Problem 1. A student is interested in knowing what proportion of TAMU students are from out of state. She takes a random sample of 43 TAMU students and determines that 7 of them are from out of state.

a. Construct a 95% confidence interval for the proportion of out of state student in the entire TAMU student body.
b. Interpret your confidence interval from part a.
c. Based on the sample above, what sample size would be required so that the margin of error of a 95% confidence interval would be at most 0.08.
d. Assuming we hadn’t taken the sample listed above, what sample size would be required so that the margin of error of a 95% confidence interval would be at most 0.08.
Problem 2. A teacher wants to know how long, on average, the students in her grade level take to complete homework. Out of the 500 students in 7th grade, she takes a random sample of 44 students. She finds that the average length of time taken for the students in the sample is 98 minutes, with a standard deviation of 34.2 minutes.

a. Construct a 90% confidence interval for the average time spent by all 7th grade student.

b. Interpret your confidence interval from part a.
Problem 3. What does the phrase “95% confidence” in a confidence statement mean?

a. The probability is 0.95 that a randomly chosen individual’s value falls within the announced margin of error.
b. 95% of the population falls within the announced margin of error.
c. The results are true for 95% of the population.
d. The results were obtained using a method that gives correct answers in 95% of all samples.
Problem 4. A survey asked the question “What do you think is the ideal number of children for a family to have?” The 519 females who responded had a median of 2, mean of 3.02, and standard deviation of 1.93. The 95% confidence interval is (2.85, 3.19). What is the best interpretation of this confidence interval?

b. We can be 95% confident that the proportion of females who want children is between 2.85 and 3.19.
c. We can be 95% confident that a given female will want between 2.85 and 3.19 children.
d. We can be 95% confident that the mean number of children that females would like to have is between 2.85 and 3.19.
Problem 5. The ASPCA claims that 75% of all households own either a cat or a dog. Vennessa believes that in her community, less than 75% of households own a cat or a dog. She takes a random sample of 100 people who live in her county (population = 126,739) and finds out that 62 of the households own either a cat or a dog. Using this data, conduct the appropriate hypothesis test using a 0.05 level of significance.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
Problem 6. A recent study showed that the average amount of money a family of four spends on groceries each week is $120. Patrick believes the average amount of money a family of four living in Houston spends on groceries each week is different from this amount. He takes a sample of 42 families of four in the Houston area and finds that the average amount spent on groceries each week is $150, with a standard deviation of $10. Conduct the appropriate hypothesis test using a 0.10 level of significance.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
Problem 7. Your local school board wants to determine if the proportion of people who plan on voting for the school levy in the upcoming election is different for families who have elementary aged students and families that do not. They conduct a random phone poll, where they contact 200 families. Of the 100 families with elementary aged students, 75 say they plan on voting for the levy. Of the 100 families without elementary aged students, 68 say they plan on voting for the levy. Let Group A = Families with Elementary Aged Students and Group B = Families without Elementary Aged Students. Create a 98% confidence interval for the difference between the two proportions.

a. What is the 98% confidence interval?
b. What is the correct interpretation of the confidence interval?
c. Are the assumptions met? Explain.
d. Based on the confidence interval, what can you say about the school board’s question?
Problem 8. Your local school board wants to determine if the proportion of people who plan on voting for the school levy in the upcoming election is different for families who have elementary aged students and families that do not. They conduct a random phone poll, where they contact 200 families. Of the 100 families with elementary aged students, 75 say they plan on voting for the levy. Of the 100 families without elementary aged students, 68 say they plan on voting for the levy. Let Group A = Families with Elementary Aged Students and Group B = Families without Elementary Aged Students. **Conduct a hypothesis test at the 0.02 significance level to test this.**

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Are the assumptions met? Explain.
Problem 9. The p-value for a two-sided hypothesis test of the null hypothesis $H_0 : \mu = 12$ is 0.07. Which of the following confidence intervals would include the value 12? Select all that apply.

a. 90% Confidence Interval  
b. 95% Confidence Interval  
c. 99% Confidence Interval
Problem 10. The level of calcium in the blood of healthy young adults follows a normal distribution with $\mu = 10$ milligrams per deciliter and $\sigma = 4$. A clinic measures the blood calcium of 25 healthy pregnant young women at their first visit for prenatal care. The mean of these 25 measurements is $\bar{x} = 9.6$. We want to test the hypotheses $H_0: \mu = 10$; $H_A: \mu < 10$. What does it mean if the p-value is 0.0002?

a. If the true population mean is less than 10, the probability that we get a sample mean of 9.6 is 0.0002.
b. If the true population mean is less than 10, the probability that we get a sample mean of 9.6 or less is 0.0002.
c. If the true population mean is 10, the probability that we get a sample mean of 9.6 is 0.0002.
d. If the true population mean is 10, the probability that we get a sample mean of 9.6 or less is 0.0002.
e. None of the above
Problem 11. A student organization at Wittenberg University has 15 freshman, 18 sophomores, 14 juniors and 12 seniors. **Is there an equal distribution of the 4 classifications in this club?**

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Are the assumptions met? Explain.
Problem 12. A news article reports that “Americans have differing views on two potentially inconvenient and invasive practices that airports could implement to uncover potential terrorist attacks.” This news piece was based on a survey conducted among a random sample of 1,137 adults nationwide, where one of the questions on the survey was “Some airports are now using ‘full-body’ digital x-ray machines to electronically screen passengers in airport security lines. Do you think these new x-ray machines should or should not be used at airports?” Below is a summary of responses based on party affiliation. **Conduct an appropriate hypothesis test to determine if there is a relationship between political affiliation and belief.**

<table>
<thead>
<tr>
<th></th>
<th>Republican</th>
<th>Democrat</th>
<th>Total</th>
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<tbody>
<tr>
<td>Should</td>
<td>264</td>
<td>299</td>
<td>563</td>
</tr>
<tr>
<td>Should Not</td>
<td>38</td>
<td>55</td>
<td>93</td>
</tr>
<tr>
<td>Don’t Know/No Answer</td>
<td>16</td>
<td>15</td>
<td>31</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>318</td>
<td>369</td>
<td>687</td>
</tr>
</tbody>
</table>

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?