Homework 8.1 Worksheet
(This is your quiz review as well)

Name **Key**
Date_____ Hour_____

In Exercises 1-2, identify the point estimator you would use to estimate the parameter and calculate the value of the point estimate

1) **Got shoes?** How many pairs of shoes, on average, do female teens have? To find out, an AP® Statistics class selected an SRS of 20 female students from their school. Then they recorded the number of pairs of shoes that each student reported having. Here are the data

| 50 | 26 | 26 | 31 | 57 | 19 | 24 | 22 | 23 | 38 |
| 13 | 50 | 13 | 34 | 23 | 30 | 49 | 13 | 15 | 51 |

Point Estimator: sample mean $\bar{x}$ Point Estimate: $\bar{x} = 30.55$
of # pairs of shoes

2) **Going to the prom** Tonya wants to estimate the proportion of seniors in her school who plan to attend the prom. She interviews an SRS of 50 of the 750 seniors in her school and finds that 36 plan to go to the prom.   Point Estimate: $\hat{p} = {}^{36}/_{50} = .72$
Point Estimator: sample proportion $\hat{p}$
of those planning to attend prom

3) **Prayer in school** A New York Times/CBS News Poll asked a random sample of U.S. adults the question "Do you favor an amendment to the Constitution that would permit organized prayer in public schools?" Based on this poll, the 95% confidence interval for the population proportion who favor such an amendment is (0.63, 0.69).

* always
state
context *

a) Interpret the (confidence interval.)

We are 95% confident that the interval from 0.63 to 0.69 captures the true proportion of all U.S. Adults who favor an amendment → to permit organized prayer in school.

b) What is the point estimate that was used to create the interval? What is the margin of error?

P.E. $= \dfrac{0.63 + 0.69}{2} = 0.66$ M.O.E. $= \dfrac{0.69 - 0.63}{2} = .03$

c) Based on this poll, a reporter claims that more than two-thirds $\overset{>.\bar{6}}{\text{two-thirds}}$ of U.S. adults favor such an amendment. Use the confidence interval to evaluate this claim.

Because there are plausible values of p less than or equal to ⅔ in the confidence interval, the interval does not give convincing evidence that more than ⅔ of U.S. adults favor such an amendment.

d) Interpret the (confidence level.)

Lesson
8.1
Day 2

If we make many 95% confidence intervals, we expect about 95% to capture the true proportion of U.S. adults who favor an amendment to permit organized prayer in school.

** Must be able to interpret confidence interval + confidence level for quiz. Know the Difference! **

4) Prayer in school Refer to Exercise 3. *Problem # 4 is 8.1 Day 2*

a) Explain what would happen to the length of the interval if the confidence level were increased to 99%.

Remember: C.L.T, M.O.E T

If the confidence level were increased to 99%, the length of the confidence interval would get wider.

b) How would a 95% confidence interval based on double the sample size compare to the original 95% interval?

Remember: Sample Size ↑, M.O.E. ↓

A 95% confidence interval would be narrower compared to the original when doubling the sample size.

c) The news article goes on to say: "The theoretical errors do not take into account additional errors resulting from the various practical difficulties in taking any survey of public opinion." List some of the "practical difficulties" that may cause errors which are not included in the ±3 percentage point margin of error

"Practical Difficulties" that may cause errors that are not included in the ±3% M.O.E include undercoverage when selecting random Sample, response bias (such as people lying) and nonresponse bias.

5) California's traffic People love living in California for many reasons, but traffic isn't one of them. Based on a random sample of 572 employed California adults, a 90% confidence interval for the average travel time to work for all employed California adults is 23 minutes to 26 minutes. 8

Problem #5 is Lesson 8.1 Day 2

a) Interpret the confidence level.

If we make many 90% confidence intervals, we expect about 90% to capture the true mean travel time to work for all employed California adults.

b) Name two things you could do to reduce the margin of error. What drawbacks do these actions have?

① One way to reduce M.O.E. is to increase sample size. A drawback is that it is more time consuming + costly to collect data for a large sample.

② A second way to reduce MOE is to decrease confidence level. A drawback is that we are less confident that the confidence interval will contain the true population mean.

c) Describe how nonresponse might lead to bias in this survey. Does the stated margin of error account for this possible bias?

Nonresponse might lead to bias in this survey b/c people who did not respond might have common characteristics which could lead us to overestimate or underestimate the true population mean.

(★★ Remember M.O.E does not account for this possible bias ★★)

6) Bottling cola A particular type of diet cola advertises that each can contains 12 ounces of the beverage. Each hour, a supervisor selects 10 cans at random, measures their contents, and computes a 95% confidence interval for the true mean volume. For one particular hour, the 95% confidence interval is 11.97 ounces to 12.05 ounces.

a) What is the point estimate that was used to create the interval? What is the margin of error?

$$P.E. = \frac{11.97 + 12.05}{2} = 12.01 \text{ oz} \qquad M.O.E. = \frac{12.05 - 11.97}{2} = .04$$

b) Interpret the ⟨confidence interval.⟩

We are 95% confident that the interval from 11.97oz to 12.05oz captures the true mean volume for all cans of that particular diet cola.

8.1 → c) Interpret the ⟨confidence level.⟩

Day 2   If we make many 95% confidence intervals, we expect about 95% to capture the true mean volume for all cans of that particular diet cola.

d) Does the confidence interval provide convincing evidence that the true mean volume is different than 12 ounces? Explain your answer. (11.97 oz to 12.05 oz)

No, the confidence interval does not provide convincing evidence that the true mean volume is different than 12 oz since 12 oz is contained in the interval.

e) Does the confidence interval provide convincing evidence that the true mean volume is 12 ounces? Explain your answer.

No, the confidence interval does not provide convincing evidence that the true mean volume is 12 oz b/c it contains other possible values for the true mean volume.

7) How confident? The figure shows the result of taking 25 SRSs from a Normal population 8.1 and constructing a confidence interval for the population mean using each sample. Which Day 2 confidence level—80%, 90%, 95%, or 99%—do you think was used? Explain your reasoning.

I believe the confidence level of 80% was used b/c only $\frac{21}{25}$ s (84%) of the intervals captured the true mean of the population.

$$\frac{21}{25} = 0.84$$
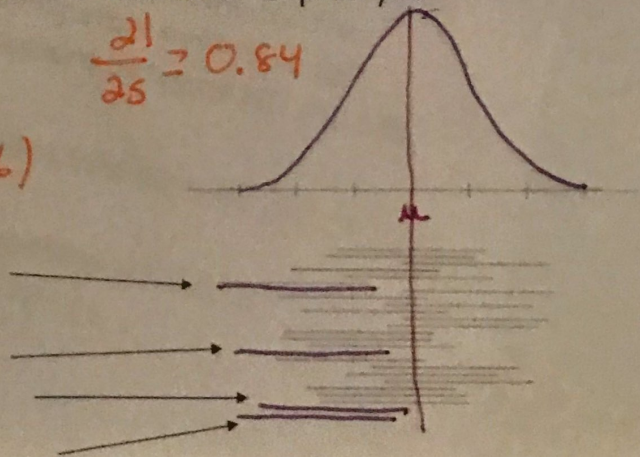
8) **Explaining Confidence** A 95% confidence interval for the mean body mass index (BMI) of young American women is 26.8 ± 0.6. Discuss whether each of the following explanations is correct, based on that information.

a) There is a 95% probability that the interval between 26.2 and 27.4 contains μ.

Incorrect. There is either a 100% or 0% probability that the interval captures the true mean. (It's either in the interval or its not)

b) We are confident that 95% of all young women have BMI between 26.2 and 27.4.

Incorrect. Interval provides plausible values for the mean BMI, but not for individual BMIs.

c) We are 95% confident that future samples of young women will have mean BMI between 26.2 and 27.4.

Incorrect. This would only be true if we knew the true population mean (μ) BMI = 26.8

d) Any value from 26.2 to 27.4 is believable as the true mean BMI of young American women.

Correct. The confidence interval offers a range of plausible values for a parameter.

e) If we take many samples, the population mean BMI will be between 26.2 and 27.4 in about 95% of those samples.

Incorrect. If we take many samples, about 95% of the confidence intervals will capture the true mean BMI of the population.

f) The mean BMI of young American women cannot be 28.

Incorrect. We are 95% confident that the population mean is between 26.2 and 27.4, but that does not rule out any other possibilities. (Remaining 5%)

9) **Multiple Choice** You have measured the systolic blood pressure of an SRS of 25 company employees. A 95% confidence interval for the mean systolic blood pressure for the employees of this company is (122, 138). Which of the following statements is true?

a. 95% of the sample of employees have a systolic blood pressure between 122 and 138.

b. 95% 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. If the procedure were repeated many times, 95% of the time the population mean systolic blood pressure would be between 122 and 138.

e. If the procedure were repeated many times, 95% of the time the sample mean systolic blood pressure would be between 122 and 138.