**Practical No. 5 :** Run test

A quality-control person randomly selects 50 of the parts produced by the machine today and examines them one at a time in the order that they were made. The result is 40 parts with no flaws and 10 parts with flaws. The sequence of no flaws (denoted by *N*) and flaws (denoted by *F)* is shown below. Use an alpha of .05.

**Enter this data in MS Excel and generate the following report:**

*NNN F NNNNNNN F NN FF NNNNNN F NNNN F NNNNNNFFFF NNNNNNNNNNNN*

**Question :**

Determine whether the machine is producing randomly (the flaws are occurring randomly).

**Solution :**

**Step 1 :** Type your data into the cells of a worksheet. Make sure you put your data into columns. Use column header for “Quality of parts” and “No. of runs”. Type the “Quality of parts” data into column A, count the runs manually and write them down in the “No. of runs” column B.

**Step 2 :** To perform run t test, we must first find out the frequency of data. For the calculation of the frequency of flawed and non-flawed parts, we have used the predefined formula in excel. The raw data column is selected, and the corresponding formula is used,

For flaws,

= COUNTIF($A$2:$A$51,D10)

= 10

For non-flaws,

= COUNTIF($A$2:$A$51,D9)

= 40

**Step 3 :** For the calculation of the sample size, we have used the basic formula in excel.

= SUM(F12:F13) i.e., no. of non-flaws + flaws

= 50

**Step 4 :** From column B, the no. of runs (r) is 13. For the calculation of the mean no. of runs, we have used the basic formula in excel.

= ((2\*F12\*F13)/F14)+1

= 17

Here, i.e.,

F12 : No. of non-flaws (n1)

F13 : No. of flaws (n2)

F14 : Sample size (n)

**Step 5 :** For the calculation of the standard deviation of runs, we have used the basic formula in excel.

= SQRT(((2\*F12\*F13)\*(2\*F12\*F13-F14))/((F14^2)\*(F14-1))) i.e.,

= 2.2131

Here,

F12 : No. of non-flaws

F13 : No. of flaws

F14 : Sample size

**Hypothesis :**

|  |  |
| --- | --- |
| Null hypothesis | H₀ : the sequence of flaw part and non-flaw parts is in random order |
| Alternative hypothesis | H₁ : the sequence of flaw part and non-flaw parts is not in random order |

**Test :**

Here, we have used large sample case. For the calculation of the Z value, we have used the basic formula in excel.

= (F16-F18)/F20 i.e.,

= -1.80739

Here,

F16 : No. of runs (r)

F18 : Mean no. of runs

F20 : S.D. of runs

For the calculation of the critical Z value, we have used the basic formula in excel.

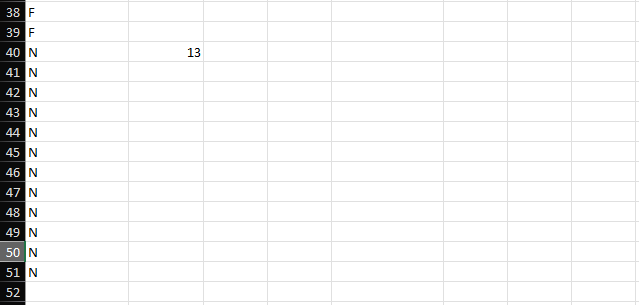
= NORM.S.INV(0.975)

= 1.959964

**Conclusion :**

Since Cal Z lies in the acceptance region i.e., 1.96 < Z < 1.96 or |Cal Z| = 1.81 < Crit Z = 1.96, we accept our null hypothesis at 5% level of significance i.e., the machine is producing parts randomly i.e. flaws and non-flaws are produced in random order.

**Worksheet :**

**A screenshot of a computer

AI-generated content may be incorrect.**