Project 1: Stroop Effect Report

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

Independent variable: Whether the words shown are congruent with the ink colors or if they are incongruent with ink colors.
Dependent variable: The amount of time it takes to name, out loud, the color of the inks in which the words are displayed.

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

H_0: $\mu_D = 0$; There is no recorded time difference between congruent and incongruent condition
H_a: $\mu_D > 0$; People spend more time on incongruent than that on congruent condition.
μ_D is the mean difference of population between congruent and incongruent condition.

Because we do not know the population variables, one-tail t-test will be performed.

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

Measure of central tendency:

	Congruent	Incongruent	Difference (μ_D)
Sample Mean	14.05	22.02	7.96
Sample Standard Deviation	3.56	4.80	4.86
Standard Error	0.73	0.98	0.99

According to the Central Limit Theorem, the distribution of sample means is approximately normal. And the means of congruent and incongruent population are assumed to be 14.05 and 22.02 respectively. The mean of difference for the population is 7.96. The standard deviations of the sample means for congruent, incongruent and difference conditions are 0.73, 0.98 and 0.99 respectively based on $\frac{\sigma}{\sqrt{n}}$.
Measure of variability:

	Mean	Media	Q_3	Q_1	IQR
Congruent	14.05	14.36	16.20	11.90	4.31
Incongruent	22.02	21.02	24.05	18.72	5.33

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.

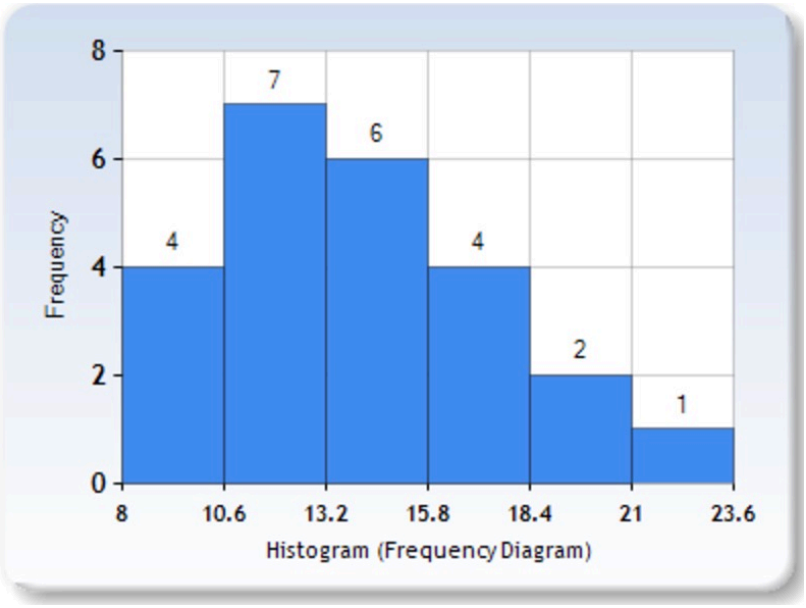

Figure 1 Histogram of Congruent Condition

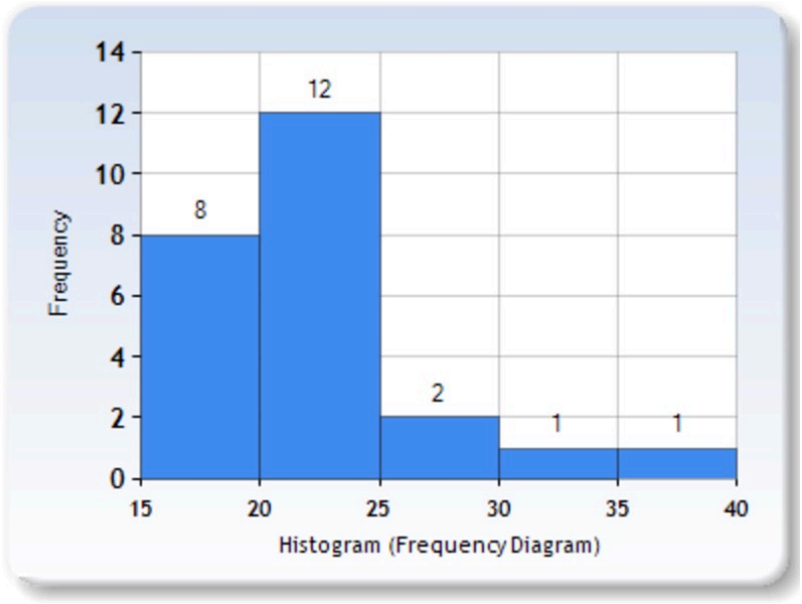

Figure 2 Histogram of Incongruent Condition

The two histograms are positively skewed. It can be seen that largest frequency in congruent sample locates between 10.6 and 13.2. However, the largest frequency in incongruent sample locates between 20 and 25.

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?

H_0: $\mu_D = 0$; There is no recorded time difference between congruent and incongruent condition
H_a: $\mu_D > 0$; People spend more time on incongruent than that on congruent condition.

One-tailed t-test in the positive direction will be performed.

Critical t-value:
t(23) = 1.714, p = .05, one-tailed

t-statistic:
t(23) = 8.04, p < .00001, one-tailed

Thus, the result is significant at p < .05. H_0 is rejected. Thus, people spend more time on incongruent condition than that on congruent condition.

Confidence interval on the mean difference:
95%CI = (5.91, 10.00)

$r^2 = \frac{8.04^2}{8.04^2+23}$ = 0.74. Therefore, 74% of results are related.

6. 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?

The processing speeds in brain for different tasks is different. Words are read faster than colors are named.

A list of square, circle, triangle(text and symbol).