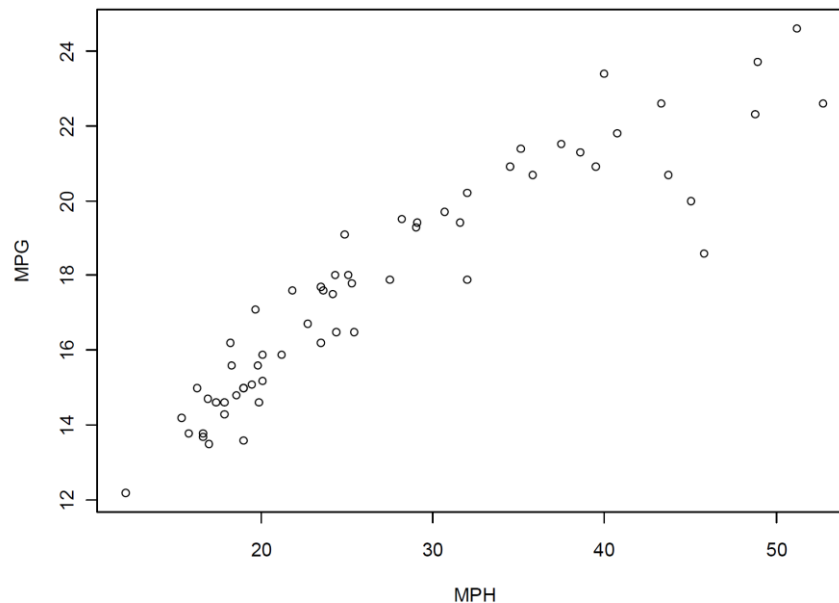


Exercise 4: Correlation

Computers in some modern cars can compute various quantities related to the performance of the car. The book "Introduction to the Practice of Statistics " by More & McCabe gives 60 pairs of measurements for one car on fuel efficiency (measured in miles per gallon --MPG) and average speed (measured in miles per hour -- MPH). One pair of measurements was recorded each time the gas tank was filled, and the computer was then reset. We are interested in the relation between fuel efficiency and average speed.



a) The scatter plot above gives the relation between MPG and MPH. Try to guess the size of the correlation coefficient ρ between MPG and MPH.

b) The empirical mean and standard deviation of MPH are 27.37 and 10.59, respectively, while the empirical mean and standard deviation of MPG are 17.73 and 3.06. The empirical covariance between the two quantities is 29.92. Find the Pearson correlation coefficient.

c) We may also measure fuel efficiency in kilometers per liter (KPL), and speed may be measured in kilometers per hour (KPH). The relations between these units are:

- 1 MPG = 0.425 KPL
- 1 MPH = 1.61 KPH

Determine the empirical standard deviation of the fuel efficiency and speed when they are measured in KPL and KPH. Also determine the empirical covariance and the empirical correlation coefficient when these measuring units are used. How does the empirical correlation coefficient depend on the units of measurement?