

Problem Sets

****Question numbers and pages based on 8th Edition, please make sure you check and do the proper questions if using a different version****

Pset 1 (All of Ch1) Exercises 4, 9, 10, 17, 21, 36, 43, 49, 60, 74

Pset 2 (Sections 2.1, 2.2, 2.3): Exercises 2, 5, 8, 13, 21, 26 (Use a Venn Diagram for this one), 30, 38, 43, 44.5

Exercise 44.5

Suppose that Austin is making lunch: consisting of bread, meat, fruit, and some cheese. He only buys whole wheat bread, but does like to vary his sandwich between turkey, chicken, and roast beef. For fruit, he either chooses grapes or tangerines, and he always buys Polly-O 2% mozzarella string cheese. How many different lunches can he make?

Pset 3 (Sections 2.4, 2.5, 3.1, 3.2, 3.3): Ch 2 Exercises: 51, 58, 69.5, 82, 89.5
Ch 3 Exercises: 5, 18, 24, 42, 45.5

Ch 2, Exercise 69.5

We are studying the mating habits of the Praying Mantis. The probability that a female Praying Mantis bites the head off of a male given they have mated is .97. The probability that a female Praying Mantis does not bite the head off of a male given they did not mate is .95. The probability of mating is .08.

- Write down the 3 pieces of given information with respect to the probabilities of event B (a female Praying Mantis bites the head off of a male) and event M (they have mated).*
- Draw a probability tree for this question.*
- What is the probability that a female Praying Mantis bites the head off of a male?*
- Knowing that a female Praying Mantis has bitten the head off of a male, what is the probability that they mated?*

Ch 2, Exercise 89.5

We know that the probability of Taylor Swift liking guys with blue eyes is .50. Given that she likes guys with blue eyes there is a 40% chance that she is complaining about an ex-boyfriend. There is a 40% chance that she is complaining about an ex-boyfriend.

- Write down the information given in terms of the probabilities of event C (Taylor Swift likes guys with blue eyes) and event D (she is complaining about an ex-boyfriend).*

- b. What is the probability that Taylor Swift is not complaining about an ex-boyfriend *and* she likes guys with blue eyes (hint: think about using the conditional probability you're given here)?
- c. What is the probability that Taylor Swift is not complaining about an ex-boyfriend *and* she does not like guys with blue eyes (hint: can you use independence here)?
- d. Knowing Taylor Swift is not complaining about an ex-boyfriend, what is the probability that she does not like guys with blue eyes?

Ch 3, Exercise 45.5

Suppose you work for Austin's new company Menger Education, LLC (true story...). The company hosts classes training high school students in Microsoft Office products in preparation for the Microsoft certifications they put out. Each student pays \$500 for the 2-month course, and Austin offers a guarantee that if the student doesn't pass the certification test, then he will refund the \$500 **AND** pay him/her back the \$100 test fee (this fee was paid to Microsoft, NOT Austin). Austin advertises that 91% of his students pass the exam.

- a. Let the random variable Y be the company's gain per student. What is the probability distribution function of Y in table form? (hint: there are only 2 possible values of Y).

Y		
$P(y)$		
	Fail	pass

- b. What is the expectation with regard to company profit (gain) for the certification class for 1 student?
- c. Suppose that in 2 years more and more students start to sign up for the certification classes. So, the passing rate for certifications will naturally decrease, say to .87. Naturally, this will have to be reflected in the price each student pays for the course. If Menger Education, LLC intends to keep the same expected profit (gain), what should the cost of the course be per student?

Pset 4 (Sections 3.4, 3.5, 3.6): Exercises 50, 51, 62, 67.5, 73, 76, 78, 81, 85, 88,

Exercise 67.5

Austin decided to give Taylor Swift another chance. So, he listened through all her songs from 2009. There were 8 in total. Let the random variable X be the number of songs in which she complained about some boy. The probability of complaining about a boy is 56%.

- a. Does X follow a distribution that we covered in class? If so, how do we know? Properly label the distribution.

- b. T/F, the probability that Taylor Swift complains about a boy in at least 2 songs equals the probability that Taylor Swift complains about a boy in more than 1 song?
- c. What is the expected number of songs that Taylor Swift will complain about a boy in?
- d. How much are we “off” by when we use the expectation to estimate the number of songs Taylor Swift will complain about a boy in?
- e. What is the probability that the number of songs Taylor Swift complains about a boy in is within 1 standard deviation of the mean (identify the interval we are interested in and then calculate the probability)? Since 3 is almost in the interval, include this in your probability calculation. What does this imply about the shape of the distribution (hint: think Empirical Rule)?

Pset 5 (Sections 4.1 & 4.2): Exercises 2, 4, 5, 7, 10 (don't sketch the graph here, just complete parts b,c,d), 12, 17, 19, 21, 24

Pset 6 (Sections 4.3, 4.4, 4.5, 4.6): Exercises 32, 44, 53, 61, 65, 71.5, 72, 83, 87, 89

Exercise 71.5

Use the pdfs for the Chi-Square distribution and Gamma distribution to find α and β in terms of ν such that $X \sim \text{Gamma}(\alpha, \beta)$ is indeed identical to $X \sim \chi^2(\nu)$ (must show the pdf of the gamma distribution with α and β in terms of ν in order to receive credit for this question).

Pset 7 (All of Ch6): Exercises 2, 6, 10, 13, 15, 20, 21, 25, 27, 29

Pset 8 (Sections 7.1, 7.2): Exercises 1, 2, 3, 5, 6, 12, 14, 15, 22, 25

Pset 9 (Sections 7.3, 7.4, 8.1, 8.2, 8.3): Ch7 Exercises 30, 36, 43, 45
Ch8 Exercises 4, 8, 21, 24, 40, 43

Pset 10 (Sections 8.4, 8.5, 9.1, 9.2, 9.3, 9.4, 9.5): Ch8 Exercises 55, 63
Ch9 Exercises 3, 5, 19, 22, 37, 39, 54, 63