
Paper Circuit Timeline Project Guide





Step 1: Select the Historic or Migration Event

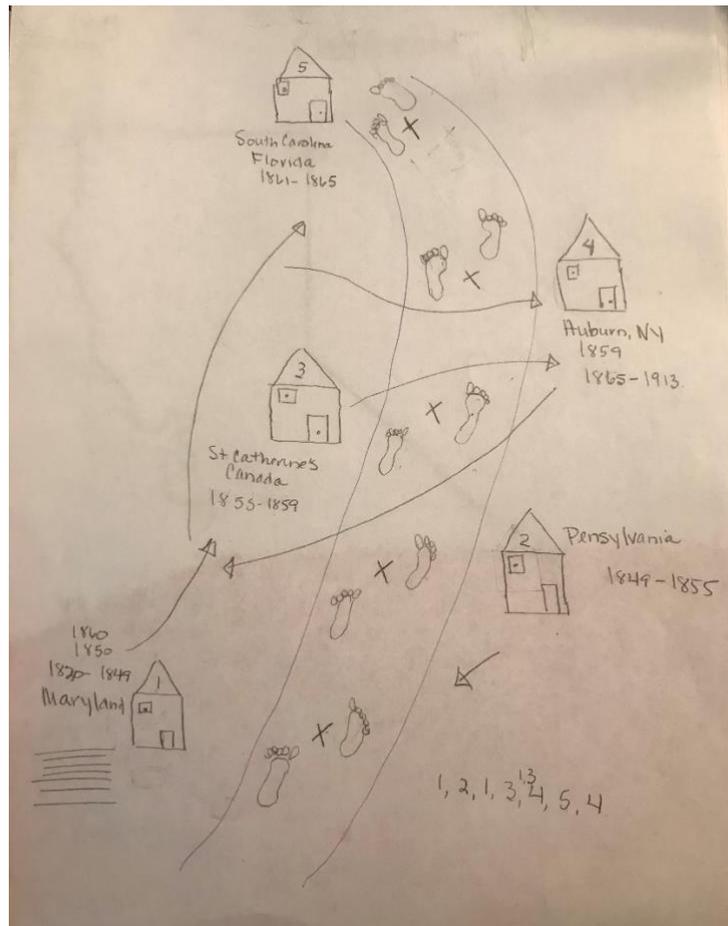
The first step of this project is to decide on a migration event around which to build your group timeline. Choose an event from one of the three stories read in class: *We Came to America*, *Julia Comes to the United States*, or *Soft Rain*. Once your group has chosen the topic of your timeline project, research and identify 3-4 main events within your topic you want to include in your timeline/narrative path. Write down your topics and research on the Timeline Builder Worksheet.



Step 2: Make Your Artistic Drawing

Next, discuss with your group how to represent each event on your timeline. Think about what pictures, photos, dates, or writing you want to include for each event. Make a drawing of what you want your timeline to look like on your Timeline Builder Worksheet. Make sure your drawing needs has X's where the light bulbs will go.

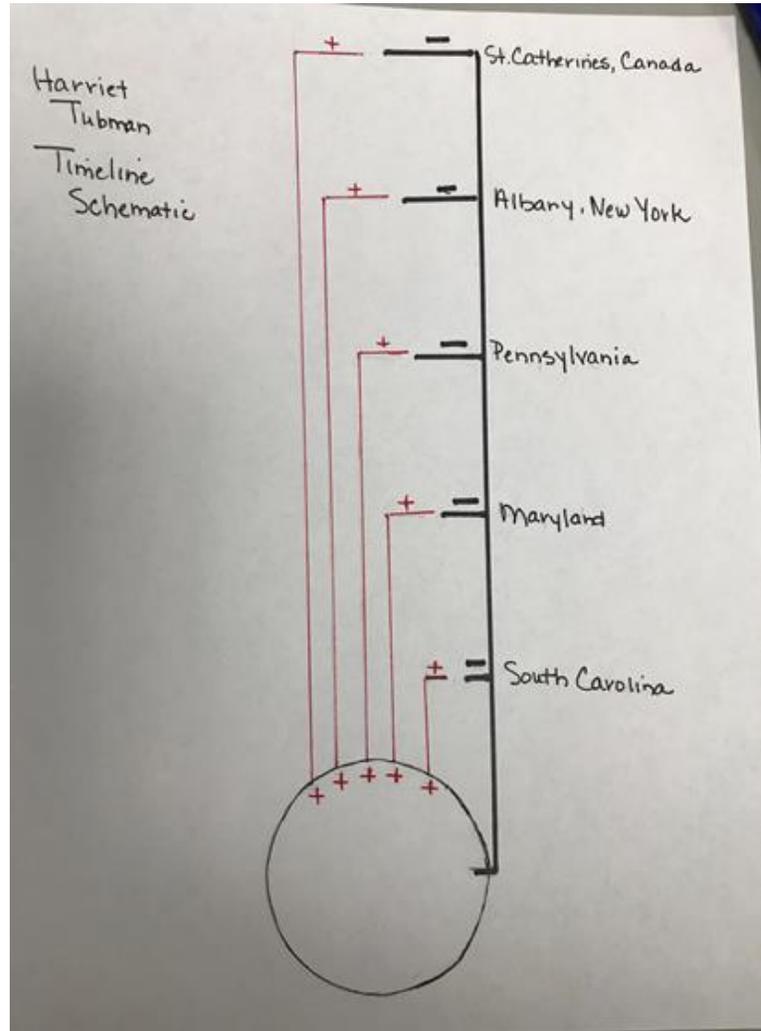
Here's an example of what your drawing might look like. Check the finished artistic drawing of your timeline off with your teacher.





Step 3: Draw Your Timeline Circuit Schematic

A schematic is a type of drawing of all the parts of your circuit. You will need to label and identify all the parts of your circuit. This will help you plan of where each component will go and help avoid crossing wires once you begin constructing your circuit. The circuit schematic does not need to be a perfect picture, but it does need to clearly show where each component will be and the lines attaching them. Draw your schematic in the space provided on the Timeline Builder Worksheet. Label all positive and negative leads as well as the pins on the Circuit Playground Express.



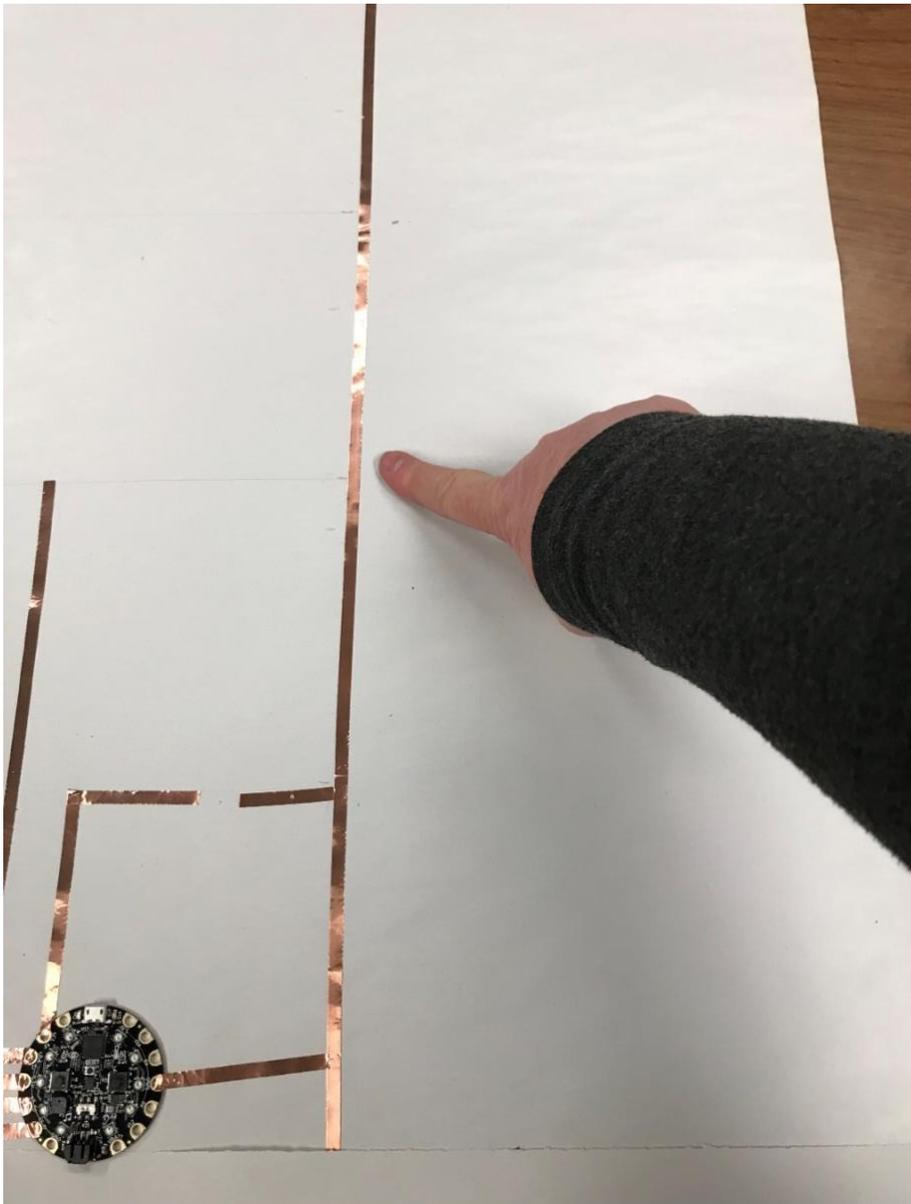
Check your schematic drawing with your teacher. Make any changes to your schematic before you begin construction. Below is an example of a timeline schematic.

Teacher Signature:



Step 4: Tape the negative (-) line and attach the Circuit Playground Express

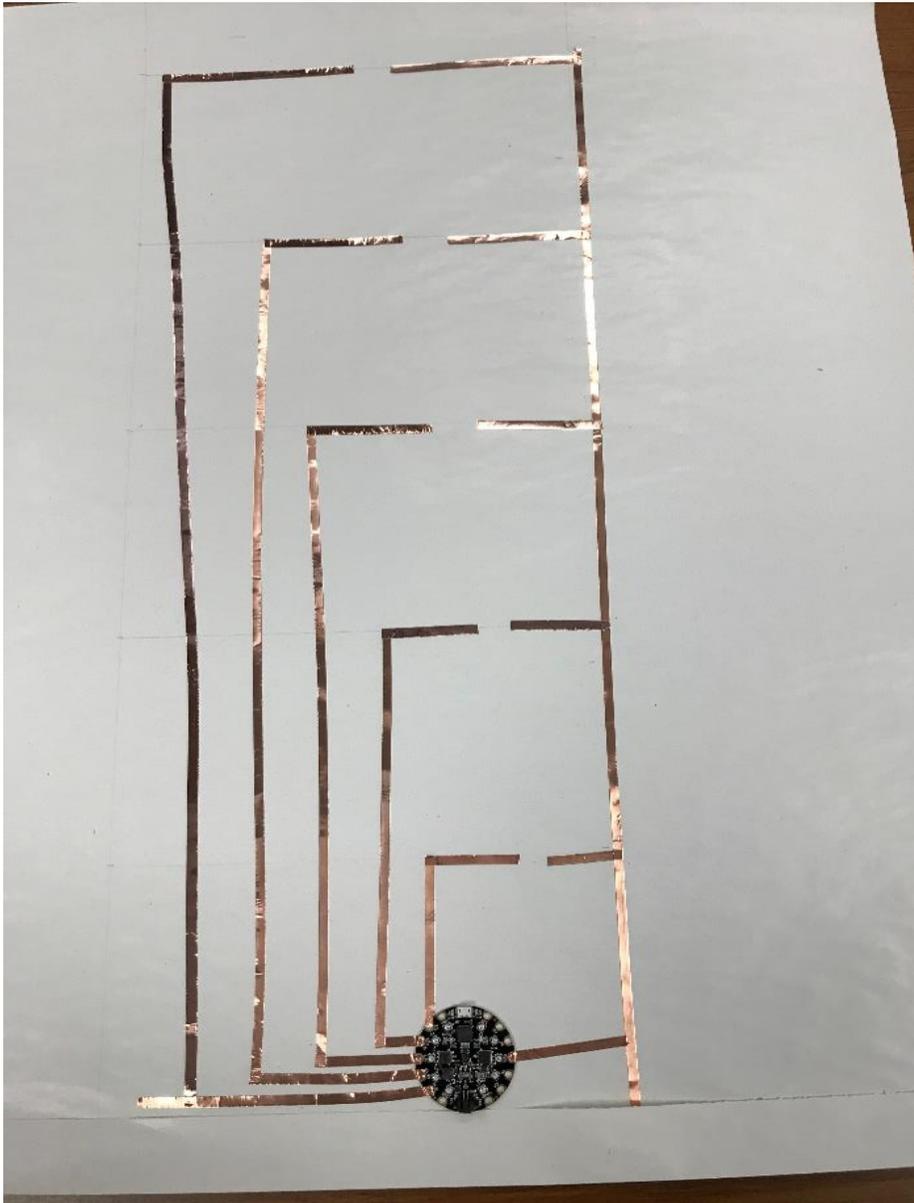
Once both your artistic and circuit drawings are teacher approved, trace your circuit drawing in pencil onto your final butcher paper/ poster board. Attach your Circuit Playground Express to the timeline using scotch tape placed on the back. Now it's time to start your negative line. Following your schematic, lay down the piece of copper tape for the negative line. Fold the copper tape into a tab on the end near the Circuit Playground Express. Using the example schematics shown above, here is what that might look like:



Pointing to the negative line. The Circuit Playground Express is also attached to the paper with scotch tape and to the negative line with a copper tape tab.

Step 5: Tape the first positive (+) line

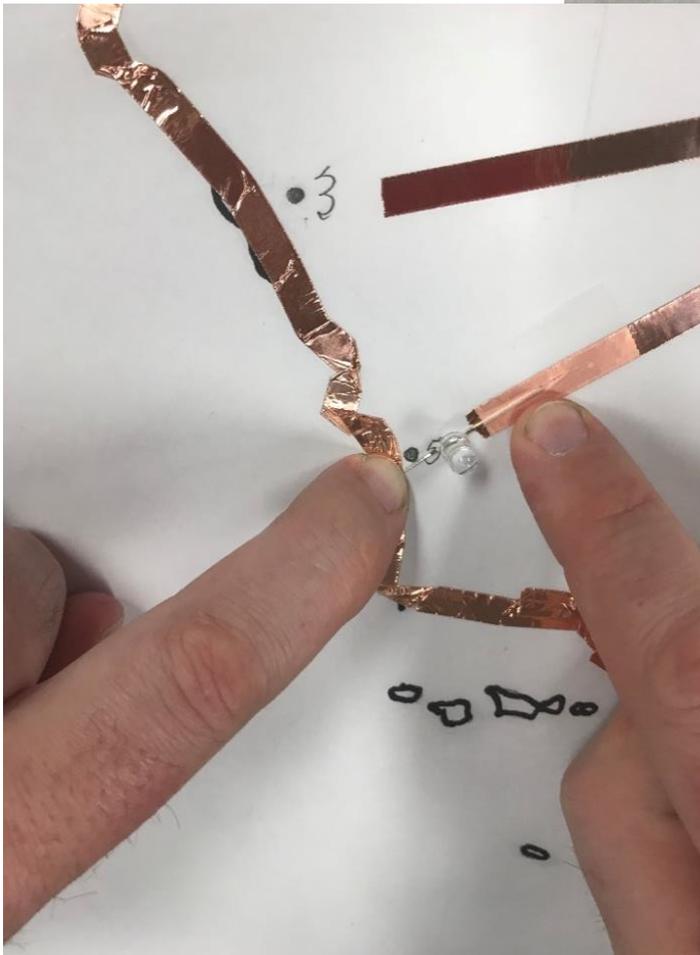
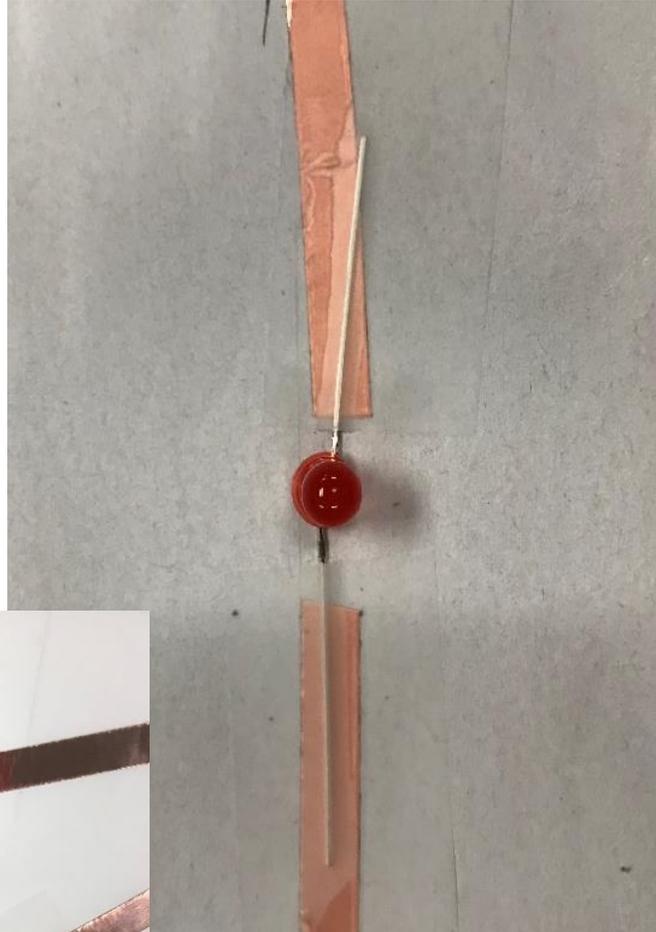
Next, place down the first positive line. In this example, the line will connect with a copper tape tab from pin number A1 on the circuit playground and run parallel to the negative line. The picture below shows what the positive looks like based on the schematic shown earlier.





Step 6: Attach the first LED bulb

After the first positive line is laid down, connect the first LED. Bend the legs of the LED to allow each leg to lay down across as much of the copper tape as possible. One of the legs of the LED is longer than the other leg. The longer leg is the positive, so place it on the positive line. The goal is to have as much of the LED wire touching the copper tape of each line. Using scotch tape, tape down the LED legs to the copper tape. Below are pictures of how this would look.





Step 7: Attach remaining positive (+) lines and LED bulbs

Repeat steps 5 and 6 for each of your LEDs. Remember to check the schematic to connect the LEDs to the correct pins on the Circuit Playground Express. The paper circuit will look something like this when complete:



All LED lights attached between the positive and negative lines. Secured with scotch tape.



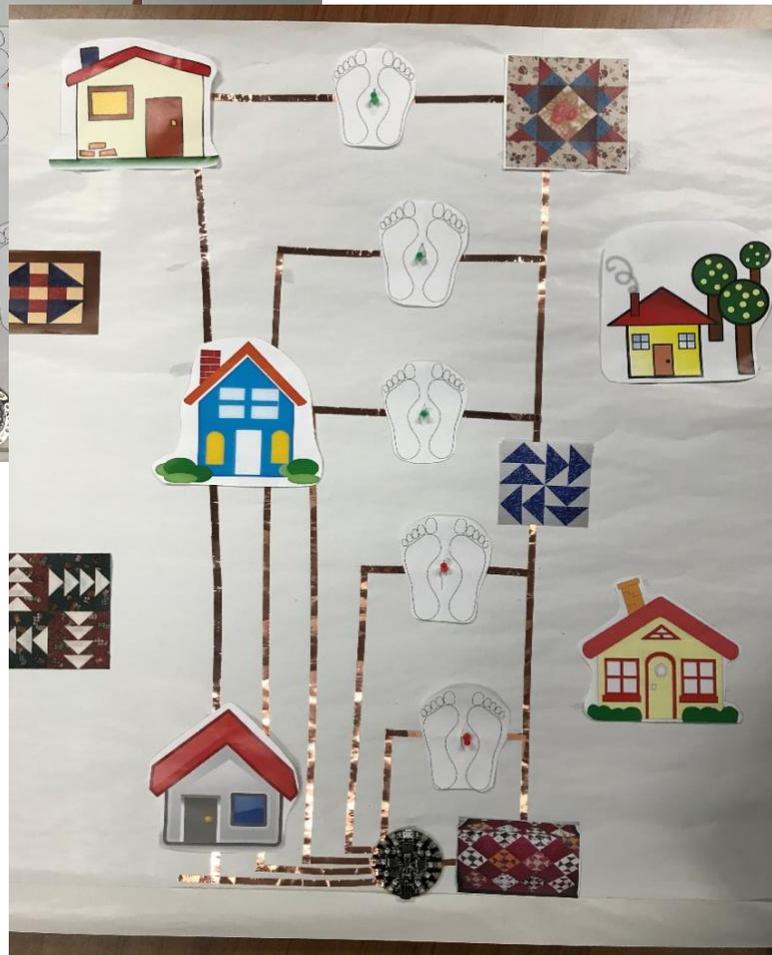
Step 8: Add the descriptors/ artistic aspects

With the circuit now built, add your artistic or descriptive components to the timeline. You will connect the Circuit Playground Express to the copper tape tabs using alligator clips, so they you want to create a pocket to support and cover the clips.



All Footprints Attached

All Houses and Quilt Squares Attached



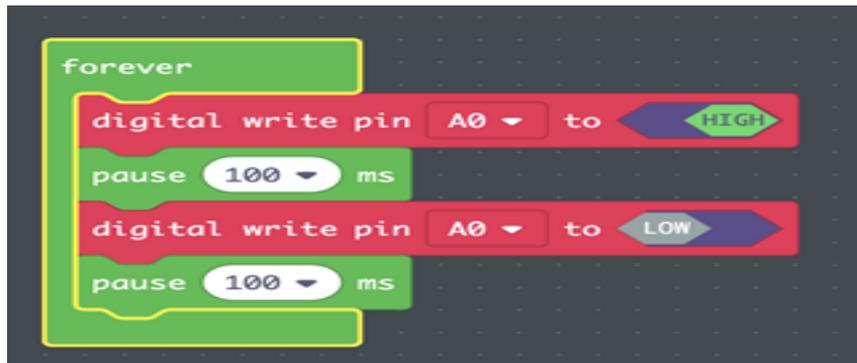
Step 9: Get ready to code

Write down the events on your timeline in order. Note which port the light is connected to on the Circuit Playground Express. If your lights are not yet connected to ports, use alligator clips to do that now. Connect your Circuit Playground Express to the computer using a USB cord. Double check that the positive (+) line of each light is connected to the correct port. Your negative line should be connected to GND.

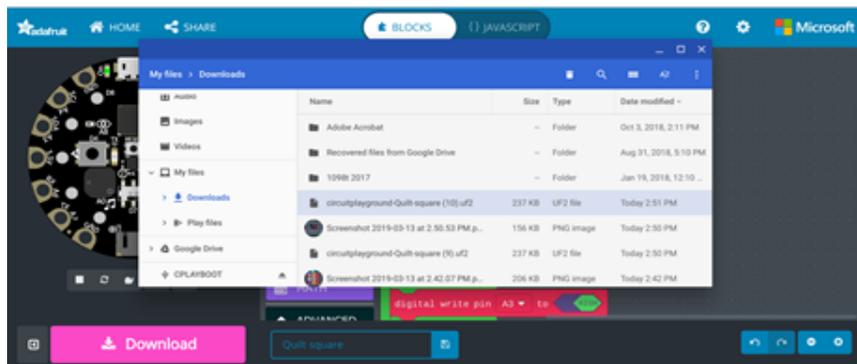
Event 1:		Port:	
Event 2:		Port:	
Event 3:		Port:	
Event 4:		Port:	

Step 10: Begin coding with makecode.com

Open makecode.com and start a new project. Name your project using your group number and the project title. Write the code for your first light. It should look like this, but you may have to change the pin number for your project.



Download the code you have written to your Circuit Playground Express using the pink download button. Drag the file from the downloads folder onto the CPLAYBOOT. Your first light should light up. If the wrong light is lighting up or nothing is happening, stop and troubleshoot.



Step 11: Code the other lights

Add new lines of code for each light on your timeline. Make sure to check you have selected the correct pin when you add a new light. Use the table in Step 9 to help you. After each light you code, check to make sure it works by downloading your code. If not, stop and troubleshoot that light. After you have coded all your lights, your code will look something like this. Remember, you may have used different pins. If it's not working, it's time to troubleshoot.



```
forever
  digital write pin A0 to HIGH
  pause 500 ms
  digital write pin A0 to LOW
  pause 500 ms
  digital write pin A1 to HIGH
  pause 500 ms
  digital write pin A1 to LOW
  pause 100 ms
  digital write pin A2 to HIGH
  pause 100 ms
  digital write pin A2 to LOW
  pause 100 ms
  digital write pin A3 to HIGH
  pause 100 ms
  digital write pin A3 to LOW
```

Step 12: Plug in your battery

After all your lights light up in the pattern that you want, plug the battery into your Circuit Playground Express. Unplug your Circuit Playground Express from the computer and from the USB cord. If it is part of your design, secure your alligator clips and Circuit Playground Express in the pouch on your timeline. Congratulations! You have finished your timeline project!