HW # 3: Due Thurs 9/19 by 11:59pm ET

Graded

2 Hours, 13 Minutes Late

Student

Ivan Wang

Total Points

10.5 / 15 pts

Question 1

Problem 1

2.5 / 3 pts

✔ **– 0.5 pts** part (c): the conclusion should be written in the context of the problem, i.e., what does rejecting or failing to reject H_0 mean?

Question 2

Problem 2

3 / 4 pts

✔ **– 1 pt** part (b): you constructed a lower interval rather than an upper. conclusion is also incorrect - since $\mu_0 = 125$ is in your interval, the decision should be to not reject.

Question 3

Problem 3

3 / 4 pts

✔ **– 1 pt** part (b): here you need a two-sided confidence interval, which is not the same as "combining" the lower and upper intervals as you seem to be doing. Also, here you seem to explain how to use the interval to corroborate part (a) answer, however this part asks you to explain why you *can not* use the two-sided interval to directly answer part (a).

Question 4

Problem 4

2 / 4 pts

✔ **– 1 pt** part (a): hypotheses should be that *variance* is 3 versus greater than 3, but yours are expressed in terms of *standard deviation*.

✔ **– 1 pt** part (b): incorrect interval. you appear to be taking both lower bounds provided, which are the lower bound of the interval using two different methods. Instead, you should take the lower bound for the chi-square method and write the interval as either $(1.77, \infty)$ (for σ) or as $(1.77^2, \infty)$ (for σ^2).

Questions assigned to the following page: 1 and 2

① a) $H_0: \mu = 10$ vs $H_1: \mu \neq 10$, $Z_0 = 1.25$

$P(Z > 1.25) = 0.1056$

p-value $= 2 \cdot 0.1056 = 0.2112$

b) $H_0: \mu = 10$ vs $H_1: \mu > 10$, $n = 20$, $t_0 = 2$

degrees of freedom $= 20 - 1 = 19$

minitab: $P(T \leq 2) = 0.969999$

$P(T > 2) \approx 1 - 0.969999 = 0.030001$

c) $\alpha = 0.05$

For ⓐ, since $0.2112 > 0.05$, we failed to reject H_0

For ⓑ, since $0.030001 < 0.05$, we reject H_0

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② $\sigma = 4$, $n = 12$, $\mu = 127$

ⓐ $H_0: \mu = 125$

$H_a: \mu > 125$

$$Z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}} = \frac{127 - 125}{4/\sqrt{12}} = \frac{2}{4/\sqrt{12}} =$$

$\boxed{Z_0 = 1.732050808}$

Use Minitab - One-sample Z : p-value ≈ 0.042

Since the p-value of $0.042 < 0.05$, we ~~fail to~~ reject H_0. There is evidence that the mean tensile strength is greater than 125 psi.

Question assigned to the following page: 2

(b) ~~One-sided upper = $\hat{p} - Z_{\alpha}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \le p$~~

one sided upper $= \bar{X} - Z_{\alpha} \cdot \frac{\sigma}{\sqrt{n}} \le \mu$

$$127 + 1.73 \cdot \frac{4}{\sqrt{12}} \approx 127 + 1.9976319314$$

$$\approx 128.997631931$$

The upper 95% confidence limit is approximately 128.997631931 psi

This 95% upper confidence interval doesn't contain the hypothesized mean of 125 psi, which supports rejecting the H_0.

Question assigned to the following page: 3

Problem 3.
A machine is used to fill containers with a liquid product. Fill volume can be assumed to be normally distributed. A random sample of ten containers is selected, and the net contents (in ounces) are as follows: 12.04, 12.00, 12.02, 12.01, 12.03, 11.99 , 11.97, 12.01, 12.06, 11.90.

(a) Suppose that the manufacturer wants to be confident that the mean net contents exceeds 12oz (which is what is displayed on the product label). What conclusion can be drawn from the data? Include the value of the test statistic, the p-value, and a well-written conclusion.

One-Sample T: X

Descriptive Statistics

N	Mean	StDev	SE Mean	95% Lower Bound for μ
10	12.0030	0.0442	0.0140	11.9774

μ: population mean of X

Test

Null hypothesis	H_0: $\mu = 12$
Alternative hypothesis	H_1: $\mu > 12$

T-Value	P-Value
0.21	0.417

Since p-value = 0.417 is greater than significance level = 0.05, we fail to reject H0. There's not enough evidence to conclude that the mean net content exceeds 12oz.

Questions assigned to the following page: 3 and 4

(b) Construct a 95% two-sided confidence interval for the mean fill volume. Can this interval be used directly to answer part (a)? Explain why or why not.

Descriptive Statistics

N	Mean	StDev	SE Mean	95% Lower Bound for μ
10	12.0030	0.0442	0.0140	11.9774

μ: population mean of X

Descriptive Statistics

N	Mean	StDev	SE Mean	95% Upper Bound for μ
10	12.0030	0.0442	0.0140	12.0286

μ: population mean of X

CI: (11.9774, 12.0286)
This CI can help with part(a) because the CI(11.9774, 12.0286) includes that value 12 and that supports the conclusion of the hypothesis test. Since the confidence interval does not entirely lie above 12 oz, it aligns with the conclusion that we do not have sufficient evidence to assert that the mean net contents exceeds 12 oz.

Problem 4.
An experiment was conducted to investigate the filling capability of packaging equipment at a winery. Twenty bottles of wine were randomly selected and the fill volume (in ml) measured. Assume that fill volume is normally distributed. The data are contained in the variable `fill_volume` in the `hw_data.xlsx` file.

(a) Do the data support the claim that the variance of fill volume is more than 3 ml? Include the value of the test statistic, the p-value, and a well-written conclusion.

Question assigned to the following page: 4

Test and CI for One Variance: fill_volume

Descriptive Statistics

N	StDev	Variance	95% Lower Bound for σ using Bonett	95% Lower Bound for σ using Chi-Square
20	2.23	4.96	1.36	1.77

Test

Null hypothesis	H_0: σ = 3
Alternative hypothesis	H_1: σ > 3

Method	Test Statistic	DF	P-Value
Bonett	—	—	0.875
Chi-Square	10.47	19	0.940

Since P-value = 0.940 > 0.05, we fail to reject Ho. There is no evidence that the variance of fill volume is more than 3 ml.

(b) Find an appropriate 95%confidence interval that can be used to support your answer to (a).

CI: (1.36, 1.77)
Since the CI is less than 3 ml, this supports the conclusion that the variance of the fill volume does not exceed 3ml.