

Example 6. The theory predicts the proportion of beans in the four groups, G_1, G_2, G_3, G_4 should be in the ratio 9 : 3 : 3 : 1. In an experiment with 1600 beans the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory. (BNU 1995 ; MKU 1995)

Sol. H_0 . The experimental result support the theory. i.e. there is no significant difference between the observed and theoretical frequency under H_0 , the theoretical frequency can be calculated as follows :

$$E(G_1) = \frac{1600 \times 9}{16} = 900 ; E(G_2) = \frac{1600 \times 3}{16} = 300 ; E(G_3) = \frac{1600 \times 3}{16} = 300 ; E(G_4) = \frac{1600 \times 1}{16} = 100$$

To calculate the value of χ^2 .

Observed frequency O_i	882	313	287	118
Exp. frequency E_i	900	300	300	100
$\frac{(O_i - E_i)^2}{E_i}$	0.36	0.5633	0.5633	3.24

$$\chi^2 = \frac{\sum (O_i - E_i)^2}{E_i} = 4.7266.$$

Conclusion. Table value of χ^2 at 5% level of significance for 3 d.f. is 7.815. Since the calculated value of χ^2 is less than that of the tabulated value. Hence H_0 is accepted.

i.e. The experimental result support the theory.