Student: ____________________	**Instructor:** Andreas Lazari	**Assignment:** Chapter 10.3-Homework
Date: ____________________	**Course:** Math2620 F - Fall 2018	

1. Several years ago, the mean height of women 20 years of age or older was 63.7 inches. Suppose that a random sample of 45 women who are 20 years of age or older today results in a mean height of 64.5 inches.
(a) State the appropriate null and alternative hypotheses to assess whether women are taller today.
(b) Suppose the P-value for this test is 0.06. Explain what this value represents.
(c) Write a conclusion for this hypothesis test assuming an $\alpha = 0.05$ level of significance.

(a) State the appropriate null and alternative hypotheses to assess whether women are taller today.

- ○ **A.** H_0: $\mu = 64.5$ in. versus H_1: $\mu < 64.5$ in.
- ○ **B.** H_0: $\mu = 64.5$ in. versus H_1: $\mu \neq 64.5$ in.
- ○ **C.** H_0: $\mu = 63.7$ in. versus H_1: $\mu \neq 63.7$ in.
- ○ **D.** H_0: $\mu = 64.5$ in. versus H_1: $\mu > 64.5$ in.
- ● **E.** H_0: $\mu = 63.7$ in. versus H_1: $\mu > 63.7$ in.
- ○ **F.** H_0: $\mu = 63.7$ in. versus H_1: $\mu < 63.7$ in.

(b) Suppose the P-value for this test is 0.06. Explain what this value represents.

- ○ **A.** There is a 0.06 probability of obtaining a sample mean height of 63.7 inches or taller from a population whose mean height is 64.5 inches.
- ● **B.** There is a 0.06 probability of obtaining a sample mean height of 64.5 inches or taller from a population whose mean height is 63.7 inches.
- ○ **C.** There is a 0.06 probability of obtaining a sample mean height of 64.5 inches or shorter from a population whose mean height is 63.7 inches.
- ○ **D.** There is a 0.06 probability of obtaining a sample mean height of exactly 64.5 inches from a population whose mean height is 63.7 inches.

(c) Write a conclusion for this hypothesis test assuming an $\alpha = 0.05$ level of significance.

- ○ **A.** Reject the null hypothesis. There is not sufficient evidence to conclude that the mean height of women 20 years of age or older is greater today.
- ○ **B.** Reject the null hypothesis. There is sufficient evidence to conclude that the mean height of women 20 years of age or older is greater today.
- ○ **C.** Do not reject the null hypothesis. There is sufficient evidence to conclude that the mean height of women 20 years of age or older is greater today.
- ● **D.** Do not reject the null hypothesis. There is not sufficient evidence to conclude that the mean height of women 20 years of age or older is greater today.

2. A college entrance exam company determined that a score of 23 on the mathematics portion of the exam suggests that a student is ready for college-level mathematics. To achieve this goal, the company recommends that students take a core curriculum of math courses in high school. Suppose a random sample of 200 students who completed this core set of courses results in a mean math score of 23.3 on the college entrance exam with a standard deviation of 3.7. Do these results suggest that students who complete the core curriculum are ready for college-level mathematics? That is, are they scoring above 23 on the math portion of the exam? Complete parts a) through d) below.

---

a) State the appropriate null and alternative hypotheses. Fill in the correct answers below.

The appropriate null and alternative hypotheses are H_0: (1) μ (2) $=$ 23 versus H_1: (3) μ (4) $>$ 23.

b) Verify that the requirements to perform the test using the t-distribution are satisfied. Check all that apply.

- [x] **A.** The sample size is larger than 30.
- [x] **B.** The students' test scores were independent of one another.
- [x] **C.** The students were randomly sampled.
- [ ] **D.** None of the requirements are satisfied.

c) Use the P-value approach at the $\alpha = 0.10$ level of significance to test the hypotheses in part (a).

From TI 83/84
$t_0 = 1.1466596 \approx 1.15$
P-Value $= 0.126449 \approx 0.126$

Identify the test statistic.

$t_0 =$ 1.15 (Round to two decimal places as needed.)

Identify the P-value.

P-value = 0.126 (Round to three decimal places as needed.)

d) Write a conclusion based on the results. Choose the correct answer below.

(5) Do not reject the null hypothesis and claim that there (6) is not sufficient evidence to conclude that the population mean is (7) greater than 23.

(1) ○ $\bar{x}$ ● μ

(2) ○ < ○ > ○ ≤ ○ ≥ ● =

(3) ● μ ○ $\bar{x}$

(4) ○ = ● > ○ ≥ ○ < ○ ≤

(5) ○ Reject ● Do not reject

(6) ○ is ● is not

(7) ○ less ● greater

---

3. In a study, researchers wanted to measure the effect of alcohol on the hippocampal region, the portion of the brain responsible for long-term memory storage, in adolescents. The researchers randomly selected 14 adolescents with alcohol use disorders to determine whether the hippocampal volumes in the alcoholic adolescents were less than the normal volume of 9.02 cm^3. An analysis of the sample data revealed that the hippocampal volume is approximately normal with $\bar{x} = 8.03$ cm^3 and $s = 0.8$ cm^3. Conduct the appropriate test at the $\alpha = 0.01$ level of significance.

State the null and alternative hypotheses.

H_0: μ (1) = 9.02

H_1: μ (2) < 9.02

(Type integers or decimals. Do not round.)

From TI83/84

$t_0 = -4.630301 \approx -4.63$

P-value = 2.3552388E^{-4}

= 0.00023552388

≈ 0.000

Identify the t-statistic.

t_0 = −4.63 (Round to two decimal places as needed.)

Identify the P-value.

P-value = 0.000 (Round to three decimal places as needed.)

Make a conclusion regarding the hypothesis.

(3) Reject the null hypothesis. There (4) is sufficient evidence to claim that the mean hippocampal volume is (5) less than 9.02 cm^3.

(1) ○ ≠ ○ < ○ > ● =

(2) ○ = ○ > ○ ≠ ● <

(3) ○ Fail to reject ● Reject

(4) ● is ○ is not

(5) ● less than ○ equal to ○ greater than

4. A credit score is used by credit agencies (such as mortgage companies and banks) to assess the creditworthiness of individuals. Values range from 300 to 850, with a credit score over 700 considered to be a quality credit risk. According to a survey, the mean credit score is 705.2. A credit analyst wondered whether high-income individuals (incomes in excess of $100,000 per year) had higher credit scores. He obtained a random sample of 42 high-income individuals and found the sample mean credit score to be 723.3 with a standard deviation of 82.7. Conduct the appropriate test to determine if high-income individuals have higher credit scores at the $\alpha = 0.05$ level of significance.

State the null and alternative hypotheses.

H_0: μ (1) = 705.2

H_1: μ (2) > 705.2

(Type integers or decimals. Do not round.)

use TI 83/84

$t_0 = 1.418396695 \approx 1.42$

P-value = 0.0818159 ≈ 0.082.

Identify the t-statistic.

t_0 = 1.42 (Round to two decimal places as needed.)

Identify the P-value.

P-value = 0.082 (Round to three decimal places as needed.)

Make a conclusion regarding the hypothesis.

(3) Fail to Reject the null hypothesis. There (4) is not sufficient evidence to claim that the mean credit score of high-income individuals is (5) greater than 705.2.

(1) ● =
○ ≠
○ >
○ <

(2) ○ =
● >
○ <
○ ≠

(3) ● Fail to reject
○ Reject

(4) ○ is
● is not

(5) ● greater than
○ less than
○ equal to

5. It has long been stated that the mean temperature of humans is 98.6°F. However, two researchers currently involved in the subject thought that the mean temperature of humans is less than 98.6°F. They measured the temperatures of 50 healthy adults 1 to 4 times daily for 3 days, obtaining 225 measurements. The sample data resulted in a sample mean of 98.2°F and a sample standard deviation of 0.9°F. Use the P-value approach to conduct a hypothesis test to judge whether the mean temperature of humans is less than 98.6°F at the $\alpha = 0.01$ level of significance.

using TI83/84

Note: $n = 225$ Not 50.

State the hypotheses.

H_0: (1) μ (2) $=$ 98.6°F

H_1: (3) μ (4) $<$ 98.6°F

Find the test statistic.

$t_0 = -6.67$

(Round to two decimal places as needed.)

$t_0 = -6.6666667 \approx -6.67$

The P-value is 0.000.

(Round to three decimal places as needed.)

P-Value $= 1.0062E^{-10} = .0000000001006$

≈ 0.000

What can be concluded?

- ● **A.** Reject H_0 since the P-value is less than the significance level.
- ○ **B.** Do not reject H_0 since the P-value is not less than the significance level.
- ○ **C.** Reject H_0 since the P-value is not less than the significance level.
- ○ **D.** Do not reject H_0 since the P-value is less than the significance level.

(1) ○ σ ○ p ● μ

(2) ○ < ○ ≠ ● = ○ >

(3) ○ σ ○ p ● μ

(4) ○ ≠ ○ = ● < ○ >

6. The mean waiting time at the drive-through of a fast-food restaurant from the time an order is placed to the time the order is received is 87.4 seconds. A manager devises a new drive-through system that he believes will decrease wait time. As a test, he initiates the new system at his restaurant and measures the wait time for 10 randomly selected orders. The wait times are provided in the table to the right. If the data is known to be Normaly distributed answer the following questions.

101.3	80.5
69.3	95.7
58.7	87.4
76.0	69.0
64.8	87.3

[1] Click the icon to view the table of correlation coefficient critical values.

Conduct a hypothesis test using the P-value approach and a level of significance of $\alpha = 0.01$.

First determine the appropriate hypotheses.

H_0: (1) μ (2) $=$ 87.4

H_1: (3) μ (4) $<$ 87.4

using TI83/84.

$t = -1.9133232 \approx -1.91$

P-Value $= 0.043996 \approx 0.044$

Find the test statistic.

$t_0 = -1.91$

(Round to two decimal places as needed.)

Find the P-value.

The P-value is 0.044.

(Round to three decimal places as needed.)

Use the $\alpha = 0.01$ level of significance. What can be concluded from the hypothesis test?

- ○ **A.** The P-value is greater than the level of significance so there is sufficient evidence to conclude the new system is effective.
- ○ **B.** The P-value is less than the level of significance so there is not sufficient evidence to conclude the new system is effective.
- ○ **C.** The P-value is less than the level of significance so there is sufficient evidence to conclude the new system is effective.
- ● **D.** The P-value is greater than the level of significance so there is not sufficient evidence to conclude the new system is effective.

1: Critical values

use TI83/84

Sample Size, n	Critical Value
5	0.880
6	0.888
7	0.898
8	0.906
9	0.912
10	0.918
11	0.923
12	0.928
13	0.932
14	0.935
15	0.939

Sample Size, n	Critical Value
16	0.941
17	0.944
18	0.946
19	0.949
20	0.951
21	0.952
22	0.954
23	0.956
24	0.957
25	0.959
30	0.960

(1) μ p σ (2) > ≠ < = (3) μ σ p (4) < = > ≠

7. A golf association requires that golf balls have a diameter that is 1.68 inches. To determine if golf balls conform to the standard, a random sample of golf balls was selected. Their diameters are shown in the accompanying data table. Do the golf balls conform to the standards? Use the $\alpha = 0.01$ level of significance.

[2] Click the icon to view the data table.

First determine the appropriate hypotheses.

H_0: (1) μ (2) = 1.68

H_1: (3) μ (4) ≠ 1.68

(Type integers or decimals. Do not round.)

using TI 83/84

$t_0 = 0.824871124 \approx 0.82$

P-value $= 0.4269706$

≈ 0.427

Find the test statistic.

0.82

(Round to two decimal places as needed.)

Find the P-value.

0.427

(Round to three decimal places as needed.)

What can be concluded from the hypothesis test?

- A. Reject H_0. There is not sufficient evidence to conclude that the golf balls do not conform to the association's standards at the $\alpha = 0.01$ level of significance.
- B. Do not reject H_0. There is not sufficient evidence to conclude that the golf balls do not conform to the association's standards at the $\alpha = 0.01$ level of significance.
- C. Reject H_0. There is sufficient evidence to conclude that the golf balls do not conform to the association's standards at the $\alpha = 0.01$ level of significance.
- D. Do not reject H_0. There is sufficient evidence to conclude that the golf balls do not conform to the association's standards at the $\alpha = 0.01$ level of significance.

2: Data Table

Golf Ball Diameter (inches)

1.682	1.677	1.682
1.685	1.678	1.685
1.684	1.684	1.673
1.685	1.682	1.675

(1) p μ σ (2) ≠ = < > (3) σ μ p (4) ≠ > = <

8. The volume of a stock is the number of shares traded for a given day. Several years ago, a certain company's stock had a mean daily volume of 7.52 million shares, according to a reputable financial news outlet. A random sample of 40 trading days in a recent year was obtained and the volume of shares traded on those days was recorded, with the accompanying results. Complete parts (a) through (d) below.

[3] Click the icon to view the shares data.

Do the appropriate hypothesis testing to check if the the evidence suggest that the volume of this company's stock has changed in recent years. Use an $\alpha = 0.05$ level of significance.

Determine the hypotheses.

using TI83/84

H_0: (1) μ (2) $=$ 7.52

$t = -4.203286 \approx -4.20$

H_1: (3) μ (4) $\neq$ 7.52

P-value = 1.484158E-4

(Type integers or decimals. Do not round.)

$= 0.0001484158$

≈ 0.000

Find the test statistic.

t_0 = -4.20

(Round to two decimal places as needed.)

Find the P-value.

The P-value is 0.000 .

(Round to three decimal places as needed.)

Use the level of significance $\alpha = 0.05$. What can be concluded from the hypothesis test?

(5) Reject H_0. There is (6) sufficient evidence to conclude that the volume of this company's stock has (7) changed in recent years.

3: Shares Data

Volume (millions of shares)	
4.1532	2.8892
4.6229	6.0204
5.6386	6.2775
4.5822	3.9681
5.6905	4.0065
4.4313	11.2345
7.3941	2.5992
9.0556	3.2285
7.9798	4.2763
10.1556	3.2914
3.4188	5.8543
4.5623	2.6153
7.3289	8.1434
9.1722	5.3305
3.6799	4.1806
4.2867	5.3667
5.5448	17.9450
3.7657	5.0502
4.0201	3.1833
3.3797	5.4562

(1) ● μ
○ p
○ σ

(2) ○ >
● =
○ $\neq$
○ <

(3) ● μ
○ p
○ σ

(4) ○ >
○ <
○ =
● $\neq$

(5) ● Reject
○ Do not reject

(6) ○ not sufficient
● sufficient

(7) ○ decreased
○ not changed
○ increased
● changed

1. E. H_0: $\mu = 63.7$ in. versus H_1: $\mu > 63.7$ in.

   B.
   There is a 0.06 probability of obtaining a sample mean height of 64.5 inches or taller from a population whose mean height is 63.7 inches.

   D.
   Do not reject the null hypothesis. There is not sufficient evidence to conclude that the mean height of women 20 years of age or older is greater today.

---

2. (1) μ

   (2) =

   23

   (3) μ

   (4) >

   23

   A. The sample size is larger than 30., B. The students' test scores were independent of one another., C. The students were randomly sampled.

   1.15

   0.126

   (5) Do not reject

   (6) is not

   (7) greater

---

3. (1) =

   9.02

   (2) <

   9.02

   −4.63

   0.000

   (3) Reject

   (4) is

   (5) less than

   9.02

---

4. (1) =

705.2

(2) >

705.2

1.42

0.082

(3) Fail to reject

(4) is not

(5) greater than

705.2

---

5. (1) μ

(2) =

(3) μ

(4) <

− 6.67

0.000

A. Reject H_0 since the P-value is less than the significance level.

---

6. (1) μ

(2) =

(3) μ

(4) <

− 1.91

0.044

D.

The P-value is greater than the level of significance so there is not sufficient evidence to conclude the new system is effective.

---

7. (1) μ

(2) =

1.68

(3) μ

(4) $\neq$

1.68

0.82

0.427

B.

Do not reject H_0. There is not sufficient evidence to conclude that the golf balls do not conform to the association's standards at the $\alpha = 0.01$ level of significance.

---

8. (1) μ

(2) =

7.52

(3) μ

(4) $\neq$

7.52

-4.20

0.000

(5) Reject

(6) sufficient

(7) changed
