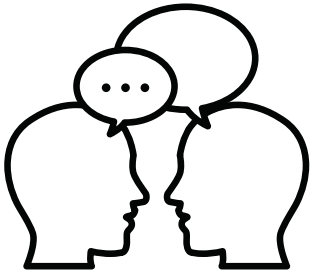


The Game Plan

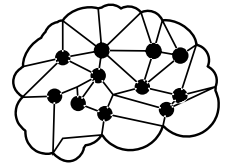
Step 1: Understand



Step 5: Share



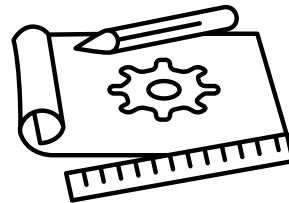
Step 2: Brainstorm



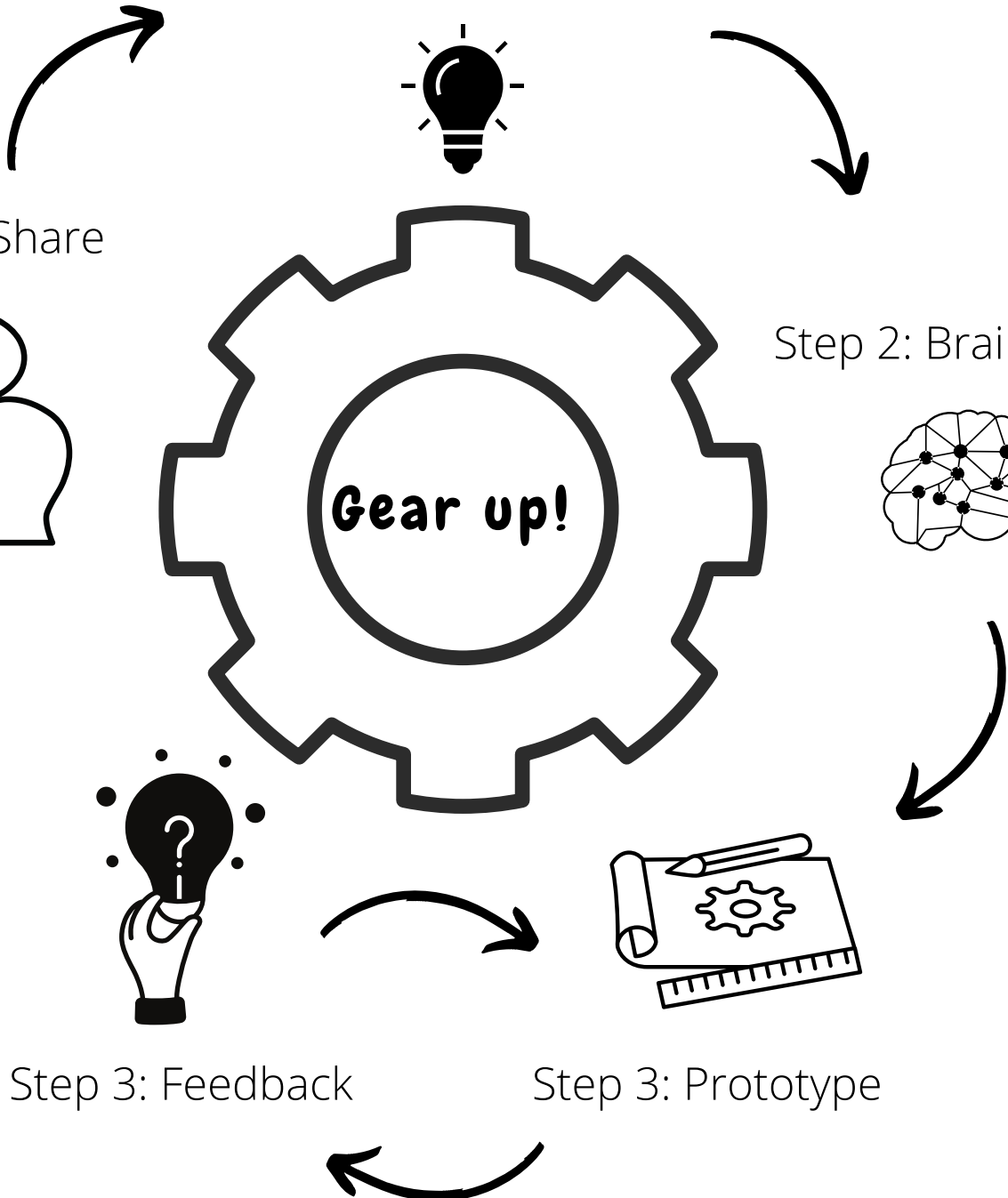
Gear up!



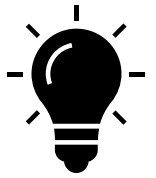
Step 3: Feedback



Step 3: Prototype



Step 1: Understand



- When designing new products, we want to ensure that they will be useful. In order to build the most useful product, we need to fully understand the challenges our community faces. Every good product solves a problem!
- One way to understand your community's needs is to ask questions in an interview!
- List some questions you could ask to understand someone's life and challenges. Focus specifically on challenges that occur regularly.

1.

2.

3.

4.

5.

6.

7.

8.

Stuck? Think about their daily life. What's something they do often that frustrates them? Ask follow up questions for more information!



Interviewing!

Interview tips:

- find someone who has a few minutes of time available, no good interview is rushed!
- **Listen attentively** and make sure they know you are paying attention
- Ask follow up questions like "why?" to understand the reasons behind their answers
- Thank them for their time at the end of the interview!

Your turn! Find someone at home or in class (it could be a friend, classmate, parent, grandparent, guardian, sibling, neighbor, etc.) and ask them a few questions from your list. Take notes on what you observe!

Question 1:

I asked, _____

They said, _____

I asked (circle one): Why? Tell me more! What might help?

They said, _____

Question 2:

I asked, _____

They said, _____

I asked (circle one): Why? Tell me more! What might help?

They said, _____

Question 3:

I asked, _____

They said, _____

I asked (circle one): Why? Tell me more! What might help?

They said, _____

Question 4:

I asked, _____

They said, _____

I asked (circle one): Why? Tell me more! What might help?

They said, _____

Let's Synthesize!



**to synthesize is to combine and clarify your thoughts*

What is one thing your interviewee loves?

What is one challenge your interviewee faces?

Why is this specific challenge important to them?

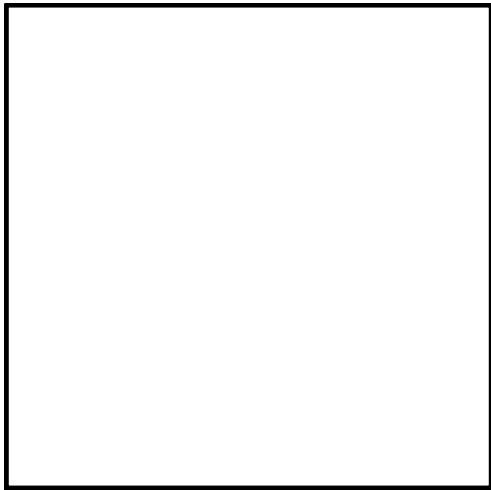
How does this challenge affect other people in your community?

A question to consider: **Empathy** is the ability to understand and share the feelings of another, the foundations of human connection. How can we build empathy in our communities?

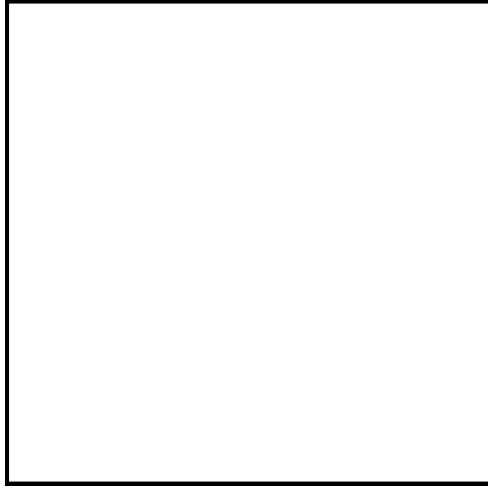
**the interviewer is the one who asks questions (you!) and the interviewee is the one who answers the questions!*

Step 2: Brainstorm

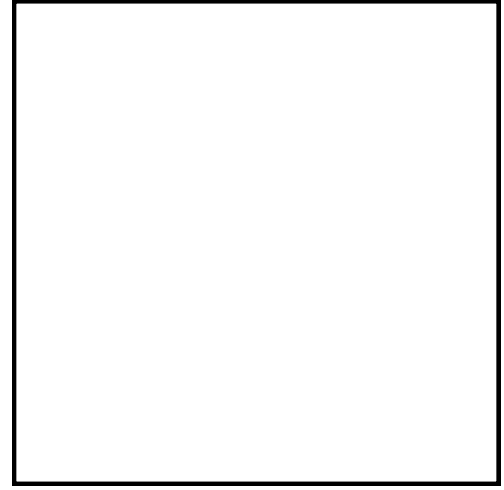
Now that we've got a challenge, it's time to think about solutions! Don't worry about finding the perfect solution yet, focus on coming up with as many ideas as possible! Come up with at least 7 products to solve your challenge and sketch them below!



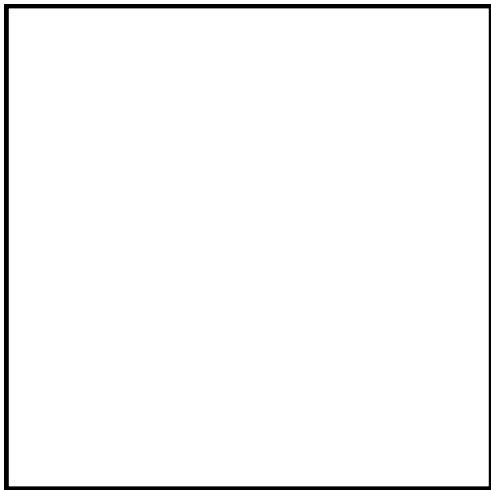
1.



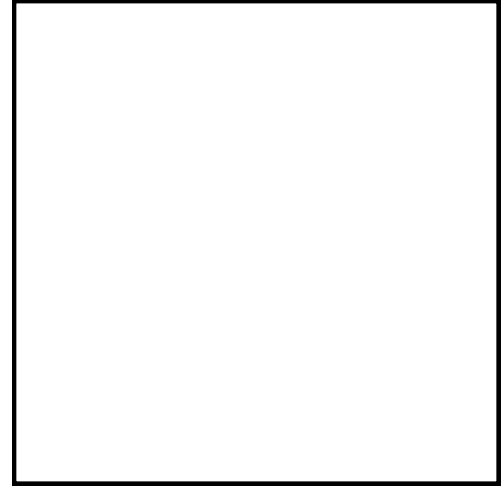
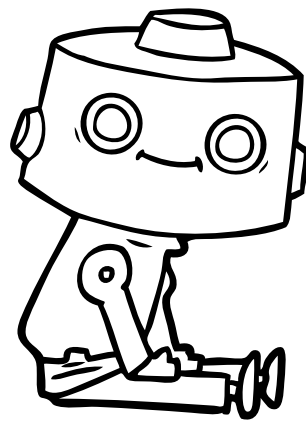
2.



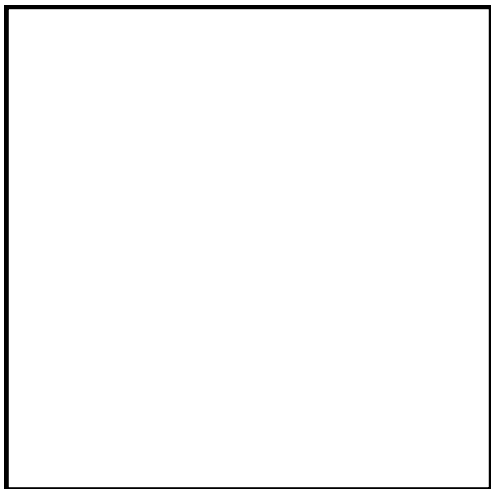
3.



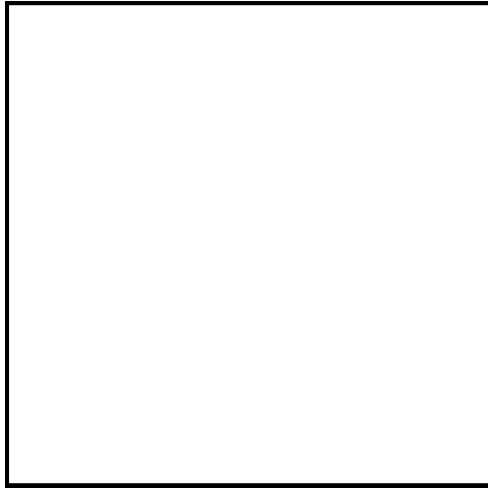
4.



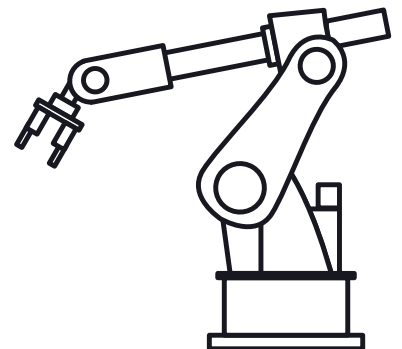
5.



6.



7.



Label each of your sketches with a name or a short description!



Feedback is fun!

Now that you have some fantastic ideas, it's time to pick a few to move forward with.

Find a friend and explain your **3 favorite ideas:**

- Listen to their questions and ask for feedback: how would they improve your design?
- Give them feedback on their top 3 as well! Focus on constructive and positive comments. Be specific, don't just say "Cool!" tell them which part was cool and which part you'd do differently.
- It's important to get feedback because we all have different perspectives- your friend may make you think about something in a whole new way!

What are 3 ideas your friend had to improve your ideas?

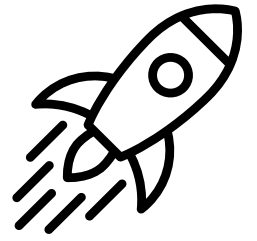
1. _____
2. _____
3. _____

More time? Find another friend and get more feedback!

You never have to use feedback, but it's a good idea to listen and consider other's ideas, just in case you missed something!



Design away!



Consider your feedback and pick one design that you think will most effectively solve your challenge. Sketch your idea below, it can be different than the idea you originally came up with! Sometimes you can even mix and match pieces of multiple designs and ideas to make a new design entirely.

Come up with a fun name for your design:

What's your vision?

Let's write a need statement! Need statements can help us focus on who we're designing for and clarify our vision!

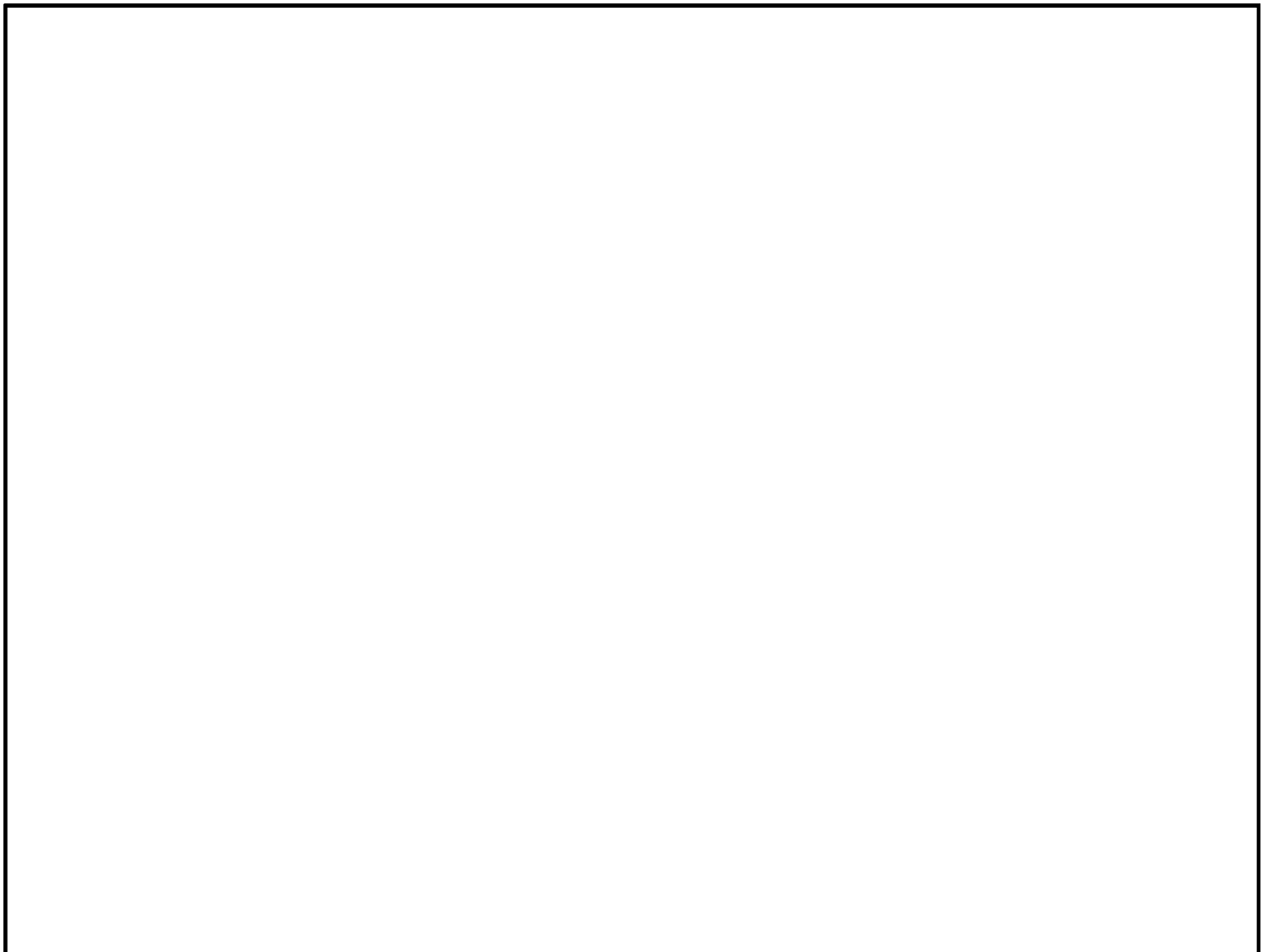
_____ (the person who you interviewed)

needs a _____ (the

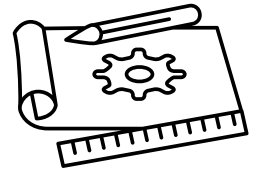
name of your design) in order to _____

_____ (why do they need this?).

Draw a picture of your person using your device here:

A large, empty rectangular box with a black border, intended for drawing a picture of a person using a device.

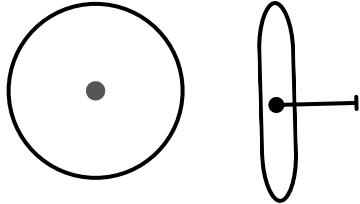
Step 3: Prototype!



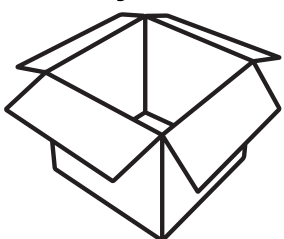
Now it's time to bring your design to life! Before engineers build a full size product, they build a practice product called a prototype. Prototypes are usually smaller and less fancy than real products so engineers can play around with details and make sure they end up building the best version of their design.

It's your turn to prototype!

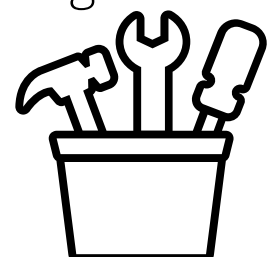
The following chart can help plan your build:

What do you want it to do?	How will it work?	Sketch it quickly
<i>example: drive around</i>	<i>Wheels!</i>	

Prototypes can give you an idea of how different parts and pieces work together; if a prototype is really not working out, it may be time to make some changes in your design.

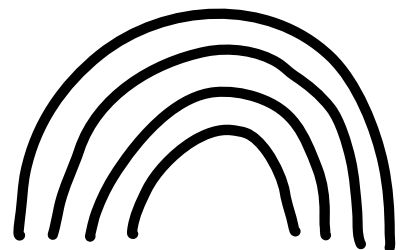
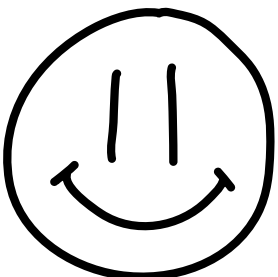


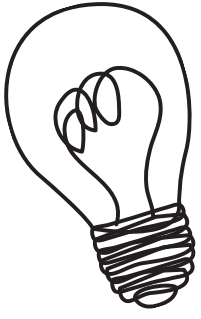
Go forth and build!



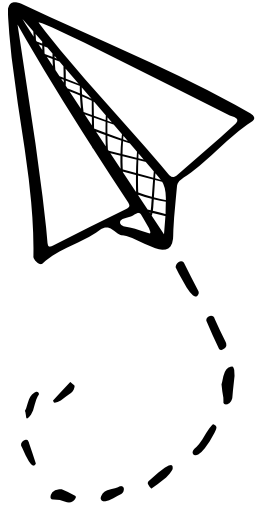
Doodle page!

You can also use these pages as scratch paper
for prototype sketches!





Get creative!



Prototype reflections

Nice job with your first prototype! Let's do some reflection to see how we can improve!

What went well with your prototype?

What could've gone better with your prototype?

What changes do you want to make with your design? What could you add to the next version?

Intro to Electronics

also known as the fun stuff!

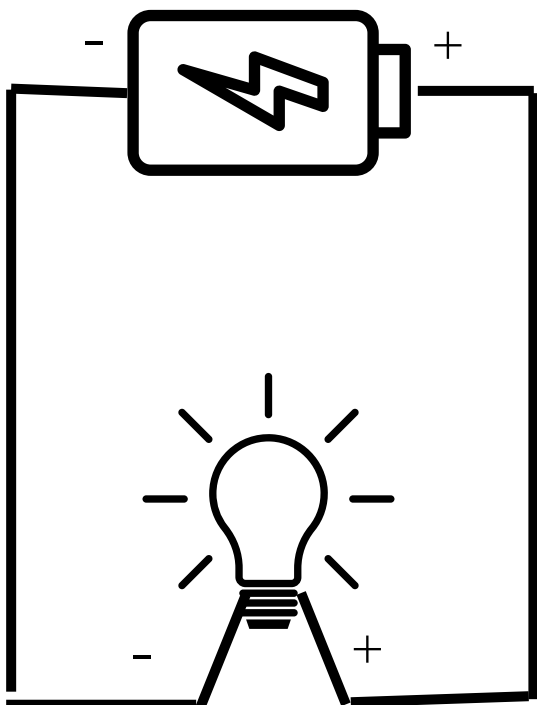
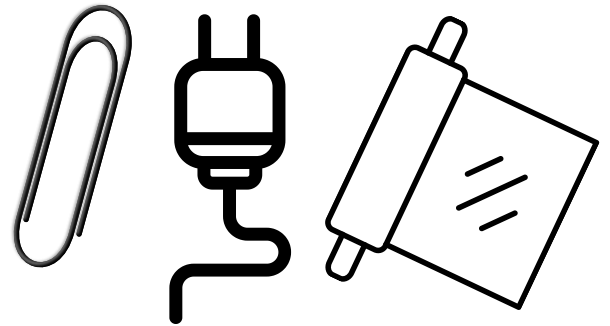
You may have parts in your prototype that you want to be able to move or light up, how do we do that?

We can use electronics!



Electronics is the study of how to control the flow of electricity, called electric charge, using circuits. Lots of everyday items use electricity to operate (lights, phones, X-rays, and more!)

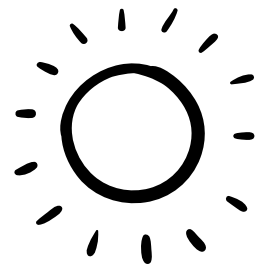
Conductors are materials that allow charge to flow through them. Some example conductors are wires, tin foil, paper clips, and most metals.



A circuit is a closed loop where charge can flow, a complete path of conductors with a power source and something to be powered. A power source, like a battery, sends a positive charge through conductors to reach the load, or the thing that uses the power. Negative charge then returns to the power source. Power sources can be batteries and the load is often lights or a motor of some kind.

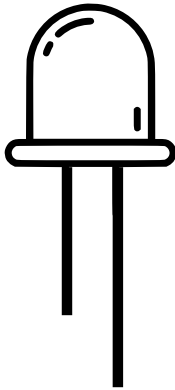
Light up your world!

So how do we make things **light up**?



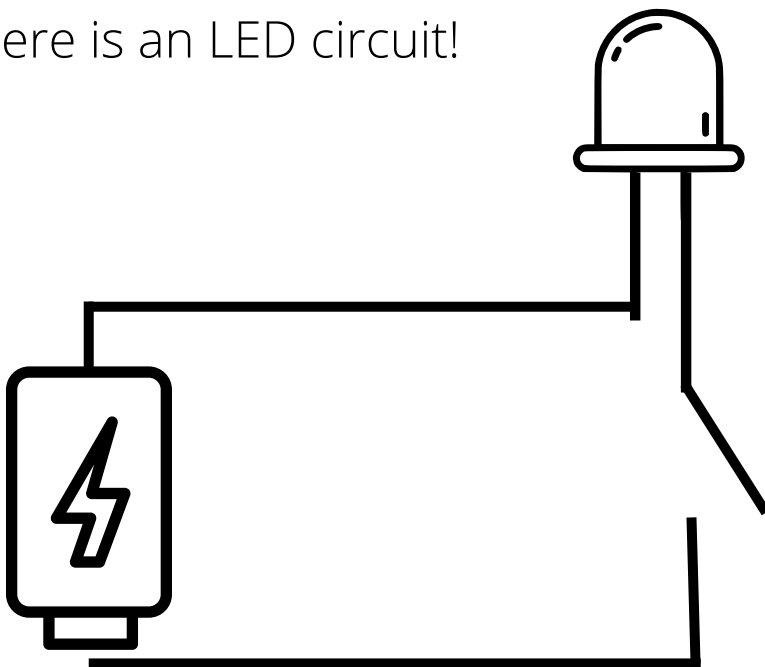
Similar to motors, we can connect lightbulbs in a circuit to incorporate light. One cool kind of lightbulb is an LED, which stands for Light Emitting Diode.

Below is a diagram of a small LED:



Each leg needs to be connected into the circuit for charge to flow through the LED. If charge flows through, it will light up!

Here is an LED circuit!



When these two wires connect, the circuit will close and the LED turns on. While they are separated, charge cannot flow and the LED is off. This creates a natural on/off switch for the circuit.

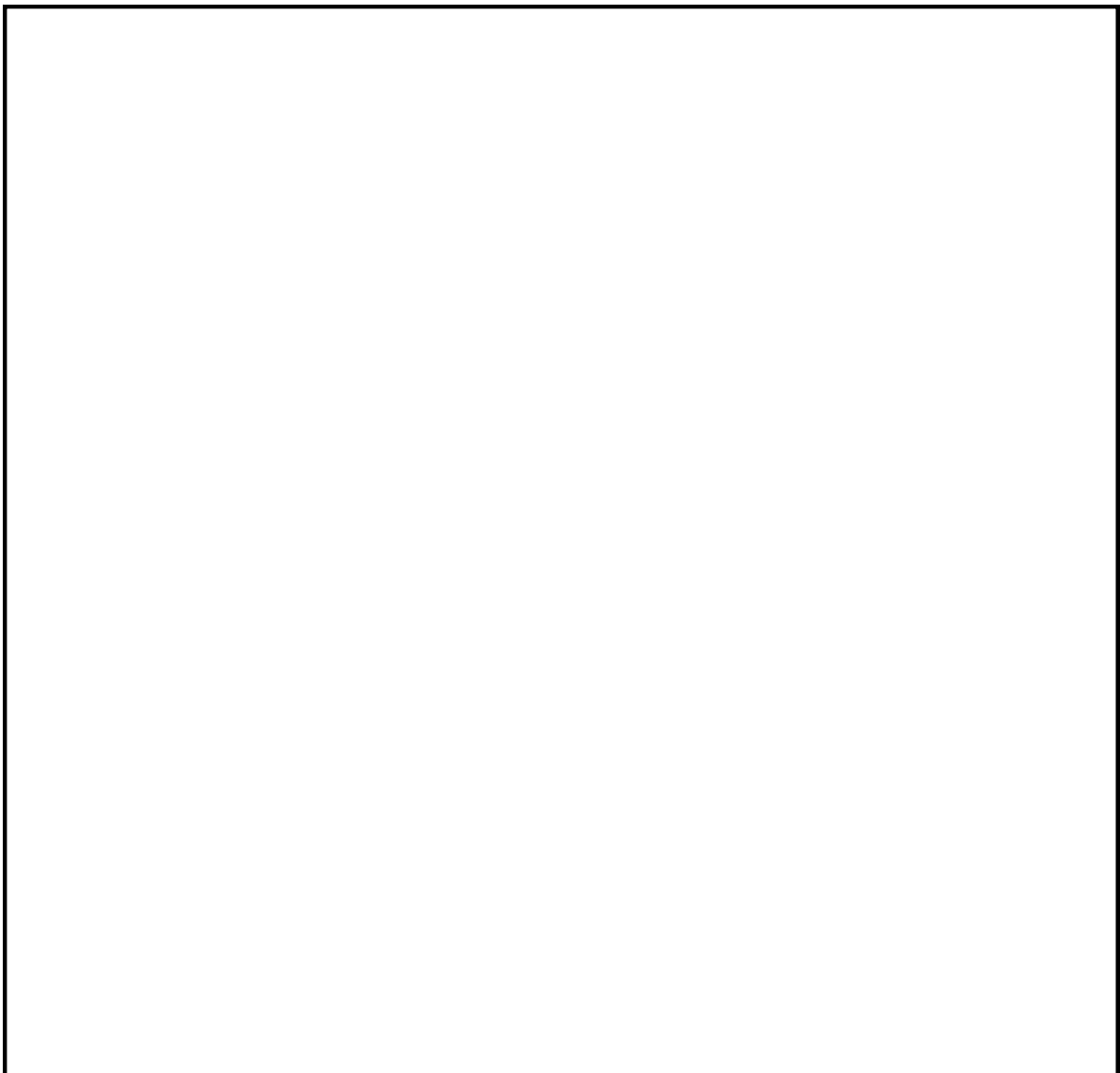
Lights are fun, but should also serve a purpose. Some lights indicate when machines are on and some signal important information to the operator of the machine.

Designing with LEDs

Where would you put an LED into your design to help your product light up?

1

Sketch your design with where you want your LED. Think: what purpose will your LED serve? How will it benefit the person using your device?



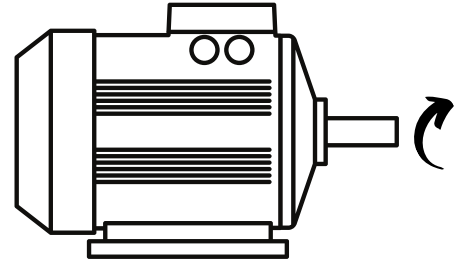
2

Where will the battery be and how will you wire it? Draw that into your picture as well. Think: where can you put an on/off switch in your circuit?

Designing for motion

So how do we make things **move**?

We can connect motors into our circuits which spin when charge flows through them.

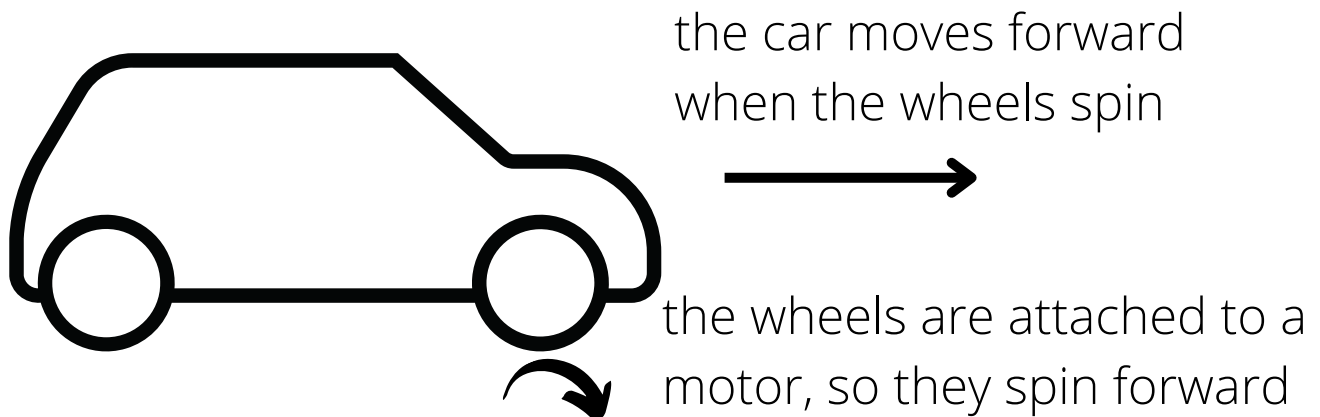


If we want something to spin, we put it on a motor, like a drill:



the drill bit spins because it's connected to a motor

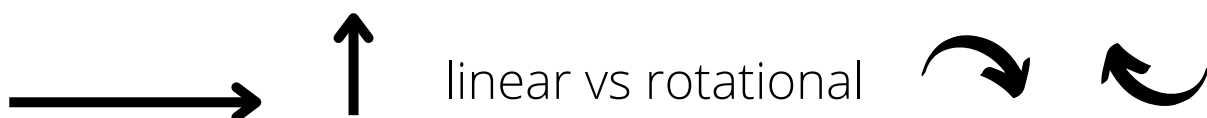
If we want something to move forward, we attach a motor sideways, like a car:



the car moves forward when the wheels spin

the wheels are attached to a motor, so they spin forward

A car is a good example of how we translate the rotational movement (spinning motion) of a motor to linear motion (forward and backwards).

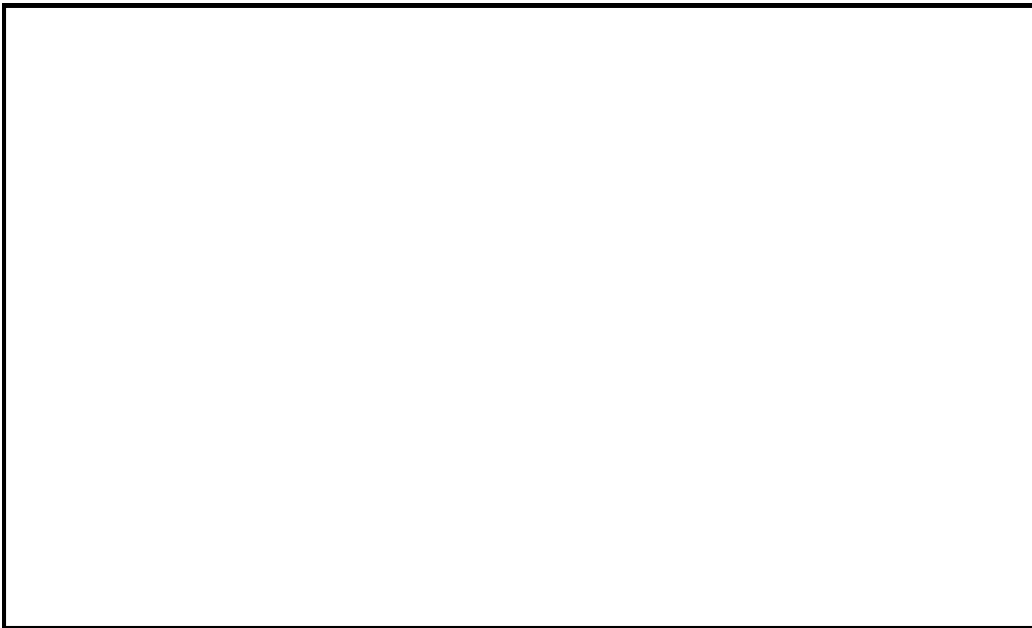


Designing with motors

Where would you put a motor into your design to help your product move?

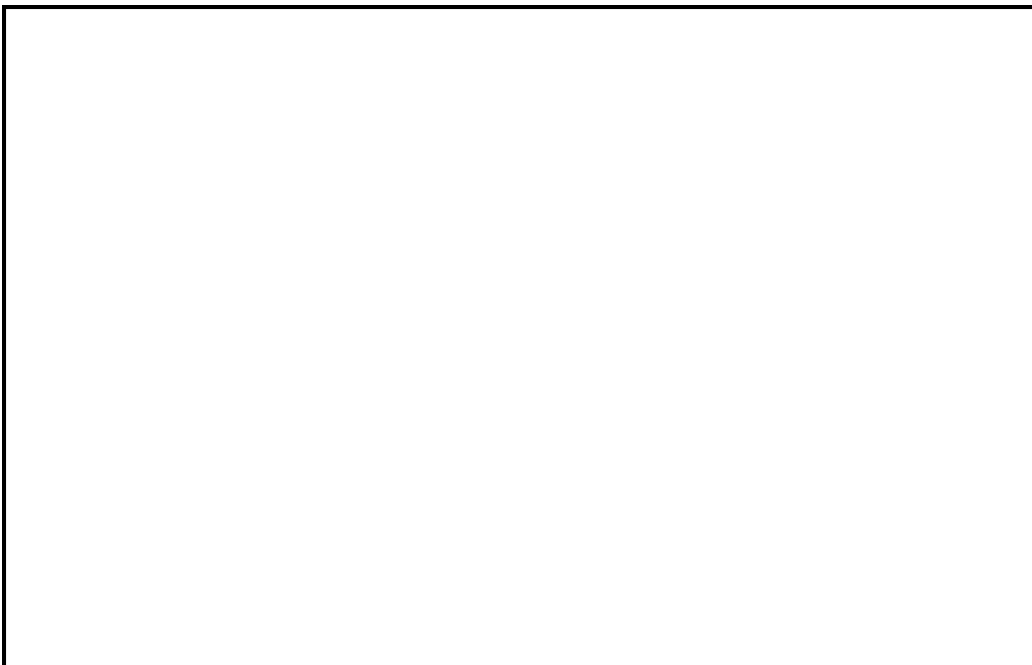
1

Sketch your design and draw an arrow indicating the direction you want it to move. Think: is it rotational or linear motion?



2

Add a motor and circuit into your drawing. Think: where could the battery go? How would the circuit connect?



Let's get digital!

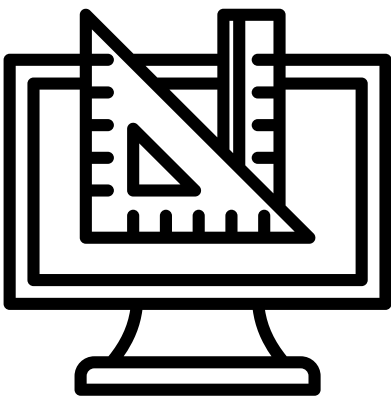
Another way engineers practice building is by designing their products online using CAD technology. CAD stands for Computer Aided Design, and it basically means an online, 3-dimensional model of your design!

Why do we use CAD?



- To practice building and ensure the whole product will work the way we want it to.
- Paper sketches only give us 2 dimensions, while CAD can give us 3 dimensions!
- Using CAD, you can model your product with the real materials at no extra cost.

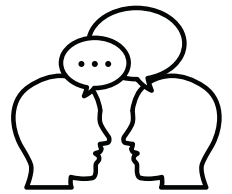
Let's use TinkerCAD to CAD our own designs!



Fun fact: CAD also allows multiple engineers to work on the same project; they can share files more easily than they can send physical prototypes!

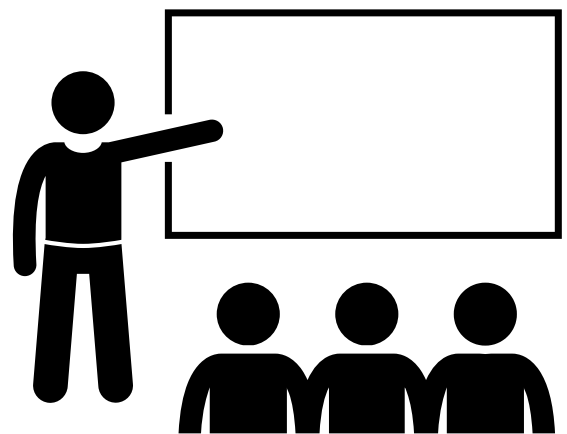
There are many different types of CAD softwares, ranging from simple to extraordinarily complex at the industry level!

Step 4: Share!



Now that we have spent some time prototyping, it's time to present our ideas. If we want to solve community challenges, we have to share our solutions with our community.

Sometimes talking to people can be scary, so it's important to remember that most people will be grateful that you took the time to understand them. It's also important to remember that every solution benefits more than one person!



List at least 4 people who could benefit from your design:

-
-
-
-

There are many different types of presentations. Sometimes it's useful to make a slide deck and present in a meeting, and sometimes it's more useful to casually speak with your friends. There is no one right way to share your ideas.

Telling your story

When presenting, it's easy to fall back on the facts, but it's more interesting for your audience if you tell a story instead. Think: What is the story behind your design?



Now let's practice presenting. It's often helpful to give your audience a visual aid.

Your presentation should include:

1. Who you interviewed and what their challenge was
2. Your solution (include pictures of your prototype, designs, and CAD)
3. At least one thing you would do differently in your next version of the prototype

Presentation tips:

- It can be fun to use pictures and visual aids: don't put so many words so that it's overwhelming. How can you *show* instead of *tell* your ideas?
- Practice practice practice. Practice what you will say when you present!
- Speak loudly and slowly! Make sure everyone in the room can easily hear you and understand what you are saying.





GATORBOTICS