MATH 140 NAME_____
SCHILLING

TEST #3

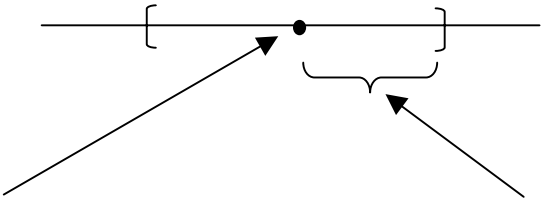
SHOW ALL WORK

1. (a) Explain clearly what is meant by "the sampling distribution of the sample mean $\bar{x}$".
Do not indicate what the distribution looks like (that's for part (b), below).

(b) Suppose we have a large population in which the distribution of the variable of interest is moderately skewed to the right with mean 40 and standard deviation 12. Draw a sketch of the approximate sampling distribution of $\bar{x}$ for the case when $n = 64$.

(c) What technical condition not given above needs to be satisfied in order for the answer you gave in part (b) to be valid?

2. A confidence interval for a population proportion can be diagrammed on a number line as shown below. Identify (give the correct names for) the two items shown:



(a) _____ (b) _____

3. National data show that, on the average, college freshmen spend 7.5 hours a week going to parties. The president of Elbonia College doesn't believe that these figures apply at her college. She has you, her assistant, take a simple random sample of 40 freshmen and interview them about how much time they spend at parties. You find that the 95% confidence interval for the number of hours per week that Elbonia College students spend going to parties is (5.72, 7.42).

(a) Explain to the President what is meant by the phrase "95% confidence" here.

The President also wants you to test the hypothesis that the Elbonia College mean is different from the national mean.

(b) Specify the null and alternative hypotheses for this test, using the correct symbols and numbers.

Null: Alternative:

(c) The sample mean and standard deviation are $\bar{x} = 6.57$ hrs and $s = 2.66$ hrs, respectively. Determine the value of the test statistic.

(d) Use the tables provided to make a numerical statement about the *p*-value. What should you conclude (reject H_0, do not reject H_0) at a 5% significance level? Justify your answer.

4. Suppose you wish to determine whether more than 10% of all Americans are left-handed. You take a random sample of 5,000 Americans and find that 556 are left-handed.

(a) Calculate a 99% confidence interval for the proportion of left-handers in America.

(b) Perform a test of significance (include hypotheses!) and use the *p*-value you obtain to assess the strength of the evidence that more than 10% of all Americans are left-handed.

5. Explain briefly how each of the following two components of a statistical analysis affect the size (width) of a confidence interval:

(a) sample size

(b) confidence level

6. A television news program conducts a call-in poll about a proposed city ban on handgun ownership, with the result that 1921 of 2372 calls oppose the ban. The news anchor makes the following announcement: "81% of our sample opposed the ban, and we are 95% confident that the actual proportion of citizens opposing a handgun ban is within 1.6% of this figure."

a) Show how the station calculated the 81% and 1.6% figures that it cites.

b) Is the station's conclusion justified? Explain briefly.

7. A psychologist believes that when people are asked to choose a number at random from the values 1, 2, 3 and 4, they pick "3" more often than would be expected if they were really picking a number randomly. He studies a random sample of 40 college students and 17 of them pick "3". Is this data enough to establish with a high degree of certainty that his theory is correct? Let θ be the proportion of all college students who would pick "3", and carry out a test of significance to find out, as follows:

(a) What proportion of the time would "3" be picked if numbers were really selected randomly from {1,2,3,4}?

(b) Give the null hypothesis (write in correct symbolic notation):

(c) Give the alternative hypothesis (write in correct symbolic notation):

(d) Compute the value of the test statistic:

(e) Find the *p*-value, and use it to answer the question given above:

PARAMETER(S)	**INFERENCE FORMULAS**	
θ:	$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$	$Z = \frac{\hat{p} - \theta_0}{\sqrt{\frac{\theta_0(1-\theta_0)}{n}}}$
μ:	$\bar{x} \pm t^* \frac{s}{\sqrt{n}}$	$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$ (with n–1 d.f.)