Tutorial TinkerCAD Electrical Series Circuit

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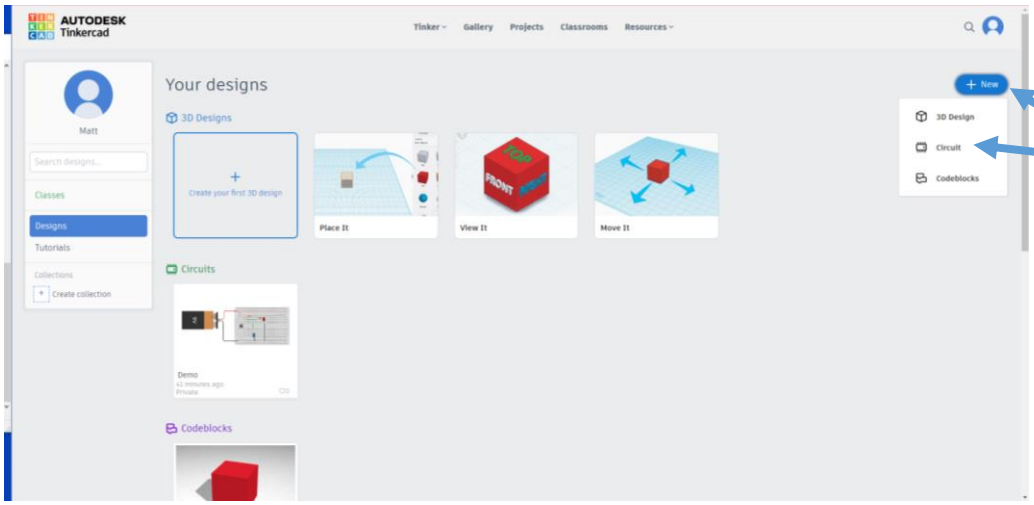
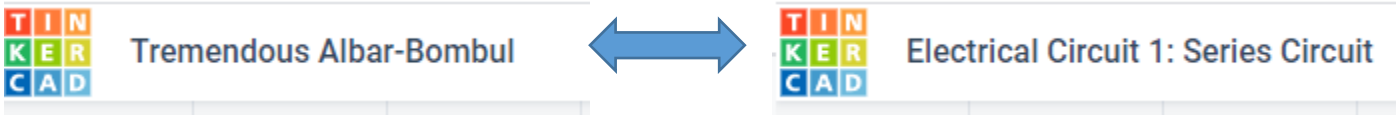
1. Navigate to TinkerCAD.com > Click Sign In Icon (Top Left Side of Screen > Select Students, Join your Classroom > Classroom CODE: See Teacher for Code > Nickname: Student First Name (all lower case)

2. Select Circuits > Select Create New Circuit



3. Change Name of Circuit to Electrical Circuit 1: Series Circuit

   Select Default File name in the Top Left Corner



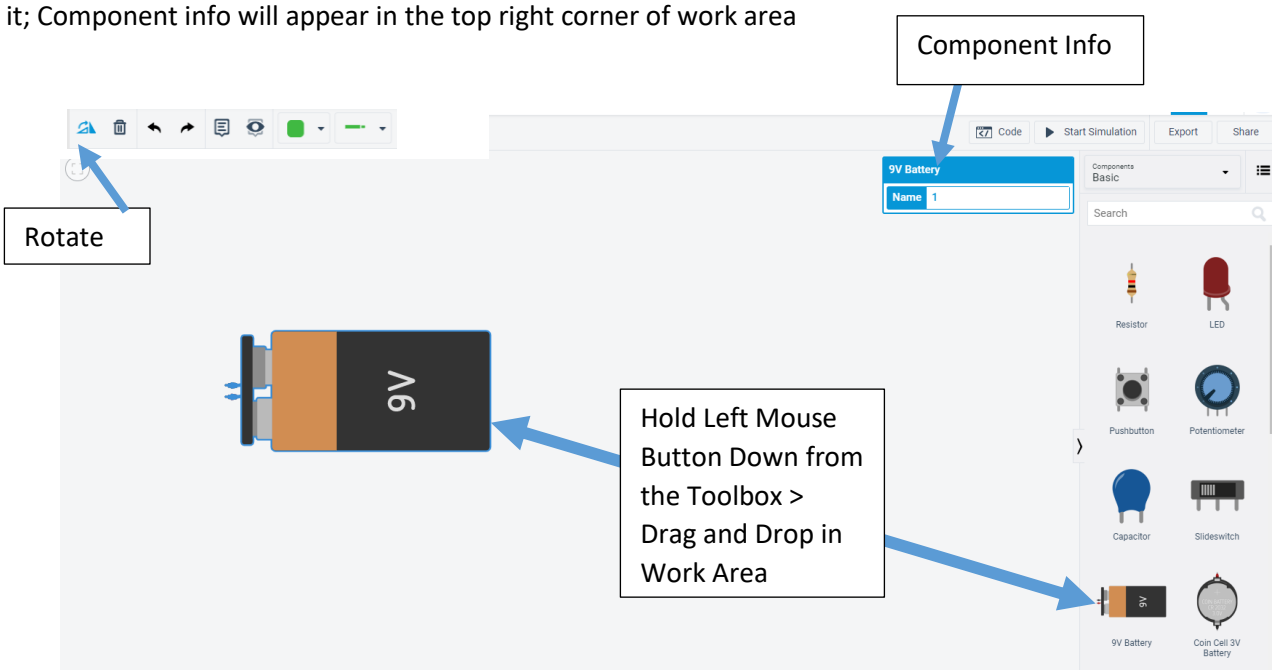
4. Adding Electrical Components. TinkerCAD is a Drag and Drop interface

Series Circuit

A **series circuit** is a closed **circuit** in which the current follows one path, as opposed to a parallel **circuit** where the **circuit** is divided into two or more paths. In a **series circuit**, the current through each load is the same and the total voltage across the **circuit** is the sum of the voltages across each load.

NOTE: TinkerCAD has an Autosave system. There is NO save button; system will update the save file every few minutes

1. From the Toolbox locate the 9V Battery > Hold Left Mouse Button to Drag and Drop in work area > Use the Rotate tool to have the Battery Terminals facing to the right (Be sure to have the component selected by left clicking on it; Component info will appear in the top right corner of work area



Rotated Battery

Battery Basics

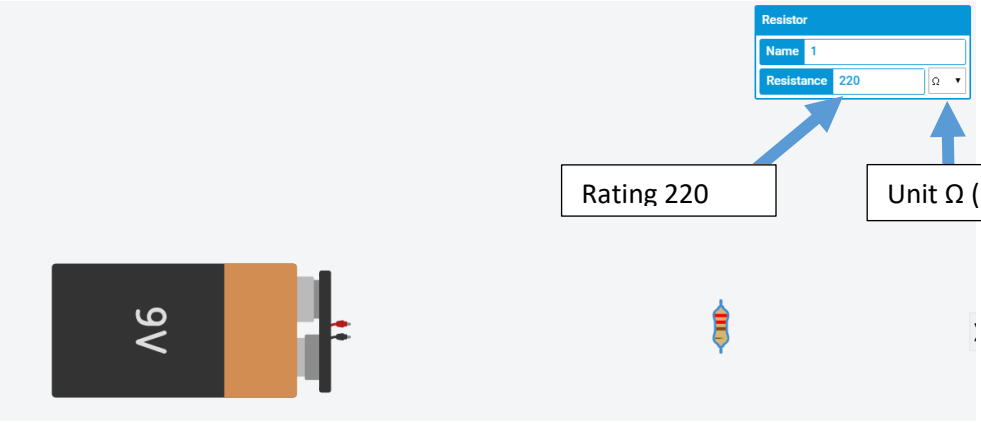
+ = Red Wire

- = Black Wire

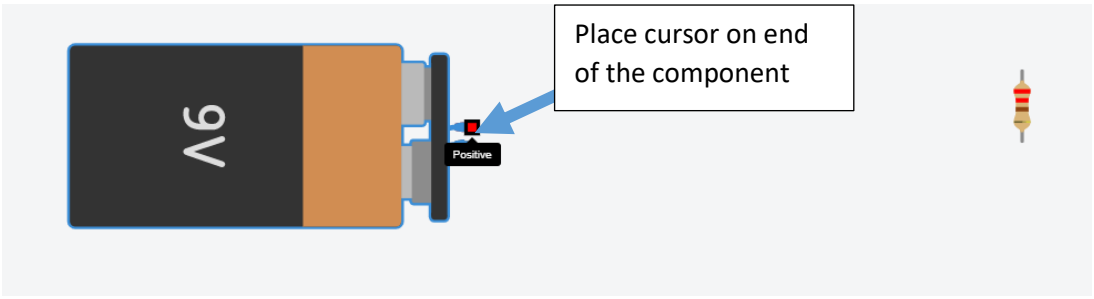
Note: Components

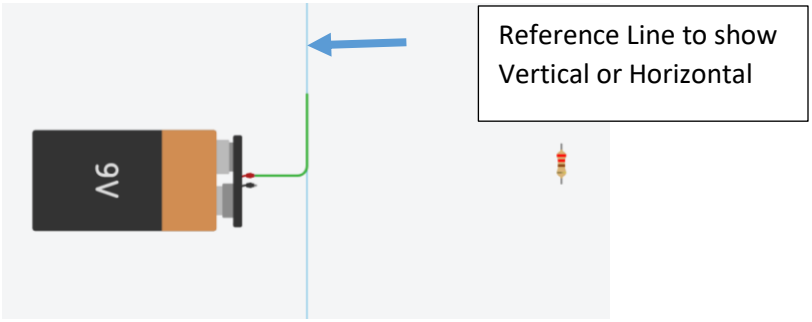
Moving: within the workspace by selecting the component > Hold Left Mouse Button Down Drag Component.
Delete: Press the Delete Key to remove the component from the workspace

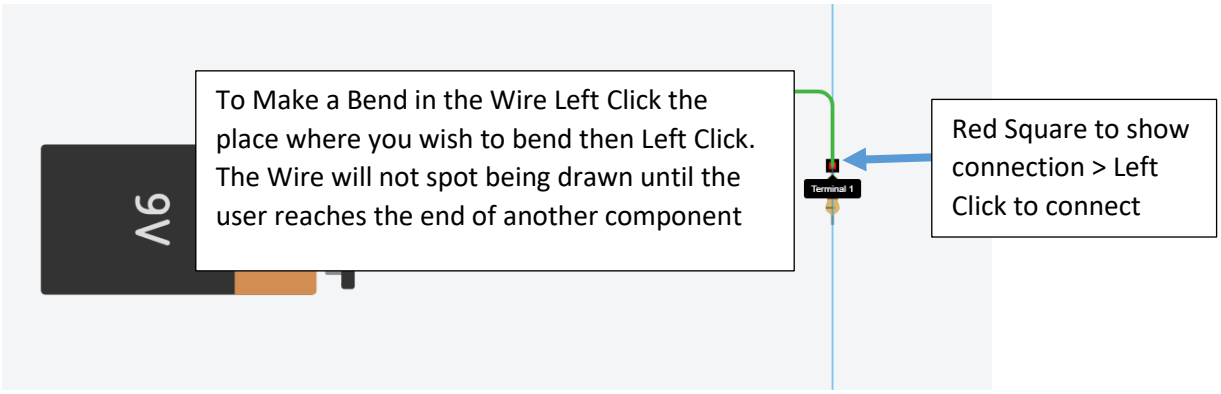
2. Drag and Drop a Resistor in the shown location > Rotate the Resistor (Note: It does not matter the orientation of the color bands does not matter; the color band are used as a means read the size of the resistor when in the field) > Change the Rating on the resistor to 220Ω (Ohm)



3. Connecting Components is simply placing the cursor on the end of a component (Red Square will Appear) > Hold Left Mouse Key Down > Drag to the end of the connecting Component > Let go of Left Mouse Button.
Note: Circuits run from the red wire (+; positive) of the battery connecting the components within the circuit back to the black wire (-; Negative) side of the battery.

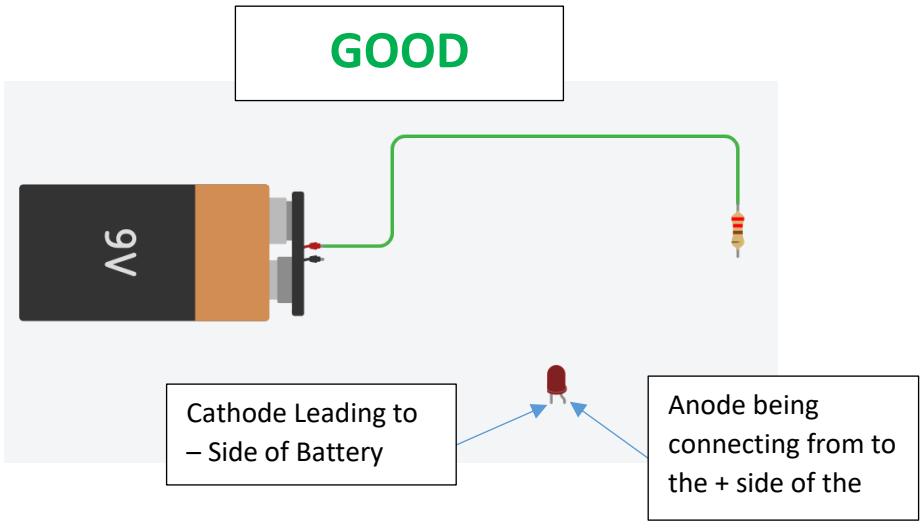


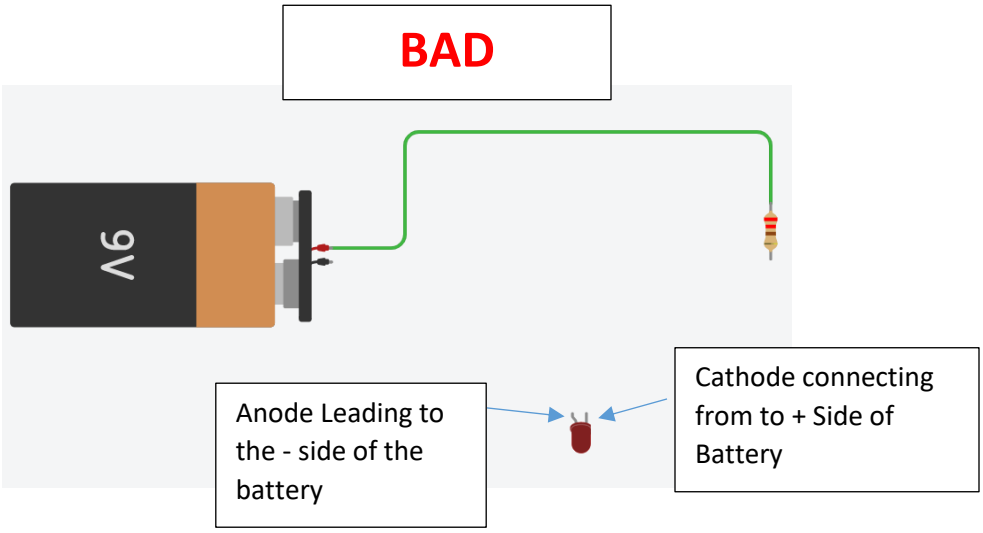




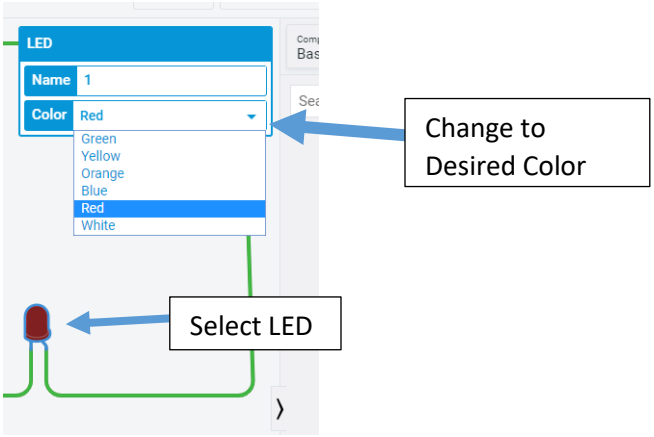
4. Light Emitting Diode (LED) in leyman's terms it is a simple light bulb. Almost all electronic/machine devices have signal LED's show the user what the machine is doing or if there is any errors (i.e Green = On; Red = something bad is happening; Orange = Off or Caution, etc.) The LED has two sides the Anode (Bent Wire) and the Cathode (Flat Wire)
   NOTE: The Anode (Bent Wire) Should ALWAYS be on the side where the + (Positive Side of the battery) is coming from and Cathode should be on the preceding side leading to the – (Negative Side of the battery). If the LED is placed in reverse then the LED will not light up; in the real world the user risks breaking the LED. In the Simulation Nothing will happen.

   Place LED in the given location

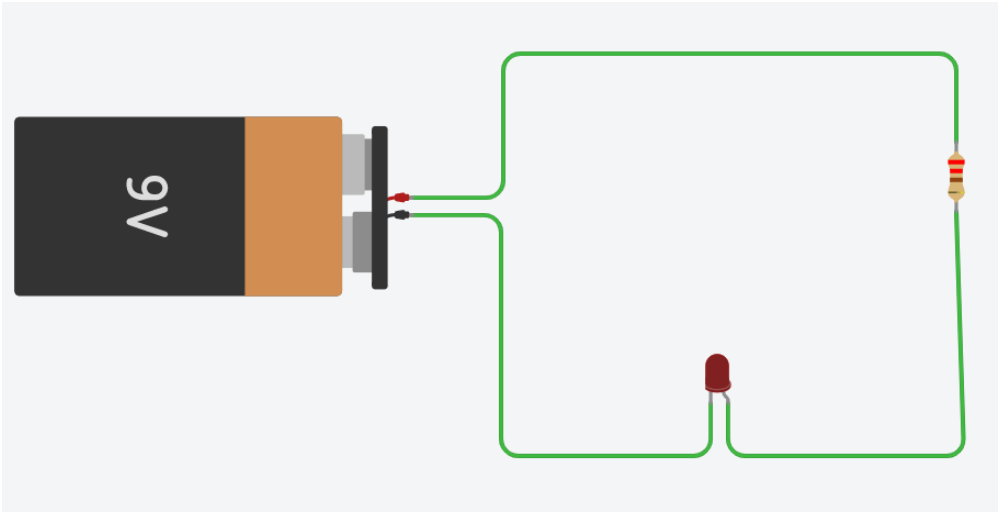




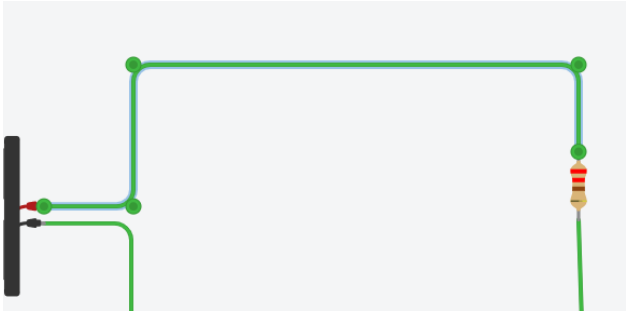
5. Adjusting LED Color: Select LED > Select desired color from Drop Down Menu on LED Properties Menu; located in the Top Right Hand of Workspace



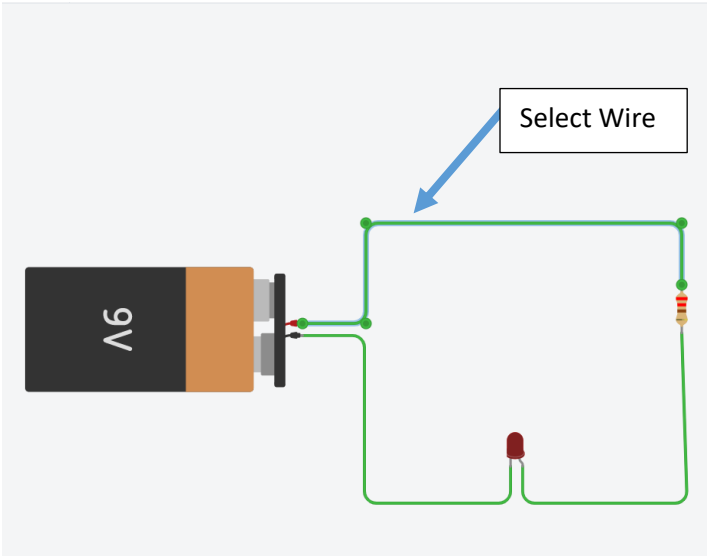
6. Connect the Wires as shown

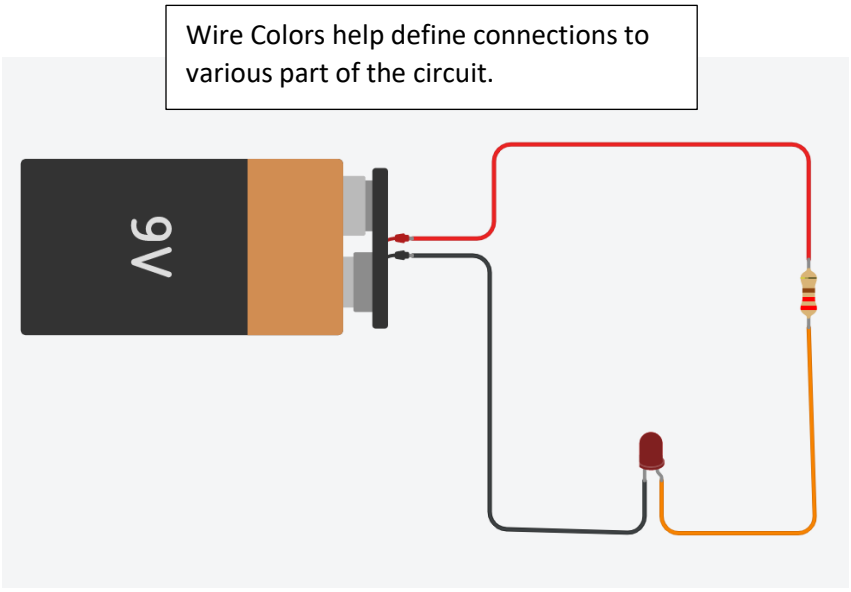


7. Adjusting the wire and/or Change Color of Wire.
    a. Adjusting Wire Angle, Length, Direction, etc.: Left Click on the wire to adjust > Place the cursor on the wire or one of the end points (shown has green dots) > Hold Left Mouse Key Down > Drag to Desired Location

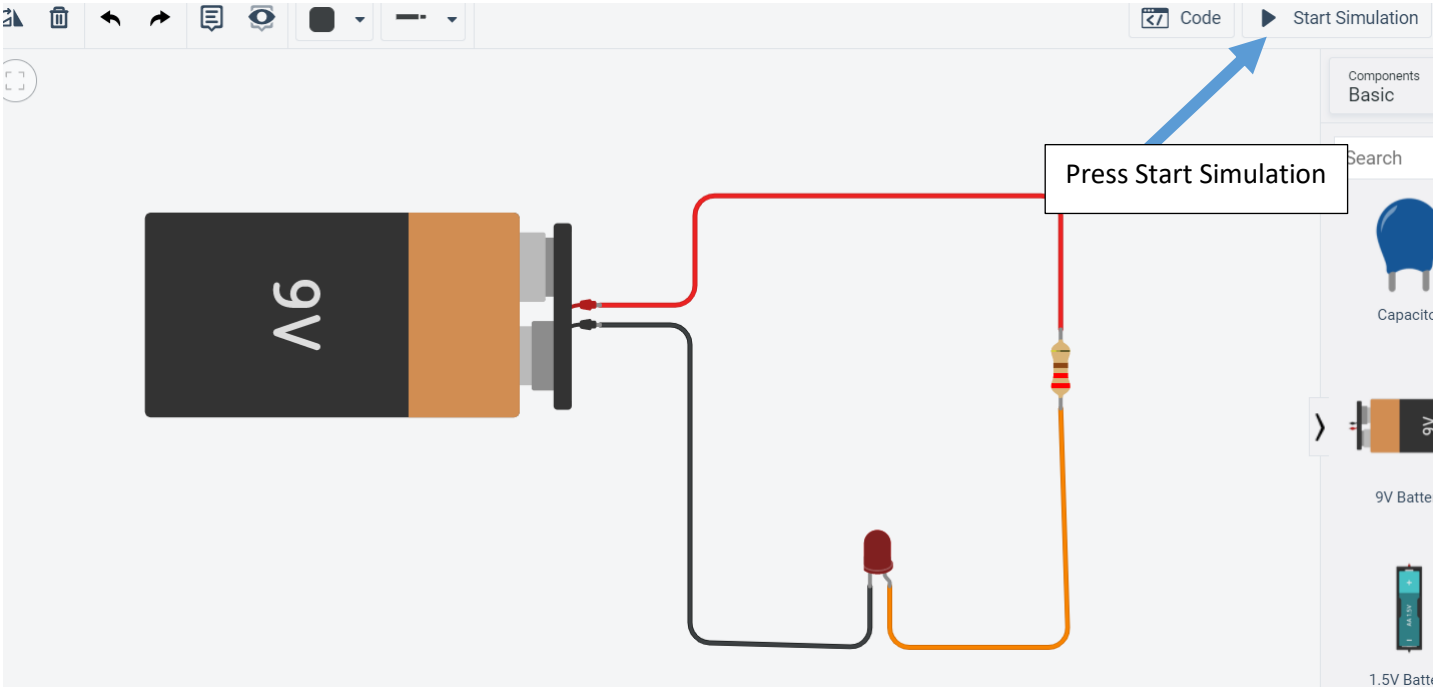


    b. Default color of wires is Green > User can change the color of the wire by selecting wire (Selecting Multiple Wires: Hold Shift and Click) changing the color wire from the wire properties menu in the top of the screen

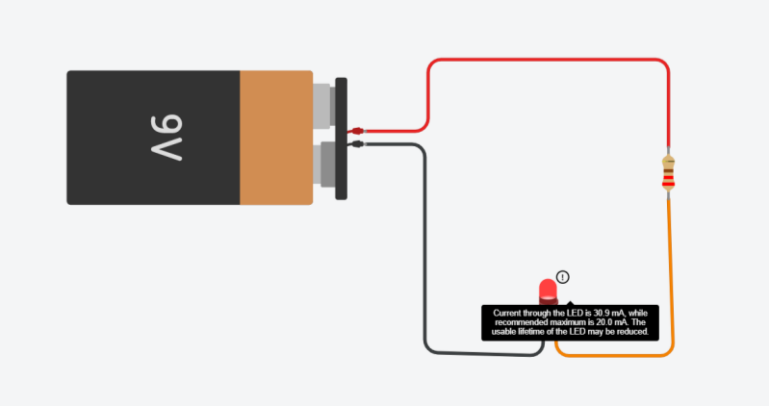




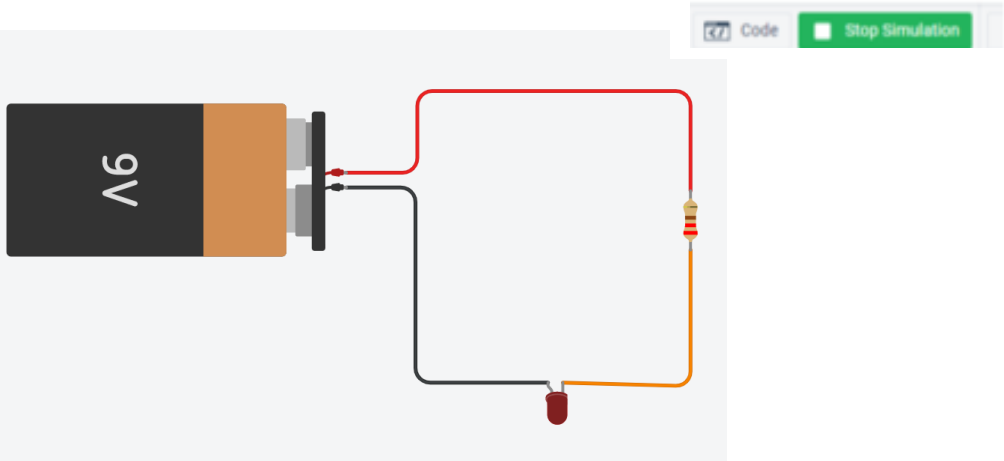
8. Testing Circuit or Code
   A. Press Start Simulation Button in the Top Right of Screen to apply an electrical load to the circuit.



b. Simulation will run showing the LED light up and provide information about the LED and the electrical load that is placed on the LED (Hover cursor over the Circle ! next to the LED.



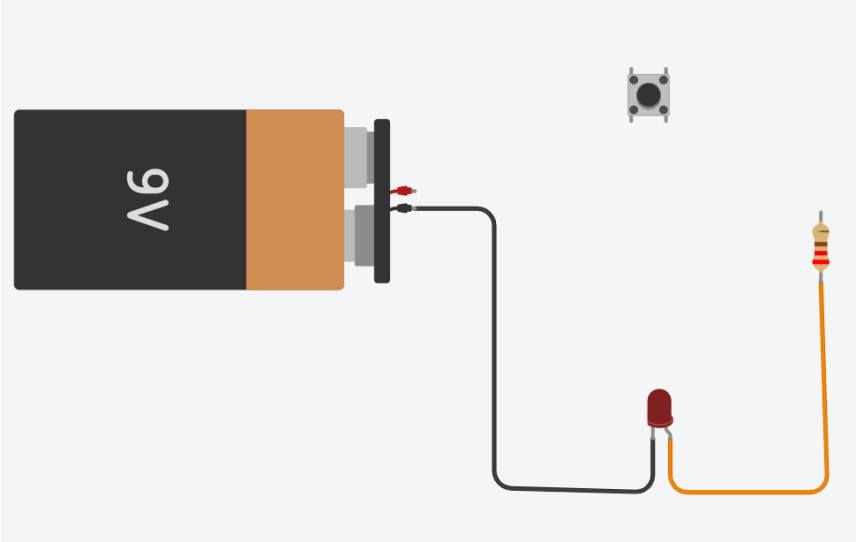
If Circuit was wired incorrectly then nothing would happen as shown below



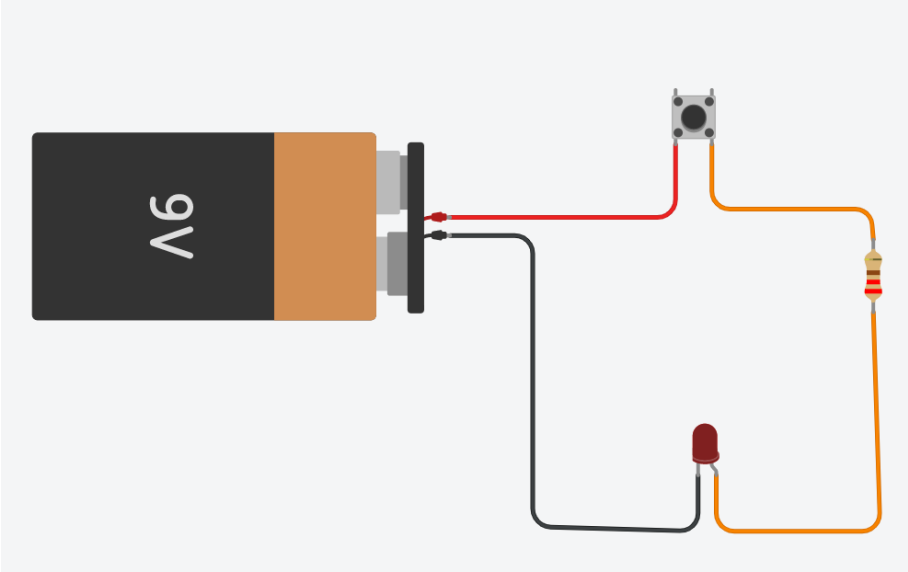
c. End Simulation: Press Stop Simulation (Same location as Start Simulation)
d. Adjust the size of the Resistor to 2200 Ω (Ohm) > Run Simulation to see what happens > Set the LED back to 220 Ω (Ohm)
HINT: The bulb should be dimmer because of more resistance.

9. Adding a Press Button

a. Delete the First Wire > Drag and Drop a Push Button in the shown location
NOTE: The Push button has four posts. We will be using two of the four posts for passing the electricity through or stopping it. The other two non-used posts can be used to hook other wires to send signals back a controller (i.e. Arduino) to tell the program if the button has been pushed or not; we will examine this later in the Arduino Tutorials.



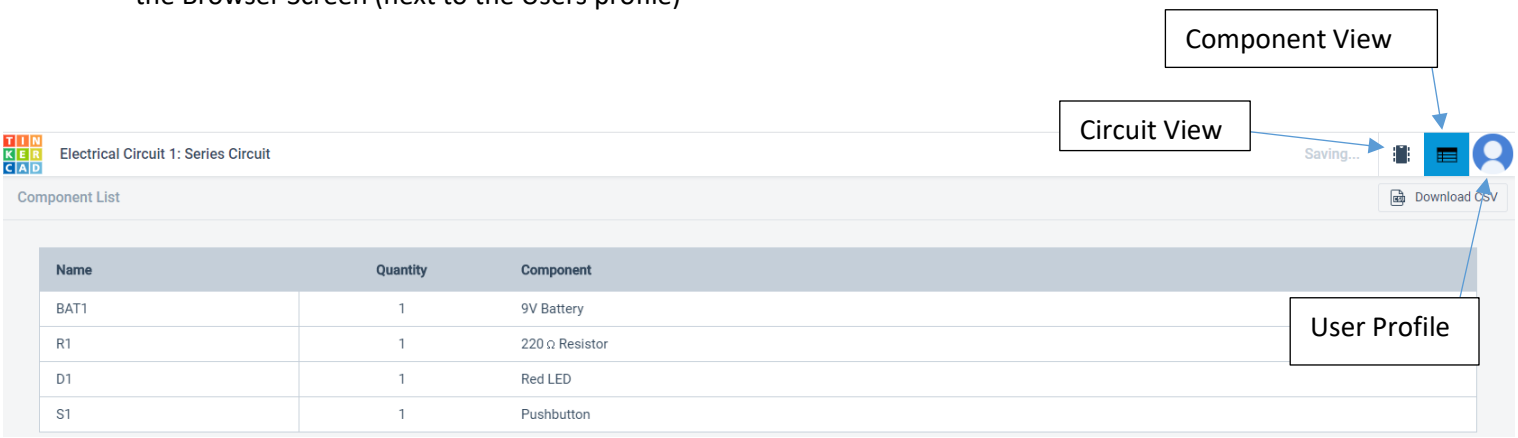
b. Connect the Wires as shown (Adjust components or wires as needed)



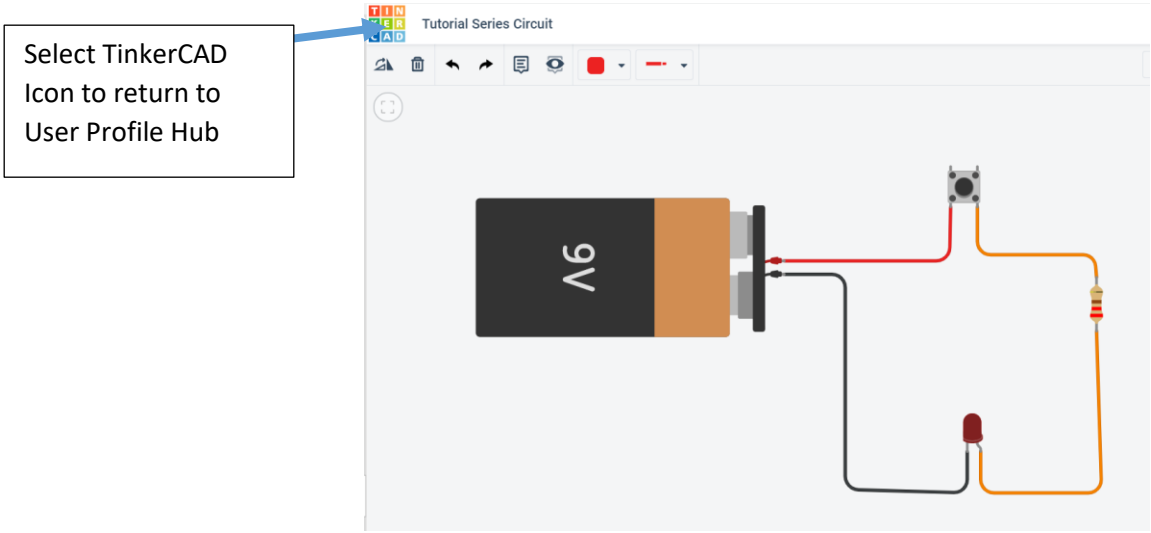
c. Run Simulation > Notice the Light does not illuminate > Left Click on the Button > The Light Should Turn On.

d. Experiment and adjust the Circuit to see what happens

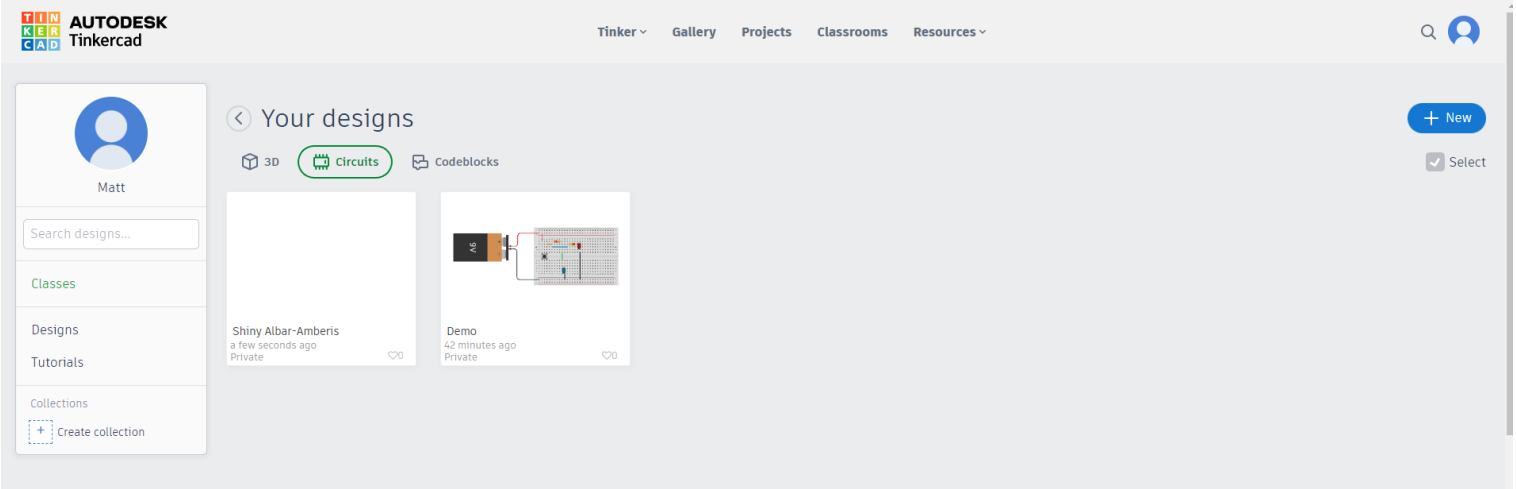
10. Component List: To see all of the components within your circuit select Component List in the Top Right Corner of the Browser Screen (next to the Users profile)

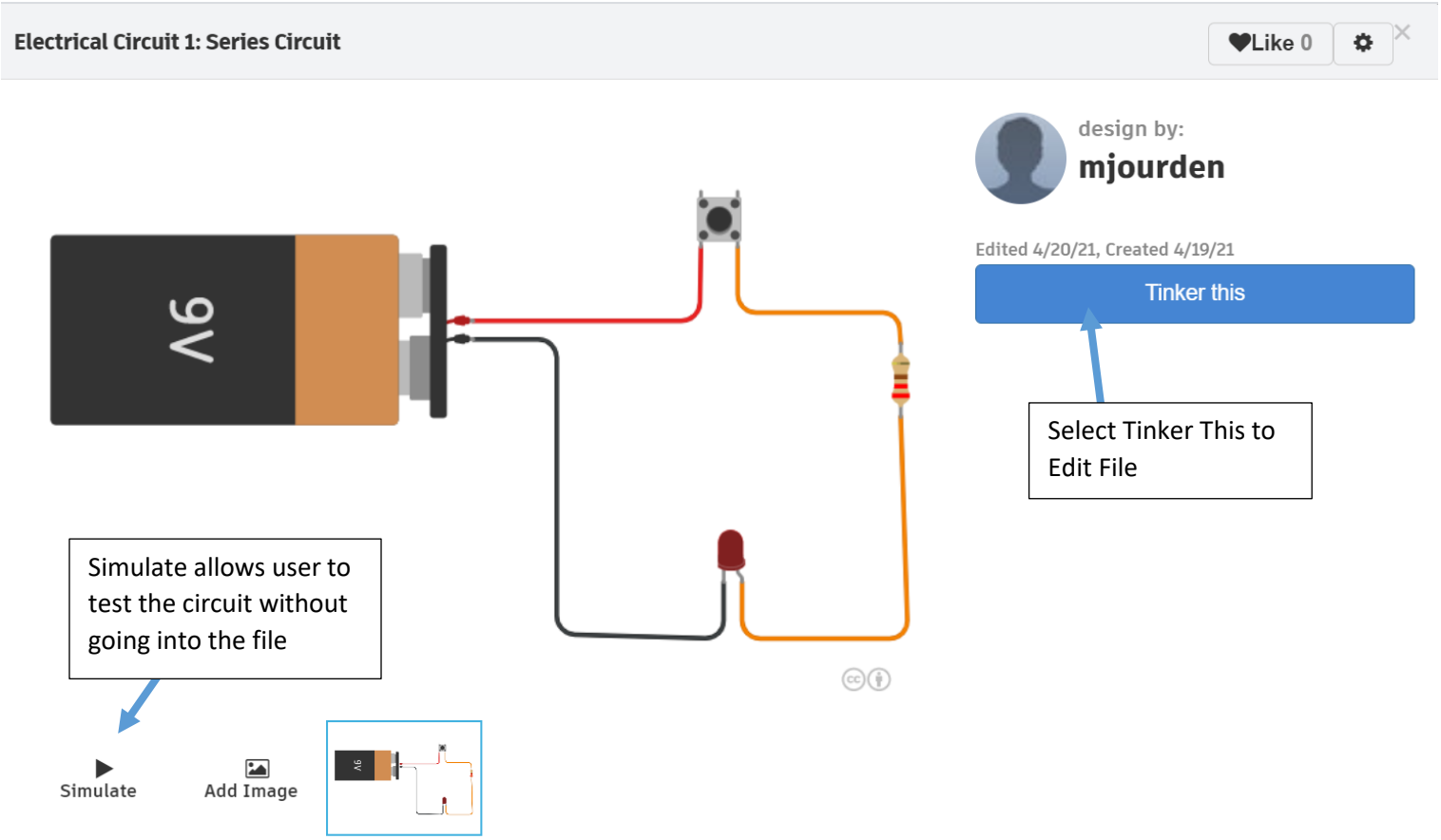


11. Select TinkerCAD Loge in the Top Left Side of the Browser Screen to Return to User Profile Hub



12. To Edit Existing File from User Hub > Select Circuit to Edit > Preview/File Information Pop Up Menu will Appear > Select Tinker This to edit file or Select Simulation to run the simulation from the Preview Window





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