ANSWER 1:

DEPENDENT VARIABLE : TIME TAKEN
INDEPENDENT VARIABLES : WORD-COLOR CONGRUENCY

ANSWER 2a:

H0 (Null Hypothesis) : THERE IS NO DIFFERENCE IN CATCHING COLORS WITH CONGRUENT WORDS COMPARED TO WITH INCONGRUENT WORDS.

$$H_0: \mu_c = \mu_{in}$$

H1 (Alternative Hypothesis) : THERE IS A SIGNIFICANT DIFFERENCE IN CATCHING COLORS WITH CONGRUENT WORDS COMPARED TO WITH INCONGRUENT WORDS.

$$H_1: \mu_c \neq \mu_{in} \text{ (a two-tailed test)}$$

where, $\mu c = Time\ taken\ in\ catching\ colors\ on\ a\ list\ of\ Congruent\ words\ for\ Population.$
$\mu in = Time\ taken\ in\ catching\ colors\ on\ list\ of\ Incongruent\ words\ for\ Population.$

ANSWER 2b:

We will perform a two-tailed t-test with $\alpha = 0.05$ to distinguish the proposed hypothesis because population statistics are unknown and number of samples is few, i.e less than 30.
We take a sample of 24 observations both for congruent and incongruent case.
For each observation the individual is kept constant.
We assume the distribution is Normal(Gaussian).
We will perform Dependent t-test as there are two observations for each iteration for two different conditions.

ANSWER 3:

Measure for Centrality: We will calculate Mean and Median for dataset's groups as measure for centrality.

Measure	Congruent words	Incongruent words
Mean(μ)	14.051125	22.01591667
Median	14.3565	21.0175

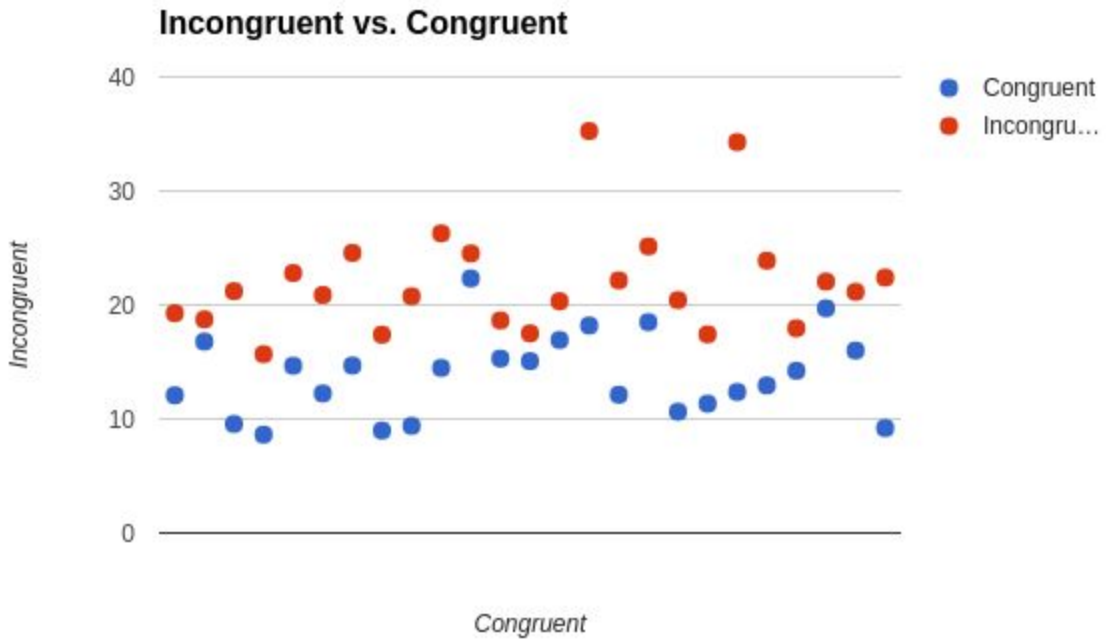
Measure for Variability:

We will calculate Variance and Standard Deviation of the samples as measure of variability.

Measure	Congruent	Incongruent
Variance	12.66902907	23.01175704
Standard Deviation(σ)	3.559357958	4.797057122

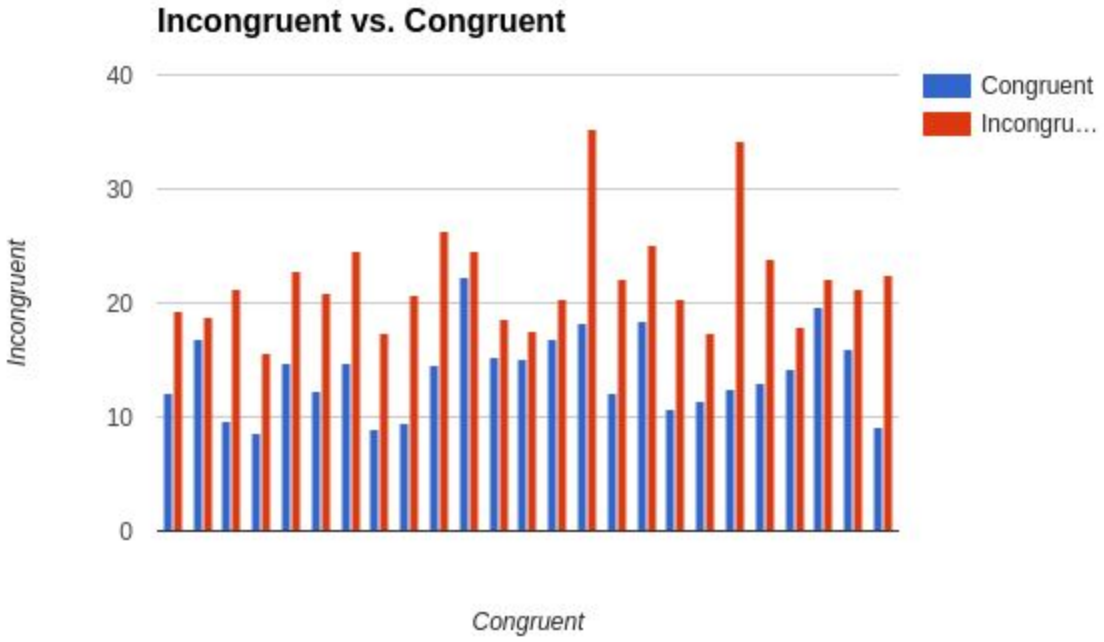
ANSWER 4:

PLOT 1:



As it can be seen that Incongruent words are taking relatively more time than Congruent words when for each observation individual is kept constant.

PLOT 2:



In each of the observation the time taken for incongruent words is always higher.

ANSWER 5:

Performing t-test

$\bar{X}c$ = 14.051125 : Average time taken for Congruent words.

$\bar{X}in$ = 24.572 : Average time taken for Incongruent words.

σc = 3.559357958 : Standard deviation for Congruent words with Bessel's Correction.

σin = 4.797057122 : Standard deviation for Incongruent words with Bessel's Correction.

Calculating Standard Error:

Standard error(σe) = $\sigma(difference\ of\ the\ values\ congruent\ and\ incogruent) \div \sqrt{n}$; where n: number of observations.

σe = 0.9930286348

Calculation t-statistics :

t = $(\bar{X}in - \bar{X}c)/\sigma e$

t = 8.020706944

t-critical values for 95% confidence interval with alpha α = 0.05
Degree of freedom = N-1 = 23
tcritical = (+or-)2.069
P-value:The two-tailed P-value is less than 0.0001

Hence, the result is extremely statistically significant.
So, we Reject the Null Hypothesis.

ANSWER 6:

4 Hypothetical Reasons for results of Stroop test:

1.Processing Speed: Brain reads the words faster than recognizing colors, it can hence be proved by kids those who can understand colors but couldn't read faster as adults are found to be performing similar in both the experiments.

2.Selective Attention: As brain requires more attention to recognize colors than reading words.

3.Automaticity : Recognizing colors is not a habitual process so there is hesitancy in response whereas reading and generating meaning is regular task.

4.Parallel distributed Processing: As there are two tasks brain performs reads words and identifies color, so there is a hinderance in pathway of each processing and weaker automaticity affecting even words i.e. recognizing colors.

Another Stroop - like experiment are:
Numerical Stroop test: where size of the numbers are altered.
Wrapped words: where words are wrapped in such a way it is difficult to read.
Other examples are Reverse, Spatial, Emotional tests.

WEBSITES USED:
Wikipedia,
Graphpad,
Google