

ECE 376 - Homework #7

Statistics and Data Collection. Due Monday, October 21st

Chi-Squared Test

The following code implements a fair die and a loaded die (with the comment removed).

- 1) Collect data for the fair 8-sided die. From your data, what is the probability that the die is fair?
- 2) Remove the comment and collect data for the loaded die. From your data, what is the probability that the die is fair?
- 3) How loaded does the die have to be for you to be able to reliably detect that something is amiss?

```
while(1) {
    while(!RB0);
    while(RB0) {
        d8 = (d8 + 1) % 8;
        d11 = (d11 + 1) % 11;
    }

    d8 = d8 + 1;

// Loaded Die
// if(d11 == 0) d8 = 8;           // load the die 9% of the time

    LCD_Move(1,8); LCD_Out(d8, 0);
    while(!TRMT); TXREG = d8 + 48; // collect data on the serial port
    while(!TRMT); TXREG = 13;     // carriage return
    while(!TRMT); TXREG = 10;     // line feed
}
```

t-Test

The monthly highs and lows for Fargo, North Dakota is available here:

- http://www.bisonacademy.com/ECE111/Code/Fargo_Weather_Monthly_High.txt
- http://www.bisonacademy.com/ECE111/Code/Fargo_Weather_Monthly_Low.txt

- 4) What is the probability that it will break 50F in November, 2019?
- 5) What is the 90% confidence interval for the high for the month of November, 2019?

(over)

Collect data using your PIC microcontroller. Some suggestions are

- The brightness of several light bulbs
- The temperature reading from several temperature sensors
- The energy in several AA batteries
- The thermal time constant for a coffee cup without a lid
- The thermal time constant for a coffee cup with a lid

6a) Explain your experiment, how you will collect the data, and how you calibrate your analog reading (so you display Lux, Celsius, etc.)

6b) Collect and plot your data.

6c) Analyze your data to determine the 90% confidence interval.

The next time you collect data, you are 90% certain that the data will lie in this range....