CSE 312 : Quiz 4 Practice 1

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Instructions

- You have twenty minutes to complete this exam.
- You are permitted one piece of 8.5x11 inch paper with handwritten notes (notes are allowed on both sides of the paper). You should also get a provided formula sheet (in section it'll be on different colored paper separate from the exam; if you take the exam with DRS it will be the last page of your exam).
- You may not use a calculator or any other electronic devices during the exam.
- We will be scanning your exams before grading them. Please write legibly, and avoid writing up to the edge of the paper.
- If you run out of room, you may also use the last page for extra space, but tell us where to find your answer if it's not right below the problem.
- Since you don't have a calculator, you are generally free to **not** simplify expressions (though you may if you think it will be helpful).
- In general, you should show us the work you used to get to an answer, and explanations will help us reward partial credit, but we do **not** expect explanations at the level we usually require on homeworks.

Advice

- Writing a few words about where an expression came from is often very helpful for awarding partial credit.
- Remember to take deep breaths.

Question	**Max points**
PDF/CDF	20
CLT	14
Grading Morale	1
Total	**35**

1. CLT

(a) A new bagel shop has opened in UDistrict and everyone is dying to try it. The store gets an average of 3 customers per minute and is open for 10 hours (600 minutes) each day. The number of customers appearing each minute is independent of all other minutes, and follows a Poisson distribution. The store will sell out of bagels if they get more than 2500 customers in a day. Use the CLT to approximate the probability that the store sells out of bagels. (You must use individual minutes as your starting variables).

You SHOULD NOT lookup values in the z-table for this problem. Instead, your solution should be an expression with Φ that can be evaluated using the lookup table (i.e. all inputs to Φ are non-negative) and a calculator (i.e. the input to Φ does not need to be simplified).

2. Concentration

You flip a fair coin (independently) 50 times, and a coin that comes up heads with probability $.8$ (independently) 50 times. Let X be the number of heads from the fair coin, Y be the number of heads of the unfair coin, and Z be the total number of heads (i.e., $X + Y$).

(a) First, compute $\mathbb{E}[X]$

(b) Compute Var (X)

For the next two parts, you may use E to mean $\mathbb{E}[X]$ and V to mean Var (X).

(c) Use Markov's inequality to bound the probability that $X \geq 40$.

$$\mathbb{P}\left(X \geq 40\right) \underset{\text{inequality}}{\square} \underset{\text{bound}}{\square}$$

(d) Use Chebyshev's Inequality to bound $\mathbb{P}(20 \leq X \leq 30)$.

$$\mathbb{P}\left(20 \leq X \leq 30\right) \underset{\text{inequality}}{\square} \underset{\text{bound}}{\square}$$

(e) Can you use the Chernoff bound to bound $\mathbb{P}(Z \geq 90)$? Select ALL that apply.

- ☐ Yes, it would be valid to apply Chernoff, and there is enough information in the problem.
- ☐ No, not enough information is given to compute δ.
- ☐ No, not enough information is given to compute μ.
- ☐ No, Chernoff only applies when the coin has the same probability always.
- ☐ No, Chernoff could only bound $\mathbb{P}(Z \leq 90)$.