SOC510 Homework #5 Solution

Chapter 5.

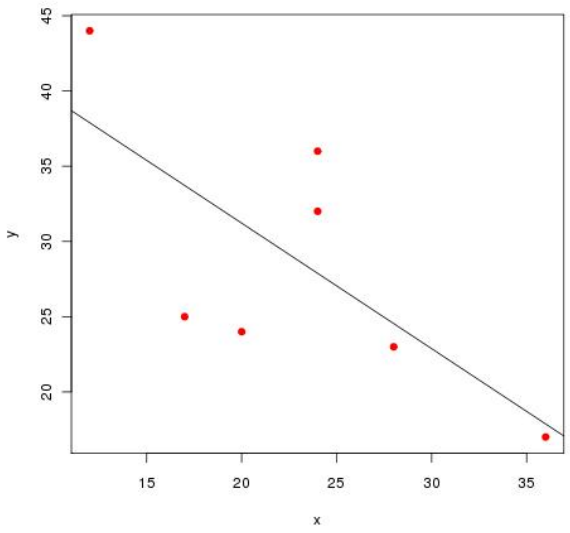
A. Answer 1–4, using the following data.

work satisfaction(x)	12	24	17	28	24	36	20
propensity to leave a job(y)	44	36	25	23	32	17	24

1. For a regression model, $y = b_0 + b_1 x + e$, find the intercept (b_0) and the slope (b_1).
   $b_1 = \frac{SS(xy)}{SS(x)} = \frac{-302}{362} = -.8343$
   $b_0 = \bar{y} - b_1 \bar{x} = 28.7 - (-.8343)23 = 47.9021$

2. Interpret the regression model, $y = b_0 + b_1 x + e$
   As the level of work satisfaction increases by 1 point, the propensity to leave a job decrease on average by .8343. When the work satisfaction is zero, the propensity to leave a job will be 47.9 on average.

3. draw a scatterplot (ChangHwan: I added a regression line for your reference)



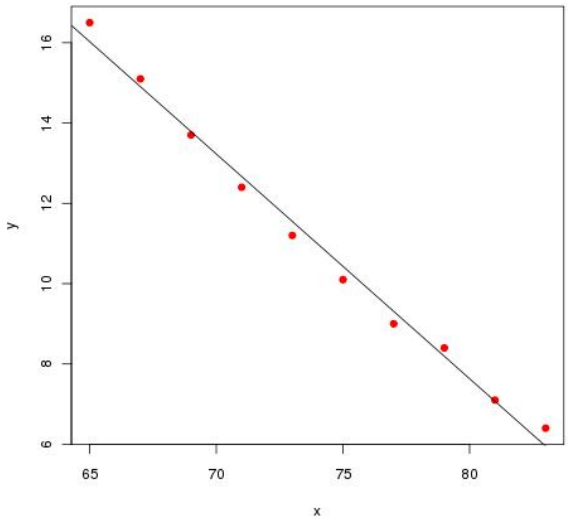
4. r^2: .5004 ($=-.7074^2$)

B. People not only live longer today but also live longer independently, The May/June 1989 issue of *Public Health Reports* published an article titled "A Multistate Analysis of Active Life Expectancy." Two of the variables studied were a person's current age and the expected number of years remaining.

Age(x)	65	67	69	71	73	75	77	79	81	83
Years Remaining (y)	16.5	15.1	13.7	12.4	11.2	10.1	9.0	8.4	7.1	6.4

1. calculate the equation of best fit.
   $y = b_0 - b_1 x + e = 52.4076 - .5597x + e$

2. draw the line of best fit on the scatterplot



3. what are the expected years remaining for a person who is 70 years old?
   $\hat{y} = 52.4076 - .5597(70) = 13.2$, thus 13.2 years.

4. r^2: .992

C. From the textbook,

5.23; (b) One can also guess this by considering the slope between the first two points: y changes by about 4 when x changes by about 1. The only slope that is even close to that is 2.4. Alternatively, note that when x = 50 cm, the data suggests that y should be about 160 cm, and only the second equation gives a result close to that.

5.26; (a) The correlation is $r = \frac{39}{\sqrt{74(66)}} = 0.558$. (b) When x = 70 inches, we predict Tonyas height to be $\hat{y} = 64.5$ inches. Because of the relatively low correlation (r^2=.311) and the variation about the line in the scatterplot, we should not place too much confidence in this prediction.

5.40; $\hat{y} = 1.286 + 11.89x$. The straight-line relationship explains $r^2 = .839$ (around 84%) of the variation in beetle larvae. So, the strong positive association supports the idea that beavers benefit beetles.

SS(xy)=379.565
SS(x) = 31.913
SS(y)= 5379.826

$b_1 = \frac{379.5652}{31.91304} = 11.894$
$b_0 = 25.08696 - 11.894(2.217391) = -1.286$

$r = \frac{379.5652}{\sqrt{31.913(5379.826)}}$

5.45 (show your work, not just an answer)
The estimated regression model is $y = 157.68 - 2.99x + e$.
(a)

x	y	$\hat{y}$	$e = (y - \hat{y})$
28	82	73.86	8.14
29	83	70.87	12.13
29	70	70.87	-.87
29	61	70.87	-9.87
30	69	67.88	1.12
32	58	61.89	-3.89
33	43	58.90	-15.00
38	50	43.93	6.07
38	47	43.93	3.07

(b) The correlation between x and e is zero.