

Midterm I

Name: _____

For the section that you *attend* please indicate:**Instructor:**(circle one) Larget Nordheim**TA:** (circle one) Cheng Wilkinson Zhang

Instructions:

1. This exam is open book. You may use textbooks, notebooks, class notes, and a calculator (but not a laptop computer).
2. Do all your work in the spaces provided. If you need additional space, use the back of the preceding page, indicating *clearly* that you have done so.
3. To get full credit, you must show your work. Partial credit will be awarded.
4. Note that some questions have multiple parts. For some questions, these parts are independent, and so you can work on part (b) or (c) separately from part (a).

 For graders' use:

Question	Possible Points	Score
1	25	
2	25	
3	25	
4	25	
Total	100	

1. Twelve (12) red clover plants of strain A were randomly selected and the nitrogen content (in mg) was determined – with the values recorded as follows:
 18.6 24.2 20.9 25.3 17.1 20.4 23.7 28.0 26.4 22.5 21.8 23.6
 - (a) Construct a stem and leaf display for these data and comment on it. Also, calculate the standard deviation of these values.
 - (b) Suppose that the nitrogen content of strain B of red clover plants is known to be distributed approximately as a normal with a mean of 27mg and a variance of $12.4mg^2$. Find the probability that a randomly selected plant from strain B has nitrogen content less than 25mg.

- (c) For strain B find symmetric limits about the mean so that there is a probability of 99% that a randomly selected plant will have a nitrogen content that falls between these limits.
2. A difficult method of gene insertion has a probability of 0.10 of success. Nine (9) independent gene insertion trials will be conducted.
- (a) Find the probability that 2 or more of the insertions will be successful.
 - (b) Find the probability that all 9 of the insertions will be successful.
 - (c) Given, the problem description, do the results from parts (a) and (b) make intuitive sense? Explain briefly.
 - (d) Suppose that 60 independent gene insertion trials will be conducted. Find the mean and variance of the number of successful insertions.
3. I have two cats named Wanda and Frieda. They both like to climb into the big oak tree in the front yard on a sunny afternoon. There is a probability of 0.6 that Wanda climbs the tree and a probability of 0.8 that Frieda climbs the tree. Also there is a 0.4 probability that they will both climb the tree. Define the events: W =Wanda climbs tree; F =Frieda climbs tree.
- (a) Are W and F disjoint?
 - (b) Are W and F independent?
 - (c) Let Y =the number of cats that climb the tree. Find $\Pr(Y=0)$.
 - (d) For Y as defined in part (c), find $E(Y)$.
4. Consider a lottery game in which you receive \$0, \$50, or \$1000 with the following probabilities: $P(0)=0.90$; $P(50)=0.09$; $P(1000)=0.01$. The price of a ticket to play the lottery is \$15. Let G be the random variable that represents the net gain from playing the game, the amount received minus the price to play the game. Suppose 150 randomly selected players participate in the lottery game. Let \bar{G} be the random variable representing the mean of G for the 150 players.
- (a) Find $P(\bar{G} \geq 0)$.
 - (b) Find $P(\bar{G} \leq -15.1)$
 - (c) What assumptions did you make to complete parts (a) and (b). Explain briefly.