

BST 140.652 Midterm Exam

Notes:

- You may use your one 8.5 by 11 formula sheet.
- Please use only the basic mathematical functions on your calculator.
- Show your work on all questions. Simple “yes” or “no” answers will be graded as if blank.
- Please be neat and write legibly. Use the back of the pages if necessary.
- There are 5 questions one per page
- Good luck!

signature and **printed name**

1. In a review of the author Jane Austen's work, scholars found the following relative frequencies of the words "an", "that" and "this"

an	that	this
.53	.35	.12

An new story claimed to be Austen's was discovered with the word "an" 140 times, the word "that" 100 times and the word "this" 50 times. Are these counts consistent with Austen's traditional frequencies? Perform an appropriate test and interpret.

2. Two drugs, A and B , are being investigated in a randomized trial with the data are given below. Investigators would like to know if the Drug A and Drug B are equivalent in the terms of side effects.

		None	Nausea	Nausea and Vomiting	N
Drug A	Observed Counts	80	15	5	100
	Expected Counts				
Drug B	Observed Counts	60	20	10	90
	Expected Counts				

State relevant null and alternative hypotheses and fill in the expected cell counts. How many degrees of freedom would the Chi-squared statistic have? (Do not perform the test.)

3. A colleague is going to study change in forced expiratory volume (FEV) over two years. In this study she is going to take individual subjects and subtract their FEV at follow-up from their FEV at baseline. She would like to test whether or not there is a decline in FEV. She needs to know how many subjects are required to have an appropriately power the study.

Give a list of the quantities that you will need and assumptions that you will make to perform the calculation. Do not use any symbols; state the quantities in English.

4. You are given three sample mean across a stratifying variable. They are (in order) 5.0, 7.0, 8.0. You are also given their standard errors: 2.0, 1.0 and 3.0 respectively. Give a sensible estimate of the common mean across strata. **Extra credit 5 points** What would be an appropriate standard error for the resulting common mean?

5. In a study of aquaporins, 12 frog eggs were randomized, 6 to receive a protein treatment and 6 controls. If the treatment of the protein is effective, the frog eggs would implode. The resulting data was

	Imploded	Did not	Total
Treated	5	1	6
Control	2	4	6
Totals	7	5	12

State the appropriate hypotheses and set up the calculation of a P-value. *Do not solve for the final number, just leave your answer in an equation format.*