1. What is our independent variable? What is our dependent variable?
Independent Variable is the 2 conditions, A congruent and Incongruent Conditions.
Dependent Variable is the time taken 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.
Null Hypothesis is there is no change in Time between both Congruent and InCongruent Conditions.
i.e, TimeTaken(Congruent) = TimeTaken(InCongruent)

Alternative Hypothesis is that there is change in time taken between both Congruent and Incongurent conditions.
i.e, TimeTaken(Congruent) != TimeTaken(InCongruent)

H_0: $\mu_{congruent}$ = $\mu_{incongruent}$
H_1: $\mu_{congruent} \neq \mu_{incongruent}$

What kind of statistical test do you expect to perform?
We will perform a 2 Tailed dependent Sample Test to observe if there is any change in Time Taken to Name the Color in both Conditional Test.This will be 2 tailed test as we are not concerned on how much time is taken but rather is there any change in Time Or not, be it less time or more.
This test is dependent test as the the same sample will be tested in both Congruent and incongruent test. We will consider the alpha level of 0.05 to test the condition.
$\alpha = 0.05$

3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.
Central Tendency:
Mean of the Congruent Dataset = 14.05
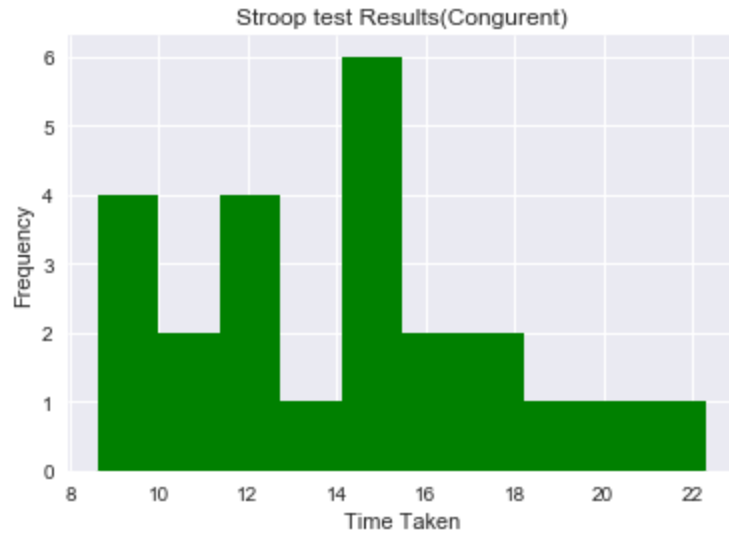Mean of the InCongruent Dataset = 21.02
Variability:
Standard Deviation(Congruent) = 3.56
Standard Deviation(InCongruent) = 4.8

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.

Congruent Plot:
Well spread with a Peak at the Mean

Stroop test Results(Congurent)

Incongruent Plot:
Positive Skewed with one outlier.

Stroop test Results(Incongurent)

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?

$\mu_{congruent}$ = 14.05

$\mu_{incongruent}$ = 22.02

n = 24

point estimate ($M_{D = \mu_{incongruent} - \mu_{congruent}}$) = 7.96

Standard Deviation (S_D) = 4.86

t-statistics (t = $M_D/(S_D/\sqrt{n}$))= 8.02

Degrees of Freedom (DF = n - 1) = 23

Alpha Level = 0.05

t-critical = 2.064

Cohen's d (d = M_D/S_D) = 1.64

SEM (t-critical($S_D/\sqrt{n}$) = 0.99*2.064 = 2.05

CI (M_D $\pm$ t-statistics*SEM) = (5.91,10.01)

p-value = 0.0001

As the p-value is 0.0001 and the t-statistics is in t-critical region hence we Fail to Reject the Null. We can statistically say that the Congruent Reading takes similar time to Incongruent Reading.

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!
What do you think is responsible for the effects observed?
brain's ability to recognize the color of the word since the brain reads words faster than it recognizes colors. The brain needs to use more attention to recognize a color than to word encoding, so it takes a little longer.recognizing colors is not an "automatic process" there is hesitancy to respond; whereas, the brain automatically understands the meaning of words as a result of habitual reading.the brain analyzes information, different and specific pathways are developed for different tasks.Some pathways, such as reading, are stronger than others, therefore, it is the strength of the pathway and not the speed of the pathway that is important.

Can you think of an alternative or similar task that would result in a similar effect?
Similar Stroop effect might be seen in an audio-visual test in which a Place/Animal Name is shown but a different Name is played. Ex- ELEPHANT written is shown on visuals but TIGER is played on the Audio, then the Subject has to write down what is being played.

References:

https://en.wikipedia.org/wiki/Stroop_effect

https://matplotlib.org/api/_as_gen/matplotlib.pyplot.hist.html