

## Stat 145 Homework Solutions: Chapter 4

### Problem 4.1

- (a) Time studying is the explanatory variable and grade on the exam is the response variable.
- (b) Explore the relationship, as there is no clear explanatory-response distinction.
- (c) Inches of rain is the explanatory variable and yield of corn is the response variable.
- (d) Explore the relationship, as there is no clear explanatory-response distinction.
- (e) Family income is the explanatory variable and years of education of eldest child is the response variable.

### Problem 4.1

The explanatory variable (percent of returning birds) should go on the horizontal axis.

### Problem 4.5

The scatterplot shows that the relationship is linear (form), negative (direction), and moderately strong (strength). The sparrow-hawk appears to be a long-lived territorial bird.

### Problem 4.8 (ab)

- (a) The scatterplot shows a strong, positive linear relationship. It appears that all five specimens come from the same species.
- (b) For the femur,  $\bar{x} = 58.2$  cm and  $s_x = 13.20$  cm. For the humerus,  $\bar{y} = 66$  cm and  $s_y = 15.89$  cm. The table below presents the standardized values for each observation.

$\frac{x_i - \bar{x}}{s_x}$	$\frac{y_i - \bar{y}}{s_y}$	$\left(\frac{x_i - \bar{x}}{s_x}\right)\left(\frac{y_i - \bar{y}}{s_y}\right)$
-1.53048	-1.57329	2.40789
-0.16669	-0.18880	0.03117
0.06061	0.25173	0.01526
0.43944	0.37759	0.16593
1.19711	1.13277	1.35605
		3.97659

The correlation is  $r = \frac{3.97659}{5-1} = 0.994$ .

### Problem 4.10

The correlation would be 1.

Problem 4.13

- (a) A positive association would mean that as IQ scores increase, grade point averages tend to increase as well. The scatterplot shows a positive association.
- (b) The relationship is positive, linear, and moderately strong (except for three outliers).
- (c) This student has an IQ of about 103 with a GPA of about 0.5.

Problem 4.17

- (a) The correlation is clearly positive but not near 1. Even ignoring the outliers, there is still a fair amount of scatter in the points.
- (b) The correlation is closer to 1, as there is less scatter in the points and the outlier strengthens the positive association.

Problem 4.19

In Figure 4.6, removing the outliers will increase  $r$ , as the amount of scatter will be decreased. In Figure 4.7, removing the outlier will decrease  $r$ , as the relative scatter about the diagonal line would increase.

Problem 4.30

- (a) Gender is a categorical variable.
- (b) The correlation  $r$  must be between  $-1$  and  $1$ , inclusive.
- (c) The correlation  $r$  has no units of measure.