

Zhuomi Yuan 19912126

First, fill in all the measurement you have in the lab.

220 Ω resistor

1st measurement: 216 Ω, error: 14 %

2nd measurement: 214 Ω, error: 25 %

3rd measurement: 217 Ω, error: 13 %

1000 Ω resistor

1st measurement: 983 Ω, error: 17 %

2nd measurement: 988 Ω, error: 12 %

3rd measurement: 981 Ω, error: 14 %

5 V voltage measurement

1st measurement: 5.10 V, error: 2 %

2nd measurement: 5.15 V, error: 3 %

3rd measurement: 5.15 V, error: 3 %

0.005 A current measurement

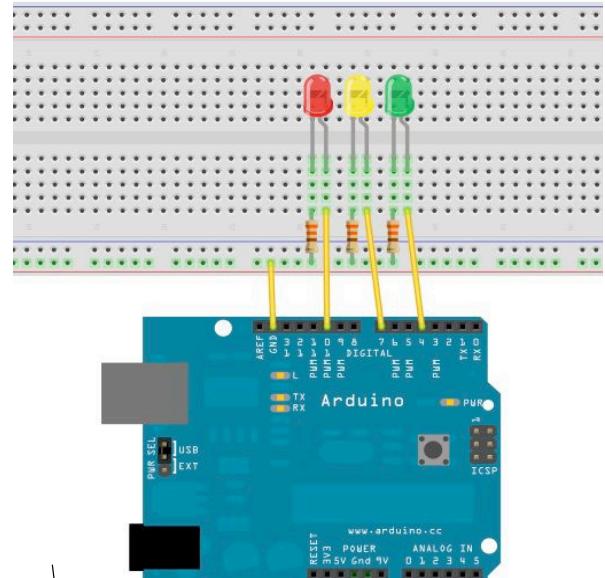
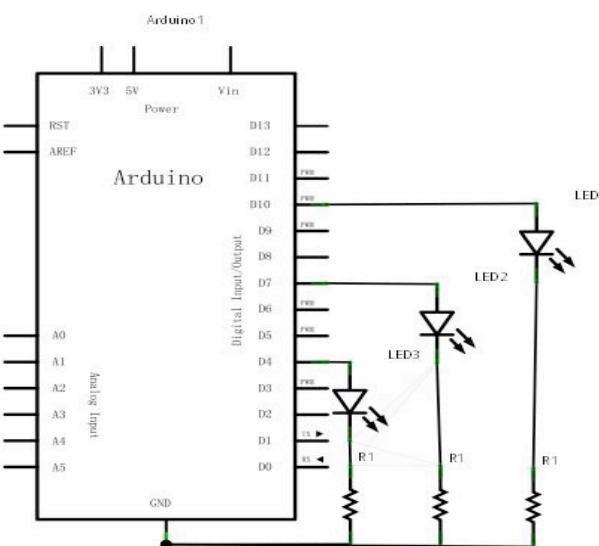
1st measurement: 0.003 A, error: 4 %

2nd measurement: 0.003 A, error: 4 %

3rd measurement: 0.003 A, error: 2 %

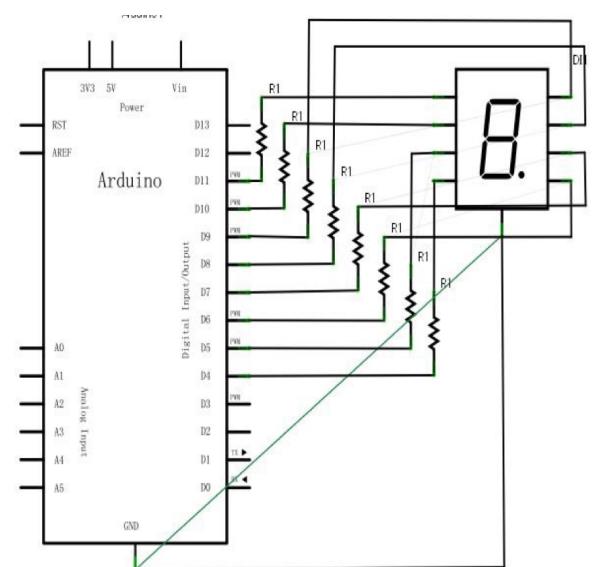
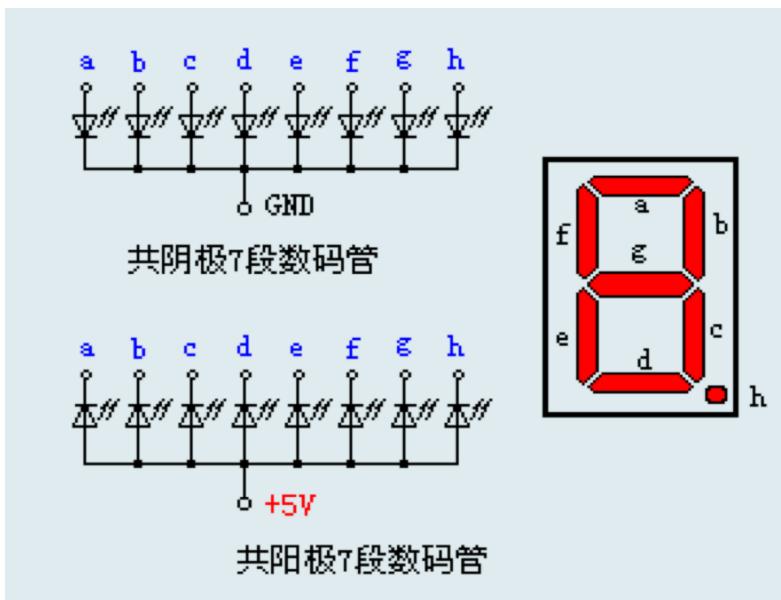
Homework problems.

1. The simple traffic light can be controlled by a time sequence: 5 seconds of green light, followed by 3 seconds of yellow light, and then 8 seconds of red light. This cycle is repeated again and again. Please use three LEDs and Arduino board to realize this sequence. The electrical diagram and the connection illustration are shown below.



Requirements: Please write code to achieve the above-mentioned function. Run the code and take a 20-second video to demonstrate. The wires are required to follow the color code and clean. The code follows strict C style ([instructions](#)). Please also insert a photo of the prototype and a copy of the code.

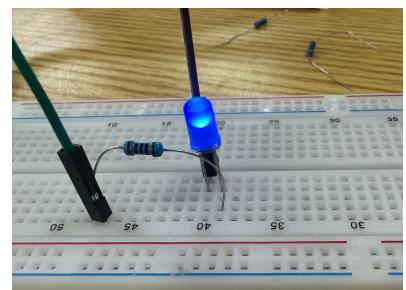
2. LED segment display can be seen everywhere in our life. Please code and realize a 10-second (from 9 to 0) counter down display. The same rule for wiring and coding as the previous problem. Please upload a 10-second video to demonstrate.



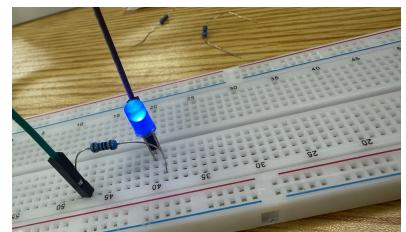
3. In the lab, we have achieved 50% 100 Hz square wave by delaying 5 ms after turning high and delaying 5 ms after turning low. The on and off time ratio can be controlled by the delay function and achieve so-called Pulse Width Modulation. Based on the lab, please code and wire to achieve a dimming LED with 20%, 30%, 50%, 75%, 90% of the time on and observe the brightness.

$$T = \frac{1}{f} = 10 \text{ ms}$$

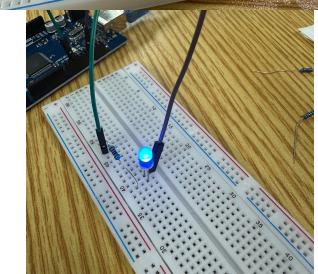
20% dimming 2ms High 8ms Low



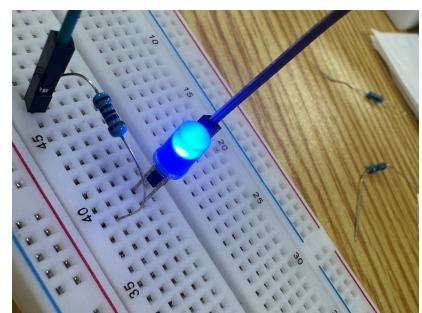
30% dimming 3ms High 7ms Low



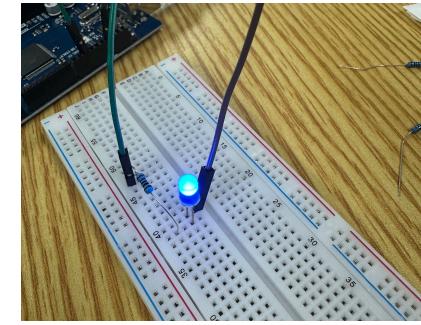
50% dimming 5ms H 5ms L



75% dim 7.5 ms H 2.5 ms L



90% duty 9 ms H 1 ms L.



The brightness increases with the increase of pulse length