Homework 2
BSTA 550

2023-10-12

Directions

Please turn in this homework on Sakai. Please submit your homework in pdf format. You can type your work on your computer or submit a photo of your written work or any other method that can be turned into a pdf. Please let me know if you greatly prefer to submit a physical copy. We can work out another way for you to turn in homework.

Try to complete all of the problems listed below at some point this quarter! You may want to save some of them for studying later! Only turn in the ones listed in the "Turn In" column. Please submit problems in the order they are listed.

The more work you include that shows your thought process, the more I can give you feedback.

Chapter	Turn In	Extra Problems
22*	TB # 1	# 3, 5, 7, 25, 27, 30, 31, 39-41, 43-48
3	TB # 10, NTB # 1	# 4, 9, 12, 13**
4	TB # 5	# 1, 4, 11, 13

See also the handout *Conditional Probability Practice* posted in Week 2 Course Materials on Sakai for more practice.

* Please note the following for Chapter 22:

- See the table on pg. 277, which summarizes some key combinatorics concepts.

- Problems 39-48 are a set that build on one another and more advanced than the other problems. It'll be much easier to do #42 after doing 39-41.

- I *highly* recommend reading Chapter 23, which is a series of case studies in counting: poker hands and Yahtzee.

**For #3.13, mathematically solve for the sample size instead of plugging in numbers and guessing.

Non-textbook problems (NTB)

1. Recall from class, that we defined events A, B, and C to mutually independent if both (1) and (2) below hold. This point of this exercise is to show that (1) $\not\Rightarrow$ (2), and (2) $\not\Rightarrow$ (1).

$$
\begin{aligned}
(1) \quad & \mathbb{P}(A \cap B \cap C) = \mathbb{P}(A)\mathbb{P}(B)\mathbb{P}(C) \\
(2) \quad & \mathbb{P}(A \cap B) = \mathbb{P}(A)\mathbb{P}(B) \\
& \mathbb{P}(A \cap C) = \mathbb{P}(A)\mathbb{P}(C) \\
& \mathbb{P}(B \cap C) = \mathbb{P}(B)\mathbb{P}(C)
\end{aligned}
$$

   a. Suppose two different fair dice are rolled. Let events A, B, and C be defined in the following way:

$$
\begin{aligned}
A : \quad & \text{Roll a total of } 7 \\
B : \quad & \text{First die is a } 6 \\
C : \quad & \text{Second die is a } 2
\end{aligned}
$$

   Show that condition (2) holds, but that condition (1) does not.

   b. Suppose two different fair dice are rolled. Let events A, B, and C be defined in the following way:

$$
\begin{aligned}
A : \quad & \text{Roll a 1 or 2 on the first die} \\
B : \quad & \text{Roll a 3, 4, or 5 on the second die} \\
C : \quad & \text{Roll a total of 4, 11, or 12}
\end{aligned}
$$

   Show that condition (1) holds, but that condition (2) does not.

Some select answers

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

- Chapter 22

  - # 30: (a) 2,835   (b) 405   (c) 10,780   (d) 7,980

  - # 40: 0.6666667

  - # 42: 0.002116402 (This is the answer when $n = 5$. Your answer needs to be in terms of n.)

  - # 44: 0.3

  - # 46: 0.3333333

- – # 48: 0.007936508 (This is the answer when $n = 5$. Your answer needs to be in terms of n.)

- Chapter 3

    - – # 4: (a) 0.111328   (b) 0.004872   0.995128

    - – # 10: (c) 0.384 If you have the right answer to (c), then you should be able to figure out the rest (see (e)).

    - – # 12: No.

    - – NTB #1: (a) 0.0799   (b) 0.07553   (c) 0.0655

- Chapter 4

    - – #4: 0.25

    - – # 12: (a) 0.4285714   (b) 0.4285714   (c) 0.1428571