Lecture 14: Simple Linear Regression
Practice Problems
STAT 630, Fall 2020

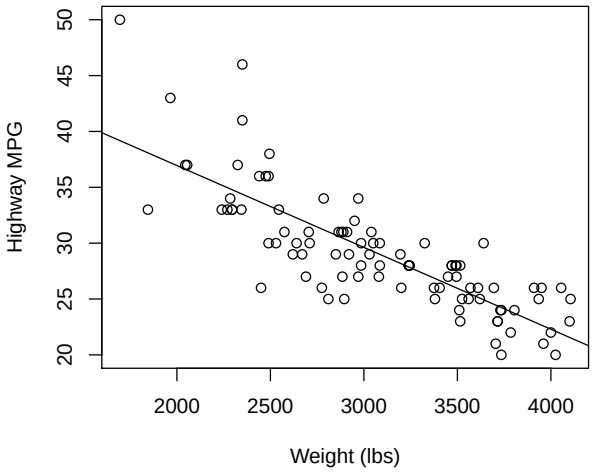
Data was collected on the highway miles per gallon (MPG) and weight (pounds) of 93 cars in the USA in 1993. Below is some R output for fitting a simple linear regression model to this data. A scatter plot with the least squares line is also shown below.

```
> library(MASS)
> lm1 <- lm(MPG.highway ~ Weight, data=Cars93)
> summary(lm1)

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) 51.6013654  1.7355498   29.73   <2e-16 ***
Weight      -0.0073271  0.0005548  -13.21   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 3.139 on 91 degrees of freedom
Multiple R-squared:  0.6572,Adjusted R-squared:  0.6534
F-statistic: 174.4 on 1 and 91 DF,  p-value: < 2.2e-16

# make scatter plot with least squares line
> plot(Cars93$Weight, Cars93$MPG.highway,
    xlab = "Weight (lbs)", ylab = "Highway MPG")
> abline(lm1)
```



(a) Describe the association between weight and highway MPG.

(b) What are the explanatory and response variables for the linear regression model?

(c) Write the equation for the least squares line.

(d) Interpret the slope of the model.

(e) Interpret the intercept of the model, or explain why it does not make sense to try to interpret the intercept.

(f) What is the predicted highway MPG for a car that weights 3000 pounds?

(g) One of car models (BMW 535i) in the data set has an observed weight of 3640 and highway MPG of 30. Calculate the residual for this car model?

(h) Interpret the coefficient of determination (R^2).