

## Stat 145 Homework Solutions: Chapter 5

### Problem 5.2

- (a) The slope is 0.0138. On average, if the depth of the dive is increased by one meter, the dive duration increases by 0.0138 minutes.
- (b)  $\hat{y} = 2.69 + 0.0138(200) = 5.45$  minutes
- (c) For  $x = 40$ ,  $\hat{y} = 2.69 + 0.0138(40) = 3.242$  minutes and for  $x = 300$ ,  $\hat{y} = 2.69 + 0.0138(300) = 6.83$  minutes. Plot these points and draw the line that connects them.

### Problem 5.7

- (a) The scatterplot should show a curved pattern.
- (b) No, because the pattern is curved. A linear regression line is not appropriate for this data.
- (c) The sum is -0.01, which is close enough to zero given roundoff error.
- (d) The residual plot should show a curved pattern.

### Problem 5.11

Stronger minority students are more likely to take more math courses, while weaker students may avoid them.

### Problem 5.13

It may be that doing well in school makes students feel good about themselves, rather than vice versa.

Problem 5.16

Women's heights are the  $x$ -values and men's heights are the  $y$ -values. The slope is

$$b = r\left(\frac{s_y}{s_x}\right) = 0.5\left(\frac{2.8}{2.7}\right) = 0.5185$$

and the intercept is

$$a = \bar{y} - b\bar{x} = 69.3 - (0.5185)(64) = 36.116$$

The equation of the regression line is

$$\hat{y} = 36.116 + 0.5185x$$

The predicted value is

$$\hat{y} = 36.116 + 0.5185(67) = 70.8555 \text{ inches}$$

Problem 5.18

(a) The slope is

$$b = r\left(\frac{s_y}{s_x}\right) = 0.6337\left(\frac{2.10}{13.17}\right) = 0.1010$$

and the intercept is

$$a = \bar{y} - b\bar{x} = 7.447 - 0.1010(108.9) = -3.5519$$

The equation of the regression line is

$$\hat{y} = -3.5519 + 0.1010x$$

(b) The value of  $r^2$  is  $(0.6337)^2$ , or 0.4016. In other words, IQ score explains 40.16% of the variation in GPA.

(c) The predicted value is

$$\hat{y} = -3.5519 + 0.1010(103) = 6.8511$$

The residual is

$$y - \hat{y} = 0.53 - 6.8511 = -6.3211$$

Problem 5.25

(a) A negative correlation means that as wine consumption increases, heart disease death rates tend to decrease. Wine consumption explains  $r^2 = (-0.843)^2 = 0.71 = 71\%$  of the variation in heart disease rates.

(b) The predicted value is

$$\hat{y} = 260.56 - 22.969(4) = 168.684 \text{ deaths per } 100,000 \text{ people}$$

(c) No, because  $b = r\left(\frac{s_y}{s_x}\right)$  and  $s_y$  and  $s_x$  are positive.

Problem 5.29

The value of  $r^2$  is 0.16, so the numerical value of the correlation is

$$r = \sqrt{0.16} = \pm 0.4$$

As attendance increases, grades tend to increase, so the correlation must be  $r = 0.4$ .

Problem 5.31

Age is a lurking variable, as both reading ability and height tend to increase with age.