SECTION 4

1. The hypothesis testing is a formal procedure that statisticians use to test whether a hypothesis can be accepted or not.

Types of hypothesis testing:

1. **Normality**: It tests for normal distribution in a population sample.
2. [**T-test**](https://sixsigmastudyguide.com/students-t-distribution/): tests for a [Student’s t-distribution](https://sixsigmastudyguide.com/students-t-distribution/) – i.e., where standard deviation in unknown and sample size is small
3. [**Chi-Square Test for Independence**](https://sixsigmastudyguide.com/chi-square-distribution/): tests for an association of significance between two variables in a population sample.
4. **Homogeneity of Variance (HOV**): tests the similarity of dispersion parameters in two or more population samples.
5. [**Analysis of Variance (ANOVA**)](https://sixsigmastudyguide.com/anova-analysis-of-variation/): tests for and analyzes differences between the means in several groups.
6. **Mood’s Median**: compares the medians of two or more population samples.
7. **Welch’s T-test**: tests for equality of means between two population samples.
8. **Kruskal-Wallis H Test**: compares two or more groups with an independent variable, based on a dependent variable.
9. [**Box-Cox Power Transformation**](https://sixsigmastudyguide.com/box-cox-transformation/): transforms a data set into normal distribution.

These hypothesis testing are used in real life, business and in statistical solutions.

2. The correlation in statistics is defined as the interdependence of variable quantities. It indicates the extent to which two or more variables fluctuate together.

(a) The methods to compute correlation are as follows,

1. Scatter Diagram Method.

2. Karl Pearson's Coefficient of Correlation.

3. Spearman's Rank Correlation Coefficient.

4. Methods of Least Squares.

(b) Applications of correlation in Biomedical Engineering and Technology are,

1. Using correlation coefficient in ECG waveforms for arrhythmia detection.

2. Use of Cross-Correlation Analysis of EEG Signals for Detecting Risk Level for Development of Schizophrenia

3. Correlation hunting between alpha band power of EEG signals.

4. Tunable diode laser spectroscopy: Correlation between breath carbon-monoxide and low level blood carboxy-haemoglobin saturation.

(c) **p-value** (probability value) is the probability of obtaining a sample “more extreme” than the ones observed data, assuming that the null hypothesis is true.

It is **calculated** using the sampling distribution of the test statistic under the null hypothesis, the sample data, and the type of test being done.

1. Lower-tailed test: p=P(TS ts | H0  is true) = cdf(ts)
2. Upper-tailed test: p= P(TS ts | H0  is true) =1- cdf(ts)
3. two-sided test: p= 2\*P(TS | ts | |H0  is true) =2\*(1- cdf(ts))

where

P- Probability of an event

TS- Test statistic

ts- Observed value of the test statistic calculated from your sample

cdf()- Cumulative distribution function of the distribution of the test statistic (TS) under the null hypothesis

H0- Null hypothesis