Practice Problems for Chapter 10

1. Once a PVC pipe joint is assembled using solvent cement, a certain amount of time must be allowed for the new joint to set. for 4- to 8-inch diameter pipes, suppose the setting time (measured in hours) is linearly related to the ambient temperature (measured in ^oF).

   (a) Which variable would you choose as the explanatory variable x?

   (b) Suppose the regression equation is $\hat{y} = 8.3 - 0.09x$. Interpret both the coefficients in the context of the problem.

2. A criminology student wants to determine if a relationship exists that so we can use robbery rates to predict homicide rates in Canada. Data was collected from 10 randomly selected cities, reported in crime rate per 100,000 population and has data output as shown below.

City	1	2	3	4	5	6	7	8	9	10
Robbery Rate	229	148	141	125	91	88	84	173	67	152
Homicide Rate	4.9	2.6	3.4	1.7	1.9	1.3	1.1	3.7	0.7	3.1

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> robbery = c(229,148,141,125,91,88,84,173,67,152)
> homicide = c(4.9,2.6,3.4,1.7,1.9,1.3,1.1,3.7,0.7,3.1)
> linear.model = lm(homicide~robbery)
> summary(linear.model)

Call:
lm(formula = homicide ~ robbery)

Residuals:
Min       1Q   Median       3Q      Max
-0.61558 -0.14265 -0.08394  0.12629  0.66968

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -0.924559   0.363541  -2.543   0.0345 *
robbery      0.025921   0.002634   9.840 9.57e-06 ***
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Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.3905 on 8 degrees of freedom
Multiple R-squared:  0.9237,    Adjusted R-squared:  0.9141
F-statistic: 96.83 on 1 and 8 DF,  p-value: 9.573e-06
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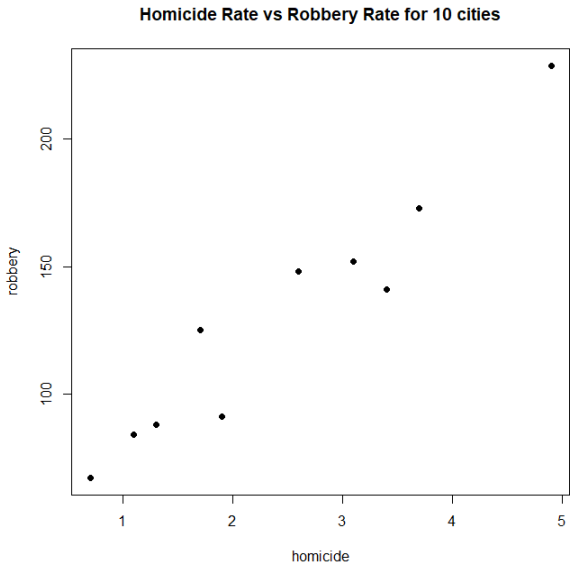

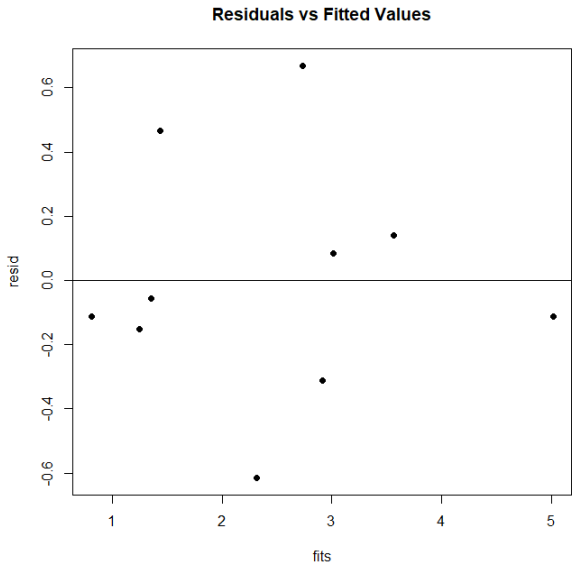

(a) Comment on the relationship shown in the scatter plot.

(b) Identify the explanatory and response variables.

(c) Calculate and interpret the correlation coefficient.

(d) Calculate the equation of the linear reqression line and interpret the coefficients.

(e) What change in homicide rate is associated with an increase by 1 in the robbery rate?

(f) What proportion of the variation in homicide rate is explained using the linear relationship with robbery rate?

(g) Estimate the predicted homicide rate when robbery rate is 141 and find the residual for this observation.

(h) Comment on the validity of your analysis using the residual plot.