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 students 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.

\[ \hat{p} = \frac{7}{43} = 0.1628 \]
\[ z^* = 1.960 \]
\[ n = 43 \]

\[ 0.1628 \pm 1.960 \sqrt{\frac{0.1628(1-0.1628)}{43}} \]

\[ 0.1628 \pm 0.1103 \]

95\% CI: (0.0525, 0.2731)

b. We are 95\% confident that the true proportion of all TAMU students who are from out of state is between 0.0525 and 0.2731.
**Week #9: Statistical Inference**

**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.

\[ n = \frac{(z^*)^2 \hat{p}(1-\hat{p})}{m^2} \]

\[ z^* = 1.960 \]

\[ \hat{p} = 0.1628 \]

\[ m = 0.08 \]

\[ n = 81.81 \]

\[ n = 82 \]
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.

\[
\begin{align*}
\text{d. } n & = \frac{(Z^*)^2 \hat{p}(1-\hat{p})}{m^2} \\
& = \frac{(1.96)^2 (0.50)(0.50)}{(0.08)^2} \\
& = 150.0025 \\
& \approx 151
\end{align*}
\]

\[Z^* = 1.96\]
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 students.

\[
\bar{x} = 98 \\
\hat{z} = 1.645 \\
S = 34.2 \\
n = 44
\]

\[
98 \pm (1.645) \left( \frac{34.2}{\sqrt{44}} \right) \\
98 \pm 8.4814
\]

\[
98 - 8.4814 = 89.5186 \\
98 + 8.4814 = 106.4814
\]

b. We are 90% confident that the true average time spent on homework by all 7th grade students (in this school) is between 89.5186 minutes and 106.4814 minutes.

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

- The probability is 0.95 that a randomly chosen individual’s value falls within the announced margin of error.
- 95% of the population falls within the announced margin of error.
- The results are true for 95% of the population.
- The results were obtained using a method that gives correct answers in 95% of all samples.

Confidence interval describe pop in parameter
- individuals
- sample
- statistic

Confidence level \( \rightarrow \) success rate
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?

- Ninety-five percent of females want between 2.85 and 3.19 children.
- We can be 95% confident that the proportion of females who want children is between 2.85 and 3.19.
- We can be 95% confident that a given female will want between 2.85 and 3.19 children.
- We can be 95% confident that the mean number of children that females would like to have is between 2.85 and 3.19.

Cl Interpretation $\rightarrow$ pop\'n parameter
Problem 5. The ASPCA claims that 75% of all households own either a cat or a dog. Venessa 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?

\[ H_0 : p = 0.75 \quad \text{null value:} \quad p_0 = 0.75 \]

\[ H_A : p < 0.75 \]

\[ \hat{p} = \frac{62}{100} = 0.62 \]

\[ p_0 = 0.75 \]

\[ n = 100 \]

\[ TS = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \]

\[ = \frac{0.62 - 0.75}{\sqrt{\frac{(0.75)(0.25)}{100}}} \]

\[ = \frac{-0.13}{0.0433} \]

\[ = -3.03 \]
Problem 5. The ASPCA claims that 75% of all households own either a cat or a dog. Venessa 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?

d. \[ p\text{-value} = P(\hat{p} \leq 0.68 \mid p = 0.75) \]

\[ = P(z \leq -1.62) \]

\[ p\text{-value} = 0.0526 \]

e. \[ 0.0526 > 0.05 \]

\[ p\text{-value} > \alpha \]

Fail to Reject H₀
Problem 5. The ASPCA claims that 75% of all households own either a cat or a dog. Venessa 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?

f. The data does not provide statistically significant evidence that the true proportion of people in Venessa’s community who own a cat or a dog is less than 0.75.
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?

\[
H_0 : \mu = \$120 \\
H_a : \mu \neq \$120
\]

\[null \ value: M_0 = \$120\]

\[x = 150\]
\[M_0 = 120\]
\[s = 10\]
\[n = 42\]

\[
TS = \frac{x - M_0}{s/\sqrt{n}} = \frac{150 - 120}{10/\sqrt{42}} = \frac{30}{1.543} = 19.44
\]
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?

d. \[ p \text{-value} = P(\mid z \mid \geq 19.44) = 2 \times P(z \leq -19.44) \]
\[ = 2 \times (\text{almost } 0) \]
\[ = \text{almost } 0 \]

e. approx 0 < 0.10
p-value < \alpha

Reject H₀

f. The data does provide statistically significant evidence that the true avg. amount of money a family of 4 in Houston spends on weekly groceries is different from $120. Based on our sample, we think it is greater than $120.
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?

\[
\hat{p}_E = \frac{75}{100} = 0.75, \quad n_E = 100 \quad \text{(Group A)}
\]
\[
\hat{p}_{NE} = \frac{68}{100} = 0.68, \quad n_{NE} = 100 \quad \text{(Group B)}
\]

\[
z^* = 2.326
\]

\[
(\hat{p}_A - \hat{p}_B) \pm z^* \sqrt{\hat{p}_A(1-\hat{p}_A) + \hat{p}_B(1-\hat{p}_B)}
\]

\[
0.75 - 0.68 \pm 2.326 \sqrt{\frac{(0.75)(0.25) + (0.68)(0.32)}{100} + \frac{(0.07)(0.93)}{100}}
\]

\[
0.07 \pm 2.326 \sqrt{0.001875 + 0.002176}
\]

\[
0.07 \pm 0.148
\]

\[
0.07 - 0.148 = -0.078
\]

\[
0.07 + 0.148 = 0.218
\]

98% CI: \((-0.078, 0.218)\)
**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?

b. We are 98% confident that the true difference between the proportion of all families w/ Elementary kids and the proportion of all families w/o Elementary kids who plan to vote for the levy is between $-0.078$ and $0.218$.

c. Independence w/ groups? random ✓  Independence b/t groups? ✓

Successes/Failures
- Elem-Yes = 75 ≥ 10
- Elem-No = 25 ≥ 10
- Non Elem-Yes = 68 ≥ 10
- Non Elem-No = 32 ≥ 10

0. $\emptyset$ is in the interval so there may be no difference.
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.

a. \( H_0: p_E = p_{NE} \)

\[ H_A: p_E \neq p_{NE} \]

b. 0.02

c. \( \hat{p}_{pooled} \)

\[ \hat{p}_{pooled} = \frac{\hat{p}_E + \hat{p}_{NE}}{n_E + n_{NE}} = \frac{\frac{75 + 68}{100 + 100}}{\frac{143}{200}} = 0.715 \]
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.

c. $T_S = \frac{\hat{p}_A - \hat{p}_B}{\sqrt{\frac{\hat{p}_{pooled}(1-\hat{p}_{pooled})}{n_A} + \frac{\hat{p}_{pooled}(1-\hat{p}_{pooled})}{n_B}}}$

$T_S = 0.75 - 0.68 \frac{0.07}{\sqrt{\frac{0.715(0.288)}{100} + \frac{0.715(0.288)}{100}}} = 0.75 - 0.68 = 0.07 \frac{1.10}{0.06384} = 1.10$
**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.

\[
d. \text{p-value} = P(|z| \geq 1.10) = 2 \times P(z \leq -1.10) = 2 \times (0.1357) = 0.2714
\]

\[
e. 0.2714 > 0.02 \quad \text{p-value} > \alpha 
\]

**Fail to Reject Ho**
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.

f. The data does not provide statistically evidence that the true proportion of elementary school families that will vote for the levy is different from the true proportion of non elementary school families that will support the levy.
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.

9. ① Independence w/i group? random
    ② Independence b/t groups? ✔
    ③ successes/failures

\[
\hat{p}_{\text{pooled}} = (\frac{75}{100}) (\frac{68}{100}) = 0.715
\]
\[
N_A \hat{p}_{\text{pooled}} = (100) (0.715) = 71.5 \geq 10
\]
\[
N_B \hat{p}_{\text{pooled}} = (100) (0.715) = 71.5 \geq 10
\]
\[
N_A (1-\hat{p}_{\text{pooled}}) = (100) (0.285) = 28.5 \geq 10
\]
\[
N_B (1-\hat{p}_{\text{pooled}}) = (100) (0.28) = 28.5 \geq 10
\]
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.

- (x) 90% Confidence Interval
  - $\alpha = 0.10 \Rightarrow 0.07 < 0.10$, p-value $< \alpha$, $\text{Rej. } H_0 \text{ (Null isn't in the CI)}$

- (✓) 95% Confidence Interval
  - $\alpha = 0.05 \Rightarrow 0.07 > 0.05$, p-value $> \alpha$, $\text{FTR } H_0 \text{ (Null is in the CI)}$

- (✓) 99% Confidence Interval
  - $\alpha = 0.01 \Rightarrow 0.07 > 0.01$, p-value $> \alpha$, $\text{FTR } H_0 \text{ (Null is in the CI)}$

Associated CIs: a 2-sided HT will agree

- $\alpha = 0.05 \rightarrow 95\% \text{ CI}$
- $\alpha = 0.01 \rightarrow 99\% \text{ CI}$
- $\alpha = 0.10 \rightarrow 90\% \text{ CI}$
**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 or less is 0.0002.

x. 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.

x. If the true population mean is 10, the probability that we get a sample mean of 9.6 or less 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

\[ p\text{-value} = P(\text{get our results or something more extreme} \mid H_0 \text{ is true}) \]

\[ = P(\text{get } \bar{x} = 9.6 \text{ or less} \mid \mu = 10) \]
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.

a. \( H_0: P_{fr} = P_{so} = P_{ju} = P_{se} = 0.25 \)

\( H_A: \) At least one is different.

b. 0.05

c. \( \rightarrow 1^{st} : \) expected counts

<table>
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<tr>
<th></th>
<th>Fv</th>
<th>So</th>
<th>Jv</th>
<th>Se</th>
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<td>15</td>
<td>18</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>EXP</td>
<td>59/4</td>
<td>59/4</td>
<td>59/4</td>
<td>59/4</td>
</tr>
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<td></td>
<td>14.75</td>
<td>14.75</td>
<td>14.75</td>
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</table>

\( \rightarrow \text{Total} = 69 \)
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.

\[ \chi^2 = \sum \frac{(0-E)^2}{E} = \frac{(15-14.75)^2}{14.75} + \frac{(18-14.75)^2}{14.75} + \frac{(14-14.75)^2}{14.75} + \frac{(12-14.75)^2}{14.75} \]

\[ = 0.00424 + 0.71610 + 0.03814 + 0.51271 \]

\[ = 1.27119 \]

d. \( \chi^2 = 1.27119 \)
df = K-1 = 4-1 = 3

TS < 3.06

p-value > 0.30
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.

e. \( p\text{-value} > 0.3070 > 0.05 \)
   \( p\text{-value} > 0.05 \)
   \( p\text{-value} > \alpha \)
   \[ \text{Fail to Reject } H_0 \]

f. The data does not provide statistically significant evidence that \( P_{FR}, P_{SO}, P_{UU}, \text{ and } P_{SE} \) are different.

9. ① Independence? maybe not
    ② expected counts ≥ 5? \( \checkmark \) expected counts = 14.75
    ③ \( df > 1? \) \( \checkmark \) \( df = 3 \)
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.

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<th>Democrat</th>
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</thead>
<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>Total</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?

\[ H_0: \text{Political party and belief are independent} \]
\[ H_a: \text{Political party and belief are associated.} \]

b. \( \alpha = 0.05 \)
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.**

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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?

\[ \chi^2 \text{exp} = \frac{(\text{row tot})(\text{col tot})}{(\text{tabu tot})} \]
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.

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<th>Republican</th>
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<tbody>
<tr>
<td>Should</td>
<td>264</td>
<td>299</td>
<td>563</td>
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<tr>
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<td>38</td>
<td>55</td>
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<tr>
<td>Don’t Know/No Answer</td>
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<td><strong>Total</strong></td>
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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?

\[
C. \chi^2 = \sum \frac{(O-E)^2}{E} \\
= \frac{(264-260.605)^2}{260.60} + \frac{(299-302.405)^2}{302.40} + \frac{(38-43.05)^2}{43.05} + \frac{(55-49.95)^2}{49.95} + \frac{(116-14.35)^2}{14.35} + \frac{(15-16.65)^2}{16.65}
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\[ \chi^2 = 0.0444 + 0.0382 + 0.5924 + 0.5106 + 0.1897 + 0.1635 \]
\[ \chi^2 = 1.5388 \]
\[ df = (r-1)(c-1) = (3-1)(2-1) = (2)(1) = 2 \]
\[ TS < 2.41, p-value > 0.30 \]
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E. \( p-value > 0.30 \)  \( > 0.05 \)
\( p-value > 0.05 \)
\( p-value > \alpha \)

f. The data does not provide statistically significant evidence that political party and belief are associated.