Chapter 8 Multiple Choice Practice ANSWER KEY

Directions. *Identify the choice that best completes the statement or answers the question. Check your answers and note your performance when you are finished.*

1. Gallup Poll interviews 1600 people. Of these, 18% say that they jog regularly. A news report adds: "The poll had a margin of error of plus or minus three percentage points." You can safely conclude
   (A) 95% of all Gallup Poll samples like this one give answers within ±3% of the true population value.
   (B) the percent of the population who jog is certain to be between 15% and 21%.
   (C) 95% of the population jog between 15% and 21% of the time.
   (D) we can be 3% confident that the sample result is true.
   (E) if Gallup took many samples, 95% of them would find that 18% of the people in the sample jog.

2. An agricultural researcher plants 25 plots with a new variety of corn. A 90% confidence interval for the average yield for these plots is found to be 162.72 ± 4.47 bushels per acre. Which of the following is the correct interpretation of the interval?
   (A) There is a 90% chance the interval from 158.28 to 167.19 captures the true average yield.
   (B) 90% of sample average yields will be between 158.28 and 167.19 bushels per acre.
   (C) We are 90% confident the interval from 158.28 to 167.19 captures the true average yield.
   (D) 90% of the time, the true average yield will fall between 158.28 and 167.19.
   (E) We are 90% confident the true average yield is 162.72.

3. I collect a random sample of size n from a population and from the data collected compute a 95% confidence interval for the mean of the population. Which of the following would produce a wider confidence interval, based on these same data?
   (A) Use a larger confidence level.
   (B) Use a smaller confidence level.
   (C) Use the same confidence level, but compute the interval n times. Approximately 5% of these intervals will be larger.
   (D) Increase the sample size.
   (E) Nothing can ensure that you will get a larger interval. One can only say the chance of obtaining a larger interval is 0.05.

4. A marketing company discovered the following problems with a recent poll:
I. Some people refused to answer questions
II. People without telephones could not be in the sample
III. 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 I.
   (B) Only source II.
   (C) Only source III.
   (D) All three sources of error.
   (E) None of these sources of error.

confidence intervals cannot account for sampling bias.

5. You are told that the proportion of those who answered "yes" to a poll about internet use is 0.70, and that the standard error is 0.0459. The sample size
   (A) is 50.
   (B) is 99.
   (C) is 100.
   (D) is 200.
   (E) cannot be determined from the information given.

standard error for a proportion is $\sqrt{\frac{pq}{n}}$ ← denation

$\sqrt{\frac{(.7)(.3)}{n}} = .0459$

$n \approx 100$

6. The standardized test scores of 16 students have mean $\bar{x} = 200$ and standard deviation $s = 20$. What is the standard error of $\bar{x}$?
   (A) 20
   (B) 10
   (C) 5
   (D) 1.25
   (E) 0.80

$s_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{20}{\sqrt{16}} = 5$

7. A newspaper conducted a statewide survey concerning the 2008 race for state senator. The newspaper took a random sample (assume it is an SRS) of 1200 registered voters and found that 620 would vote for the Republican candidate. Let p represent the proportion of registered voters in the state that would vote for the Republican candidate. A 90% confidence interval for p is
   (A) 0.517 ± 0.014.
   (B) 0.517 ± 0.022.
   (C) 0.517 ± 0.024.
   (D) 0.517 ± 0.028.
   (E) 0.517 ± 0.249.

$\hat{p} = \frac{620}{1200} = .517$

on calculator: 1-prop 2 int (.49294, .54039)

by hand: $\hat{p} \pm z^*\left(\sqrt{\frac{pq}{n}}\right)$

$.517 \pm 1.64\left(\sqrt{\frac{(.517)(.483)}{1200}}\right)$

↑ invNorm(.95)

8. After a college's football team once again lost a football game to the college's arch rival, the alumni association decided to conduct a survey to see if alumni were in favor of firing the coach. Let p represent the proportion of all living alumni who favor firing the coach. Which of the following is the smallest sample size needed to guarantee an estimate that's within 0.05 of p at a 95% confidence level?
   (A) 269
   (B) 385
   (C) 538
   (D) 768
   (E) 1436

margin of error $= z^*\sqrt{\frac{pq}{n}}$

$1.96\sqrt{\frac{(.5)(.5)}{n}} \leq .05$

invNorm(.975)

9. An SRS of 100 postal employees found that the average time these employees had worked for the postal service was $\bar{x} = 7$ years with standard deviation $s_x = 2$ years. Assume the distribution of the time the population of employees has worked for the postal service is approximately Normal. A 95% confidence interval for the mean time μ the population of postal service employees has spent with the postal service is
   (A) 7 ± 2.
   (B) 7 ± 1.984.
   (C) 7 ± 0.525.
   (D) 7 ± 0.4.
   (E) 7 ± 0.2.

$N(7, 2)$

on calculator t-interval (6.6, 7.4)

by hand → $\bar{x} \pm t^*\left(\frac{s}{\sqrt{n}}\right)$

$7 \pm 1.98\left(\frac{2}{\sqrt{100}}\right)$

↑ invT(.975) or t table

10. Do students tend to improve their SAT Mathematics (SAT-M) score the second time they take the test? A random sample of four students who took the test twice earned the following scores.

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

−10 80 0 30

Assume that the change in SAT-M score (second score – first score) for the population of all students taking the test twice is approximately Normally distributed with mean μ. A 90% confidence interval for μ is
   (A) 25.0 ± 118.03.
   (B) 25.0 ± 64.29.
   (C) 25.0 ± 47.56.
   (D) 25.0 ± 43.08.
   (E) 25.0 ± 33.24.

tinterval (−22.56, 72.56)

↑ Calculator

$\bar{x} \pm t^*\left(\frac{s}{\sqrt{n}}\right)$

→ by hand

$25 \pm 2.35\left(\frac{40.4}{\sqrt{4}}\right)$

↑ invT(.95) or t table

1. A 2. C 3. A 4. E 5. C 6. C 7. C 8. B 9. D 10. C

FRAPPY! Free Response AP® Problem, Yay!

The following problem is modeled after actual Advanced Placement Statistics free response questions. Your task is to generate a complete, concise response in 15 minutes. After you generate your response, view two example solutions and determine whether you feel they are "complete", "substantial", "developing" or "minimal". If they are not "complete", what would you suggest to the student who wrote them to increase their score? Finally, you will be provided with a rubric. Score your response and note what, if anything, you would do differently to increase your own score.

A machine at a soft-drink bottling factory is calibrated to dispense 12 (μ) ounces of cola into cans. A simple random sample of 35 cans is pulled from the line after being filled and the contents are measured. The mean content of the 35 cans is 11.92 ($\bar{x}$) ounces with a standard deviation of 0.085 ounce (s_x).

a) Construct and interpret a 95% confidence interval to estimate the true mean contents of the cans being filled by this machine.

We are trying to estimate the true mean contents of the cans being filled by this machine at a 95% confidence level. We will use a t interval.

CONDITIONS:
- It is stated as an SRS
- The sampling distribution is approx Normal because $35 \geq 30$ (CLT)
- There are more than $10(35)$ cans produced by this machine - independence

$(11.091, 11.949)$

We are 95% confident that the true mean contents of the cans is between 11.9 and 12 oz.

b) Based on your result from a), does the machine appear to be working properly? Justify your answer.

Since 12 oz is not in our interval, we have good evidence that the machine is not working properly and is underfilling the cans on average.

c) Interpret the confidence level of 95 percent in context.

We calculated this interval using a method that will capture the true mean contents of the cans being filled by this machine 95% of the time.