Lab #7 Name: ________________________________

Use the following to answer questions 1-3:

An SRS of 20 recent birth records at the local hospital were selected. In the sample, the average birth weight was 121.4 ounces and the standard deviation was 7.5 ounces. Assume that in the population of all babies born in this hospital, the birth weights follow a Normal distribution, with some mean μ.

1. The standard error of the mean is
   A) 27.1.
   B) 6.1.
   C) 1.7.
   D) 0.4.

2. We are interested in a 99% confidence interval for the population mean birth weight. The margin of error associated with the confidence interval is
   A) 21.46 ounces.
   B) 4.80 ounces.
   C) 1.07 ounce.
   D) 0.84 ounces.

3. A 90% confidence interval for the population mean birth weight based on these data is
   A) 121.4 ± 5.63 ounces.
   B) 121.4 ± 4.80 ounces. ***** Be careful this is the answer for a 99% CI (the previous problem) *****
   C) 121.4 ± 3.29 ounces.
   D) 121.4 ± 2.89 ounces.

4. The one sample t statistic from a sample of $n = 25$ observations for the one-sided test of $H_0: \mu = 9$, $H_a: \mu > 9$ has the value $t = 1.84$.
   Based on this information
   A) P-value > 0.10.
   B) 0.025 < P-value < 0.05.
   C) we would reject the null hypothesis at $\alpha = 0.025$.
   D) both (b) and (c) are correct.

Use the following to answer questions 5-8:

A special diet is intended to reduce the cholesterol of patients at risk of heart disease. If the diet is effective, the target is to have the average cholesterol of this group be below 200. After six months on the diet, an SRS of 50 patients at risk for heart disease had an average cholesterol of $\bar{x}$ = 192, with standard deviation s = 21. Is this sufficient evidence that the diet is effective in meeting the target? Assume the distribution of the cholesterol for patients in this group is approximately Normal with mean μ.

5. The appropriate hypotheses are
   A) H_0: $\mu = 200$, H_a: $\mu < 200$.
   B) H_0: $\mu = 200$, H_a: $\mu > 200$.
   C) H_0: $\mu = 192$, H_a: $\mu \neq 192$.
   D) H_0: $\mu = 200$, H_a: $\mu \neq 200$.

6. The appropriate degrees of freedom for this test are
   A) 21.
   B) 49.
   C) 51.
   D) 200.

7. Based on the data, the value of the one-sample t statistic is
   A) 3.42.
   B) 2.89.
   C) –2.69.
   D) –2.89.

8. The P-value for the one-sample t test is
   A) larger than 0.10.
   B) between 0.10 and 0.05.
   C) between 0.05 and 0.01.
   D) below 0.01.

Use the following to answer questions 9-10:

We wish to see if, on average, traffic is moving at the posted speed limit of 65 miles per hour along a certain stretch of Interstate 70. On each of four randomly selected days, a randomly selected car is timed and the speed of the car is recorded. The observed speeds are 70, 65, 70, and 75 miles per hour. Assuming that speeds are Normally distributed with mean μ, we test whether, on average, traffic is moving at 65 miles per hour, by testing the hypotheses
H_0: $\mu = 65$, H_a: $\mu \neq 65$.

9. Based on the data, the value of the one-sample *t* statistic is
   A) 5.
   B) 4.90.
   C) 2.45.
   D) 1.23.

10. Based on these data,
   A) we would reject H_0 at significance level 0.10 but not at 0.05.
   B) we would reject H_0 at significance level 0.05 but not at 0.025.
   C) we would reject H_0 at significance level 0.025 but not at 0.01.
   D) we would reject H_0 at significance level 0.01.

Use the following to answer questions 11-12:

Bags of a certain brand of tortilla chips claim to have a net weight of 14 ounces. Net weights actually vary slightly from bag to bag and are Normally distributed with mean μ. A representative of a consumer advocate group wishes to see if there is any evidence that the mean net weight is less than advertised and so intends to test the hypotheses
H_0: $\mu = 14$, H_a: $\mu < 14$.
To do this, he selects 16 bags of this brand at random and determines the net weight of each. He finds the sample mean to be $\bar{x} = 13.88$ and the sample standard deviation to be $s = 0.24$.

11. Based on these data,
   A) we would reject H_0 at significance level 0.10 but not at 0.05.
   B) we would reject H_0 at significance level 0.05 but not at 0.025.
   C) we would reject H_0 at significance level 0.025 but not at 0.01.
   D) we would reject H_0 at significance level 0.01.

12. Suppose we were not sure if the distribution of net weights was Normal. In which of the following circumstances would we not be safe using a *t* procedure in this problem?
    A) The mean and median of the data are nearly equal.
    B) A histogram of the data shows moderate skewness.
    C) A stemplot of the data has a large outlier.
    D) The sample standard deviation is large.

Use the following to answer questions 13-14:

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 minus weight after six weeks on the diet) is Normally distributed with mean μ.

13. 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
    A) we would not reject H_0 at significance level 0.10.
    B) we would reject H_0 at significance level 0.10 but not at 0.05.
    C) we would reject H_0 at significance level 0.05 but not at 0.01.
    D) we would reject H_0 at significance level 0.01.

14. A 95% confidence interval for μ based on these data is
    A) 7 ± 21.70.
    B) 7 ± 13.64.
    C) 7 ± 6.82.
    D) 7 ± 4.00.

15. Do students tend to improve their math SAT scores the second time they take the test? A random sample of four students who took the test twice received the following scores.

Student	1	2	3	4
First score	450	520	720	600
Second score	440	600	720	630

Assume that the change in math SAT score (second score – first score) for the population of all students taking the test twice is Normally distributed, with mean μ. A 90% confidence interval for μ is

A) 25.0 ± 64.29.
B) 25.0 ± 47.54.
C) 25.0 ± 43.08.
D) 25.0 ± 33.24.

16. You are thinking of employing a *t*-procedure to test hypotheses about the mean of a population using a significance level of 0.05. You suspect the distribution of the population is not Normal and may be moderately skewed. Which of the following statements is correct?

A) You should not use the *t*-procedure, because the population does not have a normal distribution.
B) You may use the *t*-procedure, provided your sample size is large, say, at least 50.
C) You may use the *t*-procedure, but you should probably claim the significance level is only 0.10.
D) You may not use the *t*-procedure, because *t*-procedures are robust to non-Normality for confidence intervals but not for tests of hypotheses.

17. To estimate μ, the mean salary of full professors at American colleges and universities, you obtain the salaries of a random sample of 400 full professors. The sample mean is $\bar{x}$ = $73,220, and the sample standard deviation is *s* = $4400. A 99% confidence interval for μ is

A) 73,220 ± 11,440.
B) 73,220 ± 572. ***I get 73,220 ± 577 * I guess that is close enough**
C) 73,220 ± 431.
D) 73,220 ± 28.6.

18. Which of the following is an example of a matched pairs design?

A) A teacher compares the pretest and posttest scores of students.

B) A teacher compares the scores of students using a computer-based method of instruction, with the scores of other students using a traditional method of instruction.

C) A teacher compares the scores of students in her class on a standardized test with the national average score.

D) A teacher calculates the average of scores of students on a pair of tests and wishes to see if this average is larger than 80%.

19. 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 group is placed on a regular program of vigorous exercise, but with no restriction on diet, and the other group 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 lbs. with standard deviation $s = 6$ lbs. Is this evidence of a difference in mean weight loss for the two methods? To test this, consider the population of differences (weight loss overweight adult would experience after 20 weeks on the exercise program) – (weight loss the same adult would experience after 20 weeks on the strict diet). Let μ be the mean of this population of differences and assume their distribution is approximately Normal. We test the hypotheses H_0: $\mu = 0$ versus H_a: $\mu \neq 0$, using the matched pairs *t* test. The *P*-value for this test is

A) larger than .10.

B) between .10 and .05.

C) between .05 and .01.

D) below .01.

Answer Key

1. C
2. B
3. D
4. B
5. A
6. B
7. C
8. D
9. C
10. A
11. B
12. C
13. A
14. A
15. B
16. B
17. B
18. A
19. A