Load necessary packages

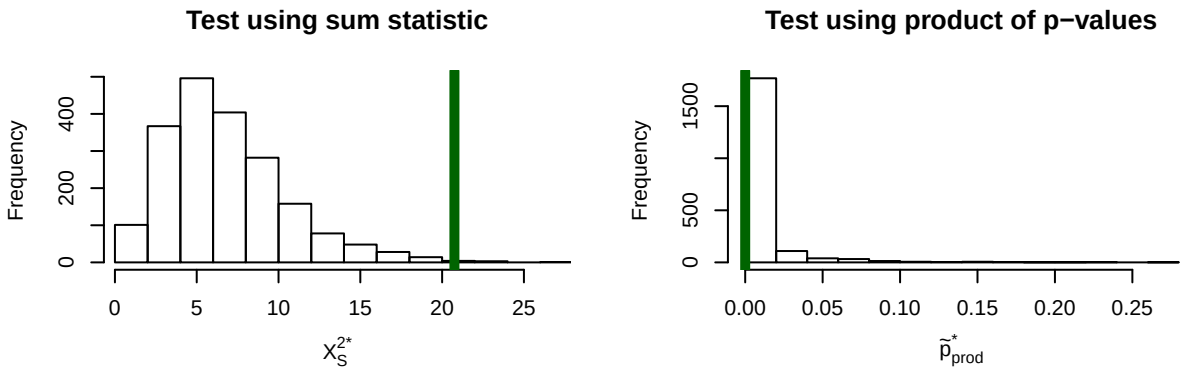
```
library(dplyr)
library(MRCV) # multiple response analysis package
```

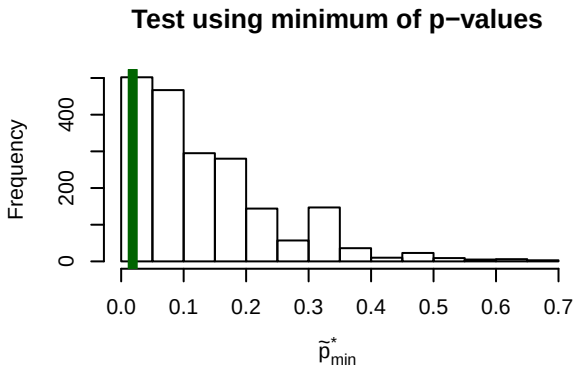
Load, process, and analyze function

```
LE.mrcv <- function(file, n.group.vars, n.codes, replicates){
  # evaluate multiple marginal independecnce of lab epistemology items with group variable
  df <- read.csv(file)

  ind <- sapply(df, is.factor)
  df[ind] <- lapply(df[ind], function(x) as.numeric(as.character(x)))
  df[is.na(df)] <- 0

  set.seed(11)
  print(MI.test(df, I = n.group.vars, J = n.codes, B = replicates, plot.hist = TRUE,
                print.status = FALSE))
}
```

Lab Epistemology analysis

```
LE.mrcv('C:/Users/Cole/Documents/DATA/LabEpistemology_DATA/Q1.csv', n.group.vars = 1,
        n.codes = 7, replicates = 2000)
```

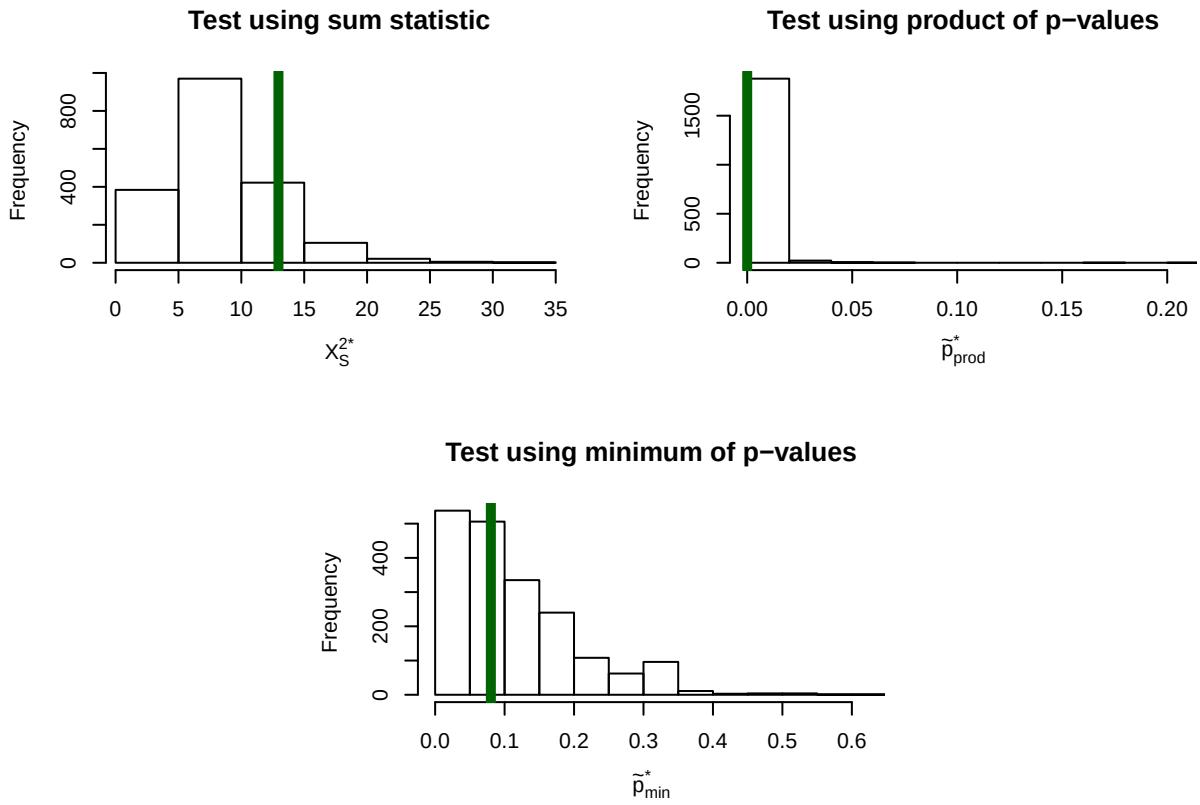





```
## Test for Multiple Marginal Independence (MMI)
##
## Unadjusted Pearson Chi-Square Tests for Independence:
## X^2_S = 20.75
## X^2_S.ij =
##  Supplemental.learning Theory.testing Theory.confirmation
##                   4.18           5.55                 0.76
##  Empirical.nature.of.physics Scientific.abilities Science.appreciation
##                         3.06                 4.42                 1.85
##  Career.preparation
##                0.94
##
## Bootstrap Results:
## 16 resamples were removed from the analysis due to not having all rows or columns represented in an i
## Final results based on 1984 resamples
## p.boot = 0.0035
## p.combo.prod = 0.002
## p.combo.min = 0.0847
##
## Second-Order Rao-Scott Adjusted Results:
## X^2_S.adj = 15.56
## df.adj = 5.25
## p.adj = 0.0098
##
## Bonferroni Adjusted Results:
## p.adj = 0.1291
```

```
## p.ij.adj =
##  Supplemental.learning Theory.testing Theory.confirmation
##  0.2871                0.1291         1.0000
##  Empirical.nature.of.physics Scientific.abilities Science.appreciation
##  0.5617                      0.2488               1.0000
##  Career.preparation
##  1.0000
```

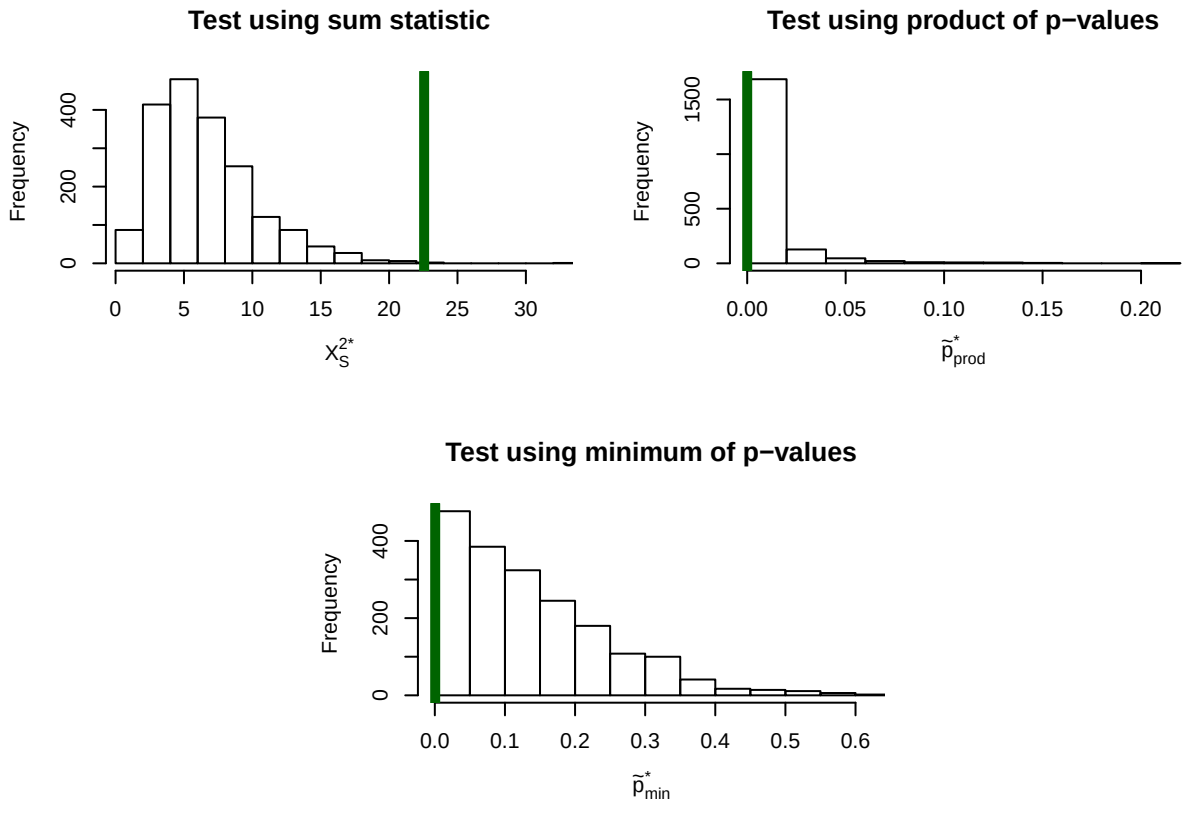
```
LE.mrcv('C:/Users/Cole/Documents/DATA/LabEpistemology_DATA/Q3.csv', n.group.vars = 1,
        n.codes = 9, replicates = 2000)
```




```
## Test for Multiple Marginal Independence (MMI)
##
## Unadjusted Pearson Chi-Square Tests for Independence:
## X^2_S = 12.95
## X^2_S.ij =
##  Explanatory.and.predictive.power Accepted Proven Evidence.supported
##                              0.33     0.33   2.08                2.6
##  Supported.by.existing.theories...laws Quantitative Lack.of.evidence
##                                  0.02         3.06             2.49
##  Falsifiability...testable Limitations
##                      1.61        0.42
##
## Bootstrap Results:
## 91 resamples were removed from the analysis due to not having all rows or columns represented in an i
```

```
## Final results based on 1909 resamples
## p.boot = 0.121
## p.combo.prod = 0.1079
## p.combo.min = 0.4384
##
## Second-Order Rao-Scott Adjusted Results:
## X^2_S.adj = 11.42
## df.adj = 7.93
## p.adj = 0.175
##
## Bonferroni Adjusted Results:
## p.adj = 0.722
## p.ij.adj =
##  Explanatory.and.predictive.power Accepted Proven Evidence.supported
##  1.0000                           1.0000   1.0000 0.9603
##  Supported.by.existing.theories...laws Quantitative Lack.of.evidence
##  1.0000                                0.7220       1.0000
##  Falsifiability...testable Limitations
##  1.0000                    1.0000
```

```
LE.mrcv('C:/Users/Cole/Documents/DATA/LabEpistemology_DATA/Q5.csv', n.group.vars = 1,
        n.codes = 7, replicates = 2000)
```




```
## Test for Multiple Marginal Independence (MMI)
##
```

```
## Unadjusted Pearson Chi-Square Tests for Independence:
## X^2_S = 22.56
## X^2_S.ij =
##  Comparison.with.theory Comparison.with.others Repeatability
##                    0.35                  0.02             0
##  Uncertainty.evaluation Statistics Quality.work Qualitative.justification
##                    8.79      12.03         1.32                      0.06
##
## Bootstrap Results:
## 90 resamples were removed from the analysis due to not having all rows or columns represented in an i
## Final results based on 1910 resamples
## p.boot = 0.001
## p.combo.prod = 0.0047
## p.combo.min < 0.0005
##
## Second-Order Rao-Scott Adjusted Results:
## X^2_S.adj = 20.6
## df.adj = 6.39
## p.adj = 0.0029
##
## Bonferroni Adjusted Results:
## p.adj = 0.0037
## p.ij.adj =
##  Comparison.with.theory Comparison.with.others Repeatability
##  1.0000                 1.0000                 1.0000
##  Uncertainty.evaluation Statistics Quality.work Qualitative.justification
##  0.0212                 0.0037     1.0000       1.0000
```