Name:

AP Statistics 8 MC Practice

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. 0.06

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.
e. 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 μ and standard deviation σ = 0.01 g. How large should n be so that a 95% confidence interval for μ has a margin of error of ± 0.0001?

a. 100
b. 196
c. 27,061
d. 10,000
e. 38,416

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

AP Statistics Practice Free Response Test – Chapter 8: Estimating with Confidence

1. A 2005 report by the American Management Association summarized the results of an extensive survey given to 526 randomly selected U.S. businesses. One of the questions asked was whether the company had fired any employees for misuse of the Internet while at work. The report gave a confidence interval of .229 to .292 for the proportion of all U.S. companies that have fired employees for misuse of the Internet while at work.

   (a) What proportion of the businesses in the sample had answered yes to this question?

   (b) What was the margin of error for this interval?

   (c) Explain to someone who does not know anything about statistics why we can't simply say that the answer to part (a) is true for all U.S. businesses.

2. A random sample of 1100 teenagers (ages 12 to 17) was asked whether they played games online; 775 said that they did.

   (a) Verify that the conditions are met here for inference about a population proportion p.

   (b) Construct and interpret a 99% confidence interval for the population proportion p.

   (c) How large a sample would you need to take to estimate p within 2% at a 99% confidence level? Use $\hat{p}$ for the value of p*. Show your work.

3. Rocky Mountain Airlines Flight 441 flies from Denver to Albuquerque each day at 8:00 am. The flight is listed as taking 58 minutes, on average. A random sample of 9 of these flight times, rounded to the nearest minute, is given in the table below.

56	62	59	58	60	57	59	61	62

   (a) Construct a 95% confidence interval for the true mean flight time for Flight 441.

   (b) Does the interval in (a) give you reason to suspect that the claim of 58 minutes is false? Explain.

   (c) What concern do you have about the data used here to construct the confidence interval in part (a)? Explain.

Name:
Score: 0 / 10 points (0%)

AP Statistics 8 MC Practice

Multiple Choice

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____ 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.

ANSWER: D

The "critical value" means z* or t*. Since we are working with means and we are given the population stabdard deviation σ, we use z*. Using Table C (bottom row), we see that for 96% confidence, z* = 2.054.

POINTS: 0 / 1

____ 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.

ANSWER: C

Only answer c correctl;y states what the 95% means. Be sure to remember that the calculations used in creating the interval give us a 95% chance of resulting in an interval that contains the true population mean.

POINTS: 0 / 1

____ 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

ANSWER: B

To achieve increased confidence, we must get a wider interval. That gives us a greater chance that the interval will contain the true population mean, μ. Recall also that the value of z* or t* will be larger, generating a larger margin of error. With the wider interval, we decrease the chance that our interval will not contain μ (so lower risk).

POINTS: 0 / 1

___ 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. 0.06

ANSWER: A

The standard error (SE) for a sample proportion is found using the formula $\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$.

In this problem, p-hat = .25 and n = 200, so SE = $\sqrt{\frac{.25(.75)}{200}} = .03$.

POINTS: 0 / 1

___ 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.

ANSWER: C

In general, outliers and strong skewness prohibit the use of the t procedures, unless we have a large sample size.

POINTS: 0 / 1

___ 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.

ANSWER: E

The margin of error only includes errors due to random sampling. All of the errors listed fall under other types of errors which are not explained by the margin of error.

POINTS: 0 / 1

___ 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

ANSWER: C

First we compute the degrees of freedom (df). The df = n - 1 = 29. From Table C , with 90% confidence and df = 29. we see that t* = 1.699.

POINTS: 0 / 1

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.
e. More than one condition is violated.

ANSWER: E

There are two main violations here.
(1) The sample was chosen "haphazardly" which means we can't consider it a Simple Random Sample (SRS).
(2) The requirement that number of successes and failures be at least 10 ($n\hat{p} \geq 10$ and $n(1-\hat{p}) \geq 10$) is not met . There are only 5 people interviewed, with 1 "yes" and two "no's".

POINTS: 0 / 1

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 μ and standard deviation σ = 0.01 g. How large should *n* be so that a 95% confidence interval for μ has a margin of error of ± 0.0001?

a. 100
b. 196
c. 27,061
d. 10,000
e. 38,416

ANSWER: E

Since σ is known, we are working with a *z* confidence interval for a population mean. The margin of error in that interval is $m = z^* \frac{\sigma}{\sqrt{n}}$. Solving that formula for n, we get $n = \left(\frac{z^* \sigma}{m}\right)^2$. Here we have z*=1.96 (for 95% confidence), σ = 0.01 and m = .0001, so $n = \left(\frac{1.96 * .01}{.0001}\right)^2 = 38,416$.

POINTS: 0 / 1

___ 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

ANSWER: D

Since this is a scenario involving proportions, we are working with a *z* confidence interval for a population proportion. The margin of error in that interval is $m = z*\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$. Solving that formula for n, we get $n = p*(1-p*)\left(\frac{z*}{m}\right)^2$. Here we have z*=1.96 (for 95% confidence), m = .03 and we use p*=0,5 (since there is no other value suggested). The result is $n = (0.5)(0.5)\left(\frac{1.96}{.03}\right)^2 = 1067.111$ which we round up to 1068..

POINTS: 0 / 1

AP Statistics Practice Free Response Test – Chapter 8: ANSWERS

1 – (a): Need to find p-hat, which is the midpoint of the interval: $\hat{p} = \frac{.229+.292}{2} = .2605$

1 – (b): Margin of Error is half the width of the interval: ME $= \frac{.292-.229}{2} = .0315$

1 – (c): The sample results describes only the 526 businesses in the survey. If we selected another 526 businesses and asked the same question, results would vary. We don't know the actual proportion for all businesses - that is why the margin of error is so important. It gives us a range of values that the true proportion is almost certainly to lie within.

2 – (a): **SRS** – sample was random
Normality – 775 successes and 325 failures; both are easily greater than 10
Independence – The population of teenagers in the U.S. is much greater than 10 times the sample size (11,000)

2 – (b): **Interval** = $.705 \pm 2.576\sqrt{\frac{(.705)(.295)}{1100}}$ = .66911 to .73998

Interpretation: We can be 99% confident that the true proportion of teenagers that play games online is between 66.9% and 74.0%.

2 – (c): n = $(.705)(.295)(2.576/.02)^2$ = 3450.189, so round up to **3451**.

3 – (a): With 95% confidence and df = 9 – 1 = 8, t* = 2.306. The sample mean for these times is 59.333. The sample standard deviation is 2.121.
So the interval is $59.333 \pm 2.306(2.121/\sqrt{9}) = 57.703$ to 60.964
(note that your interval may be slightly different, depending on how you rounded)

3 – (b): Since 58 is contained in the interval (barely), we have to assume they are correct. They might be wrong, but the interval does not give us reason to believe they are.

3 – (c): Since the sample size is so small, we must assume that the data comes from a distribution that is close to normal. If it does not, then our interval may not be accurate.