

Name:

APPLICATION: College Tuition and Graduation Statistics

Level 1

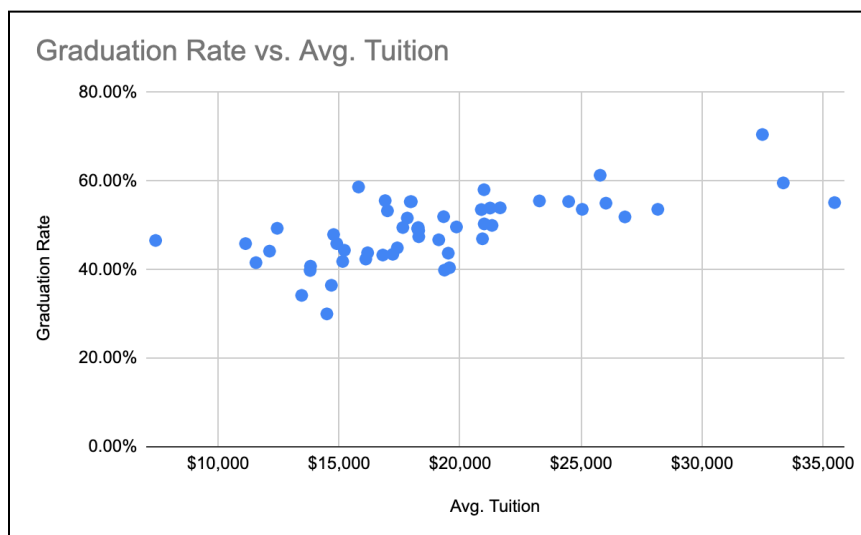
College Tuition Costs

Oftentimes one of the advertised statistics for colleges is their graduation rate or graduation rate in four years. We can evaluate some statistics on whether those claims are worth any increased tuition charges that might accompany them.

- Complete the chart by circling **Observational Study (Obs)**, **Experiment (Exp)**, **both**, or **neither**

Statement	Observational Study or Experiment?	
a. Can determine causation between variables	Obs	Exp
b. Researcher does <u>not</u> affect the subjects	Obs	Exp
c. Researcher affects the subjects	Obs	Exp
d. Can show a linear relationship between variables	Obs	Exp
e. Requires collection of data	Obs	Exp

Take a look at the following graph showing the relationship between the different states' and territories' average college tuition and graduation rates. Then, answer the questions.

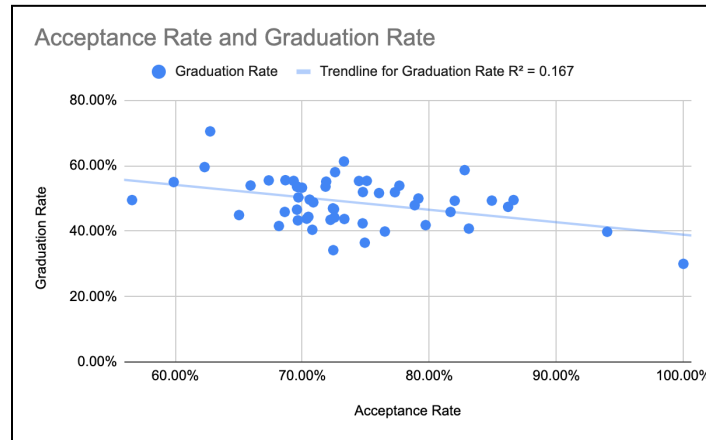


2. Describe any correlation you see between graduation rate and average tuition amount using vocabulary from this lesson.
3. Phillip looks at the graph of the data and concludes: “Going to a more expensive school increases your chances of graduating!” Explain why Phillip’s statement is incorrect.
4. This data set contains the average values for each state in the U.S. with a design to estimate the population of all colleges across the U.S. What is one population that this data would NOT be a good sample for?

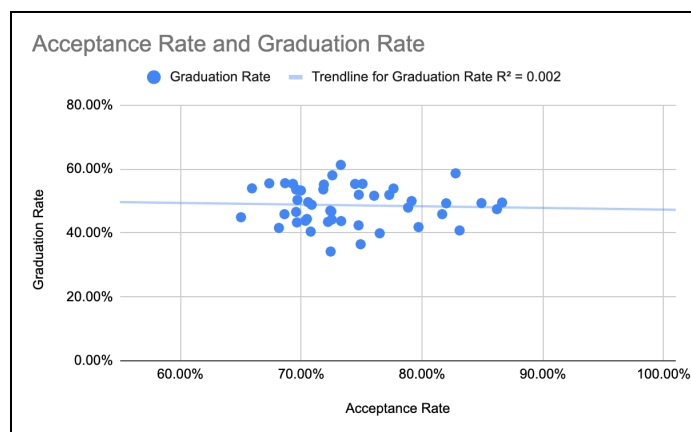
Level 2

Outlier Effects

Outliers can have dramatic effects on the mean but also on the apparent correlation of variables. Take a look at this graph of graduation rate versus acceptance rate.

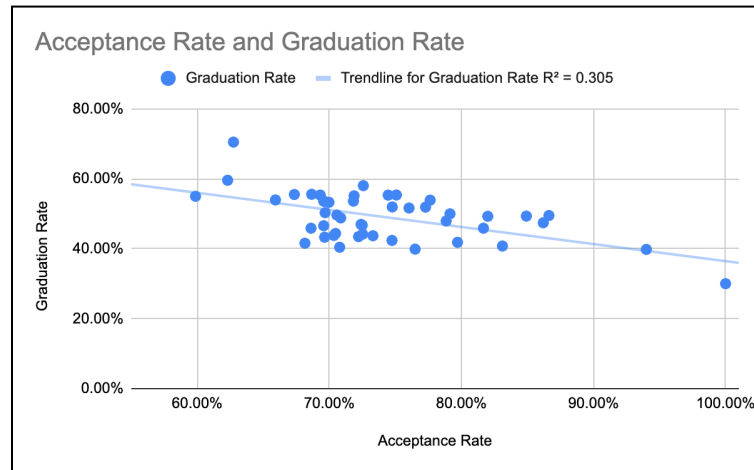


1. How would you describe the correlation relationship between these two variables?
2. What is the approximate correlation coefficient, r , for these two variables? Round to the nearest thousandth. (To find r , calculate the square root of R^2 to find the magnitude of r and then decide if it should be positive or negative based on the data.)
3. Now, look at the same data but with just 6 outliers removed, the states or territories with the top 2 and bottom 4 acceptance rates.



- a. What has changed about the correlation now?
- b. Calculate the value of r .

4. Now, look at the same data with 6 data points removed. This time, the outliers were specifically chosen to have the data tell a different story.

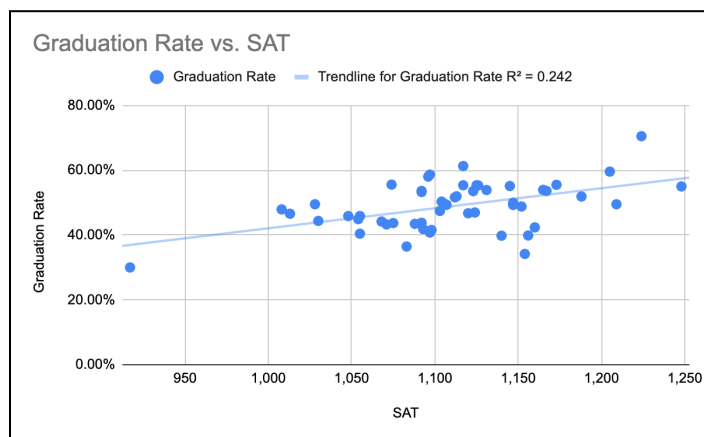


- What has changed about the correlation now?
 - Calculate the value of r .
5. Give an argument for or against the practice of excluding outliers from your sample data.
6. After seeing this outlier effect and the sensitivity of this data set, how might it change your attitude in general toward statistics you see reported in various places? What is one thing you could do to make sure you're interpreting a data set well?

Level 3

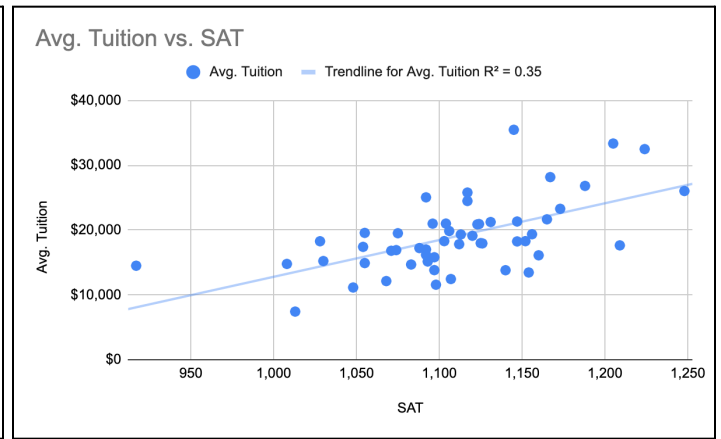
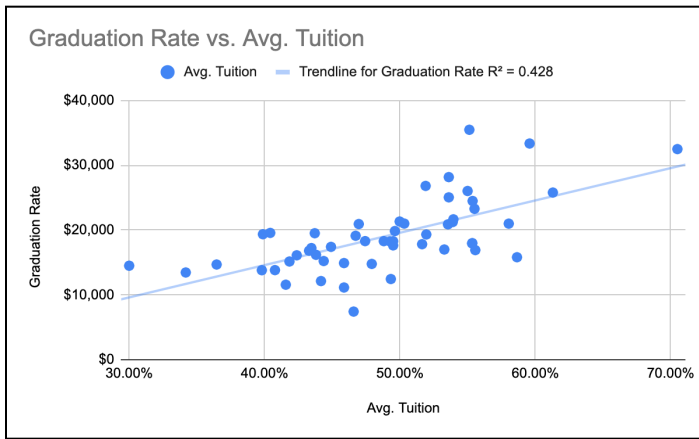
Finding False Claims

The graph shown below plots Graduation Rate vs. SAT scores by state/territory. Graduation rate is measured in percentage of students who enroll who go on to graduate and SAT represents the average SAT scores of admitted students. Use the graph to answer the questions



1. Describe the relationship between graduation rate and SAT scores using vocabulary from the lesson.
2. If the population we wanted to make a claim about was ALL universities globally, then:
 - a. Do you think this sample would be a good representation? Explain.
 - b. What factors would you have to consider when choosing a sample that could represent this population?

Take a look at these two graphs. Both graphs look at the variable of average tuition rate. The graph on the left shows its relationship with graduation rate while the graph on the right shows its relationship with the average SAT scores of incoming students.



3. How could you design an experiment to find out if tuition costs contribute to the graduation rate?

4. Your friend, Marcy, looks at the graphs and declares: “SAT scores are more highly correlated to tuition rates than graduation rates are. I can tell because the slope of the trendline is higher for the SAT graph.” Do you agree or disagree with Marcy? Explain why.

5. We know that the correlation of these two variables doesn’t mean we can say that one causes the other in any way. But consider the relationship between graduation rate and SAT scores from part I. What is one possible explanation for the correlation between graduation rate and average tuition that uses insights from all three graphs?