ECE 376 - Homework #4

C Programming and LCD Displays. Due Monday, September 25th
Please submit as a hard copy, submit on BlackBoard, or email

1) Determine how many clocks the following C code takes to execute

- Compile and download the code (modify working code and replace the main loop)
- Measure the frequency you see on RC0 (toggles every loop).
  - Use an osiclloscope - or -
  - Connect a speaker to RC0 with a 200 Ohm resistor and measure the frequency with a cell phone app like Piano Tuner
  - RC1 is 1/2 the frequency of RC0, RC2 is 1/4th, RC3 = 1/8th, etc
- The number of clocks it takes to execute each loop is

$$N = \left(\frac{10{,}000{,}000}{2 \cdot Hz} \right)$$

1a) Counting mod 16

```
unsigned char i
while(1) {
      i = (i + 1) % 16;
      if(i == 0) PORTC += 1;
      }
```

1b) Counting mod 17

```
unsigned char i
while(1) {
      i = (i + 1)% 17;
      if(i == 0) PORTC += 1;
      }
```

1c) Floating Point Division

```
float A, B, C;
A = sqrt(3);
B = sqrt(2);
while(1) {
     i = (i + 1)% 16;
     if(i == 0) PORTC += 1;
     C = A/B;
     }
```

1d) Double Precision Floating Point Division

```
double A, B, C;
A = sqrt(3);
B = sqrt(2);
while(1) {
     i = (i + 1)% 16;
     if(i == 0) PORTC += 1;
     C = A/B;
     }
```

Beep

2) Write a C program which plays 174.61Hz (note F3) for 50ms on a speaker

```
void Beep(void) {
:
:
}
```

3) Verify the frequency and duration of your note

$65 Craps Table

4) Give a flow chart for a program which turns your PIC into a Craps Table:

- On reset, you start with $10 in your bank (which is displayed on the LCD).
- The game starts by pressing a button RB0. The bet is $1 (fixed).
- When you press and release RB0, it rolls two 6-sided dice
  - hint: count mod 36. Die #1 is count mod 36. Die #2 is count/6.
- If you roll 7 or 11, you win (bank increases by $1)
- If you roll 2, 3, or 12, you lose (bank decreases by $1);
- If you roll a different number, that's your point. On RB0, you roll again.
  - If you roll your point, you win
  - If you roll 7 or 11, you lose
  - If you roll a different number, nothing happens.
  - Keep playing until you win or lose
- On the LCD, display
  - Your bank balance
  - The two dice values (1..6 and 1..6), and
  - The point (if you didn't roll a 2,3,7,11, or 12 first roll)

5) Write the C code for a craps table

6) Verify your program

- On reset, you start with $10 in your bank
- Numbers generated are random: two dice each in the range of 1..6
- The LCD displays information correctly
- When you win, you gain $1. When you lose, you lose $1.

7) (20pt) Demonstration (in person or on a video)