

Multiple Choice. Circle the letter corresponding to the best answer.

- A sociologist is studying the effect of having children within the first two years of marriage on the divorce rate. Using hospital birth records, she selects a random sample of 200 couples who had a child within the first two years of marriage. Following up on these couples, she finds that 80 couples are divorced within five years. To determine if having children within the first two years of marriage increases the divorce rate we should test
 - hypotheses $H_0: p = 0.50, H_a: p \neq 0.50$.
 - hypotheses $H_0: p = 0.50, H_a: p > 0.50$.
 - hypotheses $H_0: p = 0.50, H_a: p < 0.50$.
 - hypotheses $H_0: p = 0.40, H_a: p > 0.40$.
 - none of the above.
- In order to study the amounts owed to a particular city, a city clerk takes a random sample of 16 files from a cabinet containing a large number of delinquent accounts and finds the average amount \bar{x} owed to the city to be \$230 with a sample standard deviation of \$36. It has been claimed that the true mean amount owed on accounts of this type is greater than \$250. If it is appropriate to assume that the amount owed is a Normally distributed random variable, the value of the test statistic appropriate for testing the claim is
 - 3.33
 - 1.96
 - 2.22
 - 0.55
 - 2.1314
- An inspector inspects large truckloads of potatoes to determine the proportion p in the shipment with major defects prior to using the potatoes to make potato chips. Unless there is clear evidence that this proportion is less than 0.10, she will reject the shipment. To reach a decision she will test the hypotheses $H_0: p = 0.10, H_a: p < 0.10$ using the large-sample test for a population proportion. To do so, she selects an SRS of 50 potatoes from the more than 2000 potatoes on the truck. Suppose that only two of the potatoes sampled are found to have major defects.

Which of the following conditions for inference about a proportion using a hypothesis test are violated?

 - The data are an SRS from the population of interest.
 - The population is at least 10 times as large as the sample.
 - n is so large that both np_0 and $n(1 - p_0)$ are 10 or more, where p_0 is the proportion with major defects if the null hypothesis is true.
 - There appear to be no violations.
 - More than one condition is violated.
- What is the value of t^* , the critical value of the t distribution with 8 degrees of freedom, which satisfies the condition that the probability is 0.10 of being larger than t^* ?
 - 1.415
 - 1.397
 - 1.645
 - 2.896
 - 0.90

5. The water diet requires one to drink two cups of water every half hour from when one gets up until one goes to bed, but otherwise allows one to eat whatever one likes. Four adult volunteers agree to test the diet. They are weighed prior to beginning the diet and after six weeks on the diet. The weights (in pounds) are

Person	1	2	3	4
Weight before the diet	180	125	240	150
Weight after six weeks	170	130	215	152

For the population of all adults, assume that the weight loss after six weeks on the diet (weight before beginning the diet – weight after six weeks on the diet) is Normally distributed with mean μ . To determine if the diet leads to weight loss, we test the hypotheses

$$H_0: \mu = 0, H_a: \mu > 0$$

Based on these data we conclude that

- we would not reject H_0 at significance level 0.10.
 - we would reject H_0 at significance level 0.10 but not at 0.05.
 - we would reject H_0 at significance level 0.05 but not at 0.01.
 - we would reject H_0 at significance level 0.01.
 - the sample size is too small to allow use of the t procedures.
6. Because t procedures are robust, the most important condition for their use is
- the population standard deviation is known
 - the population distribution is exactly Normal
 - the data can be regarded as an SRS from the population
 - np and $n(1 - p)$ are both at least 10
 - there are no outliers in the sample data
7. Which of the following 95% confidence intervals would lead us to reject $H_0 : p = 0.30$ in favor of $H_a : p \neq 0.30$ at the 5% significance level?
- (0.30, 0.38)
 - (0.19, 0.27)
 - (0.27, 0.31)
 - (0.24, 0.30)
 - None of these
8. A medical researcher wishes to investigate the effectiveness of exercise versus diet in losing weight. Two groups of 25 overweight adult subjects are used, with a subject in each group matched to a similar subject in the other group on the basis of a number of physiological variables. One of the groups is placed on a regular program of vigorous exercise but with no restriction on diet, and the other is placed on a strict diet but with no requirement to exercise. The weight losses after 20 weeks are determined for each subject, and the difference between matched pairs of subjects (weight loss of subject in exercise group – weight loss of matched subject in diet group) is computed. The mean of these differences in weight loss is found to be -2 lb with standard deviation $s = 4$ lb. Is this evidence of a difference in mean weight loss for the two methods? To answer this question, you should use
- one-proportion z test
 - one-sample t test
 - one-sample z test
 - one-proportion z interval
 - one-sample t interval

Does too much sleep impair intellectual performance? Researchers examined this commonly held belief by comparing the performance of subjects on the mornings following (a) two normal night's sleep and (b) two nights of "extended sleep." In the morning they were given a number of tests of ability to think quickly and clearly. One test was for vigilance where the lower the score, the more vigilant the subject, (vigilance = alertness). The following data were collected:

Subject	1	2	3	4	5	6	7	8	9	10
Normal	8	9	14	4	12	11	3	26	3	11
Extended	8	9	15	2	21	16	9	38	10	11

9. If this experiment was properly designed, explain how the assignment of subjects to treatments could have been carried out.

10. Carry out an appropriate test to help answer the researchers' question.

Eleven percent of the products produced by an industrial process over the past several months fail to conform to the specifications. The company modifies the process in an attempt to reduce the rate of nonconformities. In a trial run, the modified process produces 16 nonconforming items out of a total of 300 produced.

11. Do these results demonstrate that the modification is effective? Support your conclusion with a test of significance.

12. Construct and interpret a 95% confidence interval for the proportion of nonconforming items for the modified process.