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CS5780 Post-Lab 3

# Lab 3 GitHub project:
# https://github.com/alex-baret/CS5780/tree/master/Labs/LAB3

To find *main.c* within the GitHub repo, click the commit link -> click 'Browse files -> navigate to: Labs/LAB3/CS5780_LAB3_Alex_Baret/Core/Src/main.c

'checkoff complete' contains the state of main.c for the lab checkoff

## Post-Lab Questions

1. Using a timer clock source of 8 MHz, calculate PSC and ARR values to get a 60 Hz interrupt.

    - Dividing our clock source by 80 allows us to count 1/80th of the clock source, which is a $0.01ms$ period:

      $$\frac{8MHz}{80} = 100kHz = 0.01ms$$

      We can then determinine the period length of $60Hz$:

      $$\frac{1}{60Hz} = 16.67ms$$

      Dividing our desired period length by the period length our clock source has been reduced to will give us how many times we need to "count":

      $$\frac{16.67ms}{0.01ms} = 1667$$

      Therefore we can get close to a 60Hz interrupt by setting a **PSC value of 79** and an **ARR value of 1667.**

2. Look through the Table 14 "STM32F072x8/xB pin definitions" in the chip datasheet and list all pins that can have the timer 3 capture/compare channel 1 alternate function

    - PE3, PA6, PC6, and PB4

3. List your measured value of the timer UEV interrupt period from the first experiment.

    - The measured value of the timer UEV interrupt period from the first experiment was **250.7ms**. Verifying the desired frequency we can take the inverse of the period:

      $$\frac{1}{250.7ms} = \sim 3.989Hz$$

4. Describe what happened to the measured duty-cycle as the CCRx value increased in PWM mode 1.

    - As the CCRx value increased in PWM mode 1 the measured duty cycle increased. Due to PC6 being connected to PWM mode 1, this resulted in the red LED appearing brighter than usual and much brighter than the blue LED.

5. Describe what happened to the measured duty-cycle as the CCRx value increased in PWM mode 2.

    - As the CCRx value increased in PWM mode 2 the measured duty cycle decreased. Due to PC7 being connected to PWM mode 2, this resulted in the blue LED appearing dimmer than usual and much dimmer than the red LED.

6. Include at least one logic analyzer screenshot of a PWM capture.

    - PWM captures are included in the lab submission

7. What PWM mode is shown in figure 3.6 of the lab manual (PWM mode 1 or 2)?

    - PWM mode 2 (with upcounting) is shown in figure 3.6 of the lab manual. We can see the timer's counter value increasing and until the counter value is greater than the CCRx (Capture/Compare Register) value, the CCx Output Pin is inactive. We then see the CCx Output Pin switch to active once the counter is greater than the value in the CCRx register (and again reset once the counter gets to the ARR value).