
ARDUINO CHALLENGE ASSIGNMENT

Our job here is to start learning about Arduinos, how to assemble various circuits, and how to program them to work like we want. In some ways, Arduinos are like little computers. In other ways, they're more like PLD chips (like the CMODS6) that we've been using in Digital Electronics. What we can do with them is create small circuits using lights, buttons, sensors, etc – and then program them to function in the way we want!

Here, these beginning Arduino challenges will get you started designing and programming in TinkerCad for Circuits! When you join TinkerCad for Circuits, join our class by using the class code: **S4GM YAWV 2Q51**

Then, work through these Arduino challenges one at a time – *in order*. Save each as a new TinkerCad Circuit! Looking for help or hints? Check out our AirTable! Mr. Benshoof will post his examples, hints, and notes to the Arduino Challenges tab!

1) *Blinking LED*: Make an LED blink

This circuit should have a single LED light bulb that blinks on-and-off

2) *LED Traffic Light*: Make green-yellow-red LEDs change like a traffic light

This circuit should have three LEDs (one red, one green, one yellow) – and they should turn on/off like a traffic light does.

3) *LED Light Bar*: Make a row of 8 LEDs all light up

This circuit should have a row of 8 LEDs that all light up at the same time.

4) *LED Color Cycler*: Make an 8-LED line light up in order

This circuit should have a row of 8 LEDs that take turns being on (like the traffic light) and light up in order. So it should look like the bright LED moves along in a row before starting back over at the beginning.

5) *LED Night Rider*: Make an 8-LED line lights light up back-and-forth

This circuit should have a row of 8 LEDs that take turns being on (like the Color Cycler), but when the bright light reaches the end of the row, it should turn around and come back. This will make it look like it's bouncing back and forth (like Pong), rather than cycling from one side to the other (like Pacman)

6) *LED Randomizer*: (HARD CHALLENGE) Make random LEDs light up

This circuit should have a row of 8 lights and they should blink on/off randomly. However, to randomly choose the LEDs, your program should actually use the random function! Check the AirTable for a good example!

7) *LED Heart Beat*: Make an LED glow brighter and softer like a heartbeat

This circuit should use one of the PWM (~) ports to make a light bulb gradually grow brighter and then gradually grow dimmer. Doing this will require a "for" loop. Check the AirTable for a good example!

- 8) *LED Matching Heartbeats*: (HARD CHALLENGE) Make 2 LEDs have opposing heartbeats
This circuit should have just 2 LEDs. They should grow brighter/dimmer (like the Heart Beat), but they should do it in opposite directions. One gets brighter while the other gets dimmer, then vice-versa.
- 9) *LED Back-and-Forth*: Make matching groups of 3 LEDs light up back and forth
This circuit should have 6 LEDs organized into two rows of three each. Then, one group of three should all turn on at the same time, then all blink off while the other set all blinks on. This “Back and Forth” should have three on and three off at any one time.
- 10) *LED Rock-Paper-Scissors*: (HARD CHALLENGE) Make your LEDs play rock-paper-scissors
This circuit will have 6 LEDs organized into two rows of three each. Name these LEDs “Rock”, “Paper”, and “Scissors”. Using the random function, have the circuit play Rock-Paper-Scissors against itself. It should randomly choose one LED from each “side” to be their choice in the game. The program should then decide who wins! The winning side should flash all 3 LEDs in victory.
- 11) *Push Button Light Switch*: Make a button light up an LED
This circuit should have 1 LED and 1 Pushbutton switch. Make the button turn on the light when help.
- 12) *Push Button Toggle*: Make a button switch an LED on, then make it switch the LED off
This circuit should have 1 LED and 1 Pushbutton switch. Make the button toggle the light on (so the button does not have to be held down). When you push the button a second time the light should go off.
- 13) *Push Button Counter*: (HARD CHALLENGE) Make an LED turn on consecutive LEDs
This circuit should have 6 LEDs in a row and 1 pushbutton switch. The lights should all start off, and then when the button is pushed the first light should come on. If the button is pushed again, the second light should ALSO come on (so that 2 of them are on now). More button pushes should turn on more lights until all 6 are on. When the button is pushed a 7th time, all the lights should turn off.