**Procedure**

1. Begin a New Project and name it Lastname\_Lab2Operations. Remember that MPLABX IDE opens the last project, Lab 1, and editing it will automatically save/alter that file.
   1. New Project>Microchip Embedded>Standalone Project
   2. Device: Mid-Range 8-bit MCUs (PIC12/16/MCP)> PIC16F917
   3. No Header
   4. Hardware: ICD 3
   5. Compiler: mpasm> mpasm (v5.57) [C:\Program Files (x86)\Microchip\MPLABX\mpasmx]
   6. Save to C:\ drive
2. Add Source Files
   1. Retrieve the .asm file from Canvas.
3. Add Header Files
   1. Retrieve the .inc file from Canvas.
4. On your board, connect the remaining LEDs to PORTD.
5. You will need to define the remaining LEDs and declare a variable (several options given in Lab1)in the include file,
6. Configure the I/O pins for the added LEDs in the initialization section of the main code.
7. Refer to Ch.17 Instruction Set Summary of the PIC16F917 Datasheet. The table on Pg. 244 shows the operation codes for the chip and the next few pages list their detailed descriptions. Alter the code so that your program uses the following operations to light the LEDs:
   1. ADDWF: pressing the switch will load a bit to D7 (the right most LED). Each additional press of the switch will add a bit, resulting in the LEDs counting up by 1 in binary.
   2. COMF: load any binary number to the PORT and pressing the switch will display the complement on the LEDs.
   3. DECF: illuminate all of the LEDs, then count down in binary with each press of the switch.
   4. INCF: with each press of the switch, count up.
   5. RLF: load a bit in the initialization to light an LED. Rotate the bit left every time the switch is pressed.

Write the code for each operation in the editor window and perform one at a time by “commenting out” the operations that you are not using. This can be done using a semicolon. For example, if I wanted to explore how to use the MOVLW operation to light the LEDs using binary and hexadecimal, my code would look like this:

Main

btfsc SW2 ; Loop here until Switch 2 is pressed (SW2 is

; defined in the include file)

goto Main

; Once Switch 2 is pressed, use MOVLW to load a binary number to light all the LEDs

;movlw b'11111111' ; move the literal 11111111 to the working

; register

;movwf var1 ; move the contents of the working register to

; the location of var1 to the file register

;movwf PORTD ; the data from var1 is sent to PORTD

; Once Switch 2 is pressed, use MOVLW to load a hex number to light all the LEDs

movlw 0xFF ; move the literal FF (hex) to the working

; register

movwf var1 ; move the contents of the working register to

; the location of var1 to the file register

movwf PORTD ; the data from var1 is sent to PORTD

Only the operation for the hex number will be executed.

**Deliverables**

To receive credit for this Lab, you will need to:

1. Have each operation working in your program **AND** checked off by the instructor or TA
2. Submission of your code on a single text file to Canvas
   1. Each line of code needs a comment to the right that follows the code given in Lab1 and above.