Go Guide

Hydraulic Claw

TeacherGeek

Build an example claw, then experiment and evolve your own unique design!
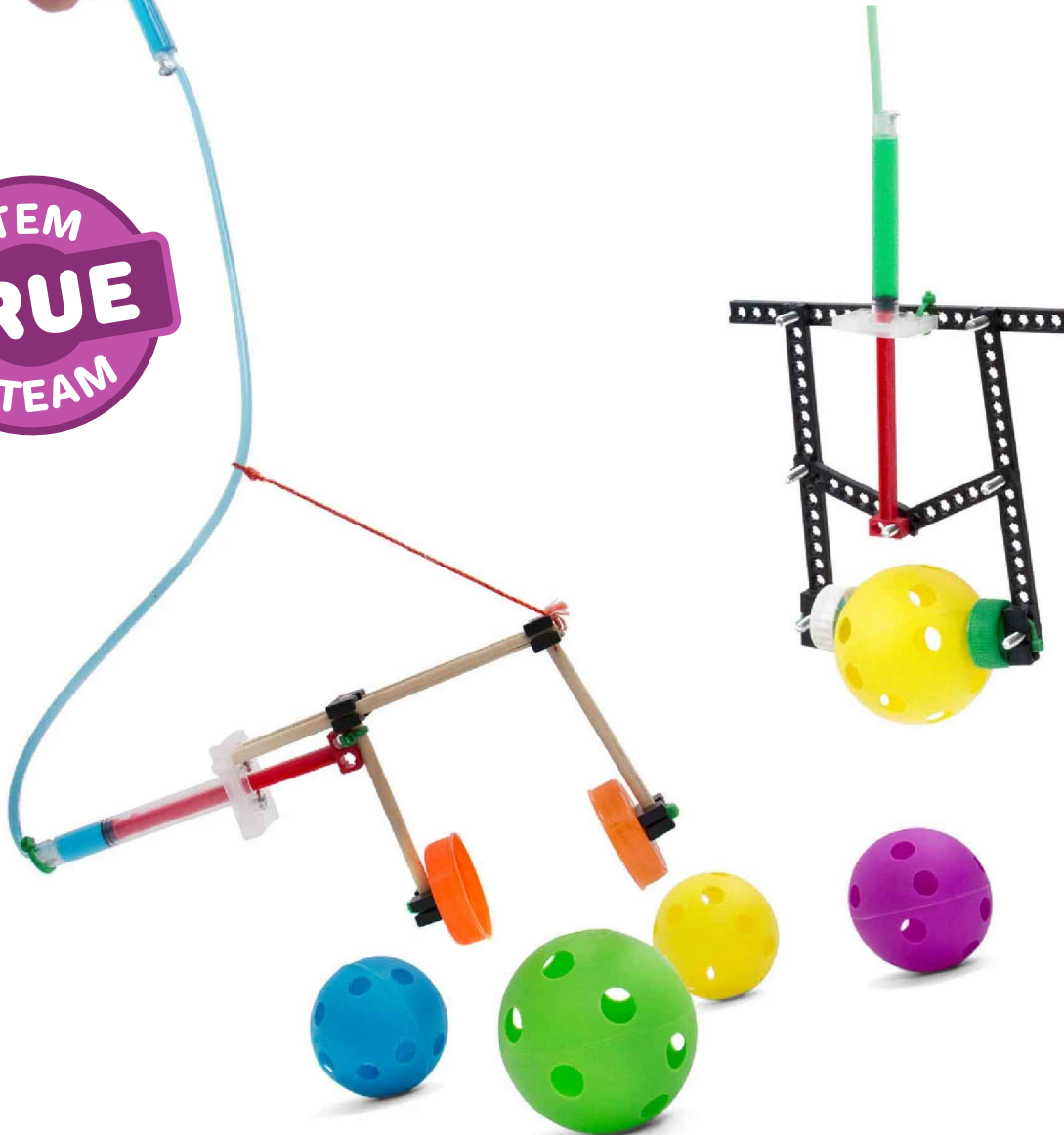
STEM TRUE STEAM

Check out our **Hydraulic Claw Videos** by scanning the QR Code or going to **teachergeek.com/claw**

Supplies

Claw Parts

These are the parts you need to build one claw, plus some extra parts for your own unique designs.

NAME	QTY	PICTURE
Strips 30 cm (12 in) SKU 1821-31	4	
Slide Stop 7 cm (3 in) SKU 1821-49	1	
Screws 25 mm (1 in) SKU 1821-22	8	
Nuts #10 hex SKU 1821-25	4	
Cylinder Screws SKU 1821-21	2	
Blocks SKU 1821-34	4	
Cylinders 4.5 ml SKU 1821-52	2	
Tubing 38 cm (15 in) SKU 1821-51	1	
Zip Ties 1823-50	4	
Dowels various sizes SKU 1821-20	12	Dowel Sizes 2x 15 cm (6") 4x 7.5 cm (3") 6x 5 cm (2")

Materials You Supply

Recycling Materials
What can you use for your claw grippers?

String

Tape

Screwdriver

A Container
To hold water for filling cylinders

Optional Tools

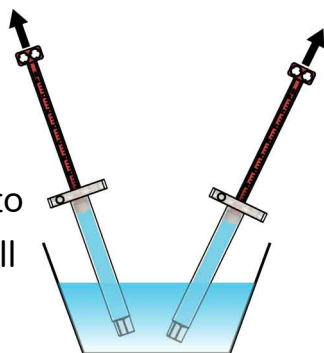Modify materials to make even more creative designs with the **Maker Tool Set**
SKU 1823-84

Fill The Hydraulics
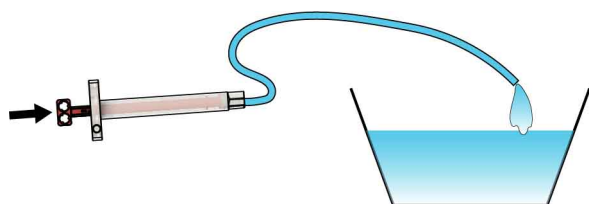
Optional Tip

Food coloring makes water easier to see.

1 **Fill** both **cylinders** with **water**.

Place tips under water.

Pull pistons to completely fill with water.

2 **Attach 38 cm** (15 in) of **tubing** to just **one** filled **cylinder**.
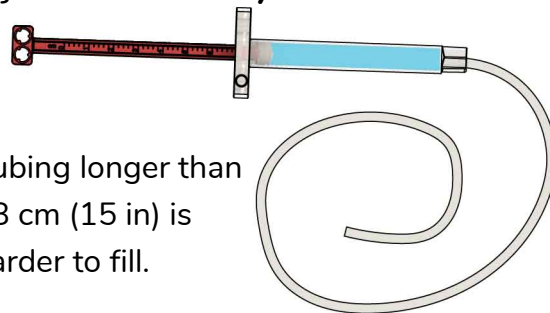
Tubing longer than 38 cm (15 in) is harder to fill.

3 **Fill** the **tubing** completely with water by **pushing the piston** all the way **in**.

4 **Attach** the **tubing** to the other cylinder.
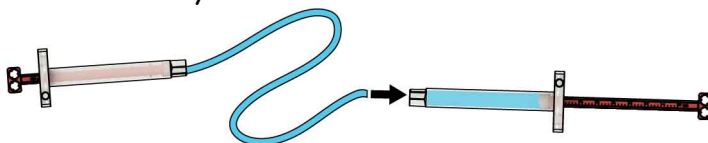
Remove all bubbles from cylinders & tubing for best performance.

Tip the cylinder so bubbles rise to the base of the tube.

Push the air out and refill.

5 **Insert** a cylinder **screw** into each cylinder to secure the tubing.
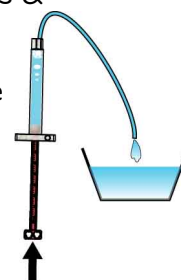
☑ Your **hydraulics** are **done**! Test them out.

Push & Pull
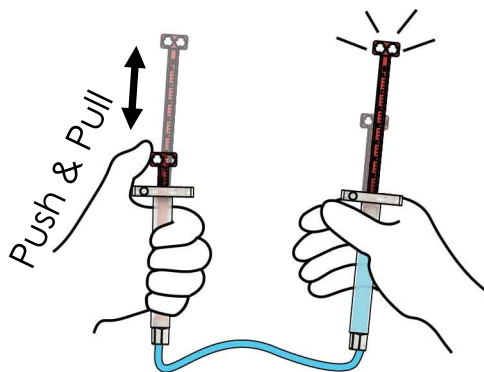
Want to learn more about hydraulics?

Download the **Fluid Power Lab** at **teachergeek.com/claw** **Ages 12+**

Which Claw Will You Make?

These examples get you started, then you can experiment and evolve your own unique design!

Accordion
(Page 4)

Chopsticks
(Page 6)

Pincer
(Page 8)
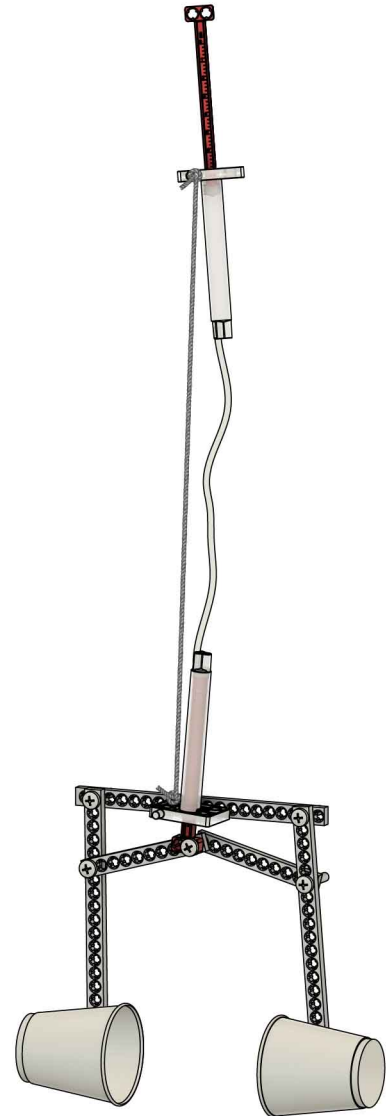
After you make your claw, try a Challenge! (Page 9-10)

Accordion Example

1 **Cross two strips** and **add** a **screw** near the middle.

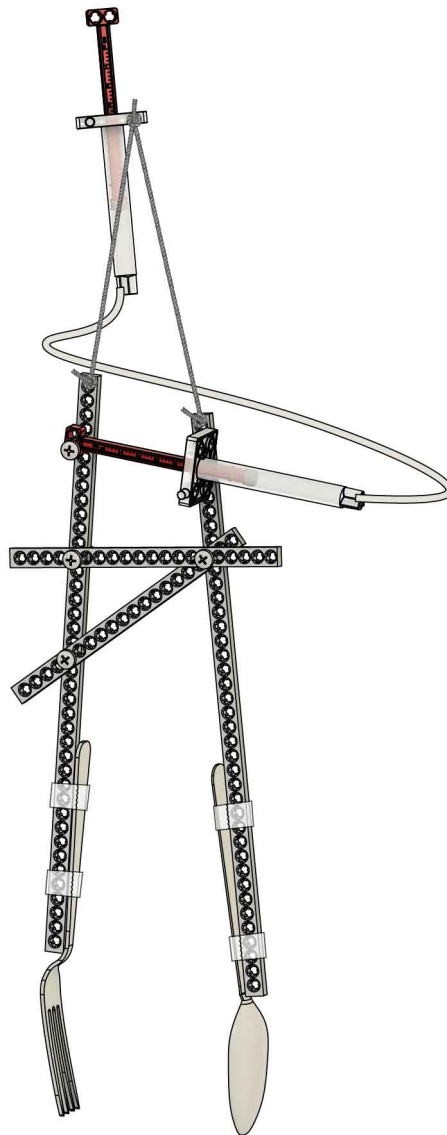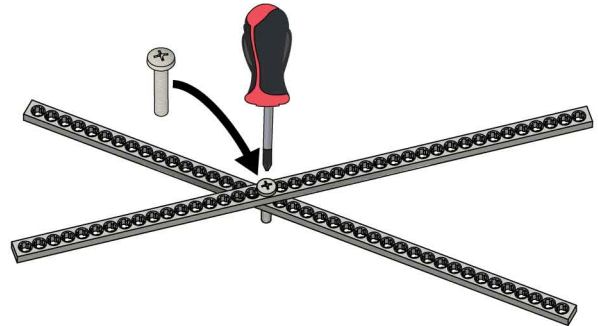**2** **Make** two **half strips**, if you don't already have them, by **cutting or snapping** a full strip.

Full Strip

2x
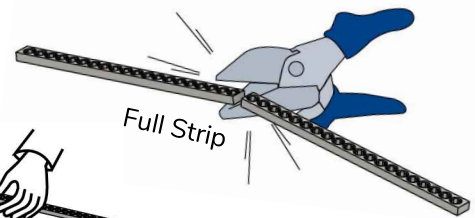
Half Strips

3 Add the half-strips and screws to **make** an **accordion-style mechanism**.
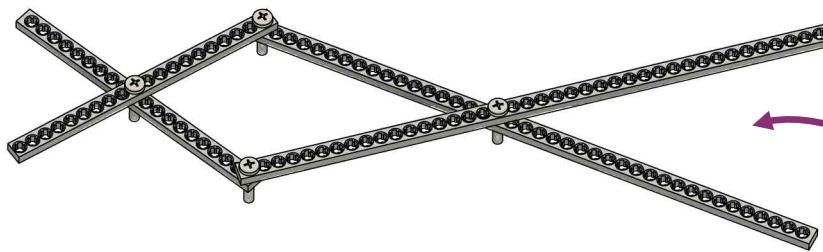
This mechanism moves like an accordion.

4 **Test your mechanism!**
Next, you are going to add hydraulics.

5 **Add** your **cylinder** assembly to the mechanism.

Pop in the cylinder **pin**.

Then **screw** in the **piston**.
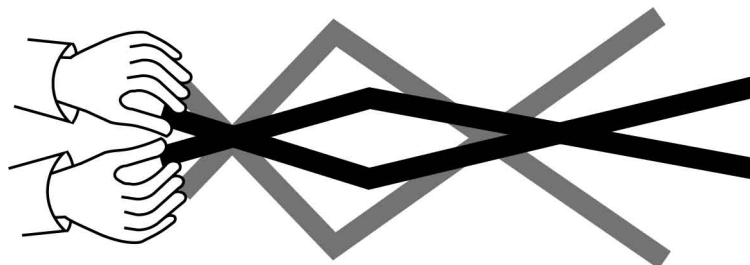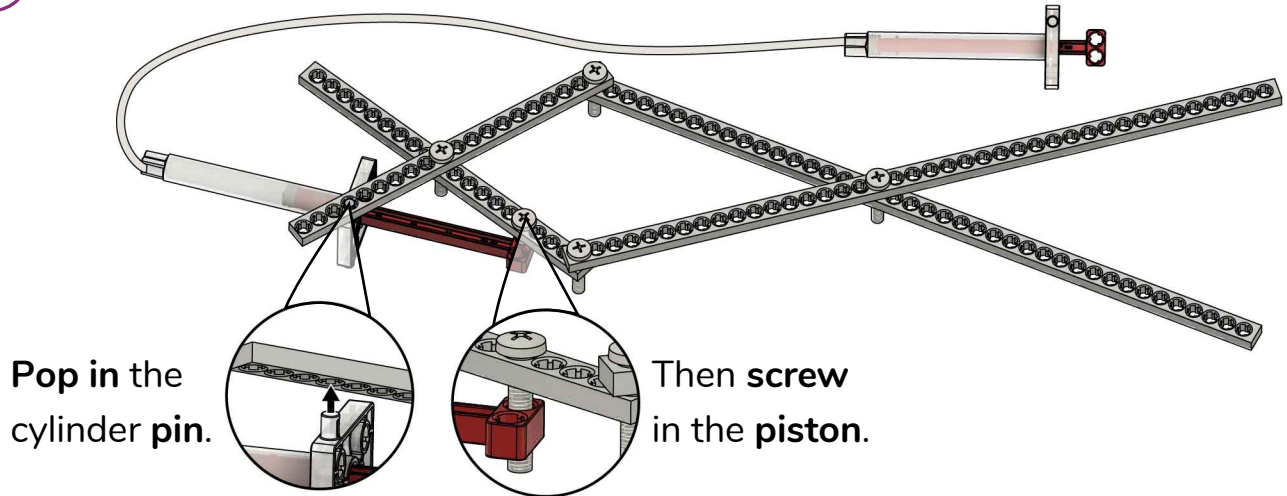
6 **Test your claw!** If it's tipping over, use string to hold it up.

String (optional)

7 Your example is done, but you aren't... **Tinker with it and keep evolving the design!**
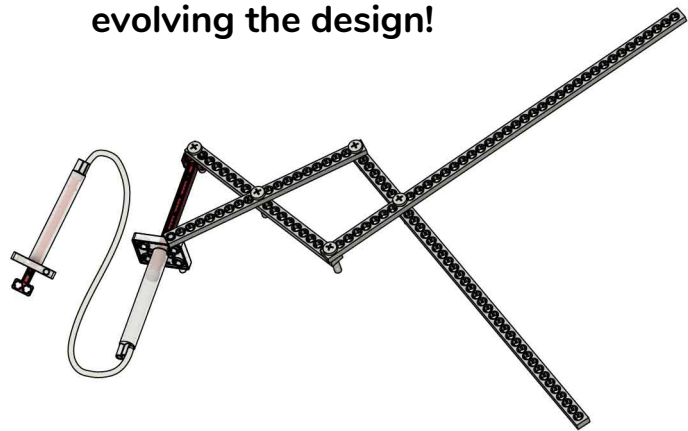
Add end effectors to grip or scoop objects.

Test a lot of them – they all have different strengths and weaknesses.

Chopsticks Example

1 **Make two half strips**, if you don't already have them, **by cutting or snapping** a full strip.

Full Strip

2x

Half Strips

2 **Screw** a **half strip to** a **full strip** near the middle.

3 **Screw on another half strip.** It doesn't have to match the picture exactly.

4 **Screw** the ends of the **half strips together**, so the screw barely sticks out the bottom.
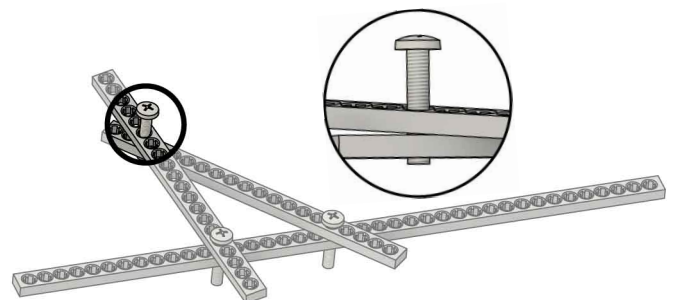
5 Put a **full strip under** the **screw** from Step 4 and **screw it in.**
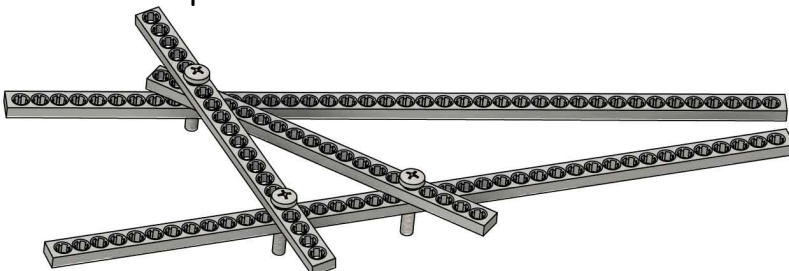
6 **Test your claw!** Next, you are going to add hydraulics.

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7 **Add** your **cylinder** assembly to the mechanism.

Pop in the cylinder **pin**.

Then **screw in** the piston.
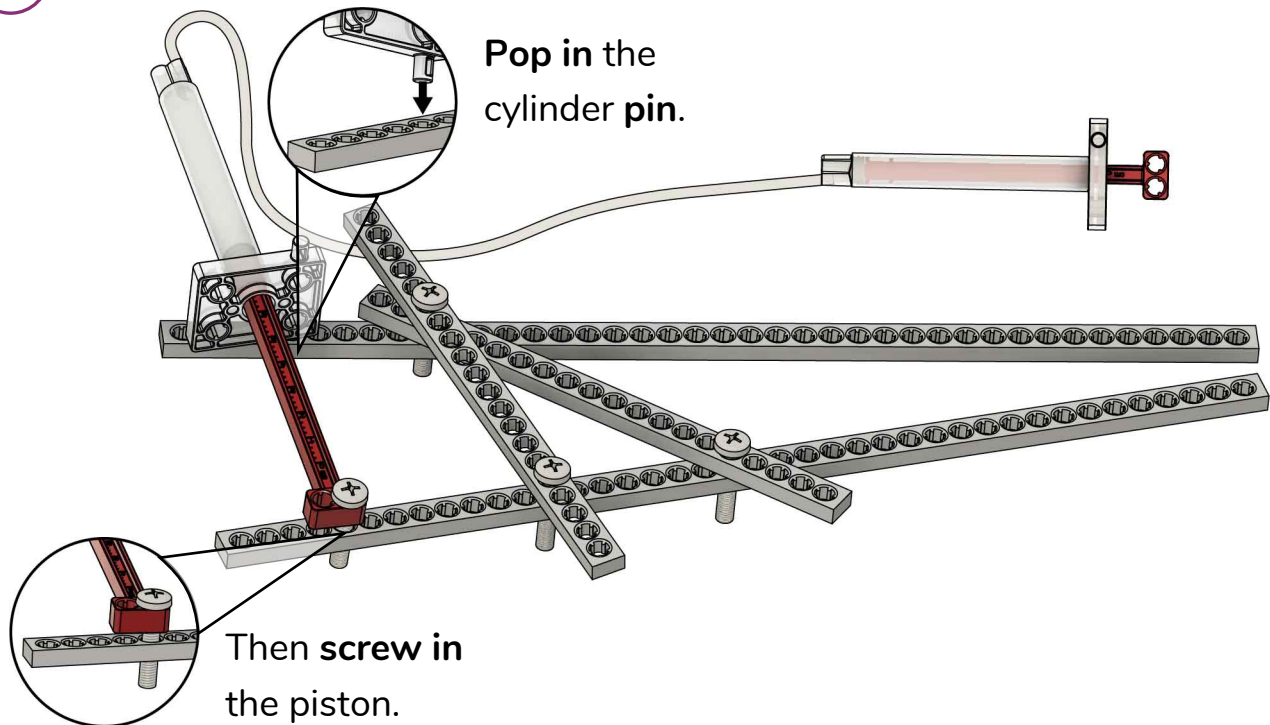
8 **Test your claw!** If it's tipping over, use string to hold it up.

String (optional)
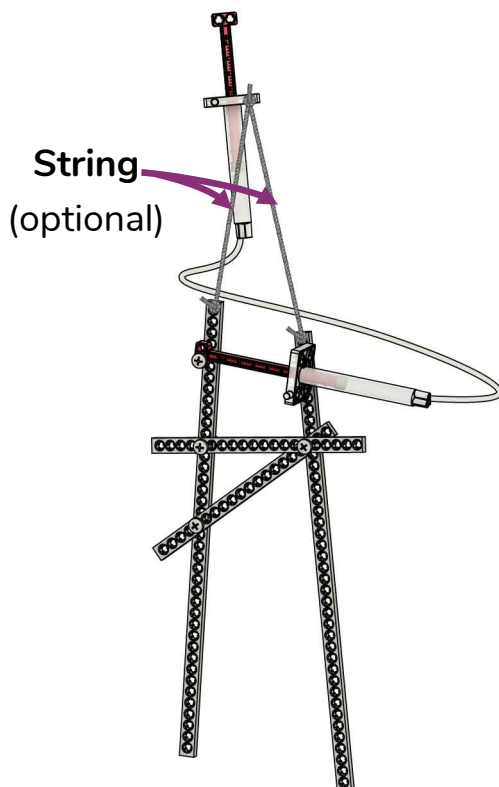
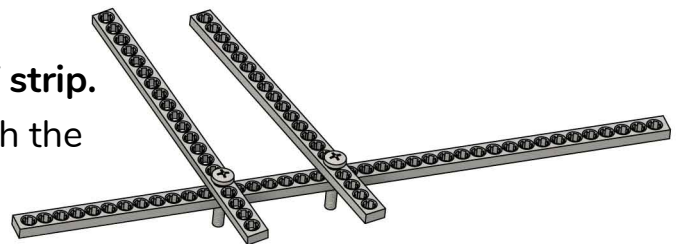**9** Your example is done, but you aren't... **Tinker with it and keep evolving the design!**
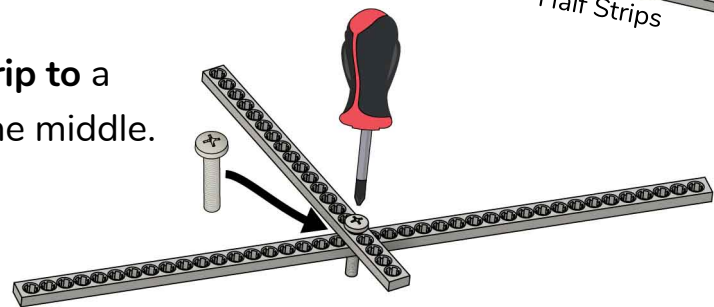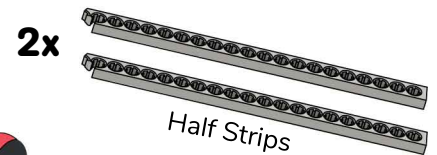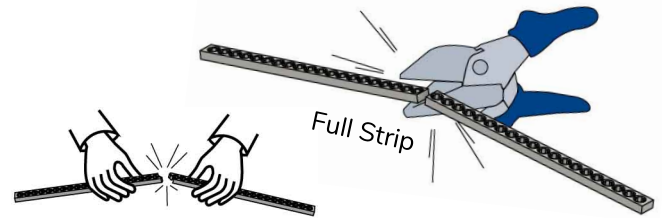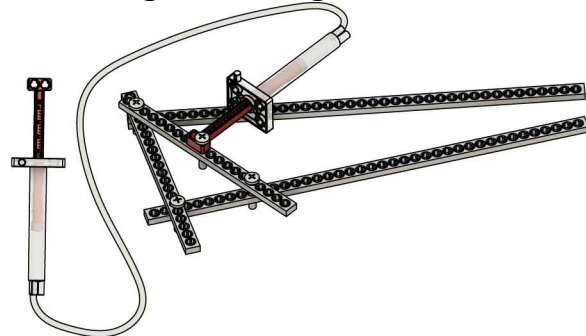
Add end effectors to grip or scoop objects.

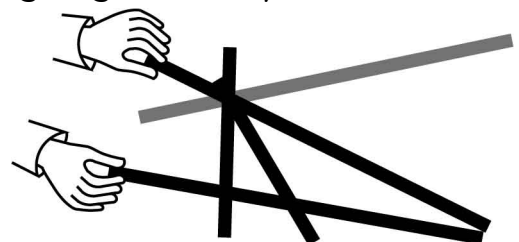Test a lot of them – they all have different strengths and weaknesses.

Pincer Example

1 **Make three half strips** and **two quarter strips** if you don't already have them. (This will require 2 full strips.)

Full Strip

3x
Half Strips

2x
Quarter Strips

2 **Screw** the three **half strips together**.
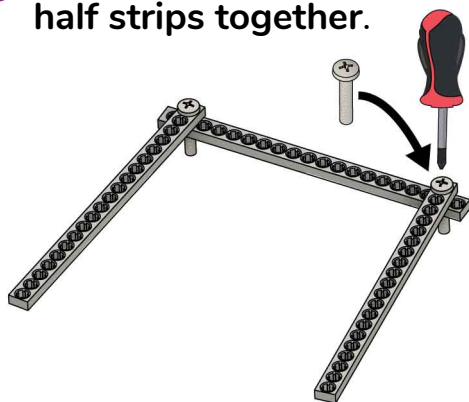
3 Use two more screws to **attach** the **two quarter strips**.

4 **Add** your **cylinder assembly**.

Pop in the cylinder **pin**.

Screw in the **piston** to both quarter strips.
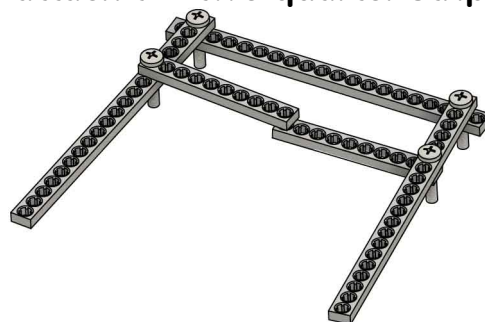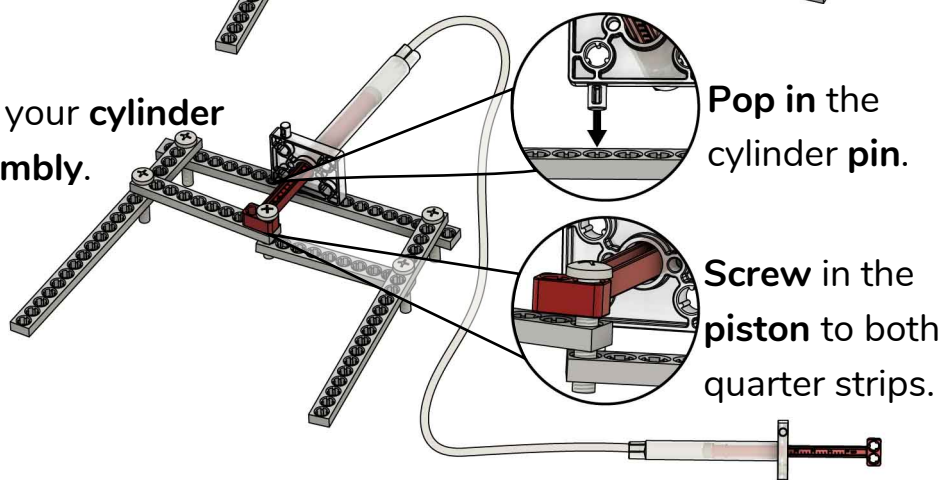
5 **Test your claw!** If it's tipping over, hold it up with **string** (optional).

6 Your example is done, but you aren't... **Tinker with it; keep evolving the design!**
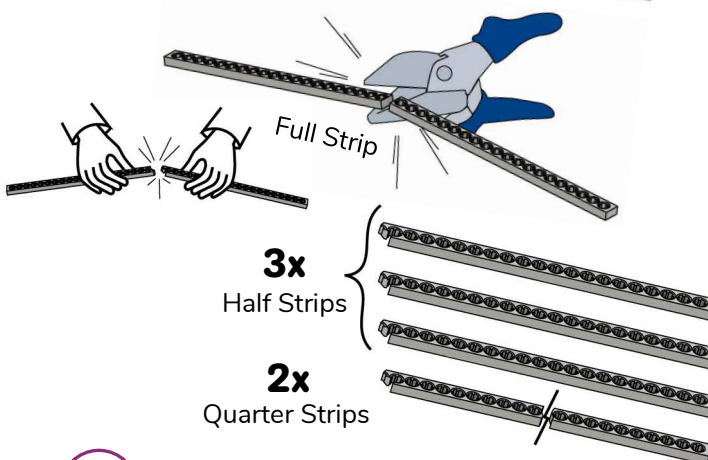
Add end effectors to grip or scoop objects.
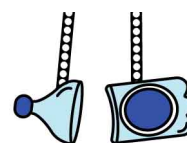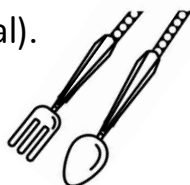
Ocean Cleanup Challenge

Design your claw to clean up the ocean!

Plastic trash is harming ocean wildlife and washing up on beaches around the world. **Use your claw to complete all three stations of the challenge (you can change your design between stations).**

Learn more about seaborne trash at **fws.gov/refuges/features/OceansOfTrash.html**

Constraints:
(rules and limits for your design)

- You must use a claw **powered by hydraulic cylinders**.
- You may **only use claw supplies** listed on Page 1
- You have _____ **minutes to complete each station** of the challenge
- You have _____ **minutes to change designs** between each station

  One claw can't do it all (at least not well), so change your claw design for each part! The engineering design process is never done – there is no perfect design.
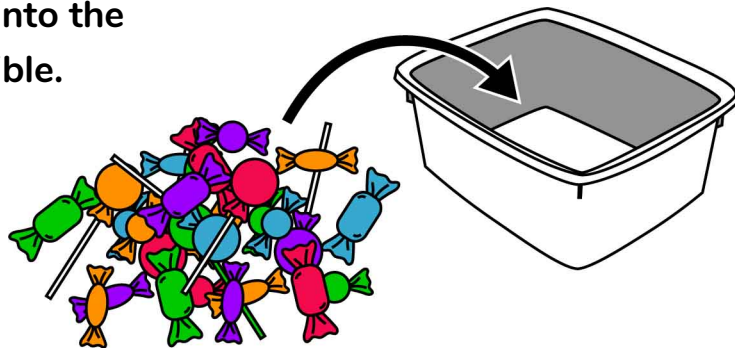
Station 1: Garbage Patch

Huge amounts of trash are floating in the ocean. **Load trash into the container as fast as possible.**

Criteria:

+5 points for every piece of "trash"

+1 point for every extra second left on the clock

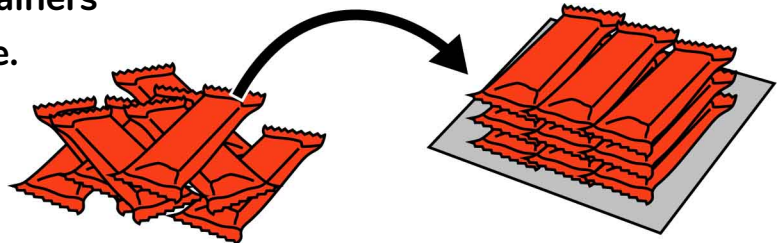You can use anything almost for "trash." Candy, office supplies, toys, recyclables, etc.

Station 2: Load the Barge

Containers of trash must be shipped to land for processing. **Stack containers on the barge as fast as possible.**

Criteria:

+5 points for each "container" on the "barge"

+1 point for every extra second left on the clock

Anything that can be stacked can be a "container." Snack bars, candy, blocks, etc.

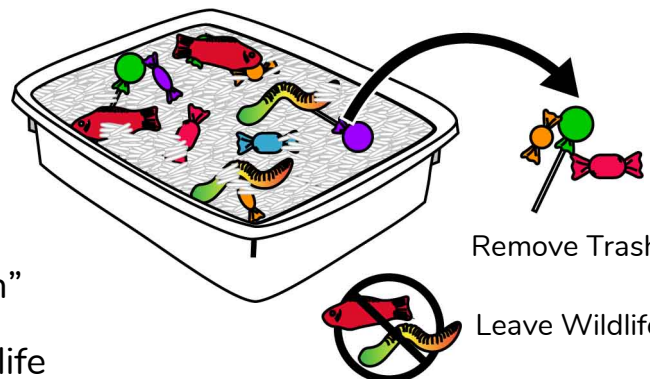Use paper or an index card for the "barge."

Station 3: Beach Cleanup

Pieces of trash are washing up onto beaches. Design a claw to separate the trash from the sand without disturbing any of the wildlife.

Criteria:

+5 points for every piece of "trash"

–10 points for every piece of wildlife

+1 point for every extra second left on the clock

Remove Trash

Leave Wildlife

Rice or sugar can be used as sand. Candy, fishing lures, etc. can be used for trash/wildlife.
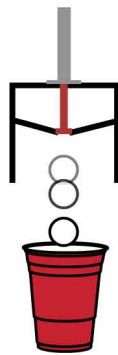
Additional Challenges

Claw Ball Challenge

Put a cup (goal) on each side of the room. Each team can pick up the ball but must pass or drop the ball after walking three steps. The first team to get 5 goals wins!
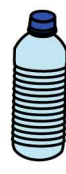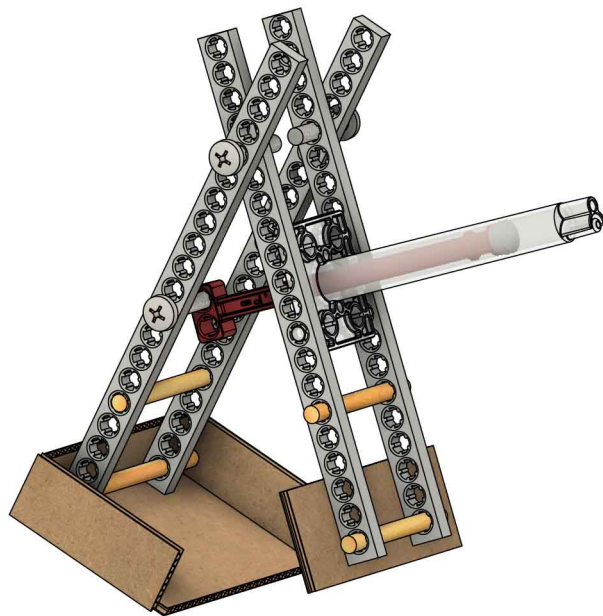
GOAL 1

GOAL 2

HORSE Challenge

Take turns picking up different objects. If one player can pick it up, and the other players can't, that player gets a letter towards the word "HORSE." The first player to spell "HORSE" wins!
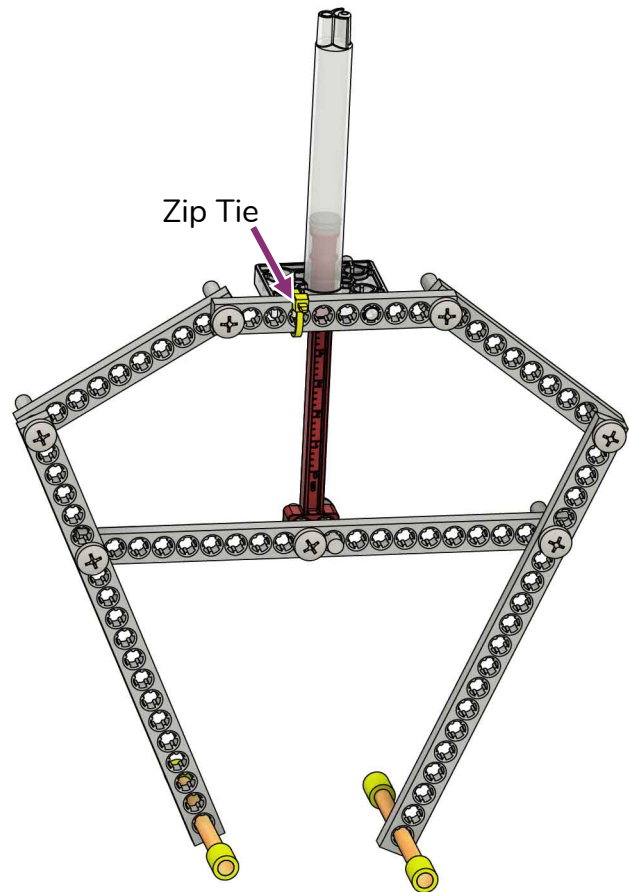
Inspiration
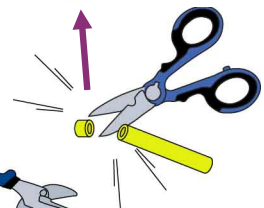
Try making completely different designs!

Zip Tie

Tap or wiggle dowels into holes with teeth to secure them.

Cut slide stop with scissors.

Cutters Optional

TeacherGeek Tools unlock even more design possibilities!

Ream these two holes.

Don't ream these holes.

Ream the teeth out of holes to let dowels slide freely.

Zip Tie

Push & Twist