(*) Test of significance :

In testing of hypotheses, we construct tests for testing the significance of certain statistics. These tests are classified in two groups (i) Large sample tests (ii) Small sample tests. In large sample tests, we use the samples with size $n \geq 30$, as the sampling distributions of many statistics are approximately normal when $n > 30$. For small sample tests, the sample size n is less than 30 and we use the exact sampling distributions of the statistics.

(*) Statistics tests :

(overall concept about ch.)

Parametric test.

Z - test

- Large sample size $n > 30$.
- Variance known
- $\boxed{z = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}}}$
- for a large sample size If σ is unknown $\Rightarrow s = \sigma$.

T - test

- Small sample size $n < 30$.
- Variance unknown
- $\boxed{t = \dfrac{\bar{x} - \mu}{s/\sqrt{n}}}$

F - test

- Small sample size.
- Two independent estimation of population
- same variance.

Non Parametric test.

χ^2 (chi square) test.

(• used for test of goodness of fit
* Value betn 0 and 1 * Large sample size $n > 50$.)

(*). P - Value :

The p-Value is the smallest level of significance (α) that would lead to rejection of the null hypothesis Ho with the given data

→ The p-value method is growing in importance with the increasing use of statistical computer packages to test hypotheses.

→ No present value of α is given in the p-value method.

e.g. If the p-value of a test is 0.038

→ then the null hypothesis cannot be rejected at $\alpha = 0.01$ because $0.038 > 0.01$

→ but the null hypothesis can be rejected at $\alpha = 0.05$ because $0.038 < 0.05$.

(0.038 is the smallest value of α for which the null hypothesis can be rejected)

Note: (for practical) As an example of using p-values with a two-tailed test, consider the CPA net income problem. The observed test statistic for this problem is $z = 2.75$ (by z-table)

∴ the null hypothesis is true if p-Value is $0.5000 - 0.4970 = 0.0030$ (By z-table)

Observe that in the MINITAB output the p-value is 0.0060. MINITAB doubles the p-value on a two tailed test so that the researcher can compare the p-value to α to reach a

statistical conclusion. On the other hand, when Excel yields a p-value in its output, it always gives the one-tailed value, which in this case is 0.0030.
($\because$ In Excel p-value is $\alpha/2$)

⊛ Testing of Statistical Hypothesis:

Steps to Hypothesis Testing.

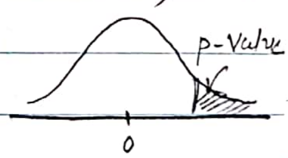
1) State the H_0 (null hypothesis) and H_1 (alternative hypothesis) (complementary to H_0)

$\boxed{H_0 : \mu = \mu_0}$; where μ is the population mean & μ_0 is the hypothesized value of the population mean.

$\boxed{H_1 : \mu \neq \mu_0}$ i.e $\mu < \mu_0$ or $\mu > \mu_0$ (one tail)
$\mu < \mu_0$ and $\mu > \mu_0$ (two tail))

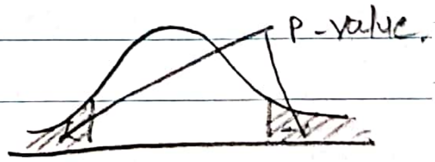
2) Calculation of test statistic value:
by appropriate formula of z-test, t-test, F-test, chi square test. . .

3) Set the level of significance (or p-value)
1) upper-tail test (right-tail test)
p-value = area in upper tail.



2) lower (left) tail test
p-value = area in lower tail

3) Two-tail test.
p-value = Sum of area in two tails.



4) Conclusion: 1) Reject H_0, if $Z < -Z_{\alpha/2}$ or $Z > Z_{\alpha/2}$

$t < -t_{\alpha/2}$ or $t > t_{\alpha/2}$

2) Not Reject H_0; if $-Z_{\alpha/2} < Z < Z_{\alpha/2}$

$-t_{\alpha/2} < t < t_{\alpha/2}$.

Note:
1) Reject H_0, if P-value $\leq \alpha$.
Do Not Reject H_0, if P-value $> \alpha$.

2) Use the word do not reject instead of accept because we conclude by one sample it's may different in other sample.

Z-test for testing the significance of a single mean.

$Z = \dfrac{\bar{X} - \mu}{\sigma/\sqrt{n}}$	If σ is known.
$Z = \dfrac{\bar{X} - \mu}{s/\sqrt{n}}$	If σ is unknown $\left(\sigma^2 = s^2 \text{ (large } n)\right)$

$\bar{X}$ = sample mean
μ = population mean
σ = standard deviation of population
s = standard deviation of sample.
n = sample size.