Midterm Fall 2021
Topics

Chapter 1

1. The basics of probability.
   (i) Review of set theory notation.
      - intersection, union, complement and how they combine
      - manipulating multiple events
      - partitions
   (ii) Sample spaces and events.
      - definitions and terminology

Chapter 1 (cont.)

(iii) The probability axioms and their consequences.

- definitions
- axioms
- corollaries
- general addition rule
- probability tables

(iv) Probability spaces with equally likely outcomes.

- Decomposition of S into equally likely sample outcomes
- Calculations of the form

$$P(A) = \frac{n_A}{n_S}$$

Chapter 1 (cont.)

(v) Combinatorial probability.

- multiplication principle
- selecting with and without replacement
- permutations
- multinomial coefficients and partitioning sets
- combinations
- binary sequences
- hypergeometric selection

(vi) Conditional probability and independence.

- concept of conditional probability
- definition
- properties
- independence
- mutual independence
- general multiplication (or chain) rule

(vii) The Theorem of Total Probability.

- relation to partitioning
- consequences
- probability trees

(viii) Bayes Theorem.

- relation to conditional probability
- interpretation and consequences
- probability trees

Instructions

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- The midterm will be held Thursday October 21st, 6.30pm – 8.00pm.
- Exam will last one hour and thirty minutes, plus thirty minutes to produce and upload your solutions.
- Exam will contain 3 questions, 10 marks each.
- Exam is open-book, but will otherwise run under regular exam conditions, and the Academic Integrity conditions of the University.
  - Most importantly, **you must not communicate with anyone concerning the exam contents once the exam starts**.
- Questions will involve numerical calculations.
- Rescaling of the final mark may occur.

Instructions (cont.)

The exam will be held online via a myCourses Quiz.

- When you start the quiz, you will be prompted to download the question paper. Do this first.
- You can supply your answers by typing into the available text box on the Quiz, or uploading a pdf or jpeg with your solutions, or both.
- You should also upload the question paper you downloaded.
- You must enter the quiz only once, and remember to press ‘Submit’ when you want to submit.