Dr Isabella Gollini

Probability and Statistics

Assignment 2 *Submit this assignment by Monday 24th April 2017.*

Guidelines for this assignment:
- *You have to answer to all of the three questions.*
- *Always interpret your conclusion in the context of the application.*
- *If needed, round the number to 3 decimal places.*
- *If needed, look for the closest value available in the statistical tables.*
- *When asked for the **R** commands:*
  - *write down the **R** function to be used to perform the test, with all the arguments.*
  - *write down the value of the test statistic, the number of degrees of freedom (if appropriate), and the p-value as returned by **R**.*
  - *do not submit the commands used to load the data.*

1. The following results are obtained from rolling 1000 times a six-faced die:

Score:	1	2	3	4	5	6
Frequency:	212	140	156	170	172	150

   (i) Suggest a hypothesis test to test if the die is fair or not, specifying any assumptions and appropriate null and alternative hypotheses. [2]

   (ii) Carry out the hypothesis test, stating your conclusions clearly. Use a 5% significance level. [2]

   (iii) Give the **R** commands, the value of the test statistic and the p-value, as returned by **R**. [1]

2. In the 19th century Francis Galton argued that the eye color are inherited. He collected the data from a sample size of 5008 individuals.

	Parent Light	Parent Dark
Child Light	2524	1060
Child Dark	528	896

   (i) Suggest a hypothesis test to investigate whether there is association between the eye color of the parents and of the children, specifying any assumptions and appropriate null and alternative hypotheses. [2]

   (ii) Carry out the relevant test, stating your conclusions clearly. Use $\alpha = 0.05$. [2]

   (iii) Give the **R** commands, the value of the test statistic and the p-value, as returned by **R**. [1]

3. In a trial to evaluate a new drug, which it is hoped will reduce the cholesterol levels, 9 people were randomly selected to try the new drug. Their cholesterol levels in mg/l were measured before (column NoDrug), and after taking the drug (column Drug). The measurement are set out below.

Person	NoDrug	Drug
1	206.13	166.81
2	203.62	181.14
3	226.43	211.65
4	139.81	96.99
5	137.40	141.41
6	131.80	166.91
7	145.41	101.25
8	141.64	169.05
9	216.86	237.90

(i) Specify any assumptions and appropriate null and alternative hypotheses, and carry out a parametric test. Draw conclusions specifying the significance level you used. [5]

 - Give the R commands, the value of the test statistic, the number of degrees of freedom and the p-value, as returned by R. [2]

(ii) Specify any assumptions and appropriate null and alternative hypotheses, and carry out the sign test. Draw conclusions specifying the significance level you used. [4]

 - Give the R commands, the value of the test statistic and the p-value, as returned by R. [2]

(iii) Specify any assumptions and appropriate null and alternative hypotheses, and carry out the Wilcoxon signed-rank test. Draw conclusions specifying the significance level you used. [5]

 - Give the R commands, the value of the test statistic and the p-value, as returned by R. [2]