Statistics 134 - Instructor: Adam Lucas

MIDTERM

Friday, October 5, 2018

Print your name: _____

SID Number: _____

Exam Information and Instructions:

- You will have 45 minutes to take this exam. Closed book/notes/etc. No calculator or computer.
- We will be using Gradescope to grade this exam. Write any work you want graded on the front of each page, in the space below each question. Additionally, write your SID number in the top right corner on every page.
- Please use a dark pencil (mechanical or #2), and bring an eraser. *If you use a pen and make mistakes, you might run out of space to write in your answer.*
- Provide calculations or brief reasoning in every answer.
- Unless stated otherwise, you may leave answers as unsimplified numerical and algebraic expressions, and in terms of the Normal c.d.f. Φ. Finite sums are fine, but simplify any infinite sums.
- Do your own unaided work. Answer the questions on your own. The students around you have different exams.

I certify that all materials in the enclosed exam are my own original work.

Sign your name: _____

GOOD LUCK!

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1. (5 pts) Suppose that on average, 2 moths per 12-hour night are killed by a particular hanging bug zapper. Assume that conditions are the same across different nights and different times of the night, and that moths arrive independently of one another. Find the chance that more than 7 moths are killed in a period of three nights.

2. (5 pts) You are given a fair coin and a coin which lands heads with probability $\frac{1}{3}$. Unsure which coin is which, you select one of the coins and decided to toss it until you observe 4 heads; this takes 10 tosses. Given this information, what is the chance you selected the fair coin?

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3. (10 pts total) There are 60 marbles in a bag, of which there are 10 each of the colors red, orange, yellow, green, blue, and violet. Let X denote the number of different colors appearing among 5 marbles selected at random from the bag. Find:

   (a) (3 pts) $P(X = 2)$;

   (b) (3 pts) $\mathbb{E}(X)$;

   (c) (4 pts) $Var(X)$.

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4. (5 pts) Suppose that bundles of yarn are 60 meters long on average, with an SD of 5 meters, and that bundles are independent of one another. In terms of n, find an upper bound (less than 1) on the probability that the total length of n bundles is less than 200 meters, for $n \geq 4$.

5. (5 pts) Three couples attend a dinner. Each of the six people chooses a seat randomly from a round table with six seats. What is the probability that no couple sits together? (Hint: use the inclusion-exclusion rule.)