Sign - Test

$n \leq 20$	$n > 20$
Sign test	z-test
$P(X \geq x) = 1 - P(X < (x-1))$	$z = \frac{x - n\theta}{\sqrt{n\theta(1-\theta)}}$

95% level of significance

$\frac{95}{100} = 0.95$

$1 - 0.95$

$= 0.05$ level of significance.

Procedure for sign-Test (Small sample)

i) Null hypothesis = $H_0 : \mu_1 = \mu_2$ (or) $H_0 : \mu_1 = x$

$\therefore x \rightarrow$ given value.

ii) Alternate hypothesis = $H_1 : \mu_1 > \mu_2$

$\mu_1 < \mu_2$

$\mu_1 = \mu_2$.

iii) Give "+" sign and "−" sign for each value.

iv) Give 0 sign for value equal to

v) find n $\therefore n =$ no of + & − signs.

vi) find x $\therefore x =$ no of '+' signs.

vii) Substitute formula $P(x, x) = 1 - P(X < (x-1))$.

viii) Check table value for $P(n, x)$ at $\theta = 1/2$ (or) 0.5.

ix) Table value higher than level of significance then accept else reject.

calculated value.

Procedure for sign-test when in large sample:

i) follow steps from i to vi from small sample. (Sign test).

vii) Substitute formula, $z = \frac{x - n\theta}{\sqrt{n\theta(1-\theta)}}$

$\therefore x$ = no of '+' sign.

n = no of '+' & '-' sign.

$\theta = 1/2$ (or) 0.5

viii) check table value

$\mu_1 \neq \mu_2$.

Two tailed

conclusion	5%	1%
Accept Ho	$\|z\| < 1.96$	$\|z\| < 2.58$
Reject Ho	$\|z\| > 1.96$	$\|z\| > 2.58$

One tailed

$\mu_1 > \mu_2$

$\mu_1 < \mu_2$.

conclusion.	5%	1%
Accept Ho	$\|z\| < 1.654$	$\|z\| < 2.33$
Reject Ho	$\|z\| > 1.654$	$\|z\| > 2.33$

ix) Reject if the calculated is higher than table value, then reject else accept

Sign Ranked test

$\neq$ → Two tail

$\leq$, $>$ → One tail.

$T = \min(T^+, T^-)$

Alternative hypothesis	Reject the null hypothesis if
$\mu \neq \mu_0$	$T \leq T_\alpha$
$\mu > \mu_0$	$T^- \leq T_{2\alpha}$
$\mu < \mu_0$	$T^+ \leq T_{2\alpha}$

Procedure for Sign Ranked test ($n \leq 30$)

i) define Null hypothesis.
Alternative hypothesis
Level of significance.

ii) From the given value, subtract the each value to find the difference.

iii) Find the rank for each sample's difference.

iv) Find T^- ∴ Total no of negative value ($\leq$). (Add only rank).

v) Find T^+ ∴ Total no of positive value ($\leq$) (Add only rank).

vi) Find, $T = \min(T^+, T^-)$.

vii) Find the table value by using n, level of significance.

viii) Compute T & T_α

ix) Reject if the table value is higher than the calculated value.

Procedure for the sign ranked test ($n > 30$)

i) Follow step i to v, then.

vi) Compute, $z = \frac{T^+ - \mu}{\sigma}$

$$\mu = \frac{n(n+1)}{4}$$

$$\sigma^2 = \frac{n(n+1)(2n+1)}{24}$$

$$\sigma = \sqrt{\frac{n(n+1)(2n+1)}{24}}$$

$\therefore$ n = Sample size after rank.

T^+ = ~~no. of~~ Sum of all '+' value Rank. (Add only rank).

vii) Compute the table value of z

viii) Reject if the calculated value is higher, else accept.

U-Test

Alternative hypothesis	Reject the null hypothesis
$\mu_1 \neq \mu_2$	$U \leq U_\alpha$
$\mu_1 > \mu_2$	$U_2 \leq U_{2\alpha}$
$\mu_1 < \mu_2$	$U_1 \leq U_{2\alpha}$

$$U_1 = W_1 - \frac{n_1(n_1+1)}{2}$$

$$U_2 = W_2 - \frac{n_2(n_2+1)}{2}$$

Procedure for U-Test

i) define Null hypothesis
Alternative hypothesis
L.O.S(α)

ii) Arrange the value jointly in increasing order.

iii) Find n_1 & n_2.

iv) Arrange lot A in increasing order with rank.

v) Arrange lot B in increasing order with rank.

vi) Arrang two set of rank in an increasing order.

vii) Compute W_1 & W_2
$\therefore W_1$ = Sum of the ranks in lot A.
$\therefore W_2$ = Sum of the ranks in lot B.

viii) Compute $U_1 = W_1 - \frac{n_1(n_1+1)}{2}$

ix) Compute, $U_2 = W_2 - \frac{n_2(n_2+1)}{2}$

x) Compute, $U = \min(U_1, U_2)$.

xi) Calculate table value, based on n_1 & n_2 & LOS.

$U_1 < U_{2\alpha}$

$U \leq U_\alpha$

$U_2 \leq U_{2\alpha}$

xii) Reject if the table value is higher, else accept.

Procedure for U-test (Z-test)

i) Follow step i to x

ii) Calculate,

$$z = \frac{U_1 - \mu_{U_1}}{\sigma_{U_1}}$$

$$\therefore \mu_{U_1} = \frac{n_1 n_2}{2}$$

$$\therefore \sigma_{U_1} = \sqrt{\frac{n_1 n_2 (n_1 + n_2 + 1)}{12}}$$

iii) Compute the table value using n_1, n_2 & LOS.

iv) Reject if table value is higher, else accept.

H - Test

→ Use χ^2 Table value.
$(n-1)$

Procedure.

i) find Null hypothesis, $H_0 : \mu_1 = \mu_2 = \mu_3$
Alternate hypothesis, $H_1 : \mu_1, \mu_2, \mu_3$ are not equal.

find n_1, n_2, n_3.
L, O, S :

ii) ~~Eatt~~ Arrange the values jointly in increasing order.

iii) Arrange lot 1, lot 2, lot 3 seperately with rank in increasing order.

iv) Find, R_1, R_2, R_3.
$\therefore R_{1,2,3}$ = ~~Total~~ of rank in each lot.

v) Compute H-test

$$H = \frac{12}{n(n+1)} \sum_{i=1}^{k} \frac{R_i^2}{n_i} - 3(n+1).$$

∴ Ex

$$H = \frac{12}{18.19} \left[\frac{R_1^2}{n_1} + \frac{R_2^2}{n_2} + \frac{R_3^2}{n_3} \right] - 3(n+1).$$

vi) Calculate H and find the Table value using χ^2 table.

vii) Reject if the calculated value is higher, else accept.