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Probability and Statistics

R version of Q11 and Q12 of 2014 Exam Paper.

1 Question 11

1.1 Output for Question 11 (a)

```
        Two Sample t-test

data:  Smokers and Non_Smokers
t = -2.8965, df = 34, p-value = 0.003277
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
       -Inf -0.6383752
sample estimates:
mean of x mean of y
 14.03125  15.56500
```

Notice that the test statistic and the p-value given by R are slightly different from the ones obtained by Minitab[1] and discussed in the solutions of the exam. The reason for this difference is that the values used in Minitab are exact, while I used the data from the exam that has been rounded to the first decimal digit.

1.2 Output for Question 11 (b)

```
        Paired t-test

data:  Before_iron and After_iron
t = -1.6824, df = 13, p-value = 0.1163
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.73418418  0.09132703
sample estimates:
mean of the differences
             -0.3214286
```

Notice that the test statistic and the p-value given by R are slightly different from the ones obtained by Minitab and discussed in the solutions of the exam. The reason for this difference is that the values used in Minitab are exact, while I used the data from the exam that has been rounded to the second decimal digit.

[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_Wins) / n
  xbar
```

```
[1] 1.35
```

```
    Observed Poisson Probability  Expected (Or - Er)^2 / Er
0         15           0.2592403 10.369610        2.0676290
1         12           0.3499744 13.998974        0.2854422
2          6           0.2362327  9.449308        1.2591105
>=3        7           0.1545527  6.182108        0.1082070
```

```
        Chi-squared test for given probabilities

data:  Observed
X-squared = 3.7204, df = 3, p-value = 0.2933
```

```
  1 - pchisq(3.7204, df = 2)
```

```
[1] 0.1556415
```

2.2 Output for Question 12 (c)

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

```
[1] 101.1
```

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

```
[1] 2.592308
```

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

```
[1] 74.88889
```

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

```
[1] 0.0004788823
```