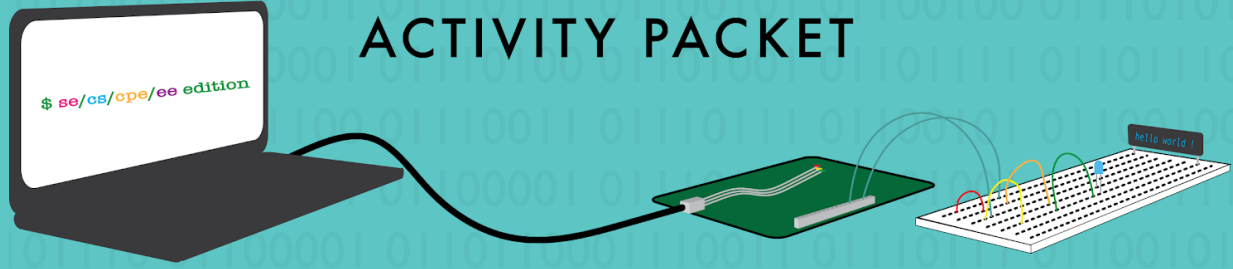


# SWEducational

## ACTIVITY PACKET



## WHAT IS SE/CS/CPE/EE?

Software Engineering (SE), Computer Science (CS), Computer Engineering (CPE), and Electrical Engineering (EE) make up a spectrum from software to hardware! Software and hardware work together to make electronics, like your computer or phone. The software is the computer code to tell the computer what to do and the hardware is the actual, physical computer.

Software Engineers usually work on the “front end” of code, which is what you see and interact with when you open a website or a video game! They make sure everything is pretty, and try to make your experience as smooth as possible! Computer Scientists also code, but they are more focused on the “back end”; this is what makes the website or video game actually run! Computer Engineers do a little bit of everything; they code and they also build physical things as well: robots, computers, electrical circuits, you name it! Electrical Engineers mainly work on building physical items, like the robots and circuits mentioned above.

## IMPORTANT TERMS

### ***Circuit: a path or loop for electricity to move***

- Electricity is like water and water needs pipes to move. Circuits are like pipes for electricity.
- We are building a circuit today to carry electricity to light up lights!
- When a pipe breaks water spills everywhere and never reaches the other side of the pipe. If a circuit breaks, would electricity reach the other side? Why is it important to make sure there are no breaks in our circuit?
- Something to think about: Does it fly better when you throw it hard or soft?

## ***Current: the flow of electricity***

- If the circuit is the pipes, then current is the water.
- The current will be powering the lights in your design. You won't be able to see the current.
- Even though we can't see water running through underground pipes, we know it is because water comes out of our sink. How do we know that a current is running through our lights? What would tell us that the current is not going through the lights?

## ***LED: a light emitting diode, a lightbulb***

- One type of LEDs are the lights you see on Christmas trees.
- When you finish your design and turn on the circuit, the LEDs will light up your design.
- What other LEDs have you seen? Are there any near you right now? (Hint: Look around for what turns on when you flip the light switch.)

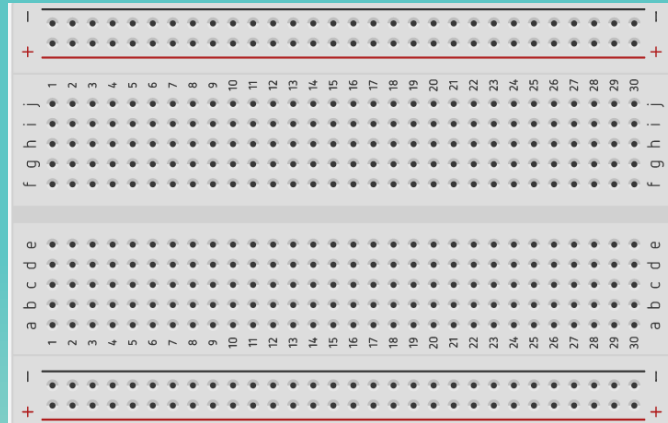
## ***Breadboard: a board to make electric circuit experiments***

- A breadboard holds all of the wires and circuits, much like the water system of a city holds all of the pipes.
- You will be putting your lights onto a breadboard.
- A city has a water system to keep water flowing to homes and other buildings. Why is a breadboard important to build your light design? (Hint: What flows through the circuit like water through pipes?)

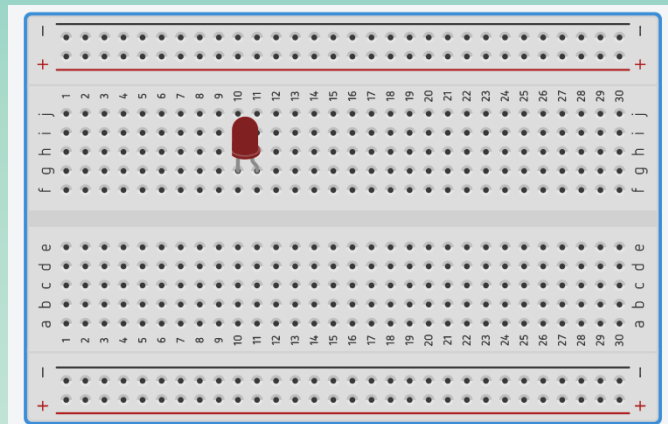
# ACTIVITY INSTRUCTIONS

1. Go to <https://www.tinkercad.com/> and click the "Start Tinkering"
2. Click the "Create personal account" and set up an account
3. Click the "Circuits" tab on the left side of the screen, then press the green "Create new Circuit" button.
  - There is a toolbar on the right where you will drag the parts for your project
  - To delete something, click once on the thing you want to delete, and then click the trash can in the top left corner

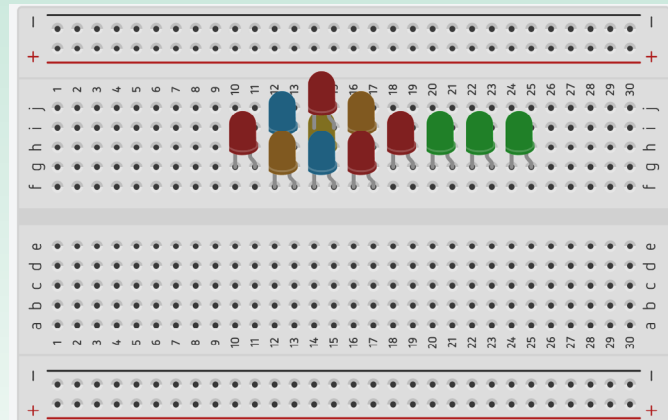
4. Scroll to find the Small Breadboard and drag it on your screen.



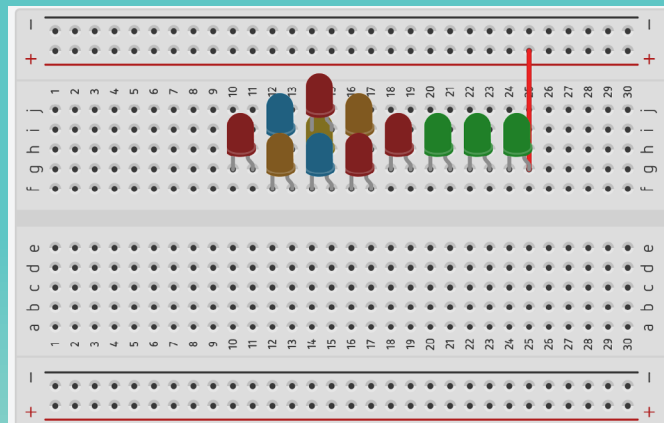
5. Now grab an LED and drag it onto the Breadboard. (To change the color, click on the LED once and pick a color.)



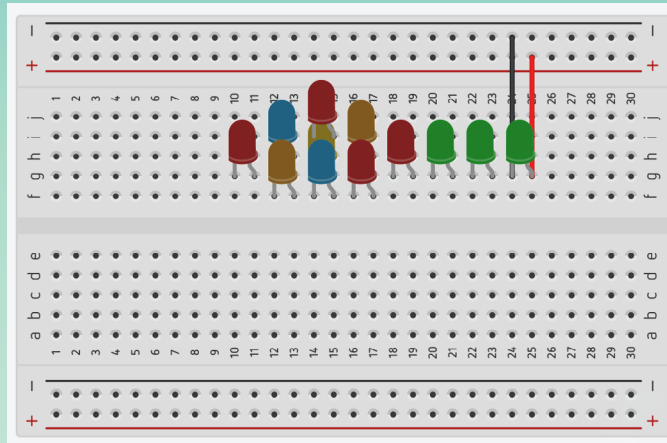
6. Keep adding LEDs until you have this flower design:



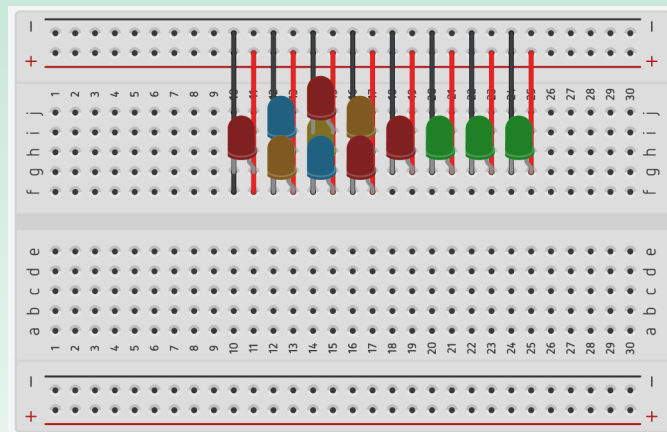
7. Add wires by clicking a hole and clicking again on another hole. Add a wire from the right side of the LED to the row that has a red addition sign (+).



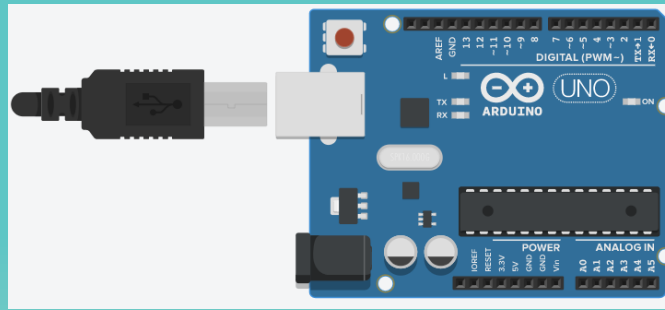
8. Connect a wire from the left side of the LED to the row with the black subtraction sign (-).



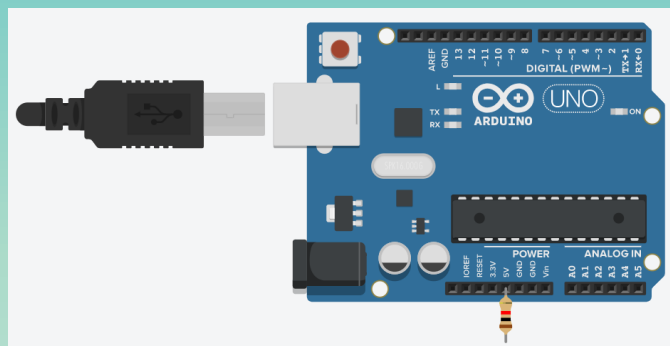
9. Repeat this with every column of LEDs. If there is more than one LED in a column, you only need one pair of wires, do not add more than one wire.



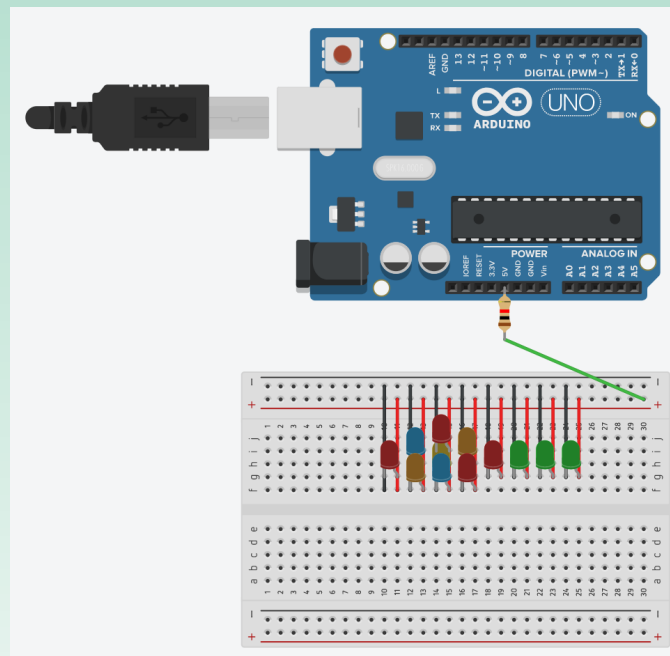
10. Your design is finished! Now to light it up, start with dragging the Arduino Uno R3 from the right (you might have to scroll a little for it).



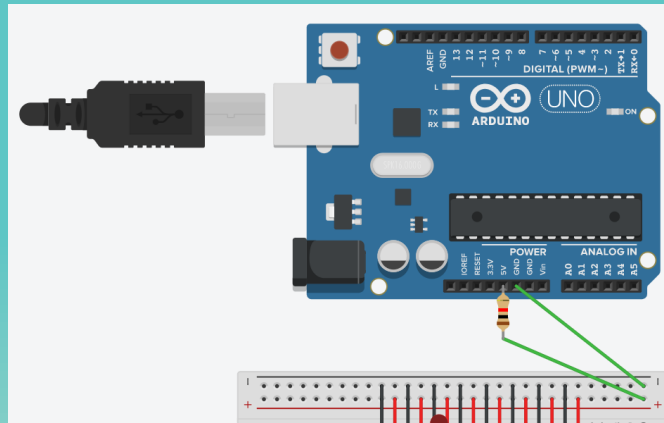
11. Grab a Resistor from the right and attach one side to the 5V spot on the Arduino.



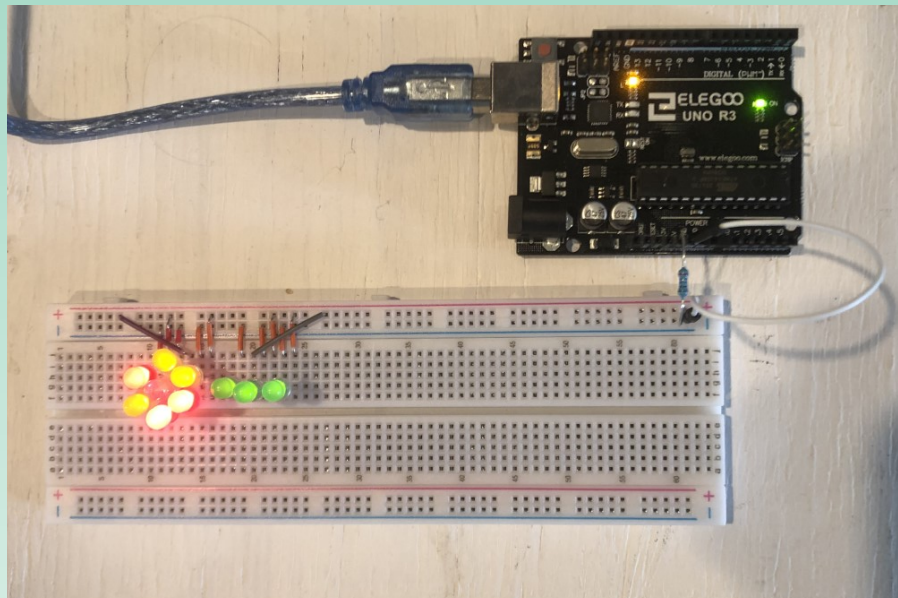
12. Click on the other end of the Resistor and drag the wire to the row with the red addition sign (+).



13. Now click on the spot on the Arduino that says GND. Drag that wire to the row with the black negative sign (-).



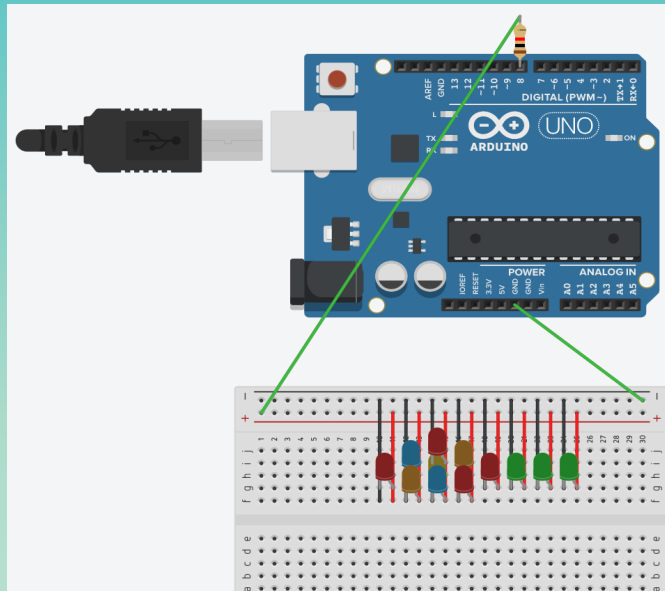
14. You're finished building your Arudino LED Spring Flower! To light it up, click the Start Simulation button in the top right corner. This is what it looks like in real life:



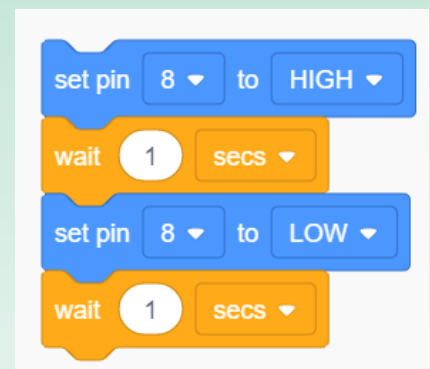
# OPTIONAL CODING CHALLENGE

Instead of completing steps 11 and 12, we're going to change it a bit to practice some Computer Science and Software Engineering (or coding)!

1. Skip steps 11 and 12 and instead, connect a Resistor to Pin 8 and connect a wire to the row with the red addition sign (+).



2. Press the Code button in the top right corner next to Start Simulation. Delete the code by dragging it into the trash can on the bottom right corner of the screen.
3. Copy this code by dragging over the parts from the left task bar. Make sure your code matches, check the pin number and if it is HIGH or LOW.



Now your Arudino LED Spring Flower should flash on and off! Try changing the number of seconds and see what happens!

# COMPUTING/ELECTRICAL RESOURCES

Electric Box Game: <https://www.learn4good.com/games/online/electricityforkids.htm>

Fun Electrical Circuits Video: <https://youtu.be/wlaxS8cqVZ4>

Coding for Kids, 12 Free Coding Game Websites: <https://childhood101.com/coding-for-kids/>

Introduction to Coding Video: [https://youtu.be/y5bXW\\_gEJl8](https://youtu.be/y5bXW_gEJl8)

Inside Your Computer: <https://youtu.be/AkFi90lZmXA>

## CAL POLY ENGINEER SPOTLIGHTS



I love Software Engineering because I love to code! To me, coding is like a puzzle; its a nice challenge to get all the pieces in place but when you do you end up with a pretty and satisfying product! The cool thing about coding is you can apply it however you want! If you are super into art you can code video games or design websites, or if you love cars you can code self driving cars! If you love hiking you can make a hiking app... the possibilities are endless! In the future I want to make sure self-driving cars are as safe as possible, so i would be working on security and autonomy (making the machine work by itself without human instructions)!



I love Computer Science because of all the cool things I can do with coding! Some cool projects I've used Computer Science for include building a robot that shoots poker chips, a bluetooth controlled electric skateboard, and an audio visualizer that produces graphics to the beat of any song. Another thing that I love about computer science is that there will always be a problem to solve and solutions to create!





I love Computer Engineering because it's a mix of Computer Science and Electrical Engineering (two topics I enjoy). On the Computer Science side I get to write code to program robots to perform cool tasks, program sensors, create web pages, process information, and so much more. On the Electrical Engineering side I get to solve and design electrical circuits and build the robots I can program. If you enjoy problem solving, robotics, programming, electronics or seeing your technical ideas come to life you'd enjoy Computer Engineering.



I love Electrical Engineering! Growing up, I loved building circuits, from cars to robots, I was always tinkering with something. In school, my favorite subject is Math and I wanted to find a way to help people and use math in my everyday life. Electrical engineering combined my love for math and hands-on projects, to help other people. I eventually want to work on designing renewable power systems so everyone can have access to clean, sustainable energy!