MAKEngineering Kit Instructions:

DIY Grabbers

Task adapted from Try Engineering as part of IEEE and DIY Grabber from CoBuild 19.

ENGINEERING TASK

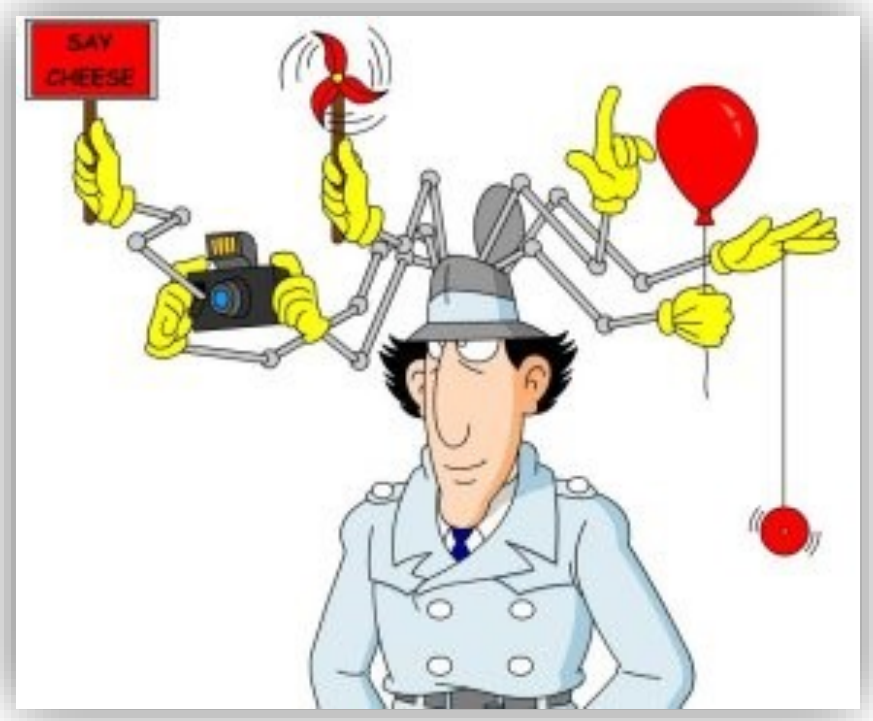
Grabbers are handheld tools that can be used to retrieve items from a distance. Watch the following video for more information:

https://youtu.be/_gw6FILANtA

Design a prototype of a grabber that can pick up three different objects from at least two feet away without damaging or dropping them.

MATERIALS IN KIT

* Scissors
* Electrical Tape
* ~3 feet of cotton twine
* 10 rubber bands
* 4 binder clips
* 4 straws
* 4 pipe cleaners
* 5 jumbo popsicle sticks
* 2 hair ties
* 6 large fasteners



https://intentergy.com/

PROTOTYPE

Prototype is a term we will use often, so what does it mean? One way to think of a prototype is a rough draft on a paper. Here are two videos that explain a prototype in engineering.

https://youtu.be/_1bOaNSy5XY

https://youtu.be/k_9Q-KDSb9o

STEP 1—RESEARCH

Did you know engineers design robotic grabber arms for individuals who are not able to use their arms to pick up objects or for garbage trucks to pick up garbage bins? How do they do that?

www.cnn.com

STEP 1—RESEARCH

As a family, search for news stories and videos using such phrases as “engineers that develop robotic arms”, “mechanical arm for garbage truck”, or “robotic hand for humans.” Here is one video to get you started.

https://youtu.be/WxCDZquT2Yk

Take notes on what you notice about the design of the arms and/or hands.

MATERIALS IN YOUR HOME—SCAVENGER HUNT

Now you need materials for the “body” of the grabber. As a family, find items around your house that start with the letters below. Only one object per letter, but you can have more than one of that object. For example, for the letter P, you can use 5 plastic bottles. Be strategic. We suggest recyclable materials.

B D E H L N P S T W

STEP 2—PLAN

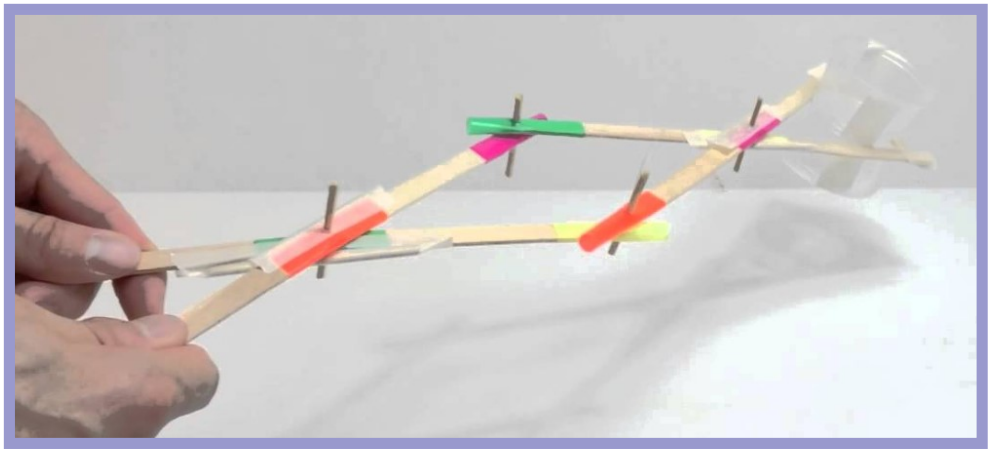
Who is your user? What do you want your grabber to grab? Think about at least 3 items in your home and consider the texture, size, weight, and shape of the objects.

Next, using your research notes, draw 3 different designs of grabbers. For each design, list or label the materials you will use. You can only use the materials in the kit and from the scavenger hunt.

STEP 3—CREATE

Pick one of your designs from Step 2 and **CREATE** a prototype. What is an appropriate name for your grabber? Think about the purpose of the grabber.

The Hook



The Scissor

STEP 4—TEST

Use your grabber to pick up three items in your home from at least two feet away. Since your grabber may be long, make sure you test in a space that has plenty of room. You don't want to accidentally hit other or knock things over!! Don't lift breakable items or any hot/dangerous objects.

STEP 5—IMPROVE

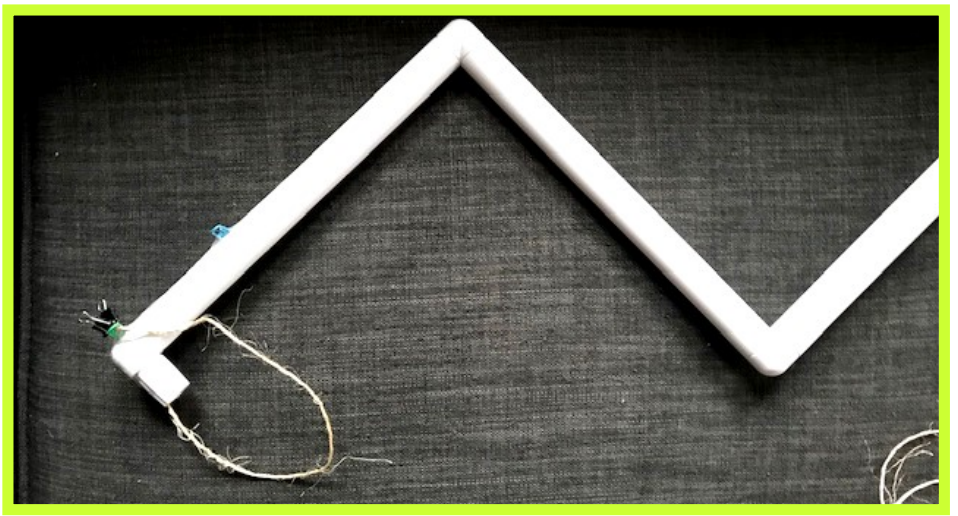
How well did your grabber pick up three items in your home from at least two feet away?

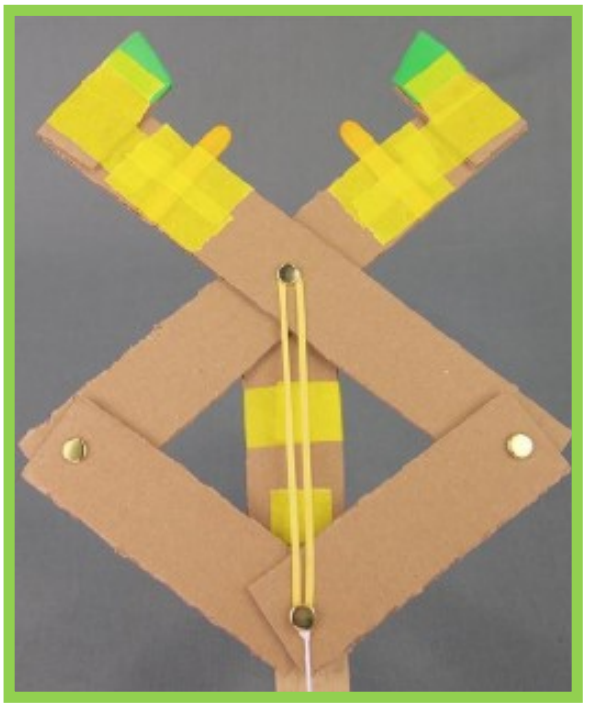
1. Can others in your family use the grabber?
2. What improvements might be made? Why do you think this?

Make any changes and test your grabber again. Continue to test and redesign until you are happy with your grabber.

STEP 6—PARALLEL PROTOTYPE

Try another design from Step 2. Do each step again—Create, Test, and Improve.





STEP 6—CHALLENGES

We also have a few challenges for you to consider:

- How many different types of items can one of your grabbers pick up? What do these items have in common?
- Design a grabber that can hand someone a water bottle across the room while you are both sitting.
- Combine elements of your three designs from Step 2 into a mega-grabber.
- Make up your own challenge. Don’t forget to start with planning your design.

DID YOU KNOW?

Different types of engineers are needed to plan, create, test, and improve robots including robotic arms—mechanical engineers work on the body, electrical engineers work on the nervous system or the electrical components (e.g., circuits), and computer science engineers work on the brain or the computer program that tells the robot what to do. If you are interested in learning more, check out this video.

https://youtu.be/A1V-QQ5wFU4

WHAT TYPE OF ENGINEER ARE YOU?

Add a sticker to your Engineering Passport that identifies the type of engineer you were most like in the design of a grabber. Don't forget to write why you chose the type of engineer.

This engineering kit would not have been possible without funding and support from the National Science Foundation.