Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

1. You want to compute a 96% confidence interval for a population mean. Assume that the population standard deviation is known to be 10 and the sample size is 50. The critical value to be used in this calculation is
   a. 1.960
   b. 1.645
   c. 1.751
   d. 2.054
   e. None of the above

2. You have measured the systolic blood pressure of a random sample of 25 employees of a company located near you. A 95% confidence interval for the mean systolic blood pressure for the employees of this company is (122, 138). Which of the following statements gives a valid interpretation of this interval?
   a. Ninety-five percent of the sample of employees have a systolic blood pressure between 122 and 138.
   b. Ninety-five percent of the population of employees have a systolic blood pressure between 122 and 138.
   c. If the procedure were repeated many times, 95% of the resulting confidence intervals would contain the population mean systolic blood pressure.
   d. The probability that the population mean blood pressure is between 122 and 138 is 0.95.
   e. If the procedure were repeated many times, 95% of the sample means would be between 122 and 138.

3. An analyst, using a random sample of $n = 500$ families, obtained a 90% confidence interval for mean monthly family income for a large population: ($600, $800). If the analyst had used a 99% confidence level instead, the confidence interval would be:
   a. Narrower and would involve a larger risk of being incorrect
   b. Wider and would involve a smaller risk of being incorrect
   c. Narrower and would involve a smaller risk of being incorrect
   d. Wider and would involve a larger risk of being incorrect
   e. Wider but it cannot be determined whether the risk of being incorrect would be larger or smaller

4. In an opinion poll, 25% of a random sample of 200 people said that they were strongly opposed to having a state lottery. The standard error of the sample proportion is approximately
   a. 0.03
   b. 0.25
   c. 0.0094
   d. 6.12
   e. $\sqrt{0.25(0.75)}/200$
5. In preparing to use a $t$ procedure, suppose we were not sure if the population was Normal. In which of the following circumstances would we not be safe using a $t$ procedure?

a. A stemplot of the data is roughly bell-shaped.

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.

e. The $t$ procedures are robust, so it is always safe.

6. In a poll, (a) some people refused to answer questions, (b) people without telephones could not be in the sample, and (c) some people never answered the phone in several calls. Which of these sources is included in the ±2% margin of error announced for the poll?

a. Only source (a).

b. Only source (b).

c. Only source (c).

d. All three sources of error.

e. None of these sources of error.

7. You want to compute a 90% confidence interval for the mean of a population with unknown population standard deviation. The sample size is 30. The value of $t^*$ you would use for this interval is

a. 1.96

b. 1.645

c. 1.699

d. 0.90

e. 1.311

8. The college newspaper of a large Midwestern university periodically conducts a survey of students on campus to determine the attitude on campus concerning issues of interest. Pictures of the students interviewed along with quotes of their responses are printed in the paper. Students are interviewed by a reporter "roaming" the campus selecting students to interview "haphazardly." On a particular day the reporter interviews five students and asks them if they feel there is adequate student parking on campus. Four of the students say "no." Which of the following conditions for inference about a proportion using a confidence interval are violated in this example?

a. The data are an SRS from the population of interest.

b. The population is at least ten times as large as the sample.

c. $n \hat{p} \geq 10$ and $n(1-\hat{p}) \geq 10$

d. We are interested in inference about a proportion.

8. More than one condition is violated.

9. To assess the accuracy of a laboratory scale, a standard weight that is known to weigh 1 gram is repeatedly weighed a total of $n$ times and the mean $\bar{x}$ of the weighings is computed. Suppose the scale readings are Normally distributed with unknown mean $\mu$ and standard deviation $\sigma = 0.01$ g. How large should $n$ be so that a 95% confidence interval for $\mu$ has a margin of error of ± 0.0001?

a. 100

b. 196

c. 27,061

d. 10,000
10. Many television viewers express doubts about the validity of certain commercials. In an attempt to answer their critics, the Timex Corporation wishes to estimate the proportion of consumers who believe what is shown in Timex television commercials. Let \( p \) represent the true proportion of consumers who believe what is shown in Timex television commercials. If Timex has no prior information regarding the true value of \( p \), how many consumers should be included in their sample so that they will be 95% confident that their estimate is within 0.03 of the true value of \( p \)?

a. 202
b. 203
c. 1067
d. 1068
e. 1165
Chapter 9 Practice MC Test: Testing a Claim

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. DDT is an insecticide that accumulates up the food chain. Predator birds can be contaminated with quite high levels of the chemical by eating many lightly contaminated prey. One effect of DDT upon birds is to inhibit the production of the enzyme carbonic anhydrase, which controls calcium metabolism. It is believed that this causes eggshells to be thinner and weaker than normal and makes the eggs more prone to breakage. (This is one of the reasons why the condor in California is near extinction.) An experiment was conducted where 16 sparrow hawks were fed a mixture of 3 ppm dieldrin and 15 ppm DDT (a combination often found in contaminated prey). The first egg laid by each bird was measured, and the mean shell thickness was found to be 0.19 mm. A “normal” eggshell has a mean thickness of 0.2 mm.

The null and alternative hypotheses are
A) \( H_0: \mu = 0.2; H_a: \mu < 0.2 \)
B) \( H_0: \mu < 0.2; H_a: \mu = 0.2 \)
C) \( H_0: \bar{x} = 0.2; H_a: \bar{x} < 0.2 \)
D) \( H_0: \bar{x} = 0.19; H_a: \bar{x} = 0.2 \)
E) \( H_0: \mu = 0.2; H_a: \mu \neq 0.2 \)

2. A significance test allows you to reject a hypothesis \( H_0 \) in favor of an alternative \( H_a \) at the 5% level of significance. What can you say about significance at the 1% level?
A) \( H_0 \) can be rejected at the 1% level of significance.
B) There is insufficient evidence to reject \( H_0 \) at the 1% level of significance.
C) There is sufficient evidence to accept \( H_0 \) at the 1% level of significance.
D) \( H_a \) can be rejected at the 1% level of significance.
E) The answer can’t be determined from the information given.

3. In a test of \( H_0: \mu = 100 \) against \( H_a: \mu \neq 100 \), a sample of size 10 produces a sample mean of 103 and a \( P \)-value of 0.08. Thus, at the 0.05 level of significance
A) there is sufficient evidence to conclude that \( \mu \neq 100 \).
B) there is sufficient evidence to conclude that \( \mu = 100 \).
C) there is insufficient evidence to conclude that \( \mu = 100 \).
D) there is insufficient evidence to conclude that \( \mu \neq 100 \).
E) there is sufficient evidence to conclude that \( \mu = 103 \).

4. Which of the following is not a condition for performing inference about a population mean \( \mu \)?
A) Inference is based on \( n \) independent measurements.
B) The population distribution is Normal or the sample size is large (say \( n > 30 \)).
C) The sample size must be less than 10% of the population size.
D) The data are obtained from an SRS from the population of interest.
E) Both $np$ and $n(1 - p)$ are 10 or greater.

5. Resting pulse rate is an important measure of the fitness of a person's cardiovascular system, with a lower rate indicative of greater fitness. The mean pulse rate for all adult males is approximately 72 beats per minute. A random sample of 25 male students currently enrolled in the Faculty of Agriculture was selected and the mean resting pulse rate was found to be 80 beats per minute with a standard deviation of 20 beats per minute. The experimenter wishes to test if the students are less fit, on average, than the general population.

A possible Type II error here would be to
A) conclude that the students are less fit (on average) than the general population when in fact they have equal fitness on average.
B) conclude that the students have the same fitness (on average) as the general population when in fact they are less fit (on average).
C) conclude that the students have the same fitness (on average) as the general population when in fact they have the same fitness (on average).
D) conclude that the students are less fit (on average) than the general population, when, in fact, they are less fit (on average).
E) conclude that the students have the same fitness (on average) when in fact they are more fit (on average).

6. Resting pulse rate is an important measure of the fitness of a person's cardiovascular system, with a lower rate indicative of greater fitness. The mean pulse rate for all adult males is approximately 72 beats per minute. A random sample of 25 male students currently enrolled in the Faculty of Agriculture was selected and the mean resting pulse rate was found to be 80 beats per minute with a standard deviation of 20 beats per minute. The experimenter wishes to test if the students are less fit, on average, than the general population.

A possible Type I error here would be to
A) conclude that the students are less fit (on average) than the general population when in fact they have equal fitness on average.
B) conclude that the students have the same fitness (on average) as the general population when in fact they are less fit (on average).
C) conclude that the students have the same fitness (on average) as the general population when in fact they have the same fitness (on average).
D) conclude that the students are less fit (on average) than the general population, when, in fact, they are less fit (on average).
E) conclude that the students have the same fitness (on average) when in fact they are more fit (on average).

7. Which of the following conditions are not necessary for the use of the one-proportion z procedures?
A) The sample size is at least 30
B) the data must be a random sample from the population of interest
C) The sample size is less than 10% of the population size
D) $np_0 \geq 10$
E) $n(1 - p_0) \geq 10$
8. You are thinking of using a t-procedure to test hypotheses about the mean of a population, using a significance level of 0.05. You know the population distribution is normal. Which of the following statements is correct?
   A) You should not use the t-procedure here since the population mean is less than 30.
   B) You may use the t-procedure here provided you have a sample size that is 30 or greater.
   C) You may use the t-procedure here with any sample size.
   D) You should not use the t-procedure here because this is a problem of proportions.
   E) You may use the t-procedure here provided there are no outliers or strong skewness in the sample data.

9. An educational researcher is collecting data for a study on the job market for graduating business majors in 2012. One variable of interest is the percentage of business grads who were able to find employment in their field within 6 months of obtaining their degree. The researcher hypothesizes in advance of the study that less than 40% of business grads will be able to find jobs within 6 months of graduation. To answer this question, one should use
   A) one-proportion z test
   B) one-sample t test
   C) one-sample z test
   D) one-proportion t test
   E) none of the above

10. A random sample survey of 175 skiers at a large European resort found that 28% of the those surveyed had taken a ski vacation outside their own country within the past year. The observed value of the test statistic for testing the null hypothesis $H_0: p = 0.3$ versus the alternative hypothesis $H_a: p < 0.3$ is

   $Z = \frac{0.3 - 0.28}{\sqrt{0.3(0.7)/175}}$

   $Z = \frac{0.28 - 0.3}{\sqrt{0.28(0.72)/175}}$

   $Z = \frac{0.3 - 0.28}{\sqrt{0.28(0.72)/175}}$

   $Z = \frac{0.28 - 0.3}{\sqrt{0.3(0.7)/175}}$

   None of the above
AP Statistics Chapter 10 Test - Comparing Two Populations or Groups

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. Suppose we have two SRSs from two distinct populations and the samples are independent. We measure the same variable for both samples. Suppose both populations of the values of these variables are Normally distributed but the population means and standard deviations are unknown. For purposes of comparing the two means, we use

A) Two-sample t procedures
B) Matched pairs t procedures
C) Two-proportion z procedures
D) The least-squares regression line
E) None of the above.

2. We wish to test if a new feed increases the mean weight gain compared to an old feed. At the conclusion of the experiment it was found that the new feed gave a 10 kg bigger gain than the old feed. A two-sample t test with the proper one-sided alternative was done and the resulting P-value was 0.082. This means that

A) there is an 8.2% chance the null hypothesis is true.
B) there was only an 8.2% chance of observing an increase greater than 10 kg (assuming the null hypothesis was true).
C) there was only an 8.2% chance of observing an increase greater than 10 kg (assuming the null hypothesis was false).
D) there is an 8.2% chance the alternative hypothesis is true.
E) there is only an 8.2% chance of getting a 10 kg increase.

3. A study was conducted to investigate the effectiveness of a new drug for treating Stage 4 AIDS patients. A group of AIDS patients was randomly divided into two groups. One group received the new drug; the other group received a placebo. The difference in mean subsequent survival (those with drugs – those without drugs) was found to be 1.04 years, and a 95% confidence interval was found to be 1.04 ± 2.37 years. Based upon this information, we can conclude that

A) the drug was effective since those taking the drug lived, on average, 1.04 years longer.
B) the drug was ineffective since those taking the drug lived, on average, 1.04 years less.
C) there is no evidence the drug was effective since the 95% confidence interval covers zero.
D) there is evidence the drug was effective since the 95% confidence interval does not cover zero.
E) we can make no conclusions since we do not know the sample size or the actual mean survival of each group.

4. Different varieties of fruits and vegetables have different amounts of nutrients. These differences are important when these products are used to make baby food. We wish to
compare the carbohydrate content of two varieties of peaches. Specifically, we wish to test if the two varieties are significantly different in their mean carbohydrate content. The null and alternative hypotheses are

A) $H_0: \mu_1 = \mu_2; H_a: \mu_1 < \mu_2$
B) $H_0: \mu_1 = \mu_2; H_a: \mu_1 > \mu_2$
C) $H_0: \mu_1 = \mu_2; H_a: \mu_1 \neq \mu_2$
D) $H_0: \bar{x}_1 = \bar{x}_2; H_a: \bar{x}_1 < \bar{x}_2$
E) $H_0: \bar{x}_1 = \bar{x}_2; H_a: \bar{x}_1 \neq \bar{x}_2$

5. Thirty-five people from a random sample of 125 workers from Company A admitted to using sick leave when they weren’t really ill. Seventeen employees from a random sample of 68 workers from Company B admitted that they had used sick leave when they weren’t ill. A 90% confidence interval for the difference in the proportions of workers at the two companies who would admit to using sick leave when they weren’t ill is

A) $0.03 \pm \sqrt{(0.25)(0.75)}$
B) $0.03 \pm 1.645 \sqrt{(0.25)(0.75)}$
C) $0.03 \pm 1.645 \sqrt{(0.25)(0.75)}$
D) $0.03 \pm 1.645 \sqrt{(0.25)(0.75)}$
E) $0.03 \pm 1.645 \sqrt{(0.25)(0.75)}$

6. To use the two-sample $t$ procedure to perform a significance test on the difference between two means, we assume that

A) the populations’ standard deviations are known.
B) the samples from each population are independent.
C) the distributions are exactly Normal in each population.
D) the sample sizes are large.
E) all of the above

7. In a large midwestern university (the class of entering freshmen being on the order of 6000 or more students), an SRS of 100 entering freshmen in 1993 found that 20 finished in the bottom third of their high school class. Admission standards at the university were tightened in 1995. In 1997 an SRS of 100 entering freshmen found that 10 finished in the bottom third of their high school class. Let $p_1$ and $p_2$ be the proportion of all entering freshmen in 1993 and 1997, respectively, who graduated in the bottom third of their high school class. What conclusion should we draw?
A) We are 95% confident that the admissions standards have been tightened.
B) Reject $H_0$ at the $\alpha = 0.01$ significance level.
C) Fail to reject $H_0$ at the $\alpha = 0.05$ significance level.
There is significant evidence at the 5% level of a decrease in the proportion of freshmen who graduated in the bottom third of their high school class that were admitted by the university.

E) If we reject \( H_0 \) at the \( \alpha = 0.05 \) significance level based on these results, we have a 5% chance of being wrong.

8. 42 of 65 randomly selected people at a baseball game report owning an iPod. 34 of 52 randomly selected people at a rock concert occurring at the same time across town reported owning an iPod. A researcher wants to test the claim that the proportion of iPod owners at the two venues is not the same. A 90% confidence interval for the difference in population proportions is \((-0.154, 0.138)\). Which of the following gives the correct outcome of the researchers' test of the claim?

A) Since the confidence interval includes 0, the researcher can conclude that the proportion of iPod owners at the two venues is the same.
B) Since the confidence interval includes 0, the researcher can conclude that the proportion of iPod owners at the two venues may be the same.
C) Since the confidence interval includes 0, the researcher can conclude that the proportion of iPod owners at the two venues is different.
D) Since the confidence interval includes more positive than negative values, we can conclude that a higher proportion of people at the baseball game own iPods than at the rock concert.
E) We cannot draw a conclusion about a claim without performing a significance test.

9. The power takeoff driveline on tractors used in agriculture is a potentially serious hazard to operators of farm equipment. The driveline is covered by a shield in new tractors, but for a variety of reasons, the shield is often missing on older tractors. Two types of shields are the bolt-on and the flip-up. It was believed that the bolt-on shield was perceived as a nuisance by the operators and deliberately removed, but the flip-up shield is easily lifted for inspection and maintenance and may be left in place. In a study initiated by the U.S. National Safety Council, a sample of older tractors with both types of shields was taken to see what proportion were removed. Of 183 tractors designed to have bolt-on shields, 35 had been removed. Of the 136 tractors with flip-up shields, 15 were removed. We wish to test \( H_0: p_b = p_f \) vs. \( H_a: p_b \neq p_f \) where \( p_b \) and \( p_f \) are the proportion of tractors with the bolt-on and flip-up shields removed, respectively. Which of the following conditions for performing the appropriate significance test is satisfied in this case?

A) Both population distributions are Normally distributed.  
B) Two independent simple random samples were chosen.
C) Both sample sizes are at least 30.  
D) \( np \) and \( n(1-p) \) are both large enough to use Normal calculations.
E) The sample size is at least 10 times the population size.

10. All of us nonsmokers can rejoice—the mosaic tobacco virus that affects and injures tobacco plants is spreading! Meanwhile, a tobacco company is investigating if a new treatment is effective in reducing the damage caused by the virus. Eleven plants were randomly chosen. On each plant, one leaf was randomly selected, and one half of the leaf (randomly chosen) was coated with the treatment, while the other half was left untouched (control). After two weeks, the amount of damage to each half of the leaf was assessed.
What is the best reason for performing a paired experiment rather than a two-independent sample experiment in this case?

A) It is easier to do since we need fewer experimental units and each unit receives more than one treatment.

B) It allows us to remove variation in the results caused by other factors since we can compare both treatments within the same experimental unit.

C) The computer program is more accurate since we work only with the differences.

D) It requires fewer assumptions since we are interested only in the difference between treatments.

E) It allows us to do more experiments since we use each experimental unit twice.