Q.1)

Independent Variable: The conditions in the Stroop Task: Congruent condition and Incongruent condition are Independent Variables

Dependent Variable: The time measured for each observation (naming the ink colour of the given word) is dependent variable

Q.2)

Hypothesis:

Null Hypothesis: There is no difference in time taken by the individual in naming the colour in congruent condition and Incongruent condition

Alternate Hypothesis: There is difference in time taken by the individual in naming the colour in congruent condition and Incongruent condition

H_0: $\mu_{Con} = \mu_{Incon}$

(Mean of Congruent condition is equal to Mean of Incongruent condition)

H_A: $\mu_{Con} \neq \mu_{Incon}$

(Mean of Congruent condition is not equal to Mean of Incongruent condition)

Statistical Test:

2-Sample paired t-test (2-Tail) should be performed for the given dataset, as the experiment is conducted twice on the same individuals. This is because It is the same individual naming the ink of the colour in both the congruent and Incongruent condition.

Assumptions: (Source: http://support.minitab.com/en-us/minitab/17/topic-library/basic-statistics-and-graphs/hypothesis-tests/tests-of-means/why-use-2-sample-t/)

- Determine whether the means of two independent groups differ.
- Calculate a range of values that is likely to include the difference between the population means.
- The observations from the first sample must not have any bearing on the observations from the second sample.

Q.3)

Descriptive Statistics: (Calculated in R Studio)

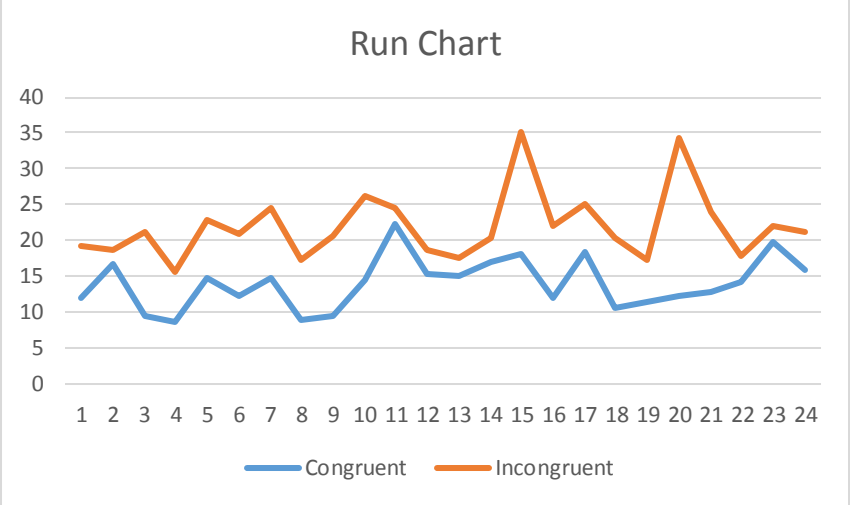
```
> setwd("F:/UB/Sem3/TA/HW 6")
> P1<-read.csv("stroopdata.csv")

> summary(P1$Congruent)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   8.63   11.90   14.36   14.05   16.20   22.33
> summary(P1$Incongruent)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  15.69   18.72   21.02   22.02   24.05   35.26
```

```
> sd(P1$Congruent)
[1] 3.559358
> sd(P1$Incongruent)
[1] 4.797057
```

It can be seen that Mean, Median, 1st Quartile, 3rd Quartile, Min and Max are higher for Incongruent condition dataset.

Q.4)

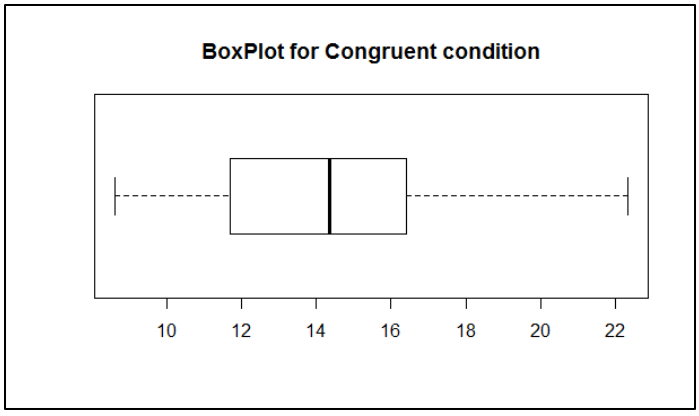
Run Chart (Source: Excel)



From this char we can say that time taken in Incongruent condition (orange line) is higher at each and every point of observations

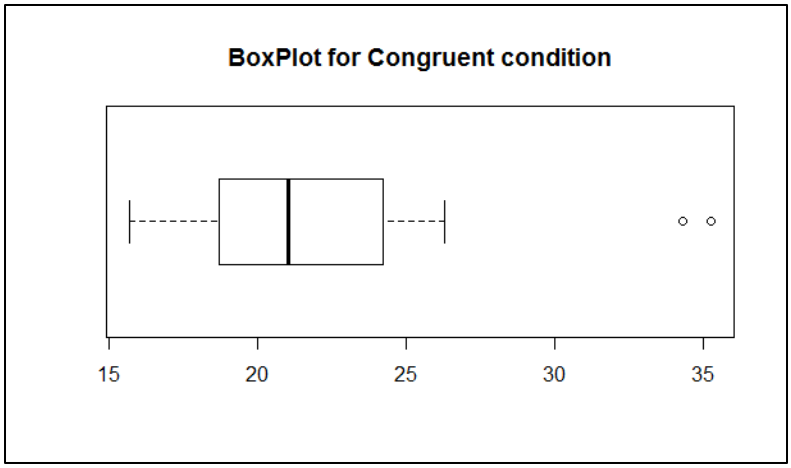
Boxplot (source: R Studio)

```
> boxplot(P1$Congruent, horizontal=TRUE, main="BoxPlot for Congruent condition")
```



From Boxplot we can see that Median is '14', IQR is around 4 and there are no outliers.

```
> boxplot(P1$Incongruent, horizontal=TRUE, main="BoxPlot for Congruent condition")
```



This boxplot shows that Median is around '21' , IQR around '5' with 2 outliers.

Q.5)

Congruent	Incongruent	D	D-Dmean	(D-Dmean)^2	Dmean	-7.96479
12.079	19.278	-7.199	0.765792	0.586436877	S^2	22.68043
16.791	18.741	-1.95	6.014792	36.17771879	Std dev	4.762398
9.564	21.214	-11.65	-3.68521	13.58076046		
8.63	15.687	-7.057	0.907792	0.82408571		
14.669	22.803	-8.134	-0.16921	0.02863146		
12.238	20.878	-8.64	-0.67521	0.455906293		
14.692	24.572	-9.88	-1.91521	3.66802296		
8.987	17.394	-8.407	-0.44221	0.19554821		
9.401	20.762	-11.361	-3.39621	11.53423104		
14.48	26.282	-11.802	-3.83721	14.72416779		
22.328	24.524	-2.196	5.768792	33.27895729		
15.298	18.644	-3.346	4.618792	21.33323646		
15.073	17.51	-2.437	5.527792	30.55648071		
16.929	20.33	-3.401	4.563792	20.82819438		
18.2	35.255	-17.055	-9.09021	82.63188754		
12.13	22.158	-10.028	-2.06321	4.256828627		
18.495	25.139	-6.644	1.320792	1.744490627		
10.639	20.429	-9.79	-1.82521	3.33138546		
11.344	17.425	-6.081	1.883792	3.548671043		
12.369	34.288	-21.919	-13.9542	194.7199302		
12.944	23.894	-10.95	-2.98521	8.911468793		
14.233	17.96	-3.727	4.237792	17.95887821		
19.71	22.058	-2.348	5.616792	31.54834863		
16.004	21.157	-5.153	2.811792	7.906172377		
14.051125	22.0159167	-7.96479				

This is paired t-test, So difference between two samples is found out (D). This is subtracted and squared to get (D-Dmean)^2. This is divided by n-1=24 to get S^2

Std dev is found by its taking sqrt which is equal to 4.76

t-statistic= $(x1bar - x2bar)/(\frac{s}{\sqrt{n}})$

x1bar = 14.05, x2bar=22.01

t-statistic=(14.05-22.01)/(4.76/sqrt(25))=-8.36, p-value=0.0001

(Source : https://graphpad.com/quickcalcs/pValue2/)

T-critical at alpha=0.05 2-tailed test =± 2.069 (df=23)

As t-statistic(-8.36) is less than T-critical (-2.069), and also p-value (0.001)<0.05, so Null hypothesis is rejected at 95% C.I

We accept the alternate hypothesis that there is a statistically significant difference in m=naming the colour of the ink in both the conditions. This is also evident from the Run chart above and so the results had match up.

Q.6)

The words themselves have a strong influence over your ability to say the color. The interference between the different information (what the words say and the color of the words) your brain receives causes a problem. There are two theories that may explain the Stroop effect:

1. Speed of Processing Theory: the interference occurs because words are read faster than colours are named.
2. Selective Attention Theory: the interference occurs because naming colors requires more attention than reading words.

(Source: https://faculty.washington.edu/chudler/words.html)

Interactive Animal Stroop Effect Experiment also has the same results.

(Source: https://faculty.washington.edu/chudler/java/readya.html)