

Answer on Question #67802 – Math – Statistics and Probability

Question

The probability of individuals with blood types A, B, AB and O are 0.45, 0.13, 0.06 and 0.36, respectively.

A geneticist tested 100 individual blood types and found that 40 had type A, 18 had type B, 5 had type AB and 37 had type O. Use goodness of fit test at 5% level of significance to test whether the observed frequencies closely correspond to the theoretical ones.

[You may like to use the values]

Solution

| | | | | |
|---------------------------|----|----|---|----|
| Observed (O_i) | 40 | 18 | 5 | 37 |
| Expected ($E_i = np_i$) | 45 | 13 | 6 | 36 |

Null hypothesis H_0 : the data are consistent with a specified distribution.

Alternative hypothesis H_a : the data are not consistent with a specified distribution.

Test statistic:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i} = \frac{(40 - 45)^2}{45} + \frac{(18 - 13)^2}{13} + \frac{(5 - 6)^2}{6} + \frac{(37 - 36)^2}{36} = 2.67.$$

Degrees of freedom:

$$df = 4 - 1 = 3.$$

P-value:

$$p = 0.445.$$

Since P-value is greater than 0.05 we can't reject the null hypothesis.

Answer: the observed frequencies closely correspond to the theoretical ones at 5% level of significance.