

# Homework 3

BSTA 550

## 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. The Adobe Scan phone app is an easy way to scan photos and compile 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.

*You must show all of your work to receive credit.*

Chapter	Turn In	Extra Problems
14		# 3, 7
15	NTB # 1	# 1, 5, 11, 18, 23, NTB # 2
16	TB # 7	# 3a-g, 8, 11, 21
17	TB # 9	# 3a-g, 6, 11, 12a-c, NTB # 3
18	TB # 20	# 1, 24, 26, 27
19	TB # 6	# 1, 18, 19
20		# 2, 3, 4

## Non-textbook problems (NTB)

- Let  $X_i \sim \text{Binomial}(n_i, p)$  be independent r.v.'s for  $i = 1, \dots, m$ .
  - What does the r.v.  $X = \sum_{i=1}^m X_i$  count, and what is the distribution of  $X$ ? Make sure to specify the parameters of  $X$ 's distribution.

- b. Find  $\mathbb{E}[X]$ . *Make sure to show your work for (b) and (c). However, you may use without proof what you know about the mean and variance of each  $X_i$ .*
- c. Find  $\text{Var}[X]$ .

### Extra Problems

2. Read the Washington Post article *The amazing woman who can smell Parkinson's disease - before symptoms appear* (<http://www.washingtonpost.com/news/morning-mix/wp/2015/10/23/scottish-woman-detects-a-musky-smell-that-could-radically-improve-how-parkinsons-disease-is-diagnosed/>)

Assuming Joy Milne does not have the ability to detect Parkinson's disease via smell, answer the following questions:

- a. What is the probability of her correctly detecting Parkinson's by smelling one t-shirt?
  - b. What is the probability of her correctly detecting Parkinson's in 12 out of 12 t-shirts?
3. Let  $X_i \sim \text{Negative Binomial}(r_i, p)$  be independent r.v.'s for  $i = 1, \dots, m$ .
    - a. What does the r.v.  $X = \sum_{i=1}^m X_i$  count, and what is the distribution of  $X$ ? Make sure to specify the parameters of  $X$ 's distribution.
    - b. Find  $\mathbb{E}[X]$ . *Make sure to show your work for (b) and (c). However, you may use without proof what you know about the mean and variance of each  $X_i$ .*
    - c. Find  $\text{Var}[X]$ .