1. What is our independent variable? What is our dependent variable?

   a. The independent variable is whether a congruent or incongruent sample is shown.
   b. The dependent variable is the reaction time of the participants..

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. The null hypothesis is that there is no difference between the means time taken in responding to a congruent population mean(μ_1) vs incongruent population mean(μ_2) color/word pairs.
      i. H_0: $\mu_1 = \mu_2$
   b. The alternative hypothesis is that the Stroop test will return a longer reaction time on average for incongruent vs congruent color/word pairs.
      i. H_a: $\mu_1 < \mu_2$
   c. I will use a paired sample t test to test the above hypothesis. I believe it is the most suitable because of the following:
      i. I expect reaction time distributions to be Gaussian
      ii. The sample size is less than 30
      iii. The sample sizes are equivalent
      iv. The true population variance is unknown

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	Difference
Mean	14.051	22.016	7.965
Standard deviation	3.559	4.797	4.865

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.
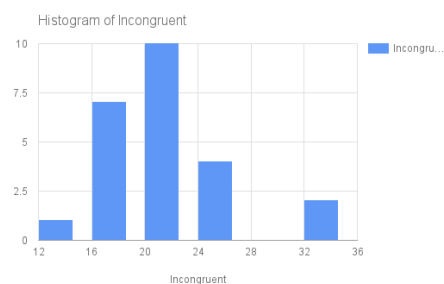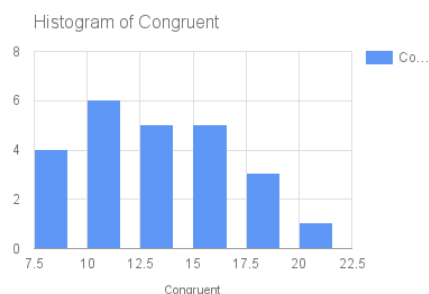
The histograms show that these samples are not quite normally distributed, but I suspect as sample size increase they will assume a normal distribution.

Incongruent vs. Congruent
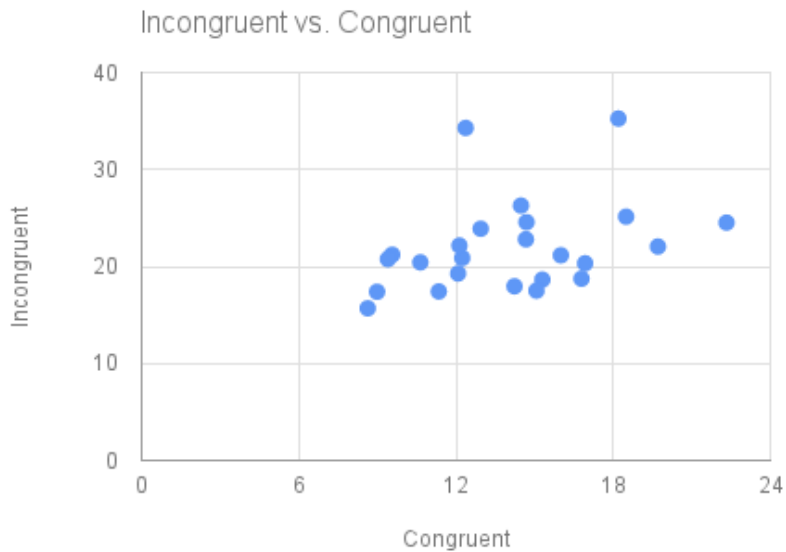
The above plot of congruent vs incongruent samples appears to show a linear relationship with two obvious outliers. The relationship is indicating that as the congruent variable increases, the incongruent variable also increases.

5. Now, perform the statistical test and report your results. What is your confidence level and your critical statistic value? Do you reject the null hypothesis or fail to reject it? Come to a conclusion in terms of the experiment task. Did the results match up with your expectations?
   a. $t(23) = 8.021$, $p < .001$, $d = 1.64$
   b. The critical t statistic at $p = .001$ is 3.7676, which is less than our calculated statistic 8.021, and indicates there is a 99.9% probability that the observed differences between the congruent and incongruent means are statistically significant.
   c. Based on the above the null hypothesis is rejected.
   d. The results display with a high degree of confidence that the means of the congruent and incongruent tests are different, and $\mu_1 < \mu_2$. This agrees with the alternative hypothesis stated above.

6. Optional: What do you think is responsible for the effects observed? Can you think of an alternative or similar task that would result in a similar effect? Some research about the problem will be helpful for thinking about these two questions!
   a. I believe that our brains have more difficulty interpreting the incongruent color/word pairs than those that are congruent, and this leads to a longer observed reaction time.
   b. I'd expect a variety of similar experiments could be designed to display a similar effect such as:
      i. An experiment with stoplights where red was marked go, and green was marked stop. Reaction time would again be recorded.

       ii. An experiment where pictures of people clearly displaying an emotion were presented with the word representing the opposite emotion printed below. Reaction time or accuracy could be measured here.

References used in the preparation of this document:

https://en.wikipedia.org/wiki/Central_tendency
http://www.dummies.com/how-to/content/how-to-set-up-a-hypothesis-test-null-versus-altern.html
https://www.xlstat.com/en/solutions/features/two-sample-t-and-z-tests
https://en.wikipedia.org/wiki/Student%27s_t-test
http://stattrek.com/hypothesis-test/paired-means.aspx?Tutorial=AP
http://oak.ucc.nau.edu/rh232/courses/EPS525/Handouts/Understanding%20the%20Dependent%20t%20Test.pdf
http://www.graphpad.com/quickcalcs/pValue2/

In addition to the above I gleaned some insight from the discussion forums. A few of the above referenced pages were links from the forums.