1) a. Explain the difference between parameter and statistic

b. For a fixed value of $\sigma$, what is the relationship between the sample size $n$ and 95% bound on the error of estimation.

c. For a fixed sample size $n$, what is the effect of an increasing value of $\sigma$ on 95% bound on the error of estimation?

d. What is meant by the confidence coefficient when constructing a confidence interval?

e. Explain the relationship between the width of a confidence interval and confidence coefficient when constructing a confidence interval.

f. What rule of thumb is used to decide to use CLT when using the techniques for statistical estimation.

g. Assume that $\alpha$ remains constant, explain the relationship between the width of confidence interval and sample size $n$.

2. Fifty cups of coffee are selected from the vending machine in an office. For this sample, the mean is 7.6 ounce. Give a 95% confidence interval for the mean amount of coffee dispensed by this machine. Assume the standard deviation is .4 ounce. Interpret this result.

3. In a crash set of 15 Honda Odyssey minivans, collision repair costs are found to have a distribution that is normal with a mean of $1786 and a standard deviation of $937.

a. What is the name of the distribution to use to calculate the confidence interval for the mean repair costs in all such vehicles collisions.

b. Under what conditions, the distribution from part a) is used.

C. Construct the 99% confidence interval for the mean repair cost in all such vehicles collisions.

d. Interpret the result in words of the problem.

4. Results of a random sample of 1500 registered voters across the U.S.A. showed that 52% of them would prefer a “Super morally straight person” to be the president of United States.

a). Find a point estimate for the true proportion, $p$, that prefer a president to be a super morally straight person.
b). Is the sample size large enough to construct a confidence interval?

c) Construct a 99 % confidence interval for the proportion of all voters that hold that view.

d) Interpret the this confidence interval in the words of the problem,

5. Give the math version of the hypothesis and indicate whether it is a null or research hypothesis.
   a. The percentage of viewers tuned to 60 minutes is equal to 24 %.

   b. Fewer than one half of the all internet users make on-line purchases.

   c. Salaries among women business analyst have a standard deviation greater than $ 3000.

   d. The mean salary of a statistics professors is at least $ 60,000.

   e. The mean amount of coca cola in cans is at least 12 oz.

   f. the proportion of defective computers is less than 0.05.

   g. The mean age of a gambler is greater than 30 years.

   h. Women’s heights have a standard deviation less than 2.8 inches, which is the standard deviation for men’s height.

6. Define the following.

   1. Type I and Type II errors.

   2. The probabilities \( \alpha \) and \( \beta \)

   3. The level of significance

7. Points 15) For each partial hypothesis test, fill in the missing steps (blanks).

   1. \( \alpha = \) _____________, \( RR: z > 1.645. \)

      Calculation: \( z = 2.73 \) (given).

      Decision: __________________________.

   2. \( H_0: \mu < 6. \) \( H_0: \) ________________.
n = 5, s = 1.3

Test statistic: (formula).__________________.

Assumptions: ___________________.

\( \alpha = .05. \)

RR:___________________________

8. (Points 12) Use the p-value method to test the following test of hypothesis.

Claim: The mean height of the men is equal to 70 Inches.

\[ H_a : \mu \neq 70. \quad H_0 : \mu = 70. \]

\( Z = -2. \) \( \alpha = .05. \)

P-value:______________.

RR:_________________.

Decision:__________________.

Conclusion:___________________

9. According to the U.S. Census Bureau, the mean family size was 3.19 in 1999. The mean family size of a sample of 1500 families is 3.10 with a standard deviation of .7. Assume that significance level \( \alpha \) is .05.

a. State the null and alternative hypothesis to test that hypothesis that mean family size of all families differs from sample mean family size.

b. Test statistic and calculations:______
c. RR:_______

Decision:_________.

Does it appear that mean family size of all families is different from sample mean. (Explain)

10. A company claims that its battery has a mean life of 65 months. A consumer protection agency tested 15 batteries and found the mean 63 months with a standard deviation of 2 months. The life such a battery has approximately normal distribution. Assume that $\alpha = .05$.

Give null and alternative hypothesis to test if all such batteries has mean less than 65 months.

Statistic:__________ calculations:__________

Critical value:______________, RR:

Decision and summary:________

11) When properly working, a machine does not produce more than 4% defective items. Whenever a machine produces greater than 4% defective items, it needs adjustment. A random sample of 200 items taken from the production line by the quality control manager contained 14 defective items. Test at %5 significance level if the machine needs the adjustment. (give null, alternative hypothesis, statistic, calculations, critical value(s), RR and decision.)

12.a If you wish to estimate a population mean to within a bound $B = .2$ using a 95% confidence interval and you know from prior sampling that $s^2$ is approximately equal to 5.4. How many observations would you have to include in your sample?

b. Find the approximate sample size required to construct a 95% confidence interval for $p$ that has bound $B = .06$. 