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

Independent variable: words with either congruent condition or incongruent condition

Dependent variable: the 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.

The null hypotheses can be: the time of naming ink colors has no difference between incongruent condition and congruent condition.

The alternative hypotheses can be: the time of naming ink colors for incongruent condition is longer than for congruent condition

Let's assume mean of the time of naming ink colors for congruent condition is $\bar{t}_{con}$ and the mean of the time of naming ink colors for incongruent condition is $\bar{t}_{incon}$. The hypotheses is following:

$H_0 : \bar{t}_{con} = \bar{t}_{incon}$

$H_1 : \bar{t}_{con} < \bar{t}_{incon}$

We can use paired one-sided t-test. Since 1. we do not know the sample variance.2. The sample size is below 30.

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

The mean of congruent sample is: 14.05s

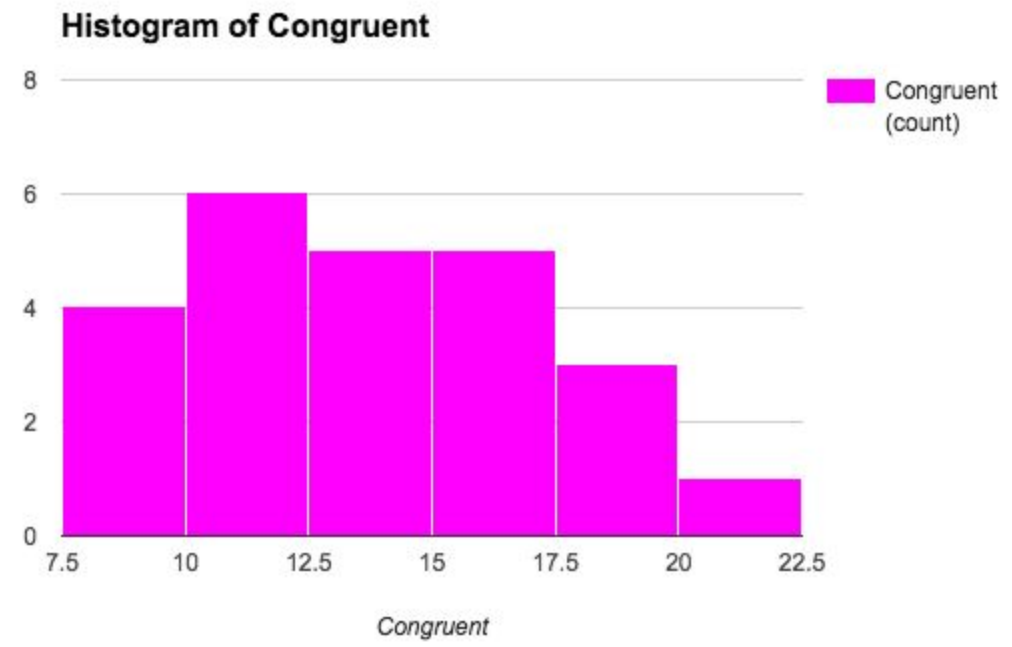
The mean of incongruent sample is: 22.02s

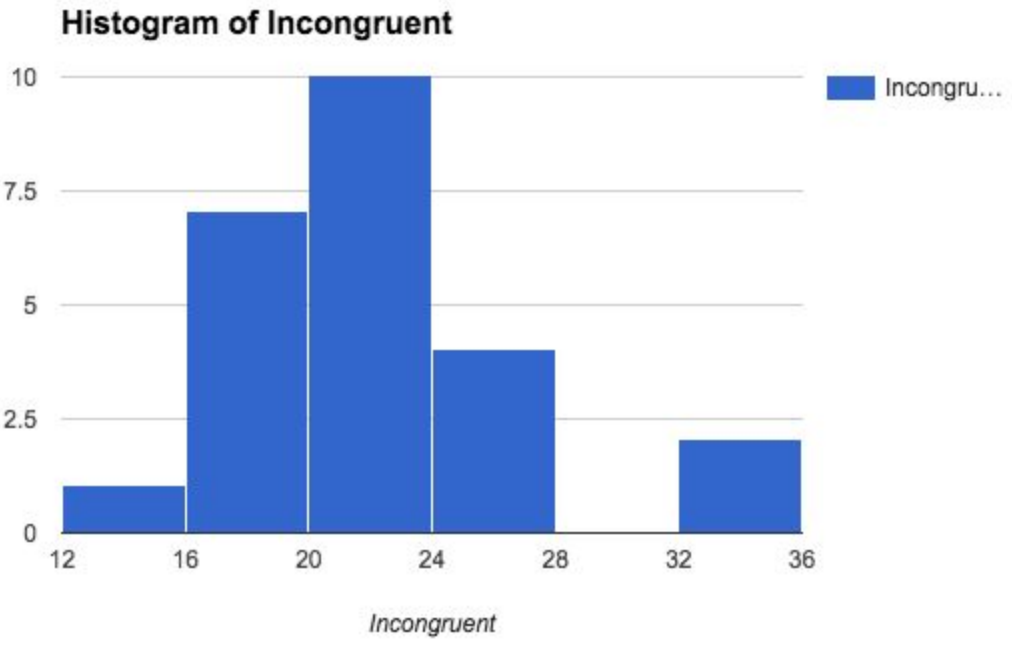
The Standard Deviation of congruent sample is: 3.56

The Standard Deviation of incongruent sample is:4.80

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.

Below are two histogram for congruent and incongruent samples:





From above plots, it shows that the mode and the mean of incongruent samples are higher than those of congruent samples. The whole distribution of incongruent shift to right compare with congruent.

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: t_con = t_incon

H_1: t_con < t_incon

$t_{incon} - t_{con} = 22.02 - 14.05 = 7.97$

$df = 24 - 1 = 23$

$S_d = 4.86$

$SE(d) = 4.86/\sqrt{24} = 0.992$

$t_{0.95,23} = 1.714$

$CI\ of\ 95\% : 7.97 \pm 1.714 * 0.992 = (6.27, 9.67)$

t -statistic: $\frac{7.97}{0.992} = 8.03$

$t_{0.95,23} = 1.714,\ t_{0.99,23} = 2.5\ , t_{0.999,23} = 3.485$

Thus, our t-statistic is much larger than t-critical. We reject the null.

The results match up my expectation because I think incongruent word will longer the time of naming color ink.