NAME: _____

Show **ALL** of your work in a legible and organized fashion.

1.   An e-commerce business states that it fills customer's orders in six calendar days or fewer. Periodically, the operations manager selects a random sample of customer orders and determines the number of days required to fill the orders. Based on this sample information, she decides whether the claim needs to be revised or not. She will assume that the average number of days to fill customers' orders is six or fewer unless the data suggest strongly otherwise. A recent sample of 40 customer orders was selected, the average number of days was 6.65, with a sample standard deviation of 1.5 days. Can the operations manager conclude that her e-commerce business is living up to its claim? Use the test statistic method and a significance level of 2.5% to answer this question.

   ANSWER: **Ho: $\mu \leq 6$**
                           Ha: $\mu > 6$

   Reject Ho: The data do not support the claim that customer's orders are filled in six days or less based on a sample of 40 and an alpha of 0.025.

2.   The makers of Mini-Oats Cereal have an automated packaging machine that can be set at any targeted fill level between 12 and 32 ounces. Not every box of cereal is expected to contain exactly the targeted weight, but the average of all boxes filled should. At the end of every shift (8 hours), 32 boxes are selected at random and the mean and standard deviation of the sample are computed. At the end of a particular shift during which the machine was filling boxes labeled as 24-ounce boxes of Mini-Oats, the sample mean calculated was 24.32 ounces, with a standard deviation of 0.70 ounces. Using the p-value method and $\alpha = .05$, determine if the boxes are being filled with 24-ounces of cereal.

   ANSWER: **Ho: $\mu = 24$**
                           Ha: $\mu \neq 24$

   Reject Ho: The data do not appear to support the claim that the Mini-Oats boxes are being filled with 24 ounces of cereal based on a sample of 32 and an alpha of 0.05.

3.   The Florida Department of Labor and Employment Security reported the state mean annual wage of $26,133. A test of wages by county can be conducted to see whether the mean annual wage for the various counties differs from the state mean. A sample of 550 people from Collier County showed a sample mean annual wage of $25,457 and a sample standard deviation of $7600. Using the confidence interval method and $\alpha = .05$, determine if the mean annual wage in Collier County is significantly different from that of the entire state.

   ANSWER: **Ho: $\mu = 26,133$**
                           Ha: $\mu \neq 26,133$

   Reject Ho: The data do not appear to support the claim that the state mean annual wage is $26,133 based on a sample of 550 and an alpha of 0.05.

4.   A bath soap manufacturing process is designed to produce a mean of 120 bars of soap per batch. Quantities over or under that standard are undesirable. A sample of 10 batches shows the following numbers of bars of soap.

108	118	120	122	119	113	124	122	120	123

The population is assumed to be normal with a standard deviation of 4.93. Using the p-value method and a .05 level of significance, test to see whether the sample results indicate that the manufacturing process is functioning properly.

ANSWER: Ho: $\mu = 120$
Ha: $\mu \neq 120$

Fail to Reject Ho: The data appear to support the claim that the mean number of bars of soap produced is 120 based on a sample of 10 and an alpha of 0.05.

5.   Peterson Automotive is a Honda dealership in the USA. They recently stated that Honda owners average more than 85,000 miles before trading in or selling their Hondas. To test this, an independent agency selected a random sample of 80 Honda owners who have either traded in or sold their Honda and determined the number of miles on the cars when the owners parted with them. They plan to test Peterson's claim at the alpha of 0.05 level. If the sample mean is 86,200 miles and the sample standard deviation is 12,000 miles, what conclusion should be reached about the claim using the critical value method?
ANSWER: Ho: $\mu \geq 85,000$
Ha: $\mu < 85,000$

Fail to Reject Ho: The data appear to support the claim that Hondas average more than 85,000 miles before being traded in or sold based on a sample of 80 and an alpha of 0.05.

6.   A major U.S. tire manufacturer has developed a new design that will allow an owner to drive on a punctured tire for some miles without having to stop and change the tire. The R&D engineers claim that the average miles should exceed 50. However, they do not want to assert this claim to the public if the sample data indicate otherwise. To conduct a test, a sample of 30 tires is selected with a sample mean of 51.05 and a standard deviation of 14.2. Using the critical value method, what conclusion should the company reach, assuming they want to test the hypothesis with a significance level of 0.05?
ANSWER: Ho: $\mu \geq 50$
Ha: $\mu < 50$

Fail to Reject Ho: The data appear to support the claim that the flat tire will average more than 50 miles before needing to be replaced based on a sample of 30 and an alpha of 0.05.

7.   Individuals filing federal income tax returns prior to March 31 received an average refund of $1056. Consider the population of "last minute" filers who mail their tax return during the last five days of the income tax period (Typically April 10 to April 15). A researcher suggests that the "last minute" filers typically have a lower refund amount. For a sample of 400 individuals who filed a tax return between April 10 and April 15, the sample mean was $910. Based on prior experience, the population standard deviation of $1600 may be assumed. Using the p-value method and a significance level of .05, what is your conclusion?
ANSWER: Ho: $\mu \geq 1,056$
Ha: $\mu < 1,056$

Reject Ho: The data appear not to support the claim that last minute tax filers also average more than a $1,056 refund based on a sample of 400 and an alpha of 0.05.

8.   The mean length of a work week for the population of workers was reported to be 39.2 hours. Suppose that we would like to take a current sample of workers to see whether the mean length of a work week has changed from the previously reported 39.2 hours. A sample of 112 workers provided a sample mean of 38.5 hours. Use a population standard deviation of 4.8 hours.   Develop the null and alternative hypothesis and draw a conclusion using a significance level of .01. Use the confidence interval method.

ANSWER: Ho: μ = 39.2
                    Ha: μ ≠ 39.2

Fail to Reject Ho: The data appear to support the claim that the average work week length is 39.2 hours based on a sample of 112 and an alpha of 0.01.

9.   The Department of Labor reported the average hourly earning for U.S. production workers to be $14.32 per hour. A sample of 75 production workers showed a sample mean of $14.68 per hour. Assuming the population standard deviation is $1.45, can we conclude that an increase occurred in the mean hourly earnings? Use a significance level of .10 and use the confidence interval method.

ANSWER: Ho: μ = 14.32
                    Ha: μ ≠ 14.32

Reject Ho: The data appear not to support the claim that the average hourly wages of U.S. production workers is $14.32 based on a sample of 75 and an alpha of 0.10.

10.   The EPA releases figures on urban air soot in several selected cities in the USA. For the city of St. Louis, the EPA claims that the average number of micrograms of suspended particles per cubic meter of air is 82. Assume the population standard deviation is 9.18. To test this, an independent agency selected a random sample of 32 readings of air soot. The sample average was found to be 78.125. They plan to test the EPA'a claim at the alpha of 0.05 level. What conclusion should be reached about the claim using the critical value method?

ANSWER: Ho: μ = 82
                    Ha: μ ≠ 82

Reject Ho: The data does not appear to support the EPA's claim that the average number of micrograms of suspended particles per cubic meter of air is 82 based on a sample of 32 and an alpha of 0.05.

11.   According to a study several years ago by PCI, the average wireless phone user earns no more than $62,600 per year. Suppose a researcher believes that the average annual earning of a wireless phone user are higher now, and he sets up a study to test this. The researcher randomly samples 48 wireless phone users and finds an average annual salary for this sample of $64,820, with a standard deviation pf $7810.   Using the p-value method, what conclusion should the researcher reach, assuming they want to test the hypothesis with a significance level of 0.01?

ANSWER: Ho: μ ≤ 62,600
                    Ha: μ > 62,600

Fail to Reject Ho: The data appears to support the claim that the average wireless phone user earns no more than $62,600 per year based on a sample of 48 and an alpha of 0.01.

12. A manufacturing firm has been averaging at least 18.2 orders per week for several years. However, during a recession, orders appeared to slow. Suppose the firm's production manager randomly samples 32 weeks and finds a sample mean of 17.6 orders, with a standard deviation of 2.3 orders. Test to determine whether the average number of orders is down by using the critical value method and an alpha of 0.05.

   ANSWER: **Ho: μ ≥ 18.2**
   Ha: μ < 18.2

   Fail to Reject Ho: The data appears to support the claim that the number of orders are at least 18.2 per week based on a sample of 32 and an alpha of 0.05.

13. The American Water Works Association claims that the average person in the United States uses 123 gallons of water per day. Suppose that we would like to take a current sample of water usage to see whether the mean water usage has changed from the previously reported 123 gallons. A sample of 40 provided a sample mean of 132.36 gallons. Use a population standard deviation of 27.68 gallons. Develop the null and alternative hypothesis and draw a conclusion using a significance level of .10. Use the confidence interval method.

   ANSWER: **Ho: μ = 123**
   Ha: μ ≠ 123

   Reject Ho: The data appears not to support the claim that the average person in the U.S. uses 123 gallons of water per day based on a sample of 40 and an alpha of 0.10.

14. Suppose that is the past years the average price per square foot for warehouses in the USA has been $32.28. A national real estate investor hires a researcher who randomly samples 39 warehouses that are for sale across the USA and finds that the sample means price per square foot is 31.67, with a standard deviation of $1.29. Use a 5% level of significance and the critical value method to determine if the average price per square foot for warehouses has changed.

   ANSWER: Ho: μ = 32.28
   Ha: μ ≠ 32.28

   Reject Ho: The data appear not to support the claim that the average price per square foot for warehouses is $32.28 based on a sample of 39 and an alpha of 0.05.

15. Suppose a study reports that the average price for a gallon of gasoline is higher than $1.16. You decide to test this claim by randomly selecting 30 gas stations. Your sample produced a mean of $1.21 and a standard deviation of $0.104. Use a 5% level of significance and the p-value method to determine if the average price per gallon is higher than $1.16.

   ANSWER: **Ho: μ ≥ 1.16**
   Ha: μ < 1.16

   Reject Ho: The data appears not to support the claim that the average price per gallon of gasoline is higher than $1.16 based on a sample of 30 and an alpha of 0.05.

16.   The EPA releases figures on urban air soot in several selected cities in the USA. For the city of St. Louis, the EPA claims that the average number of micrograms of suspended particles per cubic meter of air is 82. Assume the population standard deviation is 9.18. To test this, an independent agency selected a random sample of 32 readings of air soot. The sample average was found to be 78.125. They plan to test the EPA'a claim at the alpha of 0.05 level. What conclusion should be reached about the claim using the critical value method?

ANSWER: Ho: μ = 82
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