C Run Test (Test for Independence)
- It's a two tailed test
* Run up & Run Down [RURD]

Steps:-

S_1:- Setting up of Hypothesis

H_0:- $R \sim U[0,1]$

H_1:- $R \not\sim U[0,1]$

S_2:- Write down sequence of run ups & run downs

S_3:- Count total number of runs present in the sequence. (a)

S_4 calculate : means & variance as

$$\mu_a = \frac{2N-1}{3} \qquad \sigma_a^2 = \frac{16N-29}{90}$$

S_5:- Calculate $Z_{tab} = \frac{a - \mu_a}{\sigma_a^2}$

S_6. Determine $Z_{calc} = Z_{\alpha/2}$

S_7: Compare Z_{tab} & Z_{calc}

If: $-Z_{\alpha/2} \leq Z_{tab} \leq Z_{\alpha/2}$

Accept H_0

else Reject

Numerical 1

0.12, 0.01, 0.23, 0.78
0.64, 0.28, 0.33, 0.93, 0.89, 0.31,

Soln:

S1. H0 & H1

S2:- Sequence of Run Up & Run Down

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(1) (2) (3) (4) (5) (6)

total no of runs (a) = 6

S3 $\mu = \frac{2N-1}{3}$ $\sigma_0^2 = \frac{16N-29}{90}$

$= \frac{2 \times 10 \cdot 1}{3}$ $= \frac{16 \times 10 - 29}{90}$

$= 6.33$ $= 1.45$

S4: $Z_{calc} = \frac{a - \mu_a}{\sigma_a} = \frac{6 - 6.33}{\sqrt{1.45}}$

$= -0.274$

S5 $Z_{tab} = Z_{\alpha/2} = Z_{0.025} = -1.96$

$Z_{\alpha/2} \leq Z_{calc} \leq Z_{\alpha/2}$

$-1.96 \leq -0.274 \leq 1.96$

So accept H0.

Numerical 2 Confidence 90% sequence

0.23, 0.16, 0.49, 0.39, 0.15, 0.08, 0.39, 0.67
0.50, 0.47, 0.32, 0.62, 0.95, 0.52, 0.83, 0.89
0.44, 0.38, 0.10, 0.85, 0.24, 0.03, 0.88,
0.29, 0.56, 0.62, 0.05, 0.17

* Run Above & Below the Mean (RA RB)

S_1: Same as RURD

S_2 Define run sequence with respect to the mean: for 0 to 1 it is 0.495

S_3: Calculate total number of runs 'b'
n_1 & n_2 where n_1 is values ↑ mean & values ↓ mean

S_4: calc μ_b & σ_b^2.

$$\mu_b = \frac{2n_1 n_2}{N} + \frac{1}{2}$$

$$\sigma^2_b = \frac{2n_1 n_2 (2n_1 n_2 - N)}{N^2 (N-1)}$$

$$S_5 = Z_{calc} = \frac{b - \mu_b}{\sigma_b}$$

S_6 $Z_{\alpha/2} = Z_{tab}$

S_7 Compare Z_{calc} & Z_{tab}
$-Z_{\alpha/2} \leq Z_{calc} \leq Z_{\alpha/2}$ Accept H_0

Numerical: .11, .23, .45, .08, .11, .50, 0.9, .60, .81, $\alpha = 0.05$.