Arduino Lesson 2

Learning Objectives

- Understand how to interpret resistor colors
- Determine how to properly connect wires on a breadboard
- Draw a simple circuit diagram
- Demonstrate Ohm's Law using an LED, resistors, and a battery, and then an Arduino Nano.

These directions are meant to be read alongside the video located at http://lesliehiatt.com/arduino-lessons-for-students/arduino-lesson-2/

Directions

Identifying Resistor Values Based on Colors (Video times 0:00-3:21)

Utilize a schematic to determine resistance values such as the ones located at either: https://reviseomatic.org/rOmV4/rOmV4/page/15/Resistors_Colour_Codes or https://eepower.com/resistor-guide/resistor-standards-and-codes/resistor-color-code/#

	Color	Signficant figures			Multiply	Tolerance (%)	Temp. Coeff. (ppm/K)	Fail Rate (%)
Bad	black	0	0	0	x 1		250 (U)	
Beer	brown	1	1	1	x 10	1 (F)	100 (S)	1
Rots	red	2	2	2	x 100	2 (G)	50 (R)	0.1
Our	orange	3	3	3	x 1K		15 (P)	0.01
Young	yellow	4	4	4	x 10K		25 (Q)	0.001
Guts	green	5	5	5	x 100K	0.5 (D)	20 (Z)	
But	blue	6	6	6	x 1M	0.25 (C)	10 (Z)	
Vodka	violet	7	7	7	x 10M	0.1 (B)	5 (M)	
Goes	grey	8	8	8	x 100M	0.05 (A)	1(K)	
Well	white	9	9	9	x 1G			
Get	gold			3th digit only for 5 and 6 bands	x 0.1	5 (J)		
Some	silver				x 0.01	10 (K)		
Now!	none					20 (M)		

6 band — 3.21kΩ 1% 50ppm/K

5 band — 521Ω 1%

4 band — 82kΩ 5%

3 band — 330Ω 20%

gap between band 3 and 4 indicates reading direction
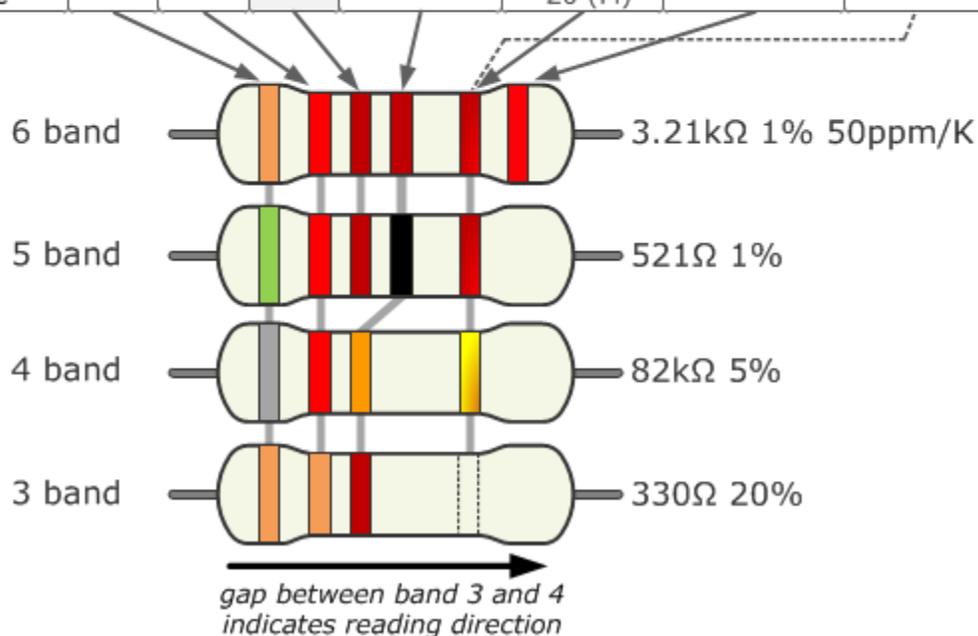
Understand Breadboard Connections (Video times 3:22-6:16)

One of the most common ways to make an error in connecting parts of a device is by not understanding how a breadboard operates. Watch the video and figure out how and why the different holes in a breadboard are connected. Might be handy to use a pair of needle nose pliers to ensure that the wires are in the breadboard securely.

Identifying polarity of an LED (Video times 6:17-7:15)

Determine why an LED has one leg longer than the other and how that relates to the polarity of the LED and how it should be connected within an schematic.
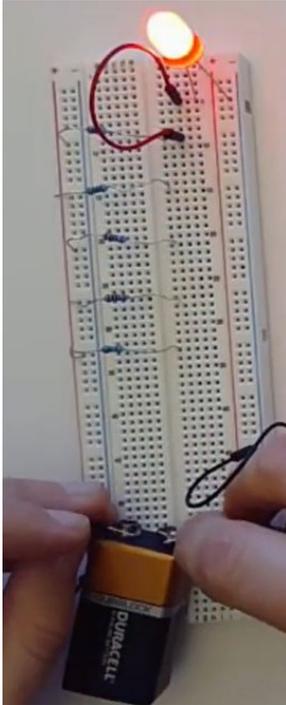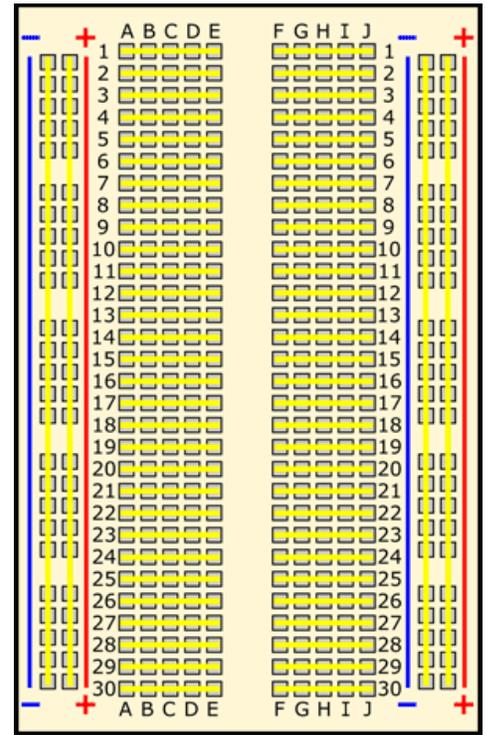
Determine how Resistance changes brightness of an LED (Video times 7:15-11:44)

Set up your breadboard as shown in the video. The resistor values are 100, 220, 1k, 10k, and 1M Ohms from top to bottom of the picture. Make sure to connect the light bulb to each resistor, noting in your lab notebook what happens as you increase the resistance. Explain mathematically your observations.

Power an LED with a microprocessor (Video times 11:45-End)

The next section of video demonstrates how to control the LED with a microprocessor. Lesson 1 demonstrated how code can be utilized to make a LED light on a microprocessor blink. Instead of powering your external LED on your breadboard with a 9 V battery, control the LED with the microprocessor. Connect the microprocessor into your breadboard. Then connect the negative wire to ground on the device and the positive wire to its D13 connection. Follow along with the video to change the blink rate of the bulb and which digital output (D8) controls the bulb's power source.

Questions to Consider

1. Which resistors are in your kit?
2. How might you connect the resistors in series and in parallel? How would you have to reconnect the resistors on the breadboard? Draw how you would connect them using pins on the breadboard.
3. Draw a circuit diagram for the circuit that is made when the LED was connected to the battery by a 1000 Ohm resistor.