ECE 376 - Homework #6

Fair Dice

```
while(1) {
   while(!RBO);
   while(RBO) DIE = (DIE + 1) % 6;
   DIE += 1;
   LCD_Move(1,0);  LCD_Out(DIE, 1, 0);
   SCI_Out(DIE, 1, 0);
   SCI_CRLF();
   }
```

R	1	2	3	4	5	6
	1	7	9	7	4	2		

R	p	p	N	
1	6	0	1	0
2	6	0	7	9
3	6	0	9	0
4	6	0	7	9
5	6	0	4	6
6	6	0	2	0
				4

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-
  -
-
  -

- Enter value for degrees of freedom.
- Enter a value for one, and only one, of the other textboxes.

Loaded Dice

```
while(1) {
  while(!RB0);
  while(RB0) {
    DIE = (DIE + 1) % 6;
    X = (X + 1) % 101;
    }
  DIE = DIE + 1;
  if(X < 15) DIE = 6;

  LCD_Move(1,0);  LCD_Out(DIE, 1, 0);
  SCI_Out(DIE, 1, 0);
  SCI_CRLF();
  }
```

R	1	2	3	4	5	6
F	0	9	6	8	6	2

R	p	p	N	
1	6	0	0	0
2	6	0	9	0
3	6	0	6	6
4	6	0	8	0
5	6	0	6	6
6	6	0	2	2
			6	8

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- Enter value for degrees of freedom.

- Enter a value for one, and only one, of the other textboxes.

Am I Psychic?

3) Write a C program which tests if you're psychic:
- Each round, predict which number is going to come up (0..3)
- Press the corresponding button RB0..RB3.
- When you release the button, a random number in the range of 0..3 is generated
- If you were right, the PIC records that. Likewise if you were wrong.
- The LCD display displays how many times you were right and wrong.

```c
// Global Variables

const unsigned char MSG0[21] = "Right              ";
const unsigned char MSG1[21] = "Wrong              ";

// Subroutine Declarations
#include <pic18.h>

// Subroutines
#include     "lcd_portd.c"

// Main Routine

void main(void)
{
   unsigned int i, j;
   int GUESS, X, RIGHT, WRONG;

   TRISA = 0;
   TRISB = 0xFF;
   TRISC = 0;
   TRISD = 0;
   TRISE = 0;
   TRISA = 0;
   ADCON1 = 15;

   PORTA = 0;

   LCD_Init();              // initialize the LCD

   LCD_Move(0,0);  for (i=0; i<20; i++) LCD_Write(MSG0[i]);
   LCD_Move(1,0);  for (i=0; i<20; i++) LCD_Write(MSG1[i]);

   X = 0;
   RIGHT = 0;
   WRONG = 0;

   while(1) {
      while(PORTB == 0);
      while(PORTB) {
         if(RB0) GUESS = 0;
         if(RB1) GUESS = 1;
         if(RB2) GUESS = 2;
         if(RB3) GUESS = 3;
         X = (X + 1)%4;
      }
      if(GUESS == X) RIGHT += 1;
      else WRONG += 1;

      LCD_Move(0,8);  LCD_Out(RIGHT, 3, 0);
      LCD_Move(1,8);  LCD_Out(WRONG, 3, 0);
   }
}
```

4) Collect data with your program.

Right	Wrong
15	49

5) Determine the chance that you were not just guessing using a chi-squared test
  - Null hypothesis: you are just guessing (correct 25% of the time).

Guess	p	np	N	chi-squared
Right	1/4	16	15	0.06
Wrong	3/4	48	49	0.02
			Total	0.08

From StatTrek, a chi-squared score of 0.08 with one degree of freedom corresponds to a probabili of
0.2227

I am 22.27% certain that I'm not just guessing
  - there is no evidence to say I'm not just guessing (probability < 0.99)
  - there is no evidence to say that I rigged the experiment (probability > 0.01)