

NAME: _____

Math 124 FALL 2004: Section 11 MWF 2-3
Midterm 2

Date: Nov 5, 2004

Instructions: Answer questions 1-4. Show all work where reasonable to do so. You have 50 minutes. To allow others to fully concentrate at the end please do not leave in the last 10 minutes. You should submit your page of notes with your test paper.

Question 1. (*25 points*)

Define each of these terms in the context of sample surveys. Where appropriate explain the possible effect (of the term) on conclusions drawn from a survey.

(a.) *Population and Sample*

(b.) *Simple Random Sample*

(c.) *Stratified Random Sample*

(d.) *Undercoverage*

(e.) *Non-response*

Question 2. (25 points)

A political scientist wants to know how college students feel about social security. She obtains a list of 3456 undergraduates at her college and mails a questionnaire to 250 students selected at random from the list. Only 104 questionnaires are returned.

(a). What is the population in this study?

(b). What is the sample?

(c). What issues should the political scientist consider when writing her questionnaire?

(d). Will the researcher have any difficulties generalizing her conclusion to the population? Why?

Question 3. (*25 points*)

Suppose that for a particular type of flower, genetic theory says that $3/4$ will have long petals and the remaining $1/4$ short petals. Assume that the petal lengths are independent between flowers.

(a). What is the probability that 6 out of a set of 9 flowers have long petals?

(b). Suppose instead that there are 100 flowers. What is the mean number of long petal flowers?
What is the standard deviation?

(c). What is the probability of 70 or more of these 100 flowers having long petals?

Question 4. (*25 points*)

The breaking strengths of cables produced by a manufacturer have mean 820 kg and standard deviation 40. Using a new technique, the manufacturer claims it can produce cables of stronger strength. A sample of 50 cables produced using the new technique is taken and has mean breaking strength of 840 kg. Are the new cables stronger?

(a). State appropriate null and alternative hypothesis

(b). Compute the test statistic

(c). Give the corresponding P-value and interpret the result of your test in terms of the original problem.

(d). When you carry out this test what assumptions are you making?

Non-compulsory bonus question. (*up to 10 points*)

Carefully explain the relationship between confidence intervals and hypothesis testing (you may do this in the context of confidence intervals and hypothesis tests for μ).