Intro Stats Project#3 Directions and Grading Rubric
One-Population Mean Average Hypothesis T-Test / Updated Winter 2026
Use with Intro Stats with Support Textbook Chapters 10 & Section 11B

PROJECT GRADING RUBRIC

- **First and Last name, Project title, Instructor's Name, Section#, Semester, and Year** *(1 point)*
- **Anti-cheating statement** *(1 point)*
- **Five StatKey Pictures:** *(5 points each)*
    - **Histogram** (Picture of Histogram of your quantitative data with slider set to 5 bars)
    - **Summary Statistics** (Picture of Summary Statistics for your quantitative data)
    - **Degrees of Freedom** (Picture of Degrees of Freedom input box with correct degrees of freedom)
    - **Critical Value Graph** (Picture of T – Distribution graph corresponding to correct degrees of freedom and tail, 0.05 significance level in the top box, and critical value in bottom box.)
    - **P-value Graph** (Picture of T – Distribution graph corresponding to correct degrees of freedom and tail with the T – test statistic in the bottom box and P-value in top box).
- **Null and Alternative Hypotheses with correct symbolic notation and units** *(3 points each)*
- **Sentence Explanations: Explain why sentences** *(3 points each)*
- **T-test stat definition sentence, P-value definition sentence, Conclusion** *(4 points each)*
- **All other problems:** *(2 points each)*

PROJECT REPORT DIRECTIONS: Use the quantitative column of data, population of interest, and claim assigned to you by your instructor. You do not need to include the questions. Just provide the answers and StatKey pictures requested for each number. You can type or write the answers on a piece of paper. Make sure to include the StatKey pictures.

Put the following title and anti-cheating statement at the top of your report.

First and Last Name
Intro Stats Project#3 One-Population Mean Hypothesis Test
Instructor's Name
Section# for your class
Semester and Year

Cheating Statement: Confirm that you did not cheat. If true, write the following:
I did not cheat on this project. I did not copy someone else's answers. I did not use any AI like ChatGPT. I did the work myself. No one else did this project for me.

Answer the following questions:

1. **What quantitative data was assigned to you?** *Be sure to include the units (milligrams, feet, miles, dollars, etc.)*

2. **What is your population of interest?**

3. **What is the claim about the population mean average that you are assigned to test?**

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Part II: Use your claim in #3 to write the Null Hypothesis and the Alternative Hypothesis.

4. **Use the claim assigned to you to write your alternative hypothesis (Ha). The statement should have "Ha", the population mean average symbol** (μ)**, the symbol >** *(greater than)* **or <** *(less than)***, the number in your claim, and the units** *(milligrams, feet, miles, dollars, etc.)*

5. **Write your null hypothesis using Ho, the population mean average symbol** (μ)**, the symbol =, the same number used in Ha, and the units** *(milligrams, feet, miles, dollars, etc.) (Remember Ho should be be = #)*

6. **Is the claim the "Null Hypothesis (Ho)" or is the claim the "Alternative Hypothesis (Ha)"?** *(For this project your claim should be Ha. Still, answer the question though.)*

7. **Is your hypothesis test a "right-tailed test" or a "left-tailed test"? Explain why.** *(Examples: Less than in Ha is a left-tailed test. Greater than in Ha is a right-tailed test.) Be sure to remember this when you create your T-distributions in StatKey.*

Part III: Paste your column of quantitative data into StatKey, create a histogram and check the One-Population Mean T-test assumptions.

Open the Project Data Excel Spreadsheet. Highlight the column of numerical measurement data assigned to you, right click and copy.

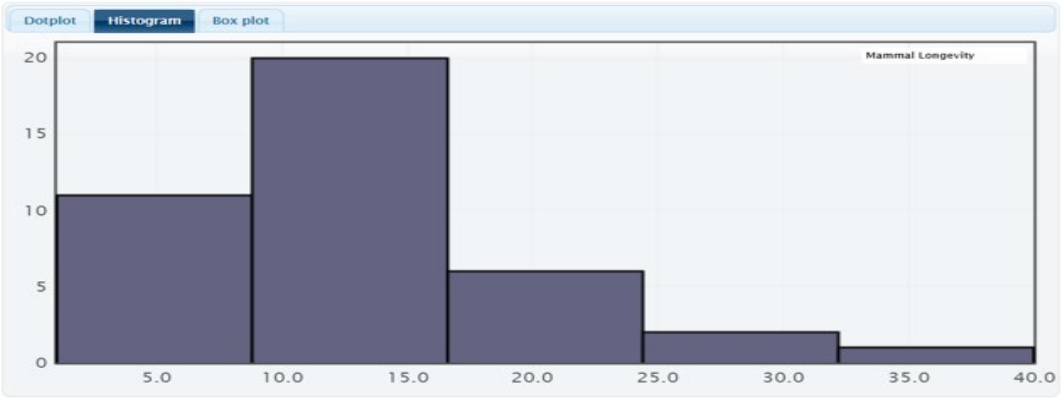
Go to www.lock5stat.com and click on StatKey. Click on "One Quantitative Variable" under the "Descriptive Statistics and Graphs" menu in StatKey.

Click on "Edit Data" and Copy and Paste your quantitative column of data into StatKey. If you have a title at the top, Check the box for "header row". If you do not have a title at the top, do NOT check the box that says header row. Push OK.

Click on "Histogram" and change the number of buckets to 5. This will give you 5 bars in your histogram. Copy the graph and the "Summary Statistics" next to the graph.

Put these StatKey Pictures on the Project Report:

8. **Copy and paste a picture of the 5-bar StatKey histogram from the column of data assigned to you into your project report.**



Intro Stats Project#3 Directions and Grading Rubric
One-Population Mean Average Hypothesis T-Test / Updated Winter 2026
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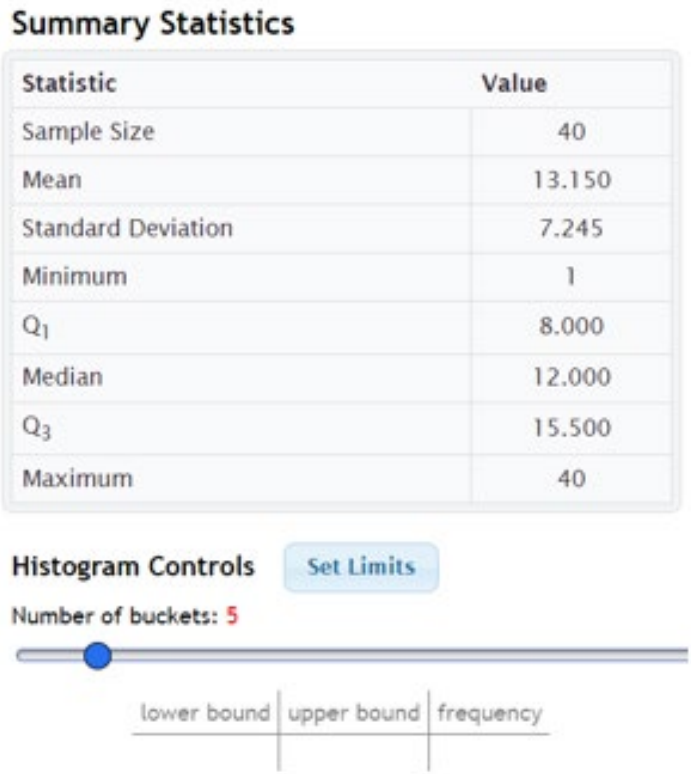
9. **Copy and paste the StatKey "Summary Statistics" printout into your project report.** *The Summary Statistics are located to the right of your histogram in StatKey. Make sure the table is large enough to read the numbers. If the table is too small, your instructor will not be able to grade your report!*



Summary Statistics

Statistic	Value
Sample Size	40
Mean	13.150
Standard Deviation	7.245
Minimum	1
Q_1	8.000
Median	12.000
Q_3	15.500
Maximum	40

Histogram Controls Set Limits

Number of buckets: 5

lower bound	upper bound	frequency

Check the following three T-test conditions with your histogram and summary statistics from StatKey.

10. **Condition #1 (Random): Your sample data provided was collected randomly. Do you think the data will pass the random condition#1? Explain why or why not.** *(Example: The data passes the random condition because the data was collected randomly.)*

11. **Condition #2 (Independent Observations): Your sample data values are not related to each other since the data was collected randomly. Does the data pass the independence condition#2? Explain why or why not.** *(Example: The data passes the independence condition because it is unlikely for data values collected randomly to be related.)*

12. **Condition #3 (30 or Normal): What was the sample size? What is the shape of your data? Does the data pass condition#3 that either the shape is normal (bell-shaped) OR the data has a sample size of at least 30? Explain why or why not.** *(Example: The shape in the histogram was skewed right. The sample size was 40. So the data will pass the 30 or normal condition.)*

Part IV: Calculate your Degrees of Freedom, Standard Error, and the T – Test Statistic

13. **What is your sample standard deviation** (s) **in your StatKey "Summary Statistics" table?**

14. **What is your sample size (n) in your StatKey "Summary Statistics" table?**

Intro Stats Project#3 Directions and Grading Rubric
One-Population Mean Average Hypothesis T-Test / Updated Winter 2026
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15. **Calculate the standard error for your data using the following formula and the answers to #14 and #15. Be sure to show your work.**

    Standard Error = $\frac{Sample\ Standard\ Deviation}{Square\ root\ of\ Sample\ Size} = \frac{s}{\sqrt{n}}$

    Example: Standard Error = 7.245 ÷ $\sqrt{40}$ = 1.145535

16. **What is your sample mean average ($\bar{x}$) in your StatKey "Summary Statistics" table?** Example: The sample mean average ($\bar{x}$) in the StatKey Summary Statistics table is 13.150

17. **What is the population mean average (μ) listed in the null hypothesis (H_0)?** Example: The number assigned for my population claim is 10 years.

18. **Calculate the T-test statistic using the following formula and the answers to #15, #16 and #17. Be sure to show your work. Round your answer to the thousandths place. (3 numbers to the right of decimal.) The T-test statistic may be negative or positive. Be sure to put the correct sign.**

    T – Test Statistic = $\frac{(Sample\ Mean - Population\ Mean)}{Standard\ Error} = (\bar{x} - \mu) \div standard\ error$

    Example: T – Test Statistic = (13.150 – 10) ÷ 1.145535 = +2.750

19. **Write the definition sentence explaining the T – Test Statistic in context.** *If the T-test statistic in #17 is positive, then the sample mean is this number of standard errors above the population mean in null hypothesis. If the T-test statistic in #17 is negative, then the sample mean is this number of standard errors below the population mean in null hypothesis.*

    Example: "The sample mean of 13.150 years was 2.750 standard errors above the population mean of 10 years in the null hypothesis."

20. **Calculate the Degrees of Freedom for your data using the formula (df = n – 1). "n" is your sample size. Be sure to show your work.**

    Example: Degrees of Freedom = n – 1 = 40 – 1 = 39

Part V: Use StatKey and a 5% (0.05) Significance Level to calculate your Critical Value

21. ***Go to StatKey. Under "Theoretical Distributions", click on " t ". Enter the degrees of freedom you listed in #20 into the df box and push OK. Take a picture of your degrees of freedom box.***

Intro Stats Project#3 Directions and Grading Rubric
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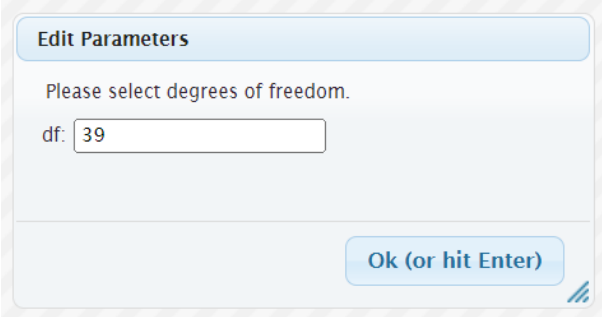
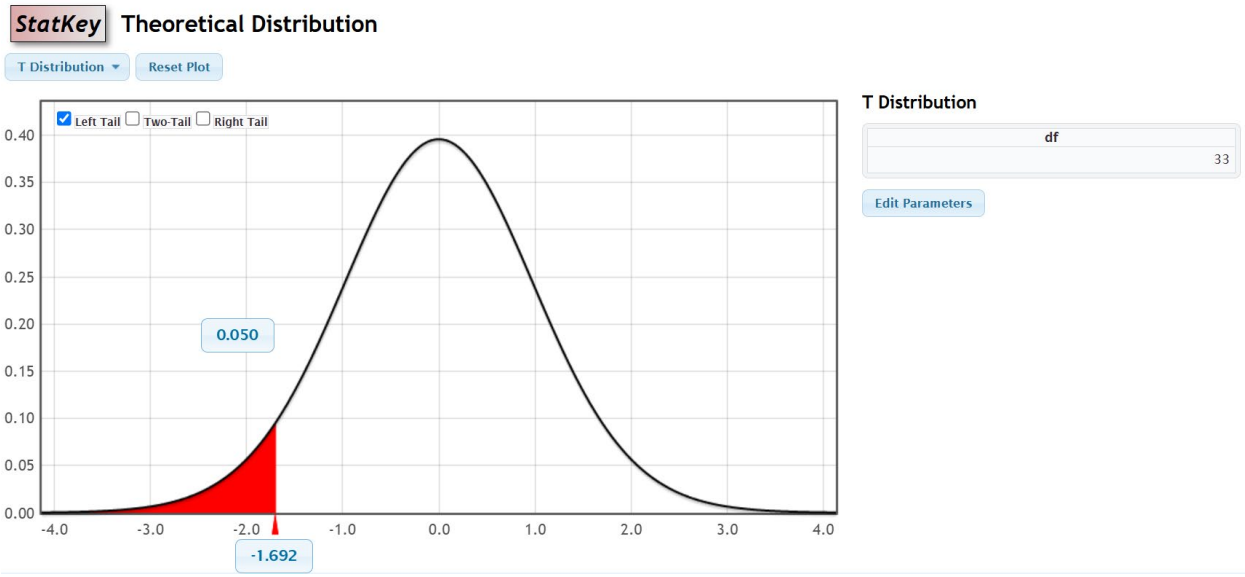


22. Show the StatKey T-distribution Critical Value picture with correct degrees of freedom, 0.05 significance level and the correct tail for your alternative hypothesis.

If you are doing a (less than) left-tailed test, your Critical Value StatKey picture should look like the picture below. You must have 0.05 in the upper left box. Make sure to show the "df" box in your picture. In the example below the df was 33 and the critical value in the lower left box was -1.692. (The degrees of freedom and critical value you calculate will be different than the example.)



If you are doing a (greater than) right-tailed test, your Critical Value StatKey picture should look like the picture below. You must have 0.05 in the upper right box. Make sure to show the "df" box in your picture. In the example below the df was 33 and the critical value in the lower right box was +1.692. (The degrees of freedom and critical value you calculate will be different than the example.)

Intro Stats Project#3 Directions and Grading Rubric
One-Population Mean Average Hypothesis T-Test / Updated Winter 2026
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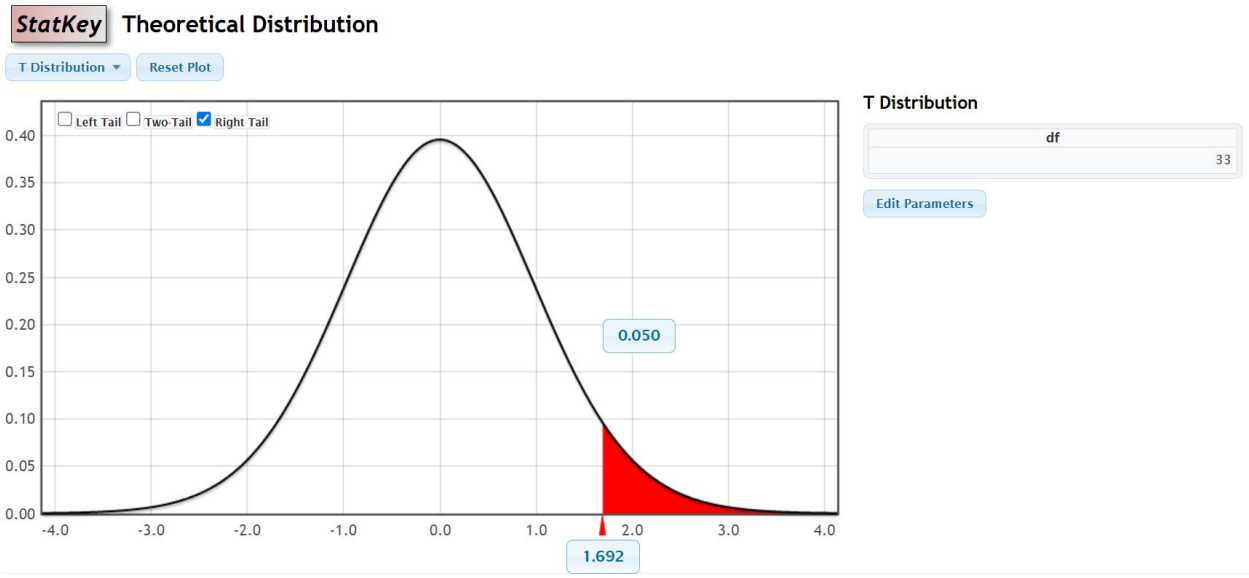

23. **What is your critical value?** (This is where your tail starts.)

24. **Look at your T – Test Statistic answer in #18 and the tail in red with your critical value. Does your T – Test Statistic fall in the tail or not?**

25. **Does the sample mean significantly disagree with the population mean in the null hypothesis or does the sample mean not significantly disagree with the population mean in the null hypothesis? Explain why.** *(Examples: The sample mean significantly disagrees with the population mean in the null hypothesis because the T-test statistic fell in the tail. The sample mean does not significantly disagree with the population mean in the null hypothesis because the T-test statistic did not fall in the tail.)*

26. **Does the sample data significantly disagree with the null hypothesis or does the sample data not significantly disagree with the null hypothesis? Explain why.** *(Examples: The sample data significantly disagrees with the null hypothesis because the T-test statistic fell in the tail. The sample data does not significantly disagree with the null hypothesis because the T-test statistic did not fall in the tail.)*

PART VI: Use StatKey and the T – Test Statistic to calculate the P-Value

27. **Show the StatKey T-distribution P-value picture with correct degrees of freedom, the T-test statistic from #18 in the bottom box, and the correct tail for your alternative hypothesis.**

    If you are doing a (less than) left-tailed test, your P-Value StatKey picture should look like the picture below. You must have the T-test statistic you calculated in the lower left box. Make sure to show the "df" box in your picture. Once you enter your T-test statistic in the lower left box, the upper left box will be the P-value. In the example below the df was 33, the T-test statistic in the lower left box was -2.184, and the P-value was 0.018 = 1.8%. (The degrees of freedom, T-test statistic, and P-value you calculate will be different than the example.)

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One-Population Mean Average Hypothesis T-Test / Updated Winter 2026
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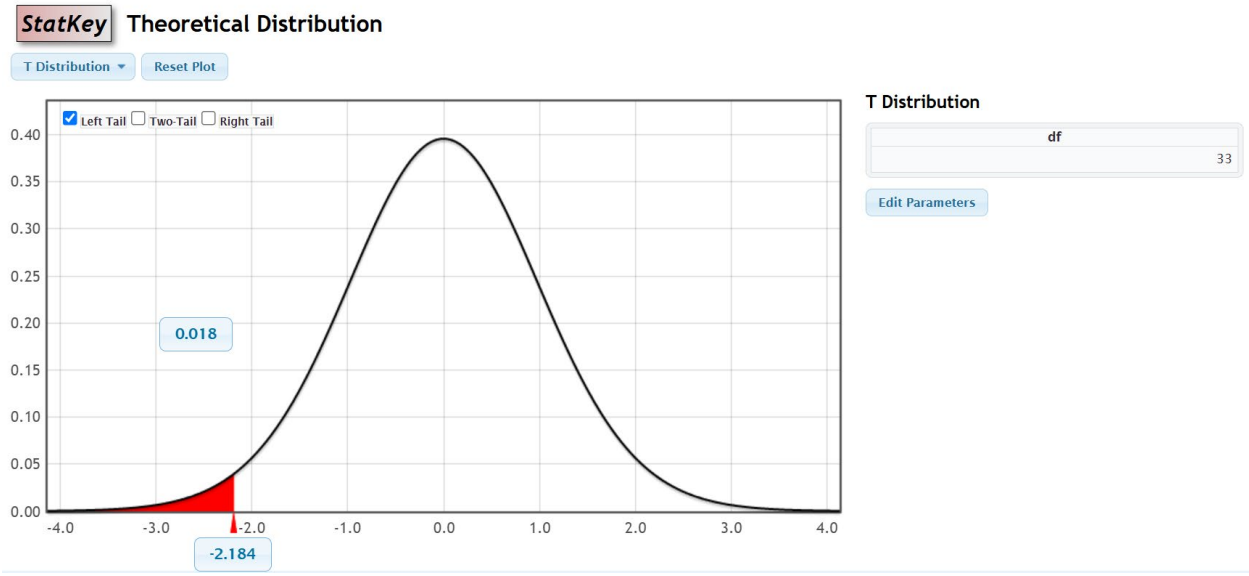
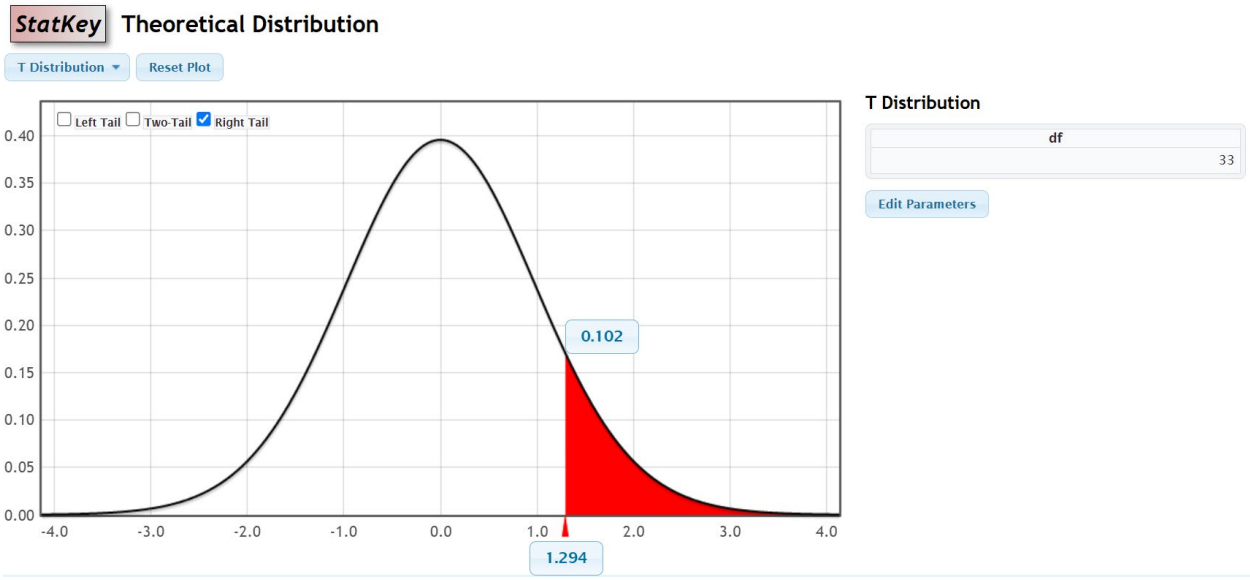


If you are doing a (greater than) right-tailed test, your P-Value StatKey picture should look like the picture below. You must have the T-test statistic you calculated in the lower right box. Make sure to show the "df" box in your picture. Once you enter your T-test statistic in the lower right box, the upper right box will be the P-value. In the example below the df was 33, the T-test statistic in the lower right box was +1.294, and the P-value was 0.102 = 10.2%. (The degrees of freedom, T-test statistic, and P-value you calculate will be different than the example.)



28. **What is your P-value proportion from StatKey?**

29. **Write your P-value as a percentage.**

30. **Write the P-value definition sentence in context to explain your P-value.**

(Example: If the null hypothesis is true and the population mean average lifespan of mammals is 10 years, then there is a 0.45% probability of getting this sample data or more extreme by sampling variability.)

31. **Is your P-value lower or higher than your 5% significance level? Is your P-value low or high?** *(If the P-value is lower than the 5% significance level, it is considered a Low P-value. If the P-value is higher than the 5% significance level, it is considered a High P-value. If a P-value was exactly 5%, that would be considered a low P-value.)*

32. **If the null hypothesis was true, could the sample data have occurred because of sampling variability or is it unlikely to be sampling variability? Explain why.** *(Examples: Low P-value indicates that the data is unlikely to have occurred because of sampling variability. High P-value indicates that the data could have occurred because of sampling variability.)*

33. **Did your data pass all three of the T-test conditions in #10, #11 and #12?** (*Examples: The data passed all of the conditions for the T-test. The data did not pass one or more of the conditions for the T-test.)*

34. **Is your P-value significant evidence or not significant evidence? Explain why.** *(Examples: The P-value is significant evidence because the P-value is low and the data passed all conditions. The P-value is not significant evidence because even though the P-value is low, the data did not pass all conditions. The P-value is not significant evidence because even though the data passed conditions, the P-value is high.)*

PART VII: Interpretations and Final Conclusion

35. **Should you Reject the Null Hypothesis or Fail to reject the Null Hypothesis? Explain why.** *(Examples: We should reject the null hypothesis because the P-value is low and the data passed all conditions. We should fail to reject the null hypothesis because even though the P-value is low, the data did not pass all conditions. We should fail to reject the null hypothesis because even though the data passed conditions, the P-value is high.)*

36. **Write the conclusion sentence for your test addressing evidence, assumptions and the claim in context.** *Here is an example sentence. You have to pick between "significant evidence" or "not significant evidence", depending on your P-value and passing or failing the assumptions. Don't forget to describe your claim in context.*

*Example Conclusion: There (**is** or **is not**) significant evidence to support the claim that the population mean average lifespan of mammals is (**less than** or **greater than**) 10 years.*