Breakout Session #3

STATISTICS: Qualitative and Quantitative

Another month has passed, and it’s time to sit down, eat some chocolate, and solve some math problems. If you can remember as far back as Immaculata Week, these are the topics that I got to present. We'll consider them together tonight, but they're very different, and I think that both have good applications at a variety of grade levels. We'll also take a look at some of the ideas that you might have considered with Mike--related to statistical studies, etc.

Multiple Choice

**Use the following information for questions 1-4.**

The scatterplot below gives the relationship between the percent scored on the final exam (on the x axis) and the overall course average (on the y axis) for Dr. Johnson's 58 students.



\_\_\_\_\_\_\_1. The lowest score on the final exam is between which 2 percentages?

A. 30 and 40 B. 40 and 50

C. 50 and 60 D. 60 and 70

\_\_\_\_\_\_\_2. The lowest overall course average is between which 2 percentages?

A. 30 and 40 B. 40 and 50

B. 50 and 60 D. 60 and 70

**The equation for the line of best fit (the linear regression line) for the data represented in the scatter plot above is **

\_\_\_\_\_\_\_3. Which statement best interprets the y-intercept of this line?

A. A student who scores a 0 on the final exam has a predicted course average of 59.531.

B. A student who has a course average of 0 has a predicted final exam score of 59.531.

C. For each additional percent a student earns on the final, his course average is predicted to increase by 0.396 percent.

D. For each additional percent a student wants to increase his course average, he needs to score an additional 0.396 percent on the final exam.

\_\_\_\_\_\_\_4. Which statement best interprets the slope of this line?

A. A student who scores a 0 on the final exam has a predicted course average of 59.531.

B. A student who has a course average of 0 has a predicted final exam score of 59.531.

C. For each additional percent that a student earns on the final, his course average is predicted to increase by 0.396 percent.

D. For each additional percent that a student wants to increase his course average, he needs to score an additional 0.396 percent on the final exam.

\_\_\_\_\_\_\_5. Let r be the correlation coefficient between a student's grade on the final exam and his course average. Which inequality best describes the value of r?

A.  B. 

C.  D. 

In problems 6-9, consider the following situation: you want to know what percentage of adult people in the United States believes that marijuana should be legal for medical purposes. You post on your webpage a survey that asks people to say whether marijuana should be legal for medical purposes. You receive a total of 3,210 replies, of which 1,823 or 56.8% of them think that marijuana should be legal for medical purposes.

\_\_\_\_\_\_\_6. Identify the population in this scenario.

A**.** All adults in the United States.

B**.** The 3,210 people who replied to the survey.

C**.** The percentage of the people who replied that think medical pot shoul be legal.

D**.** The percentage of the people in the U. S. who think medical pot should be legal.

\_\_\_\_\_\_\_7. Identify the sample in this scenario.

A**.** All adults in the United States.

B**.** The 3,210 people who replied to the survey.

C**.** The percentage of the people who replied that think medical pot should be legal.

D**.** The percentage of the people in the U. S. who think medical pot should be legal.

\_\_\_\_\_\_\_8. Identify the statistic in this scenario.

A**.** All adults in the United States.

B**.** The 3,210 people who replied to the survey.

C**.** The percentage of the people who replied that think medical pot should be legal.

D**.** The percentage of the people in the U. S. who think medical pot should be legal.

\_\_\_\_\_\_\_9. Identify the parameter in this scenario.

A**.** All adults in the United States.

B**.** The 3,210 people who replied to the survey.

C**.** The percentage of the people who replied that think medical pot should be legal.

D**.** The percentage of the people in the U. S. who think medical pot should be legal.

\_\_\_\_\_\_\_10. This sample is an example of a:

A**.** Cluster Sample

B**.** Simple Random Sample

C**.** Systematic Sample

D**.** Voluntary Response Sample

In problems 11 and 12, consider the following study. The University of Virginia does a cold study every fall where they find 40 willing participants who are willing to be infected with a cold. They randomly select half of the participants to take a vitamin (that the study is trying to test), while the other half do not take anything. Then, they record the length and severity of the cold symptoms for people in each group. They find that the length of a cold is significantly shorter in people who take the vitamin than it is in the people who don’t take the vitamin.

\_\_\_\_\_\_\_11. This is an example of:

A**.** An observational study.

B**.** A stratified sample.

C**.** A controlled experiment.

D**.** An uncontrolled experiment.

\_\_\_\_\_\_\_12. Which choice best describes the finding of the study?

A**.** The researchers can conclude neither an association, nor a cause and effect relationship exist between the length of cold and taking vitamins.

B**.** The researchers can conclude taking vitamins is associated with a shorter cold, but cannot conclude that a cause and effect relationship exists between taking vitamins and haring a shorter length of a cold.

C**.** The researchers can conclude a cause and effect relationship between taking vitamins and having a shorter length cold.

D**.** None of the above.

Combination of Multiple Choice and Open Ended

Dr. F had 40 students in his Math 109 classes last fall. These students study hard, and hope to one day be great teachers. The following 2 way table shows the breakdown by class time, and whether or not they received an A for their final course grade.

|  |  |  |  |
| --- | --- | --- | --- |
|  | 8:00 Class | 9:00 Class | TOTAL |
| Earned an A | 18 | 12 |  |
| Did not earn an A | 4 | 6 |  |
| TOTAL |  |  |  |

13. Complete the 2 way table by finding all totals.

14. Overall, what percentage of students earned an A?

\_\_\_\_\_\_\_15. Let a be the percentage of students in the 8:00 class who earned A's, let b be the percentage of students in the 9:00 class who earned A's, and let c be the percentage of students overall who earned A's. Which of the following statements is true?

A.  B. 

C.  D. 

\_\_\_\_\_\_\_16. Let x be the percentage of students who earned A's who were enrolled in the 8:00 class; let y be the percentage of students who did not earn A's who were enrolled in the 8:00 class, and let z be the overall percentage of students who were enrolled in the 8:00 class. Which of the following statements is true?

A.  B. 

C  D. 

Free Response

17. The latest blood drive at Immaculata featured a contest between the junior class and the senior class. The class that contributed the greater number of units of blood was treated to a trip to Shady Maple (of course, Dr. F went along! ☺) The following table summarizes the data, along with specific blood type for each donor.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Type A | Type B | Type AB | Type O | TOTAL |
| Junior | 7 | 5 | 5 | 9 |  |
| Senior | 1 | 6 | 8 | 6 |  |
| TOTAL |  |  |  |  |  |

A. Fill in the blanks on the table.

B. What percentage of the blood donors were Juniors?

C. What percentage of the blood donors had type AB blood?

D. Is the percentage of the type O blood donated higher in Juniors or Seniors? Show calculations for both percentages to justify your answer.

18. The following equation is the linear regression line that relates a student's quiz average in Math 107 (x) to her final course grade (y).



A. Predict Sally's final course grade if her quiz average is 80.

B. Predict Samantha's quiz average if her final course grade is 95.

C. Interpret the y-intercept of this line in the context of the problem.

D. Interpret the slope of this line in the context of the problem.

19. Dr. F has been studying the effects of parents' smoking habits on their children. If parents smoke, are their children more likely to become smokers? What if only 1 parent smokes? Do children of non-smoking parents ever become smokers? All good questions, I presume. Below are the data that Dr. F. has compiled.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Student Smokes | Student Does Not Smoke | TOTAL |
| Both Parents Smoke | 400 | 1380 |  |
| One Parent Smokes | 416 | 1823 |  |
| Neither Parent Smokes | 188 | 1168 |  |
| TOTAL |  |  |  |

A. How many students do the data describe?

B. What percent of these students smoke?

C. What percent of students smoke among those with 2 smoking parents?

D. What percent of students smoke among those with 1 smoking parent?

E. What percent of students smoke among those with neither parent smoking?

F. Draw a bar graph that illustrates the results from parts C, D, and E.

G. According to Dr. F's research above, given that a student does not smoke, what is the probability that he/she came from a family where both parents smoke?

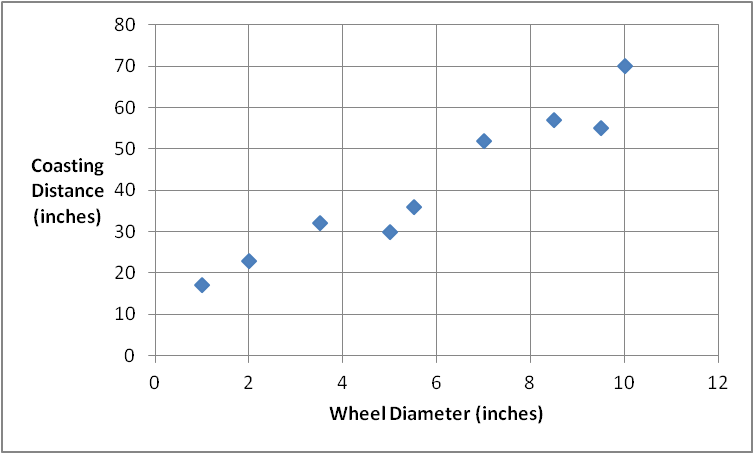
H. According to Dr. F's research above, given that a student smokes, what is the probability that he/she came from a family where neither parent smokes?

I. According to Dr. F's research above, given that a student smokes, what is the probability that he/she came from a family where at least one parent smokes?

20. The other day, Dr. F. spent some time on his skateboard--yea, you'd never guess it, but he's a real SHREDDER!!. Due to a massive crash, he had to put new wheels on his board. It just so happens that he chose larger wheels, and noticed that his board coasts farther. Ever the inquisitive math guy, Dr. F. decided to test this relationship and gathered the following data.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Wheel Diameter (inches) | 1 | 2 | 3.5 | 5 | 5.5 | 7 | 8.5 | 9.5 | 10 |
| Coasting Distance (inches) | 17 | 23 | 32 | 30 | 36 | 52 | 57 | 55 | 70 |

Here's the scatter plot for Dr. F's skateboard data.



**The equation for the line of best fit (the linear regression line) for Dr. F's skateboard data is:**

****

A. Describe the real world meaning of the slope of the line.

B. Describe the real world meaning of the y-intercept of the line.

C. If Sammy's skateboard has 8 inch wheels, how far will it coast?

D. Determine the size of Sally's wheel, if she can coast 100 inches.

E. Skippy claims that the value of the correlation coefficient, r, for the line of best fit is . How do you react to his claim?

21. Your population consists of the numbers 1-100. You want to select a sample of 10 numbers.

A. Explain how you could select a simple random sample.

B. Explain how you could select a stratified sample.

C. Explain how you could select a cluster sample, considering the clusters of 1-20,

21-40, 41-60, 61-80, and 81-100.

D. Explain how you could select a systematic sample.

22. What is the difference between association and causation? Describe the features of a statistical process that allow one to conclude causation? How is this different from statistical processes that only allow people to conclude association?