Do not open the packet until the exam begins. When it begins, please rip this page off your exam.

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.
- 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.
- 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
Squirrels!	12
More Squirrels	10
Multiple choice	3
Total	**25**

There are no problems on this page, go to the next one.

CSE 312 : Autumn 2025 Quiz 4 Form 1

Name:	**NetID:** @uw.edu

1. Squirrels! [12 points]

You are spotted by a bunch of UW's campus squirrels while on your way to lecture! There are 70 squirrels hidden throughout campus, and each squirrel comes up to visit you (and beg for food) independently with probability 0.3. Let X be the total number of squirrels that visit you.

(a) Calculate the expected value of X. [3 points]

(b) Calculate the variance of X. [3 points]

(c) Using the Central Limit Theorem to estimate the probability that you are visited by at least 20 squirrels. Write your answer in terms of $\Phi(\cdot)$, the CDF of a $\mathcal{N}(0, 1)$ random variable.
In applying the CLT, **apply a continuity correction** if and only if it is normally appropriate for approximating a variable like X.
You may also write your answer in terms of a and b, your answers from parts (a) and (b) respectively. [6 points]

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2. More Squirrels [10 points]

This is exactly the same setup as problem 1.
You are spotted by a bunch of UW's campus squirrels while on your way to lecture! There are 70 squirrels hidden throughout campus, and each squirrel comes up to visit you (and beg for food) independently with probability 0.3. Let X be the total number of squirrels that visit you.

For this problem, let a and b be the expectation and variance of X, i.e. correct answers from **problem 1, parts (a) and (b)** respectively.

(a) Use Markov's inequality to bound the probability that we are visited by at most 48 squirrels.
You may write your answer in terms of a. [5 points]

$$\mathbb{P}\left(X \leq 48\right) \underbrace{\square}_{\text{inequality}} \underbrace{\square}_{\text{bound}}$$

(b) Use Chebyshev's inequality to bound the probability that we are visited by at least 30 squirrels. You can assume that $a < 30$.
You may write your answer in terms of a and b. [5 points]

$$\mathbb{P}\left(X \geq 30\right) \underbrace{\square}_{\text{inequality}} \underbrace{\square}_{\text{bound}}$$

3. Multiple Choice

(a) Let A, B, C be events. Then, we have $\mathbb{P}(A \cup B \cup C) > \mathbb{P}(A) + \mathbb{P}(B) + \mathbb{P}(C)$. [3 points]

- ◯ Always
- ◯ Sometimes
- ◯ Never