Dr Isabella Gollini

Probability and Statistics

R version of Q11 and Q12 of 2013 Exam Paper.

1 Output for Question 11

```
        Paired t-test

data:  Caliper1 and Caliper2
t = 0.43179, df = 11, p-value = 0.6742
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.001024344  0.001524344
sample estimates:
mean of the differences
                0.00025



        Wilcoxon signed rank test

data:  Caliper1 - Caliper2
V = 21.5, p-value = 0.6215
alternative hypothesis: true location is not equal to 0
```

Notice that the p-value given by R is slightly different from the one obtained by Minitab[1] and discussed in the solutions of the exam. The reason for this difference is that function `wilcox.test` of R in presence of ties calculates the p-value using a Normal approximation.

[1] Minitab was the software used in teaching this course in the previous years

2 Question 12

2.1 Output for Question 12 (a)

```
  xbar <- sum(Observed_Frequency * Number_of_Yeast) / n
  xbar
```

```
[1] 1.8
```

```
    Observed Poisson Probability   Expected (Or - Er)^2 / Er
0         75          0.16529889  66.119555      1.192722757
1        103          0.29753800 119.015200      2.155074450
2        121          0.26778420 107.113680      1.800235936
3         54          0.16067052  64.268208      1.640563724
4         30          0.07230173  28.920693      0.040279206
5         13          0.02602862  10.411450      0.643579244
>=6        4          0.01037804   4.151215      0.005508243
```

```
        Chi-squared test for given probabilities

data:  Observed
X-squared = 7.478, df = 6, p-value = 0.2789
```

```
  1 - pchisq(7.478, df = 5)
```

```
[1] 0.1874477
```

2.2 Output for Question 12 (c)

```
  ss <- sum(Observed_Frequency * Number_of_Yeast^2) - n * xbar^2
  ss
```

```
[1] 784
```

```
  index <- ss / xbar
  index
```

```
[1] 435.5556
```

```
  pvalue <- 1 - pchisq(index, df = n - 1)
  pvalue
```

```
[1] 0.1002819
```