

Part 1: Multiple Choice. Circle the letter corresponding to the best answer.

1. 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

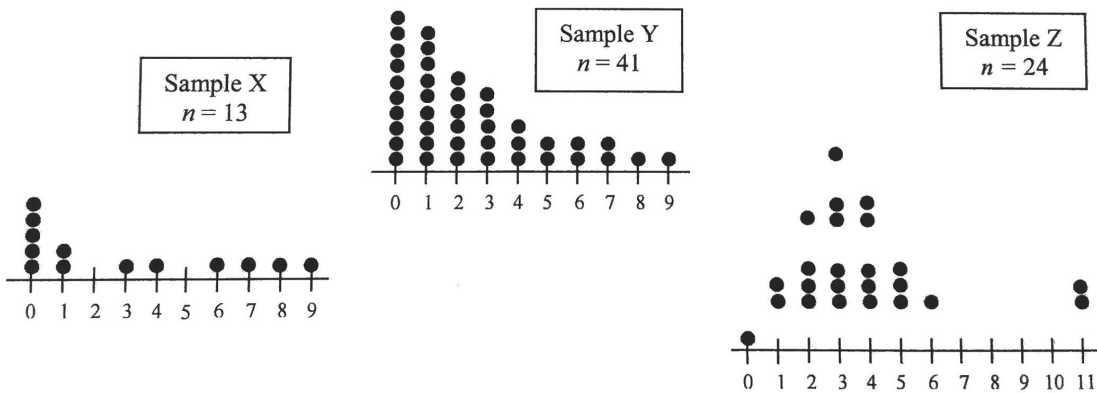
- (a) 0.0094
(b) 0.0306
(c) 0.0353
(d) 0.2500
(e) 6.1237

$$\sqrt{\frac{(.25)(.75)}{200}}$$

2. A marketing consultant wants to estimate the proportion of all shoppers at a certain mall who make at least one purchase. He stands at a mall exit for two hours on a weekday afternoon and flips a coin each time a shopper leaves. If the coin comes up heads, he asks them if they have made any purchases during this visit. After two hours, he has 132 responses, 104 of whom made a purchase. Which condition for constructing a confidence interval for a proportion has the consultant failed to satisfy?
- (a) $n\hat{p} \geq 10$
(b) $n(1 - \hat{p}) \geq 10$
(c) $n \geq 30$
(d) The data is a random sample from the population of interest.
(e) The sample is less than 10% of the population.
3. The report of a sample survey of 1,014 adults says, "With 95% confidence, between 9% and 15% of all Americans expect to spend more money on gifts this year than last year." What does the phrase "95% confidence" mean?
- (a) 95% of all Americans will spend between 9% and 15% more than what they spent last year.
(b) 9% to 15% of all Americans will spend 95% of what they spent last year.
(c) there is a 95% chance that the percent who expect to spend more is between 9% and 15%.
(d) the method used to get the interval from 9% to 15%, when used over and over, produces intervals which include the true population percentage about 95% of the time.
(e) we can be 95% confident that the method used to get the interval always gives the right answer.

4. The survey in the previous question was conducted by calling land-line telephones, and those conducting the survey are concerned about the possibility of undercoverage, since some people do not own a phone or own only a cell phone. Which of the following is the best way for them to correct for this source of bias?
- (a) Use a lower confidence level, such as 80%.
 - (b) Use a higher confidence level, such as 99%.
 - (c) Take a larger sample.
 - (d) Use a t -interval instead of a z -interval.
 - (e) Throw this sample out and start over again with a better sampling method.
5. Some scientists believe that a new drug would benefit about half of all people with a certain blood disorder. To estimate the proportion of patients who would benefit from taking the drug, the scientists will administer it to a random sample of patients who have the blood disorder. What sample size is needed so that the 95% confidence interval will have a margin of error of no more than 3%?
- (a) 748
 - (b) 1068
 - (c) 1503
 - (d) 2056
 - (e) 2401
6. Which of the following has the highest probability?
- (a) Randomly selecting a value greater than 3 from a standard Normal distribution.
 - (b) Randomly selecting a value greater than 3 from a t -distribution with 4 degrees of freedom.
 - (c) Randomly selecting a value greater than 3 from a t -distribution with 20 degrees of freedom.
 - (d) Randomly selecting a value less than 3 from a standard Normal distribution.
 - (e) Randomly selecting a value less than 3 from a t -distribution with 20 degrees of freedom.
7. A nationwide poll of 2,525 adults estimated with 95% confidence that the proportion of Americans who support health care reform is 0.78 ± 0.0162 . A member of Congress thinks that 95% confidence isn't enough. He wants to be 99% confident. How would the margin of error of a 99% confidence interval based on the same sample compare with the 95% interval?
- (a) It would be smaller, because it omits only 1% of the possible samples instead of 5%.
 - (b) It would be the same, because the sample is the same.
 - (c) It would be larger, because higher confidence requires a larger margin of error.
 - (d) Can't tell, because the margin of error varies from sample to sample.
 - (e) Can't tell, because it depends on the size of the population.

8. You want to calculate a 98% confidence interval for a population mean from a sample of $n = 18$. What is the appropriate critical t^* ?
- (a) 2.110
 (b) 2.326
 (c) 2.539
 (d) 2.552
 (e) 2.567
9. The heights (in inches) of males in the United States are believed to be approximately Normally distributed with mean μ . The mean height of a random sample of 25 American adult males is found to be $\bar{x} = 69.72$ inches and the standard deviation $s = 4.15$. What is the standard error of \bar{x} ?
- (a) 0.17
 (b) 0.69
 (c) 0.83
 (d) 1.856
 (e) 2.04
10. In checking conditions for constructing confidence intervals for a population mean, it's important to plot the distribution of sample data. Below are dot plots describing samples from three different populations. For which of the three samples would it be safe to construct a t -interval?



- (a) Sample X only
 (b) Sample Y only
 (c) Sample Z only
 (d) Samples Y and Z
 (e) None of the samples

Part 2: Free Response

Show all your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy and completeness of your results and explanations.

11. A local newspaper in a large city wants to assess support for the construction of a highway by-pass around the central business district to reduce downtown traffic. They survey a random sample of 1152 residents and find that 543 of them support the bypass.

Construct a 95% confidence interval to estimate the proportion of residents who support construction of the bypass.

$$\hat{p} = \frac{543}{1152} \approx .471$$

$$z^* = 1.96$$

$$.471 \pm (1.96) \left(\sqrt{\frac{(.471)(.529)}{1152}} \right)$$

/ \

.442 .500

$$(.442, .500)$$

We are 95% confident that the interval .442 to .500 contains the true proportion of residents who support construction of

12. There are many ways to measure the reading ability of children. Research designed to improve reading performance is dependent on good measures of the outcome. One frequently used test is the DRP, or Degree of Reading Power. A researcher suspects that the mean score μ of all third- graders in Henrico County Schools is different from the national mean, which is 32. To test her suspicion, she administers the DRP to an SRS of 44 Henrico County third-grade students. The distribution of scores is summarized in the Minitab output below:

MEAN	STDEV	SEMEAN	MIN	Q1	MEDIAN	Q3
MAX						
DRP 35.09	11.19	1.69	14.00	26.00	35.00	44.00
54.00						

\bar{x} S_x

(a) Construct a 90% confidence interval to estimate the mean DRP score in Henrico County Schools.

t^* for 90% confidence and 43 df is 1.681 but using Table B we have to use 40 df so t^* is 1.684

$$\bar{x} \pm t^* \left(\frac{S_x}{\sqrt{n}} \right) \rightarrow 35.09 \pm 1.684 \left(\frac{11.19}{\sqrt{44}} \right)$$

32.249
37.931

are 90% confident

the interval {32.249 to 37.931} contains the true mean DRP score.

(b) Use the confidence interval you constructed in (a) to comment on whether you agree with the researcher's claim. Explain your reasoning clearly.

The national mean of 32 is not in the 90% confidence interval so the mean DRP score in Henrico County is different from the national mean.