**Question 1 [3 marks]**

The weight of a group of individuals was measured before and after a diet. The results are given below. ( See R code provided : “WB.dat” and “WA.dat”)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Individual | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Weight Before | 97 | 78 | 85 | 96 | 87 | 76 | 83 | 75 | 97 |
| Weight After | 92 | 76 | 84 | 91 | 87 | 72 | 79 | 77 | 93 |

Carry out an inference procedure to test the diet does not on average change an individual’s weight (i.e. null: true difference in weight is zero) .

* 1. What is the p-value for this test?
  2. What is the confidence interval for the change of an individual’s weight?
  3. Interpret the outcome of this inference procedure. Justify your conclusions.

**Question 2 [3 marks]**

In a sample of 500 student accommodations, 353 were found to have a large screen television.

Carry out an inference procedure to test the hypothesis that the true proportion of residences with large screen televisions is 65%.

* 1. What is the confidence interval for the true proportion of residences with large screen televisions?
  2. What is the p-value for this test?
  3. Interpret the outcome of this inference procedure. Justify your conclusions.

**Question 3 [3 marks]**

Test the equality of the variances of the following data sets “WB.dat” and “WC.dat”.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Individual | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| WB.dat | 97 | 78 | 85 | 96 | 87 | 76 | 83 | 75 | 97 |
| WC.dat | 85.14 | 82.03 | 78.93 | 79.50 | 104.76 | 87.04 | 82.19 | 82.58 | 89.57 |

We can assume the populations are normal. Use “WB.dat” as the first argument for the command.

3.1) What is the P-value for this test?

3.2) What is the confidence interval for the variance ratio estimate?

3.3) Interpret the outcome of this inference procedure. Justify your conclusions.

**Question 4 [3 marks]**

A study was carried out to investigate the relationship between performance in an exam and the numbers of study hours per week. ( See R code provided : “Grade” and “Studyhrs”)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Grade [%] | 56 | 45 | 80 | 73 | 71 | 55 | 95 | 86 | 34 | 66 |
| Study hours per week | 9 | 6 | 12 | 14 | 11 | 6 | 19 | 16 | 3 | 9 |

Fit a linear model to this data and answer the following questions:

4.1 ) Use the regression coefficients to write down the regression model equation.

4.2) What is the p-value for the slope estimate?

4.3) Interpret the p-value for the slope estimate, commenting on the relevance for the overall model. Justify your conclusions.

**Question 5 [3 marks]**

Perform an inference procedure to test the correlation coefficient for the data in Question 4.

5.1) What is the confidence interval for the correlation coefficient estimate?

5.2) What is the p-value?

5.2) Interpret the outcome of this inference procedure. Justify your conclusions.