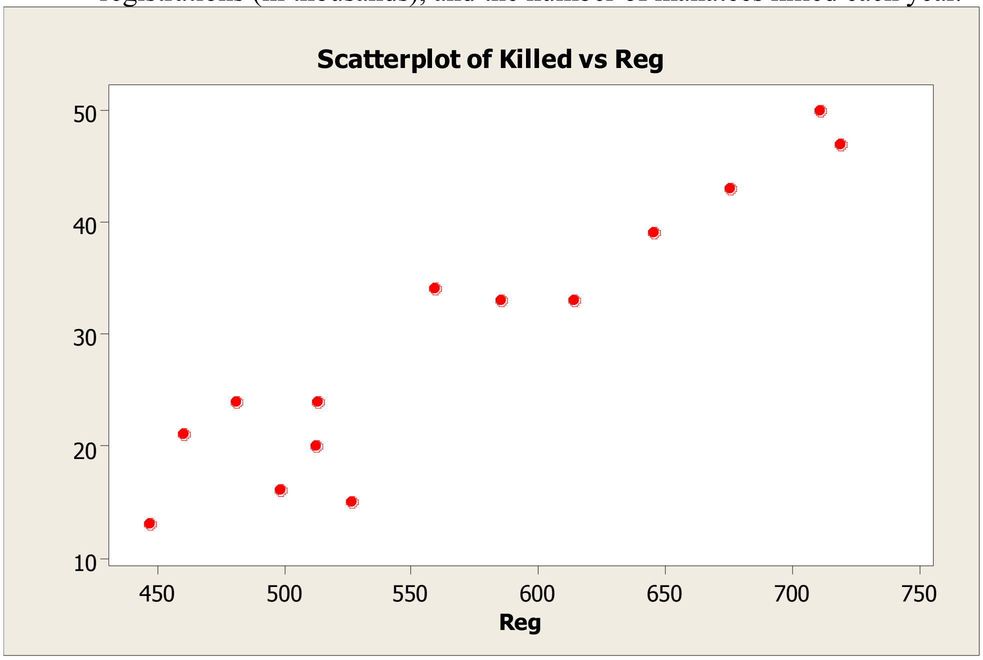
3.6

a) The explanatory variable is the number of powerboat registrations.
b) The plot below shows a moderately strong, positive, linear relationship between the number of powerboat registrations (in thousands), and the number of manatees killed each year.

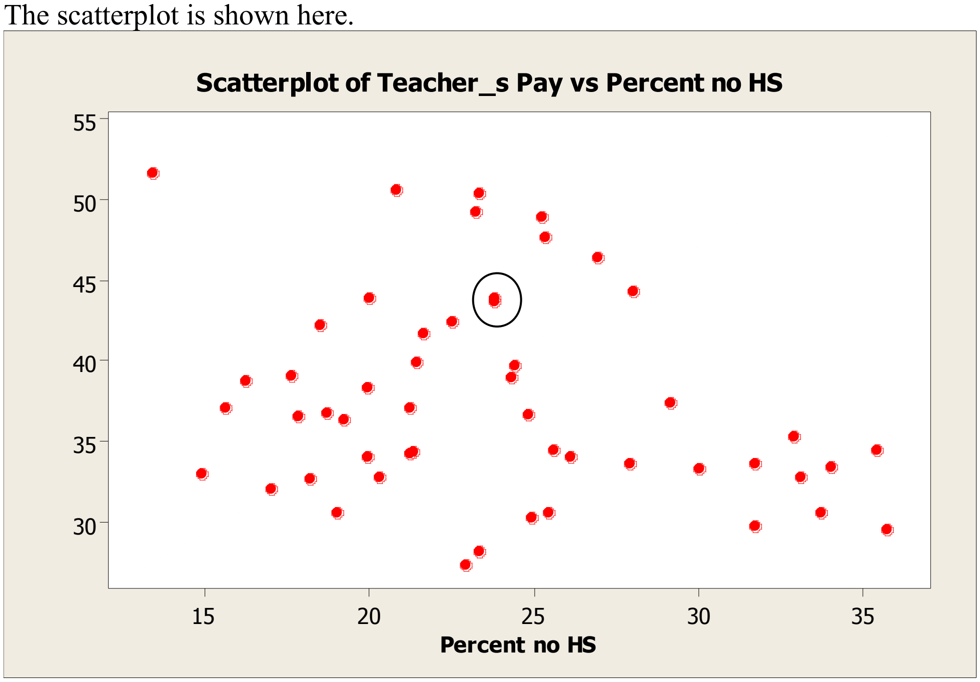


3.9

The description of the relationship is included in 3.6 above. It looks like we may be able to approximately predict the number of manatees killed from the powerboat registrations. If powerboat registrations remain at 719000, we might predict around 50 manatees killed each year.

3.22

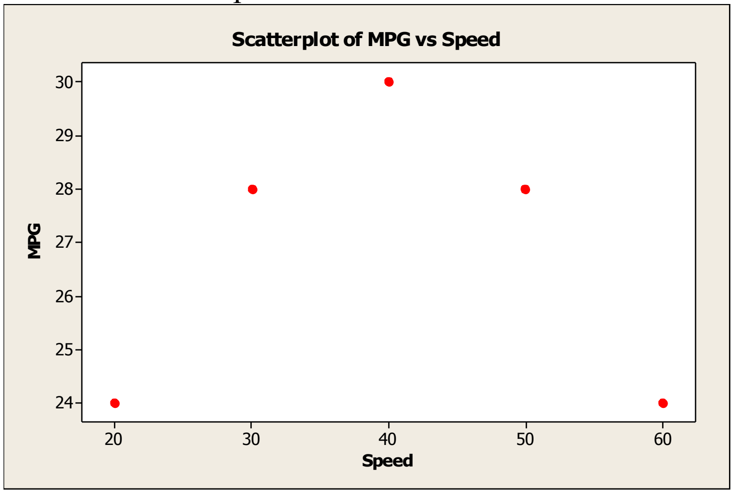
The scatterplot is shown here.



a) We say the association is negative because of the downward trend of the teacher's pay as percent HS increases. It is weak because of the very "scattered" scatterplot.
b) The outlier is from the state of Alaska.
c) The cluster in the lower right are from North Carolina, Louisiana, South Carolina, Tennessee, Alabama, Arkansas, West Virginia, Kentucky and Mississippi; all southern states.

3.28

Here is the scatterplot.

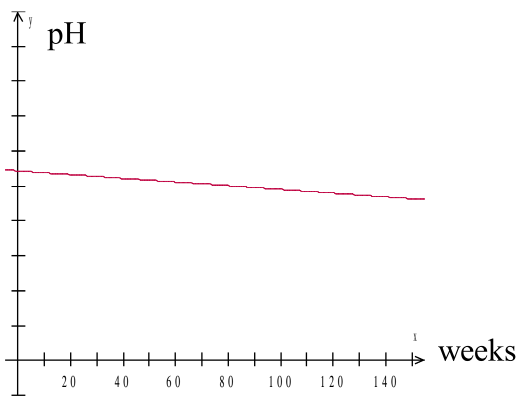


One explanation that the correlation is zero and yet the relationship is strong is simply that this strong relationship is clearly not linear.

You could also make a mathematical argument. Correlation is a sum of positive and negative values derived from the product of the deviations of the x and y data values. The symmetry of this graph shows that the positives and negatives cancel each other out.

3.40

(a)



The association is negative because as the weeks increase, we see the pH decrease.

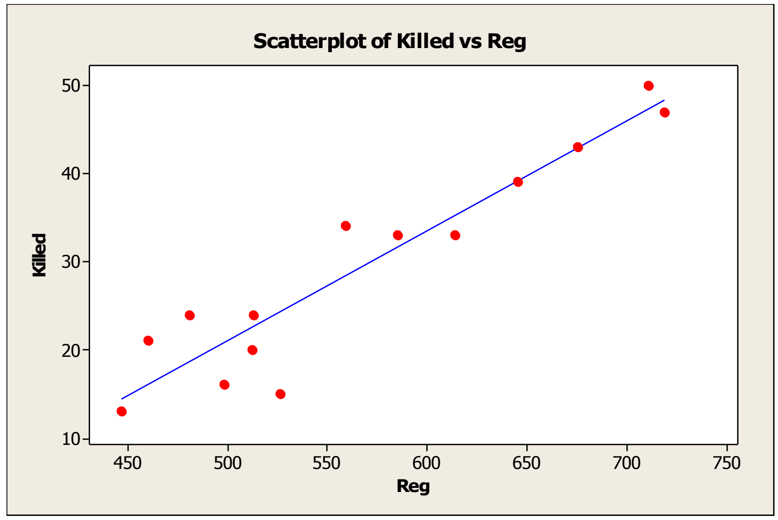
(b) Week 1 pH = 5.43 – 0.0053(1) = 5.427

Week 150 pH = 5.43 – 0.0053(150) = 4.635

(c) The slope is – 0.0053 pH per week. This means that every 1 week we expect the pH to decrease on average about 0.0053 pH units.

3.41

The scatterplot and LSRL are shown here.



The LSRL equation is

(Predicted Killed Manatees) = $-41.4 + 0.125$(# of Registered Boats), so

Predicted Killed = $-41.4+0.125(716) = 48.1$, or about 48 Manatees killed.

In 1992 and 1993 there seems to be a notable change in the pattern, that is fewer manatees killed than predicted previously.

The mean number of manatee deaths for the years 1991, 1992, 1993 was 42, a bit lower than predicted above.

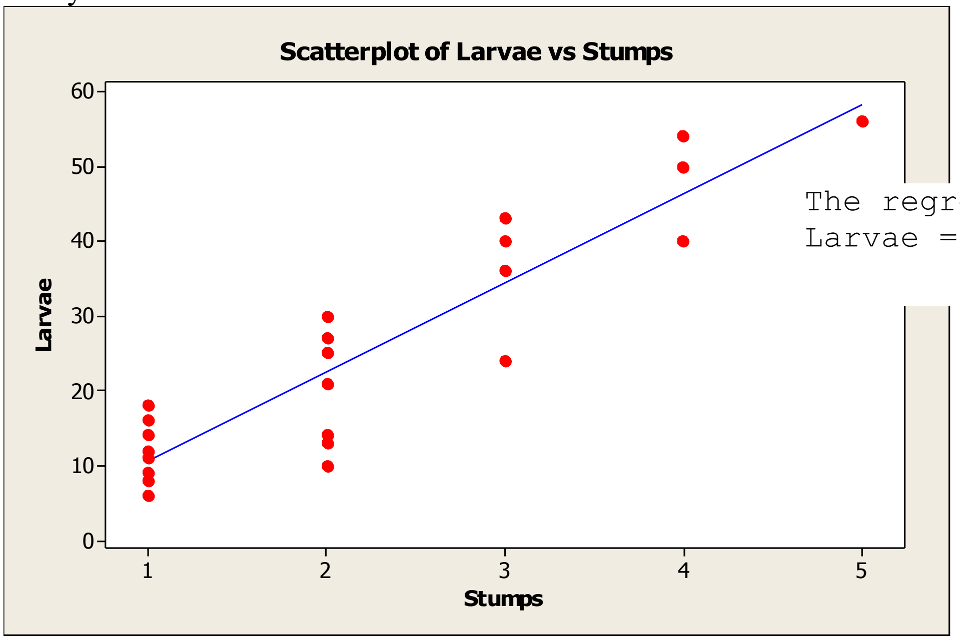
3.44

(a) 35.5% of the variation in yearly change is accounted for by the straight-line relationship with the change in January.

(b) $\hat{y} = 0.0608 + 1.707x$

(c) $\hat{y} = 0.0608 + 1.707(0.0175) = 0.0907$ Since the LSRL always passes through $(\bar{x}, \bar{y})$, we know that if we substitute $\bar{x}$ into the LSRL equation, we will get $\bar{y}$.

3.45 (a) and (b) This plot shows a moderately strong, positive linear relationship between the number of stumps cut by beavers and the number of clusters of beetle larvae

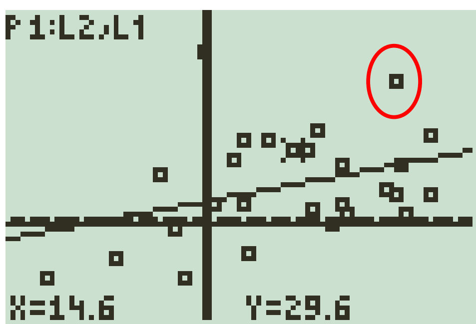


The regression equation is
Larvae = - 1.29 + 11.9*Stumps

83.95 of the observed variation in the number of larvae clusters can be accounted for by the LSRL.

3.56

Here is the scatterplot with the LSRL. $r = .464$ and $r^2 = .215$



There is a fairly weak, positive linear relationship between the U.S. returns and the Overseas returns. Only 12.3% of the variation in the Overseas returns can be accounted for by the linear relationship between U.S and Overseas returns.

The LSRL is $\widehat{\text{Overseas}} = 5.69 + 0.6201(\text{U.S.})$

$\widehat{\text{Overseas}} = 5.69 + 0.6201(33.4) = 26.404$ percent Since the relationship between the variables is so weak, we do not have much confidence using the linear model for prediction.

The largest residual is in the year 1986. It is possible that the point for year 1974 is influential.

3.62

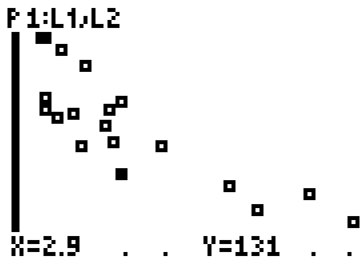
a) The smallest mother is 57 in. There are two mothers with this height. The corresponding fathers' heights are 66 and 67 in.

b) The tallest fathers are 74 in. There are three fathers with this height. The corresponding mothers' heights are 62, 64, and 67 in.

c) It seems that we can choose either of the variables for the explanatory variable. Since the scatterplot shows very little association anyway, it doesn't seem to matter.

d) A positive association in this case means that as the Fathers' heights increase, so do the mothers'. Since there is much scatter in this plot, it is difficult to discern a pattern or trend. So we say the association is weak.

3.63



(a) The scatterplot is shown here. There is a strong, negative, linear relationship between alcohol consumed from wine and the heart disease death rate.

(b) The LSRL is $\widehat{Death\ Rate} = 260.563 - 22.969(Alcohol)$ and the correlation is $r = -0.843$

(c) A correlation of -0.84 shows a moderately strong linear relationship. About 71% of the variation in heart disease death rates is explained by the linear relationship between alcohol consumption and heart disease deaths.

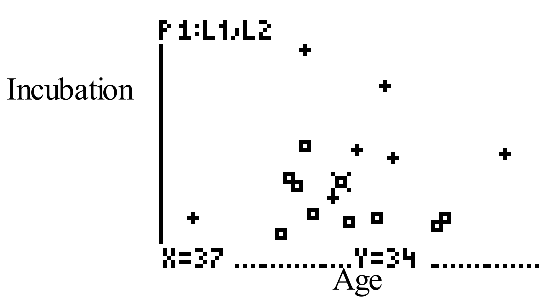
(d) $\widehat{Death\ Rate} = 260.563 - 22.969(4) = 168.68$ Deaths per 100,000.

(e) In a linear relationship it is impossible for the correlation and the slope of the LSRL to have different signs. Recall that the slope of the LSRL is calculated: $r\left(\frac{s_y}{s_x}\right)$, and since standard deviation is always positive, the sign of the slope is determined by *r*.

3.65

All of the data sets have the same regression line equation and approximately the same correlation. Based on the scatterplots, only data set A seems approximately linearly related. Therefore, I would only use the equation for data set A to describe the relationship of *y* and *x*.

3.66



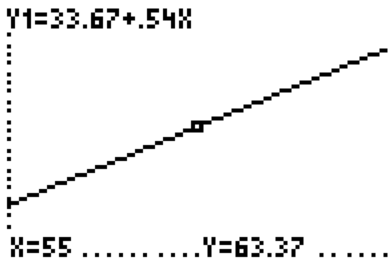
(a) The scatterplot is shown here. The box are those who died and the + are those who survived

(b) There appears to be a very weak, negative, linear relationship between Age and Incubation period.

(c) It appears that the longer the incubation period, the more likely one is to survive. There doesn't appear to be much of a relationship between age and survival.

(d) There was one survivor, the 17 year old with the 20 hour incubation period that does not quite fit the pattern of the other survivors.

3.69



The slope of the regression line is $0.5\left(\frac{2.7}{2.5}\right)=0.54$ The LSRL is $\hat{Men}=33.67+0.54(Women)$, so the graph looks like this: $\hat{Men}=33.67+0.54(67)=69.85$ inches.