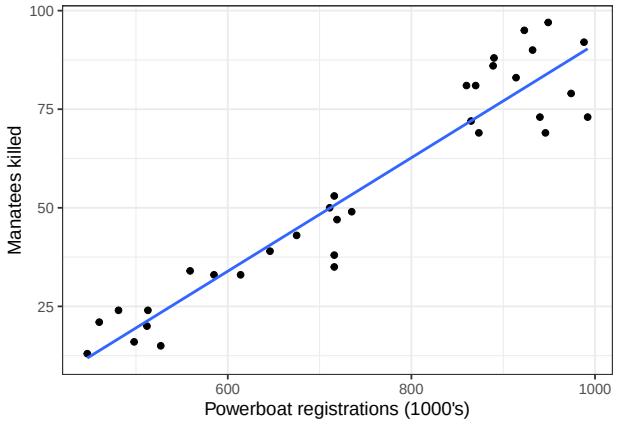
Chapter 7 worksheet: Manatees

9/9/2020

The scatterplot below shows the number of powerboats registered in Florida and the number of manatees killed for each year from 1982 through 2015, along with the least squares line (from problem R2.8, p. 315 of the text).

```
man <- read_csv("Manatees_2015.csv")
ggplot(man,aes(x=Registrations,y=Killed)) + geom_point(size=2) +
   geom_smooth(method=lm,se=FALSE) +  # adds least squares line
   labs(x="Powerboat registrations (1000's)",y="Manatees killed")
```

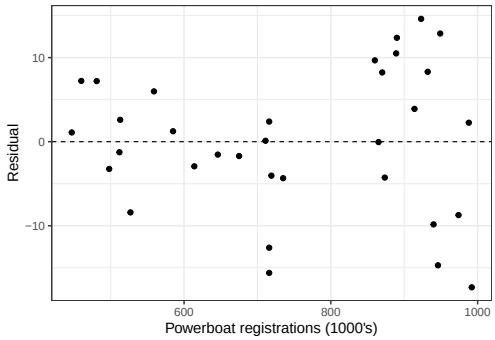


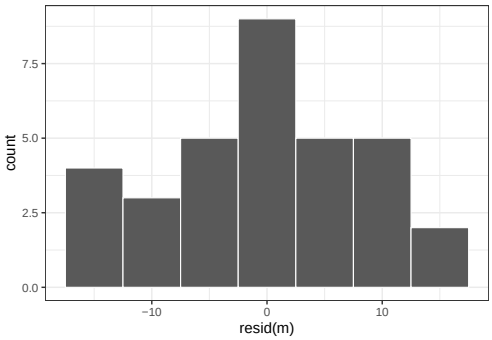
Here are the results of a linear regression model for predicting number of manatees killed from powerboat registrations, along with a residual plot and a histogram of the residuals.

```
m <- lm(Killed~Registrations,data=man)
summary(m)
```

```
##
## Call:
## lm(formula = Killed ~ Registrations, data = man)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -17.3195  -4.2691   0.1123   7.2060  14.6086
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -52.414945   6.460526  -8.113 3.66e-09
## Registrations   0.143886   0.008419  17.091  < 2e-16
##
## Residual standard error: 8.594 on 31 degrees of freedom
## Multiple R-squared:  0.9041, Adjusted R-squared:  0.901
## F-statistic: 292.1 on 1 and 31 DF,  p-value: < 2.2e-16
```

```
ggplot(man,aes(x=Registrations,y=resid(m))) +geom_point(size=2) +
  geom_hline(yintercept=0,linetype="dashed") +
  labs(x="Powerboat registrations (1000's)",y="Residual")
ggplot(NULL,aes(x=resid(m))) +geom_histogram(color='white',binwidth=5)
```





1. Using the scatterplot, describe the association, remembering direction, form, strength, and unusual features. Remember context.
2. Write the equation of the least squares line for predicting manatee deaths from powerboat registrations using the variable names.
3. Does the residual plot indicate any problems with using the linear model?
4. In 2013, there were 871,000 powerboat registrations and 73 manatees killed. Calculate the predicted number of manatees killed and the residual for 2013.
5. Write a sentence interpreting the slope of the model in the context of the problem.
6. Write a sentence interpreting the intercept.
7. Report and interpret the value of s_e.
8. Report and interpret the value of R^2.
9. Does your analysis prove that powerboats are killing manatees?