



Dr Florian Reiche  
[F.Reiche@warwick.ac.uk](mailto:F.Reiche@warwick.ac.uk)

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## 1 | Calculations by Hand

Expected Values:

Year of Study	Mode of Transport			Total
	Bike	Bus	Car	
Fresher	7.2	6.8	6	20
Finalist	10.8	10.2	9	30
Total	18	17	15	50

- Calculate the  $\chi^2$ -value **(2.8867)**
- How many degrees of freedom does this table have? Why? **(2)**
- Using the  $\chi^2$  Table, what is the p-value? **(0.236, or between 0.90 and 0.10)**
- Are mode of transport and departmental assignment independent in the population? **(Yes)**

## 2 | Cross-Tabulations in R – Exercises

1. Let us find out whether the completion of primary school influences youth unemployment rates.
  - a. State the null and directional alternative hypothesis for this test.
  - b. Create a new variable `primary_fac` using the `primary_com` variable. Cut it into three categories “low”, “medium”, and “high”, cutting `primary_com` at its first quartile, and its mean.

```
summary(wdi$prim_compl)
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.     NA's
##      37.50   90.71   98.27   92.74  101.50   114.27      83

wdi <- wdi %>%
  mutate(primary_fac=
    ordered(
      cut(prim_compl, breaks=c(0,59.868,77.952,135),
        labels=c("low","medium", "high"))))
```

- c. Apply the same procedure to `unemploy`, creating a new variable called `unemp_fac`.

```
summary(wdi$unemploy)
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.     NA's
##      0.170   3.555   6.100   7.646   9.908   27.690      25

wdi <- wdi %>%
  mutate(unemp_fac=
    ordered(
      cut(unemploy, breaks=c(0,3.585,8,38),
        labels=c("low","medium", "high"))))
```

- d. Create a cross-tabulation assessing the dependence of youth unemployment on primary completion rate.

```
ex1_table <- with(wdi, table(primary_fac, unemp_fac))
```

- e. Test whether the dependence is statistically significant.

```
Xsq <- chisq.test(ex1_table, correct=FALSE)
Xsq
##
## Pearson's Chi-squared test
##
## data:  ex1_table
## X-squared = 7.0878, df = 4, p-value = 0.1313
```