Instructions: The exam consists of eight questions. The total points for each questions is listed with the questions. The maximum number of possible points is 45. All the paper you should need is provided in the exam.

Here is a list of conditions that apply.

1. Show all work.

2. Probability table is provided.

3. When given a choice of equations (e.g., two methods to compute $\sigma_{\bar{x}}$), indicate your choice.

4. If not specified, use a confidence interval of 95% or a p (or α) value of 0.05.

5. If a question makes use of a sample test, specify null and alternative hypotheses, the significance level and critical regions and whether it is a one or two tailed test. Make a decision regarding the outcome of the test statistics.

1. (7 points) Two survey research groups each created a set of data describing a population of workers. For the first set of data (Data A), the wage question was poorly worded. Respondents randomly under reported or over reported their wages. For the second set of data (Data B), the wage question was properly prepared. Amazingly, both data sets have the same value of μ.

   (a) Compare the sets of data using the properties of point estimators. Given this comparison, which data set would you choose?

   (b) A researcher is interested in selecting samples from both sets of data. The minimum sample size for both will be based on the same margin of error value and width of confidence level. Using the sample size equation, compare the minimum sample size from Data A with Data B. How do they compare?

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. (6 points)

    (a) Is the normal approximation to the sampling distribution of $\hat{p}$ appropriate when n = 200 and p =0.80?

    (b) Use the results of part a to find the probability that $\hat{p}$ is greater than 0.85.

    (c) Use the results of part a to find the probability that $\hat{p}$ lies between 0.77 and 0.83.

4. (3 points) Find and interpret a two-sided, 95% confidence interval for a population mean μ for these values.

   (a) n=36, $\bar{x} = 14.3$ $s^2 = 3.5$
   (b) n=66, $\bar{x} = 4.35$ $s^2 = 0.203$

5. (6 points) Independent random samples were selected from two populations. The sample size, the means and variances for age are as follows:

	Population A	Population B
Size	35	43
Mean (age)	37	41
Variance	6.25	11

(a) Find a 90 % confidence interval for estimating the difference in population means $(\mu_1 - \mu_2)$.

(b) Based on the confidence interval in part a, can you conclude that there is a difference in the means of the two population? Explain.

6. (6 points) Many companies are becoming involved in flextime, in which a worker schedules his or her own work hours or compresses work weeks. A 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 80 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 be less than 7 hours? Test using $\alpha =0.05$.

7. (5 points) In an attempt to compare the starting salaries for college graduates who majored in education and the social sciences, random samples of 50 recent college graduates in each major were selected and the following information was obtained.

Major	Mean starting wage	Standard Deviation
Education	25,665	2325
Social Sciences	32,700	4760

(a) Do the data provide sufficient evidence to indicate a significant difference in the average starting wages for college graduates who majored in education and the social sciences? Test using $\alpha = 0.05$

8. (6 points) Independent random samples of $n_1 = 140$ and $n_2 = 140$ observations were randomly selected from binomial populations 1 and 2. Sample 1 had 74 successes and sample 2 had 81 successes. Do the data provide sufficient evidence to indicate a difference in the population proportions? Use $\alpha = 0.01$.