HW 1

1 section

1.1 subsection

Exercise 1 (Learning the mechanics.)**.**

Use the method of least squares to fit a straight line to these six data points:

x	1	2	3	4	5	6
y	2	4	5	4	2	7

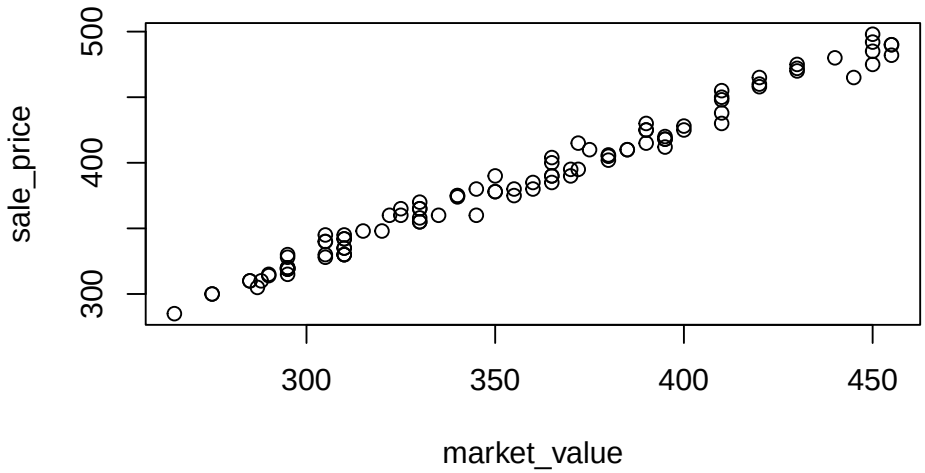
(a) What are the least squares estimates of β_0 and β_1? Compute manually.
(b) Plot the data points and graph the least squares line on the scatterplot.

1.2 subsection2

Exercise 2 (Home sales price.)**.**

Real estate investors, homebuyers, and homeowners often use the appraised (or market) value of a property as a basis for predicting sale price. Please look at the provided dataset `MARKET.csv`. All the money are in 1000 dollars.

(a) Propose a simple linear model to relate the appraised market value x to the sale price y.
(b) A scatterplot of the data is shown below. Does it appear that a straight-line model will be an appropriate fit to the data?
(c) A R simple linear regression printout is also shown below. Find the equation of the best-fitting line through the data on the printout.
(d) Interpret the y-intercept of the least squares line. Does it have a practical meaning for this application? Explain.
(e) Interpret the slope of the least squares line.
(f) Over what range of x is the interpretation meaningful?
(g) Use the least squares model to estimate the mean sale price of a property appraised at \$300,000.




```
Call:
lm(formula = sale_price ~ market_value)

Residuals:
    Min      1Q  Median      3Q     Max
-14.674  -5.480  -1.287   6.300  13.409

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  10.72069    5.01930   2.136   0.0352 *
market_value  1.05305    0.01399  75.256   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 7.234 on 98 degrees of freedom
Multiple R-squared:  0.983, Adjusted R-squared:  0.9828
F-statistic:  5663 on 1 and 98 DF,  p-value: < 2.2e-16
```

1.3 subsection3

Exercise 3 (Heart rate)**.**

A study shows that during a certain sport the mean heart rate y and the maximal oxygen uptake x might have relations. The dataset `SPORTHR.csv` shows y (expressed as a percentage of maximum heart rate) and x (VO2max).

(a) Find the equation of the least squares line.
(b) Give a practical interpretation (if possible) of the y-intercept of the line.
(c) Give a practical interpretation (if possible) of the slope of the line.

1.4 subsection4

Exercise 4 (Spilled liquid.)**.**

A researcher studied the rate at which a spilled liquid will spread across a surface. The mass (in pounds) of the spill after a period of time ranging from 0 to 60 minutes is recorded and shown below (based on the dataset `SPILLS.csv`). Do the data indicate that the mass of the spill tends to diminish as time increases? If so, how much will the mass diminish each minute?