Project - II
Test a Perceptual Phenomenon

Given :

    Data 1---->Congruent

    Data 2 --->Incongruent

===

Q1 :   Question response correctly identifies the independent and dependent variables in the experiment?

Ans1:   In a given experiment the **independent** variable are congruent or incongruent values. **Dependent variable** is Time taken by the user in a experiment.

Q2A :   Null and alternative hypotheses are clearly stated in words and mathematically. Symbols in the mathematical statement are defined ?

Ans 2A: Hypothesis -

        HO- There is no significant difference in the reaction time of the two tests.
           (μ congruent = μ incongruent or μ difference =0) at alpha level of 0.05
        HA- there is a significant difference in the reaction time of the two tests.
           (μ congruent $\neq \mu$ incongruent or μ difference $\neq 0$) at alpha level of 0.05

μ congruent = population Mean from which congruent test sample
μ incongruent = population Mean from which incongruent test sample
μ difference   = Difference in the population mean of the two samples.

Q2B :   A statistical test is proposed which will distinguish the proposed hypotheses. Any assumptions made by the statistical test are addressed ?

Ans 2B: Test proposed- two tailed T-test
In our case size of the samples is 24 and the another paramenter of the population distribution is Z-score (calculation of the z score is given in the spread sheet link).

The assumptions for choosing the t-test (instead of z-test, for example)

The assumptions of the one-sample *Z* test focus on sampling, measurement, and distribution. The assumptions are listed below. One-sample *Z* tests are considered "robust" for violations of normal distribution. This means that the assumption can be violated without serious error being introduced into the test. The central limit theorem tells us that, if our sample is large, the sampling distribution of the mean will be approximately normally distributed irrespective of the shape of the population distribution.

z-test take place when the population parameter are given.

Statical test are given in a spreadsheet
[spread sheet](#)

Q3: Descriptive statistics, including at least one measure of centrality and one measure of variability, have been computed for the dataset's groups ?

ANS 3: Statistics is an important field of math that is used to analyze, interpret, and predict outcomes from data. Descriptive statistics will teach you the basic concepts used to describe data. This is a great beginner course for those interested in Data Science, Economics, Psychology, Machine Learning, Sports analytics and just about any other field.

Measure of centrality and variability

| Congriency	Mean	Median	Standard Deviation
congruent	14.051125	14.3565	3.559357958
Incongruent	22.01591667	21.0175	4.793029359

Calculation is this spreadsheet

Spread sheet link:
https://docs.google.com/spreadsheets/d/1I6nz40kJIIDWSMizirF7Jm0vc5W8aevlia OInEM0lyk/edit?usp=sharing

Q4: One or two visualizations have been created that show off the data, including comments on what can be observed in the plot or plots ?

**ANS 4 :** --> Histogram of given Congruent values which is computed by **wolframAlpha**
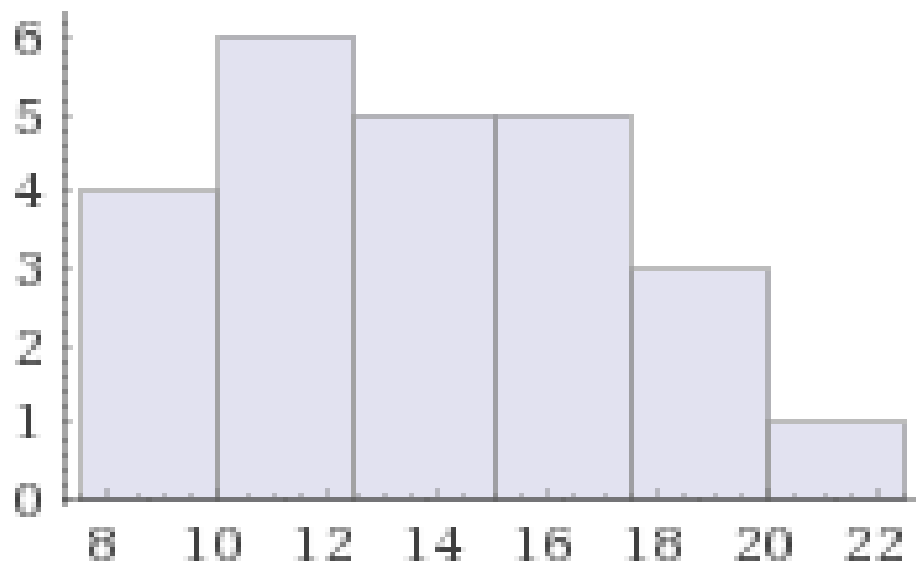
According to this histogram maximum frequency of people score value **between 10 -12**

mean	14.05
first quartile	11.71
median	14.36
third quartile	16.4

sample standard deviation	3.559
sample variance	12.67
interquartile range	4.686
sample range	13.7
coefficient of variation	0.2533

---> Histogram of given Incongruent values which is computed by **wolframAlpha**
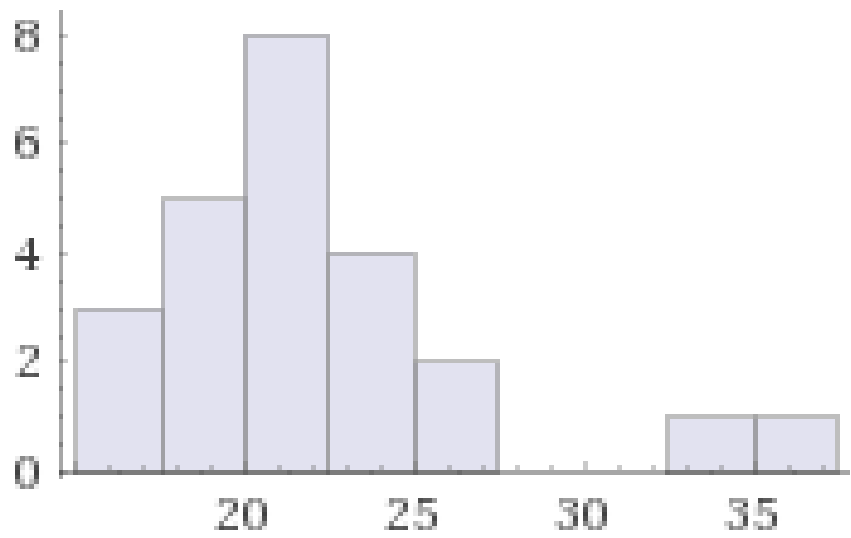
According to this histogram maximum frequency of people score value **between 20 -25**

mean	22.02
first quartile	18.69
median	21.02
third quartile	24.21

sample standard deviation	4.797
sample variance	23.01
interquartile range	5.517
sample range	19.57
coefficient of variation	0.2179

Q5:

A statistical test has been correctly performed and reported, including test statistic, p-value, and test result. The test results are interpreted in terms of the experimental task performed. Alternatively, students may use a bootstrapping approach to simulate the results of a traditional hypothesis test ?

ANS 5 :

$t(23)$ = -8.020706944 , p value = 0.00000004594948962

Two tailed calculation in spreadsheet link :
https://docs.google.com/spreadsheets/d/1I6nz40kJIIDWSMizirF7Jm0vc5W8aevliaOInEM0Iyk/edit?usp=sharing

T - critical = +2.069 ,- 2.069

For 95% confidence level   upper bound = -5.910215421
                             Lower bound = -10.01936791
And alpha =0.05 but for two tailed therefore alpha = 0.025