

# Proof-Based Math Readings

## Session: Statistics

### 2024 Summer

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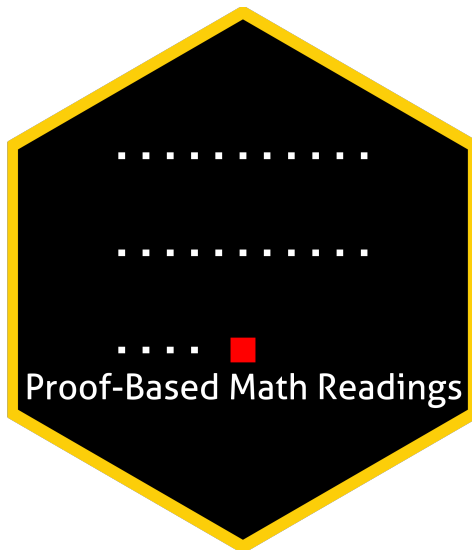
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## Table of contents

<b>0</b>	<b>Motivation</b>	<b>2</b>
<b>1</b>	<b>Prerequisites</b>	<b>2</b>
<b>2</b>	<b>Format</b>	<b>2</b>
<b>3</b>	<b>Resources</b>	<b>2</b>
3.1	Main Book and Main Book's Playlist . . . . .	2
3.2	Supplementary . . . . .	2
3.2.1	Statistics . . . . .	2
3.2.2	Proof . . . . .	2
3.2.3	Real Analysis . . . . .	2
<b>4</b>	<b>Reading Schedule</b>	<b>3</b>



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## 0 Motivation

- *Proof-Based Math Readings* is a free and independent online reading group where we study mathematics required in economics master's/PhD programs using an intuitive approach.
- This session of the reading group is on *Statistics*.

## 1 Prerequisites

- CGPA: 3.00/4.00
- [Introduction to Probability - Dimitri P. Bertsekas, John N. Tsitsiklis \(2nd Edition, 2008, Summary Material\)](#)
- [Introduction to Probability - Dimitri P. Bertsekas, John N. Tsitsiklis \(2nd Edition, 2008, Playlist\)](#)
- [Introduction to Probability - Dimitri P. Bertsekas, John N. Tsitsiklis \(2nd Edition, 2008, Solutions and Errata\)](#)
- Please use the [🔗 Application Form](#) to join our reading group anytime.
- Applicants are informed about their application results within a week via email.

## 2 Format

- This session takes 12 weeks.
- We discuss the topics/exercises that we struggle with at [🗨️ Proof-Based Math Readings \[Discord\]](#).
- We do not have face-to-face/online meetings due to the size of the group.
- Members are expected to read the chapters, and watch the chapter videos from the book's playlist.

## 3 Resources

### 3.1 Main Book and Main Book's Playlist

**Statistical Inference** by George Casella and Roger Berger is our main book because it is well-written and well-structured.

- 📖 [Statistical Inference - George Casella, Roger Berger \(2nd Edition, 2001\)](#)
- 📖 [Statistical Inference - George Casella, Roger Berger \(2nd Edition, 2001, Errata\)](#)
- 📖 [Statistical Inference - George Casella, Roger Berger \(2nd Edition, 2001, Solutions\)](#)
- 📺 [Statistical Inference - George Casella, Roger Berger \(2nd Edition, 2001, Playlist for Chapter 1-5\)](#)
- 📺 [Statistical Inference - George Casella, Roger Berger \(2nd Edition, 2001, Playlist for Chapter 5-9\)](#)

### 3.2 Supplementary

#### 3.2.1 Statistics

- 📺 [Introduction to Mathematical Statistics - Jingyi Jessica Li \(2022\)](#)
- 📺 [Mathematical Statistics - Jem N. Corcoran \(2024\)](#)

#### 3.2.2 Proof

- 📖 [Book of Proof - Richard Hammack \(3.3 Edition, 2022\)](#)
- 📺 [Book of Proof - Richard Hammack \(3.3 Edition, 2022, Companion playlist by Jeremy Teitelbaum\)](#)
- 📺 [Book of Proof - Richard Hammack \(3.3 Edition, 2022, Companion playlist by Michael Penn\)](#)

#### 3.2.3 Real Analysis

- 📖 [Basic Analysis I: Introduction to Real Analysis \[Volume I\] - Jiri Lebl \(Version 6.0, 2023\)](#)
- 📺 [Real Analysis - Casey Rodriguez \(2020, Companion playlist to Basic Analysis I\)](#)
- 📺 [Introduction To Metric Spaces - Paige Bright \(2023\)](#)

## 4 Reading Schedule

- SI is the abbreviation of **Statistical Inference - George Casella, Roger Berger (2nd Edition, 2001)**.

### SI, Chapter 1: Probability Theory

Week 01 


- 1 Set Theory, 2 Basics of Probability Theory, 3 Conditional Probability and Independence,
- 4 Random Variables, 5 Distribution Functions, 6 Density and Mass Functions

### SI, Chapter 2: Transformations and Expectations

Week 02 


- 1 Distributions of a Random Variable
- 2 Expected Values
- 3 Moments and Moment Generating Functions

### SI, Chapter 3: Common Families of Distributions

Week 03-04 


- 1 Introduction
- 2 Discrete Distributions
- 3 Continuous Distributions
- 4 Exponential Families
- 5 Location and Scale Families
- 6 Inequality and Identities

### SI, Chapter 4: Multiple Random Variables

Week 05-06 


- 1 Joint and Marginal Distributions
- 2 Conditional Distributions and Independence
- 3 Bivariate Transformations
- 4 Hierarchical Models and Mixture Distributions
- 5 Covariance and Correlation
- 6 Multivariate Distributions
- 7 Inequalities

### SI, Chapter 5: Properties of a Random Sample

Week 07-08 


- 1 Basic Concepts of Random Samples
- 2 Sums of Random Variables from a Random Sample
- 3 Sampling from the Normal Distribution
- 4 Order Statistics
- 5 Convergence Concepts
- 6 Generating a Random Sample

### SI, Chapter 6: Principles of Data Reduction

Week 09-10 

- 1 Introduction
- 2 The Sufficiency Principle
- 3 The Likelihood Principle

### SI, Chapter 7: Point Estimation

Week 11-12 

- 1 Introduction
- 2 Methods of Finding Estimators
- 3 Methods of Evaluating Estimators