ECE 376 - Homework #4

C Programming and LCD Displays. Due Monday, February 13th
Please submit as a hard copy or submit on BlackBoard

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 8

```
unsigned char i
while(1) {
      i = (i + 1) % 8;
      if(i == 0) PORTC += 1;
      }
```

1b) Counting mod 7

```
unsigned char i
while(1) {
      i = (i + 1)% 7;
      if(i == 0) PORTC += 1;
      }
```

1c) Long Integer Division

```
unsigned long int A, B, C;
unsigned char i;
A = 0x12345678;
B = 0x1234;
while(1) {
    i = (i + 1)% 8;
    if (i == 0) PORTC += 1;
    C = A / B;
    }
```

1d) Floating Point Cosine (need to add #include <math.h>)

```
float A, B, C;
A = 3.14159265379;
while(1) {
    i = (i + 1)% 8;
    if(i == 0) PORTC += 1;
    C = cos(A);
    }
```

Beep

2) Write a C program which plays 200Hz for 100ms on a speaker

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

3) Verify the frequency and duration of your note

$65 Roulette Wheel

4) Give a flow chart for a program which turns your PIC into a Roulette wheel:

- On reset, you start with $10 in your bank (which is displayed on the LCD).
- The game starts by pressing a button (RB0 .. RB7). The number you're betting on is the button you press (0..7).
- When you press and release a button, a random number, N, is generated in the range of 0..7.
- The PIC will then count (mod 8) on the LCD display 40+N times, with one count every 200ms
- Each time you count, a speaker should beep for 100ms at 200Hz (problem #2)
- If the final count matches your bet, you win $8. If not, you lose $1.
- The game then repeats.
- The LCD displays your bank, the number you're betting on, and the current number on the roulette wheel

5) Write the C code for a roulette wheel

6) Verify your program

- On reset, you start with $10 in your bank
- Numbers generated are random, in the range of 0..7
- The LCD displays information correctly
- When you win, you gain $8. When you lose, you lose $1.

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