

ECE 376 - Homework #7

Chi-Squared Test, Student t-Test. Due Monday, March 7th

Chi-Squared Test

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

```
while(1) {
    while(!RB0);
    while(RB0) {
        d4 = (d4 + 1) % 4;
        d101 = (d101 + 1) % 101;
    }
    d4 = d4 + 1;
    // Loaded Die
    // if(d101 < 10) d4 = 4;
    LCD_Move(1,8); LCD_Out(d4, 1, 0);
    SCI_Out(d4, 1, 0);
    SCI_CRLF();
}
```

- 1) Collect data for the fair 4-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?

Am I Psychic?

- 4) Determine whether or not you're psychic:
 - Guess which number you're going to roll with the fair 4-sided die.
 - or take a deck of playing cards. Predict the suit of each card then record whether you were right or wrong.
 - Roll the dice a bunch of times (>10)
 - Record how many times you are correct

Use a chi-squared test to determine whether or not you're guessing (correct 25% of the time)

t-Test

5) Use your data from problem #7 for homework set #6 (data collection). Determine the 90% confidence interval for your data.

Reflex Times

The following web site allows you to record your reflex times:

<https://faculty.washington.edu/chudler/java/redgreen.html>

6) Record your reflex times using the above link. From your data, determine

- The 90% confidence interval for the next time you play this game
- The probability that your reflex time will be less than 200ms

7) Collect a second data set from the above link with a different condition (pick one)

- After drinking a cup of coffee *does coffee improve my reflex time?*
- Using your non-dominant hand *does my dominant hand have faster reflex times?*
- Your roommate takes the test *do I have faster reflexes than my roommate?*
- Other

8) Do a comparison of means test (t-test with $W = A - B$) to determine the probability that population A has a mean that is less than population B.

- *That coffee reduces your reaction time*
- *That your dominant hand has a faster reaction time, etc.*