**MA186 Exam #1** **Name:** _____

1. (10 pts) This week, Southwest Airlines became the latest airline to restrict their allowance of emotional support animals to cats and dogs only (bad news for those of you who wanted to bring your therapy ferrets, spiders, and hedgehogs onboard!). Suppose the airline wants to conduct a survey to see if their passengers support this new restriction.

   (a) For each of the following methods, describe how the method could be used to choose the survey participants.

      i. Simple random sampling:

      ii. Cluster sampling:

      iii. Convenience sampling:

   (b) Suppose that Southwest surveys 75 passengers. Of those surveyed, 42 participants say that they support the new restriction on therapy animals. Give a conservative 95% confidence interval measuring the proportion of passengers who support the new rule.

2. (10 pts) Let's talk about last week's Emmy awards! Some of you may be familiar with the Rotten Tomatoes website, which collects reviews from various critics to provide an overall rating of a TV show from 0-100. Suppose we're interested in seeing whether a TV show's Rotten Tomatoes rating is a good predictor of how many Primetime Emmy nominations it will receive. The data for several of this year's shows is below.

| **TV Show** | **Rotten Tomatoes Rating** | **# of Emmy Nominations** |
|---|---|---|
| This is Us | 91 | 3 |
| Game of Thrones | 94 | 7 |
| The Marvelous Mrs. Maisel | 94 | 6 |
| The Crown | 91 | 6 |
| The Americans | 99 | 4 |
| Westworld | 86 | 5 |
| Barry | 98 | 6 |
| The Handmaid's Tale | 91 | 8 |
| Atlanta | 98 | 8 |

(a) Create a scatterplot of the data. Make sure to label your axes!

(b) The least-squares regression line for this data is given by $y = 0.415 + 0.056x$. Interpret the slope and $y-$intercept in the context of the problem.

(c) Using the regression equation from (b), predict the number of Emmy nominations for a show that receives a Rotten Tomatoes rating of 82.

(d) The correlation value for this data set is $r = 0.148$. What percentage of the variation in Emmy nominations can be explained by the Rotten Tomatoes rating? Do you think that the Rotten Tomatoes rating is a good predictor of Emmy nominations? Why or why not?

3. (10 pts) Recently, Hurricane Florence dumped record amounts of rain over the Carolinas, causing extreme flooding in some areas. The following is a sample of total rain amounts (in inches) from nine locations across North and South Carolina.

10 16 22 12 34 29 25 10 27

(a) Find the 5-number summary for this data set.

(b) Find the mean and standard deviation.

(c) Are there any outliers? How do you know?

(d) In 1975, three researchers explored whether injecting silver iodide into cumulus clouds would lead to increased rainfall. For 52 days, they flew a plane through a cloud. Each day, it was decided at random whether or not the cloud would be seeded with silver iodide. For the next 24 hours, radar was used to measure the volume of rainfall from the selected cloud. Answer the following:

i. Is this an experiment or an observational study? _____

ii. Identify the explanatory variable and the response variable.

iii. Circle those components that are used in this study:

**Control group** **Placebo** **Matched-pairs design** **Randomization**

4. (10 pts) Last week, Elon Musk's SpaceX Corporation announced that Japanese billionaire Yusaku Maezawa will be their first passenger to go to the moon. Would you go to the moon if given the opportunity? Suppose we polled $n = 100$ Lafayette students and obtained the following two-way contingency table:

| | **Would Go** | **Would Not Go** | **Total** |
|---|---|---|---|
| **Men** | 24 | 20 | 44 |
| **Women** | 14 | 42 | 56 |
| **Total** | 38 | 62 | 100 |

(a) Calculate the odds ratio of men wanting go to the moon as compared to women wanting to go. Interpret your value in the context of the problem.

(b) Calculate the relative risk of men wanting to go to the moon as compared to women wanting to go. Interpret your value in the context of the problem.

(c) Conduct a $\chi^2$ test to determine whether there is an association between gender and desire to go to the moon. Make sure to state your hypotheses and your conclusion within the context of the problem and show all of your work.