

# Suggested Practice Problems in Textbook (120A)

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## Tips for Using This Study Guide

1. This study guide is aimed for students who need more practice problems to support their study and prepare for the exams.
2. Please keep track of the topics in the lecture weekly and properly choose the practice problems listed below.
3. Solution will be posted after every section, dependent of the topics discussed in that section.

## Introduction

1. Basic statistics: 1.2
2. Set theory and axioms of probability: 1.13, 1.14, B.1, B.5(a)
3. Counting methods: 1.7, 1.8, 1.26

## Conditional Probability

1. Conditional probability: 2.2, 2.7
2. Law of total probability: 2.6
3. Bayes Formula: 2.33, 2.37, 2.40
4. Independence: 2.13, 2.17
5. Conditional independence: 2.27, Example 2.38

## Random Variables, Expected values

1. Discrete random variables: 3.5, 2.38
2. Continuous random variables: 3.7, 3.20
3. Expected value: 3.10, 3.30 Challenging problems: 3.51 – 3.53
4. Variance: 3.31, 3.15, 3.28
5. Moment generating functions: 5.13, 5.15, 5.17, 5.19

Hint: For exercise 5.19, use geometric series

$$\sum_{n=0}^{\infty} p^n = \begin{cases} \frac{1}{1-p} & |p| < 1 \\ \infty & |p| \geq 1 \end{cases}$$

For part b, since the second derivative is tedious, you can directly skip the variance or calculate variance by the same method as part b in 3.53

## Distributions

1. Binomial distribution: 2.21, 2.62
2. Geometric distribution: 2.20, 2.22
3. Negative binomial distribution: Example 7.7
4. Hyper-geometric distribution: 2.24, 2.28
5. Poisson distribution: 4.10, 4.33, 4.34  
Remark: The mean of Poisson random variable is exactly same as the parameter  $\lambda$
6. Uniform distribution: 1.9, 1.11, 3.4, 3.41
7. Exponential distribution: 4.49, 4.50
8. Normal distribution: 3.17, 3.18
9. Transformation of random variables: 5.7, 5.8, example 5.20 and remark 5.21

## Binomial Approximation

See exercise: 4.35, 4.41

## Joint Distributions

1. Discrete case: 6.1, 6.19
2. Continuous case: 6.5, 6.35
3. Independence: 6.12, 6.27
4. Covariance: 8.14 – 8.16

## Conditional Distributions

See exercise 10.1, 10.2, 10.5, 10.9

## Final Exams

See exercise: 3.37, 3.67, 5.10, 5.22, 6.6, 6.10, 6.32, 8.6, 8.13, 10.3

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**Note:** This study guide is used for Botao Jin's sections only. Comments, bug reports: [b\\_jin@ucsb.edu](mailto:b_jin@ucsb.edu)