Ch. 8 Practice Test

Name: Key Date: ________

1. 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 at a 95% confidence level." You can safely conclude that

Interpreting confidence level

(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 95% confident that the sample proportion is captured by the confidence interval.
(e) if Gallup took many samples, 95% of them would find that 18% of the people in the sample jog.

2. The weights (in pounds) of three adult males are 160, 215, and 195. The standard error of the mean of these three weights is

$n = 3$ $S_E: \frac{27.839}{\sqrt{3}} = 16.07$

(a) 190 (b) 27.84 (c) 22.73 (d) 16.07 (e) 13.13

$S_x = 27.839$

3. In preparing to construct a one-sample *t* interval for a population mean, suppose we are not sure if the population distribution is Normal. In which of the following circumstances would we not be safe constructing the interval based on an SRS of size 24 from the population?

(a) A stemplot of the data is roughly bell-shaped. safe
(b) A histogram of the data shows slight skewness. safe, not strong skewness or large outlier
(c) ~~A stemplot of the data has a large outlier.~~ not safe
(d) ~~The sample standard deviation is large.~~
(e) ~~The *t* procedures are robust, so it is always safe.~~

4. Many television viewers express doubts about the validity of certain commercials. In an attempt to answer their critics, Timex Group USA 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. What is the smallest number of consumers that Timex can survey to guarantee a margin of error of 0.05 or less at a 99% confidence level?

use $\hat{p} = .5$

$z^*_{99\%}$

$ME \geq z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

(a) 550 (b) 600 (c) 650 (d) 700 (e) 750

$.05 \geq 2.576 \sqrt{\frac{.5(.5)}{n}}$

5. 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

$\frac{.05}{2.576} \geq \sqrt{\frac{.25}{n}}$

(a) 1.645 (b) 1.699 (c) 1.697 (d) 1.96 (e) 2.045

$n = 30$
90%
$df = 29$ $\text{inv}T(.05, 29) = 1.699$

$n \geq \frac{.25}{\left(\frac{.05}{2.576}\right)^2}$

$n \geq 663.5776$

6. A radio talk show host with a large audience is interested in the proportion p of adults in his listening area who think the drinking age should be lowered to eighteen. To find this out, he poses the following question to his listeners: "Do you think that the drinking age should be reduced to eighteen in light of the fact that eighteen-year-olds are eligible for military service?" He asks listeners to phone in and vote "Yes" if they agree the drinking age should be lowered and "No" if not. Of the 100 people who phoned in, 70 answered "Yes." Which of the following conditions for inference about a proportion using a confidence interval are violated?

I. The data are a random sample from the population of interest.
II. n is so large that both np and $n(1-p)$ are at least 10.
III. The population is at least 10 times as large as the sample.

not a Random Sample, it is a voluntary sample

(a) I only
(b) II only
(c) III only
(d) I and II only
(e) I, II, and III

7. A 90% confidence interval for the mean μ of a population is computed from a random sample and is found to be 9 ± 3. Which of the following *could* be the 95% confidence interval based on the same data?

M.E will increase due to 5% increase in confidence level

(a) 9 ± 1.96
(b) 9 ± 2
(c) 9 ± 3
(d) 9 ± 4
(e) Without knowing the sample size, any of the above answers could be the 95% confidence interval.

8. Suppose we want a 90% confidence interval for the average amount spent on books by freshmen in their first year at a major university. The interval is to have a margin of error of \$2. Based on last year's book sales, we estimate that the standard deviation of the amount spent will be close to \$30. The number of observations required is closest to

(a) 25 (b) 30 (c) 608 (d) 609 (e) 865.

we know σ, so $ME \geq z^* \frac{\sigma}{\sqrt{n}}$

$z^*_{90\%} = 1.645$

$2 \geq 1.645 \left(\frac{30}{\sqrt{n}}\right)$

$\frac{2}{1.645} \geq \frac{30}{\sqrt{n}}$

$\sqrt{n} \geq \frac{30}{\left(\frac{2}{1.645}\right)}$

$n \geq \frac{30^2}{\left(\frac{2}{1.645}\right)^2}$

$n \geq 608.86$

9. A telephone poll of an SRS of 1234 adults found that 62% are generally satisfied with their lives. The announced margin of error for the poll was 3%. Does the margin of error account for the fact that some adults do not have telephones?

(a) Yes. The margin of error includes all sources of error in the poll.
(b) Yes. Taking an SRS eliminates any possible bias in estimating the population proportion.
(c) Yes. The margin of error includes undercoverage but not nonresponse.
(d) No. The margin of error includes nonresponse but not undercoverage.
(e) No. The margin of error only includes sampling variability.

10. A Census Bureau report on the income of Americans says that with 90% confidence the median income of all U.S. households in a recent year was $57,005 with a margin of error of ±$742. This means that

(a) 90% of all households had incomes in the range $57,005 ± $742.
(b) we can be sure that the median income for all households in the country lies in the range $57,005 ± $742.
(c) 90% of the households in the sample interviewed by the Census Bureau had incomes in the range $57,005 ± $742.
(d) the Census Bureau got the result $57,005 ± $742 using a method that will cover the true median income 90% of the time when used repeatedly. Interpreting confidence interval/level
(e) 90% of all possible samples of this same size would result in a sample median that falls within $742 of $57,005.

Must use 4 step process

Section II: Free Response

11. The U.S. Forest Service is considering additional restrictions on the number of vehicles allowed to enter Yellowstone National Park. To assess public reaction, the service asks a random sample of 150 visitors if they favor the proposal. Of these, 89 say "Yes."

(a) Construct and interpret a 99% confidence interval for the proportion of all visitors to Yellowstone who favor the restrictions.

$\boxed{\text{State:}}$ We want to estimate the true proportion p of all visitors to Yellowstone who favor the restrictions at a 99% confidence level.

$\boxed{\text{Plan:}}$ One Sample z-interval for p.

① Random: random sample of 150 visitors ✓

② 10% (Independent): 10(150) < Pop of all visitors to Yellowstone; Reasonable to assume ✓
1,150

③ Normal: 89 ≥ 10 # of successes; 61 ≥ 10 # of failures ∴ Normal ✓

$\boxed{\text{Do}}$: P.E ± ME → $\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$ → $.593 \pm 2.576\sqrt{\frac{(.593)(.407)}{150}}$ → $.593 \pm .103$ → (.490, .696)

$z^*_{99\%}$ = invNorm(.005) = 2.576

$\boxed{\text{Conclude:}}$ We are 99% confident that the interval from 0.490 to 0.696 captures the true proportion of all visitors to Yellowstone who would say they favor the restrictions.

(b) Based on your work in part (a), can the U.S. Forest Service conclude that more than half of visitors to Yellowstone National Park favor the proposal? Justify your answer.

No, the U.S. Forest service cannot conclude that more than half of visitors to Yellowstone favor the proposal because our interval contains values at 50% and below (as low as 49%.)

12. How many people live in South African households? To find out, we collected data from an SRS of 48 out of the over 700,000 South African students who took part in the CensusAtSchool survey project. The mean number of people living in a household was 6.208; the standard deviation was 2.576.

$df = 47$ $t^* = invT(.025, 47) = 2.012$ $\bar{x} \pm t^*_{95\%}\left(\frac{S_x}{\sqrt{n}}\right)$

(a) Is the Normal condition met in this case? Justify your answer.

Since sample size $48 \geq 30$, by CLT the Normal condition is met.

(b) Maurice claims that a 95% confidence interval for the population mean is $6.208 \pm 1.96\frac{0.372}{\sqrt{47}}$. Explain why this interval is wrong. Then give the correct interval.

Maurice used z^* instead of t^* for his interval. He also used the wrong # for S_x and used $\sqrt{n-1}$ in the denominator instead of $\sqrt{n}$.

$6.208 \pm 2.012\left(\frac{2.576}{\sqrt{48}}\right)$

$6.208 \pm .748 \rightarrow (5.460, 6.956)$

Correct interval is $(5.460, 6.956)$

13. A milk processor monitors the number of bacteria per milliliter in raw milk received at the factory. A random sample of 10 one-milliliter specimens of milk supplied by one producer gives the following data:

Run 1 Var Stats on Calculator:

5370 4890 5100 4500 5260 5150 4900 4760 4700 4870

$\bar{x} = 4950$ $S_x = 268.452$ $n = 10$

Construct and interpret a 90% confidence interval for the population mean μ.

Need 4 Step Process.

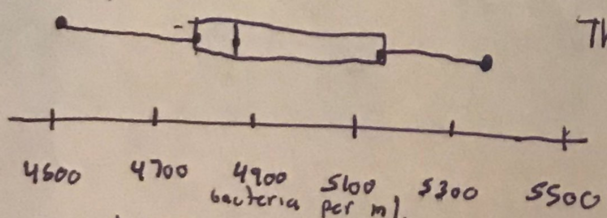
State We want to estimate μ, the true mean # of bacteria per milliliter of raw milk received at the factory at a 90% confidence level.

Plan One Sample t-interval for μ

① Random: Random sample of 10 one ml specimens ✓

② 10% (Independent): $10(10) <$ pop. of raw milk received at factory reasonable to assume ✓

③ Normal:



The boxplot indicates no strong skewness or outliers, ∴ Normal ✓

DO P.E. ± ME $\rightarrow \bar{x} \pm t^*\left(\frac{S_x}{\sqrt{n}}\right)$ $t^*_{90\%}$: $df = 9$ $t^* = invT(.05, 9) = 1.833$

$4950 \pm 1.833\left(\frac{268.452}{\sqrt{10}}\right) \rightarrow 4950 \pm 155.607$

$\rightarrow (4794.393, 5105.607)$

Conclude We are 90% confident that the interval from 4794.393 to 5105.607 bacteria/ml captures the true mean # of bacteria in the milk received at this factory.