

Write a C program to find the test of significance based on the Chi-square test.

χ^2 -Variate : — Square of a standard normal Variate.

Conditions for the Validity of the χ^2 -test .

Approximate test for large values n . For the Validity of the chi-square of goodness of fit between theory & Experiment; the following Conditions must be satisfied -

(i) The sample observations should be independent -

(ii) The constraints on the cell frequencies if any, must be linear i.e., $\sum O_i = \sum E_i$

(iii) N , the total frequency should be reasonably large, say greater than 50 -

(iv) No theoretical frequency should be less than five. If the theoretical frequency is less than 5 then for the application

of the chi-square test, it is pooled with the succeeding or preceding so that the pooled frequency is more than 5. This is to make χ^2 distribution a continuous distribution to maintain the character of continuity of the distribution.

Chi-square Test of goodness of fit =

If O_i ($i=1, 2, \dots, n$) is a set of observed (experimental) frequencies and E_i ($i=1, 2, \dots, n$) is the corresponding or expected (theoretical frequency, hypothetical frequency) frequency.

$$\text{Then } \chi^2 = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i} \quad \text{with the condition } \sum_{i=1}^n O_i = \sum_{i=1}^n E_i$$

follows the χ^2 -distribution ($n-1$) d.f. — $\chi^2 \rightarrow$ calculated χ^2 value —

From the Chi-square table $\rightarrow \chi^2$ at 5% level of significance.

If the calculated Value is less than the table Value, then 'Accept H_0 '.

Then there is no significant in the attributes selected for Comparison -

Pseudo code

- 1) start
- 2) printf("How many Values needed?");
- 3) Read the Value say 'n'.
- 4) Input the Value for the array of frequencies - — observed frequency -
- 5) Expected frequency is calculated
$$= \sum \text{obs-frequency} / n.$$

6) printf (The Expected frequencies)

7) chi-square Test calculation.

$$i.e., \chi^2 = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i} = \text{chi-calc.}$$

i.e., calculate sum of squares of differences of observed frequency and experimental frequency divided by the corresponding expected frequency.

8) ~~The~~ result is the chi-square calculated Value.

9) Read the table Value of chi-square at 5% level of significance for $(n-1)$ d.f. \rightarrow chi-tab.

10) If $(\text{chi-calc} < \text{chi-tab})$

printf ("Accept the null hypothesis for $n-1$ d.f., chi-calc")

```
else if (chi-calc > chi-tab)
    printf("Reject the null hypothesis at (n-1) df, chi-calc)
```

10. Stop-

C-Program for testing the significance using chi-square test:

```
#include <stdio.h>
#include <math.h>
#define MAXSIZE 10
```

```
void main()
```

```
{ float x[MAXSIZE], exp-freq[MAXSIZE], obs-freq[MAXSIZE];
  float efreq, chitab, chical, sume = 0, sumo = 0;
  printf("Enter the value of N \n");
  scanf("%d", &n);
```

```
for (i=0; i<n; i++)
```

```
{ print( "Enter x[%d] the values \n", i);
```

```
scanf( "%f", &x[i]);
```

```
}
```

```
/* observed frequency */
```

```
for(i=0; i<n; i++)
```

```
{ printf( "observed frequency = obs[%d]", i);
```

```
scanf( "%f", &obs-freq[i]);
```

```
sum = sum + obs-freq[i];
```

```
}
```

```
efreq = sum/n;
```

/ Compute the expected frequency */*

for (i = 0; i < n; i++)

{

printf("Expected frequency E[%d]", i);

exp-freq[i] = efreq;

printf("exp-freq[i] \n");

}

/ Calculation of chi-square */*

for (i = 0; i < n; i++)

{ sum1 = sum + ((obs-freq[i] - exp-freq[i]) * (obs-freq[i] -
exp-freq[i]) / exp-freq[i])

}

```
chicalc = sum1;  
printf ("Chi-square table value at %d degrees of freedom = (%n, n-1);  
scanf ("%f", &chitab);
```

```
if (chical < chitab)
```

```
{ printf ("Accept  $H_0$ : There is no difference in the attributes  
The calculated value of chi-square is %0.3f", chical);
```

```
} else if (chical > chitab)
```

```
{ printf ("Reject  $H_0$ : There is significant difference in the  
attributes, The calculated value of chi-square is %0.3f",  
chical);  
}
```


A die was thrown 498 times. Denoting x to be the number appearing on the top face of it. The observed frequencies of x is given below

$x:$	1	2	3	4	5	6
$f:$	69	78	85	82	86	98

What opinion would you form for the accuracy of the die.

H_0 : Die is unbiased.

Table Value of χ^2 at 5% level of significance for 5 d.f is 11.07