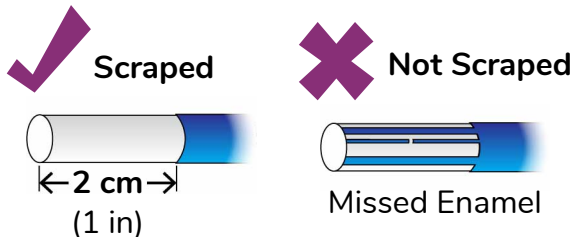
Get your wire and core ready – they'll become your magnet.

Prepare Your Wire

- 1 Carefully uncoil both ends of the wire. Don't tangle it!

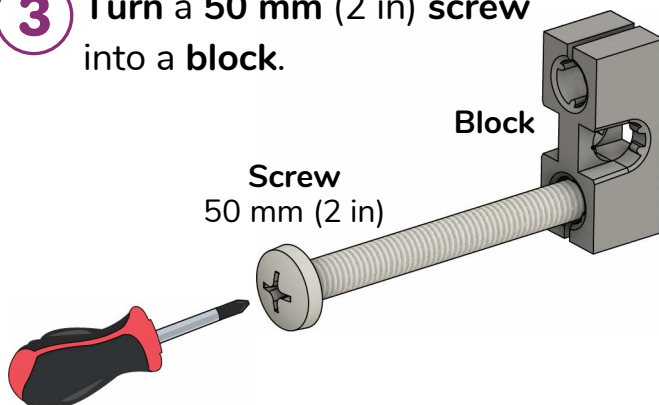


- 2 Scrape 2 cm (1 in) of enamel off both ends of the wire.

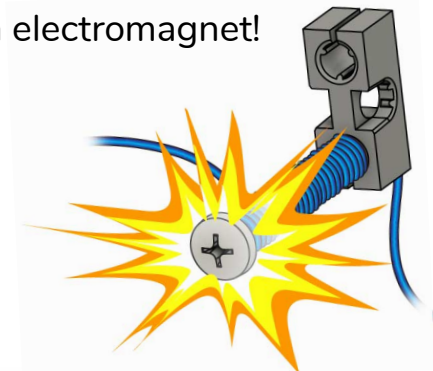


Make the Core

- 3 Turn a 50 mm (2 in) screw into a block.



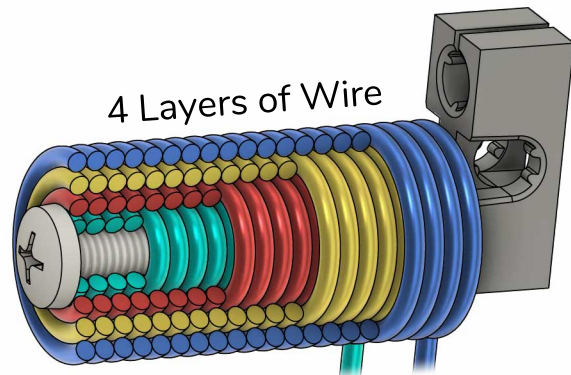
- ✓ Your wire and core are ready!
Next, you'll make them into an electromagnet!



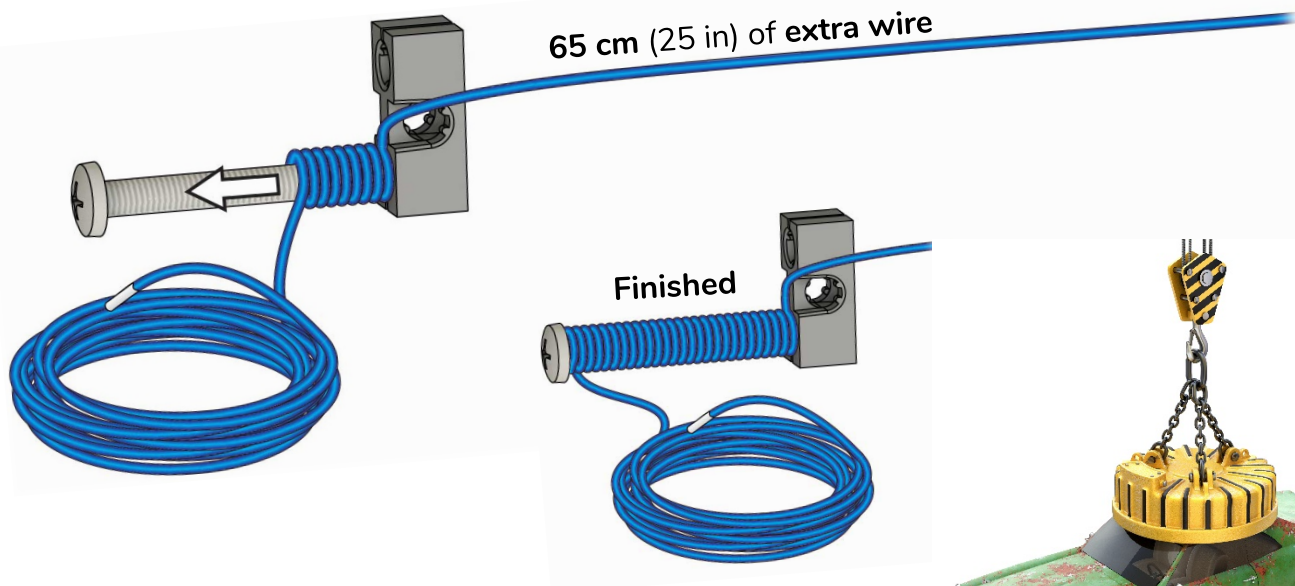
Wrap the First Layer

Your magnet will get four layers of wire wrapping. After you add each layer, you'll test your magnet.

Do you think more wraps will make your magnet stronger or weaker?

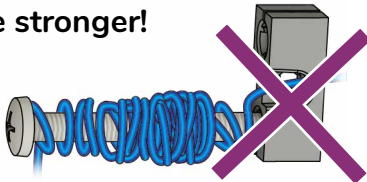


- 4** Wrap one layer of **wire** down the **screw**, leaving 50 cm (20 in) of **extra wire** at the base.



Neatness Counts!

Don't make your magnet like this...
Neat magnets are stronger!

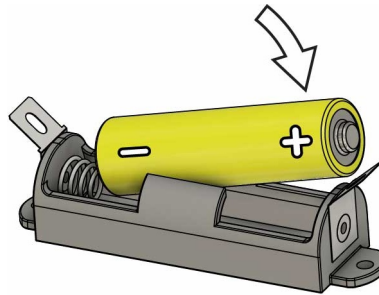


- ☒ Your magnet is ready!
Let's see how much it can pick up.

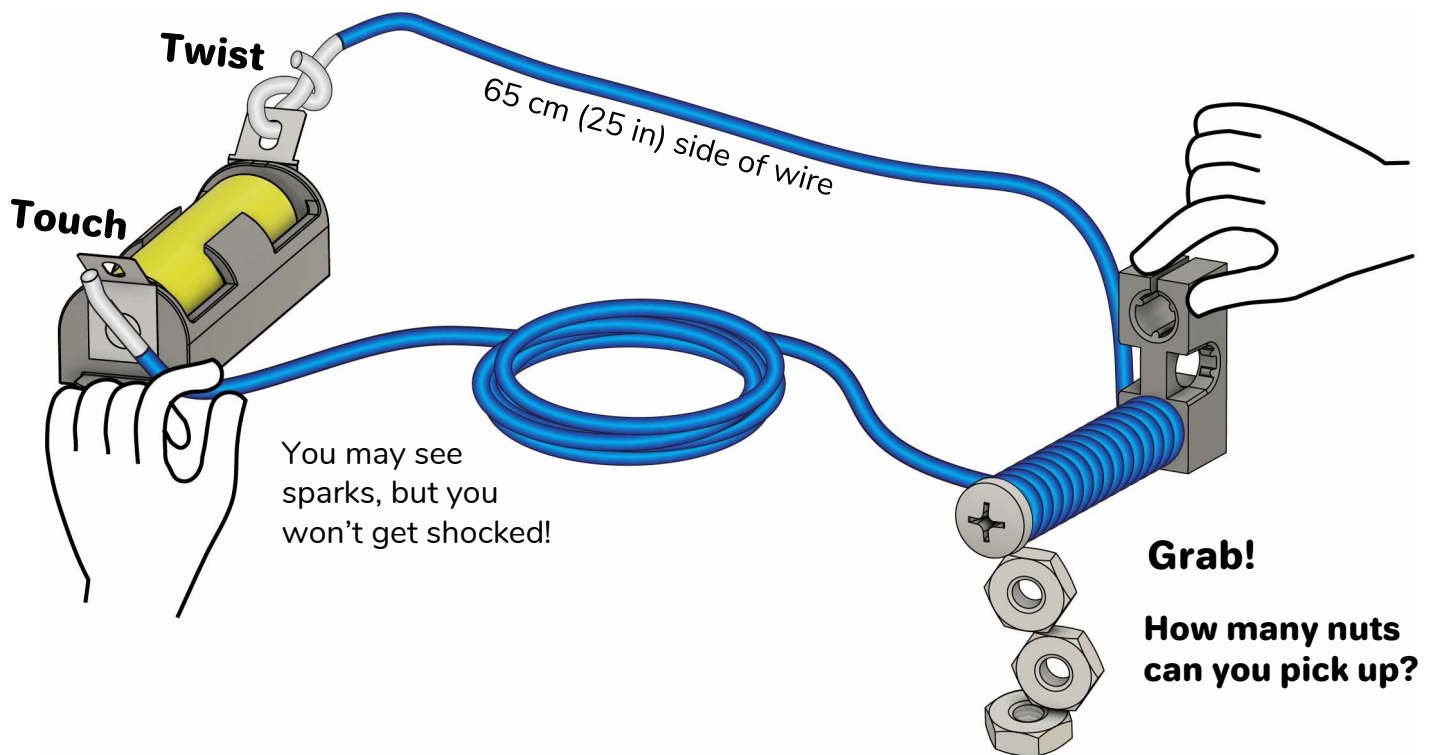
Test Your Magnet!

- 5 Put the **battery** into the **holder**.

Flat side of battery
against the spring.



- 6 Hook up your magnet and pick stuff up!

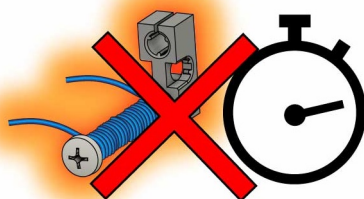


Don't Overheat!

Don't cut the wire!



Don't leave your magnet on!

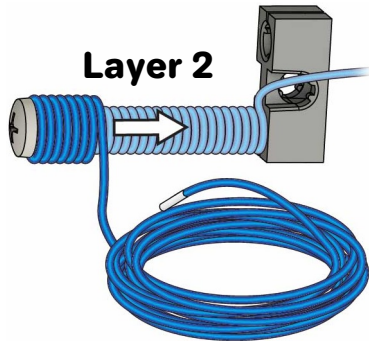


The wire, battery, and battery holder can get very hot.

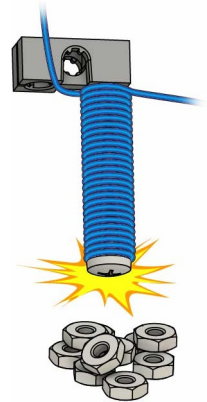
Do not permanently attach the magnet to the battery, run the magnet continuously, or cut the wire much shorter.

Wrap More Layers

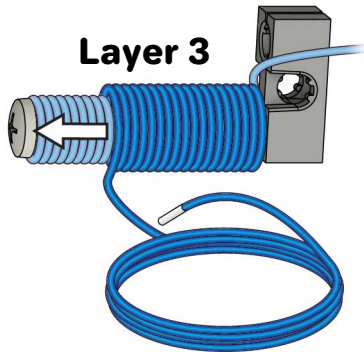
- 7** Wrap a **second layer**, then **test your magnet!**



How many nuts
can you grab now?



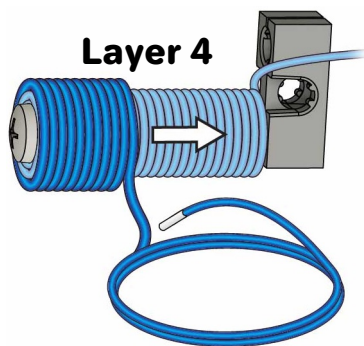
- 8** Wrap a **third layer**, then **test your magnet!**



How many nuts
can you grab now?

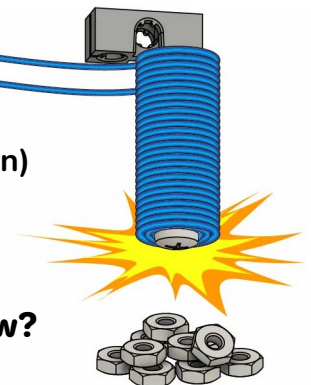


- 9** Wrap until both **wires** are the
same length, then **test it!**



Both wires about 65 cm (25 in)

How many nuts
can you grab now?



☒ You're ready to make an arm
for your electromagnet!



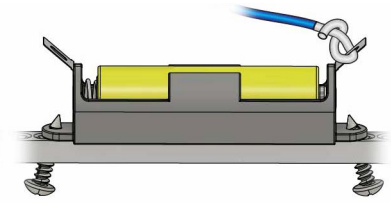
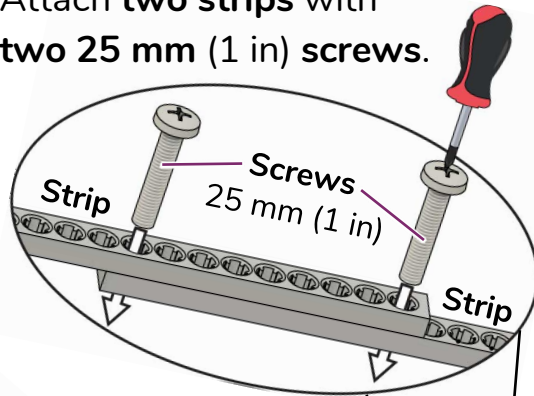
Want to learn more about magnets?

Download the [Magnetic Materials Lab](https://www.teachergeek.com/pickupstick)
at [teachergeek.com/pickupstick](https://www.teachergeek.com/pickupstick)

Ages 8+

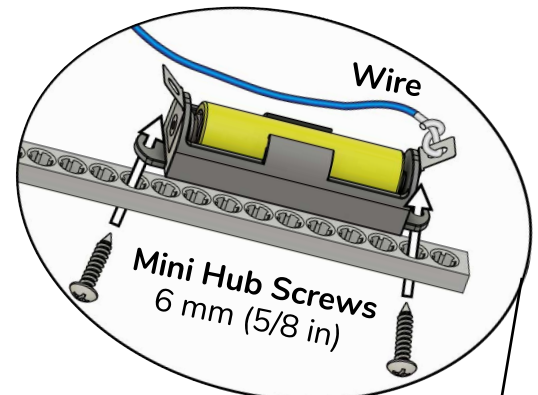
Make The Arm

- 10** Attach **two strips** with **two 25 mm (1 in) screws**.

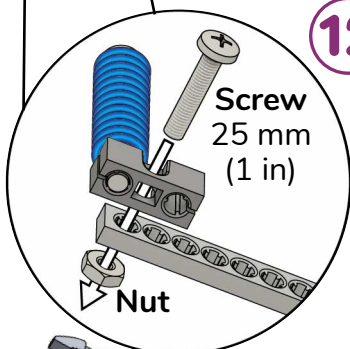


Tip

- 11** Attach the **battery holder** using **two Mini Hub Screws**.



- 12** Attach the **electromagnet** using a **nut** and a **25 mm (1 in) screw**.



Optional: to tighten the nut



☒ **Test it out!**
Next, you're going to add a switch.

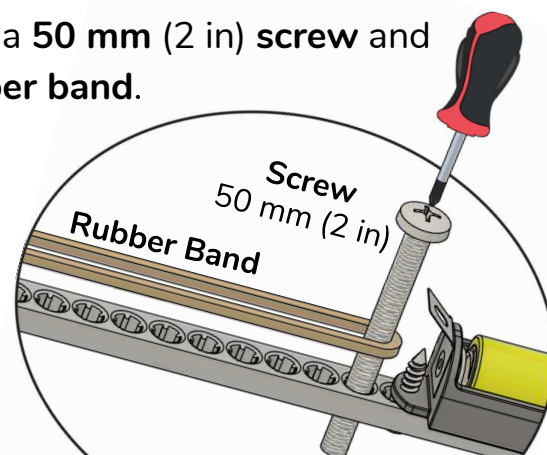


Make Your Switch

Your switch will turn
your magnet on and off!

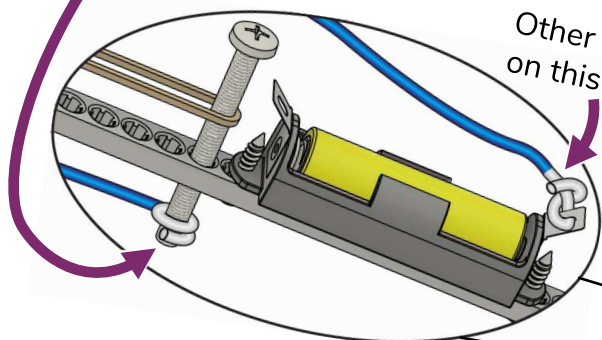
- 13** Add a 50 mm (2 in) screw and rubber band.

Stretch other side
of rubber band to
this screw.

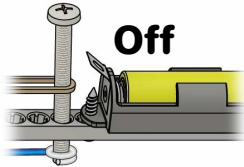
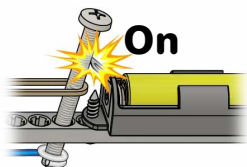


- 14** Wrap the unconnected
wire around the screw.

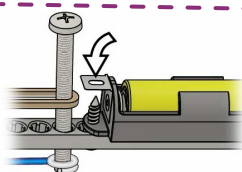
Other wire
on this side.



- 15** Test it out! Hold the screw
back to turn on the magnet.



Tip



Bend the battery
terminal down to make
it easier to turn on.

- ✓ Your example build is
done, but you aren't! Try
adding a grapple (next page)
or complete a lab or challenge!

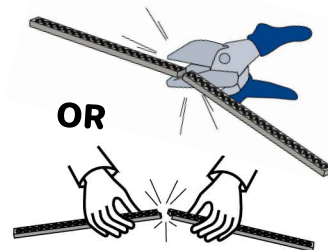
Go Guide

Pick-Up Stick



Optional Add a Grapple

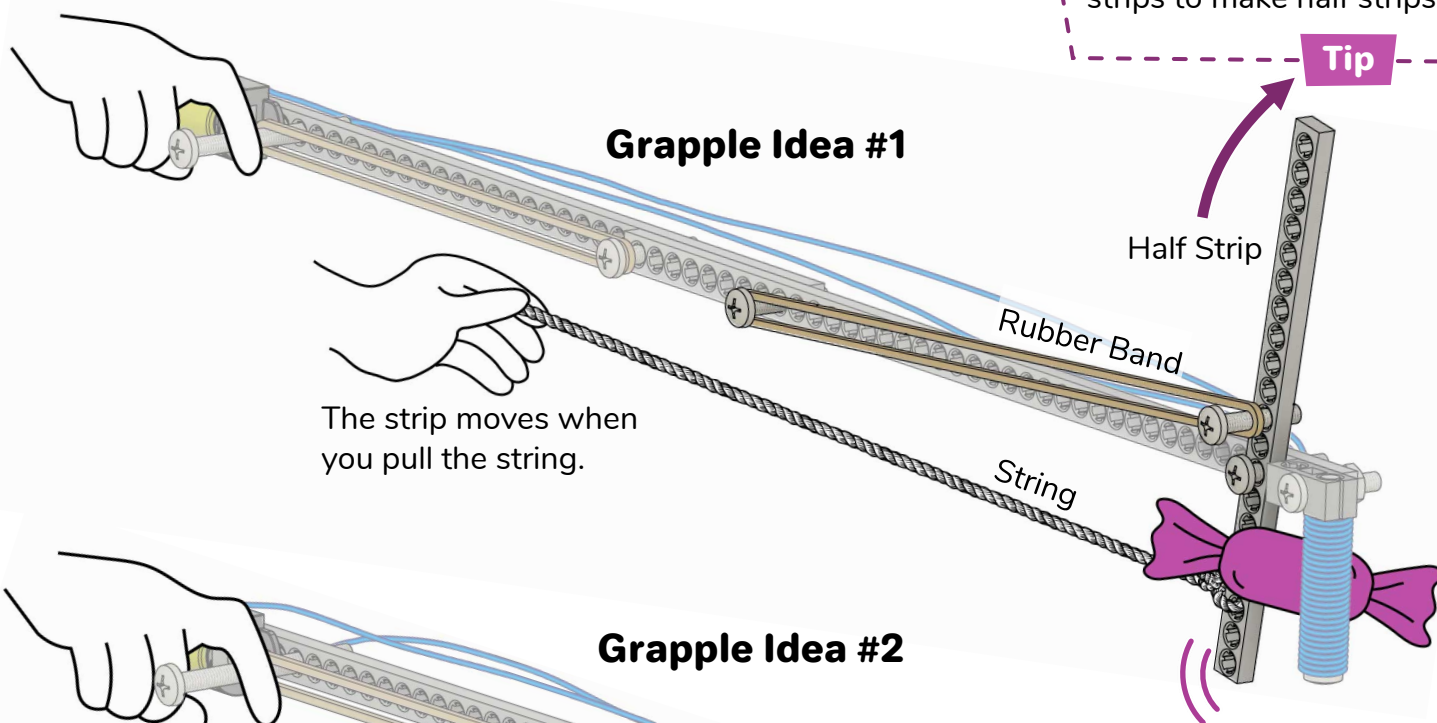
Grapples let you grab non-magnetic objects.



You can cut or snap full strips to make half strips.

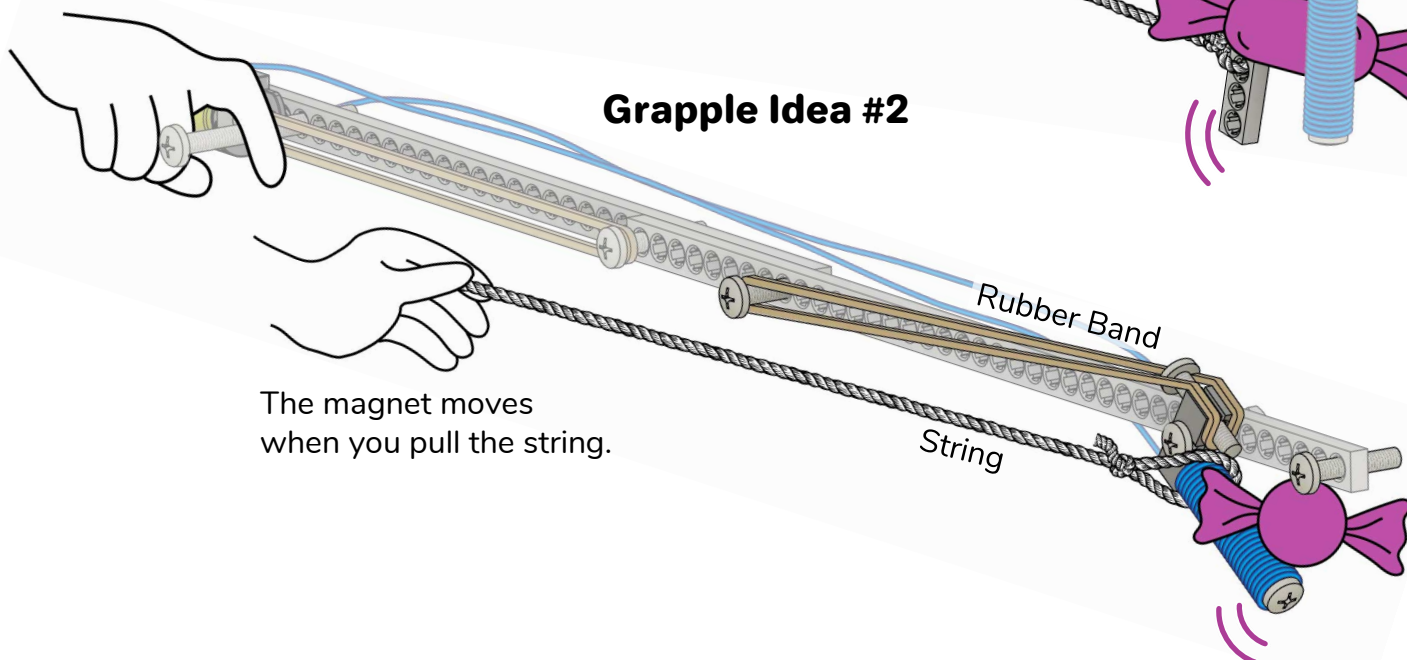
Tip

Grapple Idea #1



The strip moves when you pull the string.

Grapple Idea #2



The magnet moves when you pull the string.

These grapple ideas just get you started – you can make better ones. Tinker and experiment to make your own unique grapples!

Space Mining Challenge

Redesign your crane to mine minerals from asteroids! Load the most minerals in the spacecraft to win!

Smash through the crust (optional), gather minerals, and place them in the spacecraft to ship back to Earth!

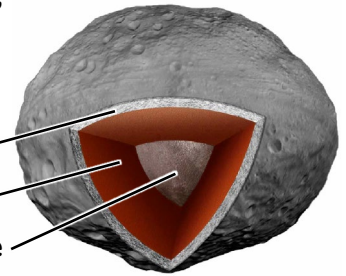


Want more challenges?

Download them at
teachergeek.com/pickupstick

Layers of 4-Vesta,
a large asteroid in
our solar system.

Crust
Mantle
Iron Core



Constraints

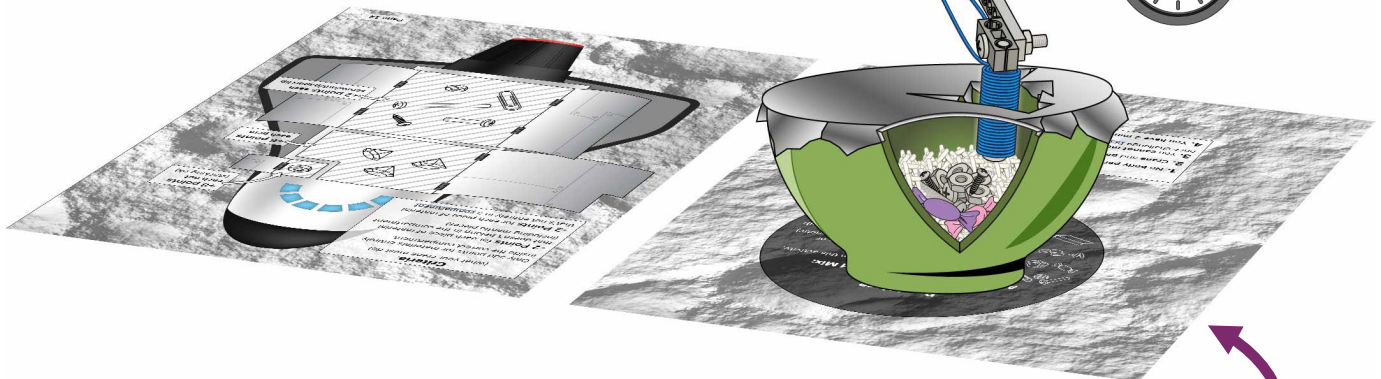
(rules and limits for your design)

1. Bowl and game boards cannot be moved once the challenge begins

2. No body parts above gameboards



3. You have 2 minutes to per challenge attempt (you can retry it and change your design)



Setup instructions on the gameboards.
(Pages 10 & 12)

Bowl Here

Add These to the Bowl and Mix:



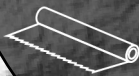
Iron (15 pieces): spare parts from this activity, or paperclips, etc.



Space Gems (optional; 5 pieces): small candies or crumpled colored paper, etc. (can't be magnetic)



Mantle Material (enough to bury iron/gems): rice, beans, or pieces of crumpled paper, etc.



Crust (optional): stretch aluminum foil across top (add layers for greater challenge)

Challenge Rules

- 1. You cannot move bowl, or game boards once challenge begins**
- 2. No body parts above gameboards**
- 3. You have 2 minutes to complete challenge**

[back of game board]

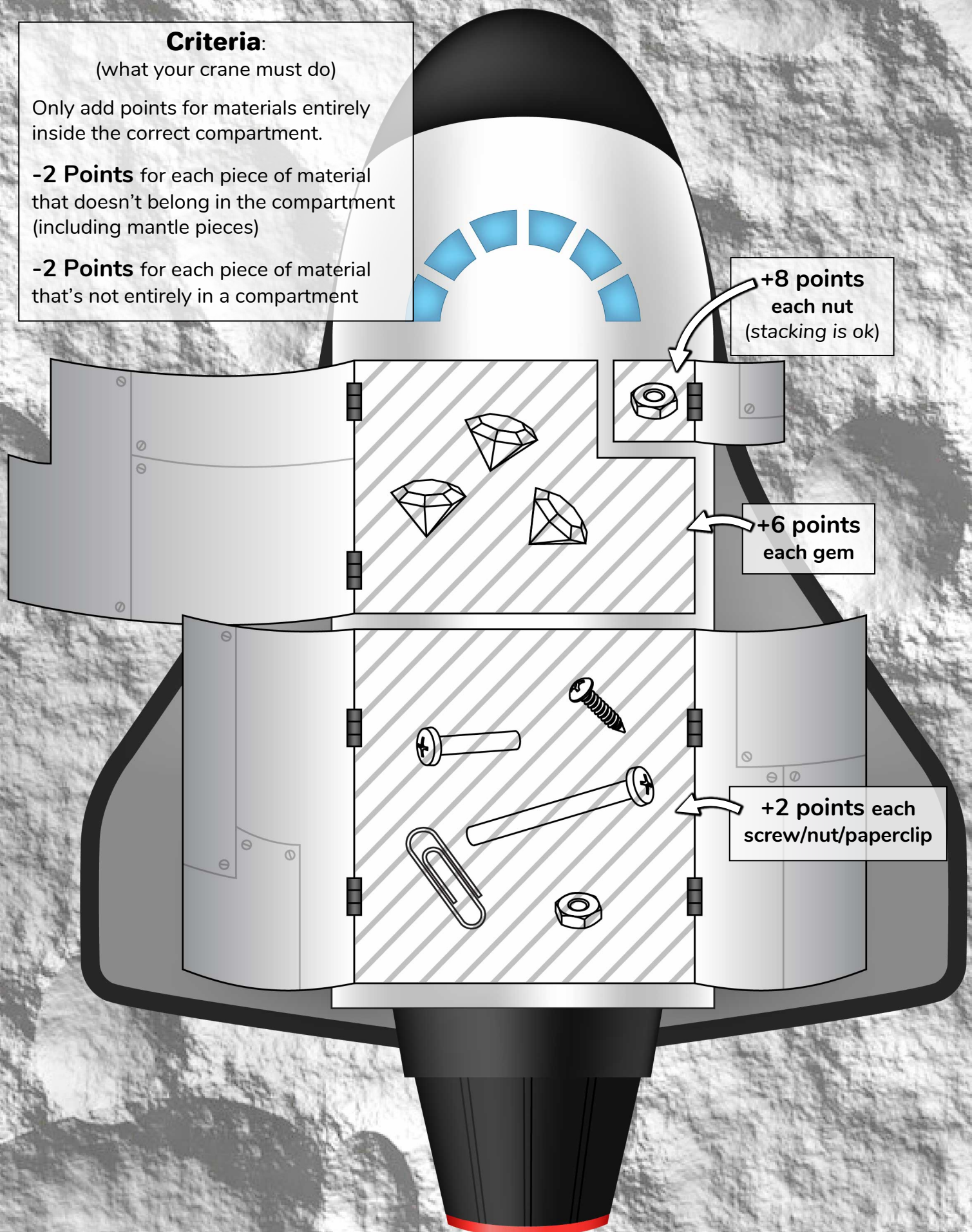
Criteria:

(what your crane must do)

Only add points for materials entirely inside the correct compartment.

-2 Points for each piece of material that doesn't belong in the compartment (including mantle pieces)

-2 Points for each piece of material that's not entirely in a compartment



+8 points
each nut
(stacking is ok)

+6 points
each gem

+2 points each
screw/nut/paperclip

[back of game board]