STAT/MA 41600
Midterm Exam #1: October 9, 2015

Name _____

Purdue student ID (10 digits) _____

1. The testing booklet contains 5 questions, but students only need to answer 4 of the questions. The 4 questions chosen by the student will all be weighted evenly (i.e., each question is worth 1/4 of the midterm exam grade).

2. Permitted Texas Instruments calculators:
   BA-35
   BA II Plus*
   BA II Plus Professional Edition*
   TI-30XS MultiView*
   TI-30Xa
   TI-30XIIS*
   TI-30XIIB*
   TI-30XB MultiView*
   *The memory of the calculator should be cleared at the start of the exam.

3. **Circle your final answer in your booklet**; otherwise, no credit may be given.

4. There is no penalty for guessing or partial work.

5. Show all your work in the exam booklet. If the majority of questions are answered correctly, but insufficient work is given, the exam could be considered for academic misconduct.

6. Extra sheets of paper are available from the proctor.

1. Suppose that X and Y are independent random variables, such that X has probability mass function $p_X(x) = (1/3)(2/3)^{x-1}$ for integers $x \geq 1$, and Y has probability mass function $p_Y(y) = (2/5)(3/5)^{y-1}$ for integers $y \geq 1$.

1a. Find $P(X = Y)$.

1b. Find $P(X > Y)$.

Grade this question? Yes No

2. At a certain college, 45% of the students live in a residence hall (on-campus), and the other 55% of the students live off-campus. Suppose that Audrey independently selects and interviews people, and she stops after she has found 6 students who live in a residence hall. Let X denote the number of interviews she conducts altogether.

2a. Find $\mathbb{E}(X)$.

2b. Find $\mathrm{Var}\,(X)$.

2c. Find $P(X \geq 9)$.

Grade this question? Yes No

3. A total of 30 bears—consisting of 10 red bears, 10 yellow bears, and 10 blue bears—are randomly arranged in a bucket. A child begins grabbing the bears at random, with all selections equally likely. The bears are selected "without replacement", i.e., she never puts the bears back after she grabs them. Let X denote the number of bears that she grabs *before* the first red bear appears (but not including the first red bear itself).

3a. Find $\mathbb{E}(X)$.

3b. Find $\mathrm{Var}\,(X)$.

Grade this question? Yes No

4. Suppose that there are 60,000 candies in a large container, and 20,000 of them are chocolate; the other 40,000 are peppermint. You choose 10 of the candies without replacement, and all such possible selections are equally likely. Let X denote the number of chocolate candies that you get.

4a. Write an exact expression for $P(X = 4)$. You do not need to evaluate the expression.

4b. Write a Binomial estimate for the probability above. Then use your calculator to evaluate the Binomial estimate.

Grade this question? Yes No

5a. Three red and three blue plates are placed at a circular table for six people, with all arrangements of the plates equally likely. Find the probability that the three red plates are adjacent and the three blue plates are adjacent.

5b. Four red and four blue plates are placed at a circular table for eight people, with all arrangements of the plates equally likely. Find the probability that the four red plates are adjacent and the four blue plates are adjacent.

Grade this question? Yes No