Objective:
Design a traffic light control system using the PIC18F4620 microcontroller with pedestrian control and left turns.

Summary:
In part one, we started by programming a one second delay subroutine that we could call to control the amount of time any of the LEDs were a certain color. This subroutine would also turn an LED on for half a second and off for half a second. The half second subroutine used the INTCON0 register and adjusted the values of TMR0L and TMR0H until the timer lasted 500 milliseconds. We used a logic analyzer to measure the duration of the half second subroutine.

In part two, we added a control variable for the delay. The value would be the number in seconds that the delay would last. To accomplish this, we created a subroutine called wait N seconds that used a for loop containing the wait one second subroutine. The for loop runs N times, causing the delay to be N seconds.

In part three, we tested the hardware wire connections by cycling through the colors. We did this by defining PORT bits to each red and green RGB LED pin. Then we made a subroutine that utilized a switch statement to set the color of each RGB LED. Finally we created a for loop that cycled through the colors by incrementing the index number of each RGB LED.

In part four, we added pedestrian control by creating a countdown before the RGB LED changed colors. We created a subroutine called PED control that had two arguments, one for time and the other for direction. The direction argument would control if the countdown was for the north-south direction or the east-west direction. We used a dual seven segment display to show the countdown. The upper digit was used for the east-west direction and the lower digit was used for the north-south direction. In addition to the countdown, we used a buzzer to buzz for half second intervals while a countdown was active.

In part five, we added control switches that would skip a function of the traffic light cycle. We used four switches in total, one for each of the left turns and one for each of the pedestrian control countdowns. If the function's switch was off, the function would skip, and if the switch was on, the function would occur. We also added a light sensor that would toggle between a day and night mode. In day mode all the switches and traffic light functions act like they did before but in night mode both the pedestrian control countdowns and buzzer would be skipped. The left turn switches would function in night mode.

Data Collected:

Conclusion:

The PIC18F4620 was an effective tool to create a traffic light controller. This project used only a few parts on the hardware side and was programming reliant. We used a combination of analog input, to control the day and night mode, and digital input, to manually skip the left turns and pedestrian control countdowns. We also had to set the OSCCON to 0x70 which made the system clock operate at 8 MHz. This project was helpful in understanding the real world applications of microcontrollers.