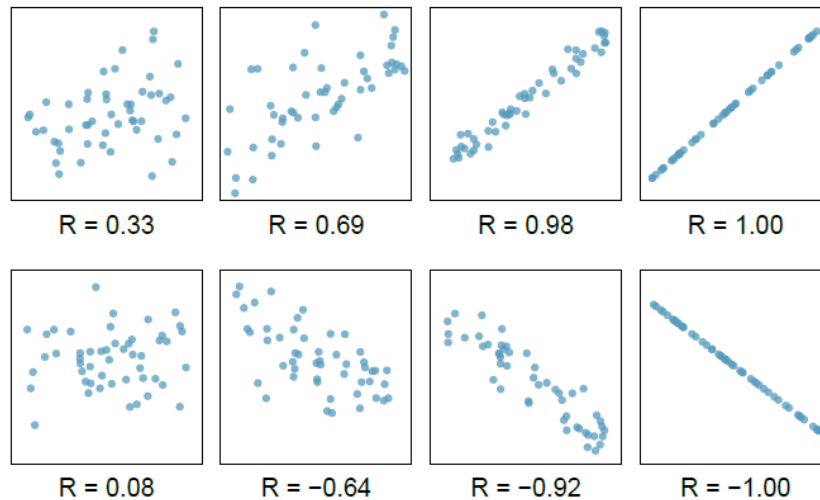## Model 1: Correlation Coefficient

In the figure below are 8 scatterplots. Each one is associated with a **correlation coefficient, R.**

R = 0.33   R = 0.69   R = 0.98   R = 1.00

R = 0.08   R = −0.64   R = −0.92   R = −1.00

1. These plots all have one variable along the horizontal axis and another along the vertical axis. For which of them would you say there is a strong relationship?

2. In which of these plots does an increase in one variable correspond to a *decrease* in the other variable?

3. What about the graph determines whether R is positive or negative?

4. What is true about the graph when R is near 1 or -1?

5. What is true about the graph when R is near 0?

6. Complete the sentences in the box below based on your results above.

When there is a strong linear relationship between an increase in one variable and an increase in another variable, R is _____.

When there is a strong linear relationship between an increase in one variable and a decrease in another variable, R is _____.

Check-in with Dr. Oehrlein here!

7. Consider the three additional scatterplots below. Some of these show a strong relationship between the two variables. Why are the *R* values relatively low?

R = −0.23   R = 0.31   R = 0.50
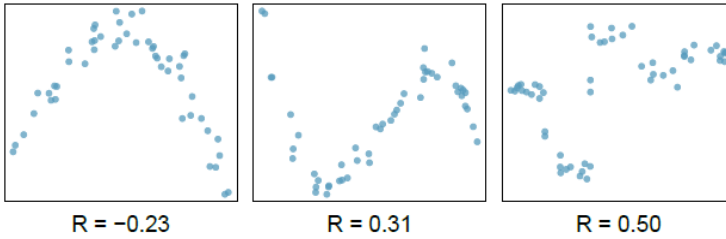
8. For each of the six plots below, describe the relationship as weak, moderate, or strong, and identify whether the relationship is linear or nonlinear.
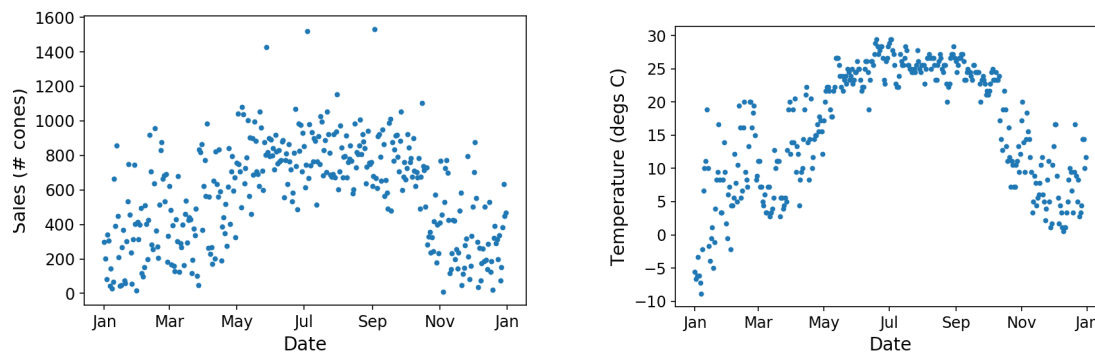

(a)   (b)   (c)

(d)   (e)   (f)
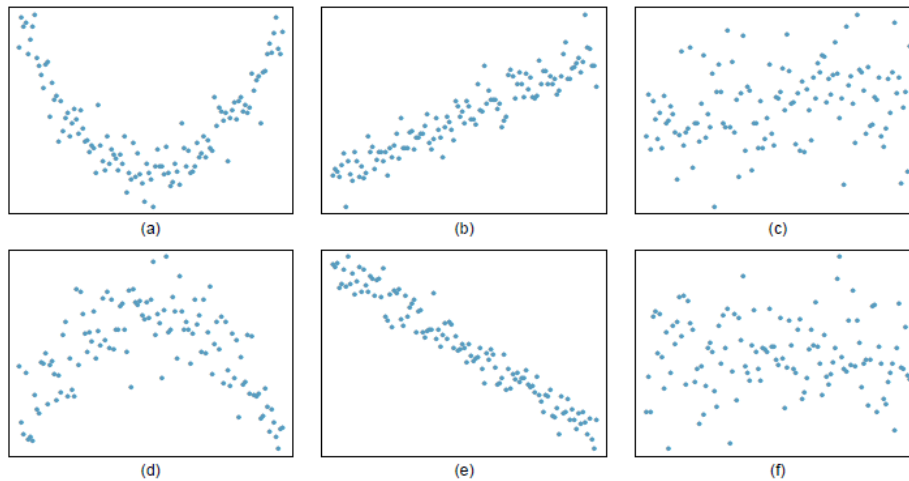
9. Which of the plots in Question 9 would you expect to have an *R* value closest to 1? Closest to -1? Closest to 0?

Check in with Dr. Oehrlein here!

## Model 2: Correlation and Causation

Consider these two graphs. The first is data from an ice cream shop.

1. What is being plotted in these two graphs, and what is the general pattern?

2. Do you think ice cream cone sales and temperature are correlated? Why or why not?

3. Here is a plot of ice cream cone sales and temperature. How would you describe this relationship (weak/strong? linear/nonlinear? positive/negative)? Is it what you expected above?
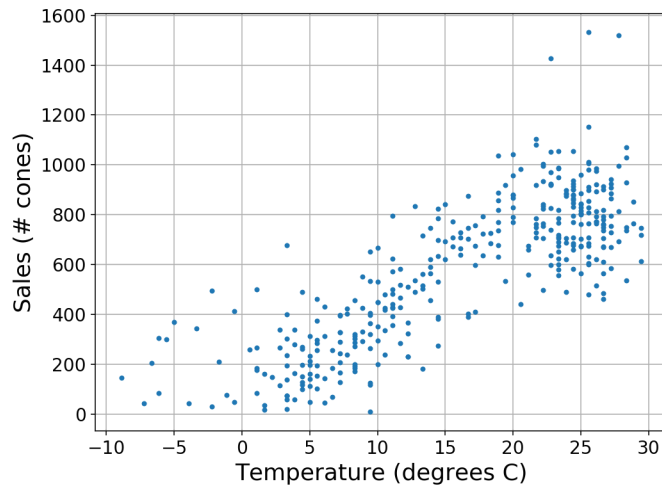

4. What is being shown in this plot? Based on the pattern, do you think the variable shown here is correlated with ice cream cone sales and/or temperature, and why or why not?


5. Suppose that a friend looked at the data and found that the correlation between ice cream cone sales and cost of care for sunburn-related emergency department visits was about $R = 0.80$. That's a high, positive correlation. Does it mean that ice cream cone sales cause sunburns (or vice versa)? Why or why not?

Check in with Dr. Oehrlein here.

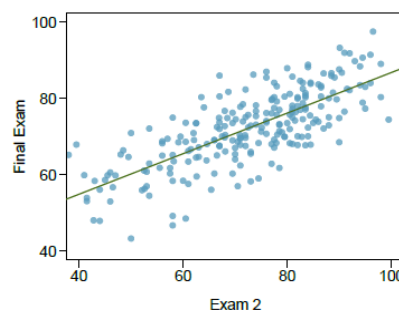# Model 3: Explanatory and Response Variables

1. Read the existing labels on the graphs below, and fill in the blanks.
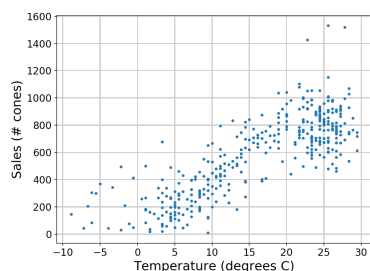
Explanatory: Temperature
**Response:** Ice cream sales
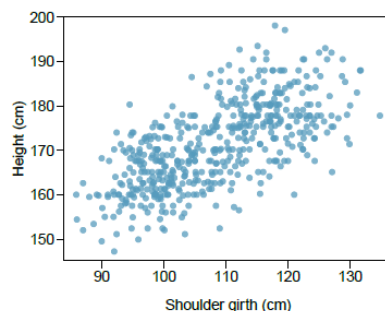
Explanatory: Shoulder girth
Response:

Explanatory:
Response: Final score

2. Suppose that a biologist wants to use data on the length of a possum to predict the size of the possum's head. Which variable is explanatory, which is the response, and why?

3. Here is the resulting plot with the **least-squares regression line**, or the line of best fit. Qualitatively, how well do you think the line describes the relationship in the data?
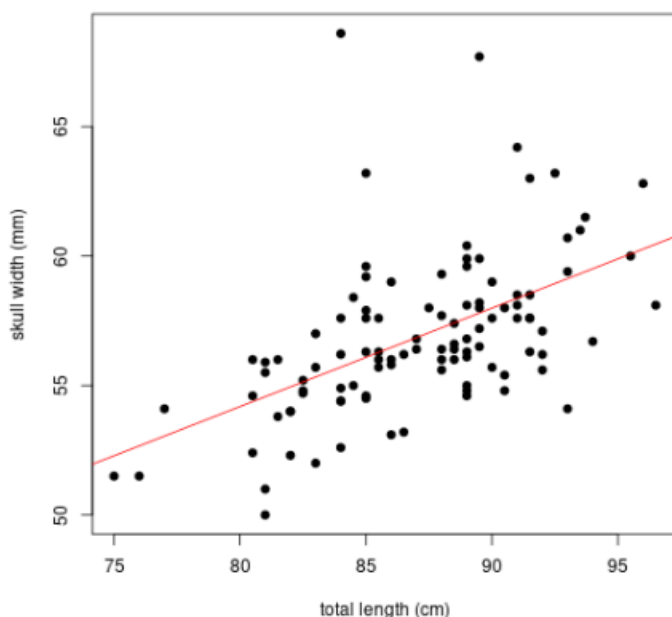
4. The equation describing the relationship is $\hat{y} = 0.38x + 23.8$, where y is skull width in millimeters and x is total length in centimeters. The hat indicates that this is a predicted value. Predict the skull width of a possum that is 88 cm in length.

Check in with Dr. Oehrlein here.