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1) Explain one tailed and two tailed test and type 1 and type 2 errors?

a) One Tailed Test:: A one-tailed test is a statistical test in which the critical area of a distribution is one-sided so that it is either greater than or less than a certain value, but not both. If the sample being tested falls into the one-sided critical area, the alternative hypothesis will be accepted instead of the null hypothesis. A one-tailed test is also known as a directional hypothesis or directional test. Key Features: • A one-tailed test is a statistical hypothesis test set up to show that the sample mean would be higher or lower than the population mean, but not both. • When using a one-tailed test, the analyst is testing for the possibility of the relationship in one direction of interest, and completely disregarding the possibility of a relationship in another direction. • Before running a one-tailed test, the analyst must set up a null hypothesis and an alternative hypothesis and establish a probability value (p-value).

Two Tailed Test.:

In statistics, a two-tailed test is a method in which the critical area of a distribution is two-sided and tests whether a sample is greater than or less than a certain range of values. It is used in null-hypothesis testing and testing for statistical significance. If the sample being tested falls into either of the critical areas, the alternative hypothesis is accepted instead of the null hypothesis.

Key Features: • In statistics, a two-tailed test is a method in which the critical area of a distribution is two-sided and tests whether a sample is greater or less than a range of values.

• It is used in null-hypothesis testing and testing for statistical
significance.

• If the sample being tested falls into either of the critical areas, the
alternative hypothesis is accepted instead of the

null hypothesis.
• By convention two-tailed tests are used to determine significance at the
5% level, meaning each side of the distribution is cut at 2.5%.
Type 1 & Type 2 error:
A Type I error means rejecting the null hypothesis when it's actually true. It means concluding that results are statistically significant when, in reality, they came about purely by chance or because of unrelated factors.
The risk of committing this error is the significance level (alpha or α) you choose.
That's a value that you set at the beginning of your study to assess the statistical
probability of obtaining your results (p value).
A Type II error means not rejecting the null hypothesis when it's actually false. This
is not quite the same as "accepting" the null hypothesis, because hypothesis testing
can only tell you whether to reject the null hypothesis.
Instead, a Type II error means failing to conclude there was an effect when there actually was. In reality, your study may not have

had enough statistical power to
detect an effect of a certain size.

Null Hypothesis is	True	false
Rejected	Type I error False Positive Probabilty=α	correct descion true negative probability -1-B
Not Rejected	Correct decision True negative Probabilty=1-α	Type II error false negativr probability=1-B

The significance level is usually set at 0.05 or 5%.
This means that your results only have a
5% chance of occurring, or less, if the null
hypothesis is actually true.
To reduce the Type I error probability, you can
simply set a lower significance level.

2) Samples of 100 voters are asked which of four
candidates they would vote for in
an election. The number supporting each candidate
is given below:
Higgins Reardon White Charlton

41 19 24 16

Do the data suggest that all candidates are equally popular?[ChiSquare=14.96,With 3 d.f.: $p<0.05$]

Sol:

Null Hypothesis: Ho= There is no preference for any of the candidate.

Therefore, we would expect roughly equal no of votes=100/4= 25 per candidate

Alternative Hypothesis: H1

H1 not equal to Ho

Calculations:

$X2 = \mathcal{E}(0-e)2/e$

0	E	0-E	(o-E)2	(0-E)2/E
41	25	16	256	10.24
19	25	-6	36	1.44
24	25	-1	1	0.04
16	25	-9	81	3.24

$$\frac{\mathcal{E}(0-\mathcal{E})2}{\mathcal{E}} = 14.96$$

Critical value:

The Critical Value of ChiSquare at 0.05 level of significance with 3

Degrees of function is 7.82.

Therefore value = 7.82
Calculated value = 14.52 //
Conclusion:
Calculated value > theoretical value
14.921 > 7.82
Therefore Null Hypothesis is accepted.
That voters are not preferring any of the candidate from four.

3.) The random samples are drawn from two normal populations and there are

X1 65 67 74 76 84 86 88 94 95

X2 65 66 74 78 84 85 89 94 96 95 98

test whether two samples have the same variance of 5% level of significance (f=3.11 at 5) (V1 = 8 & V2 = 10)

Let us take the hypothesis is that two populations have the same variant

applying F-Test.

F = S12 S22

X1 X1 = X1-X1 X12 X2 X2=X2-X2- X2

sq

65	65-81=-14	256	65	65-84 -19	361
67	67-81=-7	196	66	66 -84=-18	324
74	74-81=-7	49	74	74-84 = -10	100
76	76-81= -5	25	78	78-84= -6	36
84	84-81=3	9	84	84-84 = 0	0
86	86-81=5	25	85	85-84=1	1
88	88-81 = 7	49	89	89-84=5	25
			94	94-84=10	100
94	94-81=13	169	96	96-84=12	144
			95	95-84 =12	144
95	95-81 =14	196	98	95-84=14	196
Σx1=729	Σx1=0	Σx12=974	Σx2=924	Σx2=0	Σx22=1309

X1= Σx1/n1 =729/9 = 81

X2 = Σx2/n2 = 924/11 =84

s12 = Σx12/n1-1 = 974/9-1 = 121.75

s22 = Σx22/n2-1 = 1309/11-1 = 1309/10 = 130.9

F = 121.75/130.9

F=0.930

For V1 =81 V2 =10 F=3.11 at 5% level of significance

Calculated value is= 0.93

Tabulate value is = 3.11

Calculated value < Tabulated