

ECE 376 - Homework #6

Statistics and Data Collection. Due Monday, October 11th

Chi-Squared Test

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

```
while(1) {
    while(!RB0);
    while(RB0) {
        d7 = (d7 + 1) % 7;
        d100 = (d100 + 1) % 100;
    }
    d7 = d7 + 1;
    // Loaded Die
    // if(d100 < 10) d7 = 7;
    LCD_Move(1,8); LCD_Out(d7, 1, 0);
    SCI_Out(d7, 1, 0);
    SCI_CRLF();
}
```

- 1) Collect data for the fair 7-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?

t-Test

- 4) Using your data from problem #1 (fair die), determine the 90% confidence interval for any given roll (individual).
- 5) Using your data from problem #1 (fair die), determine the 90% confidence interval for the mean of this die (population). From this, is it a fair die?
- 6) Using your data from problem #2 (loaded die), determine the 90% confidence interval for the mean of this die (population). From this, is it a fair die?
- 7) How many times would you need to roll the die to detect
 - A shift in the mean of 0.2 or more
 - With 90% certainty?

Data Collection & Analysis

- 8) Measure the resistance of 10 resistors of the same value (100 Ohm, 2.2k Ohm, your pick). From this data, determine
 - The 90% confidence interval for any given resistor (individual).
 - The probability that a given resistor will be out of tolerance (differ from marked value by more than 1%, 2%, 5%)