

day90 Arduino force
Friday 5/3/24

Each partner needs to write the code for today's lesson. You will only make one circuit.

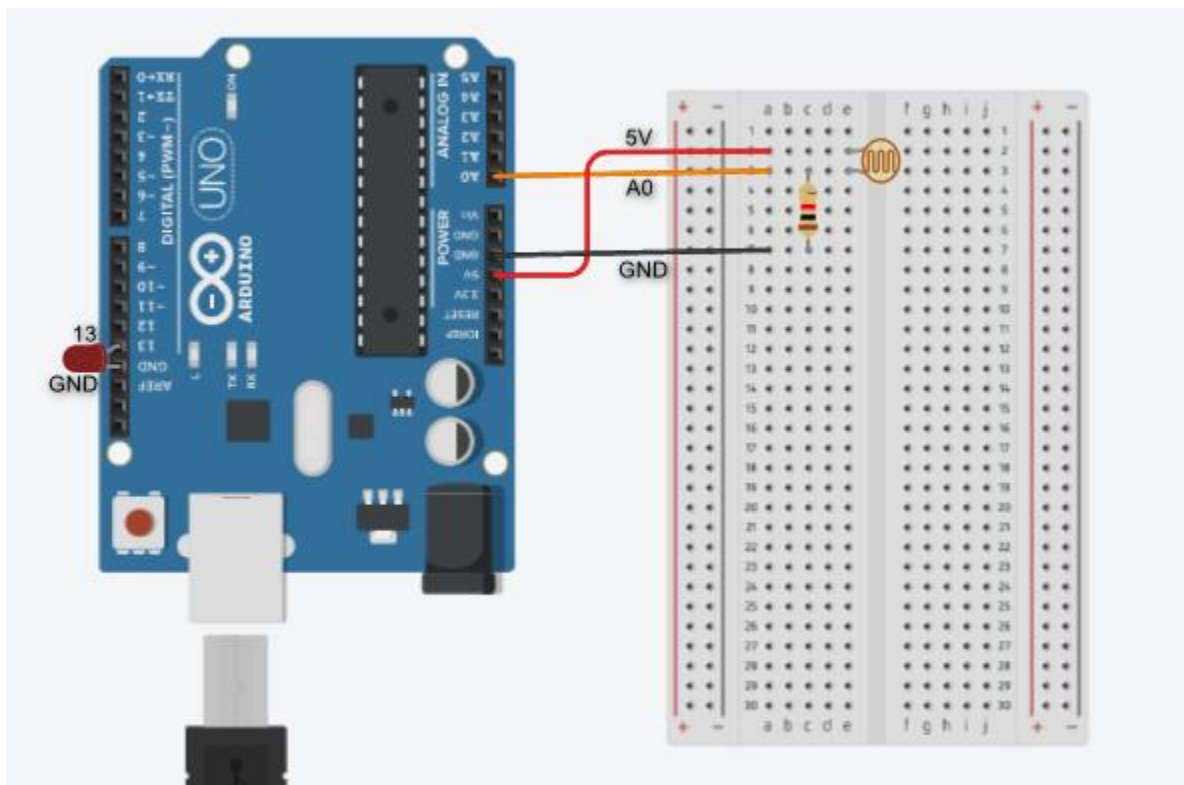
Today we'll be using a force sensing resistor. It looks like this:



This thing is a resistor. When you press it, its resistance changes, which can be sensed by an Arduino. It's a lot like the LDR (light dependent resistor) except that it's the force you apply to it that changes its value instead of light.



Create this circuit using a 10K resistor:



The force sensor is in holes e2 and e3. There is an LED over on the left on the Arduino board (long leg in pin 13, short leg in GND).

Write a program that reads the value of pin A0 and prints it to the serial monitor (or open your LDR program and do a Save as for today's program). Make sure it has a Serial.begin(9600) inside Setup and that you are printing the value of the variable used in the analogRead(0) command. Try pressing on the sensor with your thumb and forefinger, and make sure the values listed in the monitor change. If you are not pressing or touching the sensor, you should have a reading of zero. The harder you press the closer the value gets to 1023, the maximum possible reading. As tempting as it is to try to achieve perfection and get a 1023, please don't break this thing with your efforts! Debug this circuit and your program until you have it working.

I don't need to sign you off on this part, just move on once you're ready.

We're going to make a reaction time program. It should work like this:

A light turns on and off (1 second each), then stays on for a random amount of time (between 3 and 8 seconds.) When it turns off the user squeezes the pressure sensor and is told their reaction time. The program pauses 3 seconds then starts over.

To do this, you will need to do a few things:

Insert an LED into pins 13 and GND (remember, long leg into 13).

Use the random() function to choose a random time between 3 and 8 seconds. To do this, first put this command up INSIDE setup:

```
randomSeed(analogRead(0));
```

Then, down in your code where you need a random value, use this code:

```
int r = random(3000,8000);  
delay(r);
```

To time how long it took for someone to press the sensor you need to read the sensor over and over again in a loop waiting for the value to reach a certain trigger point. You can use a while loop to do this with the force variable. You also need to use the millis() function which gives you the number of milliseconds since the Arduino was turned on which allows us to measure the passage of time like this:

```
long before = millis();  
  
while(val<200)  
{  
    val = analogRead(0);  
}  
  
long after = millis();  
  
long elapsedTime = after - before;
```

In this example, the loop will repeat until the user pressed the force sensor enough to get it to read 200 or higher, then it moves on. Notice that I'm using "long" instead of "int" for the before and after times. That is because milliseconds is a very large number; too big for an int (which rolls over near 32767). The value stored in "elapsedTime" at this point is the number of milliseconds it took the user to press the sensor.

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Print the results out in the serial monitor. Here is sample output:

```
Ready...  
When the light goes out, press the sensor.  
Begin!  
Reaction time: 1060 milliseconds or 1.06 seconds
```

```
Ready...  
When the light goes out, press the sensor.  
Begin!  
You can't press the sensor until the light goes out!
```

```
Ready...  
When the light goes out, press the sensor.  
Begin!  
Reaction time: 359 milliseconds or 0.36 seconds  
Congratulations, you hold the new record.
```

For 8/10, do everything above except tracking the best score.

For 10/10 also add code to make sure the user is not pressing the sensor before the light goes out (see middle sample above).

For 12/10 (extra credit) do all of the above and also keep track of the best performance and report when the user beats the previous record.