UDACITY - P1 - STROOP TASK

1. What is our independent variable? What is our dependent variable?
    a. Independent Variable - type of word / color pairing condition
        i. congruent (same name / color) or
        ii. incongruent (different name / color)

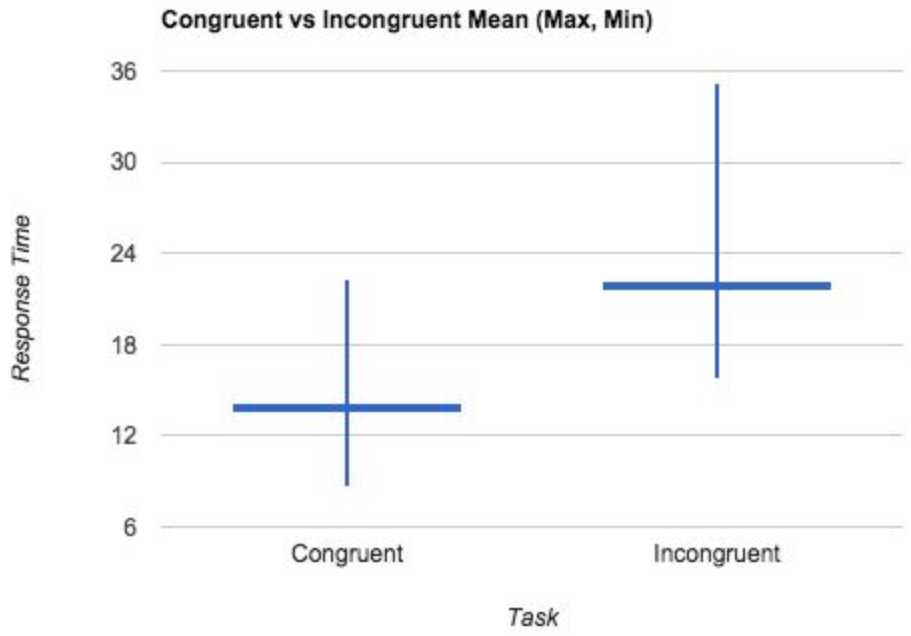
    b. Dependent Variable - response time, measured in time it takes to name the ink colors in equally-sized lists of words with name / color pairing

2. What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.
    a. Hypothesis test
        i. $\mathbf{H_O}$: $X_C - X_I = 0$
        ii. $\mathbf{H_A}$: $X_C - X_I \neq 0$
        iii. **Reason**: We want to determine whether or not response times are significantly different
    b. A **paired samples t-test** tests the hypothesis that the means of the measurement variable are the same in paired data. In the Stroop task we have two nominal variables: Congruent, Incongruent and one measurable variable: response time. This is similar to a one-sample t-test except we are testing paired observations.

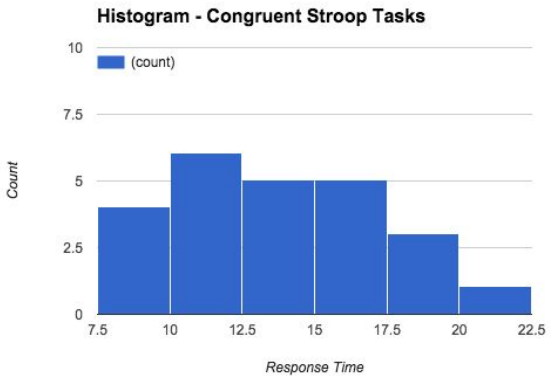
3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

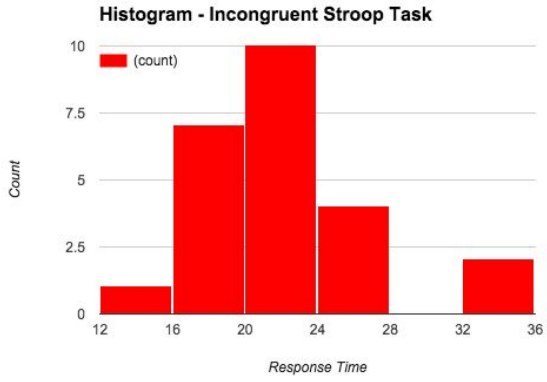
Congruent	Incongruent				
24	24	**n**		17.840	**Sp2**
14.051	22.016	**mean**		1.219	**SEM**
14.357	21.018	**median**		-7.965	**mean diff**
				-6.532	**t-stat**
23	23	**df**		0.0001	**p-value**
291.388	529.270	**SS**		0.001	**alpha**
12.141	22.053	**variance**		3.289	**t-critical**
				reject	**Null??**
3.559	4.797	**stev - samp**		-11.975	**lower CI**
0.711	0.959	**std error**		-3.955	**upper CI**

4. Provide one or two visualizations that show the distribution of the sample data. Write one or two sentences noting what you observe about the plot or plots.
    a. Below is a candlestick chart that compares Mean, Max & Min for the Congruent vs Incongruent samples. You'll observe that congruent test results in faster response times vs the incongruent test. In addition the the congruent test has a tighter distribution than the incongruent test.



    b. Below are sextile histograms for the two tests. We observe the congruent test is more evenly distributed than the incongruent test which has a higher concentration of response times in the second and third sextiles.





5. Now, perform the statistical test and report your results.
    a. What is your confidence level and your critical statistic value?
        i. confidence level 99.90% or $\alpha = 0.001$, t-critical = ± 3.289

    ii. t-statistic = -6.532
b. Do you reject the null hypothesis or fail to reject it?
    i. reject the null
c. Come to a conclusion in terms of the experiment task.
    i. The difference in response time for a congruent task vs. an incongruent task is extremely statistically significant. People take a significantly longer time to process the mix match of name / color in the incongruent task vs. the congruent task.
d. Did the results match up with your expectations?
    i. Yes. The candlestick chart set the expectation that the means would be significantly different.

6. Optional:
    a. What do you think is responsible for the effects observed?
        i. People recognize words as symbols first. Layering on a different color on a named color word and asking a person to respond to the color instead of the name slows them down.
    b. Can you think of an alternative or similar task that would result in a similar effect?
        i. Number in place of color. Dog dog would be Two -> One one one would be Three https://faculty.washington.edu/chudler/java/readyn.html