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

   Independent variable is whether participant go through a 'congruent words condition', or `an incongruent words condition`. And our dependent variable is the average time of measured time it takes to name the ink colors in equally-sized lists.

2. **What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.**

2a)

H0: Population means of time took for two different groups, congruent and incongruent, are no different each other.

Population mean of time took for congruent words condition = population mean of time took for an incongruent words condition

$\mu c = \mu i$

Ha: There are statistically significant differences in the population means of time took between two different groups, congruent and incongruent.

Population mean of time took for congruent words condition != population mean of time took for an incongruent words condition

$\mu c != \mu i$

2b)

Because (1) we don't know the population standard deviation of above test (not all human being took this test and be reported), (2) and also the sample size is just 24, which is less than 30, (3) and means of the different samples are normally distributed, we should use "two-tail" t-test, as our hypothesis is testing if there are any significant difference in population means of two groups.

We should perform an 'Dependent t-test for paired sample / within subject design with two condition' on above hypotheses.

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

   Sample size n = 24, df = 23

   Sampling average time congruent task score = Xc = 14.05

   Sampling average time incongruent task score = Xi = 22.02

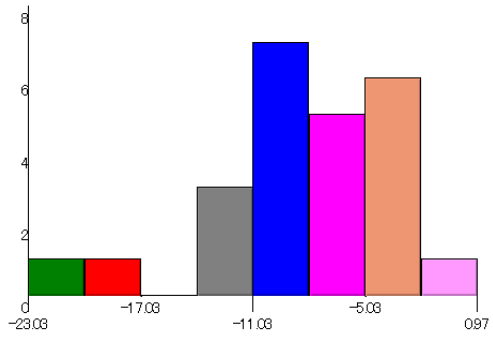
   Point estimates of Uc-Ui = -7.97

   Standard Derivation of each difference = s = sqrt(SS/n-1) = 4.86

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.**

   Plotting histogram of difference of each participants with the interval size of 3.

   *Using http://www.shodor.org/interactivate/activities/Histogram/



Note: distribution looks somewhat negatively skewed.

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?**

   We set confidence level two tailed a = 0.05.

   Critical t value = +- 2.069

   And our t value is =Xc-Xi/(s/sqrt(n)) = -8.03 , which is < than critical t value = -2.069

   So we reject null hypothesis.

   We concluded that the time participants takes in congruent task and in incongruent task are statistically different with significant level of a = 0.05.

   This might be expected by just looking at the histogram of Q4.

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!**

   The difference in the time might be caused by the confusion which people's brain see and read is different.
   I can think of similar effect when I eat something which I think it's not hot but it's actually hot. It take little bit time to feel it's hot than the time I am expecting it's hot and actually hot. This case, I think the confusion between think and tongue creating this time difference.