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Probability and Statistics

R version of Q11 and Q12 of 2015 Exam Paper.

Output for Question 11

```
        Paired t-test

data:  Before and After
t = 0.73998, df = 11, p-value = 0.4748
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.2138918  0.4305585
sample estimates:
mean of the differences
              0.1083333
```

```
        Two Sample t-test

data:  Before and After
t = 0.36504, df = 22, p-value = 0.7186
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.5071372  0.7238038
sample estimates:
mean of x mean of y
 11.89167  11.78333
```

Question 12

Output for Question 12 (a)

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

```
[1] 2.5125
```

```
    Observed Poisson Probability  Expected (Or - Er)^2 / Er
0          4          0.08106532  6.485226       0.95237197
1         18          0.20367662 16.294130       0.17859150
2         23          0.25586876 20.469501       0.31282773
3         15          0.21429008 17.143207       0.26793908
4         12          0.13460096 10.768077       0.14093835
5          5          0.06763698  5.410959       0.03121202
>=6        3          0.04286127  3.428902       0.05364890
```

```
        Chi-squared test for given probabilities

data:  Observed
X-squared = 1.9375, df = 6, p-value = 0.9254


Warning message:
In chisq.test(Observed, p = Poisson_Probability) :
  Chi-squared approximation may be incorrect
```

```
  1 - pchisq(5.1458, df = 5)
```

```
[1] 0.3983471
```

Question 12 (b) i)

State the reason for the presence of the warning message in the output:

```
Warning message:
In chisq.test(Observed, p = Poisson_Probability) :
  Chi-squared approximation may be incorrect
```

Output for Question 12 (c)

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

```
[1] 177.9875
```

```
  variance <- ss / (n - 1)
  variance
```

```
[1] 2.253006
```

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

```
[1] 70.8408
```

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

```
[1] 0.7321637
```