AP Stat Unit 9
Multiple Choice Practice

Name Key
Date ______________________

1. You want to estimate the mean SAT score for a population of students with a 90% confidence interval. Assume that the population standard deviation is $\sigma = 100$. If you want the margin of error to be approximately 10, you will need a sample size of

B

(a) 16 (b) 271 (c) 38
(d) 1476 (e) None of the above. The answer is ______________.

$10 = 1.645\left(\frac{100}{\sqrt{n}}\right)$

2. The Gallup Poll interviews 1600 people. Of these, 18% say that they jog regularly. The news report adds: "The poll had a margin of error of plus or minus three percentage points." You can safely conclude that

A

(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 exactly 18% of the people in the sample jog.

3. The diameter of ball bearings is known to be Normally distributed with unknown mean and variance. A random sample of size 25 gave a mean of 2.5 cm. The 95% confidence interval had length 4 cm. Then

E

(a) the sample variance is 4.86.
(b) the sample variance is 26.03.
(c) the population variance is 4.84.
(d) the population variance is 23.47.
(e) the sample variance is 23.47.

M.E. = 2

$t = 2.064$ (not z!)

$2 = 2.064\left(\frac{S_x}{\sqrt{25}}\right)$

$S_x = 4.84$

$S_x^2 = 23.47$

4. 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 new confidence interval with larger width (larger margin of error) based on these same data?

A

(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 guarantee absolutely that you will get a larger interval. One can only say the chance of obtaining a larger interval is 0.05.

5. A 95% confidence interval for the mean reading achievement score for a population of third-grade students is (44.2, 54.2). Suppose you compute a 99% confidence interval using the same information. Which of the following statements is correct?

C

(a) The intervals have the same width.
(b) The 99% interval is shorter.
(c) The 99% interval is longer.
(d) The answer can't be determined from the information given.
(e) None of the above. The answer is ______________.

6. The effect of acid rain upon the yield of crops is of concern in many places. In order to determine baseline yields, a sample of 13 fields was selected, and the yield of barley (g/400 m^2) was determined. The output from SAS appears below:

				QUANTILES(DEF=4)				EXTREMES	
N	13	SUM WGTS	13	100% MAX	392	99%	392	LOW	HIGH
MEAN	220.231	SUM	2863	75% Q3	234	95%	392	161	225
STD DEV	58.5721	VAR	3430.69	50% MED	221	90%	330	168	232
SKEW	2.21591	KURT	6.61979	25% Q1	174	10%	163	169	236
USS	671689	CSS	41168.3	0% MIN	161	5%	161	179	239
CV	26.5958	STD MEAN	16.245			1%	161	205	392

$t = 2.18$ $\quad \frac{58.572}{\sqrt{13}} = 16.2$

A 95% confidence interval for the mean yield is

D

~~(a)~~ 220.2 ± 1.96(58.6) ~~(b)~~ 220.2 ± 1.96(16.2) (c) 220.2 ± 2.18(58.6)
(d) 220.2 ± 2.18(16.2) (e) 220.2 ± 2.16(16.2)

7. The heights (in inches) of males in the United States are believed to be Normally distributed with mean μ. The average height of a random sample of 25 American adult males is found to be $\bar{x}$ = 69.72 inches, and the standard deviation of the 25 heights is found to be s = 4.15. The standard error of $\bar{x}$ is

C

(a) 0.17 (b) 0.69 (c) 0.83
(d) 1.856 (e) 2.04

$\frac{4.15}{\sqrt{25}}$

8. A 95% confidence interval for the mean μ of a population is computed from a random sample and found to be 9 ± 3. We may conclude that

(a) there is a 95% probability that μ is between 6 and 12. → probability language is not quite correct. stay away from using it.
~~(b)~~ 95% of values sampled are between 6 and 12.
(c) if we took many, many additional random samples and from each computed a 95% confidence interval for μ, 95% of these intervals would contain μ.
~~(d)~~ there is a 95% probability that the true mean is 9 and a 95% chance that the true margin of error is 3.
~~(e)~~ all of the above are true.

9. The weights of 9 men have mean $\bar{x}$ = 175 pounds and standard deviation s = 15 pounds. What is the standard error of the mean?

E

(a) 58.3 (b) 19.4 (c) 15 (d) 1.7 (e) 5 $\quad \frac{15}{\sqrt{9}}$

10. 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."

E

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.

3. A humane society wanted to estimate with 95 percent confidence the proportion of households in its county that own at least one dog.

   (a) Interpret the 95 percent confidence level in this context.

   The humane society selected a random sample of households in its county and used the sample to estimate the proportion of all households that own at least one dog. The conditions for calculating a 95 percent confidence interval for the proportion of households in this county that own at least one dog were checked and verified, and the resulting confidence interval was 0.417 ± 0.119.

   (b) A national pet products association claimed that 39 percent of all American households owned at least one dog. Does the humane society's interval estimate provide evidence that the proportion of dog owners in its county is different from the claimed national proportion? Explain.

   (c) How many households were selected in the humane society's sample? Show how you obtained your answer.

a) If the human society conducted many, many random samples of the same size, 95% of the resulting confidence intervals would contain the true proportion of households that own at least one dog.

b) The humane society's interval is between .298 and .536 of the population owning a dog. Therefore, since the claim of 39% is inside the interval, we do not have evidence that the humane society's estimate differs from the national pet prod. association claim.

c) $\hat{p} = .417$

$z^{*} = 1.96$

$ME = .119$

$n = ?$

$.119 = 1.96\sqrt{\frac{.417(1-.417)}{n}}$

$.0607 = \sqrt{\frac{.417(.583)}{n}}$

$.00368\,n = .243111$

$n \approx 66.1 \text{ or } 67$

5. A growing number of employers are trying to hold down the costs that they pay for medical insurance for their employees. As part of this effort, many medical insurance companies are now requiring clients to use generic brand medicines when filling prescriptions. An independent consumer advocacy group wanted to determine if there was a difference, in milligrams, in the amount of active ingredient between a certain "name" brand drug and its generic counterpart. Pharmacies may store drugs under different conditions. Therefore, the consumer group randomly selected ten different pharmacies in a large city and filled two prescriptions at each of these pharmacies, one for the "name" brand and the other for the generic brand of the drug. The consumer group's laboratory then tested a randomly selected pill from each prescription to determine the amount of active ingredient in the pill. The results are given in the following table.

ACTIVE INGREDIENT
(in milligrams)

Pharmacy	1	2	3	4	5	6	7	8	9	10	
Name brand	245	244	240	250	243	246	246	246	247	250	L1
Generic brand	246	240	235	237	243	239	241	238	238	234	L2
	-1	4	5	13	0	7	5	8	9	16	L3

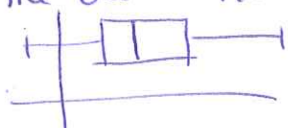
Based on these results, what should the consumer group's laboratory report about the difference in the active ingredient in the two brands of pills? Give appropriate statistical evidence to support your response.

Name

We will construct a 95% conf. interval for the true mean difference in active drug between the Name brand and the generic brand.

Conditions

An SRS of pills was taken of each type. The population of pills is clearly at least 10 x's the sample, so independence is satisfied. A Boxplot of the data shows no skewness or outliers, so we can infer the data has come from an appr. normal population.



Calculation

$$\bar{x} \pm t^* \frac{s_x}{\sqrt{n}}$$

$$6.6 \pm (2.262)\frac{5.275}{\sqrt{10}}$$

$$6.6 \pm 3.77$$

$$(2.83, 10.37)$$

Conclusion We are 95% confident that the true mean diff. in active ingred. between the Name brand drug & the generic is between 2.83 mg and 10.37 mg. Since the interval is entirely above zero, we have evidence there really is a difference in active drug.

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