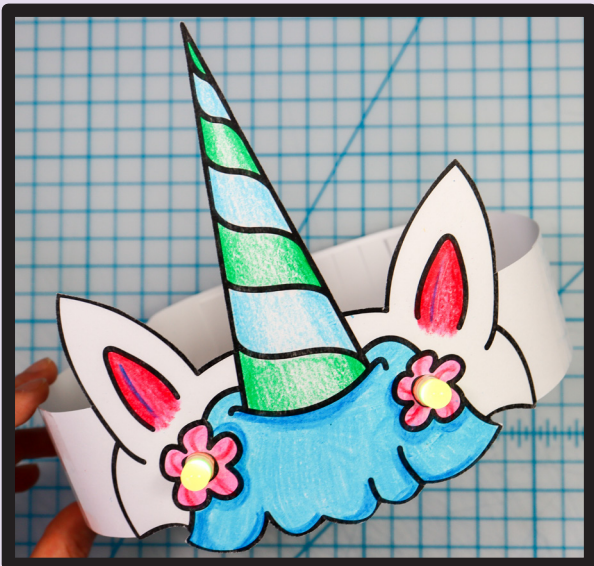




**BROWNDOG** *Gadgets*

# Light-Up Paper Circuit Hats



# Let's Make Light-Up Hats!

Making a wearable project is a fun and festive way to do something creative - especially for a holiday! In this eBook, you can choose from many holiday hats to celebrate throughout the year. There's a full-color version as well as a black & white version that makes a great coloring activity.

You can make these hats (and many more projects too!) with our Paper Circuits Kit.



## In this eBook:

We'll show you how easy it is to build a simple paper circuit. Choose a design, print the corresponding template, and follow the instructions on the page for festive light-up fun!

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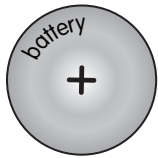
# A Quick Overview: Electronics and Paper

Adding electronics to paper crafts is a fun way to take any project to the next level. A design can really shine when you incorporate lights, and by adding a switch, you can change how someone interacts with the project. Here's an overview of the electronics needed to make the circuits in this eBook, and other paper circuit projects.

If you need paper circuits parts or supplies, pick up the **Paper Circuits Kit** from [BrownDogGadgets.com](http://BrownDogGadgets.com)

## What makes a circuit a circuit?

Every circuit has 3 or 4 main components:



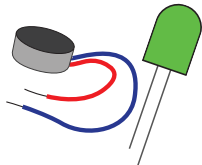
### Power:

Every circuit needs a power source. For paper circuits, a coin-cell battery is perfect because it's small and flat. We use CR2032 batteries, but any 3V coin cell battery will work.



### Wire:

Most circuits use metal wires to connect components. For paper circuits, we use Maker Tape, a conductive tape that's made of woven metal fabric with conductive adhesive on the bottom. It's flexible and flat, like paper!



### Outputs:

The output of a circuit is what it "does." The circuits in this eBook light up with LEDs (light emitting diodes). Other circuits could vibrate, make sound, or even change color.



### Inputs:

Inputs are ways to interact with a circuit like buttons and switches. Yes, you can have a circuit with no input, but a string of lights is way better with a switch! Inputs add interactivity and control.

# Tricks of the Trade

Here are a few universal techniques that will help you build the paper circuits in this eBook:

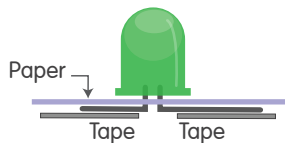
## Positive and Negative

LEDs have one positive leg and one negative leg. The long leg is positive, and the short leg is negative. If you connect an LED backwards, it won't light up!



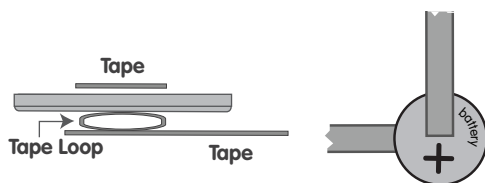
## Hide the Circuit

In many projects like the ones featured in this eBook, you don't want the circuit to show on the front of your project. To hide it, use a safety pin or other sharp object to poke holes where the LEDs go and thread the legs through the paper, then build the circuit on the backside. This will make the light seem like magic!



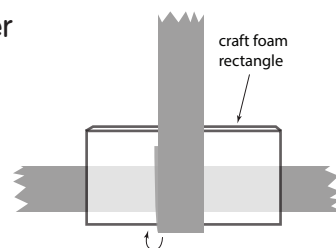
## Connecting the Battery: The Tape Loop Method

Make a small tape loop with the adhesive facing out, and place it on top of the negative strip of Maker Tape. Then, stick the negative side of the battery to the loop. This will make the connection secure and help keep the battery in place.



## The Foam Switch

Cut a small strip of craft foam, and wrap a piece of Maker Tape around the center. Tape it over the switch location in your circuit. Now, squeeze the paper in that spot to activate the switch!



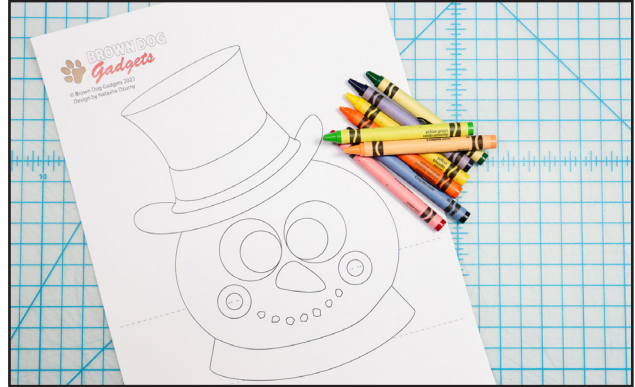
Wrap the tape around the foam flap. When the hat is worn, the switch will close.

# Using the Templates:

These photos may clear up any questions, so read this page before starting your project.



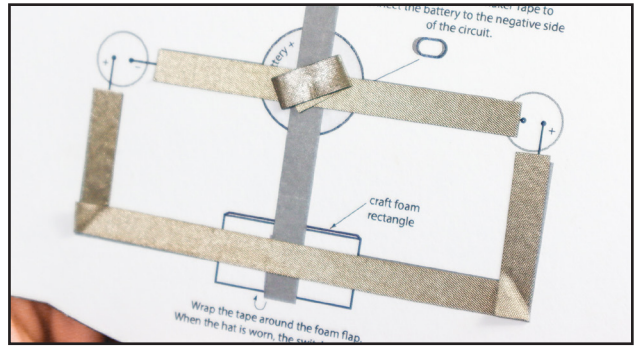
Print the template double-sided so that the circuit prints on the back of the design.



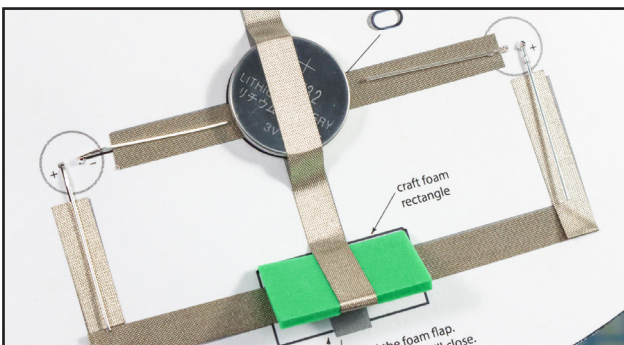
If you choose the blank design, color it with crayons or markers.



Cut out the design. For best results, cut from the front side in case your print doesn't line up properly with the back.



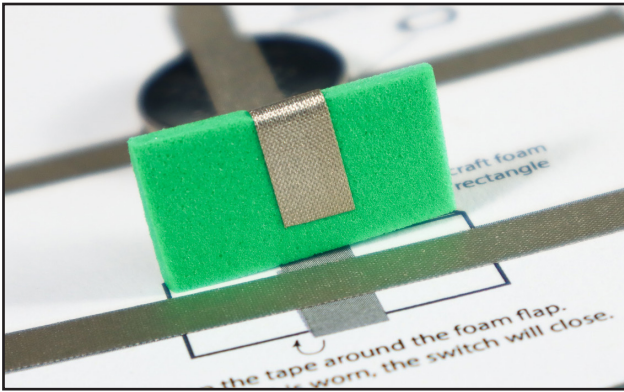
Follow the instructions on the template to cover the lines with Maker tape.



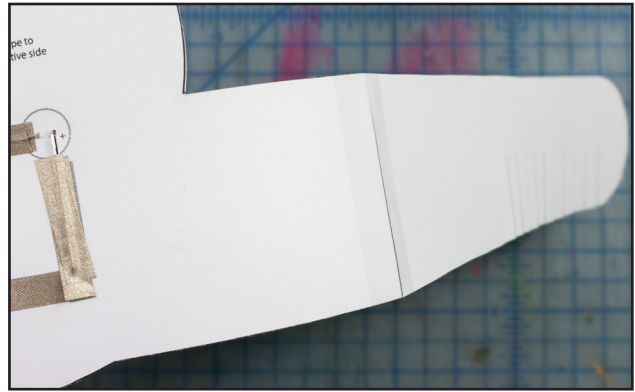
Push the LED legs through the project from the front, making sure the long leg goes through the "+" hole and the short leg goes through the "-" hole. Fold the legs flat as shown on the template.



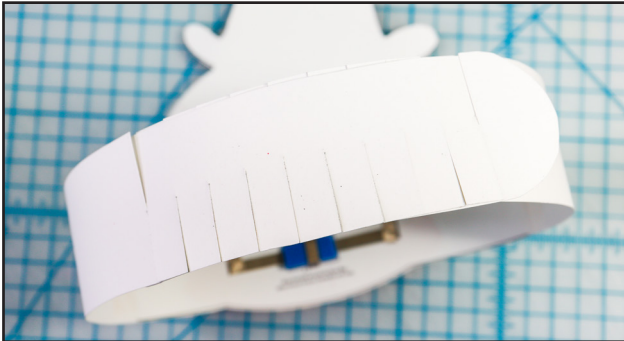
Before placing the battery, add a small loop of Maker Tape on the negative side as shown. Place the battery with the positive side up.



Cut the small rectangle out of craft foam. Position the rectangle over the template, and continue to lay the Maker Tape over the line. When the hat is worn, the switch will close and the LED will turn on!



Cut out the side strips. Tape them to the sides of the paper with the slits facing up on one side and down on the other.



Interlock the slits in two places to create the size that works for your head.



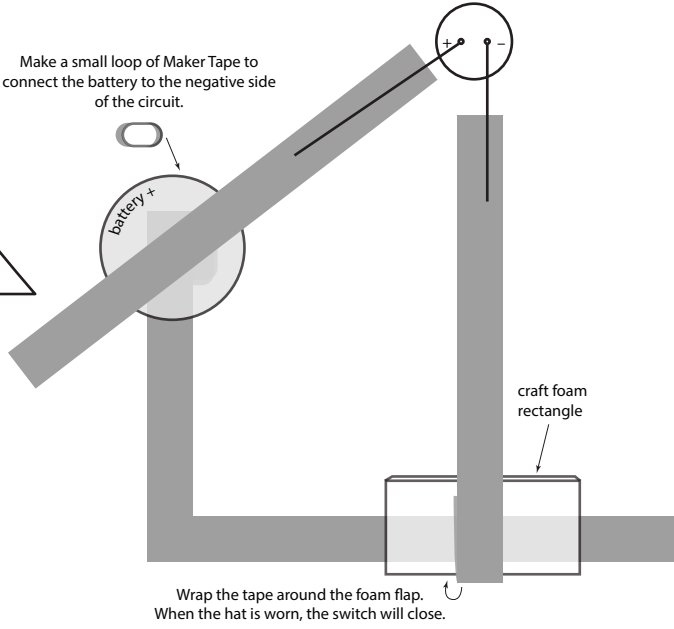
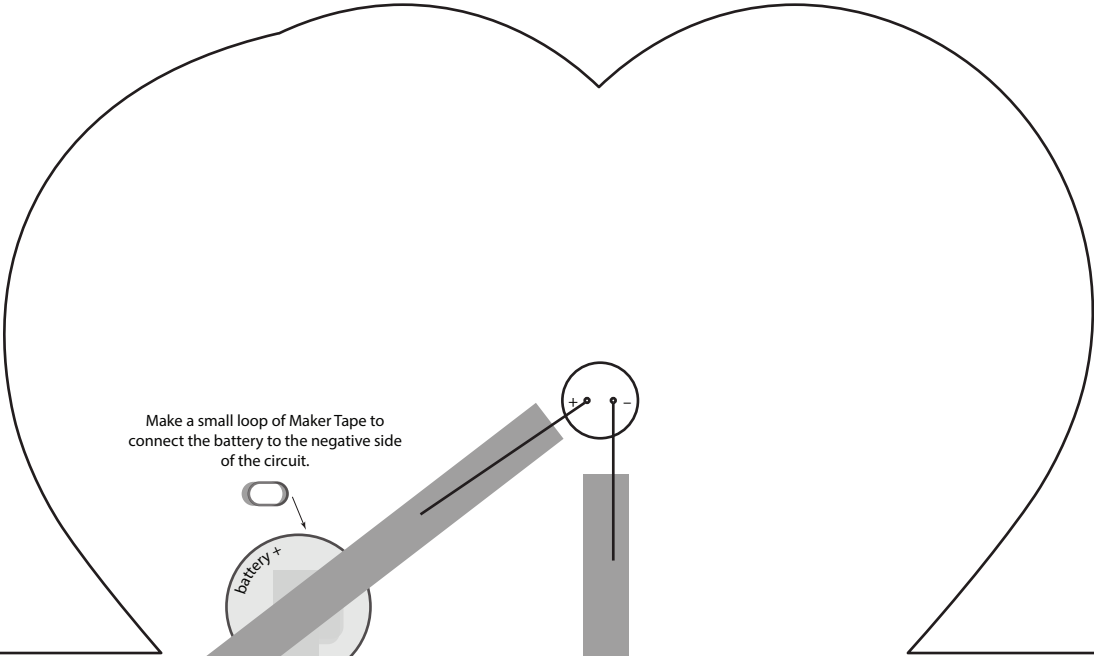
Wear the hat and enjoy!

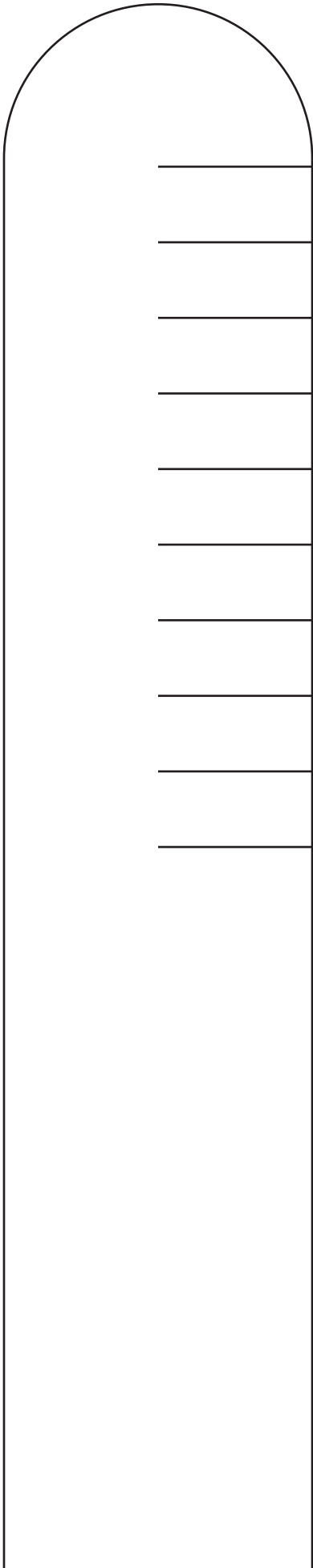
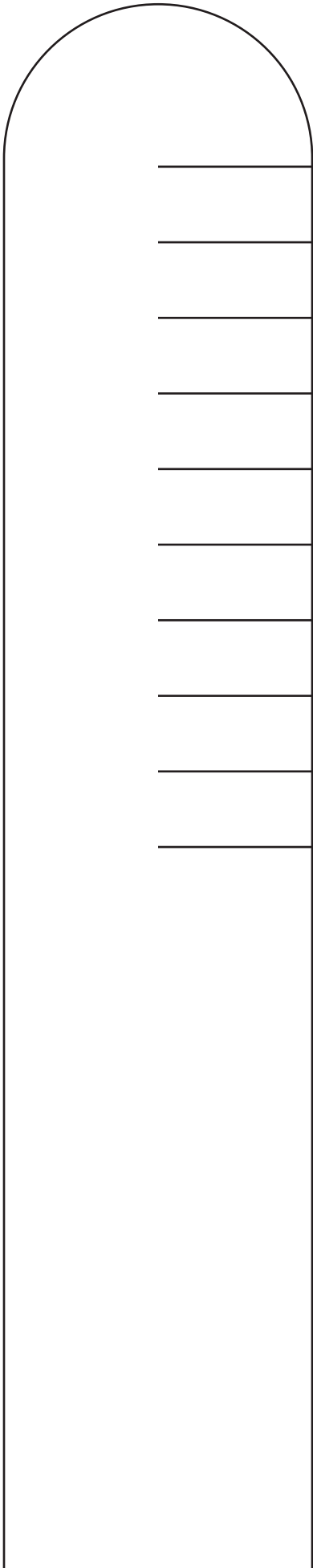






craft foam  
rectangle template



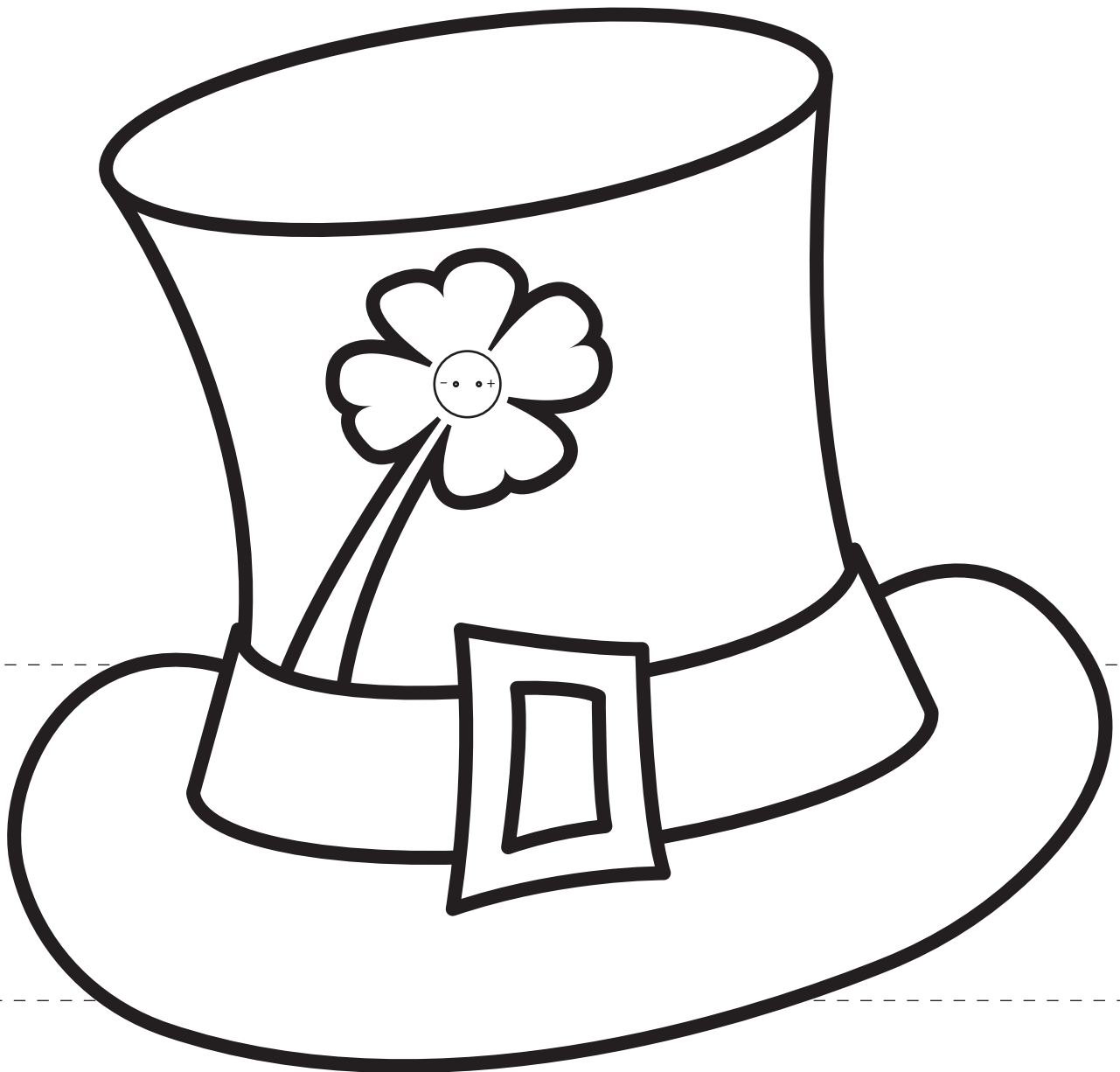


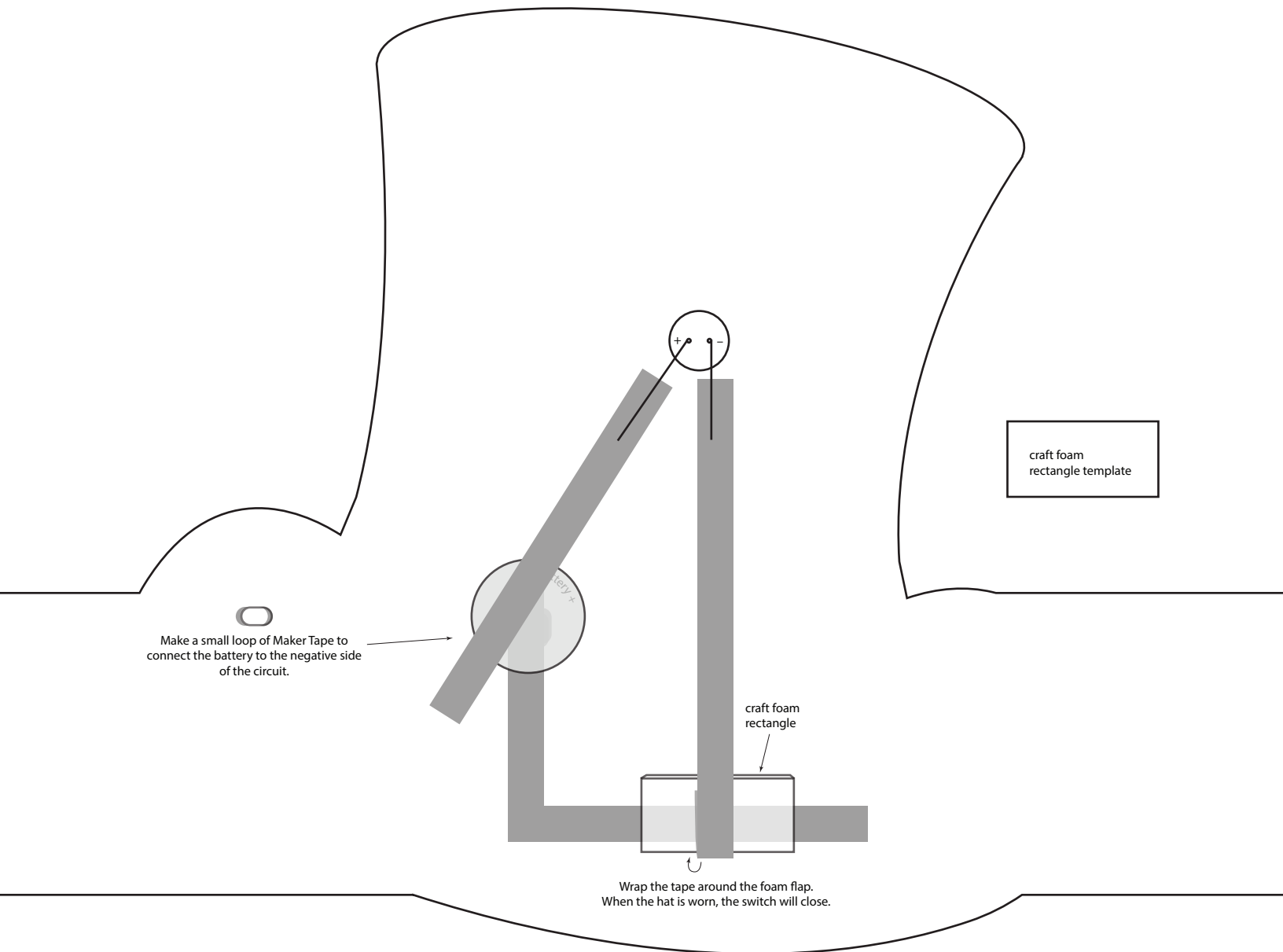


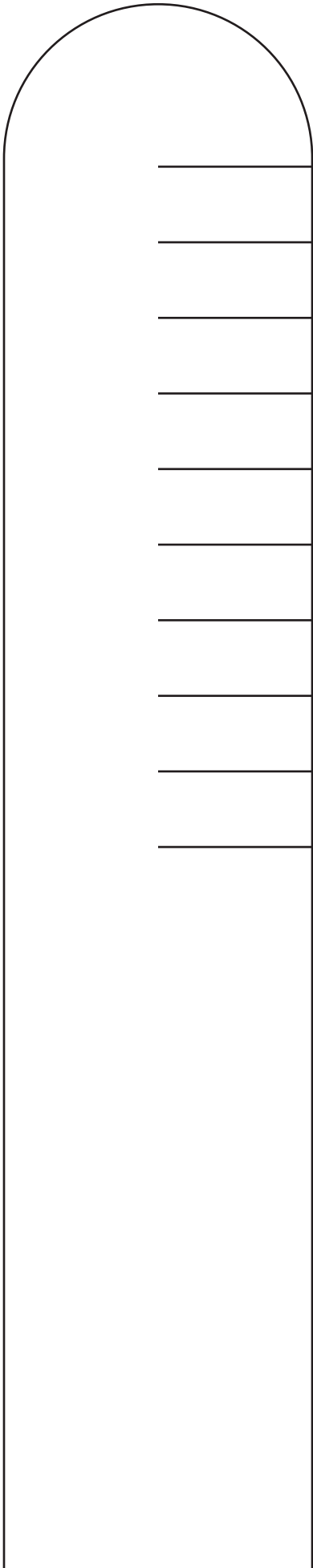
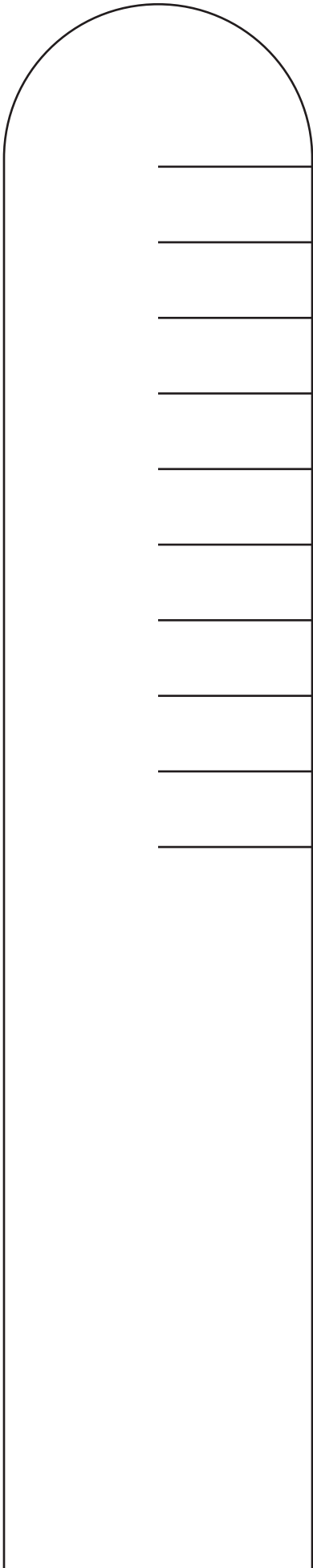
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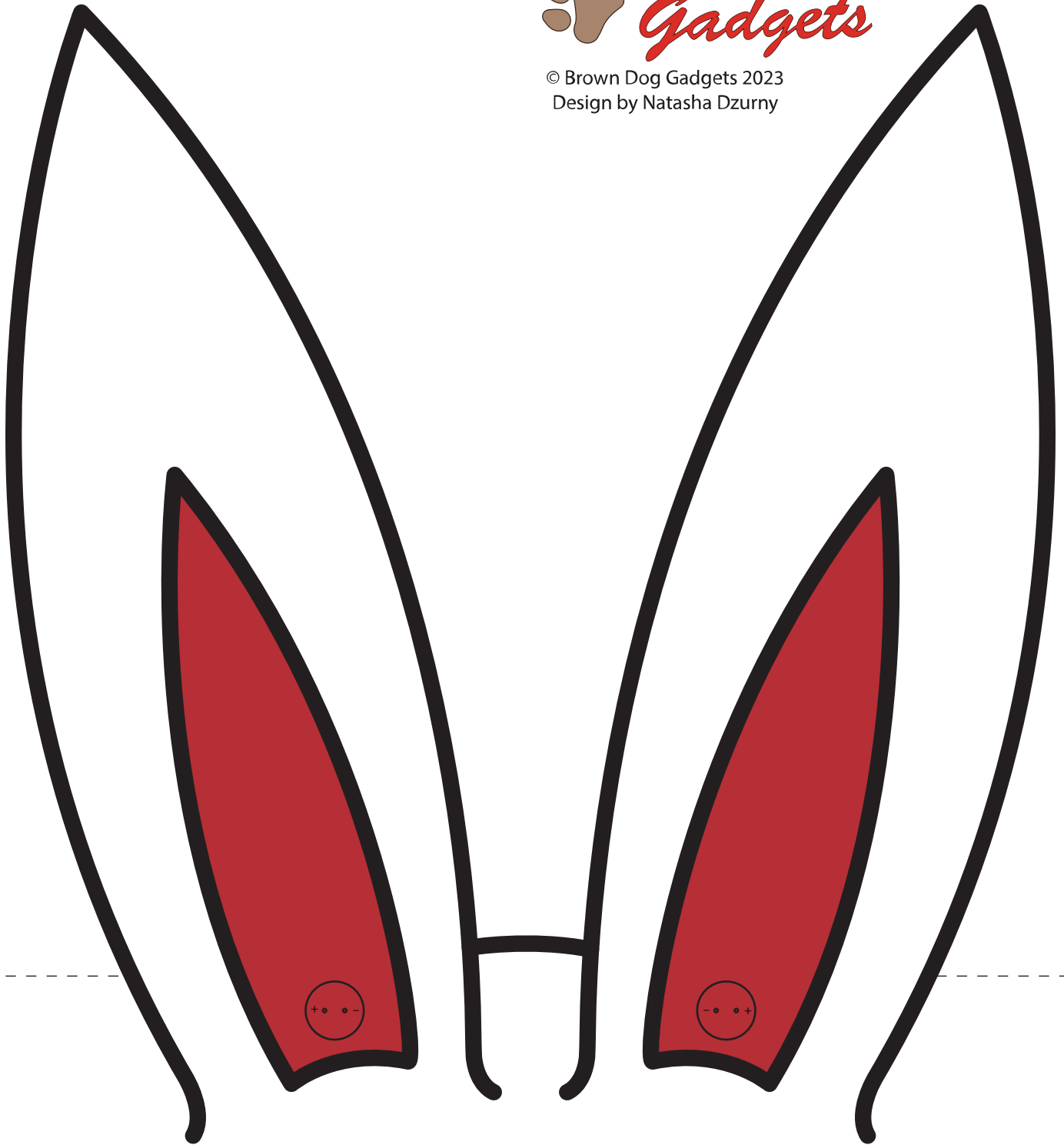


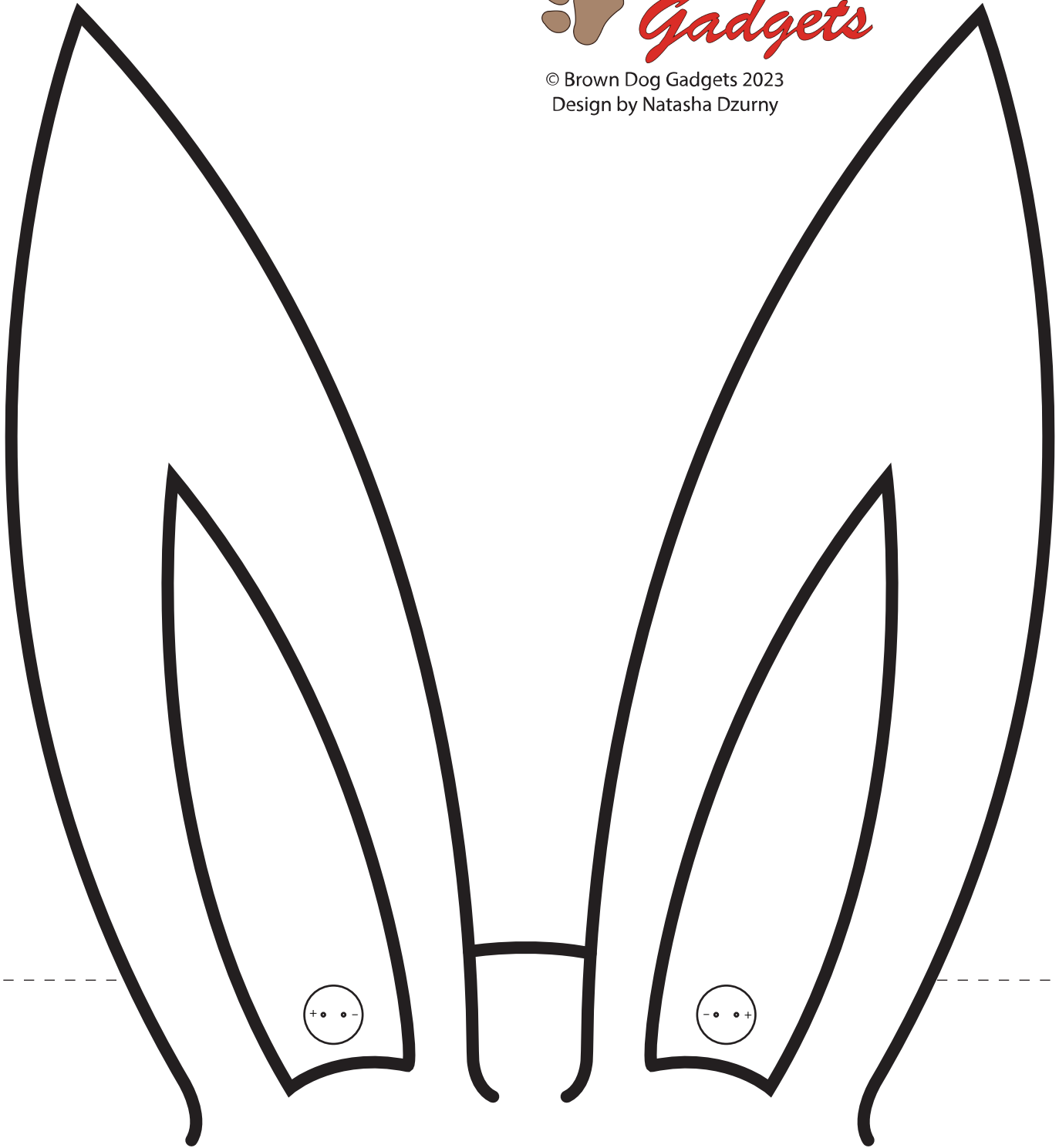




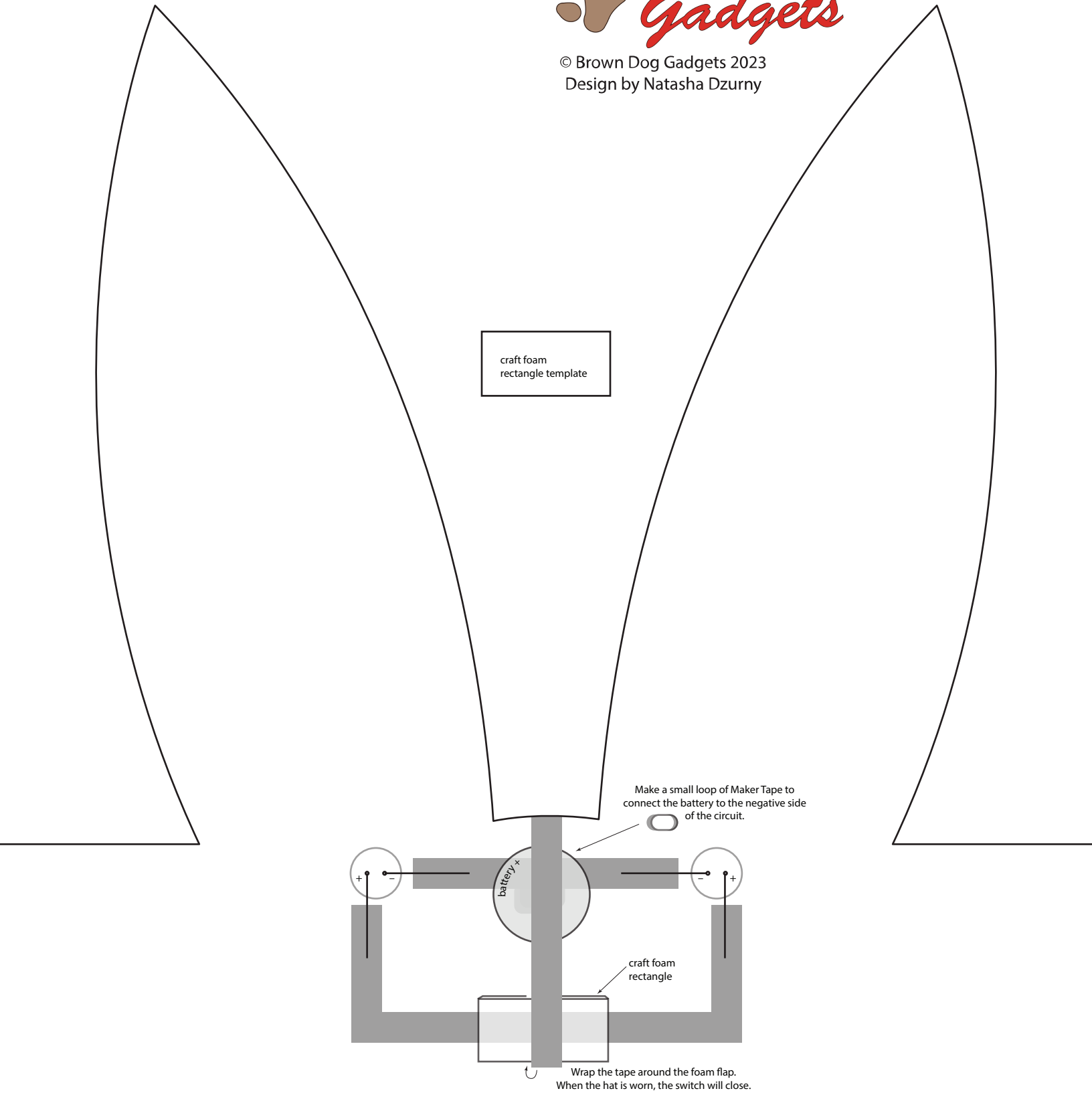


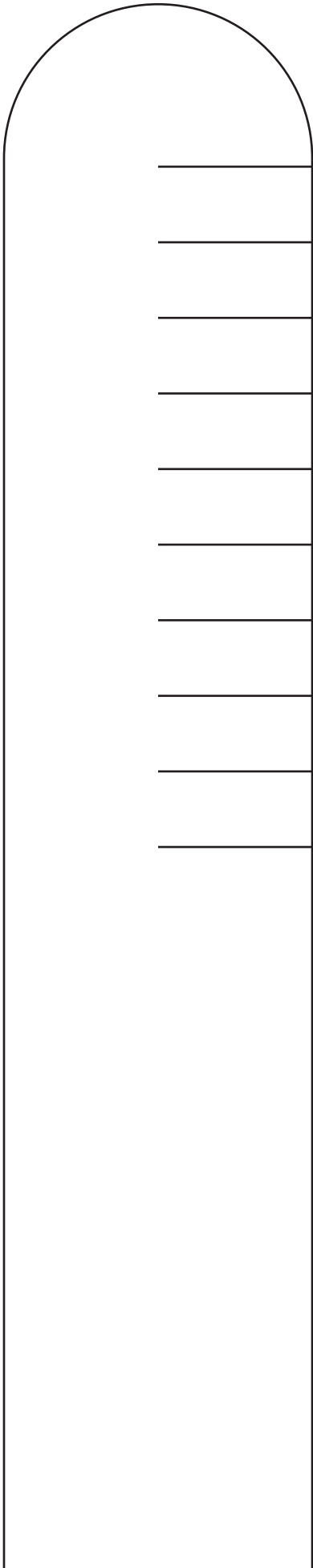
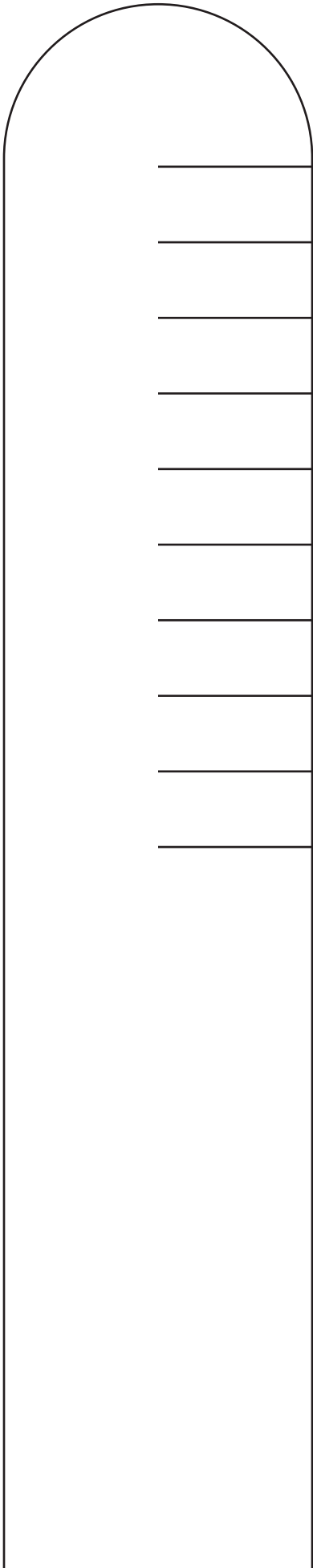
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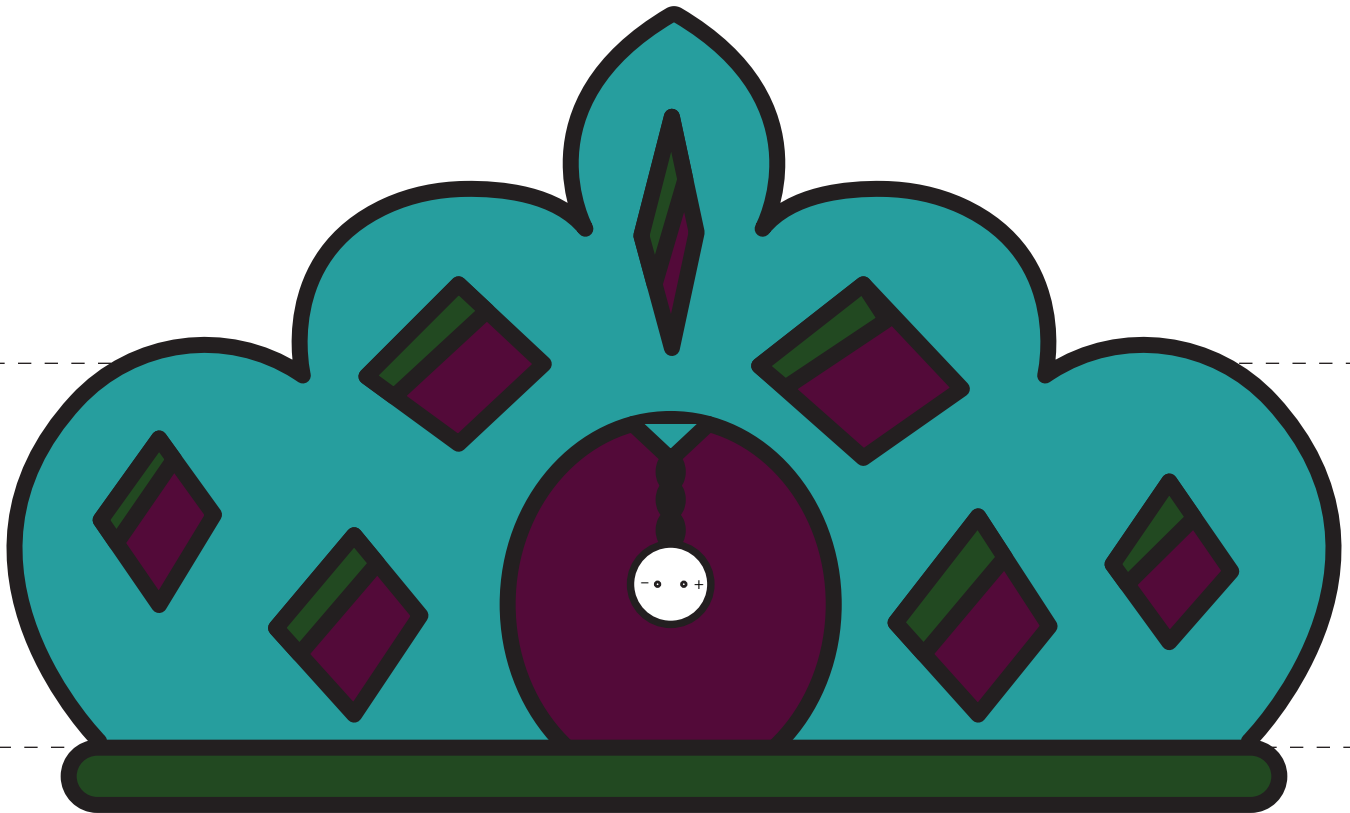
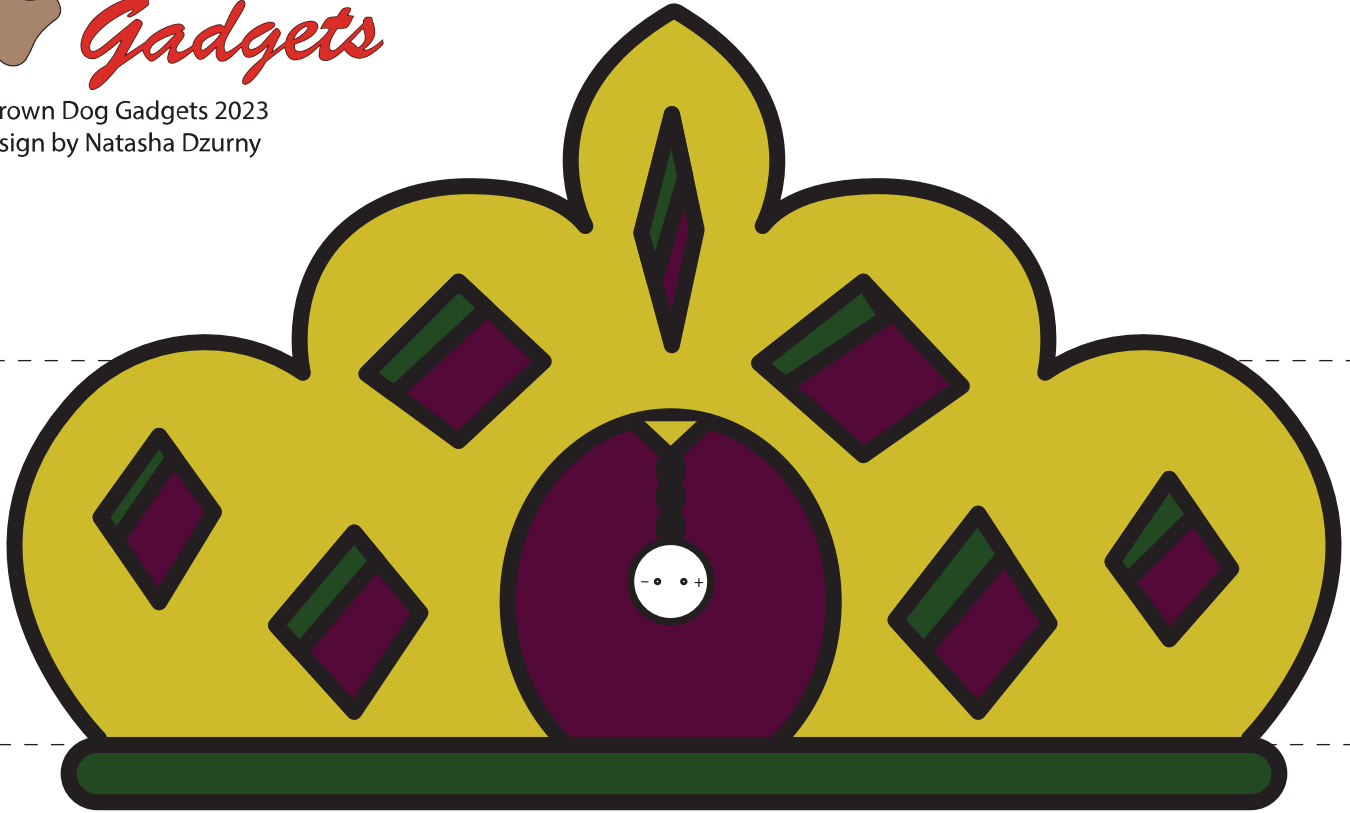


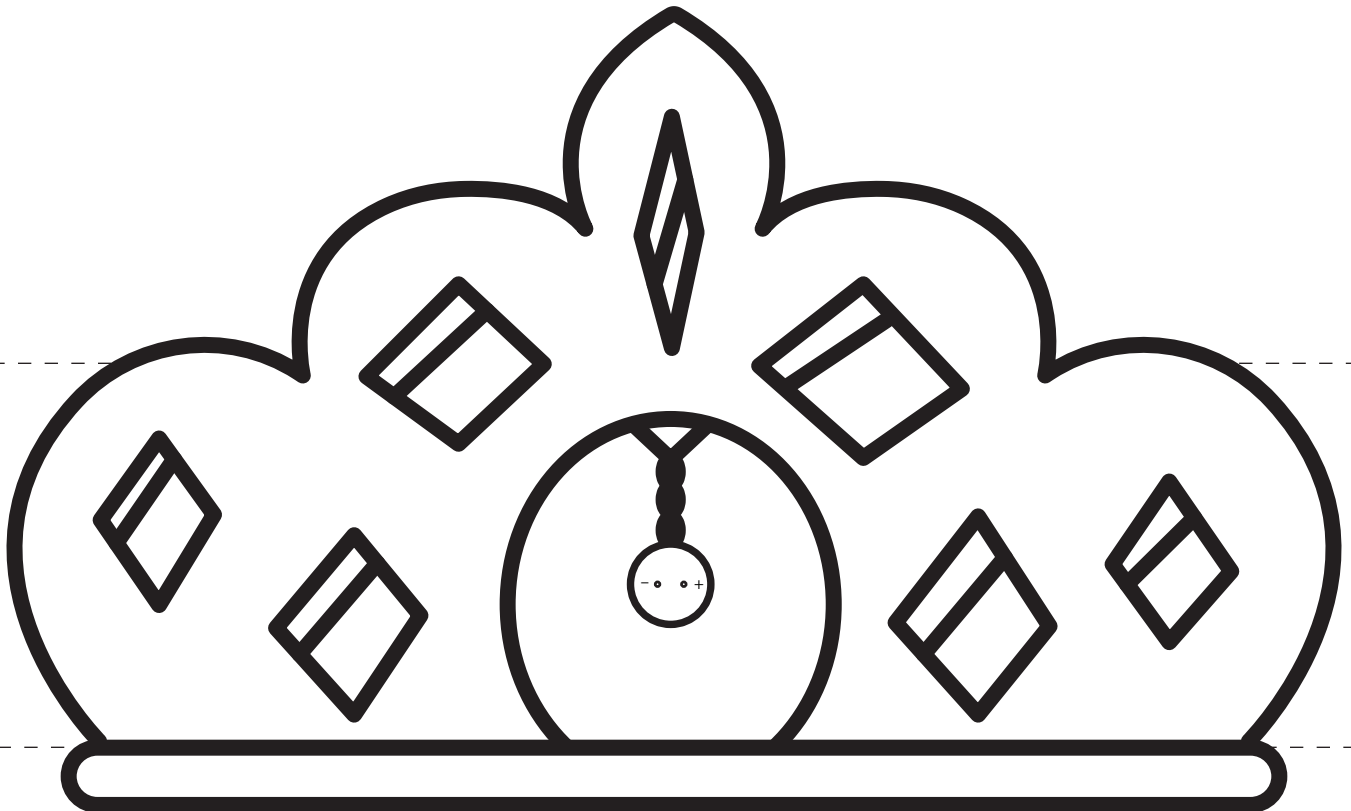
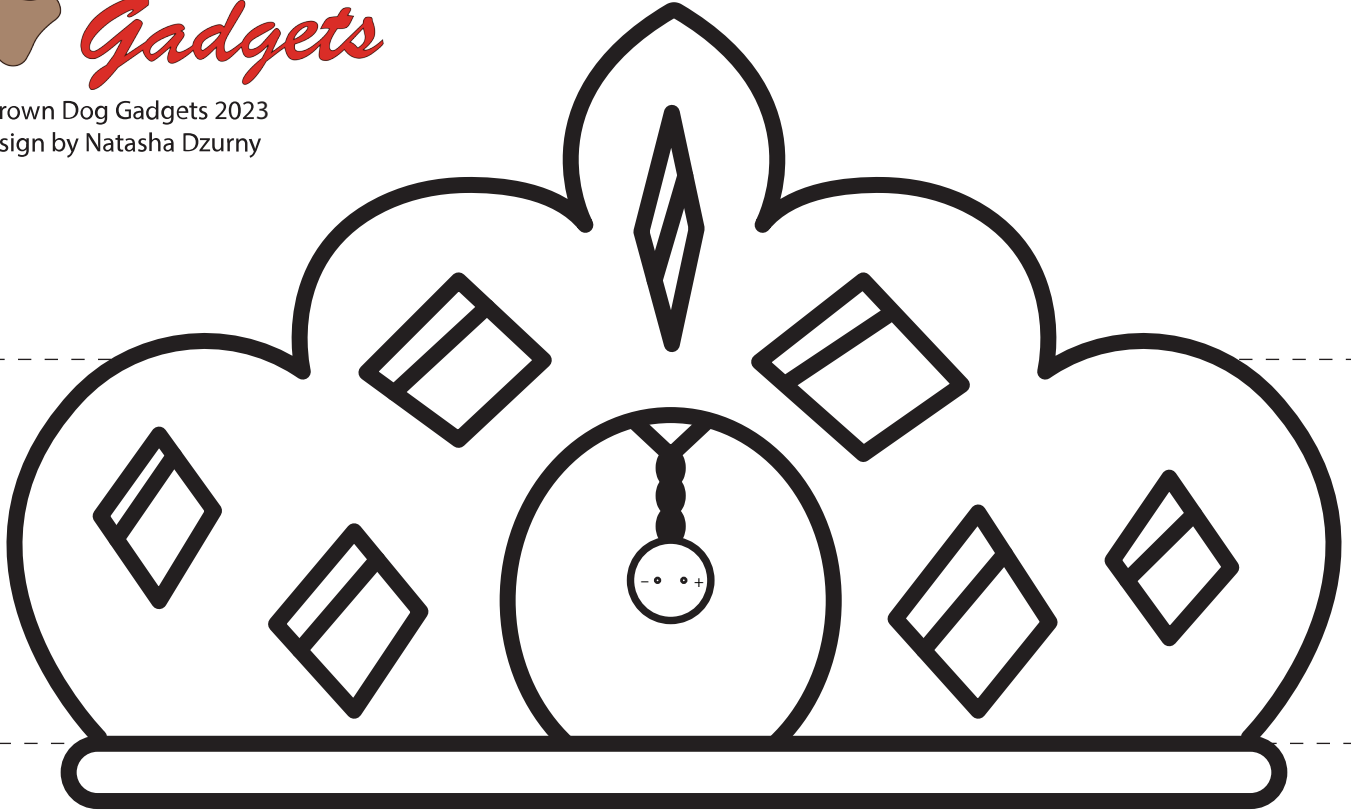










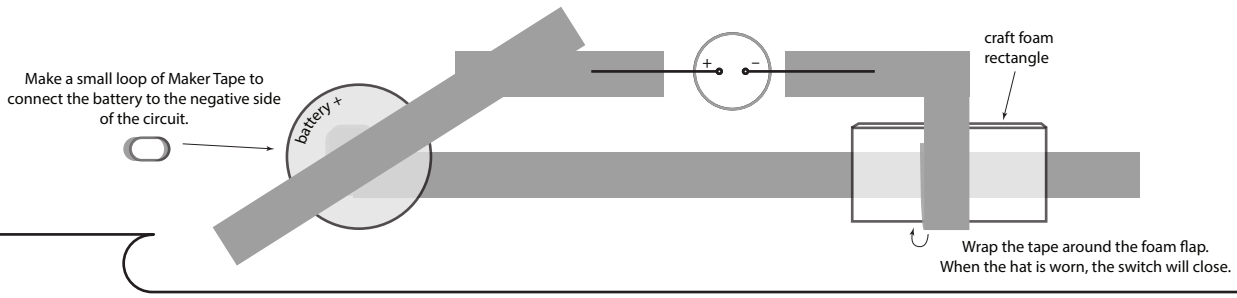




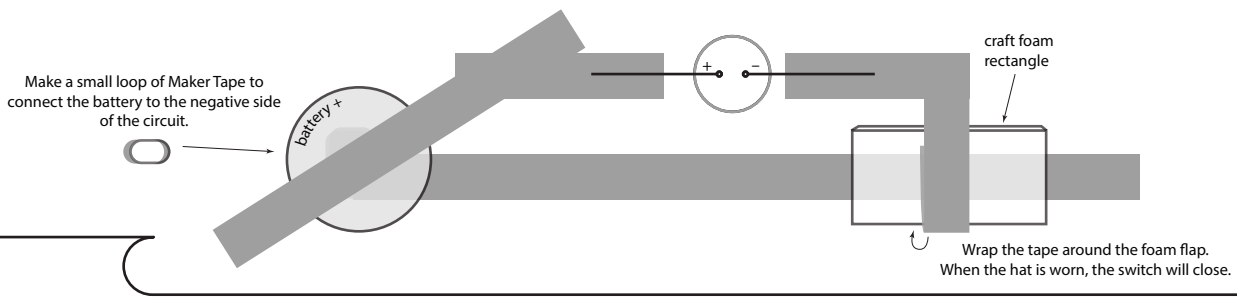
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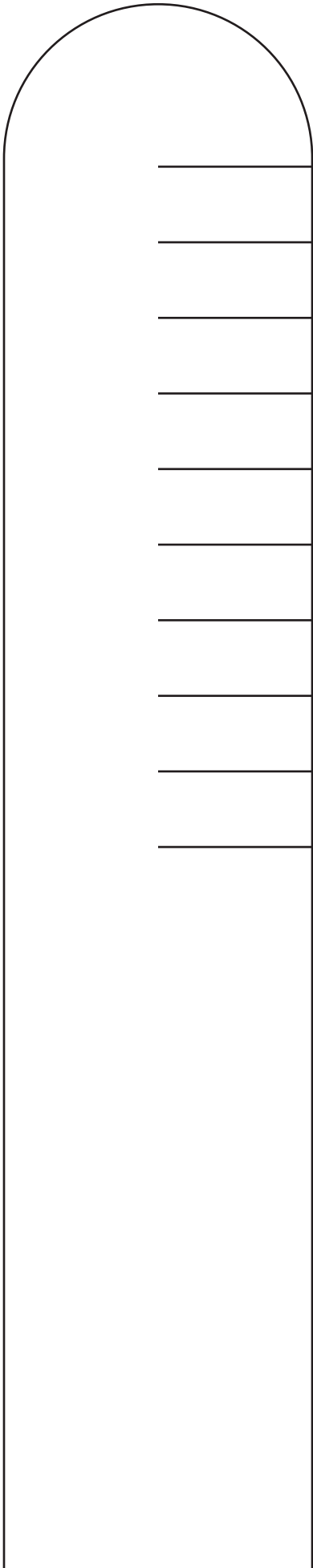
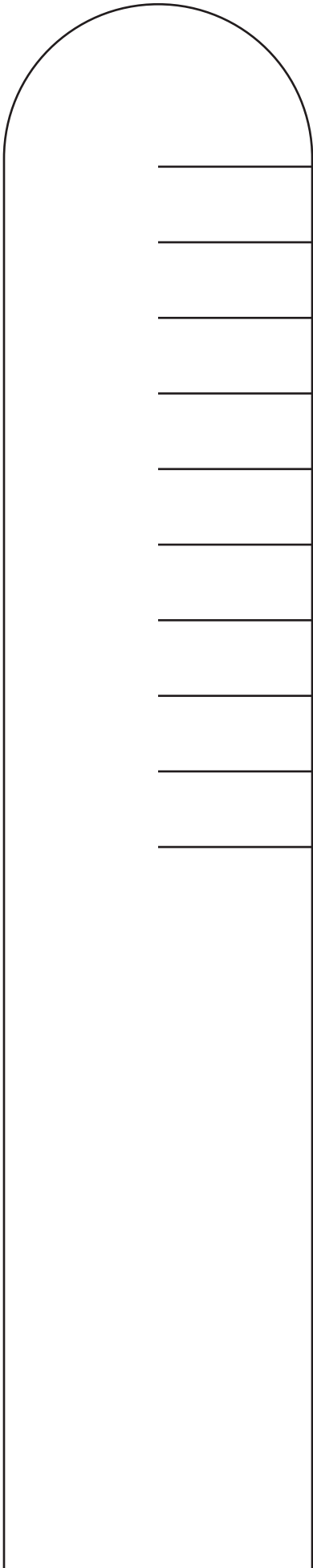
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craft foam  
rectangle template



craft foam  
rectangle template







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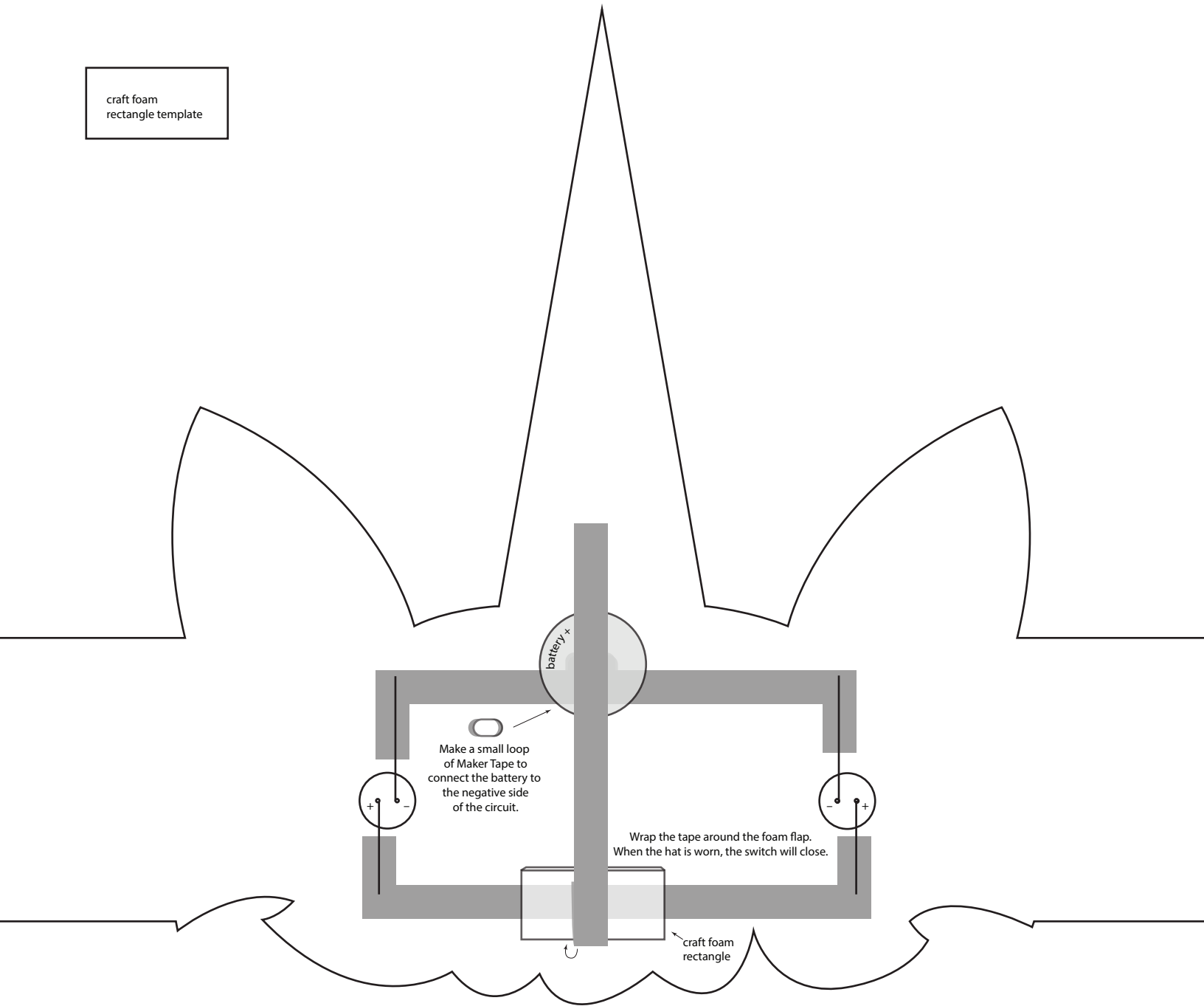
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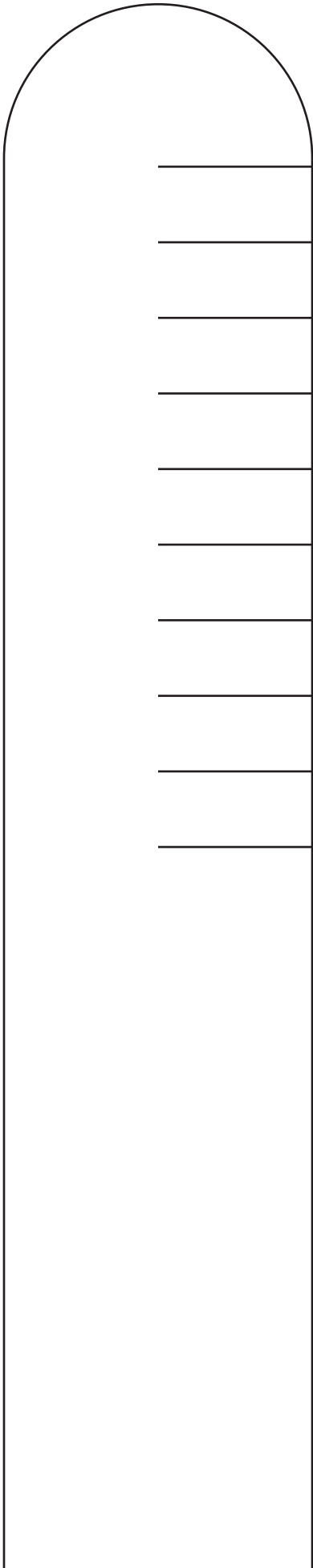
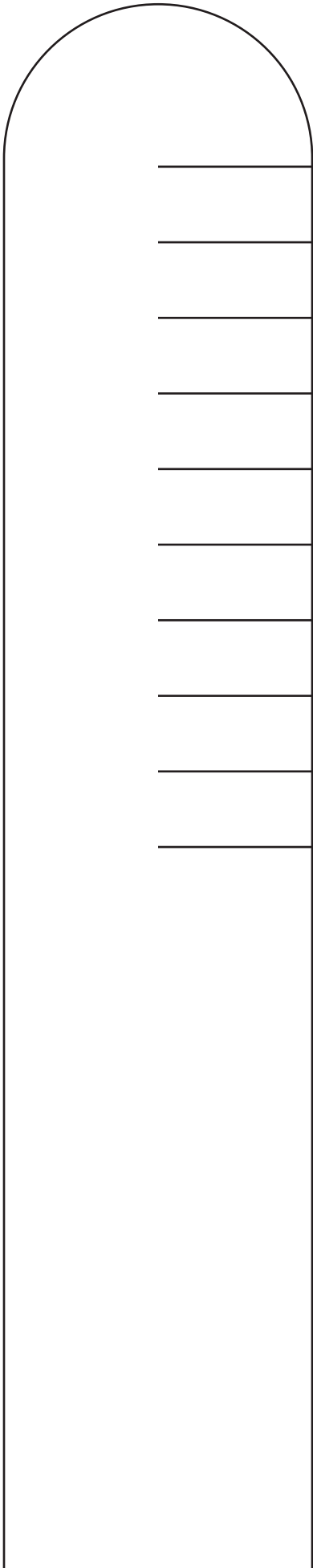


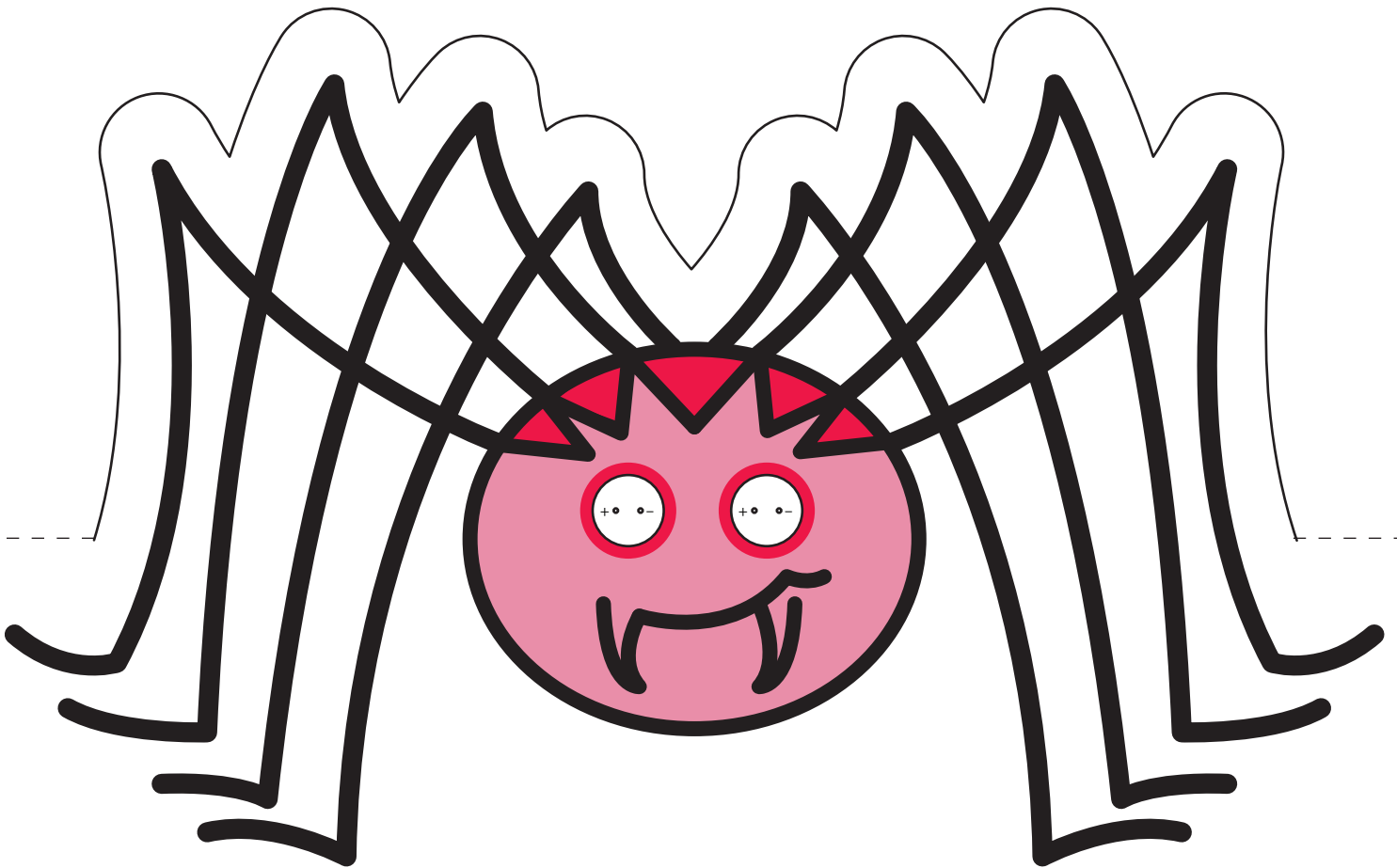


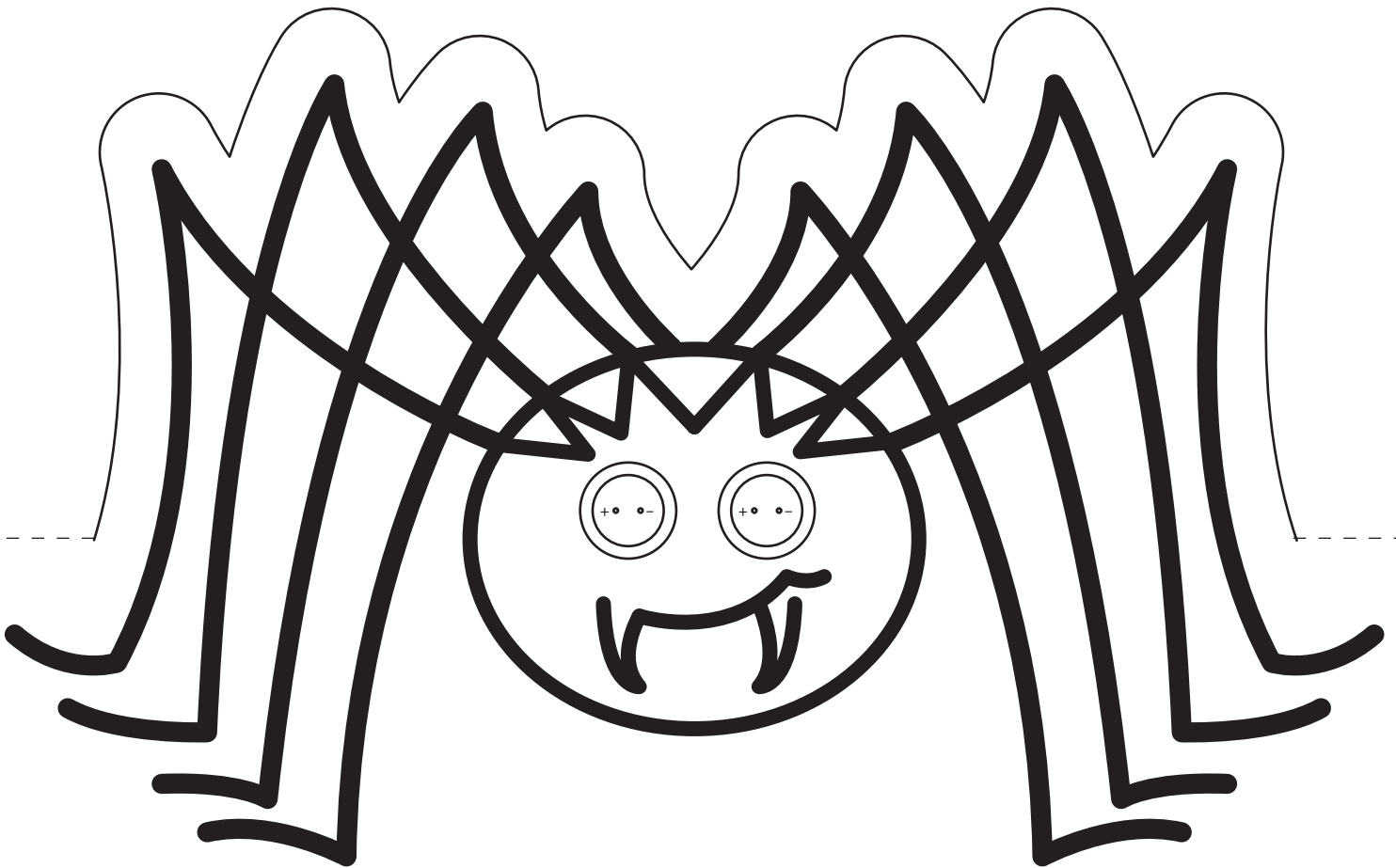


craft foam  
rectangle template

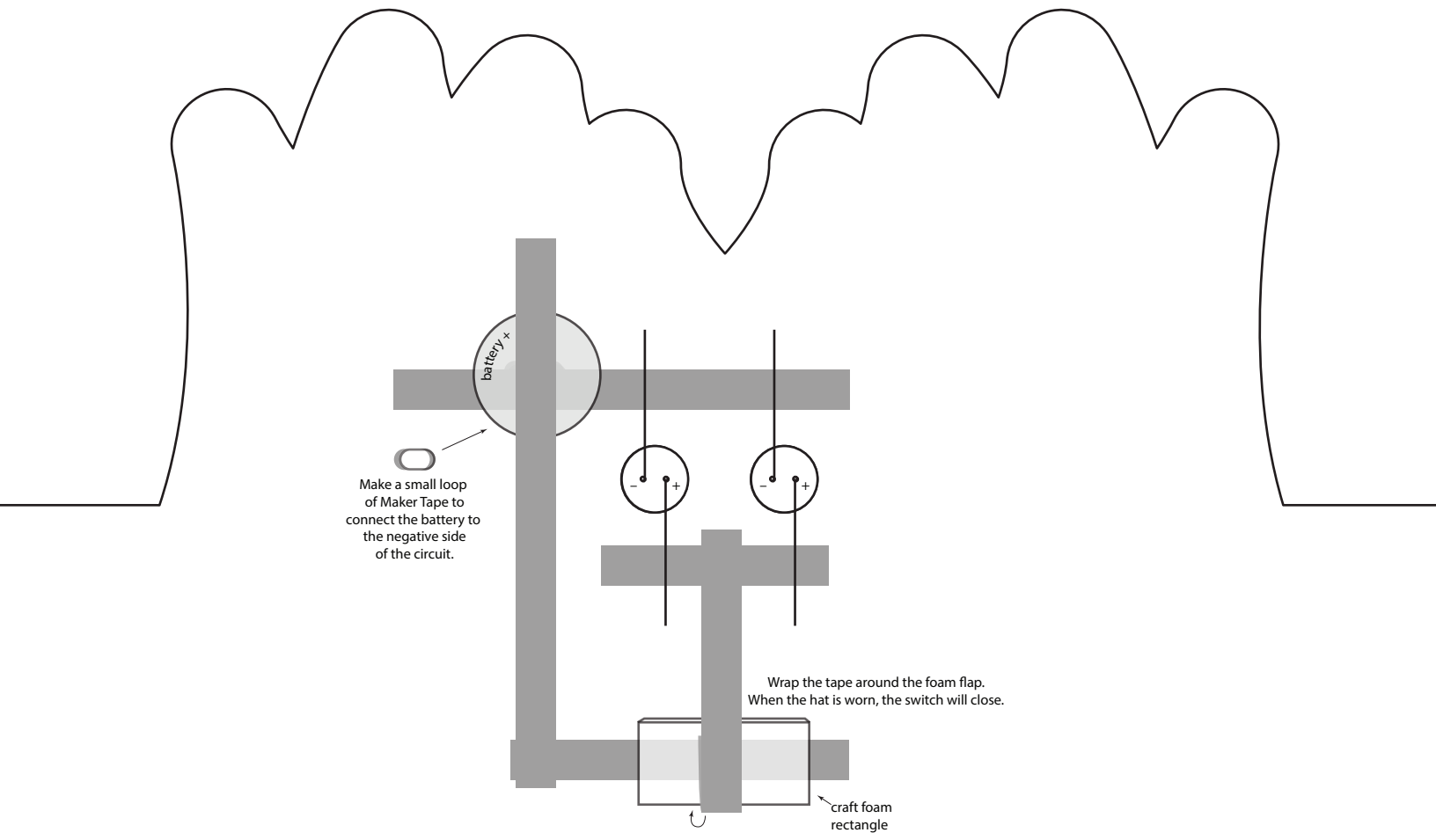


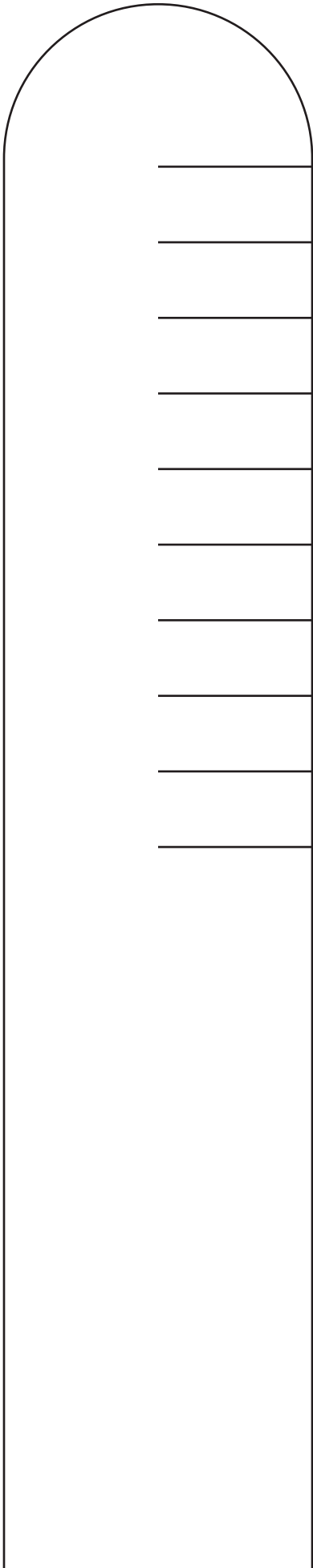
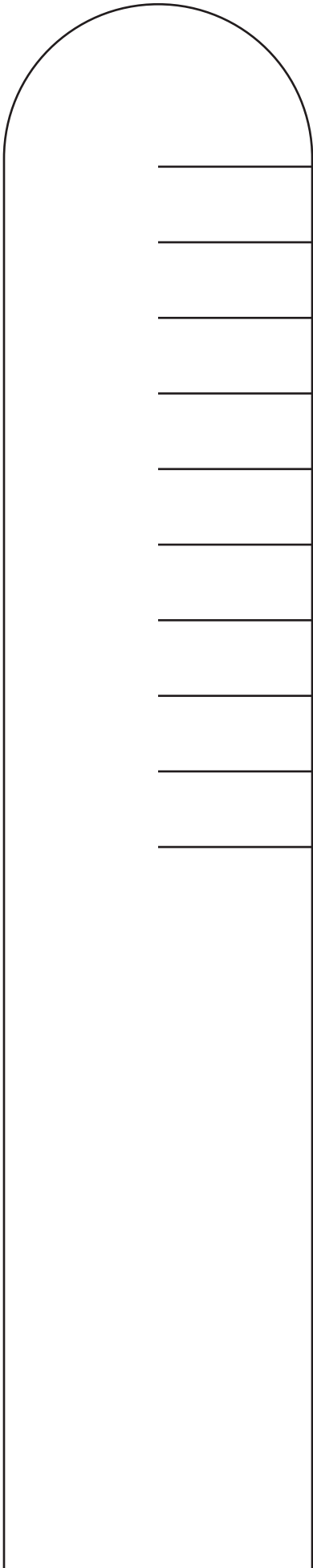






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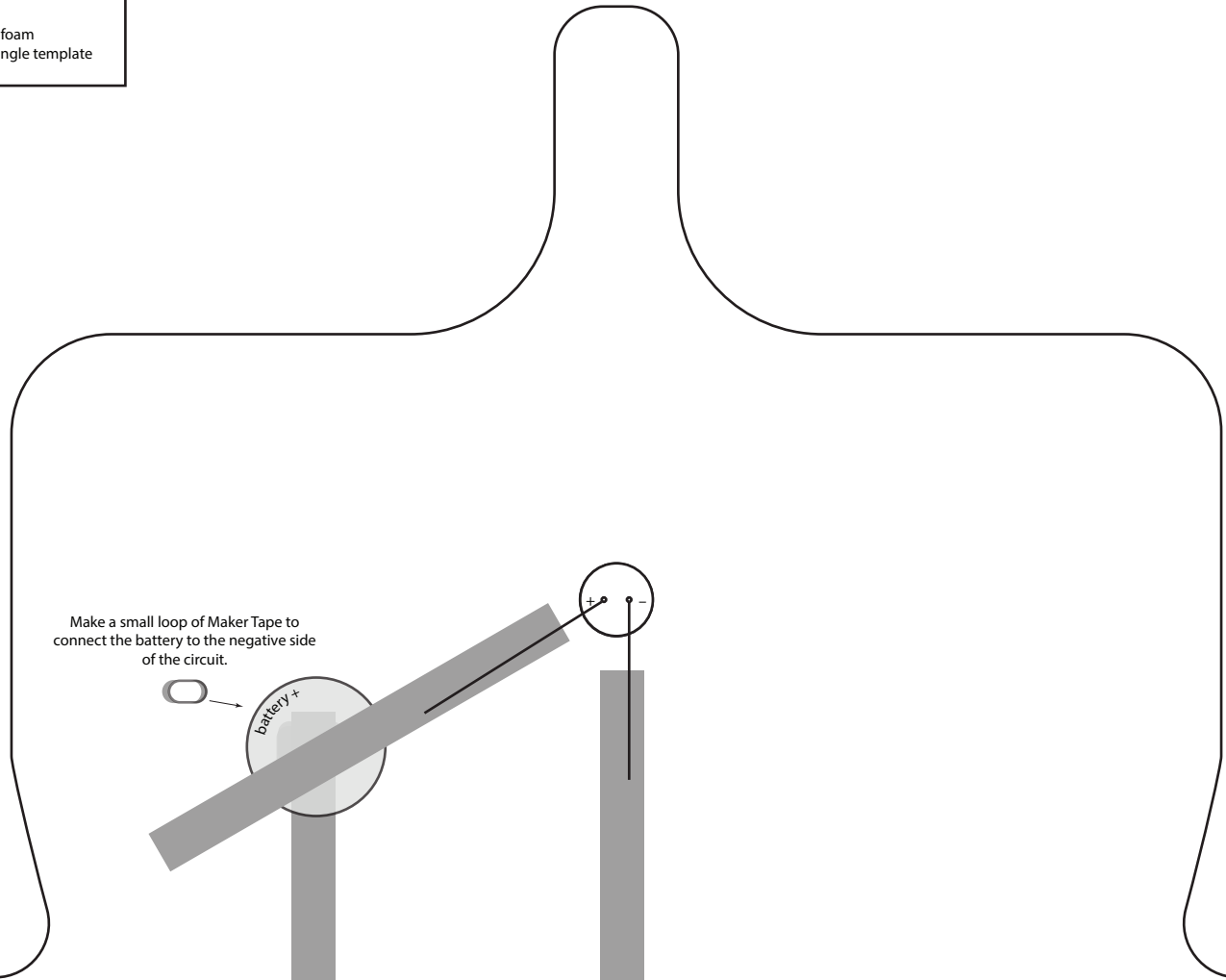




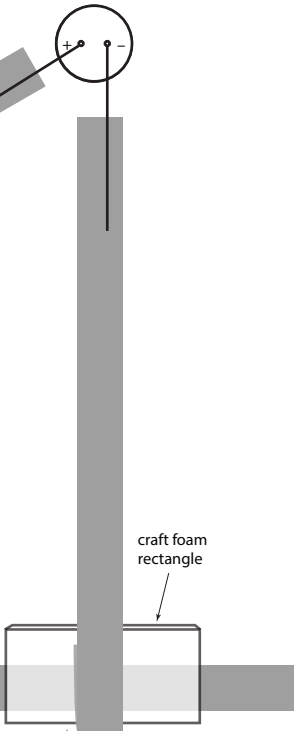
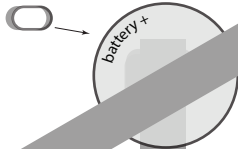




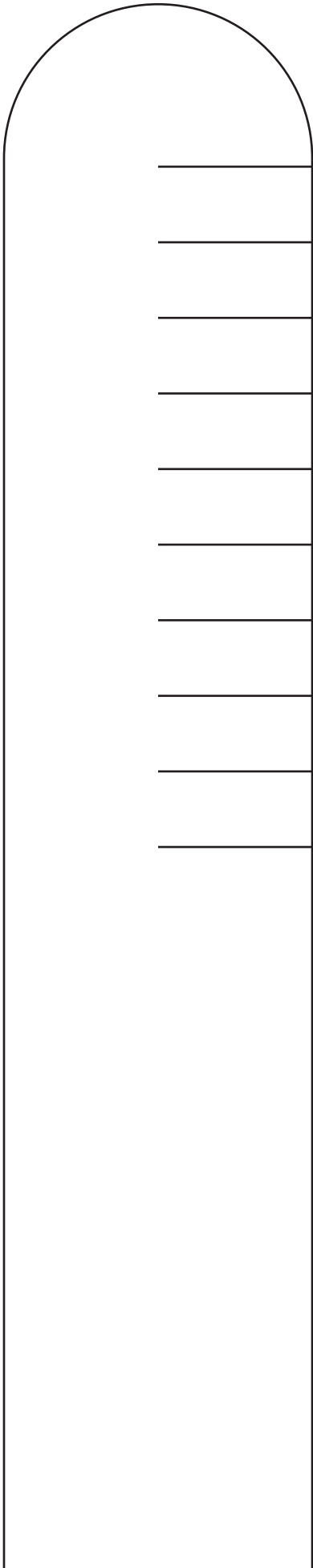
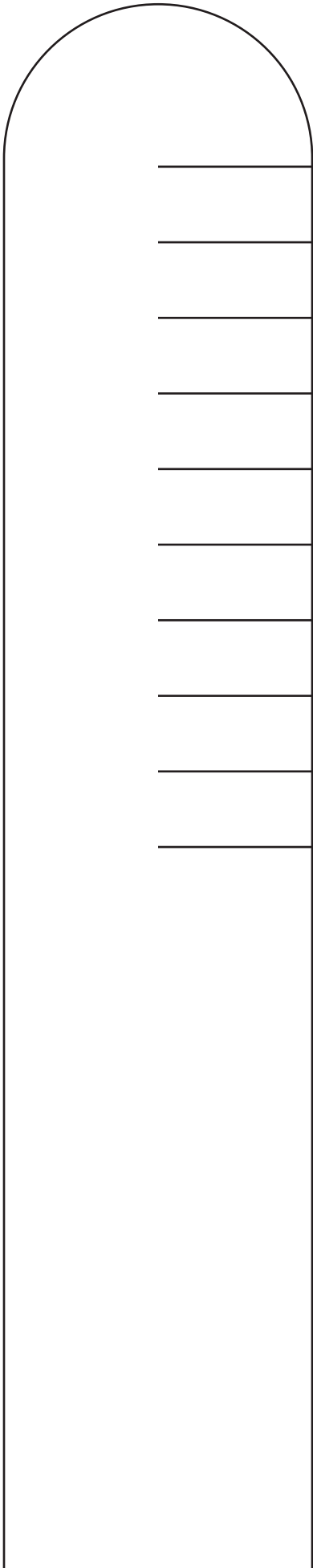
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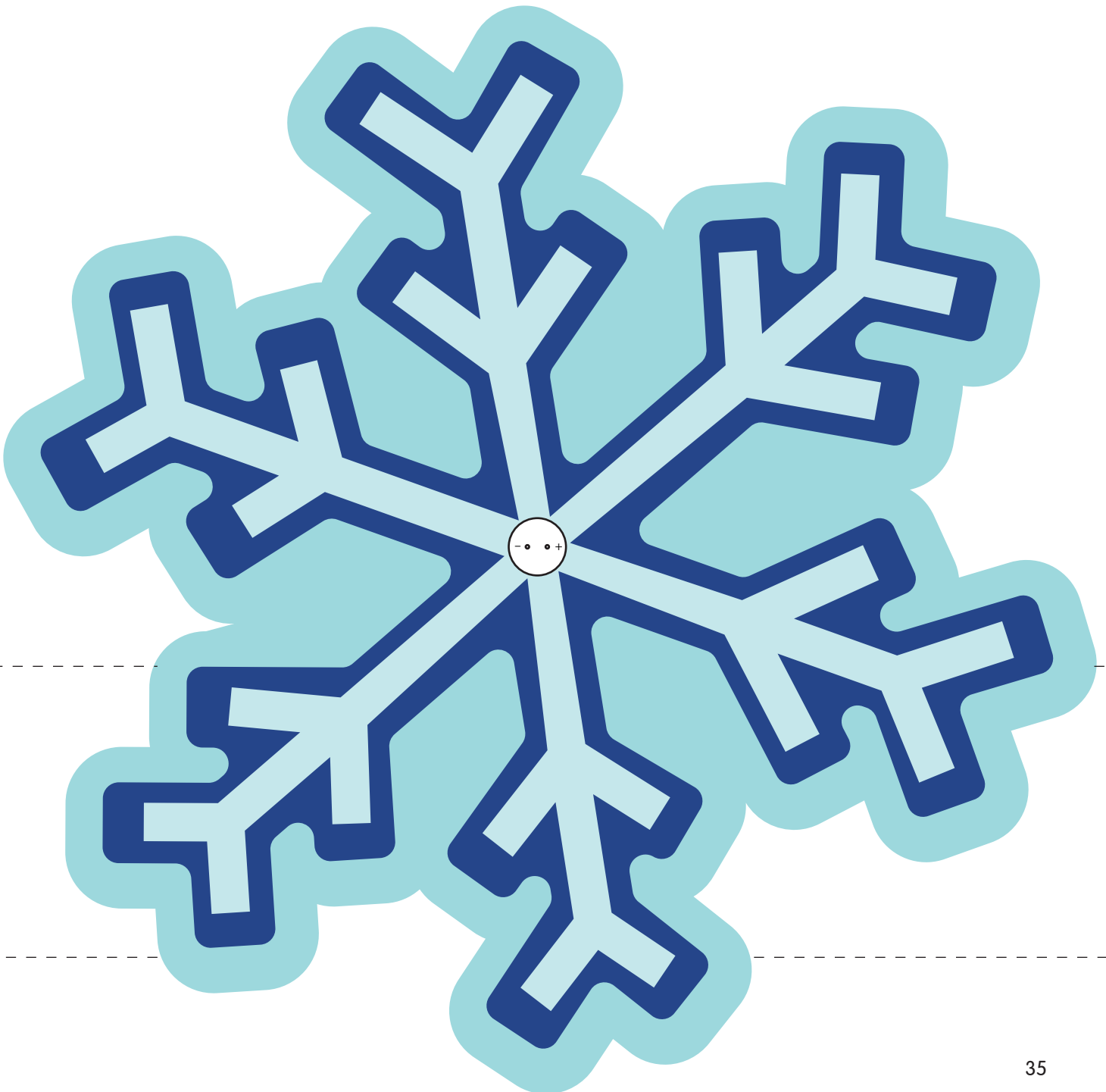


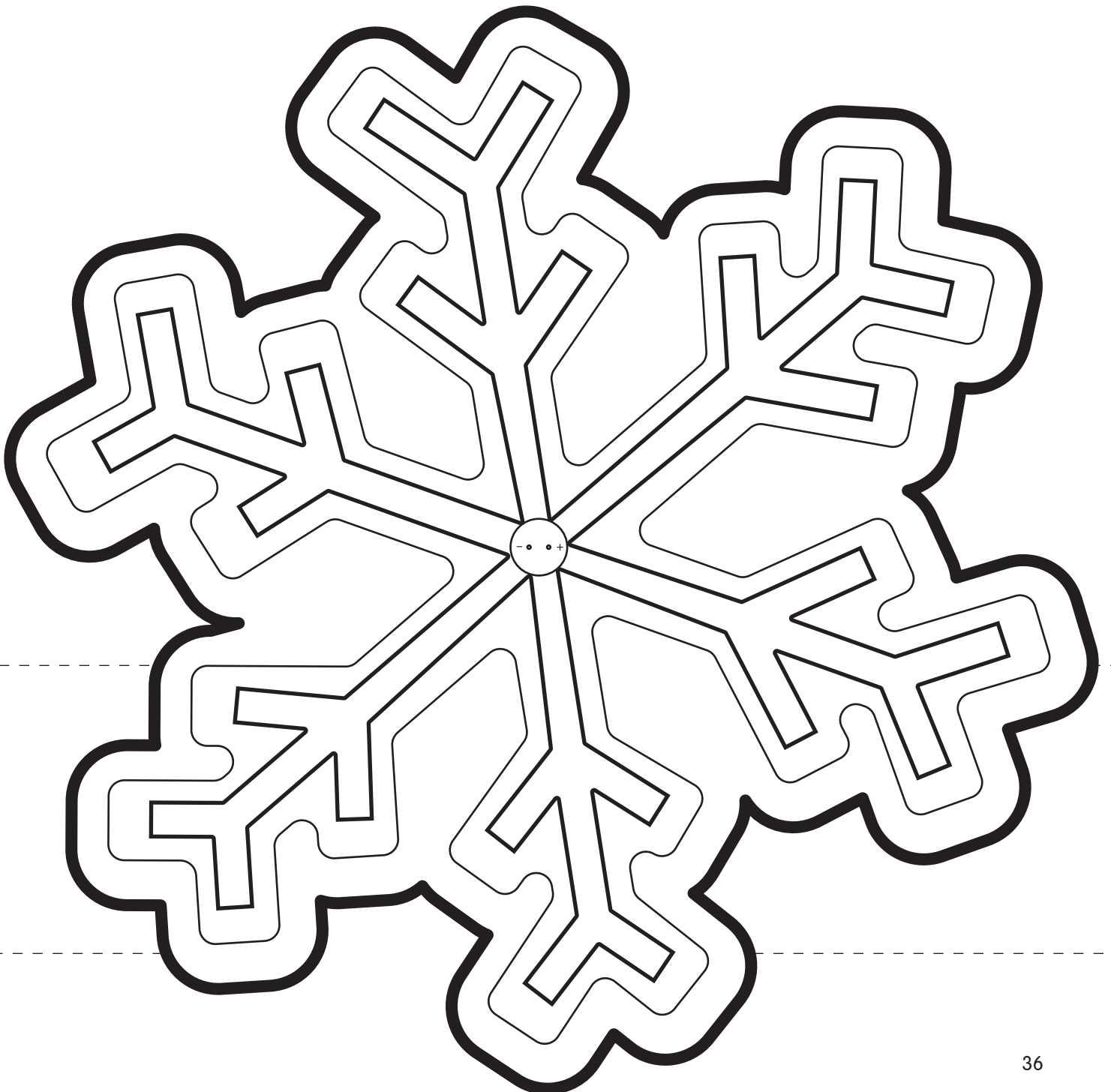
Make a small loop of Maker Tape to connect the battery to the negative side of the circuit.



Wrap the tape around the foam flap.  
When the hat is worn, the switch will close.










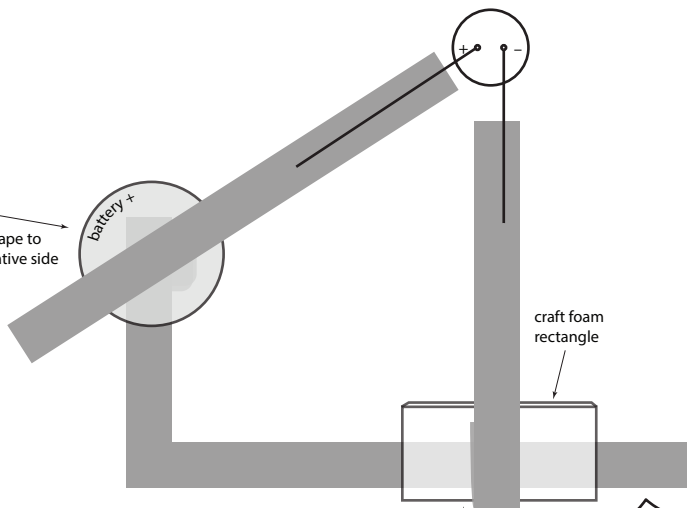
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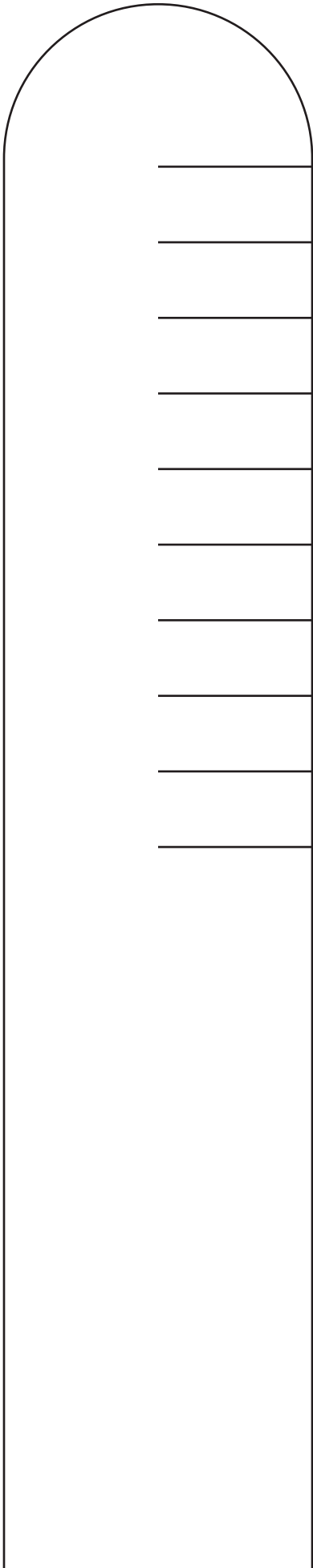
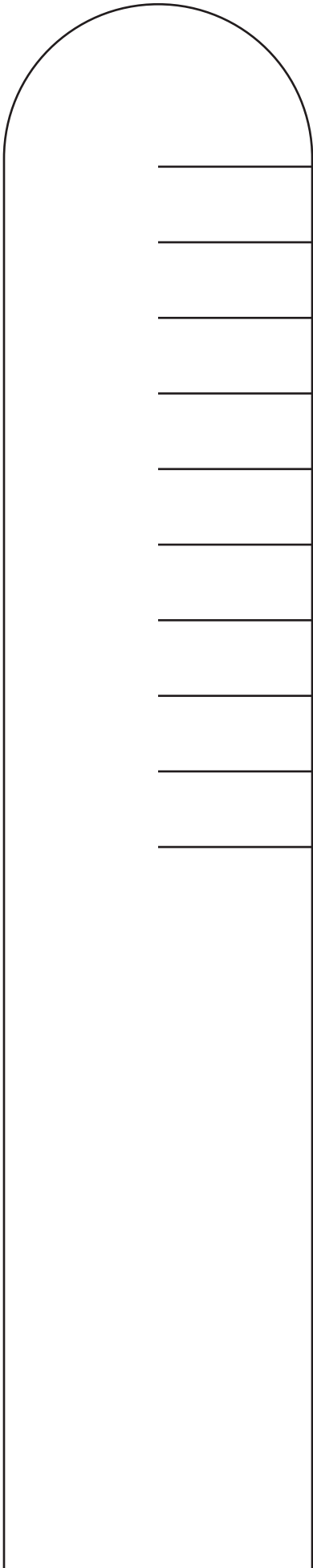
craft foam  
rectangle template



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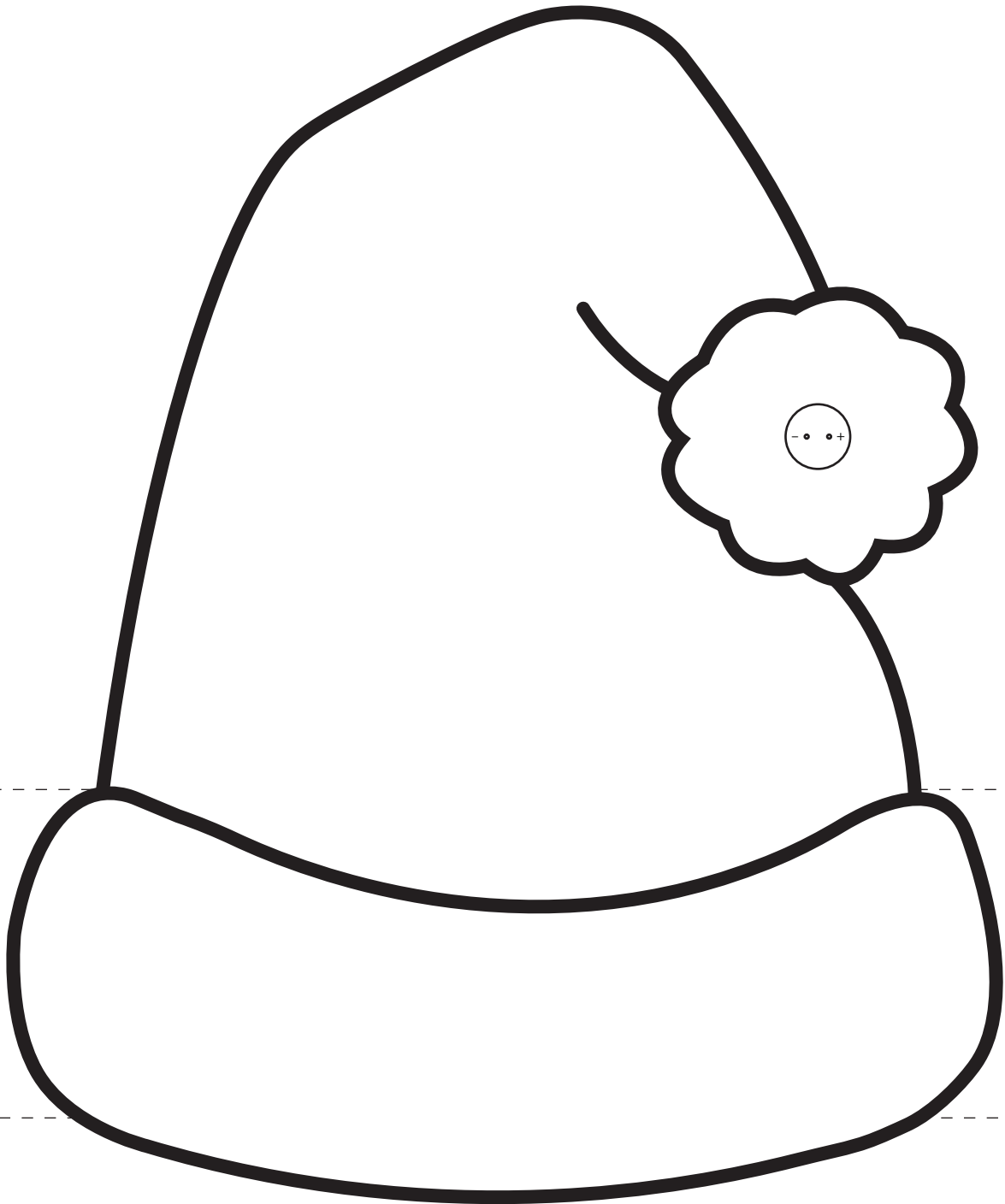




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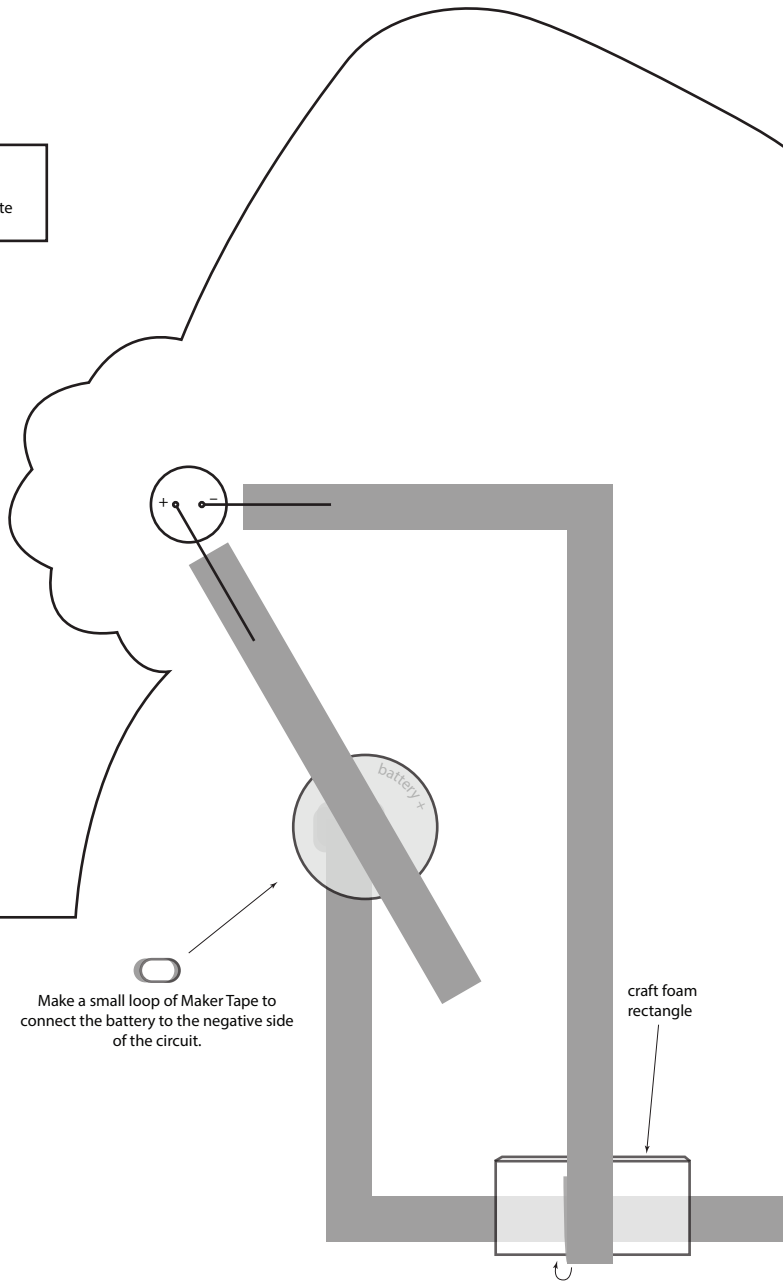




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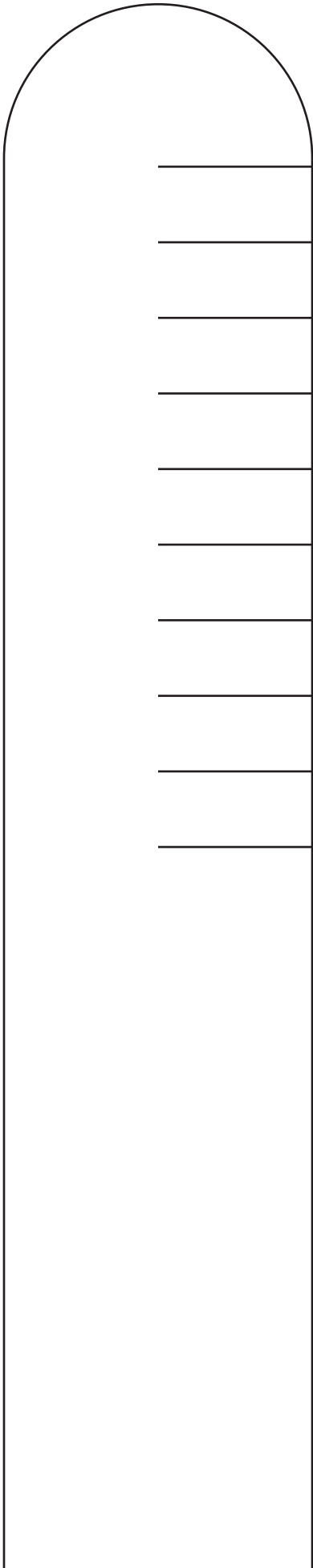
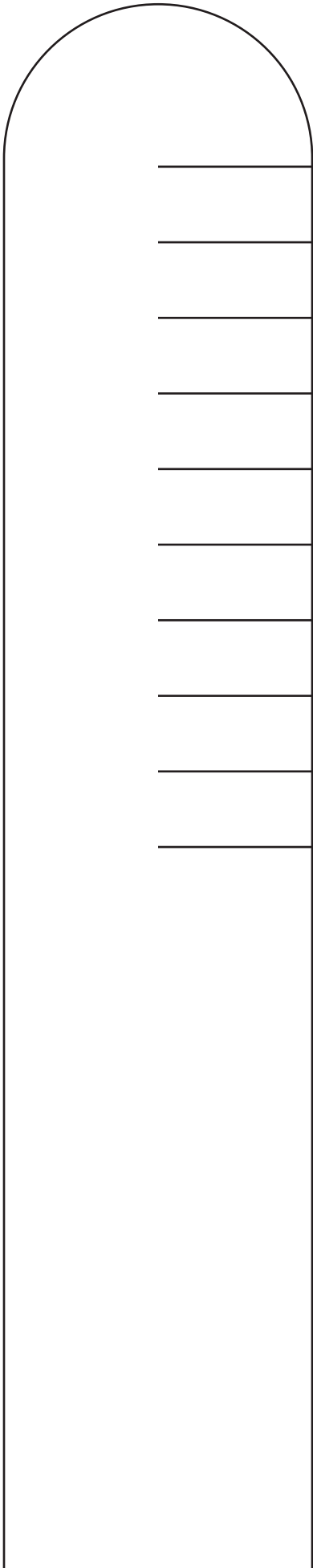
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craft foam  
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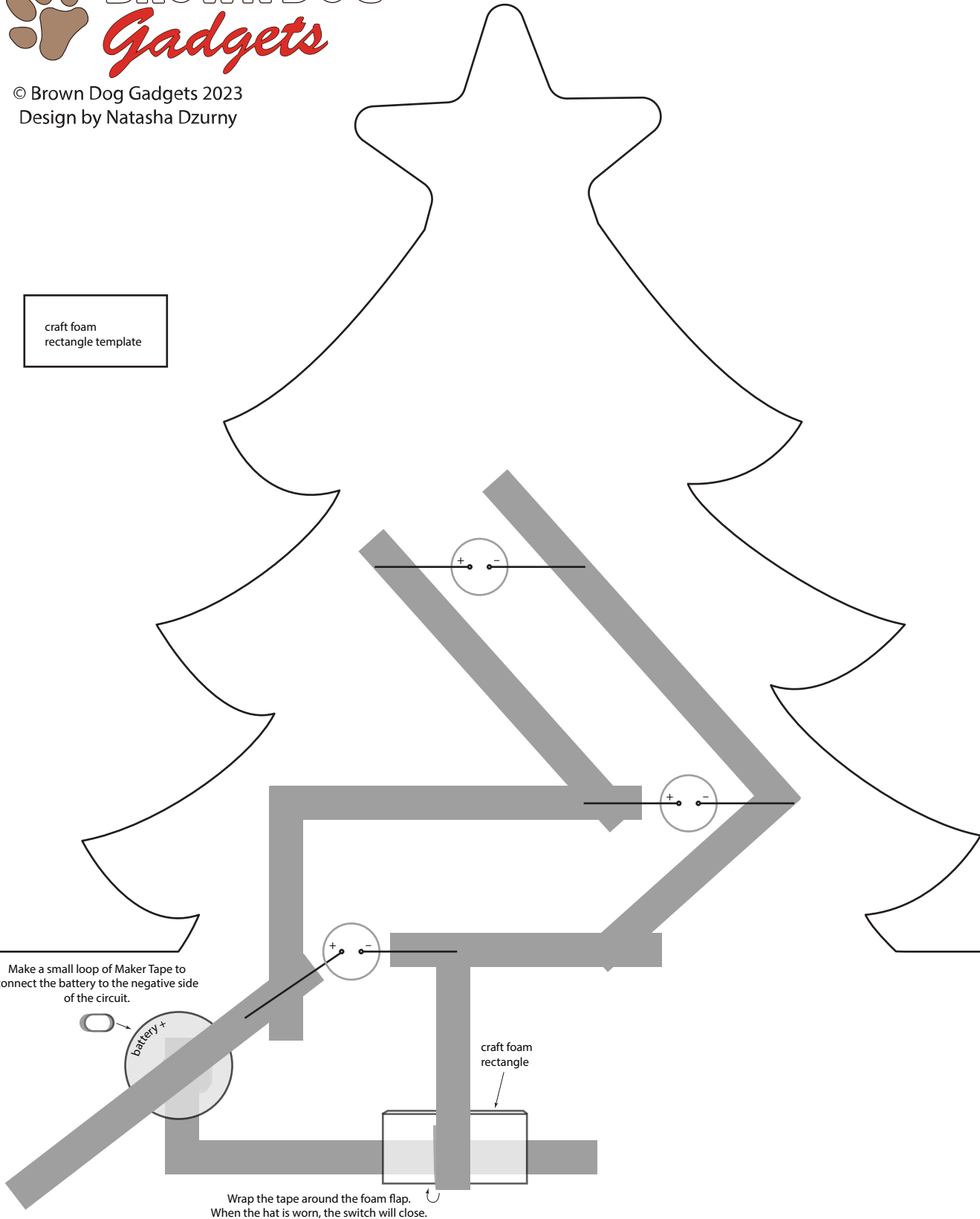




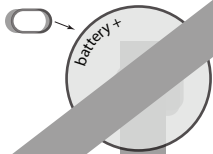
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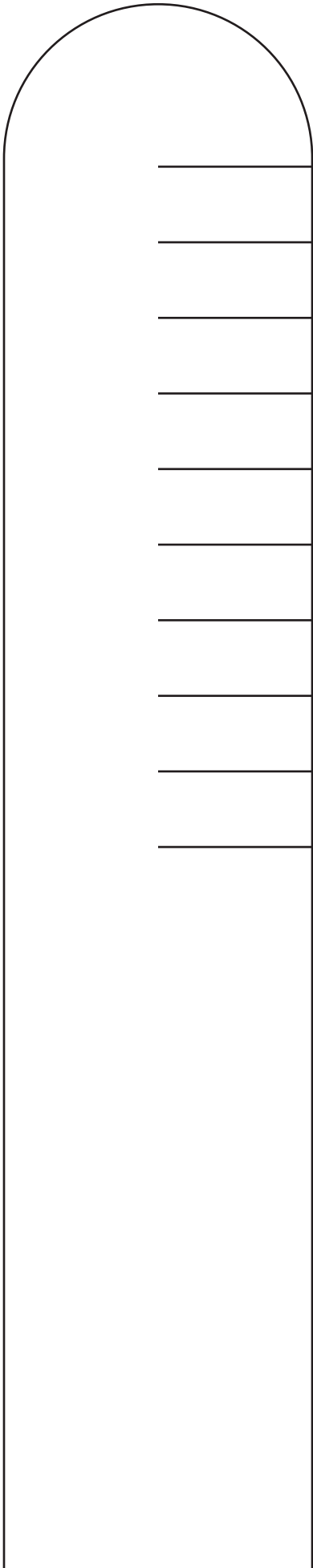
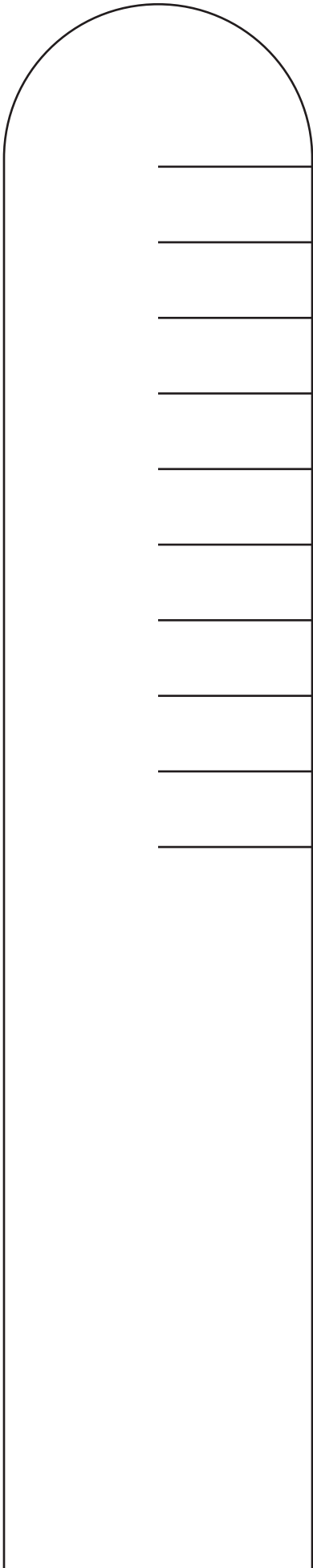


Make a small loop of Maker Tape to connect the battery to the negative side of the circuit.



craft foam  
rectangle

Wrap the tape around the foam flap.  
When the hat is worn, the switch will close.

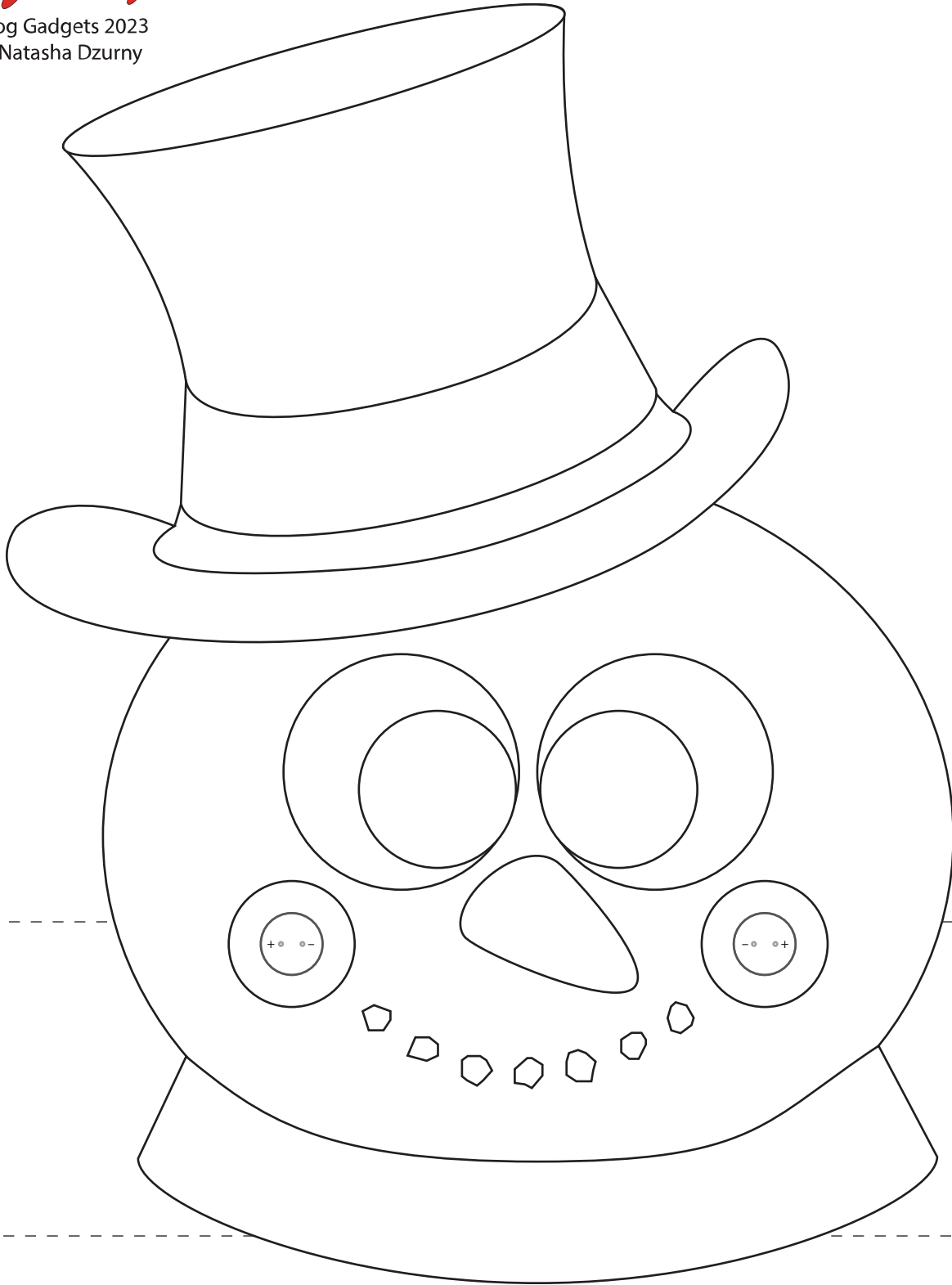






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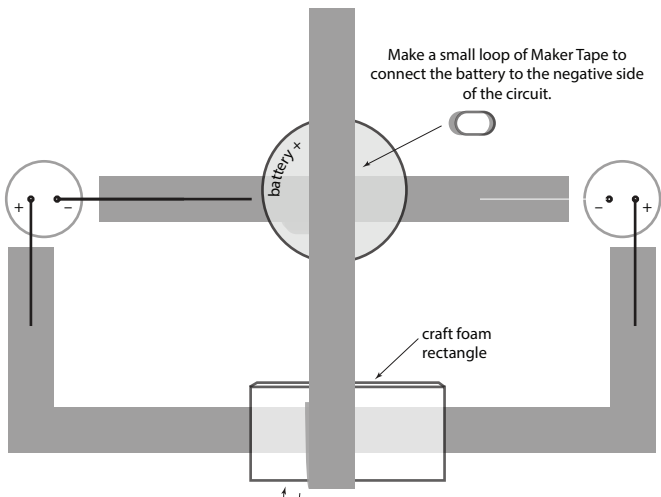
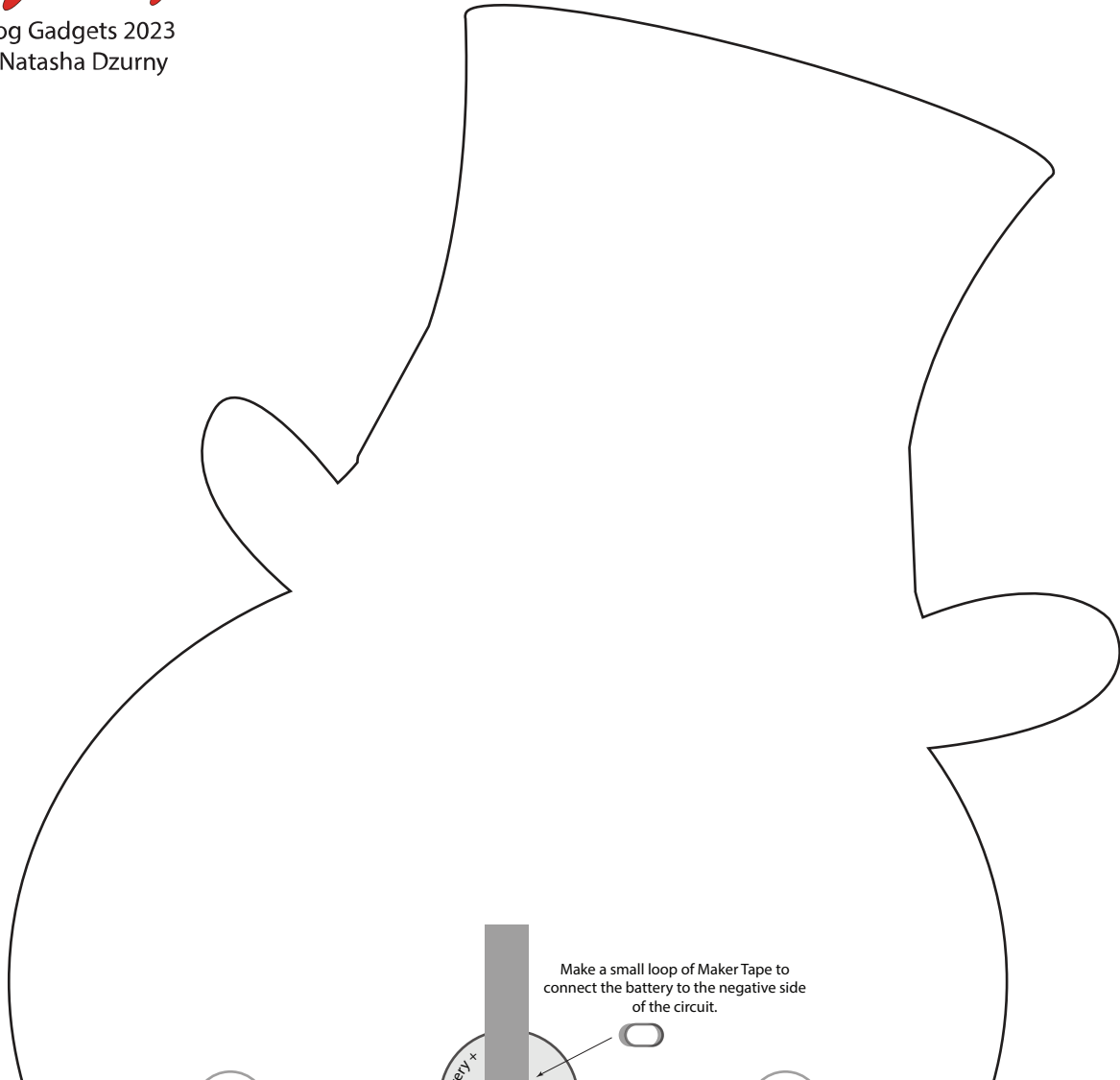






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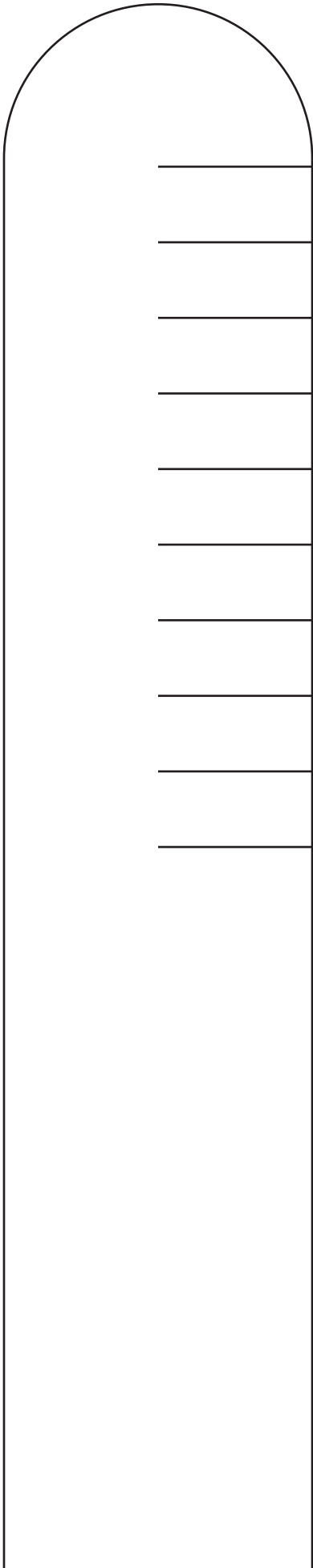
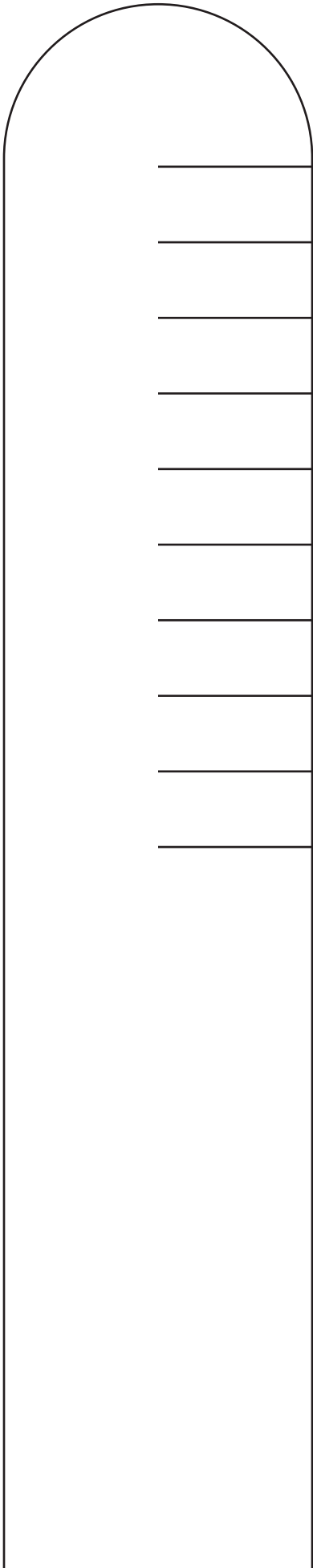


Make a small loop of Maker Tape to connect the battery to the negative side of the circuit.

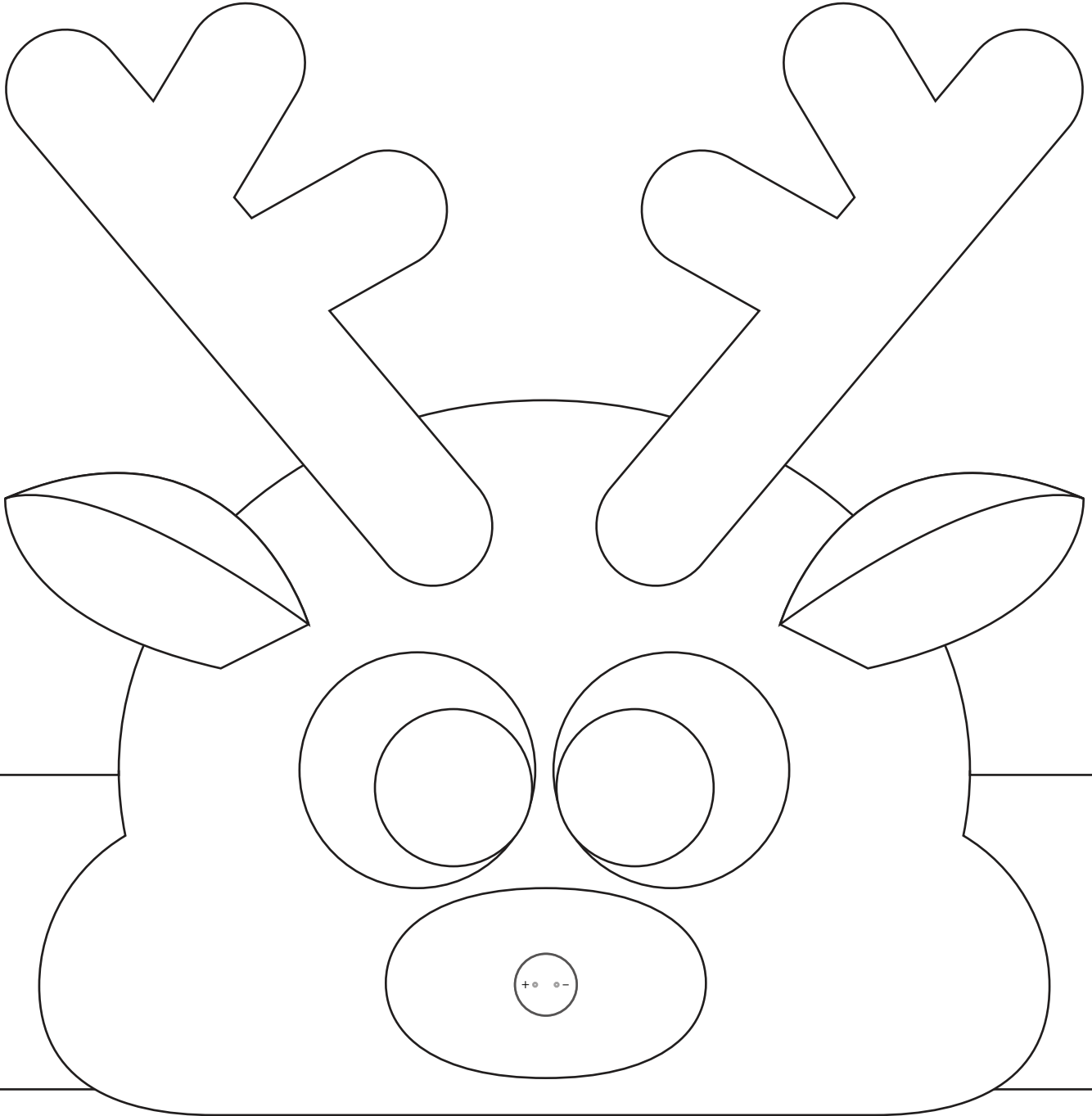
craft foam rectangle

Wrap the tape around the foam flap.  
When the hat is worn, the switch will close.

craft foam rectangle template



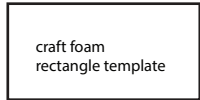
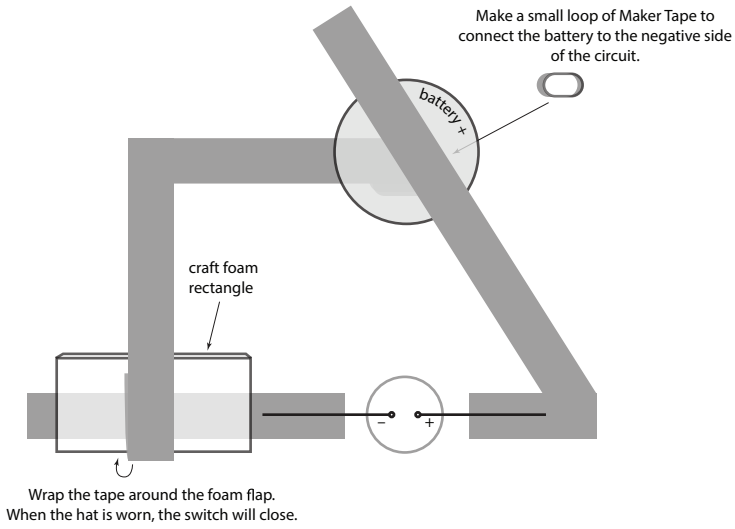
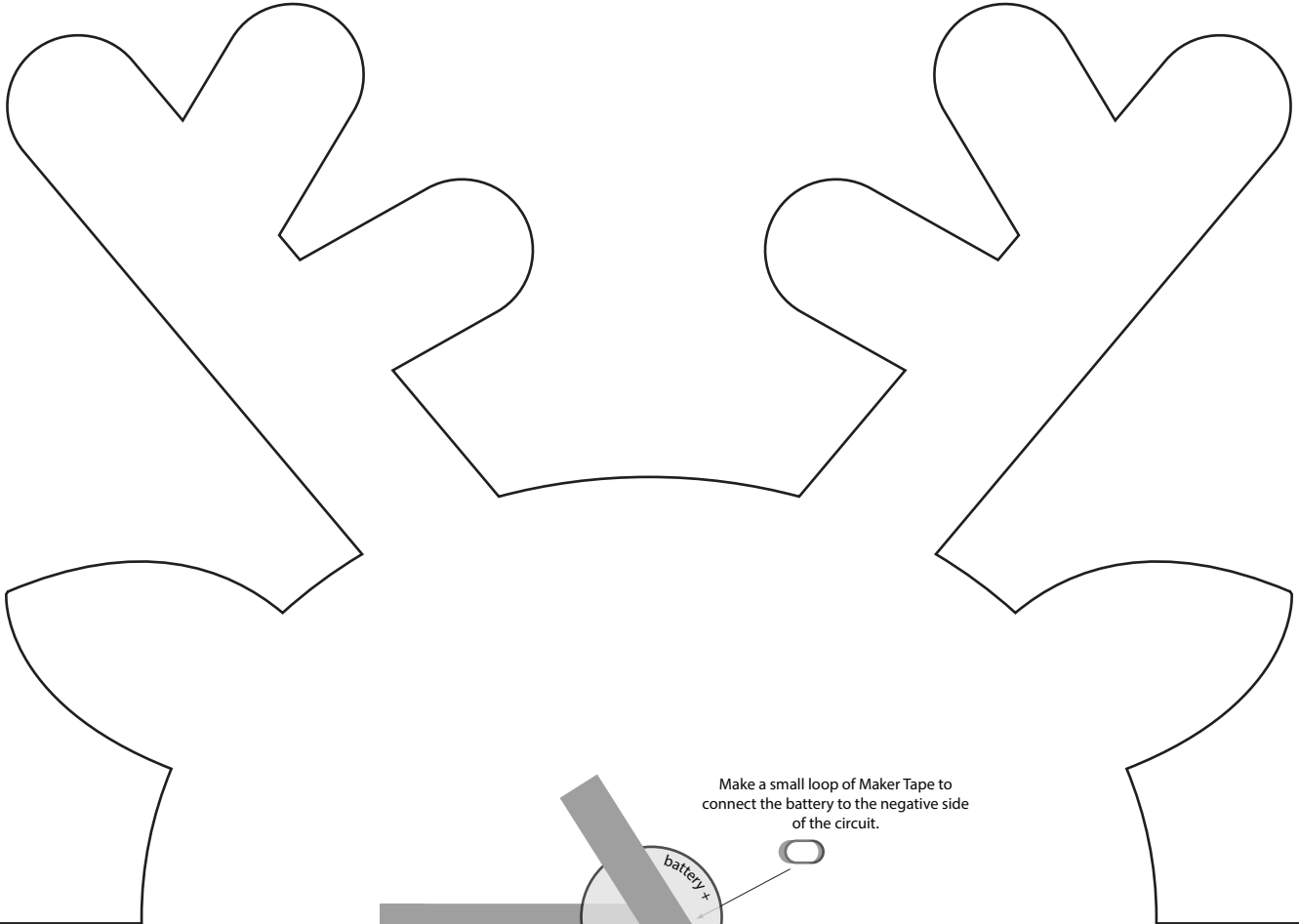


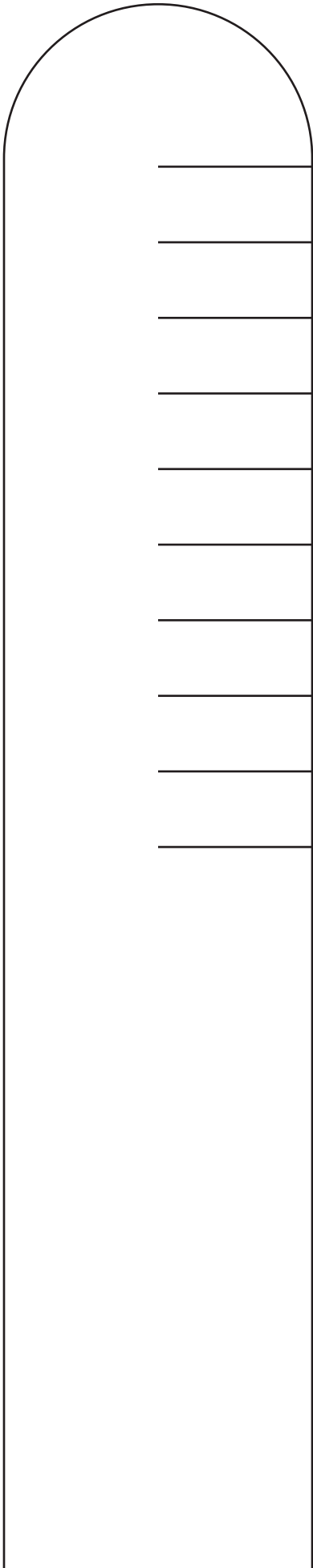
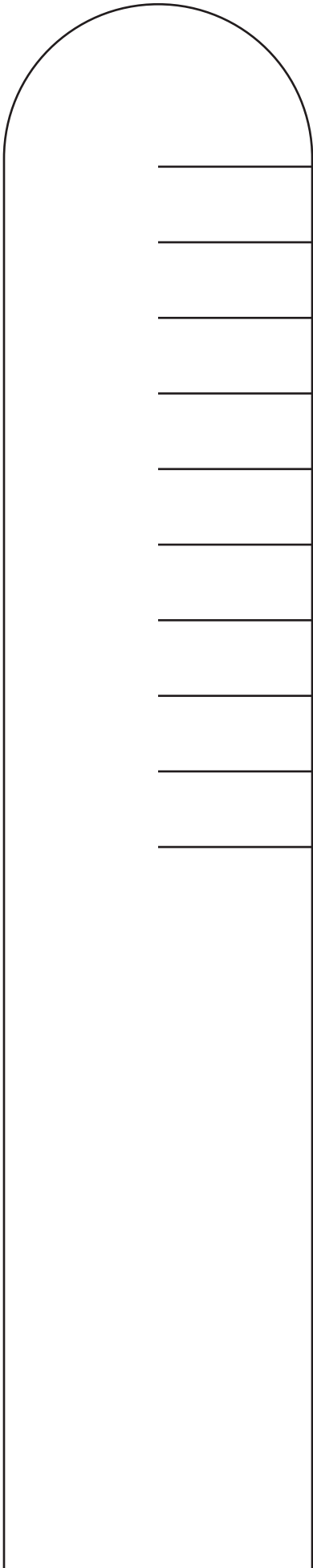




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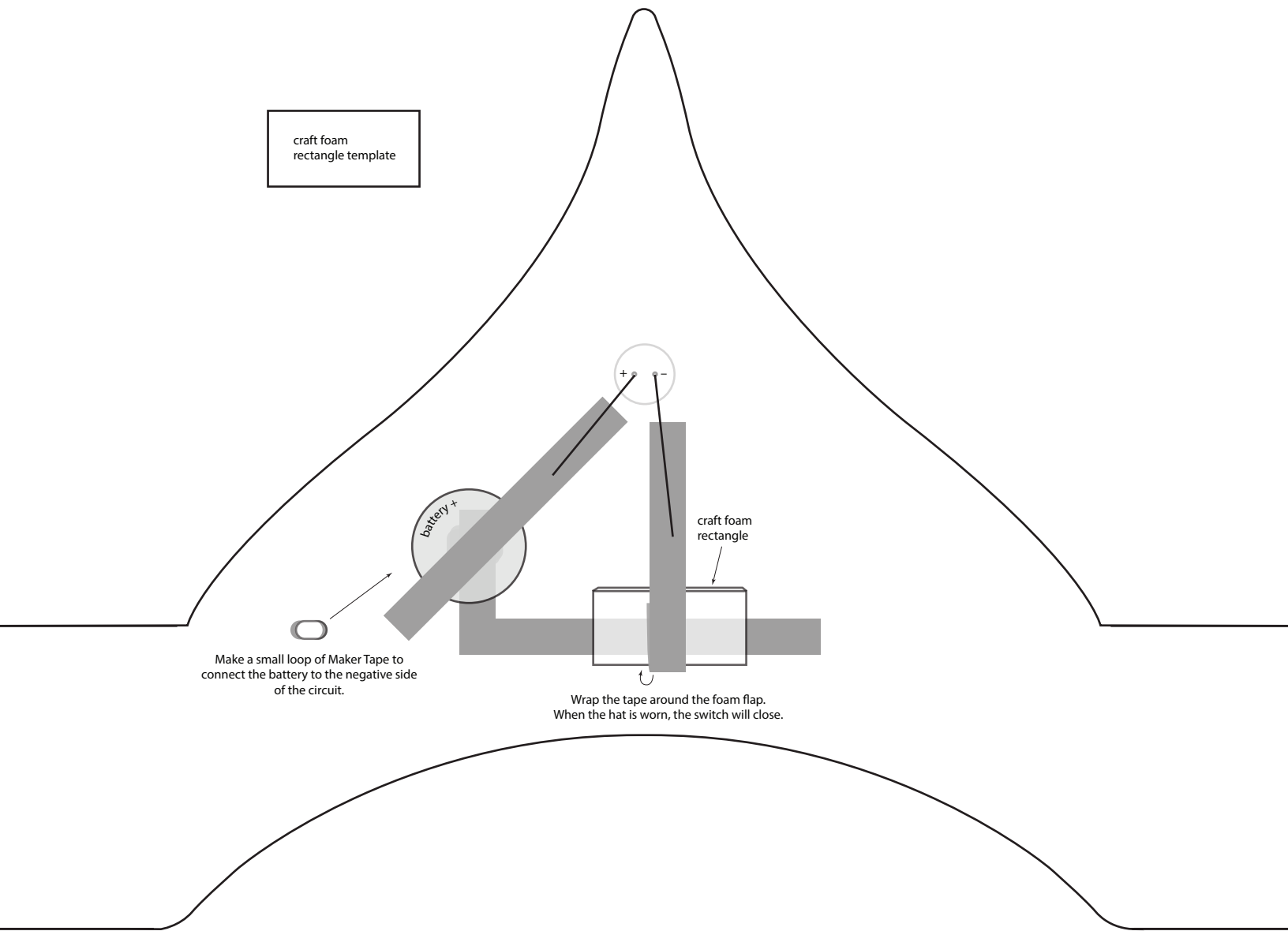


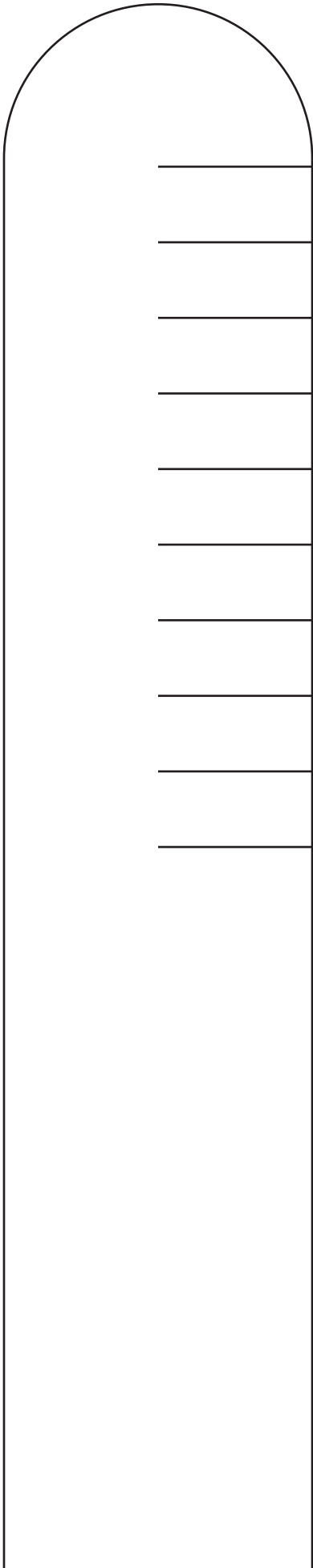
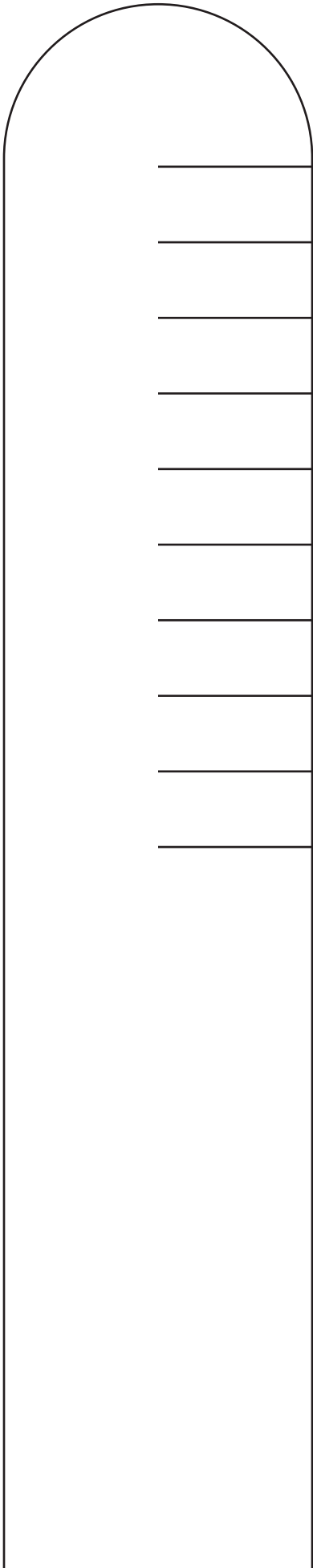


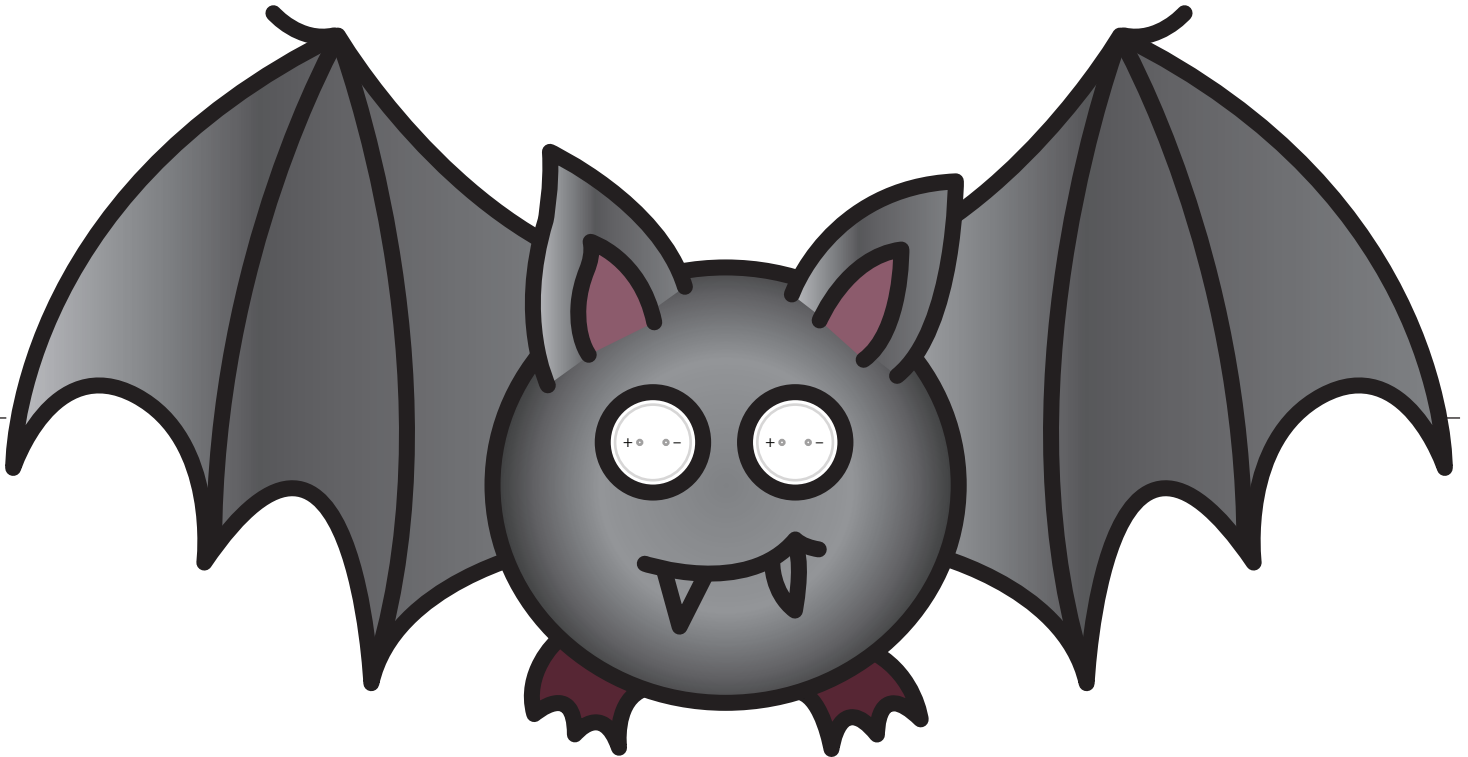


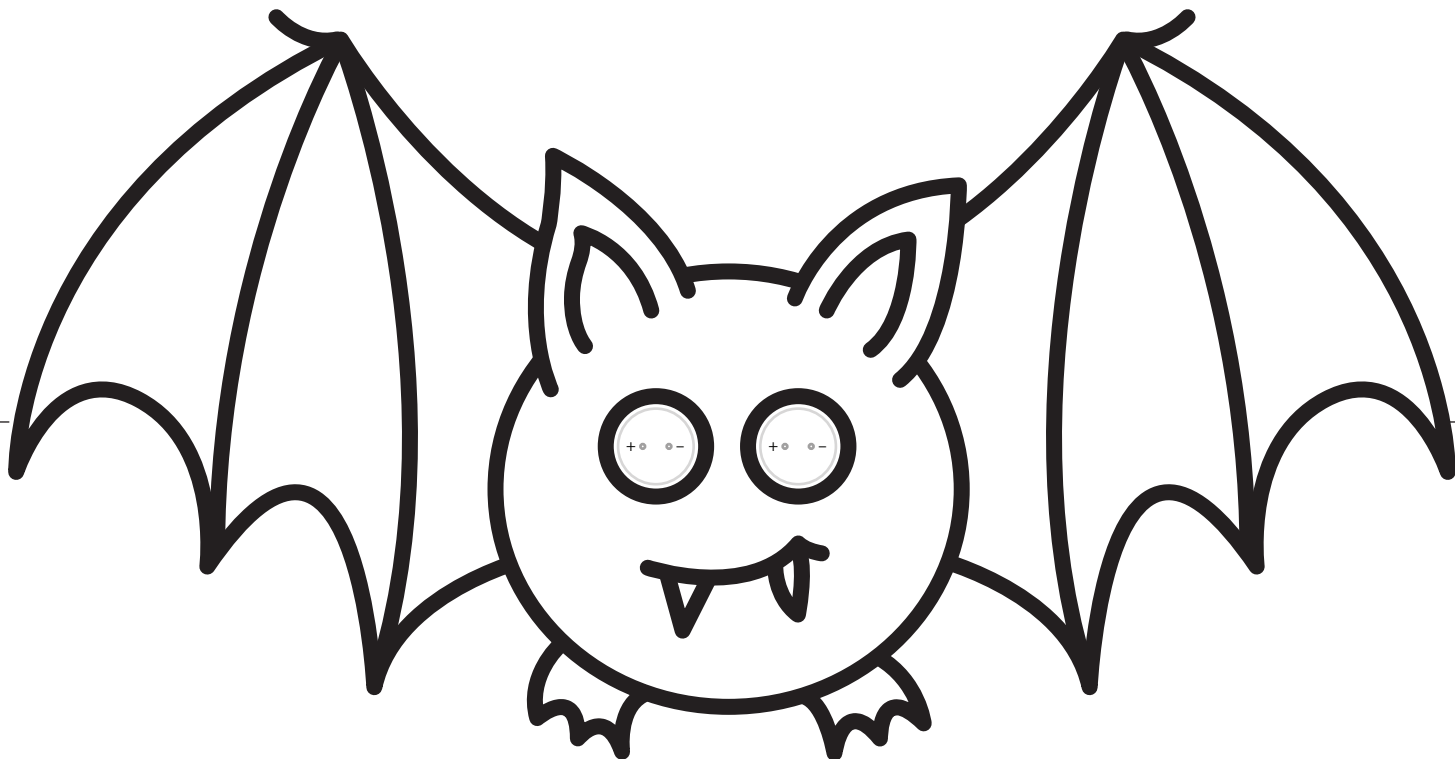
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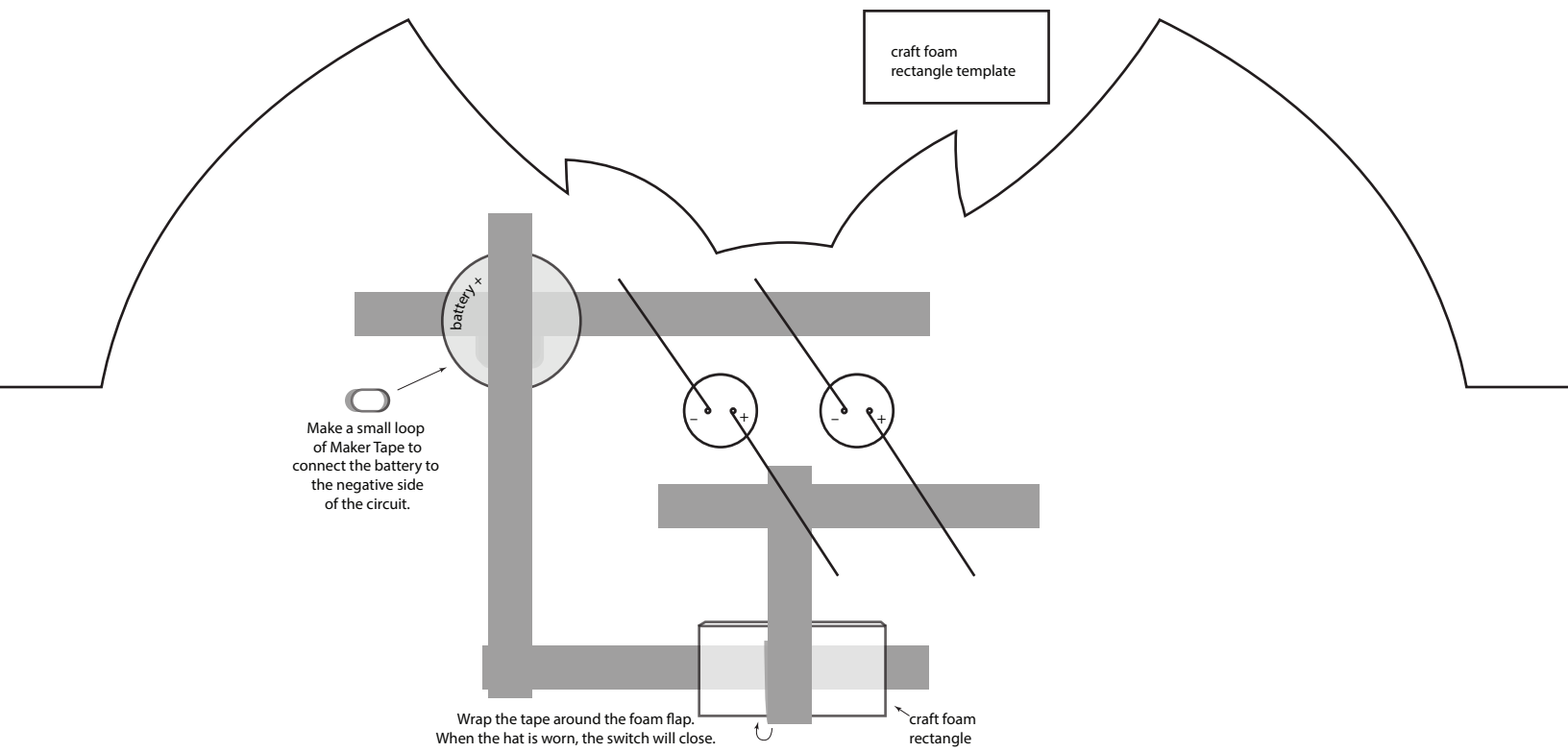
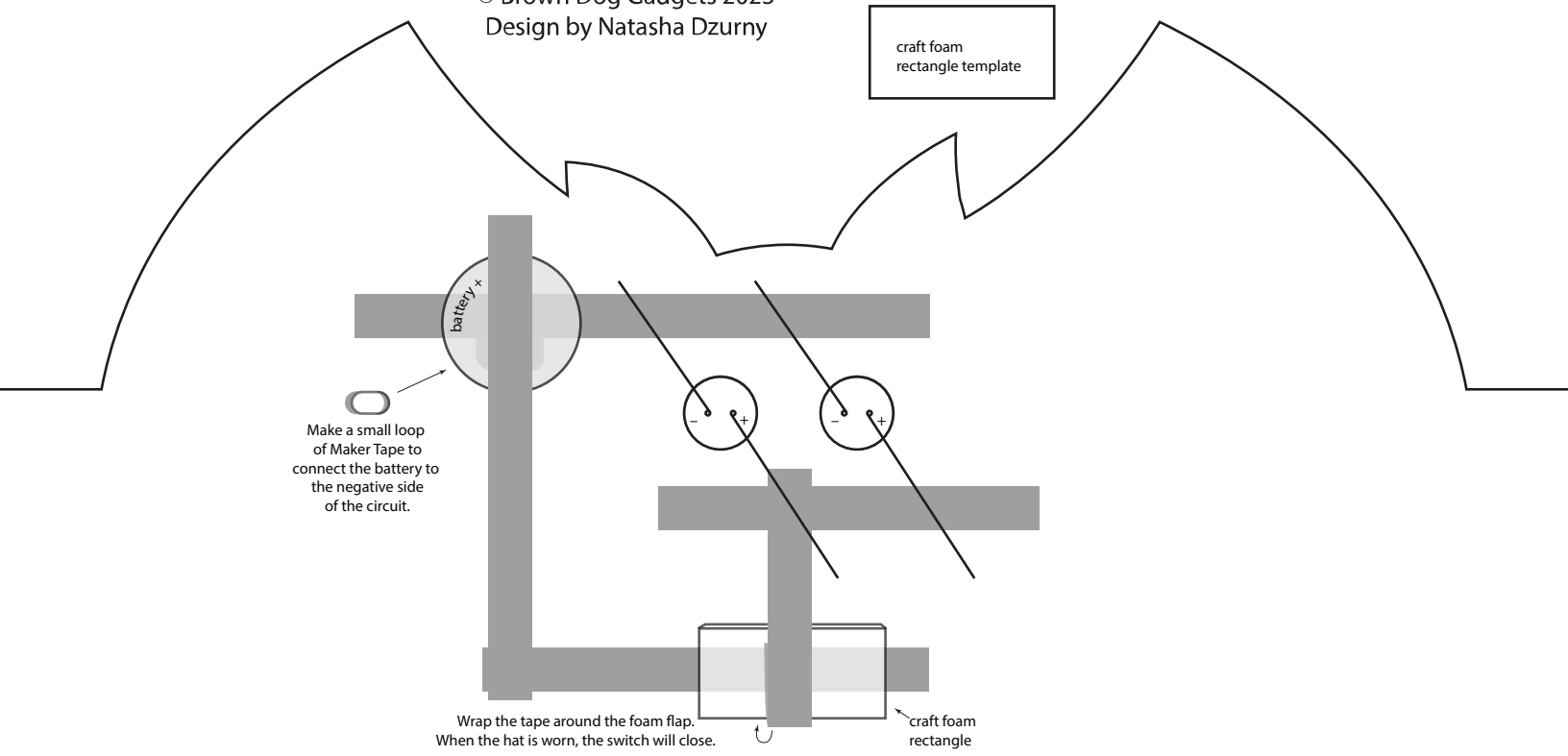
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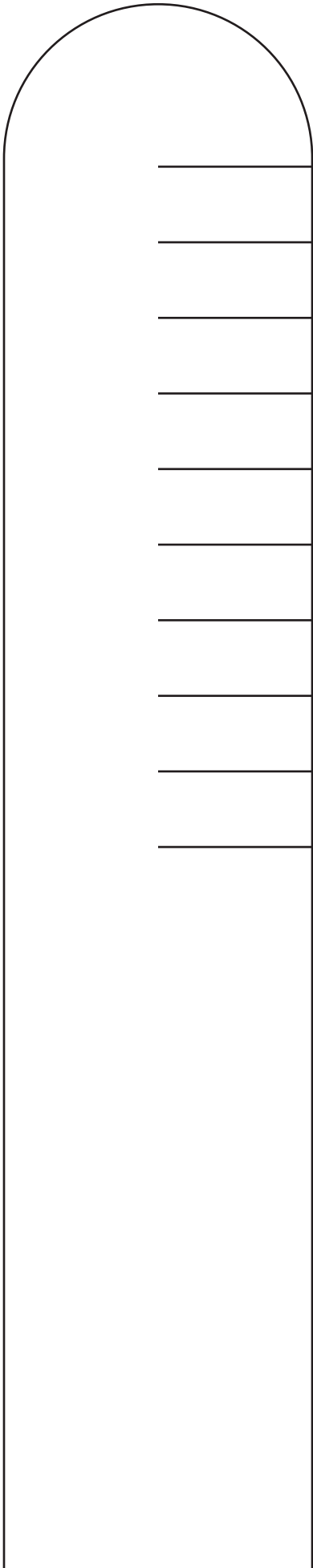
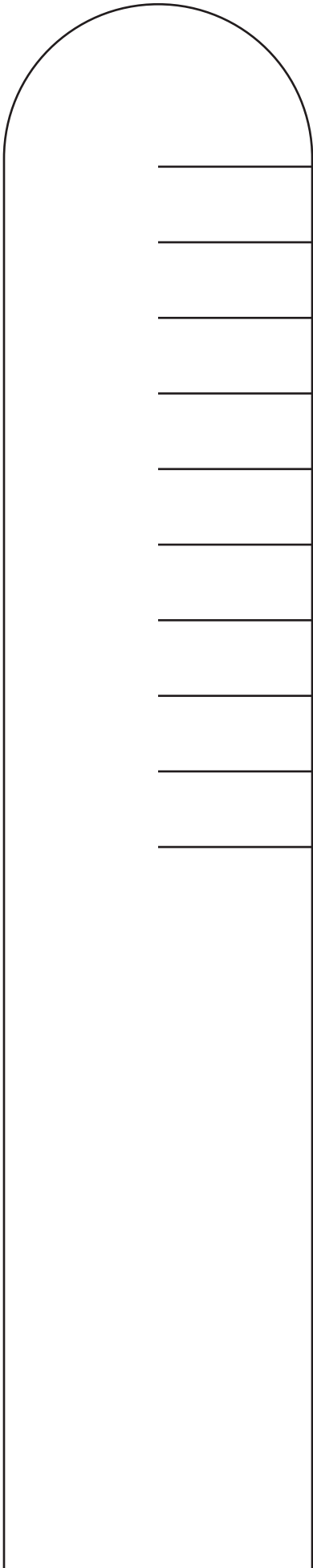














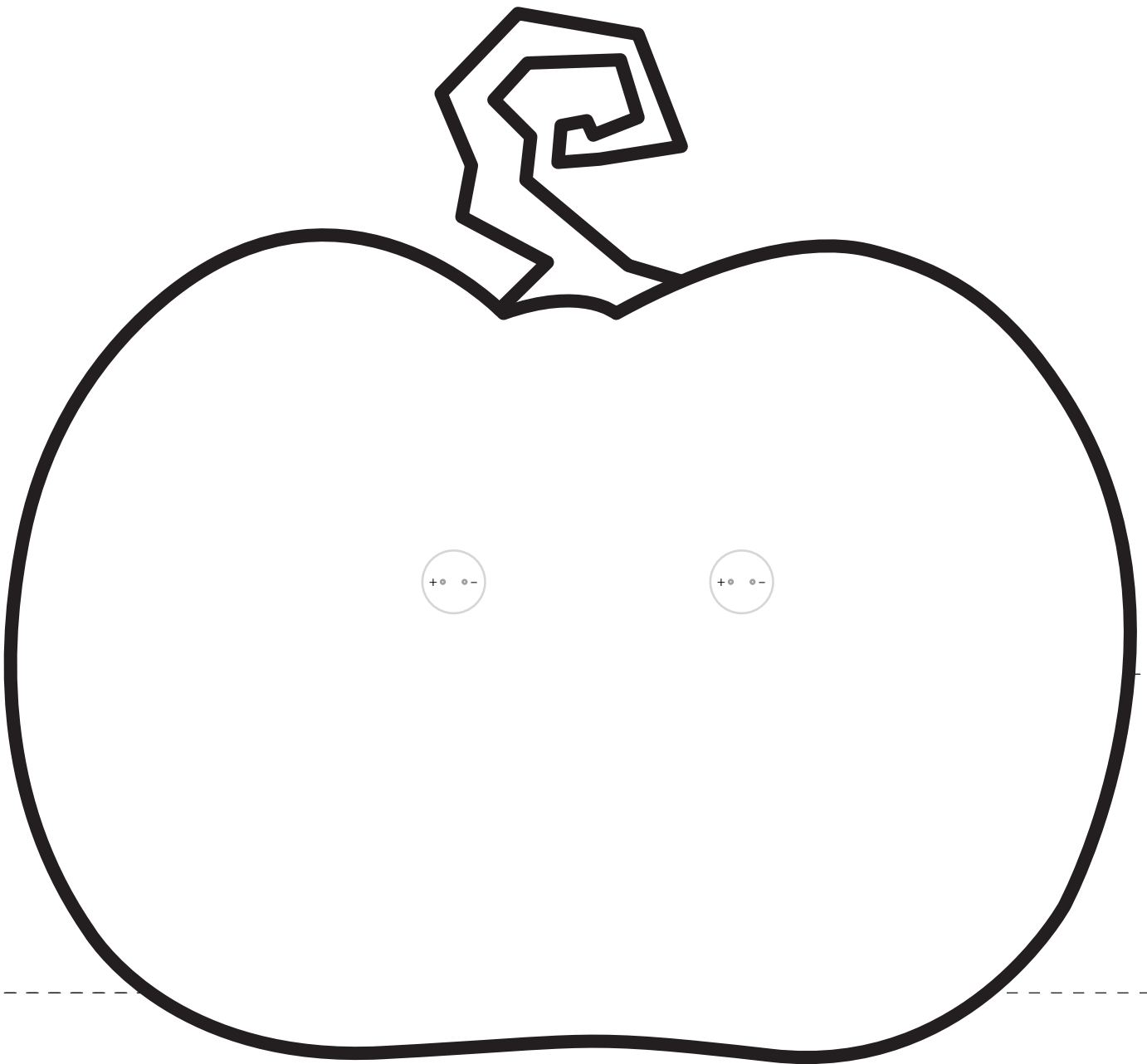






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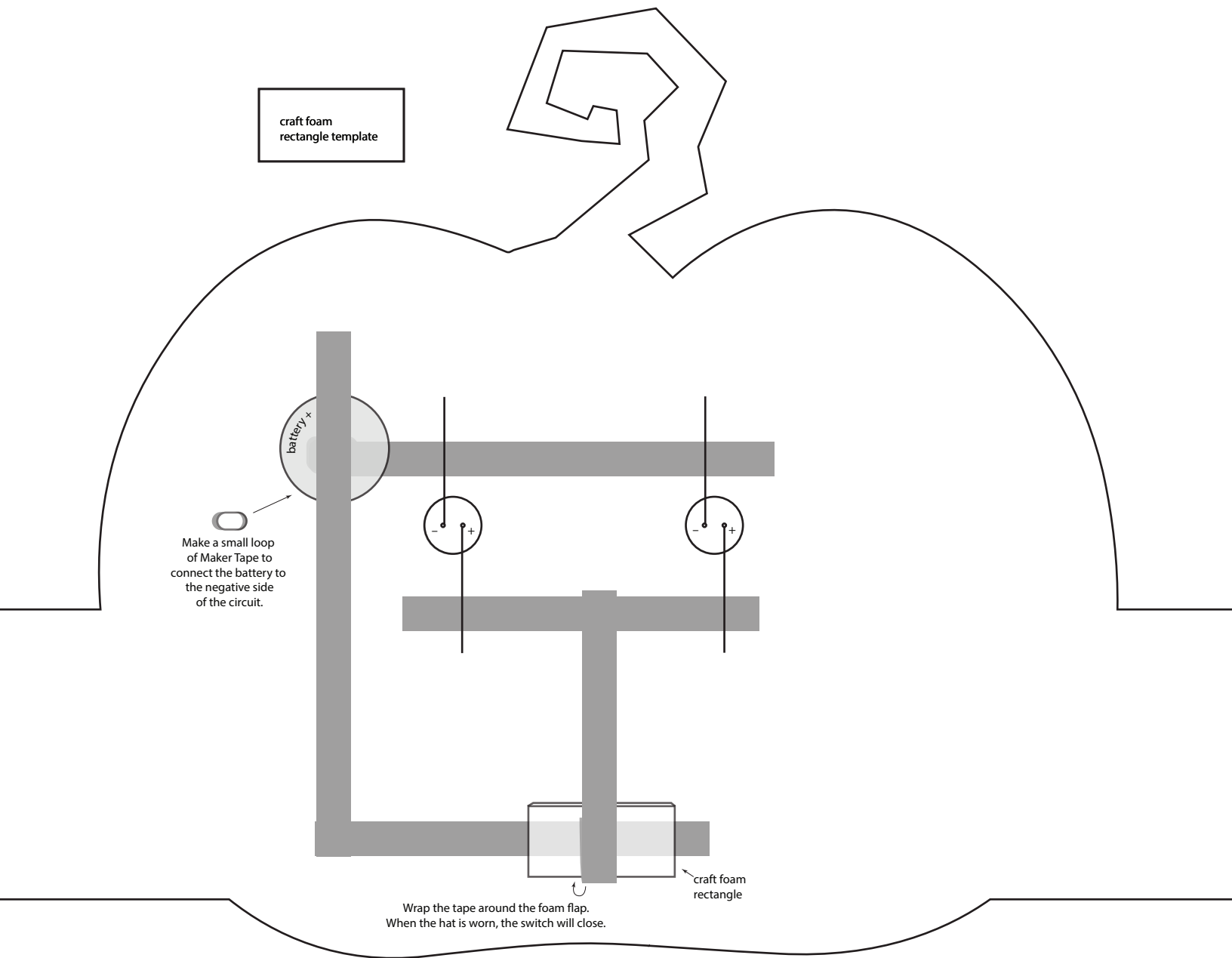
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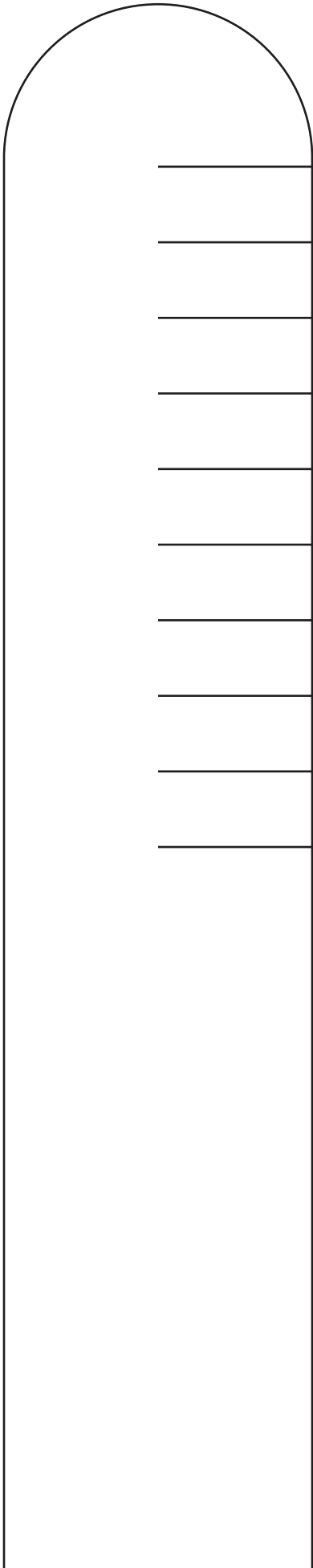
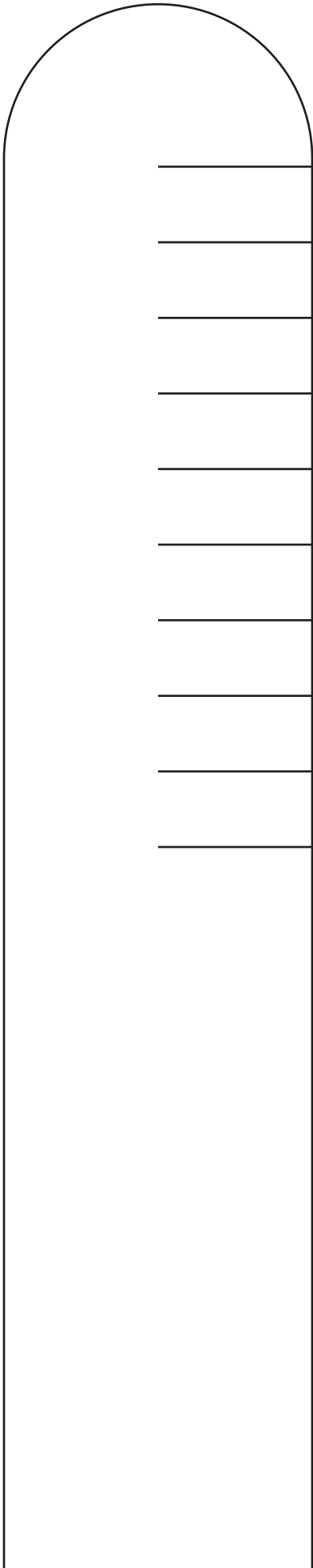




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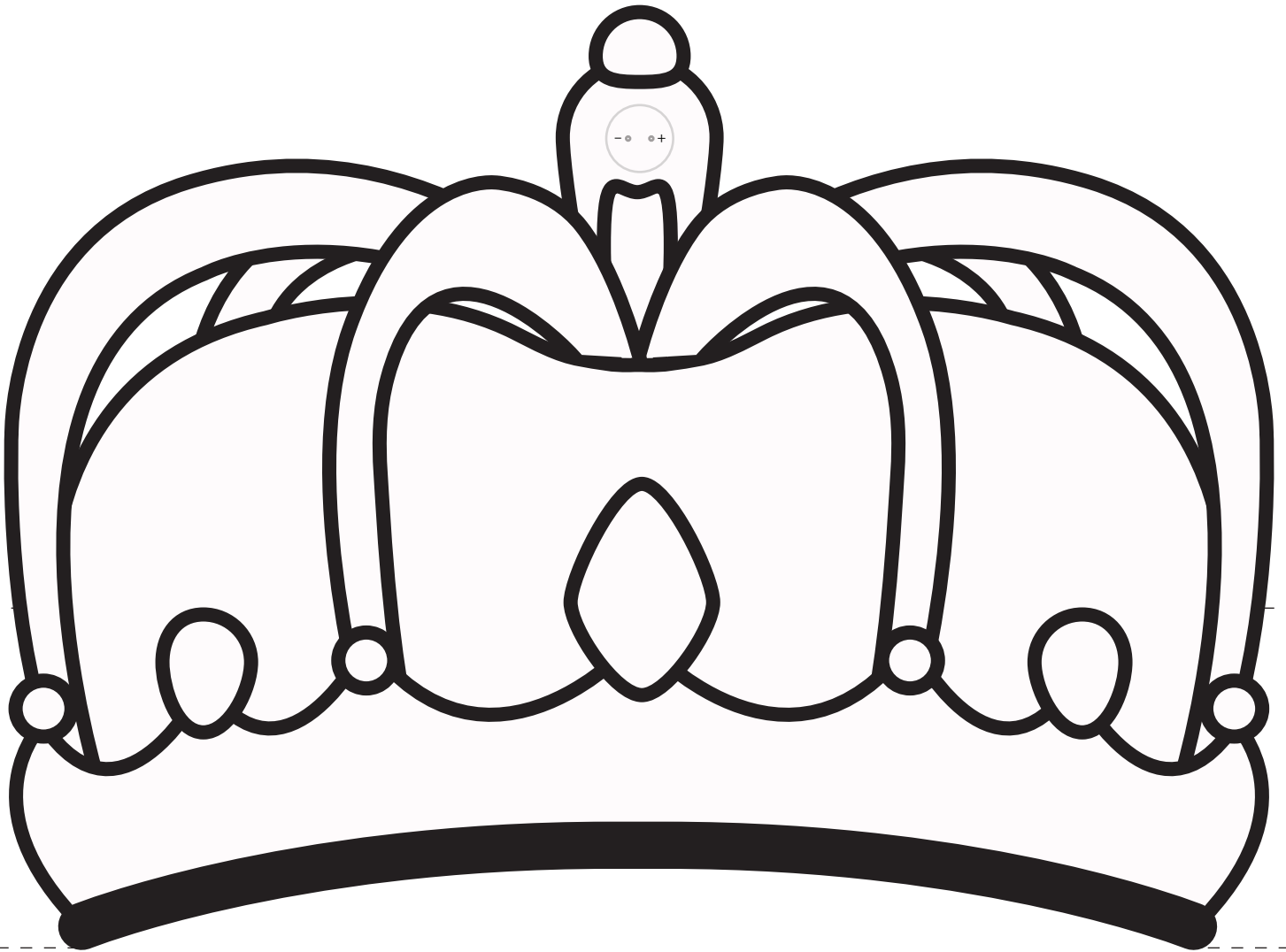


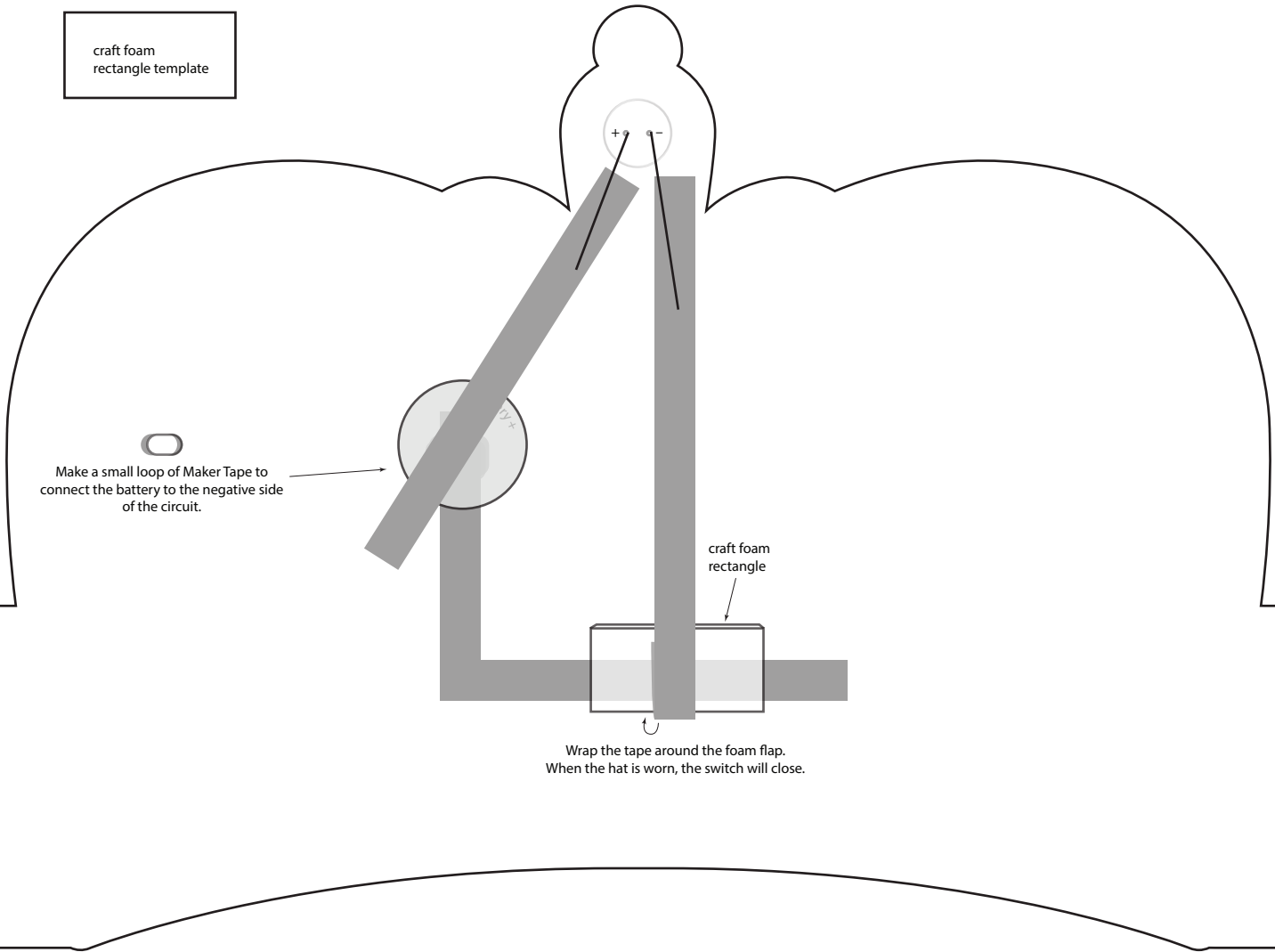


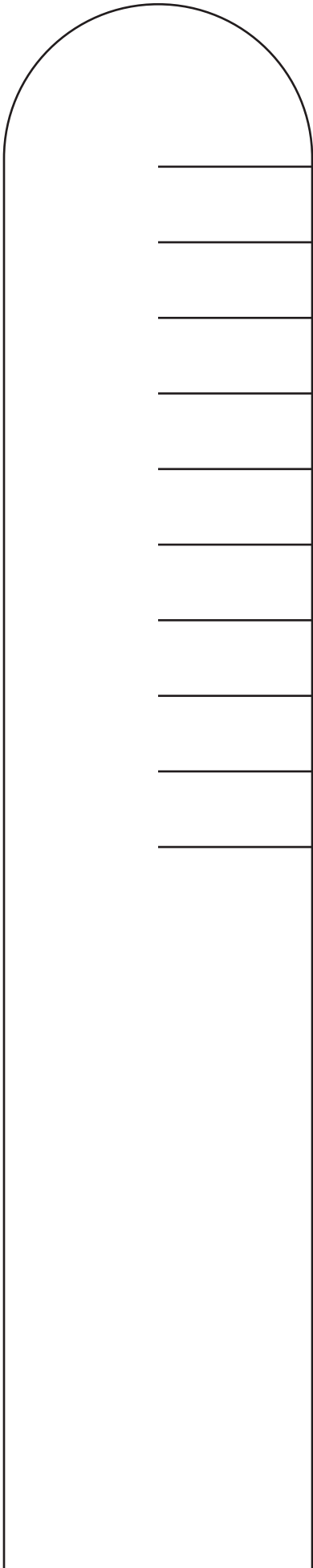
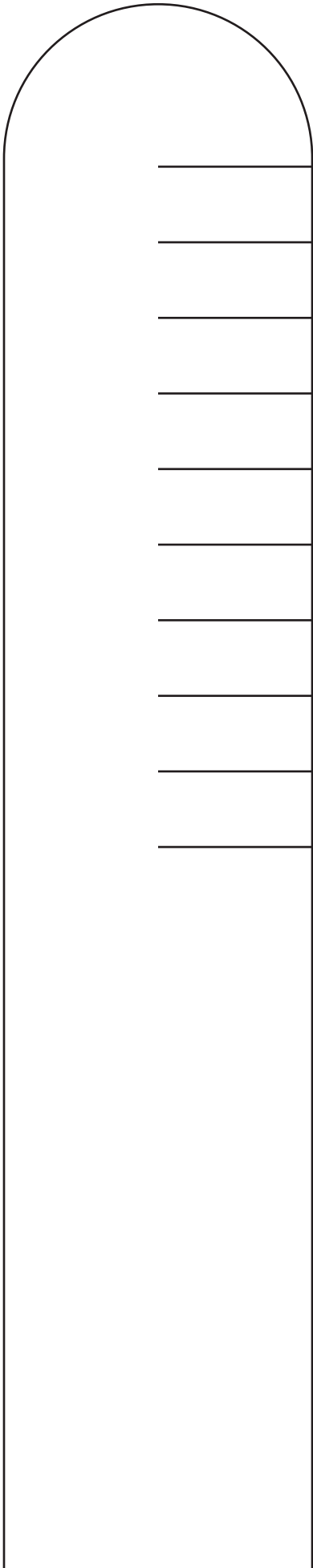
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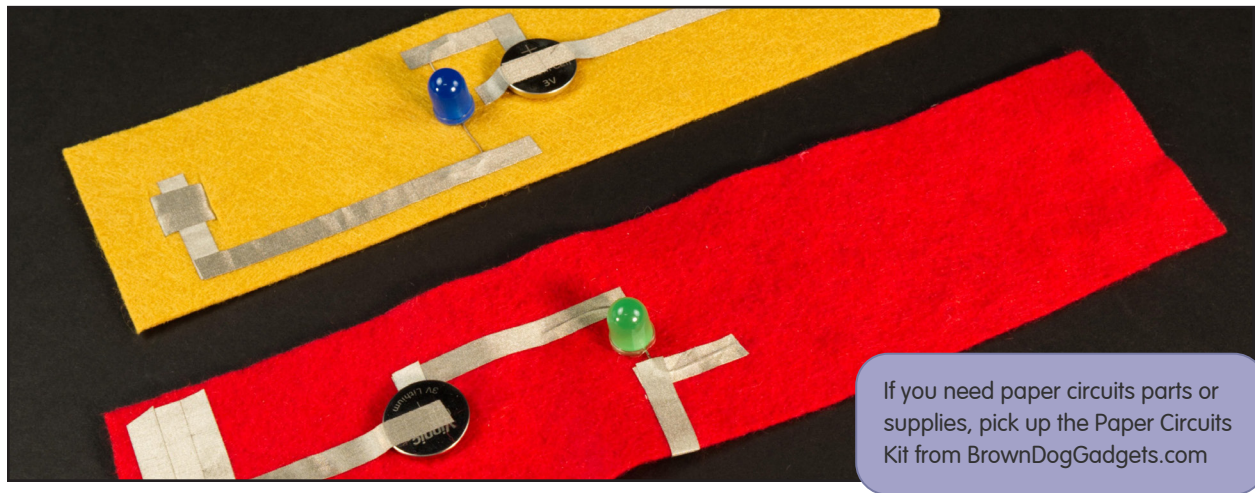


# More Projects & Inspiration

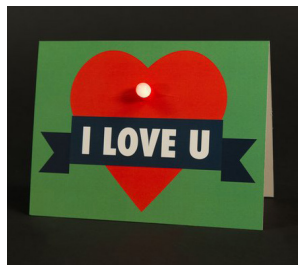
## Other Materials

You can use Maker Tape on more than just paper. In fact, any flat surface will do!

This makes it a great material to design circuits on top of felt or other craft materials, like the LED bracelet below. With the same paper circuit techniques, you can build all kinds of projects! The possibilities are endless.



## Light-Up Cards (Maker Tape, LEDs, Batteries, and Paper)



Light-Up Heart



Laser Cat



Birthday Candles



Light-Up Tree

## Robots and Wearables (Maker Tape, LEDs, Motors, Batteries, Paper, Felt)



Tree Bracelet



Motor Robot Buddy



Motor Robot Vacuum



Monster Bracelet

These are just some of the projects to try next! Check out all of our free project templates and guides available to download at [www.BrownDogGadgets.com](http://www.BrownDogGadgets.com)



# Kits from Brown Dog Gadgets

You don't need to buy our kits to make these projects, but they do have everything you need for your convenience.

## The Wearable Circuits Kit



## The Sewing Circuits Kit





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## Learn, Create, and Inspire—Even on a Budget

Creating a project from scratch can be difficult for the casual builder. Finding the right directions, the right parts, and the right tools—all at the right price—can be a major hurdle.

At Brown Dog Gadgets, we've created kits and projects for creators of all ages and budgets. Follow our step-by-step project directions and learn more with our classroom resources or find individual parts to dream up your own creations. No matter how or what you create, our products can help you learn the basics of electronics, circuitry, and solar energy.

Find additional eBooks, crafting guides, videos, directions, and educational resources at [BrownDogGadgets.com](http://BrownDogGadgets.com). Contact us for educational discounts and free professional development classes.

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