

You may use any tool of your choice: (calculator, software)

1. (15 pt) Bayes Thm: Three bowls have holiday cookies. Auntie's Bowl A has 3 sugar cookies and 2 ginger cookies. Uncle's Bowl B has 2 sugar cookies and 3 ginger cookies. Your mom's Bowl C has 6 ginger cookies. Someone randomly chooses a bowl and pulls out a ginger cookie for you. What is the chance that the cookie was made by your mom (i.e., came from Bowl C)? **YOU MUST MAKE A TREE TO GET CREDIT**
2. (15 pt) Combinatorial probability: A 5 character password has just lower case letters and digits and must have at least one letter.
 - a. What is the chance of A=exactly 1 character is a letter?
 - b. What is the chance of B=all digits are odd?
 - c. What is the chance of $A \cap B$ =exactly 1 character is a letter and all digits are odd?
 - d. Are the events A and B independent?
4. (30 pt) Discrete and continuous distributions:
 - a. A bent coin is flipped 50 times. If the chance of a head is $p = .7$, find the chance that less than 35 of the flips will be heads. Use the normal approximation (with continuity correction).
NO PICTURE NO CREDIT!
 - b. Jan's arrival to class on time is a Poisson Process. In the course of a semester, he averages arriving to class on time 3 times. What is the chance that he arrives on time exactly 2 times?
 - c. Jen is always late and her lateness is given by a density function that is given by
$$f(x) = c(x-60)^2, 0 < x < 60$$
$$= 0, \text{ everywhere else}$$
 - i. find c
 - ii. find Jen's average lateness.
 - iii. Find Jen's median lateness
 - iv. find chance that Jen arrives more than 20 minutes late.
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5. (40 pt) Hypothesis testing: the excel file can be found on blackboard.

Be sure to upload the file showing your work **BEFORE** the end of the exam.

 - a. A cat food manufacturer claims that its dry food contains at most 11% moisture on average. The FDA samples 100 bags and measures the moisture content. At the $\alpha = 5\%$ significance level, should the FDA reject $H_0: \mu \leq 11$? (t-distribution, 1-tail)
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 - b. Middle school students from around the New York State were asked whether good grades, athletic ability, or popularity was most important to them. 50 students each from rural, suburban and urban areas were chosen. Does where a student lives affect their values?
 H_0 : middle school students' values are independent of environment
YOU MUST USE a CRITICAL VALUE approach to decide whether to reject H_0 at $\alpha = 1\%$ significance level.
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