

**Instructions:** The exam consists of seven questions, six regular question with a maximum value of 45 points and a 10 point bonus question. All the paper you should need is provided in the exam.

Here is a list of conditions that apply.

1. Show all work, provide complete answers.
2. Handout provides all formulas and tables.
3. If a question makes use of a sample test, specify
  - (a) name of the sample test,
  - (b) results of any supporting formulas (e.g., justifying the use of z scores for test of proportion),
  - (c) null and alternative hypotheses,
  - (d) whether it is a one or two tailed test,
  - (e) the cutoff values of the three rejection boundaries,
  - (f) degrees of freedom (if applicable),
  - (g) your decision regarding the outcome of the test statistics (e.g., reject  $H_0$  at significance level of  $\alpha$ / fail to reject null hypothesis).
4. No credit is given if sample test is not correctly chosen.

1. (10 points) According to recent poll, ( *Gallup/CNN/USA Today* ) <sup>1</sup> 67% of Americans rate the economic conditions in this country from good to excellent. Suppose you were designing a similar poll.
  - (a) If you wanted to estimate the percentage of the population who agrees with this particular statement, what is the minimum sample size needed given a margin of error of 3% and a confidence value (z score) of 1.96?
  - (b) What is the probability that your sample will report a proportion of 65% ?

---

<sup>1</sup>poll conducted from September 10th to the 14th, 1999

2. (6 points) An important implication of a change in the federal income tax laws is that workers will see a reduction in the amount of taxes they pay. Based on a random sample of 64 academic economists, the estimates of the portion of the total tax saved have a mean of 26% and a standard deviation of 18 %
- (a) What is the approximate probability that a sample mean, based on a random sample of  $n=64$  economists will lie within 1% of the mean of the population of the estimates of all economists?
  - (b) Is it necessarily true that the mean of the population of estimates of all economists is equal to the percentage of tax savings that will actually be achieved? Why?

3. (8 points) Calculate the margin of errors for the following four problems.

(a)  $n = 68, \sigma^2 = 200$

(b)  $n = 625, p = 0.42$

(c)  $n_1 = 10000, n_2 = 8400, \sigma_1^2 = 2604, \sigma_2^2 = 1580$

(d)  $n_1 = 500, n_2 = 800, p_1 = 0.33, p_2 = 0.47$

4. (5 points) An increase in the rate of consumer saving is frequently tied to a lack of confidence and is said to be an indicator of decline in a local economy. Last summer, a random sample of 200 savings accounts in Eugene, OR showed a mean increase in savings accounts values of 6.5% with a standard deviation of 4.7%.
- (a) Calculate the margin of error for this survey.
  - (b) With 95 % confidence level, two-tailed, what range of values represents the changes in savings accounts values for Eugene?

5. (8 points) Many companies are becoming involved in flextime, in which a worker schedules his or her own work hours or compresses the work weeks. A small company that was contemplating the installation of a flextime schedule estimated that it needed a minimum mean of 7 hours per day per computer programmer in order to operate effectively. Each of a random sample of 29 of the company's programmers was asked to submit a tentative flextime schedule. If the mean number of hours per day for Monday was 6.7 hours and the standard deviation was 2.7, do the data provide sufficient evidence to indicate that the mean number of hours worked on Mondays, for all of the company's programmers will equal 7 hours or does it show that it will be less than 7 hours?

6. (8 points) The impression is that the Loop area of Houston is the most expensive area. Given the mean neighborhood rental prices of three bedroom units in 1990, it is not clear. Here are the descriptive statistics from the 1990 US Census.

	Neighborhoods	Mean	Standard Deviation
Inner Loop	123	\$533.00	\$213.15
Outer Loop	459	\$601.80	\$171.86

Test the hypothesis that the difference between the mean values of these two regions is equal to zero. Use as an alternative hypothesis that the difference is not equal to zero.

7. (10 points - bonus question) A “Union Shop” clause in a contract requires every worker to join the union soon after starting to work at the company. In 1973, there were 31 states that permitted the Union Shop and 19 states that had earlier passed “Right-to-Work” laws that outlaw the Union Shop and certain other practices. A random sample of five states from each group showed the following average hourly wages within the state:

States with Union Shops	States with Right-to-Work
\$4.00	\$3.50
3.10	3.60
3.60	3.20
4.20	3.90
4.60	2.80

On the basis of these figures, a policy analyst claims that these laws are costless - on the average, workers in each state will earn the same pay. Others say that this is not true. Use the appropriate sample test to test the claim.