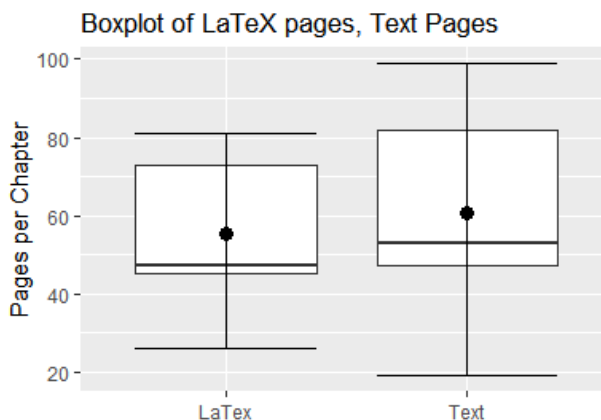


STAT 350 Exam 1 Review Problems

- The weight of the eggs produced by a certain breed of hen is Normally distributed with mean 70 grams(g) and standard deviation 5 g.
 - Sketch the graph of the normal distribution that corresponds to the weight of the eggs.
 - What is the probability that a randomly selected egg is more than 62 grams?
 - What is the probability that a randomly selected egg is between 62 and 69.4 grams?
 - How much does an egg need to weigh in order for it to be in the largest 5% of weights of all of the eggs?
 - Find a symmetric interval around the mean such that 95% of all of the weights of the eggs lie in this interval.
- The editor of a statistics text would like to plan for the next edition. A key variable is the number of pages that will be in the final version. Text files are prepared by the authors using a word processor called LaTeX, and separate files contain figures and tables. For the previous edition of the text, the number of pages in the LaTeX files can easily be determined, as well as the number of pages in the final version of the text. The data and the R output follows:

| | Chapter | | | | | | | | | | | | |
|-------|---------|----|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| LaTeX | 77 | 73 | 59 | 80 | 45 | 66 | 81 | 45 | 47 | 43 | 31 | 46 | 26 |
| pages | | | | | | | | | | | | | |
| Text | 99 | 89 | 61 | 82 | 47 | 68 | 87 | 45 | 53 | 50 | 36 | 52 | 19 |
| pages | | | | | | | | | | | | | |

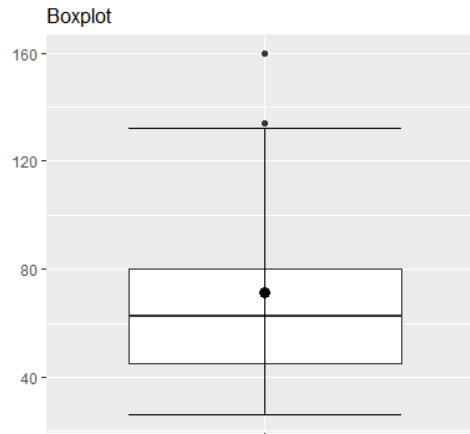
| | | | | |
|--------------|---|---|--|--|
| LaTeX | <code>> mean(LaTeX)</code> [1] 55.30769 | <code>> sd(LaTeX)</code> [1] 18.59832 | <code>> var(LaTeX)</code> [1] 345.8974 | <code>> quantile(LaTeX)</code> 0% 25% 50% 75% 100% 26 45 47 73 81 |
| Text | <code>> mean(Text)</code> [1] 60.61538 | <code>> sd(Text)</code> [1] 23.27208 | <code>> var(Text)</code> [1] 541.5897 | <code>> quantile(Text)</code> 0% 25% 50% 75% 100% 19 47 53 82 99 |



STAT 350 Exam 1 Review Problems

- a) What are the mean and the standard deviation for LaTeX pages and Text pages?
- b) What are the five number summaries for LaTeX pages and Text pages?
- c) Are there any outliers in this data using the 1.5 IQR rule? If there are any outliers, please state what they are. Justify your answer.
- d) Using the side-by-side boxplots shown above, i) Which one is more precise? ii) Which one has more pages? iii) What are their shapes?
- i) Which one is more precise?
- ii) Which one has more pages?

3. In the following boxplot, are there any 'real' outliers? Please explain your answer.



Suppose that 8% of tires manufactured by a certain company are defective. Assume that we have a random sample of 16 of these tires (enough for 4 cars). Note: This is a binomial distribution. What is the probability that more than one of the tires are defective? Hint: Write down the complete formula that is to be used.

5. Cars pass your house at an average of 2.5 cars per day (you live in the country). Let X be the number of cars that pass by your house. Assume that X is a Poisson random variable.

- a) What is the probability that the at least 2 cars pass by your house in 1.5 days?

STAT 350 Exam 1 Review Problems

- b) In the next 2 months (60 days), what is the probability that the average number of cars that passes your house per day is at least 2?
- c) If the number of cars that passes your friend's house, Y , has a Poisson distribution with an average of 25 cars per day, what is the standard deviation of $3Y - 5X$?
- d) If the vehicles that pass by your house are either trucks (T) or cars (C), what is the sample space of the next 2 vehicles that pass by your house?
- e) Suppose that 55% of the vehicles are trucks, 25% of the vehicles are red and 17% are red trucks (they are trucks and red). In addition, the vehicles that are not trucks are cars (we are assuming that there are no motorcycles). Given that a vehicle is red, what is the probability that it is a truck?
- f) Suppose that 55% of the vehicles are trucks, 25% of the vehicles are red and 17% are red trucks. In addition, the vehicles that are not trucks are cars (we are assuming that there are no motorcycles). What is the probability that the next vehicle is not red and is not a truck?

According to a book review published in the Wall Street Journal on Sep 26, 2012, 1% of 40-year-old women have breast cancer. 80% of these women who actually have breast cancer will have a positive mammogram. 10% of 40-year-old women who do not have breast cancer will also have a positive mammogram. If a 40-year-old woman has positive mammogram, what is the probability that she has breast cancer?

- b) If the 40-year-old woman has a positive mammogram, should she be worried that she has breast cancer?
7. The credit manager for a local department store discovers that 88% of all the store's credit card holders who defaulted on their payments were late by a week or more with two or more of their monthly payments before failing to pay entirely (defaulting). This prompts the manager to suggest that future credit be denied to any customer who is late with two monthly payments. Further study shows that 3% of all credit customers default on their payments and 40% of those who have not defaulted have had at least two late monthly payments in the past.
- a) What is the probability that a customer who has two or more late payments will default?
 - b) Under the credit manager's policy, in a group of 100 customers who have their future credit denied, how many would we expect *not* to default on their payments?
 - c) Does the credit manager's policy seem reasonable? Explain your response.

Servings of fruits and vegetables. The following table gives the distribution of the number of servings of fruits and vegetables consumed per day in a population.

| Number of servings X | 0 | 1 | 2 | 3 | 4 | 5 |
|------------------------|-----|-----|-----|-----|-----|-----|
| Probability | 0.3 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 |

Find the mean and the standard deviation for this random variable.

STAT 350 Exam 1 Review Problems

9.

$$f_X(x) = \begin{cases} kx(2-x) & 0 < x < 2 \\ 0 & \text{otherwise} \end{cases}$$

- a) What is the constant k that makes the above function a valid density function?
- b) Find $P(1 < X < 3)$
- c) Find the mean and the standard deviation for X.
- d) Find the 80th percentile of X.

10.

$$f_X(x) = \begin{cases} k(e^{-x} + e^{-4x}) & x > 0 \\ 0 & \text{otherwise} \end{cases}$$

- a) What is the constant k that makes the above function a valid density function?
- b) Find $P(X > 2)$.
- c) Find the mean for X.
- d) Find the cdf of this function.

11.

$$f_X(x) = \begin{cases} kx^{-2} & -2 < x < -1 \\ 0 & \text{otherwise} \end{cases}$$

- a) What is the constant k that makes the above function a valid density function?
- b) Find $P(X > 0)$.
- c) Find the cdf of this function.

12.

$$f_X(x) = \begin{cases} \frac{2}{9} & -1 < x < 0 \\ k(x-1) & 1 < x < 4 \\ 0 & \text{otherwise} \end{cases}$$

- a) What is the constant k that makes the above function a valid density function?

STAT 350 Exam 1 Review Problems

b) Find the standard deviation for X .

c) Find the cdf of this function.

d) Determine the 80th percentile of X .

STAT 350 Exam 1 Review Problems

13. Suppose the time until an earthquake in Lonely Mountain has an exponential density function with an average of 2 years.
- a) Find the probability that the next earthquake happens within two years.

b) If you are living on Lonely Mountain, should you prepare for an earthquake to occur?

e) Find the median time until the next earthquake in Lonely Mountain.