Homework - Week 11

Your name here

Questions marked with "(OS3: X.X)" are from the textbook with "X.X" as the exercise number. The answers to the odd questions (odd by book numbering that is) will be in the back of the book.

1. (OS3: 7.29) The following regression output is for predicting annual murders per million from percentage living in poverty in a random sample of 20 metropolitan areas.

	Estimate	Std. Error	t value	Pr($>$|t|)
(Intercept)	-29.901	7.789	-3.839	0.001
poverty%	2.559	0.390	6.562	0.000
$s = 5.512$	$R^2 = 70.52\%$		$R^2_{adj} = 68.89\%$	

   a. Write out the linear model.

   b. Interpret the intercept.

   c. Interpret the slope.

   d. Interpret R^2.

   e. Calculate the correlation coefficient.

2. (OS3: 7.41 a-b) Exercise 7.29 presents regression output from a model for predicting annual murders per million from percentage living in poverty based on a random sample of 20 metropolitan areas. The model output is also provided below.

	Estimate	Std. Error	t value	Pr($>$|t|)
(Intercept)	-29.901	7.789	-3.839	0.001
poverty%	2.559	0.390	6.562	0.000
$s = 5.512$	$R^2 = 70.52\%$		$R^2_{adj} = 68.89\%$	

   a. What are the hypotheses for evaluating whether poverty percentage is a significant predictor of murder rate?

   b. State the conclusion of the hypothesis test from part (a) in context of the data.

3. Consider the built-in dataset `trees`. It contains heights (ft), girth (in) and volumes (ft^3) of a sample of black cherry trees. Suppose we wish to be able to predict tree volume given a tree's height.

   a. Create a scatterplot of heights and volumes of trees.

   b. What is the correlation between height and volume of trees? Is the correlation statistically significant? How would you generally describe the strength of correlation?

   c. Create a regression model of the relationship of heights and volumes of trees, with height as the predictor variable. What is the regression line equation? Is the model statistically significant?

   d. What is the predicted volume of a tree that is 84 feet tall? Is this an appropriate prediction?

4. Suppose now we wish to be able to predict tree volume given a tree's girth.

   a. Create a scatterplot of girths and volumes of trees.

   b. What is the correlation between girth and volume of trees? Is the correlation statistically significant? How would you generally describe the strength of correlation?

   c. Create a regression model of the relationship of girths and volumes of trees, with girth as the predictor variable. What is the regression line equation? Is the model statistically significant?

    d. What is the predicted volume of a tree that has a girth of 23 inches? Is this an appropriate prediction?

5. Suppose you have access to both the height and girth of a tree. Based on the models developed above, which measurement should you use to make a prediction of volume? Why?