**Question 2.**

i.

Hypotheses

$$H\_{0}: η1- η2 =0$$

$$H\_{a}: η1- η2< 0$$

$$where η1 is the median for the treatment group and η2 is the median for the placebo group.$$

The alternative hypothesis tests the claim that the median for the treatment group is less than the placebo group.

ii.

Test of η1 = η2 vs η1 < η2 is significant at 0.0006

iii.

The results are statistically significant p-value < 0.001. The probability of observing the differences in medians by chance is low therefore, reject the null hypothesis. The treatment is effective in lowering lipids in the blood.

b.

i.

Expected frequencies = sum(frequencies)/12 = 82/12 = 6.833

|  |  |
| --- | --- |
| **Table 1** | Month of death of royal descendants |
| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Frequency | 13 | 4 | 7 | 10 | 8 | 4 | 5 | 3 | 4 | 9 | 7 | 8 |
| expected Frequency | 6.83 | 6.83 | 6.83 | 6.83 | 6.83 | 6.83 | 6.83 | 6.83 | 6.83 | 6.83 | 6.83 | 6.83 |

All the expected frequencies are greater than 5 hence it is not necessary to pull categories when performing the chi-squared test.

ii.

Hypotheses

H0: The distribution of deaths follows the hypothesized uniform distribution.

Ha: The distribution of deaths does not follow the hypothesized distribution.

α = 5%,

Test statistic = chi-squared for goodness of fit

$$χ^{2}= \frac{sum\left(O -E\right)^{2}}{E}$$

$χ^{2}\_{11}= \frac{\left(13 -6.833\right)^{2}}{6.833}+ \frac{\left(4 -6.833\right)^{2}}{6.833}+…+ \frac{\left(7 -6.833\right)^{2}}{6.833}+ \frac{\left(8 -6.833\right)^{2}}{6.833}=14.293$

The degrees of freedom are n-1 ; 12-1 = 11