

Homework 3

BSTA 550

2023-10-19

Complete all of the problems listed below. Only turn in the ones listed in the “Turn In” column. Please submit problems in the order they are listed.

You must show all of your work to receive credit.

Chapter	Turn In	Extra Problems
7		# 2, 10, 16, 17, 18
8	TB # 8*, 18*	# 2, 5, 7, 10
9	TB # 2, 8**, NTB # 1, 2	# 1, 4, 9, 10

* In addition to the graphs, include piecewise defined functions for the pmf and cdf.

** Break up your solution to Chapter 9 #8 into the following 5 parts:

1. Make a table of the joint probabilities for X and Y .
2. Using the table in the previous part, write down the piecewise-defined equation for $p_{X,Y}(x,y)$. There should be only 3 pieces (cases) for $p_{X,Y}(x,y)$.
3. Express $p_Y(y)$ as a formula (i.e. a function in terms of y).
4. Find the conditional pmf $p_{X|Y}(x|y)$ and express your answer as a piecewise-defined equation. There should be only 3 pieces (cases) for $p_{X|Y}(x|y)$.
5. Make a table of the joint cdf $F_{X,Y}(x,y)$ values.

Non-textbook problems (NTB)

1. The following table shows the results of a survey in which the subjects were a sample of 300 adults residing in a certain metropolitan area. Each subject was asked to indicate which of three policies they favored with respect to smoking in public places. (Table is from *Biostatistics: A Foundation for Analysis in the Health Sciences*, 10th Edition, Daniel, Wayne W.; Cross, Chad L., pg. 630)

Highest Education Level	Policy Favored			No Opinion	Total
	No Restrictions on Smoking	Smoking Allowed in Designated Areas Only	No Smoking at All		
College graduate	5	44	23	3	75
High-school graduate	15	100	30	5	150
Grade-school graduate	15	40	10	10	75
Total	35	184	63	18	300

Let X = highest education level and Y = policy favored. We can let $X = 1$ for college graduate, $X = 2$ for high-school graduate, etc., and similarly for Y , or just keep the category names for the different levels of X and Y

- a. Make a table for the joint pmf $p_{X,Y}(x,y)$ and briefly describe in words what the values are the probability of.
- b. Find the marginal pmf $p_X(x)$ and briefly describe in words what the values are the probability of.
- c. Find the marginal pmf $p_Y(y)$ and briefly describe in words what the values are the probability of.
- d. Make a table for the joint cdf $F_{X,Y}(x,y)$ and briefly describe in words what the values are the probability of.
- e. Find the marginal cdf $F_X(x)$ and briefly describe in words what the values are the probability of.
- f. Find the marginal cdf $F_Y(y)$ and briefly describe in words what the values are the probability of.
- g. Make a table for the conditional pmf $p_{X|Y}(x|y)$ and briefly describe in words what the values are the probability of.
- h. Make a table for the conditional pmf $p_{Y|X}(y|x)$ and briefly describe in words what the values are the probability of.

2. **Forgetful mornings revisited.** Using the joint pmf you found in Chapter 9 #2, complete the following questions:

- a. Find the joint cdf of X and Y and briefly explain what $F_{X,Y}(x, y)$ represents in the context of the problem.
- b. Find the conditional pmf $p_{Y|X}(y|x)$.

Some select answers

Selected answers (or hints) not provided at the end the book:

- Chapter 7

- # 2: $X \in (0, \infty)$, continuous; $Y \in \{0, 1, 2, \dots\}$, discrete
- # 10: $X_j \in [0, \infty)$, $j = 1, \dots, 100$; $Y \in [0, \infty)$; both continuous
- # 16: Y could be 0
- # 18: Yes, a r.v. can be both. Give an example!

- Chapter 8

- # 2: (a) $p(x) = \binom{7}{x}(.5)^7$ for $x = 0, 1, 2, \dots, 7$
- # 9: (a) $c = \frac{1}{8}$
- # 10:

x	2	4	6	8
$p(x)$	3/10	1/2	3/20	1/20

- Chapter 9

- NTB # 1 Partial answers:
 - * (g) $p_{X|Y}(X = \text{high school} | Y = \text{no smoking at all}) = 0.476$
 - * (h) $p_{Y|X}(Y = \text{no smoking at all} | X = \text{high school}) = 0.200$