

Your task is to design a robotic hand!

Step One: Get Inspired!

Move your hand in different ways. How does it move? Do your fingers all move in the same way? How about your wrist? How does each movement allow you to use your hands to complete all your daily tasks (ex: writing, typing, texting, picking up/opening items, exercise)?



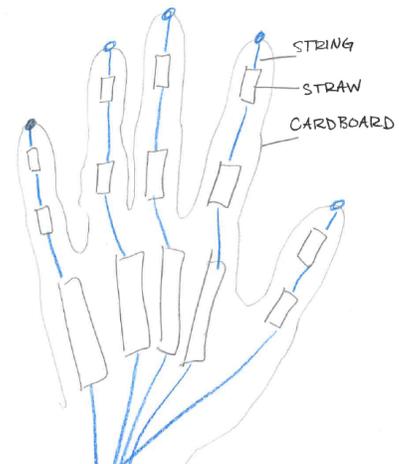
There are lots of different types of joints in your amazing arm and hand that allow you to move it in so many different ways. There are bones to make the structure, tendons to allow bending and stretching, and joints that allow twisting. For example, there is a **hinge joint** (elbow), **condyloid joint** (fingers), **pivot joint** (rotating the two bones in your forearm), **gliding joint** (wrist) and **saddle joint** (base of your thumb). To learn more about joints, consider watching this [short video](#) (1:39) about types of synovial (movable) joints by Muscle & Motor.

Your challenge is to engineer a robotic hand. In other words, we want you to use materials around your home to build something that functions like a hand. **Your robotic hand does not have to look like a human hand, but it should be able to move in the same ways.** For more inspiration, watch this episode of [How It's Made: Robotic Arm](#).

Step Two: Collect Materials

Your robotic hand will likely have lots of different materials. Let's think about the different components:

1. **What materials would you like to use to represent your bones?** Straw or small tubes would work here.
2. **What materials would work for tendons, which can be stretched and snap back into place?** Rubber bands, hair ties or uninflated balloons might work.
3. **What material would work for ligaments, which hold bones together?** Tape or string could be options.
4. **What materials might allow your robotic "wrist" to pivot?** Perhaps a cardboard roll might help.
5. **What is going to make up your robotic "hand?"** You want something sturdy but movable. Cardboard or cardstock are both useful materials



Step Three: Design Your Robotic Hand

Collect the materials you will use to create your robotic hand. Remember that you want the robotic hand you make to function the same way as a human hand. Remember to draw a picture of your ideas first. Engineers draw out their ideas to think through their designs and share their

creations with others. For an extra challenge, label your design based on how you are using your materials.

Step Four: Build Your Robotic Hand

We suggest that you trace your hand on the material you have selected for your robotic “hand” (i.e. cardboard or cardstock). Even if you struggle to make your joints, keep at it! **If you need help...**

- Consider collaborating with those around you!
- Think about more or different materials you can use.
- Take a short break and give yourself time to rest and think of new ideas!
- Conduct more research! Perhaps you can search online “DIY robotic hand” and see various ways other people have completed their project.



Fun Fact: If you studied the pictures above (the drawing and final product) as you designed your robotic hand, you engaged in **reverse engineering!** Reverse engineering is the practice of understanding how something is made so that you can create your own version.

Reflection Questions:

1. How does your robotic hand look like a real hand? What is different?
2. How does a robotic hand function like a real hand? What is different?
3. What would you need to change (if anything) about your design in order to allow your robotic hand to twist? Which joint(s) are you using?
4. What would you need to change (if anything) about your design in order to allow your robotic hand to pinch two “fingers” together?

Step 5: Sharing Your Robotic Hand on Instagram or email.

We want to see your robotic hand! With permission from your parents, or guardian, share a picture of your hand for our instagram page. Direct messaging or emailing an image of your challenge gives us the written consent to redistribute the image on our [website](#) and official instagram page.



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